

**TM 55-2320-289-14**

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**TECHNICAL MANUAL**

**TRANSPORTABILITY GUIDANCE  
COMMERCIAL UTILITY CARGO  
VEHICLE (CUCV)**

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**HEADQUARTERS, DEPARTMENT OF THE ARMY  
30 JANUARY 1987**

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WASHINGTON, DC, 30 January 1987

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### TRANSPORTABILITY GUIDANCE COMMERCIAL UTILITY CARGO VEHICLE (CUCV)

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# CHAPTER 1

## INTRODUCTION

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### 1-1. Purpose and Scope

*a.* This manual provides transportability guidance for logistical handling and movement of the commercial utility cargo vehicles (CUCVs).

*b.* This manual is intended for transportation of officers and other personnel responsible for providing movement or for providing transportation services with appropriate information to ensure safe transport of the CUCVs. Included are significant technical and physical characteristics, as well as safety considerations required for worldwide movement by various transportation modes.

### 1-2. Safety

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

### 1-3. 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.* Instructions that, if not strictly followed, could result in injury to or death of personnel.

*b. Caution.* Instructions that, if not strictly observed, could result in damage to or destruction of equipment or material.

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

### 1-4. Reporting of Recommendations and Comments

Individual users of this manual are encouraged to submit comments and recommended changes for its improvement. Comments and recommendations should be prepared on DA Form 2028 (Recommended Changes to LA Publications and Blank Forms) and forwarded to Commander, Military Traffic Management Command Transportation Engineering Agency, ATTN: MTT-TRV, PO Box 6276, Newport News, VA 23606-0276. Electrically transmitted messages should be addressed to CDR MTMCTEA FT EUSTIS VA//MTT-TRV//. A reply will be furnished by this command.

## CHAPTER 2

### TRANSPORTABILITY DATA

#### Section 1. GENERAL

##### 2-1. scope

This chapter provides a general description of the commercial utility cargo vehicles (CUCVs). Included are identification photographs and tabulated transportability characteristics and data that are necessary in the movement of these vehicles.

##### 2-2. Description

The CUCV is a family of light commercial trucks modified for military use as tactical standard mobility light duty vehicles. The family of vehicles include the truck, tactical cargo; truck, tactical utility; truck, ambulance; and truck, tactical cargo shelter carrier. Each of these vehicles is powered by a 6.2-liter diesel engine, with an automatic transmission and four-wheel drive. The vehicles can transport utility items and general cargo/personnel. The CUCV family consists of the following vehicles:

*a. M1008/M1008A1 Truck, Tactical Cargo, 5/4-Ton, 4x4.* The tactical cargo truck can transport both cargo and troops. The M1008A1 model includes a communication rack so radios can be mounted in the cargo area.

*b. M1009 Truck, Tactical Utility, 3/4-Ton, 4x4.* The tactical utility truck is a command and control vehicle that can transport four individuals (including operator), their equipment and weapons and the required communications equipment.

*c. M1010 Truck, Ambulance, 5/4-Ton, 4x4.* The ambulance truck can transport eight ambulatory or four litter patients in the patient compartment plus the driver and one cab passenger.

*d. M1028/M1028A1 Truck, Tactical Cargo Shelter Carrier, 3,600-Pound, 4x4.* This vehicle carries the S-250 communication shelter. The M1028A1 model includes a power takeoff on the transfer.

#### Section II. CHARACTERISTICS AND RELATED DATA

##### 2-3. General

The following characteristics and data are applicable to the model number shown. Changes in model

numbers may affect the loadability of trucks as related to guidance shown in this manual.

*a. M1008/M1008A1 Truck, Tactical Cargo, 5/4 Ton, 4x4.*

	<i>M1008</i>	<i>M1008A1</i>
National stock number .....	2320-01-123-6827 ✓	2320-01-123-2671
Curb weight .....	5,900 lb (2676 kg)	5,900 lb (2676 kg)
Payload capacity .....	2,900 lb (1315 kg)	2,900 lb (1315 kg)
Gross vehicle weight .....	8,800 lb (3992 kg)	8,800 lb (3992 kg)
Airlift maximum weight .....	8,800 lb (3992 kg)	8,800 lb (3992 kg)
Lift and tow hooks rated working capacity .....	6,500 lb (2948 kg)	6,500 lb (2948 kg)
Performance:		
Maximum speed .....	55 mph (88 km)	55 mph (88 km)
Cruising range .....	250 miles (403 km)	250 miles (403 km)
Fuel tank capacity .....	20 gal (76 L)	20 gal (76 L)
Ground clearance:		
Front .....	8.6 in. (218 mm)	8.6 in. (218 mm)
Rear .....	7.8 in. (198 mm)	7.8 in. (198 mm)
Dimensions and shipping data:		
Length .....	220.7 in. (5.61 m)	220.7 in. (5.61 m)
Width (mirrors folded) .....	81.2 in. (2.06 m)	81.2 in. (2.06 m)
Height .....	75.4 in. (1.93 m)	75.4 in. (1.93 m)
Center of gravity:		
Longitudinal (rear of centerline from axle) .....	57.6 in. (1.46 m)	57.6 in. (1.46 m)
Vertical (from ground level) .....	30.5 in. (.775 m)	30.5 in. (.775 m)

*b. M1009 Truck, Utility, 3/4-Ton, 4x4.*

National stock number .....	2320-01-123-2665 ✓
Curb weight .....	5,200 lb (2359 kg)
Payload capacity .....	1,200 lb (545 kg)

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Gross vehicle weight.....	6,400 lb (2903 kg)
Airlift maximum weight.....	6,400 lb (2903 kg)
Lift and tow hooks rated working capacity .....	6,500 lb (2948 kg)
Performance:	
Maximum speed .....	55 mph (88 km)
Cruising range .....	250 miles (403 km)
Fuel tank capacity .....	27 gal (102 L)
Ground clearance:	
Front.....	8.4 in. (213 mm)
Rear .....	8.6 in. (218 mm)
Dimensions and shipping data:	
Length .....	191.85 in. (4.85 m)
Width (mirrors folded).....	79.6 in. (2.02 m)
Height.....	75.0 in. (1.90 m)
Center of gravity:	
Longitudinal (rear of centerline front axle).....	48.5 in. (1.23 m)
Vertical (from ground level).....	30.8 in. (782 mm)

*c. M1010 Truck, Ambulance, 5/4-Ton, 4x4.*

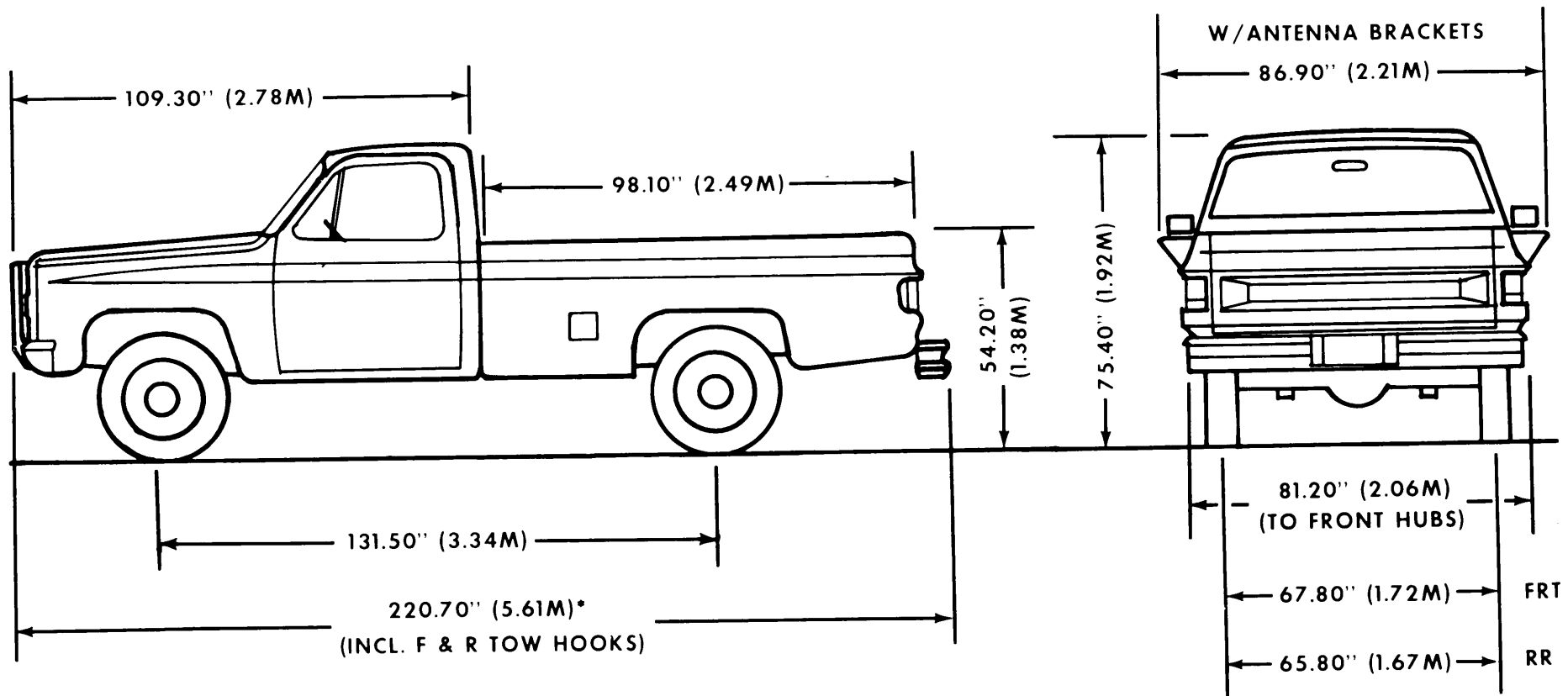
National stock number .....	2320-01-123-2666
Curb weight.....	6,880 lb (3120 kg)
Payload capacity .....	2,320 lb (1053 kg)
Gross vehicle weight.....	9,200 lb (4173 kg)
Airlift maximum weight.....	9,200 lb (4173 kg)
Lift and tow hook rated working capacity .....	9,450 lb (4286 kg)
Performance:	
Maximum speed .....	55 mph (88 km)
Cruising range .....	250 miles (403 km)
Fuel tank capacity .....	27 gal (102 L)
Ground clearance:	
Front.....	8.6 in. (218 mm)
Rear .....	7.8 in. (198 mm)
Dimensions and shipping data:	
Length .....	227.73 in. (5.78 m)
Width (mirrors folded).....	79.6 in. (2.02 m)
Height.....	101.6 in. (2.58 m)
Center of gravity:	
Longitudinal (rear of centerline front axle).....	66.0 in. (1.67 m)
Vertical (from ground level).....	36.4 in. (.925 m)

*d. M1028/M1028A1 Truck, Tactical Cargo Shelter Carrier, 3,600-Pound, 4x4.*

	<i>M1028</i>	<i>M1028A1</i>
National stock number .....	2320-01-127-5007 ✓	2320-01-158-0820 ✓
Curb weight.....	5,750 lb (2608 kg)	5,750 lb (2608 kg)
Payload capacity .....	3,600 lb (1633 kg)	3,600 lb (1633 kg)
Gross vehicle weight.....	9,350 lb (4241 kg)	9,350 lb (4241 kg)
Airlift maximum weight.....	9,350 lb (4241 kg)	9,350 lb (4241 kg)
Lift and tow hook rated working capacity .....	6,500 lb (2948 kg)	6,500 lb (2948 kg)
Performance:		
Maximum speed .....	55 mph (88 km)	55 mph (88 km)
Cruising range .....	250 miles (403 km)	250 miles (403 km)
Fuel tank capacity .....	27 gal (102 L)	27 gal (102 L)
Ground clearance:		
Front.....	8.6 in. (218 mm)	8.6 in. (218 mm)
Rear.....	7.8 in. (198 mm)	7.8 in. (198 mm)
Dimensions and shipping data:		
Length .....	220.7 in. (5.61 m)	220.7 in. (5.61 m)
Width (mirrors folded).....	81.2 in. (2.05 m)	81.2 in. (2.05 m)
Height.....	105.0 in. (2.66 m)	105.0 in. (2.66 m)
Center of gravity:		
Longitudinal (rear of centerline front axle).....	54.9 in. (1.39 m)	54.9 in. (1.39 m)
Vertical (from ground level).....	30.5 in. (.775m)	30.5 in. (.775 m)

## 2-4. Transportability Drawings

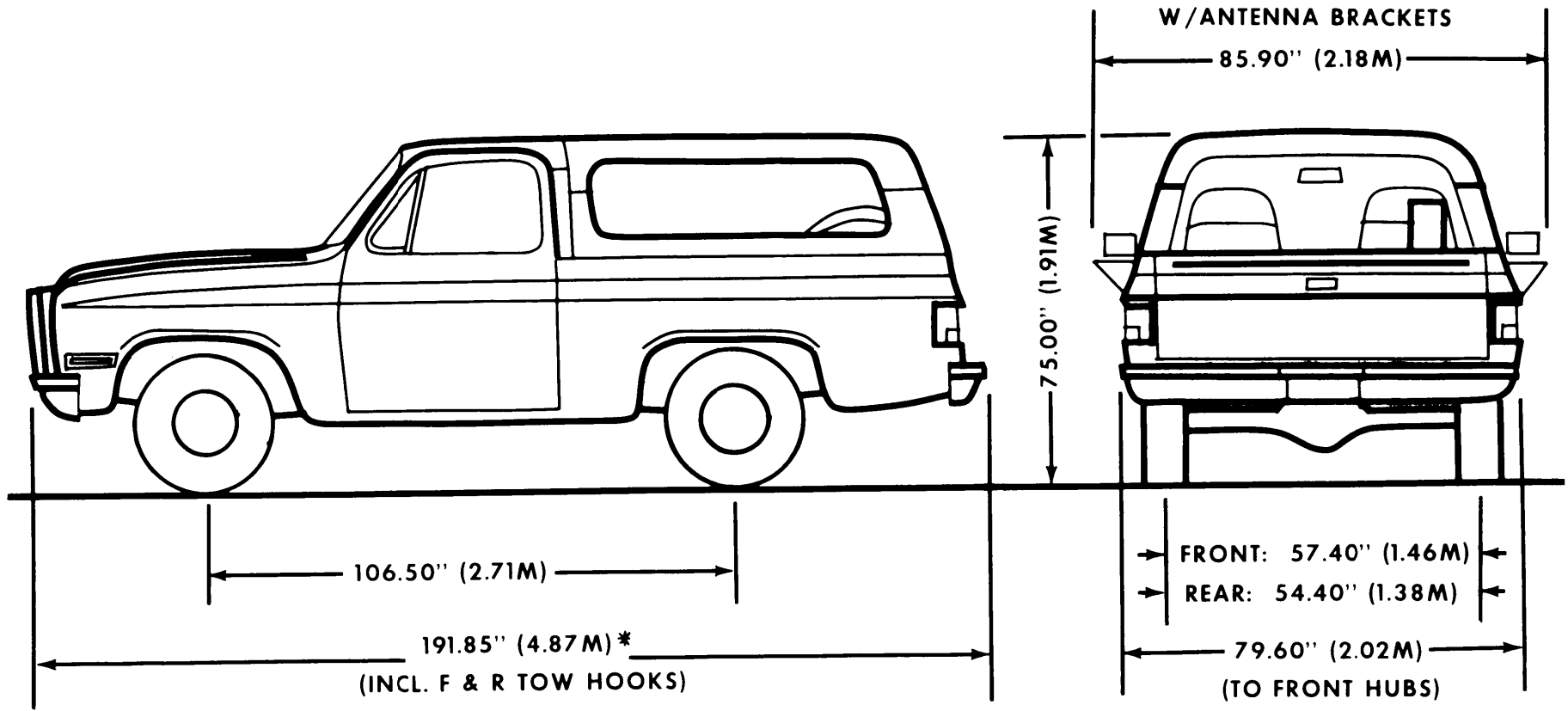
Transportability drawings of the vehicles, with dimensions required for determining the loadability of the vehicles by various transport modes, are shown in figures 2-1 through 2-4.



\*SHORTEST REDUCIBLE LENGTH

Figure 2-1. M1008/M1008A1, side and rear views.





\*SHORTEST REDUCIBLE LENGTH

Figure 2-2. M1009, side and rear views.

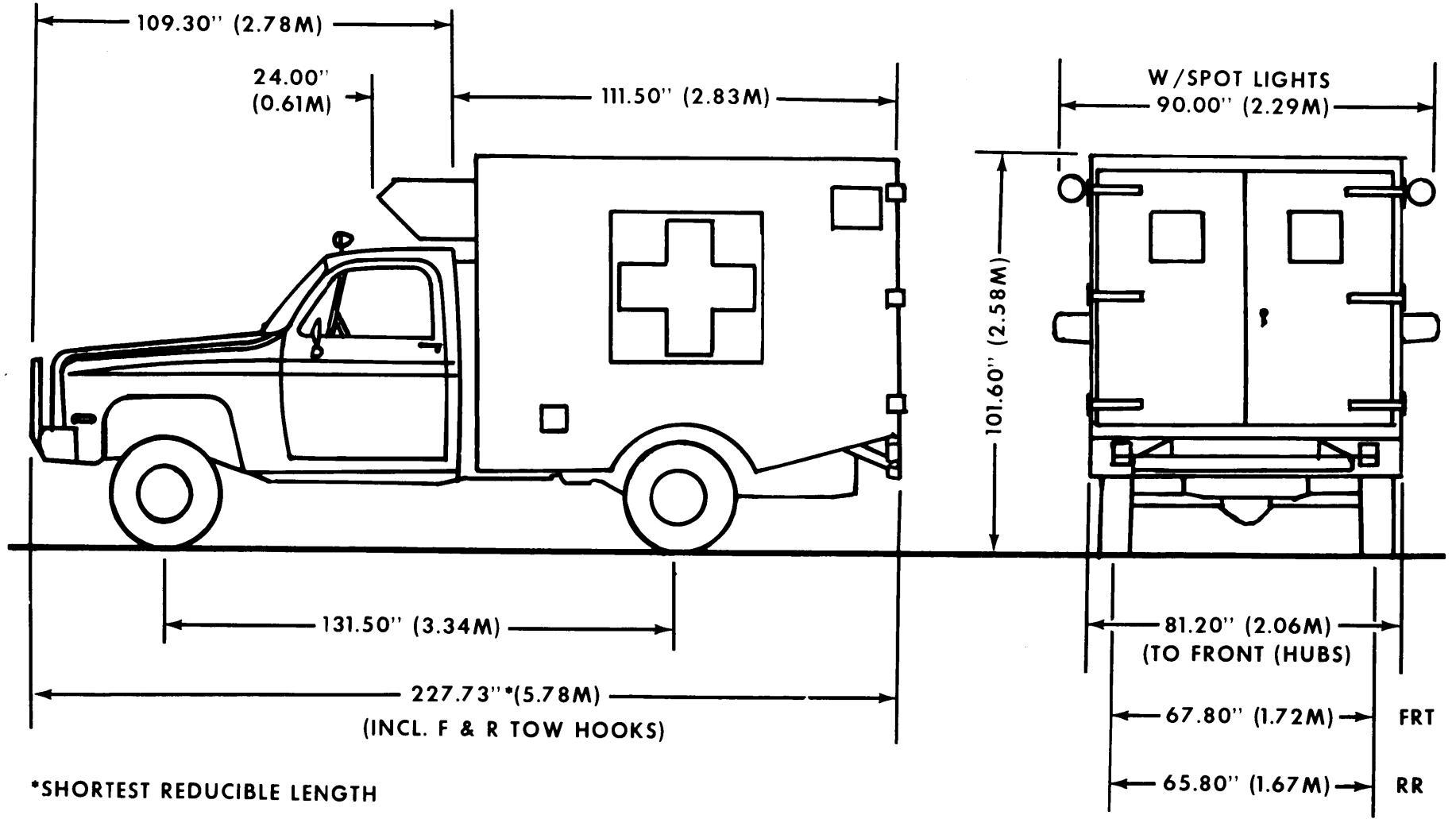


Figure 2-3. M1010, side and rear views.

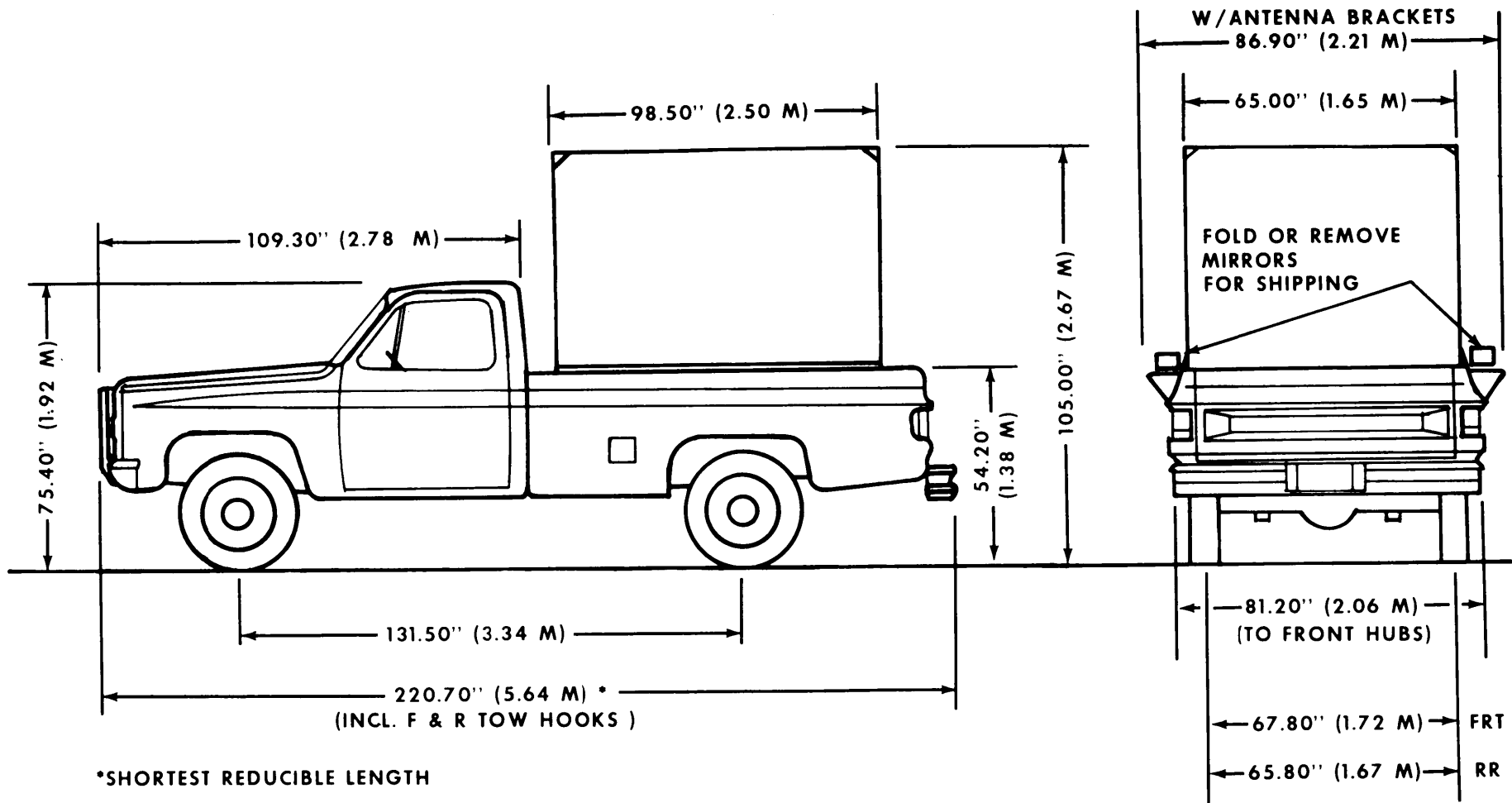


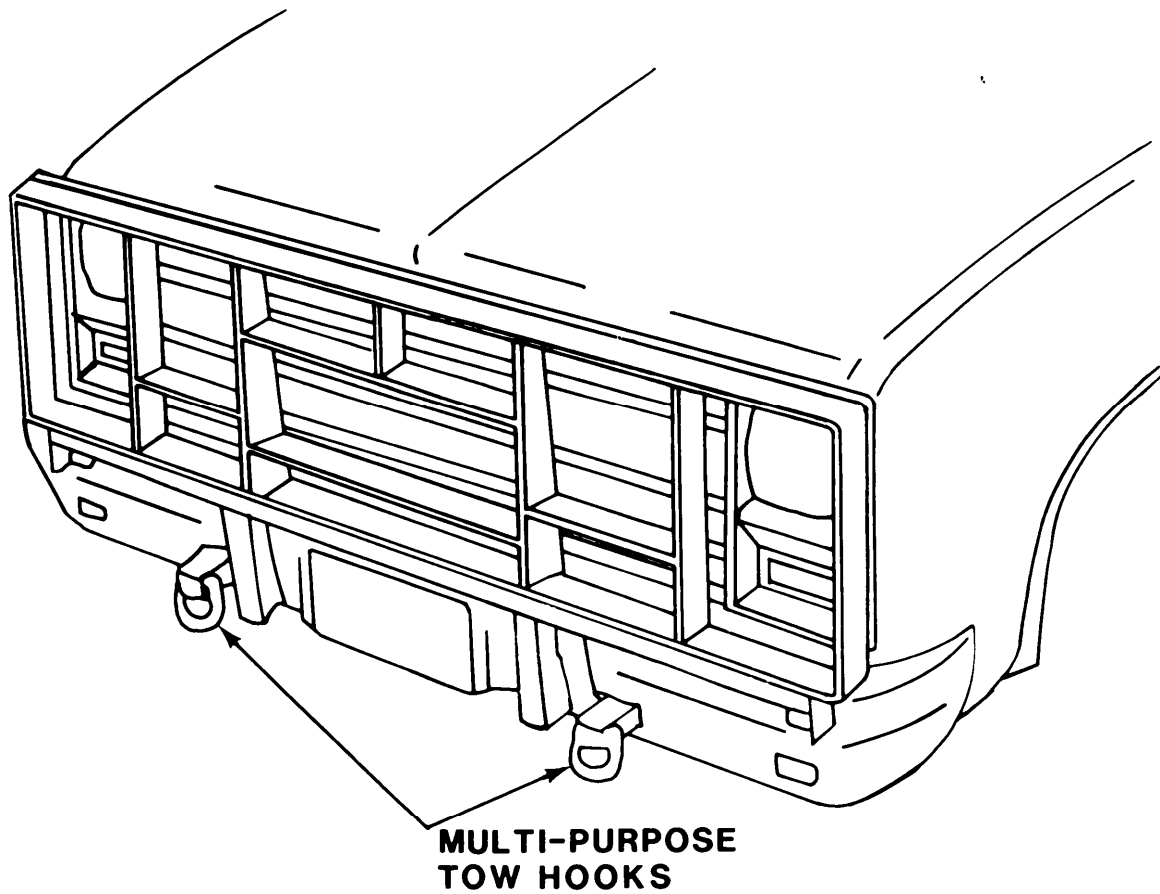
Figure 2-4. M1028/M1028A1, side and rear views.

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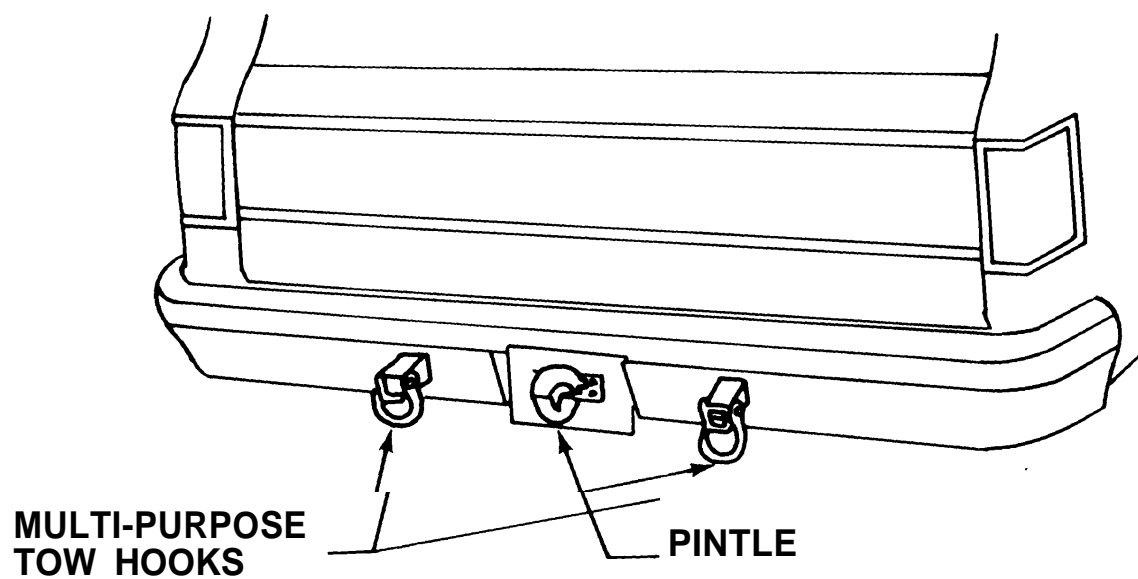
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## 2-5. Towing Capability

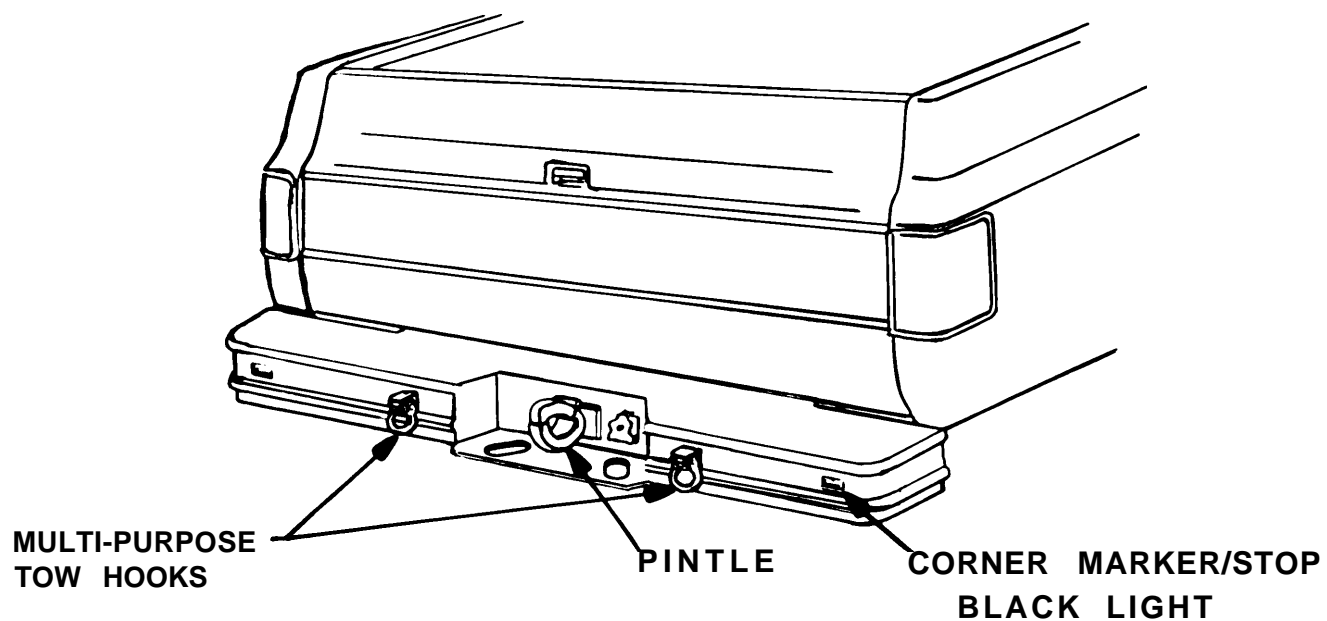
Each CUCV has two multipurpose tow hooks (shackle and pin assemblies) on the front (figure 2-5), two located on the rear, and a tow pintle (figs 2-6 and 2-7) also on the rear. Each of the tow hooks can be used as a lifting or tiedown device. Table 2-1 gives the towing capacity of the tow pintle for the CUCVs.



*Figure 2-5. Front view of tow hooks on all CUCVs.*



*Figure 2-6. M1009, rear view of tow hooks and tow pintle.*



*Figure 2-7. Rear view of tow hooks and tow pintle on all other CUCVs.*

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## 2-6. Frame Reinforcement

The M1008, M1008A1, M1010, M1028, and M1028A1 models of the CUCVs manufactured before March 1985 must have the frame reinforcement bracket applied (fig 2-8). Each vehicle must be checked to see if this bracket has been applied on all models before the CUCVs are lifted at their gross vehicle weight with a crane.



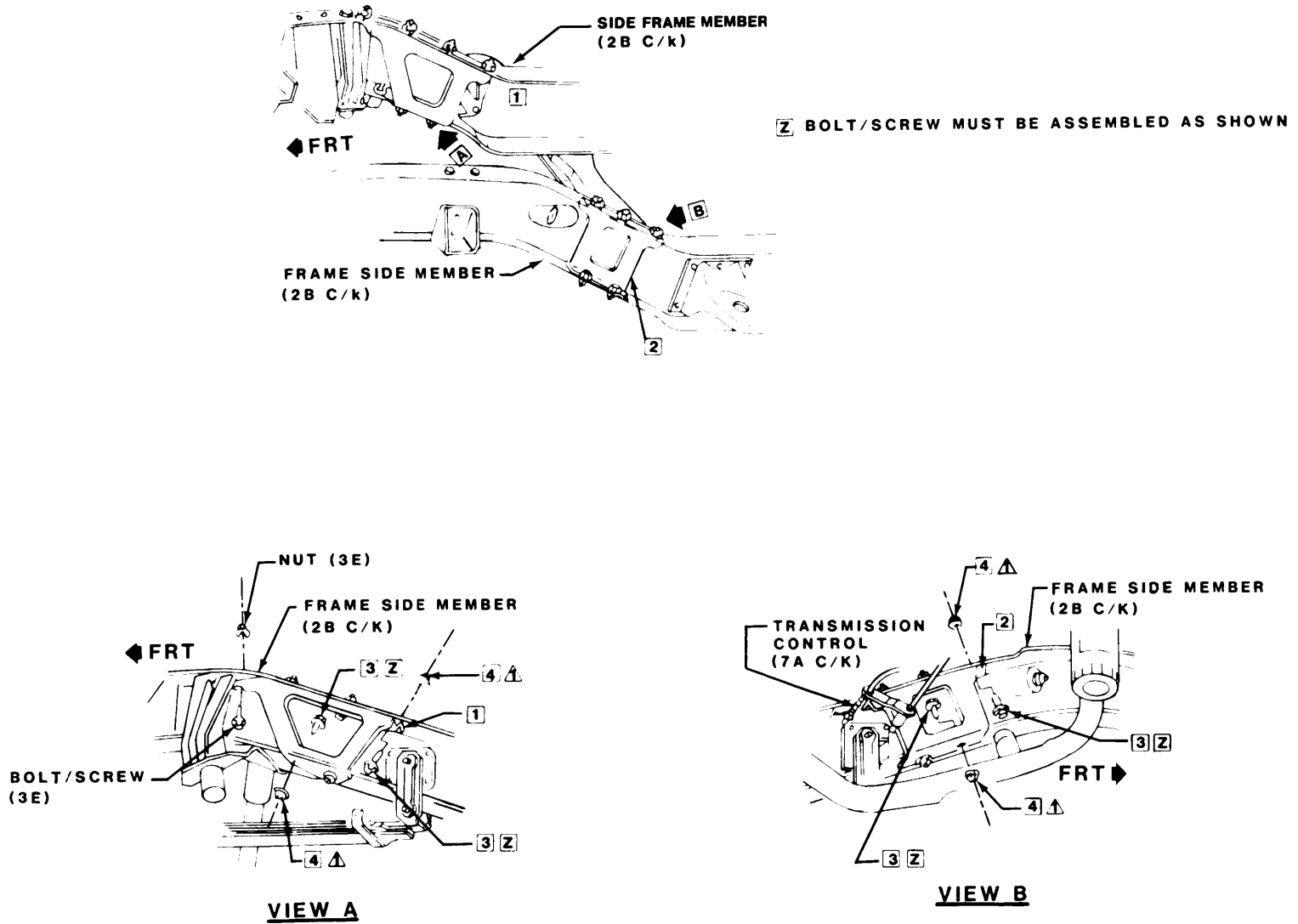


Figure 2-8. Frame reinforcement bracket, front.

## 2-7. Tiedown of CUCVs

The towing eyes located on the front and rear of the CUCVs are used as the tiedown points for the vehicles. In the cargo trucks, eight cargo tiedowns have been installed. Four are located on each side at about 4, 28, 72, and 90 inches from the front face of the cargo compartment (fig 2-9).

Table 2-1. Towing Capacity of Tow Pintles on CUCVs

Vehicle	Curb Weight (lb)	Maximum Payload (lb)	Maximum Towed Load (lb)	Flight Line Allowance (lb)	GVWR
M1008 .....	5,900	2,900	*3,160(a)	15,000	8,800
M1008A1 .....	5,900	2,900	3,160	15,000	8,800
M1009 .....	5,200	1,500	**1,200(b)	15,000	6,700
M1010 .....	6,880	2,320	NA	NA	9,200
M1028 .....	5,750	3,600	3,160	15,000	9,350
M1028A1 .....	5,750	3,600	3,160	15,000	9,350

\* (a) M101 trailer series

\*\* (b) M416 trailer series

### Definitions of Terms Used in Table:

1. *Curb weight*: The weight of base vehicle with BII and all fuels and lubes topped off.
2. *Payload*: The operator, passengers, personnel gear, cargo, trailer tongue load, or anything on the vehicle that increases the gross weight above the curb weight.
3. *Gross vehicle weight rating (GVWR)*: The maximum gross weight at which the vehicle is permitted to be operated.
4. *Gross towed load*: The weight of the towed trailer and its payload.
5. *Trailer tongue load*: The vertical load placed on the trailer towing pintle by the trailer lunette. The lunette must be considered part of the truck payload and should not exceed 10 percent of the gross trailer load.
6. *Flight-line towing allowance*: Fixed and rotary wing aircraft which exceed the normal maximum gross towed load may be towed under limited operational procedures as follows:
  - a. Speed will not exceed 5 mph.
  - b. Vehicle will be operated with transmission in low range ("1"), transfer case in 2W drive.
  - c. The gross load (ie., the aircraft) will not exceed 15,000 lb.
  - d. The tongue load will not exceed 100 lb. for the M1009 and 300 lb. for M1008, M1008A1, M1028 or M1028A1.
  - e. Operation will be on flat (level) hard surface.

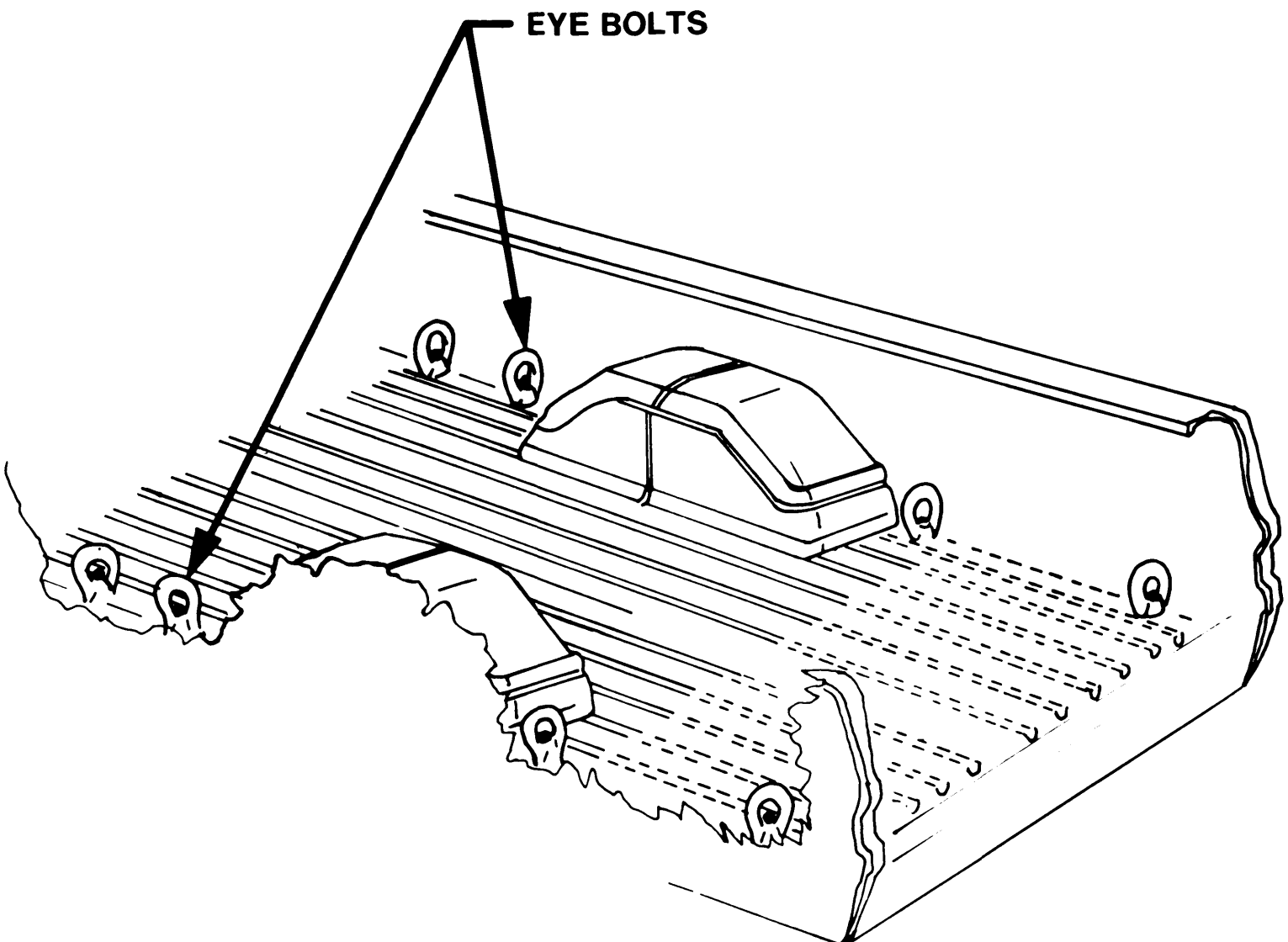


Figure 2-9. Cargo tie-downs in CUCV cargo beds.

**2-8. Reduced Configuration**

Economical transport can be obtained by reducing such vehicle to its minimum dimensions for transport. The vehicle's removable items such as bows and tarps should be stowed in the vehicle cargo compartment. Cargo will not cause vehicle to exceed the maximum certified weight when prepared for airlift.

**2-9. Unusual Characteristics**

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

**2-10. Hazardous and Dangerous Characteristics**

Unless the vehicles are shipped with ammunition or explosives under the provisions of the Department of Transportation Special Permit No. 3498 (applicable only to shipment by motor vehicle or rail in periods of actual emergency), they will not present any hazardous or dangerous characteristics during normal transport.

## CHAPTER 3

### SAFETY

---

#### 3-1. General

General safety considerations and precautions for handling and moving the CUCVs are as follows:

*a.* The entire vehicle must be checked to ensure that all loose items are properly secured to prevent damage during shipment.

*b.* A ground guide must be used when the vehicle is backed or moved in a confined area.

*c.* Other operational safety precautions are outlined in the operators manual.

#### WARNING

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

#### WARNING

If the vehicle is operated during loading and unloading, proper ventilation must be provided. Prolonged inhalation of exhaust fumes could be fatal.

#### WARNING

Personnel must not stand or walk under the vehicle when the vehicle is being lifted.

*d.* All lifts should have sufficient guidelines attached to control the swing of the vehicle.

*e.* Slings and sling items used in loading and unloading operations should be inspected for safe working conditions.

#### WARNING

The CUCVs will not be externally lifted by helicopter.

#### CAUTION

The CUCVs, at maximum gross weight, cannot be lifted by cranes unless the frame modification kit has been applied. This modification is required on all models except the M1009 (fig 2-8).

#### CAUTION

When the CUCV with the S-250 shelter is shipped by rail, using wood deck railcars, the shelter must be removed and shipped separately to prevent damage to the shelter. When using steeldeck cushioned frame flatcars, the shelter may remain on the vehicle if secured as shown in figure 7-5.

#### NOTE

The CUCV with S-250 mounted must be loaded aboard C-130 and C-141 aircraft forward end first. Do not attempt to load by backing aboard.

#### 3-2. Specific Safety Requirements

Pertinent safety requirements by individual modes are provided, where applicable, in the subsequent chapters.

## CHAPTER 4

### AIR TRANSPORTABILITY GUIDANCE

---

#### Section I. GENERAL

##### 4-1. Scope

This chapter provides air transportability guidance for movement of the CUCVs. It covers technical and physical characteristics, as well as safety considerations, and prescribes the materials required to prepare, load, and unload vehicles on US Air Force aircraft. Also, it provides examples of tiedown diagrams and data tables for loading vehicles in C-130, C-141, and C-5A aircraft.

##### 4-2. Maximum Utilization of Aircraft

Cargo may be carried in the cargo compartment of the CUCV if the gross vehicle weight rating is not exceeded. Such cargo must be securely restrained in the vehicle, otherwise cargo must be removed from the vehicle and secured to the aircraft floor. The restraining device must meet the same restraint criteria as the vehicle whether the cargo is located in or out of the vehicle. The load must not exceed the maximum rated load capacity for these vehicles. The weight of the vehicle and its cargo must be accurate. The vehicle and its cargo are considered as one package, and the gross vehicle weight is used to determine tiedown requirements in accordance with chapter 4, FM 55-9 (Unit Air Movement Planning).

##### 4-3. Safety

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

*a.* The activity offering the vehicle for air transport will notify the aircraft commander or his/her designated representative when ammunition or explosives are to be transported within the vehicles.

*b.* In accordance with TM 38-250/AFR 71-4, the fuel level may be three-quarters full when loaded on the cargo floor, or one-half full when loaded on aircraft ramp during contingencies. The fuel level must be no more than one-quarter full during routine airlift.

*c.* The vehicles must be restrained for air transport in accordance with applicable procedures in Air Force Technical Order (TO) IC-xxx-9.

#### CAUTION

The CUCV will not be externally lifted by helicopter.

#### NOTE

The CUCV with S-250 mounted must be loaded aboard C-130 and C-141 aircraft forward end first. Do not attempt to load by backing aboard.

##### 4-4. Responsibility

The loadmaster will ensure that the loaded equipment is secured in accordance with restraint criteria outlined in TO IC-xxx-9.

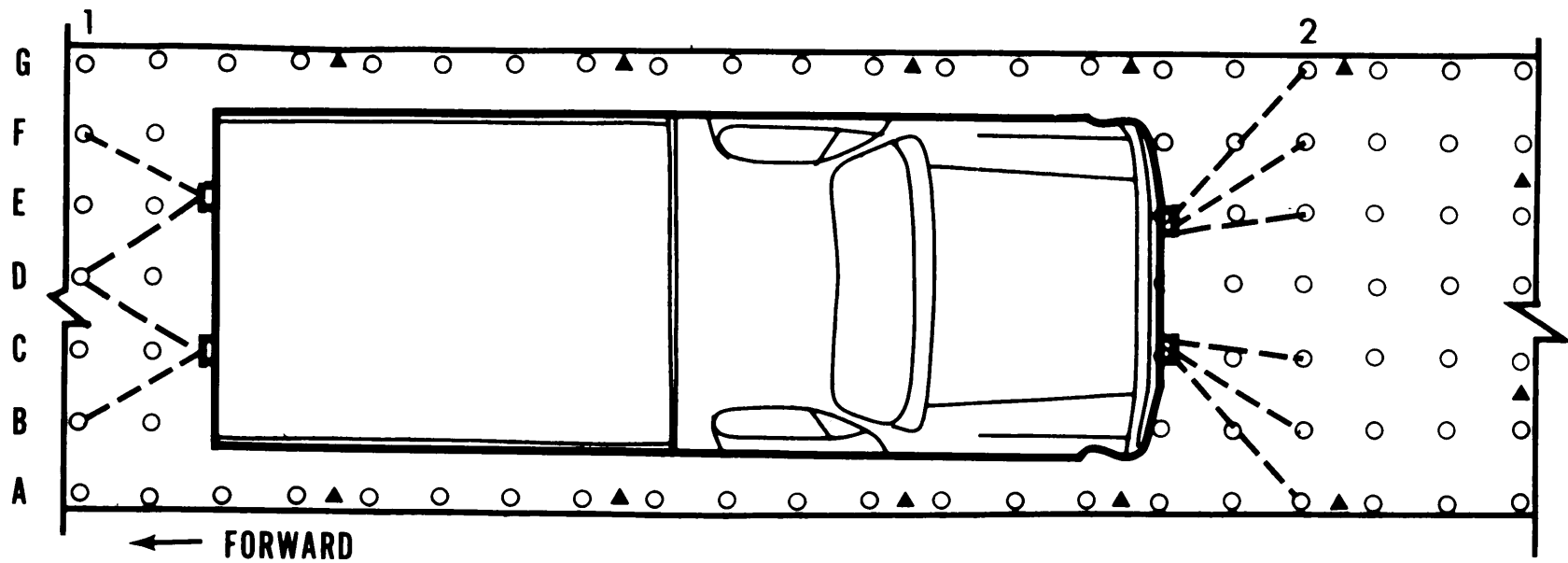
#### Section II. TRANSPORT BY US AIR FORCE AIRCRAFT

##### 4-5. Aircraft Capabilities

The CUCVs are transportable in C-130, C-141, and C-5A aircraft. Procedures in this manual and those prescribed in TO 1C-xxx-9 are applicable. The CUCVs will be restrained in accordance with MIL-A-8421 (Military Specification).

#### 4-6. Typical Loads

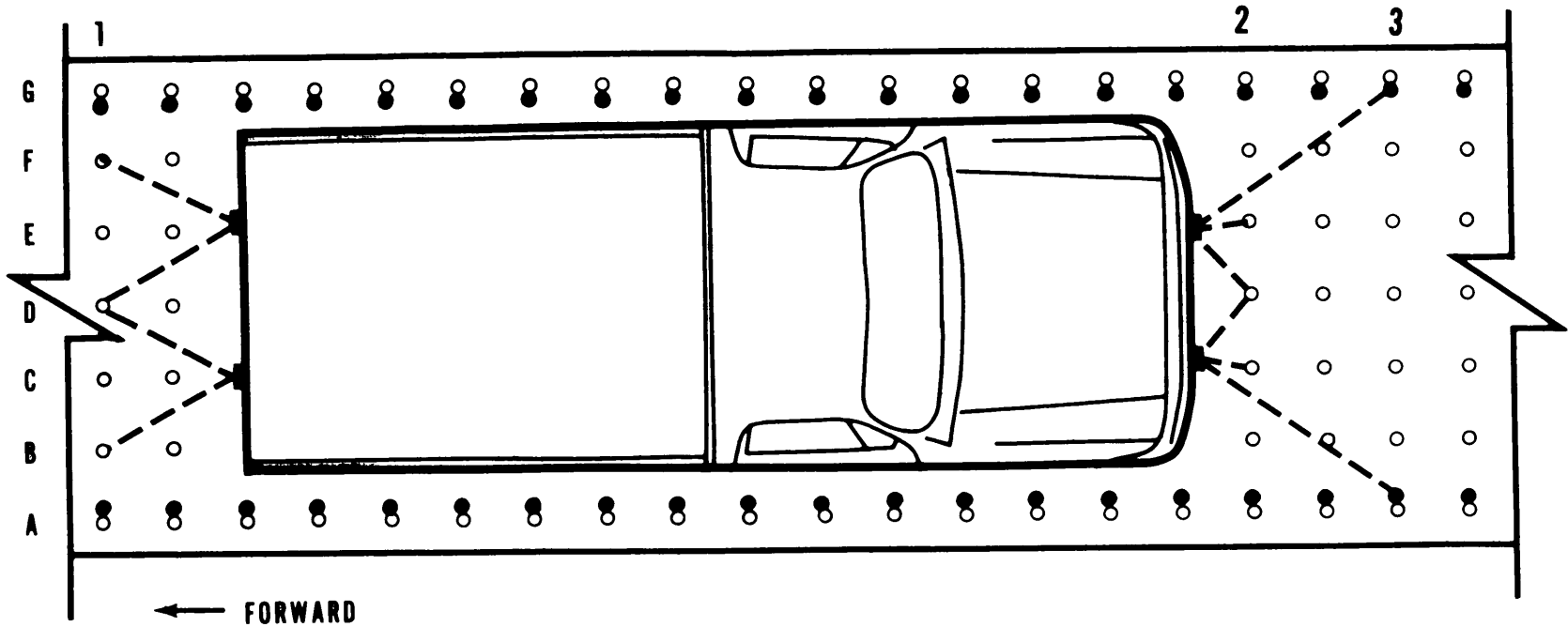
The following tiedown diagrams (figs 4-1 through 4-3) and tiedown data (tables 4-1 through 4-3) provide a guide for securing the CUCVs aboard US Air Force aircraft. Final tiedown procedures will be at the discretion of the Air Force loadmaster. The figures show a typical tiedown pattern of a representative CUCV for each aircraft. The tables give the type and capacity of tiedown devices required, location points on the vehicles, and aircraft fittings to which the devices are secured.



SYMBOL	○	▲
STRENGTH OF FITTING AND BASIC LOAD DIRECTION	10000-LB ANY	25000-LB ANY

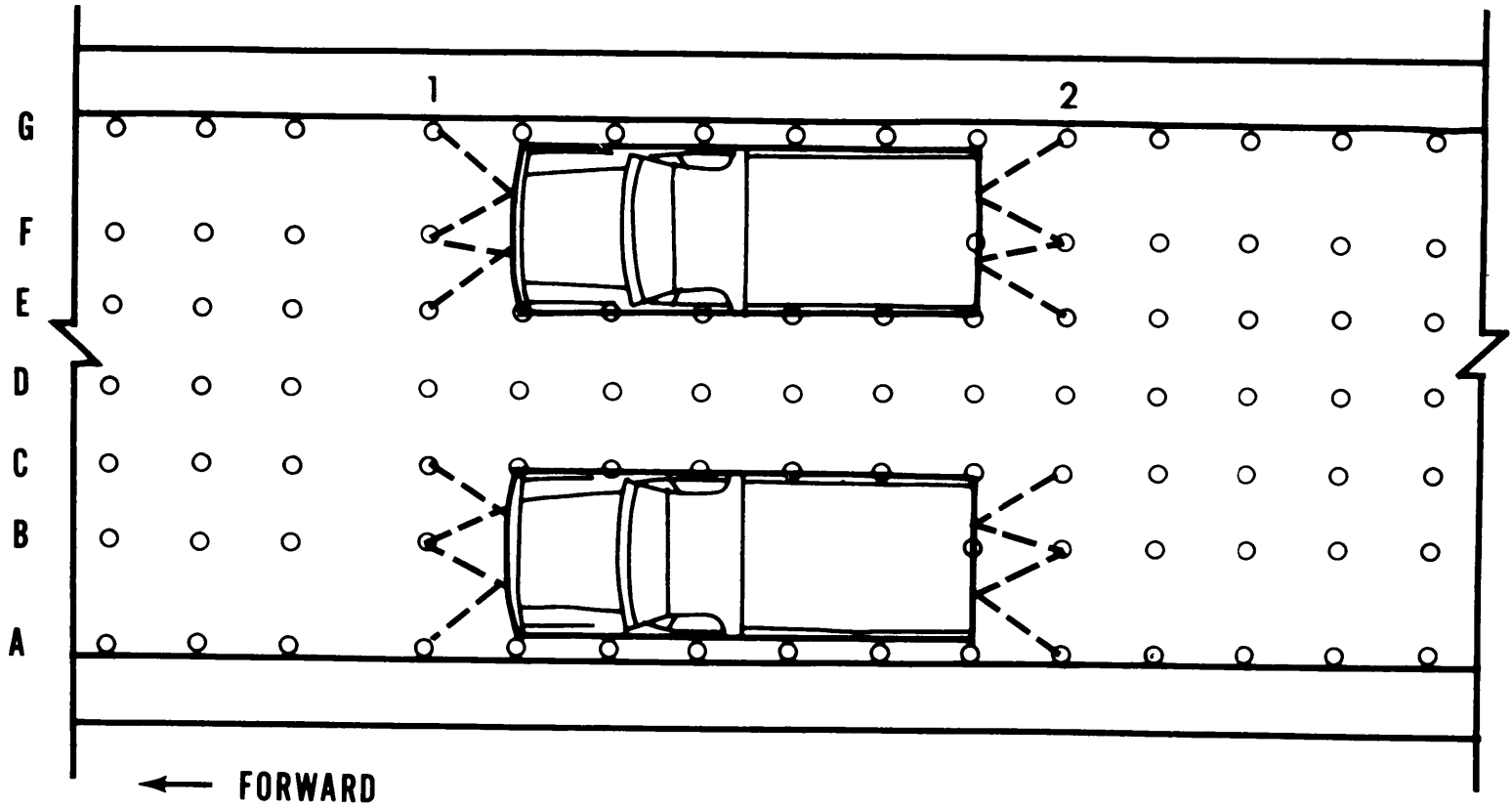
Figure 4-1. Tiedown diagram of CUCV in C-130 aircraft.





SYMBOL	○	●
STRENGTH OF FITTING AND BASIC LOAD DIRECTION	10000-LB ANY	25000-LB ANY

Figure 4-2. Tiedown diagram of CUCV in C-141 aircraft.



○ ALL CARGO TIEDOWN FITTING RATINGS 25000 LB EACH

Figure 4-3. Tiedown diagram of CUCV in C-5A aircraft.

Table 4-1. Tiedown Data for CUCV in USAF C-130 Aircraft(Fig 4-1)

Tiedown Fitting		Tiedown Device		Attach to Item
Designation	Capacity in 1,000 lb	Type	Capacity in 1,000 lb	
B1	10	MB1	10	Right rear tiedown fitting.
D1	10	MB1	10	Right rear tiedown fitting.
F1	10	MB1	10	Left rear tiedown fitting.
D1	10	MB1	10	Left rear tiedown fitting.
A2	10	MB1	10	Right front bumper tiedown fitting.
B2	10	MB1	10	Right front bumper fitting.
D2	10	MB1	10	Right front bumper tiedown fitting.
E2	10	MB1	10	Left front bumper tiedown fitting.
F2	10	MB1	10	Left front bumper tiedown fitting.
G2	10	MB1	10	Left front bumper tiedown fitting.

Table 4-2. Tiedown Data For CUCV in USAF C-141B Aircraft (Fig 4-2)

Tiedown Fitting		Tiedown Device		Attach to Item
Designation	Capacity in 1,000 lb	Type	Capacity in 1,000 lb	
B1	10	MB1	10	Right rear bumper tiedown fitting.
D1	10	MB1	10	Right rear bumper tiedown fitting.
D1	10	MB1	10	Left rear bumper tiedown fitting.
F1	10	MB1	10	Left rear bumper tiedown fitting.
C2	10	MB1	10	Right front bumper tiedown fitting.
D2	10	MB1	10	Right front bumper tiedown fitting.
D2	10	MB1	10	Left front bumper tiedown fitting.
E2	10	MB1	10	Left front bumper tiedown fitting.
A3	25	MB2	25	Right front bumper tiedown fitting.
G3	25	MB2	25	Left front bumper tiedown fitting.

Table 4-3. Tiedown Data for the CUCV in USAF C-5A Aircraft (Fig 4-3)

Tiedown Fitting		Tiedown Device		Attach to Item
Designation	Capacity in 1,000 lb	Type	Capacity in 1,000 lb	
A1	25	MB1	25	Left front bumper tiedown fitting (veh I).
B1	25	MB1	25	Left front bumper tiedown fitting (veh I).
B1	25	MB1	25	Right front bumper tiedown fitting (veh I).
C1	25	MB1	25	Right front bumper tiedown fitting (veh I).
E1	25	MB1	25	Left front bumper tiedown fitting (veh II).
F1	25	MB1	25	Left front bumper tiedown fitting (veh II).
F1	25	MB1	25	Right front bumper tiedown fitting (veh II).
G1	25	MB1	25	Right rear bumper tiedown fitting (veh I).
A2	25	MB2	25	Left rear bumper tiedown fitting (veh I).
B2	25	MB2	25	Left rear bumper tiedown fitting (veh I).
B2	25	MB2	25	Right rear bumper tiedown fitting (veh I).
C2	25	MB2	25	Right rear bumper tiedown fitting (veh I).
E2	25	MB2	25	Left rear bumper tiedown fitting (veh II).
F2	25	MB2	25	Left rear bumper tiedown fitting (veh II).
F2	25	MB2	25	Right rear bumper tiedown fitting (veh II).
G2	25	MB2	25	Right rear bumper tiedown fitting (veh II).

### Section III. TRANSPORT BY US ARMY AIRCRAFT

#### 4-7. Fixed Wing Aircraft

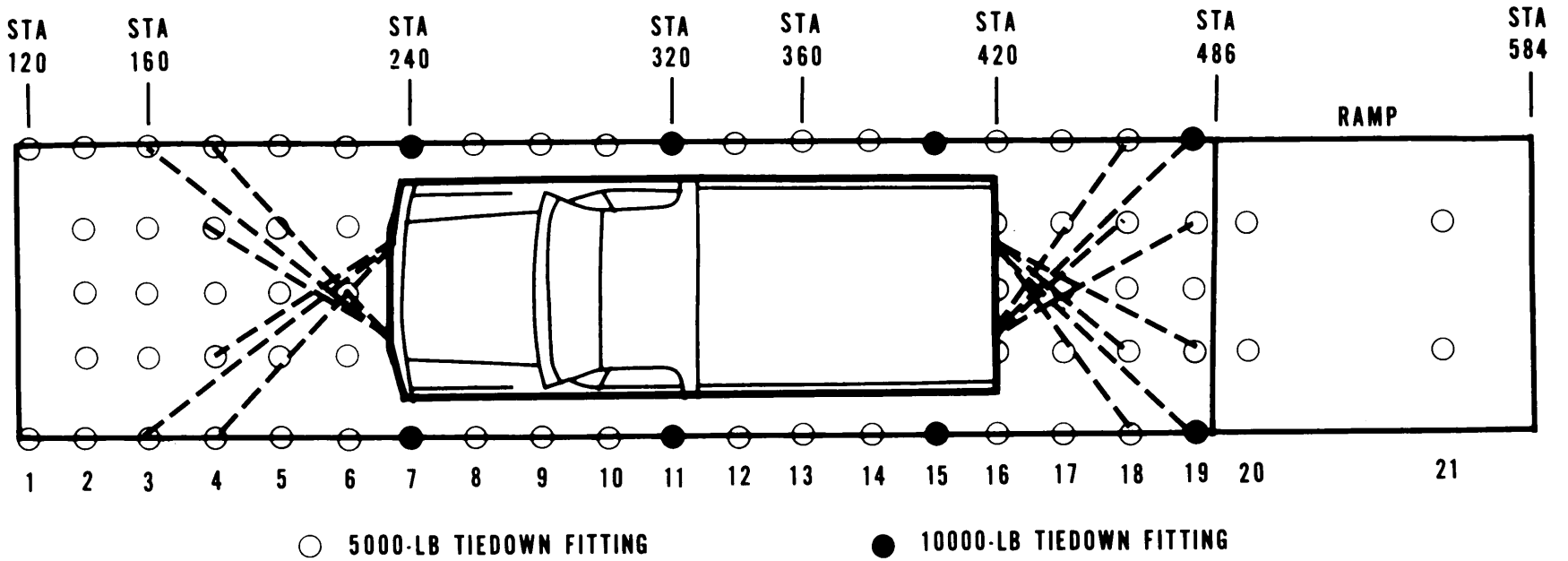
The CUCVs cannot be transported in any fixed wing aircraft, because of weight and size limitations.

#### 4-8. Rotary Wing Aircraft

### CAUTION

The CUCV will not be externally lifted by helicopter.

Except for the M1010 ambulance and the M1028 with shelter, the CUCVs can be transported internally by the CH-47 helicopter. The typical tiedown diagram and tiedown data necessary to load and secure the CUCV for movement by helicopter are provided in figure 4-4 and table 4-4, respectively. The crew chief/pilot are responsible for ensuring that the loads are properly loaded and secured.



NOTE: UTILITY HATCH DOOR IS LOCATED IN THE CENTER OF THE FLOOR BETWEEN STATIONS 320 AND 360

Figure 4-4. Tiedown diagram of CUCV in CH-47 helicopter.

#### 4-9. Civil Reserve Air Fleet (CRAF)

a. *DC-10*. Except for the M1010 ambulance, all CUCV models are within the dimensional and weight limitations for this aircraft. The vehicle height, however, must not exceed 83 inches,

b. *Boeing 747*. All CUCVs can be transported in the Boeing 747 model. Any CUCV with a load height in excess of 94 inches is restricted to only the side door models of the Boeing 747. The maximum height for side-door loading is 114 inches.

Table 4-4. Tiedown Data for the CUCV in US Army CH-47 Helicopter (Fig 4-4)

Tiedown Fitting		Tiedown Device		Attach to Item
Designation	Capacity in 1,000 lb	Type	Capacity in 1,000 lb	
A3	5	MB1	10	Right front bumper tiedown fitting.
E3	5	MB1	10	Left front bumper tiedown fitting.
A4	5	MB1	10	Right front bumper tiedown fitting.
B4	5	MB1	10	Right front bumper tiedown fitting.
D4'	5	MB1	10	Left front bumper tiedown fitting.
E4	5	MB1	10	Left front bumper tiedown fitting.
A18	5	MB1	10	Right rear bumper tiedown fitting.
B18	5	MB1	10	Right rear bumper tiedown fitting.
D18	5	MB1	10	Left rear bumper tiedown fitting.
E18	5	MB1	10	Left rear bumper tiedown fitting.
A19	10	MB1	10	Right rear bumper tiedown fitting.
B19	5	MB1	10	Right rear bumper tiedown fitting.
D19	5	MB1	10	Left rear bumper tiedown fitting.
E19	10	MB1	10	Left rear bumper tiedown fitting.

## CHAPTER 5

### HIGHWAY TRANSPORTABILITY GUIDANCE

---

#### Section I. GENERAL

##### 5-1. Scope

This chapter provides highway transportability guidance for movement of the CUCVs. It includes safety considerations and lists the materials and guidance required to prepare, load, unload, and tie down the vehicles.

##### 5-2. Safety

In addition to the safety precautions contained in chapter 3, movement is subject to all safety laws, rules, and regulations applicable to commercial carriers in CONUS. In overseas areas, movement is governed by theater and local regulations.

#### Section II. SELF-PROPELLED MOVEMENT

##### 5-3. General

As self-propelled vehicles, the CUCVs can move without any restrictions over all road networks within CONUS and overseas. No special preparations are required for the vehicles to move under their own power.

#### Section III. TRANSPORT BY SEMITRAILER

##### 5-4. Transport by Semitrailer

The CUCVs may be transported over highway by both military and commercial flatbed semitrailers. Semitrailers not more than 96 inches wide will provide for unrestricted moves in CONUS and overseas.

##### 5-5. Preparation for Transport

Special preparation of the CUCVs for transport by semitrailer may consist of reducing the CUCVs to their lowest shipping configuration. Normally, the overall height of the CUCV, when loaded on the M127A1 semitrailer, will not exceed 13 feet 6 inches.

##### 5-6. Loading on Semitrailer

*a. Loading.* The CUCVs may be towed or driven onto a flatbed trailer if ramps are available. Empty CUCVs can be loaded by crane. Before the CUCV is loaded at its gross vehicle weight, each vehicle must be checked to see if the frame reinforcement kits have been applied. The M1009, however, does not require the bracket to be mounted.

*b. Tiedown and Blocking.* After the vehicle has been placed in the tiedown position, it will be tied down on a semitrailer as shown in figure 5-1. Figure 5-2 shows blocking and tiedown details. Also, chains and binders may be used to tiedown the CUCVs on semitrailers. The bill of materials and application of materials for tiedown of a CUCV are shown in tables 5-1 and 5-2, respectively. The bill of materials and application of materials for blocking and tiedown of a CUCV are provided in tables 5-3 and 5-4, respectively.

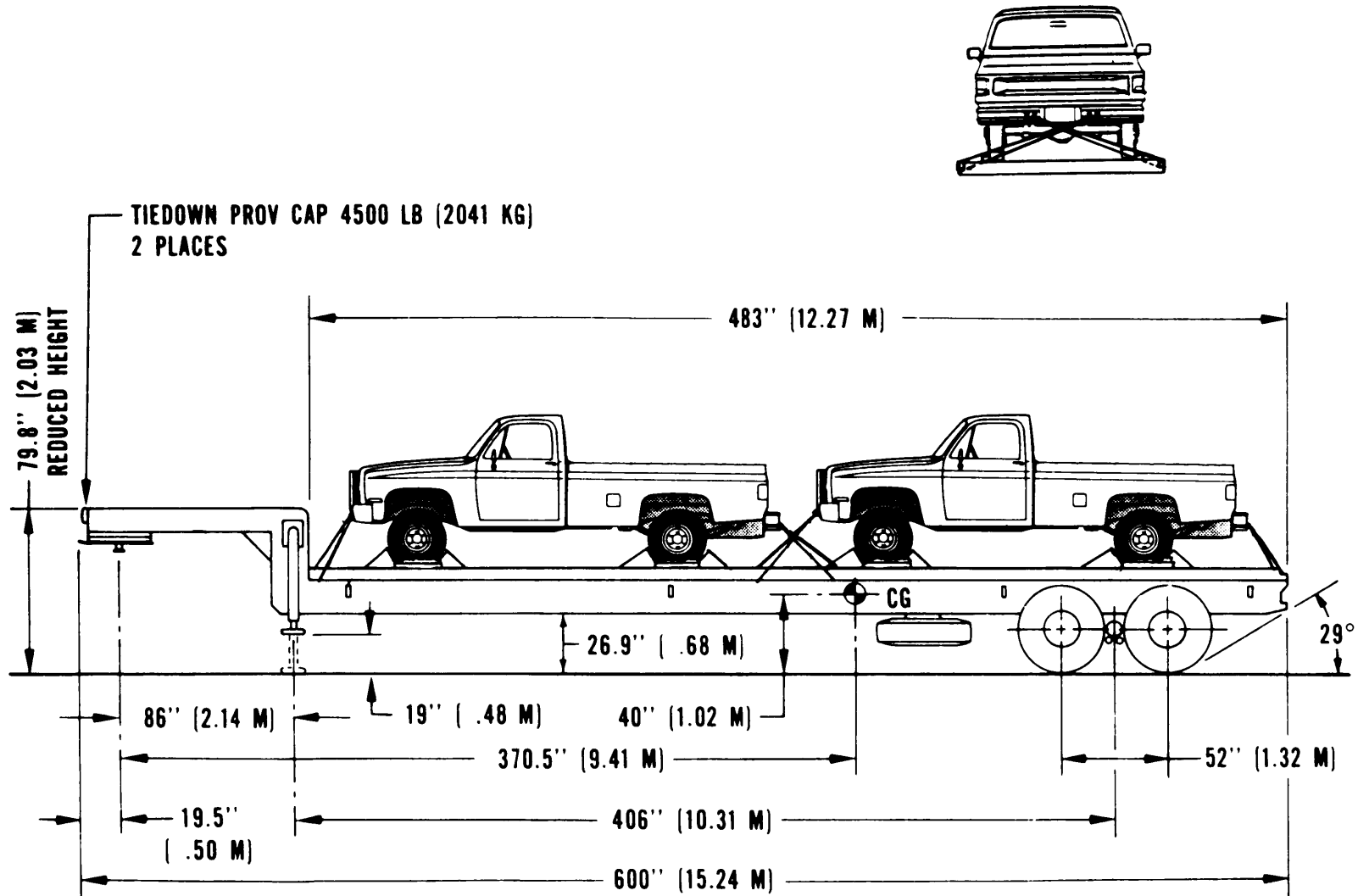


Figure 5-1. Tiedown of CUCV on a semitrailer.



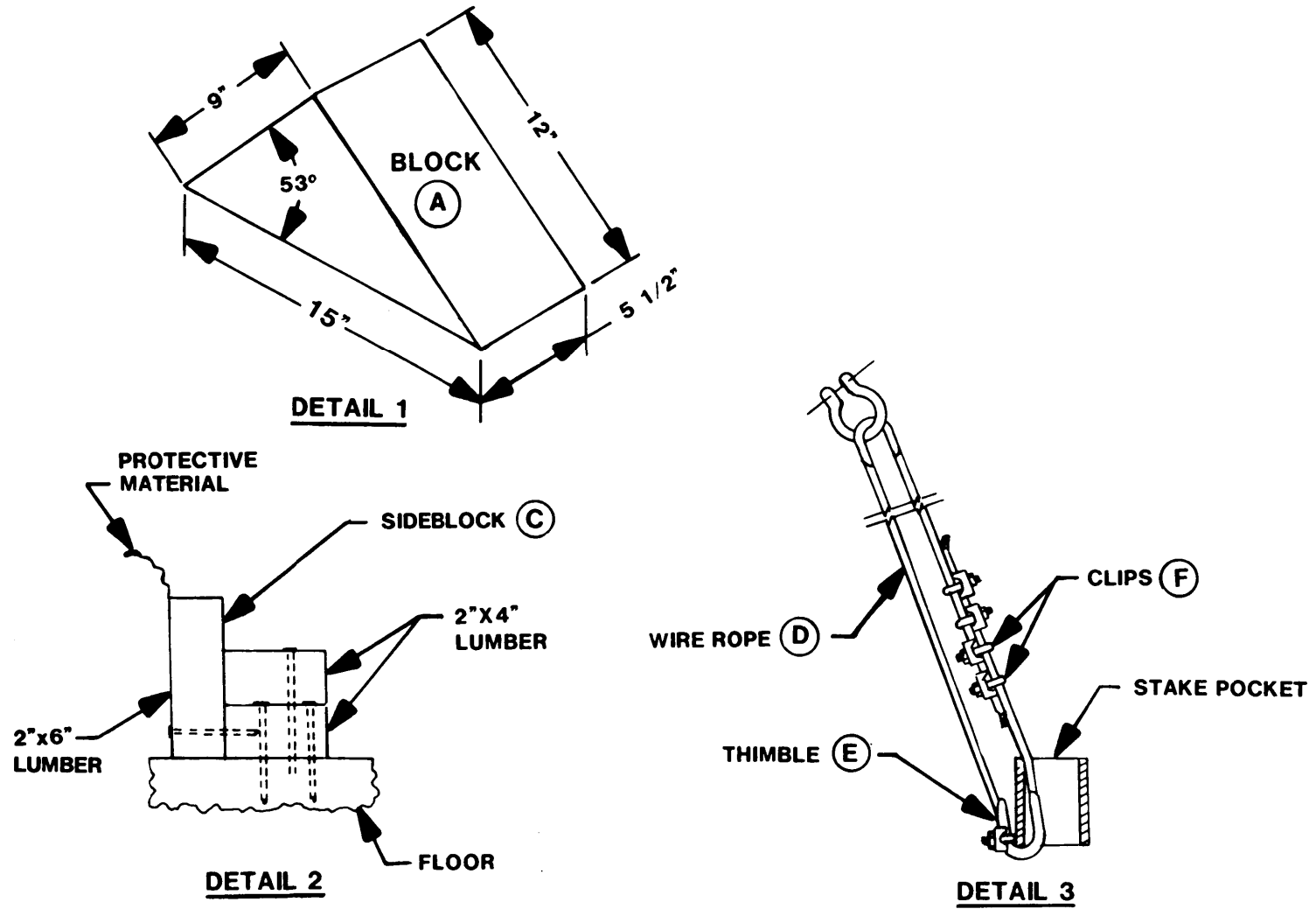


Figure 5-2. Blocking and tiedown details of CUCV on a semitrailer.

Table 5-1. Bill of Materials for Tiedown of CUCV on a Semitrailer.

Item	Description	Approximate Quantity
Chain	General service S-leg, high tensile, 1/2-inch, 10-foot-long, with two grabhooks; 16,000-lb safe working rating.	4
Load binders	Type I, plain, 18 1/2-inch, operating lever, with two grabhooks designed for 1/4- to 1/2-inch chain; 16,000-lb safe working rating. Fed Spec GGG-B-325A; NSN 3990-00-171-9774.	4

Table 5-2. Application of Materials for Tiedown of CUCV on a Semitrailer

Item	No. required	Application
NA	2 per CUCV Chains.	Secure a chain to each front tiedown ring. Crisscross the chains, and attach the ends of the chains to the trailer.
NA	2 per CUCV Load binders.	Tighten front chains with load binders.
NA	2 per CUCV Chains.	At the rear end of CUCV, attach one end of each chain to the trailer.
NA	2 per CUCV Load binders.	Tighten aft chains with load binders.

Table 5-3. Bill of Materials for Blocking and Tiedown of CUCV on a Semitrailer

Item	Description	Approximate Quantity
Lumber	Douglas-fir, or comparable; straight-grain, free from material defects; Fed Spec MM-L-751: 6- x 8-inch	6 linear feet
	2- x 6-inch	6 linear feet
	2- x 4-inch	12 linear feet
Nails	Common, steel; flathead; bright or cement-coated; Fed Spec; FF-N-105:	16
	12d	16
	20d	30
	40d	50
Wire rope	6 x 19, IWRC; improved plow steel; preformed, regular-lay; table X, Fed Spec; RR-W-410 3/8-inch	48 feet
Clamps	Wire rope, U-bolt clamps, saddled, single-grip, steel, Crosby heavyduty, or equal; MIL-STD 16842: 3/8-inch	20
Thimbles Cushioning Material	Standard, open-type; 3/8-inch Waterproof paper, burlap, or other suitable material as required	4

Table 5-4. Application of Materials for Blocking and Tiedown of CUCV on a Flatbed Semitrailer (Figs 5-1 and 5-2)

Item	No. required	Application
A	8	Chock block (detail 1, fig 5-2). Place 45° end against each wheel as shown in figure 5-1. Nail heel of block to semitrailer floor with three 40d nails. Toenail each side of block to trailer floor with one 40d nail.
B	As required	Cushioning material (detail 2, fig 5-2). Locate so that material is under and extends 2 inches above item C, between the tire and item C.
C	4	Side blocks (detail 2, fig 5-2). Each consists of one piece of 2- x 6- x 18-inch lumber and two pieces of 2- x 4- x 18-inch lumber. Nail 2- x 6- x 18-inch piece to edge of lower 2- x 4- x 18-inch piece with three 12d nails. Place 2- x 6- x 18-inch piece against cushioning material and tire, and nail to semitrailer floor, in a staggered pattern, through 2- x 4- x 18-inch piece with three 20d nails. Nail upper 2- x 4- x 18-inch piece with three 20d nails.
D	4	Tiedowns (detail 3, fig 5-2). Each consists of one piece of 3/8-inch, 6 x 19, IWRC wire rope, length as required (about 12 feet). Form a complete loop between tiedown provision and appropriate semitrailer stake pocket. The angle between the tiedowns and the trailer deck should be as close to 45° as possible. The wire rope should overlap at least 24 inches.
E	4	Thimbles. Place one thimble under wire rope when wire rope contacts bottom of stake pocket. Secure thimble to wire rope with one U-bolt clip (detail 3, fig 5-2).
F	20	Clamps. Place four on each item D at overlap area. Space clamps 2 1/2 inches apart, with a minimum of 6 inches from ends of wire rope (detail 3, fig 5-2). Place one on each item E as indicated above.

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## NOTE

Tension wire rope with a come-along mechanical hoist or equal tensioning device.

## 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 CUCVs. It includes safety considerations and lists of materials required to prepare, lift, tie down, load, and stow the vehicles.

##### 6-2. Safety

In addition to the safety precautions in chapter 3, the following precautions apply:

- a. All vessel gear and equipment should be inspected before use.
- b. All stevedore slings and other items used in loading and unloading operations should be inspected before use.
- c. Lifting rings and shackles should be inspected to ensure they are complete and undamaged.
- d. All lifts should have at least two tag lines attached to control the movement of the suspended vehicle.
- e. Fuel tanks must be drained and the battery cables disconnected and taped.

#### Section II. LOADING AND SECURING

##### 6-3. General Rules for Stowage

Whenever possible, the vehicles should receive the protection of below-deck stowage. In general, good stowage of vehicles means vehicles are placed fore and aft as close together as practical, with 4- to 6-inch spacing between outer vehicles and sweatboards. If not shipped on the vehicle, breakable parts, spare parts, and OEM (on equipment materiel) should be protected and properly identified as to location or disposition during shipment. Vehicles in the ship's hold should have wheels blocked in front, in rear, and on both sides so that the vehicles cannot move in any direction. Individual wheel blocks should be braced to bulkheads, stanchions, and other wheel blocks. All vehicles should be lashed with wire rope or chains to nearby bulkheads, stanchions, or padeyes.

a. *Lifting.* The vehicle has four lifting points—two are located on the front bumper and two are located on the rear bumper. To lift this vehicle, a spreader bar must be used as shown in figure 6-1.

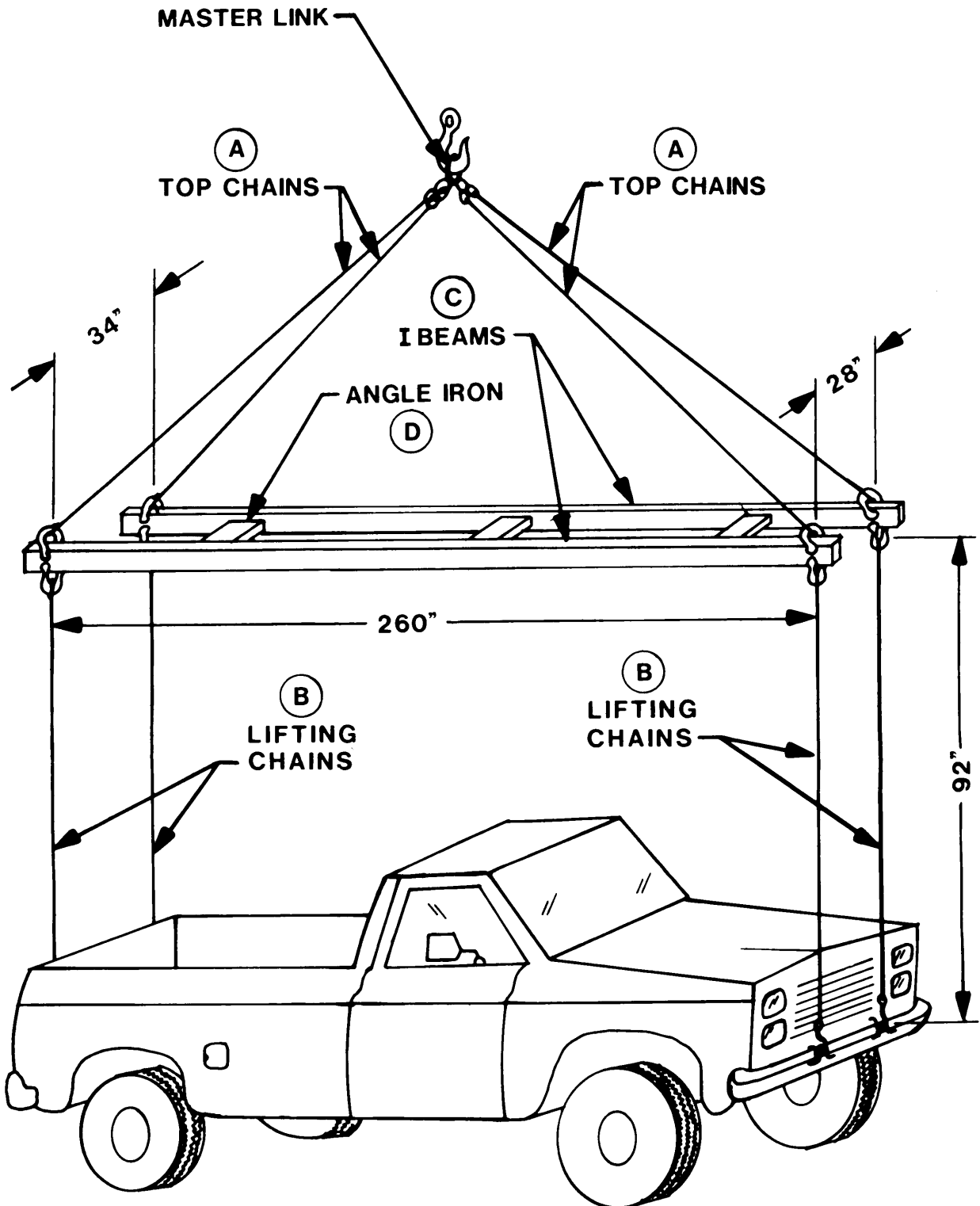


Figure 6-1. CUJCV lifted by a four-legged sling and spreader bar.

*b. Spreader Bar.* The spreader bar must be used with the four-legged sling to prevent damage to the truck's grill and hood. Typical spreader bars are shown in the Crosby General Catalog. As shown in figure 6-1, the spreader bar consists of the following items of equipment:

- (1) Four top chains, 3/8-inch, 184 inches long, with 7,300-pound workload.
- (2) Four bottom chains, 3/8-inch, 92 inches long, with 7,300-pound workload.
- (3) Two I-beams, 4-inch, (7.7 pounds per foot), 260 inches long.
- (4) Angle irons, 2-inch, at three locations so that front of spreader bar is 28% inches and rear is 34 inches.

*c. Loading.* When loaded on cargo vessels, the CUCVs will be in their minimum cube configuration; that is, reduced height with or without cargo and reduced width with side mirrors folded back or removed. The CUCVs can be loaded in operational configuration aboard landing craft, beach discharge and amphibious lighters, and landing ships under their own power, by towing, or by cranes of at least 10-ton capacity. They can be loaded onto decks of barges from a pier when tidal conditions are suitable and when ramps are available. They can also be loaded onto seagoing vessels by shoreside or floating cranes of adequate capacity or ships lifting gear. Except for the M1009 model, each vehicle must be checked to see if the frame reinforcement kits have been mounted before each vehicle is lifted at its gross vehicle weight by crane.

#### 6-4. General Cargo and Barge-Type (LASH and SEABEE) Ships

##### NOTE

Fuel tanks must be drained, and battery terminals must be disconnected and taped.

*a. Lighterage.* When the CUCVs are transported by lighterage to or from the vessel, blocking will be required. When the vehicles are to be transported long distances or through rough water, tiedowns must be used.

*b. Securing.* Requirements for securing the CUCVs aboard general cargo and barge-type vessels are essentially the same. The wheels of the trucks are blocked in front, in rear, and on both sides; if tiedowns are required, the vehicles will be lashed with wire rope or chains to bulkheads, stanchions, or padeyes. Figure 6-2 shows typical blocking and tiedown details. The bill of materials and application of materials for blocking and tiedown of CUCVs on general cargo or barge-type vessels are provided in tables 6-1 and 6-2, respectively.

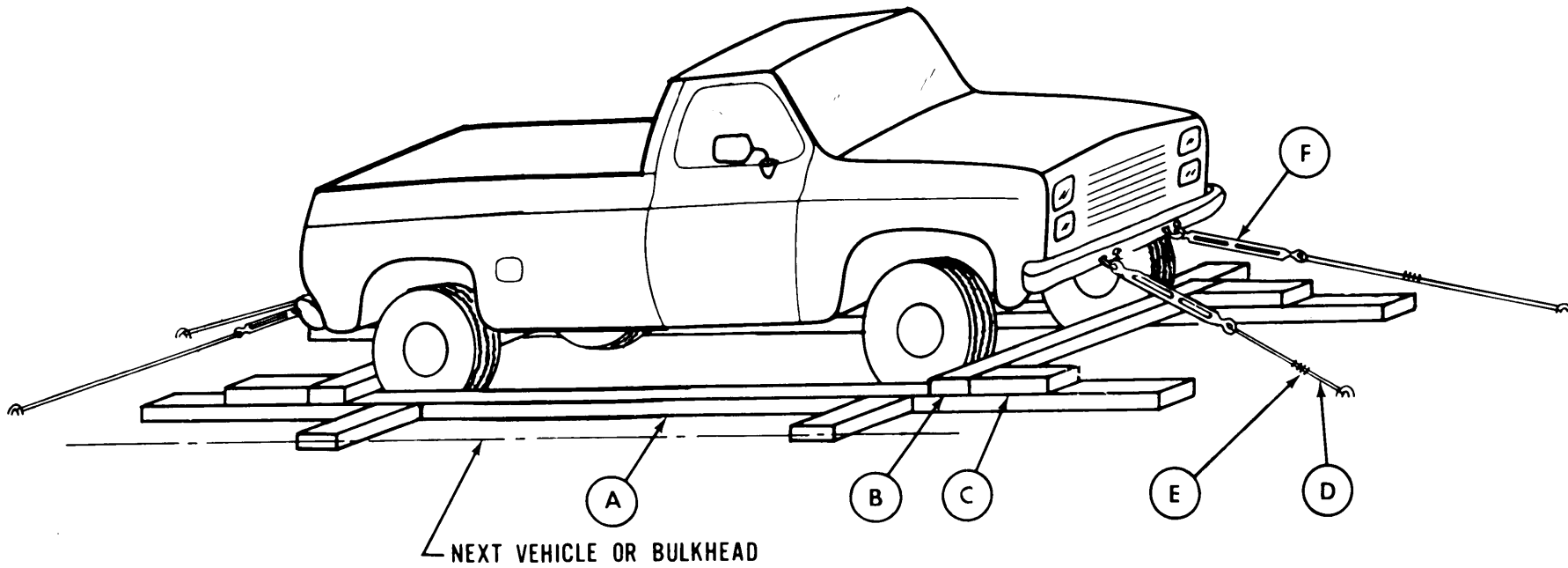


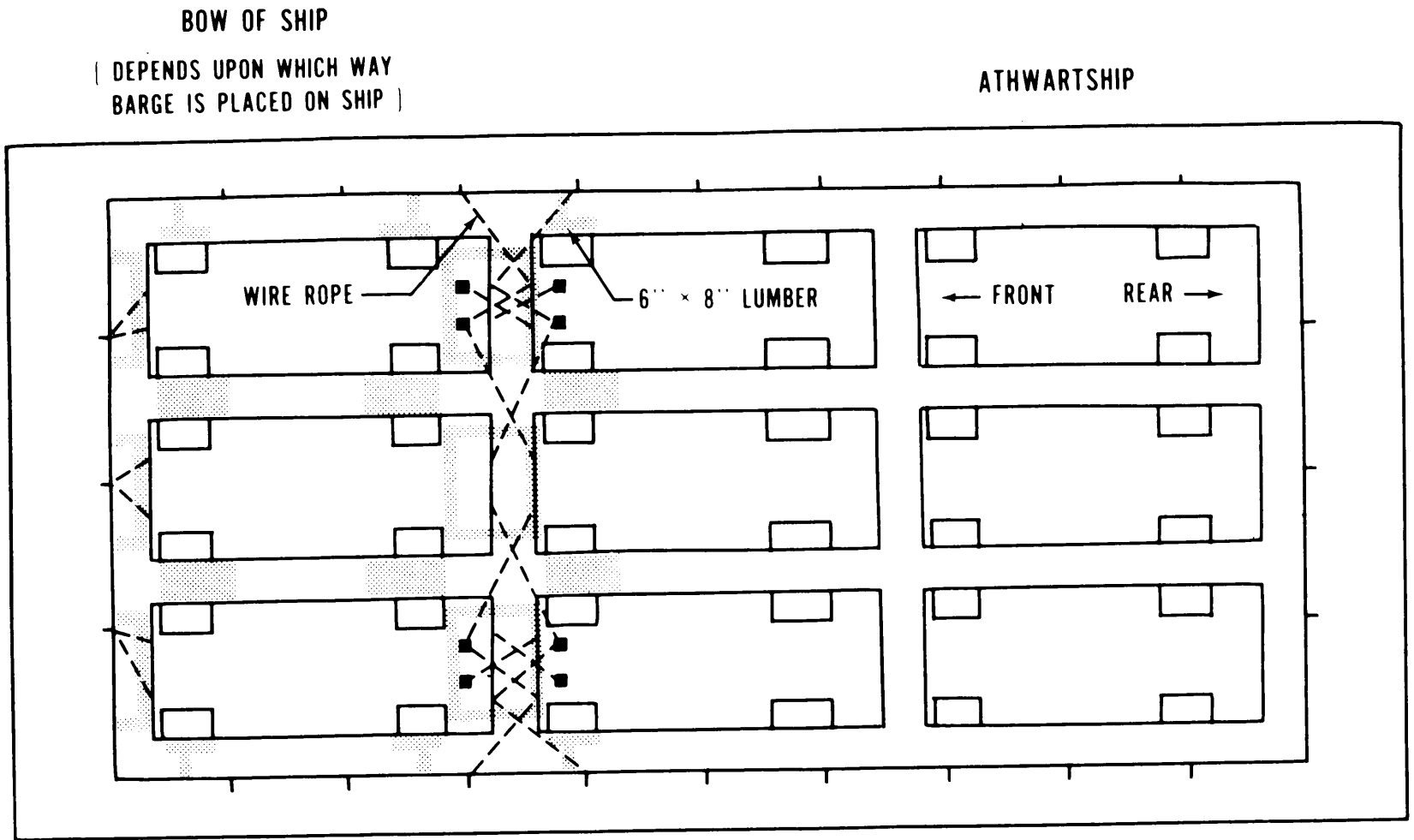
Figure 6-2. Typical blocking and tiedown of CUCV in hold of general cargo vessel.

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*c. Stowage in SEABEE Barge.* When the CUCVs are to be transported by SEABEE barge for a long distance or through rough waters, they will be blocked and tied down as shown in figure 6-3.





BLOCKED AND BRACED WITH WAY 6" x 8" LUMBER.  
 LENGTH CUT-TO-SUIT AND FORCE FITTED.  
 TIE DOWN WITH 5/8" WIRE ROPE AND 5/8"  
 CABLE CLAMPS AND TURNBUCKLES.

THIS END OF BARGE BLOCKED, BRACED, AND  
 TIED DOWN THE SAME AS OTHER END OF BARGE.

Figure 6-3. Typical blocking and tiedown of CUCV in SEABEE barge.

## 6-5. Roll-On/Roll-Off (RORO), Seatrain, and Attack Cargo Ships

## NOTE

When CUCVs are loaded on vessels that are adequately ventilated by power blowers, such as RORO vessels, fuel tanks can remain undrained and battery terminals connected.

*a. Loading.* The CUCVs can be loaded under their own power or towed aboard vessels with roll-on capability.

*b. Securing.* RORO, seatrain, and attack cargo ships are equipped with patented lashing gear and pre-positioned fittings on deck. The use of such equipment is adequate and blocking is not required. Figure 6-4 shows a typical tiedown of the CUCV on the RORO vessel with 10,000-pound-capacity lashings.

Table 6-1. Bill of Materials for Blocking and Tiedown of CUCV in General Cargo or Barge-Type Vessel (Fig 6-2)

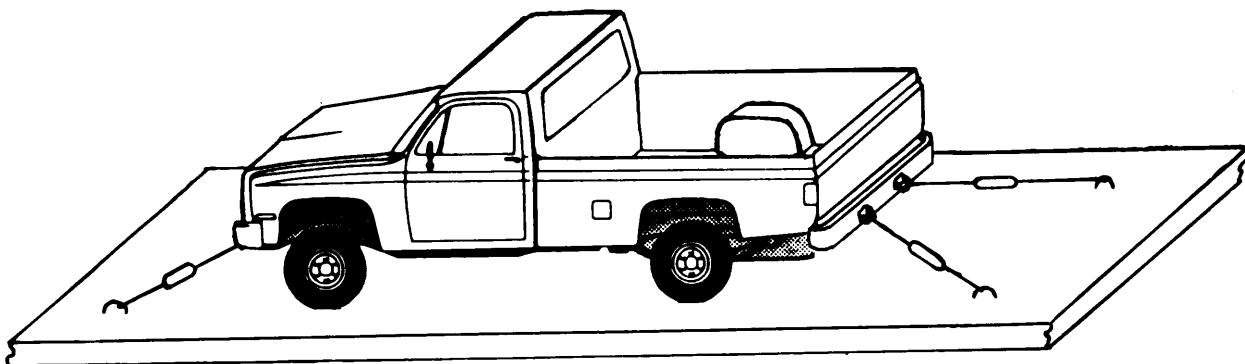
Item	Description	Approximate Quantity
Lumber	Douglas-fir, or comparable; straight-grain, free from material defects; Fed Spec MM-L-751: 4- x 4-inch	60 linear feet
Nails	Common, steel, flathead; bright or cement-coated; Fed Spec FF-N-105: 20d	20
	50d	20
Wire rope*	6 x 19, IWRC; improved plow steel; preformed, regular-lay; Fed Spec RR-W-410: 3/8-inch	75 feet
Clamps*	Wire rope, U-bolt clamps, saddled, single-grip, steel, Crosby heavy-duty, or equal; MIL-STD-16842: 3/8-inch	16
Turnbuckles*	Eye- and jaw-type; 1/2-inch diameter x 6-inch takeup; Fed Spec FF-T-791, or equal	8
Thimbles	Standard, open-type; 3/8-inch	

\* Not required for transport aboard general cargo and barge-type vessels if blocking is used.

Table 6-2. Application of Materials for Blocking and Tiedown of CUCV in General Cargo or Barge-Type Vessel (Fig 6-2)

Item	No. required	Application
A	2	Side blocks. Each consists of 4- x 4- x 238-inch lumber. Locate one piece against outside wheels on each side.
B	2	End blocks. Each consists of 4- x 4- x 64-inch lumber. Locate on top of item A and against wheels as shown in figure 6-2. Nail to item A with four 50d nails at each end of item B.
C	4	Backup cleats. Each consists of 4- x 4- x 12-inch lumber. Locate on top of item A against the joint of each item B. Toenail to each item A with four 20d nails.
D*	4	Tiedowns. Each consists of one piece 3/8-inch, 6 x 19, IWRC wire rope, length as required (about 15 feet). Form a complete loop through each truck tiedown provision and the eye of the turn-buckle, item F. Overlap wire rope ends at least 18 inches.
E*	16	Clamps. Place four on each wire rope at the overlap area, and space 2 1/2 inches apart and at least 6 inches from ends of wire rope. Details for placement of clamps are shown in figure 5-3. Tighten so that wire rope cannot slip.
F	4	Turnbuckles. Attach jaw end to padeye, stanchion, or bulkhead. Tighten as required.
G	4	Thimbles. Place one under wire rope at each place where rope passes through and around the object. Secure each thimble to the wire rope with one 3/8-inch clip (ref detail 3, fig 6-2).

\* Not required for transport aboard general cargo and barge-type vessels if blocking is used.



*Figure 6-4. Typical tiedown of CUCV in RORO vessel.*

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## **6-6. Landing Craft and Amphibious Vehicles**

When the CUCVs are to be transported for extended distances or through rough waters, tiedowns must be used. In most cases, landing craft and amphibious vehicles are equipped with lashing and deck fittings. When not provided, 10,000-pound-capacity chains may be used.

## CHAPTER 7

### RAIL TRANSPORTABILITY GUIDANCE

---

#### Section I. GENERAL

##### 7-1. scope

This chapter provides transportability guidance for movement of the CUCVs. It covers safety considerations and lists the materials required to prepare, load, block, and tie down the vehicles.

##### 7-2. Maximum Utilization of Railcars

Additional cargo, as approved by the activity offering the vehicles for transport, may be transported with the vehicles.

##### 7-3. Safety

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

#### NOTE

When shipping the CUCV with the S-250 shelter, by rail on wooden deck cars, the shelter must be removed and shipped separately to prevent damage to the shelter.

#### Section II. TRANSPORT ON CONUS RAILWAYS

##### 7-4. General

The transportability guidance contained in this section is applicable when the CUCVs are transported on CONUS railways. Consideration is given to single and multiple vehicle movements for these vehicles. The vehicles, when loaded on a suitable railcar, can be transported without restrictions and without being disassembled.

##### 7-5. Preperation for Loading

*a.* When the CUCV is placed on flatcars or open-top cars, protective material must be placed in front of and securely fastened to the windshield with rope or tape.

*b.* All doors, except the drivers door, should be tied closed. All material, including antennas, that exceed the width of the vehicle should be removed and secured inside the vehicle. All antennas should be lowered and tied down.

##### 7-6. Loading on Railcar With Wood Deck Floor

*a.* The CUCVs can be driven or towed onto the railcar if suitable ramps or bridges are available. They also can be placed in the tiedown position on the flatcar empty with a crane of adequate capacity.

*b.* Before the CUCV is lifted at its gross vehicle weight, it must be checked to see if the frame reinforcement kits have been applied. If these have been applied, the CUCV can be safely positioned on the flatcar with a crane of adequate capacity.

*c.* When the M1028 shelter carrier is loaded, the shelter must be removed and loaded separately to prevent damage to the shelter.

### 7-7. Blocking and Tiedown on Railcar With Wood Floor

a. Figure 7-1 shows the CUCV blocked and tied on a flatcar with a wood floor. Figure 7-2 is a detailed diagram of the blocking and tiedown of the CUCV. The bill of materials and application of materials for blocking and tiedown of a CUCV on a general purpose flatcar are shown in tables 7-1 and 7-2, respectively.

#### NOTE

A staggered nail pattern will be used when blocking and bracing lumber is nailed to the floor of railcar. In addition, 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 down through or right beside a nail in the lower piece of lumber.

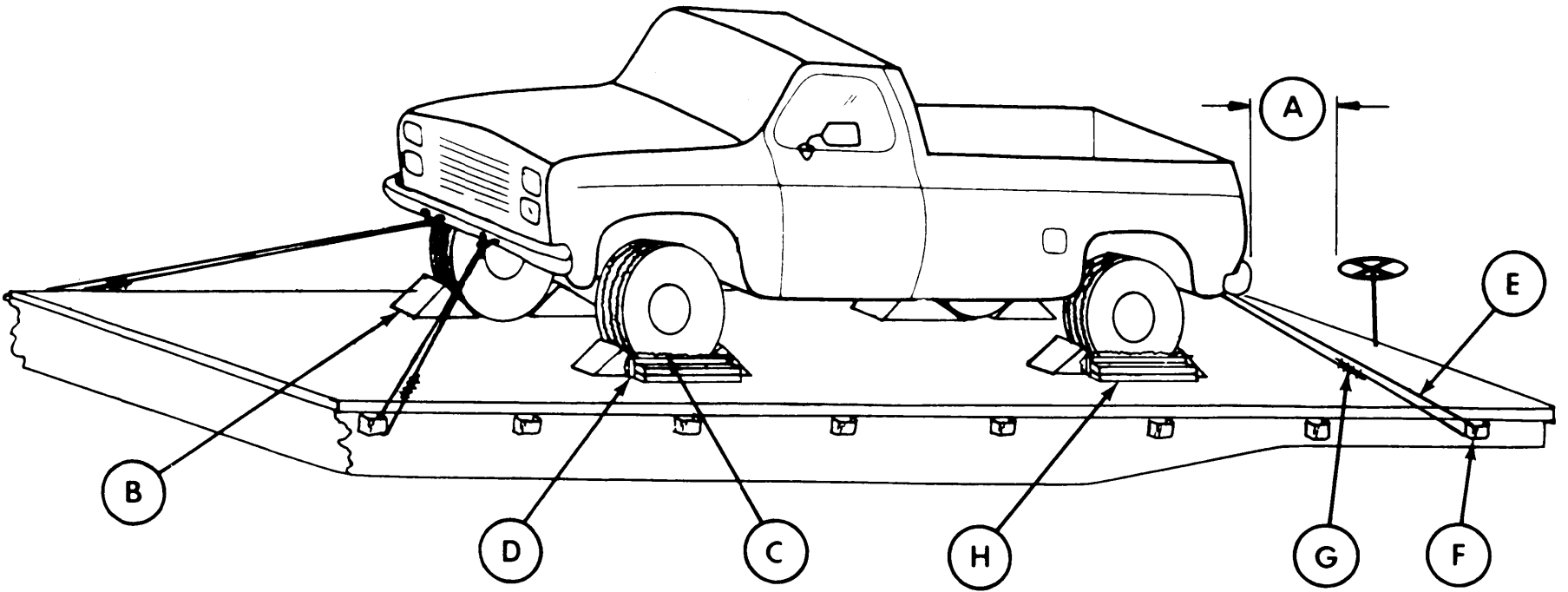
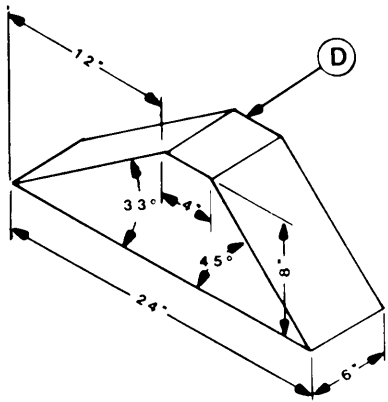
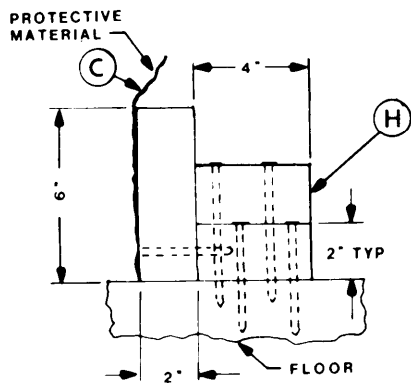


Figure 7-1. Blocking and tiedown of CUCV on flatcar with wood floor.

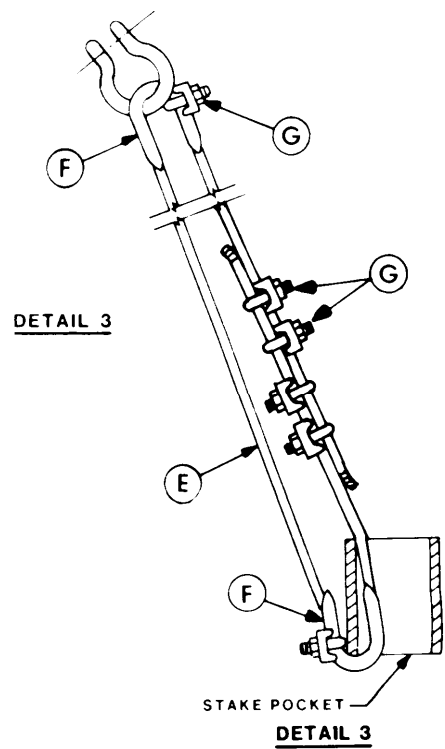


DETAIL 1



DETAIL 2

NOT TO SCALE



*Figure 7-2. Blocking and tiedown details.*



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*b.* Figure 7-3 shows the S-250 shelter blocked and tied down on a wood deck flatcar. Table 7-3 lists the bill of materials for securing six S-250 shelters on wood deck railcars. Table 7-4 is the application of materials for blocking and tiedown of six S-250 shelters on wood deck railcars.

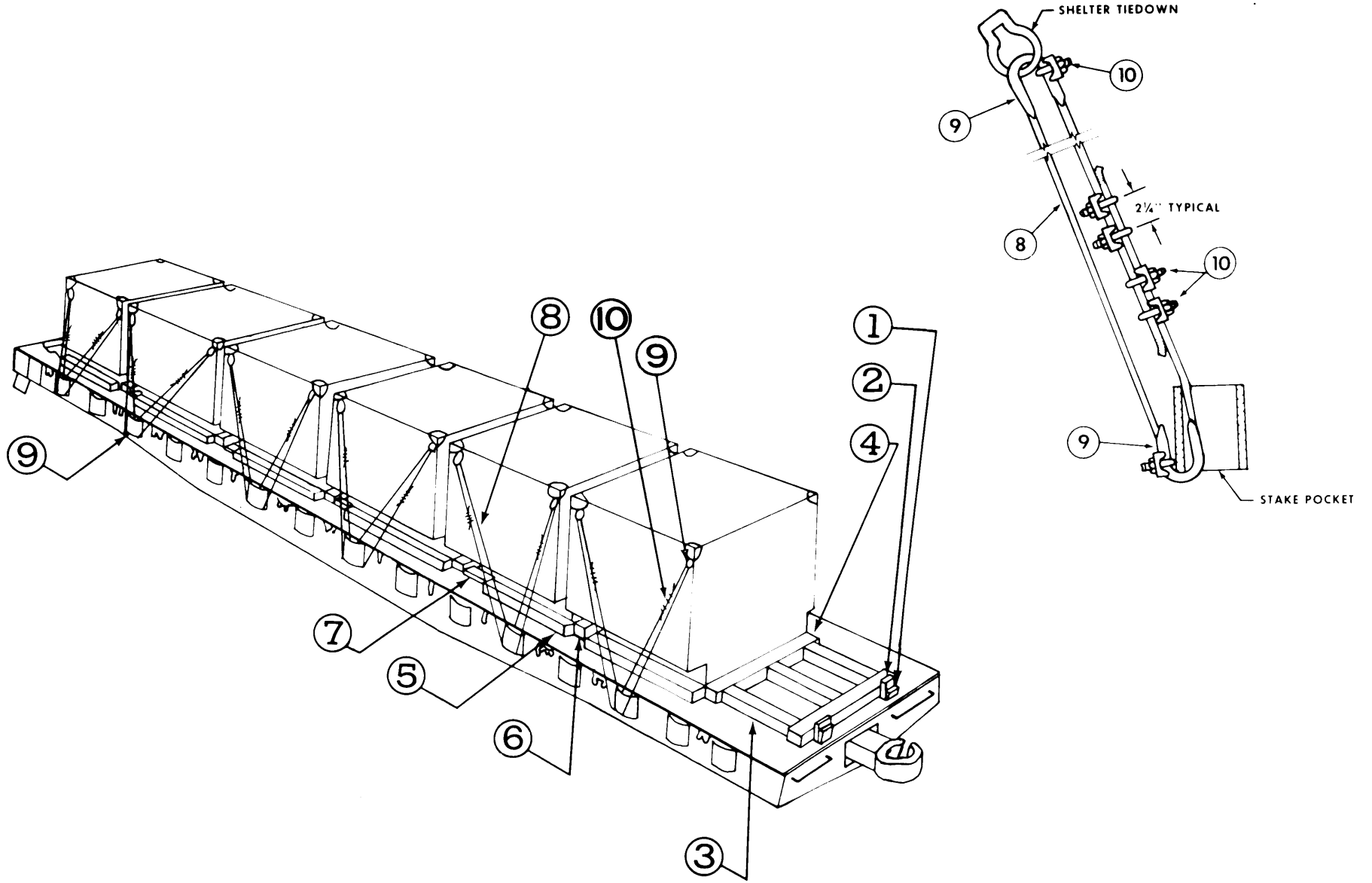


Figure 7-3. Blocking and tiedown of S-250 shelters on flatcar with wood floor.

Table 7-1. Bill of Materials for Blocking and Tiedown of CUCV on Flatcar with Wood Floor (Fig 7-1)

Item	Description	Approximate Quantity
Lumber	Douglas-fir, or comparable; straight-grain, free from material defects; Fed Spec MM-L-751: 6- x 8-inch	8 linear feet
	2- x 6-inch	8 linear feet
	2- x 4-inch	16 linear feet
Nails	Common steel; flathead; bright or cement-coated; Fed Spec FF-N-105:	
	12d	12
	20d	24
	40d	40
Thimbles	Standard, open-type, 3/8-inch	4
Clamps	Wire rope, U-bolt clamps, saddled, single-grip, steel, Crosby heavy-duty, or equal; MIL-STD-16842: 3/8-inch	16
Wire rope	6 x 19, IWRC; improved plow steel; preformed, regular-lay, table X, Fed Spec RR-W-410: 3/8-inch	34 feet
Cushioning material	Waterproof paper, burlap, or other suitable material	As required

Table 7-2. Application of Materials for Blocking and Tiedown of CUCV on General Purpose Flatcar (Fig 7-1)

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 the wheel. Also required is a 12-inch minimum clearance from end of car to load, from center of brake wheel to side of car, and 6 feet above car floor (fig 7-1).
B	8	Chock block (detail 1, fig 7-2). Place 45° portion of block against front and rear of each wheel as shown in figure 7-1. Nail heel of block to car floor with two 40d nails.
C	As required	Cushioning material (detail 2, fig 7-2). Locate so that material is under item D and extends 2 inches above item D, between tires and item D.
D	4	Side blocks (detail 2, fig 7-2). Each consists of one piece of 2- x 6- x 24-inch lumber and two pieces of item H, 2- x 4- x 24-inch lumber. Nail 2- x 6- x 24-inch piece to edge of lower 2- x 4- x 24-inch piece with four 12d nails. Place 2- x 6- x 18-inch piece against cushioning material and tire, and nail to car floor in a staggered pattern through 2- x 4- x 18-inch piece with four 20d nails. Nail upper 2- x 4- x 24-inch piece to lower piece with four 20d nails.
E	4	Tiedowns (detail 3, fig 7-2). Each consists of one piece of 3/8-inch 6 x 19, IWRC wire rope, length as required (about 15 feet). Form a complete loop between truck tiedown and appropriate stake pocket at a maximum angle of 45°. Wire rope should overlap about 20 inches.
F	4	Thimbles. Place one thimble under wire rope at each place where rope passes under bottom edge of stake pocket. Secure each thimble to wire rope with one 3/8-inch clip (detail 3, fig 7-2).
G	16	Clamps. Place four on each item E at overlap area. Space clamps 2½ inches apart, with at least 6 inches from ends of wire rope (detail 3, fig 7-2). Place one on each item F as indicated above.
H	8	Side blocks (detail 2, fig 7-2). Each consists of two pieces of 2- x 4- x 24-inch lumber assembled as described in item D.

### GENERAL INSTRUCTIONS

1. Set handbrakes, and block or wire lever in place.
2. General Rules 1 through 5, 14, 15, 19-A, and 19-B, Section I of the *Rules Governing the Loading of Commodities on Open-Top Cars and Trailers*, published by the Association of American Railroads, apply.
3. Tension wire rope with an applicable sized come-along mechanical hoist or equal tensioning device.

Table 7-3. Bill of Materials for Blocking and Tiedown of six S-250 Shelters on Flatcar with Wood Floor (Fig 7-3)

Item	Description	Approximate Quantity
Lumber	Douglasfir or comparable straight grain free from material defects:	
	Lumber wedge (to suit)	6
	Lumber block stakes (to suit)	6
	Lumber blocks 6x6 (to suit)	10
	Lumber blocks 4x4x38 (side blocks)	12

Item	Description	Approximate Quantity
	Lumber blocks 4x4x64 (between shelters)	10
	Lumber blocks 2x4 (to suit) corner of shelters	10
Nails	Common steel flathead or cement coated table X-1b Fed Spec FF-N-105B:	
Thimbles	Standard open type 3/8-inch	48
Clamps	Wire rope, U-bolt clamps, saddled single grip, steel, Crosby heavy-duty, or equal; MIL-STD-16842:	
	3/8 inch	144
Wire rope	6x19 IWRC improved plow steel preformed; regular-lay. Table X Fed Spec RR-410C: 3/8 inch	(to suit)

### GENERAL INSTRUCTIONS

1. Place the blocking tight against the shelters. Nail all lumber blocking to the flatcar deck 8 inches on center, in a staggered pattern, with nails that penetrate the deck at least 2 inches.
2. Six shelters are shown and can be loaded on most wood deck flatcars. Some flatcars are long enough to accommodate more shelters which may be loaded by the method shown.

Table 7-4. Application of Materials for Blocking and Tiedown of Six S-250 Shelters on Flatcar with Wood Floor (Fig 7-3)

Item	No. required	Application
1	6	Wedges. To be used at each stake pocket, at both ends of railcars to hold stakes into place.
2	6	Stakes. To be used at both ends of railcars to hold bracing material in place.
3	6	Blocks, 6x6. Three blocks for holding shelter into place and cut to suit for each end of railcar.
4	4	Block, 6x6. Two each for each end of railcar. Attached to the above blocks will hold shelter in place.
5	12	Blocks, 4x4x48. Side block for each side of shelter.
6	10	Blocks, 4x6x48. Two blocks between each pair of shelters.
7	10	Blocks, 2x4. To suit for corner of shelters.
8	24	Wire rope. Will be secured as shown in the detail. Tension the wire rope to 600-800 pounds.
9	48	Thimble. Secured as shown in the detail.
10	144	Clamps. Secured as shown in the detail.

## 7-8. Loading on Flatcars with Steel Decks and Center Tiedown Rails

a. The CUCVs can be driven or towed onto the railcar if suitable ramps or bridges are available. They also can be placed in the tiedown position on the railcar empty with a crane of adequate capacity.

b. Before the CUCV can be lifted at its gross vehicle weight, it must be checked to see if the frame reinforcement kits have been applied. If the bracket has been applied, then the CUCV can be safely positioned on the railcar with a crane of adequate capacity.

## 7-9. Tiedown on Railcar with Steel Deck and Center Tiedown Rails

The CUCV loaded on a railcar with center tiedown rails is shown in figure 7-4. The application of chain tiedowns, as well as general instructions, for securing vehicles on railcars with steel decks and center tiedown rails is provided in table 7-5.

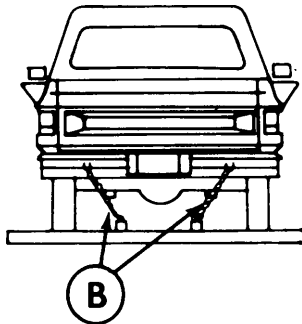
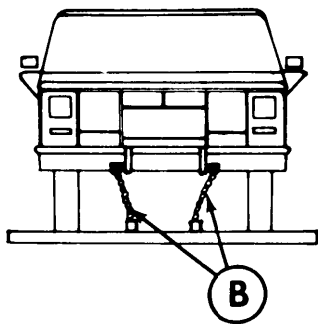
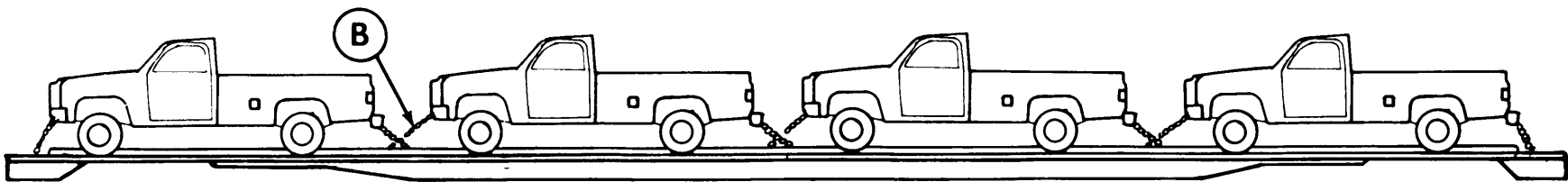


Figure 7-4. CUCV loaded on railcar with steel deck and center tiedown rails.

## 7-10. CUCV with S-250 Shelter Secured on Steel Deck Railcar

The CUCV with S-250 shelter is transportable as a single unit on steel deck railcars.

*a. Securing the CUCV with S-250 Shelter to Railcar.* The M1028 CUCV will be secured to the flatcar using four steel chains. Use a 3/8-inch diameter alloy steel chain, extra strength, proof-tested to a minimum of 18,000 pounds, or use either a 4/2-inch diameter alloy steel chain proof-tested to a minimum of 22,500 pound, or a 1/2-inch diameter alloy steel chain, extra strength.

Table 7-5. Application of Chain Tiedowns for Securing CUCVs on Railcar with Steel Decks and Center Tiedown Rails (Fig 7-4)

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 the wheel.
B	4 ea	Steel chains. Use a 3/8-inch diameter alloy steel chain, extra strength, proof-tested to a minimum of 18,000 pounds, or use either a 1/2-inch diameter alloy steel chain proof-tested to a minimum of 22,500 pounds or a 1/2-inch diameter alloy steel chain, extra strength, proof-tested to a minimum of 27,500 pounds. Attach one chain tiedown to each tiedown shackle in front and rear.

### GENERAL INSTRUCTIONS

1. When ordering specialized railway equipment, shippers should specify cars equipped with tiedown devices in the quantity and strength as shown in item B. When carriers furnish cars that do not have built-in chains and tensioning devices, chains shown in item B will be used to secure vehicles. Tiedown chains must be checked for twisted or kinked links before they are applied to the vehicles.
2. Vehicles must face in the same direction and be uniformly spaced along the length of the railcar to allow sufficient space at each end of the car and between the vehicles for securement. Apply tiedowns from the vehicle shackle to the car tiedown facility. The angle of the tiedown should be as close as possible to 45°. When the length of vehicles loaded on a 75-foot car precludes facing all vehicles in the same direction, one vehicle may be reversed to ensure application of tiedowns at a floor angle of 45°.
3. Parking brakes must be set and wire-tied or blocked.
4. The transmission select lever must be placed in N (neutral) position and wire-tied or blocked.
5. Open hooks must be secured with wire over the opening to prevent the hook from becoming disengaged.
6. Turnbuckles used to tighten chains must be wired or locked with nuts to prevent the turnbuckles from turning during transit, unless the turnbuckles are equipped with self-locking devices.
7. When vehicles are shipped in a loaded configuration, the gross vehicle weight rating of each vehicle must not be exceeded and the proper size and number of tiedowns must be used to secure the vehicles to the railcar. Proof-tested to a minimum of 27,500 pounds. Attach one chain tiedown to each tiedown shackle in front and rear. Apply tiedowns from the vehicle shackle to the car tiedown facility. The angle of the tiedown should be as close as possible to 45°. The chains are to be preloaded to the point where the vertical height of the vehicle is reduced by one inch (see figure 7-5).

### GENERAL INSTRUCTIONS

1. When ordering specialized railway equipment, shippers should specify cars equipped with tiedown devices in the quantity and strength as shown in 7-10a. above. When carriers furnish cars that do not have built-in chains and tensioning devices, chains shown in item B will be used to secure vehicles. Tiedown chains must be checked for twisted or kinked links before they are applied to the vehicles.
2. Parking brakes must be set and wire-tied or blocked.
3. The transmission select lever must be placed in N (neutral) position and wire-tied or blocked.
4. Open hooks must be secured with wire over the opening to prevent the hook from becoming disengaged.
5. Turnbuckles used to tighten chains must be wired or locked with nuts to prevent the turnbuckles from turning during transit, unless the turnbuckles are equipped with self-locking devices.

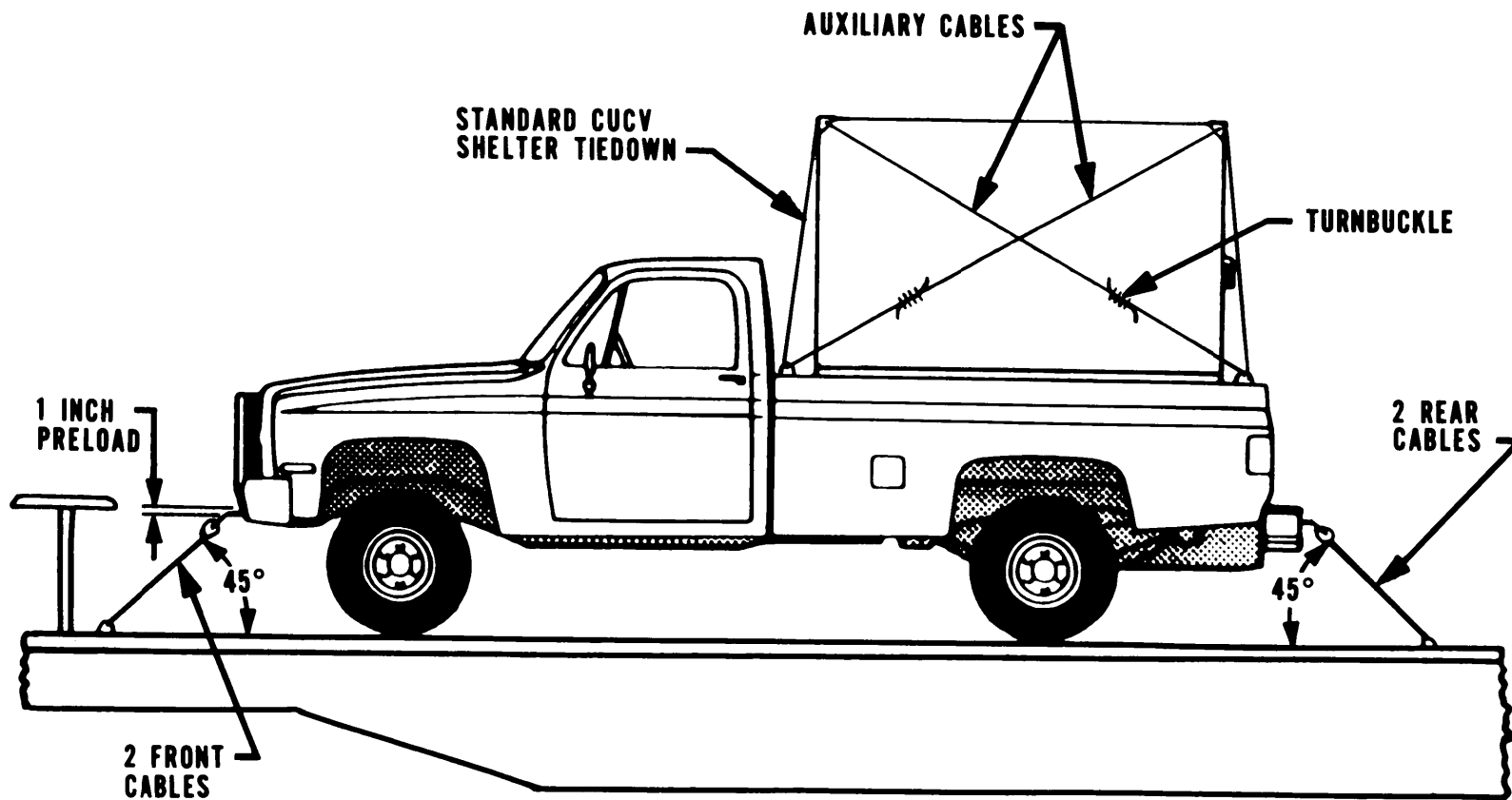


Figure 7-5. CUCV with S-250 shelter secured on steel deck railcar.

*b. Securing S-250 Shelter to CUCV.* The S-250 shelter must be secured with four standard CUCV tie-downs and four additional auxiliary shelter cables. The auxiliary cables should be fastened in a diagonal crisscross fashion to already existing shelter tiedown points as shown in figure 7-5. The auxiliary cables are fabricated from 3/8-inch improved plow steel cable, turnbuckles, cable clamps, 7/16-inch clevises and 7/8-inch clevises. The exact material list is contained in table 7-6.

*c. Shelter Tiedown Brackets for S-250 Shelter.* Figures 7-6 and 7-7 show the tiedown brackets for the front and rear of the M1028 CUCV shelter carrier as shown in figure 7-5, Tables 7-7 and 7-8 show the parts for each bracket.



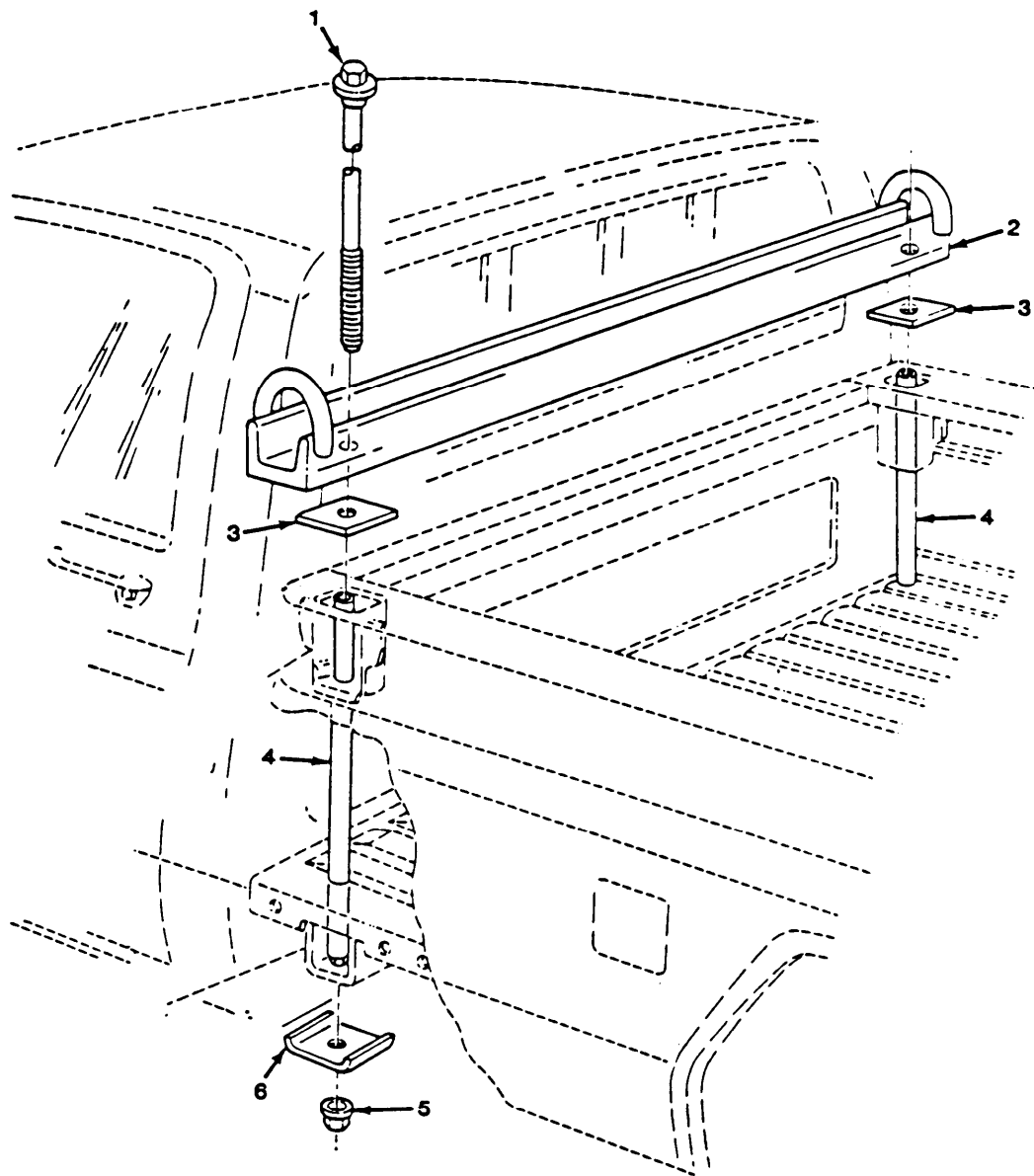


Figure 7-6. Front tiedown bracket.

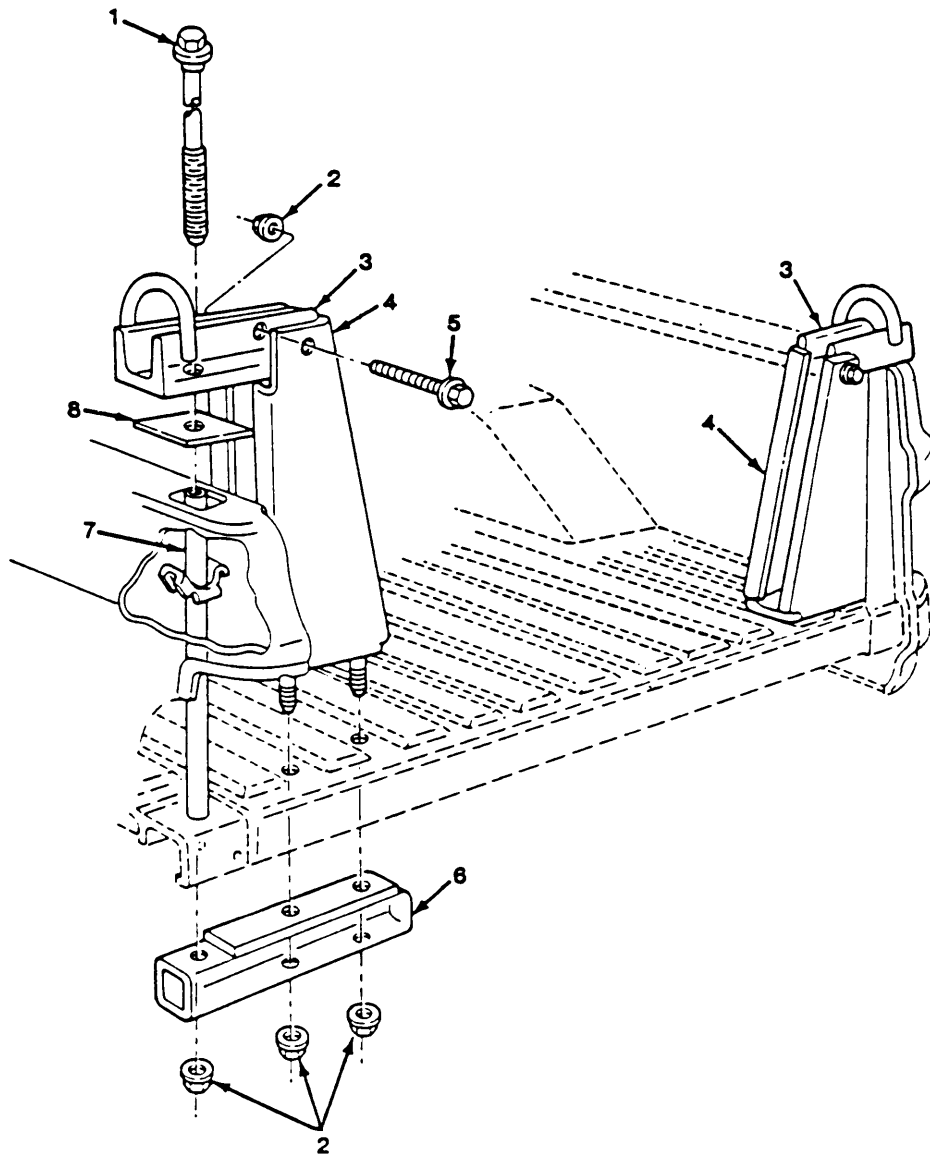


Figure 7-7. Rear tiedown bracket.

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*d. Dunnage Used for CUCV with S-250 Shelter.* The dunnage used for the CUCV/S-250 shelter is fabricated from GM Drawing Number 15599970. The dunnage is fabricated and installed according to the diagram. Dunnage should be fabricated from pressure treated lumber. Pressure treated lumber is used for added strength and durability. Dunnage instructions are shown in figures 7-8 through 7-10.

SHEET	TITLE
1	CONTENTS
2	SIZES & CUTTING DIMENSIONS
3	NAILING & ASSEMBLY

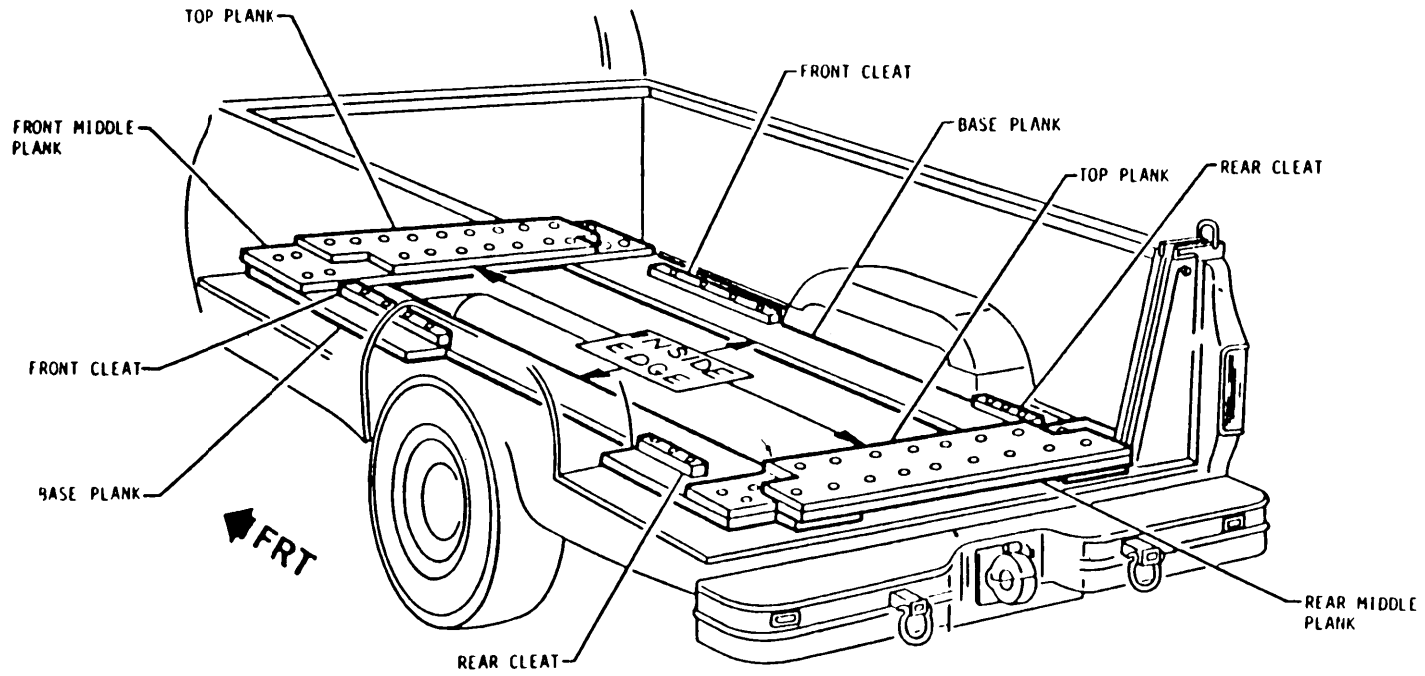


Figure 7-8. Communication shelter dunnage contents.

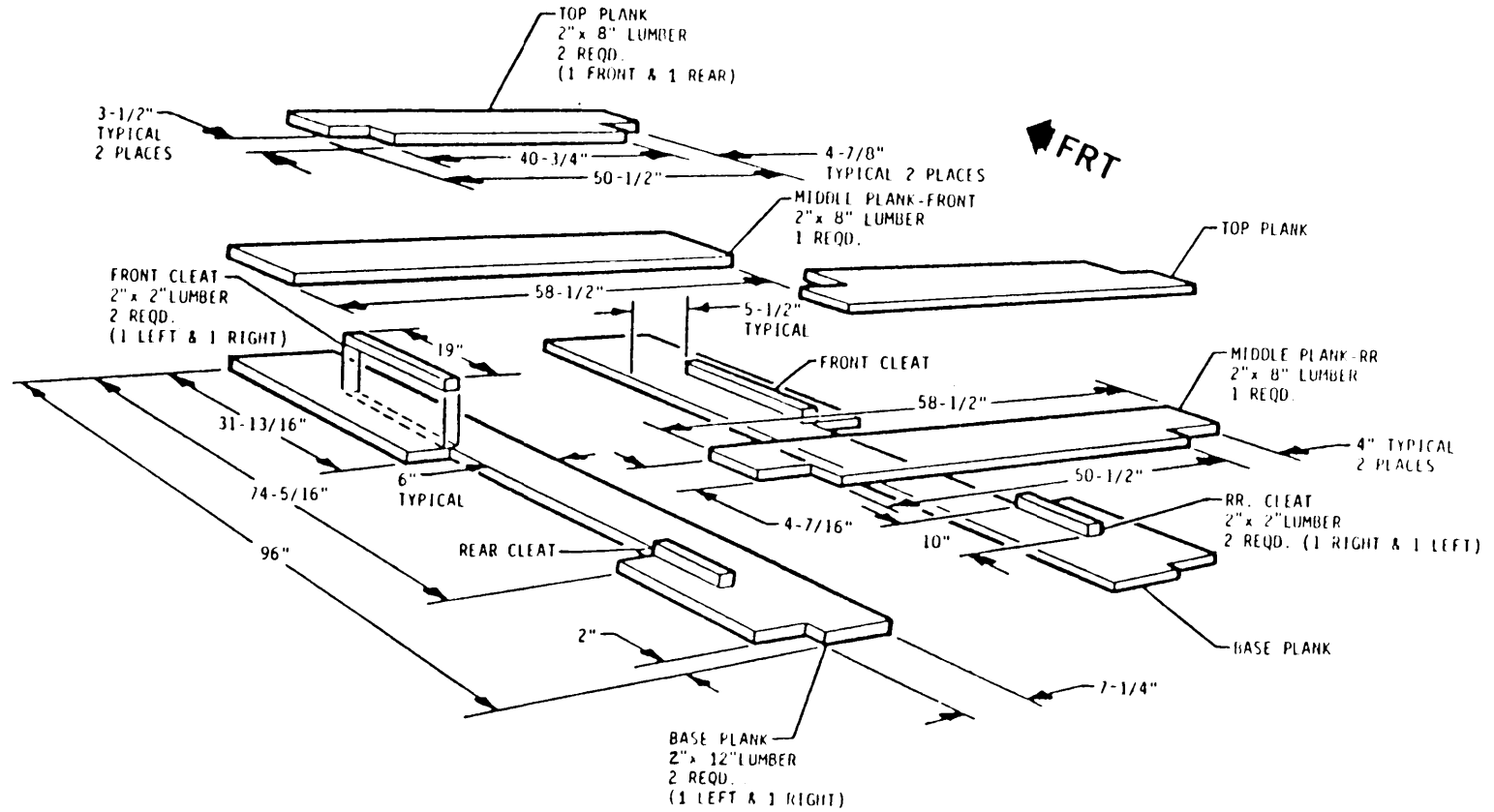


Figure 7-9. Dunnage size and cutting dimensions.



Table 7-6. Materials Used to Fabricate Auxiliary Shelter Cables

Quantity	NSN	Description
4	4010-00-194-1176	3/8-inch improved plow steel, fiber core wire rope. @ 40 inches overall length.
4	4010-00-194-1176	3/8-inch improved plow steel, fiber core wire rope. @ 62 inches overall length.
4	5340-00-187-8176	Turnbuckle.
32	4030-00-243-4438	Cable Clamp.
4	4030-01-144-5743	Clevis, 7/16-inch stud diameter.
4	4030-00-618-4967	Clevis, 7/8-inch stud diameter.

Table 7-7. Parts List for Front Tiedown Bracket

Illustration		SMR Code	National Stock Number	FSCM	Part Number	Description	Usable on Code	U/M	Qty Inc in Unit
(a) Fig. No.	(b) Item No.								
(1)	(2)	(3)	(4)	(5)	(6)		(7)	(8)	
7-6	1	PAOZZ	.....	11862	15599929	Bolt.....	230	ea.	2
7-6	2	PAOZZ	5340-01-159-6174	11862	14072452	Brkt. comm. shelter frt.....	230	ea.	1
7-6	3	PAOZZ	2510-01-155-5825	11862	14072460	Pad cross sill.....	230	ea.	2
7-6	4	PAOZZ	5365-01-158-2004	11862	14072454	Spacer comm. sh.....	230	ea.	2
7-6	5	PAOZZ	.....	11862	9439757	Nut.....	230	ea.	2
7-6	6	PAOZZ	2510-01-156-0062	11862	14072459	Reinf. cross sill fr.....	230	ea.	2

Table 7-8. Parts List for Rear Tiedown Bracket

Illustration		SMR Code	National Stock Number	FSCM	Part Number	Description	Usable on Code	U/M	Qty Inc in Unit
(a) Fig. No.	(b) Item No.								
(1)	(2)	(3)	(4)	(5)	(6)		(7)	(8)	
7-7	1	PAOZZ	.....	11862	15599929	Bolt.....	230	ea.	2
7-7	2	PAOZZ	5310-01-070-2105	96906	MS51967-14	Nut.....	230	ea.	8
7-7	3	PAOZZ	.....	11862	15599930	Brkt-comm. shelter.....	230	ea.	2
7-7	4	PAOZZ	2510-01-156-4852	11862	14072457	Supt. comm. shel. rr.....	230	ea.	2
7-7	5	PAOZZ	.....	11862	14072458	Bolt-comm. shelter.....	230	ea.	2
7-7	6	PAOZZ	2510-01-155-5112	11862	14072455	Reinf. comm. t/dn sup.....	230	ea.	2
7-7	7	PAOZZ	5365-01-158-2004	11862	14072454	Spacer comm. sh.....	230	ea.	2
7-7	8	PAOZZ	2510-01-155-5825	11862	14072460	Pad cross sill.....	230	ea.	2

## 7-11. Loading on Bilevel Railcars

a. Except for the truck with the S-250 shelter carrier and the ambulance, the CUCVs can be loaded on each deck of either as 85- or 89-foot bilevel railcar. The shelter carrier and ambulance exceed the height for shipment on either deck of the bilevel cars. Chain tiedowns are provided between the vehicle when the vehicles are loaded (fig 7-11).

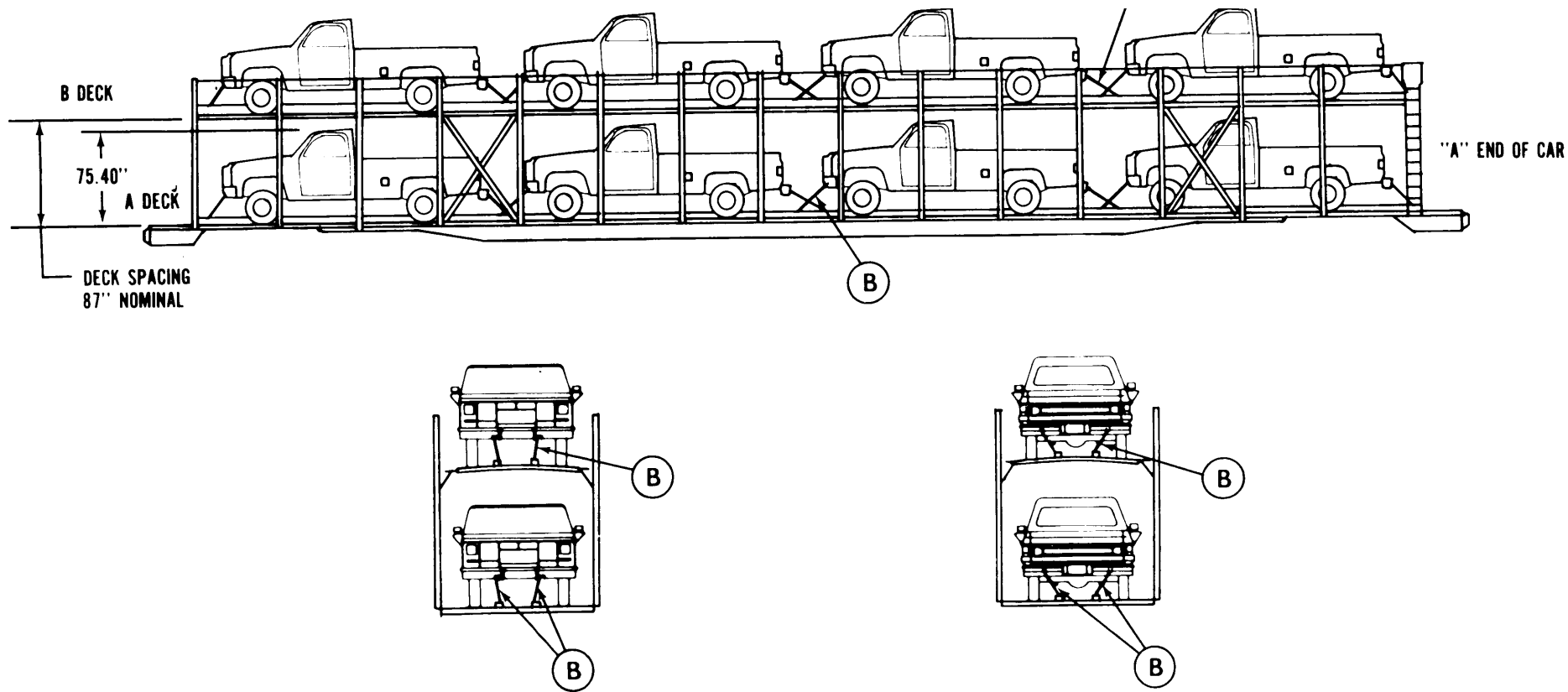


Figure 7-11. CUCV loaded on bilevel railcars.



b. Bilevel railcars must meet the following criteria to transport the CUCVs:

- (1) A width of 109 inches between columns.
- (2) A height of 84 1/2 inches on the lower deck and 96 inches on the upper deck.
- (3) A total capacity of 40,000 pounds on each level.

c. The application of chain tiedowns, as well as general instructions, for securing CUCVs on bilevel cars is provided in table 7-9.

### NOTE

When bilevel railcars are used, loading ramps will be needed at origin and destination points. AR 55-351, Terminal Facilities Guide, lists all Army installations that have the capability to receive or ship by bilevel railcars. If the receiving installation cannot offload because it has no ramps, then ramps must be requested with the railcars.

*Table 7-9. Application of Chain Tiedowns for Securing CUCVs on Bilevel Railcars (Fig 7-11)*

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 the wheel.
B	4 each	3/8-inch cabin tiedown device proof-tested to a minimum of 18,700 pounds. Attach one chain tiedown to each tiedown shackle in front and rear. Attach hooks into an appropriately located link of each chain. Open hooks must be secured with wire over the openings to prevent hooks from becoming disengaged. Each chain is to be tightened to the proper tension by use of a tensioning device supplied with the car.

#### GENERAL INSTRUCTIONS

1. The shipper should specify cars equipped with tiedown devices in the quantities shown in item B when ordering specialized railway equipment.
2. Load binders are not to be used as tensioning devices.
3. 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 shackle to the car tiedown facility. The angle of the tiedown should be as close as possible to 45°.
4. Tiedown chains must be checked for twisted or kinked links before they are applied to the vehicles.
5. Parking brakes must be set and wire-tied.
6. Transmission selector lever must be placed in N (neutral) position and wire-tied or blocked.

### Section III. TRANSPORT ON FOREIGN RAILWAYS

#### 7-12. General

The transportability guidance contained in this section is applicable when the CUCVs are transported on foreign railways. Consideration is given to single and multiple vehicle movements on the types of railcars normally used for the movement of the CUCVs. The CUCV, when loaded on suitable railcars to comply with the Gabrit Internatioanl de Chargement (GIC) gauge, can be transported without restriction with European countries, in most countries in the Middle East, and in South America, Australia, India, and Pakistan. In the Middle East and South America, the clearance varies by country and each country will require a separate check. In Australia, India, and Pakistan, wide or broad gauge railways provide greater clearances and fewer restrictions. Because of the various classification systems used by different countries, foreign railcars are not easily classified. In addition, clearances vary from country to country; therefore, evaluation of transportability capability must be made for each country.

### 7-13. Transport on Foreign Service Flatcars

*a. General.* The CUCV can be transported on most foreign rail flatcars.

*b. Materials.* The materials required for blocking and tiedown of the CUCV on foreign service flatcars are essentially the same as those used in CONUS. For general reference, refer to figure 7-1. Guidance for loading the CUCV on foreign railcars can be obtained from CDR, 1st Transportation Movement Control Agency, AEUTR-MCA-TA, APO NY 09451-4000.

By Order of the Secretary of the Army:

JOHN A. WICKHAM, JR.  
*General, United States Army*  
*Chief of Staff*

Official:

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## THE METRIC SYSTEM AND EQUIVALENTS

### NEAR MEASURE

1 Centimeter = 10 Millimeters = 0.01 Meters = 0.3937 Inches  
 1 Meter = 100 Centimeters = 1000 Millimeters = 39.37 Inches  
 1 Kilometer = 1000 Meters = 0.621 Miles

### WEIGHTS

1 Gram = 0.001 Kilograms = 1000 Milligrams = 0.035 Ounces  
 1 Kilogram = 1000 Grams = 2.2 lb.  
 1 Metric Ton = 1000 Kilograms = 1 Megagram = 1.1 Short Tons

### LIQUID MEASURE

1 Milliliter = 0.001 Liters = 0.0338 Fluid Ounces  
 1 Liter = 1000 Milliliters = 33.82 Fluid Ounces

### SQUARE MEASURE

1 Sq. Centimeter = 100 Sq. Millimeters = 0.155 Sq. Inches  
 1 Sq. Meter = 10,000 Sq. Centimeters = 10.76 Sq. Feet  
 1 Sq. Kilometer = 1,000,000 Sq. Meters = 0.386 Sq. Miles

### CUBIC MEASURE

1 Cu. Centimeter = 1000 Cu. Millimeters = 0.06 Cu. Inches  
 1 Cu. Meter = 1,000,000 Cu. Centimeters = 35.31 Cu. Feet

### TEMPERATURE

$5/9(^{\circ}\text{F} - 32) = ^{\circ}\text{C}$   
 212° Fahrenheit is equivalent to 100° Celsius  
 90° Fahrenheit is equivalent to 32.2° Celsius  
 32° Fahrenheit is equivalent to 0° Celsius  
 $9/5^{\circ}\text{C} + 32 = ^{\circ}\text{F}$

### APPROXIMATE CONVERSION FACTORS

TO CHANGE	TO	MULTIPLY BY
Inches .....	Centimeters .....	2.540
Feet .....	Meters .....	0.305
Yards .....	Meters .....	0.914
Miles .....	Kilometers .....	1.609
Square Inches .....	Square Centimeters .....	6.451
Square Feet .....	Square Meters .....	0.093
Square Yards .....	Square Meters .....	0.836
Square Miles .....	Square Kilometers .....	2.590
Acres .....	Square Hectometers .....	0.405
Cubic Feet .....	Cubic Meters .....	0.028
Cubic Yards .....	Cubic Meters .....	0.765
Fluid Ounces .....	Milliliters .....	29.573
arts .....	Liters .....	0.473
gallons .....	Liters .....	0.946
Ounces .....	Liters .....	3.785
Pounds .....	Grams .....	28.349
Short Tons .....	Kilograms .....	0.454
Pound-Feet .....	Metric Tons .....	0.907
Pounds per Square Inch .....	Newton-Meters .....	1.356
Miles per Gallon .....	Kilopascals .....	6.895
Miles per Hour .....	Kilometers per Liter .....	0.425
	Kilometers per Hour .....	1.609

TO CHANGE	TO	MULTIPLY BY
Centimeters .....	Inches .....	0.394
Meters .....	Feet .....	3.280
Meters .....	Yards .....	1.094
Kilometers .....	Miles .....	0.621
Square Centimeters .....	Square Inches .....	0.155
Square Meters .....	Square Feet .....	10.764
Square Meters .....	Square Yards .....	1.196
Square Kilometers .....	Square Miles .....	0.386
Square Hectometers .....	Acres .....	2.471
Cubic Meters .....	Cubic Feet .....	35.315
Cubic Meters .....	Cubic Yards .....	1.308
Milliliters .....	Fluid Ounces .....	0.034
Liters .....	Pints .....	2.113
Liters .....	Quarts .....	1.057
gallons .....	Gallons .....	0.264
ounces .....	Ounces .....	0.035
pounds .....	Pounds .....	2.205
Metric Tons .....	Short Tons .....	1.102
Newton-Meters .....	Pounds-Feet .....	0.738
Kilopascals .....	Pounds per Square Inch .....	0.145
Kilometers per Liter .....	Miles per Gallon .....	2.354
Kilometers per Hour .....	Miles per Hour .....	0.621

