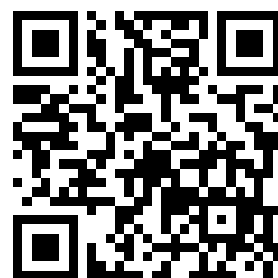


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TECHNICAL MANUAL

**TRANSPORTABILITY GUIDANCE**  
**TANK, COMBAT, FULL-TRACKED,**  
**105-MM GUN, M1**  
**120-MM GUN, M1E1**  
**(GENERAL ABRAMS)**

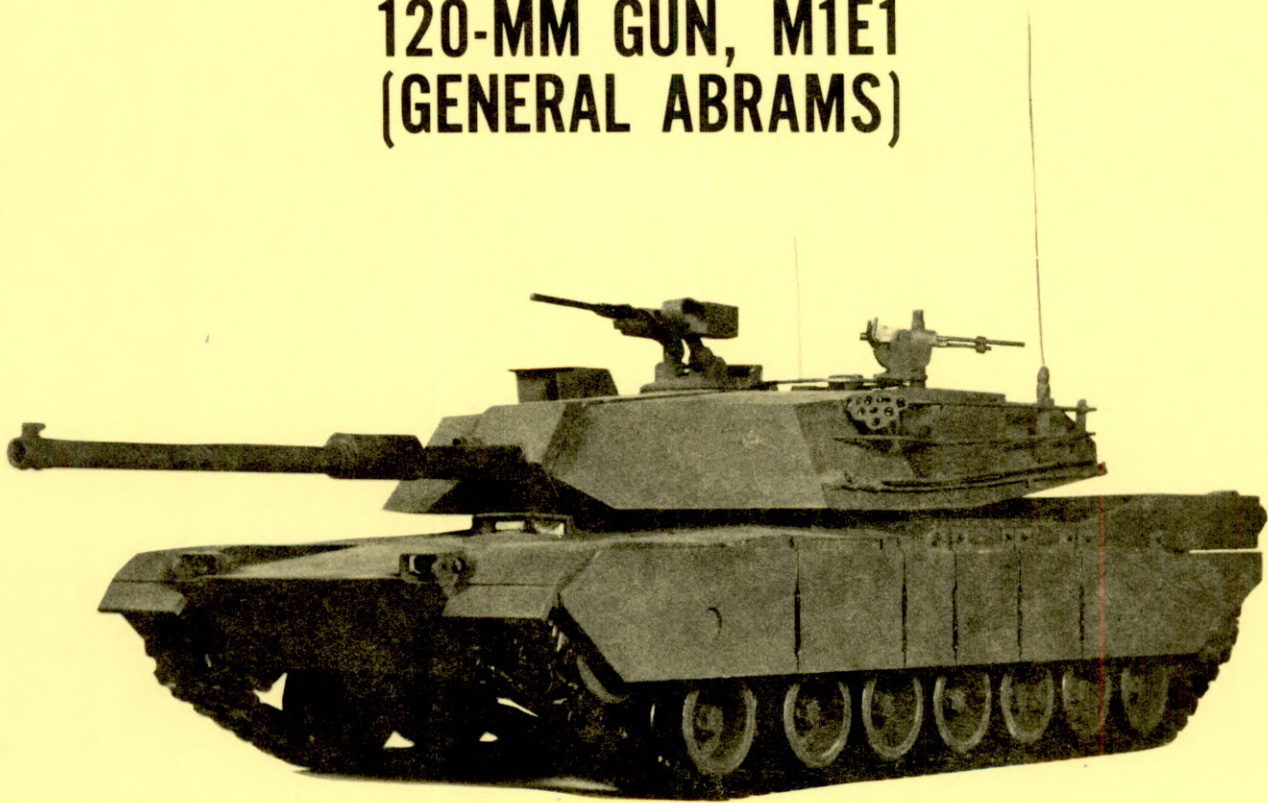




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**(GENERAL ABRAMS)**



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HEADQUARTERS, DEPARTMENT OF THE ARMY  
18 APRIL 1984





TECHNICAL MANUAL }  
 No. 55-2350-255-14 }

HEADQUARTERS  
 DEPARTMENT OF THE ARMY  
 WASHINGTON, DC 20315, 18 April 1984

TRANSPORTABILITY GUIDANCE, TANK, COMBAT, FULL-TRACKED M1-SERIES

**M1 (2350-01-061-2445) 105-MM GUN**  
**M1E1 (2350-01-087-1095) 120-MM GUN**

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\* This technical manual supersedes TM 55-2350-255-14, 1 April 1982.

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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 tank, combat, full-tracked, M1-series. It contains information considered appropriate for safe transport of the item. Also included are significant technical and physical characteristics as well as safety considerations required for worldwide movement by the various transportation modes. Where considered necessary, metric equivalents are given in parentheses following the dimension or other measurement.

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

#### 1-2. Safety

Appropriate precautionary measures required during movement of the item 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 which, if not followed, could result in injury to or death of personnel.

*b. Caution.* Instructions which, 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, condition, and so forth.

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

Individual users of this manual are encouraged to report errors and omissions and to make recommendations for improving it. Reports 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-TRC, PO Box 6276, Newport News, VA 23606. (Electrically transmitted messages should be addressed to CDR MTMCTEA FT EUSTIS VA//MTT-TRC//.) A reply will be furnished by this command.





## CHAPTER 2

### TRANSPORTABILITY DATA

#### Section I. GENERAL

##### 2-1. Scope

This chapter provides a general description and identification photographs of the M1-series tank, as well as tabulated transportability characteristics that are necessary in movement of the item.

##### 2-2. Description

*a. General.* The M1-series tanks are full-tracked-laying, heavily armored, combat vehicles operated by a four-person crew: driver, gunner, loader, and tank commander. The vehicles are powered by a 1500-horsepower turbine engine driving an automatic transmission that includes differential steering and braking functions. Transmission output is through identical left and right final drives to the track drive hub and sprocket assemblies. The suspension system, with seven roadarms per side, is torsion-bar sprung and hydraulically dampened.

*b. M1* (fig 2-1). The M1 armament includes a 105-mm gun mounted in a traversable turret, a 7.62-mm machinegun coaxially mounted on the right side of the gun mount, a 7.62-mm machinegun

skate mounted and traversable around the outer edge of the loader's hatch, and a .50-caliber machinegun externally mounted at the commander's weapon station.

*c. M1E1* (fig 2-2). The M1E1 armament includes a 120-mm mounted in a traversable turret, a 7.62-mm machinegun coaxially mounted on the right side of the gun mount, a 7.62-mm machinegun skate mounted and traversable around the outer edge of the loader's hatch, and a .50-caliber machinegun externally mounted at the commander's weapon station.

##### 2-3. Transportability Drawings

Detailed side- and end-elevation transportability drawings of the M1-series tanks, with dimensions and tiedown and lift provision load-rating capacities, are shown in figures 2-3 through 2-7. Removal of the gun tube as shown in figure 2-7 is used for depot shipment and is not desirable for unit or logistical movements.

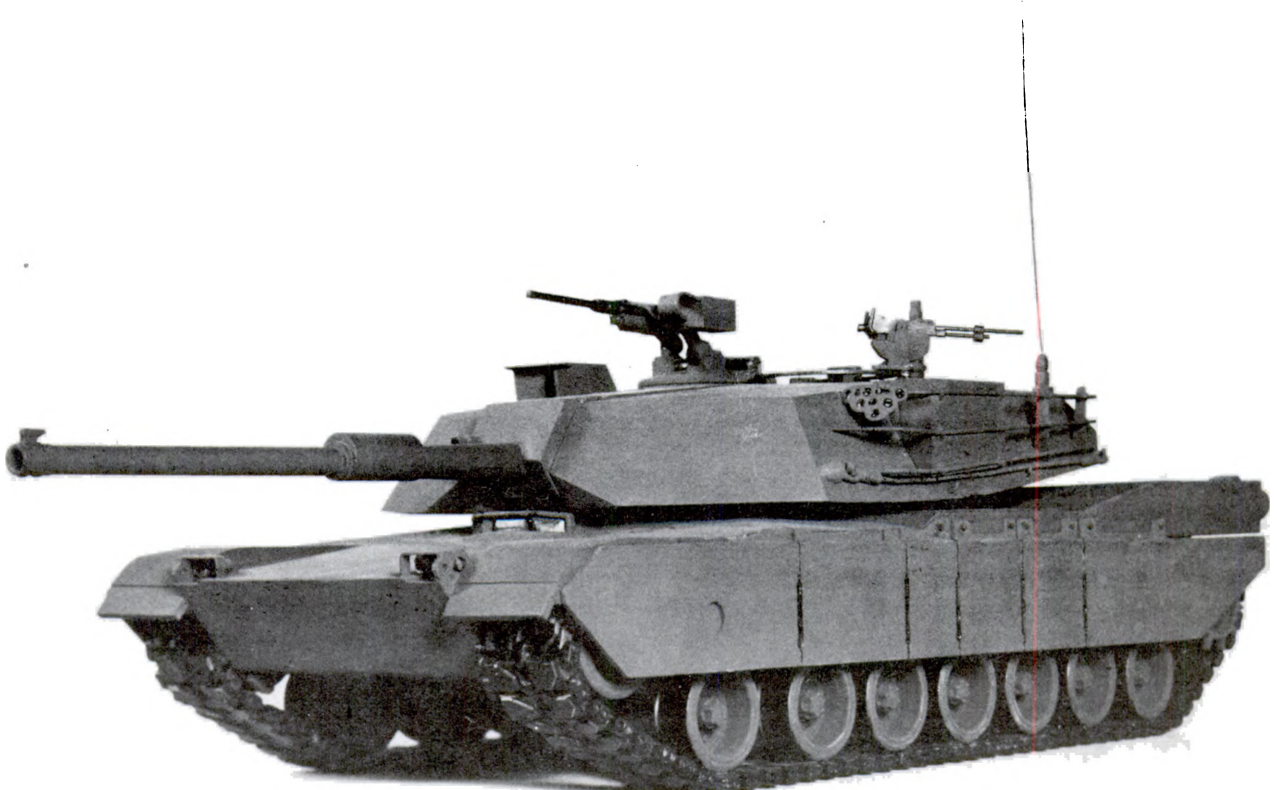


Figure 2-1. Tank, combat, full-tracked, 105-mm gun, M1.



Figure 2-2. Tank, combat, full-tracked, 120-mm, gun, M1E1.

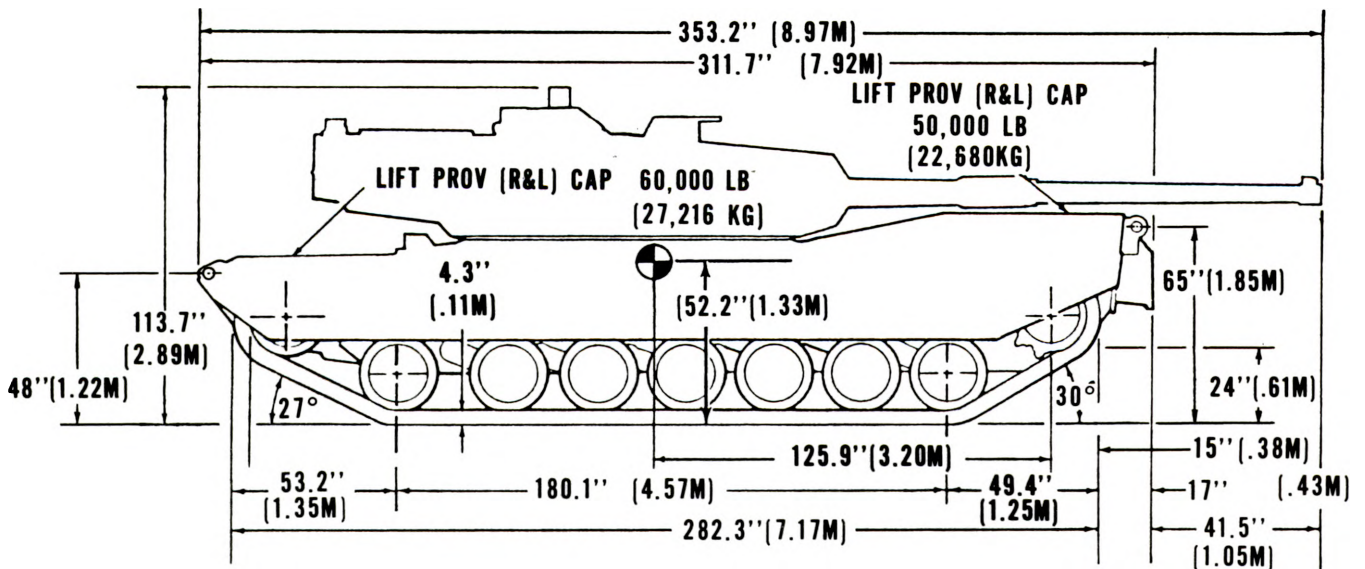


Figure 2-3. Transportability drawing, left-side elevation, M1 tank.

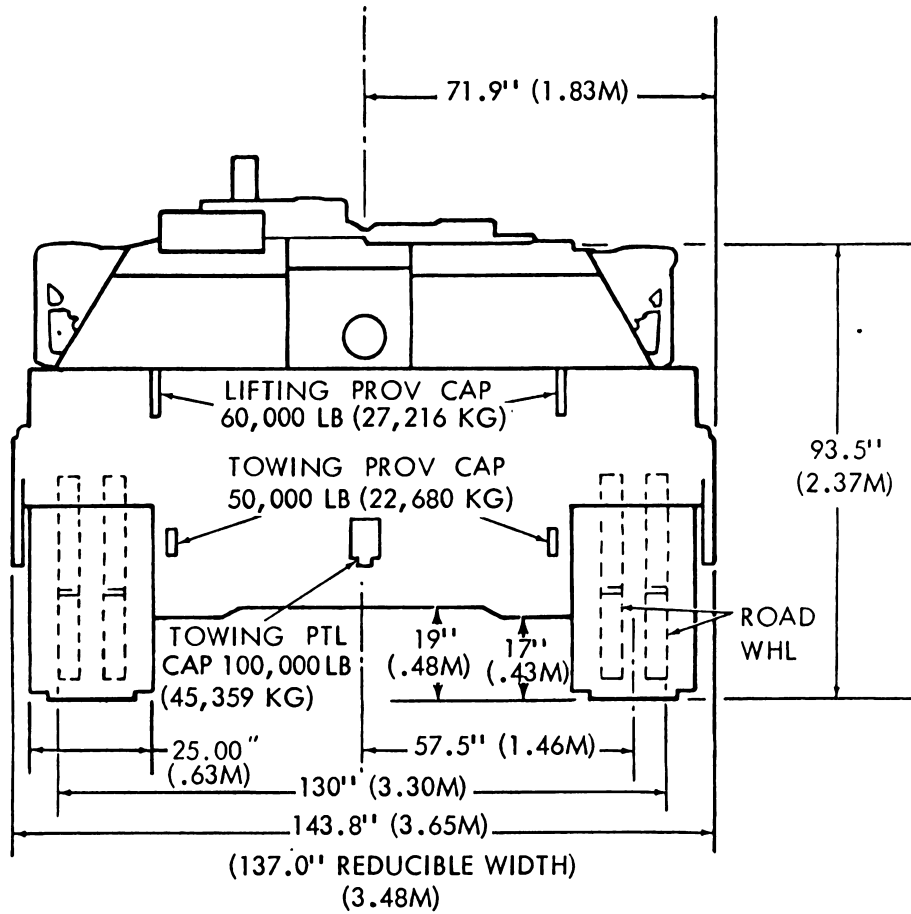


Figure 2-4. Transportability drawing, rear-end elevation, M1 tank.

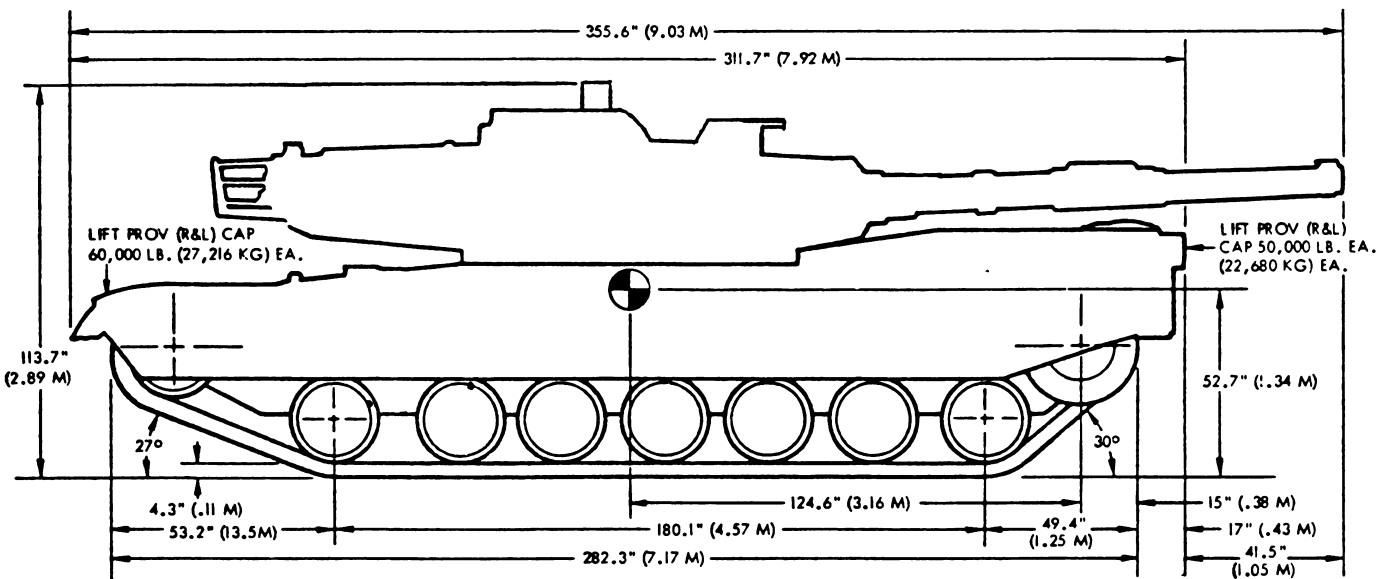


Figure 2-5. Transportability drawing, left-side elevation, M1E1 tank.

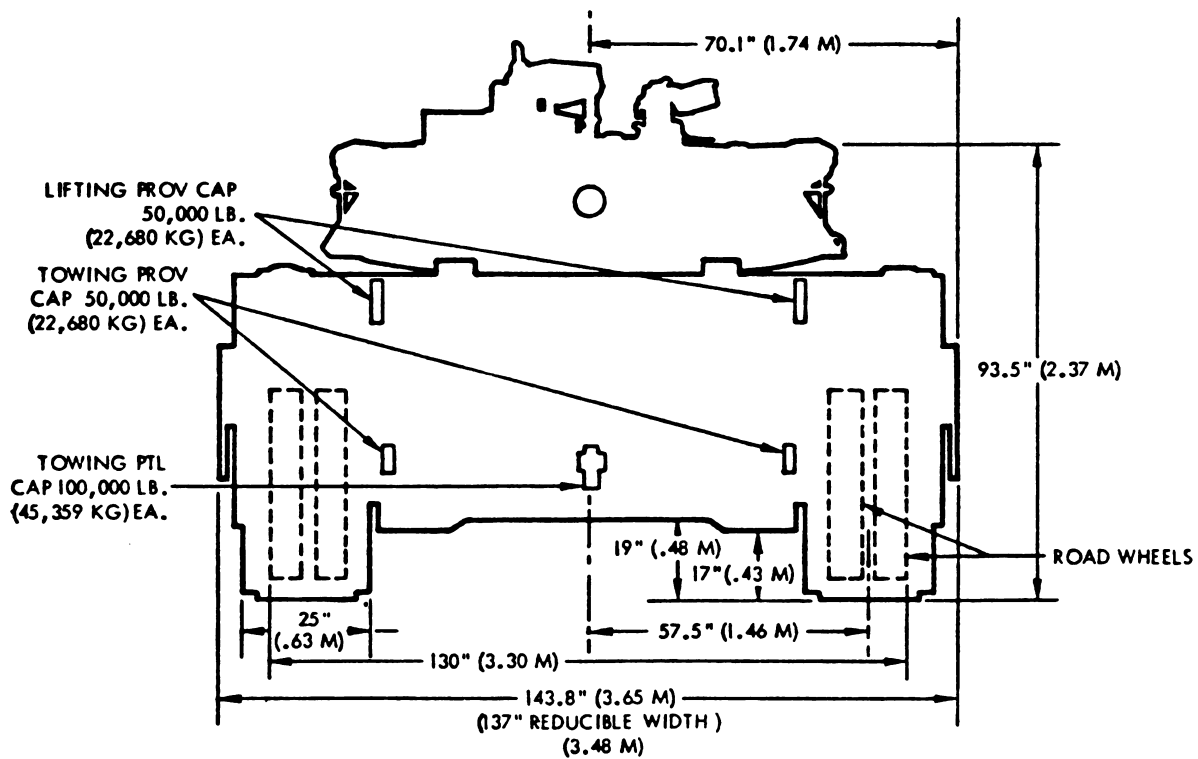


Figure 2-6. Transportability drawing, rear-end elevation, M1E1 tank.

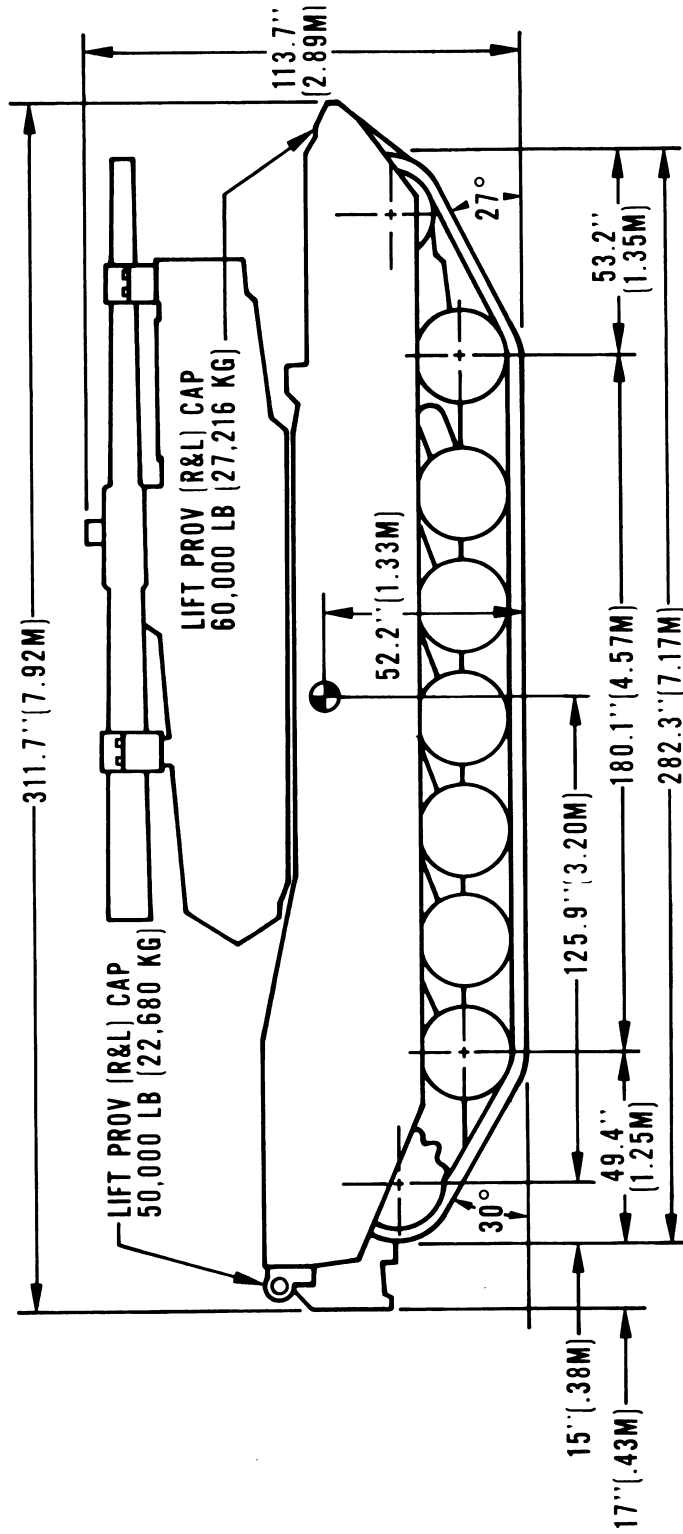


Figure 2-7. Transportability drawing, left-sided elevation, M1-series tank with gun tube removed and stowed on the turret.

Section II. CHARACTERISTICS AND RELATED DATA

2-4. General Transportability Characteristics

Data contained herein are applicable to model number or national stock number (NSN) shown.

Changes in model number or NSN may affect the loadability of the item as related to the guidance shown in this manual.

a. Tank, Combat, Full-tracked, 105-mm Gun, M1.

National stock number .....	2350-01-061-2445
Line item number .....	T13374
Ground pressure:	
Unloaded (curb weight) .....	12.2 psi (.86 kg/cm <sup>2</sup> )
Loaded, combat .....	13.1 psi (.92 kg/cm <sup>2</sup> )
Ground contact area, pad/grouser .....	20.7 ft <sup>2</sup> (1.92 m <sup>2</sup> )
Track type .....	78 steel, rubber-bushed, pin-link shoes
Size .....	25 in. (.63 m)
Pitch .....	7.62 in. (.19 m)
Grouser wear height .....	1.19 in. (.03 m)
Axleload .....	(Not applicable; see chapter 5, section II for axleloads on transporter.)

Performance

Maximum speed (fourth range) .....	45 mph (72.4 km/hr)
Maximum speed (reverse) .....	24 mph (38.6 km/hr)
Maximum grade .....	60 percent
Maximum range at 25 mph .....	275-295 miles (442.8-475.0 km)
Fuel tank capacity .....	492 (usable) US gal (1863.6 liters)
Turning radius .....	Pivot
Angel of approach .....	27°
Angle of departure .....	30°
Ground clearance .....	19 in. (.48 m) center portion 17 in. (.43 m) other portions

Dimensions and shipping data:

Length, operational .....	384.5 in. (9.77 m)
With gun tube in travel position .....	353.2 in. (8.97 m)
Reduced, with gun tube removed .....	311.7 in (7.92 m)
Width, operational .....	143.8 in. (3.65 m)
Reduced, with skirts and mudguards re-	
moved .....	137 in. (3.48 m)
Height, operational .....	113.7 in. (2.89 m)
Reduced, with external machineguns and	
mounts removed .....	103.5 in. (2.63 m)
Area, operational .....	384 ft <sup>2</sup> (35.67 m <sup>2</sup> )
With gun in travel position .....	352.7 ft <sup>2</sup> (32.77 m <sup>2</sup> )
Reduced, with gun tube removed .....	311.2 ft <sup>2</sup> (28.91 m <sup>2</sup> )
Cube, operational .....	3,635.5 ft <sup>3</sup> (102.96 m <sup>3</sup> )
With gun tube in travel position .....	3,339.4 ft <sup>3</sup> (94.57 m <sup>3</sup> )
Reduced, with gun tube, machineguns with	
mounts, mudguards, and skirts removed ...	2,557.5 ft <sup>3</sup> (72.43 m <sup>3</sup> )

Center of gravity:

Aboveground .....	52.2 in. (1.33 m)
From centerline of drive sprocket .....	125.9 in. (3.20 m)

Weights:

Shipping (less crew, ammo, and fuel) .....	113,900 lb (51,665 kg)
With combat load .....	120,000 lb (54,432 kg)

b. Tank, Combat, Full-Tracked, 120-mm Gun, M1E1.

National stock number .....	2350-01-087-1095
Line item number .....	Z77257

<b>Ground pressure:</b>	
Unloaded (curb weight) .....	12.9 psi (.91 kg/cm <sup>2</sup> )
Loaded, combat .....	13.7 psi (.97 kg/cm <sup>2</sup> )
Ground contact area, pad/grouser .....	20.7 sq ft (1.92 m <sup>2</sup> )
<b>Track type</b> .....	78 steel, rubber-bushed, pin-link shoes
Size .....	25 in. (.63 m)
Pitch .....	7.62 in. (.19 m)
Grouser wear height .....	1.19 in. (.03 m)
<b>Axleload</b> .....	(Not applicable; see chapter 5, section II for axleloads on transporter.)
<b>Performance</b>	
Maximum speed (fourth range) .....	45 mph (72.4 km/hr)
Maximum speed (reverse) .....	24 mph (38.6 km/hr)
Maximum grade .....	60 percent
Maximum range at 25 mph .....	273-298 miles (440-480 km)
Fuel tank capacity .....	505.3 gal (1912.5 liters)
<b>Turning radius</b> .....	Pivot
Angle of approach .....	27°
Angle of departure .....	30°
<b>Ground clearance</b> .....	19 in. (.48 m) center portion 17 in. (.43 m) other portions
<b>Dimensions and shipping data:</b>	
Length, operational .....	386.9 in. (9.83 m)
With gun tube in travel position .....	355.6 in. (9.03 m)
Reduced, with gun tube removed .....	311.7 in. (7.92 m)
Width, operational .....	143.8 in. (3.65 m)
Reduced, with skirts and mudguards removed	137 in. (3.48 m)
<b>Height, operational</b> .....	113.6 in. (2.89)
Reduced, with external machineguns and mounts removed .....	103.5 in. (2.63 m)
<b>Area, operational</b> .....	386.4 ft <sup>2</sup> (35.91 m <sup>2</sup> )
With gun in travel position .....	355.1 ft <sup>2</sup> (33.00 m <sup>2</sup> )
Reduced, with gun tube removed .....	311.2 ft <sup>2</sup> (28.91 m <sup>2</sup> )
<b>Cube, operational</b> .....	3657.9 ft <sup>3</sup> (103.59 m <sup>3</sup> )
With gun tube in travel position .....	3361.6 ft <sup>3</sup> (95.20 m <sup>3</sup> )
Reduced, with gun tube, machineguns with mounts, mudguards, and skirts removed ...	2557.5 ft <sup>3</sup> (72.43 m <sup>3</sup> )
<b>Center of gravity:</b>	
Aboveground .....	52.7 in. (1.34 m)
From centerline of drive sprocket .....	125.9 in. (3.20 m)
<b>Weights:</b>	
Shipping (less crew, ammo, and fuel) .....	115,800 lb (52,527 kg)
With combat load .....	122,790 lb (55,697 kg)

**2-5. Unusual Characteristics**

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

**2-6. Hazardous and Dangerous Characteristics**

Unless the vehicle is shipped with ammunition, under the provisions of Department of Transportation

Special Permit No. 3498 (applicable to shipments in periods of actual national emergency), it will not present any special hazardous or dangerous characteristics during its exposure to normal transportation environments.

**NOTE**

Those regulations and/or transportation procedures normally associated with vehicles containing diesel fuel will apply.





## CHAPTER 3

### SAFETY

---

#### 3-1. General

General safety considerations and precautions for movement are as follows:

*a.* Each vehicle must be checked to insure that all loose items are appropriately secured in accordance with applicable regulation (Operators' Manual for Tank, Combat, Full-Tracked: 105-mm Gun, M1, TM 9-2350-255-10-1.

*b.* The vehicle must be driven by qualified drivers only.

*c.* When the vehicle is being driven, the driver's sliding hatch cover must be secured in the fully open or fully closed position.

*d.* Drivers must not leave the driver's station while engine is running.

*e.* If track is thrown while vehicle is in operation, the brakes must not be applied unless absolutely necessary. The vehicle should be allowed to coast to a stop.

*f.* When the vehicle is in motion, it must not be mounted or dismounted.

*g.* Personnel must not ride "on" the vehicle.

*h.* Personnel must not smoke in or on the vehicle or within 50 feet of a refueling area.

*i.* The driver must bring the vehicle to a complete stop before entering or leaving a building.

*j.* Whenever vehicles are being operated in reverse, or within 20 feet of a building or other vehicles, a "ground guide" must be used to direct movement by the driver.

*k.* Personnel must stay clear of the engine exhaust area during and immediately after engine op-

eration. Contact with these areas can cause severe burns.

*l.* The engine must not be operated in an enclosed area without adequate ventilation to provide sufficient air for engine combustion as well as for dissipation of exhaust gases.

*m.* Driver must not exit from his compartment into the turret nor exit through the driver's hatch without assurance that the turret power is OFF and that the turret lock is engaged (fig 3-1).

*n.* When the operator is traversing the gun turret, all personnel must stay clear of vehicle and the area must be clear of obstacles.

*o.* When the commander's weapon station is traversed, the loader's hatch cover must be in the fully open or fully closed position and the turret area must be clear.

#### WARNING

The M13A1 air filter unit will not protect users against carbon monoxide.

*p.* When the tank is to be driven from the open-hatch position, the driver will insure that the turret lock is locked and the gun/turret drive switch is in MANUAL (fig 3-1).

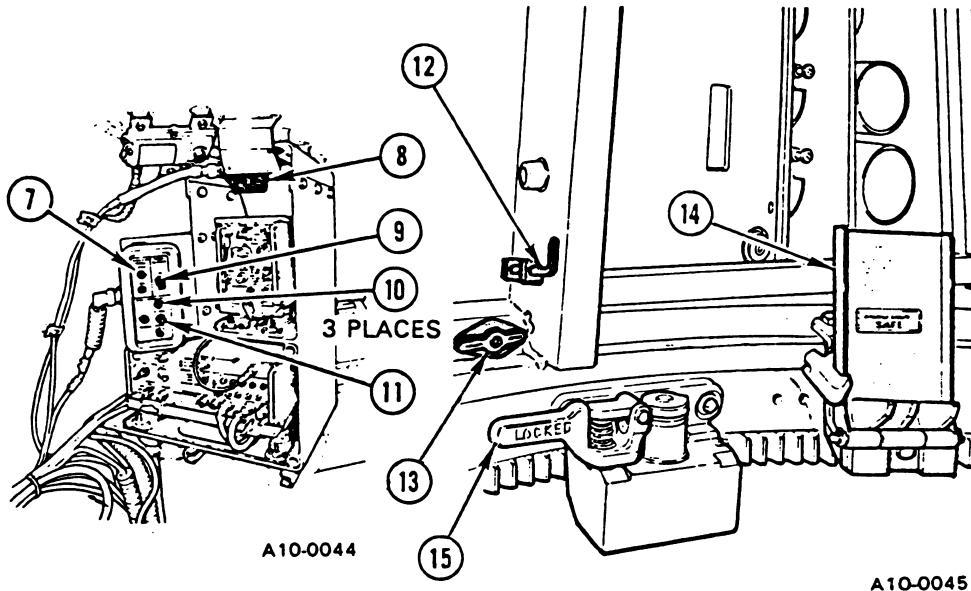
*g.* The gun elevation travel lock must be installed for all modes of transportation (fig 3-2).

#### 3-2. Specific Safety Requirements

Pertinent safety requirements by individual mode can be found, where applicable, in the appropriate chapters.

**CONTROLS AND INDICATORS**

**LOADER'S CONTROLS AND INDICATORS - Continued**



Key	Control or Indicator	Function
7	MAIN GUN STATUS lights	Show armed or safe status of main gun firing circuit.
8	Fire detector sensor	Monitors area for fire.
9	TURRET BLOWER switch	Turns turret vent blower on and off.
10	GUN/TURRET DRIVE lights	Show operating mode of gun/turret drive system.
11	GUN/TURRET DRIVE switch	Sets gun and turret drive system to powered, manual, or elevation uncoupled mode.
12	Ready ammunition door lock	Locks ready ammunition door open for loading ammunition.
13	Semi-Ready ammunition door lock	Locks semi-ready ammunition door closed during normal operation.
14	Loader's knee switch	Opens and closes ready ammunition bustle door (stowed in up position).
15	Turret traverse lock lever	Mechanically locks turret to prevent traversing.

Figure 3-1. Gun/turret drive switch and turret traverse lock lever as shown in TM 99-2350-10-1, M1 Operator's Manual.

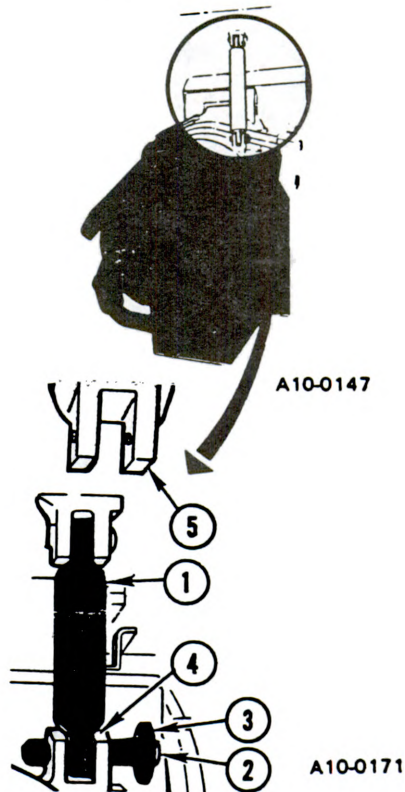
**GUNNER'S STATION**

**OPERATE MAIN GUN ELEVATION TRAVEL LOCK**

A. Set FIRE CONTROL MODE switch on GPS to MANUAL (see 2-19).

B. Do following to unlock main gun elevation travel lock (1):

1. Press and hold button (2) on end of lock pin (3).
2. Take out lock pin (3) from main gun bracket (4).
3. Swing main gun elevation travel lock (1) up into roof bracket (5).
4. Align holes in gun elevation travel lock (1) and roof bracket (5).
5. Put lock pin (3) into roof bracket (5).



C. Do following to lock main gun elevation travel lock (1):

1. Press and hold button (2) on end of lock pin (3).
2. Take out lock pin (3) from roof bracket (5).
3. Swing main gun elevation travel lock (1) down into main gun bracket (4).

**NOTE**

Gunner may have to manually elevate or depress main gun (see 2-189) to help line up holes in main gun elevation travel lock (1) and main gun bracket (4).

4. Line up holes in main gun elevation travel lock (1) and main gun bracket (4).
5. Put lock pin (3) into main gun bracket (4).

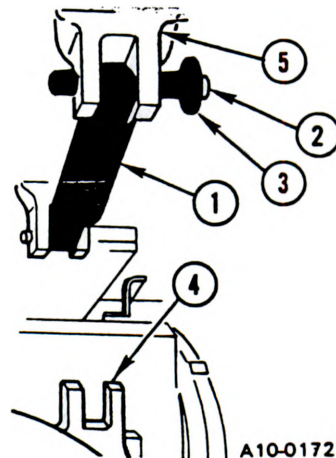


Figure 3-2. Main gun elevation travel lock as shown in TM 9-2350-255-10-1, M1 Operator's Manual.



## CHAPTER 4 AIR TRANSPORTABILITY GUIDANCE

### 4-1. Scope

This chapter provides air transportability guidance for the movement of the tank, combat, full-tracked, 105-mm gun, M1 and 120-mm gun, M1E1. It covers technical and physical characteristics and safety considerations and prescribes the manpower, materials, and time required to prepare, load, and tie down the vehicle on, or unload the vehicle from US Air Force cargo aircraft.

### 4-2. Maximum Utilization of Aircraft

The loads described in this section are not maximum loads. General guidance on total cargo loads and operating ranges is provided in TM 38-236/AFP 71-8. Additional cargo and/or personnel within allowable load limits and restrictions, prescribed by pertinent safety regulations, can be transported.

### 4-3. Applicability

*a. US Air Force Aircraft.* The M1-series tank is transportable only in the C-5 aircraft. Procedures in this manual and those prescribed by section VID, TO 1C-5A-9 are applicable.

*b. Tiedown Devices.* This vehicle is tied down in accordance with the respective figures and table.

The vehicle tiedown pattern is shown in figure 4-1. Listed in table 4-1 are the tiedown devices required, the location of the tiedown points on the vehicle, the corresponding fittings to which the devices are secured, the number and capacity of devices, and the lumber shoring required for loading and/or securement. The minimum acceptable restraint factors (g loads) are identified in TO 1C-5A-9.

*c. Aircraft Commander Responsibilities.* The aircraft commander or his representative will insure that the vehicle is secured in accordance with restraint criteria outlined in TO 1C-5A-9.

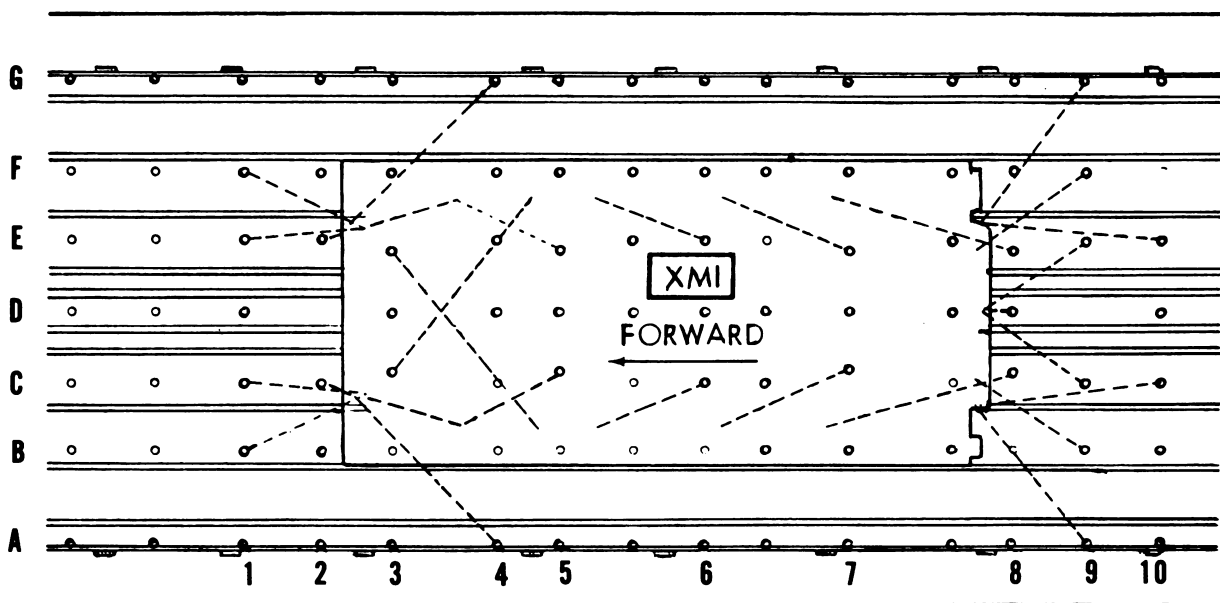
### 4-4. Safety

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

*a.* The activity offering the vehicles for air transport must notify the aircraft commander or his designated representative when ammunition or explosives are to be transported within the vehicle and that all hazardous components have been prepared for shipment in accordance with TM 38-250.

*b.* The vehicle fuel tanks must not be more than three-fourths full.

*c.* The vehicle must be tied down in accordance



**ALL CARGO TIEDOWN FITTING - RATING 25,000 LB EACH.**

*Figure 4-1. Typical tiedown diagram for M1-series tank in US Air Force C-5 aircraft*

with procedures in this manual and TO 1C-5A-9.

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

e. Antennas must be tied down or removed.

f. Windsensor must be folded down.

**WARNING**

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

**WARNING**

Proper ventilation must be provided when loading and unloading. Prolonged exposure to carbon monoxide fumes may be fatal.

**NOTE**

Headlights must be removed to adapt clevis to lifting provision.

**CAUTION**

Vehicle must not exceed 3 miles per hour inside aircraft or on the loading ramps.

**4-5. Preparation of Vehicle**

a. Turret traverse and gun-elevating mechanism must be in travel position and locked to prevent rotation (figs 3-1 and 3-2).

b. Antennas must be tied down or removed, hatches must be in closed position, and loose gear must be secured with nylon cord or suitable substitute.

c. External machineguns must be removed and secured in the locations provided.

**4-6. Transport of M1-Series Tank by US Air Force C-5 Aircraft**

a. *Materials.* When track pads are worn to the extent that deflection of the pads will cause the metal grousers of the track to contact the aircraft ramps or floor during loading or flight, rolling and parking shoring will be used.

b. *Loading.*

(1) Ammunition boxes and grenades must be secure.

**WARNING**

TM 38-250 (AFR 71-4) will be consulted to insure compatibility of any additional cargo being considered for loading with the vehicle.

(2) All externally and internally stowed equipment must be secure.

(3) Vehicle must be positioned as indicated in figure 4-1.

(4) The vehicle transmission must be placed in neutral and brakes must be set.

(5) For acceptable restraint, the vehicle must be tied down in accordance with the pattern shown in figure 4-1 and the data given in table 4-1.

c. *Time required.* Four persons can prepare, load, and tie down the vehicle in approximately 45 minutes.

d. *Unloading.* Three persons can remove restraint and unload the vehicle in approximately 15 minutes.

**4-7. Internal and External Transport by US Army Aircraft**

The M1 tank exceeds the size and weight for either internal or external transport by US Army fixed-wing aircraft or helicopters.

Table 4-1. Tiedown Data for M1-Series Tank in US Air Force C-5 Aircraft

Designation	Tiedown Fitting	Type	Tiedown Device	Attach to Item
	Capacity in 1,000 lb		Capacity in 1,000 lb	
B1	25	MB-2	25	Left front tiedown provision.
C1	25	MB-2	25	Left front tiedown provision.
E1	25	MB-2	25	Right front tiedown provision.
F1	25	MB-2	25	Right front tiedown provision.
C2	25	MB-2	25	No. 1 left road wheel arm.
E2	25	MB-2	25	No. 1 right road wheel arm.
C3	25	MB-2	25	No. 2 left road wheel arm.
E3	25	MB-2	25	No. 2 right road wheel arm.
A4	25	MB-2	25	Left front lifting provision.
G4	25	MB-2	25	Right front lifting provision.
C5	25	MB-2	25	No. 1 left road wheel arm.
E5	25	MB-2	25	No. 1 right road wheel arm.
C6	25	MB-2	25	No. 3 left road wheel arm.
E6	25	MB-2	25	No. 3 right road wheel arm.
C7	25	MB-2	25	No. 5 left road wheel arm.
E7	25	MB-2	25	No. 5 right road wheel arm.
C8	25	MB-2	25	No. 7 left road wheel arm.
D8	25	MB-2	25	Towing pintle.
E8	25	MB-2	25	No. 7 right road wheel arm.

Designation	<i>Tiedown Fitting</i>	<i>Tiedown Device</i>		Attach to Item
	Capacity in 1,000 lb	Type	Capacity in 1,000 lb	
A9	25	MB-2	25	Left rear lifting provision.
B9	25	MB-2	25	Left rear tiedown provision.
C9	25	MB-2	25	Towing pintle.
E9	25	MB-2	25	Towing pintle.
F9	25	MB-2	25	Right rear tiedown provision.
G9	25	MB-2	25	Right rear lifting provision.
C10	25	MB-2	25	Left rear lifting provision.
E10	25	MB-2	25	Right rear lifting provision.





## CHAPTER 5 HIGHWAY TRANSPORTABILITY GUIDANCE

### Section I. GENERAL

#### 5-1. Scope.

This chapter provides highway transportability guidance for movement of the M1-series tanks. It covers technical and physical characteristics and safety considerations and prescribes the materials and guidance required to prepare, load, tie down, and unload the vehicle.

#### 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. Overseas, such movements are governed by theater regulations.

#### CAUTION

Vehicles must not exceed 3 miles per hour during loading or unloading.

### Section II. TRANSPORT BY SEMITRAILER

#### 5-4. Transport of M1-Series Tank by Semitrailer

When loaded on semitrailers, the M1-series tank can be transported over highways; however, movement over public highways in CONUS and overseas should be made only when other transport modes cannot be used. Normally, highway shipments are made with the vehicle loaded on military or commercial low-bed semitrailers of adequate capacity. As identified in paragraphs 5-5 and 5-6, the vehicle, when loaded on semitrailer, exceeds length, width, and weight limitations in CONUS and overseas. Special permits are required in CONUS (AR 55-162), and special routing and permits are required overseas for outsize/overweight shipments. Military or commercial semitrailers with capabilities equal to or greater than those of the M747 are satisfactory for transporting the M1-series tank. A typical loading, with the M747 as the transport vehicle towed by a truck tractor, is contained in this chapter.

#### 5-5. Preparation of M1-Series Tank

Preparation of the M1-series tank for transport includes the following procedures:

- a. Turret traverse and gun-elevating mechanism must be in travel position and locked to prevent rotation (figs 3-1 and 3-2).
- b. Antennas must be tied down or removed,

#### 5-3. General

The vehicle is considered self-deliverable only under appropriate tactical situations. The M1-series tanks have a maximum operating range of 295 miles (475.0 km) and a maximum speed of 45 miles per hour. Although the tracks of the M1-series tanks are rubber padded, movement over paved public highways will not be attempted without specific approval. The 113,900-pound weight of the M1 and the 115,800-pound weight of the M1E1 are considered excessive for many bridges, and the 143.8-inch width exceeds limitations in CONUS and overseas areas.

headlights must be removed, hatches must be in closed position, and loose gear must be secured with nylon cord or suitable substitute. Windsensor must be folded down.

- c. External machineguns must be removed and secured in locations provided.

#### 5-6. Transport of M1-Series Tank on M747 Semitrailer Towed by Truck Tractor (M746 or M911) of the Heavy Equipment Transporter (HET) System

a. *General.* The combined length of the tractor and semitrailer (61 feet) exceeds the generally accepted CONUS and overseas unrestricted length of 55 feet. The width and weight of the vehicle/semitrailer combination exceed the legal limits for CONUS and overseas. The legal limits for CONUS are established by the American Association of State Highway and Transportation Officials. Those for overseas are given in the "Limits of Motor Vehicle Sizes and Weights," International Road Federation, Geneva, Switzerland. Movement of the loaded HET system with a payload (M1-series tank) is normally made over public highways in CONUS and overseas when other transport modes are not available or practical.

b. *Bridge Limitations.* Besides being oversize and overweight, the vehicle's high tandem-axle weights may overstress typical bridge structures

in the United States. Most states allow tandem axleloads of up to 50,000 pounds. Accordingly, all highway movements of the loaded HET system probably will require that a "certification of essentiality to national defense" be issued by the major command offering the system for movement to the appropriate state highway departments. Such certification is required prior to movement.

c. *Loaded Characteristics.* Characteristics of the loaded system exceed the 50,000-pound tandem axleload. The state-preferred 133-1/3 percent allowable is not exceeded when the M1-series tank is positioned on the M747 semitrailer so that the load is equally distributed to all axles. Placement of the M1-series tank's center of balance 267 inches from

the kingpin, with pusher axles properly extended on the M747 semitrailer and the C-HET M911 truck tractor, will achieve the best axleload distribution. The M747 semitrailer was type classified with a load-carrying capacity of 60 tons. Tests conducted with the M911 truck tractor and the M747 semitrailer indicate that the vehicle combination is capable of hauling loads up to 70 tons. Weights in excess of 60 tons must use lower maximum speeds. Loads and tire/tread separation is a combination of speed and temperature. From an operational standpoint, during highway movement of a 70-ton load at speeds greater than 27 mph, tire/tread separation can be expected as shown in figure 5-1.

### M747 TRAILER LOADED IN EXCESS OF 60 TONS RELATIONSHIP OF TIRE-LIFE TO TRIP SPEED, AMBIENT TEMPERATURE

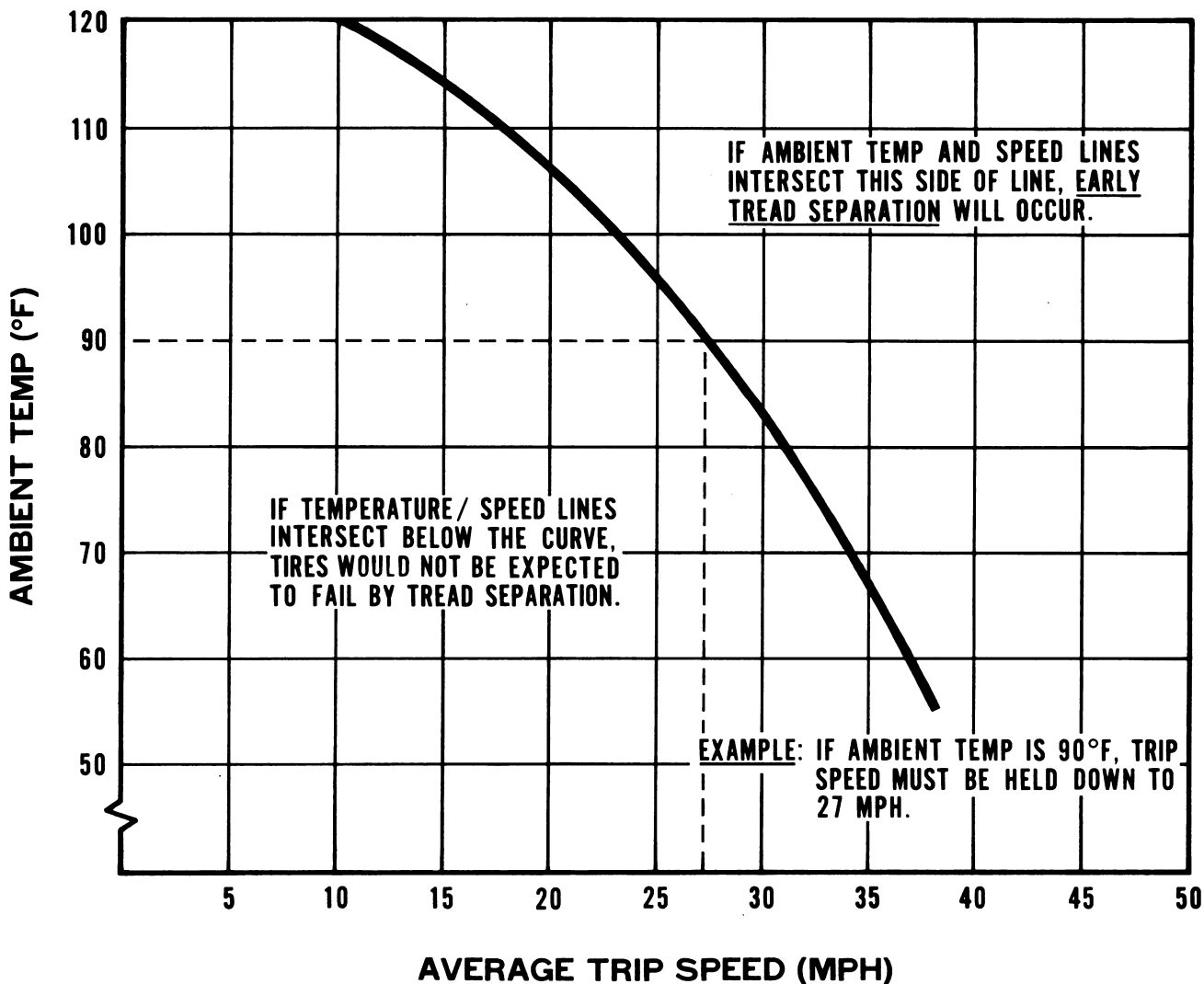


Figure 5-1. Anticipated characteristics of the loaded M1-series tank on M747 semitrailer towed by either the HET (M746) or the C-HET (M911 truck tractor).

*d. Suspension Characteristics.* Field tests have proved that a HET-loaded transport vehicle produces lower impact forces on highway bridges when compared with other types of similarly loaded highway vehicles. However, the responsible state permit official should determine the system's potential detrimental effect upon each highway route requested by the major command.

*e. MTMC Assistance.* Assistance in obtaining approvals for highway movement of the loaded transport system can be obtained from the Commander, Military Traffic Management Command, ATTN: MT-SA, Washington, DC 20315, when highway movement can be certified as essential for national defense and no other transportation mode can be used.

*f. Materials.* The bill of materials for blocking and tiedown of the M1-series tank on the M747 semitrailer is shown in table 5-1.

*g. Loading.*

(1) The vehicle may be driven to the tiedown

position on the semitrailer or towed on the semitrailer over the ramp by use of the winches on the HET truck tractor.

(2) The inside curbs on the deck of the M747 used to restrain sideways movement must be adjusted to fit the inside width of the tank tracks.

(3) After the vehicle is placed at the tiedown position, its transmission must be placed in the neutral position and brakes set, if appropriate.

(4) A tiedown diagram compatible with standard loading practices that will offer adequate restraint against the forces encountered during movements at normal speeds is provided in figure 5-2.

(5) Data concerning the application of materials required to restrain the vehicle are provided in table 5-2.

*h. Dimensions and turning radius diagram for route reconnaissance reference are shown in figure 5-3.*

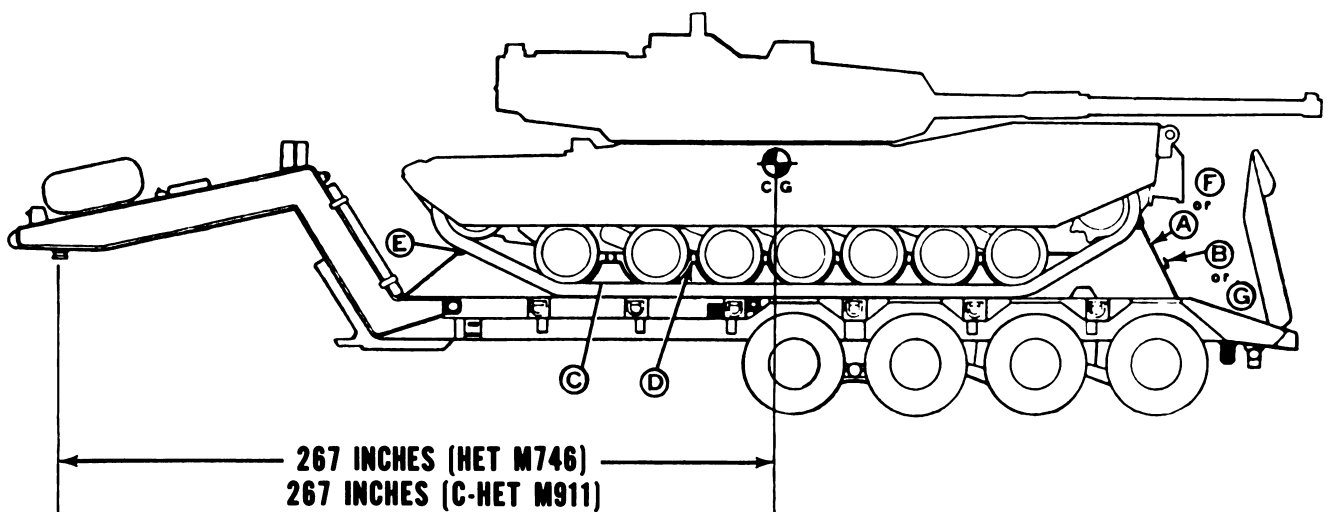


Figure 5-2. Tiedown diagram for M1-series tank on M747 semitrailer.

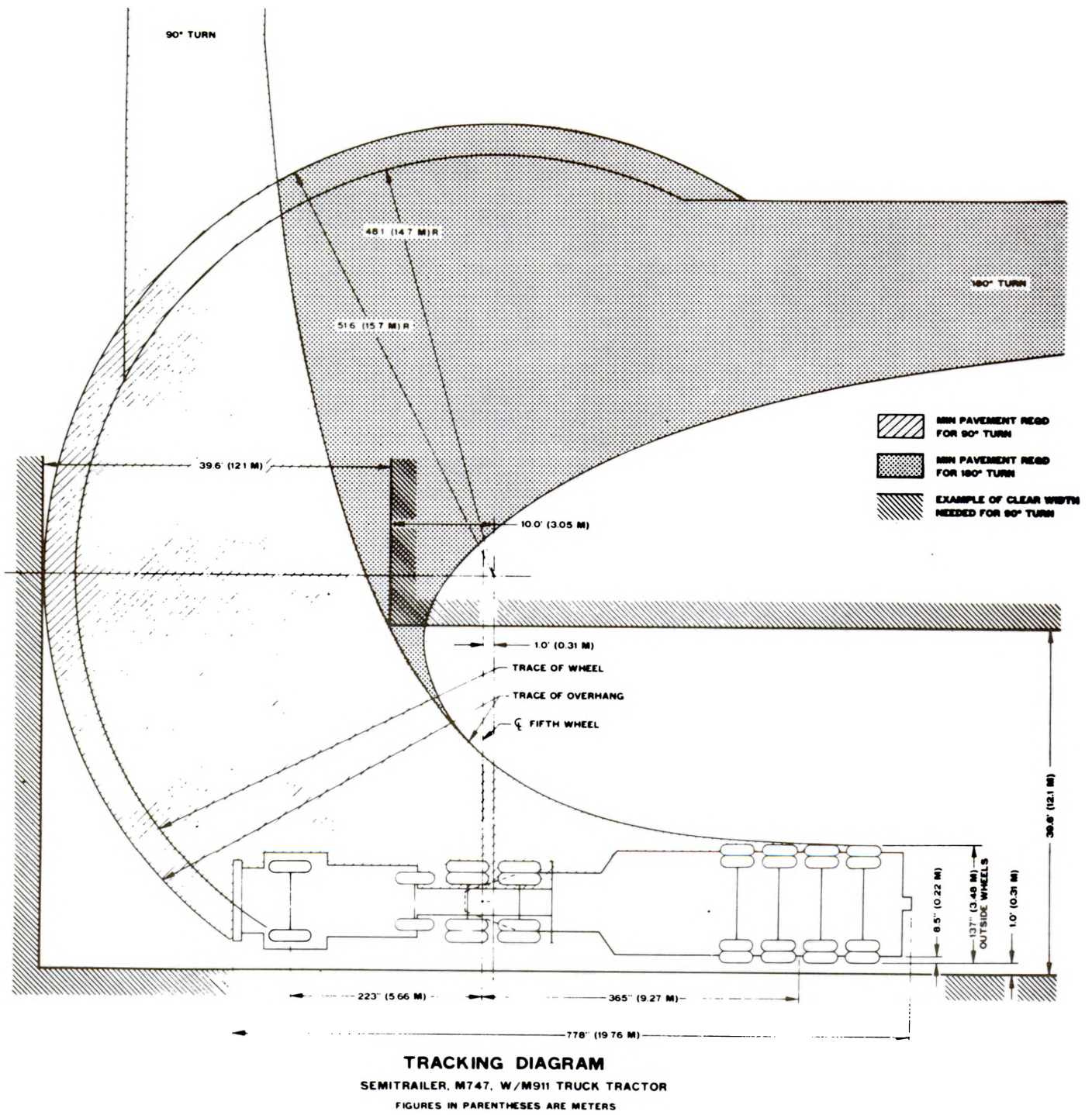


Figure 5-3. Turning diagram for M1-series tank loaded on M747 semitrailer towed by M746 truck tractor.

Table 5-1. Bill of Materials for Blocking and Tiedown of the M1-Series and M747 Semitrailer

Item	Description	Approximate Quantity
Lumber	Douglas-fir, or comparable, straight-grain, free from material defects; Fed Spec MM-L-751- 2- × 4". 6- × 6".	24 lin ft 36 lin ft
Nails	Common, steel; flathead; bright or cement-coated; table X1-b, Fed Spec FF-N-105: 20d	98
Wire Rope	6 × 19, IWRC; improved plow steel; preformed, regular-lay; table X, Fed Spec RR-W-410: 5/8-in.	64 ft
Clamps	Wire rope, U-bolt clips, saddled, singlegrip, steel, Crosby heavy-duty, or equal; MIL-STD 16842: 5/8".	32
Chain*	Utility; 5/8-in.-diameter chain link, 12-foot-long, NSN 4010-00-449-6573.	8
Load binders*	Ratchet-type with 1 grab-hook and 1 pear-shaped link, 12-ton-capacity, NSN 3990-00-401-1503.	8
Thimbles	Standard, open-type: 5/8-in.	8
Shackles	Anchor, 1-5/8-in.-diameter pin, 2-in. opening, NSN 4030-00-162-7545, or equal.	8

\*Chains and load binders may be substituted for 5/8-in wire rope and clamps.

Table 5-2. Application of Materials for Tiedown of M1-Series and M747 Semitrailer (Fig 5-2)

Item	No. Required	Application
A*	8	Wire rope, 5/8-in. Attach two complete loops from each shackle, item E, to semitrailer outside tiedown rings. Secure the ends of each loop with four clamps, item B. Not required if items F and G are used.
B*	32	Clamp, 5/8-in. Secure the overlapping ends of each wire rope loop with four clamps. Secure the thimbles, item H, with one clamp each (sketches 1 and 2, fig 7-6); not required if items F and G are used.

Item	No. Required	Application
C	24	Road wheel chocking, two pieces of 6- × 6" × length-to-fit lumber. Place one piece on track between inside road wheels and the other piece on track between outside road wheels. Secure both pieces in place with item D.
D	12	Tiecleat, 2- × 4" × length-to-fit lumber. Locate on top of items C and nail with two 16d to inside item C and two 16d nails to outside item C.
E	4	Shackles. Secure one shackle to each towing lug (two at front of vehicle and two at rear end).
F* & G*	8	Chains and load binders. Not required if items A and B are used.
	2	Chains and load binders. Secure chain to each front lifting eye with shackles (headlights must be removed). Guide each chain through adjacent gooseneck upper rollers. Install load-binder link over cleat at front of gooseneck. Ratchet load binder to full extension and attach grab hook to chain. Tighten chains with load binders.
	2	Chains and load binders. Secure one chain to shackle in each front towing lug, cross chains and attach to grab hooks of load binder attached to the semi-trailer's forward lifting eyes. Tighten chains with load binders.
	2	Chains and load binders. Secure one chain to shackle in each rear towing lug, cross chains, and attach chains to grab hooks of load binder attached to the semitrailer inside tiedown brackets. Tighten chains with load binders.
	2	Chains and load binders. Secure one chain to shackle in each rear towing lug and attach to grab hook of load binder attached to the outside tiedown eyes. Tighten chains with load binders.

\*Items F and G may be substituted for A and B.



## CHAPTER 6

### MARINE AND TERMINAL TRANSPORTABILITY GUIDANCE

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#### Section I. GENERAL

##### 6-1. Scope

This chapter provides marine and terminal transportability guidance for movement of the M1-series tank. It covers technical and physical characteristics and safety considerations and prescribes the materials and guidance required to prepare, load, tie down, and unload the vehicle.

##### 6-2. Safety

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

- a. If ammunition or explosives are to be transported with the vehicle, the activity offering the vehicle for transport will notify the carrier in compliance with paragraph 2-7, AR 55-228.
- b. Ammunition and vehicles will be handled and stowed in accordance with provisions contained in Water Carrier Tariff No. 31 or reissues thereof.

- c. Fire extinguishers must be available during all loading and unloading operations.
- d. Fuel tanks of vehicles must not be more than one-fourth full.
- e. Headlights must be removed.

##### 6-3. Water Shipment

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

##### NOTE

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

#### Section II. LOADING AND SECURING

##### 6-4. General Rules for Stowing Tracked Vehicles

a. *General.* Whenever possible, 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 minimum spacing between outer vehicles and the sweatboards; breakable parts are protected and spare parts are located usually within or near the vehicles; vehicles are stowed in neutral with brakes off; battery terminals are disconnected; fuel is drained; and vehicles are secured with adequate blocking and lashing. Securing includes blocking of tracks on all four sides so that the vehicle cannot move in any direction; bracing of individual vehicle blocks to bulkheads, stanchions, and other vehicle blocks; and lashing of vehicle with wire rope or chain.

##### WARNING

M1 tanks give off heat, noise, and exhaust gases. When operating the tanks on ship, vision becomes impaired by exhaust gases. Ships must have forced ventilation equipment to keep decks clear and cool. Ships ventilators must limit the heat rise to 30°F (16.7°C). If not, the M1 tanks must be towed.

##### NOTE

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

b. *Loading.* Vehicles are always loaded onto vessels in their minimum configuration; that is, reduced height, with or without cargo. The vehicle can be driven or lifted by crane of adequate capacity onto landing craft, beach discharge and amphibious lighters, and landing ship tanks. It can also be driven onto the decks of barges from a pier when tidal conditions are suitable and ramps are available. The vehicle can be lifted by shoreside or floating cranes of adequate capacity onto seagoing vessels. Jumbo booms and heavy-lift ship's gear may be used in loading vehicles onto vessels. The vehicle can be driven or towed onto roll-on/roll-off vessels. A typical lifting diagram for the M1-series tanks is shown in figure 6-1. Typical blocking and tiedown details are shown in figure 6-2. Materials and their application are listed in tables 6-1 and 6-2.

##### NOTE

Headlights may have to be removed to adapt clevis to lifting provision.



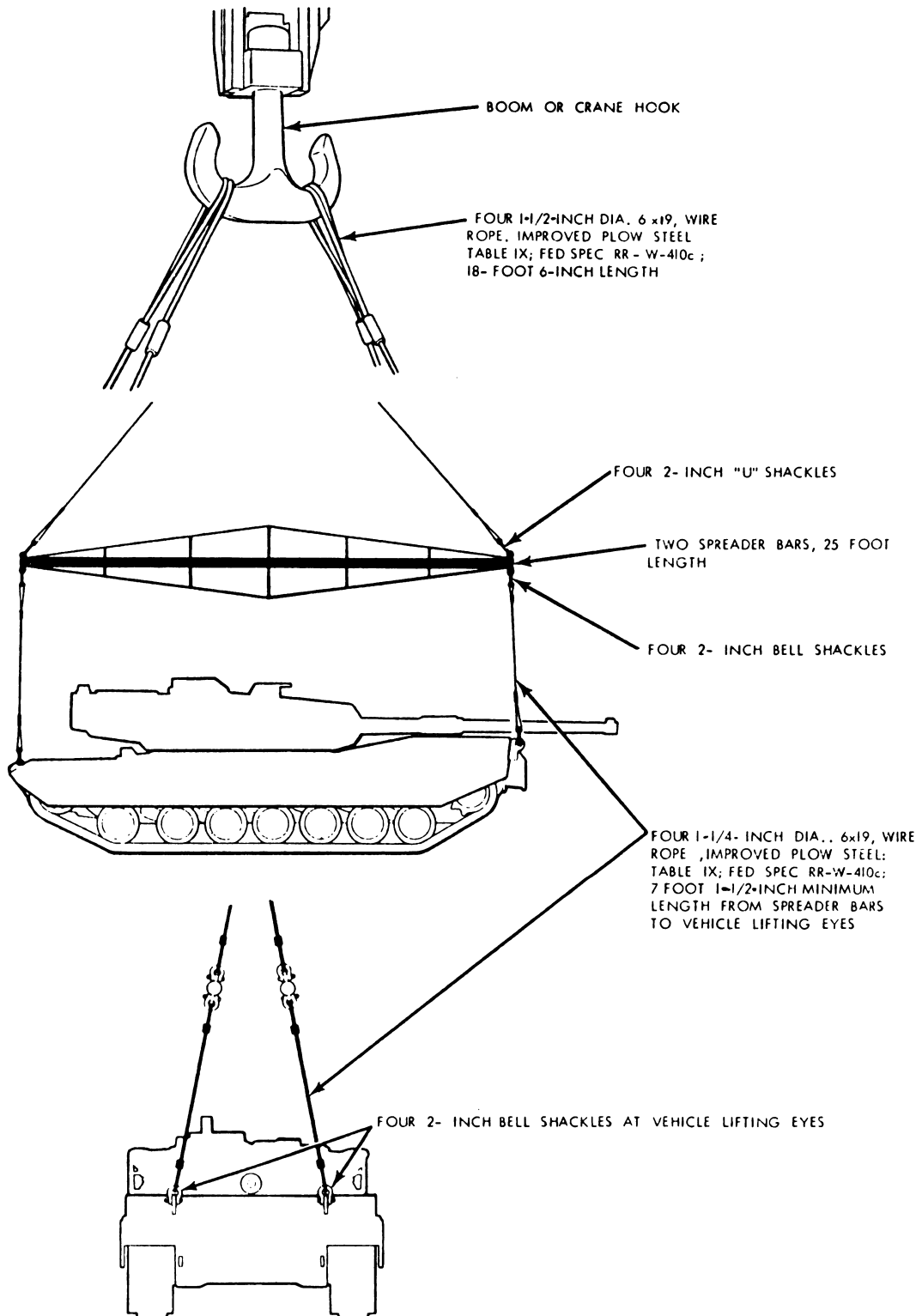


Figure 6-1. Lifting diagram for M1-series tank, using wire-rope and spreader-bar sling.

c. *Special Design.* Seatrain trailer vessels, roll-on/roll-off vessels, landing ships, and attack-cargo vessels are all equipped with patented lashing gear and pre-positioned fittings in the deck. By proper application of four 70,000-pound (31,752-kg) lashing

gear to each end, the M1-series tank will not require blocking and bracing. Typical application of patented lashing gear is shown in figure 6-3. As shown, eight 35,000-pound (15,876-kg) lashings are substituted for the four 70,000-pound lashings.

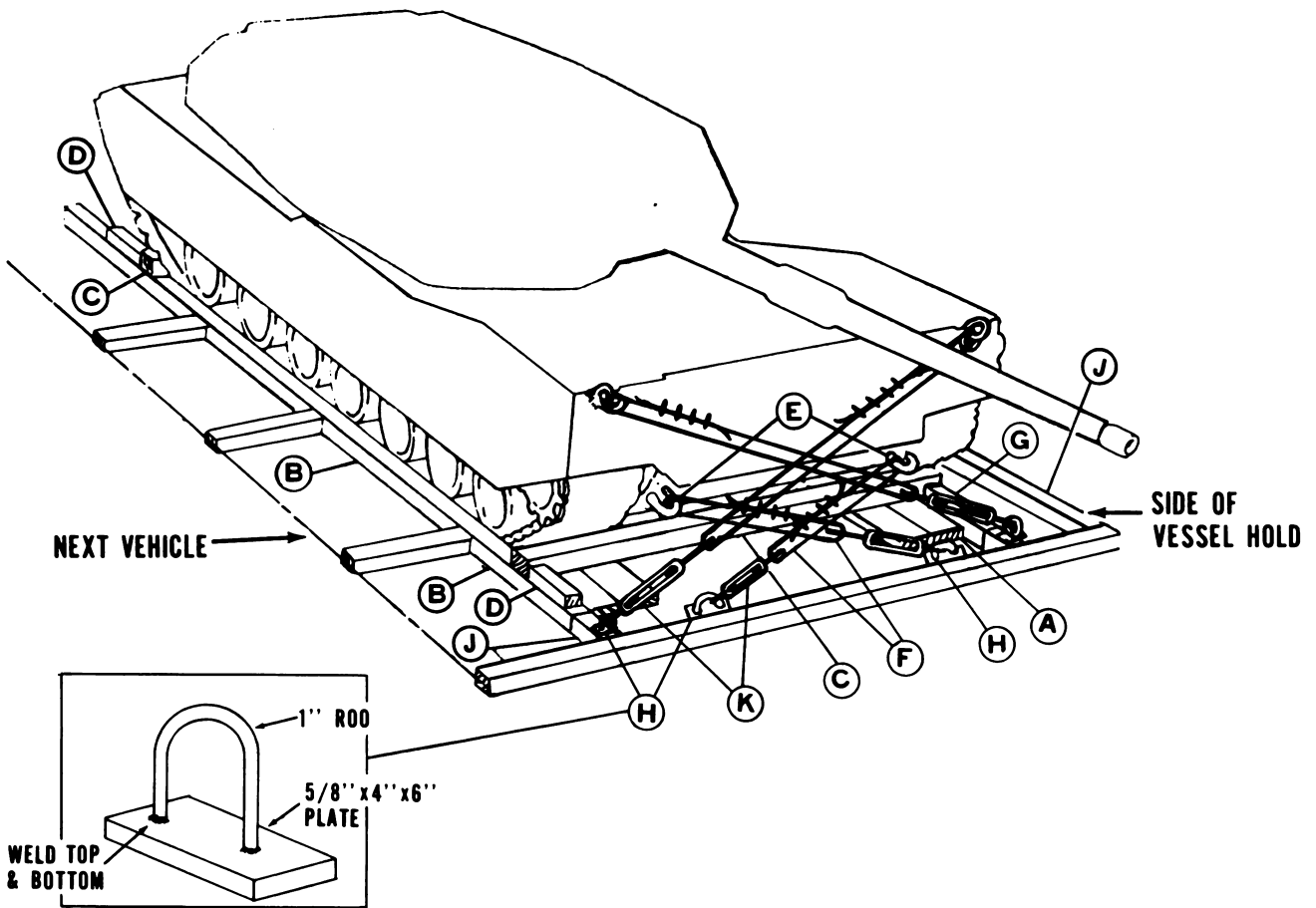


Figure 6-2. Typical blocking and tiedown for M1-series tank in hold of general-cargo vessel.



*Figure 6-3. M1-series tank secured with patented lashing gear onboard a RORO vessel.*

Table 6-1. Bill of Materials for Blocking and Tiedown of the M1-Series Tank in Hold of General-Cargo Vessel (Fig 6-2)

Item	Description	Approximate Quantity
Lumber	Douglas-fir, or comparable, straight-grain, free from material defects; Fed Spec MM-L-751:	
	4- × 6-in.	4 lin ft
	2- × 12-in.	86 lin ft
	6- × 8-in.	160 lin ft
Nails	Common, steel; flathead; bright or cement-coated; table X1-b, Fed Spec FF-N-105:	
	20d	20
	40d	116
Wire Rope	6 × 19, IWRC; improved plow steel; preformed, regular-lay; table X, Fed Spec RR-W-410:	
	5/8-in.	120 ft
Clamps	Wire rope, U-bolt clips, saddled, single-grip, steel, Crosby heavy-duty, or equal; MIL-STD 16842: 5/8-in.	38
Shackles	Anchor, 1 1/8-in.-diameter pin, 2-in. opening, NSN 4030-00-162-7545, or equal.	8
Padeyes	Local manufacture from 1-in. steel rod and 4- × 6- × 5/8-in. steel plate. Bore 1-in. holes through plate and weld U-shaped 1 in. rod ends top and bottom of plate.	8
Turnbuckles	1- × 24-in. with jaw and jaw end fittings.	8

Table 6-2. Application of Materials for Blocking and Tiedown of M1-Series Tank in Hold of General Cargo Vessel (Fig 6-2)

Item	No. Required	Application
A	1	Lumber, 2- × 12- × 240-in. Pre-position on vessel hold floor under vehicle treads; two pieces required under each tread. Not used if tracks have rubber pads.
B	2	Side blocking. Each consists of one piece of 6- × 8-in. × length-to-suit lumber. Locate against vehicle treads; one piece on each side of vehicle.
C	2	End blocking. Each consists of one piece of 6- × 8-in. × length-to-suit lumber. Locate on top of item B against vehicle treads. Toenail to item B with four 40d nails at each end
D	4	Backup cleats, 4- × 6- × 12-in. lumber. Locate on top of item B against item C. Toenail to item B with four 40d nails.
E	8	Shackles. Secure one shackle to each towing lug (four at front and four at rear end of vehicle).
F	8	Wire rope, 5/8-in., in a complete loop. Secure with clamps (item G). Attach to front and rear shackles.
G	32	Clamps, 5/8-in. Secure to item E in complete loop.
H	8	Padeye. Eight required on floor of vessel, provided D rings or deck tiedown fittings are not properly available.
J	as required	Bracing, 6- × 8-in. × length-to-suit lumber. Brace as required against vehicle blocking, side of vessel, or adjacent cargo blocking to immobilize vehicle and blocking. Secure each end to adjacent bracing or blocking detail by toenailing with four 40d nails.
K	8	Turnbuckle, 1- × 24-in. Attach one jaw to wire rope, item F, and the other jaw to padeye, item H. Tighten turnbuckle evenly.

### 6-5. Barges and Lighters

When the vehicle is moved by barge or similar lighterage to or from vessels secured to piers or a sheltered anchorage, blocking and chocking material will be required. When the vehicle is moved for extended distances or through rough waters, tiedowns must also be used.

### 6-6. Landing Ships, Landing Craft, and Amphibious Vehicles

When the vehicle is moved for extended distances or through rough waters, blocking and tiedowns must be used. In most cases, the vessels are equipped with turnbuckles with a sheep's foot on one end that fits into a deck cloverleaf; where not provided, a suitable substitute may be used.

### 6-7. Lighter Aboard Ship (LASH)

*a. General.* When the vehicle is transported by LASH-type ships, securement with blocking and tiedowns is required as illustrated in figure 6-4.

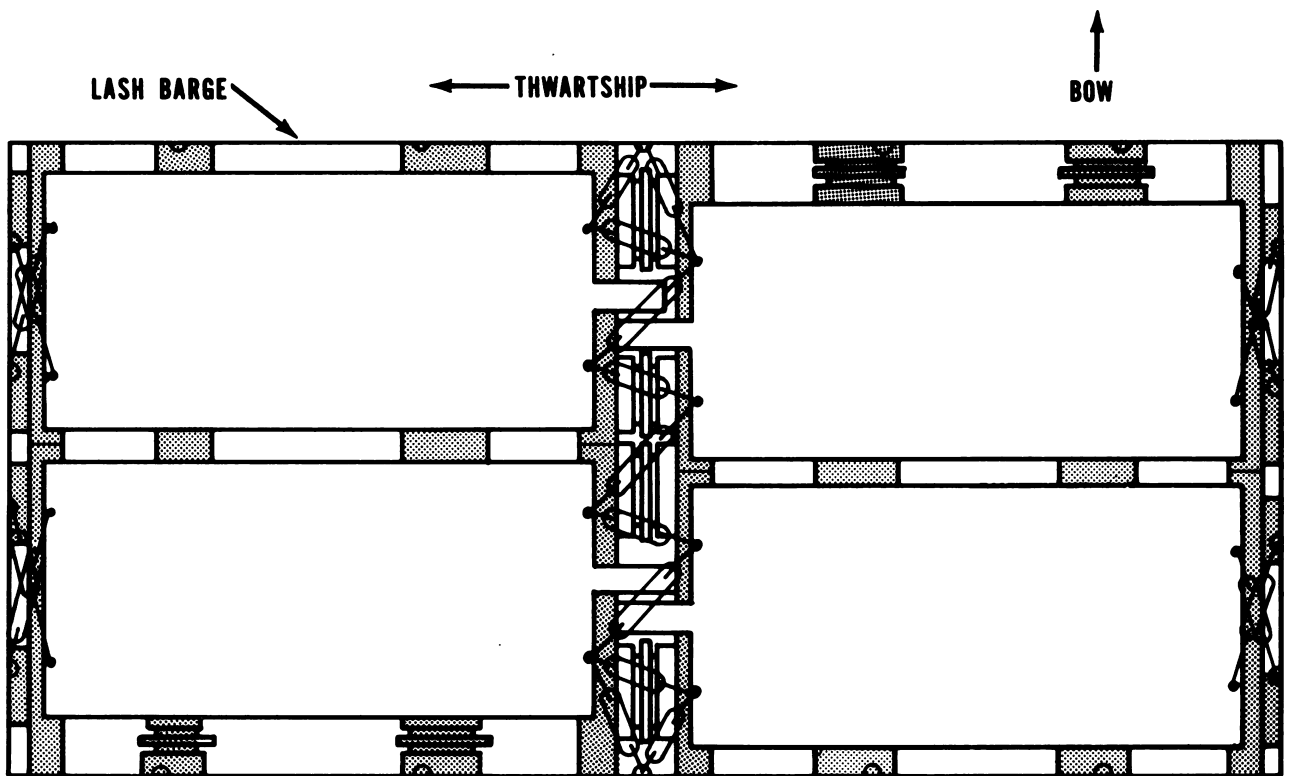
(1) Armored tracked vehicles may arrive at the processing area with access hatches or tank turrets welded shut to prevent pilferage. Since these vehicles are not maneuverable under their own power, their tracks are not braked and their transmissions are set in the neutral position to permit towing in the loading area. Contrary to normal stowage of tanks on a conventional vessel, the idler wheel chocks should be in place, and the tanks

must be positioned by crane in their final stow location.

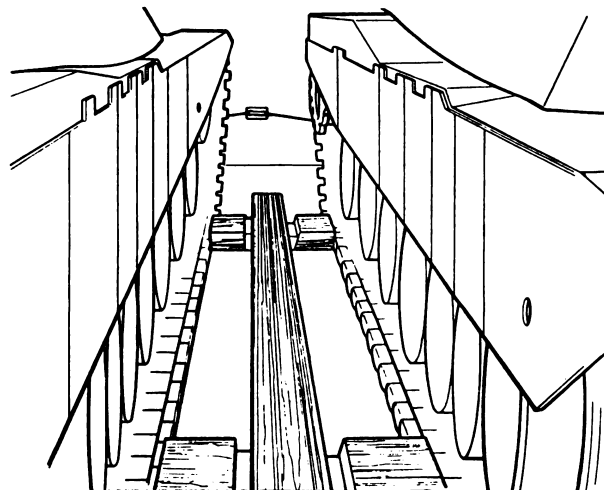
(2) Barge stability is noticeably affected by the placement of heavy-lift items; therefore, tracked vehicles should be loaded symmetrically in sequence about the center line of the barge or lighter. The M1-series tanks should be loaded in a manner to counterbalance variations in the locations of centers of gravity from true center; that is, alternate opposite corners rear to rear.

*b. Shoring.* Shoring is not generally used beneath the treads of most tracked vehicles equipped with rubber tread pads; frictional forces between the tread pads and the deck are sufficient to make it unnecessary. However, deck surfaces should be dry and free of grease or debris.

*c. Blocking.* The M1-series tank may be adequately blocked and braced with 6- by 6-inch timbers. If the load orientation permits, blocking may be installed as a separator between the vehicle track and the barge bulkhead. Blocking is usually installed in front of or in rear of the tracks, and the bracing part is force-fitted to the bulkhead. Loading, blocking, and bracing proceed from the outer areas of the barge toward the center, which is loaded last. A single separator timber is installed against the tracks of the loaded vehicle, and the next vehicle to be loaded is placed firmly against the timber. The void area remaining in the center of the barge after the final vehicle has been loaded is filled (fig 6-5) with cut and force-fitted blocking.



*Figure 6-4. Typical loading of four M1-series tanks on a LASH lighter (59.9 feet by 29.5 feet), with wire rope, cable clips, and turnbuckles and with blocking between tanks and between tanks and hull.*



*Figure 6-5. Filling center void or tank to hull void area.*



## CHAPTER 7

### RAIL TRANSPORTABILITY GUIDANCE

#### Section I. GENERAL

##### 7-1. Scope

This chapter provides rail transportability guidance for movement of the M1-series tank. It covers technical and physical characteristics and safety considerations and prescribes the materials and guidance required to prepare, load, tie down, and

unload the vehicle.

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

Additional cargo, as approved by the activity offering the items 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 vehicle is transported on CONUS railways. Consideration is given to single and multiple movements for the types of flatcars normally used in the movement of this vehicle. The vehicle, when loaded on a suitable flatcar, can be transported without sectionalization or major disassembly. The M1-series tank exceeds width limits for unrestricted movement and will require special routing as determined by officials of the railroad accepting the load.

##### 7-4. Preparation for Loading

*a. M1-Series Tank.* Preparation of the M1-series tank will vary among loads to be transported over various routes on different rail equipment and with different restraint procedures. When tanks are moved short distances over a single railroad line, preparation is minimal. When tanks are moved long distances through interchange points to several railroad lines, preparation must be adequate to assure safe and economic delivery at their destination. Loading procedures are described in paragraphs 7-5 through 7-9. Headlights must be removed for all rail loadings.

*b. Sixty-Eight-Foot, 140-Ton, Chain-Tiedown DODX Flatcar.*

(1) The 140-ton flatcar is a heavy-duty, six-axle flatcar with a loading deck 816 inches (20.73 m) long. The deck width of flatcars 40000 through 40100 is 123 inches (3.12 m); the deck width of flatcars 40101 through 40244 is 125 inches (3.17 m). The ends of all flatcars taper to about 117 inches (2.97 m). The 140-ton flatcar's metal deck has four lengthwise channels holding 48 chain tiedown assemblies. The two outboard channels, marked A and D, are 34 inches (.86 m) from the centerline of the flatcar. The two inboard channels, marked B and C, are 23-9/16 inches (.60 m) from the centerline of the flatcar. Each channel has 44 pri-

mary tiedown positions marked on the deck of the flatcar. Between each marked position are four more positions; each is 3 inches (.08 m) apart.

(2) Each chain tiedown assembly is made up of an anchor which is movable in the channels; a turnbuckle; a compression unit; and a ½-inch alloy-steel chain, 8 feet (2.44 m) long, with an open hook on the load attachment end and a grabhook on the turnbuckle end.

(3) Before loading, the chain anchors must be locked at proper locations. With the use of the turnbuckle as a handle, the chain anchor must be slid along the bottom of the channel and lifted to the required locking location in the channel. For the anchor to be locked in position, the tabs at each end of the anchor must be rotated up and moved sideways to retract the movable pins in the anchor, and the anchor must be lifted to completely seat in the channel notches. This position must be held while the tabs at each end of the chain anchor are moved sideways, to extend the movable pins so they rest on top of the channel. The tabs must be rotated down and into the recess keeper. Each turnbuckle must be extended to its mechanical stop.

(4) Each tiedown chain (and its fittings) to be used must be inspected for visible breaks, cracks, gouges, open welds, or deformed components. Special attention must be given to the connector link that attaches the chain to the anchor fitting. If defects are found, the chain or fitting must be replaced.

(a) Flatcars manufactured by Fruit Growers Express Company are equipped with chains that have a sliding hook at the free end of the chain. If all components are free of visible damage, the eight-link segment next to the free end of the chain must be compared with the eight-link segment next to the anchor fitting. If the eight-link segment near the anchor fitting is ½ inch or longer than the eight-link segment near the free end, the



chain has stretched beyond normal limits and should be replaced.

(b) Flatcars manufactured by Thrall Car Manufacturing Company are equipped with chains that have an open hook attached to the free end of the chain. If all components are free of visible damage, the eight-link segment next to the turnbuckle end of the chain must be compared with the eight-link segment next to the hook fitting at the free end. If the eight-link segment near the hook fitting at the free end is 1/2 inch or longer than the eight-link segment near the turnbuckle end, the chain has stretched beyond normal limits and should be replaced.

(5) Each turnbuckle in the chain tiedown assemblies must have adequate lubrication ("Rust Veto" Corrosion Preventive Compound MIL-C-16173, Grade 4 or equivalent) to assure smooth operation during tensioning. After tensioning is completed, 15 to 25 foot-pounds of torque must be applied to the jamnut, and the bare threaded areas of the turnbuckle must be lubricated to prevent rusting during transit.

(6) The shackles and links for attaching the chains to the M1-series tanks are furnished with the 140-ton flatcar.

(7) The ratchet-type handbrake lever is located on the side of the car below the level of the deck. In this position, the brake lever is operated from the ground and does not interfere with loading or unloading.

c. *General-Purpose Flatcar.* The wood-decked flatcar should be clear of used tiedown and blocking materials, and the flatcar decking should be in sound condition. Loads discussed in this manual are based on a flatcar that is 10 feet 4 inches wide, minimum.

**7-5. Loading M1-Series Tank on 68-Foot, 140-Ton, Chain-Tiedown DODX Flatcar**

a. The M1-series tank may be placed in the tiedown position on the flatcar by a crane, or it may be driven or towed provided a suitable ramp or bridge is available. Tanks are generally loaded facing forward in the same direction of intended transport.

b. Before the M1-series tank is loaded, the chain anchors must be placed in the proper position as shown in figures 7-1 and 7-2. Color-coded positions are provided on the flatcar for placement of tiedown anchors for tanks. White is for M1 tanks; yellow is for M60-series tanks. Stenciled on these

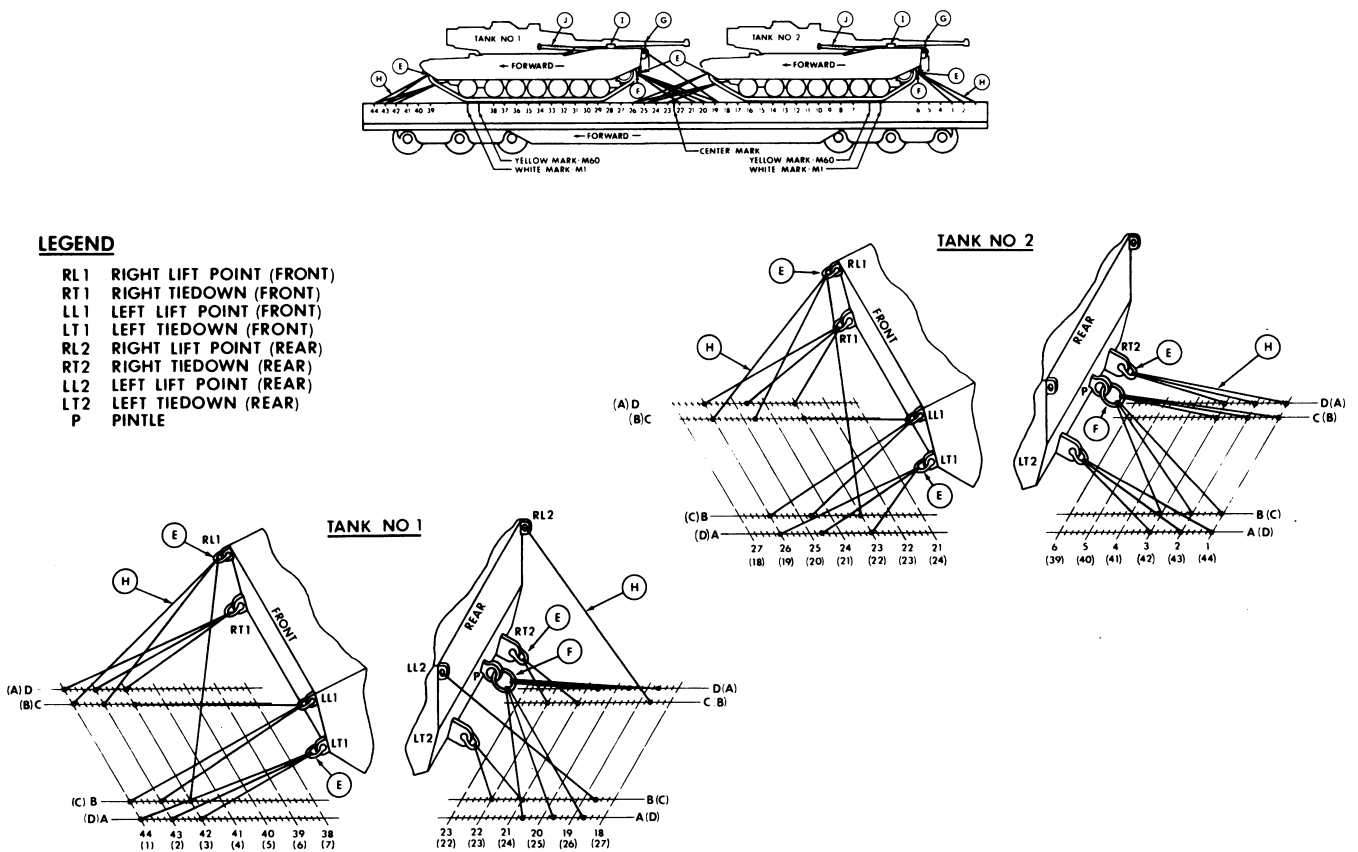


Figure 7-1. Tiedown diagram for two M1-series tanks facing one direction on 140-ton DODX flatcar.

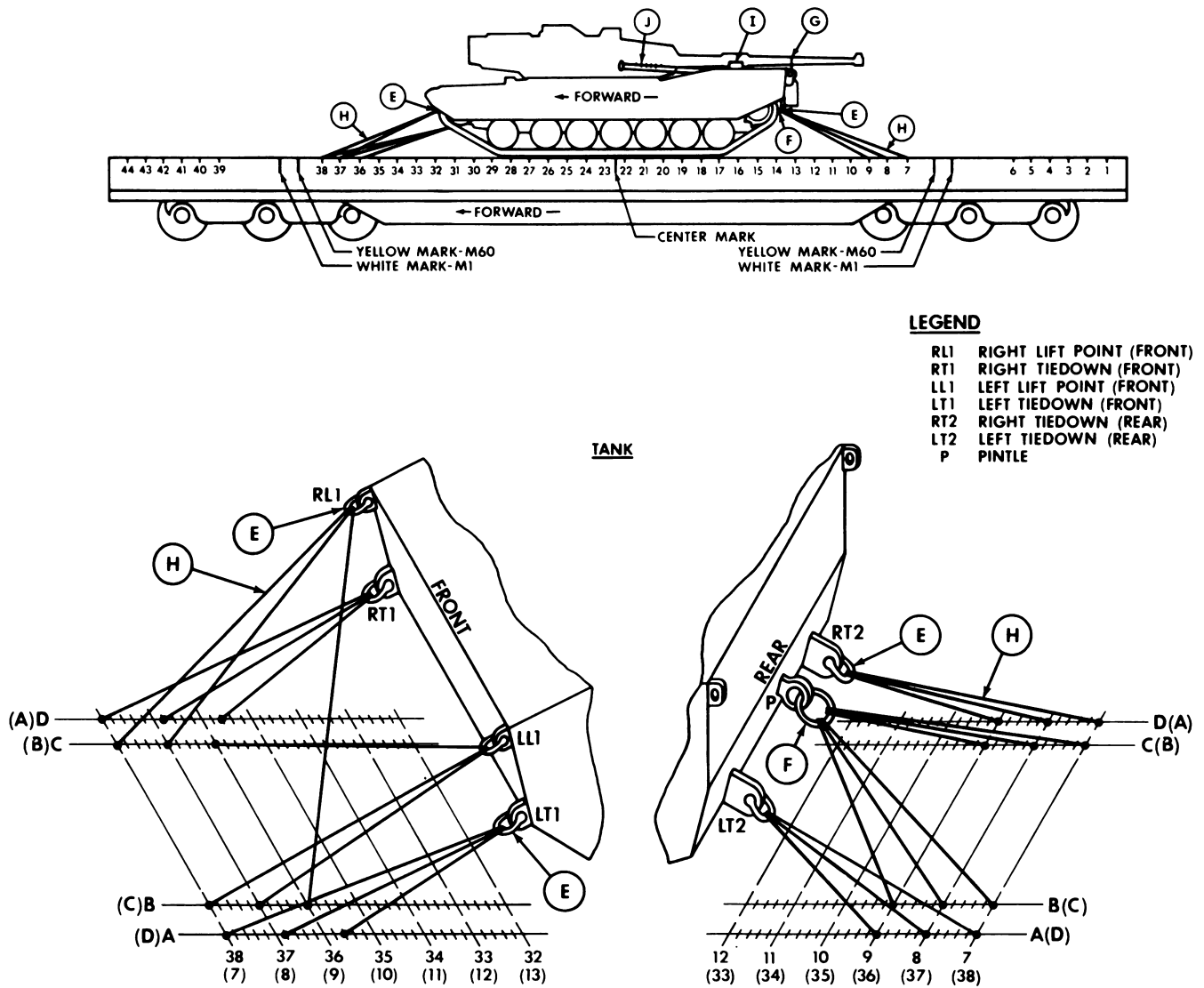


Figure 7-2. Tiedown diagram for one M1-series tank on 140-ton DODX flatcar.

painted positions are the tiedown attachment points on the applicable tank except for tanks that have the M9 bulldozer installed. Stenciled attachment positions are illustrated in figures 7-1 and 7-2 and described in tables 7-1 through 7-5. Chains attached to the anchors must be placed in piles in the center of the flatcar.

**CAUTION**

Do not place the tank on, or drive the tank over the chains, turnbuckles, or chain anchors. (Damage could result.)

c. When two M1-series tanks are loaded (fig 7-1), the forward left-hand road wheel of tank No. 1 should be centered over the yellow mark on

the left-hand side, 139 inches (3.53 m) from the forward end of the flatcar. The last left-hand road wheel of tank No. 2 should be centered over the yellow mark on the left-hand side, 139 inches (3.53 m) from the aft end of the flatcar. Should the 140-ton flatcar arrive in the reverse direction at the loading ramp, the tank will be loaded in reverse and tied down as described in table 7-2. When one M1-series tank is loaded, the hub of the center road wheel should be located over the center mark of the flatcar, 408 inches (10.37 m) from either end (fig 7-2).

d. After the M1 tank is loaded and placed in the tiedown position, handbrakes should be set. Lever for transmission must be placed in neutral position.

Table 7-1. Bill of Materials for Loading and Restraining One M1 Tank on 140-Ton DODX flatcar

Item	Description	Approximate Quantity
Lumber	Douglas-fir, or comparable, straight-grain, free from material defects; Fed Spec MM-L-751: 6- × 6-in.	2 lin ft
Wire Rope	6 × 19, IWRC, improved plow steel, preformed, regular-lay; table X, Fed Spec RR-W-410: 3/8-in.	40 ft
Clips	Wire rope, U-bolt clips, saddled, single-grip, steel, Crosby heavy-duty, or equal; MIL-STD 16842: 3/8-in.	6
Steel strap-ping Nails	3/4- × .050-in. thick Common, steel; flathead, bright or cement-coated; Fed Spec FF-N-105: 8d	3 lin ft 8
Shackles*	1 1/2-in.-diameter wire size, 4-in. diameter inside bow, 2 1/4-in. entrance to bow, 1 1/2-in. threaded pin, alloy-steel heat-treated to 130,000 pounds minimum break strength, MacLean-Fogg (M-F) 61284, or equivalent	12
Ring*	1 1/2-in.-diameter wire size, 7-in.-diameter (inside), alloy steel heat-treated to 250,000 pounds minimum break strength, MacLean-Fogg (M-F) 61283, or equivalent	2

\*Furnished with flatcar.

Table 7-2. Application of Materials for Securing Two M1 Tanks Loaded Front to Tail On 140-Ton DODX Flatcar (Fig 7-1).

Item	No. Required	Application
A thru D		Channels. For description, refer to paragraph 7-4b.
E	12	Shackles, anchor. At front of tank, attach one shackle to each tiedown fitting and one shackle to each lift fitting. At rear of tank, attach one shackle to each tiedown fitting.
F	2	Links. Attach to towing pintle at rear of tanks.
G	4	Wire rope, 3/8-in. Wrap gun tube with protective material. Apply wire rope in two complete loops, one around gun tube to left-rear lifting eye, the other around gun tube to right-rear lifting eye. Pull loops handtight and secure ends of each loop with three 3/8-in. clips.

Item	No. Required	Application
H	48	Chains. Furnished with flatcar. Apply chains between tank tiedown fittings and anchor locations on the deck of the car as shown in figure 7-1 described below.
I	2	Saddle blocks. Fabricate gun-tube rest from 6- × 6-in. lumber and contour to fit tube, with metal banding placed over the tube and nailed to the block.
J	4	Wire rope, 3/8-in., 6 × 19, IWRC. If gun tube is not installed in the turret, secure turret to hull with 3/8-in. wire rope to prevent turret rotation, and secure each loop with two 3/8-in. U-bolt clips.
<i>TANK NO. 1</i>		
LT1	3	Chains. Attach chains from the left-front tiedown fitting shackle to chain anchors in A42, A43, and A44.
RT1	3	Chains. Attach chains from the right-front tiedown fitting shackle to chain anchors in D42, D43, and D44.
LL1	3	Chains. Attach chains from the left-front lift fitting shackle to chain anchors in C42, B43, and B44.
RL1	3	Chains. Attach chains from the right-front lift fitting shackle to chain anchors in B42, C43, and C44.
LT2	2	Chains. Attach chains from the left-rear tiedown fitting shackle to chain anchors in B22 and B21.
RT2	2	Chains. Attach chains from the right-rear tiedown fitting shackle to chain anchors in C22 and C21.
P	6	Chains. Attach chains from the ring in the pintle to chain anchors in A20-3/5, A19-3/5, A18-3/5, D20-3/5, D19-3/5, and D18-3/5.
RL2	1	Chain. Attach chain from the right upper-rear lift fitting to chain anchor C18-3/5.
LL2	1	Chain. Attach chain from the left upper-rear lift fitting to chain anchor B18-3/5.
<i>TANK NO. 2</i>		
LT1	3	Chains. Attach chains from the left-front tiedown fitting shackle to chain anchors in A23, A24-3/5, and A26.
RT1	3	Chains. Attach chains from the right-front tiedown fitting shackle to chain anchors in D23, D24-3/5, and D26.
LL1	3	Chains. Attach chains from the left-front lift fitting shackle to chain anchors in C23, B24-3/5, and B26.
RL1	3	Chains. Attach chains from the right-front lift fitting shackle to chain anchors in B23, C24-3/5, and C26.
LT2	3	Chains. Attach chains from the left-rear tiedown fitting shackle to chain anchors in A3, A2, and A1.

Item	No. Required	Application
RT2	3	Chains. Attach chains from the right-rear tiedown fitting shackle to chain anchors in D3, D2, and D1.
P	6	Chains. Attach chains from the ring in the pintle to chain anchors in B3, B2, B1, C3, C2, and C1.

**GENERAL INSTRUCTIONS**

1. M1 tank brakes must not be set. Transmission selector must be in neutral.
2. Turret gun must be in the aft travel position and lowered into the saddle block (item I). Turret rotation and gun-elevating controls must be wire-tied, if feasible, to prevent movement of turret and gun.
3. Turnbuckles of front and rear chain tiedowns must be tightened at the same time to prevent uneven tensioning.
4. Also applicable are General Rules 4, 5, 7, 11, 15(g), 19, 19A, and 19C in section 1 of the *Rules Governing the Loading of Commodities on Open-Top Cars and Trailers*, published by the Association of American Railroads.

Table 7-3. Application of Materials for Securing One M1 tank on 140-Ton DODX Flatcar (Fig 7-2).

Item	No. Required	Application
A through D		Channels. For description, refer to paragraph 7-4b.
E	6	Shackles. At the front of tank, attach one shackle to each tiedown fitting and one shackle to each lift fitting. At the rear of tank, attach one shackle to each tiedown fitting.
F	1	Link. Attach to towing pintle at rear of tank.
G	2	Wire rope, 3/8-in. Wrap gun tube with protective material. Place thimbles on lifting eyes and apply wire rope in two complete loops: one around gun tube to left-rear lifting eye and the other around gun tube to right-rear lifting eye. Pull loops handtight and secure ends of each loop with two 3/8-in. U-bolt clips. Secure each thimble to wire rope with one 3/8-in. clip.
H	24	Chains. Furnished with flatcar. Apply chains between tank tiedown fittings and anchor locations on the deck of the car as shown in figure 4-1 and described below.
I	1	Saddle block. Fabricate gun-tube rest from 6- x 6-inch lumber and contour to fit tube with metal banding placed over the tube and nailed to the block.
J	2	Wire rope, 3/8-in., 6 x 19, IWRC. If gun tube is not installed in the

Item	No. Required	Application
		turret, secure turret to hull with 3/8-in. wire rope to prevent turret rotation, and secure each loop with two 3/8-in. U-bolt clips.
LT1	3	Chains. Attach chains from the left-front tiedown fitting shackle to chain anchors in A35-3/5, A36-4/5, and A38.
RT1	3	Chains. Attach chains from the right-front tiedown fitting shackle to chain anchors in D35-3/5, D36-4/5, and D38.
LL1	3	Chains. Attach chains from the left-front lift fitting shackle to chain anchors in C36, B37, and B38.
RL1	3	Chains. Attach chains from the right-front lift fitting shackle to chain anchors in B36, C37, and C38.
LT2	3	Chains. Attach chains from the left-rear tiedown fitting shackle to chain anchors in A9, A8, and A7.
RT2	3	Chains. Attach chains from the right-rear tiedown fitting shackle to chain anchors in D9, D8, and D7.
P	6	Chains. Attach chains from the ring in the pintle to chain anchors in B9, B8, B7, C9, C8, and C7.

**GENERAL INSTRUCTIONS**

1. M1 tank brakes must not be set. Transmission selector must be in neutral.
2. Turret gun must be the aft travel position and lowered into the saddle block (item I). Turret rotation and gun-elevating controls must be wire-tied, if feasible, to prevent movement of turret and gun.
3. Turnbuckles of front and rear chain tiedowns must be tightened at the same time to prevent uneven tensioning.
4. Also applicable are General Rules 4, 5, 7, 11, 15(g), 19, 19A, and 19C in section 1 of the *Rules Governing the Loading of Commodities on Open-Top Cars and Trailers*, published by the Association of American Railroads.

Table 7-4. Application of Materials for Securing Two M1 Tanks in the Opposite Direction From That Shown in Figure 7-1 (For location of "items," refer to figure 7-1).

Item	No. Required	Application
A through D		Numbered tiedown channels located on cargo deck of flatcar.
E	12	Shackles, anchor. At the front of tank, attach one shackle to each tiedown fitting and one shackle to each lift fitting. At the rear of tank, attach one shackle to each tiedown fitting.
F	2	Links. Attach to towing pintle at rear of tank.

Item	No. Required	Application
G	4	Wire rope, 3/8-in. Wrap gun tube with protective material. Apply wire rope in two complete loops, one around gun tube and to left-rear lifting eye and the other around gun tube to right-rear lifting eye. Pull loops handtight and secure ends of each loop with three 3/8-in. clips.
H	48	Chains. Furnished with flatcar. Apply chains between tank tiedown fittings and anchor locations on the deck of the car, as described below.
I	2	Saddle blocks. Fabricate gun tube rest from 6- x 6-in. lumber and contour to fit tube with metal banding placed over the tube and nailed to the block.
J	2 per tank	Wire rope, 3/8-in., 6 x 19, IWRC. If gun tube is not installed in the turret, secure turret to hull with 3/8-in. wire rope to prevent turret rotation, and secure each loop with two 3/8-in. U-bolt clips. <b>TANK NEARER THE NUMBER 1 CHAIN ANCHOR</b>
LT1	3	Chains. Attach chains from the left-front tiedown fitting shackle to chain anchors in D3, D2, and D1.
RT1	3	Chains. Attach chains from the right-front tiedown fitting shackle to chain anchors in A3, A2, and A1.
LL1	3	Chains. Attach chains from the left-front lift fitting shackle to chain anchors in B3, C2, and C1.
RL1	3	Chains. Attach chains from the right-front lift fitting shackle to chain anchors in C3, B2, and B1.
LT2	2	Chains. Attach chains from the left-rear tiedown fitting shackle to chain anchors in C23 and C24.
RT2	2	Chains. Attach chains from the right-rear tiedown fitting shackle to chain anchors in B23 and B24.
P	6	Chains. Attach chains from the ring in the pintle to chain anchors in D24-2/5, D25-2/5, D26-2/5, A24-2/5, A25-2/5, and A26-2/5.
LL2	1	Chain. Attach chain from upper left-rear lift fitting to chain anchor C26-2/5.
RL2	1	Chain. Attach chain from upper right-rear lift fitting to chain anchor B26-2/5. <b>TANK NEARER THE NUMBER 44 CHAIN ANCHOR</b>
LT1	3	Chains. Attach chains from the left-front tiedown fitting shackle to chain anchors in D22, D20-2/5, and D19.
RT1	3	Chains. Attach chains from the right-front tiedown fitting shackle to chain anchors in A22, A20-2/5, and A19.
LL1	3	Chains. Attach chains from the left-front lift fitting shackle to chain anchors in B22, C20-2/5, and C19.

Item	No. Required	Application
RL1	3	Chains. Attach chains from the right-front lift fitting shackle to chain anchors in C22, B20-2/5, and B19.
LT2	3	Chains. Attach chains from left-rear tiedown fitting shackle to chain anchors in D42, D43, and D44.
RT2	3	Chains. Attach chains from the right-rear tiedown fitting shackle to chain anchors in A42, A43, and A44.
P	6	Chains. Attach chains from the ring in the pintle to chain anchors in C42, C43, C44, B42, B43, and B44.

**GENERAL INSTRUCTIONS**

1. M1 Tank brakes must not be set. Transmission selector must be neutral.
2. Turret gun must be in the aft travel position and lowered into the saddle block (item I). Turret rotation and gun-elevating controls must be wire-tied, if feasible, to prevent movement of turret and gun.
3. Turnbuckles of front and rear chain tiedowns must be tightened at the same time to prevent uneven tensioning.
4. Also applicable are General Rules 4, 5, 7, 11, 15(g), 19, 19A, and 19C in section 1 of the *Rules Governing the Loading of Commodities on Open-Top Cars and Trailers*, published by the Association of American Railroads.

*Table 7-5. Application of Materials for Securing One M1 Tank Facing in the Opposite Direction From That Shown in Figure 7-2. (For location of "items," refer to figure 7-2.)*

Item	No. Required	Application
A through D		Numbered tiedown channels located on cargo deck of flatcar.
E	6	Shackles, anchor. At the front of tank, attach one shackle to each tiedown fitting and one shackle to each lift fitting. At rear of tank, attach one shackle to each tiedown fitting.
F	1	Link. Attach to towing pintle at rear of tank.
G	2	Wire rope, 3/8-in. Wrap gun tube with protective material. Apply wire rope in two complete loops, one around gun tube to left-rear lifting eye and the other around gun tube to right-rear lifting eye. Pull loops handtight and secure ends of each loop with two 3/8-in. U-bolt clips.
H	24	Chains. Furnished with flatcar. Apply chains between tank tiedown fittings and anchor locations on the deck of the car, as described below.
I	1	Saddle block. Fabricate gun-tube rest from 6- x 6-in. lumber and contour to fit tube, with metal banding over the tube and nailed to the block.

Item	No. Required	Application
J	2	Wire rope, 3/8-in., 6 × 19, IWRC. If gun tube is not installed in the turret, secure turret to hull with 3/8-in. wire rope to prevent turret rotation, and secure each loop with two 3/8-in. cable U-bolt clips.
LT1	3	Chains. Attach chains from the left-front tiedown fitting shackle to chain anchors in D9-2/5, D8-1/5, and D7.
RT1	3	Chains. Attach chains from the right-front tiedown fitting shackle to chain anchors in A9-2/5, A8-1/5, and A7.
LL1	3	Chains. Attach chains from the left-front lift fitting shackle to chain anchors in B9, C8, and C7.
RL1	3	Chains. Attach chains from the right-front lift fitting shackle to chain anchors in C9, B8, and B7.
LT2	3	Chains. Attach chains from the left-rear tiedown fitting shackle to chain anchors in D36, D37, and D38.
RT2	3	Chains. Attach chains from the right-rear tiedown fitting shackle to chain anchors in A36, A37, and A38.
P	6	Chains. Attach chains from the ring in the pintle to chain anchors in C36, C37, C38, B36, B37, and B38.

**GENERAL INSTRUCTIONS**

1. M1 tank brakes must not be set. Transmission selector must be in neutral.
2. Turret gun must be in the aft travel position and lowered into the saddle block (item I). Turret rotation and gun-elevating controls must be wire-tied, if feasible, to prevent movement of turret and gun.
3. Turnbuckles of front and rear chain tiedowns must be tightened at the same time to prevent uneven tensioning.
4. Also applicable are General Rules 4, 5, 7, 11, 15(g), 19, 19A, and 19C in section 1 of the *Rules Governing the Loading of Commodities on Open-Top Cars and Trailers*, published by the Association of American Railroads.

e. Securing of unused tiedown devices will be as follows:

(1) Unused chains, shackles, and rings must be secured to the flatcar so that they will not become free, endangering material or persons along the railroad right-of-way.

(2) Unused chains, shackles, and rings may be secured by use of the method described below (for securing unused chains after transporting two M1 tanks facing the station No. 44 end of the car) or a similar method.

(a) Locate chain anchors shown in figure 23 at A6, A1, A2, B1, B2, B3, C1, C2, C3, D6, D1, and D2.

(b) Stretch chains lengthwise on car deck between the channels.

(c) Form two crossover chains by moving the load-bearing hook end of chains in chain anchors A6 and D6 across the flatcar deck. Secure one ring and two shackles to the crossover chains by sliding the ring onto chains and attaching shackles to chains with shackle pins. Attach the grab hook on the chain of chain anchor A6 to the chain of chain anchor D6; attach the grab hook on the chain of chain anchor D6 to the chain of chain anchor A6. Insert the open hooks and any excess chain into the channels on the flatcar.

(d) Pull the open hook at the end of each chain in chain anchors A1, A2, B1, B2, C1, C2, D1, and D2 over crossover chains A6 and D6, then insert the hook and any excess chain into one of the channels on the flatcar.

(e) Repeat above procedures for unused chains on the opposite end of the flatcar by using chains in chain anchors A39 and D39 to form crossover chains. Attach four shackles to crossover chains in A39 and D39.

(f) Secure unused chains in the center section of the flatcar in this same manner: use the crossover chains in chain anchors A14 and D14 to secure chains attached to chain anchors A19-3/5, A20-3/5, B18-3/5, B21, B22, anchors A31 and D31 to secure chains attached to chain anchors A23, A24-3/5, B23, B24-3/5, B26, C23, C24-3/5, C26, D23, and D24-3/5.

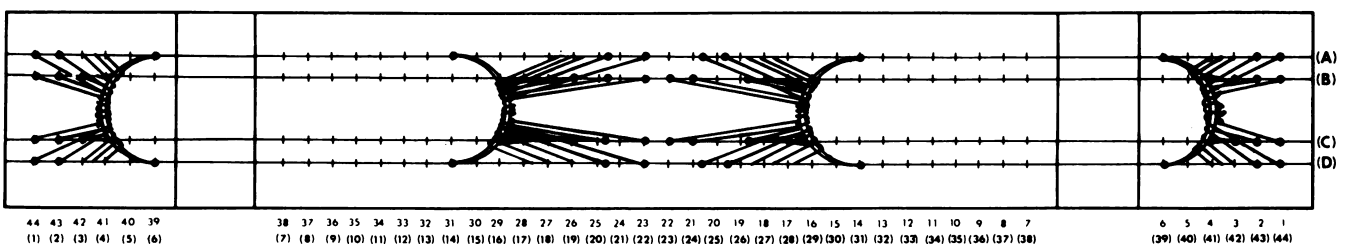


Figure 7-3. Diagram for applying the necklace method to secure tiedown chains and hardware of 140-ton DODX flatcar without load.

(g) Secure one ring and two shackles to crossover chains in chain anchors A14 and D14. Attach four shackles to crossover chain in A31 and D31.

**7-6. Loading M1-Series Tank on General-Purpose Flatcars**

a. The vehicle may be placed in the tiedown position on the flatcar by a crane, or it may be driven or towed, provided a suitable ramp or bridge is available.

b. After the vehicle is loaded and placed in the tiedown position, handbrakes on the vehicle should be set. The gearshift lever for the transmission must be placed in neutral position.

c. Loads shown in figures 7-4 and 7-5 are based on a flatcar that is 10 feet 4 inches wide, minimum.

**CAUTION**

Do not allow vehicle to exceed 3 miles per hour during loading or unloading.

d. Bill of materials for blocking and tiedown of the M60-series tanks on the flatcar is shown in table 7-6. Blocking and tiedown (figs 7-4 and 7-5) are compatible with standard loading practices and provide for adequate restraint against the forces encountered during movements at normal speeds. Blocking details are described in figure 7-6. Application of materials for loading and securing the vehicle on the flatcar is shown in table 7-7.

Table 7-6. Bill of Materials for Blocking and Tiedown of M1 on General-Purpose Flatcar (Figs 7-4 and 7-5)

Item	Description	Approximate Quantity
Lumber	Douglas-fir, or comparable, straight-grain, free from material defects; Fed Spec MM-L-751:	
	2- x 4-in.	148 lin ft
	2- x 12-in.	60 lin ft
	6- x 6-in.	36 lin ft
Wire Rope	6 x 9, IWRC; improved plow steel; preformed, regular-lay; table X, Fed Spec RR-W-410:	
	3/8-in.	112 ft
	1/2-in.	168 ft
Clamps	Wire rope, U-bolt clips, saddled, single-grip, steel, Crosby heavy-duty, or equal; MIL-STD 16842:	
	3/8-in.	12
	1/2-in.	48
Thimbles	Standard, open-type:	
	3/8-in.	6
	1/2-in.	16
Nails	Common, steel; flathead, bright or cement-coated; table XI-b, Fed Spec	

Item	Description	Approximate Quantity
	FF-N-105:	
	20d	296
	30d	160
Steel strapping	1-3/4-x .035-in. thick	3 lin ft
Shackles	Anchor, 1-3/8-in.-diameter pin, 2-in. opening; NSN 4030-00-162-7545, or equal.	8

Table 7-7. Application of Materials for Loading and Securing M1 General-Purpose Flatcar (Figs 7-4, 7-5, and 7-6)

Item	No. Required	Application
A		Brake-wheel clearance. Minimum clearance required is 6 in. above, in back of, and on both sides of, and 4 in. underneath wheel.
B	2	Chock block (detail 1, fig 7-6). Place the incline face of the block against the track, even with inboard edge at the front of vehicle.
C	2	Chock block (detail 2, fig 7-6). Place the incline face of the block against the track, even with inboard edge at the rear of vehicle.
D	4	End cleats. Each consists of two pieces of 2- x 12- x 18-in. lumber. Place one against each item B and C. Secure the lower piece to the floor with four 30d nails and the top piece to the one below, in a like manner, with four 30d nails.
E	8	Side cleats. Each consists of one piece of 2- x 4- x 24-in. lumber. Place one on each side of items B and C. Secure to item B or the floor with four 20d nails.
F	24	Idler wheel chocking. Each to consist of two pieces of 6- x 6-in. x length-to-suit lumber cut to fit contour of idler wheels. Place one piece between inside and outside wheels of each road wheel assembly.
G	12	Tie cleats, 2- x 4-in. x length-to-suit lumber. Place on top of item F (inside and outside) and secure with four 20d nails.
H	4	Shackles. Secure one shackle to each towing lug (two at front end of vehicle and two at rear end).
I	16	Thimble. Place one thimble at each item H and one thimble under each stake pocket.
J	8	Wire rope, 3/8-in. Attach wire rope to each item H and stake pockets (as shown in sketch 2, fig 7-6).
K	48	Clamp, 3/8-in. Secure the ends of the wire rope with four clamps each. Secure the thimbles with one clamp

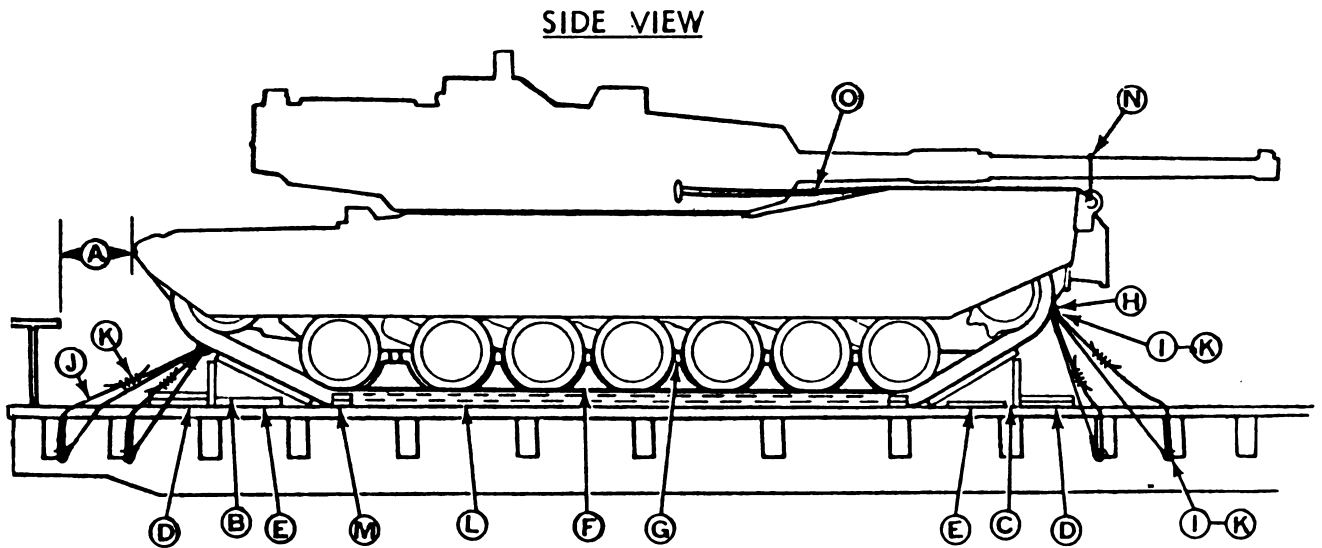


Figure 7-4. Blocking and tiedown for M1-series tank on general-purpose flatcar (side view).

### 7-7. Transport of One M1-Series Tank on 54-Foot DODX Flatcar

- a. Loads described in this paragraph are based on a flatcar that is 10 feet 4 inches wide, minimum.
- b. The M1 tank may be placed in the tiedown position on the flatcar by a crane, or it may be driven or towed provided a suitable ramp or bridge is available.
- c. After the vehicle is loaded and placed in the tiedown position, the handbrakes should be set. The gearshift lever for the transmission must be placed in neutral position and wire-tied, if practicable.
- d. When the tank is loaded, it should be loaded in the center of the 54-foot DODX flatcar. Blocking and tiedowns are applied as shown in figures 7-4, 7-5, and 7-6.

Item	No. Required	Application
L	2	each. (See sketches 1 and 2, fig 7-6.) Blocking, inside. Each consists of two pieces of 2- x 4- x 180-in. lumber. Place along the inside of each track, and nail the lower piece to car floor with sixteen 30d nails evenly spaced. Nail the top piece to one below with sixteen 30d nails in like manner.
M	3	Spreaders, inside cleat. Each consists of two pieces of 2- x 4-in. x length-to-suit lumber. Place one between each end and center of item L. Nail lower piece to car floor with six 30d nails and top piece to the one below in like manner.
N	2	Wire rope, 3/8-in. Wrap gun tube with cushioning materials. Apply wire rope in complete loop to the adjacent two lifting eyes, and secure ends with three 3/8-in. cable clamps. (Place thimbles as shown in sketch 2, fig 7-6).
O	2	Wire rope, 3/8-in. Apply wire rope in complete loop between gun turret and forward lifting eyes, and secure ends with three 3/8-in. cable clamps. (Place thimbles as shown in sketch 2, fig 7-6.)

### GENERAL INSTRUCTIONS

Loading rules 1A, 3, 4, 5, 7, 9, 14, 15, 19, and 19A appearing in section 1 of the *Rules Governing the Loading of Commodities on Open-Top Cars and Trailers*, published by the Association of American Railroads, provide applicable guidelines and are mandatory in application.

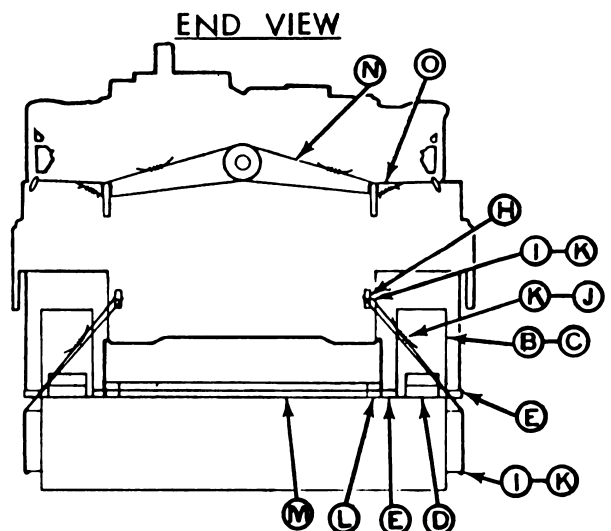


Figure 7-5. Blocking and tiedown for M1-series tank on general-purpose flatcar (end view).



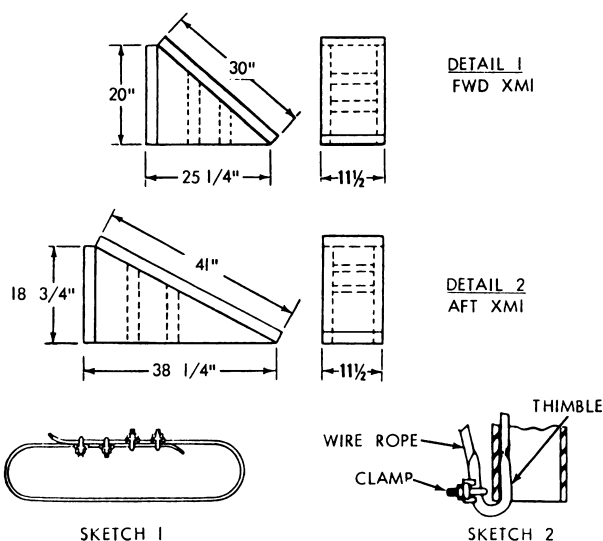
e. Bill of materials for blocking and tiedown of one M1-series tank on a 54-foot DODX flatcar is shown in table 7-6. Blocking and tiedown shown in figures 7-4 and 7-5 are compatible with standard loading practices and provide for adequate restraint against the forces encountered during movements at normal speeds. Blocking details are described in figure 7-6. Application of materials for loading and securing the tanks on the flatcar is shown in table 7-7.

**7-8. Transport of M1-Series Tank in Controlled Train Service for Unit Moves**

Controlled train service securement is reduced to chock blocks and tiedowns only. Movement under this method of securement is designed to provide prompt movement over short distances from military installations to portside for shiploading. The M1 series tanks can be loaded on a railcar of adequate weight capacity that is a minimum of 10 feet 4 inches wide. Blocking and tiedown requirements are reduced from those shown in figures 7-4 and 7-5. Only items B, C, J, K, and N of table 7-7 are applied to provide adequate restraint against forces encountered during movements on controlled train service.

**7-9. Transport of M1-Series Tank Restrained With Wood Blocking**

Controlled train service is generally a short distance from an installation to an outport or training area and over rails owned or controlled by a single handling carrier. Under these conditions, the carrier will specify the safe speed a load can move with reduced restraints. The wood blocking method of restraint can be used for movement only when prior coordination and acceptance by the handling carrier railroad have been accomplished. Loading and placement of the M1-series tank on wood-decked flatcar are as shown in figures 7-4 and 7-5. Blocking is applied as shown in A, B, C,



NOTE: DETAIL 1 AND 2 ARE FABRICATED FROM 2 x 12-INCH LUMBER. USE 20d NAILS.

Figure 7-6. Blocking detail diagram.

D, E, L, and M of table 7-7. No tiedowns or road wheel blocks are applied.

**7-10. Transport of M1-Series Tanks on Special-Purpose Flatcars**

a. Special-purpose G85 and G89 cushion rub-rail flatcars are not considered appropriate for loading the M1-series tanks since the individual weight of the vehicles exceeds the load-restraint capability of the tiedown chains working in relation to the action of the cushioned rub-rails.

b. Special-purpose flatcars owned by the Trailer Train Company, with the exception of the HTTX, are not considered appropriate for handling the M1-series tanks because of the obstruction of side guide rails, strength of tiedown chains, and spacing of tiedown devices. The M1-series tanks have not been test loaded on the HTTX; therefore, procedures have not been included in this publication.

**Section III. TRANSPORT ON FOREIGN RAILWAYS**

**7-11. General**

The transportability guidance contained in this section is applicable when the M1-series tank is transported on foreign railways. Consideration is given to single and multiple vehicle movements for the types of flatcars normally used in the movement of this type of vehicle. When loaded on a suitable flatcar, the vehicle can be transported, with restrictions, within European countries complying with the passe-partout international (PPI) gauge railways; this also applies to the majority of the countries in the Middle East, South America, Australia, India, and Pakistan. In the Middle East and South

America, the clearances vary by country, and each country will require a separate check. In Australia, India, and Pakistan, wide- or broad-gauge railways provide greater clearances and fewer restrictions. Because of the various designation systems and clearances used by different countries, evaluation of transport capability must be made on an individual basis.

**7-12. Transport on Foreign-Service Flatcars**

a. *General.* The vehicle can be transported on some foreign-service flatcars. Flatcars representative of those available in Europe that are suitable

for transporting the vehicle are described in table 7-8.

b. *Materials.* The materials required for blocking and tiedown of the vehicle on foreign-service flatcars are essentially the same as those used for transporting the vehicle within CONUS. Detailed guidance is contained in 4th Transportation Command Pamphlet 55-2, *Tiedown Guide for Rail Movements.*

Table 7-8. Characteristics of European Flatcar Available for Transporting Vehicles

Flatcar Designation	Capacity	Length	Width	Platform Height
RLMMP 700	57.3-ton (52.00 MT)	31-ft 2-in. (9.50 m)	10-ft 4-in. (3.15 m)	4-ft 2 $\frac{3}{4}$ -in. (1.29 m)
SAMMS 710	71.63-ton (65.00 MT)	49-ft 3in. (15.01 m)	10-ft 2in. (3.10 m)	4-ft 2- $\frac{3}{4}$ in. (1.29 m)



## APPENDIX A REFERENCES

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### 1. Army Regulations (AR)

AR 55-29	Military Convoy Operations in CONUS
AR 55-80	Highways for National Defense
AR 55-162	Permit for Oversize, Overweight, or Other Special Military Movements on Public Highways in the Contiguous States and the District of Columbia of the United States
AR 55-228	Transportation by Water of Explosives and Hazardous Cargo
AR 55-355	Military Traffic Management Regulation
AR 70-44	DOD Engineering for Transportability
AR 70-47	Engineering for Transportability
AR 385-40	Accident Reporting and Records
AR 746-1	Color, Marking, and Preparation of Equipment for Shipment

### A-2. Army Field Manuals (FM)

FM 55-9	Unit Air Movement Planning
FM 55-15	Transportation Reference Data
FM 55-17	Terminal Operations Specialists Handbook

### A-3. Army Supply Bulletins (SB)

SB 700-20	Army Adopted Items of Materiel
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### A-4. Army Technical Bulletins (TB)

TB 55-46-1	Standard Characteristics (Dimensions, Weight, and Cube) for Transportability of Military Vehicles and Equipment
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### A-5. Technical Manuals (TM)

TM 9-2350-255-10-1	Operators Manual; Tank, Combat, Full-Track; 105-mm Gun, M1
TM 38-250	Packaging and Handling of Dangerous Materials for Transportation by Military Aircraft
(AFR 71-4)	
TM 55-405-9	Weight and Balance
TM 55-500	Marine Equipment Characteristics and Data
TM 55-2200-001-12	Transportability Guidance Application of Blocking, Bracing, and Tiedown Materials for Rail Transportation

### A-6. Air Force Manuals

TO 1-1B-40	Handbook of Weight and Balance Data
TO 1C-5A-9	Loading Instructions, USAF Series C-5A Airplane

### A-7. Other Publications and Source of Procurement

- a. *Code of Federal Regulations*, Title 49—Transportation, Parts 170-179  
Available from: Superintendent of Documents  
US Government Printing Office  
Washington, DC 20402
- b. Association of American Railroads *Rules Governing the Loading of Commodities on Open-Ton Cars and Trailers*  
Section No. 1—General Rules  
Section No. 6—Rules Governing the Loading of Department of Defense Materiel on Open-Top Cars  
Available from: Association of American Railroads  
59 E. Van Buren Street  
Chicago, IL 60605

c. American Association of State Highway and Transportation Officials (AASHTO) *Legal Maximum Dimensions and Weight of Motor Vehicles Compared with AASHTO Standards*

Available from: American Association of State Highway and  
Transportation Officials  
341 National Press Building  
Washington, DC 20004

**A-8. Department of Transportation**

Special Permit No. 3498

USCG 108 Rules and Regulations for Military Explosives and Hazardous Munitions

By Order of the Secretary of the Army:

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