CHANGE
No. 1

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, D.C., *21 October 1970*

Transportability Criteria and Guidance
LOADING AND UNLOADING MULTILEVEL RAILCARS AT MILITARY INSTALLATIONS IN THE UNITED STATES

TM 55-625, 15 August 1970, is changed as follows:

Page 3, Add the following caption under the illustration in the left-hand column: *"Figure 1. K loader in operation."*
Page 3, Figure 2. Add the following caption: *"Figure 2. Forklift in operation."*
Page 4, Figure 3. Add the following caption: *"Figure 3. Crane/ramp combination in operation."*
Page 4, Figure 4. Add the following caption: *"Figure 4. Crane/ramp combination in operation."*
Page 6, Figure 5. Add the following caption: *"Figure 5. A typical installation of a stationary ramp."*
Page 7, Figure 6. Add the following caption: "*Figure 6. A typical installation of a rail-mounted adjustable ramp."*
Page 8, Figure 7. Add the following caption: *"Figure 7. A typical mobile adjustable ramp."*
Page 9, Figure 8. Add the following caption: *"Figure 8. A typical installation of a flatcar-mounted adjustable ramp."*
Page 10, Figure 9. Add the following caption: *"Figure 9. A typical adjustable built-in ramp on a multilevel railcar in operating position."*

By Order of the Secretary of the Army:

W. C. WESTMORELAND,
General, United States Army,
Chief of Staff

Official:

KENNETH G. WICKHAM,
Major General, United States Army,
The Adjutant General.

Distribution:
Active Army:

DCSLOG (5)
USACDC (2)
USACDCTA (2)
USAMC (5)
USATACOM (5)
USAMECOM (5)
CONARC (5)
MTMTS (10)
EAMTMTS (10)
WAMTMTS (10)
USATEA (15)
Armies (CONUS) (5)
Centers (CONUS) (2)
Svc Colleges (2)
Br Svc Sch (2) except
USATSCH (5)
Army Deps (2)
Instl (CONUS) (2)

NG: None.
USAR: None.
For explanation of abbreviations used, see AR 310-50.

✩ U.S. GOVERNMENT PRINTING OFFICE: 1990 0 262-912 (20018)

This copy is a reprint which includes current pages from Change 1.

DEPARTMENT OF THE ARMY TECHNICAL MANUAL

Transportability Criteria and Guidance

LOADING AND UNLOADING MULTILEVEL RAILCARS AT MILITARY INSTALLATIONS IN THE UNITED STATES

Headquarters, Department of the Army, Washington, D. C.
15 August 1970

1. Purpose and Scope

a. This manual provides transportability criteria and guidance to the Department of Defense (DOD) in the movement of the multilevel railcars to Army, Air Force, Navy, and Marine Corps activities located in the Continental United States (CONUS). These criteria and guidance identify, define, and justify certain methods of loading and unloading multilevel railcars within CONUS and determine the feasibility of alternate methods, safety aspects, and other related data. These criteria and guidance are intended for military installations which load and/or unload shipments of multilevel railcars. This manual is to be used as a guide to the capabilities and limitations of the various methods of loading and unloading these railcars within CONUS.

b. The reporting of errors, omissions, and recommendations for improving this publication by the individual user is encouraged. Reports should be submitted on DA Form 2028 (Recommended Changes to Publications) and forwarded to the Director, U.S. Army Transportation Engineering Agency, Military Traffic Management and Terminal Service, ATTN: MTT-GD, Fort Eustis, Va. 23604.

2. General

a. In the field of rail transportation there has been a resurgence of automotive and vehicular traffic through the use of multilevel cars. The holding of this traffic depends entirely on the ability to transport these vehicles to destination on schedule, intact and damage free. The vehicle which is entrusted to the transporters' care and handling is a complex, precision-manufactured machine, worth thousands of dollars. Countless hours of engineering design, and manufacturing skill have gone into making it a durable piece of equipment designed to serve and satisfy specific requirements.

b. Carelessness with multilevel cars during switching operations and negligence in assuring proper placement within trains can result in damage to the vehicle before it arrives at its destination. When this happens, its value and utility may be affected and costly damage claims result. Multilevel railcars now in service within CONUS are designed specifically for safe transportation of automotive equipment.

c. Information is provided in the *Terminal Facilities Guides* (AR 55-357, AR 55-358, and AR 55-359) which describe the capability of an activity to receive freight and passengers by the various modes and methods of transportation. In addition, these guides specifically designate the optimum destination to be shown on Government bills of lading and transportation requests. Information is also given as to the ability of the installation to receive multilevel railcars and load and/or unload them, or whether it will receive shipment at some distant point which has the capability of loading and/or unloading them.

d. The Military Traffic Management and Terminal Service (MTMTS) *Vehicle Loading and Unloading Capability Guide* lists the Army, Air Force, Navy, and Marine Corps installations. It states whether the installation is capable of loading and/or unloading multilevel railcars and its saddlemount or vehicle-remount capabilities. When a ship ment of vehicles is made to a military installation, and the use of multilevel railcars is most economical, the MTMTS Freight Routing Department contacts the receiving Traffic Management Office to inquire if any means can be arranged to unload these multilevel cars. Installations which do not have the capability for unloading these cars usually improvise some economical means for unloading them or reject them in favor of singlelevel cars. When the nature of the movement exceeds the indicated capability of an activity, special arrangements must be established with the receiving activity prior to shipment.

e. Numerous routing releases are issued for shipments of vehicles by means of bilevel and/or trilevel railcars. These vehicles may be consigned to installations which, in many cases, do not have the capability for loading or unloading them. Consequently such shipments must be routed to points considerably distant from the final destination and require heavy additional costs for haulaway.

f. The Terminal Facilities Guides and the MTMTS Vehicle Loading and Unloading Capabilities Guide reveal the following:

	Army	Navy and Marine Corps	Air Force
Installations w/no capability to load and/or unload multilevel railcars	79	43	89
Installations w/capability to load and/or unload multilevel railcars	42	19	12
Installations w/capability at distant point	65	27.	58
Installations w/bilevel capability only	4	2.	2
Installations w/bilevel capability and w/trilevel at distant point	4	2.	0
Total number installations	194	93.	161*

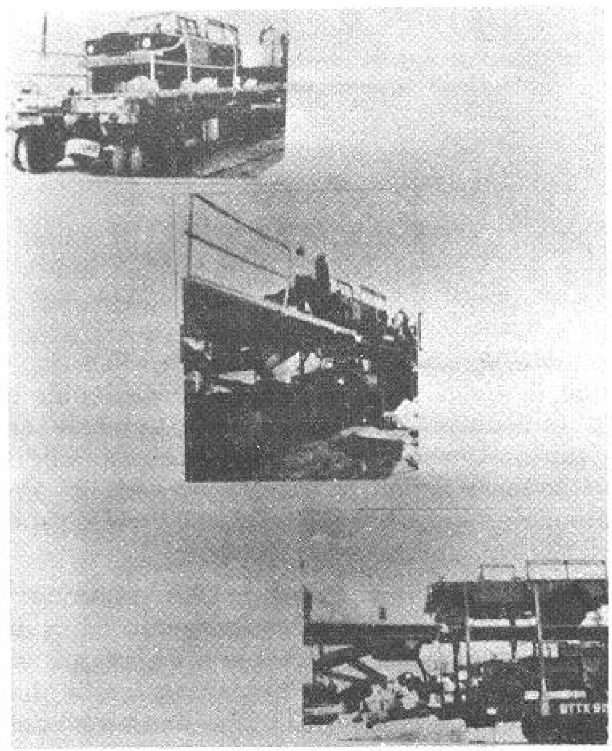
*Does not include Air Force stations.

g. By using multilevel railcars, it has been determined that labor and material costs are reduced approximately 66 percent, and freight and transportation costs are reduced approximately 48 percent. This is due to the fact that multilevel railcars are equipped with chains for tying down vehicles. These are used indefinitely; whereas on standard flatcars, blocking, dunnage, wire, etc., are used on a one-time basis.

3. Methods

There are essentially five methods of unloading multilevel railcars

a. The K Loader of the 463L Aircraft Cargo Loading System. This method is used at many Air Force installations. The primary function of these loaders is the loading and unloading of palletized cargo moving by Logair flights. The K Loader is available through commercial manufacturers and costs approximately $40,000. When this method is used, the loader is backed to the railcar, the lift body is raised to the level of the car floor, the vehicles are driven off the railcar onto the loader platform, the platform lowered, and the loader driven to a ramp where the vehicle is driven off. This procedure is repeated until the railcar has been completely unloaded. The average time to unload a railcar by this method is usually less than 1 hour. This method requires a trained K Loader operator, vehicle drivers, and laborers. See figure 1 for a K Loader in operation



b. The Forklift and Pallet, Used in Conjunction With a Crane and/or Ramp. This method is used at some installations where high ramps are not available. A crane is used to lift the vehicles from the top level of the railcar, the forklift and pallet are used to unload the middle level, and a conventional end ramp is used to unload the lower level. This equipment is usually standard TOE equipment which may be assigned to the various units located at the installation. The average time to unload a railcar by this method is approximately 2 hours and requires a trained crane operator, a forklift operator, vehicle drivers, and laborers. See figure 2 for forklift in operation.

Figure 2.

c. The Crane and Ramp Combination. With the crane and ramp combination, the following procedures are followed:

(1) On bilevel cars, the top level is unloaded either by an overhead or portable crane. The vehicles are lifted off the top level by using a spreader bar and slings attached to the vehicle lift points. The lower level vehicles are unloaded by towing or driving from the railcar to the ground by means of a ramp.

(2) On trilevel cars, the top level is unloaded by crane as above. The second and lower levels are unloaded by towing or driving the vehicles to the ground by means of a ramp, The crane is usually standard TOE equipment assigned to various units at the installation. The loading and unloading of the upper level by crane is estimated to require about 5 minutes per vehicle at a cost of approximately 30 cents per vehicle. No more lifting procedures are required for--the lifting operations of a 1 1/4-ton truck than for that of a 1/4-ton truck. Since the same principle applies when loading or unloading the center and lower levels, the cost factor would be the same for either the 1 1/4-ton or the 1/4-ton truck. The center and lower level cost is 98 cents per vehicle, requiring 15 minutes per vehicle. The tying and untying of the chains for loading and unloading of either type vehicle requires approximately

15 minutes per vehicle and a cost of 98 cents each. Based on the above, the cost of unloading the upper level is $1.28 per vehicle and the cost of the center and lower levels is $1.96 per vehicle. See figures 3 and 4 for crane/ramp combination in operation.

NOTE

All costs are approximate and may vary considerably. They are dependent upon the installation in question.

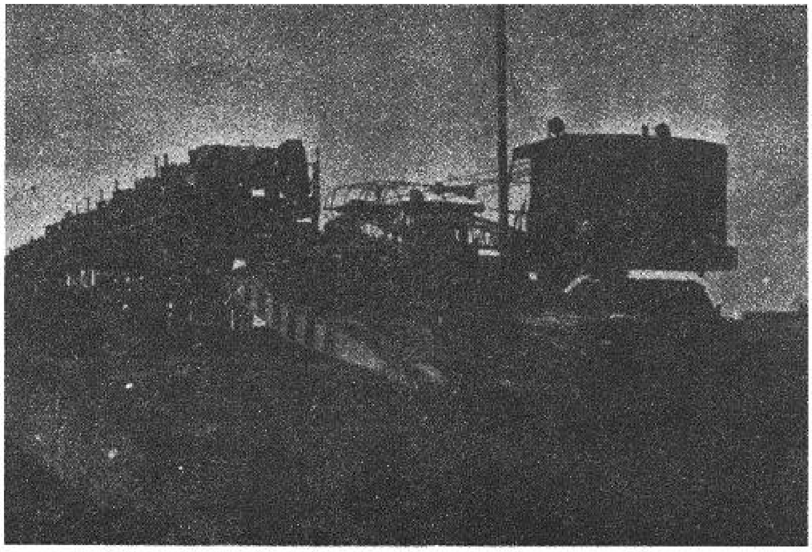


Figure 3.

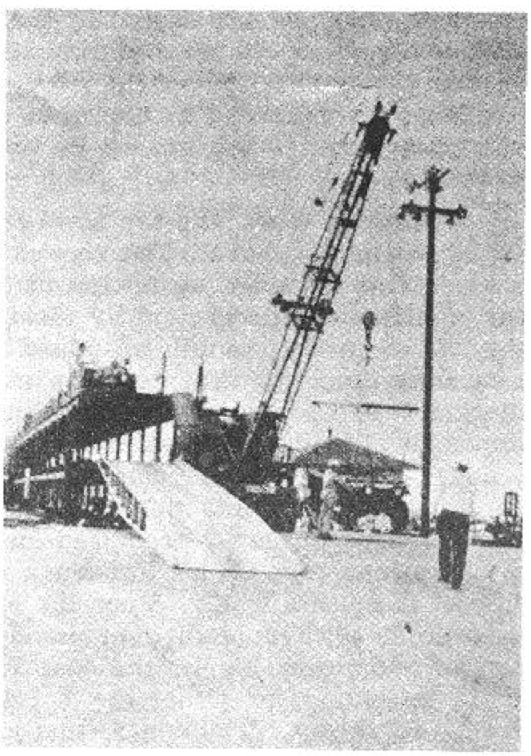


Figure 4.

d. Adjustable Ramps. When this type ramp is used, it is adjusted to all levels of the multilevel railcar, and the vehicles are driven or towed off the various levels. There are several types of adjustable ramps: the stationary type, the rail type, the mobile type, and the rail flatcar-mounted type.

(1) *Stationary ramp*. The stationary units are mounted permanently on piles in a fixed position and are used where a high volume of loading and unloading traffic dictates that a separate unit be used for each spur. A typical installation of a stationary ramp is show n in figure 5.

(2) *Rail type adjustable ramp*. To serve parallel spurs, a rail-mounted adjustable ramp unit is utilized. The rail for the ramp is set perpendicular to the spurs, permitting lateral movement. A rail-mounted unit is recommended only when total traffic is low enough to be handled by one unit. Models of this type can be obtained for mounting at ground level, on flat dock, or on piggyback dock. A typical rail-mounted adjustable ramp installation is shown in figure 6.

(3) *Mobile adjustable ramp*. Mobile units can be moved to any desired location.

This type eliminates turnaround to unload front end first. Mobile units can be obtained in either the trailer-mounted model, or the self-propelled model which can be driven and placed by one man. A typical mobile adjustable ramp is shown in figure 7.

(4) *Flatcar-mounted adjustable ramp.* Flatcar-mounted adjustable ramp units are usually used where unloading traffic does not justify a permanent installation. They also have the advantage of being able to accompany the multilevel shipments to points where no loading/unloading facilities are avail able. A typical installation of a flatcarmounted adjustable ramp is shown in figure 8.

e. Adjustable Built-In Ramp on Multilevel Railcars. The multilevel railcars equipped with ramps are designed to service points not having loading/unloading facilities. The ramp is hydraulically hand-operated and requires no outside power. Generally these cars are consigned to destinations where no loading/unloading facilities exist. A typical adjustable built-in ramp on a multilevel railcar is shown in operating position in figure 9.

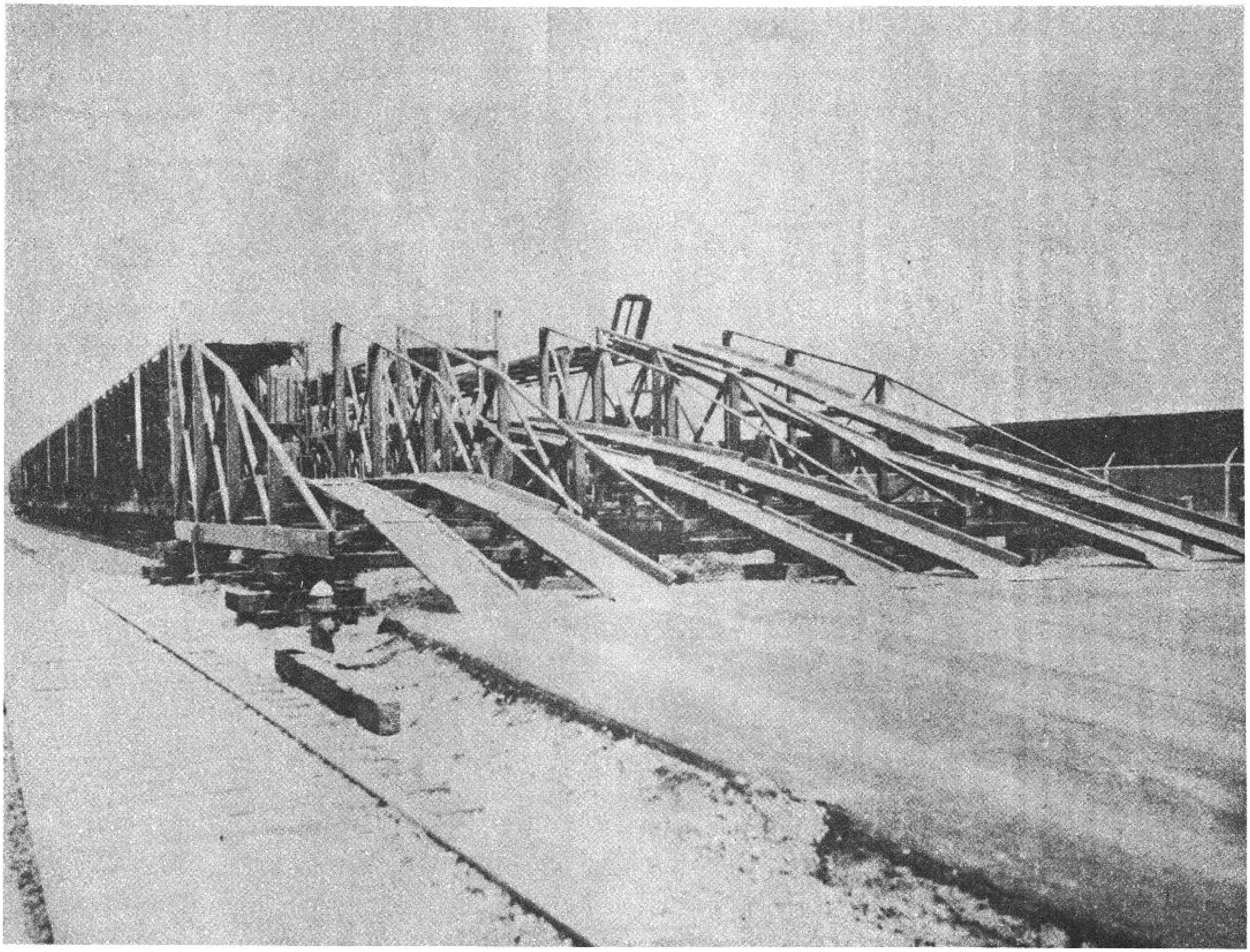


Figure 5.

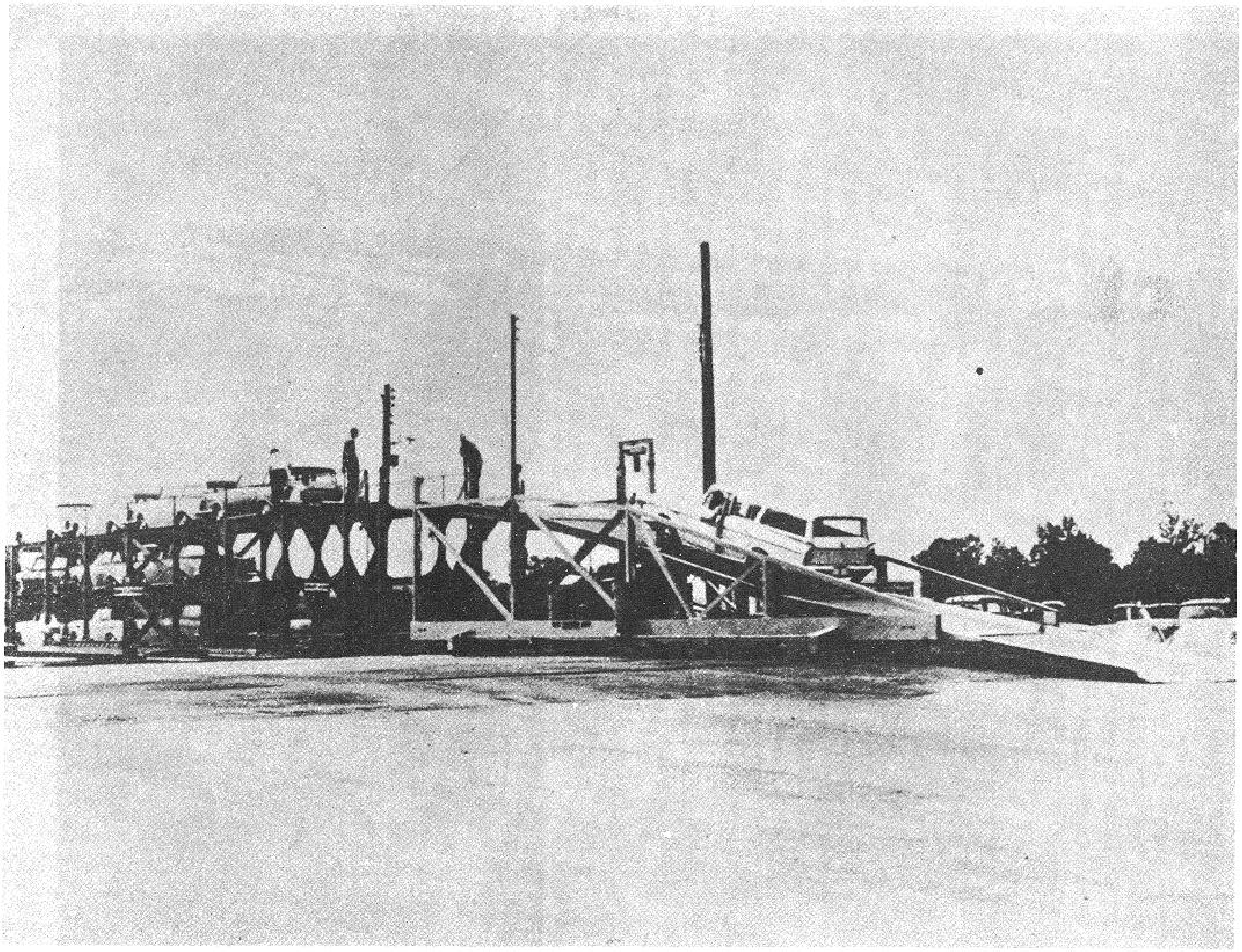


Figure 6.

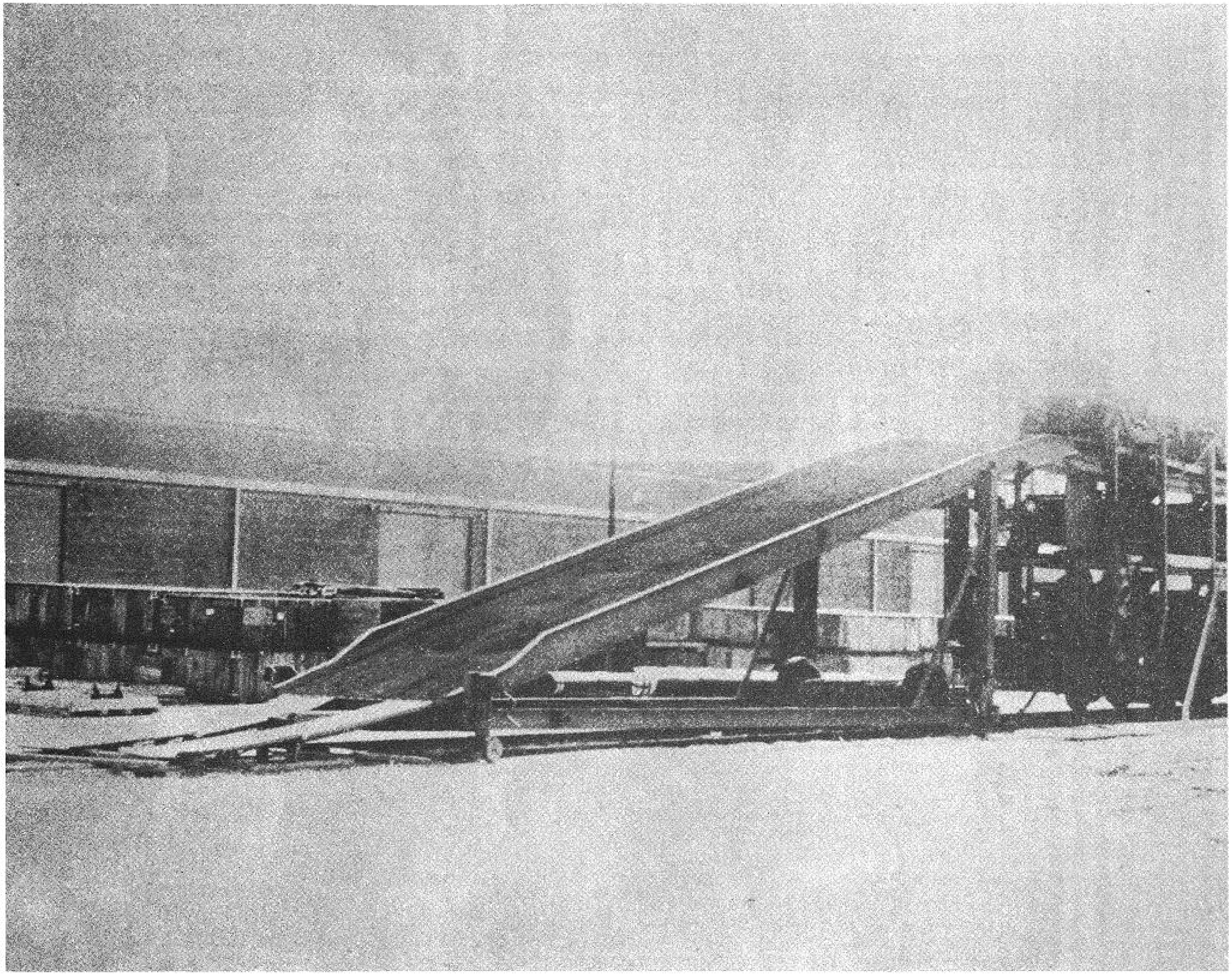


Figure 7.

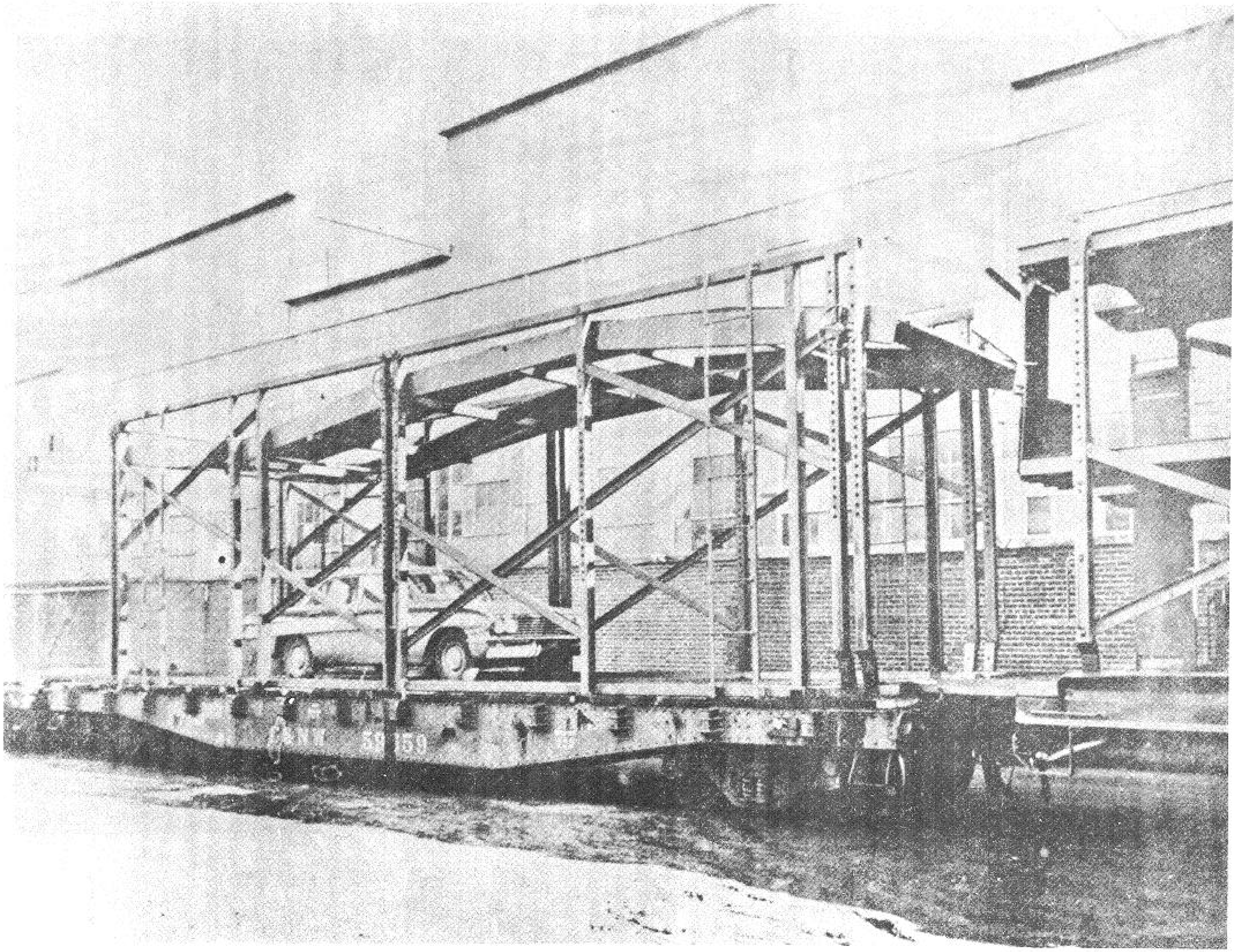


Figure 8.

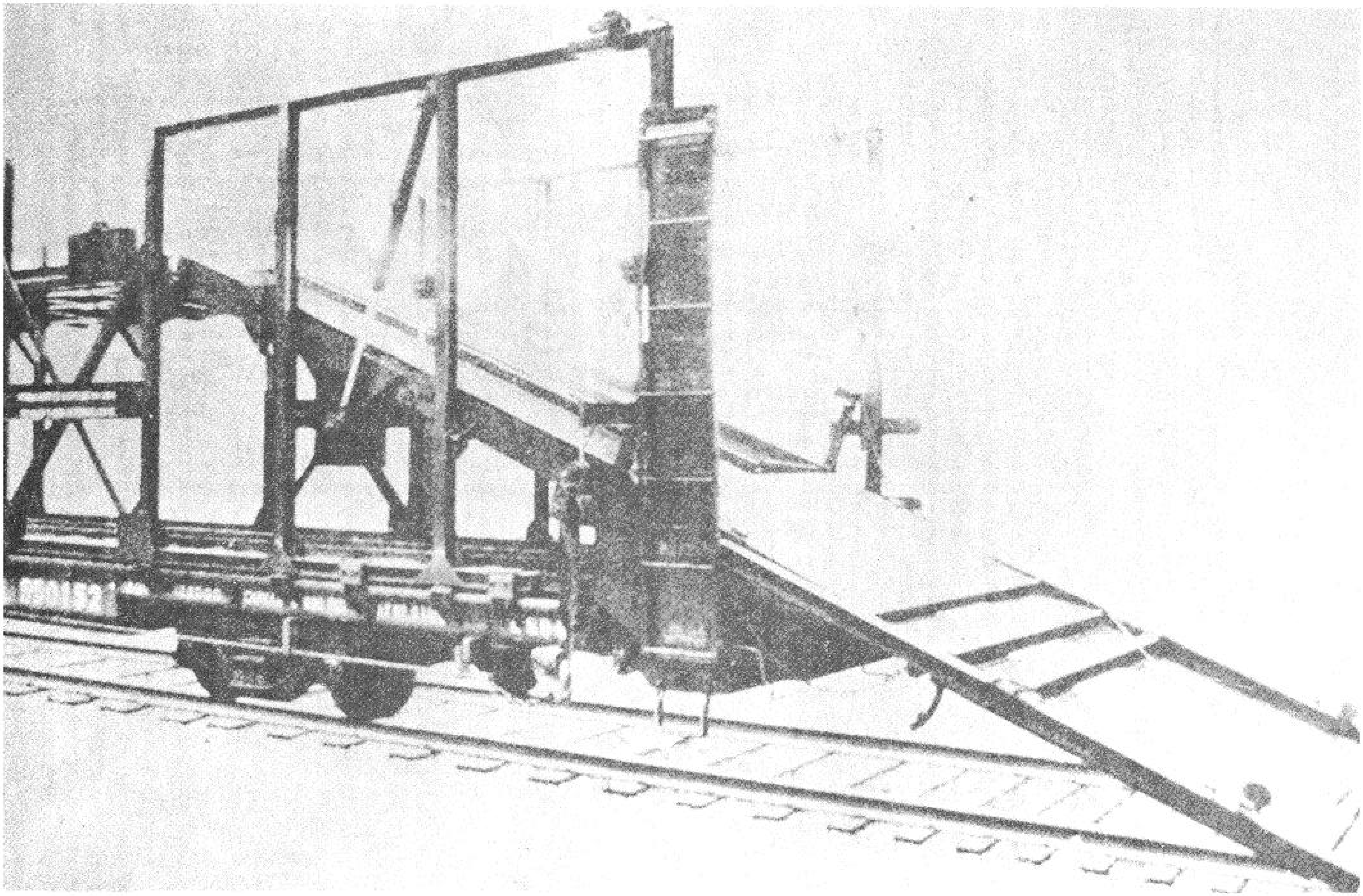


Figure 9.

4. Loading Procedures

NOTE

All personnel working around new vehicles should wear clothing free from exposed buttons or fastenings which could scratch vehicles. Tools or other objects in pockets may easily damage paint or upholstery.

Significant loading procedures and instructions for multilevel railcars are as follows:

a. When spotting multilevel equipment for loading, care must be taken to insure cars of different heights are not mixed; slack between cars must be adjusted to permit bridge plates to mate properly with adjacent car.

b. Ramp and bridge plates must be positioned so that no part of vehicle except the tires will contact ground, ramp, or railcar structure.

c. Handbrakes should be set on railcars by switch crews when spotting at ramps to facilitate proper position and retention of bridge plates.

d. Tire damage must be avoided. Keep ramp bridge plates, and car decks free from sharp objects or projections.

e. Tiedown chains must be arranged so vehicles can be driven through railcars without interference.

f. Extreme care must be used in driving vehicles on and through cars to prevent damage from contact with overhead coupler housings and sides of railcars. Speed should not exceed 5 mph when driving through railcars and should be reduced when passing from one railcar to another.

g. To permit equalization of tiedown chain tension and to prevent tire sidewall chafing, vehicles must be centered over railcar tiedown channels.

h. Uniform and sufficient spacing between vehicles and between vehicles and bridge plates must be maintained for protection against normal in-transit motion.

i. Winches and/or idlers must be positioned opposite each other during loading operations. Proper tiedown holes and hooks must be used.

j. Deck space should be fully utilized. Vehicles should be uniformly placed on each deck.

k. Clearances permitting, station wagons or vehicles with oversize tires should be loaded on top deck only.

l. Employees moving through loaded railcars should not carry tools in such a way that they will scratch or dent vehicles, nor should vehicles be used for storing wrenches or hammers.

m. After positioning vehicle on railcar, the driver must assure that—

(1) Transmission is placed in neutral, and parking brake firmly set.

(2) Front wheels are set straight ahead.

(3) Heater, vents, and windows are securely closed.

(4) Electrical accessories and lights are turned off.

(5) All doors, hoods, and tailgates are securely closed.

(6) Driver exit of vehicle is made through driver's door and care taken to avoid striking door against structural members of railcars.

5. Tiedown Procedures

NOTE

Not all vehicles are tied down in exactly the same way because of differences in length, weight, etc., but a few basic rules apply to all.

a. Each vehicle must be tied down with four chains, one at each corner.

b. Tiedown chains must be so placed that chain angles will be between 30 and 60 degrees from horizontal. Front and rear chains must exert opposing forces. For example, where front chains slope forward, rear chains must slope rearward.

c. If idlers are used, position idlers in pairs directly opposite each other in tiedown channels to give correct angle to chains. Lock idler securely to channel.

d. If idlers are not used, position ratchet carriages in pairs directly opposite each other in tiedown channels to give correct angle to chains. Lock ratchets securely to channel. After chains are tensioned, there should be a minimum of one full chain wrapped around the ratchet drum.

e. Care must be exercised in positioning tiedown devices as they may be damaged by hammer blows. Debris within or under the tiedown channels should be cleaned out and removed to permit the free movement of devices.

f. Damage to vehicles may result if chains are too loose, too tight, or have uneven pulls. To insure equal tensions on chains, ratchet gears on opposite sides of vehicle must be tightened simultaneously in pairs.

g. Ratchet wrench of proper size with suitable extension and rubber or plastic protection on handle should be used for tensioning chains.

h. Positive engagement of pawl against teeth of ratchet must be made, and locking device must be applied to prevent disengagement of pawl in transit.

i. Chains should NEVER be tightened by driving vehicle. Vehicle must be positioned, motor turned off, and brakes set before tiedown operations are performed.

j. Tightened chains should not bear against any part of the vehicle. Steering tie rods, gas or hydraulic lines, torsion bars, etc., are easily damaged by contact with chains.

k. After completion of the tiedown operation, there must be at least 1-inch clearance between vehicle underbody and railcar.

l. Sufficient clearance (not less than 1-inch) between chain and vehicle must be provided to prevent damage.

m. After tension is applied, hit chain sharply to relieve any bindings. Retension chain if necessary.

n. After tying down has been completed, tires will be inflated to 10 psi above highway operating pressure.

6. Unloading Procedures

NOTE

All personnel working around new vehicles should wear clothing free from exposed buttons or fastenings which could scratch vehicles. Tools or other objects in pockets may easily damage paint or upholstery.

a. Multilevel cars must be placed for unloading in such manner that vehicles can be driven off forward.

b. When spotting multilevel equipment for unloading, care must be taken to insure cars of different heights are not mixed; slack between cars must be adjusted to permit bridge plates to mate properly with adjacent car.

c. Position ramp and bridge plates so that no part of vehicle except the tires will contact ground, ramp, or railcar structure.

d. A sufficient number of handbrakes should be set on railcars by switch crews when spotting at ramps to facilitate proper position and retention of bridge plates.

e. Inspections of loaded multilevel cars at destination ramps by personnel trained on proper tiedown procedures can materially assist in the reduction of damage if immediate information is furnished loaders and origin carriers by wire. A comprehensive report as to condition and causes for tiedown failures should enable loaders and origin inspectors to correct the specific improper procedures.

(1) Each vehicle and tiedown device should be inspected to determine if there has been any transportation damage to vehicle.

(2) Broken, slack, or disconnected chain must be reported to supervisor.

(3) It is important that proper identification of vehicles by serial number be made on all reports, whether compiled at origin, intermediate point, or at destination.

f. Employees must not carry tools in such manner that they will scratch or dent surfaces of vehicles, and must avoid damage to interior of vehicles.

g. At unloading ramps, particular care must be taken to avoid possible roof and underbody damages when releasing chains and driving through railcars. Adjustable decks and hinged deck sections must be raised and secured before chains on the vehicles underneath are released.

h. Proper ratchet wrench must be used in disconnecting tiedown chains from vehicle. Use of hammer or other tools for releasing tiedown assemblies during unloading operation is absolutely prohibited.

i. Tiedown hooks must be moved from vehicles by hand; all hooks must be removed from vehicle before driving off railcar. Tiedown chains should be arranged so vehicles can be driven through cars without interference.

j. Driver entry of vehicle should be made through driver's door, and when entering vehicle, driver must avoid striking door against structure of railcars.

k. Vehicles must not be shoved with other vehicles to start the motors. Adequate equipment and facilities should be provided and used for dead units both on railcars and in storage areas. Vehicles that will not start on the railcars are to be pushed off by manpower. Under no circumstances are nonstarting vehicles to be pushed from railcars by other vehicles.

l. Extreme care must be used in driving vehicles through and off railcars to prevent damage from contact with overhead coupler housings, or sides of railcars. Speed should not exceed 5 mph when driving through railcars and should be reduced when passing from one railcar to another.

m. Maximum speed of 15 mph in storage lots and 5 mph at ramps or less, if conditions dictate, should be adopted and enforced. Speed limit signs should be posted. When parking, adequate clearances between sides of vehicles should be maintained.

n. Vehicles should be parked carefully; hoods, doors, and windows closed; and electrical accessories and lights turned off.

o. Storage and ramp area should be fenced and lighted for security and night operations, black-topped, and preferably striped for 4-foot distance between sides of vehicles to allow for door openings. Vehicles remaining in lots during night hours should be locked and keys maintained in the office of supervisory personnel.

By Order of the Secretary of the Army:

W. C. WESTMORELAND,
General, United States Army,
Chief of Staff.

Official:

KENNETH G. WICKHAM,
Major General, United States Army,
The Adjutant General.

Distribution:

Active Army:

DCSLOG (5)
USACDC (2)
USACDCTA (2)
USAMC (5)
USATACOM (5)
USAMECOM (5)
USCONARC (5)
Armies (CONUS) (5)
Instl (CONUS) (2)
Svc Colleges (2)
Br Svc Sch (2) except
USATSCH (5)
Cen (CONUS) (2)
Army Dep (2)
Gen Dep (2)
USATEA (15)
MTMTS (10)
EAMTMTS (10)
WAMTMTS (10)

ARNG: None.

USAR: None.

For explanation of abbreviations used, see AR 310-50.

RECOMMENDED CHANGES TO EQUIPMENT TECHNICAL PUBLICATIONS

SOMETHING WRONG WITH PUBLICATION

FROM: (PRINT YOUR UNIT'S COMPLETE ADDRESS)

DATE SENT

PUBLICATION NUMBER	PUBLICATION DATE	PUBLICATION TITLE

BE EXACT PIN-POINT WHERE IT IS

PAGE NO.	PARA-GRAPH	FIGURE NO.	TABLE NO.	IN THIS SPACE, TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT.

PRINTED NAME, GRADE OR TITLE AND TELEPHONE NUMBER	SIGN HERE

DA FORM 1 JUL 79 2028-2

PREVIOUS EDITIONS ARE OBSOLETE.

P.S.--IF YOUR OUTFIT WANTS TO KNOW ABOUT YOUR RECOMMENDATION MAKE A CARBON COPY OF THIS AND GIVE IT TO YOUR HEADQUARTERS.

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

PIN: 013737-000