

**TECHNICAL MANUAL**

**TRANSPORTABILITY GUIDANCE**

**ALL MODE**

**FIRE DIRECTION CENTER, ARTILLERY, OA-8389/GSG-10(V)**

**(NSN 7010-01-017-7039)**

**(TACFIRE)**

**SHELTER, ELECTRICAL EQUIPMENT, S491/GSG-10(V)**

**(NSN 7010-01-017-7039)**

**TRUCK, CARGO, 5-TON, M813A1**

**(NSN 2320-00-050-8905)**

**POWER UNIT, PU-732/M, TRL-MTD**

**(NSN 6115-00-260-3082)**



TECHNICAL MANUAL }  
NO. 55-7440-240-14 }

HEADQUARTERS  
DEPARTMENT OF THE ARMY  
WASHINGTON, D. C., 28 April 1978

TRANSPORTABILITY GUIDANCE

ALL MODE

FIRE DIRECTION CENTER, ARTILLERY, OA-8389/GSG-IO(V)

(TACFIRE)

SHELTER, ELECTRICAL EQUIPMENT, S491/GSG-IO(V)

(NSN 7010-01-01 7-7039)

TRUCK, CARGO, 5-TON, M813A1

(NSN 2320-00-050-8905)

POWER UNIT, PU-732/M, TRL-MTD

(NSN 6115-00-260-3082)

	Paragraph	Page
CHAPTER 1. INTRODUCTION		
Purpose and scope . . . . .	1-1	1-1
Reporting of publication improvements . . . . .	1-2	1-1
Safety . . . . .	1-3	1-1
Definitions of warnings, cautions, and notes . . . . .	1-4	1-1
2. TRANSPORTABILITY DATA		
Section I General . . . . .		
Scope . . . . .	2-1	2-1
Description . . . . .	2-2	2-1
II. Characteristics and Related Data		
General . . . . .	2-3	2-5
Side and rear elevation drawings . . . . .	2-4	2-5
Reduced configuration . . . . .	2-5	2-11
Unusual characteristics . . . . .	2-6	2-11
Hazardous and dangerous characteristics . . . . .	2-7	2-11
Fragility . . . . .	2-8	2-11
CONUS Freight classification . . . . .	2-9	2-11
CHAPTER 3. SAFETY		
General . . . . .	3-1	3-1
Specific safety requirements . . . . .	3-2	3-1
4. AIR TRANSPORTABILITY GUIDANCE . . . . .		
Scope . . . . .	4-1	4-1
Maximum use of aircraft capacity . . . . .	4-2	4-1
Maximum use of aircraft capacity . . . . .	4-2	4-1
Safety . . . . .	4-3	4-1
Preparation of system . . . . .	4-4	4-1
Transport by US Air Force aircraft . . . . .	4-5	4-1
Transport by US Army aircraft . . . . .	4-6	4-6
Operations at the Offload Base/Landing Zone . . . . .	4-7	4-6
5. HIGHWAY TRANSPORTABILITY GUIDANCE		
Section I. General . . . . .		
Scope . . . . .	5-1	5-1
Safety . . . . .	5-2	5-1
General . . . . .	5-3	5-1

	Paragraph	Page
II. Transport by Semitrailer/Truck . . . . .		
Preparation . . . . .	5-4	5-1
Transport on Semitrailer/truck . . . . .	5-5	5-1
CHAPTER 6. MARINE AND TERMINAL TRANSPORTABILITY GUIDANCE		
Section I. General . . . . .		
Scope . . . . .	6-1	6-1
Safety . . . . .	6-2	6-1
Water shipment . . . . .	6-3	6-1
II. Loading and Securing . . . . .		
General rules . . . . .	6-4	6-1
Barges and lighters . . . . .	6-5	6-9
Landing ships, landing craft, and amphibians . . . . .	6-6	6-9
CHAPTER 7. RAIL TRANSPORTABILITY GUIDANCE . . . . .		
Section I. General . . . . .		
Scope . . . . .	7-1	7-1
Maximum use of railcar capacity . . . . .	7-2	7-1
II. Transport on CONUS Railways . . . . .		
General . . . . .	7-3	7-1
Preparation . . . . .	7-4	
Loading on general-purpose flatcars . . . . .	7-5	7-1
Loading on special purpose flatcars . . . . .	7-6	7-9
III. Transport on Foreign Railways . . . . .		
General . . . . .	7-7	7-13
Transport on US Army-owned foreign service flatcars . . . . .	7-8	7-13
APPENDIX. REFERENCES . . . . .		A-1

## LIST OF ILLUSTRATIONS

Figure No.	Title	Page
2-1	TACFIRE system . . . . .	2-2
2-2	Shelter, S491, mounted on truck, cargo, 5-ton, M813A1 . . . . .	2-3
2-3	Power unit, PU-732/M, trailer-mounted . . . . .	2-4
2-4	Side elevation, truck, cargo, M813A1, with shelter . . . . .	2-6
2-5	Rear elevation, truck, cargo, M813A1, with shelter . . . . .	2-7
2-6	Side and rear elevation, power unit, PU-732/M . . . . .	2-8
2-7	Side and rear elevation, shelter, S491 . . . . .	2-9
4-1	Tiedown of shelters, S491, on the 463L pallet and power unit PU-732/M, in C-130 aircraft . . . . .	4-2
4-2	Tiedown of truck, cargo, 5-ton, M813A1, in C-130 aircraft . . . . .	4-4
5-1	Blocking and tiedown of truck, cargo, 5-ton M813A1, on semitrailer, M127 series, or larger (side view) . . . . .	5-2
5-2	Blocking and tiedown of truck, cargo, 5-ton, M813A1, on semitrailer, M127 series, or larger (rearview) . . . . .	5-3
5-3	Blocking and tiedown details for truck, cargo, 5-ton, M813A1 on semitrailer, M127 or larger. . . . .	5-5
5-4	Blocking and tiedown of shelter, S491, and power unit, PU-732/M, on semitrailer, M127 series or larger . . . . .	5-8
6-1	Lifting of truck, cargo, 5-ton, M813A1, with shelter, S491, mounted . . . . .	6-2
6-2	Blocking and tiedown of truck, cargo, 5-ton, M813A1, in general-cargo vessel. . . . .	6-3
6-3	Lifting of power unit, PU-732/M . . . . .	6-5
6-4	Blocking and tiedown of power unit, PU-732/M, in general-cargo vessel . . . . .	6-6
6-5	Lifting of shelter, S491 . . . . .	6-8
7-1	Blocking and tiedown of truck, cargo, 5-ton, M813A1, on CONUS general-purpose flatcar (side view) . . . . .	7-2
7-2	Blocking and tiedown of truck, cargo, 5-ton, M813A1, on CONUS general-purpose flatcar (rearview) . . . . .	7-3
7-3	Blocking and tiedown of power unit, PU-732/M, on CONUS general-purpose flatcar (side and rear view)... . . . .	7-4
7-4	Blocking and tiedown details for figures 7-1, 7-2, and 7-3 . . . . .	7-5
7-5	Blocking and tiedown of shelter, S491, on CONUS general-purpose flatcar (isometric view) . . . . .	7-6
7-6	Tiedown of truck, cargo, 5-ton, M813A1, on center-tiedown flatcar (side view) . . . . .	7-10
7-7	Tiedown of truck, cargo, 5-ton, M813A1, on center-tiedown flatcar (rearview) . . . . .	7-11
7-8	Tiedown of power unit, PU-732/M on center-tiedown flatcar (side and rear view) . . . . .	7-12
Table No.	Title	Page
2-1	Characteristics and Related Data . . . . .	2-10
4-1	Tiedown Data for Shelter, S491, and Power Unit, PU-732/M, in C-130 Aircraft . . . . .	4-3
4-2	Tiedown Data for Truck, Cargo, 5-Ton, M813A1, in C-130 Aircraft . . . . .	4-5
5-1	Bill of Materials for Blocking and Tiedown of Truck, Cargo, M813A1, on Highway Carrier (Figs 5-1 and 5-2) . . . . .	5-4
5-2	Application of Materials for Blocking and Tiedown of Truck Cargo, M813A1, on Highway Carrier (Figs 5-1 and 5-2) . . . . .	5-4

Table No.	Title	Page
5-3	Bill of Materials for Blocking and Tiedown of Shelter, S491, and Power Unit, PU -732/M, on Highway Carrier (Fig 5-4) . . . . .	5-6
5-4	Application of Materials for Blocking and Tiedown of Shelter, S491, and Power Unit, PU-732/M, on Highway Carrier (Fig 5-4) . . . . .	5-6
6-1	Bill of Materials for Blocking and Tiedown of Truck, Cargo, M813A1, with Shelter, S491, in General-Cargo Vessel (Fig 6-2) . . . . .	6-4
6-2	Application of Materials for Blocking and Tiedown of Truck, Cargo, M813A1, with Shelter, S491, in General-Cargo Vessel (Fig 6-2) . . . . .	6-4
6-3	Bill of Materials for Blocking and Tiedown of Power Unit, PU-732/M, in General-Cargo Vessel (Fig 6-4) . .	6-7
6-4	Application of Materials for Blocking and Tiedown of Power Unit, PU -732/M, in General-Cargo Vessel (Fig 6-4) . . . . .	6-7
7-1	Bill of Materials for Blocking and Tiedown of Truck, Cargo, M813A1, and Power Unit, PU-732/M, on CONUS General-Purpose Flatcar (Fig 7-1, 7-2, and 7-3) . . . . .	7-7
7-2	Application of Materials for Blocking and Tiedown of Truck, Cargo, M813A1, and Power Unit, PU -732/M, on CONUS General Purpose Flatcar (Fig 7-1, 7-2 and 7-3) . . . . .	7-7
7-3	Bill of Materials for Blocking and Tiedown of Shelter, S491, on CON US General-Purpose Flatcar (Fig 7-5)	7-8
7-4	Application of Materials for Blocking and Tiedown of Shelter, S491, on CON US General-Purpose Flatcar (Fig 7-5) . . . . .	7-8
7-5	Application of Chain Tiedowns for Securing of Truck, Cargo, M813A1, and Power Unit, PU -732/M, on Flatcars Equipped wiht Center-Tiedown Rails (Fig 7-6, 7-7, and 7-8) . . . . .	7-13
7-6	Characteristics of US Army-Owned European Flatcars Available for Transporting Vehicles . . . . .	7-14



## CHAPTER 1

### INTRODUCTION

---

#### 1-1. Purpose and Scope

*a.* This manual provides transportability guidance for logistics handling and movement of the Battalion Fire Direction System, also referred to as the TACFIRE System in this manual.

*b.* The intent of this manual is to give transportation officers and other personnel who are responsible for movement of the TACFIRE System, or for providing transportation services for its movement, information considered important for safe transport. Included are significant technical and physical characteristics of the TACFIRE System, as well as safety considerations required for worldwide movement of the system by the various modes of transportation. Where considered appropriate, metric equivalents are given in parentheses following dimensions or other measurements. References are contained in the appendix.

#### 1-2. Reporting of Publication Improvements

Users of this publication are encouraged to recommend changes and submit comments for its improvement. Comments should be prepared on DA Form 2028 (Recommended Changes to Publications and Blank Forms) and forwarded to Director, Mili-

tary Traffic Management Command Transportation Engineering Agency, ATTN: MTT-TRP, PO Box 6276, Newport News, Virginia 23606 (electrically transmitted messages should be addressed to: DIRMTMCTEA FT EUSTIS VA/ /MTT-TRP/ /).

#### 1-3. Safety

Appropriate precautionary measures required during movement of the TACFIRE system are contained in chapter 3.

#### 1-4. 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.

*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 that must be emphasized.





## CHAPTER 2

### TRANSPORTABILITY DATA

---

#### Section I. GENERAL

##### 2-1. Scope

This chapter provides a general description, identification photographs, tabulated transportability characteristics, and data that are necessary for transport of the TACFIRE System.

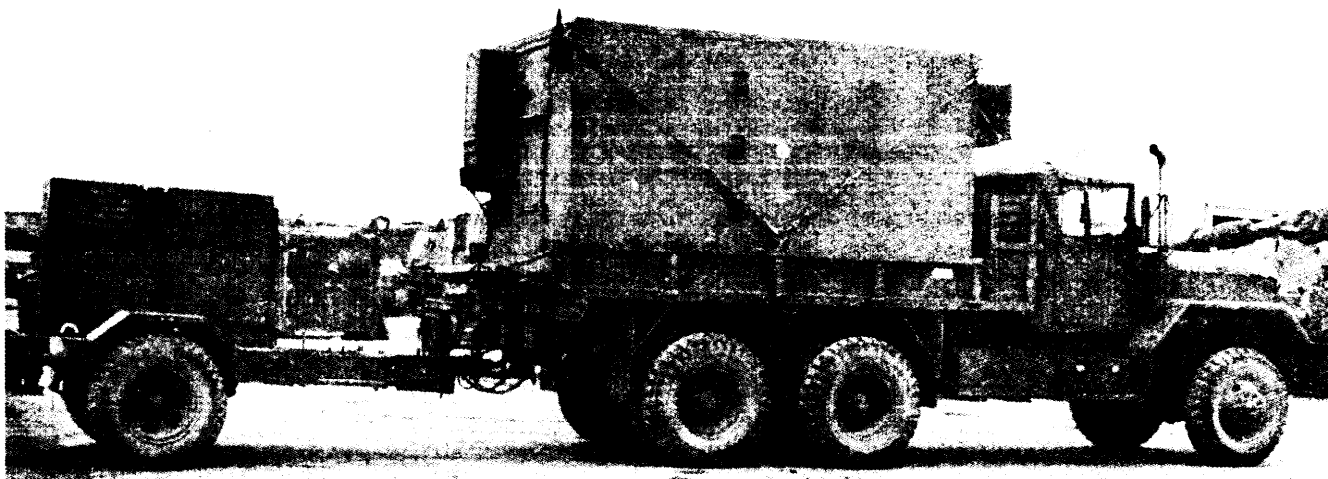
##### 2-2. Description

*a. General.* The TACFIRE System, (fig 2-1), OA-8389/GSG-10 (V), consists of two power units, PU-732/M; one shelter, with electrical equipment, S491, and two trucks, cargo, 5-ton, M813 or M813A1, either of which may be used.

*b. Shelter, S.491 (fig 2-2).* This is a modified S280 B/G shelter which houses the electronic equipment and provides space for the equipment operators.

*c. Truck, M813A1 (fig 2-2).* The M813A1 trucks provide mobility for, the shelter and are the prime movers for the trailer-mounted power units.

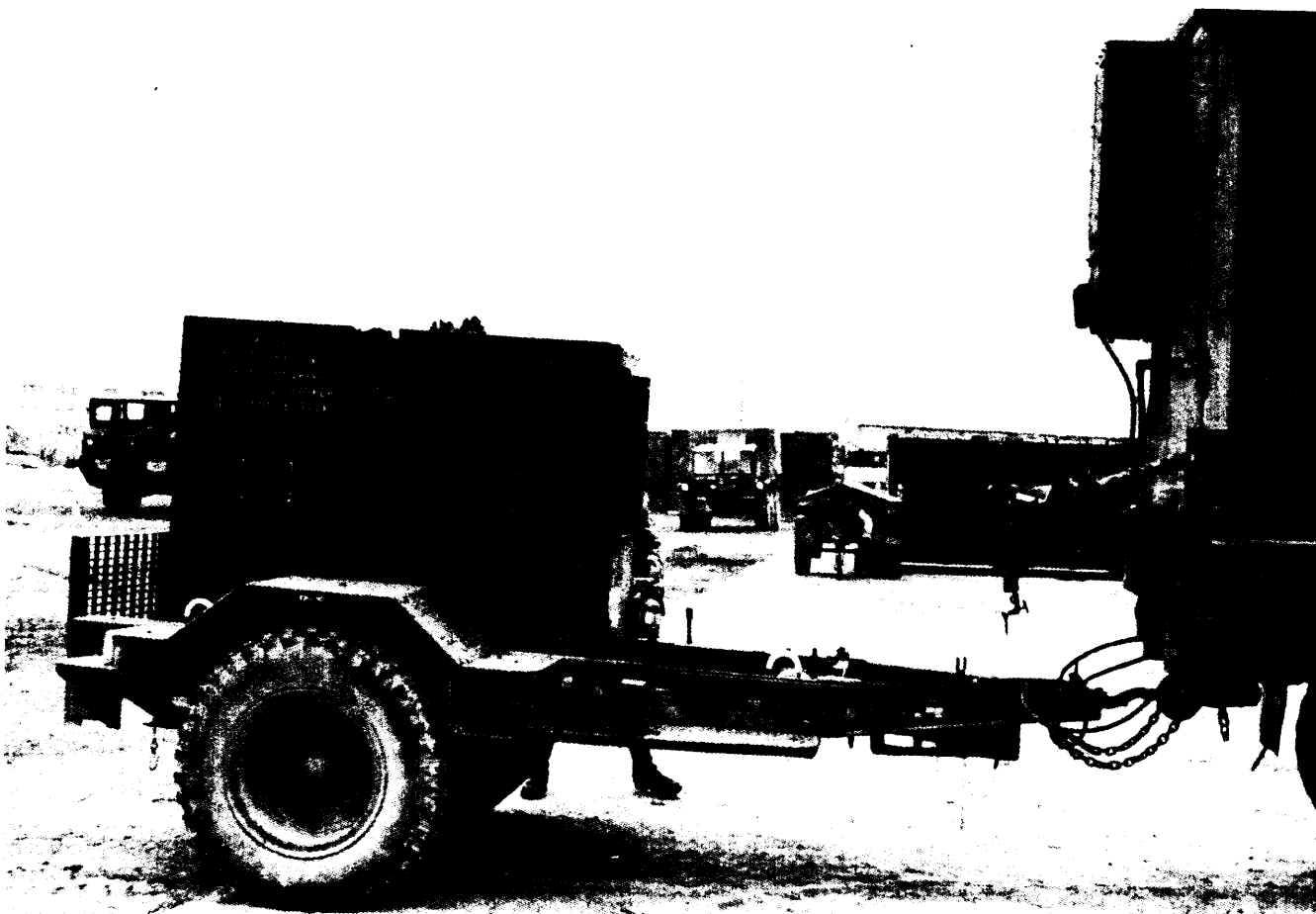
*d. Power Unit, PU-7321M (fig 2-3).* Each power unit consists of a diesel engine-driven 15KW generator, mounted on a modified 2 1/2-ton trailer chassis, M200A1.



*Figure 2-1. TACFIRE System*



*Figure 2-2. Shelter, S491, mounted on truck, cargo, 5-ton, M813A1*



*Figure 2-3. Power unit, PU-732/M, trailer-mounted.*

## Section II. CHARACTERISTICS AND RELATED DATA

### 2-3. General

Data contained in figures 2-4 through 2-7 and table 2-1 are applicable to model number or National Stock Number (NSN) shown. Changes in model or NSN may affect transportability guidance contained in this manual.

### 2-4. Side and Rear Elevation Drawings

Detailed side and rear elevation drawings (fig 2-4 through 2-7) provide necessary data for determining transportability of the system components by the various modes of transportation.

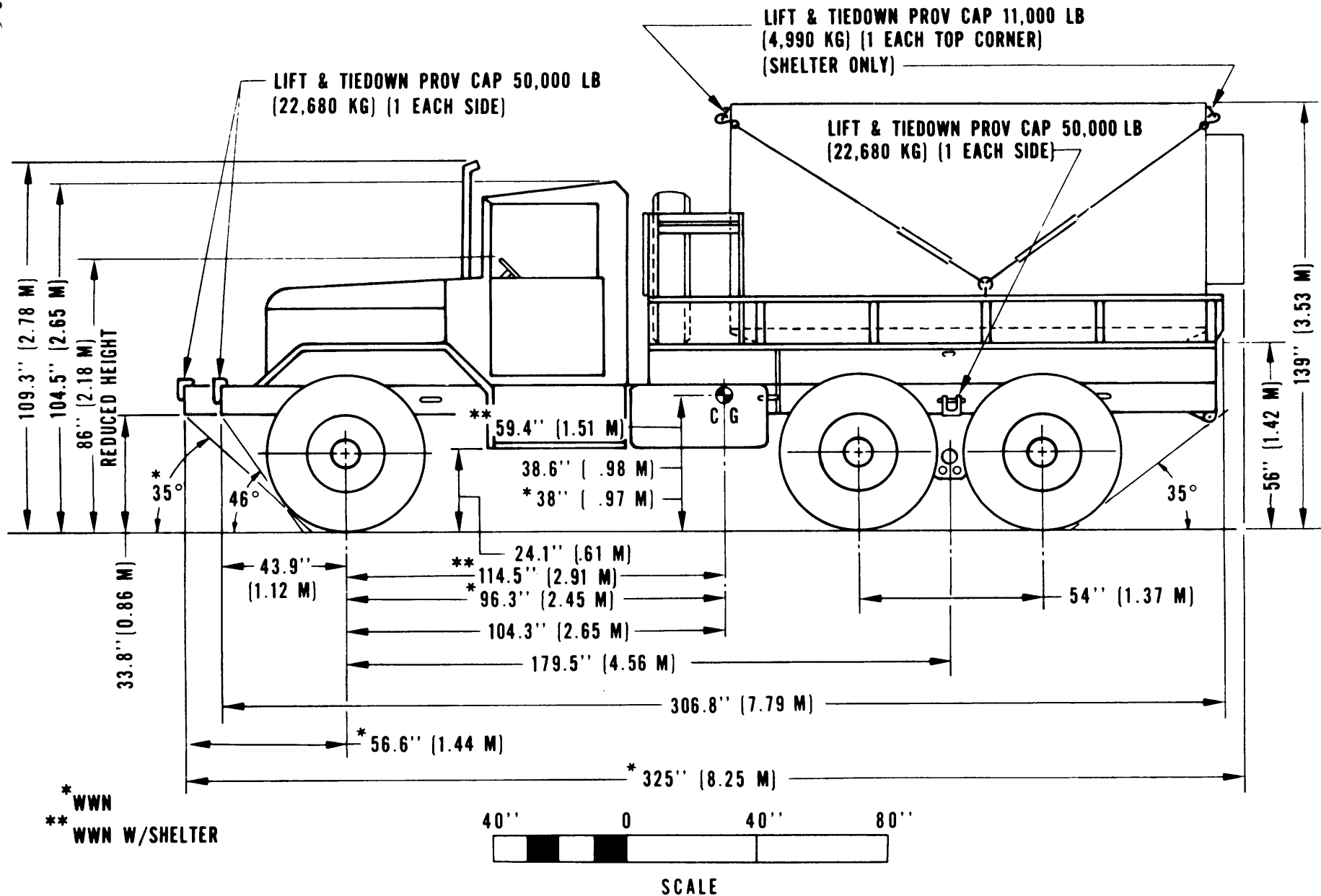


Figure 2-4. Side elevation, truck, cargo, M813A1; with shelter.

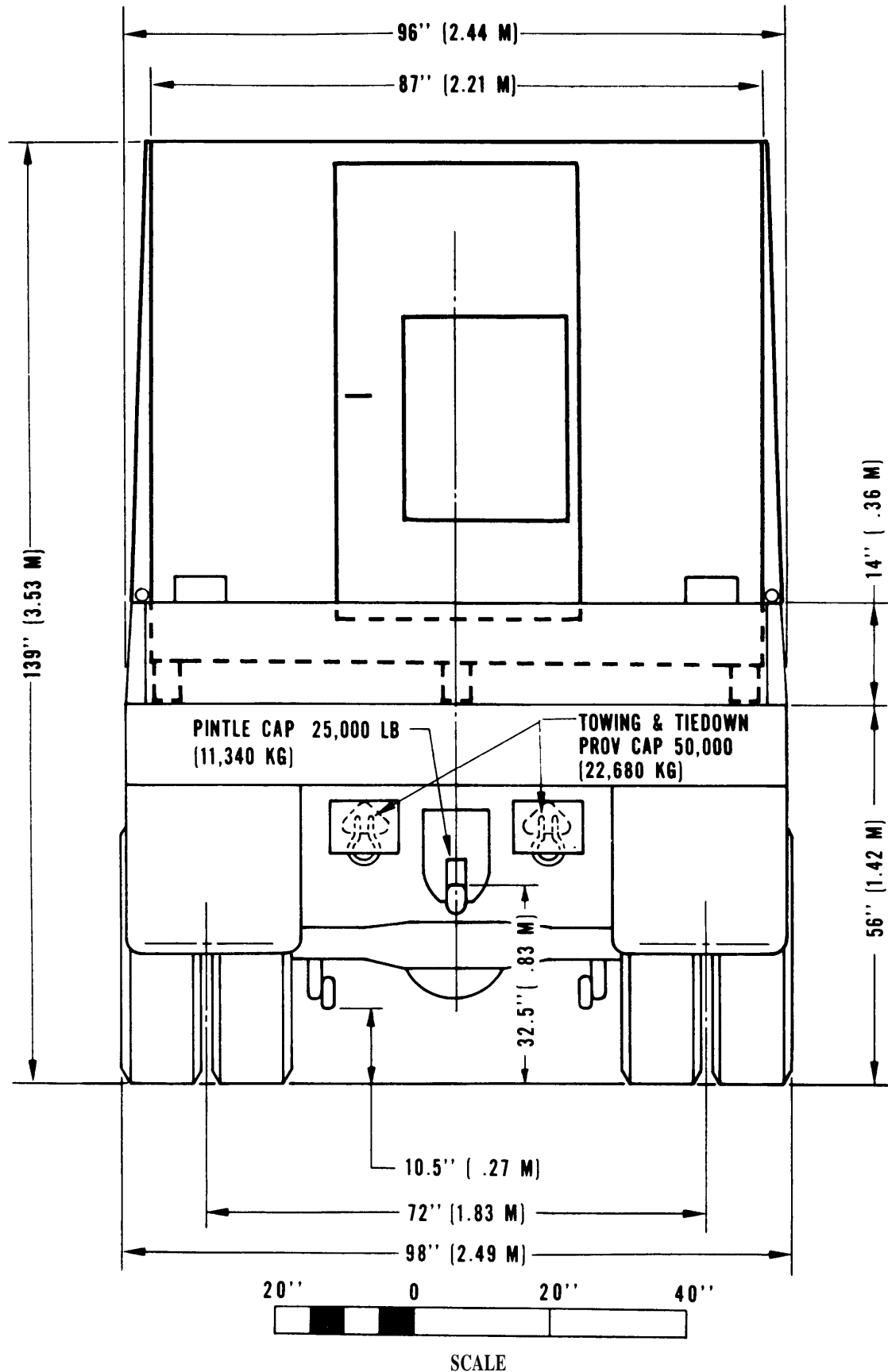


Figure 2-5. Rear elevation, truck, cargo, M813A1, with shelter.

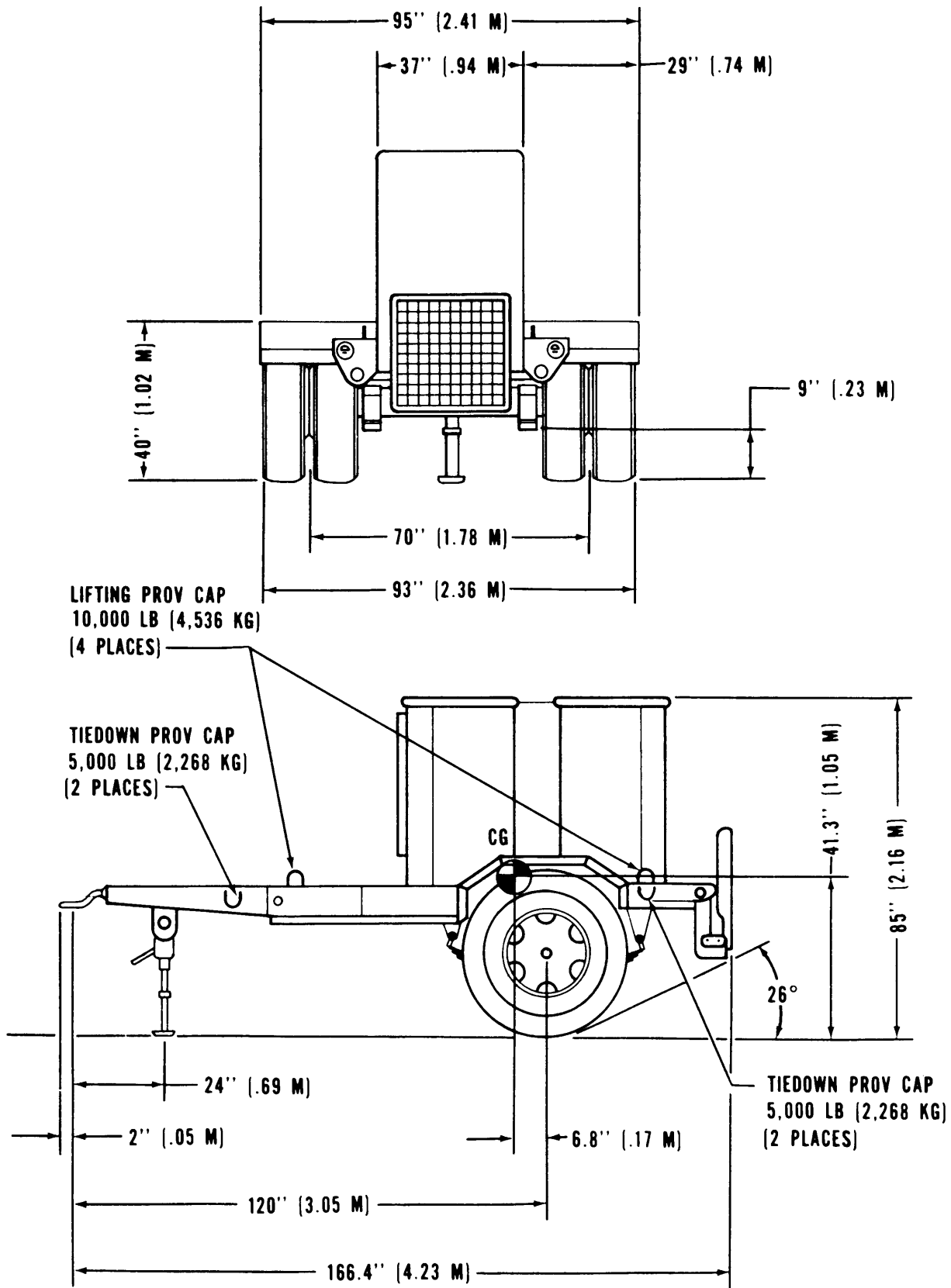


Figure 2-6. Side and rear elevation, power unit, PU-7821M.



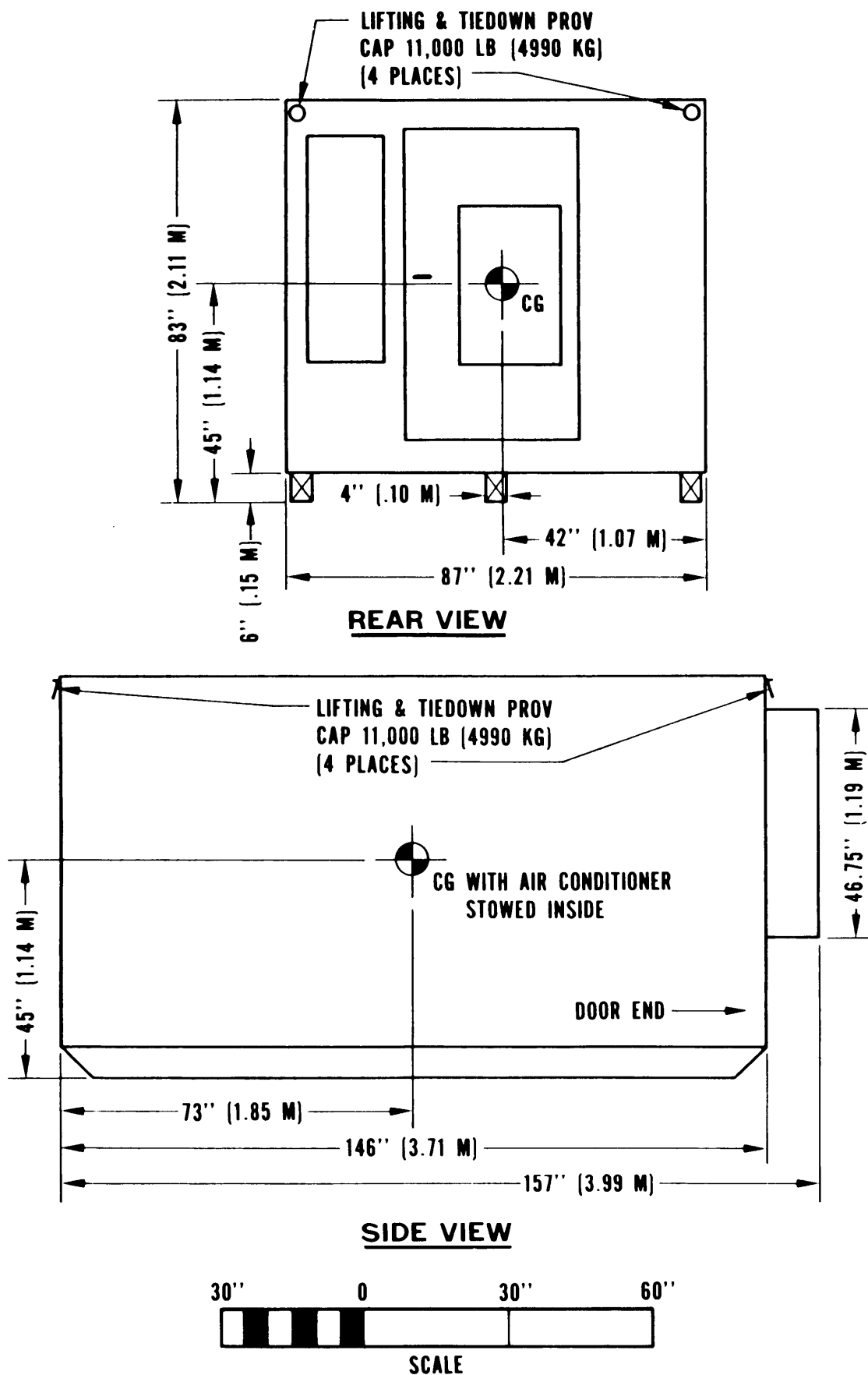


Figure 2-7. Side and rear elevation, shelter, S491.

Table 2-1. Characteristics and Related Data

Model	TOE LIN	NSN	Weight		Volume, cu ft (m <sup>3</sup> )	
			lb	(kg)	operational	reduced
Shelter, S491	Y99990	N/A	6,179	(2,802)	802 (22.72)	656 (18.56)
Truck, M813A1	X40931	2320-00-050-8905	22,144	(10,045)	1,980 (56.07)	1,560 (44.15)
Power Unit, PU-732/M	Z29559	6115-00-260-3082	5,660	(2,567)	790 (22.36)	790 (22.36)
Truck, M813A1, w/Shelter, S491, Mounted	N/A	N/A	28,323	(12,847)	2,562 (72.50)	2,562 (72.50)

### 2-5. Reduced Configuration

Except for ocean transport, the TACFIRE system components should be reduced only to the extent necessary for the selected mode of transportation. For terminal handling and ocean transport, economy can be achieved by reducing the system components to their minimum dimensions without major disassembly. The power unit is not reducible. The shelter may be reduced by removing the air conditioner, the modular collective protective equipment, and the communications terminal box. The truck height may be reduced by lowering the windshield and by removing the shelter, truck cargo body side and end racks, cab top, and exhaust pipe extension. Detailed procedures for preparation are provided in MIL-V-62038, Military Specification, Preparation for Shipment and Storage of Wheeled Vehicles.

### 2-6. Unusual Characteristics

The TACFIRE system has no unusual characteristics that require special attention to be given to temperature, atmospheric pressure, or humidity variations during exposure to normal transportation environments.

### 2-7. Hazardous and Dangerous Characteristics

Unless the system is shipped with ammunition or

explosives, under the provisions of Department of Transportation Special Permit No. 3498 (applicable only to shipments by motor vehicle or rail in periods of actual emergency), it will not present any hazardous or dangerous characteristics during exposure to normal transportation environments.

### NOTE

Those regulations and/or transportation procedures normally associated with vehicles carrying combustible liquid fuels apply (TM 38-250); Code of *Federal Regulations*, Titles 46 and 49; and the Association of American Railroads *Rules Governing the Loading of Commodities on Open-Top Cars and Trailers* (app).

### 2-8. Fragility

The TACFIRE system is designed so that, when restrained in accordance with the guidance provided in this manual, it can withstand the shocks and vibrations associated with current transportation methods.

### 2-9. CONUS Freight Classification

Rail and motor freight classification descriptions and item numbers will be determined in accordance with chapter 211, AR 55-355.



## CHAPTER 3

### SAFETY

---

#### 3-1. General

General safety considerations and precautions for handling and movement of the TACFIRE system are as follows:

*a.* Check to insure that all loose items are appropriately secured to prevent damage during transport. When transporting the system with the shelter mounted on the truck, secure the shelter to the truck and meet the same restraint criteria as required for the vehicle.

*b.* When backing the truck or maneuvering in close areas, insure that aground guide is provided.

*c.* Observe operating and handling procedures specified in the operators technical manual for each major component item of the system.

*d.* Have fire extinguishers readily available during all loading and unloading operations.

*e.* Provide proper ventilation during loading and unloading operations if internal combustion engines are operated. Prolonged inhalation of exhaust fumes will produce adverse effects that could prove fatal.

*f.* Do not allow the truck and power unit to exceed three miles per hour (walking speed) on loading ramps, rail cars, or inside cargo aircraft.

#### 3-2. Specific Safety Requirements

Specific safety requirements for each mode of transport are as follows:

##### *a. Air.*

(1) Insure that power unit and truck fuel tanks are not less than 1/4 or more than 3/4 full. Follow

provisions of paragraphs 6-27, 6-28, and 8-47 TM 38-250/AFR 71-4.

(2) The activity offering the system for air transport will insure that no ammunition or explosives are in the system prior to delivery for loading on the aircraft.

##### *b. Highway.*

(1) Do not allow personnel on truck/trailer bed during loading or unloading operations.

(2) CONUS movement is subject to all safety laws, rules and regulations applicable to commercial carriers. In oversea areas, movements are governed by theater and local regulations.

(3) Do not conduct loading or unloading operations on side or lateral slopes exceeding 10 percent or with a tractor-to-trailer offset angle greater than 5 degrees. Avoid loading on a severe downgrade to prevent the payload from rolling forward on the carrier.

##### *c. Water.*

(1) The provisions of *Code of Federal Regulations*, Title 46, Transportation, subpart 146, apply when shipping items equipped with internal combustion engines, or flammable liquid fuel.

(2) If ammunition or explosives are to be transported with the system, compliance with AR 55-228, US CG108, and *Water Carrier Tariff No. 31* or reissues thereof is mandatory.

(3) Caution personnel not to walk under items being lifted.

(4) Insure that all lifts have at least two tag lines attached for use in controlling swing of the lift while suspended.



## CHAPTER 4

### AIR TRANSPORTABILITY GUIDANCE

---

#### 4-1. Scope

This chapter provides transportability guidance for air movement of the TACFIRE system. It covers significant technical and physical characteristics and prescribes the materials required to prepare, load, and unload the system as an internal load in the C-5, C-130, and C-141 cargo aircraft.

#### 4-2. Maximum Use of Aircraft Capacity

The loads described in this chapter are not necessarily maximum aircraft loads. Total cargo loads and operating ranges are subject to variables such as weather, airfield conditions, individual aircraft characteristics, and distance. General guidance on total cargo loads and operating ranges is provided in TM 38-236/AFP 71-8. For specific guidance, contact the nearest Military Airlift Command (MAC) Activity.

#### 4-3. Safety

Safety precautions are listed in chapter 3.

#### 4-4. Preparation of System

*a.* All parking brakes must be serviceable and no rocks or stones may be embedded in the tire treads or between dual wheels.

*b.* The system components must be clean and free of dirt, grease, or other debris that could be dislodged during loading, transport, or unloading.

*c.* The installed equipment in the S491 shelter must be secured to insure that the shelter and contents will be restrained to the following G factors: 3G forward, 11/2G aft, 11/2G lateral, 2G vertical (up), and 41/2G vertical (down). The shelter will be removed from the truck and placed on two joined Air Force HCU -6/E pallets (463L) for transport by C-130 or C-141 aircraft.

*d.* If the system is to be transported in the C-130 or C-141 aircraft, the cargo truck height must be reduced to a maximum of 102 inches. The

truck may be transported at operational height with the shelter mounted in the C-5 aircraft.

#### 4-5. Transport by US Air Force Aircraft

*a.* The aircraft commander, or designated representative, is responsible for insuring that the system is loaded, properly secured, and unloaded in accordance with section IV of TO 1C-5A-9, TO 1C-130A-9, or TO 1C-141A-9, as applicable.

*b.* Restraint factors (G loads:  $1G = 1 \times$  the weight of an item) for minimum acceptable conditions specified for crew safety in the event of a controlled emergency landing are specified in TO 1C-5A-9, TO 1C-130A-9 and TO 1C-141A-9, as applicable. The tiedown diagrams (figs 4-1 and 4-2) and data (tables 4-1 and 4-2) are based on acceptable methods. Figures 4-1 and 4-2 show representative patterns. The exact placement of the system items in an aircraft is dependent primarily upon the aircraft-ready-for-loading weight and on other cargo to be loaded. Since both factors are subject to wide variances, the exact placement cannot be shown in this manual and must be determined on an individual load basis. Tables 4-1 and 4-2 list the tiedown devices required (provided aboard aircraft) and tiedown provisions on the system items.

*c.* The cargo truck may be loaded aboard aircraft under its own power or it may be winched aboard. The power unit may be loaded using the cargo truck as a prime mover or it may be winched aboard. These two items should be backed into the aircraft unless loaded over the aft ramp of the C-5. In this case, the items may go aboard front first. When the power unit has been positioned aboard the aircraft, and before it is disconnected from the prime mover, place a piece of 2- x 12- x 12-inch shoring on aircraft floor, then place power unit front support leg on shoring.

#### WARNING

Consult TM 38-250/AFR 714 to insure compatibility of any cargo being considered for loading and transport with the TACFIRE system.

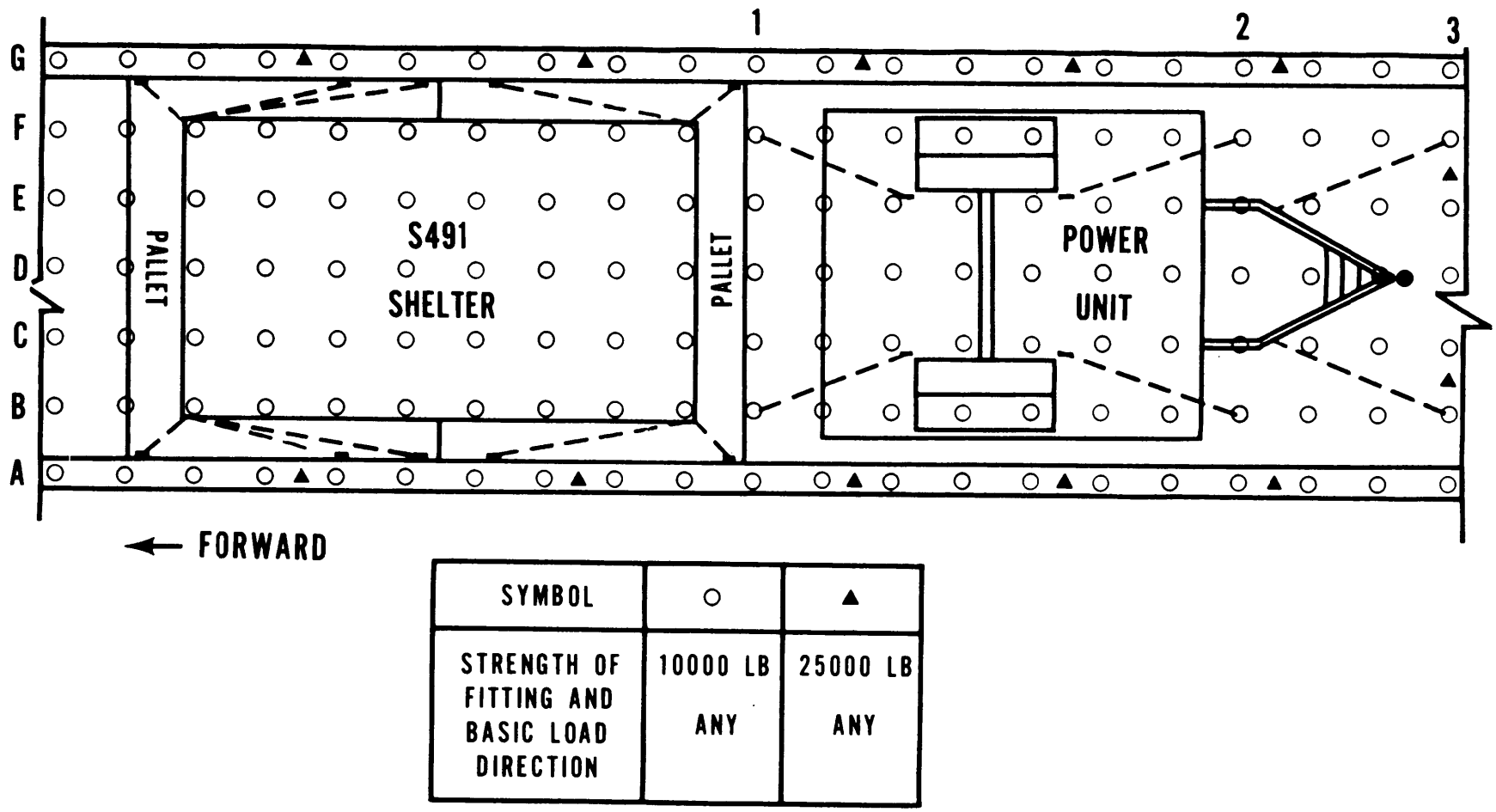


Figure 4-1. Tiedown of shelter, S491, on the 463L pallet and power unit PU-732/M, in C-130 aircraft.



Table 4-1. Tiedown Data for Shelter, S491, and Power Unit, PU-732/M in C-130 Aircraft

<i>Tiedown fitting</i>		<i>Tiedown device*</i>		Attach to item
design- nation	capacity in 1,000 lb	type	capacity in 1,000 lb	
all tie- downs from shelter to pallet	10	MB-1	7.5	Tiedown rings on each top corner
B-1	10	MB-1	10	Right rear tiedown provision
F-1	10	MB-1	10	Left rear tiedown provision
B-2	10	MB-1	10	Right center tiedown provision
F-2	10	MB-1	10	Left center tiedown provision
B-3	10	MB-1	10	Right front tiedown provision
F-3	10	MB-1	10	Left front tiedown provision

\* C-2 may be substituted for MB-1.

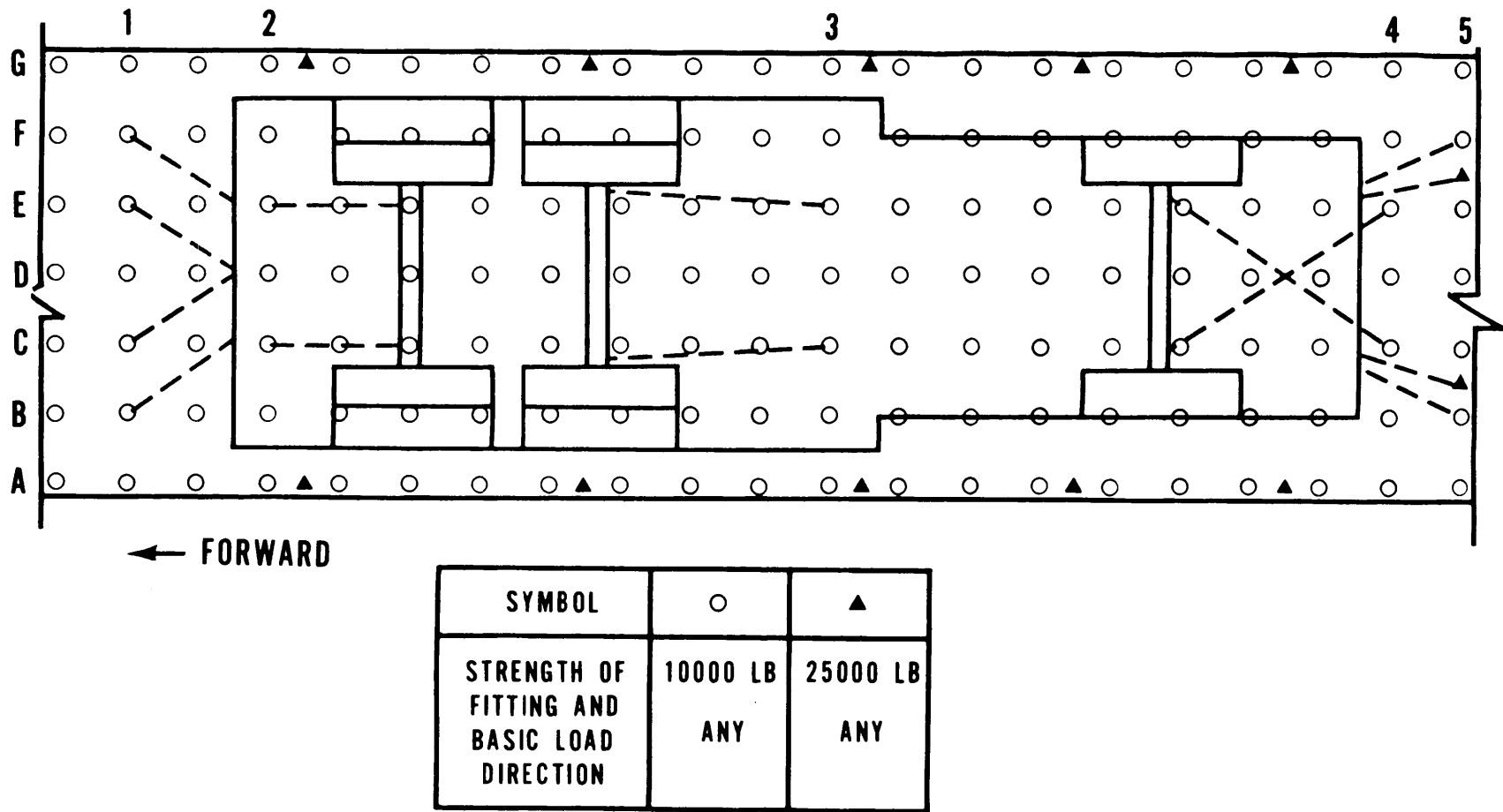


Figure 4-2. Tiedown of truck, cargo, 5-ton, M813A1, in C-130 aircraft.

Table 4-2. Tiedown Data for Truck, Cargo, 5-Ton. M813A1 in C 130 Aircraft

design- nation	Tiedown fitting	Tiedown device*		Attach to item
	capacity in 1,000 lb	type	capacity in 1,000 lb	
B1	10	MB-1	10	Right rear tiedown provision
F1	10	MB-1	10	Left rear tiedown provision
C1	10	MB-1	10	Pintle
E1	10	MB-1	10	Pintle
C2	10	MB-1	10	Right rear axle
E2	10	MB-1	10	Left rear axle
C3	10	MB-1	10	Right intermediate axle
E3	10	MB-1	10	Left intermediate axle
C4	10	MB-1	10	Left front axle
E4	10	MB-1	10	Right front axle
B5	10	MB-1	10	Right front tiedown provision
F5	10	MB-1	10	Left front tiedown provision
B5	25	MB-2	25	Right front tiedown provision
F5	25	MB-2	25	Left front tiedown provision

\*C-2 may be substituted for MB-1 D-1 may be substituted for MB-2

#### **4-6. Transport by US Army Aircraft**

The TACFIRE system component items exceed size limitations for internal transport by US Army fixed- or rotary-wing aircraft. The items are within the weight limitations for external lift by the CH-47C helicopter. The shelter and power unit can also be lifted by the CH-54 helicopter. Rigging instructions for external loads are contained in TM 55450-11 and TM 55-450-12.

#### **4-7. Operations at the Offload Base/ Landing Zone**

If the TACFIRE system shelter has been removed from the truck for air transport, planning should include transport or availability of a wrecker or crane at the offload point for remounting the shelter.

## CHAPTER 5

### HIGHWAY TRANSPORTABILITY GUIDANCE

---

#### Section I. GENERAL

##### 5-1. Scope

This chapter provides transportability guidance for highway movement of the TACFIRE system. It covers significant technical and physical characteristics and prescribes the materials and guidance required to prepare, load, and tie down the system components.

##### 5-2. Safety

Safety precautions are listed in chapter 3.

##### 5-3. General

The TACFIRE system is capable of highway

movement under its own power. The power units are towed by the 5-ton trucks and the shelter is carried in the cargo bed of one of the trucks. The system is within the weight, length, and height legal limitations for highway movement in CONUS, but the truck exceeds the 96-inch width limitation. A special permit may be required in accordance with AR 55-162. These restrictions apply also to overseas highway movement. Legal limitations in overseas areas are identified in *Limits of Motor Vehicle Sizes and Weights*, International Road Federation, 1023 Washington Building, Washington, DC 20005.

#### Section II. TRANSPORT BY SEMITRAILER/TRUCK

##### 5-4. Preparation

Secure all loose items to preclude damage enroute.

##### 5-5. Transport on Semitrailer/Truck

*a. General.* The cargo truck, shelter, and power unit, loaded on flatbed semitrailers or trucks, may be transported over highways. Movement over public highways in CONUS and overseas normally is used only for short hauls or when other modes of transport are not available or practical. Highway shipment may be made using either commercial or military flatbed trailers or trucks of adequate size and capacity (11.5-ton min). Tractor and semitrailers or trucks, when loaded with the TACFIRE components, may exceed height or width limitations. In CONUS the maximum unrestricted height is 162 inches and the width is 96 inches. To illustrate, the component items are shown as typical loads on semitrailer. M127 series (fig 5-1, 5-2 and 5-4). For unrestricted height clearance the shelter is removed from the cargo truck and loaded separately. The cargo truck height must be reduced so that, when combined with the semitrailer loading surface height of 60 inches, the unrestricted height limit is not exceeded.

*b. Material.* If semitrailers are equipped with

chain-type load binders, they will be used to secure the loads to the trailers. If load binders are not available, adequate blocking and tiedown materials are provided by the shipping activity and are specified in table 5-1 for truck, cargo, M813A1, and in table 5-3 for the shelter, S491, and power unit. PU-732/M.

*c. Loading.* The cargo truck, shelter, and power unit may each be placed in the tiedown position on the carrier equipment by a crane of 11.5 tons or more capacity (fig 6-1, 6-3 and 6-5, chapter 6, Marine and Terminal Transportability Guidance, provide lifting guidance). The cargo truck and power unit may be driven or towed onto the carrier equipment if a suitable ramp and prime mover are available. When the cargo truck and power unit are in the tiedown position, set the parking brakes.

*d. Tiedowns.* Figure 5-1 through 5-4 provide tiedown diagrams and details, compatible with standard loading practices, of how to restrain the loads adequately against forces encountered at normal speeds and under normal operating conditions. Tables 5-1 and 5-3 provide bills of materials, and tables 5-2 and 5-4 provide guidance for application of the materials for tiedown of the component items.

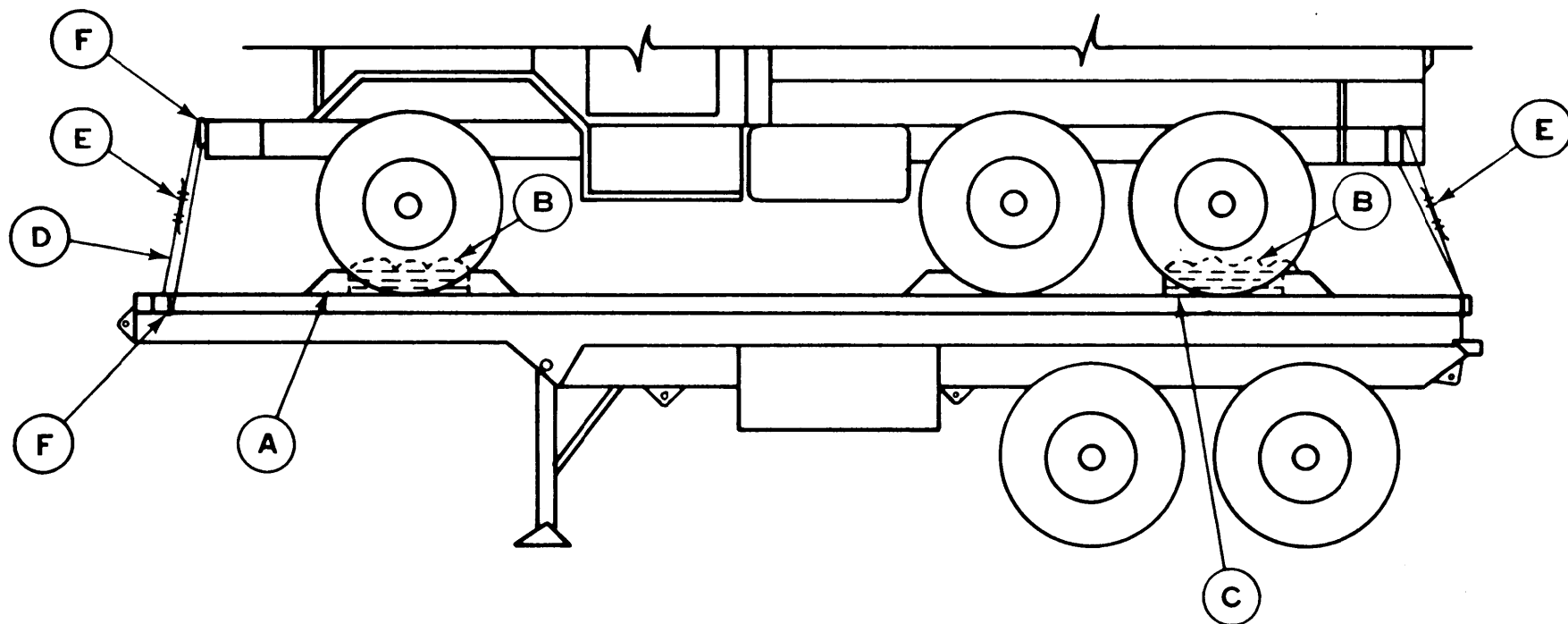


Figure 5-1. Blocking and tiedown of truck, cargo, 5-ton, M813A1, on semitrailer, M127 series, or larger (side view).

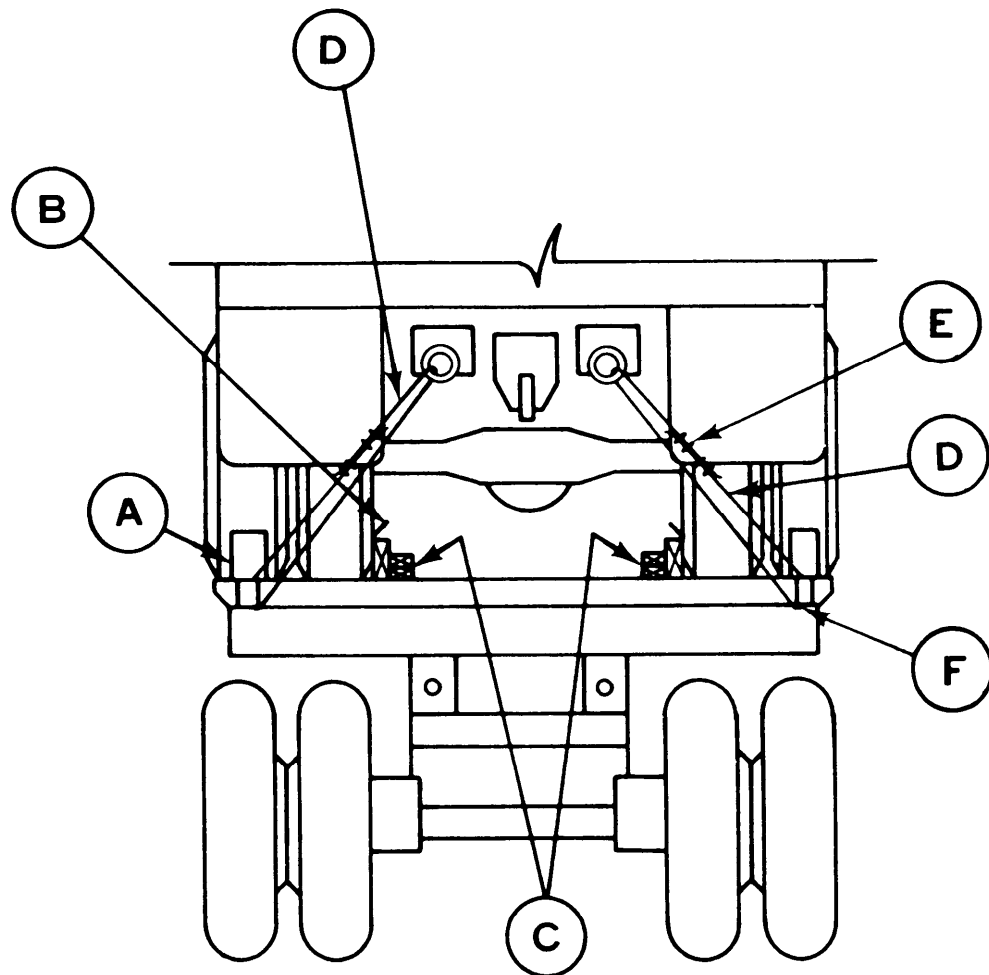


Figure 5-2. Blocking and tiedown of truck, cargo, 5-ton, M813A1, on semitrailer, M127 series, or larger (rear view).

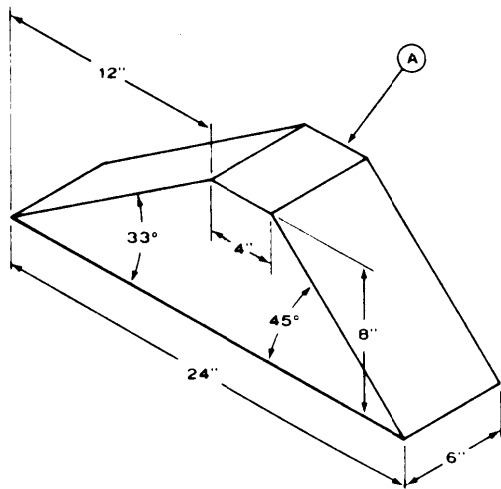
Table 5-1. Bill of Materials for Blocking and Tiedown of Truck, Cargo, M813AI, on Highway Carrier  
(Fig 5-1 and 5-2)

Item	Description	Approximate quantity
Lumber	Douglas-fir, or comparable, straightgrain, free from material defects; Fed Spec MM-L-751H: 6- x 8-inch 2- x 6-inch 2- x 4-inch	12 linear ft 12 linear ft 24 linear ft
Nails	Common, steel, flathead, bright or cement-coated; Fed Spec FF-N-105B: 20d 30d 40d	48 52 16
Wire rope	6 x 19 IWRC, improved plow steel, preformed, regular lay; Fed Spec RR-W-410C: ½-inch	60 ft
Clamps	Wire rope, U-bolt clips, saddled, single grip, steel, Crosby heavy-duty or equal; Fed Spec FF-C-450D: ½-inch	24
Thimbles	Standard, open-type: ½-inch	8
Cushioning material	Waterproof paper, burlap, or other suitable material	as required

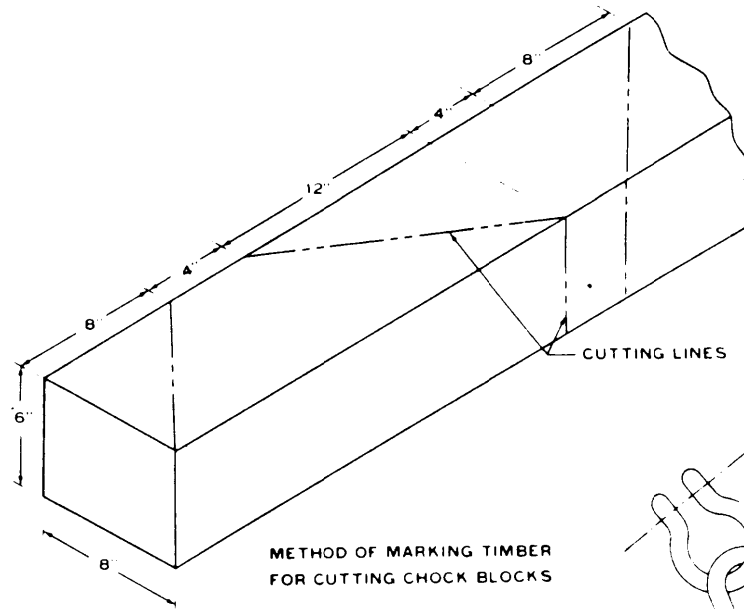
Table 5-2. Application of Materials for Blocking and Tiedown of Truck, Cargo, M813AI, on Highway Carrier  
(Fig 5-1 and 5-2)

Item	No. required	Application
A	8	Chock block (detail 1, fig 5-3). Place 45" end against front of front and outside intermediate wheels and against rear of front and outside rear wheels, as shown in figures 5-1 and 5-2. Toenail heel of block (33° end near bottom edge) to trailer floor with one 20d nail in each block. Drive two 40d nails into heel of each block, perpendicular to floor. Toenail each side of each block to floor with two 30d nails.
B	as required	Cushioning material (detail 2, fig 5-3). Locate bottom portion under item C and between tire and item C so as to be 2 inches above item C.
C	4	Side block (detail 2, fig 5-3). Each to consist of one piece of 2- x 6- x 36-inch lumber and two pieces of 2- x 4- x 36-inch lumber. Nail 2- x 6- x 36-inch piece to edge of lower 2- x 4- x 36-inch piece with five 20d nails. Place 2- x 6- x 36-inch piece against cushioning material and tire, and nail to floor through 2- x 4- x 36-inch piece with five 20d nails in a staggered pattern. Nail upper 2- x 4- x 36-inch piece to lower piece with five 30d nails.
D	4	Tiedowns (detail 3, fig 5-3). Each to consist of one piece ½-inch 6 x 19 IWRC wire rope, length as required (approximately 15 feet). Form a complete loop between tiedown provision and appropriate trailer stake pocket at a maximum angle of 45 degrees. Wire rope ends should overlap approximately 24 inches.
E	24	Clamps (detail 3, fig 5-3). Place four on each item D at overlap area. Space clamps 3½-inches apart with a minimum of 6 inches from ends of wire rope. Place one clamp on each thimble, item F, to secure thimble to wire rope at trailer stake pockets and vehicle tiedown provisions.
F	8	Thimbles (detail 3, fig. 5-3). Locate one under wire rope at each place where wire rope passes through vehicle tiedown provision and over edge of trailer stake pocket. Secure each thimble to wire rope with one ½-inch clamp.

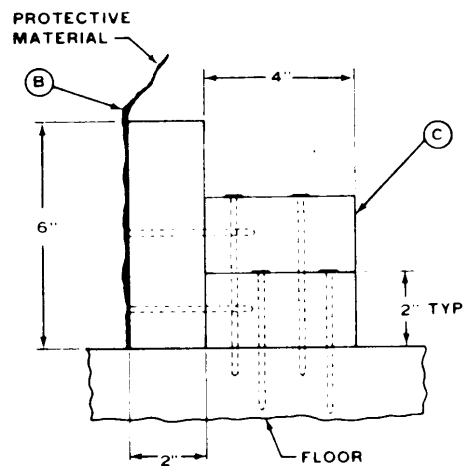




DETAIL 1

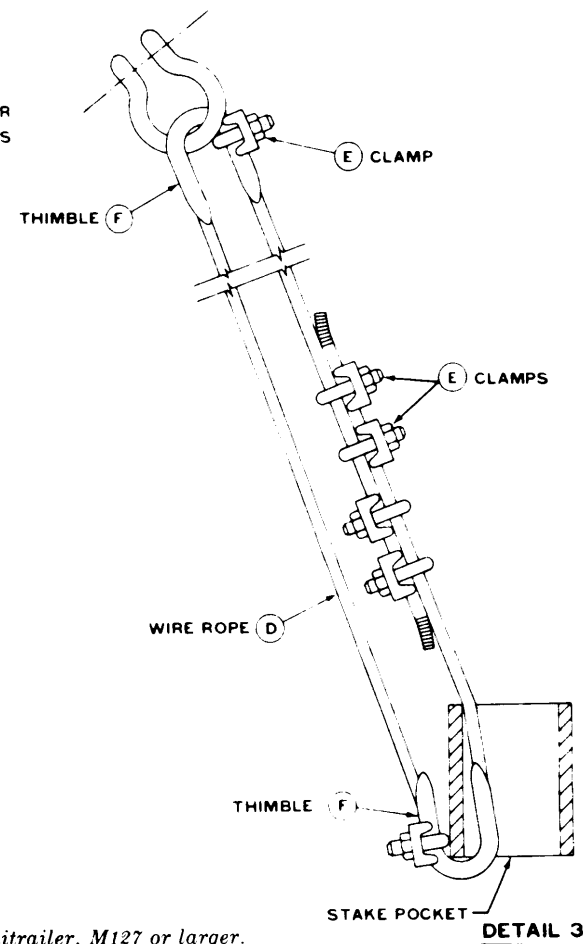


METHOD OF MARKING TIMBER  
FOR CUTTING CHOCK BLOCKS



DETAIL 2

NOT TO SCALE



DETAIL 3

Figure 5-3. Blocking and tiedown details for truck, cargo 5-ton, M813A1, on semitrailer, M127 or larger.

Table 5-3. Bill of Materials for Blocking and Tiedown of Shelter, S491, and Power Unit, PU-732/M, on Highway Carrier (Fig 5-4)

Item	Description	Approximate quantity
Lumber	Douglas-fir, or comparable, straight-grain, free from material defects; Fed Spec MM -L-751H: 6- x 8-inch 4- x 4-inch 2- x 6-inch 2- x 4-inch	6 linear ft 22 linear ft linear ft 52 linear ft
Nails	Common, steel, flathead, bright or cement-coated; Fed Spec FF-N -105B: 20d 30d 40d 60d	24 106 8 43
Wire rope	6 x 19 IWRC, improved plow steel, performed, regular lay; Fed Spec RR-W-410C: 3/8-inch	122 ft
Clamps	Wire rope, U-bolt clips, saddled, single grip, steel, Crosby heavy-duty or equal; Fed Spec FF-C-450D: 3/8-inch	48
Thimble	Standard, open-type: 3/8-inch	16
Cushioning material	Waterproof paper, burlap, or other suitable material	as required

Table 5-4. Application of Materials for Blocking and Tiedown of Shelter, S491, and Power Unit, PU-732/M, on Highway Carrier (Fig 5-4)

Item	No. required	Application
A	4	Chock block (detail 1, fig 5-3). Place 45° end against front and rear of each wheel as shown in figure 5-4. Toenail heel of block (33° end near bottom edge) to trailer to floor with one 20d nail in each block. Drive two 40d nails into heel of each block, perpendicular to floor. Toenail each side of each block to floor with two 30d nails.
B	as required	Cushioning material (detail 2, fig 5-3). Locate bottom portion under item C, and between tire and item C so as to be 2 inches above item C.
c	2	Side block (detail 2, fig 5-3). Each to consist of one piece of 2- x 6- x 36-inch lumber and two pieces of 2- x 4- x 36-inch lumber. Nail 2- x 6- x 36-inch piece to edge of lower 2- x 4- x 36-inch piece with five 20d nails. Place 2- x 6- x 36-inch piece against cushioning material and inboard side of tire and nail to floor through 2- x 4- x 36-inch piece with five 20d nails in a staggered pattern. Nail upper 2- x 4- x 36-inch piece to lower piece with five 30d nails.
D	1	Support block. Consists of one piece of 4- x 4- x 18-inch lumber. Place on floor under lunette. Nail to floor with three 60d nails.
E	8	Tiedowns (detail 3, fig 5-3). Each to consist of one piece 3/8-inch 6 x 19 IWRC wire rope, length as required. Form a complete loop between tiedown provision and appropriate trailer stake pocket at a maximum angle of 45 degrees. Wire rope ends should overlap approximately 24 inches.
F	48	Clamps (detail 3, fig 5-3). Place four on each item E at overlap area. Space clamps 3½-inches apart with a minimum of 6 inches from ends of wire rope. Place one clamp on each thimble, item G, to secure thimble to wire rope at trailer stake pockets and at equipment tiedown provisions.
G	16	Thimbles (detail 3, fig 5-3). Locate one under wire rope at each place where wire rope passes through equipment tiedown provisions and over edge of trailer stake pockets. Secure each thimble to wire rope with one 3/8-inch clamp.

Item	No. required	Application
H	2	End blocks. Each to consist of one piece 4- x 4- x 48-inch lumber and two pieces of 2- x 4- x 48-inch lumber. Place 4- x 4- x 48-inch piece centered and against end of shelter and nail to floor with eight 60d nails. Nail lower 2- x 4- x 48-inch to 4- x 4- x 48-inch piece with eight 30d nails. Nail upper 2 x 4- x 48-inch piece to lower piece with eight 20d nails. If trailer or truck is equipped with a headboard, the forward end block should be placed prior to loading the shelter on the trailer or truck.
J	4	Side blocks. Each to consist of one piece of 4- x 4- x 36-inch lumber and two pieces of 2- x 4- x 36-inch lumber. Place 4- x 4- x 36-inch piece on floor and against shelter approximately 18 inches in from end of shelter. Nail to floor with six 60d nails. Nail lower 2- x 4- x 36-inch piece to 4-x 4 x 36-inch piece with six 30d nails. Nail upper 2- x 4- x 36-inch piece to lower 2- x 4- x 36-inch with six 30d nails.

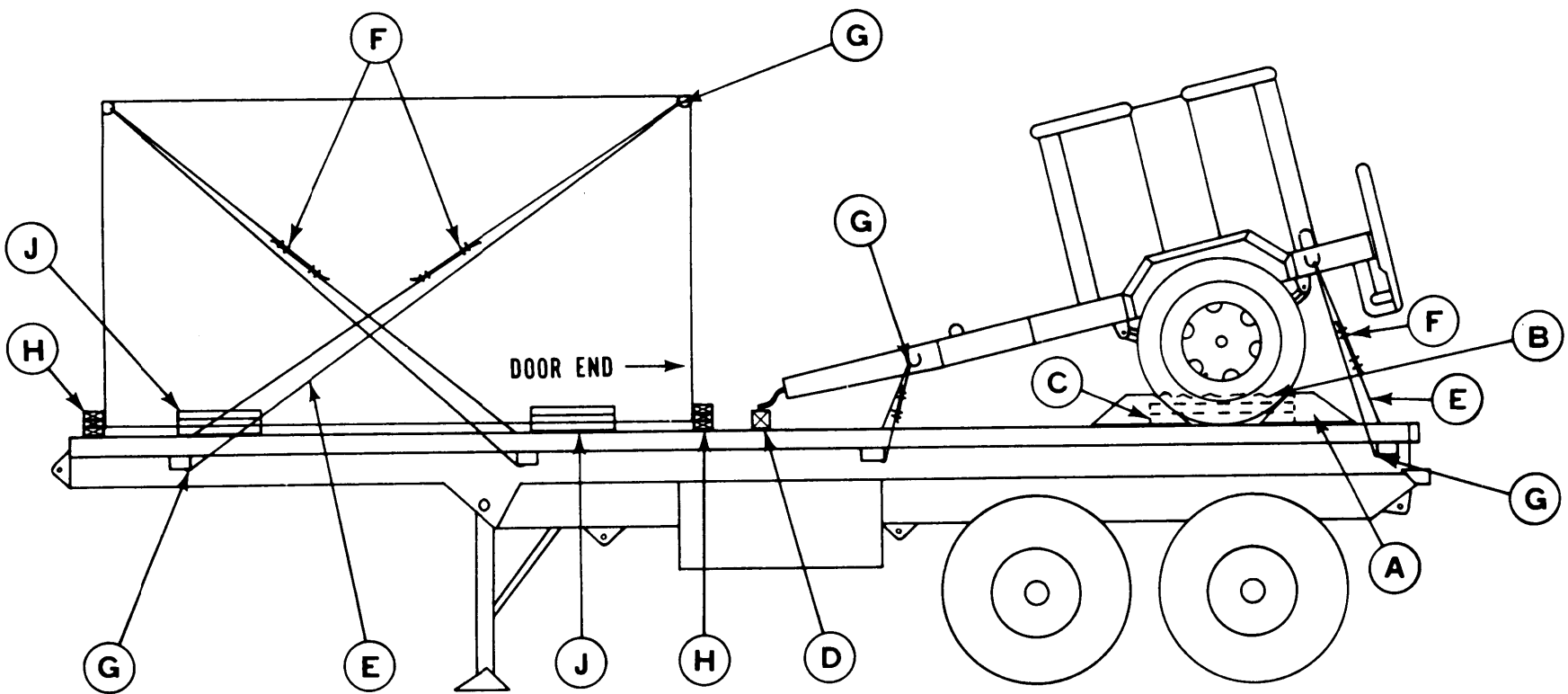


Figure 5-4. Blocking and tiedown of shelter, S491, and power unit, PU-732/M, on semitrailer, M127 series or larger.

## CHAPTER 6

## MARINE AND TERMINAL TRANSPORTABILITY GUIDANCE

## Section I. GENERAL

## 6-1. Scope

This chapter provides transportability guidance for marine and terminal handling and movement of the TACFIRE system. It covers significant technical and physical characteristics and also prescribes the materials and guidance necessary to prepare, lift, tiedown, and discharge the system.

## 6-2. Safety

Safety precautions are contained in chapter 3.

## 6-3. Water Shipment

The TACFIRE system can be transported by a variety of inland waterway cargo carriers, by lighters, and by most seagoing cargo vessels.

## NOTE

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

## Section II. LOADING AND SECURING

## 6-4. General Rules

*a. Stowage.* Whenever possible, below-deck stowage should be provided. In general, good stowage means placing the items as close together as practical, with minimum space between outer item and sweatboards (approximately 4 to 6 inches). Breakable parts should be protected, spare parts stowed in or near parent item, brakes set with brake lever wire tied, battery terminals disconnected and taped, and fuel tanks drained. Secure the system components by blocking wheels; front, rear, and on both sides. Lash with wire rope or chains to bulkhead, stanchions, or padeyes.

## NOTE

When the TACFIRE system is loaded on vessels that are adequately ventilated by power blowers, such as roll-on/roll-off vessels, fuel tanks need not be drained nor batteries disconnected.

*b. Lifting.* The cargo truck has four lifting provisions. Two are located on top of the front bumper and one on each spring saddle and pin assembly located on top of each rear spring assembly. The shelter has four lifting provisions. One is located on each top corner. The power unit has four lifting provisions located on top of the side frame rails,

two forward and two aft. Spreader bars must be used in the sling legs, as shown in figures 6-1 and 6-3. If the shelter is loaded separately, a four-legged sling with equal-length legs without spreader bars may be used (fig 6-5).

*c. Loading.* The TACFIRE system components will be loaded on seagoing cargo vessels in their minimum configuration as described in paragraph 2-5 unless operational requirements dictate otherwise. The system may be loaded under its own power aboard landing craft, beach discharge lighters, heavy or medium amphibious lighters, and landing ships; by towing with suitable prime mover; or by lifting with cranes of adequate capacity (14.5-ton minimum with shelter mounted in truck, otherwise 11.5-ton). Also, the system can be loaded onto seagoing vessels by shoreside or floating cranes or by ships' gear. Figures 6-2 and 6-4 show blocking and tiedown details. Tables 6-1 through 6-4 list materials and their application for blocking and tiedown in general-cargo vessels.

*d. Special Design.* Roll-on/roll-off ships, landing ships, and attack cargo ships are equipped with patented lashing gear and pre-positioned fittings in the decks. **The proper use of such equipment is adequate, and the additional blocking and bracing are not required.**

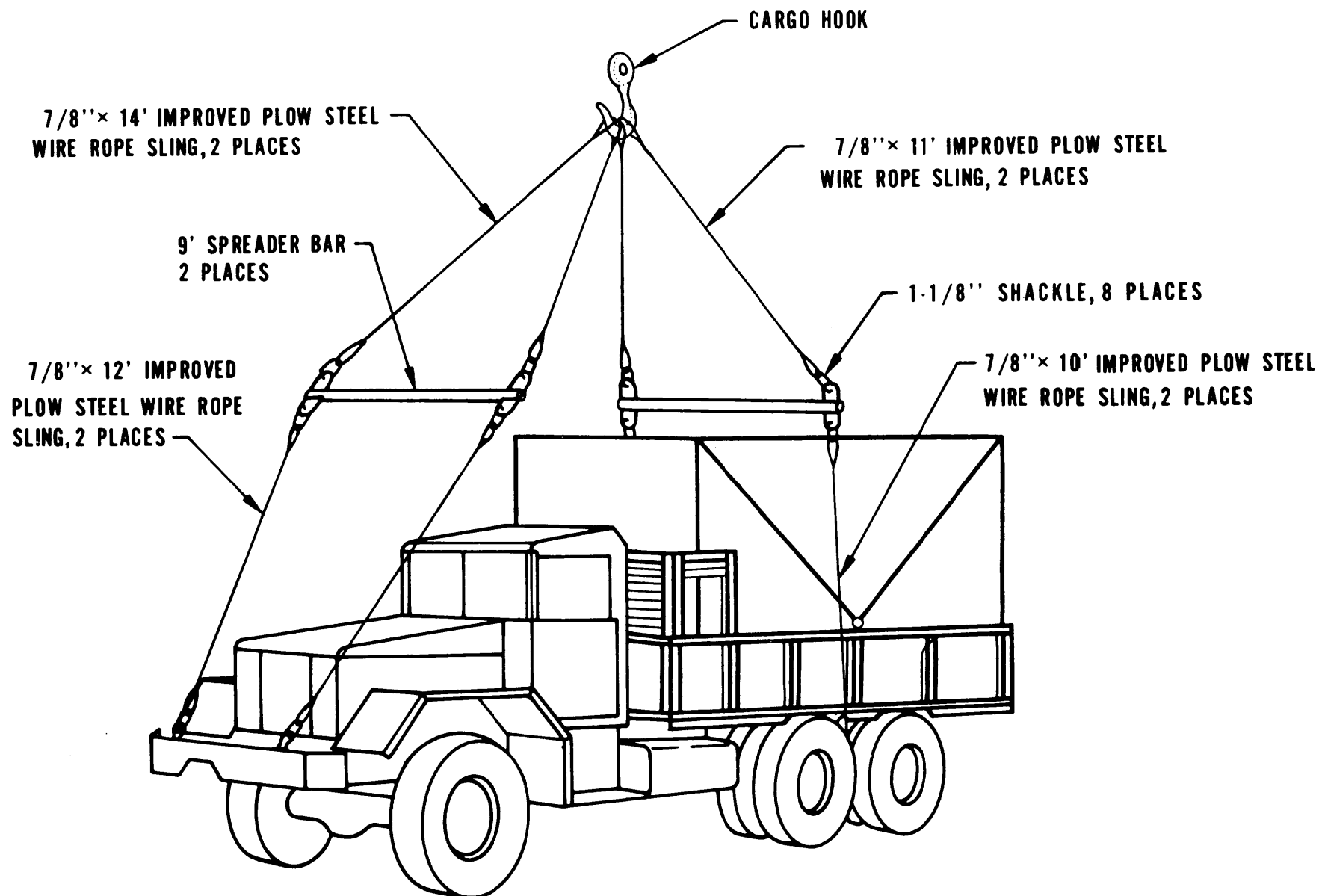


Figure 6-1. Lifting of truck, cargo, 5-ton, M813A1, with shelter, S491, mounted.

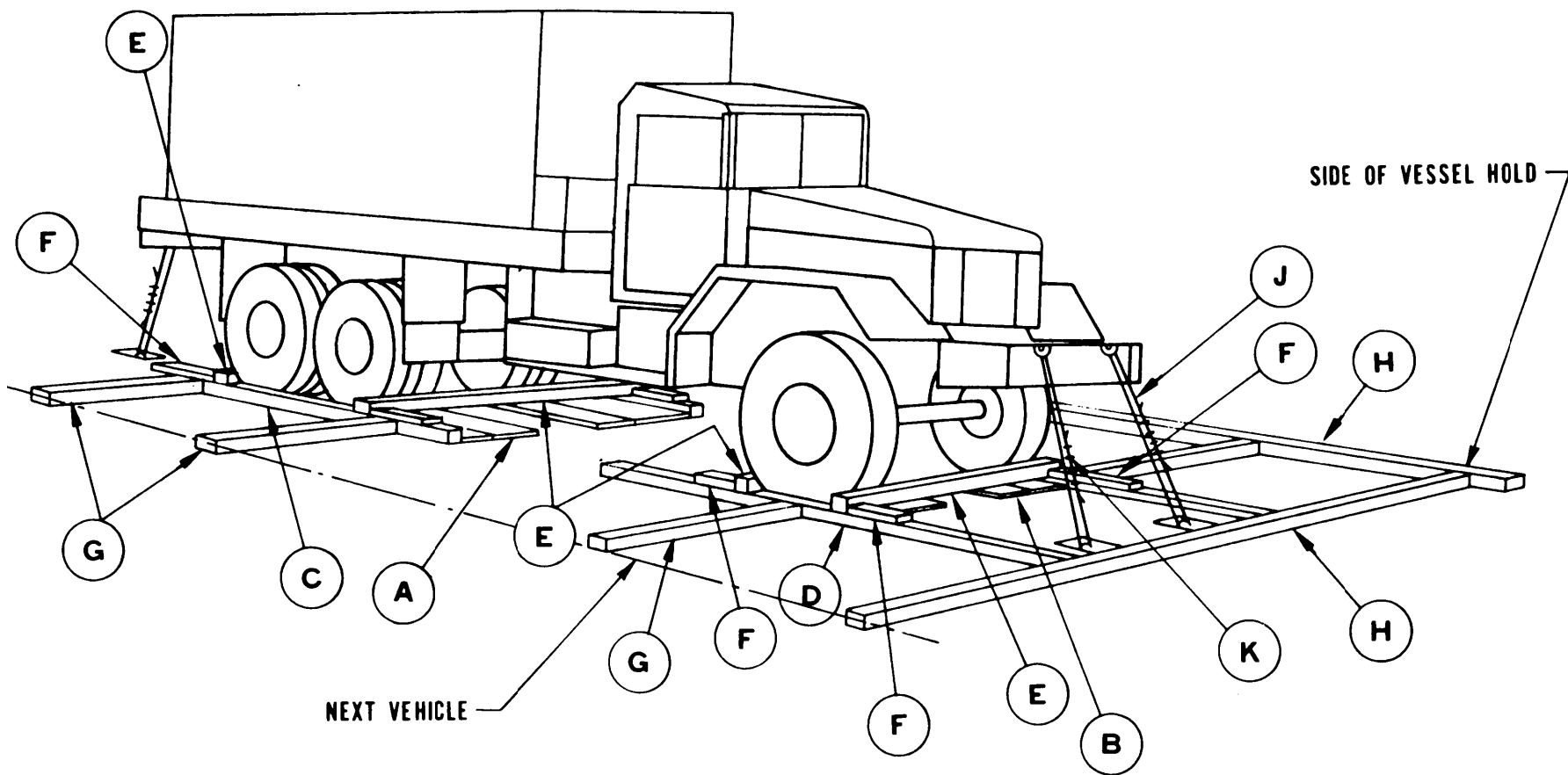


Figure 6-2. Blocking and tiedown of truck, cargo, 5-ton, M813A1, in general-cargo vessel.

Table 6-1. Bill of Materials for Blocking and Tiedown of Truck, M813A1, with Shelter, S491, in General Cargo Vessel  
(Fig 6-2)

Item	Description	Approximate quantity
Lumber	Douglas-fir, or comparable, straight-grain, free from material defects; Fed Spec MM -L-751H: 2- x 4-inch 2- x 12-inch 4- x 6-inch	8 linear ft 44 linear ft 62 linear ft
Nails	Common, steel, flathead, bright or cement-coated; Fed Spec FF-N-105B: 12d 30d 60d	32 as required 16
Wire rope	6 x 19 IWRC, improved plow steel, preformed, regular-lay; Fed Spec RR-W-410C: 5/8-inch	80 ft
Clamps	Wire rope, U-bolt clips, saddled single grip, steel, Crosby heavy-duty or equal; Fed Spec FF-C-450D: 5/8-inch	16

Table 6-2. Application of Materials for Blocking and Tiedown of Truck, M813A1, with Shelter, S491, in General-Cargo Vessel  
(Fig 6-2)

Item	No. required	Application
A	4	Lumber, 2- x 12- x 96-inch. Pre-position on vessel deck so that two pieces are under the left rear wheels and two pieces are under the right rear wheels parallel to the long axis of the truck.
B	4	Lumber, 2- x 12- x 36-inch. Pre-position on vessel deck so that two pieces are under each front wheel parallel to the long axis of the truck.
C	2	Side blocks. Each to consist of 4- x 6- x 108-inch lumber. Locate one piece centered against outside of left and right rear wheels.
D	2	Side blocks. Each to consist of 4- x 6- x 48-inch lumber. Locate one piece centered against outside of each front wheel.
E	4	End blocks. Each to consist of 4- x 6- x 108-inch lumber. Locate one piece forward of front and intermediate wheels and behind front and rear wheels. Toenail each end to side block with two 60d nails.
F	8	Backup cleats. Each to consist of one piece of 2- x 4- x 12-inch lumber. Locate one on top of items C and D against the joint of each item E. Nail to items C and D with four 12d nails each.
G*	as required	Bracing. 4- x 6-inch x random length, cut-to-fit. Place ends against side blocking and blocking of other cargo, side of ship, or other ship's structure. Nail with 30d nails where appropriate.
H*	as required	Blocking. 4- x 6-inch x random length, cut-to-fit. Place around truck and against other blocking, side of vessel, or other ship's structure as appropriate, to assist in holding bracing in place.
J	4	Wire rope, approximately 20 feet each. Form a complete loop through truck tiedown provision and appropriate deck padeye or D-ring. Pull wire rope taut and secure with clamps (item K).
K	16	Clamps. Use four to secure each item J. Details for placement of clamps may be found in figure 5-3 or 7-4.

\* Material for these items not included in table 6-1.



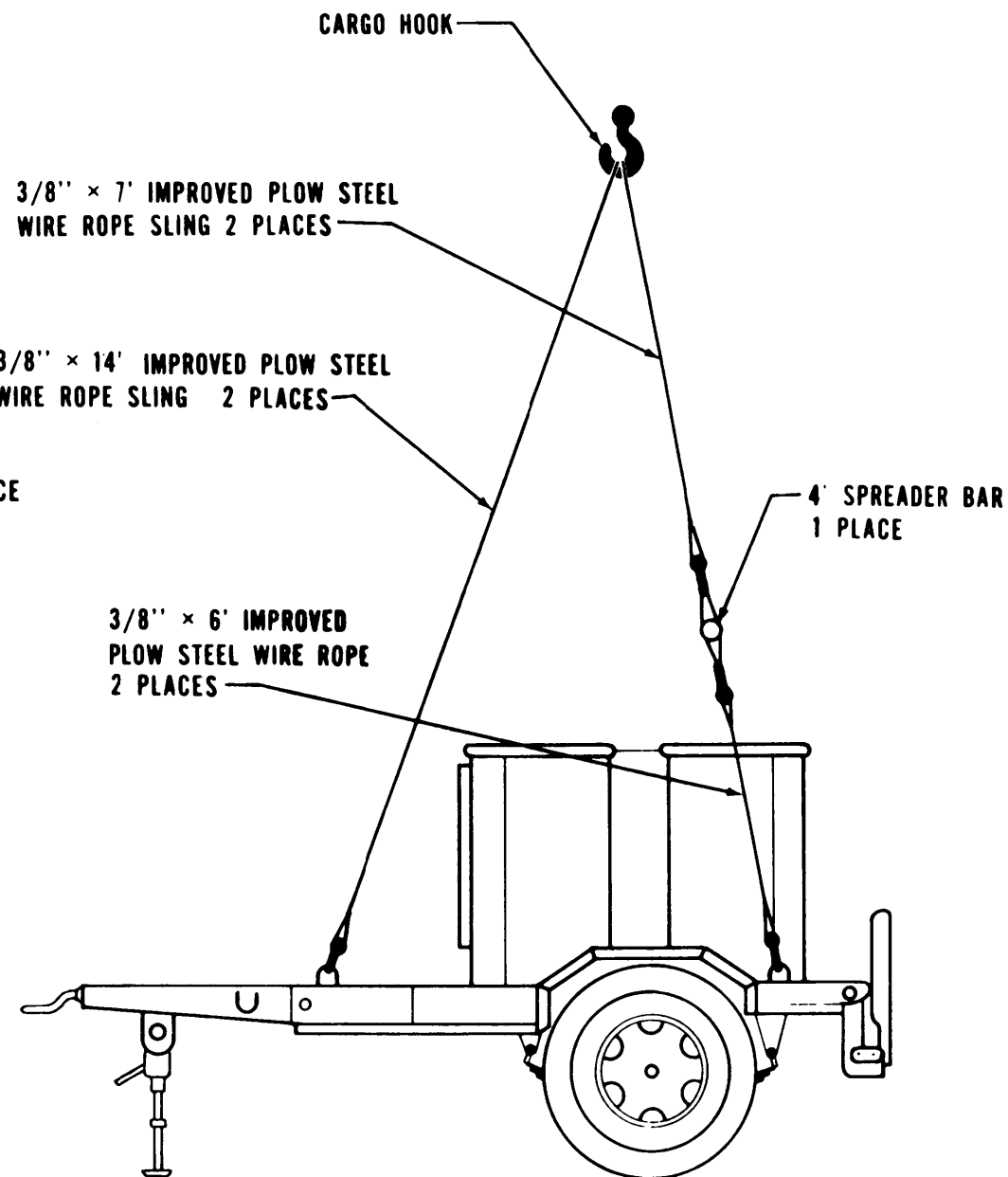
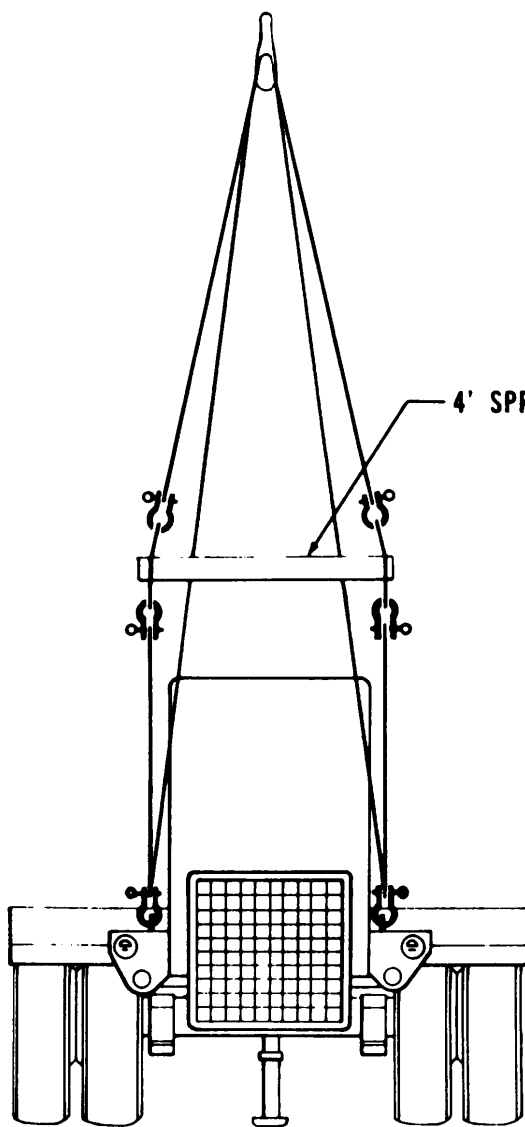


Figure 6-3. Lifting of power unit, PU-732/M.

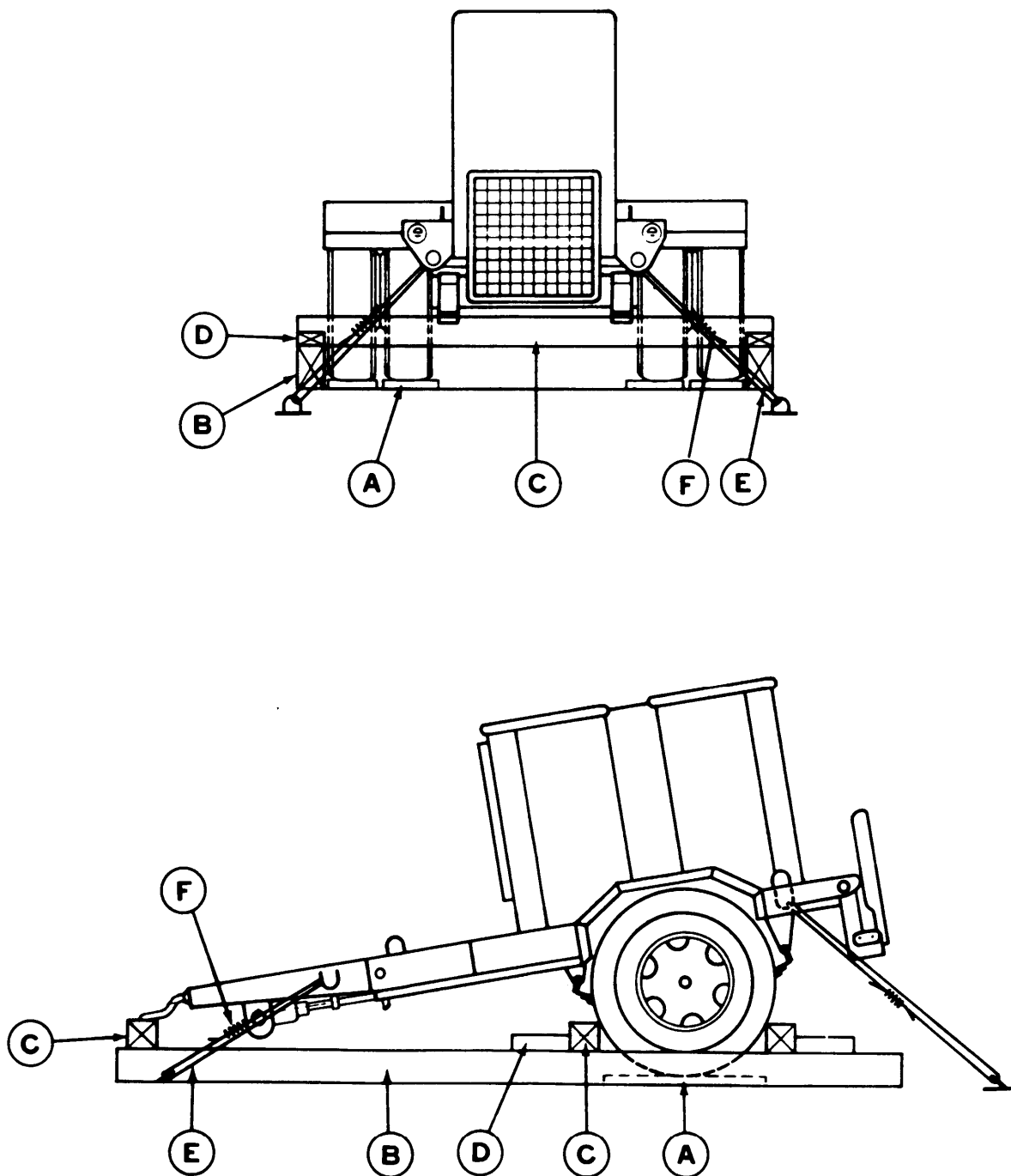


Figure 6-4. Blocking and tiedown of power unit, PU-732/M, in general-cargo vessel.

Table 6-3 Bill of Materials for Blocking and Tiedown of Power Unit, PU-732/M, in General -Cargo Vessel  
(Fig 6-4)

Item	Description	Approximate quantity
Lumber	Douglas-fir, or comparable, straight-grain, free from material defects; Fed Spec MM-L-751H: 2- x 4-inch 2- x 12-inch 4- x 6-inch	4 linear ft 12 linear ft 52 linear ft
Nails	Common, steel, flathead, bright or cement-coated; Fed Spec FF-N-105B: 12d 60d	16 12
Wire rope	6 x 19 IWRC, improved plow steel, preformed, regular-lay; Fed Spec RR-W410C: 3/8-inch	50 ft
Clamps	Wire rope, U-bolt clips, saddled, single grip, steel, Crosby heavy-duty or equal; Fed Spec FF-C-450D: 3/8-inch	16

Table 6-4. Application of Materials for Blocking and Tiedown of Power Unit, PU-732/M, in General-Cargo Vessel  
(Fig 6-4)

Item	No. required	Application
A	4	Lumber, 2- x 12- x 36-inch. Pre-position on vessel deck so that two pieces are under each pair of wheels and parallel to the long axis of the trailer.
B	2	Side blocks. Each to consist of 4- x 6- x 156-inch lumber. Locate one piece centered on the trailer and against each outside wheel.
c	3	End blocks. Each to consist of 4- x 6- x 104-inch lumber. Locate one piece forward of and to the rear of trailer wheels across items B. Locate one piece across items B and under lunette. Toenail each end of each block to items B with two 60d nails.
D	4	Backup cleats. Each to consist of 2- x 4- x 12-inch lumber. Locate one piece on top of items B against the joint of the items C which are against the wheels. Nail to items B with four 12d nails each.
E	4	Wire rope, approximately 12 feet each. Form a complete loop through a trailer tiedown provision and appropriate deck padeye or D-ring. Pull wire rope taut and secure with clamps (item F).
F	16	Clamps. Use four to secure each item E. Details for placement of clamps may be found in figures 5-3 or 7-4.

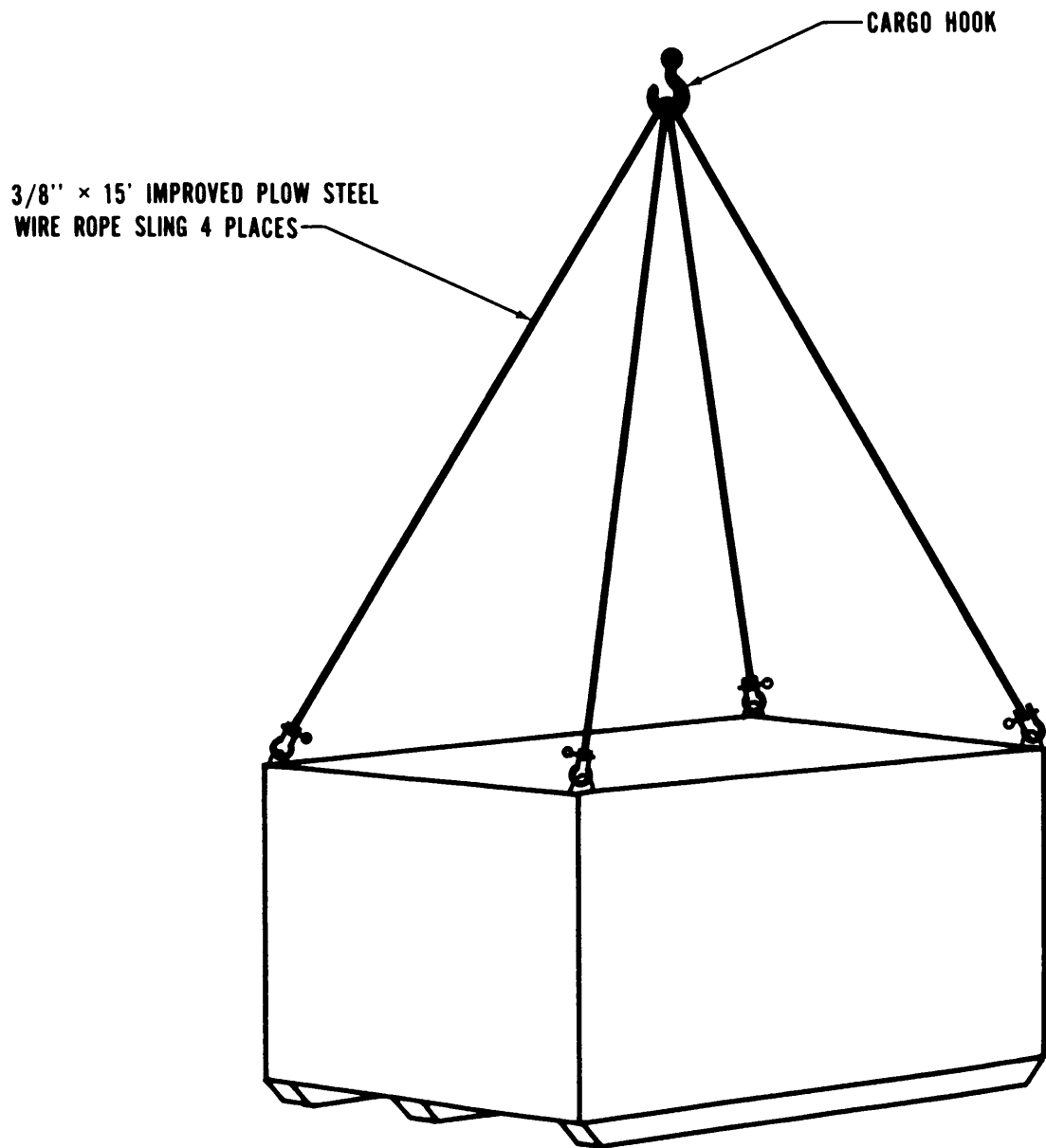


Figure 6-5. Lifting of shelter, S491.

**6-5. Barges and lighters**

When transporting the TACFIRE system short distances by barge or lighter on sheltered waters, blocking and chocking will be required. When moving extended distances or through rough waters, tiedowns must also be used.

**6-6. Landing Ships, Landing Craft, and Amphibians**

When transporting the system for extended dis-

tances or through rough waters, blocking and tiedowns must be used. In most cases, the vessels are equipped with turnbuckles and cables with a sheep's-foot fitting or hook on one end that fits into a deck cloverleaf or star fitting. Where this equipment is not provided, a suitable substitute may be used (tables 6-1 through 6-4).



## CHAPTER 7

### RAIL TRANSPORTABILITY GUIDANCE

---

#### Section I. GENERAL

##### 7-1. Scope

This chapter provides transportability guidance for rail movement of the TACFIRE system. It covers significant technical and physical characteristics and safety considerations and also prescribes the materials and guidance required to prepare, load, and tiedown the system on open-top flatcars.

##### 7-2. Maximum Use of Railcar Capacity

Additional cargo, as approved by the activity offering the system for transport, may be transported on a railcar with the system, provided the railcar weight and dimensional limitations are not exceeded.

#### Section II. TRANSPORT ON CONUS RAILWAYS

##### 7-3. General

The transportability guidance contained in this section is applicable when the system is transported on CONUS railways. Consideration is given to movements on railcars normally used for this type of equipment. When at a maximum width at the top of 87 inches and height of 139 inches, the system can be transported unrestricted and without major sectionalization or major disassembly, provided the railcar loading surface does not exceed a height of 40 inches. If the railcar loading surface exceeds 40 inches, the shelter must be removed from the truck cargo body and loaded on the railcar separately, or special routing and clearances must be obtained.

##### 7-4. Preparation

As a minimum, insure that all loose items are removed or secured to prevent loss or damage in transit.

##### 7-5. Loading on General-Purpose Flatcars

- a. The system components can be placed in the

tiedown position on a railcar by a crane of adequate capacity (14.5-ton minimum with shelter mounted in truck, otherwise 11.5-ton). Refer to chapter 6 for lifting guidance. The system may be driven or towed onto a railcar if a suitable ramp or bridge is available.

- b. The loads illustrated in figures 7-1, 7-2, 7-3 and 7-5 are based on a flatcar width of 10 feet 6 inches. Figure 7-4 gives detailed instructions for blocking and tiedown. Tables 7-1 through 7-4 provide bills of materials, with instructions for their application, to secure the system on general-purpose flatcars.

#### NOTE

A staggered nailing pattern should be used when lumber or laminated lumber is nailed to the floor of a railcar. The nailing pattern for an upper piece of lumber should be adjusted as required so that a nail for that piece will not be driven into or against a nail in the lower piece of lumber.

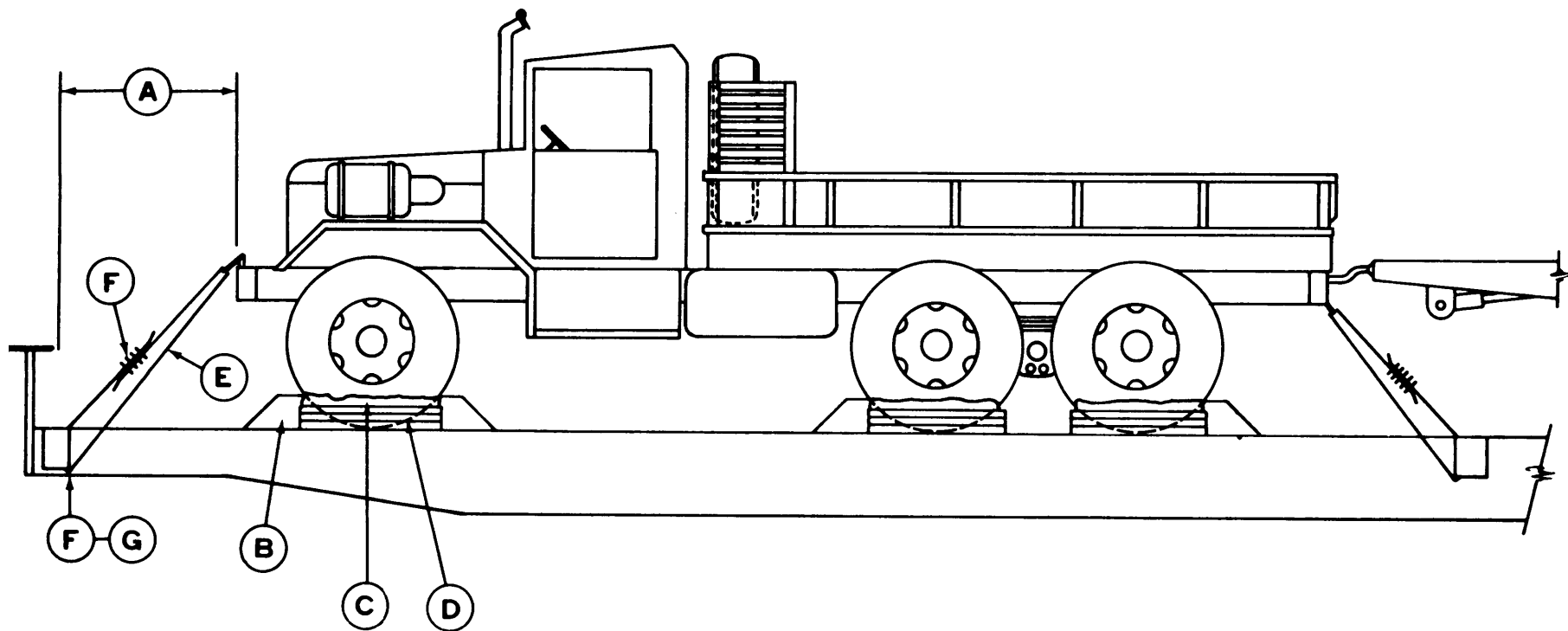


Figure 7-1. Blocking and tiedown of truck, cargo, 5-ton, M813A1, on CONUS general-purpose flatcar (side view).



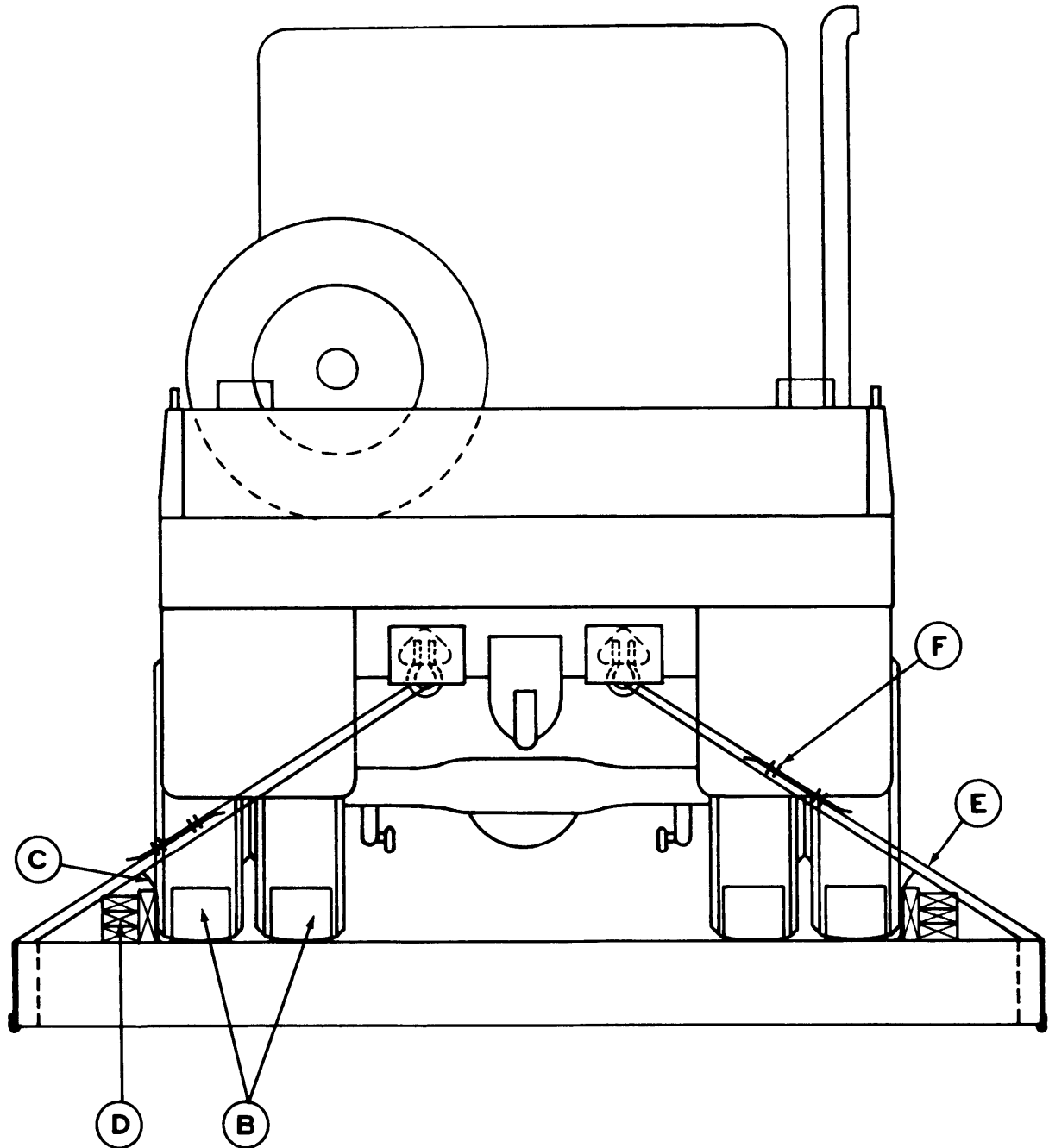


Figure 7-2. Blocking and tiedown of truck, cargo, 5-ton, M813A1, on CONUS general-purpose Flatcar (rear view).

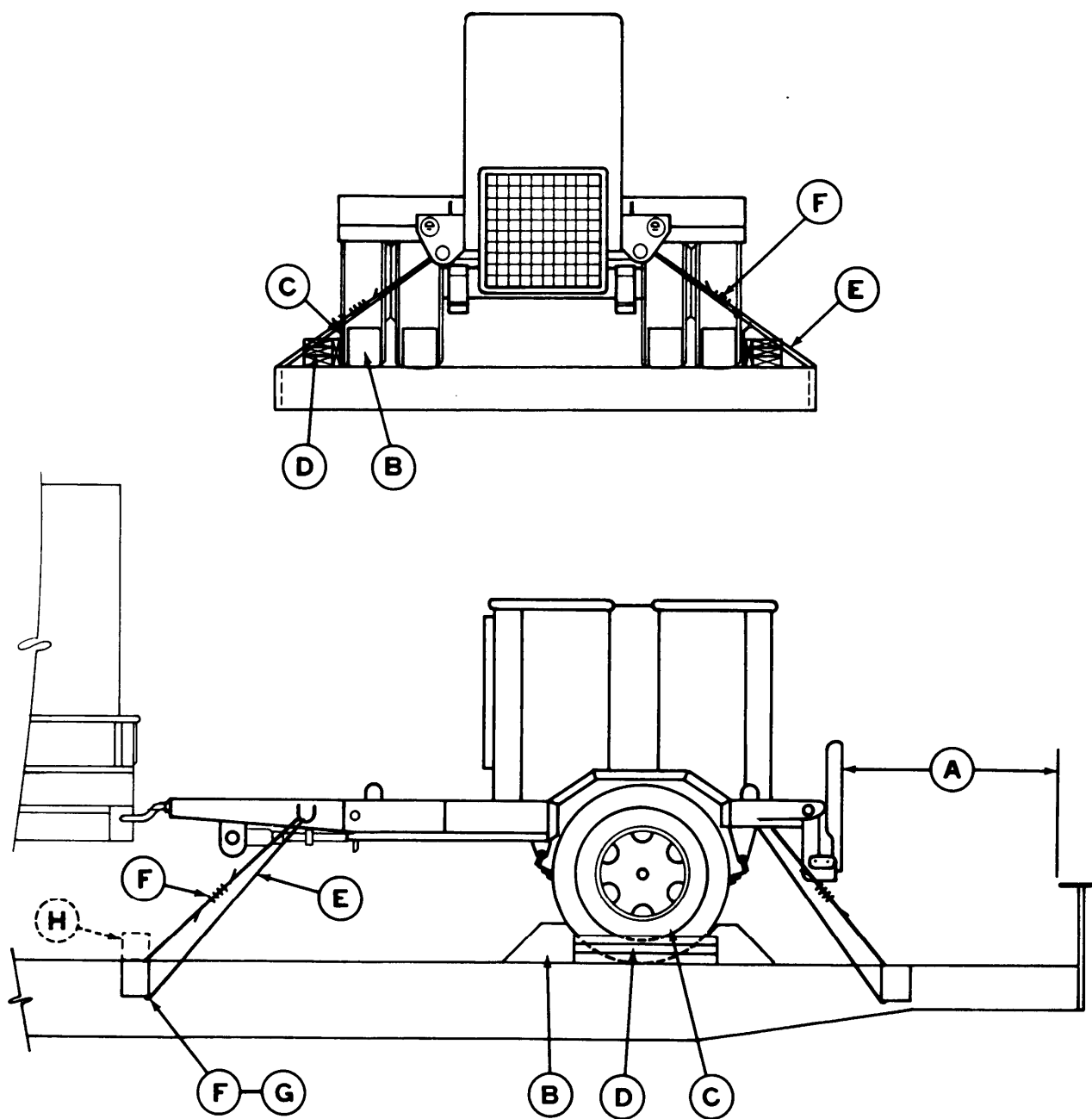
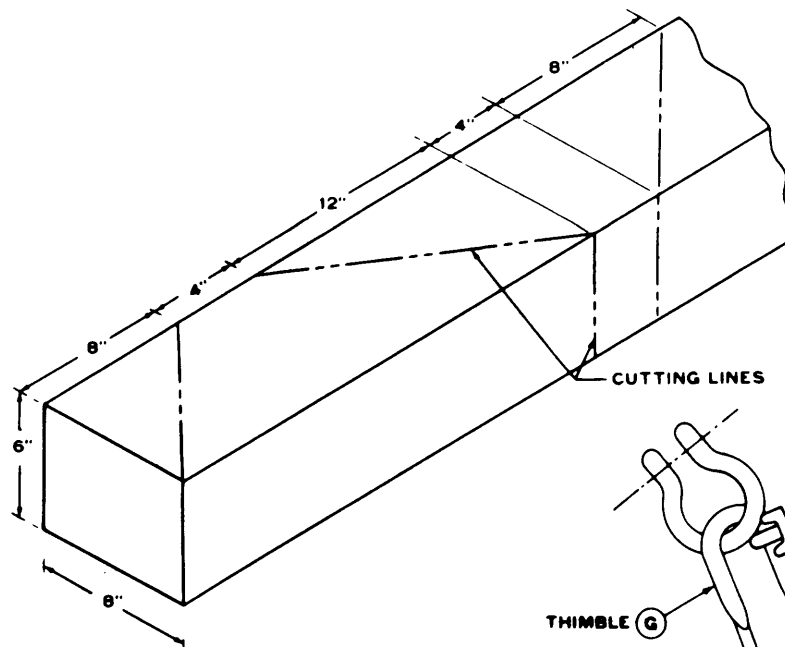
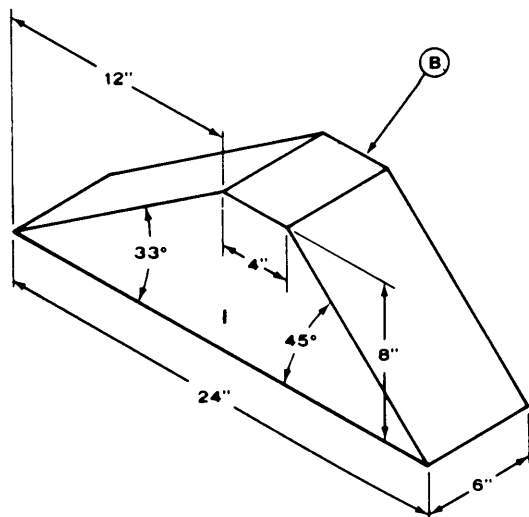
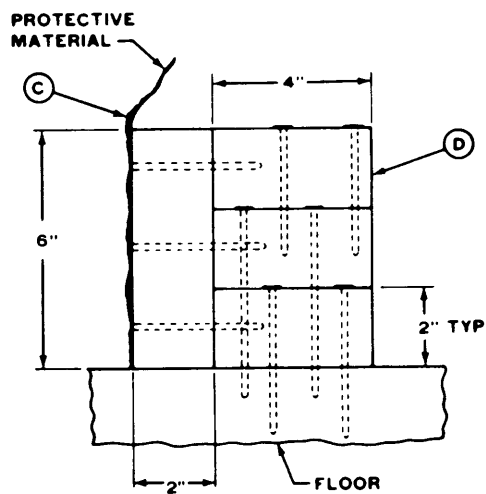


Figure 7-3. Blocking and tiedown of power unit, PU-732/M, on CONUS general-purpose flatcar (side and rear view).



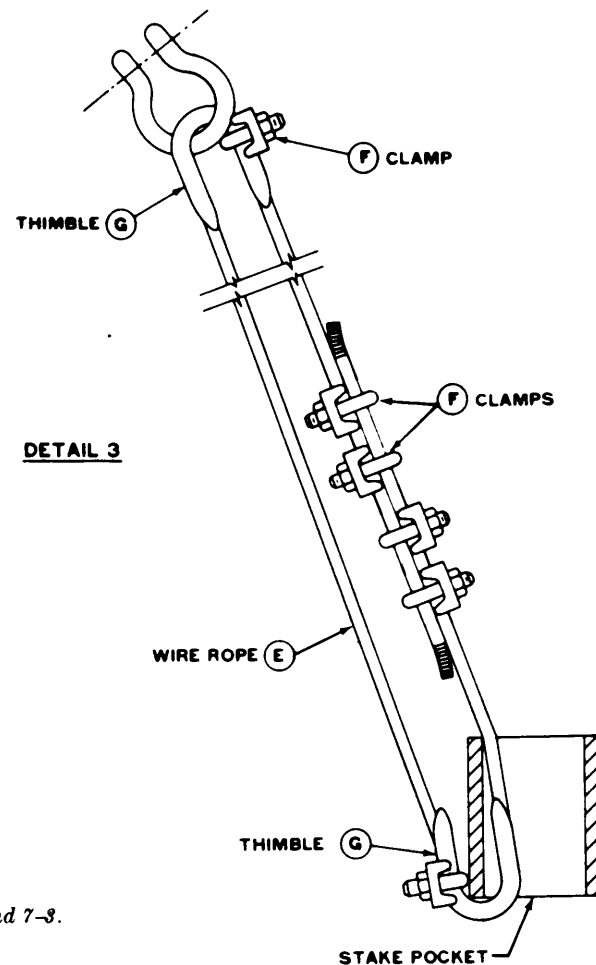
METHOD OF MARKING TIMBER  
FOR CUTTING CHOCK BLOCKS

**DETAIL 1**



**DETAIL 2**

**NOT TO SCALE**



**DETAIL 3**

Figure 7-4. Blocking and tiedown details for figure 7-1, 7-2, and 7-3.

TM55-7440-240-14

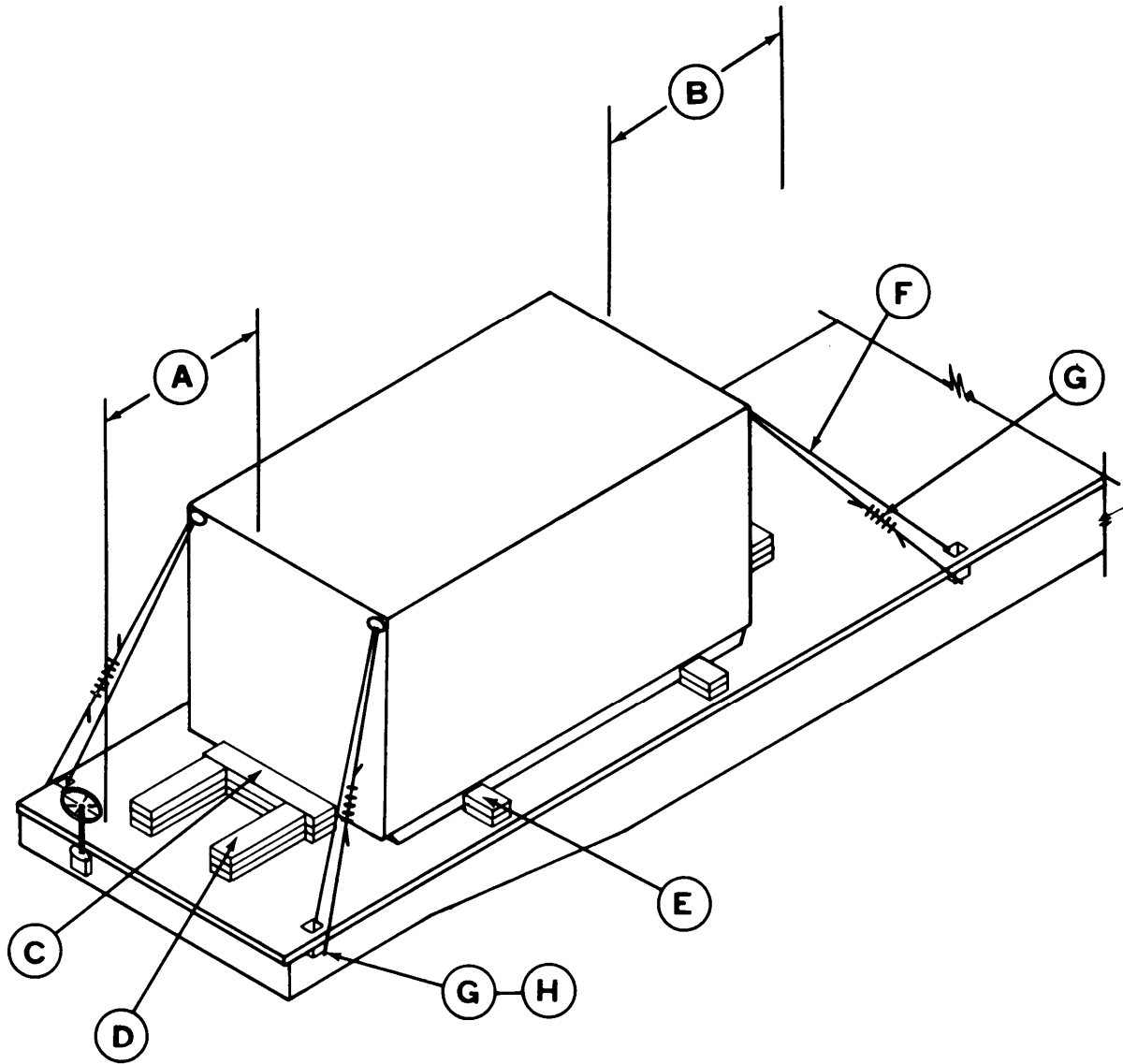


Figure 7-5. . Blocking and tiedown of shelter, S491, on CONUS general-purpose flatcar (isometric view).

Table 7-1. Bill of Materials for Blocking and Tiedown of Truck, Cargo, M813A1, and Power Unit, PU-732/M, on CON US General-Purpose Flatcar  
(Fig 7-1, 7-2, and 7-3)

Item	Description	Approximate quantity
Lumber	Douglas-fir, or comparable, straight-grain, free from material defects; Fed Spec MM-L-751H: 2 x 4-inch 2- x 6-inch 6- x 8-inch	72 linear ft 24 linear ft 30 linear ft
Nails	Common, steel, flathead, bright or cement-coated; Fed Spec FF-N-105B: 12d 20d 40d	40 100 120
Wire rope	6 x 19 IWRC, improved plow steel, preformed, regular-lay; Fed Spec RR -W 410C: 5/8-inch	120 ft
Clamps	Wire rope, U-bolt clips, saddled, single grip, steel, Crosby heavy-duty or equal; Fed Spec FF-C-450D: 5/8-inch	40
Thimbles	Standard, open-type: 5/8-inch	8
Cushioning material	Waterproof paper, burlap, or other suitable material as required.	

Table 7-2. Application of Materials for Blocking and Tiedown of Truck, M813A1, and Power Unit, PU-732/M, on CONUS General-Purpose Flatcar  
(Fig 7-1, 7-2, and 7-3)

Item	No. required	Application
A	—	Brake-wheel clearance. Minimum clearance required is 6 inches above, in back of, and on both sides of, and 4 inches underneath wheel, 12 inches minimum clearance from end of car to load, extending from center of brake wheel to side of car and 6 feet above car floor (figs 7-1 and 7-3).
B	20	Chock block (detail 1, fig 7-4). Place 45° end against each wheel as shown in figures 7-1, 7-2, and 7-3. Toenail heel of block (33° end, near bottom edge) to car floor with one 20d nail in each block. Drive two 40d nails into each block, perpendicular to car floor. Toenail each side of each block to floor with two 40d nails.
C	as required	Cushioning material (detail 2, fig 7-4). Locate so that material is under item D and extends 2 inches above item D between tires and item D.
D	8	Side blocks (detail 2, fig 7-4). Each to consist of one piece of 2- x 6- x 36-inch lumber and three pieces of 2- x 4- x 36-inch lumber. Nail 2- x 6- x 36-inch piece to edge of lower 2- x 4- x 36-inch piece with five 12d nails. Place 2- x 6- x 36-inch piece against cushioning material and tire and nail to car floor through 2- x 4- x 36-inch piece with five 20d nails in a staggered pattern. Nail other 2- x 4- x 36-inch pieces to lower piece with five 20d nails each.
E	8	Wire rope (detail 3, fig 7-4). Each to consist of one piece 5/8-inch 6 x 19 IWRC wire rope, length as required (approximately 15 feet). Form a complete loop between tiedown provision and appropriate stake pocket at a maximum angle of 45 degrees. Wire rope ends should overlap approximately 24 inches.
F	40	Clamps (detail 3, fig 7-4). Place four on each item E at overlap area. Space clamps 3½ inches apart with a minimum of 6 inches from ends of wire rope. Place one clamp on each thimble, item G, to secure thimble to wire rope at stake pockets.
G	8	Thimbles (detail 3, fig 7-4). Locate under wire rope at each place where wire rope passes over edge of stake pocket. Secure each thimble to wire rope with one 5/8-inch clamp.
H*	1	Block. To consist of one piece of 4- x 6- x 18-inch lumber. Locate on flatcar floor under trailer lunette. Toenail to floor with three 30d nails in each side of block. With trailer landing leg locked in the travel position, lower lunette onto block. Secure trailer as described above.

\* To be used only if Power Unit, PU -732/M, is transported separately or not connected to prime mover. Materials for this item not included in table 7-1.

# GENERAL INSTRUCTIONS

1. All hand brakes are to beset with hand levers wire-tied or blocked. Transmission in neutral position with shift lever wire-tied.
2. If further details are required, refer to General Rules 4, 5, 9, 10, 14, 15, and 19A, section 1, *Rules Governing the Loading of Commodities on Open-Top Cars and Trailers*, published by the Association of American Railroads.

Table 7-3. Bill of Materials for Blocking and Tiedown of Shelter, S491, on CON US General-Purpose Flatcar  
(fig 7-5)

Item	Description	Approximate quantity
Lumber	Douglas-fir, or comparable, stright-grain, free from material defects; Fed Spec MM-L-75IH: 1- x 6-inch 2- x 6-inch	6 linear ft 58 linear ft
Nail	Common, steel, flathead, bright, or cement-coated; Fed Spec FF -N -105B: 30d 60d	44 64
Wire rope	6 x 19 IWRC, improved plow steel, preformed, regular-lay; Fed Spec RR -W-410C: 3/8-inch	80 ft
Clamps	Wire rope, U-bolt clips, saddled, single grip, steel, Crosby heavy-duty or equal; Fed Spec FF-C-450D: 3/8-inch	24
Thimbles	Standard, open-type: 3/8-inch	8

Table 7-4. Application of Materials for Blocking and Tiedown of Shelter, S491, on CON US General-Purpose Flatcar  
(Fig 7-5)

Item	No. required	Application
A	—	Brake-wheel clearance. Minimum clearance required is 6 inches above, in back of, and on both sides of, and 4 inches underneath wheel, 12 inches minimum clearance from end of car to load, extending from center of brake wheel to side of car and 6 feet above car floor (fig 7-5).
B	—	Clearance to any vehicle loaded on car with shelter is 24 inches minimum.
c	2	Header block. Each to consist of three pieces of 2- x 6- x 44-inch lumber. Locate bottom piece on car floor so that when second and third piece are added, the header will be against end of shelter. Nail the first piece to car floor with six 30d nails. Nail other pieces to lower pieces with six 30d nails each.
D	4	Backup cleat. Each to consist of three pieces of 2- x 6- x 30-inch lumber. Locate bottom piece on car floor 3 inches in from end of item C. Nail to car floor with five 30d nails. Nail other pieces to lower piece with five 30d nails each.
E	4	Side block. Each to consist of one piece of 1- x 6-18-inch lumber and one piece of 2- x 6- x 18-inch lumber. Locate 1- x 6- x 18-inch piece against shelter skid. Locate 2- x 6- x 18-inch piece on top of lower piece and nail down pieces to car floor with three 30d nails.
F	4	Wire rope (detail 3, fig 7-4). Each to consist of one piece 3/8-inch 6 x 19 IWRC wire rope, length as required (approximately 20 ft). Form a complete loop between tiedown provision and appropriate stake pocket. Wire rope ends should overlap approximately 24 inches.
G	24	Clamps (detail 3, fig 7-4). Place four on each item F at overlap area. Space clamps 3-1/2 inches apart with a minimum of 6 inches from ends of wire rope. Place one clamp on each thimble, item H, to secure thimble to wire rope at stake pockets and shelter tiedown provisions.
H		Thimbles (detail 3, fig 74). Locate one under wire rope at each place where wire rope passes over edge of stake pocket and tiedown provision. Secure thimble to wire rope with one 3/8-inch clamp.

**7-6. Loading on Special-Purpose Flatcars**

*a.* The TACFIRE system can be placed in the tiedown position on a special-purpose flatcar by a crane of adequate capacity (14.5-ton minimum), or it may be driven or towed onto the flatcar provided a suitable ramp or bridge is available.

*b.* Figures 7-6 through 7-8 show the system loaded on a center-tiedown-rail-equipped flatcar. Table 7-5 provides guidance for the application of chain tiedowns (provided with flatcar) for securing the system on center-tiedown-rail-equipped flatcars.

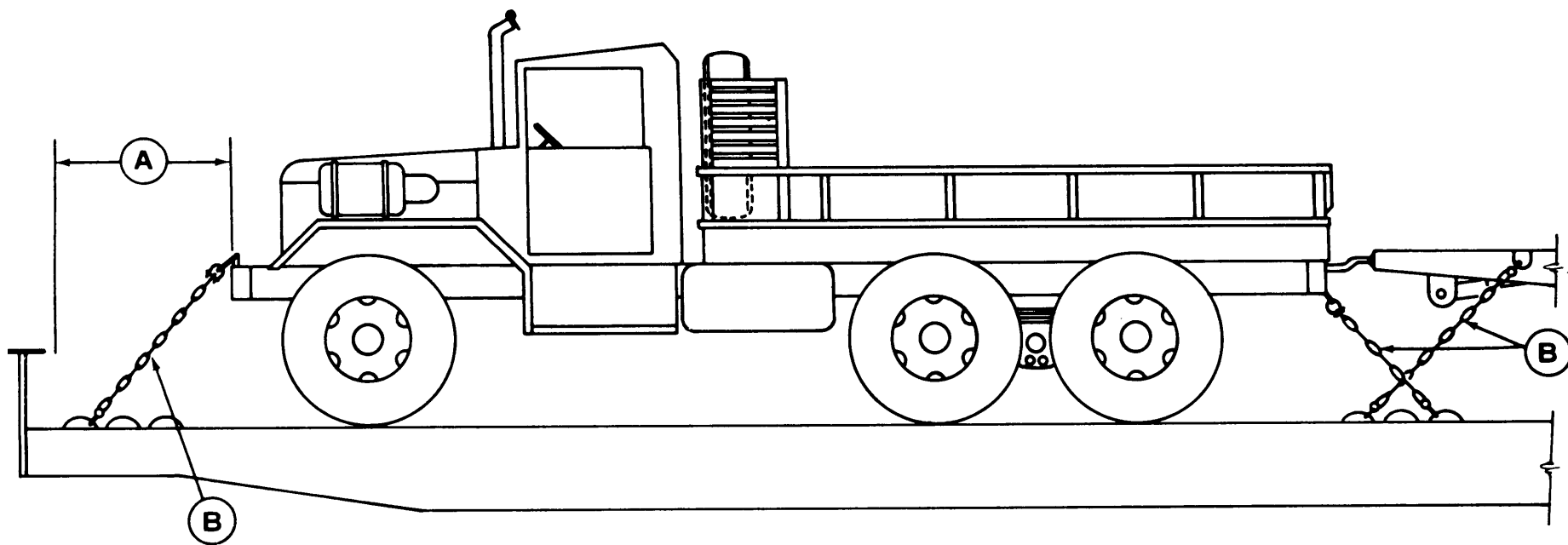


Figure 7-6. Tiedown of truck, cargo, 5-ton, M813A1, on center-tiedown flatcar (side view).



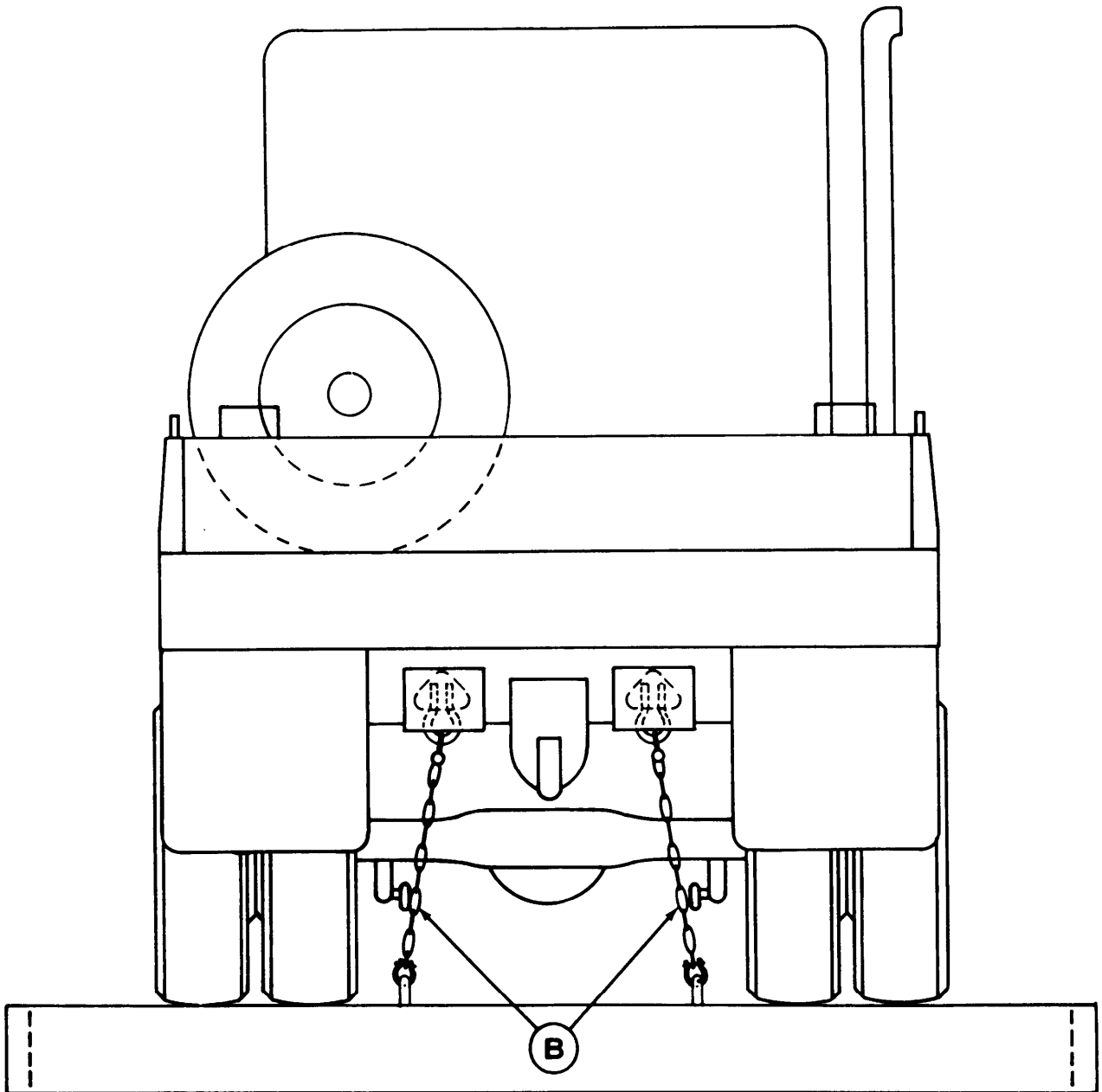


Figure 7-7. Tiedown of truck, cargo, 5-ton, M813A1, on center-tiedown flatcar (rear view).

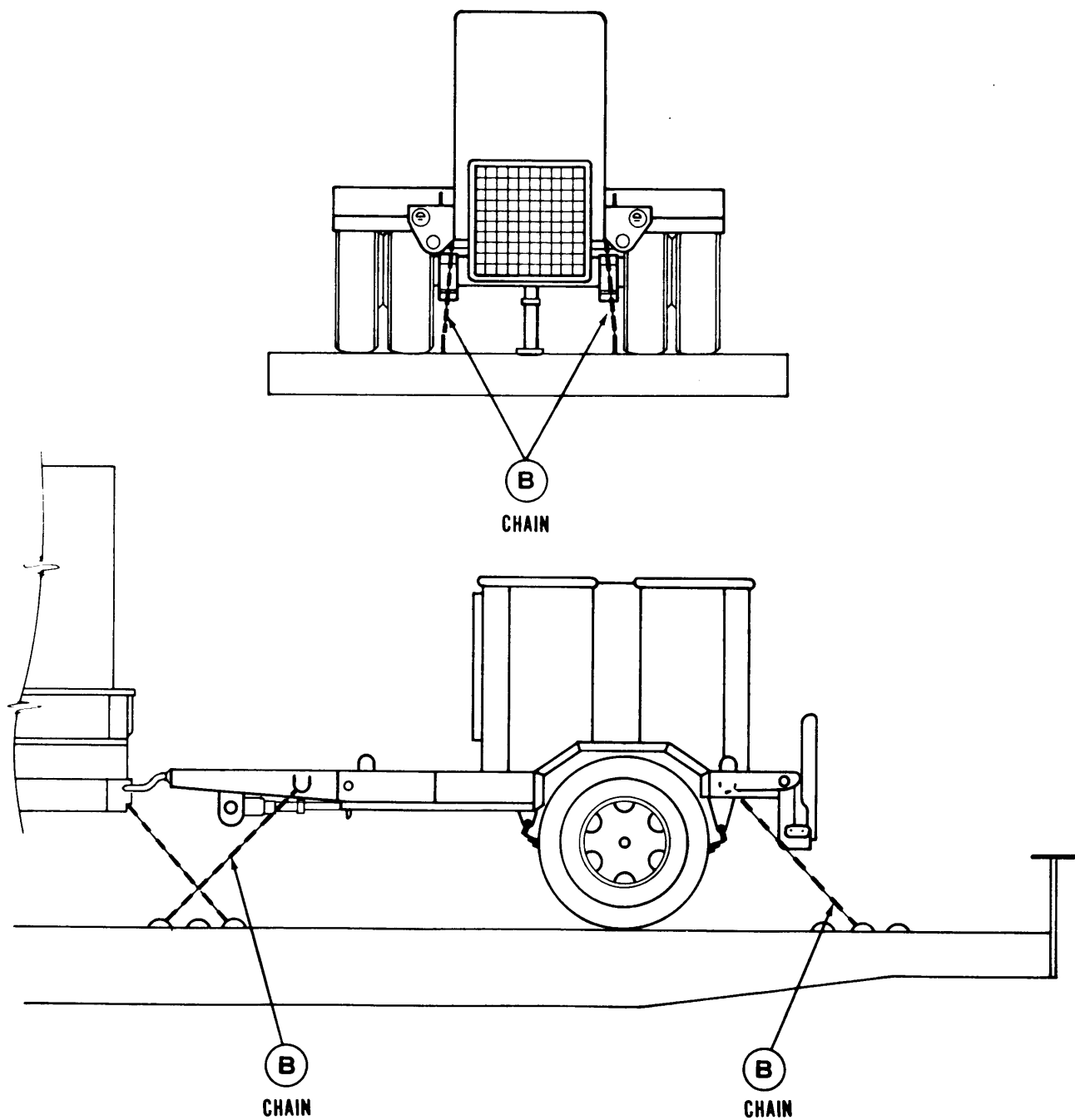


Figure 7-8. Tiedown of power unit, PU-732/M, on center-tiedown flatcar (side and rear view).

Table 7-5. Application of Chain Tiedowns for Securing of Truck, M813A1, and Power (Unit, PU-732/M, on Flatcars Equipped with Center Tiedown Rails (Fig 7-6, 7-7 and 7-8)

Item	No. required	Application
A	—	Brake wheel clearance. Minimum clearance required is 6 inches above, in back of, and on both sides of, and 4 inches underneath wheel, 12 inches minimum clearance from end of car to load, extending from center of brake wheel to side of car and 6 feet above car floor.
B	4 ea unit	3/8-inch-diameter alloy steel chain, proof tested to minimum of 13,200 lb for vehicles 8,500 lb or less. 1/2-inch diameter alloy steel chain, proof tested to minimum of 27,500 lb for vehicles over 25,000 lb to 40,000 lb inclusive.

### GENERAL INSTRUCTIONS

1. Shippers should specify cars equipped with tiedown devices in the quantity shown in item B when ordering specialized railway equipment. When carriers furnish cars that do not have built-in chains and tensioning devices, chains and turnbuckles of appropriate size and strength will be used in lieu thereof for securement of vehicles. 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 uniformly 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 from the vehicle tiedown provisions to the car tiedown facility. The angle of the tiedown should be as close to 45° as possible.
3. Hand brakes must be set on truck and trailer.
4. Vehicle transmissions must be placed in neutral and shift lever wire tied.
5. Open hooks must be secured with wire over the opening to prevent the hook from becoming disengaged from chain link to which attached.
6. If turnbuckles are used to tighten chains and are not equipped with self-locking devices, they must be wired or locked to prevent them from turning during transit.

## Section III. TRANSPORT ON FOREIGN RAILWAYS

### 7-7. General

The transportability guidance contained in this section is applicable when the TACFIRE system is transported on foreign railways. Consideration is given to movement on the types of railcars normally used for the transport of this type of equipment. The system can be transported in its operational configuration (figs 2-4 and 2-6) *with restrictions* within European countries complying with the international loading gauge. This also applies to the majority of the countries in the Middle East, South America, Australia, India, and Pakistan. Because of the height, with the shelter mounted in the truck, special clearance and routing will be required for each country. In Australia, India, and Pakistan, wide- or broad-gauge railways provide greater clearance and fewer restrictions. Because of the various designation systems used by different countries, foreign railcars are difficult to

classify. In addition, clearances vary between countries and within a country. Consequently, evaluation of transport capability must be made on an individual basis.

### 7-8. Transport on US Army-Owned Foreign Service Flatcars

a. The TACFIRE system can be transported on a number of US Army-owned foreign-service flatcars. These flatcars transport US military materiel exclusively. Table 7-6 lists the flatcars available in Europe that are suitable for transporting the system.

b. The materials and procedures for blocking and tying down the system on US Army-owned foreign-service flatcars are essentially the same as those used within CON US.

Table 7-6. Characteristics of US Army-Owned European Flatcars Available for Transporting Vehicles

Flatcar designation	Capacity	Length	Width	Platform height <sup>1</sup>
SSY <sup>2</sup>	52-ton (47.17 MTON)	31-ft 2-in. (9.50 m)	10ft 4-in. (3.15 m)	4-ft 2-3/4-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 2-3/4-in. (1.29 m)
FFLM	90-ton (81.65 MTON)	46-ft 8-in. (14.52 m)	10-ft 3-in. (3.12 m)	4-ft 2 3/4-in. (1.29 m)

<sup>1</sup> Above top of rail.

<sup>2</sup> German-owned SSY cars are designated RLMMP.

**APPENDIX****REFERENCES**

---

**1. Army Regulations (AR)**

55-162	Permits for Oversize, Overweight, or Other Special Military Movements on Public Highways in the Contiguous States and District of Columbia.
55-228	Transportation by Water of Explosives and Hazardous Cargo
55-355	Military Traffic Management Regulation
7047	Engineering for Transportability.
746-1	Color, Marking, and Preparation of Equipment for Shipment.

**2. Army Field Manuals (FM)**

1-100	Army Aviation Utilization.
55-13	Air Transport of Supplies and Equipment: Standard Loads in Air Force C-5 Aircraft.
55-15	Transportation Reference Data.
55-17	Terminal Operations Specialist's Handbook.

**3. Army Supply Bulletin (SB)**

700-20	Army Adopted/Other Items Selected for Authorization/List of Reportable Items.
--------	---

**4. Army Technical Bulletin (TB)**

55-46-1	Standard Characteristics (Dimensions, Weight, and Cube) for Transportability of Military Vehicles and Other Outsize/Overweight Equipment
---------	--

**5. Army Technical Manuals (TM)**

5-725	Rigging.
9-2320-260-10	Operator's Manual, Truck, 5-Ton, 6 x 6, M809 Series.
38-236 (AFP 71-8)	Preparation of Freight for Air Shipment.
38-250 (AFR 71-4)	Preparation of Hazardous Materials for Military Air Shipment.
55409	Fundamentals of Aircraft Hydraulics.
55450-10/1	Air Transport of Supplies and Equipment: Standard Loads in US Air Force C-130E Aircraft.
55450-10/2	Air Transport of Supplies and Equipment: Standard Loads in US Air Force C-141 Aircraft.

55-450-11	Air Transport of Supplies and Equipment: Helicopter External Loads Rigid With Air Delivery Equipment.
55-450-12	Air Transport of Supplies and Equipment: Helicopter External Loads for Sling, Nylon and Chain, Multiple Leg (15,000-Pound Capacity) FSN 1670-902-3080.
55450-15	Air Movement of Troops and Equipment (Nontactical).
55-500	Marine Equipment Characteristics and Data.

**6. Air Force Manuals (AFM)**

TO 1-1b-40	Handbook of Weight and Balance Data.
TO 1C-5A-9	Loading Instructions, USAF Series C-5 Aircraft.
TO 1C-130A-9	Loading Instructions, USAF Series C-130 Aircraft.
TO 1C-141A-9	Loading Instructions, USAF Series C-141 Aircraft

**NOTE**

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

**7. Department of Transportation**

US CG 108	Rules and Regulations for Military Explosives and Hazardous Munitions.
-----------	--

**8. Other Publications and Sources of Procurement**

*a. Rail and Highway Shipment*

- (1) *Code of Federal Regulations*, Title 49-Transportation, Parts 170-179.

Available from: Superintendent of Documents  
US Government Printing Office  
Washington, DC 20402

- (2) Association of American Railroads, *Rules Governing the Loading of Commodities on Open-Top Cars and Trailers*

Section No. 1-General Rules

Section No. 6-Rules Governing the Loading of Department of Defense Materiel on Open-Top Cars

Available from: Association of American Railroads  
59 E. Van Buren Street  
Chicago, IL 60605

- (3) R. M. Graziano's Tariff No. 31 (or reissues thereof) *Hazardous Materials Regulation of the Department of Transportation, Including Specifications for Shipping Containers*

Available from: R. M. Graziano, Agent  
1920 L. Street NW  
Washington, DC 20036

- (4) American Trucking Association, Inc., Agent Publication ICC ATA III-A/FMC F-1-17 (or reissues thereof). *Department of Transportation Regulations Governing Transportation of Hazardous Materials by Motor, Rail and Water, Including Specifications for Shipping Containers*

Available from: James C. Harkins, Issuing Officer  
1616 P Street NW  
Washington, DC 20036

- (5) International Road Federation  
*Limits of Motor Vehicle Sizes and Weights*

Available from: International Road Federation  
1023 Washington Building  
Washington, DC 20005

*b. Water Shipment*

- (1) *Code of Federal Regulations*  
Title 46-Shipping, Part 146

Available from: Superintendent of Documents  
US Government Printing Office  
Washington, DC 20402

- (2) Agent R. M. Graziano's *Water Carrier Tariff No. 31* (or reissues thereof) *Regulations Governing the Transportation or Storage of Explosives or Other Dangerous Articles or Substances, and Combustible Liquids on Board Vessels*

Available from: R. M. Graziano, Agent  
1920 L Street NW  
Washington, DC 20036





By Order of the Secretary of the Army:

Official:

J. C. PENNINGTON  
*Brigadier General, United States Army*  
*The Adjutant General*

BERNARD W. ROGERS  
*General, United States Army*  
*Chief of Staff*







This fine document...

Was brought to you by me:



### [Liberated Manuals -- free army and government manuals](#)

Why do I do it? I am tired of sleazy CD-ROM sellers, who take publicly available information, slap “watermarks” and other junk on it, and sell it. Those masters of search engine manipulation make sure that their sites that sell free information, come up first in search engines. They did not create it... They did not even scan it... Why should they get your money? Why are not letting you give those free manuals to your friends?

I am setting this document FREE. This document was made by the US Government and is NOT protected by Copyright. Feel free to share, republish, sell and so on.

I am not asking you for donations, fees or handouts. If you can, please provide a link to [liberatedmanuals.com](http://liberatedmanuals.com), so that free manuals come up first in search engines:

<A HREF=<http://www.liberatedmanuals.com/>>Free Military and Government Manuals</A>

- Sincerely  
Igor Chudov  
<http://igor.chudov.com/>
- [Chicago Machinery Movers](#)