ELECTRO-MOTIVE

M.I. 1509

MAINTENANCE INSTRUCTION

HT-B TRUCK ASSEMBLY

DESCRIPTION

The trucks support the weight of the locomotive and provide a means for transmission of power to the rails. They are designed to withstand the stress resulting from road shock and vibration due to normal variations in the road bed and other conditions encountered during operation. An important function of the truck suspension is to minimize the transmission of track induced shock and vibration to the locomotive underframe, associated equipment and cab area for crew comfort.

The high traction two axle (HT-B) truck, Fig. 1, provides improved adhesion efficiency and wheel load equalization, while eliminating bolster to truck frame wearing surfaces.

Improved adhesion is accomplished by lowering the bolster elevation and increasing the diameter of the center bearing. In addition, the secondary (bolster to frame) suspension is focalized, consisting of V-shaped rubber springs with moderate vertical stiffness and a relatively soft primary coil spring suspension between the truck frame and journal boxes.

The inclined V-shaped rubber springs reduce weight shift within the truck effectively to zero. The zero weight shift is obtained by focalizing the secondary suspension at or close to rail level.

The secondary suspension has a stiffness ratio calculated to resist longitudinal traction and braking forces, yet provide sufficient lateral and vertical spring flexibility for ride performance and better wheel load equalization, while eliminating bolster to frame driving faces.

Vertical and lateral track irregularities which may generate bouncing motions, are controlled by use of vertically and laterally mounted shock absorbers. Each axle is equipped with a vertical shock absorber mounted between the journal box and truck frame. In addition, two laterally mounted shock absorbers damp bolster to truck frame movement.

MAINTENANCE

TRUCK CLEANING

UNDER LOCOMOTIVE

Trucks should be periodically cleaned while under the locomotive to eliminate any accumulation of oil and road dirt. An oily accumulation presents a fire hazard and tends to increase wear of moving parts on the truck, as well as detract from general appearance of trucks.

CAUTION

When cleaning trucks under the locomotive, the engine should be running to supply air under pressure to the traction motors. Discharged air will help prevent overspray from entering the motors. Care should be exercised to direct spray from any motor openings.

A wetting agent and an alkaline solution type cleaner can be used on the truck. Spray wetting agent over truck surfaces and let it remain for 10 to 15 minutes. Then using steam and an alkaline solution in a mixing gun, thoroughly spray entire truck assembly. Rinse assembly with hot water.

TANK CLEANING

When the truck assembly is removed from the locomotive, the traction motors, wheels, axles, bearing adapters, rubber suspension springs, and brake cylinders should be removed if the truck is to be immersed in a cleaning tank containing an alkaline solution. In addition, phenolic or composition wear plates and pedestal liners should not be

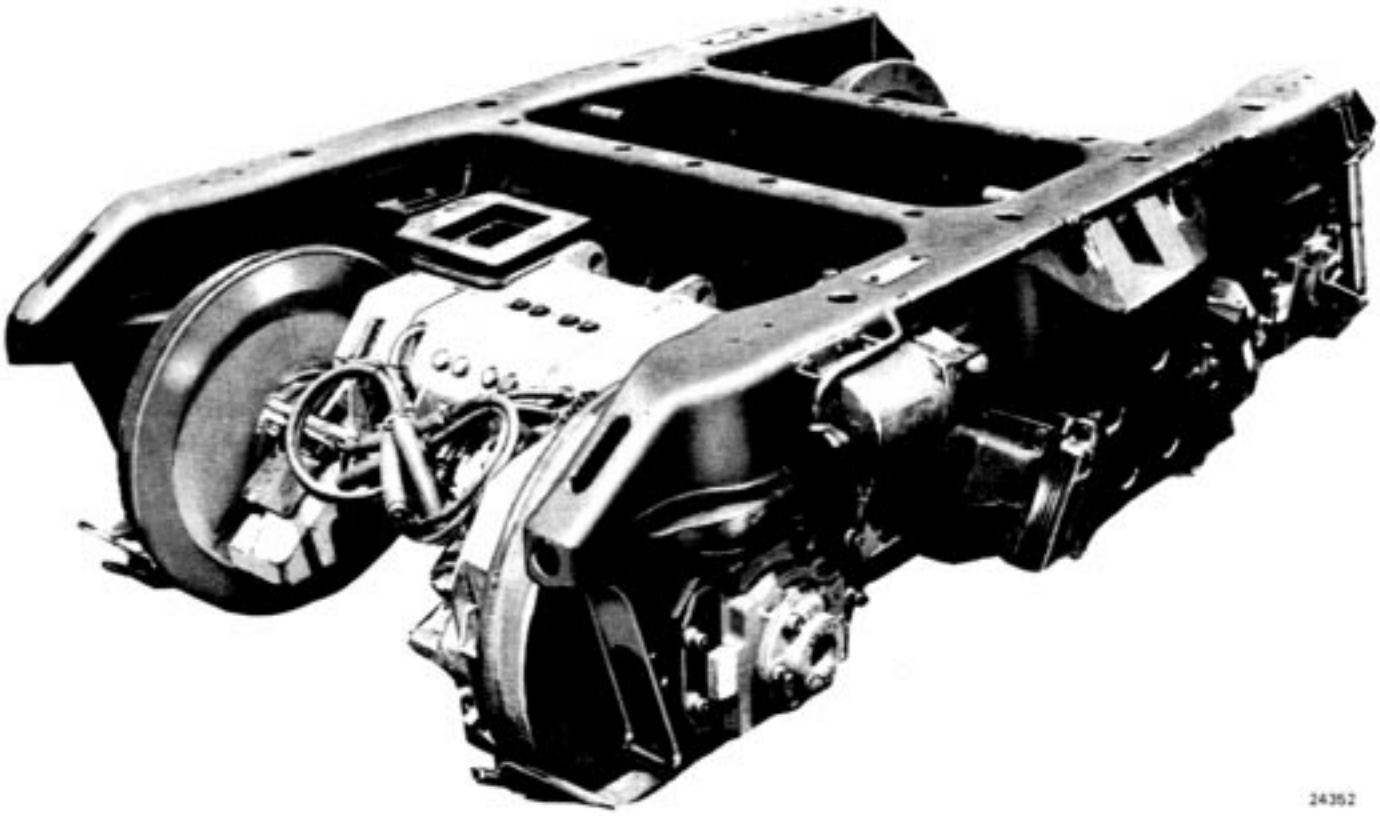


Fig. 1 - HT-B Truck Assembly

immersed. After a sufficient time to assure removal of all foreign material, remove the assemblies and rinse them using hot water.

INSPECTIONS BEFORE REMOVING TRUCKS

The following items should be inspected before the trucks are removed from the locomotive. In addition, these inspections should be part of a routine inspection schedule, to indicate worn parts before they fail.

The list is to be used as a guideline. Each item to be inspected has a reference to a section in this Maintenance Instruction where the inspections to be performed are detailed.

NOTE

Perform inspections with the locomotive on level track.

Item:

1. Shock absorbers. Refer to Shock Absorbers section.

2. Secondary (bolster to truck frame) suspension. Refer to Secondary Suspension under the Bolster section.

3. Inspect side bearing clearance. Refer to Side Bearings under the Bolster section.

4. Pedestal liners. Refer to Pedestal Liners section.

5. Brake rigging. Refer to Brake Rigging section.

TRUCK REMOVAL

The trucks may be removed from the locomotive by using an overhead crane or jacks to raise the locomotive, or by use of a drop table.

Before any attempt is made to raise the locomotive for truck removal, remove the safety pins which link the trucks to the carbody underframe. One pin is located on each side of the trucks. Make sure that all other physical connections between the trucks and carbody are disconnected, such as air brake equipment, sanding equipment, traction motor cables, hand brake chains, and speed recorder connections.

When removing only one truck it will be necessary to raise the entire locomotive until the carbody center bearings clear the truck bolster bearings to prevent bearing damage.

CAUTION

When jacks are used to raise the locomotive, ensure that all jacks are raised equal amounts. Unequal jacking may cause the carbody to be sprung out of shape. The locomotive should be supported on blocking located under the center sills near the jacking pads.

TRUCK LUBRICATION

No periodic lubrication is required on the truck assembly, however, slack adjuster threads should be lubricated if dry.

The center bearing should have enough oil added at the time a unit is trucked to cover the center bearing wear plate, approximately 3 litres (6-1/2 pints).

No lubrication is required on bearing adapter or pedestal jaw wear surfaces.

TRUCK DISASSEMBLY

The truck may be disassembled using one of two methods, provided facilities and height requirements are available, the normal procedure is to disassemble the truck in the inverted position. Procedure A provides a general guideline for disassembling the truck in the inverted position. Procedure B may be used when necessary to disassemble the truck in the upright position.

PROCEDURE A

1. Remove center bearing dust guard, wear plate, and wear half rings. Wipe oil from center bearing and drain oil from journal boxes and traction motor support bearings.

2. While truck is in the upright position, remove individual items such as brake cylinders, rigging, and piping from truck.

NOTE

Some portions of the brake rigging may be more easily removed when the truck is inverted.

3. Place wooden wedges between frame and bolster to prevent shifting of bolster while truck is being inverted, Fig. 2.

4. Turn truck upside down using a locally fabricated lifting fixture and an overhead crane of sufficient capacity. Refer to Service Data for file drawing available to fabricate lifting fixture.

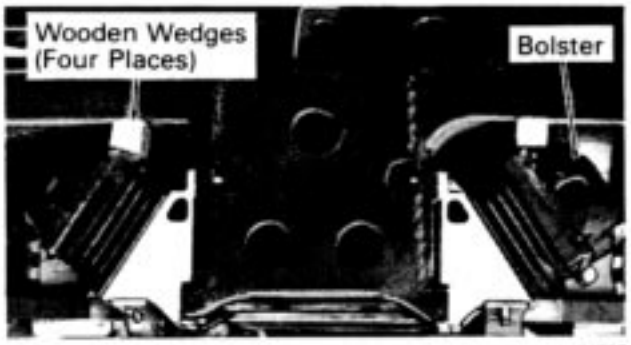


Fig.2 - Preparation For Inverting Truck

5. Disconnect vertical shock absorbers and remove pedestal tie bars.

6. Remove traction motor, axle, wheels, gear case, and journal boxes as a single assembly, Fig. 3. Refer to Service Data for file drawing available to fabricate lifting fixture.

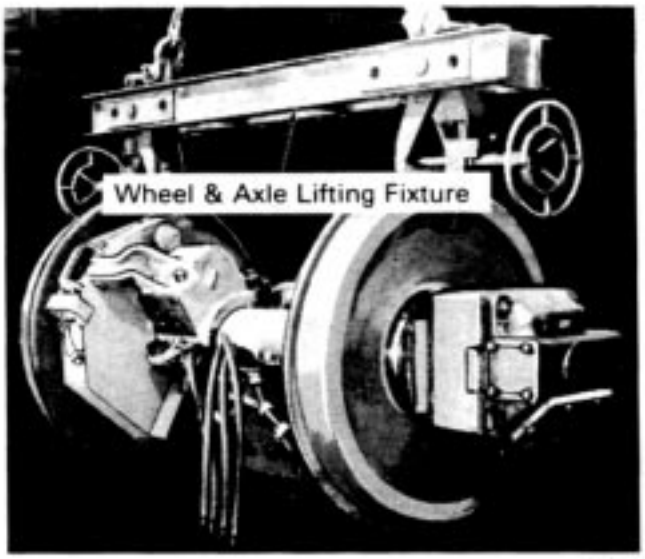


Fig.3 - Removal Of Wheels, Axle, And Motor Assembly

7. If bolster is to be removed, disconnect lateral bolster to truck frame shock absorbers and remove bolster safety straps.

8. Attach suitable lifting hoist at each corner of bolster. Lift bolster slightly to remove wooden wedges.

9. Remove the four bolster to rubber spring pad mounting bolts from each leg of the bolster. Remove the four bolster spring adapter to truck frame mounting bolts from each leg of the bolster.

10. Slide rubber bolster springs pads and adapters as a single unit from between truck frame and bolster. Remove bolster and set on blocking.

11. Coil springs and spring seats, and any other smaller parts of the truck may be removed as desired.

12. To remove traction motor nose suspension assembly:

    a. Remove pin keeper bar and remove keeper pins, Fig. 4.

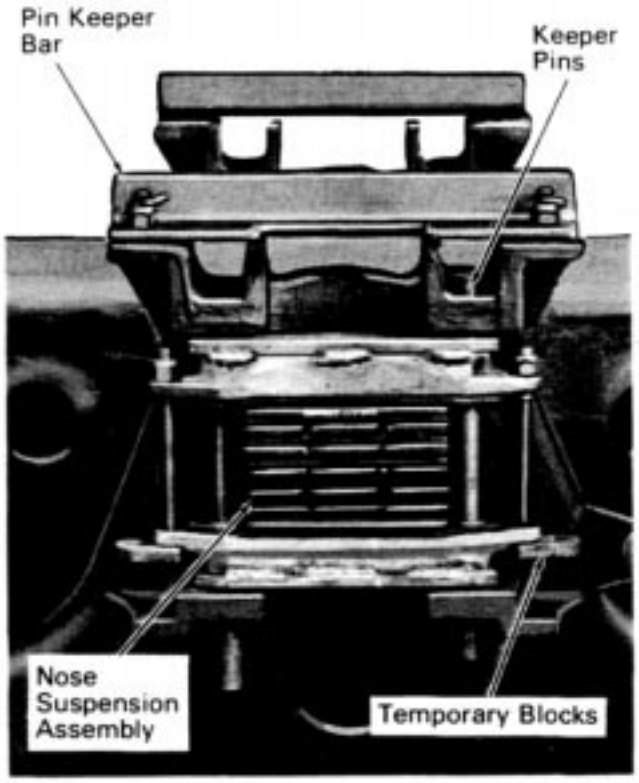


Fig.4 - Traction Motor Nose Suspension Removal, Inverted View

    b. Compress suspension assembly by loosening the assembly bolts and placing temporary blocks between the bolt heads and frame of nose suspension assembly. Retighten bolts to compress rubber pack and remove assembly.

PROCEDURE B

1. Remove center bearing dust guard, wear plate, and wear half rings. Wipe oil from center bearing and drain oil from traction motor support bearings.

2. Remove individual items such as brake cylinders, rigging, and piping from truck.

3. Remove traction motor gear case bolts and clips. Remove each half of gear case.

4. Remove dust guards, air ducts, traction motor support bearing caps, axle guard, and outer bearing half.

5. Apply lifting chains to bails at nose suspension side of traction motor. Connect lifting hoist to chains.

6. Remove traction motor nose suspension assembly:

    a. Remove pin keeper bar and remove keeper pins.

    b. Lift motor slightly to compress suspension assembly.

    c. With suspension assembly compressed, insert temporary blocks between the assembly bolt heads and frame of nose suspension assembly.

    d. Lower motor enough to remove suspension assembly from truck frame.

CAUTION

Use care in lifting motor to prevent the support bearing from falling.

A pinion protector should be applied to prevent damage to pinion after motor is removed.

7. Hoist motor, allowing it to rotate on the axle until the lower lip of the support bearing clears the axle. Lift motor assembly clear of truck.

8. Disconnect vertical shock absorbers and remove pedestal tie bars.

9. If bolster is to be removed, attach lifting hoist to bolster. Disconnect lateral bolster to truck frame shock absorbers, and remove bolster safety straps.

10. Remove the four bolster to rubber spring pad mounting bolts from each leg of bolster. Remove the four bolster spring adapter to truck frame mounting bolts from each leg of the bolster.

11. Slide rubber bolster spring pads and adapters as a single unit from between truck frame and bolster. Lower bolster to ground.

12. Lift truck frame from wheel and axle assemblies, and bolster.

13. Remove coil springs, spring seats, and shims. Any other smaller parts of the truck may be removed as desired.

INSPECTION AND RECONDITIONING

Make a thorough inspection of the following items and recondition if necessary.

GENERAL

BROKEN OR CRACKED MEMBERS

Inspect entire truck frame for breaks or cracks. Perform magnetic partical inspection at any areas suspected of being cracked.

Breaks or cracks must be repaired by welding with AWS E-7016 electrode. If the broken section can be removed or straightened, it is permissible to weld it back into place after preparing the joint to obtain a 100% section of weld with reinforcement as shown in Fig. 5.

Broken cast sections may be duplicated with a like shape made from MS-4361 steel, and welded to the truck frame.

All welds made on broken or cracked sections should be magnetic partical inspected after welds have cooled to below 204° C (400° F).

BENT SECTIONS

Bent sections may be straightened either cold or after the application of heat, Fig. 6. Before straightening any bent section, determine what effect the straightening will have on the adjoining sections. Jacks, turnbuckles or fixtures designed for straightening members will expedite the straightening of bent sections.

NOTE

Refer to Fig. 18 to determine bent sections, as described under Truck Frame Pedestal Repair.

WORN SPOTS

The truck frame should be checked for worn spots in areas other than those subject to normal wear.

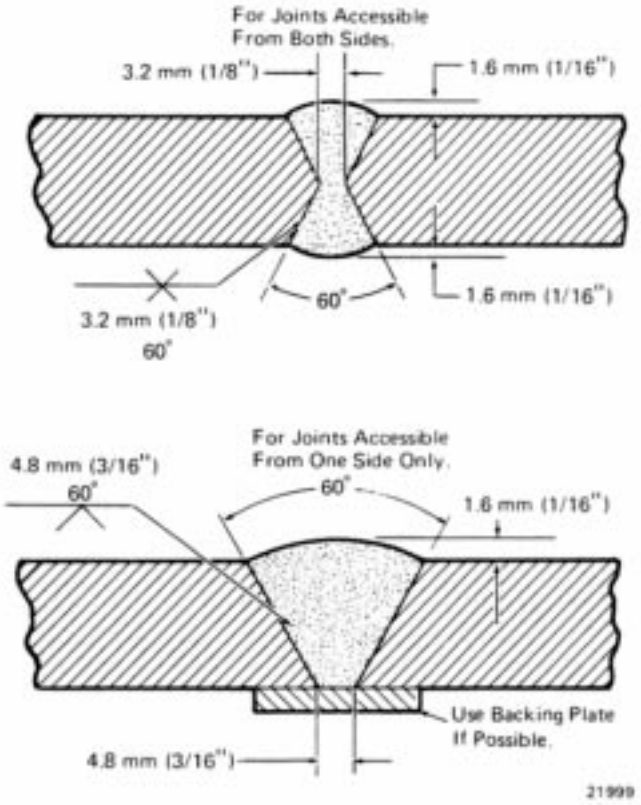


Fig.5 - Preparing Joints For Welding

Special attention should be given to loose brake levers which may cause wear within the clevis slots. Springs may have to be renewed due to excessive wear of the spring seats.

Worn spots can be repaired by building up the affected area with weld using an AWS E-7016 electrode. After welding operation is complete grind the area smooth to match its original form.

ELONGATED OR OVERSIZE HOLES

Drilled holes elongated by wear due to loose bolts, pins, sleeves or bushings, should be brought back to normal size as determined by comparison with similar locations on a truck in good condition. The holes should not be worn more than 1.2 mm (3/64") on the radius of the supporting side or 2.4 mm (3/32") on the diameter.

Holes which are beyond the above tolerances can be reconditioned by either ring or plug welding. Holes which are too small to permit proper manipulation of the welding electrode should be drilled oversize to permit proper access for the electrode. The hole should be redrilled to proper size after completion of the welding.

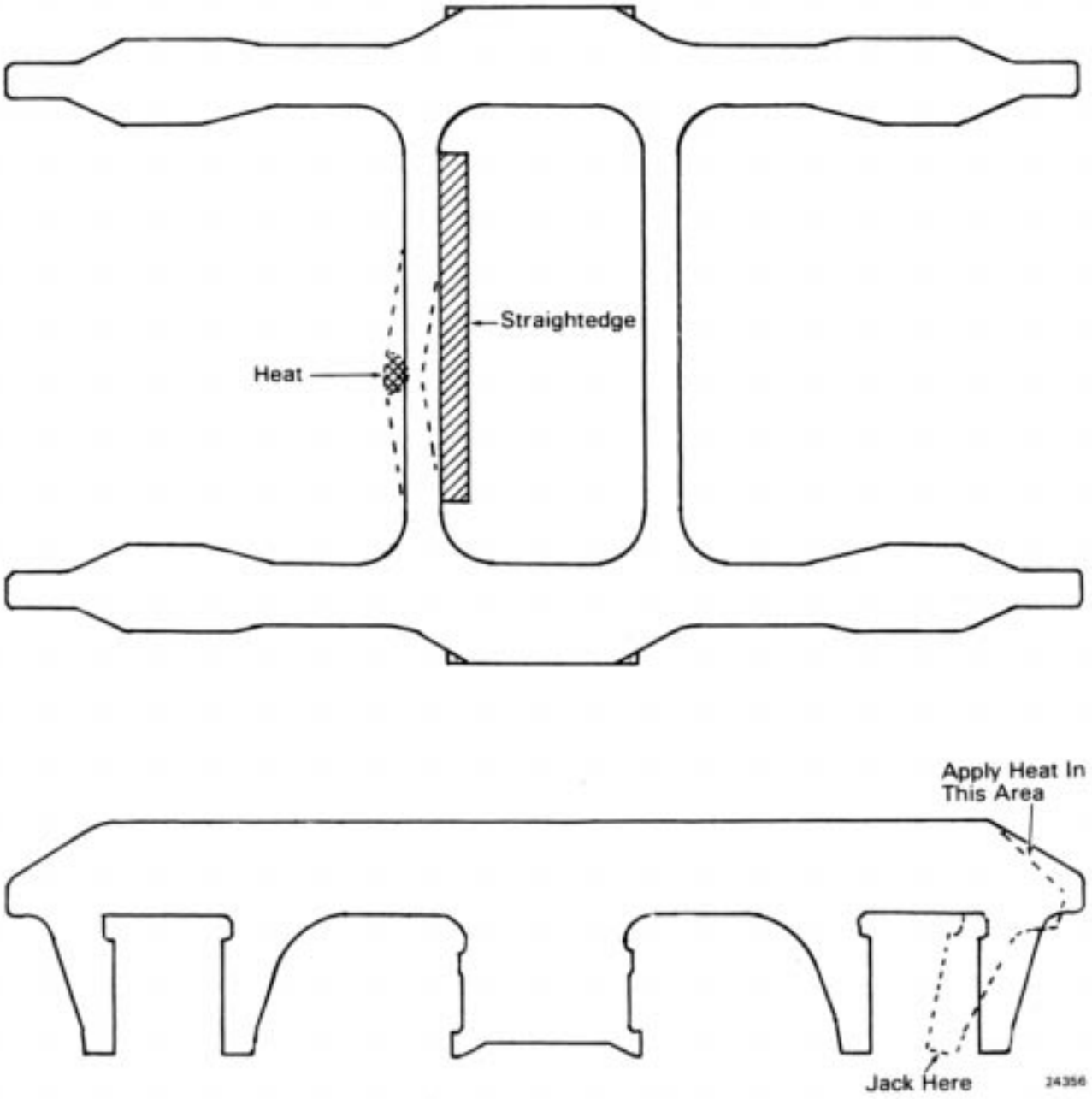


Fig.6 - Straightening Bent Sections

WORN BUSHINGS

Bushings worn 2.4 mm (3/32") or more on the diameter should be replaced with new bushings. Where bushings are paired to carry a single load, both of the bushings should be renewed if one bushing is worn sufficiently to warrant its replacement.

Worn bushings can be pressed out. After the bushing is removed, inspect the drilled hole in the frame for wear or an out-of-round condition.

Holes found unsuitable for a new bushing can be reconditioned by ring welding and then drilling to accept the new bushing. Holes which are only slightly oversize may be shrunk by applying a band of heat parallel with the drilled hole.

DAMAGED THREADS

All threaded holes should be checked and retapped if required. If the threaded holes cannot be reconditioned by retapping, they should be plug welded, redrilled and tapped. An alternate method for reclaiming unsatisfactory threaded holes is to retap them to accommodate an oversize bolt.

BROKEN OR BENT STUDS

Replace any broken or bent studs with studs which are in satisfactory condition.

MISSING PARTS

Make a thorough inspection to see that all the necessary parts are intact. Special attention should be given to cotter pins, washers, bushings, studs, brake guides, and brake pins.

SHOCK ABSORBERS

HT-B trucks are equipped with both vertical (journal to truck frame) and lateral (bolster to truck frame) shock absorbers. The shock absorbers are similar in appearance, and it is physically possible to interchange some types. Incorrect installation will cause the shock absorbers and/or the mounting hardware to fail. Each shock absorber has a label marked "L" or "V" which identifies it for lateral or vertical application.

INSPECTION

Shock absorbers should be periodically inspected. Use the following steps as a guideline. The procedures under Manual Qualification, are easily performed prior to wheel truing operations.

FLUID LEAKAGE

Shock absorbers contain a reserve of hydraulic fluid and allow seepage to lubricate the piston rod. A light film of oil is normal and is not cause for rejection. However, it is not possible to ascertain the amount of reserve fluid in the shock absorber and predict remaining life.

Check for leaking fluid. Make certain that oil has not been deposited from another source. If leakage is suspected perform procedures under Manual Qualification before rejecting shock absorber.

MANUAL QUALIFICATION

Shock absorbers rarely fail only partially. When the shock absorber fails there is no resistance to movement in compression, rebound, or both directions. The following simple manual test can detect failure.

GO/NO GO TEST

This test can be performed without completely removing the shock absorber from the truck. One end of the shock absorber is unbolted and the shock absorber is stroked manually. If there is force output in both compression and rebound, the shock absorber is acceptable. If control is gone in either direction, replace with a qualified shock absorber. If there is indication of internal looseness, renew regardless of control.

NOTE

If a shock absorber is new or has not been in service for an extended period, it must be stroked a few times to obtain consistent motion before being checked for control. Resistance developed during testing is proportional to the velocity of the test stroke.

VERTICAL SHOCK ABSORBERS

Use the following steps to qualify vertical shock absorbers.

1. Loosen the upper mounting bolt.

2. Unbolt the shock absorber from the journal box and manually stroke it while retaining the normal vertical position.

NOTE

By design, the compression resistance of vertical shock absorber 3188696 is much less than the rebound resistance (400 lbs. versus 1200 lbs.). The resistance of the lateral shock absorbers is comparable in both compression and rebound.

3. If force output is obtained in both compression and rebound, the shock is acceptable for reuse provided no looseness is indicated. Inspect mounting hardware for defects and replace if necessary, Fig. 7. Reapply shock absorber and torque mounting bolts to 366 N·m (270 ft-lbs).

LATERAL SHOCK ABSORBERS

The lateral shock absorbers can be checked by disconnecting only one end of the assembly and manually stroking it. Position during the test is not significant for the lateral shock absorber.

If shock absorbers qualify, reapply mounting bolts and torque to 366 N·m (270 ft-lbs).

MANUAL COMPARISON TEST

A wall mounted fixture has been designed to test and compare used shock absorbers with new shock absorbers of the same type. A torque wrench may be employed with the fixture. Work Sketch 41089 is available to fabricate the fixture.

A shock absorber may be reused if the torque reading at the same stroke velocity is 75% or more of the reading obtained with a new shock absorber.

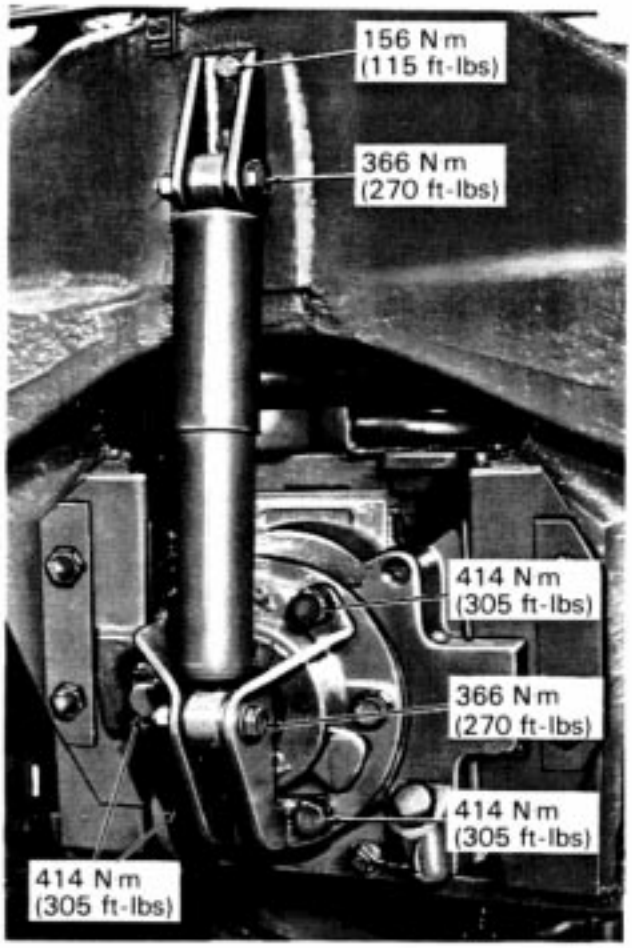


Fig.7 - Vertical Shock Absorber Installation

BOLSTER

The bolster, Fig. 8, is a steel casting used to transfer the locomotive weight to the truck frame. The truck bolster center bearing mates with the locomotive underframe center bearing. The truck is designed with a focalized, rubber secondary suspension which eliminates bolster to truck frame driving face wear plates.

The bolster should be inspected and reconditioned if required, by following the list under the General heading. In addition, the following items should be inspected and reconditioned if necessary.

SECONDARY SUSPENSION

The secondary (bolster to truck frame) suspension consists of four V-shaped rubber springs, spring adapters, and two lateral shock absorbers, one on each side of the bolster.

The shock absorbers may be inspected as described under General.

The rubber springs and spring adapters, should be inspected while the truck is under the locomotive and on level track.

Visually inspect rubber springs for deterioration, significant cracks, or tears. Check bolster to truck frame lateral clearance as shown in Fig. 9.

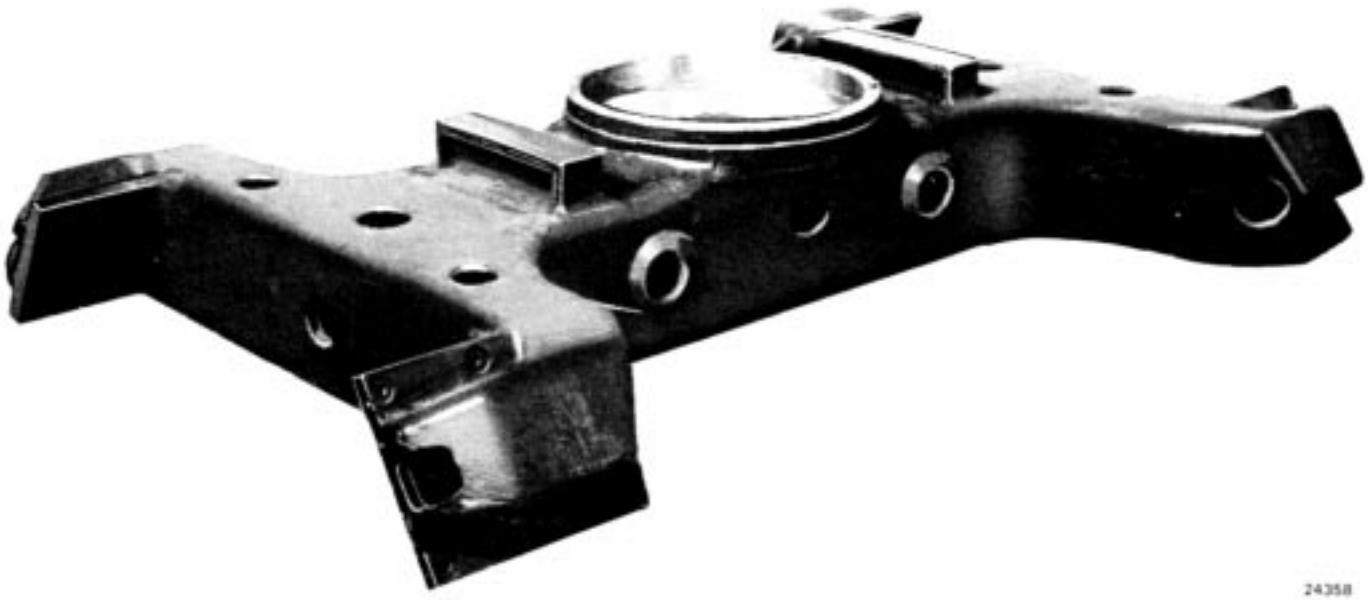


Fig.8 - Bolster Assembly

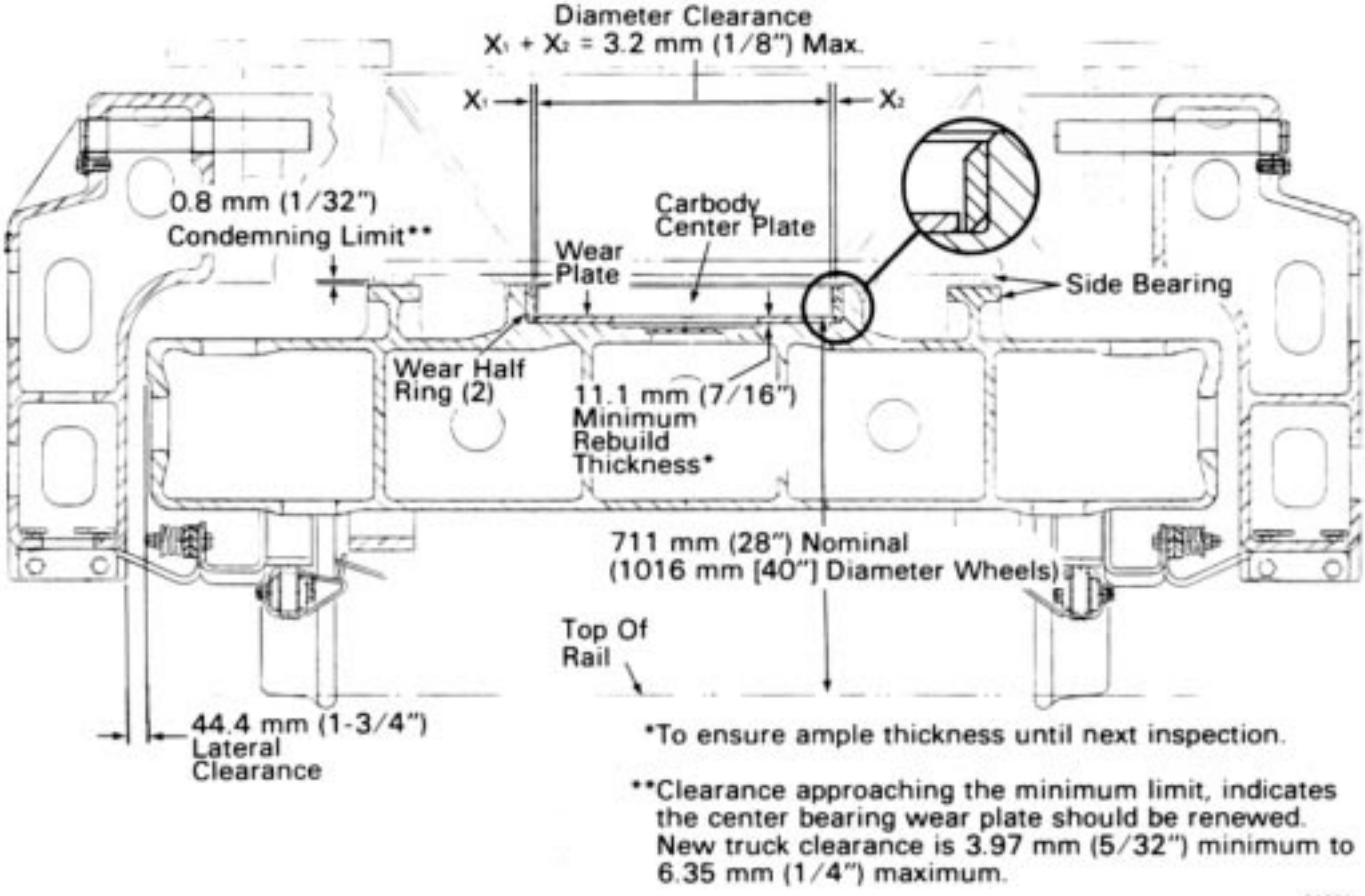


Fig.9 - Bolster Inspection

NOTE

When truck is disassembled, the rubber springs should be inspected for tears, cracks, or deterioration. Inspect the two 1" dowels which mate with holes in the spring adapters.

SIDE BEARINGS

The bolster side bearings are designed to mate with similar bearings mounted beneath the carbody underframe as indicated in Fig. 9.

A clearance is provided between the bolster side bearings and the underframe side bearings, during normal operation. The side bearings are designed to prevent excessive tilting or leaning of the locomotive, but are not designed to carry a continuous load.

Clearance between the side bearings on a new truck is 4.0 mm (5/32") minimum to 6.4 mm (1/4") maximum. Side bearing clearance approaching the 0.8 mm (1/32") minimum limit, indicates the center bearing wear plate should be renewed. Refer to Center Bearing Wear Plate And Wear Half Rings.

NOTE

The carbody underframe side bearings are renewable. If a new center bearing wear plate does not restore side bearing clearance within the limits, check underframe side bearings for wear.

CENTER BEARING DUST GUARD

A dust guard, Fig. 10, seals the bolster and underframe center bearings and prevents the entrance of moisture and dirt. The dust guard recess at the top of the center plate receptacle must be free of nicks and burrs which might cut or damage the dust guard boot.

Fig.10 - Center Bearing Dust Guard

Before trucking, a 9.5 mm (3/8") high bead of bearing grease should be applied to the dust guard surface which contacts the carbody underframe bolster.

CENTER BEARING WEAR PLATE AND WEAR HALF RINGS

The bolster center bearing on each truck supports half the weight of the locomotive. Also, the bolster center bearings transfer truck generated motive force to the locomotive carbody. The load on these parts and the relative movement between them will subject the parts to minimal wear.

As mentioned previously, side bearing clearance close to the 0.8 mm (1/32") minimum limit is an indication of wear at the center bearing wear plate. The rebuild limit of the center bearing wear plate is shown in Fig. 9. The thickness of the wear plate should be checked whenever the plate is accessible. When the plate reaches the rebuild limit, it should be renewed, to ensure ample thickness until the next inspection. If the thickness is greater than the rebuild limit, it may be used.

The outside diameter of the carbody center plate bushing and the inside diameter of the bolster center bearing wear half rings should be checked to determine the total clearance between them. The recommended clearance is shown in Fig. 9. Replace wear half rings when clearance approaches the maximum.

Center bearing wear plates and wear half rings, are made of 13 mm (1/2") thick Nylatron or laminated phenolic material.

Check the center bearing area of the bolster to make sure there are no cracks or voids which might allow lubricating oil to leak out. If any cracks are found, they must be completely removed by arc air cutting, flame cutting, chipping, or grinding and a 60° "V" groove provided for welding. Weld the crack with an AWS E-7016 electrode. Peen the second weld pass and each pass thereafter to minimize distortion. Grind off excess weld metal so the surface of the center bearing plate will be flat within 0.51 mm (0.020").

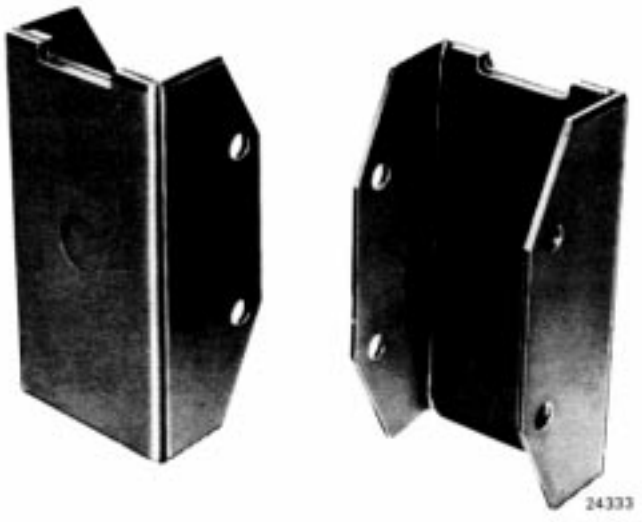
After the old wear plate and wear half rings are removed and the necessary repairs made, the bearing bore should be cleaned and the surfaces smoothed so they offer little resistance to the application of the new replacement half rings. Check the replacement half ring surfaces to see that they are smooth. Apply the rings to the center bearing bore. The replacement half rings have an interference fit in the bore, so they must be forced into position in the bolster center casting. Apply so that the split line between the half rings will be 90° from the longitudinal centerline of the locomotive.

NOTE

Apply half rings so that angled edges are positioned as shown in Fig. 9.

PEDESTAL LINERS

Pedestal liners, Fig. 11, are provided to accommodate the wear that occurs from the relative movement between the journal box and the pedestals. For convenience of replacement, the pedestal liners are bolted to the pedestal jaw. Nylatron pedestal liners are basic.



Face View

Interior View

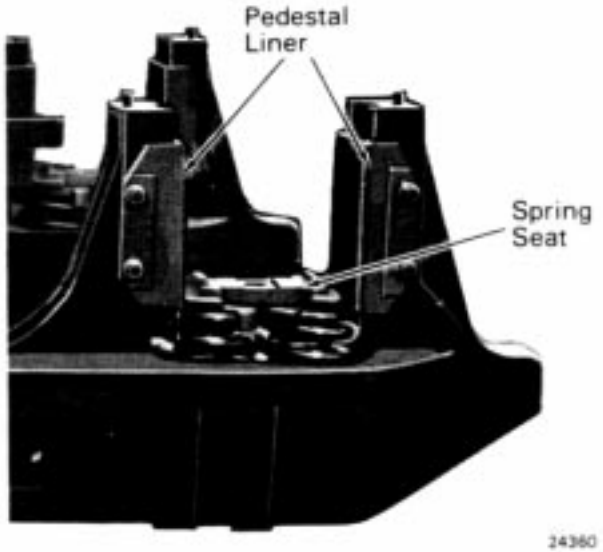


Fig.11 – Notched Pedestal Liners

The liners are equipped with a notch at the top edge. This notch reduces journal spring force on the liner when the spring seat is allowed to rest on the liner during truck buildup or wheel-axle changeouts. A groove radius is provided at the inside corners to reduce stress.

Clearance limits between the longitudinal or lateral wear surfaces, are such that in normal operation the clearance will not exceed the maximum in the period between truck reconditioning. The nominal lateral clearance between the journal box and the pedestal liner is 1.6 mm (1/16") at each side of the pedestal as shown in Fig. 12. The truck pedestal to journal box wear limits are also shown in Fig. 12. If the clearances are beyond the maximum limits, the pedestal liners must be renewed. The liners should be visually inspected for breaks or cracks before they are reused.

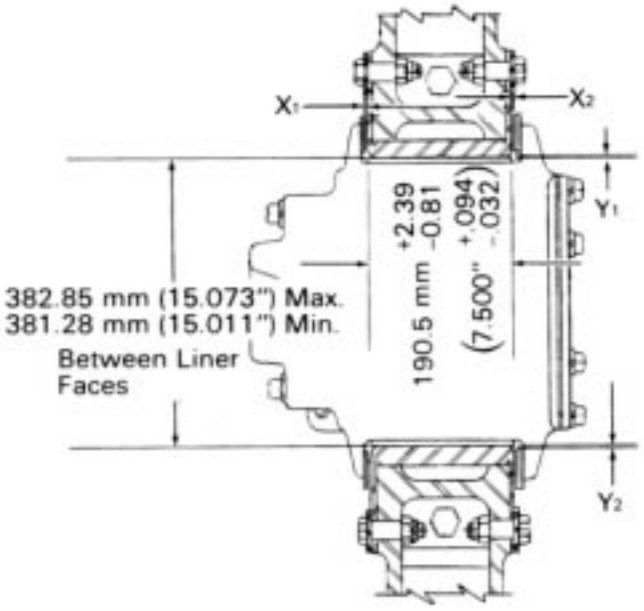


Fig.12 – Pedestal Liner Inspection

The clearance between the journal box and the pedestal can be measured using feeler gauges. Feeler gauges must be approximately 25.4 mm (1") wide and 205 mm (12") long. Care should be taken in making this measurement to see that the gauge is inserted adequately into the clearance, and that it fits into the wearing area so a true reading is obtained. All measurements should be taken with the journal boxes in the position they are in when the locomotive is stopped. No attempt should be made to shift the journal boxes on the axle while the weight of the locomotive supported by the boxes.

PEDESTAL LINER APPLICATION

Inspect pedestal jaws to make certain that surfaces are smooth and free of any raised areas that might interfere with application of liners. Chamfer any sharp corners on the journal box liners, to prevent damage to pedestal liners.

WARNING

To prevent liner breakage and possible injury to personnel, apply notched pedestal liners only in pairs. This will ensure that the journal spring seats are level during truck buildup or wheel-axle changeouts.

Apply liners using a liner pressing tool, Fig. 13. Refer to Service Data for file drawing available to fabricate pressing tool. The notch (in the pedestal liners) must be positioned next to the spring seat with the ear on the spring seat nestled into it. Liners should fit tightly on the pedestal jaw with the mounting holes mating with the pedestal bolt holes and liner driving face in complete contact with the pedestal jaw. Mounting bolts should enter liner and pedestal bolt holes freely. Apply bolts and washers, torque bolts to between 237 and 305 N·m (175 and 225 ft-lbs).

NOTE

A plate type washer 9515453 is available to replace pedestal mounting bolt washer 106269. The plate washer spans both pedestal liner mounting bolts to reduce liner stresses.

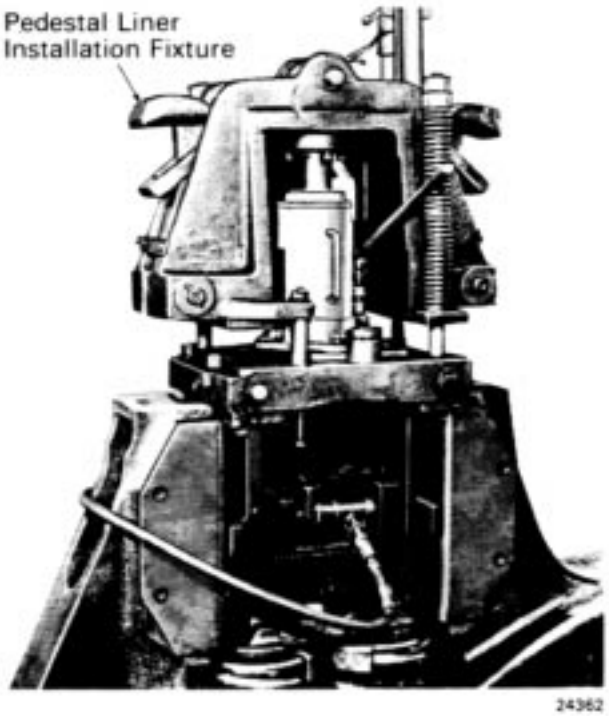


Fig.13 – Installing Pedestal Liners

COIL SPRING SEAT

A spring seat is used between the coil springs and journal box to provide a means to secure the springs to the journal box. Spring seats are also located in the truck frame journal spring pockets.

At the journal box, shim plates are used between the spring seat and springs to maintain proper locomotive height for different weight locomotives. Shim plates are used at the journal spring pockets, between the truck frame and the upper spring seat, to maintain the dimension shown in Fig. 14.

A locomotive equipped with HT-B trucks and using 1 016 mm (40") diameter wheels, should maintain a height from the rail to the bottom of the underframe of 1 197 mm (47-1/8"). Journal box spring seat shimming is provided to maintain the coupler height and a reasonably equal axle load distribution on the rail.

Inspect all spring seats during truck reconditioning for evidence of distortion or damage. Limits for dimensions which are subject to change because of wear are shown in Fig. 14. Information required to renew upper spring seats is also provided in Fig. 14.

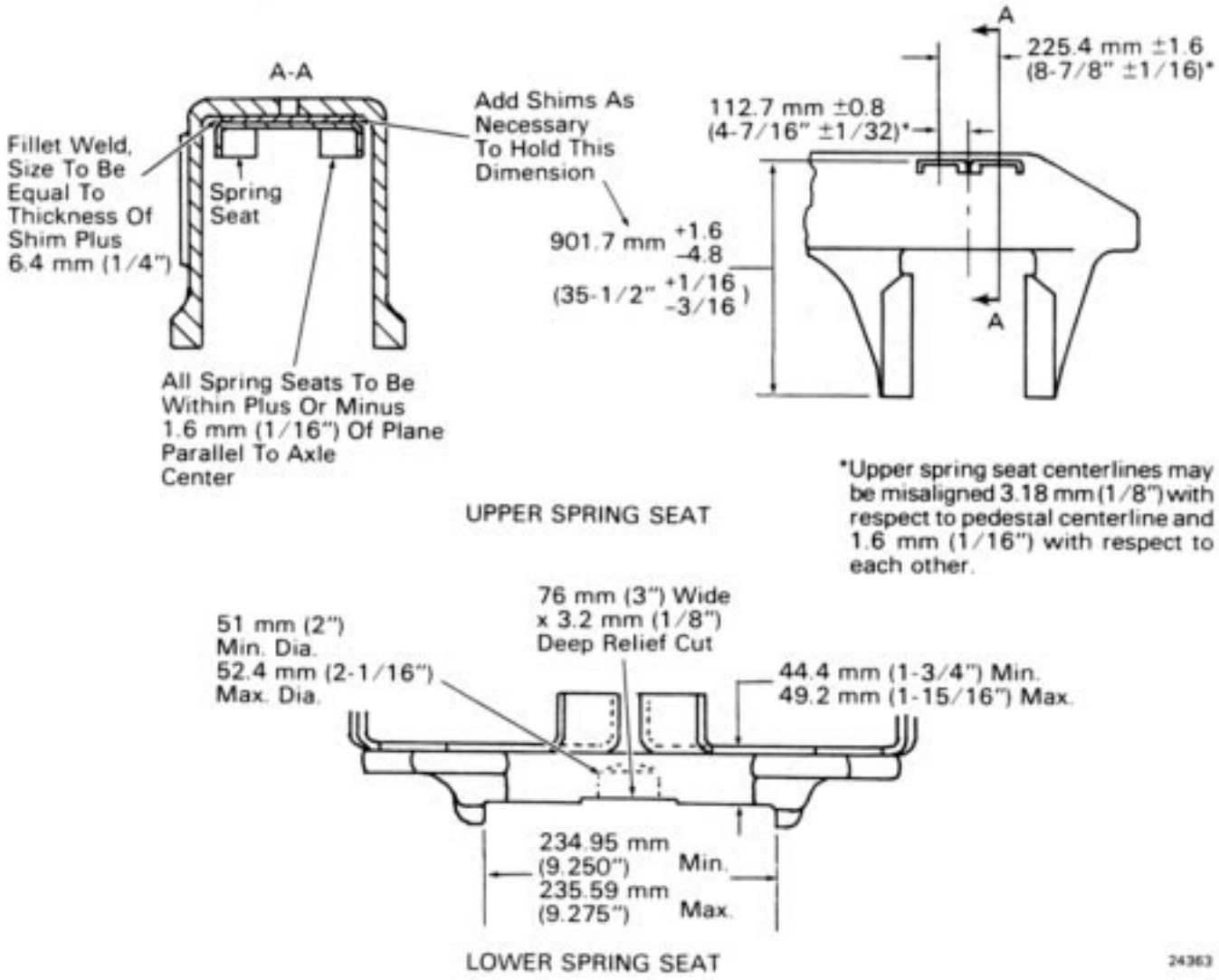


Fig.14 – Spring Seat Repair

TRACTION MOTOR NOSE SUSPENSION

SUSPENSION PACK

Each time power is applied to the traction motors, the pinion of each motor tries to ride around the axle gear, raising the motor up or pulling it down, depending on the direction of motion. This movement of the motor is arrested by securing the motor to the truck frame transom through a shock damping rubber suspension pack which is mounted as shown in Fig. 15.

WEAR PLATES

The wear plates on the suspension assembly are subjected to severe shocks and tremendous pressures, causing them to wear, resulting in free movement between the traction motor frame and the suspension assembly. As this movement increases, due to wear, the severity of the shocks increases, especially during the rapid changes of torque caused by wheel slips.

To obtain maximum cushioning effect from the suspension pack, wear plates should be periodically replaced to ensure there is not more than 6.4 mm (1/4") free movement in the traction motor nose suspension. If the wear plates, which are 12.7 mm (1/2") thick when new, are worn enough to permit more than the 6.4 mm (1/4") free movement, or if the wear plates are worn more than the limits given in Fig. 15, the suspension pack should be removed and the wear plates replaced.

The upper wear plate is identical to the lower wear plate, which has a minimum limit of 11.1 mm (7/16"). The lower wear plate may be moved to the upper position if it is still within the 10.3 mm (13/32") upper wear plate limit.

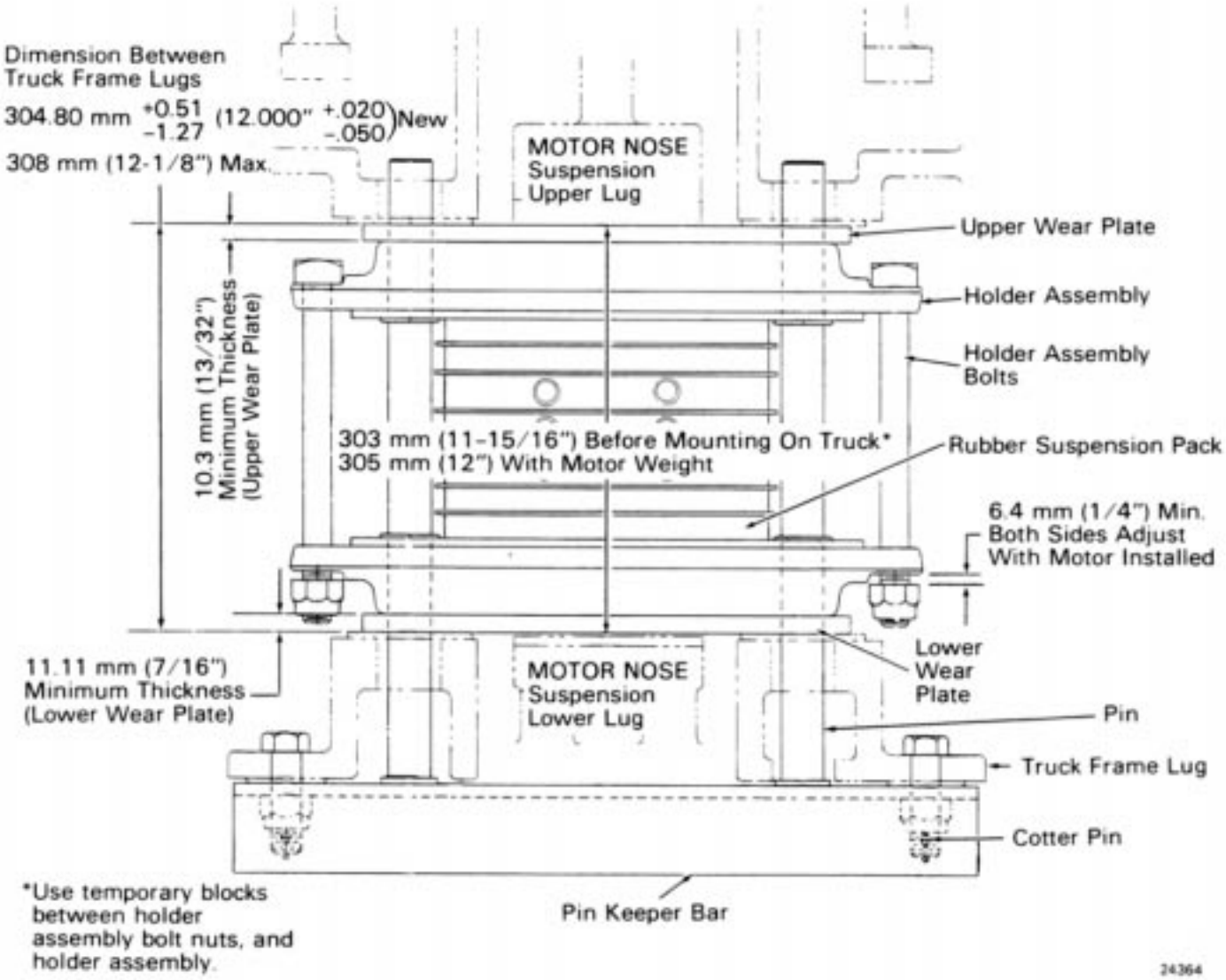


Fig.15 - Traction Motor Nose Suspension

The old wear plate can be removed from the spring pack holder by grinding or chipping off the welds holding it. The new wear plate should conform to the dimensions of the original plate. Information required to renew the wear plates, is provided in Fig. 16.

TRUCK FRAME MOTOR NOSE SUSPENSION LUGS

The steel wear plates on the upper and lower truck frame transom lugs that support the motor suspension assembly are subject to wear due to chafing of the motor suspension assembly. The dimension between these surfaces when new is 304.80 mm +0.51 mm -1.27 mm (12.00" +.020 -.050). The wear plates should be renewed when the dimension between the surfaces reaches 308 mm (12-1/8").

The old wear plates can be removed from the lugs by grinding or chipping off the welds holding it. The new plates should conform to the dimensions of the original plates. Apply the new plates to the lugs with a 4.8 mm (3/16") fillet weld using an AWS E-Fe Mn-A welding electrode. Weld the plate on three sides as shown in Fig. 17. Center wear plate on lug so that the hole through the wear plate does not obstruct or lap hole through lug.

After the wear plates are applied, the surfaces must still be in the same plane and the dimension between the upper and lower lugs should be 304.8 mm ± 0.8 mm (12" ± 1/32").

The guide pin holes in the frame lugs should be checked for size. If worn excessively, renew bushings which line the holes.

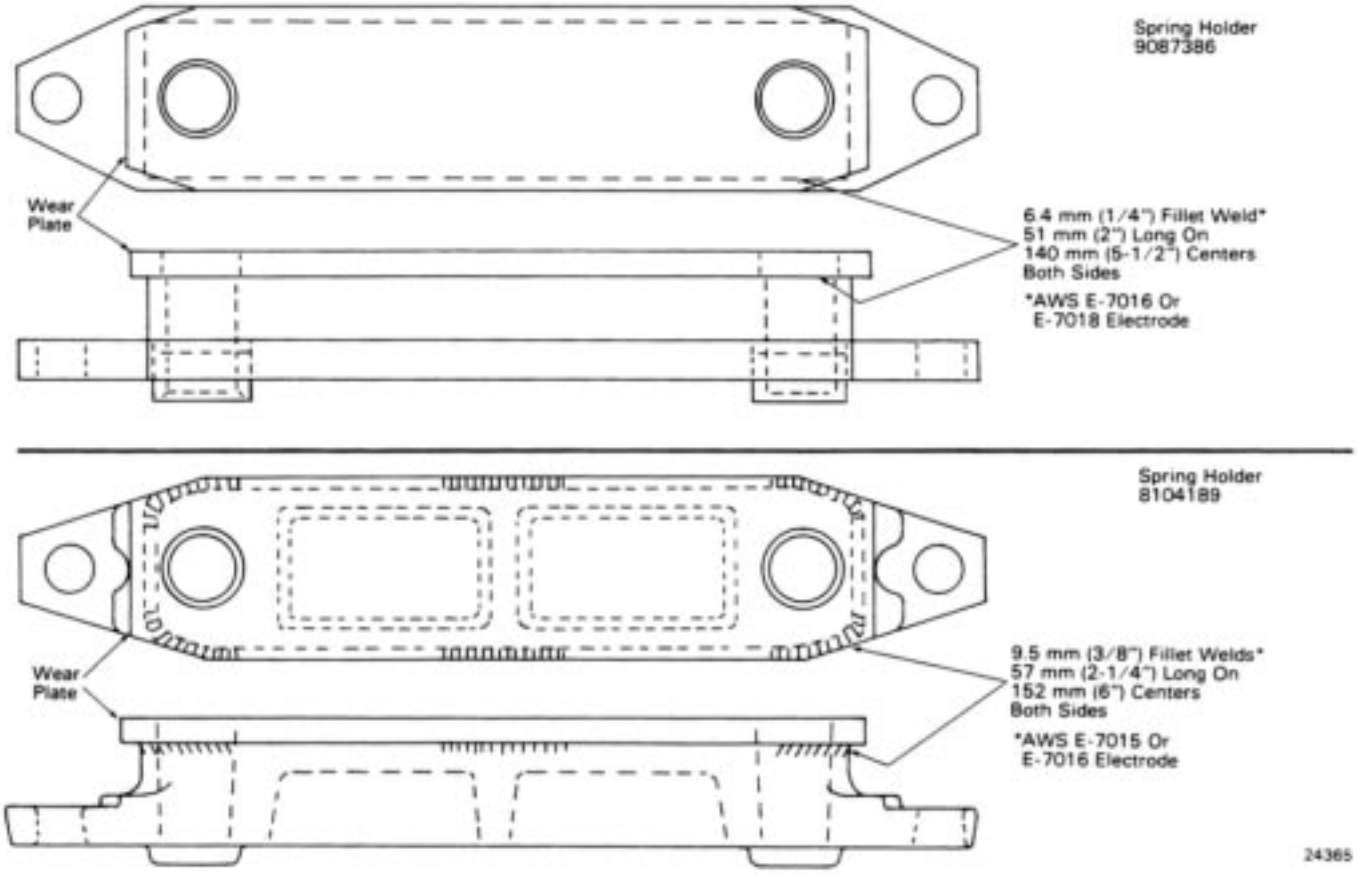


Fig.16 - Nose Suspension Wear Plates

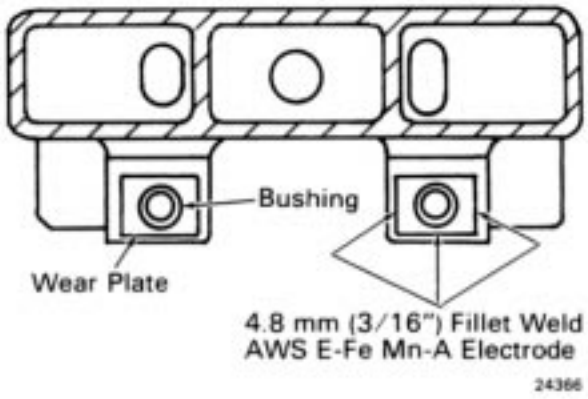


Fig.17 - Applying Motor Suspension Lug Wear Plate (Top View Of Transom Cross Section)

TRUCK FRAME PEDESTAL REPAIR

WHEEL BASE SPACING

The wheel base is the measured distance between the axle centerlines, as shown in Fig. 18, measurement D. Determine wheel base by measuring between the machined surfaces of the inside pedestal jaws on one side of the truck, and adding 427 mm (16-13/16"), which is the pedestal jaw spacing. Repeat this for the opposite side.

After the wheel base is checked, actual axle centerline spacing, measurement C, should be checked. The axle centerline can be determined by locating the truck frame transverse centerline and measuring to the machined surface of the inside pedestal jaw and adding 213.5 mm (8-13/32"), which is 1/2 the pedestal jaw spacing. Determine axle centerline for each pair of pedestals.

The wheel base and axle centerline measurements, should be within the limits provided in Fig. 18. In addition, the axle centerline must be parallel to the transverse centerline of the truck to within 0.8 mm (1/32"). Incorrect wheel base or axle centerline spacing is caused by a bent frame or bent pedestals, and will require straightening.

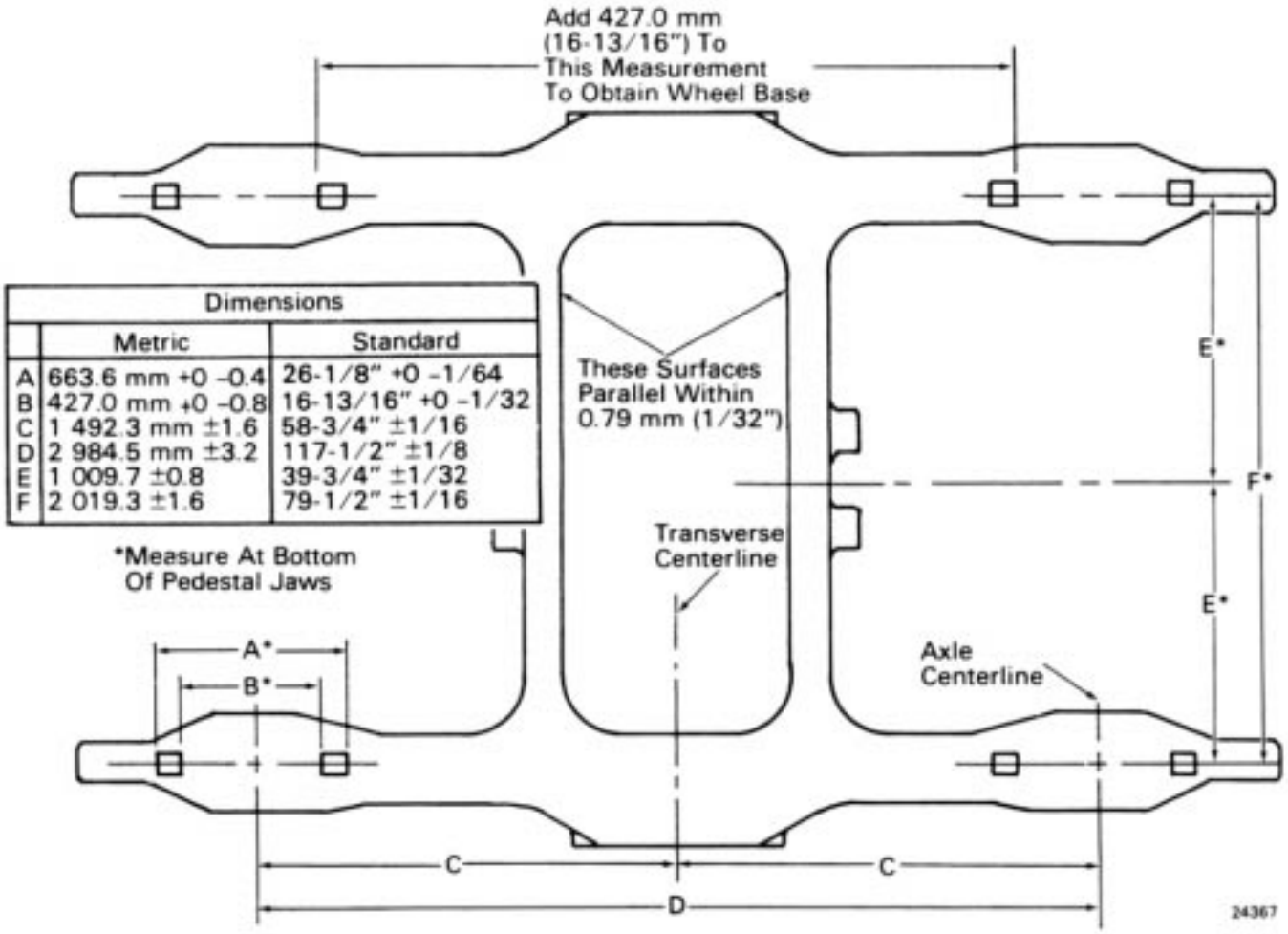


Fig.18 - Truck Frame Dimensions

TRANSVERSE PEDESTAL SPACING

Transverse pedestal spacing refers to the dimension between the longitudinal pedestal centerlines, Fig. 18, measurement F. The pedestals may lean in or out, provided both pedestals of each set lean in the same direction and are within the plus or minus tolerance provided in Fig. 18.

In addition to total transverse pedestal spacing, the longitudinal centerline of each pair of pedestals should be measured to the truck frame longitudinal centerline, measurement E.

Measurements obtained while checking transverse pedestal spacing should be within the limits provided in Fig. 18. Incorrect pedestal spacing is caused by a bent frame or bent pedestals, and will require straightening.

HORIZONTAL PEDESTAL ALIGNMENT AT THE BASELINE

The horizontal pedestal alignment at the baseline is the relationship from one pedestal jaw to any other pedestal jaw on the truck frame, as indicated in Fig. 19. This alignment can be determined by measuring from a straightedge tool or wire spanning the pedestals, as shown in Fig. 19, and may be above or below the pedestal baseline by no more than 3.2 mm (1/8"). A condition in excess of this can only be corrected by straightening the truck frame.

TRAMMING OF TRUCKS

The truck pedestals are trammed to determine if they are in correct alignment with each other, that is to determine if the distance between pedestals is equal or within the allowable limits. The diagram shown in Fig. 20, indicates which pairs of pedestals should have equal distances between them.

Tramming is accomplished by using a trammel beam with the truck frame inverted on a level table or level location. In addition to the diagonals shown in Fig. 20, it may be necessary to check the tram of the pedestals both longitudinally and transversely.

The tram assembly is made up of two trammels attached to a wooden or metal beam of such construction that it will hold the assembly rigid. This assembly facilitates taking comparative measurements of varying lengths, which could not be done using conventional dividers. The trammels permit any distance separation on the beam so the various dimensions to be trammed can be compared.

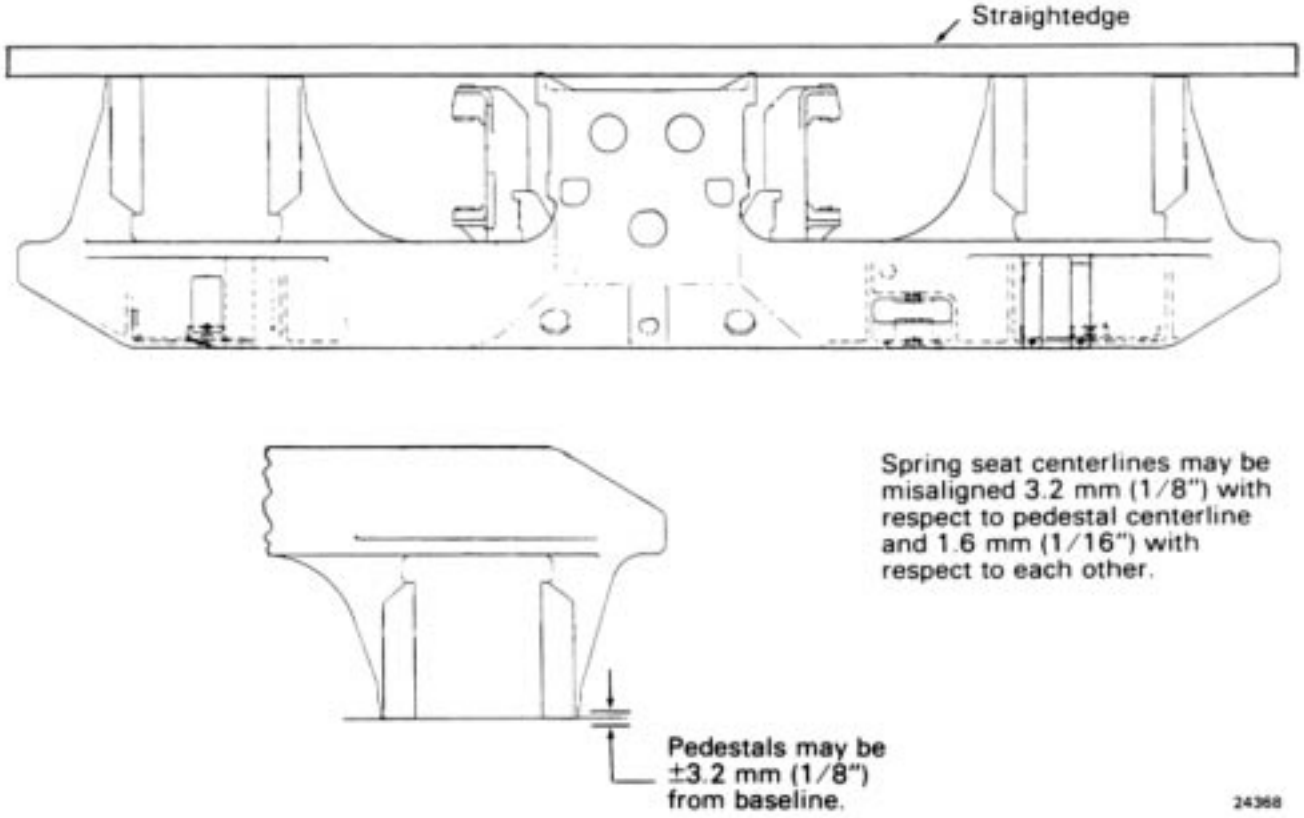


Fig.19 – Pedestal Base And Spring Seat Horizontal Alignment

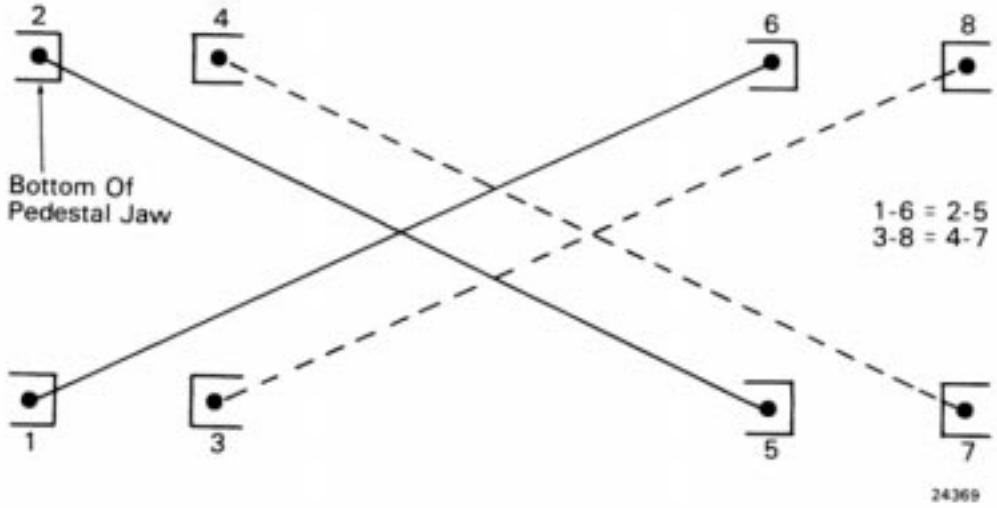


Fig.20 – Truck Frame Tramming Diagram

Tram marks are made on the end or bottom of each pedestal at the time of original manufacturing inspection of the truck frame. These marks, which are small punch indentations, are placed at identical locations on each pedestal to assure an accurate comparison. They may be either 38 mm (1-1/2") from each inside face of the pedestal or on the longitudinal centerline of the pedestal or on the longitudinal centerline of the pedestal just inward from the tie bar bolt hole. The important consideration is that the mark is made at an identical location on each pedestal.

A special tool for locating the tram marks on the pedestal can be made from File Drawing 615, which is available upon request. This tool is used to make two scribe marks at right angles to each other at the 38 mm (1-1/2") or other required dimension on the bottom of the pedestal. The hardened end of the scriber tool is placed at the intersection of the scribe lines and is lightly tapped with a hammer, to make a small indentation in the metal for the tram points. To aid in locating the tram marks, the bottom of the pedestal should first be cleaned and then coated with blue layout dye.

In the event of rework on the truck such as straightening of bent pedestals, it will be necessary to remove the old tramming marks and relocate new marks.

Each pedestal should be checked for leaning at the inside surface and the side facing the center of the truck before tramming. The pair of pedestals opposite each other (one on each side of the frame) which are found to be square or nearly square, are used as starting points for tramming. The pedestals are checked using a straightedge and square, Fig. 21.

If the diagonal measurements shown in Fig. 20, are not equal, it will be necessary to tram the pedestals longitudinally and transversely to locate the pedestals that are out of alignment and determine how much they are out of alignment.

A typical example of the tram measurements is shown in Fig. 22. The diagonal trams 3-8, 1-6, 2-5, and 4-7 are shown to be unequal by plus 3.2 mm (1/8"), 0, plus 0.8 mm (1/32") and plus 1.6 mm (1/16") respectively. The diagonal trams are allowed a tolerance of ± 1.6 mm (1/16") so the only pedestals exceeding this limit are on the 3-8 diagonal. This indicates that pedestals 3-8 are out of alignment either longitudinally or transversely. Tramming also indicates that longitudinally all the pedestals are equal as shown by the equal "0" longitudinal measurements. Transverse tramming indicates that pedestals 7-8 are equal to pedestals 1-2, but pedestals 5-6 and 3-4 are wider than the other two pair by 1.6 mm (1/16") and 5.6 mm (7/32") respectively.

Since pedestals 3-4 are plus 5.6 mm (7/32") it accounts for the plus 3.2 mm (1/8") and plus 1.6 mm (1/16") length of the diagonal trams 3-8 and 4-7 going to these pedestals. Since the 3-8 measurement of 3.2 mm (1/8") is twice the plus 1.6 mm (1/16") of 4-7, it can be seen that pedestal No. 3 needs to be bent inward twice as much as pedestal No. 4. If pedestal No. 3 is bent inward 4.0 mm (5/32") and No. 4 is bent inward 1.6 mm (1/16"), the diagonals 3-8 and 4-7 will be reduced and diagonal 3-8 will be within the limit of 1.6 mm (1/16"). The same correction would be necessary for pedestals 5-6, if diagonals 1-6 or 2-5, were out of their limits.

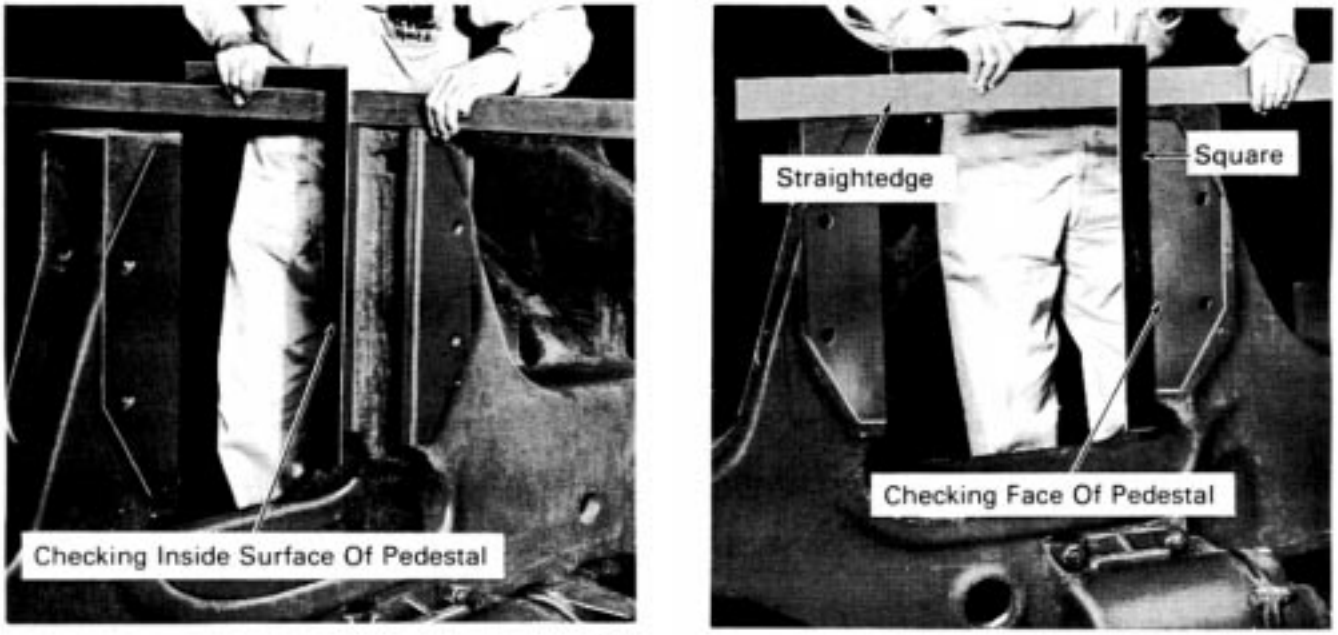


Fig.21 - Checking Pedestal Squareness, Typical

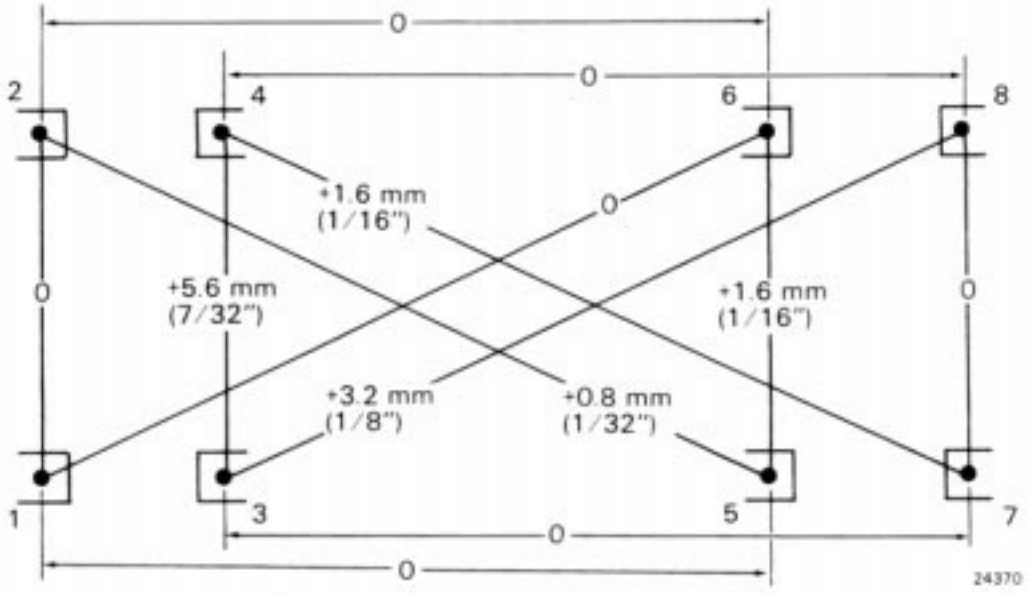


Fig.22 - Example Of Tram Measurements

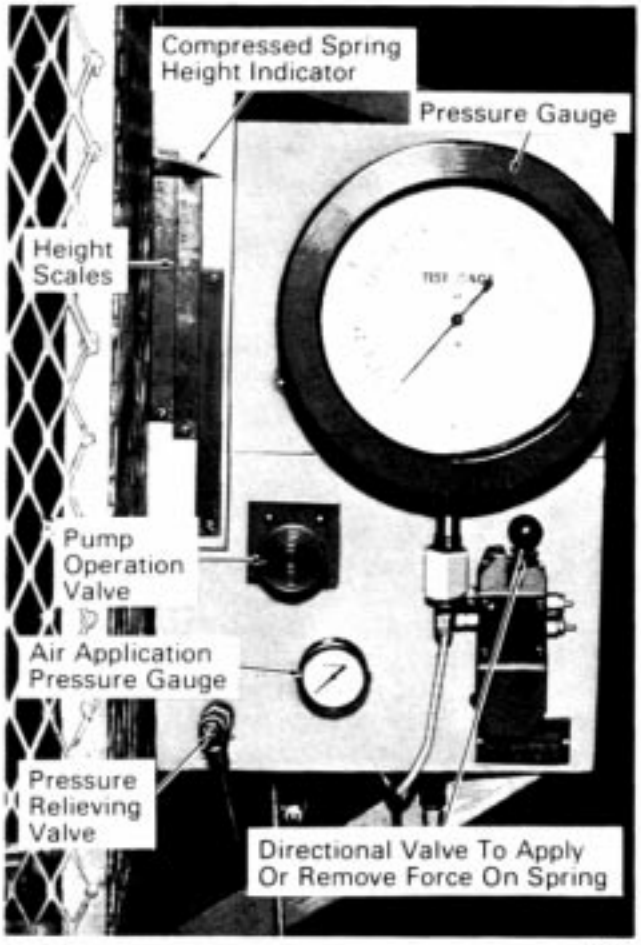
TRUCK SPRINGS

The truck assembly is equipped with coil springs above each journal box. Various combinations of springs are used to accommodate the loads which may be applied according to the weight specifications of a particular locomotive. Spring shim plates and shims of different thickness are used to maintain the proper coupler height. It is important to identify each of the springs according to part number so the spring may be tested at the proper value listed in the Service Data.

SPRING TESTING

The springs may be tested on any reliable calibration type testing press or a spring testing machine, Fig. 23, may be made as outlined in File Drawing 647, which is available upon request.

Safety wire mesh encloses the working parts of the fixture. When the two hinged doors at the front of the fixture are opened, a movable table within the fixture can be pulled out to facilitate the application of the spring assembly to be tested. The table with



the spring to be tested is then pushed into place in the fixture and the eccentric rollers supporting the table are released to provide complete support for the spring. The protective front access doors are closed and locked in place before testing.

A hydraulic jack arrangement above the spring is actuated to apply force to locate the spring at the correct height for the test. A pressure gauge adjacent to the fixture shows the pounds of force applied to the spring. A pointer at the side of the fixture indicates the height of the spring under test.

To operate the spring tester, the directional valve, Fig. 23, is positioned so the ram will compress the spring when force is applied. The pump application valve is then opened to initiate the force to lower the spring below the static height to be measured. The directional valve is then placed in the neutral or non-directional position. The relieving valve is then opened slightly to adjust the hydraulic ram pressure to the static pressure at which the spring should be tested.

Check the loaded height of the complete spring set and individual springs per information given in the Service Data. Record the spring set height on the initial compression and color code the springs.

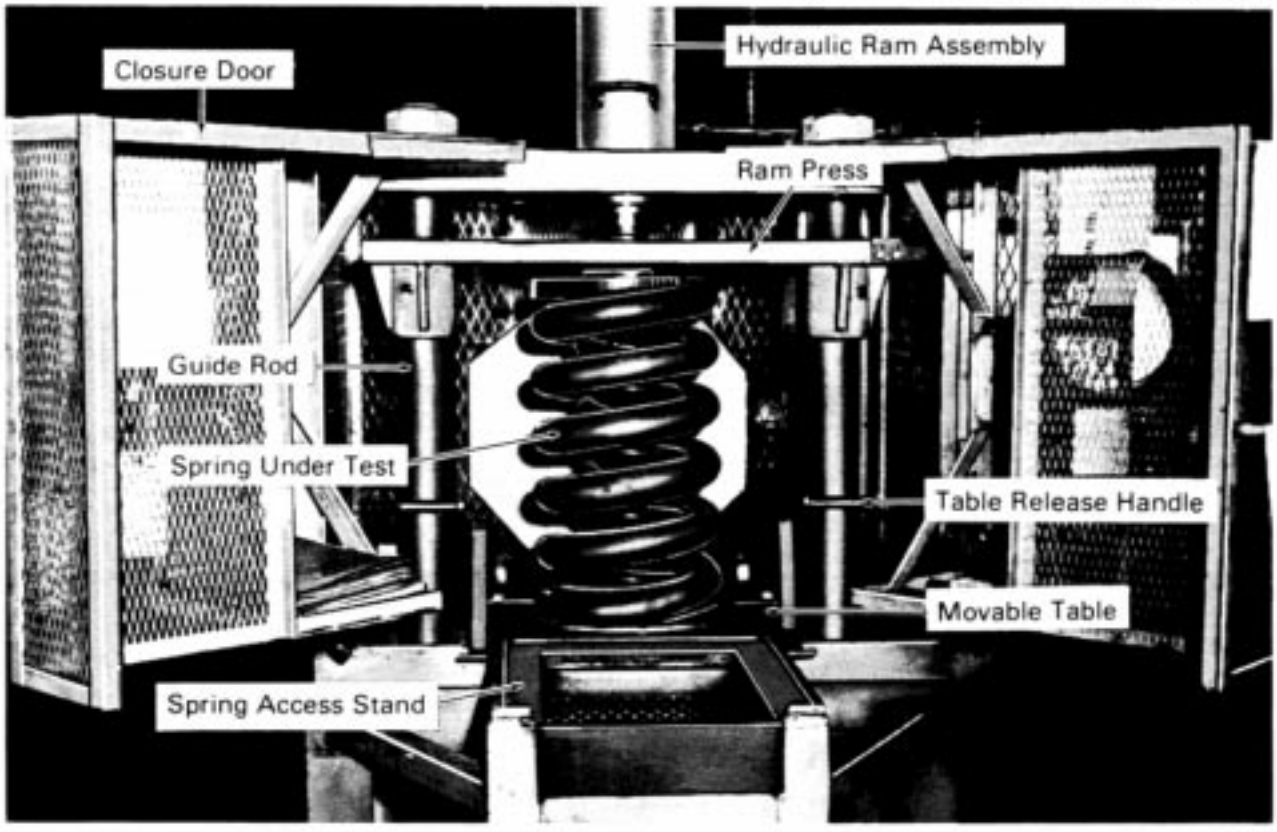


Fig.23 – Spring Testing Fixture

COLOR CODING SPRINGS

COIL SPRINGS

A color code is used to indicate the loaded height of new coil springs. Brown paint is applied on springs or spring assemblies that are more than 1.6 mm (1/16") but do not exceed 4.8 mm (3/16") limit above the nominal loaded height specified for the spring. Nominal loaded height is the spring height which is used for purposes of identification and as a base for the tolerance limits. Blue paint is applied on springs or spring assemblies that are 1.6 mm (1/16") below to 1.6 mm (1/16") above the nominal loaded height specified for the spring when under the specified test load. Green paint is applied on springs or spring assemblies that are more than 1.6 mm (1/16") but do not exceed the 4.8 mm (3/16") limit below the nominal loaded height specified. All new springs will fall into one of the above three color codes.

White paint should be applied to springs or spring assemblies that are 4.8 mm (3/16") to 7.9 mm (5/16") below the nominal loaded height specified for the spring. This is a service limit and is only for use on used springs. White coded springs should be applied with proper shims, so that their overall loaded height will fall within the limits of brown, blue, or green color coded springs.

Springs that have been tested, color coded, and qualified for use should be stored in a protected area to avoid the formation of rust and pits. Pits can cause stress concentration that may result in spring failure when under load. The springs should be stored in groups corresponding to their color code to make their selection easier.

Check the coil springs for any evidence of cracked or broken coils and replace the assembly if found defective. Recommended practice is to replace both spring sets on one spring seat if any coils have failed. However, if a satisfactory loaded height can be maintained on the old spring set, then the old set may be used. Coil springs on the same spring seat should be matched for load height as near as possible.

RUBBER BOLSTER SPRINGS

The V-shaped rubber spring pads used in the secondary suspension, are color coded to indicate a range of deflection when subjected to a specific load. With a test load of 6 804 kg (15,000 lbs.) the following colors are used to indicate amount of deflection.

Yellow – When deflection is 14.7 mm - 16.3 mm (.58" - .64").

Blue – When deflection is 16.5 mm - 17.8 mm (.65" - .70").

Each of the above deflection ranges are qualified for use on the HT-B truck, however, they should be applied only in groups of four with the same color code.

BRAKE RIGGING

Inspect the brake rigging to ensure that brake pins, bushings and brake shoes are usable. The wear surfaces of the brake rigging are equipped with replaceable hardened bushing, pins and bolts. Any of these connecting parts that are worn more than 1.6 mm (1/16") should have both parts replaced. Never use a new pin with an old bushing or vice versa.

Cylinder levers, brake levers, brake rods and connecting straps that are bent can be reused if they are restored to their original shape. Connecting straps worn more than 1.6 mm (1/16") should be replaced. If wear is caused by the connecting strap contacting the wheel, the lever pins and bushings associated with the worn strap should be carefully examined. Bolts and nuts that are not subject to wear can be reused if they are not damaged but cotter pins should always be replaced.

ASSEMBLY OF TRUCK

The truck may be assembled using one of two methods. Procedure A may be used when facilities are available to invert the truck. Procedure B may be used when it is desireable to assemble the truck while in the upright position.

PROCEDURE A

1. With the truck frame inverted, install coil springs, spring seats, and shims. Referring to the Pedestal Liner Application section, install pedestal liners.

2. If removed, install bolster assembly using the following procedure:

   a. Attach a suitable lifting hoist at each corner of the bolster. Install bolster between the frame transoms.

b. Install the four rubber spring pads and spring adapters to truck frame. Install four 3/4"-10 hex head bolts, at each spring adapter, as shown in Fig. 24. Torque bolts to 278 N·m (205 ft-lbs).

c. Lift bolster until bolster mounting bolts can be installed through bolster and into spring assembly. Torque bolts to 278 N·m (205 ft-lbs). Place wooden wedges between truck frame and bolster to prevent shifting of the bolster while truck is being turned over.

d. Install bolster to truck frame shock absorbers. Torque mounting bolts to 366 N·m (270 ft-lbs).

e. Install bolster safety straps as shown in Fig. 25.

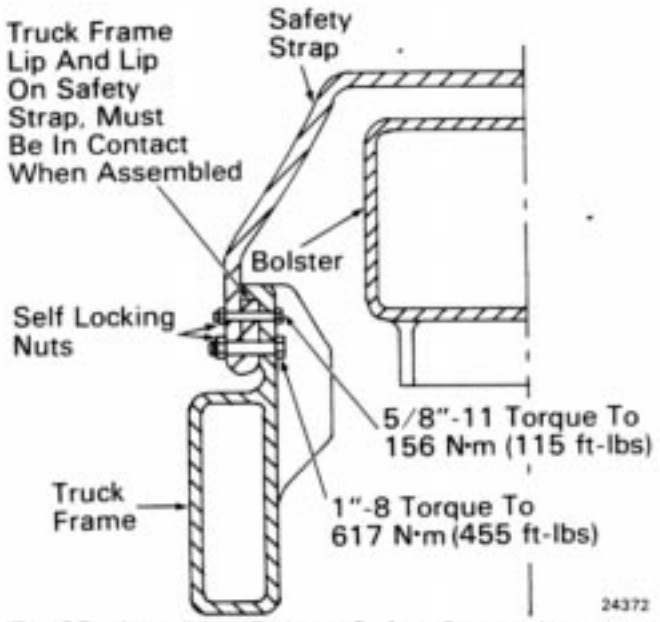


Fig.25 – Installing Bolster Safety Straps, Inverted Cut-away View

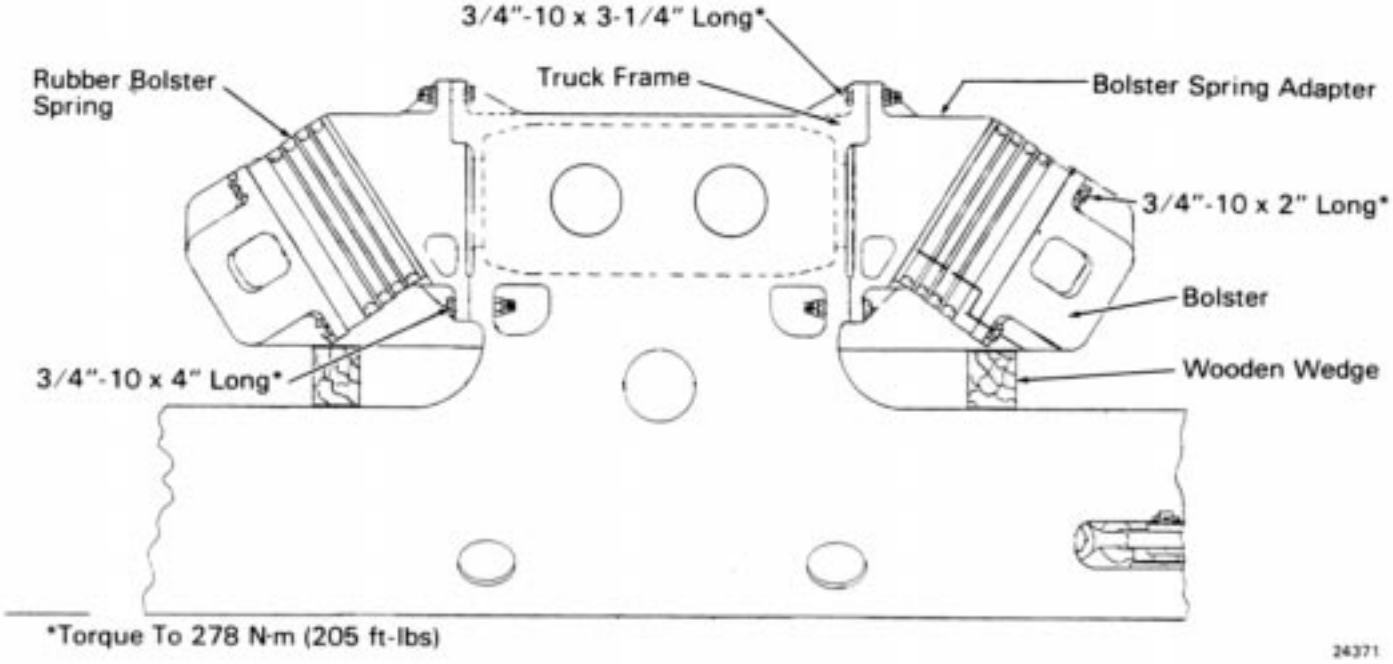


Fig.24 – Bolster Installation, Inverted View

3. Install traction motor nose suspension assemblies Fig. 26, using the following procedure:

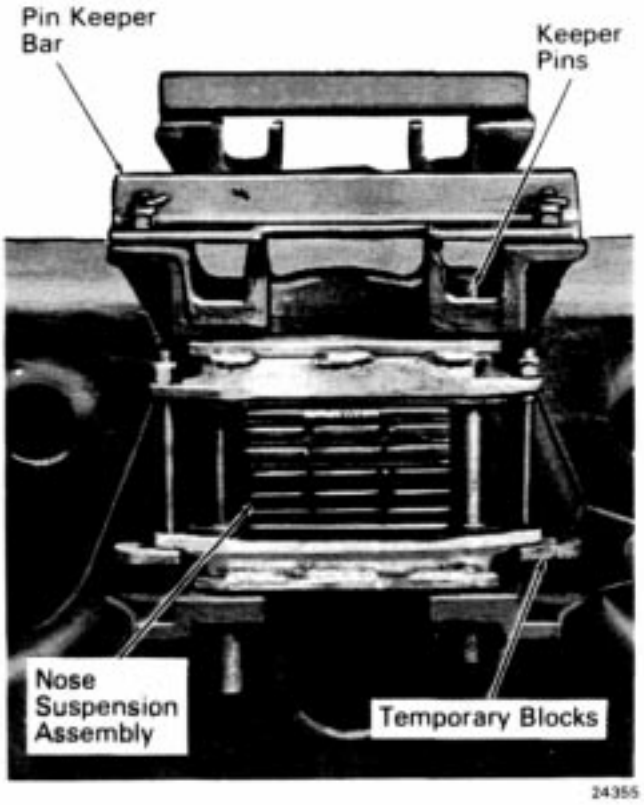


Fig.26 - Traction Motor Nose Suspension Application, Inverted View

a. Compress suspension assembly to a height of 303 mm (11-15/16"), by loosening the assembly bolts and placing temporary blocks between bolt heads and frame of nose suspension assembly. Retighten bolts to compress rubber pack. Install suspension assemblies between truck frame lugs.

b. Install keeper pins through truck frame lugs and suspension assembly.

c. Install pin keeper bar. Torque the mounting bolts to 414 N·m (305 ft-lbs). Install 1/4" cotter pins to secure nuts.

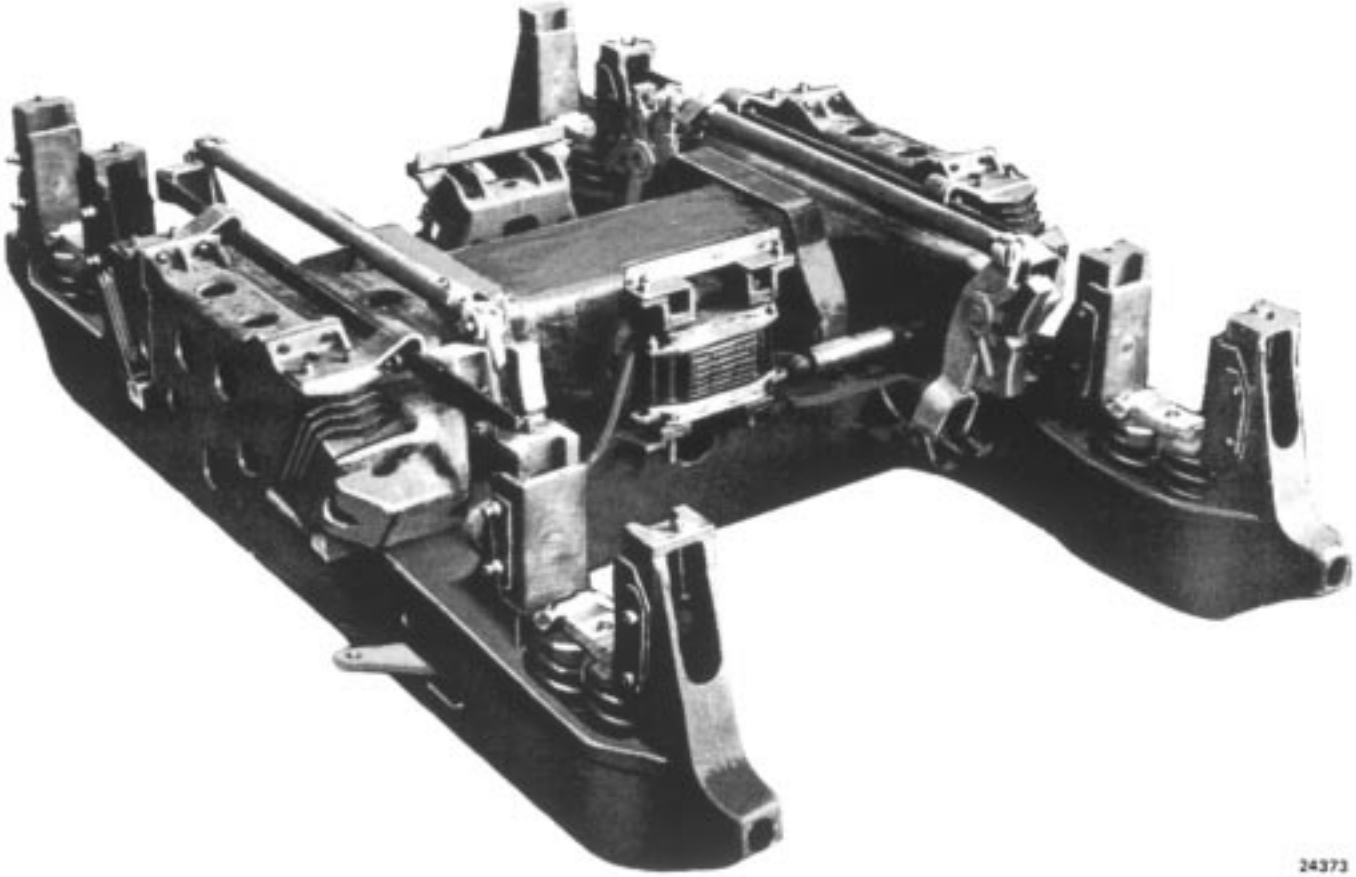
4. Due to variations, detailed application instructions for the brake rigging are not provided. However, the views shown in Fig. 27 provide a typical example of the brake rigging portions that are more easily applied while the truck frame is inverted.

5. Install pre-assembled wheel, axle, and motor assemblies in place by lifting the assembly with a lifting fixture similar to the one shown in Fig. 28, and lowering between the truck frame pedestals until the journal boxes rest on the coil spring seats. Remove temporary blocks from traction motor nose suspension assembly.

6. Install pedestal tie bars, and torque bolts to 617 N·m (455 ft-lbs). Apply sander guide assemblies.

7. Turn truck assembly over onto its wheels and install air brake piping, brake cylinders, and remainder of brake rigging. Remove wedges from between the bolsters and truck frame.

8. Install center bearing wear plate and wear half rings. Refer to Center Bearing Wear Plate And Half Rings section for application instructions. Install center bearing dust guard and apply a 9.5 mm (3/8") high bead of bearing grease to the top edge of the dust guard. Apply oil to the center bearing as explained in the Lubrication section.



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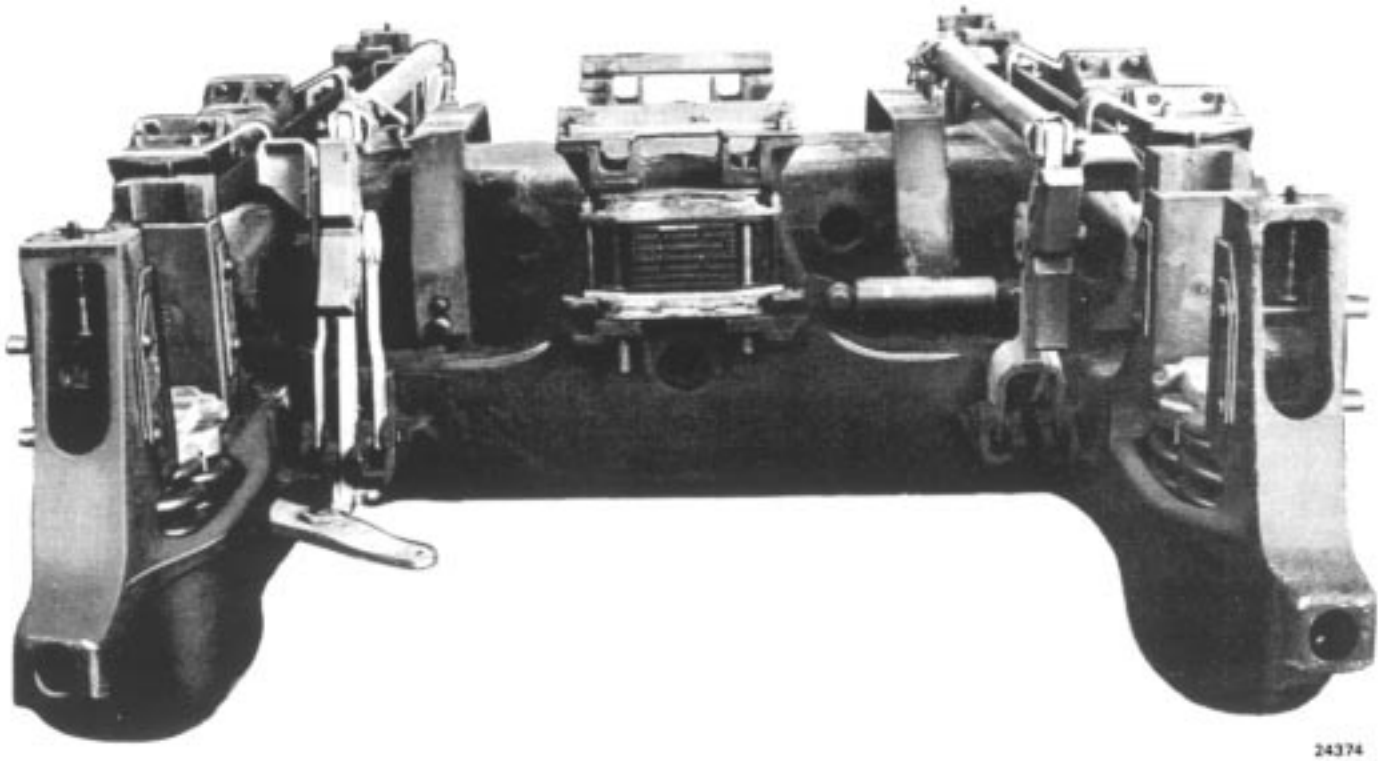

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Fig.27 – Brake Rigging Application With Truck Frame Inverted

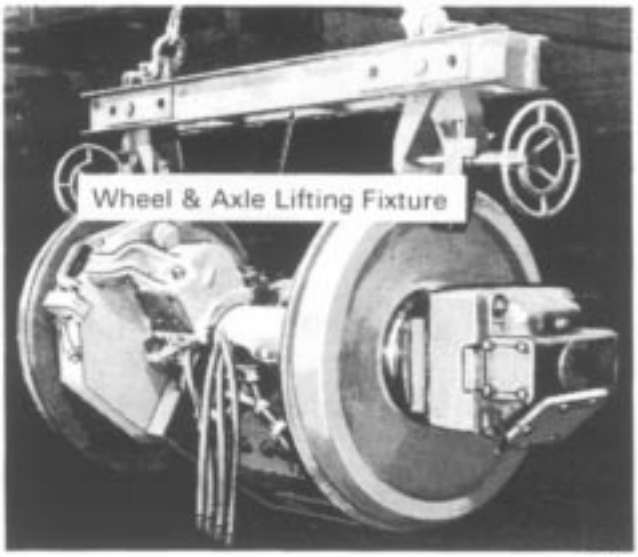

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Fig.28 – Installating Wheels, Axle, And Motor Assembly

PROCEDURE B

1. Install coil springs, spring seats, and shims. Referring to Pedestal Liner Application section, install pedestal liners.

2. If removed, place bolster in middle of assembly area. Space wheel and axle assemblies in relation to the bolster, so that the truck frame may be lifted and placed over the assemblies.

3. Lift truck frame and lower it over the bolster and the wheel and axle assemblies. Install pedestal tie bars after frame is lowered. Torque bolts to 617 N·m (455 ft-lbs).

4. If removed, install the bolster using the following procedure:

   a. Install the four rubber spring pads and spring adapters to truck frame. Install four 3/4"-10 hex head bolts at each spring adapter, as shown in Fig. 24. Torque bolts to 278 N·m (205 ft-lbs).

   b. Working through the frame transoms, attach a suitable lifting hoist to the bolster.

   c. Lift bolster until bolster mounting bolts can be installed through bolster and into spring assembly. Torque bolts to 278 N·m (205 ft-lbs).

   d. Install bolster to truck frame shock absorbers. Torque mounting bolts to 366 N·m (270 ft-lbs)

   e. Install bolster safety straps as shown in Fig. 25.

5. Compress traction motor nose suspension assembly to a height of 303 mm (11-15/16"), by loosening the assembly bolts and placing temporary blocks between the bolt heads and frame of nose suspension assembly.

6. Connect lifting hoist to bails at nose suspension side of traction motor.

7. Hoist motor and place lower lip of support bearing on top of axle, Fig. 29. Rotate motor on axle until traction motor nose suspension

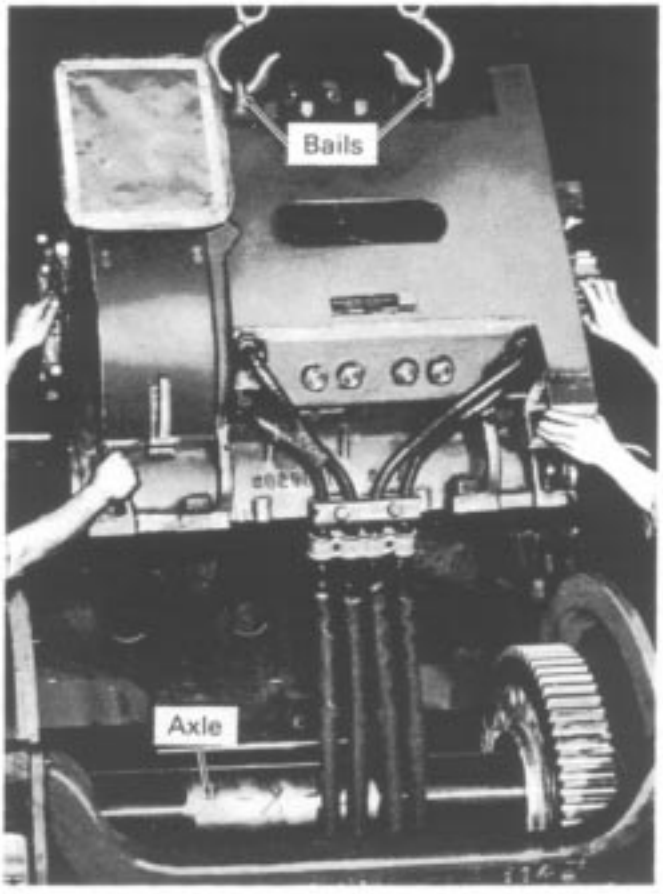

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Fig.29 – Installing Traction Motor Assembly, Typical

assembly can be mounted. Install keeper pins through bottom truck frame lugs and suspension assembly. Install pin keeper bar. Torque the mounting bolts to 414 N m (305 ft-lbs). Install 1/4" cotter pins to secure nuts. Remove temporary blocks from traction motor nose suspension assembly.

8. Install gear case, support bearing caps, axle guard, and outer bearing half. Install dust guards and air ducts.

9. Install brake rigging, piping, brake cylinders and sander guide assemblies.

10. Install center bearing wear plate and wear half rings. Refer to Center Bearing Wear Plate And Wear Half Rings section for application instructions. Install center bearing dust guard and apply a 9.5 mm (3/8") high bead of bearing grease to the top edge of the dust guard. Apply oil to the center bearing as explained under the Lubrication section.

SERVICE DATA

REFERENCES

Wheels, Axles, Axle Gears And Pinions	M.I. 1518
New Departure-Hyatt Journal Boxes With Resilient Thrust Units	M.I. 1552
Grease Lubricated Cartridge-Type Journal Bearings	M.I. 1553
Lubrication Specifications	M.I. 1756

SPECIFICATIONS

JOURNAL SPRINGS

9322481 Assembly which includes one 9322479 outer spring, and one 9322480 inner spring.

Axle Load Range	28 803 kg to 32 886 kg (63,500 lbs. to 72,500 lbs.)
Solid Height	305 mm (12")
Solid Load (9322481 Assembly)	11,213 kg (24,720 lbs.)
Static Height	359.9 mm ± 4.8 mm (14.17" ± 3/16")
Static Load	
9322481 (Assembly)	7 240 kg (15,960 lbs.)
9322479 (Outer Spring)	4 661 kg (10,275 lbs.)
9322480 (Inner Spring)	2 571 kg (5,668 lbs.)

EQUIPMENT

Wall Mounted Fixture To Test Shock Absorber	Work Sketch 41089

File Drawings

Lifting Fixture For HT-B Truck Assembly	File 909
Lifting Fixture (traction motor, wheel and axle assembly)	File 288
Tram Marking Tool	File 615
Spring Testing Machine	File 647
Liner Pressing Tool	File 649

NOTE

File Drawings and Work Sketches can be obtained by contacting Electro-Motive Division Service Department, La Grange, Illinois 60525.