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TECHNICAL MANUAL

TRANSPORTABILITY GUIDANCE
HOWITZER, LIGHT, TOWED, 105-MM, M119

HEADQUARTERS, DEPARTMENT OF THE ARMY
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List of Illustrations

List of Tables

CHAPTER 1
INTRODUCTION

1-1. Purpose and scope

a. This manual provides transportability guidance for logistical handling and movement of the howitzer, light, towed, 105-mm, M119. It contains information appropriate for safe transport of the system components, Also, it includes technical data, as well as safety considerations, that are useful in planning for worldwide movement by the various transportation modes. Where appropriate, metric equivalents appear in parentheses following the dimensions or other measurements.

b. This manual is for transportation officers and other personnel responsible for transporting the M119 howitzer or for providing transportation services.

1-2. Safety

Chapter 3 contains precautionary measures required during movement of the M119 howitzer.

1-3. Definitions of warnings, cautions, and notes

Throughout this manual, warnings, cautions, and notes emphasize important or critical guidance. They are used for the following conditions:

a. Warning. Instructions that, if not 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. An operating procedure or condition that must be emphasized,

1-4. Reporting of recommendations and comments

Users of this manual are encouraged to submit comments and recommend changes for its improvement. Comments and recommendations 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: MTTE-TRS, PO Box 6276, Newport News, Virginia 23606-0276. Electrically transmitted messages should be addressed to CDR MTMCTEA FT EUSTIS VA/lMTTE-TRS//.

CHAPTER 2
TRANSPORTABILITY DATA

2-1. Scope

This chapter provides a general description of the M119 howitzer. It includes a drawing with tabulated transportability characteristics and data necessary for transport of the system components. These characteristics apply to the model number or national stock number shown.

2-2. Description

The howitzer, light, towed, 105-mm, M119, referred to in this manual as M119, figure 2-1, is used as a light, indirect fire support weapon for a light infantry division. The prime mover for the M119 is the M1069 or modified M1037 HMMWV. The M119 can be transported in either the firing configuration (gun extended aft) or the travel configuration (gun folded forward above trail frame). The travel configuration is 4 feet 1.5 inches shorter and 2 feet 9 inches lower than the firing configuration. The travel configuration (figs 2-1 and 2-2) is used for all modes of transport except external helicopter transport and rail transport on non-cushion-draft flatcars.

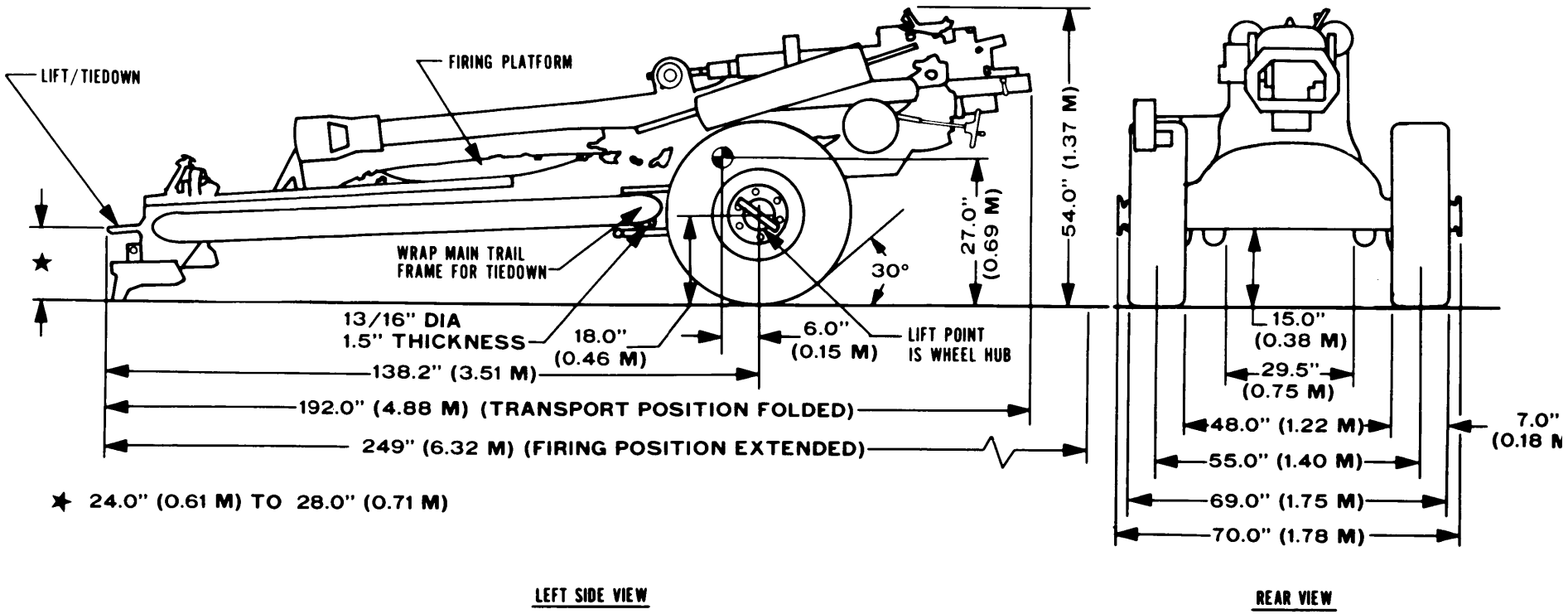
2-3. Hazardous and dangerous characteristics

a. The M119 has one recuperator, with a static charge of 750 pounds per square inch gauge (psig). It also has a direct-fire night sight with sealed tritium tubes. Tritium (H^3) lamps are part of the fire control devices normally attached to the M119 in its operational configuration. However, the shipper disassembles these devices from the weapon and ships them separately in a special protective container. During transport, this container is packaged in a larger container.

The tritium (H^3) in the lamps is gaseous hydrogen with not more than 2 percent of the hydrogen in the form of tritiated water. The maximum energy of H^3 is 8.6 kiloelectronvolts (keV); the average energy is 5.6 keV. The maximum permissible body burden is 2.0 millicuries. Thus, tritium is not a highly hazardous radioactive material. It is not readily absorbed into the body as a gas, but it is totally absorbed in the form of water. Therefore, care must be taken in handling units containing broken lamps. This is accomplished by minimum handling and thorough washing after any handling.

b. These procedures meet the requirements of the US Army Armament Research, Development and Engineering Command's (ARDEC) Ionizing Radiation Control Committee and the conditions specified in the Nuclear Regulatory Commission License No. BML 12-00722-06 issued to AMCCOM. The container shall be shipped under Title 49 of the Code of Federal Regulations (CFRS) (1 October 1986), specifically Title 49 CFRS 172.402(h), 173.421-1, and 173.422, or updated issues as they are published. When the container is air transported internally, the container must be prepared in accordance with TM 38–250, Preparation of Hazardous Materials for Military Air Shipment.

Figure 2–1. Howitzer, M119, light, towed, 105-mm, roadside, in travel (folded) configuration.



GROSS VEHICLE WEIGHT: 4,000 LB (1816 KG)
AXLE LOAD: 3,636 LB (FOLDED) 1651 KG
LUNETTE LOAD: 364 LB (FOLDED) 165 KG
TIRE SIZE: 9.00 X 16 6 PLY
TIRE PRESSURE: 37 PSI
LIFT POINTS: AXLE HUBS 14,500 LB (6577 KG) AND LUNETTE 2,000 LB (907 KG)
TIEDOWN POINTS: BESIDE FORWARD SHOCK STRUT ON MAIN FRAME 10,350 LB (4795 KG) AND LUNETTE 4,000 LB (1814 KG)
MILITARY LOAD CLASSIFICATION: 3

HOWITZER, LIGHT, TOWED, 105-MM, M119
NSN 1015-01-248-0859
LIN H5705

Figure 2-2. Side and end views of M119.

CHAPTER 3
SAFETY

3-1. General

General safety considerations and precautions for handling and transporting the M119 follow:

a. Ammunition will not be shipped with the M119 except under emergency conditions. When ammunition is shipped with the M119, all laws and regulations pertinent to the type of ammunition will apply, as required by regulations such as CFRS 46 and 49, Coast Guard (CG)–108, Department of Transportation (DOT) regulations, and TM 38-250/Air Force Regulation (AFR) 71-4.

b. The direct-fire night sight of the M119 will be provided along with the precautionary measures required for handling tritium.

3-2. Specific safety requirements

Pertinent safety requirements by individual mode appear, where applicable, in subsequent chapters.

CHAPTER 4
AIR TRANSPORTABILITY GUIDANCE

4-1. Scope

This chapter provides air transportability guidance for movement of the M119. It also prescribes the materials required to prepare, load, unload, and tie down the M119 for transport on US Air Force aircraft and for internal and external (sling load) transport by US Army helicopters.

4-2. Maximum utilization of aircraft

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

4-3. Applicability

a. US Air Force aircraft. When prepared for loading as described in paragraph 4–5, the M119 is transportable in C–130, C–141, and C–5 aircraft.

b. Tiedown devices. The M119 will be tied down as stated in section IV of applicable procedures in TO IC-XXX-9.

c. Loadmaster. The loadmaster will ensure that the loaded equipment is secured according to restraint criteria in TO 1C–XXX–9.

4-4. Safety

Besides the safety precautions in chapter 3 of this manual, the following procedures apply:

a. The activity offering the M119 for air transport must notify the aircraft commander, or the designated representative, and the airlift control squadron/element, when hazardous materials are to be transported and whether these materials have been prepared for shipment according to TM 38-250/AFR 71-4.

b. Tie down the M119 according to procedures in TO 1C-XXX-9.

c. Check each M119 carefully to make sure all loose items are property secured.

WARNING

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

WARNING

Proper ventilation must be provided during loading and unloading operations. Prolonged exposure to carbon monoxide fumes could be fatal.

CAUTION

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

4-5. Preparation of equipment

a. Stow and secure all basic issue items (BII) not required for transport.

b. Remove the direct-fire night sight and package it for transport with the M119.

c. Fold the gun in the travel configuration except when operational requirements exist during helicopter internal or external shipment that require the M119 to be shipped in the fire (also called “A” frame) condition.

WARNING

Ensure that all personnel remain clear from between the M119 and the prime mover, unless the prime mover’s engine is shut down, and the driver’s foot is on the brakes.

4-6. Transport by US Air Force aircraft

a Loading M119 on C–130, C–141, and C–5 aircraft

CAUTION

Before backing the M119, install the towing eye stop assembly to prevent application of surge brakes.

(1) With a prime mover or other suitable vehicle, back the M119 onto the aircraft to its tiedown position. Make sure the underside of the M119 and the loading vehicle clear the ramp's crest. For example, the M561 Gamma Goat must be empty if it is used to load the M119. The reason is the vertical clearance under the spade/trails of the M119 is minimal. If the Gamma Goat is carrying a load, the M119 spade/trails will contact the ramp.

(2) Place two pieces of 2– x 12– x 36-inch lumber, stacked, across the aircraft floor, and center the stacked lumber under the frame of the lunette. Disconnect the M119, and lower the lunette frame onto the shoring. Figure 4–1 and table 4–1 show the typical tiedown diagram of the M119.

Table 4-1. Tiedown Data for Ml 19 in US Air Force C-130 or C-141 Aircraft (Fig 4-1)

Tiedown Fitting		Tiedown Device		
Designation	Capacity in 1,000 lb	Type	Capacity in 1,000 lb	Attach to Item
*E16	10	MB-1	10	Around trail frame forward of right firing stay bracket.
*C16	10	MB-1	10	Around trail frame forward of left firing stay bracket.
*E20	10	MB-1	10	Around trail frame rear of tiedown E16.
*C20	10	MB-1	10	Around trail frame rear of tiedown E20.
E25	10	MB-1	10	Lunette.
C25	10	MB-1	10	Lunette.

*Use barrier or cushioning material between tiedown chains and frame.

b. Unloading M119 from C–130, C–141, and C–5 aircraft. Unloading is essentially the reverse sequence of loading.

4-7. External transport by US Army helicopters

a. Each M119 has its own sling set for lifting and for external helicopter transport.

b. The M119 may be transported by the UH-60 or larger helicopter in either the extended or folded configuration. Use the dedicated 10,000–pound sling with safety clamps installed for M119 howitzer lift. Figure 4-2 shows the 10,000-pound sling leg chains attached to the wheel hubs with the safety clamp installed. The clamp is made of two pieces of angle material that is hinged at one end with a bolt (fig 4–3).

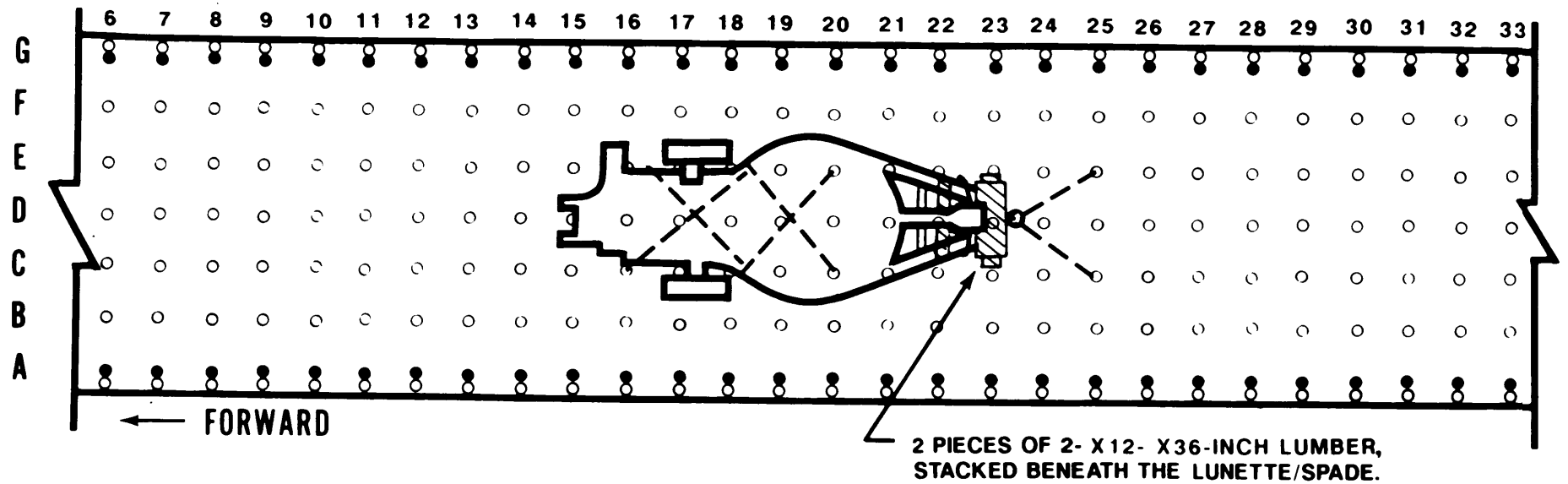
Hold the chain snug around the hub with chain link number 50 in the sling leg grabhook. Close the locking bracket on links closest to the hub, and install the spring-loaded locking pin. The safety clamp prevents the chain around the hub from becoming slack and slipping off the wheel hub. Pass the two forward sling legs through the lunette with chain link number 3 in the sling leg grabhook. For transport of the M119 in the extended configuration, route a 26–foot section of 1/2–inch tubular nylon from the center of the sling set apex fitting, through the muzzle brake, and back toward the apex fitting as shown in figures 4–2 and 4–4 (detail A). Using a square knot, tie the two ends together. The tubular nylon is not a load-carrying member of the sling set. Instead, it will act as a snubber line to prevent the barrel from pitching down when the helicopter lifts the M119.

CAUTION

Do not exceed 3,350 pounds total weight suspended beneath the M119.

WARNING

Always assume that a charge of static electricity is present on the helicopter. Use some type of static discharge wand to discharge the static electricity from the helicopter to prevent shock when placing the apex fitting on the helicopter cargo hook. To ensure safety, follow the procedures given in chapter 7, FM 55–450–1 for grounding and discharging static electricity. If contact with the hook is lost after initial grounding, ground the hook again before touching it. Maintain contact between the static discharge wand and the cargo hook until the apex fitting is placed onto the helicopter cargo hook. Do not use the load as a ground contact. Ground the load again after air delivery and before handling, to discharge any accumulated or retained static electricity.



LEGEND: C-141 AIRCRAFT

o 10,000-POUND-CAPACITY TIEDOWN FITTING
● 25,000-POUND-CAPACITY TIEDOWN FITTING

NOTE: TIEDOWN FITTINGS ARE LOCATED IN ROWS A THROUGH G AND COLUMNS 1 THROUGH 56. THIS IS A TYPICAL TIEDOWN PROCEDURE. (ONLY COLUMNS 6 THROUGH 33 ARE SHOWN.) ITEM BEING SHIPPED CAN BE TIED DOWN AT ANY LOCATION (1-56) APPROVED BY THE LOADMASTER.

Figure 4–1. Typical tiedown of M119 in C–130 or C–141 aircraft.

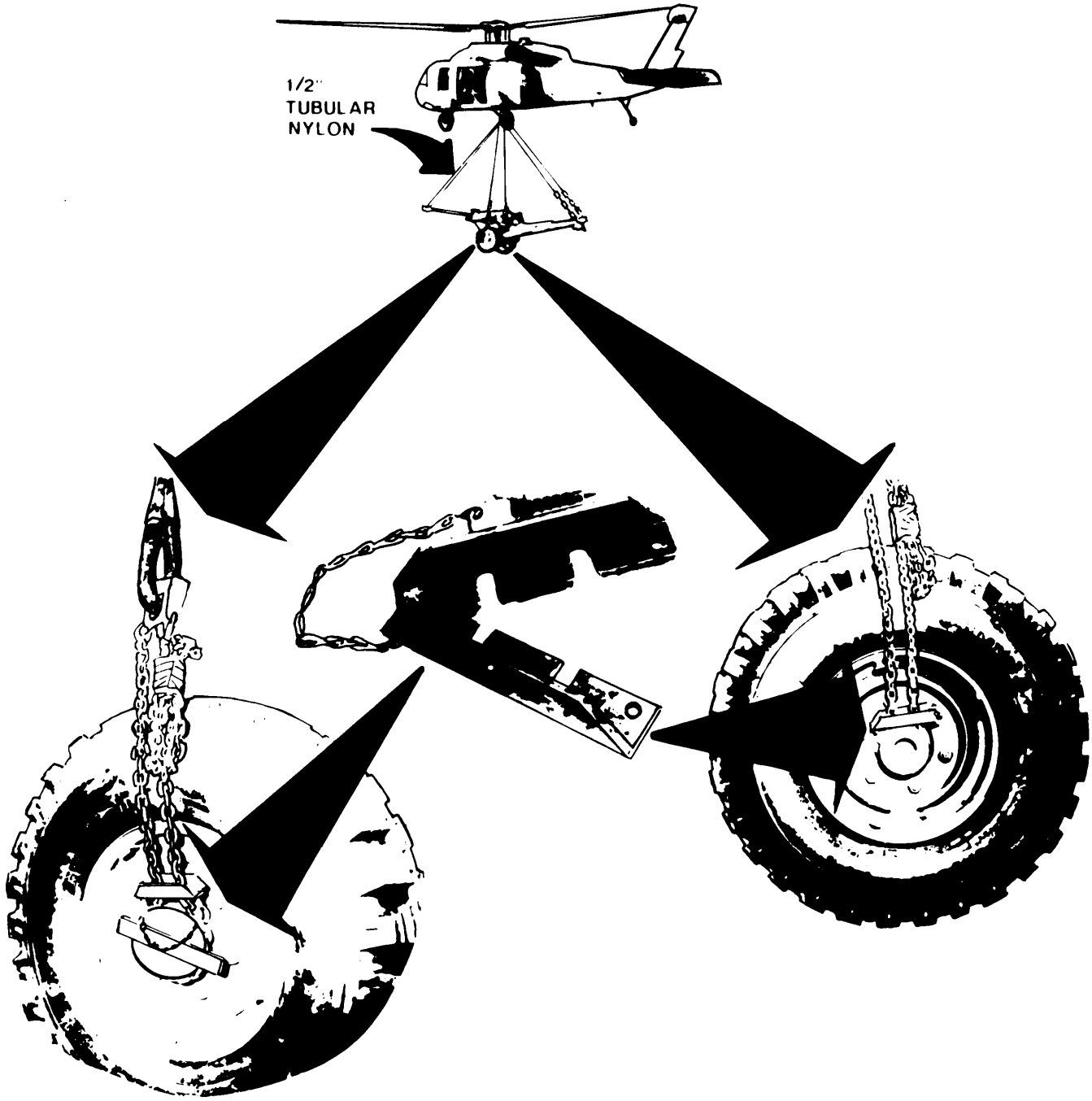


Figure 4-2. Sling leg attached to M119 wheel hub with locking bracket and sling rigging beneath UH-60 helicopter.

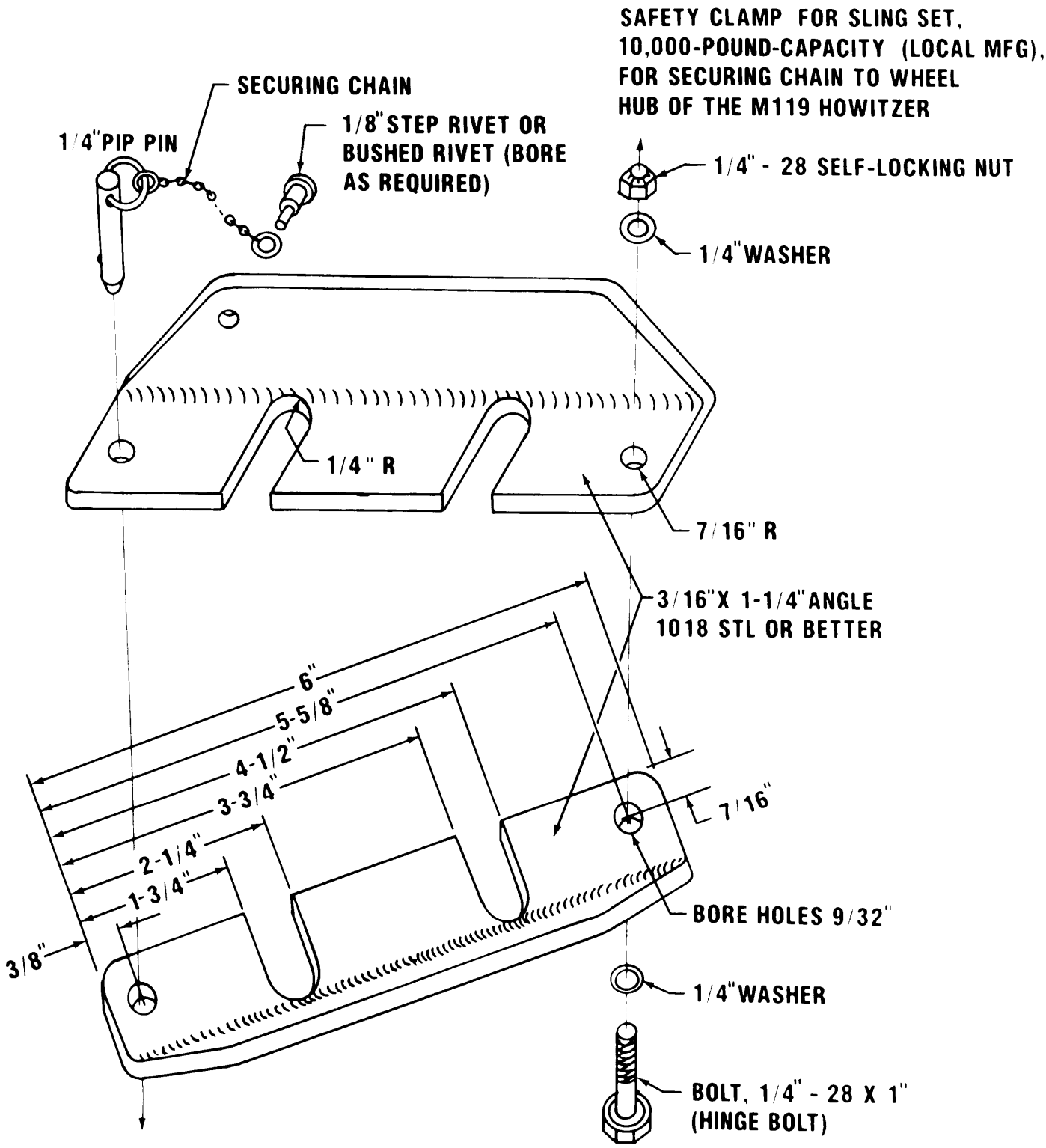


Figure 4-3. Safety clamp.

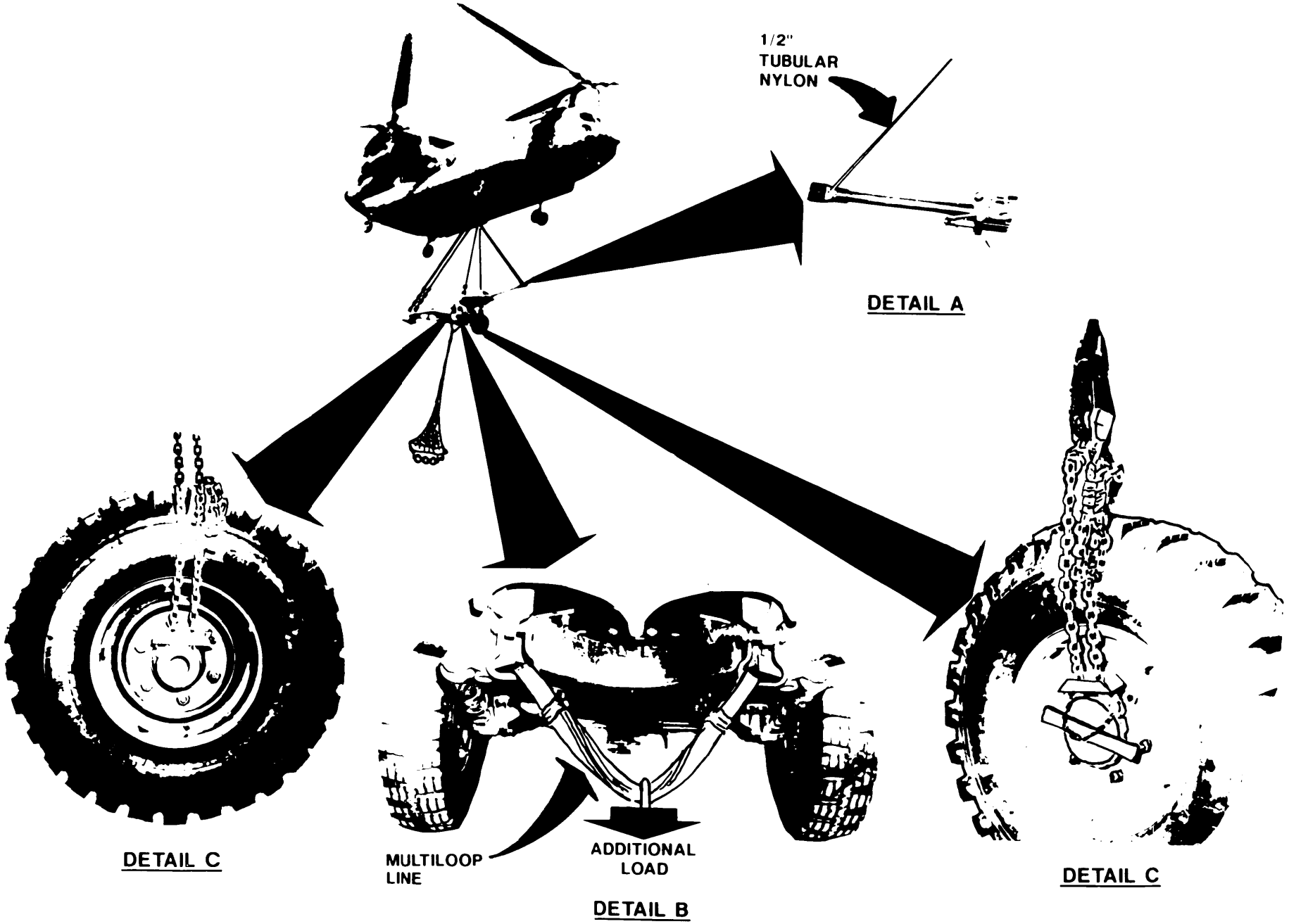


Figure 4–4. M119 sling rigging beneath CH–47 helicopter with three A22 cargo bags.

CAUTION

Since the impact of the apex fitting against the top of the sling load during release operation may damage a component, make sure that the crew is instructed to release the hook off to the side to prevent damage to the load.

NOTE

See FM 55-450-1 for pertinent information on the 10,000– and 25,000–pound sling set.

c. The M119, in either the extended or folded configturation, may be transported by the CH–47 helicopter with an additional load (see caution in para 4-7 *b*) suspended beneath the M119, as shown in figure 44. The added load may be rigged in A22 cargo bags or in a 5,000– or 10,000–pound-capacity cargo net, but in no case exceed a maximum total suspended weight of 3,350 pounds. Rigging the M119 for the CH-47 helicopter is the same as for the UH-60 helicopter. Additional materials used for attaching the additional load are:

(1) Clevis assembly; two, medium, air delivery, type I (NSN 4030-00-678-8562) (fig 44, detail B).

(2) Line, multiloop, type XXVI, four-loop, 3-foot (NSN 1670-01-062-6306) (fig 4-4, detail B), attached to the medium clevis assemblies and attached to the M119.

If A22 cargo bags are used, the four suspension webs on each container will be taped together, 2 inches above the snap hooks and just below the free end. The D-rings will be attached to the bolt portion of a medium suspension clevis and the bell portion of the clevis attached to an 11–foot, two-loop (NSN 1670-01–063-7760) aerial delivery suspension sling. The 11-foot sling will replace the 3–foot sling used only when rigging the suspended load in the 5,000– or 10,000–pound-capacity net.

4-8. Internal transport by CH-47 helicopter

a. General.

(1) The M119 105-mm howitzer (British Light Gun) can be internally air transported (IAT) by all models of the CH–47 helicopter. The M119 can be loaded in either the stowed or the firing (“A” frame) configuration.

(2) The loading may be accomplished by the winching method (using the internal aircraft winch) or by using available manpower (about six persons are required to load/unload the M119).

b. Materials and procedures for IAT by the CH-47 helicopter.

(1) *Materials.*

(a) Parking shoring. One piece of 24– x 36– x 1/2-inch plywood (or equivalent) with one piece of 4– x 4– x 36–inch lumber attached. This is used as a loading/unloading aid when loading/unloading with the winch and as parking shoring, once loaded.

(b) Chocks. Minimum of two 4– x 4– x 12-inch wheel chocks.

(c) Tiedown equipment. Six CGU-1/B or MB-1 tiedowns per weapon; also CGU-1/B straps, as required, per weapon for additional restraint.

(2) *Loading.*

(a) Position the helicopter auxiliary loading ramps, as required, to match the M119 wheels and the trail.

(b) Position the M119 at the foot of the loading ramps, attach the helicopter winch cable to the howitzer (a chain bridle is required), and safety tie the hook to prevent accidental release (fig 4-5).

NOTE

If the M119 is in the firing (“A” frame) configuration, the “A” frame must be unlocked to allow the tube to be depressed for loading.

(c) Position the 24– x 36– x 1/2-inch piece of plywood at the aircraft ramp crest, if required, to protect the floor from winch cable chafing.

(d) Position two persons (one on each side of the ramp) to adjust chocks, observe clearances, and signal the winch operator as necessary.

(e) Start winching the howitzer. When the cable clears the plywood, remove and place it under the trail with the 4 x 4 facing up and behind the spade under the trails.

(f) Winch the howitzer into its tiedown position. The actual position in the aircraft will be determined by weight and balance and/or mission scenario requirements. Position wheel chocks, attach (and tension) fore and aft restraints, release tension on the winch cable, and remove and stow the wheel chocks.

Figure 4–5. Front view of tiedown of howitzer in stowed configuration aboard CH–47.

(g) Attach tiedowns according to figure 4-6. If M119 is transported in the operational configuration, route a cargo strap (CGU-1B) from E8 around gun tube to A8 to provide additional gun tube restraint. The position of the M119 (forward or aft) in the aircraft can be adjusted as required; however, the pattern of restraint attachment must remain the same.

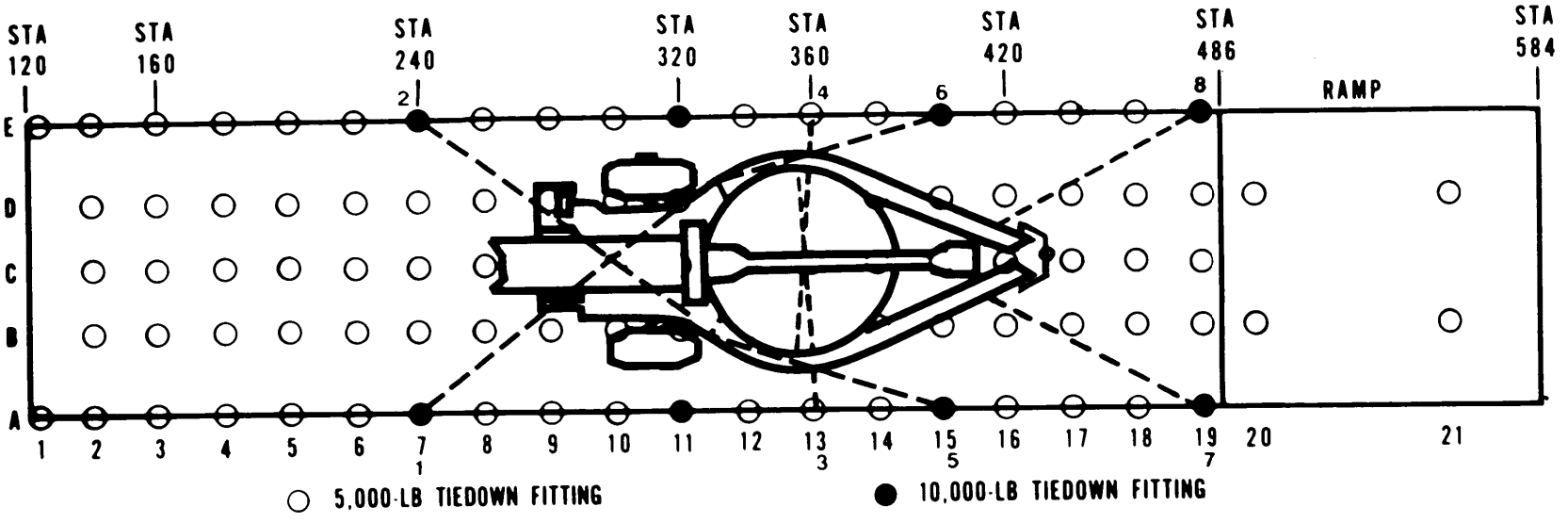
(h) CGU-1B tiedown straps may be substituted for MB-1 tiedown chains, if required; however, MB–1 chains are preferred and all tiedowns must be compatible. Straps and chains cannot be mixed except where straps are used for additional restraint on the gun barrel and/or trails.

(i) Wheel chocks, section equipment, gun crew baggage, and any additional equipment will be loaded and secured as directed by the aircraft commander.

(3) *Unloding.* Unloading procedures are essentially the reverse of loading procedures. The helicopter winch will be used as a safety restraint during unloading. Extreme care must be taken when the howitzer passes over the helicopter ramp crest. Reverse the parking shoring under the spade (4 x 4 positioned in front of the spade under the lunette), and remove the M119 by pulling it out with a HMMWV.

CAUTION

If a vehicle is used for backing the M119 into the helicopter, install the towing eye stop assembly to prevent application of surge brakes.



NOTE: UTILITY HATCH DOOR IS LOCATED IN THE CENTER OF THE FLOOR BETWEEN STATIONS 320 AND 340.

ITEM	DESCRIPTION OF ITEM	ITEM FACING	LOCATION OF REFERENCE POINT		LOCATION OF CG (STA)	APPROX. WT (LB)
			REFERENCE POINT	STATION		
1	M-119 BLG. 105MM TOWED HOWITZER	BREACH FWD	WHEEL HUB			4140
1 & 2	A7 AND E7 MB-1		CARRIAGE			
3 & 4	A13 AND E13 CGU-1B		OPPOSITE TRAIL			
5 & 6	A15 AND E15 MB-1		TRAIL AT BASE PLATE BRACKET			
7 & 8	A19 AND E19 MB-1		TRAIL			

Figure 4–6. Typical tiedown of M119 in CH–47 helicopter.

CHAPTER 5
HIGHWAY TRANSPORTABILITY GUIDANCE

Section I. GENERAL

5-1. Scope

This chapter provides highway transportability guidance for movement of the M119. It also prescribes the materials and guidance required to prepare, load, tie down, and unload the M119.

5-2. Safety

Besides the safety precautions in chapter 3, movement is subject to all safety laws, rules, and regulations that apply to commercial carriers. Theater regulations govern overseas movements.

Section II. TOWAWAY MOVEMENT

5-3. US highways

The length, height, weight, and axle loads of the M119 do not exceed any restrictions for US highways. The M119 may be towed from the pintle of any prime mover that has a 4,000-pound towing capacity. However, the preferred method of shipment is by semitrailers of adequate capacity.

5-4. European and other country highways

No movement restrictions for size or weight is anticipated.

Section III. TRANSPORT BY SEMITRAILER

5-5. General

The M119 can be transported over highways by military or commercial semitrailers of adequate size and capacity.

5-6. Preparation, loading, and tiedown on semitrailer

Figure 5-1 shows the M119 in the folded configuration for transport on semitrailers. This figure shows blocking and tiedown procedures compatible with standard loading practices that will offer adequate restraint. Tables 5–1 and 5–2 show the bill and application of materials, respectively, for blocking and tying down the M119.

Table 5-1. Bill of Materials for Blocking and Tiedown of M119 on Highway Semitrailer (Fig 5-1)

Item	Description	Approximate Quantity
Lumber	Douglas-fir, or comparable; straight-grain, free from material defects; Fed Spec MM-L-751: 6- x 6-inch	6 linear feet
	2- x 12-inch	6 linear feet
	2- x 6-inch	22 linear feet
	2- x 4-inch	12 linear feet
Nails	Common, steel, flathead; bright or cement-coated; Fed Spec FF-N-105: 10d	36
	16d	22
	20d	24
	30d	12
*Wire rope	6 x 19, IWRC; improved plow steel; preformed, regular-lay; Fed Spec RR-W-410:	
	3/8-inch	20 feet
	1/2-inch	50 feet
*Clamps	Wire rope, U-bolt clips, saddled, single-grip, steel, Crosby heavy-duty, or equal; Fed Spec FF–C–450: 3/8–inch	6
	1/2-inch	16
	5/8-inch	4

Table 5-1. Continued

Item	Description	Approximate Quantity
*Thimbles	Standard, open-type: 1/2-inch	4
Cushioning material	Waterproof, burlap, or other suitable material	as required
Chains	Type 1, Class 2, welded steel, high test chain, 1/2-inch; 9,200-pound safe working load, Fed Spec RR–C–271; with two grabhooks equal to or better than the strength of the chain	
Load binders	Type II, Class 1, style C, heavy-duty with chain grabhooks and slack take-up hook, designed for 1/2-inch chain; proof tested to 15,000 pounds, 20-inch length operating lever, Fed Spec: GGG-G-325	4

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

Table 5-2. Application of Materials for Blocking and Tiedown of M119 on Highway Semitrailer (Fig 5-1)

Item	No. Required	Application
A	4	Chock blocks, 6– x 6– x 18-inch lumber cut 450 at both ends. Place on block against the front and rear of each tire. Nail the heel of each block with three 30d nails. Toenail each side with one 20d nail.
B	as required	Cushioning material. Place between item C and tires. Wrap the trail frame before applying tiedowns (item E).
C	2	Side blocking. Each consists of one piece of 2– x 6– x 24-inch lumber and three pieces of 2– x 4– x 24–inch lumber. Nail the 2– x 6– x 24–inch piece of lumber to the side of one piece of 2– x 4– x 24–inch piece of lumber with three 16d nails. Place the 2– x 6– x 24–inch piece against the cushioning material and tire. Nail the 2– x 4– x 24-inch piece to the cargo bed with four 16d nails. Nail the next two layers of 2– x 4– x 24-inch pieces of lumber to the one below with four 20d nails. Use a staggered nailing pattern so as not to strike a nail in the piece below.
D	1	Shoring. This consists of doubled 2– x 12– x 36-inch lumber. Place evenly beneath the lunette frame (spade) before applying tiedowns (items E and F). Nail each piece in place with four 16d nails.
E	2	Tiedowns, 1/2-inch wire rope. Place a complete loop over the cushioning material on the trail frame forward of the right stay bracket, and tie down through a stake pocket on the opposite side of the semitrailer. Place a second complete loop over the cushioning material forward of the left stay bracket through a stake pocket on the opposite side of the semitrailer. Ends of wire rope should overlap about 24 inches.
F	2	Tiedowns, 1/2-inch wire rope. Place a complete loop through the lunette and a stake pocket on the right side of the semitrailer. Place a second complete loop through the lunette and a stake pocket on the left side of the semitrailer. Ends of wire rope should overlap about 24 inches.
G	4	Thimbles, 1/2-inch. Place a thimble between the tiedown and bottom of the stake pocket.
H	16	Clamps, 1/2-inch. Place four clamps on the overlap area of each item E and F, spaced 4 inches apart. After installing items G and I, tension each tiedown and tighten each clamp to 65-foot-pound torque. Strike the U-bolt on the clamp with a bar or hammer and retighten.
I	4	Clamps, 5/8-inch. Place one clamp on each thimble (item G) to secure in place on the wire rope. After tensioning the tiedown, tighten the clamp.

Table 5–2. Continued

Item	No. Required	Application
*J	1	Blocking. This consists of six pieces of 2– x 6– x 36-inch lumber. Nail one piece, cut-to-fit, wedge-shaped, to the bottom of the first piece with six 10d nails. Place the block on the trails beneath the gun tube muzzle brake, and lodge the wedge-shape piece between the trails to prevent the blocking from shifting. Nail the top five pieces, each to the one below, with six 10d nails.
*K	2	Gun tube tiedown, 3/8-inch wire rope. Place one complete loop through the muzzle brake and around the right trail arm, and overlap about 18 inches. Place the second loop around the left trail arm in the same manner.
*L	6	Clamps, 3/8–inch. Place three clamps on each item K overlap area, spaced 3 inches apart. Tension each item K and tighten each clamp to 30-foot-pound torque.

*These items must be used if the travel lock for the gun tube is defective or unserviceable.

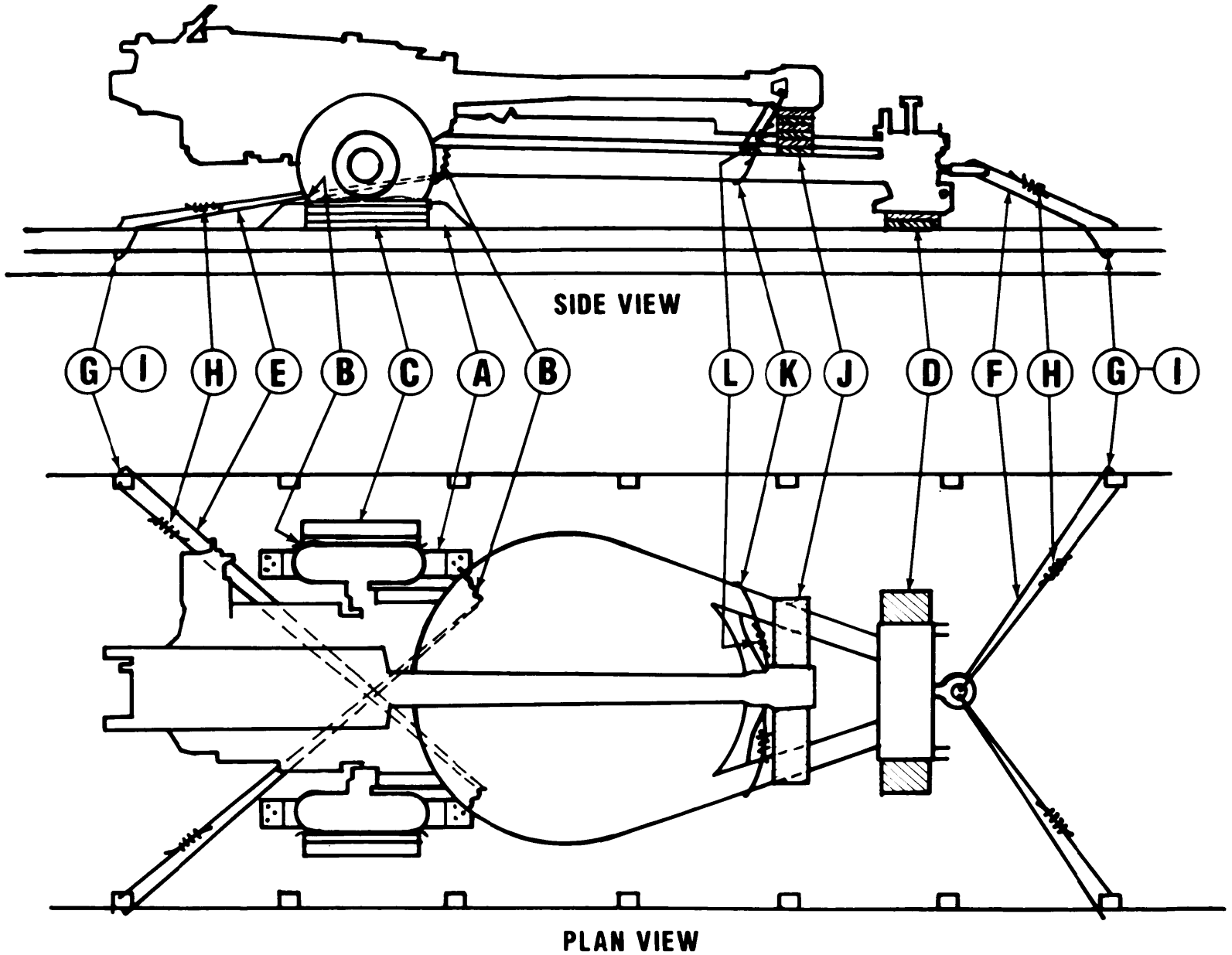


Figure 5–1. Blocking and tiedown for M119 on semitrailer.

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 M119. It also prescribes the materials and guidance required to prepare, load, tie down, and unload the M119.

6-2. Safety

Besides the safety precautions in chapter 3, the following procedures apply:

a. To transport ammunition and/or explosives with the vehicles, the activity offering the cargo for transport must notify the carrier (para 2-7, AR 55-228).

b. Handle and stow ammunition, explosives, and vehicles according to provisions in Titles 46 and 49, Code of Federal Regulations.

c. Make sure fire extinguishers are available during loading and discharge operations.

d. Inspect the condition and capacity of all slings, lifting rings, shackles, and other items used in loading and discharge operations.

e. Caution all personnel not to stand or walk under vehicles being lifted.

f. All lifts should have at least two taglines attached to control the swing of the M119 while suspended.

6-3. Water shipment

Because of its dimensions and weight, the M119's can be transported, by vessels, without restrictions. Hold-by-hold analysis of hatch-length stowage and height and boom capacity is always recommended for cargo ships. Most ships have holds capable of stowing M119's. Logistics-over-the-shore (LOTS) craft can also carry M119's.

NOTE

The methods in this chapter are recommended for lifting and securing M119's. Other methods of handling and stowing may be used provided they will ensure safe delivery.

Section II. LOADING AND SECURING

6-4. General rules for stowing

a. General. Whenever possible, the M119 should be stowed below deck for protection. In general, good stowage means placing the M119's fore and aft as close together as practicable, with minimum spacing between the outer M119's and the sweatboards. Breakable parts are protected, and spare parts are placed in or near the M119's. For stowing the M119, the brakes are set and the vehicle is secured with adequate blocking and lashing (wire rope or chains). Securement involves blocking of wheels in front and rear and on both sides to restrict movement in any direction. It also includes bracing of individual M119 blocks to bulkheads, stanchions, and other vehicle blocks.

b. Lifting. Figures 2-2, 4-2, and 4-4 identify the lifting points on the M119. Figures 4-2 and 4-4 show typical lifting of the M119.

c. Loading. M119's can be lifted by a crane of adequate capacity or loaded onto vessels from a pier when tidal conditions are suitable and ramps are available. These vessels include landing craft, beach discharge and amphibious lighters, roll-on/roll-off (RORO) vessels, and barges.

d. Tiedown. Figure 6-1 shows the typical blocking and tiedown details for the M119. The bill and application of materials are in tables 6–1 and 6–2, respectively.

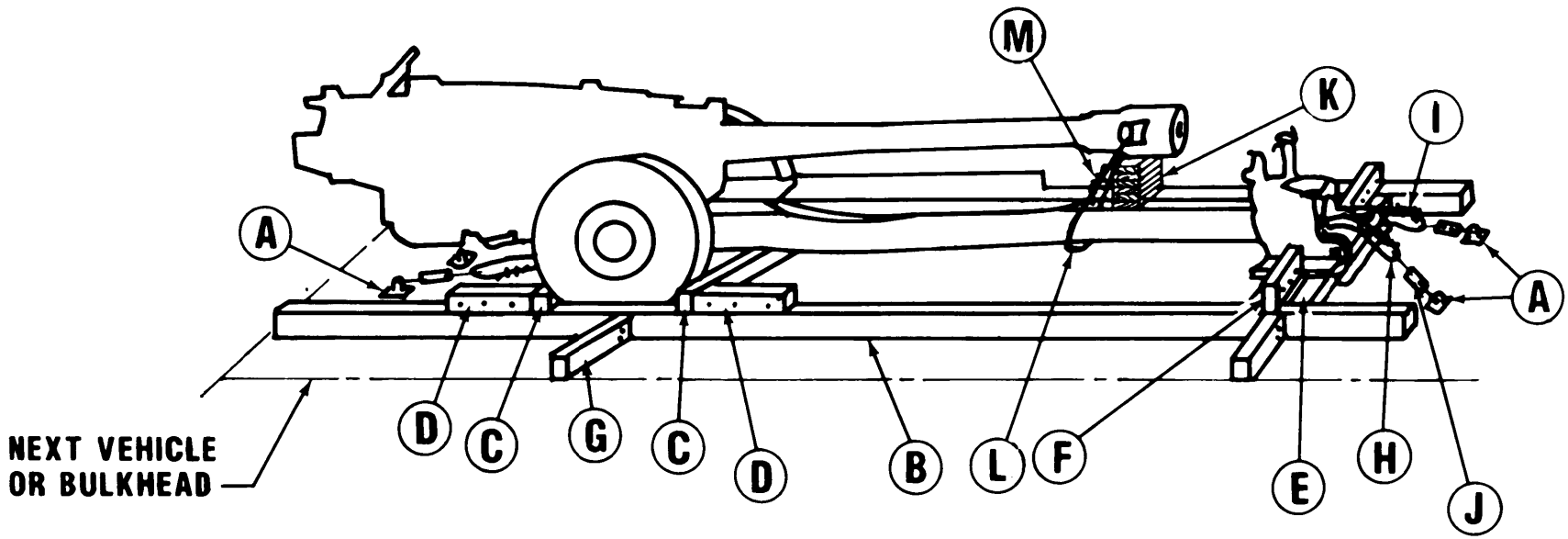


Figure 6–1. Blocking and tiedown of M119 in general cargo vessel.

Table 6-1. Bill of Materials for Blocking and Tiedown of M119 in General Cargo Vessel (Fig 6-1)

Item	Description		Approximate Quantity
Lumber	Douglas-fir, or comparable; straight-grain, free from material defects; Fed Spec MM-L-751: 2- x 6-inch		18 linear feet
	4- x 4-inch		85 linear feet
Nails	Common, steel, flathead; bright or cement-coated; Fed Spec FF-N-105:	10d	36
		20d	80
Wire rope	6 x 19, IWRC; improved plow steel; preformed, regular-lay; Fed Spec RR-W-410: 3/8-inch		20 feet
	1/2-inch		40 feet
Clamps	Wire rope, U-bolt clips, saddled, single-grip, steel, Crosby heavy-duty, or equal; Fed Spec FF–C-450: 3/8-inch		6
	1/2-inch		16
Turnbuckles	1/2- x 12-inch with jaw and jaw-end fittings (class 7); Fed Spec FF-T-791		4
Padeyes	Local manufacturer, from l-inch steel rod and 4- x 6- x 5/8-inch steel plate. Bore 1-inch holes through plate, and weld U-shaped 1-inch rod ends on top and bottom of plate.		4

Table 6-2. Application of Materials for Blocking and Tiedown of M119 in General Cargo Vessel (Fig 6-1)

Item	No. Required	Application
A	4	Padeyes. Weld padeyes to the deck of vessel if D-rings or deck tiedown fittings are unavailable.
B	2	Side blocks. Each consists of one piece of 4– x 4– x 192-inch lumber. Place one piece centered against outside of each wheel.
C	2	End blocks. Each consists of one piece of 4– x 4– x 74-inch lumber. Place on top of item B and against wheels, as shown in figure 6-2. Toenail to item B with two 20d nails at each end of each item C.
D	4	Backup cleats. Each consists of 4– x 4– x 18–inch lumber. Place on top of each item B against the joint of each item C.
E	1	Shoring. Place four pieces of 4– x 4– x 69-inch lumber beneath the lunette spade. Nail ends to side blocks (item B) with two 20d nails in each piece, on each side.
F	2	Side cleat. Each consists of 4– x 4–inch x length-cut-to-suit lumber. Place against the side of the lunette housing and extend to the outer edge of each item B. Toenail to items E and B with six 20d nails.
G	as required	Bracing. Each consists of 4– x 4-inch x length-cut-to-fit lumber. Brace as required against adjacent vehicle, cargo, side of vessel, or bulkhead, as appropriate. Materials for this requirement are not included in table 6–1.
H	4	Wire rope, 1/2-inch. Form a complete loop. Secure with clamps (item I). Attach to the front lunette and rear tiedown around the trail frames forward of the stay bracket.
I	16	Clamps, 1/2–inch. Install four clamps on each item H with 4–inch spacing between clamps, and apply 60-foot-pound torque.
J	4	Turnbuckles, 1/2- x 12-inch. Attach one jaw to wire rope (item H) and one jaw to pad-eye (item A) or deck fitting. Tighten all turnbuckles evenly.
*K	1	Blocking. This consists of six pieces of 2– x 6– x 36–inch lumber. Nail one piece, cut-to-fit, wedge-shaped, to the bottom of the first piece with six 10d nails. Place on the trails beneath the gun tube muzzle brake, and lodge the wedge-shape piece between the trails to prevent the blocking from shiftng. Nail the top five pieces, each to the one below, with six 10d nails.

Table 6-2. Continued

Item	No. Required	Application
*L	2	Gun tube tiedown, 3/8-inch wire rope. Place one complete loop through the muzzle brake and around the right trail arm, and overlap about 18 inches. Place the second loop around the left trail arm in the same manner.
*M	6	Clamps, 3/8-inch. Place three clamps on each item K overlap area, spaced 3 inches apart. Tension each item K and tighten each clamp to 30-foot-pound torque.

*These items must be used if the travel lock for the gun tube is defective or unserviceable,

6-5. Special design ships

All seatrain, RORO, and attack-cargo vessels, including landing ships, have patented lashing gear and pre-positioned fittings in the deck. With proper application of lashing gear, blocking and bracing are not required. Different classes of RORO vessels have different grid patterns for pre-positioned fittings. RORO ships are ideal for transport of the M119.

6-6. Barges and lighters

a. M119's can be transported in SEABEE barges and LASH lighters, with hatch covers in place. When M119's are transported in SEABEE barges or LASH lighters, they must be secured with blocking and tiedowns as shown in figure 6–1 and materials applied as indicated in tables 6–1 and 6–2.

b. Barge stability is noticeably affected by the placement of items. Therefore, the M119's should be loaded in a manner to counterbalance variations in the locations of the center of gravity. For example, after loading one M119 in one end of a barge or lighter, load another M119 in the opposite end before loading an M119 next to the first M119.

c. Shoring is not generally used benath items equipped with rubber tires. However, the M119 does require shoring beneath the lunette (spade). Deck surfaces should be dry and free of grease and/or debris.

6-7. Landing ships, landing craft, and amphibious vehicles

When M119's are moved for extended distances or through rough waters, blocking and tiedowns must be used. In most cases, the vessels have turnbuckles with a sheep's-foot on one end that fits into a deck cloverleaf. On vessels that do not have cloverleaf and patented lashings, a suitable substitute may be used. When M119's are moved to or from vessels secured to piers or in sheltered anchorages, only tiedowns are required.

CHAPTER 7
RAIL TRANSPORTABILITY GUIDANCE

Section I. GENERAL

7-1. Scope

This chapter provides rail transportability guidance for movement of the M119. It also prescribes the materials and guidance required to prepare, load, tie down, and unload the M119.

7-2. Maximum utilization of railcars

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

7-3. Safety

Besides the safety precautions in chapter 3, the following criteria apply:

a. The M119 towing speed should not exceed 3 miles per hour when on loading ramps and railcars.

b. Guides should be in full view of the towing vehicle's operator.

c. Guides should maintain a safe distance and location in front of the towing vehicle or on the next railcar.

d. The gun tube and movable parts or rotatable components should be secured in their shipping positions with 1/2–inch wire rope and cable clamps, whether or not equipped with positive locking devices for movable components.

Section II. TRANSPORT ON CONUS RAILWAYS

7-4. General

The transportability guidance in this section applies when the M119 is transported on CONUS railways. When loaded on a standard deck-height flatcar, the M119 is within height and width limitations of the Association of American Railroads (AAR) "Outline Diagram for Single Loads Without End Overhang on Open-Top Cars." No special preparation of the M119's will be required.

7-5. Preparation for loading

The following should be accomplished for shipment on standard draft-gear, general-purpose railcars.

a. Place the M119 in the extended configuration with the gun tube in a level position. Adjust the elevation of the gun tube during the blocking and tiedown operations.

b. Remove the following components and package and secure them to the railcar with the M119:

(1) Breech block assembly, PN FL1460A.
(2) Firing pin assembly, PN FL1337A.
(3) Firing platforms and stays, L1A1, PN FL1483.
(4) Clamp, platform and jack strut, PN FL1510A.
(5) Clamp, jack strut, PN FL1474A.
(6) Clamp, platform and handspike, PN FL1511A.
(7) Jack strut assembly, PN FL1536A.
(8) Handspike, carriage, PN FL17939.
(9) Clamp, gun barrel, PN FL1384A.
(10) Firing mechanism, NSN 1015-99-964-1208, PN FL1490A.

c. The firing platform may be placed on the railcar, with wooden dunnage nailed to the floor on all four sides to provide longitudinal and lateral bracing. Restrain the platform vertically with two 1-1/4- by 0.31– or 0.35-inch (minimum) steel bands attached to the railcar stake pockets and extending over the platform.

d. Box the remaining removed items with the basic issue items (BII), and secure similar to the firing platform.

WARNING

The gun tube is under pressure. Use extreme care while installing and removing the blocking and bracing assemblies and materials. Install and remove blocking and bracing materials with a jack back apparatus (JBA).

7-6. Loading on general-purpose flatcars

a. The M119 may be placed in the tiedown position on the flatcar by a crane of adequate capacity, or it may be towed onto the flatcar if a suitable ramp or bridge is available.

b. The loading, blocking, bracing, and tiedown of the M119 shown in figure 7-1 (sheets 1 through 14), prepared by USADACS, Savanna, Illinois, are based on a minimum flatcar width of 10 feet 6 inches. However, any general-purpose railcar wider than 9 feet may be used with adjustments in tiedown application patterns.

NOTE

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

7-7. Loading on special-purpose (chain-tiedown) flatcars

a. Wood-deck chain-tiedown flatcars usually have four parallel channels that run the full length of the flatcar deck. Two channels are in the middle of the railcar about 30 inches apart, and two run along the outer edges of the car or just inboard of the treadway loading area. These channels are recessed so the top is flush with the deck surface. Each channel contains numerous (usually 8 to 12) chain anchors with an attached 10– to 12–foot chain. The chain anchors can be moved along the channel and locked in place where needed.

At the free end of the chain, pass a hook through the tiedown shackle on the vehicle being loaded, and pull it hand-tight. Then hook it back onto the chain or directly to the shackle. Apply tension to the chain by tightening a turnbuckle built into the chain assembly or by turning a ratchet or screwjack in the anchor block. Use an open-end wrench for tightening the turnbuckles. Use a 3/4–inch square-drive heavy-duty socket wrench to tighten the ratchet at the anchor blocks. Wire-tie open hooks to prevent them from becoming disconnected during transport.

b. The load shown in figures 7-2 and 7-3 depicts the M119 on a wood-deck chain-tiedown flatcar. Tables 7-1 and 7-2 show the bill and application of materials for blocking and tiedown of the M119 on a wood-deck chain-tiedown flatcar, respectively. The tiedown of the M119 on a steel-deck chain-tiedown flatcar is similar to the procedure for blocking and tiedown on a wood-deck chain-tiedown flatcar with the following exceptions. Remove all wheel blocking. Secure the shoring to the spade (item F, fig 7-2). Attach two additional chains that run in a crossing pattern rearward from the left and right firing stay bracket shackles to the outer flatcar channels (see the rear chains in fig 7–2 for example of crossing pattern and approximate location of tiedown). Attach two additional chains that run forward in a near-side pattern from the howitzer lunette to channels on either side of flatcar in a manner similar to the front two chains in figure 7–2.

Section III. TRANSPORT ON FOREIGN RAILWAYS

7-8. General

The M119 can be transported on foreign railway systems without restrictions. When loaded on suitable railcars in European countries, the M119 is within the clearance guidelines of the Gabarit International de Chargement (GIC) gauge railways. This also applies to most countries in the Middle East, South America, and Australia and to India and Pakistan.

7-9. Transport on Foreign Flatcars

The M119 can be transported on many foreign flatcars. The materials required for blocking and tiedown of the M119 on foreign flatcars are essentially the same as those used for rail transport within CONUS. Detailed guidance appears in the 4th Transportation Command Pamphlet 55-2, *Tiedown Guide of Rail Movement.* For a copy of this pamphlet, write to Commander, 1st Transportation Movement Control Agency, ATTN: AEUTR-MCA-TA, APO New York 09451-4000. For intra-theater or in-county clearance, request assistance from the 4th Transportation Command, Oberursel, Germany.

REVIEWED BY
MECH DIV AAR, THEIR LETTER
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MTMCTEA, FT EUSTIS, VA

LOADING AND BRACING ON FLAT CAR OF 105MM HOWITZER, M119

INDEX

REVISIONS			

DRAFTSMAN: pl
PROJ ENGR: RHA/WRF
CHECKER: PC
LOG ENGRS OFFICE: WP Lamt

APPROVED, U.S. ARMY ARMAMENT, MUNITIONS AND CHEMICAL COMMAND

APPROVED BY ORDER OF COMMANDING GENERAL, U.S. ARMY MATERIEL COMMAND (AMC)

U.S. ARMY DEFENSE AMMUNITION CENTER AND SCHOOL

U.S. ARMY AMC DRAWING

CLASS	DIVISION	DRAWING	FILE
19	48	8104	5WE3

PROJECT WE 5-87

Figure 7-1. Loading, bracing, and tiedown of M119 on CONUS general-purpose railcar (sheets 1 through 14).

GENERAL NOTES

A. THIS DOCUMENT HAS BEEN PREPARED AND ISSUED IN ACCORDANCE WITH AR 740-1.

B. THE LOAD AS SHOWN IS BASED ON A FLATCAR 10'-6" WIDE (PLATFORM). CARS OF OTHER WIDTHS MAY BE USED. ONE UNIT OF LADING IS SHOWN; HOWEVER, TWO (2) UNITS OR UNITS DISSIMILAR IN NATURE, MAY BE LOADED ON A CAR IF SPACE PERMITS. THE NUMBER OF UNITS TO BE LOADED ON A CAR WILL BE DEPENDENT UPON THE SIZE OF THE CAR OR THE QUANTITIES OF UNITS TO BE SHIPPED, WITH THE VIEW OF FULL UTILIZATION OF CARRIER EQUIPMENT.

C. LADING DATA:

ITEM DIMENSIONS----- 20'-9" LONG BY 5'-10" WIDE BY 4'-6" HIGH.

ITEM GROSS WEIGHT--- 3,790 POUNDS (APPROX).

D. REFER TO ORD DWG 19-48-C-ORD JU-588, "WIRE ROPE AND ANNEALED WIRE APPLICATION METHODS FOR SECURING LADING ON RAIL AND MOTOR CARRIER EQUIPMENT", FOR PROPER TIEDOWN APPLICATION, EXCEPT NUTS ON 1/2" CABLE CLIPS WILL BE TIGHTENED TO A TORQUE OF 85 TO 95 FOOT POUNDS. NOTE: IF A TORQUE WRENCH IS NOT AVAILABLE FOR TIGHTENING CLIP NUTS, THE PROPER TORQUE FOR CLIP NUTS CAN BE ACHIEVED BY USING BOX AND/OR OPEN-END OR SOCKET WRENCHES THAT HAVE 15" LONG HANDLES. CAUTION: DURING WIRE ROPE INSTALLATION, AVOID CONTACT WITH ALL ELECTRICAL WIRING, VEHICLE CONTROLS AND OTHER APPURTENANCES. METAL FILLERS OR COMPARABLE CUSHIONING MATERIAL MUST BE USED BETWEEN TIEDOWN CABLES AND ALL SHARP EDGES.

E. REFER TO ASSOCIATION OF AMERICAN RAILROADS MANUAL, "GENERAL RULES GOVERNING THE LOADING OF COMMODITIES ON OPEN TOP CARS AND TRAILERS", FOR APPLICABLE LOADING RULES: PREFACE 1-A, 2, 3, 4, 5, 9, 11, 14, 15, 19 AND 19-B.

F. WIRE ROPE CABLES MUST BE TENSIONED SUFFICIENTLY TO CAUSE MODERATE VEHICLE BODY DEPRESSION. TENSIONING CAN BE ACCOMPLISHED BY EMPLOYING TWO (2) CABLE "GRIPPERS" AND AN APPLICABLY SIZED "COME-A-LONG" TYPE MECHANICAL HOIST.

G. CAUTION: IT IS RECOMMENDED THAT STEEL WIRE ROPE BE INSTALLED TO APPROXIMATE THE ANGLE SHOWN; HOWEVER, IF PLACEMENT OF TRANSPORTER TIEDOWN FACILITIES PREVENTS THIS, CARE MUST BE EXERCISED TO ENSURE THAT CABLES ON THE SAME SIDE OF THE LADING ARE INSTALLED SO THEIR RETENTION FORCES ACT IN OPPOSITE LONGITUDINAL DIRECTIONS.

H. DUNNAGE LUMBER SPECIFIED THROUGHOUT THIS PROCEDURAL DRAWING IS OF NOMINAL SIZE UNLESS OTHERWISE SPECIFIED. FOR EXAMPLE, 2" X 6" MATERIAL IS ACTUALLY 1-1/2" THICK BY 5-1/2" WIDE AND 4" X 4" MATERIAL IS ACTUALLY 3-1/2" THICK BY 3-1/2" WIDE.

(CONTINUED AT RIGHT)

(GENERAL NOTES CONTINUED)

J. NOTICE: A STAGGERED NAILING PATTERN WILL BE USED WHEREVER POSSIBLE WHEN NAILS ARE DRIVEN INTO JOINTS OF DUNNAGE ASSEMBLIES. ALSO, A STAGGERED NAILING PATTERN WILL BE USED WHEN DUNNAGE IS NAILED TO THE FLOOR OF THE TRANSPORTING VEHICLE, OR WHEN LAMINATING DUNNAGE. THE NAILING PATTERN WILL BE ADJUSTED AS REQUIRED SO THAT A NAIL DOES NOT PENETRATE INTO OR NEAR A CRACK BETWEEN FLOOR BOARDS. ADDITIONALLY, THE NAILING PATTERN FOR AN UPPER PIECE OF LAMINATED DUNNAGE WILL BE ADJUSTED AS REQUIRED SO THAT A NAIL FOR THAT PIECE WILL NOT BE DRIVEN THROUGH ONTO OR RIGHT BESIDE A NAIL IN A LOWER PIECE.

K. POWER DRIVEN STAPLES MAY BE USED AS ALTERNATIVE FASTENERS FOR NAILS WHEN CONSTRUCTING DUNNAGE ASSEMBLIES WHICH ARE TO BE USED IN THE DELINEATED CAR LOAD. THE STAPLES TO BE USED MUST BE EQUAL IN LENGTH TO THE SPECIFIED NAIL SIZE AND MUST BE SUBSTITUTED ON A ONE STAPLE FOR ONE NAIL BASIS. STAPLES WHICH ARE 2" OR LESS IN LENGTH SHOULD BE IN ACCORDANCE WITH FEDERAL SPECIFICATION FF-N-105 AS NEARLY AS PRACTICABLE. STAPLES WHICH ARE LONGER THAN 2" WILL BE A COMMERCIAL GRADE, OF A QUALITY EQUIVALENT TO THOSE MANUFACTURED BY SENCO PRODUCTS INCORPORATED. NOTE: STAPLES WILL NOT BE SUBSTITUTED FOR NAILS IN ANY LOAD-RESTRAINING FLOOR DUNNAGE APPLICATION.

L. CONVERSION TO METRIC EQUIVALENTS: DIMENSIONS WITHIN THIS DOCUMENT ARE EXPRESSED IN INCHES AND WEIGHTS ARE EXPRESSED IN POUNDS. WHEN NECESSARY, THE METRIC EQUIVALENT MAY BE CALCULATED ON THE BASIS OF ONE INCH EQUALS 25.4 MM AND ONE POUND EQUALS 0.454 KG.

MATERIAL SPECIFICATIONS

LUMBER	DOUGLAS FIR OR COMPARABLE LUMBER WITH STRAIGHT GRAIN AND FREE OF MATERIAL DEFECTS. REF: FED SPEC MM-L-751.
NAILS	COMMON, FED SPEC FF-N-105.
ROPE	STEEL WIRE, PLAIN, PREFORMED, REGULAR LAY, 11.5 TONS, 6 X 19, FLEXIBLE IWRC. MACWHYTE WIRE ROPE CO. (OR EQUAL). REF: FED SPEC RR-W-410.
CLIP	"U" BOLT, CROSBY, HEAVY DUTY (OR EQUAL). REF: FED SPEC FF-C-450, TYPE I, CLASS 1.
THIMBLE	TYPE II, FED SPEC FF-T-276.
ANTI-CHAFING MATERIAL	NEUTRAL BARRIER MATERIAL MIL-B-121 (OR EQUAL).
PLYWOOD	GROUP 8, CONSTRUCTION AND INDUSTRIAL PLYWOOD, INTERIOR WITH EXTERIOR GLUE, GRADE C-D, FED SPEC NN-P-530. IF SPECIFIED GRADE IS NOT AVAILABLE, A BETTER INTERIOR OR AN EXTERIOR GRADE MAY BE SUBSTITUTED.
STRAP	WEBBING, UNIVERSAL TIEDOWN, NSN [illegible] PN 37-013, OR NSN 5340-00-980-9277 ALTERNATIVE: NSN 5340-01-089-4199, PN 1166-9538.
STEEL PLATE	AISI 1020 HOT ROLLED STEEL.
THREADED ROD NUTS, WASHERS AND STAPLES	COMMERCIAL GRADE.
RUBBER	CLASS I OR III, 15-55 DURO METER, MIL-R-15624.

PAGE 2

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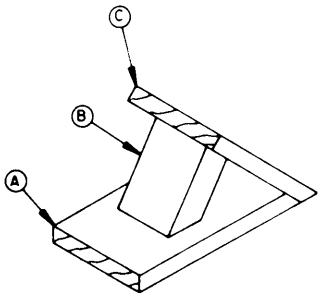
PROJECT WE 5-87

Figure 7-1–Continued (sheet 2 of 14).



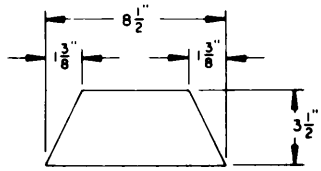
CHOCK BLOCK
(KEY NUMBER ②)

KEY LETTERS

Ⓐ 2" X 10" X 17-3/8" (1 REQD). BEVEL ONE END AT A 45° ANGLE. NAIL TO PIECES MARKED Ⓑ AND Ⓒ W/3-16d NAILS AT EACH JOINT.

Ⓑ 4" X 6" X 8-1/2" (1 REQD). BEVEL EACH END AS SHOWN BY THE "KEY LETTER PIECE Ⓑ" DETAIL AT RIGHT.

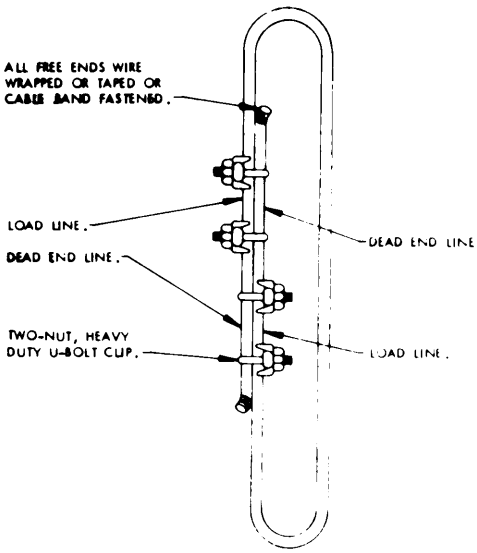
Ⓒ 2" X 10" X 15-3/8" (1 REQD). BEVEL ONE END AT A 45° ANGLE. NAIL TO PIECES MARKED Ⓐ AND Ⓑ W/3-16d NAILS AT EACH JOINT.



KEY LETTER PIECE Ⓑ

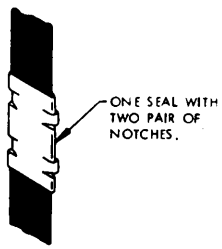
BILL OF MATERIAL

LUMBER	LINEAR FEET	BOARD FEET
2" X 10"	3	5
4" X 6"	1	2
NAILS	NO. REQD	POUNDS
16d (3-1/2")	12	1/2



CABLE JOINT

PROPER TIGHTENING OF THE WIRE ROPE CLIP NUTS CAN BE ACCOMPLISHED BY UTILIZING A PROPER SIZED TORQUE WRENCH. AFTER THE NUTS HAVE BEEN INITIALLY TIGHTENED, THE "U" SIDE OF EACH CLIP MUST BE STRUCK SEVERAL TIMES WITH A HAMMER TO INSURE PROPER SEATING IN TO THE DEAD END LINE. FINAL TORQUE WILL BE ACQUIRED BY REPEATEDLY AND ALTERNATELY TIGHTENING EACH CLIP NUT.



STRAP JOINT A

METHOD OF SECURING A STRAP JOINT WHEN USING A NOTCH-TYPE SEALER.

STRAP JOINT B

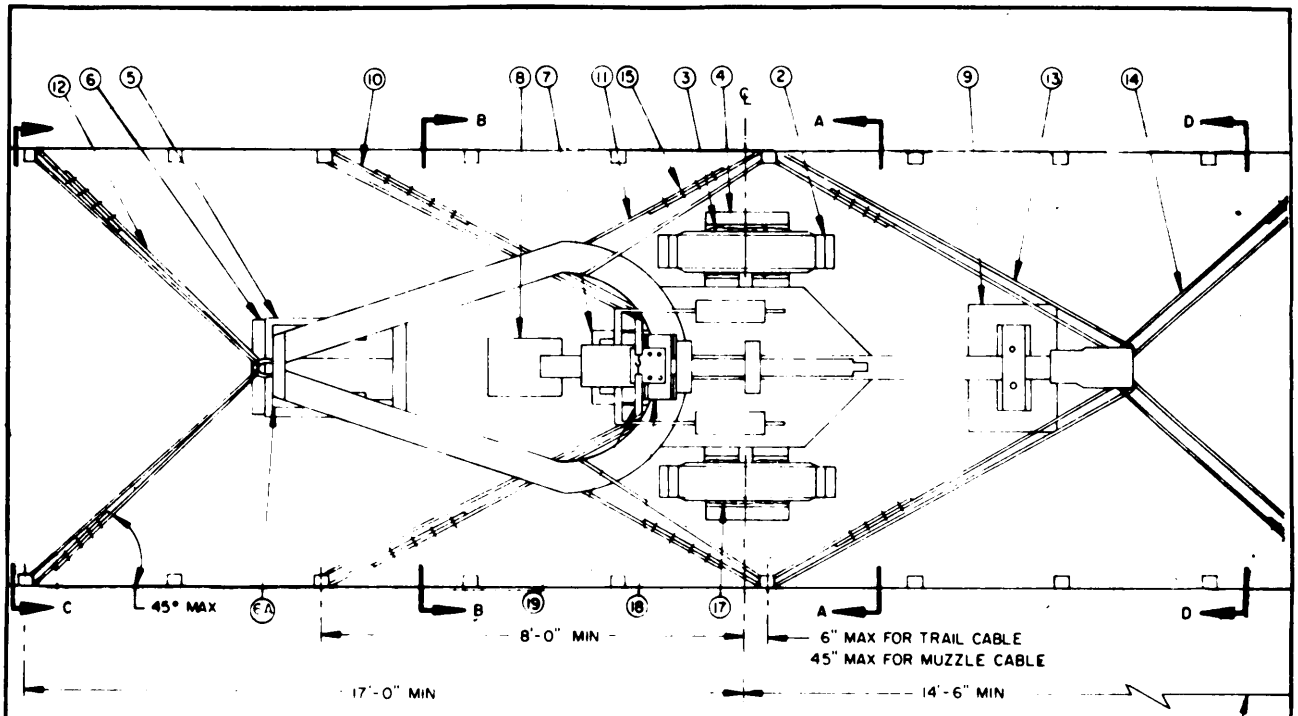
METHOD OF SECURING A STRAP JOINT WHEN USING A CRIMP-TYPE SEALER.

DETAILS

PAGE 9

PROJECT WE 5-97

Figure 7-1–Continued (sheet 3 of 14).



AN VIEW

KEY NUMBERS

(1) AXLE BLOCKING (1 REQD). SEE THE DETAILS ON PAGE 8 AND 9. REFER TO THE SECTION A-A DETAIL ON PAGE 6. NAIL TO THE CAR FLOOR W/6-20d NAILS. SEE SPECIAL NOTE ON PAGE .

(2) CHOCK BLOCK (4 REQD). SEE THE DETAIL ON PAGE 3. LOCATE THE BEVELED END OF BLOCK AGAINST A WHEEL AND NAIL TO THE CAR FLOOR W/6-20d NAILS.

(3) RUBBING STRIP, 2" X 6" X 24" (4 REQD). POSITION ON EDGE AND NAIL TO LOWER PIECE MARKED (4) W/3-12d NAILS.

(4) SIDE BLOCKING, 2" X 4" X 24" (TRIPLED) (4 REQD). NAIL THE FIRST PIECE TO CAR FLOOR W/4-20d NAILS. NAIL EACH ADDITIONAL PIECE IN A LIKE MANNER.

(5) SPADE BLOCKING (1 REQD). SEE THE DETAIL ON PAGE 12. POSITION UNDER SPADE AND NAIL TO THE CAR FLOOR W/6-20d NAILS. SEE THE SECTION C-C DETAIL ON PAGE 7.

(6) FLOOR BLOCKING, 2" X 4" X 27" (DOUBLED) (2 REQD). POSITION AT EACH END OF SPADE BLOCKING, PIECE MARKED (5), AND NAIL THE FIRST PIECE TO THE FLOOR W/16-20d NAILS. NAIL SECOND PIECE IN A LIKE MANNER.

(6A) STRIP PIECE, 2" X 4" X 2" (2 REQD). POSITION AGAINST SPADE AND NAIL TO THE SPADE BLOCKING, PIECE MARKED (5), W/4-10d NAILS.

(7) BREECH BLOCK (1 REQD). SEE THE DETAILS ON PAGE 10. NAIL TO THE CAR FLOOR BASE TO THE CAR FLOOR W/4-20d NAILS. SEE THE SECTION B-B DETAIL ON PAGE 7. SEE DETAIL FOR NAILING SCHEDULE. SEE SPECIAL NOTE 5 ON PAGE 5.

(8) BREECH BLOCK SPACER, (1 REQD). CUT TO THE SIZE AND SHAPE SHOWN. LAMINATE W/16-20d NAILS AS SHOWN. SEE THE SECTION B-B DETAIL ON PAGE 11 FOR LOCATION AND CUT OUT. NAIL TO THE CAR FLOOR W/16-20d NAILS.

(9) TUBE BLOCKING (2 REQD). SEE THE DETAILS ON PAGE 13. POSITION UPRIGHT PIECES AS SHOWN AND NAIL THROUGH THE FLOOR W/20d NAILS. NAIL THE PLYWOOD BASE TO THE CAR FLOOR W/16-20d NAILS. SEE THE SECTION B-B DETAIL ON PAGE 7. SEE SPECIAL NOTE 5 ON PAGE 5.

(10) STEEL WIRE ROPE, 1/2" DIAMETER, 11.5 TONS (2 REQD). INSTALL CABLE AS SHOWN TO FORM A COMPLETE LOOP FROM STAKE POCKET ON CAR THROUGH SHACKLES ON HOWITZER AND BACK TO STAKE POCKET. NOTE: CABLE OF A LARGER SIZE MAY BE USED IF AVAILABLE WHEN SIZE SPECIFIED IS NOT AVAILABLE. SEE GENERAL NOTES 3 AND 4 ON PAGE 2. SEE SPECIAL NOTE 6 IN DETAIL ON PAGE 5.

(11) STEEL WIRE ROPE, 1/2" DIAMETER, 11.5 TONS (2 REQD). INSTALL CABLE AS SHOWN TO FORM A COMPLETE LOOP FROM STAKE POCKET ON CAR THROUGH THE TRAIL AND BACK TO STAKE POCKET.

(CONTINUED AT RIGHT)

(KEY NUMBERS CONTINUED)

(12) STEEL WIRE ROPE, 1/2" DIAMETER, 11.5 TONS (2 REQD). INSTALL AS SHOWN TO FORM A COMPLETE LOOP FROM STAKE POCKET ON CAR THROUGH LUNETTE ON HOWITZER AND BACK TO STAKE POCKET.

(13) STEEL WIRE ROPE, 1/2" DIAMETER, 11.5 TONS (2 REQD). INSTALL AS SHOWN TO FORM A COMPLETE LOOP FROM STAKE POCKET ON CAR THROUGH THE MUZZLE AND BACK TO THE STAKE POCKET. SEE SPECIAL NOTE 6 ON PAGE 5.

(14) STEEL WIRE ROPE, 1/2" DIAMETER, 11.5 TONS (2 REQD). INSTALL AS SHOWN TO FORM A COMPLETE LOOP FROM STAKE POCKET ON CAR THROUGH THE MUZZLE AND BACK TO THE STAKE POCKET.

(15) CLIP, WIRE ROPE, SIZE 1/2" (50 REQD). USE FOUR (4) PER CABLE JOINT AND ONE (1) PER THIMBLE. NOTE: A STANDARD THIMBLE AS SPECIFIED CAN BE SECURED TO A CABLE WITH A 1/2" CLIP. HOWEVER, IF DESIRED, OR IF THE 1/2" THIMBLE BEING USED IS OF A TYPE WHICH CANNOT BE SECURED TO A CABLE WITH A 1/2" CLIP, 5/8" CLIPS MAY BE USED. ALTER NO. 14 GAGE OR HEAVIER WIRE MAY BE USED.

(16) THIMBLE, STANDARD, SIZE 1/2" (12 REQD). USE WITH PIECES MARKED (10) THRU (14). USE ONE (1) PER STAKE POCKET AND ONE (1) PER SHACKLE. SECURE TO CABLE W/1 CLIP PER THIMBLE. NOTE THAT AN "OPEN PATTERN" THIMBLE IS RECOMMENDED.

(17) WATERPROOF PAPER OR BURLAP OF A SUFFICIENT SIZE TO POSITION UNDER AND EXTEND 2" ABOVE PIECE MARKED (3).

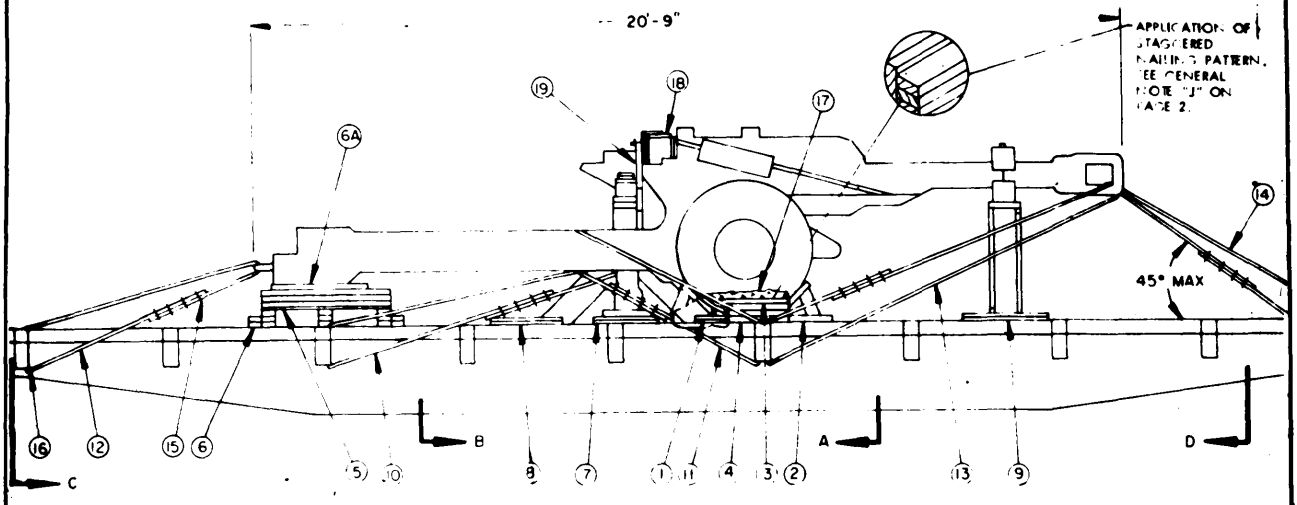
(18) BREECH BLOCKING (1 REQD). SEE THE DETAIL ON PAGE 14.

(19) WEB STRAPPING ASSEMBLY (1 REQD). INSTALL TO FORM A COMPLETE LOOP FROM THE STRAPPING BRACKET ON THE BREECH/YOKE BLOCK DOWN UNDER A SHACKLE ANCHOR POINT ON THE TRAIL ACROSS THE GUN AND UNDER THE OPPOSITE SHACKLE ANCHOR POINT AND UP TO THE STRAPPING BRACKET.

PAGE 4

PROJECT NO. 5-87

Figure 7-1–Continued (sheet 4 of 14).



ELEVATION VIEW

(SPECIAL NOTES CONTINUED)

6. THE STEEL WIRE ROPE, PIECES MARKED (13) MUST BE INSTALLED AND TENSIONED PRIOR TO INSTALLING THE STEEL WIRE ROPE, PIECES MARKED (14)

BILL OF MATERIAL (TOTAL)		
LUMBER	**LINEAR FEET**	**BOARD FEET**
1"(ACTUAL) X 6"	4	2
2" X 4"	70	47
2" X 6"	30	30
2" X 8"	4	6
2" X 10"	14	24
2" X 12"	19	38
4" X 4"	1	2
4" X 6"	16	32
6" X 6"	18	54
8" X 8"	6	27
NAILS	**NO. REQD**	**POUNDS**
5d (1-3/4")	63	1/4
8d (2-1/2")	32	1/4
10d (3")	154	2-1/2
12d (3-1/4")	363	5-1/4
16d (3-1/2")	84	2 /
20d (4")	72	2-3/4
STAPLES, 3/4"	41 REQD	NIL
PLYWOOD, 3/4	38 SQ FT REQD	81 LBS
PLYWOOD, 1/2"	1 SQ FT REQD	2 LB
PLYWOOD, 3/8"	8 SQ FT REQD	9 LBS
RUBBER, 1/2"	2 SQ FT REQD	4 LBS
RUBBER, 1/4"	1 SQ FT REQD	1/4 LB
STEEL PLATE, 1/4"	2 SQ FT REQD	21 LBS
ROPE, STEEL WIRE, 1/2" DIA.	215 ' REQD	95 LBS
CLIPS, 1/2"	52 REQD	23 LBS
THIMBLES, STANDARD, 1/2"	12 REQD	3 LBS
WATERPROOF PAPER OR BURLAP	AS REQD	NIL
THREADED ROD, 1/2" X 1" W/NUTS AND WASHERS	2 REQD	28 LBS
WEB STRAP TIEDOWN ASSEMBLY	1 REQD	5 LBS

PERTINENT NOTES:

1. THE FOLLOWING HOWITZER COMPONENTS ARE TO BE REMOVED FROM THE HOWITZER PRIOR TO SHIPMENT:
   a. BREECH BLOCK ASSEMBLY, PN: FL1460A.
   b. FIRING PIN ASSEMBLY, PN: FL133 A
   c. FIRING PLATFORM AND STAY, ETAT, PN: FL1483
   d. CLAMP, PLATFORM AND JACK STRUT, PN: FL1510A
   e. CLAMP, JACK STRUT, PN: FL14 4A
   f. CLAMP, PLATFORM AND HAND PIKE, PN: FL1511A
   g. JACK STRUT ASSEMBLY, PN: FL153AA
   h. HAND PIKE, CARRIAGE, PN: FL1939
   i. CLAMP, GUN BARREL, PN: FL1384A
   j. [illegible] A.S.S., 1115-99-9 [illegible], PN: FL 1490A
2. THE FIRING PLATFORM MAY BE PLACED ON THE CAR, WITH WOODEN DUNNAGE NAILED TO THE CAR FLOOR ON ALL FOUR SIDES TO PROVIDE LONGITUDINAL AND LATERAL BRACING. THE PLATFORM WILL BE RESTRAINED VERTICALLY WITH TWO (2) ONE AND ONE-QUARTER INCH (MINIMUM) STEEL BANDS ATTACHED TO THE CAR STAKE POCKETS AND EXTENDING OVER THE PLATFORM.
3. THE REMAINING REMOVED ITEMS WILL BE BOXED ALONG WITH THE BASIC ISSUE ITEMS AND SECURED IN A MANNER SIMILAR TO THE SECUREMENT OF THE PLATFORM
4. CAUTION: THE GUN TUBE IS UNDER PRESSURE. EXTREME CARE MUST BE USED WHEN INSTALLING AND REMOVING THE DEPICTED BLOCKING AND BRACING ASSEMBLIES AND MATERIAL. THIS BLOCKING AND BRACING MATERIAL WILL BE INSTALLED AND REMOVED WITH THE USE OF A JACK BACE-APPARATUS (JBA).
5. NOTE: THE BREECH BLOCK, PIECE MARKED (7), AND THE TUBE BLOCKING PIECE MARKED (9), MUST NOT BE NAILED TO THE CAR FLOOR UNTIL AFTER THE STEEL WIRE ROPE, PIECES MARKED (13), (13), AND (14), HAS BEEN INSTALLED AND TENSIONED. NAILING OF PIECES MARKED (7) AND (9) TO THE CAR FLOOR WILL BE ACCOMPLISHED AFTER IT HAS BEEN DETERMINED WHETHER OR NOT SHIMMING IS REQUIRED. IF SHIMMING IS REQUIRED UNDER THE BREECH BLOCK, PIECE MARKED (7) MUST BE POSITIONED AT THREE (3) PLACES. A 20" X 20" PIECE WILL BE POSITIONED UNDER PIECE MARKED (A) OF THE ASSEMBLY, A 24" WIDE BY 8" LONG PIECE WILL BE POSITIONED UNDER THE BASE END OF PIECE MARKED (E), AND A 16" WIDE BY 24" LONG PIECE WILL BE INSTALLED UNDER PIECE MARKED (B). THESE ADDED PIECES WILL BE PREVENTED FROM INTERFERING WITH LODGEMENT WHEN PIECE MARKED (A) IS NAILED. IF SHIMMING IS REQUIRED UNDER THE TUBE BLOCK, A 24" X 36" PIECE WILL BE POSITIONED UNDER PIECE MARKED (A) OF THE ASSEMBLY AND PREVENTED FROM INTERFERING WITH LODGEMENT WHEN PIECE MARKED (A) IS NAILED.

(SPECIAL NOTES CONTINUED AT LEFT)

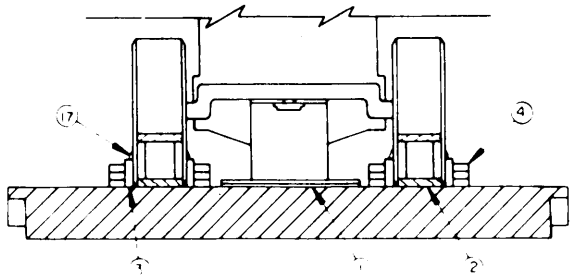
LOAD AS SHOWN

ITEM	QUANTITY	WEIGHT (APPROX)
M119 HOWITZER	1	3,790 LBS
DUNNAGE		490 LBS
TOTAL WEIGHT		4,284 LBS

PAGE 5

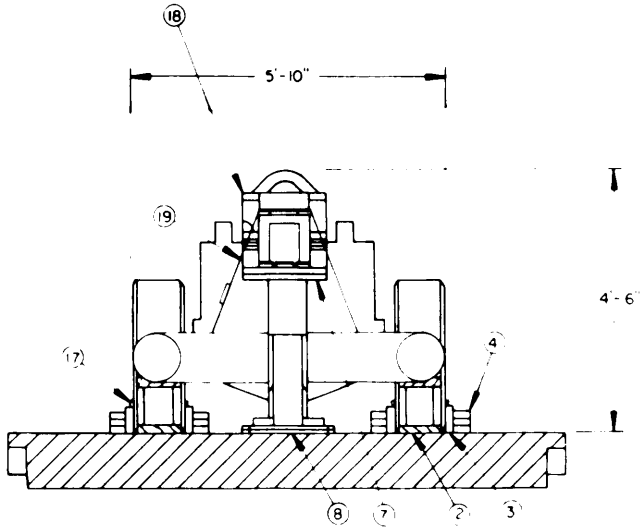
PROJECT WE 5-87

Figure 7-1–Continued (sheet 5 of 14).



SECTION A-A

NOTE: TO MORE CLEARLY IDENTIFY THE AXLE BLOCKING, PIECE MARKED (1) IN THE SECTION A-A VIEW, AND THE BREECH BLOCK, PIECE MARKED (5) IN THE SECTION B-B VIEW, ALL TIEDOWN CABLES HAVE BEEN OMITTED.

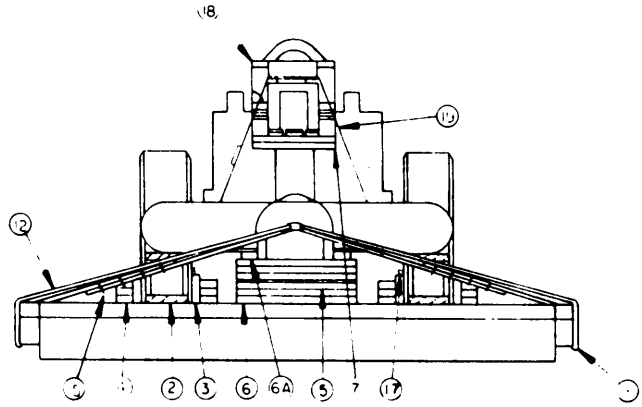


SECTION B-B

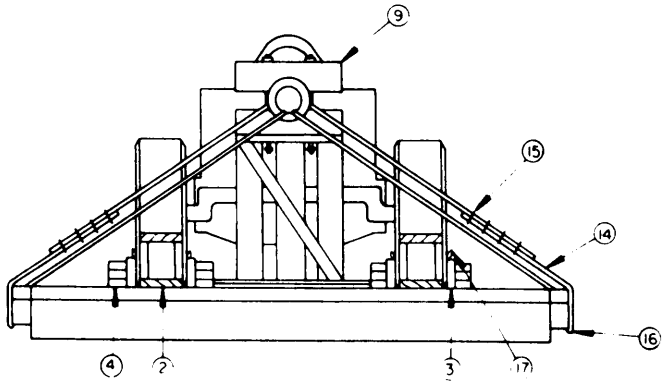
PAGE 6

PROJECT WE 5-87

Figure 7-1–Continued (sheet 6 of 14).



SECTION C-C

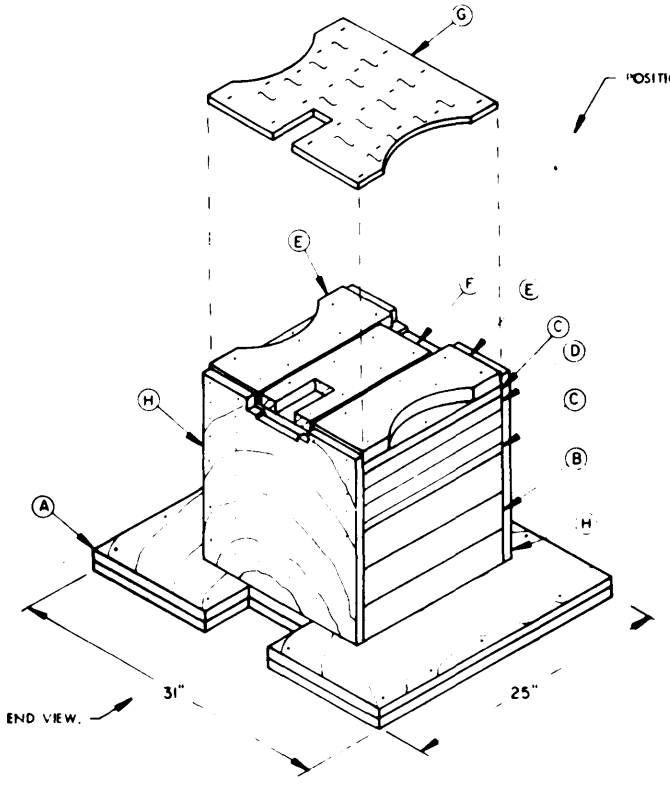


SECTION D-D

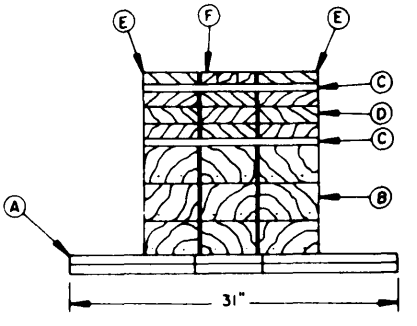
PAGE 7

PROJECT NR

Figure 7-1–Continued (sheet 7 of 14).



AXLE BLOCKING
(KEY NUMBER ⑪)



END VIEW
(KEY LETTER "H" OMITTED)

KEY LETTERS

Ⓐ PLYWOOD, 3/4" X 25" X 31" (DOUBLED) (1 REQD). LAMINATE W/12-5d NAILS AND CLINCH. SEE THE "KEY LETTER PIECE Ⓐ "DETAIL ON PAGE 9 FOR DIMENSIONS OF CUTOUT. NAIL TO LOWER PIECES MARKED Ⓑ W/7-12d NAILS AT EACH JOINT.

Ⓑ 4" X 6" X 15" (9 REQD). TOENAIL EACH FIRST LAYER PIECE TO PIECE MARKED Ⓐ W/2-16d NAILS AT EACH END. TOENAIL EACH SECOND LAYER PIECE TO A FIRST LAYER PIECE W/2-16d NAILS AT EACH END. TOENAIL THE THIRD LAYER PIECES TO THE SECOND LAYER PIECES IN A LIKE MANNER.

Ⓒ PLYWOOD, 3/4" X 16-3/4" X 15-1/8" (2 REQD). NAIL LOWER PIECE MARKED Ⓒ TO PIECES MARKED Ⓑ W/5-12d NAILS AT EACH JOINT. NAIL UPPER PIECE MARKED Ⓒ TO PIECES MARKED Ⓓ W/5-12d NAILS AT EACH JOINT.

Ⓓ 2" X 6" X 15" (9 REQD). NAIL EACH FIRST LAYER PIECE TO PIECE MARKED Ⓒ W/7-12d NAILS. NAIL EACH SECOND LAYER PIECE TO THE FIRST AND EACH THIRD LAYER PIECE TO THE SECOND W/7-12d NAILS.

Ⓔ 1" (ACTUAL) X 6" X 15" (2 REQD). SEE THE "KEY LETTER PIECES Ⓔ AND Ⓕ " DETAIL ON PAGE 9 FOR DIMENSIONS OF CUTOUT. NAIL TO UPPER PIECE MARKED Ⓒ W/7-12d NAILS.

Ⓕ 1" (ACTUAL) X 6" X 12-3/4" (1 REQD). SEE THE "KEY LETTER PIECES Ⓔ AND Ⓕ " DETAIL ON PAGE 9 FOR DIMENSIONS OF CUTOUT. NAIL TO UPPER PIECE MARKED Ⓒ W/7-12d NAILS.

Ⓖ RUBBER, 1/2" X 16-3/4" X 15-1/8" (1 REQD). SEE THE "KEY LETTER PIECE Ⓒ " DETAIL ON PAGE 9 FOR DIMENSIONS OF CUTOUT. SECURE TO PIECES MARKED Ⓔ AND Ⓕ W/20 3/4" STAPLES.

Ⓗ PLYWOOD, 3/4" X 16-3/4" X 17-1/2" (2 REQD). SEE THE "KEY LETTER PIECE Ⓗ " DETAIL ON PAGE 9 FOR DIMENSIONS OF CUTOUTS. NAIL TO PIECES MARKED Ⓑ , Ⓓ , AND Ⓔ W/2-12d NAILS AT EACH JOINT.

BILL OF MATERIAL

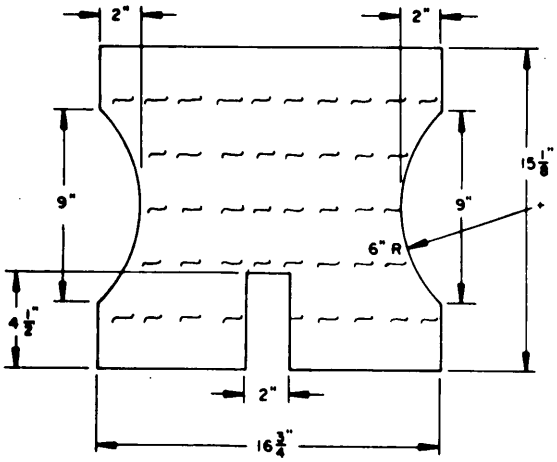
LUMBER	LINEAR FEET	BOARD FEET
1" (ACTUAL) X 6"	4	3
2" X 6"	12	12
4" X 6"	12	24
NAILS	**NO. REQD**	**POUNDS**
5d (1-3/4")	12	NIL
12d (3-1/4")	207	3-1/2
16d (3-1/2")	36	1
PLYWOOD, 3/4"	19 SQ FT	40 LBS
RUBBER, 1/2"	2 SQ FT	4 LBS
STAPLES, 3/4"	20 REQD	NIL

PAGE 8

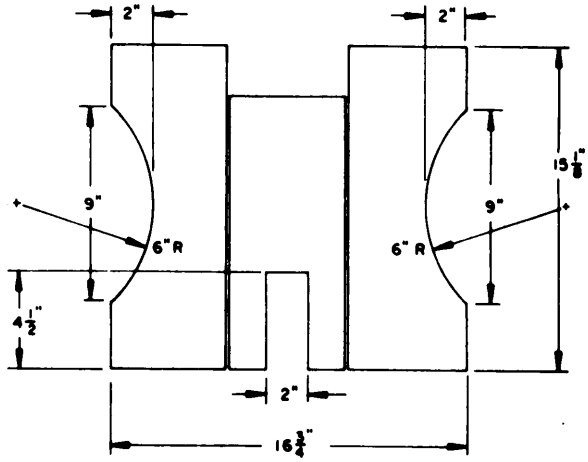
AXLE BLOCKING DETAILS

PROJECT WE 5-87

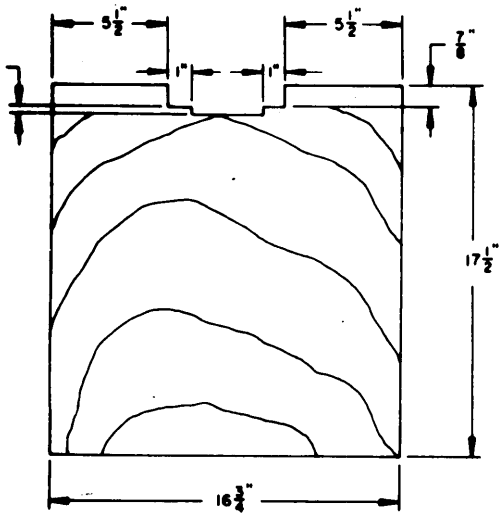
Figure 7-1–Continued (sheet 8 of 14).



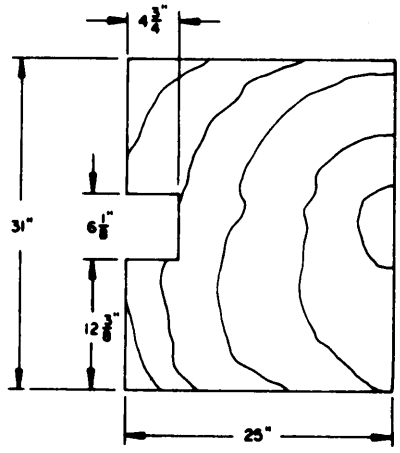
KEY LETTER PIECE ©



KEY LETTER PIECES Ⓔ AND Ⓕ



KEY LETTER PIECE Ⓗ



KEY LETTER PIECE Ⓐ

AXLE BLOCKING DETAILS

PAGE 9

PROJECT WE 5-97

Figure 7-1–Continued (sheet 9 of 14).

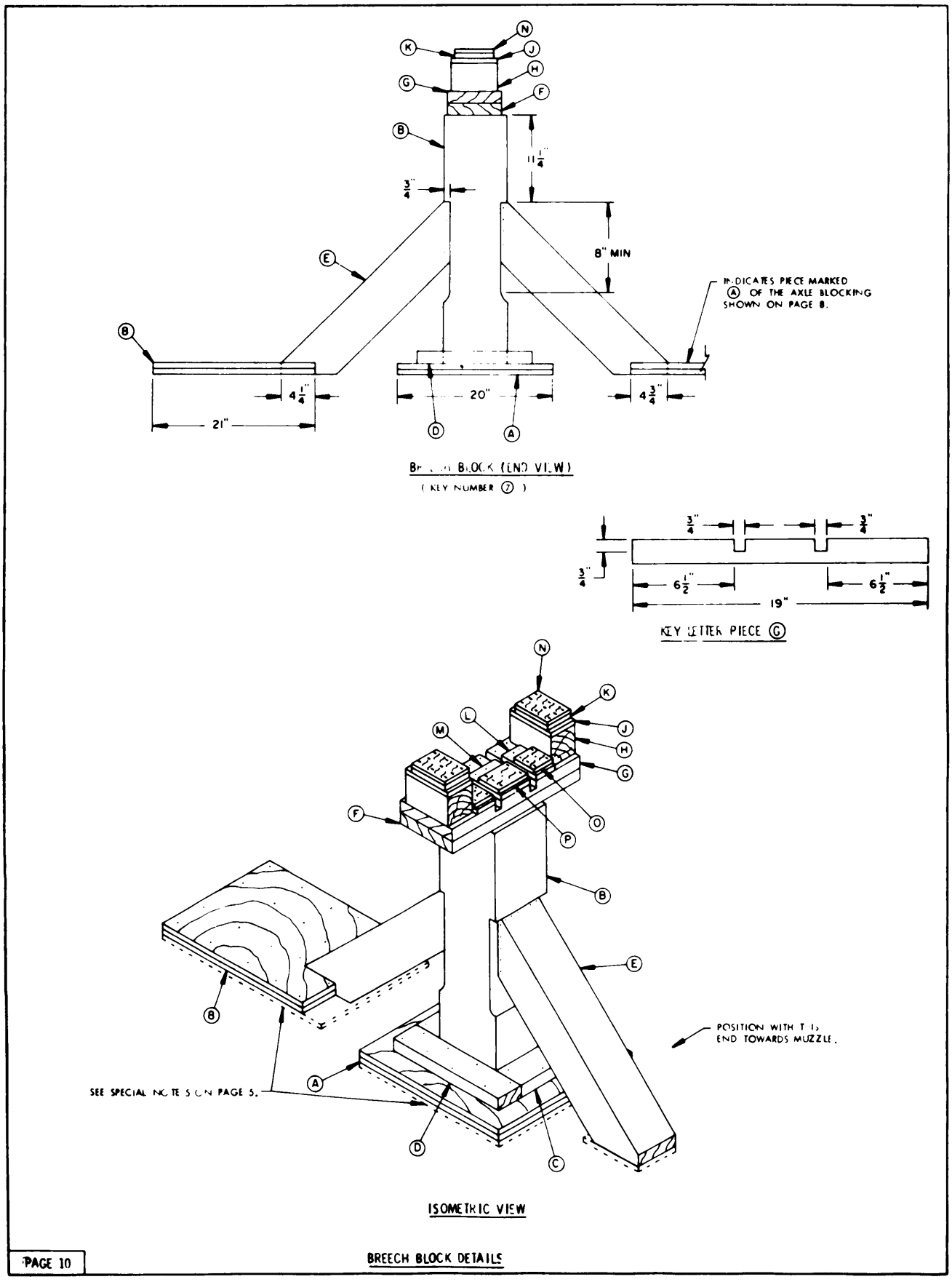
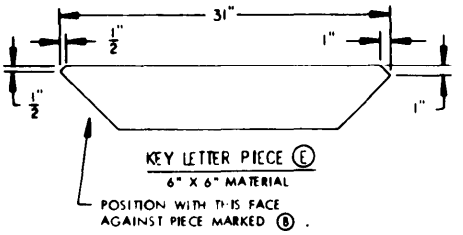
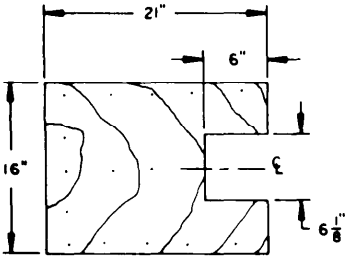


Figure 7-1–Continued (sheet 10 of 14).



KEY LETTER PIECE (E)
6" X 6" MATERIAL
POSITION WITH THIS FACE AGAINST PIECE MARKED (B).



KEY NUMBER PIECE (Q)
(3/4" PLYWOOD (DOUBLED)

KEY LETTERS

(A) PLYWOOD, 3/4" X 20" X 20" (DOUBLED) (1 REQD). LAMINATE W/12-5d NAILS AND CLINCH. NAIL TO PIECE MARKED (B) W/15-12d NAILS.

(B) 8" X 8" X 31-1/2" (1 REQD). SEE THE "END VIEW" DETAIL ON PAGE 10 FOR RABBET CUTS REQUIRED.

(C) 2" X 4" X 8" (2 REQD). NAIL TO PIECE MARKED (A) W/6-10d NAILS.

(D) 2" X 4" X 15" (2 REQD). NAIL TO PIECE MARKED (A) W/8-10d NAILS.

(E) 6" X 6" X 31" (2 REQD). SEE THE "KEY LETTER PIECE (E)" DETAIL AT LEFT FOR ANGLE CUTS REQUIRED. TOENAIL TO PIECE MARKED (B) W/3-12d NAILS ON EACH SIDE AND W/6-12d NAILS ACROSS THE TOP.

(F) 2" X 8" X 19" (1 REQD). NAIL TO PIECE MARKED (B) W/8-12d NAILS. NAIL TO PIECE MARKED (G) W/3-12d NAILS AT EACH END AFTER PIECES MARKED (G) AND (H) HAVE BEEN ASSEMBLED AND PIECE MARKED (G) HAS BEEN NAILED TO PIECE MARKED (F).

(G) 2" X 8" X 19" (1 REQD). NAIL TO PIECE MARKED (H) W/9-12d NAILS. NAIL TO PIECE MARKED (F) W/12-12d NAILS AFTER PIECES (H) HAVE BEEN APPLIED.

(H) 4" X 4" X 6" (2 REQD).

(J) PLYWOOD, 1/2" X 3-1/2" X 6" (2 REQD). NAIL TO PIECE MARKED (H) W/6-5d NAILS.

(K) PLYWOOD, 1/2" X 3-1/2" X 4-3/4" (2 REQD). POSITION SO AS TO BE CENTERED ON THE LENGTH OF PIECE MARKED (J) AND NAIL W/4-5d NAILS.

(L) PLYWOOD, 1/2" X 3" X 5" (2 REQD). NAIL TO PIECE MARKED (G) W/5-5d NAILS.

(M) PLYWOOD, 1/2" X 4-1/2" X 5" (1 REQD). NAIL TO PIECE MARKED (G) W/5-5d NAILS.

(N) RUBBER, 1/4" X 3-1/2" X 4-3/4" (2 REQD). SECURE TO PIECE MARKED (K) W/9 STAPLES.

(O) RUBBER, 1/4" X 3" X 3" (2 REQD). POSITION 1/4" FROM REAR EDGE OF PIECE MARKED (L) AS SHOWN AND SECURE W/5 STAPLES.

(P) RUBBER, 1/4" X 3" X 4-1/2" (1 REQD). POSITION 1/4" FROM REAR EDGE OF PIECE MARKED (M) AND SECURE W/5 STAPLES.

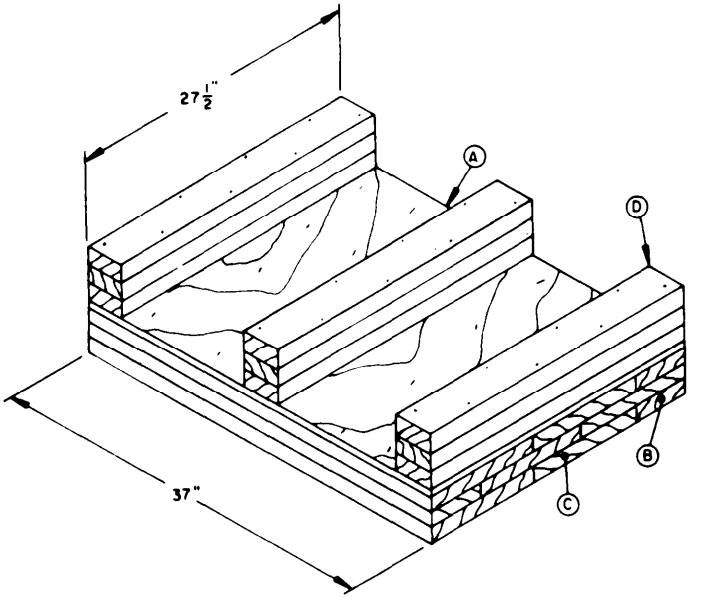
BILL OF MATERIAL		
LUMBER	LINEAR FEET	BOARD FEET
2" X 4"	4	3
2" X 8"	4	6
4" X 4"	1	2
6" X 6"	6	18
8" X 8"	3	16
NAILS	NO. REQD	POUNDS
5d (1-3/4"	12	NIL
10d (3"	28	1/2
12d (3-1/4"	66	1-1/4
PLYWOOD, 3/4" ---------- 6 SQ FT ---------- 13 LBS		
PLYWOOD, 1/2" ---------- 1 SQ FT ---------- 2 LBS		
RUBBER, 1/4" ---------- 1 SQ FT ---------- 1 LB		
STAPLES ---------- 33 REQD ---------- NIL		

BREECH BLOCK DETAIL

PAGE 11

PROJECT WE 5-87

Figure 7-1–Continued (sheet 11 of 14).



SPADE BLOCKING

(KEY NUMBER ⑤) FOR CLARITY PURPOSES THIS ASSEMBLY IS SHOWN UPSIDE DOWN.

KEY LETTERS

Ⓐ PLYWOOD, 3/8" X 27-1/2" X 37" (1 REQD).

Ⓑ 2" X 6" X 37" (3 REQD). NAIL ONE PIECE TO PIECE MARKED Ⓐ W/5-8d NAILS AND CLINCH. NAIL EACH ADDITIONAL PIECE TO A PIECE MARKED Ⓒ W/9-10d NAILS.

Ⓒ 2" X 12" X 37" (6 REQD). NAIL TWO PIECES MARKED Ⓐ W/5-8d NAILS AND CLINCH. ALTERNATE POSITION OF ADDITIONAL PIECES AS SHOWN AND NAIL EACH TO A PIECE MARKED Ⓒ AND/OR Ⓑ W/9-10d NAILS.

Ⓓ 2" X 4" X 27-1/2 (9 REQD). NAIL FIRST PIECE TO PIECE MARKED Ⓐ W/9-8d NAILS AND CLINCH. NAIL SECOND PIECE TO FIRST W/8-10d NAILS. LAMINATE THIRD PIECE IN A LIKE MANNER.

SPECIAL NOTE:

1. IF 2" X 12" AND 2" X 6" MATERIAL ARE NOT AVAILABLE, THREE (3) PIECES OF 2" X 10" MATERIAL MAY BE USED FOR EACH LAYER.

2. SHORING MATERIAL MAY NEED TO BE ADDED TO THE SPADE BLOCKING ASSEMBLY IN ORDER TO PROVIDE PROPER BEARING UNDER THE SPADE OF THE HOWITZER. FILL MATERIAL CONSISTING OF 2" X 4" X 27-1/2" AND/OR 1" X 4" X 27-1/2" MAY BE ADDED TO PIECE MARKED Ⓓ . NAIL 2" X 4" MATERIAL W/8-10d NAILS AND/OR 1" X 4" MATERIAL W/8-6d NAILS. IF DESIRED, 1" AND/OR 2" MATERIAL MAY BE ADDED TO PIECES MARKED Ⓑ AND Ⓒ . LAMINATE WITH 6d OR 10d NAILS, RESPECTIVELY.

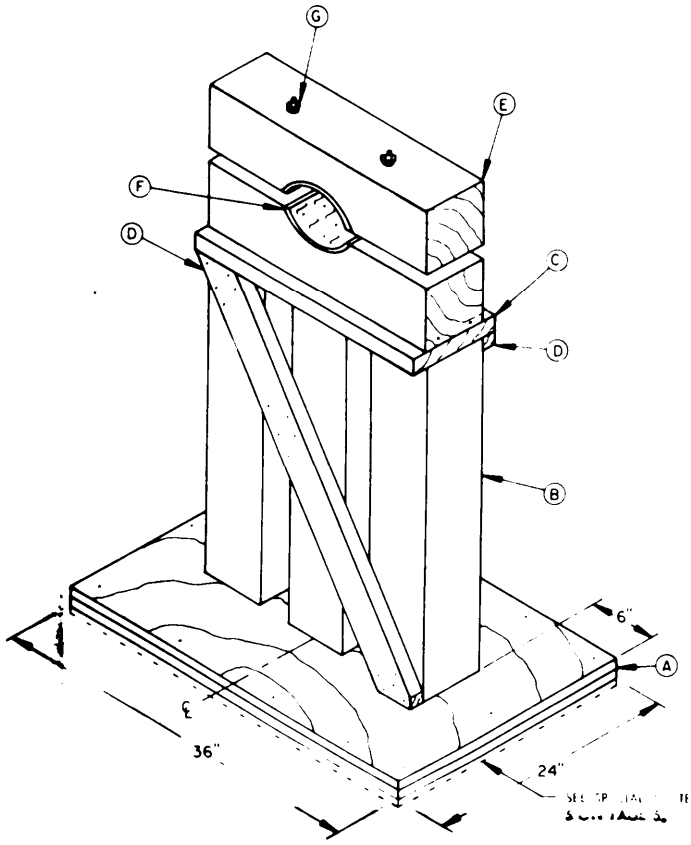
BILL OF MATERIAL		
LUMBER	LINEAR FEET	BOARD FEET
2" X 4" 2" X 6" 2" X 12"	21 10 19	14 10 38
NAILS	NO. REQD	POUNDS
8d (2-1/2") 10d (3")	.2 11	1/2 2
PLYWOOD, 3/8" ---------- 8 SQ FT ---------- 9 LBS		

PAGE 12

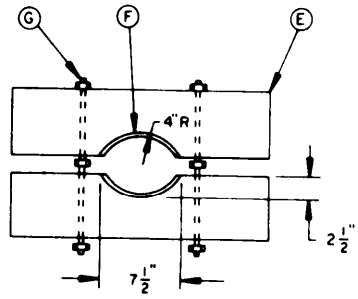
SPADE BLOCKING DETAIL

PROJECT WE 5-87

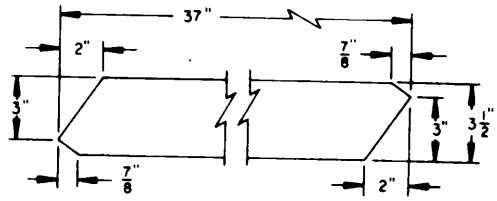
Figure 7-1–Continued (sheet 12 of 14).



TUBE BLOCKING
(KEY NUMBER ⑨)



SIDE VIEW
(KEY LETTER PIECE "E")



KEY LETTER PIECE Ⓓ

KEY LETTERS

Ⓐ PLYWOOD, 3/4" X 24" X 36" (DOUBLED) (1 REQD). LAMINATE W/15-5d NAILS AND CLINCH. NAIL TO PIECE MARKED Ⓑ W/9-12d NAILS AT EACH JOINT.

Ⓑ 6" X 6" X 3'-1/2" (3 REQD). POSITION AS SHOWN.

Ⓒ 2" X 10" X 24" (1 REQD). NAIL TO PIECE MARKED Ⓑ W/7-12d NAILS AT EACH JOINT.

Ⓓ 2" X 4" X 37" (2 REQD). SEE THE "KEY LETTER PIECE Ⓓ" DETAIL AT RIGHT FOR BEVEL CUTS REQUIRED. NAIL TO PIECE MARKED Ⓑ W/5-12d NAILS AT EACH JOINT.

Ⓔ 6" X 6" X 24" (2 REQD). SEE THE "SIDE VIEW" DETAIL ABOVE FOR DIMENSIONS OF THE RADIUS CUTS. TOENAIL THE BOTTOM PIECE TO PIECE MARKED Ⓒ W/2-12d NAILS AT EACH END.

Ⓕ RUBBER, 1/4" X 6" X 7-1/4" (2 REQD). SECURE TO RADIUS CUTS OF PIECE MARKED Ⓔ W/4-5d NAILS.

Ⓖ THREADED ROD, 1/2" DIAMETER BY 17" LONG WITH THREE (3) NUTS AND FOUR (4) WASHERS (2 SETS REQD).

BILL OF MATERIAL

LUMBER	LINEAR FEET	BOARD FEET
2" X 4"	7	5
2" X 10"	2	4
6" X 6"	12	36
NAILS	NO. REQD	POUNDS
5d (1-3/4")	23	NIL
12d (3-1/4")	64	1-1/4

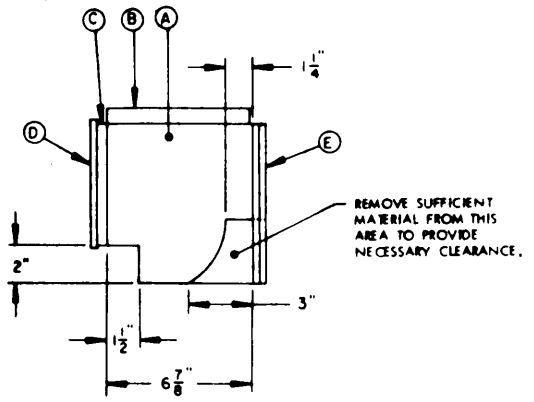
PLYWOOD, 3/4" ---------- 12 SQ FT ---------- 25 LBS
RUBBER, 1/4" ---------- 1 SQ FT ---------- 1 LB
RODS, W/NUTS AND WASHERS, 1/2" X 17-1/2" ---------- 2 REQD

TUBE BLOCKING DETAILS

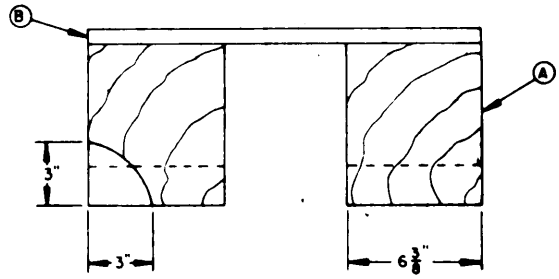
PAGE 13

PROJECT WE 5-87

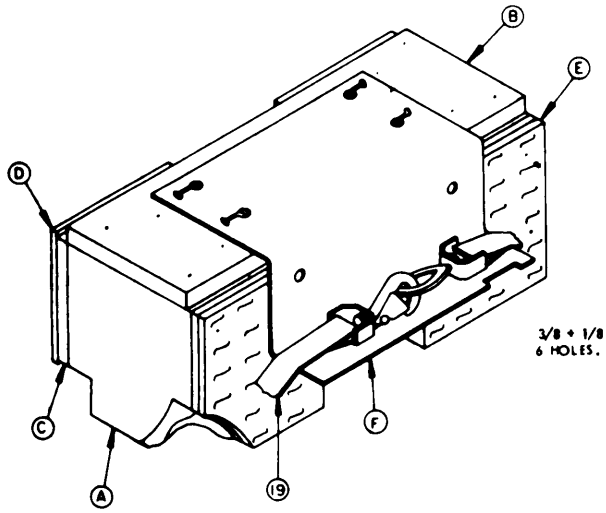
Figure 7-1–Continued (sheet 13 of 14).



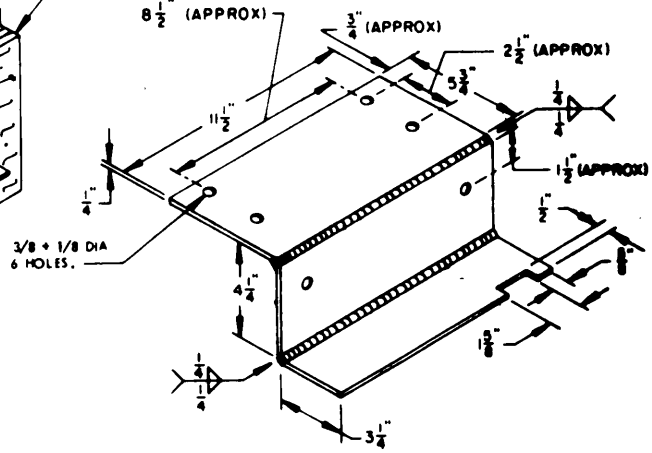
END VIEW
PIECE MARKED (F) OMITTED FOR CLARITY.



SIDE VIEW
PIECE MARKED (F) OMITTED FOR CLARITY.



BREECH/YOKE BLOCK
(KEY NUMBER (19))



STRAPPING BRACKET

SPECIAL NOTE:

THE DEPICTED ASSEMBLY IS TO BE INSTALLED BETWEEN THE BREECH RING AND THE CRADLE YOKE PRIOR TO SHIPMENT OF THE HOWITZER. THE USE OF THE JACK BACK APPARATUS (JBA) IS REQUIRED FOR THIS OPERATION.

KEY LETTERS

- (A) 6-3/8" X 7-1/2" X 7" BLOCK (2 REQD).
- (B) PLYWOOD, 3/4" X 6-1/2" X 18-3/8" (1 REQD). NAIL TO PIECE MARKED (A) W/3-12 NAILS AT EACH JOINT.
- (C) PLYWOOD, 1/2" X 5-3/4" X 6-3/8" PLYWOOD (2 REQD). NAIL TO PIECE MARKED (A) W/3-8d NAILS.
- (D) RUBBER, 1/4" X 6" X 6" (2 REQD). SECURE TO PIECE MARKED (C) W/8 STAPLES.
- (E) RUBBER, 1/2" X 6-3/8" X 7-1/2" (DOUBLED) (2 REQD). NAIL THRU BOTH PIECES TO PIECE MARKED (A) W/4-8d NAILS.
- (F) STRAPPING BRACKET (1 REQD). SEE THE DETAIL ABOVE. NAIL TO PIECE (B) W/4 PARTIALLY-DRIVEN 12d NAILS AND BEND OVER.

BILL OF MATERIAL

LUMBER	LINEAR FEET	BOARD FEET
8" X 8"	2	11
NAILS	NO. REQD	POUNDS
8d (2-1/2")	18	1/4
12d (3-1/4")	14	1/8

PLYWOOD, 3/4"	1 SQ FT	3 LBS
PLYWOOD, 1/2"	1 SQ FT	2 LBS
RUBBER, 1/4"	1 SQ FT	1 LB
RUBBER, 1/2"	2 SQ FT	4 LBS
STAPLE, 3/4"	8 REQD	NIL
STEEL PLATE, 1/4"	2 SQ FT	21 LBS

PAGE 14

BREECH/YOKE BLOCKING DETAIL

PROJECT ME 5-87

Figure 7-1–Continued (sheet 14 of 14).

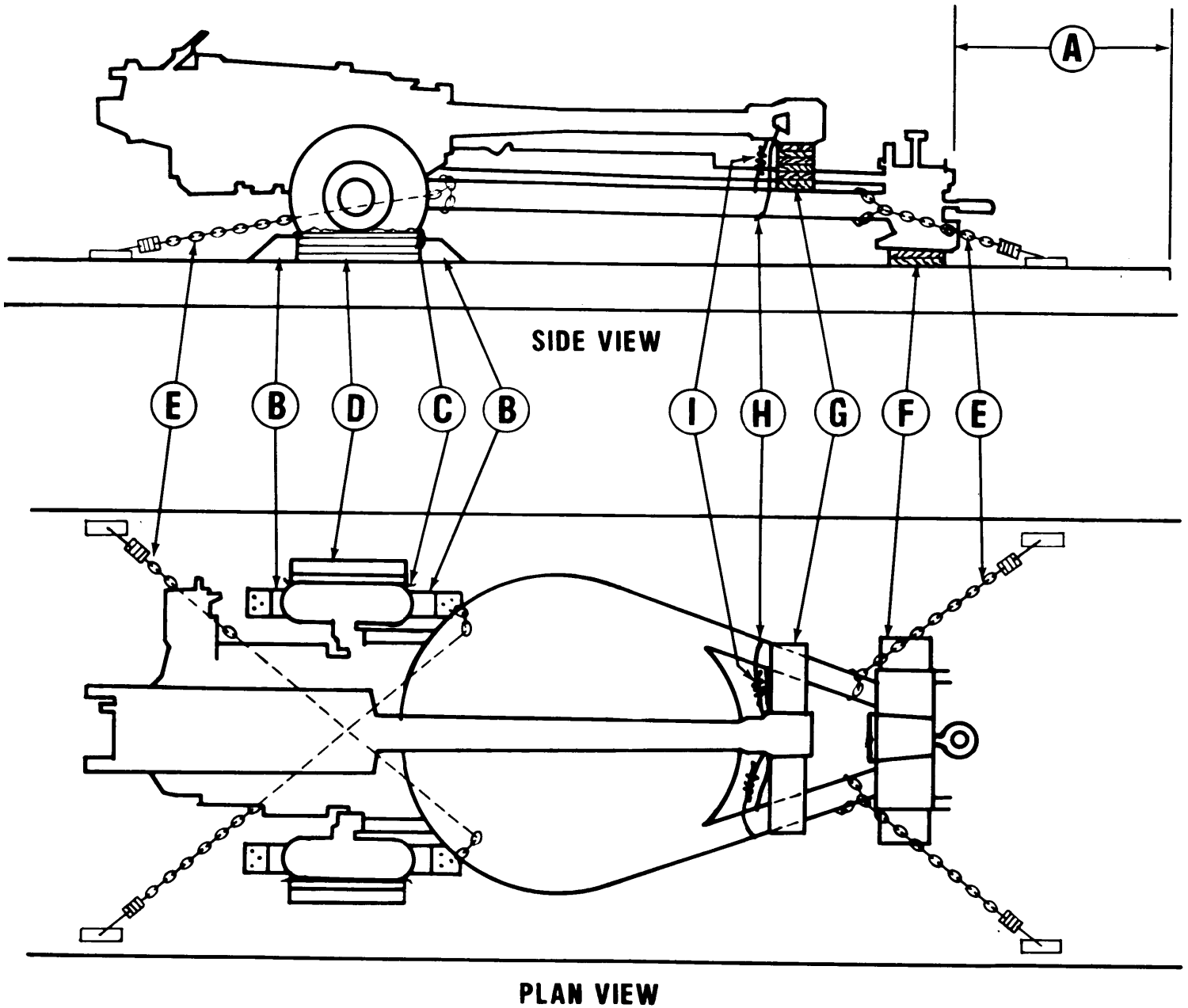
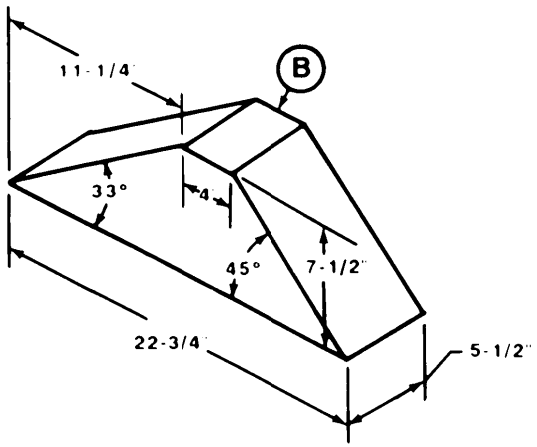
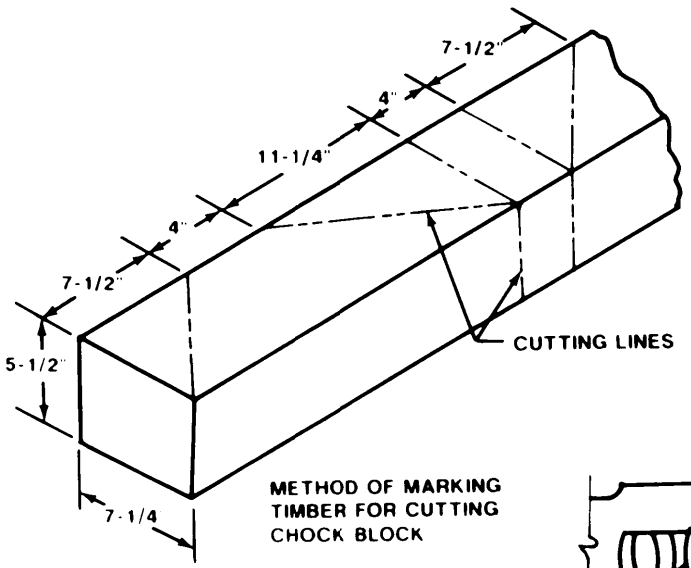


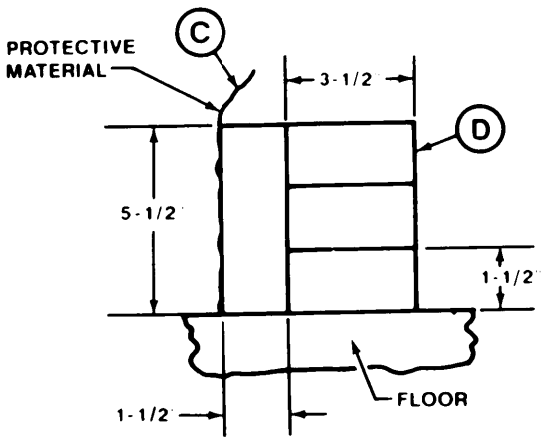
Figure 7–2. Loading and tiedown of M119 on CONUS wood-deck chain-tiedown flatcar.



DETAIL 1

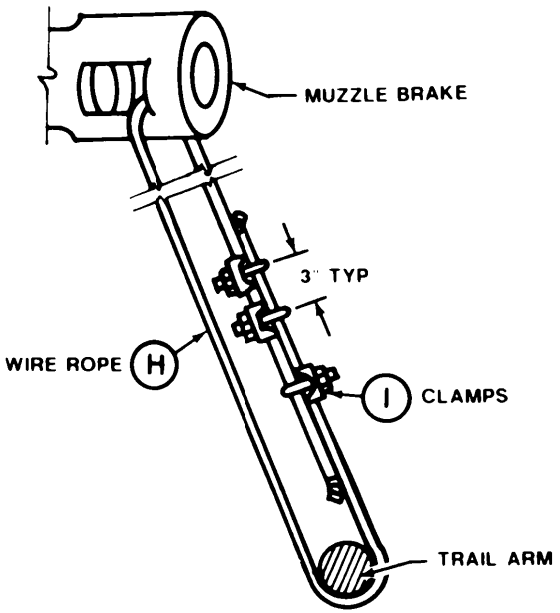


METHOD OF MARKING TIMBER FOR CUTTING CHOCK BLOCK



DETAIL 2

NOT TO SCALE



DETAIL 3

Figure 7–3. Blocking and tiedown details.

Table 7-1. Bill of Materials for Blocking and Tiedown of M119 on Wood-Deck Chain-Tiedown Flatcar (Figs 7-2 and 7-3)

Item	Description	Approximate Quantity
Lumber	Douglas-fir, or comparable; straight-grain, free from material defects; Fed Spec MM-L-751: 2- x 4-inch	12 linear feet
	2- x 6-inch	4 linear feet
	2- x 12-inch	6 linear feet
	6- x 8-inch	7 linear feet
Nails	Common, steel, flathead; bright or cement-coated Fed Spec FF-N-105: 10d	36
	12d	12
	16d	8
	20d	36
	30d	12
	40d	8
Clamps	Wire rope, U-bolt clips, saddled, single-grip, steel, Crosby heavy-duty, or equal; Fed Spec FF–C–450: 1/2–inch	6
Wire rope	6 x 19, IWRC; improved plow steel; preformed, regular-lay; Fed Spec RR-W-410: 1/2 inch	8 feet
Cushioning material	Waterproof paper, burlap, or other suitable material	as required

Table 7-2. Application of Materials for Blocking and Tiedown of M119 on Wood-Deck Chain-Tiedown Flatcar (Figs 7-2 and 7-3)

Item	No. Required	Application
A		Brake-wheel clearance. Minimum clearance required is 6 inches above, in back of, and on both sides of and 4 inch underneath wheel; 12 inches from end of railcar to load, which extends from center of brake wheel to side of railcar; and 6 feet above railcar floor.
B	4	Blocks. Each consists of one piece of 6– x 8– 24-inch lumber (detail 1, fig 7-3). Place one piece against the front and rear of each wheel. Nail the heel of each block with three 30d nails. Toenail the sides of the block to the railcar floor with two 40d nails.
C	1 per each item D	Cushioning material. Place bottom portion under item D and between the tire and item D so material extends 2 inches above item D.
D	2	Side blocks. Each consists of one piece of 2– x 6– x 24-inch lumber and three pieces of 2– x 4– x 24-inch lumber (detail 2, fig 7-3). Nail the 2– x 6– x 24-inch piece to the side edge of one 2– x 4– x 24-inch piece with six 12d nails. Place the 2– x 6- x 24-inch piece against the cushioning material and tire, and nail through the 2– x 4– x 24-inch piece to the railcar floor with six 20d nails. Nail the other two 2– x 4– x 24-inch pieces to the one below in the same manner with six 20d nails on each board, using a staggered nailing pattern to avodi striking the nail in the piece below.
E		Tiedown chains (furnished with railcar), 1/2-inch-diameter alloy steel chain, extra strength, proof-tested to a minimum of 27,500 pounds. Attach one around the main frame trails forward of the wheel and one around the main frame trails aft of the lunette, as shown in figure 7-2. Tighten all chains evenly until equal space remains between the metal rings of the compression unit of the chain tiedown assembly. The angle of the tiedown chain must be as close to 45° as possible.
F		Shoring. This consists of doubled 2– x 12– x 36-inch lumber. Place evenly beneath the lunette frame (spade) before applying tiedowns (item E). Nail each piece in place with four 16d nails.
G	1	Blocking. This consists of six pieces of 2– x 6– x 36–inch lumber. Nail one piece, cut-to-tit, wedge-shaped, to the bottom of the first piece with six 10d nails. Place on the trails beneath the gun tube muzzle brake and lodge the wedge-shaped piece between the trails to prevent the blocking from shifting. Nail the top five pieces, each to the one below with six 10d nails.

Table 7-2. Continued

Item	No. Required	Application
H	2	Gun tube tiedown, 1/2-inch wire rope, Place one complete loop through the muzzle brake and around the right trail arm, just aft of the gun tube blocking (item G), and overlap ends about 18 inches. Place the second loop around the left trail arm and through the muzzle brake in the same manner.
I	6	Clamps, 1/2-inch. Place three clamps on each item H overlap area, spaced about 3 inches apart. Tension each item H to hold tube and blocking (item G) firmly in place. Tighten each clamp to 30-foot-pound torque.

General Instructions

Loading rules 1A, 2, 3, 4, 5, 9, 11, 12, 14, 15, 19, and 19B in section 1 of the *Rules Governing the Loading of Commodities on Open-Top Cars,* Association of American Railroads, provides applicable guidelines that are mandatory.

APPENDIX
REFERENCES

1. Army Regulations (AR)

55-228 Transportation by Water of Explosives and Hazardous Cargo

2. Field Manuals (FM)

55-450-1 Army Helicopter External Load Operations

3. Technical Manuals (TM)

38-250 (AFR 71-4 Packaging and Materials Handling: Preparation of Dangerous Materials for Transportation by Military Air Shipment

4. Technical Orders (TO) (Air Force)

IC-130A-9 Loading Instructions, USAF Series C-130 Aircraft
1C-141B-9 Loading Instructions, USAF Series C-141 Aircraft
1C-5A-9 Loading Instructions, USAF Series C-5 Aircraft

5. 4th TRANSCOM Pamphlet

55-2 Tiedown Guide for Rail Movements

6. Other Publications and Source of Procurement

a. Code of Federal Regulations, Title 49—Transportation Parts 170–179 and Title 46—Shipping, Part 146
Both available from: Superintendent of Documents
US Government Printing Offie
Washington, DC 20402

b. Association of American Railroads, *Rules Governing the Loading of Commodities on Open-Top Cars*
Section No. 1–General Rules
Section No. 6–Rules Governing the Loading of Department of Defense Material
Available from: Secretary, Mechanical Division
Association of American Railroads
ATTN: J. H. Bean
59 E. Van Buren Street
Chicago, IL 60605

c. Association of American Railroads "Outline Diagram for Single Loads Without End Overhang on Open-Top-Cars," The Official Railway Equipment Register

d. ORD DWG 19–48–C–ORD JU-588, "Wire Rope and Annealed Wire Application Methods for Securing Lading on Rail and Motor Carrier Equipment

7. Department of Transportation, Special Permit No. 3498

Military Traffic Management Command
ATTN: MTMC-SS
Washington, DC 20315
USCG 108 Rules and Regulations for Military Explosives and Hazardous Munitions

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