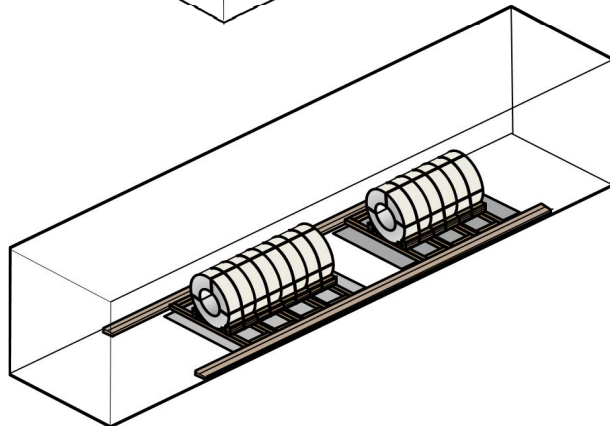
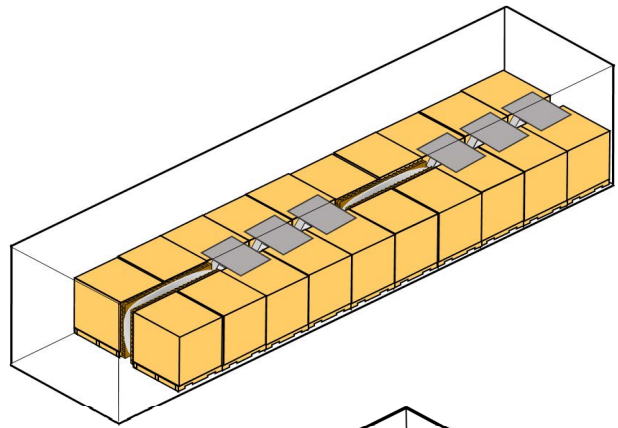
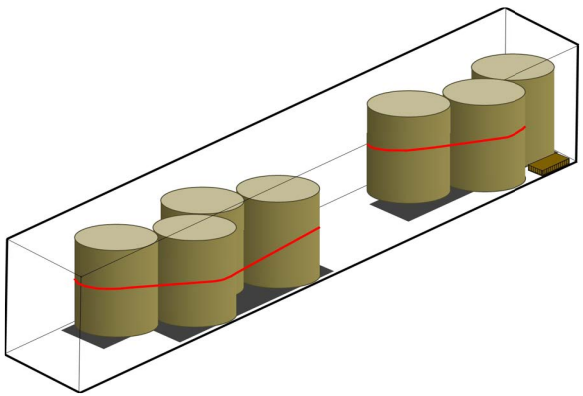


Intermodal Loading Guide for Products in Closed Containers and Trailers



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425 Third Street SW
Washington, DC 20024

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Intermodal Loading Guide for Products in Closed Containers and Trailers

**Supersedes: AAR Circular 43-G Issued May 2017
Intermodal Loading Guide Issued January 2016, and
General Information Series 755, 768, 778, 783, 784, 787, 797, 798, 799, 800, 817,
822, 824, 827, 833, 834, 835, 852, 861, and 872**

**Published by
MxV Rail
350 Keeler Parkway
Pueblo, CO 81001**

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METHODS RECOMMENDED FOR HAZARDOUS MATERIALS LOADING



The methods listed below have been recommended for hazardous materials loading by the Damage Prevention and Freight Claim Committee. They are found in [Section 6.0](#) of this publication. Those marked with an asterisk (*) have been impact tested to 8 MPH.

6.2 Drums and IBCs

Number	Loading Method	Hazmat
6.2.1	Drum Loads Secured with Ty-Gard 2000® or DS® Barriers (Former method B-1)	HM
6.2.2	Fiberboard IBCs for Liquids Secured with Ty-Gard 2000® (Former method B-7)	HM
6.2.3	Drum Loads Secured by Ty-Gard 2000® or DS® Barriers in 20-ft. ISO Containers (Former methods B-8 and B-9)	HM
6.2.6	Drum Load Secured with “T” Braces in 20-ft Containers (Former method G-2)	HM*
6.2.7	Fifty-Five Gallon Drums with Wood Blocking and Bracing (Former methods G-3 and G-4)	HM*
6.2.8	Tight-Head Steel, 55-Gallon Drums, Secured with Cordstrap® Composite Strapping (CC) 105 in 20-ft. ISO Containers (Former method I-1)	HM
6.2.10	Tight - Head Steel or Plastic, 55-Gallon Drums Secured with Carolina Strapping and Buckles Company Woven Strapping (CS) 2040 in 20-ft ISO Containers (Former method I-2 and I-3)	HM

6.3 Mixed Loads

Number	Loading Method	Hazmat
6.3.1	Mixed Loads Secured with Ty-Gard 2000® or DS® (Former method B-2)	HM*
6.3.2	Double-Layer Loads Secured with Ty-Gard 2000® or DS® (Former method B-3)	HM*
6.3.3	Double-Layer Loads of Hazardous or Nonhazardous Materials Secured with Cordstrap® Barriers in 20-ft. Containers (Former method I-4)	HM
6.3.4	Hazardous or Nonhazardous Loads Secured with Cordstrap® Barriers in 40-ft. Containers (Former method I-5)	HM

6.5 Palletized Freight & Bulk Bins

Number	Loading Method	Hazmat
6.5.1	Bulk Boxes Secured with Floor Blocking and Ty-Gard 2000® or DS® Barriers (Former method B-6, cancels GIS 798)	HM*

Special Bulkhead Braces

Information on and illustrations of special bulkhead braces are available from the Association of American Railroads by contacting Damage Prevention and Loading Services at dpls@aar.com. These bulkhead braces are approved but rarely used. The information is available for shippers who may need a system to ship special hazardous materials like ammunition or explosives.

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1.0 INTRODUCTION

1.1 General

1.1.1 The *Intermodal Loading Guide for Products in Closed Containers or Trailers* is intended to be a singular manual for loading of commodities in containers and trailers for shipment by rail. Incorporated into this publication are links to AAR Circular - No. 43 *Rules Governing the Loading, Blocking, and Bracing of Freight in Closed Containers and Trailers In Intermodal Service* (latest edition).

1.1.2 The loading methods in individual loading publications issued by the AAR 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. In addition, each carrier may have its own requirements. Contact your origin carrier for more information.

1.1.3 Compliance with the *Intermodal Loading Guide* contained herein will ensure conformance with Circular No. 43-H (or latest edition) rules and provide adequate protection for freight from sources of damage in the normal railroad environment.

1.1.4 The general rules as contained in Circular 43-H or supplements thereto issued by the AAR are formulated for the purpose of providing safe methods of loading in closed containers or trailers and must be observed. References to, or illustrations of, intermodal equipment in this publication include both containers and trailers. Shipper is defined in these rules as that party (or his agent) who is responsible for the physical loading and securement in the container or trailer.

1.1.5 The general information and loading methods contained in this publication apply to shipments transported in the USA, Canada, and Mexico.

1.1.6 The securement standards specified in AAR closed container/trailer loading publications are intended for safe transit of the container/trailer and railcar from origin to destination and for prevention of freight and equipment damage. These standards do not address unloading practices.

1.1.7 There can be differences between the loading and securement of freight in containers or trailers. Ensure the type of equipment prior to loading. If not able to confirm equipment type during equipment inspection please contact the equipment provider.

1.1.8 If loading procedures, illustrations, or principles contained in this publication appear not to cover a specific shipment being tendered for intermodal movement, contact the origin carrier's loss and damage prevention representative for assistance and/or instructions.

1.1.9 For information on container and trailer equipment standards reference AAR *Manual of Standards and Recommended Practices - M930* and AAR *Manual of Standards and Recommended Practices - M931*.

1.1.10 Wherever gallons are identified in this document, the term refers to US gallons. For other units, reference conversion charts in [Appendix A](#).

1.1.11 Loading and bracing methods not currently approved may receive consideration for approval and publication under General Information Bulletin (GIB) No. 2 - *Rules and Procedures for Testing of New Loading and Bracing Methods or Materials* (current edition). Submit request to Damage Prevention and Freight Claims Committee Manager, dpls@aar.com.

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

1.2 Reference Documents

NOTE: For the latest updates to these reference documents go to www.aar.com/standards/damage-publications.php

1.2.1 Circular No. 43-H (or supplements thereto)

“Rules Governing the Loading, Blocking, and Bracing of Freight in Closed Containers or Trailers in Intermodal Service” - This publication contains the requirements covering loads in containers or trailers.

1.2.2 Circular No. 42-P (or supplements thereto)

“General Rules Governing the Loading of Carload Shipments of Commodities in Closed Cars” - This publication provides minimum loading standards for freight in closed railcars.

1.2.3 AAR Open Top Loading Rules Manual, Section 7

“Rules for Loading All Commodities on Open Top Trailers and Containers for Rail Transport,”
<https://my.aar.org/OTLR>

1.2.4 AAR Manual of Standards and Recommended Practices (MSRP) - M930 & M931

<https://aarpublications.com/msrp.html>

1.3 Rail Transportation Environment

1.3.1 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 flatcar or well-car'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 wheels on the rail, the truck geometry, rail joints, rail elasticity, non-uniformities 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.

1.3.2 Containers or trailers may move in a backwards or reverse direction for all or a portion of their journey.

1.3.3 During its journey, normal transportation forces may shift an unsecured load or cause freight to exert excessive pressure against the nose, rear doors, or sidewalls.

1.3.4 Freight that is improperly blocked and braced can shift to one side of the vehicle and cause the vehicle to lean on the flatcar/well car. A container or trailer leaning on rail can cause a sideswipe or contribute to a derailment.

1.3.5 Weight of a load that is concentrated in a small area and not properly distributed throughout the container or trailer can also cause a vehicle floor to collapse. See [Section 1.7](#).

1.4 Container (COFC) Commodity Loading Information

1.4.1 Container Sizes and Types

1.4.1.1 Containers are temporarily loaded onto wheeled chassis for over the road transportation and will likely be removed from the chassis for rail transportation. Individual container marks will typically end with a “U”. Container walls can be constructed with contoured corrugated sidewalls.

1.4.1.2 Intermodal containers interior dimension ranges, shown in [Table 1.1](#), are for load planning purposes only. Actual container dimensions should be measured in the container or referenced from the container builder's plate.

Table 1.1 Dimension range of containers

Type	Interior Length Range:	Inside Width Range:	Inside Height Range:	Door Width Range:	Door Height Range:
20 ft	19 ft 4 in. 19 ft 5 in.	7 ft 8 in. 7 ft 9 in.	7 ft 10 in. 7 ft 11 in.	7 ft 8 in.	7 ft 5 in. 7 ft 6 in.
40 ft	39 ft 4 in. 39 ft 6 in.	7 ft 7 in. 7 ft 8 in.	7 ft 10 in. 8 ft 10 in.	7 ft. 7 ft 8 in.	7 ft 5 in. 8 ft 6 in.
45 ft	44 ft 5 in. 44 ft 6 in.	7 ft 8 in. 8 ft 2 in.	8 ft 10 in. 8 ft 11 in.	7 ft 8 in. 8 ft 2 in.	8 ft 5 in. 8 ft 11 in.
48 ft	47 ft 3 in. 47 ft 6 in.	8 ft 1 in. 8 ft 4 in.	8 ft 10 in. 9 ft 2 in.	8 ft 1 in. 8 ft 4 in.	8 ft 9 in. 9 ft 2 in.
53 ft	52 ft 3 in. 52 ft 6 in.	8 ft 1 in. 8 ft 3 in.	8 ft 6 in. 9 ft 2 in.	8 ft 1 in. 8 ft 3 in.	8 ft 6 in. 9 ft 2 in.

1.4.2 Maximum Weights

The load weight must not exceed the limit as stated on the builder's badge plate. Combined weight of container and freight may not exceed the weight specified below for the length of container being loaded. See [Table 1.2](#).

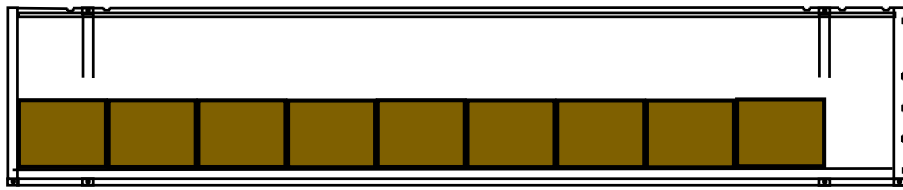
Table 1.2 Maximum Gross Weight Rating (MGWR) for containers (freight weight plus tare weight)
AAR Manual of Standards and Recommended Practices - M930

Nominal Length (ft)	Maximum Gross Weight Rating (MGWR) (lb)
53	67,200
48	67,200
45	67,200
40	67,200
20	52,900

1.4.3 Weight Distribution

1.4.3.1 Commodity weight in containers (dry container/non-insulated) must be evenly distributed both crosswise and lengthwise, and combined weight of freight and container must conform to all federal, state, provincial, and local regulations and transportation service requirements used at origin and to final destination. Commodity weight must be evenly distributed for container lifting onto and off chassis and railcar equipment. See [Figure 1.1](#).

1.4.3.2 Loading patterns are to be designed to distribute 25,000 lbs uniformly distributed over any 10 linear ft within the container. See [Figure 1.2](#).



UNIFORMLY DISTRIBUTE THE WEIGHT OF THE LOAD ACROSS THE LENGTH AND WIDTH OF THE CONTAINER OR TRAILER

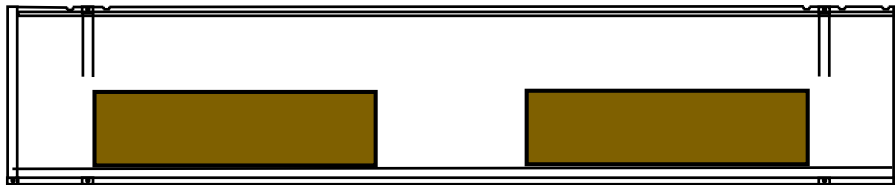


Figure 1.1 Weight distribution

LOAD NO MORE THAN 25,000 LBS. UNIFORMLY DISTRIBUTED IN ANY 10 LINEAR FT. USE RUNNERS PLACED A MINIMUM 4 FT. APART TO DISTRIBUTE CONCENTRATED WEIGHT LOADS.



CONTAINER

Figure 1.2 Concentrated weight distribution

1.4.4 Center of Gravity (CG)

1.4.4.1 Commodities or shipments with a high vertical center of gravity (CG) or an unstable narrow base, must be secured to prevent tipping or crosswise movement in transit. Avoid stacking heavier shipping units on top of lighter shipping units.

1.4.4.2 If the height of load exceeds 90 percent of the interior container height, or, if heavier freight is loaded on the top of lighter freight, contact your origin rail carrier for assistance.

Example:

- The container is 7 ft 10 in. (94 in.) high inside;
- The freight is 7 ft 4 in. (88 in.) in height.
- $88 / 94 = 0.94$, or 94 percent.
- Contact your origin rail carrier.

1.4.4.3 For additional reference information on calculating CG, visit <http://www.aar.com/standards/damage-training.php>.

1.5 Trailer (TOFC) Commodity Loading Information

1.5.1 Trailer Sizes and Type

1.5.1.1 Trailers (dry/non-insulated) have permanently attached tandems (rear wheels) and landing gear and will be shipped on rail with the trailer underframe. Individual trailer marks will typically end with a “Z”. Trailer walls are typically smooth sided and will be constructed with panels of various materials

1.5.1.2 Intermodal trailers interior dimension ranges, shown in [Table 1.3](#), are for load planning purposes only. Actual trailer dimensions should be measured in the trailer or referenced from the trailer builder's plate.

Table 1.3 Dimension range of trailers

Type	Interior Length Range:	Inside Width Range:	Inside Height Range:	Door Width Range:	Door Height Range:
28 ft	27 ft 3 in.	8 ft 4 in.	8 ft 11 in.	7 ft 9 in.	8 ft 8 in.
40 ft	39 ft 3 in.	7 ft 8 in.	8 ft 10 in.	7 ft 8 in.	8 ft 5 in.
45 ft	44 ft 3 in. 44 ft 7 in.	7 ft 7 in. 8 ft 3 in.	8 ft 8 in. 9 ft 2 in.	7 ft 6 in. 8 ft 2 in.	8 ft 7 in. 9 ft 2 in.
48 ft	47 ft. 47 ft 5 in.	8 ft 2 in. 8 ft 3 in.	8 ft 11 in. 9 ft 2 in.	8 ft 2 in.	8 ft 8 in. 9 ft 2 in.
53 ft	52 ft 4 in. 52 ft 5 in.	8 ft 2 in.	9 ft 1 in. 9 ft 2 in.	8 ft. 8 ft 2 in.	9 ft 1 in. 9 ft 2 in.

1.5.2 Maximum Weights

The load weight must not exceed the limit as stated on the manufacturer's builder's plate. Combined weight of trailer and loading may not exceed 65,000 lbs. Legal limitations pertaining to maximum gross and axle weights for highway movement must also be considered. See [Figure 1.3](#).

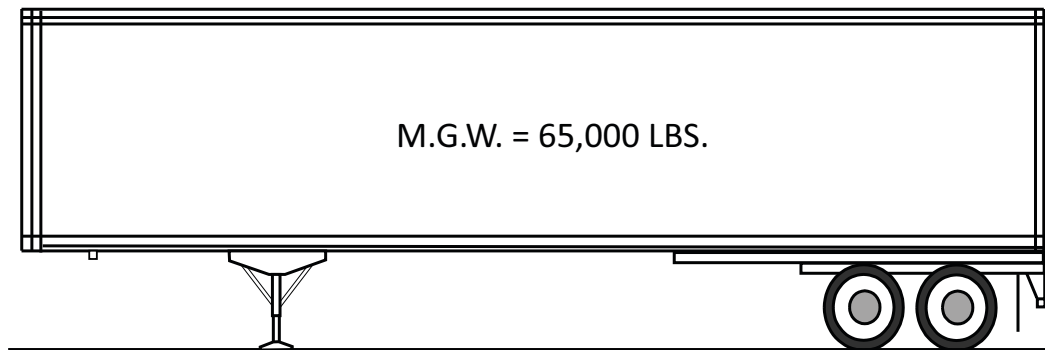


Figure 1.3 Weight - Maximum Gross Trailer - TOFC
AAR Manual of Standards and Recommended Practices - M931

Table 1.4 Maximum Gross Weight Rating (MGWR) for TOFC
AAR Manual of Standards and Recommended Practices - M931

Nominal Length (ft.)	Maximum Gross Weight Rating (MGWR) (lb) (freight plus tare)
28	36,000

1.5.3 Weight Distribution

1.5.3.1 Commodity weight in trailers must be evenly distributed both crosswise and lengthwise, and combined weight of the freight and trailer must conform to all federal, state, provincial, and local regulations and transportation service requirements used at origin and to final destination. Commodity weight must be evenly distributed for trailer lifting onto and off railcar equipment. See [Table 1.4](#).

1.5.3.2 Loading patterns are to be designed to distribute 25,000 lbs uniformly distributed over any 10 linear ft within the trailer. See [Figure 1.4](#).

LOAD NO MORE THAN 25,000 LBS. UNIFORMLY DISTRIBUTED IN ANY 10 LINEAR FT. USE RUNNERS PLACED A MINIMUM 4 FT. APART TO DISTRIBUTE CONCENTRATED WEIGHT LOADS.

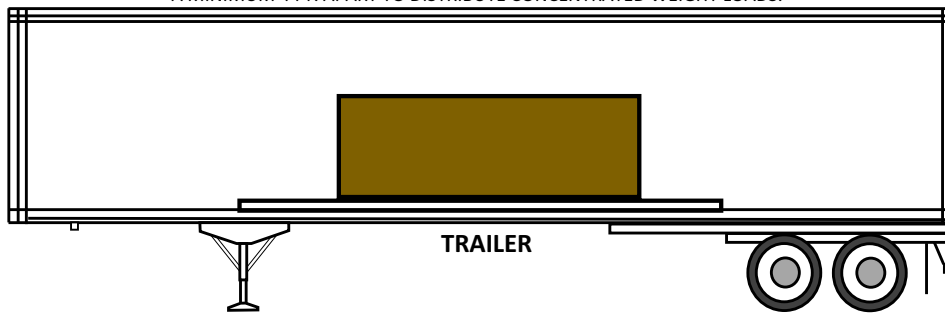


Figure 1.4 Floor strength - concentrated and uniformly distributed load - trailers

1.5.4 Center of Gravity (CG)

1.5.4.1 Commodities or shipments with a high vertical center of gravity (CG) or an unstable narrow base, must be secured to prevent tipping or crosswise movement in transit. Avoid stacking heavier shipping units on top of lighter shipping units.

1.5.4.2 If the height of load exceeds 90 percent of the interior container height, or, if heavier freight is loaded on the top of lighter freight, contact your origin rail carrier for assistance.

Example:

- The container is 7 ft 10 in. (94 in.) high inside;
- The freight is 7 ft 4 in. (88 in.) in height.
- $88 / 94 = 0.94$, or 94 percent.
- Contact your origin rail carrier.

1.5.4.3 For additional reference information on calculating CG, visit <http://www.aar.com/standards/damage-training.php>.

1.6 Refrigerated - Insulated Equipment Commodity Loading Information

1.6.1 Refrigerated - Insulated Equipment Sizes and Types

1.6.1.1 Refrigerated - insulated equipment loaded for rail transportation have listed interior dimension range for load planning purposes. Actual equipment dimensions should be measured in the equipment or referenced from the builder's plate. See [Table 1.5](#).

Table 1.5 Dimension range of refrigerated - insulated equipment

Type	Interior Length Range:	Inside Width Range:	Inside Height Range:	Door Width Range:	Door Height Range:
20 ft	17 ft 11 in.	7 ft 6 in.	7 ft 5 in.	7 ft 6 in.	7 ft 5 in.
40 ft	37 ft 11 in. 38 ft.	7 ft 6 in. 8 ft.	8 ft 2 in. 8 ft 4 in.	7 ft 6 in. 8 ft.	8 ft 2 in.
45 ft	43 ft. 43 ft 8 in.	7 ft 6 in. 8 ft.	8 ft 3 in. 8 ft 4 in.	7 ft 6 in. 8 ft	8 ft 5 in.
48 ft	46 ft 6 in. 47 ft 6 in.	8 ft. 8 ft 5 in.	8 ft 5 in. 8 ft 10 in.	8 ft. 8 ft 2 in.	8 ft 1 in. 8 ft 9 in.
53 ft	49 ft 7 in. 52 ft 4 in.	8 ft. 8 ft 2 in.	8 ft 3 in. 9 ft.	8 ft 1 in. 8 ft 3 in.	8 ft 3 in. 8 ft 11 in.

1.6.1.2 Refrigerated - insulated equipment may not have anchor or lashing points.

1.6.2 Maximum Weight and Weight Distribution

1.6.2.1 The commodity weight must not exceed the limit as stated on the manufacturer's builder's plate. Commodity weight in specialized equipment must be evenly distributed both crosswise and lengthwise, and combined weight of commodity, container or trailer, and specialized equipment must conform to all federal, state, provincial, and local regulations and transportation service requirements used at origin and to final destination. Commodity weight must be distributed for container or trailer lifting onto and off chassis and railcar equipment.

1.6.2.2 Commodity weight must be distributed in compliance with the type (container or trailer) and size of equipment with additional calculation for the refrigeration unit and the impact it will have on weight distribution and longitudinal center of gravity. Concentrated weight shipments in refrigerated - insulated equipment are to follow an approved loading pattern or contact the origin carrier for further information.

1.6.3 Center of Gravity (CG)

1.6.3.1 Commodities or shipments with a high vertical center of gravity (CG) or an unstable narrow base, must be secured to prevent tipping or crosswise movement in transit. Avoid stacking heavier shipping units on top of lighter shipping units.

1.6.3.2 If the height of load exceeds 90 percent of the interior container height, or, if heavier freight is loaded on the top of lighter freight, contact your origin rail carrier for assistance.

Example:

- The container is 7 ft 10 in. (94 in.) high inside;
- The freight is 7 ft 4 in. (88 in.) in height.
- $88 / 94 = 0.94$, or 94 percent.
- Contact your origin rail carrier.

1.7 Concentrated Loads

NOTE: Individual carrier approval must be obtained when shipping products of concentrated weight greater than 3,500 lbs. Information below is for planning purposes and must be confirmed by the carriers in the routing.

1.7.1 Coiled steel and other dense products may have concentrated weight when exceeding 3,500 lbs. per every 13.32 ft² of floor area (48 in. x 48 in. pallet floor area). See [Table 1.6](#) for weight and floor area information. Commodities with concentrated weight must be loaded to distribute the weight evenly across the container or trailer floor. See [Figure 1.5](#). Validate that the container or trailer equipment selected for concentrated weight loading is appropriate for this type of loading and contact the equipment owner for confirmation for this loading type. Contact the origin rail carrier for approval for concentrated weight loading and to conform to each individual carriers' specific tariffs, rules, or restrictions.

1.7.2 A minimum of three runners each 2.7 ft long, based on 4 ft lateral runner spacing (measured from the center of the left-most runner to the center of the right-most runner) are required for each skid or pallet for steel coils and similar products of concentrated weight weighing up to 3,500 lbs. Depending on the pallet or skid design, size, and runner spacing, the pallet or skid may be able to provide the needed weight distribution. If not, longer runners will need to be added under the shipping item. See [Section 3.2.3](#) for more detailed information on pallet and skid construction.

1.7.3 [Table 1.6](#) may be used as a guideline when shipping dense products greater than 3,500 lbs. (See [Figure 1.5](#)). Load no more than 25,000 lbs. uniformly distributed from side-to-side in any 10 lengthwise ft in a container or trailer loaded for intermodal service. This example is reflected in the bottom-right value in [Table 1.6](#).

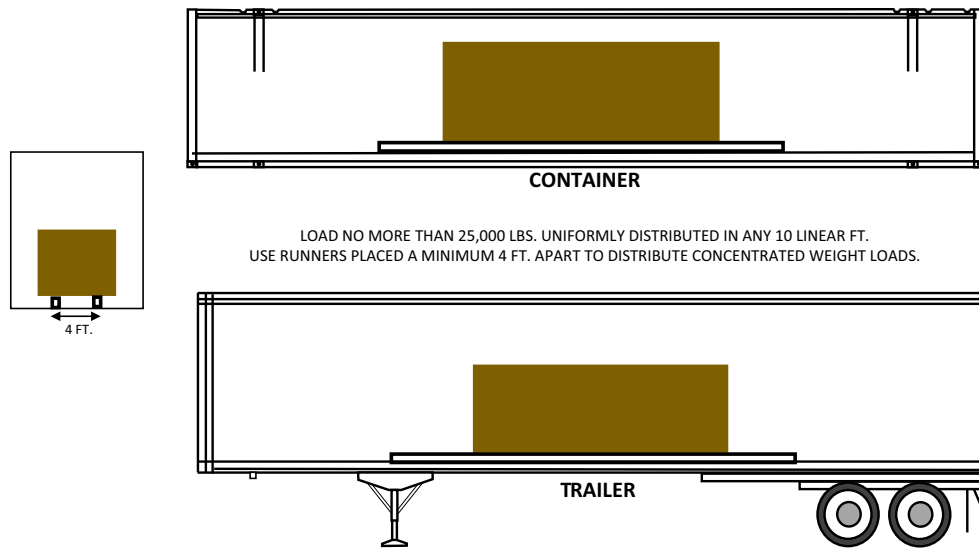


Figure 1.5 Weight distribution for concentrated weights

1.7.4 For the example in [Figure 1.5](#), a 25,000 lb. piece of freight is loaded on runners laterally spaced 4 ft apart. Per [Table 1.6](#), these runners would need to be a minimum of 20.4 ft in length.

Table 1.6 Guide to minimum required length of lengthwise runners

GUIDE TO THE MINIMUM REQUIRED LENGTH OF LENGTHWISE RUNNERS					
Freight Weight	Lateral Spacing of Lengthwise Runners				
	4 ft	5 ft	6 ft	7 ft	8 ft
3, 500 - 4,000 lbs	3.3	2.6	2.2	1.9	1.6
5,000 lbs	4.1	3.3	2.7	2.3	2
6,000 lbs	4.9	3.9	3.3	2.8	2.5
7,000 lbs	5.7	4.6	3.8	3.3	2.9
8,000 lbs	6.5	5.2	4.4	3.7	3.3
9,000 lbs	7.4	5.9	4.9	4.2	3.7
10,000 lbs	8.2	6.5	5.4	4.7	4.1
11,000 lbs	9	7.2	6	5.1	4.5
12,000 lbs	9.8	7.8	6.5	5.6	4.9
13,000 lbs	10.6	8.5	7.1	6.1	5.3
14,000 lbs	11.4	9.2	7.6	6.5	5.7
15,000 lbs	12.3	9.8	8.2	7	6.1
16,000 lbs	13.1	10.5	8.7	7.5	6.5
17,000 lbs	13.9	11.1	9.3	7.9	6.9
18,000 lbs	14.7	11.8	9.8	8.4	7.4
19,000 lbs	15.5	12.4	10.3	8.9	7.8
20,000 lbs	16.3	13.1	10.9	9.3	8.2
21,000 lbs	17.2	13.7	11.4	9.8	8.6
22,000 lbs	18	14.4	12	10.3	9

Table 1.6 Guide to minimum required length of lengthwise runners (Continued)

GUIDE TO THE MINIMUM REQUIRED LENGTH OF LENGTHWISE RUNNERS					
Freight Weight	Lateral Spacing of Lengthwise Runners				
	4 ft	5 ft	6 ft	7 ft	8 ft
23,000 lbs	18.8	15	12.5	10.7	9.4
24,000 lbs	19.6	15.7	13.1	11.2	9.8
25,000 lbs	20.4	16.3	13.6	11.7	10.2

1.7.5 For coiled metal products, the lengthwise skid or pallet runner length may equal the coil diameter. If the coil diameter or skid/pallet runner length is less than the minimum runner length required by [Table 1.6](#), the minimum values in [Table 1.6](#) will apply and runners of additional length would be required.

Example 1: Coiled product is 6,000 lbs. and 5 ft in diameter. It is secured to a wooden skid 5 ft x 5 ft. Per [Table 1.6](#), a 6,000 lb. pallet with 5 ft lateral runner spacing needs lengthwise runners with a minimum length of 3.9 ft. No additional length runners would be needed.

Example 2: Coiled product is 10,000 lbs. and 5 ft in diameter. It is secured to a wooden skid 5 ft x 5 ft. Per [Table 1.6](#), a 10,000 lb. commodity with 5 ft lateral runner spacing needs lengthwise runners with a minimum length of 6 1/2 ft. Additional lengthwise runners would be needed.

NOTE: Individual carrier approval must be obtained when shipping products of concentrated weight greater than 3,500 lbs. Information is for planning purposes and must be confirmed by the carriers in the routing.

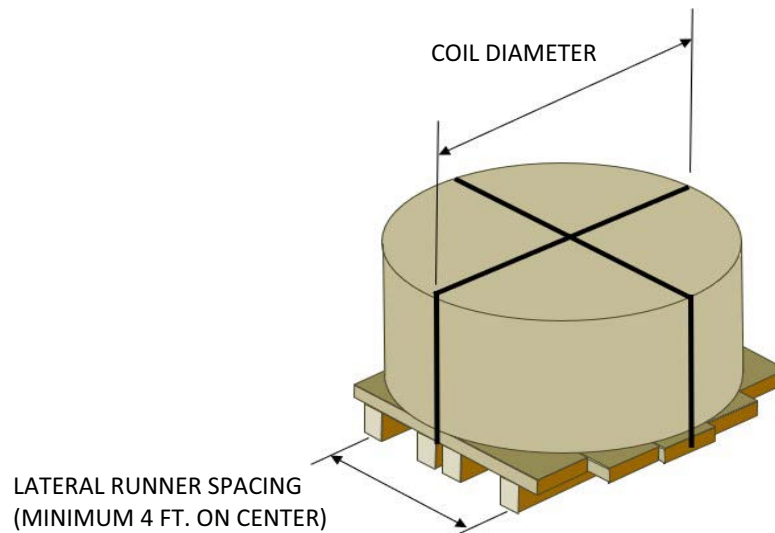


Figure 1.6 Coil diameter and runner spacing

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2.0 HAZARDOUS MATERIALS

2.1 Loading and Restraining Shipments of Hazardous Materials

2.1.1 Loads containing any quantity of hazardous materials/hazardous substances must conform to the regulations of the agency of the countries within which the shipment will move. Some, but not all, regulations are as follows:

- Department of Transportation Regulations as published in Bureau of Explosives Tariff 6000 series and supplements thereto
- Transportation of Dangerous Goods Regulations and supplements thereto as administered by the Transport of Dangerous Goods Directorate (Transport Canada)
- Mexican shipments are governed by Bureau of Explosives Tariff 6000 series and supplements thereto

2.1.2 Carrier is to be specifically informed on shipping orders as to the presence, type, characteristics, and volume of all hazardous materials.

2.1.3 All packages intended for TOFC and COFC shipments of hazardous materials in the United States must meet appropriate US DOT hazardous material regulations concerning packaging specifications, labeling, and marking as specified in CFR Title 49.

2.1.4 In 2018, the AAR Hazardous Materials (Bureau of Explosives) Committee delegated the responsibility for the loading and securement of hazardous materials approvals to the AAR Damage Prevention and Freight Claim Committee. Approved hazardous materials loading and securement methods are identified on the patterns by the Damage Prevention and Loading Services (DPLS) logo for hazardous materials. See [Figure 2.1](#)

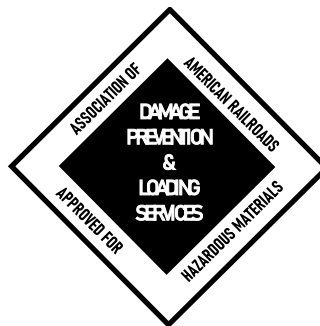


Figure 2.1 Damage Prevention and Loading Services (DPLS) logo for hazardous materials

2.1.5 The manufacturer or the manufacturer's authorized agent of the securement system must provide the shipper with installation instructions to ensure proper installation of the securement system and to prevent the system from failing in-transit.

2.1.6 Pneumatic dunnage (air bags) shall NOT be used to secure shipments or used to prevent lengthwise or crosswise commodity movement of hazardous materials.

2.1.7 All methods included have successfully passed the Association of American Railroad's Standard Impact Tests in force at the time of testing. The maximum impact speed is 6 mph for all hazardous classes except explosives, which has a maximum impact speed of at 8 mph. Those methods that were tested at 8 mph are indicated by an asterisk in the table of contents.

2.1.8 In general, the regulations of the United States Department of Transportation, the National Transportation Agency of Canada, and Transport Canada require that packages of hazardous materials or dangerous commodities be securely loaded, blocked, and braced to prevent them from changing position, falling to the floor, or sliding into each other during transportation. The U.S. regulations, as found in CFR Title 49, read, in part, as follows:

“Sec. 174.55 General Requirements.”

- a. Each package containing a hazardous material being transported by rail in a freight container or transport vehicle must be loaded so that it cannot fall or slide and must be safeguarded in such a manner that other freight cannot fall onto or slide into it under conditions normally incident to transportation. When this protection cannot be provided by using other freight, it must be provided by blocking and bracing.
- b. Each package containing a hazardous material bearing package orientation markings prescribed in Sec. 172.312 of this subchapter must be loaded within a transport vehicle or freight container to remain in the correct position indicated by those markings during transportation.

2.1.9 Container or trailer doors shall not be used to prevent lengthwise commodity movement or as part of the load securement for loads containing hazardous materials. An approved method of load securement must be applied to prevent lengthwise commodity movement.

2.1.10 To ensure that the required placards are visible during the transportation of containers on doublestack cars, it is recommended that the bottom of the placard is at least 5 ft above the bottom rail and at least 5 ft in from the corner post on the sides.

2.2 Special Rules for Explosives

2.2.1 Division 1.1, 1.2, or 1.3 explosives must be loaded, blocked, and braced within or on the truck body or trailer so that packages will not change position under impact from each end at a speed of at least 8.1 mph. Each truck body or trailer must be secured on the railcar so that it will neither permanently change position nor show evidence of failure or impending failure of the trailer securement method when impacted from each end at a speed of at least 8.1 mph. (Ref. 49 CFR §174.101 (o)(2))

2.2.2 For the TOFC or COFC transportation of Division 1.1, 1.2, or 1.3 explosives, trailers or truck bodies must meet the requirements of Part 177 of the Department of Transportation Regulations applicable to shipments of explosives by motor vehicle (Ref. 49 CFR §174.101 (o)(1)), and requirements of AAR interchange rules.

2.2.3 Divisions 1.1 and 1.2 explosives may not be loaded, transported, or stored in a railcar equipped with any type of lighted heater or open-flame device, or electric devices having exposed heating coils. Additionally, Divisions 1.1 and 1.2 explosives may not be loaded in a railcar equipped with any apparatus or mechanism utilizing an internal combustion engine in its operation. (Ref. 49 CFR §174.101 (L), 174.112)

2.2.4 Explosives must not be loaded into trailers or truck bodies equipped with automatic heating or refrigerating machinery unless these are disconnected from the source of power for their operation, and all fuel tanks for heaters or refrigerating machinery are drained. (Ref. 49 CFR §174.101 (o)(5))

2.2.5 Metal floor plates must be completely covered with wood, plywood, fiber, or composition sheets of adequate thickness and strength to prevent contact of the metal floor plates with the packages of explosives during transportation. Covering metal floor plates is not necessary for carload shipments loaded by the Department of Defense provided the explosives are of such nature that they are not liable to leakage of dust, powder, or vapor that might become the cause of an explosion. (Ref. 49 CFR §174.104 (b)(8))

2.2.6 Trailers or containers equipped with mechanical restraining devices must not be used for shipments of explosives (such as TNT, dynamite, black powder, bulk propellant powders, and similar explosives, except as a component part of ammunition or propelling charges) that are liable to shift or become lodged in the mechanism in the event of container failure.

2.3 Special Rules for Flammable Liquids and Gases

Flammable liquids and flammable gases must not be loaded into trailers or truck bodies equipped with any type of lighted heater or open-flame device, nor into a railcar equipped with any apparatus or mechanism using an internal combustion engine in its operation. In addition, they also may not be loaded into a truck body or trailer equipped with any automatic heating or refrigerating apparatus, unless it is of the non-sparking or explosion-proof types. There should be no combustion apparatus in the lading space and no connection for return of air from the lading space to any combustion apparatus. No part of the lading may be heated over 129 °F (54 °C). (Ref. 49 CFR §174.200, §174.300).

3.0 LOADING INFORMATION

3.1 Load Planning

3.1.1 General Information

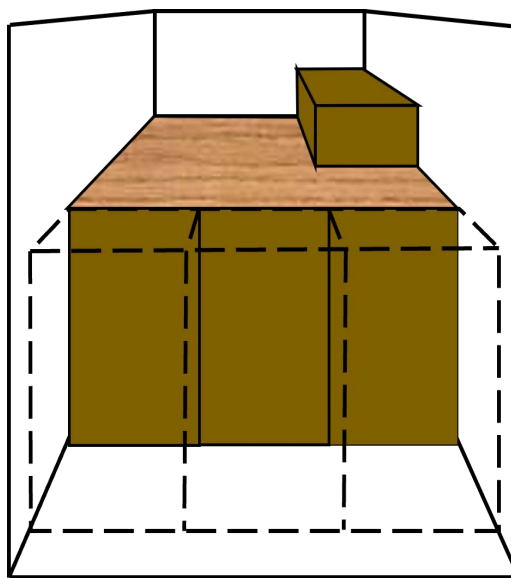
3.1.1.1 Inspect freight prior to the loading of a container or trailer. Do not load damaged freight. Handle and load all freight according to shippers' printed directions. No commodity of a contaminating nature may be loaded in the same container or trailer with commodities susceptible to that contamination, unless properly segregated or protected.

3.1.1.2 Use liners, dividers, and layer separators as necessary to prevent contact with the container/trailer that may cause damage, such as rough walls, rough floors, doorposts, anchors, sharp edges, and rough surfaces or lumber. Use container or trailer liner or apply plastic sheeting to the top and rear of freight that is susceptible to damage from moisture, water, dust, or other contaminants.

3.1.1.3 Never exceed marked or recommended restraining capacities for special interior fixtures.

3.1.1.4 Evenly distribute the weight of the load from side to side and end to end in the container or trailer to ensure balanced loading. Load freight to a uniform height, as much as the freight permits. See [Section 1.7](#) for concentrated weight requirements.

3.1.1.5 Place lighter shipping units on top of heavier shipping units with separating material used as needed between layers. See [Figure 3.1](#).



**Figure 3.1 Use of layer separators
(lengthwise blocking and bracing not shown)**

3.1.1.6 Load like-sized shipping units together and use divider material between stacks of shipping units of different size, type, or density. Segregate irregular freight from remainder of load using blocking and bracing materials or layer separators and dividers. See [Figures 3.2, 3.3 and 3.4](#).

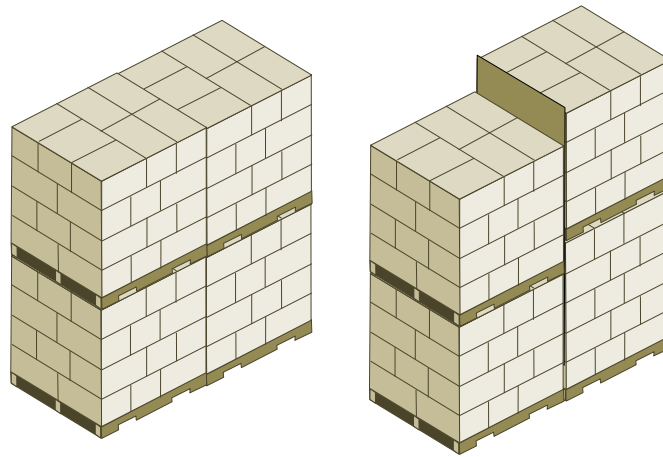


Figure 3.2 Alignment of palletized shipping units and the use of dividers

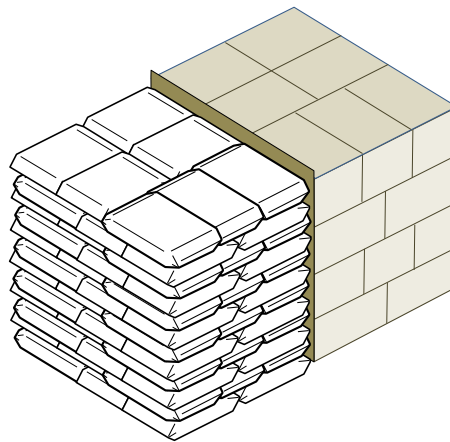
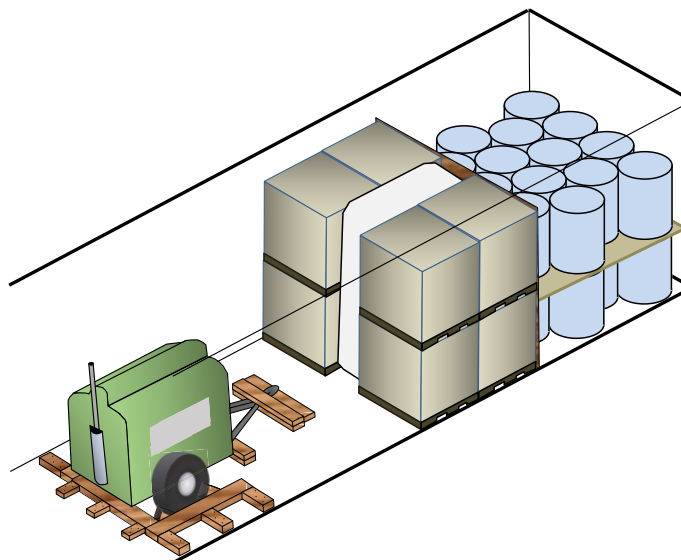


Figure 3.3 Use of dividers between different types of freight



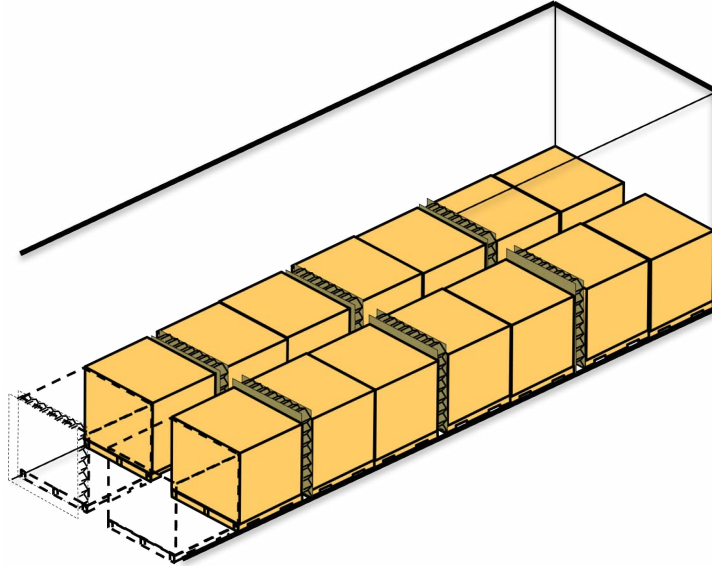
**Figure 3.4 Segregate irregular freight
(lengthwise blocking and bracing not shown)**

3.1.1.7 Divide the freight into sections and use load securement methods to block and brace the load and maintain even weight distribution.

3.1.1.8 Apply securement to safely restrain the load from damaging doors and/or prevent freight from falling out during transit or when doors are opened at destination. The weight and nature of the freight and the type of container or trailer will determine the appropriate restraining method to use.

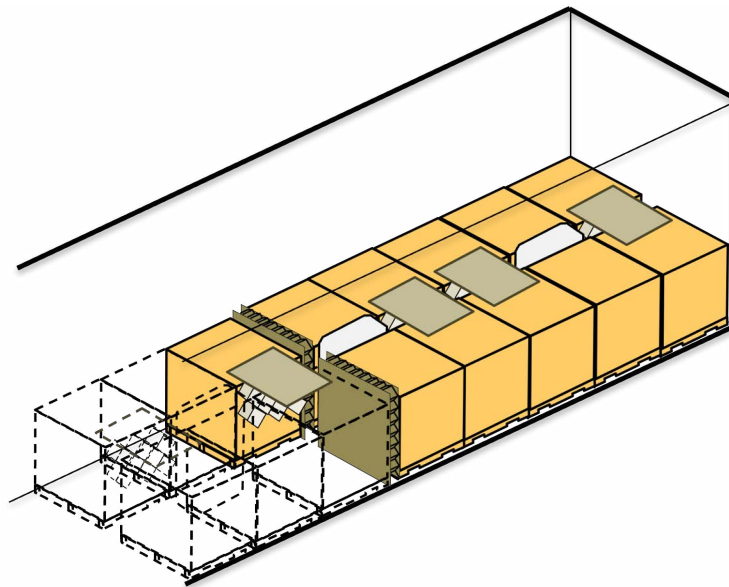
3.1.2 Filling Voids

3.1.2.1 Fill all lengthwise space with freight or filler material, and appropriately block and brace, unless loaded to a specific method. Ensure that appropriate amount of void space is left between the end of the load and the container or trailer doors, based on weight requirements or specific loading method requirements. See [Figure 3.5](#).



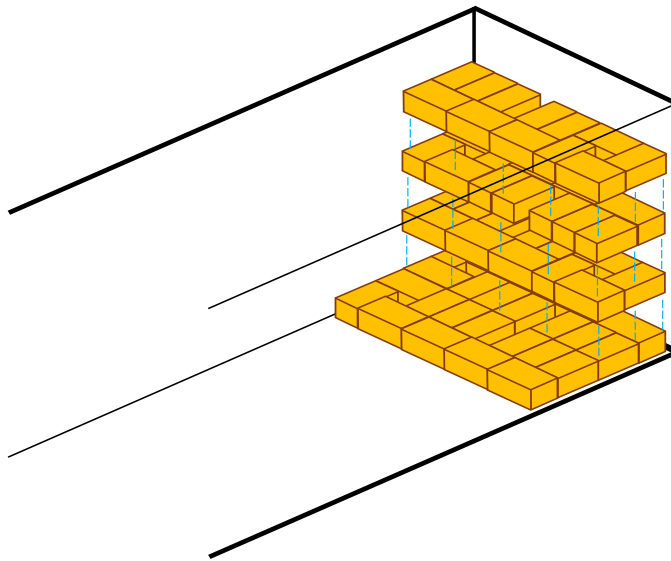
**Figure 3.5 Filling lengthwise void
(lengthwise blocking and bracing not shown)**

3.1.2.2 Fill all crosswise space with freight or filler material. Use appropriate bracing or filler material to maintain vertical alignment and to prevent crosswise movement. See [Figure 3.6](#). A four-unit pinwheel pattern may also be effective in reducing voids.



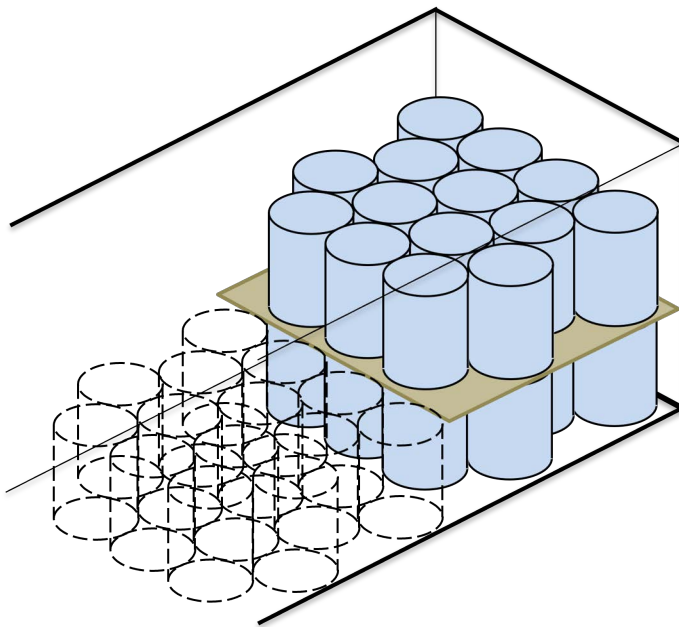
**Figure 3.6 Use of filler material in palletized loads
(lengthwise blocking and bracing not shown)**

3.1.2.3 In manually loaded shipments, use bonded block patterns for carton shipping units and key-sack or brick-wall loading patterns for bagged loads. See [Figure 3.7](#).



**Figure 3.7 Bonded block manual loading pattern
(lengthwise blocking and bracing not shown)**

3.1.2.4 Load cylindrical - shaped items, such as drums, pails, or rolls of paper, in a recessed or in-line loading pattern. See [Figure 3.8](#).



**Figure 3.8 Recessed loading for cylindrical containers
(lengthwise blocking and bracing not shown)**

3.1.2.5 Make the height and width dimensions of the filler material as near as possible the same as the dimensions of the faces of the units they will be contacting.

3.1.2.6 Lengthwise void fillers are to be of uniform strength over the face of the void filler and capable of withstanding a load of 1,500 psf (test full dimension filler sheets).

3.1.2.7 Any material used between the freight and the nose of the container must be of sufficient size and strength based on the load type and weight and be approved for this specific application.

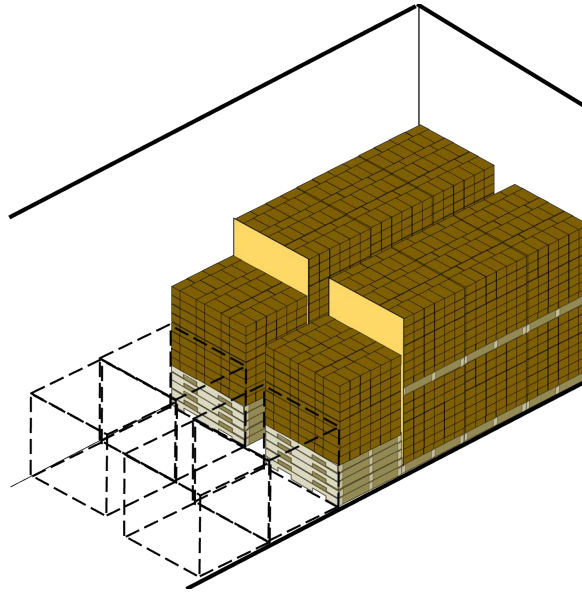
3.1.2.8 Do not reuse corrugated filler material or one time use filler material. Do not reuse lumber or other void filler if it has been damaged and is no longer capable of restraining the load.

3.1.3 Incomplete Layers

3.1.3.1 Avoid incomplete layers in shipments whenever possible. When an incomplete layer is necessary, evenly distribute the weight in the container or trailer. The partial layer may need to be in the center of the container or trailer. Load incomplete layers from sidewall to sidewall or fill crosswise voids.

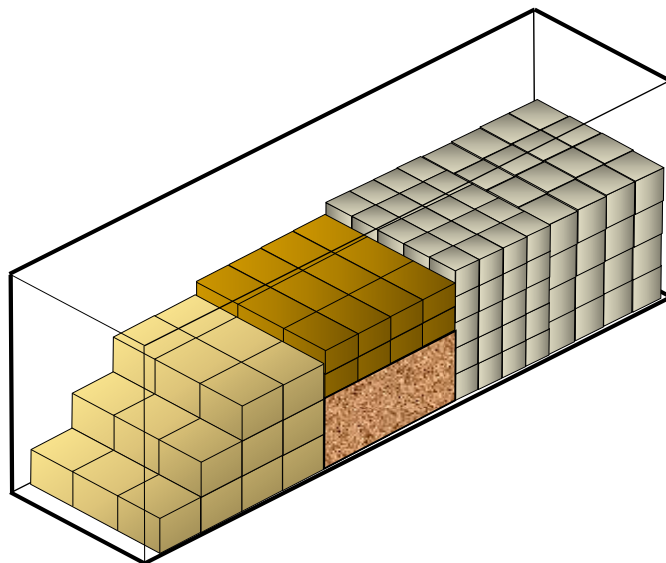
3.1.3.2 Secure the incomplete layer to prevent movement by using one of the following methods:

- Block incomplete layer by a minimum of 50 percent of the height of the top units. If the partial layer is centered in the container or trailer it must be blocked on both ends of the load. Use sufficient blocking dunnage, such as another shipping unit, risers, or pallets. See specific loading methods based on commodity. See [Figure 3.9](#).



**Figure 3.9 Incomplete layer blocking
(lengthwise blocking and bracing not shown)**

- Stair-step freight down to a single layer to prevent freight from toppling. See [Figure 3.10](#).



**Figure 3.10 Stair-stepped freight to a single layer
(lengthwise blocking and bracing not shown)**

- To secure light-weight commodities use full face and height divider sheets or bulkheads. See [Figure 3.11](#).

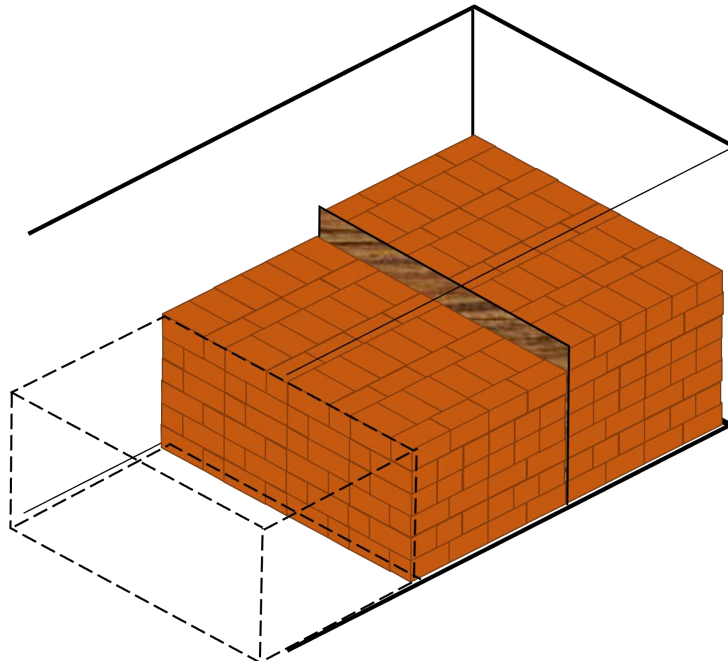


Figure 3.11 Divider sheet to secure incomplete layer
(lengthwise blocking and bracing not shown)

- An option to secure heavier commodities is to unitize the rear portion of the incomplete layer to the bottom layer. Unitize with AAR-approved Type 1A, Grade 5 nonmetallic straps with appropriate bulkheads and protection between straps and freight. See [Figure 3.12](#).

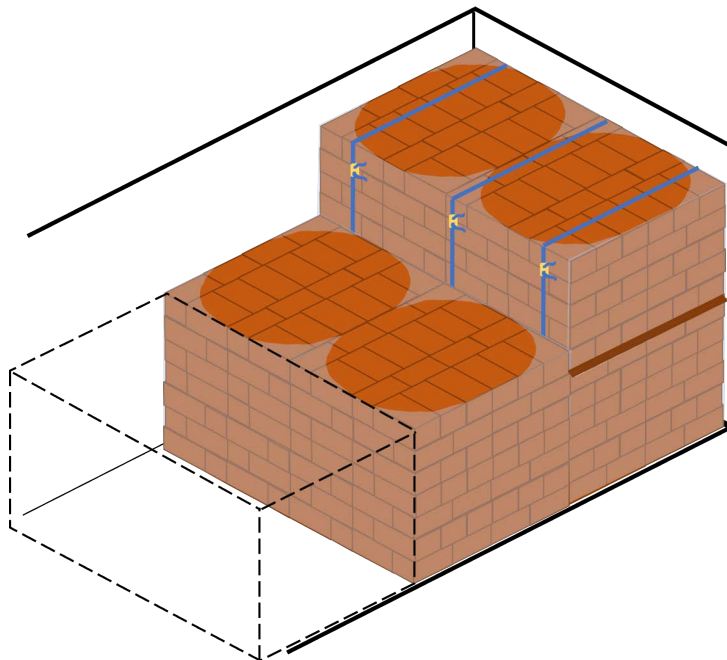


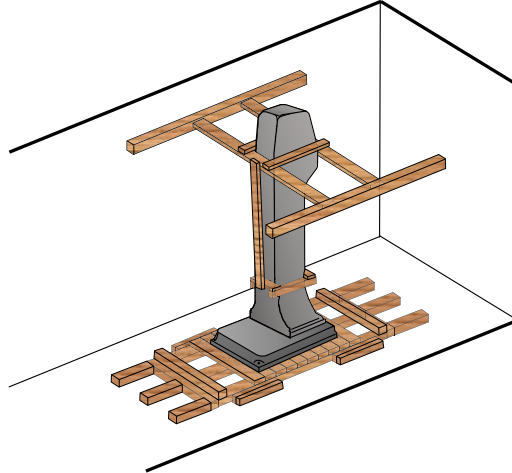
Figure 3.12 Unitizing securement
(lengthwise blocking and bracing not shown)

3.1.4 Top-Heavy Items

3.1.4.1 Prevent top-heavy items from falling or tipping over in transit by bracing at a point approximately on the upper third of the item. See [Figure 3.13](#).

3.1.4.2 Blocking of the item will be needed at both the upper third as well as the base. See [Section 4.0](#) for information on specific blocking materials and application.

3.1.4.3 Load longest dimension of narrow-base items lengthwise of the container or trailer. Load top-heavy items, if possible, in corners or against walls.



**Figure 3.13 Blocking top-heavy items
(lengthwise blocking and bracing not shown)**

3.1.5 Rear Doors to Secure Freight

3.1.5.1 Container or trailer doors may only be used to secure freight when all of the following requirements are met:

1. The load consists of multi-unit freight such as boxes of food-stuff, tissue, or soft paper products, furniture, appliances, etc., not exceeding 40,000 lb, covering a minimum of 60 percent of the door area and evenly distributed throughout the container or trailer.
2. Freight must be loaded tightly lengthwise and crosswise and flush to the rear doors of the container or trailer allowing no room for movement. If any void exists, fill void space with recommended dunnage.
3. The doors of the equipment must meet AAR container specification M-930 or AAR trailer specification M-931. The doors must fit squarely, the hinges must be tight, and locking bars must be in good condition and function properly.

NOTE: Container/trailer doors may not be used to secure loads containing hazardous materials. See [Section 2.0](#).

3.1.5.2 See [Figure 3.14](#) for an example of freight secured by rear doors.

3.1.5.3 Rigid, dense, or cylindrical freight requires specific blocking and bracing methods and must be loaded and secured in conformance with the rules and illustrations in this publication and in other applicable AAR commodity loading publications. Container or trailer doors are neither designed nor intended to restrain these commodities.

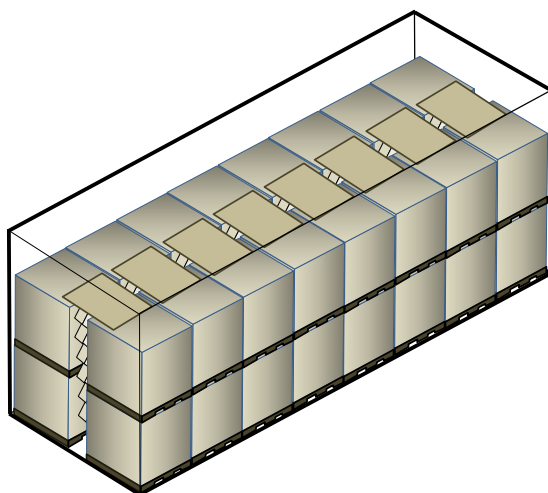


Figure 3.14 Rear doors to secure freight

3.1.6 Small Package, Consolidated, and Mixed Freight - Containers and Trailers

3.1.6.1 Commodity weight in containers and trailers must be evenly distributed both crosswise and lengthwise, and the combined commodity weight and the container/trailer must conform to all federal, state, provincial, and local regulations and transportation service requirements used at origin and to final destination. Commodity weight must be evenly distributed for container/trailer lifting onto and off railcar equipment.

3.1.6.2 Loads containing any quantity of hazardous materials/hazardous substances must conform to the regulations of the agency of the countries within which the shipment will move. Carrier is to be specifically informed on shipping orders as to the presence, type, characteristics, and volume of all hazardous materials. See [Section 2.0](#) for more information on hazardous materials.

3.1.6.3 It is the shipper's responsibility to properly package, identify, and mark the cargo. Packaging should be able to withstand the shocks and vibration inherent to handling, storage and transportation.

3.1.6.4 Consider shipments for unitization where appropriate. Unitization includes palletized or consolidation into another shipping container (i.e. bin or crate). See [Section 3.3](#) for information on unitization.

3.1.6.5 See [Sections 3.1 and 3.2](#) for information on load planning and filling voids. See [Section 4.0](#) for information on blocking and bracing materials.

3.1.6.6 Place freight in the position and on the surface offering the greatest protection giving consideration to the weight and shape of the packages. Generally place heavier freight in lower layers and lighter freight in the top layers. Provide a stable base for both palletized and individual pieces of freight. See [Figure 3.15](#).

3.1.6.7 Fit packages together snugly to the desired height to insure a tight load. Follow packaging labels, such as, This Side Up, Fragile, and Handle With Care.

3.1.6.8 Use liners, dividers and layer separators as necessary to prevent contact with the container/trailer that may cause damage such as rough walls, rough floors, doorpost, anchors, sharp edges, and rough surfaces or lumber.

3.1.6.9 Segregate irregular freight that may damage adjacent freight by using dividers, layer separators, or blocking and bracing materials. See [Figure 3.4](#).

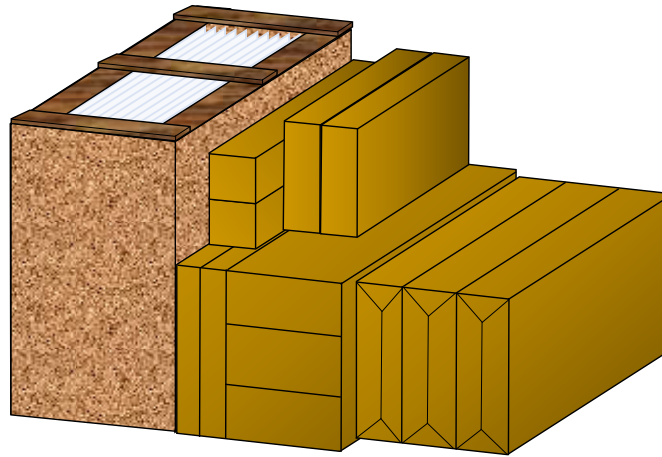


Figure 3.15 Loading mixed freight non-palletized

3.1.6.10 Load top heavy articles in corners or against container/trailer walls. It may be necessary to apply additional blocking and bracing. Flat goods which may fracture should be shipped vertically or in an "A" frame. Such goods should not be shipped laying down in a horizontal position. See [Figure 3.13](#).

3.1.6.11 Level or stair-step load to prevent freight from toppling. Use bulkheads to divide the freight into sections. See [Figures 3.10](#) and [3.11](#).

3.1.6.12 Load doorway area in a manner to prevent contact of freight with doors or doorposts and use suitable doorway protection or securement.

3.1.7 Loading Liquid Freight

3.1.7.1 Packaged Liquid Freight

3.1.7.1.1 Liquid freight can be packaged in many different methods, such as, cases/cartons of cans, jars, bottles, or pouches; palletized pails or drums; or floor loaded drums, bins, and IBC containers. Any cartons, pallets, or floor loaded units containing liquid products need to have sufficient packaging and securement to prevent the packaging and freight from damage and leaks. Liquid freight load planning and securement requires extra care and attention. For information on drums and liquid IBCs, see [Sections 5.3 & 5.4](#).

3.1.7.1.2 Liquid freight may be hazardous or non-hazardous. See [Section 2.0](#) for detailed information on shipments containing hazardous freight. Liquid non-hazardous freight may still cause an environmental concern if leakage occurs from the original packaging. Leaking freight can cause damage to packaging, securement dunnage, other freight loaded in the container/trailer, and the equipment itself.

3.1.7.1.3 Inspect freight prior to the loading of a container or trailer. Do not load damaged freight. Handle and load all freight according to shippers' printed directions. Liquid freight packaging and containers should be appropriately labeled to indicate the type of liquid (hazardous) and the proper loading orientation.

3.1.7.1.4 The container/trailer should be closely inspected prior to loading for any sharp protrusions or debris that may damage the liquid freight packaging or container. Use buffer material as needed to protect freight packaging from any potential damage that could occur from contacting the container or trailers walls. See [Section 3.3](#).

3.1.7.1.5 Loading of the liquid freight should ensure that the freight has a stable base, that different types of freight or containers are separated with the use of dividers, and that lighter freight is loaded on top of heavier freight with the use of layer separators. Inspect other freight, packaging, or containers that are to be loaded for sharp protrusions or edges or other types of damage that could result in damage or leaks to the liquid freight containers or packaging. Use buffer materials as needed. See [Sections 3.2](#) and [3.3](#).

3.1.7.1.6 Select the appropriate void filling and load securement method for the type of freight, packaging, and containers loaded. Ensure that the load securement dunnage will not damage the liquid freight containers. Use buffer materials as needed. Not all blocking and bracing methods are appropriate in securing liquid freight. See [Section 6.0](#) for loading methods appropriate for liquid freight. For hazardous material shipments ensure an approved method for hazardous material freight is selected.

3.1.7.1.7 Contact the origin rail carrier for additional information on liquid freight load securement and approvals.

3.1.7.2 Flexitanks (Conditionally Approved)

3.1.7.2.1 Flexitanks are shipping units for non-hazardous bulk liquids that can be loaded and secured in general purpose, multiple trip, intermodal containers.

3.1.7.2.2 Flexitanks that have successfully completed rail impact testing and rail simulation testing are reviewed by the Damage Prevention and Freight Claim Committee and may receive conditional approval.

3.1.7.2.3 Rail carriers that will be involved in any segment of a flexitank intermodal shipment must be contacted for direct approval prior to any shipments. Rail carriers may have additional requirements that must be met prior to acceptance by those specific carriers. Rail carriers reserve the right to accept or deny flexitank shipments, regardless of conditional approval status, based on their specific tariff requirements.

3.1.7.2.4 The current list of flexitanks with conditional approval and testing criteria can be found at: <https://aar.com/standards/IntermodalLoadingPublications.html>. Contact dpls@aar.com for further information.

3.1.7.2.5 Flexitanks must be loaded and secured as tested and approved with identical flexitank specifications, load securement material specifications, and container type and size.

3.1.8 Loading Loose Bulk Freight

3.1.8.1 Contact origin rail carrier for specific commodity and tariff information.

3.1.8.2 Loose dry (non-hazardous) bulk freight is to be loaded using an approved liner and securement system. Container or trailer doors may not be used as part of the load securement for loose dry bulk freight. See [Section 6.0](#) or contact the origin rail carrier for loading and unloading information and approval.

3.1.8.3 Inspect the container or trailer prior to loading to ensure that no leaks can occur during transit. Leaking non-hazardous freight may still cause an environmental concern. Cover rough surfaces or projections of the equipment walls with fiberboard sheets or other buffer materials. Ensure the container is fully lined and that the bulk freight is secured from contacting or applying pressure against equipment doors. Apply liner and securement systems per manufacturer's instruction.

3.2 Unitization

Unitizing shipping containers is an efficient means of handling, storing, loading, transporting, and unloading that contributes to efficient utilization of equipment. The following guidelines suggest ways to obtain the best stack stability in unit loads.

3.2.1 Unitizing On Pallets

3.2.1.1 See [Section 3.2.3](#) for information on pallet quality.

3.2.1.2 Stack boxes or bags in a bonded-block or other comparable unitizing method on the pallet. Bonded block stacking is intended for case goods and similarly dense products with strong internal stacking strength. Light cartons or similar products with little or no internal strength are intended to be straight stacked or column stacked.

- The footprint of the cartons should approximately match the size of the pallet deck area. See [Figures 3.16](#) and [3.17](#).

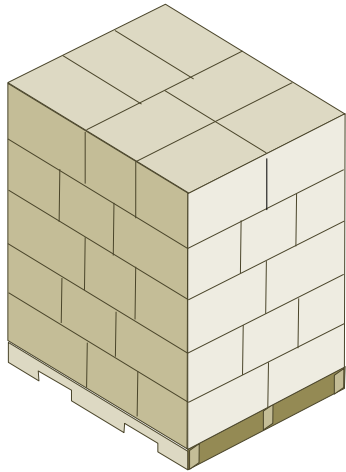


Figure 3.16 Palletized cartons

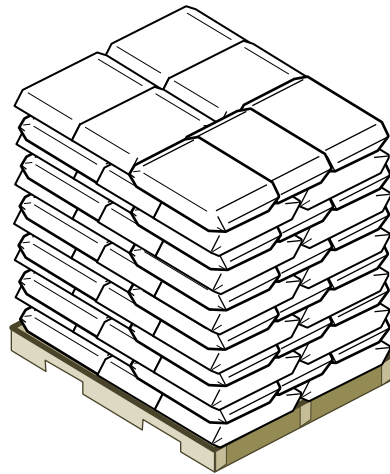


Figure 3.17 Palletized bagged freight

3.2.1.3 If units consist of bags or bales, use adequate separator material between the product and the pallet. See [Figure 3.18](#).

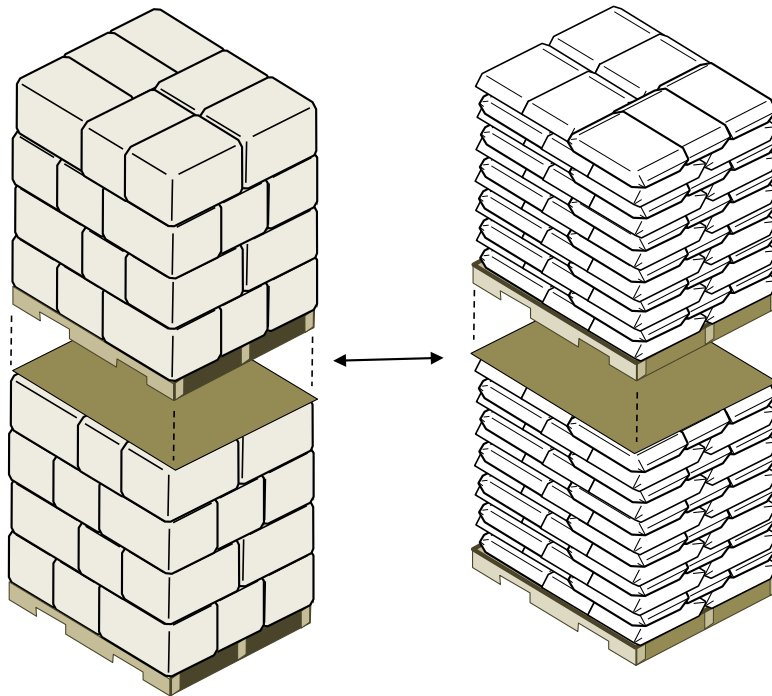


Figure 3.18 Layer separators

3.2.1.4 Stack boxes or bags with unit-to-unit contact with minimum under-hang or overhang of containers on pallets (less than 1 inch).

3.2.1.5 No under-hang on pallets is allowed lengthwise of container or trailer unless filler material is used or the under-hang is otherwise compensated for. Space filled cannot exceed 8 inches. Limit under-hang on pallets crosswise of container or trailer as much as freight allows. See [Figure 3.19](#).

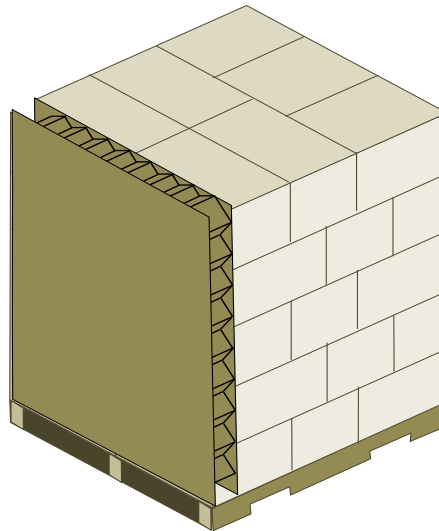


Figure 3.19 Lengthwise filler material to fill pallet underhang

3.2.1.6 Maintain vertical alignment of boxes and bags on the pallet by use of void fillers, corrugated sleeves, corner protectors and strapping, shrink-wrapping, stretch-wrapping, spot-gluing, or other similar methods. See [Figures 3.20, 3.21, and 3.22](#).

3.2.1.7 Take up all lengthwise voids between pallet loads by use of blocking and bracing methods or filler material. See [Figure 3.5](#).

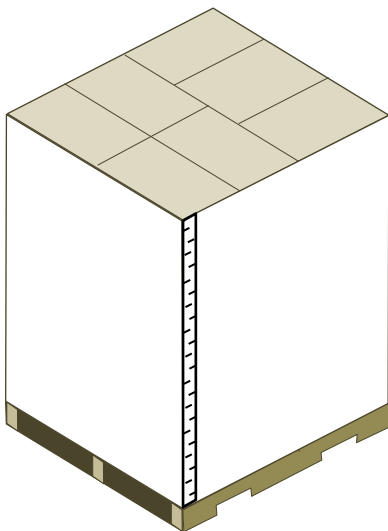


Figure 3.20 Corrugated (fiberboard) sleeves

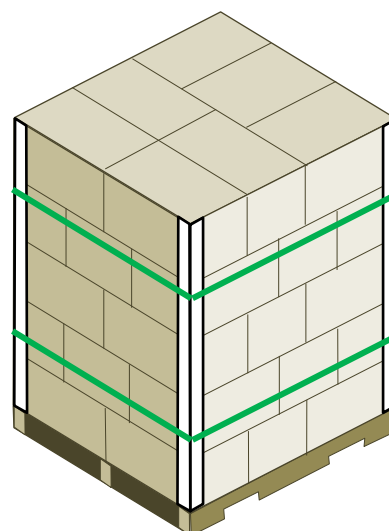


Figure 3.21 Corner posts and strapping

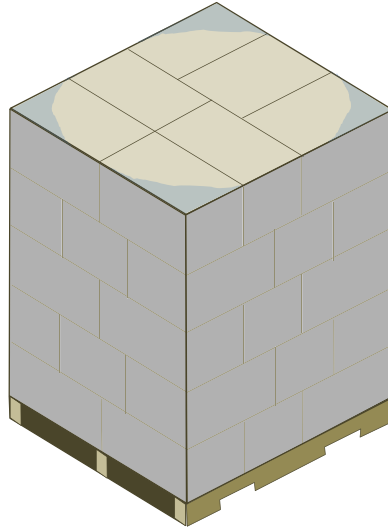
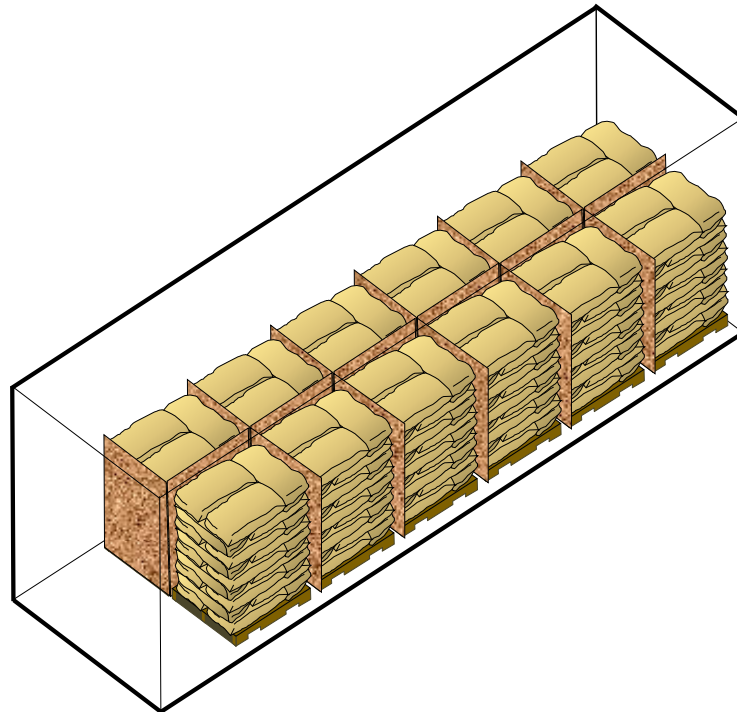
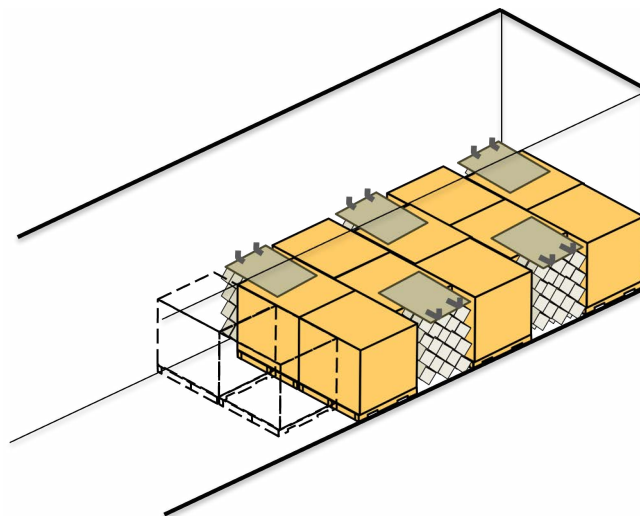


Figure 3.22 Stretch wrapped pallet

3.2.1.8 Load as many pallets across the container or trailer as space allows. Load pallets either in a straight line lengthwise in the container or trailer or in an off-set loading pattern with pallets contacting alternating sidewalls. The method of maintaining vertical alignment of the pallets must be sufficient to maintain unit alignment. Fill all crosswise void space with appropriate bracing or filler material to maintain vertical alignment and to prevent crosswise movement. See [Figures 3.23](#) and [3.24](#).



**Figure 3.23 Bagged freight with dividers
(lengthwise blocking and bracing not shown)**



**Figure 3.24 Off-set loading
(lengthwise blocking and bracing not shown)**

3.2.1.9 In double-layer pallet loads, have pallets equal in height to ensure pallet-to-pallet contact both longitudinally and laterally. If this is not the case, separate stacks of different height pallets with suitable divider sheets. See [Figure 3.2](#).

3.2.1.10 Where 4-way entry pallets are required, 2-way entry pallets may be accommodated by stacking them on 4-way pallets of equal dimension and strength.

3.2.2 Unitizing On Slip Sheets

3.2.2.1 Slip sheets are pallet-sized sheets of fiberboard or plastic used to transport stretch or shrink wrapped units. Slip sheets will have a 4 - 6 in. lip on two opposite sides or all four sides to pick up or "slip" the unit. Slip sheets should be in good condition with functioning lips. Slip sheets should be of sufficient strength for the weight of the material.

3.2.2.2 Stack boxes or bags on slip sheets in a bonded block or other comparable unitizing method. See [Figures 3.25](#) and [3.26](#).

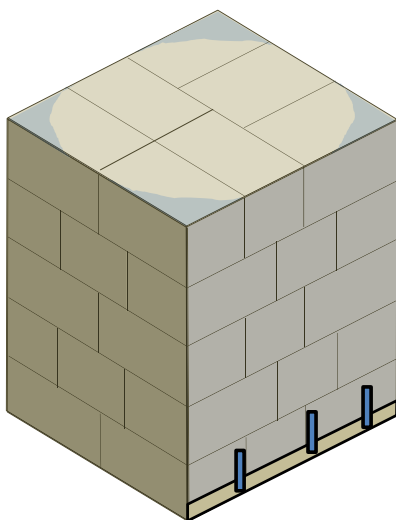


Figure 3.25 Cartons on slip sheets

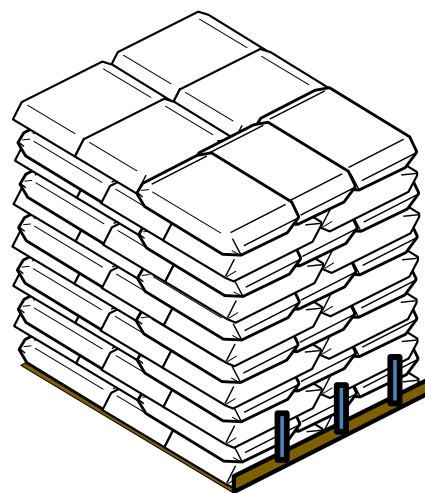


Figure 3.26 Bagged freight on slip sheets

3.2.2.3 Maintain vertical alignment of boxes or bags on slip sheets by use of fillers, corrugated sleeves, corner protectors and strapping, shrink-wrapping, stretch-wrapping, spot-gluing, or other similar methods. See [Figures 3.20](#), [3.21](#), and [3.22](#).

3.2.2.4 Take up all lengthwise voids between slip sheet units by use of blocking and bracing methods or filler material.

3.2.2.5 Load as many slip sheet units across the container and trailer as space allows. Load units either in a straight line lengthwise in the container or trailer or in an off-set loading pattern with units contacting alternating sidewalls. The method of maintaining vertical alignment of the unit must be sufficient to maintain unit alignment. Fill all crosswise void space with appropriate bracing or filler material to maintain vertical alignment and to prevent crosswise movement.

3.2.2.6 Tape the lips of slip sheets up to the unit to protect them and to prevent them from bunching up when the units are loaded. See [Figure 3.25](#).

3.2.3 Pallet Quality

3.2.3.1 Pallets can be of stringer, block, or similar design and constructed out of wood, plastic, or other suitable strength materials. Pallets or skids must be of sufficient strength, construction, and size to support the shipping units during rail transportation. Pallets should be of sufficient strength and construction to withstand degradation from humidity or other water contamination.

3.2.3.2 Select pallet type and construction based on the commodity or shipping unit and the unitization needs for the specific commodity. The pallet construction is to be sufficient to support the shipping unit in the rail handling environment.

3.2.3.3 Pallets have both top and bottom decks. Skids only have a top deck and not a bottom deck. References to pallets in this documents includes the use of skids when using skids is appropriate based on the type of shipping unit.

3.2.3.4 Ensure pallets are flat and level on both top and bottom surfaces. Pallets can be single-use or reusable. Reusable pallets must be of sufficient durability to be used multiple times without requiring repair.

3.2.3.5 Inspect pallets to ensure they are of sound construction with no delamination, no unsound or high frequency of knots, no excessive decay or wane, no splits or cracks that effect the component structure, no nail or fastener protrusions, and no missing or broken components or component sections including deckboards, stringers or stringerboards, or blocks.

3.2.3.6 Pallets are to meet design and quality standards and tolerances per pallet manufacturers and relevant ASTM standards. Damaged pallets are to be repaired or removed from service. Repaired pallets and replacement components are to meet manufacturer's standards and tolerances.

3.2.3.7 Pallets can be two-way entry pallets with pallet handling entries on two opposite ends of the pallet, partial four-way entry pallets with pallet handling entries on two opposite ends of the pallet and limited entries on two sides of the pallet, and four-way entry pallets with pallet handling entries on all four sides of the pallet.

3.2.3.8 Wooden pallets constructed out of dense hardwoods are more durable and stronger than pallets constructed out of softwoods.

3.2.3.9 Pallets used for export shipments must meet the requirements of the International Standards for Phytosanitary Measures Publication No. 15 (ISPM 15) - *Regulations of Wood Packaging Material in International Trade*. Wood pallets must be made of debarked wood, and heat treatment must meet the regulations and policies of the American Lumber Standards Committee (ALSC) - Wood Packaging Material (WPM) Program.

3.2.4 Stretch Wrap or Film, Stretch Wrap Roping, Stretch Netting, and Shrink Film Characteristics and Application

3.2.4.1 Stretch Wrap or Film

3.2.4.1.1 Stretch wrap or film may be used to unitize boxed freight, bagged freight, or other units of shipping to attach the units to a pallet or slip sheet. See [Figure 3.22](#). Stretch wrap material is to meet standards as outlined in ASTM D4649 (current version).

3.2.4.1.2 Stretch wrap is properly applied when wrap is elongated, applied under tension, and conforms to the units being wrapped. Stretch wrap creates a compressive force around the shipping unit to create load containment called film force to load. Film force to load is the amount of force applied by the film to a load (shipping unit) in providing load containment, measured by determining the force required to pull the film a set distance away from the load (shipping unit). (ASTM D4649)

3.2.4.1.3 Stretch wrap comes in gauges (thickness) from 30 – 150 gauge measured in mils or microns. The gauge selected is to be based on the weight of the entire unit, height of the entire unit, density of the shipping units, product type, and inherent stability.

- The most common stretch film wrapping recommendation is 80-gauge wrap.
- Pallets over 1,600 lbs. are recommended to use a minimum 80-gauge wrap.

3.2.4.1.4 Stretch wrap can be applied either by hand or machine application.

- Machine application increases the load containment and application consistency. Film elongation should be between 100 percent to 300 percent. (ASTM D4649) Machines are to be calibrated to the type and gauge of film and calibration checked and maintained per manufacturer’s instructions.
- If wrap is hand applied, recommended to use pre-stretched film with between 20 percent - 150 percent film elongation.(ASTM D4649)
- Film elongation is achieved with pre-stretch or post-stretch. Pre-stretched film or wrap, is film that has been mechanically stretched close to its ultimate breaking point. Post-stretch, is the stretch in the film created by the film tension between the film roll and load being wrapped.

3.2.4.1.5 Wrap the entire unit with at least three successive layers of film and have a minimum of 50 percent overlap coverage of each layer of wrap. Film must come over the top of the unit and contact a minimum of 3 inches of the shipping pallet.

- Ensure there is equal load containment measured at the top, middle, and bottom of the unit per stretch wrap manufacturer’s recommendations based on weight of the entire unit, height of the entire unit, density of the shipping units, product type, and inherent stability.
- Load containment can be measured by using a weight scale or by the application machine. Reference ASTM D4649.
- Ensure there is no loose film or wrap and that the film tail is secured to the unit.
- Additional unitization methods such as corner boards or strapping, may be needed if units are extremely light, extremely heavy, or if there is pallet under-hang.

3.2.4.2 Stretch Wrap Roping

3.2.4.2.1 The following stretch wrap roping application methods can be used to unitize palletized products to the pallet. See [Table 3.1](#) for approved stretch wrap roping applications.

Table 3.1 Approved stretch wrap roping

Name	Description
Pallet Grip®	Stretch Wrap Roping

3.2.4.2.2 The stretch wrap is rolled into a tight film rope, or cable, at the top of the pallet base and secured around all four corners of the pallet. See [Figure 3.27](#).

3.2.4.2.3 Stretch wrap must encompass all layers of the unit.

3.2.4.2.4 Apply three successive wraps of film around each layer of the unit with a unit weight of 1,000 lbs. or less and four successive wraps of film around each layer of the unit with a unit weight over 1,000 lbs.

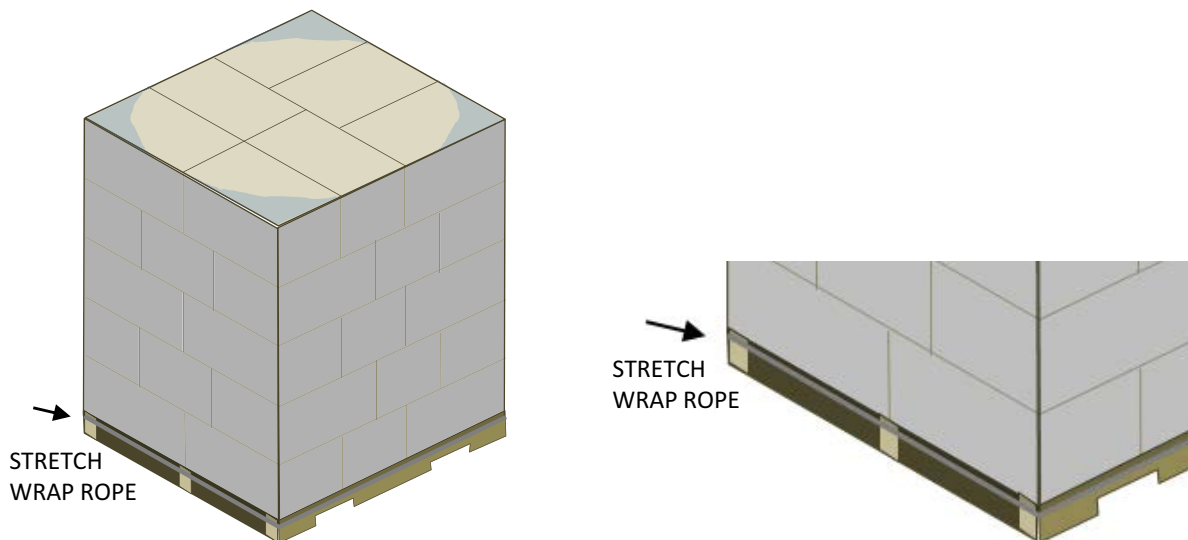


Figure 3.27 Stretch wrap rope

3.2.4.3 Stretch Netting and Shrink Film

3.2.4.3.1 Stretch netting is used to unitize goods requiring ventilation, such as produce, or irregularly shaped units having exposed carton corners. Follow manufacturer’s application recommendations. Additional unitization methods, such as corner boards or strapping, may be needed to maintain unit stability.

3.2.4.3.2 Shrink film is a heavy gauge polymer plastic, generally tube-shaped material for unitizing applications, that is placed over a pallet and shrunken tight with heat or ultra-violet rays. Shrink wrap is commonly used as an overwrap on many types of packaging, including cartons, boxes, beverage cans and pallet loads and may be used to stabilize the products, unitize them, keep them clean, or add tamper resistance. Follow manufacturer’s application recommendations.

3.3 Filler Panels, Drop Down Fillers, Dividers, Separators, and Risers

Materials used to fill space in a container or trailer not occupied by the freight or used to segregate or separate the freight are filler panels, drop down fillers, dividers, and separators. Risers are used between the floor of the container or trailer and the freight to assist in blocking incomplete layers. Do not reuse fiber filler materials or risers. Do not reuse lumber or other void filler or dividers if they have been damaged and are no longer capable of restraining or protecting the load.

3.3.1 Filler Panels

3.3.1.1 Lengthwise fiber filler panels are to be of uniform strength over the face of the filler panel and capable of withstanding a load of 1,500 pounds per square foot (psf). See [Figure 3.28](#).

3.3.1.2 Use fillers to take up crosswise space and to prevent crosswise movement in the load and to permit ready removal of freight.

3.3.1.3 Make the height and width dimensions of the filler panels as near as possible the same as the dimensions of the faces of the units they will be placed against. Use filler panels of sufficient size to maintain unit alignment and to protect shipping units from falling into the crosswise void. See [Figure 3.29](#).

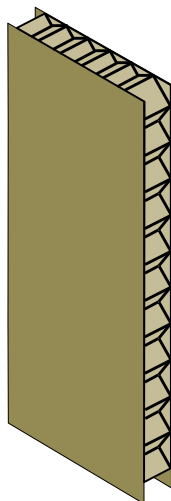


Figure 3.28 Filler panel

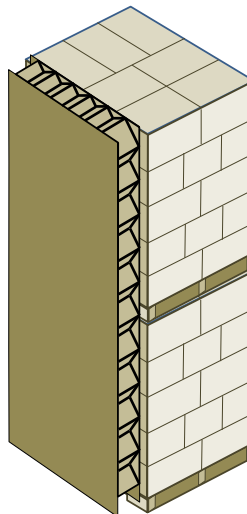


Figure 3.29 Filler panel size

3.3.1.4 Any material used between the freight and the nose of the container must be of sufficient size and strength based on the load type and weight and be approved for this specific application.

3.3.1.5 Do not use filler panels as a bulkhead or in lieu of a bulkhead.

3.3.1.6 Filler panels are to be installed vertically to fill lateral or crosswise voids. Panels are not to be installed flat against the floor unless noted in a specific loading figure such as for roll paper application.

3.3.1.7 Filler panels to fill lateral or crosswise voids may be applied between the pallets and the container/trailer walls or directly between pallets.

3.3.1.8 Filler panels may be used in the same void as air bags used to secure the load. See [Figure 3.30](#).

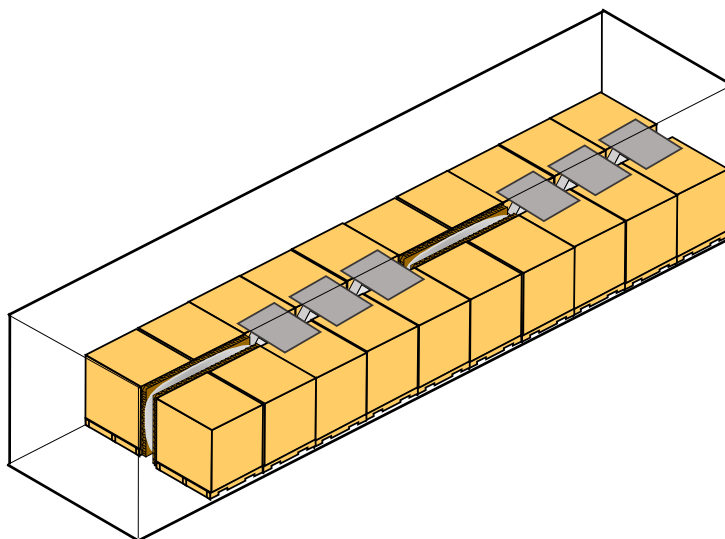


Figure 3.30 Filler panels and air bags

3.3.2 Drop Down Fillers

3.3.2.1 Drop down fillers may be used to fill crosswise or lateral voids either between pallets and the sidewall or between pallets directly. See [Figure 3.31](#). Drop down fillers may not be the proper method of void filler based on the weight and shape of the shipping units.

3.3.2.2 Drop down fillers must be of sufficient size to fill the crosswise void, maintain alignment of the pallets, and to prevent shifting into the crosswise void.

3.3.2.3 Ensure the fillers cannot fall down into the void. Drop down fillers should be secured to the sidewalls with tape or glue.

3.3.2.4 Drop down fillers must cover approximately $\frac{2}{3}$ the height of the pallet, pallet stacks, or shipping unit. See [Figure 3.32](#).

3.3.2.5 Drop down fillers may not be used in the same void or pallet row with an applied air bag.

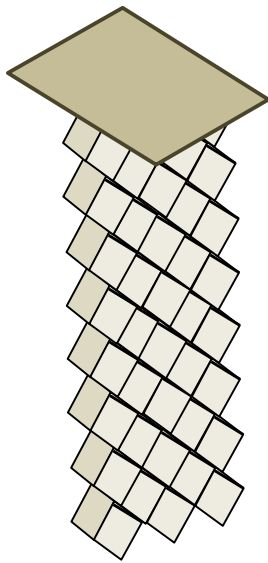


Figure 3.31 Down drop filler

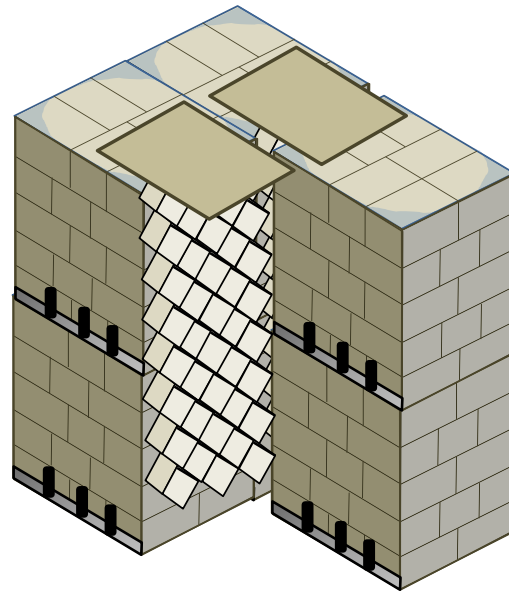


Figure 3.32 Down drop filler application

3.3.3 Dual-Drop Fillers

3.3.3.1 Dual-drop fillers may be used to fill crosswise or lateral voids when a single pallet or unit is loaded centered laterally in the container/trailer. The dual-drop fillers block the lateral void on both sides of the shipping unit using attached drop down fillers. See [Figure 3.33](#). Dual-drop fillers are most commonly used with square shaped shipping units.

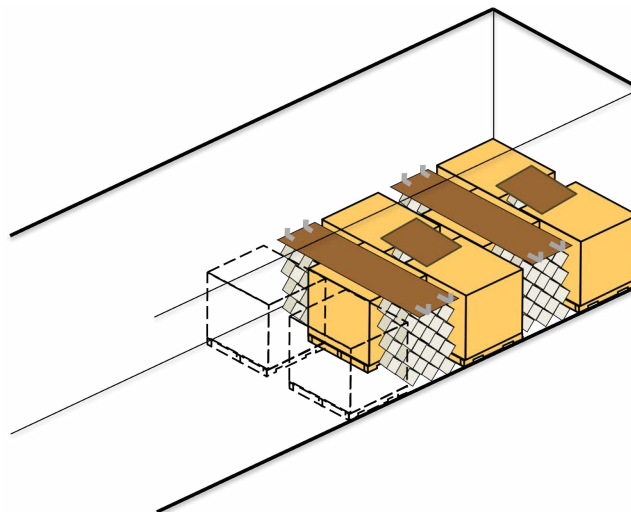


Figure 3.33 Dual-drop fillers
(lengthwise blocking and bracing not shown)

LOADING INFORMATION

3.3.3.2 Dual-drop fillers must be the correct size and strength for the pallet or shipping unit they cover, the correct size to fill the crosswise voids, be able to maintain alignment of the pallet, and prevent shifting into the crosswise void.

3.3.3.3 Dual-drop fillers must cover approximately $\frac{2}{3}$ the height of the pallet or shipping unit.

3.3.4 Dividers

3.3.4.1 Use plywood sheets or fiberboard material as dividers to separate different types of shipping units. Use divider sheets to separate different sizes of the same type of freight. See [Figures 3.2](#) and [3.3](#).

3.3.4.2 Make the height and width of the divider material as near as possible the same as the face of the unit or units they will be placed against.

3.3.5 Separators

3.3.5.1 When commodities in different types of containers or units are loaded in more than one layer, use separator material to provide an even base for the upper layers.

3.3.5.2 When commodities packaged in the same type containers but are unstable when stacked, or are in drums loaded in more than one layer, use separator material to provide an even base for the upper layers. See [Figure 3.18](#).

3.3.5.3 Use separators of adequate strength to carry the weight of the freight. Generally $\frac{1}{2}$ in. plywood sheets or other suitable material may be used. See [Table 3.2](#) for other approved single use separator materials. These separators were tested under simulated conditions, and their approval may be withdrawn if loads exhibit consistent failures. See [Figure 3.8](#).

3.3.5.4 If separators are used with hazardous materials loads they must be compatible with contents of the shipping units.

3.3.5.5 If units consist of bags or bales, use fiberboard protection between separator material and tops of lower units. See [Figure 3.18](#).

Table 3.2 Approved layer separators

Name:	Thickness:	Description:	Vendor:
Drum Tite®	3.0 mm, 3.2 mm	Eucalyptus hardboard	Lodge Lumber
Drum Sep	3.2 mm	Eucalyptus hardboard	Pasadena Skid and Pallet Inc.
Ship Tite 2	0.375 in.	Corrugated (not for use with corrosives)	Allegheny Industrial Associates
Ship Tite 3	0.625 in.	Corrugated (not for hazmat use)	Allegheny Industrial Associates
Ship Tite 5	3.2 mm	Corrugated	Allegheny Industrial Associates
Generic	3.0 mm	Eucalyptus hardboard	Greif
PlyVeneer®	3.0 mm	Wood veneer with a kraft linerboard overlay	PlyVeneer Products
LITLoad™ Separators	1.0 in. (lumber - 0.75 in.)	Softwood lumber with corrugated kraft, fluted paper	Litco, International Inc.

3.3.6 Risers

3.3.6.1 Risers may be square or strips and constructed out of paper based material or lumber. Paper based roll risers may not be reused. See [Figure 3.34](#).

3.3.6.2 Do not place risers in between shipping units or roll paper layers. Risers should only be applied on the container or trailer floor. Risers should not be applied under the last stacks of shipping units or roll paper loaded in the container or trailer.

3.3.6.3 Risers must be of sufficient strength to support the weight of the shipping units or roll paper placed on top. Based on application of the risers it is recommended to have a crush strength between 6,000 to 9,000 psf.

3.3.6.4 For palletized or slip sheet units pallets may also be stacked to use as risers. Pallets must be of the same size and be approximately the same dimensions as the unit. Pallets must be in good condition and able to withstand the weight of the shipping units. Stack no more than five pallets including the pallet of the shipping unit. Do not stack pallets in the last stack or row in the container or trailer. See [Figure 3.9](#)

3.3.6.5 Risers should be appropriately sized to fit under the shipping unit or roll paper. Pad risers should have a minimum of 70 percent coverage of the shipping unit or roll paper surface area.

3.3.6.6 Pad and strips risers are to be a minimum of 4 in. tall but must not exceed 6 inches in height.

3.3.6.7 The last stack or row of freight in a container must be loaded on the floor, not placed on risers, and secured per an approved loading method..

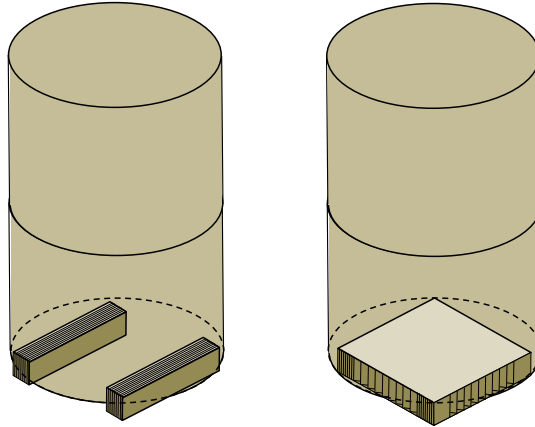


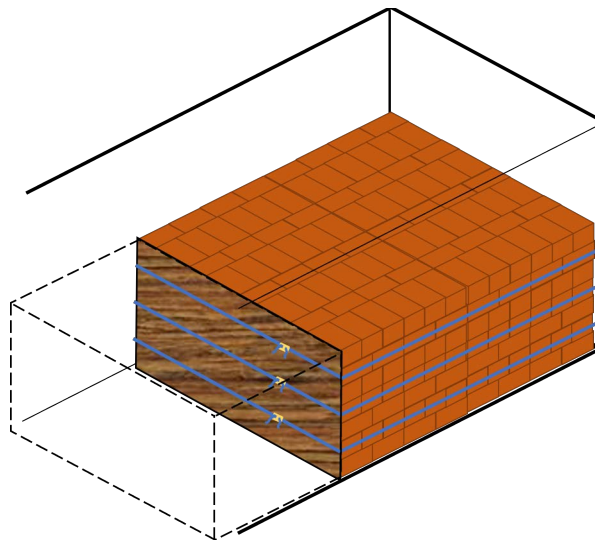
Figure 3.34 Strip and square risers

3.4 Bulkheads

3.4.1 Bulkheads can be used to rigidly secure freight when the load is divided into sections or separated by different commodity or packaging types. See [Figure 3.35](#).

3.4.2 Bulkhead component materials must be of sufficient size and strength to secure the size and weight of the section being secured. Component materials should include rigid blocking materials such as plywood, lumber uprights, wooden gate, or corrugated material with lumber reinforcement.

3.4.3 The bulkhead must be secured from moving or shifting by anchored or unitizing strapping or other methods of load securement approved for bulkhead application. See [Sections 4.0](#) and [6.0](#) for more information.



**Figure 3.35 Bulkheads with straps
(lengthwise blocking and bracing not shown)**

3.5 Wedges or Cradles

3.5.1 Wedges or cradles are to be applied as outlined in specific approved loading methods. Contact origin railroad carrier for approval for other wedge/cradle applications. Wedges/cradles are to be undamaged and constructed from the appropriate material as documented.

3.5.2 Ensure that shipping units are loaded in the correct orientation following the approved loading methods.

3.5.3 Ensure that wedges/cradles are correctly sized for the shipping units and that their height and width is sufficient to prevent the shipping units from rolling over or rocking in the wedges/cradles. A minimum wedge/cradle angle of 39° is recommended but a higher angle may be needed based on the commodity size and weight.

3.5.4 The wedges/cradles must have sufficient strength and be applied in the correct number to support the weight of the shipping units and maintain proper weight distribution. It is recommended to apply a minimum of two wedges in each rolling direction of the shipping units. Additional wedges/cradles may be needed for shipping units with concentrated weights.

3.5.5 The weight of the shipping unit should rest on the wedges/cradles and not directly on the container or trailer floor. The majority of the shipping units weight is to rest on the curved section of the of the wedge/cradle. See [Figure 3.36](#).

3.5.6 Care should be taken with the placement of the wedges/cradles under the shipping unit to ensure they prevent rolling movement.

3.5.7 The use of other load securement methods, such as strapping, webbing, or rubber mats may be needed to secure the shipping units to the wedges/cradles. Additional lengthwise and crosswise blocking of the shipping units and the wedges/cradles will be needed to prevent shifting of the entire units in the container or trailer. Wedges/cradles should be secured independently of any load securement methods applied to secure the entire load.

3.5.8 If wedges/cradles are to be secured to the container or trailer floor, it is recommended to nail the wedges/cradles to wooden bracing that is secured to the container or trailer floor. It is not recommended to secure wedges/cradles directly to the container or trailer floor.

3.5.9 Wedge/cradle application should be planned to ensure that the appropriate loading and unloading equipment can be properly used.

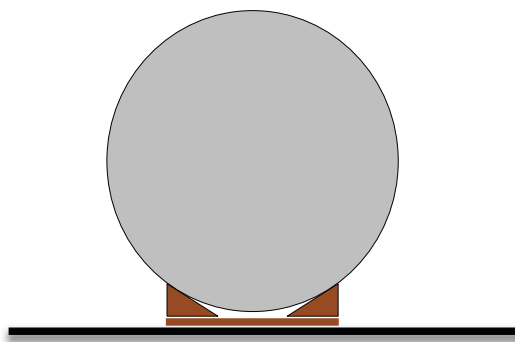


Figure 3.36 Wedges/cradles application

3.6 Loading Dunnage - Void Filters

The following dunnage products have been evaluated and approved for void fillers for intermodal service by the Damage Prevention & Freight Claim Committee. Contact the origin rail carrier for additional application variations.

3.6.1 Void-Gard® - Crosswise Void Filler

3.6.1.1 Void-Gard® (Walnut Industries) can be applied with an approved method of load securement to fill crosswise void in the container or trailer. See [Figure 3.37](#). Void-Gard can be used with shipping units with a solid square surface. Void-Gard has specific application requirements based on the weight and shape of the shipping units.



Figure 3.37 Void-Gard®

3.6.1.2 Follow manufacturer's instructions for correct application. Ensure the void to be filled is within the size range of the Void-Gard. Void-Gard is to be applied directly between shipping units and not between shipping units and the sidewall or against other types of void fillers or securement methods.

3.6.2 Shock-Gard® - Crosswise Void Filler

3.6.2.1 Shock-Gard® (Walnut Industries) panels can be applied with an approved method of load securement to fill crosswise void in the container or trailer. Shock-Gard can be used with shipping units with a solid square surface.

3.6.2.2 Follow manufacturer's instructions for correct application. The void to be filled can be directly between shipping units or between shipping units and sidewall.

3.6.2.3 Shock-Gard panels must be of sufficient size to fill the crosswise void, maintain alignment of the pallets, and prevent shifting into the crosswise void. Panels are to be approximately the same size as the shipping units or stacked shipping units. Do not reuse panels that have been crushed, broken, or otherwise damaged in any way that may affect their performance.

3.6.3 Floor Brace XL® - Crosswise Void Filler

3.6.3.1 The Floor Brace XL® (Logistick) can be applied with an approved method of load securement for palletized freight to fill crosswise void in the container or trailer. See [Figure 3.38](#). Ensure that the shipping units on the pallet are appropriately secured to the pallet and cannot slide or tip into the crosswise void.

3.6.3.2 Follow manufacturer's instructions for correct application. Use a minimum of two braces per pallet, in each direction of possible crosswise movement. Based on the weight of the palletized shipping units, additional braces may be needed. Apply to a container or trailer with wood floor using 16d double-headed nails.



Figure 3.38 Floor Brace XL®

3.6.4 G-Force™ Filler Blocks - Floor Spot Filler

G-Force™ Filler Blocks may be used to fill the space of a pallet position with an approved method of load securement for palletized freight in a container or trailer. They are to be loaded in the top layer or in a single layer not adjacent to the container or trailer endwall or any applied air bags. Follow manufacturer's instructions for proper application. See [Figure 3.39](#).



Figure 3.39 G-Force™ Filler Blocks

4.0 LOAD SECUREMENT

4.1 Lumber

4.1.1 Lumber Specifications

4.1.1.1 Use sound lumber of good quality, straight grained, and free of decay, dry rot, strength impairing knots, and crossgrain. Do not use lumber with knots, knotholes, checks, or splits. Properly store lumber to protect it from the elements to prevent rot and decay.

4.1.1.2 Do not use green lumber because it does not have the strength or stiffness qualities of dry lumber. Green lumber under certain conditions will give off quantities of moisture that can have harmful effects on some commodities.

4.1.1.3 Additional information on lumber specifications can be found in Open Top Loading Rules. *Section I - General Rules for Loading All Commodities - Rule 10 - Wood Type & Species* and *Appendix D. Material Mechanical Properties* at <https://my.aar.org/otlr>.

4.1.1.4 If the container will be shipped internationally, ensure that all lumber in the container meets the standards for the countries the container will be transported in. Heat treated lumber may be required.

4.1.1.5 When selecting the type and size of lumber for load securement, give consideration to the weight, size, and nature of the commodity to be secured. Follow lumber and nailing as outlined in specific loading figures.

4.1.1.6 Typical lumber sizes are nominal. All references to lumber are nominal, unless otherwise referenced in a specific loading method. See [Table 4.1](#).

Table 4.1 Lumber dimensions

Nominal Thickness (in.)	Actual Thickness (in.)
2 × 4	1½ × 3½
2 × 6	1½ × 5½
2 × 8	1½ × 7¼
4 × 4	3½ × 3½
4 × 6	3½ × 5½
4 × 8	3½ × 7¼

4.1.1.7 Lumber recommended for use in container or trailer blocking and bracing is found in Group II and III woods and commercial sizes may be used. When soft woods (Group I) are substituted, use the next larger commercial size. See [Tables 4.2 & 4.3](#).

Table 4.2 Wood types

Group I Soft Woods (specific gravity 0.34-0.42)	Group II and III Medium Woods (specific gravity 0.34-0.42)	Group IV Hard Woods (specific gravity 0.52-0.88)
Cottonwood	Cedar (Port Oxford)	Ash
Fir (Balsam)	Douglas Fir	Beech
Fir (White)	Hemlock	Elm
Pine (Lodgepole)	Maple (Hard Black)	Hickory
Pine (Ponderosa)	Pine (Norway)	Maple (Hard-Sugar)
Pine (White East)	Pine (So, Yellow)	Oak (White)
Pine (White West)	Sweet Gum	Oak (Red)
Spruce (White)		
Poplar (Yellow)		

Table 4.3 Lumber substitution guide

Group II and III Woods Medium (in.)	Group I Woods Soft (in.)
Size 2 × 3	Size 2 × 4
Size 2 × 4	Size 2 × 6
Size 2 × 6	Size 2 × 8
Size 3 × 4	Size 3 × 6
Size 4 × 4	Size 4 × 6
Size 4 × 6	Size 4 × 8
Size 6 × 6	Size 6 × 8
Size 6 × 8	Size 6 × 10

4.1.1.8 Lumber may be used as a method of load securement for hazardous materials if applied as outlined in applicable loading figures.

4.1.2 Nails and Nailing

4.1.2.1 Sizes of nails shown for the construction and assembly of lumber load securement and floor blocking are based on the use of common nails. Screws are not to be applied into the container or trailer floor, unless specified in a specific loading method.

4.1.2.2 Additional information on nail and nailing specifications can be found in Open Top Loading Rules - *Section 1 - General Rules for Loading All Commodities - Rule 15 - Nails, Staples, & Lag Screws* and *Appendix D - Material Mechanical Properties* at <https://my.aar.org/otlr>.

4.1.2.3 Floor blocking must be attached to a sound floor free from defects. International containers, Cargo Transport Units (CTU's) and temperature controlled containers may have floors consisting of softwood or steel floors which are not suitable for direct nailing to the floor. Always place lumber with the widest face to the floor.

4.1.2.4 Consider the number, size, and kind of nails to the size and kind of lumber being applied. Use sufficient nails to properly construct or attach the lumber bracing. The strength of the load securement increases directly with the number and size of nails. Nails and spikes used to build lumber frames or bracing may be larger sizes or different types than nails used to secure bracing to the container or trailer floor. See [Table 4.4](#).

Table 4.4 Sizes of nails for various thicknesses of material

Thickness of Material (Rough Lumber) Holding Head of Nail	Thickness of Material (Rough Lumber) Holding Point of Nail						
	1 in.	1 1/4 in.	2 in.	3 in.	4 in.	5 in.	6 in.
1 in.	8d	8d	10d 12d	16d	16d	16d	16d
2 in.	10d 12d	10d 12d	16d	20d 30d	40d	40d	40d
3 in.	16d 20d	20d 30d	30d 40d	40d	—	—	—
4 in.	40d	40d	—	—	—	—	—

4.1.2.5 Unless otherwise specified, nails used to secure the lumber load securement to the floor of the container/trailer must penetrate the floor a minimum of 1 in. See [Table 4.5](#).

Table 4.5 Lateral resistance of nails (in pounds) when nailed through 2 in. thick flooring and into 1 1/4 in. flooring - hardwoods (Group IV)

Size of Common Nail (d)				
8	10	12	16	20
344 lb	733 lb	916 lb	956 lb	1,043 lb

4.1.2.6 Unless otherwise specified, nails used in the assembly of lumber load securement consisting of 2 or more pieces must be at least 1 in. longer than the blocking lumber secured.

4.1.2.7 Drive all nails straight. All nails must be applied perpendicular or at a 90° angle to the floor.

4.1.2.8 Unless otherwise specified, apply nails in a widely spaced pattern to prevent the lumber from splitting. Nails should be applied no closer than 6 in. and staggered from side to side to prevent the lumber from splitting.

4.1.2.9 To facilitate the nailing process, prevent lumber splitting, and to increase the nail holding power, pre-drill holes slightly smaller than the nail body or shank.

4.1.2.10 When using automatic-type nailers, sizes of the nails may be less than those specified if the number of nails applied is increased by $\frac{1}{3}$ and that 10d or 20d common nails are replaced with 8d - 10d or 16d - 20d power-driven nails.

4.1.2.11 Nails used to secure lumber as a method of load securement for hazardous materials, unless otherwise specified, must penetrate the floor a minimum of 1 in. See applicable loading figures.

4.1.3 Floor Blocking

4.1.3.1 Lateral or Crosswise Floor Blocking

4.1.3.1.1 Securely nail the lumber to the container or trailer floor to prevent crosswise movement. Floor blocking can be applied between pallets or other shipping units loaded in the container or trailer or between pallets or other shipping units and the sidewalls. See [Figures 4.1](#) and [4.2](#).

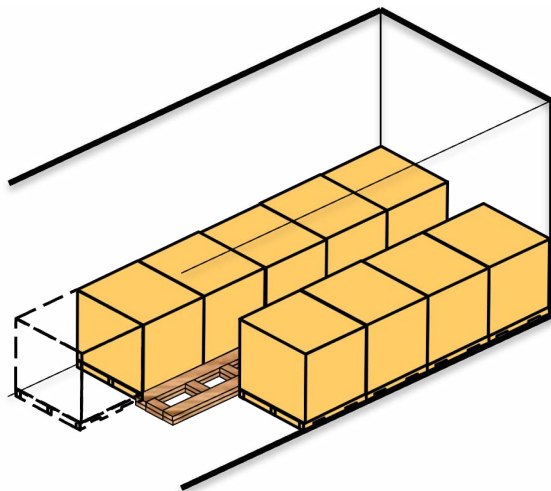


Figure 4.1 Center crosswise floor blocking (lengthwise blocking and bracing not shown)

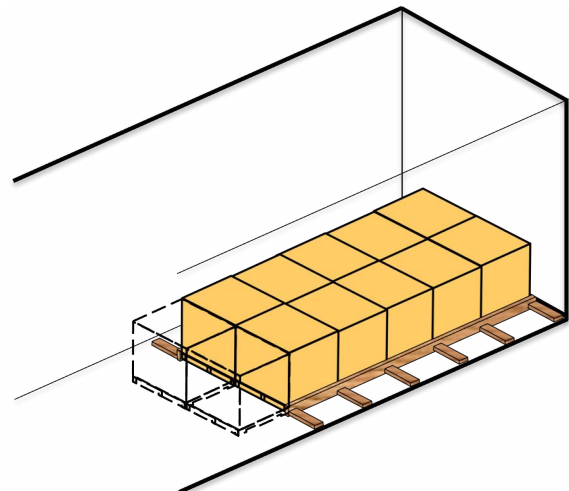


Figure 4.2 Sidewall crosswise floor blocking (lengthwise blocking and bracing not shown)

4.1.3.1.2 Lumber must fully contact the pallets or shipping units and the sidewalls. If a container has a corrugated type sidewall it is recommended to fit the lumber into a corrugated cross section.

4.1.3.1.3 Full length guide rails may be an acceptable method of lateral floor blocking based on the shipping units size and weight. For standard palletized good shipments apply one nail for every 18 in. of guide rail length or two nails per every pallet.

4.1.3.1.4 Lumber should be a minimum of 2 in. × 4 in. or 2 in. × 6 in. material. The size and amount of lumber and nails required will be dictated by the weight of the freight.

4.1.3.1.5 Unless otherwise specified, nails used to secure the lumber load securement to the floor of the container/trailer must penetrate the floor a minimum of 1 in.

4.1.3.1.6 For shipments on pallets, use lumber the same thickness as the pallet support members. Lumber should be placed in-line with the pallet support members. Ensure that the shipping units on the pallet are appropriately secured to the pallet and cannot slide or tip into the lateral void. See [Section 3.2](#).

4.1.3.1.7 Ensure any lumber applied as floor blocking will not damage the product or shipping unit. Ensure the shipping unit is properly secured to ensure the unit cannot tip into the lateral or crosswise void.

4.1.3.2 Lengthwise Floor Blocking

4.1.3.2.1 Securely nail the lumber to the container or trailer floor to prevent lengthwise movement.

4.1.3.2.2 The lumber must contact the last stack of pallets or shipping units loaded in the container. The lumber must be of equal length to the width of the container or trailer and contact both sidewalls or equal in width of the pallets or shipping units being blocked. If a container has a corrugated type sidewall it is recommended to fit the lumber into a corrugated cross section. See [Figure 4.3](#).

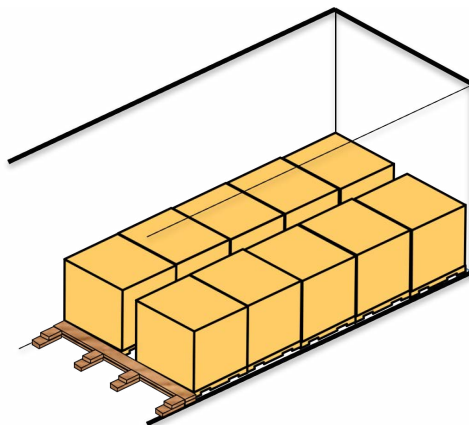


Figure 4.3 Lengthwise floor blocking

4.1.3.2.3 Lumber should be a minimum 2 in. × 6 in. material. The size and amount of lumber and nails required will be dictated by the weight of the freight.

4.1.3.2.4 Reinforce lumber with backup cleats not less than 2 in. × 4 in. material and at least 18 in. in length. See [Figure 4.4](#). The bottom board may extend past the end of the top board and exceed 18 in. in length.

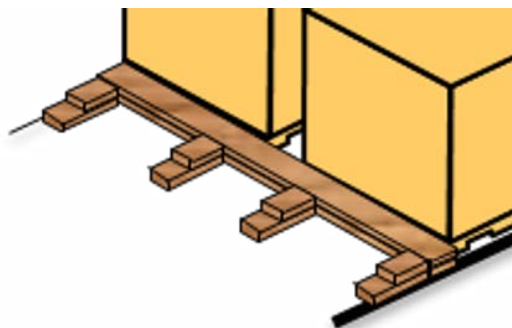


Figure 4.4 Backup cleats

4.1.3.2.5 Unless otherwise specified, nails used to secure the lumber load securement to the floor of the container/trailer must penetrate the floor a minimum of 1 in. To facilitate the nailing process, prevent lumber splitting, and to increase the nail holding power, predrill holes slightly smaller than the nail body or shank.

4.1.3.2.6 Lumber pieces may need to be nailed together to ensure proper height and application. Each layer of lumber must be nailed separately. Nail lumber into the floor first and then laminate or nail top boards to the bottom board. Ensure nails are staggered when adding additional lumber pieces. See [Figure 4.5](#).

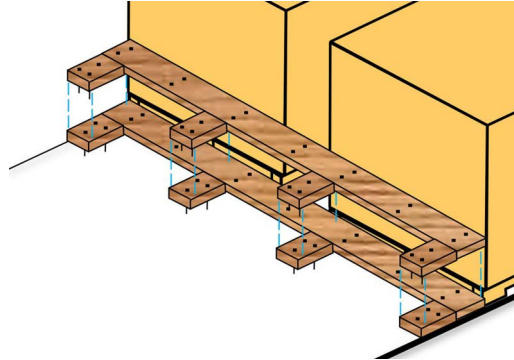


Figure 4.5 Laminated lumber blocking

4.1.3.2.7 For shipments on pallets, use floor blocking of the same thickness as the pallet support members with backup cleats placed in line with the pallet support members. Ensure that the shipping units on the pallet are appropriately secured to the pallet and cannot slide or tip into the lengthwise void. See [Section 3.2](#).

4.1.3.2.8 Ensure any lumber applied as floor blocking will not damage the product or shipping unit. Floor blocking is not adequate securement for double stacked shipping units without an additional method of lengthwise load securement.

4.1.3.2.9 If lumber lengthwise floor blocking is used in conjunction with another approved method of lengthwise load securement such as strapping or Ty-Gard, the combined load securement methods must have a combined securement strength to secure the entire weight of the load.

4.1.4 Center or Side Bracing Frames

4.1.4.1 Center or side bracing frames can be applied between pallets or other shipping units loaded in the container/trailer or between pallets or other shipping units and the sidewalls.

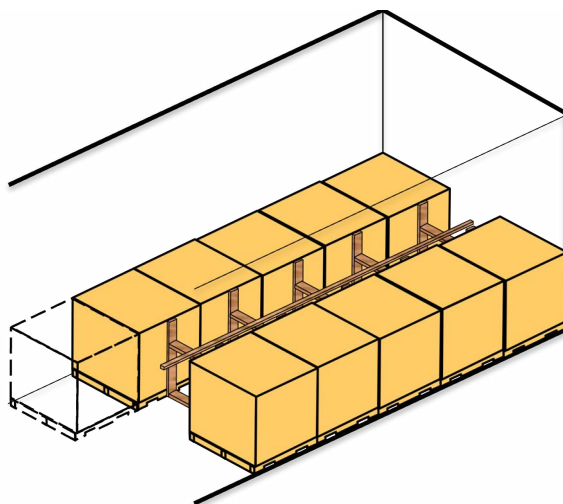
4.1.4.2 Center or side bracing frames can be built to prevent crosswise movement or shipping units from tipping. Frames can also be used to secure additional layers from movement or tipping.

4.1.4.3 Center or side bracing frames may be nailed to the container or trailer floor to prevent crosswise movement or may be applied without attachment to the container or trailer floor if it fills the crosswise void entirely.

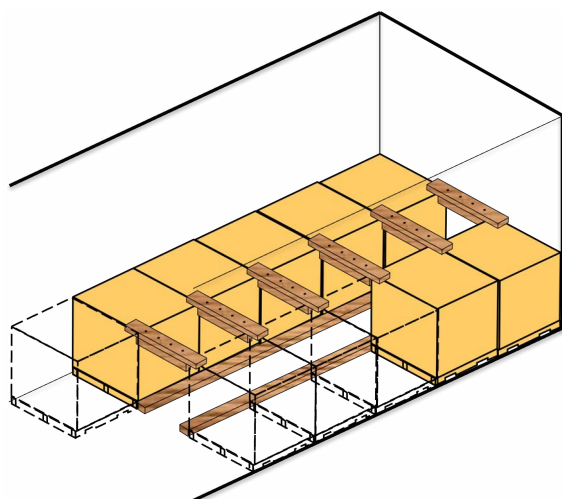
4.1.4.4 Lumber must fully contact the pallets or shipping units and the sidewalls. If a container has a corrugated type sidewall it is recommended to fit the lumber into a corrugated cross section.

4.1.4.5 Lumber should be a minimum of 2 in. × 4 in. or 2 in. × 6 in. material. The size and amount of lumber and nails required will be dictated by the weight of the freight.

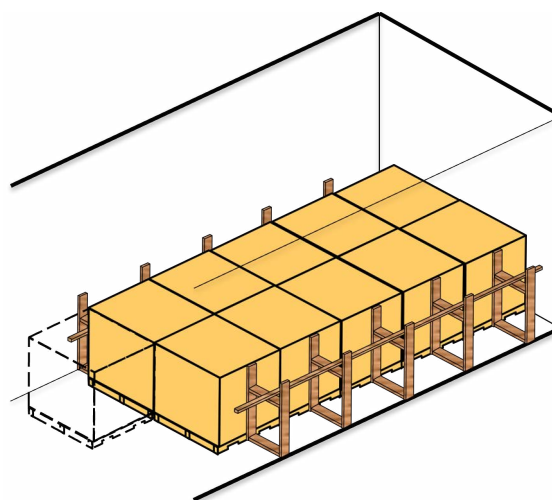
4.1.4.6 The center or side bracing frame should be of sufficient side and strength to prevent the shipping units from shifting or tipping into the crosswise void of the container or trailer. This will require suitable uprights, diagonal braces, and cross-members, as appropriate, supporting the center or side blocking frame. See [Figures 4.6, 4.7, and 4.8](#) for possible options for center or side blocking.



**Figure 4.6 Center blocking frame
(lengthwise blocking and bracing not shown)**



**Figure 4.7 Center bracing
(lengthwise blocking and bracing not shown)**

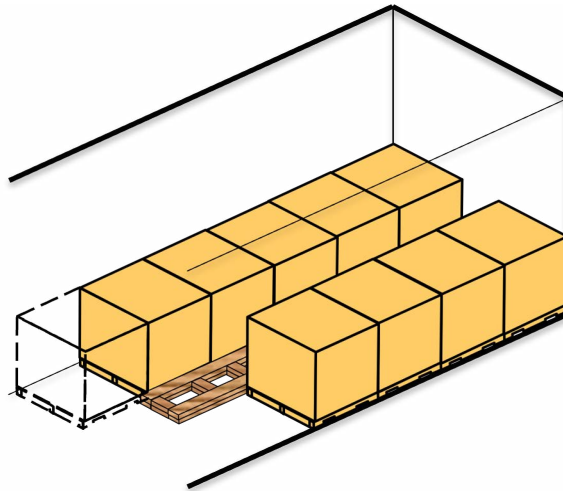


**Figure 4.8 Side blocking frame
(lengthwise blocking and bracing not shown)**

4.1.4.7 Lumber pieces may need to be laminated together to ensure proper height and application. Each layer of lumber must be nailed separately. Ensure nails are staggered when adding additional lumber pieces.

4.1.4.8 Unless otherwise specified, nails used in the assembly of lumber load securement consisting of 2 or more pieces must be at least 1 in. longer than the blocking lumber secured.

4.1.4.9 An option for center bracing of single layer shipping units that are not likely to tip is to construct a ladder frame that is the full width of the crosswise void. See [Figure 4.9](#). If the ladder is the full width of the crosswise void nailing to the container or trailer floor is not needed.



**Figure 4.9 Center ladder void filler
(lengthwise blocking and bracing not shown)**

4.1.4.10 If A-frame bracing is needed for commodities that need to be shipped upright, contact the origin rail carrier.

4.1.4.11 Ensure any lumber applied for center or side bracing will not damage the product or shipping unit.

4.1.5 Gates or Lengthwise Bracing Frames

4.1.5.1 Gates or lengthwise bracing frames can be constructed to secure shipping units from tipping into lengthwise voids, to secure multi-stacked shipping units, and to prevent lengthwise movement in the container or trailer.

4.1.5.2 Gates or lengthwise bracing frames can be constructed at the nose of the container or trailer to block units from moving towards the container or trailer nose, in the middle of the container or trailer to create loading sections, or at the end of the container or trailer to prevent movement toward the doors. Ensure there is sufficient application space for both the gate and the support members.

4.1.5.3 Gates and lengthwise bracing frames must be secured to the container and trailer floors with sufficient securement strength to prevent lengthwise movement.

4.1.5.4 Gates or lengthwise bracing frames must be of sufficient size and strength to secure the shipping units and the weight of the load being secured. This will require suitable uprights, diagonal braces, and cross members, as appropriate, supporting the gate or lengthwise bracing frame. See [Figures 4.10, 4.11, and 4.12](#) for possible options.

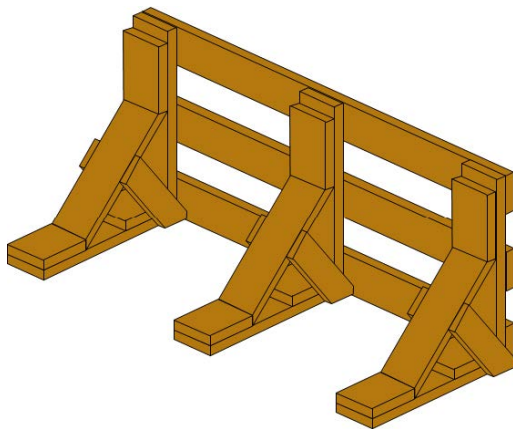


Figure 4.10 Lengthwise gate

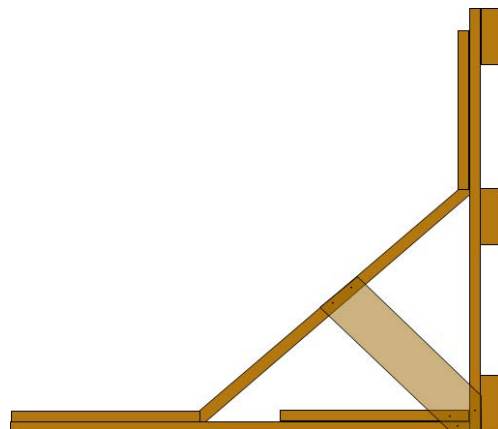


Figure 4.11 Side view of lengthwise gate

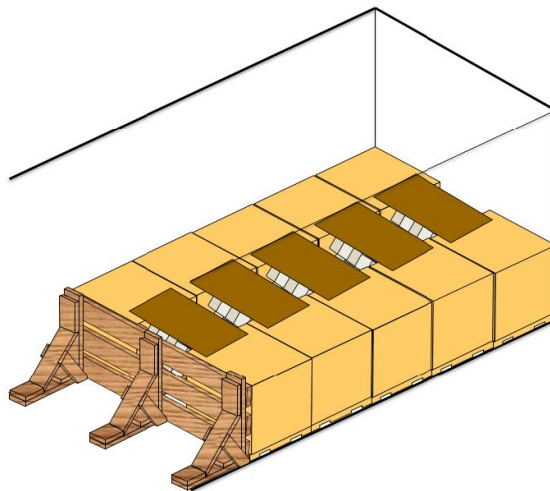


Figure 4.12 Blocking gate

4.1.5.5 Reinforcement or support members for gates can be provided by the use of diagonal blocking to the container/trailer floor. Do not apply this blocking at an angle greater than 45° with the container or trailer floor. If possible, position diagonal at the upper third of the load. [Table 4.6](#) contains approximate lengths of floor diagonals that will be of such a length that the angle will not exceed 45°.

Table 4.6 Lengths of diagonals to container floor (ft)

Height of Application of Diagonal Brace to Cross Brace or Load Above Container Floor	Minimum Length of Diagonal Brace Required
1	1 1/2
1 1/2	2 1/4
2	3
2 1/2	3 1/2
3	4 1/4
3 1/2	5
4	5 3/4
4 1/2	6 1/2
5	7 1/4
5 1/2	7 3/4
6	8 1/2

4.1.5.6 The gate or bracing frame must fully contact the shipping units. If a container has a corrugated type sidewall it is recommended to fit the lumber into a corrugated cross section or doorway corner posts.

4.1.5.7 Lumber should be a minimum of 2 in. × 4 in. or 2 in. x 6 in. material. The size and amount of lumber and nails required will be dictated by the weight of the freight.

4.1.5.8 Lumber pieces may need to be laminated together to ensure proper height and application. Each layer of lumber must be nailed separately. Ensure nails are staggered when adding additional lumber pieces.

4.1.5.9 Unless otherwise specified, nails used in the assembly of lumber load securement consisting of 2 or more pieces must be at least 1 in. longer than the blocking lumber secured.

4.1.5.10 Rear gates may be braced against corners posts if available. Ensure diagonal members extending to the container or trailer floor are double-mitered and reinforced by backup cleats with at least 2 in. x 4 in. x 18 in. lumber. Drive nails perpendicular to floor for maximum holding power.

4.1.5.11 Gates used in-conjunction with approved steel or nonmetallic strapping must have a combined securement strength to secure the entire weight of the load.

4.1.5.12 Ensure any lumber bracing will not damage product or shipping unit.

4.1.6 Doorway Bracing (Bull Boards)

4.1.6.1 Bull boards may be inserted into slotted doorposts to restrain lengthwise movement of low-density freight at the container or trailer doorway. Bull boards should be installed over the height of the freight to distribute the weight of the load. See [Figure 4.13](#).

4.1.6.2 Bull boards consist of a minimum 2 in. x 4 in. lumber (preferably hardwood) of suitable length to fit securely between doorposts. Miter the corners of the boards to fit the bull boards into position.

4.1.6.3 For heavier weight loads or freight construct a T-brace for each bull board. See [Figure 4.14](#).

4.1.6.4 Use a lumber 2 in. x 4 in. vertical upright to separate bull boards along the height of the doorway. Toenail the vertical upright to the horizontal bull boards.

4.1.6.5 Use a sufficient number of bull boards, based on total commodity weight and height of the load, to prevent freight from contacting the doors and to prevent boards from breaking. See [Table 4.7](#).

Example:

- 40,000 lb load weight, 6 ft in height
- 2 in. x 6 in. bull boards with 8,000 lb capacity: $40,000 / 8,000 = 5$ bull boards need to be applied
- 2 in. x 6 in. "T" brace with 10,000 lb capacity: $40,000 / 10,000 = 4$ "T" brace boards need to be applied

4.1.6.6 No lengthwise void space may exist between the bull boards and the freight. If necessary use a gate, lengthwise bracing frame, plywood, or fiberboard filler panels to fill any lengthwise void space.

Table 4.7 Doorway bracing (bull board) application

Restraint Device	Capacity ^{a/}
2 in. x 4 in. bull board	5,600 lb
2 in. x 6 in. bull board	8,000 lb
2 in. x 4 in. "T" brace	7,000 lb
2 in. x 6 in. "T" brace	10,000 lb

^{a/} Figures developed through testing of yellow pine lumber

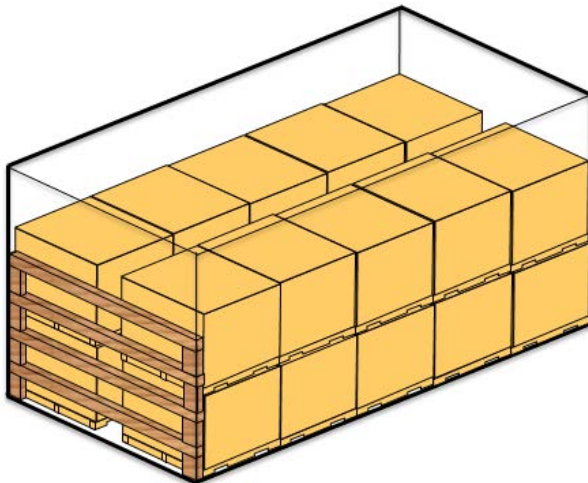


Figure 4.13 Bull boards



Figure 4.14 T-brace

4.2 Strapping

4.2.1 Strapping Application

4.2.1.1 Strapping can be applied for either load securement or to unitize shipping units. Depending on the application, strapping can be steel or nonmetallic (bonded or woven polyester cord strap or polyester plastic strapping). See [Section 4.2.2](#) and [4.2.3](#) for more detailed information on strapping types.

4.2.1.2 Strapping must be AAR-approved and marked in accordance with AAR requirements. Straps must be applied to packages and/or freight with AAR identification markings facing outwards.

4.2.1.3 When referencing a specific loading figure ensure the strap type, size, break strength, and application is followed as outlined in the loading figure. This may include the use of a specific strapping type or a complete load securement strapping system that specifically outlines the strap as well as additional hardware.

4.2.1.4 Before applying anchored load securement strapping inspect the container or trailer for the location and type of anchor points that are available. Ensure there are sufficient anchor points in both number and strength for the load securement straps. See [Section 4.2.5](#) for further information. Strapping must be secured to anchor points as outlined in specific loading methods or per manufacturer's recommendations.

4.2.1.5 When applied for load securement, strapping must be appropriate for the specific application. Straps identified as package straps may only be used for load securement straps when approved in specific loading methods.

4.2.1.6 Unless otherwise specified in loading methods or commodity guides, make the combined joint strength of the number of straps for rigidly braced loads in each lengthwise direction, greater than or equal to the weight of the load being secured.

4.2.1.7 Always determine the capacity of a strapping load securement system to its weakest point - the strap, the seals or buckles, or the anchor points.

4.2.1.8 Use the proper combination of straps, seals or buckles, and sealing or tensioning tools to provide the minimum joint strength based on strap type and size.

4.2.1.9 Load securement strapping applied in conjunction with lumber bracing must have a combined securement strength to secure the entire weight of the load.

4.2.1.10 Strapping and seals or buckles must be applied and tensioned or sealed per manufacturer's instructions. Straps must be fully tensioned per manufacturer's instructions.

4.2.1.11 Manual, pneumatic or powered tensioning and sealing equipment may be used. Follow manufacturers instructions for use and maintenance for the specific equipment to ensure proper operation and performance.

4.2.1.12 All straps must be tight at origin. Loose or sagging straps that cannot be re-tensioned must be replaced. Once a strap has been tensioned and the tension has been released by cutting or removing the strapping, it is considered secondhand or used strap. Used or secondhand strap may not be used or reapplied for load securement.

4.2.1.13 Keep the direction of the straps as close as possible to the direction providing restraint against movement. When straps are applied over the center of gravity of the shipping units, the bottom of the shipping units may require additional blocking to prevent sliding.

4.2.1.14 Use corner or edge protectors between strapping and any sharp edges or acute angles that may be capable of cutting or weakening the strapping. This includes attachment anchor points. Apply protectors to prevent displacement.

4.2.1.15 If the freight is not rigid, but malleable such as bagged freight or bales, more strapping may be needed to secure the freight.

4.2.1.16 Packaging strap must be located a reasonable distance from the edges of the unit being encircled to avoid the strap slipping past the end of the unit.

4.2.2 Steel Strapping

4.2.2.1 More detailed information regarding steel strapping approvals and application is available in the AAR Open Top Loading Rules - *Section 1 - General Rules for Loading all Commodities - Rule 17 - Steel Banding* at <https://aar.com/standards/OpenTop-approvals.html> and <https://my.aar.org/otlr>.

Steel Strapping Approvals Tables:

- Steel banding, high tensile table
- Seal specifications and identification table
- Approved steel strapping sealing tool manufacturers table
- Approved seal-less tool for 1 1/4 in. steel strapping bands table
- Approved steel bands table

4.2.2.2 All high-tension steel straps must be AAR-approved and must meet the specifications published in ASTM specifications D3953 (latest edition). Steel straps must be marked in accordance with AAR requirements.

4.2.2.3 Unless otherwise specified in loading methods or commodity guides, make the combined joint strength of the number of steel straps for rigidly braced loads in each lengthwise direction, greater than or equal to the weight of the load being secured.

4.2.2.4 Use the proper combination of steel straps, seals, sealing tools, crimps, or notches to provide the minimum joint strength for sizes listed in [Table 4.8](#).

Table 4.8 Steel securement straps

Banding				Joint Type Deformation Applications			
Width & Thickness (in.)	Width & Thickness (mm.)	Minimum Breaking Strength (MBS) (lb)	Minimum Joint Strength 75% of MBS (lb)	Minimum No. Pairs of Notches on Joint	Minimum No. Pairs of Crimps on Joint		
				Surface Finish All Types	Surface Finish		
					Not Waxed	Waxed	
1 1/4 x 0.029	31.75 x 0.75	4,750	3,565	2	3	3	4
1 1/4 x 0.031	31.75 x 0.79	4,750	3,565	2	3	3	4
1 1/4 x 0.035	31.75 x 0.89	4,750	3,565	2	3	3	4
1 1/4 x 0.044	31.75 x 1.12	6,750	5,065	4	4	4	4

NOTE: Refer to Table 17.2 (*OTLR Section 1 - Rule 17*) for seal designation. Apply a sufficient number of seals to accommodate the proper number of pairs of notches or crimps.

4.2.2.5 Strapping and seals must be applied, tensioned, and sealed per manufacturer's instructions. Straps must be fully tensioned per manufacturer's instructions.

4.2.2.6 [Table 4.8](#) lists the minimum number of notch or crimp pairs that are to be used based on accepted seal-joint technology. Pair refers to one set of opposing deformations made simultaneously, on each side of the seal. A lesser number of notches or crimps may be used provided the shipper can demonstrate that the joint has the minimum strength shown in [Table 4.8](#) under the column labeled "Minimum Joint Strength 75 percent of MBS (lb)."

4.2.2.7 Metal seal joints are made by mechanically making deformations in the seal and strapping within the seal. The two types of deformations, referred to as notch or crimp, may not be mixed in the same joint or strap being applied. The deformations are always to be applied in a pair simultaneously to each side of the seal.

4.2.2.8 Crimp-type joints must deform overlapping sections of the strapping within the seal to be effective. Notch-type joints have evenly spaced and deep cuts through both the seal and the strapping. Cut strap edges should be visible within the elevated notches. See [Figure 4.15](#).

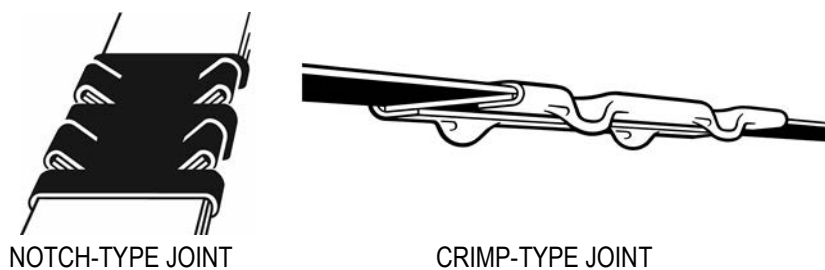


Figure 4.15 Notch and crimp type joints

4.2.2.9 Notch or crimp seals may not be closer than $\frac{3}{4}$ in. on the same seal or closer than $\frac{1}{4}$ in. to the end of the seal. Adequate spacing between the pairs and the end of the seal is essential to a strong joint. When using multiple seals for a common joint, seals should abut one another with no more than $\frac{1}{4}$ in. of separation between any two adjoining seals.

4.2.2.10 Use corner or edge protectors between strapping and any sharp edges or acute angles that may be capable of cutting or weakening the strapping. This includes attachment anchor points. Apply protectors to prevent displacement. Steel straps may only be attached to ISO container D-rings by using an intermediate securement appliance that is designed for this application.

4.2.2.11 Seal-less strap joints are those joints that do not require the use of separate metal seals. Seal-less die cut joints are for packaging strap applications. Seal-less joints can be triple die-cut seal-less joints or reverse die-cut. See Figure 4.16. Reference approval tables in AAR Open Top Load Rules - *Section 1 - General Rules for Loading All Commodities - Rule 17 - Steel Banding* for approved strapping sizes and sealing tools.

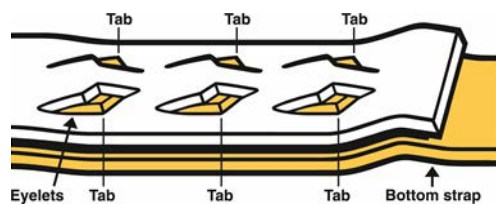


Figure 4.16 Seal-less strap joints

4.2.3 Nonmetallic Strapping

4.2.3.1 More detailed information regarding nonmetallic approvals and application is available in the AAR Open Top Loading Rules - *Section 1 - General Rules for Loading all Commodities - Rule 19 - Nonmetallic Strapping* at <https://aar.com/standards/OpenTop-approvals.html> and <https://my.aar.org/otlr>.

Nonmetallic Strapping Approval Tables:

- AAR-approved Type IV Polyester Strapping Table
- AAR-approved Type 1A Polyester Strapping (Grades 3 through 5) Table
- AAR-approved Type 1A Polyester Strapping (Grade 6 through 8) Table
- Breaking Strength of Type IV Polyester (PET) Table

4.2.3.2 Nonmetallic straps must be AAR-approved or a component of an AAR-approved load securement system and must meet the specifications published in ASTM specifications D3950 (latest edition). Nonmetallic straps must be marked in accordance with AAR requirements.

4.2.3.3 The straps are to be tensioned and joined using the correct buckle and tensioning tools or friction weld method in accordance with manufacturer's instructions. It is important that the buckle/friction weld be applied correctly to maintain strap tension.

4.2.3.4 Strapping joints (buckles, seals, or friction/heat welds) regardless of joining method used, must result in a joint strength of at least 75 percent of the minimum break strength (MBS) of the straps being joined.

4.2.3.5 There can be no knots in the strapping and nonmetallic straps should not be tied or knotted to anchor points or knotted or tied together to join the straps. Twists in the strapping should be avoided.

4.2.3.6 Use corner or edge protectors between strapping and any sharp edges or acute angles that may be capable of cutting or weakening the strapping. This includes attachment anchor points. Apply protectors to prevent displacement.

4.2.3.7 Nonmetallic - Load Securement Type IA (Bonded or Woven Polyester) Strapping

4.2.3.7.1 Unless otherwise specified in loading methods or commodity guides, make the combined joint strength of the number of nonmetallic straps for rigidly braced loads in each lengthwise impact direction, greater than or equal to the weight of the load being secured. Apply load securement strapping systems as outlined in the loading method. See [Table 4.9](#).

Table 4.9 Strapping Type 1A Grade 3 - 8 Minimum Breaking Strength

Strapping	Minimum Breaking Strength (MBS) (lb)	Minimum Joint Strength 75% of MBS (lb)
Grade 3	1,585/2,100	1,189/1,757
Grade 4	3,285/4,400	2,464/3,300
Grade 5	4,200/5,400	3,150/4,050
Grade 6	7,000	5,775
Grade 7	11,000	8,250
Grade 8	15,000	11,250

4.2.3.7.2 Strapping joints (buckles or seals) regardless of joining method used, must result in a joint strength of at least 75 percent of the minimum break strength of the straps being joined.

4.2.3.7.3 Unless other specified in a specific loading method, select buckle type and size based on strapping grade, size, approval, and per manufacturer recommendations.

4.2.3.7.4 Apply the buckle to join the strapping per manufacturer's recommendations. [Figure 4.17](#) demonstrates the application of strapping to a wire buckle. [Figure 4.18](#) demonstrates the application of strapping to a ladder buckle. If a one direction buckle is used, ensure the markings on the buckle are facing outward.

4.2.3.7.5 Strapping and buckles must be applied and tensioned per manufacturer's instructions. Straps must be fully tensioned per manufacturer's instructions.

4.2.3.7.6 Use strap hangers or tape to maintain correct strap position.

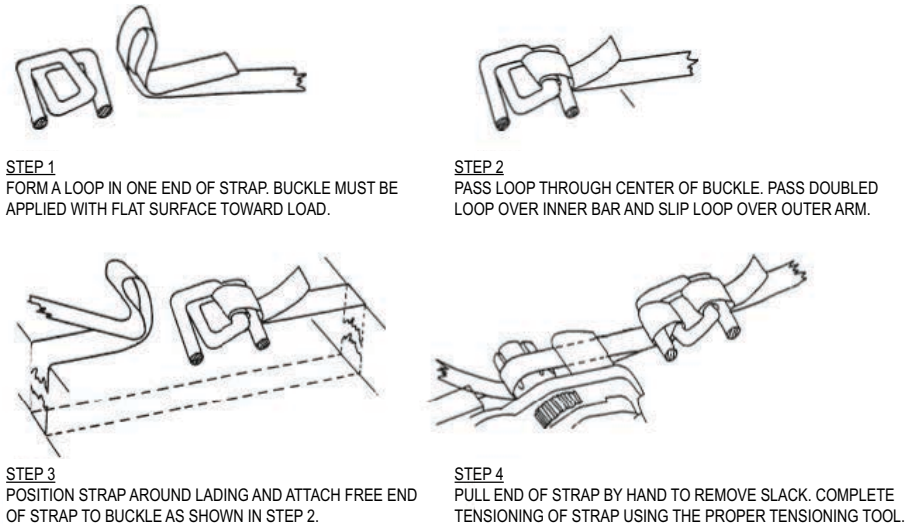


Figure 4.17 Wire buckle application

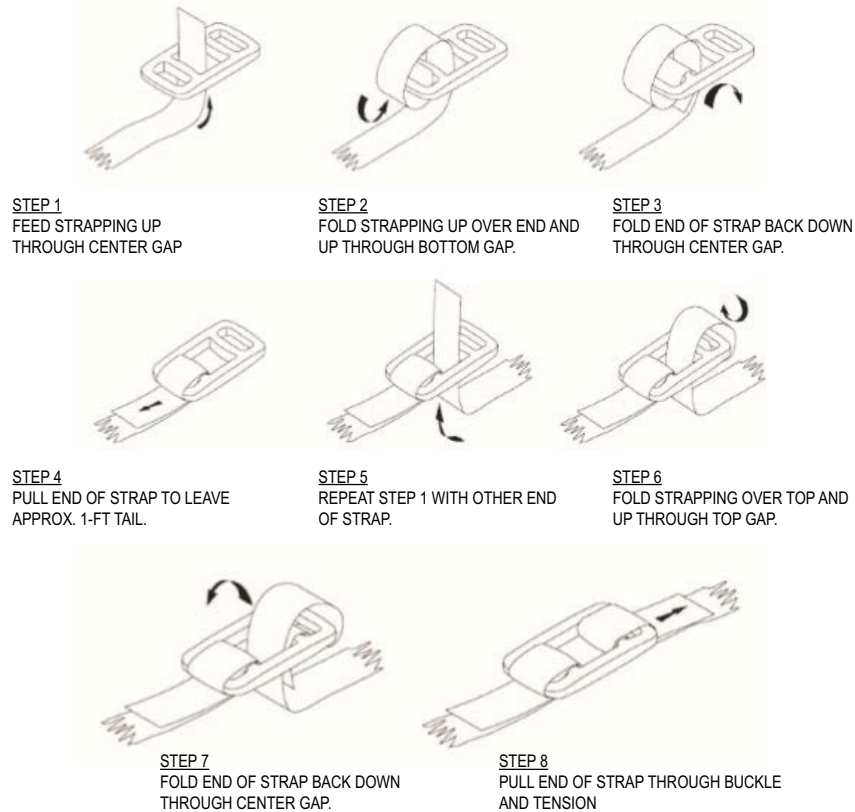


Figure 4.18 Ladder buckle application

4.2.3.8 Nonmetallic - Packaging Strapping Type IV Polyester Plastic (PET) Strapping

4.2.3.8.1 Plastic PET strapping can be used for packaging or unitizing securement in which the use of polyester plastic strapping is specified. The strap is to have a minimum break strength of 1,200 lbs. with a joint strength of 900 lbs. (75 percent minimum break strength). See [Table 4.10](#).

4.2.3.8.2 Strapping joints (metal seals or friction/heat weld seals), regardless of joining method used, must result in a joint strength of at least 75 percent of the minimum break strength of the straps being joined.

4.2.3.8.3 Metal seal joints may be used with approved system application which includes the specific strapping, metal seals, and sealing tool equipment.

4.2.3.8.4 Unless other specified in a specific loading method, select the friction/heat weld or metal seal based on strapping size, approval, and per manufacturer recommendations. Apply the weld or seal to join the strapping per manufacturer's recommendations.

Table 4.10 Breaking strength of Type IV polyester (PET) strapping

Nominal Width		Nominal Thickness		Minimum Break Strength (lb.)	Minimum Joint Strength (lb.)
in.	(mm)	in.	(mm)		
5/8	(15.9)	0.035	(0.89)	1,300	975
5/8	(15.9)	0.040	(1.02)	1,500	1,125
3/4	(19.1)	0.040	(1.02)	1,750	1,313
3/4	(19.1)	0.050	(1.27)	2,250	1,688
3/4	(19.1)	0.055	(1.40)	2,400	1,800
3/4	(19.1)	0.060	(1.53)	2,500	1,875
1	(25.4)	0.040	(1.02)	2,300	1,725
1	(25.4)	0.050	(1.27)	2,800	2,100
1 1/4	(32.0)	0.032	(0.82)	2,250	1,688
1 1/4	(32.0)	0.040	(1.02)	2,800	2,100

4.2.3.8.5 Strapping and welds or seals must be applied and tensioned per manufacturer's instructions. Straps must be fully tensioned per manufacturer's instructions.

4.2.4 Web Strap Load Securement Applications

4.2.4.1 More detailed information regarding web strap is available in the AAR Open Top Loading Rules - *Section 1 - General Rules for Loading all Commodities - Rule 20 - Synthetic Webbing and Assemblies* at <https://aar.com/standards/OpenTop-approvals.html> and <https://my.aar.org/otlr>.

Web Strap Approval Tables:

- Approved webbing companies table
- Approved web assemblies and/or tensioning devices table

4.2.4.2 Synthetic webbing refers to a narrow fabric woven of high-tenacity yarns of synthetic fibers offering suitable characteristics for use in cargo securement. Webbing can be either nylon or polyester webbing.

4.2.4.3 Webbing must be AAR-approved and marked in accordance with AAR requirements.

4.2.4.4 The use of webbing for load securement must follow an approved load securement method including the type, size, and applied number of webbing straps. See [Figure 4.19](#).

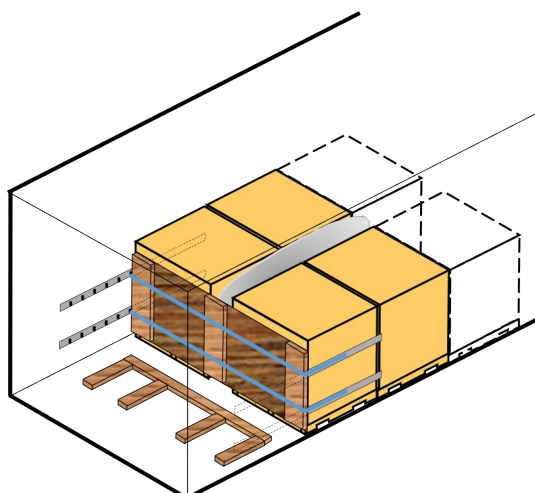


Figure 4.19 Webbing application

4.2.4.5 Minimum Breaking Strength (MBS) is the minimum tensile load lbs. at which the webbing fails. The Working Load Limit (WLL) is the stated capacity of the a web strap, specified as a fraction, or ratio of the MBS.

4.2.4.6 A webbing assembly or webbing system are any items making up the securement assembly between each ultimate point of attachment, including all components such as webbing, winches, hooks, ratchets, etc., as well as the method of securing anchorage devices to the container or trailer. When a WLL is specified in a load securement method, all components of the assembly must meet the minimum requirements.

4.2.4.7 Web strap assemblies are attached to anchor points, E-tracks, A-tracks, or logistic posts with the appropriate anchor attachment. See [Section 4.2.5](#). Use web strap assemblies - straps, ratchets, and related hardware with a minimum load rating as specified in a specific loading methods or a 3:1 safety factor (minimum break strength to working load limit).

4.2.4.8 Ensure webbing is fully tensioned per manufacturer's instructions. No knots, splices, or other repairs are permitted to webbing. Webbing may not be secured or anchored by tying or knotting.

4.2.4.9 Use sufficient corner or edge protection to protect webbing from contacting sharp edges or abrasive surfaces.

4.2.4.10 Webbing must not have:

- excessive abrasion or wear or holes, tears, cuts, snags knots, kinks, or permanent creases
- webbing damage at fittings or broken crushed, thinning, or worn stitching
- melting, charring, or weld spatter, overstressed fibers, or chemical damage
- or any other condition that degrades the strength of the webbing

4.2.4.11 Assembly pieces must not have or contain broken or non-functioning fittings, tension devices, or hardware.

4.2.4.12 Synthetic webbing and or assemblies must be removed from service if any of the previous conditions are present. Winch pawls must operate freely and be capable of retaining strap tension by engaging the ratchet wheel under gravity.

4.2.5 Anchor Attachments

4.2.5.1 Anchor or lashing points are securing devices either built into the base structure of the container or trailer (anchor points) or additional attached securing points (lashing points). See [Figure 4.20](#).



Figure 4.20 Anchor points

4.2.5.2 For Containers:

- D-rings installed at the roof intersections are considered lashing points.
- D-rings installed at floor intersection are considered anchor points.

4.2.5.3 For ISO containers each anchor point is designed and installed to provide a minimum rated load weight of 2,200 lbs. applied in any direction. Each lashing point is designed and installed to provide a minimum rated load weight of 1,100 lbs. applied in any direction.

4.2.5.4 For domestic containers or trailers, the equipment manufacturer or provider should be contacted for information on specific anchor or lashing point capacity.

4.2.5.5 Logistic tracks or posts (E-track) may also be a securement option in containers or trailers. Contact the equipment manufacturer or provider for information on securement capacity. See [Figure 4.21](#).

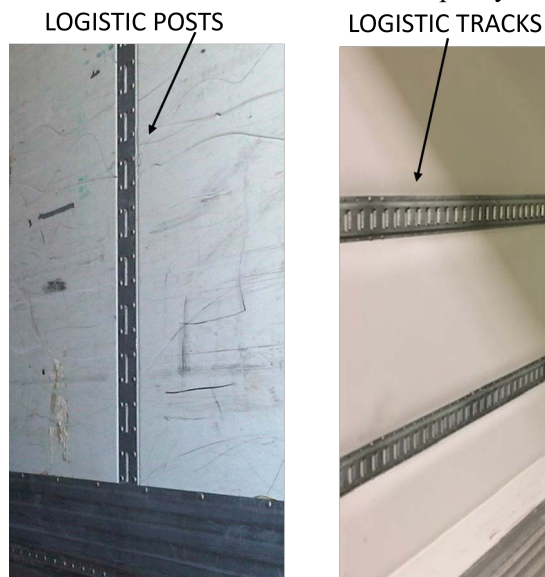


Figure 4.21 Logistic posts or tracks

4.2.5.6 Inspect the container or trailer for the location and type of anchor points that are available prior to loading the freight.

4.2.5.7 When freight is secured against the sidewalls, the capacity of the sidewall should be taken into consideration when determining the amount of load weight that can be secured to the anchor points.

4.2.5.8 Strapping or webbing must be secured to anchor points as outlined in specific loading methods or per manufacturer's recommendations.

4.2.6 Cables or Wire Ropes

4.2.6.1 Contact origin railroad carrier for approval of the loading method and application to use cable or wire rope for load securement.

4.2.6.2 Ensure cables/wire ropes are free from damage and have the appropriate strength and elongation for the application method. Cables/wire ropes cannot be knotted.

4.2.6.3 Attachment assemblies are to be the correct size and strength, free of defects, and applied in the correct amount. Attachment assemblies are to be correctly applied to the cable/wire rope and rated to the capacity of the cable/wire rope.

4.2.6.4 Cables/wire ropes are to be secured and fully tensioned per manufacturer's recommendations.

4.2.6.5 The amount and size of any bends in the cable/wire rope will effect the strength of the securement method. Avoid applying cables/wire ropes when small or tight bends in the material will be needed.

4.2.6.6 Use sufficient edge protectors to protect cables/wire ropes from sharp corners or edges.

4.2.7 Corner or Edge Protectors

4.2.7.1 Select and apply corner or edge protectors as out-lined by specific approved load securement methods. See [Section 6.0](#).

4.2.7.2 Contact the origin carrier for further information on the selection and application of corner or edge protectors. The selection and application of corner protectors is especially critical when hazardous materials are loaded in the container/trailer.

4.2.7.3 Corner or edge protectors serve two purposes:

1. Protect load securement strapping, packaging straps, or other securing material from freight with sharp or abrasive corners, edges, or surfaces or when applied at acute angles.
2. Protect freight from concentrated forces caused by strapping or other securement methods.

4.2.7.4 Corner or edge protectors are applied between the freight and the strapping or other securement materials, usually at a corner or edge.

4.2.7.5 Corner or edge protectors must be:

- Of sufficient strength to withstand pressure applied by tensioned strapping or other securement methods
- Of sufficient size to distribute pressure uniformly over a sufficient area on the freight to prevent freight damage
- Constructed to prevent damage to both the freight and strapping/securement materials
- Secured to prevent displacement during transit

4.2.7.6 Corner or edge protectors may be constructed out of lumber, plastic, multi-layered corrugated material, or other suitable materials. Select the correct type of corner or edge protector based on the type of freight and load securement method.

4.3 Pneumatic Dunnage (Air Bags or Disposable Inflatable Dunnage (D.I.D. Bags))

4.3.1 Air bags can be used to:

- Control lengthwise movement in the container or trailer for approved air bag load securement methods.
- Fill crosswise void in the container or trailer.
- Air bags must NOT be used to fill voids or secure shipments with hazardous materials.

4.3.2 When applying air bags to control lengthwise movement, apply as outlined in an approved loading method. See [Section 6.0](#). Leave a minimum of 24 in. void space between the freight and the container/trailer doors or as otherwise stated in an approved loading method.

4.3.3 For the current listing of AAR-verified pneumatic dunnage and information on the verification process refer to the *Product Performance Profile for Pneumatic Dunnage - Product Verification List* and AAR General Information Bulletin No. 9, *Product Performance Profile for Pneumatic Dunnage*. Both documents can be referenced at <https://aar.com/standards/damage-publications.php>.

4.3.4 Air bags can be:

- Level 1 through Level 5 AAR-verified air bags:
Conventional air bags consisting of a tube-shaped polypropylene bladder protected by either a kraft paper or woven polyethylene exterior and sealed with an end seam at either end of the tube.
- AAR-verified square air bags (Level 1):
Square air bags consisting of a tube-shaped polypropylene bladder protected by a woven polyethylene exterior sealed with a gusseted end seam at either end of the tube to enable greater expansion.
- AAR-verified air bag systems:
Air bag systems consisting of two conventional air bags joined, usually by woven polyethylene material, to work in-conjunction together. Both bags of the air bag system are inflated at the same time with a specifically designed inflater tool.

4.3.5 There are five levels of performance for AAR-verified air bags:

- Level 1 air bags are to fill lateral or crosswise voids (boxcar and intermodal loading methods) and for load securement (approved intermodal methods).
- Level 2 - 5 air bags are for lengthwise load securement based on the total load weight (boxcar loading methods).
- Level 2 - 5 air bags meet the requirements of level 1 air bags and can be used in applications approved for level 1 air bags but must be inflated to the same PSI as level 1 air bags.

4.3.6 Follow the manufacturer's instructions on care and storage of air bags prior to use. Use clean and dry air to fill air bags.

4.3.7 Air bag void size after inflation is to be between 4 - 12 in. Voids from 12 – 24 in. are to be filled with square air bags. Fiber filler panels may also be used to reduce the size of the air bag void prior to inflation. See Section 3.1. See Figure 4.22.

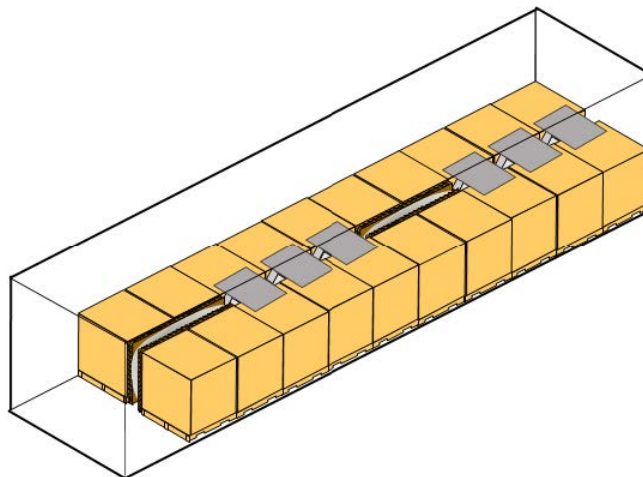


Figure 4.22 Air bags applied with void filler

4.3.8 Use air bags of appropriate size for the commodity. Do not extend the air bags vertically or horizontally beyond the face of the freight when the air bag is applied a minimum of 1 in. off the container or trailer floor. After inflation air bags must contact a minimum of 2/3 of the facing of the adjacent freight. Center the air bags on the face of the freight. Have freight adjacent to air bags nearly equal in height on each side of the air bag. See Figure 4.23.

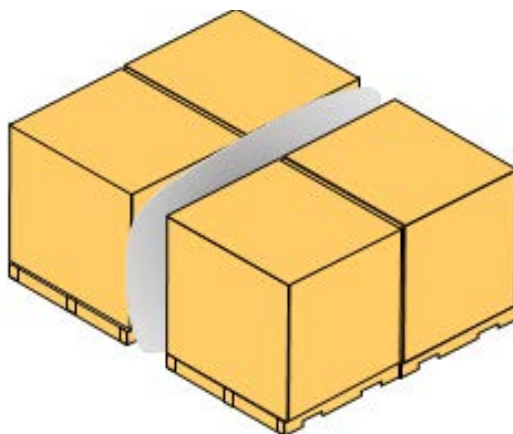


Figure 4.23 Air bag size

4.3.9 Air bags are to be applied against square shaped freight and are to not be applied against round shaped freight such as paper rolls or drums.

4.3.10 Protect air bags from pinch points, sharp edges, rough surfaces or sidewalls, anchor attachments, logistic tracks, or any other surfaces or items that could damage the air bags. Use buffer material, ½ in. thick or of sufficient strength, equal or slightly larger in size than the face of the freight to:

- Prevent the buffer material from conforming to the air bag;
- Prevent chafing to the freight;
- Prevent the air bag from crushing the freight at proper inflation pressure;
- Prevent the freight from damaging the air bags, and
- Prevent damage from any contact with the equipment sidewalls.

4.3.11 Inflate air bags with an approved inflator in accordance with the manufacturer's instructions. Inflation pressure may vary from 1 psi to 3 psi depending on the nature of freight and type of air bag applied. Use an air gauge to ensure prescribed air pressure at inflation. Ensure the correct air bag pressure is applied to prevent damage to the freight or bulging container or trailer sidewalls. Recheck air pressure 30 minutes after inflation for leakage.

4.3.12 Do not reuse air bags unless noted as Level 1 reusable air bags for crosswise or lateral void filling.

4.3.13 Air bags are not to be used to fill any space between:

- The front endwall and the freight
- The container or trailer doors and the freight
- The container or trailer roof and the top of the freight
- Individual shipping units lengthwise in the container or trailer

4.3.14 Do not use air bags in tandem (back-to-back) in the same void. Do not fold air bags in the same void.

4.3.15 Air bags constructed with a kraft paper exterior (paper air bags) are not recommended in shipments containing liquids or in shipments having a high probability of condensation occurring inside the container/trailer. Follow manufacturer's recommendations for the appropriate air bags for these types of shipments.

4.3.16 Square Air Bags

AAR-verified Level 1 square air bags can be used to fill crosswise or lateral voids in the container or trailer and for load securement for approved intermodal load securement methods. Crosswise void space for proper application is to be from 12 – 24 in. See [Figure 4.24](#).

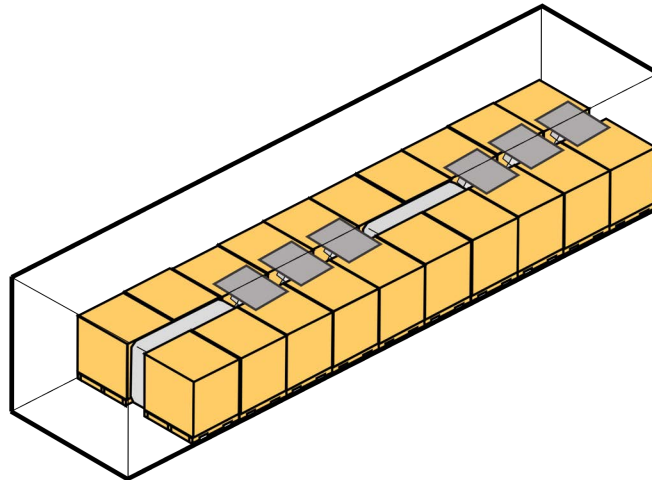


Figure 4.24 Square air bag application

4.3.17 Air Bag Systems

4.3.17.1 AAR-verified air bag systems can be used as lengthwise load securement when applied per an approved loading method (see [Section 6.0](#)), or to fill crosswise voids in the container or trailer. Crosswise void space for proper application is to be from 12 - 24 in.

4.3.17.2 AAR-verified air bag systems applied per an approved lengthwise load securement method can be applied between the container/trailer sidewall and the freight or with two attached air bags in the same crosswise void. Ensure buffer material is used between the sidewall and the air bag to protect the air bags from wall abrasion. See [Figure 4.25](#).

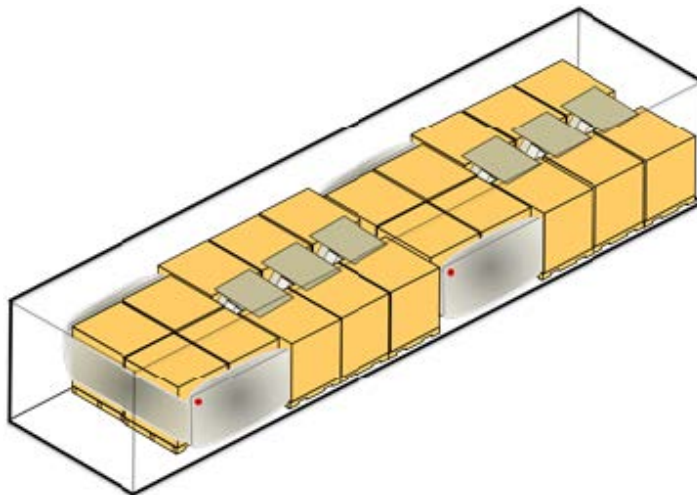


Figure 4.25 Air bag system application

4.3.18 Sidewall Application

AAR-verified level 1 or square air bags can **ONLY** be applied between the freight and the container or trailer sidewalls as crosswise void filler following specific application guidelines:

- Ensure the load maintains equal crosswise weight distribution throughout the entire load pattern.
- Freight is secured with an approved method of load securement to prevent lengthwise movement. See [Section 6.0](#) or contact the origin rail carrier.
- Level 1 air bags are to be applied in a maximum crosswise void of 12 in. and square air bags in a maximum crosswise void of 24 in.
- Use air bags of appropriate size for the commodity.

- Apply buffer material minimum ½ in. thick of sufficient strength between the air bags and the sidewall and the air bags and the freight to protect the air bag from damage.
- Inflate to a maximum of 3 PSI or manufacturer's recommendations for this specific application.
- Use hold-down methods, such as tape over the top of the air bag to prevent air bag displacement.

4.4 Rubber Friction Mats

4.4.1 For the current listing of AAR-verified rubber friction mats and information on the verification process refer to the *Product Performance Profile for Rubber Friction Mats - Product Verification List* and AAR General Information Bulletin No. 10, *Product Performance Profile for Rubber Friction Mats*. Both documents can be referenced at <https://aar.com/standards/damage-publications.php>.

4.4.2 Rubber friction mats are used between freight and the container or trailer floor and between layers of freight to increase resistance to lengthwise movement. See [Figure 4.26](#).

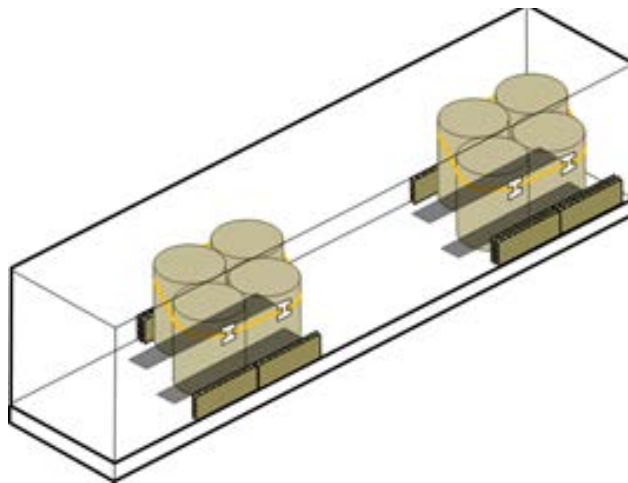


Figure 4.26 Rubber mat application

4.4.3 Do not use rubber friction mats that are torn, contaminated or otherwise damaged in any way. It is not recommended to reuse rubber mats when applied to prevent lengthwise movement in the container or trailer.

4.4.4 For freight loading applications, rubber mats are most commonly manufactured from either masticated or rebonded rubber, in thicknesses from 0.059 in. (1.5 mm) to 0.250 in. (6 mm). Rubber mats are best suited for freight with a large flat bearing surface, such as paper rolls. Shipping units with relatively small bearing surfaces, such as coils on skids, may require denser, more durable and/or thicker mats.

4.4.5 Use rubber friction mats as outlined in specific loading methods. Apply rubber mats as noted for location, number, size, and specifications. Methods will note if rubber matting is to be applied as separate rubber mat sections or continuous rubber matting strips.

4.4.6 Specific loading methods that utilize rubber mat will outline a minimum void space between the end of the load and the container or trailer doors - typically a minimum of 36 in.

4.4.7 Rubber mats need to extend beyond the edges of the freight in the direction the rubber matting is preventing movement - typically a minimum of 6 - 12 in. This could be in both lengthwise directions for loads having multiple sections. See [Figure 4.27](#).

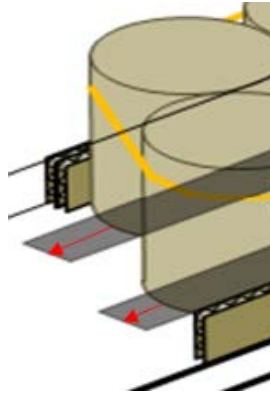


Figure 4.27 Rubber mat size

4.4.8 Do not secure rubber friction mats to the container or trailer floor. Ensure that rubber mats do not overlap underneath freight when using rubber mat sections. Ensure container or trailer floors are swept clean prior to rubber mat application.

4.4.9 Other load securement dunnage may be needed in conjunction with rubber matting. Apply other dunnage as outlined in the specific loading method.

4.5 Additional Methods for Load Securement

The following dunnage products have been evaluated and approved for load securement for intermodal service by the Damage Prevention & Freight Claim Committee. Reference load securement patterns in [Section 6.0](#) for specific application information. Contact the origin rail carrier for additional application variations.

4.5.1 Ty-Gard 2000® and Ty-Gard DS®

4.5.1.1 Ty-Gard 2000® and Ty-Gard DS® (Walnut Industries) are laminated fabric barriers that can be used for specific load securement methods. See [Figure 4.28](#). As a general guide, each Ty-Gard 2000 barrier can restrain up to 8,800 lbs of freight and each Ty-Gard DS can restrain up to 17,600 lbs of freight.

4.5.1.2 Apply Ty-Gard following manufacturer's instructions and application notes in specific loading method. In containers, bond Ty-Gard to the contours of the wall corrugations. In plywood lined trailers or containers, Ty-Gard can only be used with horizontally oriented sidewall panels.

4.5.1.3 Ty-Gard 2000 and Ty-Gard DS are approved as noted for specific loading methods. Note which type of Ty-Gard is approved for the specific method being followed. Ty-Gard is approved for hazardous materials commodities as indicated on the approved loading methods with the DPLS hazardous materials logo. See [Section 2.0](#).

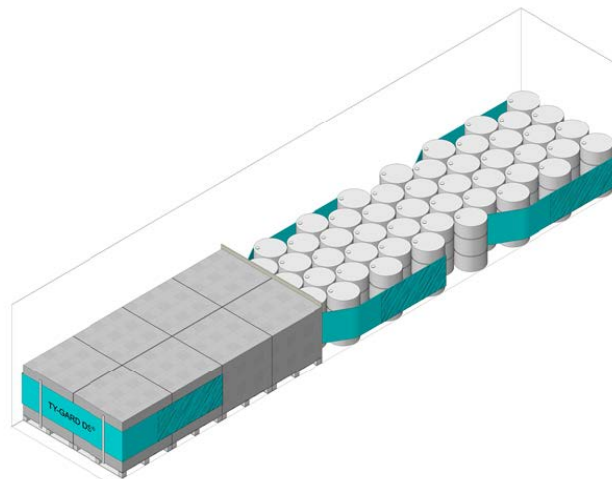


Figure 4.28 Ty-Gard application

4.5.2 Super Wedge® XL, Intermodal Wedge® XL, or Intermodal Wedge®

4.5.2.1 Super Wedge®XL, Intermodal Wedge®XL, or Intermodal Wedge® (Logistick) is applied with wood floor blocking to secure palletized case goods. See [Figure 4.29](#) and loading [Method 6.4.6](#).

- The Super Wedge XL may be used in intermodal containers or trailers with metal lined sidewalls.
- The Intermodal Wedge XL may be used in domestic intermodal containers or trailers with metal corrugated sidewalls. The wedge must fit the vertical groove of the corrugated sidewall.
- The Intermodal Wedge may be used in ISO intermodal containers with metal corrugated sidewalls. The wedge must fit the vertical groove of the corrugated sidewall.

4.5.2.2 Follow manufacturer's instructions for application and reference approved securement methods.

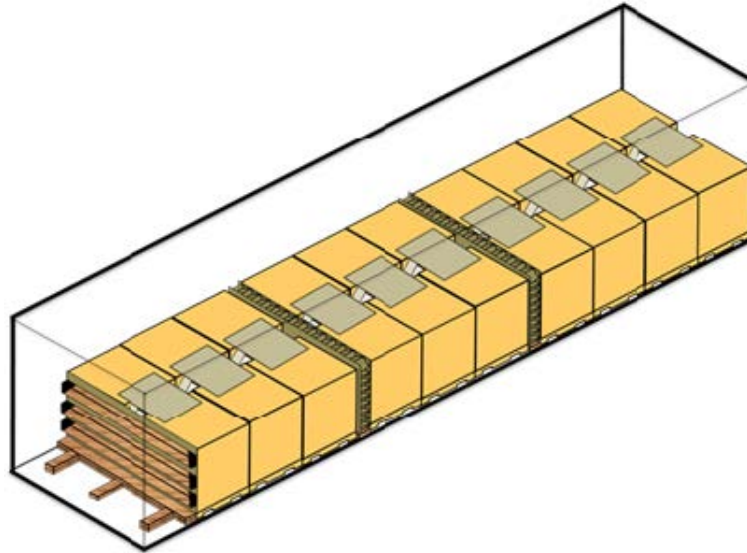


Figure 4.29 Palletized case goods secured with floor blocking and the Super Wedge®XL

5.0 LOADING CONSIDERATIONS

This section is intended to provide the reader with useful information for the loading of freight in containers and trailers. See [Section 6.0](#) for specific loading methods and application information.

5.1 General Information

5.1.1 Plan loads that are tight and secured through blocking and bracing. Each shipping unit being transported by rail is loaded, blocked, and braced to prevent the units from changing position, falling to the floor, or excessive movement during standard rail handling.

5.1.2 Ensure items cannot move or are sufficiently cushioned when packed inside a box, crate, or other shipping unit. Packaging must be sufficient to bear the weight of shipping units stacked on top of lower shipping units

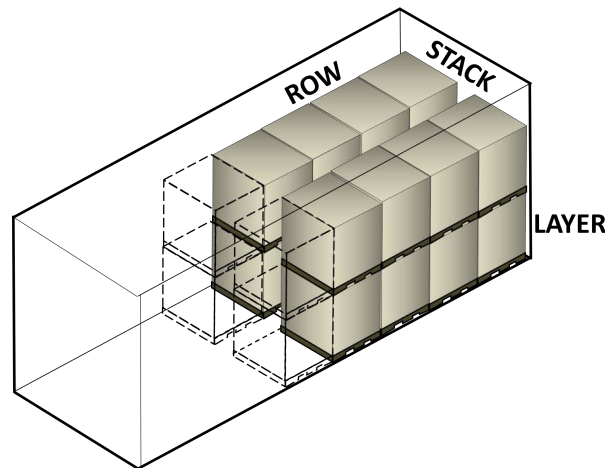
5.1.3 For accurate load planning the following information will be needed:

- Weight of the shipping units
- Dimensions (L x W x H) of the shipping units
- Stability of the shipping units
- Interior dimensions of the container or trailer (L x W x H))

5.1.4 Before planning, understand the load characteristics - weight, weight distribution, dimensions, center of gravity, crushability/fragility of freight, freight packaging and unitization, and other important or unique features.

5.1.5 Shipping units are loaded in: (See [Figure 5.1](#))

- Stacks - crosswise in the container
- Rows - lengthwise in the container
- Layers - vertically in the container



**Figure 5.1 Freight loading orientation
(lengthwise blocking and bracing not shown)**

5.1.6 Load planning focuses on devising a load plan and securement method that will prevent freight movement (load shifts), appropriately distribute load weight, and prevent freight damage. Load shifts can lead to the breakdown of the loading pattern and cause serious damage or deformation of the shipping packages that could result in loss of contents. Load shifts could also damage the trailer, container, or other rail equipment.

5.1.7 The load pattern and securement method should prevent the freight from applying excessive weight or force against the container or trailer sidewalls.

5.1.8 The weight of the load alone does not provide adequate restraint to prevent movement in-transit.

LOADING CONSIDERATIONS

5.1.9 Friction is the resistance to movement. The higher the coefficient of friction of the floor, the shipping unit, or the securement method the better the friction contributes to the load securement. A larger amount of contact area with the container or trailer floors or walls does not necessarily increase load securement friction.

5.1.10 Consider possible failure points in load securement patterns and methods, including the intermodal equipment. Ensure securement methods are not secured past their mechanical limits and not over/under tightened or inflated.

5.1.11 Load securement dunnage should not be considered individually. All load securement dunnage applied in a container/trailer needs to work together to secure the load and prevent movement.

5.1.12 If possible, freight should be loaded tightly to the container sidewalls on both sides, leaving any remaining gap in the middle. Alternatively, freight can be loaded in alternating stacks against opposite sidewalls.

5.1.13 Keep the center of gravity (vertical, crosswise, and lengthwise) of a load or a freight as low and as close to the container or trailer center as possible.

5.1.14 The weight of the load securement material is to be added to the weight of the freight for the total load weight.

5.1.15 Humidity or condensation inside the container or trailer may cause damage or loss of stability to the freight or securement dunnage.

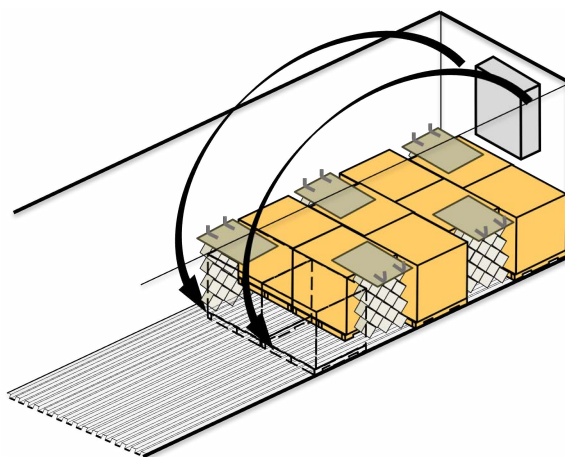
5.2 Refrigerated Equipment Loading Considerations

5.2.1 In a container or trailer with refrigeration equipment - the warm air is drawn out of the container, cooled, and then blown back into the container.

5.2.2 Prior to loading, ensure the freight is at the temperature required for transportation. Refrigerated equipment is designed to maintain temperatures.

5.2.3 Prior to loading verify that the refrigerated equipment is at the correct set point and internal temperature required for the freight being loaded.

5.2.4 Ensure air can flow freely around the load with an air gap between the top of the load and the roof of the container - minimum 18 in. and a minimum of 2 in. between rear load securement and the equipment doors. Allow for an air flow channel at the sidewalls. "T" floor grating and pallets create additional space between the floor and the freight allowing for an air flow channel. Do not load freight beyond the end of the T-floor. See [Figure 5.2](#).



**Figure 5.2 Refrigeration airflow
(lengthwise blocking and bracing not shown)**

5.2.5 In refrigerated containers or trailers ensure the method of load securement is compatible with the metal floors with "T" floor grating, sidewall configuration, and set temperature levels. Contact the origin rail carrier for further information on load securement in refrigerated equipment.

5.2.6 An option to secure freight crosswise in refrigerated equipment is to use 1 in. x 3 in. lumber guide rails in the “T” grating channels. Install guide rails adjacent to the freight and the same length as the crosswise void. Add 2 in. x 4 in. backup cleats that are equal in length to the space between the guide rail and the equipment sidewalls. Nail back-up cleats to guide rail and not to equipment floor. See [Section 4.1](#) and [Figure 5.3](#).

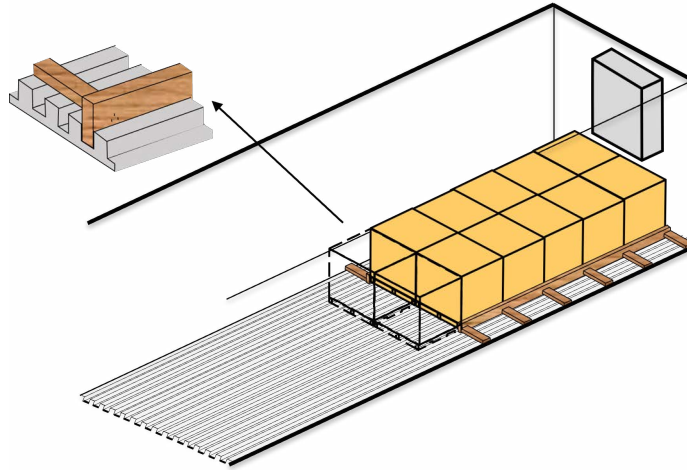


Figure 5.3 Refrigeration crosswise void filler (lengthwise blocking and bracing not shown)

5.3 Drum Palletization Loading Considerations

5.3.1 For information on liquid commodities loading, see [Section 3.1.7](#).

5.3.2 Fifty-five gallon drums may be palletized to facilitate handling. Only use pallets designed and sized to support drums. Drums are loaded four to a pallet on square pallets measuring 44 ⁷/₈ in. in both dimensions. These may have the designation CP3 or CP9 on the pallet blocks. Do not palletize less than or more than four drums per pallet. See [Section 3.2.3](#). See [Figure 5.4](#).

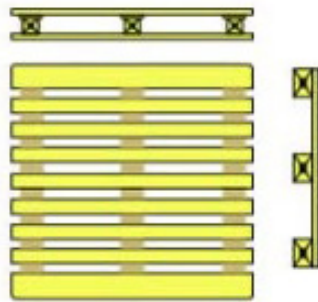


Figure 5.4 Drum pallets

5.3.3 Drums are to be secured to the pallet and unitized to prevent independent drum movement. Stretch wrap drums to pallets, or apply other adequate unitizing, such as strapping as shown in [Figure 5.5](#). Use AAR-approved strapping, either ⁵/₈ in. x 0.035 in. PET straps or Type 1A Grade 4 nonmetallic straps. See [Section 4.2.3](#). Use the correct buckle or seal based on the strapping and tension strap using proper tensioning tools. A 2 in. x 6 in. x 6 in. wood block may be nailed to the pallet deck, centered and on a diagonal, to engage the base of the drums to the pallet.

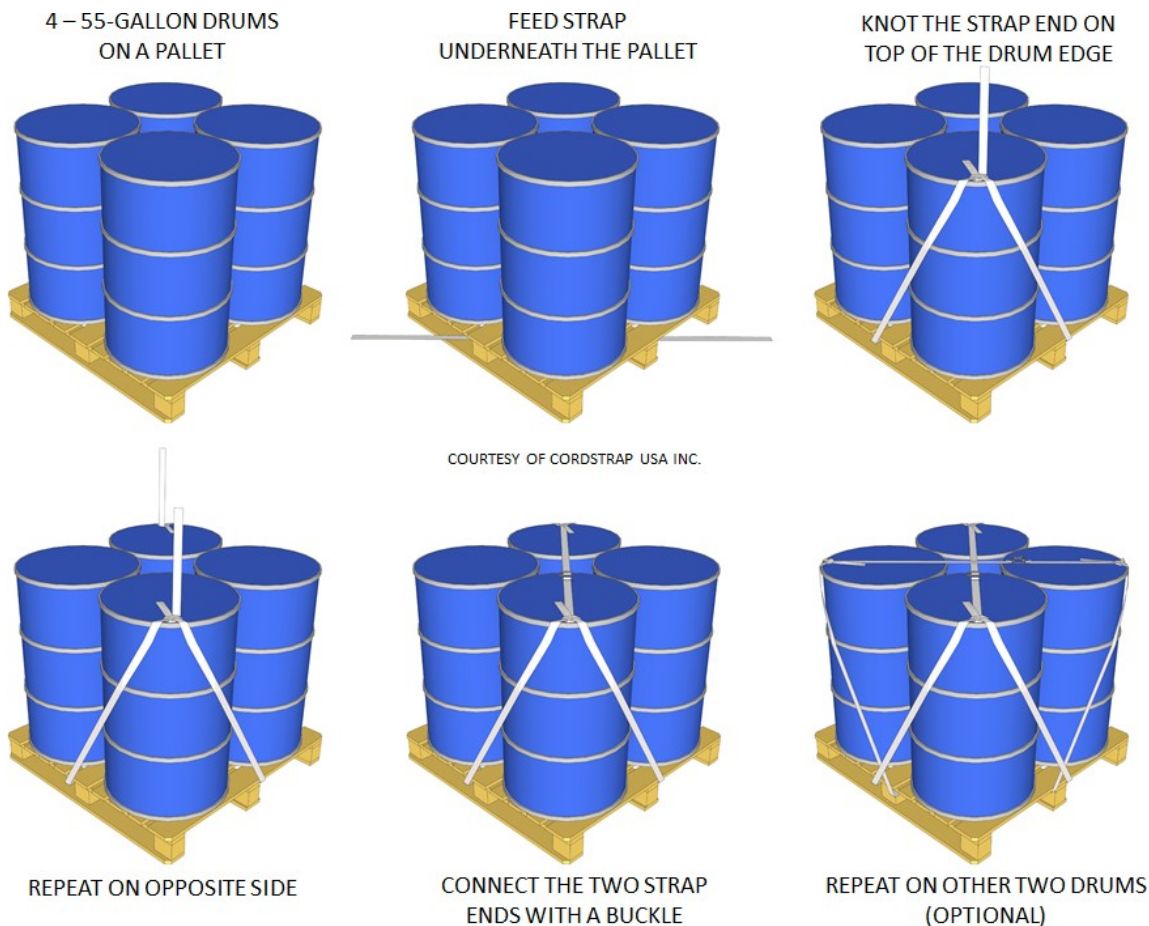


COURTESY OF CORDSTRAP USA INC.

Figure 5.5 Drums secured to pallet with strapping

5.3.4 The last stacks of drum pallets at the container/trailer doors will require additional drum stabilization. Select one of the following approved drum palletizing methods for the last stack of palletized drums.

5.3.4.1 Drums can be cross strapped to make a tight connection between the last middle drum to the second to last side drum. This is done using two strap loops and a buckle. See [Figure 5.6](#). Use AAR-approved Type 1A Grade 4 nonmetallic straps.



COURTESY OF CORDSTRAP USA INC.

Figure 5.6 Cross-strapped drums

5.3.4.2 Drums can be secured using two encircling straps located at or near the drum rolling hoops. Unitize the drums to the pallet with two straps in each direction. Use AAR-approved strapping, either $\frac{5}{8}$ in. x 0.035 in. PET straps or Type 1A Grade 4 nonmetallic straps. Apply corner protectors or angleboard against the top drum chimes to provide a level application surface for the strapping. See [Figure 5.7](#).

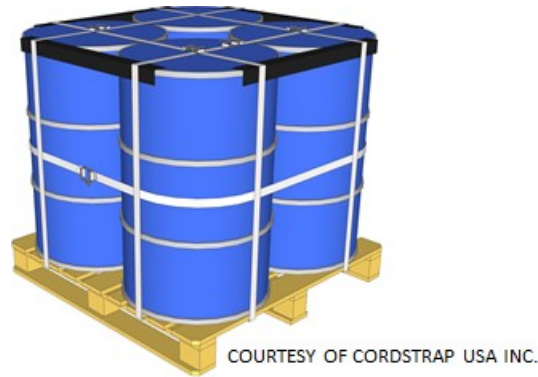


Figure 5.7 Drum encircling straps

5.3.4.3 Drumguard® Quattro may be used to secure the drums to the pallets. The metal plate attaches to the top chimes of the four drums and secures the drums to the pallet with a long, threaded metal rod that is screwed into a wood pallet. See [Figure 5.8](#). Unitize the four drums with one encircling strap at or near their top rolling hoop. Use AAR-approved strapping, either $\frac{5}{8}$ in. x 0.035 in. PET straps or Type 1A Grade 4 nonmetallic straps.



Figure 5.8 Drumguard® Quattro

5.3.5 Drumclips may be used to secure the drums to the pallets. The plastic bracket attaches to the top chimes of two drums and secures the drums to the pallet with strapping as shown in [Figure 5.9](#). For closed head steel drums, unitize the drums to the pallet with 1 strap oriented in the lengthwise loading direction. For closed head poly drums, use two straps, one in each direction.



Figure 5.9 Drumclips

5.4 Intermediate Bulk Container (IBC) Loading Considerations

5.4.1 Liquid - Intermediate Bulk Containers (IBCs)

5.4.1.1 Liquid Intermediate Bulk Containers are UN/DOT shipping containers with a specified volume (gallons or liters), dimensions, and engineering standards. They are commonly referred to as IBCs, totes, or tanks. For information on liquid commodities loading, see [Section 3.1.7](#).

LOADING CONSIDERATIONS

5.4.1.2 IBCs filled with hazardous material commodities must meet the construction and engineering specifications per Code of Federal Regulation (CFR) Title 49. Not all types of IBCs are approved for hazardous materials.

5.4.1.3 Load IBCs in a container/trailer following an approved loading securement method. See [Sections 6.2](#) and [6.3](#). Note any specific requirements for type of IBC. Ensure IBCs are not damaged and suitable for the liquid commodity they are loaded with. If loading IBCs with hazardous material commodities, ensure the load securement method is approved for hazardous materials.

5.4.1.4 Liquid IBCs can be constructed out of the following materials:

- Wooden IBCs with liners
- Fiberboard IBCs of typically a minimum triple wall corrugated fiberboard panels with a plastic inner container. IBC is secured to the pallet base.
- Flexible plastic IBCs
- Rigid plastic IBCs of polyethylene, typically high-density polyethylene (HDPE)
- Composite IBCs with a rigid metal cage containing an inner HDPE liner
- Metal IBCs of carbon steel or stainless-steel construction with specific criteria for tank thickness and metal durability

5.4.1.5 Liquid IBCs typically have a volume capacity between 110 - 550 gallons with the most common capacity of 275 or 330 gallons with common dimensions of 45 - 48 in. length x 40 - 45 in. width x 46 - 53 in. height. Pallet bases can be either plastic or wood.

5.4.1.6 If IBCs will be stacked in the container/trailer, ensure that the IBCs are designed and approved for loaded stacking during transportation.

5.4.1.7 The use and application of corner protectors is critical with IBCs as strapping or other load securement methods could damage the IBCs. See [Section 4.2.7](#).

- Use the specific corner protector that is noted in an approved IBC loading method.
- If a specific corner protector is not noted, ensure that the selected corner protector is of sufficient size and strength to prevent damage to the IBC.

5.4.1.8 Apply layer separators and load dividers as outlined in approved load securement methods. See [Section 3.3](#).

5.4.2 Dry Commodities- Intermediate Bulk Containers (IBCs)

5.4.2.1 IBC for dry flowable commodities may be constructed out of flexible woven polypropylene material. They are commonly referred to as flexible intermediate bulk containers (FIBCs), bulk bags, or super sacks.

5.4.2.2 For loading methods for FIBCs, contact the origin carrier for pattern approval and loading securement recommendations.

5.4.2.3 FIBCs dimensions are typically between 35 - 48 inches in length and width and 39 - 79 inches in height. Dimensions and capacity will be based on the type of IBC and type and density of the loaded commodity.

5.4.2.4 FIBCs will settle and bellow or bulge out when loaded. Ensure the loading pattern and securement methods accounts for the change in dimensions of the shipping unit.

5.4.2.5 FIBCs can be floor loaded or palletized:

- Floor-loaded FIBCs will have lifting loops - one, two, or four, on top of the IBC for loading and unloading of the container/trailer. Ensure that the forklift will not contact the top of the intermodal equipment when using the lifting loops.
- When FIBCs are palletized, the IBC must be approximately equal in size to the pallet and be secured to the pallet with an appropriate unitization method.

5.4.2.6 Apply buffer material between the FIBCs and the container/trailer walls and the load securement dunnage to prevent any damage to the FIBCs.

6.0 APPROVED LOAD SECUREMENT METHODS - BY COMMODITY

Methods contained in this section have been tested according to AAR procedures for evaluation and acceptance of new loading and bracing systems. These procedures involve evaluation of the method during simulation and/or field test shipments. Methods in this section have been approved by the Damage Prevention and Freight Claim Committee.

Methods marked with HM are approved for hazardous materials load securement. Methods marked with HM* were tested to 8 MPH during impact testing.

Methods will note the type (container or trailer) and size of intermodal equipment used during testing, if known. Other types or sizes of intermodal equipment may be loaded as long as the pattern is adjusted for equalized and balanced weight distribution and for the inside equipment length and width. The use of additional dunnage may be needed, such as void fillers. The quantity and placement of the commodity loaded may also require adjustment based on equipment size and weight limits.

Freight weight must be evenly distributed both crosswise and lengthwise, and combined weight of the freight and intermodal equipment must conform to all federal, state, provincial, and local regulations and transportation service requirements used at origin and to final destination.

6.1 Roll Paper

Number	Loading Method	Former Method
6.1.40.1	40-in. Diameter Roll Paper Secured with Ty-Gard 2000® or DS® Barriers	B-4 (cancels GIS 798)
6.1.40.2	40-in. Diameter Roll Paper Secured Using Rubber Mats or Wood Blocking	E-17 & G-1
6.1.45.1	45-in. Diameter Roll Paper Secured Using Rubber Mats	E-12
6.1.50.1	50-in. Diameter Newsprint Using Rubber Mats	E-13
6.1.50.2	50-in. Diameter Roll Paper Using Rubber Mats	E-5 & E-20
6.1.54.1	54-in. Diameter Paperboard Using Rubber Mats	E-22 (cancels GIS 800)
6.1.58.1	Through Loads of 58-in. Diameter Roll Pulpboard Using Rubber Mats	E-8
6.1.58.2	Split Loads of 58-in. Diameter Roll Pulpboard Using Rubber Mats	E-4; E-18; E-19; & E-23 (cancels GIS 778 & 797)
6.1.58.3	58-in. Diameter Rolls of Pulpboard Using Floor Blocking	G-5
6.1.60.1	Split Load of 60-in. Diameter Rolls Using Rubber Mats	New
6.1.X.1	40- to 45-in. Diameter, Large Width Roll Paper, Using Rubber Mats and Strapping	E-14
6.1.X.2	46- to 57-in. Diameter Roll Paper Using Rubber Mats	E-21 (cancels GIS 799)
6.1.X.3	48- to 54-in. Diameter Roll Pulpboard Using Rubber Mats with an Incomplete Second Layer	E-10

* Roll Paper securement method numbering includes the roll diameter; multiple diameter patterns use "X"

6.2 Drums and IBCs

Number	Loading Method	Hazmat	Former Method
6.2.1	Drum Loads Secured with Ty-Gard 2000® or DS® Barriers	HM	B-1 (cancels GIS 798)
6.2.2	Fiberboard IBCs for Liquids Secured with Ty-Gard 2000®	HM	B-7
6.2.3	Drum Loads Secured by Ty-Gard 2000® or DS® Barriers in 20-ft. ISO Containers - Approved for Hazardous Commodities	HM	B-8 & B-9 (cancels GIS 798)
6.2.4	Drum Loads Secured by Ty-Gard 2000® or DS® Barriers in 20-ft. ISO Containers - Approved for Nonhazardous Commodities		B-8 & B-9 (cancels GIS 798)

APPROVED LOAD SECUREMENT METHODS - BY COMMODITY

Number	Loading Method (continued)	Hazmat	Former Method
6.2.5	Closed Head Steel Drums on Rubber Matting with Strapping		E-7
6.2.6	Drum Load Secured with "T" Braces in 20-ft. Containers	HM*	G-2
6.2.7	Fifty-Five Gallon Drums with Wood Blocking and Bracing	HM*	G-3 & G-4
6.2.8	Tight - Head Steel, 55-Gallon Drums Secured with Cordstrap® Composite Strapping (CC) 105 in 20-ft. ISO Containers - Approved for Hazardous Commodities	HM	I-1
6.2.9	Tight - Head Steel or Plastic, 55-Gallon Drums Secured with Cordstrap® Composite Strapping (CC) 105 in 20-ft. ISO Containers - Approved for Nonhazardous Commodities		I-1
6.2.10	Tight - Head Steel or Plastic, 55-Gallon Drums Secured with Carolina Strapping and Buckles Company Woven Strapping (CS) 2040 in 20-ft. ISO Containers	HM	I-2 & I-3
6.2.11	Steel Drums, 55-Gallons, on Pallets Secured with Cordstrap® Barriers in 40-ft. ISO Containers		I-6 (cancels GIS 755)

* Reference Mixed Load - Load Securement Methods for additional load securement methods

6.3 Mixed Loads

Number	Loading Method	Hazmat	Former Method
6.3.1	Mixed Loads Secured with Ty-Gard 2000® or DS®	HM*	B-2 (cancels GIS 798)
6.3.2	Double-Layer Loads Secured with Ty-Gard 2000® or DS®	HM*	B-3 (cancels GIS 798)
6.3.3	Double-Layer Loads of Hazardous or Nonhazardous Materials Secured with Cordstrap® Barriers in 20-ft. Containers	HM	I-4 (cancels GIS 833)
6.3.4	Hazardous or Nonhazardous Loads Secured with Cordstrap® Barriers in 40-ft. Containers	HM	I-5 (cancels GIS 834)
6.3.5	Double-Layer Loads of Nonhazardous Materials Secured with HFLASH RHS Securement System in a 20-ft. Container		I-7 (cancels GIS 835)
6.3.6	Nonhazardous Loads Secured with Cordstrap® Barriers in 20-ft. and 40-ft. Containers		I-8 (cancels GIS 872)

6.4 Case Goods

Number	Loading Method	Former Method
6.4.1	Case Goods Secured with Air Bags	F-2
6.4.2	Split Loads of Case Goods or Fiberboard Tray Packs Secured with Air Bags	F-3
6.4.3	Case Goods Secured with Air Bag Systems	F4 & F5 (cancels GIS 783, 784, & 817)
6.4.4	Case Goods Secured with Stopak Blocker Air Bags	F-6 (cancels GIS 824)
6.4.5	Cases Goods Secured with Cargo Tuff Dually™ Air Bags	F-7 (cancels GIS 852)
6.4.6	Case Goods Secured with Floor Blocking and the Super Wedge® XL, Intermodal Wedge® XL, or Intermodal Wedge® (Logistick Inc.)	H-14 (cancels GIS 861)

6.5 Palletized Freight & Bulk Bins

Number	Loading Method	Hazmat	Former Method
6.5.1	Bulk Boxes Secured with Floor Blocking and Ty-Gard 2000® or DS® Barriers	HM*	B-6 (cancels GIS 798)
6.5.2	Palletized Flat Paper Stock Secured Using Rubber Mats and Air Bags		E-15
6.5.3	Palletized Roofing Shingles Secured Using Rubber Mats		E-16
6.5.4	Palletized Commodities Secured Using Web Strap Assemblies and Floor Blocking		H-6
6.5.5	Palletized or Crated Auto Parts Secured by Web Strap Assemblies in 53-ft. Containers		H-16 (cancels GIS 822)

6.6 Coils and Wire Cables

Number	Loading Method	Former Method
6.6.1	Coils on Skids with Rubber Mats in Refrigerated Equipment	E-1
6.6.2	Coils on Skids with Rubber Mats	E-2
6.6.3	Wire Cable Coils in Cradles Using Guide Rails and Rubber Mats	E-3
6.6.4	Metal Coils on Skids/Platforms or in Cradles Secured by Web Straps Attached to Cargo Sleds in 20-ft. Containers	H-11

6.7 Lumber and Brick

Number	Loading Method	Former Method
6.7.1	Dimensional Lumber Secured by Floor Blocking and Air Bags	G-6
6.7.2	Brick Secured with Floor Blocking and Ty-Gard 2000® Barriers	B-5

6.8 Equipment

Number	Loading Method	Former Method
6.8.1	Securement System for Wheeled Vehicles in ISO Containers	H-13
6.8.2	Gearboxes Mounted on Sleds in 20-ft. Containers	(cancels GIS 768)

6.9 Special Securement

Number	Loading Method	Former Method
6.9.1	Barless Liner System to Transport Bulk Dry Flowable Commodities in 20-ft. and 40-ft. ISO Containers	H-12
6.9.2	Universal Storage Containers Loaded in 53-ft. Intermodal Containers	H-15 (cancels GIS 787)

Reference from Prior Load Securement Methods in the 2016 Intermodal Loading Guide

B. Ty-Gard 2000® and DS® - Load Securement Methods

Former Method	Loading Method	Hazmat	Current Method
Method B-1 (GIS 798)	Drums Loaded in Two or Three Sections Secured with Ty-Gard 2000® Barriers	HM	6.2.1
Method B-2 (GIS 798)	Mixed Load Secured with Ty-Gard 2000® Barriers	HM*	6.3.1
Method B-3 (GIS 798)	Double-Layer Load Secured with Ty-Gard 2000® Barriers in a 20-ft. Container	HM*	6.3.2
Method B-4 (GIS 798)	40-in. Diameter Roll Printing Paper Secured with Ty-Gard 2000® Barriers		6.1.40.1
Method B-5	Brick Secured with Floor Blocking and Ty-Gard 2000® Barriers		6.7.2
Method B-6 (GIS 798)	Bulk Boxes Secured with Floor Blocking and Ty-Gard 2000® Barriers	HM*	6.5.1
Method B-7	Intermediate Bulk Containers for Liquids Secured with Ty-Gard 2000® Barriers	HM	6.2.2
Method B-8 (GIS 798)	Seventy-Eight to Eighty Closed-Head 55-Gallon Steel or Plastic Drums in Two Layers Secured by Ty-Gard 2000® in a 20-ft. ISO Container	HM	6.2.3 & 6.2.4
Method B-9 (GIS 798)	Intermodal Loads Secured with Ty-Gard Barriers		6.2.1, 6.3.1, 6.3.2, 6.1.40.1, 6.5.1, 6.2.3 & 6.2.4

E. Rubber Mats - Load Securement Methods

Former Method	Loading Method	Current Method
Method E-1	Coils on Skids with Rubber Mats on Floor in Refrigerated Equipment	6.6.1
Method E-2	Coils on Skids with Rubber Mats on Floor (Hardwood Flooring)	6.6.2
Method E-3	Wire Cable Coils in Cradles Using Guide Rails and Rubber Mats	6.6.3
Method E-4	58-in. Diameter Roll Pulpboard on End Using Rubber Mats	6.1.58.2
Method E-5	50-in. Diameter Rolls of Wrapping Paper on End Using Rubber Mats	6.1.50.2
Method E-6	Bilge-Loaded Large-Diameter Roll Paper on Wood Cradles	Archived
Method E-7	Closed-Head Steel Drums in a 3-4-3 Pattern on Rubber Matting with Steel or Approved Polyester Cord Strapping	6.2.5
Method E-8	Through Loads of 58-in. Diameter Roll Pulpboard on End Using Two 3-ft. Wide Rubber Mats	6.1.58.1
Method E-10	Roll Pulpboard on End Using Rubber Mats with an Incomplete Second Layer	6.1.X.3
Method E-12	45-in. Diameter Roll Paper on End Secured Using Rubber Mats	6.1.45.1
Method E-13	50-in. Diameter Newsprint on End Using 1-ft. Wide Rubber Mats	6.1.50.1
Method E-14	40- to 45-in. Diameter, Large Width Roll Paper on End in Two Sections Using Two 2-ft. Wide Rubber Mats Under Each Section and Steel Strapping	6.1.X.1
Method E-15	Skidded or Palletized Flat Paper Stock Secured Using Rubber Mats and D.I.D. Bags	6.5.2
Method E-16	Palletized Roofing Shingles Secured Using 1-ft. Wide Rubber Mats	6.5.3
Method E-17	40-in. Diameter Roll Paper on End Secured Using 2-ft. Wide Rubber Mats	6.1.40.2
Method E-18	Split Loads of 58-in. Diameter Roll Pulpboard on End Using Rubber Mats	6.1.58.2
Method E-19 (GIS 797)	Split Loads of 58-in. Diameter Roll Pulpboard on End Using Rubber Mats when Stowed in Trailers Having Large Metal Plates Approximately 9-ft. in Length at the Nose	6.1.58.2
Method E-20	50-in. Diameter Printing and Other Type Paper on End Using Rubber Mats	6.1.50.2
Method E-21 (GIS 799)	46- to 57-in. Diameter Roll Paper on End Using Rubber Mats	6.1.X.2
Method E-22 (GIS 800)	54-in. Diameter Paperboard on End Using Rubber Mats	6.1.54.1
Method E-23 (GIS 778)	Split Loads of 58-in. Diameter Roll Pulpboard on End Using Rubber Mats when Stowed in Trailers Having Large Metal Plates Approximately 9-ft. in Length at the Nose	6.1.58.2

F. Disposable Inflatable Dunnage (D.I.D.) Bags - Load Securement Methods

Former Method	Loading Method	Current Method
Method F-2	Case Goods Secured with D.I.D. Bags	6.4.1
Method F-3	Split Loads of Case Goods or Fiberboard Tray Packs Secured with D.I.D. Bags	6.4.2
Method F-4 (GIS 783)	Case Goods Secured with Tuff Wrap™ Air Bags	6.4.3
Method F-4 (GIS 784)	Case Goods Secured with Rothschenk S.A.M Air Bags	6.4.3
Method F-5 (GIS 817)	Case Goods Secured with Stopak Max Blocker D.I.D. Bags	6.4.3
Method F-6 (GIS 824)	Case Goods Secured with Stopak Blocker D.I.D. Bags	6.4.4
Method F-7 (GIS 852)	Case Goods Secured with Cargo Tuff Dually™ D.I.D. Bags	6.4.5

G. Wood - Load Securement Methods

Former Method	Loading Method	Hazmat	Current Method
Method G-1	40-in. Diameter Rolls of Printing Paper Secured with Wood Blocking and Two Unitizing Straps		6.1.40.2
Method G-2	Double-Layer Drum Load Secured with “T” Gates in a 20-ft. Container	HM*	6.2.6
Method G-3	Double-Layer 55-Gallon (Closed-Head) Steel Drums in 20-ft. Containers with Bracing Slots 1-in. or Greater in Depth or with Protruding Rear Corner Posts	HM*	6.2.7
Method G-4	55-Gallon Open-Head (Steel) Drums or Closed-Head (Steel or Polyethylene) Drums in Trailers/Containers with Bracing Slots 1 in. or Greater in Depth or with Protruding Corner Posts	HM*	6.2.7
Method G-5	58-in. Diameter Rolls of Pulpboard on End Using Floor Blocking		6.1.58.3
Method G-6	Dimensional Lumber Secured by Floor Blocking and D.I.D. Bags		6.7.1
Method G-7	58-in. Diameter Roll Pulpboard on End Using Pre-Assembled Wood Blocking		Archived
Method G-9	Commercial Refrigeration Units Secured by Floor Blocking and D.I.D. Bags		Archived
Method G-10	Bilge-Loaded 40-in. Diameter Paper Rolls Using Steel or Approved Polyester Cord Strapping and Wood Blocking		Archived

H. Special Equipment - Load Securement Methods

Former Method	Loading Method	Current Method
Method H-6	Palletized Commodities Secured by Nylon Web Strap Assemblies and Floor Blocking	6.5.4
Method H-11	Metal Coils on Platforms/Skids or in Cradles Secured by Web Straps Attached to Cargo Sleds in 20-ft Dry Containers	6.6.4
Method H-12	A Barless Liner System for Wheeled Vehicles in ISO Containers in Intermodal Service	6.9.1
Method H-13	A Securement System to Transport Bulk Dry Flowable Commodities in 20-ft, 40-ft, and 40-ft High-Cube Closed ISO Containers	6.8.2
Method H-14 (GIS 861)	Case Goods Secured with Floor Blocking and the Super Wedge® XL, Intermodal Wedge® XL, or Intermodal Wedge® (Logistick Inc.)	6.4.6
Method H-15 (GIS 787)	Universal Storage Containers Loaded in 53-ft Intermodal Containers	6.9.2
Method H-16 (GIS 822)	Palletized or Crated Auto Parts Secured by Web Strap Assemblies in 53-ft Containers	6.5.5
GIS 768	Gearboxes Mounted on Sleds in 20-ft Long ISO Containers	6.8.2

I. Non-Metallic Strapping - Load Securement Methods

Former Method	Loading Method	Hazmat	Current Method
Method I-1	76 to 80 Tight-Head Steel or Plastic, 55-Gallon Drums in Two Layers Secured with 1 1/4-in.-Wide Polyester Cordstrap® Composite Strapping (CC) 105 in. 20-ft. ISO Containers.	HM	6.2.8 & 6.2.9
Method I-2	80 Tight-Head Steel, 55-Gallon Drums in Two Layers Secured with 1 1/4-in.-Wide Polyester Woven Cord Strapping (CS) 2040 by Carolina Strapping and Buckles Company in 20-ft ISO Containers	HM	6.2.10
Method I-3	78 Tight-head Plastic, 55-Gallon Drums in Two Layers Secured with 1 1/4-in.-Wide Polyester Woven Cord Strapping (CS) 2040 by Carolina Strapping and Buckles Company in 20-ft. ISO Containers	HM	6.2.10
Method I-4 (GIS 833)	Double-Layer Loads of Hazardous or Nonhazardous Materials Secured with Cordstrap® Barriers in a 20-ft. Container	HM	6.3.3
Method I-5 (GIS 834)	Hazardous or Nonhazardous Loads Secured with Cordstrap® Barriers in 40-ft. Containers	HM	6.3.4
Method I-6 (GIS 755)	55-Gallon Steel Drums on Pallets Secured with Cordstrap® Barriers in 40-ft. ISO Containers		6.2.11
Method I-7 (GIS 835)	Double Layer Loads of Nonhazardous Materials Secured with HFLASH RHS Securement System in a 20-ft. Container		6.3.5
Method I-8 (GIS 872)	Nonhazardous Loads Secured with Cordstrap® Barriers in 20-ft. and 40-ft. Containers		6.3.6

6.1 Roll Paper

Number	Load Securement Method	Former Method
6.1.40.1	40-in. Diameter Roll Paper Secured with Ty-Gard 2000® or DS® Barriers	B-4 (cancels GIS 798)
6.1.40.2	40-in. Diameter Roll Paper Secured Using Rubber Mats or Wood Blocking	E-17 & G-1
6.1.45.1	45-in. Diameter Roll Paper Secured Using Rubber Mats	E-12
6.1.50.1	50-in. Diameter Newsprint Using Rubber Mats	E-13
6.1.50.2	50-in. Diameter Roll Paper Using Rubber Mats	E-5 & E-20
6.1.54.1	54-in. Diameter Paperboard Using Rubber Mats	E-22 (cancels GIS 800)
6.1.58.1	Through Loads of 58-in. Diameter Roll Pulpboard Using Rubber Mat	E-8
6.1.58.2	Split Loads of 58-in. Diameter Roll Pulpboard Using Rubber Mats	E-4; E-18; E-19; & E-23 (cancels GIS 778 & 797)
6.1.58.3	58-in. Diameter Rolls of Pulpboard Using Floor Blocking	G-5
6.1.60.1	Split Load of 60-in. Diameter Rolls Using Rubber Mats	New
6.1.X.1	40- to 45-in. Diameter, Large Width Roll Paper, Using Rubber Mats and Strapping	E-14
6.1.X.2	46- to 57-in. Diameter Roll Paper Using Rubber Mats	E-21 (cancels GIS 799)
6.1.X.3	48- to 54-in. Diameter Roll Pulpboard Using Rubber Mats with an Incomplete Second Layer	E-10

** Roll Paper securement method numbering includes the roll diameter; multiple diameter patterns use "X"*

Method 6.1.40.1 - 40-in. Diameter Roll Paper Secured with Ty-Gard 2000® or DS® Barriers
(Former Method B-4; Cancels GIS 798)

- This method uses Ty-Gard 2000® or DS® barriers.
 - When used with containers with corrugated sidewalls, follow the contour of the corrugations. When used in trailers or containers without corrugated sidewalls, equipment walls must have horizontally oriented sidewall panels. This method was originally tested in 98 in. interior-width equipment.
 - Plan the load to equalize the weight on each side of the container/trailer. A balanced load is required for the stability and success of this loading method.
1. Forty-inch rolls are loaded in a 2-1-2 pattern, in two sections. Each section contains approximately 1/2 the weight of the load.
 2. The first and second stack in the second section are loaded in a 2-2 pattern unless the length of the container/trailer allows a 2-1-2 pattern to be used throughout. The last stack of each section has a single roll for placement of the Ty-Gard barriers.
 3. The loading pattern may be secured with either Ty-Gard 2000 or DS barriers. Follow manufacturer's instructions for application. See [Section 4.5.1](#) for further information.
 4. For Ty-Gard 2000, apply two 16 in. wide Ty-Gard barriers to each section. Each strip is a minimum of 60 in. long. Apply the adhesive strip to each sidewall located 36 in. back from the face of the load. Pull the Ty-Gard strips across the face of the load, overlapping the ends with at least 1 ft tension, following manufacturer's instructions, using Ty-Gard tools. The tensioned barriers are then sealed with 4 ft long strips of Ty-Patch bonded to the Ty-Gard barriers.
 5. For Ty-Gard DS, apply one 24 in. wide Ty-Gard barrier to each section. Each strip is a minimum of 75 in. long. Apply the adhesive strip to each sidewall located 24 in. back from the face of the load. Tension and seal all Ty-Gard barriers in accordance with manufacturer's instructions with the noted amount of overlapping ends and patch application.

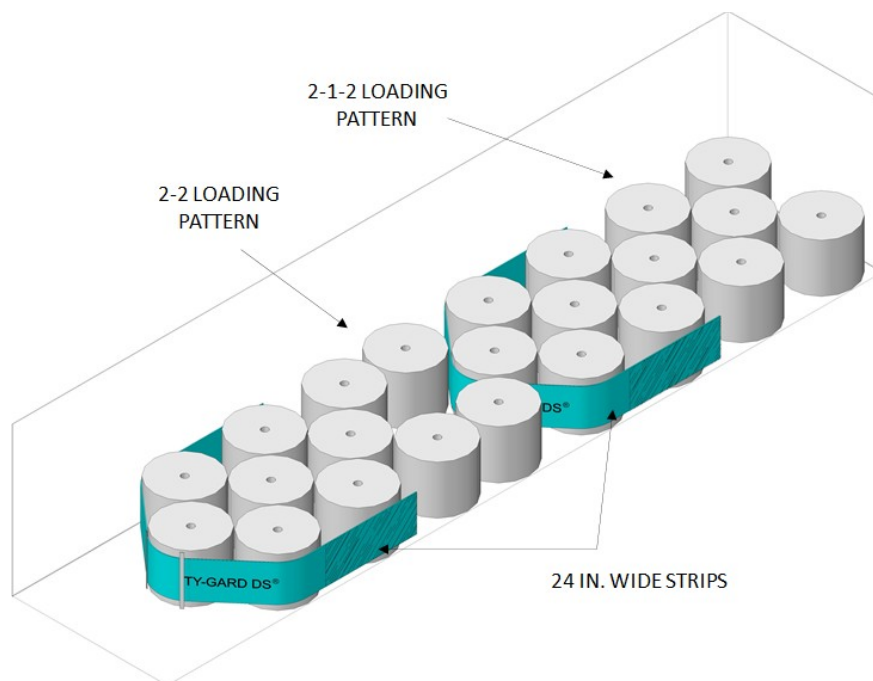


Figure 6.1.40.1 - 1

Method 6.1.40.1 - 40 in. diameter roll paper secured with Ty-Gard 2000® or DS® barriers

Method 6.1.40.2 - 40-in. Diameter Roll Paper Secured Using Rubber Mats or Wood Blocking
(Former Methods E-17 and G-1)

- This method was tested with 40-in. diameter roll paper in 92 in. and 98 in. interior-width equipment. The loading figures are drawn to the same equipment dimensions.
- Plan the load to equalize the weight on each side of the container/trailer. A balanced load is required for the stability and success of this loading method.
- The load pattern may vary slightly from the basic 2-1-2 pattern depending on the number of rolls in the shipment and weight distribution requirements. The load patterns were tested as shown in the figures.

NOTE: Damage to the roll header could occur using this load securement method. If this is considered objectionable, do not use this method.

Figure 6.1.40.2 - 1: (Rubber Mat Load Securement):

- Use containers/trailers with wood floors only
1. For the current listing of AAR-verified rubber friction mats and information on the verification process refer to the *Product Performance Profile for Rubber Friction Mats - Product Verification List* and AAR General Information Bulletin No. 10, *Product Performance Profile for Rubber Friction Mats*. Both documents can be referenced at <https://aar.com/standards/damage-publications.php>. See [Section 4.4](#).
 2. AAR-verified rubber friction mats applied for this loading method are to be either 2 mm (0.080 in.) or 3 mm (0.125 in.) thick.
 3. Load rolls into the container following a 2-1-2 pattern. The load pattern may vary slightly from the basic 2-1-2 pattern, but the last five rolls must be in a 2-1-2 pattern as shown in [Figure 6.1.40.2 - 1](#).
 4. Place two 2 ft x 9 ft rubber mats at the rear of the load running lengthwise in the container with each rubber mat placed 12 in. from the adjacent sidewall. Position rubber mats so they will extend 3 in. beyond the edge of the rolls.

NOTE: Do not use rubber mats that are torn, contaminated or otherwise damaged in any way. It is not recommended to reuse rubber mats when applied to prevent lengthwise movement in the container or trailer.

5. Unitize the last six rolls using one AAR-approved strap either Type 1A Grade 4 nonmetallic strap or 1 1/4 in. x 0.029 in. steel strap. Secure straps with the correct buckle or seal in accordance with manufacturer's instructions. Tension and seal the straps using proper tensioning and sealing tools. Use strap hangers or tape on the rolls to maintain proper strap alignment and to prevent straps from slipping out of position. See [Section 4.2](#) for further strapping information.
6. Leave a minimum of 3 ft of void space between the rolls and the container/trailer doors.

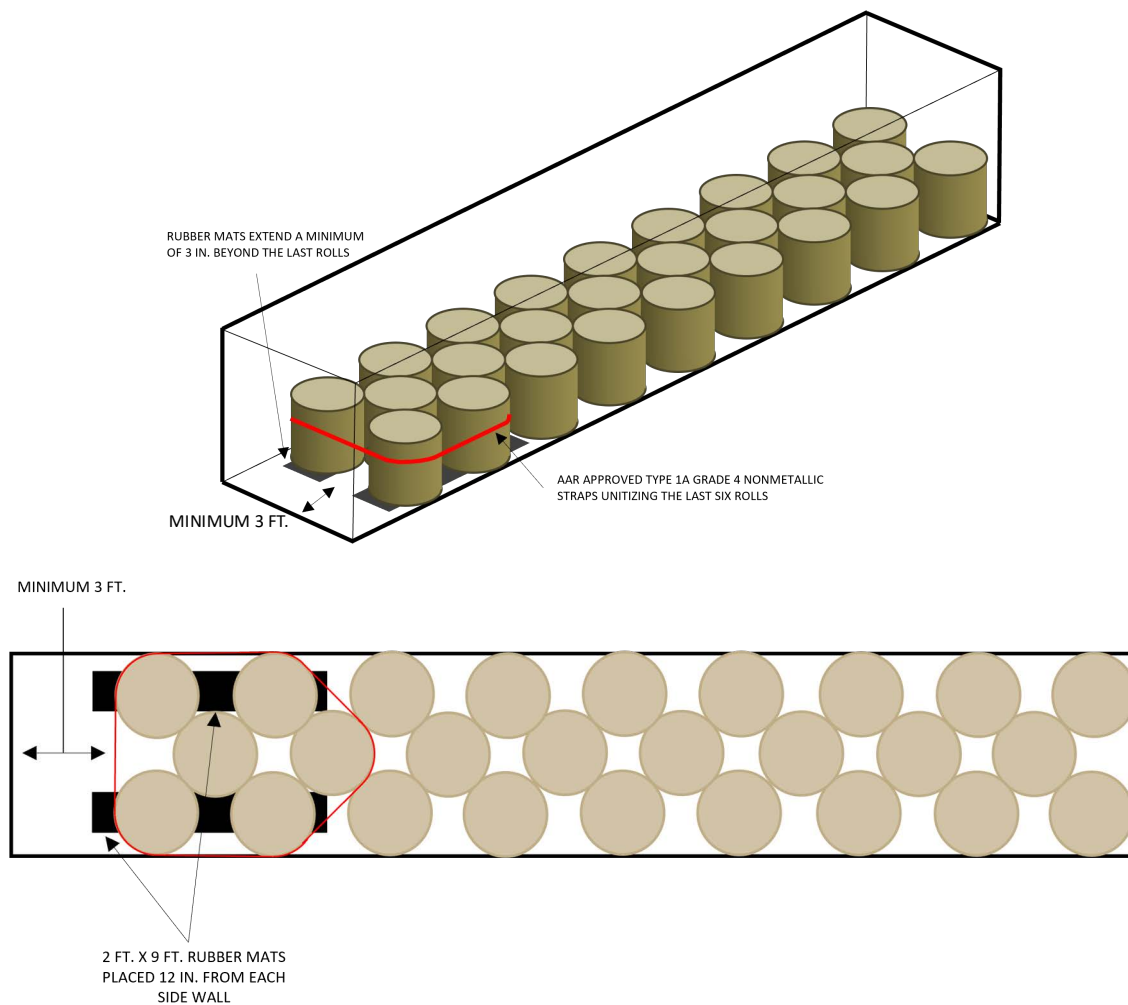


Figure 6.1.40.2 - 1

Method 6.1.40.2 - 40-in. diameter roll paper secured using rubber mats

Figure 6.1.40.2 - 2: (Rubber Mat Load Securement)

- Use containers/trailers with wood floors only.
1. For the current listing of AAR-verified rubber friction mats and information on the verification process refer to the *Product Performance Profile for Rubber Friction Mats - Product Verification List* and AAR General Information Bulletin No. 10, *Product Performance Profile for Rubber Friction Mats*. Both documents can be referenced at <https://aar.com/standards/damage-publications.php>. See Section 4.4.
 2. AAR-verified rubber friction mats applied for this loading method are to be 2mm (0.080 in.) thick.
 3. Load rolls into the container following a 2-1-2 pattern. The load pattern may vary slightly from the basic 2-1-2 pattern, but the last five rolls must be in a 2-1-2 pattern as shown in Figure 6.1.40.2 - 2.
 4. When loading a point roll at the nose, use floor blocking or appropriately sized void fillers to prevent lateral or crosswise movement. See Sections 3.2.1 and 3.3.1.
 5. Place five 20 in. × 48 in. rubber mats at the rear of the load running lengthwise in the container and centered under each of the last five rolls. Position rubber mats so they will extend 2 - 3 in. beyond the edge of the rolls.

NOTE: Do not use rubber mats that are torn, contaminated or otherwise damaged in any way. It is not recommended to reuse rubber mats when applied to prevent lengthwise movement in the container or trailer.

6. Unitize the last six rolls using one AAR-approved strap either Type 1A Grade 4 nonmetallic strap or 1 1/4 in. × 0.029 in. steel strap. Secure straps with the correct buckle or seal in accordance with manufacturer's instructions. Tension and seal the straps using proper tensioning and sealing tools. Use strap hangers or tape on the rolls to maintain proper strap alignment and to prevent straps from slipping out of position. See [Section 4.2](#) for further strapping information.
7. Leave a minimum of 3 ft void space between the rolls and the container/trailer doors.

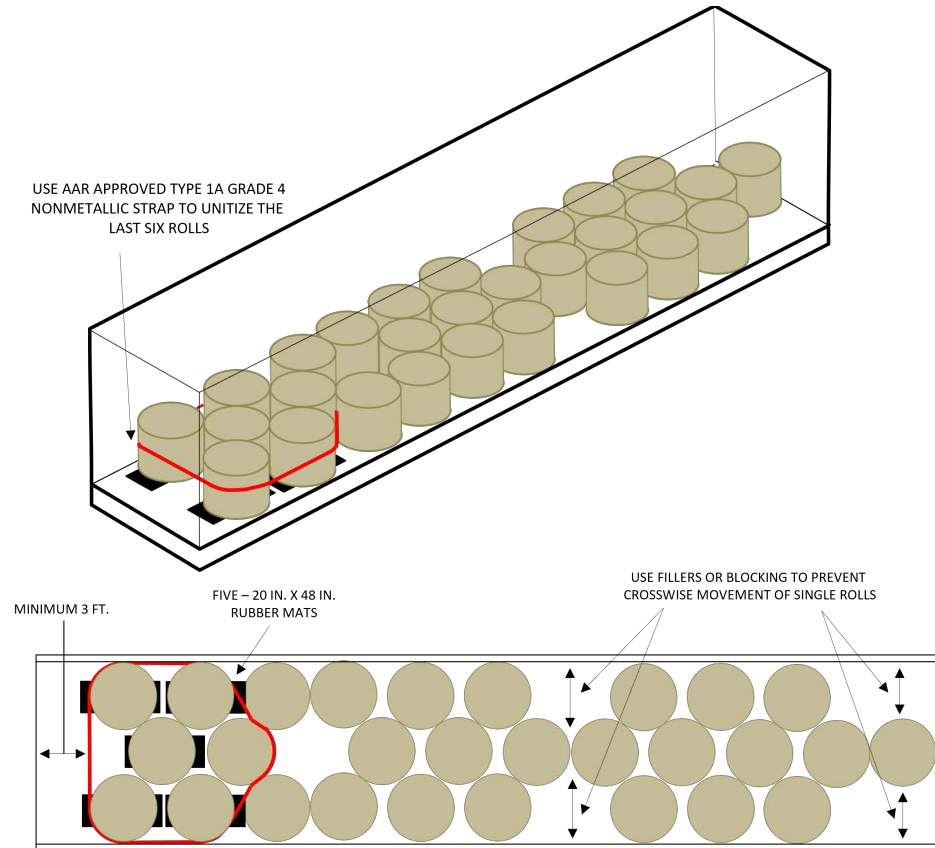


Figure 6.1.40.2 - 2

Method 6.1.40.2 - 40-in. diameter roll paper secured using rubber mats

Figure 6.1.40.2 - 3: (Wood Blocking Load Securement)

- The load pattern is for single layer rolls loaded in a 2-1-2 pattern only.
1. Unitize the last five rolls (at the doorway) with two AAR-approved straps either Type 1A Grade 4 nonmetallic straps or 1 1/4 in. × 0.029 in. (or equivalent) steel straps. Seal steel straps with two seals per strap, with two crimps per seal. Secure nonmetallic straps with the correct buckle in accordance with manufacturer's instructions. Tension and seal the straps using proper tensioning and sealing tools. Use strap hangers or tape to maintain proper strap alignment and to prevent straps from slipping out of position. See [Section 4.2](#) for further strapping information.
 2. Nail laminated 2 in. × 6 in. × 8 ft floor blocks against the last rolls perpendicular to the container sidewalls. Use fourteen 8d nails per layer or seven 12d nails per layer. If rough-cut lumber is used for blocking, use a minimum 12d nails. See [Section 4.1](#) for further information on lumber load securement.
 3. Nail four laminated 2 in. × 4 in. × 18 in. backup cleats perpendicular to the applied 2 in. × 6 in. × 8 ft lumber. Use a minimum of three nails per layer. Place two cleats 8 inches from the center of each roll as shown.
 4. Fill any remaining space with 2 in. × 18 in. lumber strips with a width equal to the void size, placed parallel to the 2 in. × 6 in. blocking (as shown) and nailed into position.

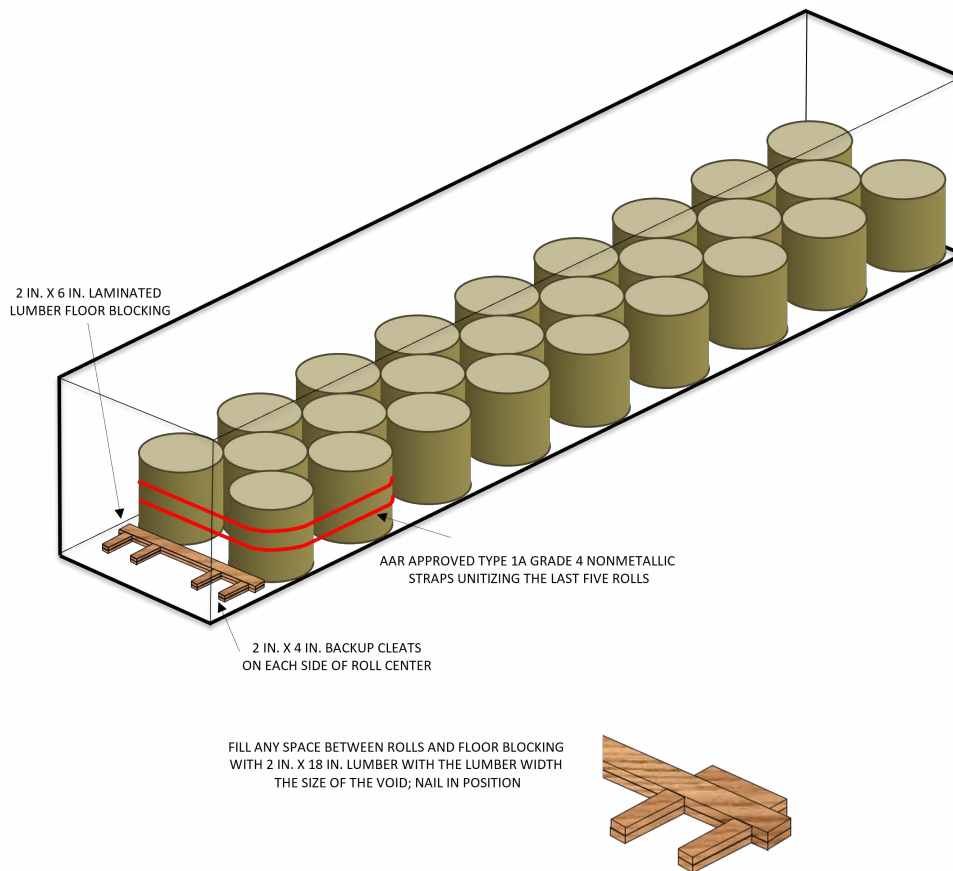


Figure 6.1.40.2 - 3

Method 6.1.40.2 - 40-in. diameter roll paper secured with wood blocking

Method 6.1.45.1 - 45-in. Diameter Roll Paper Secured Using Rubber Mats

(Former Method E-12)

- This method was tested with 45-in. diameter roll paper. This method was originally tested in 98 in. interior-width equipment.
 - Only use containers or trailers with wood floors.
 - Plan the load to equalize the weight on each side of the container/trailer. A balanced load is required for the stability and success of this loading method.
 - The load pattern may vary slightly from the basic 2-1-2 pattern depending on the number of rolls in the shipment and weight distribution requirements. The load patterns were tested as shown in the figure.
1. For the current listing of AAR-verified rubber friction mats and information on the verification process refer to the *Product Performance Profile for Rubber Friction Mats - Product Verification List* and AAR General Information Bulletin No. 10, *Product Performance Profile for Rubber Friction Mats*. Both documents can be referenced at <https://aar.com/standards/damage-publications.php>. See [Section 4.4](#).
 2. AAR-verified rubber friction mats applied for this loading method are to be 1 1/2 mm (0.059 in.), 2 mm (0.080 in.) or 3 mm (0.125 in.) thick.
 3. Place a 2 ft × 12 ft continuous rubber mat strip in the nose of the container extending lengthwise down the center of the container, or use three 21 in. × 48 in. or 21 in. × 49 in. rubber mat squares end-to-end and centered in the container. Ensure rubber mat squares do not overlap.
 4. Load the first four rolls in the nose of the container with the rubber mat extending a minimum of 6 in. beyond the fourth roll.
 5. Load the rolls in one continuous section, in a 2-1-2 type pattern starting at the nose of the container. Load rolls until reaching 14 ft from the end of the load or about four stacks.
 6. Place two 2 ft × 14 ft continuous rubber mats at the rear of the load running lengthwise of the container with one rubber mat 12 in. from each sidewall. Position the rubber mats to extend 2 - 3 in. beyond the end of the load. Alternatively place two rows of four 21 in. × 48 in. or 21 in. × 49 in. rubber mat squares end-to-end and positioned 14 in. from each sidewall with the rearmost rubber mat extending approximately 20 in. beyond the end of the load. Ensure rubber mat squares do not overlap.
- NOTE:** Do not use rubber mats that are torn, contaminated or otherwise damaged in any way. It is not recommended to reuse rubber mats when applied to prevent lengthwise movement in the container or trailer.
7. Load the remaining rolls into the container with the last five rolls in a 2-1-2 pattern as shown.
 8. Unitize the last five rolls using one AAR-approved strap, either 1 1/4 in. × 0.029 in. steel strap or Type 1A Grade 4 nonmetallic strap. Secure straps with the correct buckle or seal in accordance with manufacturer's instructions. Tension and seal the straps using proper tensioning and sealing tools. Use strap hangers or tape on the rolls to maintain proper strap alignment and to prevent straps from slipping out of position. See [Section 4.2](#) for further strapping information
 9. Leave a minimum of 3 ft void space between the rolls and the container/trailer doors.

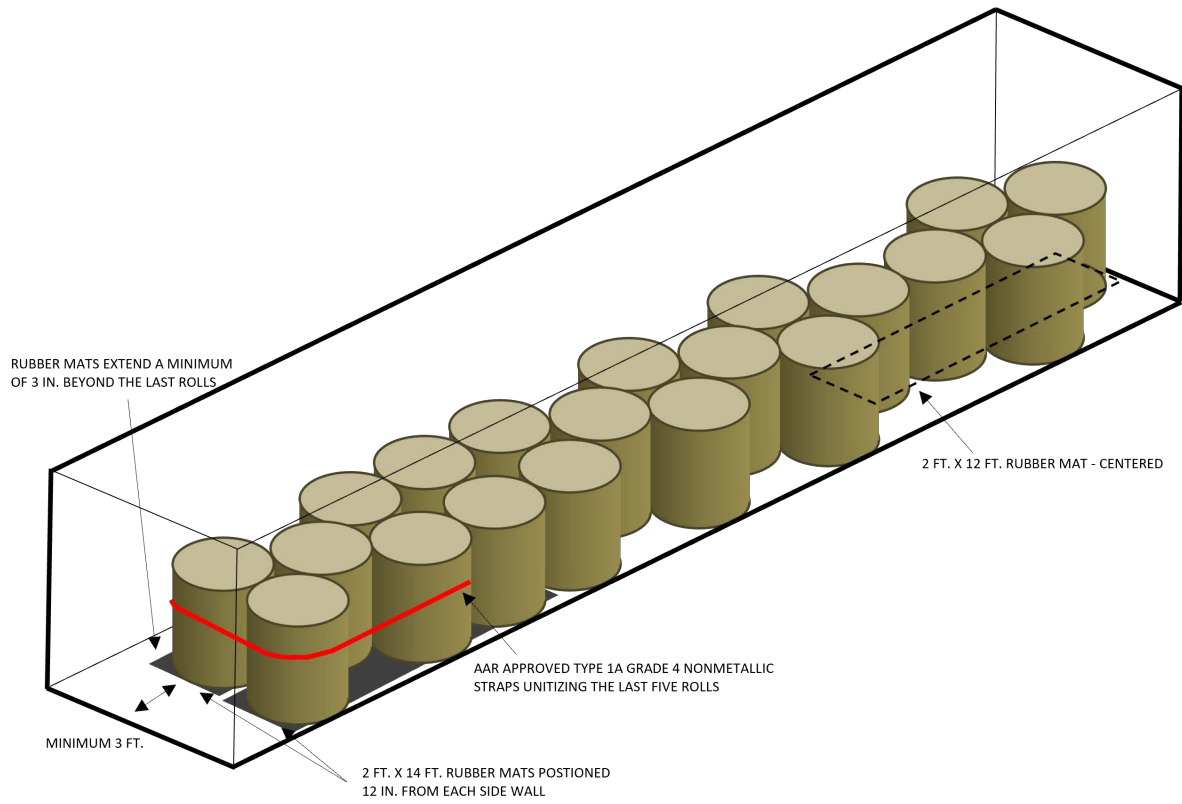


Figure 6.1.45.1 - 1
Method 6.1.45.1 - 45-in. diameter roll paper using rubber mats

Method 6.1.50.1 - 50-in. Diameter Newsprint Using Rubber Mats

(Former Method E-13)

- This method was tested with 50-in. diameter newsprint. This method was originally tested in 98 in. interior-width equipment.
- An incomplete second layer may be loaded. See [Section 3.1.3](#). It is recommended to only load rolls in the second layer that the roll height is less than the roll diameter (< 50 in. roll height).
- Plan the load to equalize the weight on each side of the container/trailer. A balanced load is required for the stability and success of this loading method.

NOTE: Damage to the roll header could occur using this load securement method. If this is considered objectionable, do not use this method.

1. For the current listing of AAR-verified rubber friction mats and information on the verification process refer to the *Product Performance Profile for Rubber Friction Mats - Product Verification List* and AAR General Information Bulletin No. 10, *Product Performance Profile for Rubber Friction Mats*. Both documents can be referenced at <https://aar.com/standards/damage-publications.php>. See [Section 4.4](#).
2. AAR-verified rubber friction mats applied for this loading method are to be 3 mm (0.125 in.) thick.
3. Load the floor layer rolls on two 1 ft wide rubber mats that are centered under each row of rolls and extend from the nose of the container the full length of the load and 3 in. beyond the end of the load.

NOTE: Do not use rubber mats that are torn, contaminated or otherwise damaged in any way. It is not recommended to reuse rubber mats when applied to prevent lengthwise movement in the container or trailer.

4. Load the rolls tightly in one section in a 1-1 offset pattern starting at the nose of the container. Based on the width of the container, void filler may be needed between the rolls and the sidewall to load a 1-1 offset pattern. See [Section 3.1.2](#).
5. If an incomplete layer is loaded, it may be necessary to center the incomplete layer lengthwise in the container to provide proper weight distribution. The incomplete layer may be secured using one of two different methods.
 - a. Secure the incomplete layer by placing a 1 ft × 4 ft × 3 mm rubber mat between each layer in multiple layer stacks. Position the rubber mats with the 4 ft dimension lengthwise in the container. The last stack loaded, is to be a single layer.
 - b. Secure the incomplete layer with blocking rolls at both the front and rear as shown in the figure. The blocking rolls should extend a minimum of 6 in. above the bottom of the adjacent layer rolls. This can be accomplished by loading rolls of smaller width in the floor layer under the second layer, using taller blocking rolls, or by using roll risers under the blocking rolls. Minimum crush strength of 6,000 psf is required for risers. See [Section 3.3](#). The last stack loaded is to be a single layer and not loaded on risers.
6. Leave a minimum of 3 ft void space between the rolls and the container/trailer doors.

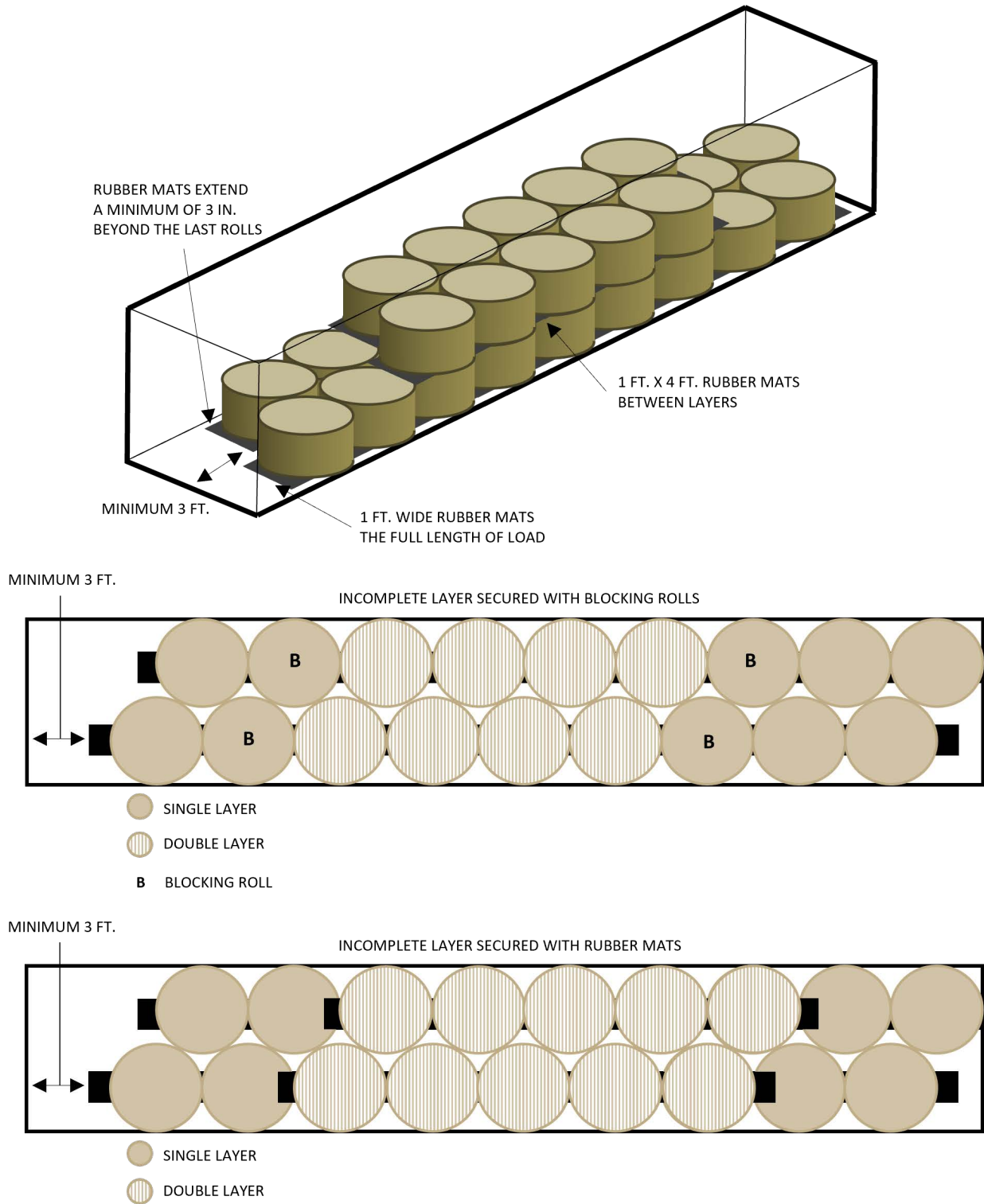


Figure 6.1.50.1 - 1
Method 6.1.50.1 - 50-in. diameter newsprint using rubber mats

Method 6.1.50.2 - 50-in. Diameter Roll Paper Using Rubber Mats

(Former Methods E-5 and E-20)

- This method was tested with 50-in. diameter roll paper or newsprint loaded in a 1-1 offset or 2-1-2 pattern.
- For all figures depicted, the rubber mats must extend a minimum of 6 in. beyond the rolls.
- Plan the load to equalize the weight on each side of the container/trailer. A balanced load is required for the stability and success of this loading method.

NOTE: Damage to the roll header could occur using this load securement method. If this is considered objectionable, do not use this method.

Figure 6.1.50.2 - 1:

- This method was originally tested in a 98-in. interior-width trailer. For wider containers/trailers use sidewall fillers to maintain a 1-1 offset pattern, or use a 2-1-2 pattern as container width and roll diameters permit.
1. For the current listing of AAR-verified rubber friction mats and information on the verification process refer to the *Product Performance Profile for Rubber Friction Mats - Product Verification List* and AAR General Information Bulletin No. 10, *Product Performance Profile for Rubber Friction Mats*. Both documents can be referenced at <https://aar.com/standards/damage-publications.php>. See [Section 4.4](#).
 2. AAR-verified rubber friction mats applied for this loading method are to be 2 mm (0.080 in.) thick.
 3. Place two 2 ft × 7 ft rubber mats (continuous or perforated matting) in the nose of the container and center them under the first two rolls or place two 21 in. × 48 in. rubber mats end-to-end and centered under the first two rolls. Ensure rubber mat squares do not overlap.
 4. Load five stacks tightly in one section in a 1-1 offset pattern starting at the nose of the container
 5. Use 4 in. × 4 in. lumber or other suitable void fillers as needed to maintain roll pattern offset and to prevent roll wedging. The thickness of the void filler is dependent the on container width. Use tape or other securement methods to keep fillers in position. See [Section 3.1.2](#).
 6. Place two 2 ft × 14 ft rubber mats (continuous or perforated matting) at the rear of the load running lengthwise of the container and position them so that they will be centered under the remaining rolls; or place four 21 in. × 48 in. rubber mats end-to-end and centered under the last three stacks of the load. Position rubber mats so that they will extend 6 in. beyond the edge of the rolls. Ensure rubber mat squares do not overlap.

NOTE: Do not use rubber mats that are torn, contaminated or otherwise damaged in any way. It is not recommended to reuse rubber mats when applied to prevent lengthwise movement in the container or trailer.

7. Load the remaining rolls tightly into the trailer in a 1-1 offset pattern against the previously loaded rolls.
8. Unitize the last two stacks (four rolls) using one AAR-approved strap, either 1 1/4 in. × 0.029 in. or Type 1A Grade 4 nonmetallic strap. Secure straps with the correct buckle or seal in accordance with manufacturer's instructions. Tension and seal the straps using proper tensioning and sealing tools. Use strap hangers or tape on the rolls to maintain proper strap alignment and to prevent straps from slipping out of position. See [Section 4.2](#) for further strapping information. Position the strap centered vertically on the rolls.
9. Leave a minimum of 3 ft void space between the rolls and the container/trailer doors.

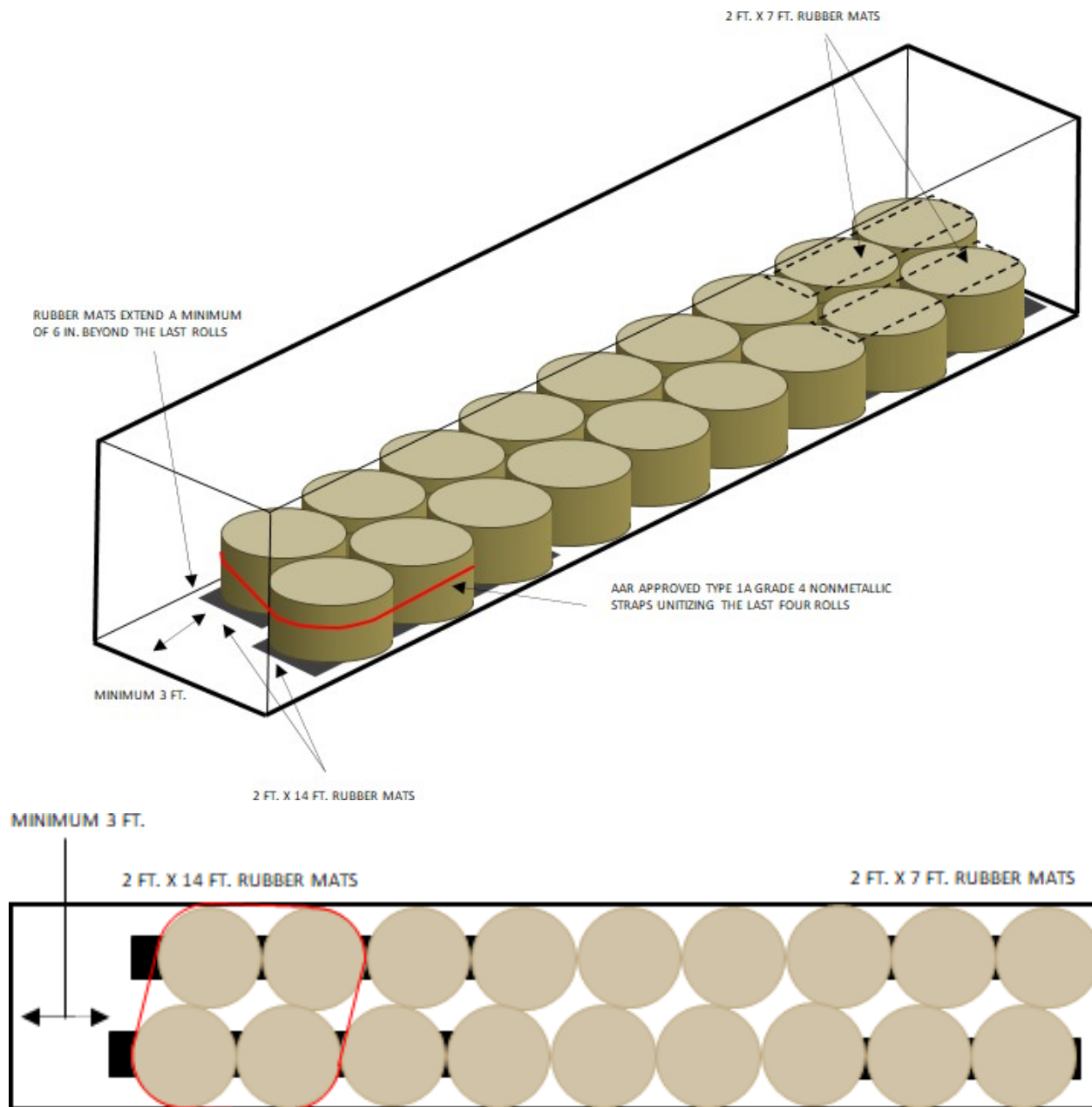


Figure 6.1.50.2 - 1

Method 6.1.50.2 - 50 in. roll paper using rubber mats

Figure 6.1.50.2 - 2:

- This method was originally tested in a 98 in. interior-width trailer. For wider containers/trailers use sidewall fillers to maintain a 1-1 offset pattern, or use a 2-1-2 pattern as container width and roll diameters permit.
- For the current listing of AAR-verified rubber friction mats and information on the verification process refer to the *Product Performance Profile for Rubber Friction Mats - Product Verification List* and AAR General Information Bulletin No. 10, *Product Performance Profile for Rubber Friction Mats*. Both documents can be referenced at <https://aar.com/standards/damage-publications.php>. See Section 4.4.
 - AAR-verified rubber friction mats applied for this loading method are to be 2 mm (0.080 in.) thick.
 - Rolls are loaded in one section starting at the nose and continuing to the rear of the container.

4. Place two 20 in. × 48 in. rubber mats end-to-end beneath the second and third rolls in each row in the forward part of the load. Place four rubber mats end-to-end beneath the last three rolls in each row. Ensure rubber mat squares do not overlap.

NOTE: Do not use rubber mats that are torn, contaminated or otherwise damaged in any way. It is not recommended to reuse rubber mats when applied to prevent lengthwise movement in the container or trailer.

5. Use 4 in. × 4 in. lumber or other suitable void fillers as needed to maintain roll pattern offset and to prevent roll wedging. The thickness of the void filler is dependent on the container width. Alternate filler to opposite side midway down the length of the load. Use tape or other securement methods to keep fillers in position. See [Section 3.1.2](#).
6. Unitize the last two stacks (four rolls) using one AAR-approved strap, either 1 1/4 in. × 0.029 in. steel strap or Type 1A Grade 4 nonmetallic strap. Secure straps with the correct buckle or seal in accordance with manufacturer's instructions. Tension and seal the straps using proper tensioning and sealing tools. Use strap hangers or tape on the rolls to maintain proper strap alignment and to prevent straps from slipping out of position. See [Section 4.2](#) for further strapping information.
7. Leave a minimum of 3 ft void space between the rolls and the container/trailer doors.

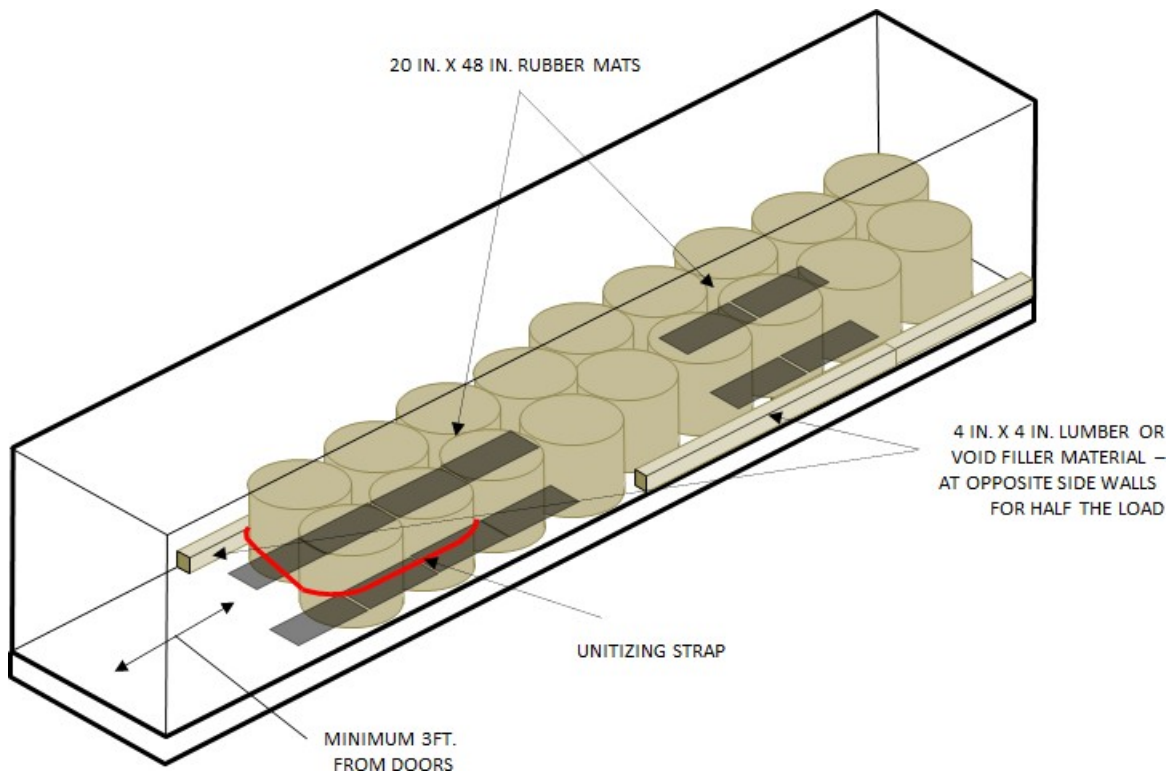


Figure 6.1.50.2 - 2

Method 6.1.50.2 - 50-in. diameter roll paper using rubber mats

Figure 6.1.50.2 - 3:

- This method was originally tested in a 98 in. interior-width trailer. If loading equipment with a narrower width or rolls with a larger diameter variance, another method may need to be selected to prevent rolls from wedging in the intermodal equipment.
1. For the current listing of AAR-verified rubber friction mats and information on the verification process refer to the *Product Performance Profile for Rubber Friction Mats - Product Verification List* and AAR General Information Bulletin No. 10, *Product Performance Profile for Rubber Friction Mats*. Both documents can be referenced at <https://aar.com/standards/damage-publications.php>. See [Section 4.4](#).

2. AAR-verified rubber friction mats applied for this loading method are to be 2 mm (0.080 in.) thick.
3. Divide the load into two sections, each containing approximately half of the load.
4. Load the first section in a 2-1-2 pattern starting at the nose of the container.
5. Load the second section also in a 2-1-2 pattern. This section should be at least 3 ft from the doors when loading is completed.
6. Load each section on ten 20 in. × 48 in. rubber mats placed side by side, two beneath each roll. For rolls loaded against the sidewalls, place the first rubber mat against the sidewall and the second rubber mat next to the first. Rubber mats are offset 6 in. lengthwise beneath each roll such that an equal amount of rubber mat extends from under the front and rear of each roll. Ensure rubber mat squares do not overlap.

NOTE: Do not use rubber mats that are torn, contaminated or otherwise damaged in any way. It is not recommended to reuse rubber mats when applied to prevent lengthwise movement in the container or trailer.

7. Unitize each section with one AAR-approved strap, either 1 1/4 in. × 0.029 in. steel strap or Type 1A Grade 4 nonmetallic strap. Secure straps with the correct buckle or seal in accordance with manufacturer's instructions. Tension and seal the straps using proper tensioning and sealing tools. Use strap hangers or tape on the rolls to maintain proper strap alignment and to prevent straps from slipping out of position. See [Section 4.2](#) for further strapping information.

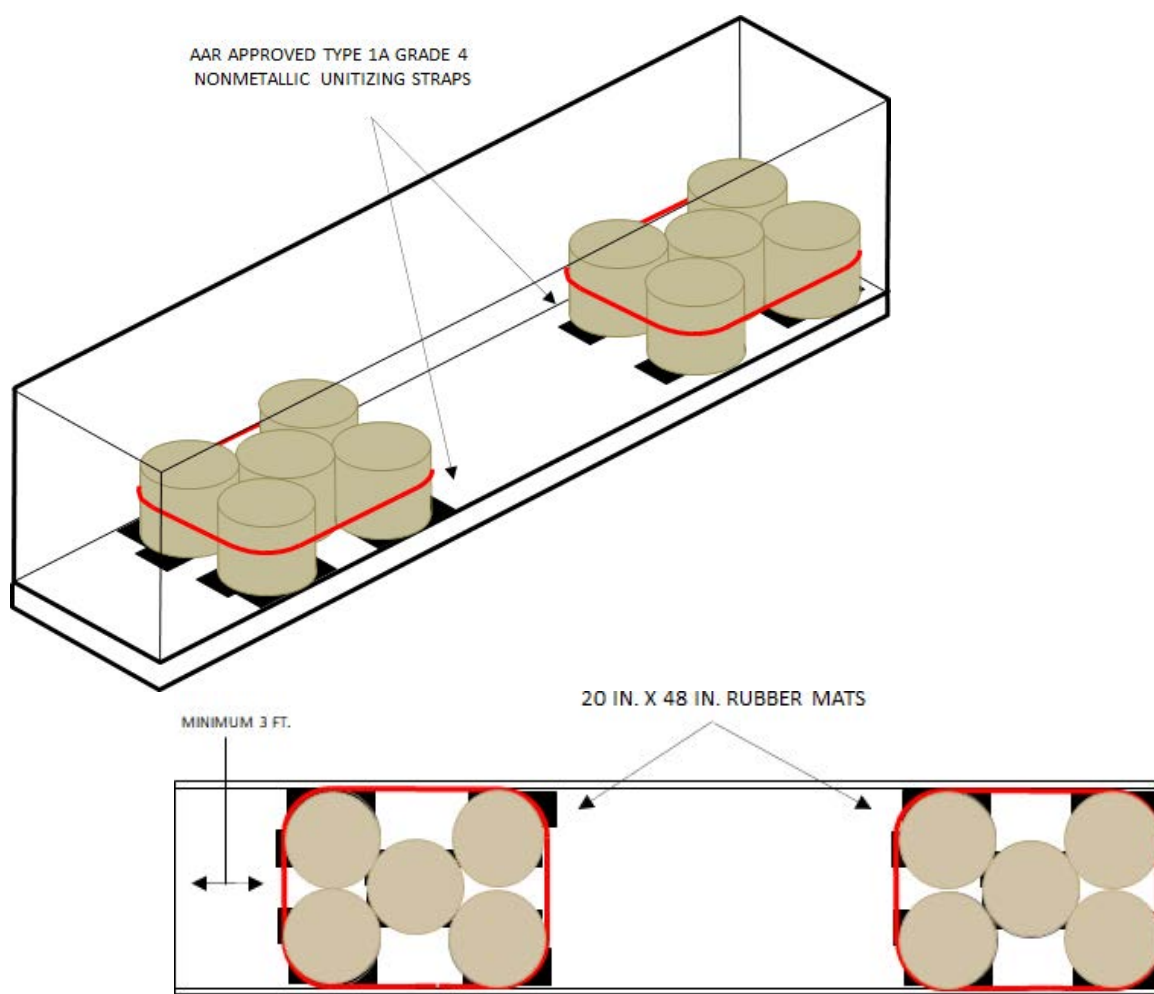


Figure 6.1.50.2 - 3

Method 6.1.50.2 - 50-in. diameter roll paper using rubber mats

Figure 6.1.50.2 - 4:

- This method was originally tested in a 98 in. interior-width trailer. Wider equipment may require additional sidewall fillers. See [item 5](#).
 - Rolls can be loaded in one section starting at the nose and continuing to the rear of the container if necessitated by the number of rolls being loaded. Use the same number and size of rubber mats as specified below.
1. For the current listing of AAR-verified rubber friction mats and information on the verification process to refer the *Product Performance Profile for Rubber Friction Mats - Product Verification List* and AAR General Information Bulletin No. 10, *Product Performance Profile for Rubber Friction Mats*. Both documents can be referenced at <https://aar.com/standards/damage-publications.php>. See [Section 4.4](#).
 2. AAR-verified rubber friction mats applied for this loading method are to be 2 mm (0.080 in.) thick.
 3. Divide the load into two sections, each containing approximately half of the load.
 4. Load the first section in a 1-1 offset pattern starting at the nose of the container.
 5. Use 4 in. × 4 in. lumber or other suitable void fillers as needed to maintain roll pattern offset and to prevent roll wedging. The thickness of the void filler is dependent on the container width. Alternate filler to opposite side midway down the length of the load. Use tape or other securement methods to keep fillers in position. See [Section 3.1.2](#).
 6. Load the second section also in a 1-1 offset pattern split from the first to provide proper lengthwise weight distribution. The rearmost roll in this section should be at least 3 ft from the doors when loading is completed.
 7. Load each section on two 20 in. wide rubber mats (continuous or perforated matting) centered beneath each row. An equal amount of rubber mat extends from under the front and rear of the each section, a minimum of 6 in.

NOTE: Do not use rubber mats that are torn, contaminated or otherwise damaged in any way. It is not recommended to reuse rubber mats when applied to prevent lengthwise movement in the container or trailer.

8. Unitize each section with one AAR-approved strap, either 1 1/4 in. × 0.029 in. steel strap or Type 1A Grade 4 nonmetallic strap. Secure straps with the correct buckle or seal in accordance with manufacturer's instructions. Tension and seal the straps using proper tensioning and sealing tools. Use strap hangers or tape on the rolls to maintain proper strap alignment and to prevent straps from slipping out of position. See [Section 4.2](#) for further strapping information.
9. Use 4 in. × 4 in. lumber or other suitable void fillers as needed to maintain roll pattern offset and to prevent roll wedging. The thickness of the void filler is dependent on the container width. Alternate filler to opposite side midway down the length of the load. Use tape or other securement methods to keep fillers in position. See [Section 3.1.2](#).

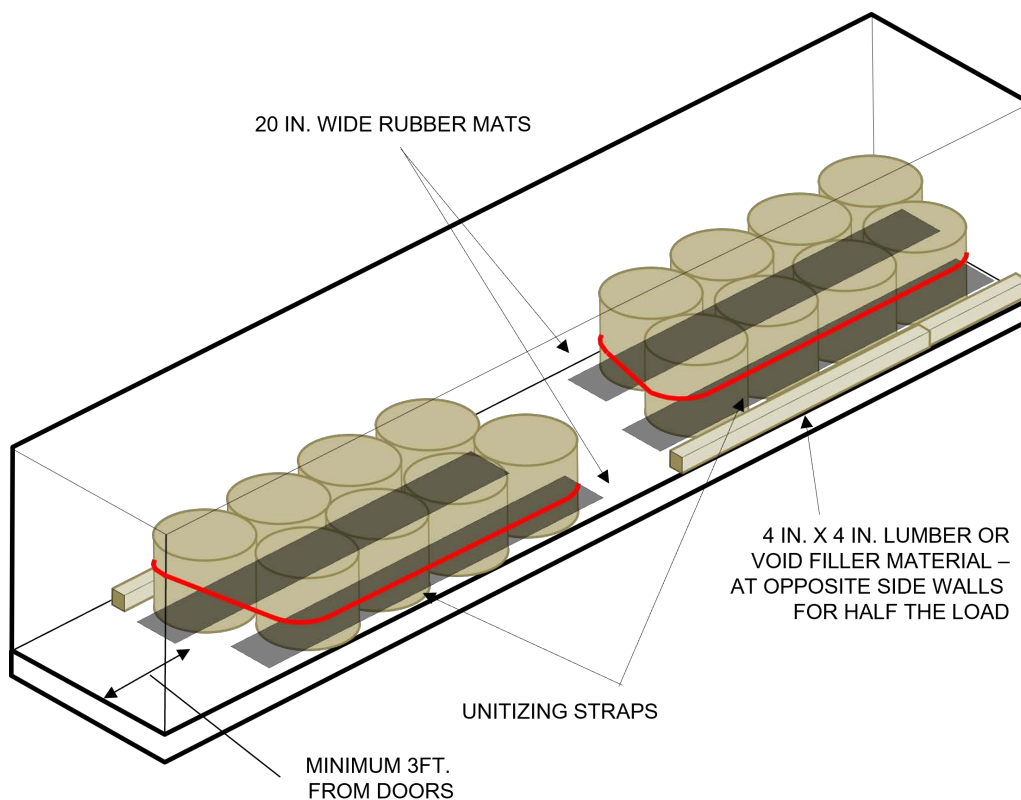


Figure 6.1.50.2 - 4

Method 6.1.50.2 - 50-in. diameter roll paper using rubber mats

Figure 6.1.50.2 - 5:

- This method was originally tested in 98 in. interior-width equipment. Wider equipment may require the use of sidewall fillers.
1. For the current listing of AAR-verified rubber friction mats and information on the verification process refer to the *Product Performance Profile for Rubber Friction Mats - Product Verification List* and AAR General Information Bulletin No. 10, *Product Performance Profile for Rubber Friction Mats*. Both documents can be referenced at <https://aar.com/standards/damage-publications.php>. See Section 4.4.
 2. AAR-verified rubber friction mats applied for this loading method are to be 6 mm (0.250 in.) thick.
 3. Divide the load into two sections, each containing approximately half of the load.
 4. Load the first section in a 1-1 offset pattern starting at the nose of the container.
 5. Load the second section also in a 1-1 offset pattern approximately 15 ft behind the first section. This section should be at least 3 ft from the doors when loading is completed.
 6. Load each section on two 4 ft × 17 ft × 6 mm thick rubber mats placed side by side. An equal amount of rubber mat extends from under the front and rear of the second section, a minimum of 6 in.

NOTE: Do not use rubber mats that are torn, contaminated or otherwise damaged in any way. It is not recommended to reuse rubber mats when applied to prevent lengthwise movement in the container or trailer.

7. Unitize each section with one AAR-approved strap, either 1 1/4 in. × 0.029 in. steel strap or Type 1A Grade 4 nonmetallic strap. Secure straps with the correct buckle or seal in accordance with manufacturer’s instructions. Tension and seal the straps using proper tensioning and sealing tools. Use strap hangers or tape on the rolls to maintain proper strap alignment and to prevent straps from slipping out of position. See [Section 4.2](#) for further strapping information.
8. Rolls can be loaded in one section starting at the nose and continuing to the rear of the container if necessitated by the number of rolls being loaded. Use the same number and size of rubber mats as specified above. Place two rubber mats in the nose of the container and two at the rear of the load. Unitizing straps are not required for rolls loaded in one section from the nose of the container.

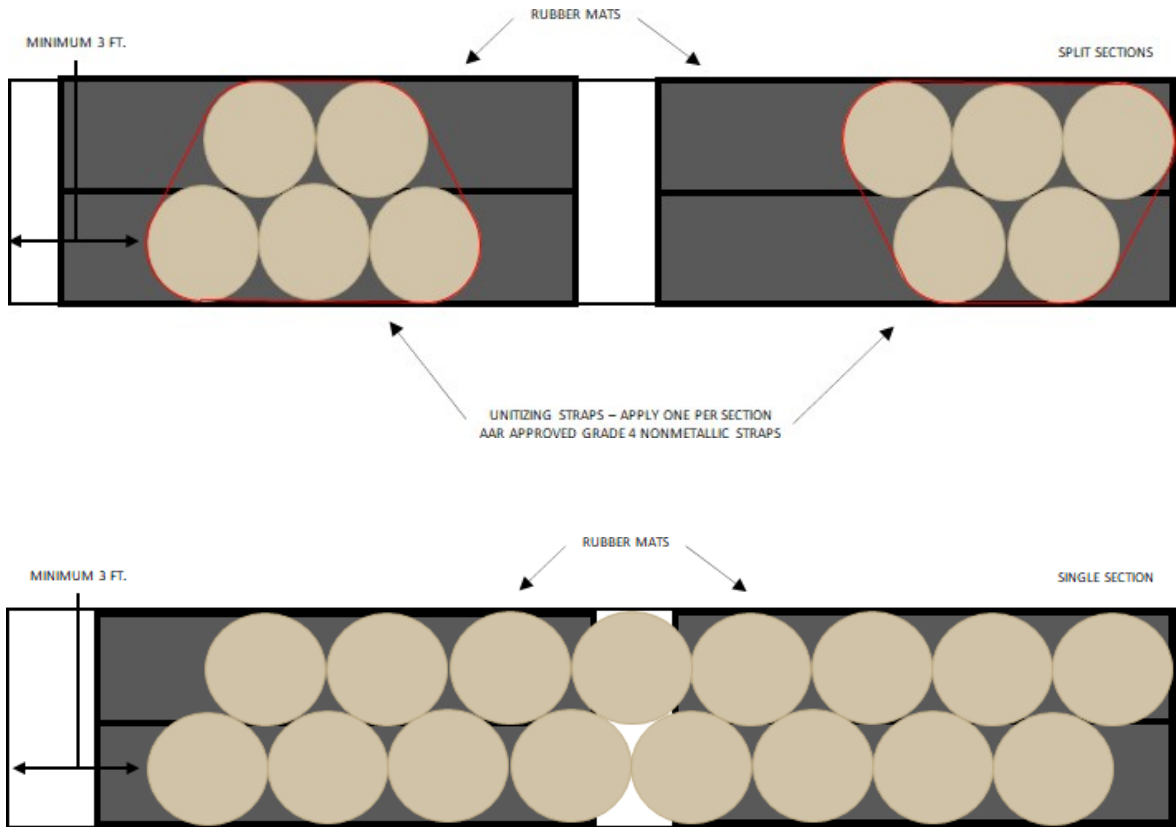


Figure 6.1.50.2 - 5
Method 6.1.50.2 - 50-in. diameter roll paper using rubber mats

Method 6.1.54.1 - 54-in. Diameter Paperboard Using Rubber Mats

(Former Method E-22; Cancels GIS 800)

- This method was tested with 54-in. diameter roll paperboard loaded in two sections. This method was originally tested in a 100 in. interior wide container.
- For all figures depicted, the rubber mats must extend a minimum of 6 in. beyond the rolls.
- Plan the load to equalize the weight on each side of the container/trailer. A balanced load is required for the stability and success of this loading method.

CAUTION: Ensure that the floor of the container/trailer is not overloaded when loading wide (tall) rolls. The load may not exceed 2,500-lb/linear ft lengthwise of the container for any 1 ft section.

1. Divide the load into two sections. Use the five-, six-, seven-, eight- or nine-roll pattern as depicted in the figure. The width (height) of the rolls is to be no more than 6 inches less than the inside height of the container. In the six-, seven-, eight-, and nine-roll pattern the rearmost section will always have 4 rolls. In the five-roll pattern the rearmost section will have 3 rolls.
2. Load the first section in a 1-1 inline pattern for the six-, seven-, eight-, and nine-roll pattern. The rolls are centered starting at the front endwall. Use filler panels or other suitable filler, such as 2 in. thick contoured fillers along both sidewalls to maintain the 1-1 inline pattern. Place fillers, with minimum 1,500 psf, 2 in. minimum thickness, between the sidewall and each of the rolls. The width of a contoured filler is dependent on the container inside width and actual roll diameter. Use tape or other securement methods to keep fillers in position. See [Sections 3.1.2](#) and [3.3.1](#) for more information.
3. Load the first section in a 1-1 offset pattern for the five-roll pattern. Place fillers, with minimum 1,500 psf and 2 in. minimum thickness, between the front endwall and sidewall and each of the rolls.
4. Load the second section for the six-, seven-, eight-, and nine-roll pattern in a 1-1 offset, separated from the first section to provide proper lengthwise weight distribution. Ensure all the rolls in this section contact the sidewalls. The rearmost roll in this section should be at least 3 ft from the doors when loading is completed.
5. Load the second section for the five-roll pattern in a 1-1 offset, separated from the first section to provide proper lengthwise weight distribution. The first roll in the section will be centered in the container with contour filler pads used between the roll and each sidewall. The second and third rolls will be loaded in a 1-1 offset with filler panels between the sidewall and each of the rolls. Contour filler panels will have a minimum 1,500 psf and 2 in. minimum thickness. Use tape or other securement methods to keep fillers in position. The rearmost roll in this section should be at least 3 ft from the doors when loading is completed.
6. For the current listing of AAR-verified rubber friction mats and information on the verification process refer to the *Product Performance Profile for Rubber Friction Mats - Product Verification List* and AAR General Information Bulletin No. 10, *Product Performance Profile for Rubber Friction Mats*. Both documents can be referenced at <https://aar.com/standards/damage-publications.php>. See [Section 4.4](#).
7. AAR-verified rubber friction mats applied for this loading method are to be 2 mm (0.080 in.) thick.
8. Load each roll on 30 in. wide rubber mat, as illustrated and extending a minimum of 6 in. beyond the rolls in both directions. If using individual sheets, ensure the rubber mats do not overlap.

NOTE: Do not use rubber mats that are torn, contaminated or otherwise damaged in any way. It is not recommended to reuse rubber mats when applied to prevent lengthwise movement in the container or trailer.

9. Use one AAR-approved Type 1A, Grade 4 nonmetallic strap for unitizing the rear section (all figures) positioned 4 ft above the floor. Use the correct buckle in accordance with manufacturer's instructions See [Section 4.2.3](#). Tension straps using proper tensioning tools. Use strap hangers or tape on the rolls to maintain proper strap alignment.

- Use one AAR-approved Type 1A, Grade 4 nonmetallic strap for unitizing the front section for the five-roll pattern. Position the strap 4 ft above the floor. Use the correct buckle in accordance with manufacturer's instructions. See [Section 4.2.3](#). Tension straps using proper tensioning tools. Use strap hangers or tape on the rolls to maintain proper strap alignment.

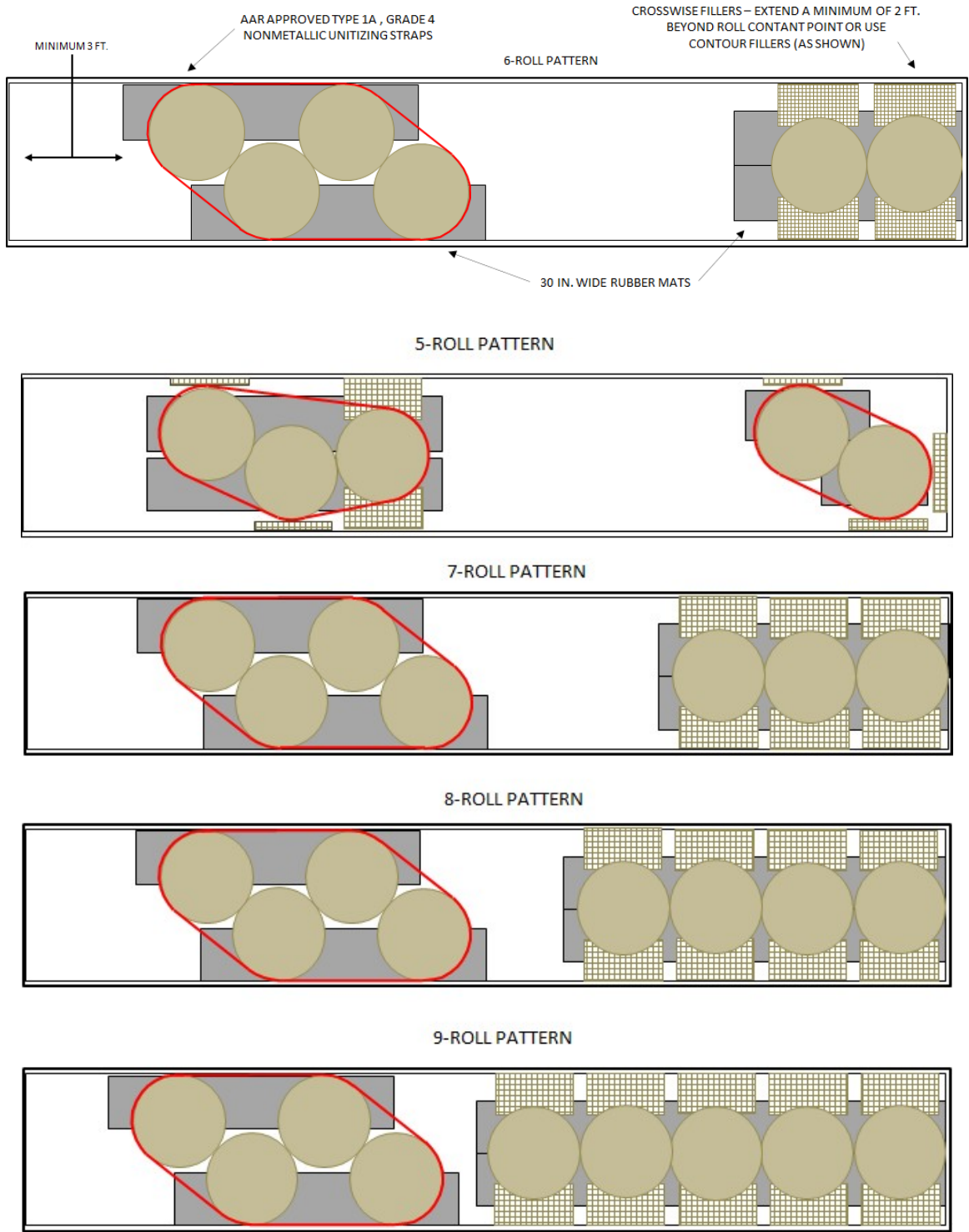


Figure 6.1.54.1 - 1

Method 6.1.54.1 - 54-in. diameter paperboard using rubber mats

Method 6.1.58.1 - Through Loads of 58-in. Diameter Roll Pulpboard Using Rubber Mats
(Former Method E-8)

- This method was tested with 58-in. diameter roll pulpboard loaded in a single section, in a 1-1 offset pattern. This method was originally tested in 98-in. interior-width equipment.
 - Plan the load to equalize the weight on each side of the container/trailer. A balanced load is required for the stability and success of this loading method.
1. For the current listing of AAR-verified rubber friction mats and information on the verification process refer to the *Product Performance Profile for Rubber Friction Mats - Product Verification List* and AAR General Information Bulletin No. 10, *Product Performance Profile for Rubber Friction Mats*. Both documents can be referenced at <https://aar.com/standards/damage-publications.php>. See [Section 4.4](#).
 2. AAR-verified rubber friction mats applied for this loading method are to be 3 mm (0.125 in.) thick.
 3. An even or odd number of rolls may be loaded. Use a 3 ft × 12 ft rubber mat at the nose and a 3 ft × 17 ft rubber mat at the rear.

NOTE: Do not use rubber mats that are torn, contaminated or otherwise damaged in any way. It is not recommended to reuse rubber mats when applied to prevent lengthwise movement in the container or trailer.

4. If loading an even number of rolls, place the first 3 ft wide rubber mat on the floor at the nose, centered crosswise in the container. Load the first four rolls tightly starting against the nose and using a 1-1 offset pattern. See [Sketches 1 and 2](#).
5. Place the second rubber mat 11 - 12 ft behind the first rubber mat. Continue to load the trailer in a 1-1 offset pattern until finished. Position the second rubber mat to extend a minimum of 6 in. beyond the rear of the load.
6. If loading an odd number of rolls, place the first 3 ft wide rubber mat on the floor at the nose, centered crosswise in the container. Load the first roll so it is centered in the container against the nose. Place void fillers, 2 in. × (void width) × 48 in. corrugated fiberboard with minimum 1,500 psf, on either side of the centered roll. If using multiple void fillers in one location, unitize them together. Use tape or other securement methods to keep fillers in position. See [Sketch 3](#). See [Section 3.3.1](#).
7. Lumber side-blocking can be used as an alternative to the void fillers, provided it is a minimum laminated 2 in. x 4 in. lumber, extending a minimum of 48 inches from the nose of the container, and is secured adequately using 12d nails. Ladder-type side-blocking may also be used as an alternative provided it has the same lumber dimensions and placement. Secure lumber to keep blocking in position. See [Section 4.1](#) for further information on lumber load securement.
8. Place the second rubber mat 5 ft behind the first rubber mat. Continue to load the container in a 1-1 offset pattern until finished. Position the second rubber mat to extend a minimum of 6 in. beyond the rear of the load.
9. Leave a minimum of 3 ft void space between the rolls and the container/trailer doors.

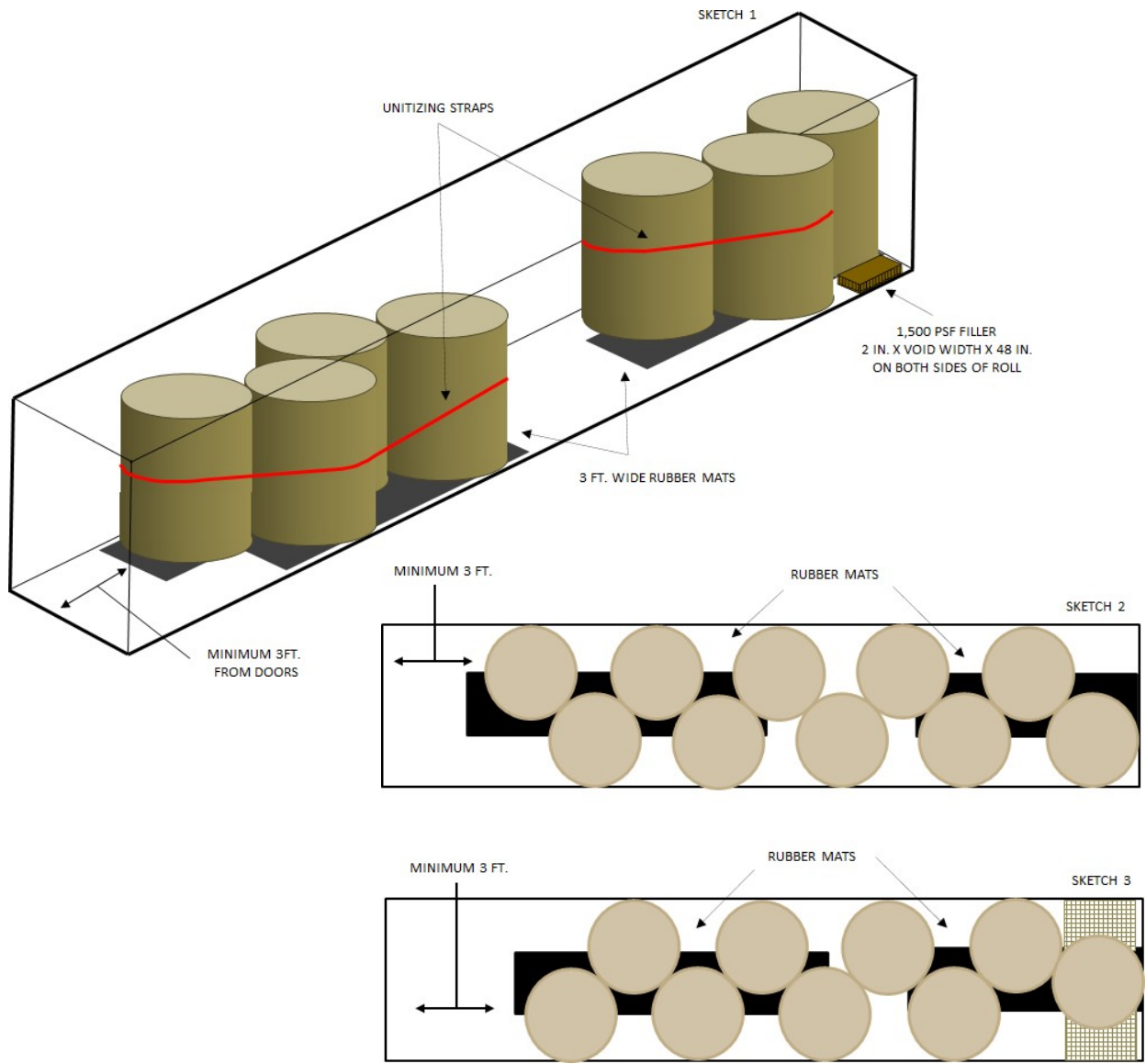


Figure 6.1.58.1 - 1

Method 6.1.58.1 - Through loads of 58-in. diameter roll pulpboard using rubber mats

Method 6.1.58.2 - Split Loads of 58-in. Diameter Roll Pulpboard Using Rubber Mats

(Former Methods E-4, E-18, E-19, and E-23; Cancels GIS 778 and 797)

- This method was tested with 58-in. diameter roll pulpboard loaded in a 1-1 offset pattern with two split sections (see [Figure 6.1.58.2 - 1](#) and [Figure 6.1.58.2 - 4](#)). The majority of these methods were originally tested in 98-in. interior-width equipment.
- See [Figure 6.1.58.2 - 2](#) for container or trailers having wood floors with large metal plates, approximately 9 ft length at the nose.
- A maximum of eight rolls may be loaded in the container/trailer. See [Figure 6.1.58.2 - 3](#) for a six roll loading variation.
- Plan the load to equalize the weight on each side of the container/trailer. A balanced load is required for the stability and success of this loading method.

Figure 6.1.58.2 - 1:

1. For the current listing of AAR-verified rubber friction mats and information on the verification process refer to the *Product Performance Profile for Rubber Friction Mats - Product Verification List* and AAR General Information Bulletin No. 10, *Product Performance Profile for Rubber Friction Mats*. Both documents can be referenced at <https://aar.com/standards/damage-publications.php>. See [Section 4.4](#).
2. AAR-verified rubber friction mats applied for this loading method are to be 1 1/2 mm (0.059 in.), 2 mm (0.080 in.) or 3 mm (0.125 in.) thick.
3. The nose section consists of three or four rolls. Place the first rubber mat on the floor at the nose, centered in the container as shown in [Sketches 2 and 3](#). Use the appropriate size rubber mat for the number of rolls being loaded. Position the rubber mats to extend a minimum of 6 in. beyond the rolls. If using individual sheets, ensure the rubber mats do not overlap.
 - a. If four rolls are loaded in the nose section, use a 3 ft × 17 ft rubber mat (continuous or perforated matting) at the nose. The following may also be used: One row of five 3 ft × 3 ft sections and one 3 ft × 20 in. section of rubber mat installed end to end with the next to last rubber mat in the row cut to 20 in. to allow more of the last rubber mat to be under the last roll; or one row of four 30 in. × 42 in. sections of rubber mat installed end to end and centered under the rolls in the nose section.
 - b. If three rolls are loaded in the nose section, use a 3 ft × 14 ft (continuous or perforated matting) rubber mat at the nose. The following may also be used: One row of four 3 ft × 3 ft sections and one 3 ft × 20 in. sections of rubber mat installed end to end with the next to last rubber mat in the row cut to 20 in. to allow more of the last rubber mat to be under the last roll; or one row of four 30 in. × 42 in. sections of rubber mat installed end to end and centered under the rolls in the nose section.

NOTE: Do not use rubber mats that are torn, contaminated or otherwise damaged in any way. It is not recommended to reuse rubber mats when applied to prevent lengthwise movement in the container or trailer.

4. Load the rolls in the front section positioned on the applied rubber mats:
 - a. If four rolls are loaded in the nose section, load the four rolls tightly starting against the nose and using offset pattern. See [Sketch 2](#).
 - b. If three rolls are loaded in the nose section, load the first roll so it is centered in the container against the nose. Place void fillers, 2 in. × (void width) × 48 in. corrugated fiberboard with minimum 1,500 psf, on both sides of the first roll between roll and sidewalls. If using multiple void fillers in one location, unitize them together. Use tape or other securement methods to keep fillers in position. See [Sketch 3](#). See [Section 3.3.1](#). Lumber side-blocking can be used as an alternative to the void fillers, provided it is a minimum laminated 2 in. x 4 in. lumber, extending a minimum of 48 in. from the nose of the container, and is secured adequately using 12d nails. Ladder-type side-blocking may also be used as an alternative provided it has the same lumber dimensions and placement. Secure lumber to keep blocking in position. See [Section 4.1](#) for further information on lumber load securement. Load the next two rolls tightly lengthwise against opposite sidewalls as shown in [Sketch 3](#).

5. Position the rear section to obtain the proper load weight distribution and maintain a minimum of 3 ft between the rear of the load and the container doors.
6. Load the rear section, consisting of four rolls, using two 3 ft × 14 ft rubber mats (continuous or perforated matting). Position the rubber mats at opposite sidewalls. Position the rubber mats to extend a minimum of 6 in. beyond the rolls at each end of each rubber mat. Place the rolls on the rubber mats in a 1-1 offset pattern. [See Sketches 2 and 3.](#)
 - The following also may be used: two rows of four 3 ft × 3 ft sections of rubber mat and one 3 ft × 20 in. sections installed end-to-end with the next to last rubber mat in each row cut to 20 in. to allow more of the last 3 ft × 3 ft rubber mat to be under the last roll and positioned approximately equidistant from each sidewall; two rows of four 30 in. × 42 in. sections of rubber mat installed end-to-end and positioned approximately equidistant from each sidewall. Position the rubber mats to extend a minimum of 6 in. beyond the rolls. If using individual sheets, ensure the rubber mats do not overlap.
7. Use one AAR-approved Type 1A, Grade 4 nonmetallic strap for unitizing the rear section. Position the unitizing strap at a maximum 4 ft height above the floor. Ensure the strap is level. Use the correct buckle in accordance with manufacturer's instructions. See [Section 4.2.3](#). Tension straps using proper tensioning tools. Use strap hangers or tape on the rolls to maintain proper strap alignment.

NOTE: A unitizing strap may also be applied on the front section using one AAR-approved Type 1A, Grade 4 nonmetallic strap. For four-roll sections unitize the whole section. For three-roll sections where the first roll is centered at the front endwall, unitize only the second and third rolls. Use strap hangers or tape on the rolls to maintain proper strap alignment
8. A minimum of 3 ft void is required between the rolls and the container/trailer doors.

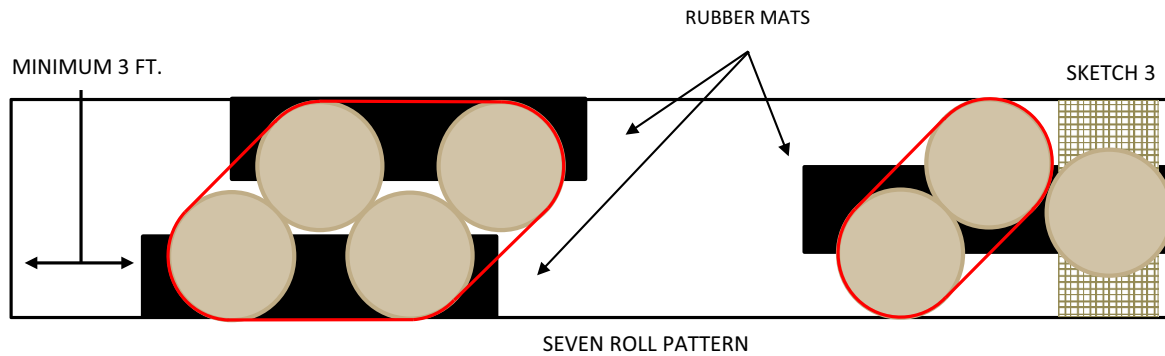
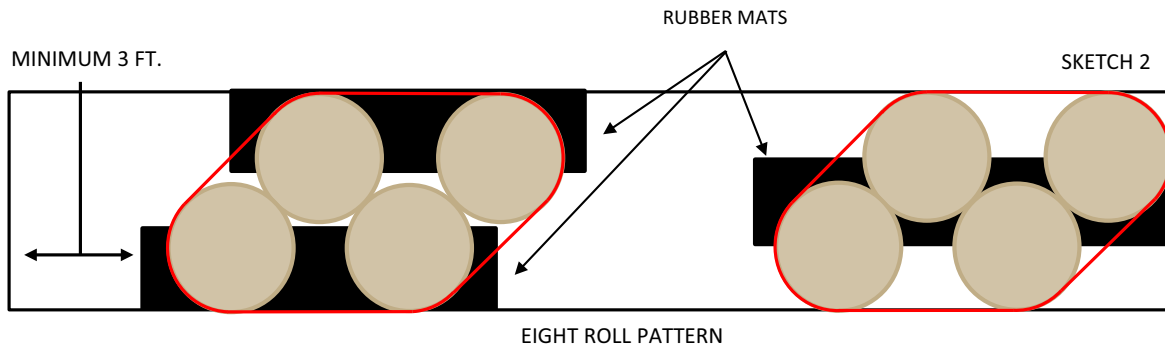
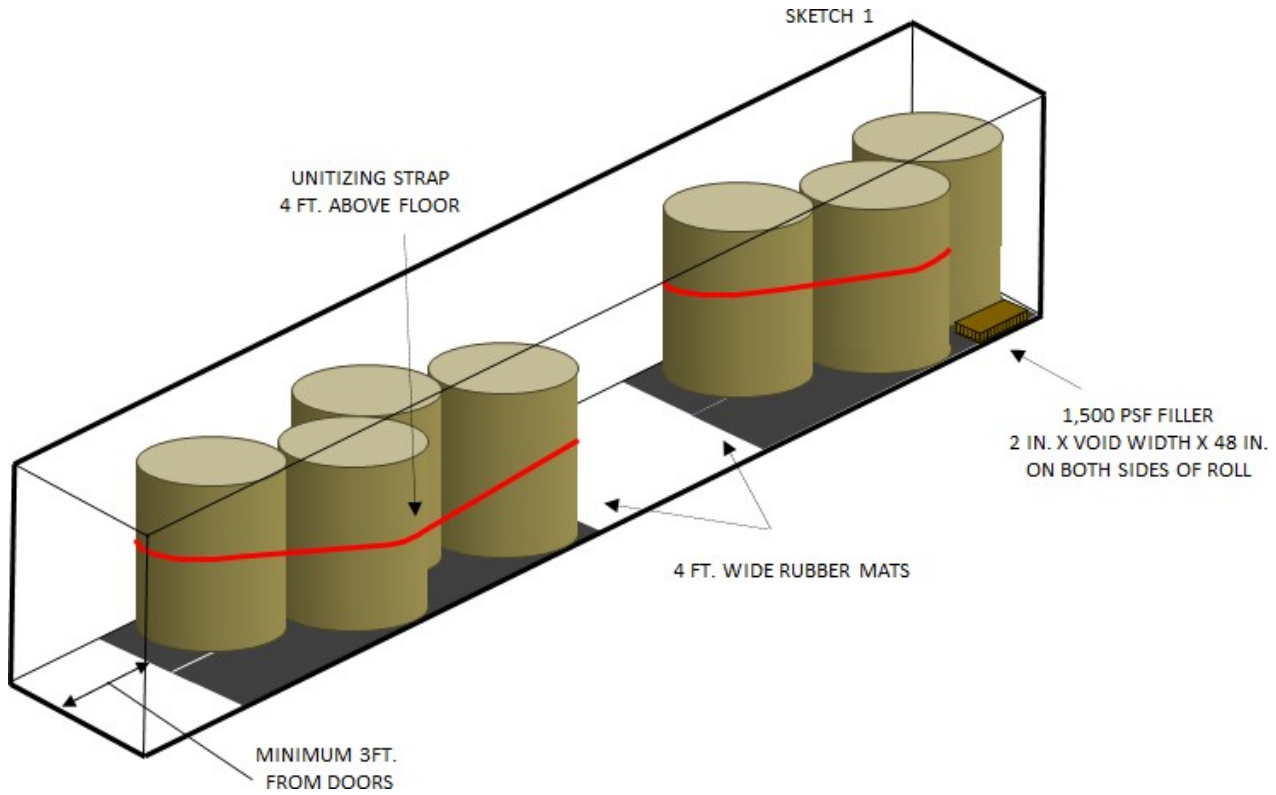


Figure 6.1.58.2 - 1
Method 6.1.58.2 - Split loads of 58-in. diameter roll pulpboard using rubber mats

Figure 6.1.58.2 - 2:

1. For containers or trailers having wood floors with large metal plates, approximately 9 ft length at the nose.
 2. For the current listing of AAR-verified rubber friction mats and information on the verification process refer to the *Product Performance Profile for Rubber Friction Mats - Product Verification List* and AAR General Information Bulletin No. 10, *Product Performance Profile for Rubber Friction Mats*. Both documents can be referenced at <https://aar.com/standards/damage-publications.php>. See [Section 4.4](#).
 3. AAR-verified rubber friction mats applied for this loading method are to be 1 1/2 mm (0.059 in.), 2 mm (0.080 in.), or 3 mm (0.125 in.) thick.
 4. The nose section consists of three or four rolls and may be loaded in-line or using a 1-1 offset pattern.
 - When loading in-line, place the first rubber mat on the floor at the nose, centered in the container as shown in [Sketches 1, 2, and 3](#).
 - When loading using a 1-1 offset pattern, place two rubber mats side by side centered in the container as shown in [Sketches 4 and 5](#).
 5. Use the appropriate size rubber mat for the number of rolls being loaded. Position the rubber mats to extend a minimum of 6 in. beyond the rolls. If using individual sheets, ensure the rubber mats do not overlap.
 - a. If three rolls are loaded in-line at the nose section, use a 3 ft × 16 ft rubber mat (continuous or perforated matting) at the nose or appropriate number of centered (crosswise) 3 ft × 3 ft square rubber mats or 30 in. × 42 in. sections of rubber mats installed end-to-end.
 - b. If four rolls are loaded in-line at the nose section, use a 3 ft × 21 ft rubber mat (continuous or perforated matting) at the nose or appropriate number of centered (crosswise) 3 ft × 3 ft square rubber mats or 30 in. × 42 in. sections of rubber mats installed end-to-end.
 - c. If three rolls are loaded using a 1-1 offset pattern at the nose, use two 3 ft × 14 ft rubber mats (continuous or perforated matting) at the nose or an appropriate number of 3 ft × 3 ft square rubber mats or 30 in. × 42 in. sections of rubber mats installed end-to-end and are positioned side by side centered under the rolls.
 - d. If four rolls are loaded using a 1-1 offset pattern at the nose, use two 3 ft × 17 ft rubber mats (continuous or perforated matting) at the nose or an appropriate number of 3 ft × 3 ft square rubber mats or 30 in. × 42 in. sections of rubber mats installed end-to-end and are positioned side by side centered under the rolls.
- NOTE:** Do not use rubber mats that are torn, contaminated or otherwise damaged in any way. It is not recommended to reuse rubber mats when applied to prevent lengthwise movement in the container or trailer.
6. Load the rolls in the front section positioned on the applied rubber mats:
 - a. If three rolls are loaded in-line at the nose section, load the first roll so it is centered in the container against the nose. Continue loading the remaining two rolls in the nose tightly in-line down the center of the container. Place void fillers, 2 in. × (void width) × 48 in. corrugated fiberboard with minimum 1,500 psf, between each roll and the adjacent sidewall. If using multiple void fillers in one location, unitize them together. Use tape or other securement methods to keep fillers in position. [See Sketches 1 and 2](#). See [Section 3.3.1](#).
 - b. If four rolls are loaded in-line at the nose section, load the first roll so it is centered in the container against the nose. Continue loading the remaining three rolls in the nose tightly in-line down the center of the container. Place void fillers, 2 in. × (void width) × 48 in. corrugated fiberboard with minimum 1,500 psf, between each roll and the adjacent sidewall. If using multiple void fillers in one location, unitize them together. [See Sketch 3](#). See [Section 3.3.1](#).

- c. If three rolls are loaded in a 1-1 offset pattern at the nose section, load the first roll so it is centered in the container against the nose. Place void fillers, 2 in. × (void width) × 48 in. corrugated fiberboard with minimum 1,500 psf, on both sides of the first roll between the roll and sidewalls. If using multiple void fillers in one location, unitize them together. Use tape or other securement methods to keep fillers in position. Lumber side-blocking can be used as an alternative to the void fillers, provided it is a minimum laminated 2 in. x 4 in. lumber and extending a minimum of 48 in. from the nose of the container. Secure lumber to keep blocking in position. Load the next two rolls tightly against opposite sidewalls. [See Sketch 4](#). See [Section 3.3.1](#) and [Section 4.1](#).
 - d. If four rolls are loaded in a 1-1 offset pattern at the nose section, load the four rolls tightly starting against the nose using a 1-1 offset pattern. [See Sketch 5](#).
7. Position the rear section to obtain the proper load weight distribution and maintain a minimum of 3 ft between the rear of the load and the container doors.
 8. Load the rear section, consisting of four rolls, using two 3 ft × 14 ft rubber mats (continuous or perforated matting). Position the rubber mats at opposite sidewalls. Position the rubber mats to extend a minimum of 6 in. beyond the rolls at each end of each rubber mat. Place the rolls on the rubber mats in a 1-1 offset pattern with rolls loaded tightly against the equipment sidewalls. [See Sketches 1 through 5](#).
 9. Use one AAR-approved Type 1A, Grade 4 nonmetallic strap for unitizing the rear section. Position the unitizing strap at a maximum 4 ft height above the floor. Ensure the strap is level. Use the correct buckle in accordance with manufacturer's instructions. See [Section 4.2.3](#). Tension straps using proper tensioning tools. Use strap hangers or tape on the rolls to maintain proper strap alignment.

NOTE: A unitizing strap may also be applied on the front section using one AAR-approved Type 1A, Grade 4 nonmetallic strap. For four-roll sections loaded in a 1-1 offset, unitize the whole section. For three-roll sections where the first roll is centered at the front endwall, and the remaining rolls are loaded in a 1-1 offset, unitize only the second and third rolls. Use strap hangers or tape on the rolls to maintain proper strap alignment.

10. A minimum of 3 ft void is required between the rolls and the container/trailer doors.

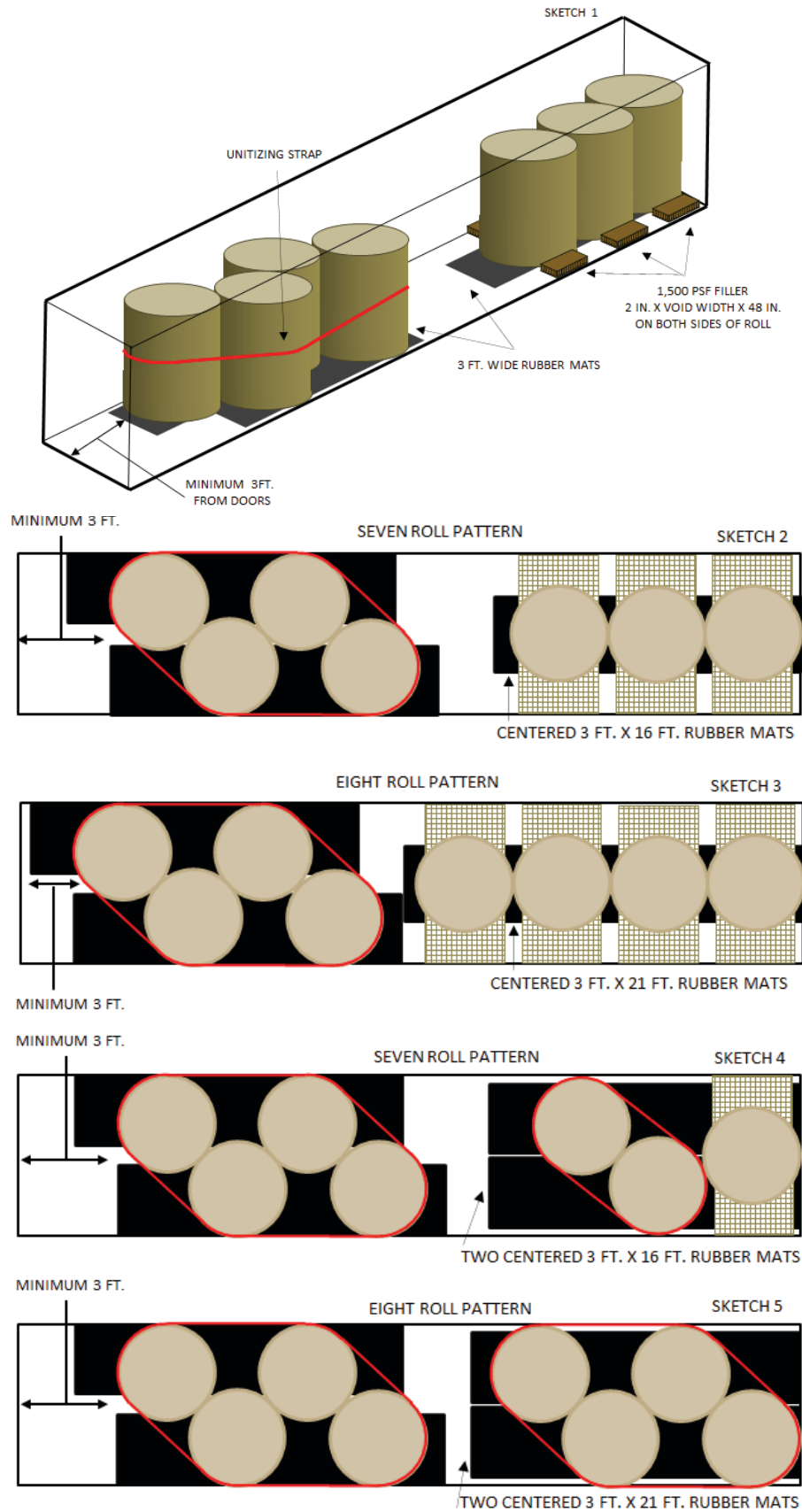


Figure 6.1.58.2 - 2

Method 6.1.58.2 - Split loads of 58-in. diameter roll pulpboard using rubber mats

Figure 6.1.58.2 - 3:

1. This loading method is for a six roll loading variation.
2. Load rolls in a 1-1 offset pattern for 3 rolls in each section as shown in [Figure 6.1.58.2 - 3](#). Rolls must be loaded tight (in contact) with sidewalls and each other.
3. For the current listing of AAR-verified rubber friction mats and information on the verification process refer to the *Product Performance Profile for Rubber Friction Mats - Product Verification List* and AAR General Information Bulletin No. 10, *Product Performance Profile for Rubber Friction Mats*. Both documents can be referenced at <https://aar.com/standards/damage-publications.php>. See [Section 4.4](#).
4. Use AAR-verified rubber friction mats 2 mm thick by 30 in. wide, placed against the container sidewalls. Rubber mats may be continuous or in sheets and must extend at least 6 in. beyond the rolls in either direction. If using individual sheets, ensure the rubber mats do not overlap.

NOTE: Do not use rubber mats that are torn, contaminated or otherwise damaged in any way. It is not recommended to reuse rubber mats when applied to prevent lengthwise movement in the container or trailer.

5. Use one AAR-approved Type 1A, Grade 4 nonmetallic strap for unitizing each section. Position the unitizing strap at a maximum 4 ft height above the floor. Ensure the strap is level. Use the correct buckle in accordance with manufacturer's instructions. See [Section 4.2.3](#). Tension straps using proper tensioning tools. Use strap hangers or tape on the rolls to maintain proper strap alignment.
6. A minimum of 3 ft void is required between the rolls and the container/trailer doors.

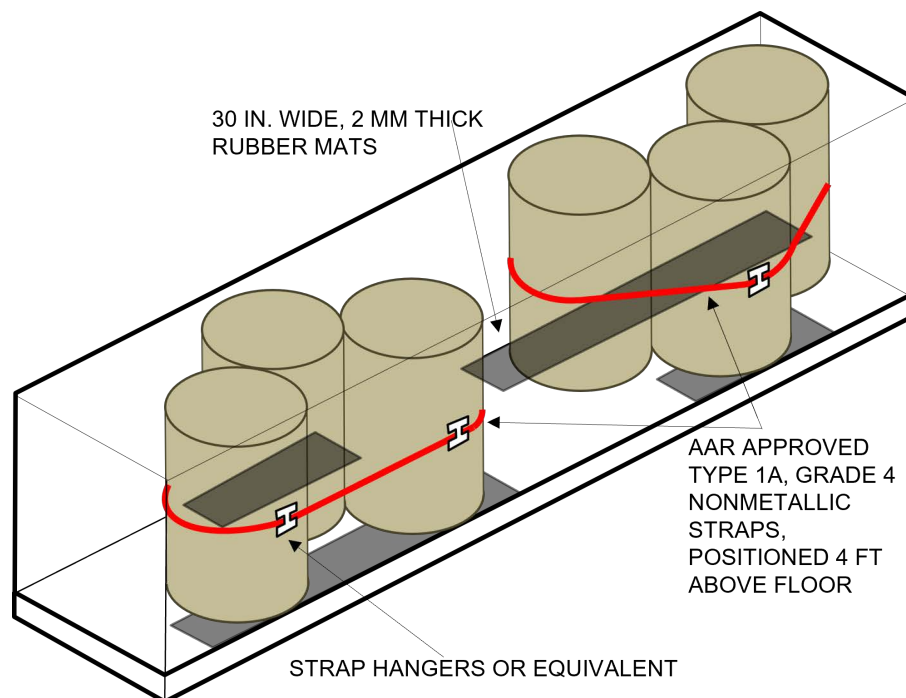
**Figure 6.1.58.2 - 3****Method 6.1.58.2 - Split loads of 58-in. diameter roll pulpboard using rubber mats**

Figure 6.1.58.2 - 4:

1. For the current listing of AAR-verified rubber friction mats and information on the verification process refer to the *Product Performance Profile for Rubber Friction Mats - Product Verification List* and AAR General Information Bulletin No. 10, *Product Performance Profile for Rubber Friction Mats*. Both documents can be referenced at <https://aar.com/standards/damage-publications.php>. See [Section 4.4](#).
2. AAR-verified rubber friction mats applied for this loading method are to be 1 1/2 mm (0.059 in.), 2 mm (0.080 in.), or 3 mm (0.125 in.) thick.
3. Divide the load into two sections. The nose section should consist of three or four rolls. Use the appropriate size rubber mat for the number of rolls being loaded. Position the rubber mats to extend a minimum of 6 in. beyond the rolls. If using individual sheets, ensure the rubber mats do not overlap.
 - a. If four rolls are loaded in the nose section, use two 4 ft × 17 ft rubber mats (continuous or perforated matting) at the nose placed side by side. The following may also be used: two rows of five 3 ft × 3 ft sections of approved rubber mats and one 3 ft × 20 in. section of approved rubber mat installed end to end with the next-to-last rubber mat in each row cut to 20 in. to allow more of the last rubber mat to be under the last roll; or one row of four 30 in. × 42 in. sections of approved rubber mat installed end to end and centered under the rolls in the nose section.
 - b. If three rolls are loaded in the nose section, use two 4 ft × 14 ft rubber mats (continuous or perforated matting) at the nose placed side by side. The following may also be used: two rows of four 3 ft × 3 ft sections of approved rubber mats and one 3 ft × 20 in. section of approved rubber mat installed end to end with the next to last rubber mat in each row cut to 20 in. to allow more of the last rubber mat to be under the last roll; or one row of four 30 in. × 42 in. sections of approved rubber mat installed end to end and centered under the rolls in the nose section.

NOTE: Do not use rubber mats that are torn, contaminated or otherwise damaged in any way. It is not recommended to reuse rubber mats when applied to prevent lengthwise movement in the container or trailer.

4. Load the rolls in the front section positioned on the applied rubber mats:
 - a. If three rolls are loaded in the nose section, load the first roll so it is centered in the container against the nose. Place void fillers, 2 in. x (void width) x 48 in. corrugated fiberboard with minimum 1,500 psf, on either side of the rolls at the nose. If using multiple void fillers in one location, unitize them together. Use tape or other securement methods to keep fillers in position. Load the next two rolls tightly against opposite sidewalls. [See Sketch 2](#). Lumber side blocking can be used as an alternative to the void fillers, provided it is a minimum laminated 2 in. x 4 in. lumber, extending a minimum of 48 in. from the nose of the container, and is secured adequately using 12d nails. Secure lumber to keep blocking in position. See [Section 3.3.1](#) and [Section 4.1](#).
 - b. If four rolls are loaded in the nose section, load the four rolls tightly starting against the nose and using an 1-1 offset pattern. [See Sketch 3](#).
5. Position the rear section to obtain the proper load weight distribution and maintain a minimum of 3 ft between the rear of the load and the container doors.
6. Load the rear section consisting of four rolls by using two 4 ft x 16 ft rubber mats (continuous or perforated matting) placed side by side or by using an appropriate number of 3 ft x 3 ft or 30 in. x 42 in. sections of rubber mat placed side by side and centered under the rolls. Position the rubber mats to extend a minimum of 6 in. beyond the rolls at each end of each rubber mat. If using individual sheets, ensure the rubber mats do not overlap.
7. Load the rolls on the rubber mats in a 1 - 1 offset pattern.
8. Use one AAR-approved Type 1A, Grade 4 nonmetallic strap for unitizing each section. Position the unitizing strap at a maximum 4 ft height above the floor. Ensure the strap is level. Use the correct buckle in accordance with manufacturer's instructions. See [Section 4.2.3](#). Tension straps using proper tensioning tools. Use strap hangers or tape on the rolls to maintain proper strap alignment.

NOTE: A unitizing strap may also be applied on the front section using one AAR-approved Type 1A, Grade 4 nonmetallic strap. For four-roll sections unitize the whole section. For three-roll sections where the first roll is centered at the front endwall, unitize only the second and third rolls. Use strap hangers or tape on the rolls to maintain proper strap alignment.

- 9. A minimum of a 3 ft void is required between the rolls and the container/trailer doors.

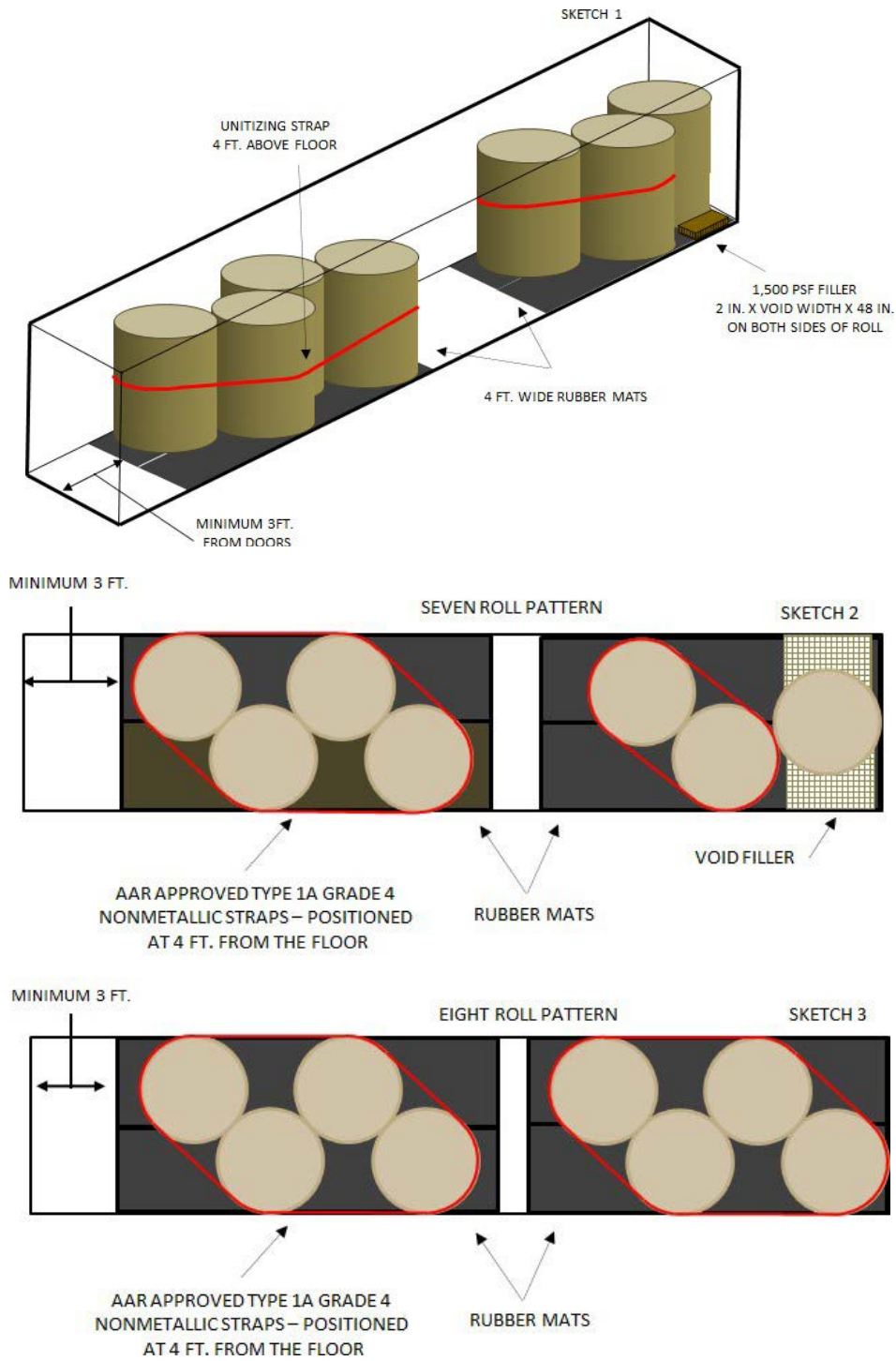


Figure 6.1.58.2 - 4
Method 6.1.58.2 - 58-in. diameter roll pulpboard using rubber mats

Method 6.1.58.3 - 58-in. Diameter Rolls of Pulpboard Using Floor Blocking
(Former Method G-5)

- This method was tested with 58-in. diameter roll paperboard loaded in two sections in a 1-1 offset loading pattern. This method was originally tested in 98-in. interior-width equipment.
 - Plan the load to equalize the weight on each side of the container/trailer. A balanced load is required for the stability and success of this loading method.
1. Divide the load into two sections, each containing approximately half of the load.
 2. The first section consists of four rolls starting at the nose of the container. Brace the last roll of this section with two floor blocks each consisting of a double 2 in. × 6 in. × 36 in. long floor block with two double 2 in. × 6 in. backup cleats 24 in. long. Install one of the two floor blocks adjacent to the roll and perpendicular to the sidewall. Install the other block adjacent to the roll at approximately 45° to the first block. Nail floor blocking and backup cleats to the container floor with 16d power-driven nails staggered every 4 in. See [Section 4.1](#) for further information on lumber-load securement.
 3. Position the rear section to obtain the proper load weight distribution and maintain sufficient void space for blocking between the rear of the load and the container doors. Load the second section in a 1-1 pattern. Brace the first and last rolls with the same configuration of blocking used in the first section.
 4. Unitize each section using one AAR-approved 1 1/4 in. x 0.029 in. steel strap. Secure straps with the correct bucket or seal in accordance with manufacturer's instructions. Tension and seal the straps using proper tensioning and sealing tools. Use strap hangers or tape to maintain proper strap alignment and to prevent straps from slipping out of position. See [Section 4.2.2](#) for further strapping information. The use of nonmetallic strapping is not approved for this loading method.
- Alternatively AAR-approved 1 3/4 in. polyester web strap and buckle assembly may be used. Strapping must have a 15,000-lb capacity rating. Use one strap around each section placed approximately 12 inches down from the top edge of the roll. Pretension each strap. See [Section 4.2.4](#).

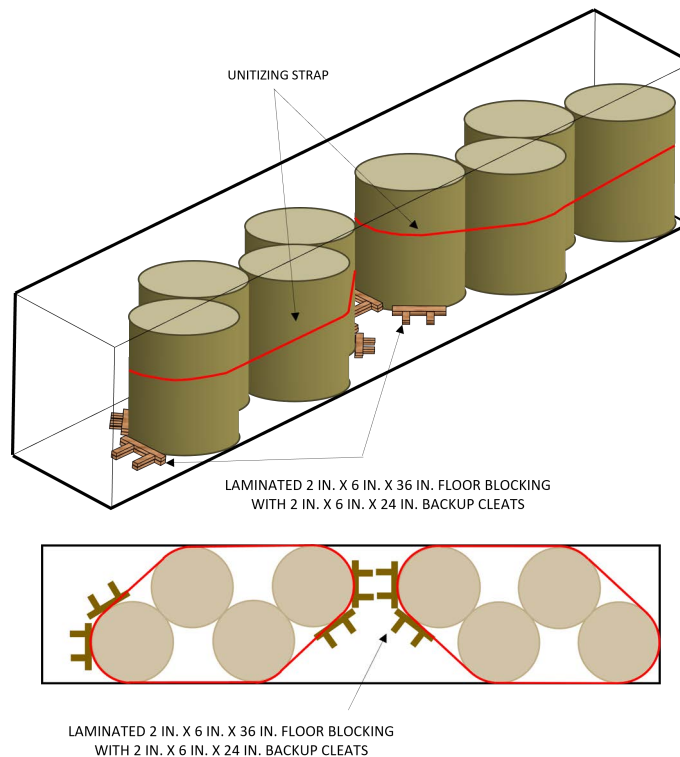


Figure 6.1.58.3. - 1

Method 6.1.58.3 - 58-in. diameter rolls of pulpboard floor blocking

Method 6.1.60.1 - Split Loads of 60-in. Diameter Roll Paper Using Rubber Mats

- This method was tested with 60-in. diameter rolls loaded in a 1-1 offset pattern with two split sections. The method was originally tested in 98-in. interior-width equipment.
 - Plan the load to equalize the weight on each side of the container/trailer. A balanced load is required for the stability and success of this loading method.
1. For the current listing of AAR-verified rubber friction mats and information on the verification process refer to the *Product Performance Profile for Rubber Friction Mats - Product Verification List* and AAR General Information Bulletin No. 10, *Product Performance Profile for Rubber Friction Mats*. Both documents can be referenced at <https://aar.com/standards/damage-publications.php>. See [Section 4.4](#).
 2. AAR-verified rubber friction mats applied for this loading method are to be 2 mm (0.080 in.) thick.
 3. The nose section consists of four rolls loaded in a 1-1 offset pattern. Load the four rolls tightly starting against the nose. Place the first rubber mat on the floor at the nose, centered in the container as shown in the figure. Apply rubber mats 36 in. wide x 17 ft long (continuous matting). Position the rubber mats to extend a minimum of 6 in. beyond the rolls.

NOTE: Do not use rubber mats that are torn, contaminated or otherwise damaged in any way. It is not recommended to reuse rubber mats when applied to prevent lengthwise movement in the container or trailer.

4. Position the rear section to obtain the proper load weight distribution and maintain a minimum of 3 ft between the rear of the load and the container doors.
5. Load the rear section, consisting of four rolls, using two 36 in. × 14 ft rubber mats (continuous matting). Position the rubber mats at opposite sidewalls. Position the rubber mats to extend a minimum of 6 in. beyond the rolls at each end of each rubber mat. Place the rolls on the rubber mats in a 1-1 offset pattern.
6. Use one AAR-approved Type 1A, Grade 4 nonmetallic strap for unitizing the rear section. Position the unitizing strap at a maximum 4 ft height above the floor. Ensure the strap is level. Use the correct buckle in accordance with manufacturer's instructions. See [Section 4.2.3](#). Tension straps using proper tensioning tools. Use strap hangers or tape on the rolls to maintain proper strap alignment.

NOTE: A unitizing strap may also be applied on the front section using one AAR-approved Type 1A, Grade 4 nonmetallic strap. Use strap hangers or tape on the rolls to maintain proper strap alignment.

7. A minimum of a 3 ft void is required between the rolls and the container/trailer doors.

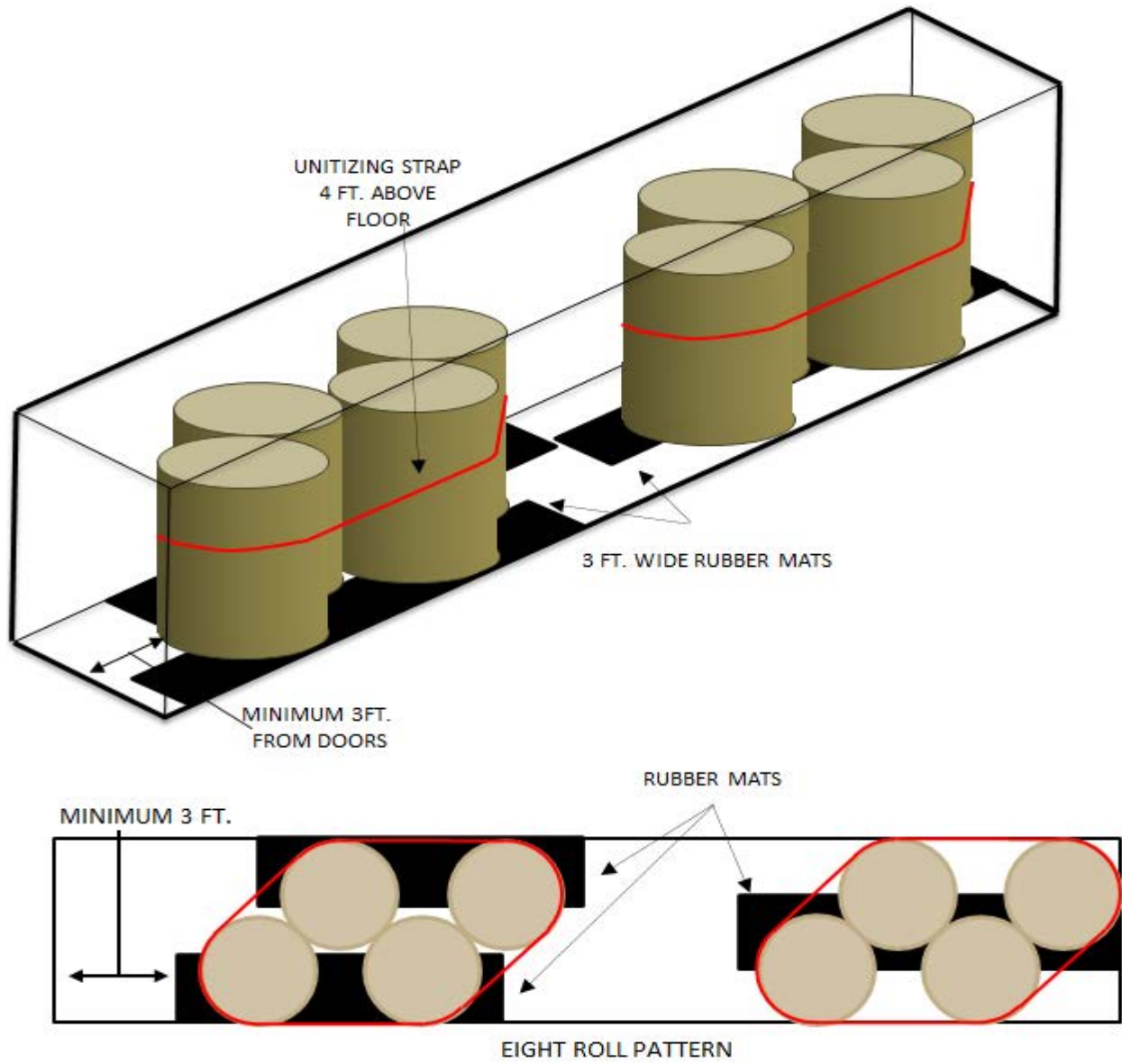


Figure 6.1.60.1 - 1

Method 6.1.60.1 - Split loads of 60-in. diameter roll paper using rubber mats

Method 6.1.X.1 - 40- to 45-in. Diameter, Large Width Roll Paper, Using Rubber Mats and Strapping
(Former Method E-14)

- This method is for 40- to 45-in. diameter roll paper with large widths or heights. The width of the rolls is at most 6 in. less than the inside height of the container/trailer. This method was originally tested in a 98 in. interior-width equipment. Wider equipment may require additional sidewall fillers.
- Plan the load to equalize the weight on each side of the container/trailer. A balanced load is required for the stability and success of this loading method.

CAUTION: Ensure that the floor of the container/trailer is not overloaded when loading wide (tall) rolls. The load may not exceed 2,500-lb/linear ft lengthwise of the container for any 1 ft section.

NOTE: Due to the nature of this concept some edge damage and/or header damage could occur due to roll rocking. If this is objectionable, do not use this loading and bracing method.

1. For the current listing of AAR-verified rubber friction mats and information on the verification process refer to the *Product Performance Profile for Rubber Friction Mats - Product Verification List* and AAR General Information Bulletin No. 10, *Product Performance Profile for Rubber Friction Mats*. Both documents can be referenced at <https://aar.com/standards/damage-publications.php>. See [Section 4.4](#).
2. AAR-verified rubber friction mats applied for this loading method are to be 3 mm (0.125 in.) thick.
3. The load is divided into two sections, containing three rolls each.
4. Position two 2 ft wide rubber mats so they will be centered under the two-roll-wide stack for each section, approximately 16 - 18 in. from the sidewalls. Use rubber mats of sufficient length to extend 8 in. beyond each end of each section of the load.

NOTE: Do not use rubber mats that are torn, contaminated or otherwise damaged in any way. It is not recommended to reuse rubber mats when applied to prevent lengthwise movement in the container or trailer.

5. Load the first section in a 2-1 pattern starting about 3 ½ ft from the nose of the container. Load the first two rolls next to each other along the lengthwise centerline of the container as shown in the figure. Center the third roll in the container in the recess between the first two rolls.
6. Unitize the first section with two AAR-approved 1¼ in. × 0.029 in. steel straps. Position the top strap 24 in. from top of the rolls and the bottom strap 18 in. from the floor. Secure straps with the seal in accordance with manufacturer's instructions. Tension and seal the straps using proper sealing tools. Use strap hangers or tape on the rolls to maintain proper strap alignment and to prevent straps from slipping out of position. See [Section 4.2.2](#) for further strapping information. The use of nonmetallic strapping is not approved for this loading method.
7. Position corrugated fiberboard void fillers, 1 ft wide × 5 ft long with minimum 1,500 psf, on edge between the sidewall and each of the rolls in the first (two-wide) stack. Use void fillers of sufficient thickness to fill the void. If using multiple void fillers in one location, unitize them together. Use tape or other securement methods to keep fillers in position. See [Section 3.3.1](#).
8. The second section also consists of three rolls loaded in a 2-1 pattern. Load on rubber mats and unitize it in the same manner as the first section.
9. Position the second section as far from the doors as possible while maintaining proper weight distribution, at least a minimum of 4 ft from the doors when loading is completed. It may be necessary to adjust the position of both sections to provide proper lengthwise weight distribution in the container.

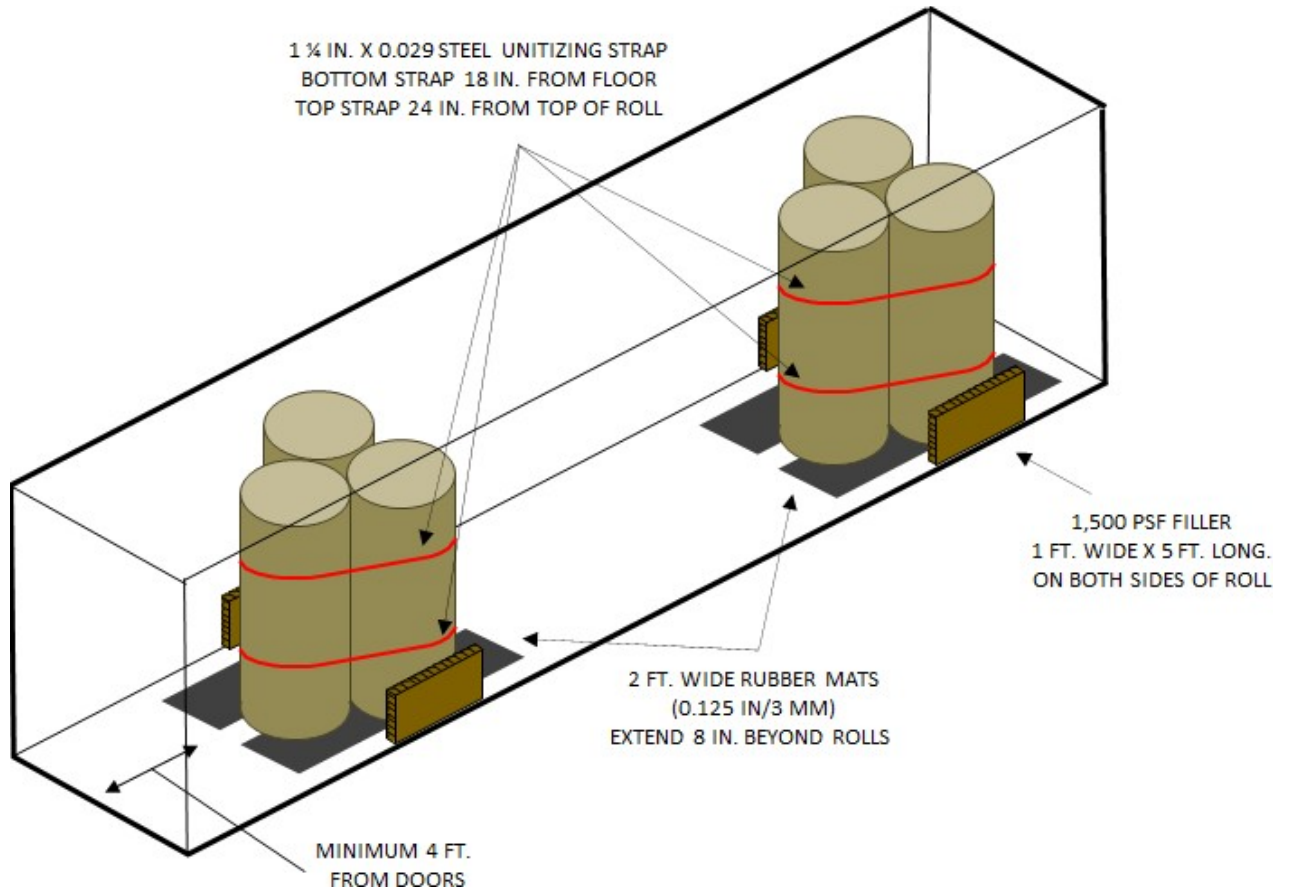


Figure 6.1.X.1 - 1

Method 6.1.X.1 - 40- to 45-in. diameter, large width roll paper using rubber mats and strapping

Method 6.1.X.2 - 46- to 57-in. Diameter Roll Paper Using Rubber Mats
(Former Method E-21; Cancels GIS 799)

- This method is for 46- to 57-in. diameter roll paper. This method was tested with roll widths (heights) of 63 in. (eight-roll pattern); 72 in. (seven-roll pattern); and 94 in. (six-roll pattern); in a 100 in. inside width container.
- For rolls of different heights or densities, select the roll pattern that will equalize and balance the weight distribution, both crosswise and lengthwise, for the inside equipment length and width. The use of additional dunnage may be needed, such as void fillers. The quantity and placement of the rolls loaded may also require adjustment based on equipment size and weight limits.
- Rolls are loaded in a 1-1 offset pattern. Use sidewall fillers to maintain the 1-1 offset pattern. Loads with an odd number of rolls (seven-roll pattern) have the first roll centered against the front endwall with fillers on both sides of sufficient size and strength to prevent crosswise roll movement.
- The rubber mats must extend a minimum of 6 in. beyond the edge of the rolls in both directions.
- Plan the load to equalize the weight on each side of the container/trailer. A balanced load is required for the stability and success of this loading method.

CAUTION: Ensure that the floor of the container/trailer is not overloaded when loading wide (tall) rolls. The load may not exceed 2,500 lb/linear ft lengthwise of the container for any 1 ft section.

NOTE: Due to the nature of this concept, some edge and/or header damage could occur as a result of roll rocking. If this is objectionable, do not use this loading and bracing method.

Figure 6.1.X.2 - 1, Figure 6.1.X.2 - 2, and Figure 6.1.X.2 - 3:

1. For the current listing of AAR-verified rubber friction mats and information on the verification process refer to the *Product Performance Profile for Rubber Friction Mats - Product Verification List* and AAR General Information Bulletin No. 10, *Product Performance Profile for Rubber Friction Mats*. Both documents can be referenced at <https://aar.com/standards/damage-publications.php>. See [Section 4.4](#).
2. AAR-verified rubber friction mats applied for this loading method are to be 2 mm (0.080 in.) thick.
3. Divide the load into two sections, each containing approximately half of the load. Use the six-, seven-, or eight-roll pattern depicted in [Figure 6.1.X.2 - 1](#), [Figure 6.1.X.2 - 2](#), and [Figure 6.1.X.2 - 3](#). The width of the rolls is to be at most 6 in. less than the inside height of the container.
4. Load the first section in a 1-1 offset pattern starting at the nose using closed-cell honeycomb filler panels or other suitable filler along both sidewalls to initiate and maintain the 1-1 offset pattern. Place fillers, with minimum 1,500 psf, between the sidewall and each of the rolls. The thickness of the filler is dependent on the inside width of the container and actual roll diameter. Use tape or other securement methods to keep fillers in position. Fillers must extend at least 2 ft beyond where the roll makes contact in either direction. If using multiple void fillers in one location, unitize them together. See [Section 3.3.1](#).
5. When three rolls are loaded in the nose section of a seven-roll load, load the first roll so it is centered in the container against the nose. Place void fillers, 2 in. × (void width) × 42 in. corrugated fiberboard with minimum 1,500 psf, on both sides of the first roll and the sidewalls. If using multiple void fillers in one location, unitize them together. Use tape or other securement methods to keep fillers in position. (see [Figure 6.1.X.2 - 2](#)).
6. For rolls greater than 72 in. in width (height), use a minimum of 5 in. deep × 22 in. wide × 60 in. tall fillers between the first roll loaded and the nose of the container. Use tape or other securement methods to keep fillers in position.
7. Load the second section also in a 1-1 offset pattern split from the first to provide proper lengthwise weight distribution. The rearmost roll in this section should be at least 3 ft from the doors when loading is completed.
8. Load each roll on 20 in. or 24 in. wide rubber mats centered under each roll and extending a minimum of 6 in. beyond the edge of the rolls in both directions.

NOTE: Do not use rubber mats that are torn, contaminated or otherwise damaged in any way. It is not recommended to reuse rubber mats when applied to prevent lengthwise movement in the container or trailer.

9. Use AAR-approved Type 1A Grade 4, nonmetallic strap for unitizing each section.
 - For three-roll sections where the first roll is centered at the front endwall, unitize only the second and third rolls.
 - For roll widths (heights) 63 in. or less, unitize each section with one strap located approximately 12 in. below the top of the rolls.
 - For roll widths 64 - 72 in., use two straps located 12 and 20 in. below the top of the rolls.
 - For roll widths greater than 72 in., use three straps located 12, 20, and 28 in. below the top of the rolls.
10. Ensure the strap is level. Use the correct buckle in accordance with manufacturer's instructions. See [Section 4.2.3](#). Tension straps using proper tensioning tools. Use strap hangers or tape on the rolls to maintain proper strap alignment.

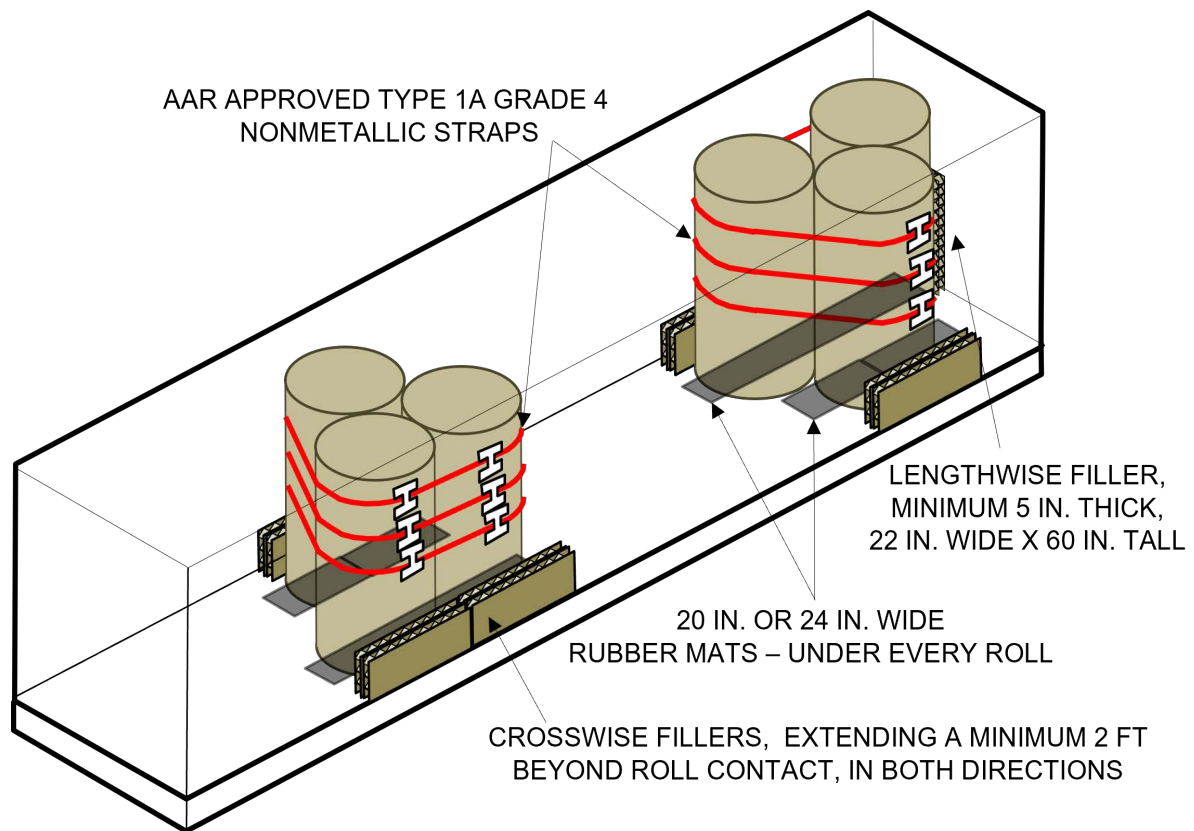


Figure 6.1.X.2 - 1

Method 6.1.X.2 - 46- to 57-in. diameter roll paper using rubber mats (six-roll load pattern, rolls greater than 72 in. height)

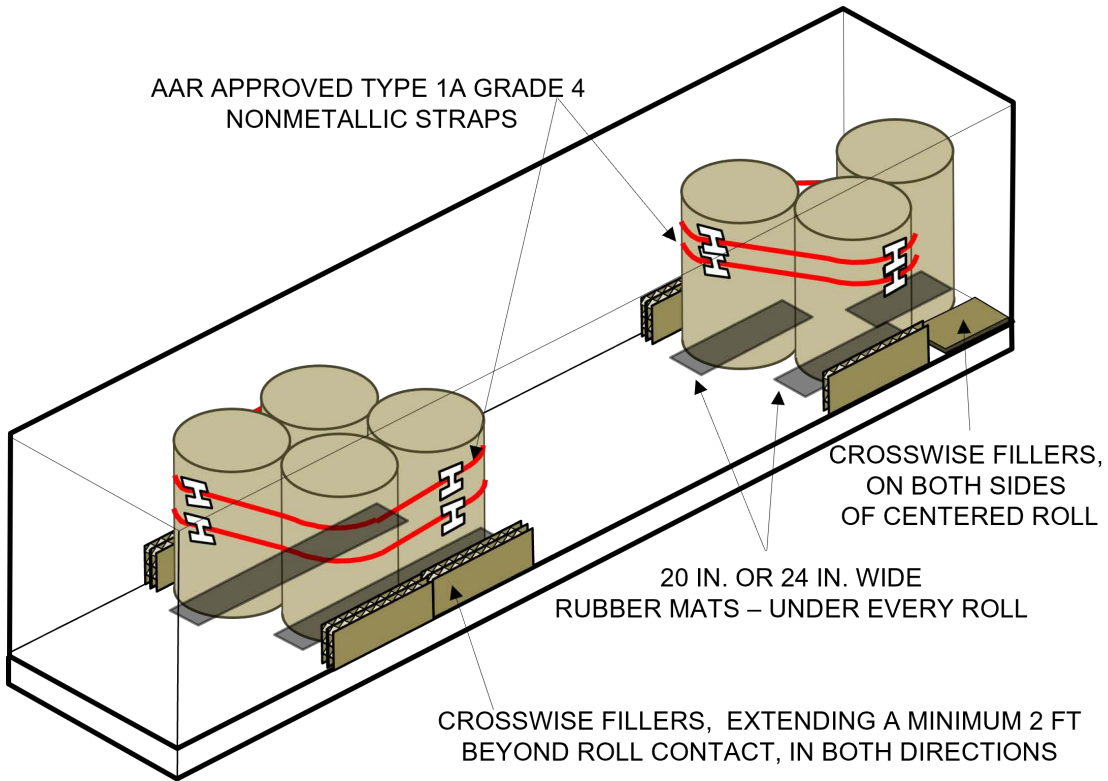


Figure 6.1.X.2 - 2

Method 6.1.X.2 - 46- to 57-in. diameter roll paper using rubber mats (seven-roll load pattern, rolls between 63- to 72 in. height)

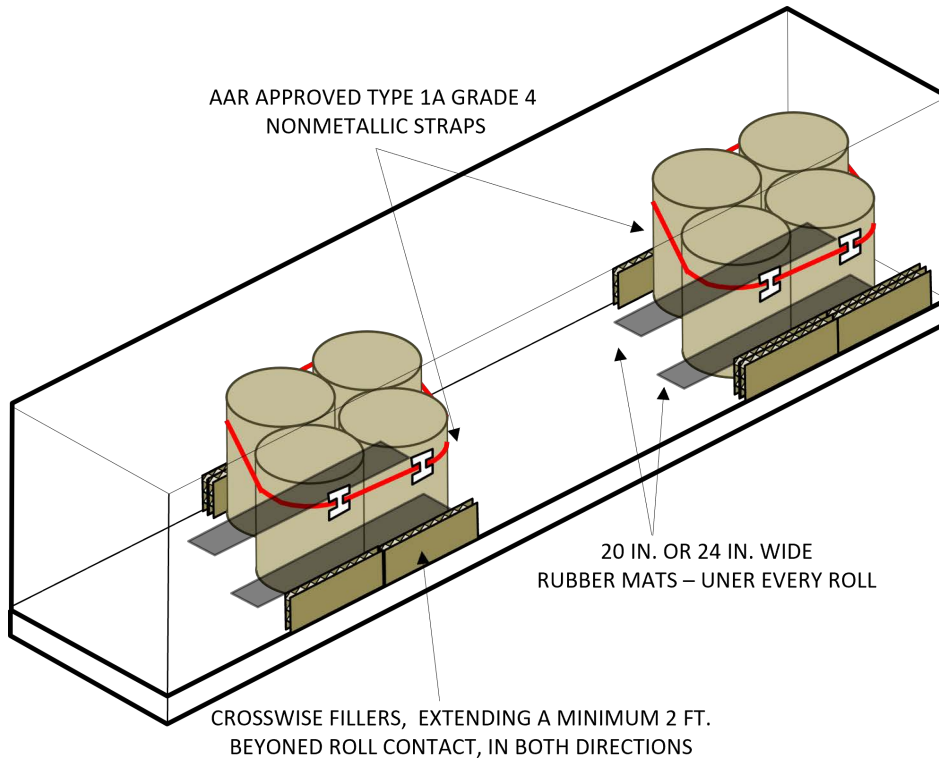


Figure 6.1.X.2 - 3

Method 6.1.X.2 - 46- to 57-in. diameter roll paper using rubber mats (eight-roll load pattern, rolls less than 63 in. height)

Method 6.1.X.3 - 48- to 54-in. Diameter Roll Pulpboard Using Rubber Mats with an Incomplete Second Layer (Former Method E-10)

- This method was tested with 50-in. roll pulpboard loaded in a 1-1 offset pattern, with an incomplete second layer. See [Section 3.1.3](#). It is recommended to only load rolls in the second layer that the roll height is less than the roll diameter.
 - Rolls are loaded in a 1-1 offset pattern. Use sidewall fillers to maintain the 1-1 offset pattern as needed. This method was originally tested in 98-in. interior-width equipment.
 - Plan the load to equalize the weight on each side of the container/trailer. A balanced load is required for the stability and success of this loading method.
1. For the current listing of AAR-verified rubber friction mats and information on the verification process refer to the *Product Performance Profile for Rubber Friction Mats - Product Verification List* and AAR General Information Bulletin No. 10, *Product Performance Profile for Rubber Friction Mats*. Both documents can be referenced at <https://aar.com/standards/damage-publications.php>. See [Section 4.4](#).
 2. AAR-verified rubber friction mats applied for this loading method are to be 3 mm (0.125 in.) thick.
 3. Load the rolls in one section in a 1-1 offset pattern starting at the nose of the container.
 4. Use sidewall fillers to maintain the 1-1 offset pattern as needed. Use fillers, with minimum 1,500 psf, between the sidewall the rolls. The thickness and use of the filler is dependent on the inside width of the container and actual roll diameter. The height of the sidewall fillers must be the same height as the entire roll stack (all layers of roll paper). Use tape or other securement methods to keep fillers in position. If using multiple void fillers in one location, unitize them together. See [Section 3.3.1](#).
 5. Load the rolls on two rubber mats placed down the center of the container. A 4 ft × 10 ft rubber mat extends from the nose of the container. Place a 4 ft × 17 ft rubber mat at the rear of the load so that it extends 3 in. beyond the end of the load.

NOTE: Do not use rubber mats that are torn, contaminated or otherwise damaged in any way. It is not recommended to reuse rubber mats when applied to prevent lengthwise movement in the container or trailer.

6. If an incomplete layer is loaded, it may be necessary to center the incomplete layer lengthwise in the container/trailer to provide proper weight distribution. Secure the incomplete layer with blocking rolls at both the front and rear as shown in the figure. The blocking rolls should extend a minimum of 6 in. above the bottom of the adjacent layer rolls. This can be accomplished by loading rolls of smaller width on the floor layer under the second layer, using taller blocking rolls, or by using roll risers under the blocking rolls. Minimum crush strength of 6,000 psf is required for risers. See [Section 3.3](#). The last stack loaded is to be a single layer and not loaded on risers.
7. Leave a minimum of 3 ft void space between the rolls and the container/trailer doors.

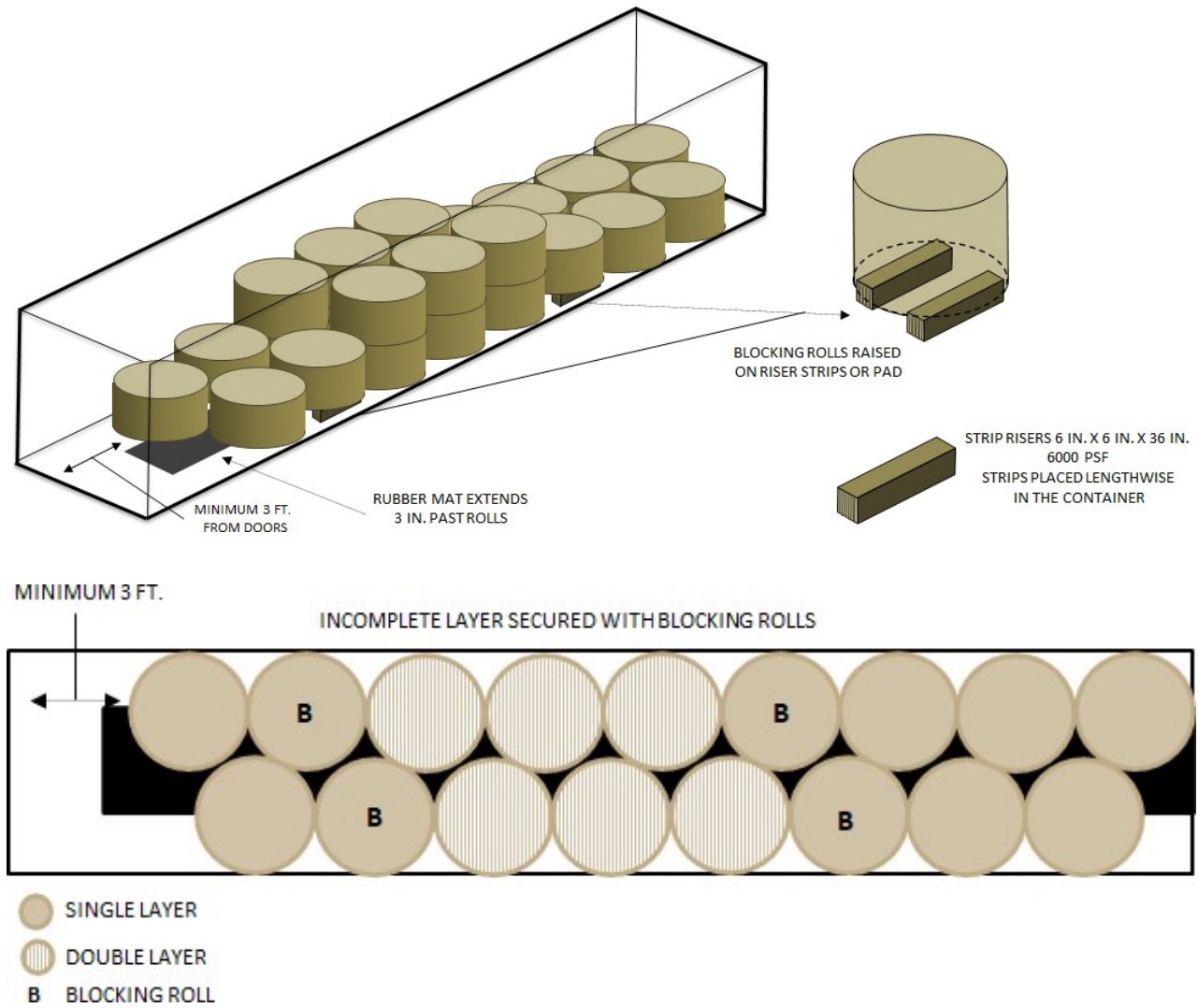


Figure 6.1.X.3 - 1
Methods 6.1.X.3 - 48- to 54 in. roll pulpboard using rubber mats with an incomplete second layer

6.2 Drums and IBCs

Number	Load Securement Method	Hazmat	Former Method
6.2.1	Drum Loads Secured with Ty-Gard 2000® or DS® Barriers	HM	B-1 (cancels GIS 798)
6.2.2	Fiberboard IBCs for Liquids Secured with Ty-Gard 2000®	HM	B-7
6.2.3	Drum Loads Secured by Ty-Gard 2000® or DS® Barriers in 20-ft. ISO Containers - Approved for Hazardous Commodities	HM	B-8 & B-9 (cancels GIS 798)
6.2.4	Drum Loads Secured by Ty-Gard 2000® or DS® Barriers in 20-ft. ISO Containers - Approved for Nonhazardous Commodities		B-8 & B-9 (cancels GIS 798)
6.2.5	Closed Head Steel Drums on Rubber Matting with Strapping		E-7
6.2.6	Drum Load Secured with "T" Braces in 20-ft. Containers	HM*	G-2
6.2.7	Fifty-Five Gallon Drums with Wood Blocking and Bracing	HM*	G-3 & G-4
6.2.8	Tight - Head Steel, 55-Gallon Drums Secured with Cordstrap® Composite Strapping (CC) 105 in 20-ft. ISO Containers - Approved for Hazardous Commodities	HM	I-1
6.2.9	Tight - Head Steel or Plastic, 55-Gallon Drums Secured with Cordstrap® Composite Strapping (CC) 105 in 20-ft. ISO Containers - Approved for Nonhazardous Commodities		I-1
6.2.10	Tight - Head Steel or Plastic, 55-Gallon Drums Secured with Carolina Strapping and Buckles Company Woven Strapping (CS) 2040 in 20-ft. ISO Containers	HM	I-2 & I-3
6.2.11	Steel Drums, 55-Gallons, on Pallets Secured with Cordstrap® Barriers in 40-ft. ISO Containers		I-6 (cancels GIS 755)

* *Reference Mixed Load - Load Securement Methods for additional load securement methods*

Method 6.2.1 - Drum Loads Secured with Ty-Gard 2000® or DS® Barriers
(Former Method B-1; Cancels GIS 798)

- This method is for closed-head drums loaded in a 4-3-4 pattern.
- This method uses Ty-Gard 2000® or DS® barriers.
- When used with containers with corrugated sidewalls, follow the contour of the corrugations. When used in trailers or containers without corrugated sidewalls, equipment walls must have horizontally oriented sidewall panels.
- Plan the load to equalize the weight on each side of the container/trailer. A balanced load is required for the stability and success of this loading method.

Figure 6.2.1 - 1 and Figure 6.2.1 - 2:

NOTE: The two-section load has been successfully impact-tested to 6 mph with Ty-Gard 2000. The three section load has been successfully impact-tested up to 8 mph with TY-Gard 2000.

1. Load the drums into two or three sections. The last stack in each section should contain three drums as shown in the figures.
 - a. In the two-section load, each section contains approximately $\frac{1}{2}$ of the total drums loaded. (Figure 6.2.1 - 1)
 - b. In the three-section load, each section contains approximately $\frac{1}{3}$ of the total drums loaded. (Figure 6.2.1 - 2)
2. The loading pattern may be secured with either Ty-Gard 2000 or DS barriers. Follow manufacturer's instructions for application. See Section 4.5.1 for further information.
3. For Ty-Gard 2000, apply two 16 in. wide Ty-Gard 2000 barriers to each section. Each strip is a minimum of 60 in. long. Apply the adhesive strip to each sidewall located 36 in. back from the face of the load. Pull the Ty-Gard strips across the face of the load, overlapping ends by at least 12 in. and tension, following manufacturer's instruction, using Ty-Gard tools. The tensioned barriers are then sealed with 48 in. long strips of Ty-Patch bonded to the Ty-Gard barriers.
4. For Ty-Gard DS, apply one 24 in. wide Ty-Gard barrier to each section. Each strip is a minimum of 75 in. long. Apply the adhesive strip each sidewall located 24 in. back from the face of the load. Tension and seal all Ty-Gard barriers in accordance with manufacturer's instruction with the noted amount of overlapping ends and patch application.
5. Drum protection consists of drum protectors or angleboard/cornerboard strips. If angleboard/cornerboard strips are used, apply a minimum of two thicknesses of 0.250 in. solid fiberboard or equivalent. Tape the barriers to the drum protectors to prevent slippage during installation.

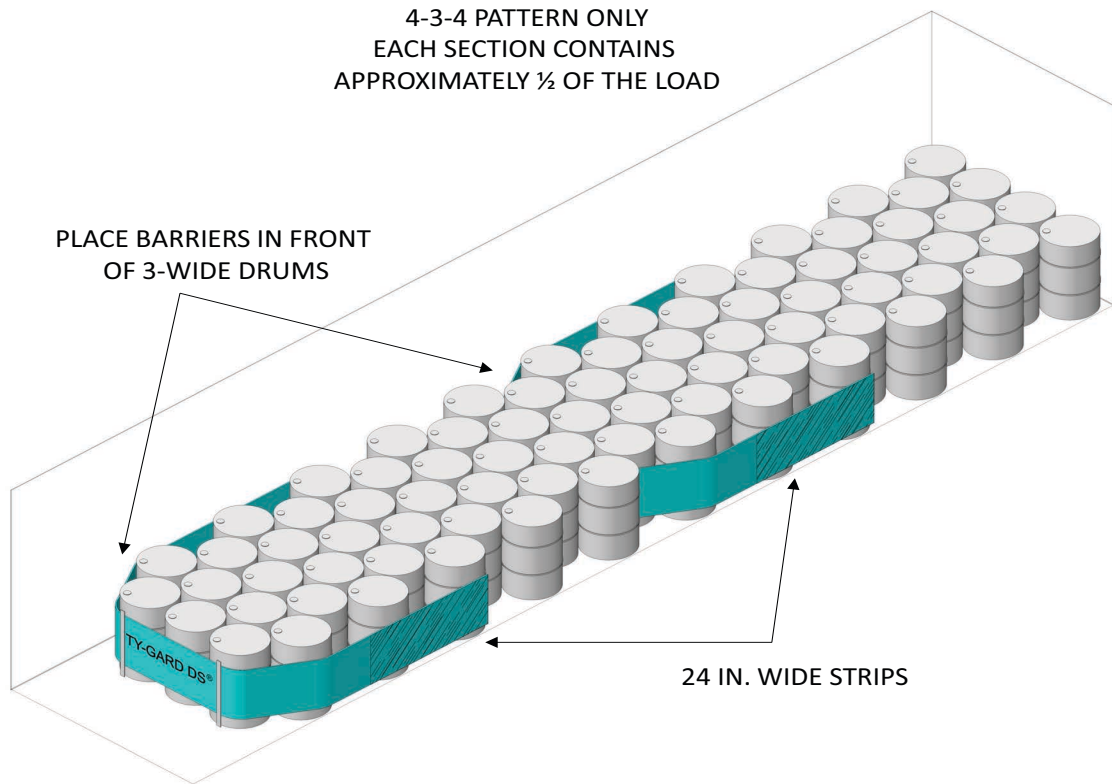


Figure 6.2.1 - 1

Method 6.2.1 - Drum loads secured with Ty-Gard 2000® or DS® barriers
(two - section pattern)

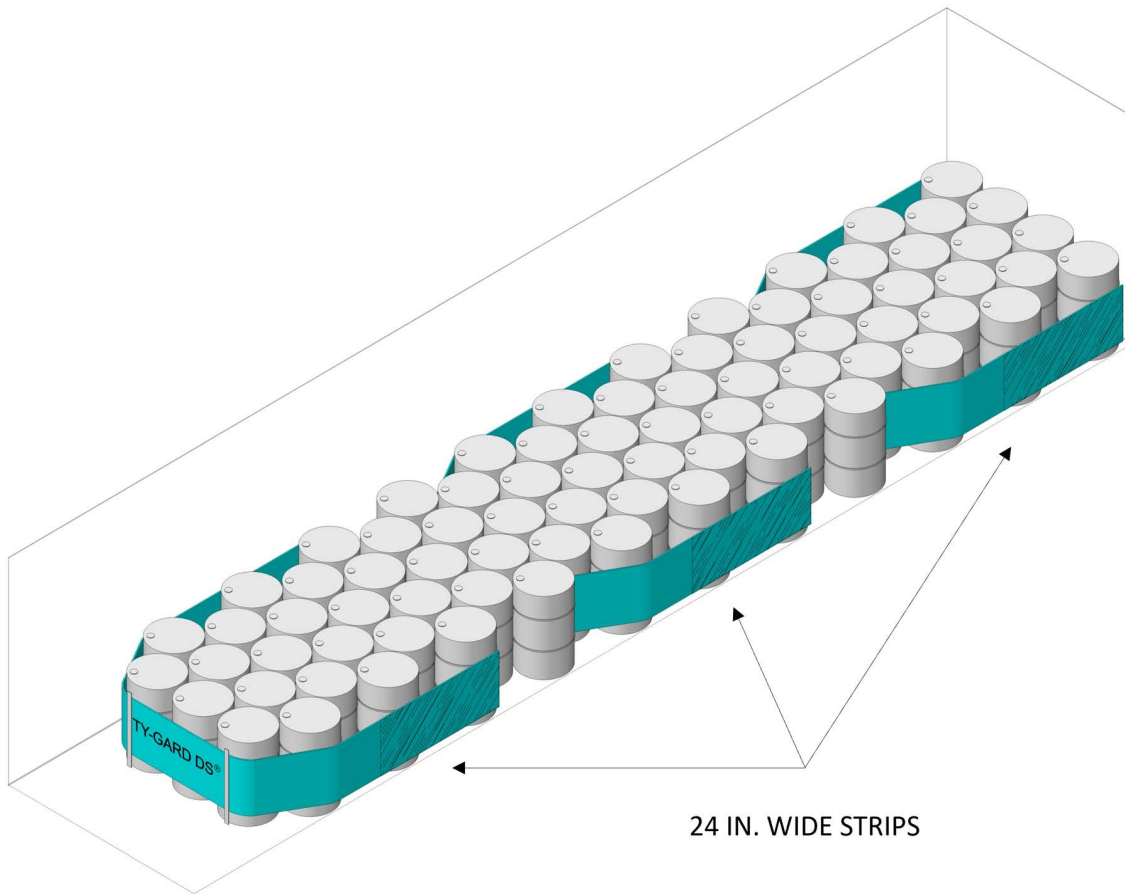


Figure 6.2.1 - 2
Method 6.2.1 - Drum loads secured with Ty-Gard 2000® or DS® barriers
(three - section pattern)

Method 6.2.2 - Fiberboard IBCs for Liquids Secured with Ty-Gard 2000®
(Former Method B-7)

- This method only allows the use of Ty-Gard 2000® for securing triple wall corrugated fiberboard IBCs with plastic inner container.
 - When used with containers with corrugated sidewalls, follow the contour of the corrugations. When used in containers/trailers without corrugated sidewalls, equipment walls must have horizontally oriented sidewall panels.
 - Plan the load to equalize the weight on each side of the container/trailer. A balanced load is required for the stability and success of this loading method.
1. Ensure the fiberboard intermediate bulk container (IBC) fits the dimensions of its pallet and is secured to the pallet.
 2. The IBCs may be loaded in a single or double layer, provided maximum weight limitations are not exceeded. Divide the floor layer into three sections. In general, each section should contain approximately $\frac{1}{3}$ the weight in the load.
 3. Load the IBCs, starting at the nose of the container, in a pinwheel or rotating pattern, against both sidewalls. See loading [Figure 6.2.2 - 1](#). Use corrugated fiberboard or honeycomb void fillers to fill any crosswise voids. See [Section 3.1.2](#).
 4. The loading pattern may be secured with Ty-Gard 2000. Follow manufacturer's instructions for application. See [Section 4.5.1](#) for further information.
 5. For Ty-Gard 2000, apply two 16 in. wide Ty-Gard 2000 barriers to each section. Each strip is a minimum of 60 in. long. Apply the adhesive strip to each sidewall located 36 in. back from the face of the load. Pull the Ty-Gard strips across the face of the load, overlapping ends by at least 12 in. and tension, following manufacturer's instruction, using Ty-Gard tools. The tension barriers are then sealed with 48 in. long strips of Ty-Patch bonded to the Ty-Gard barriers.
 6. If a second layer is loaded, position the layer, centered in the load or spaced as needed to maintain proper weight distribution. Apply approved layer separators between the first and second layers. See [Section 3.3.5](#) and [Table 3.2](#).
 7. Secure the second layer at both the front and rear of layer by three 16 in. wide strips of the Ty-Gard 2000. Each strip is a minimum of 60 in. long. Apply the adhesive strip to each sidewall located 36 in. back from the face of the load. Pull the Ty-Gard strips across the face of the load, overlapping ends by at least 12 in. and tension, following manufacturer's instruction, using Ty-Gard tools. The tension barriers are then sealed with 48 in. long strips of Ty-Patch bonded to the Ty-Gard barriers. Tape the Ty-Gard 2000 to the IBCs to maintain position during transit.

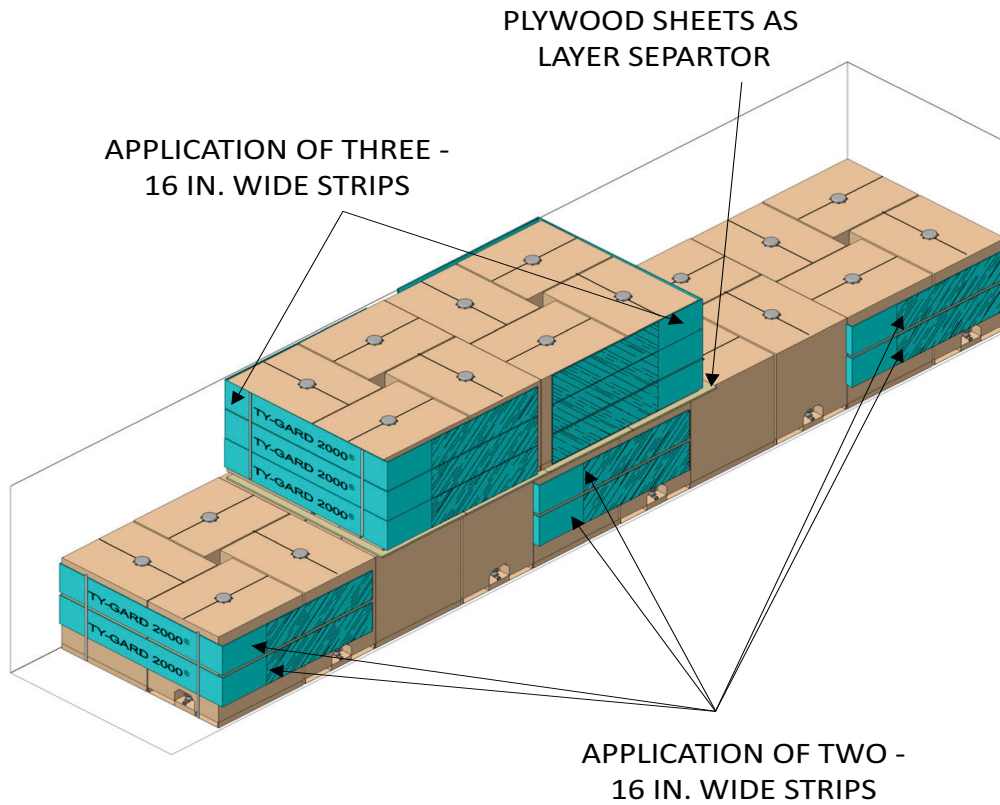


Figure 6.2.2 - 1

Method 6.2.2 - Fiberboard IBCs for liquids secured with Ty-Gard 2000®

Method 6.2.3 - Drum Loads Secured by Ty-Gard 2000® or DS® Barriers in 20-ft. ISO Containers - Approved for Hazardous Commodities
(Former Method B-8 and B-9; Cancels GIS 798)



- This method is for 55-gallon steel or plastic closed-head drums loaded in two layers in 20-ft. ISO containers. Steel drums should have the W-style rolling hoop.
- This method uses Ty-Gard 2000® or DS® barriers.
- Up to 78 drums can be loaded in a 4-3-4 or 4-4 pattern (hazardous or nonhazardous commodities).
- Up to 80 steel drums can be loaded in a modified 4-3-4 pattern with Ty-Gard DS (hazardous or nonhazardous commodities).
- When used with containers with corrugated sidewalls, follow the contour of the corrugations. When used in containers/trailers without corrugated sidewalls, equipment walls must have horizontally oriented sidewall panels.
- Plan the load to equalize the weight on each side of the container/trailer. A balanced load is required for the stability and success of this loading method.

Figure 6.2.3 - 1: 78-Drum Load (Sketches 1 and 2)

1. Loads containing 78 drums can be loaded in 10 stacks using a 4-4 pattern or in 11 stacks using a 4-3-4 pattern.
2. If following a 4-4 pattern (10 stacks), secure the front section after the fifth stack. Position three drums in each layer of the last stack in the container.
3. If following a 4-3-4 pattern (11 stacks), secure the front section after the sixth stack. Position four drums in each layer of the last stack in the container. Apply 1/2 in. plywood sheets, 6 ft long and the same height as the drums, between the last stacks of drums and the Ty-Gard barrier. Center the plywood sheets on each layer and secure with tape or Ty-Gard strips to maintain position during installation.
4. Apply approved layer separators between the first and second layers. See [Section 3.3.5](#) and [Table 3.2](#).
5. The loading pattern may be secured with either Ty-Gard 2000 or DS barriers. Follow manufacturer's instructions for application. See [Section 4.5.1](#) for further information.
6. For Ty-Gard 2000, apply two 16 in. wide Ty-Gard 2000 barriers to each section. Each strip is a minimum of 60 inches long. Apply the adhesive strip to each sidewall located 36 in. back from the face of the load. Pull the Ty-Gard strips across the face of the load, overlapping ends by at least 12 in. and tension, following manufacturer's instruction, using Ty-Gard tools. The tension barriers are then sealed with 48 in. long strips of Ty-Patch bonded to the Ty-Gard barriers.
7. For Ty-Gard DS, apply one 24 in wide Ty-Gard barrier to each section. Each strip is a minimum of 75 in. long. Apply the adhesive strip each sidewall located 24 in. back from the face of the load. Tension and seal all Ty-Gard barriers in accordance with manufacturer's instruction with the noted amount of overlapping ends and patch application.
8. A lesser number of drums can be loaded, following a 4-3-4 or nested drum loading pattern. Each section should contain approximately half of the load. Maintain proper weight distribution.

Figure 6.2.3 - 2: 80-Drum Load - Ty-Gard DS®

1. Loads containing 80 steel drums can be loaded in 11 stacks using a modified 4-3-4 pattern. Follow loading pattern: 4-3-4-3-4-3-4-4-3-4-4. Secure the front section after the seventh stack.
2. Position four drums in each layer of the last stack in each section. Apply 1/2 in. plywood sheets, 6 ft long and the same height as the drums, between the last stacks of drums and the Ty-Gard barrier. Center the plywood sheets on each layer and secure with tape or Ty-Gard strips to maintain position during installation.
3. Apply approved layer separators between the first and second layers. See [Section 3.3.5](#) and [Table 3.2](#).

4. The loading pattern may be secured with Ty-Gard DS barriers. Follow manufacturer’s instructions for application. See [Section 4.5.1](#) for further information.
5. For Ty-Gard DS, apply one 24 in. wide Ty-Gard barrier to each section. Each strip is a minimum of 75 in. long. Apply the adhesive strip each sidewall located 24 in. back from the face of the load. Tension and seal all Ty-Gard barriers in accordance with manufacturer's instruction with the noted amount of overlapping ends and patch application.

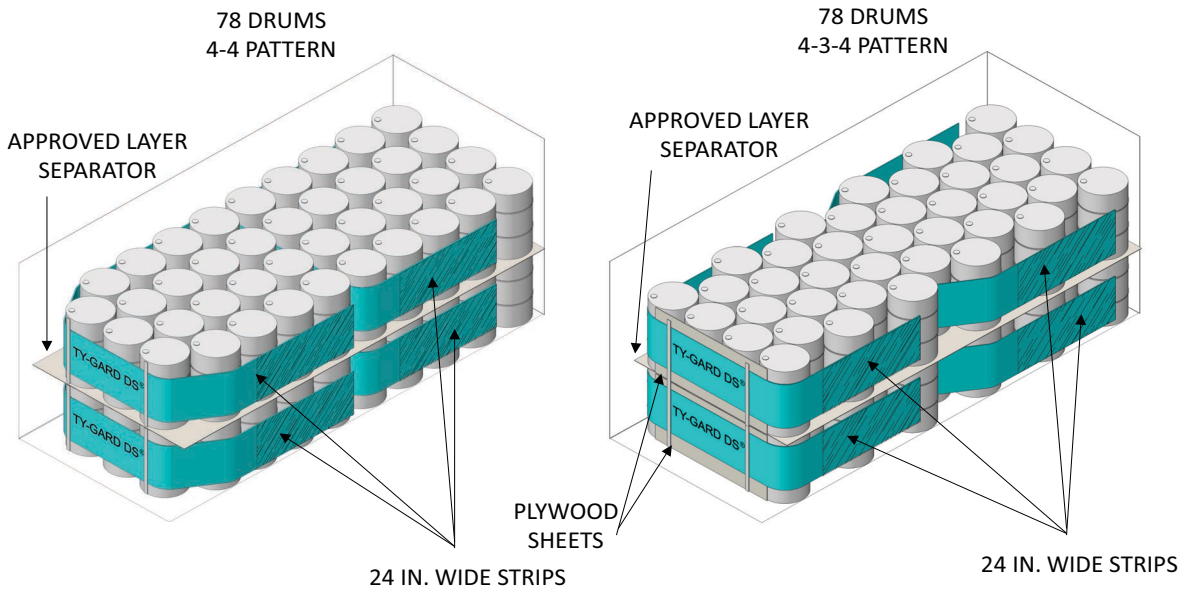


Figure 6.2.3 - 1

Method 6.2.3 - 78-Drum loads secured by Ty-Gard 2000® or DS® barriers in 20-ft ISO containers

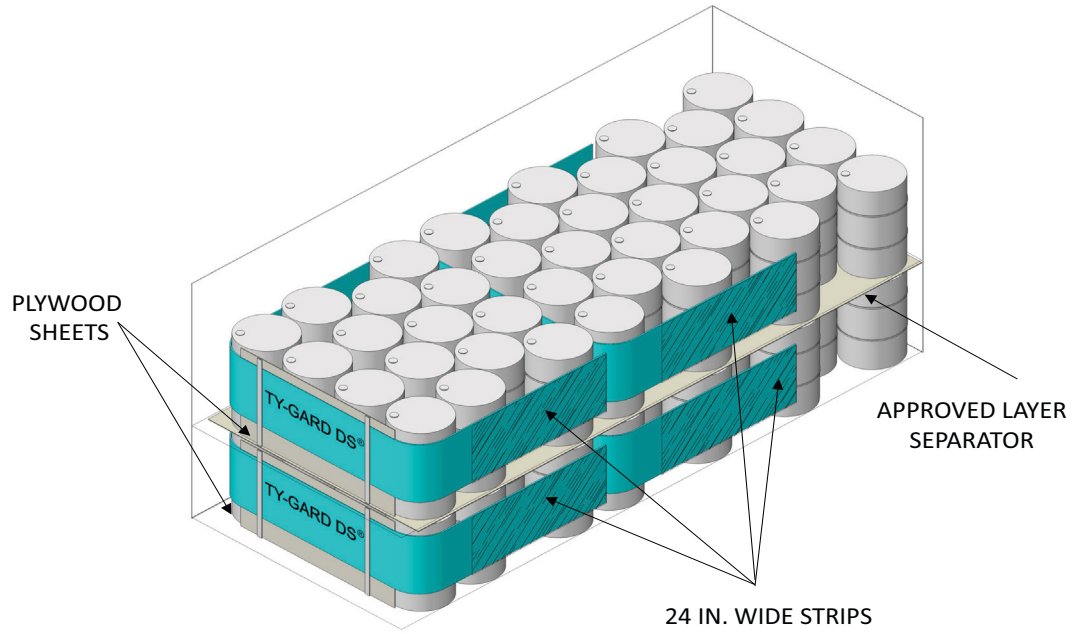


Figure 6.2.3 - 2

Method 6.2.3 - 80-Drum loads secured by Ty-Gard 2000® or DS® barriers in 20-ft ISO containers

Method 6.2.4 - Drum Loads Secured by Ty-Gard 2000® or DS® Barriers in 20-ft. ISO Containers - Approved for Nonhazardous Commodities

(Former Method B-8 and B-9; Cancels GIS 798)

- This method is for 55-gallon steel or plastic closed-head drums loaded in two layers in 20 ft ISO containers. Steel drums should have the W-style rolling hoop.
 - This method uses Ty-Gard 2000® or DS® barriers.
 - Up to 80 drums can be loaded in a 4-3-4 or 4-4 pattern (nonhazardous commodities).
 - When used with containers with corrugated sidewalls, follow the contour of the corrugations. When used in containers/trailers without corrugated sidewalls, equipment walls must have horizontally oriented sidewall panels.
 - Plan the load to equalize the weight on each side of the container/trailer. A balanced load is required for the stability and success of this loading method.
1. Loads containing 80 drums can be loaded in 10 stacks using a 4-4 pattern or in 11 stacks using a 4-3-4 pattern.
 2. If following a 4-4 pattern (10 stacks), secure the front section after the fifth stack. Apply 1/2 in. plywood sheets, 6 ft long and the same height as the drums, between the last stacks of drums and the Ty-Gard barrier. Center the plywood sheets on each layer and secure with tape or Ty-Gard strips to maintain position during installation.
 3. If following a 4-3-4 pattern (11 stacks), load the drums in the following pattern:3-4-3-4-4-3-4-3-4-4. Secure the front section after the sixth stack. Encompass only the center two drums on the sixth stack inside the Ty-Gard barrier. Position four drums in each layer of the last stack in the container. Apply 1/2 in. plywood sheets, 6 ft long and the same height as the drums, between the last stacks of drums and the Ty-Gard barrier. Center the plywood sheets on each layer and secure with tape or Ty-Gard strips to maintain position during installation.
 4. Apply approved layer separators between the first and second layers. See [Section 3.3.5](#) and [Table 3.2](#).
 5. The loading pattern may be secured with either Ty-Gard 2000 or DS barriers. Follow manufacturer's instructions for application. See [Section 4.5.1](#) for further information.
 6. For Ty-Gard 2000, apply two 16 in. wide Ty-Gard 2000 barriers to each section. Each strip is a minimum of 60 inches long. Apply the adhesive strip to each sidewall located 36 in. back from the face of the load. Pull the Ty-Gard strips across the face of the load, overlapping ends by at least 12 in. and tension, following manufacturer's instruction, using Ty-Gard tools. The tension barriers are then sealed with 48 in. long strips of Ty-Patch bonded to the Ty-Gard barriers.
 7. For Ty-Gard DS, apply one 24 in. wide Ty-Gard barrier to each section. Each strip is a minimum of 75 in. long. Apply the adhesive strip each sidewall located 24 in. back from the face of the load. Tension and seal all Ty-Gard barriers in accordance with manufacture's instruction with the noted amount of overlapping ends and patch application.

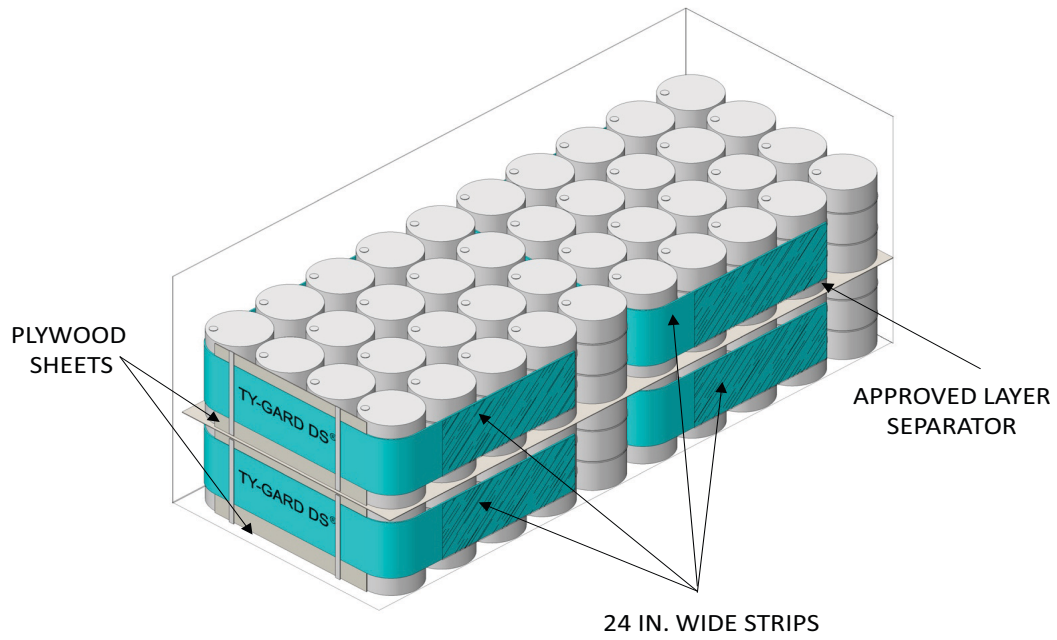


Figure 6.2.4 - 1

Method 6.2.4 - 80-Drum loads secured by Ty-Gard 2000® or DS® barriers in 20-ft ISO containers

Method 6.2.5 - Close-Head Steel Drums on Rubber Mats with Strapping
(Former Method E-7)

- This method is for close-head steel drums loaded in a 3-4-3 pattern.
 - Plan the load to equalize the weight on each side of the container/trailer. A balanced load is required for the stability and success of this loading method.
1. For the current listing of AAR-verified rubber friction mats and information on the verification process refer to the *Product Performance Profile for Rubber Friction Mats - Product Verification List* and AAR General Information Bulletin No. 10, *Product Performance Profile for Rubber Friction Mats*. Both documents can be referenced at <https://aar.com/standards/damage-publications.php>. See [Section 4.4](#).
 2. AAR-verified rubber friction mats (masticated) applied for this loading method are to be 6 mm (0.250 in.) thick.
 3. Rubber mat is a minimum of 61 1/2 in. wide and a minimum of 18 in. longer than the load. Adjust the length to suit each load. Lay the rubber matting down the center of the container/trailer floor.

NOTE: Do not use rubber mats that are torn, contaminated or otherwise damaged in any way. It is not recommended to reuse rubber mats when applied to prevent lengthwise movement in the container or trailer.

4. Load the first three stacks into the trailer in a 3-4-3 pattern.
5. Unitize the loaded drums using one AAR-approved strap, either Type 1A Grade 4 nonmetallic strap or 1 1/4 in. × 0.029 in. steel strap. Secure straps with the correct buckle or seal in accordance with manufacturer's instructions. Tension and seal the straps using proper tensioning and sealing tools. Use strap hangers or tape on the rolls to maintain proper strap alignment and to prevent straps from slipping out of position. See [Section 4.2](#) for further strapping information
6. Continue loading drums in the 3-4-3 pattern until the end of the load.
7. Unitize the last three stacks using one AAR-approved strap, either Type 1A Grade 4 nonmetallic strap or 1 1/4 in. × 0.029 in. steel strap. Secure straps with the correct buckle or seal in accordance with manufacturer's instructions. Tension and seal the straps using proper tensioning and sealing tools. Use strap hangers or tape on the rolls to maintain proper strap alignment and to prevent straps from slipping out of position. See [Section 4.2](#) for further strapping information.
8. Leave a minimum of 3 ft void space between the drums and the container/trailer doors.

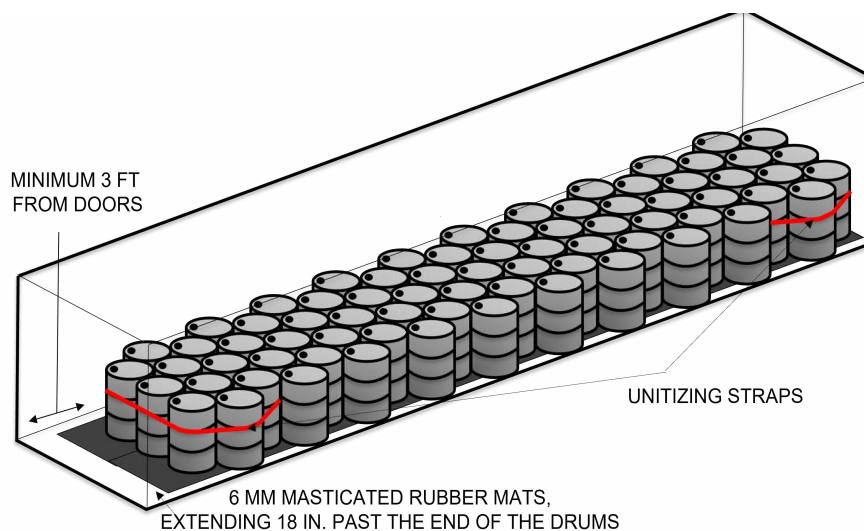


Figure 6.2.5 - 1

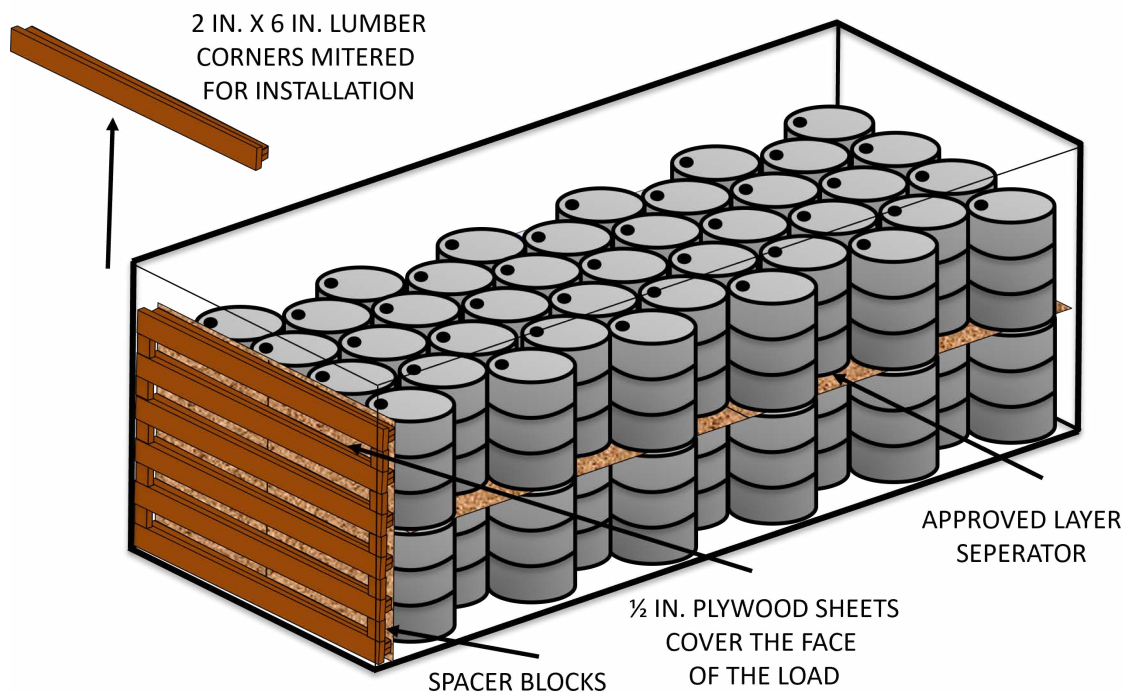
Method 6.2.5 - Close-head steel drums on rubber mats with strapping

Method 6.2.6 - Drum Load Secured with “T” Braces in 20-ft. Containers

(Former Method G-2)



- This method is for closed-head steel drums loaded in two layers in 20-ft. containers.
 - Plan the load to equalize the weight on each side of the container/trailer. A balanced load is required for the stability and success of this loading method.
1. Load 39 drums in a 4-3-4 pattern in each layer. The load ends with a four-wide stack of drums at the doorway.
 2. Apply approved layer separators between the first and second layers. See [Section 3.3.5](#) and [Table 3.2](#).
 3. Place a 1/2 in. thick piece of plywood, upright at the door of the container to cover the door opening. The plywood protects the drums from the “T” brace units used to prevent movement of the drums in the container.
 4. Construct the “T” braces of minimum 2 in. × 6 in. lumber with a length equal to the full width of the container interior plus an additional 2 in. for insertion into the doorway bracing slots. Nail two additional lumber pieces perpendicular to these boards as shown in the detail of [Figure 6.2.6 - 1](#). See [Section 4.1](#).
 5. Apply six of the “T” brace units to brace the load, with three units applied per layer of drums. Use spacer blocks between each of the “T” brace units to evenly position them between each rolling hoops on the drums.
 6. Miter the ends of the “T” brace units to facilitate installation into the doorway bracing slots, as shown in the detail of the figure.

**Figure 6.2.6 - 1****Method 6.2.6 - Drum load secured with “T” braces in 20-ft containers**

Method 6.2.7 - Fifty-Five Gallon Drums Secured with Wood Blocking and Bracing (Former Methods G-3 and G-4)



- This method is for 55-gallon closed-head steel drums loaded in two layers in 20 ft containers.
 - Or, 55-gallon open-head or closed-head steel drums or 55-gallon closed-head polyethylene drums, loaded in a single layer in 20-, 40-, or 53-ft. containers.
 - Containers or trailers must be equipped with bracing slots adjacent to rear corner posts or have doorposts that extend inward a minimum of 2 1/2 in.
 - Plan the load to equalize the weight on each side of the container/trailer. A balanced load is required for the stability and success of this loading method.
1. Prior to loading, inspect containers to ensure there are no damaged corner posts. Any protruding nails or screws in the floors must be removed, redriven, and/or tightened.
 2. Follow [Figure 6.2.7 - 1](#) for double-layer loading and [Figure 6.2.7 - 2](#) for single-layer loading.
 3. Load drums in a tight 4-3-4 pattern. The last stack loaded in the container is either four or eight drums (double-layer).
 4. For double-layer loading apply approved layer separators (Item A) between the first and second layers. See [Section 3.3.5](#) and [Table 3.2](#).
 5. Apply vertical dividers (Item B) during loading, 1/2 in. plywood x load height x container width (minus 1 in.). See [Section 3.3.4](#).
 - For double-layer loads in a 20 ft container apply a divider half-way in the load pattern.
 - For single-layer loads with open-head drums split the drums into five section and for closed-head drums, split the drums into three sections. Apply a vertical divider between each section.
 6. Construct and apply two bulkheads (Item C) at the end of the load. Construct either a single-layer or double-layer bulkhead. See [Section 4.1](#).
 - The width of the bulkhead is the width of the container minus 1/2 in.
 - The height of the bulkhead is the height of the load. For open head drums reduce the height by 1 1/2 in.
 - The bulkhead is constructed of minimum 2 in. x 6 in. lumber - both horizontal boards and vertical uprights.
 - The horizontal boards are two lumber boards laminated together. Nail the horizontal board to the vertical upright and nail the second board to the first board. The middle horizontal boards for the double-layer bulkhead will be 3 1/2 in. shorter to fit into the vertical uprights. For double-layer bulkheads center the middle horizontal board based on drum height.
 - The height of the vertical upright will be 5 1/2 in. shorter than the drum height to fit between the horizontal boards. For single-layer bulkheads center the middle vertical upright on the horizontal boards.
 - Nail the bulkhead to the container/trailer floor for single layer bulkheads.
 7. Lumber struts or fillers should be used between the bulkheads to ensure they are in the correct position for the application of the retainer pieces into the bracing slots.
 8. Apply either struts or horizontal and vertical fillers (Items D and E) between the two bulkheads.
 - Construct lumber struts (Item D) - minimum 2 in. x 6 in. x needed length, laminated lumber boards, as shown in [Figure 6.2.7 - 2](#). Use a longer lumber board (5 1/2 in. longer on each end) as the top piece and laminate to shorter lumber boards to create a wedge fit between the bulkheads. Apply a strut at each vertical upright and toenail to the bulkheads on each end. Apply horizontal fillers (Item E) on the floor between the two bulkheads. Apply fillers at each vertical upright and nail fillers to the bulkheads.



- Fillers (Item E) are lumber pieces 6 in. x 30 in. x needed thickness. Nail fillers to bulkheads directly or to additional nailing pieces. Horizontal fillers should be applied centered on the width of the bulkhead and applied at the bottom, middle, and top horizontal boards of the bulkheads. The vertical fillers should be applied centered on the height of the vertical uprights and applied at both the left and right vertical upright. Nailing pieces (Item F) are 2 in. x 6 in. x 30 in. lumber boards and are attached to the top and middle horizontal boards (centered) of the bulkheads to assist in securing the horizontal fillers.
- Retainer pieces (Item G) are 2 in. x 6 in. x needed length lumber boards. Pieces will need to have the correct length to fit into the brace slots adjacent to the corner posts or be the width of the container to fit behind the container doorposts. Apply two retainer pieces at the top and one retainer piece at the bottom of the bulkhead. Apply two retainer pieces at the middle of the double-layer bulkhead. Nail the retainer pieces to both the vertical and horizontal boards of the bulkhead.

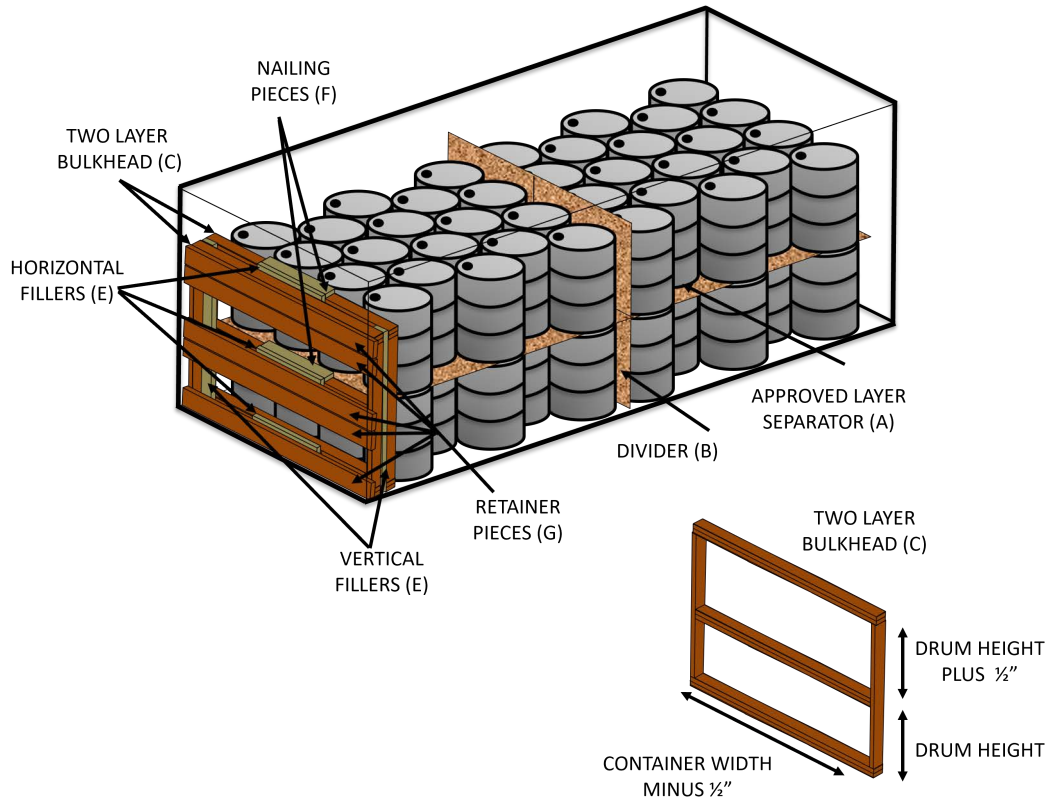


Figure 6.2.7 - 1
Method 6.2.7 - Double-layer load; 20-ft container
Fifty-five gallon drums secured with wood blocking and bracing

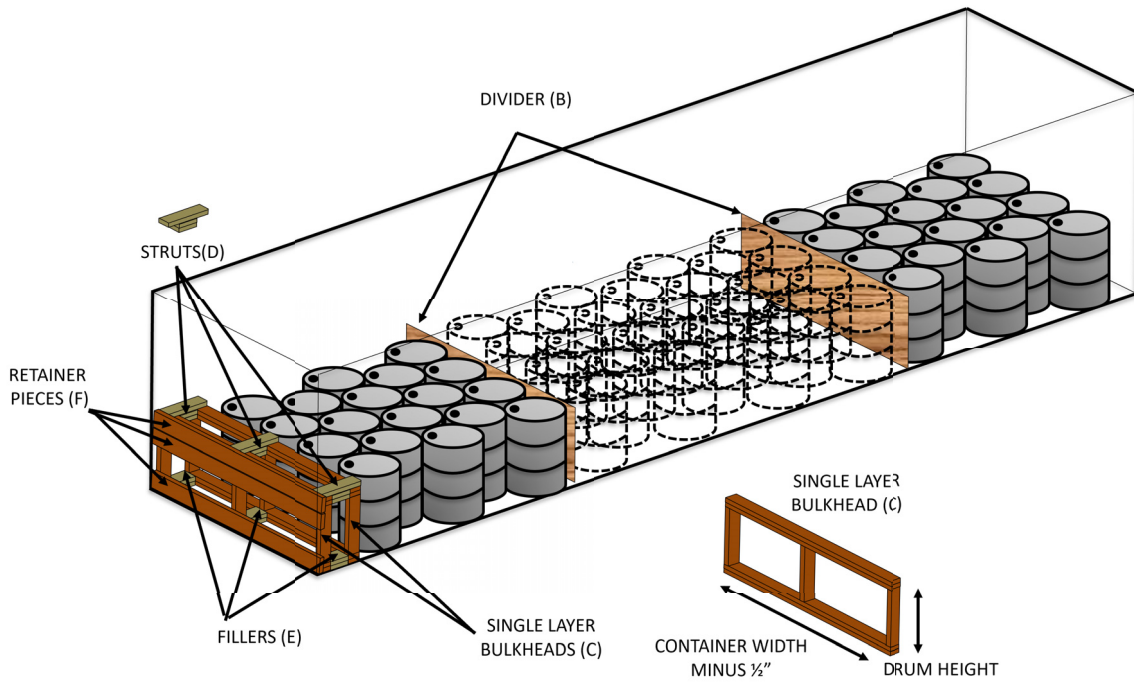


Figure 6.2.7 - 2

Method 6.2.7 - Single-layer load; 40-ft container
Fifty-five gallon drums secured with wood blocking and bracing

Method 6.2.8 - Tight-Head Steel, 55-Gallon Drums Secured with Cordstrap® Composite Strapping (CC) 105 in 20-ft. ISO Containers - Approved for Hazardous Commodities (Former Method I-1)



- This method is for 80 tight-head steel drums loaded in a 20-ft. ISO container.
 - The load limit for this system must not exceed 40,000 lbs.
 - During testing, horizontal straps were tensioned to approximately 1,438 lbs. with a pneumatic tensioner having a 90 psi air supply. If using a CT-32PN pneumatic tensioner, it should be operated at no more than 100 psi, at which the tension is maximized at approximately 1,700 lbs.
 - Plan the load to equalize the weight on each side of the container. A balanced load is required for the stability and success of this loading method.
1. Select containers that are equipped with suitable D-rings at locations consistent with the load plan. It is the shipper's responsibility to inspect and ensure that the D-rings are in sound condition and that the load does not exceed the capacity of the D-rings for the container being loaded. See [Section 4.2.5](#).
 2. The load is secured with the application of AAR-approved Type 1A Grade 4, 1 1/4-in. wide Cordstrap composite (nonmetallic) strapping (CC) 105. Strapping is secured with CB10 metal buckles. Follow manufacturer's instruction for buckle and strapping application and tensioning. See [Section 4.2.3](#).
 3. Install looped vertical straps through the container's D-rings at the floor and roof. Start at the front of the load or nose of the container and select D-rings at equal distance on each sidewall of the container. Always make sure that the strap is flat to the wall of the container with no twists. Install buckles above load height.
 - a. Locate the first set approximately 6 ft from the front of the load.
 - b. Locate the second set approximately 11 ft from the front of the load.
 - c. Locate the third set approximately 14 ft from the front of the load.
 4. Tension all straps. A pneumatic or battery tensioner may be used to tension the vertical straps while recognizing the force limitations of the D-rings. A hand-held tensioner also may be used.
 5. Install a looped, diagonal strap from the bottom D-ring of the first vertical set to the buckle of the third vertical set. Do this to both sides. Buckle and tension straps per manufacturer's instructions.
 6. Prep horizontal straps on the vertical upright straps.
 - a. On the first set of vertical upright straps, loop a horizontal strap approximately 10 ft long around the vertical strap and tape/secure the strap approximately 1 1/2 ft above the container floor. Loop and secure a second 10 ft strap approximately 4 1/2 ft above the container floor. Temporarily hold ends of the straps to the sidewalls of the container with tape or magnets. Repeat on the opposite vertical upright on the opposite sidewall.
 - b. On the second set of vertical upright straps, loop a horizontal strap approximately 13 ft long around the vertical strap and tape/secure the strap approximately 1 1/2 ft above the container floor. Loop and secure a second 13 ft strap approximately 4 1/2 ft above the container floor. Temporarily hold ends of the straps to the sidewalls of the container with tape or magnets. Repeat on the opposite vertical upright on the opposite sidewall.
 - c. On the third set of vertical upright straps - loop a horizontal strap approximately 10 ft long around the vertical strap and tape/secure the strap approximately 1 1/2 ft above the container floor. Loop and secure a second 10 ft strap approximately 4 1/2 ft above the container floor. Temporarily hold ends of the straps to the corners of the container with tape or magnets. Repeat on the opposite vertical upright on the opposite sidewall.
 7. Proceed to load the bottom and top layers of the first six stacks of drums in a 4-4-3-4-3-4 pattern. Apply approved layer separators between the first and second layers. See [Section 3.3.5](#) and [Table 3.2](#).



8. After the first six stacks of drums are loaded, connect the ends of the horizontal straps from each opposite sidewall, installed on the first set of vertical straps. Spread the horizontal straps on each drum layer, toward the rolling hoops (the strongest part of the drum). Connect each matching straps with the appropriate buckle and fully tension the straps using a pneumatic or battery tension. Follow manufacturer's instruction for buckle application and strapping tensioning. Use strap hangers or tape to maintain strap positioning on the drums.
9. Proceed to load the remaining drums in 4-3-4-3-4 pattern for the bottom and top layers. Load only the middle two rows for the last stack. Apply approved layer separators between the first and second layers. See [Section 3.3.5](#) and [Table 3.2](#).
10. Loop a strap approximately 10 ft long through the bottom rear D-rings (on both sides of the container) and position it for securing a 2 in. x 4 in. x 74 in. long lumber board with ends cut at 45° angles at the rear of the container.
11. Connect the ends of the horizontal straps from each opposite sidewall, installed on the third set of vertical straps. Spread the horizontal straps on each drum layer, toward the rolling hoops (the strongest part of the drum). Connect each matching straps with the appropriate buckle and fully tension the straps using a pneumatic or battery tension. Follow manufacturer's instruction for buckle application and strapping tensioning. Use strap hangers or tape to maintain strap positioning on the drums.
12. Load the remaining four drums at each corner of the container. Connect the ends of the horizontal straps from each opposite sidewall, installed on the second set of vertical straps. Spread the horizontal straps on each drum layer, toward the rolling hoops (the strongest part of the drum). Connect each matching straps with the appropriate buckle and fully tension the straps using a pneumatic or battery tension. Follow manufacturer's instruction for buckle application and strapping tensioning. Use strap hangers or tape to maintain strap positioning on the drums.
13. Place the 2 in. x 4 in. x 74 in. lumber board on the floor on the 2 in. edge. Connect the ends of the horizontal straps from each opposite sidewall, installed to the bottom D-rings. Connect each matching straps with the appropriate buckle and fully tension the straps using a pneumatic or battery tension. Follow manufacturer's instruction for buckle application and strapping tensioning.

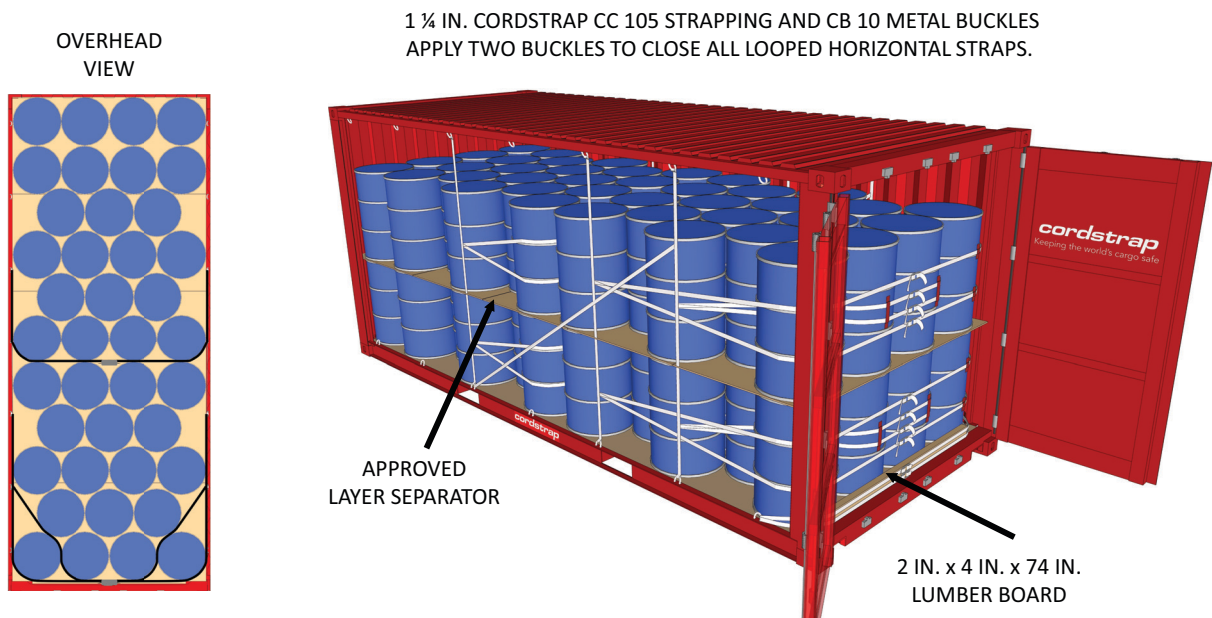


Figure 6.2.8 - 1

Method 6.2.8 - Tight-head steel, 55-gallon drums secured with Cordstrap® composite strapping (CC) 105 in 20-ft ISO containers

Method 6.2.9 - Tight-Head Steel or Plastic, 55-Gallon Drums Secured with Cordstrap® Composite Strapping (CC) 105 in 20-ft. ISO Containers - Approved for Nonhazardous Commodities
(Former Method I-1)

- This method is for 76 to 80 tight-head steel or plastic drums loaded in a 20-ft. ISO container.
 - The load limit for this system must not exceed 40,000 lbs.
 - During testing, horizontal straps were tensioned to approximately 1,438 lbs. with a pneumatic tensioner having a 90 psi air supply. If using a CT-32PN pneumatic tensioner, it should be operated at no more than 100 psi, at which the tension is maximized at approximately 1,700 lbs.
 - Plan the load to equalize the weight on each side of the container. A balanced load is required for the stability and success of this loading method.
1. Select containers that are equipped with suitable D-rings at locations consistent with the load plan. It is the shipper's responsibility to inspect and ensure that the D-rings are in sound condition and that the load does not exceed the capacity of the D-rings for the container being loaded. See [Section 4.2.5](#).
 2. The load is secured with the application of AAR-approved Type 1A Grade 4, 1 1/4 in. wide Cordstrap composite (nonmetallic) strapping (CC) 105. Strapping is secured with CB10 metal buckles. Follow manufacturer's instruction for buckle and strapping application and tensioning. See [Section 4.2.3](#).
 3. Install looped vertical straps through the container's D-rings at the floor and roof. Start at the front of the load or nose of the container and select D-rings at equal distance on each sidewall of the container. Always make sure that the strap is flat to the wall of the container with no twists. Install buckles above load height.
 4. The location of vertical upright strapping can be adjusted for the respective load pattern based on number of drums loaded.
 - a. Locate the first set approximately 6 ft from the front of the load.
 - b. Locate the second set approximately 11 ft from the front of the load.
 - c. Locate the third set approximately 14 ft from the front of the load.
 5. Tension all straps. A pneumatic or battery tensioner may be used to tension the vertical straps while recognizing the force limitations of the D-rings. A hand-held tensioner also may be used.
 6. Install a looped, diagonal strap from the bottom D-ring of the first vertical set to the buckle of the third vertical set. Do this to both sides. Buckle and tension straps per manufacturer's instructions.
 7. Prep horizontal straps on the vertical upright straps. The length of horizontal strapping can be adjusted for the respective load pattern based on number of drums loaded.
 - a. On the first set of vertical upright straps, loop a horizontal strap approximately 10 ft long around the vertical strap and tape/secure the strap approximately 1 1/2 ft above the container floor. Loop and secure a second 10 ft strap approximately 4 1/2 ft above the container floor. Temporarily hold ends of the straps to the sidewalls of the container with tape or magnets. Repeat on the opposite vertical upright on the opposite sidewall.
 - b. On the second set of vertical upright straps, loop a horizontal strap approximately 13 ft long around the vertical strap and tape/secure the strap approximately 1 1/2 ft above the container floor. Loop and secure a second 13 ft strap approximately 4 1/2 ft above the container floor. Temporarily hold ends of the straps to the sidewalls of the container with tape or magnets. Repeat on the opposite vertical upright on the opposite sidewall.
 - c. On the third set of vertical upright straps, loop a horizontal strap approximately 10 ft long around the vertical strap and tape/secure the strap approximately 1 1/2 ft above the container floor. Loop and secure a second 10 ft strap approximately 4 1/2 ft above the container floor. Temporarily hold ends of the straps to the corners of the container with tape or magnets. Repeat on the opposite vertical upright on the opposite sidewall.

8. Apply approved layer separators between the first and second layers. See [Section 3.3.5](#) and [Table 3.2](#).
9. For 80 drums, load in 11 stacks using a 4-4-3-4-3-4-4-3-4-3-4 pattern from the nose of the container to the rear of the container. See [Figure 6.2.9 - 1](#). Load the first section with six stacks.
10. For 78 drums, load in 11 stacks using a 4-3-4-3-4-4-3-4-3-4-3 pattern from the nose of the container to the rear of the container. See [Figure 6.2.9 - 2](#). Load the first section with five stacks.
11. For 76 drums, load in 10 stacks using a 4-4-4-3-4-4-4-4-3-4 pattern from the nose of the container to the rear of the container. See [Figure 6.2.9 - 3](#). Load the first section with five stacks.
12. After the first section of drum stacks are loaded, connect the ends of the horizontal straps from each opposite sidewall, installed on the first set of vertical straps. Spread the horizontal straps on each drum layer, toward the rolling hoops (the strongest part of the drum). Connect each matching straps with the appropriate buckle and fully tension the straps using a pneumatic or battery tension. Follow manufacturer's instruction for buckle application and strapping tensioning. Use strap hangers or tape to maintain strap positioning on the drums.
13. Proceed to load the remaining drums in the second section. Apply approved layer separators between the first and second layers. See [Section 3.3.5](#) and [Table 3.2](#).
 - a. For the 76-drum and 80-drum load patterns, load only the middle two rows for the last stack.
 - b. For the 78-drum load patterns, load only the middle row (single drum stack) for the last stack.
14. Loop a strap approximately 10 ft long through the bottom rear D-rings (on both sides of the container) and position it for securing a 2 in. x 4 in. x 74 in. long lumber board with ends cut at 45° angles at the rear of the container.
15. Connect the ends of the horizontal straps from each opposite sidewall, installed on the third set of vertical straps. Spread the horizontal straps on each drum layer, toward the rolling hoops (the strongest part of the drum). Connect each matching straps with the appropriate buckle and fully tension the straps using a pneumatic or battery tension. Follow manufacturer's instruction for buckle application and strapping tensioning. Use strap hangers or tape to maintain strap positioning on the drums.
16. Load the remaining four drums at each corner of the container. Install drum protection to prevent strap damage to the corner drums if shipping plastic drums.
17. Connect the ends of the horizontal straps from each opposite sidewall, installed on the second set of vertical straps. Spread the horizontal straps on each drum layer, toward the rolling hoops (the strongest part of the drum). Connect each matching straps with the appropriate buckle and fully tension the straps using a pneumatic or battery tension. Follow manufacturer's instruction for buckle application and strapping tensioning. Use strap hangers or tape to maintain strap positioning on the drums.
18. Place the 2 in. x 4 in. x 74 in. lumber board on the floor on the 2 in. edge. Connect the ends of the horizontal straps from each opposite sidewall, installed to the bottom D-rings. Connect each matching straps with the appropriate buckle and fully tension the straps using a pneumatic or battery tension. Follow manufacturer's instruction for buckle application and strapping tensioning.

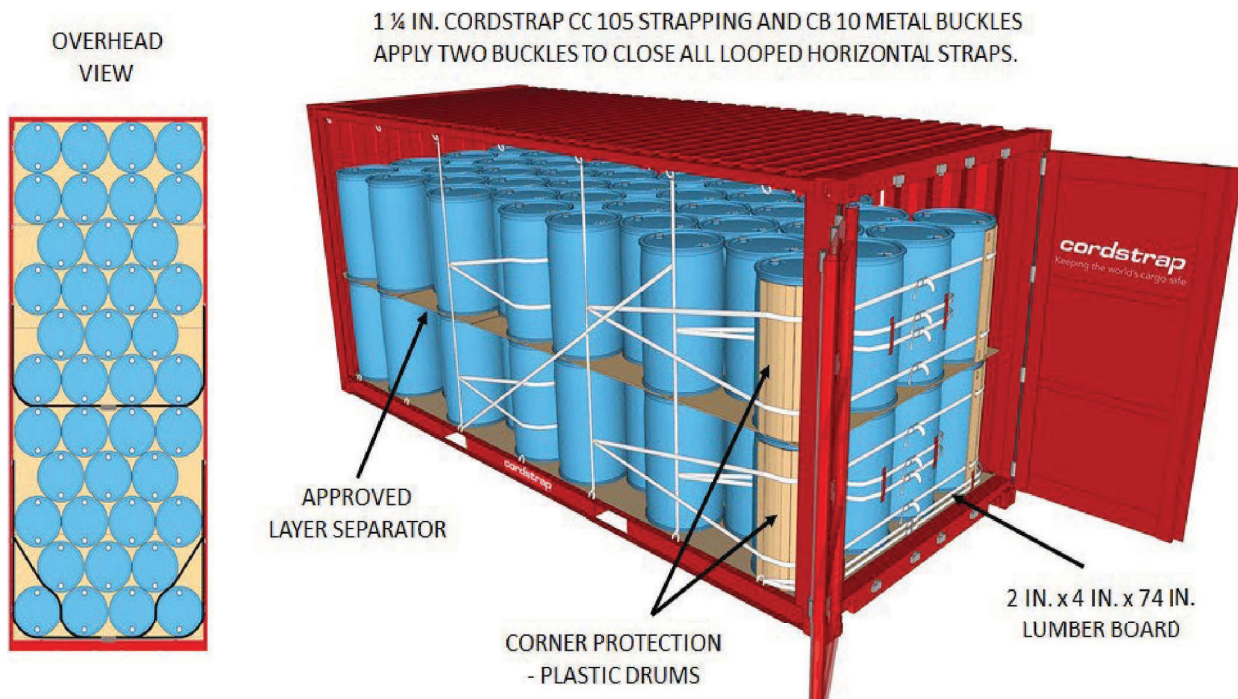


Figure 6.2.9 - 1

Method 6.2.9 - 80-Drum load, tight-head steel or plastic, 55-gallon drums secured with Cordstrap® composite strapping (CC) 105 in 20-ft ISO containers

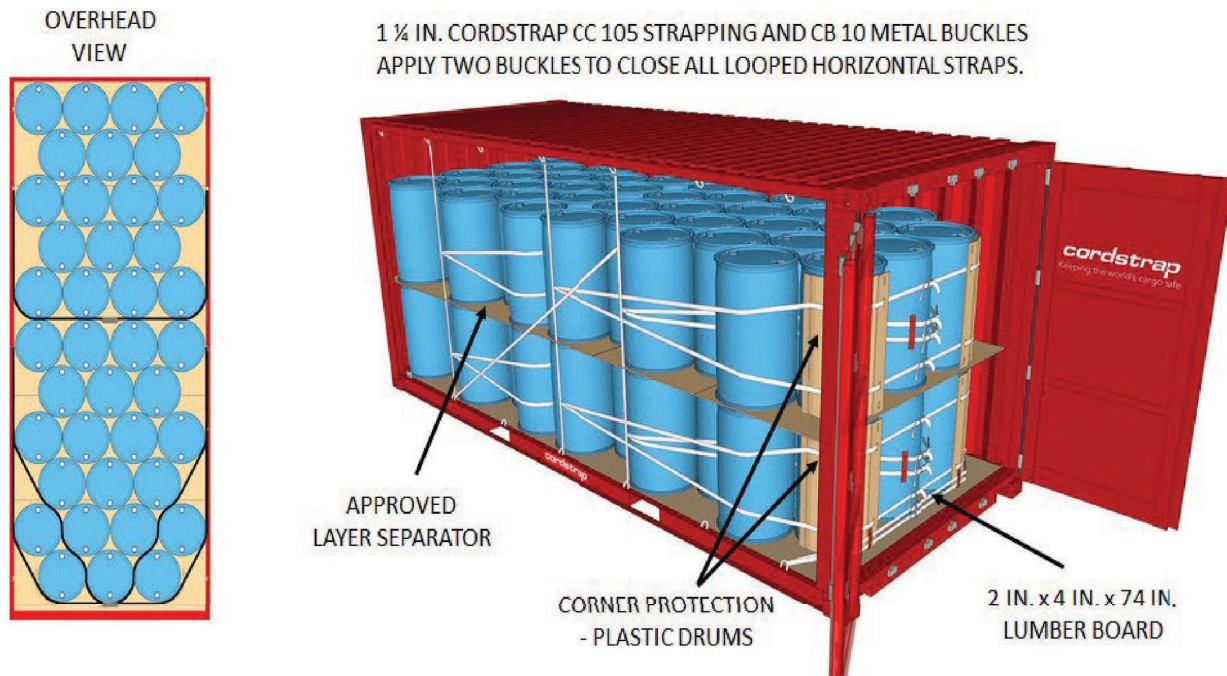


Figure 6.2.9 - 2

Method 6.2.9 - 78-Drum load, tight-head steel or plastic, 55-gallon drums secured with Cordstrap® composite strapping (CC) 105 in 20-ft ISO containers

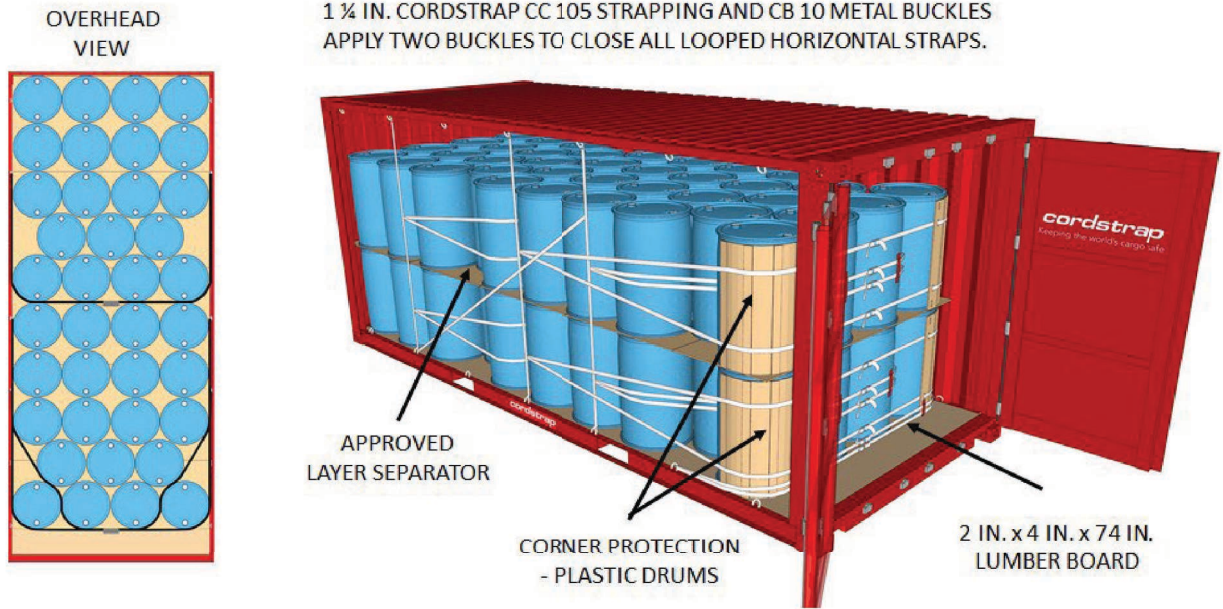


Figure 6.2.9 - 3

Method 6.2.9 - 76-Drum load, tight-head steel or plastic, 55-gallon drums secured with Cordstrap® composite strapping (CC) 105 in 20-ft ISO containers

Method 6.2.10 Tight-Head Steel or Plastic 55-Gallon Drums Secured with Carolina Strapping and Buckles Company Woven Strapping (CS) 2040 in 20-ft. ISO Containers - Approved for Hazardous Commodities

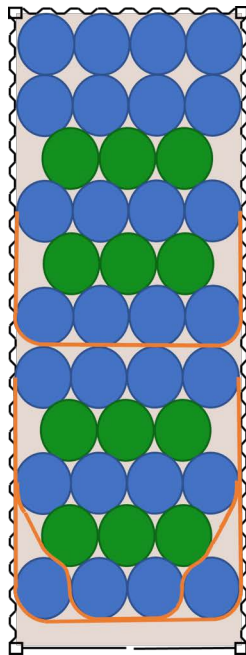
(Former Methods I-2 and I-3)



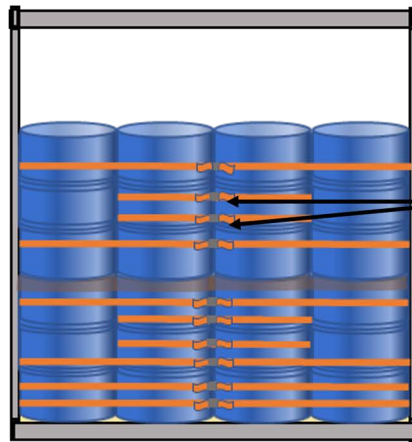
- This method is for 80 tight-head steel drums or 78 plastic drums loaded in a 20-ft. ISO container.
 - The load limit for this system must not exceed 40,000 lbs.
 - Plan the load to equalize the weight on each side of the container. A balanced load is required for the stability and success of this loading method.
1. Select containers that are equipped with suitable D-rings at locations consistent with the load plan. It is the shipper's responsibility to inspect and ensure that the D-rings are in sound condition and that the load does not exceed the capacity of the D-rings for the container being loaded. See [Section 4.2.5](#).
 2. The load is secured with the application of AAR-approved Type 1A Grade 4, 1 1/4 in. wide Carolina Strapping and Buckle woven strapping (CS) 2040. Strapping is secured with CS 3035 metal buckles. Follow manufacturer's instruction for buckle and strapping application and tensioning. During testing, horizontal straps were tensioned with a manual handheld tensioner (CS 4060). See [Section 4.2.3](#).
 3. Install looped vertical straps through the container's D-rings at the floor and roof. Start at the front of the load or nose of the container and select D-rings at equal distance on each sidewall of the container. Always make sure that the strap is flat to the wall of the container with no twists. Install buckles above load height.
 4. The location of vertical upright strapping can be adjusted for the respective load pattern based on number of drums loaded.
 - a. Locate the first set approximately 6 ft from the front of the load.
 - b. Locate the second set approximately 11 ft from the front of the load.
 - c. Locate the third set approximately 14 ft from the front of the load.
 5. Tension all straps. A pneumatic or battery tensioner may be used to tension the vertical straps while recognizing the force limitations of the D-rings. A hand-held tensioner also may be used.
 6. Install a looped, diagonal strap from the bottom D-ring of the first vertical set to the buckle of the third vertical set. Do this to both sides. Buckle and tension straps per manufacturer's instructions.
 7. Prep horizontal straps on the vertical upright straps. The length of horizontal strapping can be adjusted for the respective load pattern based on number of drums loaded.
 - a. On the first set of vertical upright straps, loop a horizontal strap approximately 10 ft long around the vertical strap and tape/secure the strap approximately 1 1/2 ft above the container floor. Loop and secure a second 10 ft strap approximately 4 1/2 ft above the container floor. Temporarily hold ends of the straps to the sidewalls of the container with tape or magnets. Repeat on the opposite vertical upright on the opposite sidewall.
 - b. On the second set of vertical upright straps, loop a horizontal strap approximately 13 ft long around the vertical strap and tape/secure the strap approximately 1 1/2 ft above the container floor. Loop and secure a second 13 ft strap approximately 4 1/2 ft above the container floor. Temporarily hold ends of the straps to the sidewalls of the container with tape or magnets. Repeat on the opposite vertical upright on the opposite sidewall.
 - c. On the third set of vertical upright straps, loop a horizontal strap approximately 10 ft long around the vertical strap and tape/secure the strap approximately 1 1/2 ft above the container floor. Loop and secure a second 10 ft strap approximately 4 1/2 ft above the container floor. Temporarily hold ends of the straps to the corners of the container with tape or magnets. Repeat on the opposite vertical upright on the opposite sidewall.

8. Apply approved layer separators between the first and second layers. See [Section 3.3.5](#) and [Table 3.2](#).
9. For 80 drums, load in 11 stacks using a 4-4-3-4-3-4-4-3-4-3-4 pattern from the nose of the container to the rear of the container. See [Figure 6.2.10 - 1](#). Load the first section with six stacks.
10. For 78 drums, load in 11 stacks using a 4-3-4-3-4-3-4-3-4-3-4 pattern from the nose of the container to the rear of the container. See [Figure 6.2.10 - 2](#). Load the first section with six stacks.
11. After the first section of drum stacks are loaded, connect the ends of the horizontal straps from each opposite sidewall, installed on the first set of vertical straps. Spread the horizontal straps on each drum layer, toward the rolling hoops (the strongest part of the drum). Connect each matching straps with the appropriate buckle and fully tension the straps using a tensioner. Follow manufacturer's instruction for buckle application and strapping tensioning. Use strap hangers or tape to maintain strap positioning on the drums.
12. Proceed to load the remaining drums in the second section. Apply approved layer separators between the first and second layers. See [Section 3.3.5](#) and [Table 3.2](#).
13. Load only the middle two rows for the last stack.
14. Loop a strap approximately 10 ft long though the bottom rear D-rings (on both sides of the container) and position it for securing the door-ward lower face of the last stack.
15. Connect the ends of the horizontal straps from each opposite sidewall, installed on the third set of vertical straps. Spread the horizontal straps on each drum layer, toward the rolling hoops (the strongest part of the drum). Connect each matching straps with the appropriate buckle and fully tension the straps using a tensioner. Follow manufacturer's instruction for buckle application and strapping tensioning. Use strap hangers or tape to maintain strap positioning on the drums.
16. Load the remaining four drums at each corner of the container.
17. Connect the ends of the horizontal straps from each opposite sidewall, installed on the second set of vertical straps. Spread the horizontal straps on each drum layer, toward the rolling hoops (the strongest part of the drum). Connect each matching straps with the appropriate buckle and fully tension the straps using a tensioner. Follow manufacturer's instruction for buckle application and strapping tensioning. Use strap hangers or tape to maintain strap positioning on the drums.
18. Connect the ends of the horizontal straps from each opposite sidewall, installed to the bottom D-rings. For 78-drum-pattern loading, place a 2 in. x 4 in. x 74 in. lumber board (with ends cut at 45° angle) on the floor on the 2 in. edge. Connect each matching straps with the appropriate buckle and fully tension the straps using a tensioner. Follow manufacturer's instruction for buckle application and strapping tensioning.



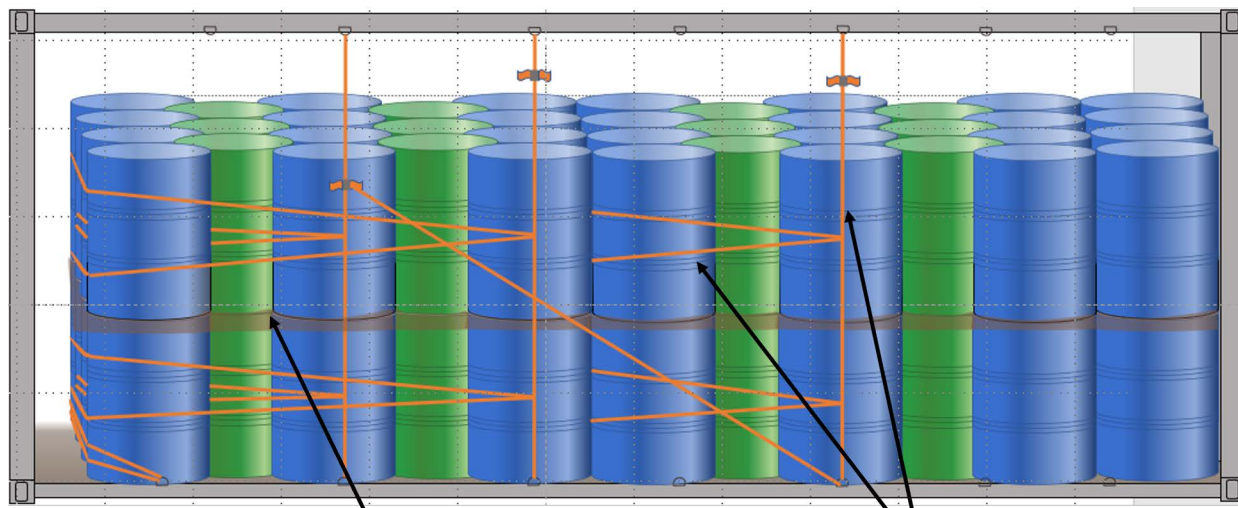


OVERHEAD VIEW



DOOR VIEW

ALL LOOPED HORIZONTAL STRAPS REQUIRE TWO BUCKLES TO CLOSE THE STRAPPING METHOD

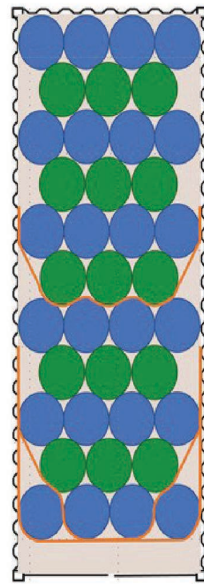


APPROVED LAYER SEPERATOR

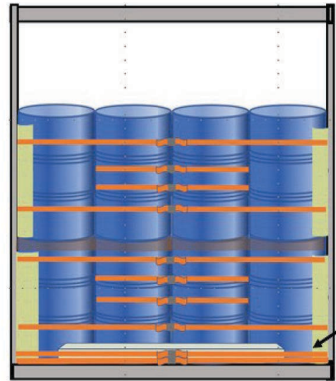
AAR APPROVED TYPE 1A GRADE 4,
1 1/4 IN. CAROLINA STRAPPING (CS 2040)
JOINED WITH CS 3035 BUCKLES

Figure 6.2.10 - 1

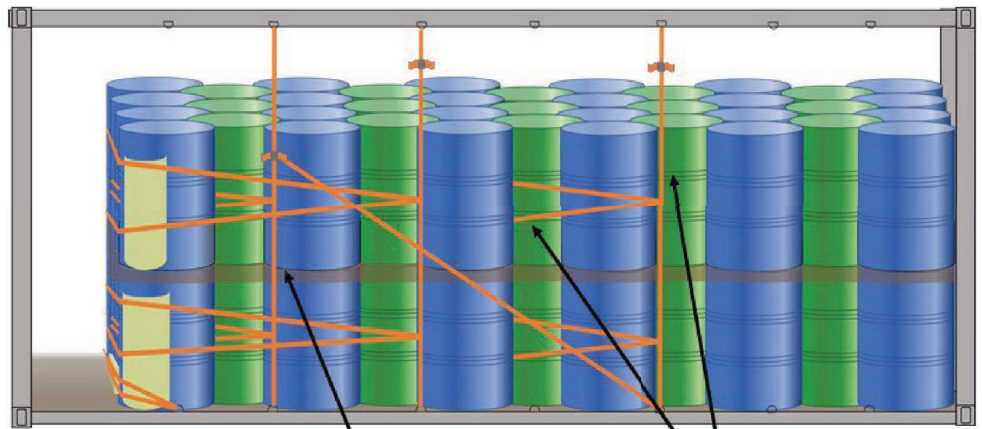
**Method 6.2.10 - 80-Tight-head steel drum load;
Tight-head steel or plastic, 55-gallon drums secured with Carolina Strapping
and Buckles Company woven strapping (CS) 2040 in 20-ft ISO containers**



OVERHEAD VIEW



DOOR VIEW



APPROVED LAYER SEPARATOR

AAR APPROVED TYPE 1A GRADE 4, 1 1/4 IN. CAROLINA STRAPPING (CS 2040) JOINED WITH CS 3035 BUCKLES

Figure 6.2.10 - 2

Method 6.2.10 - 78-Tight-head plastic drum load; Tight-head steel or plastic, 55-gallon drums secured with Carolina Strapping and Buckles Company woven strapping (CS) 2040 in 20-ft ISO containers

Method 6.2.11 - Steel Drums, 55-Gallon, On Pallets Secured with Cordstrap® Barriers in 40-ft. ISO Containers - Approved for Nonhazardous Commodities
(Former Method I-6; Cancels GIS 755)

- This method is for 80, closed-head steel drums loaded in a 40 ft ISO container.
 - Plan the load to equalize the weight on each side of the container. A balanced load is required for the stability and success of this loading method.
1. This load may contain up to 80 closed-head, steel drums loaded in a 4-4 pattern on pallets. This method is not suitable for open head, fiber or plastic drums.
 2. Pallets are loaded in a full single layer and secured in two sections of ten pallets (40 drums) each. This method is not suitable for multi-layer or partial layer loads.
 3. Drums are secured to each pallet by a minimum 90-gage stretch wrap with four wraps on top, three wraps in the middle, and four wraps at the bottom with stretch-rope to engage the pallets. See [Figure 6.2.11 - 1](#). See [Sections 3.2.1, 3.2.3, and 3.2.4](#) for further information.
 4. Alternately, drums may be secured to the pallets by strapping applied as shown in [Figure 6.2.11 - 1](#). Apply two vertical encircling straps in each pallet direction for a total of four straps. Encircling straps encompass both the drums and the pallet. Add one additional unitizing strap to encircle the four drums horizontally at their midsection. Use either a minimum of AAR-approved Type IV $\frac{3}{4}$ in. x 0.040 in. PET strap or $\frac{5}{8}$ in. x 0.020 in. steel strap. Use a wooden top cap or suitable corner protectors to provide a flat bearing surface over the top corners of the drums. See [Section 4.2](#).
 5. Install CornerLash® strap anchors, two per container corner, at approximately the midpoint of the drum height. See [Figure 6.2.11 - 2](#). Follow manufacturers installation instructions.
 6. Thread CordLash 200LE AAR-approved Type 1A, Grade 7 strap in matching height sets of CornerLash anchors in opposite corners. The strap should be long enough to encompass the first set of drum pallets. See [Figure 6.2.11 - 3](#). Secure the straps to the container walls using magnets or tape. See [Section 4.2](#).
 7. Thread CordLash 200LE AAR-approved Type 1A, Grade 7 strap in matching height sets of CornerLash anchors in opposite corners. The strap should be long enough to encompass both sets of drum pallets. See [Figure 6.2.11 - 3](#). Secure the straps to the container doors using magnets or tape.
 8. Apply a minimum $\frac{1}{2}$ in. thick plywood sheet between the drums and the front container wall.
 9. Load the first set of drum pallets. Use triple wall corrugated fiberboard as buffer sheets between the drums and straps.
 10. Bring the midpoint strap ends around the last pallets in the first section. The straps are to be horizontally aligned with the upper and lower drum rolling hoops. Join the straps using Dynablock® ladder type buckles and tension with a Cordstrap CT-50PN pneumatic tensioner according to manufacturers' instructions. Use strap hangers or tape to maintain strap position.
 11. Load the second set of drum pallets. Use triple wall corrugated fiberboard as buffer sheets between the drums and straps. Apply a minimum $\frac{1}{2}$ in. thick plywood sheet at the end of the load.
 12. Bring the full length strap ends around the last pallets in the second section. The straps are to be horizontally aligned with the upper and lower drum rolling hoops. Join the straps using Dynablock ladder type buckles and tension with a Cordstrap CT-50PN pneumatic tensioner according to manufacturers' instructions. Use strap hangers or tape to maintain strap position.



Figure 6.2.11 - 1
Method 6.2.11 - Pallet unitization



Figure 6.2.11 - 2
Method 6.2.11 - CornerLash® anchors installed

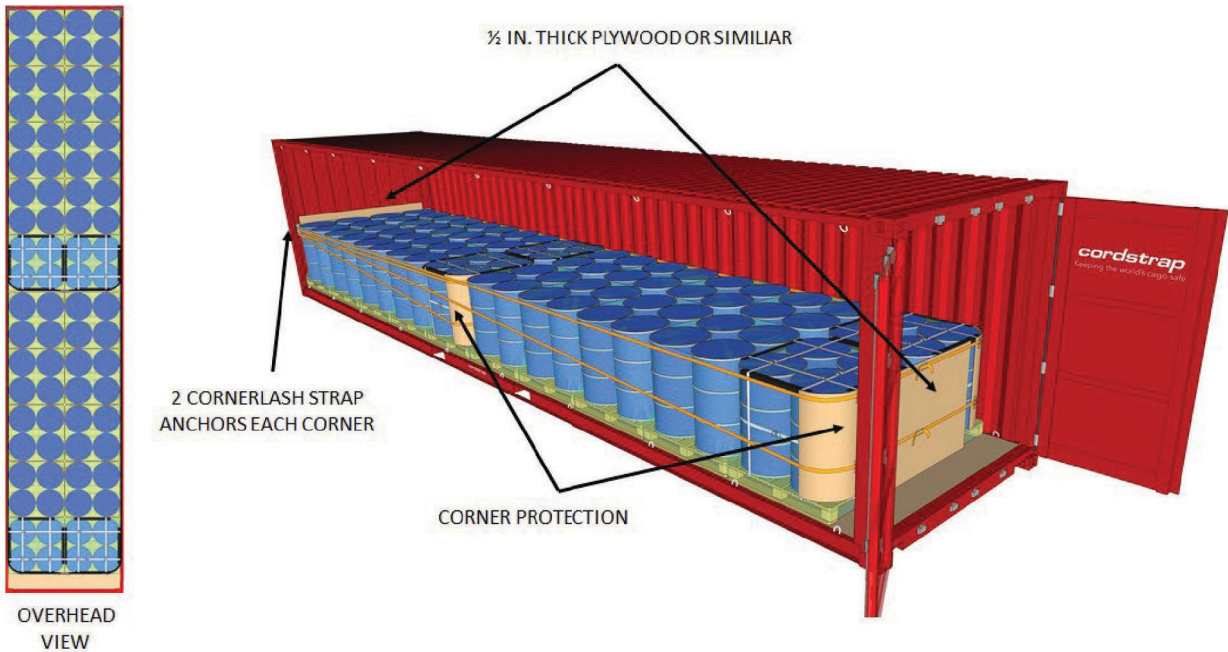


Figure 6.2.11 - 3
Method 6.2.11 - Steel drums, 55-gallons, on pallets secured with Cordstrap® barriers in 40-ft ISO containers

6.3 Mixed Loads

Number	Load Securement Method	Hazmat	Former Method
6.3.1	Mixed Loads Secured with Ty-Gard 2000® or DS®	HM*	B-2 (cancels GIS 798)
6.3.2	Double-Layer Loads Secured with Ty-Gard 2000® or DS®	HM*	B-3 (cancels GIS 798)
6.3.3	Double-Layer Loads of Hazardous or Nonhazardous Materials Secured with Cordstrap® Barriers in 20-ft Containers	HM	I-4 (cancels GIS 833)
6.3.4	Hazardous or Nonhazardous Loads Secured with Cordstrap® Barriers in 40-ft Containers	HM	I-5 (cancels GIS 834)
6.3.5	Double-Layer Loads of Nonhazardous Materials Secured with HLASH RHS Securement System in a 20-ft Container		I-7 (cancels GIS 835)
6.3.6	Nonhazardous Loads Secured with Cordstrap® Barriers in 20-ft and 40-ft Containers		I-8 (cancels GIS 872)

Method 6.3.1 - Mixed Loads Secured with Ty-Gard 2000® or DS®
(Former method B-2; Cancels GIS 798)



- This method is for mixed loads containing either closed-head drums, palletized bins, or palletized products. Freight is loaded in a single layer.
 - This method uses Ty-Gard 2000® or DS® barriers.
 - When used with containers with corrugated sidewalls, follow the contour of the corrugations. When used in trailers or containers without corrugated sidewalls, equipment walls must have horizontally oriented sidewall panels.
 - Plan the load to equalize the weight on each side of the container/trailer. A balanced load is required for the stability and success of this loading method.
1. Use suitable dividers between different product mix. When drums are loaded, this can be 1/4 in. plywood or equivalent. See [Section 3.3.4](#).
 2. Closed head drums (either steel or polyethylene) can be loaded in a 4-3-4 pattern only. The last stacks in the drum sections should contain three drums. See loading [Figure 6.3.1 - 1](#).
 3. Drum protection is required for sections containing drums. This may consist of drum protectors or angleboard strips. If angleboard strips are used, apply two 0.250 in. thick solid fiberboard strips or equivalent at each application of the Ty-Gard.
 4. Corner protectors of sufficient size and strength are required for palletized goods.
 5. The loading pattern may be secured with either Ty-Gard 2000 or DS barriers. Follow manufacturer's instructions for application. See [Section 4.5.1](#) for further information.
 6. For Ty-Gard 2000, apply two 16 in. wide Ty-Gard 2000 barriers to each section. Each strip is a minimum of 60 in. long. Apply the adhesive strip to each sidewall located 36 in. back from the face of the load. Pull the Ty-Gard strips across the face of the load, overlapping ends by at least 12 in. and tension, following manufacturer's instruction, using Ty-Gard tools. The tension barriers are then sealed with 48 in. long strips of Ty-Patch bonded to the Ty-Gard Barriers.
 7. For Ty-Gard DS, apply one 24 in. wide Ty-Gard barrier to each section. Each strip is a minimum of 75 in. long. Apply the adhesive strip each sidewall located 24 in. back from the face of the load. Tension and seal all Ty-Gard barriers in accordance with manufacturer's instruction with the noted amount of overlapping ends and patch application.

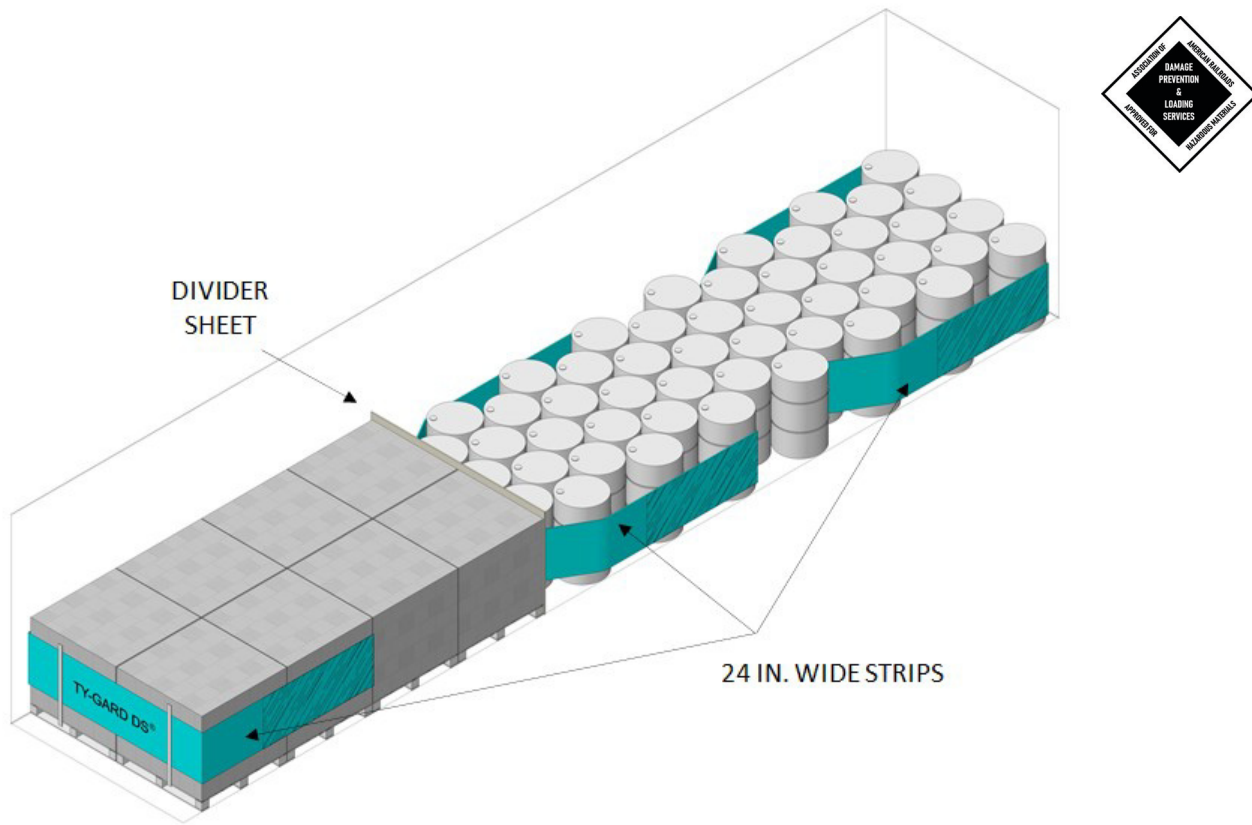


Figure 6.3.1 - 1
Method 6.3.1 - Mixed Loads Secured with Ty-Gard 2000® or DS®

NOTE: The load shown is the actual load tested.

Method 6.3.2 - Double-Layer Loads Secured with Ty-Gard 2000® or DS®
(Former Method B-3; Cancels GIS 798)



- This method is for mixed loads containing either closed-head drums, palletized bins, or palletized products.
 - This method uses Ty-Gard 2000® or DS® barriers.
 - When used with containers with corrugated sidewalls, follow the contour of the corrugations. When used in trailers or containers without corrugated sidewalls, equipment walls must have horizontally oriented sidewall panels.
 - Plan the load to equalize the weight on each side of the container/trailer. A balanced load is required for the stability and success of this loading method.
1. Plan the load so that each section contains approximately $\frac{1}{2}$ of the total weight in the container.
 2. Use suitable dividers between different product mix. When drums are loaded, this can be $\frac{1}{4}$ in. plywood or equivalent. See [Section 3.3.4](#).
 3. Apply approved layer separators between the first and second layers. See [Section 3.3.5](#) and [Table 3.2](#).
 4. Closed head drums (either steel or polyethylene) can be loaded in a 4-4 pattern. The last stacks in the drum sections should contain three drums. See loading [Figure 6.3.2 - 1](#).
 5. Drum protection is required for sections containing drums. This may consist of drum protectors or angleboard strips. If angleboard strips are used, apply two 0.250 in. thick solid fiberboard strips or equivalent at each application of the Ty-Gard.
 6. Corner protectors of sufficient size and strength are required for palletized goods.
 7. The loading pattern may be secured with either Ty-Gard 2000 or DS barriers. Follow manufacturer's instructions for application. See [Section 4.5.1](#) for further information.
 8. For Ty-Gard 2000, apply two 16 in. wide Ty-Gard 2000 barriers to each section. Each strip is a minimum of 60 in. long. Apply the adhesive strip to each sidewall located 36 in. back from the face of the load. Pull the Ty-Gard strips across the face of the load, overlapping ends by at least 12 in. and tension, following manufacturer's instruction, using Ty-Gard tools. The tension barriers are then sealed with 48 in. long strips of Ty-Patch bonded to the Ty-Gard Barriers.
 9. For Ty-Gard DS, apply one 24 in. wide Ty-Gard barrier to each section. Each strip is a minimum of 75 in. long. Apply the adhesive strip each sidewall located 24 in. back from the face of the load. Tension and seal all Ty-Gard barriers in accordance with manufacturer's instruction with the noted amount of overlapping ends and patch application.

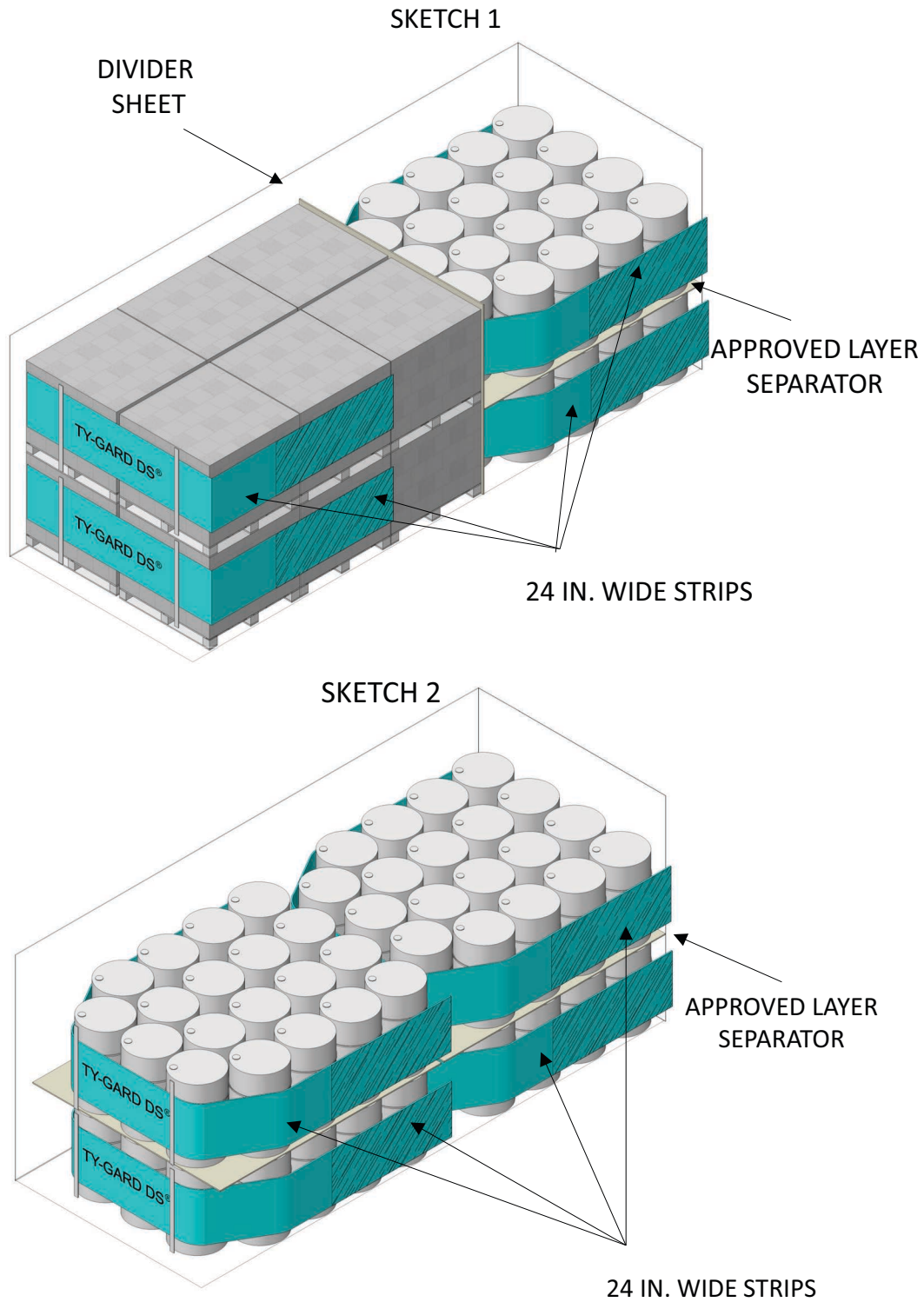


Figure 6.3.2 - 1 - Sketches 1 and 2
Method 6.3.2 - Double-Layer Loads Secured with Ty-Gard 2000® or DS®

NOTE: The load shown is the actual load tested.

Method 6.3.3 - Double-Layer Loads of Hazardous or Nonhazardous Materials Secured with Cordstrap® Barriers in 20-ft Containers (Former Method I-4; Cancels GIS 833)



- This method is for mixed loads containing either closed-head drums, (steel or plastic), palletized bins or intermediate bulk containers (IBCs), or palletized products.
 - This method uses Cordstrap barriers that are attached to the forward corner posts of a container with CornerLash® anchors.
 - Plan the load to equalize the weight on each side of the container. A balanced load is required for the stability and success of this loading method.
1. Install two CornerLash strap anchors per layer, into each container front corner at the needed height and thread CordLash 200LE Type 1A, Grade 7 strap through the anchors. Extend the straps the length of the container and out the container doors. See [Figure 6.3.3 - 1](#). See [Section 4.2](#).



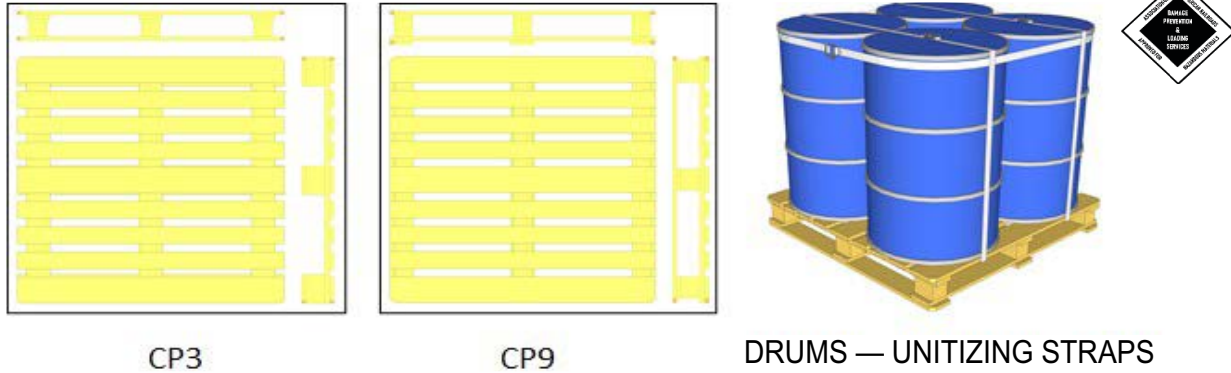
Figure 6.3.3 - 1

Method 6.3.3 - CornerLash® strap anchors

2. Use suitable dividers between different product mix. When drums are loaded, this can be 1/4 in. plywood or equivalent. See [Section 3.3.4](#).
3. Apply approved layer separators between the first and second layers. See [Section 3.3.5](#) and [Table 3.2](#).
4. Palletized product must be secured to pallet by an approved method such as strapping or stretch wrap. See [Section 3.2](#).
5. Use triple wall corrugated fiberboard or other suitable corner protectors, such as buffer sheets, between the freight and the straps in the doorway. For all load types, use strap hangers or tape to maintain straps in position.
6. Interlace the straps around the last stacks of freight. Join the straps using Dynablock® ladder-type buckles and fully tension straps with a Cordstrap CT-50PN pneumatic tensioner per manufacturer's instructions.

Drums:

1. Up to eighty closed head drums (either steel or plastic) can be loaded in a 4-4 pattern (with or without pallets) or a modified 4-3-4 pattern.
2. Palletized drums are loaded four to a pallet on CP3 or CP9 pallets measuring 44 7/8 inches in both dimensions. Stretch wrap drums to pallets or apply other adequate unitizing. See [Figure 6.3.3 - 2](#).



CP3

CP9

DRUMS — UNITIZING STRAPS

Figure 6.3.3 - 2

Method 6.3.3 - 2 - Drum pallet unitization

- The last two pallets of each stack and row are cross-strapped to make a tight connection between the last middle drums to the second to last side drums. This is done using two strap loops and a buckle. See [Figure 6.3.3 - 3](#). Alternately, apply adequate means to avoid protrusion of the middle drums, for example by tightly strapping the drums to the pallet.

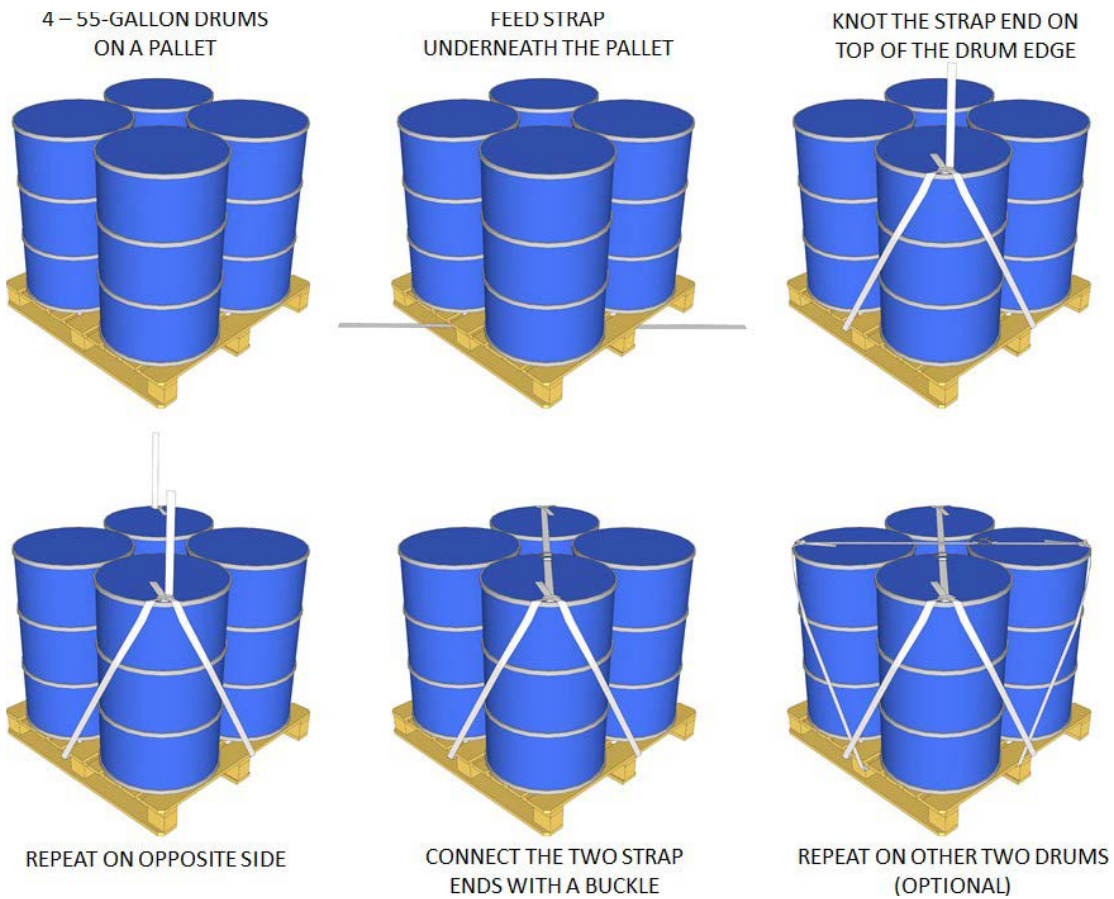


Figure 6.3.3 - 3

Method 6.3.3 - Drum pallet unitization - doorway

- For floor-loaded drums, interlace the straps around the last stacks of drums as shown in [Figure 6.3.3 - 4](#) and [Figure 6.3.3 - 5](#). Horizontally align the straps with lower drum rolling hoops and the upper drum rolling hoops or drum chimes. Join the straps using Dynablock ladder-type buckles and fully tension straps with a Cordstrap CT-50PN pneumatic tensioner per manufacturer's instruction.

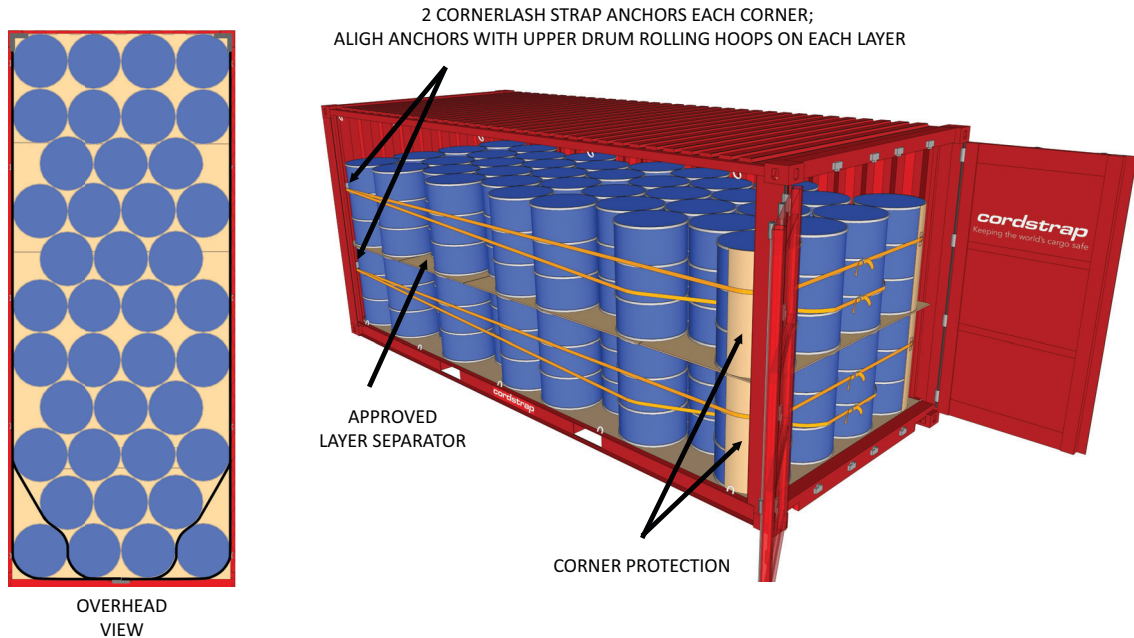


Figure 6.3.3 - 4

Method 6.3.3 - Double-layer loads of hazardous or nonhazardous materials secured with Cordstrap® barriers in a 20-ft container (4-3-4 pattern)

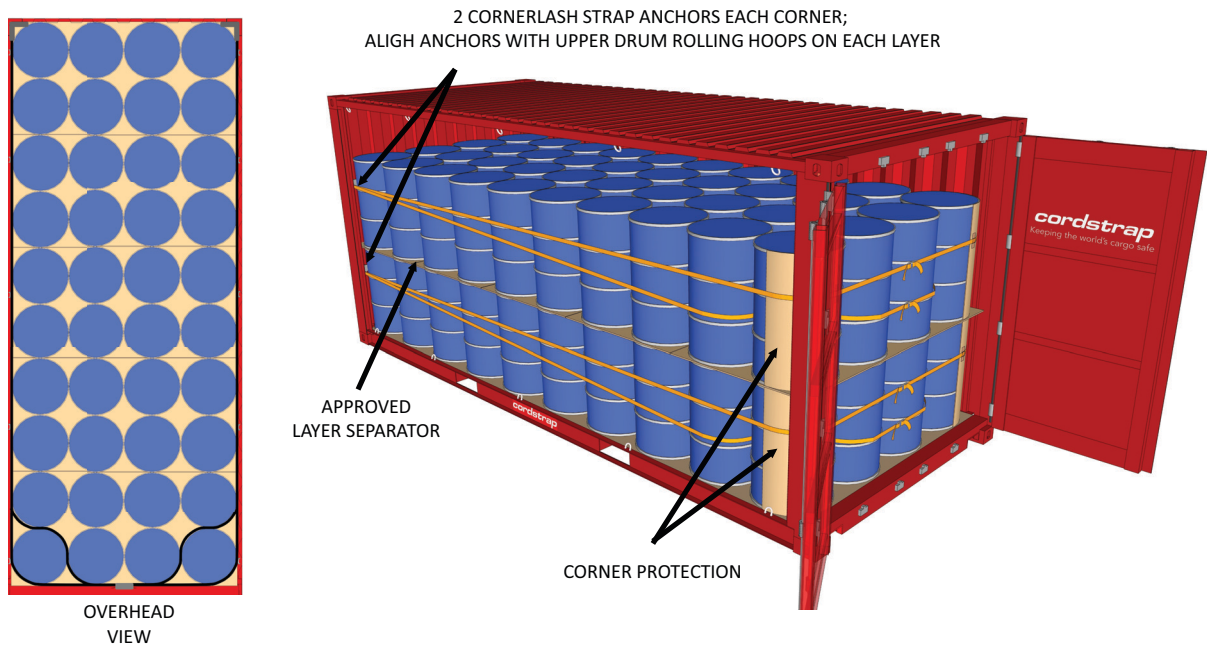


Figure 6.3.3 - 5

Method 6.3.3 - Double-layer loads of hazardous or nonhazardous materials secured with Cordstrap® barriers in a 20-ft container (4-4 pattern)

- For palletized drums, secure the straps around the last stack of palletized drums as shown in [Figure 6.3.3 - 6](#). The straps are horizontally aligned with the lower drum rolling hoops and the upper drum rolling hoops or upper drum chimes. Join the straps using Dynablock ladder type buckles and fully tension straps with a Cordstrap CT-50PN pneumatic tensioner per manufacturer's instructions.

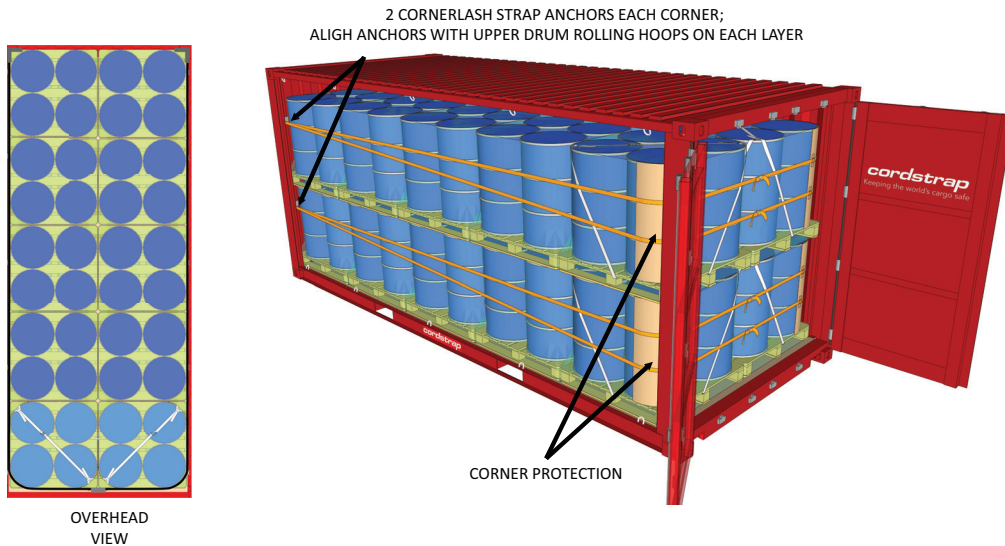


Figure 6.3.3 - 6

Method 6.3.3 - Double-layer loads of hazardous or nonhazardous materials secured with Cordstrap® barriers in a 20-ft container (palletized drums)

Intermediate Bulk Containers (IBCs)/Palletized Products:

- Use sufficient corner protectors, such as vertical 2 in. x 4 in. lumber, or other suitable material at the corners of the shipping units to protect both the strapping and the shipping unit. Secure corner protectors from displacement.
- At the doorway, the straps are horizontally aligned at approximately $\frac{1}{3}$ and $\frac{2}{3}$ of the height of the shipping unit, as shown in [Figure 6.3.3 - 7](#) and [Figure 6.3.3 - 8](#). Join the straps using Dynablock ladder type buckles and fully tension straps with a Cordstrap CT-50PN pneumatic tensioner per manufacturer's instructions.



Figure 6.3.3 - 7

Method 6.3.3 - Double-layer loads of hazardous or nonhazardous materials secured with Cordstrap® barriers in a 20-ft container (IBCs)

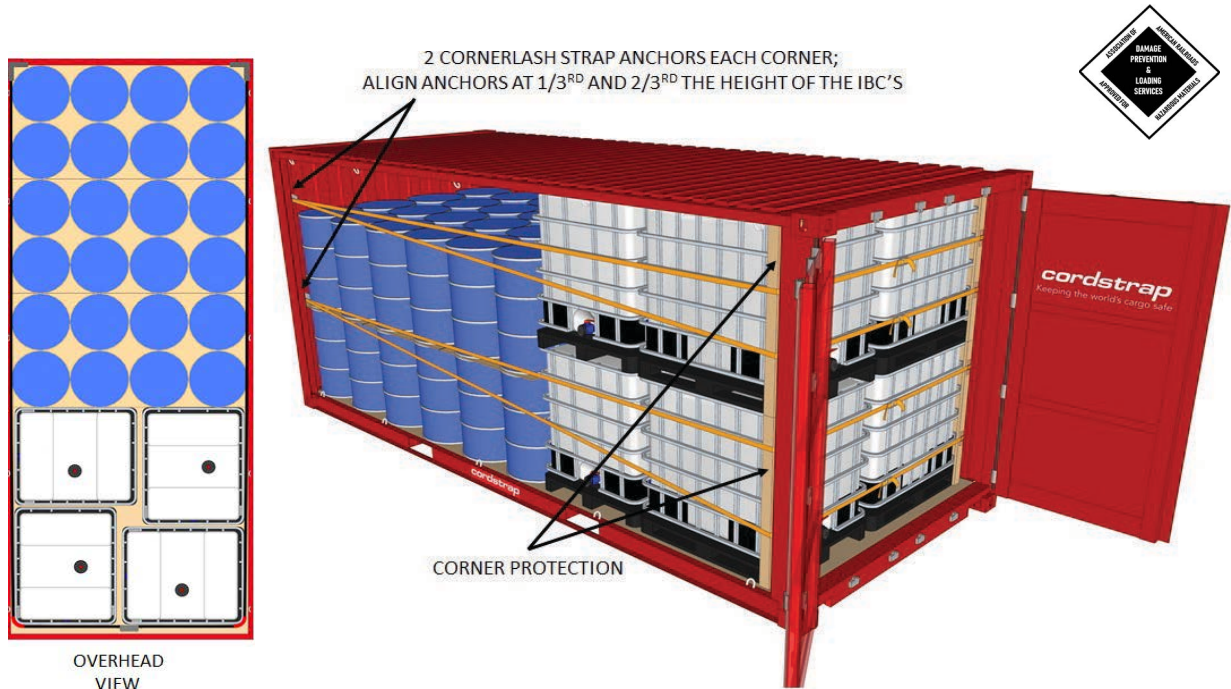


Figure 6.3.3 - 8

Method 6.3.3 - Double-layer loads of hazardous or nonhazardous materials secured with Cordstrap® barriers in a 20-ft container (mixed freight)

Method 6.3.4 - Hazardous or Nonhazardous Materials Secured with Cordstrap® Barriers in 40-ft. Containers

(Former Method I-5; Cancels GIS 834)



- This method is for mixed loads containing either closed-head drums, (steel or plastic), palletized bins or intermediate bulk containers (IBC's), or palletized products. Freight is loaded in a single layer.
 - This method uses Cordstrap barriers that are attached to the forward corner posts of a container with CornerLash® anchors.
 - Plan the load to equalize the weight on each side of the container. A balanced load is required for the stability and success of this loading method.
1. Install two CornerLash strap anchors into each container front corner at $\frac{1}{3}$ and $\frac{2}{3}$ the height of the load and thread CordLash 200LE Type 1A, Grade 7 strap through the anchors. Extend the straps the length of the container and out the container doors. See [Figure 6.3.4 - 1](#). See [Section 4.2](#).



Figure 6.3.4 - 1

Method 6.3.4 - CornerLash® strap anchors

2. Use suitable dividers between different product mix. When drums are loaded, this can be $\frac{1}{4}$ in. plywood or equivalent. See [Section 3.3.4](#).
3. Palletized product must be secured to pallet by an approved method such as strapping or stretch wrap. See [Section 3.2](#).
4. Use triple wall corrugated fiberboard or other suitable corner protectors, such as buffer sheets, between the freight and the straps in the doorway. For all load types, use strap hangers or tape to maintain straps in position.
5. Interlace the straps around the last stacks of freight. Join the straps using Dynablock® ladder-type buckles and fully tension straps with a Cordstrap CT-50PN pneumatic tensioner per manufacturer's instructions.

Drums:

1. Up to 80 closed head drums (either steel or plastic) can be loaded in a 4-4 pattern (with or without pallets) or a modified 4-3-4 pattern.
2. Palletized drums are loaded four to a pallet on CP3 or CP9 pallets measuring $44 \frac{7}{8}$ inches in both dimensions. Stretch wrap drums to pallets or apply other adequate unitizing. See [Figure 6.3.4 - 2](#).

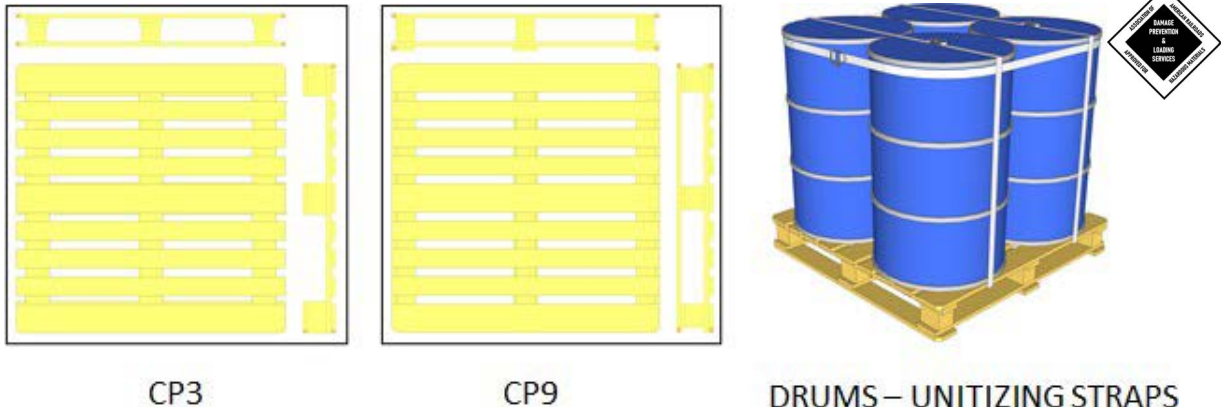


Figure 6.3.4 - 2

Method 6.3.4 - Drum pallet unitization

- The last two pallets of each stack and row are cross-strapped to make a tight connection between the last middle drums to the second to last side drums. This is done using two strap loops and a buckle. See Figure 6.3.4 - 3. Alternately, apply adequate means to avoid protrusion of the middle drums, for example by tightly strapping the drums to the pallets.

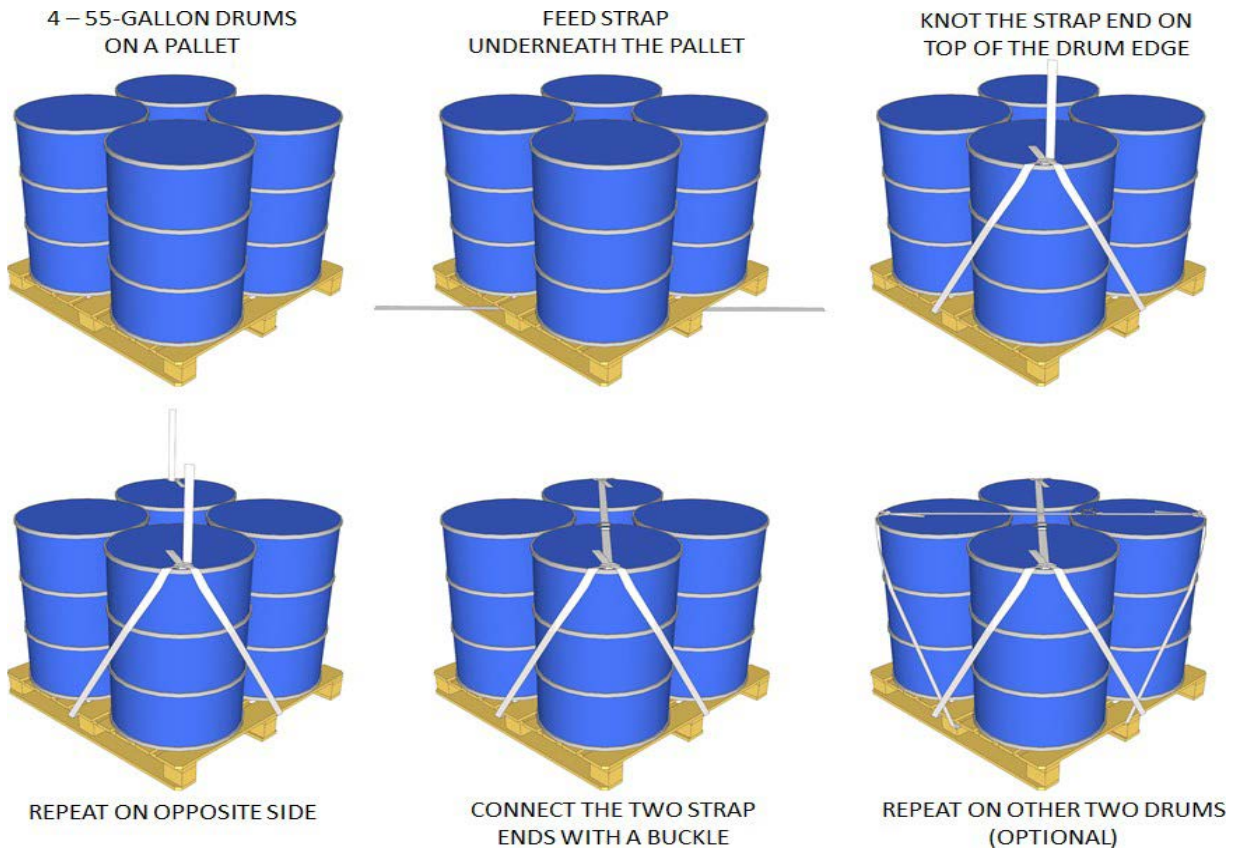


Figure 6.3.4 - 3

Method 6.3.4 - Drum pallet unitization - doorway

- For floor-loaded drums, interlace the straps around the last stacks of drums as shown in Figure 6.3.4 - 4 and Figure 6.3.4 - 5. Horizontally align the straps with lower drum rolling hoops and the upper drum rolling hoops or drum chimes. Join the straps using Dynablock ladder-type buckles and fully tension straps with a Cordstrap CT-50PN pneumatic tensioner per manufacturer's instructions.

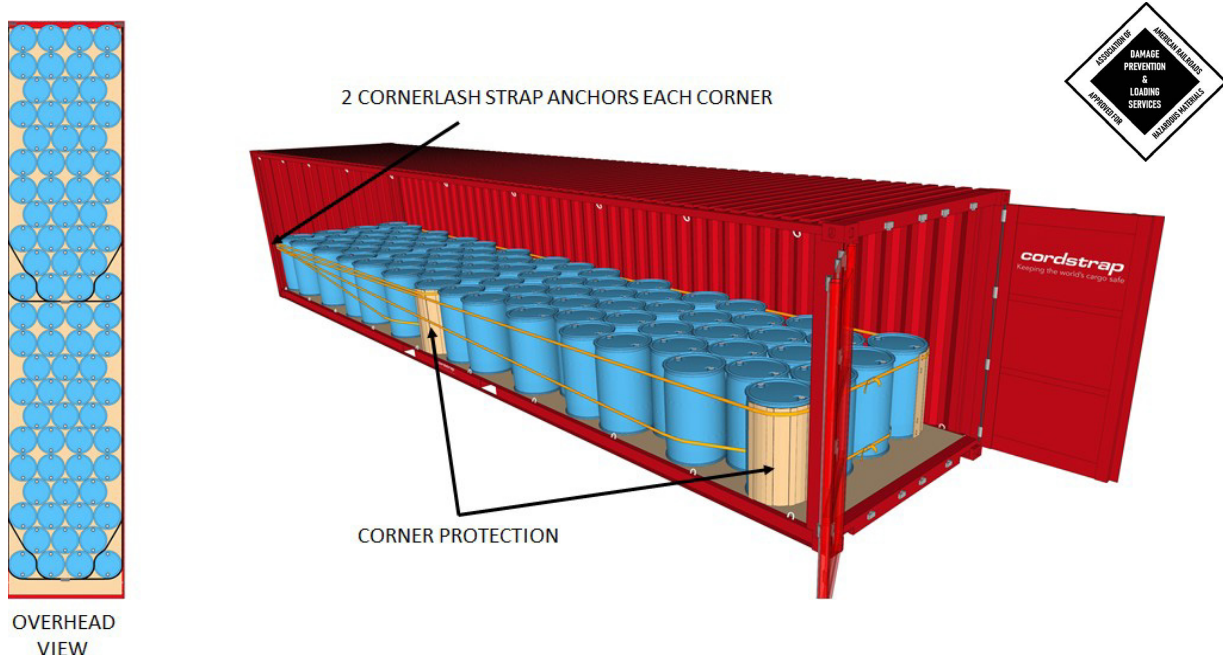


Figure 6.3.4 - 4

Method 6.3.4 - Hazardous or nonhazardous materials secured with Cordstrap® barriers in 40-ft containers (4-3-4 pattern)

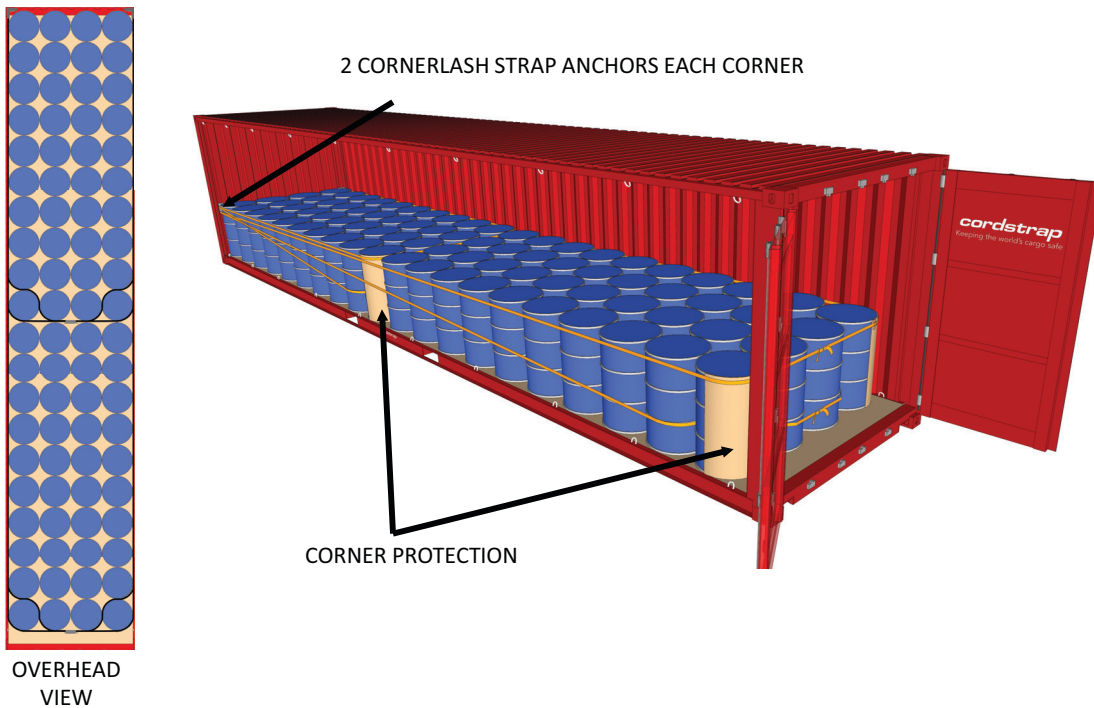


Figure 6.3.4 - 5

Method 6.3.4 - Hazardous or nonhazardous materials secured with Cordstrap® barriers in 40-ft containers (4-4 pattern)

- For palletized drums, secure the straps around the last stack of palletized drums as shown in Figure 6.3.4 - 6. The straps are horizontally aligned with the lower drum rolling hoops and the upper drum rolling hoops or upper drum chimes. Join the straps using Dynablock ladder type buckles and gully tension straps with a Cordstrap CT-50PN pneumatic tensioner per manufacturer's instructions.

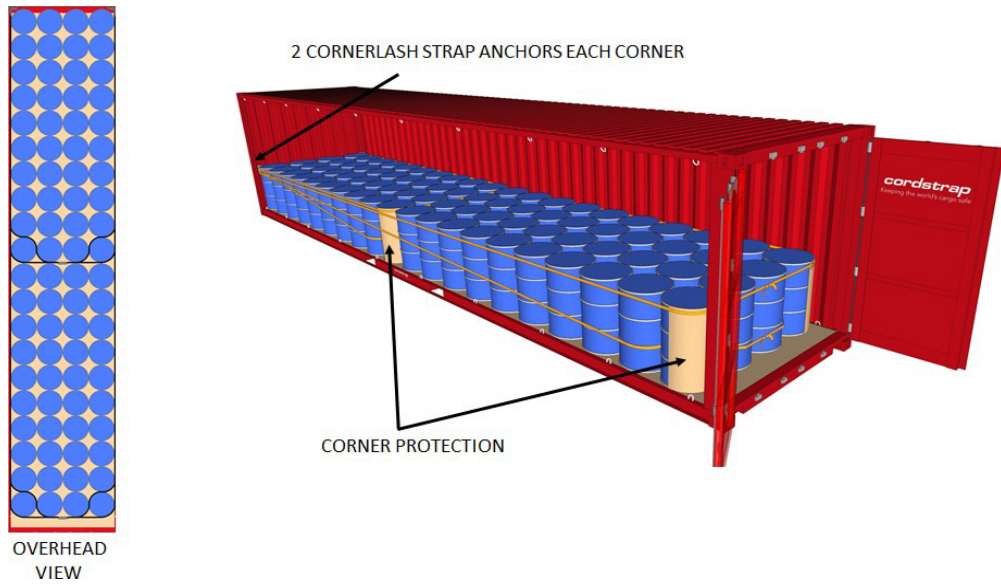


Figure 6.3.4 - 6

Method 6.3.4 - Hazardous or nonhazardous materials secured with Cordstrap® barriers in 40-ft containers (palletized drums)

Intermediate Bulk Containers (IBCs)/Palletized Products:

1. Use sufficient corner protectors, such as vertical 2 in. x 4 in. lumber, or other suitable material at the corners of the shipping units to protect both the strapping and the shipping unit. Secure corner protectors from displacement.
2. At the doorway, the straps are horizontally aligned at approximately 1/3 and 2/3 of the height of the shipping unit, as shown in Figure 6.3.4 - 7 and Figure 6.3.4 - 8. Join the straps using Dynablock ladder type buckles and fully tension straps with a Cordstrap CT-50PN pneumatic tensioner per manufacturer's instructions.

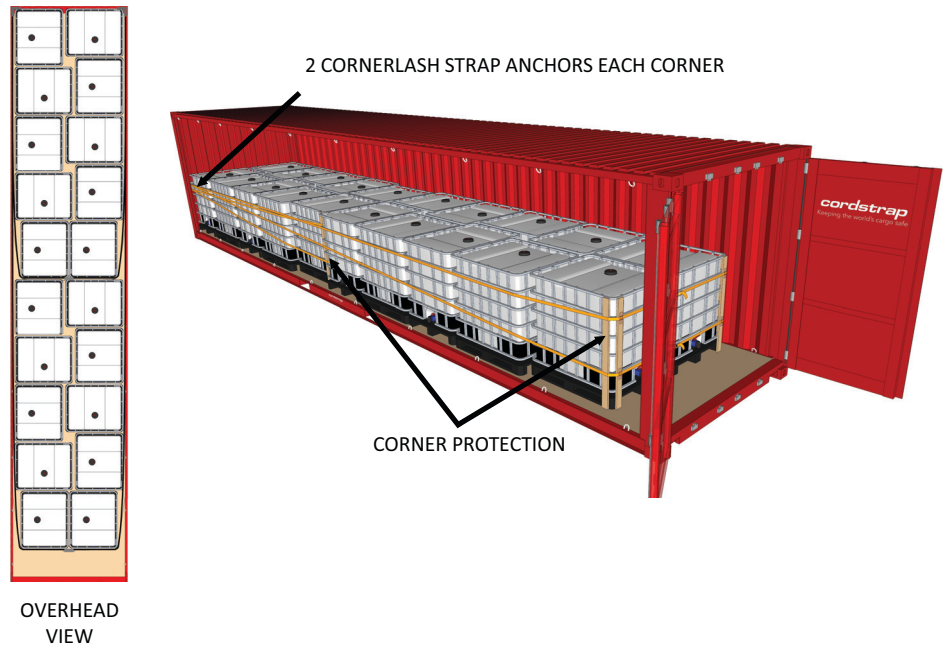


Figure 6.3.4 - 7

Method 6.3.4 - Hazardous or nonhazardous materials secured with Cordstrap® barriers in 40-ft containers (IBCs)

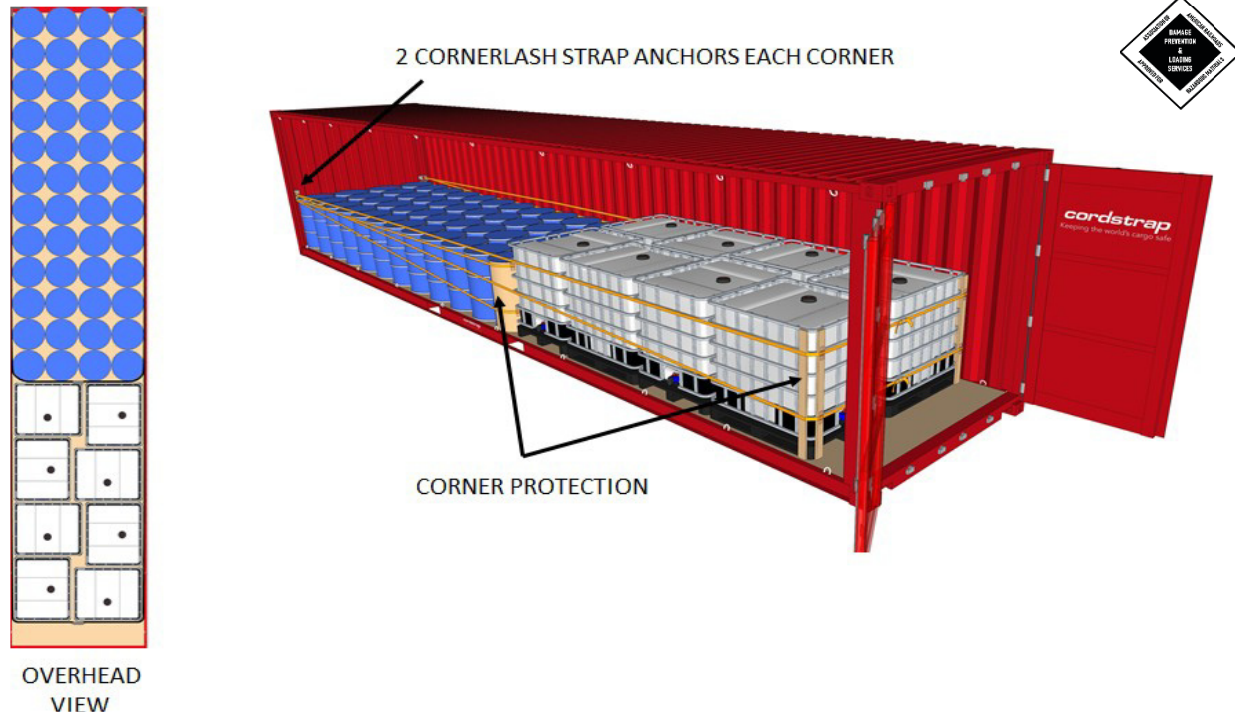


Figure 6.3.4 - 8

Method 6.3.4 - Hazardous or nonhazardous materials secured with Cordstrap® barriers in 40-ft containers (mixed freight)

Method 6.3.5 - Double-Layer Loads of Nonhazardous Materials Secured with HLASH RHS Securement System in a 20-ft. Container

(Former Method I-7; Cancels GIS 835)

- This method is for mixed loads containing either palletized closed-head steel drums, palletized bins, or intermediate bulk containers (IBC's), or palletized products.
 - This method uses HLASH RHS Securement System with the HLASH RHS 10.4v1+Rail Edition Securement System that is attached to container D-rings.
 - Plan the load to equalize the weight on each side of the container. A balanced load is required for the stability and success of this loading method.
1. Select containers that are equipped with suitable D-rings at locations consistent with the load plan. It is the shipper's responsibility to inspect and ensure that the D-rings are in sound condition and that the load does not exceed the capacity of the D-rings for the container being loaded. See [Section 4.2.5](#).
 2. This method outlines the use of HLASH RHS 10.4v1+Rail Edition Securement (four - tensioned straps) for loads weighing up to a maximum weight limit of 44,300 lbs.

NOTE: Use of HLASH RHS 16.6 (Six – tensioned straps) or HLASH RHS 14.5 (Five –tensioned straps) may also be permissible to the stated 44,300 lbs. weight limit.

3. Use suitable vertical dividers between different product mix – corrugated panels, ¼ in. plywood, or equivalent. See [Section 3.3.4](#).
4. Line the entire container floor with HLASH BioASM “Rail Edition”. See [Figure 6.3.5 - 1](#).



Figure 6.3.5 - 1

Method 6.3.5 - HLASH BioASM “Rail Edition”

5. Secure eight HLASH RHS 10.4v1+Rail Edition woven nonmetallic straps to container D-rings using the anchor attachment with locking pin. See [Figure 6.3.5 - 2](#). Apply four straps on each side of the container to matched opposite D-rings. Apply three straps on each side of the container to bottom D-rings for bottom layer load securement and apply one strap (with D-lashing ring attachment) on each side of the container to top D-rings for top layer load securement. Select D-rings based on the number, weight, and dimensions of units being loaded and manufacturer's recommendations. Ensure that strapping application is planned and applied prior to container loading. See [Figure 6.3.5 - 5](#), [Figure 6.3.5 - 7](#), and [Figure 6.3.5 - 8](#). See [Section 4.2](#).



Figure 6.3.5 - 2

Method 6.3.5 - HLASH RHS 10.4v1+Rail Edition woven nonmetallic strap connected to D-ring

Palletized Drums:

1. Up to 80 palletized, closed head steel drums may be loaded in the container. Palletized drums are loaded four to a pallet on CP3 or CP9 pallets measuring 44 7/8 inches in both dimensions.
2. Stretch wrap drums to pallets, or apply other adequate unitizing, such as strapping as shown in [Figure 6.3.5 - 3](#).

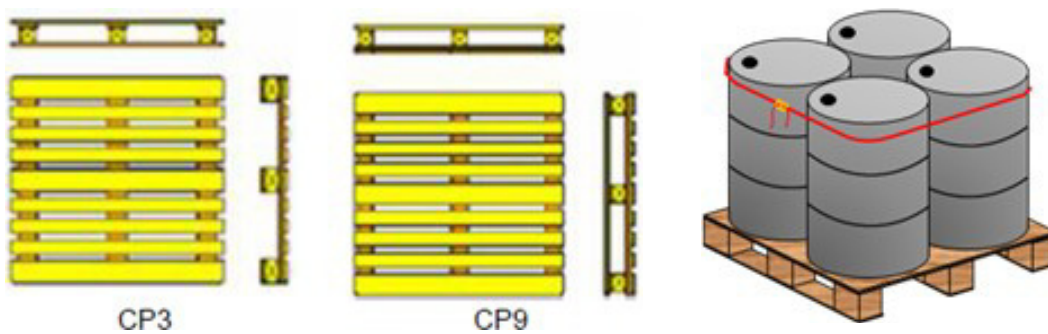


Figure 6.3.5 - 3

Method 6.3.5 - Drum pallet unitizing

3. If drum pallets are loaded as any of the last four pallets in the container (two bottom pallets and two top pallets) use Drumguard® Quattro to secure the drums to the pallets. The metal plate engages the top chimes of the four drums and secures the drums to the pallet with a long metal rod. See [Figure 6.3.5 - 4](#).



Figure 6.3.5 - 4

Method 6.3.5 - Drumguard® Quattro

4. If drum pallets are loaded as any of the last four pallets in the container (two bottom pallets and two top pallets) use triple wall corrugated fiberboard or other suitable material such as buffer sheets between the drums and the straps in the doorway.
5. Secure the straps around the last pallets of drums and apply through the vertical alignment straps (Chain Link USB) using matched opposite links on each side. Join the straps using the HFLASH 4000 buckle and fully tension using the manufacturers recommended tensioning device. See [Figure 6.3.5 - 5](#).

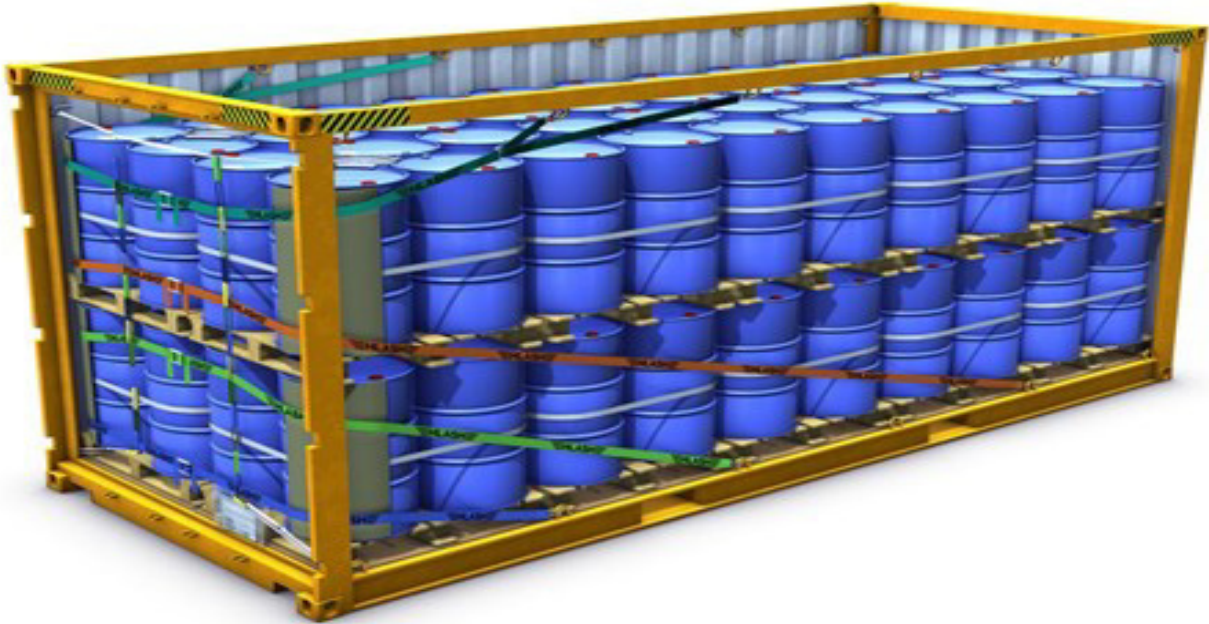


Figure 6.3.5 - 5

Method 6.3.5 - HFLASH RHS 10.4v1+Rail Edition Securement System (palletized drums)

Intermediate Bulk Containers (IBCs):

1. If IBCs are loaded as any of the last four units in the container (two bottom units and two top units) use HFLASH WFE HD 850 corner protectors or other suitable material such as triple wall corrugated fiberboard or buffer sheets between the IBCs and the straps in the doorway. See [Figure 6.3.5 - 6](#).
2. Secure the straps around the last IBCs and apply through the vertical alignment straps (Chain Link USB) using matched opposite links on each side. Join the straps using the HFLASH 4000 buckle and fully tension using the manufacturers recommended tensioning device. See [Figure 6.3.5 - 7](#).



Figure 6.3.5 - 6
Method 6.3.5 - HFLASH WFE HD 850
corner protectors



Figure 6.3.5 - 7
Method 6.3.5 - HFLASH RHS 10.4v1+Rail
Edition Securement System (IBC's)

Palletized Products and Mixed Loads:

1. Palletized product must be secured to the pallet by an approved method such as stretch wrap other adequate unitizing methods. See [Section 3.2](#).
2. Follow application information for any palletized drums or IBC's loaded in a mix load as noted in this loaded method.
3. Secure the straps around the last pallets and apply through the vertical alignment straps (Chain Link USB) using matched opposite links on each side. Join the straps using the HFLASH 4000 buckle and fully tension using the manufacturers recommended tensioning device. See [Figure 6.3.5 - 8](#).



Figure 6.3.5 - 8
Method 6.3.5 - HFLASH RHS 10.4v1+Rail Edition Securement System (mixed loads)

Method 6.3.6 - Nonhazardous Loads Secured with Cordstrap® Barriers in 20-ft. and 40-ft. Containers
(Former Method I-8; Cancels GIS 872)

- This method is for mixed loads containing either closed-head drums, (steel or plastic), intermediate bulk containers (IBCs), or palletized products. Freight is loaded in a single layer in 40-ft. containers.
 - This method uses Cordstrap barriers that are attached to the container D-rings with AnchorLash® securement straps.
 - Plan the load to equalize the weight on each side of the container. A balanced load is required for the stability and success of this loading method.
1. Select containers that are equipped with suitable D-rings at locations consistent with the load plan. It is the shipper's responsibility to inspect and ensure that the D-rings are in sound condition and that the load does not exceed the capacity of the D-rings for the container being loaded. See [Section 4.2.5](#).
 2. This load may contain up to 80 closed head steel or plastic drums loaded in a 4-4 pattern (with or without pallets) or in a modified 4-3-4 pattern, intermediate bulk containers (IBCs), or any palletized product. Palletized product must be secured to the pallet by an approved method. See [Section 3.2](#). Any combination of product mix is acceptable.
 3. Use suitable vertical dividers between different product mix. When drums are loaded, this can be 1/4 in. plywood or equivalent. See [Section 3.3.4](#).
 4. Install AnchorLash anchor straps, two per layer in a 20 ft container, or two per load section in a 40 ft container. In [Figure 6.3.6 - 1](#), the orange straps are CL200, Type 1A grade 7 nonmetallic straps, and the white straps are CL150, Type 1A grade 6 nonmetallic straps. All straps are pre-cut to the proper length. See [Section 4.2](#).
 5. The top layer straps in a 20 ft container are anchored to the D-rings at the top of the container using a snap hook. The straps for the bottom layer have sewn loops that are anchored to the D-rings at the bottom of the container. The securing straps on either side of the container are threaded through a vertical pocket strap that is attached to an upper D-ring with a snap hook, and tied off to the lower D-ring, or simply left hanging. A 20 ft container will have one set of vertical straps and a 40 ft container will have two sets of vertical straps. See [Figure 6.3.6 - 2](#).

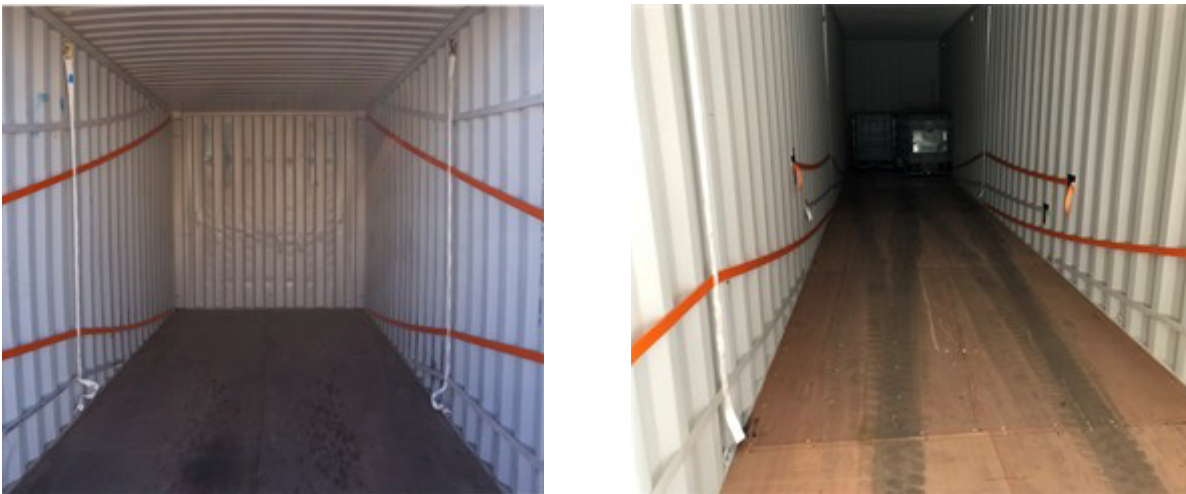


Figure 6.3.6 - 1

Method 6.3.6 - AnchorLash® Securement System installed in 20-ft and 40-ft containers



Figure 6.3.6 - 2

Method 6.3.6 - 2 - AnchorLash® snap hook and sewn loop

6. Use corner protection between the freight in the last stack in a section and the securing straps. For drums, use triple wall corrugated or equivalent; for IBCs use 2 in. x 4 in. uprights secured to the bins or other corner protection methods that can uniformly distribute strapping pressure over the entire load face; and for cased goods use solid fiberboard angle board or equivalent.
7. Apply approved layer separators between the first and second layers. See [Section 3.3.5](#) and [Table 3.2](#).
8. Join the straps using Dynablock® ladder type buckles and tension according to manufacturers' instructions, with a Cordstrap CBT40 battery tensioner or any other suitable tensioning device according to manufacturer's instructions.
9. For all load types, use strap hangers or tape to maintain straps in position.

Drums:

1. The straps are positioned and anchored to the D-rings at the bottom of the container in a 40-ft container. The straps are positioned and anchored at the top and bottom to the D-rings in a 20-ft container.
2. In the last stack of drums of each section the orange Grade 7 straps are interlaced around the two center drums as shown in [Figure 6.3.6 - 3](#) and [Figure 6.3.6 - 4](#).
3. Join the straps using Dynablock ladder type buckles and tension according to manufacturers' instructions, with a Cordstrap CBT40 battery tensioner or any other suitable tensioning device according to manufacturer's instructions.



Figure 6.3.6 - 3

Method 6.3.6 - Nonhazardous loads secured with Cordstrap® barriers in 20-ft and 40-ft containers (4-4 pattern; 40-ft. container)

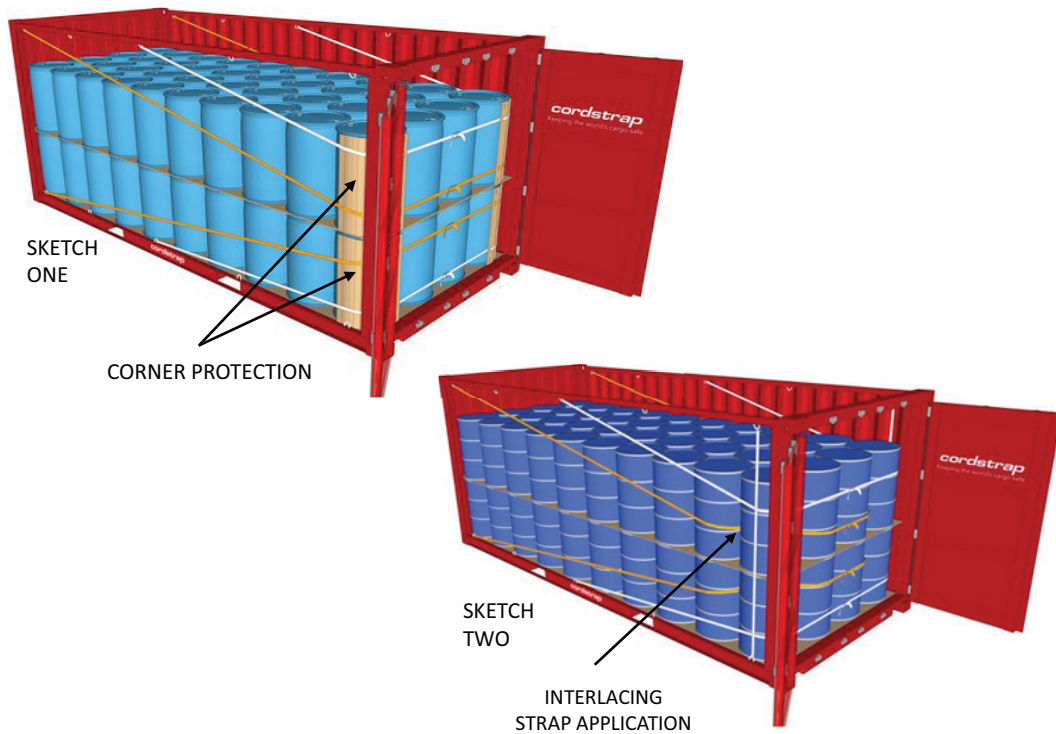


Figure 6.3.6 - 4

Method 6.3.6 - Nonhazardous loads secured with Cordstrap® barriers in 20-ft and 40-ft containers (4-4 pattern; 20-ft. container)

Intermediate Bulk Containers (IBCs):

1. Straps are positioned and anchored to the D-rings at the bottom of the container for 40 ft containers. Straps are anchored to the D-rings at the top and bottom of the container in a 20 ft container. See [Figure 6.3.6 - 5](#) and [Figure 6.3.6 - 6](#).
2. Secure 2 in. x 4 in. lumber, or other corner protection methods that can uniformly distribute strapping pressure over the entire load face, vertically to the corners of the IBCs for corner protection where the straps will be secured to prevent damage to the IBCs and the strapping.
3. Join the straps using Dynablock ladder type buckles and tension according to manufacturers' instructions, with a Cordstrap CBT40 battery tensioner or any other suitable tensioning device according to manufacturer's instructions.
4. Use strap hangers or tape to maintain straps in position.



Figure 6.3.6 - 5

Method 6.3.6 - Nonhazardous loads secured with Cordstrap® barriers in 20-ft and 40-ft containers (IBC; 40 ft container)



Figure 6.3.6 - 6

Method 6.3.6 - Nonhazardous loads secured with Cordstrap® barriers in 20-ft and 40-ft containers (IBC; 20 ft container)

Mixed Loads:

1. Straps are positioned and anchored to the D-rings at the bottom of the container for 40 ft containers. Straps are anchored to the D-rings at the top and bottom of the container in a 20 ft container. See [Figure 6.3.6 - 7](#) and [Figure 6.3.6 - 8](#).
2. For mixed load applications in 40 ft containers interlace the lashings at the last two layers of the drums.
3. Use corner protection between the freight in the last stack in a section and the securing straps. For drums, use triple wall corrugated or equivalent; for IBCs use 2 in. x 4 in. uprights secured to the bins or other corner protection methods that can uniformly distribute strapping pressure over the entire load face; and for cased goods use solid fiberboard angle board or equivalent.
4. Join the straps using Dynablock ladder type buckles and tension according to manufacturers' instructions, with a Cordstrap CBT40 battery tensioner or any other suitable tensioning device according to manufacturer's instructions.
5. Use strap hangers or tape to maintain straps in position.



Figure 6.3.6 - 7

**Method 6.3.6 - Nonhazardous loads secured with Cordstrap® barriers in 20-ft and 40-ft containers
(Mixed load; 40-ft. container)**

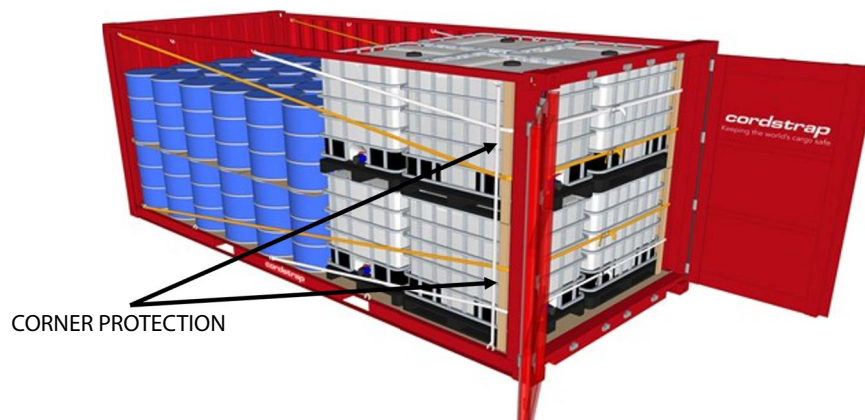


Figure 6.3.6 - 8

**Method 6.3.6 - Nonhazardous loads secured with Cordstrap® barriers in 20-ft and 40-ft containers
(Mixed load; 20-ft. container)**

6.4 Case Goods

Number	Load Securement Method	Former Method
6.4.1	Case Goods Secured with Air Bags	F-2
6.4.2	Split Loads of Case Goods or Fiberboard Tray Packs Secured with Air Bags	F-3
6.4.3	Case Goods Secured with Air Bag Systems	F4 & F5 (cancels GIS 783, 784, & 817)
6.4.4	Case Goods Secured with Stopak Blocker Air Bags	F-6 (cancels GIS 824)
6.4.5	Cases Goods Secured with Cargo Tuff Dually™ Air Bags	F-7 (cancels GIS 852)
6.4.6	Case Goods Secured with Floor Blocking and the Super Wedge® XL, Intermodal Wedge® XL, or Intermodal Wedge® (Logistick Inc.)	H-14 (cancels GIS 861)

Method 6.4.1 - Case Goods Secured with Air Bags

(Former Method F-2)

- This method is for case goods unitized on pallets or slip sheets and loaded in a single layer.
 - The load that was tested weighed 45,000 lbs. The figures show the loads as tested. Depending on container/trailer size and shipping unit size and weight, varying numbers of shipping units may be loaded.
 - Plan the load to equalize the weight on each side and each end of the container. A balanced load is required for the stability and success of this loading method.
1. For the current listing of AAR-verified pneumatic dunnage (air bags) and information on the verification process refer to the *Product Performance Profile for Pneumatic Dunnage - Product Verification List* and AAR General Information Bulletin No. 9, *Product Performance Profile for Pneumatic Dunnage*. Both documents can be referenced at <https://aar.com/standards/damage-publications.php>. See [Section 4.3](#).
 2. Unitize case goods on pallets or slip sheets using stretch wrap/film or stretch wrap roping. Wrap the entire unit with at least three successive layers of film and have a minimum of 50 percent overlap coverage of each layer of wrap. Stretch wrap must cover over the top of the unit and contact a minimum of 3 in. of the shipping pallet. See [Section 3.2](#).
 3. Protect the air bag from rough surfaces or pallet edges by using buffer material, divider material, fiberboard sheets, or other suitable materials to protect adjacent air bags. See [Section 3.3](#).
 4. Use wall liners, dividers, fiberboard sheets, or other suitable materials to cover rough walls, rough floors, or sidewall projections.
 5. Plan the load so crosswise space is minimized. Use appropriate void fillers to fill all crosswise voids and to prevent crosswise movement. See [Sections 3.1.2](#) and [3.3](#).
 6. Air bags are used to control lengthwise load movement. The air bags must be a minimum Level 1 air bag or square air bags.

NOTE: Do not reuse air bags used for load securement.

7. Minimum air bag sized is one 48 in. x 96 in. air bag at each application location. Use air bags wide enough to extend from 4 inches above the floor to the top of the freight.
8. Air bags may be used to fill crosswise void space from 4 - 12 in. after inflation. When the air bag void is larger than 12 in. after inflation, place additional full-size void fillers capable of withstanding a load of 1,500 psf alongside the air bags. Square air bags may also be used to fill crosswise void space from 12 - 24 in. after inflation.
9. Inflate the air bags to 1 psi or up to 2 psi maximum if the container/trailer has rigid, ribbed sidewall construction (e.g., domestic intermodal truckload carriers or IMC containers). Inflate square bags to 2.5 psi. Follow manufacturers' instructions and recommendations on air bag application and pressure. Recheck air bag pressure after 30 minutes.
10. When freight is positioned against the front endwall, use an air bag at the midpoint stacks of the load and at the last two stacks. The midpoint air bag will restrain approximately $\frac{1}{2}$ the load from lengthwise movement while the end air bag will restrain the other $\frac{1}{2}$ the load from lengthwise movement and from contacting the container/trailer doors. See [Figure 6.4.1 - 1](#).
11. When freight is positioned away from the front endwall or when there is unfilled lengthwise voids/pallet underhang, use air bags adjacent to every stack in the load. See [Figure 6.4.1 - 2](#).
12. Leave approximately a 2 ft space or void between the rear of the load and the container/trailer doors.

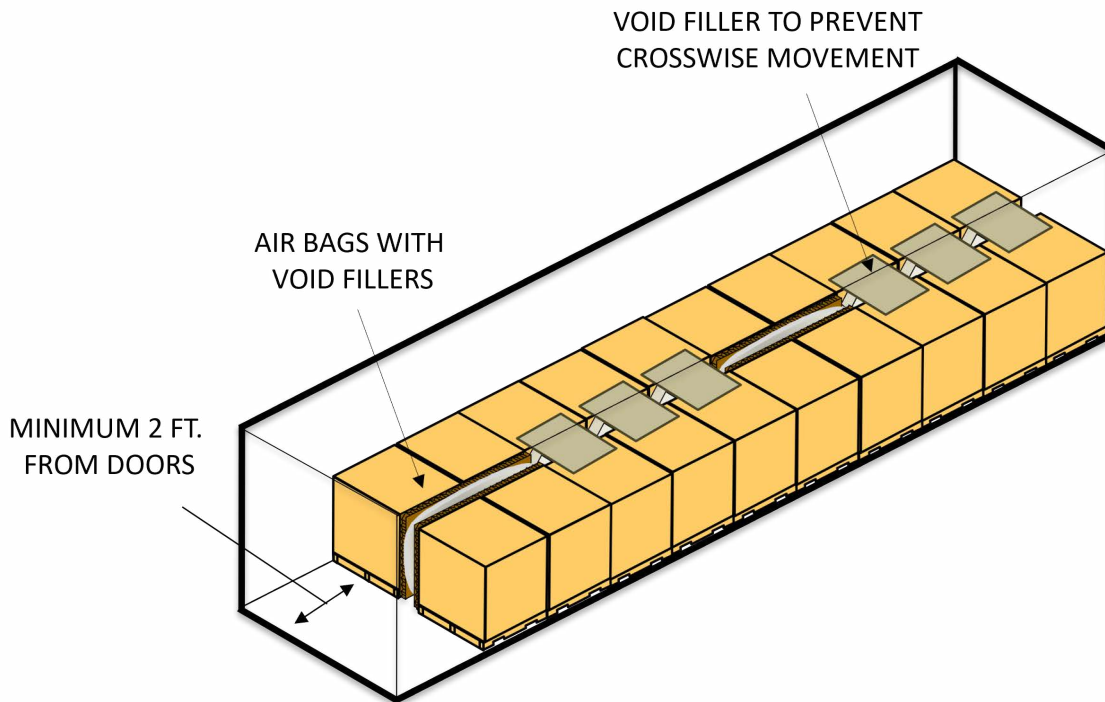


Figure 6.4.1 - 1

Method 6.4.1 - Case goods secured with air bags

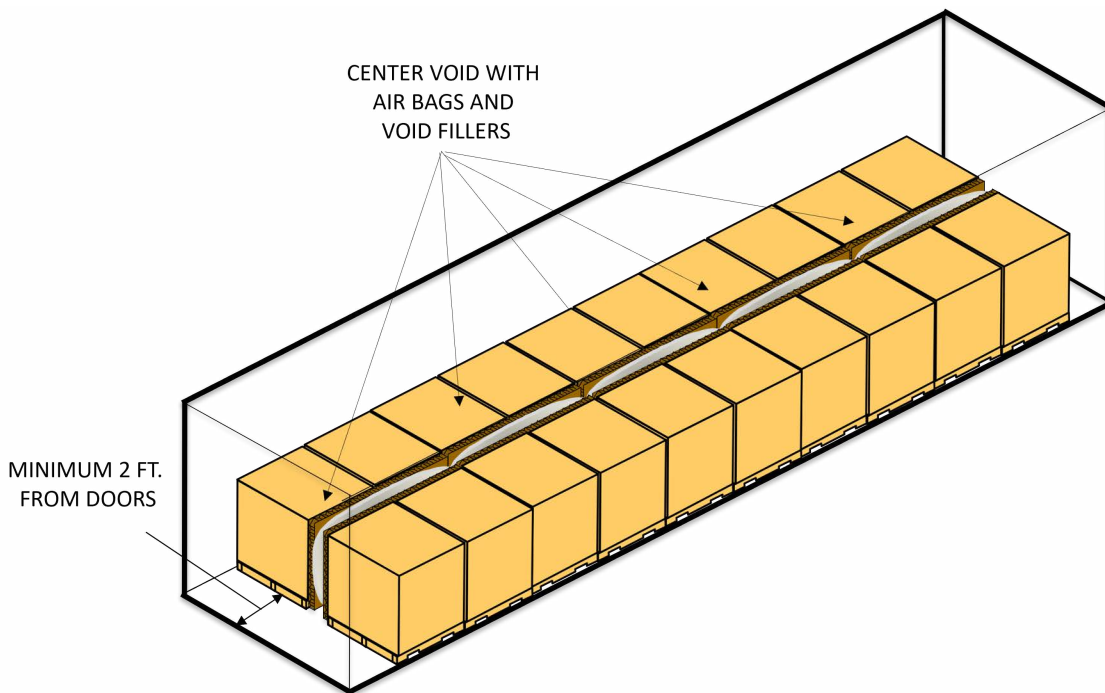


Figure 6.4.1 - 2

Method 6.4.1 - Case goods secured with air bags

Method 6.4.2 - Split Loads of Case Goods or Fiberboard Tray Packs Secured with Air Bags
(Former Method F-3)

- This method is for case goods unitized on pallets or slip sheets and loaded in a single layer.
 - The load that was tested weighed 45,000 lbs. The figures show the loads as tested. Depending on container/trailer size and shipping unit size and weight, varying numbers of shipping units may be loaded.
 - Plan the load to equalize the weight on each side and each end of the container. A balanced load is required for the stability and success of this loading method.
1. For the current listing of AAR-verified pneumatic dunnage (air bags) and information on the verification process refer to the *Product Performance Profile for Pneumatic Dunnage - Product Verification List* and AAR General Information Bulletin No. 9, *Product Performance Profile for Pneumatic Dunnage*. Both documents can be referenced at <https://aar.com/standards/damage-publications.php>. See [Section 4.3](#).
 2. Unitize case goods or tray packs on pallets or slip sheets using stretch wrap/film or stretch wrap roping. Wrap the entire unit with at least three successive layers of film and have a minimum of 50 percent overlap coverage of each layer of wrap. Stretch wrap must cover over the top of the unit and contact a minimum of 3 in. of the shipping pallet. See [Section 3.2](#).
 3. Protect the air bag from rough surfaces or pallet edges by using buffer material. Tray packs may have sharp edges and may require divider material, fiberboard sheets, or other suitable materials to protect adjacent air bags. See [Section 3.3](#).
 4. Use wall liners, dividers, fiberboard sheets, or other suitable materials to cover rough walls, rough floors, or sidewall projections.
 5. Plan the load so crosswise space is minimized. For maximum load restraint, fill any pallet underhang along the sidewalls with properly sized void fillers. See [Sections 3.1.2](#) and [3.3](#).
 6. Divide the load into two sections with proper void space between the two sections to obtain proper container/trailer weight distribution. See [Figure 6.4.2 - 1](#).
 7. Air bags are used to control lengthwise load movement. Use air bags in the center void, adjacent to every stack in the load pattern, except next to the shipping units at the nose of the container/trailer.
 8. The air bags must be a minimum Level 1 air bag or square air bags. The air bags contact the full surface of the shipping units. Minimum air bag sized is one 48 in. x 96 in. air bag at each application location. Use air bags wide enough to extend from 4 in. above the floor to the top of the freight.

NOTE: Do not reuse air bags used for load securement.

9. Air bags may be used to fill crosswise void space from 4 - 12 in. after inflation. When the air bag void is larger than 12 in. after inflation, place additional full-size void fillers capable of withstanding a load of 1,500 psf alongside the air bags. Square air bags may also be used to fill crosswise void space from 12 - 24 in. after inflation.
10. Inflate the air bags to 1 psi or up to 2 psi maximum if the container/trailer has rigid, ribbed sidewall construction (e.g., domestic intermodal truckload carriers or IMC containers). Inflate square bags to 2.5 psi. Follow manufacturers' instructions and recommendations on air bag application and pressure. Recheck air bag pressure after 30 minutes.
11. Secure the air bags from vertical displacement or coming out between shipping unit stacks by use of double-sided tape or other appropriate methods.
12. Leave approximately a 3 ft space or void between the rear of the load and the container/trailer doors.

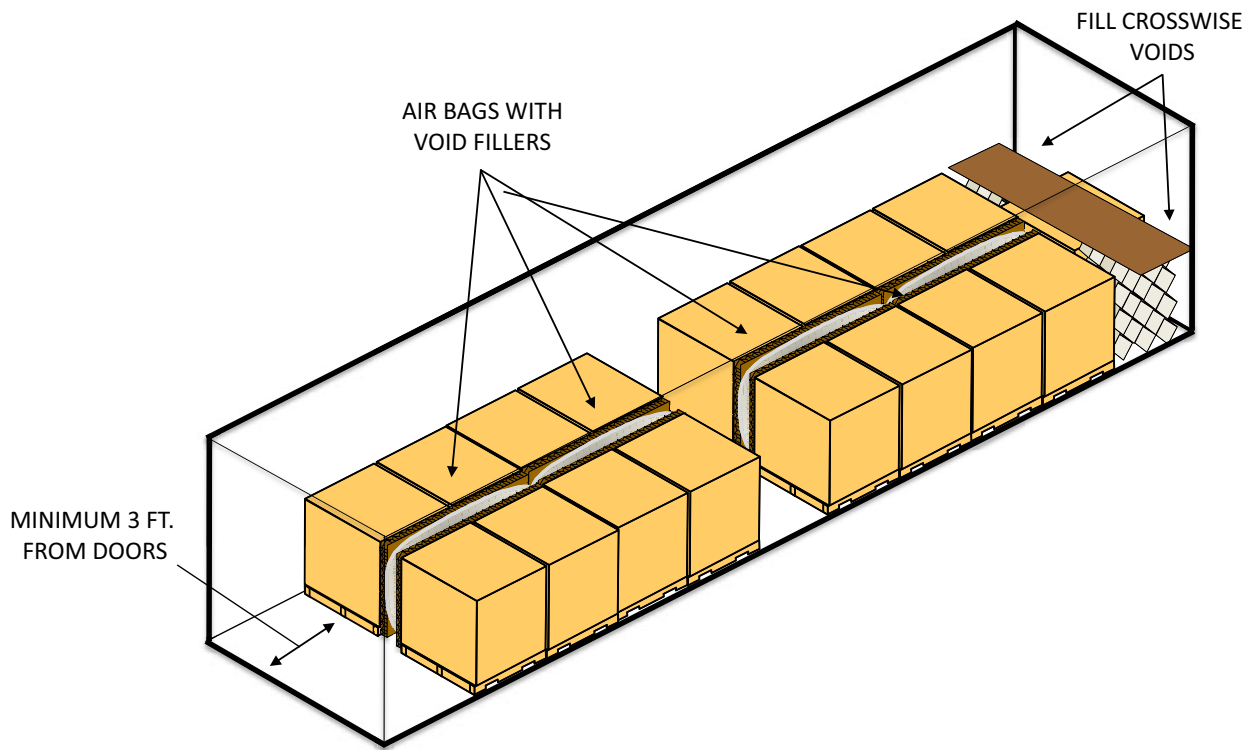


Figure 6.4.2 - 1

Method 6.4.2 - Split loads of case goods or fiberboard tray packs secured with air bags

Method 6.4.3 - Case Goods Secured with Air Bag Systems

(Former Methods F-4 and F-5; Cancels GIS 783, 784, and 817)

- This method is for case goods unitized on pallets or slip sheets and loaded in a single layer.
 - The loads that were tested weighed between 44,000 - 45,000 lbs. The figures show the loads as tested. Depending on container/trailer size and shipping unit size and weight, varying numbers of shipping units may be loaded.
 - Plan the load to equalize the weight on each side and each end of the container. A balanced load is required for the stability and success of this loading method.
1. Unitize case goods on pallets or slip sheets using stretch wrap/film or stretch wrap roping. Wrap the entire unit with at least three successive layers of film and have a minimum of 50 percent overlap coverage of each layer of wrap. Stretch wrap must cover over the top of the unit and contact a minimum of 3 in. of the shipping pallet. See [Section 3.2](#).
 2. Use wall liners, dividers, fiberboard sheets, or other suitable materials to cover rough walls, rough floors, or sidewall projections. Wall liner must be applied between the sidewalls and the air bag system and must extend a minimum of 24 in. beyond each end of the air bag systems in both directions.
 3. Protect the air bag from rough surfaces or pallet edges by using buffer material, divider material, fiberboard sheets, or other suitable materials to protect adjacent air bags. See [Section 3.3](#).
 4. Plan the load so crosswise space is minimized. Use appropriate void fillers to fill all crosswise voids and to prevent crosswise movement. See [Sections 3.1.2](#) and [3.3](#).
 5. Air bags are used to control lengthwise load movement. They air bags must be one of the following air bag systems or an air bag system approved in GIS update documents. See [Section 4.3](#).
 - Tuff Wrap™ Air Bag System
 - Rothschenk S.A.M. Air Bag System (System of Anti-Slip Material)
 - Stopack Max Blocker Air Bag System

NOTE: Do not reuse air bags or air bag systems used for load securement.

6. Place shipping units in the container/trailer against the side walls except where the air bag systems are to be installed. These units are centered in the container/trailer, leaving equal space on each side of the units for the air bag system. Air bag systems can be used to fill cumulative crosswise void space from 12 - 24 in., distributed equally at both sidewalls.
7. Use air bag systems wide enough to extend from 4 in. above the floor to the top of the freight. The length of the air bag system is to be equal to twice the shipping unit length.
8. Inflate air bag systems to 2.5 psi. Follow manufacturers' instructions and recommendations on air bag application and pressure. Each air bag in the system should be inflated in an alternating method and air pressure checked with a working gauge. Recheck air bag pressure after 30 minutes.
9. When shipping units are loaded to the front endwall of the container/trailer, apply the air bag systems in two locations in the load pattern; halfway through the load pallet and at the last two stacks. Each air bag system retains approximately $\frac{1}{2}$ the load. See [Figure 6.4.3 - 1](#).
10. For loads weighing more than 44,000 - 45,000 lbs, divide the load into approximately three equal sections using three air bag systems which each air bag system retaining approximately $\frac{1}{3}$ the load.
11. When shipping units are loaded away from the front endwall of the container/trailer or when there is unfilled lengthwise void or pallet underhang, use air bag systems adjacent to every stack in the load. See [Figure 6.4.3 - 2](#).
12. Alternately use an air bag system at the first two and last two shipping units in the load pattern and use either a square air bag in the center voids or level 1 air bags on each side of the shipping units. See [Figure 6.4.3 - 3](#).

13. Leave approximately a 2 ft space or void between the rear of the load and the container/trailer doors.

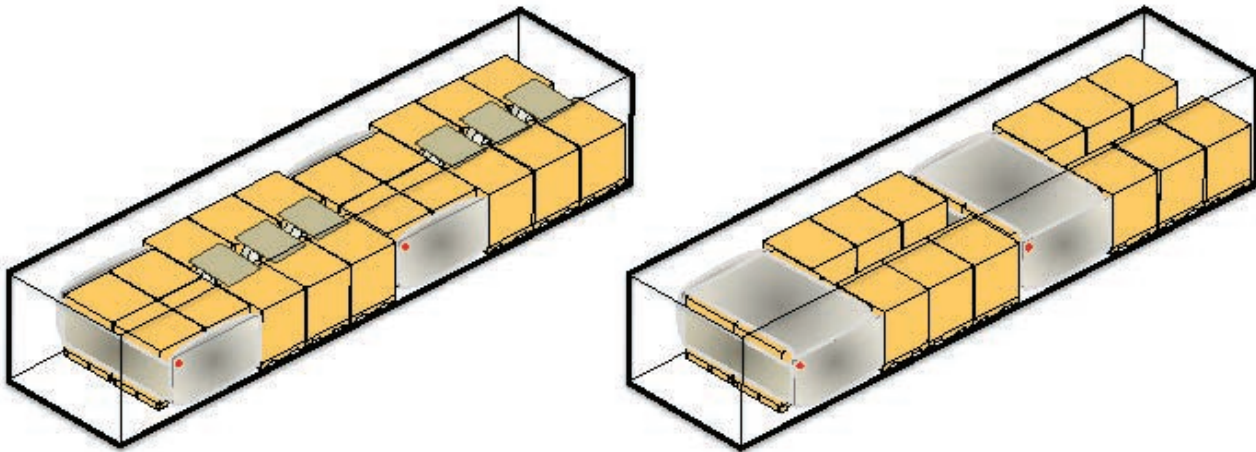


Figure 6.4.3 - 1

Method 6.4.3 - Case goods secured with air bag systems
(Air bag systems with load pattern at the front endwall)

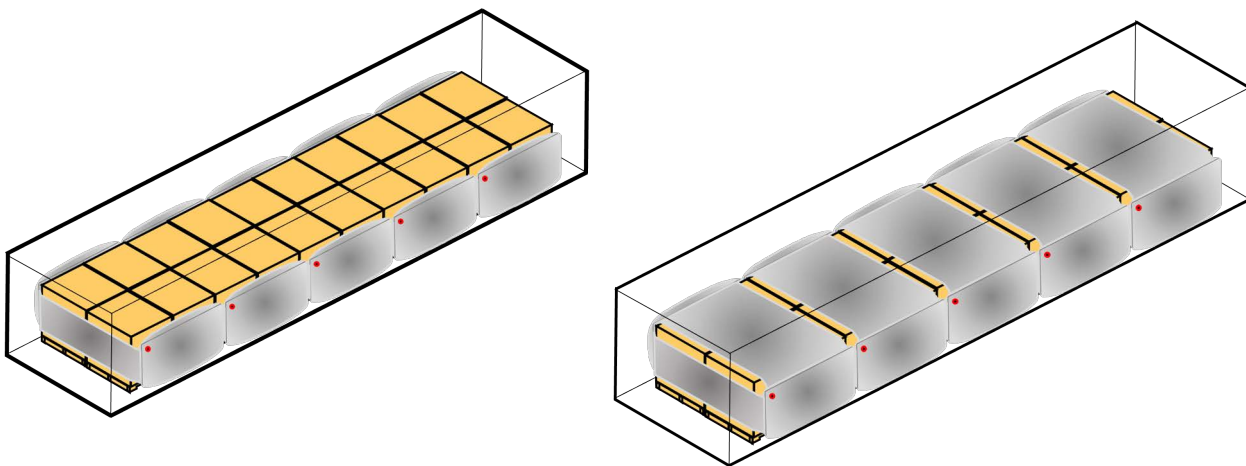


Figure 6.4.3 - 2

Method 6.4.3 - Case goods secured with air bag systems
(Air bag systems with load pattern with lengthwise void)

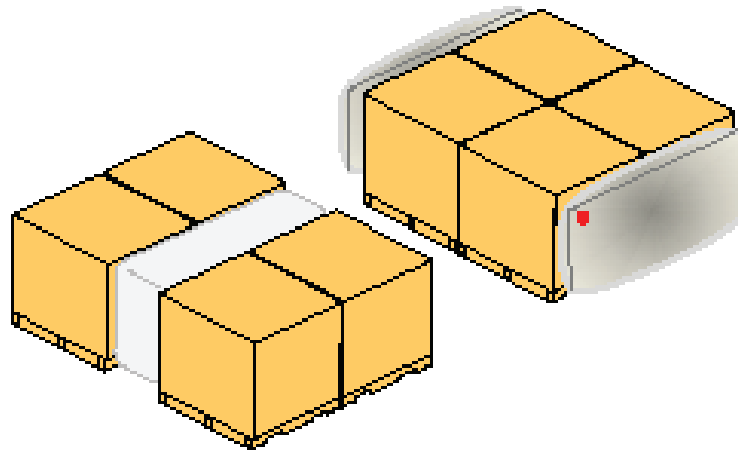


Figure 6.4.3 - 3

Method 6.4.3 - Case goods secured with air bag systems
(Alternative square air bags or level 1 air bags for interior shipping units)

Method 6.4.4 - Case Goods Secured with Stopak Blocker Air Bags (Air Bag System)

(Former Method F-6; Cancels GIS 824)

- This method is for case goods unitized on pallets or slip sheets and loaded in a single layer.
 - The load that was tested weighed 44,000 lbs. The figures show the loads as tested. Depending on container/trailer size and shipping unit size and weight, varying numbers of shipping units may be loaded.
 - Plan the load to equalize the weight on each side and each end of the container. A balanced load is required for the stability and success of this loading method.
1. Unitize case goods on pallets or slip sheets using stretch wrap/film or stretch wrap roping. Wrap the entire unit with at least three successive layers of film and have a minimum of 50 percent overlap coverage of each layer of wrap. Stretch wrap must cover over the top of the unit and contact a minimum of 3 in. of the shipping pallet. See [Section 3.2](#).
 2. Use wall liners, dividers, fiberboard sheets, or other suitable materials to cover rough walls, rough floors, or sidewall projections. Wall liner must be applied between the sidewalls and the air bags and must extend a minimum of 36 in. beyond each end of the air bag system in both directions.
 3. Protect the air bag from rough surfaces or pallet edges by using buffer material, divider material, fiberboard sheets, or other suitable materials to protect adjacent air bags. See [Section 3.3](#).
 4. Plan the load so crosswise space is minimized. Use appropriate void fillers to fill all crosswise voids and to prevent crosswise movement. See [Sections 3.1.2](#) and [3.3](#).
 5. Place shipping units in the container/trailer against the side walls except where the air bags are to be installed. These units are centered in the container/trailer, leaving equal space on each side of the units for the air bags. See [Figure 6.4.4 - 1](#).
 6. Stopak Blocker air bags are used to control lengthwise load movement. Air bags can be used to fill cumulative crosswise void space from 12 - 24 in., distributed equally at both sidewalls. See [Section 4.3](#).

NOTE: Do not reuse air bags or air bag systems used for load securement.

7. Use air bags wide enough to extend from 4 inches above the floor to the top of the freight. The length of the air bag is equal to the length of the shipping unit.
8. Inflate air bags to 2.5 psi. Follow manufacturers' instructions and recommendations on air bag application and pressure. Each air bag should be inflated in an alternating method and air pressure checked with a working gauge. Recheck air bag pressure after 30 minutes.
9. Start the loading pattern with the freight positioned against the front endwall of the container/trailer. Use Stopak Blocker air bag systems at a minimum of four locations in the load pattern, spaced equally though the load pattern. Each air bag system should restrain approximately $\frac{1}{4}$ the load pattern. A Stopak Blocker air bag system must be applied on the last row of any load pattern.
10. For loads weighing more than 44,000 lbs, divide the load into approximately five equal sections using five air bag systems which each air bag system retaining approximately $\frac{1}{5}$ the load.
11. Leave approximately a 3 ft space or void between the rear of the load and the container/trailer doors.

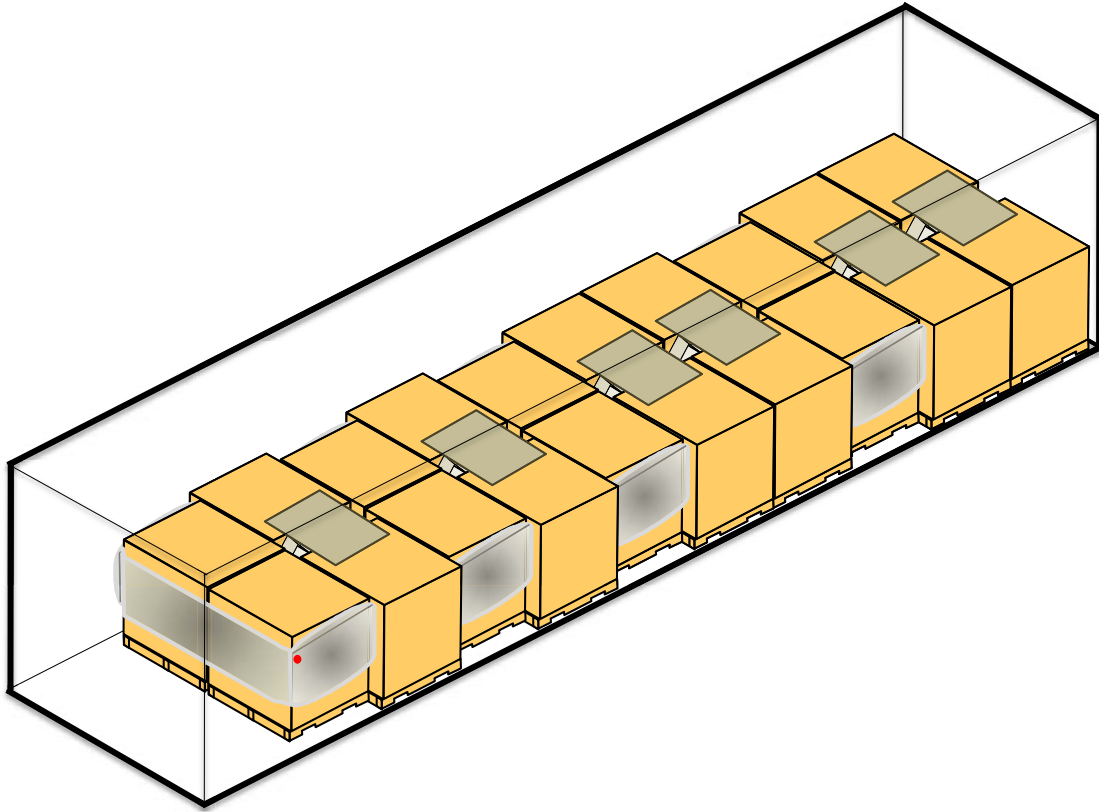


Figure 6.4.4 - 1

Method 6.4.4 - Case goods secured with Stopak Blocker air bags

Method 6.4.5 - Case Goods Secured with Cargo Tuff Dually™ Air Bags (Air Bag System)

(Former Method F-7; Cancels GIS 852)

- This method is for case goods unitized on pallets or slip sheets and loaded in a single layer.
 - The load that was tested weighed 45,000 lbs. The figures show the loads as tested. Depending on container/trailer size and shipping unit size and weight, varying numbers of shipping units may be loaded.
 - Plan the load to equalize the weight on each side and each end of the container. A balanced load is required for the stability and success of this loading method.
1. Unitize case goods on pallets or slip sheets using stretch wrap/film or stretch wrap roping. Wrap the entire unit with at least three successive layers of film and have a minimum of 50 percent overlap coverage of each layer of wrap. Stretch wrap must cover over the top of the unit and contact a minimum of 3 in. of the shipping pallet. See [Section 3.2](#).
 2. Use wall liners, dividers, fiberboard sheets, or other suitable materials to cover rough walls, rough floors, or sidewall projections.
 3. Protect the air bag from rough surfaces or pallet edges by using buffer material, divider material, fiberboard sheets, or other suitable materials to protect adjacent air bags. See [Section 3.3](#).
 4. Plan the load so crosswise space is minimized. Use appropriate void fillers to fill all crosswise voids and to prevent crosswise movement. See [Section 3.1.2](#) and [3.3](#).
 5. Place shipping units in the container/trailer against the side walls.
 6. Cargo Tuff Dually™ air bags are used to control lengthwise load movement. Air bags can be used to fill cumulative crosswise void space from 12 - 24 in. centered in the container/trailer. See [Section 4.3](#).

NOTE: Do not reuse air bags or air bag systems used for load securement.

7. Use air bags wide enough to extend from 4 in. above the floor to the top of the freight. The length of the air bag is equal to twice the shipping unit length.
8. Inflate air bag systems to 2.5 psi. Follow manufacturers' instructions and recommendations on air bag application and pressure. Inflate both bladders of the Dually air bag at the same time using an inflator designed for that purpose. Recheck air bag pressure after 30 minutes.
9. When shipping units are loaded to the front endwall of the container/trailer, apply the Dually air bag in two locations in the load pattern. Halfway through the load pallet and at the last two stacks. Each Dually air bag retains approximately $\frac{1}{2}$ the load. See [Figure 6.4.5 - 1](#).
10. When shipping units are loaded away from the front endwall of the container/trailer or when there is unfilled lengthwise void or pallet underhang, use Dually air bags adjacent to every stack in the load. See [Figure 6.4.5 - 2](#).
11. Leave approximately a 2 ft space or void between the rear of the load and the container/trailer doors.

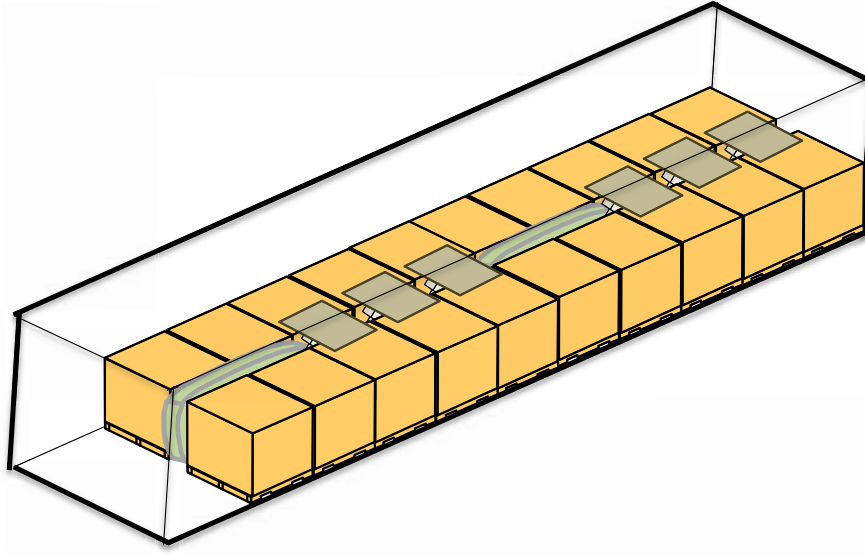


Figure 6.4.5 - 1

Method 6.4.5 - Case goods secured with Cargo Tuff Dually™ air bags
(Load pattern with shipping units at the front endwall)

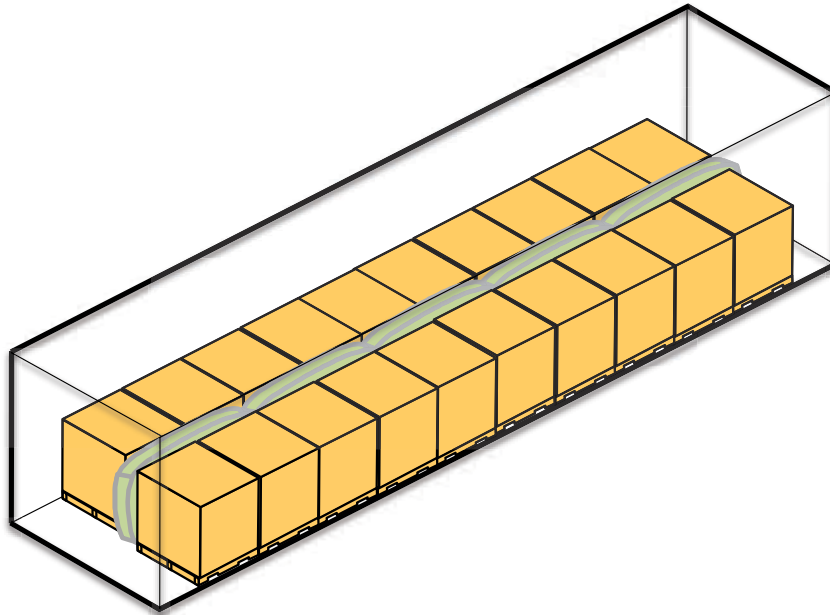


Figure 6.4.5 - 2

Method 6.4.5 - Case goods secured with Cargo Tuff Dually™ air bags
(Load pattern with lengthwise void)

Method 6.4.6 - Case Goods Secured with Floor Blocking and the Super Wedge® XL, Intermodal Wedge® XL, or Intermodal Wedge® (Logistick Inc.)

(Former Method H-14; Cancels GIS 861)

- This method is for case goods unitized on pallets and loaded in a single layer.
 - The load that was tested weighed 44,000 lbs. The figure shows the load as tested. Depending on container/trailer size and shipping unit size and weight, varying numbers of shipping units may be loaded.
 - Plan the load to equalize the weight on each side of the container. A balanced load is required for the stability and success of this loading method.
1. Apply the Super Wedge® XL, Intermodal Wedge® XL, or Intermodal Wedge® (Logistick Inc.) as recommended by the manufacturer. See [Figure 6.4.6 - 1](#).
 - The Super Wedge XL may be used in intermodal containers or trailers with metal lined sidewalls.
 - The Intermodal Wedge XL may be used in domestic intermodal containers or trailers with metal corrugated sidewalls. The wedge must fit the vertical groove of the corrugated sidewall.
 - The Intermodal Wedge may be used in ISO intermodal containers with metal corrugated sidewalls. The wedge must fit the vertical groove of the corrugated sidewall
 2. Unitize case goods on pallets using stretch wrap/film or stretch wrap roping. Wrap the entire unit with at least three successive layers of film and have a minimum of 50 percent overlap coverage of each layer of wrap. Stretch wrap must cover over the top of the unit and contact a minimum of 3 in. of the shipping pallet. See [Section 3.2](#).
 3. Use wall liners, dividers, fiberboard sheets, or other suitable materials to cover rough walls, rough floors, or sidewall projections, except for between the wedges and the sidewall.
 4. Plan the load so crosswise space is minimized. Use appropriate void fillers to fill all crosswise voids and to prevent crosswise movement. See [Sections 3.1.2](#) and [3.3](#).
 5. Logistick Inc. securement system to is used to prevent lengthwise movement in the container/trailer and consists of:
 - The Super Wedge XL, Intermodal Wedge XL, or Intermodal Wedge applied with either 4 in. x 4 in. lumber beams or two 2 in. x 4 in. laminated lumber beams.
 - Lumber floor blocking
 - Void fillers
 6. Divide the load pattern into the needed number of sections, a minimum of three sections. Place shipping units in the container/trailer against the side walls with the palletized units loaded in two rows.
 7. The floor blocking at the end of each intermediate section consists of two 2 in. x 4 in. x width of the container/trailer lumber laminated boards applied tight to the adjacent pallets and nailed to the floor. Use a minimum of ten 16d nails in a staggered nail pattern per layer of lumber. Use 3 1/2 in. thick void filler of sufficient size between sections to fill the void over the lumber floor bracing. See [Sections 3.3.1](#) and [4.1](#).
 8. The floor blocking at the end of section three consists of two 2 in. x 4 in. x width of the container/trailer lumber laminated boards applied tight to the adjacent pallets and nailed to the floor. Use a minimum of ten 16d nails in a staggered nail pattern per layer of lumber. Reinforce the lumber blocking with three backup cleats, each with two 2 in. x 4 in. x 18 in. lumber laminated boards nailed to the floor. Use a minimum of four 16d nails in a staggered pattern. See [Section 4.1](#). See [Figure 6.4.6 - 2](#).
 9. Ensure there is sufficient space between the end of the load and the equipment doors to properly install lumber bracing.

Super Wedge® XL Load Securement Method: (see [Figure 6.4.6 - 3](#))

10. Divide the load into three sections with the palletized units loaded in two rows. Begin loading the units tight to the nose of the container and adjacent to each sidewall.
11. Firmly attach three Super Wedges XL to each sidewall. Space the wedges vertically equidistant to cover the upper $\frac{2}{3}$ of the adjacent unit's height. Position them with enough distance from the face of the load to allow for insertion of 1 in. thick void filler with a minimum 1,500 psf between the lumber beams and the load. See [Section 3.3.1](#).
12. Install either 4 in. x 4 in. lumber beams or two 2 in. x 4 in. laminated lumber beams in the Super Wedges XL. Cut the beams to size according to manufacturer's instruction. Proper installation will result in the container/trailer walls expanding outward slightly.

Intermodal Wedge XL® and Intermodal Wedge® Load Securement Method:

13. Based on the weight of the load and the Intermodal Wedge XL's and Intermodal Wedge's securement capacity – divide the load into the needed number of sections. Contact the manufacturer and the origin rail carrier for specific load planning information. Begin loading the units tight the nose of the container and adjacent to each sidewall.
14. Firmly attach a minimum of three Intermodal Wedges XL or Intermodal Wedges to each sidewall. Additional wedges may be needed based on the weight of the load and the securement capacity of the wedge. Space the wedges vertically equidistant to cover the upper $\frac{2}{3}$ of the adjacent unit's height. Position them with enough distance from the face of the load to allow for insertion of 1 in. thick void filler with a minimum 1,500 psf between the lumber beams and the load. See [Section 3.3.1](#). The wedges must be applied in the vertical grooves of the corrugated sidewalls.
15. Install either 4 in. x 4 in. lumber beams or two 2 in. x 4 in. laminated lumber beams in the Intermodal Wedge XL or Intermodal Wedge. Cut the beams to size according to manufacturer's instruction. Proper installation will result in the container walls expanding outward slightly.
16. The application of Intermodal Wedge XL or Intermodal Wedge may be needed in other locations in the container based on the weight of the load and the securement capacity of the Intermodal Wedge XL or Intermodal Wedge. Contact the manufacturer and the origin rail carrier for specific load planning information.

**Figure 6.4.6 - 1**

Method 6.4.6 - Case goods secured with floor blocking and the Super Wedge® XL, Intermodal Wedge® XL, or Intermodal Wedge® (Logistick Inc.)
(Top view of application of wedges)

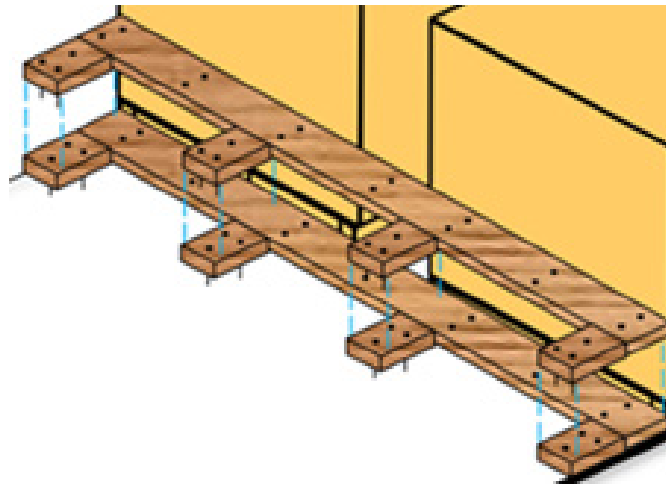


Figure 6.4.6 - 2

Method 6.4.6 - Case goods secured with floor blocking and the Super Wedge® XL, Intermodal Wedge® XL, or Intermodal Wedge® (Logistick Inc.)
 (Laminating lumber floor blocking)

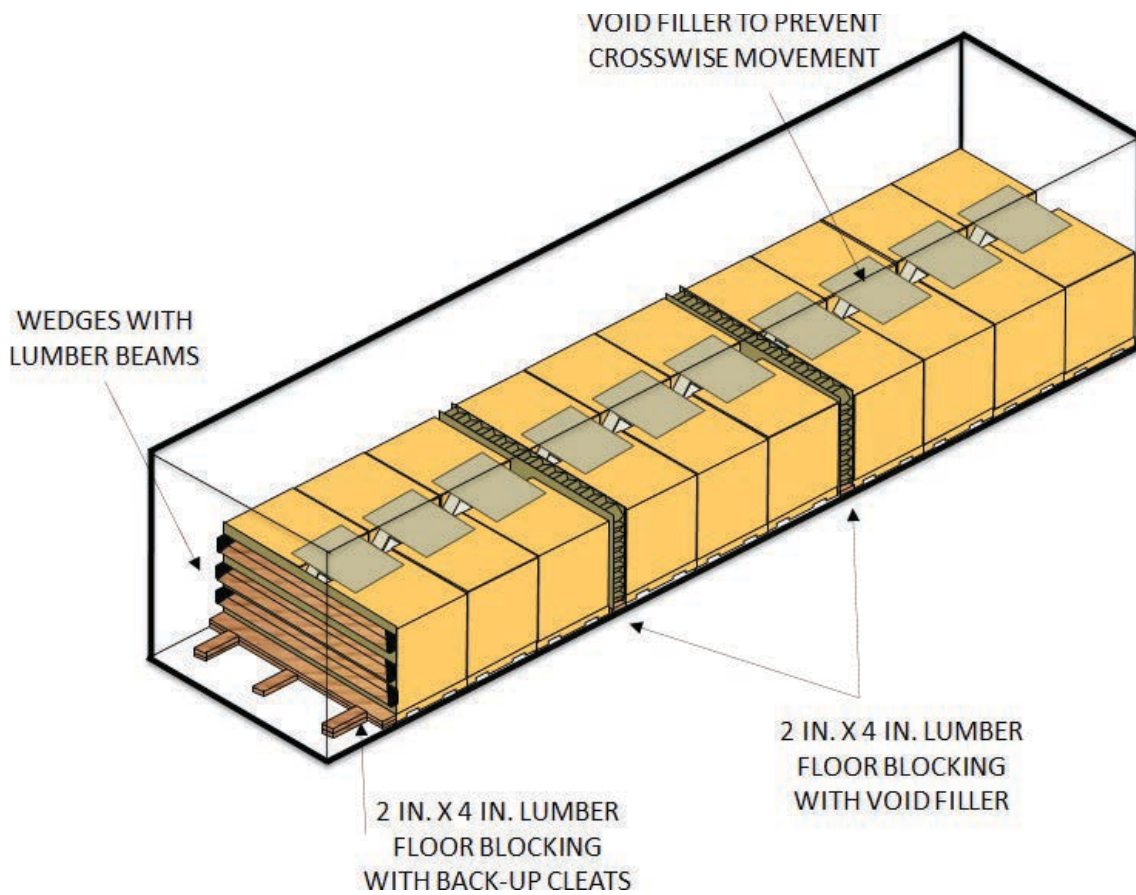


Figure 6.4.6 - 3

Method 6.4.6 - Case goods secured with floor blocking and the Super Wedge® XL, Intermodal Wedge® XL, or Intermodal Wedge® (Logistick Inc.)
 (Application of floor blocking with the Super Wedge XL)

6.5 Palletized Freight & Bulk Bins

Number	Load Securement Method	Hazmat	Former Method
6.5.1	Bulk Boxes Secured with Floor Blocking and Ty-Gard 2000® or DS® Barriers	HM*	B-6 (cancels GIS 798)
6.5.2	Palletized Flat Paper Stock Secured Using Rubber Mats and Air Bags		E-15
6.5.3	Palletized Roofing Shingles Secured Using Rubber Mats		E-16
6.5.4	Palletized Commodities Secured Using Web Strap Assemblies and Floor Blocking		H-6
6.5.5	Palletized or Crated Auto Parts Secured by Web Strap Assemblies in 53-ft. Containers		H-16 (cancels GIS 822)

Method 6.5.1 - Bulk Boxes Secured with Floor Blocking and Ty-Gard 2000® or DS® Barriers
 (Former Method B-6; Cancels GIS 798)


- This method is for bulk fiberboard boxes secured to pallets, bulk bins, or similar shipping units. Freight is loaded in a single layer.
 - This method uses Ty-Gard 2000® or DS® barriers and wood floorblocking
 - When used with containers with corrugated sidewalls, follow the contour of the corrugations. When used in trailers or containers without corrugated sidewalls, equipment walls must have horizontally oriented sidewall panels.
 - Plan the load to equalize the weight on each side of the container. A balanced load is required for the stability and success of this loading method.
1. Divide the load into two sections. Each section should contain approximately 1/2 the weight of the load.
 2. Load the bulk containers in two rows, one against each sidewall, starting at the nose of the container/trailer.
 3. Place guide rails of 2 in. × 4 in. lumber in the center void adjacent to each row. Center the guide rails 18 in. from each end of each section. Secure with 12d power-driven nails. See [Section 4.1.3](#). A center void filler is required in the last stack in each section, behind the barriers, to maintain the shipping unit's position. See [Sections 3.1.2](#) and [3.3](#). See [Figure 6.5.1 - 1](#).
 4. Use plywood sheets, 1/2 in. × 4 ft × 8 ft, as buffer sheets between the shipping units and the Ty-Gard barriers.
 5. Use appropriate corner protectors under the Ty-Gard barriers to protect the barriers from the edges of the buffer sheets and to prevent crushing of the bulk containers at the corners.
 6. The loading pattern may be secured with either Ty-Gard 2000 or DS barriers. Follow manufacturer's instructions for application. See [Section 4.5.1](#) and [Figure 6.5.1 - 2](#).
 7. For Ty-Gard 2000, apply two 16 in. wide Ty-Gard 2000 barriers to each section. Each strip is a minimum of 60 in. long. Apply the adhesive strip to each sidewall located 36 in. back from the face of the load. Pull the Ty-Gard strips across the face of the load, overlapping ends by at least 12 in. and tension, following manufacturer's instruction, using Ty-Gard tools. The tension barriers are then sealed with 48 in. long strips of Ty-Patch bonded to the Ty-Gard Barriers.
 8. For Ty-Gard DS, apply one 24 in. wide Ty-Gard barrier to each section. Each strip is a minimum of 75 in. long. Apply the adhesive strip each sidewall located 24 in. back from the face of the load. Tension and seal all Ty-Gard barriers in accordance with manufacturer's instruction with the noted number of overlapping ends and patch application.
 9. Nail laminated 2 in. × 6 in. × 8 ft crosswise floor blocking 3 in. from the face of the last section using thirty-six 12d power-driven nails (eighteen nails per layer). Placing the floor blocking 3 in. away from the face is crucial to the success of this method of bracing. This allows the Ty-Gard barrier to receive the initial forces, and then the floor blocking can work in conjunction with the barrier. See [Section 4.1](#).
 10. Nail four 2 in. × 6 in. × 18 in. laminated backup cleats perpendicular to the floor blocking using eight 12d power-driven nails (four nails per layer). Stagger the nails to prevent splitting of the lumber.

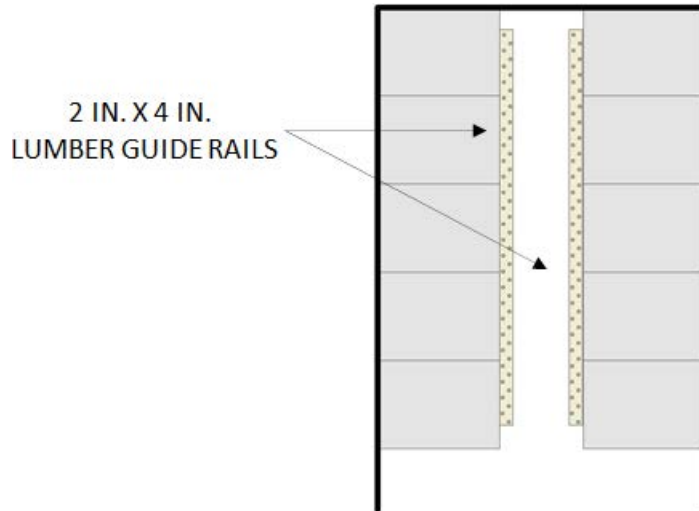


Figure 6.5.1 - 1- Center void filler

Method 6.5.1 - Bulk boxes secured with floor blocking and Ty-Gard 2000® or DS® barriers

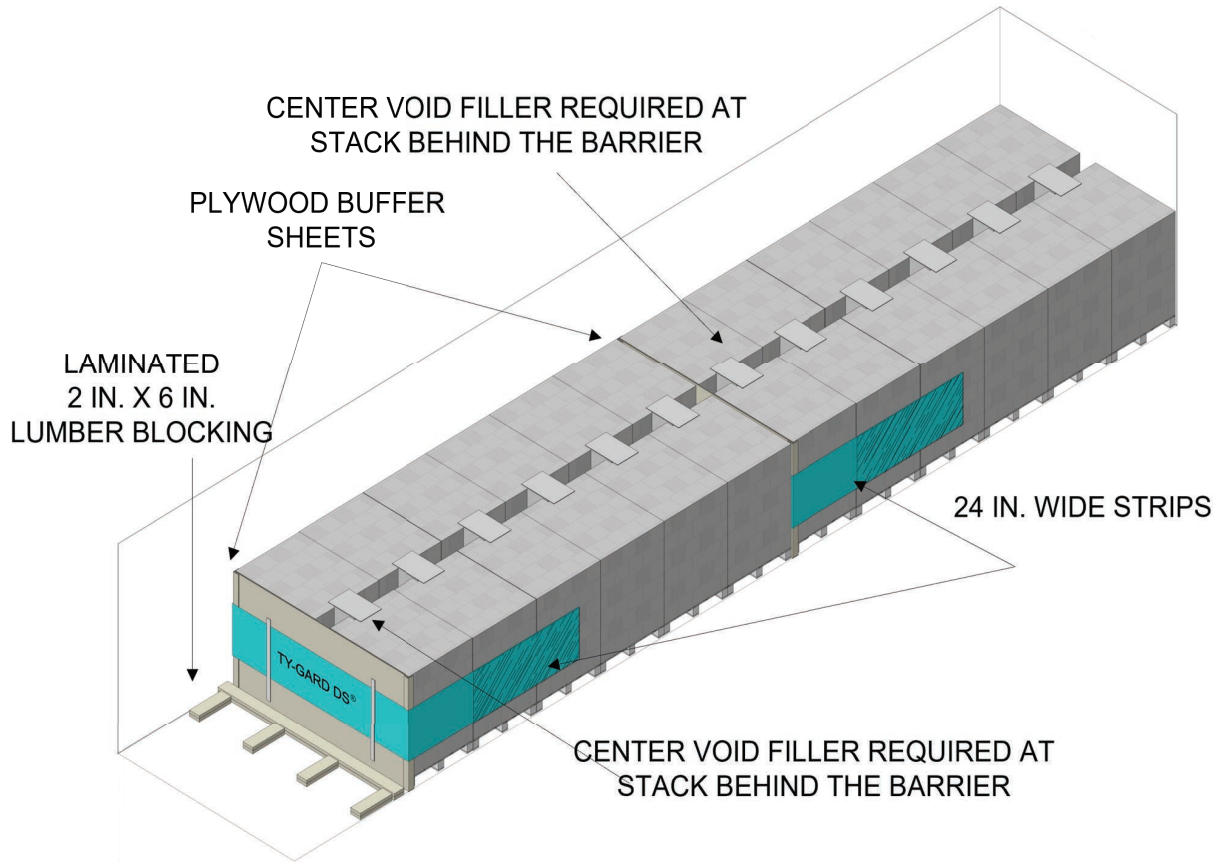


Figure 6.5.1 - 2

Method 6.5.1 - Bulk boxes secured with floor blocking and Ty-Gard 2000® or DS® barriers

Method 6.5.2 - Palletized Flat Paper Stock Secured Using Rubber Mats and Air Bags

(Former Method E-15)

- This method is for palletized sheet flat paper stock or palletized boxed flat paper stock. Freight is loaded in a single layer. The figure shows the load as tested. Depending on container/trailer size and shipping unit size and weight, varying numbers of shipping units may be loaded.
 - Only use containers or trailers with wood floors.
 - Plan the load to equalize the weight on each side and end of the container. A balanced load is required for the stability and success of this loading method.
1. For the current listing of AAR-verified rubber friction mats and information on the verification process refer to the *Product Performance Profile for Rubber Friction Mats - Product Verification List* and AAR General Information Bulletin No. 10, *Product Performance Profile for Rubber Friction Mats*. Both documents can be referenced at <https://aar.com/standards/damage-publications.php>. See [Section 4.4](#).
 2. AAR-verified rubber friction mats applied for this loading method are to be 3 mm (0.125 in.) thick.
 3. Unitize flat paper on pallets using stretch wrap/film or stretch wrap roping. Wrap the entire unit with at least three successive layers of film and have a minimum of 50 percent overlap coverage of each layer of wrap. Stretch wrap must cover over the top of the unit and contact a minimum of 3 in. of the shipping pallet. Alternatively, packaging straps may be used to secure the flat paper stock to the pallet or skid. See [Figure 6.5.2 - 1](#) and [Sections 3.2](#) and [4.2](#).
 4. Position a 4 ft wide rubber mat strip down the center of the container/trailer extending from the equipment nose. This mat extends under all but the last two stacks/pallets in the load.

NOTE: Do not use rubber mats that are torn, contaminated or otherwise damaged in any way. It is not recommended to reuse rubber mats when applied to prevent lengthwise movement in the container or trailer.

5. Load the first stack consisting of two units with one unit placed against the nose and a sidewall and the other unit placed against the nose and the opposite sidewall. Load the following stacks with two unit stacks loaded against alternate sidewalls and one unit stack centered in the trailer. Follow this load configuration until reaching the last two stacks in the load. See [Figure 6.5.2 - 2](#).
6. Fill all crosswise void space with appropriate filler material. Use void fillers or lumber floor blocking except in the last two stacks where an air bag is utilized. See [Sections 3.1, 3.3, and 4.1.3](#).
7. Load the last two stacks consisting of two pallets each with one placed in each stack against each sidewall. Place a 4 ft × 4 ft rubber mat under each pallet in the last two stacks.
8. Position one air bag, minimum Level 1, lengthwise in the center void of the last two stacks. Use an air bag long enough to extend over two stacks and wide enough to extend from 4 in. above the floor to the top of the shipping units. Minimum air bag size is 36 in. × 84 in. See [Section 4.3](#).
9. Air bags may be used to fill crosswise void space from 4 - 12 in. after inflation. When the air bag void is larger than 12 in. after inflation, place additional full-size void fillers capable of withstanding a load of 1,500 psf alongside the air bags.
10. Inflate the air bags to 1 psi or up to 2 psi maximum if the container/trailer has rigid, ribbed sidewall construction (e.g., domestic intermodal truckload carriers or IMC containers). Follow manufacturers' instructions and recommendations on air bag application and pressure. Recheck air bag pressure after 30 minutes.

NOTE: Do not reuse air bags used for load securement.

11. For the current listing of AAR-verified pneumatic dunnage (air bags) and information on the verification process refer to the *Product Performance Profile for Pneumatic Dunnage - Product Verification List* and the AAR General Information Bulletin No. 9, *Product Performance Profile for Pneumatic Dunnage*. Both documents can be referenced at <https://aar.com/standards/damage-publications.php>.
12. Leave approximately a 3 ft space or void between the rear of the load and the container/trailer doors.

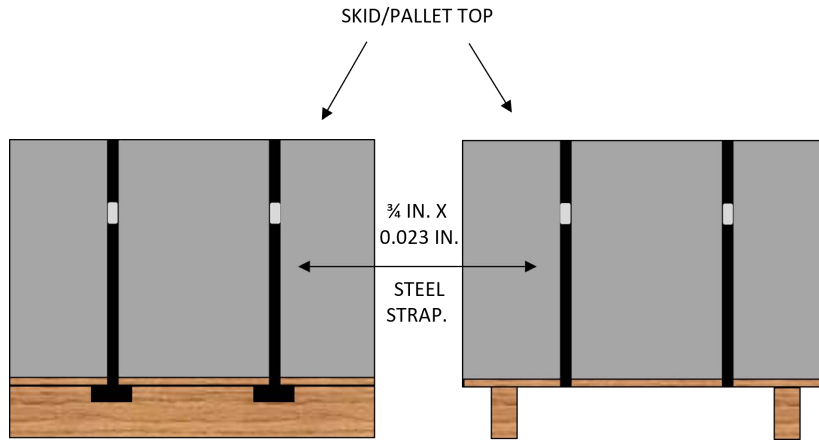


Figure 6.5.2 - 1 - Packaging straps unitization

Method 6.5.2 - Palletized flat paper stock secured using rubber mats and air bags

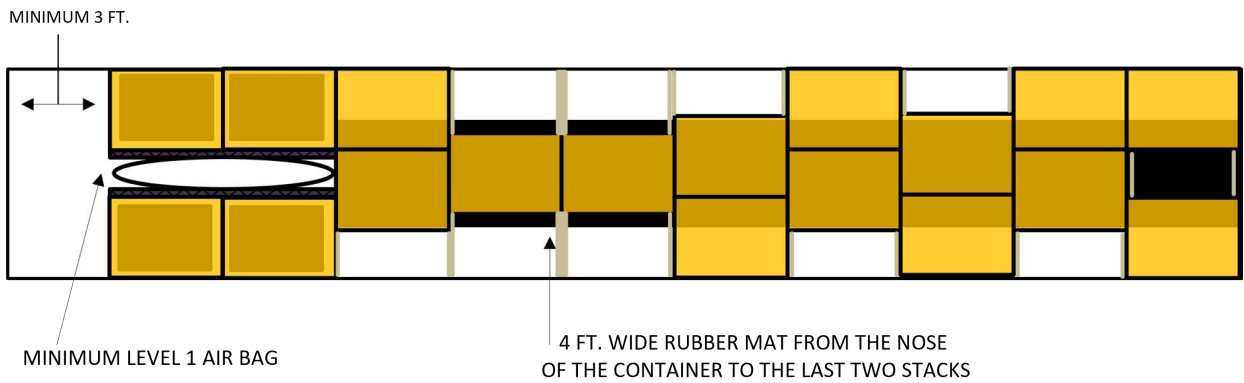


Figure 6.5.2 - 2

Method 6.5.2 - Palletized flat paper stock secured using rubber mats and air bags

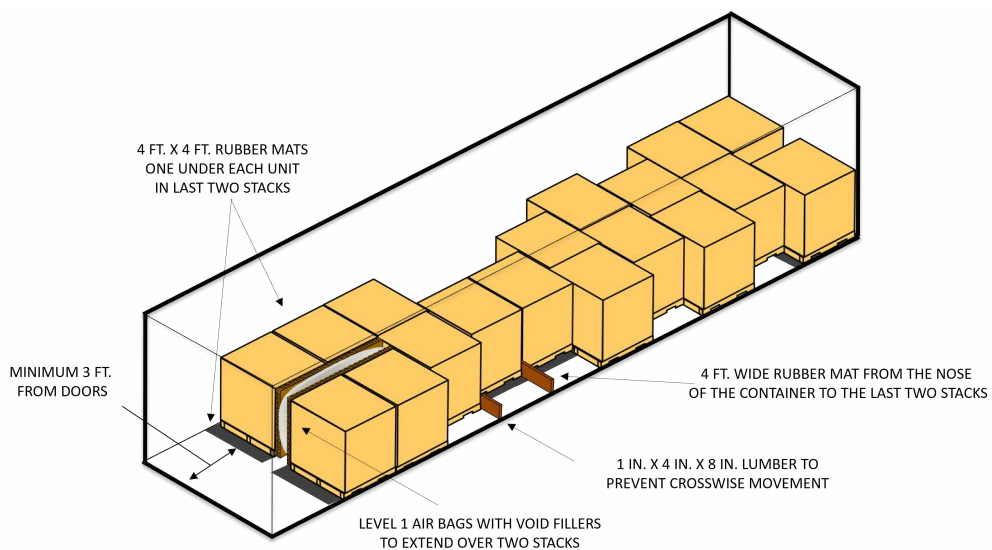


Figure 6.5.2 - 3

Method 6.5.2 - Palletized flat paper stock secured using rubber mat and air bags

Method 6.5.3 - Palletized Roofing Shingles Secured with Rubber Mats

(Former Method E-16)

- This method is for roofing shingles on double-deck pallets. Freight is loaded in a single layer. The figure shows the load as tested. Depending on container/trailer size and shipping unit size and weight, varying numbers of shipping units may be loaded.
 - Only use containers or trailers with wood floors.
 - Plan the load to equalize the weight on each side and end of the container. A balanced load is required for the stability and success of this loading method.
1. For the current listing of AAR-verified rubber friction mats and information on the verification process refer to the *Product Performance Profile for Rubber Friction Mats - Product Verification List* and AAR General Information Bulletin No. 10, *Product Performance Profile for Rubber Friction Mats*. Both documents can be referenced at <https://aar.com/standards/damage-publications.php>. See [Section 4.4](#).
 2. AAR-verified rubber friction mats applied for this loading method are to be 3 mm (0.125 in.) thick.
 3. Unitize shingles on pallets using stretch wrap/film or stretch wrap roping. Wrap the entire unit with at least three successive layers of film and have a minimum of 50 percent overlap coverage of each layer of wrap. Stretch wrap must cover over the top of the unit and contact a minimum of 3 in. of the shipping pallet. See [Section 3.2](#).
 4. Divide the load into two sections with two rows per section. Each section should contain approximately 1/2 the weight of the load. The first sections consist of two rows of pallets loaded down the center of the container. Adjust the void at the nose of the container and between the first and second sections, to provide proper weight distribution based on pallet weight and size and equipment size. Leave approximately a 3 ft space or void between the rear of the load and the container/trailer doors. See [Figure 6.5.3 - 1](#).
 5. Load each row in each section on a 1 ft wide rubber mat centered under each row. The rubber mat extends 6 in. from under the front and rear of each row. Do not secure the rubber mats to the container/trailer floor.

NOTE: Do not use rubber mats that are torn, contaminated or otherwise damaged in any way. It is not recommended to reuse rubber mats when applied to prevent lengthwise movement in the container or trailer.

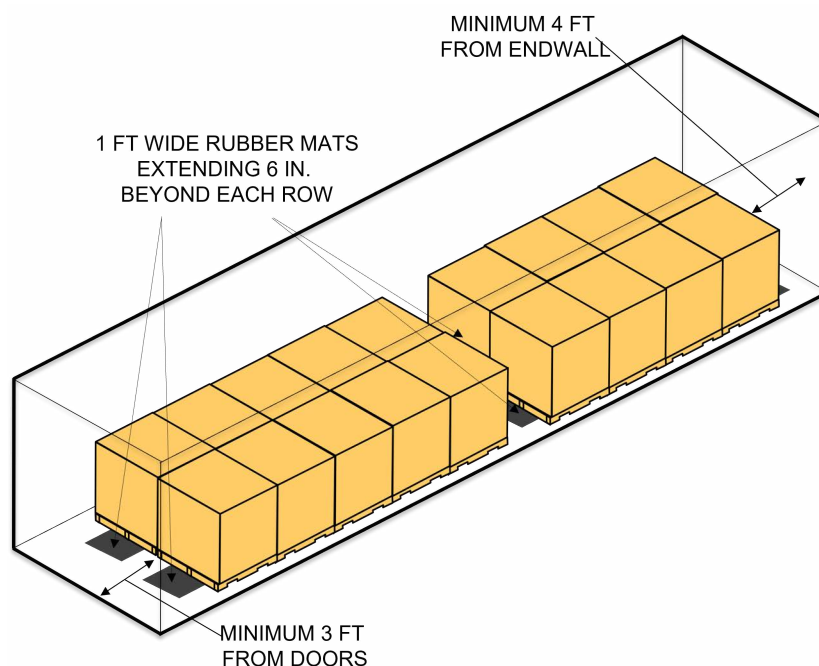


Figure 6.5.3 - 1
Method 6.5.3 - Palletized roofing shingles secured using rubber mats

Method 6.5.4 - Palletized Commodities Secured Using Web Strap Assemblies and Floor Blocking
(Former Method H-6)

- This method is for palletized commodities. Freight is loaded in a single layer. The figure shows the load as tested. Depending on container/trailer size and shipping unit size and weight, varying numbers of shipping units may be loaded.
 - Plan the load to equalize the weight on each side and end of the container. A balanced load is required for the stability and success of this loading method.
1. Unitize commodities on pallets using stretch wrap/film or stretch wrap roping. Wrap the entire unit with at least three successive layers of film and have a minimum of 50 percent overlap coverage of each layer of wrap. Stretch wrap must cover over the top of the unit and contact a minimum of 3 in. of the shipping pallet. See [Section 3.2](#).
 2. Load palletized units in two rows. When crosswise void space exceeds 4 in., alternate stacks against opposite sidewalls and use appropriate crosswise void fillers. Line container/trailer with single-wall corrugated fiberboard. See [Sections 3.1.2](#) and [3.3](#). See [Figure 6.5.4 - 1](#).
 3. Select containers/trailers that are equipped with suitable logistic tracks or post at locations consistent with the load plan. It is the shipper's responsibility to inspect and ensure that they are in sound condition and that the load does not exceed the capacity of the logistic tracks or posts. See [Section 4.2.5](#).
 4. If trailers are not equipped with anchor attachments, install 5 ft long series "E" belt rails. Install two per sidewall, positioned 1 ft and 3 ft above the trailer floor. Position them lengthwise so that belt rails extend approximately 1 ft beyond the rear face of the load. Attach each belt rail section to three sidewall posts using twelve 1/8 in. x 1 in. long self-tapping metal screws (four screws per sidewall post).
 5. Web strap assemblies are comprised of the following components (see [Section 4.2.4](#)):
 - Three-piece anchors (parallel loading) - 4,500 lb. capacity
 - Ratchet-type buckle - 15,000 lb. capacity
 - Polyester webbing (16 ft.) - 9,500 lb. tensile capacity
 6. Secure 1 3/4 in. web strap assemblies to the logistic tracks/post/belt rails approximately 2 ft behind the load face.
 7. Install single-wall corrugated fiberboard sheets between units in the last four stacks.
 8. Install two sheets of corrugated fiberboard between the units in the last stack and the sidewalls at the strap anchor locations.
 9. Position one air bag, minimum Level 1, lengthwise in the center void of the last two stacks. Use an air bag long enough to extend over two stacks and wide enough to extend from 4 in. above the floor to the top of the shipping units. Minimum air bag size is 48 in. x 96 in. See [Section 4.3](#).

NOTE: Do not reuse air bags used for load securement.

10. Inflate the air bags to 1 psi or up to 2 psi maximum if the container/trailer has rigid, ribbed sidewall construction (e.g., domestic intermodal truckload carriers or IMC containers). Follow manufacturers' instructions and recommendations on air bag application and pressure. Recheck air bag pressure after 30 minutes.
11. For the current listing of AAR-verified pneumatic dunnage (air bags) and information on the verification process refer to the *Product Performance Profile for Pneumatic Dunnage - Product Verification List* and the AAR General Information Bulletin No. 9, *Product Performance Profile for Pneumatic Dunnage*. Both documents can be referenced at <https://aar.com/standards/damage-publications.php>.
12. Install a 3/4 in. plywood sheet at the rear of the load. Gate height should be equal to load height and 2 in. less than the container/trailer width. Nail three 2 in. x 6 in. x 36 in. uprights to the plywood sheet with six 6d nails each. See [Section 4.1](#).

13. Connect the web straps across the gate. Follow manufacturer's instruction on securing and tension the web strap using the ratchet buckle. Use a buckle handle extension tool to achieve sufficient tension. Secure the straps in position by stapling or taping the straps to the middle gate upright.
14. Nail laminated 2 in. × 6 in. × 60 in. crosswise floor blocking 12 in. from the rear of the load using twenty 12d power-driven nails per layer.
15. Nail four 2 in. × 6 in. × 18 in. laminated backup cleats perpendicular to the floor blocking using eight 16d power-driven nails each. Stagger the nails to prevent splitting of the lumber.

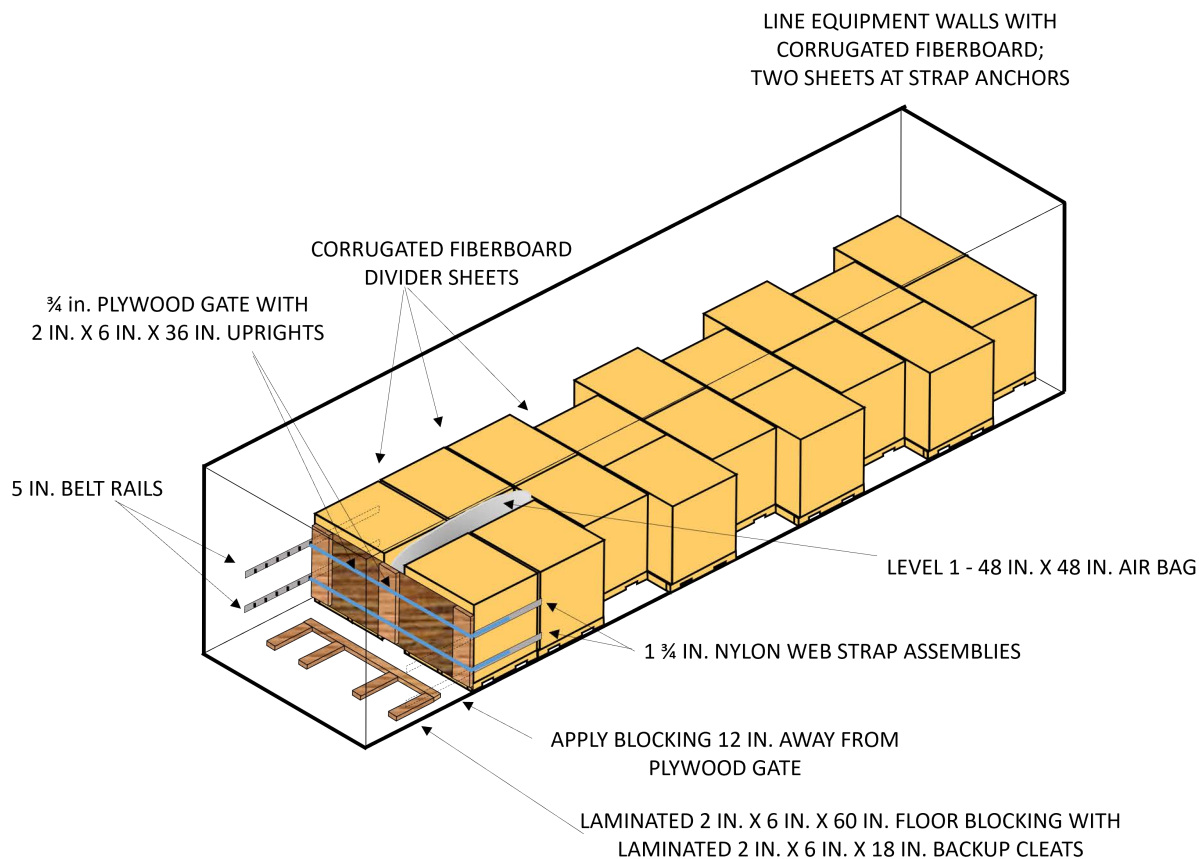


Figure 6.5.4 - 1

Method 6.5.4 - Palletized commodities secured using web strap assemblies and floor blocking

Method 6.5.5 - Palletized or Crated Auto Parts Secured by Web Strap Assemblies in 53-ft. Containers
(Former Method H-16; Cancels GIS 822)

- This method is for palletized or crated auto parts with a total load weight not to exceed 22,000 lbs.
 - Containers are to be 53 ft long and have E-tracks and corrugated steel walls.
 - Plan the load to equalize the weight on each side and end of the container. A balanced load is required for the stability and success of this loading method.
1. Unitize auto parts on pallets using stretch wrap/film or stretch wrap roping. Wrap the entire unit with at least three successive layers of film and have a minimum of 50 percent overlap coverage of each layer of wrap. Stretch wrap must cover over the top of the unit and contact a minimum of 3 in. of the shipping pallet. See [Section 3.2](#).
 2. Crated auto parts are secured to ensure auto parts remain in the crates in-transit. Stacked crates must nest and interlock together. Crates should have a max load capacity of 2,400 lbs. and be able withstand stacking weight of 26,400 lbs.
 3. Pallets or crates are stagger loaded against opposite side walls and with no lengthwise space between pallets or crates in the container. See [Sections 3.1.2](#) and [3.3](#). See [Figure 6.5.5 - 1](#).
 4. Partial layers must be securely blocked to prevent tipping in-transit. See [Section 3.1.3](#).
 5. Only crates are to be loaded where web strapping will be applied and tensioned.
 6. Select containers that are equipped with welded E-track anchors at locations consistent with the load plan. It is the shipper’s responsibility to inspect and ensure that they are in sound condition and that the load does not exceed the capacity of the E-Track anchors. See [Section 4.2.5](#).
 7. The loading pattern will be secured with AAR-approved 2 in. x 16 ft woven polyester web strapping with E-fittings and ratchets. Reference Open Top Loading Rules - Section 1 - *General Rules for Loading All Committees - Rule 20 - Synthetic Webbing and Assemblies* and *AAR-approved Web Assemblies and/or Tensioning Devices* Table for the current AAR-approved web strapping at <https://aar.com/standards/OpenTop-approvals.html> and <https://my.aar.org/otlr>.
 8. The number and location of straps applied will be based on the total weight of the load. See [Table 6.5.5 - 1](#). All loads must have a minimum of two web straps. See [Section 4.2.4](#).

Table 6.5.5 - 1 - Web strap application

Number of Straps	Minimum Weight	Maximum Weight	Application
2	0 lbs.	7,000 lbs.	End of shipment
3	7,001 lbs.	10,500 lbs.	End of shipment
6	10,501 lbs.	22,000 lbs.	3 - Straps at 80% of shipment 3 - Straps at end of shipment

9. Attach the web strap’s E-fittings to the container’s E-tracks 12 - 18 in. behind the face of the crate on each side of the container. If crates are double stacked apply at least one strap around each crate at or above the mid-height of the crate.
10. Apply and secure E-fittings and web strapping per manufacturer’s instructions. Use ratchet to fully tension web strapping to manufacturer’s instructions.

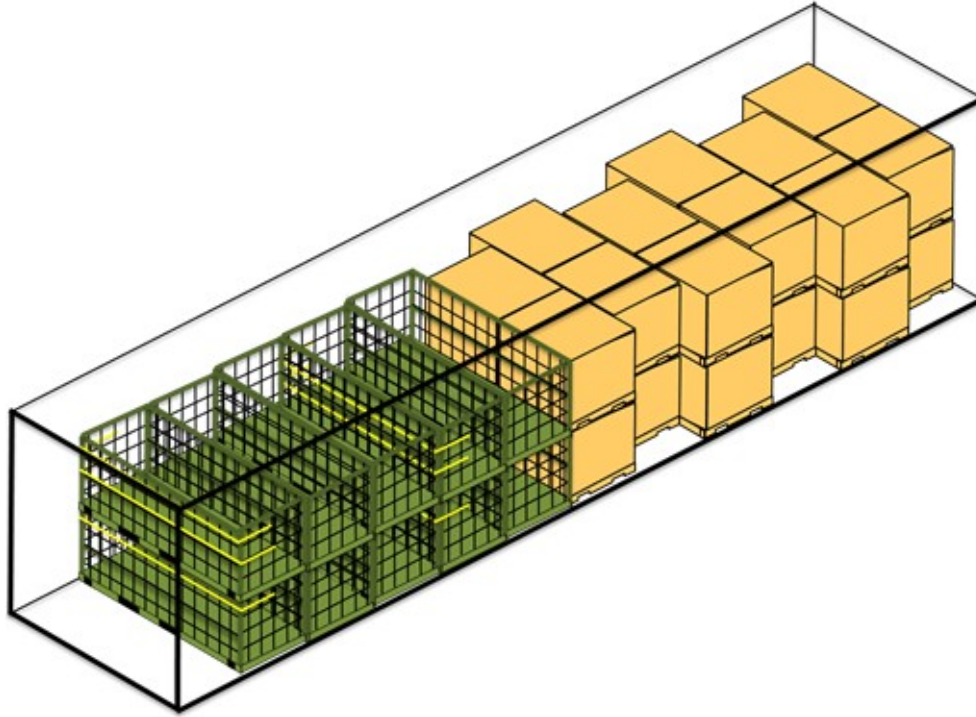


Figure 6.5.5 - 1

Method 6.5.5 - Palletized or crated auto parts secured by web strap assemblies in 53-ft containers

6.6 Coils and Wire Cables

Number	Load Securement Method	Former Method
6.6.1	Coils on Skids with Rubber Mats in Refrigerated Equipment	E-1
6.6.2	Coils on Skids with Rubber Mats	E-2
6.6.3	Wire Cable Coils in Cradles Using Guide Rails and Rubber Mats	E-3
6.6.4	Metal Coils on Skids/Platforms or in Cradles Secured by Web Straps Attached to Cargo Sleds in 20-ft. Containers	H-11

Method 6.6.1 - Coils on Skids with Rubber Mats in Refrigerated Equipment

(Former Method E-1)

- This method is for coils on skids. Freight is loaded in a single layer.
 - Only use refrigerated equipment with “T”-rail or ribbed floors.
 - Plan the load to equalize the weight on each side and end of the container. A balanced load is required for the stability and success of this loading method.
1. For the current listing of AAR-verified rubber friction mats and information on the verification process refer to the *Product Performance Profile for Rubber Friction Mats - Product Verification List* and AAR General Information Bulletin No. 10, *Product Performance Profile for Rubber Friction Mats*. Both documents can be referenced at <https://aar.com/standards/damage-publications.php>. See [Section 4.4](#).
 2. AAR-verified rubber friction mats applied for this loading method are to be 6 mm (0.250 in.) thick.
 3. If individual coil weight exceeds 3,500 lbs, individual carrier approval must be gained for concentrated weights. See [Section 1.7](#).
 4. Coils are unitized to skids with appropriate packaging straps with an inter-sectional seal used to prevent slippage of the packaging straps. See [Sections 3.2](#) and [4.2](#). Any lengthwise underhang of the coils on the skids is to be filled.
 5. Load a maximum of six coils loaded in two sections. Position coils to give proper weight distribution lengthwise in the container/trailer. No section may have a single coil skid. See [Figure 6.6.1 - 1](#).
 6. Install rubber mat 6 ft longer than each section of coils. Place each section of coils 3 ft from each end of the rubber mat. The location of the nose unit may be less than 3 ft due to weight distribution considerations. Have the width of the rubber mat greater than the width of the skid. It is recommended that mat width be no more than 4 - 8 in. greater than skid width.
- NOTE:** Do not use rubber mats that are torn, contaminated or otherwise damaged in any way. It is not recommended to reuse rubber mats when applied to prevent lengthwise movement in the container or trailer.
7. Load two or three coils as a unit at the nose of the equipment. Place the remaining coils as a unit at least 3 ft from the doors of the container/trailer.
 8. Unitize each section of coils vertically by running a strap under the skid and then over the top of the coils. Use a minimum of AAR-approved 1¹/₄ in. × 0.029 in. steel straps. Secure straps with the correct seal in accordance with manufacturer's instructions. Tension and seal the straps using proper tensioning and sealing tools. See [Section 4.2.2](#).
 9. Apply guide rails, 1 in. × 3 in. lumber boards, placed on edge in the “T”-rail channels of the floor, adjacent to the rubber mat. The lumber boards run the full length of the equipment.
 10. Apply 2 in. × 4 in. backup cleats that are equal in length to the space between the guide rail and the side of the equipment. Use a minimum of three per section on each side of the coils, keeping them evenly spaced. Nail the backup cleats to the guide rail to prevent displacement. Do not nail to the equipment floor. See [Section 4.1](#).

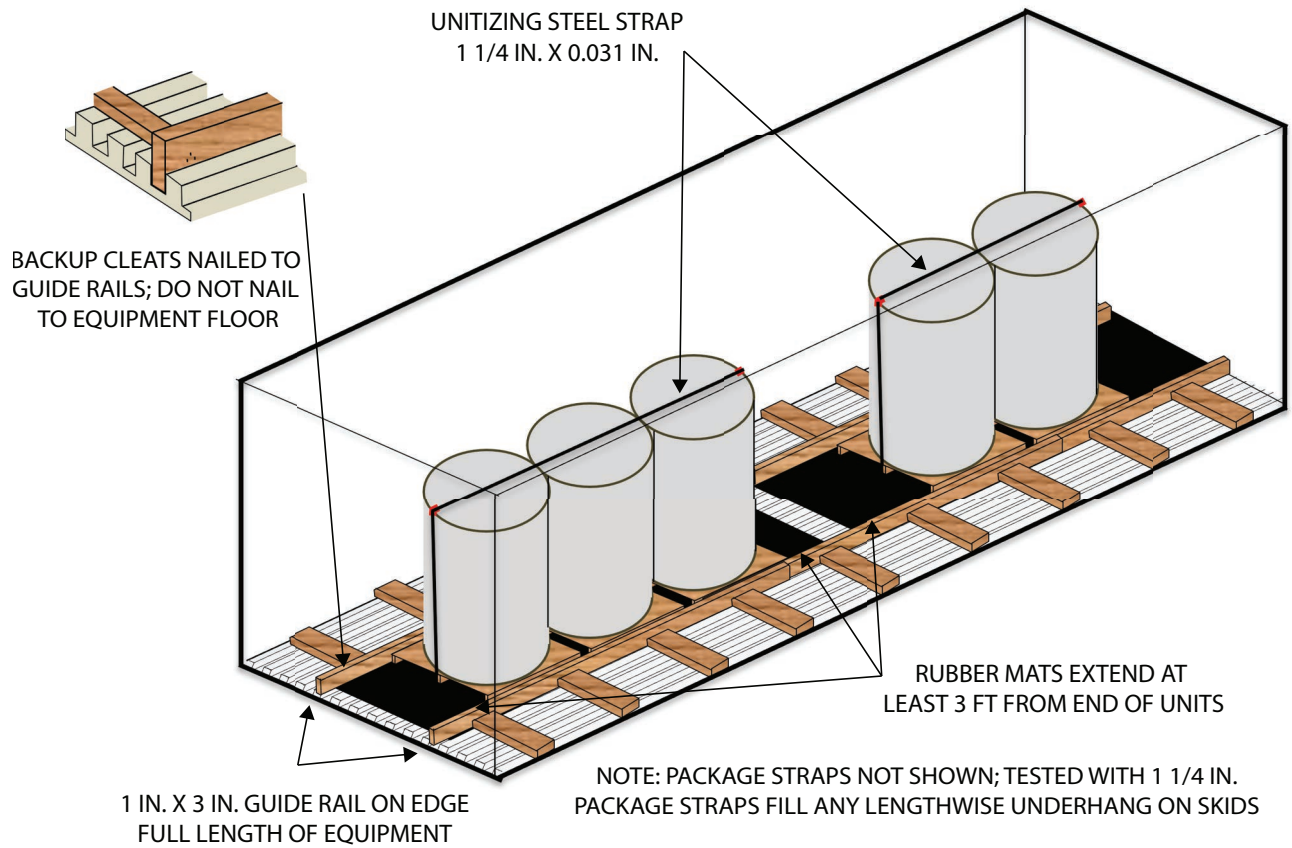


Figure 6.6.1 - 1

Method 6.6.1 - Coils on skids with rubber mats in refrigerated equipment

Method 6.6.2 – Coils on Skids with Rubber Mats

(Former Method E-2)

- This method is for coils on skids. Freight is loaded in a single layer.
 - Only use containers or trailers with hard wood floors.
 - Plan the load to equalize the weight on each side and end of the container. A balanced load is required for the stability and success of this loading method.
1. For the current listing of AAR-verified rubber friction mats and information on the verification process refer to the *Product Performance Profile for Rubber Friction Mats - Product Verification List* and AAR General Information Bulletin No. 10, *Product Performance Profile for Rubber Friction Mats*. Both documents can be referenced at <https://aar.com/standards/damage-publications.php>. See [Section 4.4](#).
 2. AAR-verified rubber friction mats applied for this loading method are to be 6 mm (0.250 in.) thick.
 3. If individual coil weight exceeds 3,500 lbs, individual carrier approval must be gained for concentrated weights. See [Section 1.7](#).
 4. Coils are unitized to skids with appropriate packaging straps with an inter-sectional seal used to prevent slippage of the packaging straps. See [Sections 3.2](#) and [4.2](#). Any lengthwise underhang of the coils on the skids is to be filled.
 5. Load a maximum of six coils loaded in two sections. Position coils to give proper weight distribution lengthwise in the trailer. No section may have a single coil skid. See [Figure 6.6.2 - 1](#).
 6. Install rubber mat 6 ft longer than each section of coils. Place each section of coils 3 ft from each end of the rubber mat. The location of the nose unit may be less than 3 ft due to weight distribution considerations. Have the width of the rubber mat greater than the width of the skid. It is recommended that mat width be no more than 4 - 8 in. greater than skid width.

NOTE: Do not use rubber mats that are torn, contaminated or otherwise damaged in any way. It is not recommended to reuse rubber mats when applied to prevent lengthwise movement in the container or trailer.

7. Load two or three coils as a unit at the nose of the equipment. Place the remaining coils as a unit at least 3 ft from the doors of the container/trailer.
8. Unitize each section of coils vertically by running a strap under the skid and then over the top of the coils. Use a minimum of AAR-approved 1 1/4 in. × 0.029 in. steel straps. Secure straps with the correct seal in accordance with manufacturer's instructions. Tension and seal the straps using proper tensioning and sealing tools. See [Section 4.2.2](#).
9. Apply 2 in. × 4 in. guide rails as long as each rubber mat on each side of each unit, adjacent to the rubber mat. Secure guide rails with 12d nails staggered every 6 in. See [Section 4.1](#).

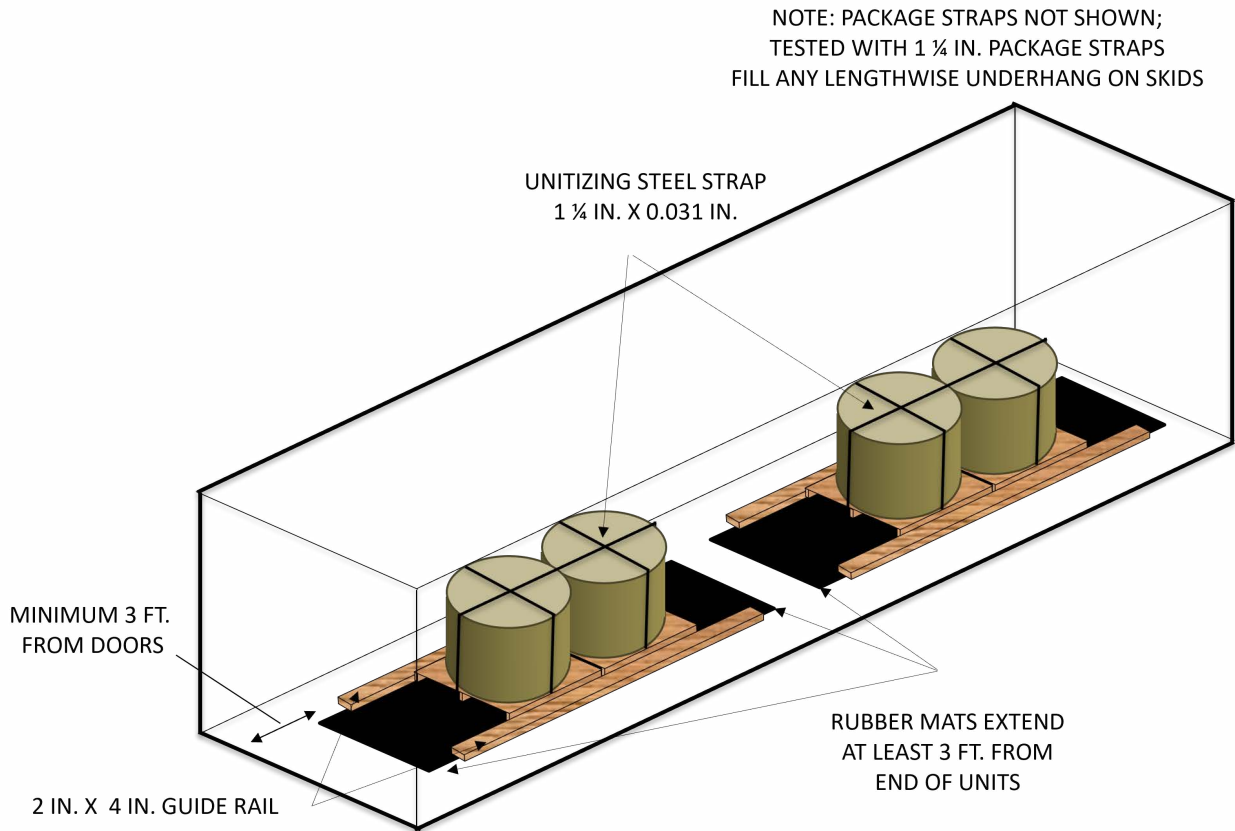


Figure 6.6.2 - 1
Method 6.6.2 - Coils on skids with rubber mats

Method 6.6.3 - Wire Cable Coils in Cradles Using Guide Rails and Rubber Mats

(Former Method E-3)

- This method is for small to large coils of wire cable on cradles. Some loading shift may occur using this loading pattern.
 - Only use containers or trailers with hard wood floors.
 - Plan the load to equalize the weight on each side and end of the container. A balanced load is required for the stability and success of this loading method.
1. For the current listing of AAR-verified rubber friction mats and information on the verification process refer to the *Product Performance Profile for Rubber Friction Mats - Product Verification List* and AAR General Information Bulletin No. 10, *Product Performance Profile for Rubber Friction Mats*. Both documents can be referenced at <https://aar.com/standards/damage-publications.php>. See [Section 4.4](#).
 2. AAR-verified rubber friction mats applied for this loading method are to be 3 mm (0.125 in.) thick.
 3. If individual coil weight exceeds 3,500 lbs, individual carrier approval must be gained for concentrated weights. See [Section 1.7](#).
 4. Package coils with minimum AAR-approved 1¼ in. x 0.029 in. steel straps. Dependent on coil size, use up to six straps longitudinally threaded through the eye of the coil and equally spaced around the coil's circumference. See [Section 4.2.2](#) and [Figure 6.6.3 - 1](#).
 5. Construct wood cradles from 4 in. x 4 in. lumber. The cradles have a length and width minimum to the same dimensions of the wire coils. Support the wire coils on the cradles with 2 in. x 4 in. lumber that are bolted to the cradles. See [Sections 3.5](#) and [4.1](#).
 6. Secure the wire coils to the cradles by wrapping one AAR-approved 1¼ in. x 0.029 in. steel strap laterally around the outside of the wire coil and the support blocking. See [Figure 6.6.3 - 2](#).
 7. Divide the total weight of the coils into two approximately equal sections. Load three to four coils in each section. Position each section give proper weight distribution lengthwise in the container/trailer. Load the second section of coils at least 3 ft from the doors of the container/trailer. See [Figure 6.6.3 - 3](#).
 8. Place rubber mats to extend 3 - 4 in. beyond each end of each coil section. If more than one rubber mat is required under a coil section overlay the ends of the rubber mats 4 to 6 in.

NOTE: Do not use rubber mats that are torn, contaminated or otherwise damaged in any way. It is not recommended to reuse rubber mats when applied to prevent lengthwise movement in the container or trailer.

9. Unitize each section with a minimum of three AAR-approved 1¼ in. x 0.029 in. steel straps. Thread the straps longitudinally through the eyes of the coils at the 4, 8, and 12 o'clock positions on the coil.
10. On each side of coil sections nail two 2 in. x 4 in. lumber guide rails adjacent to each other using minimum 12d nails, staggered every 4 in. Place guide rails at least ½ - 1 in. from the outer edge of the cradles on each side. The extra width allows the load to float within the guide rail. Extend the guide rails 3 ft past each end of each section.

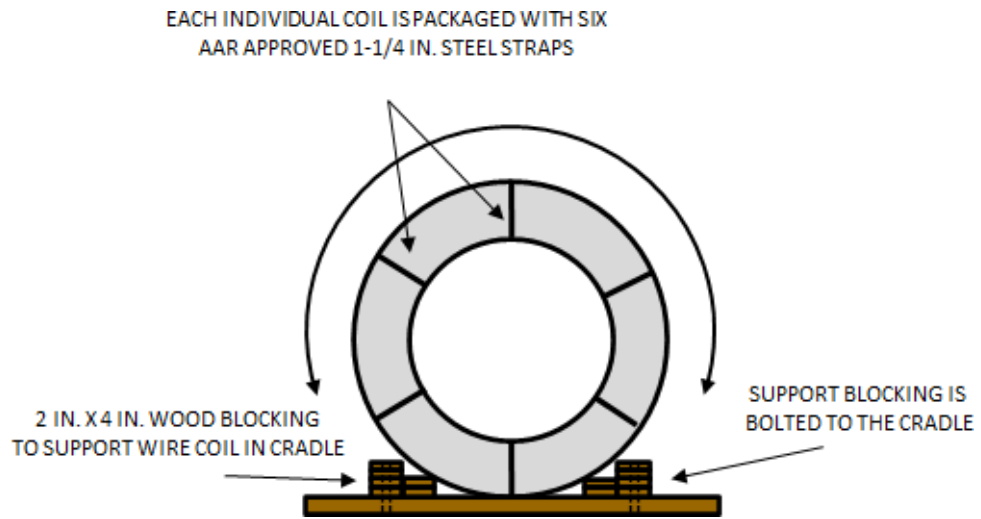


Figure 6.6.3 - 1

Method 6.6.3 - Wire cable coils in cradles using guide rails and rubber mats

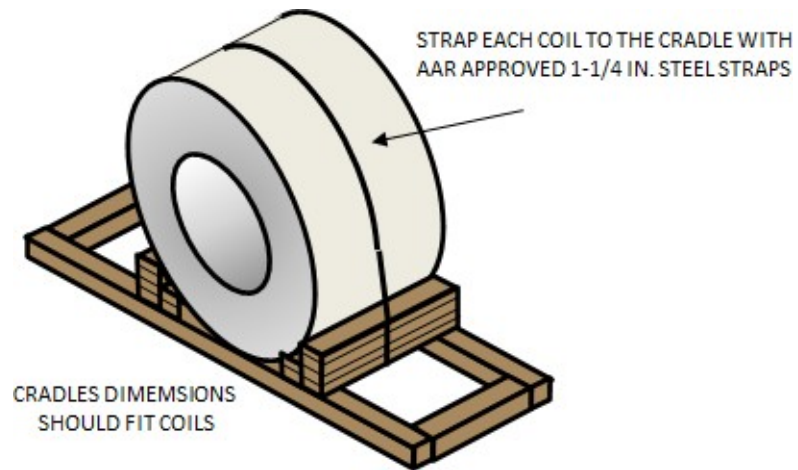


Figure 6.6.3 - 2

Method 6.6.3 - Wire cable coils in cradles using guide rails and rubber mats

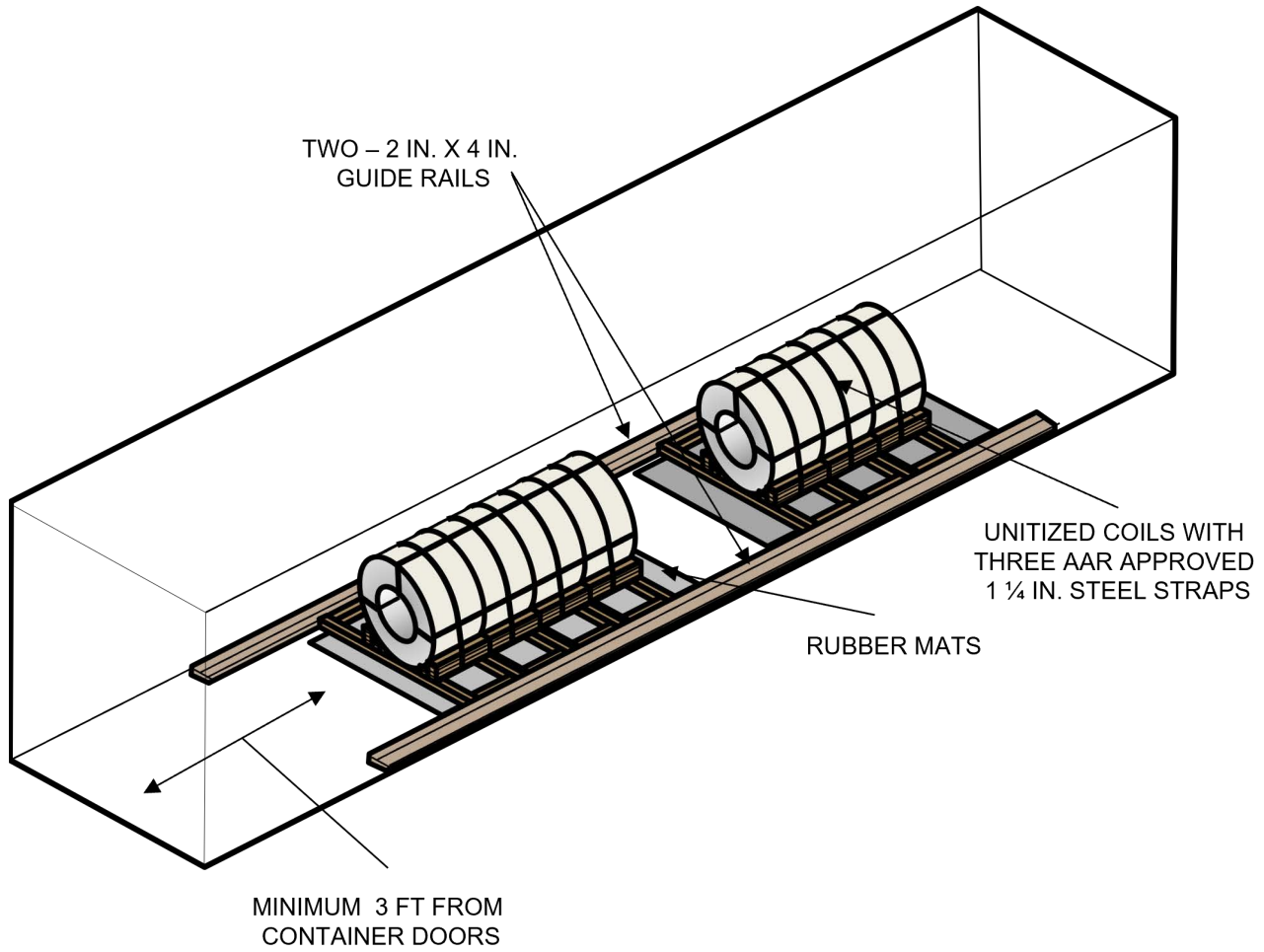


Figure 6.6.3 - 3

Method 6.6.3 - Wire cable coils in cradles using guide rails and rubber mats

Method 6.6.4 - Metal Coils on Skids/Platforms or in Cradles Secured by Web Straps Attached to Cargo Sleds in 20-ft. Containers

(Former Method H-11)

- This method is for small (3,500 lbs.) to large (25,000 lbs.) metal coils on skids/platforms with eyes vertical or horizontal or secured to cradles, loaded on a cargo sled.
 - The shipper is responsible for inspecting the container to ensure that it is suitable to carry the freight to destination. There must be no obvious damage, distress, weakened parts or weakened sections. Any exception is cause for rejection.
 - Plan the load to equalize the weight on each side and end of the container. A balanced load is required for the stability and success of this loading method.
1. If individual coil weight exceeds 3,500 lbs, individual carrier approval must be gained for concentrated weights. See [Section 1.7](#).
 2. Coils are unitized to skids/platforms with a minimum AAR-approved 1 1/4 in. x 0.029 in. steel straps or equivalent stretch film roping method. See [Sections 3.2](#) and [4.2](#).
 3. The following cargo sled has been evaluated and found acceptable for this loading method:

Name	Vendor
Universal Cargo Sled (UCS) with anchor points and bracing chocks	Holland Company

4. Load the coil skids/platform down the center of the cargo sled while maintaining proper load balance and freight load limits. Coils may be loaded two wide when foam spacers or equivalent are used between coils. Secure the spacers in place to maintain position during transit. See [Figure 6.6.4 - 1](#) and [Figure 6.6.4 - 2](#).
5. Position coils loaded on cradles down the center of the sled. Place a sufficient number of lumber on each side of each coil to adequately nest the coil and restrict lateral movement. The amount of lumber used is determined by the coil size. See [Sections 3.5](#) and [4.1](#). See [Figure 6.6.4 - 3](#).
6. The loading pattern will be secured with AAR-approved 4 in. web strapping with E-fittings and ratchets. Reference Open Top Loading Rules - Section 1 - *General Rules for Loading All Committees - Rule 20 - Synthetic Webbing and Assemblies* and AAR-approved Web Assemblies and/or Tensioning Devices Table for the current AAR-approved web strapping at <https://aar.com/standards/OpenTop-approvals.html> and <https://my.aar.org/otlr>.
7. Anchor each single coil and/or side-by-side combination using 4 in. wide web strap assemblies. Place a sufficient number of strap assemblies around the front and rear of each single or side-by-side coil units at the base of the coil(s). For coils, bilge or cradle loaded, apply 4 in. wide web strap assemblies though the center or eye of the coils. See [Table 6.6.4 - 1](#).
8. Place a sufficient number of web strap assemblies across the top of each single coil greater than 36 in. in width/height and over each single coil loaded in the bilge position or in a cradle. See [Table 6.6.4 - 1](#).
9. Anchor web straps to the cargo sled using “B” hooks inserted into the anchor points located along each side of the sled. Use web strap assemblies (strap, ratchets, and related hardware) with a minimum load rating of 18,000 lbs. Apply and secure web strapping per manufacturer’s instructions. Use a ratchet to fully tension the strapping. Ensure straps are straight with no twists before tensioning. Use corner protectors as needed to protect the straps from sharp edges. See [Section 4.2.4](#).
10. Load the cargo sled into the 20 ft container. Properly place and position the blocking chocks in the doorway bull-board slots on each side of the cargo sled.

Table 6.6.4 - 1 - Web strap application

Coils Upright on Skids/Platforms			Coils on Bilge Cradles		
Coil Weight (lbs)	Strap Assembly's Base/Coil	Strap Assembly's Top/Coil (width > 36 in.)	Coil Weight (lbs)	Strap Assembly's Core/Coil	Strap Assembly's Top/Coil
< 10,001	2	1	< 10,001	2	1
10,001 - 15,000	2	1	10,001 - 15,000	2	1
15,001 - 20,000	2	1	15,001 - 20,000	2	1
20,001 - 25,000	4	2	20,001 - 25,000	2	1

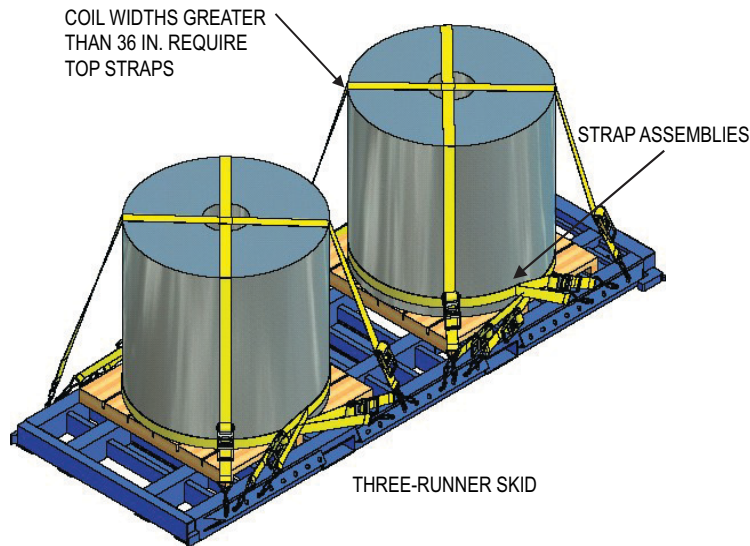


Figure 6.6.4 - 1 - Coils loaded vertically

Method 6.6.4 - Metal coils on skids/platforms or in cradles secured by web strap attached to cargo sleds in 20-ft containers

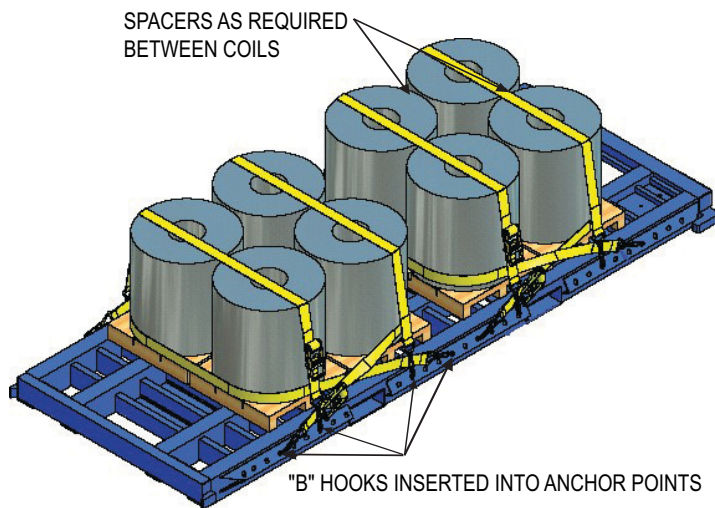


Figure 6.6.4 - 2 - Coils loaded side-by-side

Method 6.6.4 - Metal coils on skids/platforms or in cradles secured by web strap attached to cargo sleds in 20-ft containers

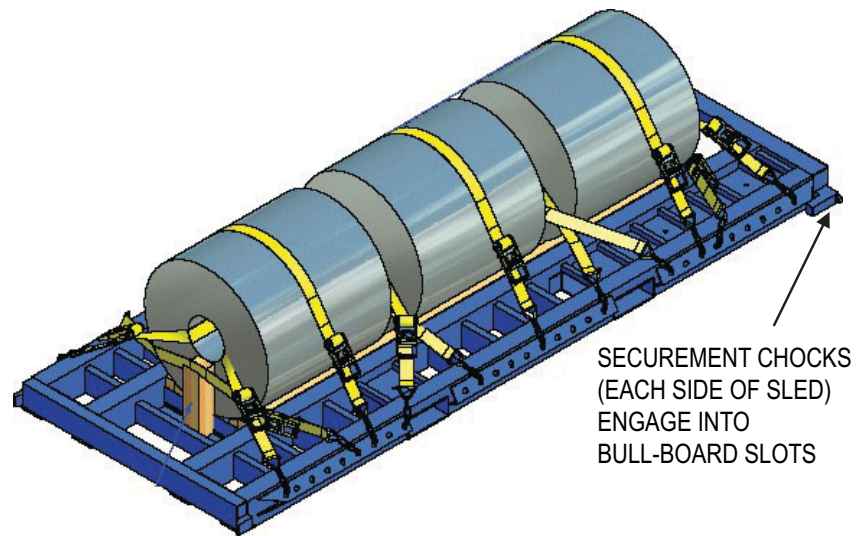


Figure 6.6.4 - 3 - Coils loaded on bilge or in cradles

Method 6.6.4 - Metal coils on skids/platforms or in cradles secured by web strap attached to cargo sleds in 20-ft containers

6.7 Lumber and Brick

Number	Load Securement Method	Former Method
6.7.1	Dimensional Lumber Secured by Floor Blocking and Air Bags	G-6
6.7.2	Brick Secured with Floor Blocking and Ty-Gard 2000® Barriers	B-5

Method 6.7.1 - Dimensional Lumber Secured by Floor Blocking and Air Bags
(Former Method G-6)

- This method is for dimensional lumber.
 - Plan the load to equalize the weight on each side of the container. A balanced load is required for the stability and success of this loading method.
1. Unitize each stack of lumber approximately 2 ft from each end with a minimum of one AAR-approved strap either 1¹/₄ in. × 0.029 in. steel strap or Type 1A Grade 4 nonmetallic strap. Stacks positioned at the container doorway should have a minimum of two AAR-approved unitizing straps either 1¹/₄ in. × 0.029 in. steel straps or Type 1A Grade 4 nonmetallic straps around the doorway end. Secure straps with the correct buckle or seal in accordance with manufacturer's instructions. Tension and seal the straps using proper tensioning and sealing tools. Use corner protectors to protect both the strapping and the lumber. See [Section 4.2](#).
 2. Load the lumber units lengthwise in two rows in the container or trailer. Load the lumber units starting at the front endwall. See [Figure 6.7.1 - 1](#).
 3. Position air bags vertically, minimum Level 1, in the center void to maintain crosswise alignment. Apply at least one air bag between each lumber stack. Air bags are a minimum 30 in. wide and approximately equal in height to the lumber units. See [Section 4.3](#).
 4. Position air bags 1 in. above equipment floor. Space filled by air bags should not exceed 12 in. after inflation. Use single-wall corrugated fiberboard sheets (minimum) on each side of the air bag.
 5. Inflate the air bags to 1 psi or up to 2 psi maximum if the transportation vehicle is of rigid, ribbed sidewall construction (e.g., domestic intermodal truckload carriers or IMC containers). Follow manufacturers' instructions and recommendations on air bag application and pressure. Recheck air bag pressure after 30 minutes.

NOTE: Do not reuse air bags used for load securement.

6. For the current listing of AAR-verified pneumatic dunnage (air bags) and information on the verification process refer to the *Product Performance Profile for Pneumatic Dunnage - Product Verification List* and the AAR General Information Bulletin No. 9, *Product Performance Profile for Pneumatic Dunnage*. Both documents can be referenced at <https://aar.com/standards/damage-publications.php>.
7. Apply lumber floor blocking at the doorway end of each row. Blocking consists of two 2 in. × 6 in. × 4 ft, pieces of softwood lumber laminated together and reinforced with two 2 in. × 6 in. × 2 ft laminated lumber backup cleats. See [Figure 6.7.1 - 2](#).
8. Place the first 2 in. × 6 in. lumber piece on the equipment floor across the end of each row of freight. Use 16d common nails to secure the blocking. Do the same for the backup cleats. Laminate a second piece of 2 in. × 6 in. lumber to the floor blocking using 16d nails. See [Section 4.1](#).

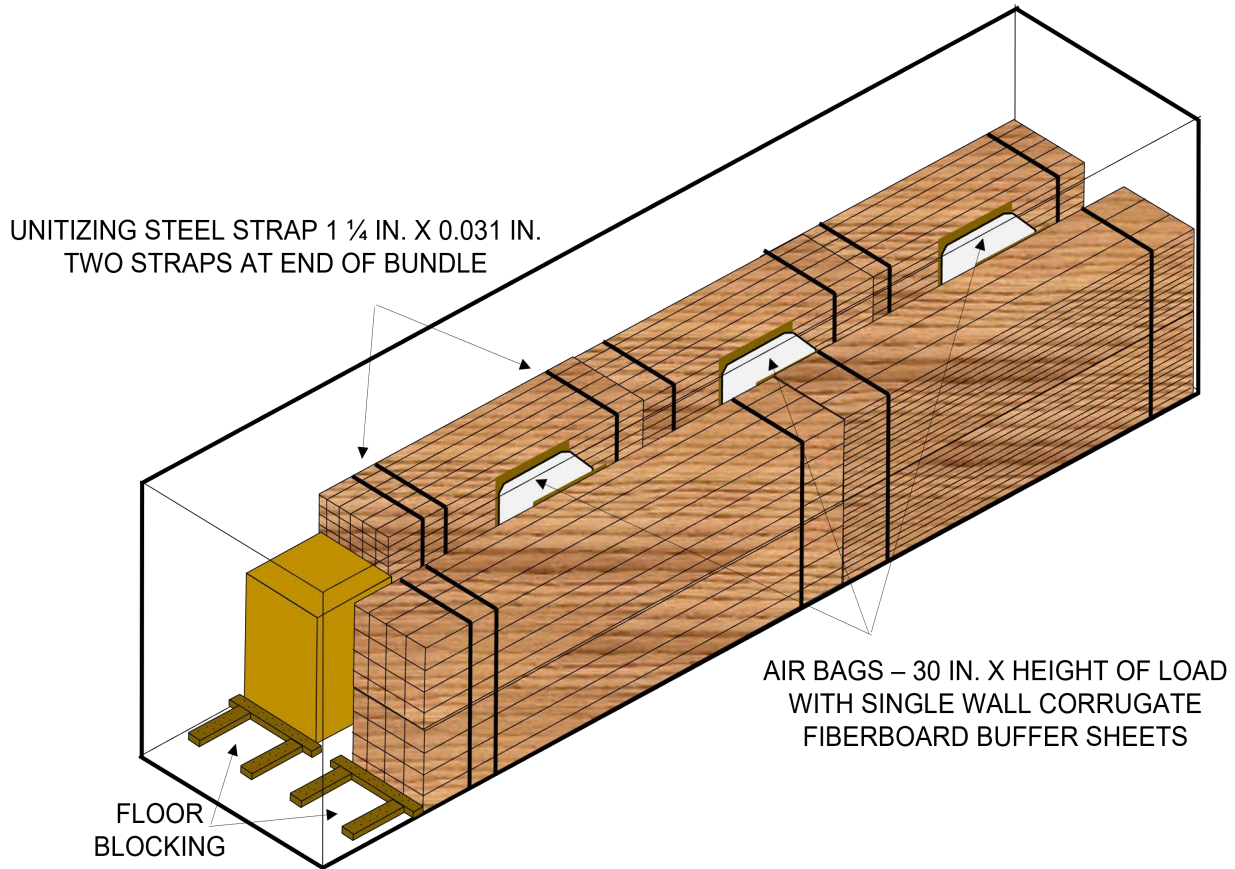


Figure 6.7.1 - 1 - Load pattern

Method 6.7.1 - Dimensional lumber secured by floor blocking and air bags

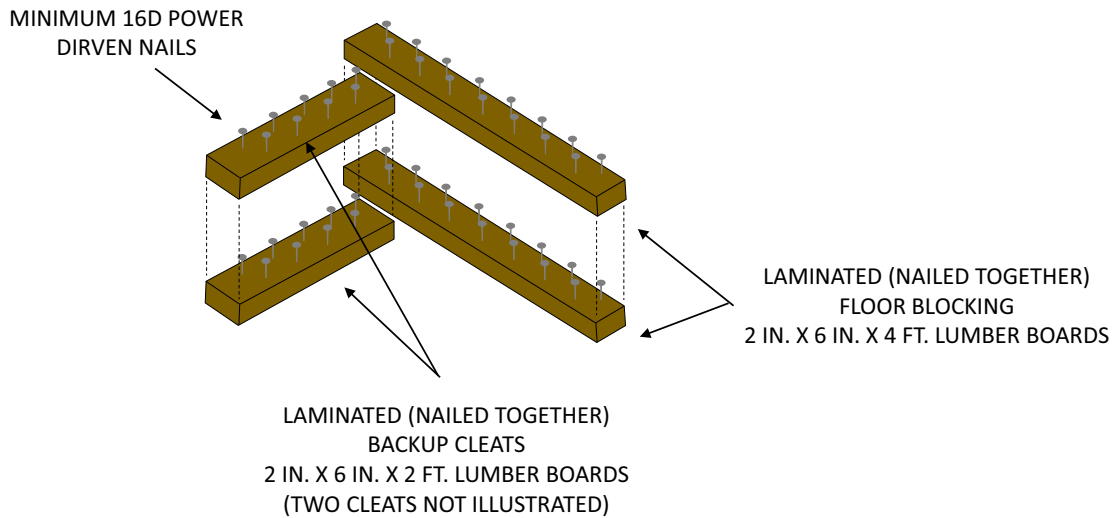


Figure 6.7.1 - 2 - Floor blocking

Method 6.7.1 - Dimensional lumber secured by floor blocking and air bags

Method 6.7.2 - Brick Secured with Floor Blocking and Ty-Gard 2000®
(Former Method B-5)

- This method is for packaged brick. Freight is loaded in a single layer.
 - This method uses Ty-Gard 2000® barriers and wood floor blocking.
 - When used with containers with corrugated sidewalls, follow the contour of the corrugations. When used in trailers or containers without corrugated sidewalls, equipment walls must have horizontally oriented sidewall panels.
 - Plan the load to equalize the weight on each side and end of the container. A balanced load is required for the stability and success of this loading method.
1. Unitize brick into multi-pack units or cubes with packaging straps. Additionally stretch wrapping of the brick units is recommended to help maintain the integrity of the units. Ensure that all package straps are secure, tight, and intact before loading. Do not load units or cubes with loose or broken straps. See [Sections 3.2](#) and [4.2](#).
 2. Load brick units or cubes three unit wide in two sections. Each section containers approximately half of the load. See [Figure 6.7.2 - 1](#). Place corrugated fiberboard or equivalent dividers material between each stack. See [Section 3.3.4](#).
 3. Load the first section tight against the container/trailer nose. Place corrugate fiberboard across the face of the brick units as buffer material between the brick and the Ty-Gard barriers.
 4. The loading pattern may be secured with Ty-Gard 2000. Follow manufacturer's instructions for application. See [Section 4.5.1](#).
 5. For Ty-Gard 2000 apply one 16 in. wide Ty-Gard 2000 barrier to each section. Each strip is a minimum of 60 in. long. Apply the adhesive strip to each sidewall located 36 in. back from the face of the load. Pull the Ty-Gard strips across the face of the load, overlapping ends by at least 12 in. tension, following manufacturer's instruction, using Ty-Gard tools. The tension barriers are then sealed with 48 in. long strips of Ty-Patch bonded to the Ty-Gard Barriers.
 6. Nail laminated 2 in. × 4 in. × 8 ft crosswise floor blocking 1 in. from the face of the first section using twenty-two 16d power-driven nails. Placing the floor blocking 1 in. away from the face is crucial to the success of this method of bracing. This allows the Ty-Gard barrier to receive the initial forces, and then the floor blocking can work in conjunction with the barrier. See [Section 4.1](#).
 7. Nail five 2 in. × 4 in. × 18 in. laminated backup cleats perpendicular to the floor blocking using five 16d power-driven nails. Stagger the nails to prevent splitting of the lumber.
 8. Load the second section of brick units in the rear of the container. Location of this section is dependent on required spacing for proper weight distribution and to ensure adequate room for floor blocking.
 9. Apply Ty-Gard 2000 to both the front and rear of the second section. Apply floor blocking to the rear of the second section. Follow the same application method for the Ty-Gard barriers and floor blocking as outlined for the first section.

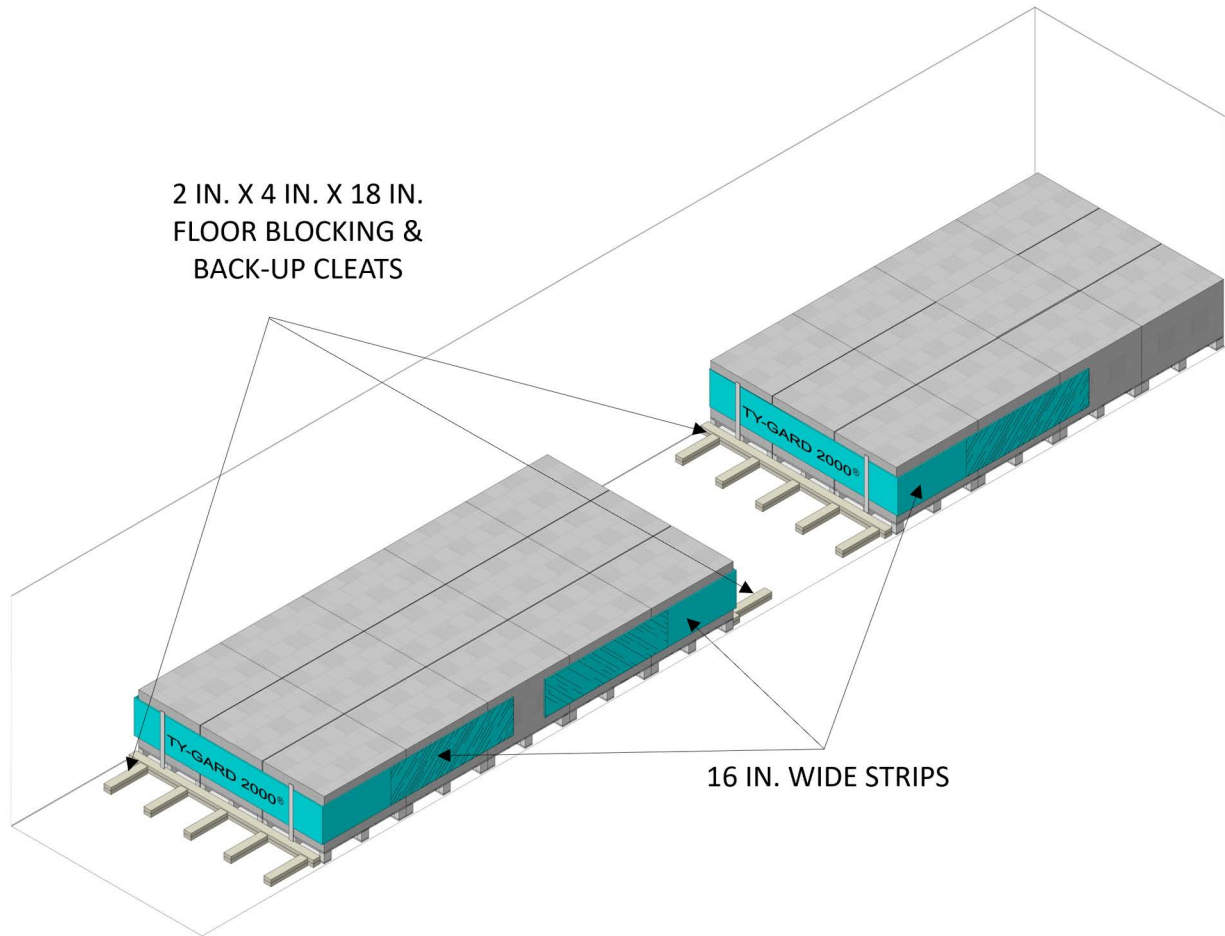


Figure 6.7.2 - 1

Method 6.7.2 - Brick secured with floor blocking and Ty-Gard 2000® barriers

6.8 Equipment

Number	Load Securement Method	Former Method
6.8.1	Securement System for Wheeled Vehicles in ISO Containers	H-13
6.8.2	Gearboxes Mounted on Sleds in 20-ft. Containers	(cancels GIS 768)

Method 6.8.1 - Securement System for Wheeled Vehicles in ISO Containers

(Former Method H-13)

- This method is for wheeled vehicles, such as scissor lifts or other equipment. The maximum weight per vehicle during was 4,780 lbs., and maximum load weight per container was 43,000 lbs. The floor rating at the time of testing was 24,000 lbs.
 - The figure shows the load as tested. Depending on container/trailer size and shipping unit size and weight, varying numbers of shipping units may be loaded.
 - Plan the load to equalize the weight on each side and end of the container. A balanced load is required for the stability and success of this loading method.
1. Select containers that are equipped with suitable D-rings at locations consistent with the load plan. It is the shipper's responsibility to inspect and ensure that the D-rings are in sound condition and that the load does not exceed the capacity of the D-rings for the container being loaded. See [Section 4.2.5](#).
 2. Inspect containers to ensure that the floor shows no signs of excessive wear that could hinder vehicle placement and support.
 3. Vehicle spacing is limited by the number of available D-rings and the weight of vehicles. Various size units can be loaded from one to three-wide.
 4. All vehicle batteries must be disconnected, and terminals taped. Secure all handles, latches, and other devices to prevent movement during transportation.
 5. Vehicles should be loaded into the container facing in with brake on, if available.
 6. Use floor blocking next to each tire at the both the front and rear of the vehicle, except when loaded tight to the nose wall. If metal floor components prevent floor blocking contact with the tires, locate the floor blocking tight to a rigid vehicle frame component to prevent lengthwise movement of the vehicle during transit.
 7. Construct floor blocking using nominal lumber sizes and, in the order, as indicated below. Nail in a staggered pattern with 16d nails approximately every 3 in. See [Section 4.1](#) and [Figure 6.8.1 - 1](#).
 - Crosswise blocking lumber (1): 2 in. x 6 in. x outside width of vehicle; nail to container floor.
 - Back-up cleats (4): 2 in. x 6 in. x 18 in.; nail to container floor and crosswise blocking lumber.
 - Securement of chock (2): 3 in. x 6 in. x 9 in.; nail to back up cleats.
 - Chocks (2); Composite or wood chock; nail to back-up cleats.
 - Side blocking (1): 2 in. x 6 in.; nail to side of floor block when needed to separate vehicles from wheel-to-wheel contact
 8. When vehicles are loaded one wide; use floor blocking next to the outside of each tire. Nail lumber boards 2 in. x 6 in. x 1/2 in. diameter of the tire to the floor using 16d nails.
 9. Tie down each stack of vehicles at the front and rear of the vehicles by applying 3/8 in. aircraft cable with approximately 14,400 lb. tensile strength. Run the cable through each vehicle where accessible and secure to D-rings on each side of the container. Secure one side of the cable with clamps and the opposite side by turnbuckles. Apply and secure cable per manufacturer's instructions. See [Section 4.2.6](#). See [Figure 6.8.1 - 2](#) and [Figure 6.8.1 - 3](#).

NOTE: Ensure that the turnbuckle is secured against movement during transit.

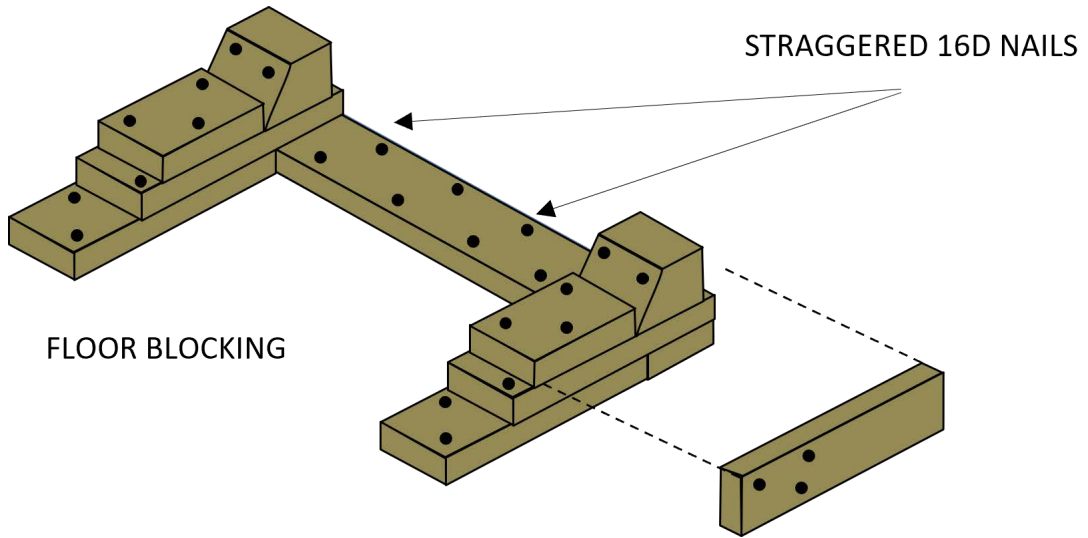


Figure 6.8.1 - 1

Method 6.8.1 - Securement system for wheeled vehicles in ISO containers

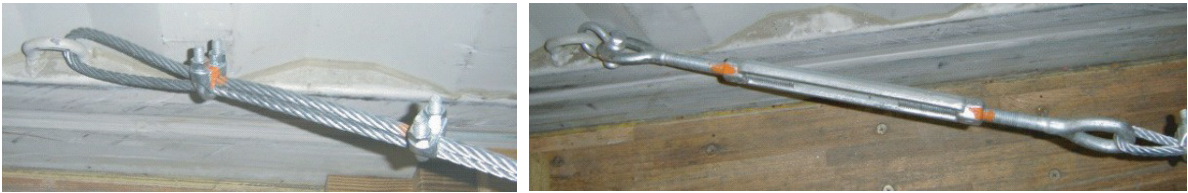


Figure 6.8.1 - 2

Method 6.8.1 - Securement system for wheeled vehicles in ISO containers

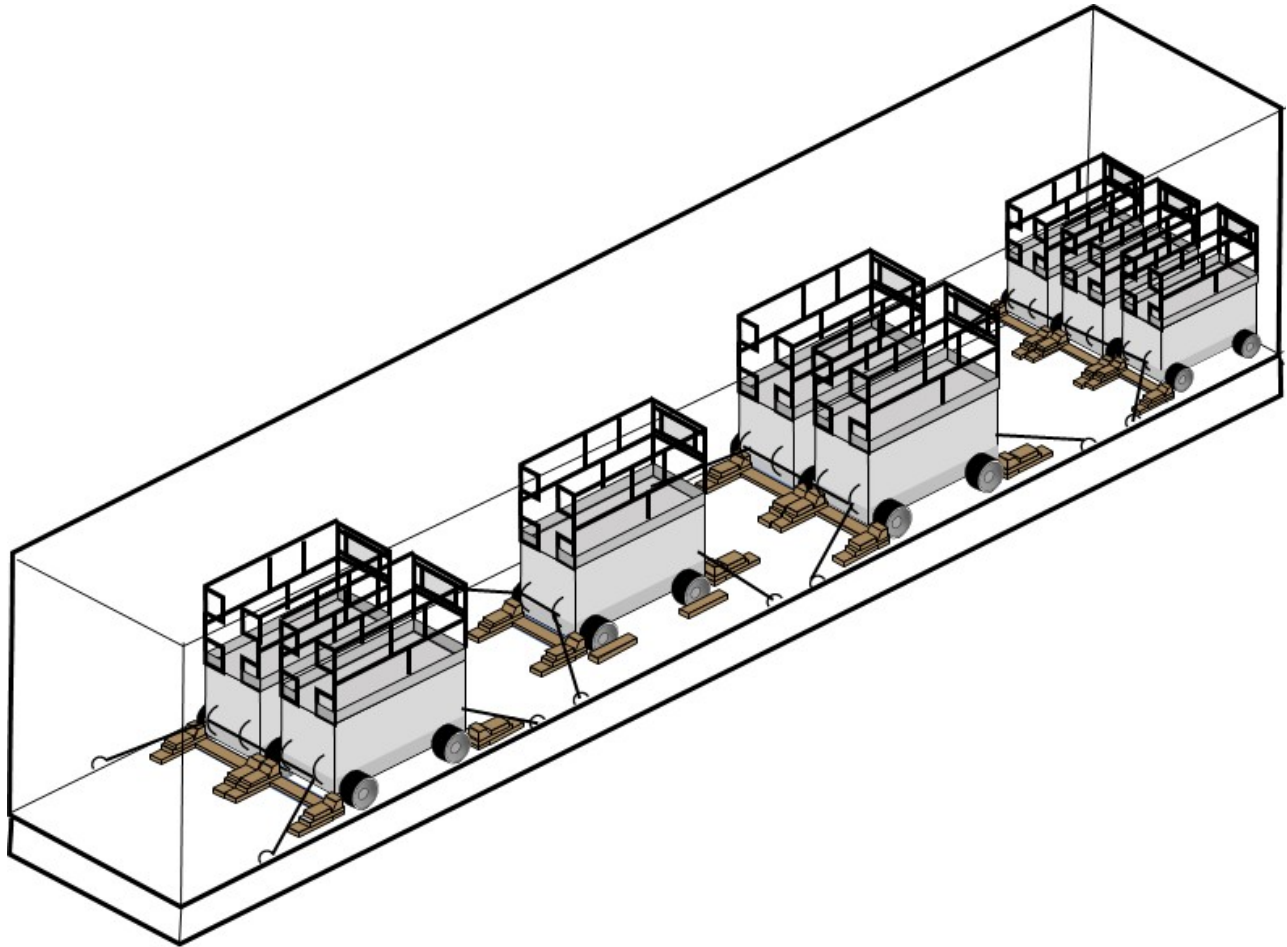


Figure 6.8.1 - 3

Method 6.8.1 - Securement system for wheeled vehicles in ISO containers

Method 6.8.2 - Gearboxes Mounted on Sleds in 20-ft. Containers
(Cancels GIS 768)

- This method is for gearboxes weighing up 38,500 lbs.
 - Plan the load to equalize the weight on each side and end of the container. A balanced load is required for the stability and success of this loading method.
1. Select containers that are equipped with suitable D-rings at locations consistent with the load plan. It is the shipper's responsibility to inspect and ensure that the D-rings are in sound condition and that the load does not exceed the capacity of the D-rings for the container being loaded. Do not use container securement points that appear to be damaged, cracked, bent, or otherwise changed from their original condition. If uncertain, do not use. See [Section 4.2.5](#).
 2. Gearboxes are rigidly mounted on steel sleds and secured with four AAR-approved 1 1/2 in. woven polyester straps having a minimum break strength (MBS) of 2,200 lbs. See [Section 4.2](#) and [Figure 6.8.2 - 1](#). Sled runners are rectangular steel beams welded to the underside of the gearbox sled.
 3. Install a 2 in. x 8 in. x 95 in. (container interior width) long steel beam with a 0.125 in. wall thickness across the front endwall of the container. Install two 16 in. x 8 in. x 0.25 in. (minimum) rectangular steel load distribution beams, 19 ft long, one on either sidewall of the container. Alternately, wood beams of the same dimension may be substituted. See [Figure 6.8.2 - 2](#).
 4. Sled runners can be installed to the sled so that they may either be loaded inside or outside of the distribution beams. See [Figure 6.8.2 - 3](#).
 5. The sled mounted gearboxes are loaded onto the distribution beams at fixed locations. Maintain proper lengthwise and crosswise weight distribution. See [Figure 6.8.2 - 3](#).
 6. Install damping pads between the sled and the top of the load distribution beams. Pads are 16 in. x 16 in. x 3 in. See [Figure 6.8.2 - 2](#).
 7. Install a 2 in. x 8 in. x 95 in. (container interior width) long steel beam with a 0.125 in. wall thickness, across the doorway in the doorpost slots of the container.
 8. The gearbox is attached to securement points in the container with a minimum of twelve straps, with a minimum of three straps per corner. Each strap is AAR-approved with a minimum breaking strength (MBS) of 11,000 lbs. Each strap is anchored to a different D-ring (top or bottom), lashing bars in the container front corners, or the rear doorpost slots. In each corner, one of the three straps is secured to a D-ring at the container floor. The other two straps are secured to front lashing bars, upper D-rings (furthest away from the gearbox), or rear doorpost slots. See [Section 4.2](#) and [Figure 6.8.2 - 4](#).
 9. Straps are secured anchors mounted to the gearbox. Secure straps with the correct buckle in accordance with manufacturer's instructions. Tension the straps using proper tensioning tools per manufacturer's instructions.



Figure 6.8.2 - 1 - Gearboxes mounted on sled
Method 6.8.2 - Gearboxes mounted on sleds in 20-ft ISO containers

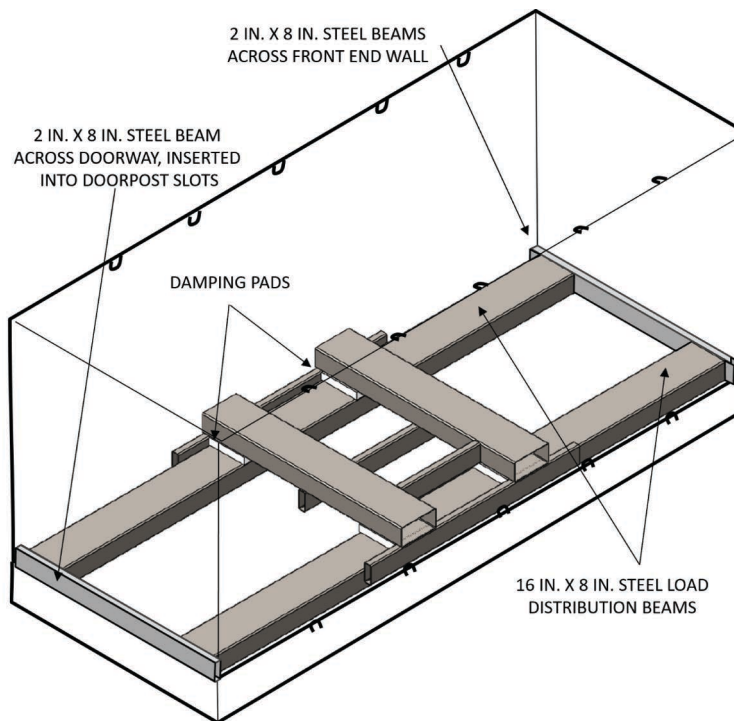


Figure 6.8.2 - 2 - Placement of load distribution beams
Method 6.8.2 - Gearboxes mounted on sleds in 20-ft ISO containers

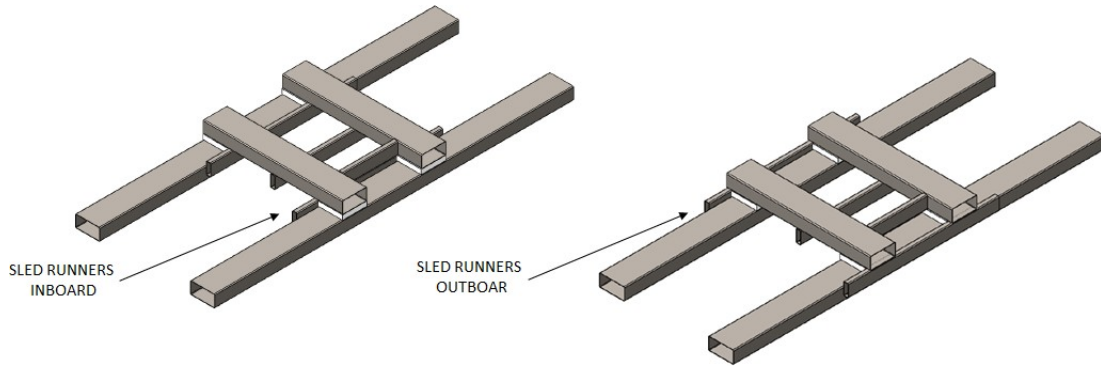


Figure 6.8.2 - 3 - Sled with inside or outside runners

Method 6.8.2 - Gearboxes mounted on sleds in 20-ft ISO containers

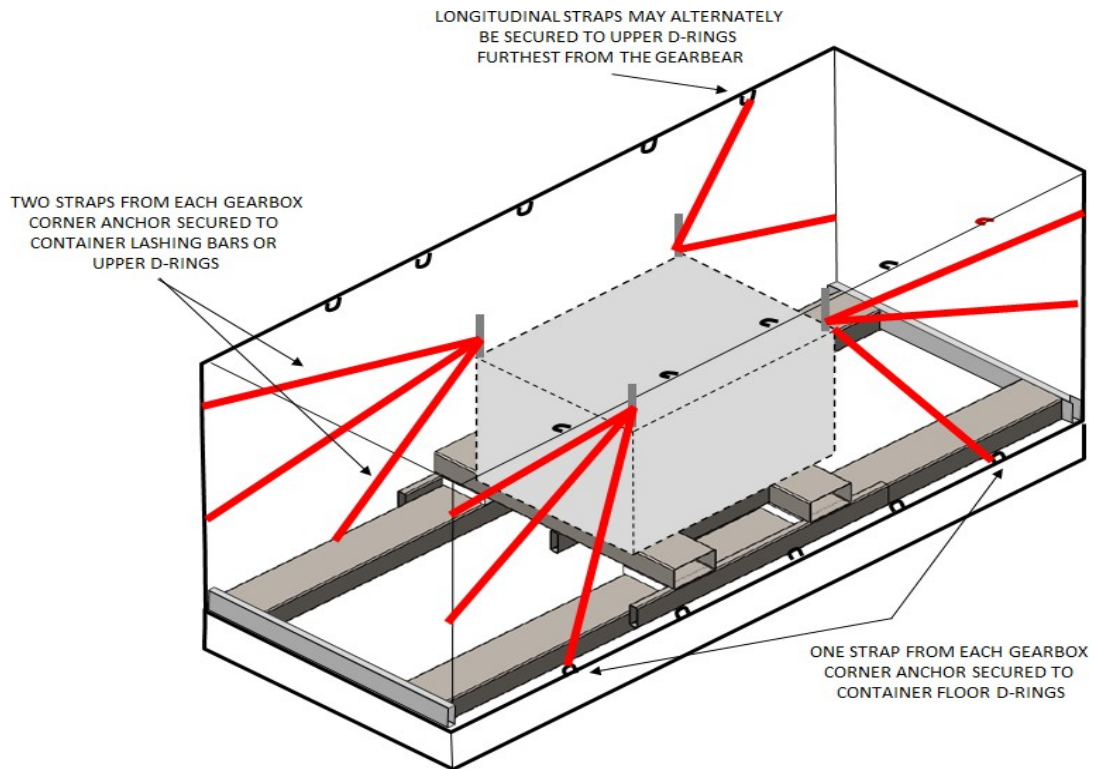


Figure 6.8.2 - 4 - Gearbox anchored to container securement points

Method 6.8.2 - Gearboxes mounted on sleds in 20-ft ISO containers

6.9 Special Securement

Number	Load Securement Method	Former Method
6.9.1	Barless Liner System to Transport Bulk Dry Flowable Commodities in 20-ft. and 40-ft. ISO Containers	H-12
6.9.2	Universal Storage Containers Loaded in 53-ft. Intermodal Containers	H-15 (cancels GIS 787)

Method 6.9.1 - Barless Liner System to Transport Bulk Dry Flowable Commodities in 20-ft. and 40-ft. ISO Containers

(Former Method H-12)

- This method is for shipping dry flowable bulk commodities.
 - Load 20 ft, 40 ft, or 40 ft high-cube ISO containers.
 - Plan the load to equalize the weight on each side and end of the container. A balanced load is required for the stability and success of this loading method.
1. Only the following barless liner systems have been evaluated and found acceptable for application with this loading method:

Name	Vendor
20 ft standard barless baffle container liner	AsiaTek
40 ft standard barless baffle container liner	
40 ft hi-cube barless baffle container liner	

2. Cover rough surfaces or projections of the sidewall with fiberboard sheets or other suitable material.
3. Follow the manufacturer's instructions for installation and securement of the barless liner system (See [Figure 6.9.1 - 1](#) and [Figure 6.9.1 - 2](#)):
 - a. Place the liner in the container toward the doors. Liner is packaged to unfold as it is dragged toward the nose.
 - b. Place a steel bar through the bottom front straps (located on each of the bottom front corners of the liner) and sleeve.
 - c. Secure the top front with a snap hook at each corner of the nose using one of the three loops that allows the top of the liner to come closest to the top of the container.
 - d. Hook the back bottom liner strap to one end of the hook-and-strap device and hook the other end to the back of the container. Pull tight to stretch the liner fully along the length of the container.
 - e. Connect the lower anchor straps to the container rings and pull tight. This will distribute the weight of the filler liner along its length when the container is titled.
 - f. Connect the back upper anchor straps to the container rings (one section at a time) and pull tight. Next connect the forward upper anchor straps (one section at a time) and pull tight. There should be no slack between the forward section of the liner and the anchor straps. Following this procedure will distribute the weight evenly along the length of the liner.
 - g. Using a snap hook, raise the back of the liner with the brace strap. To attain the proper height, step on the blue strap located at the bottom back corner of the liner and pull the strap tight until the back corners are stretched tight. This will appear to lift the liner off the container floor by a couple of inches.
 - h. After the line is installed, fill the liner with air until it has filled itself out in the container. Then, remove the air hose and connect the elastic straps on the upper back of the liner to the door hooks on the top back of the container.
4. Ensure the liner is stretched tight the length of the container prior to filling to ensure proper weight distribution along the liner length. If the liner is loose between anchor straps, too much weight will be placed on the straps and liner will be too short once it reaches the back of the container.

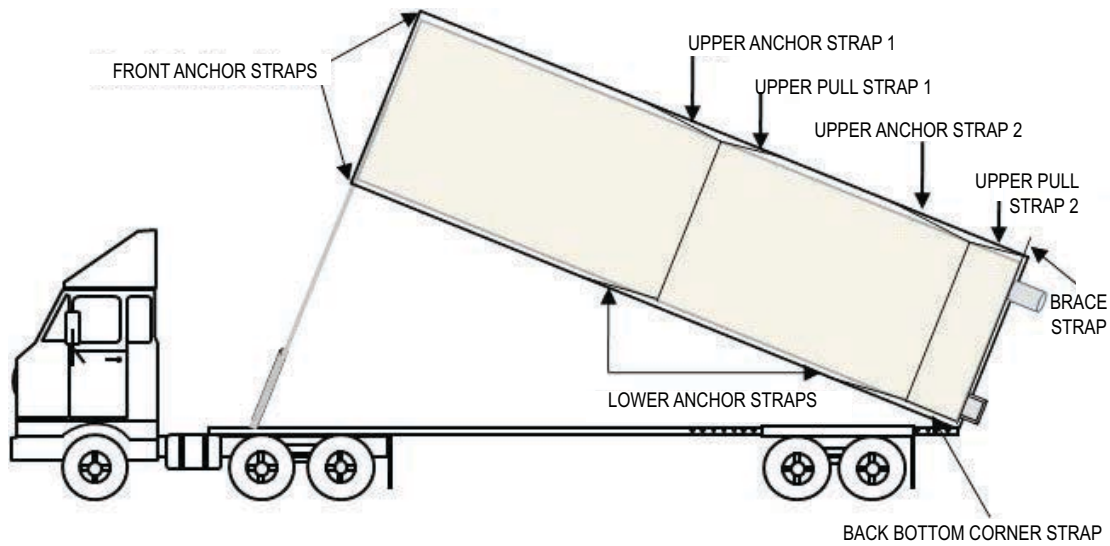


Figure 6.9.1 - 1

Method 6.9.1 - Barless liner system to transport bulk dry commodities in 20-ft and 40-ft ISO containers.

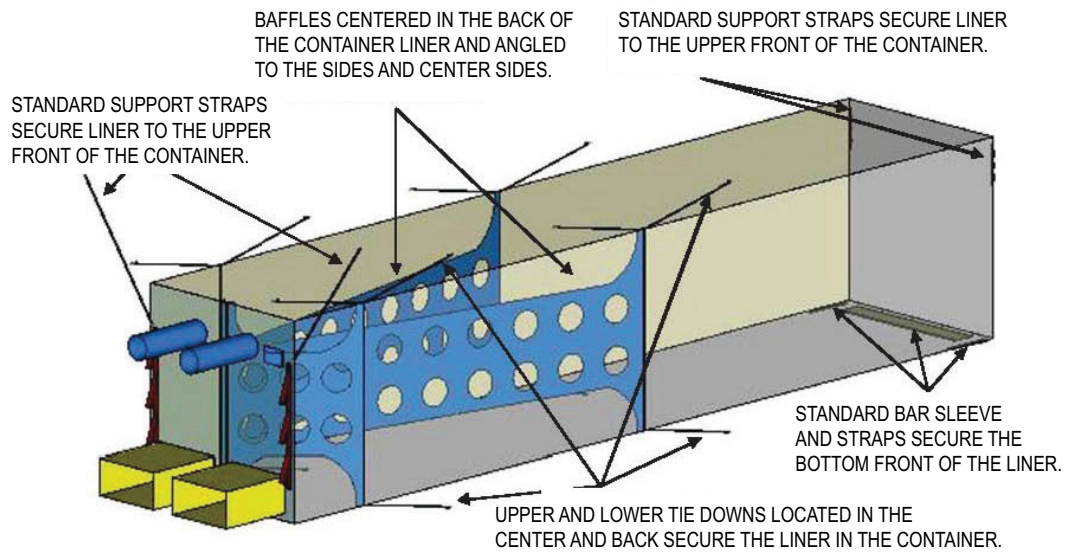


Figure 6.9.1 - 2

Method 6.9.1 - Barless liner system to transport bulk dry commodities in 20-ft and 40-ft ISO containers.

Method 6.9.2 - Universal Storage Containers Loaded in 53-ft. Intermodal Containers

(Former Method H-15; Cancels GIS 787)

- This method is for Universal Storage Containers (USC), loaded with household goods in 53 ft containers. USC containers have a maximum load weight of 3,300 lbs.
 - Plan the load to equalize the weight on each side and end of the container. A balanced load is required for the stability and success of this loading method.
1. Household goods, furnishings, or furniture are restricted commodities in intermodal service. The use of this method must conform to each individual carriers' specific tariffs or restrictions. Individual carrier approval must be gained prior to shipment.
 2. This method does not permit the loading of dangerous or hazardous goods or nonhazardous liquids in the USC containers in any quantity.
 3. Universal Storage Containers are 87 1/2 in. long by 92 in. wide by 100 in. tall and are loaded in one row centered in the container. A maximum of seven USC containers can fit into a 53 ft container. See [Figure 6.9.2 - 1](#).
 4. At the door, along the left side wall, install one 2 in. x 6 in. x 8 in. lumber guide rails, with the 2 in. face contacting the container floor. The top of the board is to be beveled at a 45° angle down the entire 8 ft length so that the shorter part of the bevel is facing the inside of the container and the taller side is up against the container wall. The guide rail is to be toe-nailed into the container floor on each end and in the middle. See [Section 4.1](#) and [Figure 6.9.2 - 2](#).
 5. At the door, along the right-side wall, install two 2 in. x 6 in. x 8 ft lumber guide rails, side by side, with the 2 in. face contacting the container floor. The top of the board closest to the inside of the container is to be beveled at a 45° angle down the entire 8 ft length so that the shorter part of the bevel is facing the inside of the container and the taller side is up facing the container wall. The top of the board closest to the sidewall of the container is not beveled. Both boards are toe-nailed into the container floor on each end and in the middle. See [Figure 6.9.2 - 2](#).
 6. Along the remaining length of the container, install along the left and right-side walls 2 in. x 4 in. lumber guide rails with the 2 in. face contacting the container floor. Form a continuous guide rail along the container side walls to crosswise block each USC container. Toe-nail the boards to the container floor on each end and in the middle. See [Figure 6.9.2 - 2](#) and [Figure 6.9.2 - 3](#).
 7. Load the first two USC containers (#1 and #2). Between the second and third USC container apply two filler panels side-by-side, 48 in. wide x 96 in. tall x 3 in. thick. Panels are small cell honeycomb constructed of core type four having a 4,752 psf compression strength. See [Section 3.3.1](#) and [Figure 6.9.2 - 2](#) and [Figure 6.9.2 - 3](#).
 8. Load the next two USC containers (#3 and #4) and apply the next set of filler panels. Load the next two USC containers (#5 and #6) and apply the next set of filler panels. Load the last container (#7). See [Figure 6.9.2 - 3](#).
 9. After loading the last USC container (#7), install three 2 in. x 6 in. softwood lumber bull boards across the doorway. Securely fit each end of the boards into the doorpost slots on either side of the doorway. The lowest bull board should be positioned 8 in. above the container floor, using wooden spacers placed upright in the doorpost. Use 12 in. tall spacers between the other sets of bull boards. Toe-nail the spacers into the bull boards to prevent them from becoming dislodged. See [Section 4.1](#) and [4.1.6](#). See [Figure 6.9.2 - 4](#).

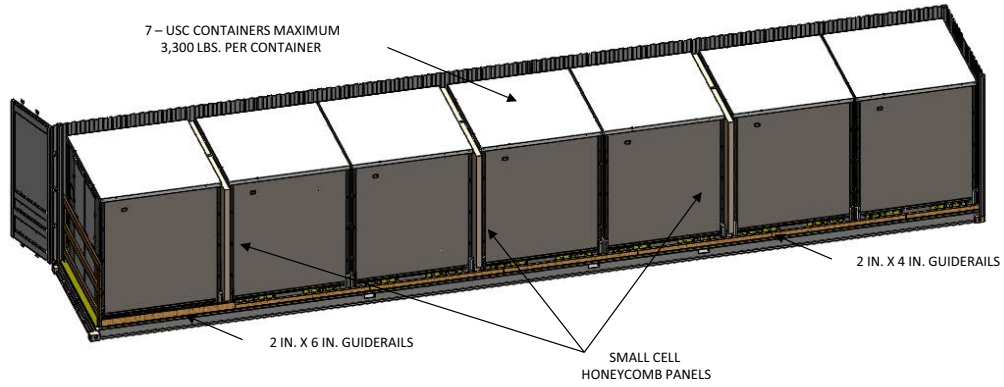


Figure 6.9.2 - 1 - Loading application of USC containers

Method 6.9.2 - Universal Storage Containers loaded in 53-ft intermodal containers

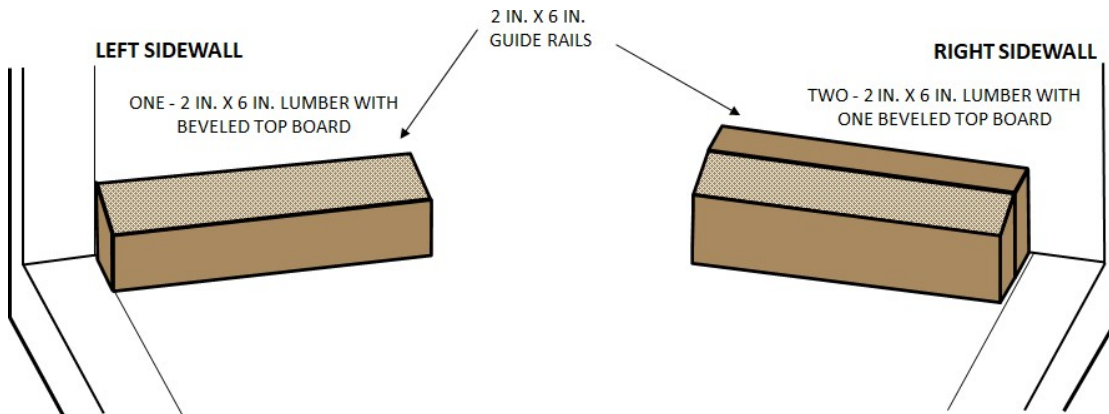


Figure 6.9.2 - 2 - Application of doorway guide rails

Method 6.9.2 - Universal Storage Containers loaded in 53-ft intermodal containers

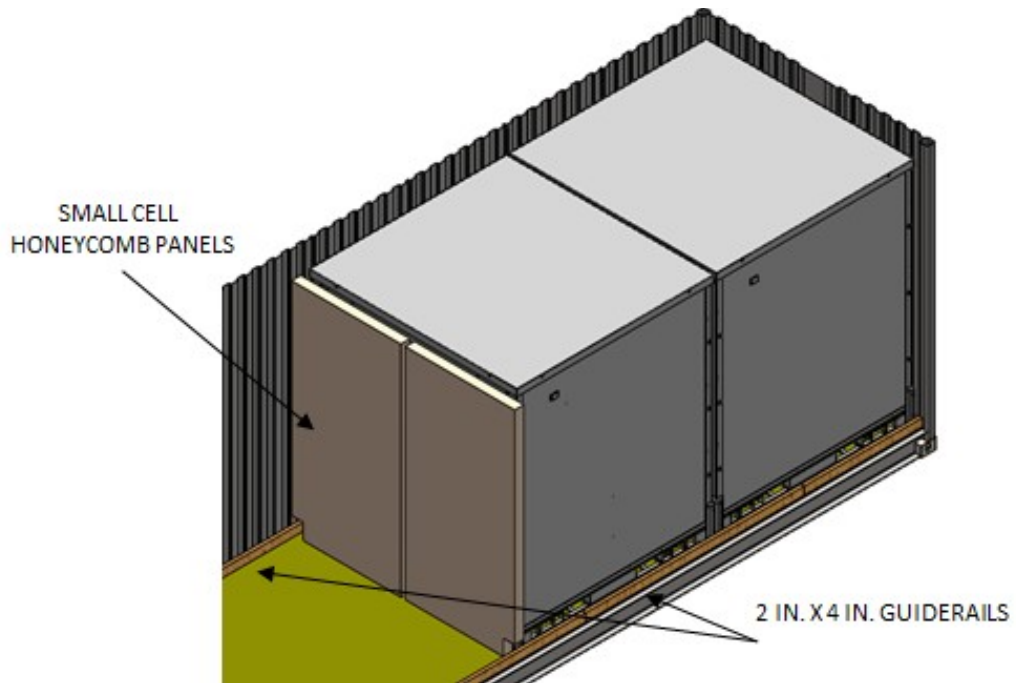


Figure 6.9.2 - 3 - Application of filler panels

Method 6.9.2 - Universal Storage Containers loaded in 53-ft intermodal containers

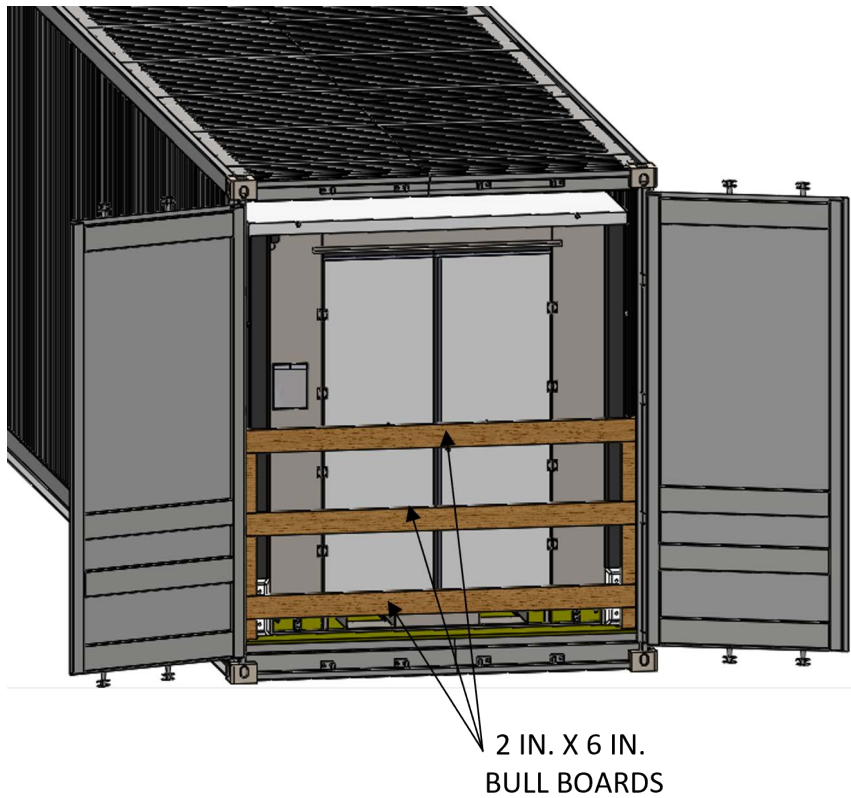


Figure 6.9.2 - 4 - Application of bull boards

Method 6.9.2 - Universal Storage Containers loaded in 53-ft intermodal containers

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Appendix A

Measurement Conversion Chart

Table A.1 - Measurement conversion chart

Capacity (volume):			
1 gallon (gal), (US liquid)	=	0.832	gallon (gal), (Imperial)
	=	3.78	liter (L)
	=	0.031	barrel (US liquid)
	=	3,785.43	cubic centimeters (cm ³)
Weight			
1 ounce (oz)	=	28.35	grams (g)
1 kilogram	=	2.2	pounds (lb)
1 pound (lb)	=	453.6	grams (g)
	=	0.4536	kilograms (kg)
1 ton	=	907.2	kilograms (kg)
	=	9072	metric ton
	=	2000	pounds (lb)
1.1023 ton	=	1	metric ton
Length			
1 centimeter (cm)	=	0.394	inches (in)
1 inch (in)	=	25.4	millimeters (mm)
	=	2.54	centimeters (cm)
1 foot (ft)	=	304.8	millimeters (mm)
	=	30.48	centimeters (cm)
	=	0.3048	meters (m)
1 yard (yd)	=	3.0	feet (ft)
	=	91.44	centimeters (cm)
	=	0.9144	meters (m)
1 mile (mi)	=	5,280	feet (ft)
	=	1,609.34	meters (m)
	=	1.6093	kilometers (km)
0.6214 miles (mi)	=	1.0	kilometers (km)

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Appendix B

Damage Prevention Product Vendor Information

For a contact list of damage prevention product vendors please visit:

<https://aar.com/standards/damage-prevention-approvals.html>

This list is provided as a service to rail customers and member carriers. The AAR does not endorse or guarantee the use or reliability of the products produced or distributed by the vendors listed.

This list is not a complete list, and any vendors not shown have not been intentionally left out. Addresses shown are generally the office address of the company's headquarters. Each company may also have regional offices and/or regional contacts for product availability and distribution.

Submit Changes to:

Manager Closed Car Loading Rules
Damage Prevention and Loading Services
dppls@aar.com

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Appendix C

Other Publications of Interest

The following are publications that may be of interest to shippers responsible for loading trailers or containers.

Code of Safe Practice for Cargo Storage and Securing
Published by the International Maritime Organization,
<https://www.imo.org/en/OurWork/Safety/Pages/CSS-Code.aspx>
ccc@imo.org

AAR Open Top Loading Rules Manuals
Section 7 - Open Top Trailers and Containers for Rail Transport
Published by the AAR Safety and Operations Department
<https://my.aar.org/otlr>
otlr@aar.com

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