

TRANSPORTATION AND TRAVEL

TIEDOWN HANDBOOK

FOR

RAIL MOVEMENTS

FIFTH EDITION

May 2000

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Preface

This is the fifth edition of the pamphlet. It contains some changes and improvements over the earlier editions. However, do not destroy the earlier editions because they are still usable. This pamphlet will aid the soldier in ensuring safe rail transport of equipment. It contains general information, procedures, and figures for the correct tiedown of military equipment on railcars. Supplemental information will be published on the Internet as an unprinted Appendix D starting with the Common Bridge Transporter.

This pamphlet covers minimum standards; your local railroad may require additional securement based on the condition of the railcar or other factors that cannot be standardized. The pamphlet is not designed to cover every vehicle in the US Army inventory. The vehicles covered herein are those most commonly transported by rail. When in doubt, check the Association of American Railroads (AAR) Loading Rules or check with the mechanical department of the railroad transporting your equipment.

In this fifth edition, we have kept most of the information from the earlier editions. To ease the transition to this edition, we have kept most page numbers the same as in earlier editions. On each tiedown figure, we have updated the pertinent figure and section numbers from the AAR loading rules for cross referencing. The most significant changes are in Appendix C (chain tiedown). We have tried to clarify some of the issues regarding shackles and links (rings).

The earlier editions lack the above changes, but they will satisfy your other needs. You may want to compare the fifth edition with the earlier editions to annotate changes in your earlier pamphlets. Because of printing costs, we are printing only a limited supply of the fifth edition. Please feel free to make copies of the pamphlet at your own discretion.

We invite users of this pamphlet to recommend changes and submit comments. Please prepare comments on DA Form 2028 (Recommended Changes to Publications and Blank Forms) or in a similar format and forward to the address given on the back of the title page (p. ii).

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TIEDOWN HANDBOOK FOR RAIL MOVEMENTS

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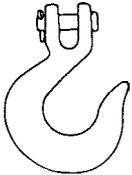
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What is *That* Called?



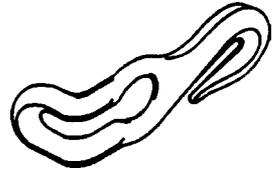
Slip hook



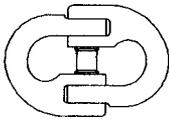
Grab hook



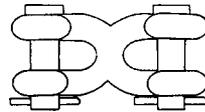
Claw hook



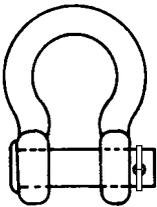
Adjustable double grab hook



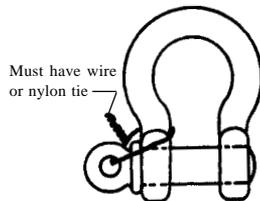
Coupling link



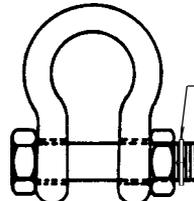
Double clevis chain link



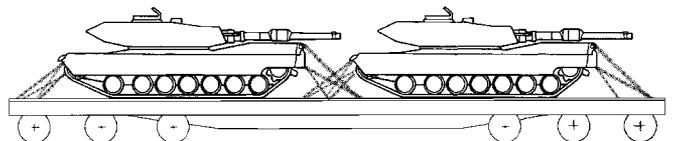
Round pin anchor shackle
(not recommended for rail tiedown)



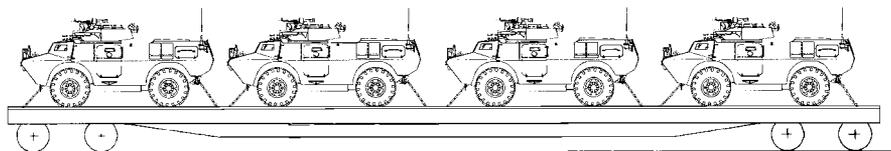
Screw pin anchor shackle



Safety anchor shackle



Tiedown Handbook For Rail Movements



Section I. Requirements for All Equipment

A. This pamphlet provides users with the proper methods for securing wheeled and tracked vehicles on both standard wire rope and specialized chain-equipped flatcars. It contains basic information from the Association of American Railroads (AAR)¹ and from experience gained through the monitoring of many military rail loadouts during exercises.

B. Remember, all equipment loaded onto railcars must be firmly and properly secured to counteract longitudinal, lateral, and vertical forces. AAR General Rules require both the rail carrier (1.2.2) and the shipper (1.2.3) to comply with all applicable loading rules and observe the drawings and specifications of applicable figures. The AAR rules are mandatory for Government shippers. Flatcars loaded with your equipment will not move until the railroad inspects and accepts them as safe loads. The railroad inspector has the final word if a specific figure is not involved. This pamphlet was published in accordance with the AAR loading rules; however, follow the AAR loading rules if any conflict arises with this pamphlet.² If, in such a conflict, you feel you have followed all the rules and want a second opinion or some help resolving the issue, call the DOD-AAR Representative, Mr. Robert Kerr at (757) 599-1645 or DSN 927-4646.

C. The following general procedures apply to all types of railcars.

1. Gearshift Levers

Place gearshift levers of automatic or conventional transmissions in neutral and secure with wire. Set all parking brakes and then wire tie or block the hand levers. Setting the brakes is a precaution against the vehicle rolling inadvertently and not part of the securement.

¹AAR *Open Top Loading Rules Manual*, Section No. 1, General Rules for Loading All Commodities; Section No. 3, Rules for Loading Construction and Farm Machinery; Section No. 6, Rules for Loading Military Equipment and Materiel; and Section No. 7, Rules for Loading All Commodities on Open Top Trailers and Containers for Rail Transport. (Washington, DC: Association of American Railroads, Revised Annually.)

²See footnote 1.

2. Brake Wheel

Allow a 12-inch minimum clearance from the end of the car, 6 inches around and above the brake wheel, and 4 inches below the brake wheel. Note that side-mounted brake lever clearance need not be taken into account. (rule 2.1)

3. Vehicle Spacing

The AAR rules state: “1.2.22 Separate piles or units loaded on one car may be secured to different specific figures or General Rules and located not closer than 2 ft to the adjacent pile or unit. Vehicles with spring suspensions secured to different figures or General Rules may be loaded closer than 2 ft but not less than 10 in. apart. 1.2.23 Cargo such as trailers and fork trucks may be loaded with the tongue or forks beneath the next vehicle, provided that points where the vehicles may touch are separated by a minimum horizontal distance of 10 in. and the tongue or forks are secured against vertical displacement.”

4. Securing Movable Structure

Equipment with rotating parts, such as tank turrets, and movable parts, such as crane outriggers and booms, must have those parts positively secured, usually with wire rope. (rules 6.1 to 6.3) This prevents the parts from moving out or up during shipment. Serious accidents can result from parts striking bridges, structures, or passing trains.

5. Forty-Five Degree Tiedown Angle

Place the vehicles on the flatcar so the tiedown wire rope or chain makes approximately a 45° angle with the flatcar's deck when viewed from the side. Measuring by eye is usually good enough. If you want to layout the correct angle with a tape measure, make the longitudinal distance from the point the tiedown attaches to the deck to the tiedown provision on the vehicle equal to the vertical distance from the deck to the provision. Do not cross the tiedowns.

6. Inverted Tiedowns

Inverted tiedowns are tiedown chains or wire ropes that are secured under the vehicle rather than out, away from the vehicle. Inverted tiedowns are only appropriate in cases in which the tiedown does not contact any part of the vehicle except the tiedown provision.

Do not use inverted tiedowns if the tiedown bears on the bottom of the bumper or frame of the vehicle. For example, some trailers do have tiedown provisions that are mounted below the frame such that inverted tiedowns can be used. Another consideration is the vehicle ground clearance. To use inverted tiedowns, there must be enough space under the vehicle for a soldier to adequately secure the tiedowns.

7. Tiedown Provisions

The procedures in this pamphlet generally cover equipment that was manufactured to meet MIL-STD-209, *Interface Standard for Lifting and tiedown Provisions*. MIL-STD-209 provides for adequate strength tiedown provisions for all modes of transport including rail. Some equipment requires specialized procedures, which will be described on a MIL-STD-209 data plate attached to the equipment.

Notes

Section II. Wheeled Vehicles

All wheeled vehicles must have their tires fully inflated to highway pressure. The tires must be capable of holding that pressure for at least the length of the trip. Tires are a part of the securement of the vehicle in that, if a tire goes flat, it will leave the tiedowns loose. Also, flat tires have started fires on moving trains by rubbing on the flatcar deck.

A. WHEELED VEHICLES ON GENERAL-PURPOSE FLATCARS

Most of the Army wheeled vehicles fall into either the two- or three-axle category. To secure such items on general-purpose flatcars, the following securement devices must be used.

1. Chock Blocks (App A)

Two per wheel; place in front and in back of both single- and dual-wheel assemblies.

2. Side Bracing/Blocking

Apply side bracing/blocking to the outside of each wheel, but be sure to apply protective material between the side bracing and tire to prevent chafing while in transit, as figure 1 shows.

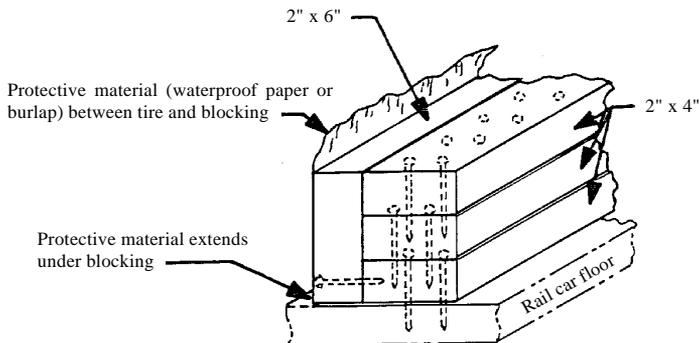


Figure 1. Barrier material on side blocks.

3. Wire Rope

Apply wire rope through the tiedown provisions on the vehicle and through the side stake pockets on the flatcar in a complete loop, as shown in figure 2. Application and diameter of wire rope will depend on the weight of the vehicle. Be sure that the vehicle

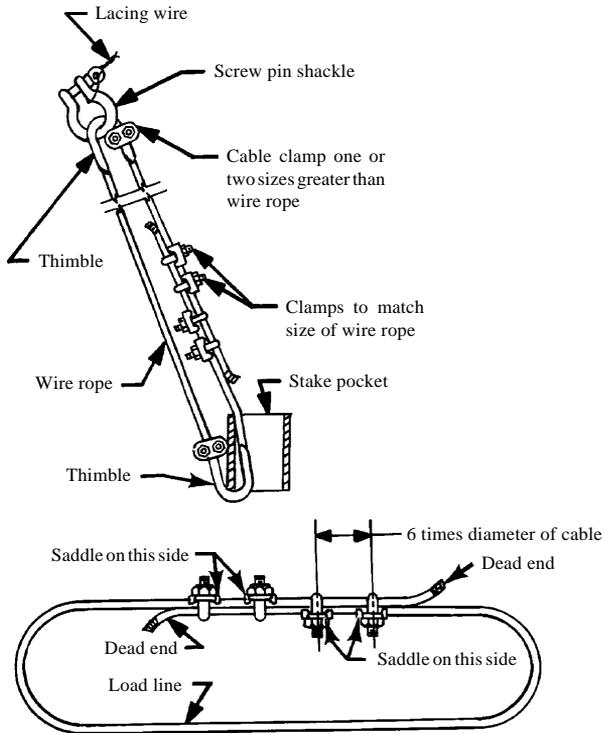


Figure 2. Complete loop wire rope assembly.

weight includes any cargo on the vehicle. Apply a thimble under the side stake pocket to prevent chafing of wire rope, as shown in figure 3. Secure the thimble to the wire rope with a cable clamp one or two sizes larger than the wire rope being used. Use 6 x 19-class independent wire rope core (IWRC), improved plow steel (IPS) wire rope. Protect wire rope, where it goes around sharp corners or crosses another wire rope, with suitable cushioning material or protective material. Rubber hose or soft sheet metal will serve the purpose.

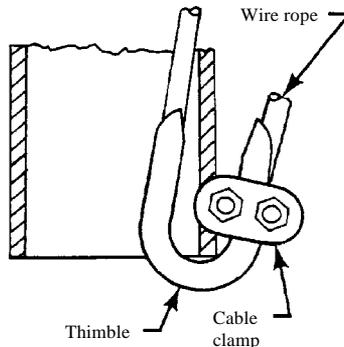


Figure 3. Detail of thimble attachment.

Secure the wire rope using clamps. Apply the clamps, also called clips, (first distance apart) with the saddle against the tension-bearing side of the wire rope and the U-bolt against the dead end. The clamp must be the same size as the wire rope being used (fig 2). Tension the wire rope by using a chain hoist with two cable grippers, as shown in figures 4 and 5. A properly tensioned tiedown will deflect no more than about an inch with the weight of a person standing on it. Be sure that at least 24 inches of wire rope overlap to allow proper application of cable clamps. Alternately tighten the nuts and torque cable clamps to the following guideline values:

- 45 foot-pounds for 3/8-inch wire rope
- 65 foot-pounds for 1/2-inch wire rope
- 130 foot-pounds for 5/8-inch wire rope

If the clamps break before reaching the above torques, use six instead of four clamps for a complete loop and torque to a value just below the breaking point.

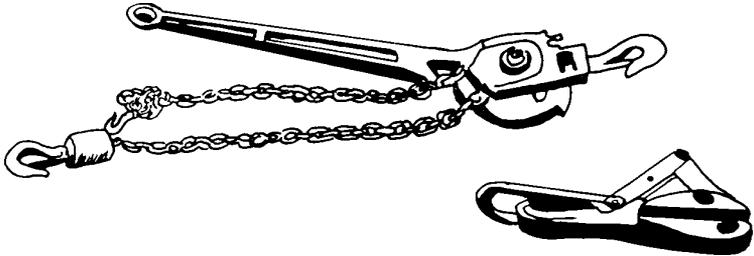


Figure 4. Chain hoist and cable gripper.

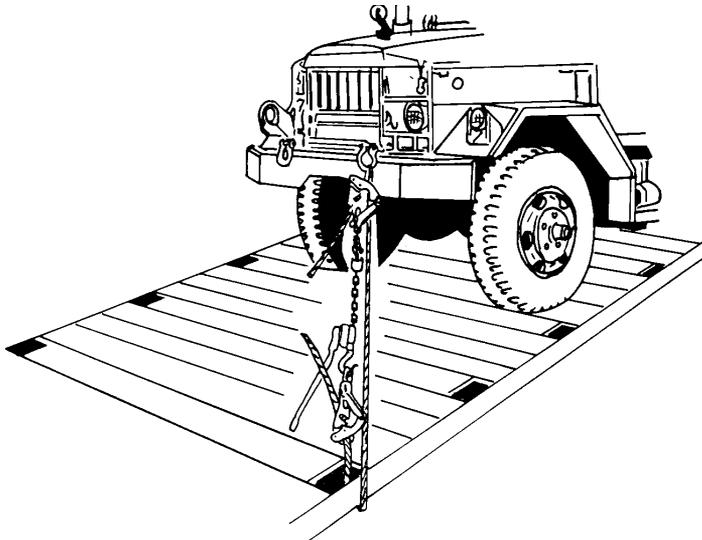


Figure 5. Chain hoist and cable gripper in use.

4. Securement Steps

When attaching blocking and bracing on general-purpose flatcars, use the following order to get the best results.

- a. Nail front chock blocks to deck in front of each wheel.
- b. Attach and tension wire rope to front of vehicle.
- c. Nail rear chock blocks to deck in back of each wheel.
- d. Attach and tension wire rope to rear of vehicle.
- e. Apply side bracing to tires.

B. WHEELED VEHICLES ON CHAIN-EQUIPPED FLATCARS

Most CONUS chain-equipped flatcars have either 3/8- or 1/2-inch steel alloy chains. Apply chain hooks over the vehicle tiedown shackles, rather than under. Wire (or secure by other suitable means such as nylon tie straps) the grabhook to the chain link, as shown in figure 6, to prevent disengagement. Side bracing may be required on center rail chain-equipped cars. If turnbuckles (used to tighten chains) are not equipped with jamnuts (fig 7) or a locking device, they must be wired to prevent them from loosening.

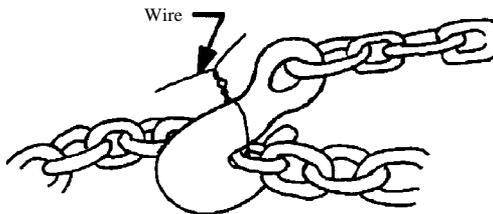


Figure 6. Proper securement of grabhook and chain link.

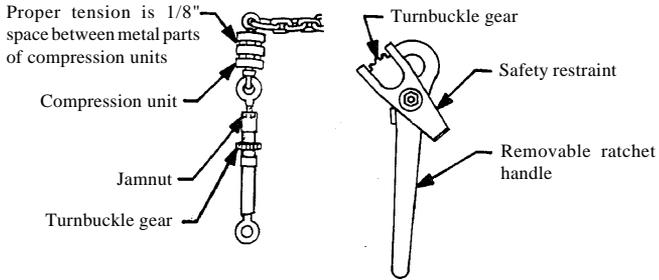


Figure 7. Turnbuckle.

Apply tiedown chains symmetrically around the vehicle with an angle from deck to chain of about 45°. Do not cross the chains. Completely seat the chain anchors in the channels, as shown in figure 8. When attaching chains to the vehicle, secure the shortest chains first and the longest chains last. A properly tensioned tiedown will deflect no more than about an inch with the weight of a person standing on it.

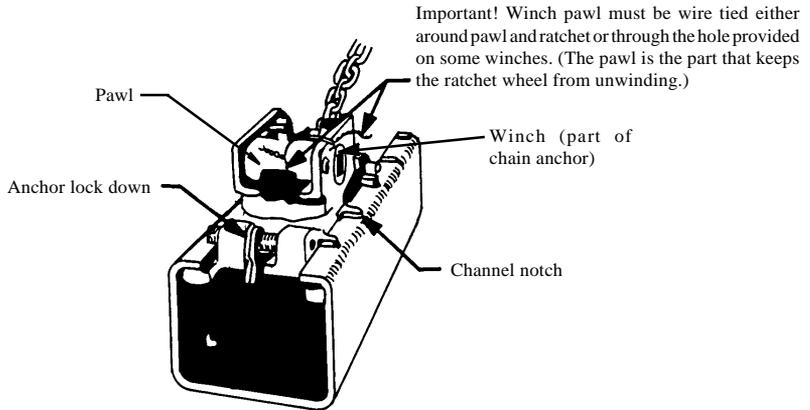


Figure 8. Chain anchor channel.

The general guidelines for securing wheeled vehicles on chain-equipped cars by diameter of chains are as follows:³

| | |
|-------------------------|--|
| Four, 3/8-inch chains | Working load limit (WLL) 6,600 pounds for vehicles 8,500 pounds or less. |
| Four, 3/8-inch chains | Extra-strength, Working load limit (WLL) at least 9,000 pounds (WLL pounds) for vehicles 8,500 to 16,000 pounds. |
| Eight, 3/8-inch chains | Extra-strength, Working load limit (WLL) at least 9,000 pounds for vehicles 16,000 to 25,000 pounds. |
| Four, 1/2-inch chains | Working load limit (WLL) at least 11,250 pounds for vehicles 16,000 to 25,000 pounds. |
| Four, 1/2-inch chains | Extra-strength, Working load limit (WLL) at least 13,750 pounds for vehicles 25,000 to 40,000 pounds. |
| Eight, 1/2-inch chains | Extra-strength, Working load limit (WLL) at least 13,750 pounds for vehicles 40,000 to 55,000 pounds. |
| Twelve, 1/2-inch chains | Extra-strength, Working load limit (WLL) at least 13,750 pounds for vehicles 55,000 to 80,000 pounds. |

For vehicles not covered above, use the following formula to determine the number of chains required:⁴ The minimum breaking strength of a chain is 4 times the working load limit (WLL), and the proof load is 2 times the WLL.

$$\text{Number of chains required} = \frac{\text{vehicle weight}}{\text{chain working strength}} \times 2$$

The tables provided with the figures in appendix C are based on this formula or on

³See footnote 1, page 1, Figure 88-B, Section No. 6.

⁴See footnote 1, page 1, Rule 5.3, Section No. 1.

specific figures. However, when using this formula in the field, the user must realize that it yields the least number of chains required. If the resulting number of chains required does not provide for a symmetrical configuration, add chains such that each tiedown has the same number. For example, if the formula yields 9 chains required, use 12 chains to establish symmetry about the 4 tiedown provisions.

The new DODX 41000- and DODX 42000-series flatcars and repaired chains on some of the DODX 40000-series flatcars are equipped with turnbuckle locking sleeves as shown in figure 9. The lock nut (if present) need not be used if the locking sleeve is properly applied.

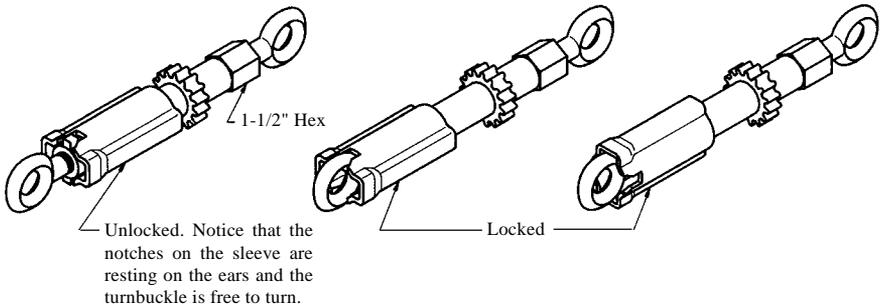


Figure 9. Turnbuckle locking sleeves.

C. TRAILERS AND SEMITRAILERS ON GENERAL-PURPOSE FLATCARS

Treat trailers similar to wheeled vehicles except for the trailer tongues. Place the tongues on a piece of dunnage, and tie them down to each side of the flatcar.

Apply chock blocks in front and in back of each tire. If the trailer is loaded or used as a machinery platform such that the equipment is in danger of tipping over, then build a front support and secure it to the flatcar deck on which the tongue of the trailer shall rest (pattern 90 or 91 in app A). When possible, load trailers attached to prime movers. This

eliminates the need for either the dunnage or the front support. An example of such a configuration appears in appendix B (p. B-11).

Semitrailers shipped detached from their prime movers require additional support such as the front support in pattern 90 or 91 (app A). This structure is built to support the front end since the landing legs of the semitrailer cannot bear the shock of rail movement. Consequently, the landing legs must be raised at least 4 inches above the deck of the flatcar. Once the semitrailer is resting on the front support, block it and tie it down as shown in appendix B (p. B-7).

Like trailers, load semitrailers attached to prime movers when possible. The tiedown procedure is the same except omit the front support (see pp. B-9 and B-10 for more detail).

D. TRAILERS AND SEMITRAILERS ON CHAIN-EQUIPPED FLATCARS

Tie trailers down the same way they are tied down on general-purpose railcars. The exception to this procedure is that chocks and side bracing are generally not required. It is best to transport trailers attached to their prime mover as shown in appendix C (pp. C-5 and C-6).

Semitrailers are shipped most efficiently on specialized flatcars with retractable hitches or stanchions, but they may be shipped attached to their prime mover. Both configurations are covered in appendix C (pp. C-6 and C-7).

E. VEHICLES ON BI-LEVEL FLATCARS

Bi-level flatcars may be used for smaller vehicles. The tiedown procedure is the same as for single-deck chain-tiedown flatcars. The types of chain assemblies on bi-level flatcars vary widely. Your local railroad can provide details about the chain assemblies on and the dimensions of bi-level flatcars. Before using bi-level flatcars, check their dimensions to be sure sufficient clearance exists for the driver to get into or out of the vehicle after the vehicle is loaded on the railcar. Also, make certain your destination has ramps to unload the cars you use. When you order bi-level flatcars make certain that the railroad knows they will be used for military vehicles. Many bi-level cars are equipped with restraint devices such as frame tiedown T-hooks that are not suitable for most military vehicles.

F. GRATE/LOCK CHOCKING SYSTEM (GLCS) ON BI-LEVEL CARS

The GLCS has been tested and approved by the AAR for HMMWVs without trailers. Use four chocks per HMMWV, carefully following the instructions posted inside the bi-level car. In addition to those instructions, the HMMWV brakes must be set hard, the engine must be in neutral, and the transfer case must be in four wheel drive, low range. Make certain that the total load on each deck of the bi-level car does not exceed 40,000 pounds.

Section III. Tracked Vehicles

A. SHACKLES

Most existing tracked vehicles do not have tiedown shackles as basic issue items (BII). The towing hooks are not suitable for rail securement. Pack the towing hooks and use the towing lugs for tiedown by equipping them with shackles. Select the largest and strongest shackles that will fit the towing lugs.

TACOM has developed a special shackle suitable for the light tracked vehicles. The stock number is 4030-01-369-7612, which will get you a 1-inch shackle, labeled working load limit (WLL) 12.5 T, on which the pin has been replaced with a 1-inch grade 8 bolt. The end of the bolt must be wired or secured by other suitable means to prevent the nut from vibrating off during rail transport.

For medium-sized vehicles, use the shackles developed for the Bradley, NSN 4030-01-187-0964. These shackles have a 1-3/8-inch diameter pin and are labeled WLL 21 T. The 21 T shackle (210,000 lbs min breaking strength) is a 1-1/4 inch size safety anchor shackle with a 1-1/4 body, a 3-1/4-inch diameter opening at the bow, and a 1-3/8-inch bolt pin. No wire tying is necessary on this shackle if the cotter pin is in place.

Heavy vehicles require either the special unmarked military shackles developed for the DODX 40000-series flatcar or the 21 T shackles. Some vehicles may still need the link (ring) in the pintle as a tiedown provision. The unmarked military shackles have a 1-1/2-inch body, a 4-inch diameter opening at the bow, and a 1-3/8-inch diameter screw-pin and were bought by part number as given below (by unmarked we mean no WLL, manufacturer, nor size marking; many are indeed marked "Japan"). Any tiedown point that requires three chains requires the 4-inch diameter or larger opening shackle. For tiedown points that require no more than two chains, the 21 T shackle may be used. The above numbers of chains allowed per shackle are based on DODX flatcars that have a slip hook at the free end of each chain assembly. On flatcars such as HTTX on which the chain assemblies have no slip hook, the chain is passed through the tiedown shackle and secured to itself with an adjustable double grabhook. Up to about four 1/2-inch chains can be passed through the 21 T shackle. The unmarked military shackles are in the supply system, but they are not

stocked and cost \$87.51 each (as of the publication date of this pamphlet) using NSN 4030-01-391-2790. These shackles have the following manufacturers' part numbers:

Shackle: MacLean-Fogg 61284 or Midland Forge MK0267

Link or Ring: MacLean-Fogg 61283 (optional for M1)
(The Air Force very much wants the link (ring) for air transport)

The manufacturer of the MK0267 shackle is Columbus McKinnon Corp., Midland Forge (319) 362-1111.

The following suppliers can provide the MacLean-Fogg shackle and link:
(MacLean-Fogg is no longer in this business.)

Holland Company (708) 672-2300 extension 779

John Sakash Company (630) 833-3940

You may use lifting provisions for tiedown if they are located so the wire rope or chain does not bear on the body of the vehicle. Lifting provisions are often large enough for tiedown without using shackles. A good example of usable lift provisions is the rear lift provisions on the M1 tank.

B. TRACKED VEHICLE TURRET RESTRAINT AND SIDE OVERHANG

Once the tracked vehicle is in place on the flatcar, tie the gearshift lever in the neutral position. Do not set the brakes until chock blocks are in place (see para B1 below). Wire the turret lock and elevating mechanisms in place, and engage any hull-mounted barrel lock. Insure that two complete wire rope loops have been put around the barrel and secured one to each side of the hull. This procedure provides positive visible protection against the barrel elevating or the turret turning.

Many tracked vehicles are wider than the railcar. Therefore, when loading tracked vehicles onto flatcars, be sure to center the vehicle on the flatcar. The overhang of the vehicle on each side of the flatcar must be equal to avoid rail clearance difficulties. Measure the overhang on both sides from the car side to the edge of the vehicle's track. The allowable variation is when the two measurements, one subtracted from the other, have a difference

of 1 inch or less. This results in the load's longitudinal centerline being no more than 1/2-inch away from the flatcar's longitudinal centerline.

C. TRACKED VEHICLES ON GENERAL-PURPOSE FLATCARS

1. Chock Blocks

Locate appropriate chock block against the front of the track and secure to the deck. Instruct the driver to pull forward until the tracks are up on the front blocks a few inches, and set the brake. Next, place the appropriate block against the rear of the track, and nail it to the deck. Release the brake, and allow the vehicle to settle against the blocks.

2. Side or Lateral Blocking

When possible, apply side blocking to the outside of the treads. When side blocking is not possible, apply lateral blocking on the interior of the treads. The lateral blocking frame may be put on the floor and secured before loading the tracked vehicle. To do this, measure the inside distance between the treads, cut the lumber, and nail it to the flatcar deck. Then, carefully guide the vehicle onto the flatcar. Interior lateral blocking can be deleted when the vehicle is shipped in controlled train service, which is generally short distance over rails owned or controlled by a single carrier. You will have to get the inspectors approval for this type service.

3. Wire Rope

Attach wire rope from the tiedown shackle on the vehicle to the side stake pocket, and secure with four clamps of the same diameter as the cable. Two pieces of wire rope are normally attached at each end of the vehicle, but both the size and number of cables will depend on the weight of the vehicle. Apply a thimble and cable clamp at the point where the wire passes around the side stake pocket, to prevent the wire rope from chafing. Also, overlap the wire rope at least 24 inches.

4. Bogie Wheel Blocks (Road Wheel Blocks)

The specified number of blocks (between the road wheels), cut to fit the road wheels, is installed on each track. Install 2 by 4's over the road wheel blocks as shown in appendix A (p. A-8).

5. Gun Tube Securement

If applicable, wrap cushioning material around the gun tube, and secure the gun tube with one complete loop of 3/8-inch wire rope, with two clamps, to a lifting eye on each side of the gun tube (a total of 2 complete loops). Hand tension the wire rope, but fully torque the clamps. This must be checked at the flatcar loading site, but will be easier to apply at the motor pool before loading begins.

The bridge sections of tracked vehicles used as bridge launchers normally must be removed and shipped separately.

For further guidance, check the vehicle data plate and the transportability guidance technical manual applicable to the vehicle being secured.

D. TRACKED VEHICLES ON CHAIN-EQUIPPED FLATCARS

Generally, the tiedown procedures for tracked vehicles on chain cars are the same as for general-purpose flatcars, except chains replace wire rope and blocking is not generally practical on steel-deck chain cars. Therefore, the size and number of chains required will depend on the size and weight of the vehicle. Slip hooks as used on the DODX 40000-, 41000-, and 42000-series flatcars should be applied to tiedown provisions with the point down. If the hooks are placed horizontally, they can point either direction.

NOTE

Armored personnel carriers are shipped on a variety of commercial chain-equipped cars; however, the M2/M3 Bradley can be easily shipped only on HTTX, DODX 41000- series, and similar cars. Similarly, the recommended railcar on which to ship the M1-series tanks is the DODX 40000-series flatcar. It has the ability to transport two M1 tanks, and it is equipped with thirty-six 1/2-inch special alloy, 13,750-lb working load limit (WLL) chains. The DODX 40000-series flatcars are no longer equipped with shackles or links (rings), so any shackles or links used should be unloaded with the vehicles and, ideally, should be assigned to and kept with the vehicles.

Section IV. Blocking

Below is a list of the blocks detailed in Appendix A. Although other blocking patterns exist, these are the most common. The pattern numbers correspond to the numbers used in AAR Sections 1 and 6.⁵

A. PATTERN 16

Chock block used mainly on wheeled vehicles.

B. PATTERN 30

Front chock block used mainly on tracked vehicles.

C. PATTERN 31

Rear chock block used mainly on tracked vehicles.

D. PATTERN 89

External side blocking used when flatcar width allows.

E. PATTERNS 90 AND 91

Front supports, or stanchions, used with trailers and semitrailers on flatcars.

F. ROAD WHEEL BLOCKS

One or two 2 by 4's on top. Also called bogie wheel blocks, these are used on tracked vehicles to block the road wheels.

⁵See footnote 1, page 1, Section No. 1.

G. LATERAL BLOCKING

Usually used when the width of the flatcar does not allow for side blocks. Often called interior side blocking since it provides lateral support on the inside of the tires or tracks.

NOTE

Blocking may be fabricated using dressed lumber of the nominal sizes indicated on each drawing. For example, a dressed 2x4 is really 1-1/2 by 3-1/2 inches and may be used where a 2x4 is required.

Section V. Tools for Rail Loading

Table 1 outlines the suggested rail loading toolkit needed by personnel conducting a rail outload in CONUS. Specific information on some items follows:

A. SOCKET

Users must check socket sizes against actual hardware that will be used. The nut size used on wire rope clamps varies by manufacturer and by clamp size.

B. FLEX HANDLE (COMMONLY CALLED “BREAKER BAR”)

For tightening the chain and the anchor block of a chain-tiedown assembly, this tool is more effective than a 3/4-inch drive ratchet. It costs much less than a ratchet and is less likely to be pilfered. An even more cost-effective substitute would be a locally fabricated tool made of 3/4-inch square bar stock, cut into 20-inch lengths, and bent 90° on the end (2 or 1-1/2 inches) of each bar. This would form, in effect, a huge Allen wrench, and would be as effective as a more expensive tool since the chain winch usually requires only one-half to three-quarters of a turn to tension the chain.

C. MONKEY WRENCH

Some chain tiedowns are tensioned by a turnbuckle (see fig 7) with a tubular body in the chain assembly, rather than by a winch in the anchor block. Although the slack can be taken out of the chain by manually twisting the turnbuckle (which gives the tiedown the appearance of being tight), additional tension is necessary and can be applied with a wrench since one end of the turnbuckle body has a 1-1/2-inch hexagonal section. A 15-inch adjustable wrench is the smallest that will open to 1-1/2 inches. But, a much smaller (11-inch), and less expensive, monkey wrench will open to 3 inches, for turning the turnbuckle and for other uses requiring a general-purpose wrench. Two wrenches are needed, one to hold the turnbuckle and one to set the jamnut.

Table 1
Suggested CONUS Rail Loading Toolkit

| <i>Quantity</i> | <i>Item</i> | <i>Remarks</i> | <i>National Stock Number</i> |
|-----------------|-----------------------------------|--|---|
| 1pr | Pliers | Side cutting or slip-joint (8-inch) | 5120-00-239- 8251 or 5120-00-223-7397 |
| 2 | Puller, hoist | Cumalong, left-hand (cable grip), 7000-pound capacity | 5120-00-785-5860 |
| 2 | Ratchet | 1/2-inch square drive, reversible | 5120-00-230-6385 |
| 1 | Removable turnbuckle handle | To rapidly tighten turnbuckles with turnbuckle gear | NA |
| 1 | Screwdriver | Common, 8-inch-square shank | 5120-00-596-9364 |
| 2 | Socket | 1/2-inch square drive, 3/4-inch (12-point) | 5120-00-189-7985 |
| 2 | Socket | 1/2-inch square drive, 7/8-inch (12-point) | 5120-00-189-7934 |
| 2 | Socket | 1/2-inch square drive, 15/16-inch (12-point) | 5120-00-189-7935 |
| 2 | Tape measure | Steel, 12-foot, recoil type | 5210-00-182-9893 |
| 1 | Torque wrench | 1/2-inch square drive, for wire rope clips | 5120-00-640-6364 |
| 1 | Wire cutter | Diagonal steel wire cutter | 5110-00-516-4227 |
| 1 | Wire rope cutter | Hydraulic, 3/4-inch cable capacity | 5110-00-224-7058 |

Table 1- Continued

| <i>Quantity</i> | <i>Item</i> | <i>Remarks</i> | <i>National Stock Number</i> |
|-----------------|---------------------------------|---|--|
| 1 | Brace and bit or electric drill | To predrill chock blocks for spikes | 5110-00-293-1958 or 5130-00-935-7354 |
| 1 | Drill set, twist | Sizes 1/16 to 1/2-inch by 16ths | 5133-00-293-0982 |
| 4 | Cable grip | 3/8-inch capacity 5/8-inch capacity | 5120-00-238-4436 5120-00-224-2661 |
| 1 | Chain saw | Gasoline-engine-driven, 10-inch bar (requires chain lubricating oil and gas/oil fuel mixture for two-cycle engines) | NA |
| 2 | Claw & pinch bar | 30-inch length | NA |
| 1 | Drift or pin punch | 1/8-inch point, 3-1/2 to 5-inch length | 5120-00-240-8898 |
| 1 | Flex handle (breaker bar) | 3/4-inch square drive, 20 inches long | 5120-00-221-7959 |
| 10pr | Gloves, work | Leather or leather-palm | 8415-00-634-4658 |
| 3 | Hammers | 1-pound 2-pound 3-pound | 5120-00-061-8543 5120-00-061-8546 5120-00-900-6111 |
| 2 | Marker crayon | One black, one yellow | 7510-00-285-1730 |
| 2 | Monkey wrench | Lightweight, 11 inches long, 3-inch capacity | 5120-00-293-3009 |
| 1 | Nailpuller | If not on pliers | 5120-00-542-4828 |

D. GLOVES

Leather or leather-palm work gloves must be worn by persons loading railcars. The gloves may be included in the toolkit or issued by the unit supply section. Regardless, gloves must be worn for safety reasons.

E. CHAIN SAW

A small gasoline-engine-driven chain saw with a 10-inch cutter bar is useful for cutting lumber at the loading area. One saw with a qualified operator is sufficient at each loading site (not one saw per toolkit).

The blocking lumber should be delivered to the loading site in precut, usable lengths. This allows the chain saw to be used only for cutting special blocking and bracing pieces for unusual equipment or for special cases. Handsaws are far too slow and are usually kinked by inexperienced “carpenters.”

Section VI. Tips and Common Mistakes

A. PREPARING VEHICLES PRIOR TO LOADING

1. Be sure that all lifting and tiedown shackles are attached to the vehicle. Do not use bumperettes, axles, towing pintles, or towing hooks as points of attachment, except where specifically shown in a figure.

2. Make sure fuel tanks are no more than three-quarters full. Jerry cans are either DOT 5 metal or (performance oriented packaging) POP certified plastic 5 gallon containers. The safest transport is empty and purged of fuel. The POP certified containers are less likely to leak than the metal ones and are, therefore, the preferred type if you must transport fuel.

3. Remove or band canvas and bows to prevent wind damage.

4. Protect windshields from thrown rocks (if needed; this is a local decision). Notched plywood banded in place works well. Remember, what you use will have to withstand sustained high wind on the moving train.

5. Reduce vehicles to their lowest configuration (for shipping or if appropriate).

6. Secure any materials or equipment loaded in the beds of trucks by banding or other means. Such loads are called nested or secondary loads. Bands (also called steel strapping) should be at least 3/4 by 0.020 inches and must be AAR approved. Bands, 1-1/4-inch and larger, (and, after 1 Oct 2001, all banding, which will all be marked) must be applied with the AAR approval marking facing out. You may also use wire rope properly secured with clamps, see pages 6 and 7. Nylon straps are not AAR approved.

7. Make certain that hood latches are functional and secure (wind can tear hoods off).

8. Inflate tires to highway pressure. Repair or replace leaking tires. A flat tire on a truck loaded on a moving train can cause a fire due to the rubbing of the wheel on the rubber.

B. PREPARING RAILCARS FOR LOADING

1. Inspect railcars to verify deck suitability. Holes in decking, bad order safety

appliances, and so forth, must be repaired by the railroad prior to loading, or the car must be rejected by the installation transportation officer (ITO) or his representative at a port or activity. On chain-equipped cars, anchor channels should not be bent, and all chains and tightening devices should be operative. Loading teams should have a rust retardant oil available to free frozen locking devices.

2. Chock railcar wheels to prevent movement while loading.

3. Store unused chains in the channels to prevent damage when loading vehicles.

4. Clean debris from anchor channels on chain-equipped cars to allow locking devices to be moved the length of the channel. Remove any protruding nails from the deck of the car (they are a trip hazard).

C. LOADING VEHICLES

1. Use railcar and ground guides when loading vehicles. Guides should keep one railcar distance between them and the vehicle being loaded. A guide should never walk backwards on a railcar onto which a second vehicle is being loaded. Before directing the loading of a second vehicle, the railcar guide should mount the previously loaded vehicle to avoid being crushed between the vehicles.

2. When loading wheeled vehicles, use spanners strong enough to support the heaviest load anticipated and properly position them. When loading vehicles between railcars of unequal deck heights, be sure to place dunnage under the spanner to prevent it from slipping. When driving on spanners, try to maintain a constant speed; avoid four-wheel drive, jamming on brakes, and reversing. For added safety, use nylon straps to secure spanners between flatcars.

3. Be sure to leave at least 10 inches between vehicles to avoid damage in transit and to obtain a proper angle of tiedown.

4. When loading wheeled vehicles on multilevel railcars, exercise care when going from one railcar to another. Loading decks may be set at different heights, thereby causing the top of the vehicle to strike the upper deck. Load bottom decks first since the upper deck ramps may block the lower deck.

D. SECURING VEHICLES

1. Turn turntable-type winches in the proper direction so that the chain is taken up on the underside of the ratchet wheel (fig 9).

2. Be sure proper tension of wire rope or chains exists. Tension wire rope to allow no more than 1-inch deflection when supporting the weight of a full grown man. Tension chains to achieve a moderate deflection of the vehicle's suspension. After initially tensioning each chain, strike it sharply with a hammer or bar and retighten. Repeat this step if necessary. This helps the links seat in their longest length and helps prevent loose chains in transit.

3. Secure excess wire rope or chain to the tension bearing part of the wire rope or chain.

4. On chain devices, secure open-faced hooks to the chain link with wire or nylon tie strap.

5. Lock chain-tightening devices with wire. Turnbuckles must have jamnuts tightened wrench-tight with two wrenches. Locking sleeves must be lowered to eyebolt.

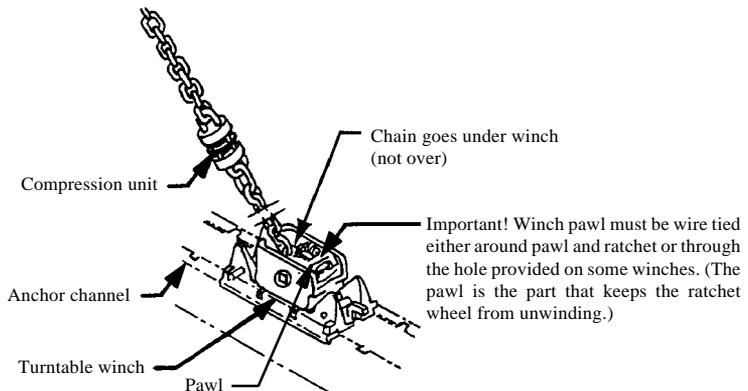


Figure 10. Correct position of chain anchor winch.

Loading and Tiedown Checklist

For Vehicles on Chain Tiedown Flatcars

NOTE: Copies of this page should be distributed to loading teams.

- Make certain all hood latches are secured (to avoid wind damage).
- Leave at least 10 inches between vehicles.
- Check for proper brake wheel clearance.
- Do not cross the chains.
- Use symmetrical tiedown patterns.
- Secure tiedowns at approximately 45° angles.
- Seat and lock chain anchor or winch.
- Secure shackle in tiedown provision with wire tie or cotter pin.
- Pull chain tight and attach hook above the compression unit.
- Tighten chain.
- Use appropriate tools.
- Make sure chain is not kinked or binding.
- Secure hooks with wire or nylon tie straps.
- Make sure turnbuckles are wired or locked.
- Tighten jamnuts with two wrenches. Lower locking sleeves.
- Do not secure chains to axles or springs unless figure shows to.
- Make certain turrets and guns, radiator doors, side skirts, outriggers, crane booms, expansible van bodies, and so forth are secured from extending up or over the side of the flatcar.

APPENDIX A ⁶

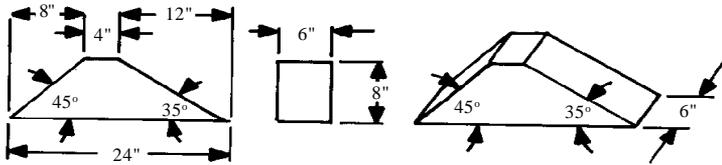
BLOCKING

(See p. 17)

| | <i>Page</i> |
|-------------------------------|-------------|
| Pattern 16 | A-2 |
| Pattern 30 | A-3 |
| Pattern 31 | A-4 |
| Pattern 89 | A-5 |
| Pattern 90 | A-6 |
| Pattern 91 | A-6 |
| Lateral blocking | A-7 |
| Road wheel block | A-8 |

⁶See footnote 1, page 1, Section no. 6.

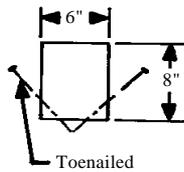
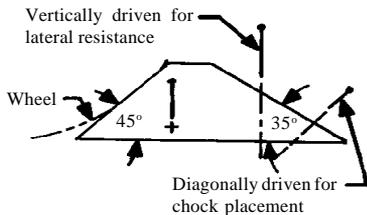
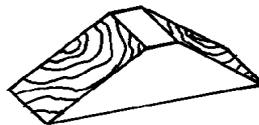
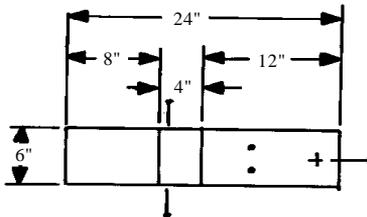
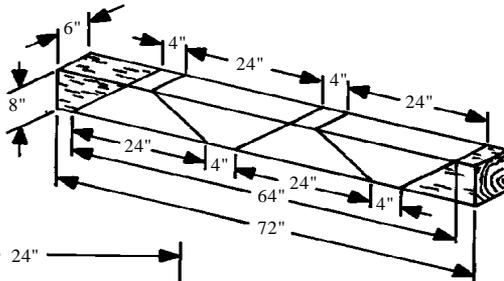
Pattern 16



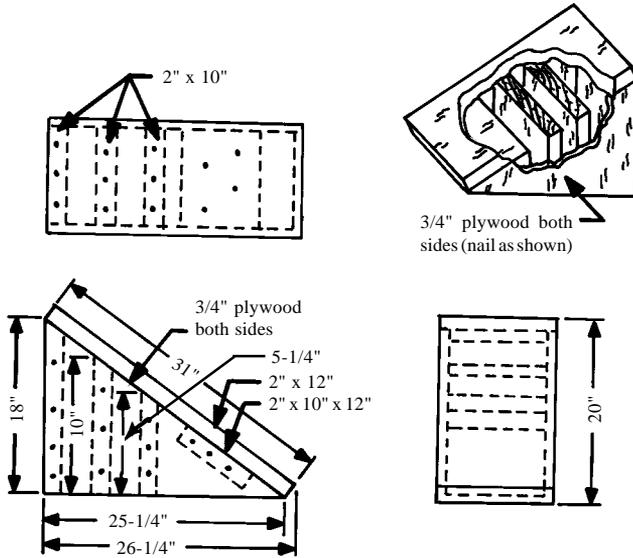
Locate 45° portion of block against front and rear of wheels. Secure heel of block to floor with three 40-D nails and toenail that portion under tire with two 40-D nails. Usually, 2 blocks per wheel are required.

Note: Predrilling is advised to prevent splitting.

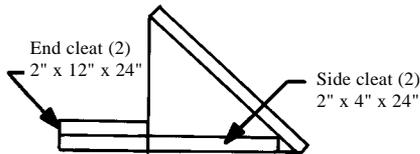
Note: An 8" allowance is provided for wastage.



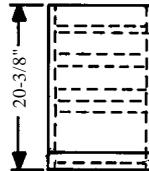
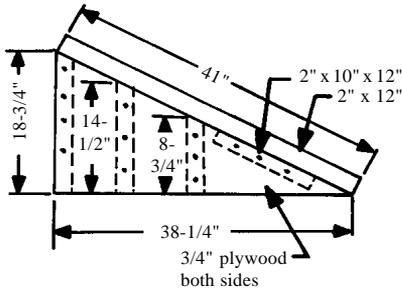
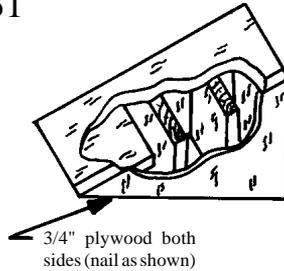
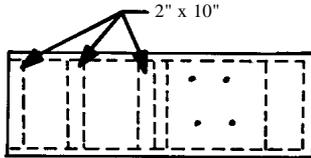
Pattern 30



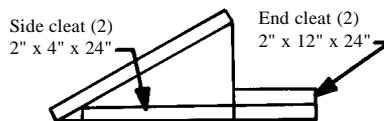
After assembling the block as shown, locate the inclined face of the block against the track, even with the inboard edge, at the front of the vehicle. Next, construct 2 end cleats: each consists of 2 pieces of 2" x 12" x 24" lumber. Secure the lower piece to the floor with four 20-D nails and the top piece to the one below with four 20-D nails. Then, construct 2 side cleats: each consists of one piece of 2" x 4" x 24" lumber. Locate on the outside of the block and secure to the floor with four 20-D nails. (see below)



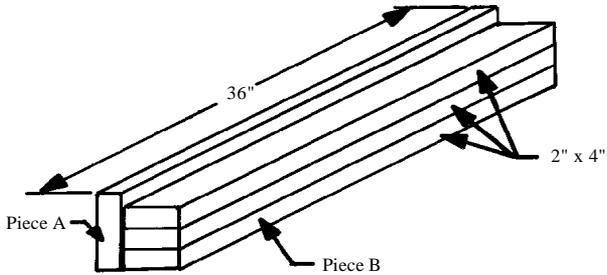
Pattern 31



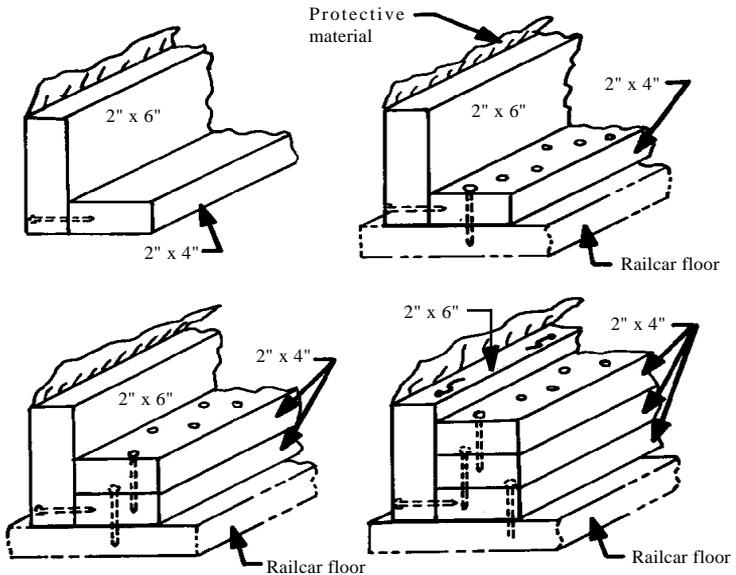
After assembling the block as shown, locate the inclined face of the block against the track, even with the inboard edge, at the rear of the vehicle. Next, construct 2 end cleats: each consists of 2 pieces of 2" x 12" x 24" lumber. Secure the lower piece to the floor with four 20-D nails and the top piece to the one below with four 20-D nails. Then, construct 2 side cleats: each consists of one piece of 2" x 4" x 24" lumber. Locate on the outside of the block and secure to the floor with four 20-D nails. (see below)



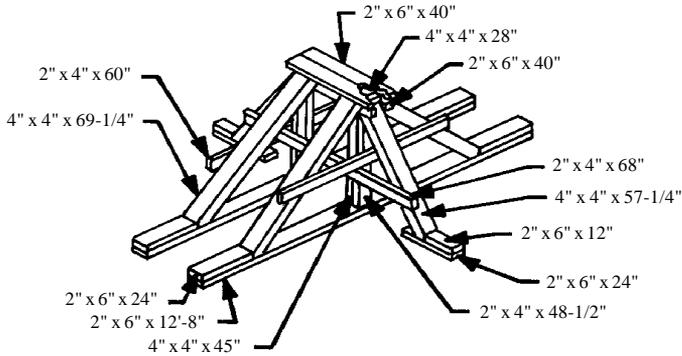
Pattern 89



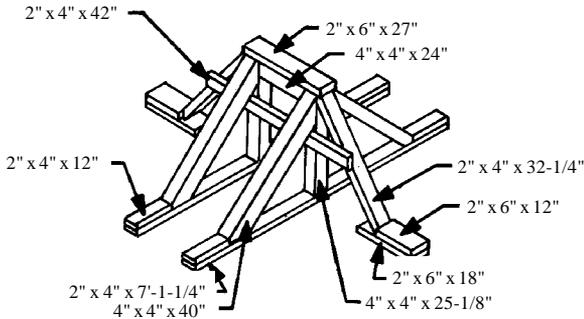
Note: Nail piece A to piece B with five 12-D nails. Nail piece B to the car floor with five 20-D nails. Nail the other pieces to the one below in the same manner.



Pattern 90



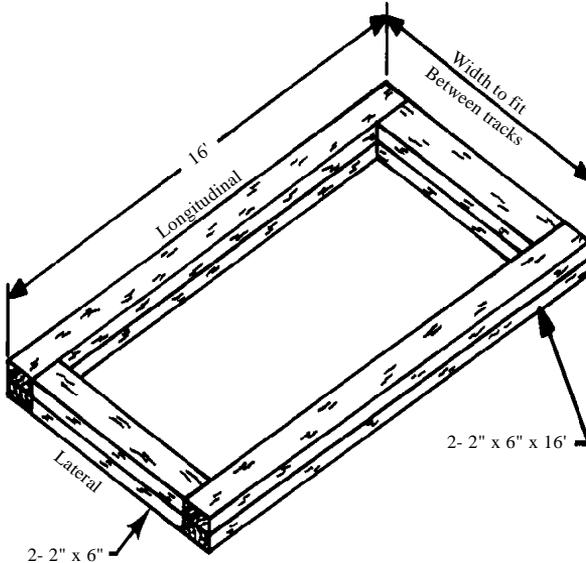
Pattern 91



Notes:

- Using dressed lumber dimensioned as shown, pattern 90 will be about 51-1/2" high and pattern 91 will be about 28-1/8" high.
- Length of support members and other components may vary to suit trailer type and height.

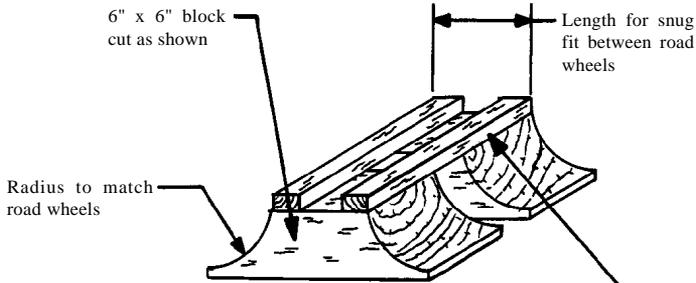
Lateral Blocking



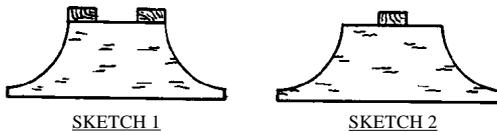
Framework to consist of 4 pieces of lumber 2" x 6" x 16'. Locate lower pieces on car floor against inside edge of each crawler tread. Secure to car floor with twelve 20-D nails. Secure top piece to lower piece in like manner. Apply nails in staggered pattern. Four pieces of 2" x 6" lumber cut-to-fit shall be placed between the longitudinal pieces. Secure lower pieces to car floor with four 20-D nails. Secure top piece to lower piece in like manner.

Road Wheel Block

(also called bogie wheel block)



Note: 2" x 4" - Two places if possible (sketch 1) tight against road wheels. Fasten each with four 20-D nails after putting 6" x 6" blocks in place.



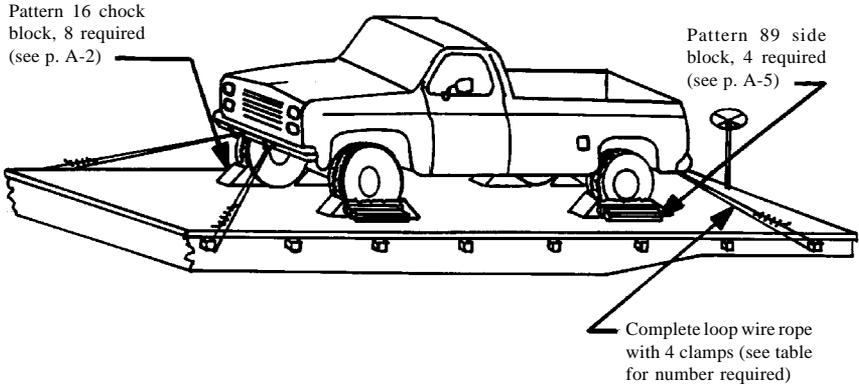
Note: If two 2" x 4" pieces will not fit as shown in sketch 1, use one 2" x 4" as shown in sketch 2. Fasten with four 20-D nails after putting 6" x 6" blocks in place.

APPENDIX B

TIEDOWN GUIDE FOR GENERAL-PURPOSE FLATCARS

| | <i>Page</i> |
|--|-------------|
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| Single-Axle Trailers | B-6 |
| One- or Two-Axle Trailers | B-7 |
| M198 Howitzer and Similar Artillery | B-8 |
| One- or Two-Axle Semitrailers | B-9 |
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| Trailer and Prime Mover | B-11 |
| Tracked Vehicles up to 30,000 lb | B-12 |
| M577 and M1068 Ramp Securement | B-14 |
| Tracked Vehicles, 30,000 to 60,000 lb | B-15 |
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| D-7 Caterpillar Dozer | B-26 |
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| S-280 Shelters | B-28 |
| Light Armored Vehicle up to 30,000 lb | B-29 |
| S-787 and S-788 Shelters | B-30 |

Two-Axle Vehicles (except for the HMMWV)

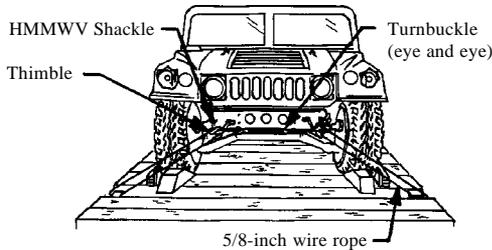


| Vehicle Weight Ranges (lb) | 6 x 19 IWRC IPS Wire Rope | |
|----------------------------|---------------------------|----------------------------------|
| | Wire Rope Size (Dia. in.) | Number of Ropes (Complete Loops) |
| 0-7,000 | 1/2 | 4 |
| 7,000-25,000 | 5/8 | 4 |
| 25,000-76,000 | 5/8 | 8 |

Notes:

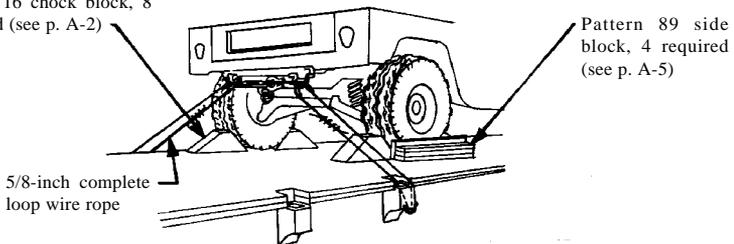
1. The CUCV, with payload, can only be transported on cushioned flatcars. Otherwise, the CUCV may be damaged. When tensioning tiedowns, lower the CUCV about 1 inch.
2. From figure 88-A, Section No. 6, with increased wire rope sizes.

HMMWV



| Models | Turnbuckle | Front | Turnbuckle | Rear |
|----------------------------------|------------|--------------|------------|--------------|
| M998, M1025, M1035, M1038, M1043 | 3/4" x 12" | 33.0" ± 1/4" | 3/4" x 12" | 33.0" ± 1/4" |
| M1026, M1036, M1044, M1046 | 3/4" x 12" | 28.5" ± 1/4" | 3/4" x 12" | 33.0" ± 1/4" |
| M996, M1037, M1097 | 3/4" x 12" | 33.0" ± 1/4" | 3/4" x 18" | 41.5" ± 1/4" |
| M997, M1042 | 3/4" x 12" | 28.5" ± 1/4" | 3/4" x 18" | 41.5" ± 1/4" |

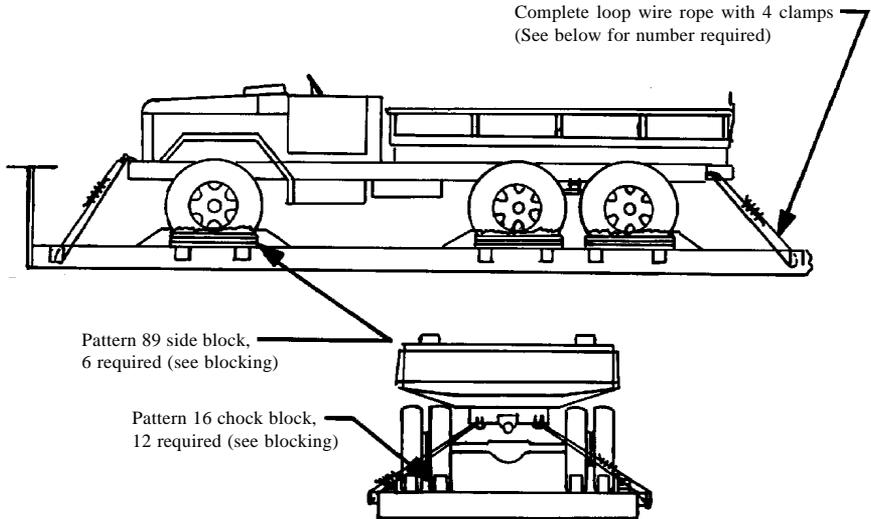
Pattern 16 chock block, 8 required (see p. A-2)



Notes:

1. The tie-downs should reduce the normal height of vehicle between 1 and 3 inches.
2. This tie-down procedure must be used to prevent damage to the HMMWV.
3. This figure (requiring a turnbuckle) is a procedural fix for a vehicle with inadequate transportability. Do not use this figure as a basis of design for vehicles that do not have transportability approval.
4. HMMWVs with 360° swivel tie-down provisions do not require the turnbuckle.

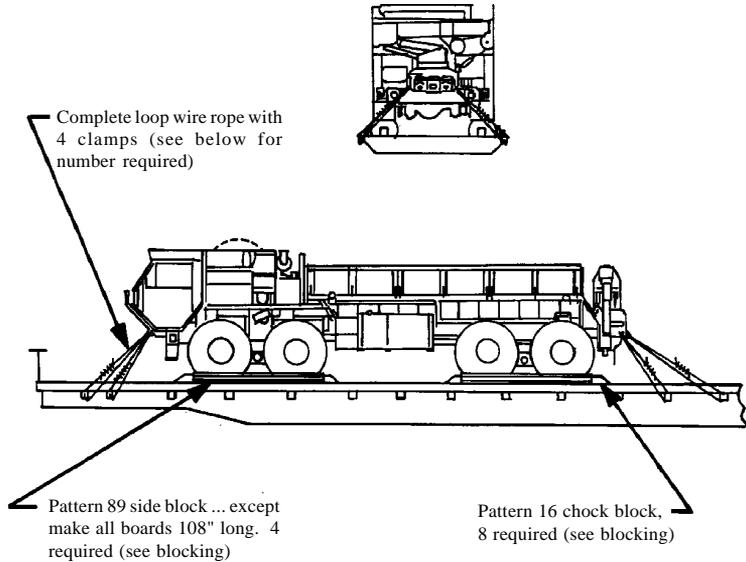
Three-Axle Vehicles



Note: From figure 88-A, Section No. 6 with lower weight ranges.

| Vehicle Weight Ranges (lb) | 6 x 19 IWRC IPS Wire Rope | |
|----------------------------|---------------------------|----------------------------------|
| | Wire Rope Size (Dia. in.) | Number of Ropes (Complete Loops) |
| 0-7,000 | 1/2 | 4 |
| 7,000-25,000 | 5/8 | 4 |
| 25,000-76,000 | 5/8 | 8 |

Four-Axle Vehicles

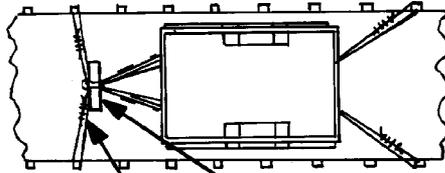


| Vehicle Weight Ranges (lb) | 6 x 19 IWRC IPS Wire Rope | |
|----------------------------|---------------------------|----------------------------------|
| | Wire Rope Size (Dia. in.) | Number of Ropes (Complete Loops) |
| 0-7,000 | 1/2 | 4 |
| 7,000-25,000 | 5/8 | 4 |
| 25,000-76,000 | 5/8 | 8 |

Notes:

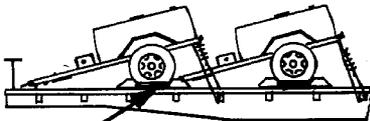
1. On narrow flatcars, place side blocking on inside of tires
2. From General Rules, Section No. 1.

Single-Axle Trailers

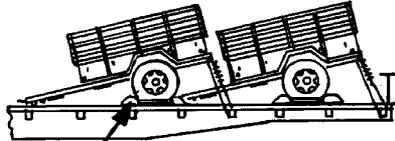


Complete loop wire rope with 4 clamps
(see below for number required)

4 x 4 x 18" toenail under towbar
with 40-D nails



Pattern 89 side block, 2 required per unit
(see blocking)



Pattern 16 chock block, 4 required per unit
(see blocking)

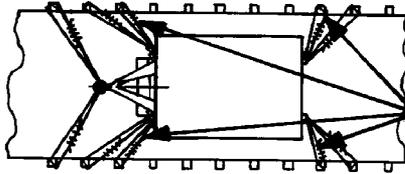
| Vehicle Weight Ranges (lb) | 6 x 19 IWRC IPS Wire Rope | |
|----------------------------|---------------------------|----------------------------------|
| | Wire Rope Size (Dia. in.) | Number of Ropes (Complete Loops) |
| 0-7,000 | 1/2 | 4 |
| 7,000-25,000 | 5/8 | 4 |
| 25,000-76,000 | 5/8 | 8 |

Notes:

1. If the trailer is loaded or used as a machinery platform such that equipment is in danger of tipping over, then use the figure on p. B-7.

2. From General Rules, Section No.1

One- or Two-Axle Trailers



If only 6 loops are required, leave off these 4

Complete loop wire rope with 4 clamps (see below for number required)



Forward support pattern 90, height to suit (see blocking)

Pattern 16 chock block, 8 required (see blocking)

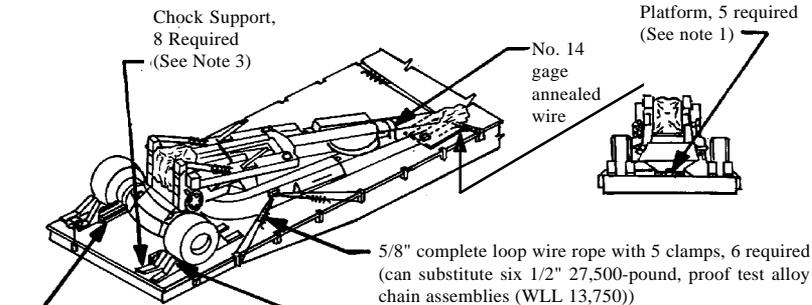
Pattern 89 side block, 4 required (see blocking)

| Vehicle Weight Ranges (lb) | 6 x 19 IWRC IPS Wire Rope | |
|----------------------------|---------------------------|----------------------------------|
| | Wire Rope Size (Dia. in.) | Number of Ropes (Complete Loops) |
| 0-7,000 | 1/2 | 6 |
| 7,000-25,000 | 5/8 | 6 |
| 25,000-76,000 | 5/8 | 10 |

Notes:

1. Tiedown provisions may be located at the end of trailer (above) or under trailer frame (below).
2. From General Rules, Section No. 1.

M198 Howitzer and Similar Artillery



Side blocking, 2 required (see note 4)

Chock block 8 required (see note 2)

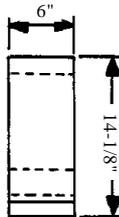
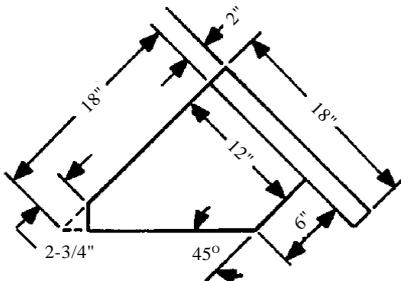
Notes:

1. Platform, 2" x 6" x 36" lumber. Nail each piece to car floor with three 20-D nails at each end. Lay the five boards side-by-side under the spade.

2. Position chock block with face plate against wheel. Nail through heel of block with two 60-D nails. Toenail to car floor with two 40-D nails on each side. Pre-drill block if necessary.

3. Chock support, 2" x 6" x 12" position against chock block and nail to car floor with three 20-D nails.

4. Side blocking lumber, 4 pieces 2" x 6" x 48". Position first piece on edge and nail to bottom piece lying flat on car floor using five 12-D nails. With the first piece on edge, nail the bottom piece to the car floor using five 20-D nails. Nail the other pieces lying flat to the bottom piece in like manner.



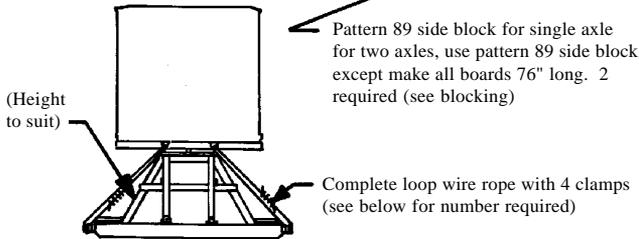
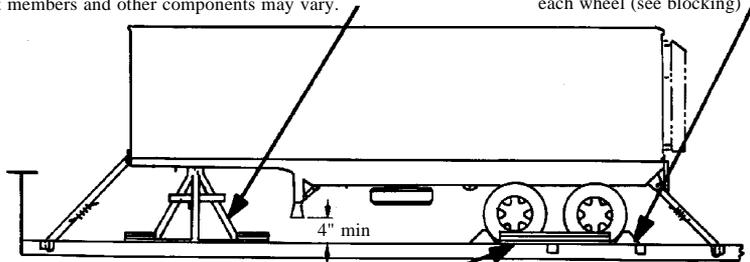
CHOCK BLOCK

5. Wire the pin that locks the gun tube stowage bracket so that the pin can not come out during transit.
6. Two howitzers may be shipped on a 10'-6"-wide flatcar. Position the first diagonally at one end of car and the second diagonally at the opposite end of the car, with barrels pointing inward.
7. If only one howitzer is shipped, locate it centrally on car.
8. From figure 7, Section No. 6.

One- or Two-Axle Semitrailers

Block pattern 90 front support, length of upright support members and other components may vary.

Pattern 16 chock block, 2 each wheel (see blocking)

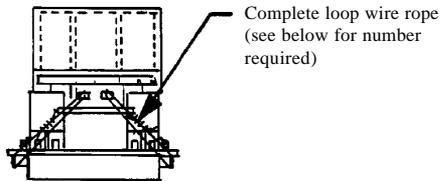
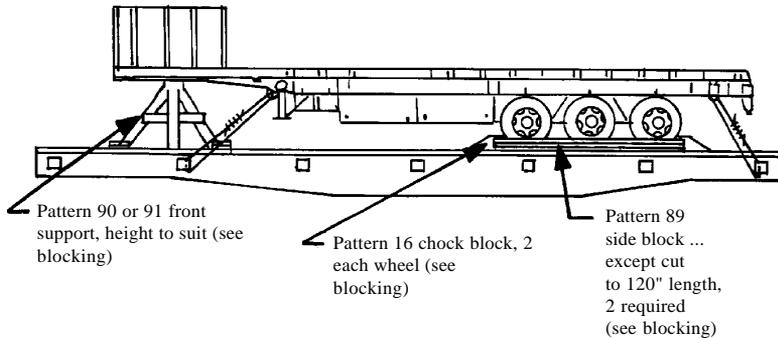


FRONT VIEW

| Vehicle Weight Ranges (lb) | 6 x 19 IWRC IPS Wire Rope | |
|----------------------------|---------------------------|----------------------------------|
| | Wire Rope Size (Dia. in.) | Number of Ropes (Complete Loops) |
| 0-7,000 | 1/2 | 4 |
| 7,000-25,000 | 5/8 | 4 |
| 25,000-76,000 | 5/8 | 8 |

Note: From General Rules, Section No. 1.

Three-Axle Semitrailers

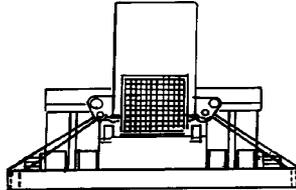
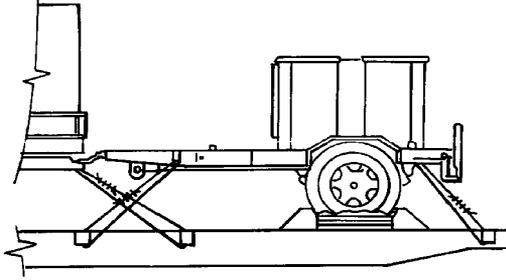


| Vehicle Weight Ranges (lb) | 6 x 19 IWRC IPS Wire Rope | |
|----------------------------|---------------------------|----------------------------------|
| | Wire Rope Size (Dia. in.) | Number of Ropes (Complete Loops) |
| 0-7,000 | 1/2 | 4 |
| 7,000-25,000 | 5/8 | 4 |
| 25,000-76,000 | 5/8 | 8 |

Notes:

1. See data plate for tiedown locations. If no provisions exist, use hard points on frame carefully avoiding brake lines, wiring, and so forth.
2. From General Rules, Section No. 1.

Trailer and Prime Mover

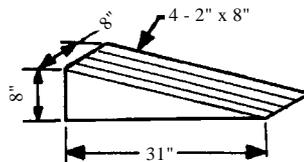
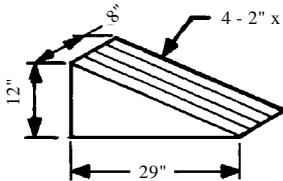
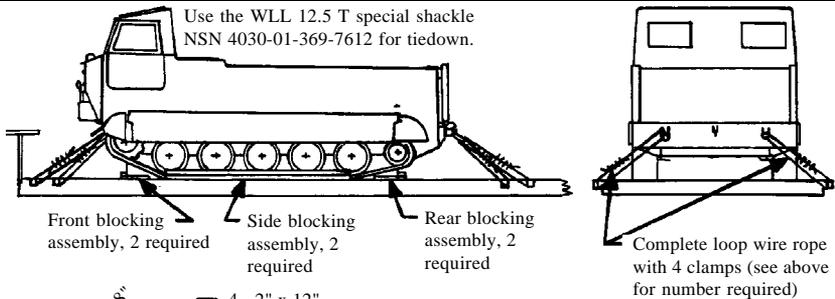


Notes:

1. Tie down trailer as shown. Refer to figures in this section for blocking and bracing and for wire rope requirements.
2. Prime mover shall be tied down using figures from this section, also .
3. Treat each vehicle as if it were being tied down individually, except omit front support on the trailer. Omit any tiedowns to towing eye.
4. Pintles must have pintle lock secured with a cotter pin or wire.
5. From General Rules, Section No. 1.

Tracked Vehicles up to 30,000 lb

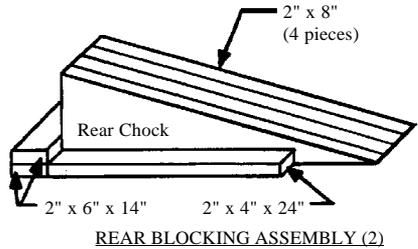
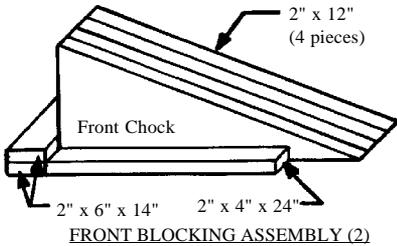
| Vehicle Weight Ranges (lb) | 6 x 19 IWRC IPS Wire Rope | |
|----------------------------|---------------------------|----------------------------------|
| | Wire Rope Size (Dia. in.) | Number of Ropes (Complete Loops) |
| 0-7,000 | 1/2 | 4 |
| 7,000-25,000 | 5/8 | 4 |
| 25,000-30,000 | 5/8 | 8 |



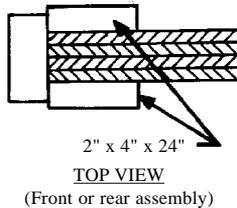
Front chock: Cut 4 pieces of 2" x 12" x 29" lumber as shown. Nail the two inside pieces with three 12-D nails through each opposite side. Nail the 2 outside pieces to the inside pieces with four 12-D nails on each side. Locate each block against the front of each track as shown. Toenail the heel of each block through the 2 inside pieces to the car floor with two 30-D nails. Toenail each side of the block to the car floor with two 40-D nails.

Rear Chock: Each to consist of 4 pieces of lumber 2" x 8" x 31" cut as shown. Construct and apply (to rear tracks) in same manner as front chock above.

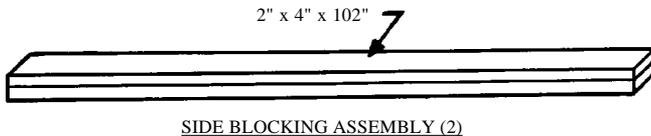
Note: From figure 87-A, Section No. 6.



Two pieces of 2" x 6" x 14" lumber. Center the bottom piece crosswise against heel of front and rear chocks and nail to car floor with four 20-D nails. Nail top piece to bottom piece in a like manner.

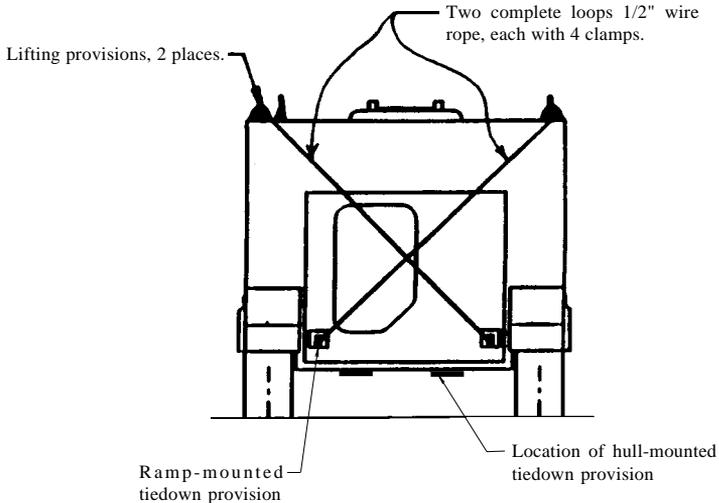


Two pieces of 2" x 4" x 24" lumber. Locate one on each side of front and rear chocks (flush with heels of chocks) and nail to car floor with four 20-D nails.



Two pieces of 2" x 4" x 102" lumber. Locate bottom piece longitudinally against the inside or outside of each track and nail to car floor with 20-D nails spaced approximately every 8 inches. Nail top piece to lower piece in like manner.

M577 and M1068 Ramp Securement



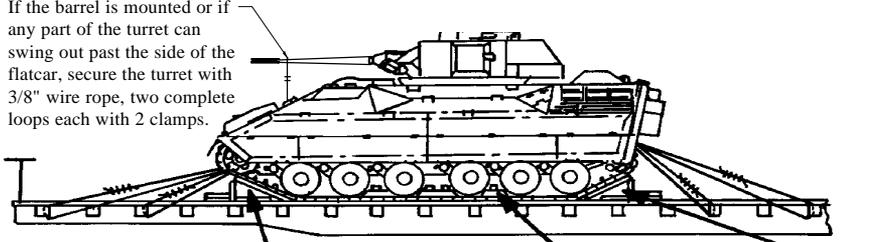
M577/M1068 REAR VIEW

Notes:

1. This applies to all series of M577 and M1068 vehicles on which the tiedown provisions used to secure the vehicle are mounted on the ramp. The wire rope is not required on vehicles that have the rear tiedown provisions mounted on the hull used for securement rather than those on the ramp.
2. Fully engage ramp latches.
3. The wire rope must be crossed as shown. The wire ropes are routed from the lifting provision to the tiedown shackle. The point where the two wire rope loops touch must be protected from chafing. Scrap rubber hose or sheet metal fastened in place will meet this requirement.
4. This (laced wire rope) is a procedural fix for vehicles with inadequate transportability. Do not grant transportability approval for any vehicles or versions of these vehicles that require this procedure for safely securing the ramp.
5. From AAR circular letter c-7824 (M577), 20 April 92, and figures 87, 87-A, and 87-B, Section No. 6.

Tracked Vehicles, 30,000 to 60,000 lb

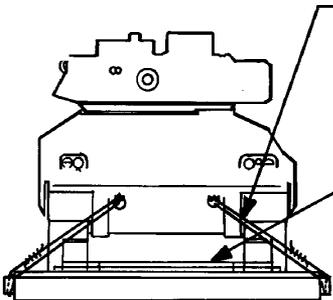
If the barrel is mounted or if any part of the turret can swing out past the side of the flatcar, secure the turret with 3/8" wire rope, two complete loops each with 2 clamps.



Pattern 30 blocks, 2 required (see blocking)

Road wheel blocks, 6 required (see blocking)

Pattern 31 blocks, 2 required (see blocking)

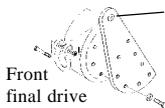


Complete loop wire rope with 4 clamps (see below for number required)

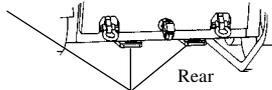
Lateral blocking (see blocking)

Note: From figure 79, Section No. 6.

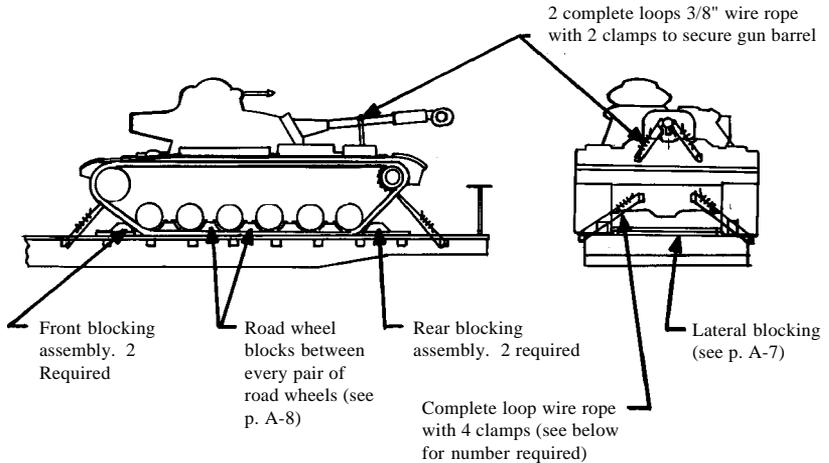
| Vehicle Weight Ranges (lb) | 6 x 19 IWRC IPS Wire Rope | |
|----------------------------|---------------------------|----------------------------------|
| | Wire Rope Size (Dia. in.) | Number of Ropes (Complete Loops) |
| 30,000-60,000 | 5/8 | 8 |



Additional tiedown provisions for heavier Bradleys.

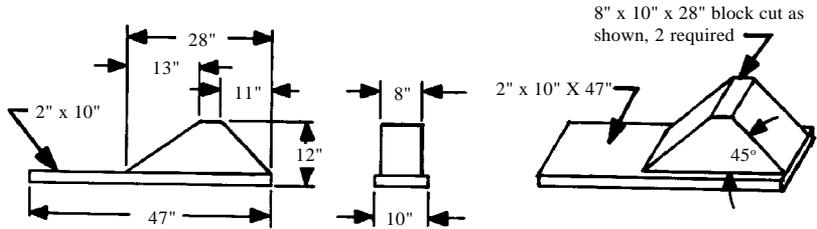


Tracked Vehicles, 60,000 to 100,000 lb

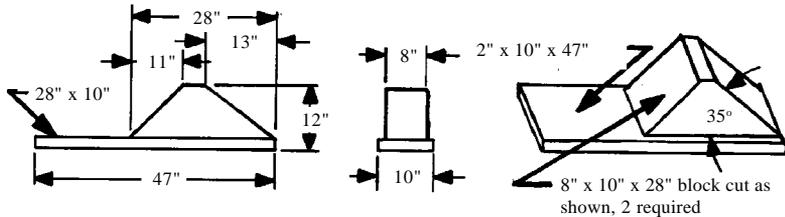


| Vehicle Weight Ranges (lb) | 6 x 19 IWRC IPS Wire Rope | |
|----------------------------|---------------------------|----------------------------------|
| | Wire Rope Size (Dia. in.) | Number of Ropes (Complete Loops) |
| 60,000-100,000 | 5/8 | 8 |

Note: From figure 80, Section No. 6.



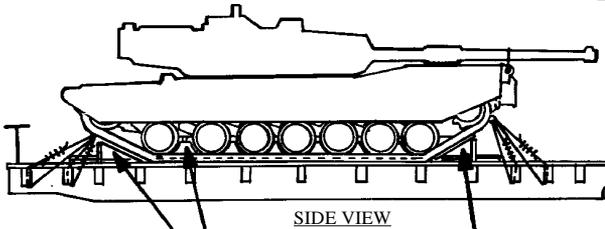
FRONT BLOCKING ASSEMBLY



REAR BLOCKING ASSEMBLY

8" x 10" x 28" Solid block: Cut blocks as shown above. Nail each block to a 2" x 10" x 47" piece of lumber with eight 20-D nails so that 2 blocks have 45° end forward and 2 blocks have 35° end forward. Place blocks against tank treads and nail to car floor with eight 20-D nails.

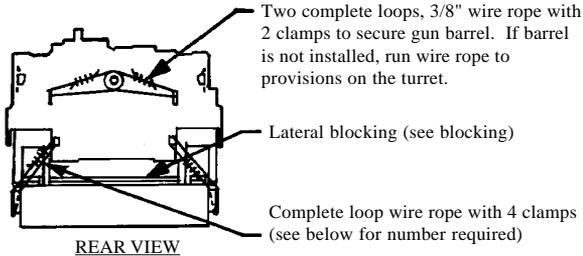
Tracked Vehicles, 100,000 lb and Up



Pattern 30 blocks. 2 required
(see blocking)

Road wheel block between
every pair of road wheels (see
blocking)

Pattern 31 blocks. 2 required
(see blocking)



Two complete loops, 3/8" wire rope with
2 clamps to secure gun barrel. If barrel
is not installed, run wire rope to
provisions on the turret.

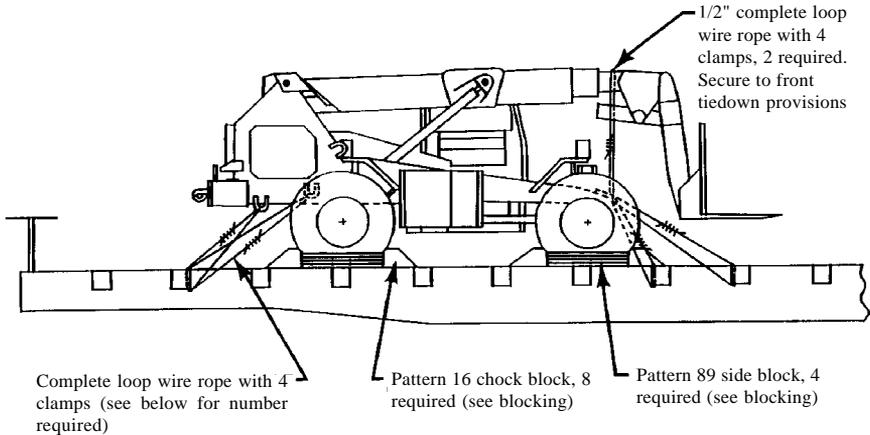
Lateral blocking (see blocking)

Complete loop wire rope with 4 clamps
(see below for number required)

| Vehicle Weight Ranges (lb) | 6 x 19 IWRC IPS Wire Rope | |
|-------------------------------|------------------------------|-------------------------------------|
| | Wire Rope Size (Dia. in.) | Number of Ropes (Complete Loops) |
| 100,000-150,000 | 5/8 | 8 |
| 100,000-150,000 | 1/2 | 12 |

Note: From figure 81, Section No. 6.

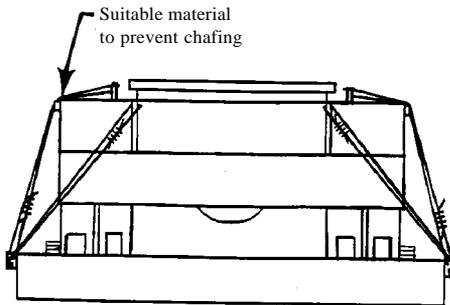
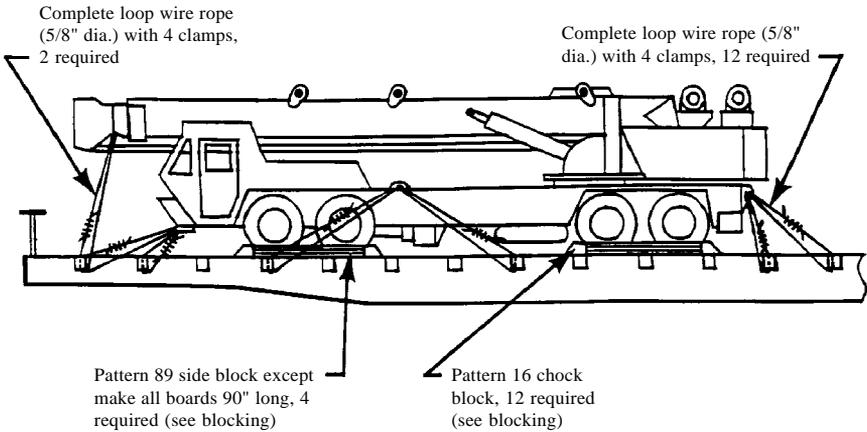
Variable Reach Forklift Truck, 38,000 lb and Under



| Vehicle Weight Ranges (lb) | 6 x 19 IWRC IPS Wire Rope | |
|----------------------------|---------------------------|----------------------------------|
| | Wire Rope Size (Dia. in.) | Number of Ropes (Complete Loops) |
| 0-7,000 | 1/2 | 4 |
| 7,000-25,000 | 5/8 | 4 |
| 25,000-38,000 | 5/8 | 8 |

Note: From General Rules, Section No. 1.

Wheel-Mounted Crane (25- and 35-ton) Under 72,000 lb

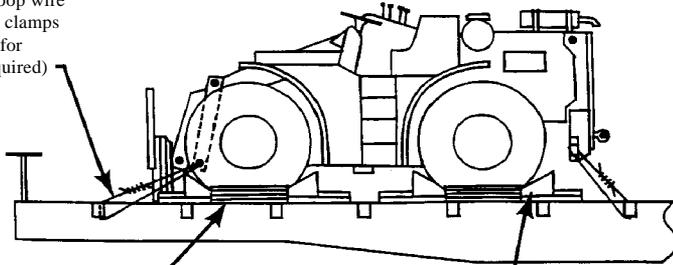


Note: From General Rules, Section No.1

Tractors, Forklifts, Loaders, and so forth

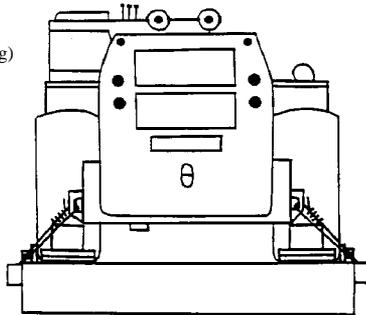
(Rough Terrain Forklift Truck, and so forth)

Complete loop wire rope with 4 clamps (see below for number required)



Pattern 89 sideblock, 4 required (see blocking)

Pattern 30 chockblock, 8 required (see blocking)



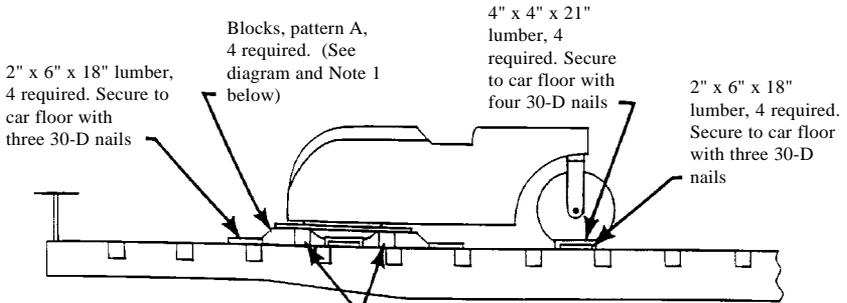
Notes:

1. Articulated vehicles must have lockout bars in Place. Lockout bar pins must be wire-tied to prevent displacement.

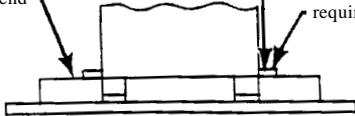
2. From General Rules, Section No. 1.

| Vehicle Weight Ranges (lb) | 6 x 19 IWRC IPS Wire Rope | |
|----------------------------|---------------------------|----------------------------------|
| | Wire Rope Size (Dia. in.) | Number of Ropes (Complete Loops) |
| 0-7,000 | 1/2 | 4 |
| 7,000-25,000 | 5/8 | 4 |
| 25,000-76,000 | 5/8 | 8 |

Tandem Steel-Wheel Roller



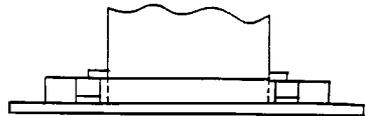
8" x 8" x 8',
Secure to car
floor with two
40-D nails in
each side and
two 30-D nails
in each
end



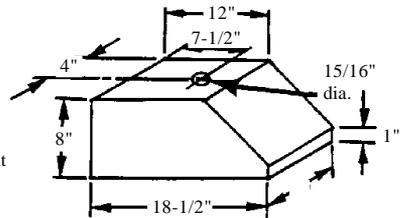
REAR VIEW OF REAR ROLLER

Nail to each
8" x 8" x 8'
with three
30-D nails
at each
location

2" x 6" x 6'
against each
end of rear
roller, 2
required



FRONT VIEW OF REAR ROLLER

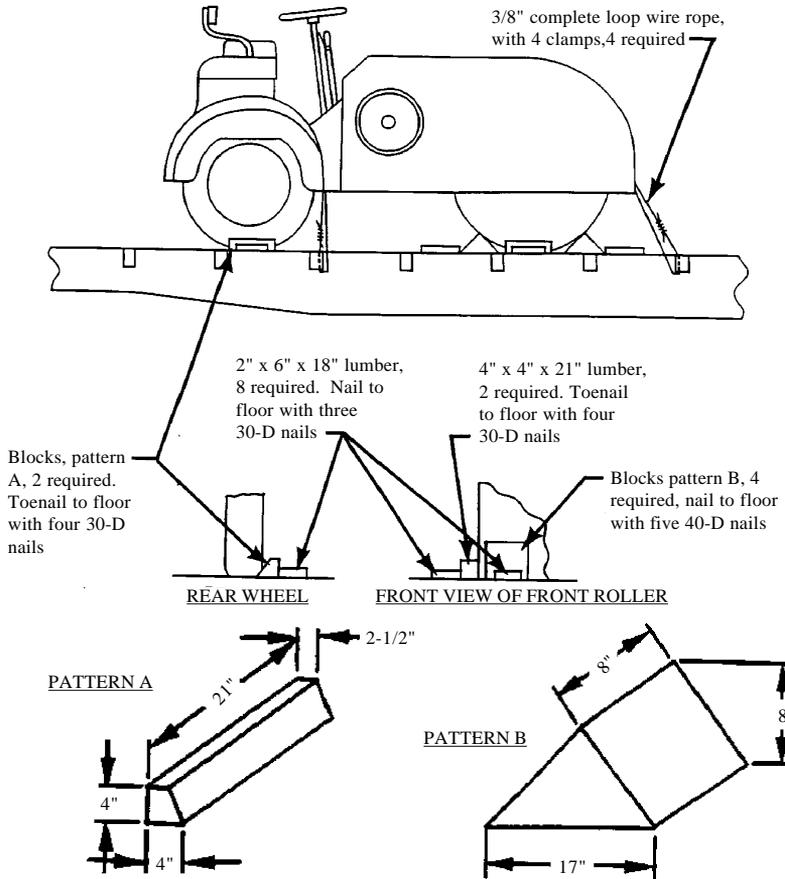


PATTERN A

Notes:

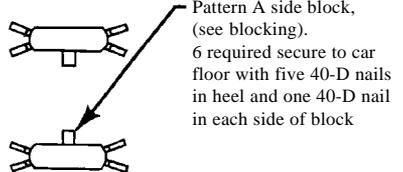
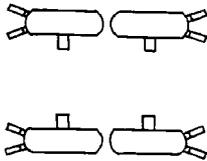
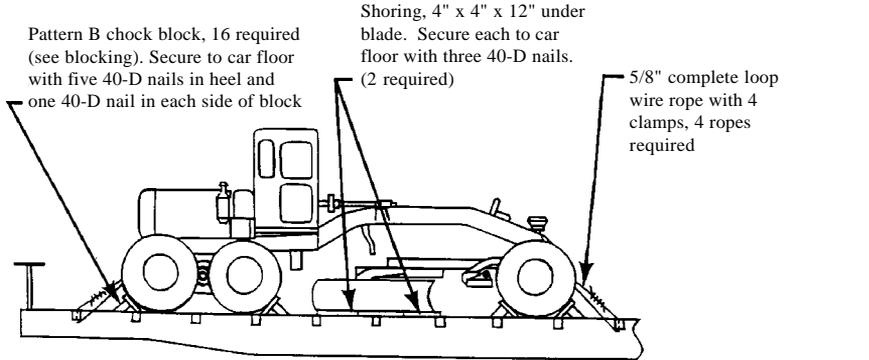
1. Bolt each pattern 22 block to floor with one 7/8" dia. bolt passed through floor and 4" x 4" x 18" cleat under floor.
2. From figure 47-B, Section No. 6

Three-Wheel Rubber-Tired Roller

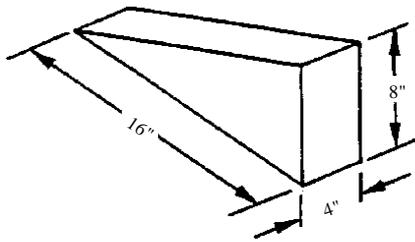


Note: From figure 47-C, Section No. 6.

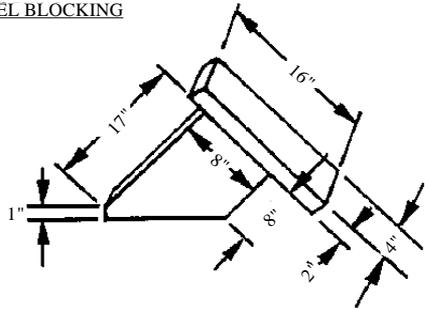
Motor Grader



TOP VIEW OF WHEEL BLOCKING



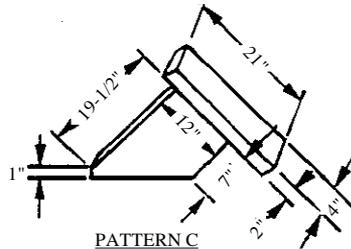
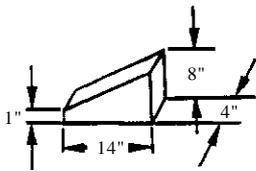
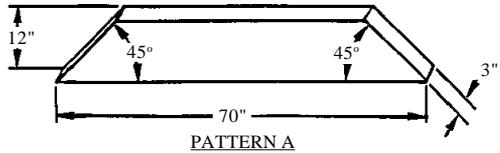
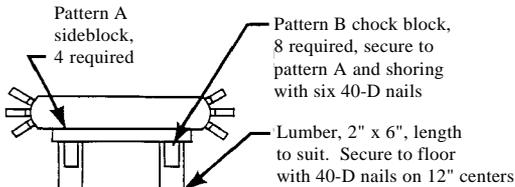
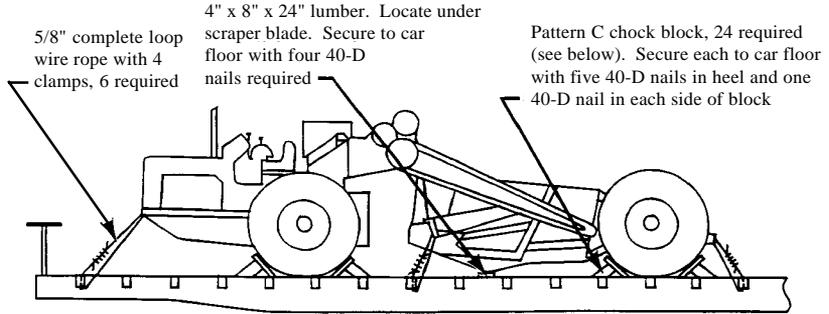
PATTERN A



PATTERN B

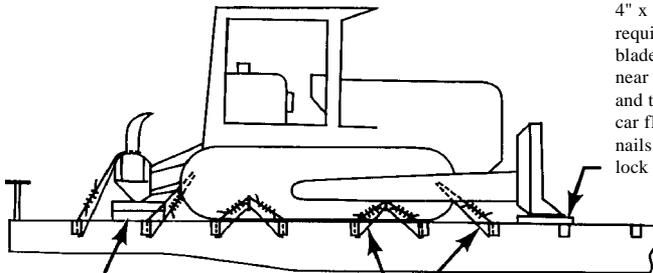
Note: From figure 48-A, Section No. 6.

Scraper (Earthmover) up to 100,000 lb



Note: From figure 48-B, Section No. 6.

D-7 Caterpillar Dozer



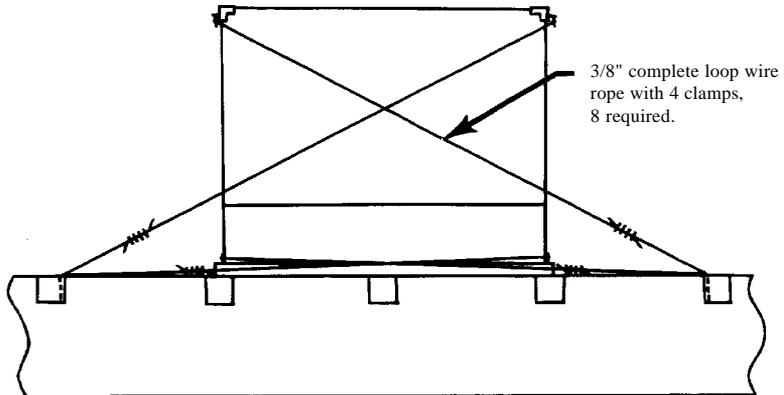
4" x 8" x 30" lumber (2 required), place under blade lengthwise on flatcar near ends of blade. Drill and toenail each block to car floor with four 30-D nails. Lower blade and lock cylinders in position.

4" x 8" x 30" lumber, (2 Required) stacked under center ripper. Drill and toenail first block to car floor with four 30-D nails, then nail second block to first in the same manner. Lower ripper onto blocks.

5/8" complete loop wire rope with 4 clamps, 14 required

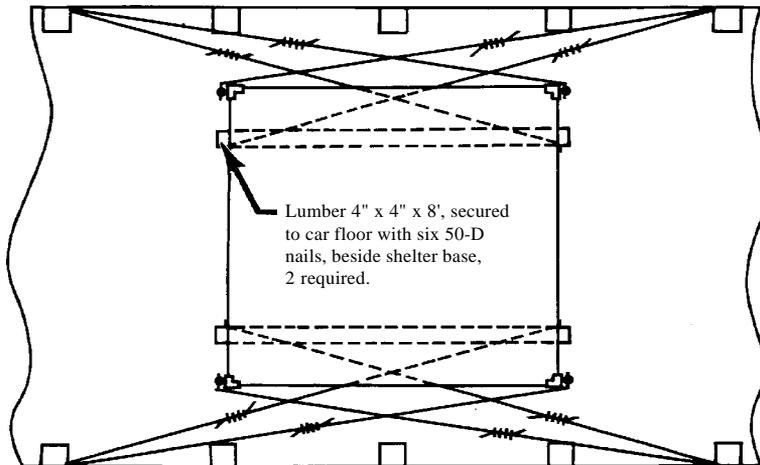
Note: From General Rules, Section No. 1.

S-250 Shelters

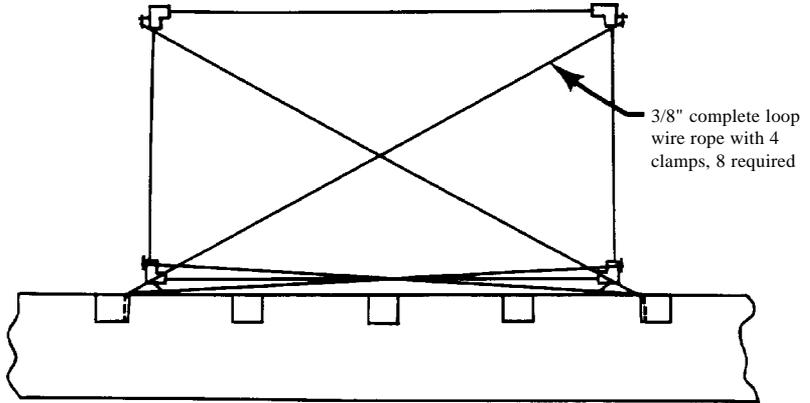


Notes:

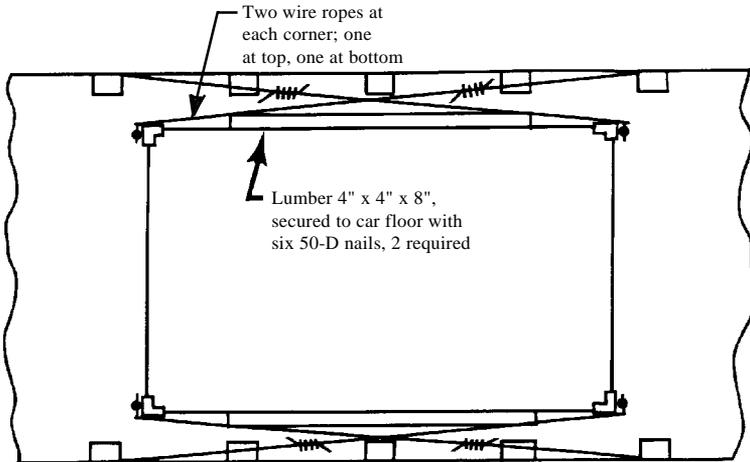
1. Only single line shown for clarity.
2. From figure 36-A, Section No. 6.



S-280 Shelters



Note: From figure 36-A, Section No. 6.



Light Armored Vehicles up to 30,000 lb

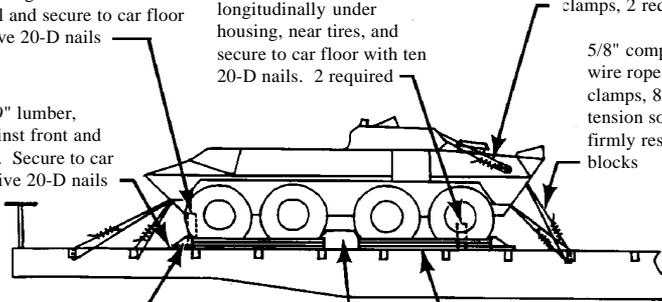
Front support block (see sketch 1). 1 required, height to suit between car deck and vehicle hull. Nail 1/2" plywood sheets with twenty 10-D nails. Secure 2" x 12" base to 6" x 12" piece with eight 20-D nails. Center assembly lengthwise to vehicle under hull and secure to car floor with twelve 20-D nails

Rear support blocks (see sketch 3) height to suit between car floor and rear torsion bar suspension housing, nail each 2" x 6" piece to 8" x 8" pieces with eight 20-D nails. Locate longitudinally under housing, near tires, and secure to car floor with ten 20-D nails. 2 required

3/8" complete loop wire rope with 4 clamps, 2 required

5/8" complete loop wire rope with 4 clamps, 8 required. tension so vehicle firmly rests on support blocks

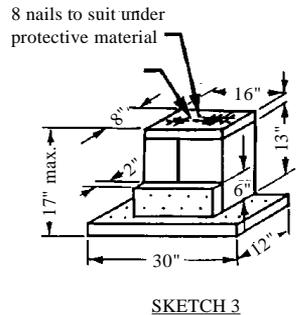
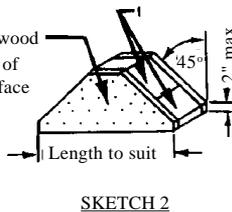
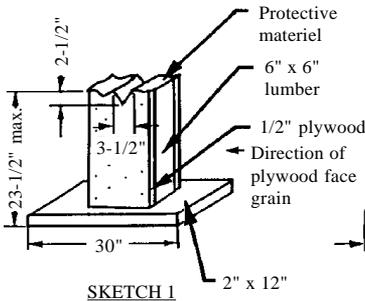
2" x 6" x 29" lumber, located against front and rear wheels. Secure to car floor with five 20-D nails



Pattern 16 chock block, 4 required. Place on top of 2" x 6" x 29" lumber

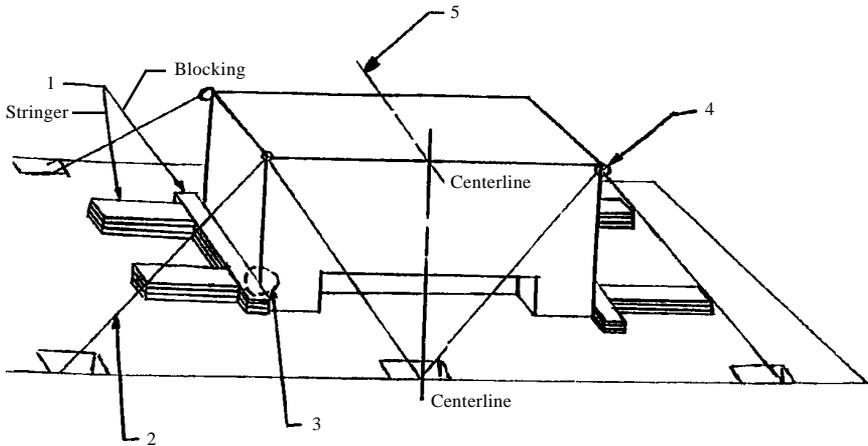
Chock block (see sketch 2), 2 required. Toenail to car floor with four 40-D nails

Pattern 89 Side Block... Except Make All Boards 84" Long. 4 Required (See Blocking)



Note: From figure 58, Section No. 6.

S-787 and S-788 Shelters (SICPS and LMS)



1. Blocking 2" x 4" x 84", 3 high. Stringers 2" x 4" x 36", 3 high. Blocking and stringers should be nailed to the railcar deck.
2. 3/8" complete loop wire rope with 4 clamps, 8 required. Single lines shown for clarity.
3. Only the "Rubber Feet" of the shelter should be in contact with the blocking.
4. Thimbles should be used in the ring eyes and in the stake pockets.
5. Align center of shelter with center of stake pocket on the railcar.

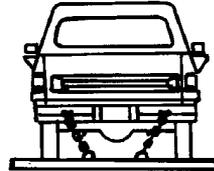
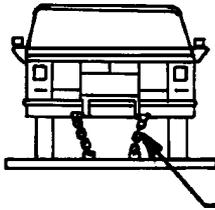
Note: From General Rules, Section No. 1.

APPENDIX C

TIEDOWN GUIDE FOR TOFC AND CHAIN-TIEDOWN FLATCARS

| | <i>Page</i> |
|---|-------------|
| Two-Axle Vehicles (HMMWV Included) | C-2 |
| Three-Axle Vehicles | C-3 |
| Four-Axle Vehicles | C-4 |
| Trailer Attached to Prime Mover | C-5 |
| Semitrailer Attached to Prime Mover | C-6 |
| Semitrailers on Flatcars with Stanchions | C-7 |
| Tracked Vehicles up to 30,000 lb | C-8 |
| Tanks and Similar Units, 30,000 to 60,000 lb | C-9 |
| Tanks and Similar Units, 60,000 to 100,000 lb | C-10 |
| Tracked Vehicles over 100,000 lb | C-12 |
| M1 with Mine Clearing Blade System (Mine Plow) | C-14 |
| Tracked Vehicles Over 100,000 lb without the Link | C-14 |
| Variable Reach Forklift Truck, 30,000 lb and Under | C-16 |
| Wheel-Mounted Crane (25- and 35-ton) | C-17 |
| Tractors, Forklifts, Loaders, and so forth | C-18 |
| Motor Grader | C-19 |
| Scraper (Earthmover) | C-20 |
| D-7 Caterpillar Dozer | C-21 |
| Trailers, M872, Double Stacked | C-22 |
| Light Armored Vehicle up to 30,000 lb | C-23 |
| Logistics Vehicle System | C-24 |
| M109A6 Paladin Howitzer | C-25 |
| M1074/1075 Palletized Load System (PLS) Truck | C-26 |
| M1076 Palletized Load System (PLS) Trailer | C-27 |
| M1070 Tractor | C-28 |
| M1000 Trailer | C-29 |
| M129A4 and M1063 Semitrailers | C-30 |
| CONEX or ISU Container on 5-Ton Trucks | C-31 |

Two-Axle Vehicles (HMMWV Included)

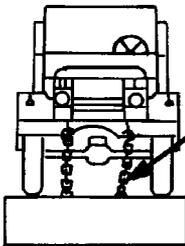
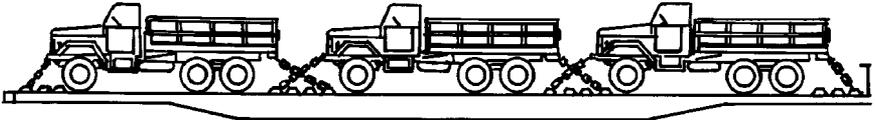


Steel chain (see below for number required)

| Vehicle Weight Ranges (lb) | Alloy Steel Chain | | |
|----------------------------|-------------------|---------------------------------|---------------------------------------|
| | Dia (in.) | Minimum Working Load Limit (lb) | Number of Chains Required Per Vehicle |
| 0-8,500 | 3/8 | 6,600 | 4 |
| 8,500-16,000 | 3/8 | 9,000 | 4 |
| 16,000-25,000 | 3/8 | 9,000 | 8 |
| 16,000-25,000 | 1/2 | 11,250 | 4 |
| 25,000-40,000 | 1/2 | 13,750 | 4 |
| 40,000-55,000 | 1/2 | 13,750 | 8 |
| 55,000-80,000 | 1/2 | 13,750 | 12 |

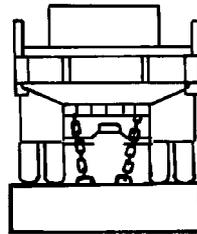
Note: From figure 88-B, Section No. 6.

Three-Axle Vehicles



FRONT VIEW

Steel chain (see below for number required)

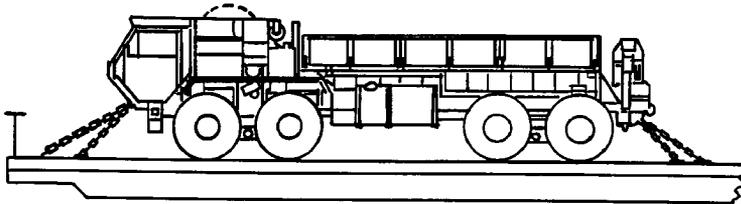
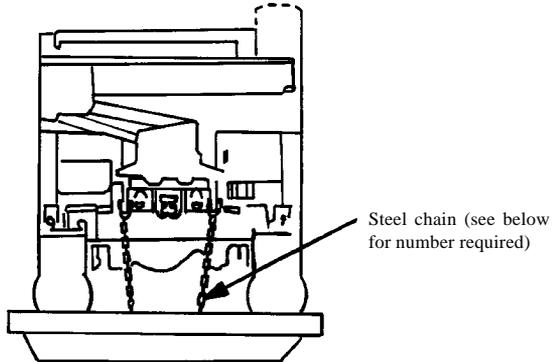


REAR VIEW

| Vehicle Weight Ranges (lb) | Alloy Steel Chain | | |
|----------------------------|-------------------|---------------------------------|---------------------------------------|
| | Dia (in.) | Minimum Working Load Limit (lb) | Number of Chains Required Per Vehicle |
| 0-8,500 | 3/8 | 6,600 | 4 |
| 8,500-16,000 | 3/8 | 9,000 | 4 |
| 16,000-25,000 | 3/8 | 9,000 | 8 |
| 16,000-25,000 | 1/2 | 11,250 | 4 |
| 25,000-40,000 | 1/2 | 13,750 | 4 |
| 40,000-55,000 | 1/2 | 13,750 | 8 |
| 55,000-80,000 | 1/2 | 13,750 | 12 |

Note: From figure 88-B, Section No. 6.

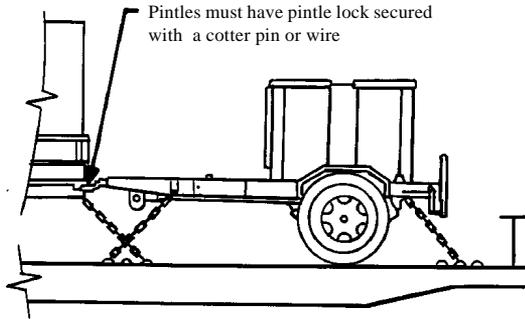
Four-Axle Vehicles



| Vehicle Weight Ranges (lb) | Alloy Steel Chain | | |
|----------------------------|-------------------|---------------------------------|---------------------------------------|
| | Dia (in.) | Minimum Working Load Limit (lb) | Number of Chains Required Per Vehicle |
| 8,500-16,000 | 3/8 | 9,000 | 4 |
| 16,000-25,000 | 1/2 | 11,250 | 4 |
| 25,000-40,000 | 1/2 | 13,750 | 4 |
| 40,000-55,000 | 1/2 | 13,750 | 8 |
| 55,000-80,000 | 1/2 | 13,750 | 12 |

Note: From figure 88-B, Section No. 6.

Trailer Attached to Prime Mover



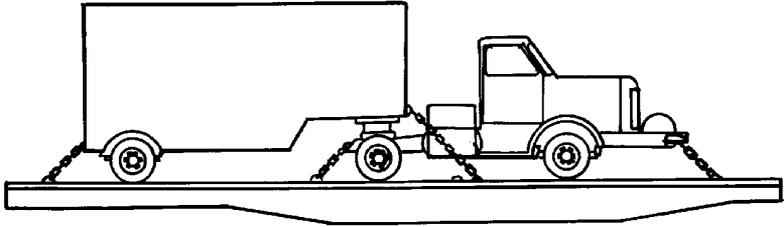
Notes:

1. Tie down trailer as shown. Refer to table below for chain requirements.
2. The prime mover will be chained as if it were being loaded alone. Check the specific diagram in the wheeled vehicles part of the appendix.
3. Treat each vehicle as if it was being tied down separately, except omit the front support and towing ring tiedowns on the trailer. Each vehicle must have at least 4 tiedowns with equal numbers pulling fore and aft.
4. From General Rules, Section No. 1.

THIS TABLE IS FOR THE TRAILER ONLY

| Vehicle Weight Ranges (lb) | Alloy Steel Chain | | |
|----------------------------|-------------------|---------------------------------|---------------------------------------|
| | Dia (in.) | Minimum Working Load Limit (lb) | Number of Chains Required Per Vehicle |
| 0-8,500 | 3/8 | 6,600 | 4 |
| 8,500-16,000 | 3/8 | 9,000 | 4 |
| 16,000-25,000 | 3/8 | 9,000 | 8 |
| 16,000-25,000 | 1/2 | 11,250 | 4 |
| 25,000-40,000 | 1/2 | 13,750 | 4 |
| 40,000-55,000 | 1/2 | 13,750 | 8 |
| 55,000-80,000 | 1/2 | 13,750 | 12 |

Semitrailer Attached to Prime Mover



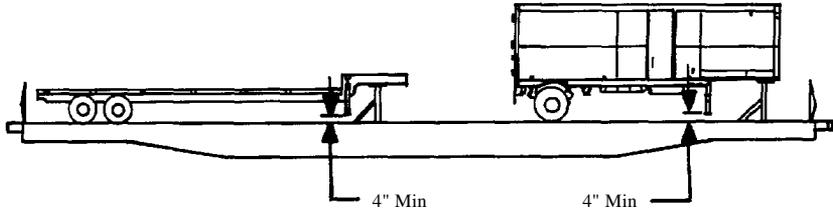
Notes:

1. Front supports, or stanchions (pattern 90), are not used when semitrailers are attached to prime movers.
2. Secure the semitrailer as shown using the table below to determine the chain requirements.
3. Chain the prime mover as if it were alone, using the appropriate figure from this appendix.
4. From General Rules, Section No. 1.

THIS TABLE IS FOR THE TRAILER ONLY

| Vehicle Weight Ranges (lb) | Alloy Steel Chain | | |
|----------------------------|-------------------|---------------------------------|---------------------------------------|
| | Dia (in.) | Minimum Working Load Limit (lb) | Number of Chains Required Per Vehicle |
| 0-8,500 | 3/8 | 6,600 | 4 |
| 8,500-16,000 | 3/8 | 9,000 | 4 |
| 16,000-25,000 | 3/8 | 9,000 | 8 |
| 16,000-25,000 | 1/2 | 11,250 | 4 |
| 25,000-40,000 | 1/2 | 13,750 | 4 |
| 40,000-55,000 | 1/2 | 13,750 | 8 |
| 55,000-80,000 | 1/2 | 13,750 | 12 |

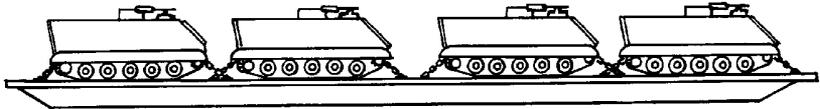
Semitrailers on Flatcars with Stanchions



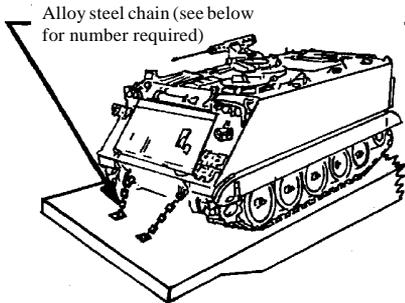
Notes:

1. Be sure hitch is securely locked in "UP" position.
2. Be sure trailer kingpin is locked in place on the hitch.
3. Applies to vehicles up to 40,000 lb as long as kingpin height is between 47 inches minimum and 52 inches maximum.
4. Useful only for 2-inch kingpins.
5. From figure 202, Section No. 6.

Tracked Vehicles up to 30,000 lb

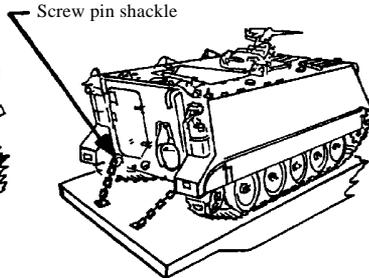


SIDE VIEW



Alloy steel chain (see below for number required)

FRONT VIEW



Screw pin shackle

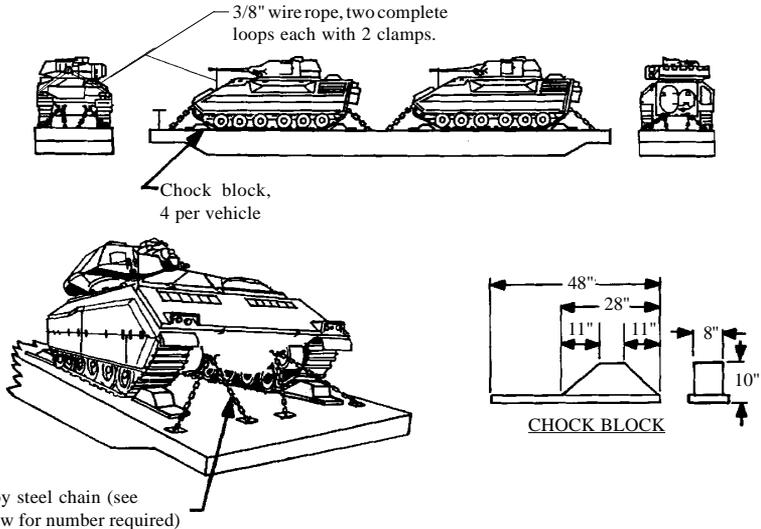
REAR VIEW

| Vehicle Weight Ranges (lb) | Alloy Steel Chain | | |
|----------------------------|-------------------|---------------------------------|---------------------------------------|
| | Dia (in.) | Minimum Working Load Limit (lb) | Number of Chains Required Per Vehicle |
| 0-16,000 | 3/8 | 9,000 | 4 |
| 16,000-25,000 | 3/8 | 9,000 | 8 |
| 16,000-25,000 | 1/2 | 11,250 | 4 |
| 25,000-30,000 | 1/2 | 13,750 | 4 |

Notes:

1. Use the WLL 12.5 ton special shackle NSN 4030-01-369-7612 for tiedown. Wire-tie the nut on the bolt or drill the bolt and install a cotter pin. The railroad does not provide shackles.
2. The M577 and the M1068 (all series) must have an X pattern of 1/2" wire rope to secure the ramp (see p. B-14).
3. From figure 87-B, Section No. 6.

Tanks and Similar Units 30,000 to 60,000 lb



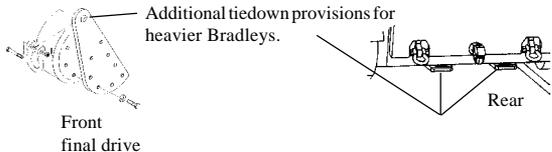
Notes:

1. Chock blocks are not required on steel decks but add four additional chains to each vehicle.

2. Shackle - use the 21-ton, 1-1/4-inch (1-3/8-inch pin), bolt-pin safety anchor shackle, NSN 4030-01-187-0964. The railroad does not provide shackles.

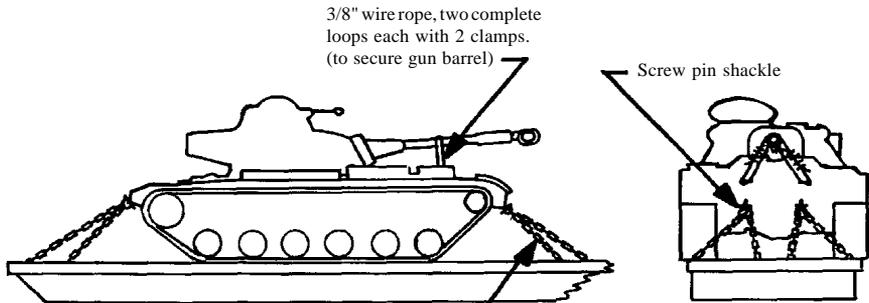
3. From figure 78-B, Section No. 3.

4. If the gun barrel is installed, the turret must be secured from rotation with two complete loops of 3/8" wire rope each with 2 clamps, one to each side from the gun to the hull.



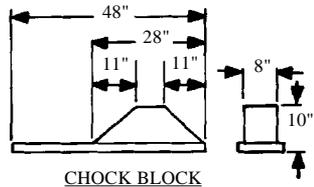
| Vehicle Weight Ranges (lb) | Alloy Steel Chain | | | |
|----------------------------|-------------------|---------------------------------|---------------------------------------|------------------|
| | Dia (in.) | Minimum Working Load Limit (lb) | Number of Chains Required Per Vehicle | |
| | | | With Chock Blocks | Without Blocking |
| 30,000-40,000 | 1/2 | 13,750 | 4 | 8 |
| 40,000-55,000 | 1/2 | 13,750 | 8 | 12 |
| 55,000-60,000 | 1/2 | 13,750 | 12 | 16 |

Tanks and Similar Units 60,000 to 100,000 lb



Notes:

1. Shackle - use the 21-ton, 1-1/4-inch (1-3/8-inch pin), bolt-pin safety anchor shackle, NSN 4030-01-187-0964. If a towing lug requires more than two chains, put two chains in the first shackle and add another shackle for up to two more chains. Add a third shackle if a fifth chain is required. Another approach, if the tiedown provisions are not too high, is to feed the slip hook and chain through the shackle in the towing lug and hook the chain into the claw hook on the same chain assembly. One slip hook and four chains will fit in the 21-ton shackle. Put the hook in last, but tension it first to make certain it is seated properly on the shackle. The railroad does not provide shackles.



2. From figure 78-B, Section No. 6.

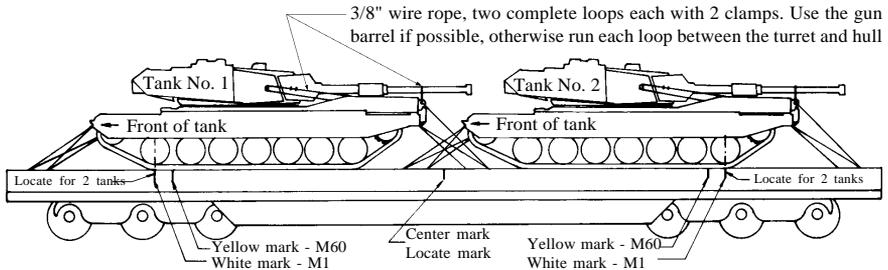
| Vehicle Weight Ranges (lb) | Alloy Steel Chain | | | |
|----------------------------|-------------------|---------------------------------|---------------------------------------|------------------|
| | Dia (in.) | Minimum Working Load Limit (lb) | Number of Chains Required Per Vehicle | |
| | | | With Chock Blocks | Without Blocking |
| 60,000-82,000 | 1/2 | 13,750 | 12 | 16 |
| 82,000-100,000 | 1/2 | 13,750 | 16 | 20 |

DODX 40000-Series Flatcar Checklist

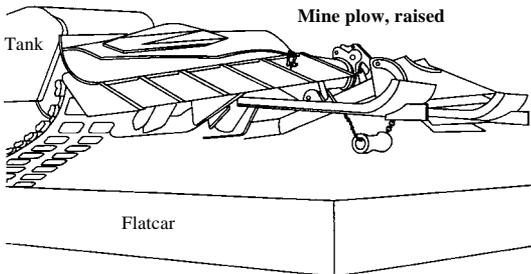
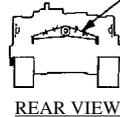
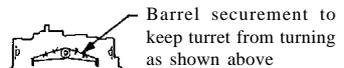
Note: Copies of this page should be distributed to loading teams.

- Locate chain anchors as indicated.
- Extend turnbuckles.
- Position tanks on flatcar.
- Install shackles (and links (rings), if required, on tanks).
- Pull chain tight and attach claw hook.
- Tighten until 1/8 inch of rubber shows at compression unit.
- Ensure anchor locking tabs are down in recess.
- Wire tie shackle screw pins (or secure by other suitable means).
- Secure pintle lock with cotter pin, if the pintle is used.
- Two-wrench tighten jamnuts or properly apply locking device.
- Make certain turret and gun, radiator door, side skirts, and so forth are secured from extending over the side of the flatcar.
- Lock turret and secure the handle.

Tracked Vehicles Over 100,000 lb DODX 40000-Series Flatcars

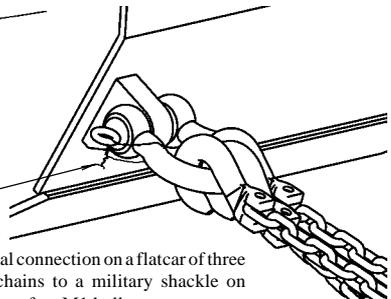


Note: From figure 83, Section No. 6.



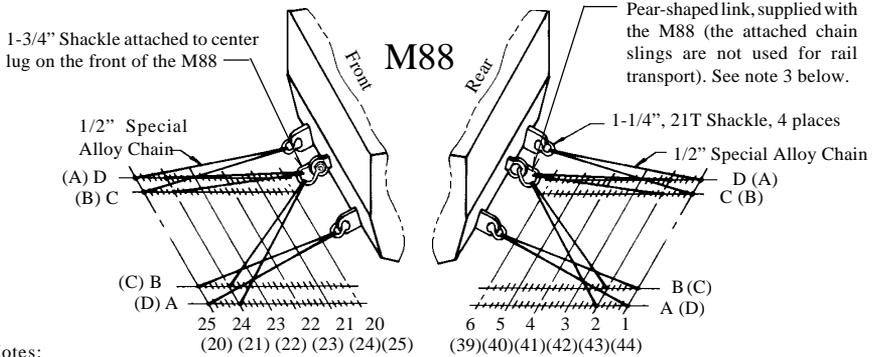
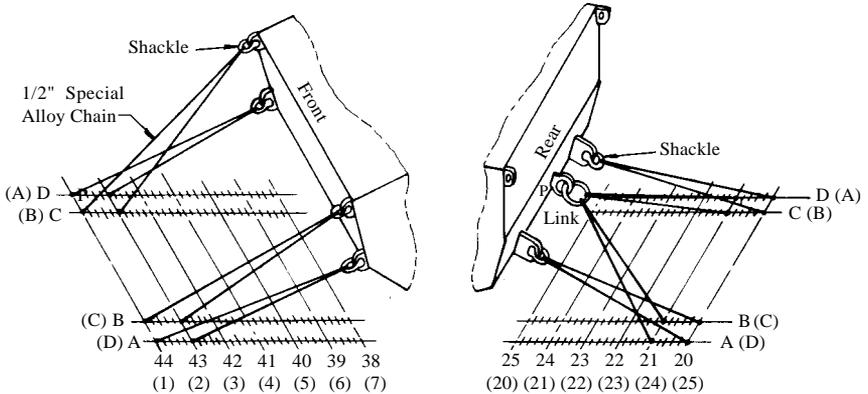
Mine Clearing Blade System (MCBS), See Page C-14

Screw pin shackle pins must be wire tied to the shackle body or secured by other suitable means.



M1 Tanks with Optional Link (Ring)

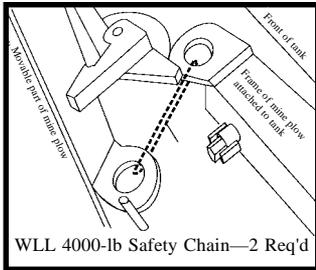
(See the next page (C-14) for procedure without link (ring))



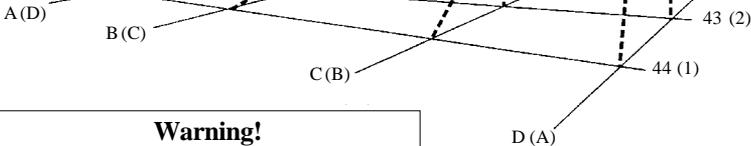
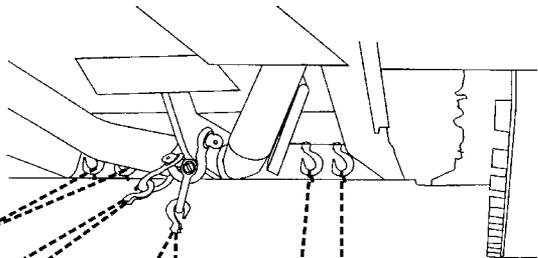
Notes:

1. Sixteen (16) Chains required per tank; use 1/2" dia extra strength special alloy chain, working load limit (WLL) 13,750 lb. Use 200,000-lb minimum breaking strength links (rings). See page 15 and 16 for approved shackles and shackle and link sources.
2. For the front of the M88 use an alloy, 1-3/4-inch, 40-ton safety anchor shackle, NSN 4030-00-369-2955.
3. If the pear-shaped link (NSN 4010-00-133-6517) is not available on the M88, you may use the MacLean-Fogg part number 61283 ring (link) or any other master link having a minimum breaking strength of 200,000 pounds, a maximum nominal bar size of 1-3/4 inches, and a clear opening of about 5 inches to accommodate four chain assembly slip hooks.
4. From figure 83, Section No. 6.

M1 with Mine Clearing Blade System (Mine Plow)



Note: From figure 83, Section No. 6.



Warning!

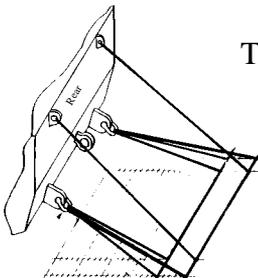
Do not allow anyone under the mine plow until both safety chains are secure.

1. Apply the safety chain with the plow in the raised position forming a complete loop through the two eyes. Fasten the chain to itself with a grabhook (secured with wire or other suitable means) or a double clevis chain link.
2. The chains that attach to the pipe structure at the bottom of the mine plow are routed under the pipe, over and down in front of the pipe, and the hooks attached to the chains as chokers which must be pulled tight.

Tracked Vehicles Over 100,000 lb without the Link

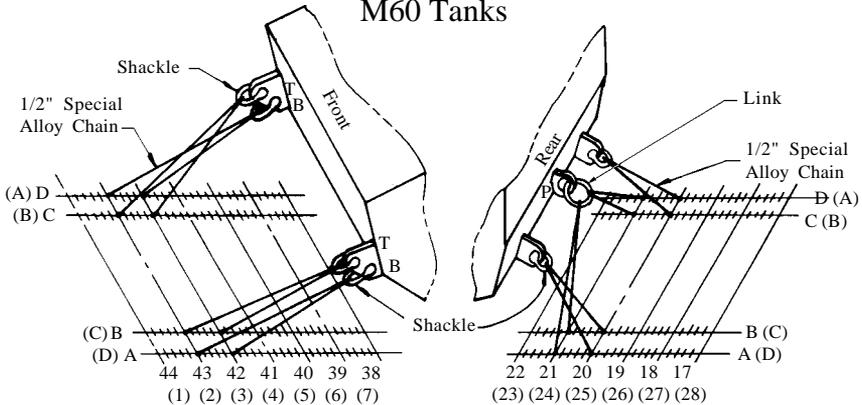
This procedure is approved as an option in Section No. 6, figure number 83.

Use the same anchor locations on the flatcar as shown on page C-13 and reroute the chains as shown to the left.

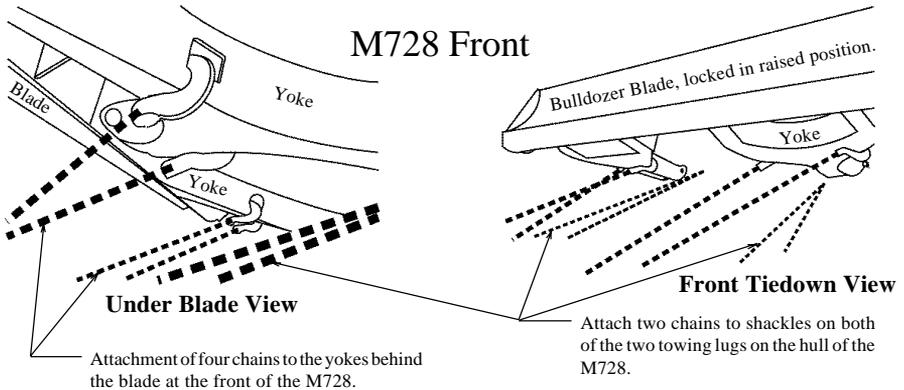


— Unmarked military shackle, see page 15 and C-12.

M60 Tanks



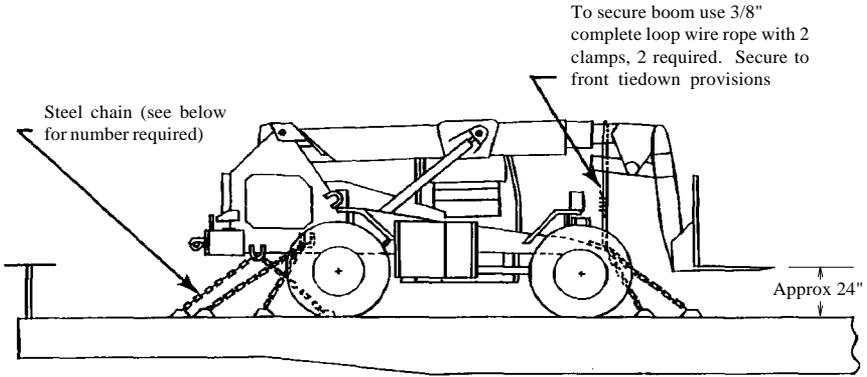
M728 Front



Notes:

1. The rear of the M728 is the same as the M60, but the M728 has its own master link that may be used in the pintle.
2. On the M728, wire tie the blade latches to ensure the blade is secured in the raised position, and don't forget to lock the turret lock and wire rope tie the boom and turret to prevent rotation.
3. Sixteen (16) Chains required per tank; use 1/2" dia extra strength special alloy chain, working load limit (WLL) 13,750 lb. Use 200,000-lb minimum breaking strength links (rings). See page 15 and 16 for approved shackles and shackle and link sources.
4. From figure 83, Section No. 6.

Variable Reach Forklift Truck 30,000 lb and Under

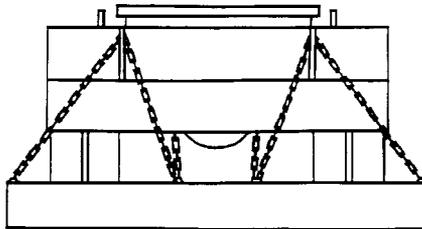
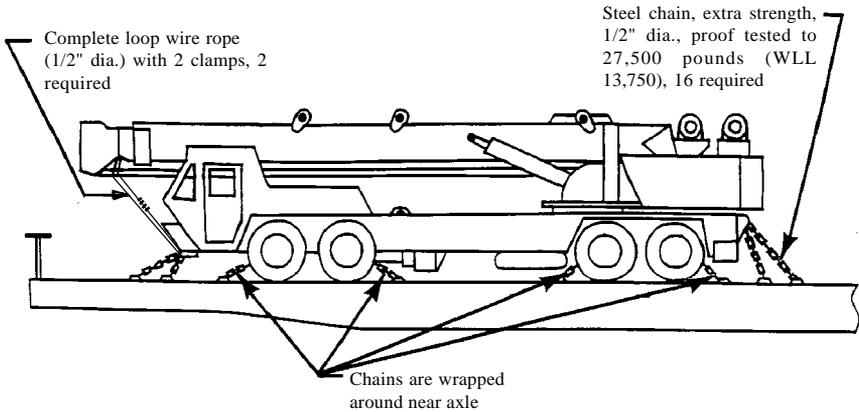


Notes:

1. Use flatcars with raised side sills, if possible. Locate suitable protective material such as waterproof paper or burlap, and so forth, between each tire and side sill to extend 2 in. above sill.
2. From figure 54-A, Section No. 6.

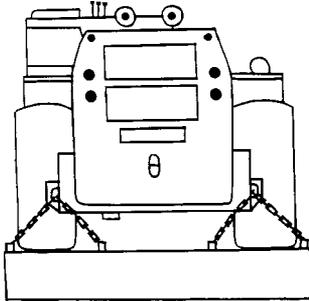
| Vehicle Weight Ranges (lb) | Alloy Steel Chain | | |
|----------------------------|-------------------|---------------------------------|---------------------------------------|
| | Dia (in.) | Minimum Working Load Limit (lb) | Number of Chains Required Per Vehicle |
| 0-30,000 | 3/8 | 9,000 | 12 |
| 0-15,000 | 1/2 | 13,750 | 4 |
| 15,000-30,000 | 1/2 | 13,750 | 8 |

Wheel-Mounted Crane (25- and 35-ton) UNDER 72,000 LB



Note: From General Rules, Section No. 1.

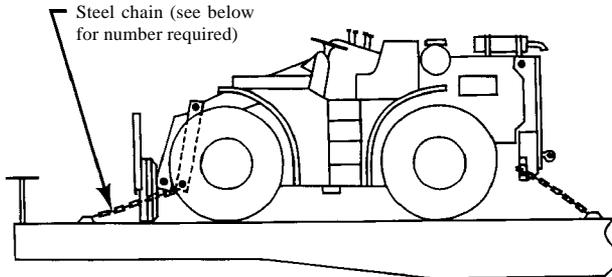
Tractors, Forklifts, Loaders, and so forth (Rough Terrain Forklift Truck, and so forth)



Notes:

1. Articulated units must be made rigid by use of the lock-out bar. Lock-out bar pins must be secured to prevent displacement. Add four chains if the lock-out bar is missing.

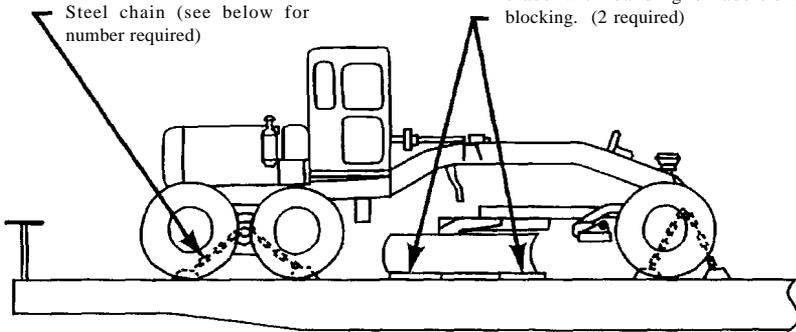
2. From figure 48-C, Section No. 6.



| Vehicle Weight Ranges (lb) | Alloy Steel Chain | | |
|----------------------------|-------------------|---------------------------------|---------------------------------------|
| | Dia (in.) | Minimum Working Load Limit (lb) | Number of Chains Required Per Vehicle |
| 0-15,000 | 1/2 | 13,750 | 4 |
| 15,000-30,000 | 1/2 | 13,750 | 8 |
| 30,000-45,000 | 1/2 | 13,750 | 12 |
| 45,000-60,000 | 1/2 | 13,750 | 16 |
| 60,000-75,000 | 1/2 | 13,750 | 20 |

Motor Grader

Shoring: 8" wide by 30" long, thickness to suit, under blade. Secure with nails long enough to penetrate deck 2". If loaded on steel deck, secure shoring to blade with banding or additional blocking. (2 required)

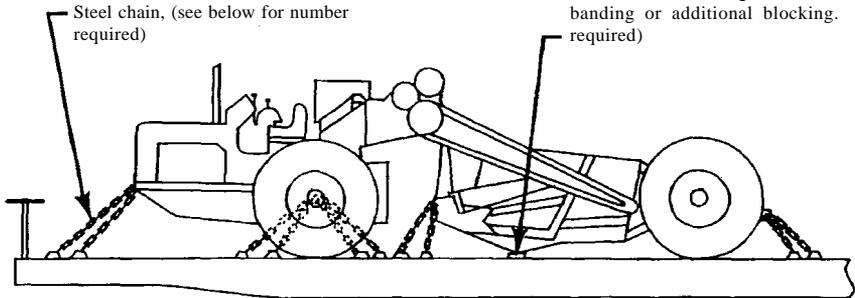


| Vehicle Weight Ranges (lb) | Alloy Steel Chain | | |
|----------------------------|-------------------|---------------------------------|---------------------------------------|
| | Dia (in.) | Minimum Working Load Limit (lb) | Number of Chains Required Per Vehicle |
| 0-15,000 | 1/2 | 13,750 | 4 |
| 15,000-30,000 | 1/2 | 13,750 | 8 |

Note: From figure 110, Section No. 3.

Scraper (Earthmover)

Shoring: 8" wide by 30" long, thickness to suit, under blades. Secure to floor with four 40-D nails. If loaded on steel deck, secure shoring to blade with banding or additional blocking. (2 required)



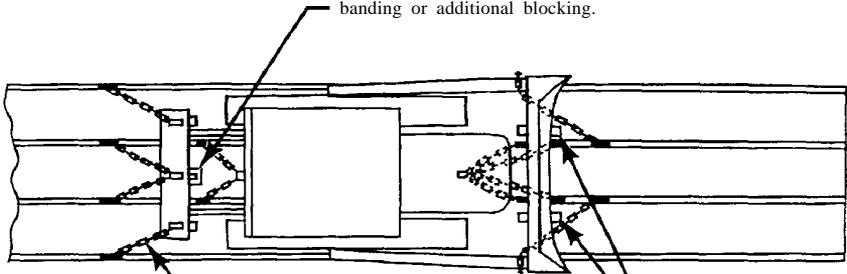
| Vehicle Weight Ranges (lb) | Alloy Steel Chain | | |
|----------------------------|-------------------|---------------------------------|---------------------------------------|
| | Dia (in.) | Minimum Working Load Limit (lb) | Number of Chains Required Per Vehicle |
| 0-15,000 | 1/2 | 13,750 | 4 |
| 15,000-30,000 | 1/2 | 13,750 | 8 |
| 30,000-45,000 | 1/2 | 13,750 | 12 |
| 45,000-60,000 | 1/2 | 13,750 | 16 |
| 60,000-75,000 | 1/2 | 13,750 | 20 |

Note: From figure 48-D, Section No. 6.

D-7 Caterpillar Dozer

up to 82,000 lb

4" x 8" x 30" lumber (2 required) stacked under center ripper. Drill and toenail first block to car floor with four 30-D nails. Then nail second block to first in same manner. Lower ripper onto blocks. If loaded on steel deck, secure shoring with banding or additional blocking.



1/2" steel chain, (27,500 lb minimum proof test value (WLL 13,750)), 12 required

4" x 8" x 30" lumber, place under blade lengthwise. Drill and toenail each block to car floor. Lower blade and lock cylinders in position. If loaded on a steel deck, secure shoring to blade with banding or additional blocking. (2 required)

Note: From General Rules, Section No. 1.

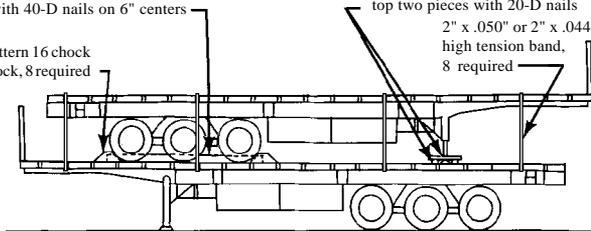
Trailers, M872, Double Stacked

4" x 4" lumber, length to suit, 2 required.
Place against inside of wheels. Secure
to floor with 40-D nails on 6" centers

Pattern 16 chock
block, 8 required

2" x 4" lumber, length to suit, 4 required per landing
leg. Secure bottom two pieces with 10-D nails and
top two pieces with 20-D nails

2" x .050" or 2" x .044"
high tension band,
8 required

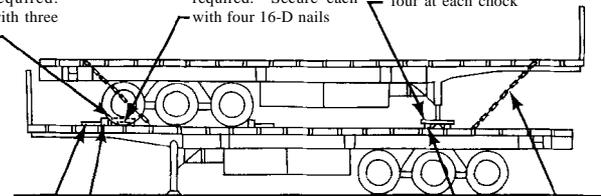


Note: From figure 434, Section No. 7.

4" x 4" x 18" lumber
side blocks. Locate
inside rear tandem
wheels, 2 required.
Secure each with three
40-D nails

2" x 4" x 18" lumber.
Locate against rear
tandem side blocks, 2
required. Secure each
with four 16-D nails

2" x 4" lumber, length to
extend beyond landing leg
chocks, 2 required. Secure
each with eight 16-D nails,
four at each chock



4" x 4" lumber, length equal
to one pair of wheels, 4
required. Secure each with
three 40-D nails

2" x 4" lumber,
landing leg chock, length equal to
width of trailer, 2 required. Secure
each with five 16-D nails

3/8" alloy steel
chain, 4 required.
Angle about 45° as
shown. Wire tie
each binder
handle and
grabhook

2" x 4" x 18" lumber, 2
against each 4" x 4" piece
spaced same as tires, 8
required. Secure each with
four 16-D nails

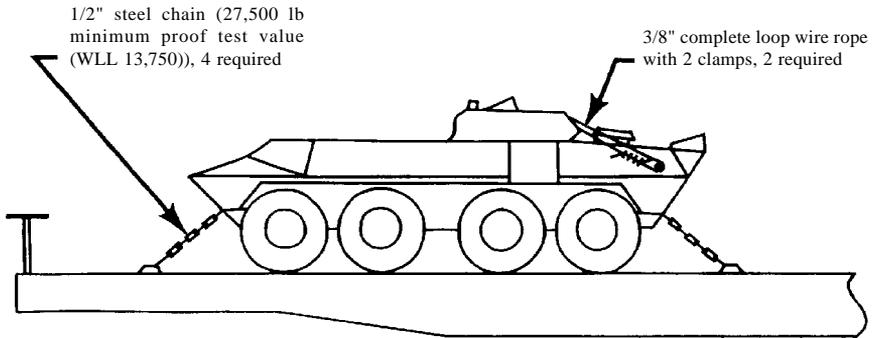
Notes:

1. From figure 432, Section No. 7.

2. Tie bottom trailer same as single trailer, trailer attached to prime mover, or as trailer on flatcar with retractable stanchion.

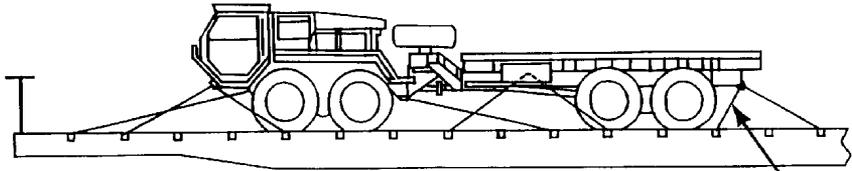
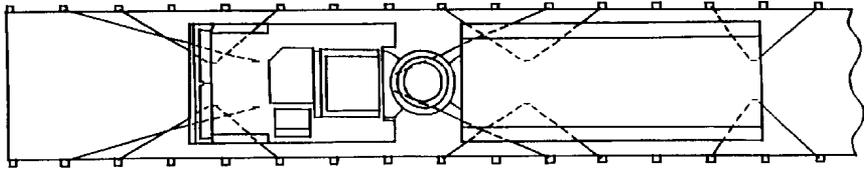
3. Some trailers have partial steel decking preventing the direct nailing of blocking. On these trailers the blocking must be secured to side stakes or fastened by other means.

Light Armored Vehicle up to 30,000 lb



Note: From figure 88-B, Section No. 6.

Logistics Vehicle System



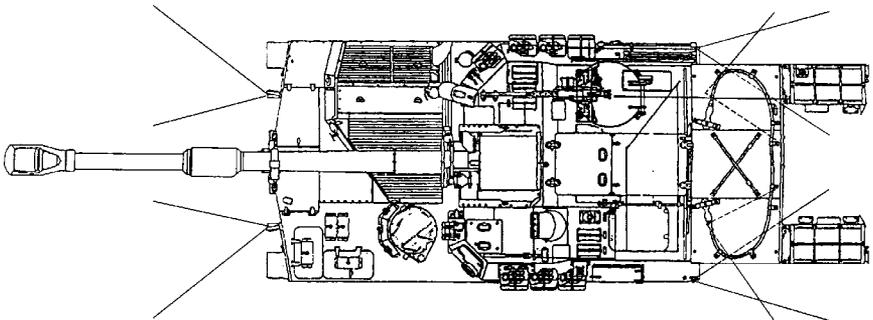
1/2" steel chain (22,500 lb minimum proof test value (WLL 11,250)), 16 required

Notes:

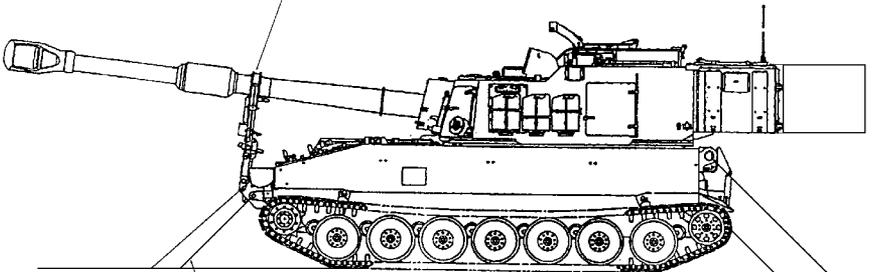
1. 5/8" wire rope may be used in place of the chains. Use complete loops with 4 clamps each.
2. If wire ropes are used, use the Pattern 16 chock block (8 required) and the Pattern 89 side block (except make all boards 108" long), 4 required. (see blocking)
3. Install and secure the lockout strut to prevent articulation.
4. From General Rules, Section No. 1.

M109A6 Paladin Howitzer

56,800 to 82,000 lb



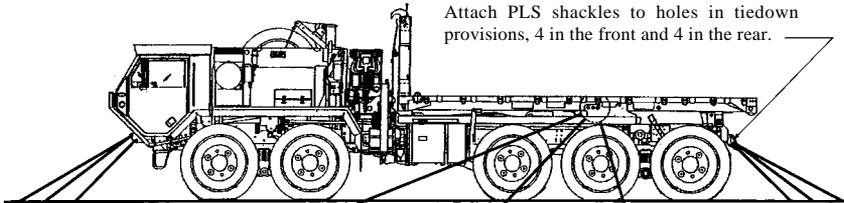
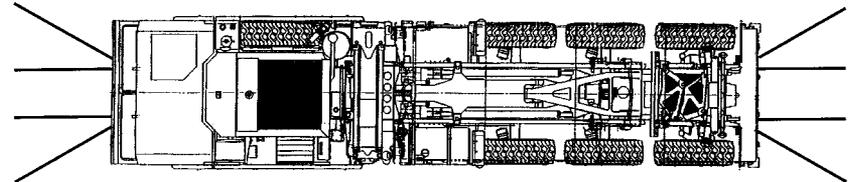
Barrel brace must be fully secured. If brace is not functional, secure barrel with two complete loops of 3/8" wire rope each with two clamps.



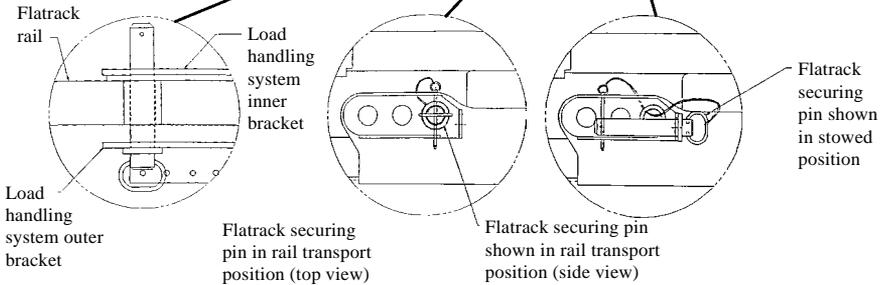
16 chains required per howitzer; 2 chains to each of the eight tiedown provisions: use 1/2" special alloy chain with a minimum working load limit (WLL) of 13,750 lb. (The eight provisions each require a shackle such as for the Bradley, NSN 4030-01-187-0964.)

Note: From figure 78-B, Section No. 6.

M1074/M1075 Palletized Load System (PLS) Truck



Attach PLS shackles to holes in tiedown provisions, 4 in the front and 4 in the rear.



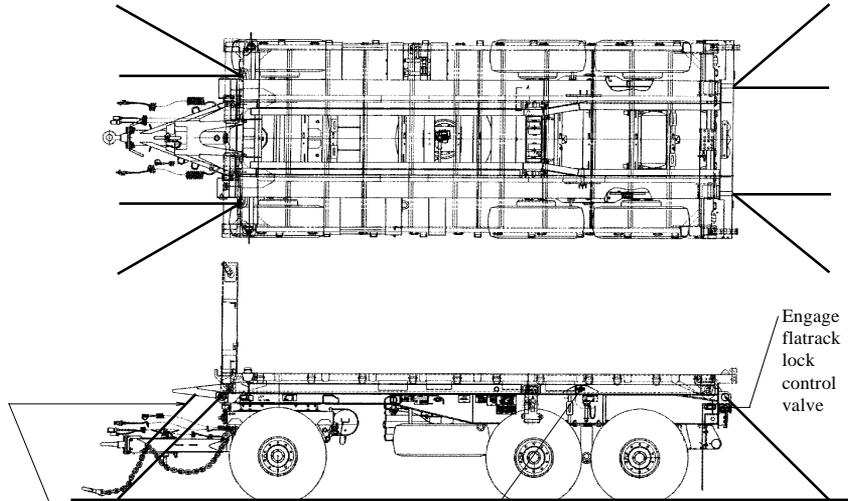
Notes:

1. The majority of chains should go to the center tiedown channels.

2. From Figure 88-C, Section No. 6.

| Vehicle Weight Ranges (lb) | Alloy Steel Chain | | |
|----------------------------|-------------------|---------------------------------|---------------------------------------|
| | Dia (in.) | Minimum Working Load Limit (lb) | Number of Chains Required Per Vehicle |
| 49,500-82,000 | 1/2 | 13,750 | 12 |
| 82,000-88,000 | 1/2 | 13,750 | 16 |

M1076 Palletized Load System (PLS) Trailer



Secure drawbar in shortest position. With drawbar raised horizontal, secure drawbar safety chain attachment point to bumper with one complete loop of 3/8" wire rope pulled snug, fastened with 4 clamps. If desired, drawbar may be lowered onto a piece of 2" lumber nailed to the deck. Secure drawbar down with two chains.

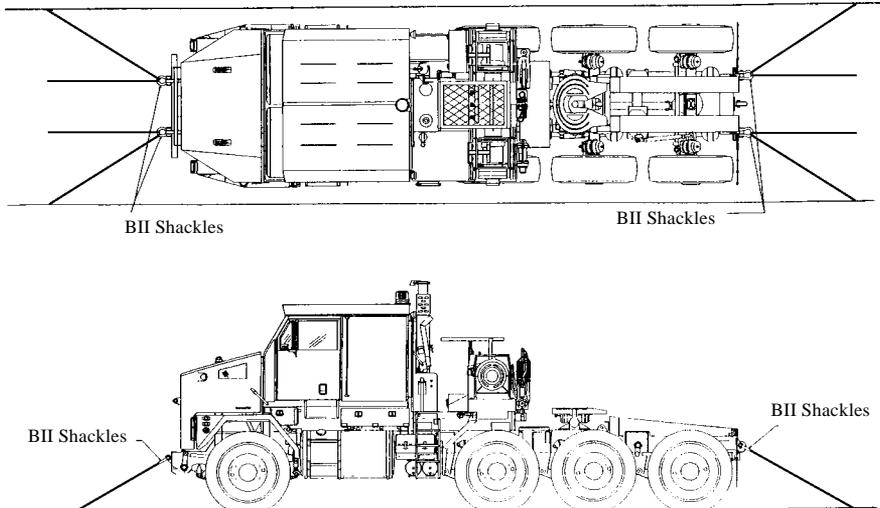
Install 2 removable plates (one on each side of trailer) and then install the 2 flattrack securing pins.

Engage flattrack lock control valve

| Vehicle Weight Ranges (lb) | Alloy Steel Chain | | |
|----------------------------|-------------------|---------------------------------|---------------------------------------|
| | Dia (in.) | Minimum Working Load Limit (lb) | Number of Chains Required Per Vehicle |
| 16,500-27,500 | 1/2 | 13,750 | 4 |
| 27,500-55,000 | 1/2 | 13,750 | 8 |

Note: From Figure 88-C, Section No. 6.

M1070 Tractor (41,000 lb)

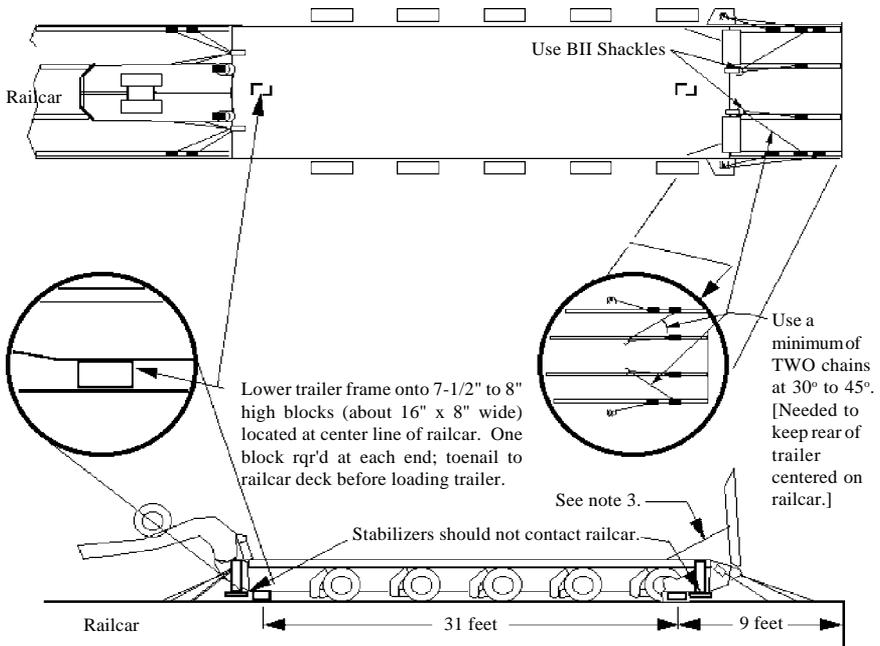


Notes:

1. 1/2" steel chain (27,500 lb minimum proof test value (WLL 13,750)), 8 required.
2. BII shackles, NSN: 4030-01-408-2774, WLL 17T, 1-3/8" screw pin anchor shackle with cotter pin.
3. From figure 88-B, Section No. 6.

M1000 Trailer

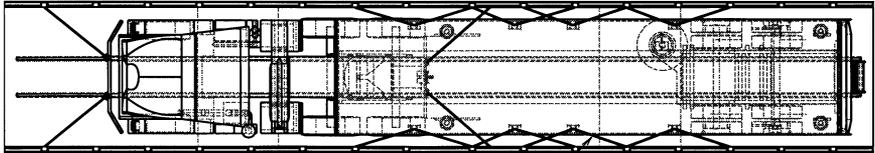
50,500 lb Empty



Notes:

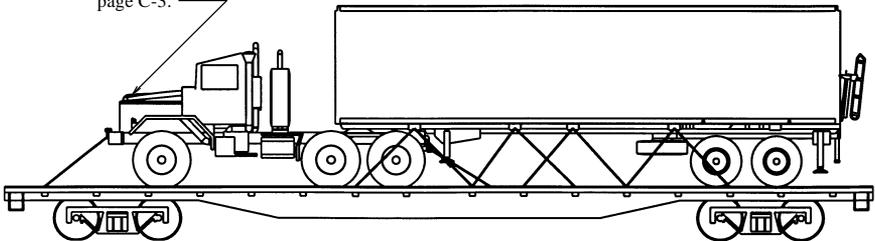
1. Use OTTX (or equal) Chain Tiedown Railcar: 16 chains (8 at each end) 3/8" chain for empty (unloaded) M1000.
2. HTTX (and other) railcars equipped with 1/2" chain: 12 chains (6 at each end) may be used for empty M1000; 20 chains (10 at each end) must be used for the loaded M1000 (50,500 lb. max load).
3. Onboard chains.
4. From General Rules, Section No. 1.

M129A4 and M1063 Semitrailers
(If TOFC Is Not Available)
Semitrailer 16,000 lb Empty to 41,000 lb Fully loaded



Secure semitrailer with 16 chains,
as shown, regardless of chain size.
Use 3/8-inch or larger chain.

Tie down tractor as
if it is by itself, see
page C-3.



Notes:

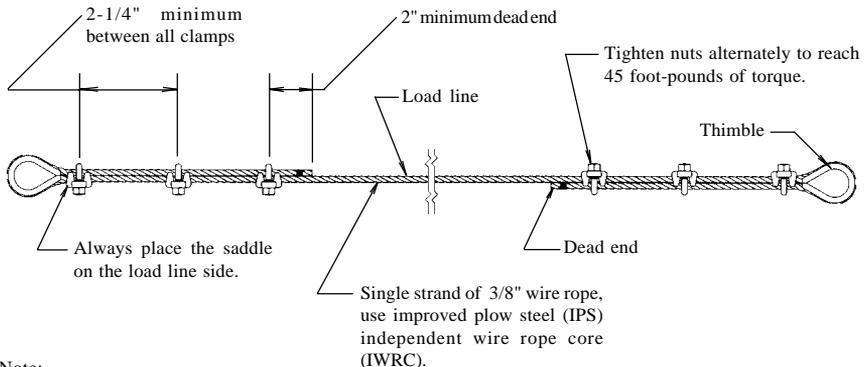
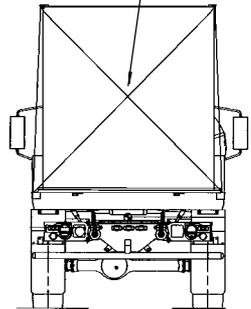
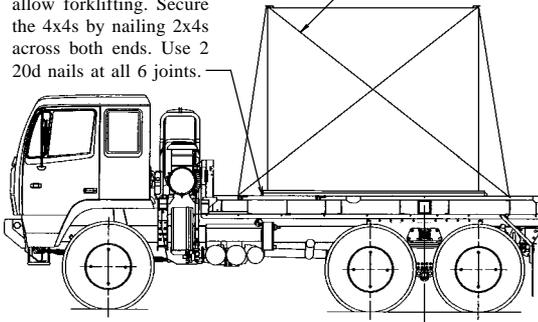
1. From General Rules, Section No. 1.
2. This may also be used for all semitrailers with bar tiedown provisions built into the semitrailer underframe.
3. This semitrailer figure (requiring more than 4 tiedown chains for the semitrailer) is a procedural fix for a vehicle with inadequate transportability. Do not use this figure as a basis of design for new or rebuy vehicles.

CONEX or ISU Container on 5-Ton Trucks

Single strand of 3/8-inch wire rope with a loop and thimble at both ends, each secured with 3 wire rope clamps (8 places, see details below).

Place 3 4x4s along the truck bed to protect the bottom of the ISU and to allow forklifting. Secure the 4x4s by nailing 2x4s across both ends. Use 2 20d nails at all 6 joints.

Protect the wire ropes from chafing where they cross with rubber hose, soft sheet metal, or other means secured to stay in place (4 places).



Note:

1. From General Rules, Section No. 1. See page C-3 for tiedown of the truck to the flatcar.
2. If you use shackles to attach the wire rope to the tiedown rings, use at least 1/2-inch, 2-ton working load limit (WLL) safety anchor shackles and make certain the nut is secured with the cotter pin.
3. Use the same procedure for each container loaded on a flatbed semitrailer.

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