TECHNICAL MANUAL

TRANSPORTABILITY GUIDANCE
TUBE-LANCHED, OPTICALLY-TRACKED, WIRE-GUIDED, HEAVY ANTITANK/ASSAULT WEAPON SYSTEM (TOW)
GUIDED MISSILE, SURFACE ATTACK, BGM-71A (IN SHIPPING CONTAINER) (FSN 1410-087-1521)
LAUNCHER, TUBULAR, GUIDED MISSILE, M220 (FSN 1440-179-4152)
CARRIER, GUIDED MISSILE EQUIPMENT, TOW (FSN 1450-176-2697)
TRUCK, 1/4-TON, GUIDED MISSILE EQUIPMENT, TOW (FSN 1450-176-2712)
TRUCK, 1/4-TON, GUIDED MISSILE CARRIER, TOW (FSN 1450-878-9024)
TRUCK, 1/2-TON, GUIDED MISSILE EQUIPMENT, TOW (FSN 1450-176-2709)
TRAINING SET, GUIDED MISSILE SYSTEM, M70 (FSN 6920-179-7320)
SHOP EQUIPMENT, GUIDED MISSILE SYSTEM, CONTACT SUPPORT, TOW (FSN 4935-150-5905)

HEADQUARTERS, DEPARTMENT OF THE ARMY

SEPTEMBER 1973

CHANGE
No. 1

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D. C., *15 October 1974*

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TM 55-1425-470-15-1, 28 September 1973, is changed as follows:

1. Changed material is indicated by a star.
2. Figures and tables in chapters 5, 6, and 7 have been realigned for clarity.
3. Remove old pages and insert new pages as indicated below:

Remove pages—	*Insert pages*
iii and iv	iii
2–15 through 2–17	2–15 and 2–16
5–1 and 5–2	5–1 and 5–2
5–29 through 5–32	5–29 through 5–32
6–3 through 6–9	6–3 through 6–10
7–37 through 7–51	7–37 through 7–50

4. File this change sheet in front of the manual for reference purposes.

By Order of the Secretary of the Army:

FRED C. WEYAND
General, United States Army
Vice Chief of Staff

Official:

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Major General, United States Army
The Adjutant General

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To be distributed in accordance with DA Form 12-32 (qty rqr block No. 657) organizational maintenance requirements for TOW.

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TECHNICAL MANUAL
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DEPARTMENT OF THE ARMY
WASHINGTON, D. C., 28 *September* 1973

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TUBE-LAUNCHED, OPTICALLY-TRACKED, WIRE-GUIDED, HEAVY ANTITANK/ASSAULT WEAPON SYSTEM (TOW)

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TRAINING SET, GUIDED MISSILE, SYSTEM, M70 (FSN 6920-179-7320)

SHOP EQUIPMENT, GUIDED MISSILE SYSTEM, CONTACT SUPPORT, TOW (FSN 4935-150-5905)

LIST OF ILLUSTRATIONS

CHAPTER 1

INTRODUCTION

1-1. Purpose and Scope

This manual provides transportability guidance for logistic handling and movement of the major end items comprising the TOW missile system. It provides transportation officers down to division level and other personnel engaged in or responsible for movement or providing transportation services with information considered appropriate to insure safe transport. Significant technical and physical characteristics as well as safety considerations required for worldwide movement by the various modes of transportation are included. When considered necessary, metric equivalents are given in parentheses following the dimensions or other measurement.

1-2. General

The TOW (Tube-launched, Optically-tracked, Wire-guided) weapon system is a crew-portable, heavy antitank weapon, consisting of a launcher and guided missile designed to complement shoulder-fired weapons. Components of the launcher are the launch tube, traversing unit, missile guidance set (including battery assembly when in use), optical sight, and a tripod. Mounting kits are provided for deployment on appropriate tactical vehicles. The missile is encased in a cylindrical fiberglass case with a handling ring at each end of the container.

Major items that comprise the TOW weapon system and necessary support equipment are as follows:

a. Guided missile, surface attack, BGM-71A*

b. Guided missile, practice, BTM-71A*

c. Guided missile, surface attack, telemetry, BEM-71A*

d. Launcher, tubular, guided missile, M220

e. Carrier, guided missile equipment, TOW

f. Truck, 1/4-ton, guided missile equipment, TOW**

g. Truck, 1/4-on, guided missile carrier, TOW**

h. Truck, 1/2-ton, guided missile equipment, TOW

i. Training set, guided missile system, M70

j. Shop equipment, guided missile system, contact support, TOW

k. Battery charger, PP-4884 (XO-)/T***

1-3. Reporting of Recommendations and Comments

The reporting of errors, omissions, and recommendations for improving this manual by the individual user is encouraged. Reports should be submitted on DA Form 2028 (Recommended Changes to DA Publications) and forwarded to Director, US Army Transportation Engineering Agency, Military Traffic Management and Terminal Service, ATTN: MTT-GDP, P.O. Box 6276, Newport News, Va. 23606.

1-4. Safety

Appropriate precautionary measures required during movement of the items are contained in **chapter 3.**

1-5. Definitions of Warnings, Cautions, and Notes

Throughout this manual, warnings, cautions, and notes emphasize important or critical guidance. They are used for the following conditions:

a. Warning. An operating procedure or practice that, if not correctly followed, could result in personal injury or loss of life.

*For the purpose of transportability guidance the guided missiles are considered similar. Shipping data are shown for the BGM-71A and are also applicable for the BTM-71A and BEM-71A.

**For the purpose of transportability guidance the trucks, ¼-ton, guided missile equipment, TOW, and missile carrier, TOW, are identical.

*** Transportability guidance is not required due to its size and weight. No special handling is required. This item may be shipped as general cargo in its original shipping container.

b. Caution. An operating procedure or practice that, if not strictly observed, could result in damage to or destruction of equipment.

c. Note. An operating procedure or condition **that must be emphasized.**

CHAPTER 2

TRANSPORTABILITY DATA

Section I. GENERAL

2-1. Scope

This chapter provides a general description of the major tems and/or shipping containers, identification photographs, and tabulated characteristics and data that are necessary for movement of the items.

2-2. Descriptions

a. The guided missile, surface attack, BGM-71A, is shipped in an overpack shipping container (fig 2-1). This container is a wirebound plywood box with polystyrene spacer pads that provide protection for the encased missile against shock and vibration encountered during normal transportation environments. The fiberglass launcher container, in which the missile is encased, provides additional protection during transportation and handling.

b. The launcher, tubular, guided missile, M220, is shipped in a packing box (fig 2-2). The packing box for shipment of the TOW launcher equipment components is designed with a modified skid base.

c. The carrier, guided missile equipment, TOW (fig 2-3), is a full-tracked, armored personnel carrier designed to transport troops or cargo in support of tactical operations. The carrier is air-transportable and air-droppable. This vehicle is used for carrying an operational TOW guided missile system and launching its missiles. The carrier includes a mounting kit, M233, for the launcher.

d. The truck, 1/4-ton, guided missile equipment, TOW (fig 2-4) and the truck, 1/4-ton, guided missile carrier, TOW, are the same basic vehicle. Transportability guidance is the same for both vehicles.

(1) The truck, 1/4-ton, guided missile equipment, TOW, is a 4x4 utility truck. This vehicle includes a mounting kit, M232, for the TOW system; this vehicle is the forward jeep used for transporting and firing the missile system. It transports the pedestal with the traversing unit, optical sight, and launch tube mounted and the storage rack for the missile guidance set. It also has facilities for carrying two ready missiles. A tripod is bracket-mounted for easy removal for ground employment.

(2) The truck, 1/4-ton, guided missile carrier, TOW, includes a mounting kit, M236. This vehicle is used as a support vehicle and has storage facilities for six missiles and a spare battery.

e. The truck, 1/2-ton, guided missile equipment, TOW (fig 2-5), is a platform, utility, 4x4 truck. It is a lightweight, low-speed vehicle designed to carry light cargo over rough terrain, keeping pace with riflemen in combat. It has a mounting kit, M225, secured to its platform for launching TOW missiles.

f. The training set, guided missile, M70, is designed for use with the TOW weapon system. The training set is used for TOW gunner indoctrination, tracking, instruction, practice, and qualification with the TOW weapon system. It is crew-portable and consists of an instructor console, a target set (including mounting kit), three missile simulation rounds, power supply modulator, connecting cables, and cable set shipping case. Figure 2-6 shows the training set in a packing box.

g. The shop equipment, guided missile system, contact support, TOW (fig 2-7), consists of a standard model shelter, S-250/G, modified for the TOW weapon system. It contains tools and test equipment required to provide limited direct support maintenance on site. Major equipment includes shelter, multimeter, breakout box, maintenance stand assembly, heater, and blower.

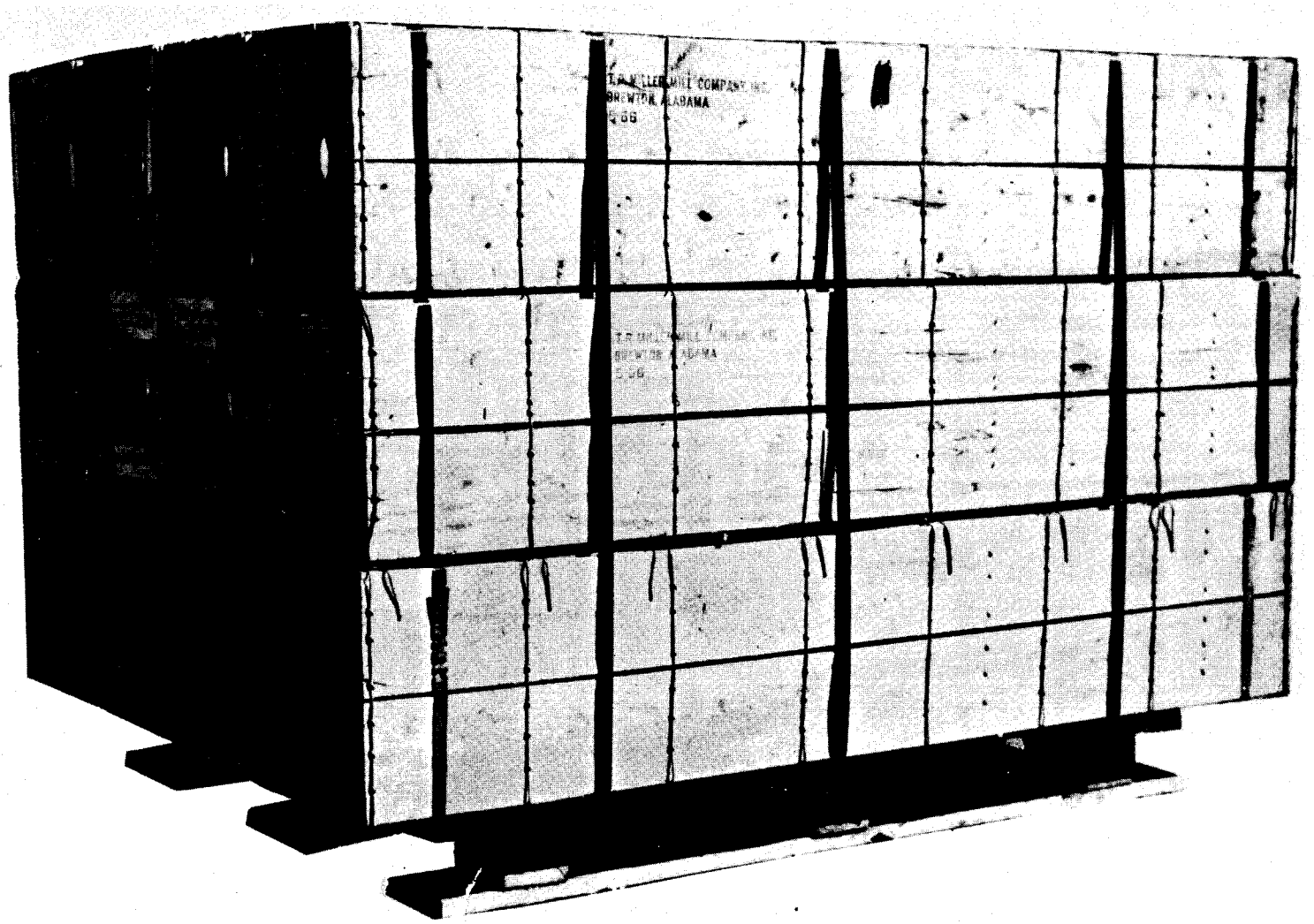


Figure 2–1. Guided missile, surface attack, BGM–71A, in overpack shipping container, unitized 12 on a pallet.

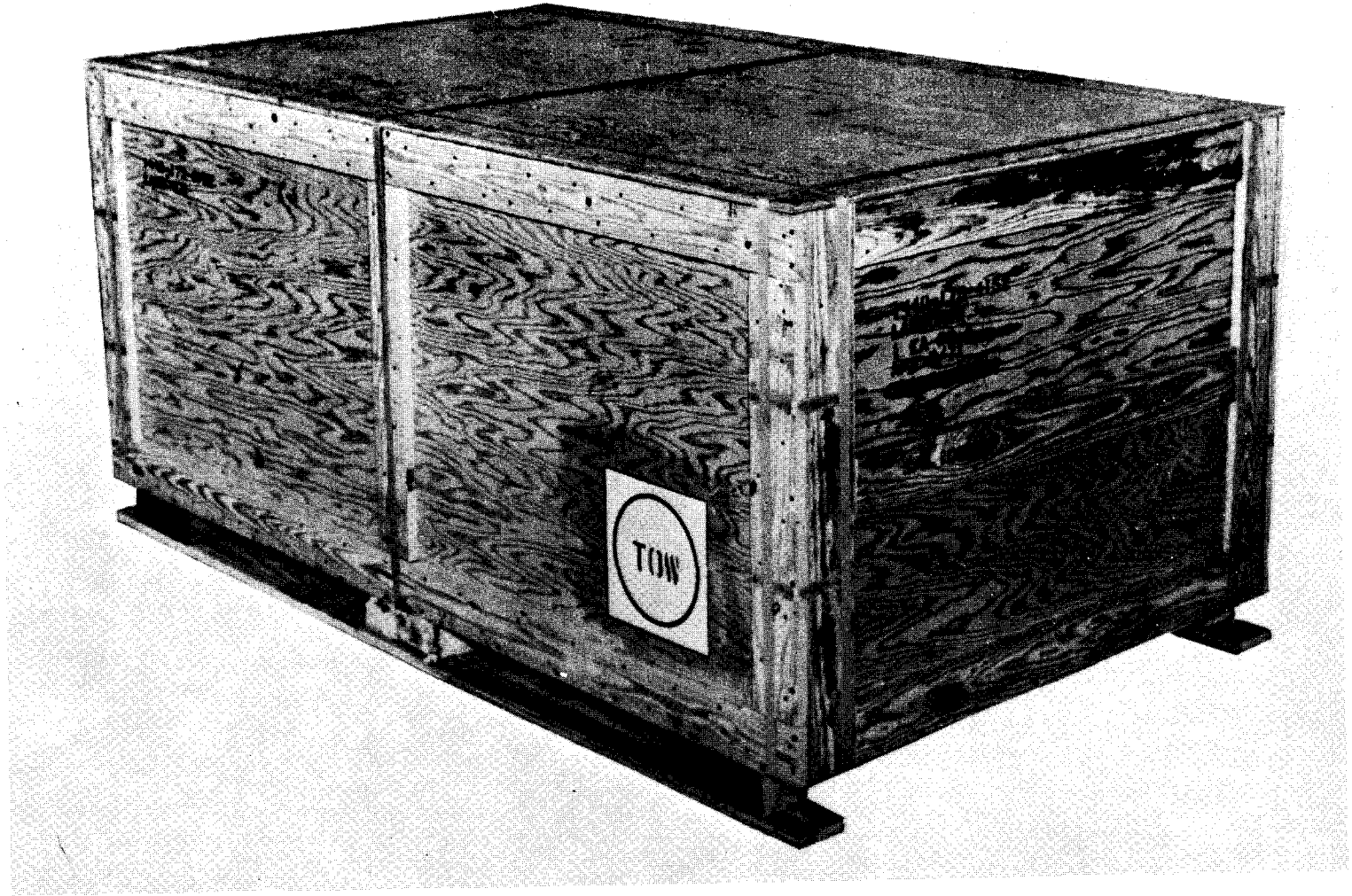


Figure 2–2. Launcher, tubular, guided missile, M220, in packing box.

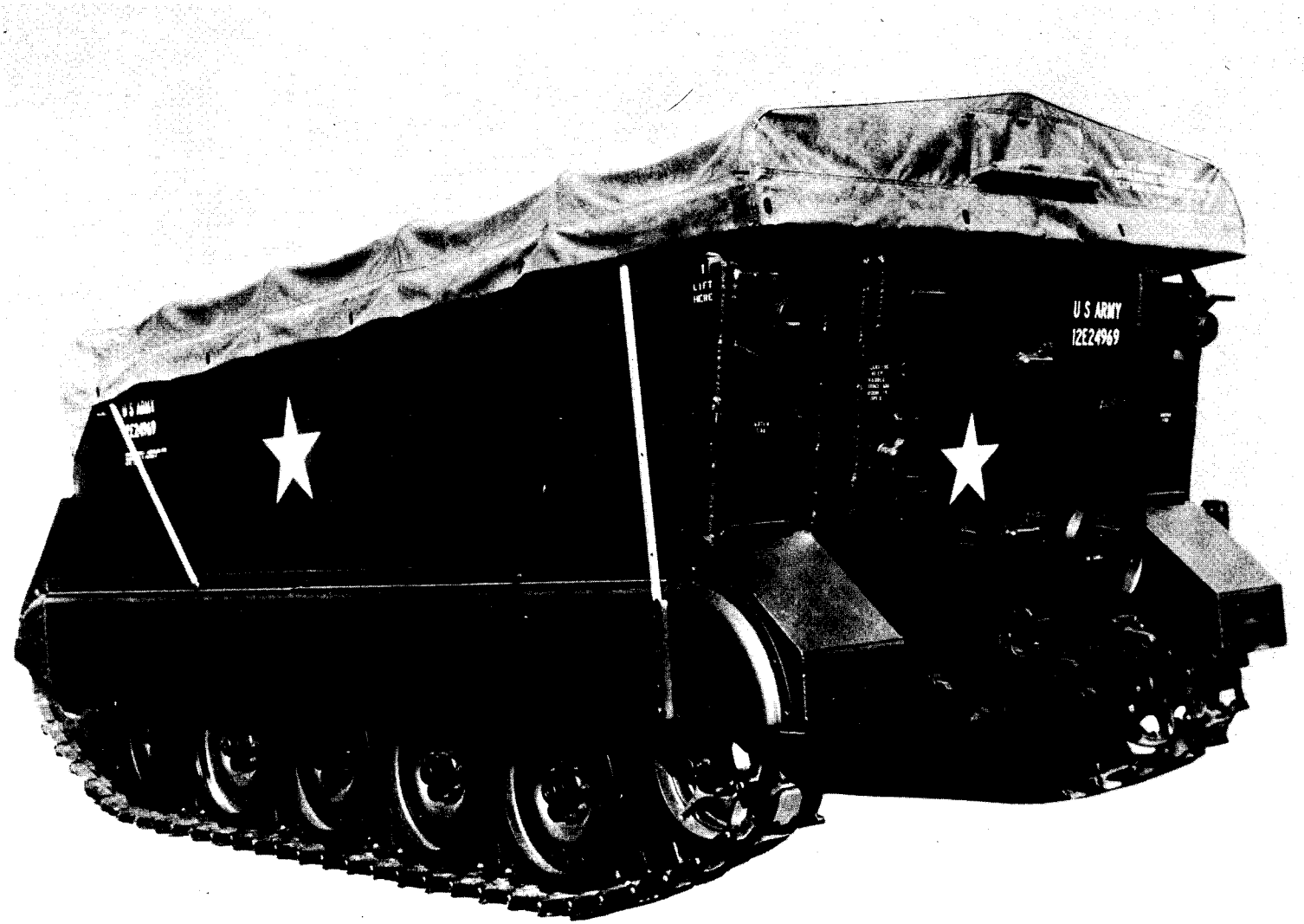


Figure 2-3. Carrier, guided missile equipment, TOW.

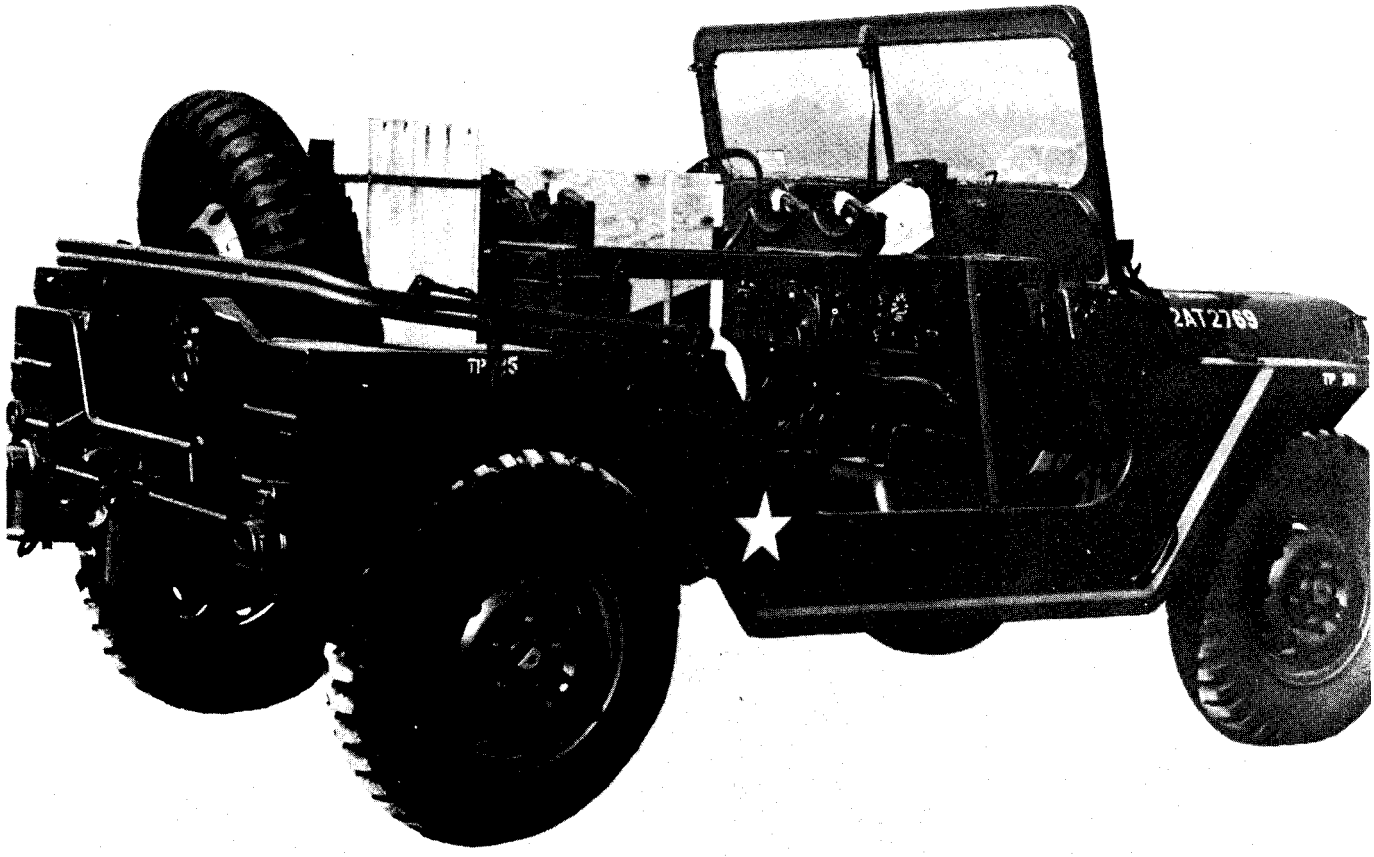


Figure 2–4. Truck, ¼-ton, guided missile equipment, TOW.

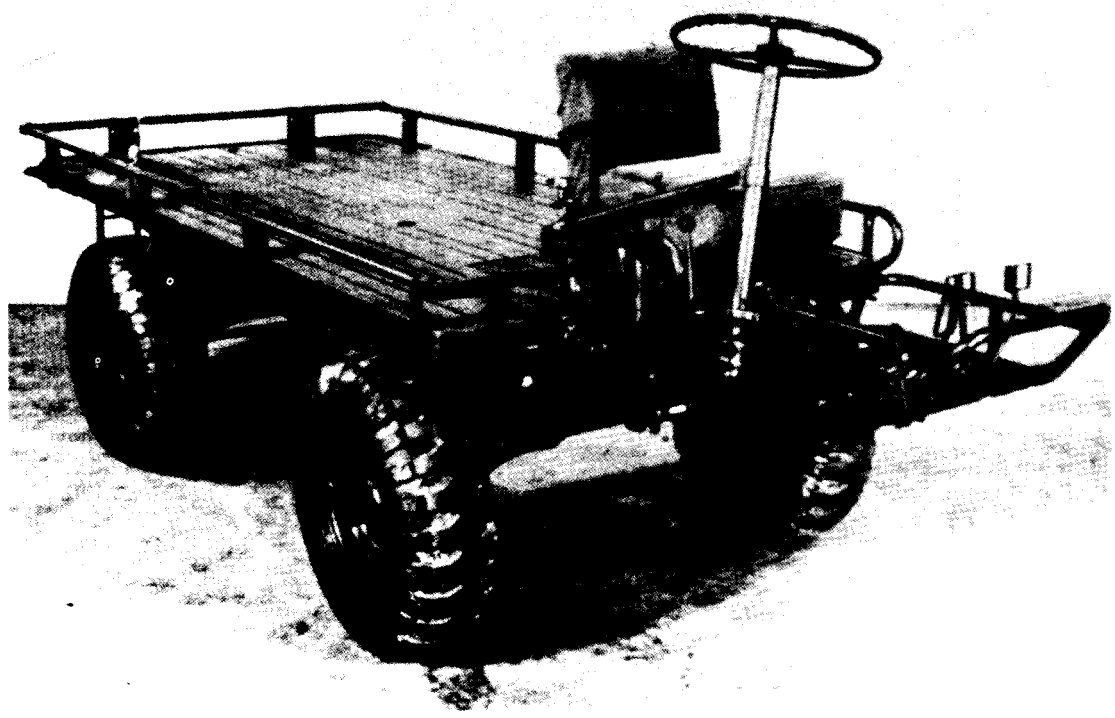


Figure 2–5. Truck ½-ton, guided missile equipment, TOW.

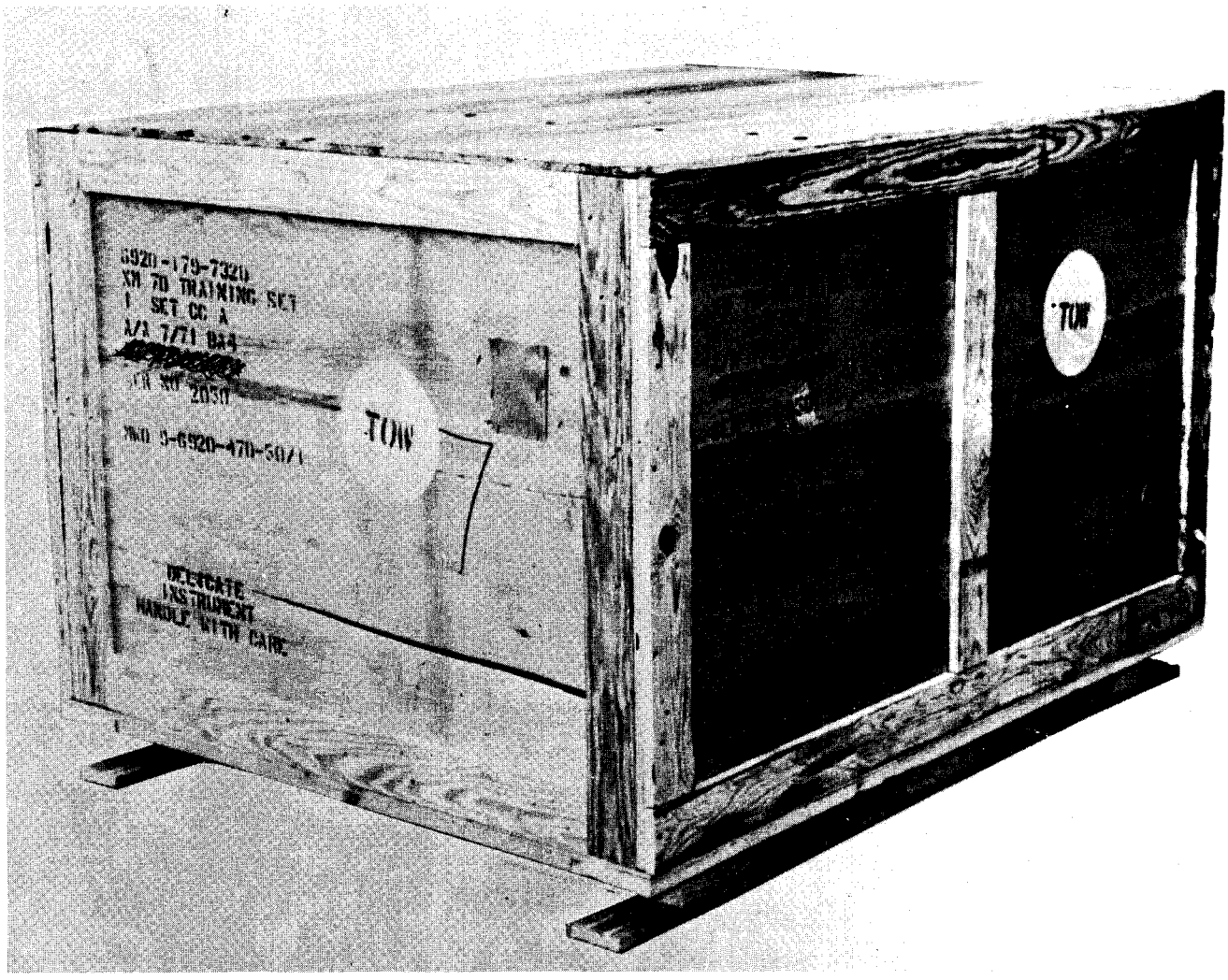


Figure 2-6. Training set, M70, in packing box.

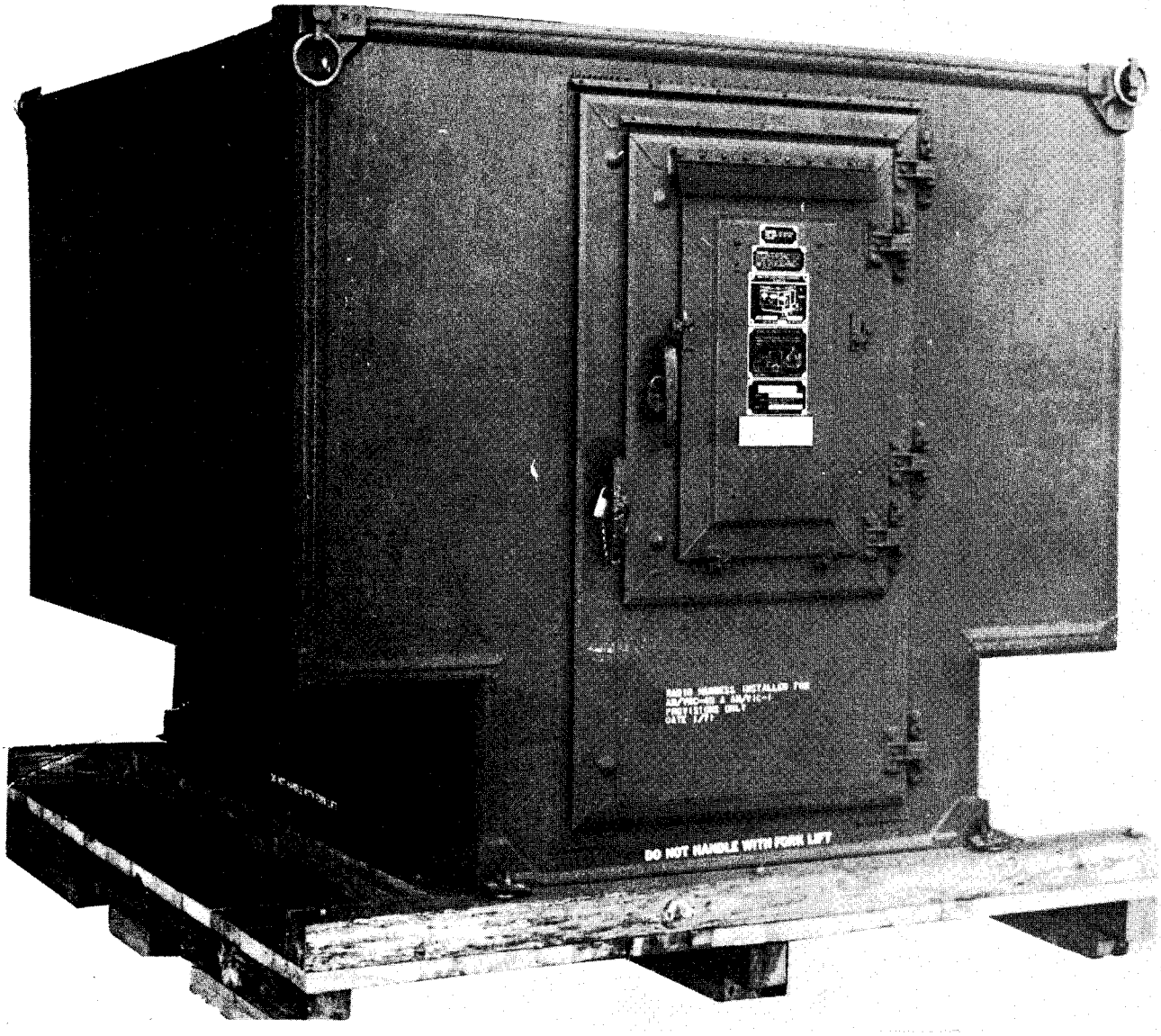


Figure 2–7. Shop equipment, guided missile system, contact support, TOW, skid-mounted.

2-3. Operational Configurations of TOW Vehicles

Figures 2-8 through 2-11 show the TOW vehicles in their operational configuration. The phantom lines used in these figures illustrate the material removed from the vehicles for resupply transportation purposes.

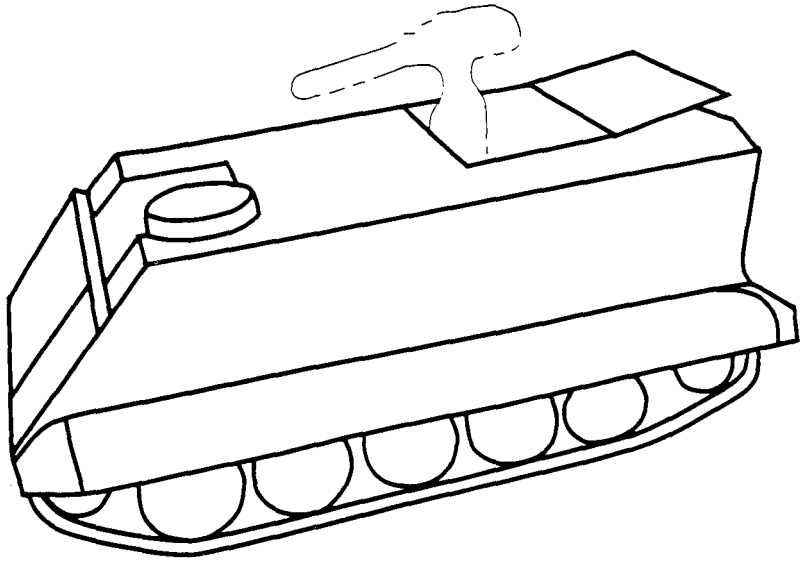


Figure 2-8. Carrier, guided missile equipment, TOW, in operational configuration (phantom-lined equipment is removed for transportation).

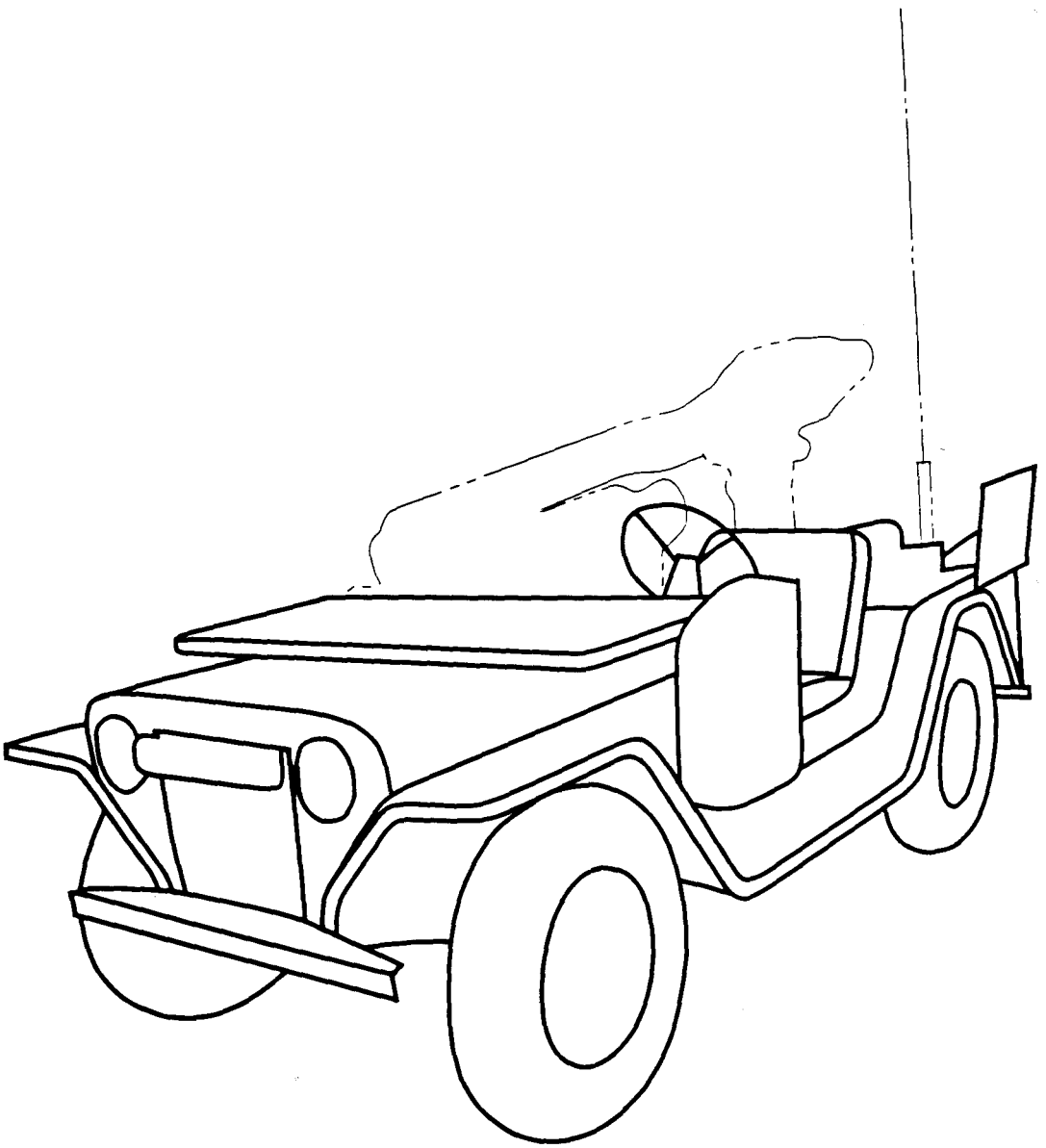


Figure 2-9. Truck, ¼-ton, guided missile equipment, TOW, in operational configuration (phantom-lined equipment is removed for transportation).

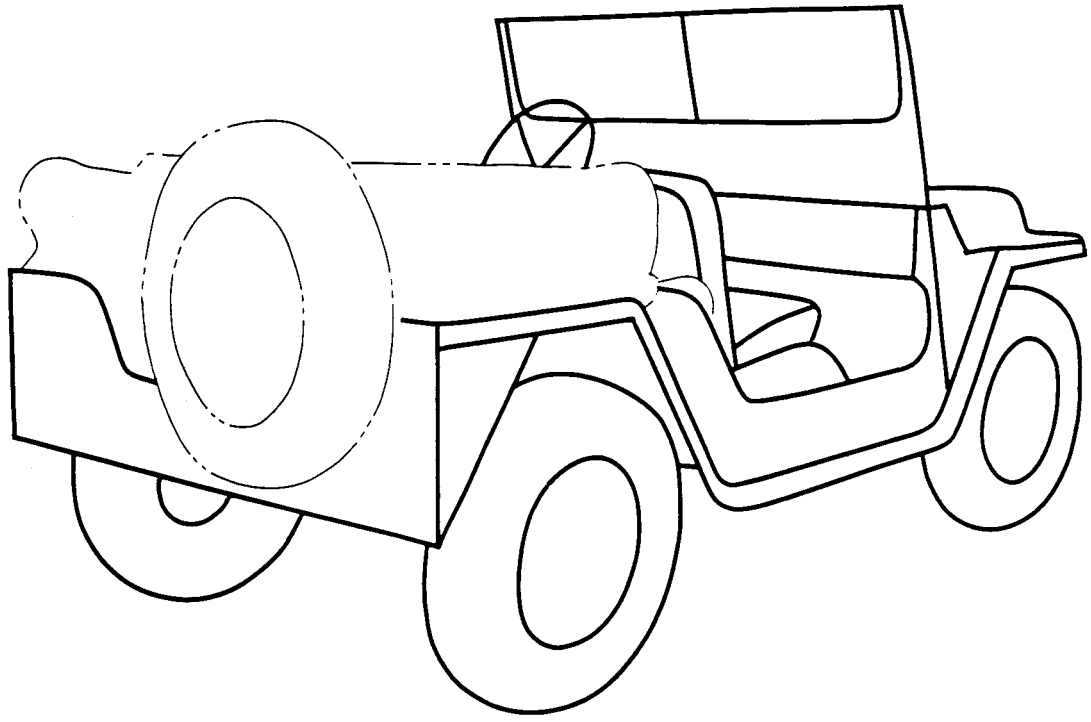


Figure 2–10. Truck, ¼-ton, guided missile carrier, TOW, in operational configuration (phantom-lined equipment is removed for transportation).

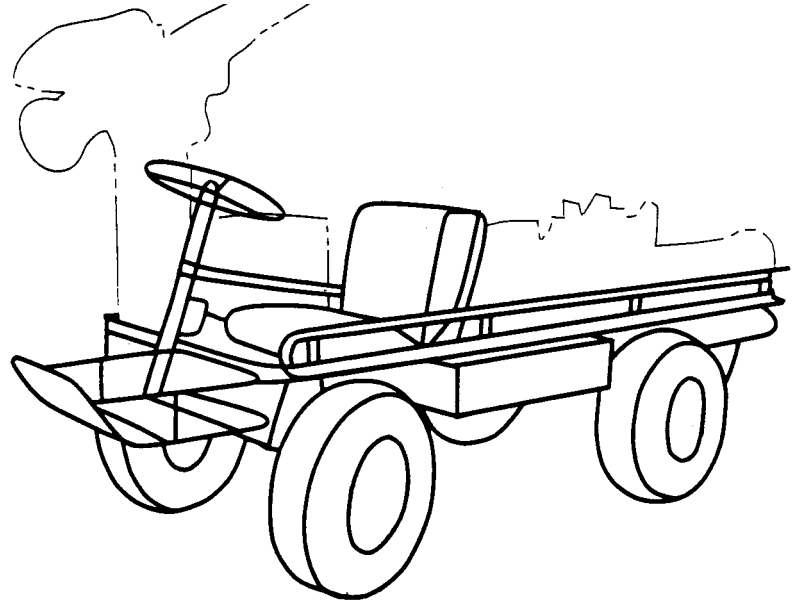


Figure 2–11. Truck, ½-ton, guided missile equipment, TOW, in operational configuration (phantom-lined equipment is removed for transportation).

2-4. Transportability Drawings (fig 2-12 through 2-16)

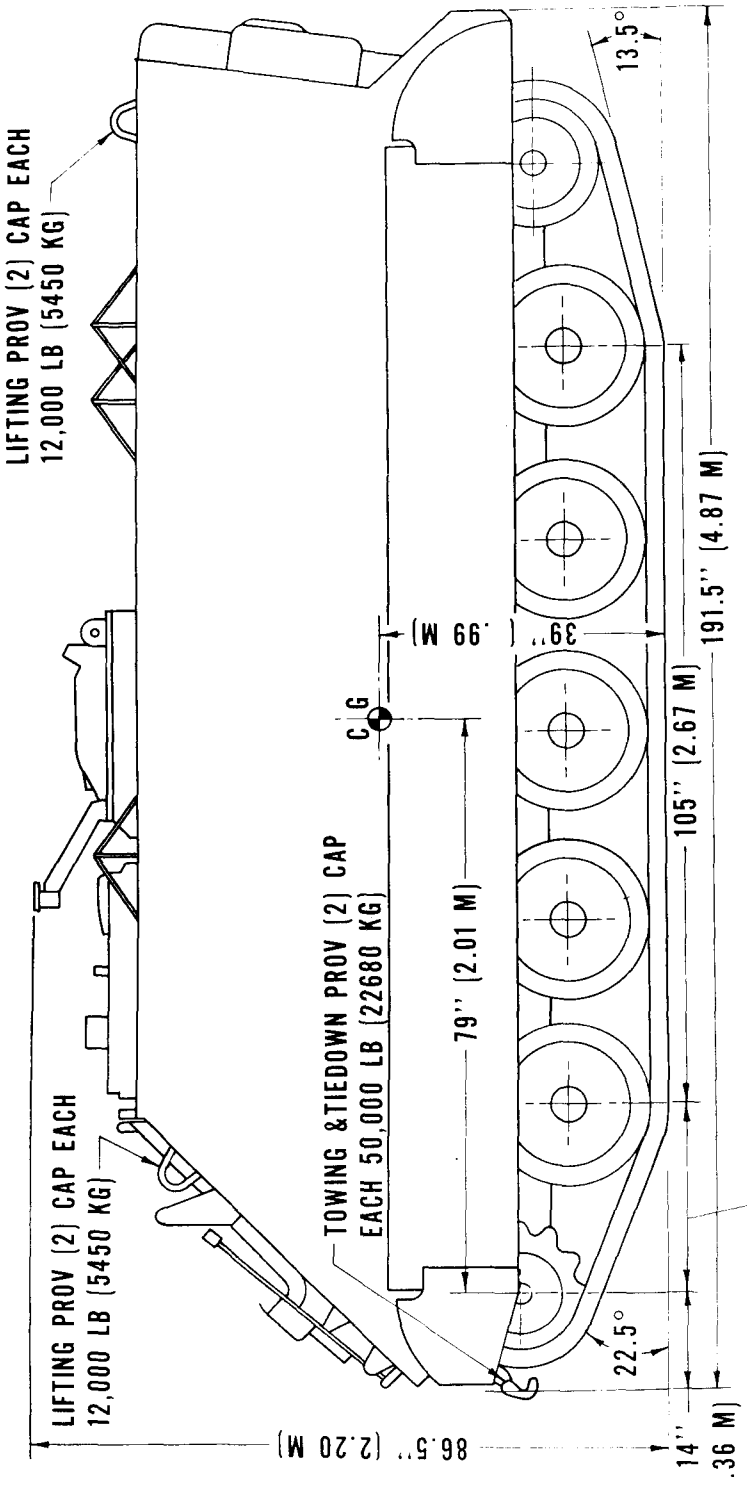


Figure 2-12. Side elevation of carrier, guided missile equipment, TOW.

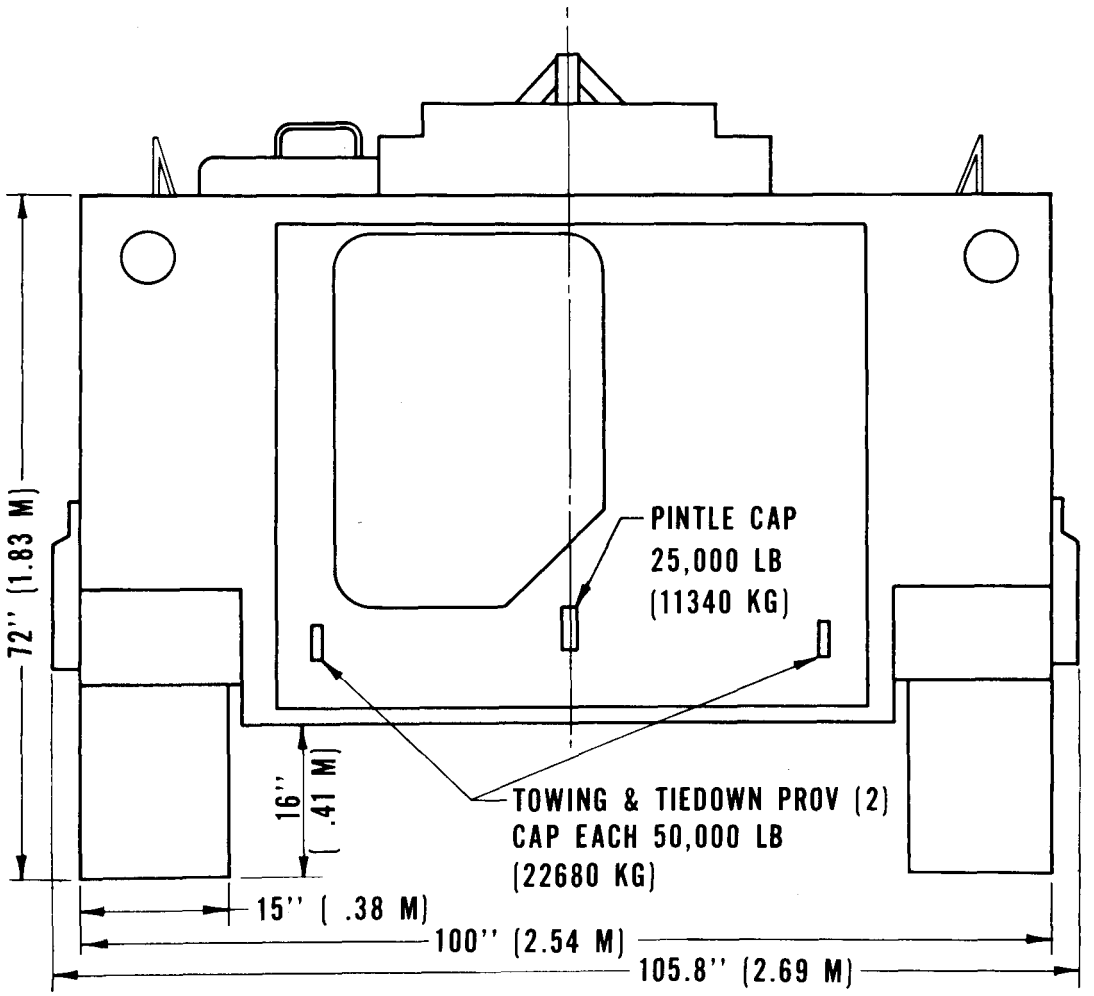


Figure 2–13. Rear end elevation of carrier, guided missile equipment, TOW.

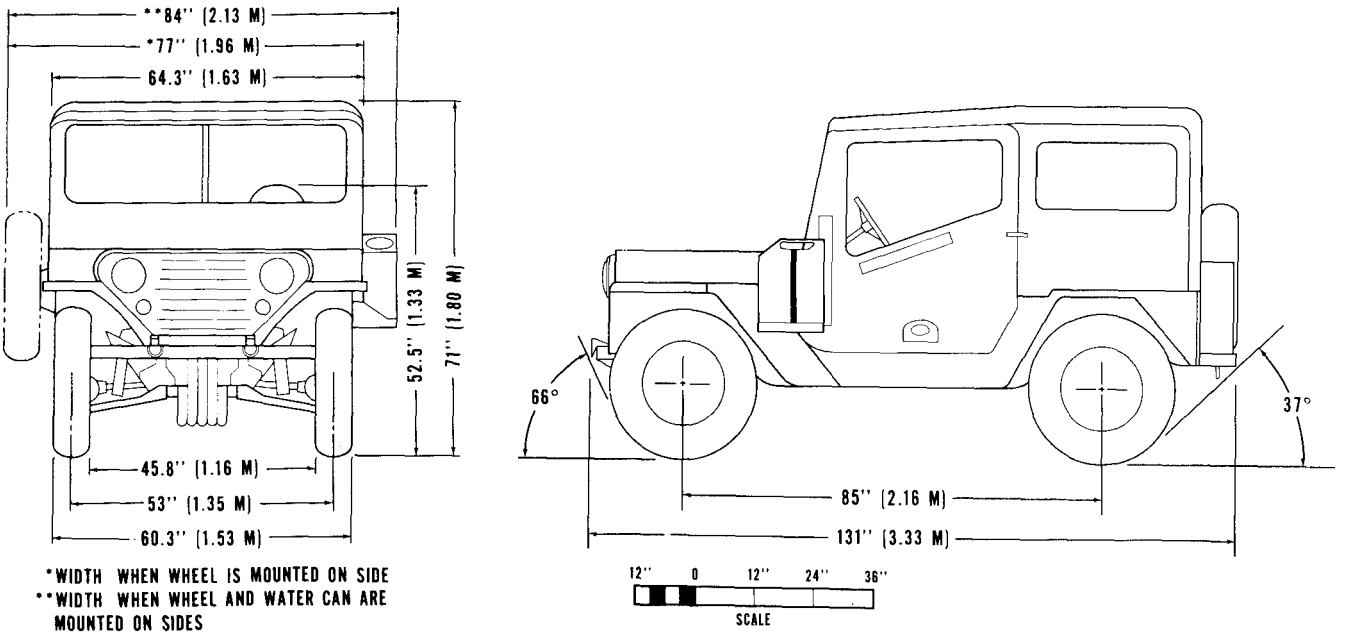


Figure 2–14. Side and end elevations of truck, ¼-ton, guided missile equipment or carrier, TOW.

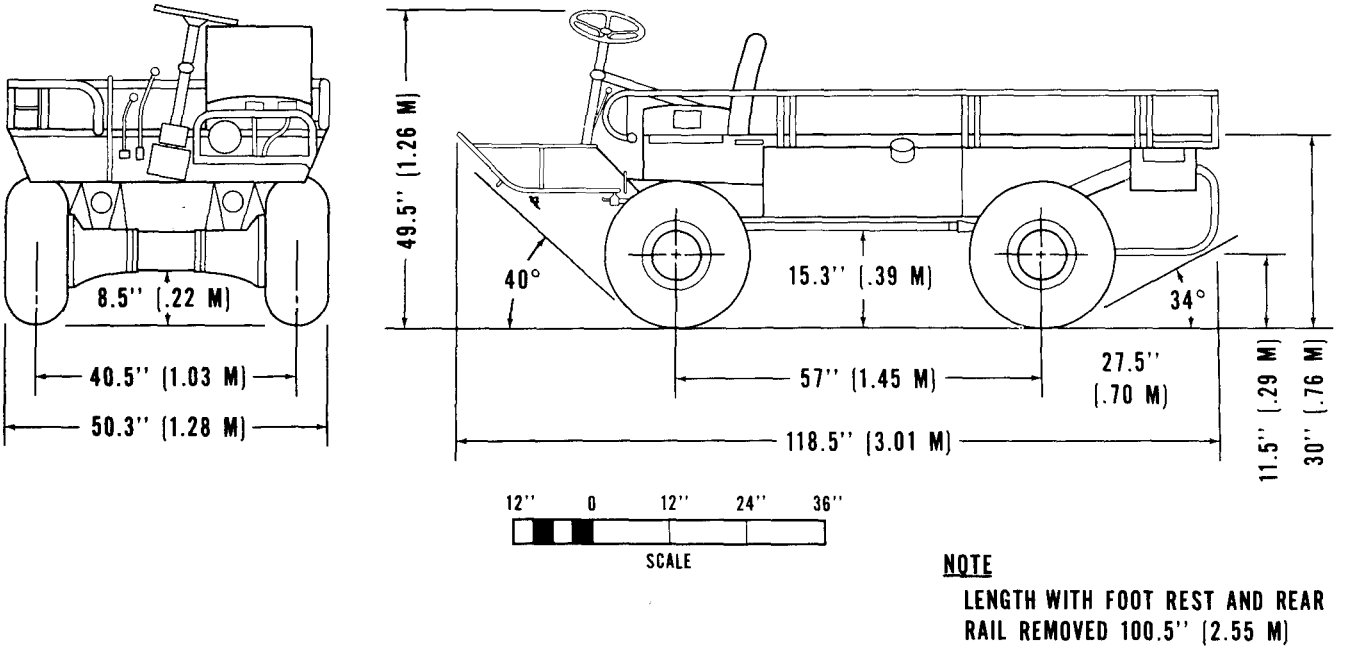


Figure 2–15. Side and end elevations of truck, ½-ton, guided missile equipment, TOW.

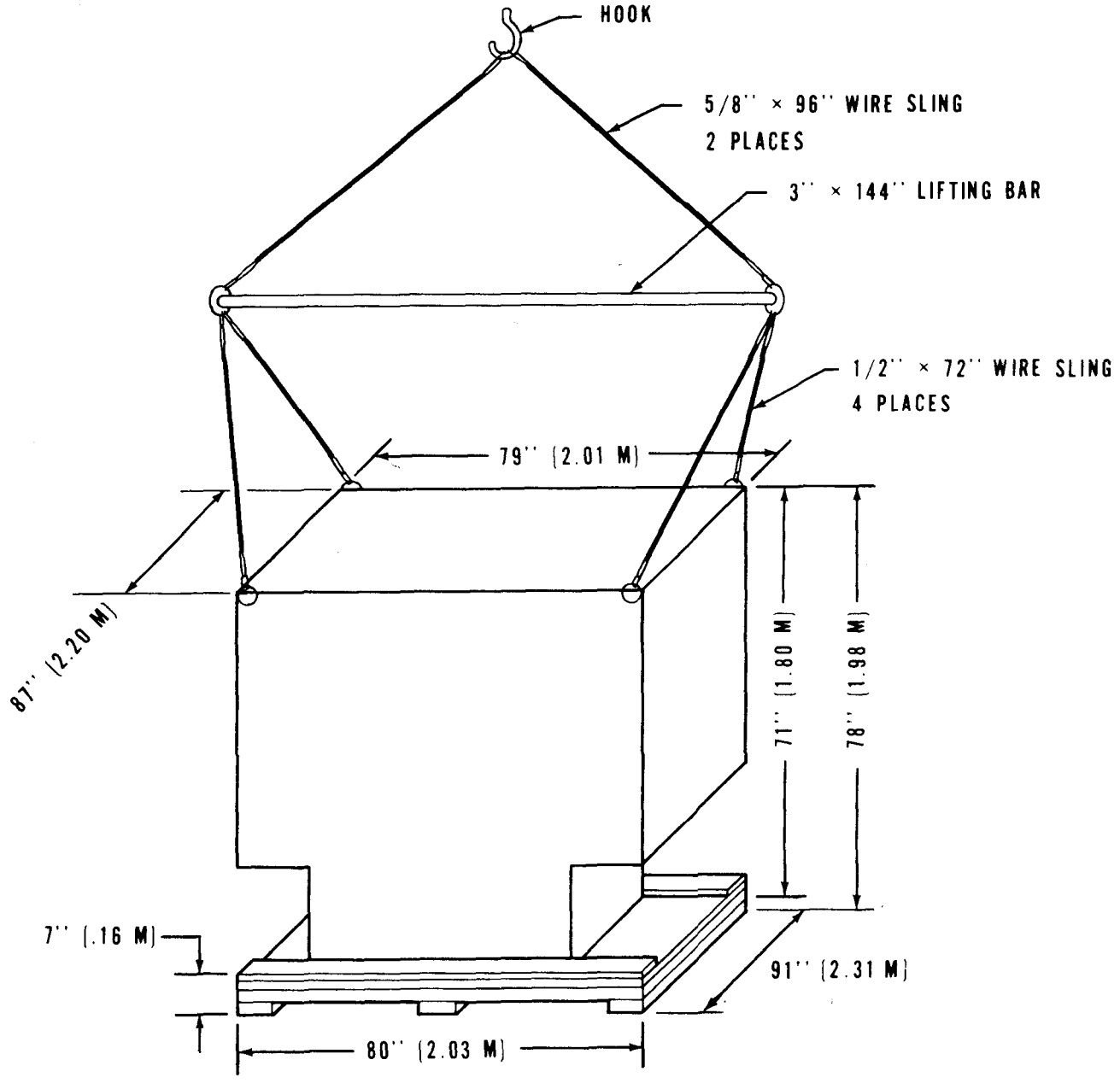


Figure 2–16. Schematic of skid-mounted shop equipment with lifting bridle.

Section II. CHARACTERISTICS AND RELATED DATA OF ITEMS

2-5. General Transportability Characteristics

Data contained herein are applicable to model number or Federal Stock Number (FSN) shown. Changes in model number or FSN may affect the loadability of the item as related to the guidance shown in this manual.

a. Guided missile, surface attack, BGM-71A, boxed and palletized:

Federal Stock Number: 1410-087-1521
Line item number: J95525
Type classification: Standard A

Measurements:

Boxed	Palletized
Length 58 in. (1.47 m.)	58.25 in. (1.48 m)
Width 11.5 in. (0.29 m)	47.75 in. (1.21 m)

Boxed	*Palletized*
Height 11.5 in. (0.29 m)	39.75 in. (1.01 m)
Volume 4.4 cu ft (0.12 cu m)	63.9 cu ft (1.81 cu m)
Weight 89 lb (40 kg)	1,151 lb (522 kg)

NOTES

(Applicable for all TOW missiles)

★1. The Department of Transportation hazard classification is Class A explosive, and missiles must be shipped in accordance with approved US Army Materiel Command outloading drawings (fig. 5-1, 5-2, 7-1, and 7-2).
2. Standard pallet load is three rounds high and four rounds wide.
3. See figure 5-1, sheets 1 and 2 of 19 for general notes and details of container and-pallet unit.

**b. Guided Missile, Practice, BTM-71A (Encased), Boxed and Palletized.*

Federal Stock Number: 1410-087-1527
Line Item Number: J95494
Type Classification: Standard
Measurements: Same as a above.

c. Guided Missile, Telemetry, BEM-71A, Boxed and Palletized.

Federal Stock Number: 1410-087-1520
Line Item Number: J95531
Type Classification: Not applicable
Measurements: Same as a above, except for weight.

Boxed	*Palletized*
Weight 87 lb (39 kg)	1,127 lb (511 kg)

**d. Launcher, Tubular, Guided Missile, M220, in Shipping Configuration.*

Federal Stock Number: 1440-179-4152
Line Item Number: L45740
Type Classification: Standard
Measurements:

Boxed	
Length 75 in.	(1.91 m)
Width 40.5 in.	(1.03 m)
Height 34.1 in.	(0.87 m)
Volume 60 cu ft	(1.70 cu m)
Weight: 584 lb	(265 kg)

*e. Carrier, Guided Missile Equipment,

TOW

FederalStockNumber:1450-176-2697

LineItemNumber:D11680

TypeClassification:Standard

Turning Radii: 13 ft (pivot)
Measurements: Operational and reduced dimensions shown in figures 2-12 and 2-13.
Volume: 1,014 cu ft (28.70 cu m) operational
958 cu ft (27.11 cu m) reduced
Weight: 19,660 lb (8,918 kg)

NOTES

1. Carrier, guided missile equipment, TOW is to be shipped without being disassembled.
2. Plans call for packaging launcher (everything except the missiles) inside the vehicle.
3. Weight will vary due to the weight of items removed to permit the installation of the TOW missile system.
4. If weight or dimensions become critical, each vehicle should be weighed and measured.

★ *f. Truck, 1/4-Ton, Guided Missile Equipment, TOW.*

Federal Stock Number: 1450-176-2712
Line Item Number: X45549
Type Classification: Standard
Turning Radii: 18 ft
Center of Gravity (empty):
Horizontal From Center Line of Front Wheel 37.5 in.
Vertical From Ground Level 23.9 in.
Measurements: Operational and reduced dimensions shown in figure 2-14.
Volume: 255.9 cu ft (7.24 cu m) Notes 1 and 2
414.5 cu ft (11.73 cu m) Note 1
Weight: 2,330 lb (1,057 kg)

NOTES

(Also applicable tog below)

1. For CONUS shipping, windshield is up and spare tire is mounted on side of vehicle. For overseas shipping and for operational use, windshield is down, canvas top lowered, and spare tire is removed.
2. With windshield down and canvas top lowered, top of steering wheel is highest point.

★ *g. Truck, 1/4-Ton, Guided Missile Carrier, TOW.*

Federal Stock Number: 1450-878-9024
Line Item Number: X45317
Type Classification: Limited procurement
Turning Radii: 18 ft
Center of Gravity (empty):
Horizontal From Center Line of Front Wheel 37.5 in.
Vertical From Ground Level 23.9 in.
Measurements: Operational and reduced

dimensions shown in figure 2-14.
Volume: 255.9 cu ft (7.24 cu m) Notes 1 and 2, *f* above
414.5 cu ft (11.73 cu m) Note 1, *f* above
Weight: 2,291 lb (1,039 kg)

★ *h Truck, 1/2-Ton, Guided Missile Equipment, TOW.*
Federal Stock Number: 1450-176-2709
Line Item Number: X45554
Type Classification: Limited Procurement
Turning Radii: 10 ft
Measurements: Operational and reduced dimensions shown in figure 2-15.
Volume: 170.7 cu ft (4.83 cu m) operational
87.8 cu ft (2.48 cu m) reduced
Weight: 970 lb (440 kg)

★ *i Training Set, Guided Missile System, M70, TOW.*
Federal Stock Number: 6920-179-7320
Line Item Number: X04584
Type Classification: Standard
Measurements (boxed):

Length	60.5 in. (1.54 m)
Width	48.0 in. (1.22 m)
Height	43.0 in. (1.09 m)
Volume	70 cu ft (1.98 cu m)
	Weight 775 lb (352 kg)

★ *j Shop Equipment, Guided Missile System, Contact Support, TOW.*
Federal Stock Number: 4935-150-5905
Line Item Number: T14493
Type Classification: Standard
Measurements:

Length	87.0 in. (2.20 m) operational
	91.0 in. (2.31 m) on skids
Width	79.0 in. (2.01 m) operational
	80.0 in. (2.03 m) on skids
Height	71.0 in. (1.80 m) operational
	78.0 in. (1.98 m) on skids
Volume	282 cu ft (7.98 cu m) operational
	383 cu ft (10.84 cu m) on skids
Weight	1,140 lb (517 kg) operational
	1.,290 lb (585 kg) on skids

2-6. CONUS Freight Classification

Rail and motor freight classification descriptions and item numbers will be determined in accordance with chapter 211 of AR 55–355 and the Freight Classification Guide System. Proper classification and/or description of articles must be determined and provided on the bill of lading before the shipment is released to the carrier.

CHAPTER 3

SAFETY

3-1. General

General safety considerations and precautions for lifting, moving, and securing the items of the TOW missile system are as follows:

a. Do not leave vehicles unattended while engines are running.

b. Do not smoke or allow open flames in area while performing service to fuel system.

c. Exercise extreme care when removing radiator cap if temperature gauge reads above 180 degrees Fahrenheit.

d. Check each vehicle to insure that all loose items are secured.

e. When backing a vehicle, insure that no personnel or obstructions are behind it.

f. Exercise extreme caution during towing operations of disabled vehicles.

g. Do not walk under any items when they are being lifted by crane or other means.

h. Do not move any items unless they are properly secured to transportation equipment.

3-2. Hazardous Materials

Shipment of hazardous materials by all modes of commercial transportation within CONUS will be made in accordance with the requirements outlined in chapter 216 of AR 55-355. It is mandatory that the utmost care and prudence be exercised by everyone engaged in the handling and transport of all kinds of explosives, ammunition, and ammunition components. In the event the transport of ammunition or explosives is authorized:

a. The missile, which contains class A explosives, must be shipped with the same class or a compatible class. *DO NOT* mix noncompatible classes of explosives or hazardous munitions (app).

b. Proper ventilation must be provided when loading and unloading. Prolonged exposure to carbon monoxide fumes will produce adverse effects that may prove fatal

c. Fire extinguishers must be readily available during all loading and unloading operations.

d. The missile must not be removed from the launcher container.

e. The missiles must not be rough handled or dropped; such mishandling may damage the motor propellant grain or other missile components and cause a malfunction at launch or in flight.

f. Eroased missiles must point in the same direction. This direction should allow the least danger to personnel or property in case of accidental explosion or fire.

CHAPTER 4

AIR TRANSPORTABILITY GUIDANCE

Section I GENERAL

4-1. Scope

This chapter provides air transportability guidance for movement of the TOW missile system. It covers significant technical and physical characteristics; safety considerations; and prescribes the manpower, materials, and time required to prepare, load, tie down, and unload the vehicles in US Army and Air Force aircraft.

4-2. Maximum Utilization of Aircraft

The loads described in this chapter are not maximum loads. Additional cargo and/or personnel with allowable load limits and restrictions prescribed by pertinent safety regulations (app) can be transported.

4-3. Applicability

a. These instructions apply when the items are located and tied down as shown in the loading diagrams and tiedown data tables.

b. For operational reasons or to accommodate additional cargo, the aircraft commander may designate a location other than that shown in the loading diagram. If the item is relocated, the aircraft commander must insure that-

(1) The number and load capacity of the tiedown devices are as prescribed in this manual.

(2) The tiedown devices restraining the item are secured to tiedown fittings of at least the same strength and in the same location relative to the item as those fittings in the loading diagrams and tables. The restraint factors (g loads) for minimum acceptable condition specified for crew and passenger safety in the event of a controlled emergency landing are identified in AR 70-39.

4-4. Safety

In addition to the safety precautions contained in chapter 3, the following areas should be noted:

a. The activity offering the vehicles for air transport will notify the aircraft commander or his designated representative in the event ammunition or explosives are to be transported within the vehicles.

b. When transported by aircraft, vehicle fuel tanks must not be more than three-fourths full.

c. The required number of tiedowns plus their capacity must be checked and the criteria of gravity forces adhered to.

d. Each vehicle or component must be checked carefully to insure that all loose items are properly secured.

e. Vehicles must not exceed 3 miles per hour inside aircraft or on loading ramps.

f. Aircraft floors and ramps must be protected by rolling and parking shoring when tracked vehicles are loaded and unloaded. Two-inch lumber must be placed under the tracks. Lumber, two pieces wide, on each side of the aircraft from end of ramp to the tiedown point is required.

Section II. INTERNAL AND EXTERNAL TRANSPORT BY US ARMY AIRCRAFT

4-5. Applicability

a. The TOW missile system (except for small components) cannot be transported internally or externally by US Army fixed wing aircraft.

b. All items in the TOW missile system (except for the carrier, guided missile equipment, TOW) can be transported internally or externally by US Army UH-1-series and CH-47 and CH-54 helicopters.

4-6. Internal Transport by US Army Helicopters

a. Load 1 in UH-1D helicopter. The approximate dimensions and weights of the items are given in table 4-1. Figure 4-1 is a photograph of the TOW components in the *UH-1D* helicopter,

(1) *Preparation.* None, other than inspection according to operator's manual (app).

(2) *Material required. 12-* by 15-by 3/4-inch plywood under traversing unit. Weight of the item on bearing points exceeds the maximum pounds per square inch floor loading of the helicopter.

(3) *Loading time.* Two men can prepare and load items in approximately 45 minutes.

(4) *Loading procedures.* Load in the following sequence:

(a) Missiles in overpack.
(b) Launch tube.
(c) Remaining items as desired.

Table 4-1. Load 1, TOW Components (UH-1D Helicopter) (Fig 4-1)

Item	Description	Length	Width	Height	Weight
A	Traversing unit	11.7 in. (0,30 m)	20.4 in. (0.52 m)	20.1 in. (0.51 m)	54 lb (25 kg)
B	Tripod retracted	41.9 in. (1.06 m)	25,4 in. (0.65 m)	25.4 in. (0.65 m)	21 lb (10 kg)
C	Optical sight	21.4 in. (0.54 m)	11.6 in. (0.29 m)	12.4 in. (0.31 m)	32 lb (15 kg)
D	Guidance set w/battery assembly	16.0 in. (0.40 m)	16.0 in. (0.40 m)	10.0 in. (0.25 m)	53 lb (23 kg)
E	Launch tube	66,0 in. (1.68 m)	7.5 in. (0.19 m)	7.5 in. (0.19 m)	13 lb (6 kg)
F	Missiles (two) in overpack	58 in. (1,47 m)	12.0 in. (0.30 m)	24.0 in. (0.61 m)	178 lb (80 kg)
		Total weight			351 lb* (159 kg)

***The spare battery, 15.5 x 4.8 x 7.8 inches and 21 pounds, is not included in total.**

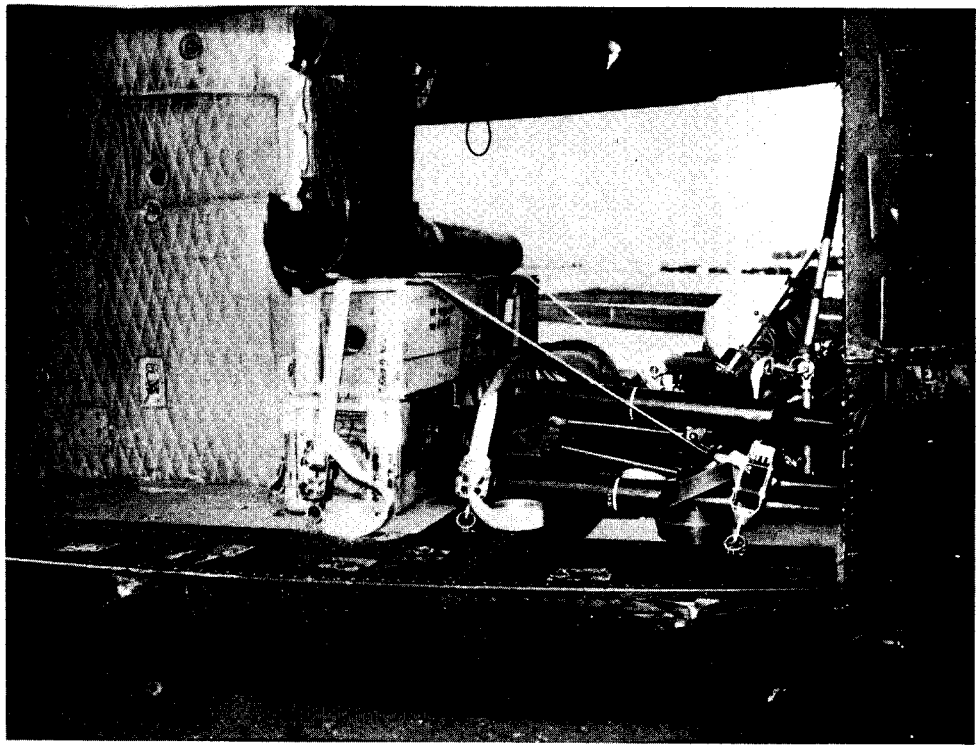


Figure 4–1. TOW components in UH–1D helicopter.

(5) Tiedown procedures. Tie down as indicated by table 4-2 and figure *4-2.*

(6) *Unloading procedures.* Two men can unload in approximately 10 minutes, in reverse procedures to loading.

b. Load 2 in CH-47 Helicopter.

(1) Table 4-3 details measurements and weights of the items comprising load 2 in the CH-47 helicopter.

(2) *Preparation.*

(a) Insure that both vehicles are in the travel mode.

(b) Insure that optical sight is in bag stowed in launcher vehicle.

(c) Ascertain that fuel tank is not more than three-fourths full.

(d) Insure that optical sight is tied down with 550-pound-capacity nylon cord.

(3) *Materials.*

(a) Cord: nylon, natural, type-III, 550-pound-capacity (FSN 4020-240-2146).

(b) Clevis: small, four each at wheel hub fittings for each vehicle.

(4) *Loading procedures.* Two men can load and tie down both vehicles in approximately 40 minutes.

(a) Each vehicle is backed into helicopter and tied down independently.

(b) Care must be taken with launcher vehicle because there are only 3 inches of vertical clearance during and after loading.

(c) Brakes must be engaged.

NOTE

Front end of tiedowns on item B cannot be secured until after ramp is raised.

(5) *Unloading procedures. Two* men can unload, in reverse procedure, in approximately 15 minutes.

(6) Table 4-4 and figure 4-3 give tiedown

Table 4-2. *Tiedown Data for TOW Components in UH–1D Helicopter* (Fig 4-2)

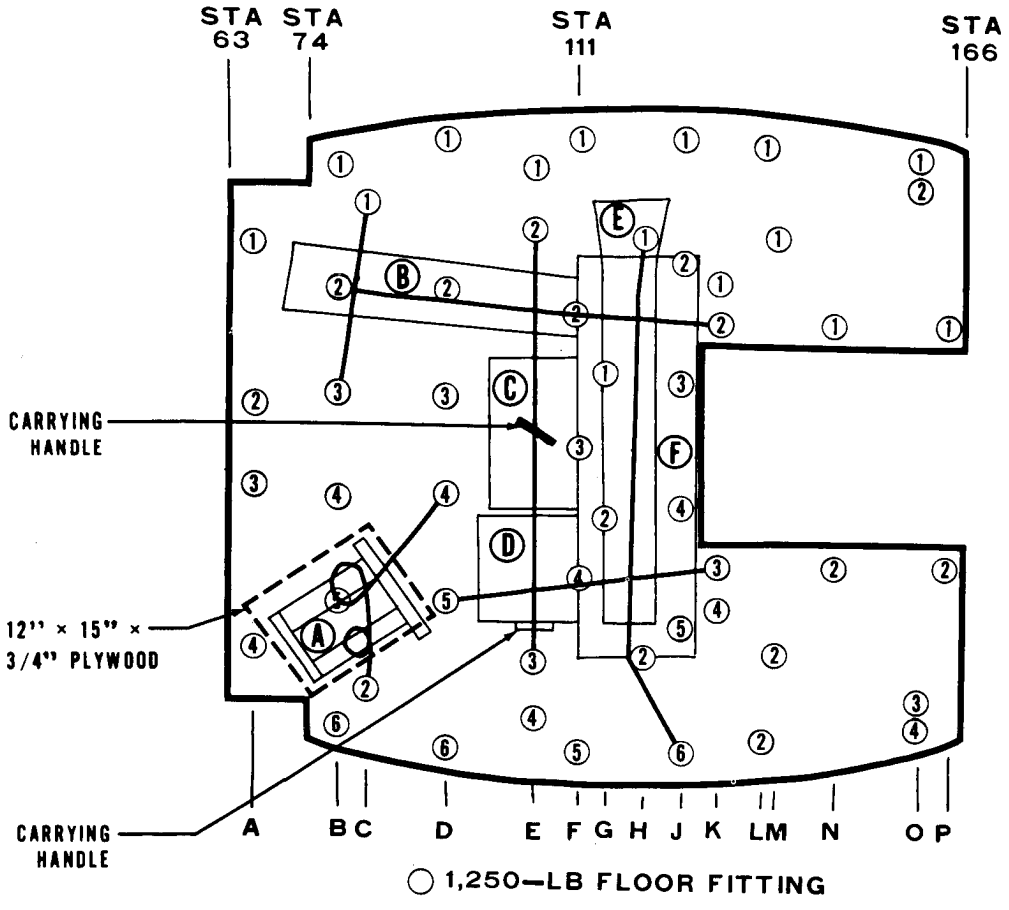
Item No.	Tiedown fitting No.	Capacity of fitting in 1,000 lb	Type device	Attach to item
A	C2/D4	1.25	CGU–1/B	Looped around each side of item.
B	B3/C1	1.25	CGU–1/B	Over item.
B, E, & F	B2/K2	1.25	CGU–1/B	Over items B, E, and F through forward end of item B.
B, C, & D	E2/E3	1.25	CGU–1/B	Over items B, C, and D.
D, E, & F	D5/K3	1.25	CGU–1/B	Over items D, E, and F.
E & F	H1/J6	1.25	CGU–1/B	Over items E and F through the tube.

Table 4-3. *Load 2, Two Trucks, ¼-Ton, Guided Missile Equipment, TOW and Guided Missile Carrier, TOW (CH–47 Helicopter)* (Fig 4-3)

Item	Description	Length	Width	Height	Weight
A	Truck, ¼-ton, guided missile equipment, TOW w/M232 mounting kit, with two missiles and launcher.	131.0 in. (3.33 m)	64.3 in. (1.63 m)	62 in. (1.57 m)	2,910 lb (1,310 kg)
B	Truck, ¼-ton, guided missile carrier, TOW w/M236 mounting kit, with six missiles.	131.0 in. (3.33 m)	64.3 in. (1.63 m)	58 in. (1.47 m)	2,740 lb (1,233 kg)

Table 4-4. *Tiedown Data for Two ¼-Ton Trucks in CH–47 Helicopter* (Fig 4-3)

Item No.	Tiedown fitting No.	Capacity of fitting in 1,000 lb	Type device	Attach to item
A	B2	5	CGU–1/B	Left rear tiedown clevis.
	D2	5	CGU–1/B	Right rear tiedown clevis.
	A11	10	CGU–1/B	Right front wheel hub fitting.
	E11	10	CGU–1/B	Left front wheel hub fitting.
	B12	5	CGU–1/B	Left front tiedown clevis.
	D12	5	CGU–1/B	Right front tiedown clevis.
B	B11	5	CGU–1/B	Left rear tiedown clevis.
	D11	5	CGU–1/B	Right rear tiedown clevis.
	A19	10	CGU–1/B	Right front wheel hub fitting.
	E19	10	CGU–1/B	Left front wheel hub fitting.
	B20R	5	CGU–1/B	Left front tiedown clevis.
	D20R	5	CGU–1/B	Right front tiedown clevis.



ITEM	DESCRIPTION OF ITEM	ITEM FACING	LOCATION OF REFERENCE POINT		LOCATION OF CENTER OF GRAVITY	APPROX WT (LBS)
			REFERENCE POINT	STATION		
(A)	TRAVERSING UNIT	ON SIDE	FWD EDGE	68	78	54
(B)	TRIPOD RETRACTED	FWD	FWD EDGE	70	90	21
(C)	OPTICAL SIGHT	SIDE FWD	FWD EDGE	99	105	32
(D)	GUIDANCE SET W/BATTERY ASSEMBLY	ON BOTTOM	FWD EDGE	95	103	53
(E)	LAUNCH TUBE	SIDE FWD	FWD EDGE	116	120	13
(F)	MISSILES (2) IN OVERPACK	SIDES FWD	FWD EDGE	111	117	178

*Figure 4-2. Tiedown diagram for TOW components in **UH-1D** helicopter.*

details for loading two 1/4-ton vehicles in the CH-47 helicopter.

c. Load 3 in CH-47 *helicopter,*

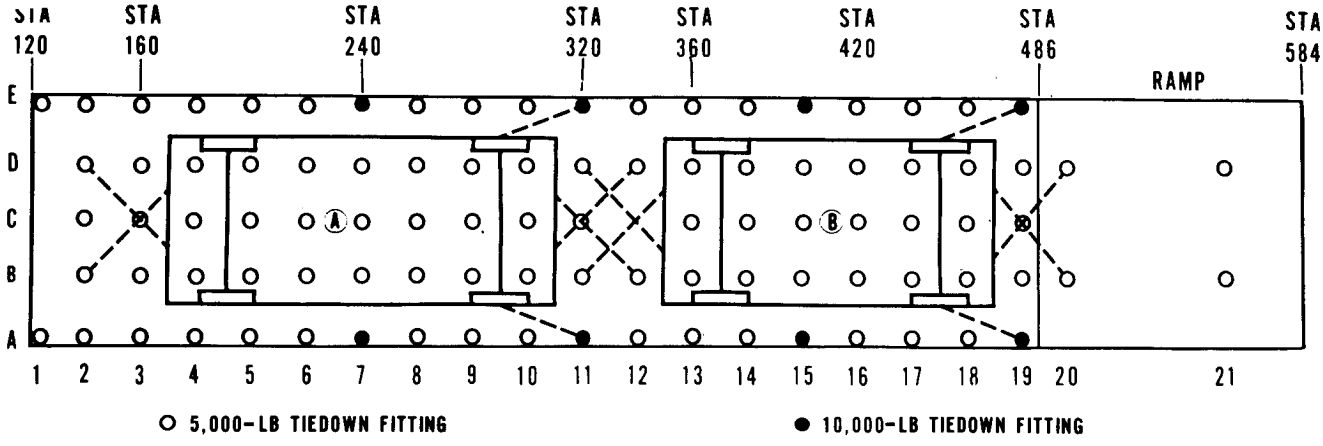
(1) Table 4-5 gives measurements and weights of the items comprising load 3 in the CH-47 helicopter.

(2) *Preparation.* Place vehicle in travel mode with three-fourths tank of fuel.

(3) Materials. None.

(4) *Loading procedures.*

(a) Item A. Item is backed in and tied down in accordance with diagram. Engage



NOTE: FLOOR AREA BOUNDED BY COLUMNS 11 AND 13 AND ROWS B AND D INCLOSES UTILITY HATCH.

ITEM	DESCRIPTION OF ITEM	ITEM FACING	LOCATION OF REFERENCE POINT		LOCATION OF CG (STA)	APPROX WT (LB)
			REFERENCE POINT	STATION		
Ⓐ	TRUCK, ¼-TON, GUIDED MISSILE EQUIPMENT, TOW, W/M232 MOUNTING KIT, 2 MISSILES, & LAUNCHER	AFT	FRONT AXLE	290	245	2,910
Ⓑ	TRUCK, ¼-TON, GUIDED MISSILE CARRIER, TOW, W/M236 MOUNTING KIT W/6 MISSILES	AFT	FRONT AXLE	445	397	2,740

Figure 4–3. Tiedown diagram for two ¼-ton trucks in CH–47 helicopter.

Table 4–5. Load 3, Truck, ½-Ton, Guided Missile Equipment, TOW, and Resupply Load (Fig. 4–4)

Item	Description	Length	Width	Height	Weight
A	Truck, ½-ton, guided equipment, TOW, w/M225 mounting kit, six missiles, and launcher	100.5 in. (2.55 m)	50.3 in. (1.28 m)	38 in. (0.97 m)	1,560 lb (702 kg)
B	Resupply load (10 missiles in overpack), loaded as bulk cargo	58 in. (1.47 m)	55 in. (1.40 m)	48 in. (1.22 m)	890 lb (404 kg)

brakes. Two men can load and tie down item in approximately 15 minutes.

(b) Item B. Missiles are handled as bulk cargo and are located and tied down as directed by aircraft commander or his representative. (Time and personnel are based upon number of missiles and required tiedowns.)

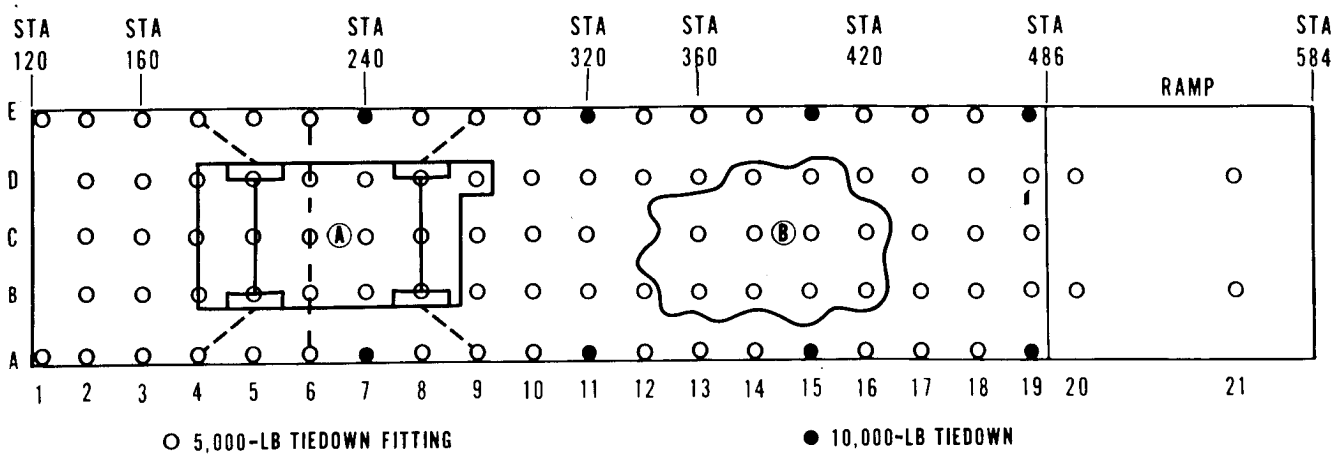
(5) *Unloading procedures.* Two men can unload, in reverse procedure, in approximately 15 minutes.

(6) Table 4-6 and figure 4-4 give tiedown details for loading the M274 vehicle and resupply load is the CH-47 helicopter.

4-7. External Transport by US Army Helicopters

WARNING

1. A charge of static electricity is nearly always present on the helicopter. Use of some type of discharge apparatus (see fig 4-1, TM 55-450-19) to ground the hook and discharge electricity is necessary to prevent shock when the hook is touched. After discharge of electricity, the hook is grasped quickly and firmly held, if possible, until the hookup is com-



NOTE: FLOOR AREA BOUNDED BY COLUMNS 11 AND 13 AND ROWS B AND D INCLOSES UTILITY HATCH.

ITEM	DESCRIPTION OF ITEM	ITEM FACING	LOCATION OF REFERENCE POINT		LOCATION OF CG (STA)	APPROX WT (LB)
			REFERENCE POINT	STATION		
Ⓐ	TRUCK, ½-TON, GUIDED MISSILE EQUIPMENT, TOW, W/M225 MOUNTING KIT, 6 MISSILES, AND LAUNCHER	AFT	FRONT AXLE	260	218	1,560
Ⓑ	RESUPPLY LOAD	NA	NA	NA	NA	890
	10 MISSILES IN OVERPACKS		LOADED AS BULK CARGO			

Figure 4-4. Tiedown diagram for truck, ½-ton, guided missile equipment, TOW, and resupply load in CH-47 helicopter.

Table 4-6. Tiedown Data for Truck, ½-Ton, Guided Missile Equipment, TOW, and Resupply Load in CH-47 Helicopter (Fig 4-4)

Item No.	Tiedown fitting No.	Capacity of fitting in 1,000 lb	Type device	Attach to item
A	A4	5	CGU-1/B	Right rear wheel hub fitting.
	E4	5	CGU-1/B	Left rear wheel hub fitting.
	A9	5	CGU-1/B	Right front wheel hub fitting.
	E9	5	CGU-1/B	Left front wheel hub fitting.
	A6/E6	5	CGU-1/B	Over item.
B	Load and tie down as bulk cargo.			

pleted. If contact with the hook is lost after initial grounding, the hook must be grounded again before it is touched. Do not use the load as a ground contact. After air delivery and before handling, again ground the load to discharge any accumulated/retained static electricity.

2. The high noise level of CH-47 helicopters can cause permanent damage to the ear and a cumulative loss of hearing. Personnel working in the vicinity should use earplugs. Hookup personnel should wear goggles and hard hats.

CAUTION

Caution should be exercised in transporting external cargo, as flight may be affected by size, weight, and shape of the cargo load. An air speed of 80 knots should not be exceeded under ideal flying conditions. Higher speeds cause load instability.

NOTES

1. The carrier, guided missile equipment, TOW, exceeds the weight capacity of the helicopters; therefore, it is not included in helicopter loadings.
2. The 1/4-ton and 1/2-ton trucks are lifted by helicopter, using the same air delivery material and method; therefore, one figure is used for both items.
3. Only one figure is used because unpalletized missiles or various components stowed in an A-22 bag make a similar load.

a. Load 4 *Transported by* UH–1D Helicopter. Load 4 consists of various TOW components or TOW missiles in A-22 bags. A maximum 2,000 pounds of cargo may be carried in one A-22 bag. The total number of bags to be carried determines the type of helicopter to be used. Figures 4-5 and 4-6 show rigging procedures for TOW missiles or various components in A-22 cargo bags for external lift.

(1) *Materials.*

(a) A-22 bag (FSN 1670-587-3421): one.

(b) Aerial delivery cargo slings: 3-loop (FSN 1670-753-3788), 3-foot, one.

(c) Aerial delivery cargo slings: 3-loop (FSN 1670-823-5041), 12-foot, one.

(d) Type-IV link assembly (FSN 1670-783-5988): one.

(e) Clevis assembly: suspension, air delivery, type-I, medium (size 3/4 in.) (FSN 1670-678-8562), one.

(f) Two-inch pressure-sensitive tape: (FSN 7510-663-0916), or suitable substitute.

(g) Wadding, cellulose (FSN 8135-558-0823), or similar packing material as required for items to be loaded into A-22 cargo bag: as required.

(h) Skid board, A-22 (FSN 1670-883-1654), or suitable plywood substitute: 1/2- x 48- x 48-inch, one.

(i) Tubular nylon, 1/2 inch (FSN 8305-082-5752) or type-III nylon cord (FSN 4020-240-2146): 12 feet.

(2) *Preparation and rigging.* (Use figures 4-5 and 4-6 as guides.)

(a) Place skid board on a level surface and secure 3-f oot length of 1/2-inch tubular nylon webbing or type-III nylon cord through hole in each corner of skid. This cord will be used to tie the skid to the sling assembly when the load is completely rigged.

(b) Center sling assembly lengthwise on skid.

(c) Center the cover, outer side down, on sling assembly with long panel over long tiedown strap.

(d) Center the load on canvas cover (A, fig 4-5). Use cushioning material as necessary.

(e) Fold panels of canvas cover over top of load (B, fig 4-5), folding under excess material as necessary. Secure cover at each corner through lacing loops, forming a figure eight with the cord. Secure ends of cord with bow knot and tape. If original lacing cord is not available, use type-III nylon cord.

(f) Pass free end of each tiedown strap over top of load and across to strap fastener on opposite end of strap. Tighten strap and fold and tape excess webbing (C, fig 4-5).

(g) Fasten lower lateral straps together around corner of load, by attaching free ends of straps to strap fasteners (D, fig 4-5). Fasten upper lateral straps in same manner as lower straps. If load is of sufficient height, all lateral straps will fasten around the load, but for a lower load the upper lateral straps are fastened diagonally across corners of load.

(h) Connect the four snap fasteners of suspension webs to D-rings on support webs of sling assembly (E, fig 4-5), making certain that open side of snaps face inward. Tape snaps to D-rings,

(i) Adjust all straps until sling assembly fits snugly around load. Fold and tape excess webbing. When the upper lateral strap runs across the top of container, pull the suspension webs to their full height, as in E, figure 4-5. Then adjust and secure upper lateral strap so that it does not bind to container. This procedure will prevent the support web from snapping the upper lateral band during lifting and transporting.

(j) Tie plywood skid to sling assembly with 1/2-inch tubular nylon webbing or type-III nylon cord attached to each corner of skid.

(k) Attach suspension webs to support webs of A-22 bag (fig 4-6). Tape suspension web snaps.

(l) Attach one end of the 12-foot sling to the bell end of the medium clevis assembly.

(m) Attach suspension webs to clevis on

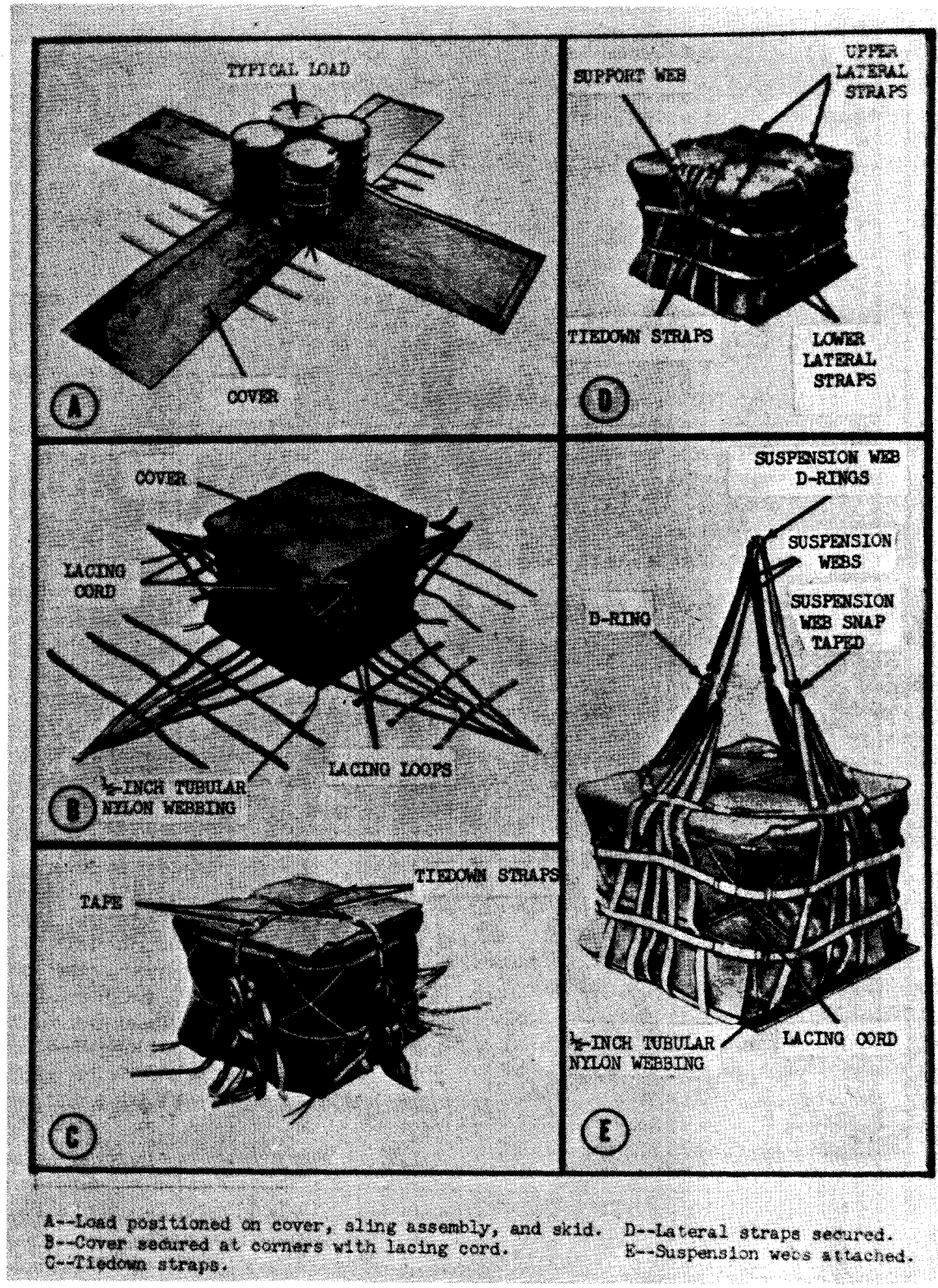


Figure 4–5. Rigging procedures for A–22 cargo bag.

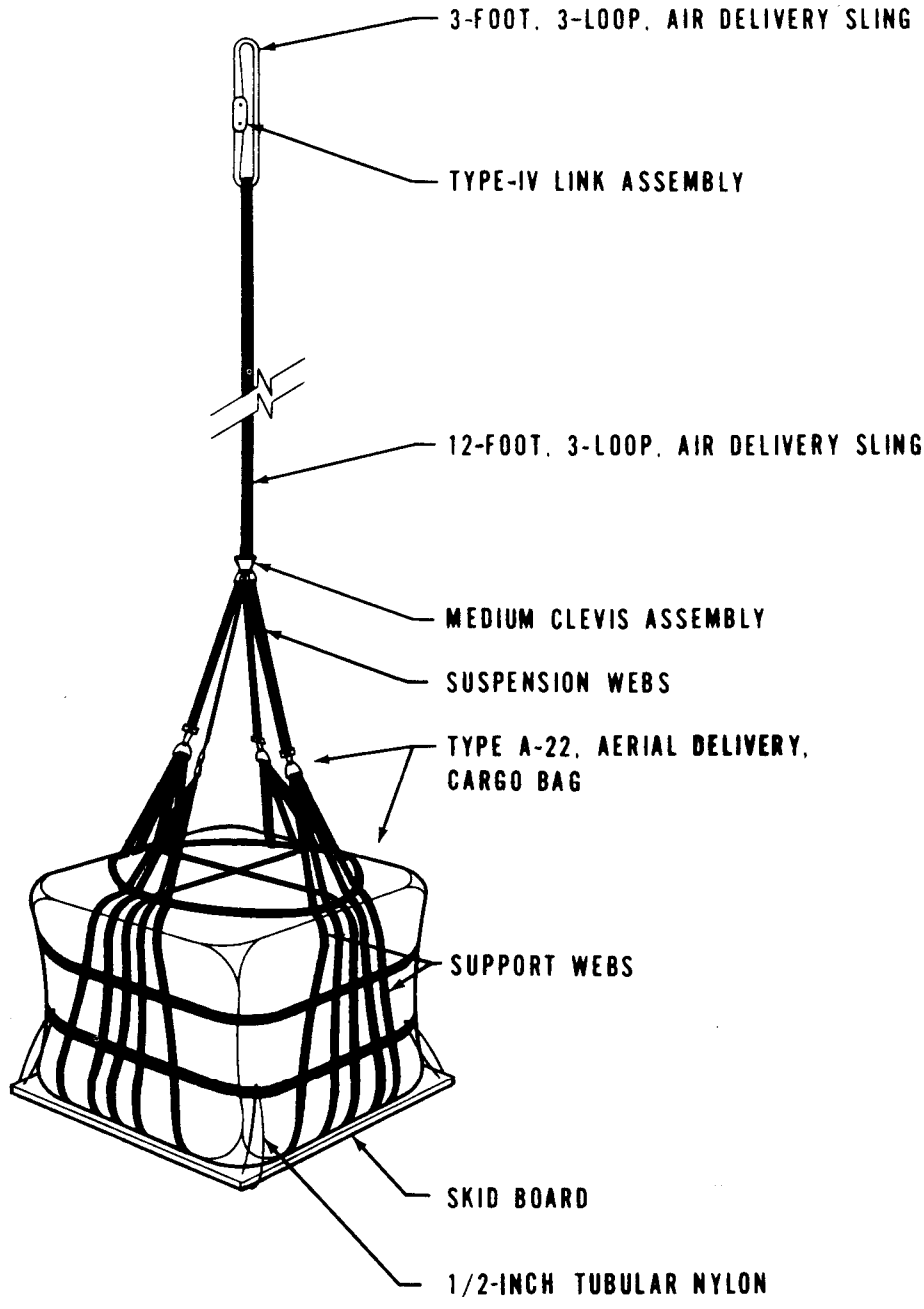


Figure 4-6. TOW missiles or various components rigged for external lift.

12-foot sling by passing clevis bolt through suspension web D-rings. Secure and tighten bolt.

(n) Pass the 3-foot sling through the free end of the 12-foot sling (fig 4-6). Form a loop sling using the type-IV link assembly to connect the two ends of the 3-foot sling. Tape the link assembly.

(3) *Time required.* Two men can prepare and rig the load for external lift in approximately 15 minutes.

(4) *Derigging.* Two men can derig the load in approximately 10 minutes.

b. Load 5 *Transported by UH-1, CH-47, or* CH-54 *Helicopters.* Load 5 (fig 4-7) consists of the 1/4-ton truck (launcher or resupply vehicle) or the 1/2-ton truck.

(1) *Materials.*

(a) Aerial delivery cargo slings: 3-loop (FSN 1670-753-3788), 3-foot, two.

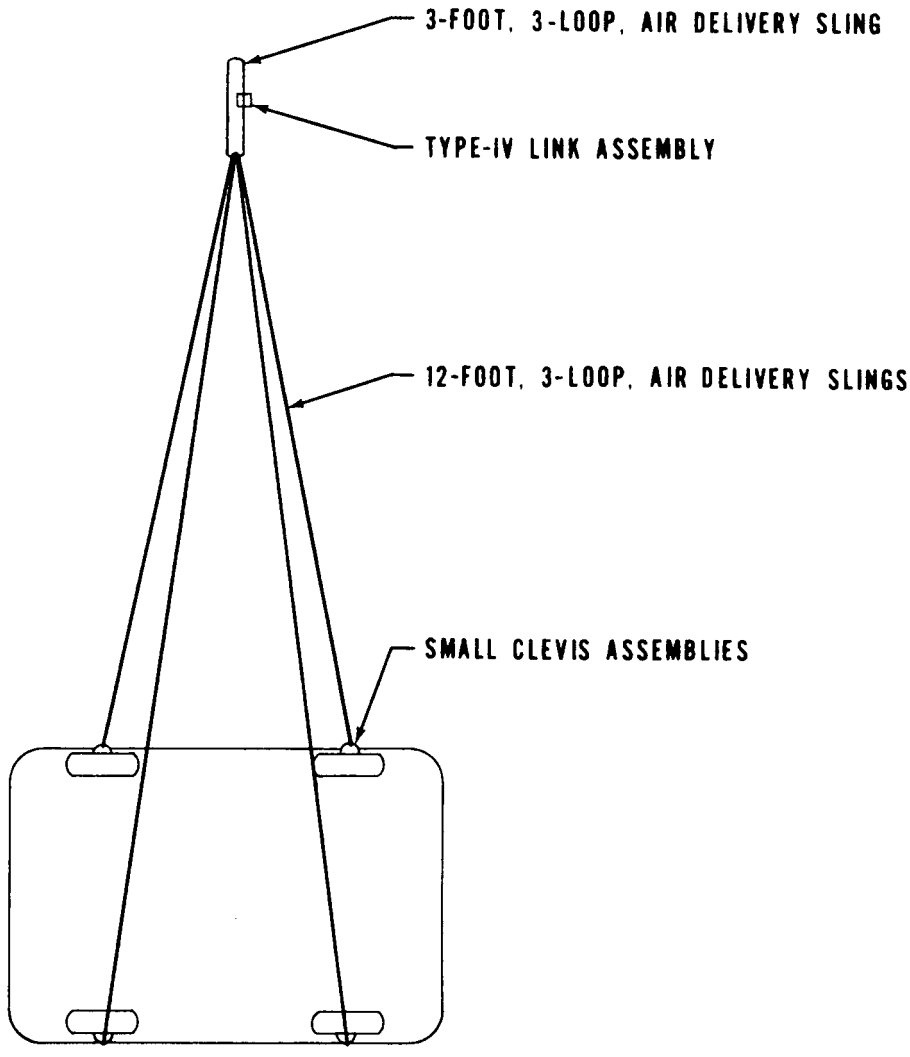


Figure 4–7. ¼-ton or ½-ton truck rigged for external lift.

(b) Aerial delivery cargo slings: 3-loop (FSN 1670-823-5041), 12-foot, four.

(c) Type-IV link assembly (FSN 1670-783-5988): one.

(d) Small clevis assemblies (FSN 1670-360-0304):four.

(e) Two-inch pressure-sensitive tape (FSN 7510-663-0916), or suitable substitute as required.

(f) Cushioning material, cellulose wadding (FSN 8135-558-0823), or suitable substitute as required.

(g) Cord: nylon, natural, type-III, 550-pound-capacity (FSN 4020-240-2146), as required.

(2) *Preparation and rigging.* (Use fig 4-7 as a guide.)

(a) Remove the top bows.

(b) Lower and Fold the tarpaulin, and the windshield. Secure with nylon cord.

(c) Lower the left rearview mirror so that it is flush with the truck body. Tape it to the side of the vehicle.

(d) Insure that all cargo is secured to vehicle by cord or similar lashing material.

(e) Insure that the gasoline content of the vehicle does not exceed 75-percent capacity. Inspect the gas tank cap, oil filler cap, and battery caps for proper installation.

(f) Engage the vehicle brake, and place the transmission in neutral.

(g) Attach one lower end of the four 12-

foot slings to the bells of the four small clevis assemblies (one each sling).

(h) Attach the bolt of the clevis assemblies to the hubs of the four wheels (one each wheel).

(i) After twisting each sling leg four times, basket-hitch the 3-foot sling through the upper ends of the four 12-foot slings.

(j) Connect the ends of the 3-foot sling with a type-IV link assembly.

(k) Protect the four sling legs where they rub against the vehicle body by use of cellulose wadding. Tape it in place by use of 2-inch pressure-sensitive tape.

(1) Tape the four sling legs at the top center of the load (breakaway technique) to prevent fouling during lift-off.

(m) Tape front legs to windshield locking bracket, then tape left front sling (breakaway technique) to top of steering wheel to prevent fouling during lift-off.

(3) *Time required.* Two men can prepare and rig the vehicle for external transport in approximately 20 minutes.

(4) *Air speed.* This load is suitable for the UH-1 series and CH-47 and CH-54 helicopters at a maximum air speed of 80 knots.

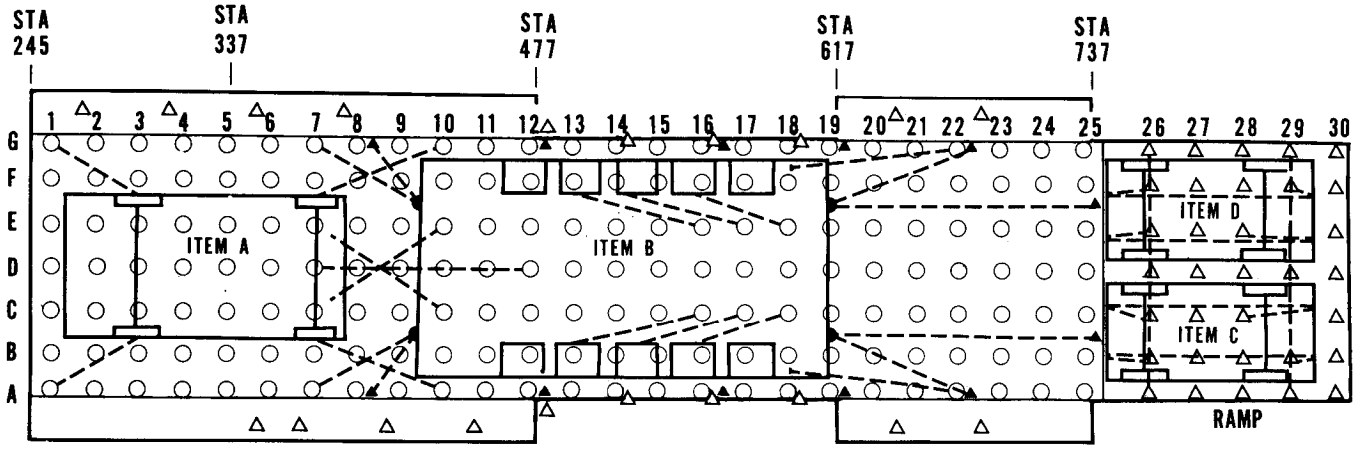
(5) *Derigging.* Two men can derig the vehicle in approximately 10 minutes,

Section III. TRANSPORT BY US AIR FORCE AIRCRAFT

4-8. Applicability

a. The TOW missile system can be transported by one or more of the following US Air Force aircraft: C-130, C-141, and C-5. A typical load is shown in figure 4-8, a tiedown diagram of the TOW trucks in a C-130 airplane; while table 4-7 is the tiedown data for the trucks,

b. The aircraft commander must insure that



ITEM	DESCRIPTION OF ITEM	ITEM FACING	LOCATION OF REFERENCE POINT		LOCATION OF CG (STA)	APPROX WT (LB)
			REFERENCE POINT	STATION		
A	TRUCK, ¼-TON, GUIDED MISSILE EQUIPMENT, TOW	AFT	FORWARD END	388	315	2,330
B	CARRIER, GUIDED MISSILE EQUIPMENT, TOW	AFT	FORWARD END	614	525	19,660
C&D	TRUCKS, ½-TON, GUIDED MISSILE EQUIPMENT, TOW	FWD	FORWARD END	741	783	1,940

Figure 4-8. Tiedown diagram for the TOW trucks in a C-130 airplane.

the number and types of tiedown devices are as prescribed in this manual and that the tiedown devices are secured to tiedown fittings of at least the same strength and in the same locations relative to those shown in the tiedown diagram.

WARNING

Proper ventilation must be provided when loading and unloading. Prolonged exposure to carbon monoxide fumes will produce adverse effects that may prove fatal.

CAUTION

Do not allow vehicles to exceed 3 miles per hour inside aircraft or on the loading ramps.

4-9. Preparation of Vehicles

Before preparation of equipment is begun, all preparation, loading, tiedown, and unloading procedures and pertinent photographs, tiedown diagrams, and tiedown data tables should be carefully reviewed by the loading personnel.

a. Check the vehicles, and tighten all loose parts,

b. When necessary, remove top bows, canvas tarpaulin, and other removable parts, and stow them securely in the vehicle.

c. Fold rearview mirrors, windshields, antennas, and similar equipment when necessary.

d. If the vehicle is loaded, make sure the load is restrained in the vehicle. Bracing, lashing, and tiedown nets, as appropriate, should be used.

ront and rear towing shackles on the carrier. A suitable substitute is the clevis assembly, suspension, air delivery, type-I, large (size 1 in.) (FSN 1670-090-5354) (Part No. MS70087-3) .

4-10. Loading Vehicles

Materials.

a. Shoring, 2- by 12-inch: 170 linear feet for the carrier.

b. Cord: nylon, type-III, 550-pound-capacity, as required.

c. MB-1 or C-2 tiedown device: 18 each.

d. MB-2 or D-1 tiedown device: 8 each.

e. CGU-1/B tiedown device: 8 each.

Table 4-7. Tiedown Data for TOW Trucks in C-130 Airplane (Fig 4-8)

Item No.	Tiedown fitting No.	Capacity of fitting in 1,000 lb	Type device	Attach to item
A	A1	10	MB–1 or C–2	Right rear wheel hub tiedown.
	G1	10	MB–1 or C–2	Left rear wheel hub tiedown.
	A10	10	MB–1 or C–2	Right front wheel hub tiedown.
	G10	10	MB–1 or C–2	Left front wheel hub tiedown.
	C10	10	MB–1 or C–2	Left front frame behind bumper.
	E10	10	MB–1 or C–2	Right front frame behind bumper.
B	A7	10	MB–1 or C–2	Right rear towing and tiedown provisions.
	D7	10	MB–1 or C–2	Pintle towing provision.
	G7	10	MB–1 or C–2	Left rear towing and tiedown provision.
	A8	25	MB–2 or D–1	Right rear towing and tiedown provision.
	G8	25	MB–2 or D–1	Left rear towing and tiedown provision.
	D12	10	MB–1 or C–2	Pintle towing provision.
	C16	10	MB–1 or C–2	No. 4 right road wheel arm.
	E16	10	MB–1 or C–2	No. 4 left road wheel arm.
	C17	10	MB–1 or C–2	No. 3 right road wheel arm.
	E17	10	MB–1 or C–2	No. 3 left road wheel arm.
	C18	10	MB–1 or C–2	No. 2 right road wheel arm.
	E18	10	MB–1 or C–2	No. 2 left rear wheel arm.
	A22	10	MB–1 or C–2	Right front lifting provision.
	A22	25	MB–2 or D–1	Left front towing and tiedown provision.
	G22	10	MB–1 or C–2	Left front lifting provision.
	G22	25	MB–2 or D–1	Left front towing and tiedown provision.
	B25*	25	MB–2 or D–1	Right front towing and tiedown provision.
	F25*	25	MB–2 or D–1	Left front towing and tiedown provision.
C	B26/B29	5	CGU–1/B**	Over item.
	C26/C28	5	CGU–1/B**	Over item.
	A26/D26	5	CGU–1/B**	Over item.
	A29/D29	5	CGU–1/B**	Over item.

Table 4-7. *Tiedown Data for TOW Trucks in C–130 Airplane (Fig 4–8)*—Continued

Item No.	Tiedown fitting No.	Capacity of fitting in 1,000 lb	Type device	Attach to item
D	E26/E28	5	CGU–1/B**	Over item.
	F26/F29	5	CGU–1/B**	Over item.
	D26/G26	5	CGU–1/B**	Over item.
	D29/G29	5	CGU–1/B**	Over item.

*Two 25,000-lb chains required.
**MC1 tiedown device may be substituted for CGU–1/B.

CHAPTER 5

HIGHWAY AND OFF-ROAD TRANSPORTABILITY GUIDANCE

5-1. General

This chapter provides off-road and highway transportability guidance for the TOW heavy antitank/assault weapon system. It covers significant technical and physical characteristics and prescribes the materials and guidance required to prepare, load, tie down, and unload the items. The 1/4-ton and 1/2-ton trucks can be transported over highway or move under their own power, either empty or loaded, without restrictions. The carrier can move over highway under its own power; however, normally, highway moves are made with the item loaded on a military or commercial low-bed semi-trailer of adequate capacity. The carrier exceeds CONUS legal width limitations by 9.8 inches, and highway permits will be required either for movement under its own power or when loaded on semi-trailers. These restrictions also apply to highway movement overseas where special routing may be required. The procedures for obtaining special permits in CONUS are outlined in AR 55-162 and associated Army area regulations. For logistic movement, the preferred method of shipment by highway is with the items loaded on semitrailers.

5-2. Off-Road Operations, Soils Trafficability Data

A vehicle cone index (VCI) is a number that tests have proved can be related to characteristics of a particular vehicle. This number, when used in connection with the rating cone index (of the soil), can forecast the ability of that vehicle to cross fine-grained soil. The rating index is obtained by use of the cone penetrometer and its associated equipment. See TM 5-330, chapter 9 for use of the equipment in the field and for interpretation of index numbers.

5-3. Preparation of Items

The degree of preparation for items prior to being transported by semitrailers is dependent upon the operational commitment.

5-4. Movement by Semitrailer

The items can be transported over highway by semitrailers of adequate capacity and size. The combined length of the tractor and semitrailer and the height will not exceed the highway limitations for movement in CONUS and the recommended highway limitations in oversea areas; however, the width of the carrier exceeds CONUS and oversea limitations.

5–5. Loading and Securing

a. Table 5-1 is the bill of materials for blocking and tiedown of the carrier on a semitrailer.

b. Table 5-2 provides data concerning the application of materials required to restrain the carrier on a semitrailer.

c. Figure 5-3 provides a tiedown diagram for the carrier that is compatible with standard loading practices and will offer adequate retraint against forces encountered during movements at normal speeds.

d. Table 5-3 is the bill of materials for blocking and tiedown of the 1/4-ton and 1/2-ton trucks on a semitrailer.

e. Table 5-4 provides data concerning the application of materials required to restrain the 1/4-ton and 1/2-ton trucks on a semitrailer.

f. Figure 5-4 provides a tiedown diagram for the 1/4-ton and 1/2-ton trucks that is compatible with standard loading practices and will offer adequate restraint against forces encountered during movement at normal speeds.

NOTE

See tables 7-8 and 7-9 and figure 7-8 for method of blocking and tiedown of skid-mounted shop equipment.

GENERAL NOTES

A. Not applicable.

B. THE OUTLOADING PROCEDURES SPECIFIED HEREIN ARE APPLICABLE TO THE TOW GUIDED MISSILE PACKED ONE PER WIREBOUND WOODEN BOX (OVERPACK). SUBSEQUENT REFERENCE TO CONTAINER HEREIN MEANS THE WIREBOUND WOODEN BOX WITH CONTENTS. ALSO, SUBSEQUENT REFERENCE TO PALLET UNIT HEREIN MEANS THE PALLET UNIT OF TWELVE (12) WIREBOUND BOXES WITH CONTENTS.

C. FOR DETAILS OF WIREBOUND WOODEN BOX (OVERPACK) SEE DRAWING NO. D10224699 (U.S. ARMY MISSILE COMMAND), AND "CONTAINER UNIT" VIEW ON PAGE 3.

CONTAINER DIMENSIONS --- 58-1/4" LONG X 11-5/8" WIDE X 11-5/8" HIGH (APPROX).
GROSS WEIGHT ---------- 80 POUNDS (APPROX).
CUBE ---------- 4.9 CUBIC FEET.

D. FOR DETAILS OF THE PALLET UNIT SEE U.S. ARMY MATERIEL COMMAND DRAWING NO. 19-48-5229-GM20P4, AND "PALLET UNIT" VIEW ON PAGE 3.

PALLET UNIT DIMENSIONS -- 58-1/4" LONG X 47-3/4" WIDE X 39-3/4" HIGH (APPROX).
GROSS WEIGHT ---------- 1,049 POUNDS (APPROX).
CUBE ---------- 64.0 CUBIC FEET.

E. THIS ITEM WITH A HE WARHEAD OR A HEAT WARHEAD IS DOT SHIPPING NOMENCLATURE "ROCKET AMMUNITION WITH EXPLOSIVE PROJECTILE", AND IS A DOT CLASS "A" EXPLOSIVE. THIS ITEM, WHEN SHIPPED UNDER DOT SHIPPING NOMENCLATURE "ROCKET MOTOR, CLASS A EXPLOSIVE" (TELEMETRY OR INERT LOADED PROJECTILES), IS ALSO A DOT CLASS "A" EXPLOSIVE. THE OUTLOADING PROCEDURES SPECIFIED HEREIN CAN ALSO BE UTILIZED FOR THE SHIPMENT OF THE DEPICTED CONTAINERS WHEN THEY ARE LOADED WITH AN ITEM WHICH IS IDENTIFIED DIFFERENTLY BY NOMENCLATURE THAN THE ITEM DESIGNATED WITHIN THE DRAWING TITLE.

F. THE LOADS AS SHOWN HEREIN ARE FOR CLOSED OR OPEN TOP VAN TRAILERS WHICH ARE 89" TO 93" WIDE (INSIDE DIMENSION) AND OF VARIOUS LENGTHS, AND THEY ARE LIMITED TO HIGHWAY MOVEMENTS ONLY. THE DEPICTED LOADS ARE BASED ON TRAILERS OF THE CONVENTIONAL TYPE OR ARE BASED ON TRAILERS WHICH ARE EQUIPPED WITH SELF-CONTAINED MECHANICAL BRACING DEVICES (CROSS MEMBERS AND WALL MEMBERS) AND APPLY TO TRAILERS HAVING WOOD, WOOD AND METAL, OR METAL FLOORS.

G. THE OUTLOADING PROCEDURES SPECIFIED ON PAGES 4, 6, 7, AND 12 THROUGH 15 ARE FOR CONVENTIONAL TYPE VAN TRAILERS.

H. THE OUTLOADING PROCEDURES SPECIFIED ON PAGES 5, AND 18 THROUGH 20 ARE FOR TRAILERS EQUIPPED WITH VARIOUS TYPES OF SELF-CONTAINED MECHANICAL BRACING DEVICES. HOWEVER, CROSS MEMBER ATTACHMENT FACILITIES WITHIN THESE TRAILERS MUST PROVIDE FOR THE INSTALLATION OF LOAD BLOCKING CROSS MEMBERS AT THE HEIGHTS SPECIFIED HEREIN. CAUTION: TRAILERS EQUIPPED WITH FACILITIES WHICH DO NOT MEET THE LOCATION REQUIREMENTS MUST NOT BE USED. THE HEIGHT DIMENSIONS SPECIFIED WITHIN THIS DRAWING FOR INSTALLATION OF CROSS MEMBERS ARE IDENTICAL WITH THOSE RECOMMENDED BY THE BUREAU OF EXPLOSIVES PAMPHLET 6C, AND APPENDICES THERETO.

1. VOIDS LENGTHWISE WITHIN THE LOAD MUST BE HELD TO A MINIMUM. CROSS MEMBERS MUST BE PLACED AGAINST THE LADING AS TIGHTLY AS THE HOLE SPACING IN THE CROSS MEMBER ATTACHMENT FACILITY PERMITS. EACH CROSS MEMBER WILL BE INSTALLED WITH THE ENDS ATTACHED AS NEARLY AS POSSIBLE IN "MATED" POSITIONS (AT EQUAL HEIGHTS AND AT EQUAL DISTANCES FROM THE END OF THE TRAILER).

2. CROSS MEMBERS IN EMPTY TRAILERS AND THOSE NOT USED IN LOADED TRAILERS MUST BE SECURED FOR SHIPMENT. COMPONENTS ASSIGNED TO EACH TRAILER MUST REMAIN THEREWITH EVEN THOUGH UNUSED DURING SOME SHIPMENTS.

3. A CROSS MEMBER WILL NOT BE RELIED UPON TO RETAIN MORE CONTAINERS THAN SHOWN IN THE LOAD VIEWS.

J. SELECTION OF A VEHICLE TO BE USED TO TRANSPORT THE DESIGNATED ITEM MUST COMPLY WITH AR 55-355, CHAPTER 213, FOR EXPLOSIVES AND OTHER DANGEROUS ARTICLES, IN FULL.

K. THE GROSS WEIGHT AND AXLE DISTRIBUTION OF WEIGHT FOR A LOAD WILL BE THE RESPONSIBILITY OF THE CARRIER. THE CARRIER WILL ADVISE THE SHIPPER OF THE APPLICABLE LOADING REQUIREMENTS, AND THE SHIPPER WILL LOAD ACCORDINGLY.

(CONTINUED AT RIGHT)

(GENERAL NOTES CONTINUED)

L. THE APPROVED BLOCKING, BRACING, AND STAYING METHODS FOR THE LOADS SPECIFIED HEREIN MUST BE FOLLOWED. THE NUMBER OF UNITS MAY BE ADJUSTED TO FIT THE SIZE OF THE VEHICLE TO BE LOADED OR THE QUANTITY TO BE SHIPPED. FOR A LOAD QUANTITY OTHER THAN SPECIFIED, THE APPROVED METHODS MUST BE FOLLOWED AS CLOSELY AS POSSIBLE.

M. OTHER TYPES OF LADING ITEMS MAY BE LOADED INTO TRAILERS WHICH ARE PARTIALLY LOADED WITH THE DESIGNATED ITEMS, PROVIDING THE TOTAL LOAD IS COMPATIBLE, EXISTING DIRECTIVES ARE NOT VIOLATED, AND THE OTHER LADING ITEMS ARE BLOCKED AND BRACED TO EQUAL THE BLOCKING AND BRACING CRITERIA SPECIFIED HEREIN.

N. FOR TRAILERS NOT EQUIPPED WITH REAR CORNER POSTS, REAR BLOCKING MUST BE EXTENDED TO CONTACT THE REAR DOORS WHEN THEY ARE CLOSED.

O. IN SOME INSTANCES CONTAINERS WILL ALREADY BE PALLETIZED WHEN OFFERED FOR LOADING. THESE PALLET UNITS SHOULD BE INSPECTED AND, AS REQUIRED, LOOSE UNITIZING STEEL STRAPPING MUST BE REPLACED.

P. DUNNAGE LUMBER SPECIFIED THROUGHOUT THIS PROCEDURAL DRAWING IS OF NOMINAL SIZE. FOR EXAMPLE, 2" X 4" MATERIAL IS ACTUALLY 1-5/8" THICK BY 3-5/8" WIDE AND 4" X 4" MATERIAL IS ACTUALLY 3-5/8" THICK BY 3-5/8" WIDE.

Q. NOTICE: A STAGGERED NAILING PATTERN WILL BE USED WHEREVER POSSIBLE WHEN NAILS ARE DRIVEN INTO JOINTS OF DUNNAGE ASSEMBLIES. ALSO A STAGGERED NAILING PATTERN WILL BE USED WHEN DUNNAGE IS NAILED TO THE FLOOR OF THE TRANSPORTING VEHICLE, OR WHEN LAMINATING DUNNAGE. ADDITIONALLY, THE NAILING PATTERN FOR AN UPPER PIECE OF LAMINATED DUNNAGE WILL BE ADJUSTED AS REQUIRED SO THAT A NAIL FOR THAT PIECE WILL NOT BE DRIVEN THROUGH ONTO OR RIGHT BESIDE A NAIL IN A LOWER PIECE.

R. PORTIONS OF THE TRAILER BODIES DEPICTED WITHIN THIS PROCEDURAL DRAWING, SUCH AS ONE OF THE SIDE WALLS, HAVE NOT BEEN SHOWN IN THE LOAD VIEWS FOR CLARITY PURPOSES.

S. FOR ADDITIONAL GUIDANCE, ATTENTION IS DIRECTED TO THE "SPECIAL NOTES" SECTIONS WHICH ARE IMMEDIATELY ADJACENT TO DEPICTED OUTLOADING METHODS

T. WHEN ANY STRAP IS SEALED AT AN END-OVER-END LAP JOINT FOR A STRAP APPLICATION OTHER THAN FOR PALLETIZING, A MINIMUM OF TWO (2) SEALS, BUTTED TOGETHER, WITH TWO (2) PAIR OF CRIMPS PER SEAL MUST BE USED TO SEAL THE JOINT.

REVISIONS

REVISION NO. 1, DATED MAY 1970, CONSISTS OF:

1. CHANGED OUTLOADING PROCEDURES FOR REDESIGNED PALLET UNIT

MATERIAL SPECIFICATIONS

LUMBER ---------- : SEE TM 743-200-1, DUNNAGE LUMBER; FED SPEC MM-L-751.

NAILS ---------- : COMMON, CEMENT COATED OR CHEMICALLY ETCHED; FED SPEC FF-N-105.
ALT: ANNULAR-RING TYPE NAIL OF SAME SIZE.

PLYWOOD ------ : GROUP B OR C, GRADE* C-D (EXTERIOR); FED SPEC NN-P-530.

STRAPPING, STEEL: TYPE I OR IV, CLASS A OR B. FED SPEC QQ-S-781

STRAP SEALS ---- : COMMERCIAL GRADE.

WIRE ---------- : FED SPEC QQ-W-461.

*IF SPECIFIED GRADE IS NOT AVAILABLE A BETTER EXTERIOR GRADE MAY BE SUBSTITUTED.

(Reference to page numbers in the notes within the figures refer to the number listed in the lower right- or left-hand corner of each figure.)

Figure 5-1. *Loading and bracing (TL and LTL) in closed or open top van trailers of guided missile packed one per wirebound wooden box (overpack) unpalletized and palletized (12 per pallet) (sheet 1 of 19).*

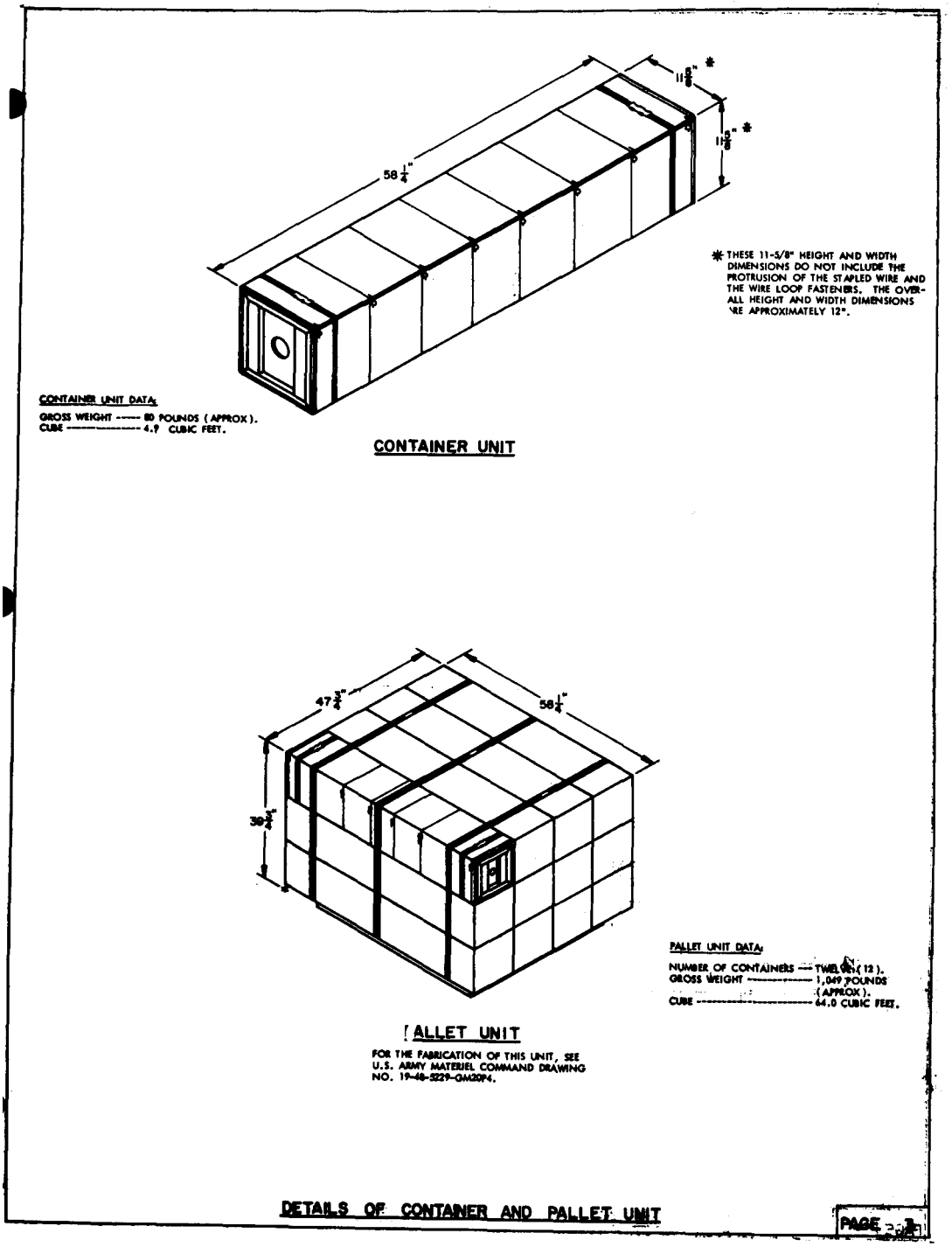


Figure 5-1-Continued (sheet 2 of 19).

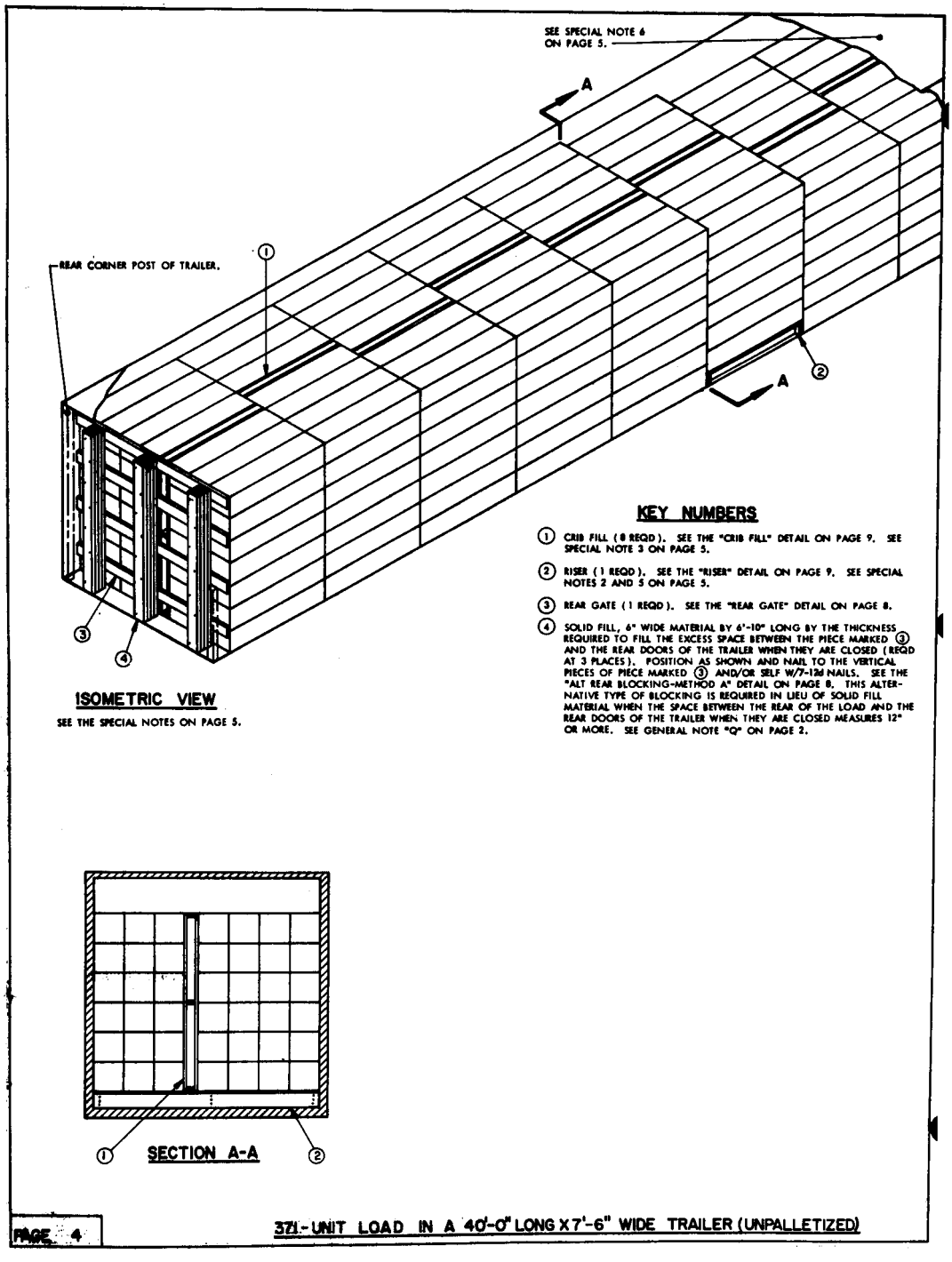


Figure 5–1—Continued (sheet 3 of 19).

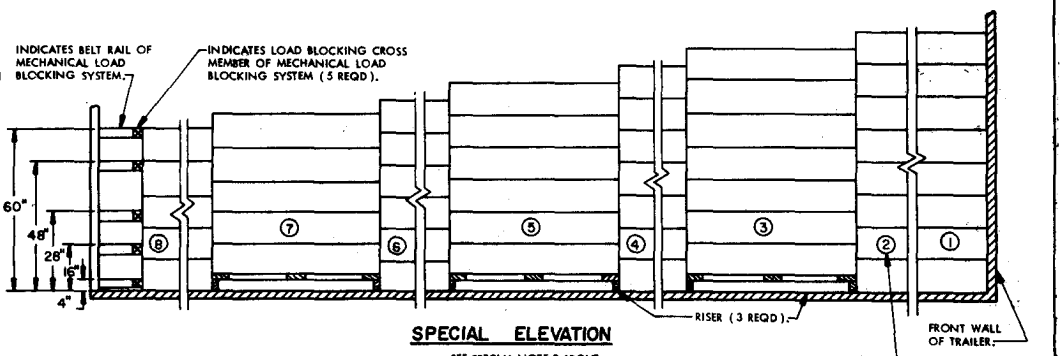
SPECIAL NOTES:

1. A 371-UNIT LOAD IS SHOWN IN A SQUARE-FRONT TRAILER WHICH IS 7'-6" WIDE BY 7'-6" HIGH (INSIDE DIMENSIONS) BY 40'-0" LONG, AND WHICH IS EQUIPPED WITH REAR CORNER POSTS. SEE SPECIAL NOTES 5 AND 7.
2. A 343-UNIT LOAD CAN BE OUTLOADED IN A 35'-0" LONG TRAILER, SEVEN (7) STACKS OF FOURTY-NINE (49) CONTAINERS EACH. DELETE THE "RISER" AND USE REAR BLOCKING AS DEPICTED FOR THE 40'-0" LONG TRAILER. IF A TRAILER LENGTH OF 36'-0" TO 39'-0" IS USED, REFER TO THE "ALT REAR BLOCKING-METHOD A" DETAILED ON PAGE 8.
3. A WIDER OR A NARROWER TRAILER THAN SHOWN MAY BE USED FOR SHIPPING THE DEPICTED LOAD. ADJUST THE WIDTH OF THE "CRIB FILL" AS NECESSARY TO PROVIDE A "TIGHT" LOAD ACROSS THE WIDTH OF THE TRAILER. ALSO, THE "CRIB FILL" SHOULD BE ALTERNATED AS SHOWN IN THE "ISOMETRIC VIEW" ON PAGE 4.
4. A TRAILER WITH A LESSER INSIDE HEIGHT THAN SHOWN CAN BE USED FOR SHIPPING THE DEPICTED LOAD. THE LADING HEIGHT OF THE LOAD SHOWN IS APPROXIMATELY 6'-10-1/2". THEREFORE, THE MINIMUM INSIDE HEIGHT OF A TRAILER TO BE USED TO SHIP A 7-HIGH LOAD MUST BE AT LEAST 7'-0" AT THE EAVES.
5. THE USE OF THE "RISER ASSEMBLY" IS ONLY SPECIFIED FOR THE DEPICTED LOAD TO SHOW TYPICAL APPLICATION. WITHOUT THE "RISER ASSEMBLY", 392-UNITS CAN BE SHIPPED IN THE SAME SIZE TRAILER SHOWN. IF THE HEIGHT OF THE DOOR OPENING PREVENTS THE PLACEMENT OF THE SEVENTH (7TH) LAYER OF THE MOST REARWARD STACK; DECREASE THE HEIGHT OF THE SECOND STACK FROM THE REAR TO SIX (6) CONTAINERS HIGH WITH A "RISER ASSEMBLY" UNDER THE FIRST LAYER, DECREASE THE HEIGHT OF THE MOST REARWARD STACK TO SIX (6) CONTAINERS HIGH AND MAKE NECESSARY HEIGHT CHANGES TO THE "REAR GATE". ADDITIONALLY, TO SATISFY THE NUMBER OF CONTAINERS TO BE SHIPPED, THE LOAD AS SHOWN MAY BE INCREASED OR DECREASED BY MULTIPLES OF SEVEN (7) CONTAINERS BY ADJUSTING THE LOCATION OF THE DEPICTED "RISER ASSEMBLY", OR CHANGED AS REQUIRED BY THE USE OF NARROWER "RISER" OR "FILLER" ASSEMBLIES AS DETAILED ON PAGES 9 AND 10.
6. IF THE TRAILER BEING LOADED HAS A ROUND-FRONT OR ROUNDED CORNERS AT THE FORWARD END, REFER TO PAGE 11 FOR "FORWARD BLOCKING" SPECIFICATIONS WHICH MUST BE USED. NOTE: A 40'-0" LONG TRAILER HAVING ROUNDED CORNERS WITH A RADIUS OF 5" OR MORE CANNOT BE USED TO SHIP AN EIGHT (8) CONTAINER LONG LOAD. IF A TRAILER IS EQUIPPED WITH ROUNDED CORNERS WITH A RADIUS OF 5" OR MORE, OR HAS A ROUND FRONT, A SEVEN (7) CONTAINER LONG LOAD IS THE MAXIMUM LENGTH LOAD THAT CAN BE SHIPPED IN A 40'-0" LONG TRAILER.

(CONTINUED AT RIGHT)

(SPECIAL NOTES CONTINUED)

7. IF THE INSIDE HEIGHT OF THE VAN BEING USED PERMITS, SUCH AS WILL BE THE CASE WITH A HIGH-VOLUME VAN, THE CONTAINERS CAN BE STACKED EIGHT (8) LAYERS HIGH THROUGHOUT THE FORWARD PORTION OF THE VAN. THE TWO REARWARD STACKS WILL BE LIMITED TO SEVEN (7) LAYERS IN HEIGHT, WITH A "RISER ASSEMBLY" UNDER THE SECOND FROM REAR STACK. A MAXIMUM SIZE LOAD OF 434 CONTAINERS CAN BE LOADED BY THE PROCEDURES JUST DESCRIBED. REAR BLOCKING FOR THE INCREASED LOAD WILL BE AS SPECIFIED FOR THE LOAD SHOWN ON PAGE 4 AND THE "CRIB FILL" ASSEMBLIES WILL BE INCREASED IN HEIGHT AS SPECIFIED ON PAGE 9.
8. IF THE TRAILER BEING OUTLOADED CONTAINS MECHANICAL BRACING DEVICES, SUCH AS A WALL BELT RAIL AND LOAD BLOCKING CROSS MEMBERS, WHICH CONFORM TO SPECIFICATIONS SET FORTH WITHIN THE BUREAU OF EXPLOSIVES PAMPHLET 6C AND THE APPENDICES THERETO, THEY MAY BE USED AT THE REAR OF THE LOAD IN LIEU OF THE "REAR GATE" AND "SOLID FILL", PIECES MARKED ③ AND ④, OR THE "GATE AND STRUT" METHOD. 364 CONTAINERS CAN BE LOADED IN A 40'-0" LONG, HIGH-VOLUME VAN AS SHOWN BY THE "SPECIAL ELEVATION" DETAIL BELOW. THE REAR CONTAINER STACK WHICH IS AGAINST THE CROSS MEMBERS IS LIMITED TO FIVE (5) CONTAINERS HIGH. A 364 CONTAINER LOAD WILL REQUIRE THREE (3) "RISER" ASSEMBLIES. THE LOAD WILL CONSIST OF: TWO (2) EIGHT-CONTAINER HIGH STACKS AT THE FRONT OF THE TRAILER, ONE (1) SEVEN-CONTAINER HIGH STACK ON A RISER, ONE (1) SEVEN-CONTAINER HIGH STACK, ONE (1) SIX-CONTAINER HIGH STACK ON A RISER, ONE (1) SIX-CONTAINER HIGH STACK, ONE (1) FIVE-CONTAINER HIGH STACK ON A RISER, AND (1) FIVE-CONTAINER HIGH STACK AT THE REAR AGAINST THE CROSS MEMBERS. IF THE INSIDE HEIGHT OF A TRAILER PROHIBITS AN EIGHT-CONTAINER HIGH STACK, THE FOUR (4) FORWARD STACKS WILL BE LIMITED TO SEVEN-CONTAINER HIGH STACKS, RESULTING IN A 350 CONTAINER LOAD. POSITION THE CROSS MEMBERS TIGHTLY AGAINST THE CONTAINERS AT THE REAR OF THE LOAD. SEE THE "SPECIAL ELEVATION" VIEW FOR CROSS MEMBER LOCATION AND QUANTITY REQUIREMENTS. THE MECHANICAL BRACING DEVICE SYSTEM OF A TRAILER MUST HAVE A LENGTH OF AT LEAST 39'-2" AS MEASURED FROM THE FRONT WALL OF THE TRAILER. TRAILERS HAVING A SHORTER MECHANICAL SYSTEM WILL BE LIMITED TO A LOAD CONSISTING OF LESS-THAN EIGHT (8) CONTAINER STACKS IN LENGTH. IF A TRAILER HAS ROUNDED CORNERS AT THE FORWARD END, POSITION FIVE (5) CROSS MEMBERS AT THE FRONT OF THE TRAILER AT HEIGHTS SPECIFIED IN THE "SPECIAL ELEVATION" VIEW. NOTE THAT A 40'-0" TRAILER WITH ROUNDED CORNERS WILL ONLY HOLD SEVEN (7) STACKS. ALSO, A TRAILER WITH ROUNDED CORNERS AT THE FORWARD END MUST HAVE A SYSTEM LENGTH OF 34'-6" FOR A SEVEN (7) STACK LOAD. THE STACK ADJACENT TO THE CROSS MEMBERS AT THE FRONT OF A TRAILER IS LIMITED TO A FIVE-CONTAINER HIGH STACK. SEE GENERAL NOTE "H" ON PAGE 2.



SPECIAL ELEVATION

SEE SPECIAL NOTE 8 ABOVE. A TOLERANCE OF PLUS OR MINUS 2" WILL BE ALLOWED FOR THE VERTICAL POSITIONING OF THE CROSS MEMBERS.

BILL OF MATERIAL

LUMBER	LINEAR FEET	BOARD FEET
1" X 6"	334	167
2" X 4"	116	78
2" X 6"	141	141
NAILS	**NO. REQD**	**POUNDS**
6d (2")	459	2-3/4
10d (3")	56	1
12d (3-1/4")	63	1

LOAD AS SHOWN

ITEM	QUANTITY	WEIGHT (APPROX).
CONTAINER	371	29,680 LBS
DUNNAGE		970 LBS
TOTAL WEIGHT		30,650 LBS

371-UNIT LOAD IN A 40'-0" LONG X 7'-6" WIDE TRAILER (UNPALLETIZED) PAGE 5

Figure 5–1—Continued (sheet 4 of 19).

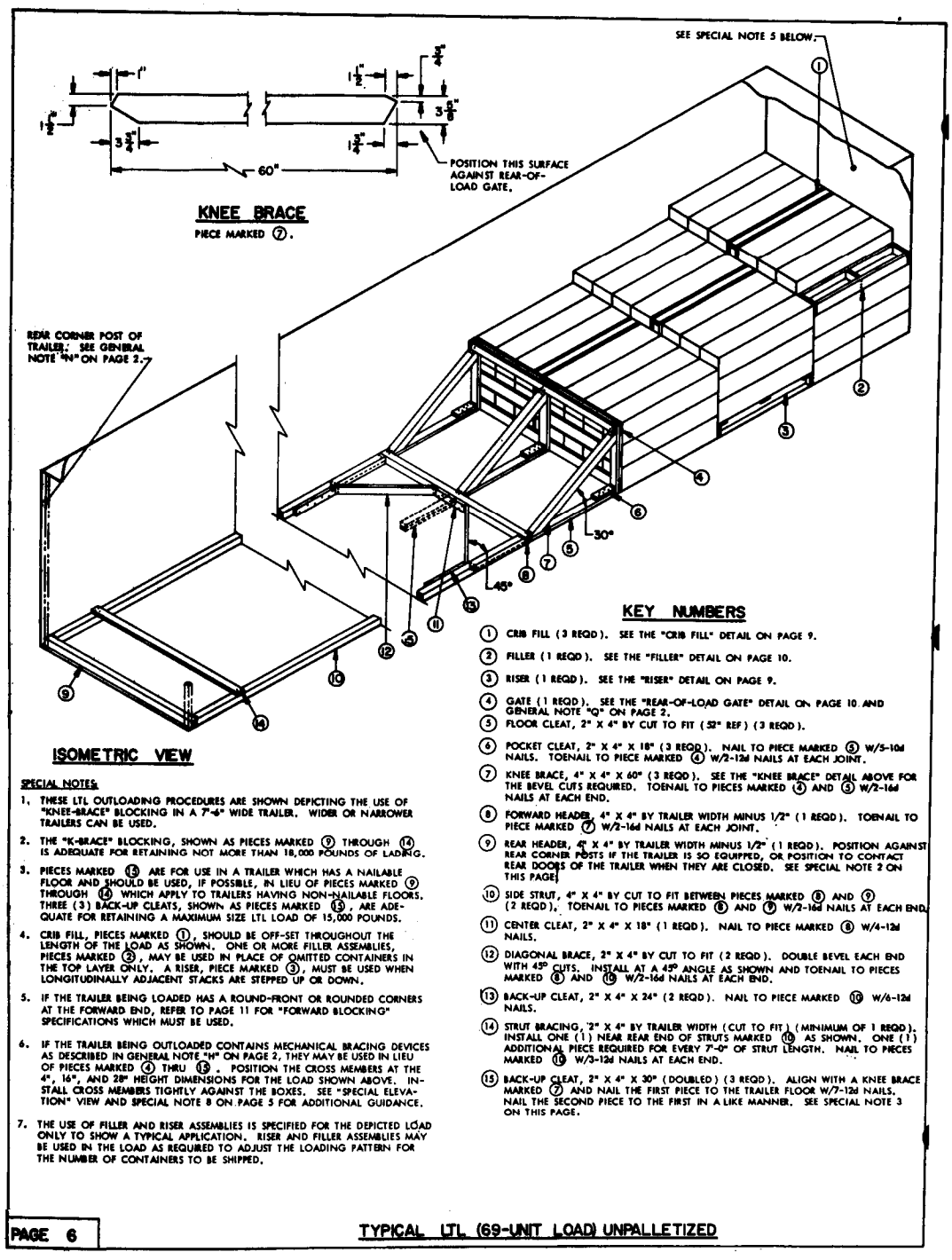
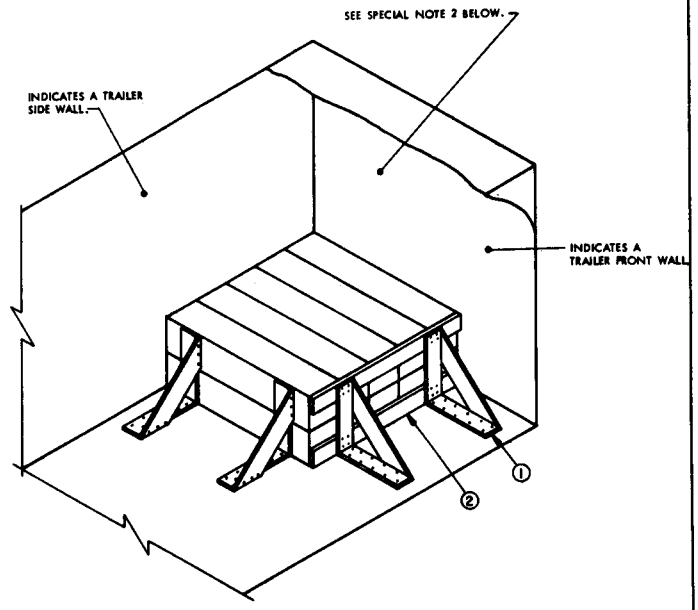


Figure 5–1—Continued (sheet 5 of 19).



ISOMETRIC VIEW

SPECIAL NOTES:

1. THESE OUTLOADING PROCEDURES DEPICT THE OUTLOADING OF A TWO (2) CONTAINER HIGH LOAD IN A TRAILER WHICH HAS A NAILABLE FLOOR. TRAILERS WITH A NON-NAILABLE FLOOR CANNOT BE USED. CONTAINERS WILL NOT BE STACKED MORE THAN TWO (2) HIGH WHEN USING THE LTL BRACE.
2. IF THE TRAILER BEING LOADED HAS A ROUND-FRONT OR ROUNDED CORNERS AT THE FORWARD END, TWO ADDITIONAL LTL BRACES MAY BE USED AT THE FORWARD END OF THE LADING.
3. NOT LESS THAN TWO (2) LTL BRACES MARKED (1) SHALL BE USED FOR LONGITUDINAL BRACING, ALSO AN LTL BRACE MUST BE USED AT EVERY FOURTH (4TH) JOINT FOR LATERAL BLOCKING AS SHOWN ABOVE.

KEY NUMBERS

(1) LTL BRACE (4 REQD). SEE DETAIL ON PAGE 10. NAIL TO PIECE MARKED (2) W/4-6d NAILS AT EACH JOINT. NAIL TO THE TRAILER FLOOR W/10-6d NAILS. SEE GENERAL NOTE "Q" ON PAGE 2.

(2) HORIZONTAL PIECE, 2" X 4" BY LENGTH TO SUIT (2 REQD). POSITION AS SHOWN.

TYPICAL LTL (10-UNIT LOAD) UNPALLETIZED

PAGE 7

Figure 5-l-Continued (sheet 6 of 19).

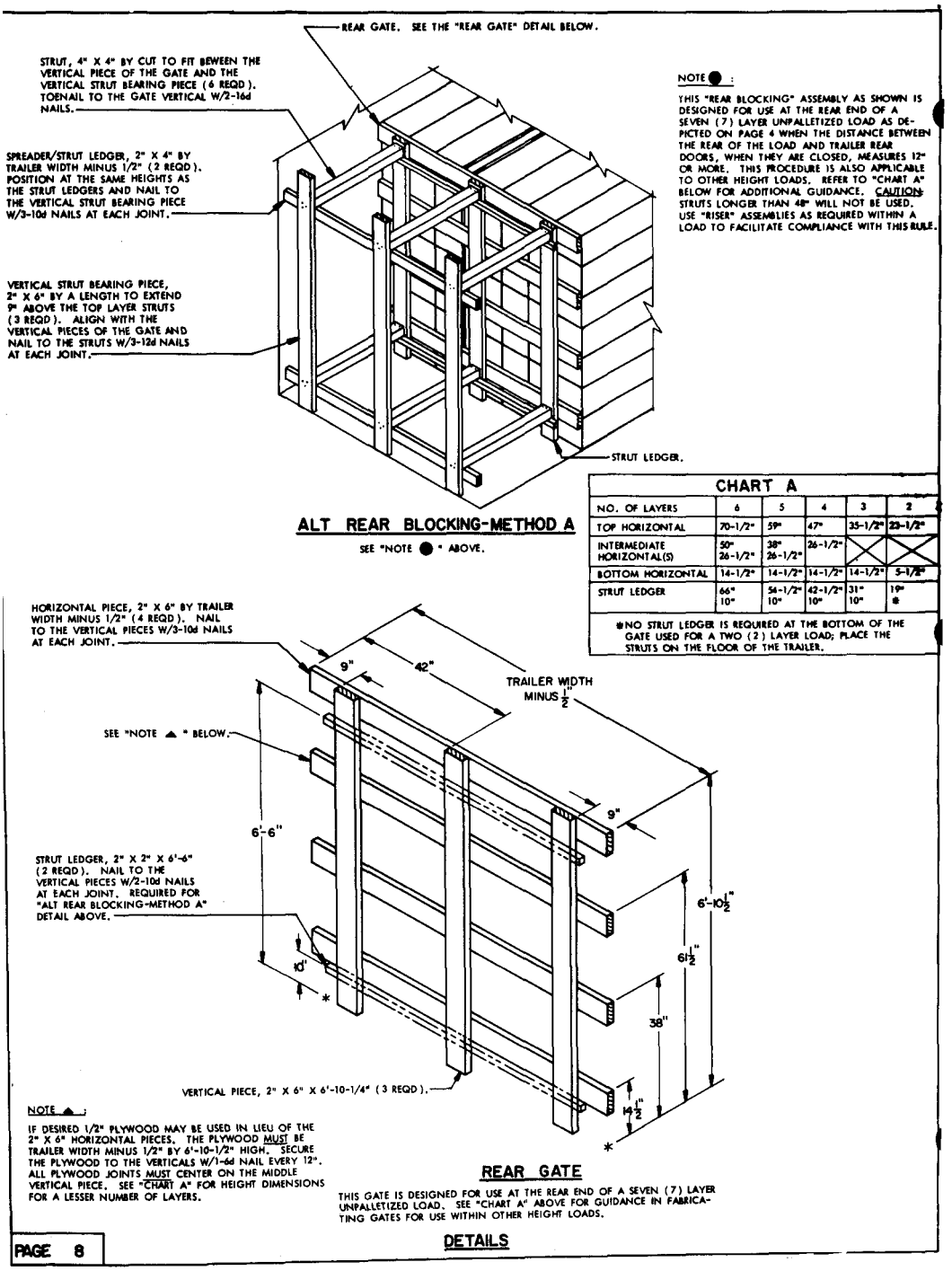


Figure 5-1-Continued (sheet 7 of 19).

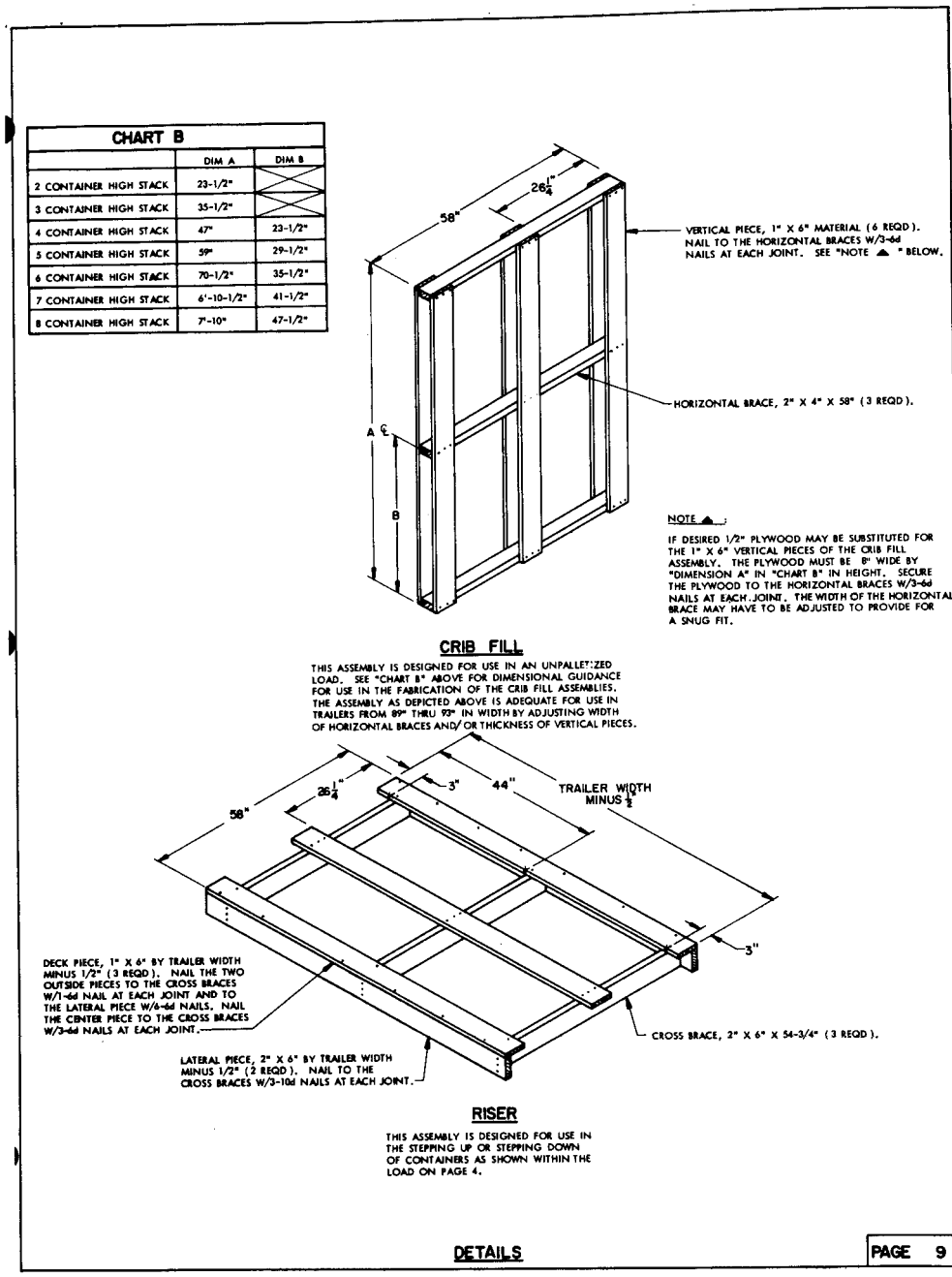
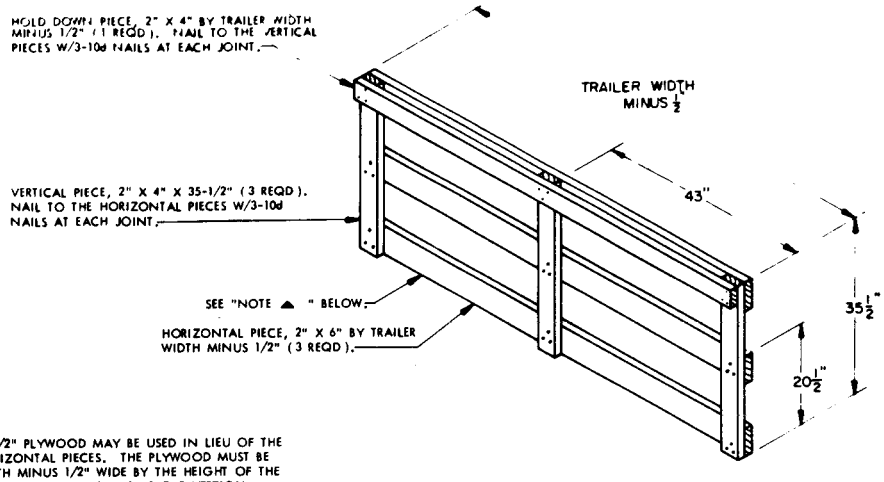


Figure 5-1—Continued (sheet 8 of 19).

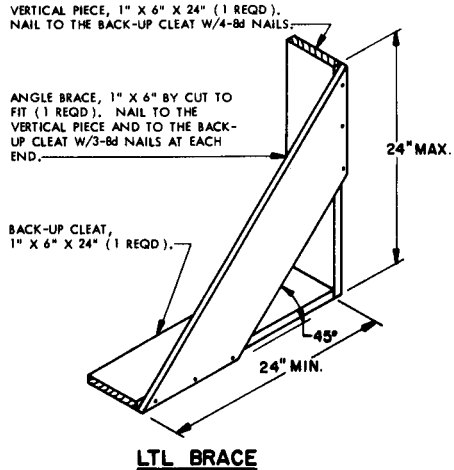


NOTE ▲:

IF DESIRED 1/2" PLYWOOD MAY BE USED IN LIEU OF THE 2" X 6" HORIZONTAL PIECES. THE PLYWOOD MUST BE TRAILER WIDTH MINUS 1/2" WIDE BY THE HEIGHT OF THE TOP HORIZONTAL PIECE. SECURE TO THE VERTICAL PIECES W/1-6d NAIL EVERY 12". ALL PLYWOOD JOINTS MUST CENTER ON THE MIDDLE OR CENTRALLY LOCATED 2" OR 4" VERTICAL PIECE, AS APPLICABLE.

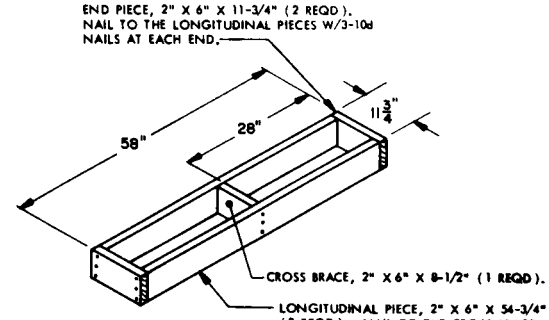
REAR-OF-LOAD GATE

THIS GATE IS DESIGNED FOR USE AT THE REAR END OF A THREE (3) LAYER UNPALLETIZED LOAD, SUCH AS DEPICTED ON PAGE 6. TO SATISFY THE REQUIREMENTS FOR A TWO (2) LAYER LOAD, ELIMINATE THE INTERMEDIATE HORIZONTAL PIECE AND LOWER THE HEIGHT OF THE GATE TO 23-1/2". NOTE: THIS TYPE OF GATE CAN ONLY BE USED AGAINST A TWO OR THREE LAYER UNPALLETIZED LOAD UNIT AT THE REAR OF AN LTL LOAD.



LTL BRACE

SEE "NOTE ■" BELOW.



FILLER

THE FILLER ASSEMBLY AS SHOWN IS TO BE USED WITHIN LOADS TO TAKE THE PLACE OF AN OMITTED CONTAINER. IT MUST BE USED IN THE TOP LAYER ONLY.

NOTE ■:

EACH BRACE AS APPLIED FOR LONGITUDINAL BRACING WILL SUPPORT 2,000 POUNDS OF LADING.

PAGE 10

DETAILS

Figure 5-1-Continued (sheet 9 of 19).

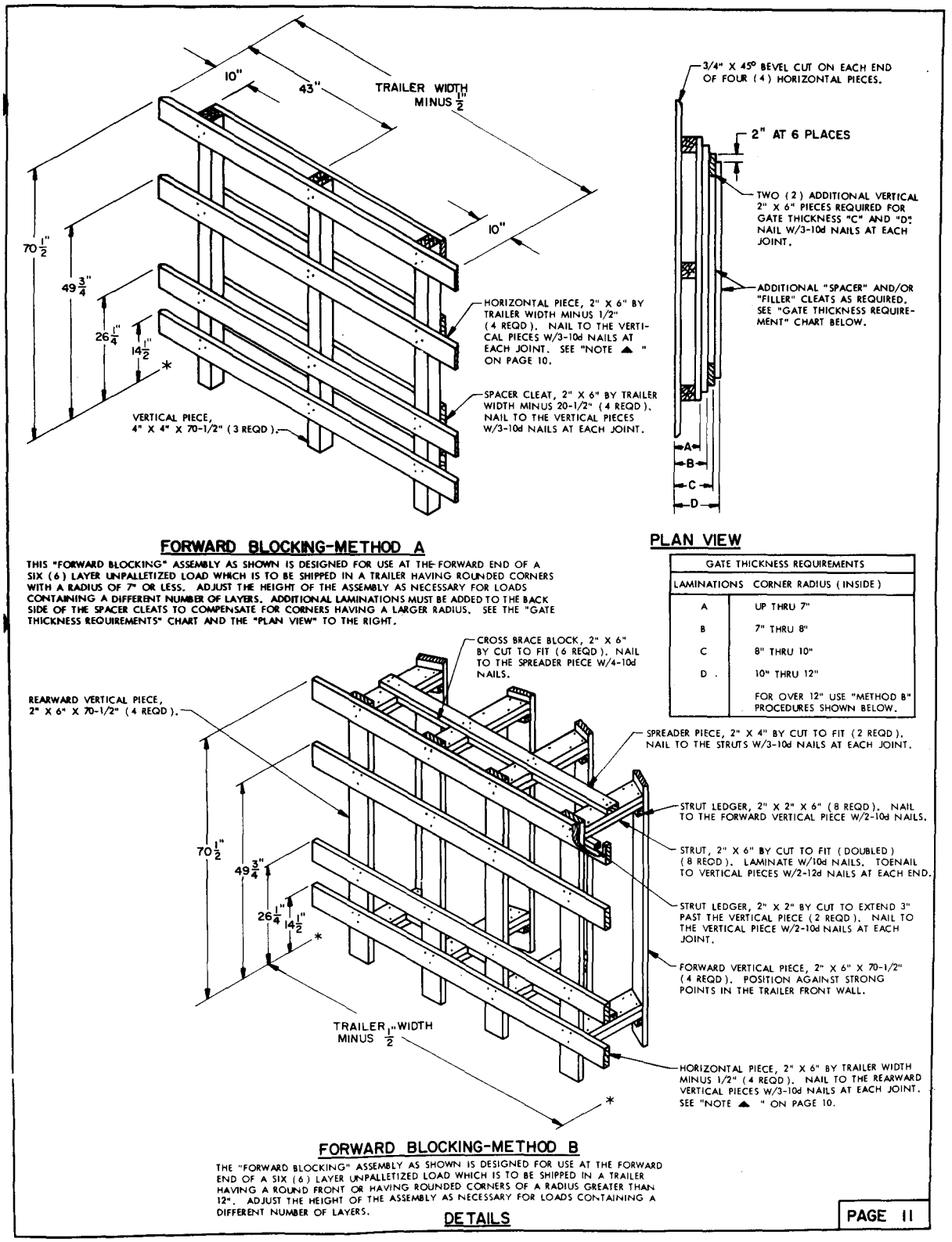


Figure 5–1—Continued (sheet 10 of 19).

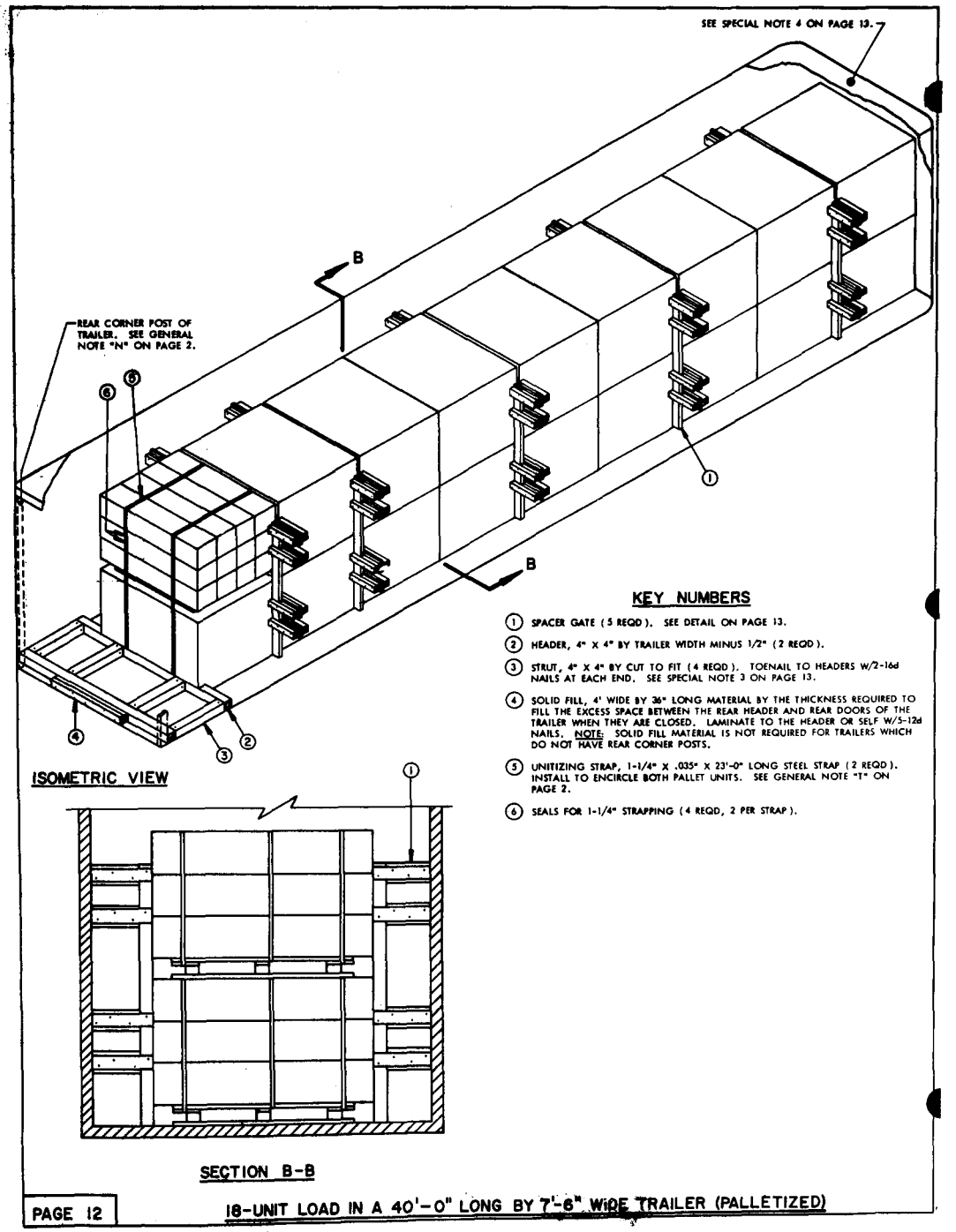
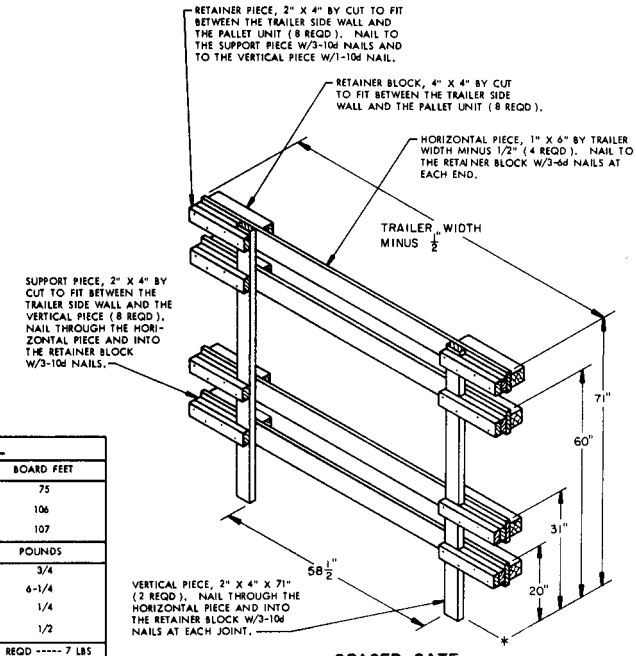


Figure 5–1—Continued (sheet 11 of 19).

SPECIAL NOTES:

1. AN 18-UNIT LOAD IS SHOWN IN A 7'-6" WIDE (INSIDE DIMENSION) BY 40'-0" LONG VAN TRAILER WITH ROUNDED-CORNERS AT THE FORWARD END.
2. A WIDER OR A NARROWER TRAILER CAN BE USED FOR THE DEPICTED LOAD.
3. IF A SHORTER TRAILER IS USED AND THE SPACE BETWEEN THE PALLET OF THE MOST REARWARD UNIT AND THE TRAILER DOORS, WHEN THEY ARE CLOSED, IS 12" OR LESS, A SOLID FILL TYPE OF REAR BLOCKING AS SHOWN ON PAGE 17 MUST BE USED.
4. IF THE TRAILER BEING LOADED HAS A ROUND-FRONT, REFER TO PAGE 17 FOR "FORWARD BLOCKING" SPECIFICATIONS WHICH MUST BE USED. ALSO, THE MOST FORWARD STACK MUST BE UNITIZED W/2-1-1/4" UNITIZING STRAPS. SEE PIECES MARKED (5) AND (6) ON PAGE 12.
5. IF A 17-UNIT LOAD IS TO BE SHIPPED IN A 40'-0" LONG TRAILER, OMIT THE SECOND LAYER UNIT FROM EITHER THE MOST FORWARD OR THE MOST REARWARD LOAD UNIT. IF THE FORWARD SECOND LAYER UNIT IS OMITTED, UNITIZING STRAPS AND SEALS, PIECES MARKED (5) AND (6), MUST BE USED TO UNITIZE THE MOST FORWARD TWO-UNIT HIGH LOAD UNIT. IF THE REARWARD SECOND LAYER UNIT IS OMITTED, MOVE THE UNITIZING STRAPS AND SEALS TO THE MOST REARWARD TWO-UNIT HIGH LOAD UNIT. IN EITHER CASE THE UNITIZING STRAP MUST ENCOMPASS THE FIRST AND SECOND LAYER UNITS AND THE SPACER GATE.



SPACER GATE

BILL OF MATERIAL

LUMBER	LINEAR FEET	BOARD FEET
1" X 6"	150	75
2" X 4"	160	106
4" X 4"	80	107
NAILS	**NO. REQD**	**POUNDS**
6d (2")	120	3/4
10d (3")	400	6-1/4
12d (3-1/4")	10	1/4
16d (3-1/2")	16	1/2
STEEL STRAPPING, 1-1/4" X .035" ---------- 46' REQD ----- 7 LBS		
SEALS FOR 1-1/4" STRAPPING ---------- 4 REQD ----- NIL		

LOAD AS SHOWN

ITEM	QUANTITY	WEIGHT (APPROX)
PALLET UNIT	18	18,882 LBS
DUNNAGE		735 LBS
TOTAL WEIGHT		19,617 LBS

18-UNIT LOAD IN A 40'-0" LONG BY 7'-6" WIDE TRAILER (PALLETIZED) PAGE 13

Figure 5-1-Continued (sheet 12 of 19).

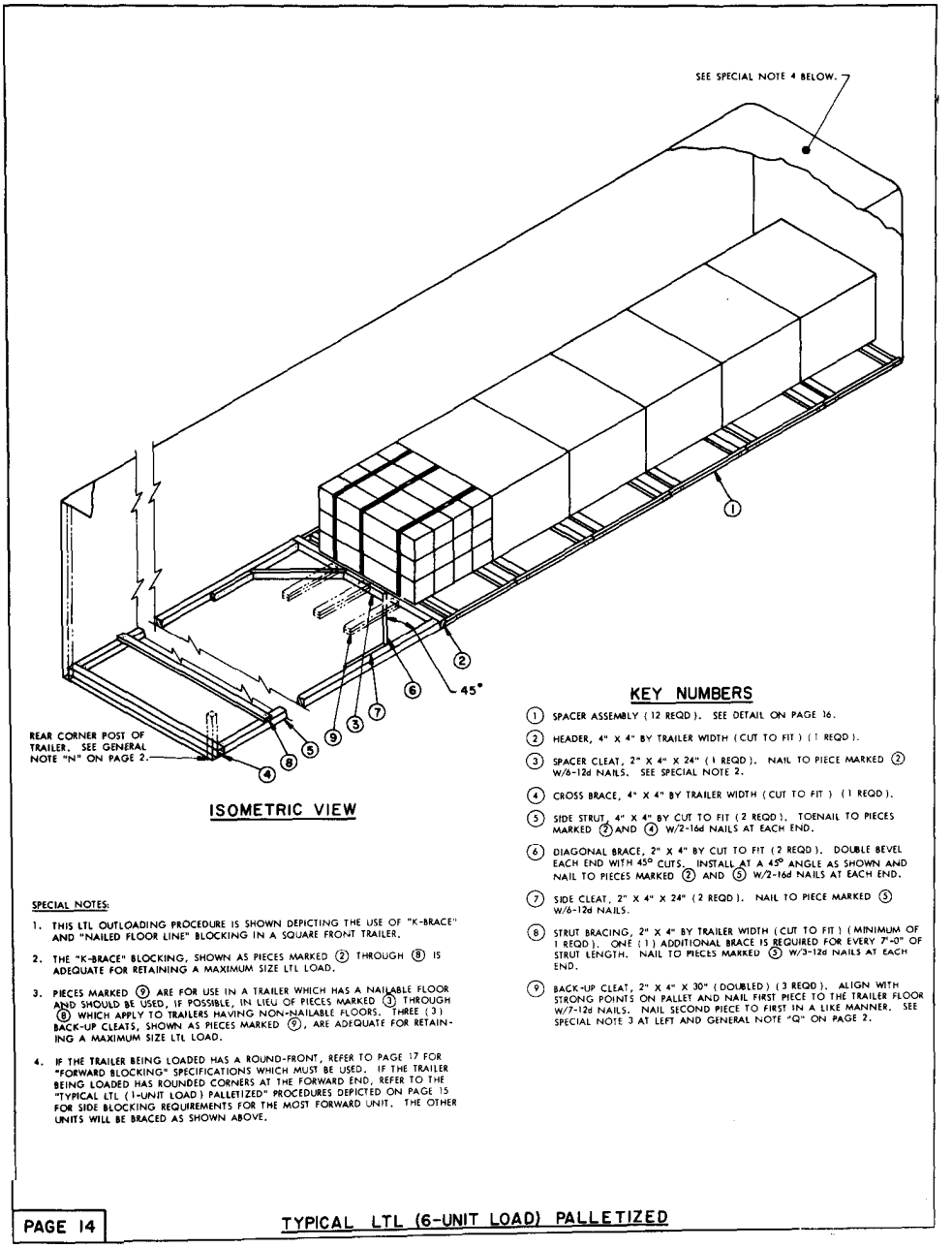
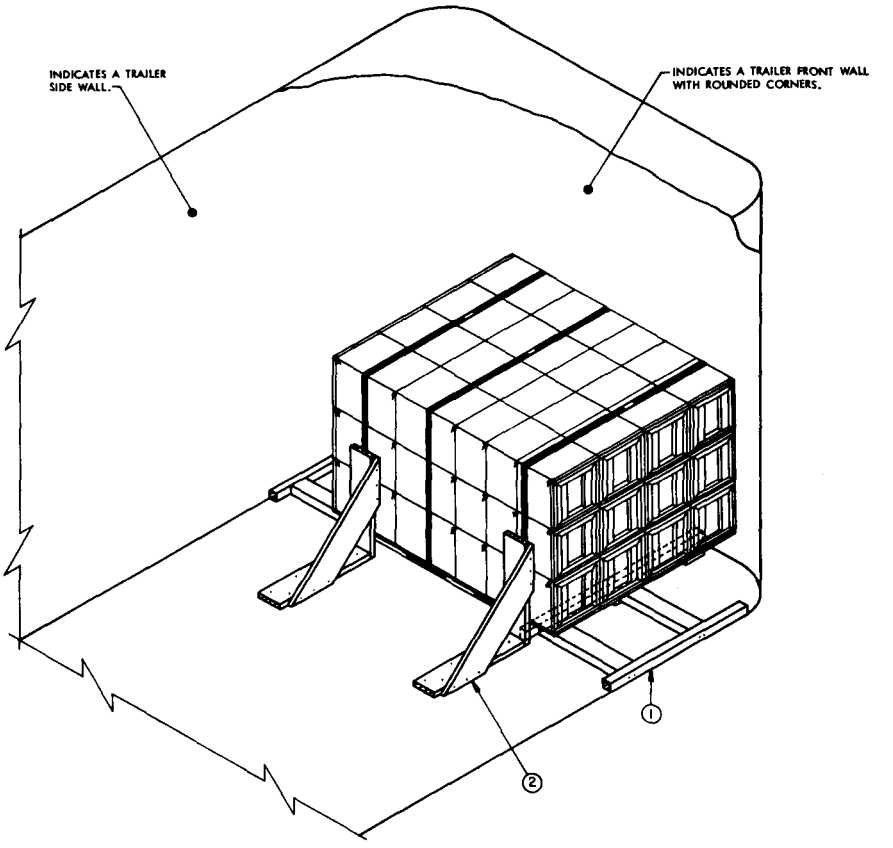


Figure 5–1—Continued (sheet 13 of 19).



ISOMETRIC VIEW

KEY NUMBERS

(1) SPACER ASSEMBLY (2 REQD). SEE DETAIL AND "NOTE ◉ " ON PAGE 16.

(2) LTL BRACE (2 REQD). SEE DETAIL ON PAGE 16. NAIL TO THE TRAILER FLOOR W/10-6d NAILS. SEE SPECIAL NOTE 3 AT LEFT AND GENERAL NOTE "Q" ON PAGE 2.

SPECIAL NOTES:

1. A ONE PALLET UNIT LOAD IS SHOWN DEPICTING THE USE OF LTL BRACES IN A TRAILER EQUIPPED WITH ROUNDED CORNERS AT THE FORWARD END AND WHICH HAS A NAILABLE FLOOR. TRAILERS WITH NON-NAILABLE FLOORS CANNOT BE USED.
2. IF DESIRED, TWO (2) ADDITIONAL LTL BRACES MAY BE INSTALLED AT THE FORWARD END OF THE LADING.
3. NOT LESS THAN TWO (2) LTL BRACES MARKED (2) SHALL BE USED FOR LONGITUDINAL BRACING.
4. THIS OUTLOADING PROCEDURE IS ALSO APPLICABLE FOR LTL LOADS OF MORE THAN ONE UNIT, PROVIDING THE CRITERIA OF "NOTE ■ " ON PAGE 16 IS OBSERVED.

TYPICAL LTL (1-UNIT LOAD) PALLETIZED

PAGE 15

Figure 5–1—Continued (sheet 14 of 19).

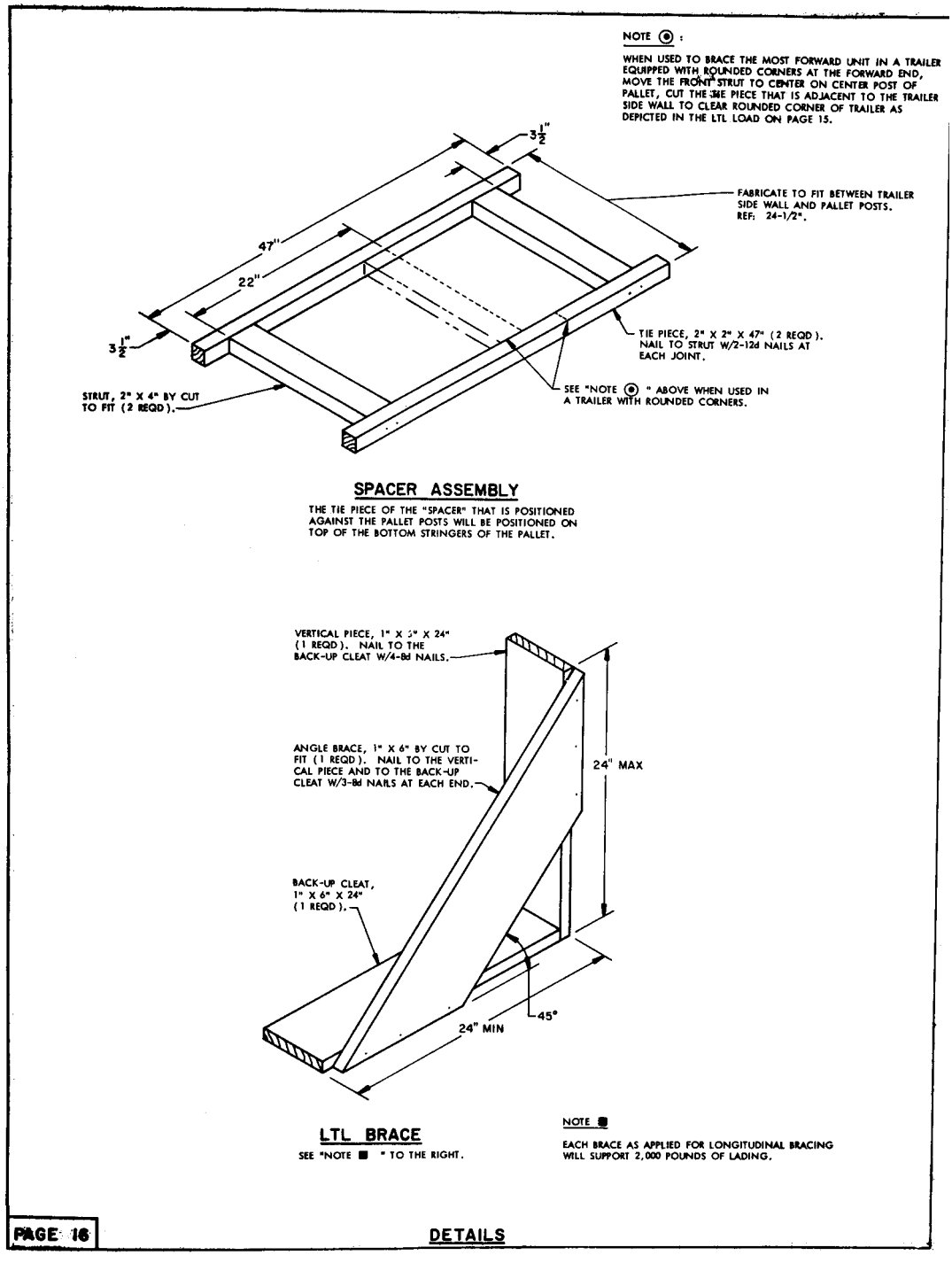


Figure 5-1 -Continued (sheet 15of 19).

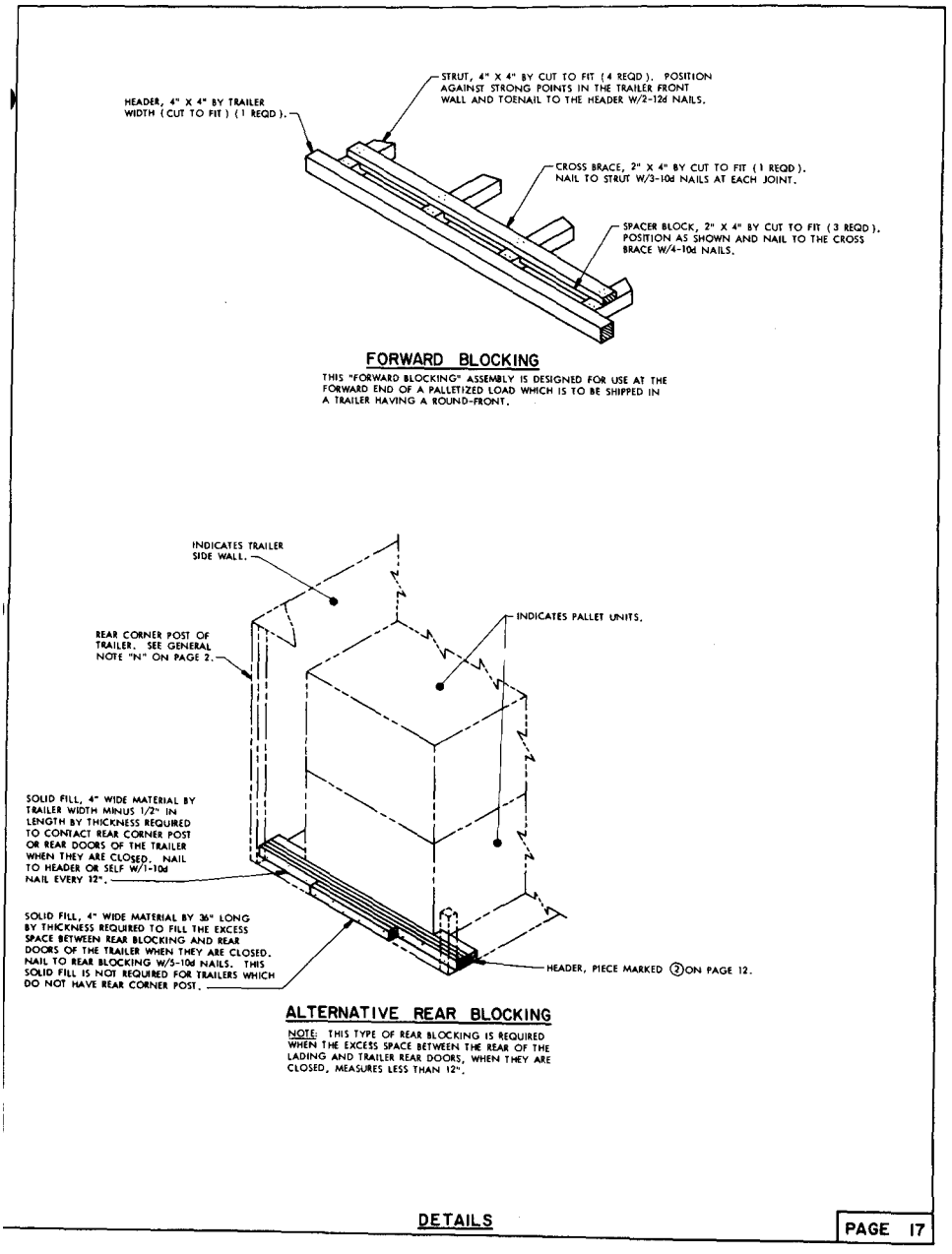


Figure 5–1—Continued (sheet 16 of 19).

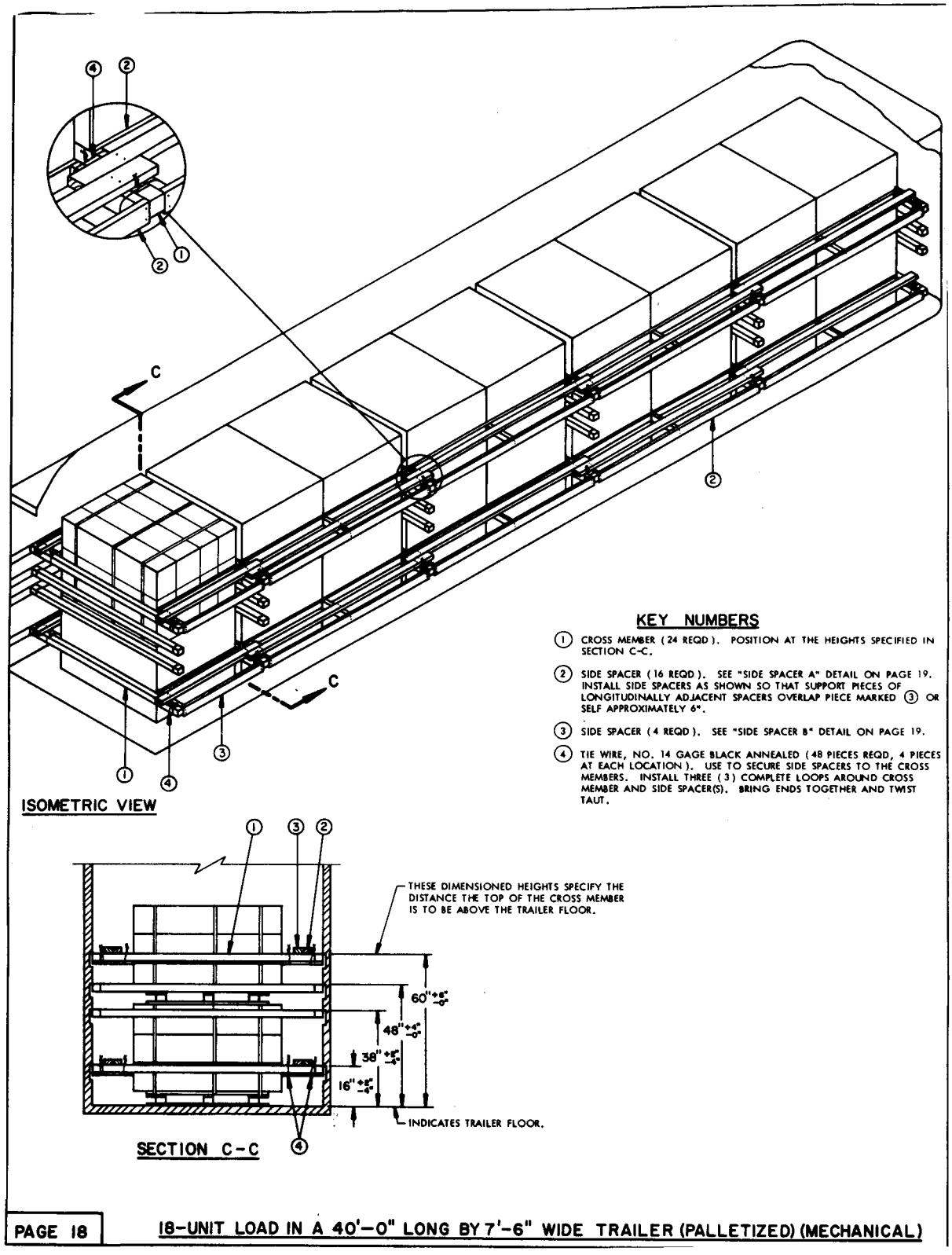
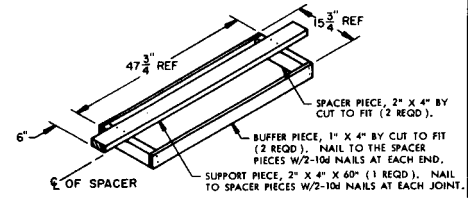


Figure 5-1-Continued (sheet 17 of 19).

SPECIAL NOTES:

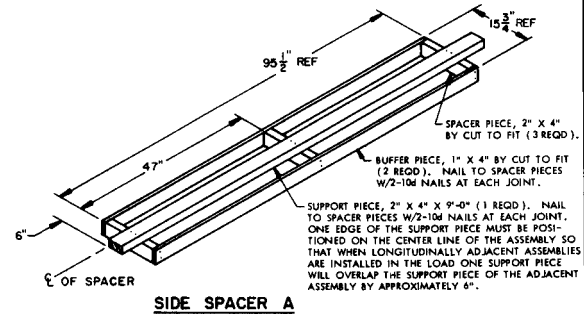
1. AN 18-UNIT LOAD IS SHOWN IN A 40'-0" LONG BY 7'-6" WIDE (INSIDE DIMENSION) TRAILER WITH ROUNDED CORNERS AT THE FORWARD END AND WHICH IS EQUIPPED WITH A MECHANICAL LOAD BLOCKING SYSTEM THAT CONTAINS AT LEAST TWENTY-FOUR (24) CROSS MEMBERS, AND MEASURES AT LEAST 37'-4" IN LENGTH. A WIDER OR NARROWER TRAILER CAN BE USED.

2. IF A LOAD CONTAINING ONE (1) LESS UNIT THAN SHOWN IN THE ISOMETRIC VIEW IS TO BE OUTLOADED DELETE THE SECOND LAYER UNIT IN THE ONE-UNIT LONG BAY AT THE REAR OF THE LOAD. IF A LOAD CONTAINING TWO (2) LESS UNITS THAN SHOWN IS TO BE OUTLOADED DELETE BOTH UNITS IN THE ONE-UNIT LONG BAY. ALSO, DELETE THE NUMBER OF SIDE SPACERS AND CROSS MEMBERS ACCORDINGLY.



SIDE SPACER B

SEE "NOTE ● " BELOW.



SIDE SPACER A

SEE "NOTE ● " BELOW.

BILL OF MATERIAL		
LUMBER	LINEAR FEET	BOARD FEET
1" X 4"	288	96
2" X 4"	211	140
NAILS	NO. REQD	POUNDS
10d (3")	336	5-1/4
NO. 14 GAGE WIRE ---------- 304' REQD ---------- 5 LBS		

NOTE ● :

THE SPACE BETWEEN THE PALLET UNIT AND THE TRAILER SIDE WALL MUST BE FIELD CHECKED TO INSURE THAT SPACER CAN BE INSTALLED AFTER CROSS MEMBERS ARE INSTALLED. LIKEWISE, THE SPACE BETWEEN LONGITUDINALLY ADJACENT CROSS MEMBERS MUST BE FIELD CHECKED.

LOAD AS SHOWN

ITEM	QUANTITY	WEIGHT (APPROX)
PALLET UNIT	18	18,882 LBS
DUNNAGE		600 LBS
TOTAL WEIGHT		19,482 LBS

18-UNIT LOAD IN A 40'-0" LONG BY 7'-6" WIDE TRAILER (PALLETIZED) (MECHANICAL) PAGE 19

Figure 5-1-Continued (sheet 18 0f 19).

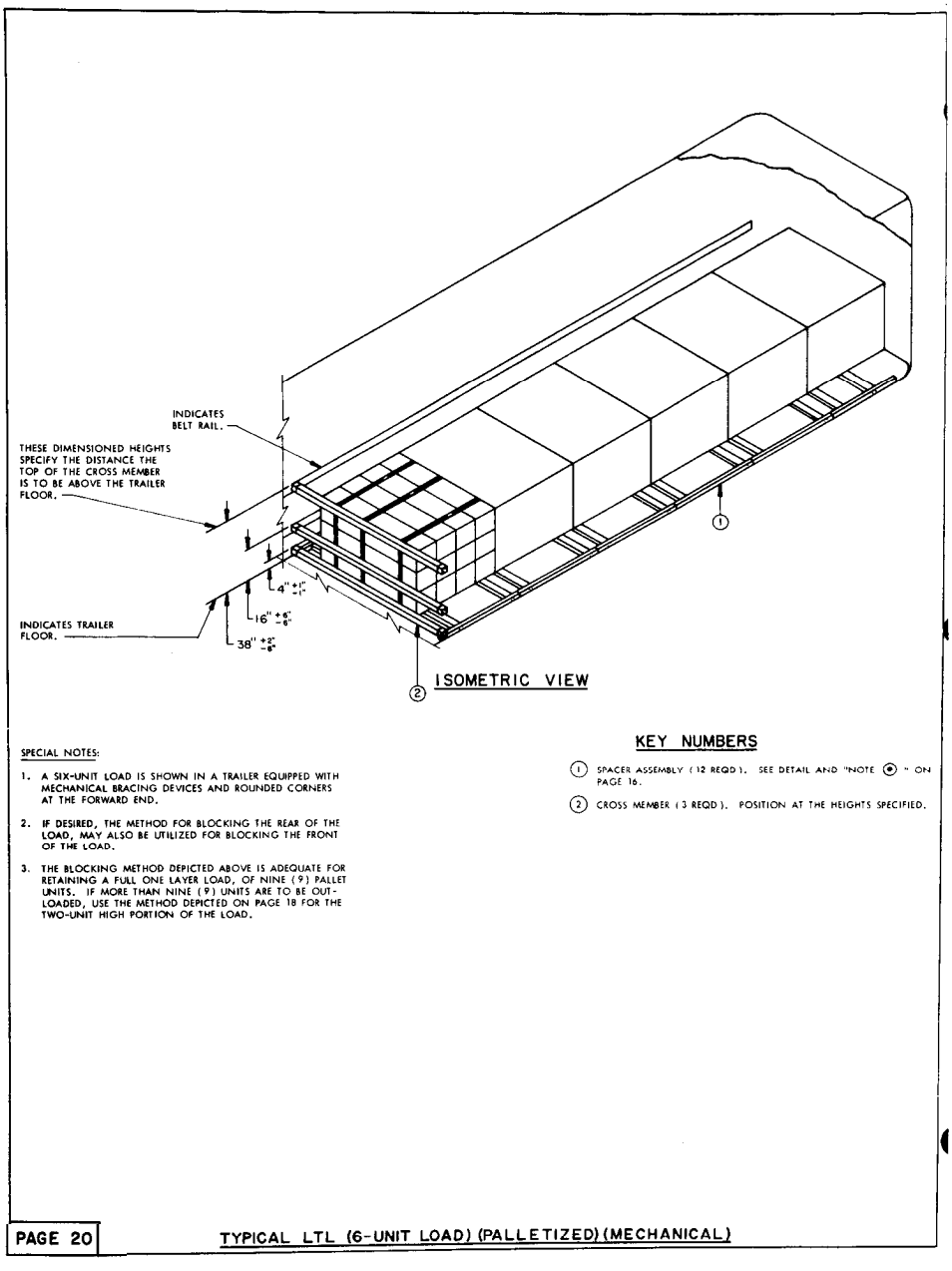


Figure 5–1—Continued (sheet 19 of 19).

(Reference to page numbers in the notes within the figures refer to the number listed in the lower right- or left-hand corner of each figure.)

Figure 5–2. Loading and bracing (TL and LTL) in closed or open top van trailers of components for launcher equipment packed one set per wooden box (sheet 1 of 9).

GENERAL NOTES

A. Not Applicable.

B. THE LOAD AS SHOWN ON PAGES 4 AND 5 IS BASED ON A CLOSED OR OPEN TOP VAN TRAILER WHICH IS 40'-0" LONG BY 7'-6" WIDE (INSIDE DIMENSION) AND HAS A WOOD, WOOD AND METAL, OR A METAL FLOOR. THE DEL IN EATED OUTLOADING PROCEDURES ARE ALSO APPLICABLE TO TRAILERS WHICH ARE FROM 86 INCHES THROUGH 93 INCHES WIDE.

C. THE OUTLOADING PROCEDURES SPECIFIED IN THIS DRAWING ARE APPLICABLE TO THE COMPONENTS FOR LAUNCHER EQUIPMENT PACKED ONE SET PER WOODEN BOX. SUBSEQUENT REFERENCE TO CONTAINER MEANS THE WOODEN BOX WITH CONTENTS.

D. FOR DETAILS OF THE CONTAINER SEE DRAWING NO. 19-48-5211-GSE 20M2.

CONTAINER DIMENSIONS --- 75" LONG BY 39-1/2" WIDE BY 31" HIGH.
GROSS WEIGHT ---------- 510 POUNDS (APPROX).
TARE WEIGHT ---------- 129 POUNDS (APPROX).
CUBE ---------- 52.6 CUBIC FEET.

COMPONENTS PACKED IN THE CONTAINER:

ITEM	QUANTITY
SIGHT OPTICAL	
MISSILE GUIDANCE SET	1
MOUNT, TRIPOD, GM LAUNCHER XM154	1
TUBE, GM LAUNCHER	1
TRAVERSING UNIT, GM LAUNCHER	1
BATTERY ASSEMBLY, STORAGE	2

E. GROSS WEIGHT AND AXLE DISTRIBUTION OF WEIGHT FOR A LOAD WILL BE THE RESPONSIBILITY OF THE CARRIER. THE CARRIER WILL ADVISE THE SHIPPER OF THE APPLICABLE LOADING REQUIREMENTS AND THE SHIPPER WILL LOAD ACCORDINGLY.

F. THE NUMBER OF LADING UNITS MAY BE ADJUSTED TO FIT THE SIZE OF THE TRAILER TO BE LOADED OR THE QUANTITY TO BE SHIPPED. HOWEVER, THE APPROVED METHODS SHOWN MUST BE FOLLOWED AS CLOSELY AS POSSIBLE FOR BLOCKING, BRACING, AND STAYING OF THE DESIGNATED ITEMS.

G. THE OUTLOADING PROCEDURES SPECIFIED IN THIS DRAWING CAN ALSO BE UTILIZED FOR THE SHIPMENT OF THE DEPICTED CONTAINER WHEN IT IS EMPTY OR LOADED WITH AN ITEM WHICH IS IDENTIFIED DIFFERENTLY BY NOMENCLATURE THAN THE ITEMS DESIGNATED WITHIN THE DRAWING TITLE.

H. OTHER TYPES OF LADING ITEMS MAY BE LOADED INTO TRAILERS WHICH ARE PARTIALLY LOADED WITH THE DESIGNATED ITEM, PROVIDING THE TOTAL LOAD IS COMPATIBLE, EXISTING DIRECTIVES ARE NOT VIOLATED, AND THE OTHER LADING ITEMS ARE BLOCKED AND BRACED TO EQUAL THE BLOCKING AND BRACING CRITERIA SPECIFIED IN THIS DRAWING.

J. ONLY TRAILERS CAPABLE OF SAFELY TRANSPORTING THE LADING TO DESTINATION WITHOUT DAMAGE WILL BE SELECTED. TRAILERS SELECTED MUST HAVE "SOUND" FLOORS WHICH PROVIDE NAIL RETENTION PROPERTIES EQUAL TO OR BETTER THAN SPECIFIED DUNNAGE LUMBER.

K. WHEN ANY STRAP IS SEALED AT AN END-OVER-END LAP JOINT, A MINIMUM OF TWO (2) SEALS, BUTTED TOGETHER, WITH TWO (2) PAIR OF CRIMPS PER SEAL MUST BE USED. CAUTION: EXERCISE CARE DURING TENSIONING TO PREVENT DAMAGE TO THE CONTAINER.

L. DUNNAGE LUMBER SPECIFIED THROUGHOUT THIS PROCEDURAL DRAWING IS OF NOMINAL SIZE. FOR EXAMPLE, 2" X 4" MATERIAL IS ACTUALLY 1-5/8" THICK BY 3-5/8" WIDE AND 2" X 6" MATERIAL IS ACTUALLY 1-5/8" THICK BY 5-5/8" WIDE.

M. NOTICE: A STAGGERED NAILING PATTERN WILL BE USED WHEREVER POSSIBLE WHEN NAILS ARE DRIVEN INTO JOINTS OF DUNNAGE ASSEMBLIES. ALSO, A STAGGERED NAILING PATTERN WILL BE USED WHEN DUNNAGE IS NAILED TO THE FLOOR OF THE TRANSPORTING VEHICLE, OR WHEN LAMINATING DUNNAGE. ADDITIONALLY, THE NAILING PATTERN FOR AN UPPER PIECE OF LAMINATED DUNNAGE WILL BE ADJUSTED AS REQUIRED SO THAT A NAIL FOR THAT PIECE WILL NOT BE DRIVEN THROUGH ONTO OR RIGHT BESIDE A NAIL IN A LOWER PIECE.

N. PORTIONS OF THE TRAILER BODY DEPICTED WITHIN THIS PROCEDURAL DRAWING, SUCH AS ONE OF THE SIDE WALLS, HAVE NOT BEEN SHOWN IN THE LOAD VIEWS FOR CLARITY PURPOSES.

(GENERAL NOTES CONTINUED AT RIGHT)

MATERIAL SPECIFICATIONS

LUMBER ---------- : DOUGLAS FIR OR COMPARABLE LUMBER WITH STRAIGHT GRAIN AND FREE OF MATERIAL DEFECTS. REF: FED SPEC MM-L-751.

NAILS ---------- : COMMON, CEMENT COATED OR CHEMICALLY ETCHED.
REF: FED SPEC FF-N-105.
ALT: ANNULAR-RING TYPE NAIL OF SAME SIZE.

STRAPPING, STEEL --: TYPE I OR IV, CLASS A OR B. REF: FED SPEC QQ-S-781 (FOR FSN SEE SB-38-100).

STRAP SEAL -------- : COMMERCIAL GRADE.

(GENERAL NOTES CONTINUED)

O. FOR ADDITIONAL GUIDANCE, ATTENTION IS DIRECTED TO THE "CONTAINER DETAIL" ON PAGE 3 AND TO THE "SPECIAL NOTES" SECTION WHICH IS IMMEDIATELY ADJACENT TO A DEPICTED OUTLOADING METHOD.

Figure 5-2-Continued (sheet 1 of 9).

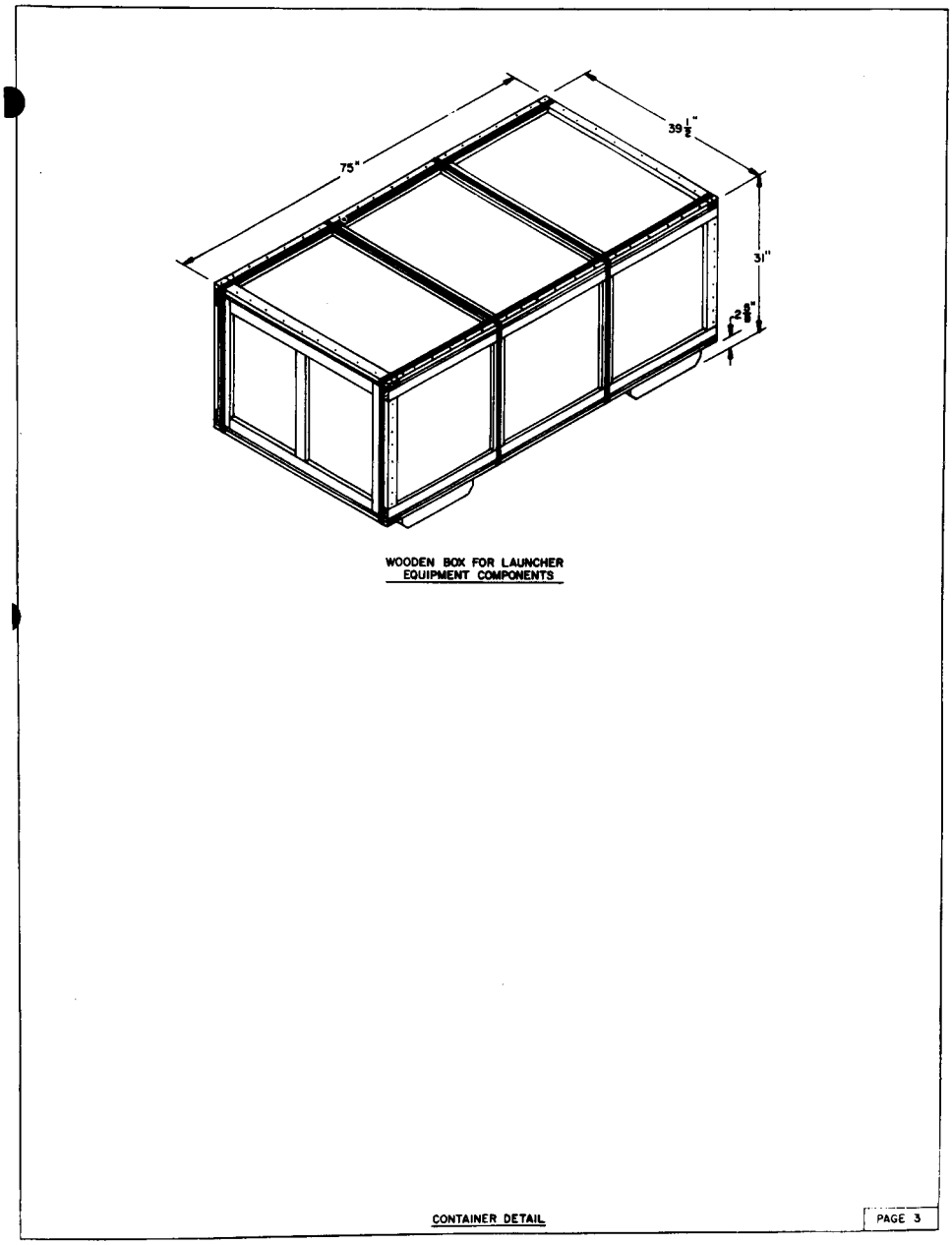


Figure 5–2—Continued (sheet 2 of 9).

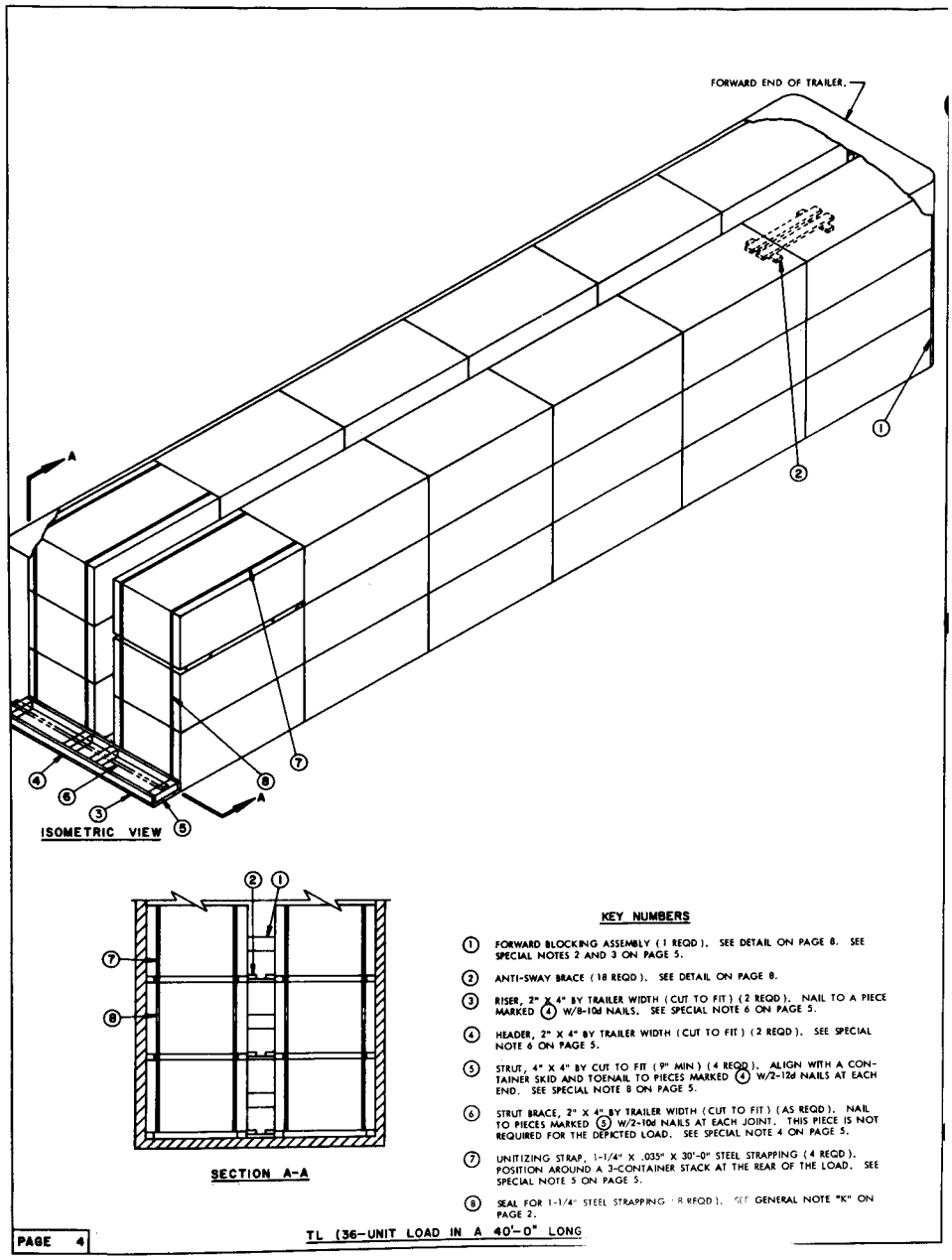
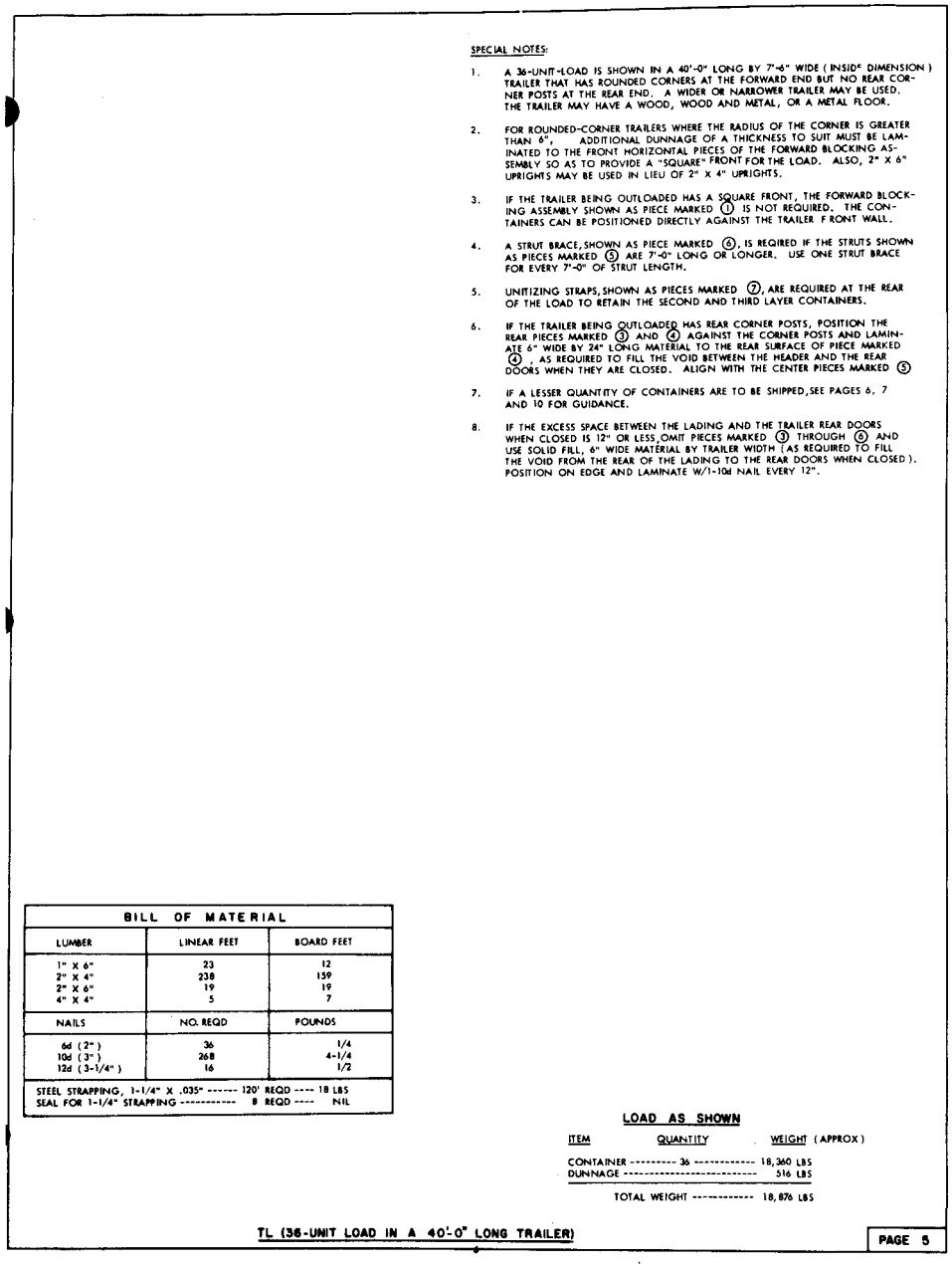


Figure 5–2—Continued (sheet 3 of 9).



SPECIAL NOTES:

1. A 36-UNIT-LOAD IS SHOWN IN A 40'-0" LONG BY 7'-6" WIDE (INSIDE DIMENSION) TRAILER THAT HAS ROUNDED CORNERS AT THE FORWARD END BUT NO REAR CORNER POSTS AT THE REAR END. A WIDER OR NARROWER TRAILER MAY BE USED. THE TRAILER MAY HAVE A WOOD, WOOD AND METAL, OR A METAL FLOOR.
2. FOR ROUNDED-CORNER TRAILERS WHERE THE RADIUS OF THE CORNER IS GREATER THAN 6", ADDITIONAL DUNNAGE OF A THICKNESS TO SUIT MUST BE LAMINATED TO THE FRONT HORIZONTAL PIECES OF THE FORWARD BLOCKING ASSEMBLY SO AS TO PROVIDE A "SQUARE" FRONT FOR THE LOAD. ALSO, 2" X 6" UPRIGHTS MAY BE USED IN LIEU OF 2" X 4" UPRIGHTS.
3. IF THE TRAILER BEING OUTLOADED HAS A SQUARE FRONT, THE FORWARD BLOCKING ASSEMBLY SHOWN AS PIECE MARKED (1) IS NOT REQUIRED. THE CONTAINERS CAN BE POSITIONED DIRECTLY AGAINST THE TRAILER FRONT WALL.
4. A STRUT BRACE, SHOWN AS PIECE MARKED (6), IS REQIRED IF THE STRUTS SHOWN AS PIECES MARKED (5) ARE 7'-0" LONG OR LONGER. USE ONE STRUT BRACE FOR EVERY 7'-0" OF STRUT LENGTH.
5. UNITIZING STRAPS, SHOWN AS PIECES MARKED (7), ARE REQUIRED AT THE REAR OF THE LOAD TO RETAIN THE SECOND AND THIRD LAYER CONTAINERS.
6. IF THE TRAILER BEING OUTLOADED HAS REAR CORNER POSTS, POSITION THE REAR PIECES MARKED (3) AND (4) AGAINST THE CORNER POSTS AND LAMINATE 6" WIDE BY 24" LONG MATERIAL TO THE REAR SURFACE OF PIECE MARKED (4), AS REQUIRED TO FILL THE VOID BETWEEN THE HEADER AND THE REAR DOORS WHEN THEY ARE CLOSED. ALIGN WITH THE CENTER PIECES MARKED (5)
7. IF A LESSER QUANTITY OF CONTAINERS ARE TO BE SHIPPED, SEE PAGES 6, 7 AND 10 FOR GUIDANCE.
8. IF THE EXCESS SPACE BETWEEN THE LADING AND THE TRAILER REAR DOORS WHEN CLOSED IS 12" OR LESS, OMIT PIECES MARKED (3) THROUGH (6) AND USE SOLID FILL, 6" WIDE MATERIAL BY TRAILER WIDTH (AS REQUIRED TO FILL THE VOID FROM THE REAR OF THE LADING TO THE REAR DOORS WHEN CLOSED). POSITION ON EDGE AND LAMINATE W/1-10d NAIL EVERY 12".

BILL OF MATERIAL

LUMBER	LINEAR FEET	BOARD FEET
1" X 6"	23	12
2" X 4"	238	159
2" X 6"	19	19
4" X 4"	5	7
NAILS	**NO. REQD**	**POUNDS**
6d (2")	36	1/4
10d (3")	268	4-1/4
12d (3-1/4")	16	1/2

STEEL STRAPPING, 1-1/4" X .035" ------ 120' REQD ---- 18 LBS
SEAL FOR 1-1/4" STRAPPING ---------- 8 REQD ---- NIL

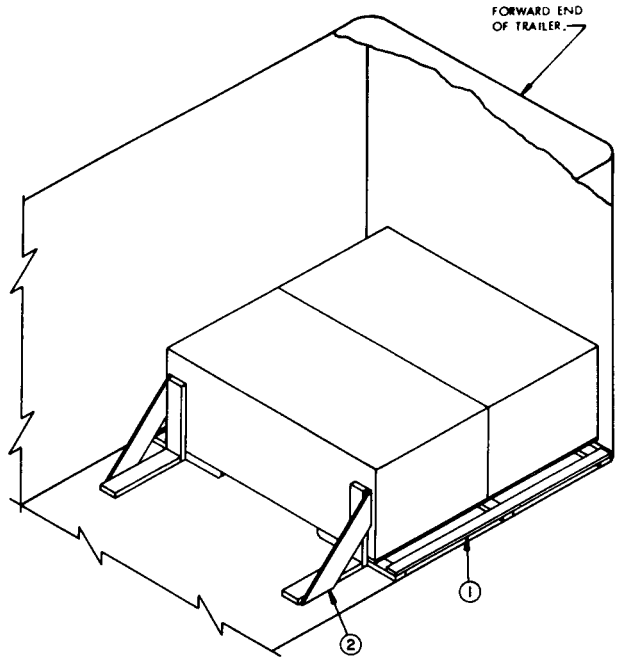
LOAD AS SHOWN

ITEM	QUANTITY	WEIGHT (APPROX)
CONTAINER	36	18,360 LBS
DUNNAGE		516 LBS
TOTAL WEIGHT		18,876 LBS

TL (36-UNIT LOAD IN A 40'-0" LONG TRAILER)

PAGE 5

Figure 5-2-Continued (sheet 4 of 9).



ISOMETRIC VIEW

SPECIAL NOTES:

1. THESE LTL OUTLOADING PROCEDURES DEPICT THE USE OF BLOCKING THAT IS ONLY APPLICABLE TO TRAILERS THAT HAVE A NAILABLE FLOOR.
2. EACH LTL BRACE AS SPECIFIED WILL RETAIN 2,000 POUNDS OF LADING; HOWEVER, A MINIMUM OF TWO (2) BRACES MUST BE USED TO BLOCK THE LOAD.
3. POSITION THE LTL BRACE SO THAT THE ANGLE BRACE IS LOCATED 1" IN FROM THE EDGE OF THE CONTAINER.

KEY NUMBERS

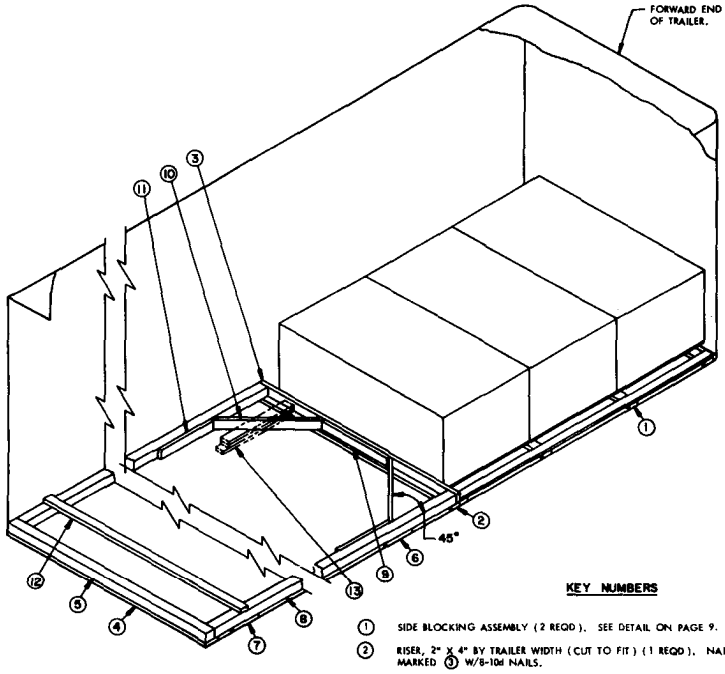
(1) SIDE BLOCKING ASSEMBLY (2 REQD). SEE DETAIL ON PAGE 9.

(2) LTL BRACE (2 REQD). SEE DETAIL ON PAGE 9. NAIL TO THE TRAILER FLOOR W/10-10d NAILS. SEE SPECIAL NOTES 1, 2, AND 3 ON THIS PAGE.

PAGE 6

TYPICAL LTL (2-UNIT LOAD)

Figure 5–2—Continued (sheet 5 of 9).



ISOMETRIC VIEW

SPECIAL NOTES:

1. THESE LTL OUTLOADING PROCEDURES DEPICT THE USE OF "K-BRACE" BLOCKING FOR USE IN A TRAILER HAVING WOOD, WOOD AND METAL, OR A METAL FLOOR. IT ALSO DEPICTS THE USE OF BACK-UP CLEATS FOR A NAILABLE FLOOR ONLY (ONE OMITTED FOR CLARITY).
2. THE "K-BRACE" BLOCKING, SHOWN AS PIECES MARKED (2) THROUGH (12), IS ADEQUATE FOR RETAINING A MAXIMUM LTL LOAD OF 24,000 POUNDS.
3. TWO (2) BACK-UP CLEATS, SHOWN AS PIECE MARKED (13), ARE ADEQUATE FOR RETAINING A MAXIMUM LTL LOAD OF 8,000 LBS AND SHOULD BE USED, IF POSSIBLE, IN LIEU OF THE "K-BRACE", SHOWN AS PIECES MARKED (2) THROUGH (12), WHICH APPLIES TO TRAILERS HAVING NON-NAILABLE FLOORS.
4. THE "K-BRACE" BLOCKING SHOWN ABOVE MAY BE USED TO RETAIN LOADS TWO OR THREE LAYERS HIGH WHEN CONTAINERS ARE POSITIONED IN THE TRAILER AS SHOWN ON PAGE 4 AND THE REAR STACKS ARE UNITIZED AS SHOWN ON THAT PAGE.

KEY NUMBERS

(1) SIDE BLOCKING ASSEMBLY (2 REQD). SEE DETAIL ON PAGE 9.
(2) RISER, 2" X 4" BY TRAILER WIDTH (CUT TO FIT) (1 REQD). NAIL TO PIECE MARKED (3) W/8-10d NAILS.
(3) HEADER, 2" X 4" BY TRAILER WIDTH (CUT TO FIT) (1 REQD).
(4) RISER, 2" X 6" BY TRAILER WIDTH (CUT TO FIT) (1 REQD). NAIL TO PIECE MARKED (5) W/8-10d NAILS.
(5) CROSS BRACE, 4" X 4" BY TRAILER WIDTH (CUT TO FIT) (1 REQD).
(6) DIAGONAL BRACE SUPPORT, 2" X 6" X 12" (2 REQD). CENTER UNDER JOINT OF PIECES MARKED (10) AND (11) AND NAIL TO A PIECE MARKED (8) W/2-10d NAILS.
(7) SIDE STRUT SUPPORT, 2" X 4" X 12" (AS REQD). POSITION UNDER EVERY PIECE MARKED (12) AND NAIL TO A PIECE MARKED (8) W/2-10d NAILS.
(8) SIDE STRUT, 4" X 4" BY CUT TO FIT (2 REQD). TOENAIL TO PIECES MARKED (3) AND (5) W/2-16d NAILS AT EACH END.
(9) SPACER CLEAT, 2" X 4" X 30" (1 REQD). NAIL TO PIECE MARKED (3) W/7-10d NAILS.
(10) DIAGONAL BRACE, 2" X 4" BY CUT TO FIT (2 REQD). DOUBLE BEVEL EACH EACH END WITH 45° CUTS. INSTALL AT A 45° ANGLE AS SHOWN AND NAIL TO PIECES MARKED (3) AND (8) W/2-16d NAILS AT EACH END.
(11) SIDE CLEAT, 2" X 4" X 24" (2 REQD). NAIL TO PIECE MARKED (8) W/8-12d NAILS.
(12) STRUT BRACING, 2" X 4" BY TRAILER WIDTH (CUT TO FIT) (MINIMUM OF 1 REQD). POSITION EVERY 7'-0". NAIL TO PIECES MARKED (8) W/3-10d NAILS AT EACH END.
(13) BACK-UP CLEAT, 2" X 4" X 30" (TRIPLED) (MINIMUM OF 2 REQD). ALIGN WITH CONTAINER SKIDS. POSITION THE FIRST PIECE AGAINST PIECE MARKED (2) AND NAIL TO THE TRAILER FLOOR W/7-12d NAILS. POSITION SECOND AND THIRD PIECES AGAINST PIECE MARKED (3) AND NAIL TO FIRST PIECE IN A LIKE MANNER. SEE SPECIAL NOTE 3 ON THIS PAGE.

TYPICAL LTL (3-UNIT LOAD) PAGE 7

PROJECT GSE 457-68

Figure 5-2—Continued (sheet 6 0f 9).

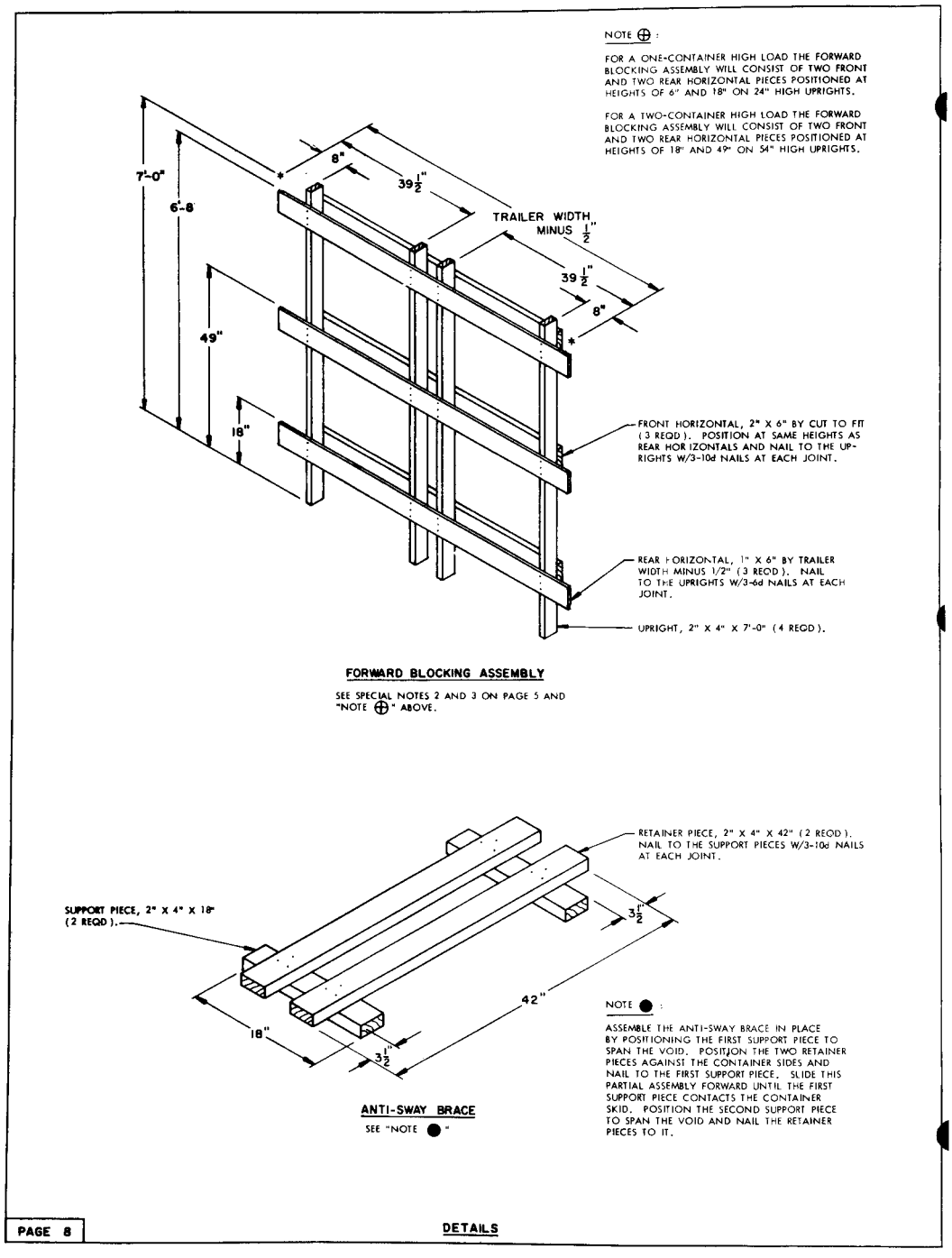


Figure 5-2—Continued (sheet 7 0f 9).

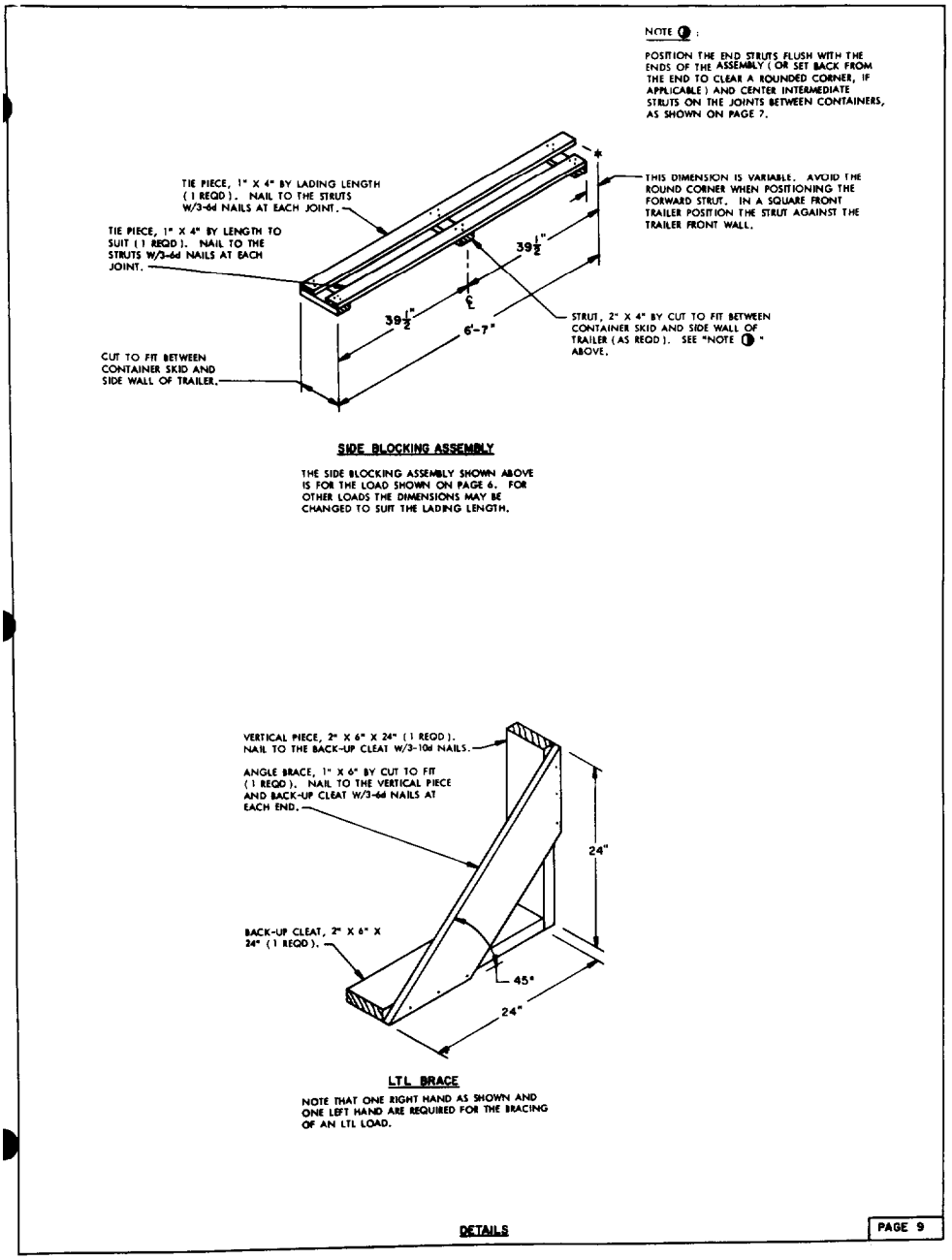
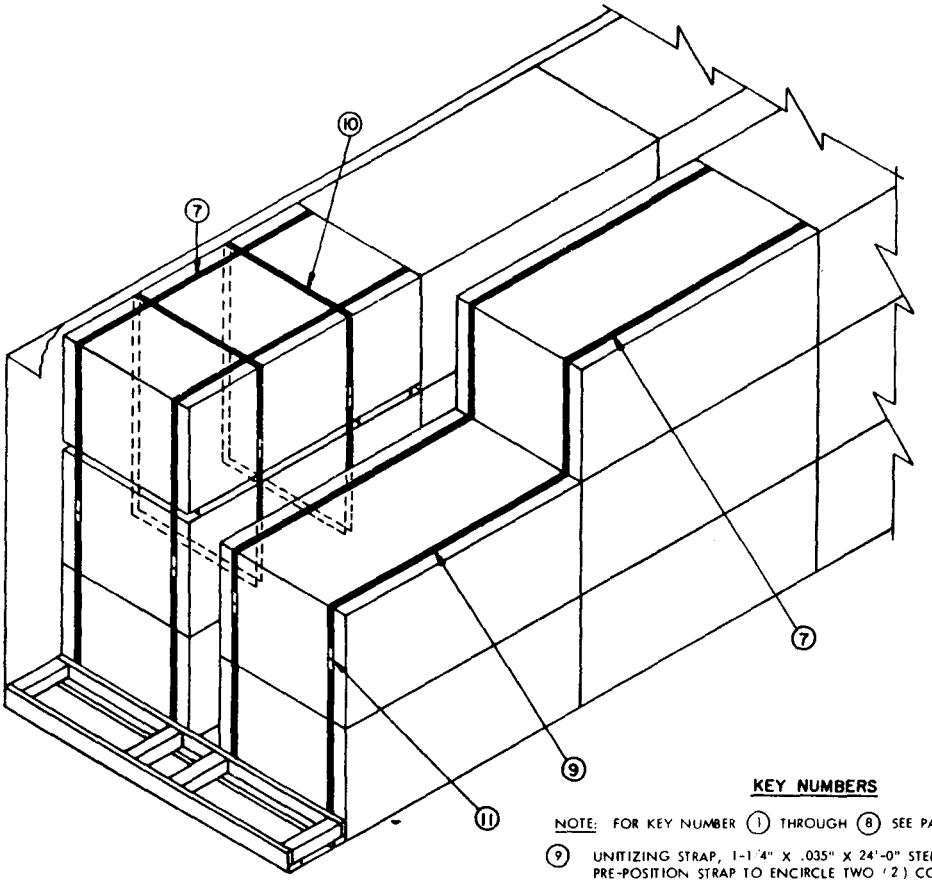


Figure 5-2-Continued (sheet 8 of 9).



ISOMETRIC VIEW

SPECIAL NOTES:

1. THE PARTIAL VIEW SHOWN ABOVE DEPICTS THE LOAD AS SHOWN ON PAGE 4 WITH ONE CONTAINER OMITTED. MORE CONTAINERS MAY BE OMITTED BY USING SIMILAR STRAPPING METHODS AS SHOWN ABOVE TO RETAIN THE LOAD. NOTE THAT THE UNITIZING STRAPS SHOWN AS PIECES MARKED (10) ARE ONLY REQUIRED WHEN THE LOAD CONSISTS OF AN UNEVEN NUMBER OF CONTAINERS.

KEY NUMBERS

NOTE: FOR KEY NUMBER (1) THROUGH (8) SEE PAGE 4.

(9) UNITIZING STRAP, 1-1/4" X .035" X 24'-0" STEEL STRAPPING (2 REQD). PRE-POSITION STRAP TO ENCIRCLE TWO (2) CONTAINERS AS SHOWN. REQUIRED TO RETAIN THE TOP CONTAINER LONGITUDINALLY. SEE GENERAL NOTE "K" ON PAGE 2.

(10) UNITIZING STRAP, 1-1/4" X .035" X 18'-0" STEEL STRAPPING (2 REQD). PRE-POSITION STRAP TO ENCIRCLE TWO (2) CONTAINERS AS SHOWN. REQUIRED TO RETAIN THE TOP CONTAINER LATERALLY. SEE GENERAL NOTE "K" ON PAGE 2.

(11) SEAL FOR 1-1/4" STEEL STRAPPING (8 REQD).

PAGE 10

DETAILS

Figure 5-2—Continued (sheet 9 of 9).

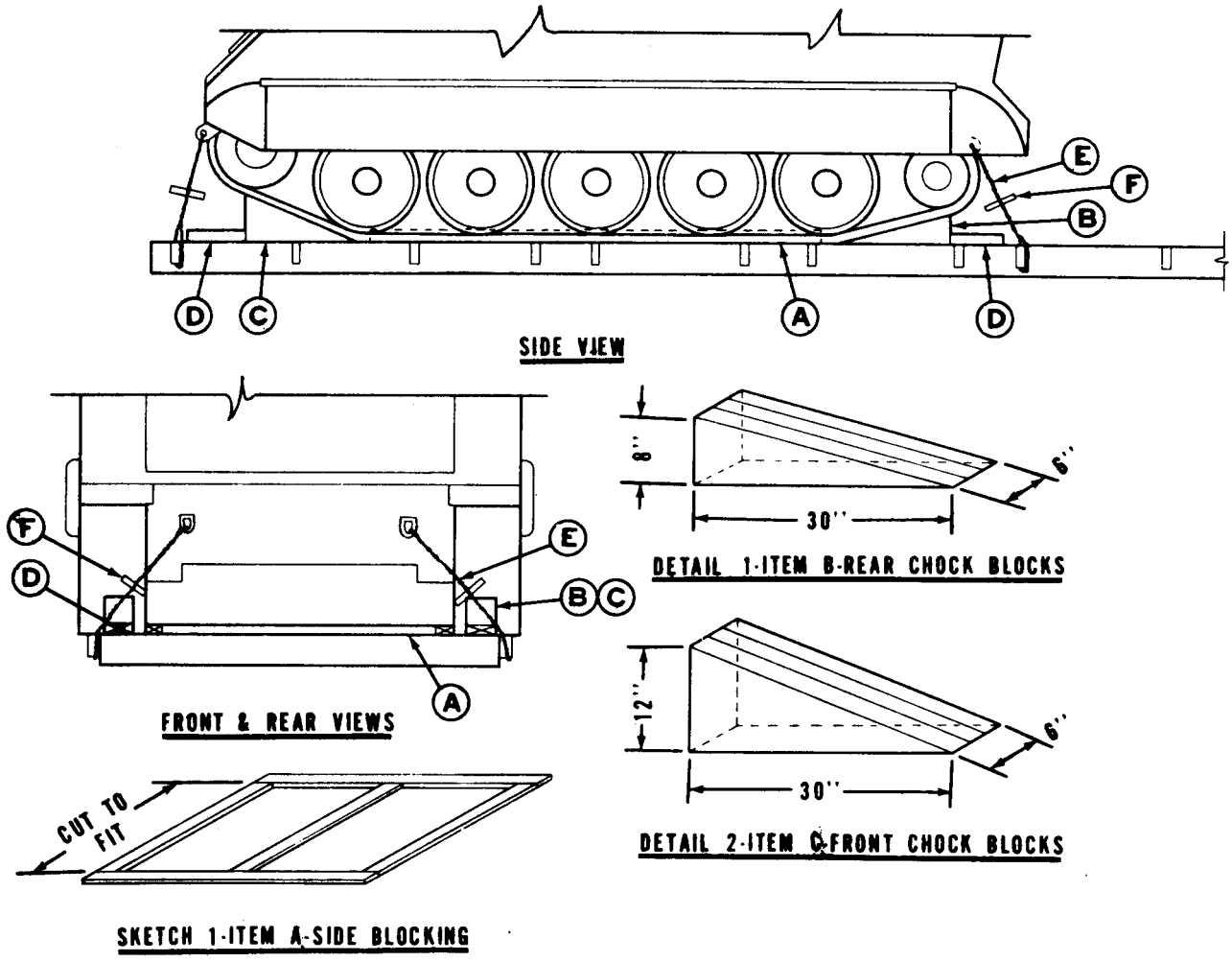


Figure 5–3. Blocking and tiedown diagram for carrier on semitrailer.

Table 5-1. *Bill of Materials for Blocking and Tiedown of Carrier on Semitrailer* (Fig-5-3).

Item	Description	Approximate quantity
Lumber	Douglas-fir, or comparable, straight-grain, free from material defects; Fed Spec MM–L–751c: 2- x 2-in.	6 linear ft
	2- x 4-in.	34 linear ft
	2- x 6-in.	6 linear ft
	2- x 8-in.	8 linear ft
	2- x 12-in.	8 linear ft
Nails	Common, steel; flathead; bright or cement coated; table X1–b, Fed Spec FF–N–105a: 16d	71
	20d	92
Wire	No. 8 gage black annealed finish; Fed Spec QQ–W–461f	200 ft

Table 5-2. *Application of Materials for Blocking and Tiedown of Carrier on Semitrailer* (Fig 5-3).

Item	No. required	Application
A	1	Side blocking (sketch 1, item A, fig 5-3). Nail 2-in. x 4-in. x 96-in. piece of lumber against inside of each track. Secure to trailer floor with 16d nails staggered every 8 in. Nail 3 pieces of 2-in. x 4-in x length-to-fit lumber between longitudinal side blocking with 16d nails staggered every 8 in.
B	2	Rear chock blocks (detail 1, item B, fig 5-3). Construct block from three pieces of 2-in. x 8-in. material. Nail outside pieces to center piece with six 20d nails in staggered pattern.

Table 5-2. *Application of Materials for Blocking and Tiedown of Carrier on Semitrailer* (fig 5-3)—Continued

Item	No. required	Application
		Locate one block against rear of each track. Toenail heel of block to trailer floor with one 20d nail in center piece of block. Toenail each side of block to trailer floor with two 20d nails on each side.
C		Front chock blocks (detail 2, item C, fig 5–3). Construct block from three pieces of 2-in. x 12-in. material. Nail outside pieces to center piece with six 20d nails in staggered pattern. Locate one block against front of each track. Toenail heel of block to trailer floor with one 20d nail in center piece of block. Toenail each side of block to trailer floor with two 20d nails on each side.
D		Cleats. Place 2-in. x 6-in. x 18-in. cleat against heel of each chock block. Secure to trailer floor with five 16d nails in staggered pattern.
E		Eight strands of No. 8 gage black annealed wire. Attach to front and rear tiedown provisions on vehicle and thence to the tiedown points on trailer as indicated. Twist wire taut with rod, bolt, or suitable length of 2-in. x 2-in. lumber, and secure to prevent unwinding. Substitute, if desired, ⅜-in., ½-in. or ⅝-in. IWRC wire rope in a complete loop, and secure with four appropriate size cable clips spaced approximately 4 in. apart.
F	4	Wire twisters. Use 2-in. x 2-in. lumber cut to suit. (Metal rod or bolt may be used in lieu of lumber.) After twisting wire taut, rod, bolt, or lumber should be left in place and secured to prevent unwinding.

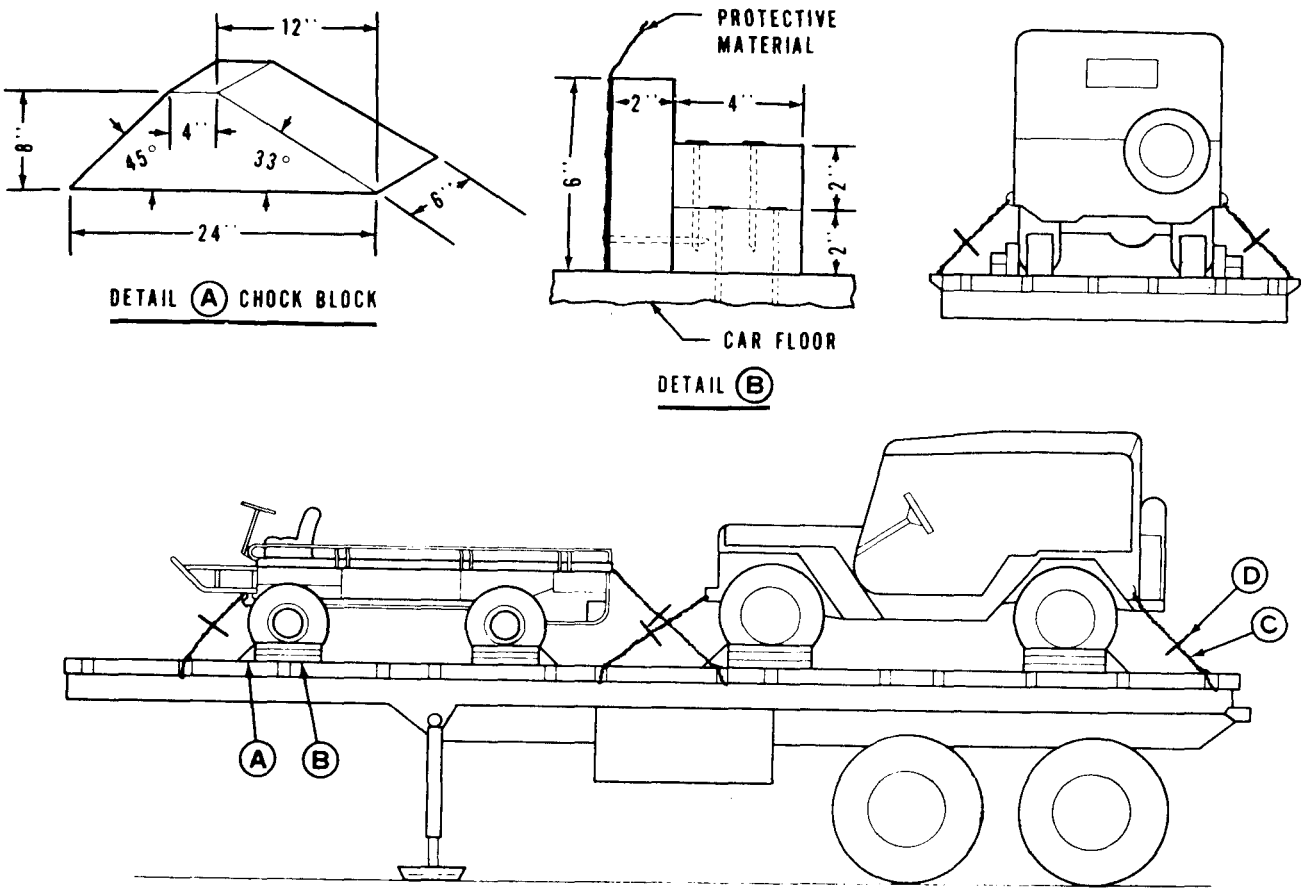


Figure 5-4. *Blocking and tiedown diagram for ¼-ton and ½-ton trucks on semitrailer.*

Table 5-3. *Bill of Materials for Blocking and Tiedown of ¼-Ton and ½-Ton Trucks on Semitrailer* (Fig 5-4)

Item	Description	Approximate quantity
Lumber	Douglas-fir, or comparable, straight-grain, free from material defects; Fed Spec MM–L–751c: 2- x 4-in.	40 linear ft
	2- x 6-in.	20 linear ft
	2- x 8-in.	16 linear ft
Nails	Common, steel; flathead; bright or cement-coated; table X1–b, Fed Spec FF–N–105a: 12d	64
	20d	8
	30d	48
	40d	16
Wire	No. 8 gage black annealed finish; Fed Spec QQ–W–461f	250 ft
Cushioning material.	Waterproof paper, or suitable material	as required

Table 5-4. *Application of Materials for Blocking and Tiedown of ¼-Ton and ½-Ton Trucks on Semitrailer* (Fig 5-4)

Item	No. required	Application
A	8	Block (detail A, fig 5-4). Locate 30° portion of blocks against the front and rear wheels of each vehicle as indicated, Toenail heel of blocks (near bottom edge) to trailer floor with one 20d nail. Additionally, drive two 40d nails into heel of block perpendicular to trailer floor. Toenail each side of block to trailer floor with two 30d nails on each side.
B	8	Side blocking (detail B, fig 5-4). Each to consist of one piece of 2-in. x 6-in. x 30-in. lumber and two pieces of 2-in. x 4-in. x 30-in. lumber. Nail the 2-in. x 6-in. x 30-in. piece to the edge of the lower 2-in. x 4-in. piece with four 12d nails. Place the 2-in. x 6-in. piece against the tire, and nail to the trailer floor through the 2-in. x 4-in. piece with four 20d nails in staggered pattern. Suitable protective material, such as waterproof paper or burlap, should be located under the bottom edge of the 2-in. x 4-in. piece and between the tire and 2-in. x 6-in. piece to extend 2-in. above blocking. Nail second 2-in. x 4-in. piece to first piece to first piece with four 30d nails in staggered pattern.
C	8	Six strands of No. 8 gage black annealed wire. Attach to front and rear tiedown provisions on each vehicle and thence to tiedown points on trailer as indicated. Twist wire taut with rod, bolt, or suitable length of 2-in. x 2-in. lumber, and secure to prevent unwinding. Substitute, if desired, ⅜-in. IWRC wire rope in a complete loop, and secure with four ⅜-in. cable clips spaced approximately 3 in. apart.
D	8	Wire twisters. Use 2-in. x 2-in. lumber x length-to-suit (metal rod or bolt may be used in lieu of lumber). After twisting wire taut, rod, bolt, or lumber should be left in place and secured to prevent unwinding.

CHAPTER 6

MARINE AND TERMINAL TRANSPORTABILITY GUIDANCE

Section I. GENERAL

6-1. Scope

This chapter provides marine and terminal transportability guidance for movement of the TOW heavy antitank/assault weapon system guided missile packed one per wirebound box (overpack) ; boxed launcher equipment (components for one set) ; 1/4-ton missile carrier and firing vehicle; 1/2-ton vehicle; and armored personnel carrier. It covers significant technical and physical characteristics and prescribes the materials and guidance required to prepare, load, and unload the items.

6-2. Water Shipment

The items can be transported by a great variety of inland-waterway cargo carriers and lighters and by all seagoing cargo/vessels.

NOTE

The methods described in this chapter for lifting and securing items are suggested procedures. Other methods of handling and stowage may be used providing they will insure safe delivery without damage.

Section II. LOADING AND SECURING

6-3. General Rules for Stowing Tracked and Wheeled Vehicles and Large, Boxed, or Skid-Mounted Equipment in General Cargo Vessels

a. Whenever possible, vehicles should receive the protection of below-deck stowage. In general, good stowage of vehicles means placing them fore and aft, 4 to 6 inches apart, with similar space between outer vehicles and the sweatboards; protecting breakable parts and noting the disposition of spare parts, usually within or near the vehicles; stowing vehicles in neutral, with brakes off, battery terminals disconnected, and gasoline drained; and securing them by adequate chocking and lashing. Securing includes chocking the wheels or tracks on all four sides so that the vehicle cannot move in any direction; bracing individual vehicle chocks to bulkheads, stanchions, and other vehicle chocks; and lashing the vehicle with wire rope or chain.

NOTE

When vehicles are loaded on vessels that are adequately ventilated by power blowers, such as the roll-on/roll-off vessels, gasoline need not be drained from gas tanks.

b. Vehicles should be loaded on vessels in their minimum configuration; that is, reduced height, with or without cargo. The vehicles can be loaded onto landing craft, beach discharge and amphibious lighters, and landing ship tanks under their own power or onto the deck of barges from piers when tidal conditions are suitable and ramps are available. The vehicles can be loaded onto seagoing vessels by shoreside or floating cranes of adequate capacity. Jumbo booms and heavy-lift ships' gear may be used for loading tracked vehicles; normal ships' booms are adequate for loading the wheeled vehicles on vessels. The vehicles can, under their own power or towed, be loaded on roll-on/roll-off vessels. For typical lifting diagrams for vehicles, see figures 6-1 and 6-3. Figure 6-2 is a detail diagram for a lifting bridle.

c. Boxed, skid-mounted equipment, or explosives are blocked, braced, shored, lashed, and tommed as required to prevent movement. Items should be stowed tightly against one another or against a bulkhead or the sweatboards at side of vessel.

d. Prior to any loading aboard vessels the ship's gear should be examined for serviceability. All stevedore equipment and handling gear including wire slings, shackles, lifting and spreader

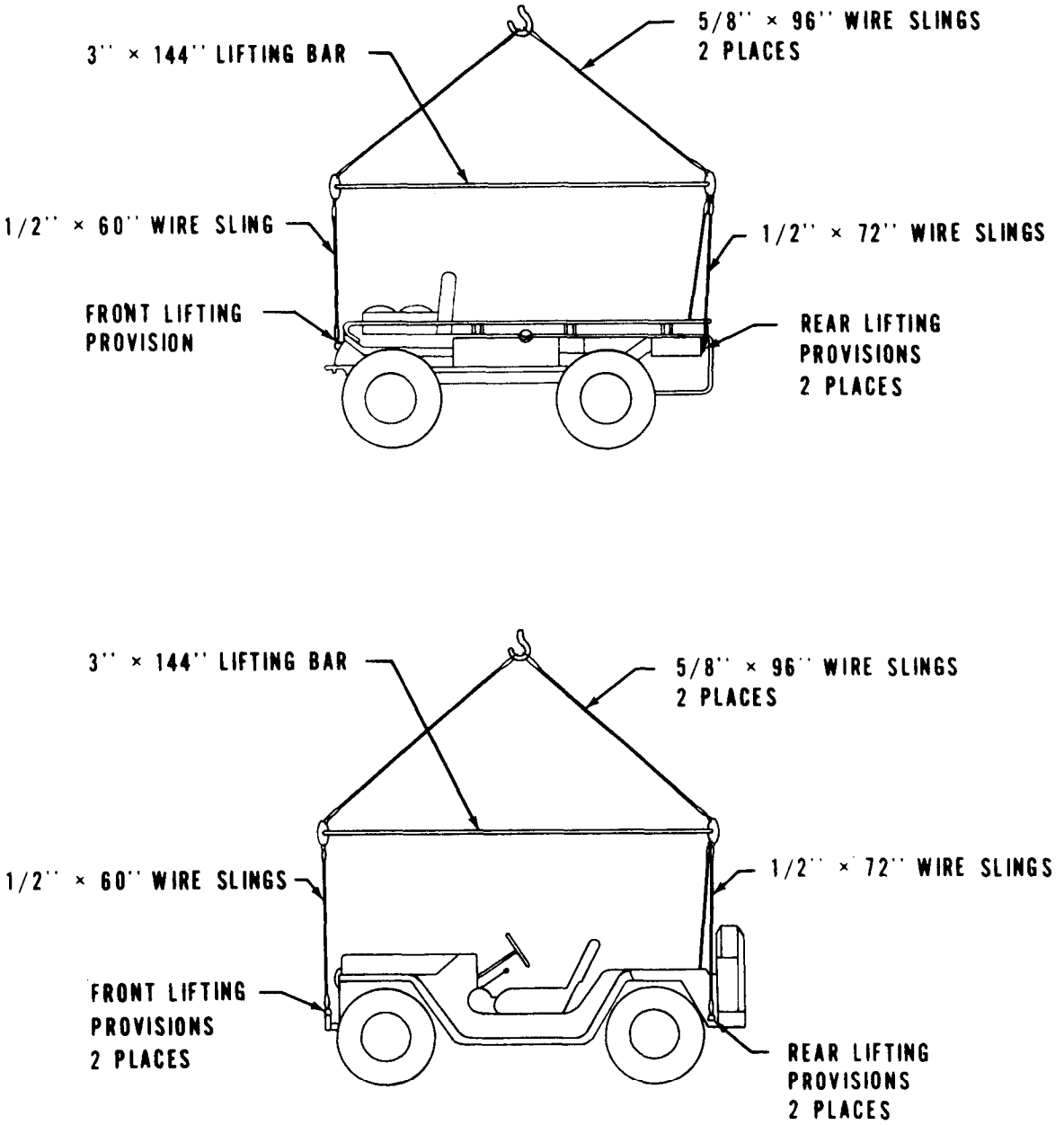


Figure 6–1. Lifting diagram for ¼-ton and ½-ton trucks.

bars, cargo nets, and pallets should also be examined for any excessive wear and serviceability (fig 6-4 and 6-5). See figure 2-16 for lifting of skid-mounted shop equipment.

e. Table 6-1 is a bill of materials for blocking the 1/4-ton truck in hold of a general cargo vessel, and table 6-2 is the application of materials for blocking the l/4-ton truck in hold of a general cargo vessel (fig 6-6). Table 6-3 is a bill of materials for blocking the l/2-ton truck in hold of a general cargo vessel, and table 6-4 is the application of materials for blocking the l/2-ton truck in hold of a general cargo vessel (fig 6-7). Table 6-5 is a bill of materials for blocking and tiedown of the carrier in a general cargo vessel, and table 6-6 is the application of materials for blocking and tiedown of the carrier in hold of general cargo vessel (fig 6-8).

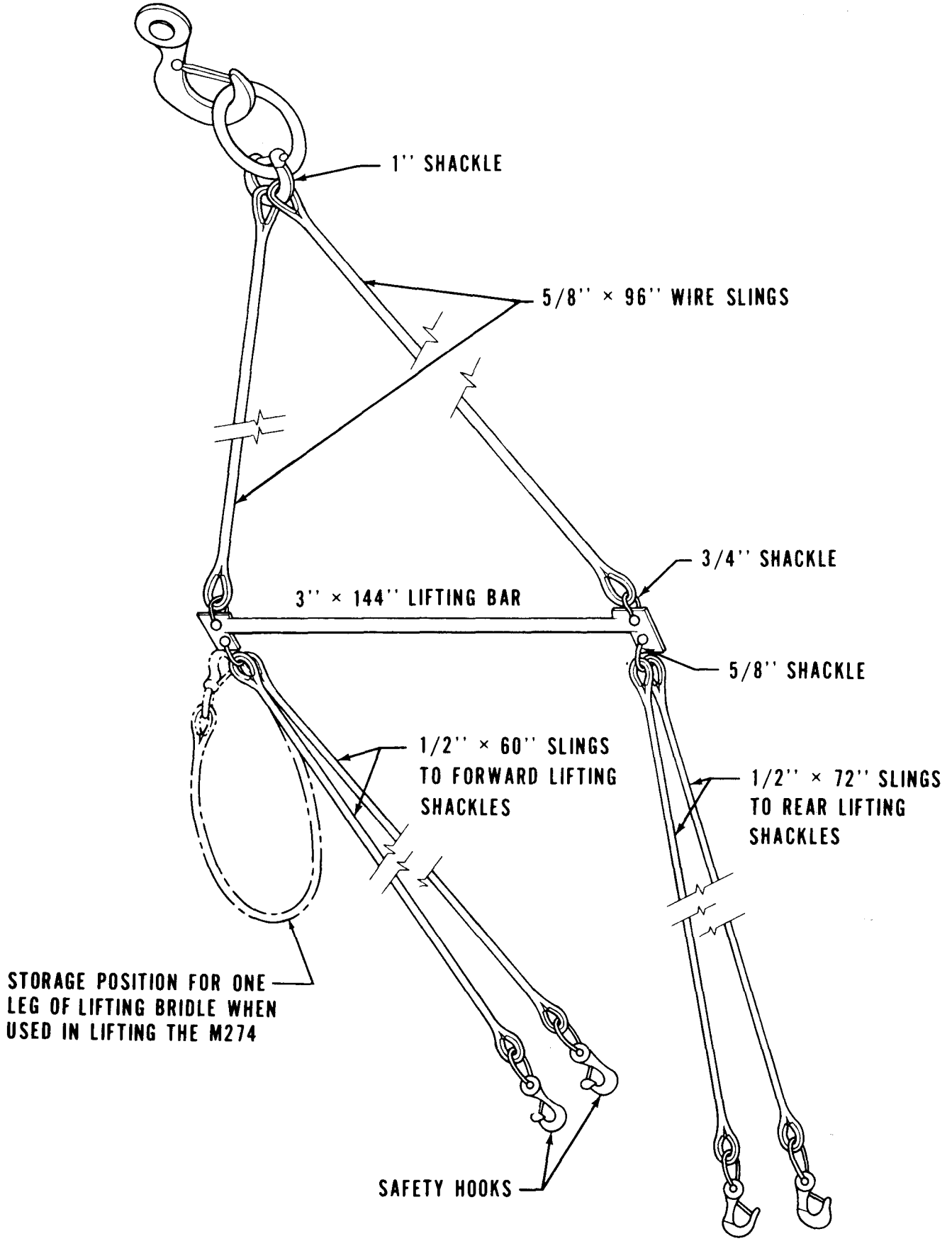


Figure 6–2. Detail diagram for lifting bridle.

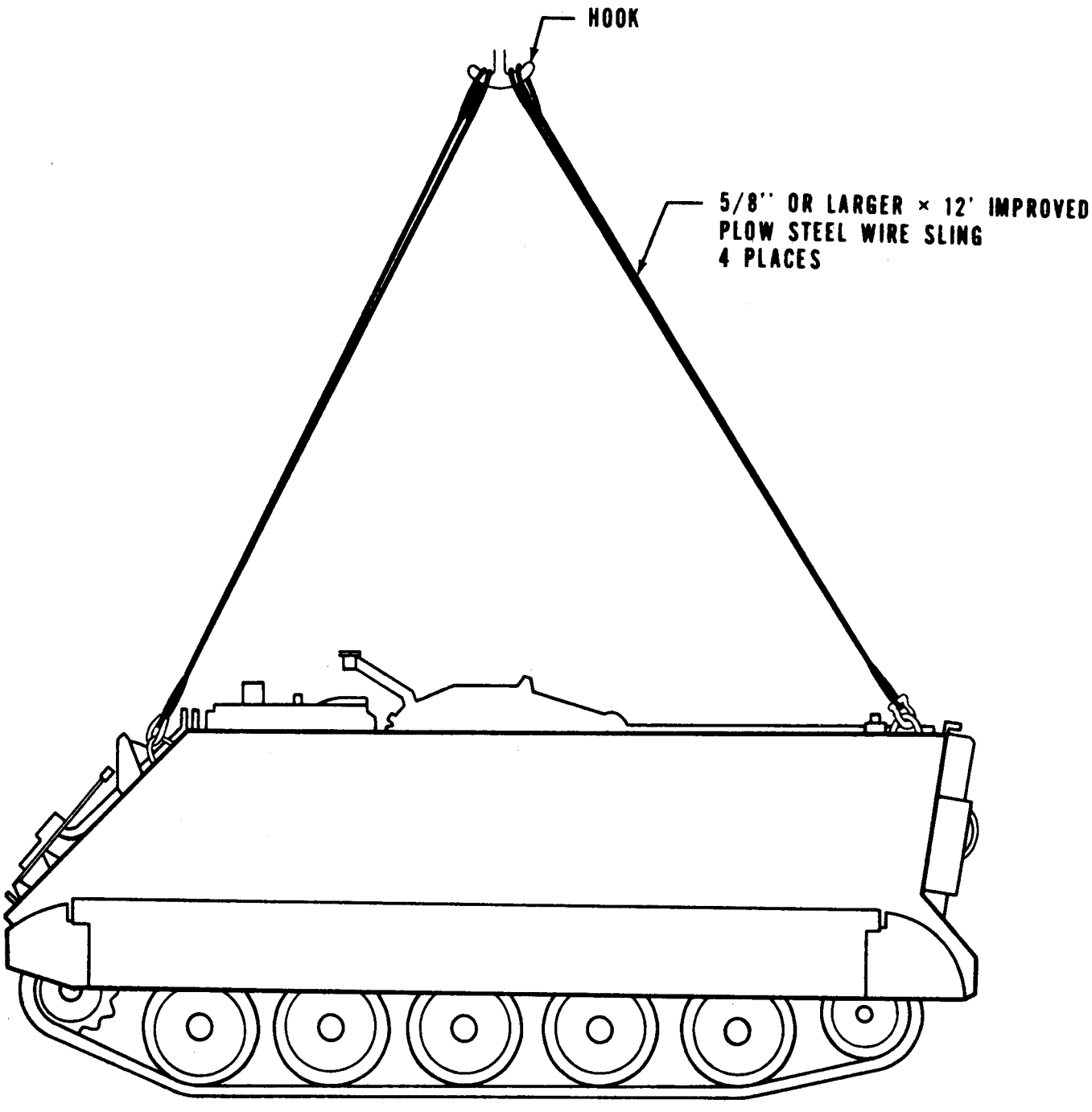


Figure 6-3. *Lifting diagram for* carrier.

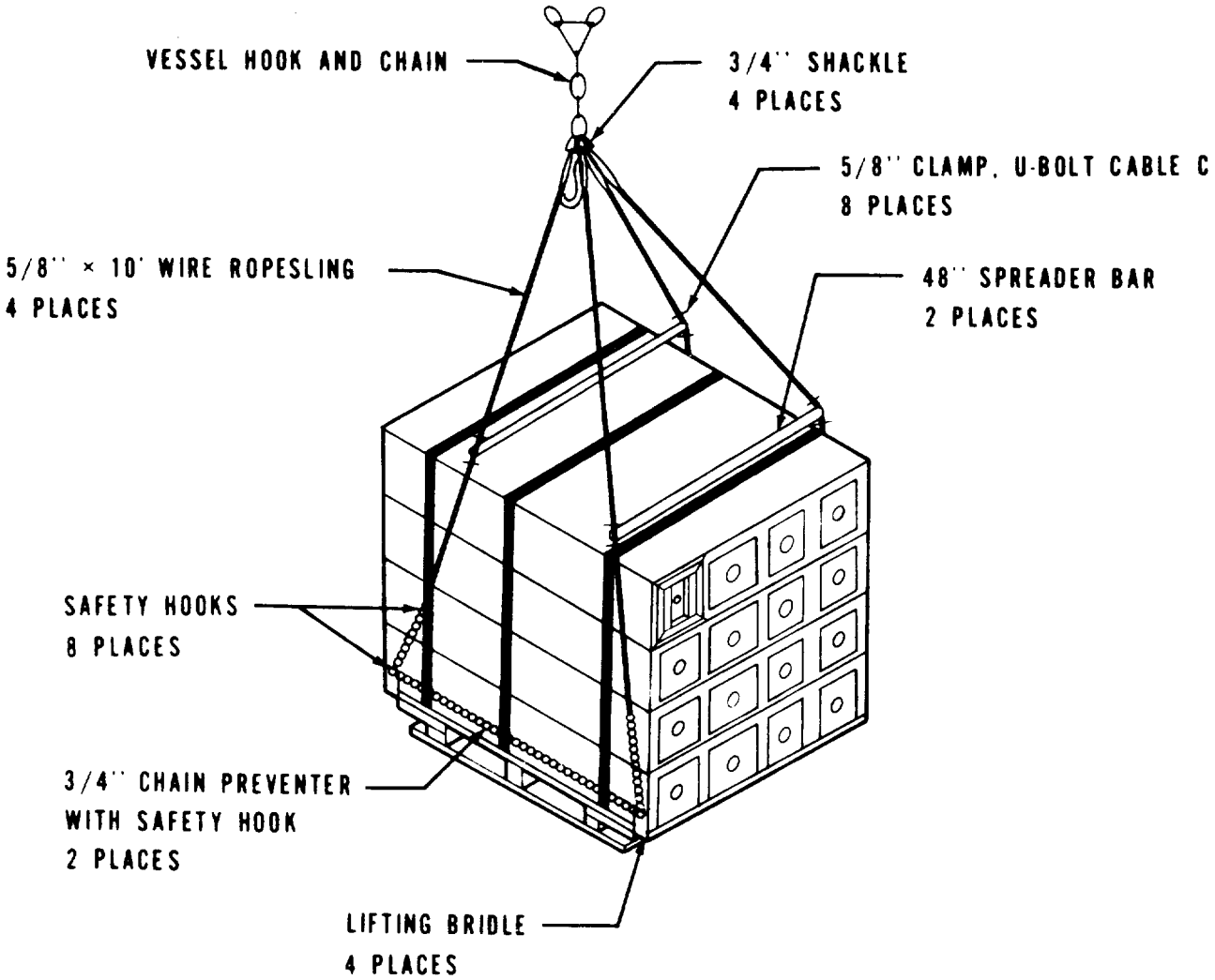


Figure 6-4. Lifting diagram for boxed and palletized TOW missile.

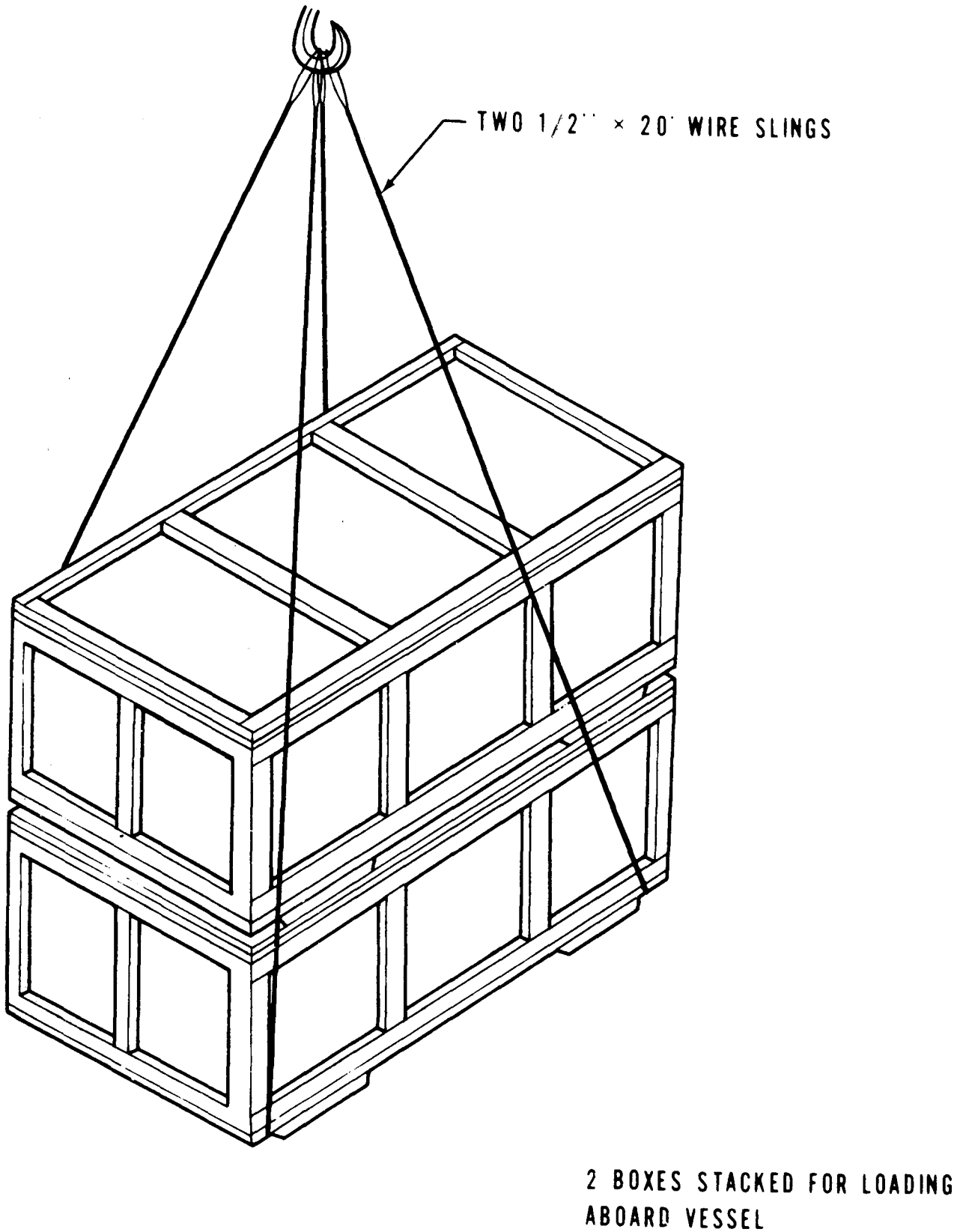


Figure 6–5. Lifting diagram for boxed TOW weapon system components.

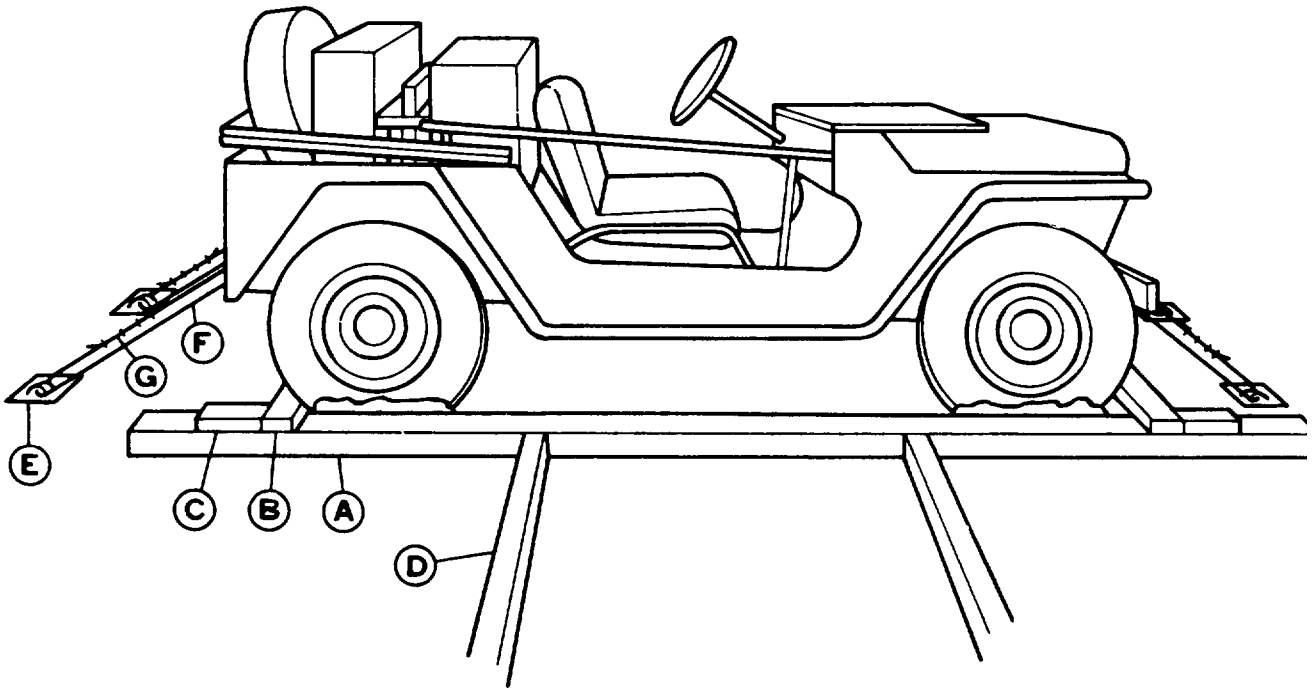


Figure 6–6. Blocking and bracing of ¼-ton truck in hold of general cargo vessel.

Table 6-1. Bill of Materials for Blocking and Bracing of ¼-Ton Truck in Hold of General Cargo Vessel (Fig 6-6).

Item	Description	Approximate quantity
Lumber	Douglas fir, or comparable, straight-grain, free from material defects; Fed Spec MM-L-751c: 2- x 4-in.	16 linear ft
	4- x 4-in.	40 linear ft
Nails	Common steel; flathead; bright or cement-coated; table Xl-b, Fed Spec FF-N-105a: 10d	36
	30d	16
Wire Rope	6X19; IWRC, improved plow steel; preformed; regular-lay; table X, Fed Spec RR-W-410a: ½-in.	60 ft
Clamps	Wire-rope, U-bolt clips, saddled, single-grip, steel, Crosby heavy-duty (or equal); Fed Spec FF-C-450d: ½-in.	16
Cushioning material.	Waterproof paper, or suitable material ----------	as required

Table 6-2. Application of Materials for Blocking of the ¼-Ton Truck in Hold of General Cargo Vessel (Fig 6-6).

Item	Quantity	Application
A	2	Side blocking, 4- x 4- x 146-in. lumber. Locate one piece against wheels on each side of vehicle. Suitable protective material such as waterproof paper or burlap should be located under edge of 4- x 4-in. piece and between the tire and 4- x 4-in. piece and extend 2 in. above blocking.
B	2	End blocking, 2- x 4- x 72-in. lumber. Locate at front and rear of vehicle against tires on top of item A. Nail to item A at each location with four 10d nails.
C	4	Backup cleat, 2- x 4- x 12-in. lumber. Locate on top of item A against item B. Nail to item A with five 10d nails.
D	as required	Bracing, 4- x 4-in. x length-to-suit. Brace as required against vehicle blocking, side of vessel, or against cargo blocking to immobilize vehicle and blocking. Secure each end to adjacent bracing or blocking detail by toenailing with four 30d nails.
E	4	Padeye, four required on floor of vessel.
F	4	Wire rope, ½-in., in a complete loop. Secure by clips (item G). Attach to front and rear shackles on vehicle and padeyes on vessel floor.
G	16	Clamps, ½-in. wire-rope, U-bolt clips. Used to secure item G in complete loop.

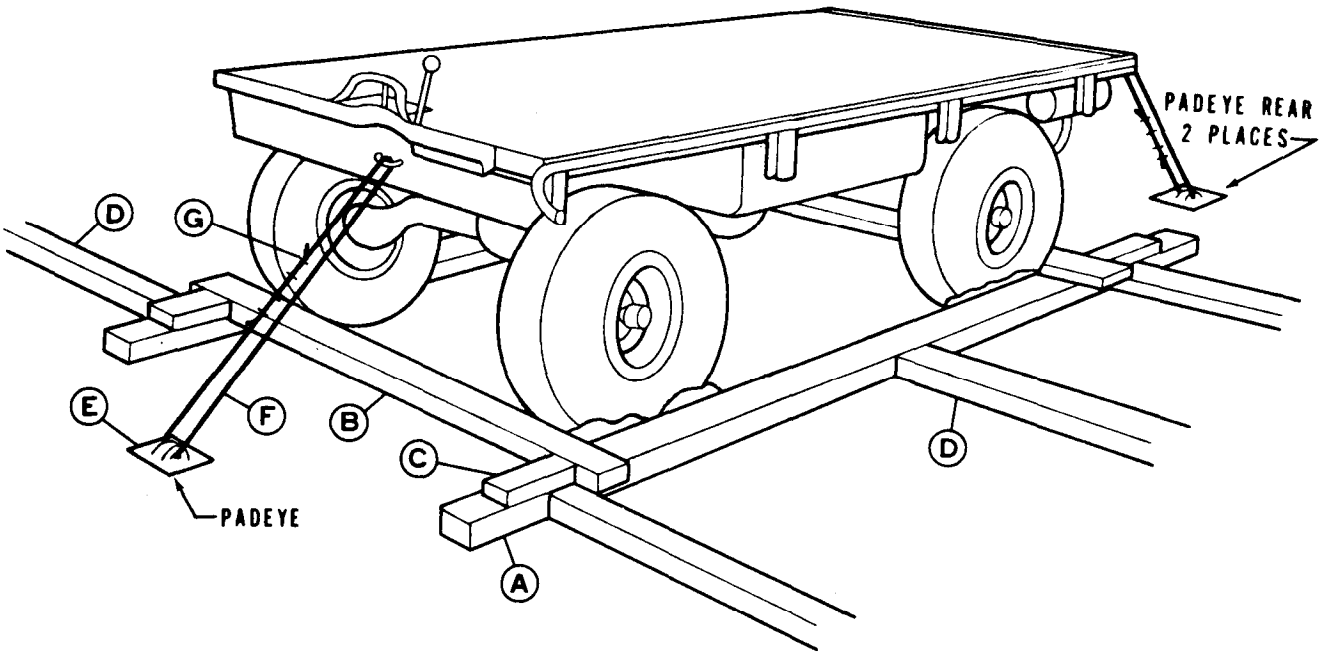


Figure 6-7. Blocking and bracing of ½-ton truck in hold of general cargo vessel.

Table 6-3. Bill of Materials for Blocking and Bracing of ½-Ton Truck in Hold of General Cargo Vessel (Fig 6-7).

Item	Description	Approximate quantity
Lumber	Douglas fir, or comparable, straigh-grain, free from material defects; Fed Spec MM–L–751c: 2- x 4-in.	14 linear ft
	4- x 4-in.	40 linear ft
Nails	Common, steel, flathead; bright or cement-coated; table X1–b, Fed Spec FF–N–105a: 10d	36
	30d	24
Wire rope	6X19; IWRC, improved plow steel; preformed; regular-lay; table X, Fed Spec RR–W–410a: ½-in.	45 ft
Clamps	Wire-rope, U-bolt clips, saddled, single-grip, steel, Crosby heavy-duty (or equal), Fed Spec FF–C–450d: ½-in.	12

Table 6-4. Application of Materials for Blocking and Bracing of ½-Ton Truck in Hold of General Cargo Vessel (Fig 6-7).

Item	No. required	Application
A	2	Side blocking, 4- x 4- x 120-in. lumber. Locate one piece against wheels on each side of vehicle. Suitable protective material, such as waterproof paper or burlap, should be located under edge of 4- x 4-in. piece and between the tire and 4- x 4-in. piece and extend 2-in. above blocking.
B	2	End blocking, 2- x 4- x 60-in. lumber. Locate at front and rear of vehicle against tires on top of item A. Nail to item A at each location with four 10d nails.
C	4	Backup cleat, 2- x 4- x 12-in. lumber. Locate on top of item A against item B. Nail to item A with five 10d nails.
D	as required	Bracing, 4- x 4-in. x length-to-suit. Brace as required against vehicle blocking, side of vessel, or against cargo blocking to immobilize vehicle and blocking. Secure each end to adjacent bracing or blocking by toenailing with four 30d nails.
E	3	Padeye, three required on deck of vessel.
F	3	Wire rope, ½-in., in a complete loop. Secure by clips (item G). Attach to front and rear padeyes on vessel floor and to tiedowns on front and rear of vehicle.
G	12	Clamps, ½-in. wire-rope, U-bolt clips. Used to secure item G in complete loop.

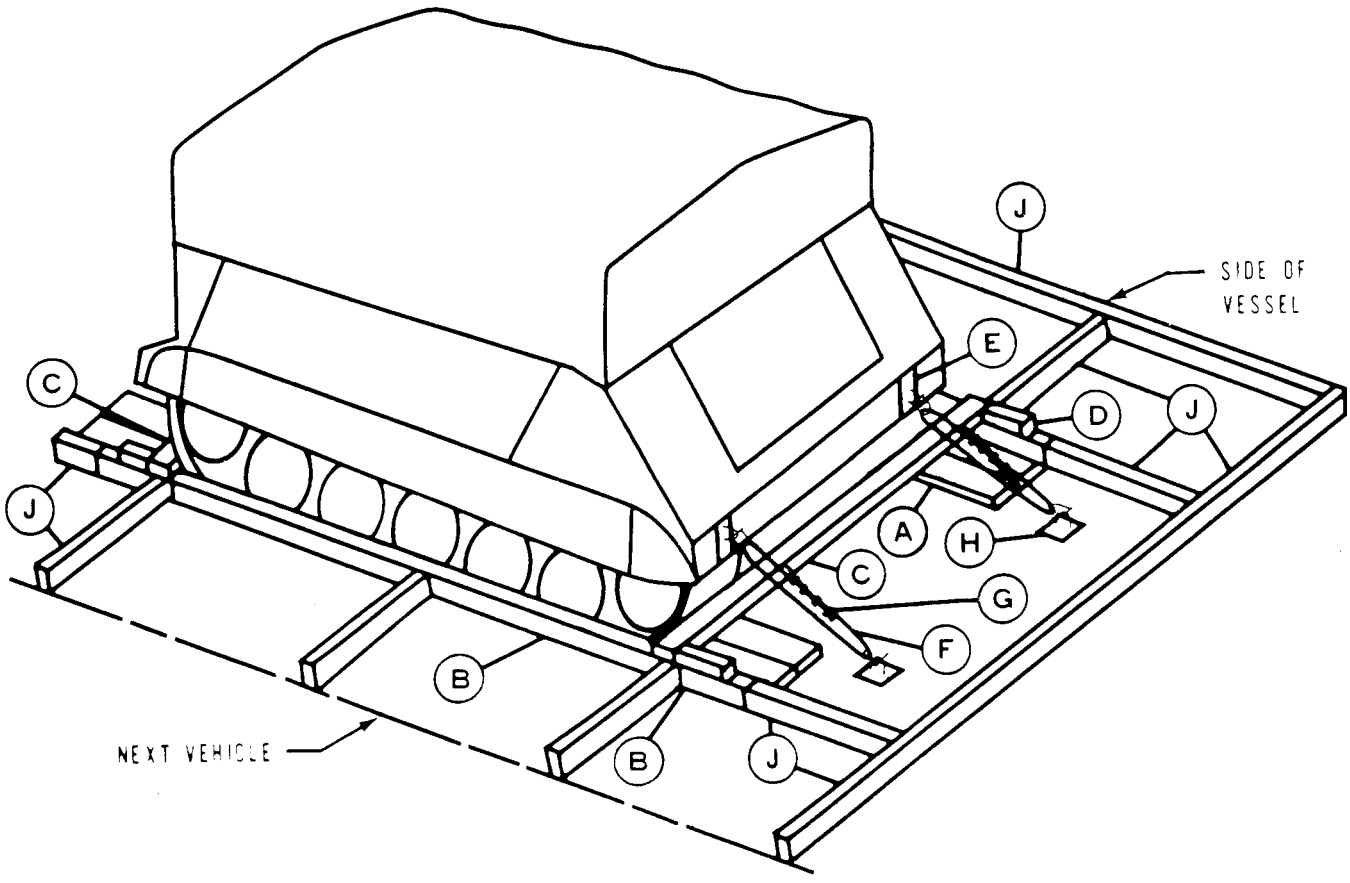


Figure 6-8. *Blocking and bracing of carrier in hold of general cargo vessel.*

Table 6-5. Bill of Materials for Blocking and Bracing of Carrier in Hold of General Cargo Vessel (Fig 6-8).

Item	Description	Approximate quantity
Lumber	Douglas fir, or comparable lumber, straight-grain, free from material defects; Fed Spec MM–L–751c: 2 x 4 in.	4 linear ft
	2 x 12 in.	70 linear ft
	4 x 6 in.	125 linear ft
Nails	Common, steel; flathead; bright or cement-coated; table X1–b, Fed Spec FF–N–105a; size: 20d	20
	40d	116
Wire rope	6X19; IWRC, improved plow steel; preformed; regular-lay; table X, Fed Spec RR–W–410a: ⅝-in.	60 ft
Clamps	Wire-rope, U-bolt clips, saddled, single-grip, steel, Crosby heavy-duty (or equal), Fed Spec FF–C–450d: ⅝-in.	16
Clevis	Assembly suspension (shackles), bolt and nut type, large, FSN 1670–090–5354, or equal (for front and rear towing and tiedown provisions).	4

Table 6-6, Application of Materials for Blocking and Bracing of Carrier in Hold of General Cargo Vessel (Fig 6-8)

Item	No. required	Application
A	4	Bearing pieces, 2- x 12-in. x length-to-suit lumber to extend 12 in. beyond ends of tracks. Preposition on vessel hold deck. Two pieces required under tracks on each side of vehicle.
B	2	Side blocking, 4- x 6- x 228-in. lumber. Locate one piece against tracks on each side of vehicle.
C	2	End blocking, 4- x 6- x 112-in. lumber. Locate at front and rear of vehicle against tracks on top of item B. Toenail to item B at each location with four 40d nails.
D.	4	Backup cleat, 2- x 4- x 12-in. lumber. Locate on top of item B against item C. Nail to item B with five 20d nails.

CHAPTER 7

RAIL TRANSPORTABILITY GUIDANCE

Section I. GENERAL

7-1. Scope

This chapter provides rail transportability guidance for movement of the TOW heavy antitank/ assault weapon system guided missile packed one per wirebound box (overpack) ; boxed launcher equipment (components for one set) ; 1/4-ton missile carrier and firing vehicle; 1/2-ton vehicle; and armored personnel carrier. It covers significant technical and physical characteristics and prescribes the materials and guidance required to prepare, load, tie down, and unload the items.

7–2. Maximum Utilization of Railcars

Additional cargo, as approved by the activity offering the items for transport, may be transported with the items. The skid-mounted shop equipment may be loaded either on a flatcar or in a boxcar with other equipment.

Section II. TRANSPORT ON CONUS RAILWAYS

7-3. General

The transportability guidance contained in this section is applicable when the items are transported on CONUS railways. Consideration is given to single and multiple movement of these items. All items when loaded on suitable railcars can be transported without sectionalization or major disassembly within the Association of American Railroads' Outline Diagram for Single Loads, Without End-Overhang, On Open Top Cars as shown in both the *Railway Line Clearance Publication* and the *Official Railway Equipment Register.*

7-4. Preparation of Items

The degree of preparation for the items prior to being transported by railcar is dependent upon the operational commitment.

7-5. Loading

The wheeled and tracked vehicles may be placed in the tiedown position on the railcar by a crane, or they may be driven or towed provided a suitable ramp or bridge is available. The boxed or skid-mounted items can be loaded with a forklift truck.

7-6. Transport on General-Purpose Flatcars

The number of units to be loaded on a car will be dependent on the size of the car and the quantities or assortment of units to be shipped with view of full utilization of carrier equipment. After loading and placement at the tiedown position, handbrakes on the carrier must not be set. Gearshift levers for automatic or conventional transmissions must be placed and wire-tied in neutral position. Loads as shown on flatcars are based on 9-foot 6-inch-wide platforms. Cars with wider platforms may also be used. Figures 7-3 through 7-7 are diagrams depicting methods and materials used in blocking and tiedown of the items on general-purpose flatcars. Tables 7-1 through 7-10 are bills of materials for blocking and tiedown and the application of the materials on the items.

GENERAL NOTES

A. Not Applicable.

B. THE OUTLOADING PROCEDURES SPECIFIED HEREIN ARE APPLICABLE TO THE TOW GUIDED MISSILE PACKED ONE PER WIREBOUND WOODEN BOX (OVERPACK). SUBSEQUENT REFERENCE TO CONTAINER HEREIN MEANS THE WIREBOUND WOODEN BOX WITH CONTENTS. ALSO, SUBSEQUENT REFERENCE TO PALLET UNIT HEREIN MEANS THE PALLET UNIT OF TWELVE (12) WIREBOUND BOXES WITH CONTENTS.

C. FOR DETAIL OF WIREBOUND WOODEN BOX (OVERPACK) SEE DRAWING NUMBER D10224699 (U.S. ARMY MISSILE COMMAND), AND " CONTAINER UNIT" VIEW ON PAGE 3.

CONTAINER DIMENSIONS --- 58-1/4 " LONG BY 11-5/8" WIDE BY 11-5/8" HIGH (APPROX).
GROSS WEIGHT ---------- 80 POUNDS (APPROX).
CUBE ---------- 4.9 CUBIC FEET.

D. FOR DETAIL OF PALLET UNIT SEE U.S. ARMY MATERIEL COMMAND DRAWING NUMBER 19-48-5229-GM20P4, AND " PALLET UNIT" VIEW ON PAGE 3.

PALLET UNIT DIMENSION S -- 58-1/4" LONG BY 47-3/4" WIDE X 39-3/4" HIGH (APPROX).
GROSS WEIGHT ---------- 1, 049 POUNDS (APPROX).
CUBE ---------- 64.0 CUBIC FEET.

E. THIS ITEM WITH A HE WARHEAD OR A HEAT WARHEAD IS DOT SHIPPING NOMENCLATURE "ROCKET AMMUNITION WITH EXPLOSIVE PROJECT ILE", AND IS DOT CLASS "A" EXPLOSIVE. THIS ITEM WHEN SHIPPED UNDER DOT SHIPPING NOMENCLATURE "ROCKET MOTOR, CLASS A EXPLOSIVE" (TELEMETRY OR INERT LOADED PROJECTILES), IS ALSO A DOT CLASS "A" EXPLOSIVE. THE OUTLOADING PROCEDURES SPECIFIED HEREIN CAN ALSO BE UTILIZED FOR THE SHIPMENT OF THE DEPICTED CONTAINERS WHEN THEY ARE LOADED WITH AN ITEM WHICH IS IDENTIFIED DIFFERENTLY BY NOMENCLATURE THAN THE ITEM DESIGNATED WITHIN THE DRAWING TITLE.

F. OUTLOADING PROCEDURES SPECIFIED IN THIS DRAWING ARE FOR CONVENTIONAL TYPE BOX CARS OF VARIOUS LENGTH AND WIDTH COMBINATIONS.

G. THE LOADS AS SHOWN ARE BASED ON CARS WHICH HAVE VARIOUS WIDTH DOORS OF THE CONVENTIONAL SLIDING TYPE. THE DEPICTED OUTLOADING PROCEDURES ARE ALSO APPLICABLE TO CARS WHICH ARE EQUIPPED WITH PLUG DOORS. THE " DOORWAY AREA" WITHIN A CAR IS DEFINED AS THE CARGO SPACE THAT IS ADJACENT TO A CONVENTIONAL TYPE AND/OR A PLUG TYPE DOOR. THE LENGTH OF A "DOORWAY AREA" CAN BE AS MUCH AS 24 FEET IN SOME CARS THAT ARE EQUIPPED WITH STAGGERED DOORS. CAUTIONDUNNAGE MATERIAL MUST NOT BE NAILED TO ANY PLUG DOOR, WHETHER AUXILIARY OR MAIN, EXCEPT TO A NAILING STRIP IF A DOOR IS SO EQUIPPED, FOR SECURING SUCH ITEMS AS GATE HOLD DOWNS OR DOORWAY SPANNER DUNNAGE; ALSO, SPECIAL PROVISIONS MUST BE IMPLEMENTED AS DIRECTED WITHIN THE " SPECIAL NOTES" SECTION WHICH APPLIES TO THE BASIC LOAD INVOLVED. ALSO, AFTER THE PLUG DOORS ON A CAR ARE CLOSED AND READY FOR THE INSTALLATION OF "CAR SEALS", A PIECE OF WIRE OF SUITABLE SIZE WILL BE USED IN ADDITION TO. AND IN CONJUNCTION WITH, EACH CAR SEAL USED TO " SEAL" THE CAR. THE WIRE WILL BE THREADED THROUGH THE HOLES IN THE DOOR LATCH ASSEMBLY ONE OR MORE TIMES, AND THE WIRE ENDS WILL BE TWISTED TOGETHER.

H. THE SELECTION OF RAIL CARS FOR THE TRANSPORT OF THE DESIGNATED ITEMS WILL BE IN ACCORDANCE WITH HAZARDOUS MATERIALS REGULATIONS OF DOT AND AR 55-355, CHAPTER 213, FOR EXPLOSIVES OR OTHER DANGEROUS ARTICLES, IN FULL.

J. NOTICE: A SHIPMENT WILL BE POSITIONED IN THE RAIL CAR IN COMPLIANCE WITH THE WEIGHT DISTRIBUTION REQUIREMENTS OF THE AAR. THE APPROVED BLOCKING, BRACING, AND STAYING METHODS FOR THE LOADS SPECIFIED HEREIN MUST BE FOLLOWED. THE NUMBER OF UNITS MAY BE ADJUSTED TO FIT THE SIZE OF THE CAR TO BE LOADED. OR THE QUANTITY TO BE SHIPPED. FOR A LOAD QUANTITY OTHER THAN SPECIFIED, THE APPROVED METHODS MUST BE FOLLOWED AS CLOSELY AS POSSIBLE.

K. OTHER TYPES OF LADING ITEMS MAY BE LOADED IN A CAR WHICH IS PARTIALLY LOADED WITH THE DESIGNATED ITEM, PROVIDING THE TOTAL LOAD IS COMPATIBLE, EXISTING DIRECTIVES ARE NOT VIOLATED, AND THE OTHER LADING ITEMS ARE BLOCKED AND BRACED TO EQUAL THE BLOCKING AND BRACING CRITERIA SPECIFIED HEREIN.

(CONTINUED AT RIGHT)

MATERIAL SPECIFICATIONS

LUMBER ----------: SEE TM 743-200-1, DUNNAGE LUMBER; FED SPEC MM-L-751

NAILS ----------: COMMON, CEMENT COATED OR CHEMICALLY ETCHED, FED SPEC FF-N-105. ALT: ANNULAR-RING TYPE NAIL OF THE SAME SIZE.

STRAPPING, STEEL: TYPE I OR IV, CLASS A OR B. FED SPEC QQ-S-781

STRAP SEALS ---- : COMMERCIAL GRADE.

PLYWOOD ------ : GROUP B OR C, GRADE* C-D (EXTERIOR), FED SPEC NN-P-530.

WIRE ---------- : FED SPEC QQ-W-461.

* IF SPECIFIED PLYWOOD IS NOT AVAILABLE, A BETTER EXTERIOR GRADE MAY BE SUBSTITUTED.

(GENERAL NOTES CONTINUED)

L. WHEN STEEL STRAPPING IS SEALED AT AN END-OVER-END LAP JOINT FOR A STRAP APPLICATION OTHER THAN FOR PALLETIZING, A MINIMUM OF TWO (2) SEALS, BUTTED TOGETHER, WITH TWO (2) PAIR OF CRIMPS PER SEAL MUST BE USED TO SEAL THE JOINT.

M. IN SOME INSTANCES CONTAINERS WILL ALREADY BE PALLETIZED WHEN OFFERED FOR LOADING. THESE PALLET UNITS SHOULD BE INSPECTED AND, AS REQUIRED, LOOSE UNITIZING STEEL STRAPPING MUST BE REPLACED.

N. DUNNAGE LUMBER SPECIFIED THROUGHOUT THIS PROCEDURAL DRAWING IS OF NOMINAL SIZE. FOR EXAMPLE, 2" X 4" MATERIAL IS ACTUALLY 1-5/8" THICK BY 3-5/8" WIDE AND 2" X 6" MATERIAL IS ACTUALLY 1-5/8" THICK BY 5-5/8" WIDE.

O. IF THE CAR BEING LOADED FOR THE SHIPMENT OF THE DEPICTED LOADS IS EQUIPPED WITH A NAILABLE METAL FLOOR AND A NAIL SIZE FOR FLOOR NAILIN IS MARKED ON THE SIDE WALL OF THE CAR, THAT GUIDANCE SHOULD BE APPLIED TO THE NAILING OF THE FLOOR DUNNAGE. IF A NAIL SIZE IS NOT SPECIFIED IN THE CAR, 30d NAILS SHOULD BE USED IN LIEU OF THOSE SPECIFIED IN THE KEY NUMBERS.

P. A STAGGERED NAILING PATTERN WILL BE USED WHEREVER POSSIBLE WHEN NAILS ARE DRIVEN INTO JOINTS OF DUNNAGE ASSEMBLIES. ALSO, A STAGGERED NAILING PATTERN WILL BE USED WHEN DUNNAGE IS NAILED TO THE FLOOR OR A SIDE WALL OF THE TRANSPORTING VEHICLE, OR WHEN LAMINATING DUN NAG ADDITIONALLY, THE NAILING PATTERN FOR AN UPPER PIECE OF LAMINATED DUNNAGE WILL BE ADJUSTED AS REQUIRED SO THAT A NAIL FOR THAT PIECE WI NOT BE DRIVEN THROUGH ONTO OR RIGHT BESIDE A NAIL IN A LOWER PIECE.

R. THROUGHOUT THIS PROCEDURAL DRAWING PORTIONS OF THE BLOCKING COMPONENTS AND OF THE DEPICTED CARS, SUCH AS A CAR SIDE WALL, HAVE BEEN OMITTED FROM THE LOAD VIEWS FOR CLARITY PURPOSES.

S. FOR ADDITIONAL GUIDANCE, ATTENTION IS DIRECTED TO THE "SPECIAL NOTES" SECTIONS WHICH ARE IMMEDIATELY ADJACENT TO DEPICTED OUTLOADING METHODS.

REVISIONS

REVISION NO. 1, DATED MAY 1970 CONSISTS OF:

1. CHANGED OUTLOADING PROCEDURES FOR REDESIGNED PALLET UNIT.

PAGE 2

Figure 7-1. *Loading and bracing (CL and LCL) in boxcars of guided missile packed one per wirebound wooden box (overpack), unpalletized and palletized (12 per pallet)* (sheet 1 of 25).

(References to page numbers in the notes within the figures refer to the number listed in the lower right- or left-hand corner of each figure.)

Figure 7-1-Continued (sheet 1 of 25).

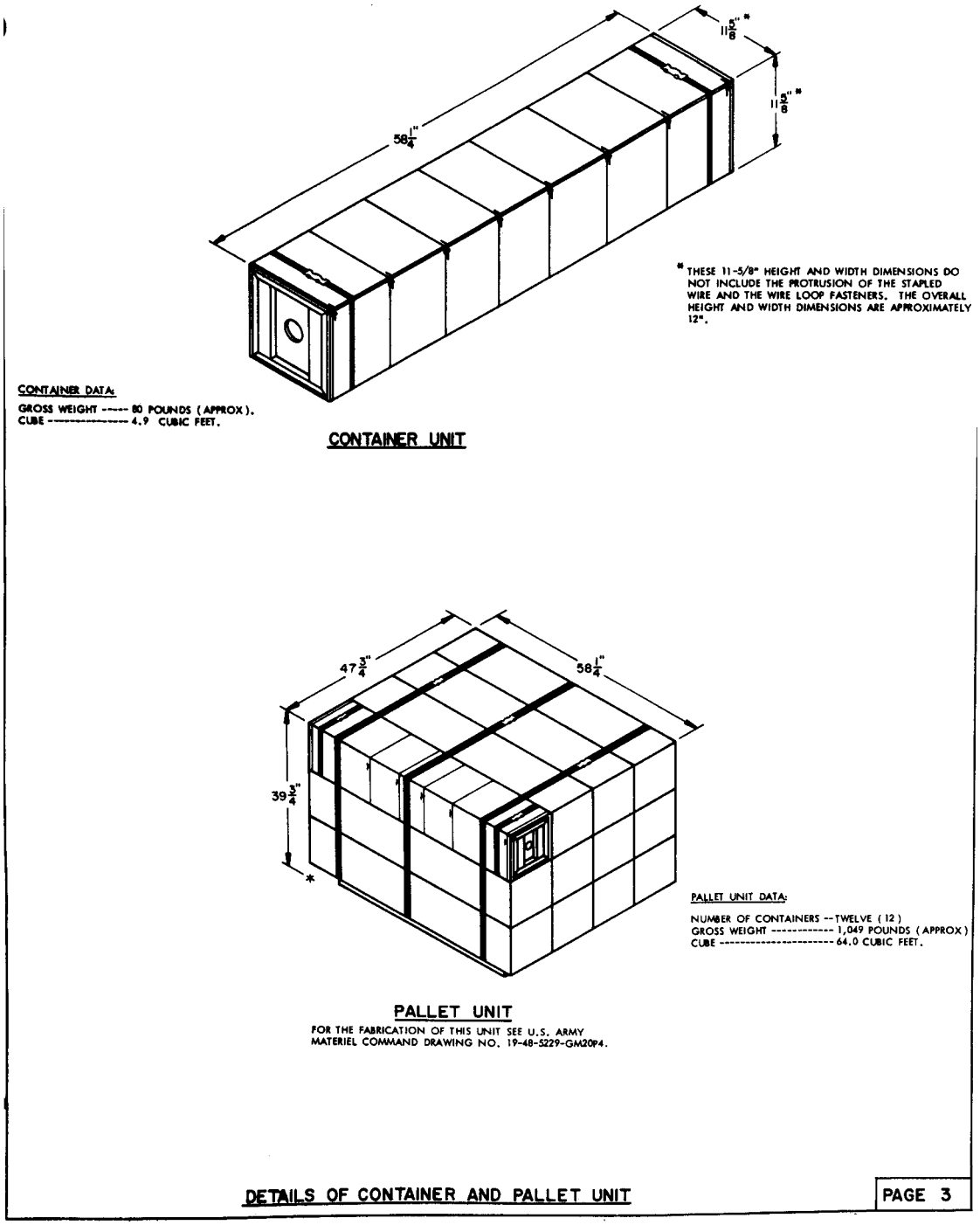


Figure 7-1-Continued (sheet 2 of 25).

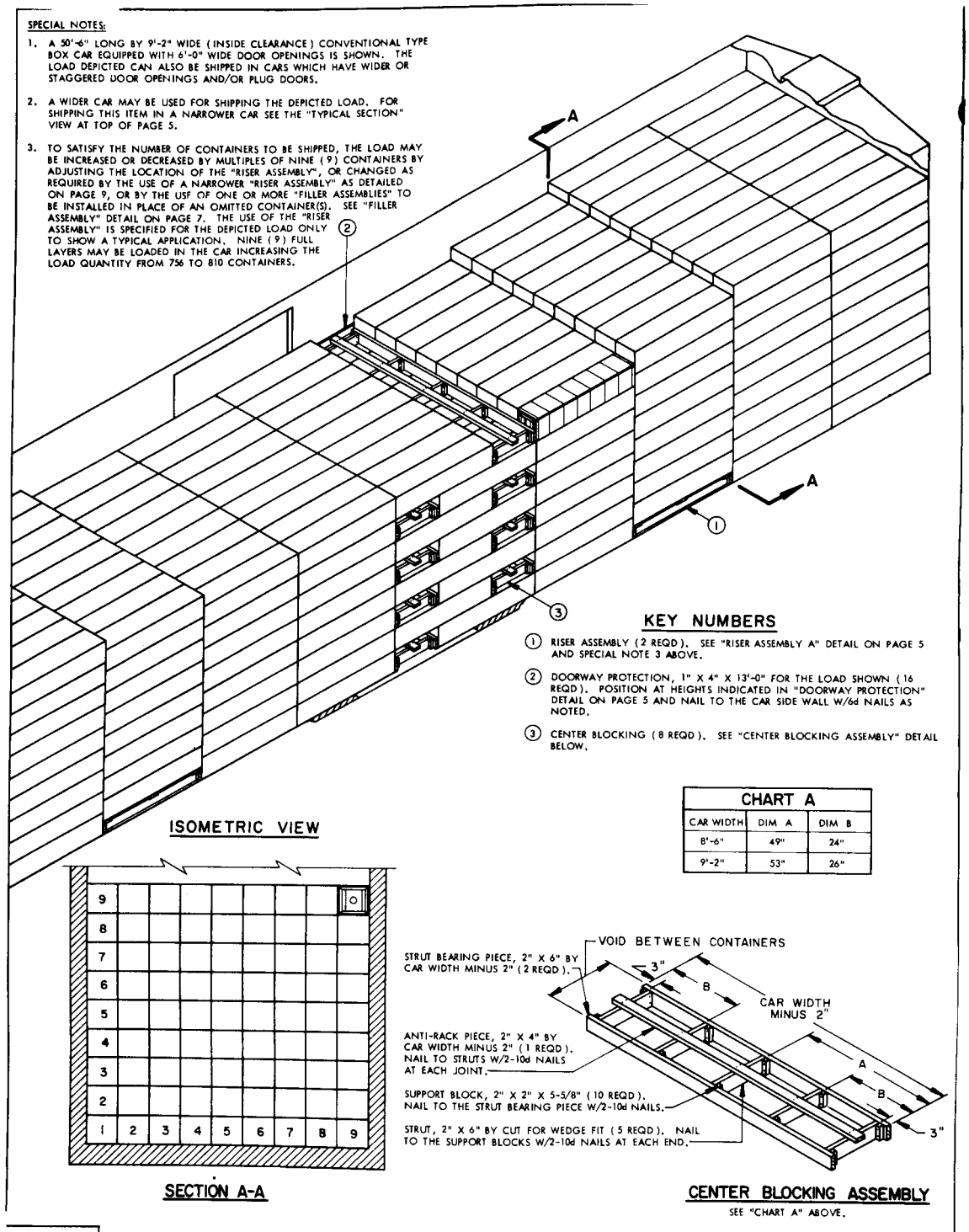
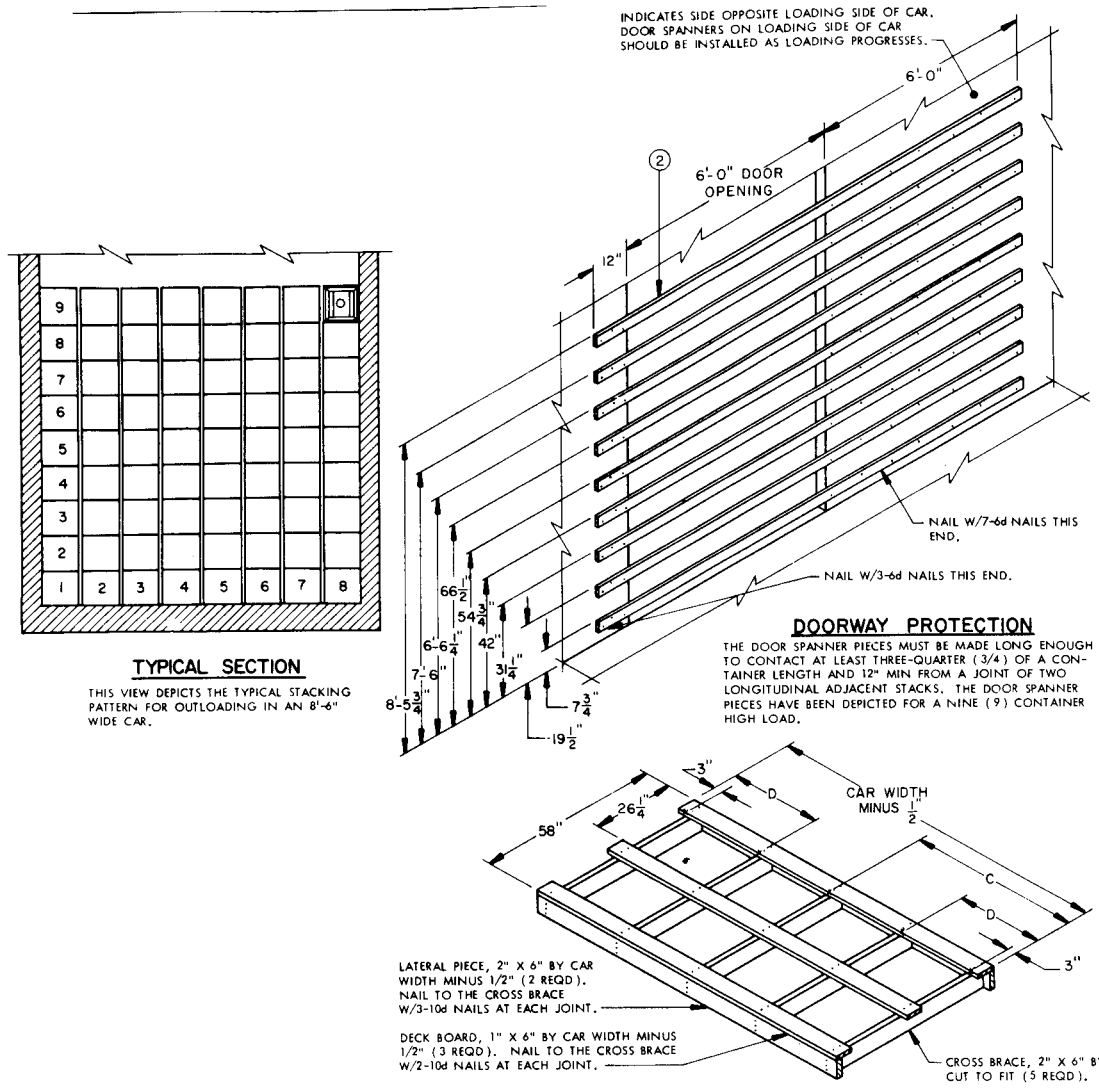


Figure 7-1—Continued (sheet 3 of 25).



TYPICAL SECTION

THIS VIEW DEPICTS THE TYPICAL STACKING PATTERN FOR OUTLOADING IN AN 8'-6" WIDE CAR.

DOORWAY PROTECTION

THE DOOR SPANNER PIECES MUST BE MADE LONG ENOUGH TO CONTACT AT LEAST THREE-QUARTER (3/4) OF A CONTAINER LENGTH AND 12" MIN FROM A JOINT OF TWO LONGITUDINAL ADJACENT STACKS. THE DOOR SPANNER PIECES HAVE BEEN DEPICTED FOR A NINE (9) CONTAINER HIGH LOAD.

RISER ASSEMBLY A

SEE "CHART B" BELOW.

BILL OF MATERIAL		
LUMBER	LINEAR FEET	BOARD FEET
1" X 4"	208	70
1" X 6"	55	28
2" X 2"	38	13
2" X 4"	73	49
2" X 6"	296	296
NAILS	NO. REQD	POUNDS
6d (2")	160	1
10d (3")	600	9-1/2

CHART B		
CAR WIDTH	DIM C	DIM D
8'-6"	50	25
9'-2"	54	27

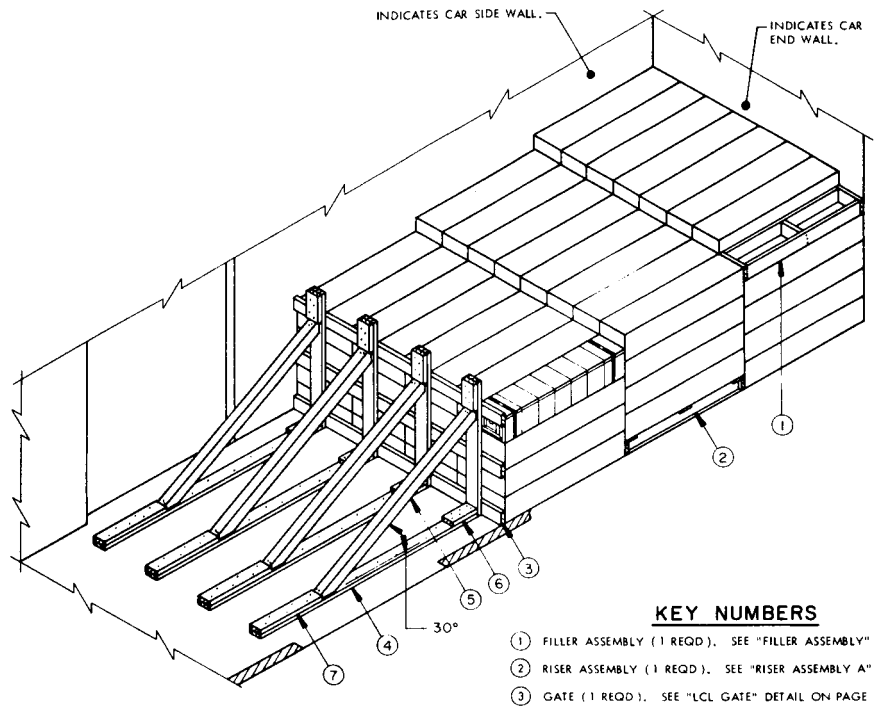
LOAD AS SHOWN

ITEM	QUANTITY	WEIGHT (APPROX)
CONTAINER	756	60,480 LBS
DUNNAGE		1,151 LBS
TOTAL WEIGHT		61,631 LBS

756-UNIT LOAD IN A 50'-6" LONG BY 9'-2" WIDE CAR (UNPALLETIZED)

PAGE 5

Figure 7-1-Continued (sheet 4 of 25).



ISOMETRIC VIEW

SPECIAL NOTES:

1. THESE OUTLOADING PROCEDURES ARE SHOWN DEPICTING THE "KNEE BRACE" BLOCKING IN AN 8'-6" WIDE BOX CAR.
2. A "FILLER ASSEMBLY" IS SHOWN AS BEING USED IN PLACE OF ONE (1) OMITTED CONTAINER. THE ASSEMBLY CAN BE USED IN MULTIPLES FOR THE OMISSION OF MORE THAN ONE (1) CONTAINER. A "RISER ASSEMBLY" IS SHOWN AS BEING USED TO INCREASE/DECREASE THE LOAD BY MULTIPLES OF EIGHT (8) CONTAINERS. TO SATISFY THE NUMBER OF ITEMS TO BE SHIPPED, THE LOCATION OF THE DEPICTED "RISER" MAY BE ADJUSTED OR A NARROWER "RISER" AS DETAILED ON PAGE 9, MAY BE USED. CAUTION: A "RISER" OR A "FILLER" ASSEMBLY MUST NOT BE LOCATED ADJACENT TO THE "LCL GATE". THE "FILLER" AND "RISER" ASSEMBLIES ARE SPECIFIED FOR THE DEPICTED LOAD ONLY TO SHOW A TYPICAL APPLICATION.
3. THE "KNEE BRACE" IS ADEQUATE FOR RETAINING AN LCL LOAD OF NOT MORE THAN 17,000 POUNDS.
4. CAUTION: IF A CONTAINER EXTENDS MORE THAN 29" PAST A DOOR POST INTO THE DOORWAY AREA OF A CONVENTIONAL TYPE SLIDING DOOR, OR IF THE CONTAINERS ARE ADJACENT TO A PLUG DOOR, DOOR SPANNER PIECES OF 1" X 4" MATERIAL WILL BE POSITIONED ACROSS THE DOOR OPENING AND NAILED TO THE CAR SIDE WALL W/5-6d NAILS AT EACH END.

KEY NUMBERS

(1) FILLER ASSEMBLY (1 REQD). SEE "FILLER ASSEMBLY" DETAIL ON PAGE 7.

(2) RISER ASSEMBLY (1 REQD). SEE "RISER ASSEMBLY A" DETAIL ON PAGE 5.

(3) GATE (1 REQD). SEE "LCL GATE" DETAIL ON PAGE 7.

(4) BACK-UP PIECE, 2" X 6" X 9'-0" (4 REQD). NAIL TO THE CAR FLOOR W/1-16d NAIL EVERY 8". SEE GENERAL NOTES "O" AND "P" ON PAGE 2.

(5) BRACE, 4" X 4" X 7'-6" (4 REQD). SEE "BRACE" DETAIL ON PAGE 7. TOENAIL TO PIECES MARKED (3) AND (4) W/2-16d NAILS AT EACH END.

(6) SUPPORT PIECE, 2" X 6" X 12" (4 REQD). NAIL TO PIECE MARKED (4) W/4-16d NAILS AND TOENAIL TO PIECE MARKED (3) W/2-12d NAILS.

(7) BACK-UP CLEAT, 2" X 6" X 30" (4 REQD). NAIL TO PIECE MARKED (4) W/6-40d NAILS.

PAGE 6

TYPICAL LCL (103-UNIT LOAD) UNPALLETIZED

Figure 7-1-Continued (sheet 5 of 25).

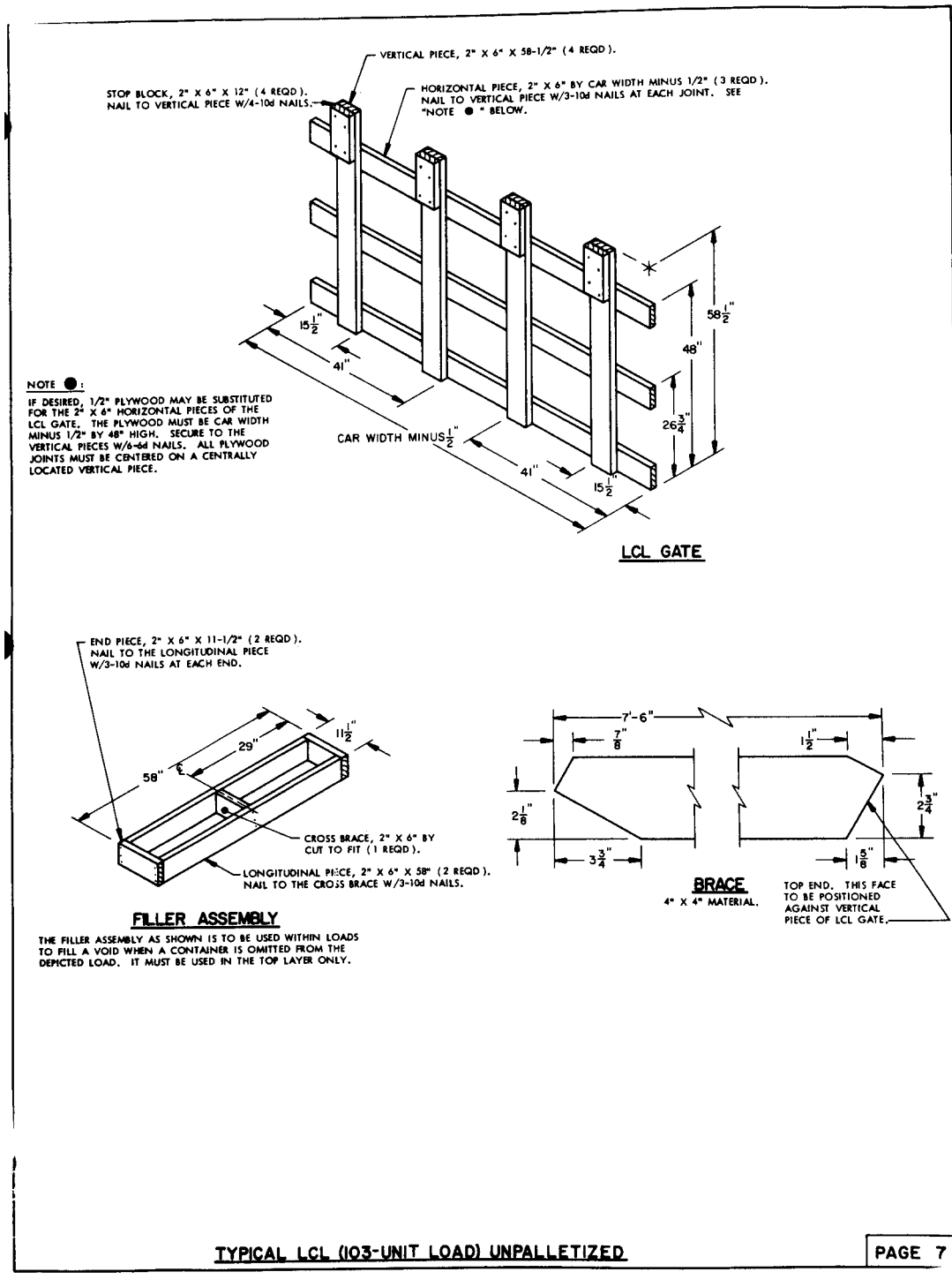
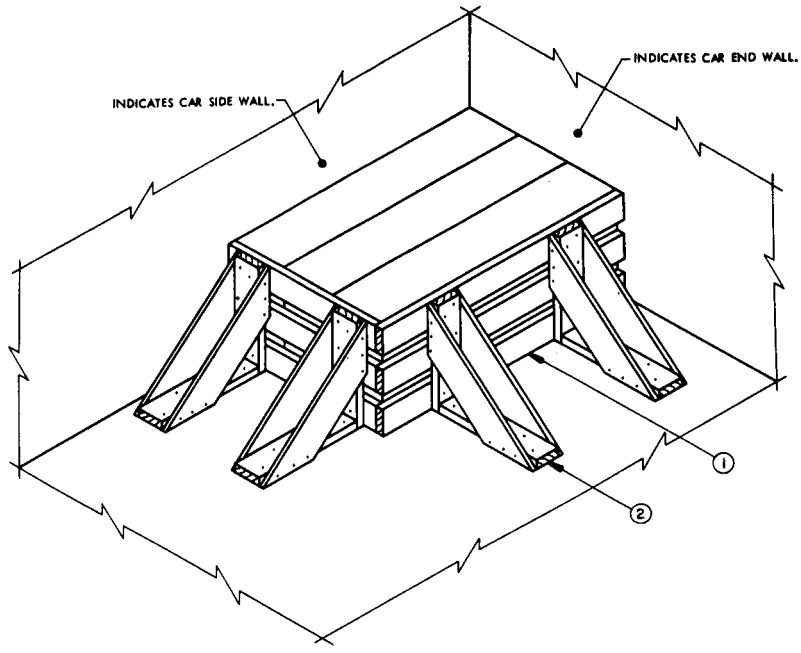


Figure 7-1-1-Continued (sheet 6 of 25).



ISOMETRIC VIEW

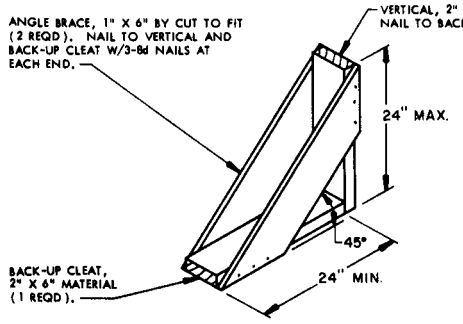
SPECIAL NOTES:

1. THESE LCL OUTLOADING PROCEDURES ARE SHOWN DEPICTING THE USE OF LCL BRACES. CONTAINERS MUST NOT BE STACKED MORE THAN TWO (2) CONTAINERS IN HEIGHT.
2. IF DESIRED LCL BRACES MAY BE INSTALLED AT EACH END OF THE LOAD.

KEY NUMBERS

(1) HORIZONTAL PIECE, 2" X 6" MATERIAL BY LENGTH TO SUIT (AS REQD).

(2) LCL BRACE (4 REQD). SEE "LCL BRACE" DETAIL BELOW. NAIL TO THE CAR FLOOR W/7-16d NAILS AND NAIL TO PIECES MARKED (1) W/2-10d NAILS AT EACH JOINT. SEE GENERAL NOTES "O" AND "P" ON PAGE 2.



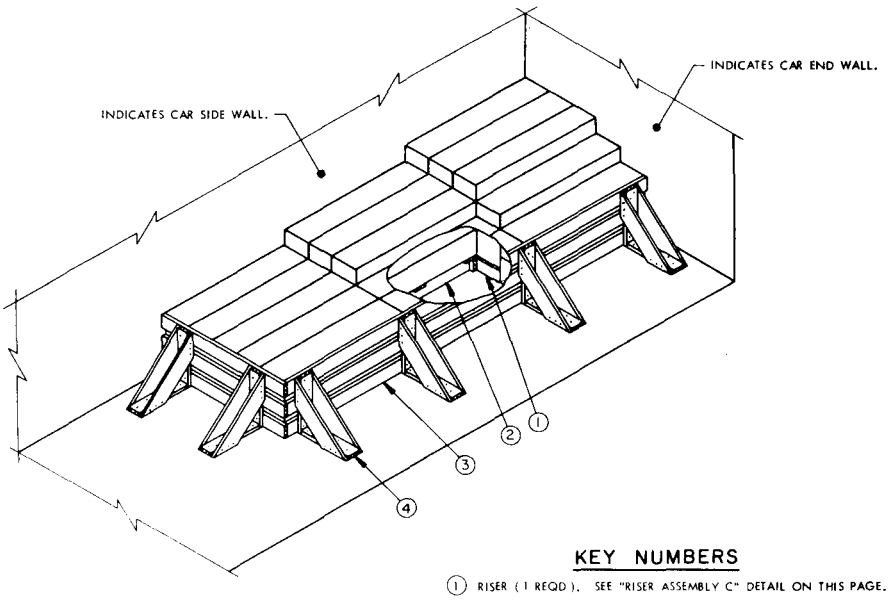
LCL BRACE

EACH BRACE AS APPLIED FOR LONGITUDINAL OR LATERAL BRACING WILL SUPPORT 2,000 OR 8,000 POUNDS OF LADING, RESPECTIVELY. ALSO RESPECTIVELY, A BRACE MUST BE USED FOR EACH 30" OR 48" INCREMENT OF LOAD DIMENSION; ADDITIONALLY, A MINIMUM OF TWO (2) BRACES MUST BE USED IN THEIR RESPECTIVE DIRECTIONS IF THE LOAD IS MORE THAN TWO (2) CONTAINERS LONG OR WIDE.

PAGE 8

TYPICAL LCL (6-UNIT LOAD) UNPALLETIZED

Figure 7-1-Continued (sheet 7 of 25).



ISOMETRIC VIEW

SPECIAL NOTES:

1. THESE LCL OUTLOADING PROCEDURES ARE SHOWN DEPICTING THE USE OF LCL BRACES AND RISER ASSEMBLIES.
2. CONTAINERS MUST NOT BE STACKED MORE THAN TWO (2) CONTAINERS HIGH ADJACENT TO AN LCL BRACE.
3. IF DESIRED LCL BRACES MAY BE INSTALLED AT EACH END OF A TWO (2) CONTAINER HIGH LOAD.
4. THE USE OF THE "RISER ASSEMBLIES" ARE SPECIFIED FOR THE DEPICTED LOAD ONLY TO SHOW A TYPICAL APPLICATION. "RISER ASSEMBLIES" MAY BE USED IN THE LOAD AS REQUIRED TO ADJUST THE LOADING PATTERN FOR THE NUMBER OF CONTAINERS TO BE SHIPPED.

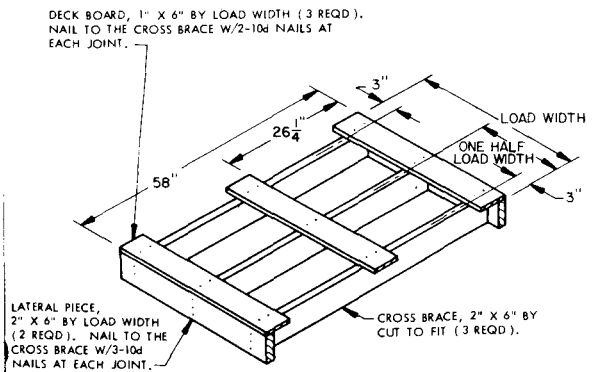
KEY NUMBERS

(1) RISER (1 REQD). SEE "RISER ASSEMBLY C" DETAIL ON THIS PAGE.

(2) RISER (1 REQD). SEE "RISER ASSEMBLY B" DETAIL ON THIS PAGE.

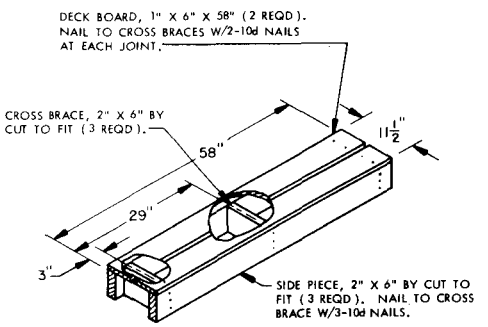
(3) HORIZONTAL PIECE, 2" X 6" MATERIAL BY LENGTH TO SUIT (AS REQD).

(4) LCL BRACE (6 REQD). SEE "LCL BRACE" DETAIL ON PAGE 8. NAIL TO THE CAR FLOOR W/7-16d NAILS AND NAIL TO PIECES MARKED (3) W/2-10d NAILS AT EACH JOINT. SEE GENERAL NOTES "O" AND "P" ON PAGE 2.



RISER ASSEMBLY B

THIS ASSEMBLY IS DESIGNED FOR USE IN STEPPING UP OR STEPPING DOWN CONTAINERS AS SHOWN IN ISOMETRIC VIEW.



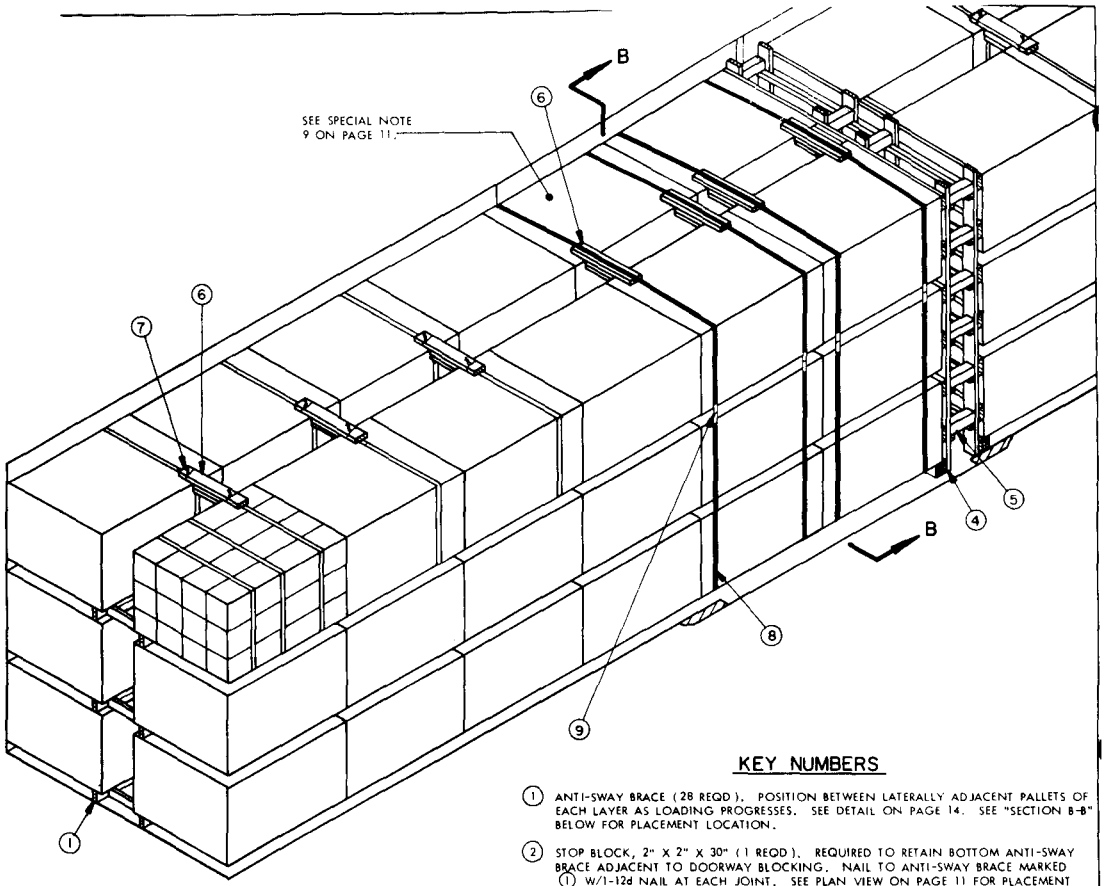
RISER ASSEMBLY C

THIS ASSEMBLY IS DESIGNED FOR USE IN STEPPING UP OR STEPPING DOWN CONTAINERS AS SHOWN IN ISOMETRIC VIEW.

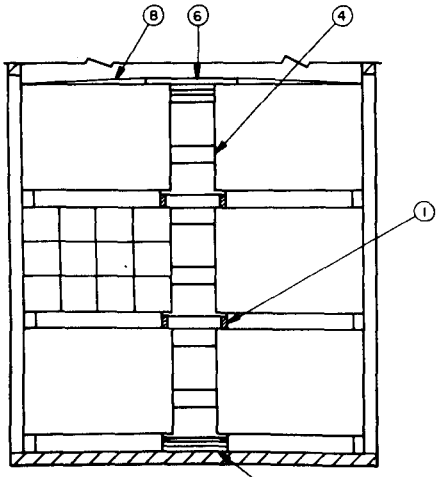
TYPICAL LCL (33-UNIT LOAD) UNPALLETIZED

PAGE 9

Figure 7-1—Continued (sheet 8 of 25).



ISOMETRIC VIEW



SECTION B-B

KEY NUMBERS

(1) ANTI-SWAY BRACE (28 REQD). POSITION BETWEEN LATERALLY ADJACENT PALLETS OF EACH LAYER AS LOADING PROGRESSES. SEE DETAIL ON PAGE 14. SEE "SECTION B-B" BELOW FOR PLACEMENT LOCATION.

(2) STOP BLOCK, 2" X 2" X 30" (1 REQD). REQUIRED TO RETAIN BOTTOM ANTI-SWAY BRACE ADJACENT TO DOORWAY BLOCKING. NAIL TO ANTI-SWAY BRACE MARKED (1) W/1-12d NAIL AT EACH JOINT. SEE PLAN VIEW ON PAGE 11 FOR PLACEMENT LOCATION.

(3) DOORWAY BLOCKING, 2" X 6" BY CUT TO FIT BETWEEN PALLET POSTS OF LATERALLY ADJACENT PALLET UNITS (REF: 22" FOR A 9'-2" WIDE CAR) DOUBLED (4 REQD). ALIGN WITH PALLET POSTS AND NAIL THE FIRST PIECE TO THE CAR FLOOR W/6-16d NAILS. NAIL THE SECOND PIECE TO THE FIRST IN A LIKE MANNER. SEE GENERAL NOTES 'O" AND "P" ON PAGE 2.

(4) CENTER GATE (2 REQD). SEE "CENTER GATE A" DETAIL ON PAGE 14.

(5) STRUTS, 4" X 4" BY CUT TO FIT (24 REQD). TOENAIL TO THE CENTER GATES MARKED (4) W/2-12d NAILS AT EACH END. FOR STRUTS 48" OR LONGER IN LENGTH SEE "STRUT BRACING" DETAIL ON PAGE 17.

(6) STRAPPING BOARD (10 REQD). SEE "STRAPPING BOARD A" DETAIL ON PAGE 15. SEE SPECIAL NOTE 8 ON PAGE 11.

(7) WIRE TIE, NO. 14 GAGE BLACK ANNEALED WIRE 18" LONG (12 REQD). INSTALL WIRE UNDER UNITIZING STRAP OF PALLET UNIT AND AROUND STRAPPING BOARD. BRING ENDS TOGETHER AND TWIST TAUT. WIRE TIE IS USED TO PREVENT STRAPPING BOARDS WHICH ARE NOT RETAINED BY DOORWAY PROTECTION STRAPS, PIECE MARKED (8), FROM BECOMING DISLODGED DURING TRANSIT.

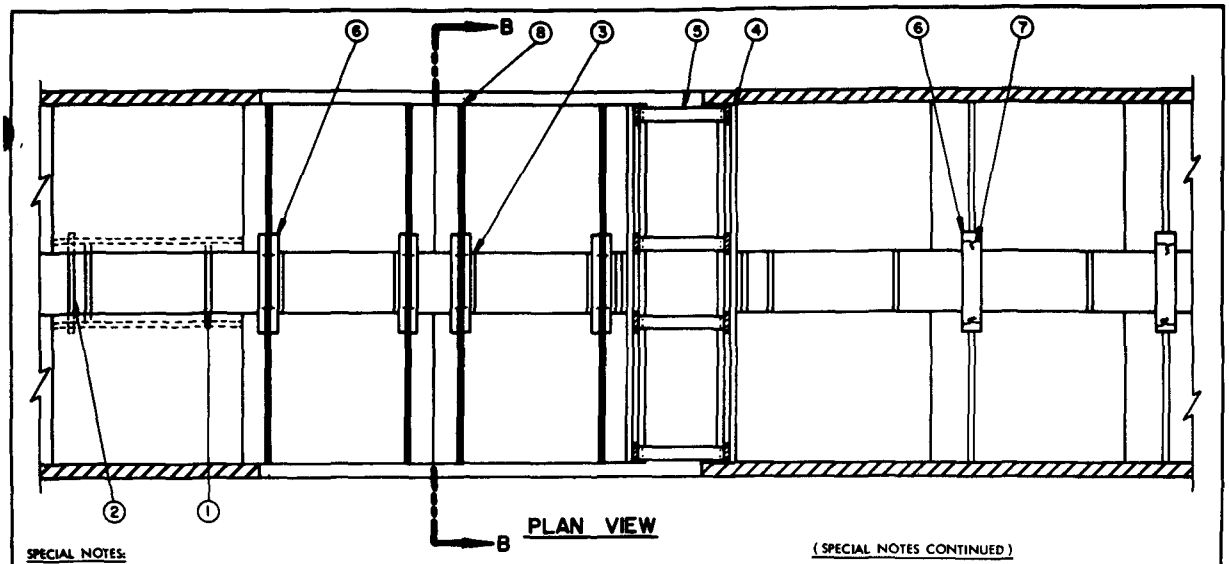
(8) DOORWAY PROTECTION STRAP, 1-1/4" X .035" X 40'-0" LONG STEEL STRAPPING (4 REQD). INSTALL AS SHOWN, TO ENCIRCLE THOSE LOAD UNITS WHICH PROTRUDE INTO THE DOORWAY AREA. STAPLE TO STRAPPING BOARD MARKED (6) W/2-1-3/8" X 3/4" STAPLES EACH LOCATION.

(9) SEAL FOR 1-1/4" STEEL STRAPPING (8 REQD, 2 PER STRAP). POSITION JOINTS AT VOID BETWEEN UNITS AS SHOWN AND DOUBLE CRIMP EACH SEAL. SEE GENERAL NOTE "L' ON PAGE 2.

PAGE 10

(3) 60-UNIT LOAD IN A 50'-6" LONG BY 9'-2" WIDE CAR (PALLETIZED)

Figure 7–1—Continued (sheet 9 of 25).



PLAN VIEW

SPECIAL NOTES:

1. A 50'-6" LONG BY 9'-2" WIDE (INSIDE CLEARANCE) CONVENTIONAL TYPE BOX CAR EQUIPPED WITH 10'-0" WIDE BY 10'-3" HIGH (MIN.) DOOR OPENINGS IS SHOWN. CARS WITH WIDER OR STAGGERED DOORWAYS MAY ALSO BE USED. CARS WITH DOORWAYS NARROWER THAN 10'-0" CAN BE USED, BUT A STACK OF SIX (6) UNITS WILL HAVE TO BE OMITTED FROM THE SPECIFIED LOAD IN THE DOORWAY AREA.
2. A WIDER OR NARROWER CAR MAY BE USED FOR SHIPPING THE DEPICTED LOAD.
3. TO SATISFY THE NUMBER OF UNITS TO BE SHIPPED, THE LOAD MAY BE DECREASED BY ONE (1) UNIT WITH THE USE OF THE OMITTED-UNIT GATE AND STRUTS AS DEPICTED ON PAGE 22. A PARTIAL SECOND OR THIRD LAYER MAY BE SHIPPED BY USING "PARTIAL LAYER BRACING" AS DEPICTED ON PAGE 22.
4. IF THE CAR BEING LOADED HAS PLUG DOORS, NO SPECIAL PROCEDURES ARE REQUIRED; HOWEVER, THE CRITERIA SET FORTH IN GENERAL NOTE "G" ON PAGE 2 WILL BE OBSERVED.
5. A 42-UNIT LOAD MAY BE LOADED AND SHIPPED IN A 40'-6" LONG BOX CAR. DELETE EIGHT (8) "ANTI-SWAY BRACE" ASSEMBLIES WHEN SHIPPING A 42-UNIT LOAD. SEE SPECIAL NOTES 6 AND 7 BELOW.
6. FOR EACH LOAD UNIT WHICH EXTENDS 52" OR MORE INTO THE DOORWAY AREA ON ONE OR BOTH SIDES OF THE CAR BEING LOADED, PIECES MARKED (3) AND TWO (2) SETS OF PIECES MARKED (6), (8), AND (9) MUST BE INSTALLED TO BUNDLE THAT UNIT AS SHOWN WITHIN THE BASIC LOAD VIEWS. FOR EACH LOAD UNIT OF SIX (6) PALLET UNITS WHICH EXTENDS MORE THAN 29" PAST A DOOR POST INTO THE DOORWAY AREA ON ONE OR BOTH SIDES OF THE CAR BEING LOADED, PIECES MARKED (3), AND ONE (1) SET OF PIECES MARKED (6), (8), AND (9) MUST BE INSTALLED TO BUNDLE THAT UNIT. SEE GENERAL NOTE "G" ON PAGE 2.
7. FOR EACH LOAD UNIT OF SIX (6) PALLET UNITS WHICH DOES NOT EXTEND MORE THAN 29" PAST A DOOR POST, USE PIECE MARKED (1) IN LIEU OF PIECES MARKED (2) AND (3) AND OMIT PIECES MARKED (6), (8), AND (9).
8. THE FIRST THREE (3) LOAD UNITS IN EACH END OF THE CAR WILL REQUIRE A STRAPPING BOARD TO SERVE AS AN ANTI-SWAY DEVICE FOR THE TOP OF THE LOAD. WIRE TIE THESE STRAPPING BOARDS TO THE UNITIZING STRAP OF THE PALLET UNIT.

(CONTINUED AT RIGHT)

(SPECIAL NOTES CONTINUED)

9. IF THE DOOR HEIGHT OF THE CAR IS NOT OF A HEIGHT TO PERMIT LOADING THE PALLET UNITS THREE (3) UNITS HIGH IN THE DOORWAY AREA OF THE CAR AS DEPICTED IN THE ISOMETRIC VIEW, REFER TO PAGE 24 FOR THE SPECIFICATIONS WHICH MUST BE USED. IT WILL BE NECESSARY TO OMIT FOUR (4) PALLET UNITS FROM THE CAR LOAD.

BILL OF MATERIAL

LUMBER	LINEAR FEET	BOARD FEET
2" X 2"	112	37
2" X 4"	424	280
2" X 6"	263	263
4" X 4"	34	44
NAILS	**NO. REQD**	**POUNDS**
10d (3")	628	9-3/4
12d (3-1/4")	98	1-3/4
16d (3-1/2")	48	1
STEEL STRAPPING, 1-1/4" X .035"	160' REQD	23 LBS
SEAL FOR 1-1/4" STRAPPING	8 REQD	NIL
STAPLE, 1-3/8" X 3/4"	8 REQD	NIL
NO. 14 GAGE WIRE	18' REQD	NIL

LOAD AS SHOWN

ITEM	QUANTITY	WEIGHT (APPROX)
PALLET UNIT	60	62,940 LBS
DUNNAGE		1,596 LBS
TOTAL WEIGHT		64,536 LBS

60-UNIT LOAD IN A 50'-6" LONG BY 9'-2" WIDE CAR (PALLETIZED) PAGE 11

Figure 7-1—Continued (sheet 10 of 25).

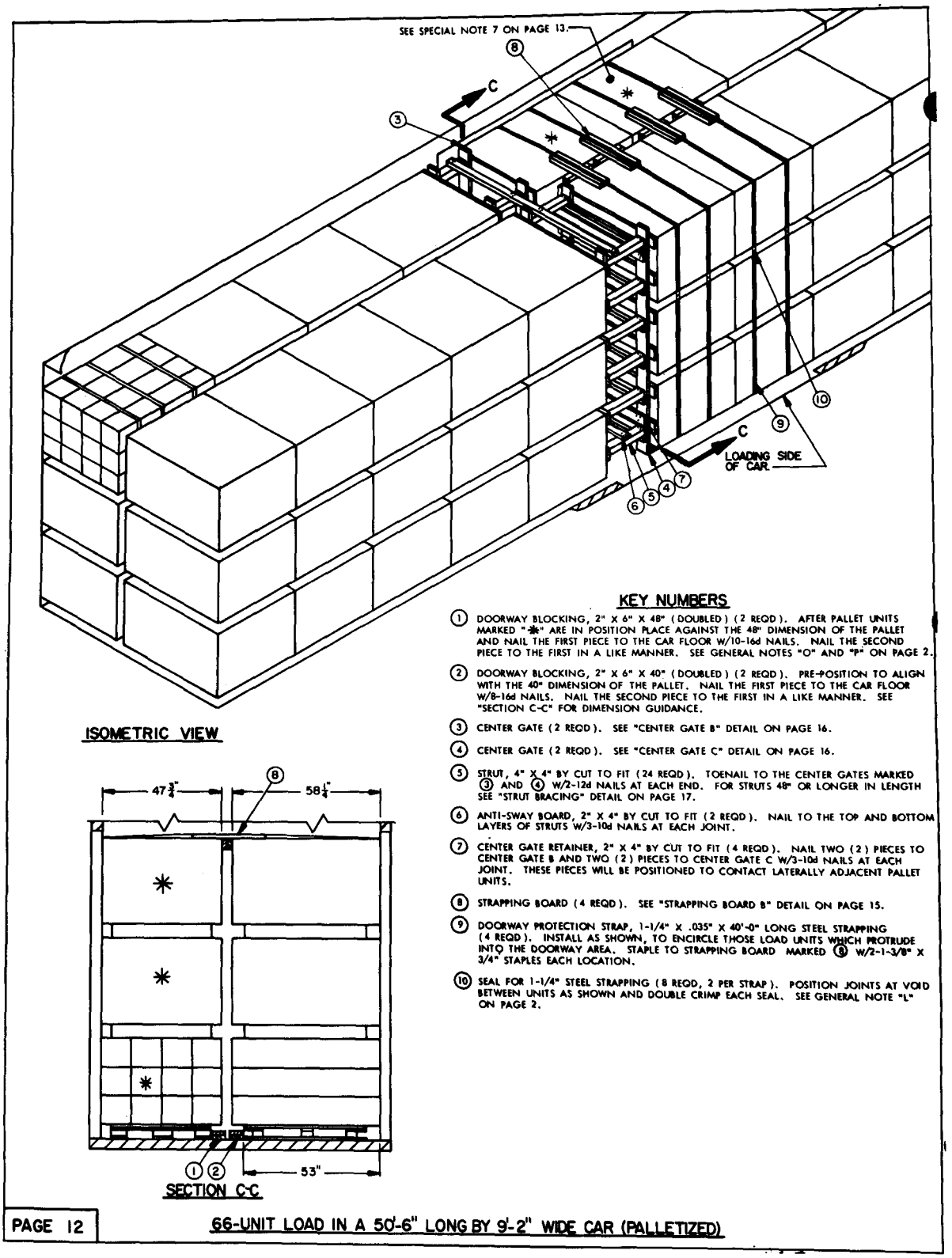
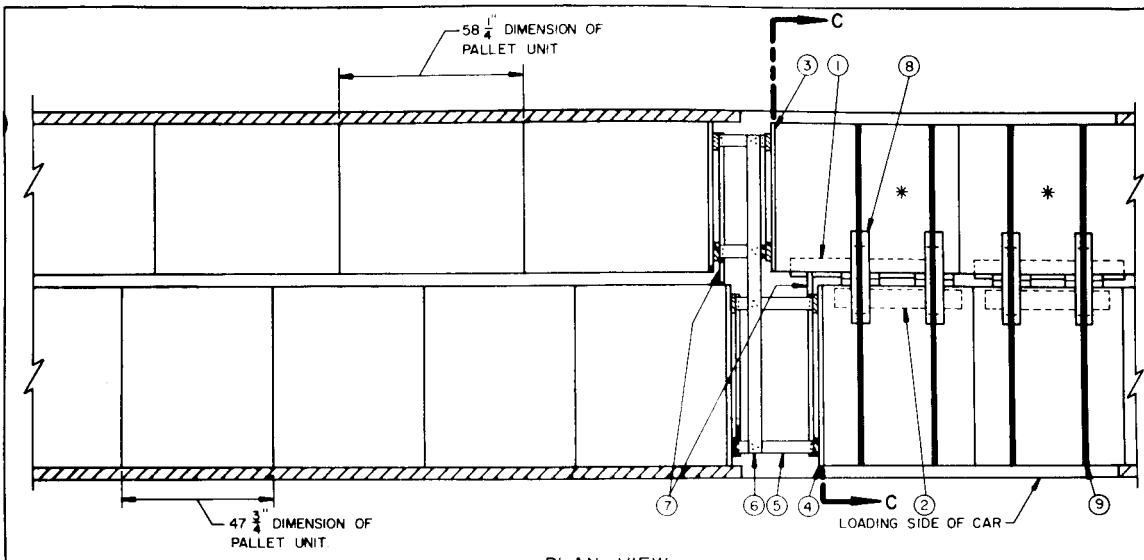


Figure 7–1—Continued (sheet 11 of 25).



PLAN VIEW

SPECIAL NOTES:

1. A 50'-6" LONG BY 9'-2" WIDE (INSIDE CLEARANCE) CONVENTIONAL TYPE BOX CAR EQUIPPED WITH 10'-0" WIDE BY 10'-3" HIGH (MIN.) DOOR OPENINGS IS SHOWN. CARS WITH WIDER OR STAGGERED DOORWAYS MAY ALSO BE USED. CARS WITH DOORWAYS NARROWER THAN 10'-0" CAN BE USED, BUT A STACK OF SIX (6) UNITS WILL HAVE TO BE OMITTED FROM THE SPECIFIED LOAD IN THE DOORWAY AREA.
2. A NARROWER WIDTH CAR MAY BE USED FOR SHIPPING THE DEPICTED LOAD. NOTE: IF A CAR IS USED WHICH IS 8'-11" WIDE OR LESS THE PROCEDURES DEPICTED ON PAGES 10 AND 11 WILL HAVE TO BE USED.
3. TO SATISFY THE NUMBER OF UNITS TO BE SHIPPED THE LOAD MAY BE DECREASED BY ONE (1) UNIT WITH THE USE OF THE OMITTED-UNIT GATE AND STRUTS AS DEPICTED ON PAGE 22.
4. IF THE CAR BEING LOADED HAS PLUG DOORS NO SPECIAL CHANGES TO THE SPECIFIED PROCEDURES ARE REQUIRED; HOWEVER, THE CRITERIA SET FORTH IN GENERAL NOTE "G" ON PAGE 2 WILL BE OBSERVED.
5. FOR EACH LOAD UNIT WHICH EXTENDS 52" OR MORE ON THE 58-1/4" DIMENSION OF THE UNIT OR 42" OR MORE ON THE 47-3/4" DIMENSION OF THE UNIT INTO THE DOORWAY AREA ON ONE OR BOTH SIDES OF THE CAR BEING LOADED, PIECES MARKED (1) AND (2), AND TWO (2) SETS OF PIECES MARKED (8), (9), AND (10) MUST BE INSTALLED TO BUNDLE THOSE UNITS AS SHOWN WITHIN THE BASIC LOAD VIEWS. FOR EACH LOAD UNIT WHICH EXTENDS MORE THAN 29" ON THE 58-1/4" DIMENSION OF THE UNIT OR MORE THAN 24" ON THE 47-3/4" DIMENSION OF THE UNIT PAST A DOOR POST INTO THE DOORWAY AREA ON ONE OR BOTH SIDES, PIECES MARKED (1) AND (2), AND ONE (1) SET OF PIECES MARKED (8), (9), AND (10) MUST BE INSTALLED TO BUNDLE THAT UNIT. SEE GENERAL NOTE "G" ON PAGE 2.
6. FOR EACH LOAD UNIT WHICH DOES NOT EXTEND 29" ON THE 58-1/4" DIMENSION OF THE UNIT OR 24" ON THE 47-3/4" DIMENSION OF THE UNIT PAST A DOOR POST ON ONE OR BOTH SIDES, OMIT ALL PIECES MARKED (1), (2), (8), (9), AND (10).

(SPECIAL NOTES CONTINUED)

IF THE DOOR HEIGHT OF THE CAR IS NOT OF A HEIGHT TO PERMIT LOADING THE PALLET UNITS THREE (3) UNITS HIGH IN THE DOORWAY AREA OF THE CAR AS DEPICTED IN THE ISOMETRIC VIEW, REFER TO PAGE 25 FOR THE SPECIFICATIONS WHICH MUST BE USED. IT WILL BE NECESSARY TO OMIT FOUR (4) PALLET UNITS FROM THE CAR LOAD.

(CONTINUED AT RIGHT)

BILL OF MATERIAL

LUMBER	LINEAR FEET	BOARD FEET
2" X 2"	94	31
2" X 4"	92	62
2" X 6"	306	306
4" X 4"	45	60
NAILS	NO. REQD	POUNDS
10d (3")	388	6
12d (3-1/4")	96	1-3/4
16d (3-1/2")	72	1-1/2
STEEL STRAPPING, 1-1/4" X .035"	160' REQD	23 LBS
SEAL FOR 1-1/4" STEEL STRAPPING	8 REQD	NIL
STAPLES, 1-3/8" X 3/4"	8 REQD	NIL
NO. 14 GAGE WIRE	18' REQD	NIL

LOAD AS SHOWN

ITEM	QUANTITY	WEIGHT (APPROX)
PALLET UNIT	66	69,234 LBS
DUNNAGE		1,180 LBS
TOTAL WEIGHT		70,414 LBS

66-UNIT LOAD IN A 50'-6" LONG BY 9'-2" WIDE CAR (PALLETIZED)

PAGE 13

Figure 7-1-Continued (sheet 12 of 25).

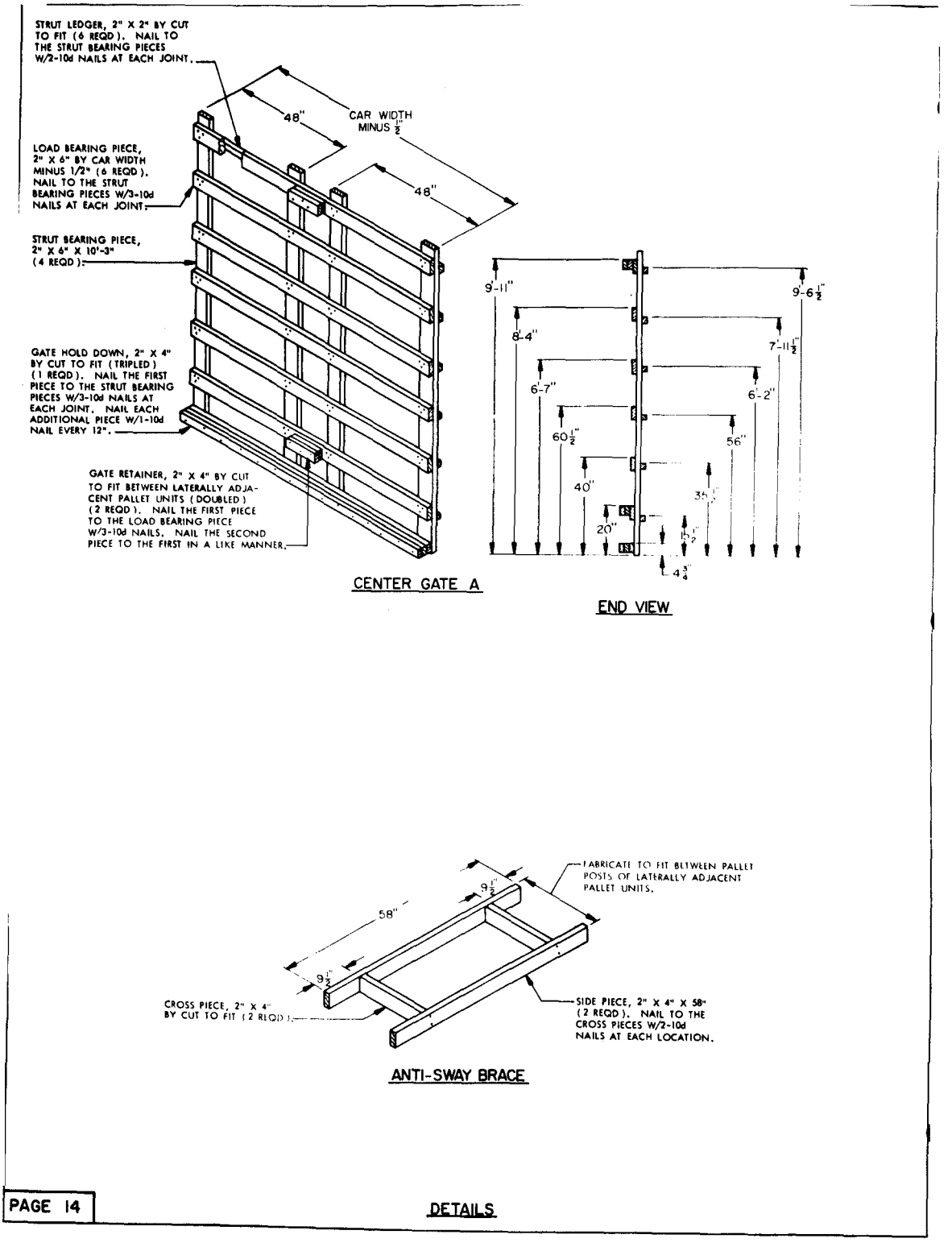
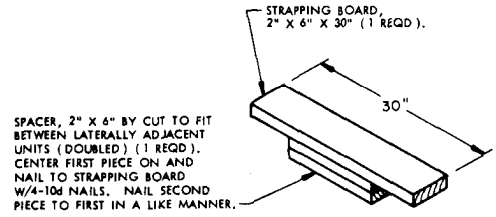
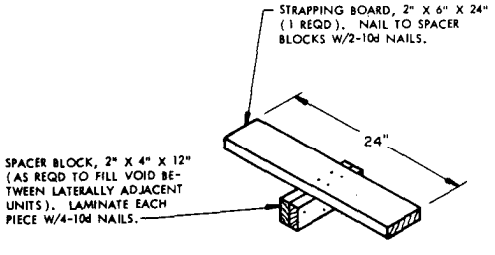


Figure 7-1 -Continued (sheet 13 of 25).



STRAPPING BOARD A



STRAPPING BOARD B

DETAILS

PAGE 15

Figure 7-1-Continued (sheet 14 0f 25).

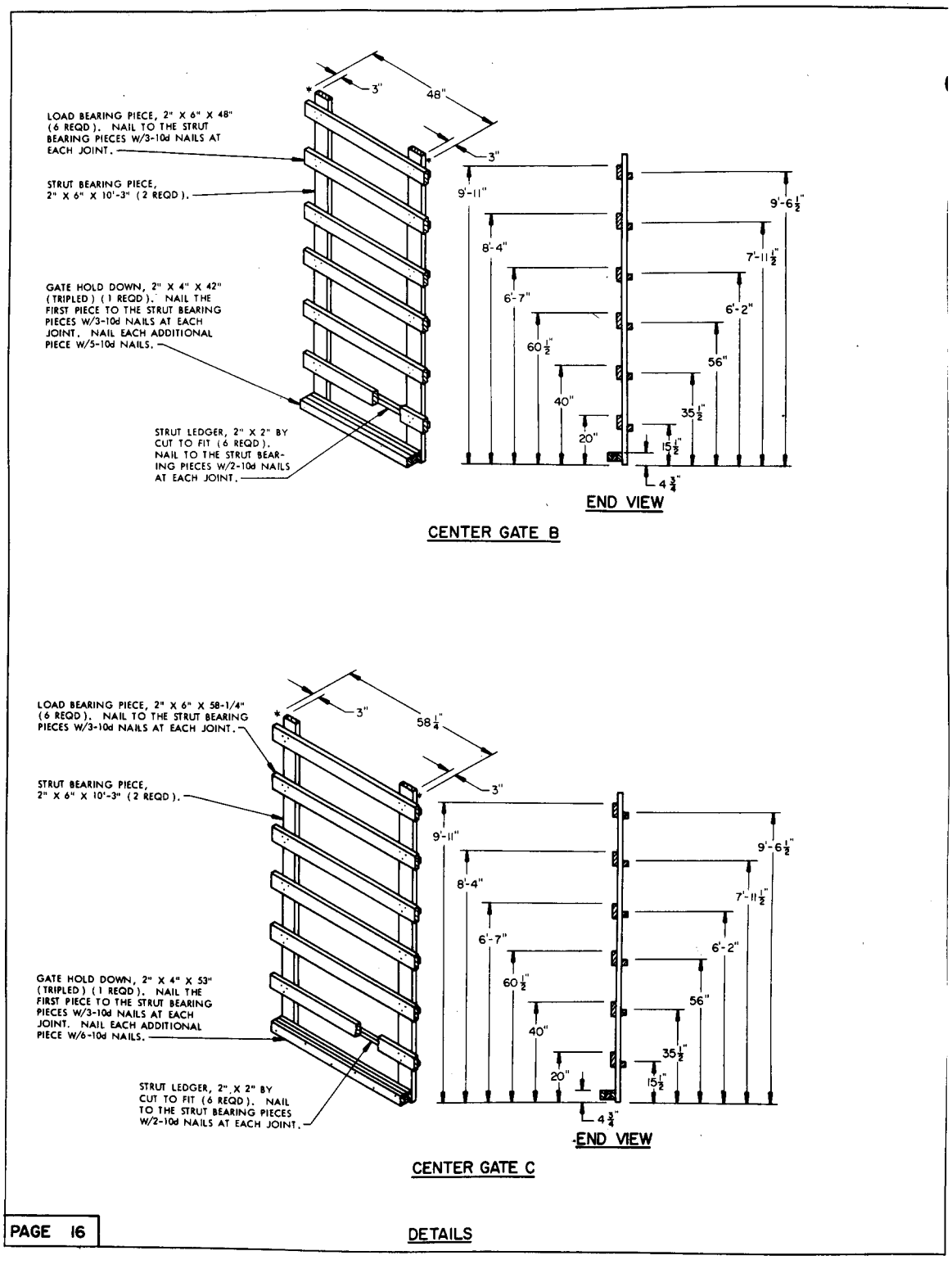
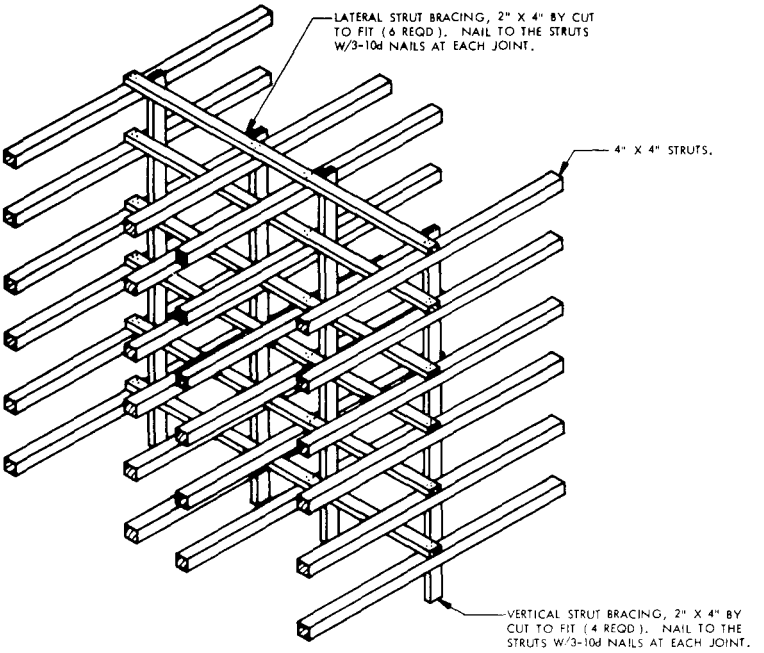


Figure 7–1-Continued (sheet 15 of 25).



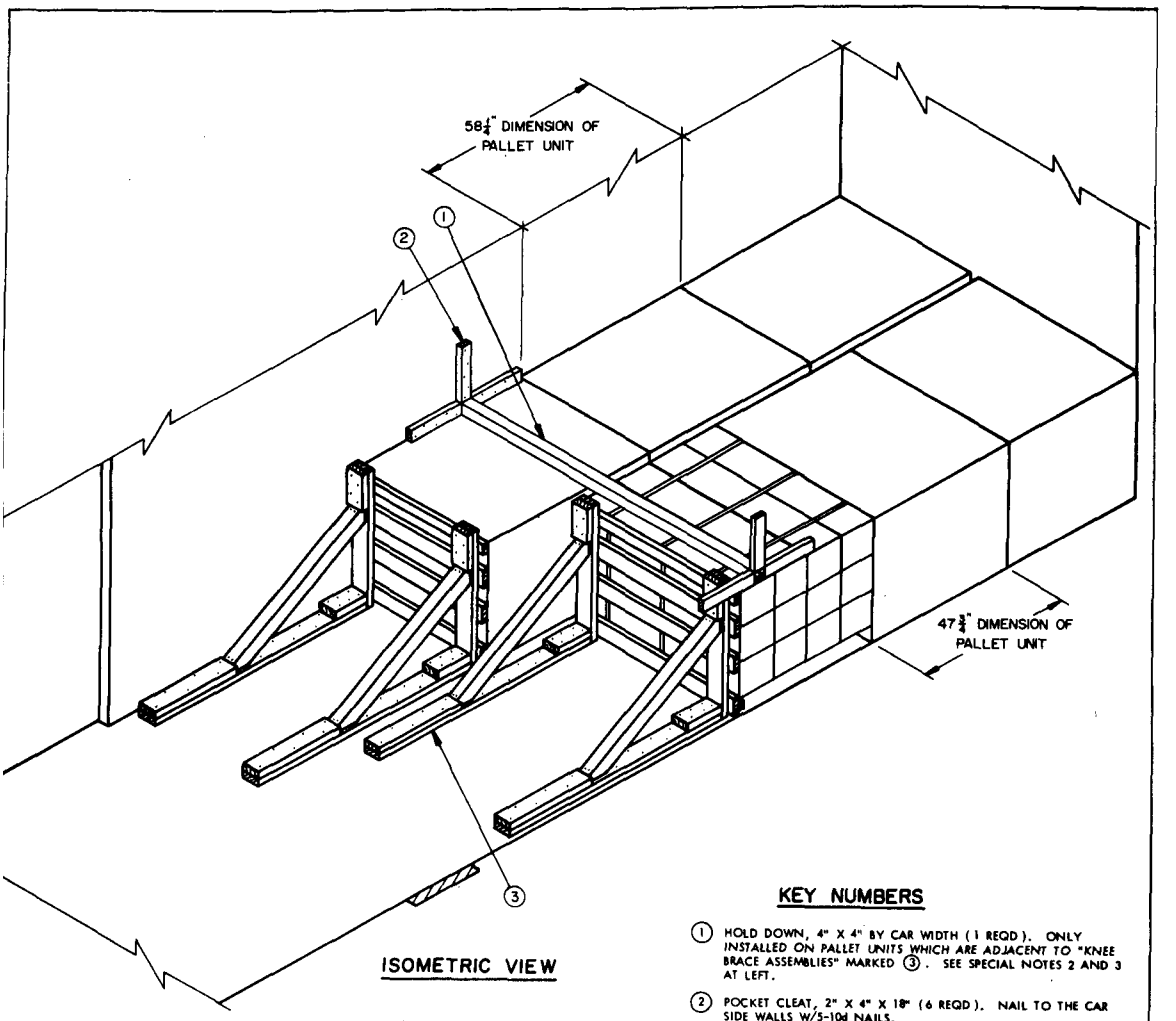
STRUT BRACING

STRUT BRACING IS REQUIRED WHEN STRUTS ARE 48" OR GREATER IN LENGTH. ONE (1) SET, AS SHOWN ABOVE, IS REQUIRED FOR EVERY 48" OF STRUT LENGTH.

DETAILS

PAGE 17

Figure 7-1-Continued (sheet 16 of 25).



ISOMETRIC VIEW

KEY NUMBERS

(1) HOLD DOWN, 4" X 4" BY CAR WIDTH (1 REQD). ONLY INSTALLED ON PALLET UNITS WHICH ARE ADJACENT TO "KNEE BRACE ASSEMBLIES" MARKED (3). SEE SPECIAL NOTES 2 AND 3 AT LEFT.

(2) POCKET CLEAT, 2" X 4" X 18" (6 REQD). NAIL TO THE CAR SIDE WALLS W/5-10d NAILS.

(3) KNEE BRACE ASSEMBLY (2 REQD). SEE DETAIL ON PAGE 19 AND SPECIAL NOTE 4 AT LEFT.

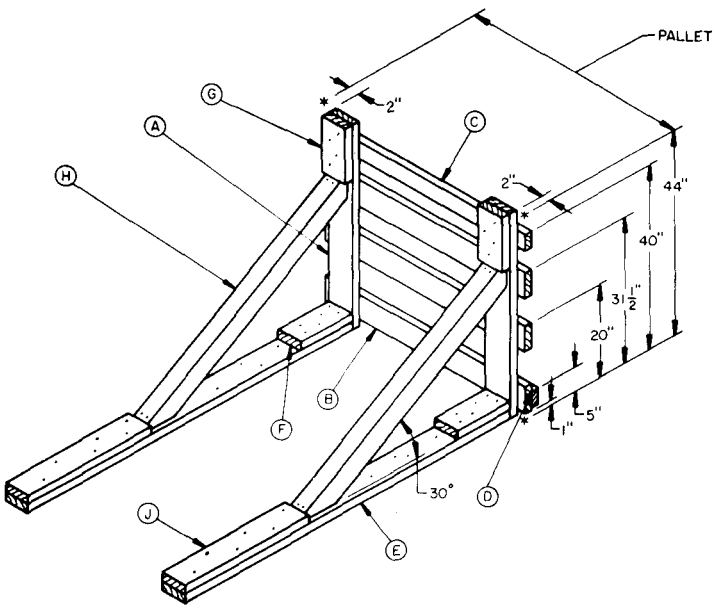
SPECIAL NOTES:

1. THESE LCL OUTLOADING PROCEDURES ARE SHOWN DEPICTING THE USE OF KNEE-BRACE ASSEMBLIES IN A BOX CAR EQUIPPED WITH WOOD OR NAILABLE METAL FLOORS.
2. IF THE LADING EXTENDS INTO A DOORWAY AREA USE TWO (2) PIECES OF DOOR-SPANNING 2" X 6" MATERIAL ACROSS EACH DOORWAY, INVOLVED FOR SECUREMENT OF HOLD DOWN AND POCKET CLEATS MARKED (1) AND (2). A HOLD DOWN MARKED (1) WILL BE CUT FOR A "SNUG" FIT AGAINST THE DOOR SPANNING PIECES AND THE POCKET CLEATS MARKED (2) WILL ALL BE INSTALLED IN A HORIZONTAL POSITION INSTEAD OF A VERTICAL POSITION AS SHOWN.
3. CAUTION: IF A PALLET UNIT EXTENDS MORE THAN ONE-HALF OF ITS WIDTH OR LENGTH PAST A DOOR POST INTO THE DOORWAY AREA IN A CONVENTIONAL TYPE DOOR OPENING OR A CAR EQUIPPED WITH PLUG DOORS, A PIECE OF DOOR SPANNING DUNNAGE OF 2" X 6" MATERIAL BY DOOR-OPENING-WIDTH PLUS 24" IN LENGTH WILL BE POSITIONED ACROSS THE DOOR OPENING APPROXIMATELY 24" ABOVE THE CAR FLOOR AND NAILED TO THE CAR SIDE WALL W/5-12d NAILS AT EACH END. SEE GENERAL NOTE "G" ON PAGE 2.
4. TWO (2) KNEE BRACE ASSEMBLIES ARE ADEQUATE FOR RETAINING A LCL LOAD OF *NOT MORE THAN 17,000 POUNDS OF LADING.*
5. WHEN ALL PALLETS ARE POSITIONED IN THE CAR WITH THE 58-1/4" DIMENSION RUNNING PARALLEL WITH THE CAR LENGTH, SUCH AS WILL BE WHEN OUTLOADING AN 8'-6" WIDE BOX CAR, *"ANTI-SWAY BRACE ASSEMBLIES" WILL BE REQUIRED BETWEEN* LATERALLY ADJACENT UNITS. IF THE QUANTITY SHOULD INCLUDE AN ODD NUMBER OF UNITS, SUCH AS THREE, FIVE, OR SEVEN UNITS, ADDITIONAL BLOCKING WILL BE REQUIRED. ONE ADDITIONAL HOLD DOWN MARKED (1), SEVEN POCKET CLEATS MARKED (2) AND A DOUBLED 2" X 6" X 48" PIECE FOR SIDE BLOCKING WILL BE REQUIRED. NAIL EACH PIECE OF SIDE BLOCKING W/8-16d NAILS AGAINST THE PALLET UNIT NOT BLOCKED LATERALLY WITH AN ANTI-SWAY BRACE ASSEMBLY.

PAGE 18

TYPICAL LCL (6-UNIT LOAD) PALLETIZED

Figure 7-1-Continued (sheet 17 of 25).



KNEE BRACE ASSEMBLY

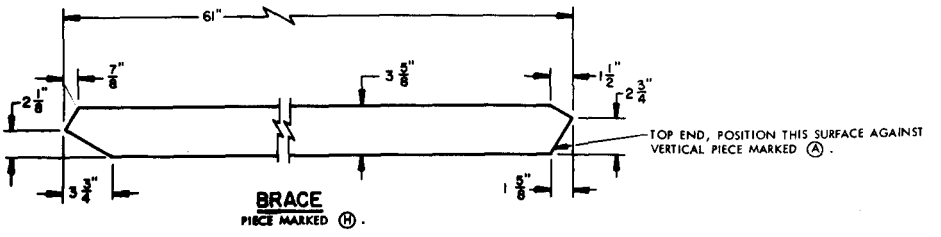
ONE (1) KNEE BRACE ASSEMBLY AS SHOWN ABOVE IS ADEQUATE FOR RETAINING A MAXIMUM LCL LOAD OF 8,500 POUNDS OF LADING.

NOTE ●:

IF DESIRED, 1/2" PLYWOOD MAY BE SUBSTITUTED FOR PIECES MARKED (B) AND (C). THE PLYWOOD MUST BE PALLET UNIT LENGTH OR WIDTH BY PALLET UNIT HEIGHT. NAIL THE PLYWOOD TO PIECES MARKED (A) W/6-6d NAILS AT EACH LOCATION. NAIL THE PLYWOOD TO PIECE MARKED (D) W/6-6d NAILS.

LUMBER AND NAILING DATA

PC MK	LUMBER SIZE	NO. REQD	NAIL TO	NUMBER AND SIZE OF NAIL
(A)	2" X 6" X 44"	2	----------	----------
(B)	2" X 6" BY CUT TO FIT SEE "NOTE ● " AT LEFT	3	(A)	3-10d AT EACH JOINT
(C)	2" X 4" BY CUT TO FIT	1	(A)	3-10d AT EACH JOINT
(D)	2" X 4" BY CUT TO FIT	1	(B)	6-10d
(E)	2" X 6" X 6'-6"	2	CAR FLOOR	1-16d EVERY 8"
(F)	2" X 6" X 12"	2	(E)	4-10d
			(A)	TOENAIL W/2-12d
(G)	2" X 6" X 12"	2	(A)	4-10d
(H)	4" X 4" X 57-1/2" SEE "BRACE" DETAIL BELOW	2	(A) & (E)	2-16d AT EACH END
(J)	2" X 6" X 30"	2	(E)	6-40d

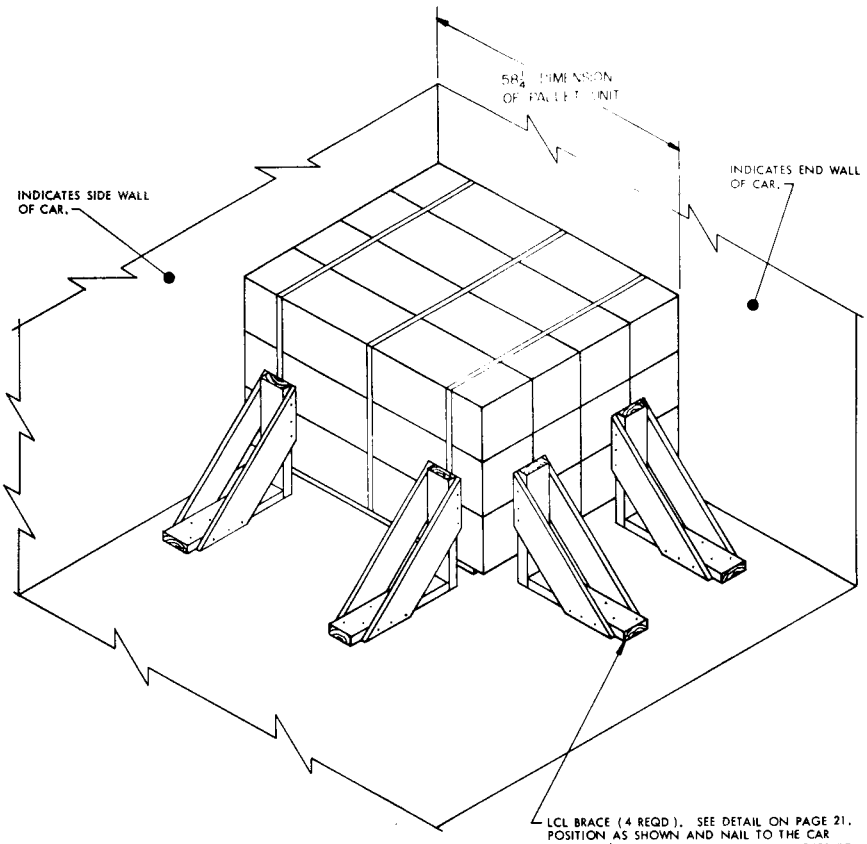


BRACE
PIECE MARKED (H).

TYPICAL LCL (6-UNIT LOAD) PALLETIZED

PAGE 19

Figure 7-1-Continued (sheet 18 of 25).



ISOMETRIC VIEW

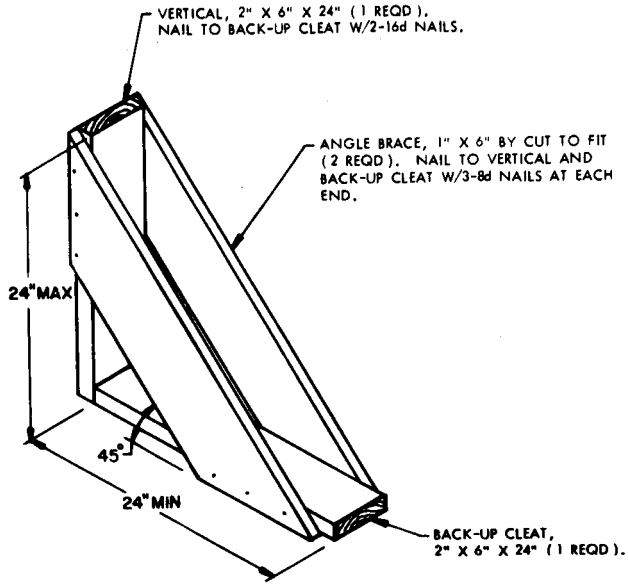
SPECIAL NOTES:

1. THESE LCL OUTLOADING PROCEDURES ARE SHOWN DEPICTING THE USE OF LCL BRACES IN A BOX CAR WITH WOOD OR NAILABLE METAL FLOORS.
2. IF DESIRED LCL BRACES MAY BE INSTALLED ON EACH END OR EACH SIDE OF THE PALLET UNIT.
3. TWO (2) LCL BRACES ARE ADEQUATE FOR RETAINING NOT MORE THAN THREE (3) PALLET UNITS.

PAGE 20

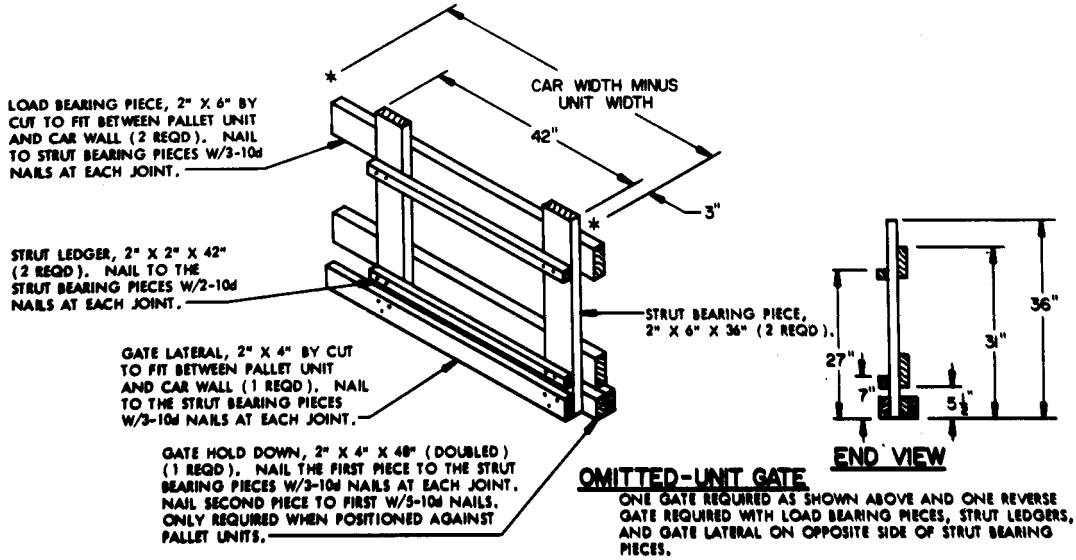
TYPICAL LCL (1-UNIT LOAD) PALLETIZED

Figure 7-1 -Continued (sheet 19 of 25).



LCL BRACE

EACH BRACE AS APPLIED FOR LONGITUDINAL OR LATERAL BRACING WILL SUPPORT 2,000 OR 8,000 POUNDS OF LADING RESPECTIVELY. A MINIMUM OF TWO (2) BRACES MUST BE USED FOR LONGITUDINAL OR LATERAL BRACING.



OMITTED-UNIT GATE

ONE GATE REQUIRED AS SHOWN ABOVE AND ONE REVERSE GATE REQUIRED WITH LOAD BEARING PIECES, STRUT LEDGERS, AND GATE LATERAL ON OPPOSITE SIDE OF STRUT BEARING PIECES.

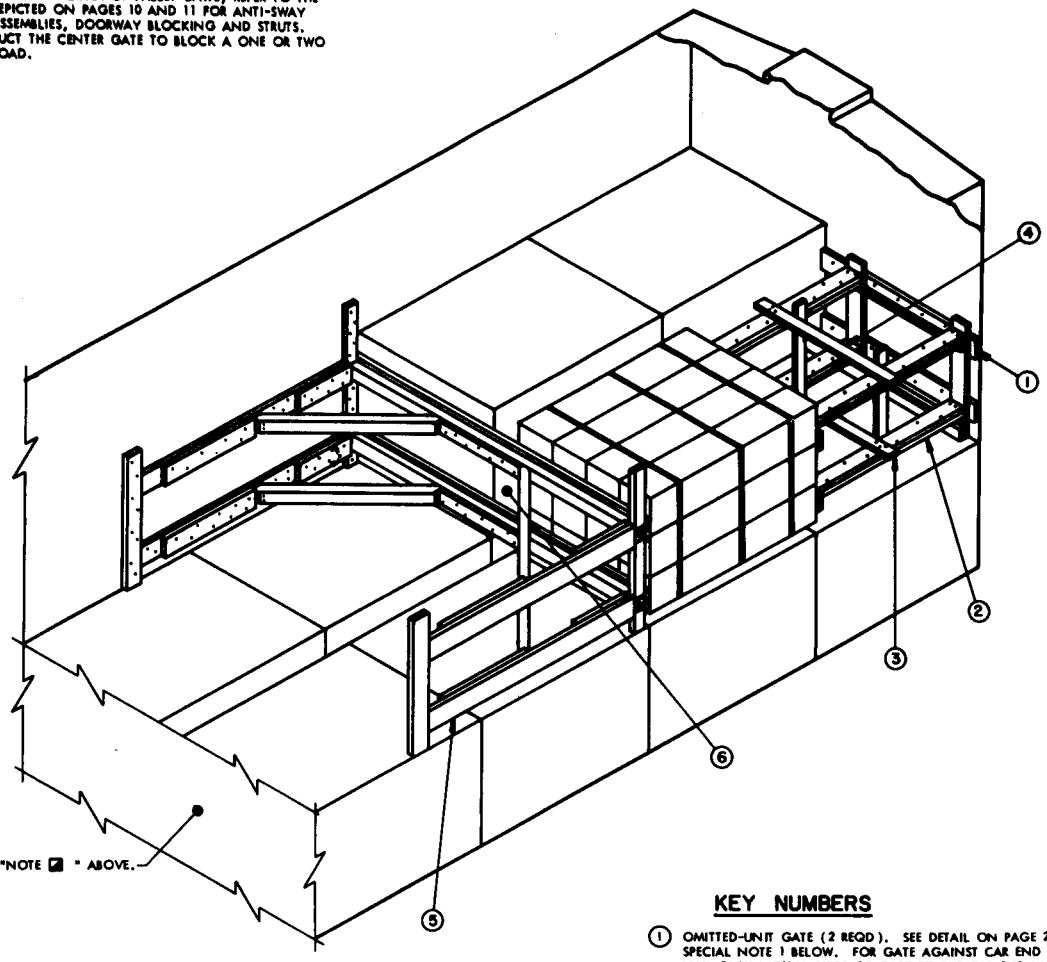
DETAILS

PAGE 21

Figure 7–1-Continued (sheet 20 of 25).

NOTE ◪ :

FOR BLOCKING SPECIFICATIONS APPLICABLE TO THE FIRST AND/OR SECOND LAYER OF PALLET UNITS, REFER TO THE LOAD DEPICTED ON PAGES 10 AND 11 FOR ANTI-SWAY BRACE ASSEMBLIES, DOORWAY BLOCKING AND STRUTS. CONSTRUCT THE CENTER GATE TO BLOCK A ONE OR TWO LAYER LOAD.



ISOMETRIC VIEW

AN 8'-6" WIDE BOX CAR WITH A PARTIAL SECOND LAYER IS DEPICTED.

KEY NUMBERS

① OMITTED-UNIT GATE (2 REQD). SEE DETAIL ON PAGE 21 AND SPECIAL NOTE 1 BELOW. FOR GATE AGAINST CAR END WALL NAIL EACH LATERAL PIECE OF GATE TO THE CAR END WALL W/5-12d NAILS.

② STRUT, 2" X 6" BY CUT TO FIT (DOUBLED) (4 REQD). LAMINATE W/1-10d NAIL EVERY 6". TOENAIL TOP PIECE TO PIECES MARKED ① W/2-12d NAILS AT EACH END.

③ LATERAL STRUT BRACING, 2" X 4" BY CUT TO FIT (2 REQD). NAIL TO STRUTS MARKED ② W/3-10d NAILS AT EACH JOINT.

④ VERTICAL STRUT BRACING, 2" X 4" BY CUT TO FIT (2 REQD). NAIL TO STRUTS MARKED ② W/3-10d NAILS AT EACH JOINT.

⑤ K-BRACE (1 REQD). SEE DETAIL ON PAGE 23 AND SPECIAL NOTE 2 AT LEFT.

⑥ TIE WIRE, LENGTH TO SUIT (1 REQD). WIRE TIE ANTI-SWAY BRACE TO PALLET UNIT BELOW LAYER BEING BRACED. INSERT A LENGTH OF WIRE THROUGH WIRE ON SIDE OF WIREBOUND BOX, LOOP OVER "CROSS PIECE" OF "ANTI-SWAY BRACE" AND BRING LOOSE ENDS TOGETHER AND TWIST TAUT. SEE "SECTION B-B" VIEW ON PAGE 10 FOR LOCATION OF "ANTI-SWAY BRACE" ASSEMBLY.

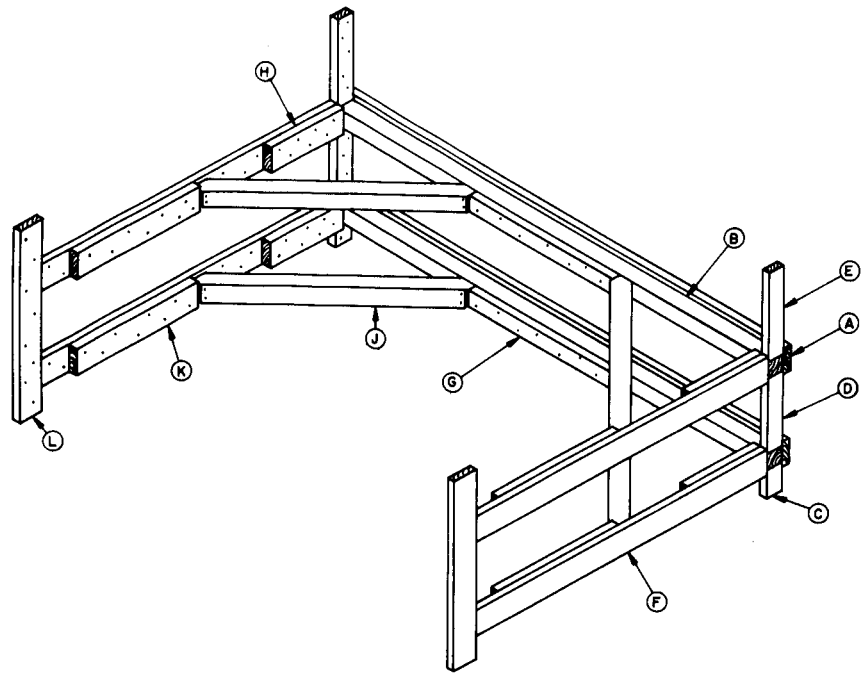
SPECIAL NOTES:

1. WHEN ONE (1) PALLET UNIT IS OMITTED FROM A LOAD AS SHOWN ON PAGES 10 AND 11, THE LOCATION OF THE OMITTED-UNIT DUNNAGE ABOVE SHOULD BE POSITIONED NEAR THE CENTER OF THE CAR.
2. A "K-BRACE ASSEMBLY" AS SHOWN IS ADEQUATE FOR RETAINING A MAXIMUM PARTIAL LAYER LOAD OF NOT MORE THAN 14,000 POUNDS.
3. ALTHOUGH THE VIEW DEPICTS A PARTIAL SECOND LAYER, THE METHOD IS ALSO APPLICABLE TO A PARTIAL THIRD LAYER.
4. IF DESIRED, 4" X 4" MATERIAL STRUT MAY BE SUBSTITUTED FOR EACH DOUBLED 2" X 6" STRUT THAT IS SPECIFIED.

PAGE 22

PARTIAL LAYER BRACING

Figure 7–1-Continued (sheet 21 of 25).



K-BRACE ASSEMBLY

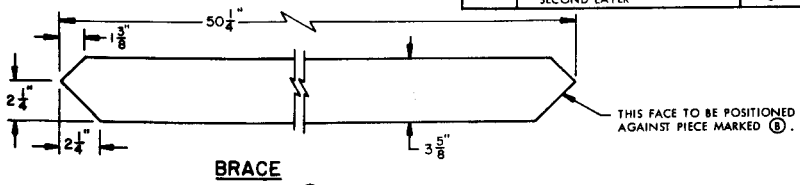
K-BRACE ASSEMBLY AS SHOWN ABOVE IS ADEQUATE FOR RETAINING A MAXIMUM LCL OR PARTIAL-LAYER LOAD OF 14,000 POUNDS.

CAUTION: SOME CARS ARE NOT SUITED FOR THE APPLICATION OF "PARTIAL LAYER BRACING" BECAUSE THE LENGTH OF THE PARTIAL LAYER TO BE SHIPPED AND/OR THE SIZE OR CONFIGURATION OF THE CAR DOORS WILL NOT PERMIT PROPER INSTALLATION OF THE SPECIFIED K-BRACE DUNNAGE. PIECES MARKED (A), (B), (C), (D), (E), AND (H) OR THE COMPARABLE PIECES ON A HEAVIER BRACE MUST BE SUPPORTED AT THE SIDES OF A CAR BY A CAR SIDE WALL. IT IS ALRIGHT FOR THE END OF A DIAGONAL BRACE TO BEAR IN FRONT OF A DOOR OPENING; HOWEVER, THE ADJACENT PIECE MARKED (F) OR THE COMPARABLE PIECE ON A HEAVIER BRACE MUST BE DOUBLED AND EXTENDED ACROSS AND FAR ENOUGH PAST THE DOOR OPENING TO PROVIDE FOR THE SPECIFIED NAILING OF EACH PIECE.

NOTE ⊕ :
1/2" PLYWOOD MAY BE SUBSTITUTED FOR PIECE MARKED (A). THE PLYWOOD MUST BE OF A SIZE TO COVER THE AREA OF THE PALLET UNIT ADJACENT TO THE "K-BRACE". SECURE THE PLYWOOD TO PIECE MARKED (B) W/1-6d NAIL EVERY 6".

LUMBER AND NAILING DATA

PC MK	LUMBER SIZE	NO. REQD	NAIL TO	NUMBER AND SIZE OF NAILS
(A)	2" X 6" BY CAR WIDTH (SEE "NOTE ⊕" BELOW)	2	(B)	1-12d EVERY 12"
(B)	4" X 4" BY CAR WIDTH	2	----------	----------
(C)	2" X 4" X 5-1/2"	2	CAR WALL	2-10d
(D)	2" X 4" X 16-1/2"	2	CAR WALL	4-10d
(E)	2" X 4" X 18"	2	CAR WALL	5-10d
(F)	2" X 6" X 72"	4	CAR WALL	16-12d
(G)	2" X 4" X 28" FOR A 8'-6" WIDE BOX CAR OR 2" X 4" X 36" FOR A 9'-2" WIDE BOX CAR	2	(B)	7-12d
(H)	2" X 6" X 18"	4	(F)	7-12d
(J)	4" X 4" MATERIAL, SEE "BRACE" DETAIL BELOW	4	(B) & (F)	2-16d EACH END
(K)	2" X 6" X 30"	4	(F)	8-16d
(L)	2" X 6" X 42" FOR A PARTIAL THIRD LAYER OR 2" X 3" X 72" FOR A PARTIAL FIRST OR SECOND LAYER	2	CAR WALL	8-12d



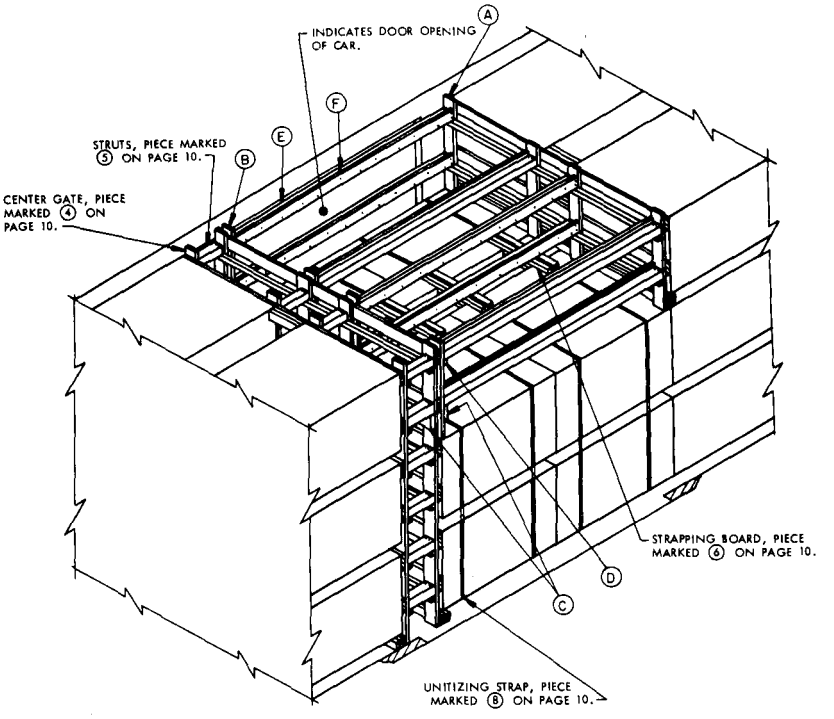
BRACE

PIECE MARKED (J).

PARTIAL LAYER BRACING

PAGE 23

Figure 7-1-Continued (sheet 22 of 25).



ISOMETRIC VIEW

SPECIAL NOTES:

THE ISOMETRIC VIEW ABOVE DEPICTS THE PROCEDURES WHICH MUST BE USED IF THE DOOR OPENING HEIGHT IS NOT OF A HEIGHT TO PERMIT LOADING THE PALLET UNITS THREE UNITS HIGH IN THE DOORWAY AREA OF THE CAR. THE KEY NUMBERS ON PAGE 10 WILL BE FOLLOWED WITH THESE CHANGES: THE NUMBER OF ANTI-SWAY BRACES MARKED (1) WILL BE REDUCED TO 26 REQUIRED, THE LENGTH OF THE UNITIZING STRAP MARKED (B) WILL BE SHORTENED ACCORDINGLY, THE 2" X 2" STRUT LEDGER ON ONE CENTER GATE MARKED (4) WILL BE REPLACED WITH FOUR 2" X 6" X 12" BLOCKS IDENTIFIED AS KEY LETTER (C) ABOVE. IF ADDITIONAL UNITS HAVE TO BE OMITTED FROM THE DEPICTED LOAD, AND THE WIDTH OF THE DOOR OPENING IS SUCH THAT A PARTIAL-LAYER BRACE MAY BE USED SEE THE PROCEDURES AND NOTES ON PAGES 22 AND 23.

KEY LETTERS

(A) PARTIAL-LAYER GATE (1 REQD). SEE "PARTIAL-LAYER GATE A" ON PAGE 26.

(B) STRUT BEARING PIECES, 2" X 6" X 42" (4 REQD). ALIGN WITH STRUT BEARING PIECES OF CENTER GATE MARKED (4) AND NAIL TO LOAD BEARING PIECES W/3-NAILS AT EACH JOINT.

(C) STRUT LEDGER BLOCKS, 2" X 6" X 12" (8 REQD). POSITION FOUR (4) BLOCKS AT THE 7'-11-1/2" HEIGHT AND NAIL EACH TO GATE MARKED (4) W/3-10d NAILS. POSITION THE REMAINING FOUR (4) BLOCKS ON OPPOSITE SIDE OF GATE AND NAIL EACH TO STRUT BEARING PIECES MARKED (B) W/3-10d NAILS.

(D) STRUT LEDGER, 2" X 2" BY CUT TO FIT (1 REQD). NAIL TO STRUT BEARING PIECES MARKED (B) W/2-10d NAILS AT EACH JOINT.

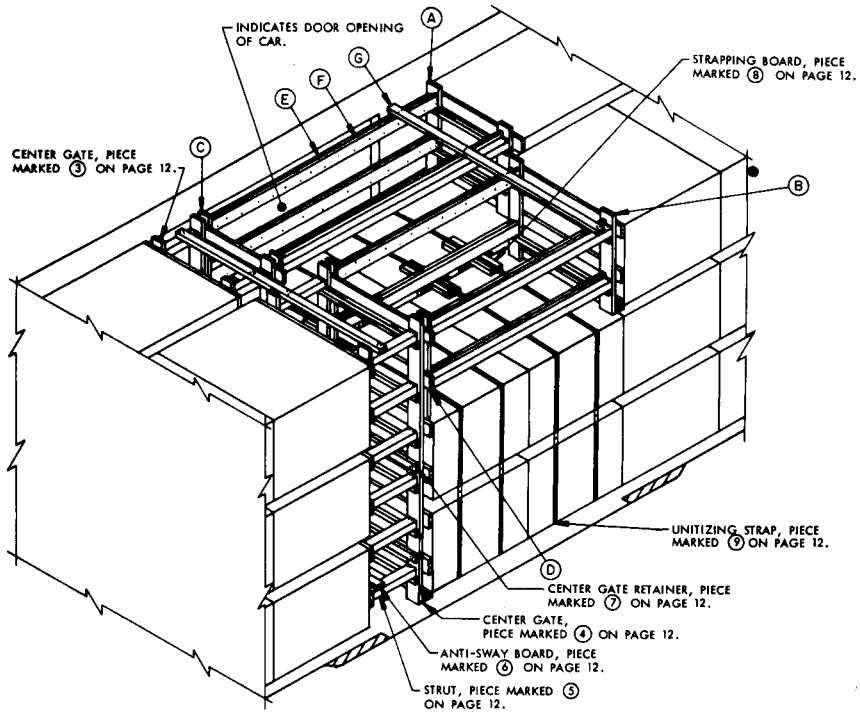
(E) STRUT, 4" X 4" BY CUT TO FIT (8 REQD). TOENAIL TO PARTIAL LAYER GATE MARKED (A) AND STRUT BEARING PIECE MARKED (B) W/2-12d NAILS. SEE KEY LETTER (F) BELOW.

(F) STRUT, 2" X 6" BY CUT TO FIT (8 REQD). NAIL TO STRUT MARKED (E) W/1-10d NAIL EVERY 8". TOENAIL TO PARTIAL LAYER GATE MARKED (A) AND STRUT BEARING PIECE MARKED (B) W/2-12d NAILS EACH.

PAGE 24

DETAILS

Figure 7–1-Continued (sheet 23 of 25).



ISOMETRIC VIEW

SPECIAL NOTES:

THE ISOMETRIC VIEW ABOVE DEPICTS THE PROCEDURES WHICH MUST BE USED IF THE DOOR OPENING HEIGHT IS NOT OF A HEIGHT TO PERMIT LOADING THE PALLET UNITS THREE UNITS HIGH IN THE DOORWAY AREA OF THE CAR. KEY NUMBERS ON PAGE 12 WILL BE FOLLOWED WITH THESE CHANGES: THE LENGTH OF THE UNITIZING STRAPS MARKED (9) WILL BE SHORTENED ACCORDINGLY AND THE UPPER CENTER GATE RETAINER MARKED (7) WILL BE LOWERED TO CONTACT THE SECOND LAYER PALLET UNIT.

KEY LETTERS

(A) PARTIAL-LAYER GATE (1 REQD). SEE "PARTIAL-LAYER GATE B" ON PAGE 26.

(B) PARTIAL-LAYER GATE (1 REQD). SEE "PARTIAL-LAYER GATE C" ON PAGE 26.

(C) STRUT BEARING PIECE, 2" X 6" X 42" (4 REQD). ALIGN WITH STRUT BEARING PIECES OF CENTER GATES MARKED (3) AND (4) AND NAIL TO LOAD BEARING PIECES W/3-10d NAILS AT EACH JOINT.

(D) STRUT LEDGER, 2" X 2" BY CUT TO FIT (4 REQD). ALIGN WITH STRUT LEDGER PIECES OF CENTER GATES MARKED (3) AND (4) AND NAIL TO STRUT BEARING PIECES MARKED (C) W/2-10d NAILS AT EACH JOINT.

(E) STRUT, 4" X 4" BY CUT TO FIT (8 REQD). TOENAIL TO PARTIAL-LAYER GATES MARKED (A) OR (B) AND STRUT BEARING PIECES MARKED (C) W/2-12d NAILS AT EACH END. SEE KEY LETTER (F) BELOW.

(F) STRUT, 2" X 6" BY CUT TO FIT (8 REQD). NAIL TO STRUT MARKED (E) W/1-10d NAIL EVERY 8". TOENAIL TO PARTIAL-LAYER GATES MARKED (A) OR (B) AND TO STRUT BEARING PIECES MARKED (C) W/2-12d NAILS EACH.

(G) ANTI-SWAY BOARD, 2" X 4" BY CUT TO FIT (1 REQD). NAIL TO STRUTS MARKED (F) W/2-10d NAILS AT EACH JOINT.

DETAILS

PAGE 25

Figure 7-1-Continued (sheet 24 of 25).

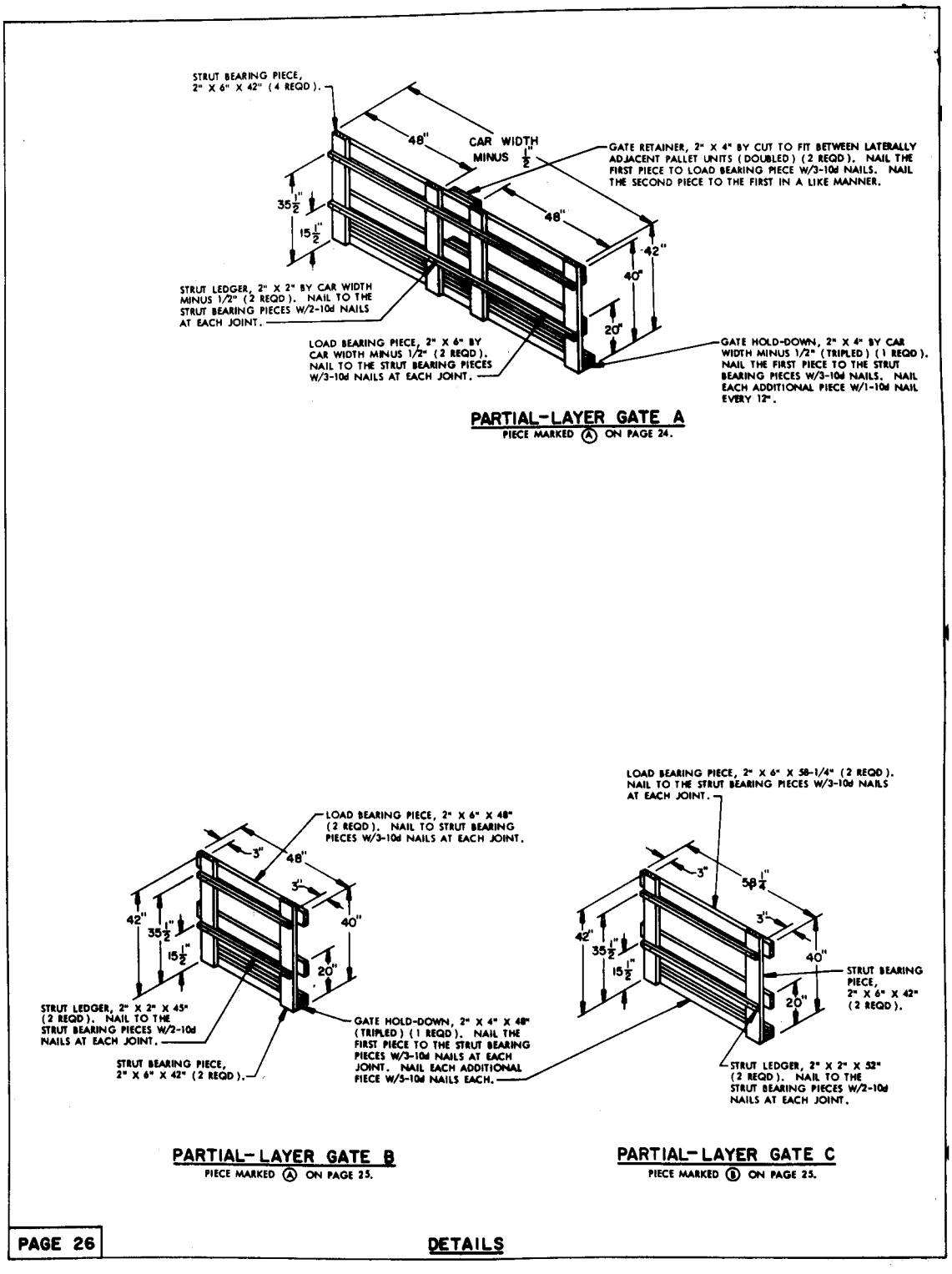
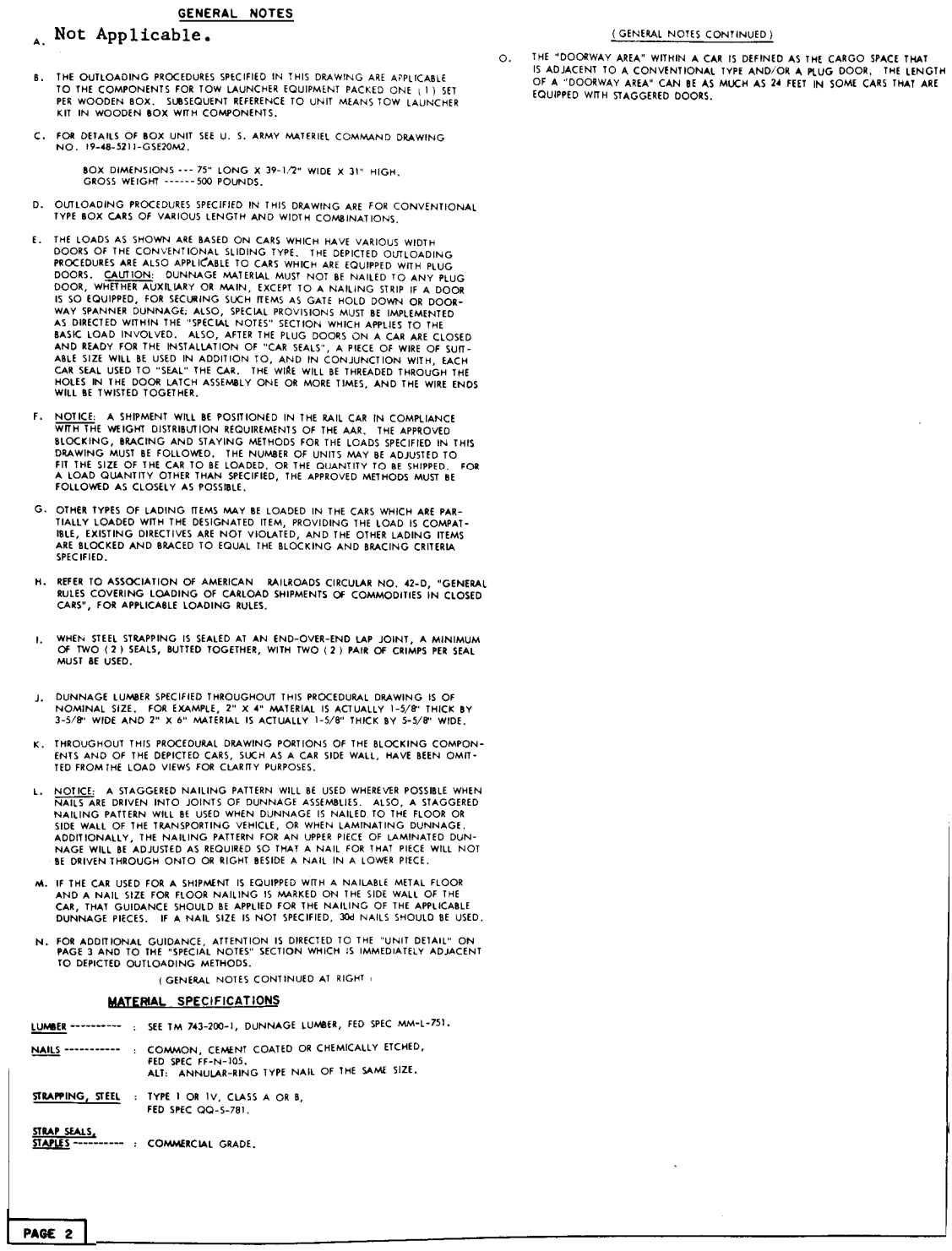


Figure 7-1-Continued(sheet 25 of 25).



GENERAL NOTES

A. Not Applicable.

B. THE OUTLOADING PROCEDURES SPECIFIED IN THIS DRAWING ARE APPLICABLE TO THE COMPONENTS FOR TOW LAUNCHER EQUIPMENT PACKED ONE (1) SET PER WOODEN BOX. SUBSEQUENT REFERENCE TO UNIT MEANS TOW LAUNCHER KIT IN WOODEN BOX WITH COMPONENTS.

C. FOR DETAILS OF BOX UNIT SEE U. S. ARMY MATERIEL COMMAND DRAWING NO. 19-48-5211-GSE20M2.

BOX DIMENSIONS --- 75" LONG X 39-1/2" WIDE X 31" HIGH.
GROSS WEIGHT ------500 POUNDS.

D. OUTLOADING PROCEDURES SPECIFIED IN THIS DRAWING ARE FOR CONVENTIONAL TYPE BOX CARS OF VARIOUS LENGTH AND WIDTH COMBINATIONS.

E. THE LOADS AS SHOWN ARE BASED ON CARS WHICH HAVE VARIOUS WIDTH DOORS OF THE CONVENTIONAL SLIDING TYPE. THE DEPICTED OUTLOADING PROCEDURES ARE ALSO APPLICABLE TO CARS WHICH ARE EQUIPPED WITH PLUG DOORS. CAUTION: DUNNAGE MATERIAL MUST NOT BE NAILED TO ANY PLUG DOOR, WHETHER AUXILIARY OR MAIN, EXCEPT TO A NAILING STRIP IF A DOOR IS SO EQUIPPED, FOR SECURING SUCH ITEMS AS GATE HOLD DOWN OR DOORWAY SPANNER DUNNAGE; ALSO, SPECIAL PROVISIONS MUST BE IMPLEMENTED AS DIRECTED WITHIN THE "SPECIAL NOTES" SECTION WHICH APPLIES TO THE BASIC LOAD INVOLVED. ALSO, AFTER THE PLUG DOORS ON A CAR ARE CLOSED AND READY FOR THE INSTALLATION OF "CAR SEALS", A PIECE OF WIRE OF SUITABLE SIZE WILL BE USED IN ADDITION TO, AND IN CONJUNCTION WITH, EACH CAR SEAL USED TO "SEAL" THE CAR. THE WIRE WILL BE THREADED THROUGH THE HOLES IN THE DOOR LATCH ASSEMBLY ONE OR MORE TIMES, AND THE WIRE ENDS WILL BE TWISTED TOGETHER.

F. NOTICE: A SHIPMENT WILL BE POSITIONED IN THE RAIL CAR IN COMPLIANCE WITH THE WEIGHT DISTRIBUTION REQUIREMENTS OF THE AAR. THE APPROVED BLOCKING, BRACING AND STAYING METHODS FOR THE LOADS SPECIFIED IN THIS DRAWING MUST BE FOLLOWED. THE NUMBER OF UNITS MAY BE ADJUSTED TO FIT THE SIZE OF THE CAR TO BE LOADED, OR THE QUANTITY TO BE SHIPPED. FOR A LOAD QUANTITY OTHER THAN SPECIFIED, THE APPROVED METHODS MUST BE FOLLOWED AS CLOSELY AS POSSIBLE.

G. OTHER TYPES OF LADING ITEMS MAY BE LOADED IN THE CARS WHICH ARE PARTIALLY LOADED WITH THE DESIGNATED ITEM, PROVIDING THE LOAD IS COMPATIBLE, EXISTING DIRECTIVES ARE NOT VIOLATED, AND THE OTHER LADING ITEMS ARE BLOCKED AND BRACED TO EQUAL THE BLOCKING AND BRACING CRITERIA SPECIFIED.

H. REFER TO ASSOCIATION OF AMERICAN RAILROADS CIRCULAR NO. 42-D, "GENERAL RULES COVERING LOADING OF CARLOAD SHIPMENTS OF COMMODITIES IN CLOSED CARS", FOR APPLICABLE LOADING RULES.

I. WHEN STEEL STRAPPING IS SEALED AT AN END-OVER-END LAP JOINT, A MINIMUM OF TWO (2) SEALS, BUTTED TOGETHER, WITH TWO (2) PAIR OF CRIMPS PER SEAL MUST BE USED.

J. DUNNAGE LUMBER SPECIFIED THROUGHOUT THIS PROCEDURAL DRAWING IS OF NOMINAL SIZE. FOR EXAMPLE, 2" X 4" MATERIAL IS ACTUALLY 1-5/8" THICK BY 3-5/8" WIDE AND 2" X 6" MATERIAL IS ACTUALLY 1-5/8" THICK BY 5-5/8" WIDE.

K. THROUGHOUT THIS PROCEDURAL DRAWING PORTIONS OF THE BLOCKING COMPONENTS AND OF THE DEPICTED CARS, SUCH AS A CAR SIDE WALL, HAVE BEEN OMITTED FROM THE LOAD VIEWS FOR CLARITY PURPOSES.

L. NOTICE: A STAGGERED NAILING PATTERN WILL BE USED WHEREVER POSSIBLE WHEN NAILS ARE DRIVEN INTO JOINTS OF DUNNAGE ASSEMBLIES. ALSO, A STAGGERED NAILING PATTERN WILL BE USED WHEN DUNNAGE IS NAILED TO THE FLOOR OR SIDE WALL OF THE TRANSPORTING VEHICLE, OR WHEN LAMINATING DUNNAGE. ADDITIONALLY, THE NAILING PATTERN FOR AN UPPER PIECE OF LAMINATED DUNNAGE WILL BE ADJUSTED AS REQUIRED SO THAT A NAIL FOR THAT PIECE WILL NOT BE DRIVEN THROUGH ONTO OR RIGHT BESIDE A NAIL IN A LOWER PIECE.

M. IF THE CAR USED FOR A SHIPMENT IS EQUIPPED WITH A NAILABLE METAL FLOOR AND A NAIL SIZE FOR FLOOR NAILING IS MARKED ON THE SIDE WALL OF THE CAR, THAT GUIDANCE SHOULD BE APPLIED FOR THE NAILING OF THE APPLICABLE DUNNAGE PIECES. IF A NAIL SIZE IS NOT SPECIFIED, 30d NAILS SHOULD BE USED.

N. FOR ADDITIONAL GUIDANCE, ATTENTION IS DIRECTED TO THE "UNIT DETAIL" ON PAGE 3 AND TO THE "SPECIAL NOTES" SECTION WHICH IS IMMEDIATELY ADJACENT TO DEPICTED OUTLOADING METHODS.

(GENERAL NOTES CONTINUED AT RIGHT)

(GENERAL NOTES CONTINUED)

O. THE "DOORWAY AREA" WITHIN A CAR IS DEFINED AS THE CARGO SPACE THAT IS ADJACENT TO A CONVENTIONAL TYPE AND/OR A PLUG DOOR. THE LENGTH OF A "DOORWAY AREA" CAN BE AS MUCH AS 24 FEET IN SOME CARS THAT ARE EQUIPPED WITH STAGGERED DOORS.

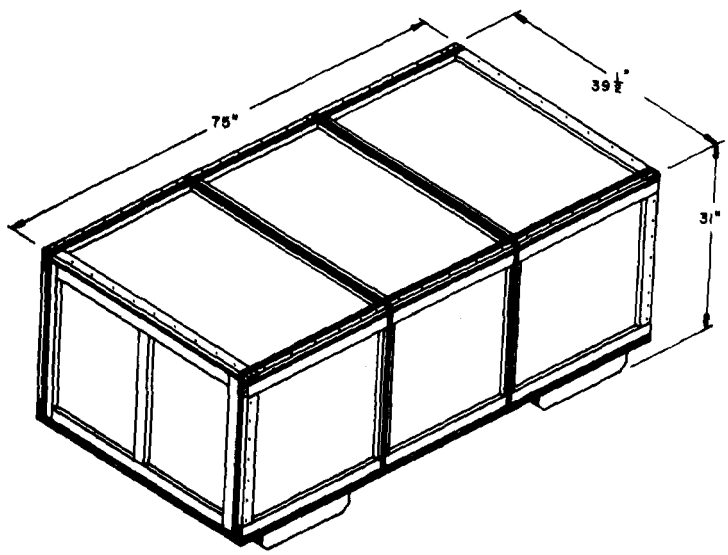
MATERIAL SPECIFICATIONS

LUMBER ----------	:	SEE TM 743-200-1, DUNNAGE LUMBER, FED SPEC MM-L-751.
NAILS ----------	:	COMMON, CEMENT COATED OR CHEMICALLY ETCHED, FED SPEC FF-N-105. ALT: ANNULAR-RING TYPE NAIL OF THE SAME SIZE.
STRAPPING, STEEL	:	TYPE I OR IV, CLASS A OR B, FED SPEC QQ-S-781.
STRAP SEALS, STAPLES ----------	:	COMMERCIAL GRADE.

PAGE 2

(Reference to page numbers in the notes within the figures refer to the number listed in the lower right- or left-hand corner of each figure.)

Figure 7-2. *Loading and bracing (CL and LCL) in boxcars of components for launcher equipment packed* on *set per wooden box* (sheet 1of 10).



ISOMETRIC VIEW

FOR DETAILS OF THE PACKING BOX AND INSTRUCTIONS FOR ASSEMBLY AND LOADING OF PACKING BOX, REFER TO U. S. ARMY MATERIEL COMMAND DRAWING NO. 19-48-3211-OSE20M2

UNIT DETAIL

PAGE 3

Figure 7–2—Continued (sheet 2 of 10).

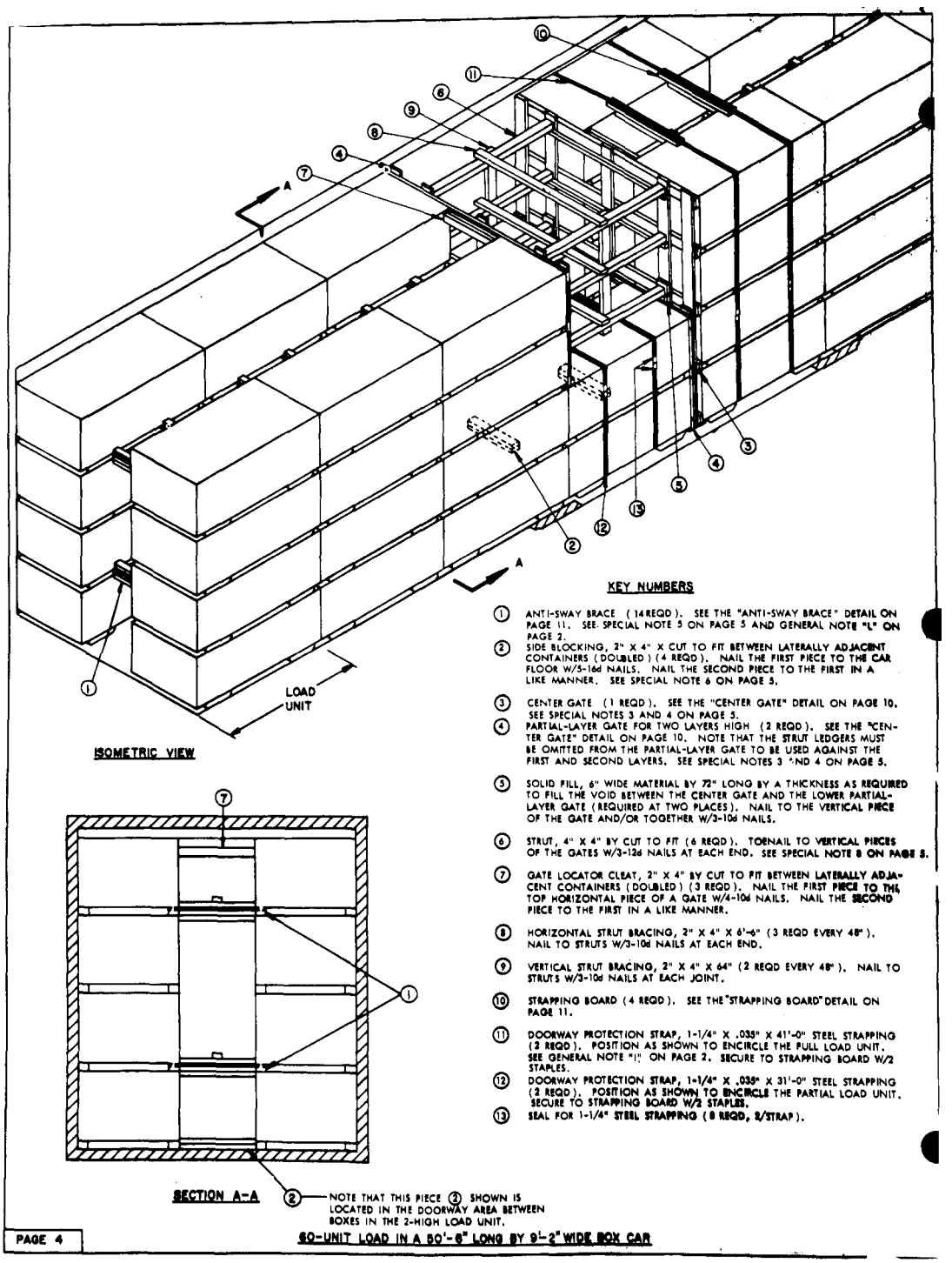


Figure 7-2-Continued (sheet 3 of 10).

SPECIAL NOTES:

1. A 50'-6" LONG BY 9'-2" WIDE BY 11'-0" HIGH BOX CAR IS SHOWN. WIDER CARS MAY BE USED; HOWEVER, NARROWER CARS ARE NOT RECOMMENDED. CARS WHICH ARE LESS THAN 10'-6" HIGH WILL BE LIMITED TO LOADS OF NOT MORE THAN THREE (3) LAYERS. SEE SPECIAL NOTE 5.

2. THE DEPICTED CAR IS EQUIPPED WITH DOOR OPENINGS WHICH ARE 12'-0" WIDE BY 10'-6" HIGH. TO FACILITATE LOADING AND UNLOADING, WIDER OR STAGGERED DOORS ARE RECOMMENDED. IF THE DOOR OPENINGS ARE LESS THAN 10'-6" HIGH, LOADING IN THE DOORWAY AREA WILL BE LIMITED TO THREE LAYERS.

3. FOR SHIPMENT OF SIXTY (60) BOXES IN A 50'-6" LONG CAR, AS SHOWN ON PAGE 4, IT WILL BE NECESSARY TO OMIT THE LOWER THREE (3) STRUT LEDGERS FROM THE CENTER GATE, PIECE MARKED ③. ALSO, OMIT ALL OF THE STRUT LEDGERS FROM THE PARTIAL-LAYER GATE, PIECE MARKED ④, WHICH IS USED IN CONJUNCTION WITH SOLID FILL FOR BRACING THE BOTTOM TWO LAYERS OF THE LOAD.

4. IF EIGHT (8) LOAD UNITS CANNOT BE LOADED IN A CAR BECAUSE OF VARIATIONS IN CONTAINER LENGTH, CAR LENGTH, OR DOOR SIZE, SEVEN (7) LOAD UNITS MAY BE SHIPPED. THESE SEVEN LOAD UNITS WILL BE BRACED WITH TWO (2) CENTER GATES, PIECE MARKED ③, AND TEN (10) STRUTS, PIECE MARKED ⑥. ADJUST QUANTITIES OF OTHER PIECES, AS NECESSARY.

5. IF A THREE-LAYER LOAD IS BEING SHIPPED, INSTALL THE TOP LEVEL OF ANTI-SWAY BRACE ASSEMBLIES BETWEEN THE SECOND AND THIRD LAYERS OF THE LOAD. ADJUST THE HEIGHT OF THE CENTER GATES AS SPECIFIED IN THE "GATE CONSTRUCTION CHART" ON PAGE 10.

6. IF THE CAR OFFERED FOR THE SHIPMENT OF THE TOW LAUNCHER SET IS EQUIPPED WITH STAGGERED AND/OR PLUG DOORS, IT MAY BE USED. HOWEVER, IF A LOAD UNIT EXTENDS 30" INTO THE DOORWAY AREA AT EITHER SIDE OF THE LOAD UNIT, THAT END OF THE LOAD UNIT MUST BE SECURED BY INSTALLING PIECES MARKED ②, ⑩, ⑪ AND ⑬. IF A LOAD UNIT EXTENDS 60" INTO THE DOORWAY AREA AT EITHER SIDE OF THE LOAD UNIT, BOTH ENDS OF THE LOAD UNIT MUST BE SO SECURED. SEE GENERAL NOTE "O" ON PAGE 2.

7. IF THE DELINEATED OUTLOADING METHOD IS USED FOR THE SHIPMENT OF A LOAD WHICH CONTAINS A LOAD UNIT OF LESS BOXES THAN SHOWN TO SATISFY A LESS-THAN-FULL-LOAD QUANTITY, A "FILLER ASSEMBLY", AS DETAILED ON PAGE 11, MUST BE SUBSTITUTED FOR EACH OMITTED BOX. THE TOP BOX OF A STACK IN ONE OF THE TWO END LOAD UNITS IS A PREFERRED LOCATION. A "FILLER ASSEMBLY" MUST NOT BE USED IN THE DOORWAY AREA. IF THE QUANTITY TO BE SHIPPED CANNOT READILY BE ACHIEVED BY SUBSTITUTION OF ONE OR MORE FILLER ASSEMBLIES, A K-BRACE ASSEMBLY MAY BE INSTALLED TO RETAIN THE PARTIAL LAYER. REFER TO PAGE 8 FOR THE K-BRACE SPECIFICATIONS AND A TYPICAL INSTALLATION.

8. IF 4" X 4" MATERIAL IS NOT AVAILABLE FOR STRUTS, 2" X 4" MATERIAL MAY BE SUBSTITUTED. LAMINATE W/1-10d NAIL EVERY 6" AND TOENAIL TOP PIECE TO VERTICAL PIECES OF THE GATES W/3-12d NAILS AT EACH END.

BILL OF MATERIAL

LUMBER	LINEAR FEET	BOARD FEET
1" X 4"	92	31
1" X 6"	107	54
2" X 2"	33	11
2" X 3"	6	3
2" X 4"	370	247
2" X 6"	113	113
4" X 4"	39	52

NAILS	NO. REQD	POUNDS
6d (2")	443	2-3/4
10d (3")	498	7-3/4
12d (3-1/4")	36	3/4
16d (3-1/2")	40	1

STRAPPING, STEEL, 1-1/4" X .035"	144'-0"	20-1/2 LBS
SEALS FOR 1-1/4" STRAPPING	8 REQD	1/2 LB
STAPLES FOR 1-1/4" STRAPPING	8 REQD	NIL

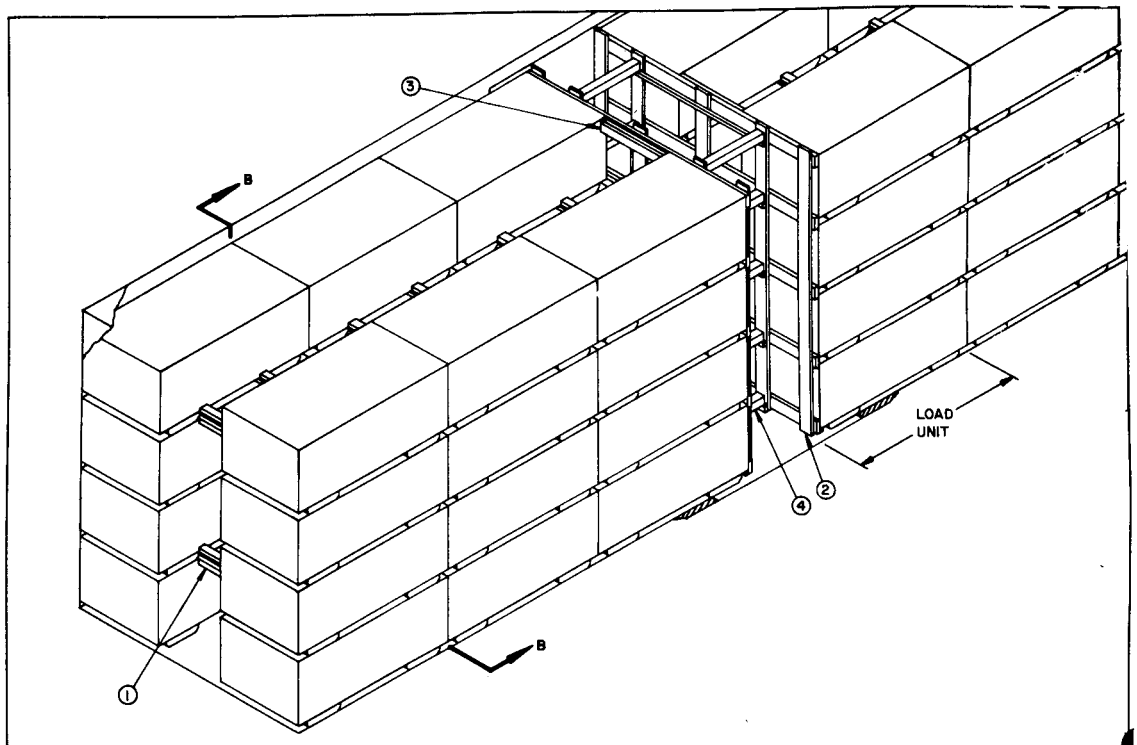
LOAD AS SHOWN

ITEM	QUANTITY	WEIGHT
TOW LAUNCHER SET (BOXED)	60	30,000 LBS
DUNNAGE		1,311 LBS
TOTAL WEIGHT		31,311 LBS

60-UNIT LOAD IN A 50'-6" LONG BY 9'-2" WIDE BOX CAR

PAGE 5

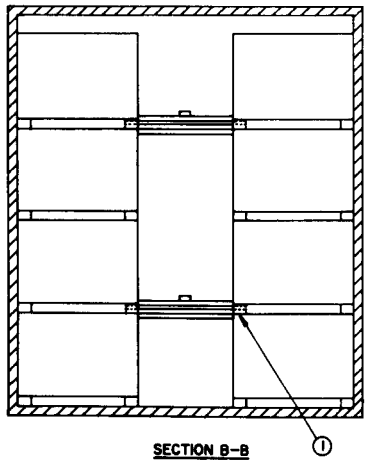
Figure 7-2-Continued (sheet 4 of 10).



ISOMETRIC VIEW

KEY NUMBERS

1. ANTI-SWAY BRACE (12 REQD). SEE THE "ANTI-SWAY BRACE" DETAIL ON PAGE 11. SEE SPECIAL NOTE 3 ON PAGE 7 AND GENERAL NOTE "L" ON PAGE 2.
2. CENTER GATE (2 REQD). SEE THE "CENTER GATE" DETAIL ON PAGE 10.
3. GATE LOCATOR CLEAT, 2" X 4" BY CUT TO FIT BETWEEN LATERALLY ADJACENT CONTAINERS (DOUBLED) (2 REQD). NAIL THE FIRST PIECE TO THE TOP HORIZONTAL PIECE OF CENTER GATE W/4-10d NAILS. NAIL THE SECOND PIECE TO THE FIRST IN A LIKE MANNER.
4. STRUT, 4" X 4" BY CUT TO FIT (10 REQD). TOENAIL TO THE VERTICAL PIECES OF THE CENTER GATES W/3-12d NAILS AT EACH END. NOTE THAT IF 4" X 4" MATERIAL IS NOT AVAILABLE, DOUBLED 2" X 4" MATERIAL MAY BE SUBSTITUTED. LAMINATE W/1-10d NAIL EVERY 6".



SECTION B-B

PAGE 6

48-UNIT LOAD IN A 40'-6" LONG BY 9'-2" WIDE BOX CAR

Figure 7-2-Continued (sheet 5 of 10).

SPECIAL NOTES:

1. A 40'-6" LONG BY 9'-2" WIDE BY 11'-0" HIGH BOX CAR IS SHOWN. WIDER CARS MAY BE USED; HOWEVER, NARROWER CARS ARE NOT RECOMMENDED. CARS WHICH ARE LESS THAN 10'-6" HIGH WILL BE LIMITED TO LOADS OF NOT MORE THAN THREE (3) LAYERS. SEE SPECIAL NOTE 3.

2. THE DEPICTED CAR IS EQUIPPED WITH DOOR OPENINGS WHICH ARE 6'-0" WIDE BY 10'-6" HIGH. TO FACILITATE LOADING AND UNLOADING, WIDER DOORS ARE RECOMMENDED. SEE SPECIAL NOTE 4. IF THE DOOR OPENINGS ARE LESS THAN 10'-6" HIGH, LOADING IN THE DOORWAY AREA WILL BE LIMITED TO THREE LAYERS.

3. IF A THREE-LAYER LOAD IS BEING SHIPPED, INSTALL THE TOP LEVEL OF ANTI-SWAY BRACE ASSEMBLIES BETWEEN THE SECOND AND THIRD LAYERS OF THE LOAD. ADJUST THE HEIGHT OF THE CENTER GATES AS SPECIFIED IN THE "GATE CONSTRUCTION CHART" ON PAGE 10.

4. IF THE CAR OFFERED FOR THE SHIPMENT OF THE TOW LAUNCHER SET IS EQUIPPED WITH WIDER, STAGGERED, AND/OR PLUG DOORS, IT MAY BE USED. HOWEVER, IF A LOAD UNIT EXTENDS 30" INTO THE DOORWAY AREA AT EITHER SIDE OF THE LOAD UNIT, THAT END OF THE LOAD UNIT MUST BE SECURED BY INSTALLING THE PIECES MARKED ②, ⑩, ⑪ AND ⑬ SHOWN ON PAGE 4. IF A LOAD EXTENDS 60" INTO THE DOORWAY AREA AT EITHER SIDE OF THE LOAD UNIT, BOTH ENDS OF THE LOAD UNIT MUST BE SO SECURED. SEE GENERAL NOTE "O" ON PAGE 2.

5. IF THE DELINEATED OUTLOADING METHOD IS USED FOR THE SHIPMENT OF A LOAD WHICH CONTAINS A LOAD UNIT OF LESS BOXES THAN SHOWN TO SATISFY A LESS-THAN-FULL-LOAD QUANTITY, A "FILLER ASSEMBLY", AS DETAILED ON PAGE 11, MUST BE SUBSTITUTED FOR EACH OMITTED BOX. THE TOP BOX OF A STACK IN ONE OF THE TWO END LOAD UNITS IS A PREFERRED LOCATION. A "FILLER ASSEMBLY" MUST NOT BE USED WITHIN THE DOORWAY AREA. IF THE QUANTITY TO BE SHIPPED CANNOT READILY BE ACHIEVED BY SUBSTITUTION OF ONE OR MORE FILLER ASSEMBLIES, A K-BRACE ASSEMBLY MAY BE INSTALLED TO RETAIN THE PARTIAL LAYER. REFER TO PAGE 8 FOR THE K-BRACE SPECIFICATIONS AND A TYPICAL INSTALLATION.

BILL OF MATERIAL

LUMBER	LINEAR FEET	BOARD FEET
1" X 4"	78	26
1" X 6"	105	53
2" X 2"	54	18
2" X 3"	12	6
2" X 4"	249	166
2" X 6"	92	92
4" X 4"	25	38
NAILS	**NO. REQD**	**POUNDS**
6d (2")	269	1-3/4
10d (3")	370	5-3/4
12d (3-1/4")	60	1

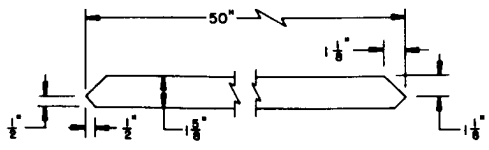
LOAD AS SHOWN

ITEM	QUANTITY	WEIGHT (APPROX)
TOW LAUNCHER SET (BOXED)	48	24,000 LBS
DUNNAGE		1,000 LBS
TOTAL WEIGHT		25,000 LBS

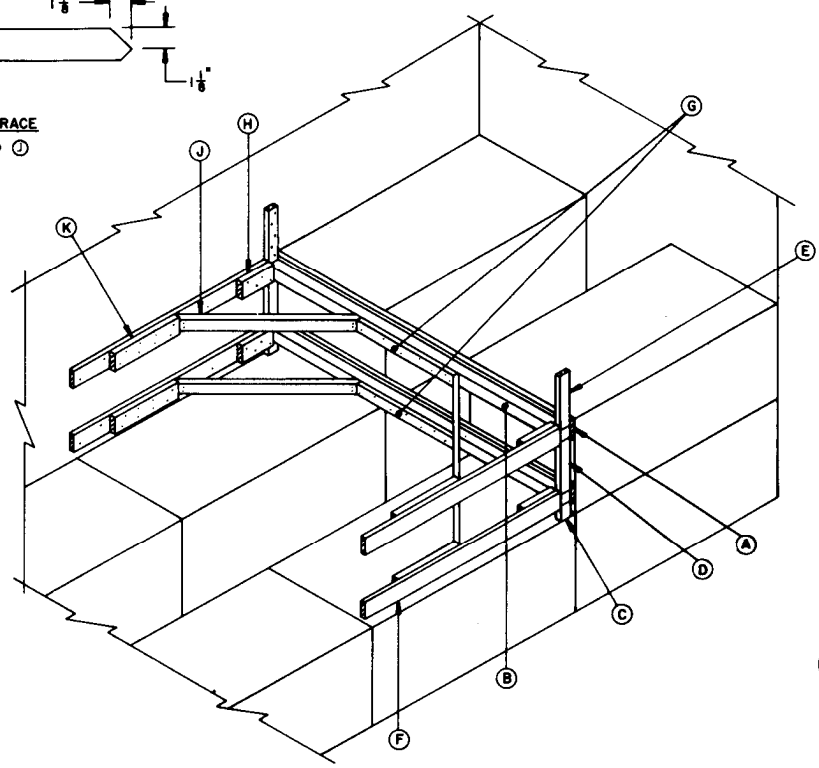
48-UNIT LOAD IN A 40'-6" LONG BY 9'-2" WIDE BOX CAR

PAGE 7

Figure 7-2-Continued (sheet 6 of 10).



DIAGONAL BRACE
PIECE MARKED (J)



ISOMETRIC VIEW

SPECIAL NOTES:

1. A 9'-2" WIDE (INSIDE CLEARANCE) CONVENTIONAL TYPE CAR IS SHOWN.
2. A K-BRACE ASSEMBLY AS SHOWN IS ADEQUATE FOR RETAINING A MAXIMUM PARTIAL LAYER LOAD OF 8,000 POUNDS. CAUTION: SOME CARS ARE NOT SUITED FOR THE APPLICATION OF "PARTIAL LAYER BRACING" BECAUSE THE LENGTH OF THE PARTIAL LAYER TO BE SHIPPED AND/OR THE SIZE OR CONFIGURATION OF THE CAR DOORS WILL NOT PERMIT PROPER INSTALLATION OF THE SPECIFIED K-BRACE DUNNAGE. PIECES MARKED (A), (B), (C), (D), (E) AND (H) MUST BE SUPPORTED AT THE SIDES OF A CAR BY A CAR SIDE WALL. IT IS ALRIGHT FOR THE END OF A DIAGONAL BRACE TO BEAR IN FRONT OF A DOOR OPENING; HOWEVER, THE ADJACENT PIECE MARKED (F) MUST BE DOUBLED AND EXTENDED ACROSS AND FAR ENOUGH PAST THE DOOR OPENING TO PROVIDE FOR THE SPECIFIED NAILING OF EACH PIECE.
3. THE K-BRACE ASSEMBLY IS SHOWN INSTALLED AGAINST BOXES IN AN END OF A CAR. IF DESIRED, THE ASSEMBLY MAY BE CONSTRUCTED IN THE END OF A CAR AND USED FOR THE BRACING OF THE BALANCE OF THE LAYER OF BOXES. MULTIPLES OF TWO BOXES UP TO AND INCLUDING FOURTEEN MAY BE BRACED IN THIS MANNER. A "FILLER ASSEMBLY" MUST BE INSTALLED TO OBTAIN AN UNEVEN QUANTITY.

KEY LETTERS

(A) BUFFER, 2" X 6" X CAR WIDTH (2 REQD). NAIL TO PIECE MARKED (B) W/1-12d NAIL EVERY 12".
(B) CROSS CAR BRACE, 4" X 4" X CAR WIDTH (2 REQD).
(C) WALL CLEAT, 2" X 4" X 5" (2 REQD). NAIL TO CAR SIDE WALL W/2-12d NAILS.
(D) SPACER CLEAT, 2" X 4" X 18" (2 REQD). NAIL TO CAR SIDE WALL W/5-12d NAILS.
(E) WALL CLEAT, 2" X 4" X 18" (2 REQD). NAIL TO CAR WALL W/5-12d NAILS.
(F) HORIZONTAL WALL CLEAT, 2" X 6" X 72" (4 REQD). NAIL TO CAR SIDE WALL W/16-12d NAILS.
(G) CENTER CLEAT, 2" X 4" X 28" FOR AN 8'-6" WIDE CAR OR 2" X 4" X 36" FOR A 9'-2" WIDE CAR. NAIL TO PIECE MARKED (B) W/7-12d NAILS.
(H) POCKET CLEAT, 2" X 6" X 12" (4 REQD). NAIL TO PIECE MARKED (F) W/4-16d NAILS.
(J) DIAGONAL BRACE, 2" X 4" X 50" (4 REQD). SEE "DIAGONAL BRACE" DETAIL ABOVE. TOENAIL TO PIECES MARKED (B) AND (F) W/2-16d NAILS AT EACH END.
(K) BACK-UP CLEAT, 2" X 6" X 24" (4 REQD). NAIL TO PIECE MARKED (F) W/8-16d NAILS.

PAGE 8

PARTIAL LAYER BRACING (K-BRACE)

Figure 7-2-Continued (sheet 7 of 10).

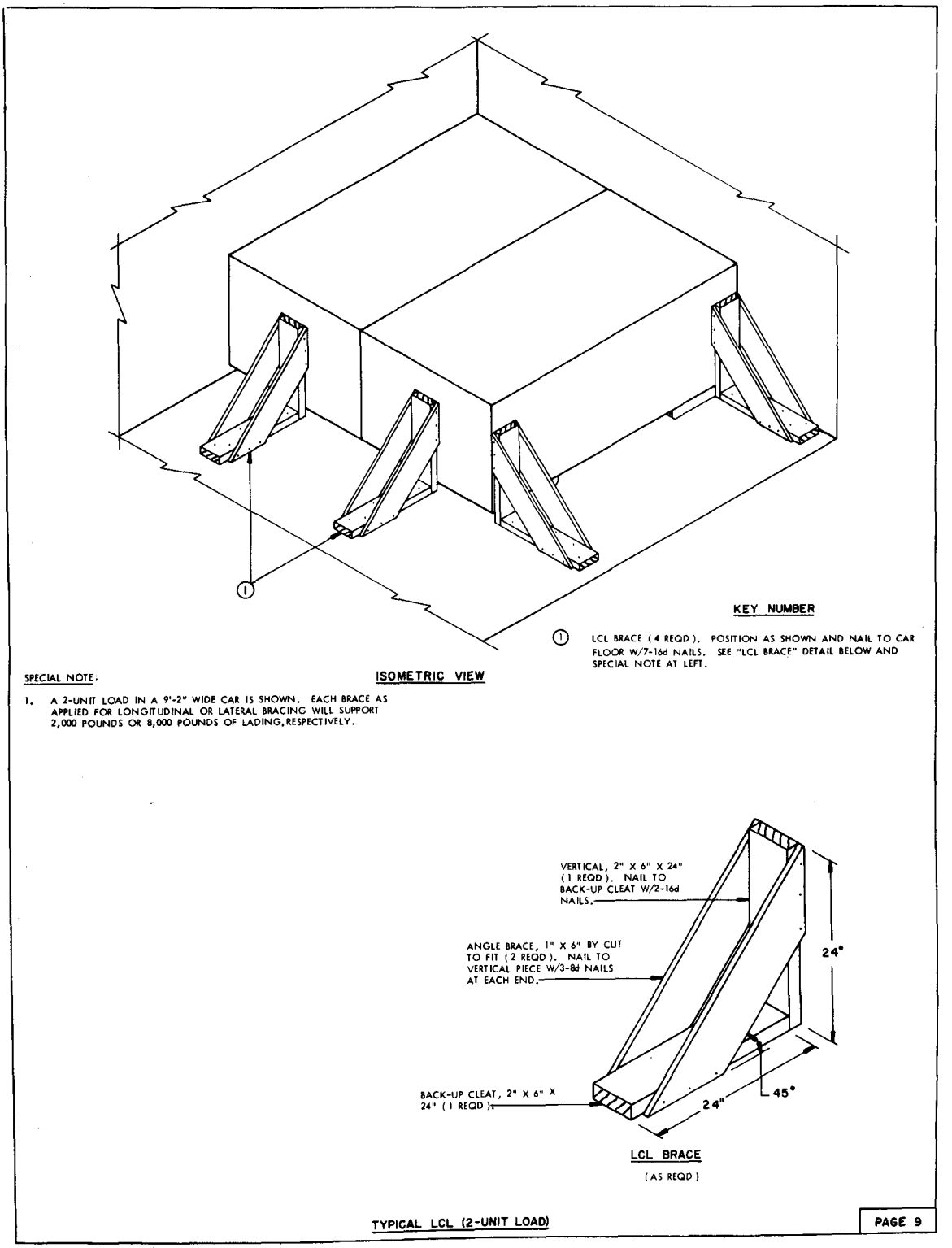


Figure 7-2 Continued (sheet 8 of 10).

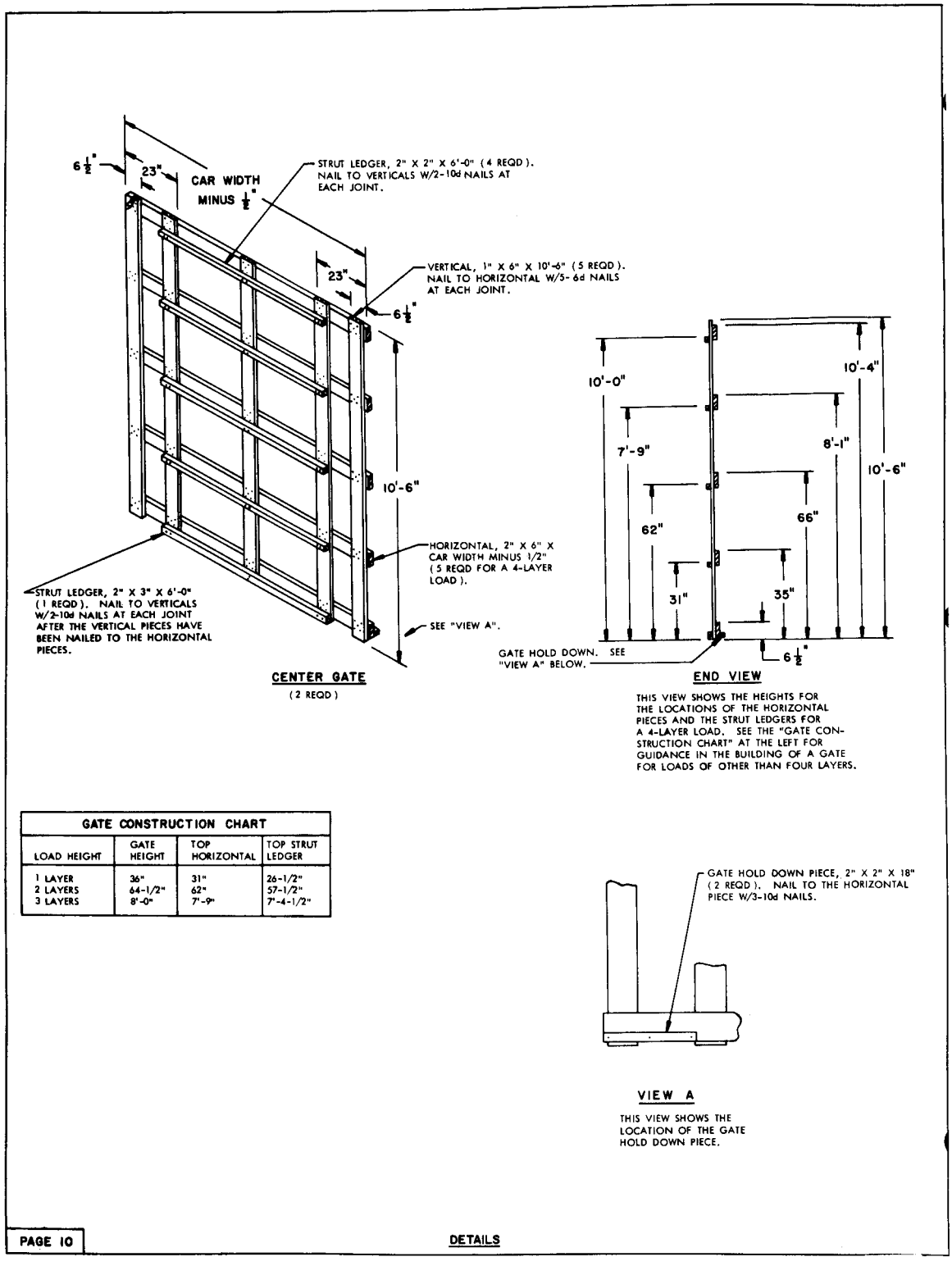


Figure 7-2-Continued (sheet 9 0f 10).

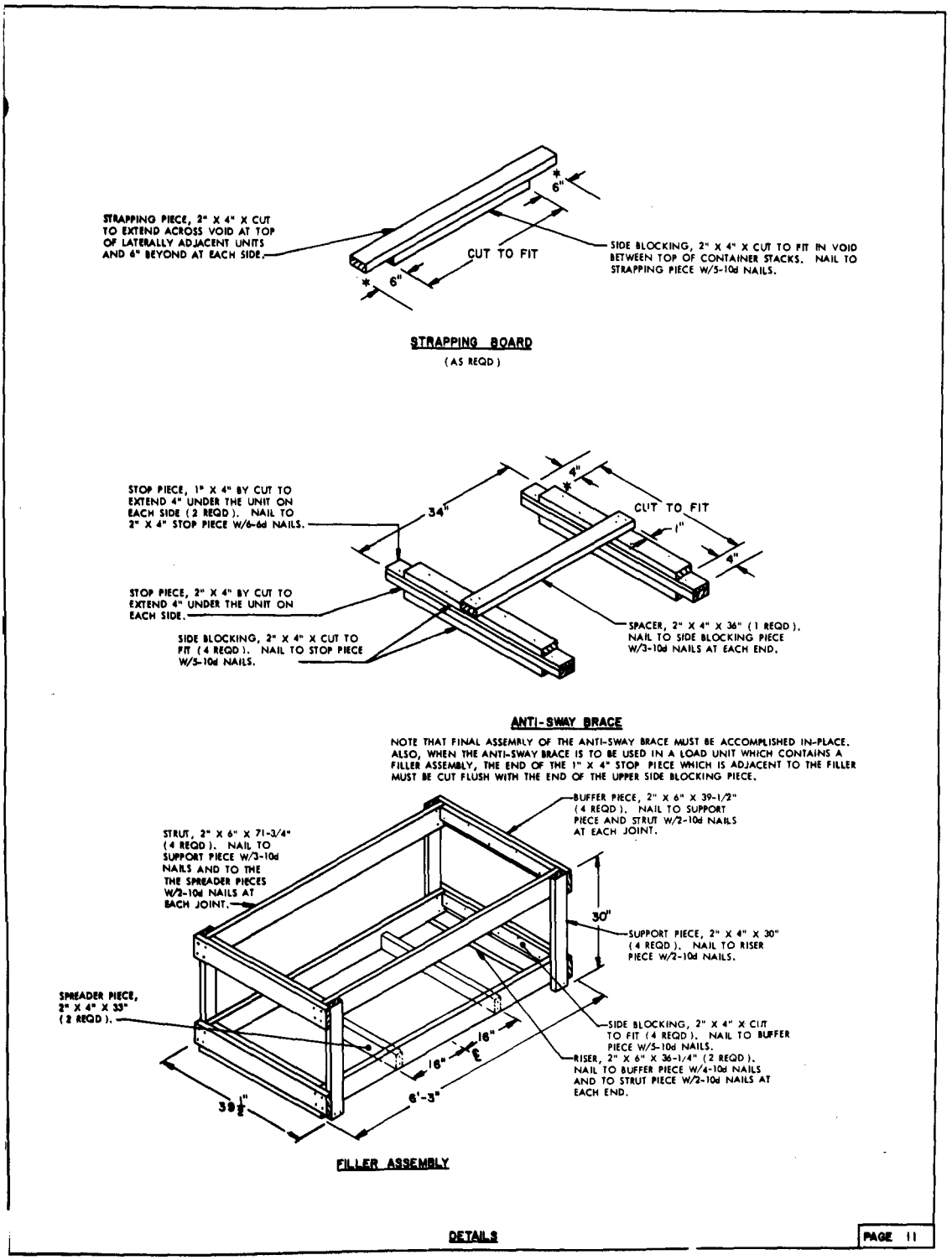


Figure 7-2-Continued (sheet 10 of 10).

Table 6-6. Application of Materials for Blocking and Bracing of Carrier in Hold of General Cargo Vessel (Fig 6-8)-Continued

Item	No. required	Application
E	4	Clevis (shackles) (see table 6-5). Secure one shackle at each towing lug (two at front and two at rear end of vehicle).
F	4	Wire rope, 5/8-in., in a complete loop. Secure with clips (item G). Attach to front and rear shackles and padeyes.
G	16	Clamps, 5/8-in., wire-rope, U-bolt clips. Used to secure item E in complete loop.
H	4	Padeye, four required on floor vessel.
J	as required	Bracing, 4- x 6-in. x length-to-suit. Brace as required against vehicle blocking, side of vessel, or adjacent cargo blocking to immobile vehicle and blocking. Secure each end to adj acent bracing or blocking by toenailing with four 40d nails.

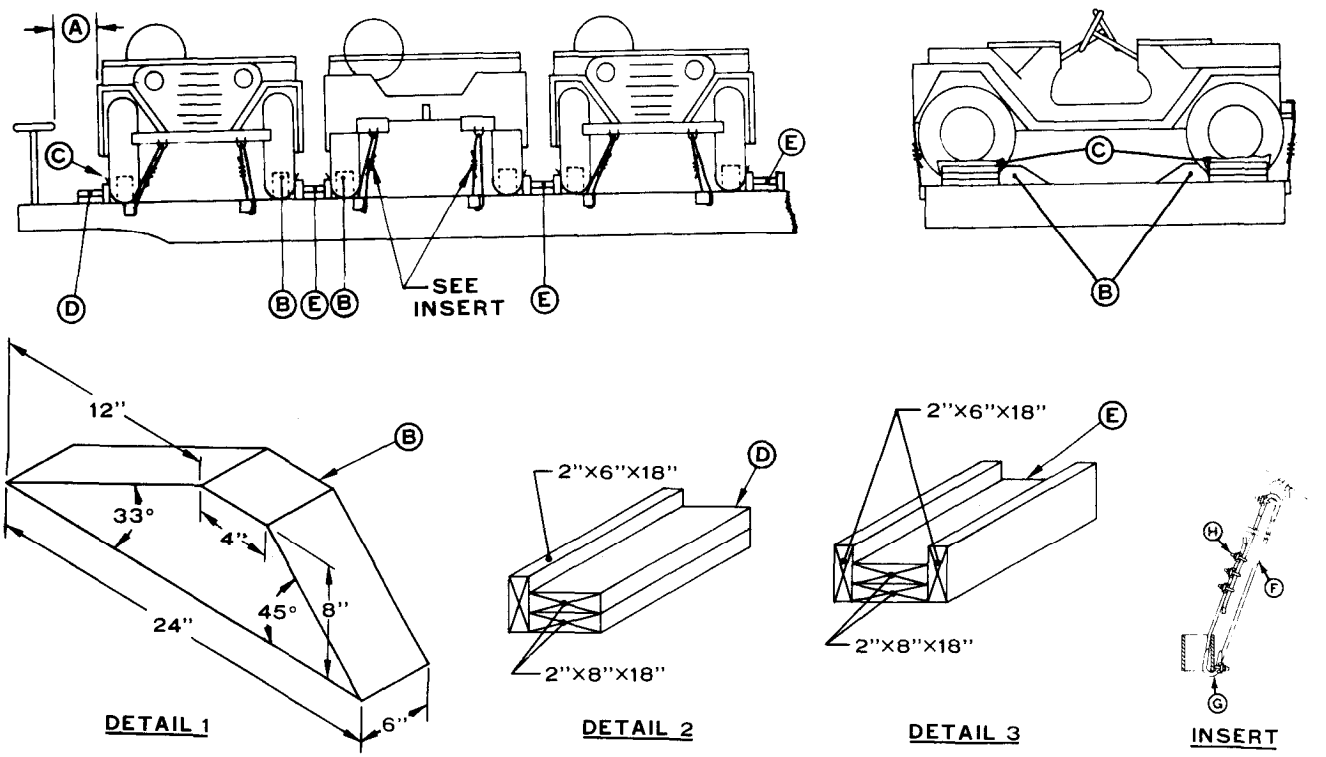


Figure 7-3. Blocking and tiedown diagram for multiple loading of ¼-ton trucks crosswise on general-purpose flat cars.

Table 7-1. Bill of Materials for Blocking and Tiedown of Multiple Loading of ¼-Ton Trucks Crosswise on General-Purpose Flatcars (Fig 7-3)

Item	Description	Approximate quantity
Lumber	Douglas fir, or comparable, straight-grain, free from material defects; Fed Spec MM-L-751c: 2- x 6-in.	9 linear ft
	2- x 8-in.	12 linear ft
	6- x 8-in.	6 linear ft
Nails	Common, steel; flathead; bright or cement-coated; table X1-b, Fed Spec FF-N-105a: 12d	18
	20d	24
	30d	20
Wire rope	6X19, IWRC; improved plow steel; preformed, regular-lay; table X, Fed Spec RR-W-410a: 3/8-in.	40 ft
Clamps	Wire-rope, U-bolt clips, saddled, single-grip, steel, Crosby heavy-duty (or equal); Fed Spec FF-C-450d: 3/8-in.	16
Thimbles	Standard, open-type: 3/8-in.	4
Cushioning material	Waterproof paper, or suitable material.	as required

NOTE

After the first vehicle is loaded, the second and succeeding vehicles will require 3 feet less of 2- by 6-inch lumber, 6 feet less of 2- by 8-inch lumber, and 12 less 12d nails, and 12 less 20d nails. Lumber and nail requirements will vary depending on the number of vehicles loaded.

Table 7-2. Application of Materials for Blocking and Tiedown of Multiple Loading of ½-Ton Trucks Crosswise on General-Purpose Flatcars (Fig 7-3)

Item	No. required	Application
A	—	Brake-wheel clearance. Minimum clearance required is 6 in. above, in back of, and on both sides of and 4 in. underneath wheel.
B	4 each vehicle	Wheel block (detail 1, fig 7-3), 6- x 24-in. Locate 45° portion of block against inside of front and rear wheels as shown. Nail heel of block to car floor with three 30d nails, and toenail that portion of block under tire with two 30d nails.
C	as required	Suitable protective material such as waterproof paper or burlap. Locate bottom portion under items D and E, the top portion to extend 2 in. above items D and E.
D	2	Each vehicle wheel blocking (detail 2, fig 7-3), each to consist of one piece of 2- x 6- x 18-in. lumber and two pieces of 2- x 8- x 18-in. lumber. Nail one edge of 2- x 6- x 18-in. piece to bottom piece of 2- x 8- x 18-in. lumber with three 12d nails as shown in detail 2, figure 7-3. Place against tire, and nail to car floor with three 20d nails. Nail other 2- x 8- x 18-in. piece to one below in a like manner.
E	2 between vehicles*	Between-vehicles wheel blocking (detail 3, fig 7-3), each to consist of two pieces of 2- x 6- x 18-in. lumber and two pieces of 2- x 8- x 18-in. lumber. Nail bottom edge of two 2- x 6- x 18-in. pieces to bottom 2- x 8- x 18-in. piece with three 12d nails on each side. Secure assembled pieces to car floor through 2- x 8-in. piece with three 20d nails. Nail other 2- x 8- x 18-in. piece to one below in a like manner.
F	4 each vehicle	Wire rope, ⅜-in. (insert, fig 7-3), Attach to each stake pocket and each tiedown shackle as indicated.
G	8	Thimbles, ⅜-in. (insert, fig 7-3). Locate one thimble at each stake pocket and on each tiedown shackle.
H	20	Clamps, ⅜-in. (insert, fig 7-3). Secure ends of wire rope with three clamps each. Secure thimbles with one clamp each.

GENERAL INSTRUCTIONS

1. Shippers should specify cars 9 ft 6 in. wide or wider, 53 ft 6 in. long for the loading of nine vehicles.
2. Handbrakes must be set.
3. Gearshift lever must be placed in neutral position.
4. Wire rope must be applied as near to parallel to each other as possible. Tiedown wire rope must not be crossed.
5. When rail line clearances require, spare wheel assembly and mounting bracket, rear bumperettes, towing pintle, and water/gas can with carrier should be removed from the vehicle prior to loading and securely stowed in cargo compartment.
6. A staggered nailing pattern will be used when lumber is nailed to floor of the railcar, or when laminating lumber. Additionally, the nailing pattern for an upper piece of laminated lumber will be adjusted as required so that a nail for that piece will not be driven through, onto, or right beside a nail in the lower piece of lumber.
7. Loading rules 4, 5, 7, 9, 14, 15, 19–A, and 19–B, appearing in section 1 of the *Rules Governing the Loading of Commodities on Open Top Cars* published by the Association of American Railroads provide applicable guidelines and are mandatory in application.

*16 required for 9 vehicles on 53-foot 6-inch car.

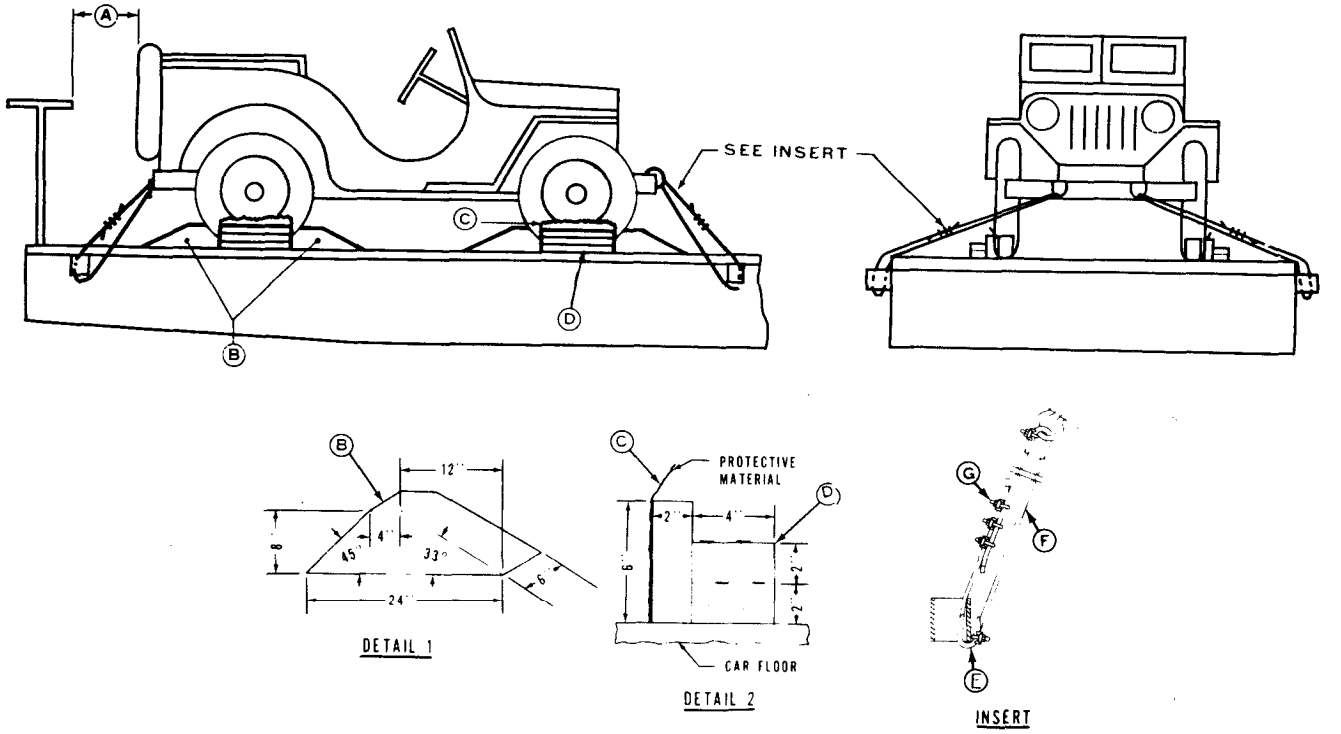


Figure 7-4. Blocking and tiedown diagram for ¼-ton truck lengthwise on

Table 73. Bill of Materials for Blocking and Tiedown of ¼-Ton Truck Lengthwise on General-Purpose Flatcars (Fig 7-4)

Item	Description	Approximate quantity
Lumber	Douglas fir, or comparable, straight-grain, free from material defects, Fed Spec MM-L-751c: 2- x 4-in.	12 linear ft
	2- x 6-in.	6 linear ft
	6- x 8-in.	12 linear ft
Nails	Common, steel; flathead; bright or cement-coated; table X1-b, Fed Spec FF-N-105a: 12d	12
	20d	24
	30d	40
Wire rope	6X19, IWRC; improved plow steel; preformed; regular-lay; table X, Fed Spec RR-W-410a: ⅜-in.	60 ft
Clamps	Wire-rope, =-bolt clips, saddled, single-grip, steel, Crosby heavy-duty (or equal); Fed Spec FF-C-450d: ⅜-in.	20
Thimbles	Standard, open-type: ⅜-in.	8
Cushioning	Waterproof paper, or suitable material	as required

Table 7-4. Application of Materials for Blocking and Tiedown of ¼-Ton Truck Lengthwise on General-Purpose Flatcars (Fig 7-4)

Item	No. required	Application
A	—	Brake-wheel clearance. Minimum clearance required in 6 in. above, in back of, and on both sides of and in. underneath wheel.
B	8	Blocks (detail 1, fig 7-4), 6- x 8- x 24-in. lumber. Locate 45° portion of block against front and rear of each wheel. Nail heel of block to car floor with three 30d nails, and toenail that portion of block under tire to car floor with two 30d nails before items C and D are applied.
C	1 each Item D	Suitable material (detail 2, fig 7-4), such as waterproof paper or burlap. Locate bottom portion under item D, the top portion to extend 2 in. above item D.
D	4	Side blocking (detail 2, fig 7-4), each to consist of one piece of 2- x 6- x 18-in. lumber and two pieces of 2- x 4- x 18-in. lumber. Nail one edge of 2- x 6- x 18-in. piece to bottom piece of 2- x 4- x 18-in. with three 12d nails. Place against tire, and nail to car floor with three 20d nails. Nail other 2- x 4- x 18-in. piece to one below in a like manner; locate as shown.
	8	Thimbles, ⅜-in. (insert, fig 7-4). Locate one thimble at each stake pocket and on each tiedown shackle.

Table 7-4. *Application of Materials for Blockin and Tiedown of ¼-Ton Truck Lengthwise on General-Purpose Flatcars* (Fig 7-4)—Continued

F	4	Wire rope, ⅜-in. (insert, fig 7-4). Attach to each stake pocket and each tiedown shackle as indicated in figure 7-4.
G	20	Clamps, ⅜-in. (insert, fig 7-4). Secure ends of wire rope with three clamps each. Secure thimbles with one clamp each.

General Instructions

For further details refer to Association of American Railroads *Rules Governing the Loading of Commodities on Open Top Cars* and General Rules 4, 5, 9, 11, 14, 15, 19–A, and 19–B.

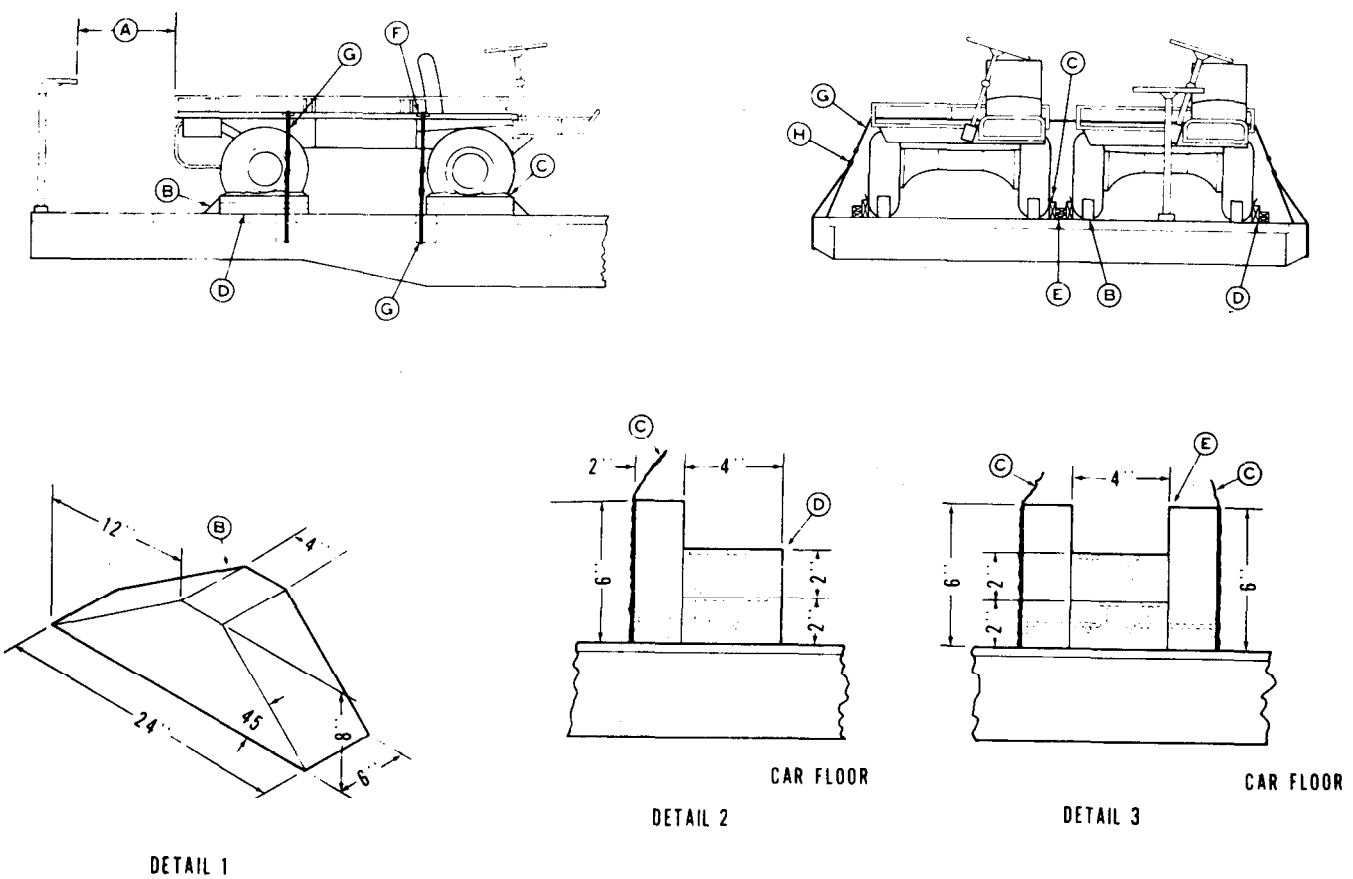


Figure 7-5. *Blocking and tiedown diagram for two ½-ton trucks lengthwise on general-purpose flatcars.*

Table 7-5. *Bill of Materials for Blocking and Tiedown of Two ½-Ton Trucks Lengthwise on General-Purpose Flatcars* (Fig 7-5)

Item	Description	Approximate quantity
Lumber	Douglas fir, or comparable, straight-grain, free from material defects; Fed Spec MM–L–751c: 2- x 4-in.	18 linear ft
	2- x 6-in.	12 linear ft
	6- x 8-in.	12 linear ft
Nails	Common, steel; flathead; bright or cement-coated; table X1–b, Fed Spec FF–N–105a: 12d	24
	20d	36
	40d	40
Cushioning material.	Waterproof paper, or suitable material	as required
Steel strapping.	1¼- x 0.35-in. thick	40 ft
Corner protectors.	1¼-in.	4
Seals	1¼-in.	8

Table 7–6. Application of Materials for Blocking and Tiedown of Two ½-Ton Trucks Lengthwise on General-Purpose Flatca
(Fig 7-5)

Item	No. required	Application
A	—	Brake-wheel clearance. Minimum clearance required is 6 in. above, in back of, and c both sides of and 4 in. underneath wheel.
B	8	Block (detail 1, fig 7-5), 6- x 8- x 24-in. lumber. Locate 45° portion of block again front of front wheels and against rear of rear wheels. Nail heel of block to car flo with three 40d nails, and toenail that portion of block under tire to car floor wit two 40d nails before items C and D are applied.
C	1 each Item D	Suitable material such as waterproof paper or burlap. Locate bottom portion und item D, the top portion to extend 2 in. above item D.
D	1 each outside wheels.	Side blocking (detail 2, fig 7-5), each to consist of one piece of 2- x 6- x 18-in. lumbe and two pieces of 2- x 4- x 18-in. lumber. Nail one edge of 2- x 6- x 18-in. piece t bottom piece of 2- x 4- x 18-in. with three 12d nails. Place against tire, and nail t car floor with three 20d nails. Nail other 2- x 4- x 18-in. piece to one below in a lik manner; locate as shown.
E	1 each outside wheels.	Side blocking (detail 3, fig 7-5), each to consist of two pieces of 2- x 6- x 18-in. lumbe and two pieces of 2- x 4- x 18-in. lumber. Nail one edge of two 2- x 6- x 18-i pieces to bottom of 2- x 4- x 18-in. piece with three 12d nails each. Place agains first vehicle tire, and nail to car floor with three 20d nails. Nail other 2- x 4- x 18-i piece to one below in like manner; locate as shown. Load second vehicle tightl against item E.
F	4	Corner protectors for 1¼- x .035-in steel strapping. Locate two on each outside edg of vehicle as indicated on figure 7–5.
G	2	Steel strapping, 1¼- x .035- x 240-in. Pass over vehicle and secure to stake pocket on opposite sides of car with two seals at each joint (fig 7–5).
H	8	Seals (crimped two times) for 1¼-in. steel strapping. Locate as indicated on figure 7-5.

Table 7-7. Bill of Materials for Blocking and Tiedown of Two Unitized ½-Ton Trucks Lengthwise on General-Purpose Flatcar
(Fig 7-6)

Item	Description	Approximate quantity
Lumber	Douglas fir, or comparable, straight-grain, free from material defects; Fed Spec MM–L–751c: 2- x 4-in.	30 lear ft
	2- x 6-in.	12 linear ft
	4- x 4-in.	16 linear ft
	6- x 8-in.	12 linear ft
Nails	Common, steel; flathead, bright or cement-coated; table X1–b, Fed Spec FF–N–105a: 10d	24
	12d	24
	20d	36
	40d	40
Cushioning material.	Waterproof paper, or suitable material	as required
Steel banding.	¾- x .035-in. thick	54 ft
	1¼- x .035-in. thick	74 ft
	2-in. x .050-in. thick	52 ft
Corner protectors.	¾-in.	16
	1¼-in.	16
	2-in.	4
Seals	¾-in.	4
	1¼-in.	4
	2-in.	8

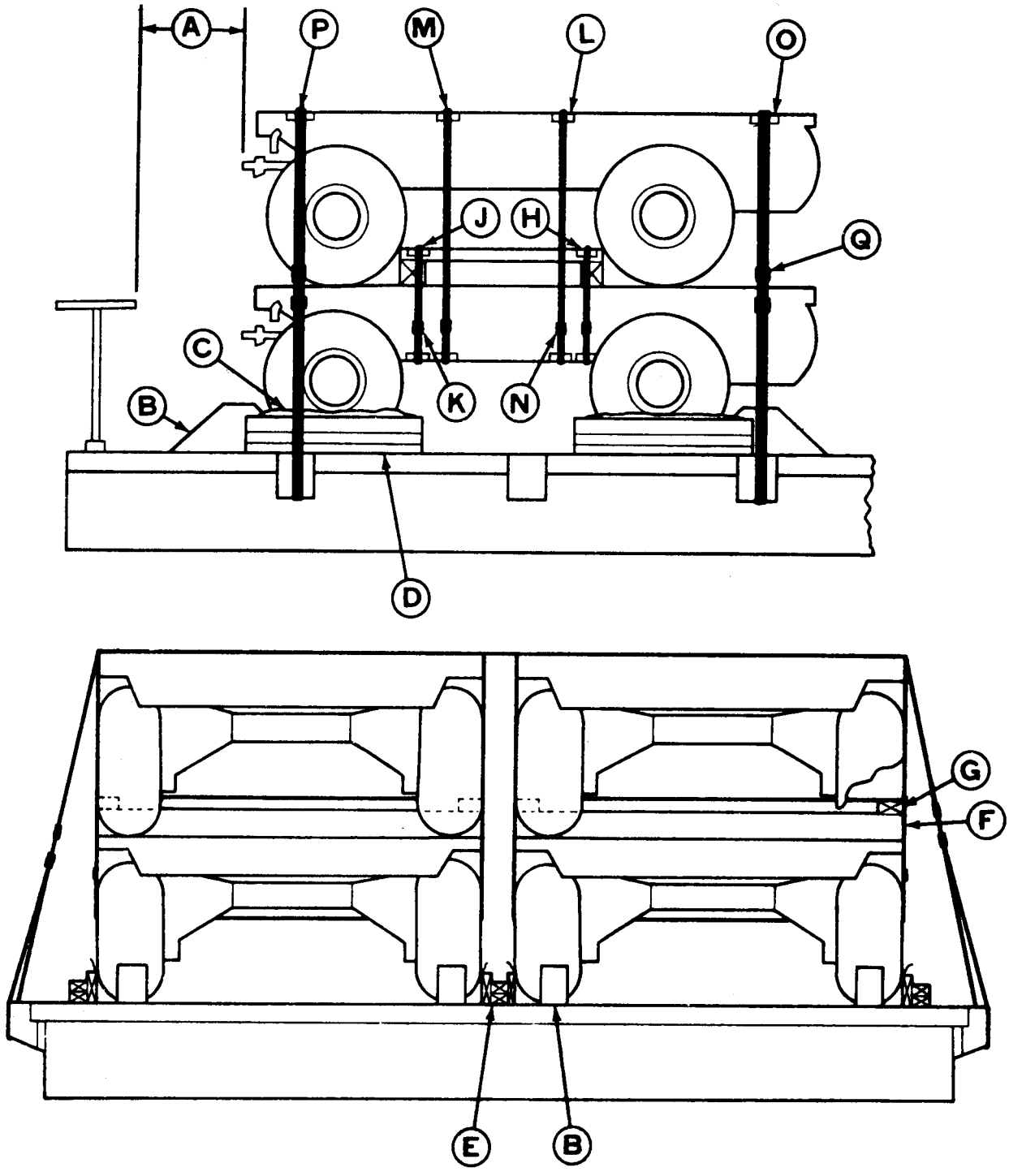


Figure 7-6. Blocking and tiedown diagram for two unitized ½-ton trucks lengthwise on general-purpose flatcars.

Table 7-8. Application of Materials for Blocking and Tiedown of Two United ½-Ton Trucks Lengthwise on General-Purpose Flatcars (Fig 7-6)

Item	No. required	Application
A	—	Brake-wheel clearance. Minimum clearance required is 6 in. above, in back of, and on both sides of and 4 in. underneath wheel.
B	4 each unit	Block, 6- x 8- x 24-in. lumber. Locate 45° portion of block against front of front wheels and against rear of rear wheels of bottom vehicle. Nail heel of block to car floor with three 40d nails, and toenail that portion of block under tire to car floor with two 40d nails before items C and D are applied.
C	1 each item D and E	Suitable material, such as waterproof paper or burlap. Locate bottom portion under items D and E, the top portion to extend 2 in. above items D and E.
D	1 each outside wheels	Side blocking, each to consist of one piece of 2- x 6- x 18-in. lumber and two pieces of 2- x 4- x 18-in. lumber. Nail one edge of 2- x 6- x 18-in. piece to bottom piece of 2- x 4- x 18-in. lumber with three 12d nails. Place against tire, and nail to car floor with three 20d nails. Nail the other 2- x 4- x 18-in. to the one below in a like manner; locate as shown.
E	1 each inside wheels	Side blocking, each to consist of two pieces of 2- x 6- x 18-in. lumber and two pieces of 2- x 4- x 18-in. lumber. Nail one edge of two 2- x 6- x 18-in. pieces to bottom piece of 2- x 4- x 18-in. lumber with three 12d nails each. Place against the first vehicle tire and nail to car floor with three 20d nails. Nail other 2- x 4- x 18-in. piece to one below in like manner; locate as shown. Load second vehicle tightly against item E.
F	2 each unit	Block, 4- x 4- x 48-in. lumber. Locate one piece against the rear of the front wheels and one piece against the front of the rear wheels of top ½-ton truck.
G	2 each unit	Brace, 2- x 4- x 36-in. lumber. Nail each end to ends of item F with three 10d nails.
H	8 each unit	Corner protectors, ¾-in., for steel banding. Locate one at each end of item G and one under the lower vehicle as indicated in figure 7-6.
J	2 each unit	Steel banding, ¾- x .035- x 162-in. Secure items F and G to lower vehicle as indicated in figure 7-6.
K	2 each unit	Seals, ¾-in., for steel banding. Locate as indicated in figure 7-6. Crimp each seal twice.
L	8 each unit	Corner protectors, 1¼-in., for steel banding. Locate four on top of top vehicle and four on bottom of lower vehicle as indicated in figure 7-6.
M	2 each unit	Steel banding, 1¼- x .035- x 222-in. Band two vehicles together as indicated in figure 7-6.
N	2 each unit	Seals, 1¼-in., for steel banding. Locate as indicated in figure 7-6. Crimp each one twice.
O	4	Corner protectors, 2-in., for steel banding. Locate two on outside of top vehicle as indicated in figure 7-6.
P	2	Steel banding, 2- x .050- x 312-in. Pass over vehicles, and secure to stake pockets on opposite sides of car with two seals at each end crimped two times.
Q	8	Seals, 2-in., for steel banding. Locate as indicated in figure 7-6.

Table 7-9. Bill of Materials for Blocking and Tiedown of Carrier on General-Purpose Flatcars (Fig 7-7)

Item	Description	Approximate quantity
Lumber	Douglas fir, or comparable, straight-grain, free from material defects; Fed Spec MM–L–751c: 2- x 4-in.	100 linear ft
	2- x 12-in.	65 linear ft
Nails	Common, steel; flathead; bright or cement-coated; Table X1–b, Fed Spec FF–N–105a: 2d	200
	30d	170
Wire rope	6x19, IWRC; improved plow steel; preformed; regular-lay; Table X1–b, Fed Spec RR–W–410a: ⅝-in.	100 ft
Clamps	Wire-rope U-bolt clips, saddled single grip, steel, Crosby heavy-duty or equal; Fed Spec FF–C–450d: ⅜-in.	24
Thimbles	Standard, open-type: ⅝-in.	8
Clevis assembly suspension (shackled).	Bolt and nut type, large, FSN 1670–090–5354, or equal (for front and rear towing and tiedown provisions).	4

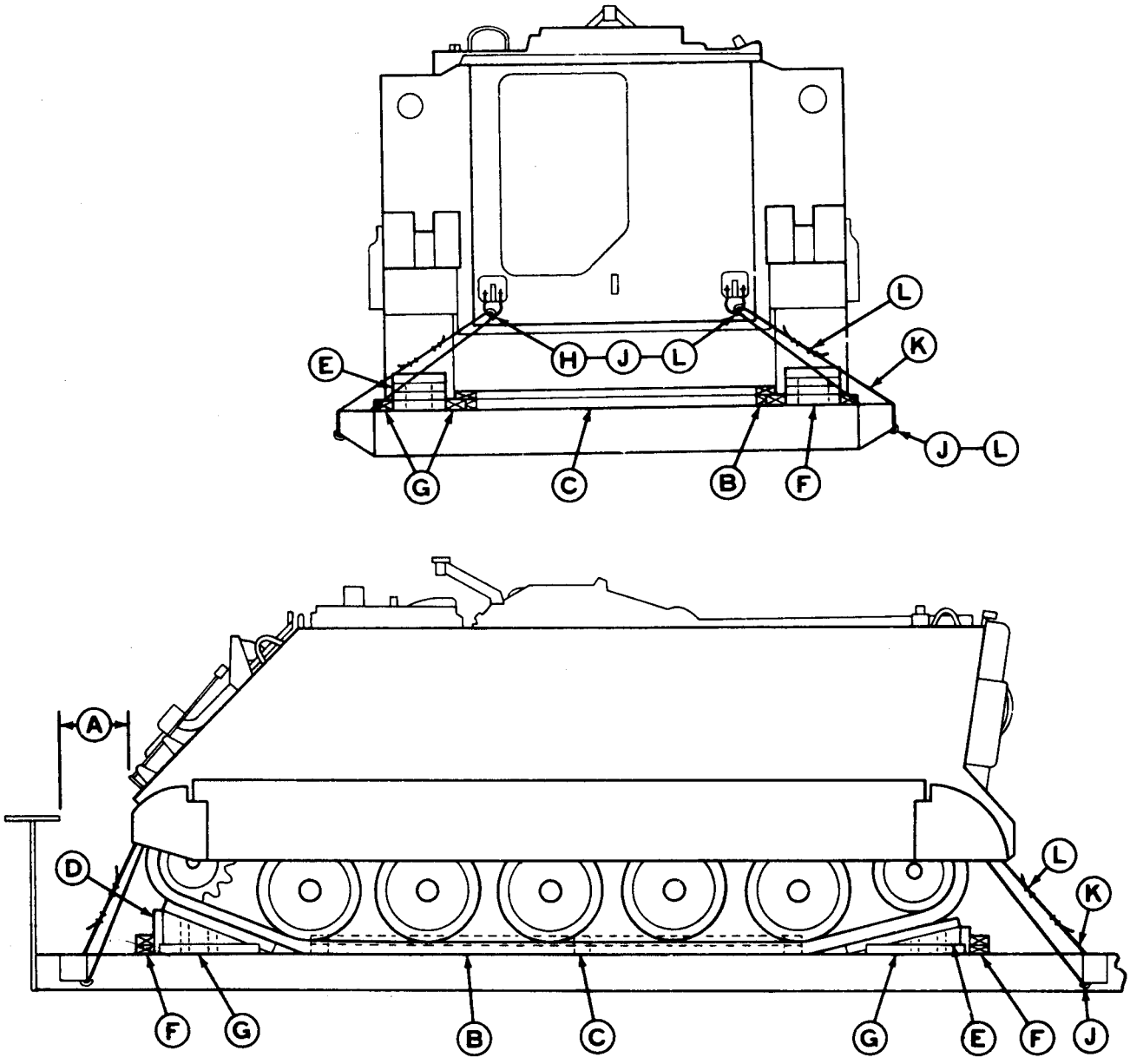


Figure 7-7. Blocking and tiedown diagram for carrier on general-purpose flatcars.

Table 7-10. *Application of Materials for Tiedown of Carrier on General-Purpose Flatcars (Fig 7-7 and 7-8)*

Item	No. required	Application
A	—	Brake-wheel clearance. Minimum clearance required is 6 in. above, in back of, and on both sides of and 4 in. underneath wheel.
B	2	Cleats, inside, each to consist of two pieces of 2- x 4- x 105-in. lumber. Locate along the inside of each track, and nail lower piece to car floor with sixteen 30d nails. Nail top piece to one below with sixteen 30d nails.
C	3	Spreaders, inside cleat, each to consist of two pieces of 2- x 4-in. x length-to-suit lumber. Locate between each end and in center of item B. Nail lower piece to car floor with four 30d nails. Nail top piece to one below with four 30d nails.
D	2	Block, track, front; right and left sides. Construct with 2- x 12-in. material and 20d nails. See detail, figure 7-8. Locate angle ends under right and left tracks at front.
E	2	Block, track, rear; right and left sides. Construct with 2- x 12-in. material and 20d nails. See detail, figure 7-8. Locate angle ends under right and left tracks at rear.
F	4	Cleats, end, each to consist of two pieces of 2- x 4- x 12-in. lumber. Locate against ends of ech item D and E. Nail lower piece to car floor with four 30d nails and top piece to one below in a like manner.
G	8	Cleats, side, 2- x 4- x 24-in. lumber. Locate one piece on inside and outside of each item D and E. Nail each piece to car floor with four 30d nails.
H	4	Shackles. Secure one at each towing lug (two at front end of vehicle and two at rear end).
J	8	Thimbles, ⅝-in. (sketch 2, fig 7-8). Locate one thimble at each item H and one thimble under each stake pocket.
K	4	Wire rope, ⅝-in. (sketch 1, fig 7-8). Attach to each item H and stake pockets as indicated in figure 7-8.
L	24	Clamps, ⅝-in. (sketch 1, fig 7-8). Secure ends of wire rope with four clamps each. Secure thimbles with one clamp each.

General Instructions

1. Load as shown is based on a flatcar 9 ft 6 in. wide (platform). Cars with wider platforms may also be used.
2. It will be advantageous to pre-position and install items B and C prior to loading vehicle on flatcar.
3. Handbrakes on vehicles must *not* be set.
4. Gearshift levers for automatic or conventional transmissions must be placed and wire-tied in neutral position.
5. For further details, refer to Association of American Railroads' *Rules Governing the Loading of Commodities on Open Top Cars* and General Rules 3, 4, 5, 9, 14, 15, and 19A.

Table 7-11. Bill of Materials for Blocking and Tiedown of Skid-Mounted Shop Equipment on General-Purpose Flatcars (Fig 7-9)

Item	Description	Approximate quantity
Lumber	Douglas fir, or comparable, straight-grain, free from material defects; Fed Spec MM–L–751c: 2- x 6-in.	80 linear ft
Nails	Common, steel; flathead; bright or cement-coated; table X1–b, Fed Spec FF–N–105a: 30d	56
	60d	80
Wire rope	6x19, IWRC; improved plow steel; preformed, regular-lay; table V Fed Spec RR–W–410a: ⅜-in. dia.	70 ft
Clamps	Wire-rope U-bolt clips, saddled single grip, steel, Crosby heavy-duty or equal; Fed Spec FF–C–450d: ⅜-in.	24
Thimbles	Standard, open-type: ⅜-in.	8

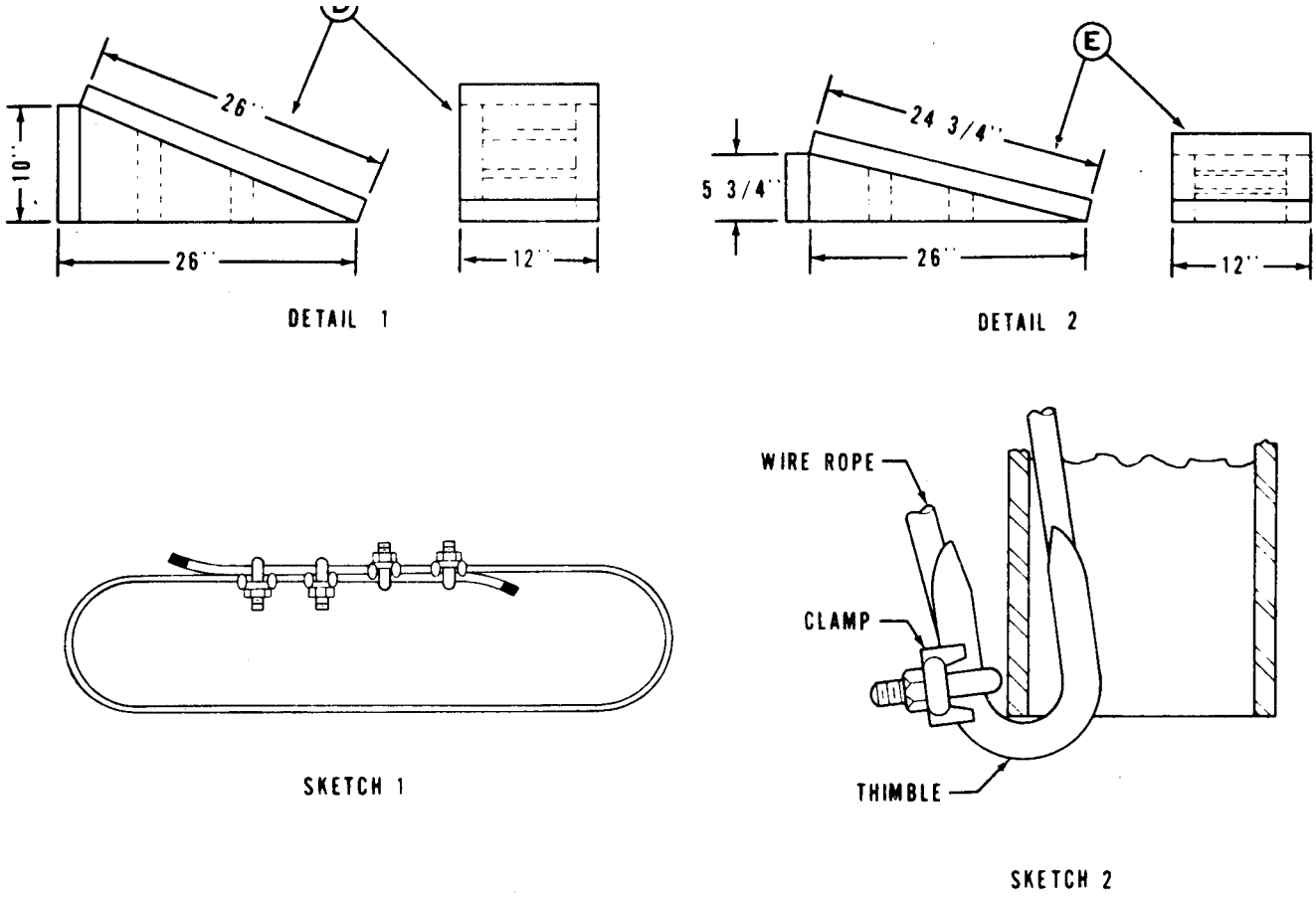


Figure 7–8. Blocking and tiedown detail diagram.

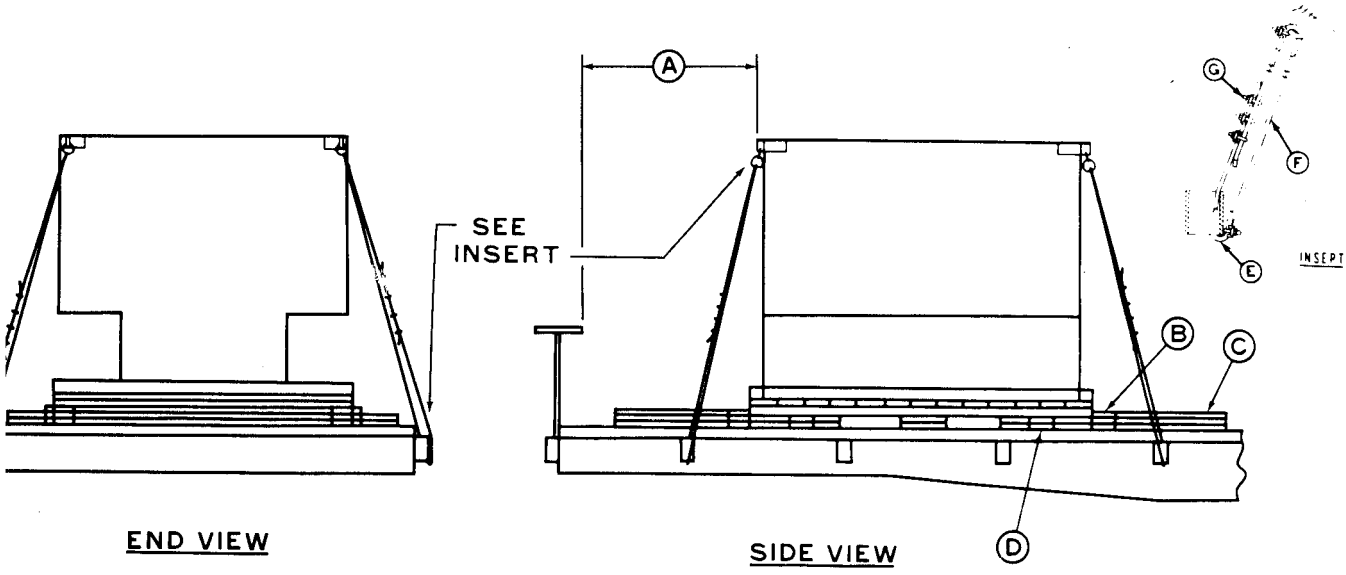


Figure 7-9. Blocking and tiedown diagram of skid-mounted shop equipment on general-purpose flatcars.

Table 7-12. Application of Materials for Blocking and Tiedown of Skid-Mounted Shop Equipment on General-Purpose Flatcars (Fig 7-9)

Item	No. required	Application
A	—	Brake-wheel clearance. Minimum clearance required is 6 in. above, in back of, and on on both sides of and 4 in. underneath.
B	2	End blocking, each to consist of three pieces of 2- x 6- x 84-in. lumber. Place against front and rear skids, and nail first piece to car floor with ten 30d nails. Nail other two 2- x 6- x 84-in. pieces to one below in the same manner with ten 60d nails.
C	4	End cleats, each to consist of three pieces of 2- x 6- x 30-in. lumber. Align with skids of lading base, place against front and rear blocking, and nail first piece to car floor with five 30d nails. Nail other two 2- x 6- x 30-in. pieces to one below in same manner with five 60d nails.
D	4	Side blocking, each to consist of two pieces of 2- x 6- x 12-in. lumber. Position against skids of lading base, and nail first piece to car floor with two 30d nails. Nail second piece to first in the same manner.
E	4	Wire rope, ⅜-in., in a complete loop. Pass through tiedown rings and stake pockets on same side of car (see insert, fig 7-9).
F	24	Clamp, ⅜-in. Secure ends of wire rope with four clamps each. Secure thimbles with one clamp each (see insert, fig 7-9).
G	8	Thimble. Locate one thimble at each tiedown ring and one thimble under each stake pocket (see insert, fig 7-9).

7-7. Transport on Special-Purpose Rail cars Equipped With Chain Tiedowns

These generally provide greater economies in loading costs and transportation charges; they should be used whenever appropriate and available from the rail carriers. Figures 7-10 and 7-11 are tiedown diagrams for the ¼-ton truck and carrier on special-purpose railcars. Tables 7-13 and 7-14 give the application of materials for tiedown on the ¼-ton truck and carrier.

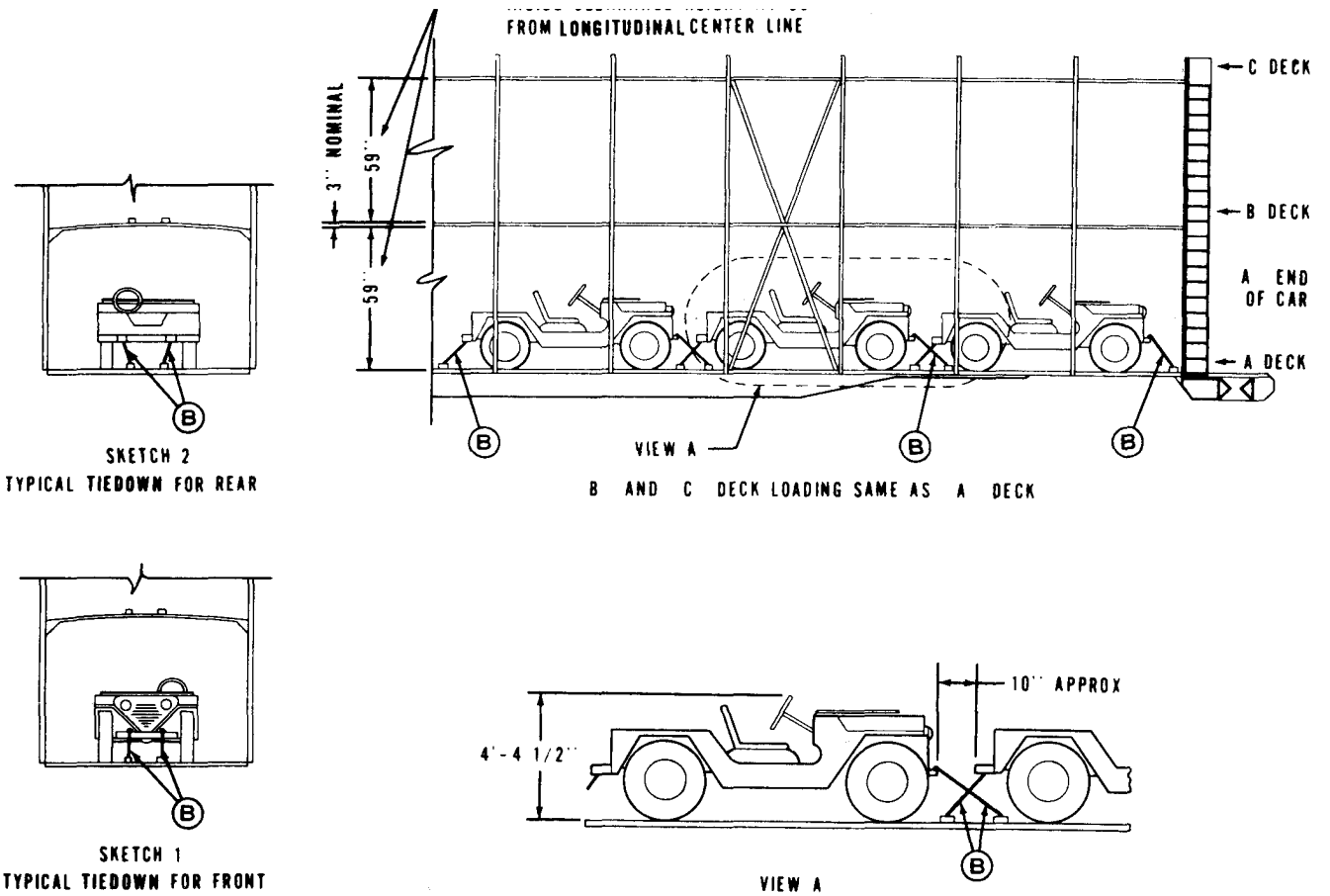


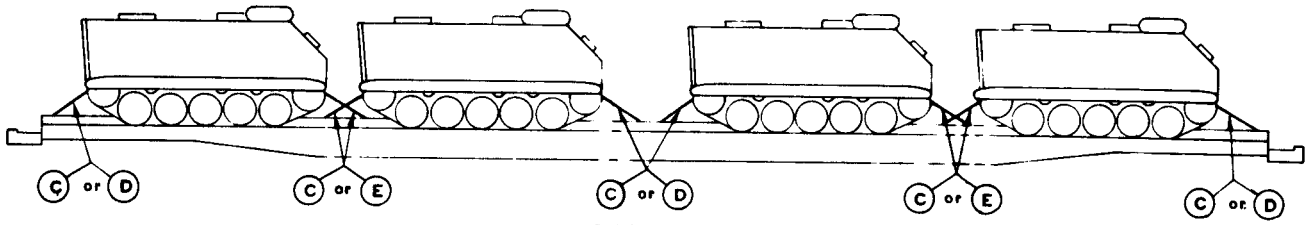
Figure 7–10. Tiedown diagram for ¼-ton truck on bi-level or tri-level railcars.

Table 7-13. Application of Materials for Tiedown of ¼-Ton Truck on Bi-Level or Tri-Level Railcars (Fig 7-10)

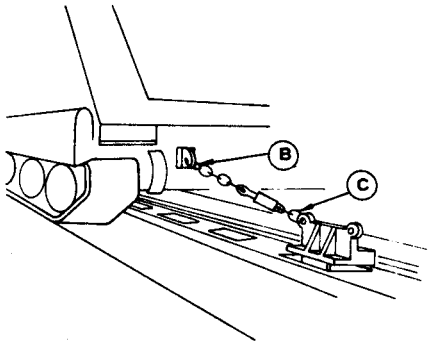
Item	No. required	Application
A	—	Brake-wheel clearance. Minimum clearance required is 6 in. above, in back of, and on both sides of and 4 in. underneath wheel.
B	4 each unit	Chair tiedown and tensioning device with a minimum proof-test of 6,700 lb. Pass one chain through each clevis attached to front bumper and rear of truck under each bumperette. See sketches 1 and 2, figure 7-10. Hand tension, as tight as possible, each tiedown chain, and attach grabhook into an appropriate link of the tiedown chain. Each chain is adjusted to the proper tension by use of the tensioning device supplied with car.

General Instructions

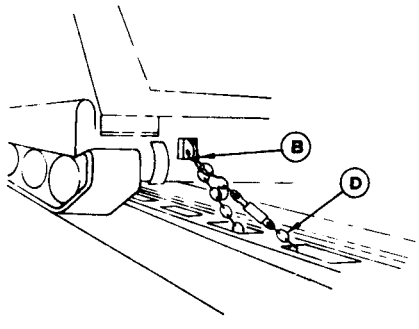
1. Shippers should specify cars equipped with tiedown devices in the quantities specified in item B and with decks of sufficient capacities to withstand the total weight of vehicles loaded thereon.
2. Trucks must face in the same direction and be uniformly spaced along the length of the railcar to allow sufficient space between the trucks and at each end of the railcar for proper securement.
3. Tiedown chains must be free from twisted or kinked links prior to their application to the vehicles.
4. Tiedown chains will be secured parallel to each other at the same end of the vehicle and so placed that the chain angles will be approximately 45 degrees outboard from the truck clevis to the tiedown device. After tiedown chains are tensioned, they should be hit sharply with a hammer to relieve any binding and the tiedown chains retensioned, if necessary. There must be at least one full wrap of chain around the tensioning device drum with the ratchet locking device in position.
5. Truck transmission gear must be set in neutral position and handbrake firmly set before railcar is released for transit.
6. Tiedowns when installed must not come in contact with electrical wiring, vehicle controls, or other appurtenances.
7. Seven trucks can be loaded on each deck of an 85-ft., 87-ft. 4-in., or 89-ft. 1 in. bi-level or tri-level car that has two continuous parallel tiedown tracks or rails running the entire length of each deck, located between the wheels of the vehicles. For all loadings, there should be approximately 10 in. between vehicles.
8. The numbering sequence of units starts from the B end of the car, on any deck.
9. For further details, refer to Association of American Railroads *Rules Governing the Loading of Commodities on Open Top Cars* and General Rules 4, 5, 7, 19–A, and 19–B.



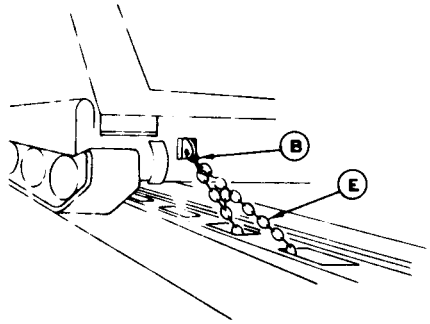
SIDE VIEW



SKETCH 1
DETAIL OF TIEDOWN DEVICE IN CUSHIONED RUB-RAIL



SKETCH 2
DETAIL OF CHAIN WITH TURN BUCKLE THROUGH CUSHIONED RUB-RAIL SLOTS



SKETCH 3
DETAIL OF CHAIN THROUGH CUSHIONED RUB-RAIL SLOTS

Figure 7–11. Tiedown diagram for carrier on G–85 or G–89 flatcars equipped with cushioned rub-rail or similar railroad flatcars.

Table 7-14. *Application of Materials for Tiedown of Carrier on CONUS, ATTX, ITTX, HTTX, TTDX, or Similar-Type Flatcars Equipped With Center Tiedown Rails Running Entire Length of Car* (Fig 7-11)

Item	No. required	Application
A	—	Brake-wheel clearance. Minimum clearance required is 6 in. above, in back of, and on both sides of and 4 in. underneath wheel.
B	4 each unit	Shackles. For vehicles having a 1-in.-dia. hole in towing bracket, use a 1-in.-dia. pin with a ⅞-in. steel galvanized-coated anchor shackle. For vehicles having a larger hole in towing bracket, use an appropriate size pin and shackle. Attach shackle to towing bracket, and secure pin with a cotter key.
C	4 each unit	Brandon single chain* tiedown device. Attach to vehicle tiedown provision and to rub-rail of car as shown in sketch 1, figure 7-11. Substitute, if desired, items D and E in lieu of item C. See general instructions below for further details.
D	2 each unit (when required)	Chain* with turnbuckle. Attach to vehicle tiedown provision and to rub-rail of car as shown in sketch 2, figure 7-11. See general instructions below for further details.
E	2 each unit	Chain.* Attach to vehicle tiedown provision and to rub-rail of car as shown in sketch 3, figure 7-11. See general instructions below for further details.

General Instructions

1. When ordering specialized railroad freight equipment, shippers should specify cars that are equipped with tiedown devices in quantity shown in item C. In the event conventional chain tiedowns are supplied in lieu of tiedown devices specified, they must conform to requirements of items D and E and must be applied in the following manner:
   a. Attach the two chain tiedowns, as shown in sketch 3, figure 7-11, to one end of the vehicle and to the rub-rail of the car. Pull as tight as possible by hand, and attach the hook to the appropriate link of the chain.
   b. Attach the two chain tiedowns with the adjustable turnbuckles, as shown in sketch 2, figure 7-11, to the opposite end of the vehicle and to the rub-rail of the car. All four chain tiedowns should be made taut by tightening the turnbuckles.

NOTE

Load binders are not to be used in lieu of turnbuckles to tension tiedown chains.

2. Vehicles must face in the same direction and be spaced along the length of the car to allow sufficient space at each end of the car and between the vehicles for securement. Apply tiedowns parallel to each other at the same end of the vehicle and down from the vehicle point of attachment to the car tiedown facility. The angle of the tiedown must not be greater than 45°.
3. Handbrakes on vehicles *must not* be set.
4. Gearshift levers on tracked vehicles equipped with automatic transmissions are to be placed in neutral position. Vehicles equipped with standard transmissions must have the gearshift lever wire-tied in neutral position.
5. Open hooks must be secured with wire over the opening to prevent the hook from becoming disengaged from the chain link to which it is secured.
6. Turnbuckles used to tighten chains must be wired or locked to prevent them from turning during transit unless the turnbuckles are equipped with self-locking devices.
7. For further details, see Association of American Railroads (AAR) *Rules Governing the Loading of Commodities on Open Top Cars* and General Rules 4, 5, 7, and 19A therein.

* ½-in.-dia. Excelloy chain, or similar, proof-tested at 27,500 lb.

Section III. TRANSPORT ON FOREIGN RAILWAYS

7-8. General

The transportability guidance contained in this section is applicable when the vehicles and skid-mounted shop equipment are transported on flatcars of foreign railways. Consideration is given to single and multiple item movements on the types of railcars normally used for the movement of these types of items. The items, when loaded on a suitable railcar, can be transported without restrictions within European countries complying with the International Loading Gauge (formerly Berne International); the majority of the countries in the Middle East and South America; and Australia, India, and Pakistan. In the Middle East and South America, the clearances vary by country, and each country will require a separate check. In Australia, India, and Pakistan, wide- or broad-gauge railways provide adequate clearances. Because of the various designation systems used by different countries, foreign railcars are not easily classified. In addition, clearances vary, in many cases, from one country to the next and within one country; consequently, evaluation of transportability capability must be made on an individual basis. The carrier, 1/4-ton and 1/2-ton trucks, and skid-mounted shop equipment can be loaded on foreign railroad flatcars, and all other TOW items can be loaded into foreign railroad boxcars. The methods for securing these items are similar to securing the items on American railroad cars.

7-9. Transport on US Army-Owned Foreign Service Flatcars

*a. General. The TOW system vehicles and skid-mounted shop equipment can be transported on a number of US Army-owned foreign service flatcars. These flatcars are exclusively for the transport of US military materiel. Table 7-15 represents a few of the flatcars available in Europe that are suitable for transportation of the TOW system.

b. Materials. The materials required for blocking and tiedown of the items on US Army-owned foreign service flatcars are essentially the same as those used for transporting the items within CONUS. For general guidance, refer to figures 7-1 through 7-9.

*Table 7-15. *Characteristics of European Flatcars Available for Transportation of the TOW*

Flatcar designation	Capacity	Length	Wdith	Platform height*
FF	50-ton (45.36 MTON)	40-ft. 9-in. (12.42 m)	8-ft. 7⅛-in. (2.62 m)	4-ft. 1⅛-in. (1.25 m)
SSY	55-ton (45.90 MTON)	31-ft. 2-in. (9.50 m)	10-ft. 4-in. (3.15 m)	4-ft. 2¾-in. (1.29 m)
SSYS	66-ton (59.88 MTON)	31-ft. 2-in. (9.50 m)	10-ft. 4-in. (3.15 m)	4-ft. 2¾-in. (1.29 m)
SSYM	88-ton (79.83 MTON)	39-ft. ½-in. (11.90 m)	10-ft. 4-in. (3.15 m)	4-ft. 3½-in. (1.31 m)
FFLM	90-ton (81.65 MTON)	46-ft. 8-in. (14.42 m)	10-ft. 3-in. (3.12 m)	4-ft. 2¾-in. (1.29 m).

*Above top of rail.

APPENDIX

REFERENCES

1. Field Manuals (FM)

1-100	Army Aviation Utilization.
5-36	Route Reconnaissance and Classification.
55-15	Transportation Reference Data.
60-30	Embarkation and Loading, Amphibious.

2. Supply Bulletins (SB)

700-20	Army Adopted and Other Items of Material Selected for Authorization.

3. Air Force Manuals

T.O. 1-1B-40	Handbook of Weight and Balance Data.
T.O. 1C-130-9	Cargo Loading Manual USAF Series C-130 Aircraft.

4. Army Regulations (AR)

65-29	Military Convoy Operations in CONUS.
55-162	Permit for Oversize, Overweight, or Other Special Military Movements on Public Highways in the United States.
55-355	Military Traffic Management Regulation.
59-106	Operation of Air Force Terminals.
70-39	Criteria for Air Transport and Airdrop Material.
95-16	Weight and Balance-Army Aircraft.
385-40	Accident Reporting and Records.
746-1	Color, Marking, and Preparation of Equipment for Shipment.

5. Technical Manuals (TM)

5-330	Planning and Design of Roads, Airbases, and Heliports in the Theater of Operations.
5-725	Rigging.
9-1300-206	Care, Handling, and Preservation of Ammunition.
10-500-1	Airdrop of Supplies and Equipment: Rigging Containers.
9-1425-470-12	Operator and Organizational Maintenance Manual: TOW Heavy Anti-tank/Assault Weapon System.
9-2300-257-10	Operator's Manual for Carrier, Personnel, Full Tracked, Armored M113A1.
9-2320-213-10	Operator's Manual for Truck, Platform Utility 1/2-ton, 4 x 4, M274.
9-2320-218-10	Operator's Manual for Truck, Utility, 1/4ton, 4 x 4, M151.
38-250	Packaging and Handling of Dangerous Materials for Transportation by Military Aircraft.
55-450-15	Air Movement of Troops and Equipment (Nontactical).
65-450-18	
55-208	Railway Equipment Characteristics and Data.
55-312	Military Convoy Operations in CONUS.
55-405-9	Weight and Balance.
65-450-8	External-Transport Procedures.

55-450-10/1 AFM 76-3	Air Transport of Supplies and Equipment Standard Loads in US Air Force C-130E Aircraft.
65450-11	Aircraft Transport of Supplies and Equipment : Helicopter External Loads, Rigged with Air Delivery Equipment, June 1968.
55-450-15	Air Movement of Troops and Equipment (Nontactical).
55-450-18	Internal and External Loads, CH-47 Helicopter.
55450-19	Air Transport of Supplies and Equipment Helicopter External Lift Rigging Material, Techniques and Procedures.
55-500	Marine Equipment Characteristics and Data.
55-513	Military Stevedoring.
55-1520-209-10	Operator's Manual US Army Model CH-47A Helicopter.
55-1520-227-10	Operator's Manual US Army Model CH-47B and CH-47C Helicopters.
55-2300-257-12-1	Transportability Guidance, Carrier, Personnel, Full-Tracked, Armored, M113 and M113A1.

Note. Air Force Technical Orders that have not been integrated into the Department of the Army publications systems may be requisitioned through the Adjutant General Office in accordance with AR 310-71.

6. Other Publications and Source of Procurement

Association of American Railroads Rules Governing the Loading of Commodities on Open Top Cars
Section No. 1-General Rules
Section No. 6-Rules Governing the Loading of Department of Defense Material

Mr. R. C. Reber, Secretary
Mechanical Division
Association of American Railroads
1920 L. St., N.W.
Washington D.C. 20036

Rail Carriers' Tariff No. 25 or reissues thereof-Hazardous Materials Regulations of the Department of Transportation Including Specifications for Shipping Containers.

R. M. Graziano, Agent
American Railroad Building
1920 L. St., N.W.
Washington D.C. 20036

Water Carrier Tariff No. 26 or reissues thereof-Regulations Governing the Transportation or Storage of Explosives or Other Dangerous Articles or Substances, and Combustible Liquids on Board Vessels.

R. M. Graziano, Agent
American Railroad Building
1920 L. St., N.W.
Washington D.C. 20036

Motor Carriers' Explosives and Dangerous Articles Tariff No. 14 or reissues thereof-Department of Transportation Regulations Governing Transportation of Explosives and Other Dangerous Articles by Motor, Rail and Water Including Specifications for Shipping Containers.

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