CONSTRUCTION EQUIPMENT TRAILERS

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1. GENERAL

1.01 To be assured that construction equipment trailers (tag-along trailers) are safe for use, thorough, periodic inspections must be made and appropriate maintenance and repairs completed as required. To minimize the possibility of trailer or towing vehicle breakdown or damage, neither the trailer nor the towing vehicle should be operated with loads exceeding their respective rated capacities. This section provides information for use in establishing inspection and maintenance routines, discusses capacities and load distribution, lists safety checks and maintenance intervals, and includes other information necessary for the safe use of construction equipment trailers.

1.02 Brake service information is available from Warner Electric Brake and Clutch Company, Beloit, Wisconsin and Kelsay Hayes, Romulus, Michigan. In addition, the following Bell System Practices shall be considered supplementary to this section:

SECTION	TITLE
649-040-100	Electric Brake Control—Description
649-040-200	Wheel Chocks
649-210-105	Towing Hooks
720-305-300	Pneumatic Tires and Tubes
720-305-310	Wheels and Rims
720-315-600	Electric Brake Controls—Inspection

2. TRAILER DECK TYPES AND AXLE ARRANGEMENTS

2.01 Three basic types of decks used on construction equipment trailers are:

Pan—Two channel runways, usually constructed of steel, located between the trailer wheels with an open area between the runways.

DBW—*D*eck *B*etween the *W*heels—A solid wooden or metal platform located between the wheels of the trailer.

DOW—*D*eck *O*ver the *W*heels—A solid wooden or metal platform that extends in width over the trailer wheels.

2.02 The Pan, DBW or DOW decks may either be flat for their full length or have a "beaver tail" ramp that angles down at the rear. Many have a tilt arrangement to make equipment loading easier. Most trailer decks are also equipped with either folding or demountable ramps for equipment loading. Typical trailers are shown in Fig. 1, 2, and 3.

2.03 Pan and DBW decks are usually lower than DOW decks giving the loaded trailer a lower center of gravity for better trailing and a smaller angle of incline for easier loading. However, they are limited to transporting equipment narrow enough to fit between the trailer wheels and tires, allowing enough clearance for loading, slight shifting of equipment, and accumulated rocks, mud, etc.

2.04 DOW decks are higher and have a steeper angle of incline for loading, but they can be used for a greater range of equipment sizes since they are normally eight feet wide.

2.05 Trailers may be equipped with various axle arrangements depending upon the manufacturer's rated capacity of the trailer. Some higher capacity

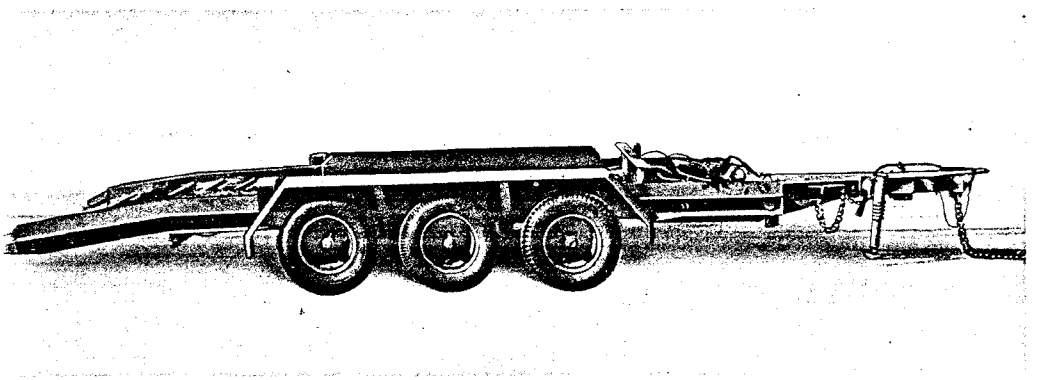

Fig. 1—DBW Trailer With Tilt Deck—3 Axles

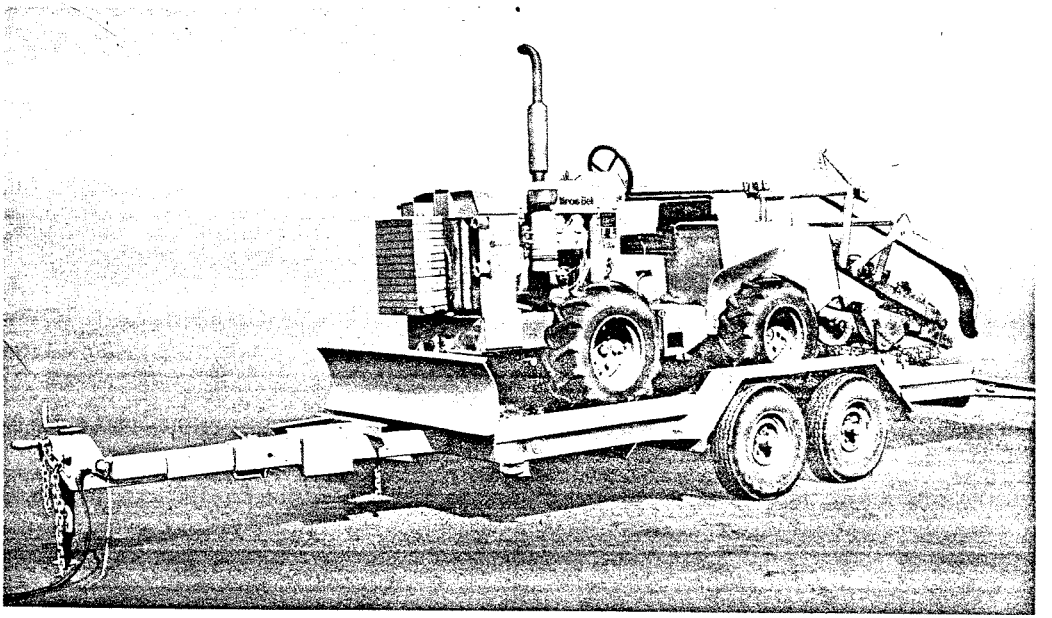

Fig. 2—DBW Trailer With Tilt Deck—2 Axles

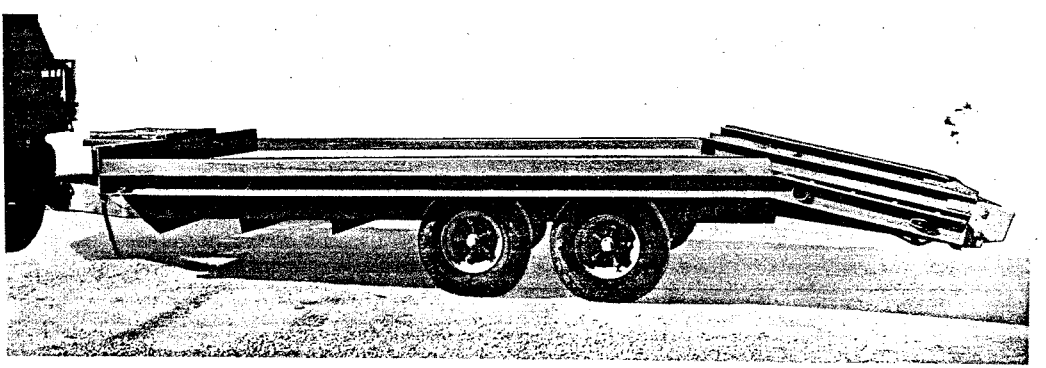

Fig. 3—DOW Trailer With Folding Ramps

trailers use double transverse axles which relegate the two inboard wheels to a position where inspection and servicing are difficult because of their inaccessibility (Fig. 4). Where this axle arrangement is necessary, removable deck plates should be provided so the required inspections and service checks can be performed. However, even with this provision working space is limited. (See Fig. 5.)

3. TRAILER WHEELS AND TIRES

3.01 The two types of wheels used on construction equipment trailers are the cast spoke wheel with demountable rim (Fig. 6) and the disc wheel (Fig. 7 and 8). The cast spoke wheel includes the hub with either 3, 5, or 6 spokes equipped with studs, clamps, and nuts for retaining a separate demountable rim. The disc wheel has the rim permanently attached to a disc equipped with mounting holes for mounting the wheel to the drum.

3.02 Small diameter wheels and tires developed for mobile home use are commonly used on construction equipment trailers because they keep the trailer deck and the load close to the ground. Because of their small diameter, particular attention must be paid to keeping the wheel cap nuts or rim studs tightened to the proper torque. Table A gives the recommended torque values for mobile home wheel nuts and studs. The threads of studs, bolts, nuts, and the bearing surfaces should be clean, dry, and free from oil or grease when torqued. DO NOT LUBRICATE. Insufficient torque can cause slippage, which leads to wear and wheel damage. Excessive torque can strip studs, crush ball seats, and lead to wheel damage.

3.03 Using the proper method to tighten wheel nuts will prevent them from rapidly losing torque when the trailer is in use. For disc wheels,

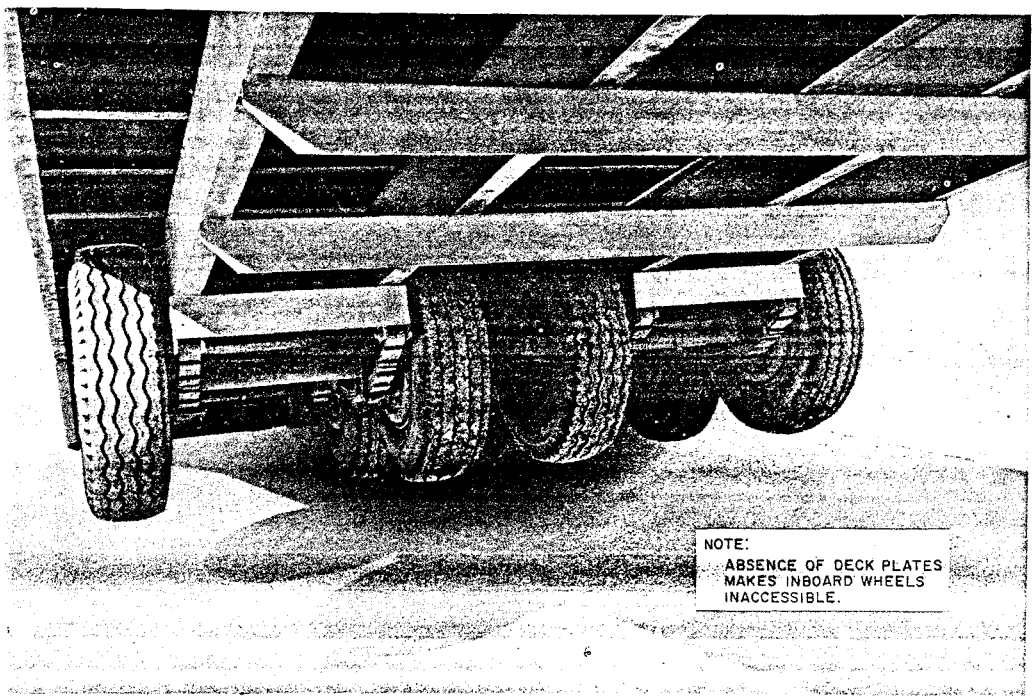

Fig. 4—Double Transverse Axles on DOW Trailer

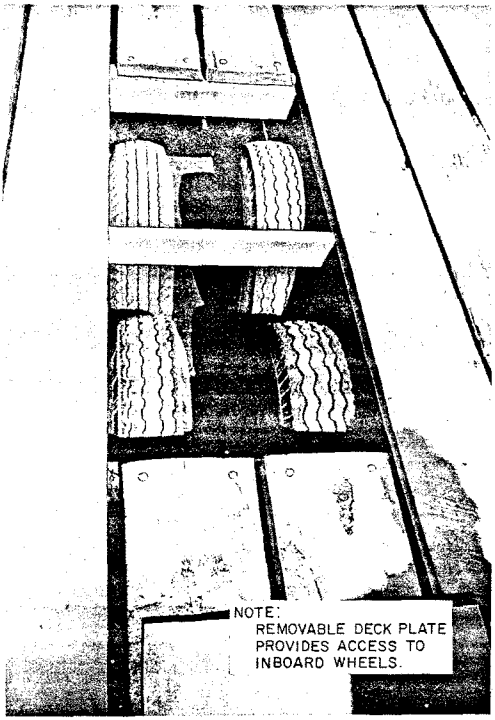

Fig. 5—DOW Trailer With Deck Plate Removed

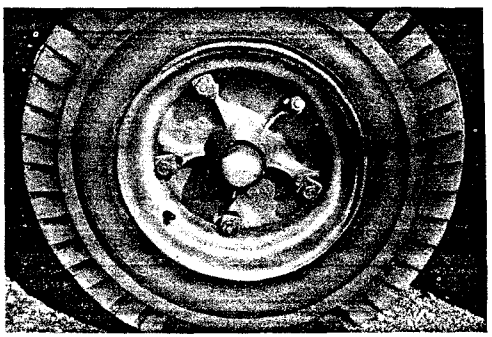

Fig. 6—Cast Spoke Wheel—Mobile Home Type

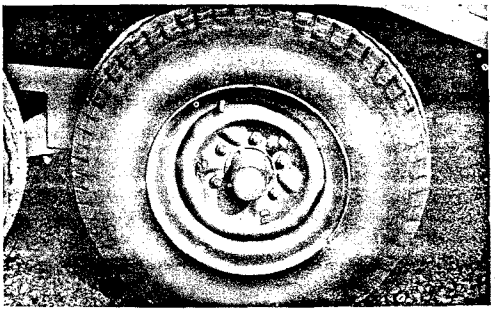

Fig. 7—Disc Wheel—Mobile Home Type

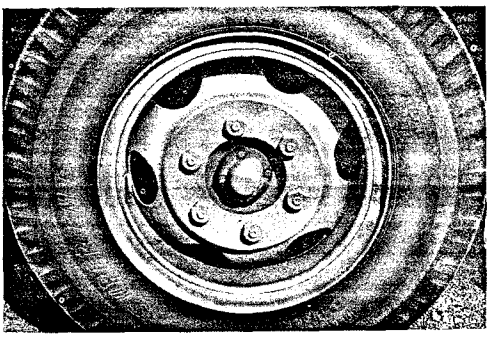

Fig. 8—Disc Wheel—Truck Type

TABLE A

RECOMMENDED TORQUE

STUD OR BOLT SIZE	TYPE OF WHEEL	RECOMMENDED TORQUE (FOOT/POUNDS)
1/2"-20	Disc Wheel	75 to 85
9/16"-18	Disc thickness over 0.150 in.	100 to 125
9/16"-18	Disc thickness under 0.150 in.	80 to 90
1/2"-20	Cast Wheel	90

tighten diagonally opposite nuts until all nuts are snug. Repeat the sequence to bring all nuts to proper torque. For cast wheels, select any three nuts that form a triangular pattern as shown in Fig. 9. Tighten nut No. 1 until it is snug. Rotate the wheel to position nut No. 2 on top and tighten it until snug. Rotate the wheel to position nut No. 3 on top and tighten it until snug. Repeat the sequence tightening the three nuts to proper torque, then bring the remaining nuts to proper torque. After any wheel is mounted, the nuts should be checked and tightened before each use of the trailer until it has traveled 50 miles. Thereafter, torque should be checked at weekly intervals.

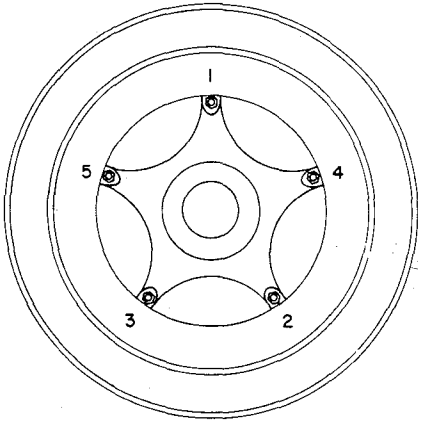

Fig. 9—Nut Tightening Sequence for Cast Spoke Wheels

3.04 The wheels should be inspected for cracks and hole elongation. Discard wheels with elongated holes. Inspect for rim slippage on cast wheels. Paint scratches in the vicinity of the clamps indicate rim slippage.

3.05 Wheel bearings must be properly lubricated and preloaded as recommended by the manufacturer. In most cases, the manufacturer recommends that a specific torque be applied to the nut and then the nut backed off a specified part of a turn. Generally, end play between 0.001 to 0.008 of an inch is recommended.

3.06 Proper tire inflation pressures must be maintained to ensure maximum wear and safe operation. Underinflation causes excessive sidewall flexing and heat build-up which leads to rapid tire wear and damage. Overinflation reduces the ability of the tire to absorb road shock and can lead to tire failures caused by rapid wear and damage. Overloading causes tire damage and wear in much the same manner as underinflation. A decal or other marking showing the recommended tire pressure should be displayed on the trailer. Any tire changes shall be called to the attention of the motor equipment foreman who will make certain that the tires are the proper size and load range. Maximum inflation pressure and load for mobile home tires are given in Table B.

TABLE B

M.H. TIRE INFLATION PRESSURE

SIZE	LOAD RANGE	MAXIMUM INFLATION PRESSURE	MAXIMUM LOAD
7-14.5	F	100	2300
8-14.5	F	100	2790

3.07 ***Tire inflation pressure should be gauged when the tire is cold,*** because heat generated during use will cause a normal increase in tire pressure. If after use the tire pressure increase should exceed 20 lbs, overloading is probably the cause. ***Do not bleed tires to relieve excess pressure caused by heat build-up.*** This will cause the tire to be badly underinflated when cool, which can be just as damaging as overinflation.

> ***Note:*** A device that provides a means for making a quick visual check for low tire pressure is the "Indicap" which is available from the Engler Instrument Company. The device, available in increments from 20 psi to 110 psi, replaces the valve cap and indicates low tire pressure by retraction of a small indicator.

3.08 The conventional mobile home tire is not designed for off the road truck-type application and is, therefore, more susceptible to damage in off the road situations. When replacing mobile home tires, it is recommended that a truck-type tire, such as the Armstrong 8-14.5, Load Range F, H.D. tire, or equivalent be used. Because of differences in loaded radii, these tires must not be mounted as duals with mobile home tires.

3.09 Tires mounted as duals must have very nearly the same circumference and inflation pressure, otherwise one of the tires will be subjected to overloading. Dual tires size 9.00 and larger should have circumferences within 1-1/2 inches of each other. Dual sizes smaller than 9.00 should have circumferences within 3/4 inch of each other. A flexible steel tape may be used to obtain the measurements.

4. TRAILER CAPACITIES AND LOAD DISTRIBUTION

4.01 The following definitions apply to trailers and towing vehicles:

Curb Weight—The weight of an empty vehicle less payload and occupants but including fuel, coolant, oil, and all standard equipment.

Gross Vehicle Weight (GVW)—The total allowable weight of a vehicle including chassis, body, payload, driver, fuel, etc.

Gross Combination Weight (GCW)—The total allowable weight of a vehicle and trailer combination including payloads on both vehicle and trailer, driver, and fuel.

Laden Weight—The total measured weight of trailer or towing vehicle including payload and passengers. Laden vehicle weight must never exceed the GVW of the vehicle, or in the case of a vehicle-trailer combination, the sum of the laden weights must not exceed the GCW rating.

Payload—The weight of the cargo carried by a vehicle, not including body weight.

Full Trailer—Any vehicle with or without motive power that is designed to be drawn by another vehicle, and so designed that no part of its weight, except the hitch, is transmitted to the towing vehicle.

Tag-Along Trailer (Construction Equipment Trailer)—A low, flat bed trailer with one or more axles used to transport mobile construction equipment such as backhoes, plows, and trenchers. Usually towed on a pintle hook or ball hitch and transferring 10 to 15 percent of their laden weight to the towing vehicle.

Semitrailer—A trailer, except a pole trailer, constructed so a substantial part of its weight rests upon or is carried by a motor vehicle.

4.02 Load capacities listed by trailer manufacturers are often based on factors which do not provide adequate safety margins for heavy duty service. It is advisable, therefore, to derate the trailer capacity and post this rating and the trailer curb weight in a conspicuous location on the trailer. General Letter 72-07-075, ***Bell System Construction Trailers,*** formulates the derating procedure.

Caution: Keep trailer decks free of dirt and mud. Mud buildup can easily add 1000 pounds to the load and can make the deck slippery.

4.03 Knowing the maximum payload capacity of a given trailer can prevent overloading if the total weight of the load to be hauled is known. To do this, add the weights of all equipment, tools, auxiliary equipment, cable reels, etc, that will be carried simultaneously. Add to this figure the estimated weight of mud and dirt on the equipment. A good rule is to allow 50 pounds of mud and dirt for each 1000 pounds of equipment. The trailer capacity must equal or exceed this value.

4.04 The allowable trailer laden weight must be determined in relation to the capacity of the towing vehicle. Assuming that the towing hook structure is adequate for the load, the chassis capability of the towing vehicle for safely handling the trailer is dependent upon chassis components such as the engine, front and rear springs, front axle, rear axle, tires, brakes, transmission, and frame. Considering the capability of each of these components, truck manufacturers arrive at GCW ratings for chassis of 13000 GVW and more. Using these published ratings, the allowable trailer payload may be obtained by subtracting the sum of the laden weight of the towing vehicle (not the GVW) and the curb weight of the trailer from the GCW.

Allowable trailer payload = GCW – (Vehicle laden weight + Trailer curb weight)

Note: The towing vehicle payload capacity must be reduced by 15 percent of the trailer laden weight to allow for the load transmitted to the towing hook.

4.05 The following method will be helpful in the selection of adequately sized towing vehicles:

(a) post a decal or other permanent marking on the trailer denoting:

TRAILER CAPACITY—LBS
CURB WEIGHT—LBS

(b) post a decal or other permanent marking on vehicles fitted with towing hooks denoting:

TOWING CAPACITY—LBS
WITH STANDARD LOAD

The towing capacity is derived by use of the formula in 4.04 with the laden weight of the vehicle being determined with a "standard" load. A payload in excess of the "standard" load will require an equivalent reduction in the towing capacity.

4.06 In practice the trailer would be matched to the towing vehicle as follows:

(1) Load the trailer with a payload not exceeding the posted ***Trailer Capacity.***

(2) Add the ***Curb Weight*** to the payload. The sum must not exceed the ***Towing Capacity.***

(3) If the towing vehicle is carrying cable reels or other material that is in excess of the standard load, deduct that amount from the ***Towing Capacity.***

4.07 A trailer carrying a load will not handle properly unless approximately 15 percent of the trailer laden weight is on the towing hook. Since the position of the load on the trailer determines the weight on the towing hook, the correct position on the trailer for any piece of equipment hauled needs to be known. Without the use of scales, the following method may be used to determine the proper load position.

(1) Place a temporary mark on the trailer at the axle, or midway between the axles on a two-axle trailer.

(2) With the load on the trailer, the trailer lunette eye in the towing hook, and ***the latch closed,*** move the load forward, or backward, on the trailer until the eye "floats" in the towing hook. Place a permanent mark in a conspicuous place on the load so the permanent mark on the load is aligned with the temporary mark on the trailer.

(3) Measure the distance from the temporary mark on the trailer to the center of the lunette eye. Multiply this distance by 0.15.

(4) Using the distance determined in (3), measure that distance forward from the temporary mark on the trailer and place a permanent mark on the trailer at that point.

(5) Move the load forward to register its permanent mark with the permanent mark on the trailer. Proper weight distribution has now been achieved (see note). When loading the same equipment in the future, it will be necessary only to drive the machine onto the trailer and register its mark with the permanent mark on the trailer.

(6) When a load is generally not carried on a specific trailer, the proper weight distribution can be achieved for the temporary condition by following the procedure through step (3) except that all marks are temporary. Following step (3), move the load forward the distance computed and bind the load. The proper balance will be achieved and no further marking of the trailer or load is required.

Note: This method of achieving proper weight distribution does not consider the trailer weight and, therefore, is applicable only when the weight of the load is considerably greater than the weight of the trailer, as is usually the case.

5. SAFETY CHAINS AND SLINGS

5.01 Although some State Motor Vehicle regulations require the use of only one safety chain or wire rope sling, trailers used in the Bell System should use two chains or wire ropes for added safety in the event that one chain or wire rope should become disengaged or fail. Also, two chains or wire ropes will keep the trailer tongue from dropping to the ground if the hitch fails or accidental uncoupling occurs. Each safety chain or wire rope and the associated attachments must have a breaking strength equal to no less than the maximum laden weight of the trailer. Breaking strength is generally

four to five times the manufacturer's catalog rating, which is usually the working load. Breaking strengths of various safety chains and wire ropes are listed in S.A.E. Recommended Practice J697. Table C lists the breaking strengths of chains and wire ropes commonly used for this application.

5.02 Installation of the chains or ropes should be permanent on the trailer with the coupling done on the towing vehicle. A suitable bracket for securing the chain or rope is shown welded to the trailer in Fig. 10. The dual holes in the bracket ensure straight chain or rope alignment with the bracket mounted on either the right or left side of the trailer. The chain is secured to the bracket with a Hammerlock chain coupling link manufactured by the Columbus-McKinnon Company. The coupling link size is embossed on the body and should be matched with that size chain to assure continuity of load capacity. This link is a highly reliable alloy steel coupler that is readily assembled without the use of special tools. The coupling link used with a chain hook is shown in Fig. 11.

5.03 Points of attachment of the safety chains or wire ropes to the towing vehicle must be located equidistant from and on opposite sides of the vehicle centerline and must be on the frame or frame extension of the vehicle. The safety rope shackle on the BU towing hook ***shall not*** be used for attaching safety chains or ropes of construction equipment trailers.

TABLE C

BREAKING STRENGTHS OF CHAIN AND WIRE ROPE

DIAMETER (INCHES)	ALLOY STEEL CHAIN (LBS)	6 X 19 WIRE ROPE, EXTRA IMPROVED PLOW STEEL (LBS)
9/32	14,200	—
3/8	23,000	—
7/16	—	22,800
1/2	32,000	26,600

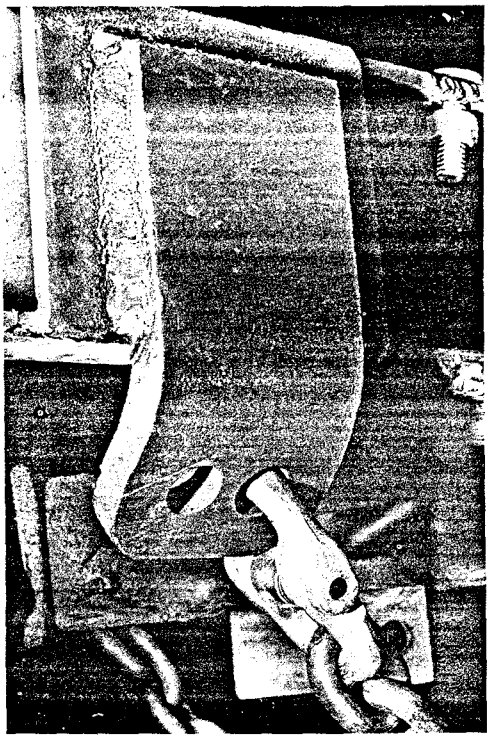

Fig. 10—Safety Chain Bracket

5.04 The method used to secure the safety chain or wire rope to the towing vehicle depends upon the attachment device on the vehicle. Chains fitted with grab hooks (hook that hooks back on a chain link) are suitable but must be used with care since the hook can disengage when under no load and subjected to road vibration. These hooks should be taped in place during use. Chains with large throat hooks with safety latches (Fig. 11) may be used but often the safety latches will not function properly. Hooks with malfunctioning latches should not be used.

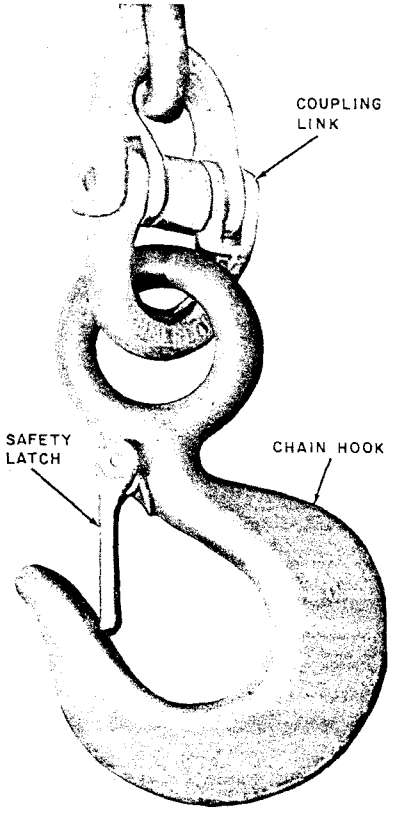

Fig. 11—Chain Hook With Safety Latch

5.05 The preferred attachment device is shown in Fig. 12. This device permits easy attachment of a safety chain with no hook required. Typical assemblies are shown in Fig. 13, 14, 15, and 16. Tensile tests have shown that the complete assemblies, consisting of the chain, truck bracket, trailer bracket, and coupling links exceed the recommended towing capacities of towing hook structures installed in accordance with MV drawings. See Table D.

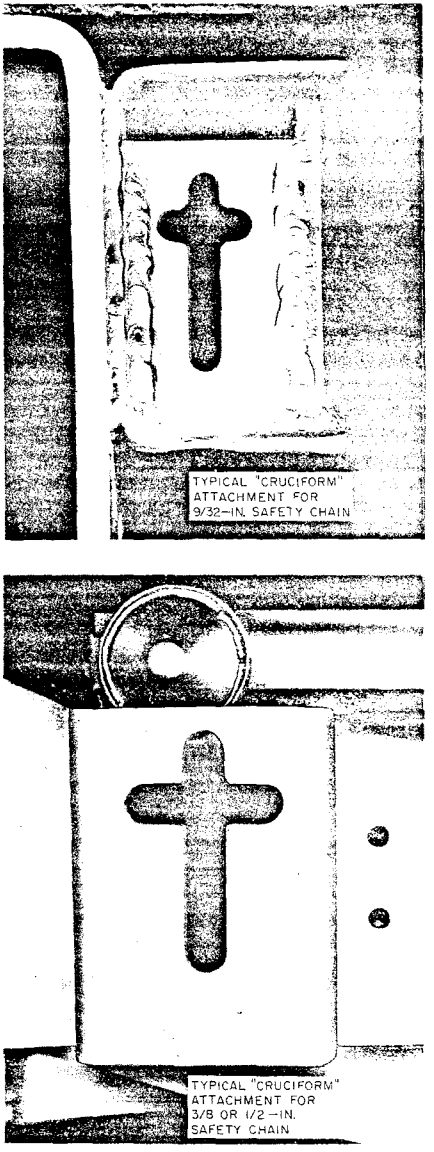

Fig. 12—Chain Attachment Device—"Cruciform"

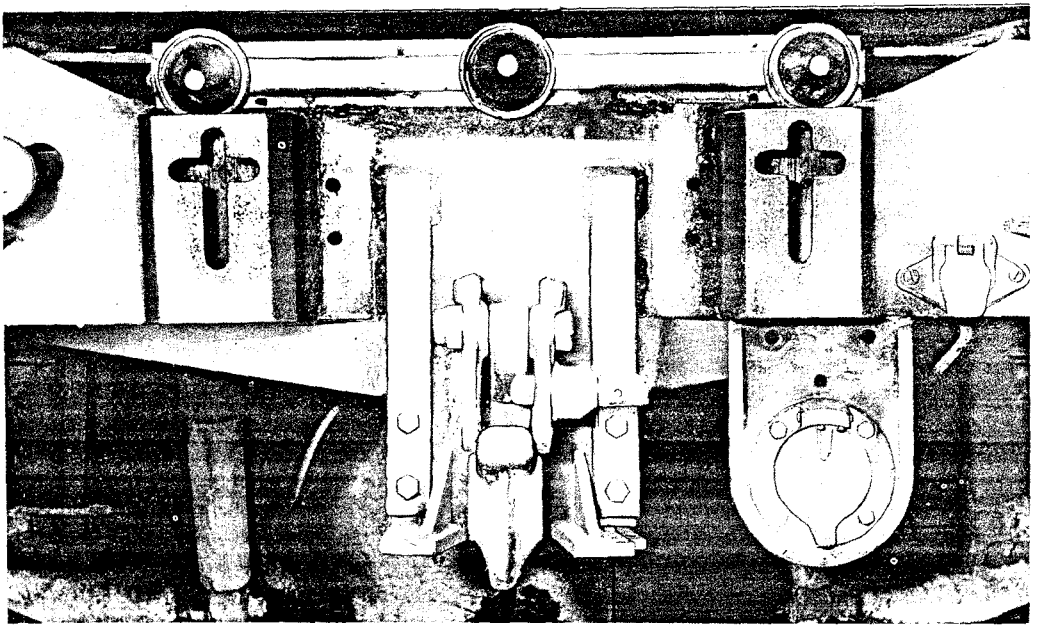

Fig. 13—"Cruciform" Safety Chain Attachments BU Towing Hook—for Use With 3/8- or 1/2-Inch Alloy Steel Chain

TABLE D

TOWING CAPACITIES

TOWING HOOK INSTALLATION DRAWING NUMBER	RECOMMENDED MAX. LADEN TRAILER WEIGHT (LBS)	ULTIMATE STRENGTH– CHAIN AND ASSOC. ATTACHMENTS (LBS)
MV-1H975	18K	3/8" chain - 23K
MV-6H199	30K	1/2" chain - 32.5K

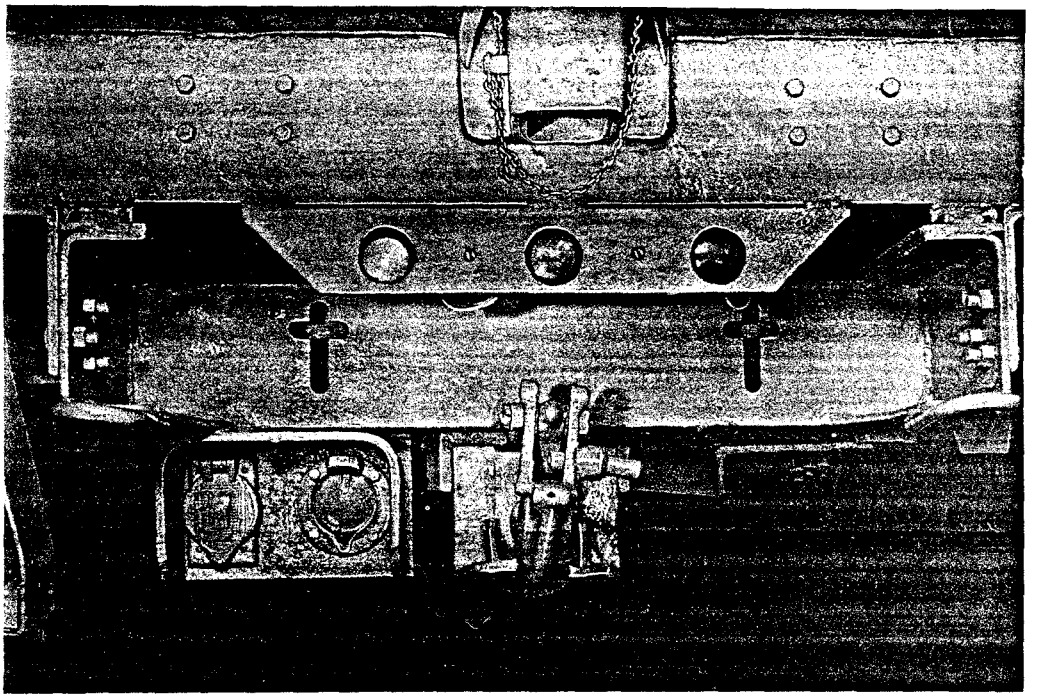

Fig. 14—"Cruciform" Safety Chain Attachments in Crossmember—BU Towing Hook—For Use With 3/8- or 1/2-Inch Alloy Steel Chain

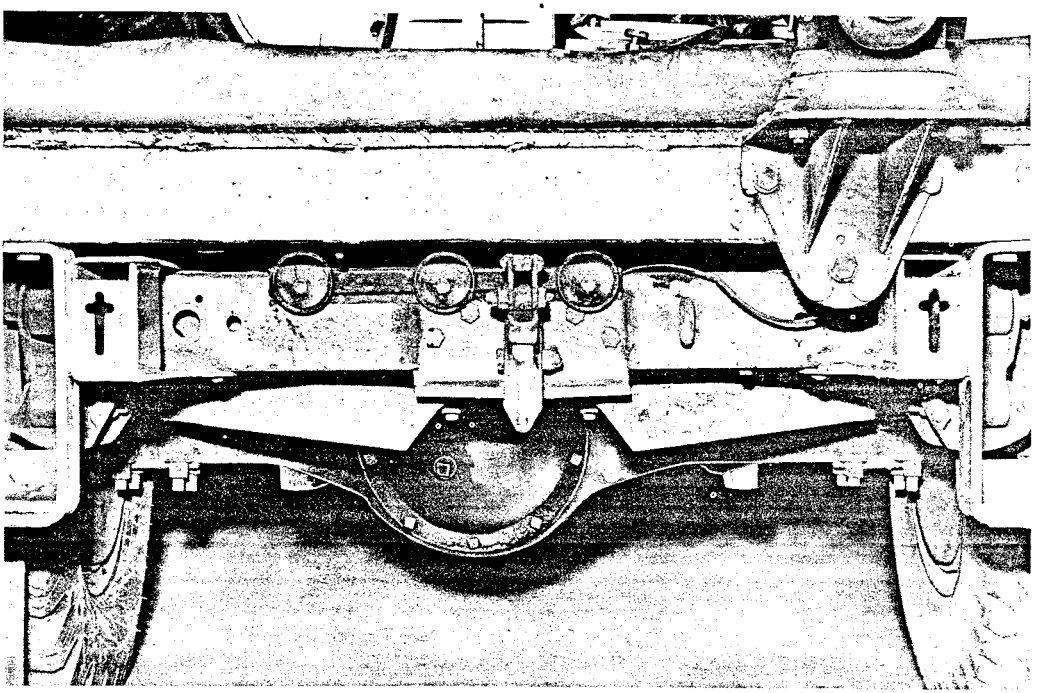

Fig. 15—"Cruciform" Safety Chain Attachments on Frame Extension—LB Towing Hook—For Use With 9/32-Inch Alloy Steel Chain

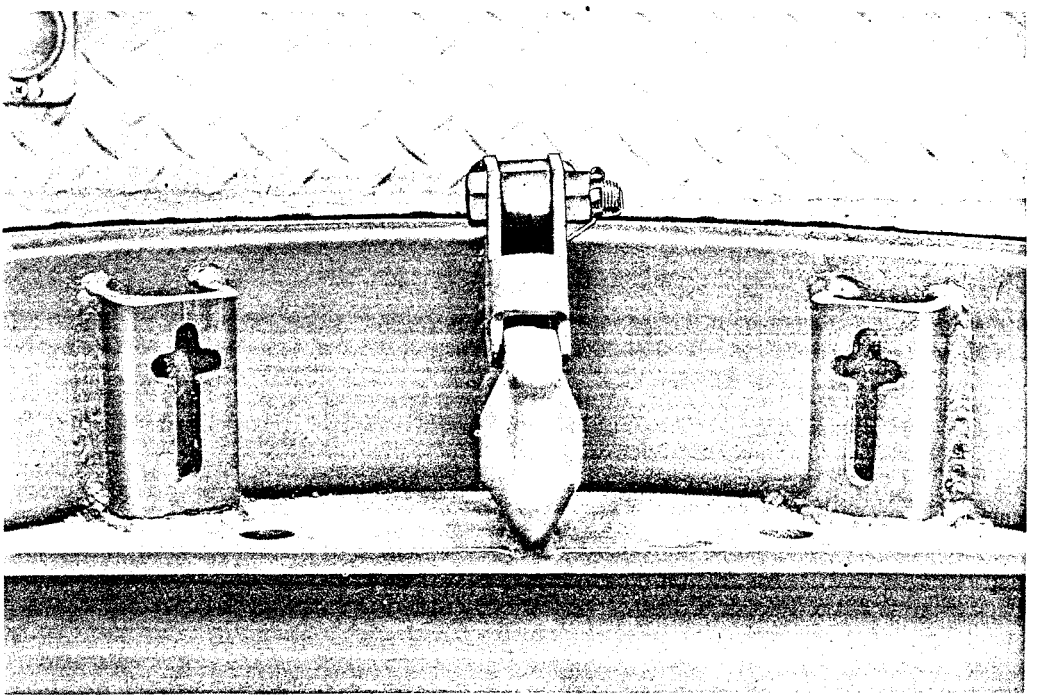

Fig. 16—"Cruciform" Safety Chain Attachments on Crossmember—LB Towing Hook—For Use With 9/32-Inch Alloy Steel Chain

5.06 Attach the safety chains or cables to the towing vehicle by taking the chain or cable that is secured to the left side of the trailer tongue and coupling it to the attachment on the right of the towing hook. Take the chain secured to the right side of the trailer tongue and couple it to the attachment on the left side of the towing hook. (See Fig. 17.) The chains must be long enough to allow the trailer to be negotiated through turns but short enough to prevent the trailer tongue from contacting the ground if unintentional uncoupling occurs. (See Fig. 18.)

Caution: Do not use any truck or trailer with hitching or safety components missing or in improper working order.

6. COUPLING A TRAILER TO THE TOWING VEHICLE

6.01 The wheels of any uncoupled trailer should be chocked front and rear. All single axle trailers should be equipped with two wheel chocks. Multiaxle trailers should be equipped with four wheel chocks. The standard wheel chocks (see Section 649-040-200) are adequate for most applications. However, it may be desirable to use chocks of superior holding power on large tag-along trailers.

6.02 Check the parking stand (support jack) to be sure it is locked in the upright position.

6.03 Raise or lower the trailer tongue as required by operating the control that extends or retracts the support jack. Back the truck into position. Keep clear of the truck and trailer while the truck is backing. Lower the towing eye into the towing hook by retracting the support jack.

6.04 Close and lock the latch on the towing hook.

6.05 Attach the safety chains or cables in accordance with instructions in Part 5.

6.06 Plug in the power cord used to connect the truck and trailer electrical systems.

6.07 Attach the chain for the breakaway switch. The point of attachment on the truck should be a ring or bracket other than used for the safety chains. The breakaway switch chain should be long enough to permit trailer turning maneuvers without operating the switch, but it should be shorter than the safety chains. In the event of accidental uncoupling, the breakaway switch should operate before the safety chains catch the load.

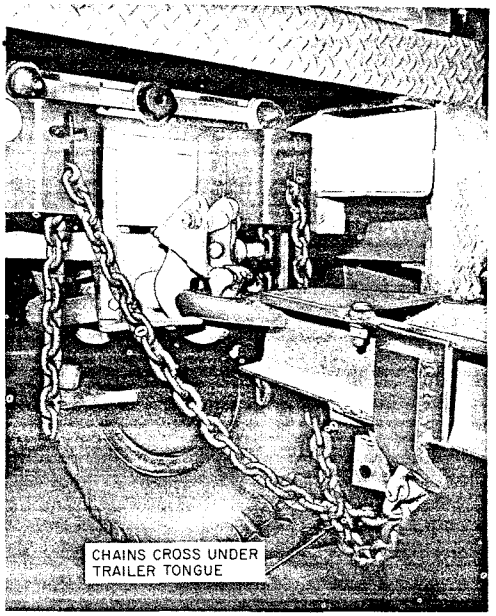

Fig. 17—Proper Method of Coupling Safety Chains

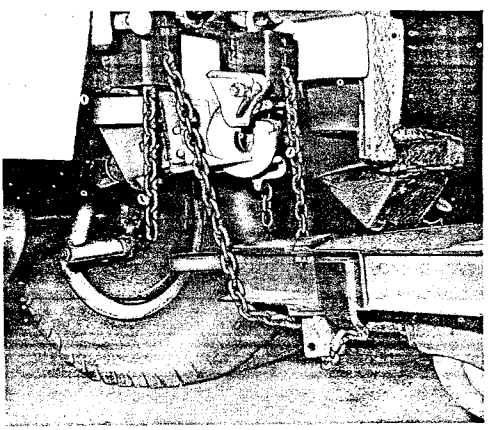

Fig. 18—Safety Chains Supporting Trailer Tongue

6.08 Raise the support jack and secure it in the travel position. If the trailer is to be moved, be sure ramps are in the travel position and, if the trailer has a tilting deck, be sure the deck is locked in the down position. If the trailer is to be loaded proceed as covered in Part 7. Before traveling with the trailer, check the brake lights and turn signals. Test the brakes in accordance with instructions in Part 8.

7. LOADING AND UNLOADING CONSTRUCTION EQUIPMENT

7.01 Before loading or unloading equipment, the trailer must be coupled to the towing vehicle, the parking brake set on the towing vehicle, and the trailer wheels chocked, front and rear.

7.02 For tilt-deck type trailers, release the deck lock at the front of the deck and stand on the rear of the deck to lower it to the ground. For trailers with ramps, position the ramps so they line up with the wheels or tracks of the machine to be loaded. Be sure the ramps are securely attached to the trailer.

7.03 Raise buckets, blades, etc, to clear trailer deck and drive the machine onto the trailer. Drive slowly taking care to avoid damaging the trailer wheels or fenders. The machine should straddle the center line of the trailer. Guide rails mounted as shown in Fig. 19 will aid in centering the load and preventing shifting while traveling.

7.04 When loading tilt-deck trailers, pause just after the machine passes the balance point to allow the deck to return to the horizontal position. Move the machine forward far enough so that 15 percent of the load is on the towing hook (see Part 4). Lower bucket, blade, etc, to rest on trailer deck.

> ***Note:*** It may be necessary to back the machine onto the trailer to obtain proper load distribution (Fig. 20). Improper load distribution (Fig. 21) will cause poor handling and "fish-tailing".

7.05 Secure the deck lock on tilt-deck trailers. Store ramps in the travel position. Bind the load securely at opposing angles, front and rear, with tie-down chains and load binders (Fig. 22). It is important to secure tie down chains to the trailer at points forward and to the rear of the load (Fig. 23) to prevent fore and aft movement during starting and stopping. Ideally, tie down rings are a part of the machine, but if rings or similar devices are not provided, be certain that chains are not anchored to or do not contact vulnerable areas such as hydraulic cylinders, hoses, or lines.

7.06 To unload the equipment, the trailer must be coupled to the towing vehicle, the parking brake set on the towing vehicle, and the trailer wheels chocked, front and rear.

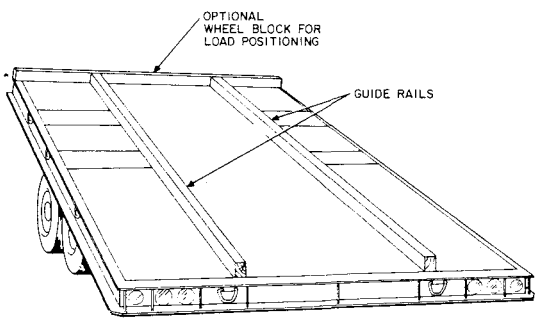

Fig. 19—Approximate Locations For Guide Rails

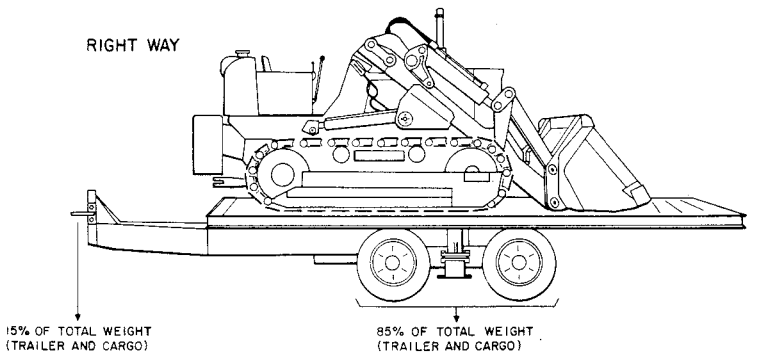

Fig. 20—Correct Load Distribution

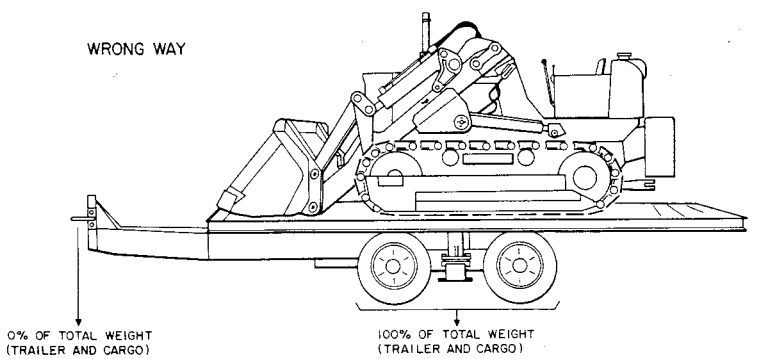

Fig. 21—Incorrect Load Distribution

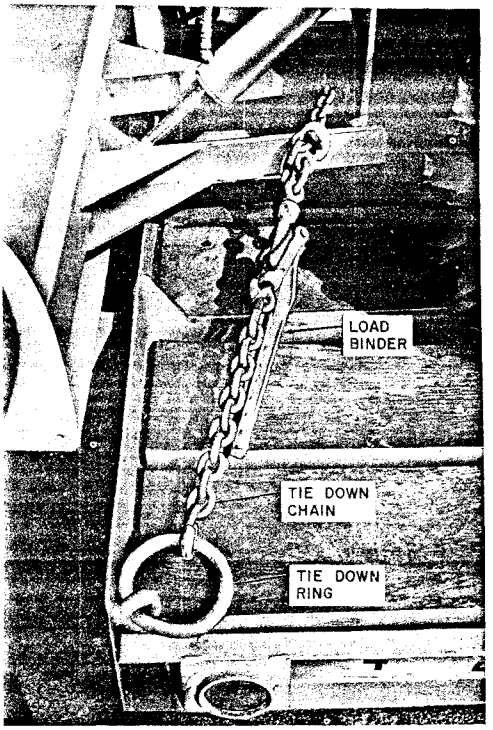

Fig. 22—Tie Down Chain and Load Binder

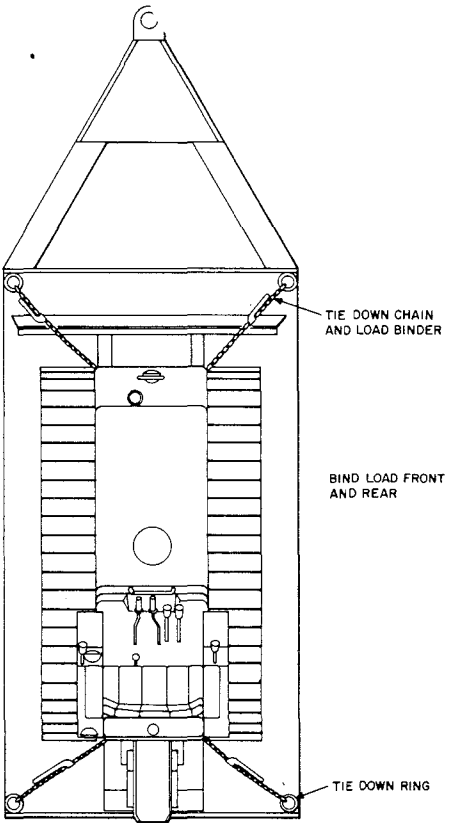

Fig. 23—Typical Angular Positions of Tie Down Chains

7.07 Remove the tie-down chains, position the loading ramps, and for tilt-deck trailers, release the deck lock. Raise bucket, blade, etc, to clear trailer and slowly drive the machine off the trailer. For tilt-deck trailers, pause when the machine is just past the balance point to allow the deck to tilt.

8. TESTING THE BRAKES

8.01 ***Test the breakaway emergency braking system*** by pulling the breakaway switch chain by hand. With the brake operated, the wheels of an empty trailer should lock and slide when the trailer is pulled by the truck. The wheels of a loaded trailer may not lock and slide but the trailer should be difficult to move forward.

8.02 Immediately after completing the test, release the brakes and replace the chain. The switch should not be on for more than 10 or 15 seconds to keep from running down the emergency brake battery.

8.03 ***Test the truck and trailer service brakes,*** both electric and surge brakes, by determining whether the truck and loaded trailer can be stopped within a distance of 10 feet from a speed of 10 mph. On a hard, paved, level, dry surface that is free of loose material, mark off a distance of 10 feet. Approach the marks at a speed of 10 mph, and apply the brakes at the first of the marks. The brakes must be applied so the stopping distance is measured from the point at which ***movement of the brake pedal or control begins.*** To be used on the public highway, the truck and trailer must stop within the 10-foot distance.

9. INSPECTING THE TRAILER

STRUCTURAL

9.01 Inspect the towing eye for excessive wear and replace as required. Do not attempt to build up worn eyes with weld. The eyes are heat treated and welding has the effect of annealing the steel. Inspect the tongue attachment for loose bolts, rivets, etc. Repair or replace as required.

9.02 Inspect the frame, fasteners, springs, spring shackles, U bolts, and axles for cracks and damage. Magnetic particle and dye penetrants are ideally suited to this type of examination, and the equipment is relatively inexpensive and simple to use. Many private companies are available to perform this type of inspection service if structural damage is suspect.

9.03 Inspect welds for overall quality as well as for cracks and signs of failure. Pay particular attention to repairs since experience has shown that most weld problems are associated with welds made in local repair shops. The magnetic particle and dye penetrant tests will show surface cracks not visible to the naked eye; however, these tests do not show degree of penetration, porosity, or inclusions. Radiographs do show subsurface conditions; however, this method is generally not suitable for examining fillet welds and structural welds are often not accessible. Also, radiographs should be examined only by experienced personnel. The best method of inspecting welds on construction trailers is visual examination by a knowledgeable person. Amount of weld deposit, undercut, overlap, and convexity may be seen, and they are good indications of overall weld quality.

9.04 Persons inspecting welds and those doing the welding should obtain and become familiar with the following standards available for a nominal fee from the American Welding Society, 2501 N.W. 7th, Miami, Florida 33125.

- "Specification for Welding Industrial Mill Cranes" D14.1-70
- "Structural Welding Code" AWS D1.1-72

HYDRAULIC SYSTEMS

9.05 Where a hydraulic system is used to position support jacks, inspect all hydraulic fittings and lines for leaks. Badly abraded hose should be replaced. Maintain the correct level of fluid in the reservoir and check for signs of water in the hydraulic fluid. This is indicated by a milky appearance of the fluid and the presence of foam in the reservoir. If water contamination is indicated, replace the oil with a type recommended by the manufacturer.

LIGHTING

9.06 Check the operation of all lamps. Replace cracked or broken lenses. Inspect terminals for signs of corrosion. Inspect wiring for wear or fraying. Wires should be protected by fabric or metallic loom. Crimp-type terminals, where exposed to the elements, should be taped or otherwise protected to prevent salt and water from entering the joint and causing corrosion.

9.07 Lighting systems must conform to State Lighting Requirements. The Department of Transportation, Motor Carrier Safety Regulations, Part 393, Subpart B may be used as a guide for equipping trailers with lights since most of the state's requirements are met by this standard. However, state motor vehicles laws should be checked for any special requirements. All lights and reflectors must be certified by the manufacturer that they meet S.A.E requirements.

POWER CORDS

9.08 Inspect power cords used to connect the truck and trailer electrical systems. Look for insulation damage and damaged or corroded contacts. Repair or replace as necessary.

BREAKAWAY SYSTEM

9.09 The breakaway system is an essential safety device required by law and, therefore, must be functional. The "light duty" mobile home type of breakaway switch is vulnerable to damage and

corrosion and should be replaced with a heavy duty switch (Fig. 24). The Warner emergency brake switch #1300-831-002 is a suitable replacement. Makeshift devices such as ropes, wire, marline, etc, must not be used to activate the switch. Remove these devices and replace with a suitable chain assembly, such as the Warner chain assembly #1300-100-002.

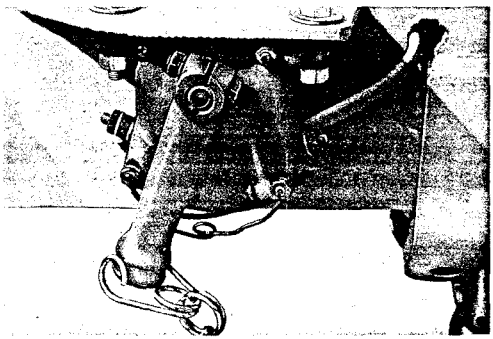

Fig. 24—Heavy Duty Emergency Brake Switch

9.10 Test brake operation by pulling the chain by hand. The most common problem associated with breakaway systems is the battery. Neglect will result in a discharged battery that will not perform when required. When replacing a battery, be sure to use a suitable replacement. Six volt batteries are not suitable for use on trailers with twelve volt systems, but twelve volt batteries may be used on trailers with six volt systems. The following batteries are suitable for use in electric brake systems. From a viewpoint of inventory it may be advisable to stock only 12-volt batteries.

Eveready #1461-6 volt

Eveready #1463-12 volt (preferred)

Ray-O-Vac #641-6 volt

Ray-O-Vac #922-12 volt (preferred)

10. INSPECTION AND MAINTENANCE INTERVALS

10.01 Regular inspection and maintenance in accordance with the following routine will help to ensure safe, dependable service from equipment trailers.

DRIVER RESPONSIBILITY—***Daily***

Be certain the towing truck has proper towing capacity.
Be certain that cargo weight does not exceed trailer capacity.
Check towing hook, latch, safety chains, and breakaway switch.
Check load security.
Check trailer brakes.
Check all lights.
Visually examine tires for signs of under inflation.
Visually examine wheels for missing or loose wheel nuts, also check for evidence of rim slippage on cast wheels.

DRIVER OR MOTOR VEHICLE DEPARTMENT—***Weekly***

Check tire pressure and inspect tires.
Check torque of all wheel nuts.
Inspect for wheel and rim damage.

MOTOR VEHICLE DEPARTMENT—***Monthly***

Inspect truck towing hook and mounting.
Lubricate moving parts of towing hook.
Inspect condition of power cable receptacle on truck.
Inspect safety chain brackets on truck.
Inspect trailer safety chains and points of attachment.
Inspect power cable and receptacle on trailer.
Inspect condition of emergency brake switch.
Inspect and lubricate trailer parking stand.
Replace trailer battery if necessary.
Lubricate trailer as required.
Inspect reflectors, lights, and turn signals.

MOTOR VEHICLE DEPARTMENT—***Semi-annually***

Check all critical welds.
Inspect running gear (wheels, rims, tires, springs, etc.)
Inspect deck planking and ramps.
Inspect tilt deck pivots and cushioning cylinders.
Inspect condition of all wiring.
Inspect brake linings and drums.
Repack wheel bearings as required.