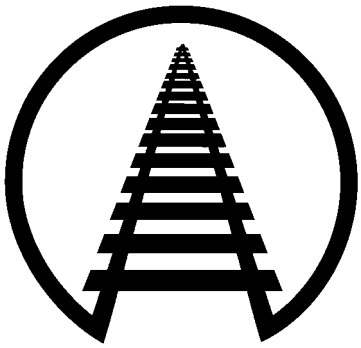
INTERMODAL LOADING GUIDE for Products in Closed Trailers and Containers

Circular No. 43-F
Pamphlet No. 45
BOE Pamphlet No. 6C



Issued: January 2016

Supersedes BOE Pamphlet No. 6C Issued 1990,
AAR Circular 43-E Issued July 2011, and
Intermodal Loading Guide Issued July 1995 (Incl. 1997, 1998, 2001, 2011 Revisions)
Cancels Intermodal Loading Guide for Paper Products August 2001

Approved by
DAMAGE PREVENTION & FREIGHT CLAIM COMMITTEE
HAZARDOUS MATERIALS BOE COMMITTEE

Published by
AAR/TTCI
55500 DOT Road
Pueblo, CO 81001

(Printed in U.S.A.)

(This Page Left Blank Intentionally)

TABLE OF CONTENTS

(This Page Left Blank Intentionally)

METHODS RECOMMENDED FOR HAZARDOUS MATERIALS LOADING

The methods listed below have been recommended for hazardous materials loading by the Hazardous Materials (BOE) Committee. They are found in paragraph 4.0 of this publication. Those marked with an asterisk (*) have been impact-tested to 8 mph.

Special Bulkhead Braces

Information on and illustrations of special bulkhead braces are available from the Association of American Railroads by contacting the Bureau of Explosives or Damage Prevention and Loading Services. 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.

(This Page Left Blank Intentionally)

1.0 INTRODUCTION

1.1 General

1.1.1 The *Intermodal Loading Guide for Products in Closed Trailers and Containers* is intended to be a comprehensive manual for loading of commodities in trailers and containers for shipment by rail. Incorporated into this publication are AAR Circular 43-F Rules Governing the Loading, Blocking, and Bracing of Freight in Closed Trailers and Containers for TOFC/COFC Service (see paragraph 2.0); the approved loading and bracing information contained in AAR Bureau of Explosives Pamphlet No. 6C on hazardous materials; and AAR Pamphlet No. 45 on general loading in closed trailers and containers.

1.1.2 The "General Rules," as contained in Circular 43-F or supplements thereto, are issued by the Association of American Railroads and have been formulated for the purpose of providing safe methods of loading in closed trailers or containers. These General Rules must be observed. References to, or illustrations of, trailers in this publication include both containers and trailers.

1.1.3 It must be understood that trailers or containers may move in a backwards or reverse direction for all or a portion of their journey. During its journey, normal transportation forces may shift an unsecured load or cause lading to exert excessive pressure against the nose, rear doors, or sidewalls. Lading that is improperly blocked and braced can shift to one side of the vehicle and cause the vehicle to lean on the flatcar. A container or trailer leaning on a flatcar can cause a sideswipe or contribute to a derailment. Weight of a load that is concentrated in a small area and not properly distributed throughout the trailer or container can also cause a vehicle floor to collapse. It is imperative that trailers or containers moving in rail service be loaded by the shipper in strict compliance with the General Rules. Shipper is defined in these rules as that party (or his agent) who is responsible for the physical loading and securement of the lading in the trailer or container.

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

1.1.5 The loading methods, as described in this Intermodal Loading Guide, are approved by the Damage Prevention and Freight Claim Committee and Hazardous Materials BOE Committee of the Association of American Railroads and are minimum standards that have been evaluated and approved. These minimum standards offer practical guidelines on the subjects covered. As these are minimum standards, it may be necessary to supplement these methods in some instances.

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

1.1.7 Wherever gallons are identified in this document, the term refers to US gallons. For other units, see conversion charts on page 1-4.

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

1.1.9 Loading and bracing methods not currently approved may receive consideration for approval and publication under the "Damage Prevention and Loading Services Procedures Governing Evaluation and Acceptance of New Closed Car Loading and Bracing Methods and Materials," General Information Bulletin No. 2. Submit request to Director, Damage Prevention and Loading Services, AAR/TTCI, 55500 DOT Road, Pueblo, CO 81001.

1.1.10 For additional information concerning intermodal open top loads, consult the AAR *Open Top Loading Rules Manual*, Section 7, "Rules for Loading All Commodities on Open Top Trailers and Containers for Rail Transport," issued by the AAR Safety and Operations Department.

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

1.2 Loading and Restraining Shipments of Hazardous Materials

1.2.1 Loading of hazardous material must conform to the regulations of the agency of authority 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

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

1.2.3 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.

1.2.4 Paragraph 4.0 of this publication contains information on recommended methods for loading and restraining shipments of hazardous materials for TOFC/COFC movement. The methods illustrated in this publication are published to offer recommended guidelines when establishing loading and restraining configurations for hazardous materials shipments. Methods recommended for use with hazardous materials are indicated in the table of contents for paragraph 4.0 and by the BOE logo on each method as illustrated here.

1.2.5 The manufacturer or the manufacturer's authorized agent of the securement system must provide the shipper with installation instructions to prevent improper installation that could lead to failure of the securement system.

NOTE: Pneumatic dunnage bags must *not* be used to secure shipments of hazardous materials.

1.2.6 All methods included have successfully passed the Association of American Railroad's Standard Impact Tests in force at the time of testing. The procedure was changed in 1990 by reducing the maximum impact speed from 8 mph to 6 mph for all hazardous classes except explosives, which still must be secured with methods tested at 8 mph. This loading guide now contains methods that have been tested at both 6 mph and 8 mph. Those methods that were tested at 8 mph are indicated by an asterisk in the listing on page v.

1.2.7 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. For examples of blocking and bracing in freight containers and transport vehicles, see Bureau of Explosives Pamphlet Nos. 6 and 6C (now incorporated into this Intermodal Loading Guide).
>
> **(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.
>
> **(c)** The doors of a freight container or transport vehicle may not be used to secure a load that includes a package containing a hazardous material unless the doors meet the design strength requirements of Specification M-930 (for freight containers) and M-931 (for trailers) in the AAR's specification for "Specially Equipped Freight Car and Intermodal Equipment" and the load is also within the limits of the design strength requirements for the doors.

1.2.8 As a result of revisions to 49 CFR §174.55 as shown above, Department of Transportation conditional special approval SA-861102 authorizing the use of TY-GARD™ restraint systems is no longer applicable. The subject restraint systems are now authorized by the regulations as currently written.

1.3 Special Rules for Explosives

1.3.1 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))

1.3.2 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.

1.3.3 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)

1.3.4 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))

1.3.5 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))

1.3.6 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.

1.3.7 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 §74.200, §174.300)

1.3.8 Recommended Location for Placards on Containers

To ensure that the required placards are visible during the transportation of containers on double-stack 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.

1.4 Conversion Chart

Capacity (Volume):

1 gallon (US liquid) = 0.832 gallon (gal), Imperial
= 3.78 liter (L)
= 0.031 barrel, US liquid
= 3785.43 cubic centimeters (cm^3)

Weight:

1 ounce	=	28.35 gram (g)
1 pound	=	453.6 g
	=	.4536 kilogram (kg)
1 ton	=	907.2 kg
	=	9072 metric ton
1.1023 ton	=	1 metric ton

Length:

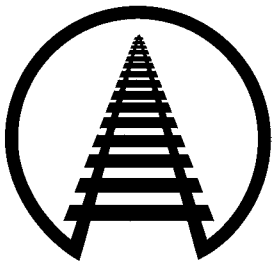
1 inch	=	25.4 millimeters (mm)
	=	2.54 centimeters (cm)
1 foot	=	304.8 mm
	=	30.48 cm
	=	.3048 meter (m)
1 yard	=	3 feet (ft)
	=	91.44 cm
	=	.9144 m
1 mile	=	5,280 ft
	=	1609.34 m
	=	1.6093 kilometers (km)
0.6214 mi	=	1 km

2.0 CIRCULAR 43-F

The most recent version of Circular 43 is available online at http://www.aar.com/standards/damage-publications.php. Circular 43-F is reprinted here for your convenience. For specific questions, email dpls@aar.com.

Circular 43-F

RULES GOVERNING THE LOADING, BLOCKING, AND BRACING OF FREIGHT IN CLOSED TRAILERS AND CONTAINERS FOR TOFC/COFC SERVICE



Issued September 2015
by
Association of American Railroads

A—INTRODUCTION

These rules, which supersede Circular 43-E as issued in 2011, apply both to trailers and containers regardless of shipping plan used. Reference to, or illustrations of, trailers in this publication includes both containers and trailers.

These rules are designed for the benefit of all parties concerned. By adhering to the rules, both lading and equipment will be protected in the absence of unusual circumstances.

It must be understood that trailers or containers may move in a backwards or reverse direction for all or a portion of their journey. During its journey, normal transportation forces will shift an unsecured load or cause lading to exert excessive pressure against the nose, rear doors, or sidewalls. It is therefore imperative that trailers or containers moving in rail service be loaded by the shipper in strict compliance with the General Rules as contained in this publication. Shipper is defined in these rules as that party or his agent who is responsible for the physical loading and securement of the lading in the trailer or container.

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

Loading rules contained herein apply to shipments transported in the USA, Canada, and Mexico.

General information and approved loading methods for TOFC/COFC shipments are published in the AAR *Intermodal Loading Guide*.

B—GENERAL RULES

The following rules have been formulated for the purpose of providing *safe* methods of loading closed trailers and containers and *must* be observed. The primary purpose of these rules is safe transit of trailers and containers from origin to destination. Reference to, or illustration of, trailers in this publication includes both trailers and containers.

1. Inspection and Selection of Equipment

A. It is the equipment supplier's responsibility to furnish trailers or containers that are clean and have sound roofs, sides and end walls, smooth floors, and snug-fitting doors. **There must be no obvious damage, distress, weakened parts, or weakened sections.** Any exception is cause for rejection. **The trailer or container must be appropriate for the lading it is to transport.** The shipper also has a responsibility to inspect the trailer or container at origin to see that it is suitable to carry lading safely to destination.

B. It is important that **trailers or containers** be clean and free from nails and other protruding objects.

C. If trailer or container supplied is not suitable for loading and shipper elects to load this trailer or container rather than reject it, it is the shipper's responsibility to properly prepare the trailer or container .

2. Load Planning

A. Plan loading to prevent damage to lading and equipment. Lading that is obviously unsuitable for movement in a trailer or container, as far as safety in handling and protection to lading and equipment are concerned, is not to be loaded.

3. Maximum Weights, Weight Distribution, and Center of Gravity

A. The load weight *must not* exceed the limit as stated on the manufacturer's plate. Combined weight of trailer and lading may not exceed 65,000 lb.[1] Combined weight of container and lading may not exceed the weight specified below for the length of container being loaded:

Table 1: Maximum gross weight vs. container length

Nominal Length (ft)	Maximum Gross Weight (lb)[a/] (Lading Plus Tare)
53	67,200
48	67,200
45	67,200
40	67,200
28	52,900
20	52,900

[a/] Maximum weights as defined in current AAR *Manual of Standards and Recommended Practices*, Section I, Specification M-930, for containers and subject to revisions thereto.

B. Lading weight in trailers or containers must be evenly distributed both crosswise and lengthwise, and combined weight of lading and trailer or container must conform to all federal, state, provincial, and local regulations and transportation service requirements used at origin and to final destination. (See Figures 1, 2, 3, and 4.)

C. Combined center of gravity (measured from top of rail) of car, trailer or container, and load is not to exceed 98 in.

Note: The vertical center of gravity can be calculated only after the trailer or container is loaded onto a railcar.

4. Hazardous Materials/Hazardous Substances

A. Loads containing any quantity of hazardous materials/hazardous substances must conform to the regulations of the agency of authority 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.

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

1 Maximum weights as defined in current AAR *Manual of Standards and Recommended Practices*, Section I, Specification M-931, for trailers and subject to revisions thereto.

5. Loading and Securement

A. Secure lading to prevent both lengthwise and crosswise movement. If the lading is rigid in nature and/or very dense, such as boxes of nuts and bolts, machinery, metal beams, brick, lumber, cut paper, etc., or if the shape of the lading is such that the area of door contact is minimal, such as with cylindrical objects like drums or rolled paper, blocking and bracing is necessary. Vehicle doors are neither designed nor intended to restrain commodities with these characteristics. Such products must be loaded and secured in conformance with the rules and illustrations in this publication and in other applicable AAR commodity loading publications.

Trailer/container doors may not be used to secure loads containing hazardous materials.

The doors of the vehicle, meeting AAR trailer specification M-931 and AAR container specification M-930, can be relied on to secure *non-hazardous materials* lading only under the following conditions:

1. The load consists of multi-unit lading such as boxes of food-stuff, tissue, or soft paper products, furniture, appliances, etc., not exceeding 40,000 lb, covering a minimum of 60% of the door area and evenly distributed throughout the vehicle.

2. Lading must be loaded tightly lengthwise and crosswise and flush to the rear doors of the vehicle allowing no room for movement. If any void exists, fill void space with recommended dunnage.

3. The doors must fit squarely, the hinges must be tight, and locking bars must be in good condition and function properly.

See *Intermodal Loading Guide*, Figure 3.35.

B. Fill voids and apply blocking and bracing to maintain proper lengthwise and crosswise weight distribution during transit and to prevent lading from damaging doors, nose, and walls or from falling out when doors are opened.

C. Secure machinery or other equipment that has a high center of gravity to prevent tipping. (See the *Intermodal Loading Guide*, Figure 3.1.)

D. Do not nail into the walls of trailers or containers. Toe-nailing is not permitted, except as specifically exempted by applicable AAR commodity loading publications.

E. Strapping used for load securement must be of sufficient strength and amount and be properly applied so as to secure the load from crosswise or lengthwise movement.

F. The combined joint strength of steel straps used must be equal to the weight of the lading being secured, except as provided in approved loading methods in the I*ntermodal Loading Guide,* Chapter 4. (See I*ntermodal Loading Guide,* Table 3.5.)

G. High-tension band sizes 1 1/4 in. and 2 in. used for load securements shall be marked to indicate manufacturer's or supplier's name and the letters "AAR." Markings shall consist of the letters "AAR"; the manufacturer's or distributor's name or abbreviated name; or registered trademark, or symbol, or AAR code consisting of two digits. Markings shall be in characters not less than 1/8 in. high for steel die imprint and not less than 1/4 in. high for paint, ink surface printing, or embossing, spaced at not more than 5 ft intervals. Markings applied to high tension bands manufactured to metric dimensions must be followed by the letter "M" of the same size as the original marking.

H. The combined joint strength of nonmetallic straps used must be equal to the weight of the lading being secured, except as provided in approved loading methods in the AAR *Intermodal Loading Guide.*

GENERAL RULES

I. Coiled steel and other dense products must be stowed to conform to Figure 3. A minimum of three runners each 2.7 ft long based on 48 in. on-center spacing are required for each skid or pallet for steel coils and similar products of concentrated weight weighing up to 3,500 lb. The following chart may be used as a guideline when shipping dense products greater than 3,500 lb.

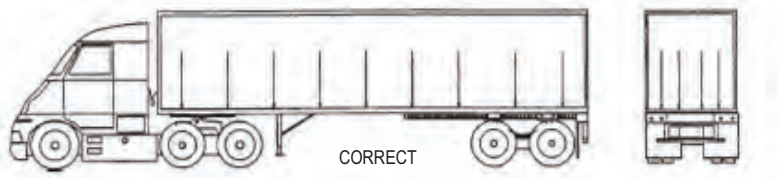
Table 2: Guide to minimum required length of longitudinal runners

DOMESTIC TRAILERS/CONTAINERS					
Payload Weight	**Spacing of Longitudinal Runners (ft)**				
	4.0	**5.0**	**6.0**	**7.0**	**8.0**
4,000	3.3	2.6	2.2	1.9	1.6
5,000	4.1	3.3	2.7	2.3	2.0
6,000	4.9	3.9	3.3	2.8	2.5
7,000	5.7	4.6	3.8	3.3	2.9
8,000	6.5	5.2	4.4	3.7	3.3
9,000	7.4	5.9	4.9	4.2	3.7
10,000	8.2	6.5	5.4	4.7	4.1
11,000	9.0	7.2	6.0	5.1	4.5
12,000	9.8	7.8	6.5	5.6	4.9
13,000	10.6	8.5	7.1	6.1	5.3
14,000	11.4	9.2	7.6	6.5	5.7
15,000	12.3	9.8	8.2	7.0	6.1
16,000	13.1	10.5	8.7	7.5	6.5
17,000	13.9	11.1	9.3	7.9	6.9
18,000	14.7	11.8	9.8	8.4	7.4
19,000	15.5	12.4	10.3	8.9	7.8
20,000	16.3	13.1	10.9	9.3	8.2
21,000	17.2	13.7	11.4	9.8	8.6
22,000	18.0	14.4	12.0	10.3	9.0
23,000	18.8	15.0	12.5	10.7	9.4
24,000	19.6	15.7	13.1	11.2	9.8
25,000	20.4	16.3	13.6	11.7	10.2

Individual carrier approval must be gained when shipping products of concentrated weight greater than 3,500 lb.

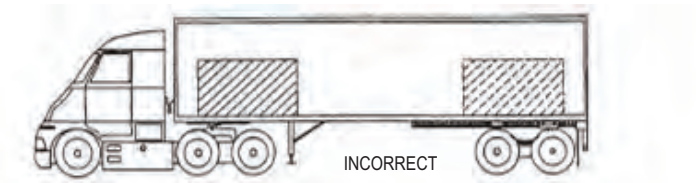
6. Special Equipment

Some trailers and containers are equipped with special interior fixtures. Properly fasten and lock such equipment in place. Properly secure all special equipment in trailers and containers when empty. The use of any type of material handling equipment to unlock and raise or lower and lock special equipment is prohibited.



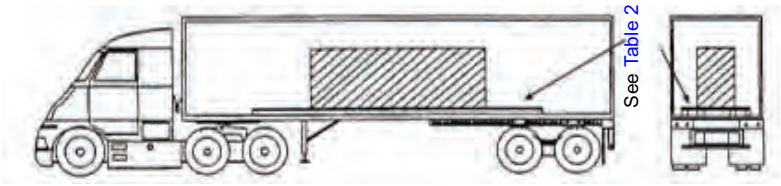
Trailers/containers are designed for uniform load distribution as shown. Distribute the lading equally between the rear tires and the king pin that transfers its load to the truck tractor.

Figure 1



Units loaded in either position indicated are incorrect because weight is not equally distributed to tires and king pin.

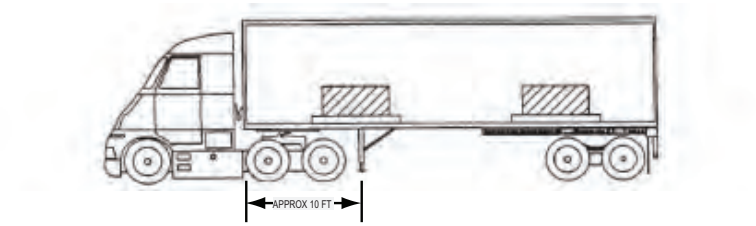
Figure 2



HIGHLY CONCENTRATED LOADS

Not more than 25,000 lb uniformly distributed in any 10 linear ft can be loaded on trailers meeting the specifications of AAR *Manual of Standards and Recommended Practices*, Specification M-931 or on containers meeting the specifications of *MSRP* Specification M-930. Item A is a skid of adequate length, width, and construction to properly distribute weight. Trailers in intermodal service not meeting the M-931 specifications or containers in intermodal service not meeting the M-930 specifications may be of lower floor strength. Considerations of such must be a part of any load planning, particularly that of highly concentrated loads, e.g., steel coils.

Figure 3



TOFC trailers and containers on chassis are often left unsupported by truck tractors and are lifted by cranes. In positioning two concentrated weight units as illustrated, position the forward unit for equal weight distribution on the landing gear (approximately 10 ft from nose).

Figure 4

3.0 GENERAL INFORMATION

3.1 Load Planning

3.1.1 Inspect lading prior to loading of trailer or container. Do not load damaged lading.

3.1.2 Evenly distribute the weight of load from side to side and end to end in trailer or container and to a uniform height insofar as lading permits. Place lighter shipping containers on top of heavier shipping containers with separating material used as needed between layers. Load like-sized shipping containers in stacks, and use divider material between stacks of different sizes or types of shipping containers and shipping containers of different densities. (See Figure 3.2.) Not more than 25,000 lb uniformly distributed in any 10 linear feet can be loaded on trailers meeting the specifications of M-931or on containers meeting the specifications of M-930.

3.1.3 Place shipping containers in the position to best utilize the shipping containers' inherent strength (See Figure 3.3.)

3.1.4 Fill all lengthwise space with lading or with lading and filler material, or appropriately block and brace, unless loaded to a specific method. (See paragraphs 3.3.1.1 through 3.3.1.5 for details.) (See Figure 3.4.)

3.1.5 Fill all crosswise space with lading or with lading and filler material. Use appropriate bracing or filler material to maintain vertical alignment and to prevent crosswise movement. (See Figures 3.4, 3.21, 3.22, 3.23, 3.24, and 3.25.) A four-unit pinwheel pattern may be effective in reducing voids.

3.1.6 In manually loaded shipments, use bonded block patterns for fiberboard shipping containers and key-sack or brick-wall loading patterns for bag loads. (See Figures 3.5, 3.6, 3.7, and 3.8 on bags and boxes.) Load cylindrical- shaped items, such as drums, pails, or rolls of paper, in a recessed or in-line loading pattern. (See Figures 3.9 and 3.10.)

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

3.1.8 Handle and load all freight according to shippers' printed directions, such as "This Side Up," "Do Not Drop," "Clamp Here," etc.

3.1.9 Segregate irregular lading (see Figure 3.11) from remainder of lading using blocking and bracing or separators and dividers. (See paragraphs 3.3 and 3.4 of this section.)

3.1.10 Load longest dimension of narrow-base items lengthwise of trailer or container. (See Figure 3.2.)

3.1.11 No commodity of a contaminating nature may be loaded in the same trailer or container with commodities liable to be contaminated thereby, unless properly segregated or protected.

3.1.12 Use a trailer or container liner or apply plastic sheeting to the top and rear of lading that is susceptible to damage from moisture, water, dust, etc.

3.1.13 Stop-off Trailers or Containers—Load consignments in reverse order to that in which they will be unloaded. Separately block or brace each individual consignment where necessary. Intermediate receivers are to reload in a level manner of brace or rebrace, if necessary, the remaining portion of the lading destined to subsequent receiver(s).

3.1.14 Top-Heavy Articles

Prevent top-heavy articles from falling or tipping over in transit by bracing at a point approximately opposite the upper third of the article.

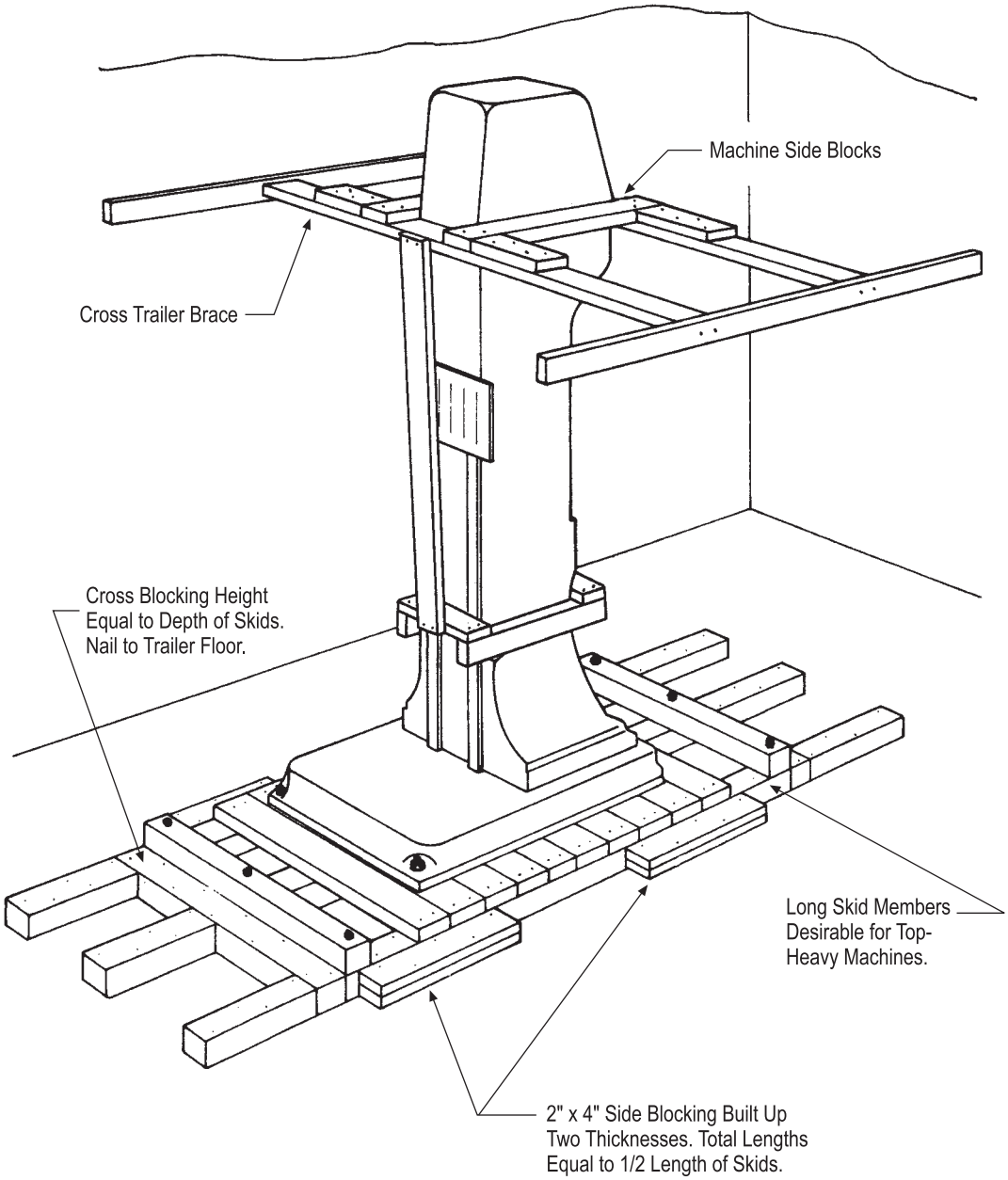
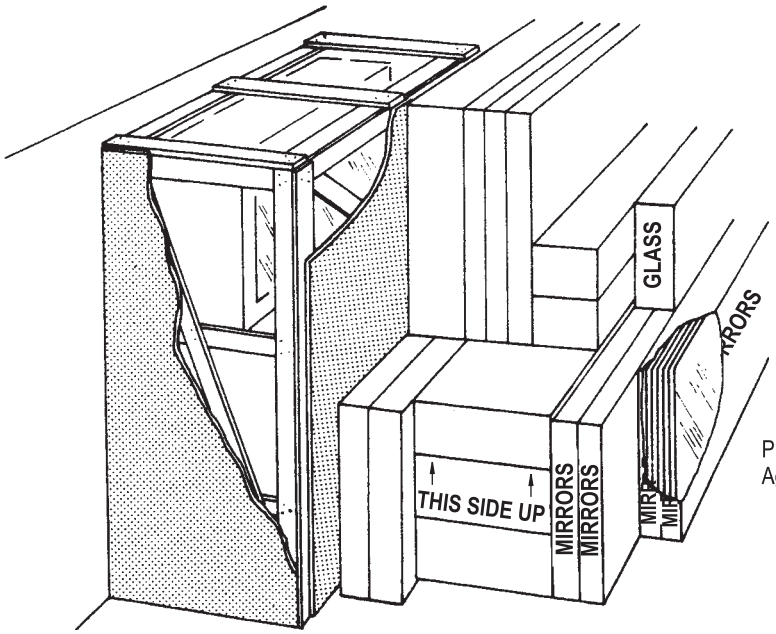
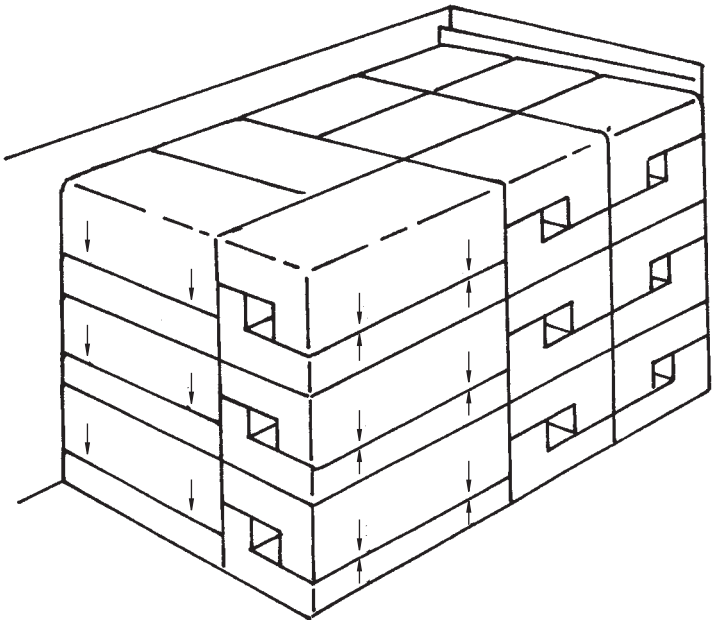


Figure 3.1 Top-heavy machinery—not leg type
(paragraph 3.1.14)



Open crate contains large piece. Two layers of corrugated fibreboard (cut away for better perspective) are used to protect against the possibility of small boxes falling or moving into open crate. Load mirrors, marble tops, KD tables, and/or bed ends, etc., on edge lengthwise of trailer.

Figure 3.2 Stowing mixed sizes and products
(paragraphs 3.1.2 and 3.1.10)



Load furniture in accordance with the arrows except articles in form fitting containers which may be inverted.

Figure 3.3 Placement of odd-shaped containers
(paragraph 3.1.3)

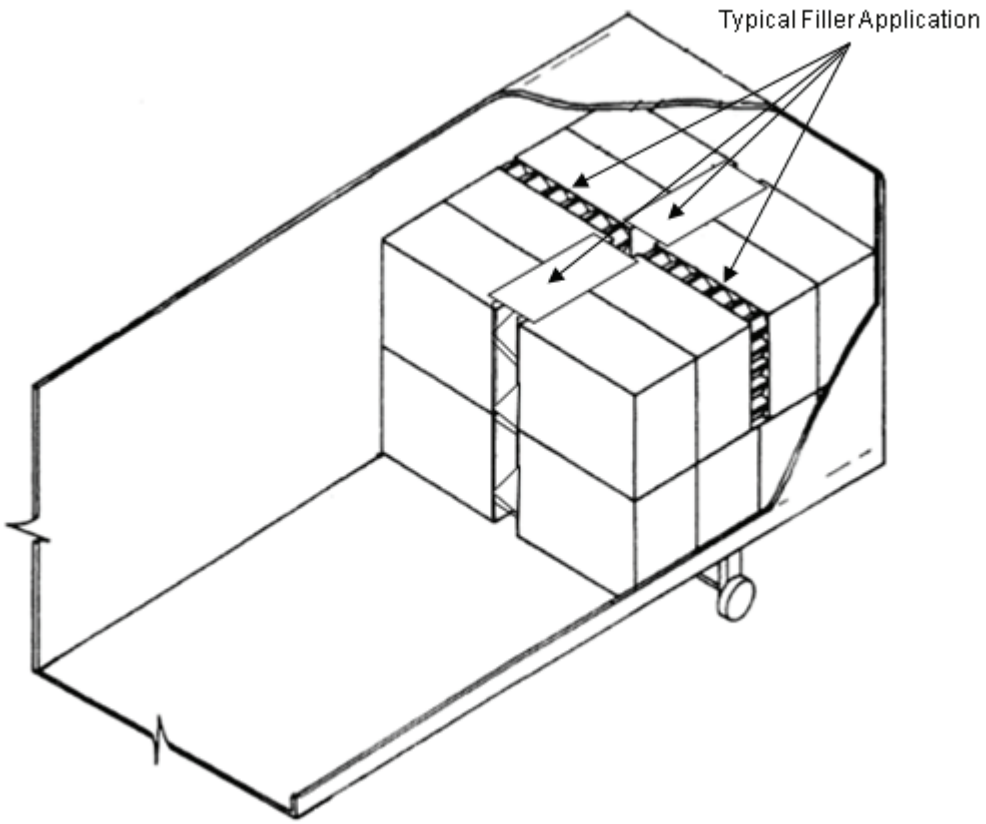


Figure 3.4 Use of filler material in loads of unitized shipping containers

3.1.15 Filler Construction

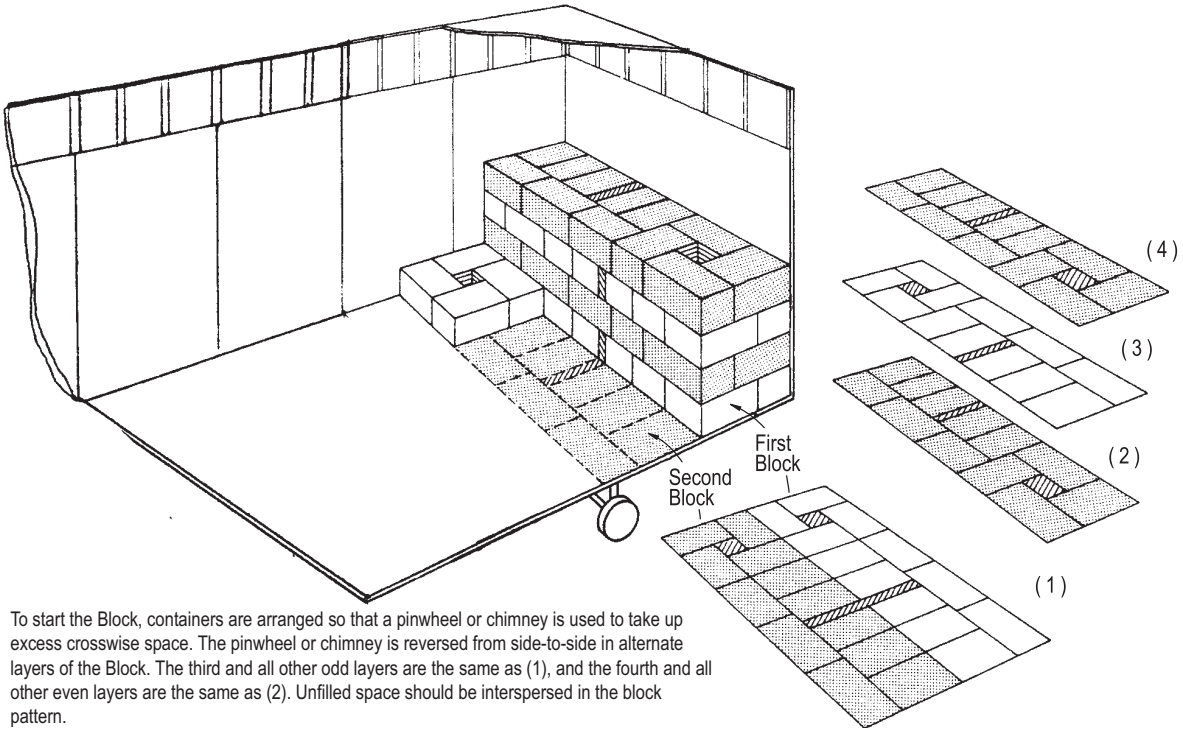
3.1.15.1 Lengthwise void fillers are to be of uniform strength over the face of the void filler and capable of withstanding a load of 1,500 lb/ft^2 (test full dimension filler sheet).

3.1.15.2 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 separating.

3.1.15.3 In two-layers loads, limit fillers to the top layer whenever possible. If fillers are used in both top and bottom layers, place the top layer filler directly above the bottom layer filler.

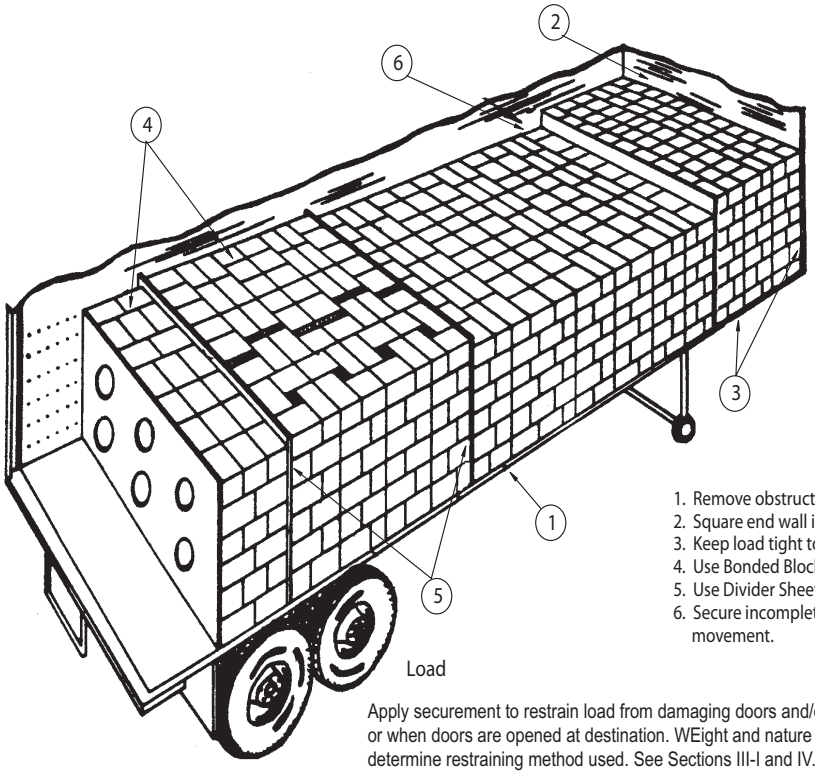
3.1.15.4 Do no reuse filler material if it has been damaged and is no longer capable of filling the intended void or if there is any evidence of creasing damage to the filler that might reduce the compression strength of the filler.

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



To start the Block, containers are arranged so that a pinwheel or chimney is used to take up excess crosswise space. The pinwheel or chimney is reversed from side-to-side in alternate layers of the Block. The third and all other odd layers are the same as (1), and the fourth and all other even layers are the same as (2). Unfilled space should be interspersed in the block pattern.

Figure 3.5 Bonded block pattern for manual loading
(paragraph 3.1.6)



1. Remove obstructions from walls and floors.
2. Square end wall if needed.
3. Keep load tight to end and side walls.
4. Use Bonded Block method of loading.
5. Use Divider Sheets between different size containers.
6. Secure incomplete layer of containers to prevent movement.

Apply securement to restrain load from damaging doors and/or lading from falling out during transit or when doors are opened at destination. WEight and nature of lading and type of trailer will determine restraining method used. See Sections III-I and IV.

Figure 3.6 Loading fiberboard containers
(paragraph 3.1.6)

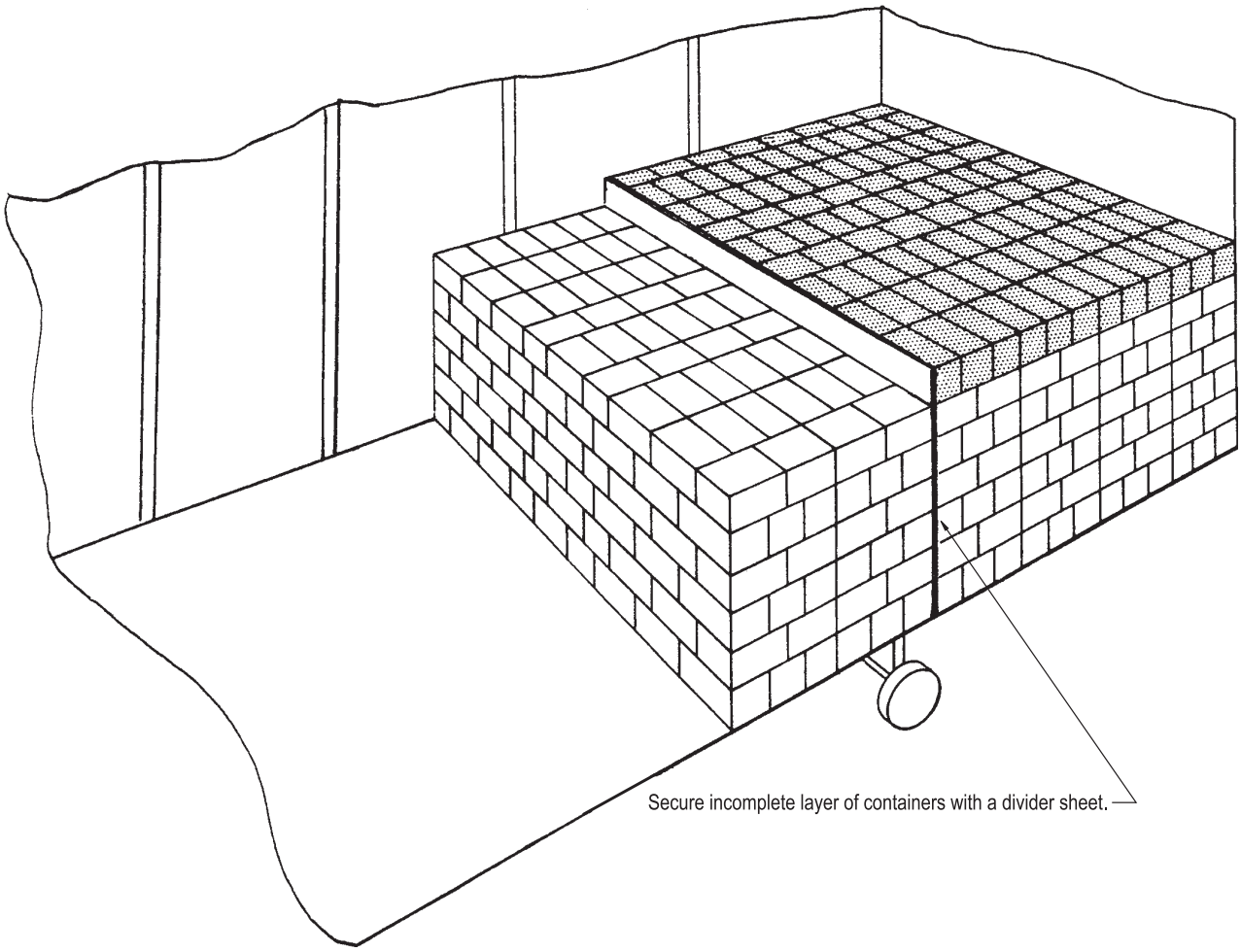


Figure 3.7 Incomplete layer
(paragraph 3.1.6)

3.1.16 Incomplete Layers

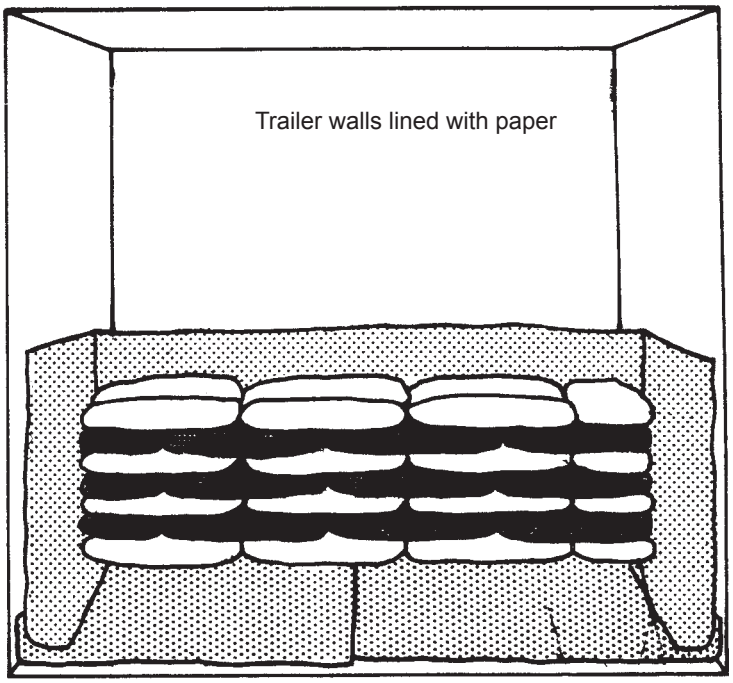
3.1.16.1 Avoid incomplete layers in shipments whenever possible. However, when incomplete layers have to be loaded, use full face and height bulkhead for light-weight commodities. For heavier commodities, unitize the rear portion of the incomplete layer to the bottom layer. Unitize with Type 1A, Grade 5 nonmetallic straps with appropriate bulkheads and protection between straps and lading.

3.1.16.2 Load incomplete layer from sidewall to sidewall. If containers in incomplete layer vary in size or weight, load as follows:

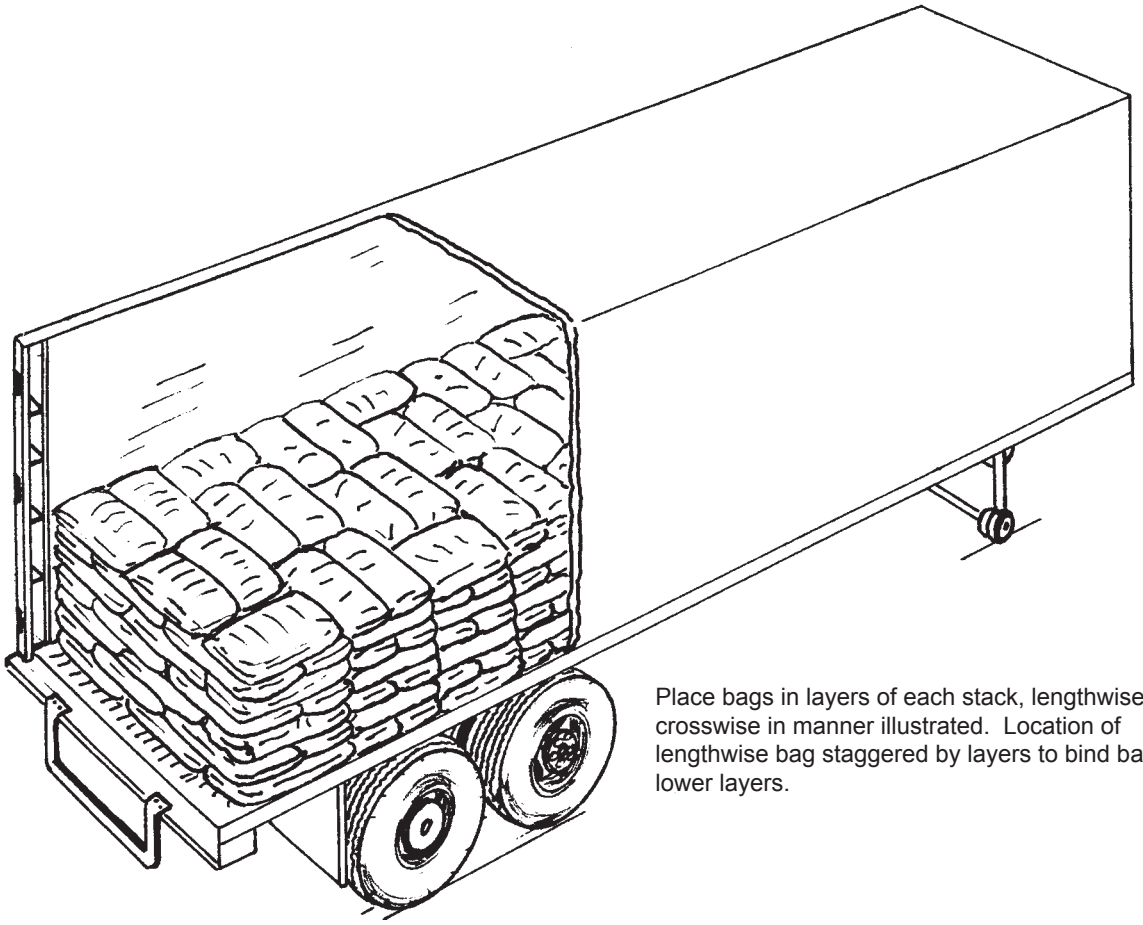
3.1.16.3 If there is a sufficient number of same-size rectangular containers, load the incomplete layer in a bonded-block pattern.

3.1.16.4 If there are not sufficient same-size rectangular containers, load the containers crosswise from sidewall to sidewall. If there is more than one size of container, load large, heavy containers closest to the end wall; then the next largest, heavy container, etc.

3.1.16.5 Secure incomplete layer of containers to prevent movement.

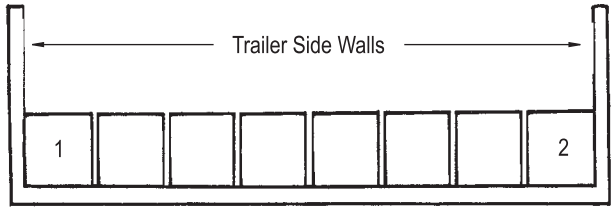


Apply Securement to restrain load from damaging doors and/or lading from falling out during transit or when doors are opened at destination. Weight and nature of lading and type of trailer will determine restraining method used. See Sections III-I and IV.



Place bags in layers of each stack, lengthwise and crosswise in manner illustrated. Location of lengthwise bag staggered by layers to bind bags in lower layers.

Figure 3.8 Manually loaded bags
(paragraph 3.1.6)



Load containers nos. 1 and 2 in opposite corners of trailer. The remaining containers in stack to be equally spaced between containers nos. 1 and 2.

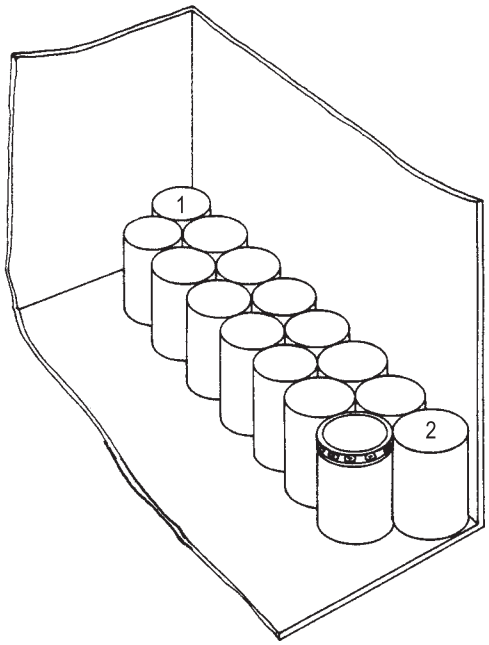
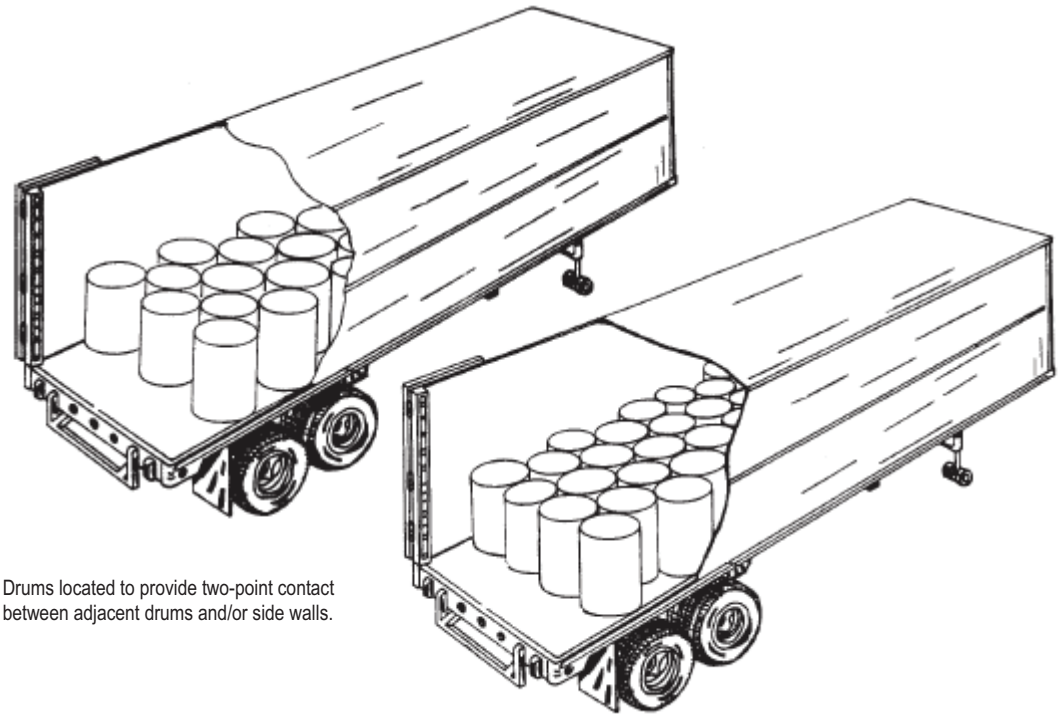


Figure 3.9 Recessed cylindrical containers in adjacent stacks
(paragraph 3.1.6)



Drums located to provide two-point contact between adjacent drums and/or side walls.

Apply securement to restrain load from damaging doors and/or lading from falling out during transit or when doors are opened at destination. Weight and nature of lading and type of trailer/container will determine restraining method used. See paragraph 4.0.

Figure 3.10 Recessed method of loading straight-sided drums
(paragraph 3.1.6)

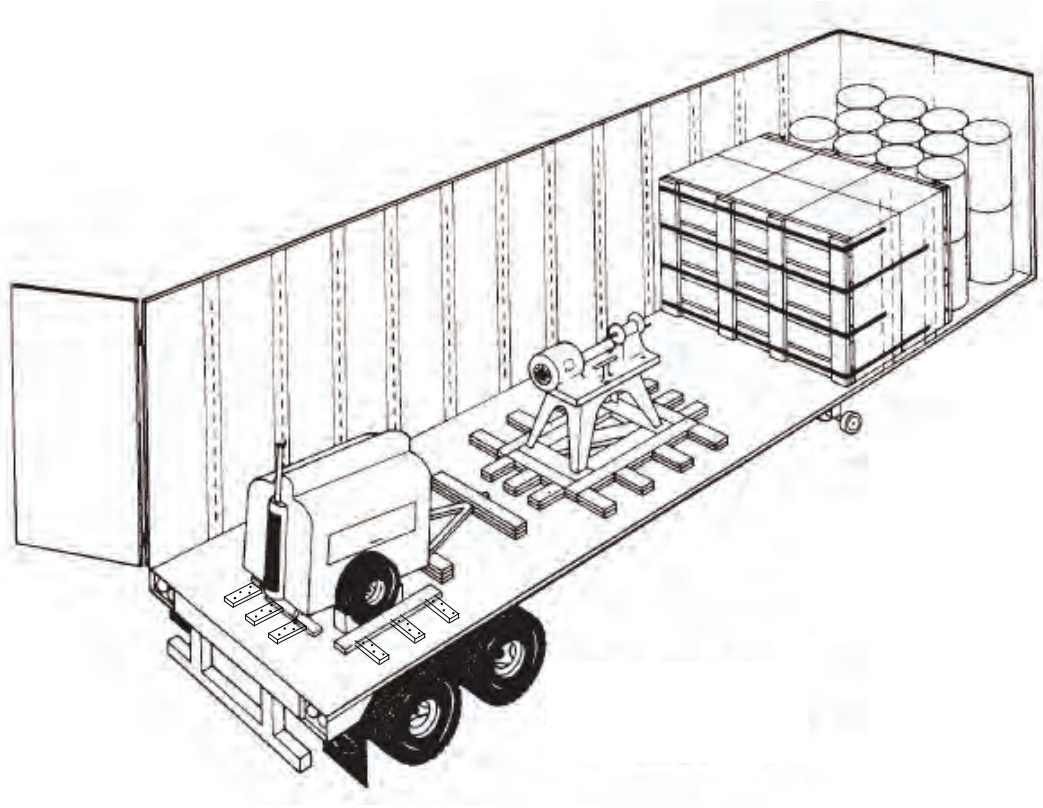


Figure 3.11 Segregate irregular lading
(paragraph 3.1.9)

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 On Wooden Pallets

3.2.1.1 Stack shipping containers in a bonded-block or other comparable unitizing method. (See Figures 3.12 and 3.13.) If units consist of bags or bales, use adequate separator material between the product and the pallet. (See Figure 3.27.)

3.2.1.2 Provide palletized units with unit-to-unit contact with minimum overhang of shipping containers on pallets. (See Figure 3.14.)

3.2.1.3 No underhang on pallets is allowed lengthwise of trailer or container unless filler material is used or underhang otherwise compensated for. Figure 3.15 shows a method of filling underhang on pallets by using expanded corrugated honeycomb fiberboard with glued facings of single-wall corrugated fiberboard. Adhere to limitations described on figure.

3.2.1.4 Maintain vertical alignment of shipping containers by use of space fillers, corrugated sleeves, corner protectors and strapping, shrink-wrapping, stretch-wrapping, spot-gluing, or other similar methods. (See Figures 3.16, 3.24, and 3.25.)

3.2.1.5 Take up all lengthwise voids between pallet loads by use of load-restraining devices or filler material. (See Figure 3.4.)

3.2.1.6 Load as many units across the trailer or container as practical and as long as units are loaded in a straight line lengthwise. Fill all crosswise void space with appropriate bracing or filler material to maintain vertical alignment and to prevent crosswise movement. (See Figures 3.16, 3.24, and 3.25.)

3.2.1.7 In double-layer wooden pallet loads, have units equal in height to ensure pallet contact both longitudinally and laterally. If this is not the case, then separate stacks of units with suitable divider sheets. (See Figure 3.19.)

3.2.1.8 Where 4-way entry is required, 2-way entry pallets may be modified. (See Figure 3.17.)

3.2.2 On Slip Sheets

3.2.2.1 Stack shipping containers on slip sheets in a bonded block or other comparable unitizing method.

3.2.2.2 Provide units with unit-to-unit contact lengthwise in trailer or container. See Figures 3.4 and 3.15 for a method of filling lengthwise voids (rows and layers of different size units) to provide a solid face for applying securement.

3.2.2.3 Maintain vertical alignment of shipping containers on slip sheets by use of space fillers, corrugated sleeves, corner protectors and strapping, shrink-wrapping, stretch-wrapping, spot-gluing, or other similar methods. (See Figures 3.16, 3.24, and 3.25.)

3.2.2.4 Take up all lengthwise void between units by use of load-restraining devices, shipping containers, or filler material. (See Figure 3.4.)

3.2.2.5 Load as many units across the trailer or container as practical and as long as units are loaded in a straight line lengthwise in the trailer or container. Fill all crosswise void space with appropriate bracing or filler material to maintain vertical alignment and to prevent crosswise movement. (See Figures 3.16, 3.24, and 3.25.)

3.2.2.6 Tape the lips of slip sheets to protect them and to prevent them from bunching up when the units are loaded.

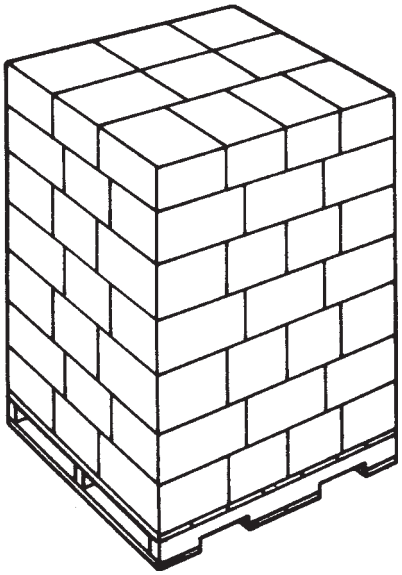


Figure 3.12 Palletized boxes
(paragraph 3.2.1.2)

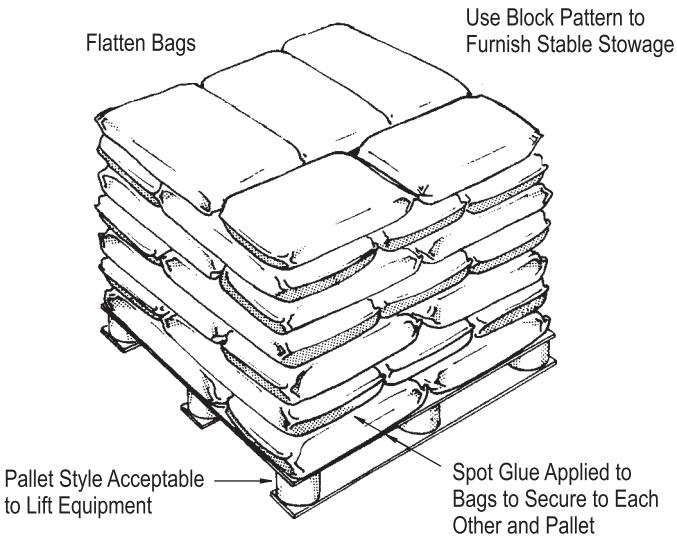
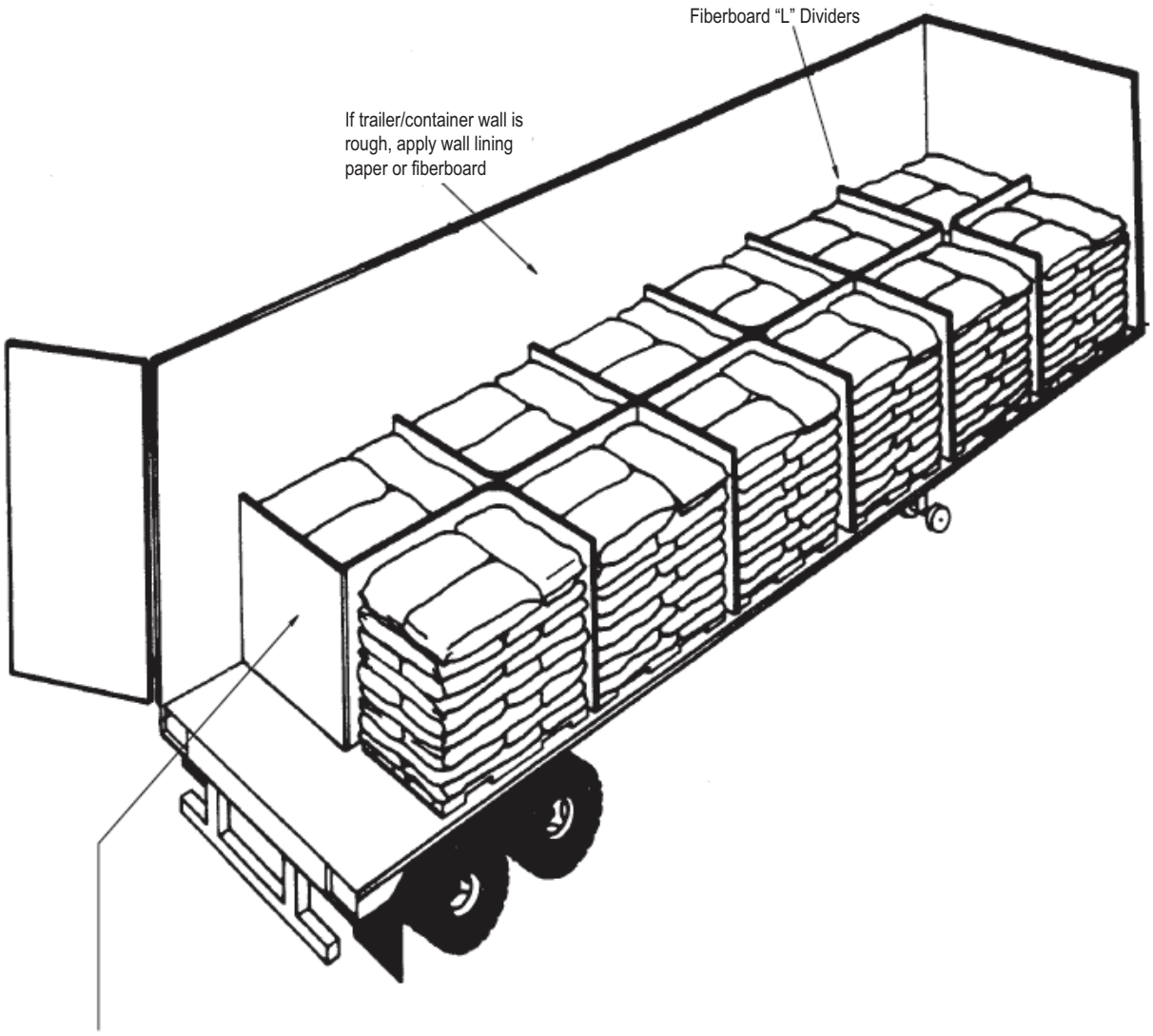


Figure 3.13 Palletized bags
(paragraph 3.2.1.2)



Apply securement to restrain load from damaging doors and/or lading from falling out during transit when doors are opened at destination. Weight and nature of lading and type of trailer/container will determine restraining method used. See paragraphs 3.10 and 4.0.

Note: If pallet is hand-loaded in trailer/container, use same type pattern.

Figure 3.14 Palletized bag loading
(paragraph 3.2.1.2)

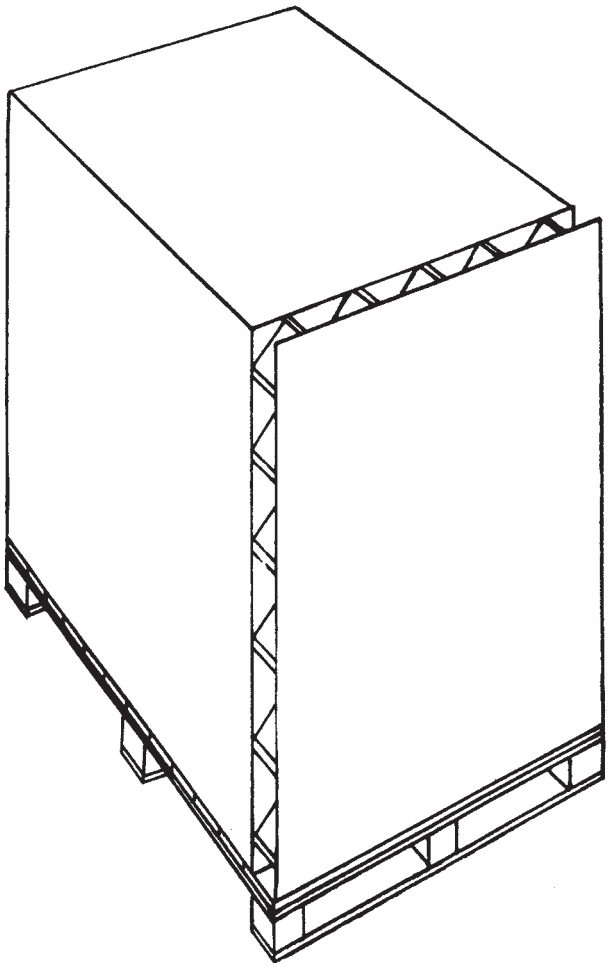


Figure 3.15 Use of lengthwise filler material on wood pallet to fill lengthwise void space (paragraphs 3.2.1.3 and 3.2.2.2)

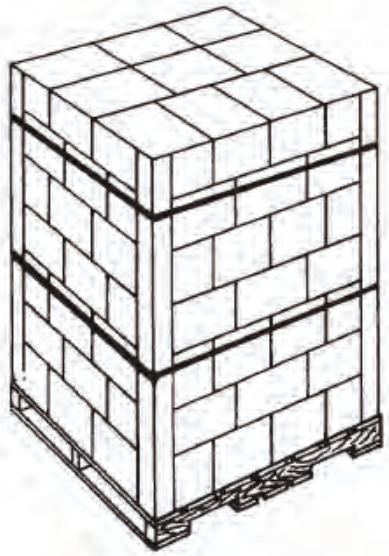
3.2.3 Filler Construction

3.2.3.1 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 lb/ ft² (test full dimension filler sheet).

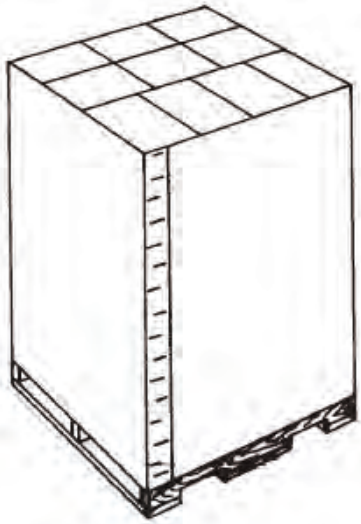
3.2.3.2 Make the height and width dimensions of the faces of the filler material as near as possible the same as the dimensions of the faces of the units they will be separating.

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

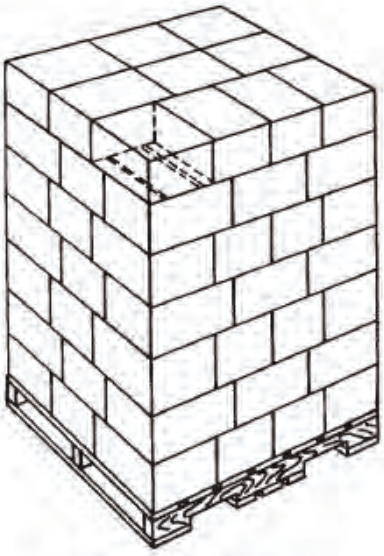
3.2.3.4 Do not use lengthwise void filler material as a bulkhead or in lieu of a bulkhead.



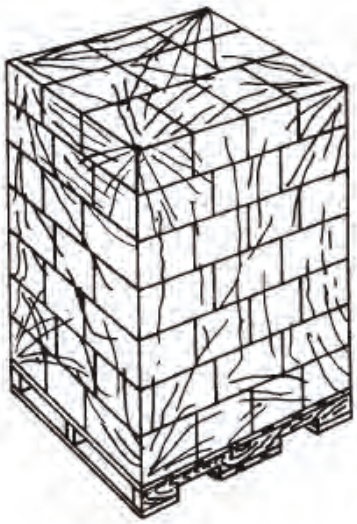
Corner Posts and Strapping
Corner Posts May Be Made From Plywood, Hardboard, Multi-Wall Corrugated Fibreboard or Other Suitable Material



Corrugated (Fibreboard) Sleeves



Spot Gluing of Containers
Double Dash Represents Glue Lines.



Pallet Load Utilizing
One of the Stretch Wrap or Shrink-Wrapping Films

Figure 3.16 Examples of maintaining vertical alignment of unitized containers (paragraphs 3.2.1.4, 3.2.1.6, 3.2.2.3, and 3.2.2.5

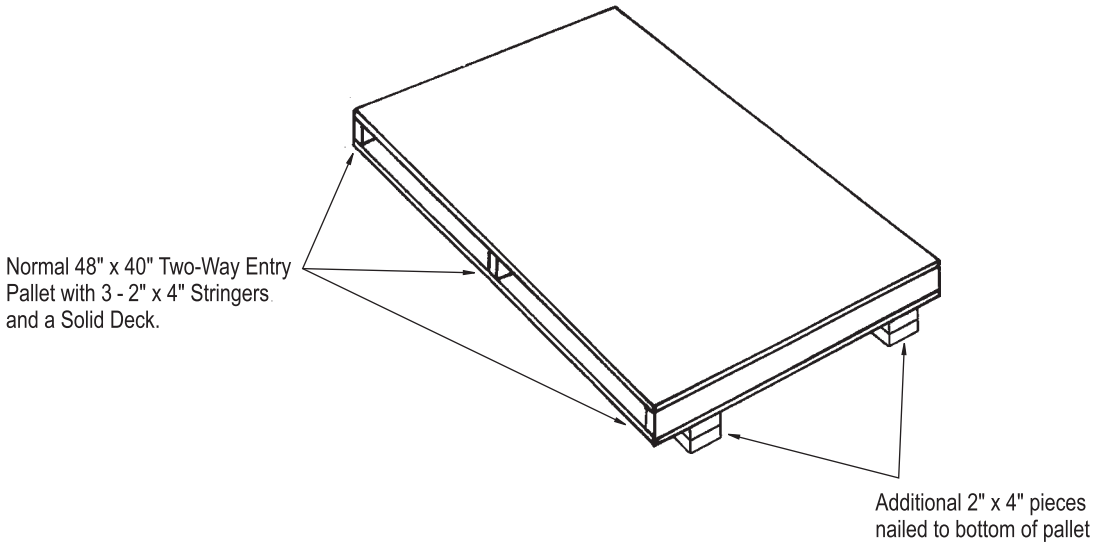


Figure 3.17 A Method of preparing two-way entry pallets
(paragraph 3.2.1.8)

3.3 Fillers, Dividers and Separators

3.3.1 Fillers and Dividers

3.3.1.1 Those structures used to fill the lengthwise space in a trailer or container not occupied by the lading or used to segregate the lading are designated according to types as fillers and dividers.

3.3.1.2 Use fillers to square off bowed or angled end walls before trailer or container is loaded. (See Figure 3.18.)

3.3.1.3 Separate different type containers lengthwise by use of plywood sheets or fiberboard of sufficient height to protect the tallest stack of containers. (See Figure 3.20.)

3.3.1.4 Separate different sizes of the same type of containers by divider sheets. (See Figures 3.19 and 3.20.)

3.3.1.5 Use fillers to take up crosswise space in trailer to prevent movement in the load and to permit ready removal of lading. (See Figures 3.21, 3.22, 3.23, 3.24, and 3.25.)

3.3.2 Separators

3.3.2.1 When commodities in different type containers or units are loaded in more than one layer, use separator material to provide an even base for the upper layers. Use separators adequate to carry weight of lading. Generally ½ in. plywood sheets or other suitable material may be used. If units consist of bags or bales, use fiberboard protection between separator material and tops of lower units. (See Figures 3.26 and 3.27.)

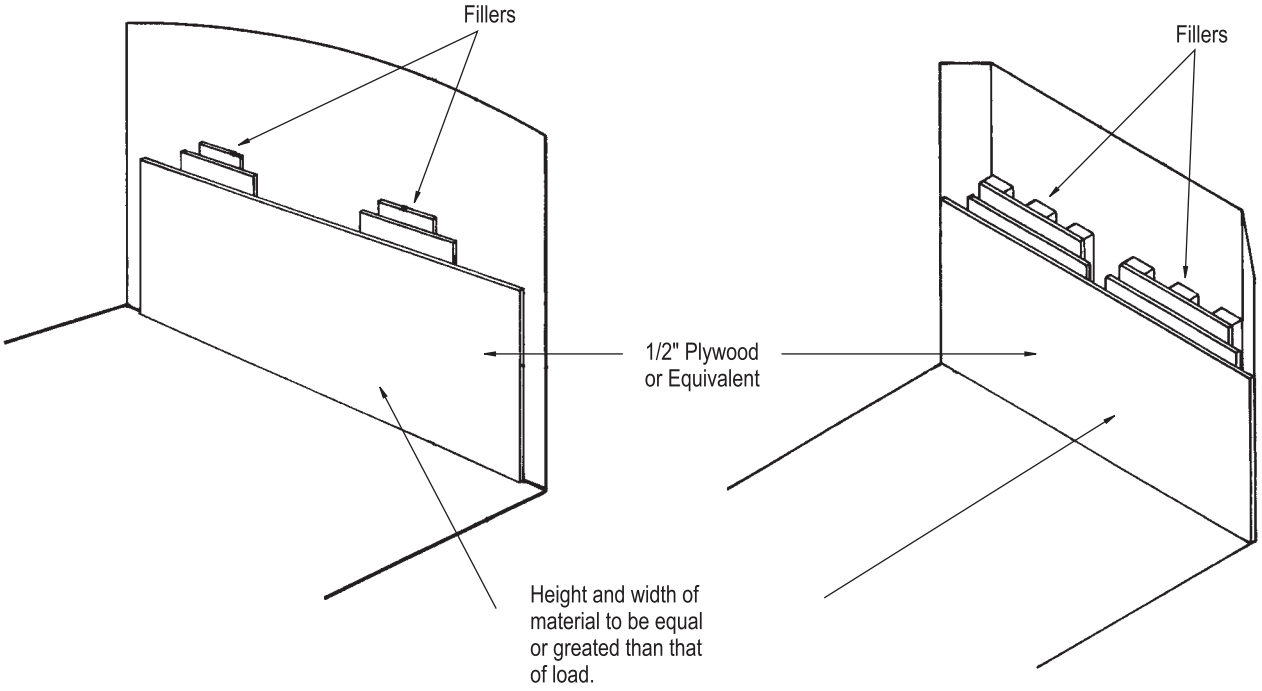
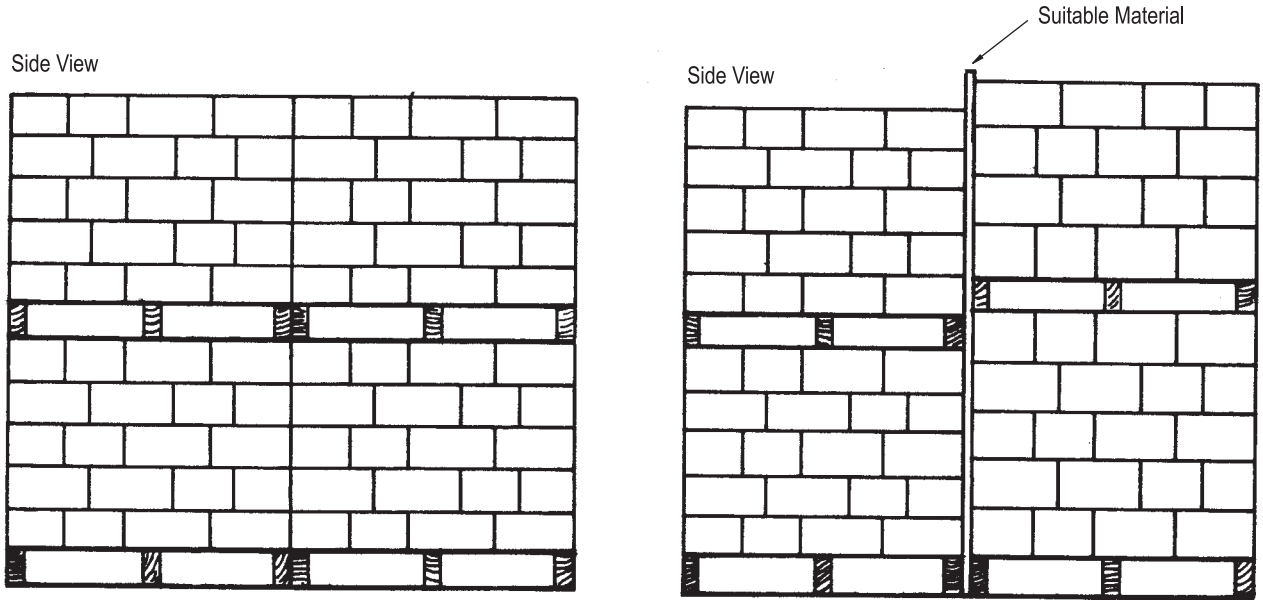


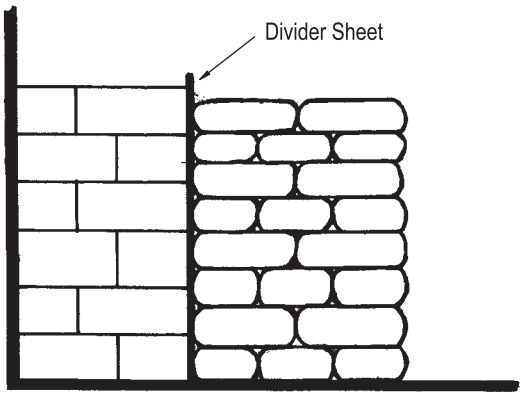
Figure 3.18 Methods of using fillers to square off angled or bowed end walls
(paragraph 3.3.1.2)



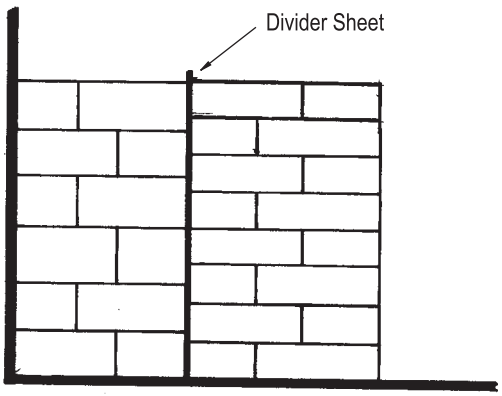
PROPER
Wood pallets in the same horizontal plane in the trailer insuring pallet-to-pallet contact.

PROPER
Wood pallets not in the same horizontal plane lengthwise of trailer, but a divider sheet added to insure no wood to product contact longitudinally.

Figure 3.19 Unitized double-layer wood pallet loads
(paragraph 3.2.1.7)



Use full width and height sheets of sufficient strength to prevent deformation of fibreboard containers.



Use full width and height sheets of fibreboard, preferrably 80 point solid fibreboard.

Figure 3.20 Divider sheets
(paragraphs 3.3.1.3 and 3.3.1.4)

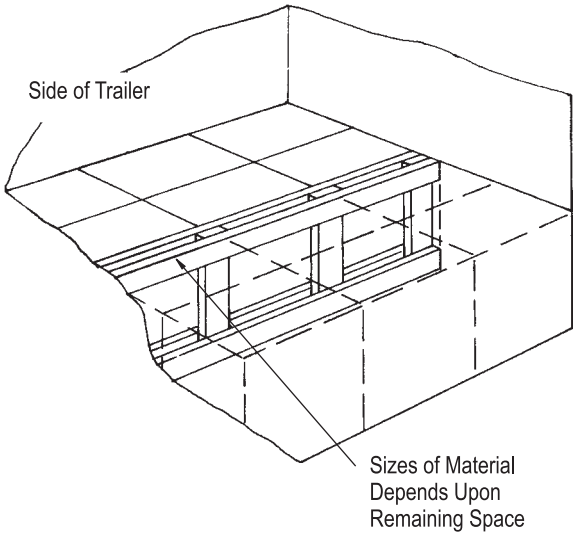


Figure 3.21 Center blocking and bracing
(paragraphs 3.1.5, 3.3.1.5, and 3.4.8.2)

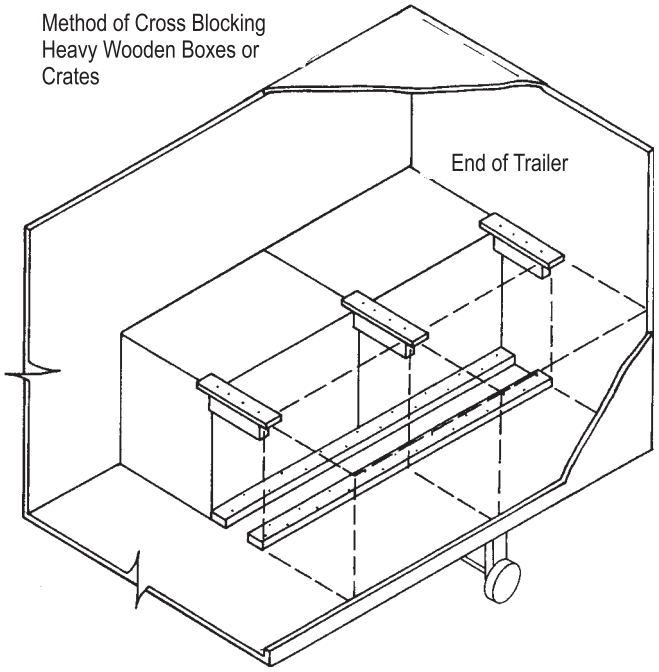
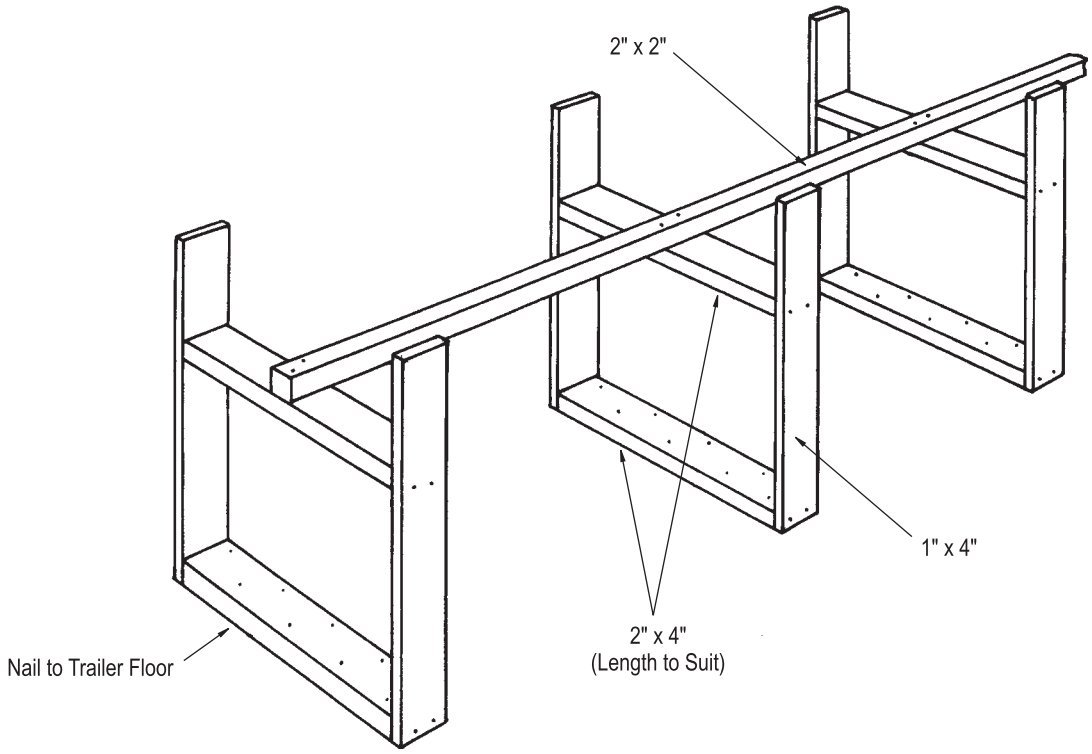
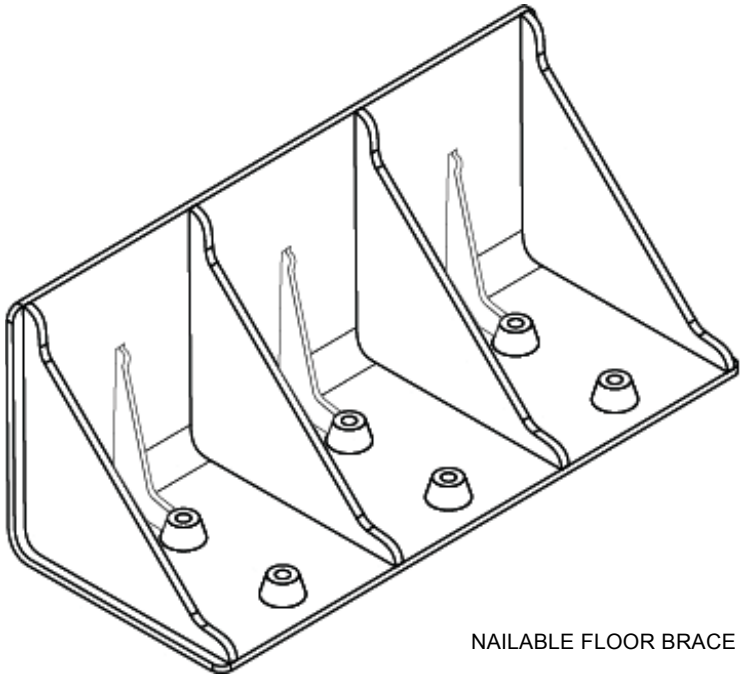


Figure 3.22 Center blocking and bracing
(paragraphs 3.1.5, 3.3.1.5, and 3.4.8.2)

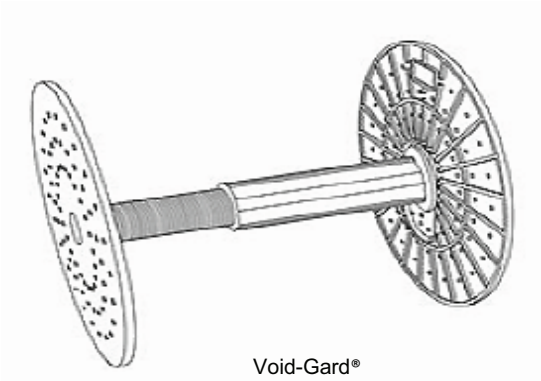




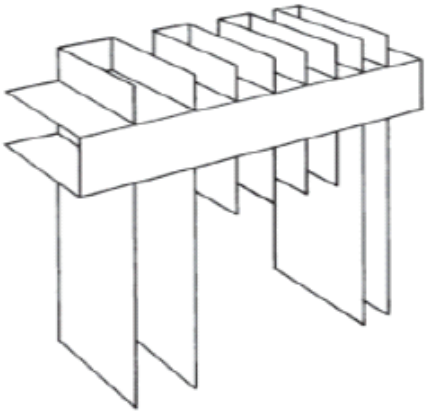
NAILABLE FLOOR BRACE

NOTES:
1. FOR USE AS LATERAL BRACING ONLY. USE 2 BRACES PER PALLET.
2. USE 16D DOUBLE-HEADED NAILS.

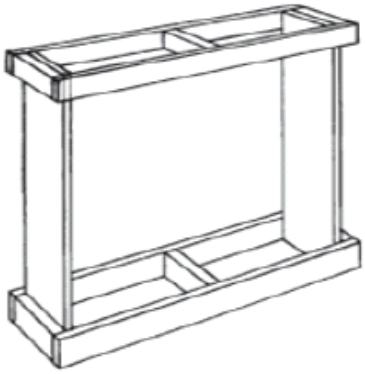
Figure 3.23 Center blocking and bracing
(paragraphs 3.1.5, 3.3.1.5, and 3.4.8.2)



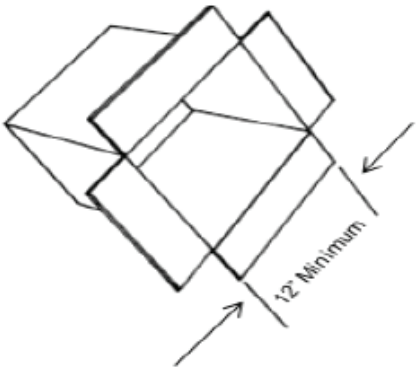
Void-Gard®



Slotted ad Folded Corrugated Fibreboard

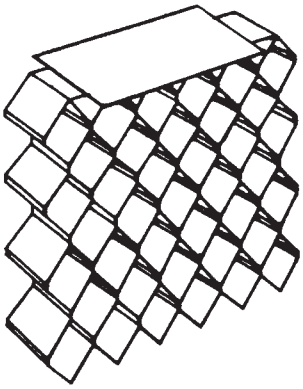


Wood Construction

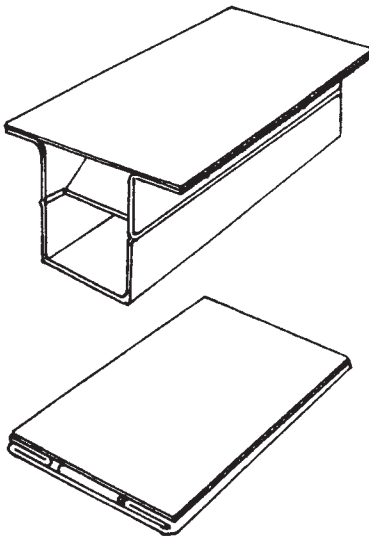


Tube Type Corrugated Fibreboard

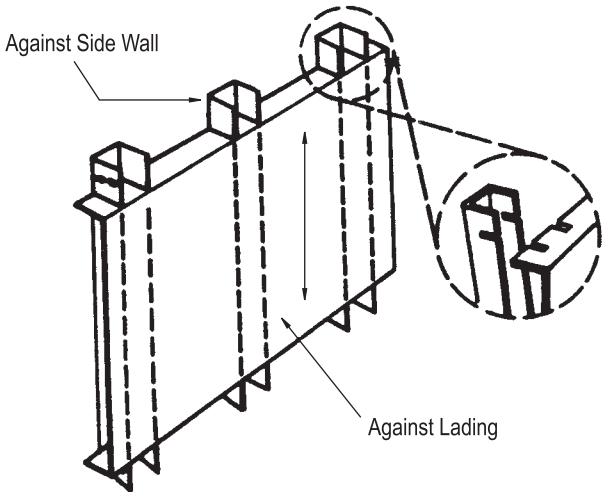
Figure 3.24 Examples of fillers to occupy unfilled crosswise space (paragraphs 3.1.5, 3.2.1.4, 3.2.1.6, 3.2.2.3, 3.2.2.5, 3.3.1.5, and 3.4.8.2)



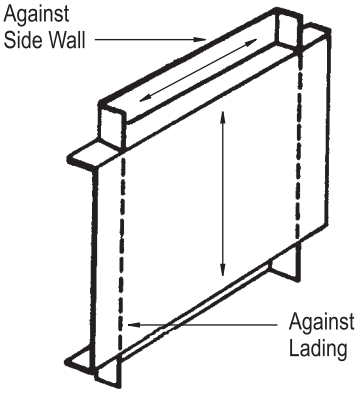
Honeycomb Style



Collapsible - May Be Used With Film Wrapped Units
Where Excluded By Specific Loading M



Flanged Tubes Interlocked With Flanged Sheets



Interlocked Flanged Sheets

NOTE: Use fillers of sufficient size to maintain alignment and to protect containers from falling into the crosswise void. Arrows indicate direction of corrugation.

Figure 3.25 Examples of corrugated fillers to occupy unfilled crosswise space
(paragraphs 3.1.5, 3.2.1.4, 3.2.1.6, 3.2.2.3, 3.2.2.5, 3.3.1.5, and 3.4.8.2)

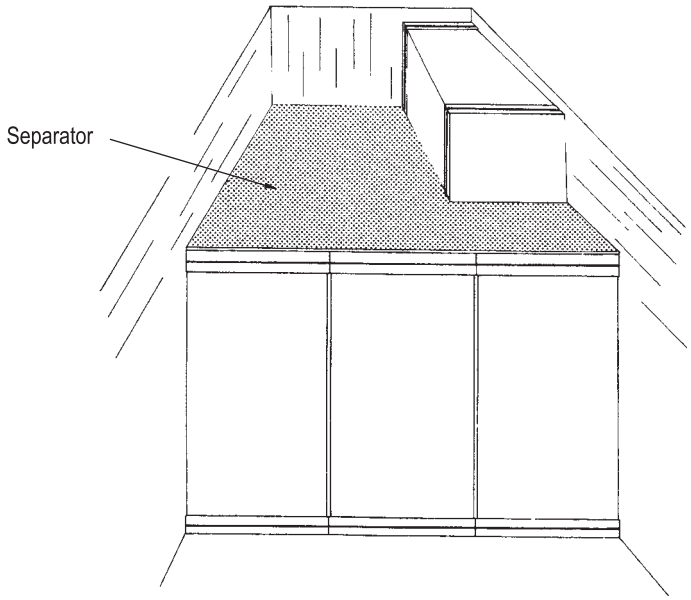


Figure 3.26 Separator materials between layers when required
(Item paragraph 3.3.2.1)

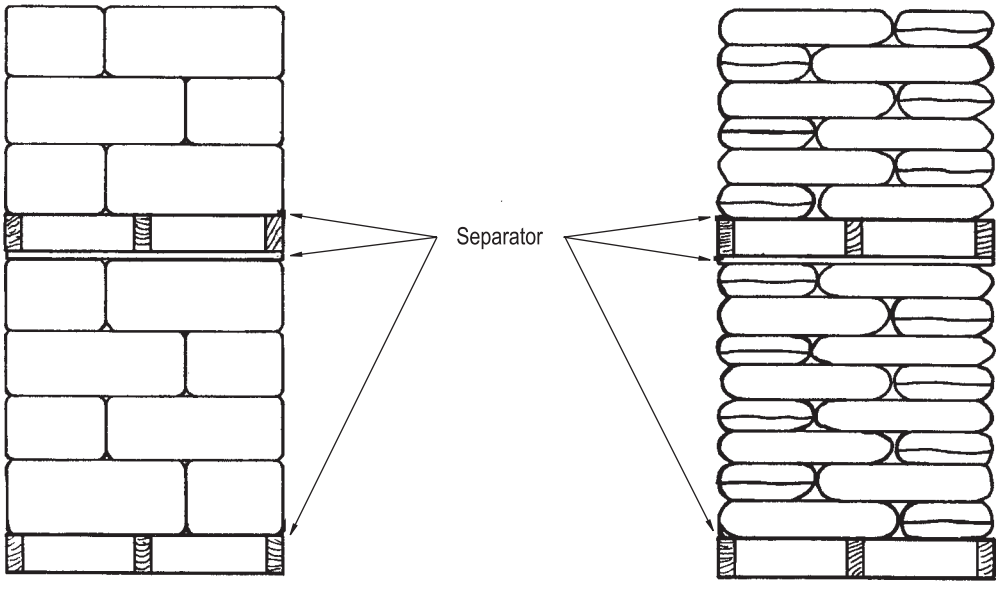


Figure 3.27 Unitized Double-Layer Wood Pallet Loads
(paragraphs 3.2.1.1 and 3.3.2.1)

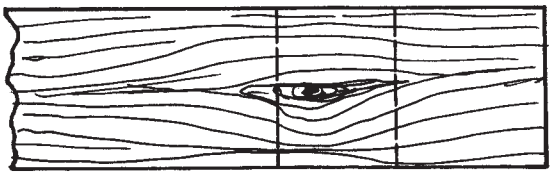
3.4 Wood

3.4.1 Use properly seasoned lumber for trailer blocking and bracing. 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. For specific information on the types and characteristics of lumber used for blocking and bracing, refer to Appendix A.

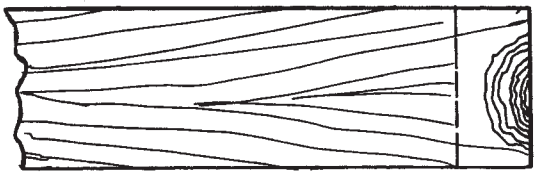
3.4.2 Properly store lumber used for blocking and bracing to protect it from the elements, preventing rot or decay from affecting its strength.

3.4.3 When selecting the size of lumber for blocking and bracing, give consideration to the weight, size, and nature of the commodity to be secured.

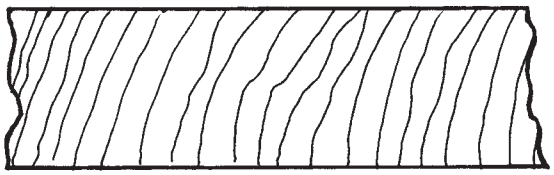
3.4.4 Select all blocking and bracing material from sound lumber free from crossgrain or dry rot. Do not use lumber with knots, knotholes, and checks or splits that affect its strength or interfere with proper nailing. (See Figure 3.28.)



Large knots weaken members. Cut off as shown and use short pieces for cleats, etc.



Cut off knots that interfere with nailing at dotted line as shown.



Never use lumber with cross grain for structural members.

Do not reject lumber with small amount of bark.

Figure 3.28 Selecting wood blocking and bracing material (paragraph 3.4.4)

3.4.5 Bull boards may be inserted into slotted doorposts at rear of trailer to restrain low-density material. Use minimum 2 in. × 4 in. lumber (preferably hardwood), free of knots or other strength-impairing defects, and of suitable length to fit snugly between doorposts. Use a sufficient number of bull boards to prevent lading from contacting rear doors. (See chart below.) When necessary, use a wooden gate and fiberboard or plywood buffer material to fill remaining void space and evenly distribute lading forces. (See Figure 3.29)

Restraint Device	Capacity
2 in. × 4 in. bull board	5,600 lb[a/]
2 in. × 6 in. bull board	8,000 lb[a/]
2 in. × 4 in. "T" brace	7,000 lb[a/]
2 in. × 6 in. "T" brace	10,000 lb[a/]

a/ Figures developed through testing of bull boards and "T" braces constructed of yellow pine.

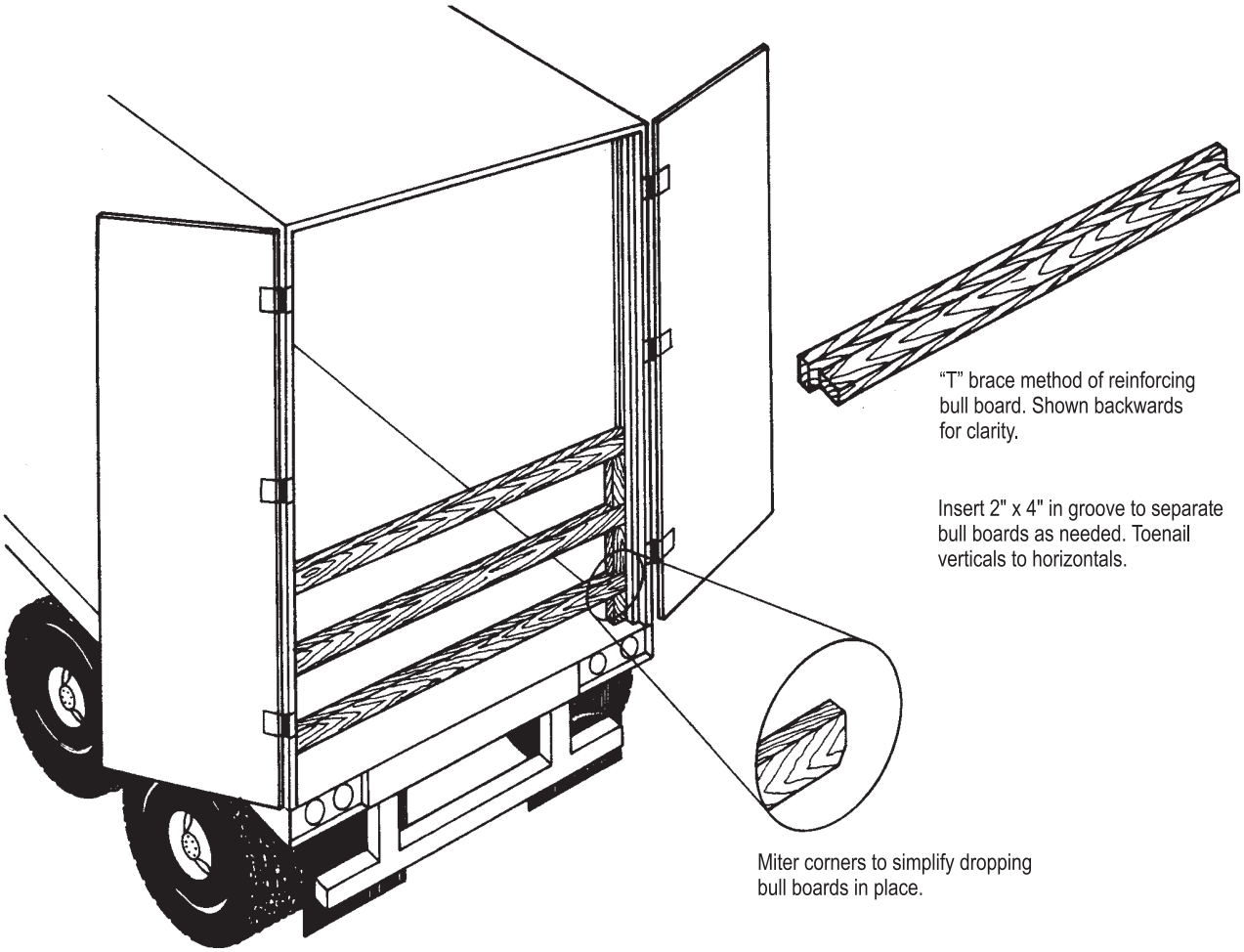


Figure 3.29 Use of slotted doorposts
(paragraph 3.4.5)

3.4.6 Nails and Nailing

3.4.6.1 Sizes of nails shown for the construction and assembly of blocking and bracing and the securing of same within the trailer or container are based on use of common nails. When heavy blocking and bracing material is used, spikes may be necessary. Table 3.1 shows the sizes of common nails, power-driven nails and staples, and spikes that are used in trailer or container bracing and blocking.

Do not nail into the walls of trailers or containers. Toenailing is not permitted except when specified in an approved securement method.

Table 3.1 Common nails, power-driven nails, power-driven staples, and spikes

	Common Nails		Power-Driven Nails		Power-Driven Staples		Spikes	
Size Penny Weight	Length (in.)	Wire Diameter (in.)	Length (in.)	Wire Diameter (in.)	Length (in.)	Wire Diameter (in.)	Length (in.)	Wire Diameter (in.)
6d	2	.113	—	—	—	—	—	—
8d	2½	.131	2⅜	.113	2½, 2	.080	—	—
10d	3	.148	3	.120	¾	.080	3	.192
12d	3¼	.148	3¼	.131	3, 3¼	—	3¼	.192
16d	3½	.162	3½	.131	—	.080	3½	.207
20d	4	.192	4	.145	3½	.080	4	.225
30d	4½	.207	4¾	.165	3½	—	4½	.244
40d	5	.225	5⅛	.165	—	—	5	.263
50d	5½	.244	—	—	—	—	5½	.283
60d	6	.263	—	—	—	—	6	.283
5⁄16	—	—	—	—	—	—	7	.312
⅜	—	—	—	—	—	—	8	.375

3.4.6.2 Consider the relation of the number, size, and kind of nails to the size and kind of lumber used in blocking and bracing. Use sufficient nails, because the strength of blocking and bracing increases directly with the number and size of nails. Do not use nails where they will be in direct tension, but preferably in lateral resistance as shown in Figures 3.30 and 3.31.

3.4.6.3 Drive nails into side grain of lumber because they have 50% more holding power than when driven into the end grain and there is less probability of their splitting the wood. Drive all nails straight.

3.4.6.4 To facilitate driving, prevent splitting, and increase the holding power of the nail, pre-drill holes slightly smaller than the diameter of the shank of the nail.

3.4.6.5 Use nails of such length to develop the necessary holding power through ample penetration into trailer floors and other blocking and bracing members. The nailing schedule shown in Table 3.2 will be of assistance in determining the proper size to use.

Table 3.2 Sizes of nails and spikes for various thicknesses of material

Thickness of Material (Rough Lumber) Holding Head of Nail or Spike	Thickness of Material (Rough Lumber) Holding Point of Nail						
	1 in.	1¼ in.	2 in.	3 in.	4 in.	5 in.	6 in.
1 in.	6d[a/] 8d[b/]	6d 8d[b/]	10d 12d[b/]	16d —	16d —	16d —	16d —
2 in.	10d 12d[b/]	10d 12d	16d —	20d 30d	40d 50d	40d 60d	40d 60d
3 in.	16d 20d	20d 30d[b/]	30d 40d	40d 60d	60d 7 in. spike	7 in. spike —	8 in. spike —
4 in.	40d 50d[b/]	40d 50d[b/]	50d 60d	60d 7 in. spike	7 in. spike 8 in. spike	8 in. spike —	9 in. spike —
5 in.	50d 60d	60d —	60d 7 in. spike	7 in. spike 8 in. spike	8 in. spike 9 in. spike	9 in. spike —	10 in. spike —
6 in.	7 in. spike —	7 in. spike —	7 in. spike 8 in. spike	8 in. spike 9 in. spike	9 in. spike 10 in. spike	10 in. spike —	10 in. spike —

a/ d = penny
b/ Nails clinched

3.4.6.6 Nails one size smaller than those used for medium or soft wood may be used for extremely hard woods, such as Group IV of Table A.2 in Appendix A.

3.4.6.7 Table 3.2 shows nail and spike sizes that are used in the construction and assembly of trailer or container blocking and bracing.

3.4.6.8 When using automatic-type nailers, sizes of nails may be less than those specified if number driven is increased by one third and the size substitution as follows is adhered to:

Common Nails		Power Driven Nails
10d	or	8d or 10d
20d	or	16d or 20d

Table 3.3 Lateral resistance of nails (in pounds) when nailed through 2 in. thick flooring and into 1¼ in. trailer floor – hardwoods (Group IV)

Size of Common Nail (d)				
8	10	12	16	20
344 lb	733 lb	916 lb	956 lb	1043 lb

Load applied is at a 90°angle to the shank or direction of driving of nail point in the securing wood.

NOTE: For types of lumber, see Table A.2 in Appendix A.

3.4.7 Floor Blocking

3.4.7.1 Securely nail to trailer or container floors all floor blocking to prevent lengthwise movement. Reinforce with backup cleats not less than 2 in. × 4 in. material and at least 18 in. in length. Stagger nails or spikes. The size and amount of lumber and nails required will be dictated by weight of lading. (See Table 3.3 above and Tables A.1, A.2, A.3, and A.4 in Appendix A.) (See Figures 3.30, 3.31, and 3.32.)

3.4.7.2 Use floor blocking as shown in Figure 3.30 of not less than 2 in. × 4 in. or 2 in. × 6 in. material and extend or exceed full width of the boxed or crated article against which it bears to prevent concentrated pressure or shearing of the container. For shipments on skids, use floor blocking of the same thickness as the skid members as shown in Figures 3.31 and 3.32 with backup cleats placed in line with the skid members.

3.4.7.3 Use floor blocking applied against beveled or mitered skids the same thickness as the skid member (see Figure 3.32) and reinforce with backup and hold-down cleats secured to the trailer or container floor. Avoid excessive mitering of the ends of the skids to prevent the skidded article from riding over the floor blocking. If beveling or mitering is necessary to facilitate handling, do not exceed one third of the thickness of the skid member.

3.4.7.4 Figure 3.32 shows the use of a hold-down cleat that is nailed to the floor cleats and extends over the floor blocking member and the skid runner. Height of this cleat is equal to that of crosswise skid member.

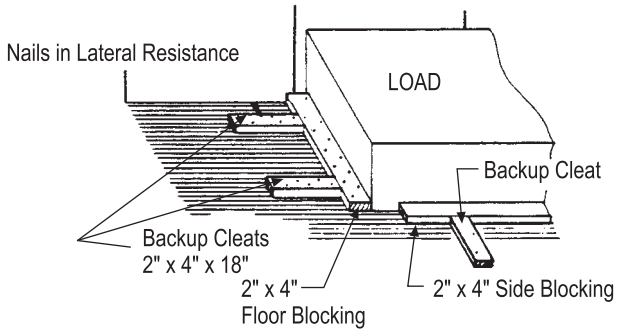


Figure 3.30 Floor blocking
(paragraphs 3.4.6.2, 3.4.7.1, and 3.4.7.2)

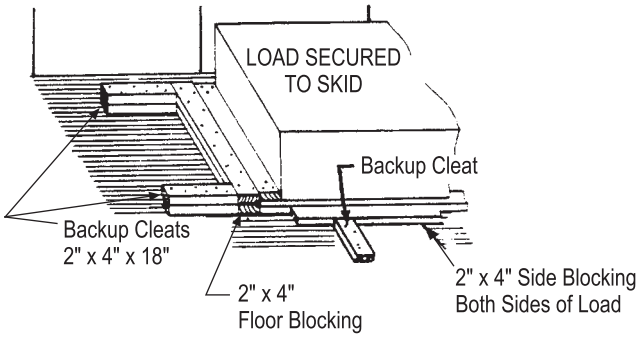


Figure 3.31 Floor blocking
(paragraphs 3.4.6.2, 3.4.7.1, and 3.4.7.2)

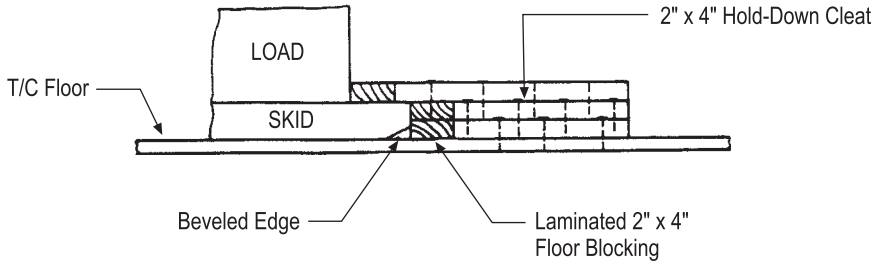


Figure 3.32 Floor blocking
(paragraphs 3.4.6.2, 3.4.7.1, and 3.4.7.2)

3.4.8 Side or Center Bracing

3.4.8.1 Have dimensions of side or center bracing sufficient to properly hold the load in position in the trailer or container. Keep double-decked loads (two or more units high) in alignment by full-height dividers. (See paragraph 4.0 for possible exceptions.)

3.4.8.2 Figures 3.24 and 3.25 depict different methods of constructing crosswise void fillers. These may be taped or glued directly to the trailer or container wall. If palletized units are loaded, fillers may be used in the void space down center of trailer or container. See Figures 3.21, 3.22, and 3.23 for other means of side and center bracing using constructed wood forms.

3.4.9 Reinforcement of Lengthwise Blocking to Trailer Floors

3.4.9.1 Reinforcement of lengthwise blocking placed cross-trailer or container can be provided by the use of diagonal blocking to the trailer or container floor. *Do not apply this blocking at an angle greater than 45° with the trailer/container floor.* If possible, position diagonal at the upper third of the load. (See Figures 3.33 and 3.34.)

3.4.9.2 Table 3.4 contains approximate lengths of floor diagonals that will be of such a length that the angle will not exceed 45°.

Table 3.4 Lengths of diagonals to trailer floor (ft)

Height of Application of Diagonal Brace to Cross Brace or Load Above Trailer Floor	Minimum Length of Diagonal Brace Required
1	1½
1½	2¼
2	3
2½	3½
3	4¼
3½	5
4	5¾
4½	6½
5	7¼
5½	7¾
6	8½

3.4.9.3 Rear gates may be braced against corner posts where trailers or containers are so constructed. Double-miter diagonal members extending to the trailer or container floor and reinforce by a backup cleat of at least 2 in. × 4 in. × 18 in. material. Drive nails perpendicular to floor for maximum holding power of nails. (See Figure 3.34.)

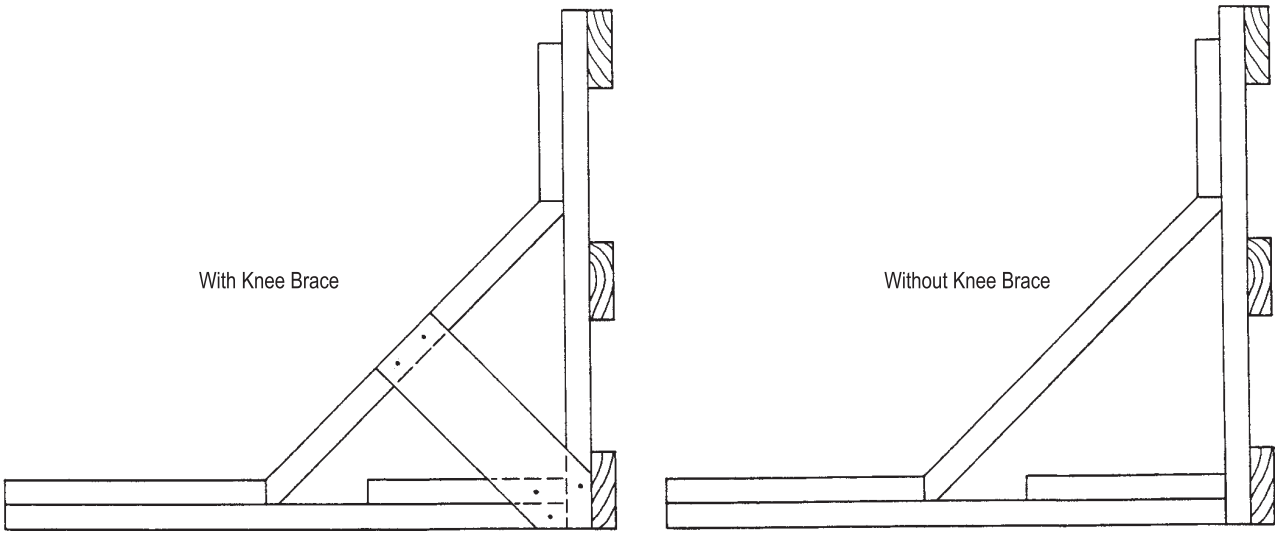


Figure 3.33 Floor Blocking—Diagonal Brace
(paragraph 3.4.9.1)

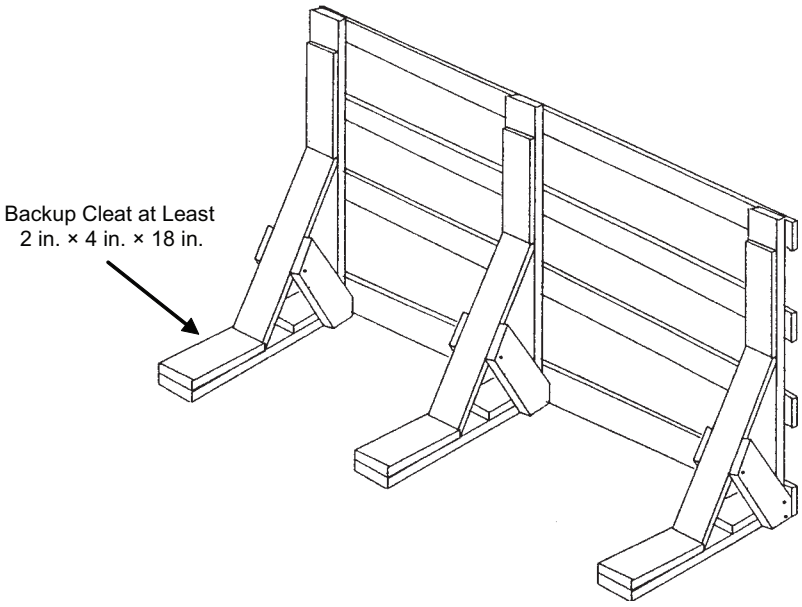


Figure 3.34 Rear Gate with Floor Blocking and Knee Braces
Items paragraphs 3.4.9.1 and 3.4.9.3

3.5 Steel Strapping

See Tables 3.5 and 3.6. For the latest updates to these tables, go to TTCI's Web site at http://www.aar.com/standards/OpenTop-approvals.html.

3.5.1 Unless otherwise specified in commodity guides, make the combined joint strength of the number of steel straps for rigid braced loads in each longitudinal impact direction greater than or equal to the weight of the lading being secured.

3.5.2 Use the proper combination of steel straps, seals, sealing tools, crimps, or notches to provide the minimum joint strength for sizes listed in Table 3.5. Figures 3.35 and 3.36 show crimp- and notch-type joints.

Table 3.5 Steel securement straps

Width and Thickness (in.)	Width and Thickness (mm)	Minimum Breaking Strength (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	
Securement Bands					Std.	Grit	Grit	
1 1/4 × .029	31.75 × .75	4,750	3,565	2	3	3	4	
1 1/4 × .031	31.75 × .79	4,750	3,565	2	3	3	4	
1 1/4 × .035	31.75 × .89	4,750	3,565	2	3	3	4	
1 1/4 × .044	31.75 × 1.12	6,750	5,065	4	4	4	4	
1 1/4 × .050	31.75 × 1.27	6,750	5,065	4	4	4	4	
1 1/4 × .065	31.75 × 1.65	8,900	6,675	N/A	4	4	6	
							Std.	Grit
2 × .044	50.80 × 1.12	10,600	7,950	4	4	4	6	4
2 × .050	50.80 × 1.27	10,600	7,950	4	4	4	6	4
2 × .065	50.80 × 1.65	13,800	10,350	4	4	4	6	4

Note: Apply a sufficient number of seals to accommodate the proper number of pairs of notches or crimps.

Figure 3.35 Crimp-type joint

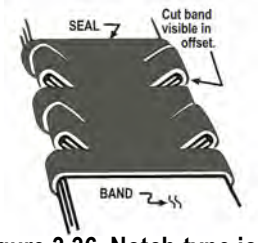


Figure 3.36 Notch-type joint

3.5.3 The number of notches or crimps shown in Table 3.5 is based on current general recommendations of high tension strapping manufacturers on the basis that tensioning and sealing tools are in proper operating condition. 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 3.5 under the column labeled "Minimum Joint Strength 75% of MBS (lb)."

3.5.4 AAR Approved Steel Bands, Manufacturers, and Suppliers

Table 3.6 AAR approved steel band manufacturers and suppliers and assigned AAR ID

AAR ID[a/]	Marking Method[b/]	Company	Approved Through[c/]	Securement Bands Band Width (in.)										Package Bands Band Width (in.)																	
				2			1 1/4							1 1/4			3/4											5/8		1/2	
				.065	.050	.044	.065	.050	.044	.040	.035	.031	.029	.040	.025	.020	.050	.044	.035	.031	.029	.028	.025	.023	.022	.020	.023	.020	.023	.020
11	E	ITW/Acme Packaging	6/15			X			X		X	X	X		X					X	X				X	X	X	X	X	X
11	E	ITW/Signode (Mexico)	6/15						X		X	X								X										
11	E	ITW/Signode	6/15			X			X		X	X	X		X					X	X			X		X	X	X	X	X
22, 33, 47	D, I	Samuel Strapping Systems	6/16		X	X		X	X	X[d/]	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
52	I	Gerrard-Ovalstrapping	6/16							X[d/]		X	X	X	X					X	X		X	X		X	X	X		
20	D, I, P	Garibaldi (Chile)[e/]	1/14						X			X								X			X	X						
20	D, I, P	Garibaldi (Chile)[e/]	1/16										X													X		X		
26	I	Hankum Co., Ltd.	5/16										X										X					X		
26	I	Hankum Co., Ltd.	2/15									X																		
57	I	Maillis Strapping Systems—USA Inc.	12/15						X		X	X	X											X				X		
58	I	DuBose Strapping Inc.	6/15			X			X	X[d/]	X	X	X	X	X	X				X	X		X	X		X	X	X	X	X
56	D	LS Strapping, Inc.	8/14									X																		
48	D	Independent Metal Strap Co.	4/15								X																			

a/ All AAR identification numbers or marks are to be preceded with the letters "AAR."

b/ Legend of marking methods: D = steel die imprint; E = steel embossed; I = ink print; P = paint embossed

c/ Month and year, 3-year approval per the *Open Top Loading Rules Manual*, Section 1, Rule 3, expires at the end of the date shown unless approval is renewed.

d/ Meets ASTM D3953 and OTLR requirements of 1 1/4 in. × 0.044 steel banding crimp seal only.

e/ Garibaldi (Chile)—1¼ in. and ¾ in. steel die imprint and ink print marking, ⅝ in. paint embossed only.

Note: This table corresponds with AAR the *Open Top Loading Rules Manual*, Section 1, Table 17.8. Current as of July 10, 2013.

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

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

3.6 Nonmetallic Strapping

3.6.1 The following bonded or woven polyester cord strapping has been approved for use in closed cars, trailers, or containers for approved loading and securement methods in which the use of polyester cord strapping is specified:

Table 3.7 Approved Type 1A bonded polyester strapping

Manufacturer/ Distributor	Approved through (Mo/Yr)	Grade 3 a/ AAR ID (Part No.) MBS (LBS) 1,585	Grade 3 a/ AAR ID (Part No.) MBS (LBS) 2,100	Grade 4 b/ AAR ID (Part No.) MBS (LBS) 3,285	Grade 4 b/ AAR ID (Part No.) MBS (LBS) 4,400	Grade 5 a/ b/ AAR ID (Part No.) MBS (LBS) 4,200	Grade 5 a/ b/ AAR ID (Part No.) MBS (LBS) 5,400	Approved Joint Type
Caristrap International, Inc.	07/18	CW-60 WGHD		CW-105 WOJ			CW-125 WOJ	N8 Buckle CB32 Buckel Ladder Buckle
Caristrap International, Inc	07/18			CW-105 WGSD				CB32 Buckle
Carolina Strapping GatorSTRAP	03/16	AAR-80 CS-2025		AAR-80 CS-2040			AAR-80 CS 2055	Buckle CSB 9093 (CS2055)
Carolina Strapping MakoSTRAP	06/15			AAR-80 CS-5080				Buckle
AlleghenyIndustrial Associates/Downriver Avistrap	11/17	AAR-11		AAR-11		AAR-11	AAR-11	Buckle
Pacific Strapping	06/13			AAR-79 (P104)				Buckle
Southern Strapping	07/15			AAR-78 (AW-105)				Buckle
Southern Strapping	07/15			AAR-78 (TY-105)			AAR-78 (AW-125)	Buckle
TAPEX American Corp.	07/17	AAR-1 (65WLMD)						Buckle (170) B6-OT
TAPEX American Corp.	07/17			AAR-1 (105WXH)				Ladder Buckle FCT-10 (FLB)
TAPEX American Corp.	07/17						AAR-1 (125WXH)	Ladder Buckle FCT-12 (FLB)
R.C. Packaging Systems Inc.	05/18	AAR-38		AAR-38			AAR-38	Buckle
R.C. Packaging Systems Inc.	5/18			AAR-38 (RC105)				Buckle
Redback Industries	03/16			AAR-39 (RBC105) (CW105RB)				Buckle
Cordstrap USA Inc.	02/16			AAR-77 CC105 Cordweb 105		AAR-77 Cordlash 95	AAR-77 Cordlash 105 Cordweb 150	Buckles (CC105/ CB10) (Cordweb 105/) CB10F & HDB35N (Cordlash 95 &105 /HDB10N) (Cordweb 150/HDB12C)
Complete Packaging Systems, Inc. TEX-STEEL™	05/16			AAR-83 CPS105			AAR-83 CPS125	G4-CB10F Wire Buckle G4-HDB35N G5-HDB12C

[a/] Strapping is acceptable for use as a substitution for steel package bands up to and including 3/4 in. × .028 in. only where substitution is specifically permitted in lumber figures in Section No. 5.

[b/] Strapping is acceptable for use as a substitution for steel bands up to and including 1 1/4 in. × .031 in. under applicable lumber figures where substitution is specifically permitted in Section No. 5, unless otherwise specified.

Note: This table corresponds with the AAR *Open Top Loading Rules Manual*, Section 1, Table 19.2. Current as of February 17, 2015. For the latest updates to this table, go to TTCI's Web site at http://www.aar.com/standards/OpenTop-approvals.html

3.6.1.1 The strap is to be clearly marked with the Strap I.D. in accordance with the strap marking requirements of AAR Circular 42-K, "General Rules Covering the Loading of Carload Shipments of Commodities in Closed Cars."

3.6.1.2 The straps are to be tensioned and joined using the correct buckle and tensioning tools in accordance with manufacturer's instructions. It is important that the buckle be applied correctly to maintain strap tension. Split and knot the strap on the tensioning side of the buckle after tensioning, when possible, to ensure against strap slippage.

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

3.6.2 The following polyester plastic strapping has been approved for use in trailers or containers for approved loading and securement methods in which the use of polyester plastic strapping is specified.

Table 3.8 Approved Type IV polyester strapping (page 1 of 2)

AAR ID	Manufacturer/ Distributor	Approved Through (Mo/Yr)	Approved Size in. (mm)										Approved Joint Type
			5/8 (15.9)			3/4 (19.1)		1 (25.4)		1-1/4 (32.0)			
			.035	.038	.040	.040	.050	.040	.050	.032	.040	.050	
11	Acme[a]	6/16	X	X[b]	X	X	X	X[b]	X[b]				H, F
11	Acme[a]	12/15	X[c]		X[c]	X[c]					X[b]		H, F
11	Acme[a]	5/15										X	F
82	Allstrap Strapping Systems LLC	2/15										X	F
58	DuBose Strapping Inc.	6/15	X		X	X	X	X[b]	X[b]		X[b]		H, F
58	DuBose Strapping Inc.	6/15	X[c]		X[c]	X[c]					X[b/c]		H, F
59	Cyklop—Brazil	1/18	X[c]		X[c]	X[c]							F. S
59	Cyklop—Germany	1/18	X		X	X							F. S
53	Polychem Corp.	9/16	X		X								H, F
53	Polychem Corp.	2/17	X[c]		X[c]	X[c]	X[c]						F
53	Polychem Corp.	2/17				X	X	X	X				F
22	Samuel Strapping Sys.[d]	8/18	X	X	X	X	X						H, F
22	Samuel Strapping Sys.[d]	3/16	X[c]		X[c]	X[c]		X[b]	X[b]		X[b]		H, F
11	Signode[a]	5/15										X	F
11	Signode[a]	6/16	X	X[b]	X	X	X	X[b]	X[b]				H, F
11	Signode[a]	12/15	X[c]		X[c]	X[c]					X[b]		H, F
11	Strapex[a]	6/16	X	X[b]	X	X							H, F
11	Strapex[a]	12/15	X[c]		X[c]	X[c]					X[b]		H, F
11	Strapex[a]	5/15										X	F
14	Itistrap S.r.1.	10/16	X		X[c]	X	X						F
57	Mallis Strapping Systems—USA	8/17	X		X	X	X	X[b]	X[b]				H, F
57	Mallis Strapping Systems—USA	8/17	X[c]		X[c]	X[c]	X[c]	X[bc]	X[bc]				H, F
51	Gerrard-Ovalstrapping [d]	8/18	X	X	X	X	X						H, F
51	Gerrard-Ovalstrapping [d]	3/16	X[c]		X[c]	X[c]		X[b]	X[b]		X[b]		H, F
60	Teufelberger GesmbH—Austria	6/16	X		X	X							H, F
63	Hangzhou Fuyang Hua Chen Plastic Co. Ltd. —China	12/15	X		X								F
64	Fromm Chile S.A.	3/16	X[b]		X	X	X[b]	X[b]	X[b]		X[e]	X[e]	H, F
64	Fromm Chile S.A.	3/16	X[c]		X[c]	X[c]			X[c]		X[c]	X[c]	H, F
65	U.S. Strapping Company	3/16	X		X	X[b]	X[b]		X[b]				H,F
65	U.S. Strapping Company	7/18	X[c]										H,F
66	Strapack Embalagens Ltda.	1/14	X		X	X							F
67	STEK Strap Packaging (FoShan) CO., LTD	9/16	X		X	X							F
68	Fromm Plastics GmbH Germany	2/15	X[b]		X[b]	X	X		X[b]	X[b]	X[b]	X[b]	H, F
68	Fromm Plastics Asia Co., LTD.	2/15	X[b]		X[b]	X	X		X[b]	X[b]	X[b]	X[b]	H, F
27	Green Span Packaging System - Indonesia	06/16	X										F
12	Haining Tricot Plastic	12/13	X		X								F
40	Yongheng Polyester Strap Co. - China	9/14	X										F
41	Dae Yang Straps Co LTD.	06/16	X		X	X	X						F

Table 3.8 Approved Type IV polyester strapping (page 2 of 2)

42	JSC Polivektris	06/16	X		X								F
61	Plast-O-Fine Industries	09/16	X										F
37	D.S.Pack Co. Ltd.	09/16	X										F
20	Garibaldi S.A.	12/16			X								F
20	Garibaldi S.A.	12/16		X[c]	X[c]								F
3	Messers'l Packaging	5/18	X										H
5	Petroplast Industria de Fitas e Selos Ltda	5/18											
	H = Heat-sealed (hot knife) joint F = Friction-welded joint S = Seal, approved metal (metal seal joints must be approved systems)												
	Strapping in the table above may be used only where specified in an approved figure or as an allowable substitution for steel banding under the applicable figures in Sect. 5. Strapping in the table above is for smooth sided polyester plastic type strap only unless otherwise denoted.												

[a] Associated with Signode Industrial Group as a manufacturer employing common production procedures and specifications.
[b] Friction-weld only approved joint type.
[c] Embossed Type Strap.
[d] Associated with Samuel Manutech Strapping Companies as a manufacturer employing common production procedures and specifications.
[e] Heat-sealed only approved joint type.

Note: This table corresponds with the AAR *Open Top Loading Rules Manual*, Section 1, Table 19.1. Current as of May 7, 2015. For the latest updates to this table, go to TTCI's Web site at http://www.aar.com/standards/OpenTop-approvals.html

3.6.2.1 The strap is to have a minimum break strength*/ of 1,200 lb.

3.6.2.2 The strap is to be sealed with a friction weld of heat seal joint (sealless) with a joint strength of 900 lb (75% of minimum break strength).

3.6.2.3 The strap is to be clearly marked with the strap I.D. spaced at not more than 5 ft intervals.

3.7 Ty-Gard 2000®

3.7.1 Ty-Gard 2000® is a laminated fabric barrier material that is constructed of the following material:

Backing
Base material—spun-bonded polyester
Unit weight—1.35 oz/yd²
Thickness—9 mil
Sheet grab tensile—29 lb (MD) 24 lb (CD)
Tear—11 lb (MD) 12 lb (CD)
Mullen burst—36 psi

Strength Material (CORD)
Base material—hybrid polyester fiber
Yarn count—22/in.
Denier—1500
Filament count—546
Type—DSP high modulus fibers
Elongation at break—10%
Modulus elongation at 10 lb—3%

3.7.2 Use of Ty-Gard 2000 as a lading restraint (in trailers) is restricted to trailers with horizontally oriented side-wall panels. Bond to the contour of corrugations in containers.

*/ See ASTM Standard D3950, "Standard Specification for Strapping, Non-metallic," for information on strapping type and grade and testing procedures.

3.7.3 Loads are normally separated into two or more sections with each section secured with two 16 in. wide Ty-Gard 2000 flexible barriers. As a general guide, each Ty-Gard 2000 barrier can restrain up to 8,800 lb of lading. To secure the Ty-Gard 2000 to the trailers sidewalls, cut two lengths of Ty-Gard 2000 for each band required and apply the adhesive strip to each sidewall in the predetermined position. The Ty-Bond 2000 strips are a minimum of 60 in. long and are located 36 in. back from the face of the load. Pull the Ty-Gard 2000 strips across the face of the load overlapping ends at least 1 ft and tension using Ty-Gard tools. The tensioned barriers are then sealed with 4 ft long strips of Ty-Patch bonded to the Ty-Gard 2000 barriers. Ty-Gard 2000 has been approved for use as a restraining system for several different commodities. For more specific information, refer to paragraph 4.0, "Tested and Approved Securement Methods."

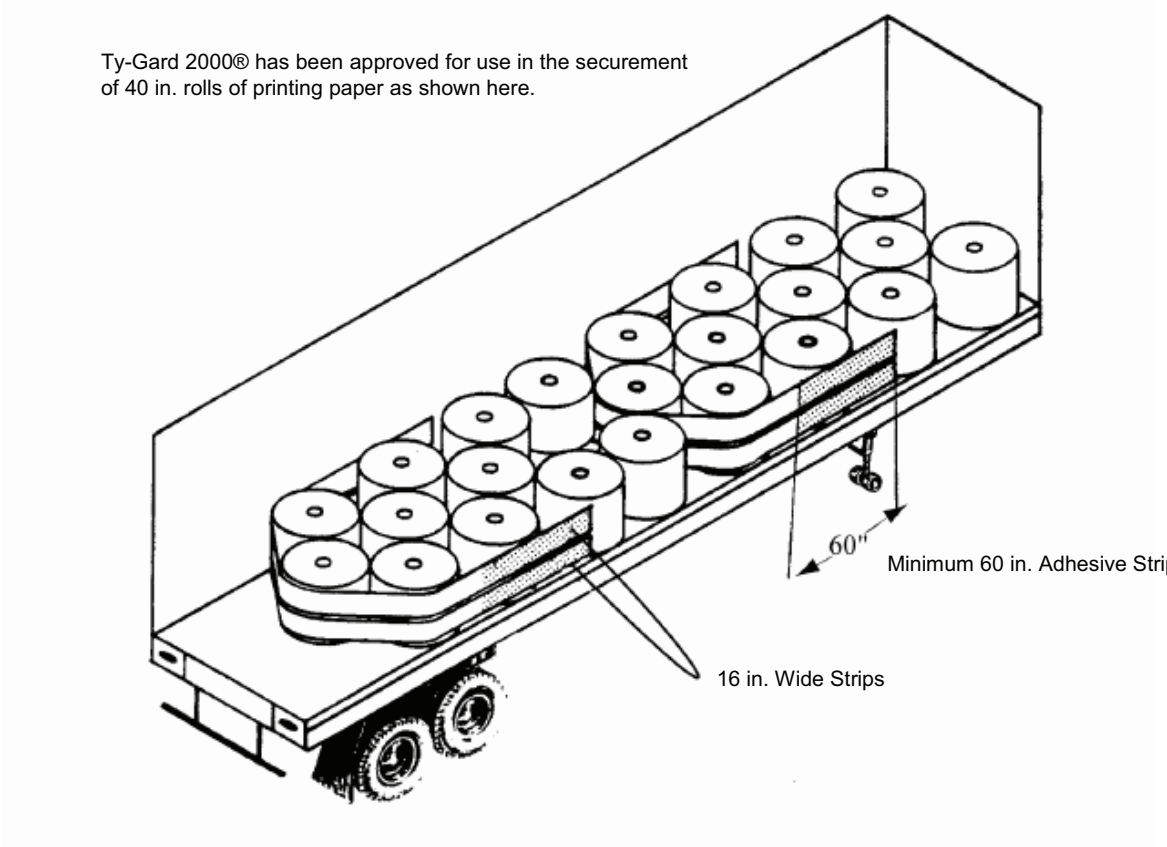


Figure 3.37 Example of an approved Ty-Gard 2000® load

3.8 Pneumatic Dunnage (Air Bags or D.I.D. Bags

3.8.1 Table 3.9 defines five levels of performance for pneumatic dunnage: Level 1 for pneumatic dunnage as lateral void fillers (and load securement in certain intermodal applications) and Levels 2 through 5 for pneumatic dunnage as lengthwise void fillers in boxcars with varied performance requirements. Pneumatic dunnage meeting Level 2 through 5 requirements fulfills all Level 1 requirements.

Table 3.9 Performance level application guide

Level 1	For filling lateral voids, primarily in intermodal loads
Level 2	For filling lengthwise voids in loads weighing up to 75,000 lb
Level 3	For filling lengthwise voids in loads weighing up to 160,000 lb
Level 4	For filling lengthwise voids in loads weighing up to 216,000 lb and horizontal applications in approved roll paper loading methods weighing up to 190,000 lb
Level 5	For filling lengthwise voids in loads weighing up to 216,000 lb and horizontal applications in approved roll paper loading methods

3.8.2 Usage guidelines: follow the manufacturer's instructions on care and storage of bags prior to use. Inflate bags with an approved inflator in accordance with the manufacturer's instructions.

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

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

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

3.8.6 Inflation pressure may vary from 1 psig to 3 psig depending on the nature of lading and equipment.

3.8.7 Void size after inflation will be from 4 in. to 10 in. Voids greater than 12 in. should be filled with "square"air bags. See Table 3.10.

Table 3.10 Approved square bags for use in voids greater than 12 in.

Supplier	General Description
AB Airbags	"Tuffy" Series Level 1 Square Woven Poly Bag
Atlas Dunnage/CargoTuff	Level 1 Square Woven Poly Bag
Complete Packaging Systems Inc.	Level 1 Square Woven Poly Bag
International Dunnage	Level 1 Square Woven Poly Bag with Fast Flow Valve
Shippers Products	Level 1 Square Paper Bag
Shippers Products	Level 1 Square HIPPO woven Poly Bag
Stopak	Level 1 Square Paper Bag
Stopak	Level 1 Square Woven Poly Bag
Sunrise Mfg., Inc.	Level 1 Square Woven Poly Bag

3.8.8 Install bag(s) so that the bottom(s) will be a minimum of 1 in. above the floor after inflation. Apply protective material (e.g., fiberboard) between the bag and floor.

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

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

3.8.11 Use clean and dry air to fill dunnage bags.

3.8.12 Do not use bags in tandem (back-to-back).

3.8.13 Never use air bags to fill lengthwise space or between the load and the rear doors.

3.8.14 For further information, refer to AAR General Information Bulletin No. 9, "Product Performance Profile for Pneumatic Dunnage."

3.8.15 Go to http://www.aar.com/standards/damage-prevention.html for the most current "Product Performance Profile for Pneumatic Dunnage Product Verification List."

3.9 Friction Mats

Friction mats are used between freight and the railcar and between layers of freight to increase resistance to lateral and longitudinal movement. For freight loading applications, friction mats are most commonly manufactured from either masticated or rebonded rubber, in thicknesses up to ¼ in. Use friction mats as specified in specific loading methods.

3.10 Rear Doors

Trailer/container doors may not be used to secure loads containing hazardous materials. Under certain conditions, as outlined in "Circular 43-F," paragraph B.5, below, trailer doors can be relied on to secure non-hazardous materials lading.

5. Loading and Securement

A. Secure lading to prevent both lengthwise and crosswise movement. If the lading is rigid in nature and/or very dense, such as boxes of nuts and bolts, machinery, metal beams, brick, lumber, cut paper, etc., or if the shape of the lading is such that the area of door contact is minimal, such as with cylindrical objects like drums or rolled paper, blocking and bracing is necessary. Vehicle doors are neither designed nor intended to restrain commodities with these characteristics. Such products must be loaded and secured in conformance with the rules and illustrations in this publication and in other applicable AAR commodity loading publications.

Trailer/container doors may not be used to secure loads containing hazardous materials.

The doors of the vehicle, meeting AAR trailer specification M-931 and AAR container specification M-930, can be relied on to secure non-hazardous materials lading only under the following conditions:

1. The load consists of multi-unit lading such as boxes of food-stuff, tissue, or soft paper products, furniture, appliances, etc., not exceeding 40,000 lb, covering a minimum of 60% of the door area and evenly distributed throughout the vehicle.

2. Lading must be loaded tightly lengthwise and crosswise and flush to the rear doors of the vehicle allowing no room for movement. If any void exists, fill void space with recommended dunnage.

3. The doors must fit squarely, the hinges must be tight, and locking bars must be in good condition and function properly.

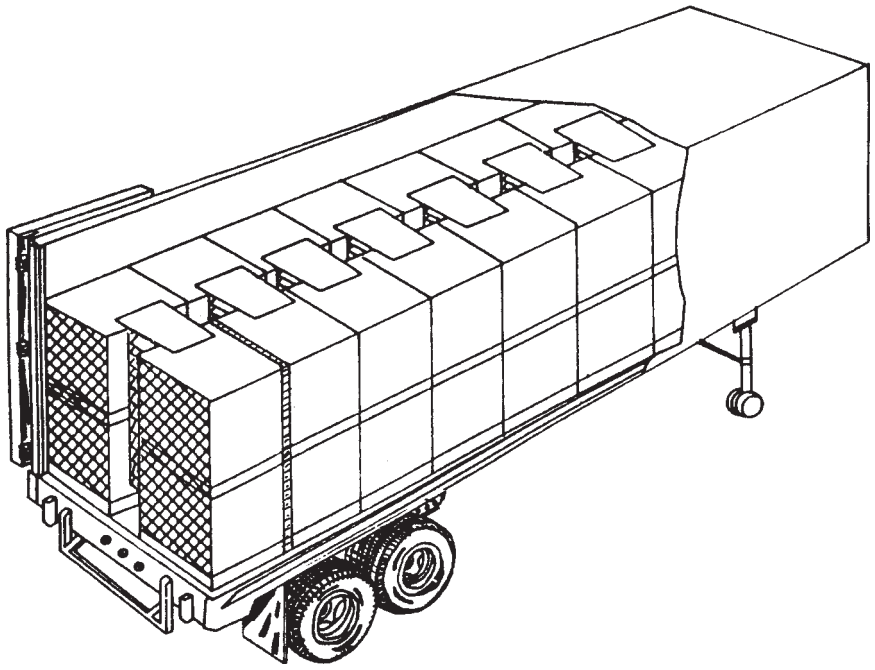


Figure 3.38 Example of load that could conform to Circular 43-F, paragraph B.5, as stated above

(This Page Left Blank Intentionally)

4.0 TESTED AND APPROVED SECUREMENT METHODS

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 a diamond (♦) have been recommended for hazardous materials loading by the Bureau of Explosives Steering Committee.

* Methods marked with an asterisk (*) have been tested to 8 mph.

♦ Methods marked with a diamond (♦) have been recommended for hazardous materials loading by the Bureau of Explosives Steering Committee.

* Methods marked with an asterisk (*) have been tested to 8 mph.

♦ Methods marked with a diamond (♦) have been recommended for hazardous materials loading by the Bureau of Explosives Steering Committee.

* Methods marked with an asterisk (*) have been tested to 8 mph.

Cross Reference—Securement Methods

Type of commodity/container and approved securement method

Drums

Mixed Loads – Drums, Bin Palettes and Palletized Products

Coils

Palletized Steel Products

♦ Methods marked with a diamond (♦) have been recommended for hazardous materials loading by the Bureau of Explosives Steering Committee.

* Methods marked with an asterisk (*) have been tested to 8 mph.

Palletized Bag Loads

Palletized or Slip-Sheeted Box Loads

Case Goods on Slip Sheets

Paper Products

♦ Methods marked with a diamond (♦) have been recommended for hazardous materials loading by the Bureau of Explosives Steering Committee.

* Methods marked with an asterisk (*) have been tested to 8 mph.

♦ Methods marked with a diamond (♦) have been recommended for hazardous materials loading by the Bureau of Explosives Steering Committee.

* Methods marked with an asterisk (*) have been tested to 8 mph.

A—STEEL STRAPPING—CANCELED

Method A-1—Canceled September 2015

Method A-2—Canceled September 2015

Method A-3—Canceled September 2015

Method A-4—Canceled September 2015

Method A-5—Canceled September 2015

B—TY-GARD 2000

Method B-1—Drums Loaded in Two or Three Sections Secured with Ty-Gard 2000 Barriers

Use the following bracing method for closed-head drums loaded only in a 4-3-4 pattern. The method of bracing involves restraint of the drums by use of Ty-Gard 2000 barriers that are attached to the sidewalls of the trailer/container. When used in trailers, restrict use of this method to trailers with horizontally oriented sidewall panels.

Figure 4.1

1. Load the drums into two or three sections. The three-section load has been successfully impact-tested up to 8 mph. The two-section load has been successfully impact-tested to 6 mph.

   a. In the two-section load, each section contains approximately one half of the total drums loaded.

   b. In the three-section load, each section contains approximately one third of the total drums loaded.

   c. The last stack in each section should contain three drums as shown in the figure.

2. Secure each section with two 16 in. wide strips of the Ty-Gard 2000 bulkhead material. Attach this to the sidewalls (per manufacturer's instructions) with an adhesive strip at least 60 in. long and at least 36 in. back from face of load.

3. Drum protection consists of drum protectors or angleboard strips. If angleboard strips are used, apply three thicknesses of 250 in. solid fiberboard or equivalent at the rear barrier at the door of the trailer/container and two thicknesses at the other barrier(s) in the load.

4. Close and seal the Ty-Gard 2000 barriers for each section in accordance with manufacturer's instructions. Tape the bulkhead to the drum protectors to prevent slippage during handling.

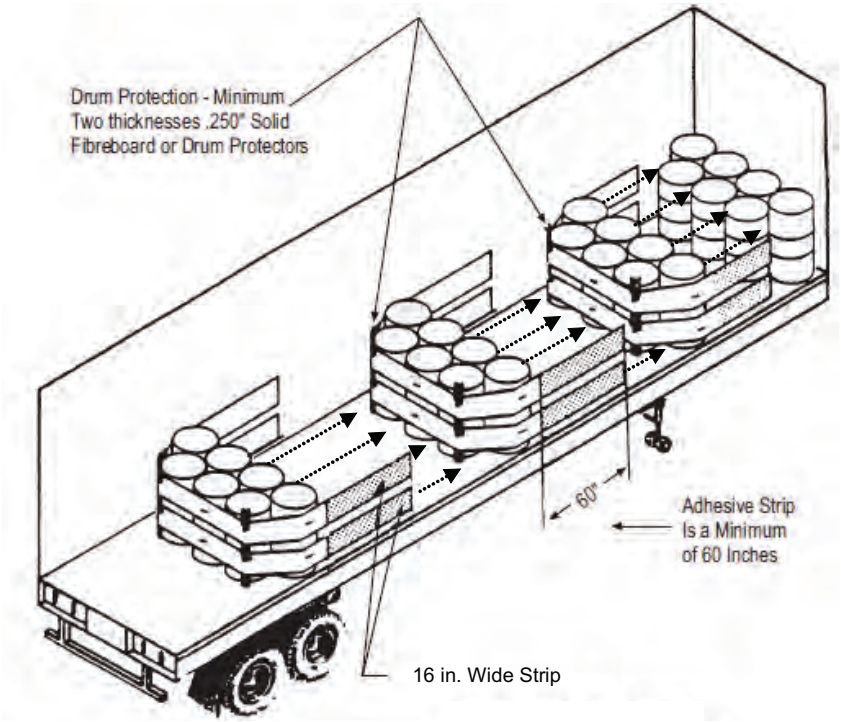


Figure 4.1 — Sketch 1

Method B-1
Drums loaded in three sections secured with Ty-Gard 2000® barriers

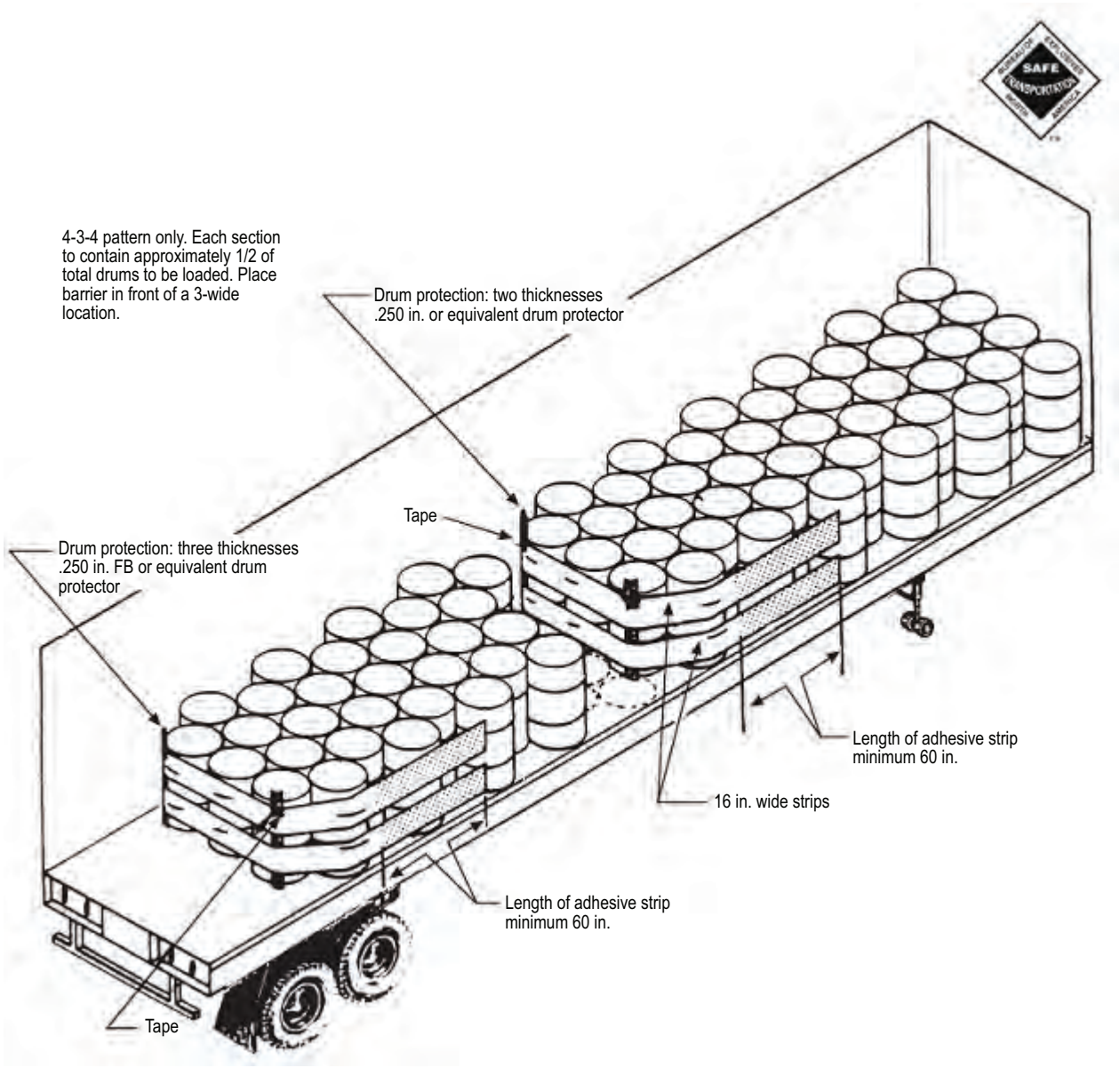


Figure 4.1 — Sketch 2

Method B-1
Drums loaded in two sections secured with Ty-Gard 2000® barriers

Method B-2—Mixed Load Secured with Ty-Gard 2000 Barriers

Use the following bracing method for a mixed load containing either closed-head drums, bin pallets, or palletized products. The method of bracing involves restraint of the products by use of Ty-Gard 2000 that is attached to the sidewalls of the trailer/container. When used with trailers, restrict the load to trailers with horizontally oriented sidewall panels.

This method uses a Ty-Gard 2000 barrier. See paragraph 3.7 for barrier material specifications.

Figure 4.2:

1. Drums (either steel or polyethylene) can be loaded only in a 4-3-4 pattern. The last stacks in these sections should contain three drums as shown in the figure. Use suitable dividers between different product mix. When drums are loaded, this can be ¼ in. plywood or equivalent.

2. Secure each section with two 16 in. wide strips of Ty-Gard 2000. Attach this to the sidewalls (per manufacturer's instructions) with an adhesive strip at least 60 in. long and at least 36 in. back from the face of the load. When used with containers with corrugated sidewalls, follow contour of the corrugations.

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 thicknesses of .250 in. solid fiberboard or equivalent at each barrier of the trailer/container. Corner protection is required for palletized goods.

4. Close and seal the Ty-Gard 2000 barriers for each section in accordance with the manufacturer's instructions.

The load shown in Figure 4.2 was the actual load tested. For illustration clarity, portions of the load have been omitted.

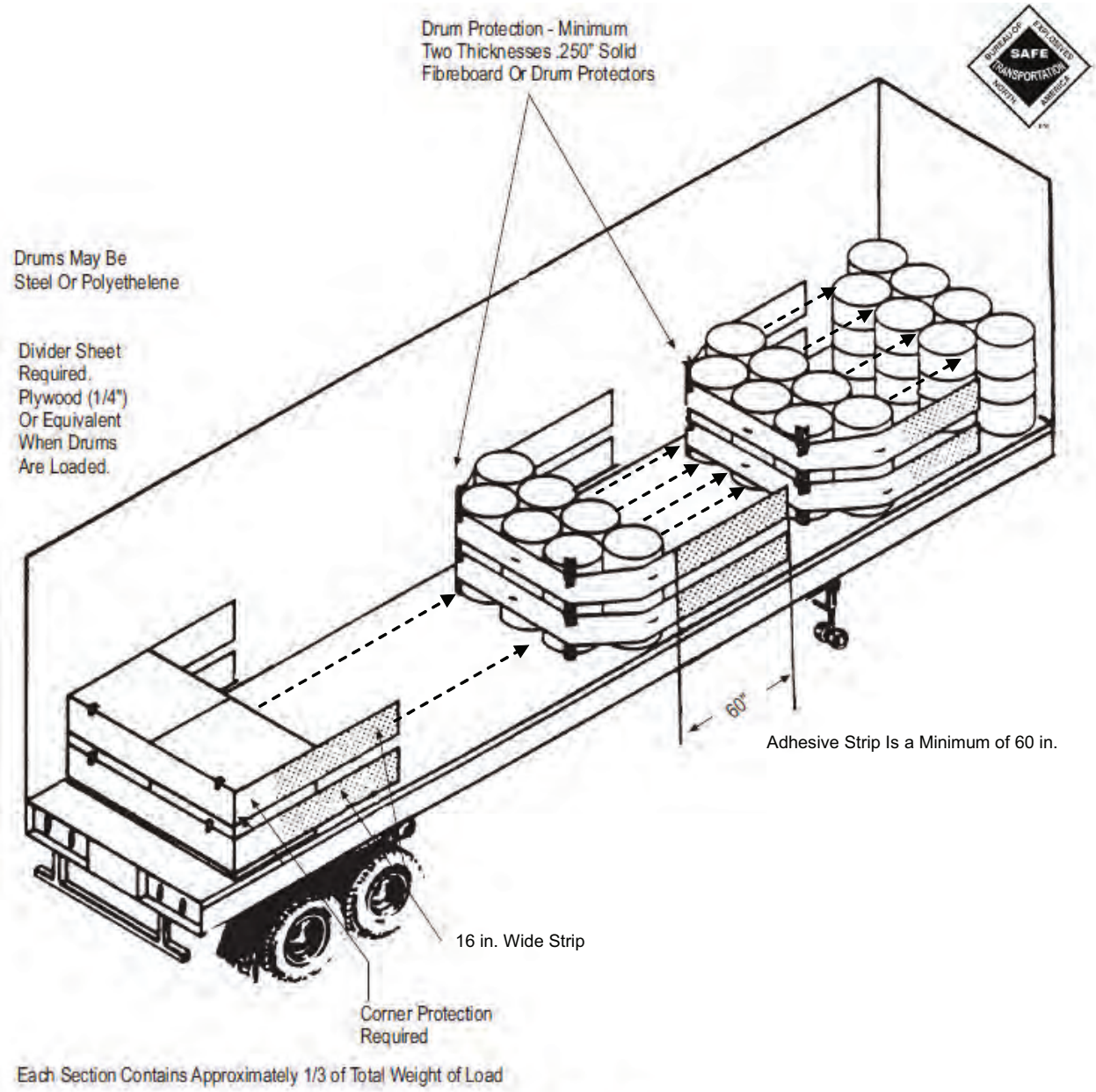


Figure 4.2

Method B-2
Mixed load secured with Ty-Gard 2000® barriers

Method B-3—Double-Layer Load Secured with Ty-Gard 2000 Barriers in a 20 ft Container

The following bracing method uses Ty-Gard 2000 barriers that are attached to the sidewalls of a container. See paragraph 3.7 for barrier material specifications.

Figure 4.3:

1. This load may contain double-decked, closed-head drums loaded in a 4-4 pattern (with the last stack in each section only containing drums three wide) or bin pallets or any palletized product two layers high. Any combination of product mix is acceptable. Each section contains approximately one half of the total weight in the container.

2. Use suitable dividers between different product mix. When drums are loaded, this can be ¼ in. plywood or equivalent.

3. Secure each layer of each section with two 16 in. wide strips of Ty-Gard 2000. Attach these to the sidewalls (per manufacturer's instructions) with an adhesive strip at least 60 in. long and at least 36 in. back from the face of the load. When used with containers with corrugated sidewalls, follow the contour of the corrugations.

4. Drum protection is required for sections containing drums. This may consist of drum protectors or angleboard strips. If angleboard strips are used, apply two thicknesses of .250 in. solid fiberboard or equivalent at each barrier of the container. Corner protection is required for palletized goods.

5. Close and seal the Ty-Gard 2000 barriers for each section in accordance with manufacturer's instructions.

The load shown in Figure 4.3 was the actual load tested.

The following separators have been evaluated and found acceptable for one-time use with this loading method. These separators were tested under simulated conditions and their acceptance may be withdrawn if loads exhibit consistent load failures. If used with hazmat loads, these panels must be compatible with the contents of drums.

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	.375 in.	Corrugated (*not* for use with corrosives)	AIA/Down River
Ship Tite 3	.625 in.	Corrugated (*not* for hazmat use)	AIA/Down River
Ship Tite 5	3.2 mm	Corrugated	AIA/Down River
Generic	3.0 mm	Eucalyptus hardboard	Greif
PlyVeneer®	3.0 mm	Wood veneer with a Kraft linerboard overlay	PlyVeneer Products
Tier 55™	1.0 in., 0.50 in.	Corrugated	Damage Prevention Company

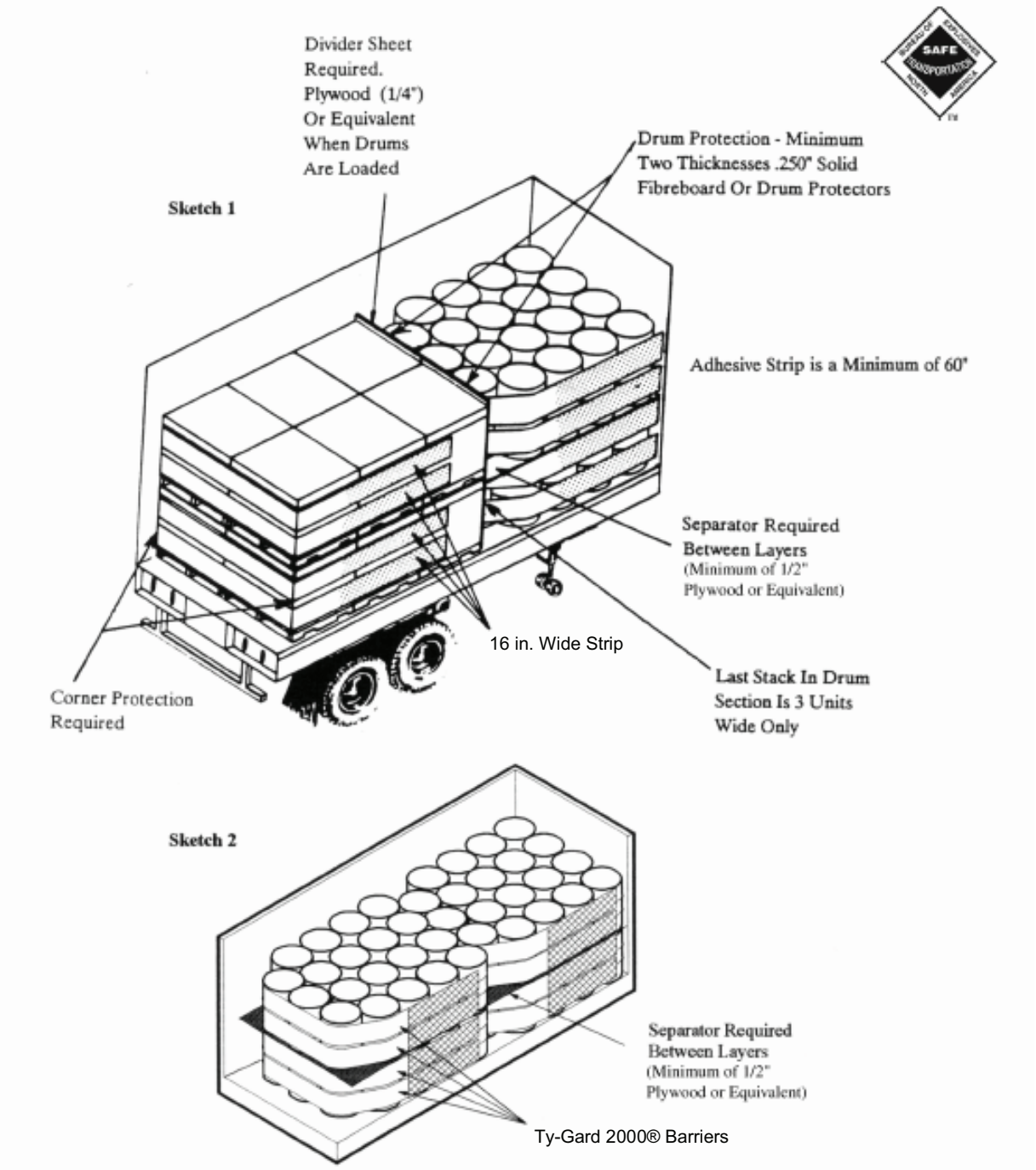


Figure 4.3

Method B-3
Double layer load secured with
Ty-Gard 2000® barriers in a 20 ft container

Method B-4—40 in. Diameter Roll Printing Paper Secured with Ty-Gard 2000 Barriers

This method uses Ty-Gard 2000 barriers. See paragraph 3.7 for barrier material specifications. Restrict use of this method to trailers with horizontally oriented sidewall panels. It was tested in a 102 in. wide trailer.

Figure 4.4:

1. This method is restricted to a 2-1-2 pattern of 40 in. rolls of printing paper. The only exception is the first and second stack in the second section which are placed in a 2-2 pattern. If the length of the trailer allows, a 2-1-2 pattern can be used throughout. The last stack of each section has a single roll for placement of the Ty-Gard 2000 barriers. Each section contains approximately one half the weight of the load.

2. Secure each section with two 16 in. wide strips of the Ty-Gard 2000. Attach these to the sidewalls (per manufacturer's instructions) with an adhesive strip 60 in. long and at least 36 in. back from the face of the load.

3. Close and seal the Ty-Gard 2000 barriers for each section in accordance with the manufacturer's instructions.

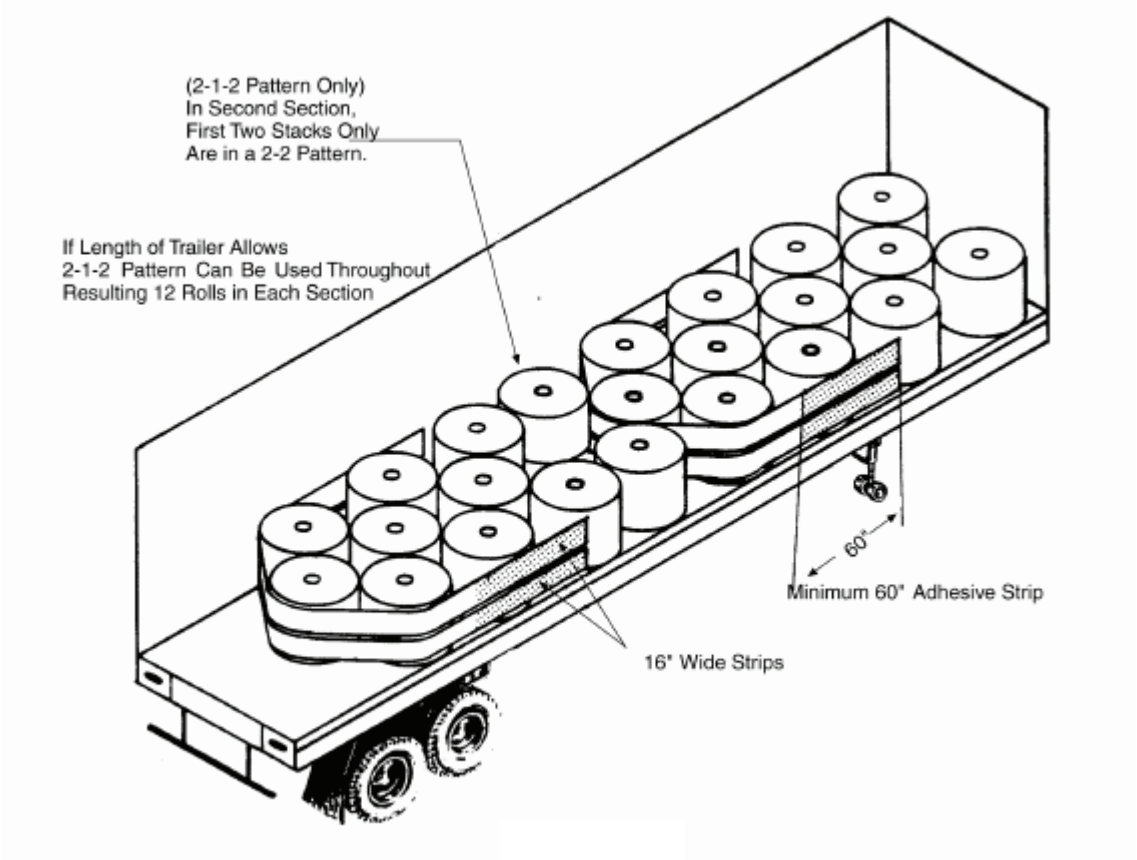


Figure 4.4

Method B-4
40 in. diameter roll printing paper secured with Ty-Gard 2000® barriers

Method B-5—Brick Secured with Floor Blocking and Ty-Gard 2000 Barriers

Use this bracing method for packaged brick. It involves restraint of the brick by use of floor blocking and Ty-Gard 2000 barriers attached to the sidewalls of the trailer. Restrict use of this method to trailers with horizontally oriented sidewall panels. See paragraph 3.7 for barrier material specifications.

Stretch wrapping of the brick units is recommended to help maintain the integrity of the units.

Figure 4.5:

1. Load brick multi-pack units (cubes) three units wide in two sections as shown in the figure. Ensure that all package bands are secure, tight, and intact before loading. *Do not load cubes with loose or broken bands.* Place corrugated fiberboard or equivalent material between the stacks.

2. Place the first section, containing approximately half of the load, tight against the trailer nose. Place corrugated fiberboard across the face of the brick units to act as a buffer material between the brick units and the barrier.

3. Secure the brick using two 16 in. wide strips of Ty-Gard 2000. Attach these to the sidewalls (per manufacturer's instructions) with an adhesive strip 60 in. long and at least 36 in. back from the face of the load. Tape the Ty-Gard 2000 to the corrugated fiberboard to prevent sagging if it becomes slack in transit.

4. Close and seal each strip of Ty-Gard 2000 per manufacturer's instructions.

5. Nail laminated 2 in. × 4 in. × 8 ft cross-trailer floor blocking 1 in. from the face of the brick units 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 barrier to receive initial forces, and then the floor blocking can work in conjunction with the barrier. 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 blocking.

6. Load the second section of lading in the rear of the trailer. Location of this lading may be dependent on required spacing for proper weight distribution.

7. Secure the front and rear of the second section with Ty-Gard 2000 and floor blocking in the same manner as the rear of the first section.

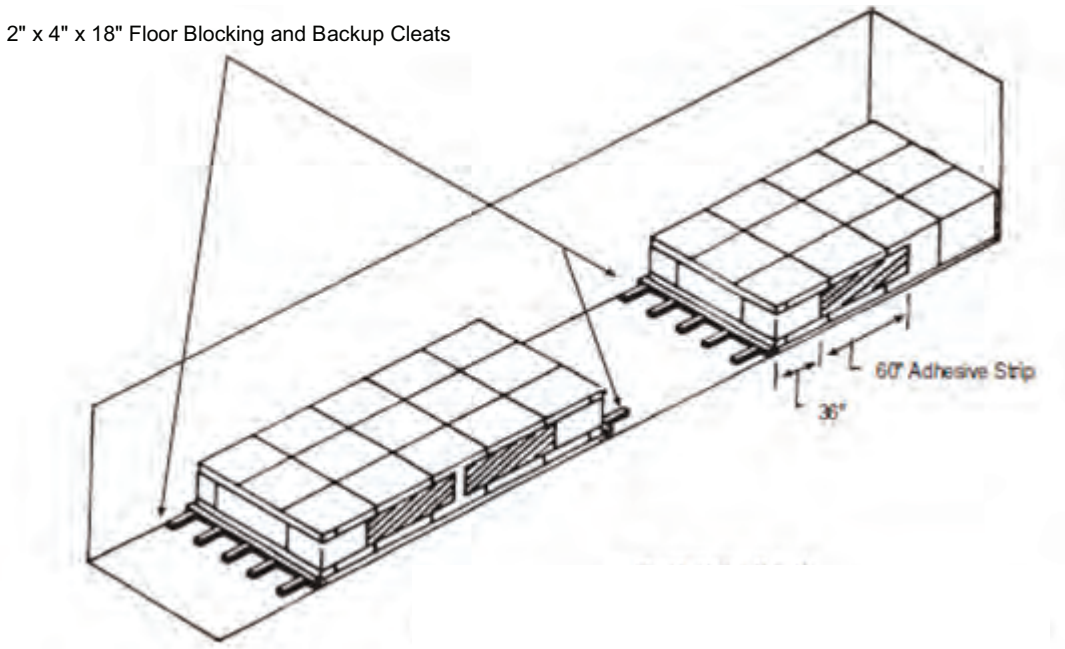


Figure 4.5

Method B-5
Brick secured with floor blocking and Ty-Gard 2000® barriers

Method B-6—Bulk Boxes Secured with Floor Blocking and Ty-Gard 2000 Barriers

Use this bracing method for bulk fiberboard boxes secured to pallets, bulk bins, etc. Size the bulk fiberboard box to fit the dimensions of its pallet and secure it to the pallet. The method involves restraint of bulk containers by use of floor blocking and Ty-Gard 2000 barriers that are attached to the sidewalls of the trailer. Restrict use of this method to trailers with horizontally oriented sidewall panels.

This method uses Ty-Gard 2000 barriers. See paragraph 3.7 for barrier material specifications.

Figure 4.6:

1. Divide the load into two sections. Each section should contain one half the weight of the load.

2. Secure each section with two 16 in. wide strips of the Ty-Gard 2000. Attach these to the sidewalls (per manufacturer's instructions) with an adhesive strip 60 in. long and at least 36 in. back from the face of the load.

3. Load the bulk containers in two rows, one against each sidewall, starting at the nose of the trailer.

4. 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.

5. Use plywood sheets, ½ in. × 4 ft × 8 ft, as buffer sheets between the lading and the Ty-Gard 2000 barriers. Use corner protectors under the Ty-Gard 2000 barriers to protect the barriers from the edges of the buffer sheets and to prevent crushing of the bulk containers at the corners.

6. A center void filler is required in the last stack in each section, behind the barriers, to maintain lading position.

7. Close and seal each strip of Ty-Gard 2000 per manufacturer's instructions.

8. Nail laminated 2 in. × 6 in. × 8 ft cross-trailer floor blocking 3 in. from the face of the last section using thirty-six 12d (18 per layer) power-driven nails. *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 2000 barrier to receive initial forces, and then the floor blocking can work in conjunction with the barrier.

9. Nail four 2 in. × 6 in. × 18 in. laminated backup cleats perpendicular to the floor blocking using eight 12d (four per layer) power-driven nails. Stagger the nails to prevent splitting of blocking.

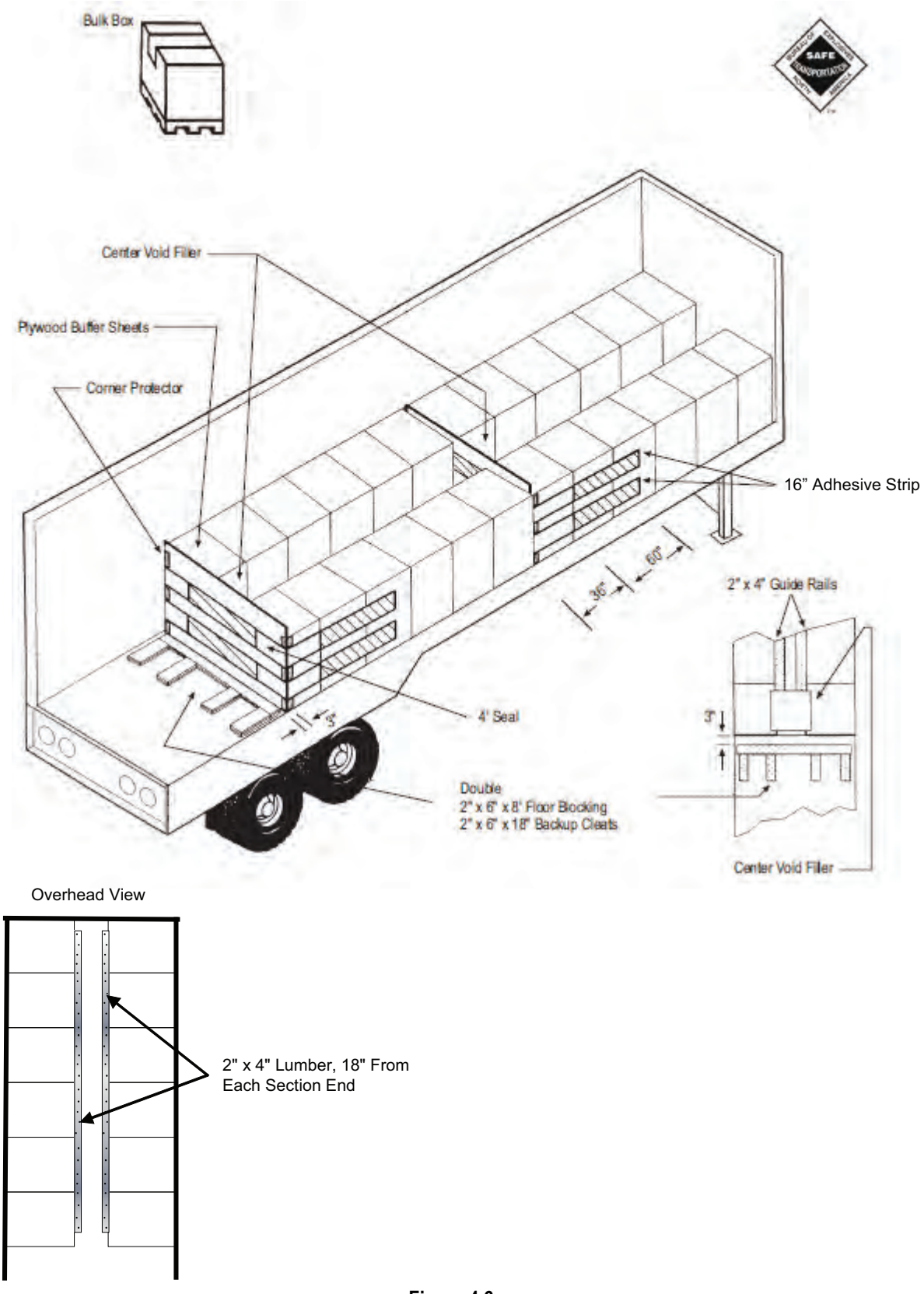


Figure 4.6

Method B-6
Bulk boxes secured with floor blocking and Ty-Gard 2000® barriers

Method B-7—Intermediate Bulk Containers for Liquids Secured with Ty-Gard 2000 Barriers

Use this bracing method for intermediate bulk containers for liquids. Size the intermediate bulk container to fit the dimensions of its pallet and secure it to the pallet. The method involves restraint of the intermediate bulk containers by use of Ty-Gard 2000 barriers that are attached to the sidewalls of the trailer. Restrict use of this method to trailers with horizontally oriented sidewall panels or containers.

Figure 4.7:

1. Load the intermediate bulk containers in a pinwheel pattern in two rows, one against each sidewall, starting at the nose of the trailer as shown in Figure 4.7—Sketch 2. Use corrugated fiberboard or honeycomb void fillers to fill crosswise voids between the rows. The containers may be loaded in a single layer or with an incomplete second layer, provided maximum weight limitations are not exceeded.

2. Divide the floor layer into three sections. **Sketch 2** shows the barrier locations in the load as tested. In general, each section should contain approximately one third the weight in the layer.

3. Secure each floor layer section with two 16 in. wide strips of the Ty-Gard 2000. Secure the Ty-Gard 2000 to the sidewalls with an adhesive strip at least 60 in. long and located at least 36 in. back from the face of the lading. Follow manufacturer's instructions for application.

4. If an incomplete second layer is loaded, position it in the center of the trailer to maintain proper weight distribution. Secure the incomplete layer at both the front and rear by three 16 in. wide strips of the Ty-Gard 2000. Secure the Ty-Gard 2000 to the sidewalls with an adhesive strip at least 60 in. long and located at least 36 in. back from the face of the lading. Follow manufacturer's instructions for application.

5. Use combination wood/honeycomb core divider panels (¾ in. thick), ½ in. thick plywood sheets, or equivalent material between the first and second layer intermediate bulk containers.

6. Close and seal each strip of Ty-Gard 2000 per manufacturer's instructions. Tape the Ty-Gard 2000 to the intermediate bulk containers to prevent sagging if it becomes slack in transit.

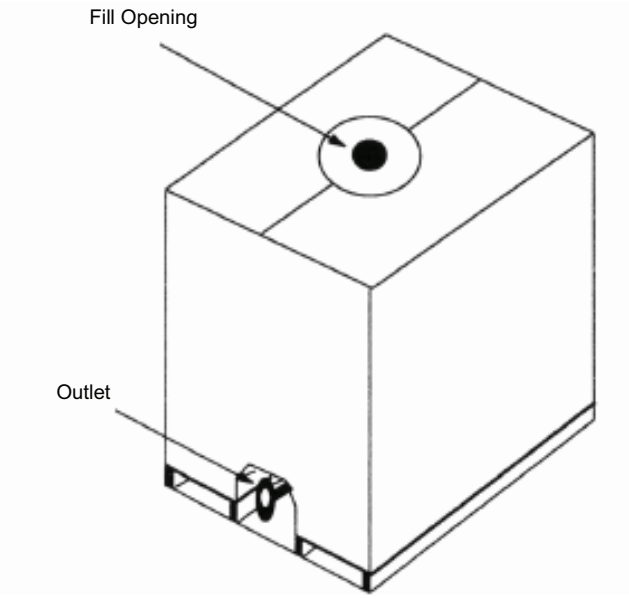


Figure 4.7 — Sketch 1

Method B-7
Typical intermediate bulk container

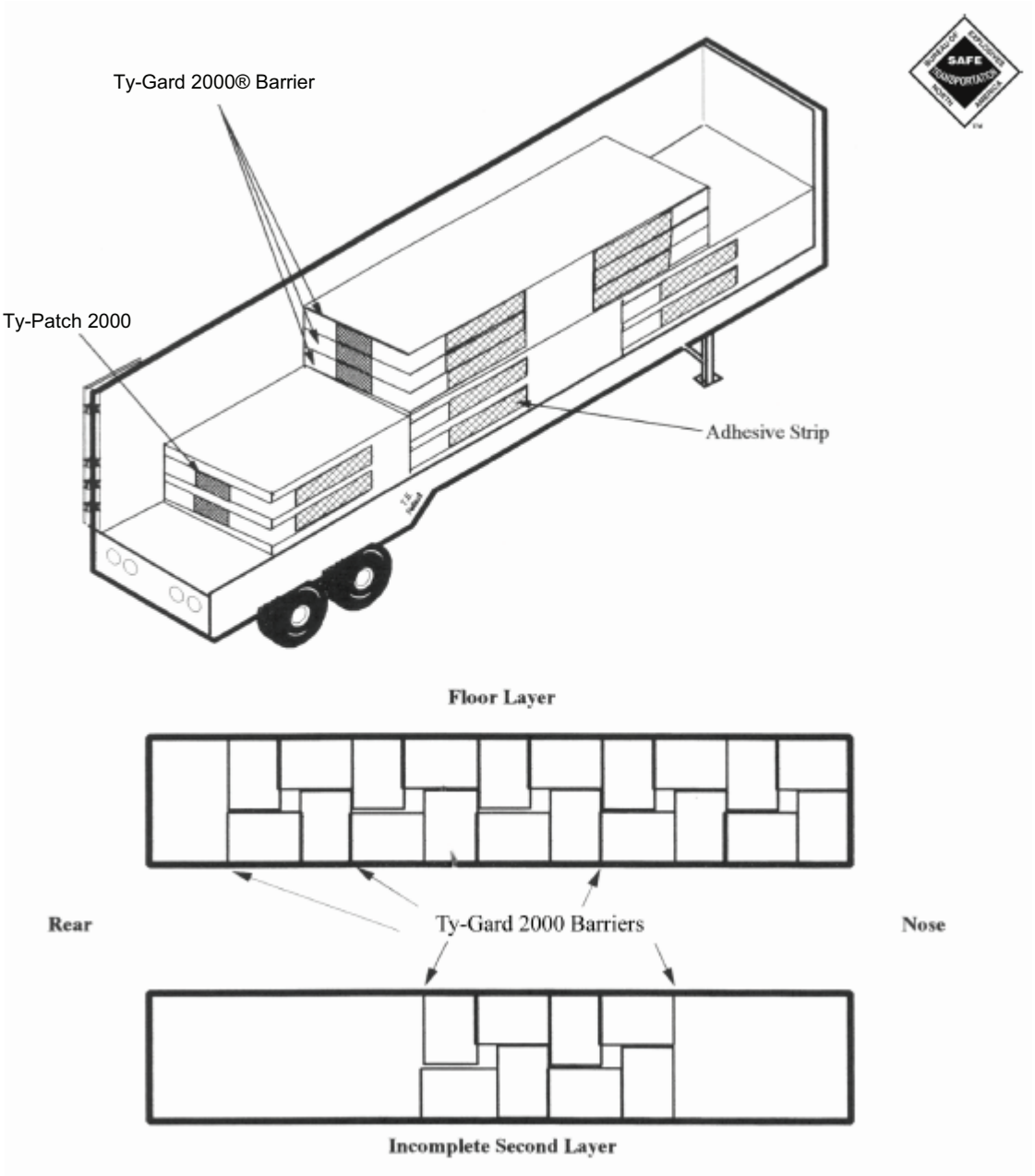


Figure 4.7 — Sketch 2

Method B-7
Intermediate bulk containers secured with Ty-Gard 2000® barriers

Method B-8—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

Use this loading method for 55-gallon steel or plastic closed-head drums in two layers in a 20 ft ISO container. Steel drums should have the W-style rolling hoop. Up to 80 drums can be loaded in a 4-4 pattern. A 4-3-4 or 4-4 pattern can also be used for 78-drum loads.

NOTE: Limit use of this loading method to 20 ft ISO containers.

Figure 4.8:

80-Drum Loads (Sketches 1 and 2):

1. Load forty drums in a 4-4 pattern in each layer for an eighty-drum load. Use ½ in. thick plywood, or equivalent strength, as a separator between each layer. The separator material runs the full width of the container and the full length of the load.

2. Secure the nose section of the load through the use of Ty-Gard 2000 barriers after the fifth stack. Secure each layer with two 16 in. wide strips of Ty-Gard 2000. Attach the Ty-Gard 2000 to the sidewalls (per manufacturer's instructions) with an adhesive strip at least 60 in. long and at least 36 in. back from the face of the last stack in this section. When used with containers with corrugated sidewalls, follow the contour of the corrugations.

3. Load the remaining drums in a 4-4 pattern. For securement of the rear of the load, position a ½ in. thick plywood sheet, 6 ft in length with width equal to the height of the drums, on its side edge and centered behind the last stack of each layer (two required). Secure the plywood sheet in the top layer to the drums with tape or strips of Ty-patch material. Position the plywood sheets between the drums and the Ty-Gard 2000 barriers. These sheets help keep the center drums in the last stack in position.

4. Secure the rear of the load using two Ty-Gard 2000 16 in. wide barriers per layer. Attach each barrier to the sidewalls of the container (per manufacturer's instructions) with an adhesive strip at least 60 in. long and at least one stack back from the face of the load. When used with containers with corrugated sidewalls, follow the contour of the corrugations.

5. Tension and seal all Ty-Gard 2000 barriers in accordance with the manufacturer's instructions.

80-Drum Loads (Modified Pattern)

6. Load forty drums in a 4-3-4-3-4-4-3-4-3-4-4 pattern in each layer for an eighty drum load. Use ½ in. thick plywood, or equivalent strength, as a separator between each layer. The separator material runs the full width of the container and the full length of the load.

7. Secure the nose section of the load through the use of Ty-Gard 2000 barriers after the sixth stack. Encompass only the center two drums of the sixth stack inside the barrier, leaving the two drums adjacent the sidewalls outside the barriers. Secure each layer with two 16 in. wide strips of Ty-Gard 2000. Attach the Ty-Gard 2000 to the sidewalls (per manufacturer's instructions) with an adhesive strip at least 60 in. long and at least 36 in. back from the face of the last stack in this section. When used with containers with corrugated sidewalls, follow the contour of the corrugations.

8. Load the remaining drums in a 4-3-4-3-4 pattern. For securement of the rear of the load, position a ½ in. thick plywood sheet, 6 ft in length with width equal to the height of the drums, on its side edge and centered behind the last stack of each layer (two required). Secure the plywood sheet in the top layer to the drums with tape or strips of Ty-patch material. Position the plywood sheets between the drums and the Ty-Gard 2000 barriers. These sheets help keep the center drums in the last stack in position.

9. Secure the rear of the load using two Ty-Gard 2000 wide barriers per layer. Attach each barrier to the sidewalls of the container (per manufacturer's instructions) with an adhesive strip at least 60 in. long and at least one stack back from the face of the load. When used in containers with corrugated sidewalls, follow the contour of the corrugations.

10. Tension and seal all Ty-Gard 2000 barriers in accordance with the manufacturer's instructions.

78-Drum Loads (Sketches 3 and 4):

11. Loads containing 78 drums can be loaded in 10 stacks using a 4-4 pattern or 11 stacks using a 4-3-4 pattern. If using a 4-4 pattern, secure the nose section after the fifth stack. If using a 4-3-4 pattern, secure the nose section after the sixth stack. See **Sketches 3 and 4** of the figure. Use ½ in. thick plywood, or equivalent strength, as a separator between each layer. The separator material runs the full width of the container and the full length of the load.

12. If a 4-4 pattern is used, position three drums in each layer of the last stack in the container as shown in **Sketch 3**. Plywood sheets are not required at the end of the layers.

13. If a 4-3-4 pattern is used, position four drums in each layer of the last stack in the container as shown in **Sketch 4**. For securement of the rear of the load, position a ½ in. thick plywood sheet, 6 ft in length with width equal to the height of the drums, on its side edge and centered behind the last stack of each layer (two required). Secure the plywood sheet in the top layer to the drums with tape or strips of Ty-patch material. Position the plywood sheets between the drums and the Ty-Gard 2000 barriers. These sheets help keep the center drums the last stack in position.

14. Secure each section of the load using two Ty-Gard 2000 16 in. wide barriers per layer. Attach each barrier to the sidewalls of the container (per manufacturer's instructions) with an adhesive strip at least 60 in. long and at least one stack back from the face of the load. When used with containers with corrugated sidewalls, follow the contour of the corrugations.

15. Tension and seal all Ty-Gard 2000 barriers in accordance with the manufacturer's instructions.

NOTE: These load patterns and securement applications can be used for lesser numbers of drums. In these instances, the nose section of the load should contain approximately half of the load. Maintain proper weight distribution.

The following separators have been evaluated and found acceptable for one time use with this loading method. These separators were tested under simulated conditions and their acceptance may be withdrawn if loads exhibit consistent load failures. If used with hazmat loads, these panels must be compatible with the contents of drums.

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	.375 in.	Corrugated (*not* for use with corrosives)	AIA/Down River
Ship Tite 3	.625 in.	Corrugated (*not* for hazmat use)	AIA/Down River
Ship Tite 5	3.2 mm	Corrugated	AIA/Down River
Generic	3.0 mm	Eucalyptus hardboard	Greif
PlyVeneer®	3.0 mm	Wood veneer with a Kraft linerboard overlay	PlyVeneer Products
Tier 55	1.0 in., 0.50 in.	Corrugated	Damage Prevention Company

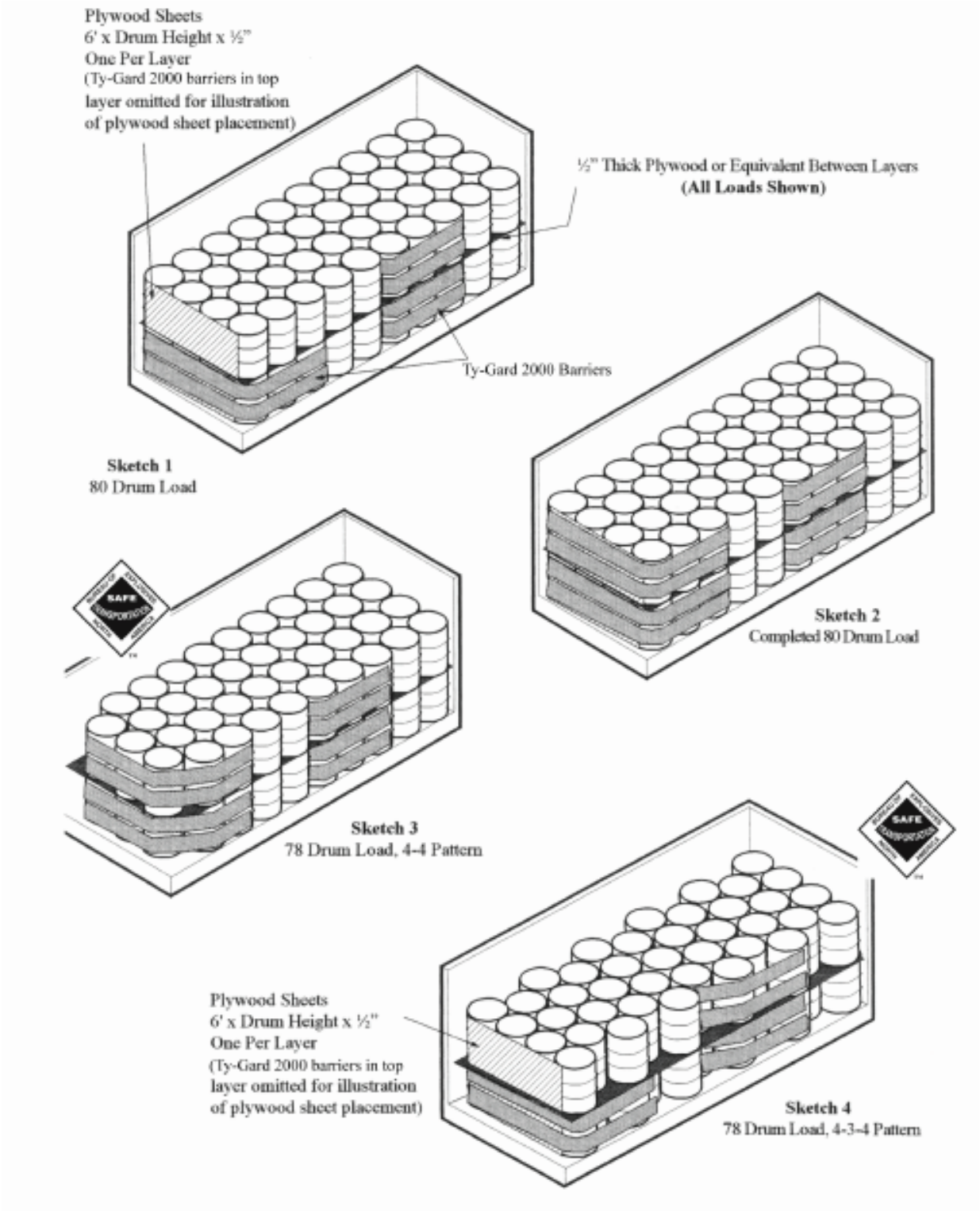


Figure 4.8

Method B-8
78 to 80 tight-head 55-gallon steel or plastic drums in two layers secured by Ty-Gard 2000® in a 20 ft ISO container

C—PALLA-GARD™/DRUM-TITE™—CANCELED

Method C-1—Canceled November 2009

Method C-2—Canceled November 2009

Method C-3—Canceled November 2009

(This Page Left Blank Intentionally)

D—FREIGHTMATE™—CANCELED

Method D-1—Canceled June 2011

E—RUBBER MATS

Method E-1—Coils on Skids with Rubber Mats on Floor in Refrigerated Equipment

Use refrigerated trailers only with floors made up of "T" rails or with ribbed floors.

The following procedures have been tested and found successful for delivering coils on skids with masticated rubber sheets on floors in refrigerated TOFC.

Figure 4.9:

1. Only the following rubber sheet has been evaluated and found acceptable for this loading method:

Type:	Masticated Rubber Sheets (Load Grip®)—National Rubber Technologies Corp.
Thickness:	¼ in.
Weight:	17 g/in.^{3} average.
Tensile strength:	ASTM D-412, 677 psi average
Durometer hardness:	ASTM D-676, Shore A Type, 80 I average
Tear resistance:	ASTM D-624, Die B Nicked Specimens, 410 ppi average

Specifications for Load Grip® also can be found in Appendix D.

NOTE: Do not reuse rubber mats if torn or otherwise damaged.

2. Use this loading method for a maximum of six coils loaded into two bays. Place two or three coils as a unit at the nose of the trailer. Position coils to give proper weight distribution lengthwise in the trailer. Place the remaining coils as a unit at least 3 ft from the doors of the trailer. No single coil units may be used. Use unitizing straps (1¼ in. × .031 in. or equivalent) around each unit. The packaging straps on each coil have an intersectional seal used to prevent slippage of these straps.

3. Cut the rubber mat 6 ft longer than each unit of coils. Place the unit of coils 3 ft from each end of the sheet. 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 in. to 8 in. greater than skid width.

4. Use 1 in. × 3 in. boards placed on edge in the channels of the floor, abutting the rubber mat. Boards run full length of trailer.

5. Use 2 in. × 4 in. backup cleats that are equal in length to the space between the guide rail and the side of the trailer. Use a minimum of three per unit on each side of the coils, keeping them evenly spaced. Nail to guide rail to prevent displacement. *Do not nail to trailer floor.*

NOTE: If individual coils exceed 3,500 lb, consult with your serving railroad.

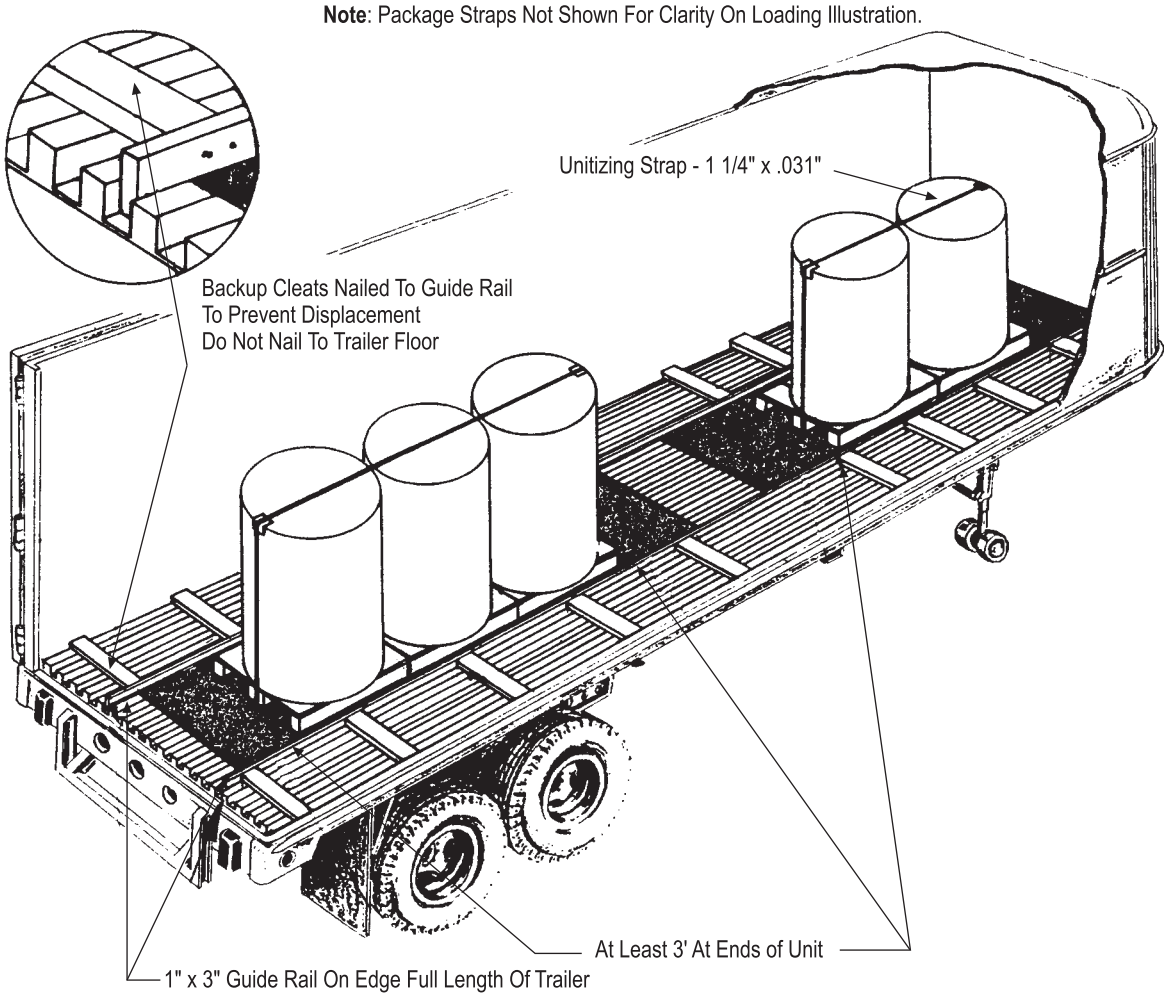


Figure 4.9

Method E-1
Coils on skids with rubber mats on floor in refrigerated equipment

Method E-2—Coils on Skids with Rubber Mats on Floor (Hardwood Flooring)

Use general service trailers or containers with hardwood floors. When using this loading method, position coils to achieve proper weight distribution and minimize the chances for improper weight distribution if slight lengthwise lading shift occurs.

NOTE: If individual coils exceed 3,500 lb, consult with your serving railroad.

The following procedures have been tested and found successful for delivering coils on skids with masticated or rebonded rubber mats on floors.

Figure 4.10:

1. Only the following rubber sheet has been evaluated and found acceptable for this loading method:

Type:	Masticated Rubber Sheets (Load Grip®)—National Rubber Technologies Corp.
Thickness:	⅛ in.
Weight:	17 g/in.^{3} average
Tensile strength:	ASTM D-412, 677 psi average
Durometer hardness:	ASTM D-676, Shore A Type, 80 I average
Tear resistance:	ASTM D-624, Die B Nicked Specimens, 410 ppi average

Only the following rubber mats have been evaluated and found acceptable for this loading method:

Name	Thickness	Vendor
TransMat™ 7513	0.250 in.	AIA/Down River
Rubber Restraint Mat BC548	0.250 in.	Amorim Industrial Solutions

Specifications for these rubber mats are provided in Appendix D.

NOTE: Do not reuse rubber mats if torn or otherwise damaged.

2. Use this loading method for a maximum of six coils loaded into two sections. Place two or three coils as a unit at the nose of the trailer. Position coils to give proper weight distribution lengthwise in the trailer. Place the remaining coils as a unit at least 3 ft from the doors of the trailer. No single coil units may be used. Use unitizing straps (1¼ in. × 0.31 in. or equivalent) around each unit. The packaging straps on each coil have an intersectional seal used to prevent slippage of these straps.

3. Cut the rubber mat 6 ft longer than each unit of coils. Place the unit of coils 3 ft from each end of the sheet. 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 the mat width be no more than 4 in. to 8 in. greater than the skid width.

4. Use 2 in. × 4 in. guide rails as long as each rubber mat on each side of each unit, abutting the rubber mat. Secure guide rails with 12d nails staggered 6 in. on center.

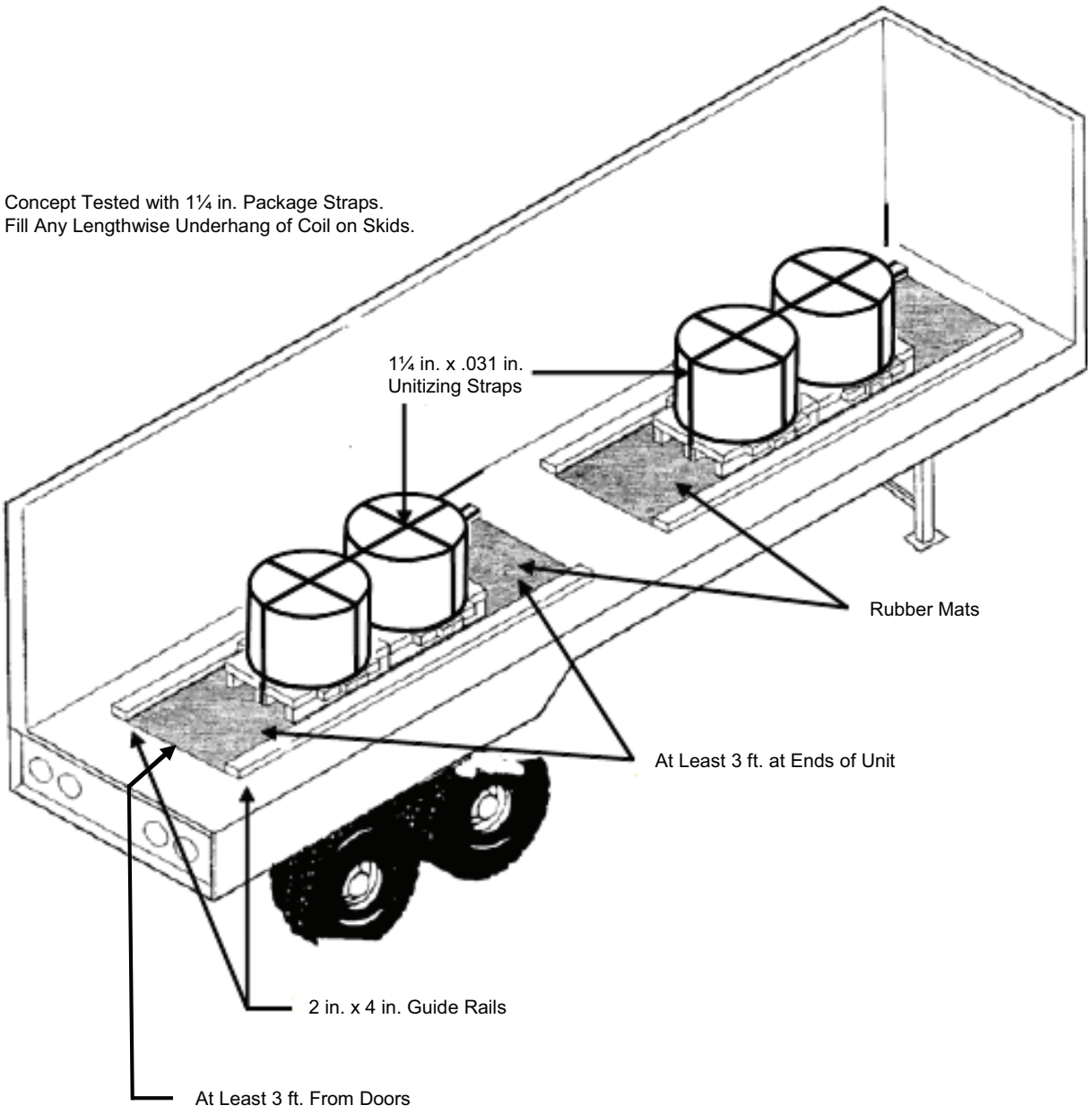


Figure 4.10

Method E-2
Coils on skids with rubber mats on floor
(hardwood flooring)

Method E-3—Wire Cable Coils in Cradles Using Guide Rails and Rubber Mats

Use this loading method for small to large coils of wire cable. Divide the total weight of the lading into two approximately equal sections. During actual testing, each individual coil weighed approximately 6,180 lb.

NOTE: If individual coils exceed 3,500 lb, consult with your serving railroad.

Use general service trailers or containers with hardwood floors. Some lading shift may occur when using this loading method. Position coils to achieve proper weight distribution and to minimize the chances for improper weight distribution if slight lengthwise lading shift occurs.

Figure 4.11:

1. Depending on the individual coil sizes, up to six 1¼ in. × 0.031 in. steel packaging bands are needed. Thread the bands longitudinally through the eye of the coil and equally spaced around the coil's circumference.

2. Fabricate cradles from wood 4 × 4s. The cradles have a length and width at least the same as the wire coils.

3. Place the coils on the fabricated wooden cradles. Support the wire coils with wood 2 × 4s that are bolted to the cradles. Secure the coils to the cradles by wrapping one 1¼ in. × 0.031 in. steel band laterally around the outside of the wire coil and the support blocking.

4. On each side of the trailer/container, abut and nail two wooden 2 in. × 4 in. guide rails edge to edge using minimum 12d nails. Place nails 4 in. on center staggered. The guide rail width needs to be a little wider (½ in. to 1 in.) than the width of the cradles. The extra width allows the load to float within the guide rails. The guide rails extend 3 ft past the load for a proper load-floating area.

5. Load the coils in two sections. Position one section near the nose of the trailer. Position the unit to give proper weight distribution lengthwise of the trailer/container. Place the second section at least 3 ft from the trailer/container doors. Place rubber mats to extend 3 in. to 4 in. beyond each end of each coil unit. If more than one mat is required under a coil unit, overlay the ends of the mats 4 in. to 6 in.

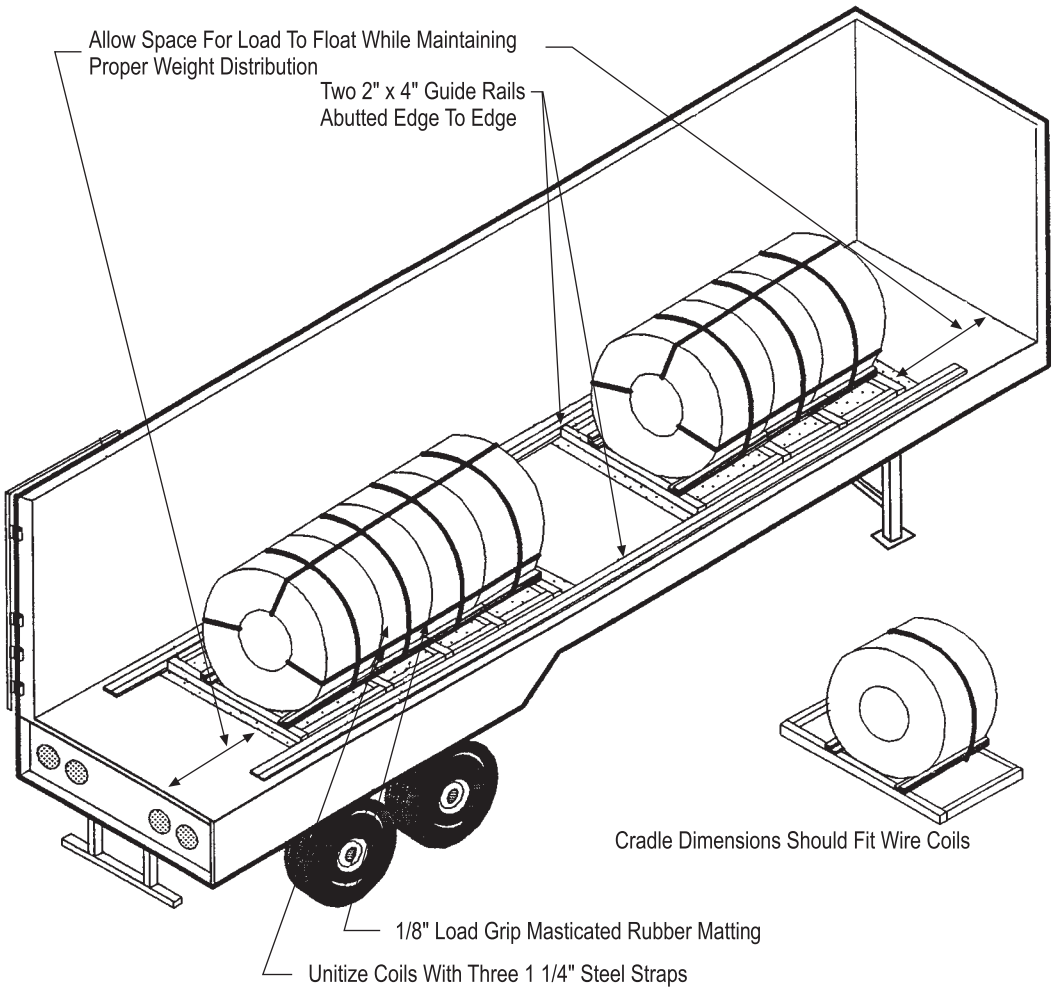
Only the following rubber sheet has been evaluated and found acceptable for this loading method:

Type:	Masticated Rubber Sheets (Load Grip®)—National Rubber Technologies Corp.
Thickness:	3 mm (0.125 in.) thick
Weight:	17 g/in.^{3} average
Tensile strength:	ASTM D-412, 677 psi average
Durometer hardness:	ASTM D-676, Shore Type, 80 I average
Tear resistance:	ASTM D-624, Die B Nicked Specimens, 410 ppi average

Specifications for Load Grip® also can be found in Appendix D.

NOTE: Do not reuse rubber mats if torn or otherwise damaged.

6. Unitize three to four coils in each section with three 1¼ in. × 0.031 in. steel bands. Thread the bands longitudinally through the eyes of the coils at 4, 8, and 12 o'clock positions.



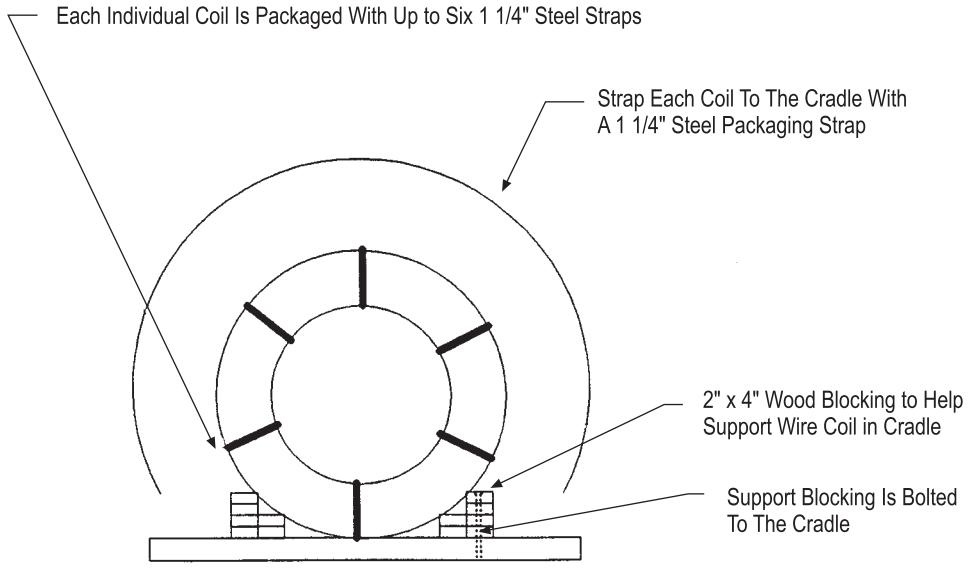


Figure 4.11

Method E-3
Wire cable coils in cradles using guide rails and rubber mats

Method E-4—58 in. Diameter Roll Pulpboard on End Using Rubber Mats

Use this method for 58 in. diameter roll pulpboard loaded on end in a 1-1 offset pattern in a trailer or container for intermodal service. Plan the load to *equalize the weight on each side of the trailer or container.* Because roll weights vary, this will require attention to pre-planning. *A balanced load is required for the stability and success of this loading method.*

Figure 4.12:

1. Only the following rubber mats have been evaluated and found acceptable for this loading method:

Name	Thickness	Description	Vendor
TransMat™ 7513	3mm (0.125 in.)	Continuous rolls	Allegheny Industrial Associates, an ITW company
TransMat™ 6900	2mm (0.080 in.)	Continuous and perforated rolls and 30 in. × 42 in. sheets	
	3mm (0.125 in.)	Continuous rolls	
TransMat™ 8060	2mm (0.080 in.)	Continuous rolls	
Rubber Restraint Mat BC548	2mm (0.080 in.) 3mm (0.125 in.)	Continuous rolls	Amorim Industrial Solutions
Load Grip® 5	1.5mm (0.059 in.)	Continuous and perforated rolls and 30 in. × 42 in. sheets	National Rubber Technologies Corp.
	2mm (0.080 in.)	3 ft × 3 ft square sections	
Load Grip® 6	2 mm (0.080 in.)	Continuous and perforated rolls and 30 in. × 42 in. sheets	
Zro-Shift™	2 mm (0.080 in.)	30 in. × 42 in. sheets	Sunrise Manufacturing Inc.
Load Lock™	3mm (0.125 in.)	Continuous rolls	RB Rubber Products, Inc.
Brown Bear™ Friction Mat 101	2mm (0.080 in.) 3mm (0.125 in.	Continuous rolls	Circle, Inc.
Load Secure™ 6910	2mm (0.080 in.)	Continuous rolls	Regupol America

Specifications for these rubber mats are in Appendix D. The mats are not secured to the trailer floor.

NOTE: Do not reuse rubber mats if torn or otherwise damaged.

2. Divide the load into two sections. The nose section should consist of three or four rolls. Use the appropriate size mat for the number of rolls being loaded.

a. If *four rolls* are loaded in the nose section, use two 4 ft × 17 ft mats 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 mat in each row cut to 20 in. to allow more of the last 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 mats 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 mat in each row cut to 20 in. to allow more of the last 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.

3. If *four rolls* are loaded in the nose section, load the four rolls tightly starting against the nose and using a 1-1 offset pattern. See **Sketch 3.**

4. If *three rolls* are loaded in the nose section, load the first roll so it is centered in the trailer against the nose. Place void fillers, 3 in. × (void width) × 48 in. corrugated fiberboard with 1,500 lb minimum crush strength, on either side of the trailer at the nose. Position void fillers so that the crush strength is crosswise to the trailer or container. If using multiple void fillers in tandem, unitize them to restrict independent movement. See **Sketch 2.** Ladder-type lumber side-blocking can be used as an alternative to the void fillers provided it is 3 in. in height and extends a minimum of 48 in. from the nose of the trailer. Lumber side-blocking may also be used as an alternative provided it is 3 in. in height, extends a minimum of 48 in. from the nose of the trailer, and is secured adequately using 12d nails. Load the next two rolls tightly lengthwise against opposite sidewalls of the trailer as shown in **Sketch 2.**

5. A minimum of 3 ft of void is required between the lading and the trailer doors. Position the rear section to obtain the proper load weight distribution, and maintain the 3 ft void at the rear of the trailer.

6. Load the rear section consisting of four rolls by using two 4 ft × 16 ft mats placed side by side or by using an appropriate number of 3 ft × 3 ft or 30 in. × 42 in. sections of approved rubber mat placed side by side and centered under the rolls. Position the mats to extend a minimum of 6 in. beyond the rolls at each end of each mat. Place the rolls on the mats in a 1-1 offset pattern.

7. Unitize the rear section (at trailer doors) with one approved polyester cord strap or one ⅝ in. × .040 in. approved polyester plastic strap. Position the unitizing strap at a maximum height of 4 ft above the trailer floor. Be sure the strap is level. Tension and seal the straps using proper tensioning and sealing tools.

   a. If using approved polyester cord strap, a wire buckle with legs (prongs) on the same side of the frame and that has a non-slip surface is required. See paragraph 3.6 for approved polyester cord strapping.

   b. If using a ⅝ in. × .040 in. approved polyester plastic strap, a heat seal, a friction weld, or metal seals may be used to seal the strap. A minimum joint strength of 900 lb is required. See paragraph 3.6 for approved polyester plastic strapping.

8. Position two strap hangers on each trailer sidewall at the rear section as indicated in **Sketch 1** to maintain proper strap alignment and to prevent straps from slipping out of position. Strap hangers may be solid fiberboard secured by use of adhesive, tape, or staples; or looped cord strap secured by staples. Use adhesive or tape that is heat and cold resistant for this purpose. Do not use tape as the strap hanger. If additional strap hangers are positioned on the rolls, be sure they are positioned so that the strap remains level.

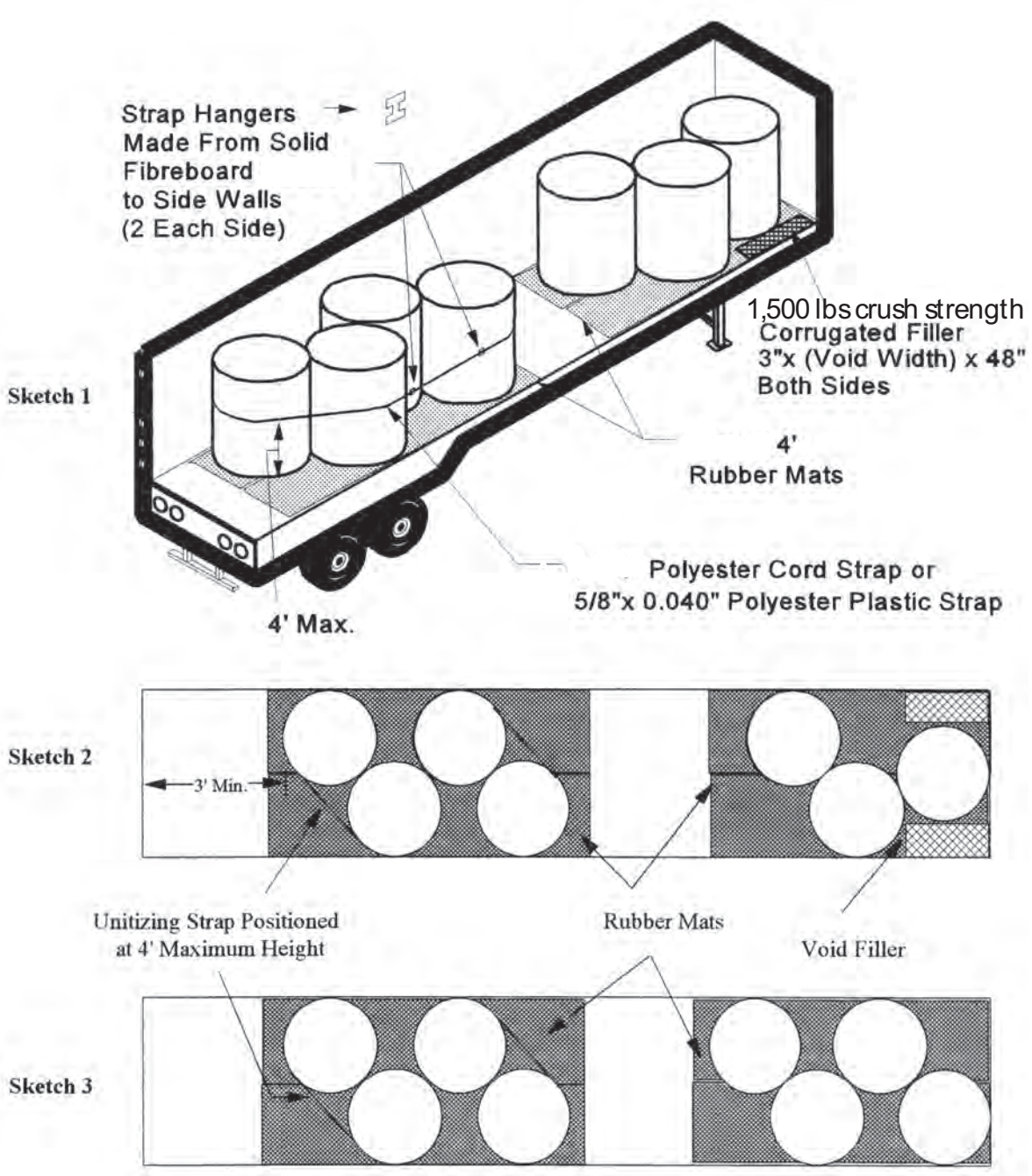


Figure 4.12

Method E-4
58 in. diameter roll pulpboard on end using 4 ft wide rubber mats

(This Page Left Blank Intentionally)

Method E-5—50 in. Diameter Rolls of Wrapping Paper on End Using Rubber Mats

Use this loading method for 50 in. diameter roll wrapping paper loaded on end in a 1-1 offset pattern in a trailer or container for intermodal service. This method was tested in a 102 in. wide trailer. Plan the load to *equalize the weight on each side of the trailer or container.* Because roll weights vary, this will require attention to pre-planning. *A balanced load is required for the stability and success of this loading method.*

Figure 4.13:

1. Use ¼ in. thick rubber mats.

Only the following rubber mats have been evaluated and found acceptable for this loading method:

Name	Thickness	Vendor
TransMat™ 7513	0.250 in.	AIA/Down River
Rubber Restraint Mat BC548	0.250 in.	Amorim Industrial Solutions

Specifications for these rubber mats are in Appendix D.

2. Divide the load into two sections, each containing approximately half of the load.

3. Load the first section in a 1-1 offset pattern starting at the nose of the trailer.

4. Load the second section also in a 1-1 offset pattern approximately 180 in. behind the first section. This section should be at least 3 ft from the doors when loading is completed.

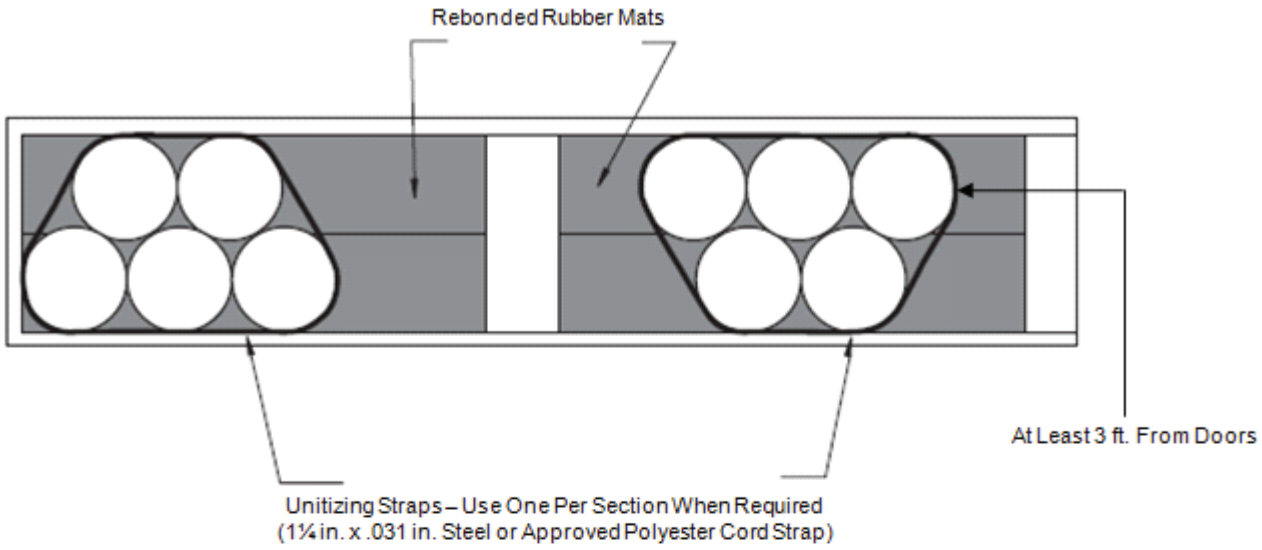
5. Load each section on two 4 ft × 17 ft × ¼ in. thick rubber mats placed side by side. An equal amount of rubber mat extends from under the front and rear of the second section. Do not secure the mats to the trailer floor.

6. If roll width exceeds 1.5 times roll diameter (75 in. for a 50 in. diameter roll), unitize each section with one approved polyester cord strap using the correct buckle in accordance with manufacturer's instructions (see paragraph 3.6 for approved polyester cord strapping). Tension and seal straps using proper tensioning and sealing tools. Use strap hangers or tape to maintain proper strap alignment.

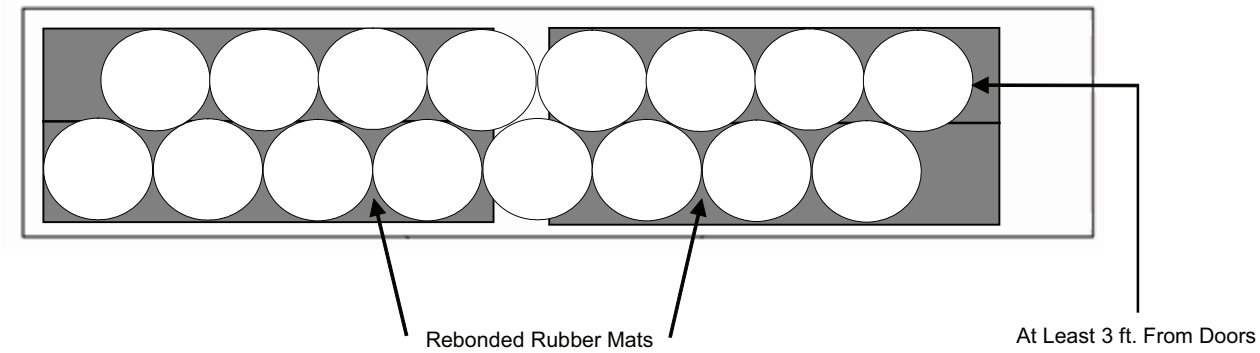
NOTE: Rolls can be loaded in one section starting at the nose and continuing to the rear of the trailer if necessitated by the number of rolls being loaded. Use the same number and size of rubber mats as specified above.

7. Place two mats in the nose of the trailer and two at the rear of the lading. See Figure 4.13 for an example of this type load. Unitizing straps are not required for rolls loaded in one section from the nose of the trailer.

NOTE: Do not use rubber mats if torn or otherwise damaged.



Sketch 1
50 in. Diameter Roll Wrapping Paper Loaded in Two Sections



Sketch 2
50 in. Diameter Roll Wrapping Paper Loaded in One Section

Figure 4.13

Method E-5
50 in. diameter roll paper on end using 4 ft wide rubber mats

Method E-6—Bilge-Loaded Large-Diameter Roll Paper on Wood Cradles

Use this method for large-diameter bilge-loaded roll paper. The loading method utilizes fabricated wood cradles to secure the commodity. Some shifting of the rolls on the cradles can occasionally occur. If the rolls are neither wrapped nor given end protection, regard the outer plies and ends as protective packaging for the rolls. Therefore, chafing, scuffing, and/or edge abrasion of the outer plies and ends may occur when shipping this product using this loading method.

Figure 4.14:

1. Package the rolls using two ⅜ in. × 0.020 in. packaging bands.

2. Manufacture the cradles from ½ in. plywood and 2 in. × 4 in. lumber. The cradle length equals the length of the rolls to be shipped. The width should be 50% of the diameter of the rolls (minimum). The outside wedge height should be high enough to allow lifting with forklift tines, 5 in. minimum. The top face of the cradle has ¼ in. rebonded rubber mats affixed with adhesive. The bottom face of the cradle has a ¼ in. masticated rubber mat affixed with adhesive. The adhesive used is “Sure Seal 90-8-30A.”

Use rebonded rubber mats ¼ in. thick.

Only the following rubber mats have been evaluated and found acceptable for this loading method:

Name	Thickness	Vendor
TransMat™ 7513	0.250 in.	AIA/Down River
Rubber Restraint Mat BC548	0.250 in.	Amorim Industrial Solutions

Specifications for these rubber mats are in Appendix D.

The masticated rubber mats have the following specifications:

Type:	Masticated Rubber Sheets (Load Grip®)—National Rubber Technologies Corp.
Thickness:	¼ in.
Weight:	17 g/in.^{3} average
Tensile strength:	ASTM D-412, 677 psi average
Durometer hardness:	ASTM D-676 Shore A Type, 80 I average
Tear resistance:	ASTM D-624, Die B Nicked Specimens, 410 ppi average

Specifications for Load Grip® also can be found in Appendix D.

3. Secure the rolls to the cradles by two straps. The straps may be either ¾ in. × 0.031 in. steel strapping or approved polyester cord strap using the correct buckle in accordance with manufacturer’s instructions (see paragraph 3.0 for approved polyester cord strapping). Thread the straps through the cradles and tension them around the rolls.

4. Load the rolls down the center of the trailer with their cores lengthwise. If the difference between the roll diameter and the inside trailer width exceeds 18 in., stagger the rolls against opposite sidewalls.

5. Apply minimum 2 in. × 4 in. side blocking where required.

6. Apply minimum 2 in. × 4 in. floor blocking tight to doorway end of cradle with minimum 2 in. × 4 in. backup cleats.

NOTE: Cradles may be reused as long as they are in good condition and the rubber mats on the top and bottom surfaces are not damaged.

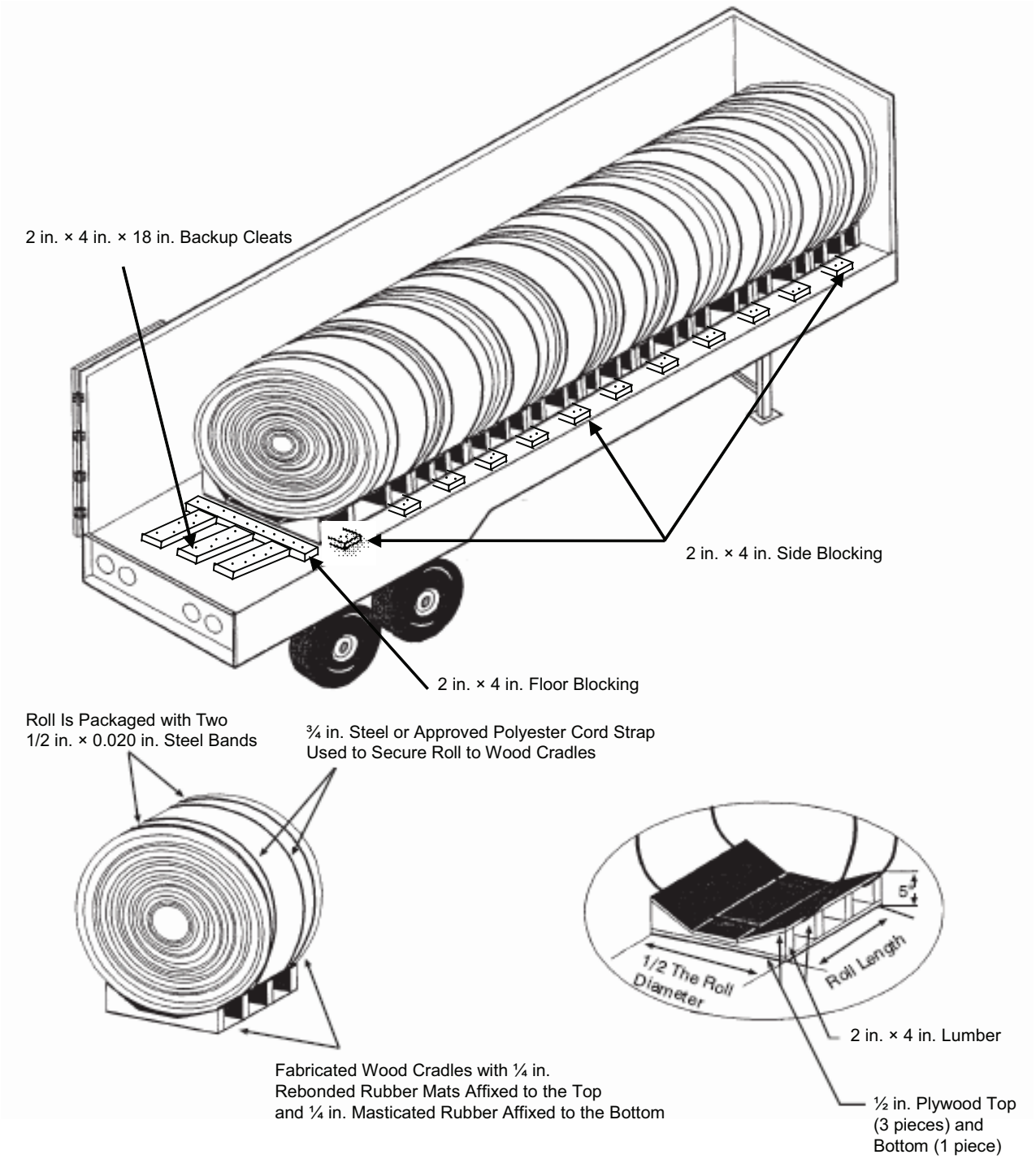


Figure 4.14

Method E-6
Bilge-loaded, large-diameter roll paper on wood cradles

Method E-7—Closed-Head Steel Drums in a 3-4-3 Pattern on Rubber Matting with Steel or Approved Polyester Cord Strapping

Use the following bracing method for 55-gallon closed-head steel drums loaded in a 3-4-3 pattern. The method utilizes ¼ in. masticated rubber matting and steel or approved polyester cord strapping.

Figure 4.15:

1. Only the following rubber sheet has been evaluated and found acceptable for this loading method:

Type:	Masticated Rubber Mats (Load Grip®)—National Rubber Technologies Corp.
Thickness:	¼ in. thick × 61½ in. wide × length of load plus 18 in.
Weight:	17 g/in.^{3} average
Tensile Strength:	ASTM D-412, 677 psi average
Durometer Hardness:	ASTM D-676 Shore A Type, 80 I average
Tear Resistance:	ASTM D-624, Die B Nicked Specimens, 410 ppi average

Specifications for Load Grip® can also be found in Appendix D.

NOTE: Do not reuse rubber mats if torn or otherwise damaged.

NOTE: Mat is a minimum of 61½ in. wide and a minimum of 18 in. longer than the load. Adjust the length to suit each load.

2. Lay the rubber matting down the center of the trailer floor as the drums are loaded.

3. Load the first three stacks into the trailer in a 3-4-3 pattern.

4. Unitize the drums with one strap. Use 1¼ in. × 0.031 in. steel strap or approved polyester cord strap using the correct buckle in accordance with manufacturer's instructions (see paragraph 3.6 for approved polyester cord strapping). Use tape or fiberboard strap stays to prevent strap from slipping down on drums.

5. Continue loading drums (3-4-3) until the end of the load.

6. Unitize the last three rows with one 1¼ in. × 0.031 in. steel strap or approved polyester cord strap using the correct buckle in accordance with manufacturer's instructions (see paragraph 3.6 for approved polyester cord strapping). Use tape or strap stays to prevent strap from slipping down on drums.

7. Leave a minimum 3 ft of space between the back of the load and the trailer doors.

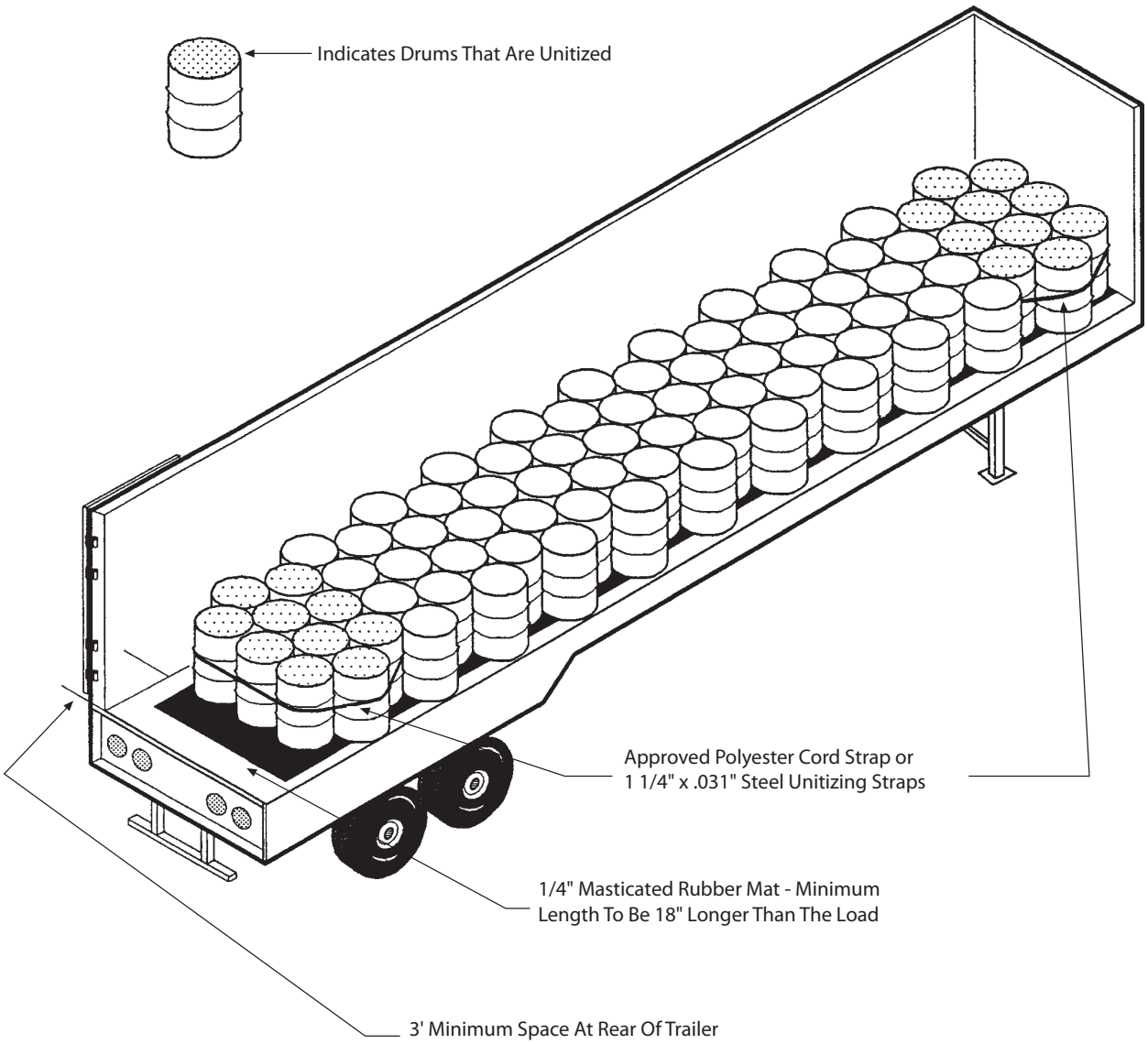


Figure 4.15

Method E-7
Closed-head steel drums in a 3-4-3 pattern on rubber matting with steel or approved polyester cord strap

Method E-8—Through Loads of 58 in. Diameter Roll Pulpboard on End Using Two 3 ft Wide Rubber Mats

Use this method for through loads of 58 in. diameter roll pulpboard loaded as a single section, on end, in a 1-1 offset pattern in a trailer or container for intermodal service. Plan the load to *equalize the weight on each side of the trailer or container*. Because roll weights vary, this will require attention to pre-planning. *A balanced load is required for the stability and success of this loading method.*

Figure 4.16:

1. Only the following rubber mats have been evaluated and found acceptable for this loading method:

Name	Thickness	Vendor
TransMat™ 7513	3 mm (0.125 in.)	AIA/Down River
TransMat™ 7010		
TransMat™ 6510		
Rubber Restraint Mat BC548	3 mm (0.125 in.)	Amorim Industrial Solutions

Specifications for these rubber mats are in Appendix D.

NOTE: Do not reuse rubber mats if torn or otherwise damaged.

2. An even or odd number of rolls may be loaded. Use a 3 ft × 12 ft mat at the nose and a 3 ft × 17 ft mat at the rear. Do not secure the mats to the trailer floor.

3. If loading an even number of rolls, place the first mat on the floor at the nose, aligning the longitudinal centerline of the mat along the longitudinal centerline of the trailer. Load the first four rolls tightly starting against the nose and using a 1-1 offset pattern. See **Sketches 1 and 2.**

4. Place the second mat 11 ft to 12 ft behind the first mat. Continue to load the trailer in a 1-1 offset pattern until finished. Position the second mat to extend a minimum of 6 in. beyond the rear of the load.

5. If loading an odd number of rolls, place the first mat on the floor at the nose, aligned along the longitudinal centerline of the trailer. Load the first roll so it is centered in the trailer against the nose. Place void fillers, 3 in. × (void width) × 48 in. corrugated fiberboard with 1,500 lb minimum crush strength, on either side of the trailer at the nose. Position void fillers so that the crush strength is crosswise to the trailer or container. If using multiple void fillers in tandem, unitize them to restrict independent movement. See **Sketch 3.** Lumber side-blocking can be used as an alternative to the void fillers provided it is 3 in. in height, extends a minimum of 48 in. from the nose of the trailer, and is secured adequately using 12d nails. Ladder-type side-blocking may also be used as an alternative provided it is 3 in. in height and extends a minimum of 48 in. from the nose of the trailer.

6. Place the second mat 5 ft behind the first mat. Continue to load the trailer in a 1-1 offset pattern until finished. Position the second mat to extend a minimum of 6 in. beyond the rear of the load.

7. Leave a minimum of 3 ft between the lading and the trailer doors.

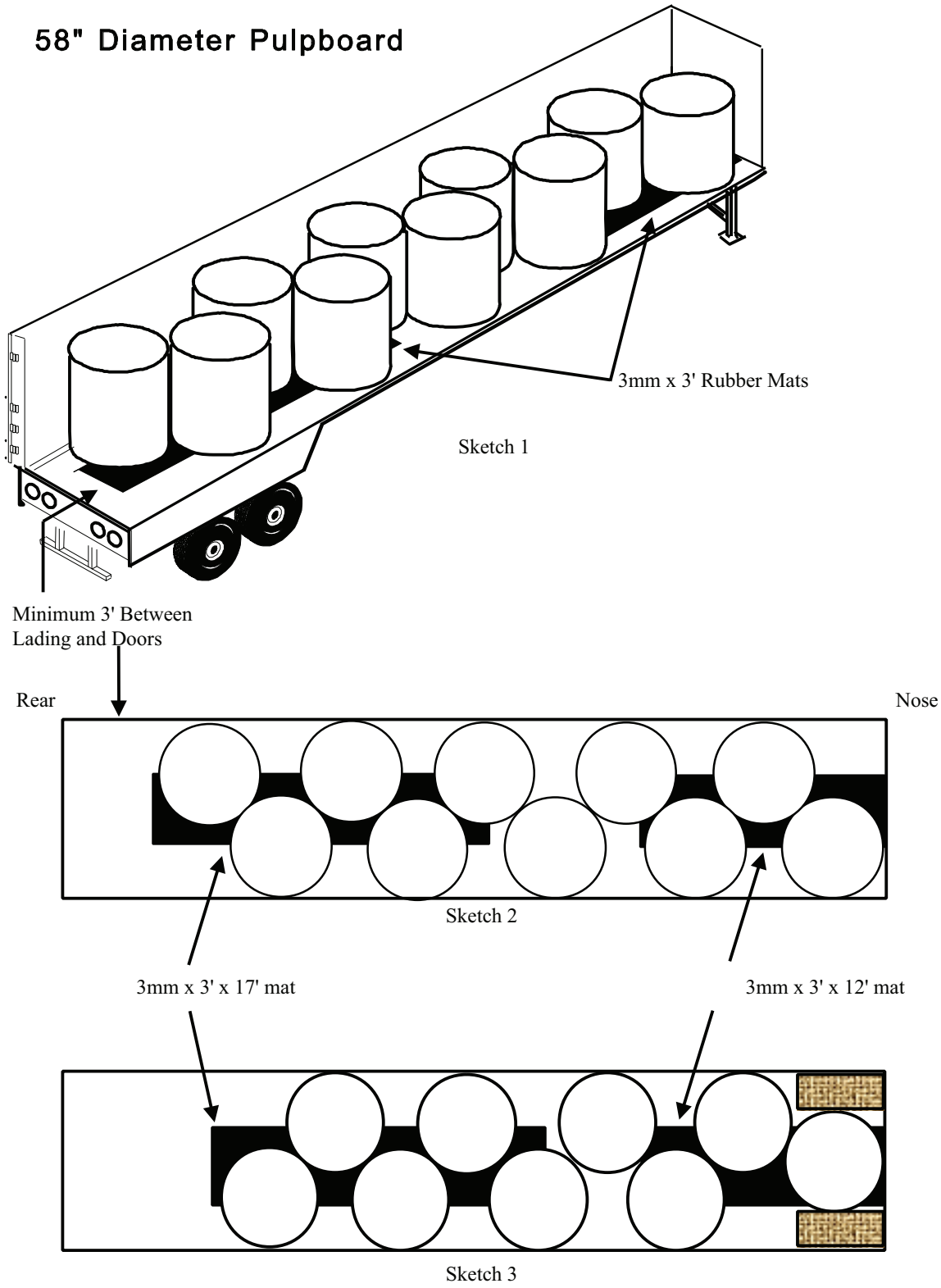


Figure 4.16

Method E-8
Through loads of 58 ft diameter roll pulpboard on end using 3 ft wide rubber mats

Method E-9—Canceled March 1998

Method E-10—Roll Pulpboard on End Using Rubber Mats with an Incomplete Second Layer

Use this loading method for roll pulpboard loaded on end in a 1-1 offset pattern, with an incomplete second layer, in a trailer or container for intermodal service. Plan the load to *equalize the weight on each side of the trailer or container.* Because roll weights vary, this will require attention to pre-planning. *A balanced load is required for the stability and success of this loading method.*

Figure 4.17:

1. Only the following rubber mats have been evaluated and found acceptable for this loading method:

Name	Thickness	Vendor
TransMat™ 7513	3 mm (0.125 in.)	AIA/Down River
Rubber Restraint Mat BC548	3 mm (0.125 in.)	Amorim Industrial Solutions

Specifications for these rubber mats are in Appendix D.

NOTE: Do not reuse rubber mats if torn or otherwise damaged.

2. Load the rolls on two 3 mm thick rubber mats placed down the center of the trailer. A 4 ft × 10 ft rubber mat extends from the nose of the trailer. Place a 4 ft × 17 ft mat at the rear of the load so that it extends 2 in. to 3 in. beyond the end of the lading. Do not secure the mats to the trailer floor.

3. Load the rolls in one section in a 1-1 offset pattern starting at the nose of the trailer.

4. Load the incomplete layer approximately in the center of the trailer. Secure the incomplete layer with two 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 is accomplished by loading rolls of smaller width in the floor layer under the second layer or using roll risers under the blocking rolls. Roll risers are a minimum 6 in. × 6 in. × 30 in. corrugated fiberboard or equivalent material placed lengthwise in the trailer. If the risers are made of corrugated fiberboard, position with the corrugations vertical. If they are made of other material, follow the manufacturer's instructions for positioning. Minimum crush strength of 6,000 lb/ft^2 is required for the risers.

5. Leave a minimum of 3 ft of void space between the lading and the trailer doors.

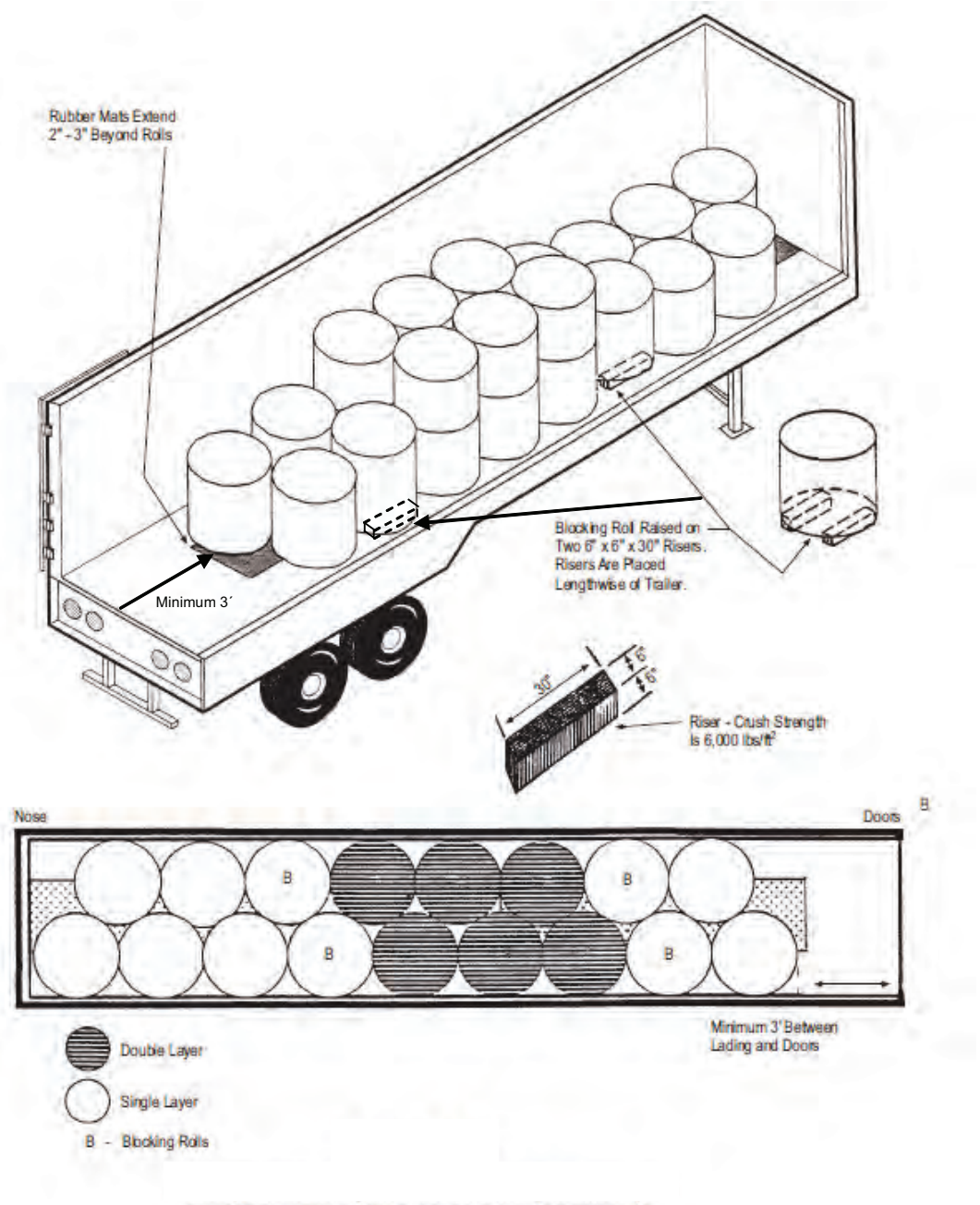


Figure 4.17

Method E-10
Roll pulpboard on end using rubber mats with an incomplete second layer

Method E-11—Canceled March 1998

Method E-12—45 in. Diameter Roll Paper on End Secured Using Rubber Mats

Use this loading method for 45 in. diameter roll paper loaded on end in a 2-1-2 type of pattern in a trailer or container for intermodal service. 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. Figure 4.18 shows the load configuration used for testing this concept. Plan the load to *equalize the weight on each side of the trailer or container.* Because roll weights vary, this will require attention to pre-planning. *A balanced load is required for the stability and success of this loading method.*

NOTE: Use trailers/containers only with wood floors.

Figure 4.18:

1. Only the following rubber mats have been evaluated and found acceptable for this loading method:

Name	**Thickness**	**Description**	**Vendor**
TransMat™ 6510	3 mm (0.125 in.)	Continuous rolls	AIA/Down River
TransMat™ 8060	2 mm (0.080 in.)		
Rubber Restraint Mat BC548	3 mm (0.125 in.)	Continuous rolls	Amorim Industrial Solutions
Load Grip® 3	3 mm (0.125 in.)	Continuous rolls	National Rubber Technologies Corp.
Load Grip® 5	1.5 mm (0.059 in.)	Continuous and perforated rolls and 21 in. × 48 in. and 21 in. × 49 in. sheets	

Specifications for these rubber mats are in Appendix D.

NOTE: Do not reuse rubber mats if torn or otherwise damaged.

2. Place a 2 ft × 12 ft rubber mat in the nose of the trailer extending lengthwise down the center of the trailer, or place three 21 in. × 48 in. or 21 in. × 49 in. rubber sheets end-to-end and centered under the first four stacks in the nose of the trailer with the rearmost mat extending approximately 6 in. beyond the doorward face of the last roll of the fourth stack. Do not secure the mat to the trailer floor. Load the rolls in one section in a 2-1-2 type pattern starting at the nose of the trailer and going back to within 14 ft of the end of the load, about four stacks.

3. Place two 2 ft × 14 ft mats at the rear of the load running lengthwise of the trailer with one mat 12 in. from each sidewall positioned to extend 2 in. to 3 in. beyond the end of the lading; or place two rows of four 21 in. × 48 in. or 21 in. × 49 in. rubber sheets end-to-end and positioned 14 in. from each sidewall with the rearmost mat extending approximately 20 in. beyond the doorward face of the last rolls loaded. Do not secure the mats to the trailer floor.

4. Load the remaining rolls into the trailer with the last three stacks in a 2-1-2 pattern as shown.

5. Unitize the last three stacks (five rolls) using one 1¼ in. × 0.031 in. steel strap or one approved polyester cord strap using the correct buckle in accordance with manufacturers instructions. (See paragraph 3.6 for approved polyester cord strapping.) 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.

6. Leave a minimum of 3 ft of void space between the lading and the trailer doors.

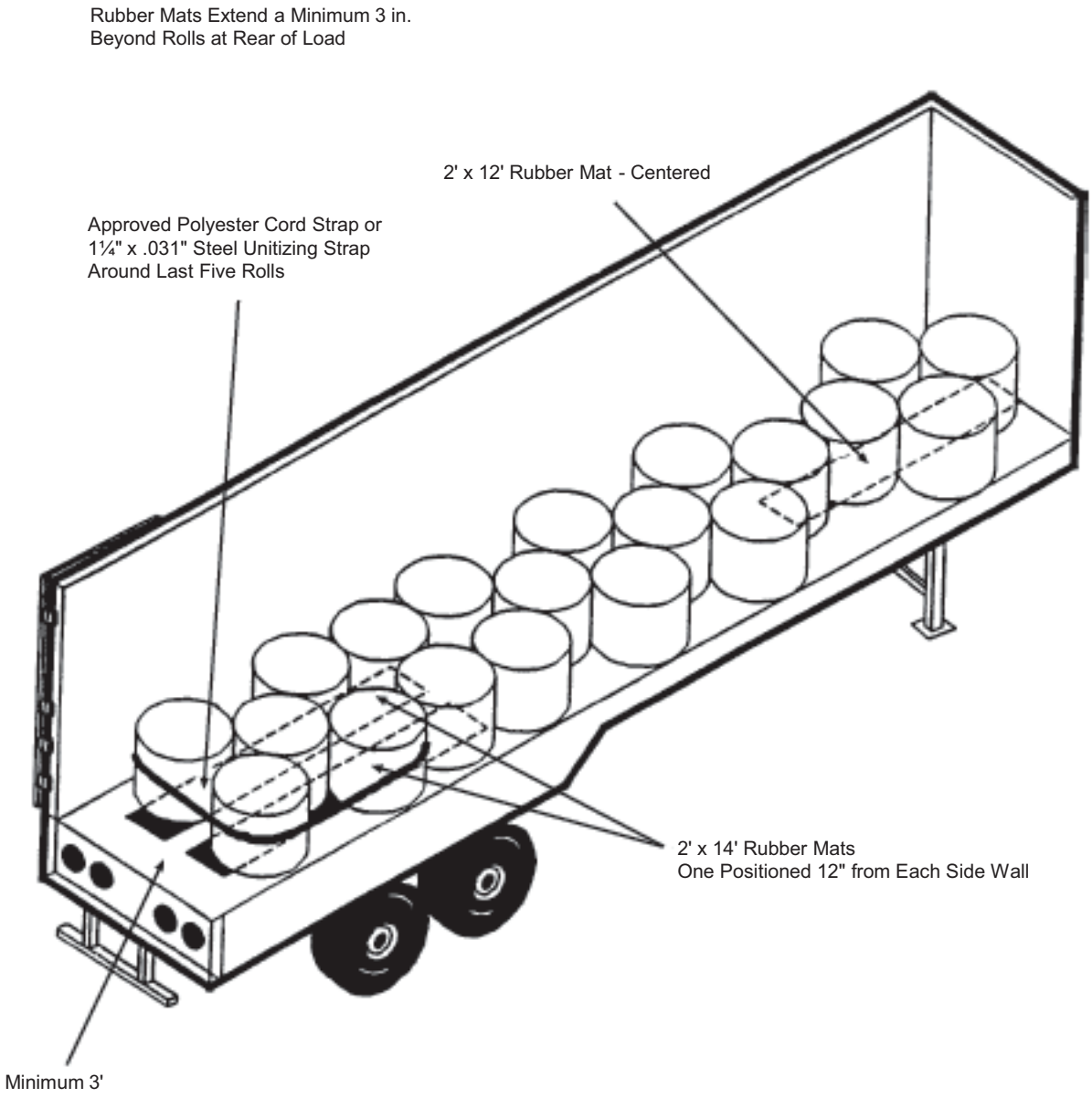


Figure 4.18

Method E-12
45 in. diameter roll paper on end using 2 ft wide rubber mats

Method E-13—50 in. Diameter Newsprint on End Using 1 ft Wide Rubber Mats

Use this loading method for 50 in. diameter newsprint loaded on end in a 1-1 offset pattern in a trailer or container for intermodal service. An incomplete layer may be loaded. This method was tested in a 102 in. wide trailer. Plan the load to *equalize the weight on each side of the trailer or container*. Because roll weights vary, this will require attention to pre-planning. *A balanced load is required for the stability and success of this loading method.*

NOTE: Due to the nature of this concept, some header damage could occur. If this is considered objectionable, do not use this loading and bracing method.

Figure 4.19:

1. Only the following rubber mat has been evaluated and found acceptable for this loading method:

Name	Thickness	Vendor
TransMat™ 6510	3 mm (0.125 in.)	AIA/Down River

Specifications for this rubber mat are in Appendix D.

NOTE: Do not reuse rubber mats if torn or otherwise damaged.

2. 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 trailer the full length of the load and 3 in. beyond the end of the load.

3. Load the rolls tightly in one section in a 1-1 offset pattern starting at the nose of the trailer.

4. If an incomplete layer is loaded, it may be necessary to center the incomplete layer to provide proper weight distribution. The incomplete layer may be secured using one of two different concepts.

   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 of the trailer. The last stack in the trailer should be a single layer stack if this option is used.

   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 is accomplished by loading rolls of smaller width in the floor layer under the second layer or by using roll risers under the blocking rolls. Roll risers are a minimum 6 in. × 6 in. × 30 in. corrugated fiberboard or equivalent material placed lengthwise in the trailer. If the risers are made of corrugated fiberboard, position with the corrugations vertical. If they are made of other material, follow the manufacturer's instructions on positioning. Minimum crush strength of 6,000 lb/ft^2 is required for the risers.

5. Leave a minimum of 3 ft of void space between the lading and the trailer doors.

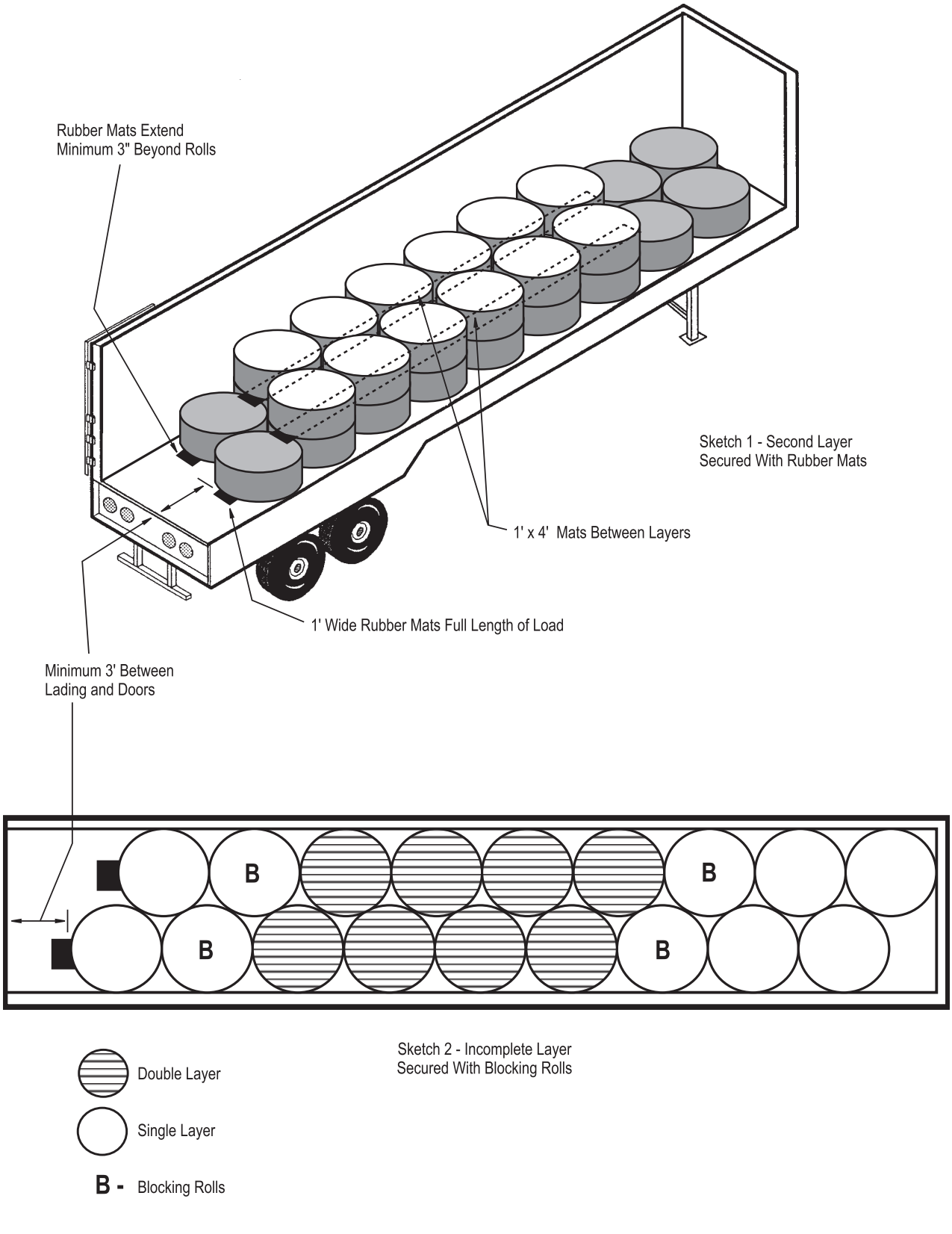


Figure 4.19

Method E-13
50 in. diameter newsprint on end using 1 ft wide rubber mats

Method E-14—40 in. 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

Use this method for 40 in. to 45 in. diameter, large-width roll paper loaded on end in a 2-1 pattern in a trailer or container for intermodal service. The rubber floor mats are 2 ft wide and extend 8 in. beyond each end of each section of rolls.

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.

Figure 4.20:

The mats are not secured to the trailer floor.

1. Only the following rubber mat has been evaluated and found acceptable for this loading method:

Name	Thickness	Vendor
TransMat™ 6510	3 mm (0.125 in.)	AIA/Down River

Specifications for this rubber mat are in Appendix D.

NOTE: Do not reuse rubber mats if torn or otherwise damaged.

2. The load is divided into two sections, each containing three rolls. *The width of the rolls is at least 6 in. less than the inside height of the trailer/container.*

3. Position two 2 ft wide rubber strips so they will be centered under the two-roll-wide stack for each section, approximately 16 in. to 18 in. from the sidewalls. Use mats of sufficient length to extend 8 in. beyond each end of each section of the load.

4. Load the first section in a 2-1 pattern starting about 3½ ft from the nose of the trailer. Load the first two rolls next to each other along the longitudinal centerline of the trailer as shown in the figure. Centered the third roll in the trailer in the recess between the first two rolls.

5. Unitize the first section with two 1¼ in. × 0.031 in. steel straps, one positioned 24 in. from top of rolls and one 18 in. from the floor as shown in Figure 4.20. 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.

6. Position corrugated fiberboard void fillers 1 ft wide × 5 ft long with 1,500 lb minimum crush strength 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 tandem, unitize them to restrict independent movement.

7. The second section also consists of three rolls loaded in a 2-1 pattern. Load and unitize it in the same manner as the first section. Position this section as far from the doors as possible while maintaining proper weight distribution (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 trailer.

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

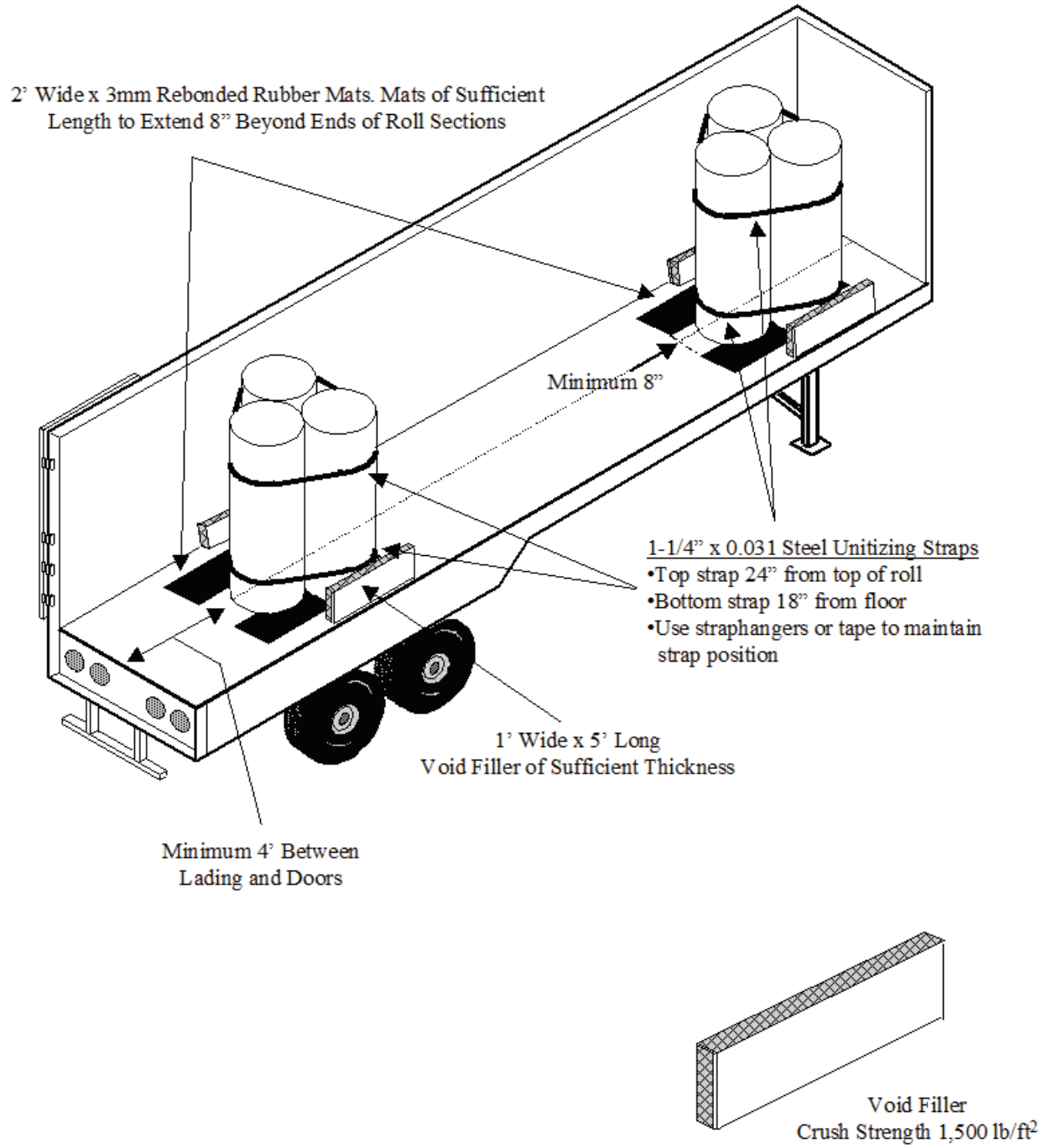


Figure 4.20

Method E-14
40 in. to 45 in. diameter roll paper on end in two sections using two 2 ft wide rubber mats under each section

Method E-15—Skidded or Palletized Flat Paper Stock Secured Using Rubber Mats and D.I.D. Bags

Use this method for sheet flat paper stock or flat paper stock in boxes or on skids or pallets. Unitize the paper by stretch-wrapping (90 gauge film) with three wraps at the top and bottom and two wraps around the middle of the unit, or by using packaging bands or a skid top and packaging bands. The stretch-wrap should extend down and encompass the top of the pallet. *Use trailers / containers only with wood floors.*

Figure 4.21:

1. Only the following rubber mat has been evaluated and found acceptable for this loading method:

Name	Thickness	Vendor
Load Grip® 2	3 mm (0.125 in.)	National Rubber Technologies Corp.

Specifications for this rubber mat are in Appendix D.

NOTE: Do not reuse rubber mats if torn or otherwise damaged. Do not reuse D.I.D. bags used for load securement.

2. Position a 4 ft wide rubber mat down the center of the trailer extending from the nose. This mat extends under all but the last two stacks in the load.

3. Fill all lateral void space with appropriate filler material. 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. **Sketch 2** shows the load used in testing this concept. The number of stacks and the number of units in each stack will vary depending on the weight of the units, the shipment requirements, and the weight distribution requirements.

4. Secure all stacks against lateral shifting. Use void fillers or 1 in. × 4 in. × 8 ft lumber nailed to the skid or pallet runners and extending across the trailer width, except in the last two stacks where a disposable inflatable dunnage (D.I.D.) bag is utilized.

5. Load the last two stacks consisting of two units each with one unit in each stack against each sidewall. Place a 4 ft × 4 ft rubber mat under each unit in the last two stacks.

6. Position one minimum Level 1 D.I.D. bag lengthwise in the center void of the last two stacks. Use D.I.D. bags long enough to extend over two stacks of lading and wide enough to extend from 4 in. above the floor to the top of the lading. Minimum D.I.D. bag size is 36 in. × 84 in. If the center void filled by the D.I.D. bag is larger than 12 in. after inflation of the bag, place full-size void fillers (capable of withstanding a load of 1,500 lb/ft^2) alongside the D.I.D. bag. Position the D.I.D. bag 4 in. above the trailer floor. Inflate the D.I.D. bag 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).

7. The back of the load should be at least 3 ft from the doors when loading is completed.

NOTE: An updated listing of verified D.I.D. bags can be found on the TTCI Web site at http://www.aar.com/dpls/pfds/PPPPD_Verification_List.pdf

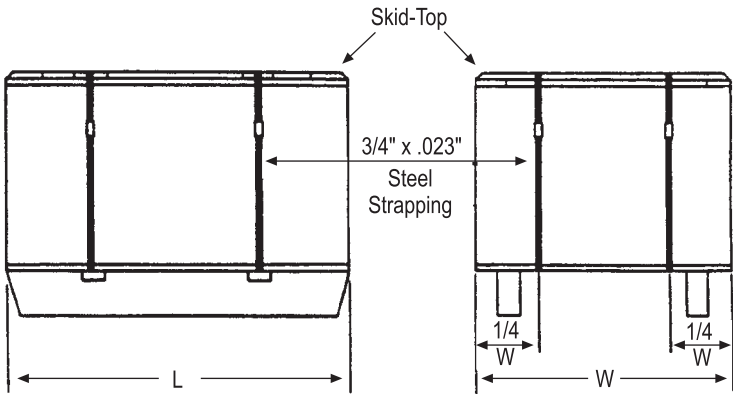


Figure 4.21 — Sketch 1

Method E-15
Use of a skid top and packaging bands

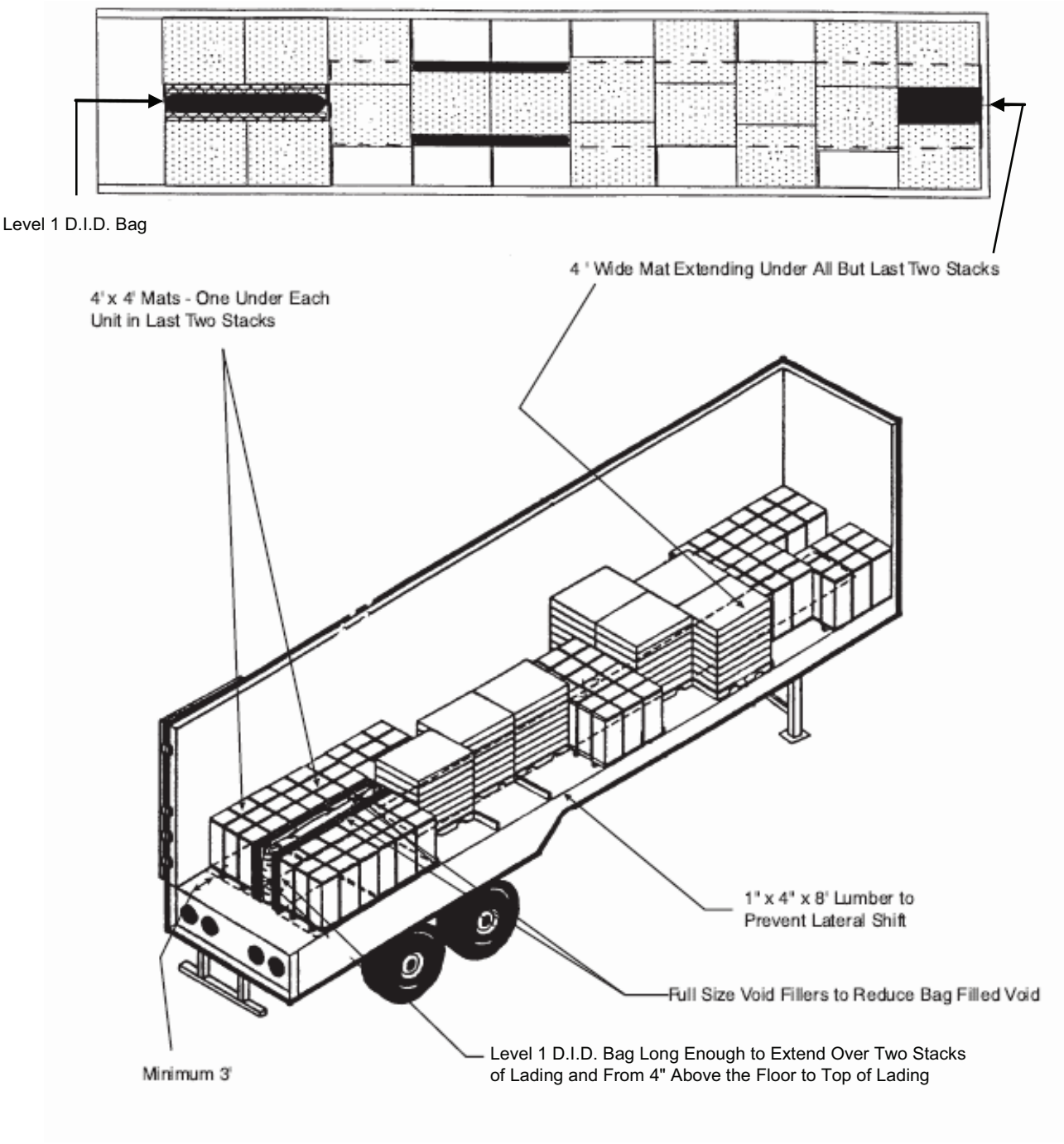


Figure 4.21 — Sketch 2

Method E-15
Skidded or palletized flat paper stock secured using rubber mats and D.I.D. bags

(This Page Left Blank Intentionally)

Method E-16—Palletized Roofing Shingles Secured Using 1 ft Wide Rubber Mats

Use this method for roofing shingles on double-deck pallets. Unitize the shingles by stretch-wrapping (90 gauge film) with three wraps at the top and bottom and two wraps around the middle of the unit. The stretch-wrap should extend down and encompass the top of the pallet. *Use trailers/containers with wood floors only.*

Figure 4.22:

1. Only the following rubber mats have been evaluated and found acceptable for this loading method:

Name	Thickness	Vendor
TransMat™ 6510	3 mm (0.125 in.)	AIA/Down River
Load Grip® 2	3 mm (0.125 in.)	National Rubber Technologies Corp.

Specifications for these rubber mats are in Appendix D.

NOTE: Do not reuse rubber mats if torn or otherwise damaged.

2. Divide the load into two sections with two rows per section. Each section contains approximately half of the load.

3. Load each row in each section on a 1 ft wide rubber mat centered under the row. The rubber mat extends 6 in. from under the front and rear of each row. Do not secure the mats to the trailer floor.

4. The first section consists of two rows of pallets loaded down the center of the trailer as shown in the figure. Position the first stack about 4 ft from the nose of the trailer.

5. The second section also consists of two rows of pallets loaded down the center of the trailer about 5 ft behind the first section. This section should be at least 3 ft from the doors when loading is completed. Adjust the void at the nose and between the first and second sections of lading, if necessary, to provide proper weight distribution and maintain the minimum 3 ft void at the rear of the trailer.

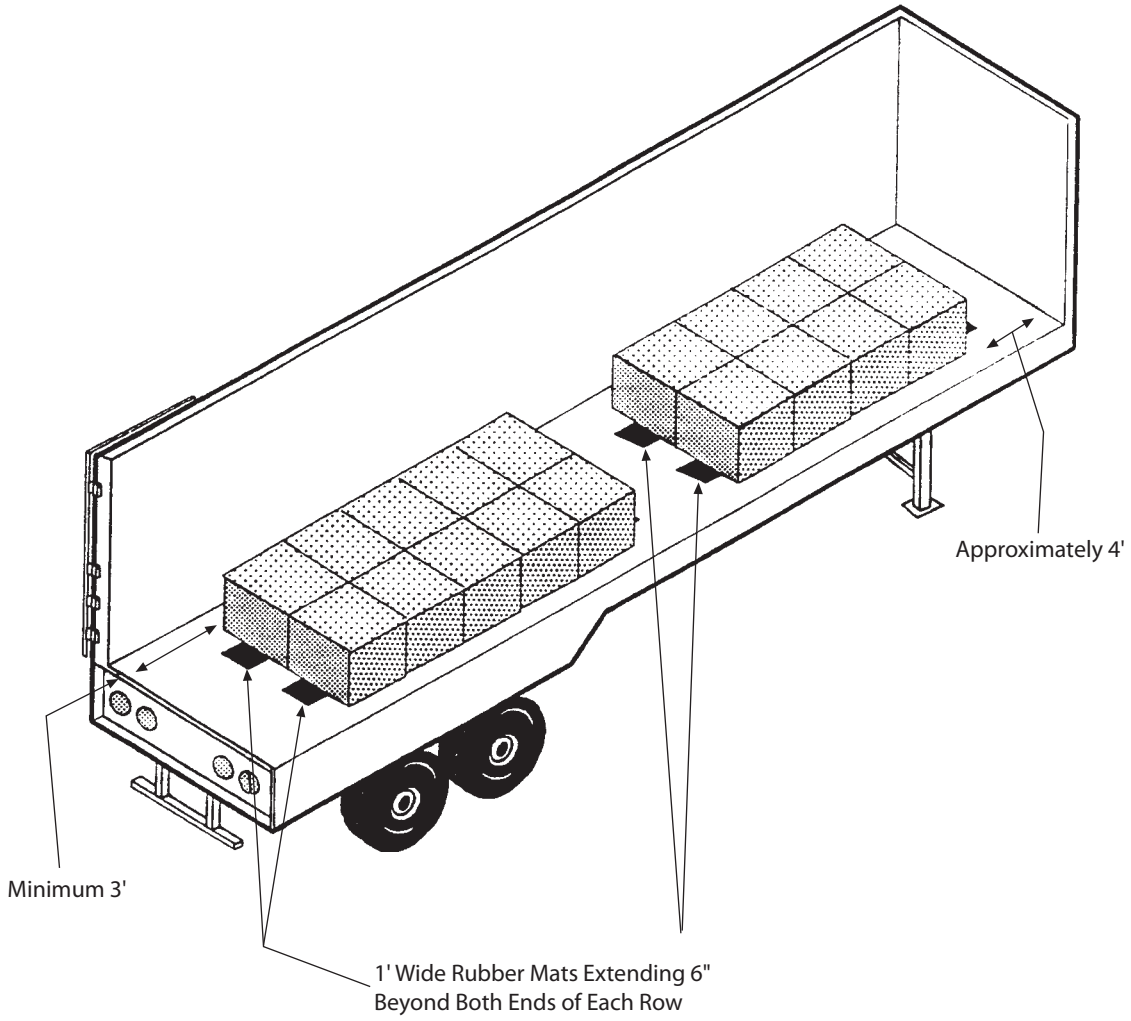


Figure 4.22

Method E-16
Palletized roofing shingles secured using robber mats

Method E-17—40 in. Diameter Roll Paper on End Secured Using 2 ft Wide Rubber Mats

Use this loading method for 40 in. diameter roll paper loaded on end in a 2-1-2 type of pattern in a trailer or container for intermodal service. 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. Figure 4.23 shows the load configuration used for testing this concept. Plan the load to *equalize the weight on each side of the trailer or container*. Because roll weights vary, this will require attention to pre-planning. *A balanced load is required for the stability and success of this loading method.*

Use trailers/containers with wood floors only.

NOTE: Due to the nature of this concept, some header damage could occur. If this is considered objectionable, do not use this loading and bracing method.

Figure 4.23:

1. Only the following rubber mat has been evaluated and found acceptable for this loading method:

Name	Thickness	Vendor
TransMat™ 6510	3 mm (0.125 in.)	AIA/Down River, an ITW company
Load Secure™ 6910	2 mm (0.080 in.)	Regupol America/Complete Packaging Systems Inc.

Specifications for this rubber mat are in Appendix D.

NOTE: Do not reuse rubber mats if torn or otherwise damaged.

2. Load rolls into the trailer. The load pattern may vary slightly from the basic 2-1-2 pattern, but the last three stacks must be in a 2-1-2 pattern as shown.

3. Place two 2 ft × 9 ft mats at the rear of the load running lengthwise of the trailer with one mat 12 in. from each sidewall. Position mats so they will extend 2 in. to 3 in. beyond the end of the lading. Do not secure the mats to the trailer floor. See Figure 4.23.

4. Unitize the last four stacks (six rolls) using one 1¼ in. × 0.029 in. steel strap or one approved polyester cord strap using the correct buckle in accordance with manufacturer's instructions. (See paragraph 3.6 for approved polyester cord strapping). 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.

5. Leave a minimum of 3 ft of void space between the lading and the trailer doors.

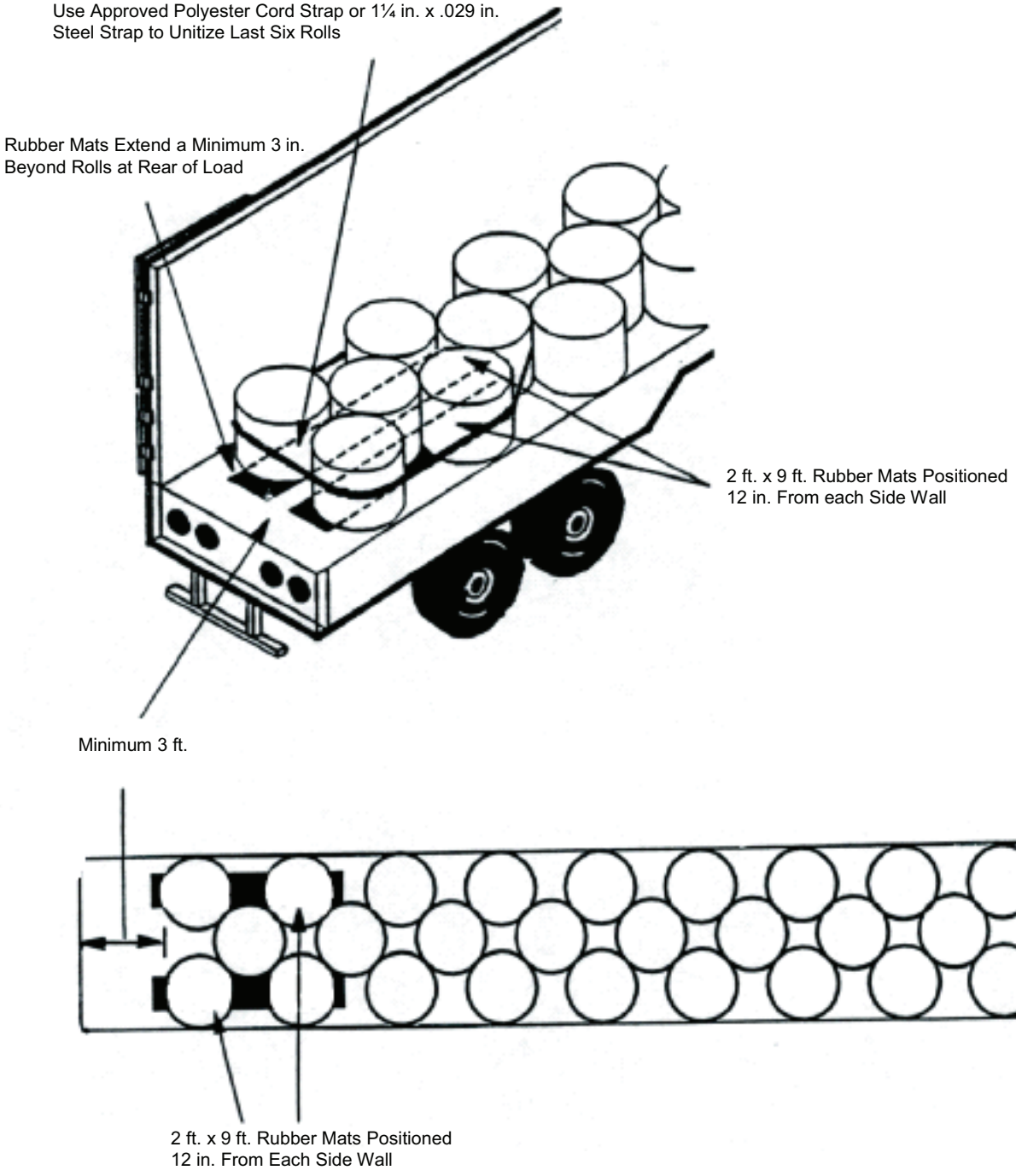


Figure 4.23

Method E-17
40 in. diameter roll paper on end secured using 2 ft wide rubber mats

Figure 4.24:

6. Only the following rubber mat has been evaluated and found acceptable for this loading method:

Name	Thickness	Vendor
TransMat™ 6900	2 mm (0.080 in.)	AIA/Down River, an ITW company

Specifications for this rubber mat are in Appendix D.

NOTE: Do not reuse rubber mats if torn or otherwise damaged.

7. Load rolls into the trailer. The load pattern may vary slightly from the basic 2-1-2 pattern, but the last three stacks must be in a 2-1-2 pattern as shown. The pattern shown in Figure 4.24 is as tested. When loading a point roll at the nose, use floor blocking or appropriately sized fillers to prevent lateral movement.

8. Place five 20 in. × 48 in. mats at the rear of the load running lengthwise of the trailer and centered under each of the last 5 rolls. Position mats so they will extend 2 in. to 3 in. beyond the end of the lading. Do not secure the mats to the trailer floor. See Figure 4.24.

9. Unitize the last four stacks (six rolls) using one 1 ¼ in.× 0.029 in. steel strap or one approved polyester cord strap using the correct buckle in accordance with manufacturer's instructions. (See paragraph 3.6 for approved polyester cord strapping). Tension and seal the straps using proper tensioning and sealing tools. Use strap hangers or tape attached to the trailer sidewalls to maintain proper strap alignment and to prevent straps from slipping out of position.

10. Leave a minimum of 3 ft of void space between the lading and the trailer doors.

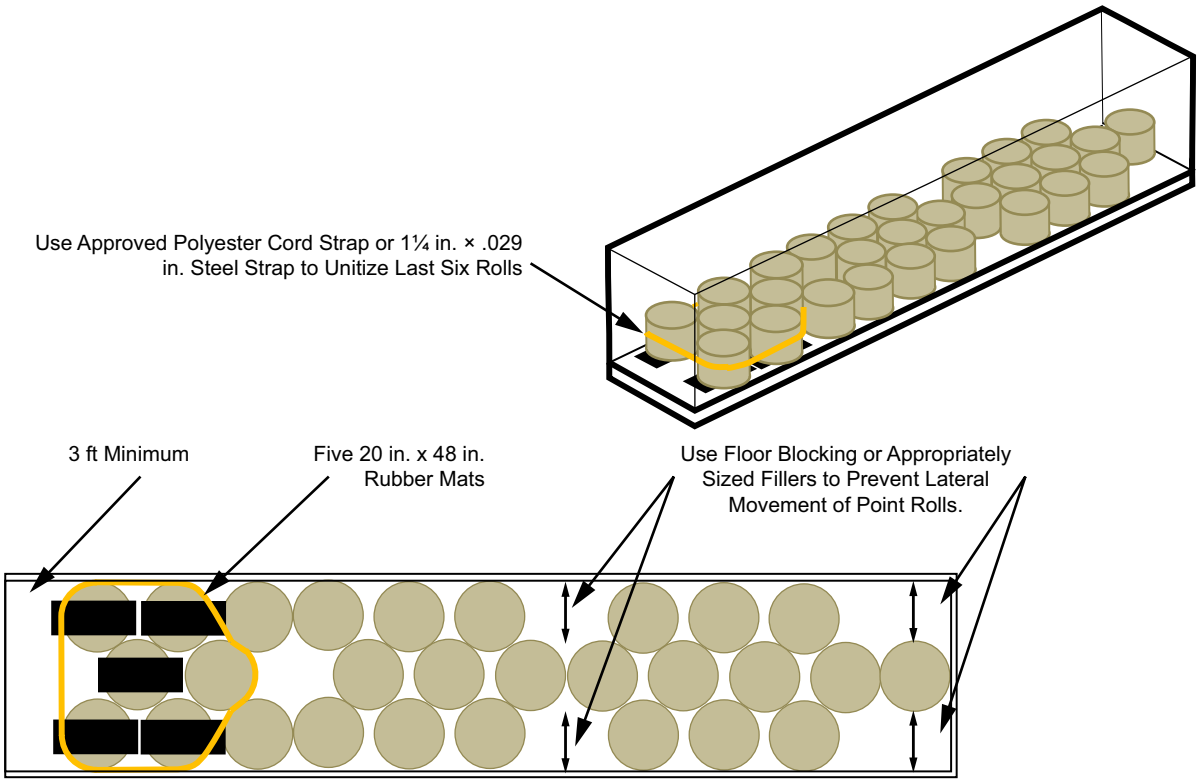


Figure 4.24

Method E-17
Pattern variation for 40 in. diameter roll paper on end secured using 2 ft wide rubber mats

Method E-18—Split Loads of 58 in. Diameter Roll Pulpboard on End Using Rubber Mats

(If loading split loads of 58 in. diameter roll pulpboard on end in trailers having large metal plates approximately 9 ft in length at the nose, use Method E-19.)

Use this method for split loads of 58 in. diameter roll pulpboard loaded on end in a 1-1 offset pattern in a trailer or container for intermodal service. A maximum of eight rolls may be loaded in a trailer or container using this method. The loads generally consist of seven or eight rolls loaded in two sections in the trailer or container. Plan the load to *equalize the weight on each side of the trailer or container*. Because roll weights vary, this will require attention to preplanning. *A balanced load is required for the stability and success of this loading method.*

Figure 4.25:

1. Only the following rubber mats have been evaluated and found acceptable for this loading method:

Name	Thickness	Description	Vendor
TransMat™ 7513	3mm (0.125 in.)	36 in. continuous rolls	Allegheny Industrial Associates, an ITW company
TransMat™ 6900	2mm (0.080 in.)	36 in. continuous and perforated rolls and 30 in. × 42 in. sheets	
	3mm (0.125 in.)	36 in. continuous rolls	
TransMat™ 8060	2mm (0.080 in.)	36 in. continuous rolls	
Rubber Restraint Mat BC548	2mm (0.080 in.) 3mm (0.125 in.)	36 in. continuous rolls	Amorim Industrial Solutions
Load Grip® 5	1.5mm (0.059 in.)	36 in. continuous and perforated rolls and 30 in. × 42 in. sheets	National Rubber Technologies Corp.
	2mm (0.080 in.)	36 in. × 36 in. square sections	
Load Grip® 6	2 mm (0.080 in.)	36 in. continuous and perforated rolls and 30 in. × 42 in. sheets	
Zro-Shift™	2 mm (0.080 in.)	36 in. 30 in. × 42 in. sheets	Sunrise Manufacturing Inc.
Load Lock™	3mm (0.125 in.)	36 in. continuous rolls	RB Rubber Products, Inc.
Brown Bear™ Friction Mat 101	2mm (0.080 in.) 3mm (0.125 in.	36 in. continuous rolls	Circle, Inc.
Load Secure™ 6910	2mm (0.080 in.)	36 in. continuous rolls	Regupol America/Complete Packaging Systems Inc.
		30 in. continuous and perforated rolls and 30 in. × 42 in. sheets	

Specifications for these rubber mats are in Appendix D.

NOTE: Rubber mats approved for use in Method E-18 are also suitable for use in Method E-4 and Method E-19.

NOTE: Do not reuse rubber mats if torn or otherwise damaged.

2. The nose section consists of three or four rolls. Place the first mat on the floor at the nose, centered in the trailer as shown in **Sketches 2 and 3**. Use the appropriate size mat for the number of rolls being loaded.

a. If *four rolls* are loaded in the nose section, use a 3 ft × 17 ft mat 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 approved rubber mat installed end to end with the next to last mat in the row cut to 20 in. to allow more of the last 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 a 3 ft × 14 ft 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. section of approved rubber mat installed end to end with the next to last mat in the row cut to 20 in. to allow more of the last 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.

3. If *four rolls* are loaded in the nose section, load the four rolls tightly starting against the nose and using a 1-1 offset pattern. See **Sketch 2.**

4. If *three rolls* are loaded in the nose section, load the first roll so it is centered in the trailer against the nose. Place void fillers, 3 in. × (void width) × 48 in. corrugated fiberboard with 1,500 lb minimum crush strength, on both sides of the first roll between roll and trailer walls. Position void fillers so that the crush strength is crosswise to the trailer or container. If using multiple void fillers in tandem, unitize them to restrict independent movement. See **Sketch 3.** Lumber side-blocking can be used as an alternative to the void fillers provided it is 3 in. in height, extends a minimum of 48 in. from the nose of the trailer, and is secured adequately using 12d nails. Ladder-type lumber side-blocking may also be used as an alternative provided it is 3 in. in height and extends a minimum of 48 in. from the nose.

5. Load the next two rolls tightly lengthwise against opposite sidewalls of the trailer as shown in **Sketch 3.**

6. A minimum of 3 ft of void is required between the lading and the trailer doors. Position the rear section to obtain the proper load weight distribution and maintain the 3 ft void at the rear of the trailer.

7. Load the rear section, consisting of four rolls, using two 3 ft × 14 ft mats. Position the mats at the opposite sidewalls of the trailer. Position the mats to extend a minimum of 6 in. beyond the rolls at each end of each mat. Place the rolls on the 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 approved rubber mat and one 3 ft × 20 in. section installed end-to-end with the next to last mat in each row cut to 20 in. to allow more of the last 3 ft × 3 ft mat to be under the last roll and positioned approximately equidistant from each sidewall; two rows of four 30 in. × 42 in. sections of approved rubber mat installed end-to-end and positioned approximately equidistant from each sidewall. Position the mats to extend a minimum of 6 in. beyond the rolls.

8. Unitize the rear section (at trailer doors) with one approved polyester cord strap or one 5⁄8 in. × .040 in. approved polyester plastic strap. Position the unitizing strap at a maximum height of 4 ft above the trailer floor. Be sure the strap is level. Tension and seal the straps using proper tensioning and sealing tools.

a. If using approved polyester cord strap, a wire buckle with legs (prongs) on the same side of the frame and that has a non-slip surface is required. (See paragraph 3.6 for approved polyester cord strapping.)

b. If using a 5⁄8 in. × .040 in. approved polyester plastic strap, a heat seal, a friction weld, or metal seals may be used to seal the strap. A minimum joint strength of 900 lb is required.

9. Position two strap hangers on each trailer sidewall at the rear section as indicated in **Sketch 1** to maintain proper strap alignment and to prevent straps from slipping out of position. Strap hangers may be solid fiberboard secured by use of adhesive, tape, or staples; or looped cord strap secured by staples. Use adhesive or tape that is heat and cold resistant for this purpose. Do not use tape as the strap hanger. If additional strap hangers are positioned on the rolls, be sure they are positioned so that the strap remains level.

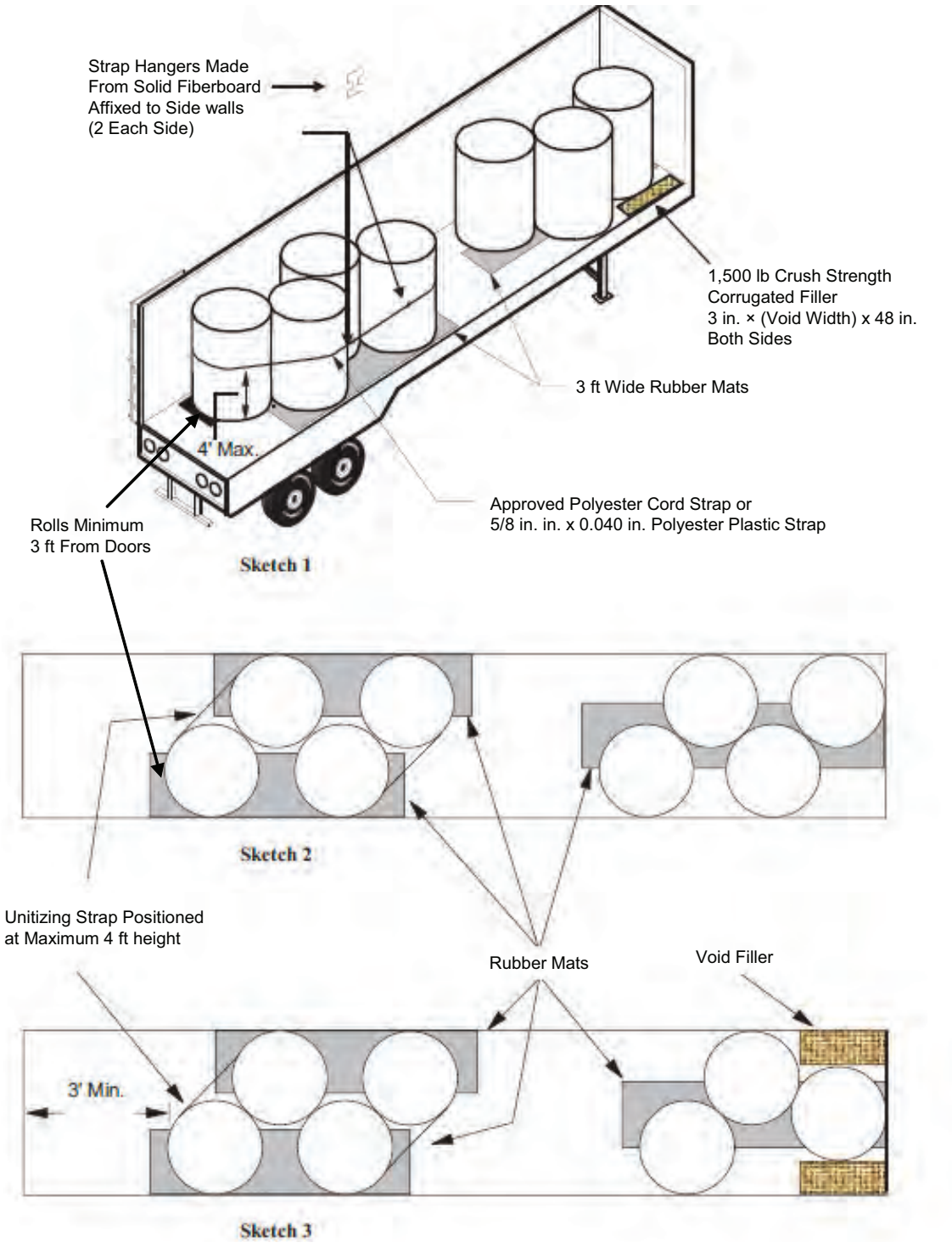


Figure 4.25

Method E-18
Split loads of 58 in. diameter roll pulpboard on end using robber mats

(This Page Left Blank Intentionally)

Method E-19—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

Use this method for split loads of 58 in. diameter roll pulpboard loaded on end in a 1-1 offset pattern for intermodal service in a trailer or container having wood floors with large metal plates approximately 9 ft in length at the nose. A maximum of eight rolls may be loaded in a trailer or container using this method. The loads generally consist of seven or eight rolls loaded in two sections in the trailer or container. Plan the load to *equalize the weight on each side of the trailer or container*. Because roll weights vary, this will require attention to pre-planning. *A balanced load is required for the stability and success of this loading method.*

Figure 4.26:

1. Only the following rubber mats have been evaluated and found acceptable for this loading method:

October 6, 2015 10:52 am

Name	Thickness	Description	Vendor
TransMat™ 7513	3mm (0.125 in.)	36 in. continuous rolls	AIA/Down River
TransMat™ 6900	2mm (0.080 in.)	36 in. continuous and perforated rolls and 30 in. × 42 in. sheets	
	3mm (0.125 in.)	36 in. continuous rolls	
TransMat™ 8060	2mm (0.080 in.)	36 in. continuous rolls	
Rubber Restraint Mat BC548	2mm (0.080 in.) 3mm (0.125 in.)	36 in. continuous rolls	Amorim Industrial Solutions
Load Grip® 5	1.5mm (0.059 in.)	36 in. continuous and perforated rolls and 30 in. × 42 in. sheets	National Rubber Technologies Corp.
	2mm (0.080 in.)	36 in. × 36 in. square sections	
Load Grip® 6	2 mm (0.080 in.)	36 in. continuous and perforated rolls and 30 in. × 42 in. sheets	
Zro-Shift™	2 mm (0.080 in.)	36 in. 30 in. × 42 in. sheets	Sunrise Manufacturing Inc.
Load Lock™	3mm (0.125 in.)	36 in. continuous rolls	RB Rubber Products, Inc.
Brown Bear™ Friction Mat 101	2mm (0.080 in.) 3mm (0.125 in.	36 in. continuous rolls	Circle, Inc.
Load Secure™ 6910	2mm (0.080 in.)	36 in. continuous rolls	Regupol America/Complete Packaging Systems Inc.
		30 in. continuous and perforated rolls and 30 in. × 42 in. sheets	

Specifications for these rubber mats are in Appendix D.

NOTE: Do not reuse rubber mats if torn or otherwise damaged.

2. 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 mat on the floor at the nose, centered in the trailer as shown in **Sketches 1, 2, and 3**. When loading using a 1-1 offset pattern, place two mats side by side centered in the trailer as shown in **Sketches 4 and 5**. Use the appropriate size mat for the number of rolls being loaded. The mats are not secured to the trailer floor.

a. If *three rolls* are loaded *in-line* at the nose section, use a 3 ft × 16 ft mat at the nose or appropriate number of laterally centered 3 ft × 3 ft approved square mats or 30 in. × 42 in. sections of approved rubber mats installed end-to-end so that a minimum of 6 in. extends beyond the last rolls.

b. If *four rolls* are loaded *in-line* at the nose section, use a 3 ft × 21 ft mat at the nose or appropriate number of laterally centered 3 ft × 3 ft approved square mats or 30 in. × 42 in. sections of approved rubber mats installed end-to-end so that a minimum of 6 in. extends beyond the last rolls.

c. If *three rolls* are loaded using a *1-1 offset* pattern at the nose, use two 3 ft × 14 ft mats at the nose or an appropriate number of 3 ft × 3 ft approved square mats or 30 in. × 42 in. sections of approved rubber mats installed end-to-end so that a minimum of 6 in. extends beyond the last roll and are positioned side by side centered laterally under the rolls.

d. If *four rolls* are loaded using a *1-1 offset* pattern at the nose, use two 3 ft × 17 ft mats at the nose or an appropriate number of 3 ft × 3 ft approved square mats or 30 in. × 42 in. sections of approved rubber mats installed end-to-end so that a minimum of 6 in. extends beyond the last rolls and are positioned side by side centered laterally under the rolls.

3. If *three rolls* are loaded *in-line* at the nose section, load the first roll so it is centered in the trailer against the nose. Continue loading the remaining two rolls in the nose tightly in-line down the center of the trailer. Place void fillers, 3 in. × (void width) × 48 in. corrugated fiberboard with 1,500 lb minimum crush strength, between each roll and the adjacent sidewall. If using multiple void fillers in tandem, unitize them to restrict independent movement. See **Sketches 1 and 2.**

4. If *four rolls* are loaded *in-line* at the nose section, load the first roll so it is centered in the trailer against the nose. Continue loading the remaining three rolls in the nose tightly in-line down the center of the trailer. Place void fillers, 3 in. × (void width) × 48 in. corrugated fiberboard with 1,500 lb minimum crush strength, between each roll and the adjacent sidewall. If using multiple void fillers in tandem, unitize them to restrict independent movement. See **Sketch 3.**

5. 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 trailer against the nose. Place void fillers, 3 in. × (void width) × 48 in. corrugated fiberboard with 1,500 lb minimum crush strength, on both sides of the first roll between roll and trailer walls. Position void fillers so that the crush strength is crosswise to the trailer or container. If using multiple void fillers in tandem, unitize them to restrict independent movement. See **Sketch 4**. Ladder-type side-blocking may also be used as an alternative provided it is 3 in. in height and extends a minimum of 48 in. from the nose of the trailer.

6. Load the next two rolls tightly lengthwise against opposite sidewalls of the trailer as shown in **Sketch 4**.

7. 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**.

8. A minimum of 3 ft of void is required between the lading and the trailer doors. Position the rear section to obtain the proper load weight distribution and maintain the 3 ft void at the rear of the trailer.

9. Load the rear section, consisting of four rolls, using two 3 ft × 14 ft mats. Position the mats at the opposite sidewalls of the trailer. Position the mats to extend a minimum of 6 in. beyond the rolls at each end of each mat. Place the rolls on the mats in a 1-1 offset pattern. See **Sketches 1 through 5.**

10. Unitize the rear section (at trailer doors) with one approved polyester cord strap or one 5/8 in. × .040 in. approved polyester plastic strap. Position the unitizing strap at a maximum height of 4 ft above the trailer floor. Be sure the strap is level. Tension and seal the straps using proper tensioning and sealing tools according to the strap manufacturer's instructions.

a. If using approved polyester cord strap, a wire buckle with legs (prongs) on the same side of the frame and that has a non-slip surface is required. See paragraph 3.6 for approved polyester cord strapping.

b. If using a 5/8 in. × .040 in. approved polyester plastic strap, a heat seal, a friction weld, or metal seals may be used to seal the strap. A minimum joint strength of 900 lb is required. See paragraph 3.6 for approved polyester plastic strapping.

11. Position two strap hangers on each trailer sidewall at the rear section as indicated in **Sketch 1** to maintain proper strap alignment and to prevent straps from slipping out of position. Strap hangers may be solid fiberboard secured by use of adhesive, tape, or staples; or looped cord strap secured by staples. Use adhesive or tape that is heat and cold resistant for this purpose. Do not use tape as the strap hanger. If additional strap hangers are positioned on the rolls, be sure they are positioned so the strap remains level.

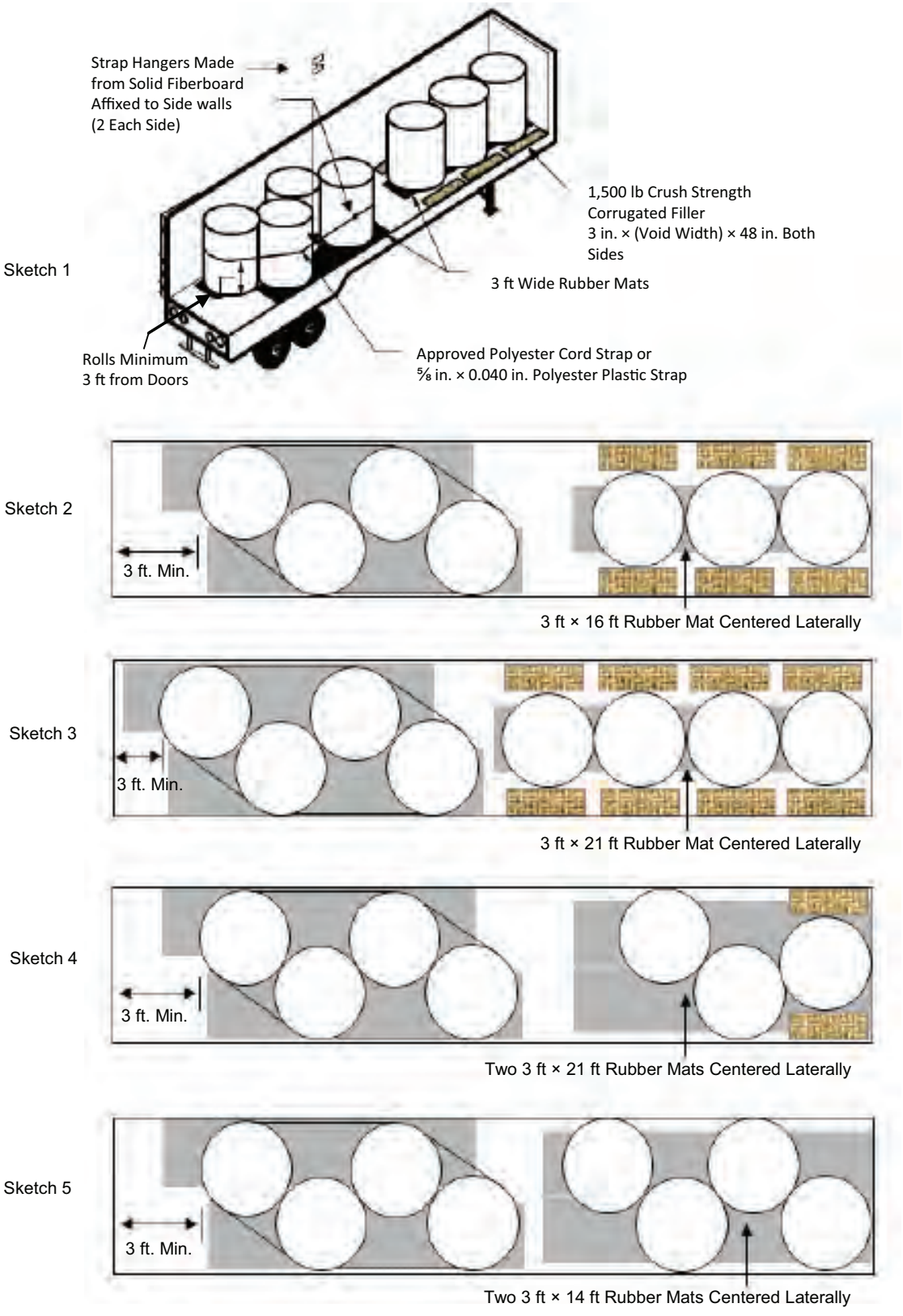


Figure 4.26

Method E-19
Split loads of 58 in. diameter roll pulpboard on end using rubber mats in trailers/containers with partial metal floors in the nose
(other sizes of approved mats may also be applied as described in the E-19 verbiage)

Method E-20—50 in. Diameter Printing and Other Type Paper on End Using Rubber Mats

Use this loading method for 50 in. diameter roll paper loaded on end in a 1-1 offset or 2-1-2 pattern in a trailer or container for intermodal service. This method was originally tested in a 98 in. inside width trailer. For wider trailers, use sidewall fillers to maintain a 1-1 offset pattern, or use a 2-1-2 pattern as trailer width and roll diameters permit. Plan the load to *equalize the weight on each side of the trailer or container*. Because roll weights vary, this will require attention to preplanning. *A balanced load is required for the stability and success of this loading method.*

NOTE: Due to the nature of this concept, some header damage could occur. If this is considered objectionable, do not use this loading and bracing method. Do not reuse rubber mats if torn or otherwise damaged.

For all methods depicted, the rubber mats must extend a minimum of 6 in. beyond the nose of the last roll.

Figure 4.27:

1. Use rubber mats of the type and thickness specified in the following table for Figure 4.27. Only the following rubber mats have been evaluated and found acceptable for this loading method:

Name	Thickness	Description	Vendor
TransMat™ 8060	2 mm (0.080 in.)	Continuous and perforated rolls	AIA/Down River
Load Grip® 6	2 mm (0.080 in.)	Continuous and perforated rolls, and 21 in. × 48 in. sheets	National Rubber Technologies Corp.
Load Secure™ 6910	2 mm (0.080 in.)	Continuous and perforated rolls and 21 in. × 48 in. sheets	Regupol America/Complete Packaging Systems Inc.

Specifications for these rubber mats are in Appendix D.

2. Place two 2 ft × 7 ft mats in the nose of the trailer and center them under the first two rolls adjacent to each sidewall of the trailer; or place two 21 in. × 48 in. rubber mats end-to-end and centered under the first two rolls adjacent to each sidewall of the trailer. Do not secure the mats to the trailer floor. Load five stacks tightly in one section in a 1-1 offset pattern starting at the nose of the trailer.

3. Place two 2 ft × 14 ft mats at the rear of the load running lengthwise of the trailer 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 mats so that they will extend 6 in. beyond the end of the lading. Do not secure the mats to the trailer floor.

4. Load the remaining rolls tightly into the trailer in a 1-1 offset pattern against the previously loaded rolls.

5. Unitize the last two stacks (four rolls) using one 1¼ in. × 0.029 in. steel strap or one approved polyester cord strap using the correct buckle in accordance with manufacturer's instructions. (See paragraph 3.6 for approved polyester cord strapping.) 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.

6. Leave a minimum of 3 ft of void space between the lading and the trailer doors.

7. Use 4 in. × 4 in. lumber or other suitable fillers as needed to maintain roll pattern offset and prevent roll wedging. Thickness of filler is dependent on trailer inside width. Use industrial tape or other means to keep fillers in position.

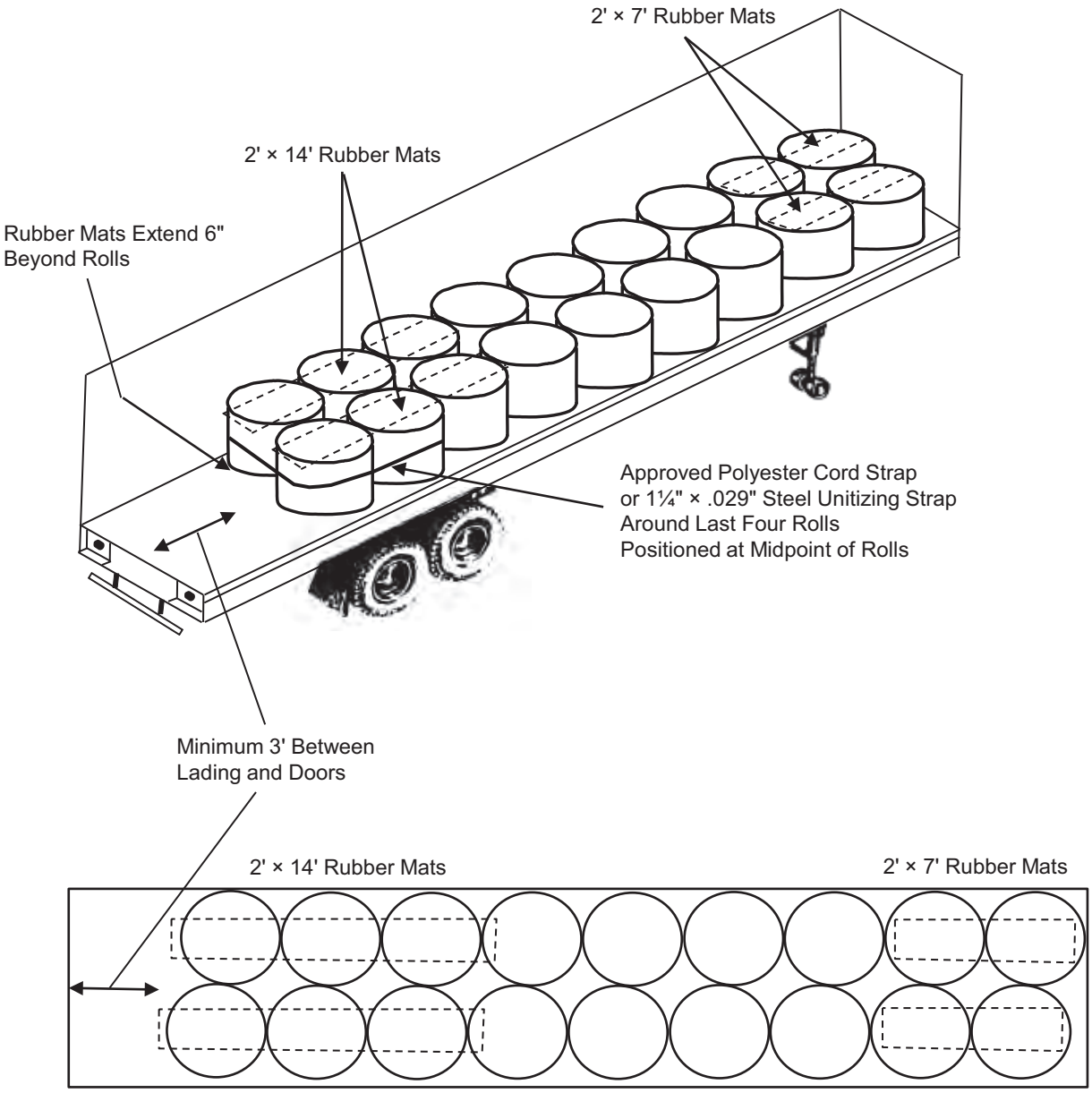


Figure 4.27

Method E-20
50 in. diameter printing paper on end using 2 ft wide rubber mats

Figure 4.28

1. Use rubber mats of the type and thickness specified in the following table for Figure 4.28. Only the following rubber mats have been evaluated and found acceptable for this loading method:

Name	Thickness	Description	Vendor
Load Secure™ 6910	2 mm (0.080 in.)	20 in. × 48 in. sheets	Regupol America/Complete Packaging Systems Inc.

Specifications for this rubber mat are in Appendix D.

2. Rolls can be loaded in one section starting at the nose and continuing to the rear of the trailer if necessitated by the number of rolls being loaded. Use the same number and size of rubber mats as specified above.

3. Place two 20 in. × 48 in. mats end-to-end beneath the second and third rolls in each row in the forward part of the load. Place four mats end-to-end beneath the last three+ rolls in each row.

4. If roll width exceeds 1.5 times roll diameter (75 in. for a 50 in. diameter roll), unitize each section with one 1 ¼ in. × 0.029 in. steel strap or one approved polyester cord strap using the correct buckle in accordance with manufacturer's instructions (see paragraph 3.6 for approved polyester cord strapping). Tension and seal straps using proper tensioning and sealing tools. Use strap hangers or tape attached to the trailer sidewalls to maintain proper strap alignment.

5. Use 4 in. × 4 in. lumber or other suitable fillers as needed to maintain roll pattern offset and prevent roll wedging. Thickness of filler is dependent on trailer inside width. Alternate filler to opposite side midway down the length of the load. Use industrial tape or other means to keep fillers in position.

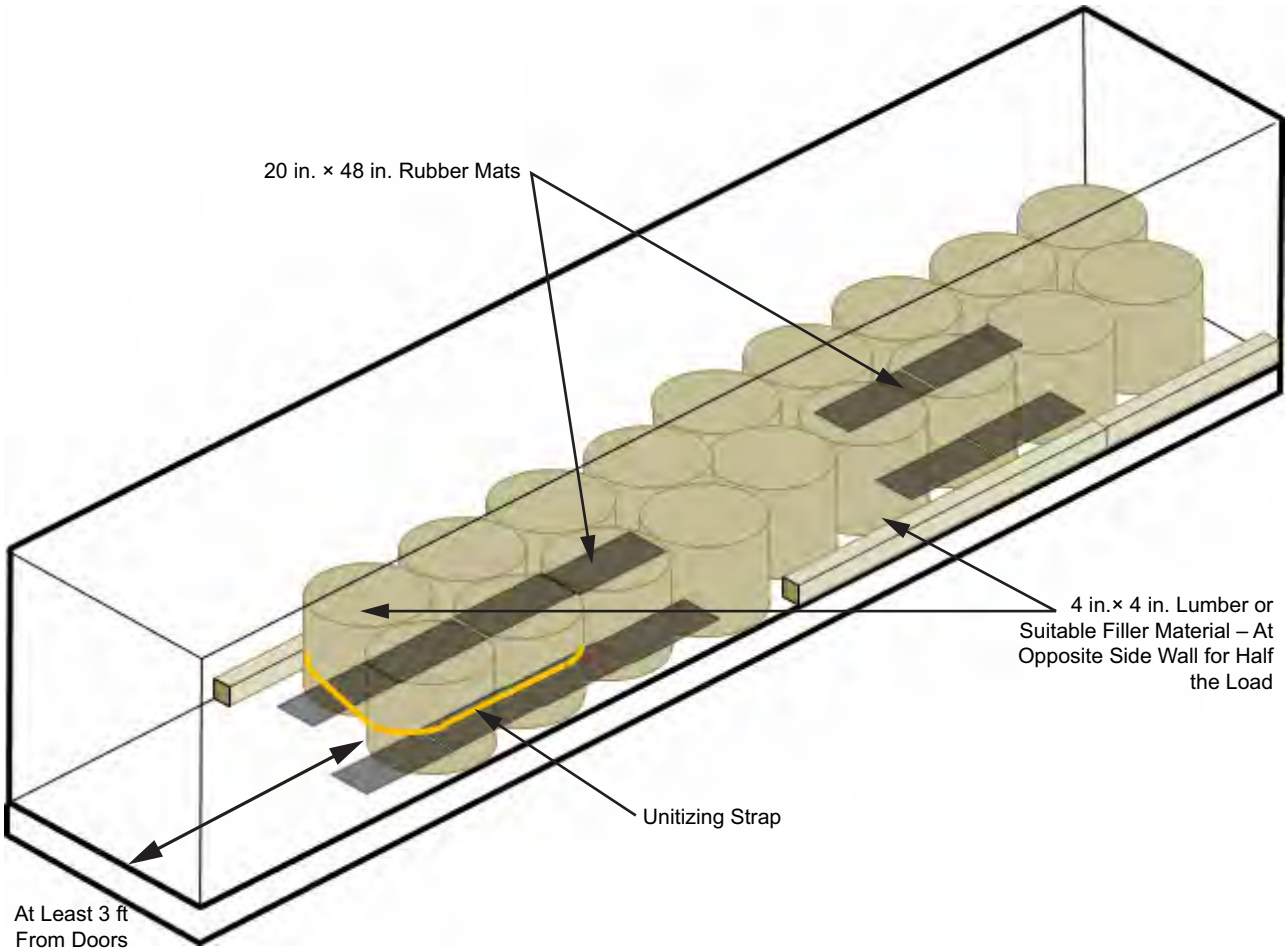


Figure 4.28

Method E-20
Through load of 50 in. diameter paper rolls

Figure 4.29:

1. Use rubber mats of the type and thickness specified in the following table for Figure 4.29. Only the following rubber mats have been evaluated and found acceptable for this loading method:

Name	Thickness	Description	Vendor
TransMat™ 6900	2 mm (0.080 in.)	20 in. × 48 in. sheets	AIA/Down River

Specifications for this rubber mat are in Appendix D.

2. Divide the load into two sections, each containing approximately half of the load.

3. Load the first section in a 2-1-2 pattern starting at the nose of the trailer.

4. 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.

5. Load each section on ten 20 in. × 48 in. × 2 mm (0.080 in.) thick rubber mats placed side by side, two beneath each roll. For rolls loaded against the sidewalls, place the first mat against the sidewall and the second mat next to the first. 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. Do not secure the mats to the trailer floor.

6. If roll width exceeds 1.5 times roll diameter (75 in. for a 50 in. diameter roll), unitize each section with one 1 ¼ in. × 0.029 in. steel strap or one approved polyester cord strap using the correct buckle in accordance with manufacturer's instructions (see paragraph 3.6 for approved polyester cord strapping). Tension and seal straps using proper tensioning and sealing tools. Use strap hangers or tape attached to the trailer sidewalls to maintain proper strap alignment.

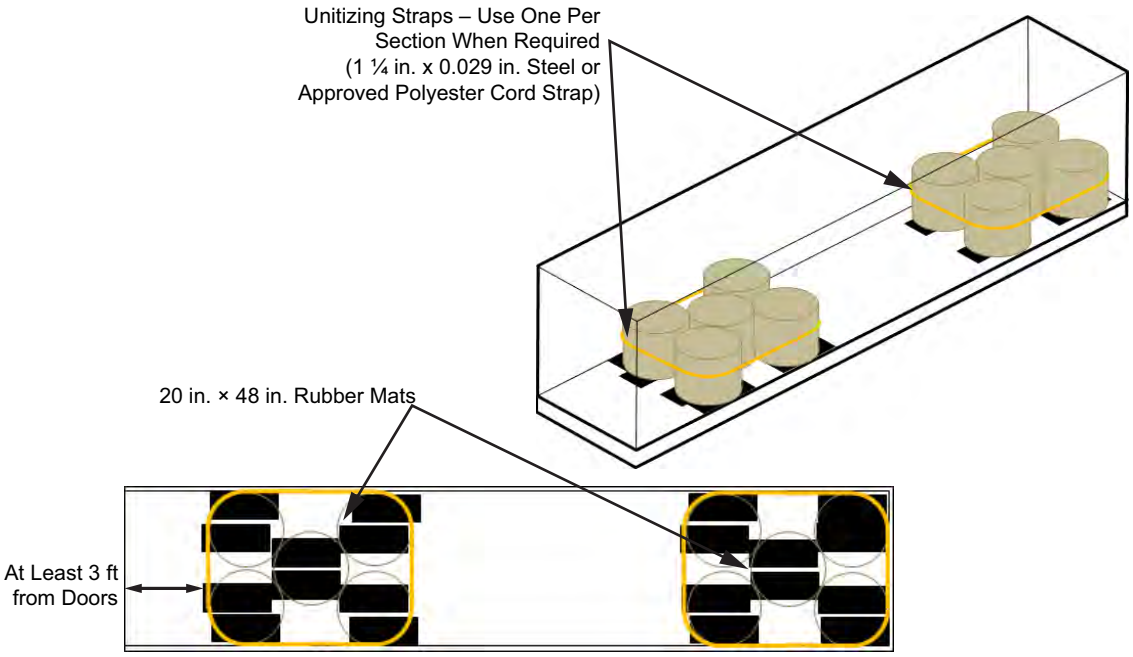


Figure 4.29

Split load of 50 in. diameter rolls in a 2-1-2 pattern

Figure 4.30:

1. Use rubber mats of the type and thickness specified in the following table for Figure 4.30. Only the following rubber mats have been evaluated and found acceptable for this loading method:

Name	Thickness	Description	Vendor
Load Secure™ 6910	2 mm (0.080 in.)	20 in. continuous or perforated rolls	Regupol America/ Complete Packaging Systems Inc.

Specifications for this rubber mat are in Appendix D.

2. Divide the load into two sections, each containing approximately half of the load.

3. Load the first section in a 1-1 offset pattern starting at the nose of the trailer.

4. 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.

5. Load each section on two 20 in. wide rubber mats centered beneath each row. An equal amount of rubber mat extends from under the front and rear of the each section. Do not secure the mats to the trailer floor.

6. If roll width exceeds 1.5 times roll diameter (75 in. for a 50 in. diameter roll), unitize each section with one 1 ¼ in. × 0.029 in. steel strap or one approved polyester cord strap using the correct buckle in accordance with manufacturer's instructions (see paragraph 3.6 for approved polyester cord strapping). Tension and seal straps using proper tensioning and sealing tools. Use strap hangers or tape attached to the trailer sidewalls to maintain proper strap alignment.

7. Use 4 in. × 4 in. lumber or other suitable fillers as needed to maintain roll pattern offset and prevent roll wedging. Thickness of filler is dependent on trailer inside width. Alternate filler to opposite side midway down the length of the load. Use industrial tape or other means to keep fillers in position.

NOTE: Rolls can be loaded in one section starting at the nose and continuing to the rear of the trailer if necessitated by the number of rolls being loaded. Use the same number and size of rubber mats as specified above.

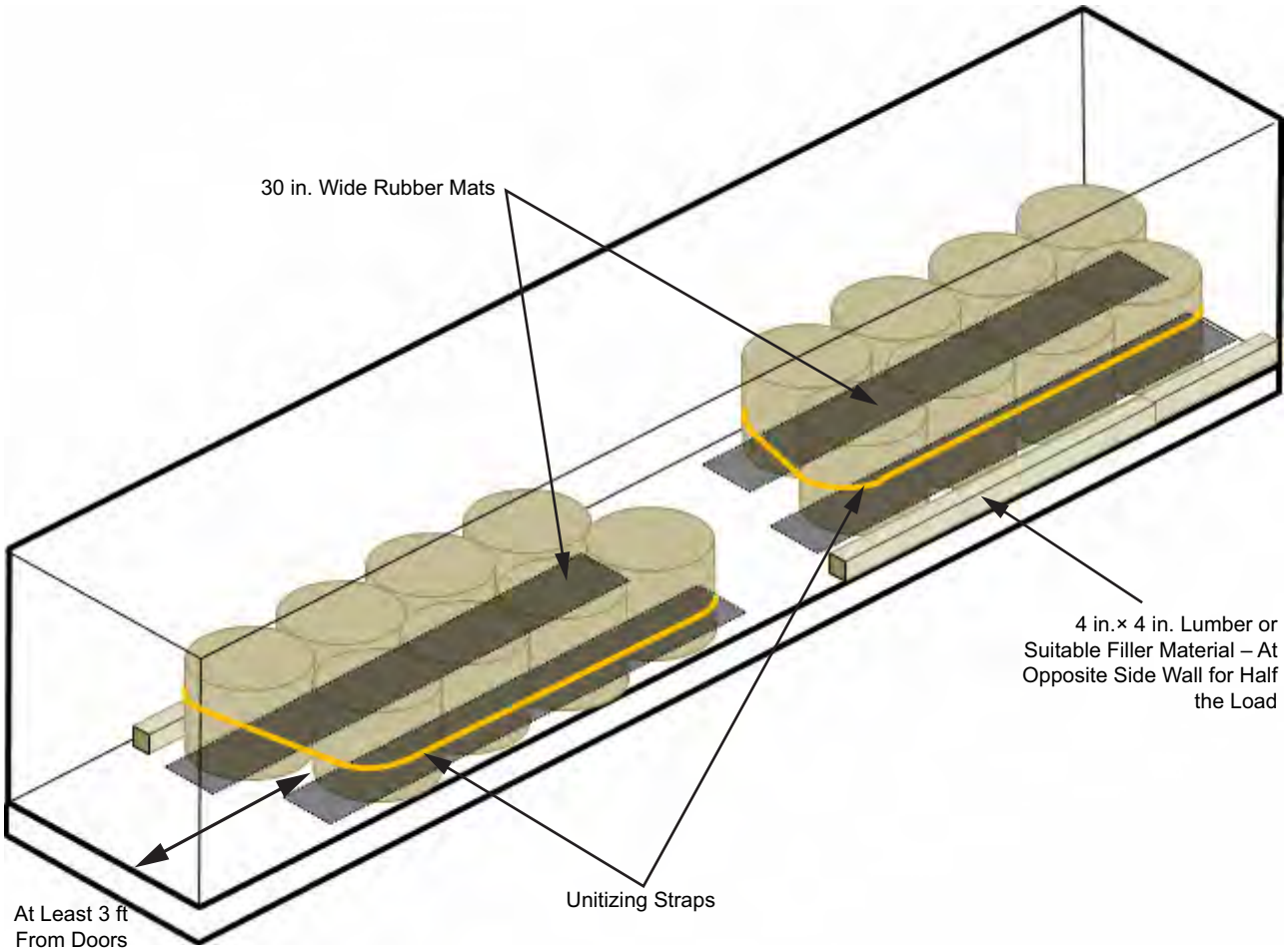


Figure 4.30

Split load of 50 in. diameter rolls in a 1-1 offset pattern

Method E-21—47 in. to 50 in. Diameter Roll Paper on End Using Rubber Mats

Use this loading method for 47 in. to 50 in. diameter roll paper loaded on end in a 1-1 offset pattern in a trailer or container for intermodal service. This method was originally tested in a 100 in. inside width container with roll widths (height) of 63 in., 72 in., and 94 in., representing eight roll, seven roll, and six roll load patterns, respectively. Use sidewall fillers to maintain a 1-1 offset pattern.

Plan the load to equalize the weight on each side of the trailer or container. Because roll weights vary, this will require attention to preplanning. A balanced load is required for the stability and success of this loading method. Loads with an odd number of rolls have the first roll centered against the front end wall with fillers on both sides of sufficient size and strength to prevent lateral roll movement.

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.

For all methods depicted, the rubber mats must extend a minimum of 6 in. beyond the nose of the last roll in both directions.

Figure 4.31 through Figure 4.33:

1. Use rubber mats of the type and thickness specified in the following table for Figure 4.31. Only the following rubber mats have been evaluated and found acceptable for this loading method:

Name	Thickness	Description	Vendor
TransMat™ 6900	2 mm	2 ft wide rolls	AIA/Down River

Specifications for this rubber mat are in Appendix D.

2. Divide the load into two sections, each containing approximately half of the load. Use the six-, seven-, or eight-roll pattern depicted in Figures 4.31 through 4.33. The width of the rolls is to be at least 6 in. less than the inside height of the trailer/container.

3. 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 1,500 lb minimum crush strength, on edge between the sidewall and each of the rolls. Thickness of filler is dependent on trailer inside width and actual roll diameter. Use industrial tape or other means 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 tandem, unitize them to restrict independent movement.

4. When three rolls are loaded in the nose section of a seven-roll load, load the first roll so it is centered in the trailer against the nose. Place void fillers, 3 in. × (void width) × 42 in. corrugated fiberboard with a 1,500 lb minimum crush strength, on both sides of the first roll and the sidewalls. If using multiple void fillers in tandem, unitize them to restrict independent movement (see Figure 4.32).

5. For rolls greater than 72 in. in width, use a minimum of 5 in. deep × 22 in. wide × 60 in. tall fillers between the first roll loaded and the nose of the trailer or container. Use industrial tape or other means to keep fillers in position.

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 roll on 2 ft wide mats centered under each roll and extending a minimum of 6 in. beyond the nose of the roll in both directions. Do not secure the mats to the trailer floor.

NOTE: Do not use rubber mats if torn or otherwise damaged.

8. Use Type 1A, Grade 4, nonmetallic strap for unitizing each section. For three-roll sections where the first roll is centered at the front end wall, unitize only the second and third rolls. For roll widths 63 in. or less, unitize each section with one strap located approximately 12 in. below the top of the rolls; for roll widths 64 in. to 72 in., use two straps located 12 in. and 20 in. below the top of the rolls; for roll widths greater than 72 in., use three straps located 12 in., 20 in., and 28 in. below the top of the rolls. Use the correct buckle in accordance with manufacturer's instructions (see paragraph 3.6 for approved polyester cord strapping). Tension and seal straps using proper tensioning and sealing tools. Use strap hangers or tape attached to the rolls to maintain proper strap alignment.

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

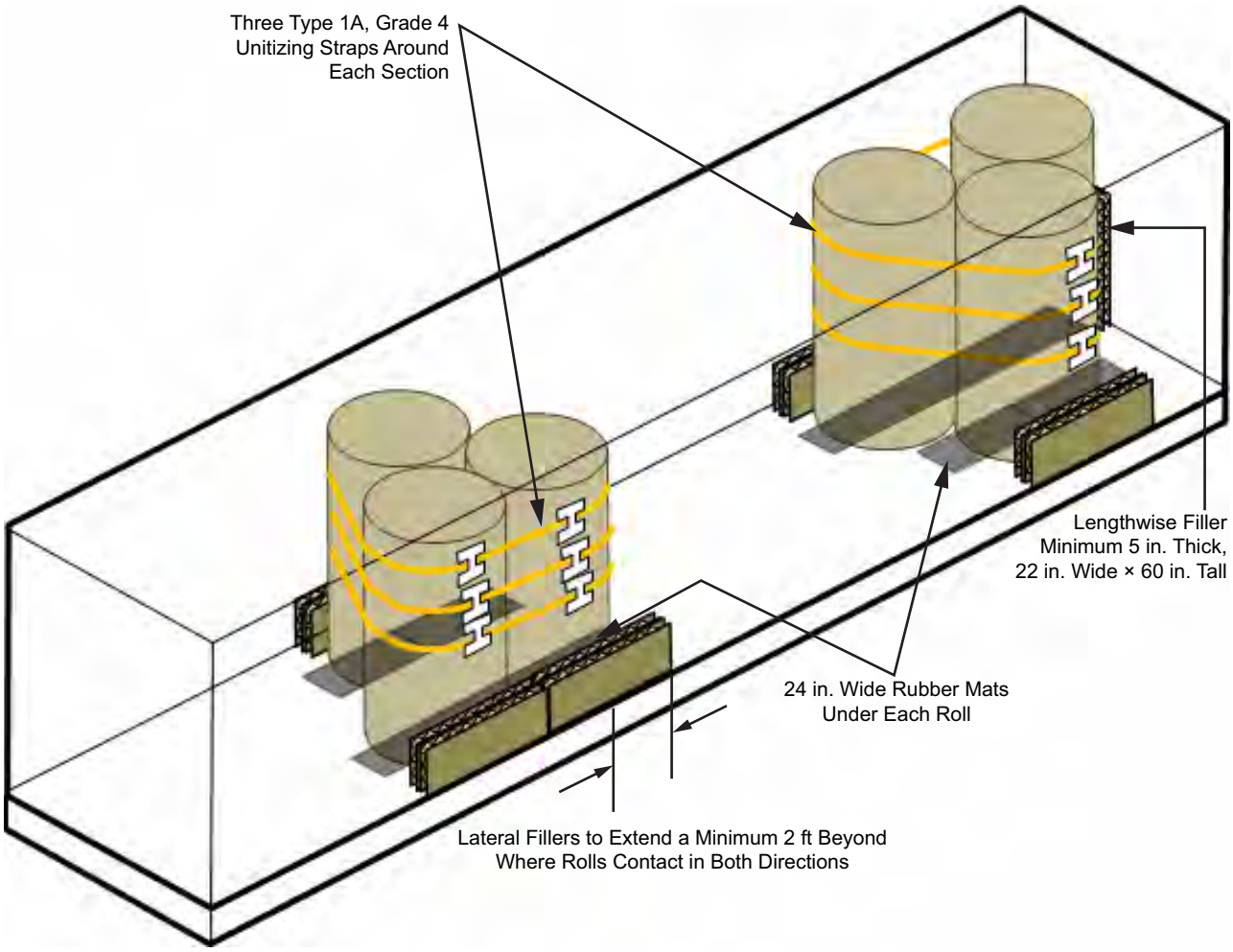


Figure 4.31

Method E-21
Six-roll load pattern (for rolls greater than 72 in. wide)

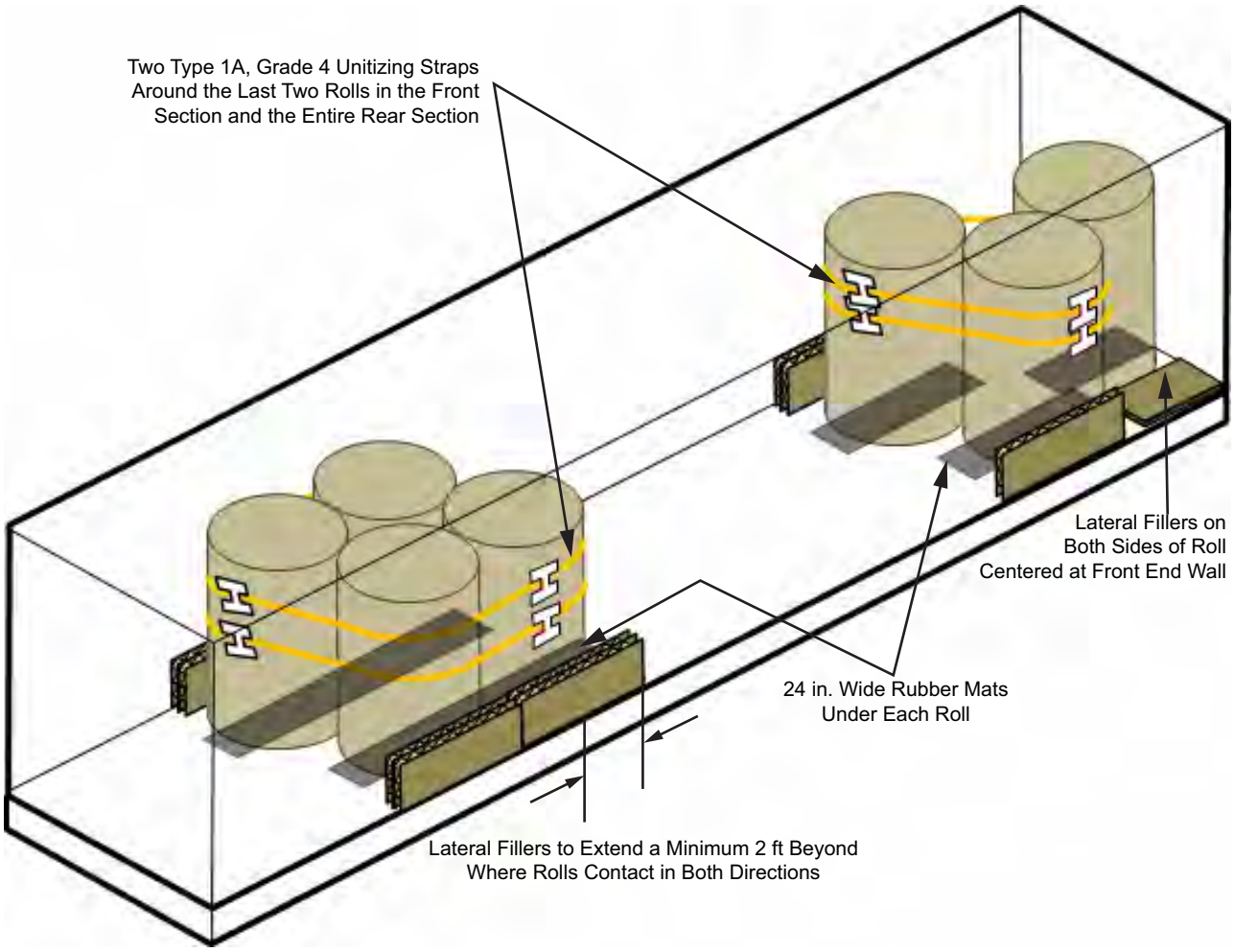


Figure 4.32

Method E-21
Seven-roll load pattern (for rolls between 63 in. and 72 in. wide)

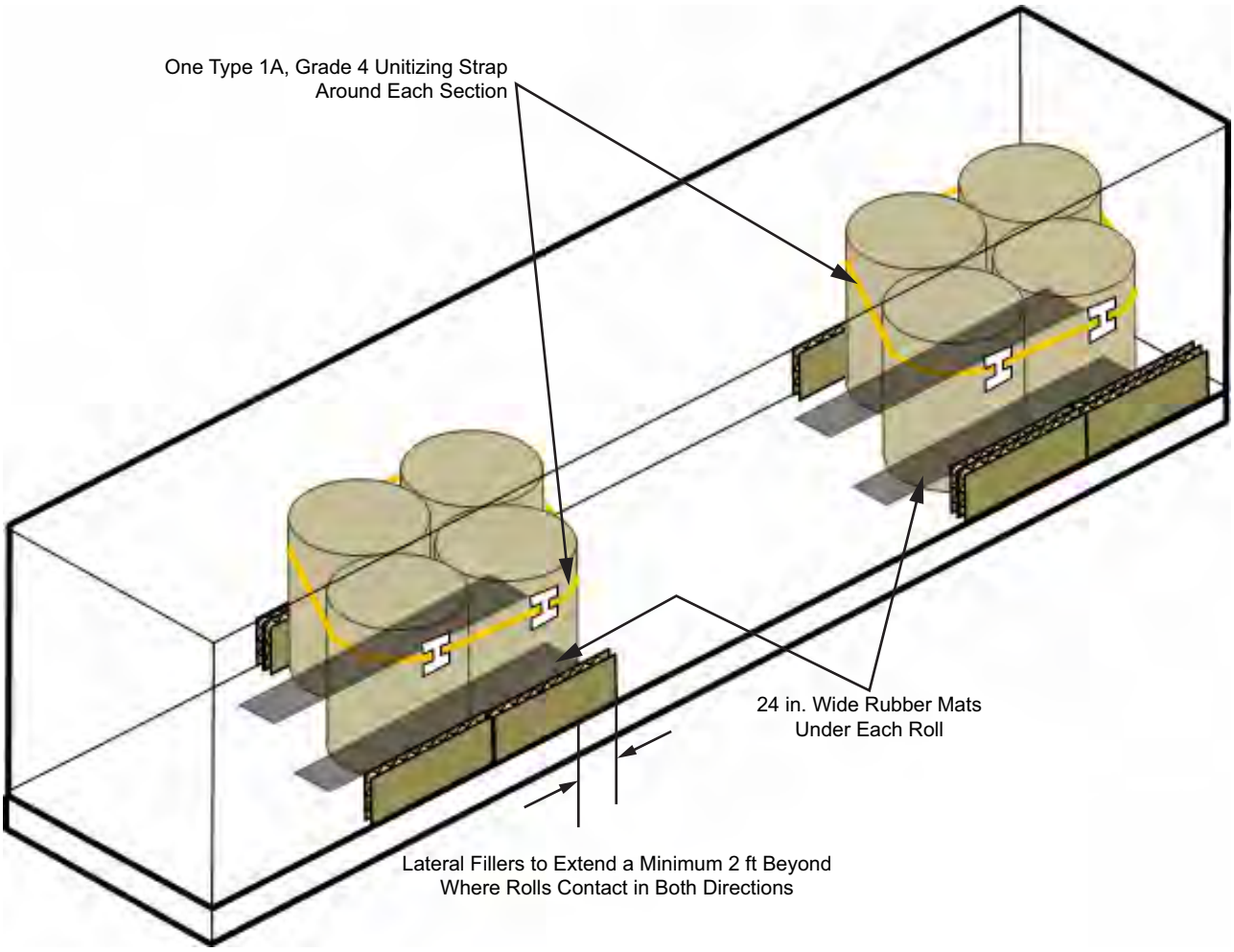


Figure 4.33

Method E-21
Eight-roll load pattern (for rolls less than 63 in. wide)

F—DISPOSABLE INFLATABLE DUNNAGE (D.I.D.) BAGS

Method F-1—Canceled September 2015

Method F-2—Case Goods Secured with D.I.D. Bags

Use this method for case goods unitized on pallets or slip sheets by minimum 90 gauge stretch-wrap. Follow manufacturer's instructions regarding the minimum number of wraps to be used, but in all cases use a minimum of three wraps for the top and bottom layers and two wraps for the center layers. The load that was tested weighed 45,000 lb.

Figure 4.34:

1. Cover rough surfaces or projections of the sidewall with fiberboard sheets or other suitable material.

2. Plan the load so crosswise space is minimized. Use appropriate void fillers to prevent crosswise movement.

3. Lading weight in trailers and containers must be evenly distributed both crosswise and lengthwise, and the combined weight of lading must conform to all federal, state, provincial, and local regulations and transportation service requirements used at origin and to final destination.

4. Use D.I.D. bags to control lengthwise load movement. The D.I.D. bags must be either a minimum Level 1 bag as described in AAR General Information Bulletin No. 9, "Product Performance Profile for Pneumatic Dunnage," or supplements thereto; or square bags also may be used to fill crosswise void space from 12 in. to 24 in. to control lengthwise movement.

Sketch 1: Use this method for loads in which the lading is positioned against the front end wall.

5. Use D.I.D. bags at two locations in the load: at the fourth and fifth stacks and at the last two stacks. The figure shows ten units in two rows. Depending on trailer/container size and unit weight, varying numbers of units may also be loaded. In any case, the first D.I.D. bag restrains approximately one half the load. Use D.I.D. bags wide enough to extend from 4 in. above the floor to the top of the lading. Minimum D.I.D. bag size is one 48 in. × 96 in. bag at each location.

6. Place units in the trailer/container with a minimum 4 in. center void between the units where the D.I.D. bags are located. Leave a 24 in. (approximate) space between the rear of the load and the trailer/container doors.

7. When the center void filled by the D.I.D. bag is larger than 10 in. after inflation of the bag, place additional full-size void fillers capable of withstanding a load of 1,500 lb/ft^2 alongside the D.I.D. bags. Position the D.I.D. bags 4 in. above the trailer/container floor. Inflate the D.I.D. 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), except when square D.I.D. bags are used. Inflate square bags to 2.5 psi. Recheck D.I.D. bag pressures after all are inflated.

Sketch 2: Use this method for case goods unitized on pallets when there is unfilled lengthwise pallet underhang and/or for case goods unitized on pallets or slip sheets that are loaded away from the front end wall to obtain proper weight distribution.

8. Use D.I.D. bags adjacent to every stack in the load. The D.I.D. bags contact the full surface of the units along the center void of the trailer/container as shown in the figure. The figure shows ten units in two rows. Depending on trailer/container size and unit weight, varying numbers of units may also be loaded. Use D.I.D. bags wide enough to extend from 4 in. above the floor to the top of the lading. Minimum D.I.D. bag size is one 48 in. × 96 in. bag at each location.

9. When the center void filled by a minimum Level 1 D.I.D. bag is larger than 10 in. after inflation of the bag, place additional full-size void fillers capable of withstanding a load of 1,500 lb/ft^2 alongside the D.I.D. bags. Position the D.I.D. bags 4 in. above the trailer floor. Inflate the D.I.D. 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), except when square D.I.D. bags are used. Inflate square bags to 2.5 psi. Recheck D.I.D. bag pressures after all are inflated.

10. Leave a 24 in. (approximate) space between the rear of the load and the trailer/container doors.

NOTE: Do not reuse D.I.D. bags used for load securement.

NOTE: An updated listing of verified D.I.D. bags can be found on the TTCI Web site at http://www.aar.com/dpls/pfds/PPPPD_Verification_List.pdf

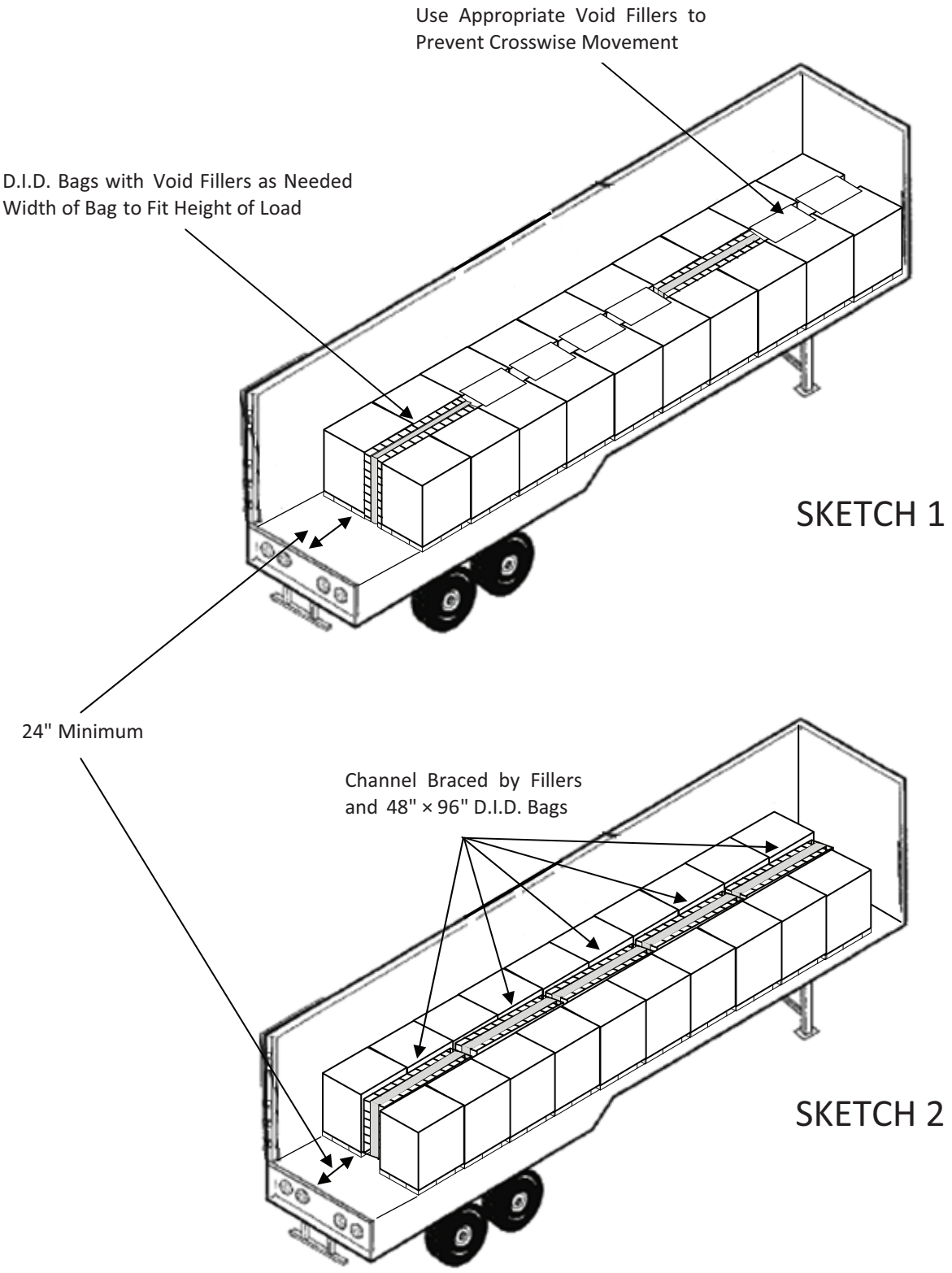


Figure 4.34

Method F-2
Palletized case goods secured with D.I.D. bags

(This Page Left Blank Intentionally)

Method F-3—Split Loads of Case Goods or Fiberboard Tray Packs Secured with D.I.D. Bags

Use this method for case goods or fiberboard tray packs unitized on pallets by minimum 90 gauge stretch-wrap. Follow manufacturer's instructions regarding the minimum number of wraps to be used, but in all cases use a minimum of three wraps that extend over the pallet edge to help maintain vertical alignment. Tray packs may have sharp edges and may require facing material to guard against contact with adjacent disposable inflatable dunnage (D.I.D.) bags.

Figure 4.35:

1. Cover rough surfaces or projections of the sidewall with fiberboard sheets or other suitable material.

2. Plan the load so that crosswise space is minimized. Use appropriate void fillers to prevent crosswise movement.

3. For maximum load restraint, fill any pallet underhang along the sidewalls with properly sized void fillers.

4. Lading weight in trailers and containers must be evenly distributed both crosswise and lengthwise, and combined weight of lading must conform to all federal, state, provincial, and local regulations and transportation service requirements used at origin and to final destination.

5. Place units in the trailer/container with a minimum 4 in. center void between the units where the D.I.D. bags are located. Leave a minimum of 36 in. (approximate) space between the rear of the load and the container doors.

6. Use D.I.D. bags to control lengthwise load movement. The D.I.D. bags must be either a minimum Level 1 bag as described in AAR General Information Bulletin No. 9, "Product Performance Profile for Pneumatic Dunnage" or supplements thereto; or square bags also may be used to fill crosswise void space from 12 in. to 24 in. to control lengthwise movement.

7. Use D.I.D. bags adjacent to every stack in the load except that at the nose. The D.I.D. bags contact the full surface of the units along the center void of the container as shown in the figure. The figure shows five stacks loaded in the nose of the container. Position the first stack against the nose wall one-wide, braced laterally to restrict crosswise movement and follow it with four two-wide stacks. Then create a void space to obtain proper weight distribution and follow that with four stacks loaded at the rear. Depending on container size and unit weight, varying numbers of units also may be loaded. Use D.I.D. bags wide enough to extend from 4 in. above the floor to the top of the lading. Protect the D.I.D. bags from rough surfaces, e.g., pallet edges, by use of proper facing material. Secure the D.I.D. bags from vertical displacement during transit by use of double-sided tape or other appropriate methods.

8. When the center void filled by the D.I.D. bags is larger than 10 in. after inflation of the bag (except when using approved large void bags), place additional full-size void fillers capable of withstanding a load of 1,500 lb/ft^2 alongside the D.I.D. bags to reduce the void to between 4 in. and 10 in. Position the D.I.D. bags 4 in. above the trailer floor. Inflate the D.I.D. 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).

NOTE: Do not reuse D.I.D. bags used for load securement.

NOTE: An updated listing of verified D.I.D. bags can be found on the TTCI Web site at http://www.aar.com/dpls/pfds/PPPPD_Verification_List.pdf

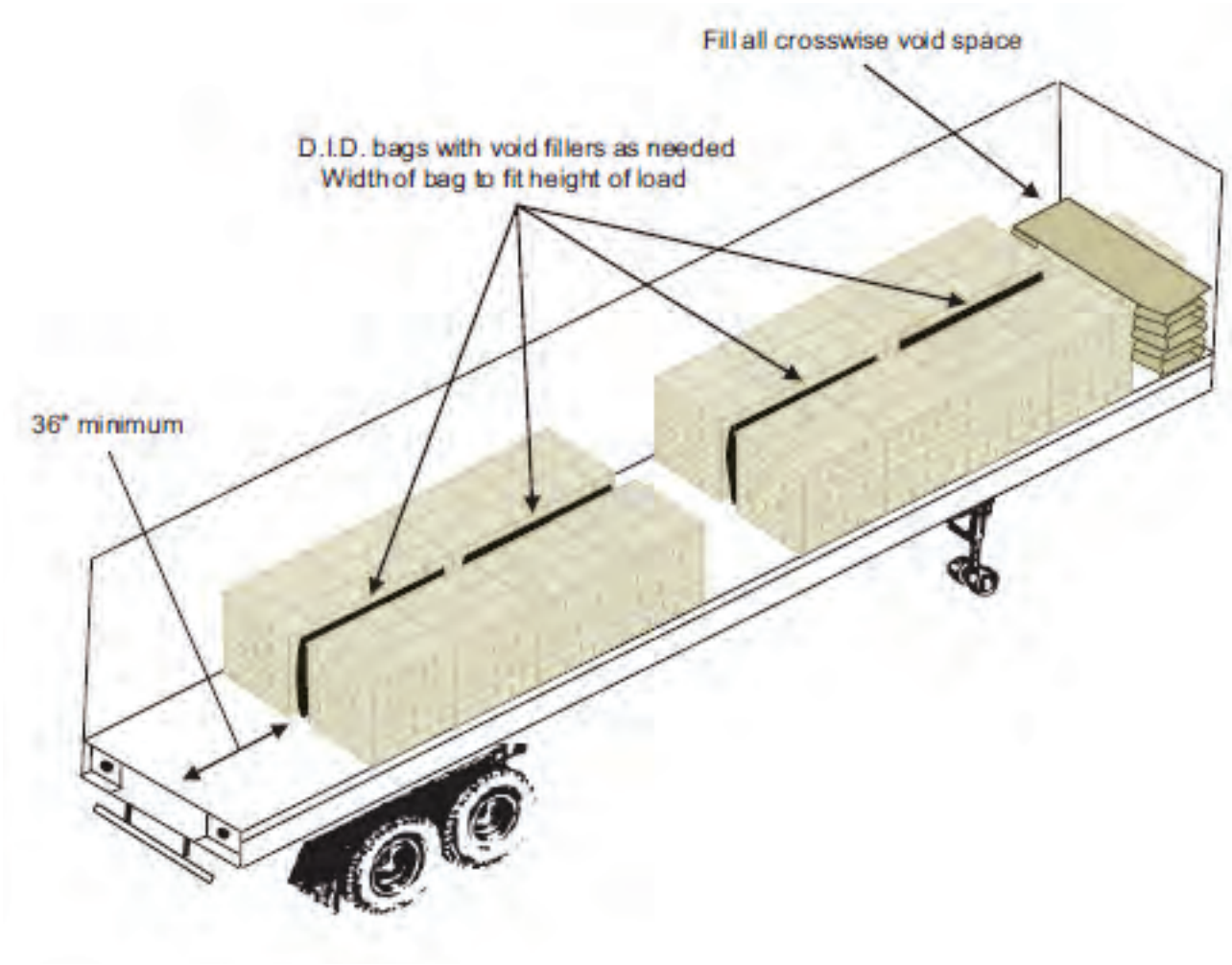


Figure 4.35

Method F-3
Split loads of case goods or fiberboard tray packs secured with D.I.D. bags

G—WOOD

Method G-1—40 in. Diameter Rolls of Printing Paper Secured with Wood Blocking and Two Unitizing Straps

Restrict this loading method to single-layer, 2-1-2 pattern loads of 40 in. diameter roll printing paper in trailers/containers for TOFC/COFC service. This method was tested in a 102 in. wide trailer. Plan the load to *equalize the weight on each side of the trailer or container.* Because roll weights vary, this will require attention to pre-planning. *A balanced load is required for the stability and success of this loading method.*

Figure 4.36:

1. Unitize the last five rolls (at the doorway) with two 1¼ in. × .031 in. or equivalent steel straps. Seal these with two seals per strap, with two crimps per seal. Use a strap holder to keep these straps in position. A 1¾ in. polyester web strap also may be used.

The following may be used as alternatives to 1¼ in. × .031 in. steel strap:

a. 1¾ in. polyester web strap with proper hardware and ratchet tension device

b. Approved polyester cord strapping using the correct buckle in accordance with manufacturer's instructions. (See paragraph 3.6 for approved polyester cord strapping.) Split the strap end on the tension side of the buckle and knot after tensioning. Follow manufacturer's/supplier's instructions for tensioning and sealing strap used.

2. Nail a double 2 in. × 6 in. × 8 ft 0 in. floor block against the last rolls perpendicular to the trailer/container sidewall. Use fourteen 8d nails per layer. If 12d nails are used, only seven are needed per layer.

3. Nail four double 2 in. × 4 in. × 18 in. backup cleats perpendicular to the 2 in. × 6 in. lumber. Use three nails minimum per layer for these cleats. Place two cleats 8 in. off the centerline of each roll of paper as shown.

4. Fill any remaining space with 2 in. lumber 18 in. long, with a width equal to the void size, placed parallel to the 2 in. × 6 in. block (see detail on figure) and nail it in position.

If rough-cut lumber is used for blocking, use minimum 12d nails.

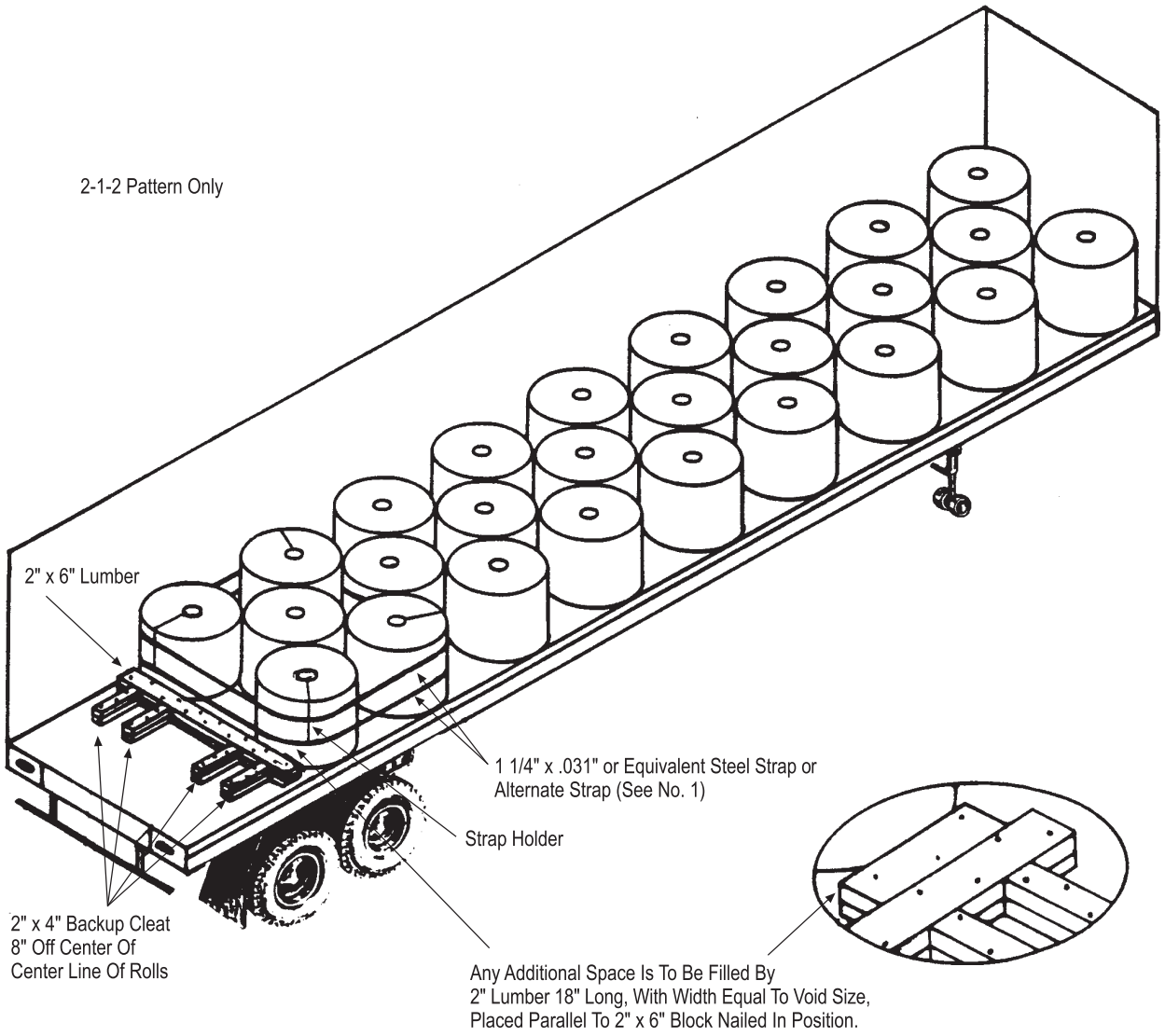


Figure 4.36

Method G-1
4 in. diameter rolls of printing paper secured with wood blocking and two unitizing straps

Method G-2—Double-Layer Drum Load Secured with "T" Gates in a 20 ft Container

This method loads drums two layers high in a 20 ft container.

Figure 4.37:

1. Load thirty-nine drums in a 4-3-4 pattern in each layer. Use ¼ in. thick plywood as a separator between each layer. This separator material runs the full length and width of the container.

2. The load ends with the four-wide stack of drums in the doorway. Place a ½ in. thick piece of plywood upright at the door of the container. Use this to protect the drums from the "T" gates used to prevent movement of the drums in the container.

3. Construct the "T" gates of 2 in. × 6 in. material 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 pieces perpendicular to these boards as shown in the detail of the figure.

4. Use six of these units to brace this load, with three units per layer of drums. Use spacers between each of these units to evenly position these "T" gate units between each rolling hoop on the drums.

5. Miter the ends of the "T" gate unit to facilitate installation into the doorway bracing slots. See figure for a view of the completed load.

The following separators have been evaluated and found acceptable for one-time use with this loading method. These separators were tested under simulated conditions, and their acceptance may be withdrawn if loads exhibit consistent load failures. If used with hazmat loads, these panels must be compatible with the contents of drums.

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	.375 in.	Corrugated (*not* for use with corrosives)	AIA/Down River
Ship Tite 3	.625 in.	Corrugated (*not* for hazmat use)	AIA/Down River
Ship Tite 5	3.2 mm	Corrugated	AIA/Down River
Generic	3.0 mm	Eucalyptus hardboard	Greif
PlyVeneer ®	3.0 mm	Wood veneer with a Kraft linerboard overlay	PlyVeneer Products
Tier 55	1.0 in., 0.50 in.	Corrugated	Damage Prevention Company

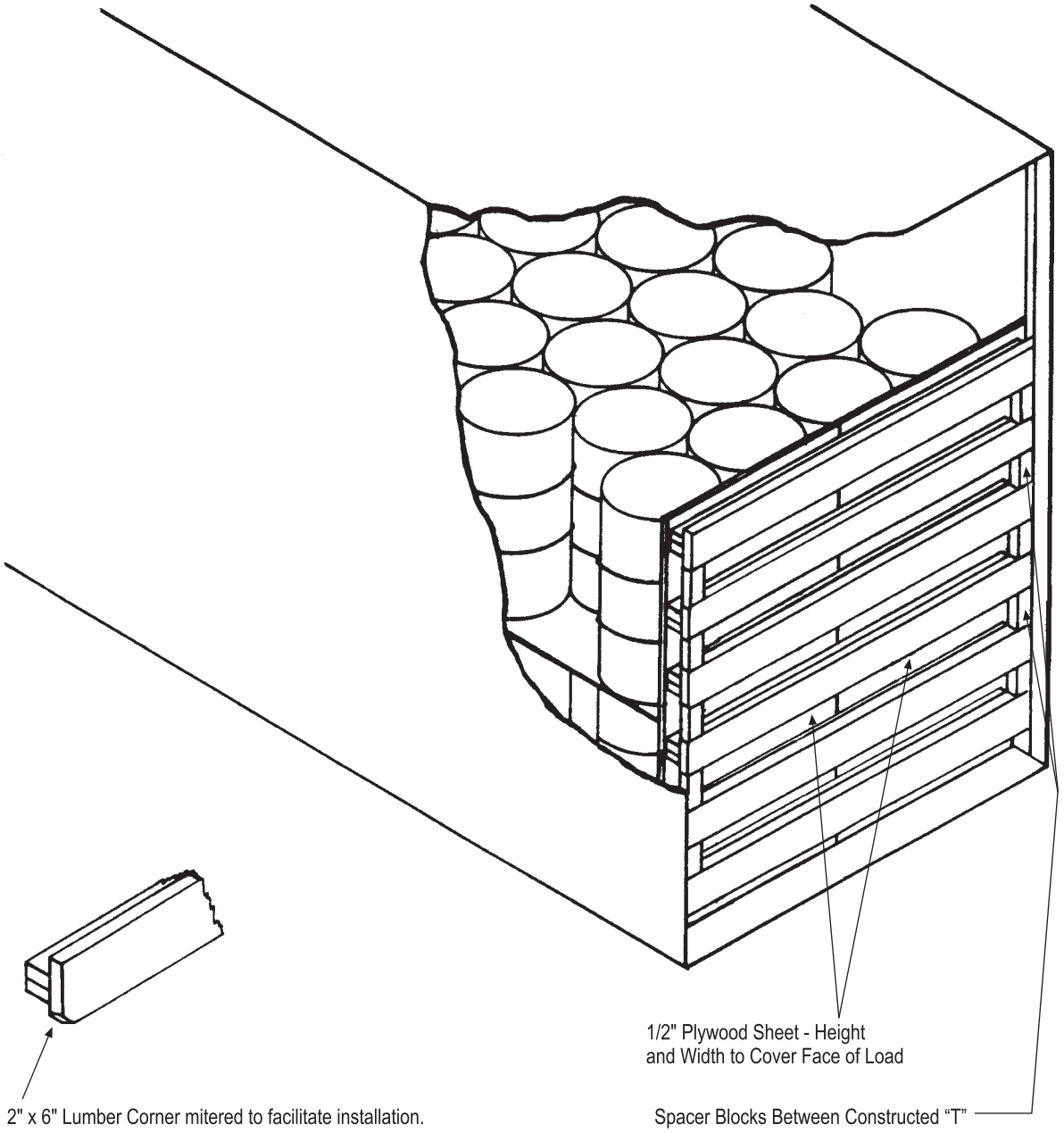


Figure 4.37

Method G-2
Double-layer drum load secured with "T" gates in a 20 ft container

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

The following procedures have been tested and found successful in loading and bracing 55-gallon (closed-head) drums in 20 ft containers equipped with bracing slots or protruding rear corner posts. Follow these procedures, without exception, in all loads using this bracing method.

Figure 4.38:

1. Prior to loading, inspect containers to ensure there are no damaged corner posts. Any protruding nails or screws in the floors must be drawn, redriven, and/or tightened.

2. Position drums directly opposite each other on opposite sides of a separator.

CAUTION: Trailer/container must have brace slots adjacent to corner posts or have doorposts that extend a minimum of 2½ in.

Item	No. of Pieces	Description
A	3	Two-layer bulkhead (see **Sketch 1**).
B	2	Plywood decking—¼ in. × (container width minus ¼ in.) × (length as required).
C	1	Separator ¼ in. plywood × (load height) × (container width, minus 1 in.).
D	3	Horizontal fill—6 in. × 30 in. × (thickness required). Nail to bulkhead and/or nailing piece.
E	2	Nailing piece—2 in. × 6 in. × 30 in.
F	2	Vertical fill—6 in. × 30 in. × (thickness required). Nail to bulkhead.
G	5	Retainer piece—2 in. × 6 in. × length to fit into brace slots adjacent to corner posts (inside container width if brace slots are not present). Nail to bulkhead vertical or horizontal pieces.

The following separators have been evaluated and found acceptable for one-time use with this loading method. These separators were tested under simulated conditions, and their acceptance may be withdrawn if loads exhibit consistent load failures. If used with hazmat loads, these panels must be compatible with the contents of drums.

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	.375 in.	Corrugated (not for use with corrosives)	AIA/Down River
Ship Tite 3	.625 in.	Corrugated (*not* for hazmat use)	AIA/Down River
Ship Tite 5	3.2 mm	Corrugated	AIA/Down River
Generic	3.0 mm	Eucalyptus hardboard	Greif
PlyVeneer®	3.0 mm	Wood veneer with a Kraft linerboard overlay	PlyVeneer Products
Tier 55	1.0 in., 0.50 in.	Corrugated	Damage Prevention Company

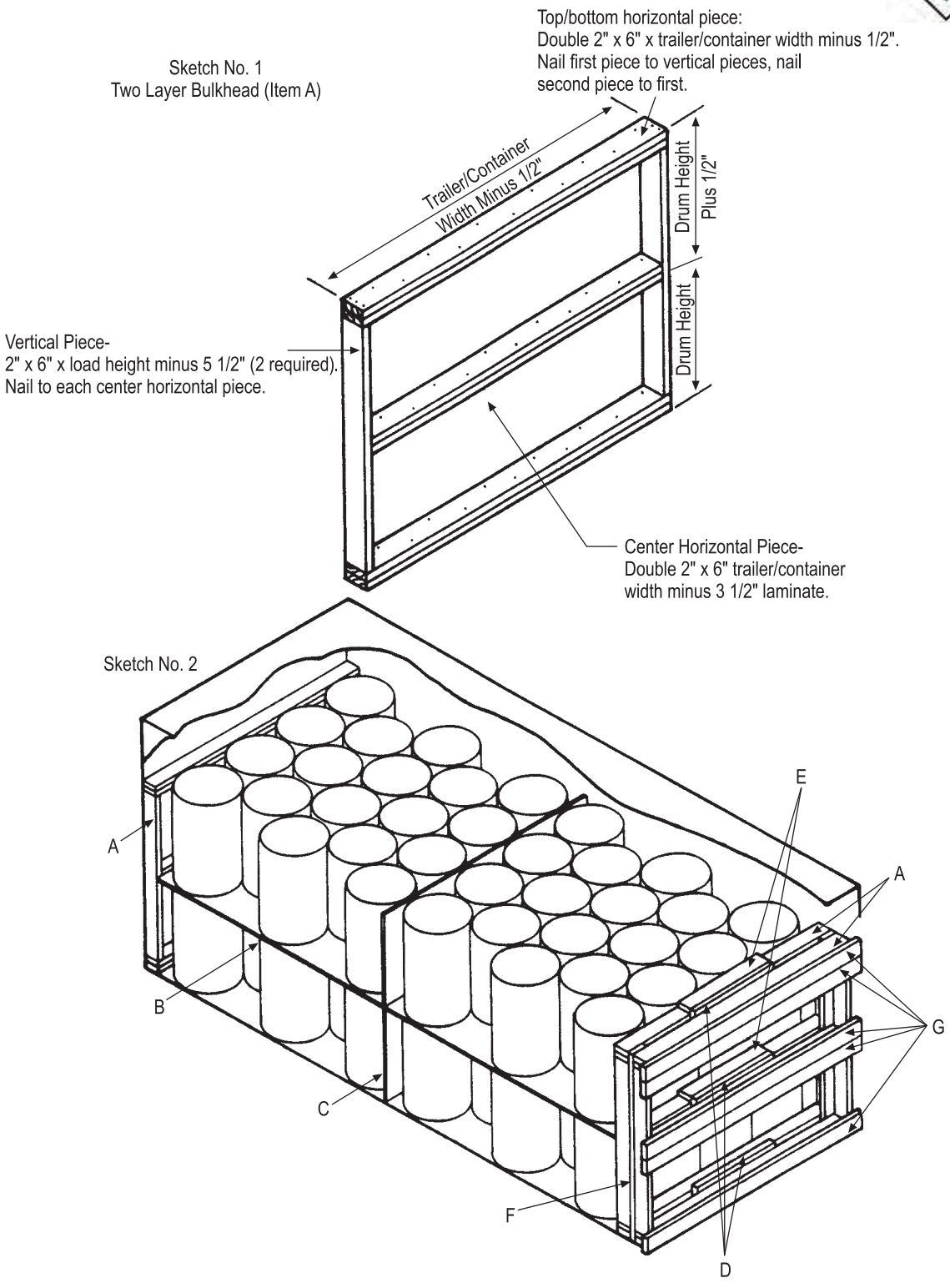


Figure 4.38

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

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 Rear Corner Posts

The following procedures have been tested and found successful in loading and bracing 55-gallon drums in trailers or containers equipped with bracing slots or protruding rear corner posts. Follow these procedures, without exception, in all loads using this bracing method.

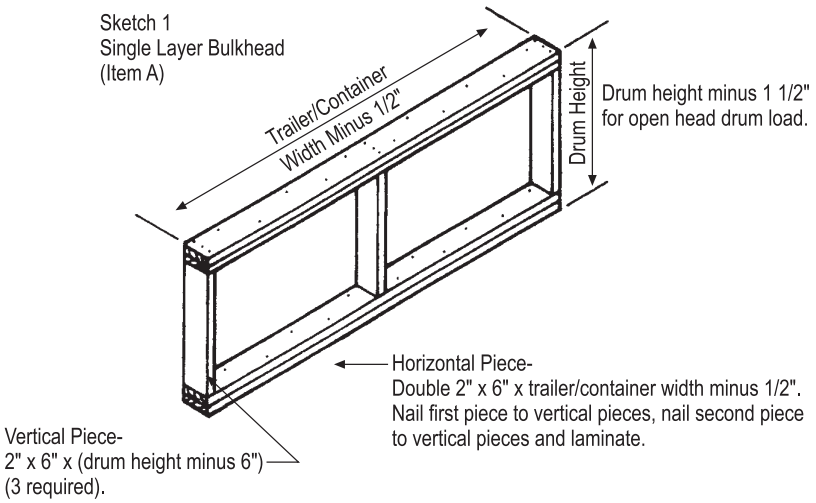
Figure 4.39:

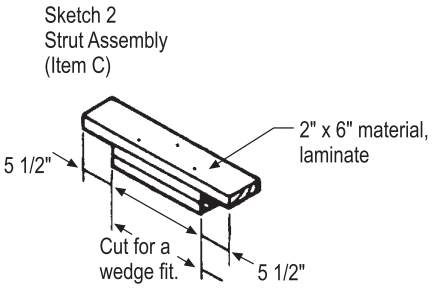
1. Prior to loading, inspect trailers/containers to ensure there are no damaged corner posts. Any protruding nails or screws in the floors must be drawn, redriven, and/or tightened.

2. Position drums directly opposite each other on opposite sides of a separator.

CAUTION: Trailer/container must have brace slots adjacent to corner posts or have doorposts that extend a minimum of 2½ in.

Item	No. of Pieces	Description
A	3	Single layer bulkhead. Nail to trailer/container floor (see **Sketch 1**).
B	4 (open-head drums) 2 (closed-head drums)	½ in. plywood separator (load height) × (trailer width, minus 1 in.)
C	3	Strut—Two 2 in. × 2 in. × (length cut to fit, laminated and toe-nailed to bulkheads at each end).
D	3	Horizontal fill—6 in. × 30 in. × (thickness required). Nail to bulkhead and/or nailing piece.
E	3	Length cut to fit into brace slots adjacent to corner posts (inside trailer/container width if brace slots are not present). Nail top and bottom pieces to bulkhead and nail other piece to vertical pieces.
F	9 (open-head drums)	Risers laminated 2 in. × 6 in. × (sufficient length to support width of stack). Required for open-head drums only.





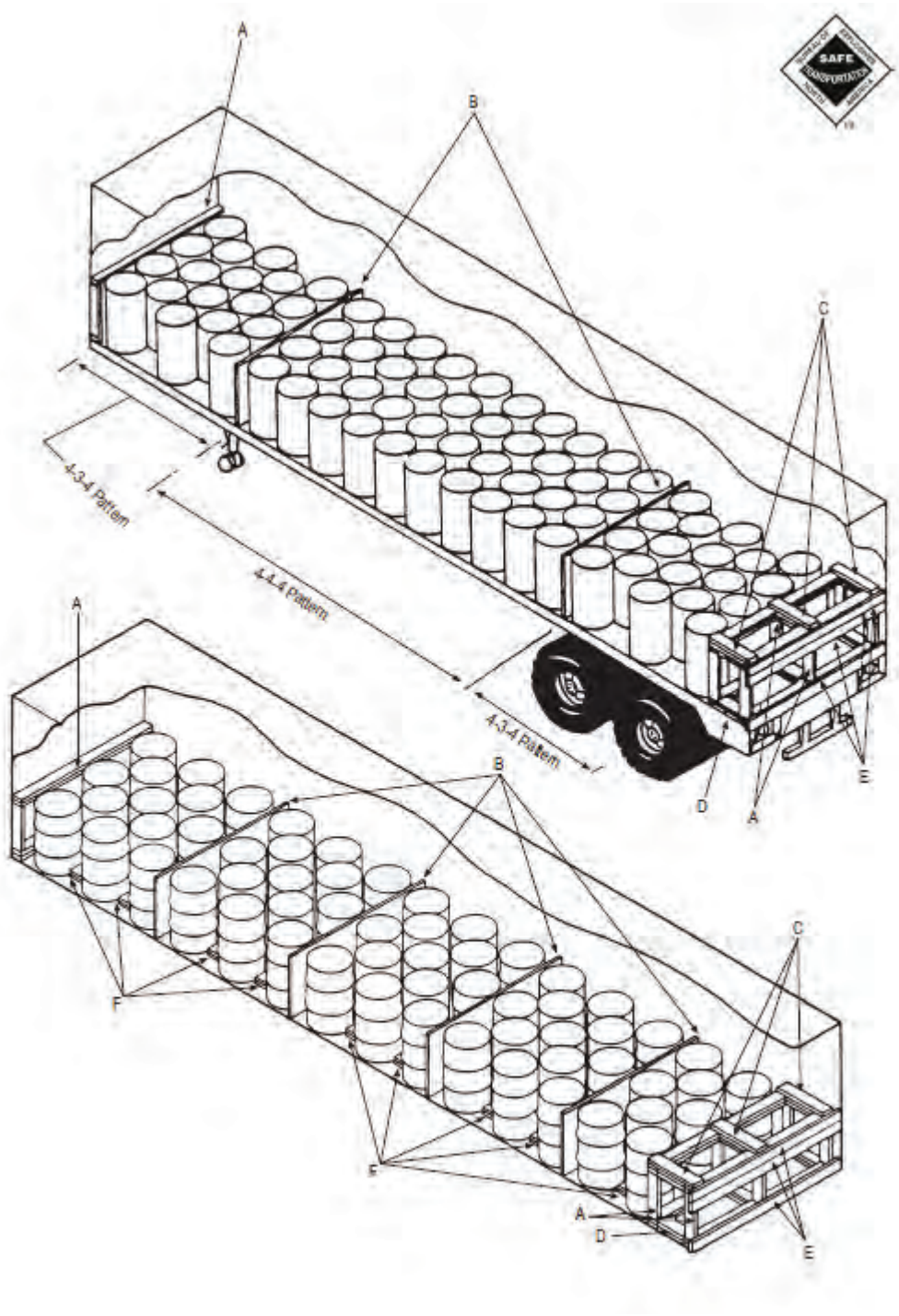


Figure 4.39

Method G-4
55-gallon (open head) steel drums in trailers/containers with bracing slots 1 in. or greater in depth or with protruding rear corner posts

Method G-5—58 in. Diameter Rolls of Pulpboard on End Using Floor Blocking

Use this loading method for 58 in. diameter roll pulpboard loaded on end in a 1-1 offset pattern in a trailer or container for intermodal service. This method was tested in a 102 in. wide trailer. Plan the load to *equalize the weight on each side of the trailer or container.* Because roll weights vary, this will require attention to pre-planning. *A balanced load is required for the stability and success of this loading method.*

Figure 4.41:

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 trailer/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 trailer/container floor with 16d power-driven nails staggered 4 in. on center.

3. Load the second section in a 1-1 pattern between 75 in. and 85 in. behind the first section. Brace the first and last rolls with the same configuration of blocking used in the first section.

4. Use one of two types of strapping to unitize each section:

   a. A 1¾ in. polyester web strap and buckle assembly having a 15,000 lb capacity rating. Use one strap around each section placed approximately 12 in. down from the top edge of the roll. Pretension each strap.

   b. A 1¼ in. × .031 in. steel strap. Use one strap around each section. Install straps approximately 12 in. down from the top edge of each roll. Seal straps on both sections with two grit-type seals per strap with two crimps per seal.

5. Use polyester filament tape or equivalent to suspend the unitizing strap from the top of the rolls in both sections.

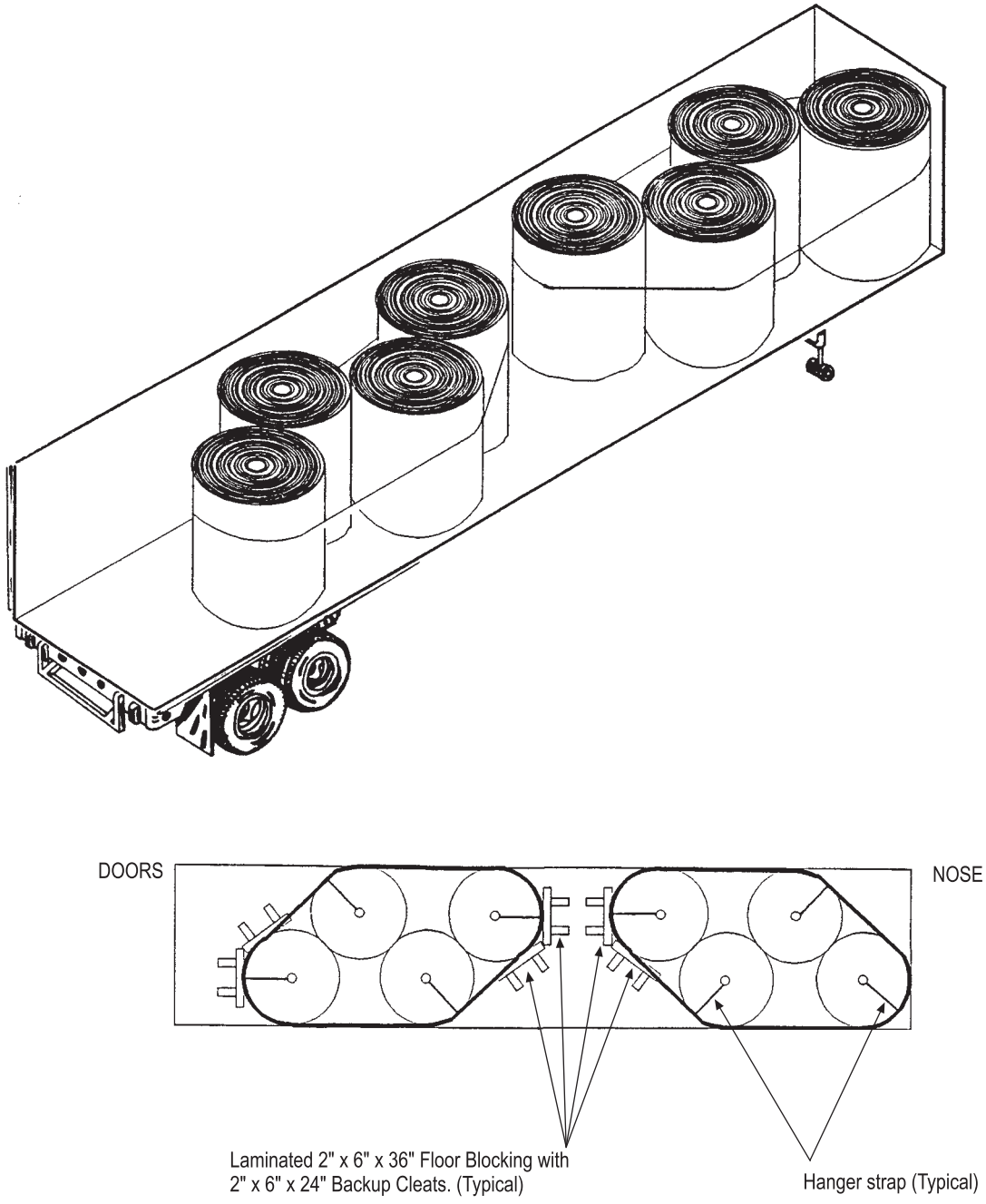


Figure 4.40

Method G-5
58 in. diameter rolls of pulpboard on end using floor blocking

Method G-6—Dimensional Lumber Secured by Floor Blocking and D.I.D. Bags

Use this loading and bracing method for dimensional lumber loaded lengthwise in two rows in a trailer or container for intermodal service. Load lading to the front end wall.

Illustration No. 85:

1. Unitize each stack of lumber approximately 2 ft from each end with one 1¼ in. × .031 in. steel strap. Stacks positioned at the trailer/container doorway should have two 1¼ in. × .031 in. unitizing straps around the doorway end. Seal the unitizing straps with two seals having a minimum of four crimps. Corner protectors are recommended to protect the product from the steel strapping.

2. Install D.I.D. bags (minimum Level 1x, 30 in. wide × height of load) in center void to maintain lateral alignment. Use single-wall corrugated fiberboard sheets (minimum) on each side of the D.I.D. bag for protection. Inflate the D.I.D. 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). Position bags 1 in. above floor. Space filled by inflatable dunnage should not exceed 12 in.

3. The floor blocking at the doorway end of each row consists of two 2 in. × 6 in. × 4 ft laminated pieces of softwood lumber reinforced with two 2 in. × 6 in. × 2 ft laminated backup cleats. Assemble the blocking according to **Sketch 2**. After laying the first 2 in. × 6 in. floor block on the trailer floor across the end of a row of lading, lay two pieces of 1¼ in. punched steel strapping 4 ft long on top of the block. Then hand-drive 16d common nails through the prepunched holes, through the blocking, and into the floor. Do the same for the backup cleats. Laminate a second piece of 2 in. × 6 in. lumber to the floor blocking using 16d nails as shown.

NOTE: Do not use a power nailer because deflection of the nail may occur if it is not properly aligned with the strap holes. Do not reuse D.I.D. bags used for load securement.

NOTE: An updated listing of verified D.I.D. bags can be found on the TTCI Web site at http://www.aar.com/dpls/pfds/PPPPD_Verification_List.pdf

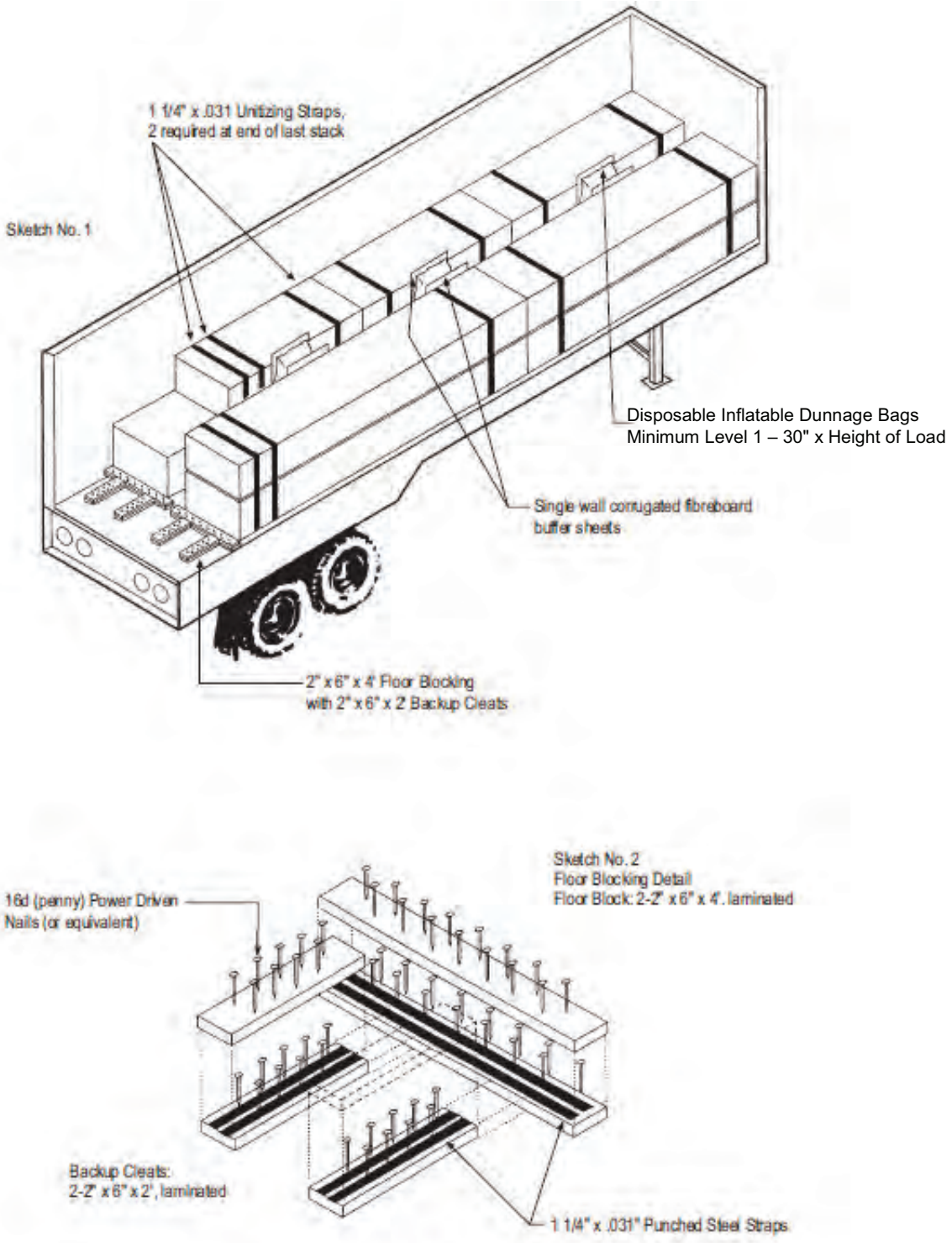


Figure 4.41

Method G-6
Dimensional Lumber Secured by Floor Blocking and D.I.D. Bags

Method G-7—58 in. Diameter Roll Pulpboard on End Using Pre-Assembled Wood Blocking

Use this loading method for 58 in. diameter roll pulpboard loaded on end in a 1-1 offset pattern in a trailer or container for intermodal service. Plan the load to *equalize the weight on each side of the trailer or container.* Because roll weights vary, this will require attention to pre-planning. *A balanced load is required for the stability and success of this loading method.*

Figure 4.42:

1. The pre-assembled blocking is constructed from four pieces of 2 in. × 6 in. × 24 in. softwood lumber. Assemble the blocking as shown in Figure 4.42 — Sketch 1. Place the crossbrace on top of the three backup cleats and nail it with four to five 12d nails at each backup cleat.

2. Divide the load into two sections, each containing approximately half of the load.

   a. The first section starts at the nose of the trailer/container. Brace the last roll of this section with two of the pre-assembled units. Install one of the blocking units adjacent to the roll with the crossbrace perpendicular to the sidewall.

   b. Install the second blocking unit adjacent to the roll at a 30° to 45° angle to the first. Place a 20 gauge strip of sheet metal, approximately equal to the size of the exposed area of the backup cleats, on top of each backup cleat. Nail the units through the sheet metal to the trailer/container floor with eight 12d power-driven nails staggered on each backup cleat.

3. Load the second section in a 1-1 pattern between 75 in. and 85 in. behind the first section. Brace the first and last rolls of this section in the same manner as the last roll in the first section.

NOTE: Tilting of rolls can occur during normal transit, resulting in slight edge or bilge flattening. Use of unitizing straps (e.g., 1¼ in. × .031 steel strap) may reduce tilting.

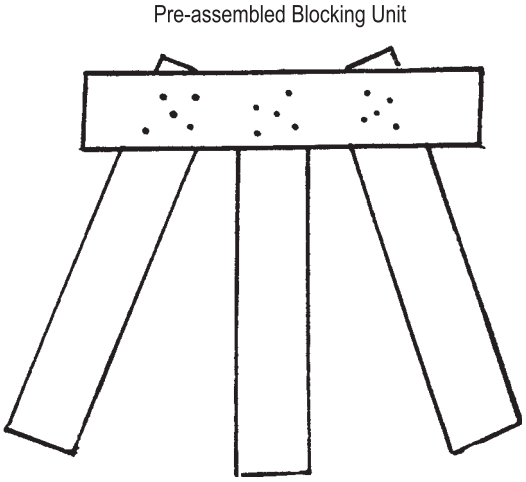
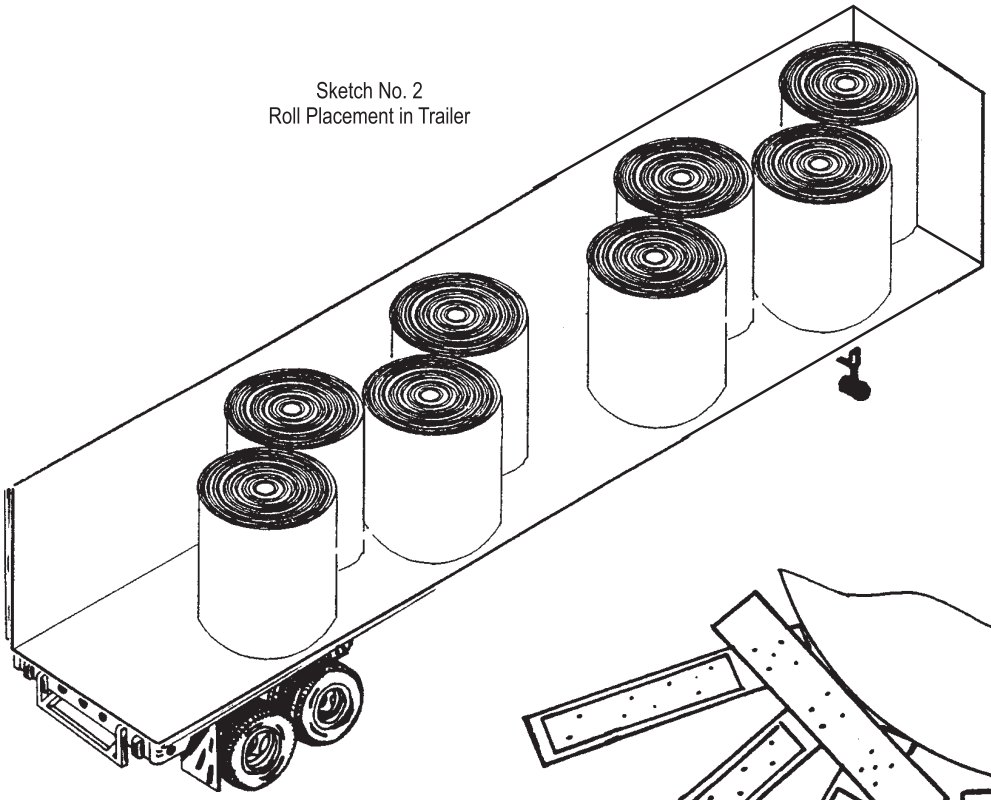
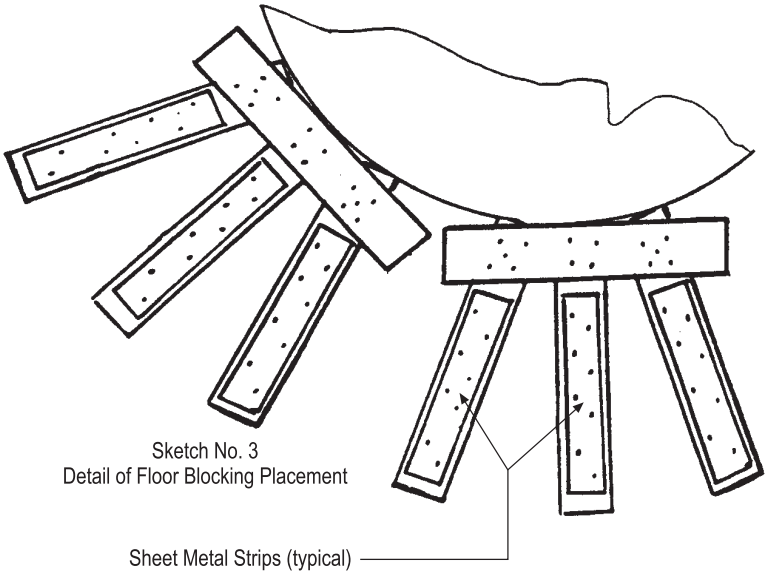


Figure 4.42 — Sketch 1

Method G-7
58 in. diameter roll pulpboard on end using pre-assembled wood blocking





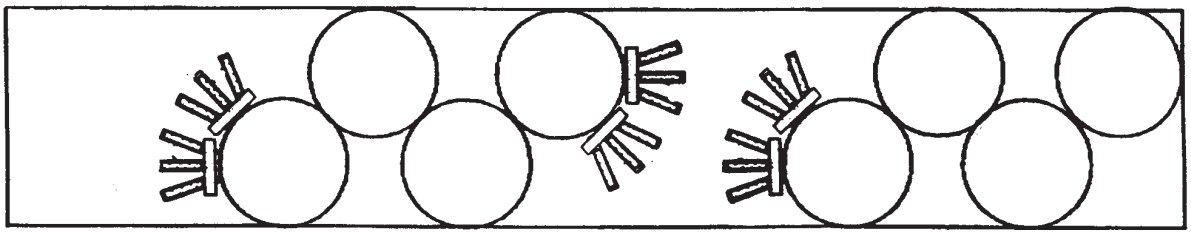


Figure 4.42 — Sketches 2, 3, and 4

Method G-7
58 in. diameter roll pulpboard on end using pre-assembled wood blocking

Method G-8—Canceled September 2015

Method G-9—Commercial Refrigeration Units Secured by Floor Blocking and D.I.D. Bags

Use this loading method for commercial refrigeration units, typically display cases used in retail stores. The illustrated load is representative of the type of loads shipped. The number, size, shape, weight, and arrangement of units may vary, however, for each shipment utilizing this method.

Figure 4.43:

1. Line the trailer/container sidewalls and nose with single-wall corrugated fiberboard. Tape may be used to keep the fiberboard in place. Do not use nails or staples to attach the fiberboard to the walls.

2. Load the units lengthwise of the trailer/container and place them in two rows, one along each sidewall. Load the backs of the units against the sidewalls.

3. Install Level 2, 18 in. × 36 in. disposable inflatable dunnage (D.I.D.) bags vertically between the ends of the units in each row. The D.I.D. bags prevent damaging contact between units and help maintain load tightness. Place corrugated fiberboard buffer sheets on each side of the D.I.D. bags. Inflate the D.I.D. 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). Check the D.I.D. bag pressure 30 minutes after installation to make sure no leakage has occurred. Use tape to secure D.I.D. bags and buffer sheets in place.

4. Reinforce tall units with 2 in. × 4 in. lumber bolted to the side panels as shown in the figure. This may not be possible on some units with finished end panels.

5. Crosswise bracing can be accomplished in three ways:

   a. Nail two pieces of 2 in. × 6 in. lumber to the end panel reinforcement as shown for units A and B in the figure. The units so braced are of the same length with this bracing used at both ends of the units. Use nails long enough to penetrate into the end panel reinforcement but not go completely through to the end panel.

   b. Install Level 2, 18 in. × 36 in. D.I.D bags horizontally, lengthwise, in the center void between units if the void does not exceed 8 in. Be sure the front panels of units so braced are capable of withstanding the pressure exerted by the D.I.D. bag. Inflate the D.I.D. 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). Check the D.I.D. bag pressure 30 minutes after installation to make sure no leakage has occurred.

   c. Use laminated 2 in. × 4 in. × 9 in. to 12 in. side-blocking in the center void against the ends of the units as shown in the figure.

6. Secure each row by floor blocking and backup cleats. Construct floor blocking by nailing one 2 in. × 6 in. × 36 in. piece of lumber to the edge of a second similar piece with two to three nails to form an L-shaped block. Position this floor block against the row of lading as shown in the figure and nail it to the floor with six 16d nails staggered to prevent splitting. Use two sets of 2 in. × 6 in. × 18 in. backup cleats for each row. Position the backup cleats as shown and secure them using three 16d nails per lamination.

NOTE: Fluorescent bulbs, detachable panels, shelves, dividers and trim pieces, and any other loose or easily detachable components can be displaced during transit due to normal vibration inputs. These components should be securely taped in place or removed and individually packaged. Do not reuse D.I.D. bags used for load securement.

NOTE: An updated listing of verified D.I.D. bags can be found on the TTCI Web site at http://www.aar.com/dpls/pfds/PPPPD_Verification_List.pdf

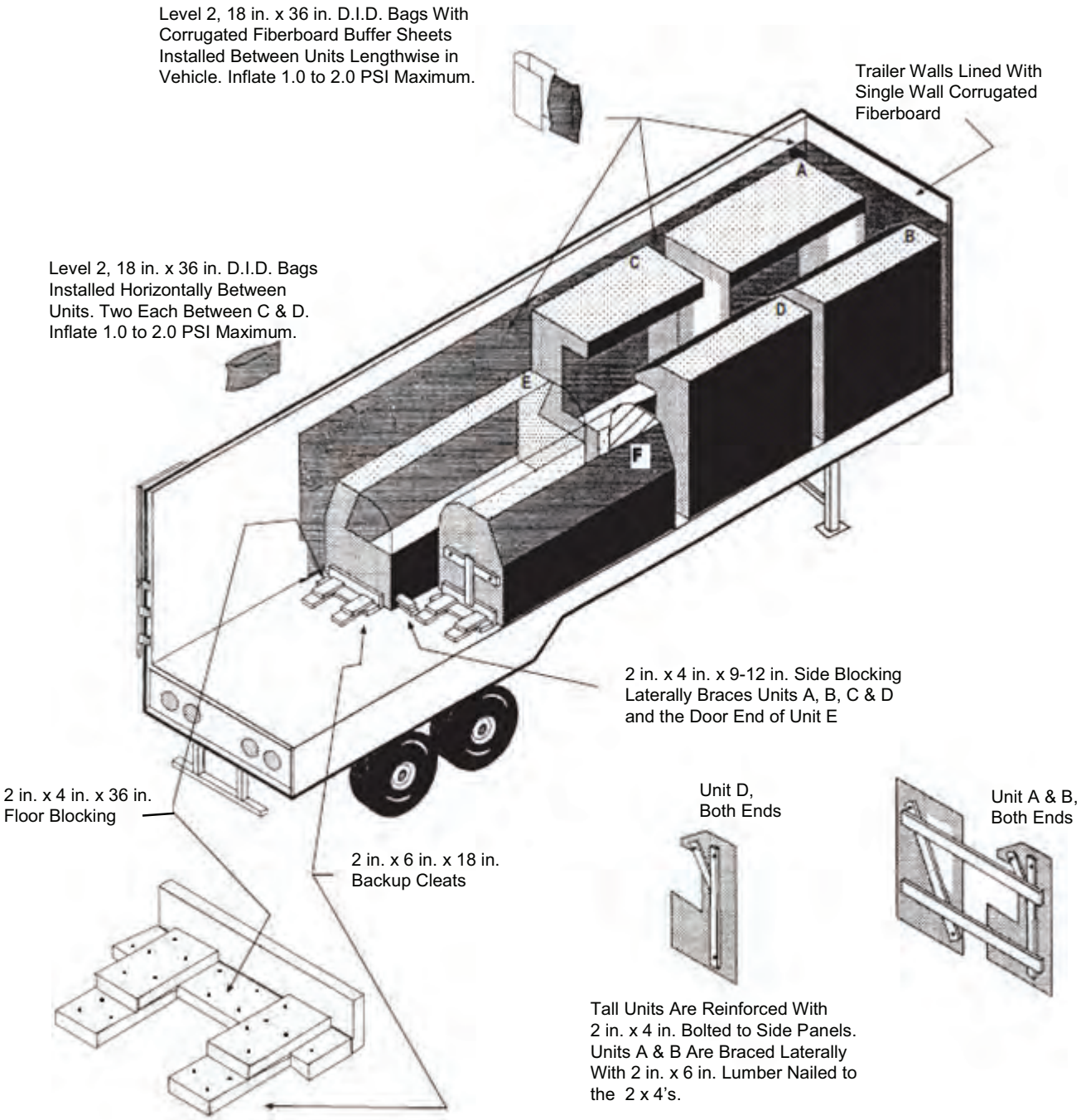


Figure 4.43

Method G-9
Commercial refrigeration units secured by floor blocking and D.I.D. bags

Method G-10—Bilge-Loaded 40 in. Diameter Paper Rolls Using Steel or Approved Polyester Cord Strapping and Wood Blocking

Use this method for 40 in. diameter roll paper loaded on bilge with the cores orientated crosswise of the trailer/container. The loading method utilizes steel or approved polyester cord strapping (see paragraph 3.6 for approved polyester cord strapping), wood blocking, and wooden chocks. The paper rolls may be of varying widths.

Figure 4.44:

1. Divide the load into two sections, each containing approximately half the load. Use temporary chocks to secure stacks during loading and unloading.

2. Load the first section starting at the nose of the trailer/container. Load the rolls adjacent to each other across the trailer/container. Center each stack of rolls laterally.

3. Before loading the last three stacks on the floor, cut strapping consisting of three 1¼ in. × .031 in. steel strapping or approved polyester cord strapping (see paragraph 3.6 for approved polyester cord strapping), fold it in half, and place it on the floor with the looped end at the rear of the last stack loaded. Space the strapping evenly across the stack or center it on rolls, depending on the number of rolls across the trailer/container. Place one 2 in. × 6 in. board the width of the stack inside the loop of the strapping and nail it to the floor. Laminate a second 2 in. × 6 in. board of the same length on top of the first board, sandwiching the strapping between them. See detail on figure.

4. Load the next floor stack on top of the strapping. Place the top half of the folded-over strapping back over the previous loaded stacks toward the nose of the trailer. The bottom half of the strap remains on the floor. Load the remaining two floor- and two second-layer stacks.

5. Bring the top half of the straps back over the rolls, and tension and seal the ends of each of the three straps. Before sealing, place a 2 in. × 4 in. board the width of the stack inside the strapping across the face of the second-layer stack. After sealing, drive a staple over each strap to secure the crosswise board in position. This board is not required if the width of the second-layer stacks is three rolls or less and all rolls in the second layer are secured by the securement straps.

6. Nail to the floor blocking consisting of at least three 8 in. wooden chocks backed up with one upright 2 in. × 6 in. board and two laminated 2 in. × 6 in. If the floor-layer stack consists of more than three rolls, use one chock for each roll adjacent to the floor blocking.

7. Load the second section identically to the first section with the addition of a 2 in. × 4 in. across the face of the first-layer stack as well as the second-layer stack inside the strapping. After sealing, drive staples over the straps to secure each crosswise board in position. These boards are not required if the width of the stacks is three rolls or less and all rolls in the these stacks are secured by the securement straps.

8. If the total crosswise void is 12 in. or greater, install lengthwise guide rails consisting of 2 in. × 4 in. boards along both sides of the floor stacks to prevent lateral movement. The guide rails run the entire length of the load and are spaced approximately 1 in. away from the edge of the rolls. Secure guide rails with 12d nails staggered 18 in. on center.

9. If the lateral void between the end of the second-layer stacks and the sidewalls of the trailer in either section is equal to more than half the width of the rolls, install a void filler to prevent lateral movement of the rolls. The figure shows use of Level 1 D.I.D. bags installed between the end of the second-layer stacks and the sidewalls. Use corrugated fiberboard buffer sheets between the trailer sidewalls and the bags. Inflate the bags to 1 psi. Check D.I.D. bag pressure 30 minutes after inflation to ensure no leakage has occurred. Tape void fillers to rolls and/or trailer walls to prevent displacement.

The load shown in Figure 4.44 was the actual load tested.

NOTE: An updated listing of verified D.I.D. bags can be found on the TTCI Web site at http://www.aar.com/dpls/pfds/PPPPD_Verification_List.pdf

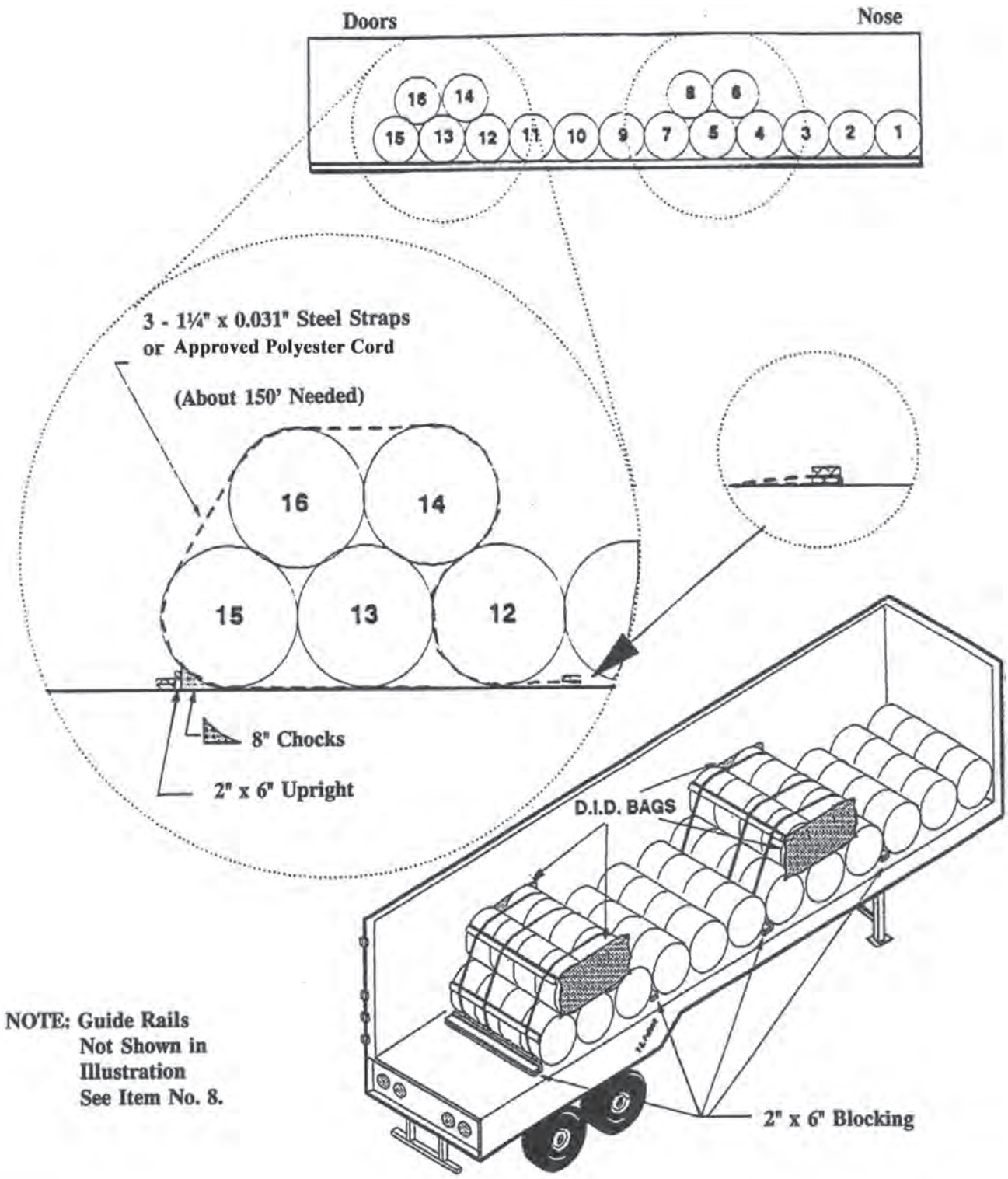


Figure 4.44

Method G-10
Bilge-loaded 40 in. diameter paper rolls using steel or approved polyester cord strapping and wood blocking

H—SPECIAL EQUIPMENT

Method H-1—Canceled September 2015

Method H-2—Canceled September 2015

Method H-3—Canceled September 2015

Method H-4—Canceled September 2015

Method H-5—Canceled September 2015

Method H-6—Palletized Commodities Secured by Nylon Web Strap Assemblies and Floor Blocking

Use this loading and bracing method for palletized commodities. Follow manufacturer's instructions regarding the minimum number of wraps to be used for this application, but in all cases use a minimum of three wraps for the top and bottom layers and two wraps for the center layers.

Load units in two rows. When crosswise space exceeds 4 in., alternate stacks against opposite sidewalls and use appropriate crosswise void fillers. Line trailer with single-wall corrugated fiberboard.

Figure 4.45:

Method of Bracing

1. Prior to loading, calculate the overall length of the load. Install 5 ft long sections of Series "E" belt rails, two per sidewall, positioned 1 ft and 3 ft above trailer floor. Position them lengthwise so that the belt rails extend beyond the rear face of the load approximately 1 ft. Attach each belt rail section to three sidewall posts using twelve ⅛ in. × 1 in. long self-tapping sheet metal screws (four screws per sidewall post).

2. Secure 1¾ in. nylon web strap assemblies to the belt rails approximately 2 ft in from the rear load face. Strap assemblies have a 16 ft overall length; 4 ft fixed end length with three-piece 4,500 lb capacity (parallel loading) anchors; 15,000 lb capacity ratchet-type buckle; and minimum 9,500 lb tensile capacity polyester webbing. Temporarily tape the straps against the trailer sidewalls for loading.

3. When loading, install single-wall, corrugated fiberboard sheets between the units in the last four stacks. Install two sheets of corrugated fiberboard between the units in the last stack and the trailer sidewalls at the strap anchors.

4. When loading is complete, install one minimum Level 1, 48 in. × 96 in. D.I.D. bag in the center void between the last two stacks. Inflate the D.I.D. bag 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).

5. Install a ¾ in. plywood gate. Gate height should be equal to load height and 2 in. less than the trailer width. Nail three 2 in. × 6 in. × 36 in. uprights to the plywood sheet with six 6d nails each. Position per diagram.

6. Tension the web straps across gate. Use a buckle handle extension tool to achieve sufficient tension. Secure the straps in position by stapling the straps to the middle gate upright or by taping them with strapping tape or equivalent.

7. Install floor blocking and backup cleats 12 in. *away* from plywood gate. Secure the blocking with twenty 16d power-driven nails (or equivalent) per lamination. Secure the backup cleats with eight 16d nails each.

NOTE: An updated listing of verified D.I.D. bags can be found on the TTCI Web site at http://www.aar.com/dpls/pfds/PPPPD_Verification_List.pdf

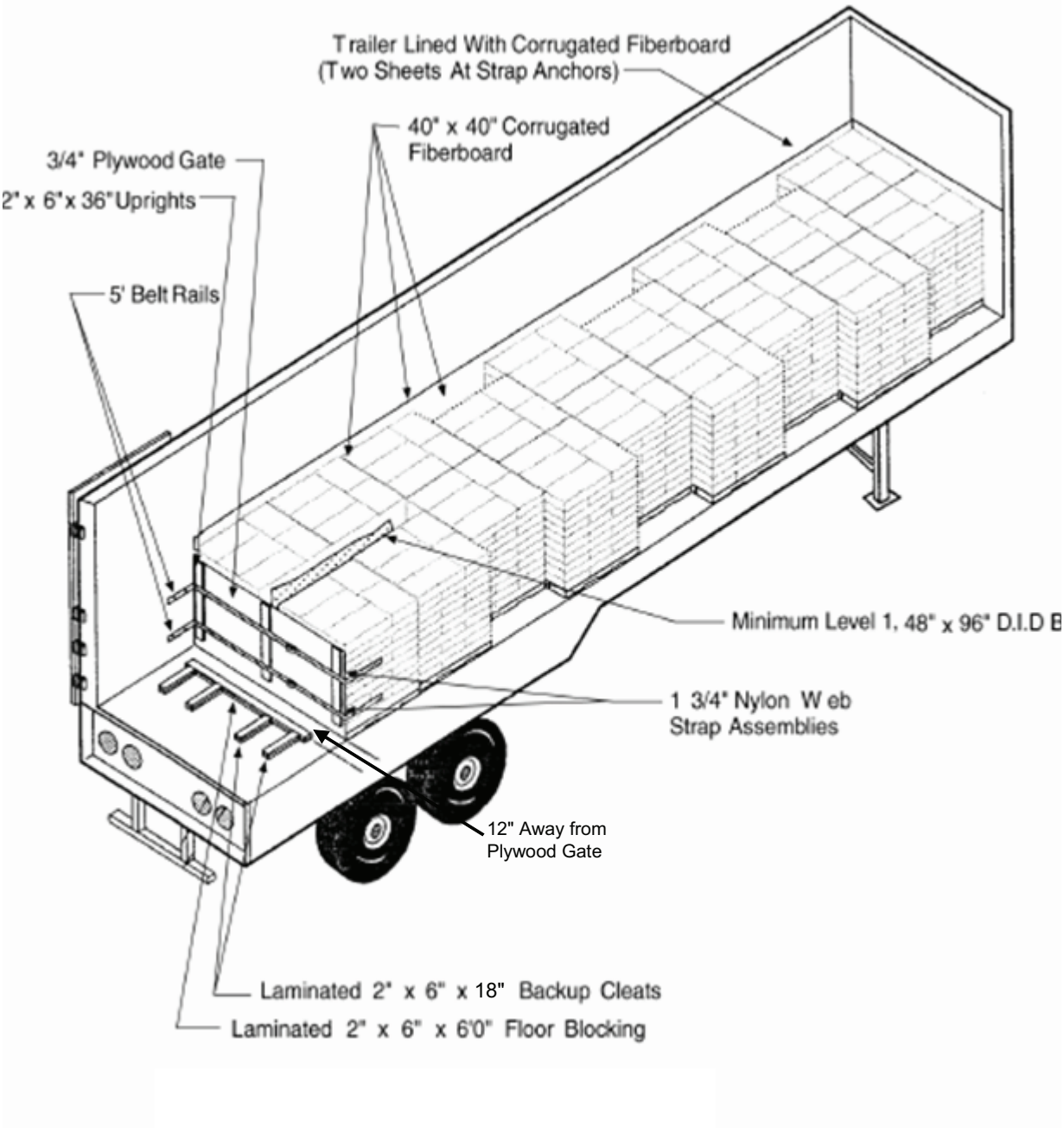


Figure 4.45

Method H-6
Palletized commodities secured by nylon web strap

Method H-7—Canceled June 2011

Method H-8—Canceled June 2011

Method H-9—Canceled June 2011

Method H-10—Canceled June 2011

Method H-11—Metal Coils on Platforms/Skids or in Cradles Secured by Web Straps Attached to Cargo Sleds in 20 ft Dry Containers

The shipper is responsible for inspecting the container to ensure that it is suitable to carry lading safely to destination. *There must be no obvious damage, distress, weakened parts or weakened sections.* Any exception is cause for rejection.

Use this loading method for small (3,500 lb) to large (25,000 lb) metal coils on platforms/skids with eyes vertical/horizontal or cradled within the sled. When using this loading method, position coils to achieve proper weight distribution. Secure coils to the platforms/skids with 1¼ in. × 0.031 in. steel straps or an equivalent stretch film roping method to prevent movement on the platforms/skids during transit.

Figure 4.46:

The following has been evaluated and found acceptable for this loading method:

Name	Vendor
Universal Cargo Sled (UCS) with anchor points and bracing chocks	Holland Company

1. Load the coil/platform units down the center of the cargo sled using the figures as a guide while maintaining proper load balance within load limits. *Utilize a sufficient number of web strap assemblies, as required by the loading pattern.* See **Sketches 1, 2,** and **3** strap assembly requirements.

2. Coil/platform units may be loaded two wide when spacers (e.g., foam) are used between coils to maintain coil-to-spacer contact. Secure the spacers in place to maintain positioning during transit. See **Sketch 2**.

3. Position coils loaded on their bilges down the center of the sled. Place a sufficient number of timbers on each side of each coil to adequately nest the coil and restrict lateral movement. The amount of timbers used is determined by the coil size and the bevel placed adjacent each coil. See **Sketch 3**. *Protect the straps from sharp edges as needed.*

4. Anchor each single coil and/or tandem 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 unit application at the base of the coil(s) and through the cores of coils stowed on their bilges. Place a sufficient number of assemblies across the top of each single coil greater than 36 in. in width as shown in the figures and over each single coil stowed on its bilges. 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 lb. Tension straps using ratchets.

Be sure straps are straight, not twisted, before tensioning.

5. Properly place and position the blocking chocks in the container to engage the bull-board slots. Carefully place the sled with lading into the container to engage the chocks.

Table 4.1 Strap assembly requirements

Coils Upright on Platforms			Coils on Bilge		
Coil Weight (lb)	**Strap Assembly's Base/Coil**	**Strap Assembly's Crossover/Coil (widths > 36 in.)**	**Coil Weight (lb)**	**Strap Assembly's Coil Core/Coil**	**Strap Assembly's Crossover/Coil**
< 10,000	2	1	< 10,000	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

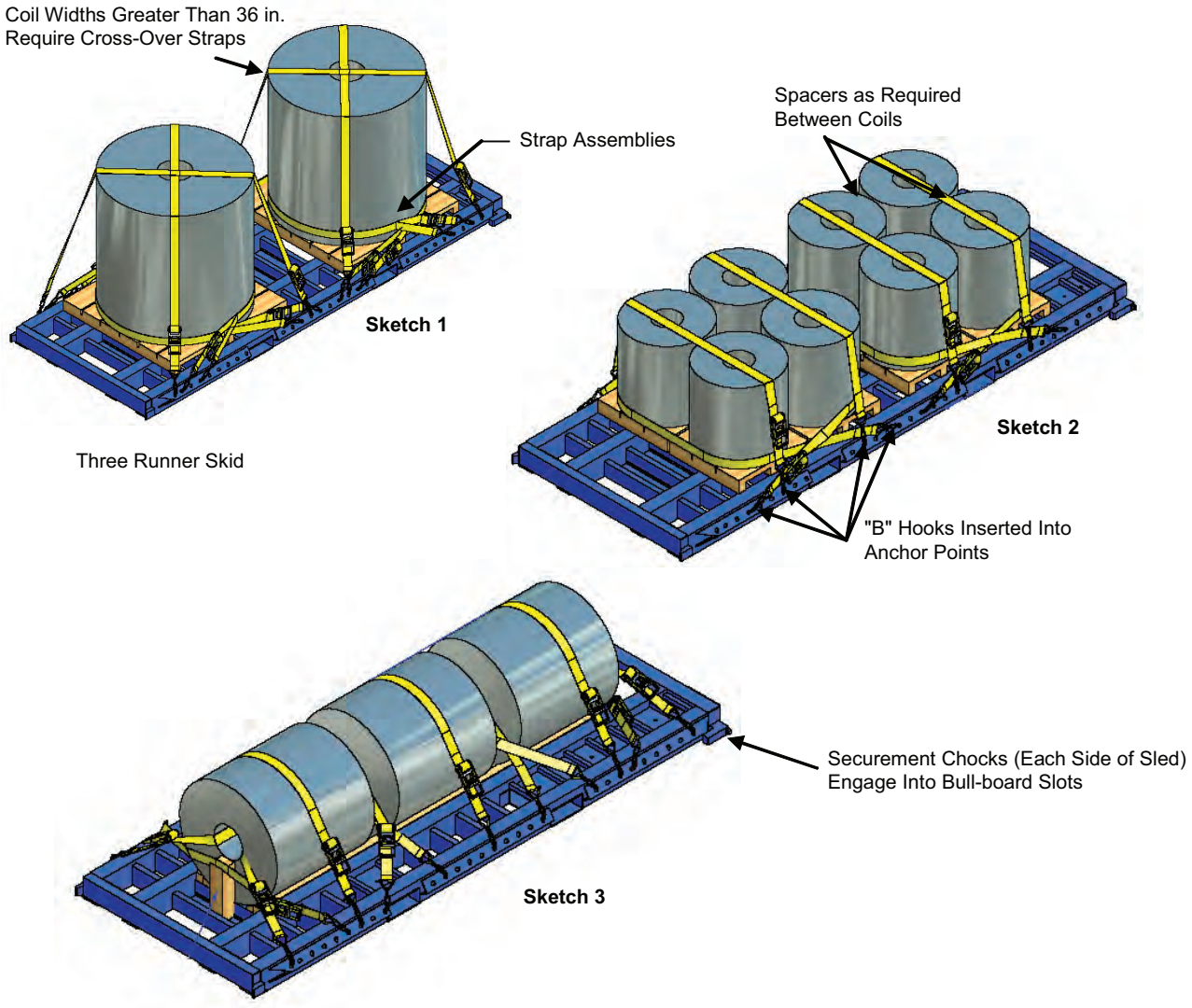


Figure 4.46

Method H-11
Metal coils on platforms/skids in 20 ft dry containers

Method H-12—A Barless Liner System to Transport Bulk Dry Flowable Commodities in 20 ft, 40 ft, and 40 ft High-Cube Closed ISO Containers

Use this method for shipping dry flowable commodities in bulk inside of 20 ft, 40 ft, and 40 ft high-cube closed ISO containers. The maximum weight shipped may not exceed the load limit of the particular vehicle of conveyance. Lading weight in trailers and containers must be evenly distributed both crosswise and lengthwise, and the combined weight of lading must conform to all federal, state, provincial, and local regulations and transportation service requirements.

Figure 4.47:

1. Cover rough surfaces or projections of the sidewall with fiberboard sheets or other suitable material.

2. Follow the manufacturer's instructions for installation and securement of the barless liner system.

   a. Place the liner in the container toward the back. 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 filled liner along its length when the container is tilted.

   f. First, connect the back upper anchor straps to the container rings (one section at a time) and pull tight. Second, 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.

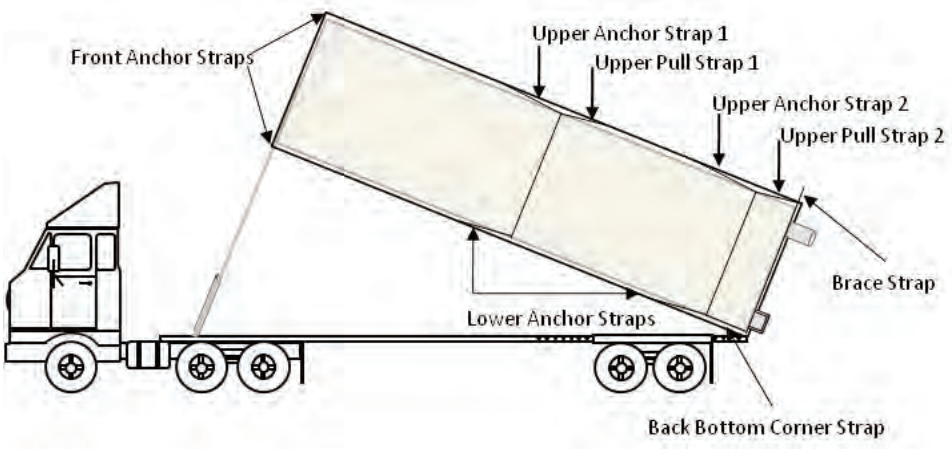
   g. Using a snap hook, raise the back of the liner with the brace strap. To attain the proper height, step on the blue strap located at the bottom back corner of the liner and pull the strap tight until the back corners are stretched tight. This will appear to lift the liner off the container floor by a couple of inches.

   h. After the liner 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.

NOTE: Be sure the liner is stretched tight the length of the container prior to filling to ensure proper weight distribution and liner length. If liner is loose between anchor straps, too much weight will be placed on the straps and the liner will be too short once it reaches the back of the container.

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	



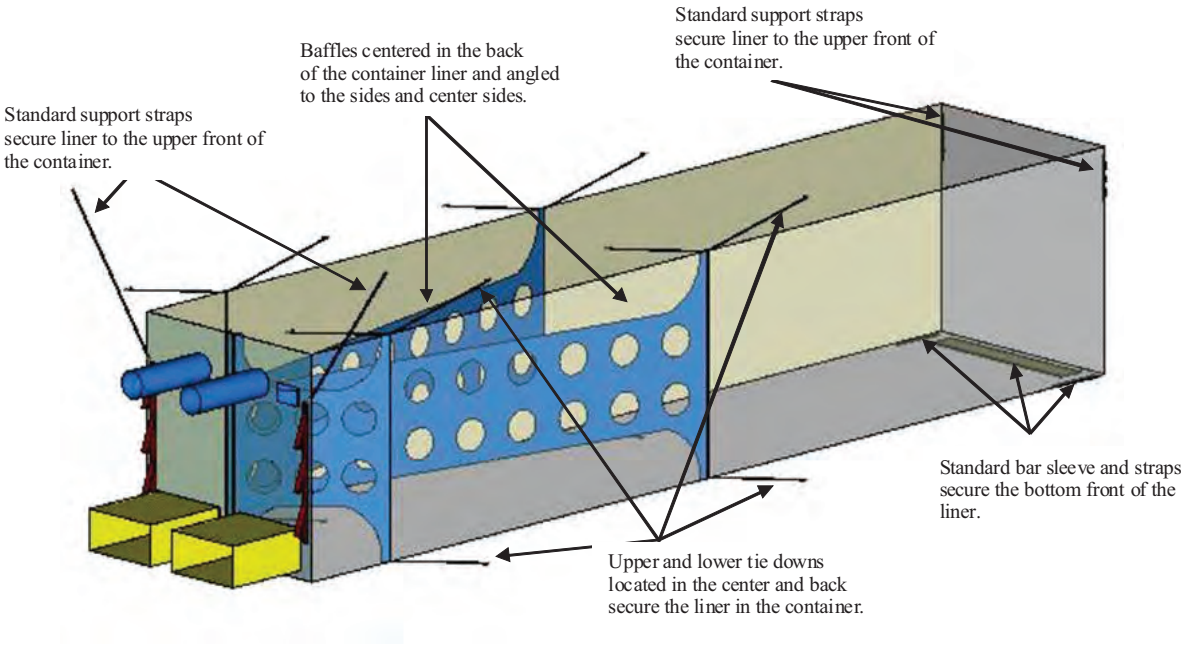


Figure 4.47

Method H-12
Barless liner system

Method H-13—A Securement System for Wheeled Vehicles in ISO Containers in Intermodal Service

The following method has been tested and found successful in loading wheeled vehicles in intermodal service. The maximum weight per vehicle during testing was 4,780 lb, and the maximum load weight per container was 43,000 lb. The various size units were loaded from one to three wide. The floor rating at the time of testing was 24,000 lb.

Figure 4.48:

1. Before loading, inspect the container to ensure that a sufficient number of lashing points in good order are available and that the floor shows no signs of excessive wear that might hinder vehicle placement and support.

2. Vehicle spacing is limited by the number of available lashing points and the weight of vehicles. The combined weight of vehicles and container must conform to all federal, state, provincial, and local regulations and transportation service requirements used at origin and final destination.

3. All vehicle batteries must be disconnected and terminals taped. Secure all handles, latches, and other devices to prevent movement during transportation.

4. Vehicles should be loaded into the container facing in with brake on, if so equipped.

5. Use floor blocking adjacent to each tire at the vehicle front and rear, except when loaded tight to the nose wall. If metal floor components prevent chock contact with tires, locate the chock tight to a rigid vehicle frame component to negate longitudinal movement of the vehicle during transit.

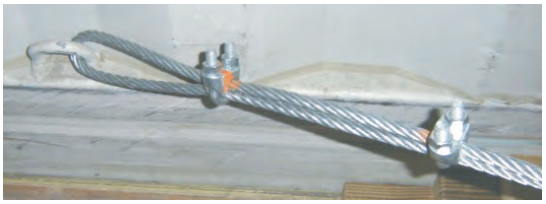
6. Fabricate floor blocking using nominal sizes indicated on **Sketch 1**. Nail in a staggered pattern with 16d nails approximately every 3 in.

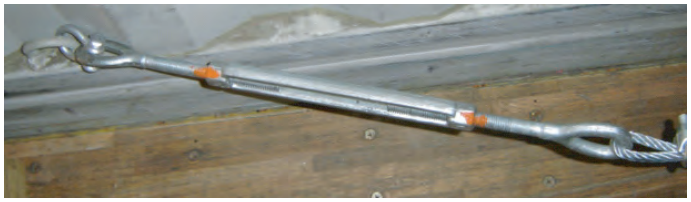
Item	No. of Pieces	Description
A	1	Floor blocking (see **Sketch 1**).
B	1	2 in. × 6 in. × outside width of vehicle
C	4	2 in. × 6 in. × 18 in.
D	2	2 in. × 6 in. × 9 in.
E	2	Composite or wood chock
F	1	2 in. × 6 in. between wheels when needed

7. When stowed one wide, use floor blocking adjacent to the outside of each tire. Nail boards 2 in. × 6 in. × ½ in. diameter of tire to the floor using 16d nails.

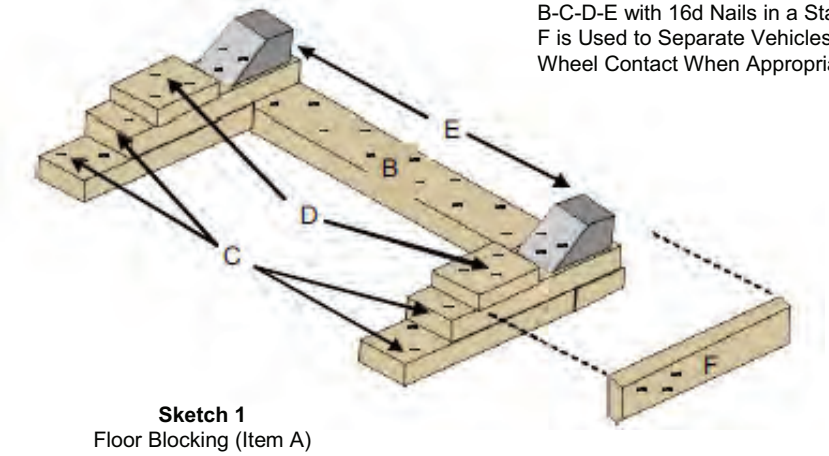
Tie down each stack of vehicles at the front and rear by applying a 3/8 in. aircraft cable (approximately14,400 lb tensile) running crosswise through each vehicle where accessible and securing it to anchor points on each side of the container; one side by clamps and the opposite side by turnbuckle. See the following photos.

NOTE: Ensure that the turnbuckle is secured against movement during transit.





Nail Components in Position in the Following Order:
B-C-D-E with 16d Nails in a Staggered Pattern.
F is Used to Separate Vehicles from Wheel to
Wheel Contact When Appropriate.



Sketch 1
Floor Blocking (Item A)

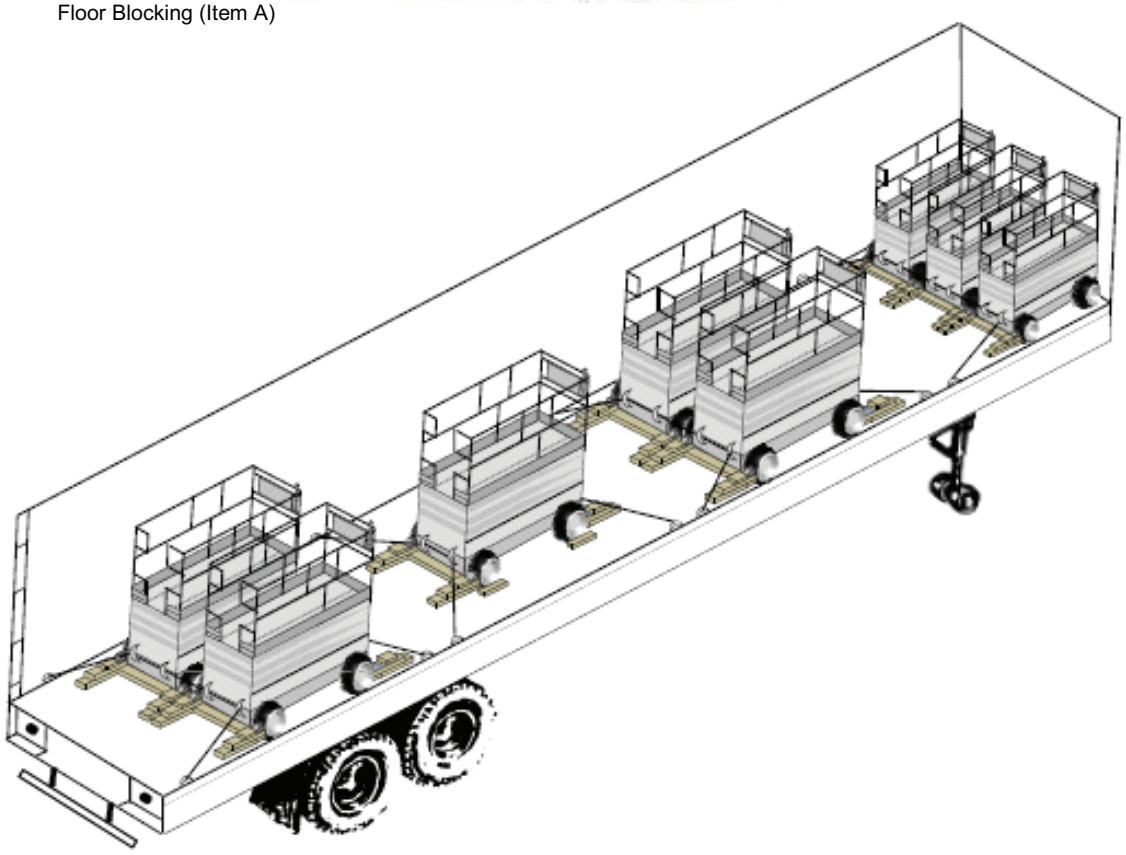


Figure 4.48

Method H-13
Wheeled vehicles in ISO containers

Method H-14—Case Goods Secured with Floor Blocking and Super Wedge® Manufactured by Logistick, Inc.

The following method has been tested and found successful in loading and bracing case goods unitized on pallets secured by Super Wedge® manufactured by Logistick, Inc., when shipped in equipment having metal-lined sidewalls. Follow manufacturer's installation guide for securing the dunnage to the sidewalls. The test load weighed approximately 44,000 lb.

Figure 4.49:

1. Cover rough surfaces or projections of the sidewall with fiberboard sheets or other suitable material, except between sidewall and Super Wedge.

2. Use a securement system by Logistick, Inc., to secure the load from lengthwise movement. The compartmentized system is composed of Super Wedge, 2 in. × 4 in. floor blocking, honeycomb void fillers, and either 4 in. × 4 in. lumber beams or two 2 in. × 4 in. laminated lumber beams.

3. Plan the load so crosswise spaces are minimized, and fill all lateral void space with appropriate fillers to prevent crosswise movement.

4. Divide the load into three sections with the units stowed in two rows. Begin loading the units tight to the nose wall and adjacent to each sidewall. The floor blocking at the end of sections one and two consists of two 2 in. × 4 in. × 96 in. laminated boards laid tight to the adjacent pallet stringers and nailed to the floor. Use a minimum of ten 16d nails in a staggered pattern per layer. Use one 3½ in. thick by 8 ft wide by 50 in. high void filler having minimum crush strength of 1,500 lb/ft^2 between sections and positioned above the floor blocking between sections.

5. The floor blocking at the end of section three consists of two 2 in. × 4 in. × 96 in. laminated boards laid tight to the adjacent pallet stringers, reinforced with three backup cleats each two 2 in. × 4 in. × 18 in. laminated boards nailed to the floor. Use a minimum of ten 16d nails in a staggered pattern per layer for the 96 in. boards and a minimum of four 16d nails in a staggered pattern for the 18 in. boards.

6. Firmly attach three Super Wedges to each sidewall according to the manufacturer's instructions. Space the wedges vertically equidistant to cover the upper two thirds of the adjacent unit height and position them away from the face of the load to allow for insertion of a 1 in. thick void filler having minimum crush strength of 1,500 lb/ft^2 between the load and the 4 in. × 4 in. or two 2 in. × 4 in. laminated beams installed with 3 in. dimension upright.

7. Cut the beams to size according to Super Wedge manufacturer's instructions. Proper installation will result in the trailer walls expanding outward *slightly*.

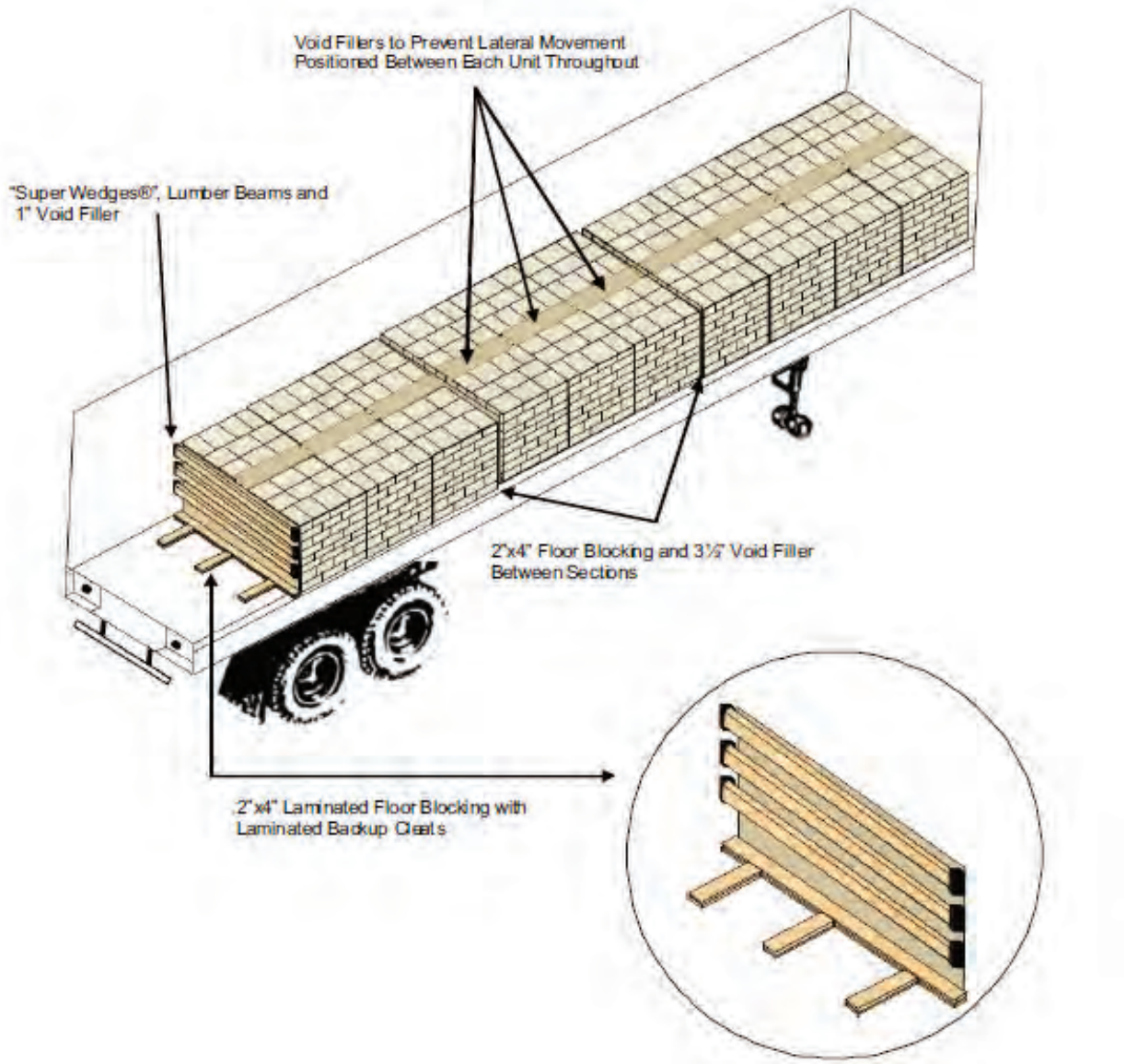


Figure 4.49

Method H-14
Case goods secured with "Super Wedge®" manufactured by Logistick, Inc.

I—NON-METALLIC STRAPPING

Method I-1—76 to 80 Tight-Head Steel or Plastic, 55-Gallon Drums in Two Layers Secured with 1¼ in. Wide Polyester Cordstrap® Composite Strapping (CC) 105 in 20 ft ISO Containers

Use this method 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 lb.* The method of bracing involves restraint of the drums by use of *1¼ in. wide Cordstrap® composite strapping (CC) 105* attached to the container D-rings are attached to other Cordstrap applications by use of CB10 metal buckles. (Follow the manufacturer's instructions for buckle application.) Use one 2 in. × 4 in. × 74 in. long wood board with ends cut at 45° angles at the rear of the container. During testing, horizontal straps were tensioned to approximately 1,438 lbf 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 lb.*

Figure 4.50:

NOTE: Approved for hazmat use only with 80-steel-drum loads.

80-Drum Loads (Figure 4.50 — Sketch 1)

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.

2. Install looped vertical Cordstraps and buckles using the container's D-rings:

   a. Locate the first set approximately 6 ft from the front of the load, with the buckle above load height.

   b. Locate the second set approximately 11 ft from the front of the load, with the buckle above load height.

   c. Locate the third set approximately 14 ft from the front of the load, with the buckle positioned in the middle of the strap. Protect the buckle from contact with adjacent drums.

   d. Always make sure that the strap is flat to the surface; avoid making a spiral turn.

NOTE: A pneumatic tensioner may be used to tension the verticals while recognizing the force limitations of the D-rings. A hand-held windlass tensioner also may be used.

3. Install a looped, diagonal Cordstrap and buckle from the bottom D-ring of the first vertical set to the buckle of the third vertical set. Do this to both sides.

4. On the first set of vertical Cordstraps,

   a. Loop a new horizontal run approximately 10 ft long around the vertical strap and position/tape it in place about 1½ ft from the floor for the bottom layer of drums.

   b. Loop a similar 10 ft run and position/tape it about 4½ ft from the floor for the top layer drums.

   c. Temporarily hold the ends of these lengths with tape or magnets to the side of the container.

   d. Repeat for the other side of the container.

5. On the second set of vertical Cordstraps,

   a. Loop a new horizontal run approximately 13 ft long around the vertical strap and position/tape it in place about 1½ ft from the floor for the bottom layer of drums.

   b. Loop a similar 13 ft run and position/tape it about 4½ ft from the floor for the top layer drums.

   c. Temporarily hold the ends of these lengths with tape or magnets to the side of the container.

   d. Repeat for the other side of the container.

6. On the third set of vertical Cordstraps,

   a. Loop a new horizontal run approximately 10 ft long around the vertical strap and position/tape it in place about 1½ ft from the floor for the bottom layer of drums.

   b. Loop a similar 10 ft run and position/tape it about 4½ ft from the floor for the top layer drums.

   c. Temporarily hold the ends of these lengths with tape or magnets to the corner of the container.

   d. Repeat for the other side of the container.

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. Use ¼ in. plywood or equivalent horizontal separators as needed.

8. After the sixth stack of drums is added,

   a. Pull the ends of the *top* Cordstrap installed on the *first set* of vertical straps from both sides together. Connect the ends with the buckles (two) and *use the pneumatic tensioner* to secure the top layer of drums.

   b. Pull the ends of the *bottom* Cordstrap installed on the *first set* of vertical straps from both sides together. Connect the ends with the buckles (two) and *use the pneumatic tensioner* to secure the bottom layer of drums.

NOTE: Always spread the two horizontal straps on each drum layer out toward the rolling hoops. This will help to spread the load over the strongest part of the drum.

9. Proceed to load the drums in a 4-3-4-3-2 pattern for the bottom and top layers. Use ½ in. plywood or equivalent horizontal separators as needed. The last row should consist of two drums that are positioned in the middle.

10. Loop a Cordstrap approximately 10 ft long from the bottom rear D-ring and position it for securing a 2 in. × 4 in. × 74 in. long wood board. Do this to both sides.

11. After the last row of drums is added,

   a. Pull the ends of the *top* Cordstrap installed on the *third set* of vertical straps from both sides together. Connect the ends with the buckles (two) and *use the pneumatic tensioner* to secure the top drum layer.

   b. Pull the ends of the *bottom* Cordstrap installed on the *third set* of vertical straps from both sides together. Connect the ends with the buckles (two) and *use the pneumatic tensioner* to secure the bottom layer.

12. Load the remaining four drums at each corner of the container.

NOTE: Install drum protection to preclude strap damage to the corner drums if shipping plastic drums.

13. After the last corner drums are loaded,

    a. Pull the ends of the *top* Cordstrap installed on the *second set* of vertical straps from both sides together. Connect the ends with the buckles (two) and *use the pneumatic tensioner* to secure the top drum layer.

    b. Pull the ends of the *bottom* Cordstrap installed on the *second set* of vertical straps from both sides together. Connect the ends with the buckles (two) and *use the pneumatic tensioner* to secure the bottom layer.

14. Place a 2 in. × 4 in. × 74 in. long wood board (ends cut at a 45° angle) upright on edge on the floor against the center floor drums, and pull the ends of the Cordstraps from both sides together. Connect the ends with the buckles (two) and *use the pneumatic tensioner* to secure the board in position.

NOTE: Use strap hangers or tape to maintain strap positioning at the rear face of the load.

78-Drum Loads (Figure 4.50 — Sketch 2)

15. Load 78-drum loads in 11 stacks using a 4-3-4-3-4-4-3-4-3-4-3 pattern from the nose to the rear.

16. Secure each section of the load using similar methodology to that noted in numbers 1 through 14. The location and estimated length of strapping is adjusted for the respective load pattern to be used. See Figure 4.50 — Sketch 2.

76-Drum Loads (Figure 4.50 — Sketch 3)

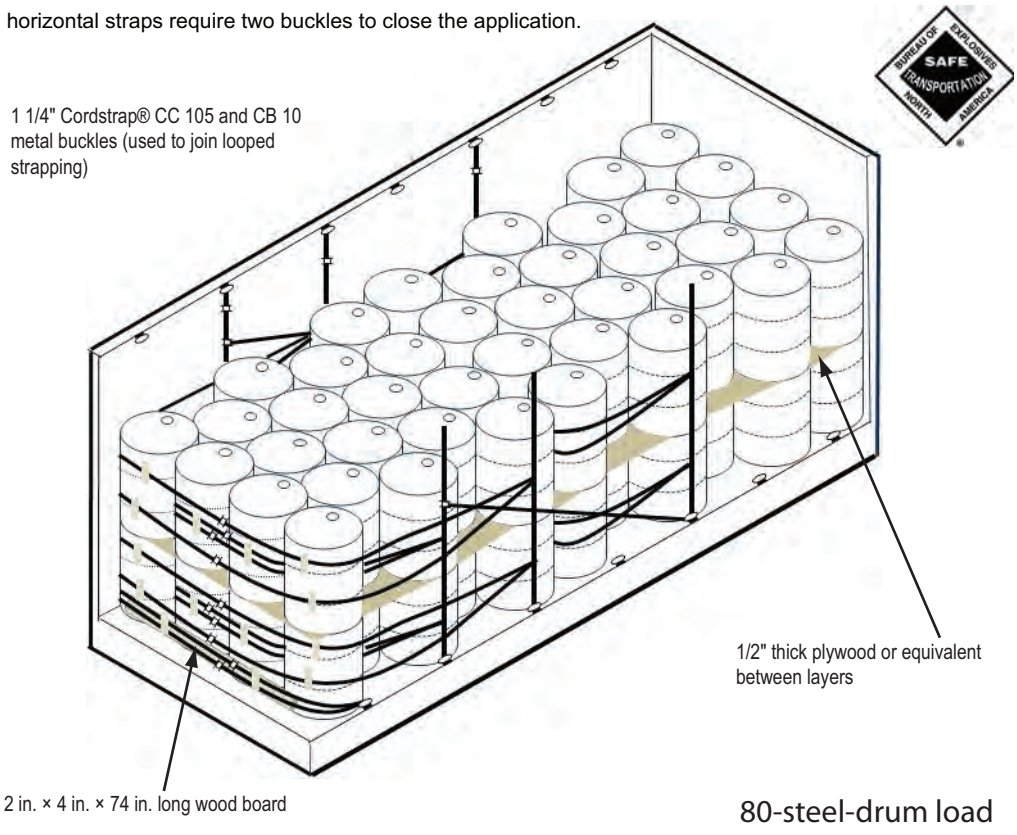
17. Loads containing 76 drums can be loaded in 10 stacks using a 4-4-4-3-4-4-4-4-3-4 pattern from the nose to the rear.

18. Secure each section of the load using methodology similar to that noted in paragraphs 1 through 14 above. The location and estimated length of strapping are adjusted for the respective load pattern to be used. See Figure 4.50 — Sketch 3.

The following separators have been evaluated and found acceptable for one-time use with this loading method. These separators were tested under simulated conditions, and their acceptance may be withdrawn if loads exhibit consistent load failures. If used with hazmat loads, these panels must be compatible with the contents of the drums.

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	.375 in.	Corrugated (*not* for use with corrosives)	AIA/Down River
Ship Tite 3	.625 in.	Corrugated (*not* for hazmat use)	AIA/Down River
Ship Tite 5	3.2 mm	Corrugated	AIA/Down River
Generic	3.0 mm	Eucalyptus hardboard	Greif
PlyVeneer®	3.0 mm	Wood veneer with a Kraft linerboard overlay	PlyVeneer Products
Tier 55	1.0 in., 0.50 in.	Corrugated	Damage Prevention Company

NOTE: All looped horizontal straps require two buckles to close the application.



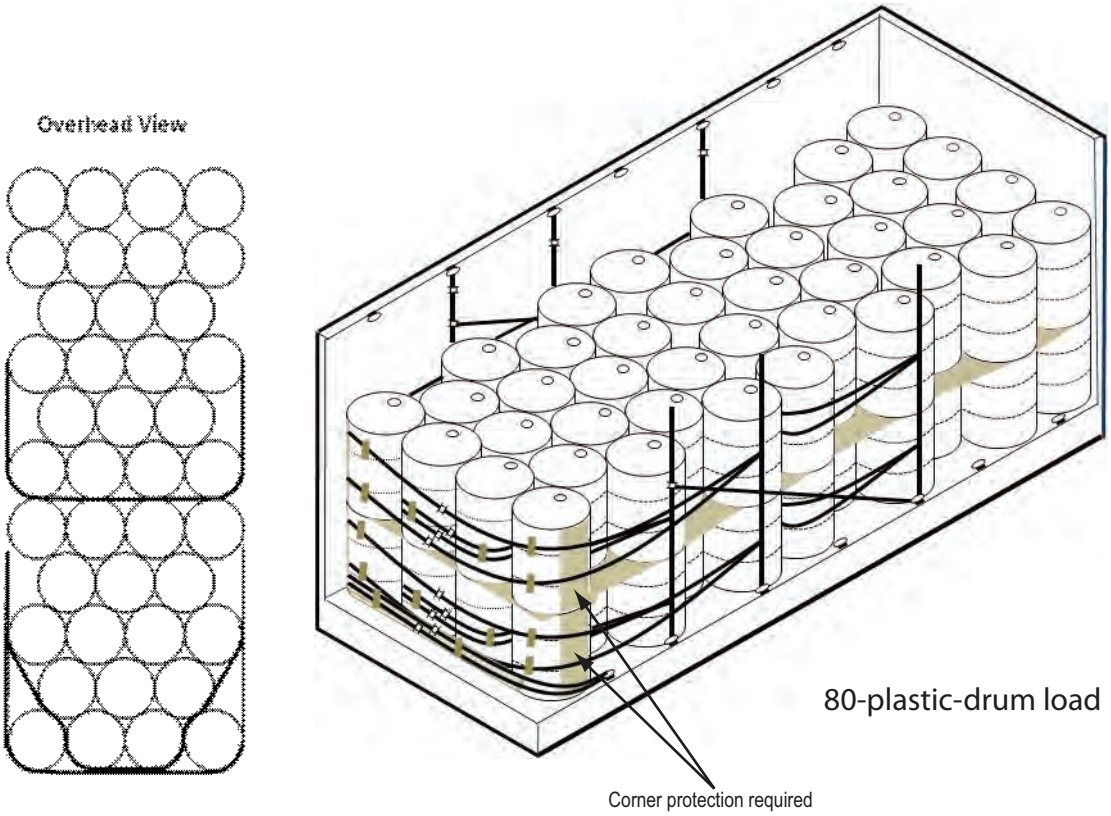
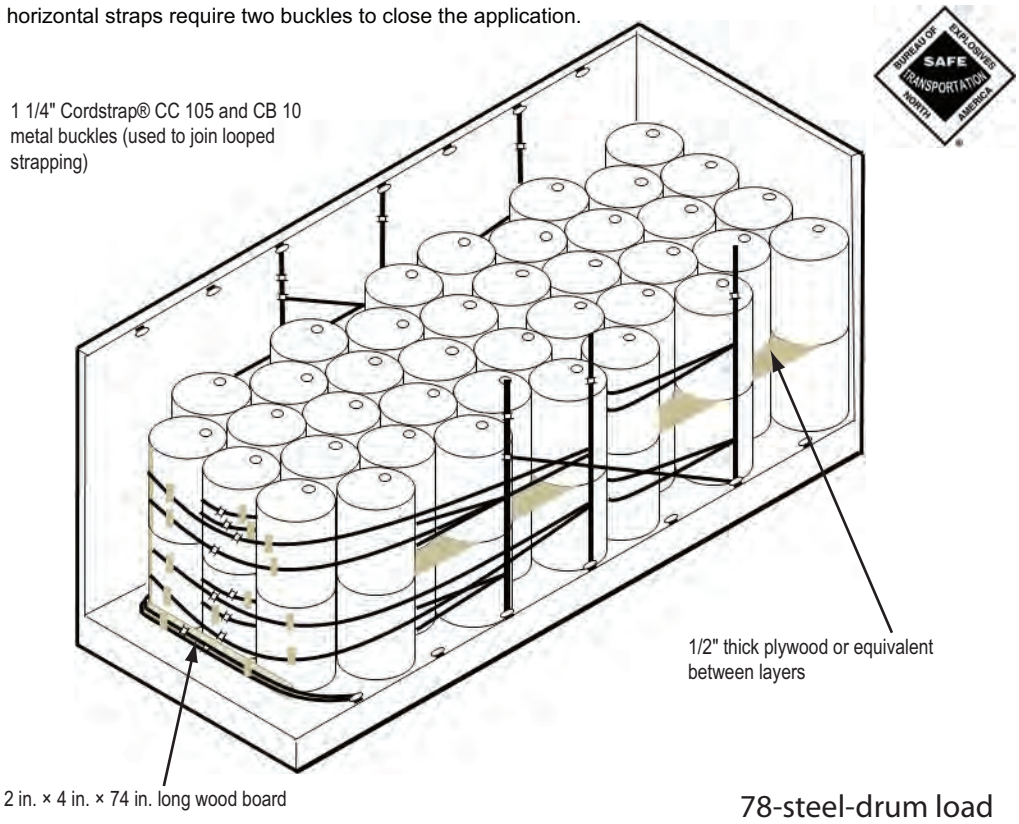
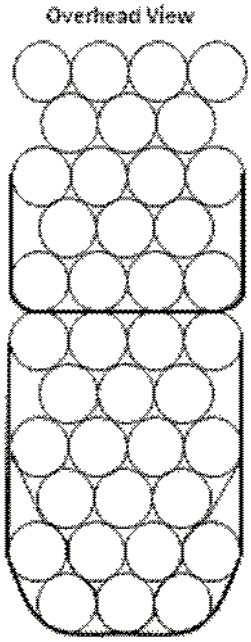


Figure 4.50 — Sketch 1

Method I-1
80-drum loads

NOTE: All looped horizontal straps require two buckles to close the application.





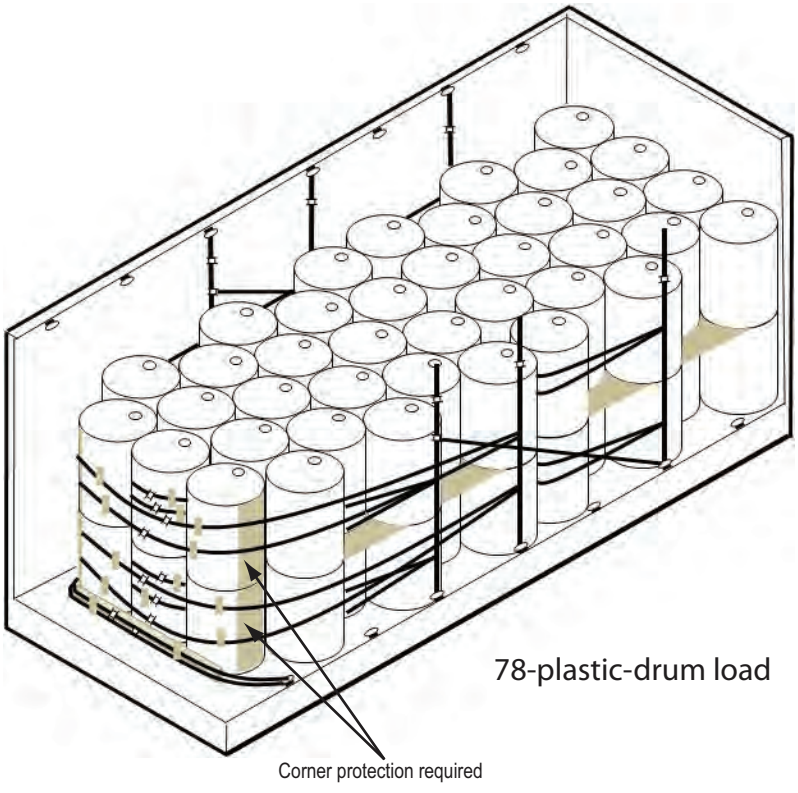
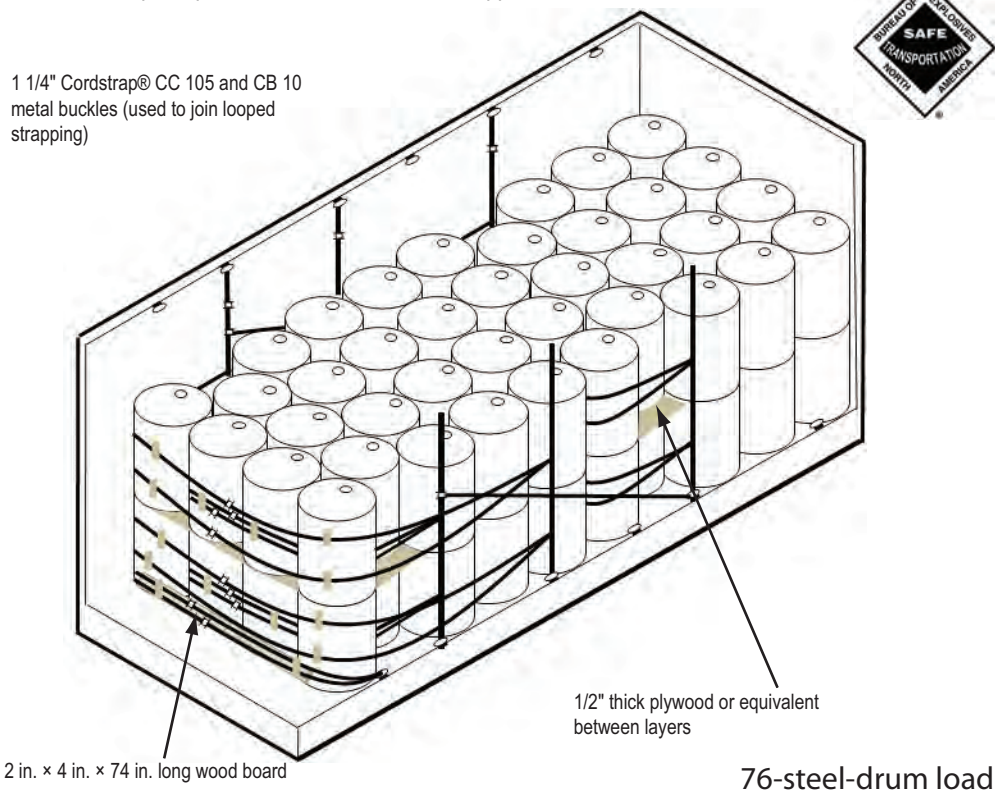


Figure 4.50 — Sketch 2

Method I-1
78-drum loads

NOTE: All looped horizontal straps require two buckles to close the application.



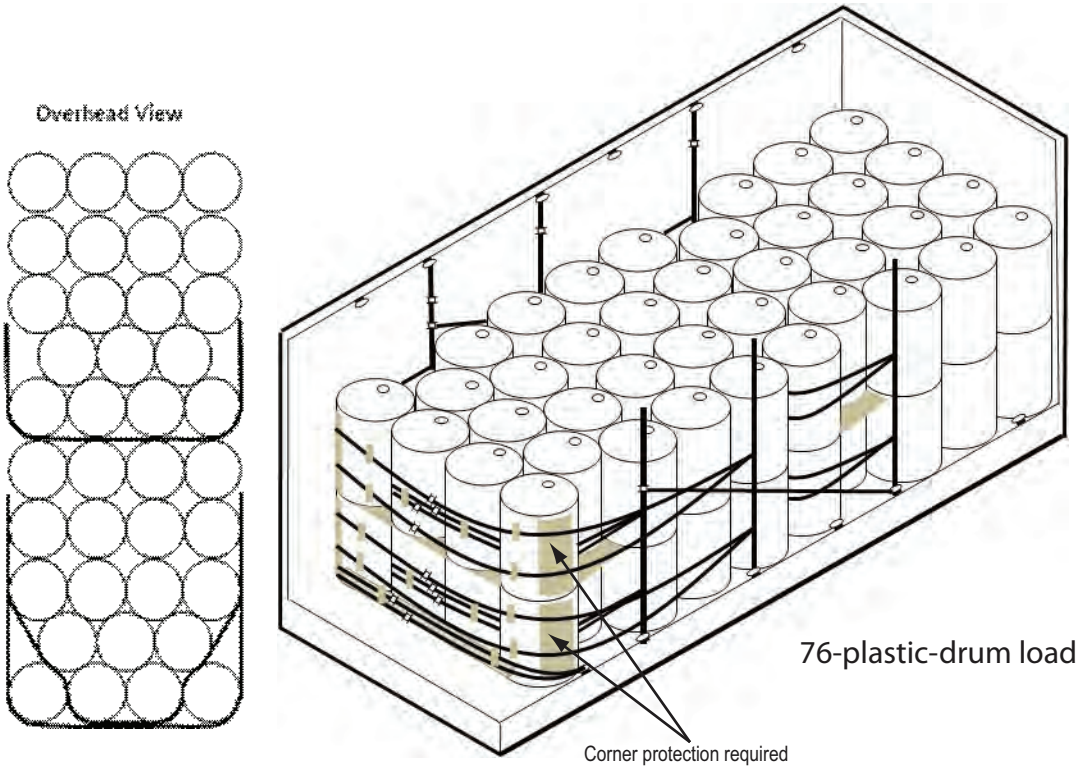


Figure 4.50 — Sketch 3

Method I-1
76-drum loads

Method I-2—80 Tight-Head Steel, 55-Gallon Drums in Two Layers Secured with 1¼ in. Wide Polyester Woven Cord Strapping (CS) 2040 by Carolina Strapping and Buckles Company in 20 ft ISO Containers

Use this method for eighty tight-head steel drums loaded in a 20 ft ISO container. *The load limit for this system must not exceed 40,000 lb.* The method of bracing involves restraint of the drums by use of *1¼ in. wide polyester woven cord strapping (CS) 2040* attached to the container D-rings and attached to other strap applications by use of CS 3035 metal buckles. (Follow the manufacturer's instructions for buckle application.) During testing, horizontal straps were tensioned with a manual windlass tensioner (CS 4060).

Figure 4.51:

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.

2. Install looped vertical straps and buckles using the container's D-rings:

   a. Locate the first set approximately 6 ft from the front of the load, with the buckle above load height.

   b. Locate the second set approximately 11 ft from the front of the load, with the buckle above load height.

   c. Locate the third set approximately 14 ft from the front of the load, with the buckle positioned in the middle of the strap. Protect the buckle from contact with adjacent drums.

   d. Always make sure that the strap is flat to the surface; avoid making a spiral turn.

NOTE: A pneumatic tensioner may be used to tension the straps while recognizing the force limitations of the D-rings. A hand-held windlass tensioner also may be used.

3. Install a looped, diagonal strap and buckle from the bottom D-ring of the first vertical set to the buckle of the third vertical set. Do this to both sides.

4. On the first set of vertical straps,

   a. Loop a new horizontal run approximately 10 ft long around the vertical straps and position/tape it in place about 1½ ft from the floor for the bottom layer of drums.

   b. Loop a similar 10 ft run and position/tape it about 4½ ft from the floor for the top layer drums.

   c. Temporarily hold the ends of these lengths with tape or magnets to the side of the container.

   d. Repeat for the other side of the container.

5. On the second set of vertical straps,

   a. Loop a new horizontal run approximately 13 ft long around the vertical straps and position/tape it in place about 1½ ft from the floor for the bottom layer of drums.

   b. Loop a similar 13 ft run and position/tape it about 4½ ft from the floor for the top layer drums.

   c. Temporarily hold the ends of these lengths with tape or magnets to the side of the container.

   d. Repeat for the other side of the container.

6. On the third set of vertical straps,

   a. Loop a new horizontal run approximately 10 ft long around the vertical strapping and position/tape it in place about 1½ ft from the floor for the bottom layer of drums.

   b. Loop a similar 10 ft run and position/tape it about 4½ ft from the floor for the top layer drums.

   c. Temporarily hold the ends of these lengths with tape or magnets to the corner of the container.

   d. Repeat for the other side of the container.

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. Use ¼ in. plywood or equivalent horizontal separators as needed.

8. After the sixth stack of drums is added,

   a. Pull the ends of the *top* strap installed on the *first* set of vertical straps from both sides together. Connect the ends with the buckles (two) and use a tensioner to secure the top layer of drums.

   b. Pull the ends of the *bottom* strap installed on the *first* set of vertical straps from both sides together. Connect the ends with the buckles (two) and use a tensioner to secure the bottom layer of drums.

NOTE: Always spread the two horizontal straps on each drum layer out toward the rolling hoops. This will help to spread the load over the strongest part of the drum. Use strap hangers at the face of the load to maintain strap position.

9. Proceed to load the drums in a 4-3-4-3-2 pattern for the bottom and top layers. Use ¼ in. plywood or equivalent horizontal separators as needed. The last row should consist of two drums that are positioned in the middle.

10. Loop a strap approximately 10 ft long from the bottom rear D-ring and position it for securing the doorward lower face of the last stack. Do this to both sides.

   a. After the last row of drums is added,

   b. Pull the ends of the *top* strap installed on the *third* set of vertical straps from both sides together. Connect the ends with the buckles (two) and use the tensioner to secure the top drum layer.

   c. Pull the ends of the *bottom* strap installed on the *third* set of vertical straps from both sides together. Connect the ends with the buckles (two) and use the tensioner to secure the bottom layer.

11. Load the remaining four drums at each corner of the container.

12. After the last corner drums are loaded,

    a. Pull the ends of the *top* strap installed on the *second* set of vertical straps from both sides together. Connect the ends with the buckles (two) and use the tensioner to secure the top drum layer.

    b. Pull the ends of the *bottom* strap installed on the *second* set of vertical straps from both sides together. Connect the ends with the buckles (two) and use the tensioner to secure the bottom layer.

13. Pull the ends of the straps installed at the rear D-rings from both sides together. Connect the ends with the buckles (two) and use the tensioner to secure the bottom layer.

The following separators have been evaluated and found acceptable for one time use with this loading method. These separators were tested under simulated conditions and their acceptance may be withdrawn if loads exhibit consistent load failures. If used with hazmat loads, these panels must be compatible with the contents of the drums.

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	.375 in.	Corrugated (*not* for use with corrosives)	AIA/Down River
Ship Tite 3	.625 in.	Corrugated (*not* for hazmat use)	AIA/Down River
Ship Tite 5	3.2 mm	Corrugated	AIA/Down River
Generic	3.0 mm	Eucalyptus hardboard	Greif
PlyVeneer®	3.0 mm	Wood veneer with a Kraft linerboard overlay	PlyVeneer Products
Tier 55	1.0 in., 0.50 in.	Corrugated	Damage Prevention Company

NOTE: All looped horizontal straps require two buckles to close the application.

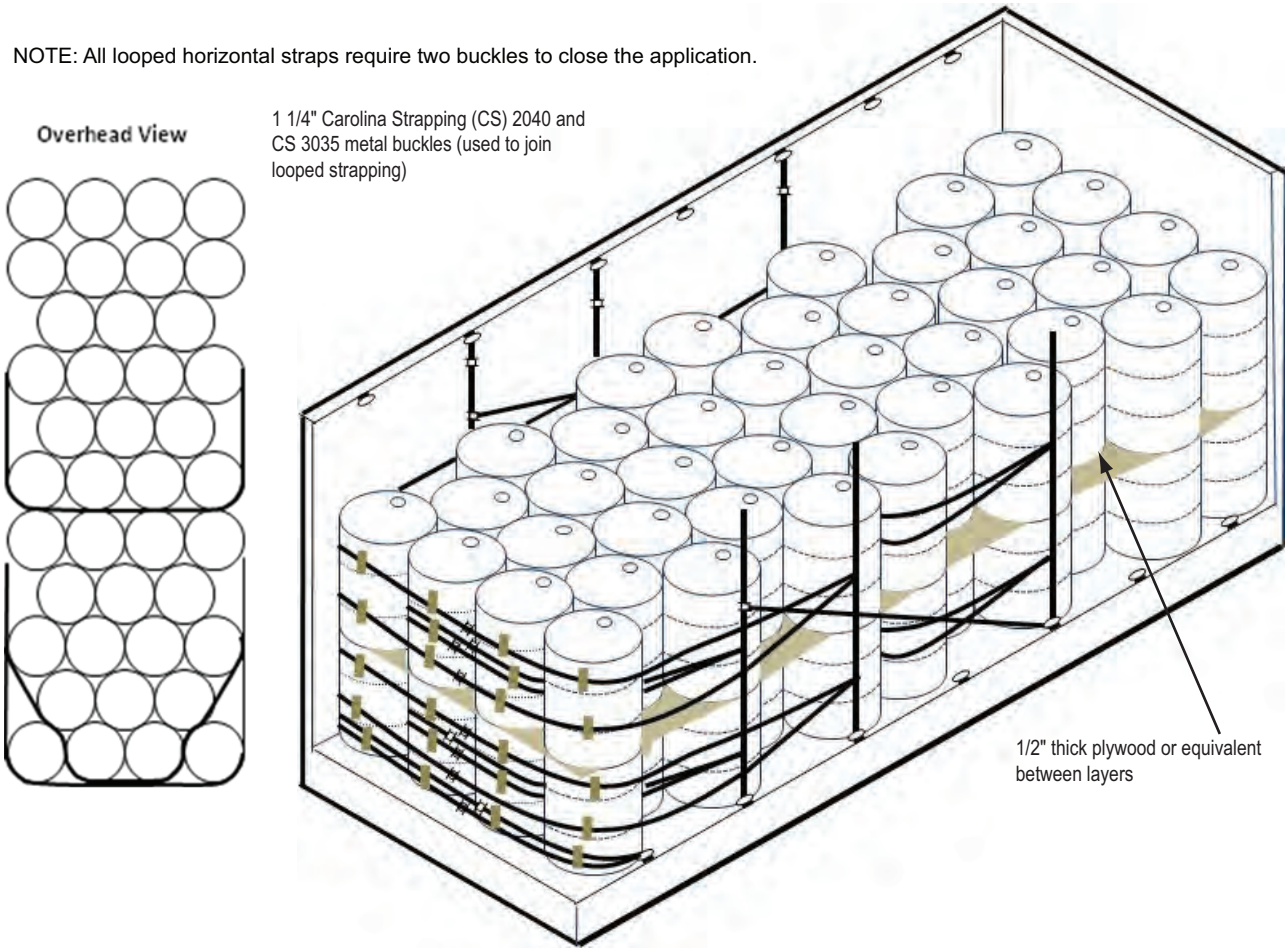


Figure 4.51

Method I-2
80-drum load

Method I-3—78 Tight-Head Plastic, 55-Gallon Drums in Two Layers Secured with 1¼ in. Wide Polyester Woven Cord Strapping (CS) 2040 by Carolina Strapping and Buckles Company in 20 ft ISO Containers

Use this method for seventy-eighty tight-head plastic drums loaded in a 20 ft dry container. *The load limit for this system must not exceed 40,000 lb.* The method of bracing involves restraint of the drums by use of *1¼ in. wide polyester woven cord strapping (CS) 2040* attached to the container D-rings and attached to other strap applications by use of CS 3035 metal buckles. (Follow the manufacturer's instructions for buckle application.) During testing, horizontal straps were tensioned with a manual windlass tensioner (CS 4060).

Figure 4.52:

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.

2. Install looped vertical straps and buckles using the container's D-rings at each side of the container:

   a. Locate the first set approximately 6 ft from the front of the load, with the buckle above load height.

   b. Locate the second set approximately 11 ft from the front of the load, with the buckle above load height.

   c. Locate the third set approximately 14 ft from the front of the load, with the buckle positioned in the middle of the strap. Protect the buckle from contact with adjacent drums.

   d. Always make sure that the strap is flat to the surface; avoid making a spiral turn.

NOTE: A pneumatic tensioner may be used to tension the straps while recognizing the force limitations of the D-rings. A hand-held windlass tensioner also may be used.

3. Install a looped, diagonal strap and buckle from the bottom D-ring of the first vertical set to the buckle of the third vertical set. Do this to both sides.

4. On the first set of vertical straps,

   a. Loop a new horizontal run approximately 10 ft long around the vertical strap and position/tape it in place about 1½ ft from the floor for the bottom layer of drums.

   b. Loop a similar 10 ft run and position/tape it about 4½ ft from the floor for the top layer drums.

   c. Temporarily hold the ends of these lengths with tape or magnets to the side of the container.

   d. Repeat for the other side of the container.

5. On the second set of vertical straps,

   a. Loop a new horizontal run approximately 13 ft long around the vertical strap and position/tape it in place about 1½ ft from the floor for the bottom layer of drums.

   b. Loop a similar 13 ft run and position/tape it about 4½ ft from the floor for the top layer drums.

   c. Temporarily hold the ends of these lengths with tape or magnets to the side of the container.

   d. Repeat for the other side of the container.

6. On the third set of vertical straps,

   a. Loop a new horizontal run approximately 10 ft long around the vertical strap and position/tape it in place about 1½ ft from the floor for the bottom layer of drums.

   b. Loop a similar 10 ft run and position/tape it about 4½ ft from the floor for the top layer drums.

   c. Temporarily hold the ends of these lengths with tape or magnets to the corner of the container.

   d. Repeat for the other side of the container.

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. Use ¼ in. plywood or equivalent horizontal separators as needed.

8. After the sixth stack of drums is added,

   a. Pull the ends of the *top* strap installed on the *first* set of vertical straps from both sides together. Connect the ends with the buckles (two) and use a tensioner to secure the top layer of drums.

   b. Pull the ends of the *bottom* strap installed on the *first* set of vertical straps from both sides together. Connect the ends with the buckles (two) and use a tensioner to secure the bottom layer of drums.

NOTE: Always spread the two horizontal straps on each drum layer out toward the rolling hoops. This will help to spread the load over the strongest part of the drum. Use strap hangers at the face of the load to maintain strap position.

9. Proceed to load the drums in a 4-3-4-3-2 pattern for the bottom and top layers. Use ¼ in. plywood or equivalent horizontal separators as needed. The last row should consist of two drums that are positioned in the middle.

10. Loop a strap approximately 10 ft long from the bottom rear D-ring and position it for securing the doorward lower face of the last stack. Do this to both sides.

11. After the last row of drums is added,

   a. Pull the ends of the *top* strap installed on the *third* set of vertical straps from both sides together. Connect the ends with the buckles (two) and use the tensioner to secure the top drum layer.

   b. Pull the ends of the *bottom* strap installed on the *third* set of vertical straps from both sides together. Connect the ends with the buckles (two) and use the tensioner to secure the bottom layer.

12. Load the remaining four drums at each corner of the container and place sufficient protection at the outside of each drum to preclude the strap from creasing the adjacent drums.

13. After the last corner drums are loaded,

    a. Pull the ends of the *top* strap installed on the *second* set of vertical straps from both sides together. Connect the ends with the buckles (two) and use the tensioner to secure the top drum layer.

    b. Pull the ends of the *bottom* strap installed on the *second* set of vertical straps from both sides together. Connect the ends with the buckles (two) and use the tensioner to secure the bottom layer.

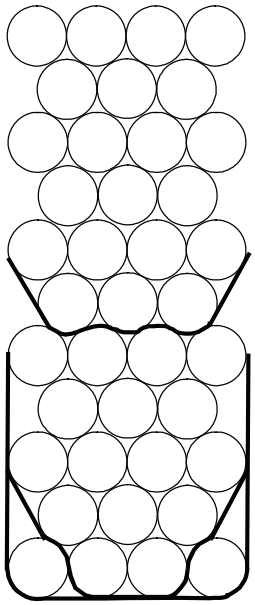
14. Place a 2 in. × 4 in. × 74 in. long wood board (ends cut at a 45° angle) upright on edge on the floor against the center floor drums and pull the ends of the straps from both sides together. Connect the ends with the buckles (two) and use the tensioner to secure the board in position.

The following separators have been evaluated and found acceptable for one time use with this loading method. These separators were tested under simulated conditions and their acceptance may be withdrawn if loads exhibit consistent load failures. If used with hazmat loads, these panels must be compatible with the contents of the drums.

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	.375 in.	Corrugated (*not* for use with corrosives)	AIA/Down River
Ship Tite 3	.625 in.	Corrugated (*not* for hazmat use)	AIA/Down River
Ship Tite 5	3.2 mm	Corrugated	AIA/Down River
Generic	3.0 mm	Eucalyptus hardboard	Greif
PlyVeneer®	3.0 mm	Wood veneer with a Kraft linerboard overlay	PlyVeneer Products
Tier 55	1.0 in., 0.50 in.	Corrugated	Damage Prevention Company

NOTE: All looped horizontal straps require two buckles to close the application.

Overhead View



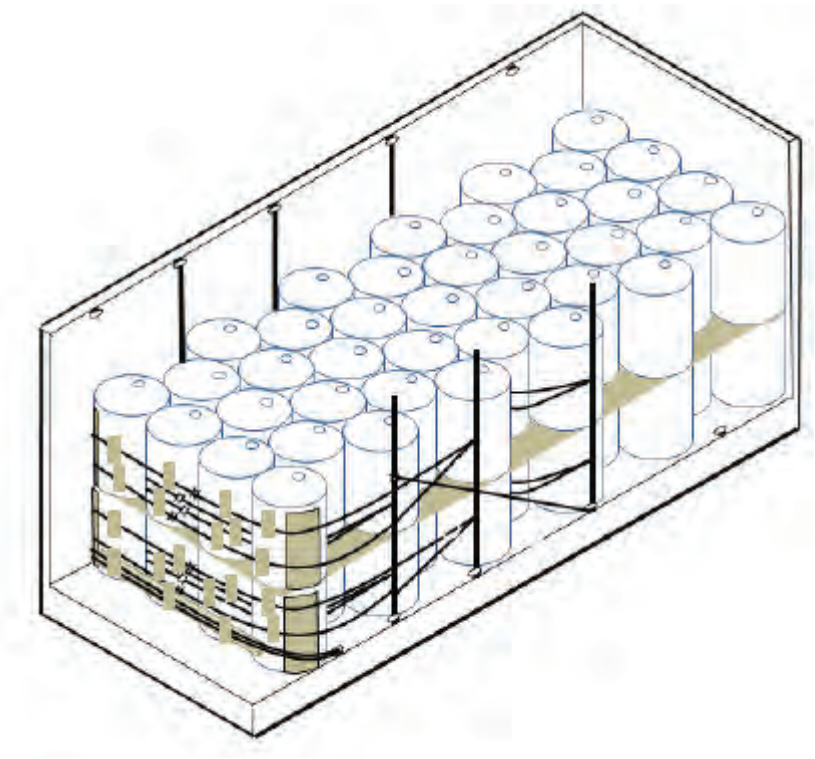


Figure 4.52

Method I-3
80-drum load

Method I-4—Double-Layer Loads of Nonhazardous Materials Secured with Cordstrap® Barriers in a 20 ft Container

The following bracing method uses Cordstrap® barriers that are attached to the forward corner posts of a container with CornerLash® anchors.

Figure 4.53:

1. This load may contain double-decked closed-head drums loaded in a modified 4-3-4 pattern, intermediate bulk containers (IBCs), or any palletized product two layers high. Any combination of product mix is acceptable.

2. Use suitable dividers between different product mix. When drums are loaded, this can be 1/4 in. plywood or equivalent.

3. The following separators have been evaluated and found acceptable for one-time use with this loading method. These separators were tested under simulated conditions, and their acceptance may be withdrawn if loads exhibit consistent load failures. If used with hazmat loads, these panels must be compatible with the contents of the drums.

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	.375 in.	Corrugated (not for use with corrosives)	AIA/Down River
Ship Tite 3	.625 in.	Corrugated (not for hazmat use)	AIA/Down River
Ship Tite 5	3.2 mm	Corrugated	AIA/Down River
Generic	3.0 mm	Eucalyptus hardboard	Greif
PlyVeneer®	3.0 mm	Wood veneer with a Kraft linerboard overlay	PlyVeneer Products
Tier 55	1.0 in., 0.50 in.	Corrugated	Damage Prevention Company

4. Install CornerLash® strap anchors at the heights specified and thread Cordlash® 200LE Type 1A, Grade 7 strap through the anchors, extending out the container doors.

Figure 4.53 CornerLash® element installed

Figure 4.53— Sketch 1

1. Use triple-wall corrugated fiberboard as buffer sheets between the drums and the straps in the doorway.

2. Interlace the straps around the last stack of drums as shown in Figure 4.53— Sketch 1. Horizontally align the straps with the upper and lower drum rolling hoops. Join the straps using Dynablock® ladder-type buckles and tension with a Cordstrap CT50PN pneumatic tensioner.

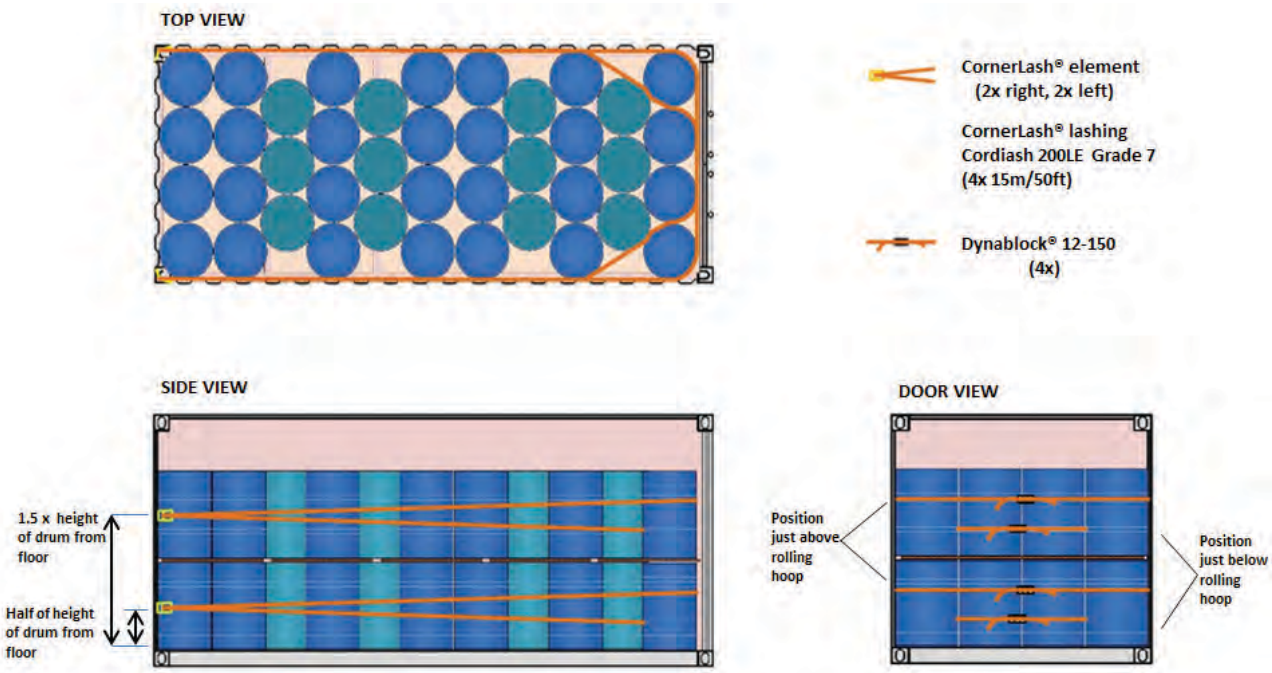


Figure 4.53— Sketch 1

Method I-1
80-drum load

Figure 4.53— Sketch 2 and Figure 4.53— Sketch 3

1. Secure 2 in. × 4 in. lumber vertically to the corners of IBCs for corner protection.

2. Horizontally align the straps at the base of the IBCs and at approximately two-thirds of the height of the IBCs as shown in Figure 4.53— Sketch 2. Join the straps using Dynablock® ladder-type buckles and tension with a Cordstrap CT50PN pneumatic tensioner.

3. Use strap hangers or tape to maintain straps in position.

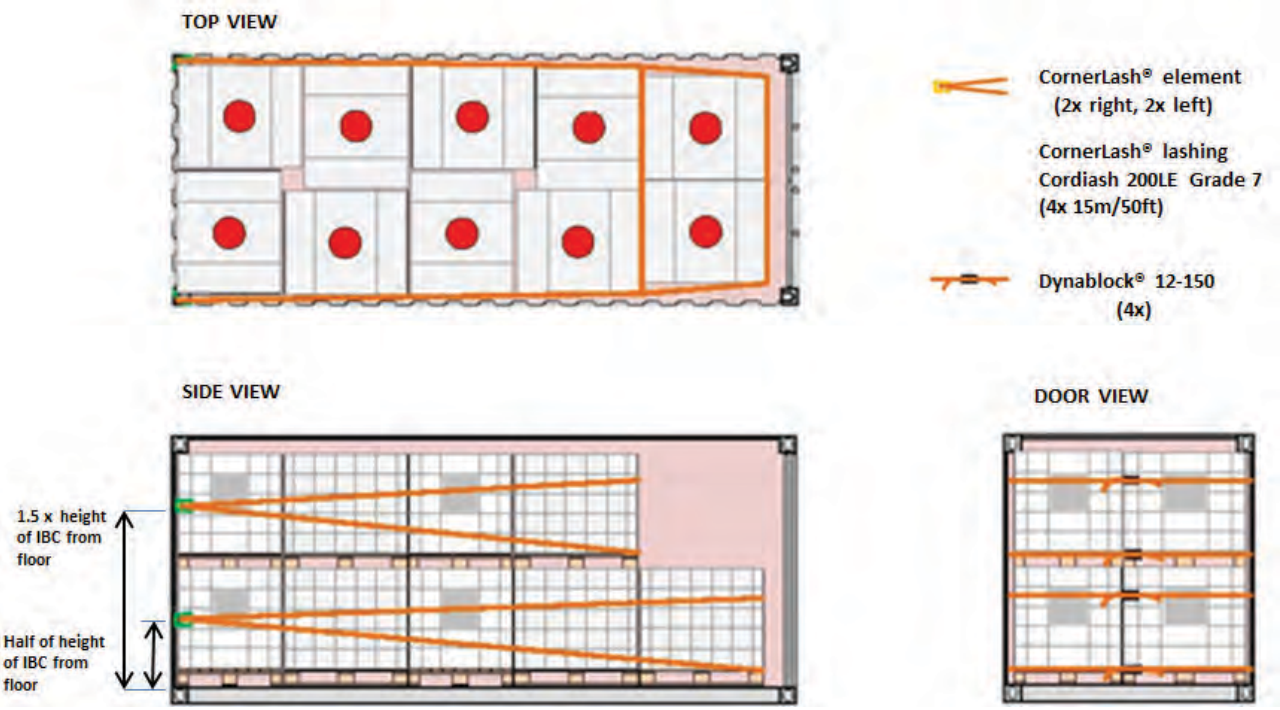


Figure 4.53— Sketch 2

Method I-1
IBC load

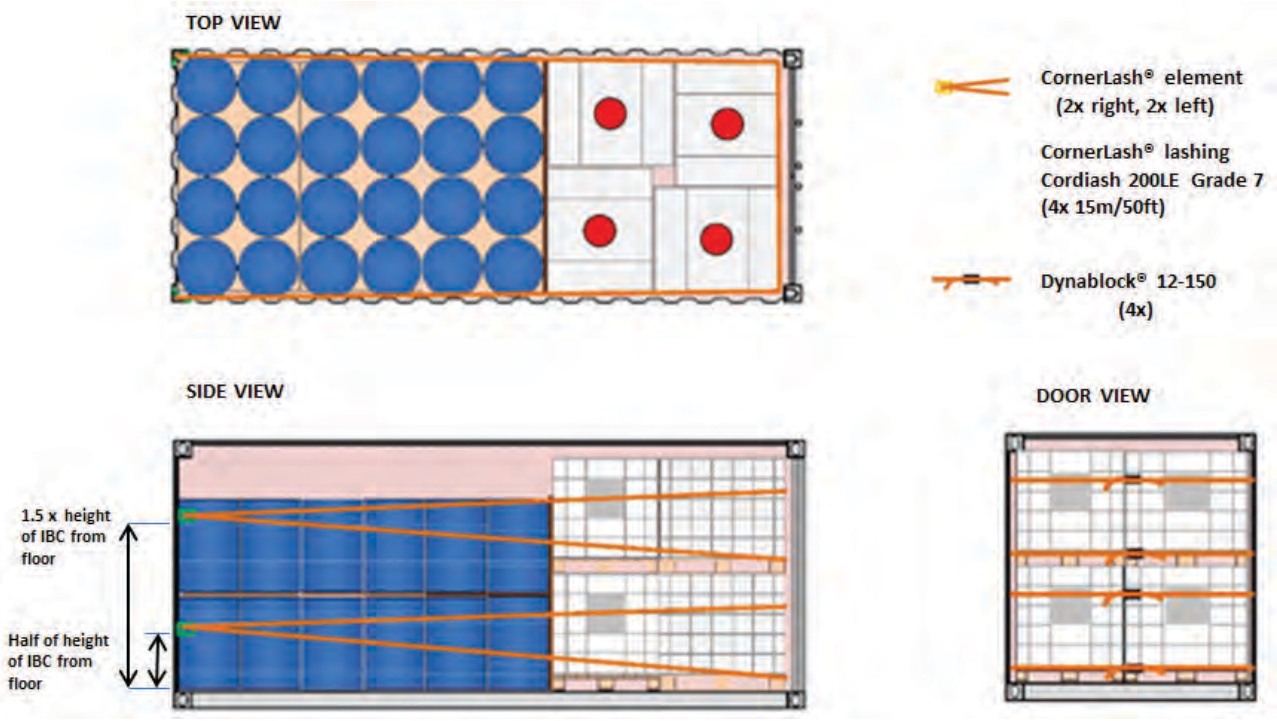


Figure 4.53— Sketch 3

Method I-1
Mixed load—drums and IBCs

(This Page Left Blank Intentionally)

Appendix A
Wood Blocking and Bracing Specifications

Relative strength values of lumber, such as stiffness, bending, and compression strength qualities and the ability to resist shocks, are important. Equally important are the factors of nail-holding qualities and resistance against splitting.

Table A.1 Lumber dimensions

Nominal Thickness Rough Lumber (in.)	Actual Thickness S4S (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

Dimensions shown are the minimum commercial sizes for lumber to be used in the construction of center gates, end gates, doorway blocking, and bracing. See Table A.2. Table A.3 shows species of wood most commonly used.

Table A.2 Wood types

Group I Soft Woods	Specific Gravity	Group II and III Medium Woods	Specific Gravity	Group IV Hard Woods	Specific Gravity
Cottonwood	0.37	Douglas Fir	0.51	Ash	0.64
Fir (Balsam)	0.41	Hemlock	0.44	Beech	0.67
Fir (White)	0.42	Maple (Hard Black)	0.62	Elm	0.66
Pine (Lodgepole)	0.43	Larch	0.59	Hickory	0.80
Pine (Ponderosa)	0.42	Pine (So, Yellow)	0.59	Maple (Hard-Sugar)	0.68
Pine (White East)	0.37	Pine (Norway)	0.47	Oak (White)	0.71
Pine (White West)	0.42	Cedar (Port Oxford)	0.44	Oak (Red)	0.66
Spruce (White)	0.45	Sweet Gum	0.53		
Poplar (Yellow)	0.43				

Lumber recommended for use in trailer blocking and bracing is found in Group II and III woods. Use commercial sizes. When soft woods (Group I) are substituted, use the next larger commercial size per the following:

Table A.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

Table A.4 Withdrawal power of common and threaded nails (allowable loads in pounds per inch of penetration)

Specific Gravity	Size of Nails			
	8d	12d	16d	20d
0.75	87	—	—	127
0.68	69	78	85	101
0.67	66	75	82	97
0.66	64	72	79	94
0.62	55	62	68	80
0.51	34	38	42	49
0.47	27	31	34	40
0.45	25	28	30	36
0.44	23	26	29	34
0.43	22	25	27	32
0.42	21	23	25	30
0.41	21	22	24	29
0.37	15	17	19	22

For types of lumber, see Table A.2.

Appendix B
Damage Prevention Product Vendor List

Revised May 29, 2015

Purpose:

This list is provided as a service to rail customers and member carriers. The Association of American Railroads does not endorse or guarantee the use or reliability of the products produced or distributed by the vendors listed herein.

This list is not a complete list, and any vendors not shown have not been intentionally left out. Addresses shown are generally the company's headquarters office address. Each company may also have regional offices and/or regional contacts for product availability and distribution.

Submit Changes to: Mr. Tom Feltault, Director
Damage Prevention and Loading Services
AAR/TTCI
DPLS@aar.com

ALPHABETICAL LIST

AIA/Down River
311 Plus Park Blvd., Suite #220
Nashville, TN 37217
(800) 444-6337
(615) 399-9987
(615) 399-9982 Fax
http://www.aiateam.com or
http://www.godunnage.com
Products:
- Bulkheads
- Cargo Restraining Devices
- Contour Polyfoam Pads
- Contour Buffer Pads
- Corner Protectors
- Custom Design Products
- D.I.D. Bags
- Edge Protectors
- Polyester Cord Strap
- Rebonded Rubber Mats
- Risers
- Separators
- Strap Anchors
- Void Fillers

Acme Packaging Systems (affiliated with Signode Industrial Group)
501 West Lake Street, Suite 105
Elmhurst, IL 60126
Products:
- Plastic Strap
- Steel Strap (630) 589-5100

Amorim Industrial Solutions
26112 110th Street Trevor, WI 53179
(800) 558-3206
(262) 862-2500 Fax
Products:
- Rebonded Rubber Mats

Ancra International
4880 West Rosecrans Avenue Hawthorne, CA 90250 (310) 973-5000
Products:
- Beam End Sockets
- Cargo Restraining Devices
- Corner Protectors
- Custom Design Products
- Shoring Beams
- Strap Anchors
- Strap Assemblies
- Winches

Boomerang Packaging, Inc.
15401 Vantage Parkway W. #116
Houston, TX 77032
(281) 590-5163
(800) 214-2803
(281) 590-9755 Fax
http://www.boomerangpackaging.com/
Products:
- Polyester Cord Strap
- Steel Strap
- Strapping Tools

Caristrap International, Inc.
1760 Fortin Blvd.
Laval Quebec, Canada H7S 1N8
(800) 361-9466
(450) 667-4700
(450) 663-1520 Fax
Email: info@caristrap.com
Products:
- Cargo Restraining Devices
- Custom Design Strapping Products (including printed or dyed)
- Woven, Non-woven, and Thermal Fixation (Hot melt) Strapping
- Industrial Tapes
- Polyester Cord Strapping
- Strap Anchors

Cascades Enviropac Inc.
541 Melchers Street
Berthierville, QC, Canada J0K 1A0
(866) 836-1799
(450) 752-7029

Circle Inc.
2756 Whiting Road
Burlington, WI 53105
(262) 539-4400
(262) 539-4409 Fax
Products:
- Contour Buffer Pads
- Corner Protectors
- Custom Designed Products
- Risers
- Rubber Mats
- Void Fillers

Complete Packaging Systems Inc.
11 Ritter Way
Lebanon, PA 17042
(866) 858-8800
(717) 875-2199 Fax

Complete Packaging Systems LLC
1375 Hopkins Street
Whitby, ON L1N 2C2
(800) 858-8800
(905) 666-6565 Fax
Products:
- Cyclone™ Airbags
- LoadSecure™ Friction Mats
- Tex-Steel™ Synthetic Cord Strapping
- Honeycomb/Corrugated Dunnage
- Security Seals
- Training/Consultation Services
- Packaging Products

Cordex Limited
412 High Street, East
Strathroy, ON, Canada N7G 1H5
(519) 245-3801
(519) 245-3808
Email: cordex@execulink.com
Products:
- AAR Approved Polyester Cord Strapping Grades, III, IV, V and VI
- AAR Approved Fasteners
- Complete Range of Manual and Pneumatic Tools and Accessories

Cordstrap USA
1101 South Sylvania Ave. #101
Sturtevant, WI 53177
(262) 898-6670
(262) 898-6677 Fax
Products:
- Manufacturer and supplier of Composite and Woven Polyester strapping and Lashing and other one way load restraint products.

Cougar Packaging Designers, Inc.
800 Regency Drive
Glendale Heights, IL 60139
(630) 539-7361
(630) 539-7398 Fax
Products:
- Cushion Contour Polyfoam Pads

Down River Load Securement
3901 Navone Road
Stockton, CA 95215
(888) GoDunnage
(888) 403-8662
(866) 675-2391 Fax
Products:
- Honeycomb Void Fillers
- Honeycomb Panels
- Bulkhead Systems
- Riser Runners
- AIA Transmat® Friction Mats
- GatorSTRAP™ and GatorLash® Non-Metallic Load Strapping
- Paper, Poly and Vinyl D.I.D. Air Bags
- G-FORCE Shock Absorption System
- G-FORCE FillerBlock
- Slip Sheets
- Tier Sheets
- Corrugated Sheets

Dunnage Systems, Inc.
P.O. Box 656 Sheridan, AR 72150
(800) 288-4830
(870) 942-4830
(888) 942-4710 Fax
Products:
- Air Compressors
- Bulk Containers
- Bulkheads
- Contour Buffer Pads
- D.I.D. Bags
- Risers
- Separators
- Slip Sheets
- Void Fillers

Gerrard Ovalstrapping
Forest Products Division
120-55th Street N.E.
Fort Payne, AL 35967-8140
(256) 845-1914
(256) 845-1493 Fax
Products:
- Polyester Cord Strap

Hexacomb Corporation
1294 Barclay Blvd.
Buffalo Grove, IL 60089
(855) 439-2266
Email: kevinarnold@packagingcorp.com
Products:
- Void Fillers
- Die Cut Honeycomb
- Honeycomb Pallets
- Rubber Mats
- Air Bags

Holden Sales and Service, LLC
6700 Cote de Liesse, Suite 404
Montreal, PQ, Canada H4T 2B5
(514) 313-8332
(514) 313-9403 Fax
Products:
- Multi-Level Wheel Chocks

Holland Company
1000 Holland Dr.
Crete, IL 60417
(708) 672-2300
Email: customerservice@hollandco.com
Products:
- Car Components
- Cargo Sleds
- Web Strap Assemblies
- Chocks, Grating, and Door Edge Protection

Industrial Packaging Supplies
10 Jack Casey Court Fountain Inn, SC 29644
(864) 862-1500 Fax:
(864) 862-1005
Products:
- D.I.D. Bags
- Plastic Strap
- Steel Strap

Industrial Packaging Corp.
1515 W. Mohawk Drive
Tomahawk, WI 54487
(715) 453-2223
(715) 453-7972 Fax
www.ipcfamily.com
Products:
- Void Fillers (Honeycomb and Corrugated)

International Dunnage LLC
3216 Center Street
Thunderbolt, GA 31404 USA
(912) 355-8884
(912) 355-7234 Fax
Products:
- D.I.D. Bags

Instrumented Sensor Technology
4704 Moore St.
Okemos, MI 48864
(517) 349-8487
(517) 349-8469 Fax
Products:
- Shock and Vibration Recorders
- Accelerometers
- Temperature and Humidity Recorders
- Data Loggers
- Data Acquisition

Ireco LLC
805 Golf Lane
Bensenville, IL 60106
(630) 741-0155
(630) 595-0646 Fax
Email: sales@ireco.com
Products:
- Lading Anchors
- Strap Retainers
- Tie Down Assemblies

Kinedyne Corp.
3701 Greenway Circle
Lawrence, KS 66046-5442
(800) 848-6057
(785) 841-3668 Fax
Email: customerservice@kinedyne.com
Products:
- Beam End Sockets
- Cargo Restraint Devices
- Corner Protectors
- Custom Design Products
- Shoring Beams
- Strap Anchors
- Strap Assemblies
- Winches

Lansmont Corporation
17 Mandeville Court
Monterey, CA 93940
(831) 655-6600
Products:
- Data Loggers
- Temperature Recorders
- Humidity Recorders,
- Vibration Measurement Tools
- Test Instruments

Lat-Lon
2300 South Jason Street
Denver, CO 80223
(877) 300-6566
(303) 937-7406
(303) 531-5754 Fax
Email: sales@lat-lon.com
Products:
- Data Recorders

Litco International, Inc.
One Litco Drive
Vienna, OH 44473
(330) 539-5433
(303) 539-5388 Fax
www.litco.com
Products:
- Load Securement (Training)
- Packaging Materials (Sales)
- Corrugated Void Fillers
- Dunnage Air Bags

Logistick
19880 State Line Road
South Bend, IN 46637-1545
(800) 758-5840
(574) 271-2565
(574) -271-2574 Fax
Products:
- Blocking and Bracing Devices
- Strapping
- D.I.D. Bags
- Void Fillers
- Security Seals
- Corner Protectors

Lock n' Pop
1320 Leslie Drive
Douglasville, GA 30134
(800) 225-5539
Email: customer.service@locknpop.com
Products:
- Lock 'n' Pop Adhesive

Lodge Lumber Company Inc.
5001 Oates Road
Houston, TX 77013
(713) 672-6679
(713) 672-5135 Fax
Email: lodgeteam@lodgelumber.com
Products:
- Separators

Maillis Strapping Systems
404 Wall Street
Fountain Inn, SC 29644-2035
(877) 962-4648
Email: info@maillisstrapping.com
Products:
- Polyester Strapping
- Plastic Strapping
- Strapping Tools

Menasha Packaging Company
1645 Bergstrom Road
Neenah, WI 54957
(800) 558-5073
Products:
- Corrugated Boxes
- Corrugated Fanfold Bulk Containers

Moldwood Products Co.
104 Mallard Circle
York, AL 36925
(205) 392-5256
Products:
- Core Plugs

National Rubber Technologies Corp.
35 Cawthra Ave.
Toronto, ON Canada M6N 2W3
(800) 387-8501
(416) 657-1111 Ext. 4283
Products:
- Rubber Mats
- Masticated Rubber
- Friction Mats
- Load Bearing Rubber
- Mud Flaps
- Rubber Wheel Chocks
- Custom Designed Rubber

Pasadena Skid and Pallet Co. 5
202 Red Bluff Road
Pasadena, TX 77503
(281-991-0190
281-991-0905 Fax
Products:
- Eucalyptus Hardboard
- Skids and Pallets
- Corrugated Pallets
- Palletizing Materials

PendaForm
200 Friendship Drive
New Concord, OH 43762
(866) 558-1913
(740) 261-4420
Products:
- Truck Bulkhead Spacer
- Rail Bulkhead Spacer
- Truck Separator
- Rail Separator
- 4-96 Void Panel
- 2-102 Void Panel
- 4-120 Void Panel
- 814 Lateral Void Filler
- 1618 Lateral Void Filler
- 1420 Lateral Void Filler
- Plastic Board
- Plastic Cover

PlyVeneer Products
800 48th Street
Springfield, OR 97478
(866) 447-0771
(541) 747-0771
(541) 747-0775 Fax
Products:
- Ply Veneer Panels

Rainer GmbH
Graf-Zeppenlinstrasse 22b D-51147
Cologne, Germany
0049 2203 922 970
0049 2203 922 975

RB Rubber Products
904 E. 10th Avenue
McMinnville, OR 97128
(503) 472-4691
(800) 525-5530
(503) 434-4455 Fax
Products:
Rubber Mats

RC Packaging Systems, Inc.
4935 Technical Drive
Milford, MI 48381
(248) 684-6363
(248) 685-3521 Fax
Products:
Polyester Cord Strap

RFTrax-Now IONX
515 S. Franklin Street
West Chester, PA 19382
(484) 653-2600
Products:
Rail Asset Tracking Data Acquisition Devices

Samuel Strapping Systems
1455 James Parkway
Heath, OH 43056
(800) 222-1855
Products:
Steel Strap
Plastic Strap
Strapping Tools

Shippers Products
808 Blake Road
Sheridan, AR 72150
(870) 942-2151
Products:
Air Compressors
Angleboard
Bulk Containers
Coil/Roll Edge Protectors
Contour Buffer Pads
D.I.D. Bags
Load Bars
Roll Risers
Rubber Mats
Separators
Slip Sheets
Void Fillers.

Signode Packaging Systems
3650 West Lake Avenue
Glenview, IL 60026
(800) 323-2464
(847) 657-5323
Products:
Load Cushioners
Plastic Strap
Polyester Cord Strapping
Steel Strapping
Strap Anchors

Shockwatch Corp.
5501 Lyndon B Johnson Fwy, Suite 350
Dallas, TX 75240
(800) 393-7920
Email: info@shockwatch.com
Products:
Impact, Tilt and Temperature Recorders

Southern Bracing Systems, Inc.
1900 Parish Drive
Rome, GA 30161
(706) 291-4206
(706) 291-0229 Fax
Email: sales@southernbracing.com
Products:
Bulkheads
Cargo Restraining Devices
Contour Buffer Pads
Corner Protectors
Custom Design Products
D.I.D. Bags
Polyester Cord Strap
Risers
Rubber Mats
Separators
Laminated Bulkhead (Ty-gard™)
Void Fillers

Southern Strapping Systems
1900 Parish Drive
Rome, GA 30161
(888) 290-0967
(706) 291-0229 Fax
Email: sales@sstrap.com
Products:
Polyester Strapping

Stopak (Pty) Ltd.
4 Paddy Close, Ottery
Cape Town, South Africa 7808
+27 21 703 9393
+027 21 704 1349 Fax
Email: bsearson@stopak.com
Products:
D.I.D. Bags

Sunrise Arkansas, Inc.
400 Airline Drive
Benton, AR 72015
(800) 264-5411
(501) 778-6335 Fax
Email: info@mytransitprotection.com
Products:
- Bulkheads
- D.I.D. Bags
- Risers
- Separators
- Void Fillers

Sunrise Mfg., Inc
2665 Mercantile Drive
Rancho Cordova, CA 95742
(800) 748-6529
(916) 635-9730 Fax
Products:
- Buf-Bags
- Bulkheads
- D.I.D. Bags
- Laminated Bulkheads (Ty-gard™)
- Polyester Strap
- Rubber Matting
- Separators
- Slip Sheets
- V-Boards
- Void Fillers

Sunrise Washington, Inc.
5900-A N.E. 88th Street #119
Vancouver, WA 98665
(360) 574-3512
(888) 485-4085
(360) 574-7695 FAX
Products:
- Buf-Bags Bulkheads
- D.I.D. Bags
- Corner Protectors
- Void Fillers
- Laminated Bulkheads (Ty-Gard 2000)
- Corrugated Pallets
- Rubber Matting
- Polyester Strap
- Slip Sheets
- Stretch Film
- Roll Risers
- Security Seals

Superior Packaging Company
500 South 59th Avenue
West Duluth, MN 55807
(800) 705-5279
(218) 624-8945
(218) 624-8949 Fax
Products:
- Angleboard
- Beam and Sockets
- Beverage Bulkheads
- Bulk Containers
- Bulkheads
- Car Liner Sheets
- Cargo Restraining Devices
- Core Plugs
- Corner Posts
- Corner Protectors
- Contour Buffer Pads
- Cushion Contour Poly Foam Pads
- Custom Design Products
- DID Bags
- Laminated Bulkheads
- Load Bars
- Metal Blocking Devices
- Rebonded Rubber Pads
- Risers
- Rubber Mats
- Separators
- Shore and Beams
- Slip Sheets-Paper and Plastic
- Strap Anchors
- Strap Assemblies
- Stretch Wrap Equipment and Film
- Thermo Barriers
- Top Caps
- Void Fillers

Tapex American Corporation
2626 20th Street
Port Huron, MI 48061-0233
(810) 987-4722
Fax:(810) 987-4728
Products:
- AAR Approved Polyester Cord Strapping Grades III, IV, V, and VI
- AAR-Approved Fasteners
- Complete Range of Manual and Pneumatic Tools and Accessories

Trinity Industries, Inc.
106 Wellwood Road
Brooklyn, MI 49230
(734) 281-4466
(734) 281-2098

TydenBrooks
409 Hoosier Drive
Angola, IN 46703
(800)348-4777
(260) 665-8309
Email: info@tydenbrooks.com
Products:
Security Seals
Locking Devices

Tyoga Container Co., Inc
9 Fish Street
Tioga, PA 16901
(570) 835-5295
(570) 835-5647

US Dunnage LLC
144 Wood Street
Crossett, AR 71635
(866) 407-2247
(870) 304-2247
(870) 364-2288 Fax
Products:
D.I.D. Bags

Walnut Industries Inc.
1356 Adams Road
P.O. Box 624
Bensalem, PA 19020
(800) 523-6536
(215) 638-4939 Fax
Email: Sales@ty-gard.com
Products:
Laminated Bulkheads (Ty-gard™)

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, Second Edition 2003, ISBN Number 92-801-5145-2.

Order From: IMO Publishing Service
4 Albert Embankment
London SE1 7SR
United Kingdom
e-mail: sales@imo.org

AAR Open Top Loading Rules Manual—Sections 1–7—Issued by the AAR Safety and Operations Department.

Order From: TTCI
P.O. Box 79780
Baltimore, MD 21279-0780
Phone: (877) 999-8824
Online Ordering: www.aarpublications.com
www.aar.com

(This Page Left Blank Intentionally)

Appendix D
Rubber Mat Specifications (Typical Values)

Supplier: AIA/Down River (Page 1 of 2)

TransMat™ 8060

Density:	ASTM D–297:	.80 g/cm^3
Tensile:	ASTM D–412:	175 psi
Elongation:	ASTM D–412:	90%
Hardness:	ASTM D–2240:	Shore A: 40–60 (points)
Tear:	ASTM D–624:	50 ppi (Die C)
Compression Properties:	ASTM F–36:	100 psi—15–25%, Recovery 80%
Coefficient of Friction:	ASTM D–1894:	1.3

TransMat™ 7513

Density:	ASTM D–297:	46.7 lb/ft^3
Tensile:	ASTM D–412:	200 psi
Elongation at Break:	ASTM D–412:	125%
Hardness:	ASTM D–2240	Shore A: 40–60 (points)
Tear:	ASTM D–624:	50 ppi (Die C)
Compression Set B:	ASTM D–395:	40% maximum (25% Deflection, 158 °F/22 hours)
Compression Set (Foam):	ASTM D3676:	30% maximum (50% Deflection, 158 °F/22 hours)
Compression Properties:	ASTM F–36:	100 psi—15–25%, 200 psi—30–40% 300 psi—40–50%, 400 psi—45–55%
Coefficient of Friction:	ASTM D–1894:	1.20

TransMat™ 7010

Density:	ASTM D–297:	50 lb/ft^3
Tensile:	ASTM D–412:	120 psi
Elongation at Break:	ASTM D–412:	75–105%
Hardness:	ASTM D–2240	Shore A: 35–55 (points)
Tear:	ASTM D–624:	70 ppi (Die C)
Compression Set B:	ASTM D–395:	70% maximum (25% Deflection, 158 °F/22 hours)
Compression Set(Foam):	ASTM D3676:	80% maximum (50% Deflection, 158 °F/22 hours)
Compression Properties:	ASTM F–36:	100 psi – 15–25%, 200 psi—30–40%, 300 psi—35–45%, 400 psi—45–55%
Coefficient of Friction:	ASTM D–1894:	1.195

TransMat™ 6900

Density:	ASTM D–297:	52 lb/ft^3
Tensile:	ASTM D–412:	100 psi
Elongation:	ASTM D–412:	95% (Die C)
Hardness:	ASTM D–2240	Shore A: 45–55 (points)
Tear:	ASTM D–624:	40 ppi (Die C)
Compression Set B:	ASTM D–395:	40% maximum (25% Deflection, 158 °F/22 hours)
Compression Set (Foam):	ASTM D3676:	30% maximum (50% Deflection, 158 °F/22 hours)
Compression Properties:	ASTM F–36:	100 psi—20–30%
Coefficient of Friction:	ASTM D–1894:	1.2

Supplier: AIA/Down River (Page 2 of 2)

TransMat™ 6510

Density:	ASTM D–297:	40 lb/ft^3
Tensile:	ASTM D–412:	75 psi
Elongation at Break:	ASTM D–412:	60%
Hardness:	ASTM D–2240	Shore A: 20–60 (points)
Tear:	ASTM D–624:	20 ppi (Die C)
Compression Set B:	ASTM D–395:	20–30 (25% Deflection, 158 °F/22 hours)
Compression Set (Foam):	ASTM D3676:	20–30 (50% Deflection, 158 °F/22 hours)
Compression Properties:	ASTM F–36:	100 psi—25–35%, 200 psi—40–50%, 300 psi—50–60%, 400 psi—60–70%
Coefficient of Friction:	ASTM D–1894:	1.083

Supplier: KN Rubber LLC

Load Grip

Thickness:		1⁄8 in. and 1⁄4 in.
Weight:		17 g/in.^{3} average
Tensile Strength:	ASTM D–412:	677 psi average
Durometer Hardness:	ASTM D–676:	Shore Type: 80 I average
Tear Resistance:	ASTM D–624:	Die B Nicked Specimens: 410 ppi average

Load–Grip 2

Density:		74.8 lb/ft^3 (maximum)
Tensile:	ASTM D–412:	100 psi minimum—machine direction (Die C) 150 psi minimum—across machine direction
Elongation at Break:	ASTM D–412:	100%
Tear:	ASTM D–624:	25 ppi—both directions
Hardness:	ASTM D–2240:	Shore A: 40 ± 10 (points)
Compression Set B:	ASTM D–395:	60% (24 hours at 21 °C)
Coefficient of Friction:	TAPPI TB16OM-92:	0.9

Load–Grip 3

Density:		69 lb/ft^3 (maximum)
Tensile:	ASTM D–412:	250 psi minimum—with grain (Die C) 150 psi minimum—across grain
Elongation at Break:	ASTM D–412:	30% minimum—with grain (Die C) 60% minimum—across grain
Tear:	ASTM D–624:	60 ppi—with grain (Die B) 100 ppi—across grain
Hardness:	ASTM D–2240:	Shore A: 50 ± 10 (points)
Compression Set B:	ASTM D–395:	50% (22 hours at room temp.)
Coefficient of Friction:	TAPPI TB16OM-92:	0.7

Load–Grip 5

Tensile:	ASTM D–412:	5.3 (768.5) with grain Die C 3.3 (478.5) across grain
Elongation:	ASTM D–412:	18% with grain 74% across grain
Tear:	ASTM D–624:	35 (199.5)—with grain (Die B) 53 (302.1)—across grain
Hardness:	ASTM D–2240:	Shore A: 79 (points)
Coefficient of Friction:	ASTM D–1894:	1.15

Load–Grip 6

Thickness		0.08 in. (2 mm)
Tensile:	ASTM D–412:	210 psi (Die C)
Elongation:	ASTM D–412:	90% (Die C)
Tear:	ASTM D–624:	70 pi (Die B)
Density	ASTM D–297:	0.8g/cm^3
Hardness:	ASTM D–2240:	Shore A: 45 to 65 (points)
Coefficient of Friction:	ASTM D–1894:	1.0

Supplier: Amorim Industrial Solutions

Rubber Restraint Mat BC548

Density:	ASTM D–3676:	52 lb/ft^3
Tensile:	ASTM D–412:	185 psi
Elongation at Break:	ASTM D–412:	100%
Tear:	ASTM D–624:	75 ppi (Die C)
Compression Set B:	ASTM D–395:	32% maximum (25% Deflection, 158 °F/22 hours)
Compression Properties:	ASTM F–36:	100 psi—15%
		400 psi—45%
Coefficient of Friction:	ASTM D–1894:	0.965

Supplier: RB Rubber Products, Inc.

Friction Mat

Density:	ASTM D–3676:	64.59 lb/ft^3
Tensile:	ASTM D–412:	327.6 psi
Elongation at Break:	ASTM D–412:	83.1%
Tear:	ASTM D–624:	149.2 (16 f/in.)
Hardness:	ASTM D–2240:	Shore A: 63 (points)
Coefficient of Friction:	ASTM D–1894:	.980

Supplier: Circle, Inc.

Brown Bear™ Friction Mat 101

Density:	ASTM D–3676:	52 lb/ft^3 minimum
Tensile:	ASTM D–412:	200 psi, minimum, with grain
Elongation at Break:	ASTM D–412:	125%, minimum, with grain
Tear:	ASTM D–624:	85 ppi, minimum, with grain
		150 ppi, minimum, across grain
Coefficient of Friction:	ASTM D–1894:	0.965

Supplier: Sunrise Manufacturing

ZRO-SHIFT™

Density:	ASTM D–297:	54 lb/ft^3
Tensile:	ASTM D–412:	149 psi
Elongation at Break:	ASTM D–412:	80–95%
Hardness:	ASTM D–2240:	Shore A: 50–55 (points)
Tear:	ASTM D–624:	45 ppi (Die C)
Compression Set B:	ASTM D–395:	40% maximum (25% deflection, 158 °F/22 hours)
Coefficient of Friction:	ASTM D–1894:	0.91

Supplier: Regupol America

Load Secure™ 6910

Density:	ASTM D–297:	53.9 lb/ft^3
Tensile Wide:	ASTM D–412:	216.2 psi
Tensile Across:	ASTM D–412:	256.76 psi
Elongation Across:	ASTM D–412:	74.23%
Elongation Wide:	ASTM D–412:	66.62%
Hardness:	ASTM D–2240:	Shore A: 68.4 (points)
Tear:	ASTM D–624:	12.42 n /mm (Die C)