DEPARTMENT OF THE ARMY TECHNICAL MANUAL

TRANSPORTABILITY GUIDANCE

WATER PURIFICATION EQUIPMENT SET, TRUCK-MOUNTED,

DIATOMITE FILTER, 3,000-GALLON PER HOUR

Headquarters, Department of the Army, Washington, D.C.

23 June 1967

1. Purpose and Scope

a. This manual provides transportability guidance for movement of the water purification equipment set, truck-mounted, diatomite filter, 3,000-gallon per hour, FSN 4610-2028701 (fig. 1). It covers significant transportability and safety considerations in the movement of the item by the various modes of transport. The M105A2 cargo trailer, which is a component of the set, presents no transportability problems; therefore, it is discussed only where necessary. Included are side- and end-elevation drawings (figs. 2 and 3) and characteristics of the item.

b. Users of this publication are encouraged to submit recommended changes and comments for its improvement. Comments should be keyed to the specific page, paragraph, and line of the text in which the change is recommended. Reasons should be provided for each comment to insure understanding and complete evaluation. Comments should be forwarded to the Director, U.S. Army Transportation Engineering Agency, Military Traffic Management and Terminal Service, ATTN: MTT-TG, Fort Eustis, Va., 23604.

2. Description

The water purification equipment set consists of a truck-mounted van, a 1 1/2-ton cargo trailer, and the other components required to assemble a portable water treatment plant. The set is available with winch (WWN) or without winch (WOWN). The trailer is used for transporting those components of the set that cannot be stowed inside the van. See paragraph 6 for characteristics of the set.

Note. For shipment by air, the dimensional and weight characteristics of the cargo trailer are considered in this manual; other modes of transport for the trailer are not included. See paragraph 6 for measurements and weight of the cargo trailer.

3. Modes of Transport

a. Shipment by Air.

(1) The item cannot be transported by U.S. Army aircraft.

(2) Based on a typical logistical mission of 2,500 nautical miles (4630 km), one way, the item can be transported by U.S. Air Force aircraft as follows:

(a) Not sectionalized, with winch, with trailer: C-133-series U.S. Air Force aircraft.

(b) Not sectionalized, with winch, without trailer: C-124C and C-133 series U.S. Air Force aircraft.

(c) Sectionalized (para 4), with winch, with trailer (trailer at reduced

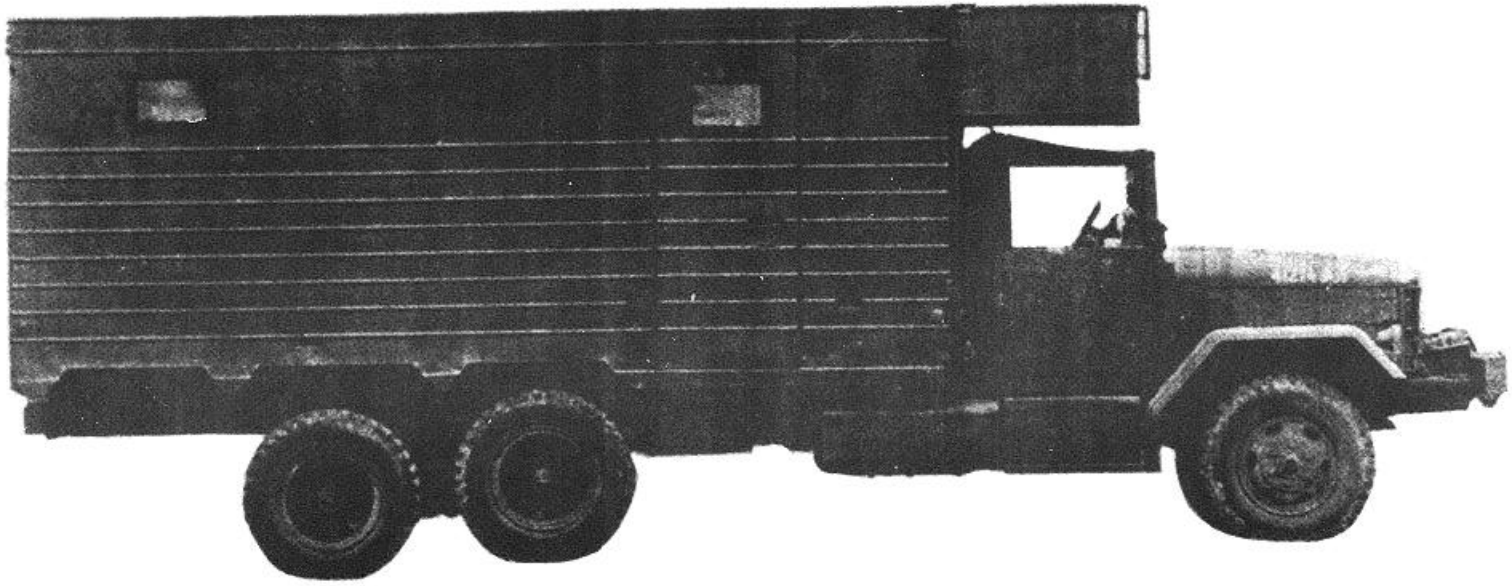

Figure 1. Water purification equipment set, truck-mounted, diatomite filter, 3,000-gallon per hour (shown with winch).

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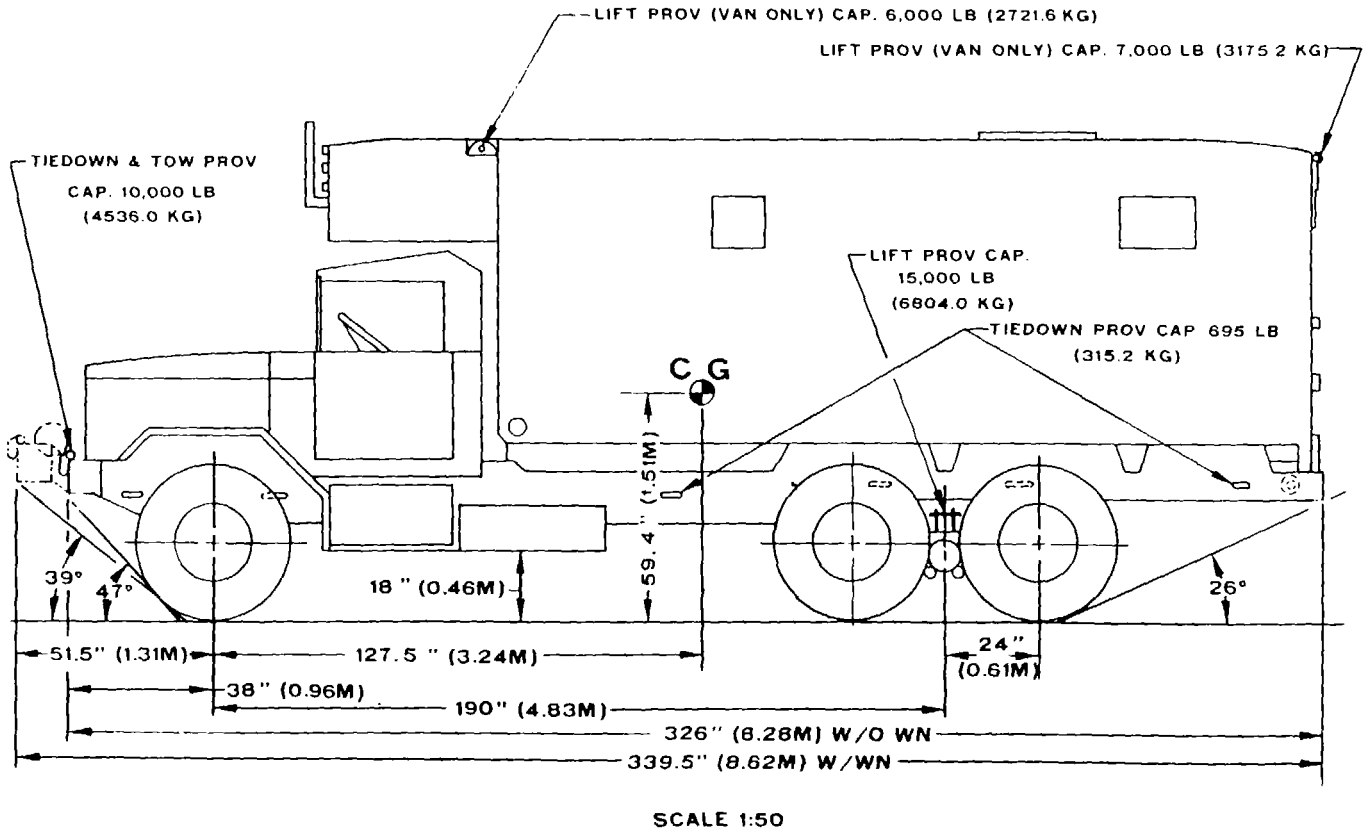

Figure 2. Side elevation.

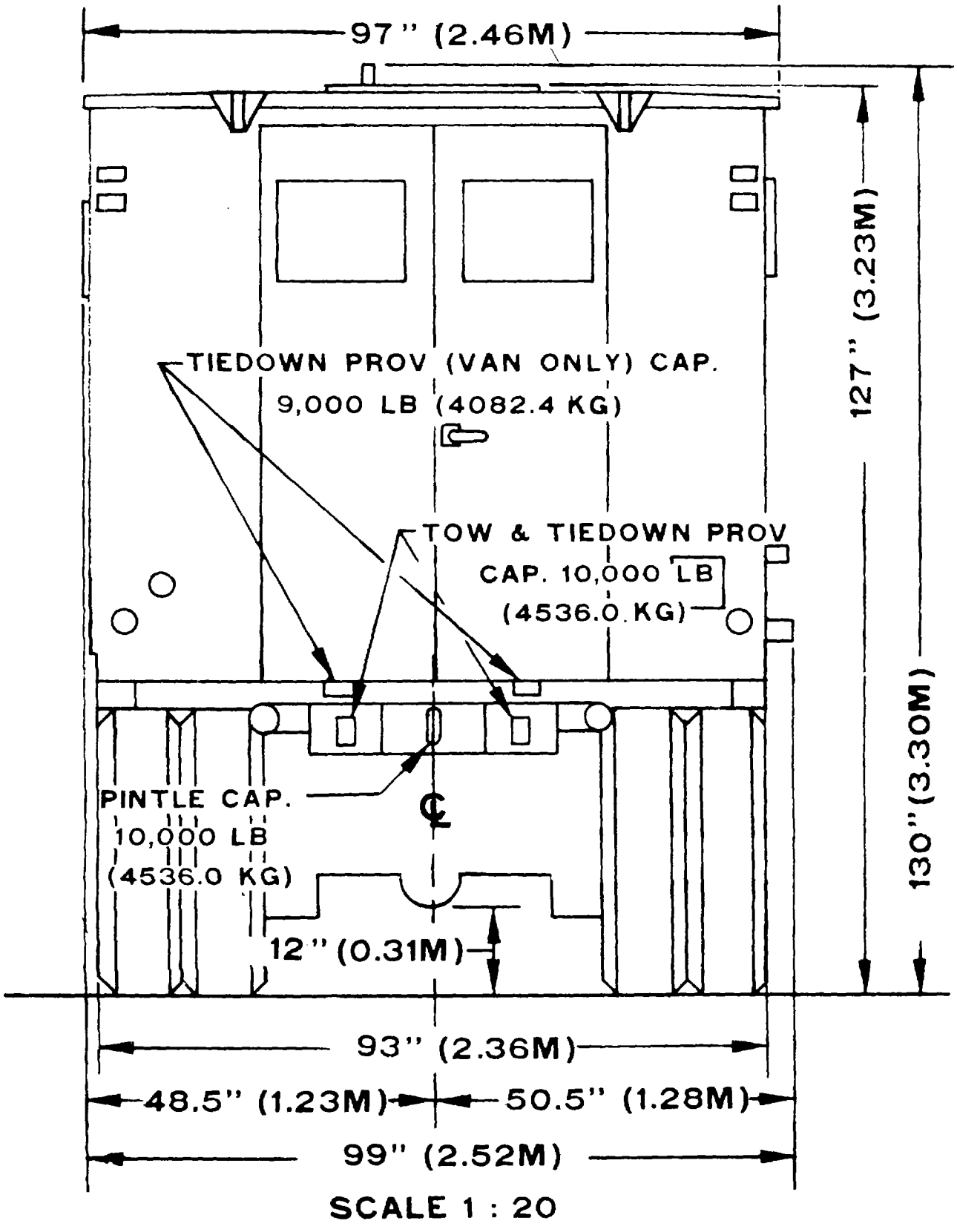

Figure 3. End elevation.

height, wheels removed, positioned and secured on top of truck chassis, wooden platform under trailer axle): C-130E, C-133-series, and C-141A U.S. Air Force aircraft.

(3) Based on a typical logistical mission of 1,000 nautical miles (1852 km), one-way, the item can be transported by U.S. Air Force aircraft as follows:

(a) Not sectionalized, with winch, with trailer: C-124- and C-133-series U.S. Air Force aircraft.

(b) Not sectionalized, with winch, without trailer: C-124- and C-133-series U.S. Air Force aircraft.

(c) Sectionalized (para 4), with winch, with trailer (trailer at reduced height, wheels removed, positioned and secured on top of truck chassis, wooden platform under trailer axle): C-124-, C-130-, C-133-series, and C-141A U. S. Air Force aircraft.

Note. The maximum U.S. Air Force aircraft cargo weight and range capabilities

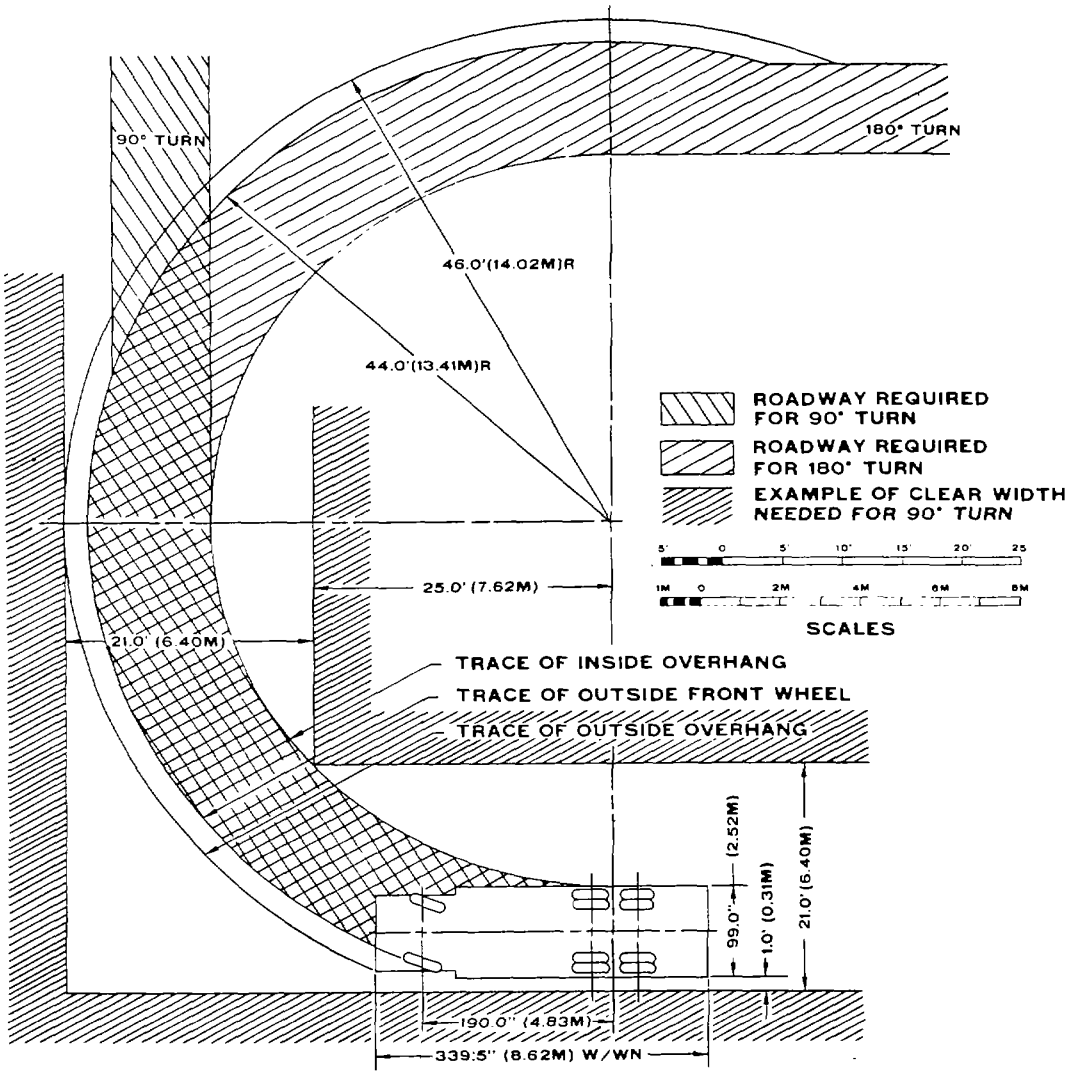

Figure 4. Turning characteristics diagram.

bilities are based on the following conditions:

Standard (lay conditions
Sea level operating conditions
Hard-surfaced runways
No weather alternate required
No wind conditions
Fuel reserve
Constant cruising altitude

In the event one or more of these operating conditions are changed, the maximum cargo load and/or range may be affected.

b. Shipment by Highway.

(1) *On road*. The item can be transported on highway under its own power. The item width is 3 inches (0.08 m) in excess of legal highway limitations in CONUS and the recommended highway limitations in overseas areas. Special permits will be required in CONUS, and special routing may be required overseas. Turning characteristics of the item are shown in figure 4.

(2) *Off road: soils trafficability data*. A vehicle cone index (VCI) is a number which tests have proven can be related to the characteristics of a particular vehicle (para 6). This number, when used in connection with the rating cone index (of the soil), can forecast the ability of that vehicle to repeatedly cross fine-grained soil, and sands with fines, poorly drained. The rating cone index is obtained by use of the cone penetrometer and its associated equipment. See TB ENG 37 for use of the equipment in the field and for interpretation of index numbers.

c. Shipment by Rail. Within CONUS, the item loaded on a railroad flatcar can be transported without sectionalization within the "Outline Diagram for Single Loads, Without End Overhang, on Open Top Cars." * In countries complying with the Berne International Rail Interchange Agreement, the item can be transported by rail without sectionalization but exceeds the height limitations, and verification of line clearance will be required. After sectionalization as described in paragraph 4, the item can be transported, without limitation, as two separate components. See appendix I for information regarding blocking and restraining the item on railroad flatcars.

d. Shipment by Water. The item can be transported by inland waterway cargo carriers and lighters of adequate capacity. It can also be shipped by Mariner-, Victory-, and Liberty-class seagoing vessels, subject to the following limitations:

Class	*Hatch size adequate*	*Hatch boom adequate*	*Hatches requiring terminal crane*
Mariner	No. 2, 3, 4, 5, 6, 7	No. 2, 3, 4, 5, 6	No. 7
Victory	No. 3, 4	No. 3, 4	None
Liberty	No. 1, 2, 4, 5	No. 2, 4	No. 1, 5

4. Sectionalization

a. The overall height can be reduced from 130 inches (3.30 m) to 127 inches (3.23 m) by removing the personnel heater exhaust pipe.

b. For shipment by air (para 3a(2) (c) and (3) (c)) and for unrestricted rail transport within countries complying with the Berne International Rail Interchange Agreement (para 3c), the van body must be removed from the truck chassis. See figure 5 for sectionalization diagram. This sectionalization should be accomplished by qualified personnel as follows:

(1) Disconnect the personnel heater fuel line from the truck fuel tank.

(2) Disconnect the running-light electrical connections, and tape or tie as necessary to preclude pinching or entanglement.

(3) Remove the spare tire for access to van body mounting brackets. Replace spare tire after removing holddown bolts.

(4) Remove the ten 15/16-inch holddown bolts. Tape bolts and nuts together and stow in van body.

(5) Lift the body from the chassis, using four cables with shackles connected to the lift provisions at the four top corners of the van.

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*Detailed information available in Railway Line Clearance publication.

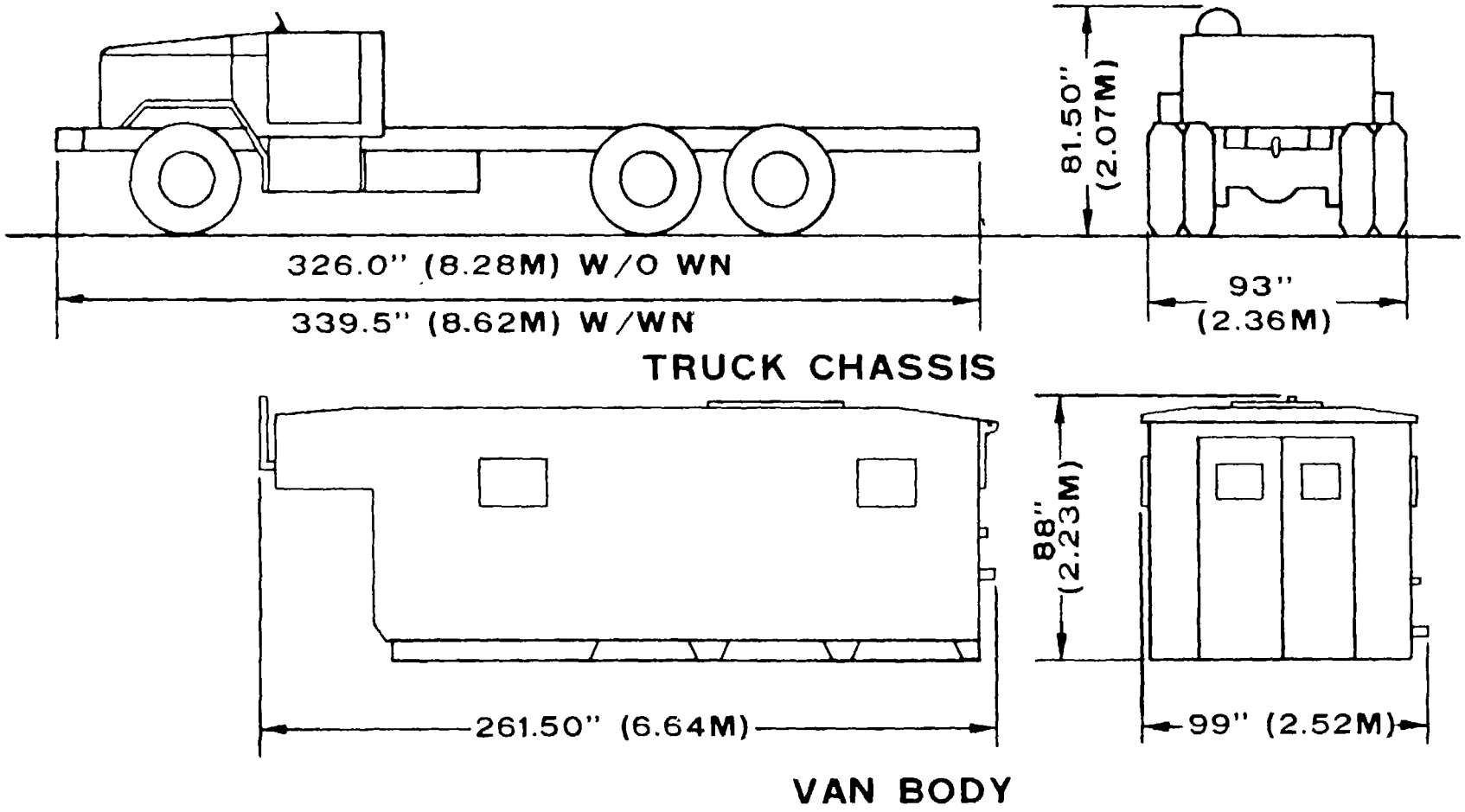

Figure 5. Sectionalization diagram.

Note. See chapter 3, TM 5-4610-203-35 for detailed instructions regarding removal of van body.

5. Precautionary Loading Procedures to Prevent Chassis Bending

Upon receipt of a request for shipment of the water purification set, CONUS depots ol0 other authority responsible for the shipment should take the following action:

a. Mark both sides of the van body with 2inch high white letters:

"CAUTION-SENSITIVE ITEM-SEE LOADING INSTRUCTIONS"

b. Attach a packet to the van marked "LOADING INSTRUCTIONS," to read as follows:

(1) Do not load with front lifting point or use sudden jerking motions in raising or lowering the equipment.

(2) Alternate methods of loading:

(a) Roll on, roll off.

(b) Use the overpacked lifting kit, and refer to the installation instructions contained in the applicable Department of the Army technical manual and/or modification work order.

(c) Put entire truck on platform or net, and load using spreader bars.

Note. Unloading procedures should also comply with (1) and (2) above.

c. Notify the applicable receiving agency of the FSN, requisition number. and date of arrival of the sensitive equipment.

6. Item Characteristics and Related Data

(Data based on item in operating condition without chemicals, and without trailer unless otherwise indicated.)
Nomenclature-Water Purification Equipment Set, Truck-Mounted, Diatomite Filter, 3,000-gallon per hour.

FSN	4610-202-8701
LIN	Y36034
Type Classification	Standard A

	WWN	*WOWN*
Item Weight:		
Front Axle	7,020 lb (3184 kg)	6,526 lb (2960 kg)
Bogie	14,400 lb (6532 kg)	14,484 lb (6570 kg)
Total	21,420 lb (9716 kg)	21,010 lb (9530 kg)
Center of Gravity:		
Above Ground	59.4 in. (151 m)	59.4 in. (1.51 m)
From CL Front Axle	127.5 in. (3.24 m)	131 in. (3.32 m)
Angle of Approach	39°	47°
Angle of Departure	26°	26
Turning Radii (R&L Over Front Bumper)	46 ft (14.03 m)	45 ft (13.72 m)
Dimensions and Shipping Data, Van Body on Truck Chassis (Without Trailer):		
Length	339.5 in (8.62 m)	326 in. (8.28 m)
Width	99 in. (2.52 m)	99 in. (2.52)
Height, Operational	130 in. (3.30 m)	130 in. (3.30 m)
Height, Reduced	127 in. (3.23 m)	127 in. (3.23 m)
Volume, Operational	2,528 cu ft (71.6 cu m)	2,427 cu ft (68.7 cu m)
Volume, Reduced	2,470 cu ft (70 cu m)	2,371 cu ft (67.1 cu m)

Area	233.4 sq ft (21.7 sq m)	224.1 sq ft (20.8 sq m)
Weight	21,420 lb (9716 kg)	21,010 lb (9530 kg)

Dimensions and Shipping Data,
Truck Chassis, Van Body,
Cargo Trailer.

Truck Chassis, M46:

Length	339.5 in (8.62 m)	326 in. (8.28 m)
Height	93 in. (2.36 m)	93 in. (2.36 m)
Width	81.5 in. (2.07 m)	81.5 in. (2.07 m)
Volume	1,489.2 cu ft (42.1 cu m)	1,429.6 cu ft (40.5 cu m)
Area	219.2 sq ft (20.4 sq m)	210.5 sq ft (19.6 sq m)
Weight	11,270 lb (5112 kg)	10,860 lb (4926 kg)

Van Body:

Length	261.5 in. (6.64 m)
Width	99 in. (2.52 m)
Height, Operational	88 in. (2.23 m)
Height, Reduced	85 in. (2.16 m)
Volume, Operational	1,318.4 cu ft (37.3 cu m)
Volume, Reduced	1,273.4 cu ft (36.0 cu m)
Area	179.8 sq ft (16.7 sq m)
Weight	10,150 lb (4604 kg)

Cargo Trailer, M105A2:

Length	166.in. (4.22 m)
Width	83 in. (2.11 m)
Height, Operational	98 in. (2.49 m)
Height, Reduced	55 in. (1.40 m)
Volume, Operational	781.4 cu ft (22.1 cu m)
Volume, Reduced	438.5 cu ft (12.4 cu m)
Area	95.7 sq ft (8.9 sq m)
Weight (Curb)	2,670 lb (1211 kg)

Vehicle Classification 9

Soils Trafficability Data (para 3b (2)):

Water Purification Equipment Set, With Personnel-21,820 lb (9898 kg)	VCI 65

CONUS Freight Classification	Freight Automobiles
Uniform Freight Classification (UFC)	93340
National Motor Freight Classification (NMFC)	190190

Tire Size ..... 9:00 x 20 (0.23 x 0.51 m), 8-ply

Tire Pressure:

Highway	45 psi (3.16 kg/sq cm)
Cross-Country	45 psi (3.16 kg/sq cm)
Mud, Sand, Snow	15 psi (1.06 kg/sq cm)

Publications ..... TM 5-4610-203-12
TM 5-4610-203-35
TM 9-2320-209-series
TB ENG 37
SC 4610-93-CL-E06

Blocking and Restraining Item on Railroad Flatcars With Wooden Floors'

1. Bill of Material

Type of Material	*Quantity*
a. Lumber	
2- x 4-in ..	54 ft
2- x 6-in	18 ft
6- x 8-in .	24 ft
b. Nails	
12d	30
20d	72
40d	60
c. Wire	
No. 8 gage, annealed, black	300 ft (item E) * 300 ft (item F)
d. Rope	
Steel cable, ½/-in. dia	100 ft * *
e. Clips	
Wire rope, ½/-in	20* *
f. Thimbles	
Std, 1/2-in., open-type	4* *
g. Waterproof paper or burlap	As required

2. Material Specifications

a. Lumber

Douglas fir, or comparable lumber, straight-grain, free from material defects, fed spec MM-L-751.

b. Nails

Common, cement-coated, fed spec FF-N-105.

c. Wire

No. 8 gage, annealed, black, fed spec QQ-W-461.

d. Rope

1/2-in., 6 x 19, IWRC, steel cable, fed spec RR-W-410

e. Clips

"U-bolt", ½-in, Crosby, heavy-duty, or equal

3. Application of Materials

(figs. 6, 7, and 8)

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* Not required if ,-in. wire rope is used for item E.

* * Not required if No, 8 gaze wire is used for item E.

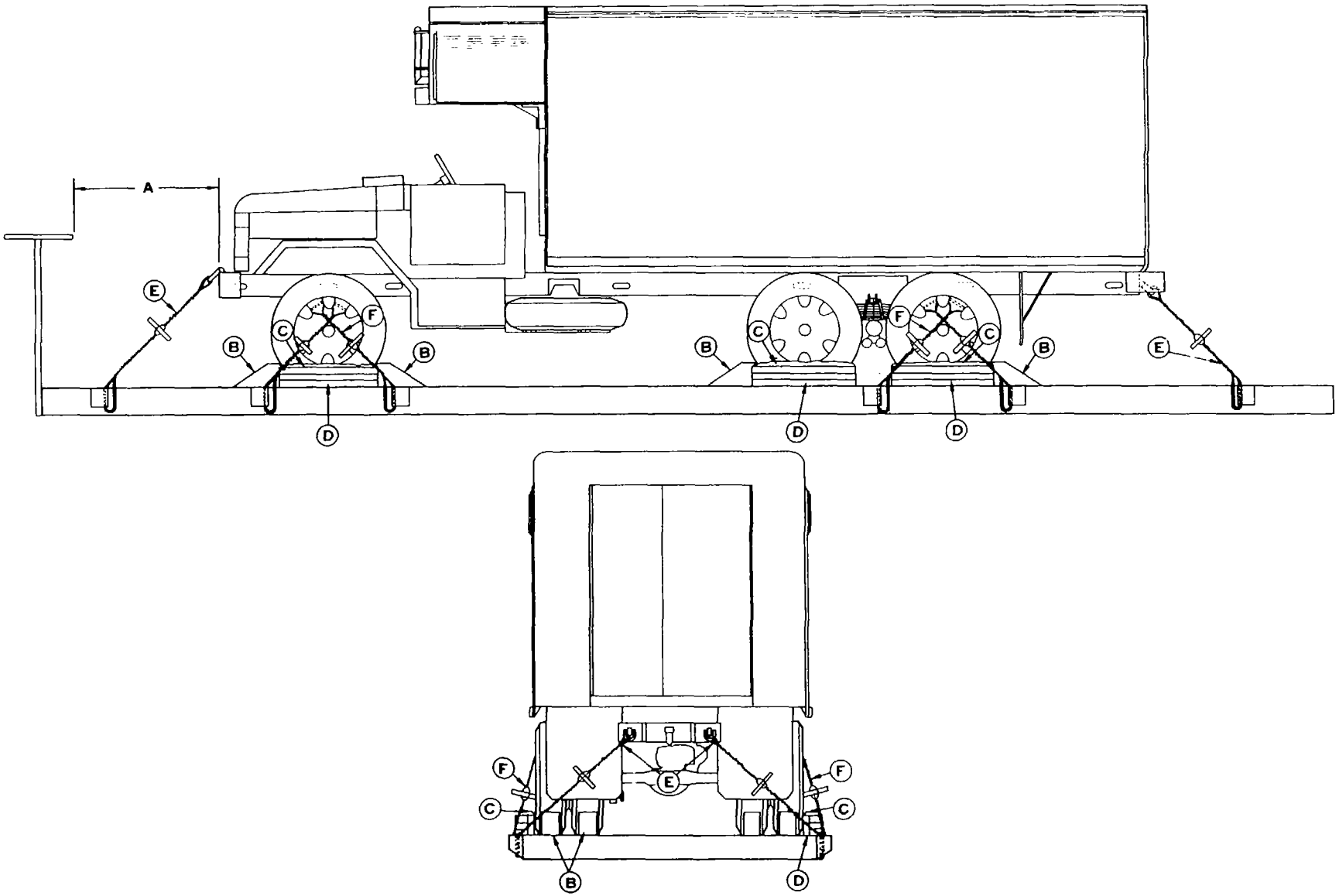
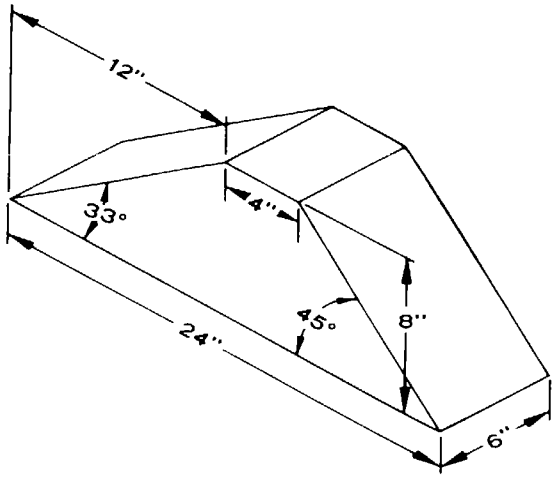
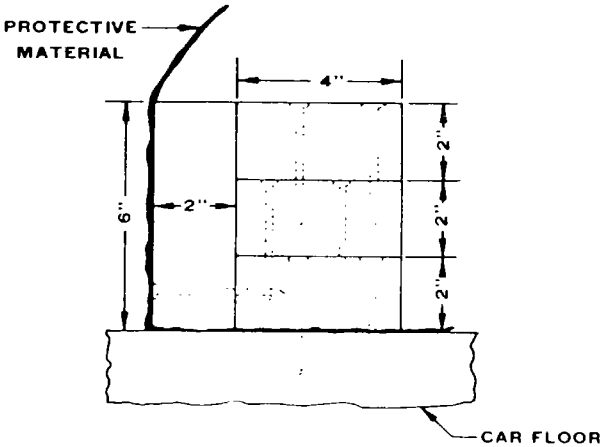


Figure 6. Blocking and restraining diagram.



SKETCH 1



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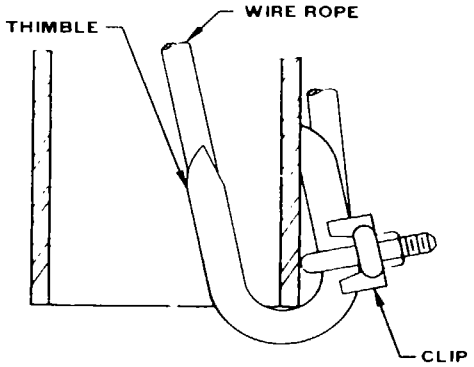

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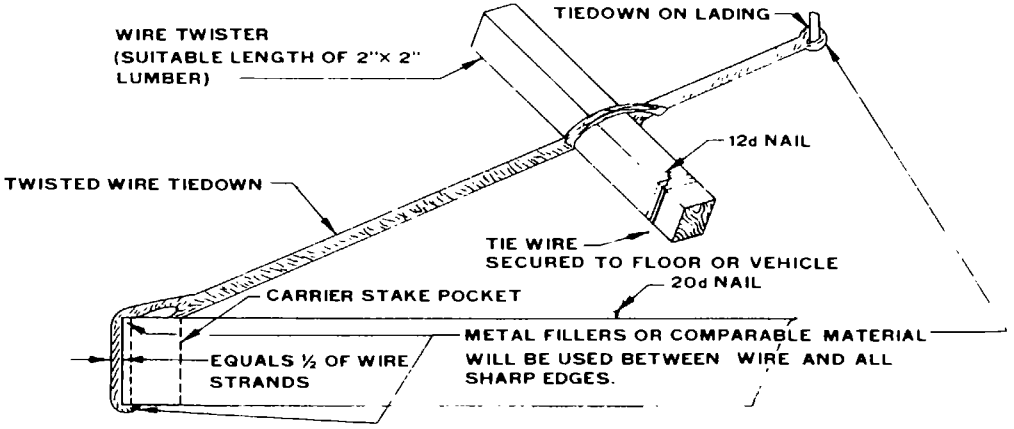

SKETCH 4

Figure 7. Blocking and restraining detail diagram.

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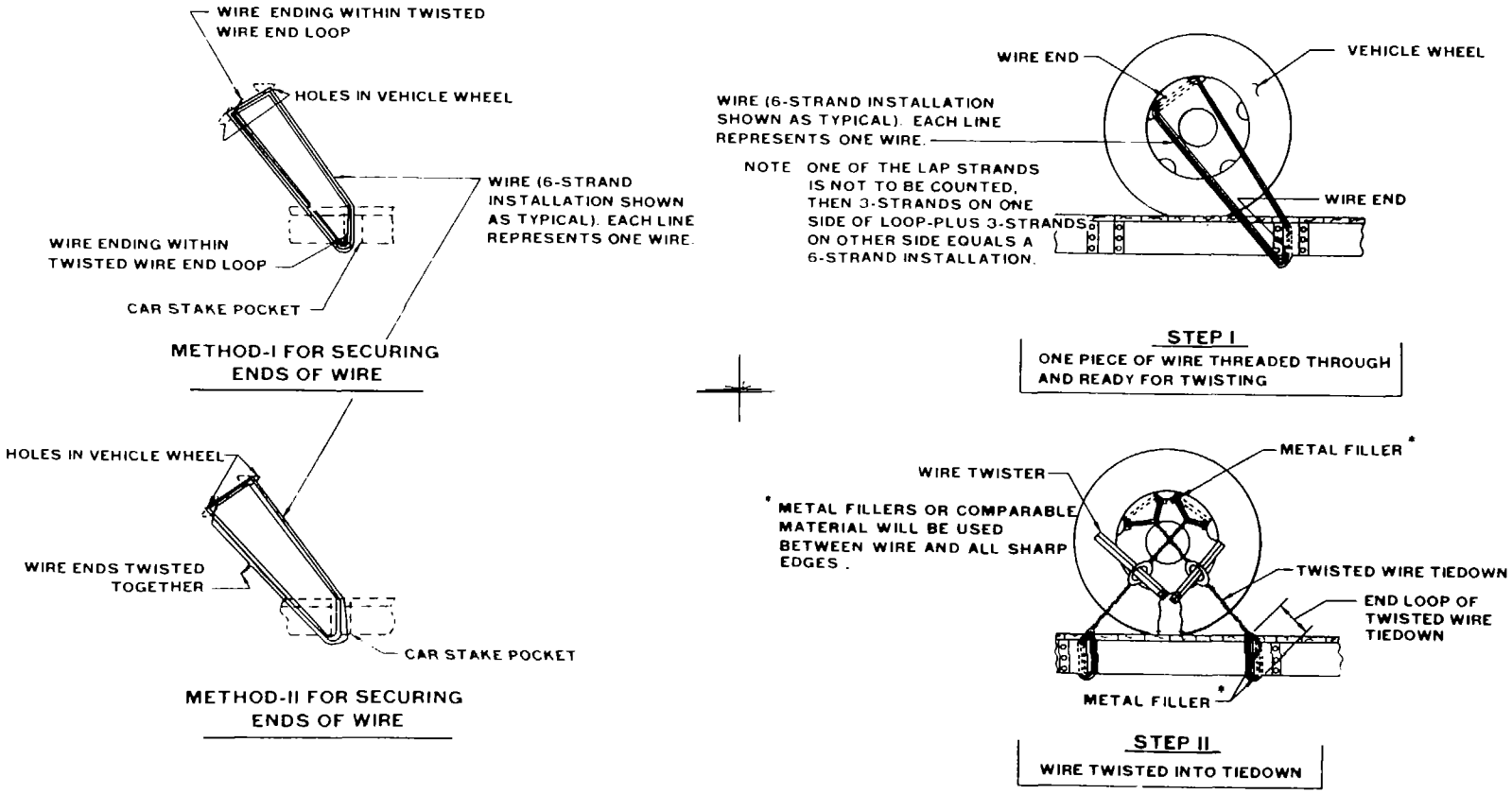

Figure 8. Restraining detail diagram.

Item	*No. of Pieces*	*Application*
A	--------	Brake wheel clearance. Minimum clearance required is 6 in. above, in back of, and on both sides of and 4 in. underneath wheel.
B	12	Block (Sketch 1, fig. 7), 6- x 8- x 24-in. ,Locate 450 portion of block against front and rear of front wheels, in front of inside and outside intermediate wheels, and in back of inside and outside rear wheels. Nail heel of the block to the car floor with three 40d nails, and toenail that portion of the block under the tire to the car floor with two 40d nails before items C and D are applied.
C	1 each item D	Suitable material, such as waterproof paper or burlap, etc. Locate bottom portion under item D, and top portion to extend 2 in. above item D (sketch 2, fig. 7).
D	6	Blocks, each to consist of one piece of 2- x 6- x 36-in. lumber and three pieces of 2- x 4- x 36-in. lumber (sketch 2, fig. 7). Nail one edge of the 2- x 6- x 36-in. piece to the bottom 2- x 4- x 36-in. piece with five 12d nails. Then place against the tire and nail to the car floor through the 2- x 4- x 36-in. piece with four 20d nails. Nail the other two 2- x 4- x 36-in. pieces to the one below in the same manner.
E	4	No. 8 gage black annealed wire, six strands (4c and e below). Attach to the shackles located at each end of the item and to stake pockets on the same side of the car. Metal fillers sufficient to provide a suitable radius must be used to protect the wire at stake pockets and applied so as to prevent dislodgement. Twist wires taut with a rod, bolt, or suitable length of 2- x 2- in. lumber, and secure to preclude unwinding (sketch 4, fig. 7). Substitute, if desired, 1/2-in. IWRC steel cable, in a complete loop, and secure with four 1/,-in. cable clips. Thimble must be used at stake pocket to protect the the cable and must be secured to the cable "with one cable clip (sketch 3, fig. 7).
F	8	No. 8 gage black annealed wire, six strands. Pass through the spokes or holes in the front and rear wheels and through the care stake pockets (figs. 6 and 8, and para 4c and e below). Wires should be attached to the wheel above the midpoint and the twisted wire tiedowns installed so they form an "X" across the face of the wheel. Twist taut with a rod, bolt, or suitable length of 2- x 2-in. lumber, and secure to preclude unwinding.

4. General Notes

a. Load as shown is based on a flatcar 9 feet 2 inches wide (platform). Cars with wider platforms may be used.

b. All handbrakes will be applied with the hand levers wired or blocked. Gearshift levers for automatic or conventional transmissions must be placed and wire-tied in neutral position. Clutch pedal will be secured in depressed position by wiring to floorboard plate or by wiring a woodblock to the pedal shaft beneath the floorboard.

c. When No. 8 gage wire is used for tiedown purposes, the wire is to be threaded in a continuous length until all the required number of strands are formed (one complete loop consists of two strands).

d. Tires will be inflated to 10 psi above highway operating pressures.

e. If at any time this vehicle is shipped in a loaded condition and the combined weight of the vehicle and cargo exceeds 22,000 pounds, additional securement will be required as follows: Apply additional wheel tiedowns (item

F) to the intermediate wheels, and increase item E to 8 strands of No. 8 gage black annealed wire.

f. For further -details, refer to Association of American Railroads (AAR) "Rules Governing the Loading of Commodities on Open Top Cars" and General Rules 4, 5, 9, 14, 15, 19A and 19B therein.

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Instls (2)
Trans Dep (3)

NG: State AG (3).
USAR: None.
For explanation of abbreviations used, see AR 320-50.

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The Metric System and Equivalents

Linear Measure

1 centimeter = 10 millimeters = .39 inch
1 decimeter = 10 centimeters = 3.94 inches
1 meter = 10 decimeters = 39.37 inches
1 dekameter = 10 meters = 32.8 feet
1 hectometer = 10 dekameters = 328.08 feet
1 kilometer = 10 hectometers = 3,280.8 feet

Weights

1 centigram = 10 milligrams = .15 grain
1 decigram = 10 centigrams = 1.54 grains
1 gram = 10 decigram = .035 ounce
1 decagram = 10 grams = .35 ounce
1 hectogram = 10 decagrams = 3.52 ounces
1 kilogram = 10 hectograms = 2.2 pounds
1 quintal = 100 kilograms = 220.46 pounds
1 metric ton = 10 quintals = 1.1 short tons

Liquid Measure

1 centiliter = 10 milliters = .34 fl. ounce
1 deciliter = 10 centiliters = 3.38 fl. ounces
1 liter = 10 deciliters = 33.81 fl. ounces
1 dekaliter = 10 liters = 2.64 gallons
1 hectoliter = 10 dekaliters = 26.42 gallons
1 kiloliter = 10 hectoliters = 264.18 gallons

Square Measure

1 sq. centimeter = 100 sq. millimeters = .155 sq. inch
1 sq. decimeter = 100 sq. centimeters = 15.5 sq. inches
1 sq. meter (centare) = 100 sq. decimeters = 10.76 sq. feet
1 sq. dekameter (are) = 100 sq. meters = 1,076.4 sq. feet
1 sq. hectometer (hectare) = 100 sq. dekameters = 2.47 acres
1 sq. kilometer = 100 sq. hectometers = .386 sq. mile

Cubic Measure

1 cu. centimeter = 1000 cu. millimeters = .06 cu. inch
1 cu. decimeter = 1000 cu. centimeters = 61.02 cu. inches
1 cu. meter = 1000 cu. decimeters = 35.31 cu. feet

Approximate Conversion Factors

To change	*To*	*Multiply by*	*To change*	*To*	*Multiply by*
inches	centimeters	2.540	ounce-inches	Newton-meters	.007062
feet	meters	.305	centimeters	inches	.394
yards	meters	.914	meters	feet	3.280
miles	kilometers	1.609	meters	yards	1.094
square inches	square centimeters	6.451	kilometers	miles	.621
square feet	square meters	.093	square centimeters	square inches	.155
square yards	square meters	.836	square meters	square feet	10.764
square miles	square kilometers	2.590	square meters	square yards	1.196
acres	square hectometers	.405	square kilometers	square miles	.386
cubic feet	cubic meters	.028	square hectometers	acres	2.471
cubic yards	cubic meters	.765	cubic meters	cubic feet	35.315
fluid ounces	milliliters	29,573	cubic meters	cubic yards	1.308
pints	liters	.473	milliliters	fluid ounces	.034
quarts	liters	.946	liters	pints	2.113
gallons	liters	3.785	liters	quarts	1.057
ounces	grams	28.349	liters	gallons	.264
pounds	kilograms	.454	grams	ounces	.035
short tons	metric tons	.907	kilograms	pounds	2.205
pound-feet	Newton-meters	1.356	metric tons	short tons	1.102
pound-inches	Newton-meters	.11296			

Temperature (Exact)

°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C

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