M.I. 1505 *Rev. A

Maintenance Instruction

Service Department

ELECTRO-MOTIVE

GHC LOCOMOTIVE TRUCK ASSEMBLY

DESCRIPTION

The model GHC 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 due to normal variations in the roadbed and other conditions encountered during operation. An important function of the truck assembly is to absorb and isolate these shocks so they will not be transmitted to the locomotive underframe and the equipment mounted on the underframe.

Three traction motors mounted in the truck convert electrical energy into locomotive tractive effort. The motors are geared to the driving axles which in turn apply force to the rail through the wheels. The driving force is transmitted through the axle journal bearings to the truck frame and through truck frame pressure areas to mating pressure areas on the truck bolster. The bolster then transmits the force through its center bearing to the carbody center bearing to provide the locomotive tractive effort.

Air brake cylinders and brake rigging mounted on the trucks are used to apply retarding forces to the wheels to slow and stop the locomotive.

The locomotive carbody weight is applied at the bolster center bearing. The "H" design bolster is supported at each of its four corners by a truck frame mounted rubber spring assembly. The four corners of the bolster are held between upright pedestals which are an integral part of the frame. This bolster and pedestal arrangement serves to transmit force from the bolster to the frame or the frame to the bolster. Stops are provided on the bolster which may contact the inboard side of the bolster stops on the frame, to limit the bolster side movement.

The main frame of the truck is supported on sets of double coil springs, two of which are above each journal bearing. The journal bearing transmits the load directly from the springs to the axle. Each journal bearing is held between two pedestal jaws, which are an integral part of the truck frame. Each

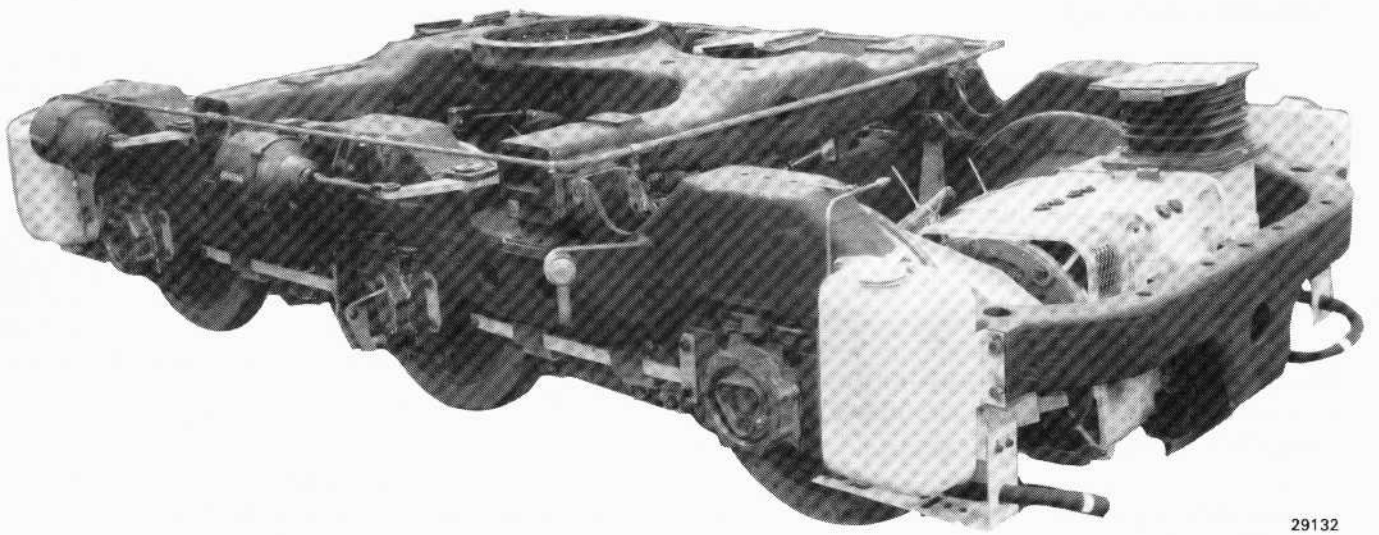

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Fig.1 - GHC Truck Assembly

*Extensively revised and completely retyped. Supersedes previous issue of this number.

pair of pedestals is joined at the bottom by a pedestal tie bar. Renewable pedestal liners and journal bearing wear plates provide control of clearances between the pedestals and journal bearings.

A heavy duty shock absorber is mounted between the truck frame and journal bearing at the center axle to damp excessive vertical and rolling oscillations of locomotive carbody.

The three traction motors are supported on their respective drive axles and at suspension assemblies mounted on separate truck frame transoms. A main feature of the GHC truck is the orientation of the traction motors in the same direction to produce similar torque reactions at each axle. This arrangement provides good motor accessibility and good wheel adhesion characteristics.

Air brake cylinders and brake rigging mounted on the trucks are used to apply retarding forces to the wheels to slow and stop the locomotive. A single shoe brake system is used which utilizes one cast iron brake shoe at each wheel.

The truck is also available with clasp brakes.

MAINTENANCE

TRUCK CLEANING UNDER LOCOMOTIVE

The trucks should be cleaned periodically to eliminate any accumulations of oil, sand, dust, and road dirt. Accumulations of the above tend to increase wear as well as detract from the general appearance of the truck.

CAUTION

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

Using a wetting agent and an alkaline solution cleaner, spray the truck, being careful to direct spray away from any motor openings.

Let the cleaning solution remain on the truck for 10 to 15 minutes. Then, using steam and an alkaline solution in a mixing gun, thoroughly spray the truck assembly.

The truck may now be rinsed, using hot water if desired; however, rinsing is not generally required.

LUBRICATION

No periodic lubrication is required on the truck assembly, however, if the truck is equipped with threaded type brake shoe slack adjusters, the adjuster threads should be lubricated, if found to be dry.

The center bearing should have enough oil added at the time a unit is trucked to cover the center bearing wear plate by 1.6 mm (1/16").

No lubrication is required on journal bearing or pedestal jaw wear surfaces. Special care should be taken to keep bolster and transom rubbing surfaces free of oil or grease.

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.

Remove the safety links before any attempt is made to raise the locomotive for truck removal. Make sure that all other physical connections between the trucks and carbody are disconnected, such as the air brake equipment, sanding equipment, traction motor cables, hand brake chain and the speed recorder connection.

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.

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.

CAUTION

If the locomotive is equipped with interbogie control, place a block of wood between the truck and the underframe at the left-front and right-rear corners of the locomotive.

TANK IMMERSION CLEANING OF TRUCKS

When the truck assembly is removed from the locomotive, the traction motors, wheels, gears, axles, shock absorbers, journal bearings, rubber suspension pads, phenolic or composition wear plates, and brake cylinders should be removed if the truck is to be immersed in a cleaning tank containing an alkaline solution.

After removal of the above components, the truck frame and bolster may be immersed in the cleaning solution. After allowing sufficient time to ensure removal of all foreign material, the assemblies should be removed and rinsed with hot water.

If the truck is equipped with screw-type brake shoe slack adjusters, the adjuster threads should be lubricated immediately to prevent seizing.

SHOCK ABSORBERS

This truck is equipped with vertical shock absorbers as basic equipment, Fig. 2. Upon special customer request, the truck is equipped additionally with lateral shock absorbers for high speed operation.

There is rarely a partial failure of a shock absorber. When it fails there is no resistance to movement in compression, in rebound, or in both directions and a simple manual test can detect the failure.

If a shock absorber is new or has not been used for some time, it must be stroked to obtain consistent motion before being checked for control. Resistance developed during testing is proportional to the velocity of the test stroke.

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.

Shock absorbers should be periodically inspected. Use the following steps as a guide.

PERIODIC CHECKS

Perform the following periodically or when loss of damping action is suspected.

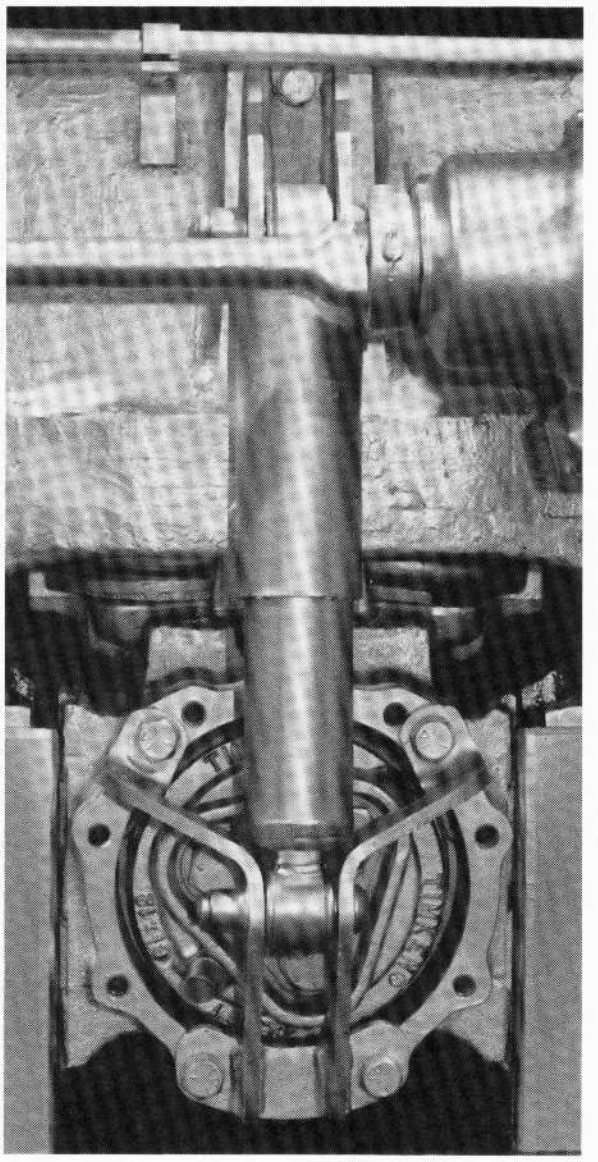

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Fig.2 – Vertical Shock Absorber Assembly

1. Check for leaking fluid. Make certain that oil has not been deposited from some other source and check shock absorber per Step 2 before condemning.

2. Perform manual qualification tests to detect gross loss of control.

3. Inspect bushing integrity. Bushings should not permit gross vertical or lateral movements of the shock absorber.

4. If a failed shock absorber is detected, inspect journal springs.

MANUAL QUALIFICATION PROCEDURES

NOTE

Shocks which are found to be reusable should never be disassembled using a flame cutting device. The bushings will be damaged by high temperatures.

GO/NO-GO TEST

This is a quick and easy test that can be performed without completely removing the shock absorber from the locomotive. One end of the shock absorber is unbolted and the shock absorber is stroked manually. If there is a 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.

VERTICAL SHOCK ABSORBERS

Use the following steps to qualify vertical shock absorbers.

1. Unbolt the shock absorber snubber bracket (3, Fig. 3) from the journal bearing or journal bearing adapter.

2. Manually stroke the shock absorber while retaining the normal vertical position.

3. Renew shock absorber if necessary. If shock tests good reapply the mounting bolts and torque to 366 N·m (270 ft-lbs).

LATERAL SHOCK ABSORBERS

Lateral shock absorbers are recommended for high speed locomotive operation. 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.

The lateral shock absorbers can be checked by disconnecting only the outer end of the assembly and manually stroking it. Position during the test is not significant for the lateral shock absorber. After the test, torque mounting bolts at both ends of the assembly to 366 N·m (270 ft-lbs). Inspect lateral shock absorber mounting brackets for fatigue failures at the welds. If fatigue cracks are detected, rework the brackets to full 13 mm (1/2") weld.

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 giving details is available upon request from your EMD service representative.

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

TRUCK DISASSEMBLY

The truck may be disassembled 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 desirable to disassemble the truck in the upright position.

PROCEDURE A

1. Remove the center bearing, dust guard, and wear plates. Wipe oil from center bearing and drain oil from traction motor support bearings.

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

NOTE

Brake rigging can more readily be removed with the truck in the inverted position.

3. Remove bolster from truck frame and unbolt rubber suspension pads.

4. Using an overhead crane of sufficient capacity, turn truck upside down either endways or sideways.

5. Remove shock absorbers. Remove pedestal tie bars. Remove traction motor, axle, wheels, journal bearings, and gear case as an assembly, using a lifting fixture as shown in Fig. 4. Refer to Service Data for File Drawing available to fabricate lifting fixture.

6. Remove wear plates, springs, traction motor nose suspension, and any other remaining smaller parts of the truck as desired.

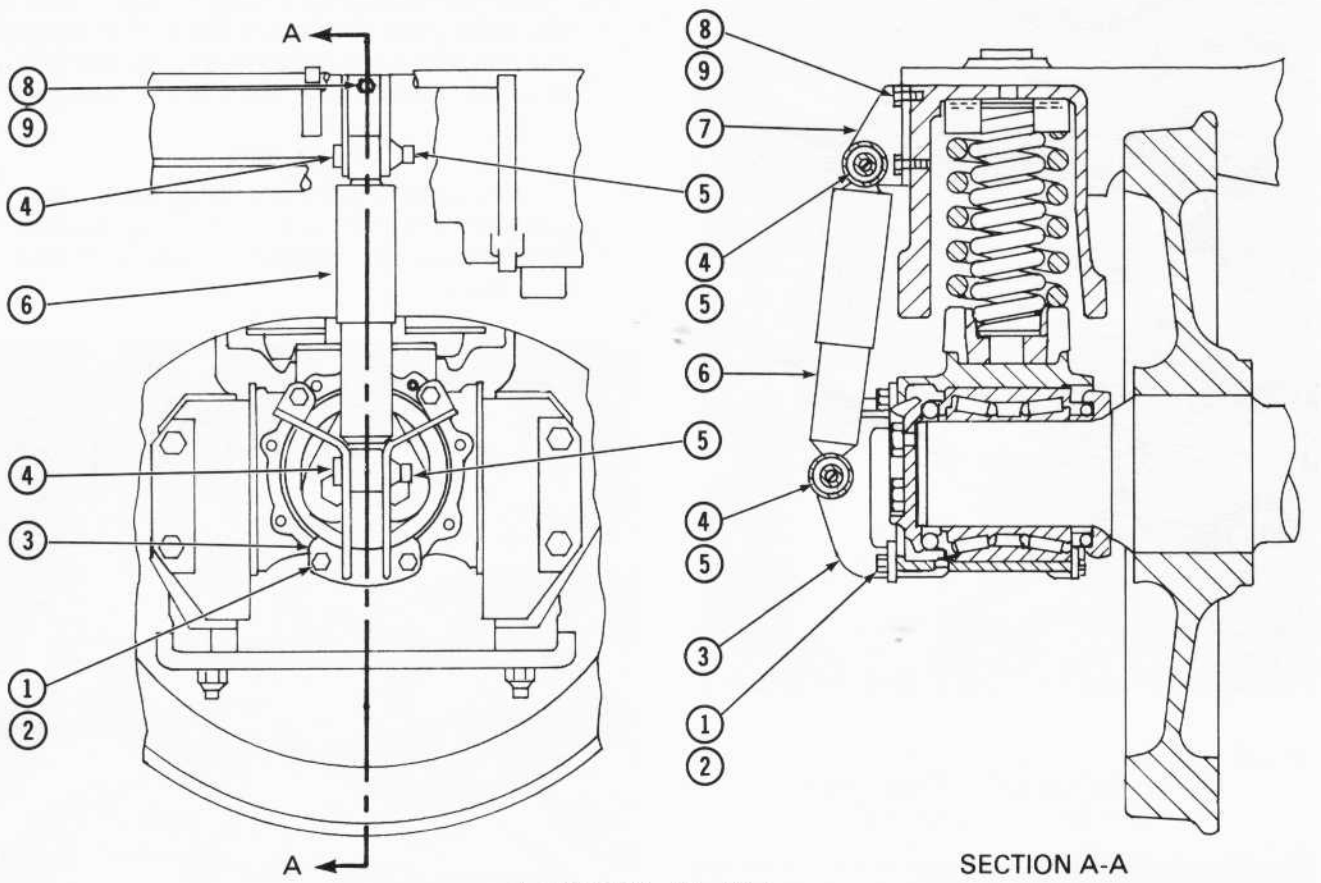

Fig.3 – Vertical Absorber Installation

PROCEDURE B

1. Remove the center bearing, dust guard, and wear plates. Wipe oil from center bearing and drain oil from traction motor support bearings.
2. Remove individual items such as brake cylinders, piping, and cross-over lever from truck.
3. Remove bolster from truck and unbolt rubber suspension pads.
4. Remove the traction motor air duct and gear case.
5. Remove the dust guards, traction motor support bearing caps, axle guards, and outer bearing half.
6. Apply chains to bails at nose suspension side of traction motor. Connect lifting hoist to chains.
7. Remove traction motor suspension pin keeper bar to allow pins to drop down.
8. Lift traction motor slightly to compress rubber nose pack of traction motor suspension. With the suspension assembly compressed, insert temporary blocks about 19 mm (3/4") thick between the nose pack holder and mounting bolts as shown in Fig. 5.
9. Lower traction motor a small amount to free nose suspension assembly. Remove suspension assembly from truck frame.

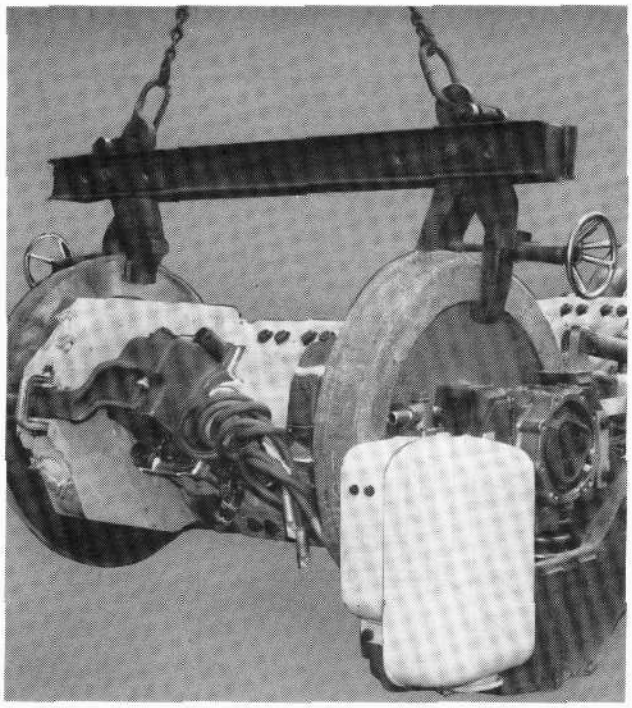

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Fig.4 – Removal Of Wheel, Axle, And Motor Assembly

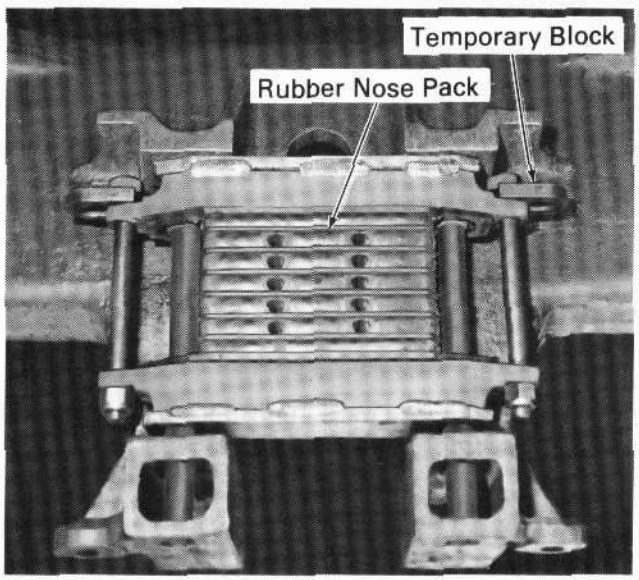

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Fig.5 – Compressing Nose Suspension Assembly

CAUTION

Use care in lifting the motor so the support bearings will not fall and be damaged. A pinion protector should be applied to prevent damage to pinion after motor is removed. Reapply the traction motor support bearing caps to their original location on the motor. The caps are not interchangeable between motors.

10. Hoist traction motor and allow it to rotate on the axle until the lower lip of the support bearing will clear the axle, Fig. 6. The motor assembly may now be lifted clear of the axle.

WARNING

Remain clear of truck while lifting truck frame from wheel and axle assemblies in Step 11. Coil assemblies are not secured and could fall and cause injury.

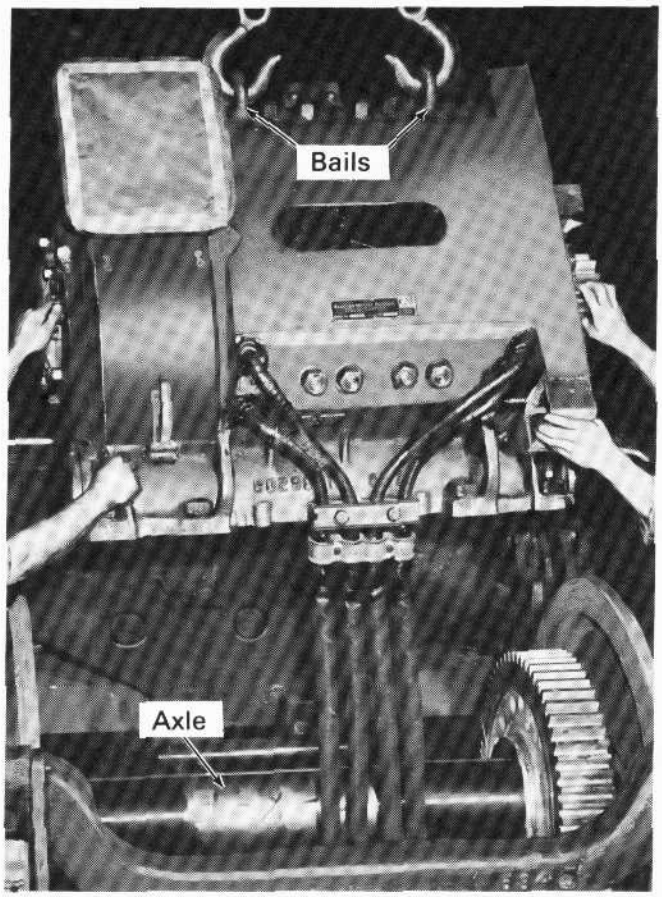

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Fig.6 – Removing Traction Motor From Frame

11. Remove shock absorbers. Remove pedestal tie bars. Lift truck frame from wheel and axle assemblies.

WARNING

Use extreme care when removing pedestal liners. Springs and spring seats can fall and cause injury.

12. Remove the remaining brake equipment and pedestal liners from truck frame.

INSPECTION AND RECONDITIONING

Make a thorough inspection of the truck frame and bolster for the following items and recondition if necessary.

TRUCK FRAME

BROKEN OR CRACKED MEMBERS

Inspect entire truck frame for breaks or cracks. Perform magnetic particle 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. 7.

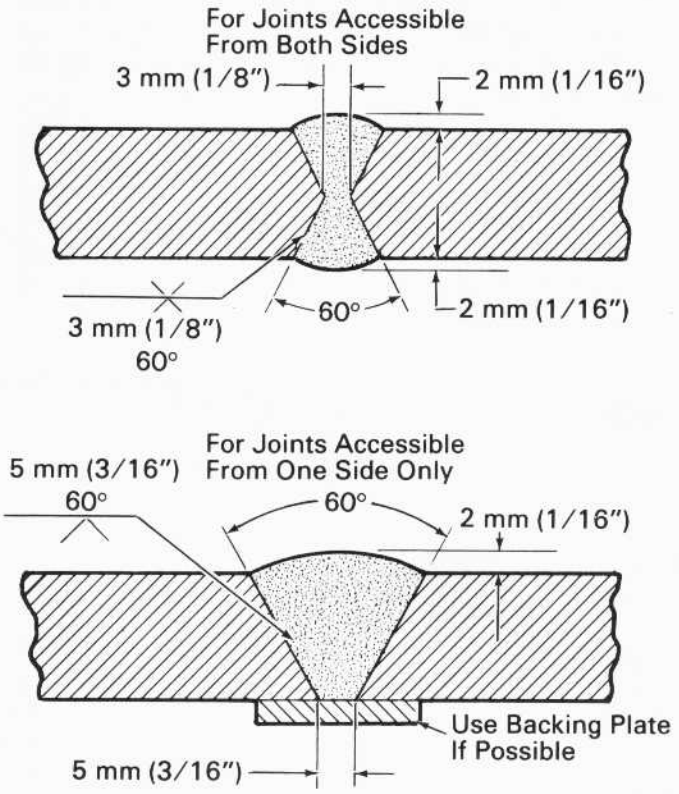

Fig.7 - Preparing Joints For Welding

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 particle 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. Before straightening any bent section, determine what effect it will have on the adjoining sections. Jacks, turnbuckles or fixtures designed for straightening members will expedite the straightening of bent sections.

WORN SPOTS

The truck frame should be thoroughly checked for worn spots in areas normally not subject to wear. For example, loose brake levers may wear the clevis slots through which they are pinned. Also, excessive wear on the spring seats may necessitate their recondition or replacement.

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 mm (3/64") on the radius of the supporting side or 2 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 electrode. The hole should be redrilled to proper size after completion of the welding.

WORN BUSHINGS

Bushings worn 2 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 replaced 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 of 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 wear plates, cotter pins, washers, bushings, studs, brake guides, and brake pins.

BOLSTER

The bolster, Fig. 8, is a steel casting used to transfer the locomotive weight to the truck frame. As previously explained, the truck bolster center bearing mates with the locomotive underframe center bearing. A neoprene rubber dust guard, Fig. 9, clamps over the truck center casting and rides against the underframe to prevent dust and dirt from entering the center bearing.

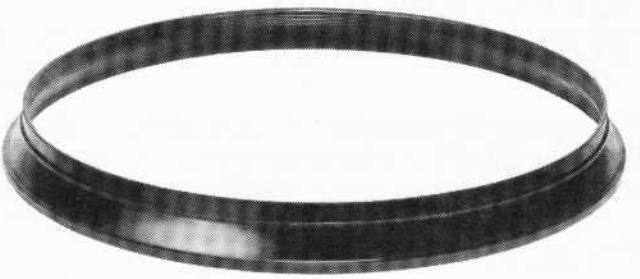

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Fig.9 – Center Bearing Dust Guard

SIDE BEARING WEAR PADS

NOTE

Effective in March of 1985, bolster side bearing wear pads were eliminated from truck.

The side bearing surfaces on the bolster are designed to mate with similar side bearings mounted beneath the carbody underframe as indicated in Fig. 10.

A clearance is provided between the truck bolster side bearings and the carbody side bearings during normal operation. Side bearings are designed to prevent excessive tilting or leaning of the locomotive but are not designed to carry a continuous load. On a new assembly, clearance at any one pair of side bearing wear pads across the locomotive centerline or diagonally opposite should be 4 mm (5/32″) minimum to 10 mm (13/32″) maximum. The other pair can be 4 mm (5/32″) minimum to 13 mm (1/2″) maximum.

Any time the side bearing clearance approaches the minimum limit, Fig. 10, the bolster center bearing

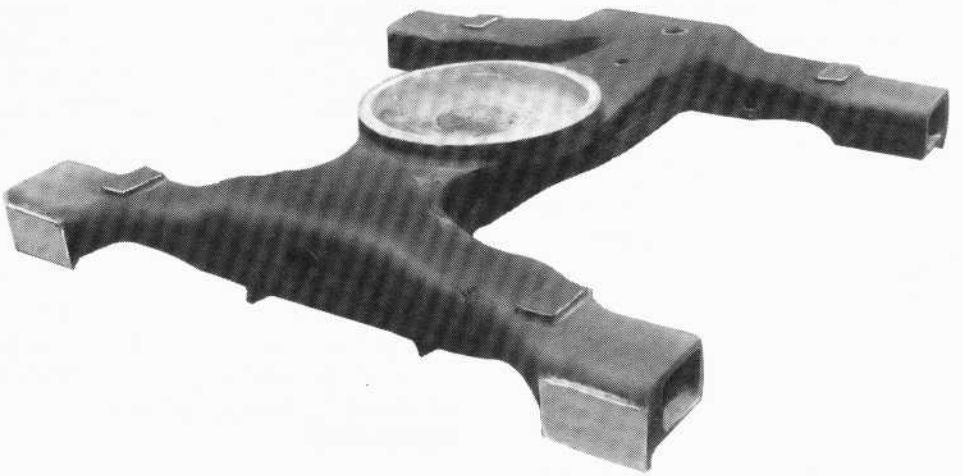

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Fig.8 – Truck Bolster

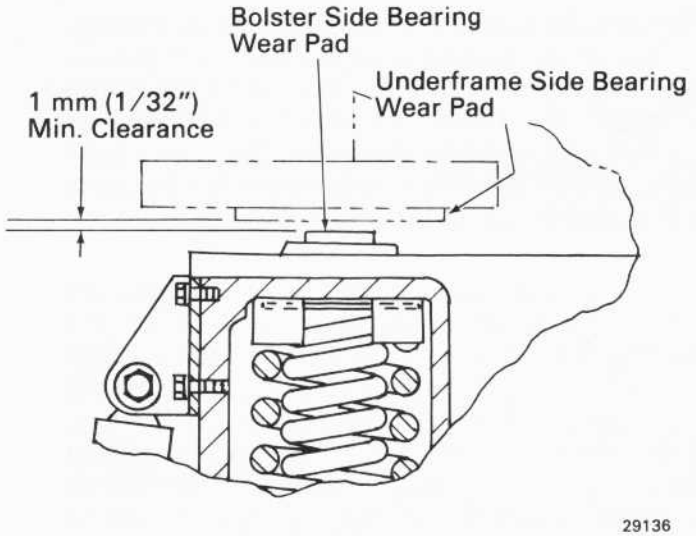


Fig.10 – Side Bearing Wear Pad Clearance

wear plate should be checked for wear. The side bearing wear pads should be flat and in the same plane within 1 mm (1/32") as the side wear pad on the opposite side of the truck. If wear pad is misaligned or is uneven, it may be repaired by building up the surface with weld and grinding to proper level.

A worn side bearing wear pad can be removed by grinding off the fillet welds around the pad. New wear pads should be made of mild steel with the thickness depending on the thickness required to give proper clearance.

BOLSTER WEAR PLATES

Nylatron wear plates, Fig. 11, are bolted to the truck frame to bolster contact surfaces, to provide an easily replaceable mating surface with the bolster faces. If clearance between these surfaces exceeds the limits shown in Fig. 11, the wear plates must be replaced. Maximum total side clearance between the truck frame and bolster must not exceed 10 mm (3/8") or 5 mm (3/16") on one side. The wear plates should be replaced in pairs or complete truck sets so the total clearance on one side of the truck is not more than 2 mm (1/16") greater than on the opposite side.

The wear plates also must be parallel within 1 mm (1/32").

Prior to application of the new wear plates, ensure that mating surfaces of the parts to be welded are clean, smooth, and flat. Use AWS E-7016 electrodes.

During welding, the plate should be held in the proper position and in full contact against the mating part. Ensure that welds are not higher than the wearing surface of the plate. Grind down any weld material that overlaps onto surface of the wear plate. Wear plates which have holes in the plate for welding should have the area of the holes welded first to ensure contact at the center of the plate and prevent warping of the plate.

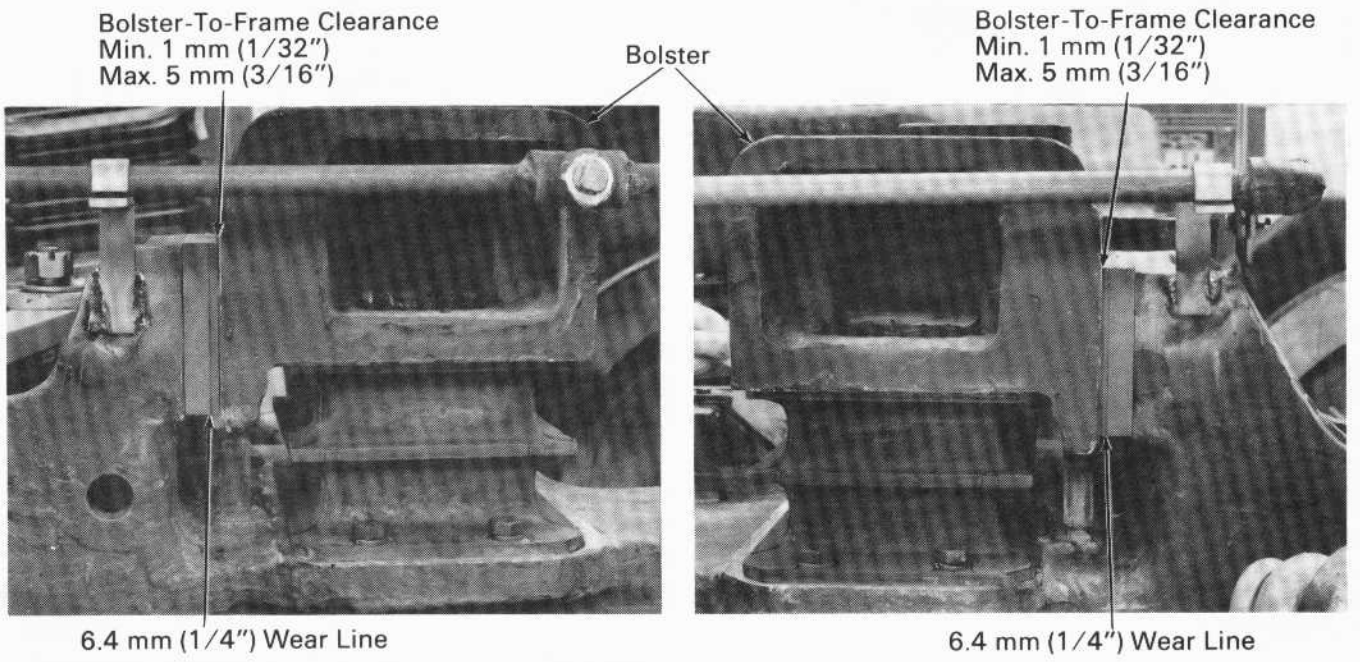


Fig.11 – Bolster-To-Frame Contact Surface Wear Plates

CENTER BEARING WEAR PLATE AND WEAR RING

The center bearing on each truck supports half the weight of the locomotive. Also, the center bearing transfers tractive force to the locomotive carbody. The load on these parts and the relative movement between them will cause the parts to wear.

Side bearing clearance close to the limit is usually an indication of wear at the center bearing wear plate. The limits for the center bearing wear plate are shown in Fig. 12. The thickness of the plate should be checked whenever the plate is accessible. If the plate thickness is above the minimum limit it may be used again. The truck center bearing wear plate may be used as long as it is not completely deteriorated or broken and as long as there is a positive clearance between the side bearings.

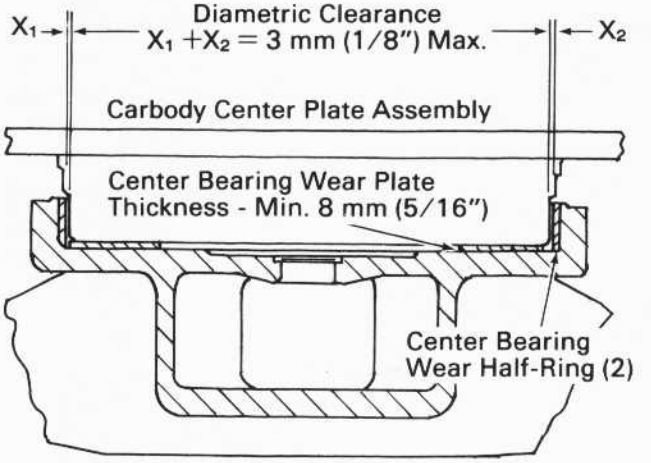


Fig.12 – Center Bearing Wear Plate And Wear Half-Ring Limits

The outside diameter of the carbody center bearing assembly and the inside diameter of the bolster center bearing wear ring should be checked to determine the total clearance between them. The recommended clearance is shown in Fig. 12. The maximum clearance between these parts is 3 mm (1/8″) as indicated.

Center bearing wear plates and wear rings are made of 10 mm (3/8″) thick laminated phenolic material or Nylatron.

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 flame cutting, chipping, or grinding, and a 60° "V" groove provided for welding. Weld the crack with 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 plates and wear 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 a lubricant to the outside diameter of the half rings and apply the half 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.

PEDESTAL LINERS

Pedestal liners, Fig. 13, are provided to absorb the wear that occurs from the relative movement between the journal bearing or journal bearing adapter and the pedestals. For convenience of replacement, the pedestal liners are bolted to the pedestal jaws.

NOTE

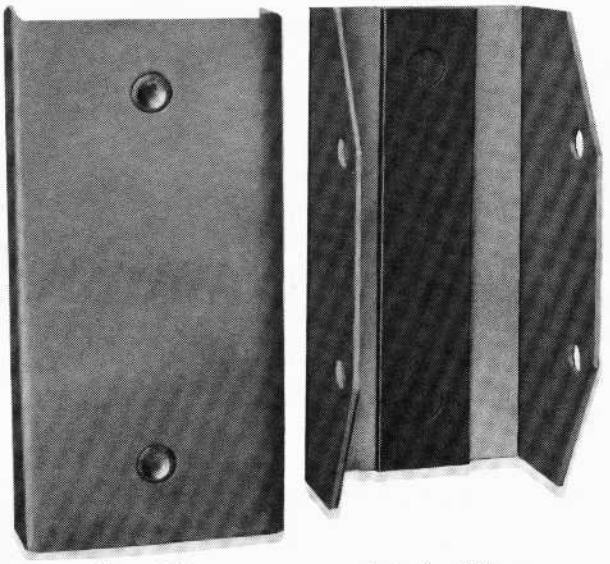
Effective mid-1986, pedestal liners are attached to the pedestals with a simplified through-bolt arrangement. Two 229 mm (9″) bolts replace the four 83 mm (3-1/4″) bolts.

Customers can, at their option, continue to use the four bolt application on existing truck frames.

PEDESTAL LINER-TO-JOURNAL BEARING OR BEARING ADAPTER CLEARANCE

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 the truck reconditioning.

Refer to Fig. 14 for pedestal liner-to-tapered journal bearing adapter clearance limits or Fig. 15 for pedestal liner-to-cylindrical journal bearing clearance limits.



Face View Interior View 13036

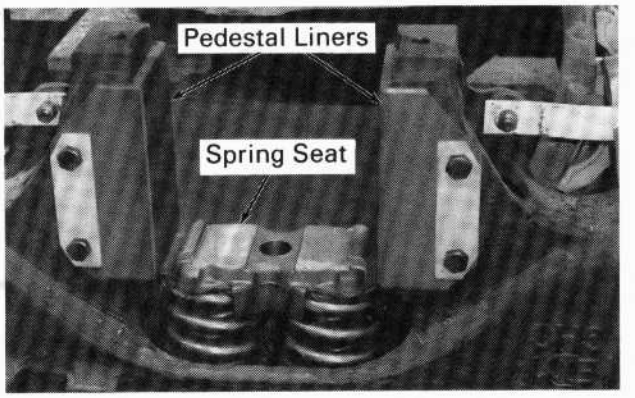


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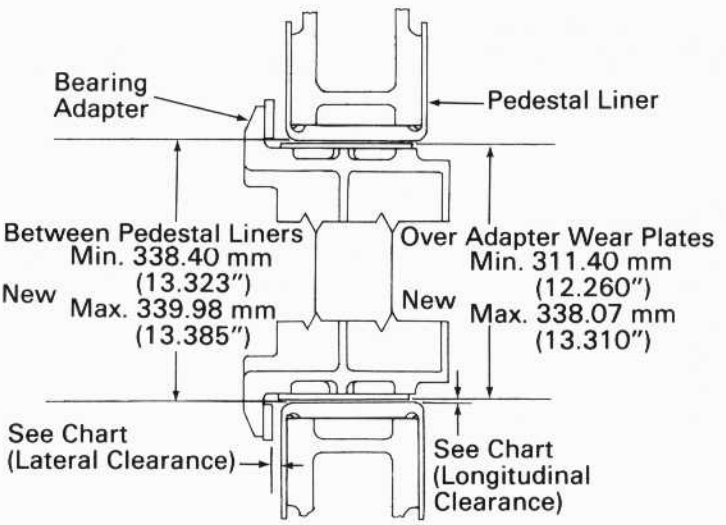
Fig.13 – Pedestal Liners



***NOTE**
This tolerance should be maintained at 6.4 mm (1/4") maximum for trucks used in high speed (over 113 km/h [70 MPH]) service.

JOURNAL BEARING TO PEDESTAL LINER CLEARANCE	mm	(inch)
Standard GHC Truck		
Lateral (Total)		
New	9.5	3/8
Max.	12.7	1/2
GT18MC And GT26 Locomotive GHC Trucks		
Lateral (Total)		
New	6.4	1/4
Max.	9.5	3/8
All GHC Trucks		
Longitudinal (Total)		
New	0.4 - 3.2	1/64 - 1/8
Max.	9.5*	3/8*

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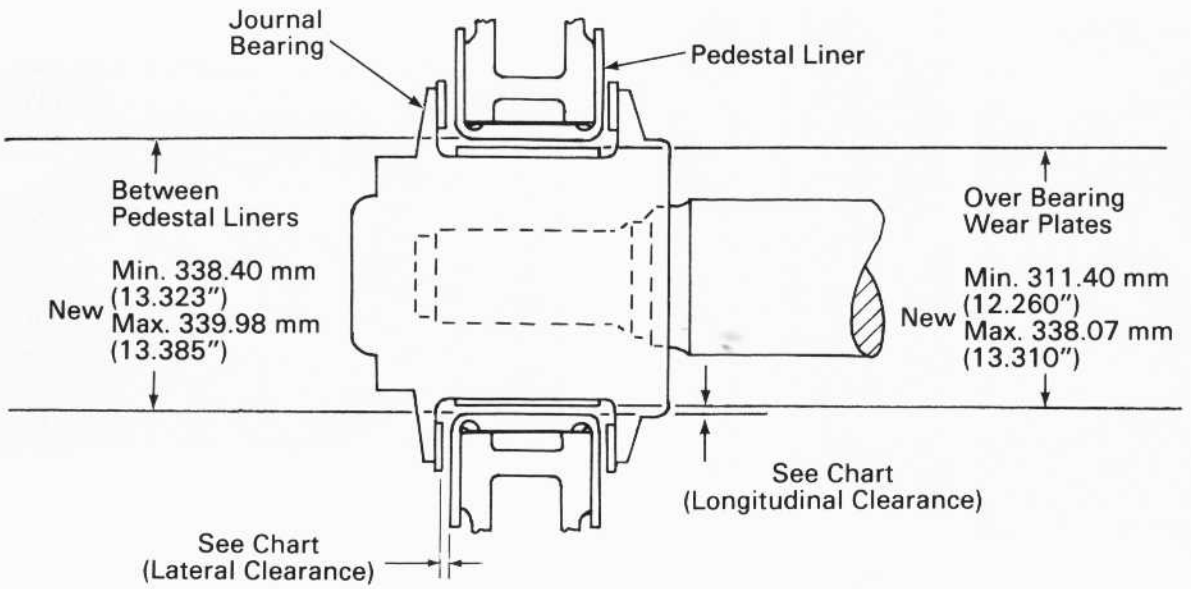
Fig.14 – Truck Pedestal Liner-To-Tapered Journal Bearing Adapter Wear Limits



***NOTE**
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JOURNAL BEARING TO PEDESTAL LINER CLEARANCE	mm	(inch)
Standard GHC Truck		
Lateral (Total)		
New	9.5	3/8
Max.	12.7	1/2
GT18MC And GT26 Locomotive GHC Trucks		
Lateral (Total)		
New	6.4	1/4
Max.	9.5	3/8
All GHC Trucks		
Longitudinal (Total)		
New	0.4 - 3.2	1/64 - 1/8
Max.	9.5*	3/8*

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Fig.15 – Truck Pedestal Liner-To-Cylindrical Journal Bearing Wear Limits

PEDESTAL LINER APPLICATION

Inspect the pedestal jaws to ensure the surfaces are smooth and free of any raised areas that might interfere with the application of the liner. The liner should fit tightly on the pedestal jaw with the mounting holes mating with the pedestal bolt holes. A special liner pressing tool may be made as shown in Fig. 16. Refer to Service Data for file number of liner pressing tool drawing.

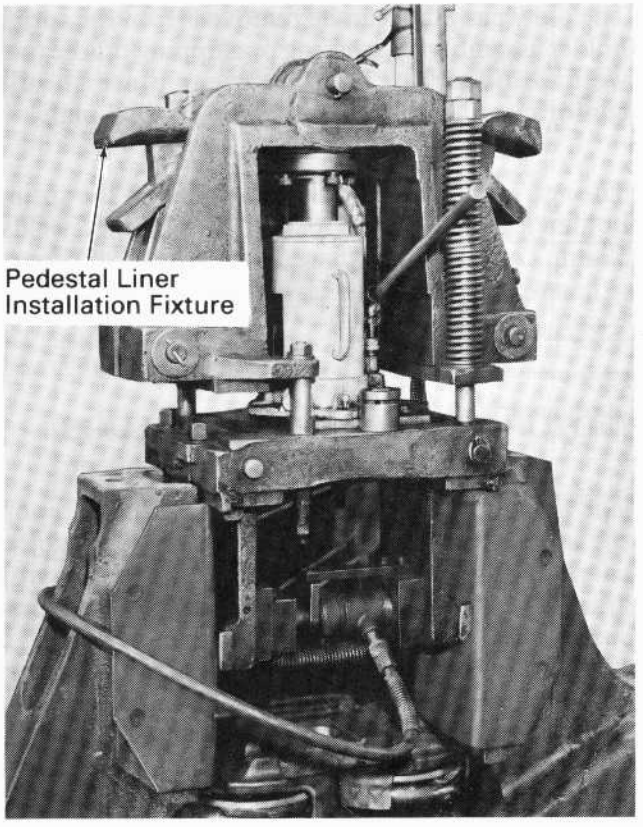
CAUTION
Do not over-torque pedestal liner bolts. Damage to the liner and bolts can occur.

Torque liner bolts to 237-305 N·m (175-225 ft-lbs).

The dimension between the liner faces should be 338.40 mm (13.323") minimum or 339.98 mm (13.385") maximum as indicated in Figs. 14 or 15 as applicable.

JOURNAL BEARING ADAPTER (TAPERED JOURNAL BEARINGS)

On units equipped with tapered journal bearings, the journal bearing is contained in a journal bearing adapter, Fig. 17, which is held between the truck pedestal jaws.



13492

Fig.16 – Pedestal Liner Application

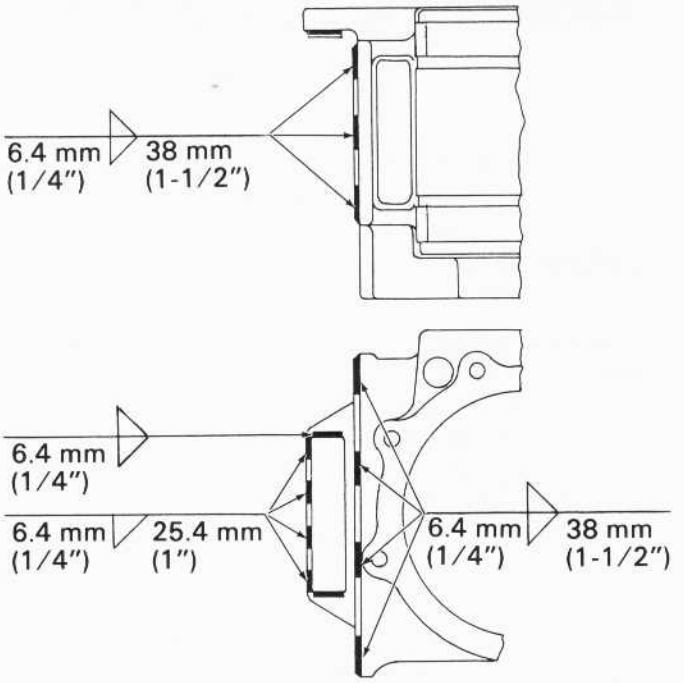
The outside dimension across the adapter wear plates, with new wear plates, should be 338.07 mm +0.00, -1.27 (13.310″ +.000, -.050). The inside dimension between new pedestal liners is 338.40 mm +1.57, -0.00 (13.323″ +.062, -.000), Fig. 14. These dimensions provide for a maximum longitudinal clearance of 3.18 mm (.125″) or a minimum clearance of 0.33 mm (.013″) when all new parts are used. The rebuild clearance limit between the pedestal liner and adapter wear plate is 5 mm (3/16″). The condemning limit is 6 mm (1/4″).

Refer to Fig. 14 for the lateral nominal clearance between the adapter lug and the pedestal liner.

The adapter wear plates which are cracked or worn beyond their limits should be replaced. The old wear plates can be removed by grinding or chipping off the tack welds holding the plates. The wear plates should not be removed by any form of flame cutting. Care should be taken not to damage the surface of the bearing adapter to which the new plates will be applied.

The journal bearing should be removed from the adapter before applying new wear plates. Welding electrode AWS-E-FeMn-A, E-308-16, or E-310-16 is recommended for wear plate application. See Fig. 17 for welding details. The weld should be made with proper current to obtain a weld slightly convex and without craters. Welds extending beyond the wear surfaces of the plates should be ground off flush with the liner to prevent contact with mating surfaces on the truck pedestals.

When applying wear plates that have holes provided for welding, apply the weld to the holes before welding the outer edges. This will help to ensure contact at the centers of the wear plates and prevent warping. Clamps should also be used to hold the wear plates tightly against the bearing adapter while they are being applied.



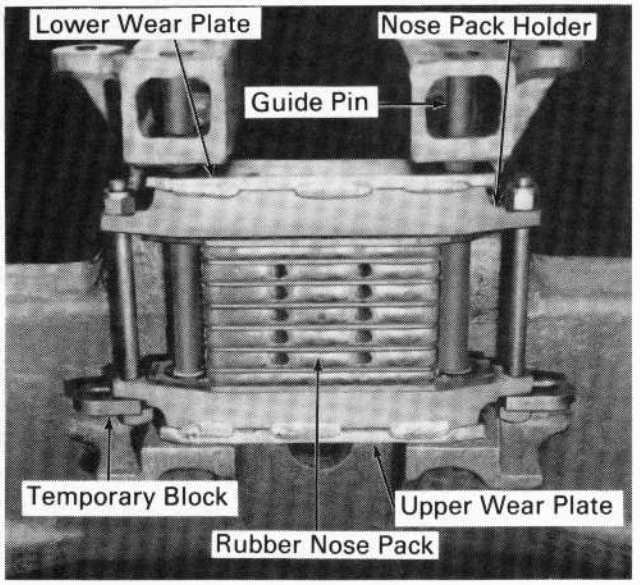
29612

Fig.17 – Journal Bearing Adapter Wear Plate Application

TRACTION MOTOR NOSE SUSPENSION ASSEMBLY

SUSPENSION PACKS

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. 18.



29143

Fig.18 – Traction Motor Nose Suspension Assembly

WEAR PLATES

The wear plates on the motor nose 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 slip.

Wear plates should be periodically replaced to ensure not more than 6 mm (1/4″) free movement in the traction motor nose suspension to obtain maximum cushioning effect from the rubber suspension pack. If the wear plates, which are 13 mm (1/2″) thick when new, are worn enough to permit more than the 6 mm (1/4″) free movement or if the wear plates are worn more than the limits given in Fig. 19, the motor nose suspension assembly 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 mm (7/16″). The lower wear plate may be moved to the upper position if it is still within the 10 mm (13/32″) upper wear plate limit.

The old wear plate can be removed from the spring holder assembly by grinding or chipping off the tack welds holding it. The new wear plate should conform to the dimensions of the original plate.

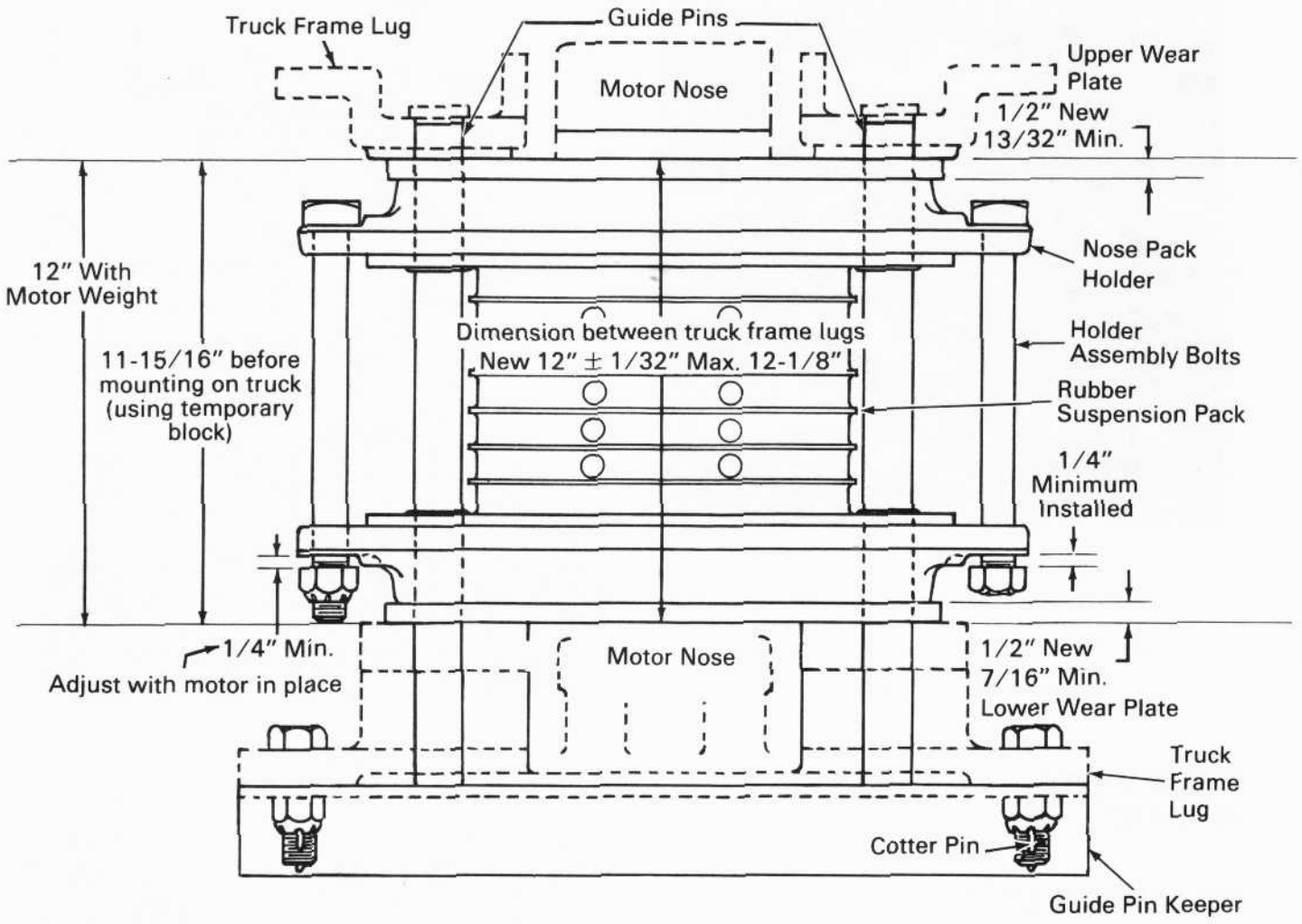
The new wear plate should be applied to the spring holder assembly with 10 mm (3/8″) fillet welds, 57 mm (2-1/4″) long, spaced 95 mm (3-3/4″) apart. When welding wear plates, use an AWS-E-FeMn-A welding rod.

MOTOR NOSE SUSPENSION LUGS

The lugs on the truck frame transom that support the traction motor suspension assembly are subject to wear due to the chafing of the suspension assembly. The maximum dimension between these surfaces is 308 mm (12-1/8″) as shown in Fig. 19. If this limit is exceeded, it will be necessary to build up the lug faces by welding and machining or grinding to obtain the original dimension of 305 mm ±1 (12″ ±1/32). The ground or machined surfaces of the lugs should be in the same plane within 1 mm (1/32″).

Current practice is to install a 5 mm (3/16″) thick manganese steel wear plate on each of the four truck frame suspension lugs. If manganese wear plates are used on the suspension assembly they should also be used on the suspension lugs. This will reduce wear at these points and allow an extended period between rework. The wear plates are applied to the lugs with a 5 mm (3/16″) fillet weld using an AWS-E-FeMn-A welding rod. Weld the plate on three sides as shown in Fig. 20. After the wear plates are applied, the surfaces must still be in the same plane and the dimension between the upper and lower lugs must be 305 mm ±1 (12″ ±1/32).

The guide pin holes in the frame lugs should be checked for size. The holes are drilled to a nominal 33 mm (1-5/16″) diameter when new. If they become worn or elongated by 2 mm (3/32″) or more, they must be ring or plug welded and redrilled to the correct dimension. An optional method of repairing the guide pin holes is to drill the worn holes to 47.62 mm ±0.05 (1.875″ ±.002) and press in bushing 8308240. The guide pins are 31.75 mm (1.250″) in diameter when new and should be replaced when they have worn to a diameter of 30.99 mm (1.220″).



METRIC CONVERSION CHART			
(inch)	mm	(inch)	mm
1/32	0.79	1/2	12.7
1/4	6.4	11-15/16	303.2
13/32	10.3	12	304.8
7/16	11.7	12-1/8	308.0

29144

Fig.19 - Traction Motor Nose Suspension Assembly

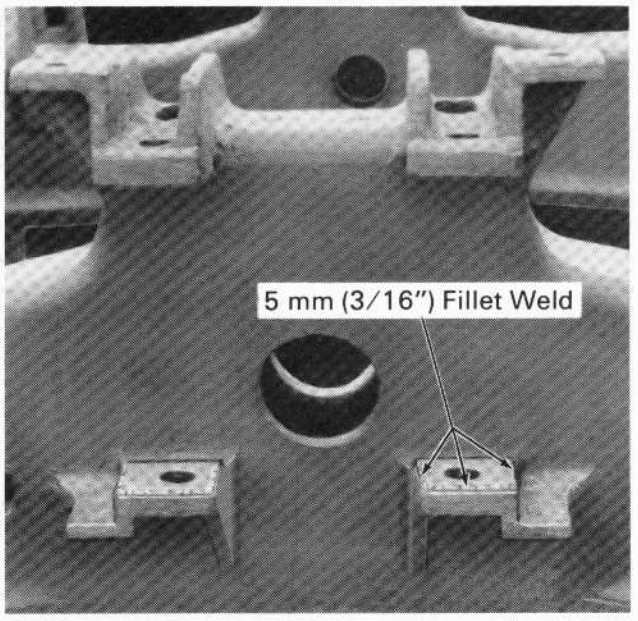


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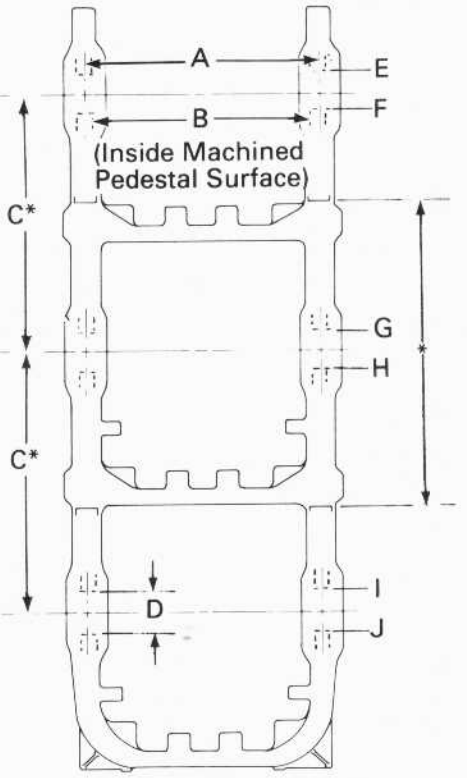
Fig.20 – Truck Frame Motor Nose Suspension Lugs



*Parallel within 0.8 mm (1/32")

	Dimensions	
	(inch)	mm
A	63-1/2 ± 1/32	1 613 ± 0.1
B	58 ± 1/32	1 473 ± 0.1
C	71-1/2 ± 1/8	1 816 ± 3
D	14-7/8 +0, -1/32	378 +0, -0.1

29146

Fig.21 – Truck Dimensions

TRUCK FRAME PEDESTAL REPAIR

WHEELBASE SPACING

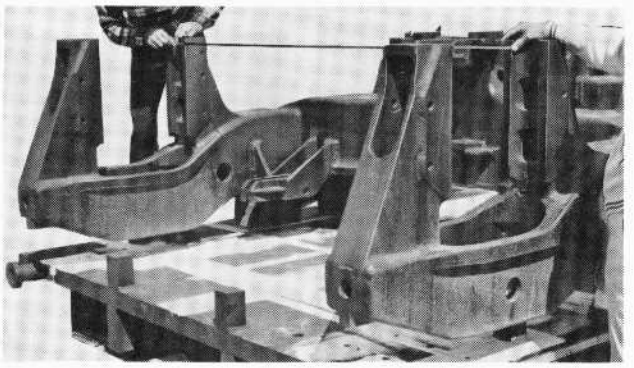
The wheelbase spacing is the distance between the axle centerlines. These dimensions are shown in Fig. 21.

To determine the wheelbase spacing, use a straight-edge as shown in Fig. 22 and measure the distance between points E and G of Fig. 21. This dimension can be checked by measuring between points F and H. Measure the distance between points G and I and check by measuring between points H and J. Refer to Fig. 21 for dimensions.

The axle centerlines should be parallel within 0.8 mm (1/32") at the outer face of the pedestal jaws.

TRANSVERSE PEDESTAL SPACING

The transverse pedestal spacing refers to the dimension between the inside machined surface of the pedestal jaw on opposite sides of the truck, as shown in Fig. 21. The transverse measurements may be made as shown in Fig. 22. The pedestals may lean in or out, providing both pedestals of each set lean in the same direction and are within the plus or minus tolerance allowed.



Measuring Transverse Spacing

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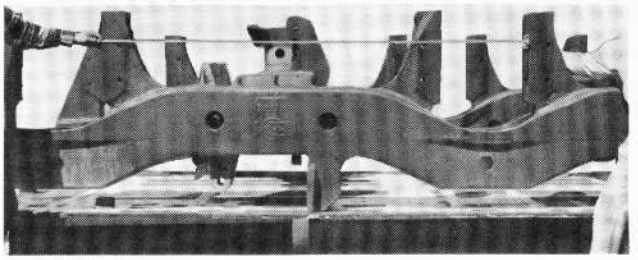


Measuring Wheelbase

13499

Fig.22 – Measuring Wheelbase Dimensions And Transverse Pedestal Spacing

Pedestals which do not conform to the dimensional limits can be corrected by straightening the truck frame, hot or cold.

LONGITUDINAL PEDESTAL SPACING

The longitudinal pedestal spacing refers to the distance between the inside surfaces of the pedestal jaws on the same side of the truck, as indicated in Fig. 21.

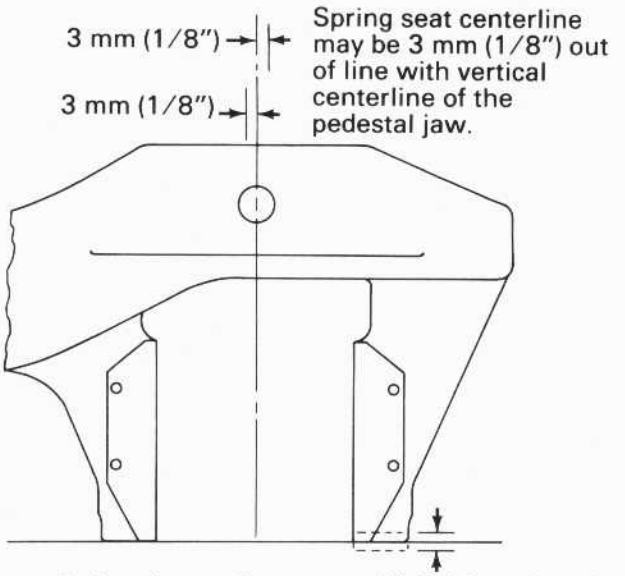
Incorrect longitudinal pedestal spacing may be caused by a bent frame, bent pedestals, or wear between the pedestal liner and pedestal face.

A bent frame or bent pedestals require straightening to obtain correct pedestal face.

Wear between the pedestal liner and pedestal face should be corrected by welding and remachining of the pedestal face.

HORIZONTAL PEDESTAL ALIGNMENT AT THE BASE LINE

The horizontal pedestal alignment at the baseline is the relationship from one pedestal jaw to any other pedestal jaw on the same side of the truck frame, as indicated in Fig. 23. This alignment can be determined by measuring from a straight edge tool or wire spanning the pedestals, as shown in Fig. 23, and may be above or below the pedestal baseline by no more than 3 mm (1/8"). A condition in excess of this can only be corrected by straightening the truck frame.



Pedestals may be ± 3 mm (1/8") from baseline.

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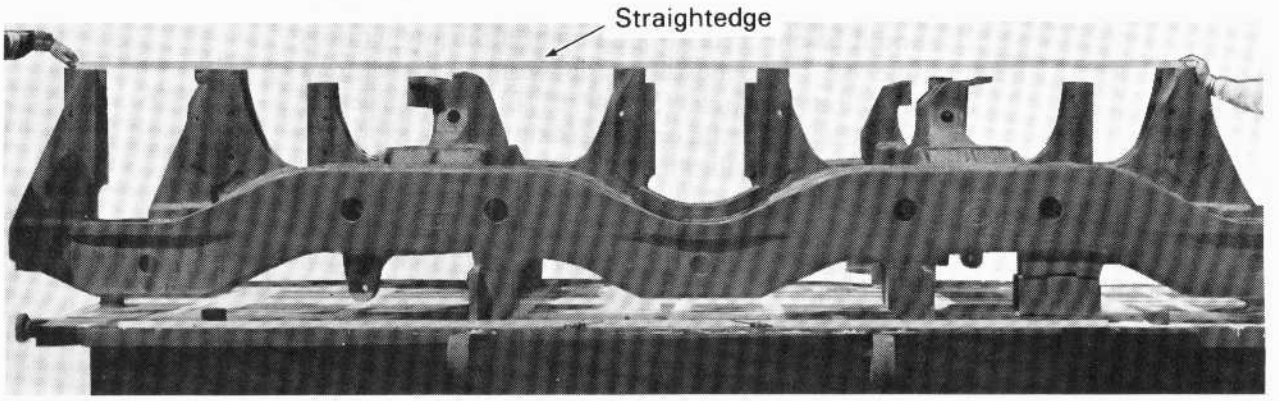

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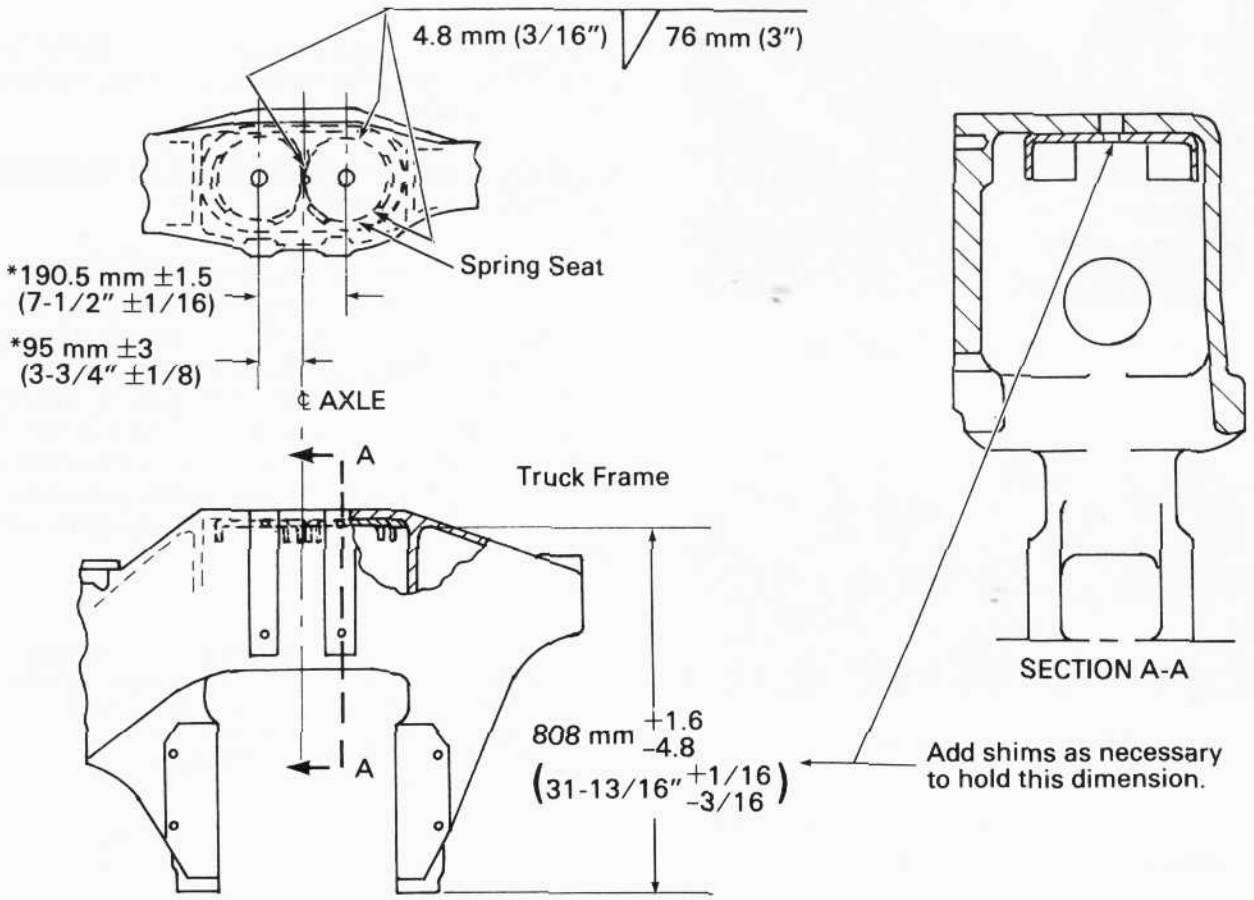
Fig.23 – Pedestal Base Horizontal Alignment



*Spring seat centerline may be misaligned 3.2 mm (1/8") to pedestal centerline and 1.6 mm (1/16") to each other.

29158

Fig.24 - Truck Frame Coil Spring Seat Location

LOCATION OF TRUCK FRAME COIL SPRING SEATS

The coil spring seats welded to the truck frame should be checked for alignment after any work is done on the pedestals. The spring seat centers should be 95 mm ±3 (3-3/4" ±1/8) from the center of the truck pedestal opening (axle center), as shown in Fig. 24. If misalignment is more than 3 mm (1/8"), the spring seats should be moved to correct. The distance between the two spring seat centers should be within 190.5 mm ±1.5 (7-1/2" ±1/16) as shown in Fig. 24.

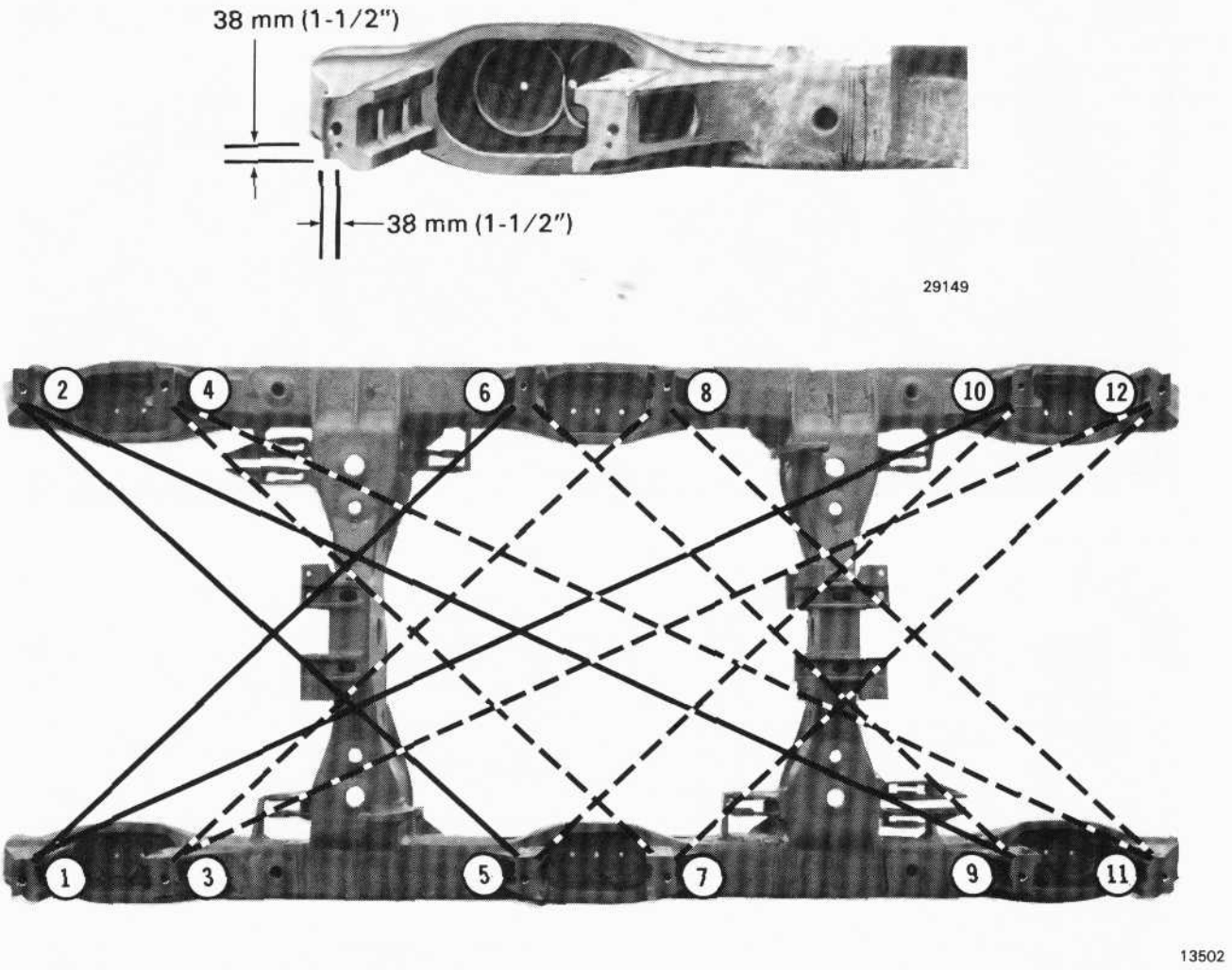


Fig.25 – Truck Frame Tramming Diagrams

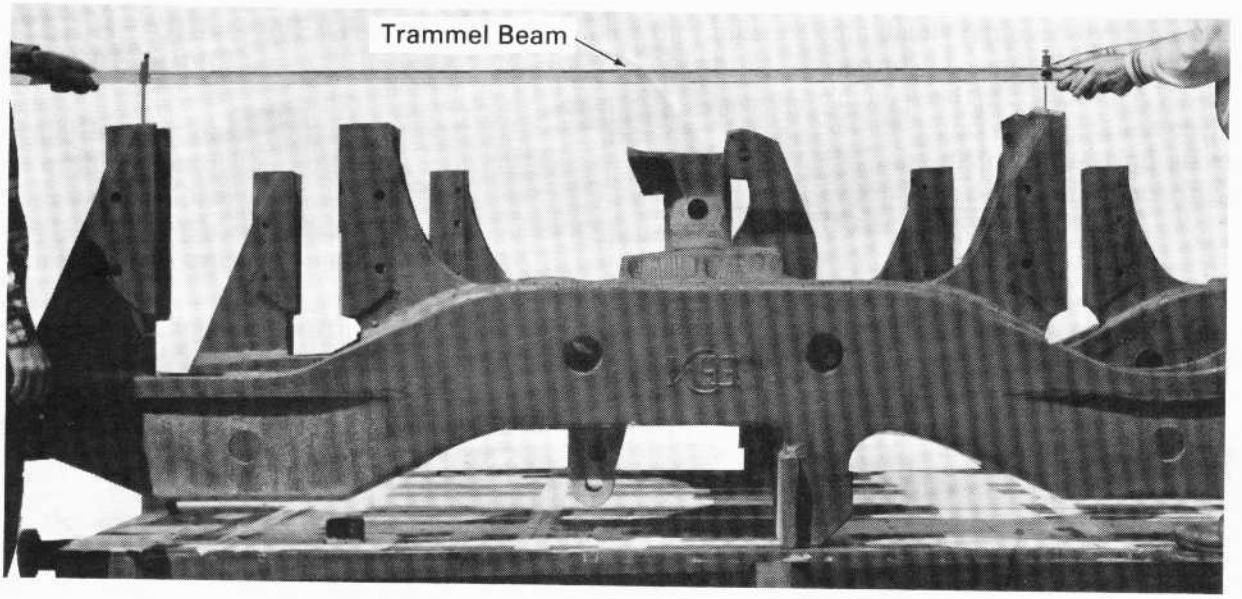
TRAMMING OF TRUCKS

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 to or within the allowable limits. The diagrams shown in Fig. 25 indicate which pairs of pedestals should have equal distances between them.

Tramming is accomplished using a trammel beam as shown in Fig. 26 with the truck frame inverted on a level table or level location. In addition to the diagonals shown in Fig. 25, it may be necessary to check the tram of the pedestals both longitudinally and transversely as indicated in Fig. 26.

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 adjustable trammels permit any distance separation on the beam so the various dimensions to be trammed can be compared.

Tram marks are made on the end or bottom of each pedestal jaw 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 the outside corner of the pedestal or on the



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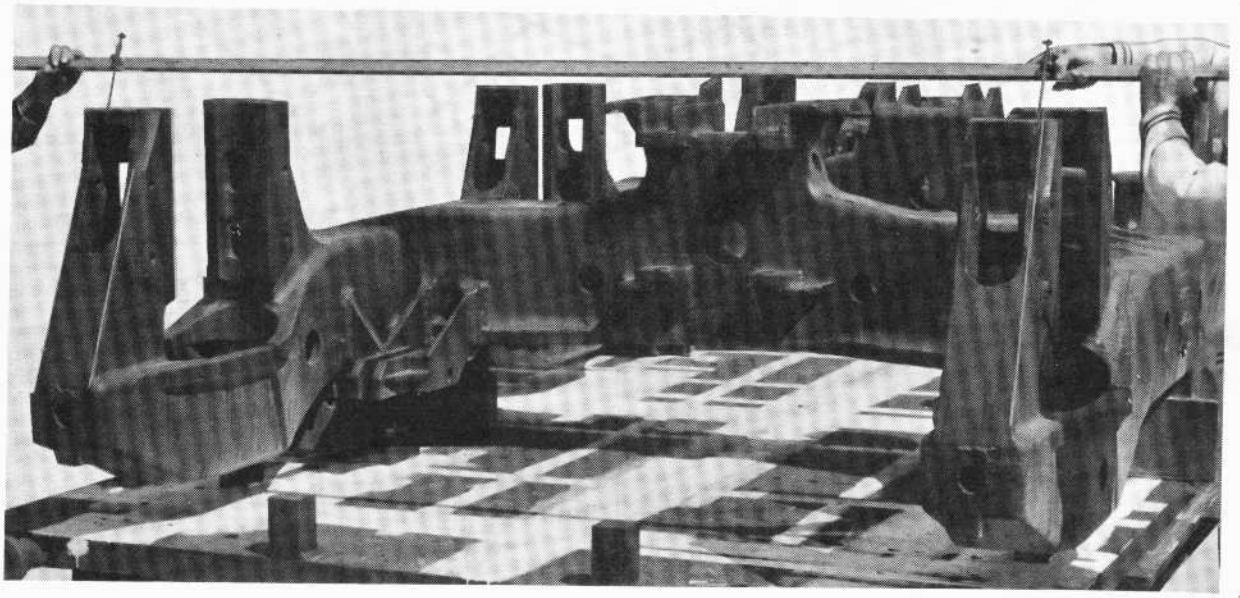

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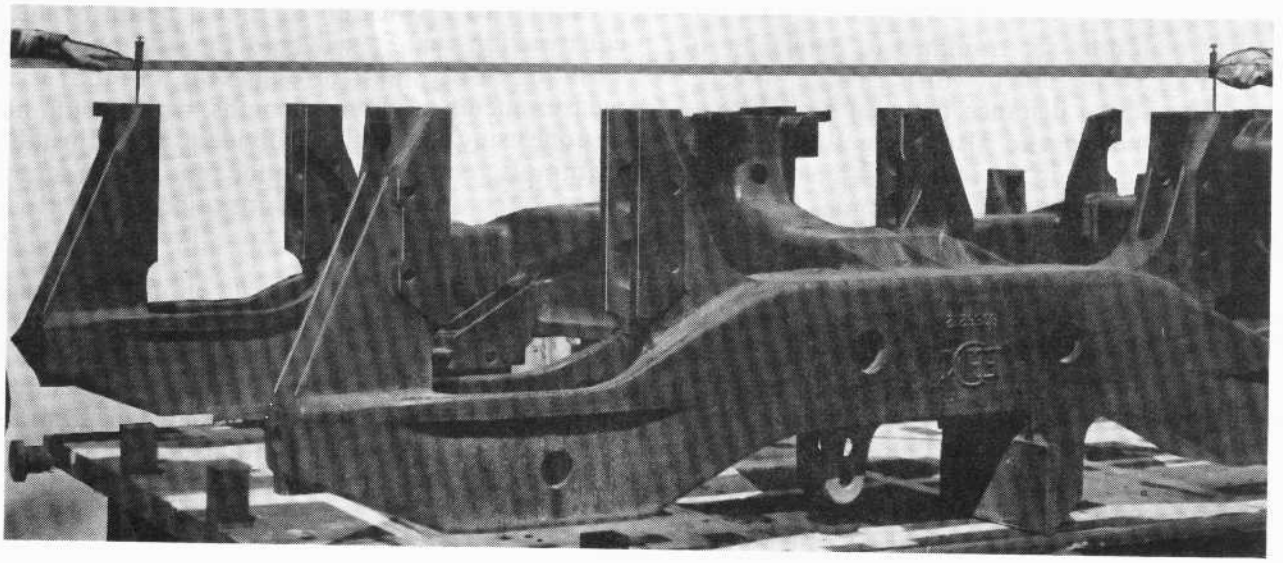

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Fig.26 – Application Of Trammel Beam

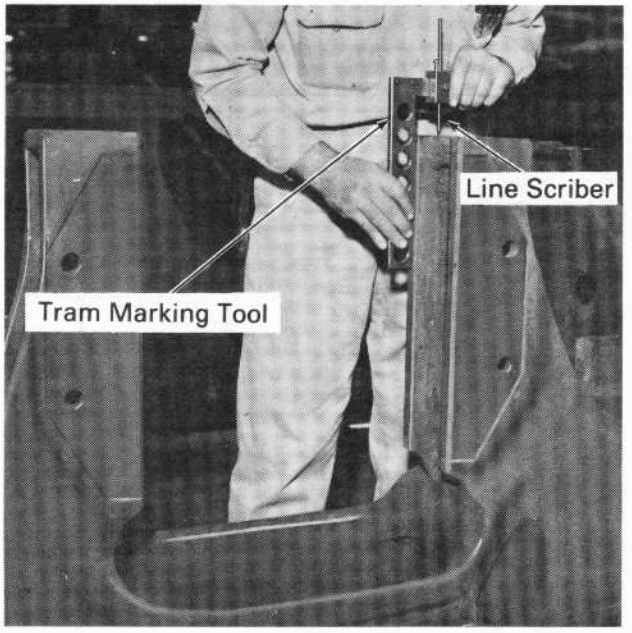

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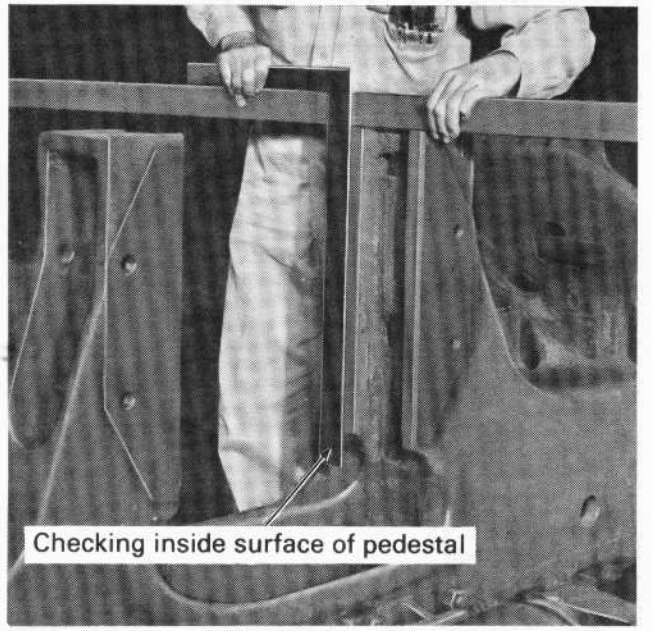
Fig.27 – Tram Marking Tool

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 shown in Fig. 27 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 dimensions on the bottom of the pedestal. the hardened end of the scriber on the 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 mark and and relocate a new mark.

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 straight edge and square, as shown in Fig. 28.

If the diagonal measurements shown in Fig. 25 are not equal, it will be necessary to tram the pedestals longitudinally and transversely, as shown in Fig. 26, to locate the pedestals that are out of alignment and determine how much they are out of alignment.



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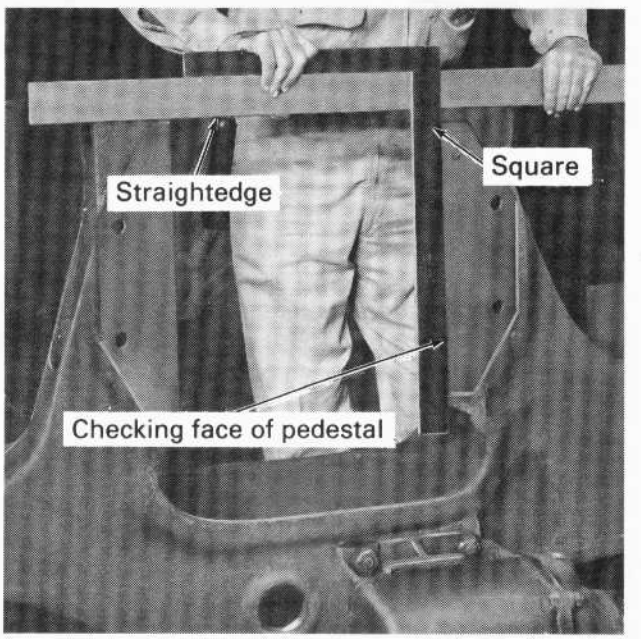

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Fig.28 - Checking Pedestal Squareness

A typical example of the tram measurements is shown in Fig. 29. The diagonal trams 3-8, 1-6, 2-5, and 4-7 are shown to be unequal by +3 mm (1/8″), 0, +1 mm (1/32″) and +1.5 mm (1/16″) respectively.

The diagonal trams are allowed a tolerance of +1.5 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.

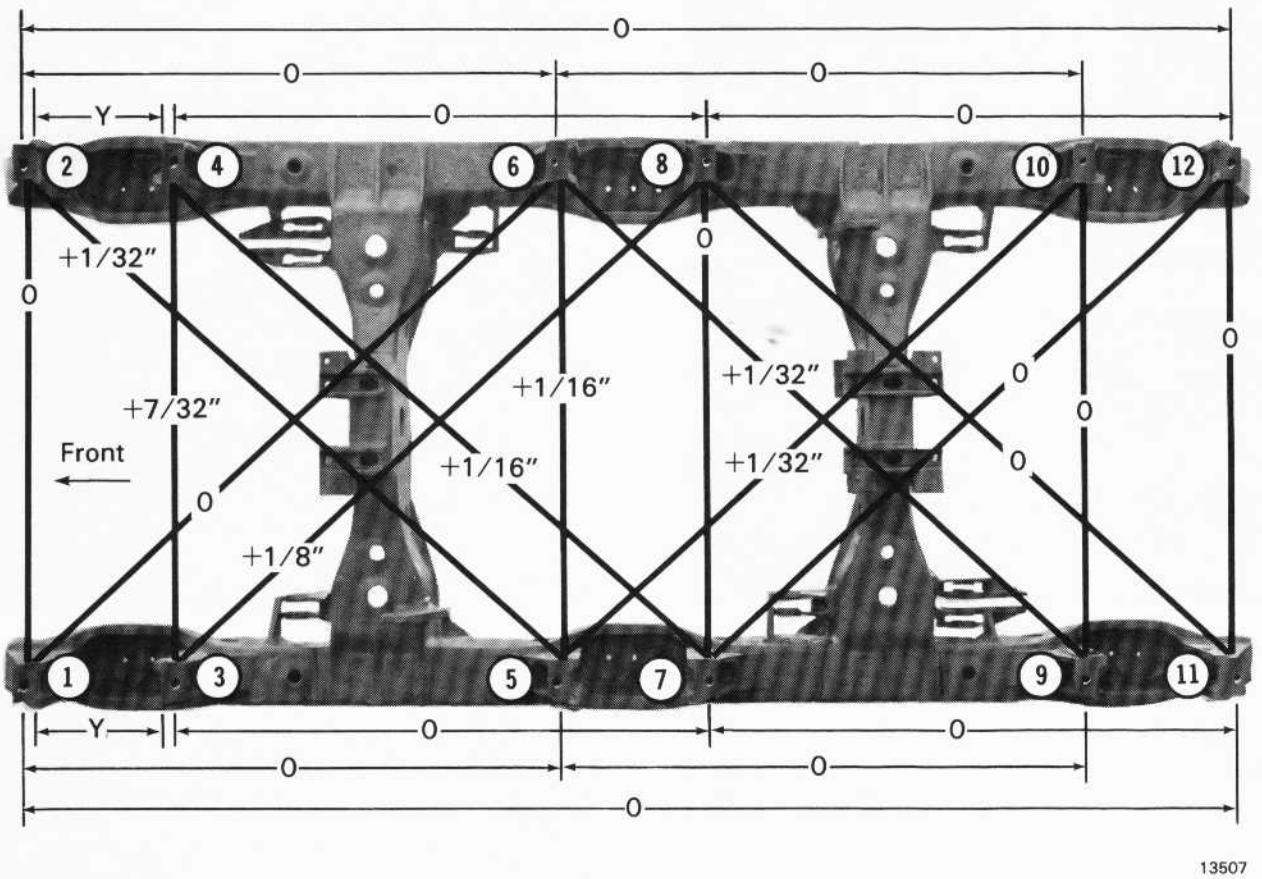


Fig.29 - Typical Example Of Tram Measurements

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 1.5 mm (1/16") and 5.5 mm (7/32") respectively.

Since pedestals 3-4 are 5.5 mm (7/32") it accounts for the +3 mm (1/8") and +1.5 mm (1/16") length of the diagonal trams 3-8 and 4-7 going to these pedestals. Since pedestals 3-8 +3 mm (1/8") is twice the 1.5 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 mm (5/32") and No. 4 is bent inward 1.5 mm (1/16"), the diagonals 3-8 and 4-7 will be reduced and diagonal 3-8 will be within the limit of 1.5 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.

TRUCK SPRINGS

The truck assembly is equipped with coil springs above each journal bearing. Various combinations of springs are used to accommodate the loads which may be applied according to the weight specification of a particular locomotive. Spring shim plates and shims of different thickness are used to maintain the proper coupler height.

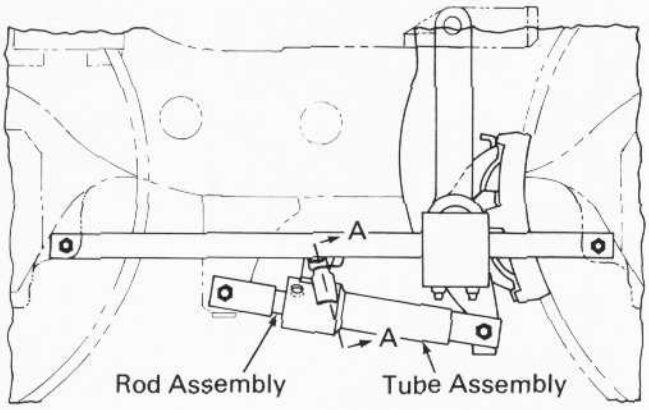
Refer to Maintenance Instruction M.I. 1512 "Coil, Elliptic, And Rubber Truck Spring Qualification And Replacement" for inspection, qualification, and application of the coil spring.

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 bushings, 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 visa versa.

Cylinder levers and brake levers that are slightly bent can be reused if they are restored to their original shape without any damage. Bolts and nuts that are not subject to wear can be reused if they are not damaged, but cotter pins should always be replaced.

The brake rigging is basically equipped with pin-type slack adjusters, Fig. 30. To adjust the slack



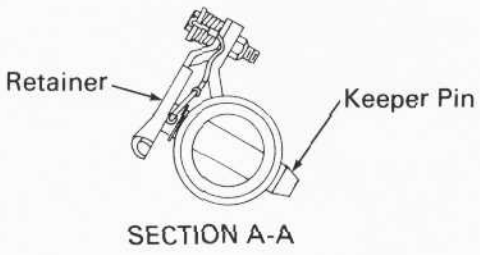


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Fig.30 – Brake Shoe Pin-Type Slack Adjuster

adjusters, lift the spring-loaded retainer and rotate it away from the keeper pin. Lift keeper pin out of hole. Move the rod assembly in or out of the tube assembly until brake shoe clears the wheel by at least 9.5 mm (3/8″). Align the holes in the rod and tube assemblies and re-install keeper pin. Lift and rotate the retainer, placing it over the keeper pin.

ASSEMBLY OF TRUCKS

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 desirable to assemble the truck while in the upright position.

PROCEDURE A

1. Set the truck frame in an inverted position on the floor.

2. Install coil spring assemblies, spring seats, spring shims, and pedestal liners. Bolt in place where required.

3. Install traction motor nose suspension assemblies in place between the frame lugs. Compress traction motor suspension pack assembly by placing temporary blocks between nose pack holder and mounting bolt heads and tightening bolts. Install suspension pack keeper pins and pin keeper bar.

4. Install brake levers in place, leaning them back to provide enough clearance for the wheel and axle assembly.

5. Install pre-assembled wheel, axle, and motor assemblies in place by lifting the assembly with a lifting fixture similar to the one in Fig. 31, and lowering between the truck frame pedestals until the journal box adapters rest on the coil spring seats. Remove temporary blocks from traction motor nose suspension assembly.

6. Install pedestal tie bars, slack adjusters and sander guide assemblies.

7. Turn truck assembly over onto its wheels and install shock absorbers, air brake piping, brake cylinders, and any remaining brake rigging.

8. Install bolster support pads, then set the bolster in place between bolster pedestals.

9. Install center bearing wear plate and wear half rings. Apply a coat of grease to the dust guard and install it on the bolster center casting. Apply oil to the truck center bearing as explained under the "Lubrication" section.

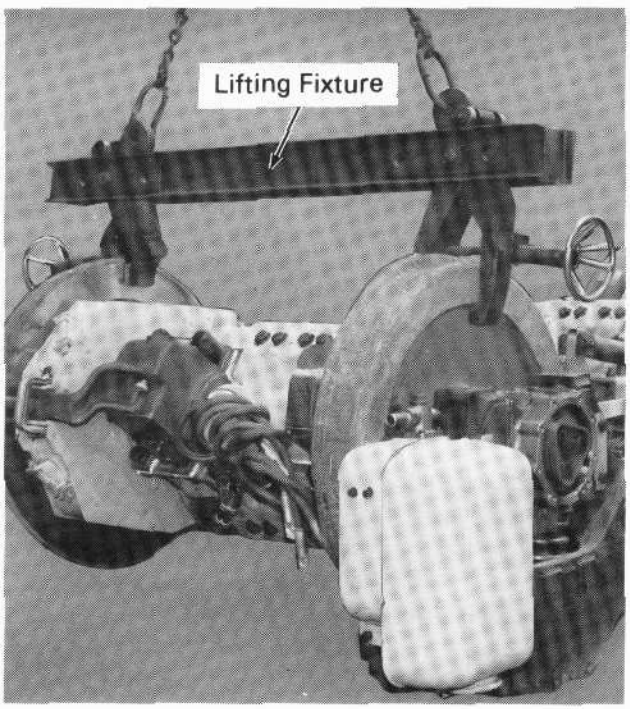

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Fig.31 – Installing Wheel, Axle, And Motor Assembly

PROCEDURE B

1. Space wheel and axle assemblies so that when the truck frame is lifted it can be placed over the assemblies.

2. Lift truck frame and lower it over the wheel and axle assemblies. Install coil spring assemblies, spring seats, and shims before fully lowering the frame. Install pedestal tie bars after frame is lowered.

3. Compress traction motor suspension pack assembly by placing temporary blocks between nose pack holder and mounting bolt heads and tightening bolts.

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

5. Hoist motor and place lower lip of support bearing on top of axle, Fig. 32. Rotate motor on axle until traction motor nose suspension assembly can be mounted. Install suspension pack keeper pins and pin keeper bar and remove temporary blocks.

6. Install traction motor gear case, outer bearing half, axle guard, support bearing caps, and dust guards.

7. Install brake lever assemblies and traction motor cooling ducts.

8. Install slack adjusters and sander guide assemblies.

9. Install shock absorbers, air brake piping, brake cylinders and rigging.

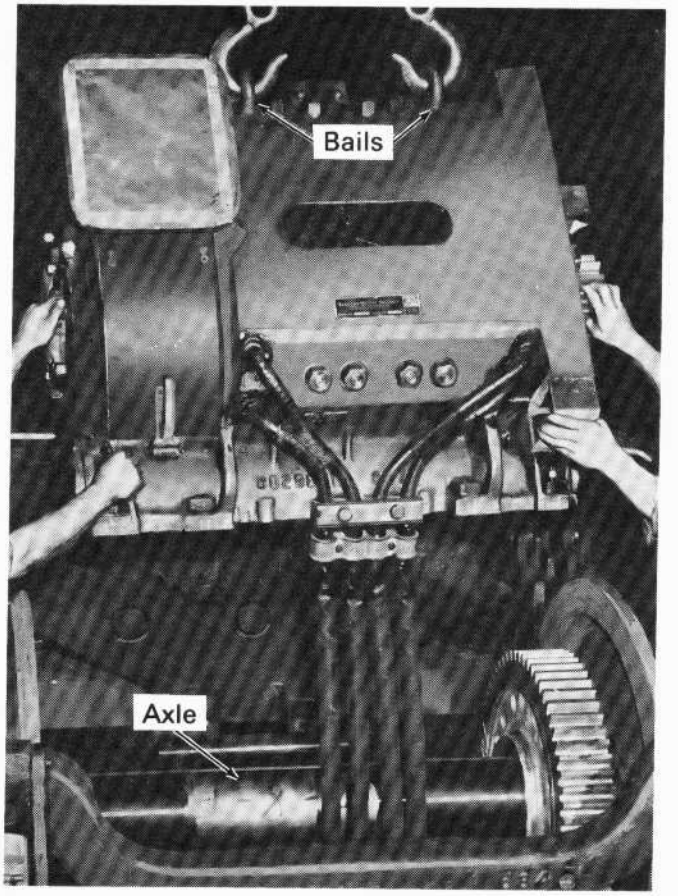

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Fig.32 – Installing Traction Motor

10. Install bolster support pads, then set the bolster in place between bolster pedestals.

11. Install center bearing wear plate and wear half rings. Apply a coat of grease to the dust guard and install it on the bolster center casting. Apply oil to the truck center bearing as explained under the "Lubrication" section.

SERVICE DATA

REFERENCES

Coil Elliptic, And Rubber Truck Spring
Qualification And Replacment . . . . . M.I. 1512
Wheels, Axles, Axle Gears And Pinions . . . . . M.I. 1519
Cylindrical Roller Oil Lubricated
Journal Box . . . . . M.I. 1552
Grease Lubricated Cartridge-Type
Journal Bearings . . . . . M.I. 1553
Lubrication Specifications . . . . . M.I. 1756

EQUIPMENT

Wall Mounted Fixture To Test
Shock Absorber . . . . . *Work Sketch No. 41089
Pinion Protector 8054871
Lifting Fixture (traction motor, wheel
and axle assembly) . . . . . *File No. 288
Tram Marking Tool . . . . . *File No. 615
Pedestal Liner Pressing Tool . . . . . *File No. 649

*File number drawings and work sketches represent facility drawings that are available from EMD Technical Publications, Dept. 400. These drawings include construction details of tooling that can be manufactured.