TECHNICAL MANUAL

TRANSPORTABILITY GUIDANCE FOR THE CRANE, 7½-TON, ROUGH-TERRAIN, KOEHRING TYPE I (NSN 3810-01-165-0646) TYPE II (NSN 3810-01-165-0647)

HEADQUARTERS, DEPARTMENT OF THE ARMY

7 SEPTEMBER 1990

TECHNICAL MANUAL
No. 55-3810-01-165-14

HEADQUARTERS
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WASHINGTON, DC, *7 September 1990*

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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 Koehring 7½-ton rough-terrain crane. It contains information considered appropriate for safe transport of the crane. Also included are physical characteristics, as well as safety considerations, required for worldwide movement by various transport modes. Where considered necessary, metric equivalents appear in parentheses following the dimensions or other measurements.

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

1-2. Safety

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

1-3. Definitions of Warnings, Cautions, and Notes

Throughout this manual, warnings, cautions, and notes emphasize important or critical guidance.

a. Warning. Instructions that, if not 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

Request users of this manual report errors, omissions, and recommendations to Commander, Military Traffic Management Command Transportation Engineering Agency, ATTN: MTTE-TRS (J. Atwood), PO Box 6276, Newport News, VA 23606-0276, AUTOVON 927-4646 or (804) 878-4646. Report changes on DA Form 2028 (Recommended Changes to DA Publications and Blank Forms). Address electrically transmitted messages to CDR MTMCTEA FT EUSTIS VA//MTTE–TRS//.

CHAPTER 2
TRANSPORTABILITY DATA

Section I. GENERAL

2-1. Scope

This chapter provides a general description and identification photographs of the 7½-ton crane, as well as tabulated transportability characteristics of the types I and II cranes.

2-2. Description

The 7½-ton types I and II cranes have a rated lift capacity of 7½- tons at a 10-foot radius. Each crane has a two- and four-wheel drive, two-wheel steering, and four-wheel crab steering, pneumatic tired, diesel-engine-driven chassis. On this chassis is a center mounted, hydraulically operated, fully revolving telescoping boom. The cranes are capable of maintaining a speed of about 22 miles per hour (mph) (35.39 km/hr) and are equipped with an audio warning buzzer that sounds at speeds exceeding 25 mph. Each crane has an adequate fuel capacity for a maximum of 20 hours of operation or 200 miles of travel at maximum road speed. The type I crane (fig 2-1) is for general-purpose operations. The type II crane (fig 2-2) is for airborne and airmobile operations. The types I and II cranes are the same except for changes required to allow the type II to be sectionalized for external helicopter transport. The sectionalization parts and tools are stowed on the type II crane. When this crane is sectionalized, the carrier unit (section with the wheels, chassis, body, and so forth) weighs 15,600 pounds (7076 kg), and the boom assembly (upper structure) weighs 8,630 pounds (3915 kg). For simplicity in this manual, the power unit is called the carrier, and the boom section is called the upper structure.

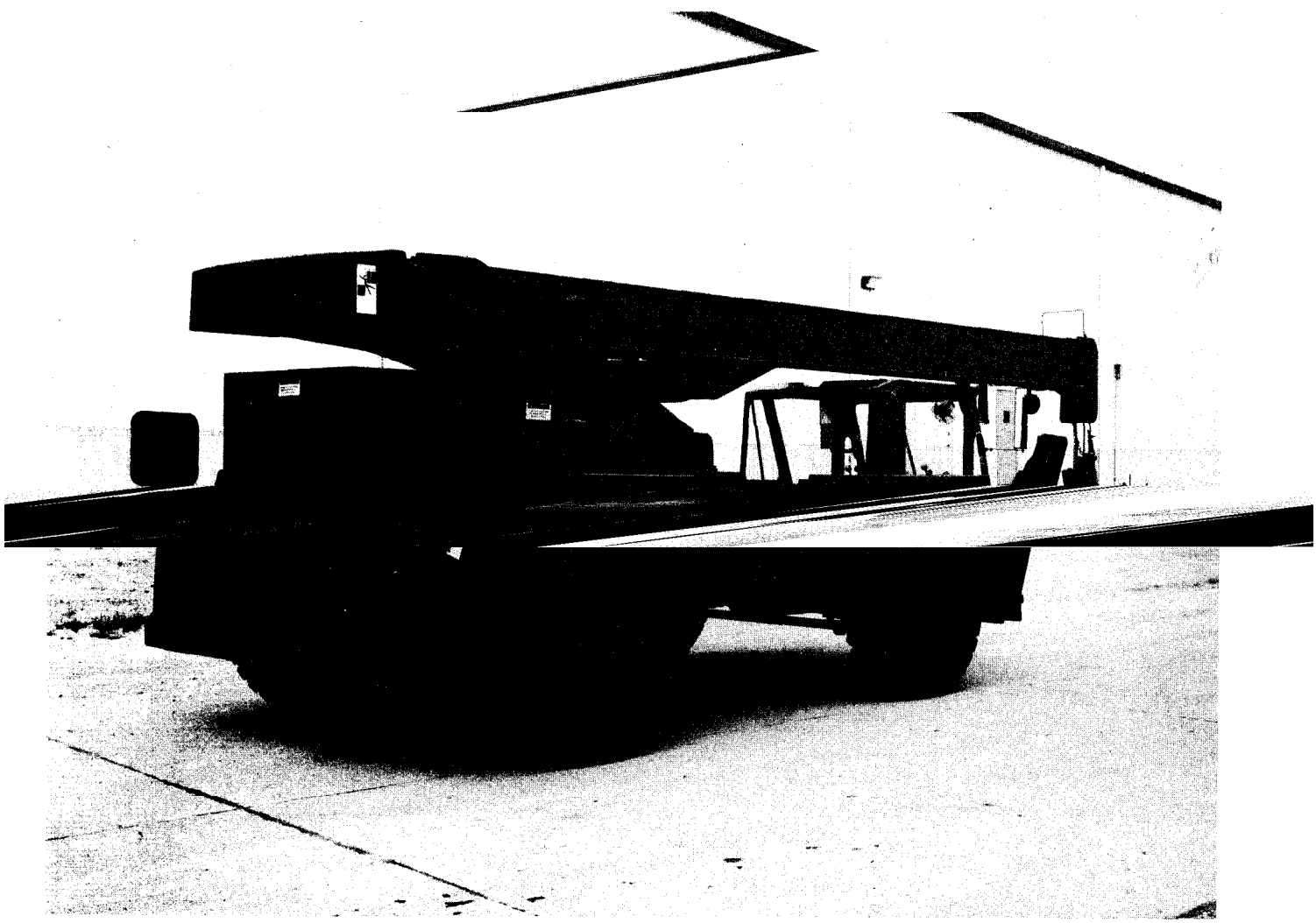


Figure 2–1. Type I crane, right rear view.

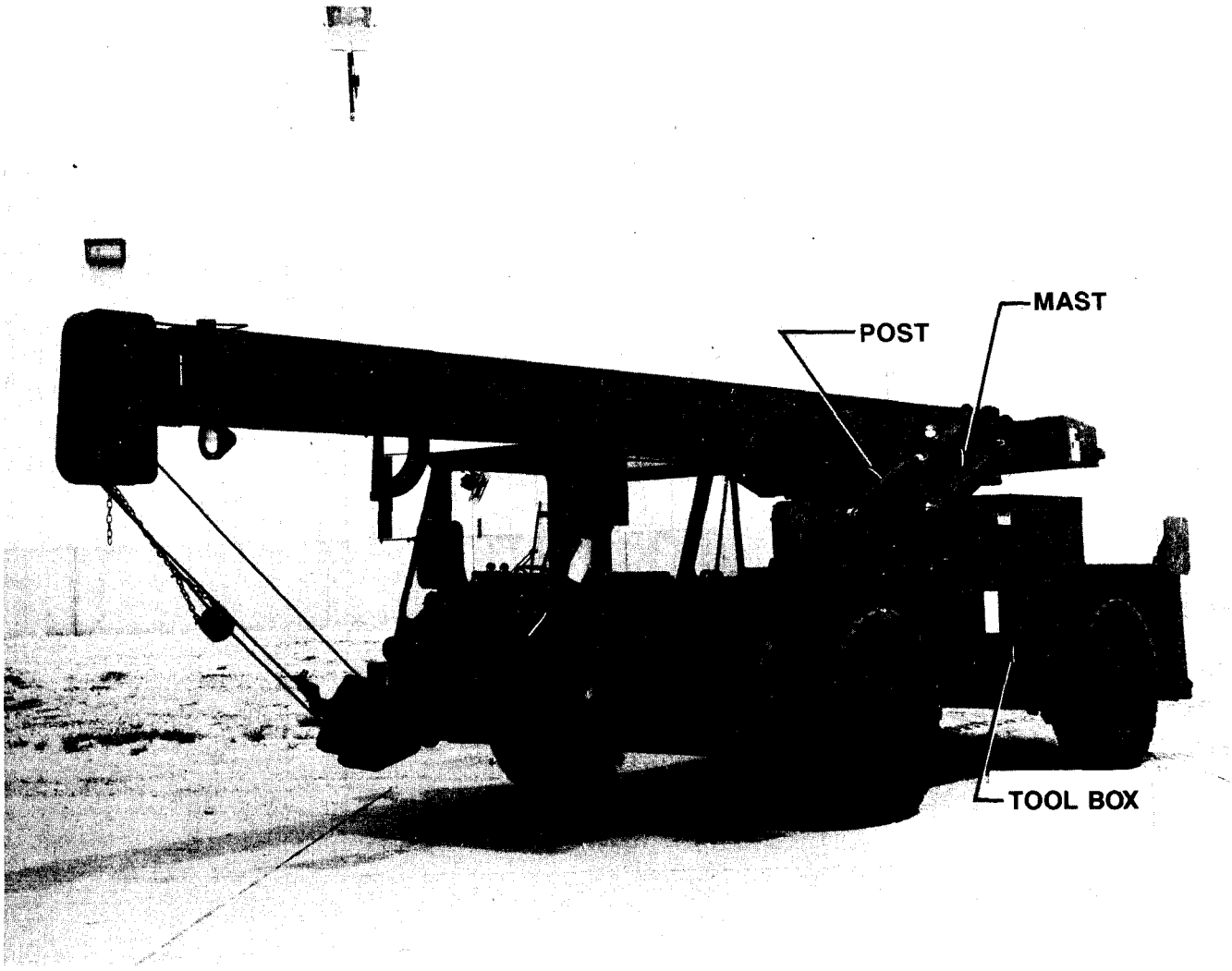


Figure 2–2. Type II airborne/airmobile crane, left front view.

2-3. Transportability Drawings

Transportability drawings, side and rear views, of both 7½-ton cranes are shown in figures 2-3 through 2-6. These figures include dimensions and loadrating capacities of the tiedown and lifting provisions.

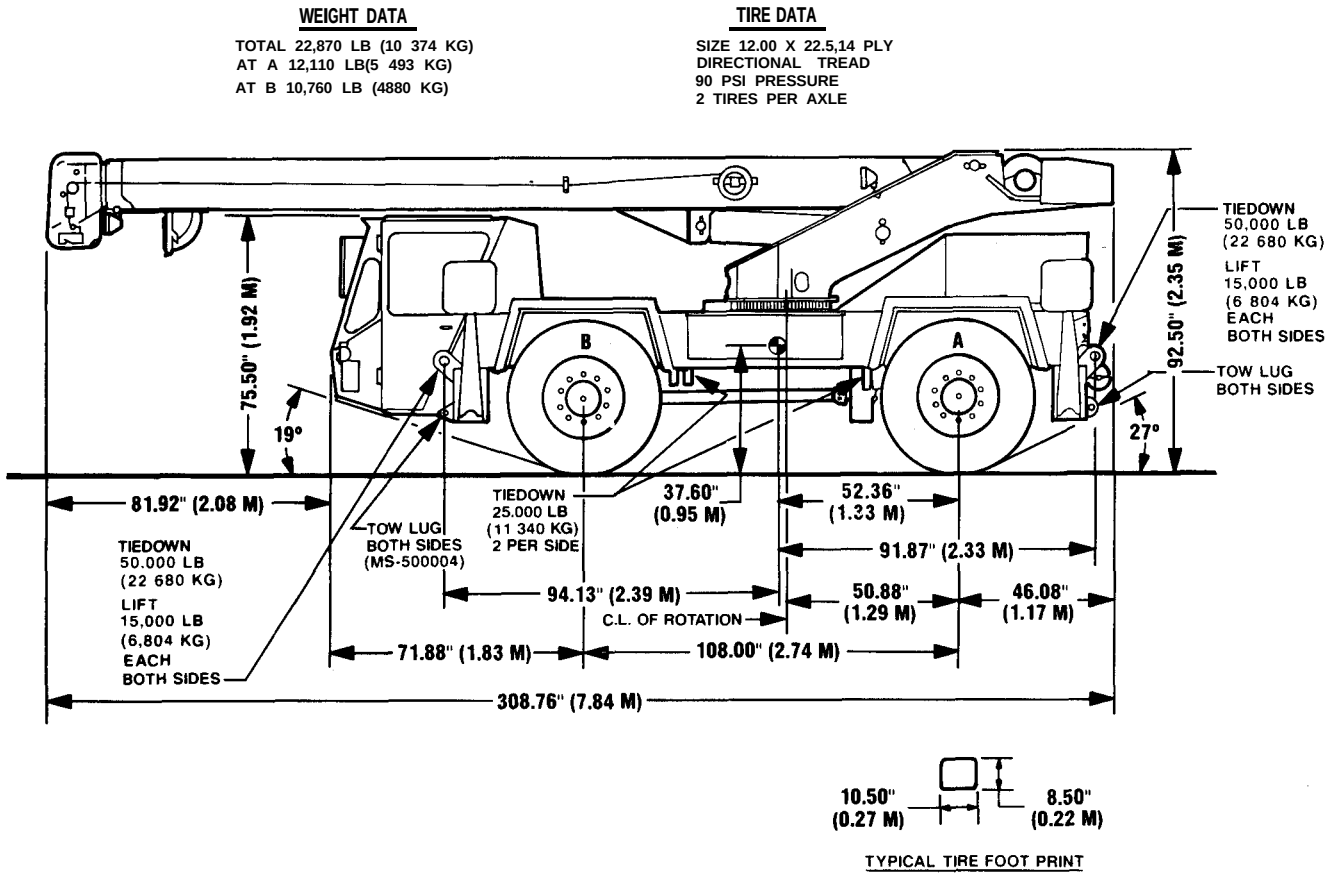


Figure 2-3. Type I crane transportability drawing, side view.

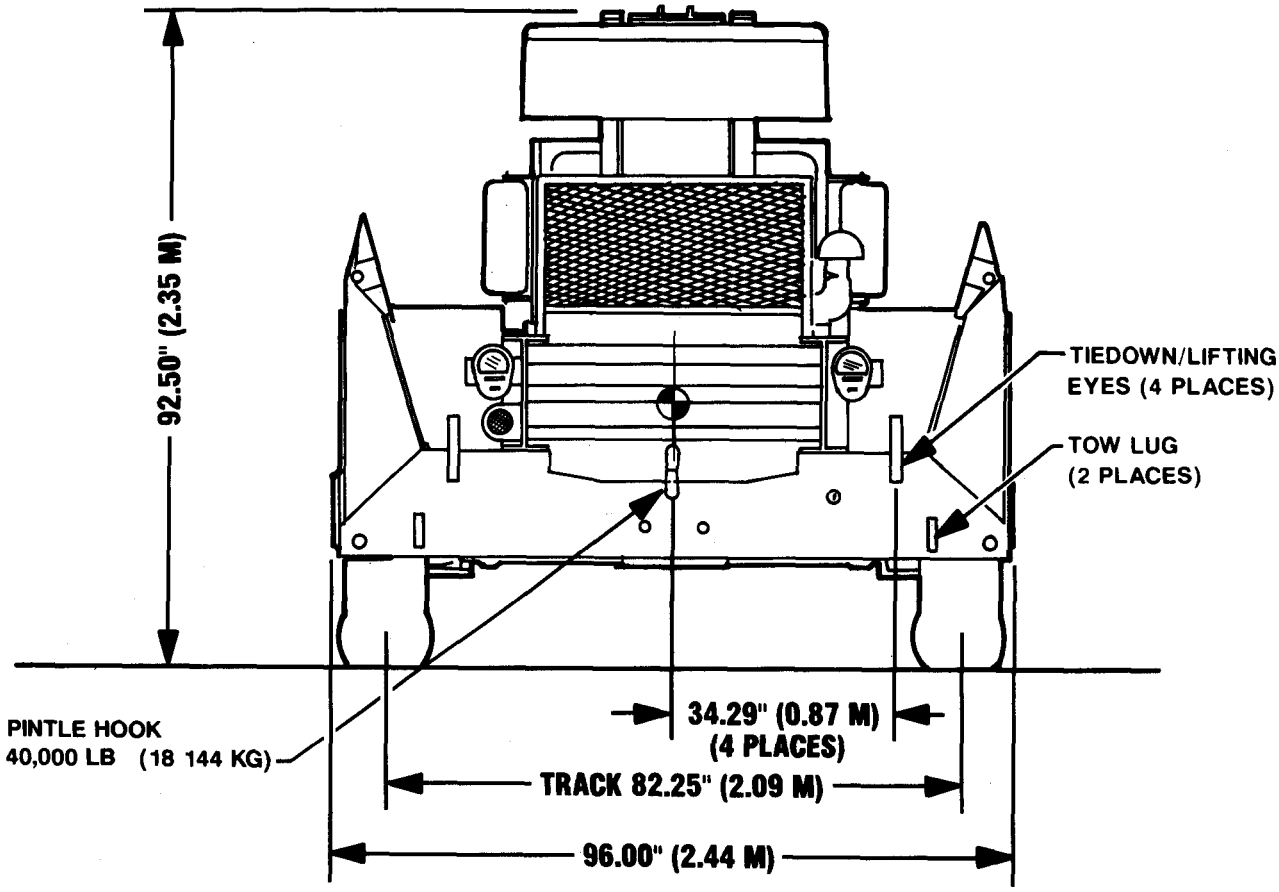


Figure 2–4. Type I crane transportability drawing, rear view.

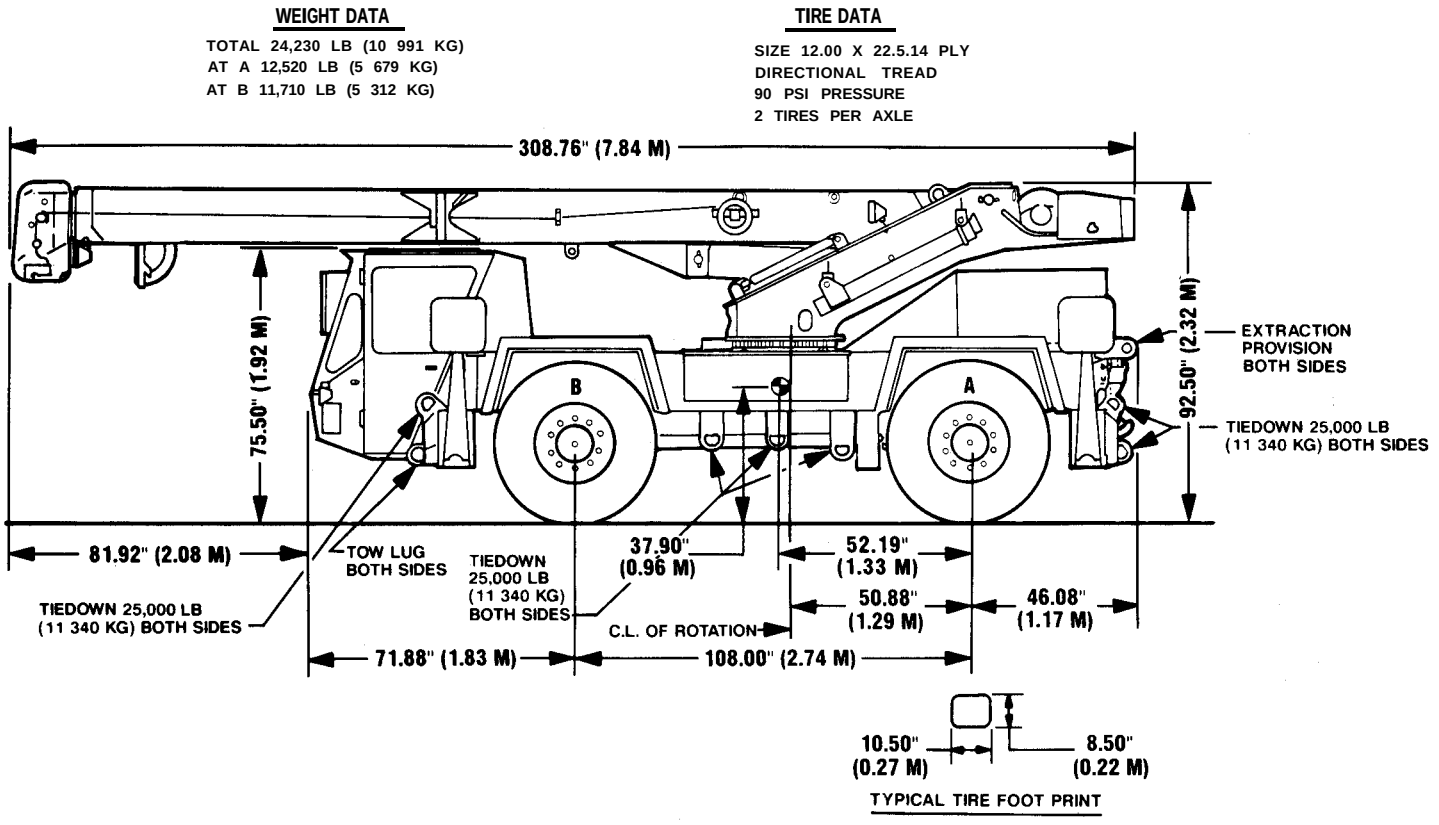
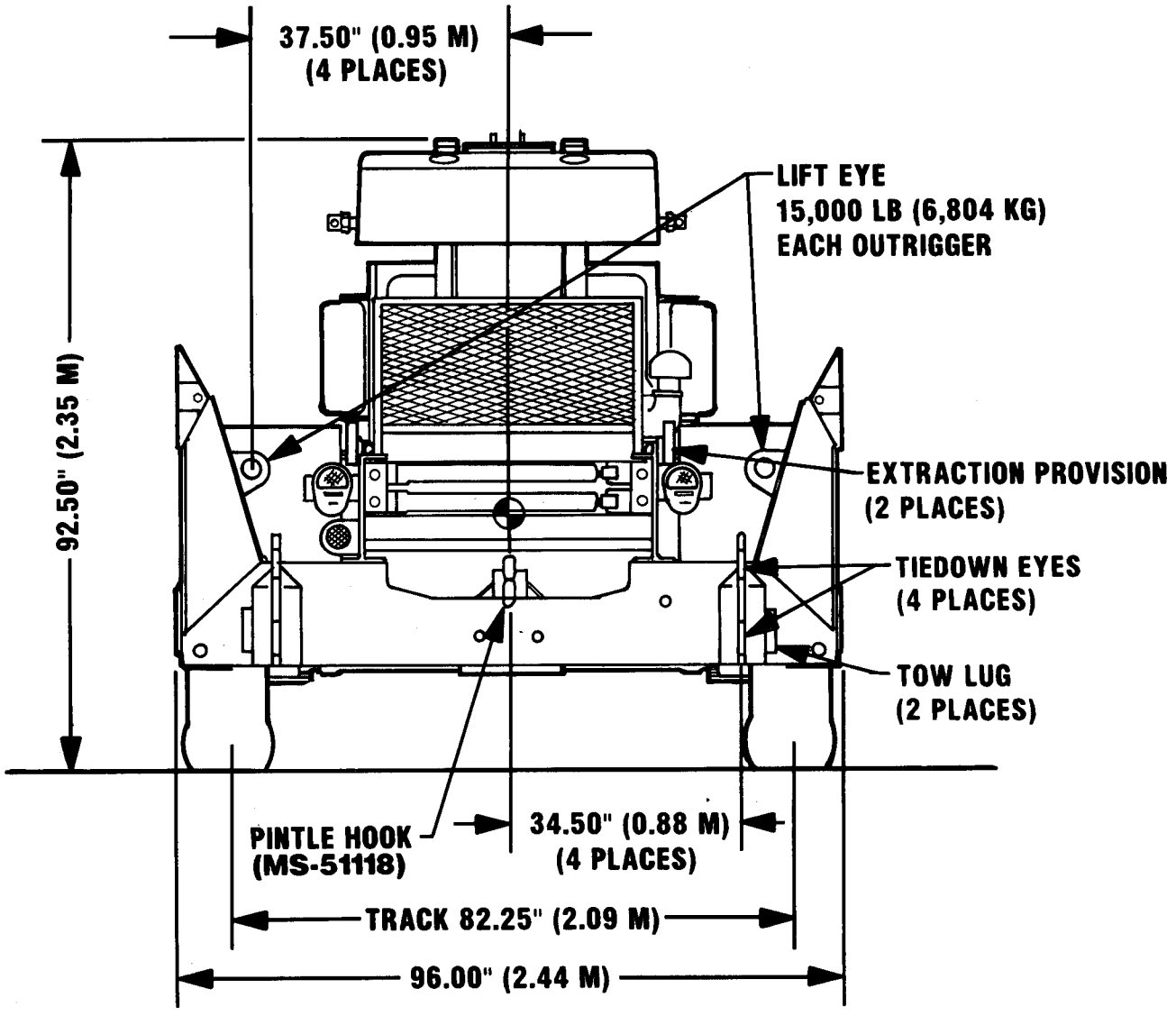


Figure 2-5. Type II crane transportability drawing, side view.



OUTRIGGERS RETRACTED

Figure 2-6. Type II crane transportability drawing, rear view.

Section II. CHARACTERISTICS AND RELATED DATA

2-4. General Transportability Characteristics

Data contained here apply 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 in this manual.

National stock number:	
Type I	3810-01-165-0646
Type II	3810-01-165-0647
Line item number	
Type I	C36151
Type II	C36219
Model number	LRT-11O
Performance:	
Maximum speed	22 mph (35.39 km/hr)
Fuel tank capacity	44 gal (166.5 L)
Turning radius:	
Four-wheel steering	18.3 ft (5.53 m)
Two-wheel steering	32.3 ft (9.84 m)
Ground clearance (bottom of transmission to ground level)	14.4 in. (0.36 m)
Dimensions and shipping data:	
Length:	
Type I	308.76 in. (7.8 m)
Type II:	
Sectionalized carrier unit	225.96 in. (5.74 m)
Upper structure	308.76 in. (7.8 m)
Width	96.00 in. (2.44 m)
Height:	
Operational all models	92.50 in. (2.35 m)
Reduced (type II) ground to top of cab	74.0 in. (1.9 m)
Size all models	12 x22.5 4 ply
Tire pressure 90 psi travel, creep speed 2.5 mph, 110 psi stationary pick	
Weight:	
Type I	22,870 lb (10374 kg)
Type II (total)	24,230 lb (10991 kg)
Sectionalized weight:	
Carrier	15,600 lb (7076 kg)
Upper structure	8,630 lb (3915 kg)

2-5. Usual Characteristics

The vehicle does not have any unusual characteristics requiring special attention for temperature, atmospheric pressure, or humidity variations during the crane's exposure to normal transportation environments.

2-6. Hazardous and Dangerous Characteristics

The vehicle will not present any 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.

2-7. Sensitivity

The vehicle, when restrained according to guidance in this manual, can withstand the shock and vibration of current transportation methods.

CHAPTER 3
SAFETY

3-1. General

General safety considerations and precautions for movement of the 7½-ton crane are:

a. Never leave the crane unattended while the engine is running.

b. Only qualified drivers should operate the crane.

c. Exercise caution when towing a disabled crane. Follow the specific requirements described in the operator's manual for towing the crane.

d. Permit no one under the crane when it is being lifted.

WARNING

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

Use a ground guide to direct the driver when the vehicle is operated in reverse or within 20 feet of a building or other vehicles.

WARNING

Do not operate the engine in an enclosed area that does not have adequate ventilation. Prolonged inhalation of carbon monoxide could be fatal.

3-2. Specific Safety Requirements

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

CHAPTER 4
AIR TRANSPORTABILITY GUIDANCE

Section I. GENERAL

4-1. Scope

This chapter provides air transportability guidance for movement of the Koehring 7½-ton crane. It contains tiedown diagrams and safety considerations. It also prescribes the materials required to prepare, load, tie down, and offload the crane for transport by US Air Force C-130, C–141, and C-5A aircraft.

4-2. Maximum Utilization of Aircraft

The loads described in this chapter are not maximum loads. Additional cargo and/or personnel within allowable load limit and restrictions, prescribed by pertinent safety regulations, can be transported.

4-3. Responsibility

The loadmaster will ensure that the configurations described below are properly loaded in or unloaded from the aircraft.

4-4. Safety

Besides the safety precautions contained in chapter 3, the following should be noted:

WARNING

Fire extinguishers must be readily available during offloading and loading operations.

WARNING

Provide adequate ventilation during loading and unloading.

CAUTION

Do not allow the crane to exceed 3 mph inside the aircraft or on the loading ramps.

The activity offering the vehicle for transport will notify the aircraft commander or a designated representative if ammunition or explosives are to be transported with the vehicle (ref TM 38-250/AFR 71-4).

4-5. Preparation of the Crane

a. Retract the boom and lower it over the front of the carrier.

CAUTION

When securing the hook block to the front bumper, apply only enough tension to take up the slack.

b. Use the link in the tool box to connect the hook block to the attachment on the front bumper. Using the winch, take up the slack in the cable.

c. Fold mirrors in and secure them to the crane to protect their faces.

d. Use TM 38-250 (AFR 71-4) to ensure safety and compatibility of any additional cargo being considered for loading with the crane.

e. Secure all externally and internally stored equipment.

f. Place the crane's transmission in neutral and set the brakes.

g. Be sure the fuel tank is no more than one-half full (TM 38-250/AFR 71-4).

Section II. TRANSPORT BY US AIRCRAFT AND HELICOPTER

4-6. Transport by US Air Force Aircraft

a. Sleeper shoring will be required between the vehicle frame and the floor of the aircraft. Shoring will consist of four stacks of wood material 12 inches wide by 18 inches in length by approximately 24 inches in height. The shoring stacks shall be positioned on each side of the vehicle forward of the front axle and aft of the aft axle. Standard construction grade wood material will be adequate. The shipper must supply the shoring.

b. The 7½-ton rough-terrain crane is transportable in C-130, C-141, and C-5A aircraft.

c. For C-130 aircraft transport:

(1) Back the crane aboard the aircraft.

(2) Position both axles between fuselage stations 337 and 689, the high-strength compartments.

d. For C-141 aircraft transport:

(1) Back the crane aboard the aircraft.

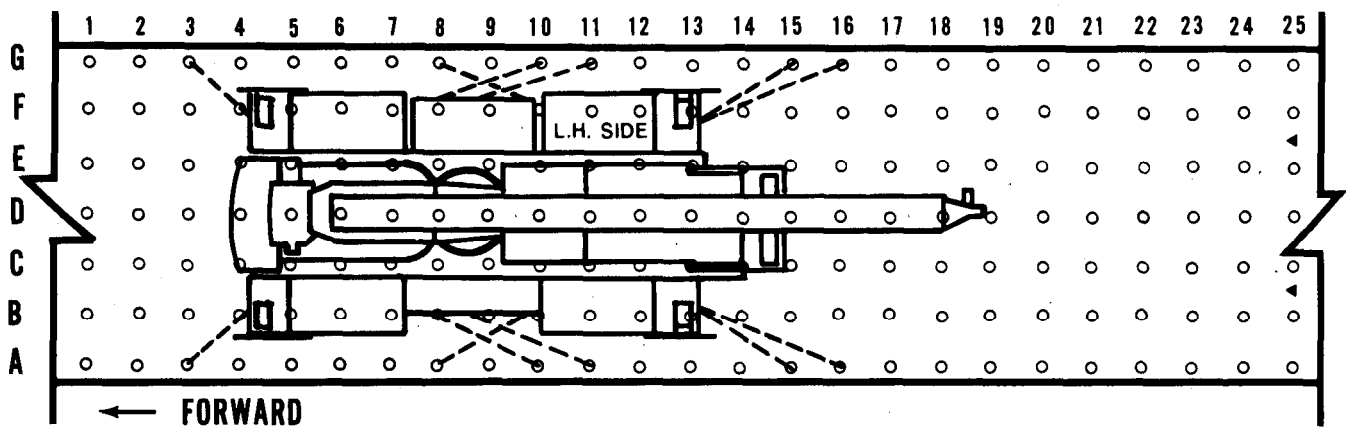
(2) Position both axles between fuselage stations 678 and 998, the high-strength compartments.

e. For C-5A aircraft transport:

(1) Load through the forward cargo opening with the aircraft forward or level kneeled.

(2) With aircraft in any kneeled position, load through the aft cargo opening and position between butt lines 70 left and 78 right.

f. A typical tiedown diagram for transport in C-130 aircraft is given in figure 4-1. Since the C-130 aircraft has only a few 25,000-pound tiedown fittings, this diagram requires a larger number of restraints than a diagram for the C-141 and C-5A. However, all the tiedown provisions should be inspected and repaired, if necessary, prior to delivery to the aircraft. The restraint factors (g loads) for the minimum acceptable condition specified for crew and passenger safety in a controlled emergency landing are identified in applicable procedures in USAF Technical Orders (TO) 1C-130-9, 1C-141B-9, and 1C-5A-9.



LEGEND: C-130 AIRCRAFT

- ○ 10,000-POUND-CAPACITY TIEDOWN FITTING
- ▲ 25,000-POUND-CAPACITY TIEDOWN FITTING

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 4-1. Tiedown diagram for the 7½-ton rough-terrain crane in C-130 aircraft.

g. For airdrop of the Koehring 7½-ton type II crane, rig the crane acording to FM 10-548/TO 13C7-24-21. Then the 7½-ton type II crane can be successfully delivered by LAPES and LVAD from a C-130 and by LVAD from a C-141B.

4-7. Transport by US Army Aircraft

WARNING

Use extreme caution during the removal and installation of the upper structure from and onto the carrier. The lifting apparatus (part of the sectionalization equipment) allows free rotation of the upper structure after lifting it from the carrier. During this rotation, the upper structure should be under control; if not under control, it can cause injury to personnel and damage to the crane.

For helicopter external air transport (EAT) of the type II crane, remove the boom assembly (upper structure) (fig 4-2) from the chassis (carrier) (fig 4-3). If a suitable size crane (l0-ton or larger) is not available, use the crane's lifting device. All lifting device components (mast, post, lift arms, and truss rods) are stowed on the type II crane with pin connection (figs 2-2, 4-2, and 4-3). All tools, extension hoses, and accessories required for disassembly and reassembly are stowed in the carrier tool box on the left-hand side (fig 4-3). When the type II crane is sectionalized into two separate loads, the weight of each section should be according to paragraph 2-4. Any additional components, when added to the carrier, that will affect the total weight or flight characteristics may affect helicopter transport. Sectionalization and rigging of crane must follow the procedures given in the Koehring *Commercial Operation Instructions.* This manual contains all sectionalized instructions. The maintenance manual is separate and is entitled "Koehring Commercial Maintenance Instructions". The type II crane, when sectionalized for helicopter transport, is within the lifting capability of the CH-47 helicopter. The carrier unit or upper structure can be transported by CH-47 as a single- or dual-point load, as shown in figures 4-4 through 4-7.

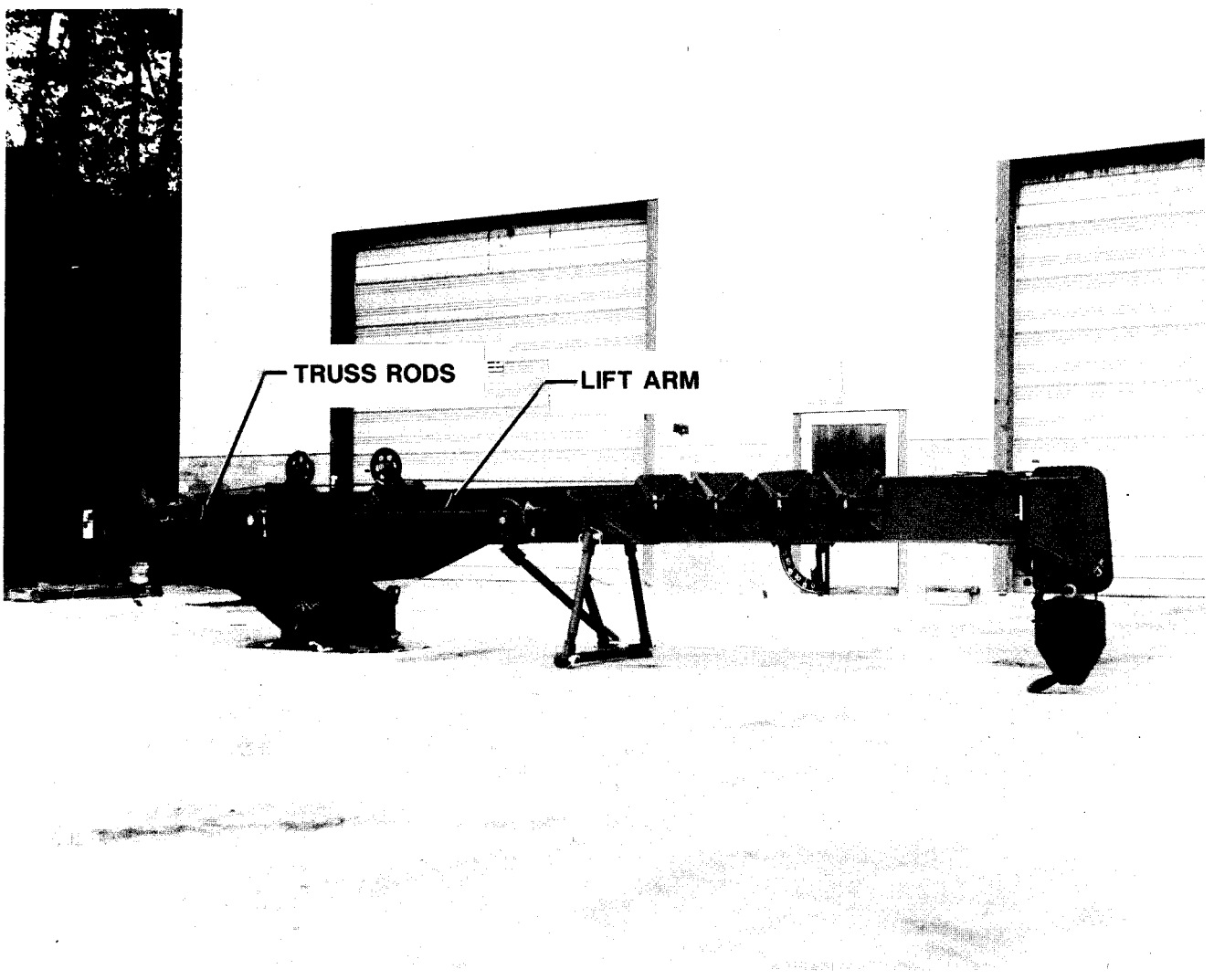


Figure 4-2. Boom assembly (upper structure) type II 7½-ton rough-terrain crane in EAT configuration.

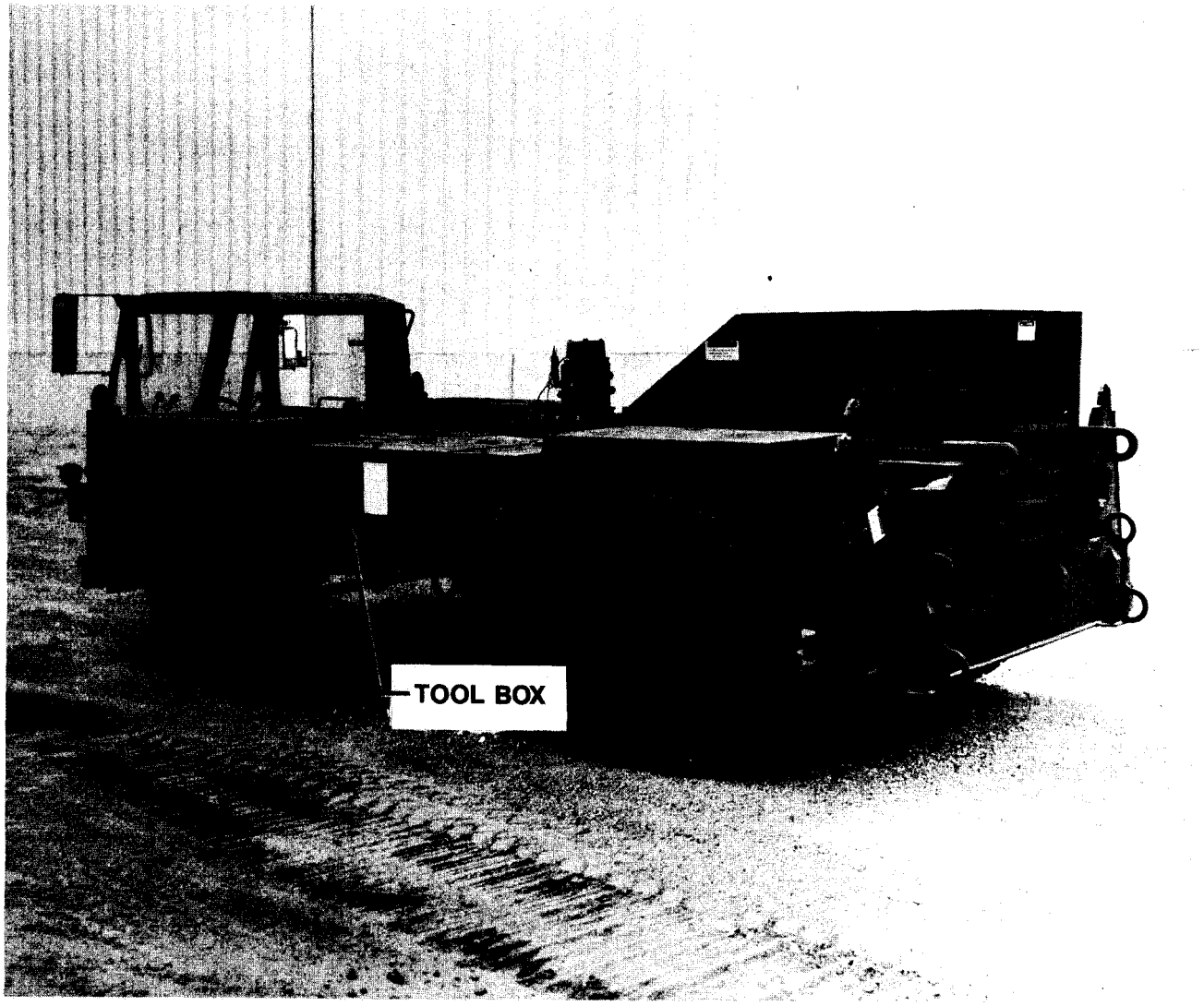


Figure 4-3. Chassis (carrier) of type II airborne/airmobile crane in EAT configuration.

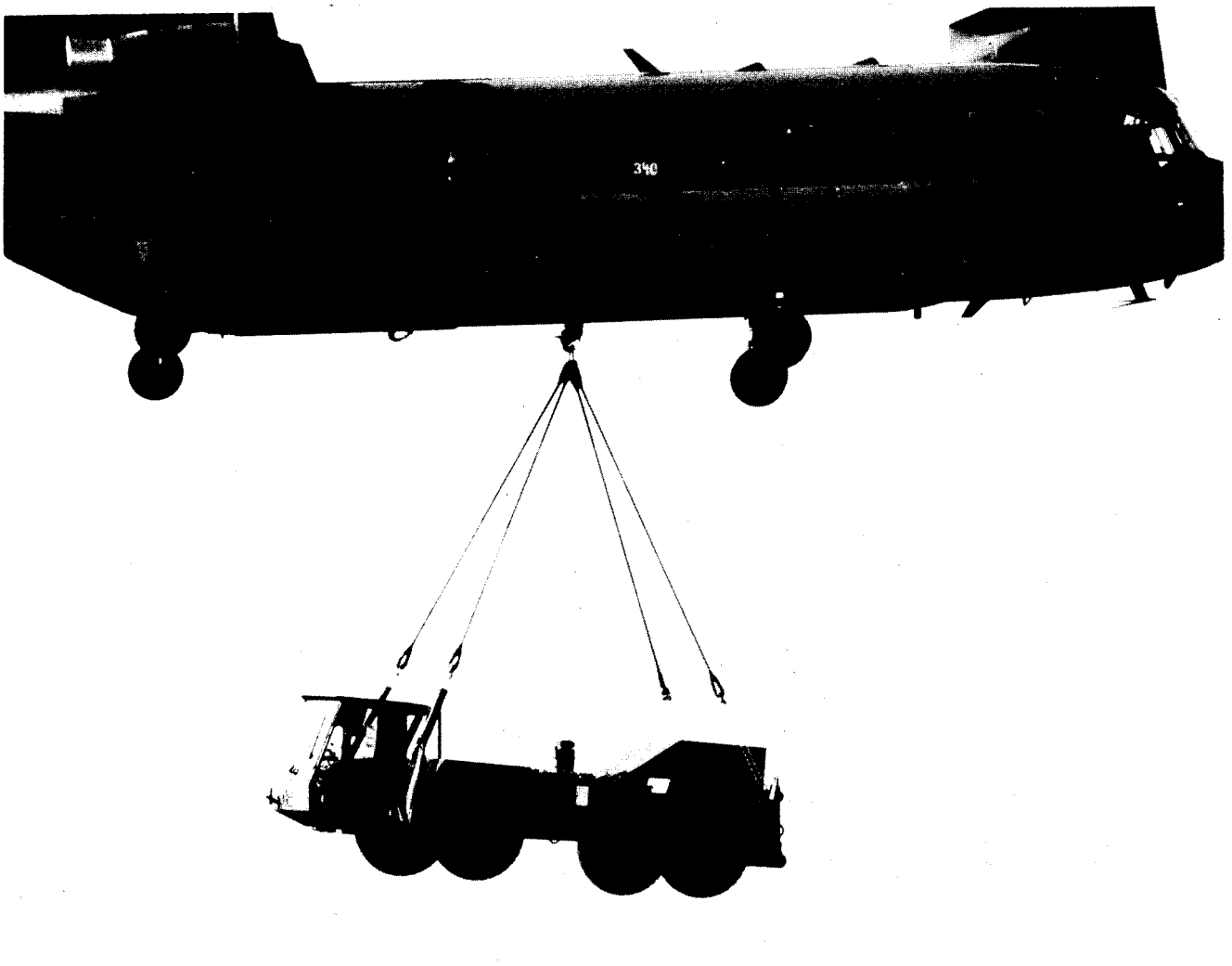


Figure 4-4. Type II 7½-ton crane carrier unit: single-point hookup (rear end facing direction of flight).

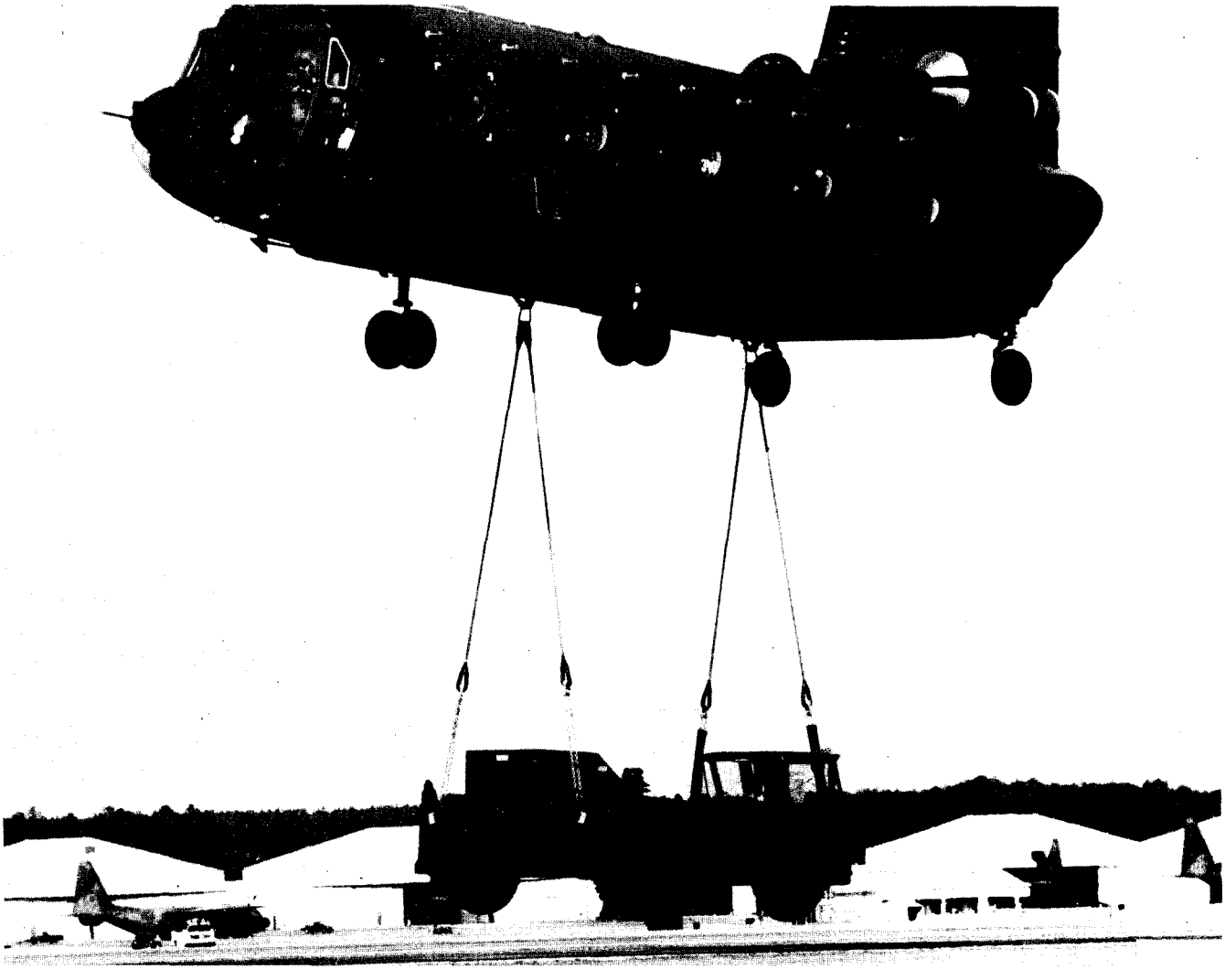


Figure 4-5. Type II 71/2-ton crane carrier unit: dual-point hookup (rear end facing direction of flight).

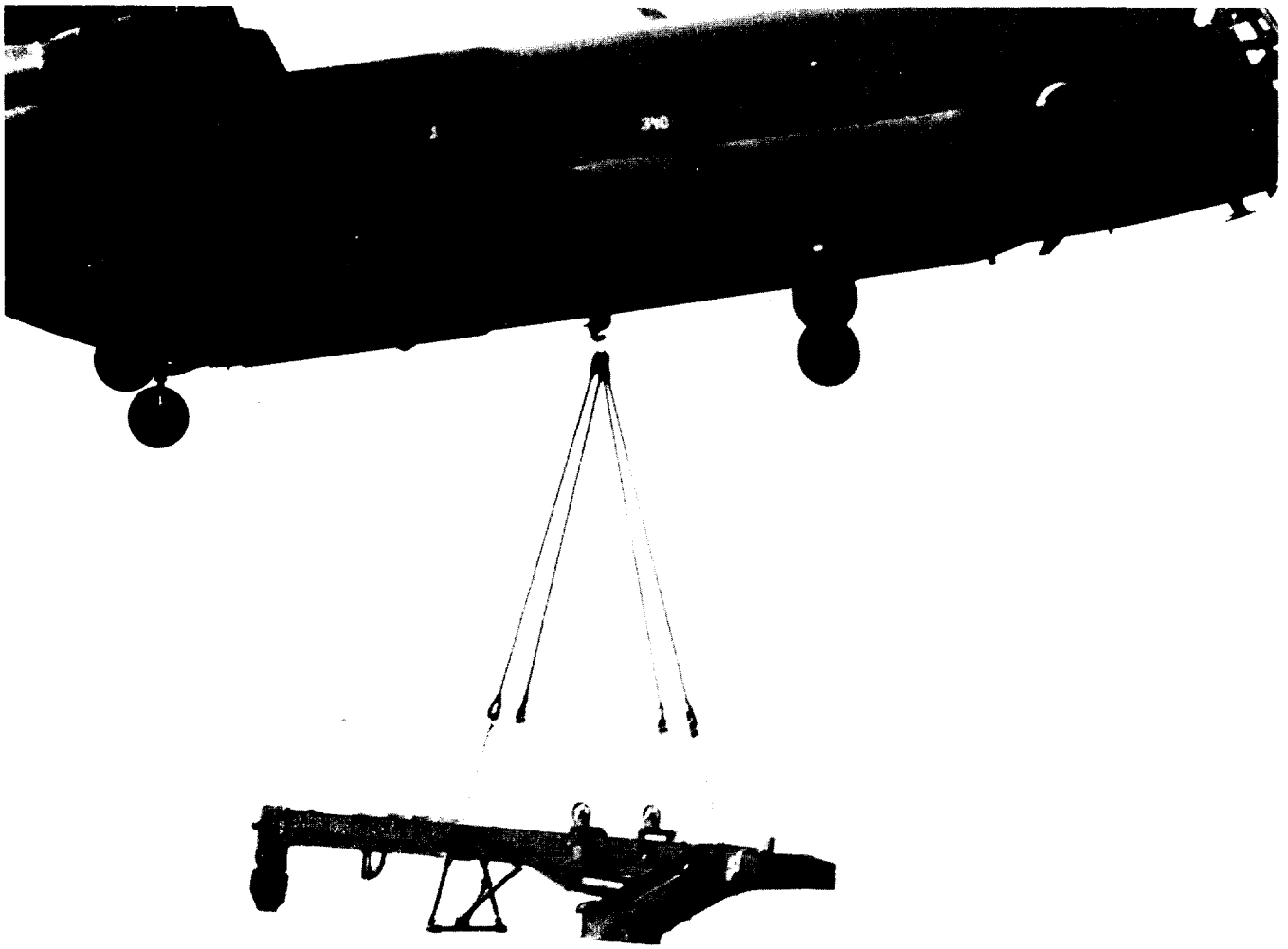


Figure 4–6. Type II 7½-ton crane upper structure: single-point hookup.

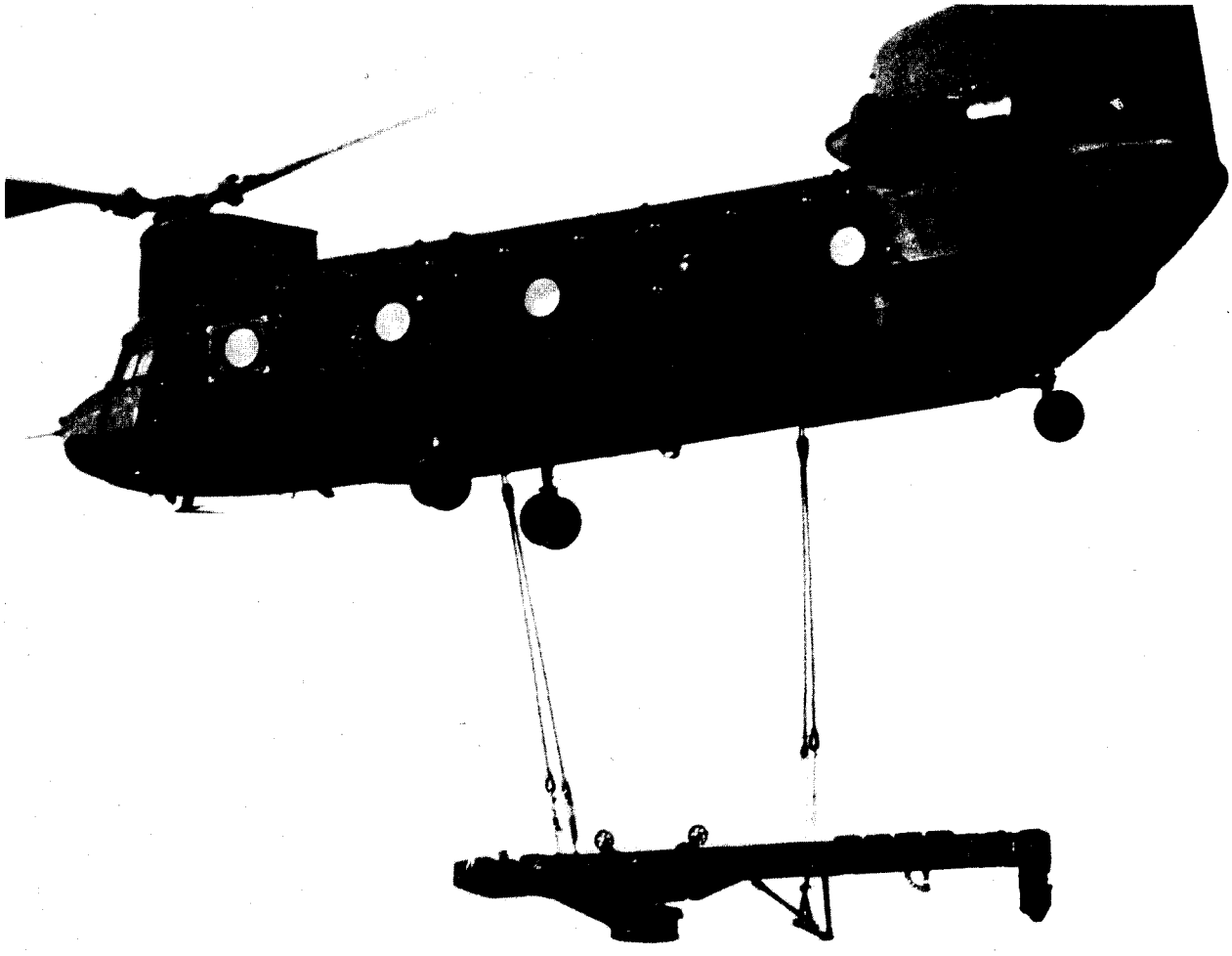


Figure 4-7. Type II 7½-ton crane upper structure: dual-point hookup.

a. Material required for EAT.

(1) Sling set, 25,000-pound capacity, 1 each.

(2) Cord, nylon, type III, 550-pound BS.

(3) Tape, adhesive, pressure-sensitive, 2-inch wide roll.

(4) Cotton webbing, ¼-inch, 80-pound BS.

(5) Nylon, tubular, ½-inch, l,000-pound BS.

(6) Tie-down, nylon, cargo, CGU-1B, 1 each.

(7) Padding material, felt or cellulose.

b. Preparation for EAT.

(1) Locate the crane in a clear and level area for the disassembly procedure.

(2) Separate the upper structure (boom assembly) from the carrier unit (vehicle chassis).

(3) For carrier unit, fold the side mirrors inboard and tie or tape as required. Tape windshield wipers to windshield. Secure steering wheel, doors, and all loose equipment with cord as necessary.

(4) For upper structure, secure hook-block assembly to the end of the boom mast with CGU–1B cargo tiedown or equivalent. Secure boom light power cable with nylon cord. Insert wood-block cable wedge at the drum to prevent cable from unspooling if slack should occur. Secure wooden cable wedge (left and right sides) with ½-inch tubular nylon. For rigging, hookup, and sectionalization procedures, see Koehring *Commercial Operation Instructions* and FM 55450-1, *Army Helicopter External Load Operations.*

NOTE

When the unit is sectionalized, secure the boom hydraulic hoses with nylon cord and ensure they are tied and free of the boom base.

c. The loads of the sectionalized 7½-ton crane are suitable for CH-47D helicopters in either single- or dual-point configuration at the following airspeeds, when rigged and transported according to FM 55450-1

Configuration	*Weight (lb)*	*Airspeed (KIAS)*
Nonsectionalized	24,230	120
Power unit (vehicle chassis)	15,600	140
Boom assembly (upper structure)	8,630	140

CHAPTER 5
HIGHWAY TRANSPORTABILITY GUIDANCE

Section I. GENERAL

5-1. Scope

This chapter provides highway transportability guidance for movement of the 7½-ton rough-terrain crane. It covers the physical characteristics and safety considerations. It also prescribes the materials required to prepare, load, tie down, and unload the crane.

5-2. Safety

Besides the safety precautions in chapter 3, movement of the crane is subject to all safety laws, rules, and regulations applicable to commercial carriers. Overseas, theater regulations govern such movement.

CAUTION

Do not allow the crane to exceed 3 mph during loading or unloading operations

5-3. General

The crane is transportable under its own power for limited highway movement in CONUS and in overseas areas. It has an operating range of 200 miles (321 km) and a maximum speed of 22 mph (35.39 km/hr).

Section II. TRANSPORT BY SEMITRAILER

5-4. Transport on Semitrailer

The 7½-ton rough-terrain crane is transportable by semitrailer. Self-propelled movement over public highways in CONUS and overseas should be made only when no other transport means are available or practical. Either military or commercial semitrailers of adequate capacity are suitable for highway shipments. Transport of the crane by an M915/M127A2C military truck-tractor/semitrailer combination exceeds the legal width for 36 of the 51 States (including the District of Columbia). However, the width is within permit limits, thereby requiring only routine permits for highway transport. Overseas, the cranes exceed legal limits for highway transport in Africa; North, Central, and South America; Europe; Asia; Middle East; and Oceania. Transport by the M931A1/M871 tractor-trailer/semitrailer combination will result in restrictions similar to those for the M915/M127A2C tractor-trailer/semitrailer combination above. Procedures for obtaining permits in CONUS are given in AR 55-162. For legal limits in overseas countries, use *Limits of Motor Sizes and Weights,* published by International Road Federation, 1023 Washington Building, Washington, DC 20005.

5-5. Preparation of the 7½-Ton Crane

Preparation of the crane for transport includes the following procedures:

a. Place the crane in the tiedown position on a semitrailer by using an appropriate size crane, or by driving or towing it, provided a suitable ramp or bridge-is available.

b. Set the handbrake when the crane is placed in the tiedown position. Also, place the gearshift lever in the neutral position.

c. Retract the boom and lower it to the travel position (fig 5-1).

d. Use the link in the tool box to connect the hook block to the bumper loop.

CAUTION

When securing the hook block to the front bumper, apply only enough tension to take up the slack.

e. With the winch, take up the slack in the cable.

f. Wire the socket down to prevent the cable from loosening on the winch drum.

g. Band the tool and battery boxes lids.

h. Fold the side mirrors in and secure.

i. Place fuel shutoff switch on the rear cab wall in the off position for transport.

j. Secure all loose gear with nylon cord or a suitable substitute.

5-6. Loading on Semitrailers

Use a 25,000-pound-capacity or larger semitrailer for highway transport of the 7½-ton. Figures 5-1 and 5-2 show a tiedown diagram for the 7½-ton crane that is compatible with standard loading practices. Table 5-1 shows the bill of materials for blocking and tying down the crane on a semitrailer. Refer to table 5-2 for data on the application of these materials.

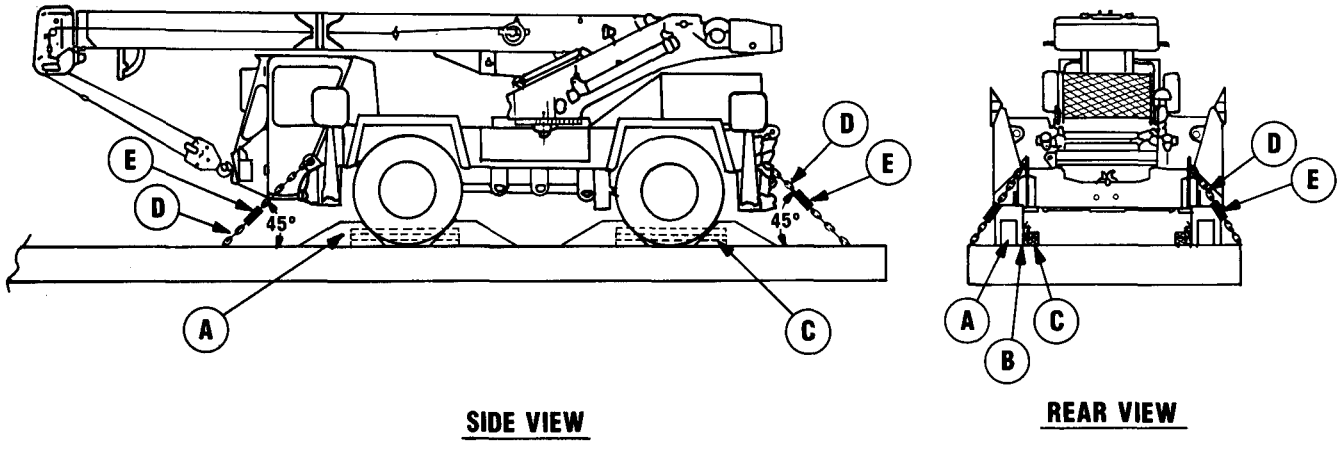


Figure 5–1. Blocking and tiedown of the 7½-ton rough-terrain crane on a semitrailer (using chains or wire rope) (tables 5–1 and 5–2).

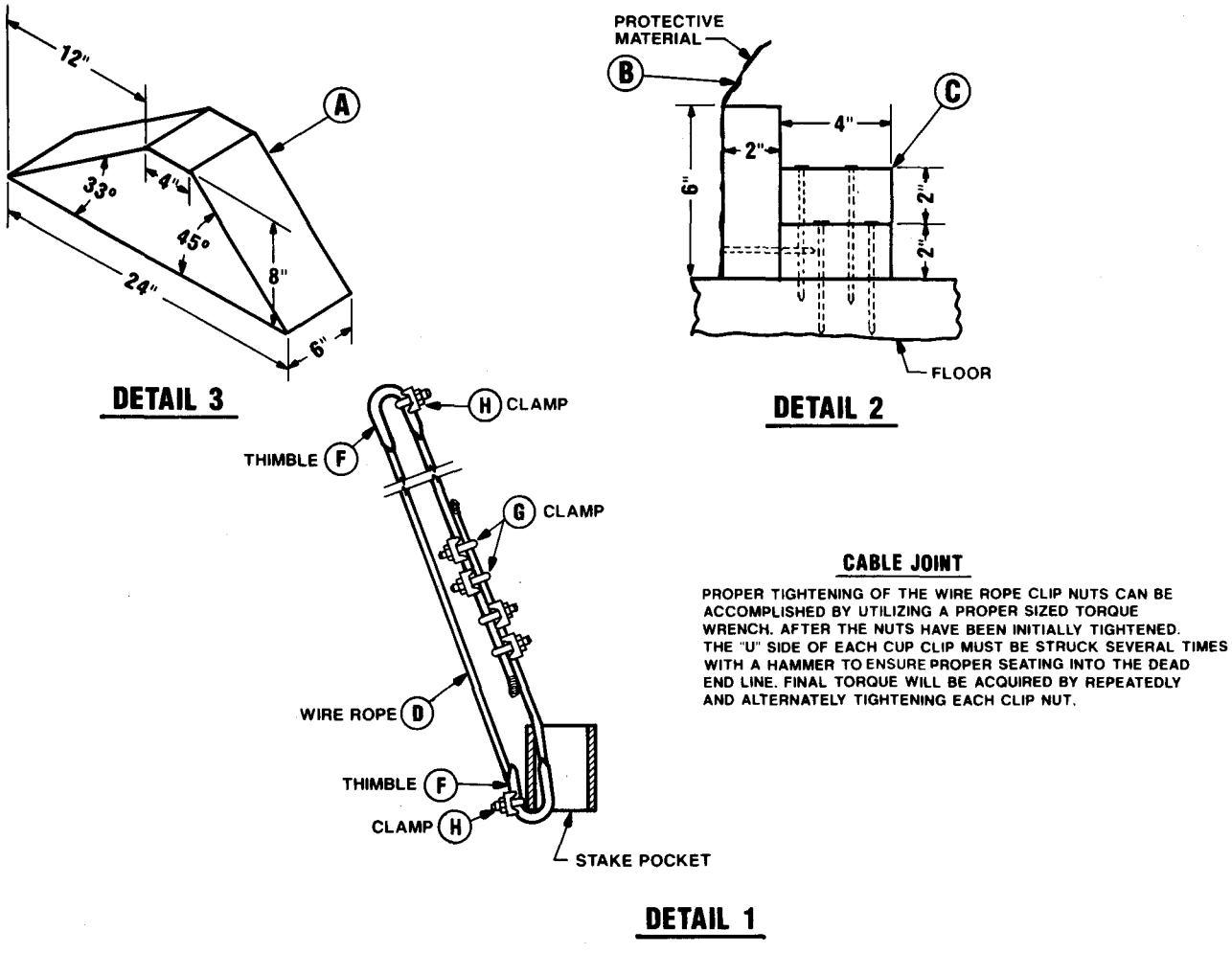


Figure 5-2. Detail blocking and tiedown for the 7½-ton crane on a 25,000-pound-capacity or larger trailer (tables 5-1 and 5-2)

Table 5-1. Bill of Materials for Blocking and Tiedown of the 7½-Ton Rough-Terrain Crane on M127A2C/Semitrailer (Figs 5-1 and 5-2)

Item	Description	Approximate Quantity
Lumber	Douglas-fir, or comparable; straight-grain, free from material defects; Fed Spec MM-L–751H: 2- × 4-inch	20 linear feet
	2- × 6-inch	10 linear feet
	6- × 8-inch	16 linear feet
Nails	Common, steel; flathead; bright or cement-coated; table XI–b, Fed Spec FF–N–105B: 20d	48
	30d	52
	40d	16
Cushioning	Waterproof paper, burlap, or suitable material	
Chains	Type 1, grade C, class 2, welded steel, ½-inch × 12-foot with grabhook; Fed Spec RR–C–271	
Load binder	Double-hook, heavy-duty, eccentric takeup with chain grabhook for ⅜- to ½-inch chain with two swivels, 25,000-pound load capacity	4
Wire rope	6 × 19, IWRC; improved plow steel; preformed, regular-lay; table X, Fed Spec RR–W–410C: ½-inch	80 feet
Clamps	Wire rope, U-bolt clip, saddled, single-grip steel, Crosby heavy-duty, or equal; FF–C–450D: ½-inch	18
	⅝-inch	4

Table 5–2. Application of Materials for Blocking and Tiedown of the 7½-Ton Rough-Terrain Crane on M127A2C/Semitrailer (Figs 5–1 and 5–2)

Item	No. Required	Application
A	8	Chock blocks. Locate the 45° portion against the wheels as shown in figure 5–1. Toenail the heel of the block (near the bottom edge) to the semitrailer floor with one 20d nail. Also drive two 40d nails into the heel of the block, perpendicular to semitrailer floor. Toenail each side of the block to the semitrailer floor with two 30d nails on each side (detail 3, fig 5–2).
B	As required	Protective material, such as waterproof paper or burlap. Locate the material under the 2- × 4- × 36-inch piece of lumber and between the tire and the 2- × 6- × 36-inch piece of lumber, to extend 2 inches above blocking.
C	4	Side blocks. Each consists of one piece of 2- × 6- × 36-inch lumber and two pieces of 2- × 4- × 36-inch lumber. Nail the 2- × 6- × 36-inch piece to the edge of the 2- × 4- × 36-inch piece with five 20d nails. Place block with the 2- × 6- × 36- inch piece against the tire, and nail to the semitrailer floor through the 2- × 4- × 36- inch piece with five 20d nails in staggered pattern. Nail the remaining 2- × 4- × 36-inch piece to the one below in like manner with five 30d nails (detail 2, fig 5–2).
D	62 ft	Chains, load-lashing. Attach to the front and rear tiedown provisions on the crane. Substitute, if desired, ½-inch IWRC wire rope (15 feet) in a complete loop in four places, and secure with four ½-inch cable clamps spaced 4 inches apart (detail 1, fig 5–2).
E	4	Load binders. Pass the chain through the tiedown provisions, secure grabhooks to chains, and take up slack with eccentric takeup, grabhook (25,000-lb-capacity load binder). Load binders are not required if wire rope and cable clamps are used.
F (fig 5–2)	8	Thimble, standard, open-type, ½-inch. Place one in tiedown provision and one in stake pocket (detail 2, fig 5–2).
G (fig 5–2)	16	Clamps, ½-inch. Secure the ends of the wire rope at the overlap area with four clamps. Tighten nuts alternately until they are torqued to 65-ft-lb (detail 1, fig 5–2).
H (fig 5–2)	8	Clamps, ⅝-inch. Secure thimble to wire rope as shown in detail 1, figure 5–2.

CHAPTER 6
MARINE AND TERMINAL TRANSPORTABILITY GUIDANCE

Section I. GENERAL

6-1. Scope

This chapter provides marine and terminal transportability guidance for movement of the 7½-ton crane. It covers physical characteristics and safety considerations. It also prescribes the materials required to prepare, lift, and tie down the crane.

6-2. Safety

Besides the safety precautions contained in chapter 3, the following precautions also apply:

NOTE

The methods described in this chapter for lifting and securing are suggested procedures. Other methods of handling and stowage may be used if they will allow safe delivery.

a. Do not fill vehicle fuel tanks more than one-fourth full.

b. Firmly set the parking brake.

c. Protect headlights and taillights with suitable covering.

d. Inspect slings and other items used in loading and discharge operation for condition and adequate capacity (sling minimum capacity 25,000 pounds).

e. Make sure all lifts have enough guidelines attached to control the swing of the crane while suspended.

f. When the crane is being lifted, for any purpose, permit no one to walk under it.

6-3. Water Shipment

A large variety of inland-waterway cargo carriers and lighters and all cargo seagoing vessels can transport the crane.

Section II. LOADING AND SECURING

6-4. General Rules

a. Stowage. When possible, the vehicles should receive the protection of below-deck stowage. In general, for good stowage of vehicles, place them fore and aft as close together as practicable, with minimum spacing between other vehicles and the sweatboards. Protect fragile parts, and stow spare parts on the vehicles. Securing includes blocking of the wheel on four sides to restrict vehicle movement in any direction. Brace individual vehicle blocks to the bulkhead, stanchions, and other vehicle blocks, and secure vehicles with wire rope or chain.

NOTE

Department of Transportation Exemption (DOT–E–7280) authorizes DOD to ship vehicle with fuel tanks three-quarters full provided the vessels have adequate ventilation systems, such as the roll-on/roll-off vessels.

b. Lifting. The type II crane has two methods for lifting. One method consists of using the lifting provisions located on the four outriggers (ref fig 2-6 and 6-l). The other method consists of using two provisions on the front end and two provisions on the rear end of the crane (ref fig 2-3).

c. Loading. Reduce the crane to its minimum height and width configuration. The crane can be driven onto various landing crafts, lighters, and landing ships. It can also be driven onto the decks of barges from a pier when tidal conditions are suitable and ramps are available. The crane can be loaded onto seagoing vessels by shoreside or floating cranes of adequate capacity. The crane can be driven or towed onto roll-on/roll-off vessels. Figure 6-1 shows a typical lifting arrangement for the crane. Figure 6-2 has typical blocking and tiedown details for securement in the hold of a general cargo vessel. Tables 6-1 and 6-2 have the bill of materials and application of those materials.

6-5. Landing Ships, Landing Craft, and Amphibious Vehicles

When moving the crane for extended distances or through rough waters, block and tie down the vehicle. In most cases, the vessels have turnbuckles with a sheep's foot on one end that fits into the deck cloverleaf. Where patented equipment is not available, use a suitable substitute.

6-6. Lighter Aboard Ship (LASH)

a. General. When transporting the 7½-ton rough-terrain crane by LASH-type ships, secure with adequate blocking and tiedowns. Barge stability is noticeably affected by the placement of heavy-lift items; therefore, load the crane in a manner to counterbalance variations in the locations of centers of gravity from true center.

b. Shoring. Deck shoring generally is not used beneath vehicles with rubber tires. Frictional forces

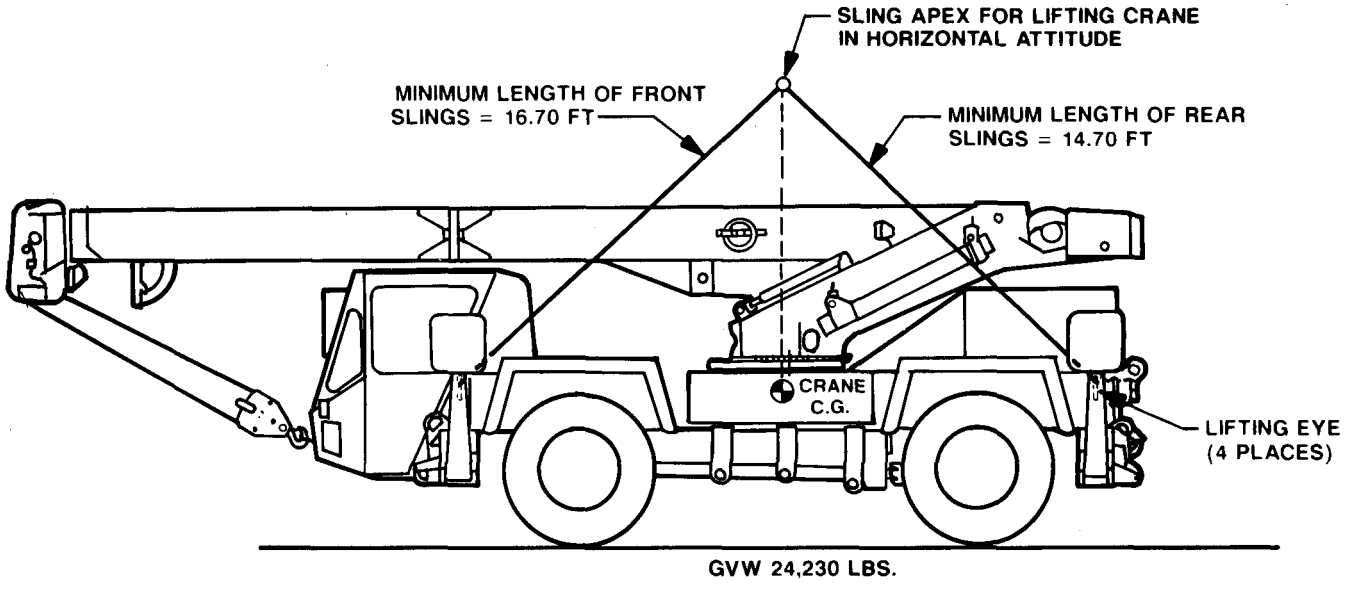


Figure 6–1. The 7½-ton rough-terrain crane being lifted by outriggers.

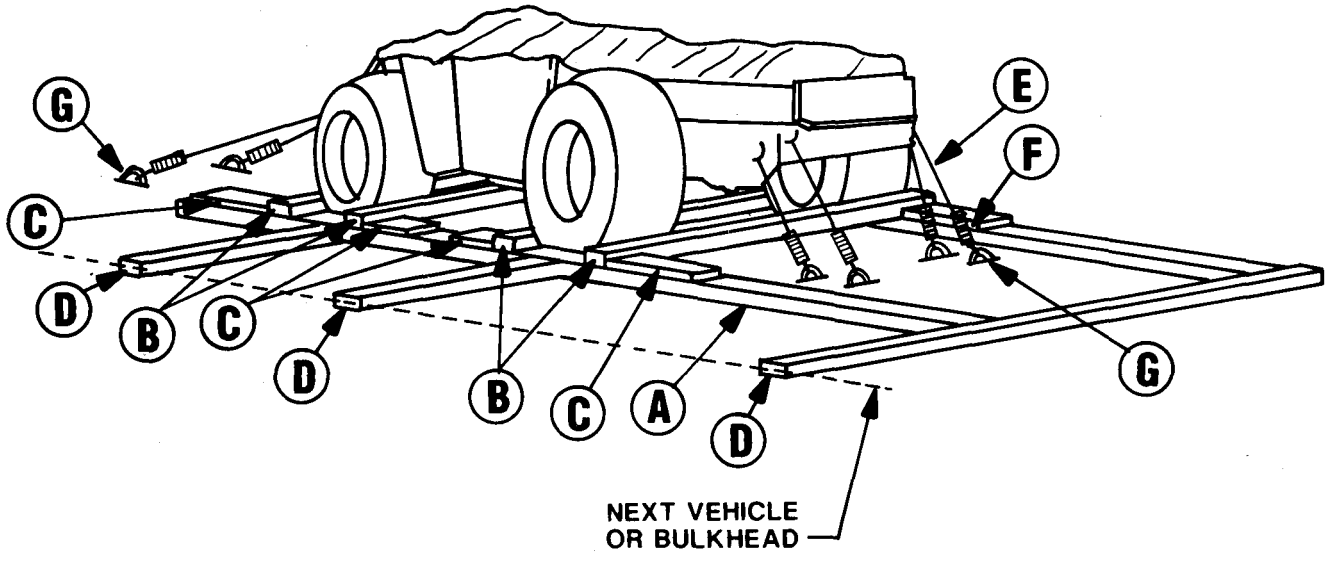


Figure 6-2. Typical blocking and tiedown for the 7½-ton rough-terrain crane in the hold of a general cargo vessel (tables 6-1 and 6-2).

between the tires and the deck are sufficient to make it unnecessary. However, deck surfaces should be dry and free of grease or debris. When the cranes are moved by barges or similar lighterage to or from vessels secured to piers or at a sheltered anchorage, use appropriate blocking and chocking material. Also, when the cranes are moved for long distances or through rough waters, use appropriate tiedowns.

Table 6-1. Bill of Materials for Blocking and Tiedown of the 7½-Ton Rough- Terrain Crane in Hold of General Cargo Vessel (Fig 6-2)

Item	Description	Approximate Quantity
Turnbuckle	Eye- and jaw-type, 1-inch diameter × 18-inch takeup; NSN 5340–00–188–0341 or equal	8
Lumber	Douglas-fir, or comparable; straight-grain, free from material defects; Fed Spec MM–L–751H:	
	2- × 4-inch	8 linear feet
	2- × 12-inch	40 linear feet
	4- × 6-inch	70 linear feet
Nails	Common, steel; flathead; bright or cement-coated; table XI-b, Fed Spec FF–N–105B 40d	100
Wire rope	6 × 19, IWRC; improved plow steel; regular-lay; table X, Fed Spec RR–W–410C:	
	⅝-inch	60 feet
	½-inch	25 feet
Clamps	Wire rope, U-bolt clips, saddled, single-grip, steel, Crosby heavy-duty, or equal; FF–C–450D:	
	⅝-inch (torque to 90 ft-lb)	16
	½-inch (torque to 65 ft-lb)	16
Thimbles	Standard, open-type; ⅝-inch	8

Table 6–2. Application of Materials for Blocking and Tiedown of the 7½-Ton Crane in Hold of General Cargo Vessel (Fig 6–2)

Item	No. Required	Application
A	2	Side blocking, 4- × 6-in. by length-to-suit lumber. Brace as required against crane tire and on the side of the vessel or adjacent to cargo blocking, to immobilize the equipment. Toenail each end to adjacent bracing with four 60d nails.
B	4	End blocking, 4- × 6- × 115-in. lumber. Locate on top of A. Locate one each in front and rear of front wheels and in front and rear of the rear wheels. Toenail each end to A with four 40d nails.
C	8	Backup cleats. Each consists of 2- × 4- × 12-in. lumber. Locate on top of side blocking (item A) and against item B. Nail to side blocking with four 40d nails.
D	As required	Bracing. Each consists of 6- × 8-in. by length-cut-to-suit lumber. Brace as required against adjacent vehicle, cargo, or side of vessel bulkhead, as appropriate. Secure end of each piece by toenailing with four 40d nails.
E	8	Wire rope, ⅝-in. Form two loops from each vehicle tiedown provision to appropriate deck padeye.
F	32	Clamp, ⅝-in. Secure the ends of wire rope of the overlapped area with four clamps, spacing the clamps 3½ in. apart, with a minimum of 6 in. from the ends of the rope.
G	16	Thimbles, ⅝-in. Place one at each vehicle tiedown provision where the wire rope passes through.

CHAPTER 7
RAIL TRANSPORTABILITY GUIDANCE

Section I. GENERAL

7-1. Scope

This chapter provides rail transportability guidance for movement of the crane. It includes physical characteristics and safety considerations. It also prescribes the materials required to prepare, load, tie down, and unload the crane.

7-2. Maximum Utilization of Railcars

Additional cargo, as approved by the activity providing the item for transport, may be shipped with the crane.

7-3. Safety

Besides the safety precautions contained in chapter 3, the following items apply:

a. Keep the crane's speed below 3 mph when it is on loading ramps and railcars.

b. Ensure the vehicle operator keeps the guide in full view at all times during loading.

c. Ensure guides maintain a safe distance and location in front of the crane or on the next railcar.

d. Secure crane, boom, and outriggers and removable parts in their shipping position. Use ½-inch wire rope and cable clamps on the boom and outrigger, even if they have positive locking devices.

Section II. TRANSPORT ON CONUS RAILWAYS

7-4. General

The guidance in this section is for transport of the crane on CONUS railways. It considers single and multiple movements on the types of flatcars normally used for moving this type of vehicle.

WARNING

Weight of the hook block is approximately 235 pounds (107 kg). Use adequate lifting equipment, and always properly support the hook block. Do not lift the crane over personnel or let personnel walk underneath the suspended crane.

7-5. Preparation of Crane for Loading

a. Remove the hook block from the cable. Store and restrain it in the tool box.

b. Retract the boom and lower it into its transport position. Operate the winch to wind the cable back into the winch drum. Wire the socket down to prevent the cable from loosening on the winch drum.

c. Install a ½-inch-diameter cable around the load sheave and hook block. Tie back in a complete loop, and secure with two ½-inch clamps, as shown in figure 7-1.

d. Fully retract outriggers and lock in place.

e. As a minimum, secure all loose items to prevent loss or damage in transit.

f. Band all tool and battery boxes lids.

g. Place fuel shutoff switch on rear cab wall in the off position for transport.

7-6. Loading on General-Purpose Flatcar

a. Place the crane in the tiedown position on the flatcar by using a crane. However, the crane may be driven or towed into position provided a suitable ramp or bridge is available.

b. When the crane is in the tiedown position, do not set the handbrakes. Place the gearshift lever in the neutral position, but do not secure.

c. The blocking and tiedown information in figures 7-1 through 7-3 are for the crane on a flatcar with a minimum width of 10 feet 4 inches.

CAUTION

Do not allow the crane to exceed 3 mph during loading and unloading.

d. Table 7-1 shows the bill of materials for blocking and tying down of the crane on a general-purpose flatcar. The blocking and tiedown diagram, figures 7-1 and 7-2, is compatible with standard loading practices. It provides for adequate restraint against the forces encountered during movement of the railcar at normal speeds. Figure 7-3 shows the blocking details. Table 7-2 explains how to apply materials for loading and securing the crane on a flatcar.

7-7. Transport in Controlled Train Service for Unit Moves

Movement by this method provides prompt movement over short distances from a military installation to the port of embarkation. Load the crane on a railcar that has an adequate weight capacity and at least a 10-foot 4-inch width. Blocking and tiedown requirements can be reduced from those shown in figures 7-1 and 7-2. Apply only items B, C, D, E, and G of table 7-2 to provide adequate restraint during move-

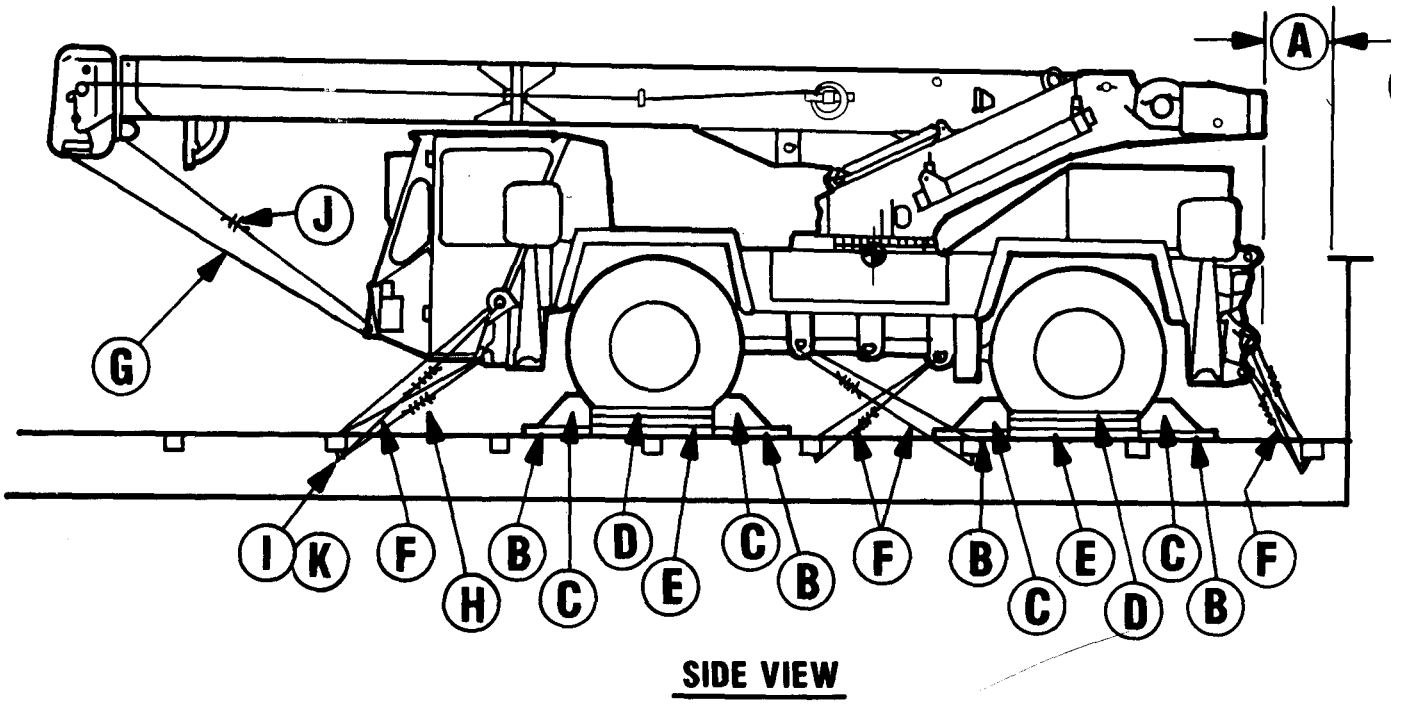


Figure 7-1. Blocking and tiedown diagram for the 7½-ton crane on a general-purpose flatcar (side view) (table 7-1 and 7-2).

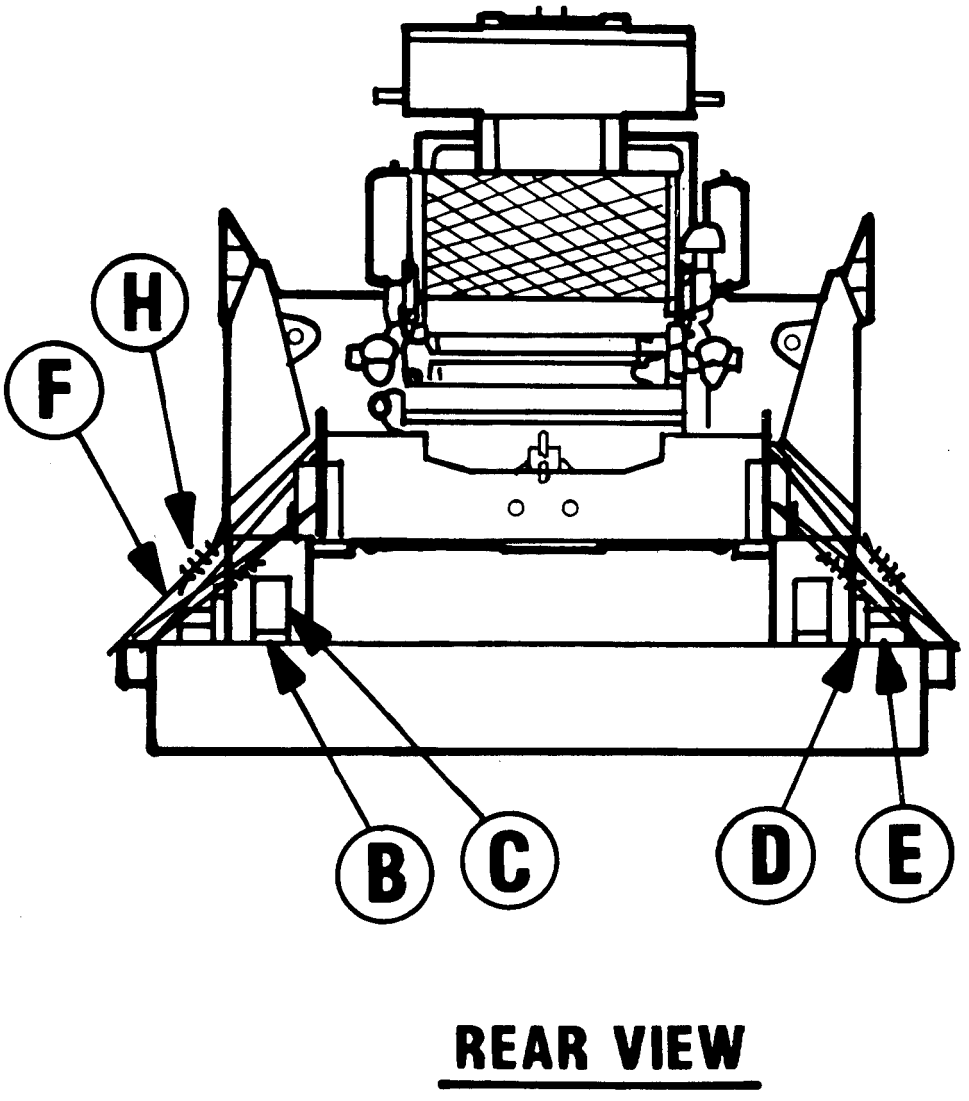


Figure 7-2. Blocking and tiedown diagram for the 7½-ton crane on a general-purpose flatcar (rear view) (tables 7-1 and 7-2).

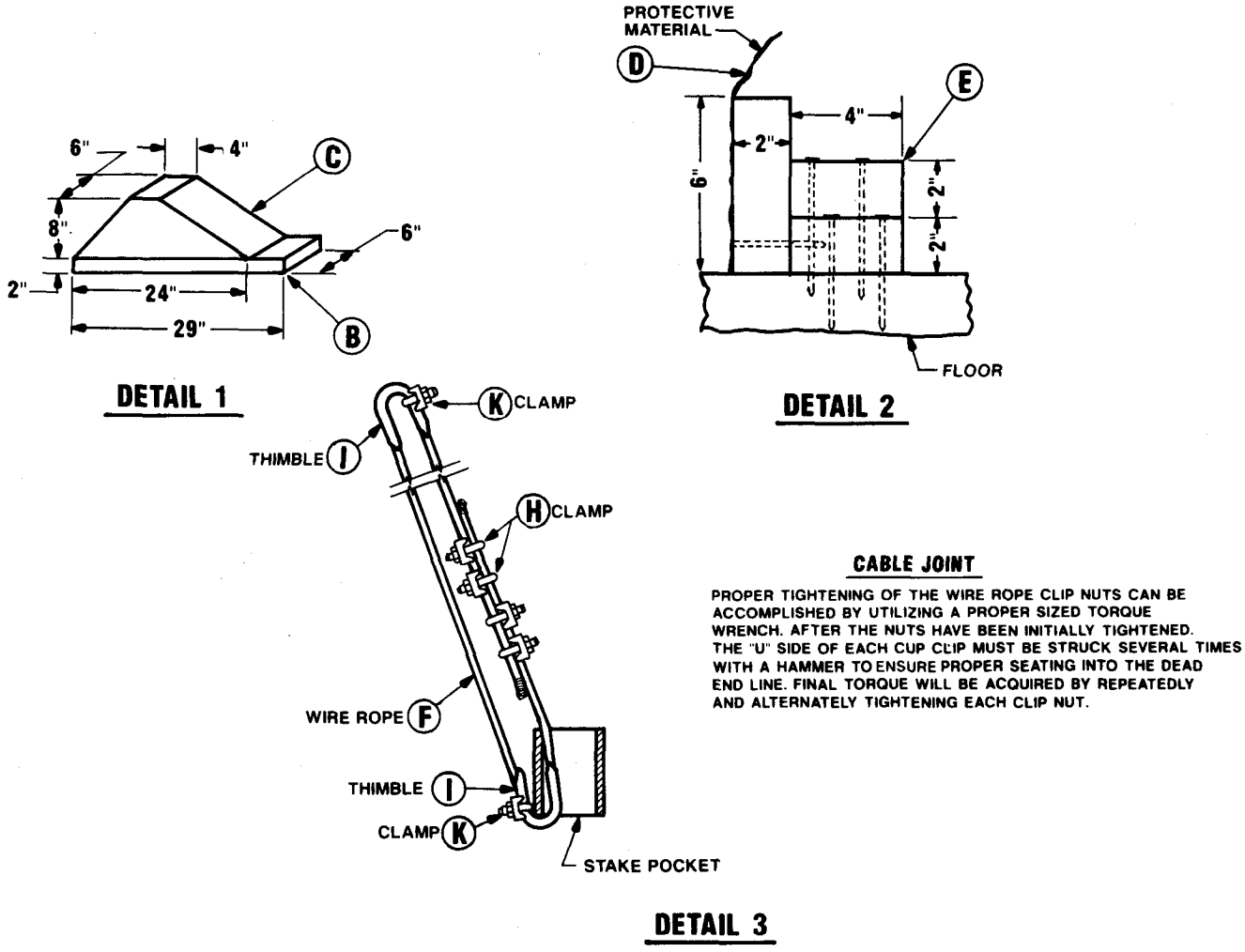
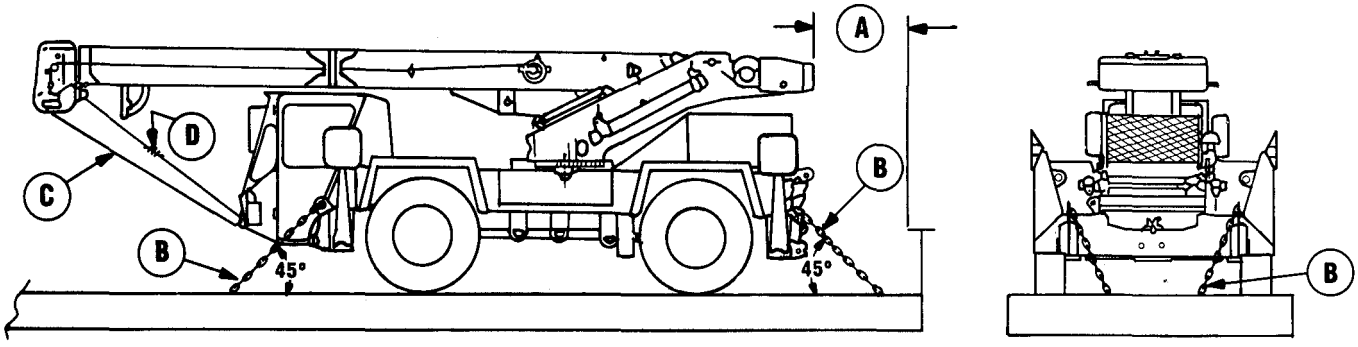


Figure 7-3. Blocking and tiedown details (tables 7-1 and 7-2).

ment on controlled train service. Transport of the crane using this method, in a controlled train service, is generally for a short distance from an installation to an outport and over railroads owned or controlled by a single handling carrier. Under these conditions, the carrier can specify the safe speeds for such movements. Only use the wood blocking method of restraint on equipment after prior coordination with and acceptance by the handling carrier railroad.

7-8. Transport on Special-Purpose Flatcars

a. The HTTX or similar railcars are suitable for transporting the 7½-ton crane in CONUS, as shown in figure 7-4.



SIDE VIEW **REAR VIEW**

Figure 7-4. Side and rear views, chain tiedown diagram for the 7½-ton rough-terrain crane on special-purpose flatcar (table 7-3).

Table 7-1. Bill of Materials for Blocking and Tiedown of the 7-½-Ton Crane on CONUS General-Purpose Flatcar (Figs 7-1 Through 7-3)

Item	Description	Approximate Quantity
Lumber	Douglas-fir, or comparable; straight-grain, free from material defects; Fed Spec MM–L–751H:	
	2- × 4-in.	20 linear feet
	2- × 6-in.	10 linear feet
	6- × 8-in.	16 linear feet
Nails	Common, steel; flathead; bright or cement-coated; table XI-b, Fed Spec FF–N–105B:	
	12d	60
	20d	50
	40d	20
Wire rope	6 × 19, IWRC; improved plow steel; preformed, regular-lay; table X, Fed Spec RR–W–410C:	
	⅝-in.	180 feet
	½-in.	20 feet
Thimbles	Standard, open-type, ⅝-in.	24
Clamps	Wire rope, U-bolt clips, saddled, single-grip; Crosby heavy-duty, or equal; FF–C–450D:	
	⅝-in.	42
	¾-in.	24
	½-in.	2
Cushioning Material	Waterproof paper, burlap, or other suitable material	as required

Table 7-2. Application of Materials for Blocking and Tiedown of the 7½-Ton Crane on Rail Flatcar (Figs 7-1 Through 7-3)

Item	No. Required	Application
A		Brake wheel clearance. Minimum clearance required is 6 inches above, in back of, on both sides of, and 4 inches underneath wheel (fig 7–1).
B	8	Base of chock block. Nail one 2- × 6- × 29-in. board to base of each chock block using five 20d nails.
C	8	Chock block pattern no. 16 (fig 7–3, detail 1). Locate item B with the 45° portion of block against the front of the wheel and against the rear of the wheel. Nail the heel of the blocks to item B with three 40d nails. Toenail sides of blocks to the railcar floor through item B with two 40d nails on each side.
D	4	Suitable protective material, such as waterproof paper of burlap, and so forth. Locate material under item E and between tires and item E so as to extend 2 inches above item E (fig 7–3, detail 2).
E	4	Side blocks (fig 7–3, detail 2). Each consists of one piece of 2- × 6- × 36-in. lumber and two pieces of 2- × 4- × 36-in. lumber. Nail 2- × 6-in. piece to edge of 2- × 4-in. piece with five 12d nails. Place block with the 2- by 6-in. piece against tire, and nail to the railcar floor through the 2- by 4-in. piece with five 20d nails in a staggered pattern. Nail second piece of 2- × 4-in. through the first piece to railcar floor with five 20d nails in a like manner.
F	8	⅝-inch, 6 × 19, IWRC, cable. Apply from tiedown provision on crane to stake pocket in a complete loop at approximately a 45° angle. Secure cable with four ⅝-inch cable clamps (torque to 95 ft-lb). Use the ⅝-inch thimble at the stake pocket, and secure it to the cable with a ¾-in. clamp as shown in figure 7–3, detail 3. If necessary, install ⅝-in, thimbles at tiedown provision on the crane to protect the cable.
G	1	Cable, ½-inch. Locate as shown between load sheave and hook block (fig 7–1). Tie back to prevent boom from creeping out or swinging to the side, and secure with two ½-inch clamps (torque to 65 ft-lb).
H (fig 7–2)	48	Clamp, ⅝-inch. Used to clamp overlapped cable together.
I (fig 7–2)	24	Thimble, ⅝-inch. Place one at each vehicle tiedown provision and stake pocket where wire rope passes.
J (fig 7–2)	2	Clamp, ½-inch. Secure item G to the sheave and hook block.
K (fig 7–2)	24	Clamp, ¾-inch. Install to hold the cable into the thimble, at the tiedown provision and at the stake pocket.

b. Do not use special-purpose G85 and G89 cushion rub-rail flatcars for loading the crane. Table 7-3 shows the application of chain tiedowns for securing the crane on flatcars equipped with chain-tiedown assemblies.

Section III. TRANSPORT ON FOREIGN RAILWAYS

7-9. General

The guidance contained in this section applies for transport of the crane on foreign railways. It considers single and multiple vehicle movements on types of flatcars normally used for moving this type of vehicle. When the type I or II crane is loaded and secured on a 50-inch-high deck flatcar, it is within the Gabarit International De Chargement (GIC) clearance diagram for unrestricted rail transport in NATO countries. This also applies to most of the countries in the Middle East and South America. Clearances will vary by country, and each country will require a separate check. Because of various designations and clearances used by different countries, each country must evaluate the crane's transport capability on an individual basis.

7-10. Transport on Foreign-Service Flatcars

a. General. The crane is transportable on a number of foreign-service flatcars.

b. Materials. The material required for blocking and tying down the crane on foreign-service flatcars is essentially the same as those described in tables 7-1 and 7-2. Detailed guidance is contained in the 4th Transportation Command Pamphlet 55-2, *Tiedown Guide for Rail Movements.* For copies of this pamphlet, contact Commander, 1st Transportation Movement Control Agency, ATTN: AEUTR-MCA-TA, APO New York 09451-4000. For intertheater or in-country clearance, obtain assistance from the 4th Transportation Command, Oberursel, Germany.

Table 7-3. Application of Chain Tiedowns for Securing the 7½-Ton Crane on Rail Flatcar Equipped with Chain Tiedown Assemblies (Fig 7-4)

Item	No. Required	Application
A		Brake wheel clearance. Minimum clearance required is 6 inches above, in back of, and both sides of, and 4 inches underneath the wheel.
B	4	½-inch diameter alloy steel chain, proof-tested to at least 22,500 pounds attached to tiedown provision.
C	1	½-inch, 6 x 19, IWRC, wire rope. Complete loop located as shown between load sheave and hook block. Tie back to prevent boom from creeping out. Secure with two ½-inch clips (torque to 65 ft-lb).
D	2	Clips, ½-inch cable.

APPENDIX
REFERENCES

1. Army Regulations (AF)

55-15	Land Transportation in Overseas Areas
55-29	Military Convoy Operations in CONUS
55-162	Permits for Oversize, Overweight, or Other Special Military Movements on Public Highways in the Continental United States and the District of Columbia of the United States
55-355	Military Traffic Management Regulation
385-40	Accident Reporting and Records
746-1	Color, Marking, and Preparation of Equipment for Shipment

2. Army Field Manuals (FM)

5-36	Route Reconnaissance and Classification
10-548/TO 13C7-24-21	Airdrop of Supplies and Equipment
55-9	Unit Air Movement Plan
55-15	Transportation Reference Data
55-17	Terminal Operations Specialists Handbook
55-60	Army Terminal Operations

3. Army Supply Bulletins (SB)

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

4. Army Technical Bulletins (TB)

55-46-1	Standard Characteristics (Dimensions, Weight, and Cube) for Transportation of Military Vehicles and Other Outsize/Overweight Equipment (in TOE Line Item Number Sequence)

5. Technical Manuals (TM)

38-236 (AFP 71-8)	Preparation of Freight for Air Shipment
38-250 (AFR 71-4)	Packaging and Materials Handling
55-500	Marine Equipment Characteristics and Data
55-600	Transportation Services at Continental United States (CONUS) Installations
55-601	Railcar Loading Procedures
55-2200-001-12	Transportability Guidance: Application of Blocking, Bracing, and Tiedown Materials for Rail Transportation

6. Other Technical Manuals

Koehring Commercial Parts Manual

Koehring Commercial Maintenance with Supplemental Operator Maintenance and Repair and Instruction Manual

Koehring Commercial Operator Manual

7. Air Force Technical Orders

1-1B-40	Handbook of Weight and Balance Data
lC-5A-9	Loading Instructions, USAF Series C-5A Aircraft
lC-130-9	Loading Instructions, USAF Series C-130 Airplane
lC-141B-9	Loading Instructions, USAF Series C-141 Airplane

NOTE

Air Force Technical Orders that have not been integrated into the Department of the Army Publications system may be requisitioned through The Adjutant General Office in accordance with AR 310-70.

8. Other Publications and Sources of Procurement

a. Rail and Highway Shipment

b. Code of Federal Regulations. Title 49—Transportation, Parts 170-179. Available from:

Superintendent of Documents
US Government Printing Office
Washington, DC 20402

c. Association of American Railroads, *Rules Governing the Loading of Commodities on Open-Top Cars and Trailers.*

Section No. l—General Rules
Section No. 6—Rules Governing the Loading of Department of Defense Materiel in Open-Top Cars

Available from:

Association of American Railroads
50 F Street, NW
Washington, DC 20001

d. American Trucking Associations, Inc (ATA), *Summary of Size and Weight Limits.*
Available from:

American Trucking Associations, Inc
2200 Mill Road
Alexandria, VA 22314-4677

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THE METRIC SYSTEM AND EQUIVALENTS

'NEAR MEASURE

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

'VEIGHTS

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

LIQUID MEASURE

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

SQUARE MEASURE

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

CUBIC MEASURE

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

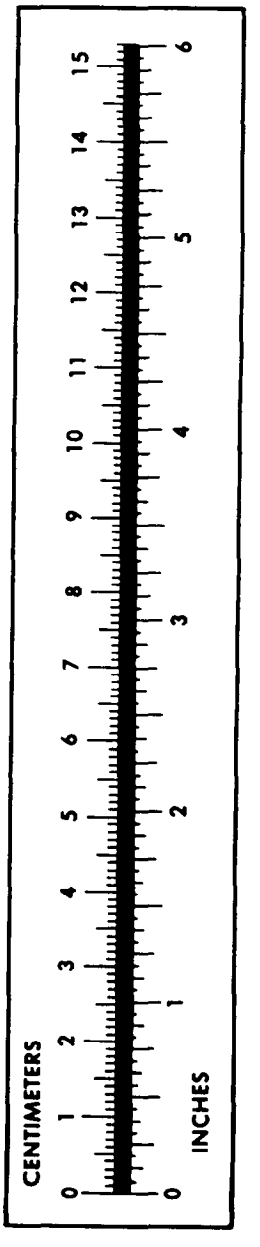
TEMPERATURE

5/9(°F - 32) = °C
212° Fahrenheit is evuivalent to 100° Celsius
90° Fahrenheit is equivalent to 32.2° Celsius
32° Fahrenheit is equivalent to 0° Celsius
9/5C° + 32 =°F

APPROXIMATE CONVERSION FACTORS

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

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



PIN: 068044-000