

TECHNICAL MANUAL
TRANSPORTABILITY GUIDANCE
M998 SERIES
HIGH-MOBILITY MULTIPURPOSE
WHEELED VEHICLES
(HMMWV)

HEADQUARTERS. DEPARTMENT OF THE ARMY
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 (HMMWV)

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CHAPTER 1

INTRODUCTION

1-1. Purpose and Scope

a. This manual provides transportability guidance for logistical handling and movement of the high-mobility multipurpose wheeled vehicles (HMMWVs). It contains information necessary for safe transport of the items. Included are technical and physical characteristics, as well as safety considerations required for worldwide movement by the four basic transport modes—air, highway, marine, and rail. Metric equivalents are given in parentheses following the dimensions or other measurements.

b. This manual is intended for transportation officers and other personnel responsible for movement of HMMWVs or for providing transportation services.

1-2. Safety

Precautionary measures required during movement of the HMMWVs 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.
- c. *Note*. A brief statement for use as necessary to emphasize a particular operating procedure or condition.

1-4. Reporting of Recommendations and Comments

Individual users of this manual are encouraged to submit comments and to recommend changes for its improvement. Comments should be prepared on DA Form 2028 (Recommended Changes to DA Publications and Blank Forms) and forwarded to Commander, Military Traffic Management Command Transportation Engineering Agency, ATTN: MTT-TRV (J. Alexander), 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 I. GENERAL

2-1. Scope

This chapter provides a general description of the M998-series high-mobility multipurpose wheeled vehicles (HMMWVs). Included are identification photographs and tabulated transportability characteristics and data that are necessary in the movement of these vehicles.

2-2. Description

The M998 series is a family of tactical wheeled vehicles with a common 4x4 chassis that supports HMMWV utility, weapons carrier, ambulance, and shelter carrier configurations (fig. 2-1). The M998 series consists of the following vehicles:

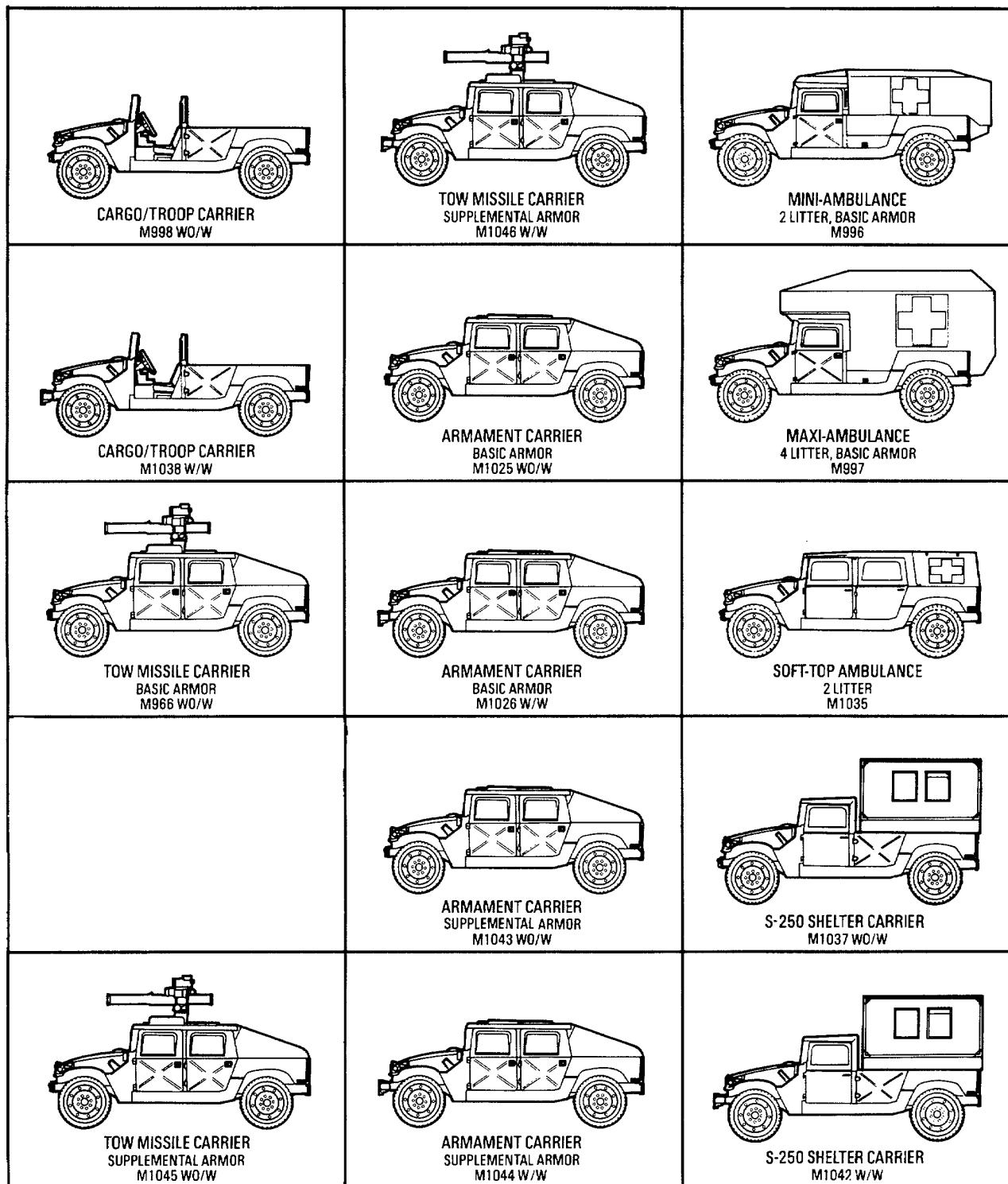


Figure 2-1. M998 family of tactical vehicles.

a. *M966 Truck, Utility, TOW Carrier, Armored, 1-1/4-Ton, 4x4.* This truck is furnished with hardware necessary to mount and stow the TOW missile launcher system and associated equipment.

- b. *M996 Truck, Ambulance, Two-Litter, Armored, 1-1/4-Ton, 4x4.* This HMMWV can transport two litter patients with the required medical supplies and equipment.
- c. *M997 Truck, Ambulance, Four-Litter, Armored, 1-1/4-Ton, 4x4.* This HMMWV can transport four litter patients or eight ambulatory patients with the required medical supplies and equipment.
- d. *M998 Truck, Utility, Cargo/Troop Carrier, 1-1/4-Ton, 4x4.* This truck can be configured with vehicle kits as two-door or four-door soft-top cargo/personnel carriers with troop seats.
- e. *M1025 Truck, Utility, Armament Carrier, Armored, 1-1/4-Ton, 4x4.* This truck is equipped with a ring mount suitable for firing the MK19 40-mm grenade launcher, the M52 50-caliber machine-gun, and the M60 7.62-mm machine-gun with a 360-degree swing.
- f. *M1026 Truck, Utility, Armament Carrier, Armored, 1-1/4-Ton, 4x4, With Winch.* This truck is equipped with a ring mount suitable for firing the MK19 40-mm grenade launcher, the M52 50-caliber machine-gun, and the M60 7.62-mm machine-gun with a 360-degree swing.
- g. *M1035 Truck, Ambulance, Two-Litter, Soft-Top, 1-1/4-Ton, 4x4.* This HMMWV can transport two litter patients with the required medical supplies and equipment.
- h. *M1037 Truck Utility, S-250 Shelter Carrier, 1-1/4-Ton, 4x4.* This truck is equipped to transport the S-250 electrical equipment shelter, which must be secured on the vehicle.
- i. *M1038 Truck, Utility, Cargo/Troop Carrier, 1-1/4-Ton, 4x4, With Winch.* This truck can be configured with vehicle kits as two-door or four-door soft-top cargo/personnel carrier with troop seats.
- j. *M1042 Truck, Utility, S-250 Shelter Carrier, 1-1/4-Ton, 4x4, With Winch.* This truck is equipped to transport the S-250 electrical equipment shelter, which must be secured on the vehicle.
- k. *M1043 Truck, Utility, Armament Carrier, Armored, 1-1/4-Ton, 4x4.* This truck is equipped with a ring mount suitable for firing the MK19 40-mm grenade launcher, the M52 50-caliber machine-gun, and the M60 7.62-mm machine-gun with a 360-degree swing.
- l. *M1044 Truck, Utility, Armament Carrier, Armored, 1-1/4-Ton, 4x4, With Winch.* This truck is equipped with a ring mount suitable for firing the MK19 40-mm grenade launcher, the M52 50-caliber machine-gun, and the M60 7.62-mm machine-gun with a 360-degree swing.
- m. *M1045 Truck, Utility, TOW Carrier, Armored, 1-1/4-Ton, 4x4.* This truck is furnished with hardware necessary to mount and stow the TOW missile launcher system and associated equipment.
- n. *M1046 Truck, Utility, TOW Carrier, Armored, 1-1/4-Ton, 4x4, With Winch.* This truck is furnished with hardware necessary to mount and stow the TOW missile launcher system and associated equipment.

Section II. CHARACTERISTICS AND RELATED DATA

2-3. General

- a. The following general data and performance characteristics are for all variants.

Performance:

Maximum speed	55 mph (89 km/in)
Cruising range	300 mi (482 km)
Fuel tank capacity.....	25 gal (94.6 L)
Tire size.....	36 x 12.5-16-5 LT

Military load classification (MLC):

Empty	3
Loaded.....	4

- b. The characteristics and data shown in tables 2-1 and 2-2 are applicable to the model number shown. Any changes in the model number may affect the loadability of the trucks as related to guidance shown in this manual.

2-4. Side and Rear Drawings

This section provides drawings (figs. 2-2 through 2-6) that show the dimensions necessary for determining the loadability of the vehicles by various transport modes.

2-5. Reduced Configuration

Transportation economy can be obtained by reducing each vehicle to its minimum dimension for transport. The vehicle's removable items such as bows and tarps should be stowed in the vehicle cargo compartment. Cargo to be transported shall not exceed the vehicle's gross weight.

2-6. Unusual Characteristics

HMMWVs do not have any unusual characteristics that would require special precaution or attention be given to temperature, atmospheric pressure, or humidity variations during their exposure to normal transportation environments.

2-7. Hazardous or Dangerous Characteristics

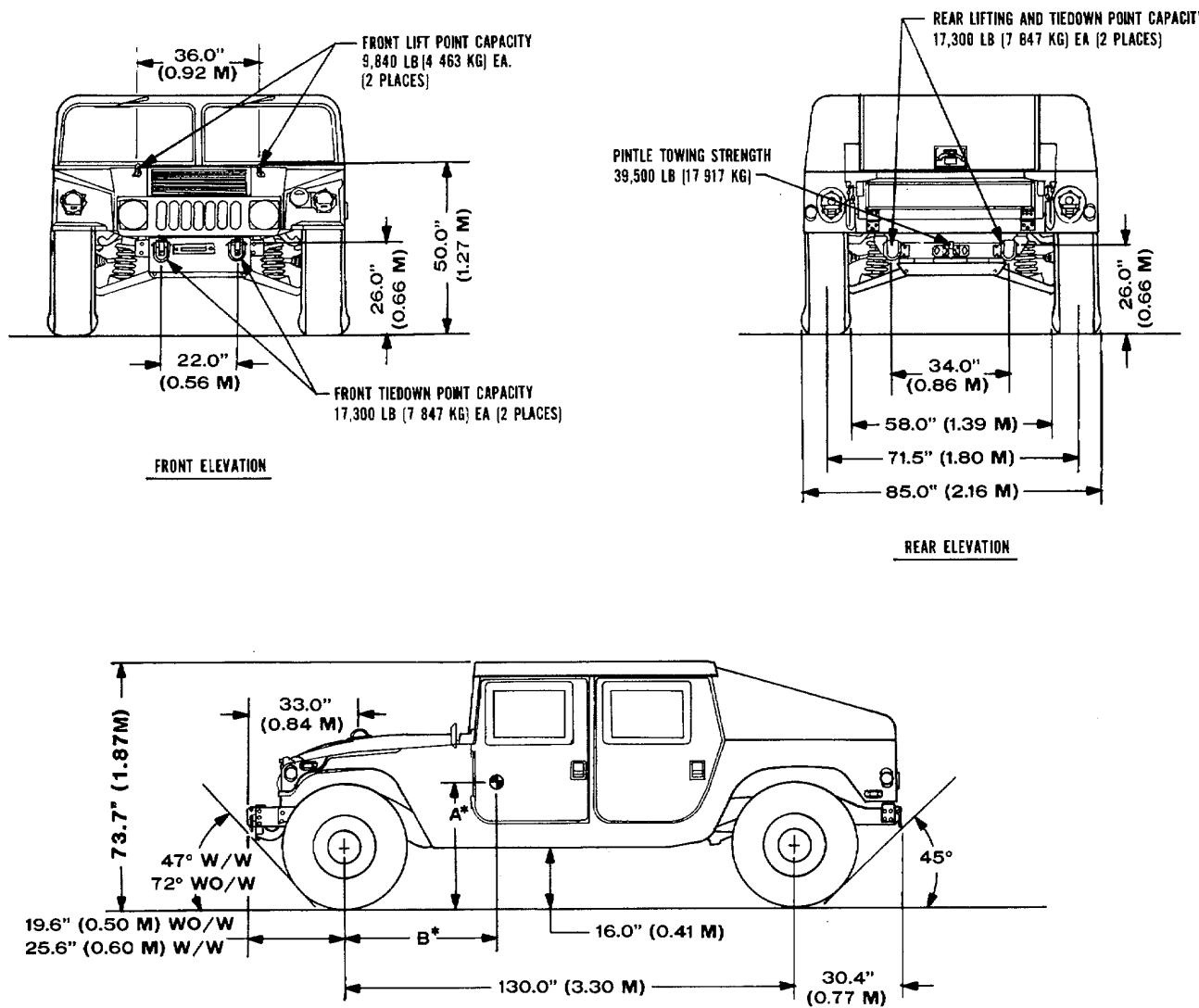
Unless the HMMWVs are shipped with ammunition, they will not present any special hazardous or dangerous characteristics during transport.

Table 2-1. Vehicle Characteristic Data

Vehicle	TOE LIN or TAMN	National Stock Number (NSN)	Shipping Dimensions			Shipping Volume ft ³ (m ³)	Center of Gravity at Curbweight	
			Length in. (m)	Width in. (m)	Height in. (m)		Longitudinal in. (m)	Vertical in. (m)
M966	T05096	2320-01-107-7153	180.0 (4.57)	85.0 (2.16)	73.7 (1.87)	656.6 (18.46)	63.0 (1.60)	32.8 (0.883)
M966	T38707	2310-01-111-2275	205.9 (5.23)	85.0 (2.16)	70.3 (1.79)	712.5 (19.43)	70.8 (1.80)	38.8 (0.986)
M997	T38844	2310-01-111-2274	202.1 (5.13)	85.0 (2.16)	102.0 (2.59)	1,014.0 (28.81)	71.2 (1.81)	38.8 (0.986)
M998	T61494	2320-01-107-7155	180.0 (4.57)	85.0 (2.16)	71.0 (1.80)	628.6 (17.77)	62.1 (1.58)	33.1 (9.841)
M1025	T92242	2320-01-128-9551	180.0 (4.57)	85.0 (2.16)	73.7 (1.87)	646.4 (18.46)	62.1 (1.58)	33.1 (0.841)
M1025	T92310	2320-01-128-9552	186.0 (4.72)	85.0 (2.16)	73.7 (1.87)	674.3 (19.06)	60.3 (0.53)	32.9 (0.836)
M1035	D1002	2310-01-146-7194	180.0 (4.57)	85.0 (2.16)	71.0 (1.80)	628.6 (17.77)	58.9 (1.50)	29.3 (0.744)
M1037	T07543	2320-01-146-7193	188.4 (4.78)	85.0 (2.16)	107.0 (2.72)	991.6 (28.08)	66.1 (1.68)	28.4 (0.721)
M1038	T61562	2320-01-107-7156	186.0 (4.72)	85.0 (2.16)	71.0 (1.80)	649.6 (18.35)	55.8 (1.42)	29.7 (0.754)
M1042	Z94116	2320-01-146-7187	194.4 (4.94)	85.0 (2.16)	107.0 (2.72)	1,023.1 (28.96)	59.6 (1.51)	28.3 (0.719)
M1043	D1159	2320-01-146-7190	180.0 (4.57)	85.0 (2.16)	73.8 (1.87)	656.6 (18.46)	63.2 (1.61)	32.8 (0.833)
M1044	D1159	2320-01-146-7189	186.0 (4.72)	85.0 (2.16)	73.8 (1.87)	674.3 (19.06)	61.5 (1.56)	32.6 (0.828)
M1045	D1125	2320-01-146-7191	180.0 (4.57)	85.0 (2.16)	73.7 (1.87)	656.6 (18.46)	64.1 (1.63)	32.5 (0.826)
M1046	D1125	2320-01-146-7188	186.0 (4.72)	85.0 (2.16)	73.7 (1.87)	674.3 (19.06)	62.4 (1.59)	32.9 (0.836)

Table 2-2. Vehicle Characteristic Data

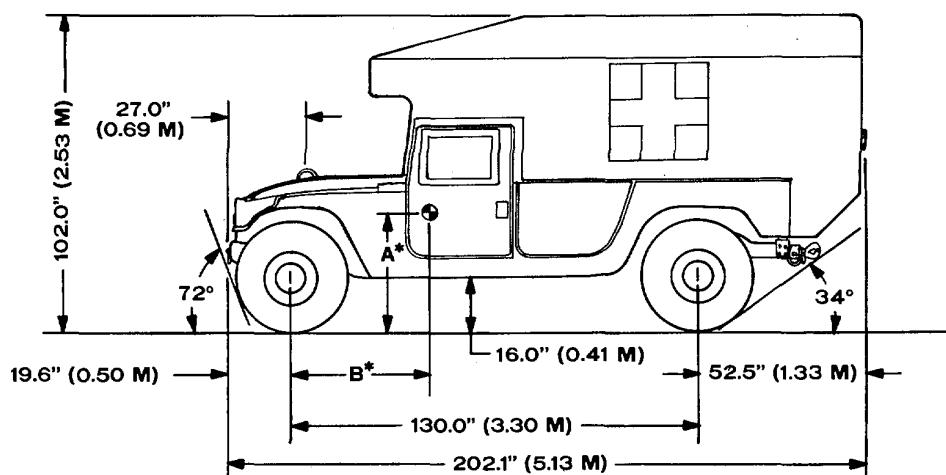
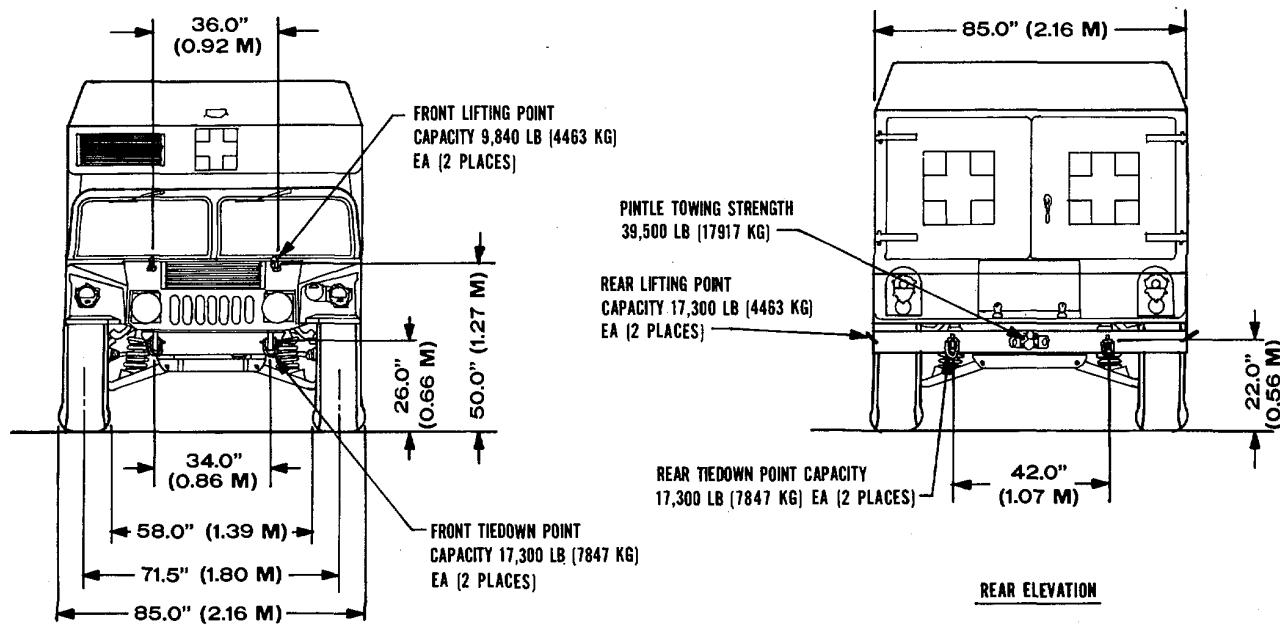
Vehicle	Curbweight lb (Kg)	Gross vehicle weight (GVW) lb (Kg)	Curbweight axle load		Gross vehicle weight (GVW) axle load		Tire inflation pressure at gross vehicle weight (GVW)		Turning radius in. (m)
			Front lb (Kg)	Rear lb (Kg)	Front lb (Kg)	Rear lb (Kg)	Front psi (kPa)	Rear psi (kPa)	
M966	6,051 (2745)	8,200 (3720)	3,111 (1411)	2,940 (1334)	3,550 (1610)	4,650 (2109)	20 (137.9)	22 (151.7)	290 (7.37)
M996	6,688 (3034)	8,600 (3901)	3,043 (1380)	3,645 (1653)	3,653 (1657)	4,947 (2244)	20 (137.9)	30 (206.8)	292 (7.42)
M997	7,180 (3257)	8,600 (3901)	3,235 (1467)	3,945 (1789)	3,650 (1656)	4,950 (2245)	20 (137.9)	30 (206.8)	290 (7.37)
M998	5,200 (2359)	7,700 (3493)	2,900 (1315)	2,300 (1043)	3,350 (1520)	4,350 (1973)	20 (137.9)	22 (151.7)	292 (7.42)
M1025	5,960 (2703)	7,900 (3583)	3,112 (1412)	2,848 (1292)	3,550 (1610)	4,350 (1973)	20 (137.9)	22 (151.7)	290 (7.37)
M1026	6,087 (2761)	7,900 (3583)	3,259 (1478)	2,828 (1283)	3,700 (1678)	4,200 (1905)	20 (137.9)	22 (151.7)	290 (7.37)
M1035	5,297 (2403)	7,700 (3493)	2,890 (1311)	2,407 (1092)	3,350 (1520)	4,350 (1973)	20 (137.9)	22 (151.7)	290 (7.37)
M1037	5,424 (2460)	8,600 (3901)	2,834 (1285)	2,590 (1174)	3,350 (1520)	5,250 (2381)	20 (137.9)	30 (206.8)	290 (7.37)
M1038	5,372 (2437)	7,700 (3493)	3,052 (1384)	2,275 (1032)	3,400 (1542)	4,300 (1950)	20 (137.9)	22 (151.7)	292 (7.42)
M1042	5,551 (2518)	8,600 (3901)	2,991 (1357)	2,560 (1161)	3,875 (1531)	5,225 (2370)	20 (137.9)	30 (206.8)	290 (7.37)
M1043	6,411 (2908)	7,900 (3583)	3,300 (1497)	3,111 (1411)	3,725 (1690)	4,175 (1894)	20 (137.9)	22 (151.7)	290 (7.37)
M1044	6,538 (2966)	7,900 (3583)	3,445 (1563)	3,093 (1403)	3,850 (1746)	4,050 (1837)	20 (137.9)	22 (151.7)	290 (7.37)
M1045	6,437 (2920)	8,400 (3810)	3,266 (1481)	3,172 (1439)	3,725 (1690)	4,675 (2120)	20 (137.9)	22 (151.7)	290 (7.37)
M1046	6,565 (2978)	8,400 (3810)	3,407 (1545)	3,158 (1432)	3,850 (1746)	4,550 (2064)	20 (137.9)	22 (151.7)	290 (7.37)



*NOTE: SEE TABLE 2-1 FOR CENTER-OF-GRAVITY DIMENSIONS.

LEFT-SIDE ELEVATION

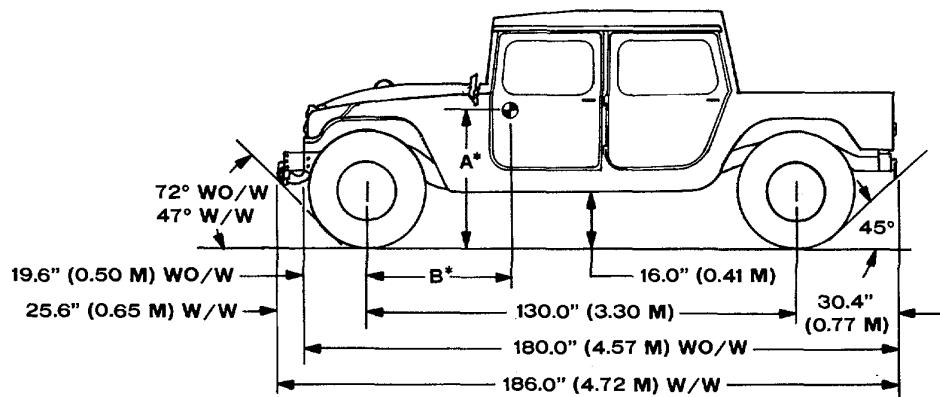
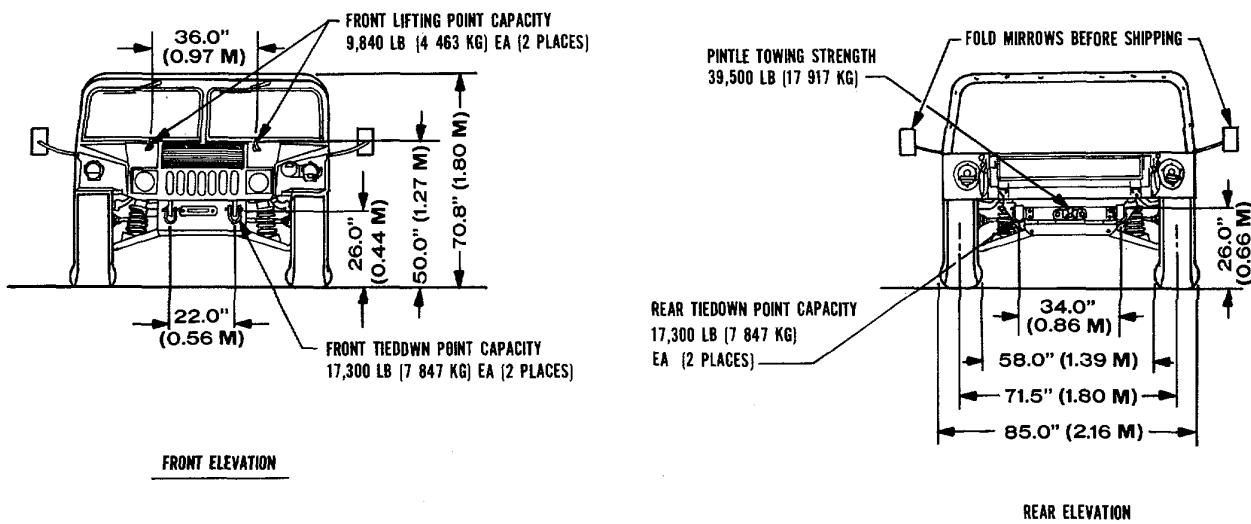
Figure 2-2. M966, M1045, and M1046 truck, utility, TOW carriers, armored; M1025, M1026, M1043, and M1044 truck, utility, armament carriers (front, left-side, and rear views).



*NOTE: SEE TABLE 2-1 FOR CENTER-OF-GRAVITY DIMENSIONS.

LEFT-SIDE ELEVATION

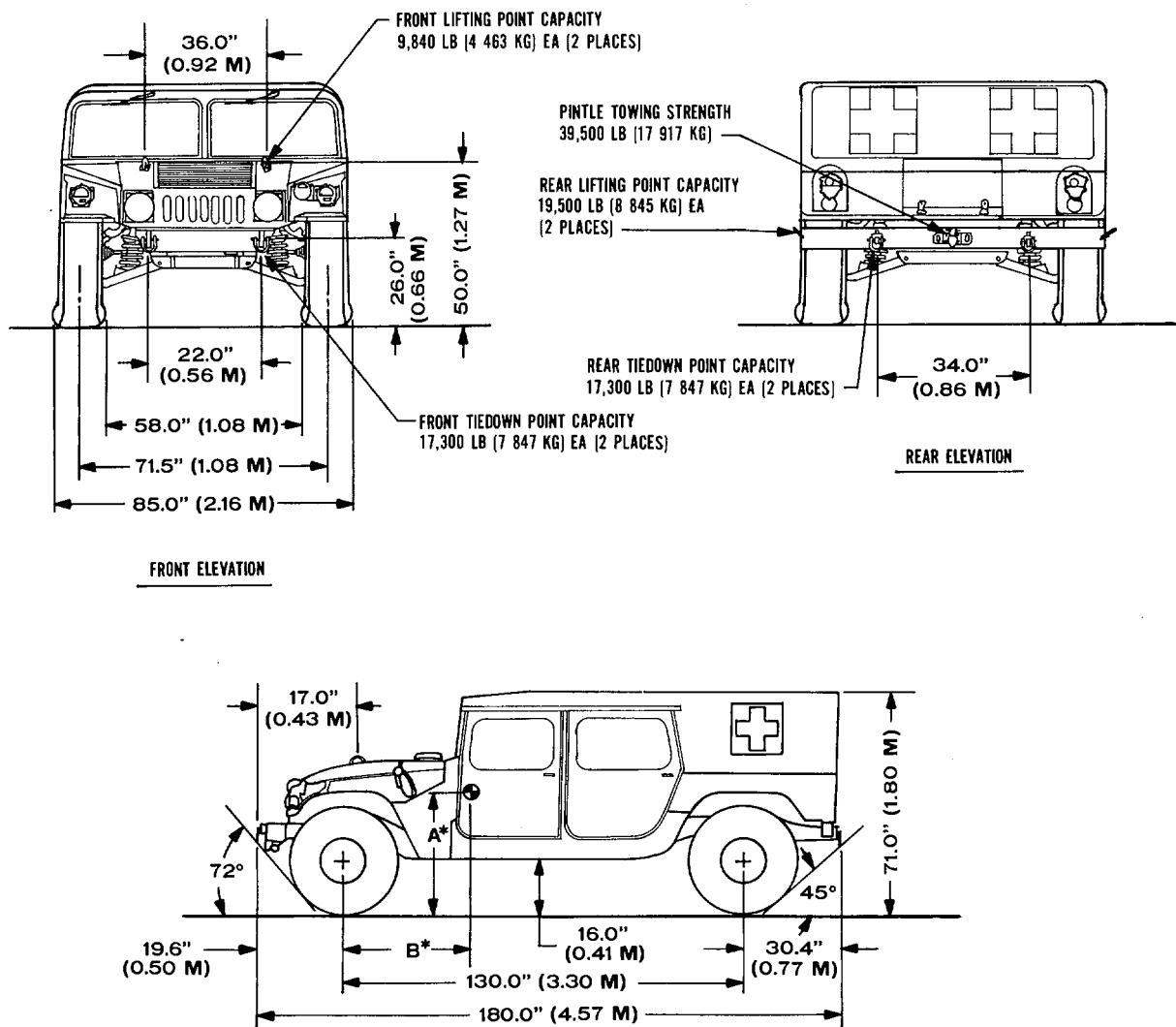
Figure 2-3. M997 truck, ambulance (front, left-side, and rear views).



***NOTE: SEE TABLE 2-1 FOR CENTER-OF-GRAVITY DIMENSIONS.**

LEFT-SIDE ELEVATION

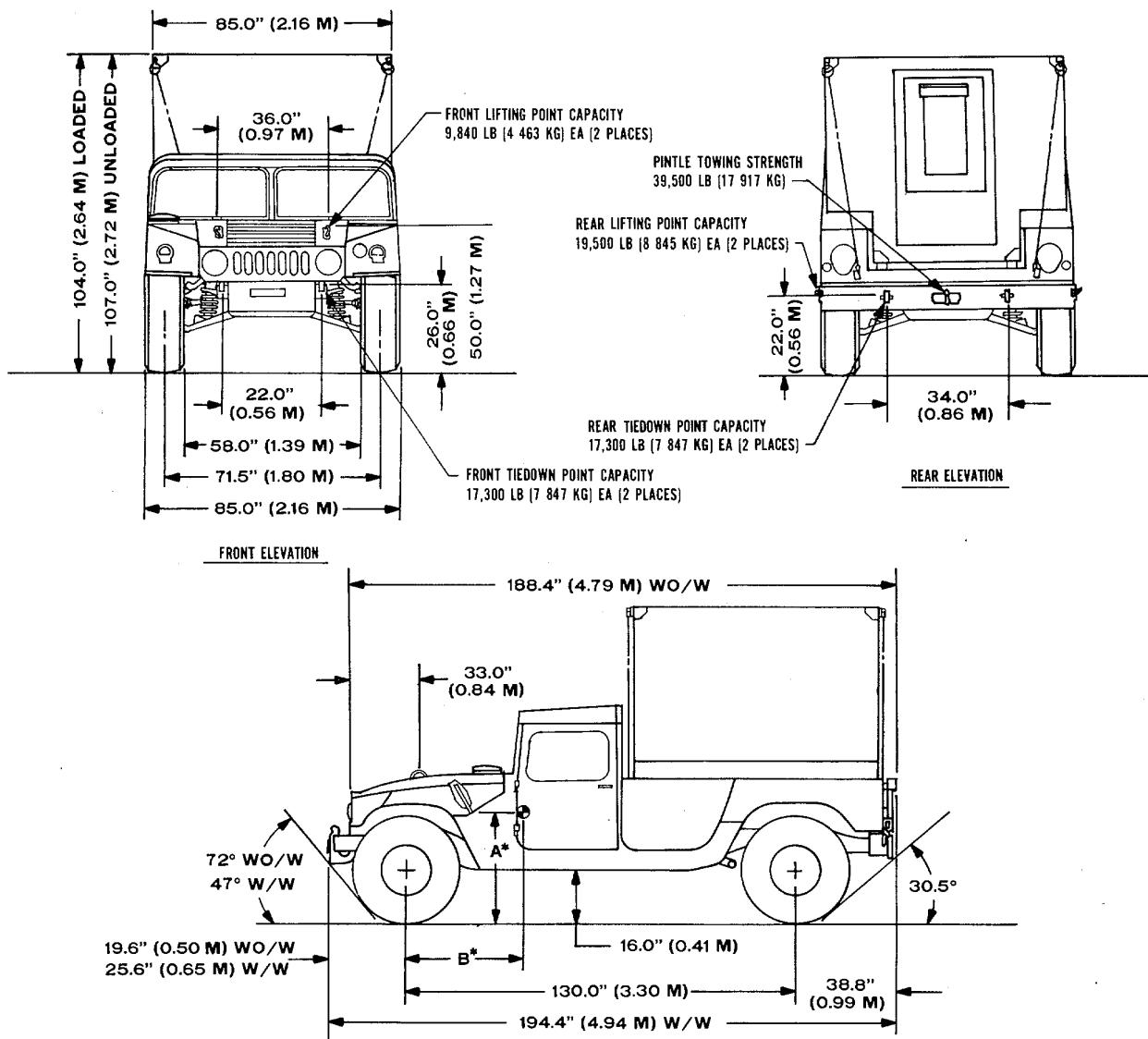
Figure 2-4. M998 and M1038 truck, utility, cargo/troop carrier (front, left-side, and rear views).



*NOTE: SEE TABLE 2-1 FOR
CENTER-OF-GRAVITY DIMENSIONS.

LEFT-SIDE ELEVATION

Figure 2-5. M1035 truck, ambulance, soft-top (front, left-side, and rear views).



*NOTE: SEE TABLE 2-1 FOR CENTER-OF-GRAVITY DIMENSIONS.

LEFT-SIDE ELEVATION

Figure 2-6. M1037 and M1042 truck, utility, S-250 shelter carrier (front, left-side, and rear views).

CHAPTER 3

SAFETY

3-1. General

General safety considerations and precautions for handling and movement of the HMMWVs 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 operator's 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 shall not stand or walk under the vehicle when it is being lifted.

WARNING

Personnel shall not stand between vehicles when ground-guiding vehicle operators during loading and unloading operations.

- d. Vehicles should not exceed 3 mph while on loading ramps, on railcars, or inside aircraft.

3-2. Specific Safety Requirements

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

CHAPTER 4

AIR TRANSPORTABILITY

Section I. GENERAL

4-1. Scope

This chapter provides air transportability guidance for movement of the HMMWVs. It covers technical and physical characteristics of HMMWVs, as well as safety considerations. It also prescribes the materials required to prepare the vehicles and to load them into and unload them from US Air Force aircraft. For example, it provides sample tiedown diagrams and data tables for loading these vehicles into C-130, C-141, and C-5A aircraft.

4-2. Maximum Utilization of Aircraft

Cargo may be carried in the cargo compartment of these vehicles provided the gross vehicle weight rating is not exceeded. Such cargo must be securely restrained in the vehicle cargo compartment by attaching the cargo to the vehicle or to the aircraft floor. Also, the cargo must meet the same restraint criteria as the vehicle. The restraint criteria for the vehicle is as follows: aft 1.5g, forward 3g, lateral 1.5g, and vertical 2g. 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 weight is used to determine the number of tiedowns needed to meet the restraint criteria.

4-3. Safety

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

- a. The activity offering the vehicles for air transport will notify the aircraft commander or his/her designated representative if 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 the aircraft ramp during contingencies. The fuel level must be no more than one-quarter full during routine airlift.
- c. Each vehicle must be checked carefully to ensure that all loose items are properly secured in accordance with restraint criteria.

NOTE

In air loading, the center of gravity of each vehicle must be determined and, where the weight and/or measurement is critical, each vehicle should be weighed and measured by Army personnel prior to air loading.

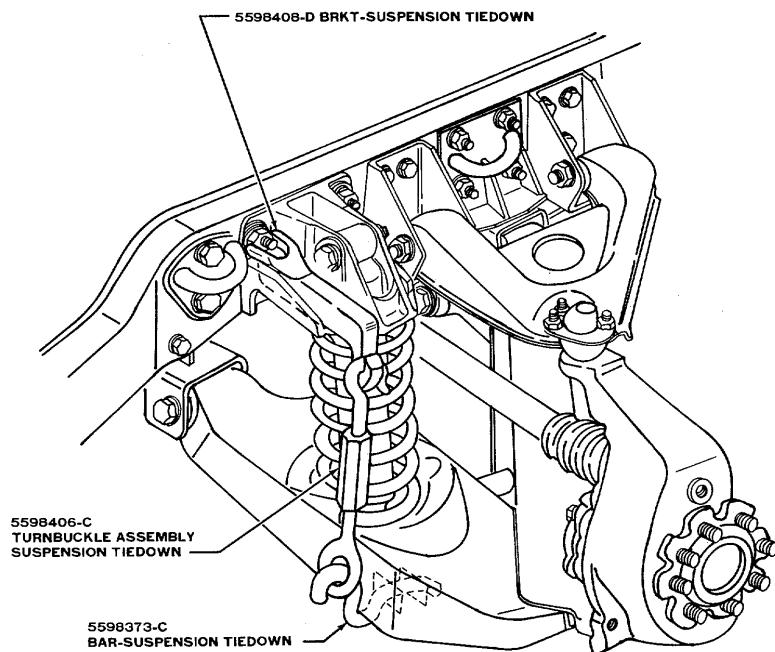
4-4. Responsibility

The loadmaster will ensure that the loaded equipment is secured in accordance with restraint criteria outlined in TO 1C XXX-9.

Section II. TRANSPORT BY US AIR FORCE AIRCRAFT

4-5. Aircraft Capabilities

All HMMWVs can be transported in C-130, C-141, and C-5A aircraft. When the M1037 and M1042 shelter carriers, with the S-250 shelter mounted, are transported in C-130 and C-141 aircraft, the snubbing device (fig. 4-1) must be used to fully compress the rear suspension of these vehicles. If the snubbing device is not available, the shelter will be removed and palletized on 463L pallets.



5598408-D UPPER BRACKET (2 REQUIRED)
 55983734-C LOWER BAR (2 REQUIRED)
 5598406-C TURNBUCKLE ASSEMBLY (2 REQUIRED)
 559807-C 18-INCH WRENCH
 5591543-B LUBRICANT

REAR SUSPENSION ONLY

GENERAL INSTRUCTIONS

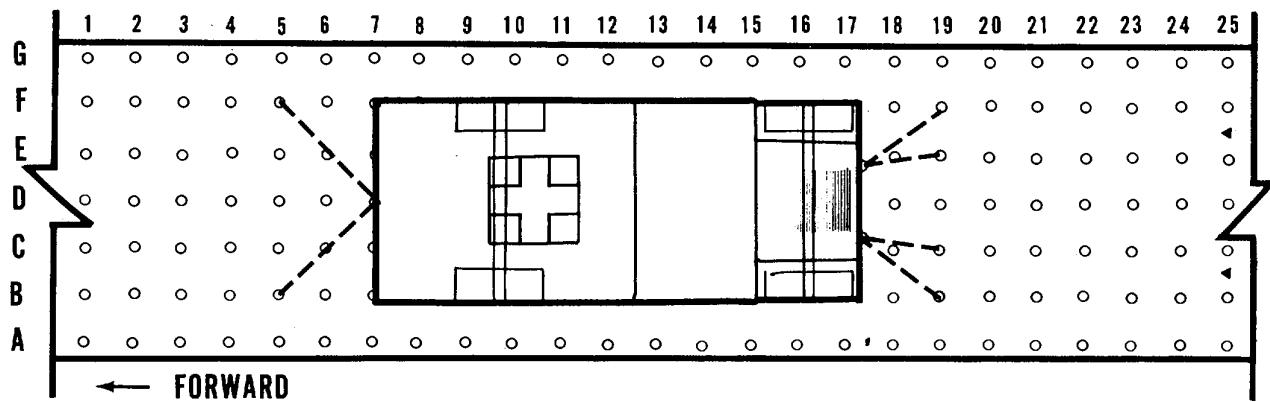
1. INSERT UPPER BRACKET CASTINGS AS SHOWN
2. INSERT S-SHAPED LOWER BARS IN HOLE IN REAR LOWER ABSORBER BRACKET AS SHOWN
3. APPLY GREASE TO THREADS OF TURNBUCKLE
4. INSTALL TURNBUCKLES WITH EYE OVER, S-SHAPED LOWER BAR AND WITH HOOK OVER UPPER BRACKET CASTINGS AS SHOWN
5. ROTATE TURNBUCKLE WITH WRENCH PROVIDED UNTIL OVERALL HEIGHT OF VEHICLE IS 102 INCH MAXIMUM AS SHOWN
6. VEHICLE CAN BE DRIVEN ABOARD AIRCRAFT AND SHIPPED WITH TURNBUCKLES IN PLACE
7. AFTER ARRIVAL AT DESTINATION AND VEHICLE HAS BEEN DRIVEN OFF AIRCRAFT, THE TURNBUCKLE ASSEMBLIES MUST BE REMOVED

REAR SUSPENSION ONLY

Figure 4-1. Snubbing device for reducing height of shelter carrier.

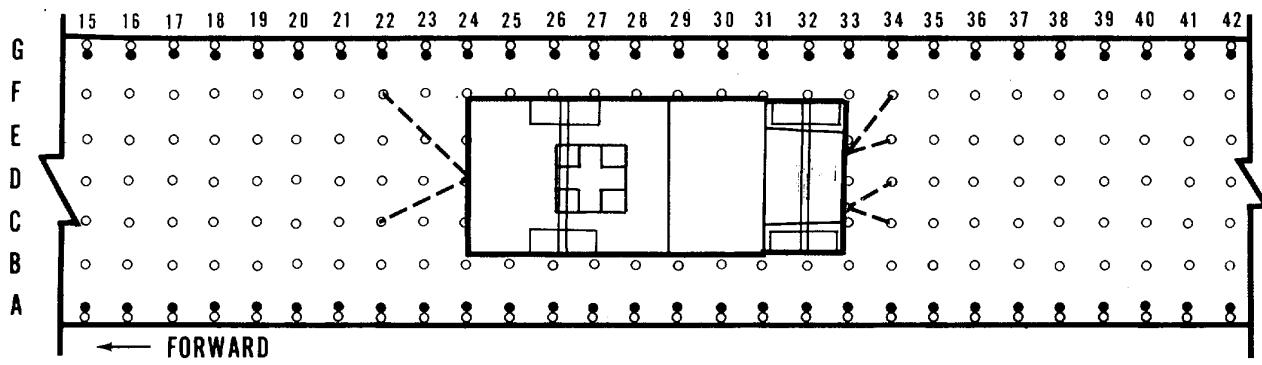
4-6. Typical Loads

The following diagrams (figs. 4-2 through 4-4) and tiedown data (tables 4-1 through 4-3) provide a guide for securing the HMMWVs aboard US Air Force aircraft. Actual placement of the vehicles on the aircraft and tie-down procedures will be at the discretion of the loadmaster.



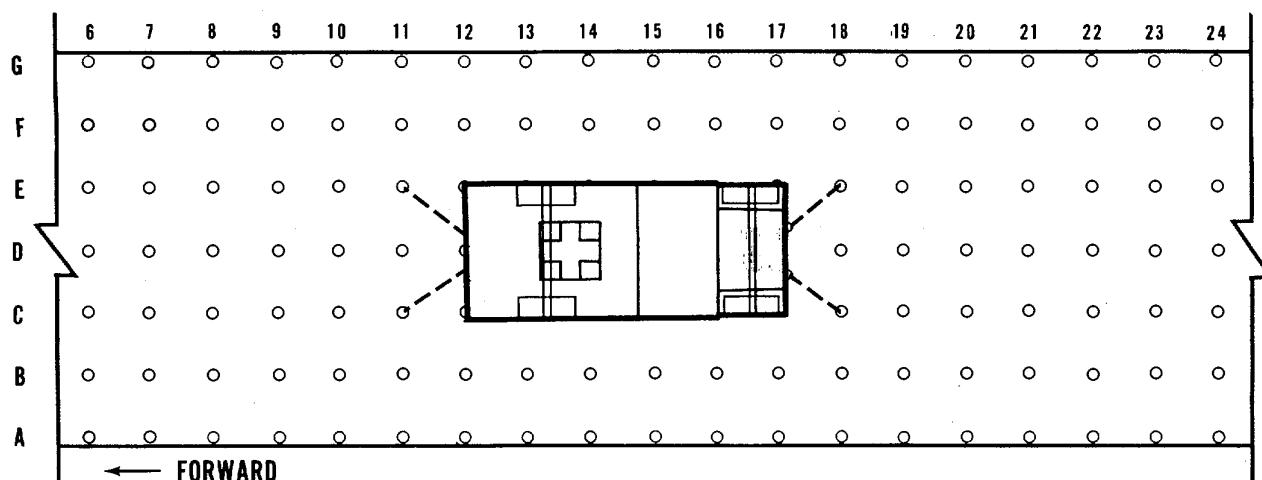
NOTE: FLOOR TIEDOWN FITTINGS ARE LOCATED IN ROWS A THROUGH G AND COLUMNS 1 THROUGH 25. THE RAMP HAS 5 ADDITIONAL COLUMNS. THIS IS A TYPICAL TIEDOWN PROCEDURE AND ONLY COLUMNS 1 THROUGH 25 ARE SHOWN. ITEM BEING SHIPPED CAN BE TIED DOWN AT ANY LOCATION APPROVED BY THE LOADMASTER.

Figure 4-2. Tiedown diagram for HMMWV in C-130 aircraft.



NOTE: FLOOR TIEDOWN FITTINGS ARE LOCATED IN ROWS A THROUGH G AND COLUMNS 1 THROUGH 56. THE RAMP HAS 6 ADDITIONAL COLUMNS. THIS IS A TYPICAL TIEDOWN PROCEDURE AND ONLY COLUMNS 15 THROUGH 42 ARE SHOWN. ITEM BEING SHIPPED CAN BE TIED DOWN AT ANY LOCATION APPROVED BY THE LOADMASTER.

Figure 4-3. Tiedown diagram for HMMWV in C-141 aircraft.



LEGEND: C-5 AIRCRAFT

○ ALL CARGO TIEDOWN FITTING RATINGS 25000 LB EACH

NOTE: FLOOR TIEDOWN FITTINGS ARE LOCATED IN ROWS A THROUGH G AND COLUMNS 1 THROUGH 38. COLUMNS OF TIEDOWNS ARE LOCATED ON THE RAMPS: FOUR ON THE FORWARD RAMP AND FIVE ON THE AFT RAMP. THIS IS A TYPICAL TIEDOWN PROCEDURE AND ONLY COLUMNS 6 THROUGH 24 ARE SHOWN. ITEM BEING SHIPPED CAN BE TIED DOWN AT ANY LOCATION APPROVED BY THE LOADMASTER.

Figure 4-4. Tiedown diagram for HMMWV in C-5A aircraft.

Section III. TRANSPORT BY US ARMY AIRCRAFT

4-7. Fixed-Wing Aircraft

The HMMWVs cannot be transported in any US Army fixed-wing aircraft, because the vehicles exceed the aircraft size and weight limitations.

Table 4-1. Tiedown Data for HMMWV in US Air Force C-130 Aircraft (Fig. 4-2)

Tiedown Fitting		Tiedown Device		Attach to Item
Designation	Capacity in 1,000 lb	Type	Capacity in 1,000 lb	
B5.....	10	MB1	10	Right rear bumper tiedown fitting.
F5.....	10	MB1	10	Left rear bumper tiedown fitting.
B19.....	10	MB1	10	Right front bumper tiedown fitting.
C19	10	MB1	10	Right front bumper tiedown fitting.
E19.....	10	MB1	10	Left front bumper tiedown fitting.
F19.....	10	MB1	10	Left front bumper tiedown fitting.

Table 4-2. Tiedown Data for HMMWV in US Air Force C-141 Aircraft (Fig. 4-3)

Tiedown Fitting		Tiedown Device		Attach to Item
Designation	Capacity in 1,000 lb	Type	Capacity in 1,000 lb	
C22	10	MB1	10	Right rear bumper tiedown fitting.
F22.....	10	MB1	10	Left rear bumper tiedown fitting.
C34	10	MB1	10	Right front bumper tiedown fitting.
D34	10	MB1	10	Right front bumper tiedown fitting.
E34.....	10	MB1	10	Left front bumper tiedown fitting.
F34.....	10	MB1	10	Left front bumper tiedown fitting.

Table 4-3. Tiedown Data for HMMWV in US Air Force C-5A Aircraft (Fig. 4-4)

Tiedown Fitting		Tiedown Device		Attach to Item
Designation	Capacity in 1,000 lb	Type	Capacity in 1,000 lb	
C11	25	MB2	25	Right rear bumper tiedown fitting.
E11.....	25	MB2	25	Left rear bumper tiedown fitting.
C18	25	MB2	25	Right front bumper tiedown fitting.
E18.....	25	MB2	25	Left front bumper tiedown fitting.

4-8. Rotary-Wing Aircraft

a. The HMMWVs can be externally transported by CH-47 and CH-53 helicopters. Figures 4-5 through 4-7 show the proper method to sling load the HMMWVs. This method is also used when the HMMWV must be lifted for other modes of transportation. The data plate, located on the left rear fender of each HMMWV, also shows the sling-load diagram.

b. All models of the HMMWV at GVW can be transported by CH-47 and CH-53 aircraft. However, the vehicle maximum weight and climatic conditions may restrict external transport by UH-60 aircraft. The M997 ambulance and the M1037/M1042 shelter carriers may be externally transported by the UH-60 helicopter provided the maximum vehicle weight is within the performance criteria of the aircraft.

c. The slinging procedures for the HMMWV M998 cargo truck, the M966, TOW weapons carrier, and the M1087 shelter carrier will be completed by using the following materials, personnel, and procedures:

(1) *Materials.*

- (a) Sling set (10,000-lb capacity), NSN 1670-01-027-2902.
- (b) Tape, adhesive, pressure-sensitive, 2-inch-wide roll.
- (c) Cord, nylon, Type III, 500-pound breaking strength.

(2) *Personnel.* Two men can prepare and rig the load in 15 minutes.

(3) *Preparation.*

(a) Fold the mirrors forward in front of the windshield; then tie the mirrors together with Type III nylon cord. Also, using Type III nylon cord, tie the mirrors to the lift provisions that protrude through the hood.

- (b) Secure all equipment inside the vehicle with tape, nylon cord, and/or lashings.

(c) For the M1037, ensure that the shelter is secured to the truck with wire rope or tiedown assemblies. Secure all equipment inside the shelter with tape, nylon cord, and/or lashings, and close and lock the door.

(d) Make sure that the fuel content of the vehicle does not exceed 75-percent capacity. Check the fuel tank cap, oil filter cap, and battery caps for proper installation.

- (e) Set the vehicle parking brakes and put transmission in neutral.

(f) Using the securing device under the dash, tie down the steering wheel. Ensure that the wheels are pointed straight ahead.

(g) Fold bows and tarps or troop enclosures on M998 and secure in bed of vehicle.

(4) *Rigging*

(a) *Forward Sling-Leg Set.*

(1) Connect two sling legs to one 10,000-pound apex fitting.

(2) Attach one sling leg to each lift shackle that protrudes through the hood, and secure each chain by link 80 in the grabhook.

(3) Secure all excess chain with 2-inch-wide tape.

(b) *Aft Sling-Leg Set.*

(1) Connect the rear sling legs to the same 10,000-pound apex fitting used for the front sling legs.

(2) For the M998 and M966 vehicles, thread each chain end through the eyelet opening in the upper corners of the tailgate (fig. 4-8). Loop each chain end through the lift shackles on the rear bumper, and thread the chain back through the eyelet openings in the tailgate. Secure each chain by link 3 in the grabhook. For the M1037 shelter carrier, move the lifting shackle to outside of the bumper and route each chain around the shelter and loop the chain through the lift shackles on the rear bumper. Secure each chain by link 30 in the grabhook.

(3) Secure all excess chain with 2-inch-wide tape.

d. For other methods of external lifting of the HMMWV, refer to FM 55-450-1, *Army Helicopter External Load Operations*.

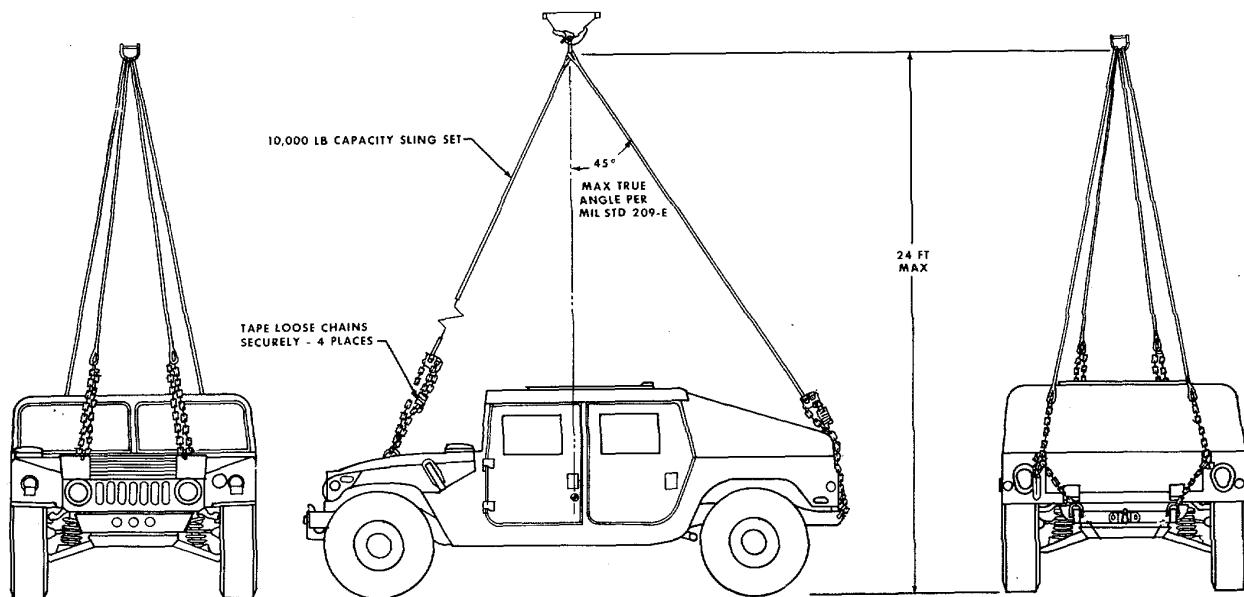


Figure 4-5. Typical sling loading of basic HMMWV for external lift by helicopter.

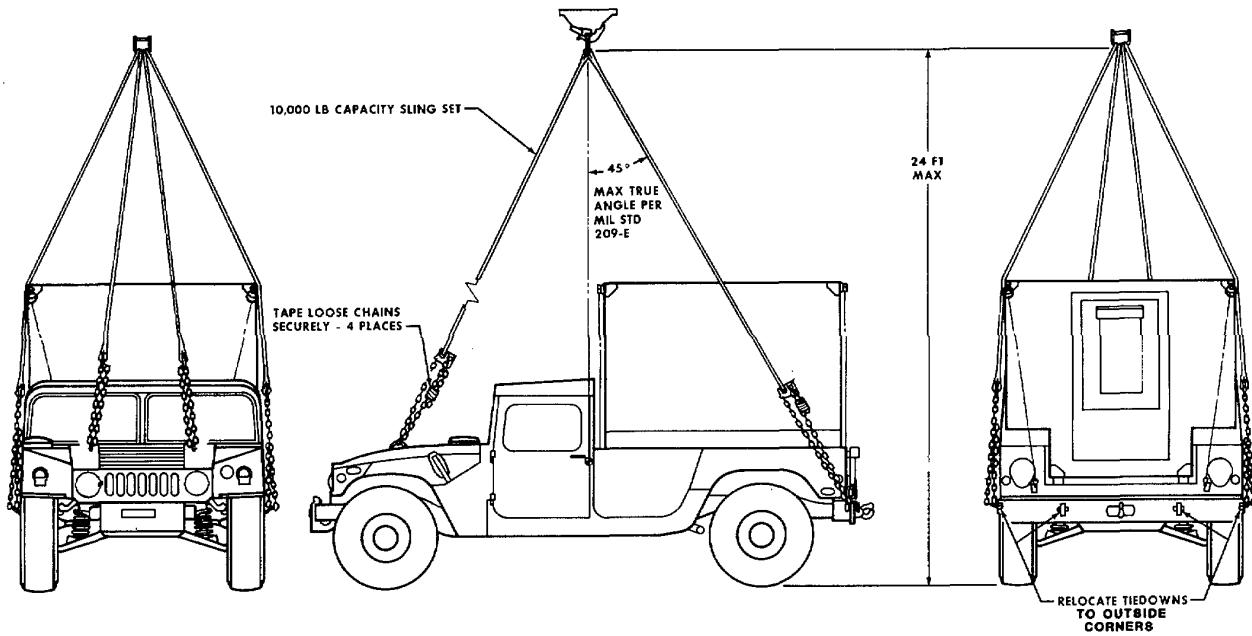


Figure 4-6. Typical sling loading of shelter carrier for external lift by helicopter.

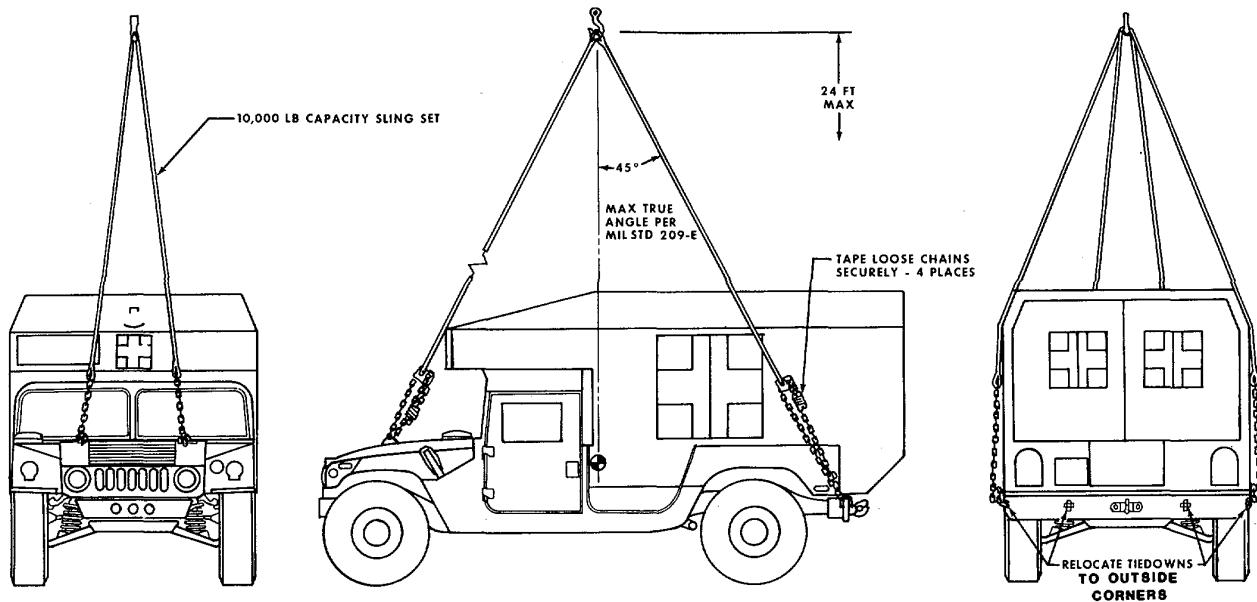


Figure 4-7. Typical sling loading of ambulance for external lift by helicopter.

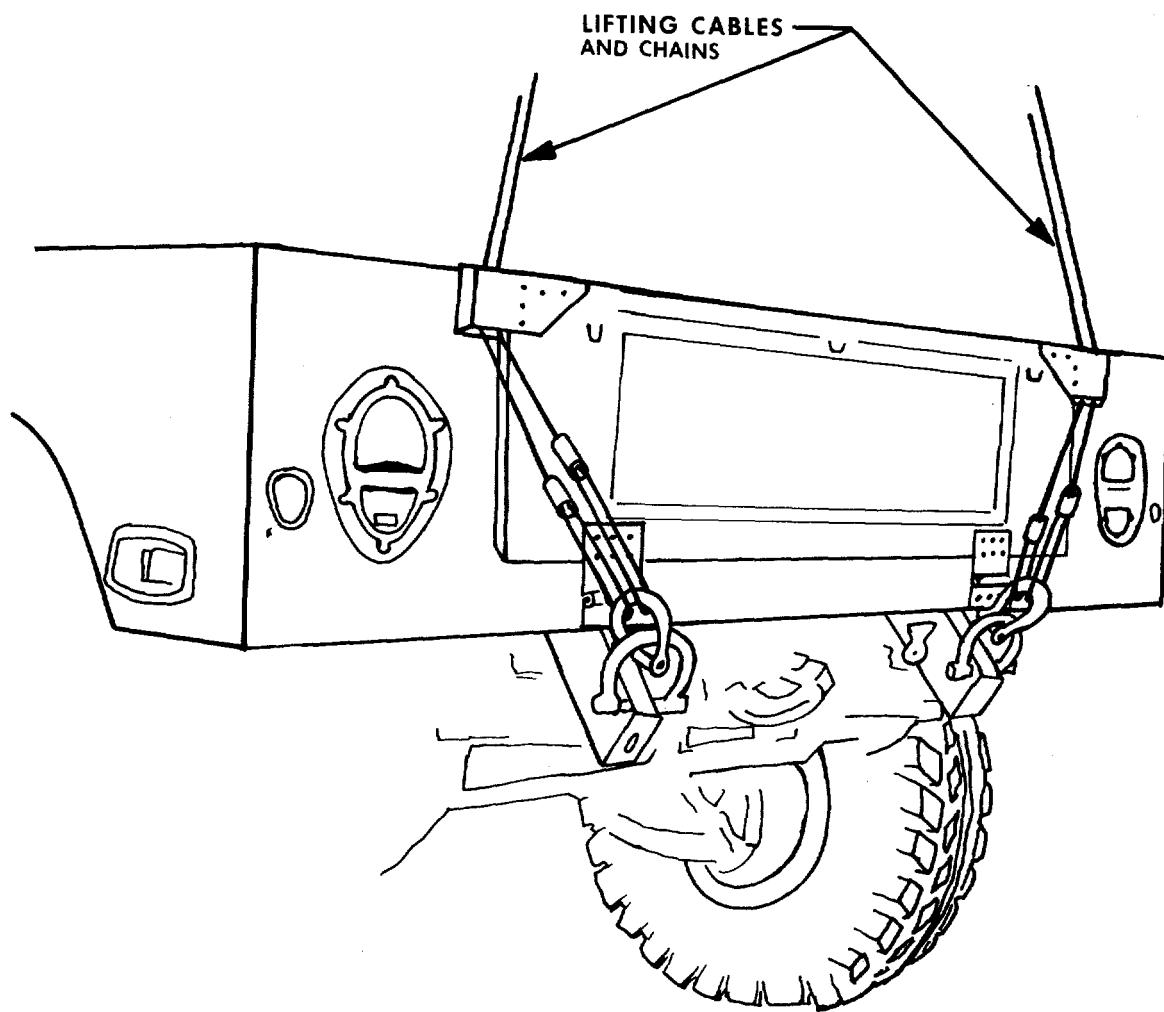


Figure 4-8. Lifting cables and chains that pass through eyelets on tailgate of M966 and M998.

CHAPTER 5

HIGHWAY TRANSPORTABILITY GUIDANCE

Section I. GENERAL

5-1. Scope.

This chapter provides highway transportability guidance for movement of the HMMWVs. It also includes safety considerations and lists the materials required to load and tie down these vehicles.

5-2. Safety

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

Section II. SELF-PROPELLED MOVEMENT

5-3. General

The HMMWVs can move without any restrictions over all road networks in CONUS and overseas as self-propelled vehicles.

5-4. Preparation of HMMWVs for Movement

No special preparation, other than organizational maintenance, is required when the HMMWVs are moved under their own power.

Section III. TRANSPORT BY SEMITRAILER

5-5. General

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

5-6. Preparation of HMMWVs for Shipment on Semitrailers

Special preparation of the HMMWVs for movement on semitrailers may consist of reducing the HMMWVs to their lowest shipment configuration. Normally, the overall height of the vehicles, when loaded on the M127A1 semitrailer, should not exceed 13 feet 6 inches.

5-7. Loading on Semitrailer

The HMMWVs may be placed in the tiedown position on the semitrailer by crane, or they may be driven over loading ramps. If a crane is used, it must have a capacity of 5 tons or more to lift the vehicles. After the vehicles are placed at the tiedown point, they will be secured in accordance with figure 5-1. Chain and load binders can be used in lieu of wire rope for securing vehicles to semitrailers. The bill and application of materials for securing the HMMWVs on semitrailers are shown in tables 5-1 and 5-2, respectively.

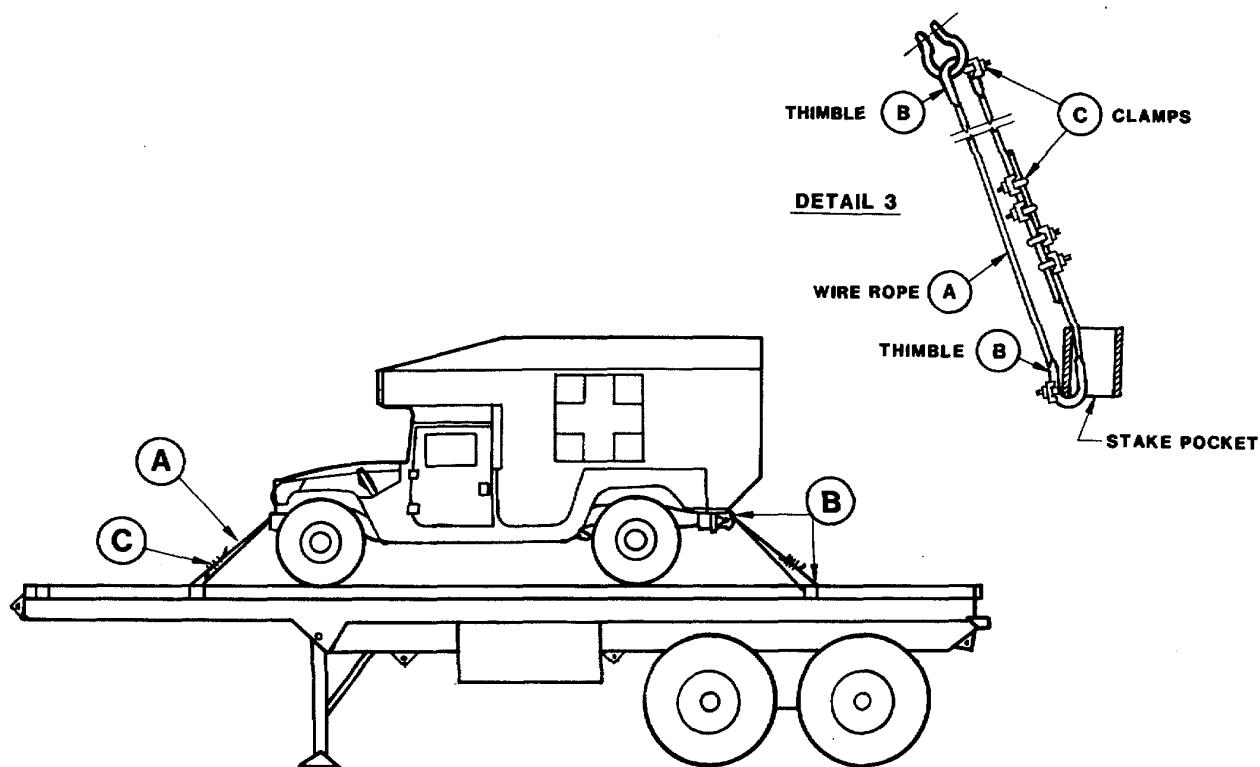


Figure 5-1. Tiedown of HMMWV on semitrailer.

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

Item	Description	Approximate quantity
Wire rope	6 x 19, IWRC; improved plow steel; preformed, regular-lay; table X, Fed Spec RR-W-410C: 3/8-inch.	48 feet.
Clamps.....	Wire rope, U-bolt clamps, saddled, single-grip, steel, Crosby heavy-duty, or equal; Fed Spec FF-C-4500: 3/8-inch	24
Thimbles	Standard, open-type, 3/8-inch.....	8
Chain*	General service, S-leg, high-tensile, 1/2-inch-wide, 10-foot-long, with two grabhooks; 16,000-pound 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-pound safe-working rating; Fed Spec GGG-B-325A; NS 3990-00-171-9774.	4

*Chain and load binders may be substituted for wire rope, clamps, and thimbles.

Table 5-2. Application of Materials for Tiedown of HMMWV on Semitrailer (Fig. 5-1)

Item	No. Required	Application
A	4	Tiedowns (detail 3). Each consists of one piece of 3/8-inch, 6 x 10, 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 semitrailer deck should be as close to 45 degrees as possible. The wire rope ends should overlap at least 24 inches.

Table 5-2. Application of Materials for Tiedown of HMMWV on Semitrailer (Fig. 5-1) - Continued

Item	No. Required	Application
B	8	Thimbles. Place one under wire rope where wire rope contacts bottom of stake pocket. Place another where wire rope goes through shackle. Secure each thimble to wire rope with one U-bolt clip (detail 3).
C	24	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). Place one clamp on each item E as indicated above. Tighten clamps so wire rope cannot slip.
D*	4	Chains. Attach one end of each chain to each front tiedown shackle. Pull chains straight back and attach their ends to the semitrailer side stake pockets.
E*	4	Load binders. Tighten front chains with load binders.

*Chain and load binders may be substituted for wire rope, clamps, and thimbles.

CHAPTER 6

MARINE AND TERMINAL TRANSPORTABILITY GUIDANCE

6-1. Scope

This chapter provides marine and terminal transportability guidance for movement of the HMMWVs. It includes safety considerations and lists the materials required to prepare, lift, tie down, load, and stow these vehicles.

6-2. Safety

In addition to the safety precautions in chapter 3, the following precautions also 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 that they are complete and undamaged.
- d. All lifts should have at least two taglines attached to control the movement of the vehicle while suspended.
- e. Fuel tanks must be drained and battery cables disconnected and taped.

6-3. General Rules for Stowing

Whenever possible, the vehicles should receive the protection of below-deck stowage. In general, good stowage of vehicles means having them placed fore and aft as close together as practical, with 4 to 6 inches of space between outer vehicles and sweatboards. If not shipped on the vehicle, breakable parts, spare parts, and OEM (on-equipment material) 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 the vehicles cannot move in any direction. Individual wheel blocks should be braced to bulkhead, stanchions, and other wheel blocks. All vehicles should be lashed with wire rope or chains to nearby bulkheads stanchions, or padeyes.

NOTE

When vehicles are loaded on vessels that are adequately ventilated by power blowers, such as those commonly found on roll-on/roll-off (RORO) vessels, fuel tanks may remain undrained and battery terminals may remain connected.

a. *Lifting.* The vehicle has four lifting points, two in the center of the hood and two at the rear of the vehicle. The vehicle will be lifted using the four-legged sling method, as shown, in figures 4-5 through 4-7 in chapter 4 and on the data plate on the left rear fender of each HMMWV.

b. *Loading.* The HMMWVs will be loaded onto cargo vessels in their minimum cube configurations; that is, reduced height, with or without cargo, and reduced width, sideview mirrors folded back or removed. The vehicles can be loaded in operational configuration aboard landing craft, beach discharge and amphibious lighters, and landing ships under their own power or by crane of adequate capacity. The vehicles can be loaded from a pier onto the deck of barges when tidal conditions are suitable and ramps are available. They can be lifted onto seagoing vessels by shoreside cranes, floating cranes, or ship's cranes. The vehicles can be driven or towed onto roll-on/roll-off (RORO) vessels.

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 HMMWVs 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 waters, tiedowns must be used.

b. *Securing*. Requirements for securing HMMWVs 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; the vehicles will be lashed with wire rope or chains to bulkheads, stanchions, or padeyes. Weld padeyes to the deck if D-ring or deck tiedown fittings are not available. Figure 6-1 shows typical blocking and tiedown details. The bill and application of materials are provided in tables 6-1 and 6-2, respectively.

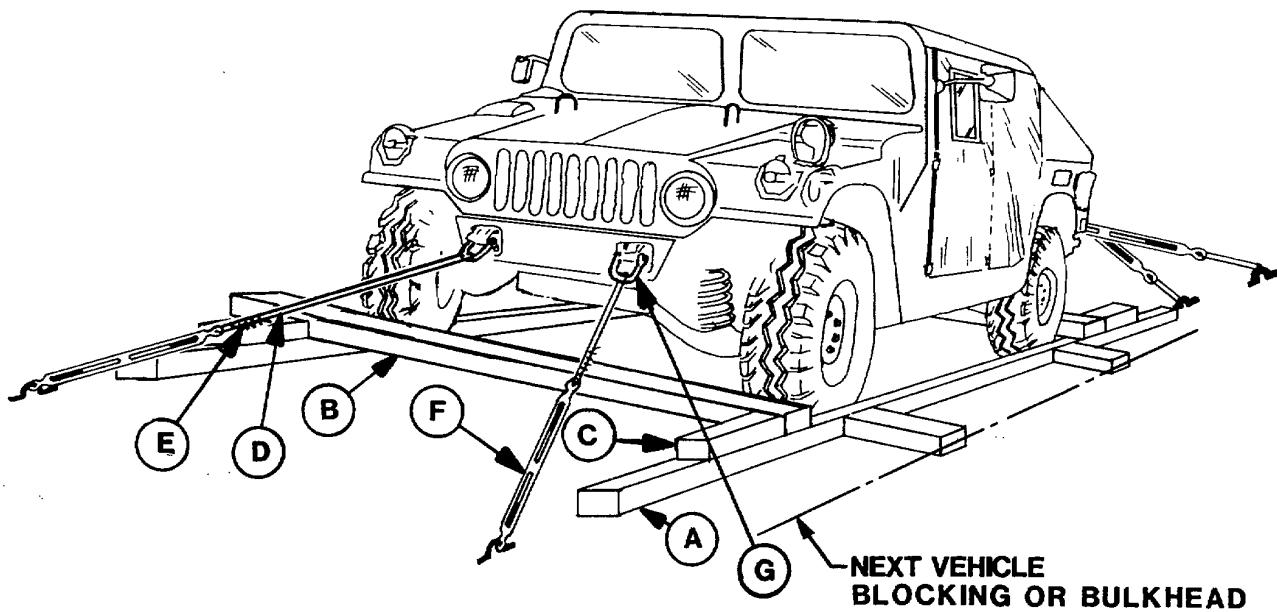
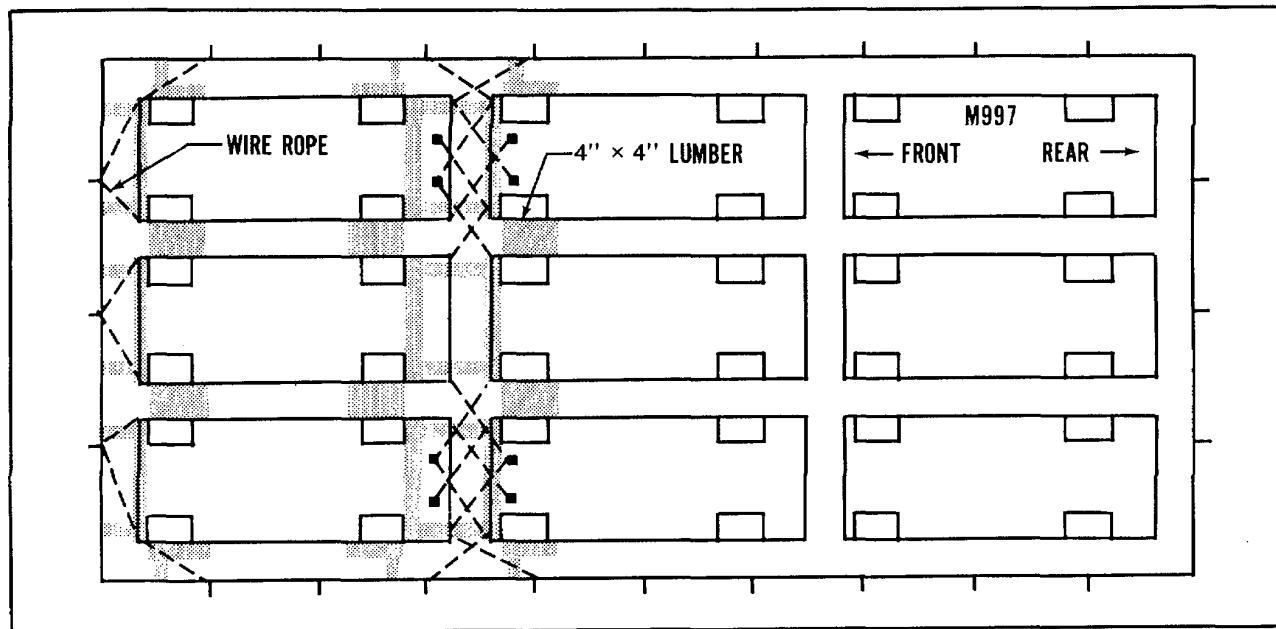


Figure 6-1. Typical blocking and tiedown of HMMWV in general cargo vessel.

c. *Stowage in SEABEE Barge and/or LASH Lighters*. When the HMMWVs are to be transported by SEA-BEE barge for a long distance or through rough waters, they will be blocked and tied down as shown in figure 6-2.



BLOCKED AND BRACED WITH 4" X 4" LUMBER,
LENGTH CUT-TO-SUIT AND FORCE FITTED.
TIEDOWN WITH 3/8" WIRE ROPE AND 3/8"
CABLE CLAMPS AND TURNBUCKLES.

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

NOTE: TYPICAL LOADS:
9 IN LASH LIGHTER
15 IN SEABEE BARGE

Figure 6-2. Typical blocking and tiedown of HMMWV in LASH lighter or SEABEE barge.

Table 6-1. Bill of Materials for Blocking and Tiedown of HMMWV (Fig. 6-1)

Item	Description	Approximate quantity
Lumber.....	Douglas-fir, or comparable; straight-grain, free from material defects; Fed Spec MM-L-751H: 4 x 4-inch.	60 linear feet
Nails.....	Common, steel; flathead; bright or cement-coated; Fed Spec FF-N-105B: 20d, 50d.....	20
Wire rope	6 x 19, IWRC; improved plow steel; preformed, regular-lay; Fed Spec RR-W-140C: 3/8-inch.....	60 feet
Clamps.....	Wire rope, U-bolt clamps, saddled, single-grip, steel, Crosby heavy-duty, or equal; MIL-STD 16842: 3/8-inch.	24
Turnbuckles.....	Eye- and jaw-type, 1/2-inch diameter x 6-inch takeup; Fed Spec FF-T-791B, or equal.....	4
Thimbles	Standard, open-type, 3/8-inch.....	8

Table 6-2. Application of Materials for Blocking and Tiedown of HMMWV (Fig. 6-1)

Item	No. Required	Application
A	2	Side blocks. Each consists of 4- x 4- x 238-inch lumber. Locate one piece against outside of wheels on each side of HMMWV.
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.

Table 6-2. Application of Materials for Blocking and Tiedown of HMMWV (Fig. 6-1) - Continued

Item	No. Required	Application
C	4	Backup cleats. Each consists of 4- x 4- x 12-inch lumber. Locate on top of item A with one end against each item B. Nail to item A with four 20d nails each.
D*	4	Tiedowns. 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 through each truck shackle and the eye of a turnbuckle, item F. Overlap wire rope ends at least 18 inches. Optimum tiedown angles are 45 degrees.
E	24	Clamps. Place four on each wire at overlap area. Space 2-1/2 inches apart, with a minimum of 6 inches from ends of wire rope. Place one at each place where rope passes through a shackle or turnbuckle. Details for placement of clamps are shown in figure 6-2. Tighten clamps so wire rope cannot slip.
F.....	4	Turnbuckles. Attach jaw end to padeye, stanchion, or bulkhead. Tighten as required.
G	8	Thimbles. Place one under wire rope at each place where rope passes through a shackle or turnbuckle. Secure each 3/8-inch thimble to wire rope with one 3/8-inch clamp.

6-5. Roll-on/Roll-off (RORO) Seatrain, Landing, and Attack Cargo Ships

NOTE

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

- a. *Loading*. The HMMWVs can be loaded under their own power or towed aboard RORO vessels.
- b. *Securing*. RORO, seatrain, landing, and attack cargo ships are equipped with patented lashing gear and pre-positioned fittings in the deck. The use of such equipment and blocking and bracing is not required. Figure 6-3 shows typical tiedown of HMMWVs on a RORO vessel using 10,000-pound-capacity lashings.

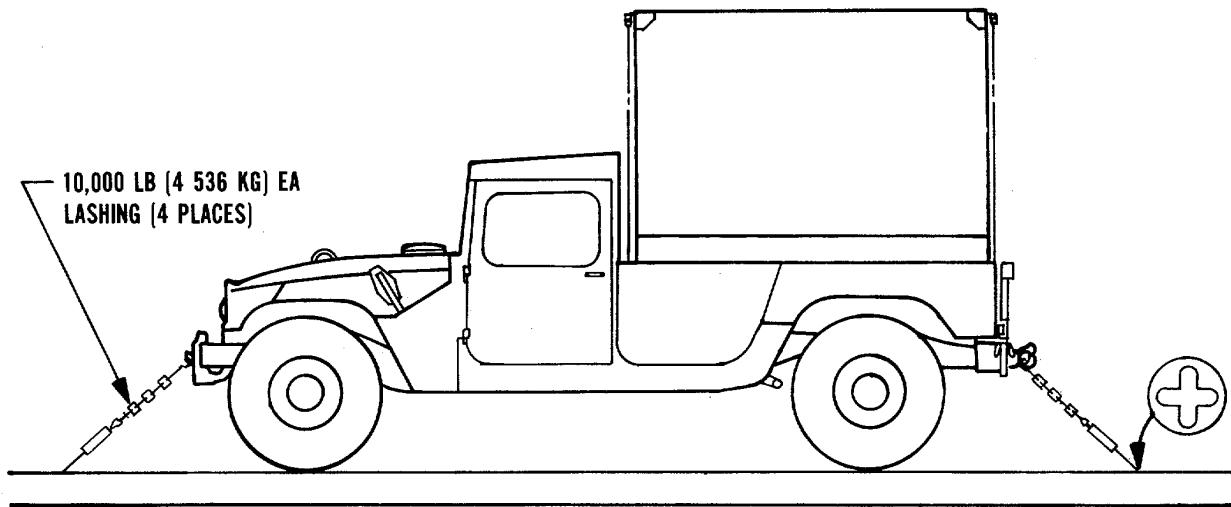


Figure 6-3. Typical tiedown of HMMWV on RORO ship.

6-6. Landing Craft and Amphibians

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

CHAPTER 7

RAIL TRANSPORTABILITY GUIDANCE

Section I. GENERAL

7-1. Scope

This chapter provides rail transportability guidance for movement of the HMMWVs. 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 trucks for transport, may be transported with the vehicles.

Section II. TRANSPORT ON CONUS RAILWAYS

7-3. General

The transportability guidance contained in this section is applicable when the HMMWVs are transported on CONUS railways. Consideration is given to single and multiple vehicle movement on the types of railcars normally used for the movement of these vehicles. The vehicles, when loaded on suitable railcars, can be transported without restrictions and disassembly.

7-4. Preparation

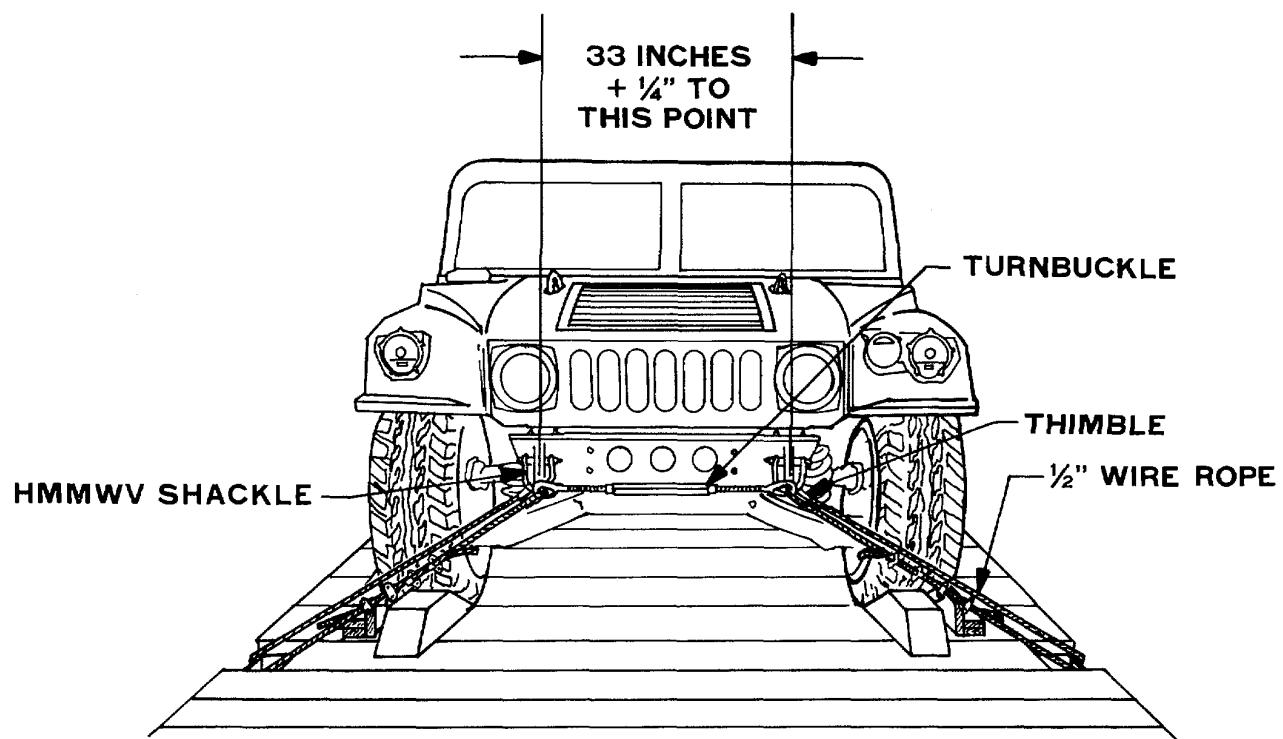
When the HMMWV is placed on flatcars or open-top cars, outside mirrors should be repositioned in front of the windshield. All doors except the driver's door should be tied closed. All material, including antennas, that exceeds the width of the vehicle should be removed and secured inside the vehicle. All antennas should be lowered and tied down.

7-5. Loading of HMMWVs on Railcars With Wood Floor

- a. The HMMWVs 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 by a crane of adequate capacity.
- b. The HMMWV must be positioned on the centerline of the railcar. When the vehicle is in position, its front or rear must clear the end of the railcar by 12 inches. Where practical, the HMMWV should be positioned so the front and rear shackles are located equal distances to the nearest flatcar side pocket. This allows similar angles of tiedown for both the front and rear of the HMMWV.

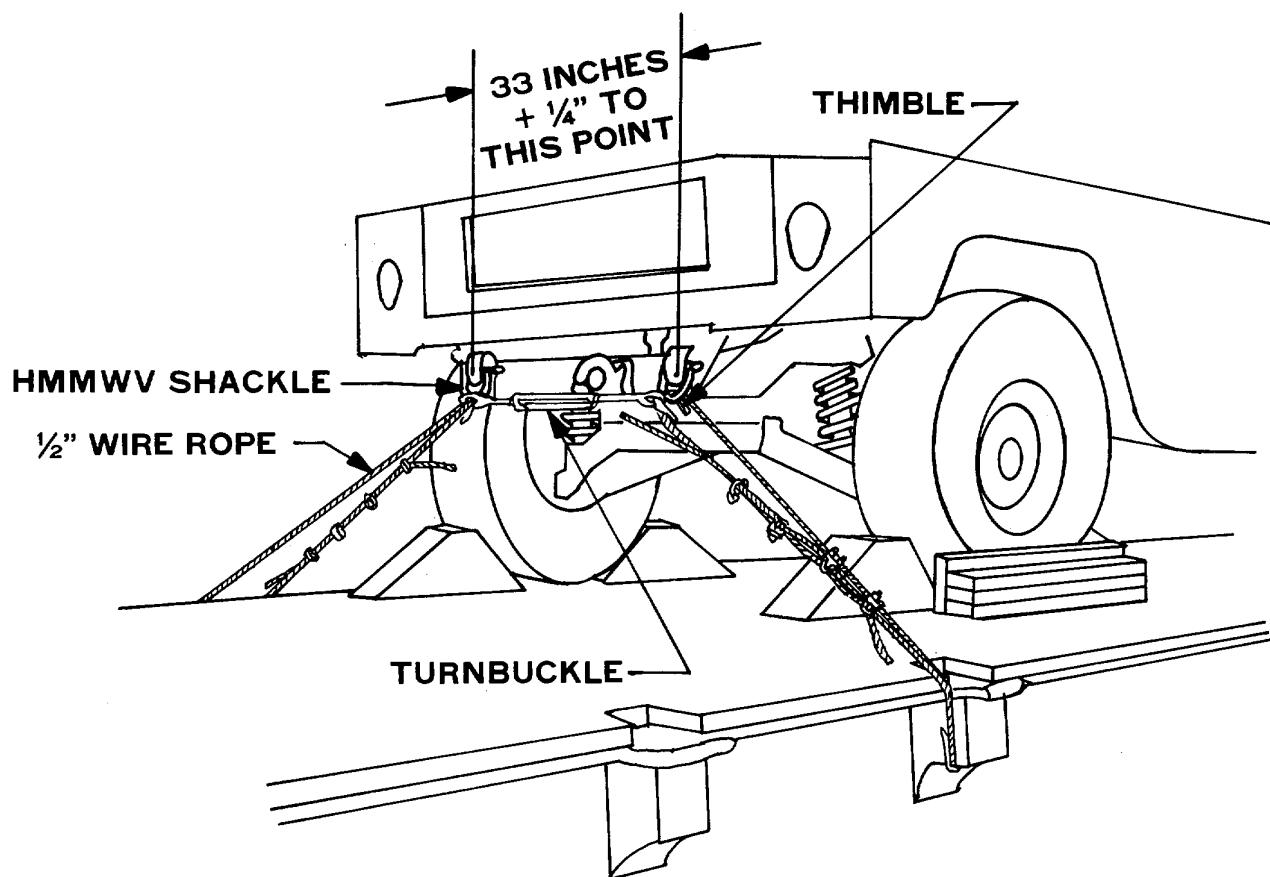
7-6. Blocking and Tiedown of HMMWVs on Wood-Deck Railcar

- a. After the HMMWV is loaded on the flatcar as shown in figures 7-1 and 7-2, it will be blocked and tied down with the materials shown in table 7-1.



NOTE: REDUCE THE NORMAL HEIGHT OF VEHICLE BETWEEN 1 AND 3 INCHES PRIOR TO TIEDOWN (SEE STEP 1, PARA C)

Figure 7-1. Tiedown of HMMWV on wood-deck car (front view).



NOTE: REDUCE THE NORMAL HEIGHT OF VEHICLE BETWEEN 1 AND 3 INCHES PRIOR TO TIEDOWN (SEE STEP 1, PARA C)

Figure 7-2. Tiedown of HMMWV on wood-deck car (rear view).

b. Blocking of the HMMWVs will be as follows:

(1) Step 1. Fabricate eight wheel blocks in accordance with block pattern 16 in figure 7-3. Locate the 45-degree end of the blocks against the front and rear of each wheel. Nail the heel of blocks to the railcar floor with three 40d nails. Toenail ends touching the tires to the railcar floor with two 40d nails.

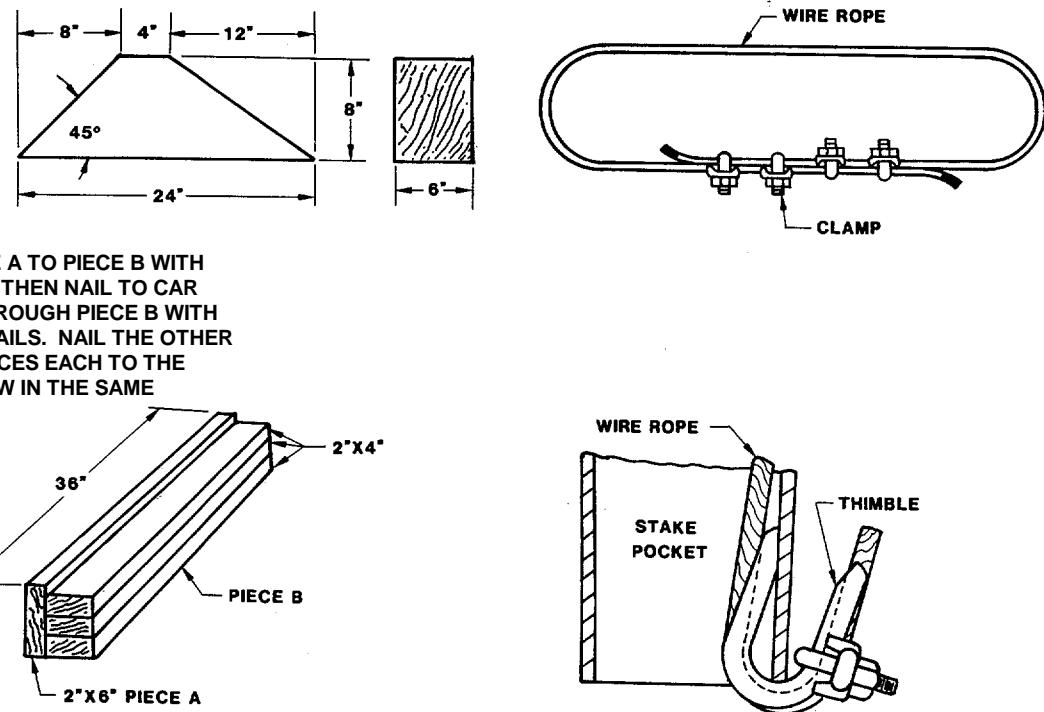


Figure 7-3. Blocking, bracing and tiedown material for standard flatcar.

Table 7-1. Materials Required to Ship HMMWV on Wood-Deck Flatcar

Item	Description	Approximate quantity
Lumber.....	Douglas-fir, or equivalent; straight-grain, free of material defects; Fed Spec MM-L-751c:	
	2 x 4 x 36 in	12
	2 x 6 x 26 in	4
	6 x 8 x 24 in	8
Nails.....	Common, steel; flathead; bright or cement-coated, table X1-b, Fed Spec FF-N-105a:	
	12d	80
	40d	64
Wire rope	6 x 19, IWRC; improved plow steel; preformed, regular-lay; table X, Fed Spec RR-W-140C; 1/2-inch	52 feet.
Clamps.....	Wire rope, U-bolt clamps, saddled, single-grip, steel, Crosby heavy-duty, or equal; Fed Spec FF-C-450c, 1/2-in. dia..	24
Thimbles	Standard, open-type, 1/2-in.	8
Turnbuckles.....	Standard type, FSN 5340-01-121-1961, 3/4 x 12 in.	2
Cushioning material.	Waterproof paper, burlap, or suitable material	As required.
Come-along.....	Tool, tensioning device, mechanical	1

(2) Step 2. Fabricate four tire sidewall blocks in accordance with blocking pattern 89 in figure 7-3. Place cushioning material between tire and sidewall block and between railcar floor and sidewall block. Follow the instruction in figure 7-3 for nailing sidewall blocks to railcar.

c. Tiedown of the HMMWVs will be as follows:

NOTE

This procedure is unusual, and compared to more traditional methods, will require more time and material.

(1) *Step 1.* Using a tensioning device (come-along), tighten tiedown cable until the vehicle height is reduced between 1 and 3 inches front and rear. Measure the height at approximately the same points on the left and right sides of the vehicle to ensure consistent height reduction. Do only one corner at a time. See figures 7-1 and 7-2.

(2) *Step 2.* Install wire rope tiedowns to tiedown shackles and to the stake pockets. Use metal filler or thimbles sufficient to provide a suitable radius to protect the wire rope at the stake pockets and at the vehicle tiedown shackles. Use clamp to prevent dislodgement, as shown in figure 7-3. Install cable clamps as shown in figure 7-3. Manually tighten wire rope U-bolt clamp nuts to 65 foot-pounds. Make wire rope as tight as possible. Once installed, remove come-along. Repeat steps 1 and 2 for the remaining three corners.

(3) *Step 3.* After all tiedowns are installed, check them for uniform tension by measuring the distances between the left and right sides of the bumpers to the railcar floor. Readjust tightness of the tiedowns as required. Verify that the horizontal turnbuckles are dimensional at 33 inches + 1/4 inch.

NOTE

After the vehicle is tied down and blocked, apply the parking brake and place the transmission select lever in N (neutral) position. Wire-tie or block parking brake and transmission select lever.

7-7. Loading of HMMWVs on Steel-Deck Flatcars With Center Tiedowns

a. The HMMWVs can be placed in the tiedown position on the railcar by crane, or they can be driven or towed onto a railcar provided a suitable ramp or bridge is available.

b. A HMMWV loaded on a railcar equipped with a center tiedown is shown in figure 7-4. The application of chain tiedowns as well as general instructions for securing vehicles on flatcars with center tiedowns are provided in table 7-2.

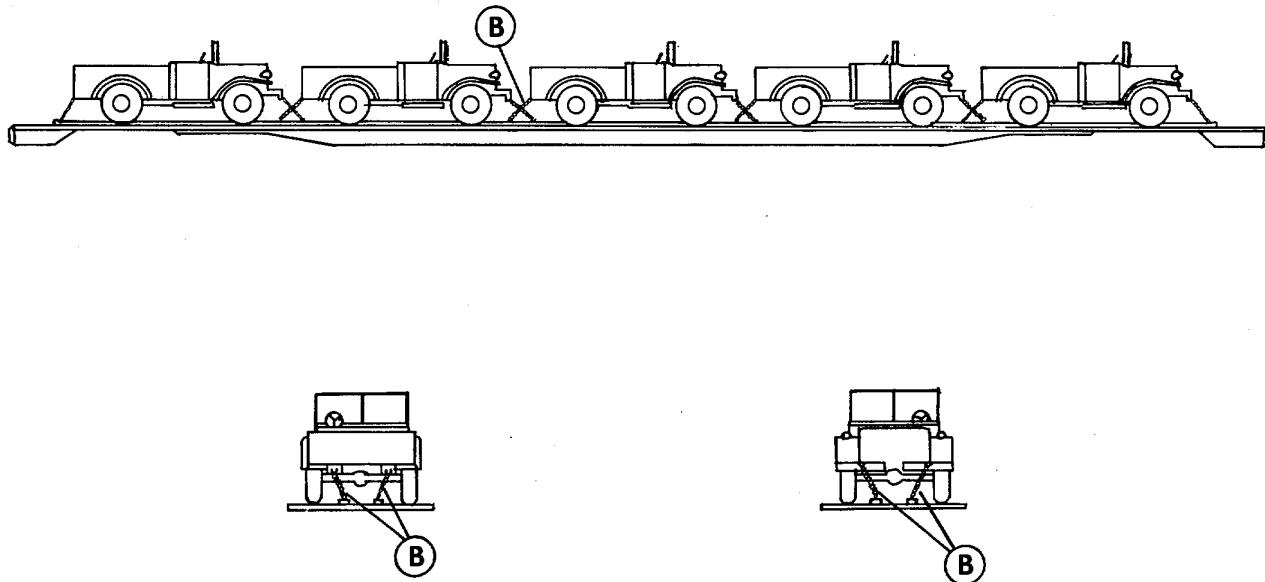


Figure 7-4. HMMWV loaded on steel-deck flatcar with center tiedowns.

Table 7-2. Application of Chain Tiedowns for Securing HMMWV on Flatcars Equipped with Center Tiedown Rails (Figure 7-4)

Item	No. Required	Application
A	NA	Brake wheel clearance. Minimum clearance required is 6 inches above, behind, and on both sides and 4 inches underneath the wheel.
B	4 ea	Alloy steel chain, extra-strength, 3/8-inch diameter, proof-tested to at least 18,000 pounds, or use alloy steel chain, 1/2-inch diameter either proof-tested to at least 22,500 pounds or extra-strength proof-tested to at least 27,500 pounds. Attach one chain tiedown to each tiedown shackle in front and rear.

General instructions

1. Shippers should specify cars equipped with tiedown devices in the quantity and strength as shown in item B when ordering specialized railway equipment. When carriers furnish cars that do not have built-in chains and tensioning devices, chains shown in item B will be used for securement of vehicles. Tiedown chains must be checked for twisted or kinked links before they are applied to the vehicle.
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. Tiedowns should be applied from the vehicle shackle to the car tiedown facility. The angle of the tiedown should be as close as possible to 45 degrees. When the length of vehicles loaded on a 75-, 85-, or 89-foot railcar precludes facing all vehicles in the same direction, one vehicle may be reversed to ensure application of tiedowns at a floor angle of 45 degrees.
3. Parking brakes must be set and wire-tied or blocked.
4. 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 the vehicle must not be exceeded and the proper size and number of tiedowns must be used to secure the vehicles to the railcar.

7-8. Loading of HMMWVs on Bilevel Railcars (Fig. 7-5)

a. Five HMMWVs can be loaded on each deck of either an 85- or 89-foot bilevel railcar. Chain tiedowns are provided with the railcar. A space of 10 inches should be provided between the vehicles when loaded.

b. Bilevel railcars that meet the following criteria can transport the HMMWVs: a width of 109 inches between columns, a height of 84-1/2 inches on the lower deck and 96 inches on the upper deck, and a total capacity of 40,000 pounds in each level

NOTE

The two ambulances and the trucks with S-250 shelters exceed the height for shipment on either deck of bilevel railcars.

NOTE

When bilevel railcars are used, loading ramps will be needed at the origin and destination. AR 55-357, Terminal Facilities Guide, gives a list of all US 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 portable ramps must be requested with the railcar.

c. The application of chain tiedowns as well as general instructions for securing vehicles on bilevel cars is provided in table 7-3.

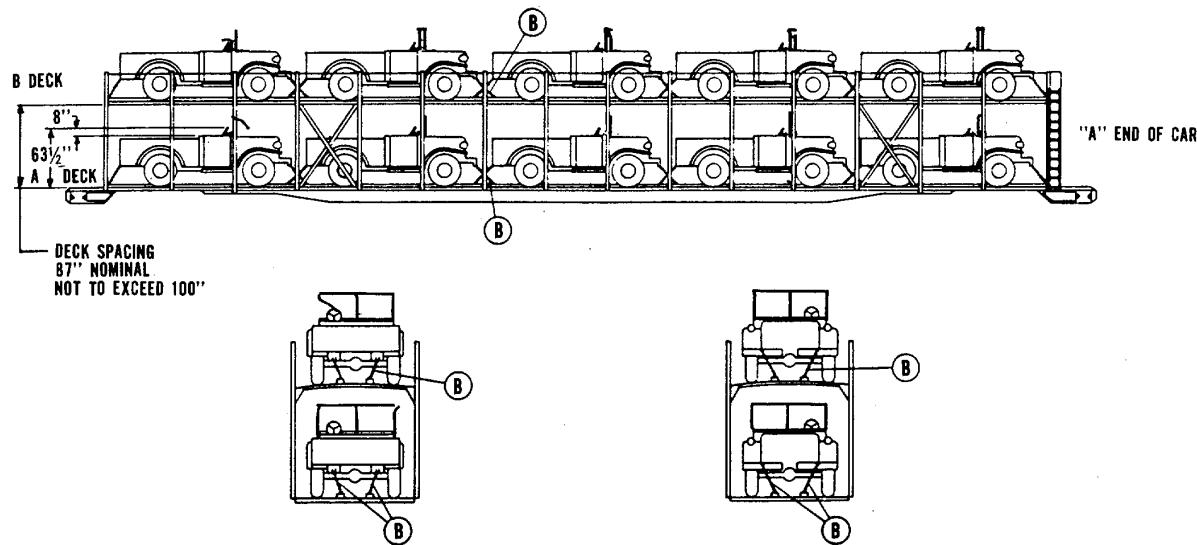


Figure 7-5. Loading of HMMWV on bilevel railcars.

Table 7-3. Application of Chain Tiedowns for Securing HMMWVs on Bilevel Railcars (Fig. 7-5)

Item	No. Required	Application
A	(Not shown)	This car is equipped with a brake lever on the side of the railcar. Laden on the car deck with not interfere with brake lever operations.
B	4 ea	Chain tiedown device, 3/8-inch, proof-tested to a minimum of 18,7000 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 applied with the car.

General Instructions

1. 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 degrees.
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

7-9. General

The transportability guidance contained in this section is applicable to transporting HMMWVs on foreign railways. Consideration is given to single and multiple vehicle movement on the types of railcars normally used for the movement of these vehicles. The vehicle, when loaded on suitable railcars to comply with the Gabarit International de Chargement (GIC) (formerly Passe-Partout International (PPI)) railway gauge, can be transported without restriction within 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.

7-10. Transport on Foreign-Service Flatcars

a. *General.* The vehicle can be transported on a number of foreign railcars.

b. *Materials.* The materials required for blocking and tiedown of the HMMWV are essentially the same as those used in CONUS. For general reference, refer to figures 7-1 through 7-5. Guidance for loading the HMMWVs on foreign railcars can be obtained from the Cdr, 1st Transportation Movement Control Agency, ATTN: AEUTR-MCA-TA, Oberursel, Germany.

APPENDIX

CONVERSION TABLES

1. Common Metric Abbreviations.

m = meter
dm = decimeter
cm = centimeter
mm = millimeter
kg = kilogram
km = kilometer
MT = metric ton

2. Linear Measure.

1 mi = 1609.35 m
1 yd = 0.9144 m
1 ft = 0.3048 m
1 in = 0.0254 m
1 m = 10 dm = 100 cm = 1000 mm
1 km = 0.6214 mi
1 m = 1.0936 yd
1 m = 3.2808 ft
1 m = 39.3700 in.

3. Surface Measure.

1 yd² = 0.8361 m²
1 ft² = 0.0929 m²
1 in² = 0.00065 m²
1 m² = 1.196 yd²
1 m² = 10.764 ft²
1 m² = 1.550 in²

4. Cubic Measure.

1 yd³ = 0.76455 m³
1 ft³ = 0.02831 m³
1 in³ = 0.000016 m³
1 m³ = 1.31 yd³
1 m³ = 35.30 ft³
1 m³ = 61,023 in³

5. Weight.

1 STON = 907.185 kg
1 lb = 0.45359 kg
1 kg = 2.2046 lb
1 MT = 1000 kg
1 MT = 2,204.62 lb

6. The following simplified conversion factors are accurate to within 2 percent for quick computations:

a. *Inches to centimeters* - Multiply in. by 10 and divide by 4.

- b. *Yards to meters* - Multiply yd by 9 and divide by 10.
- c. *Miles to kilometers* - Multiply mi by 8 and divide by 5.
- d. *Pounds to kilograms* - Multiply lb by 5 and divide by 11.

Paragraph 7-37, FM 55-15, and paragraph 2-15, TM 55-450-15, contain additional detailed conversion factors.

7. The following conversions are provided for guidance when procuring lumber, wire rope, or wire in areas that use the metric system. Lumber sizes are rounded off to nearest 1/2 cm.

a. *Lumber.*

2-in. x 4-in. x desired length = 5-cm x 1-cm x desired length

1-in. x 6-in. x desired length = 2.5-cm x 1-cm x desired length

1-in. x 12-in. x desired length = 2.5-cm x 30-cm x desired length (length normally expressed in ft or m)

b. *Wire rope.*

3/8-in. dia = 9.5-mm dia

1/2-in. dia = 12.7-mm dia

5/8-in. dia = 15.8-mm dia

3/4-in. dia = 19.0-mm dia

7/8-in. dia = 22.2-mm dia

1-in. dia = 25.4-mm dia

1-1/4-in. dia = 31.7-mm dia

1-1/2-in. dia = 38.1-mm dia

Round off to next higher whole mm of available wire rope sizes.

c. *Wire.* No. 8 gauge annealed (11/64-in. dia) = 4.37-mm dia. Round off as in b above.

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