ELECTRO-MOTIVE DIVISION • GENERAL MOTORS CORPORATION
SERVICE DEPARTMENT
MAINTENANCE INSTRUCTION

GP TRUCK ASSEMBLY WITH SINGLE BRAKE SHOE RIGGING

DESCRIPTION

Two GP truck assemblies, Fig. 1, 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. A 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.

Two 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 to the truck frame by the axle journal boxes and from the truck frame to the bolster at the truck and bolster chafing plate interfaces. The bolster then transmits the force at the center bearing to the carbody center bearing to provide the locomotive tractive effort.

The frame of the truck is supported on two coil spring assemblies above each journal box. The journal box transmits the vertical load directly from the springs to the axle.

Each journal box is held between the pedestal jaws, which are an integral part of the frame. Each pair of pedestals is joined at the bottom by a pedestal tie bar, which transfers a portion of the driving force from one pedestal to the other. Renewable pedestal liners and journal box wear plates provide control of clearances between the pedestals and journal boxes. See M.I. 1552 for information on journal boxes.

Bosses on both sides of the frames are provided to support the swing hangers, which carry the spring plank. Rubber bolster springs at each end of the spring plank support the bolster, which is confined between the center frame transoms.

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

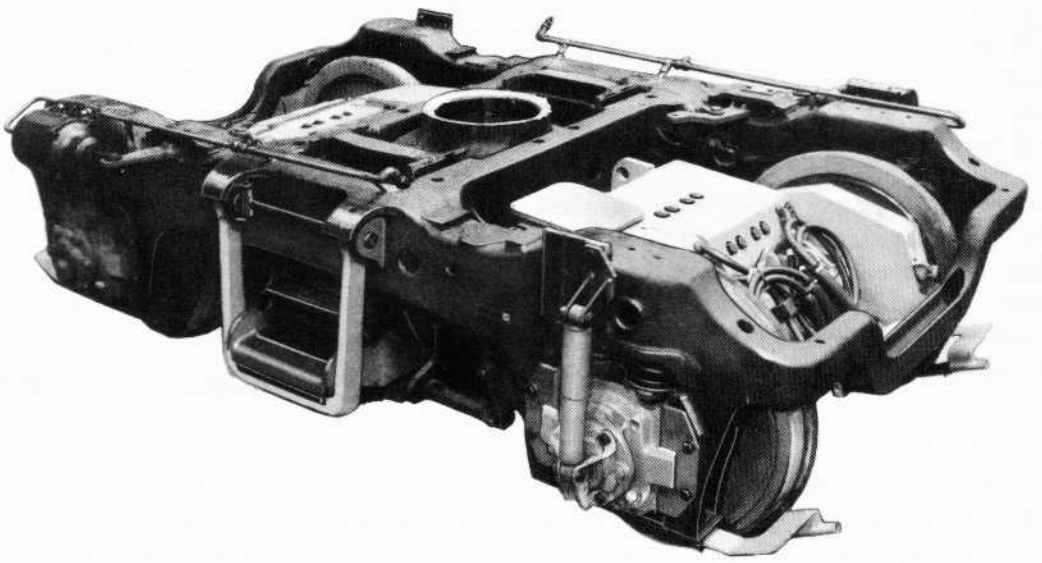

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Fig. 1 – GP Truck Assembly With Single Shoe Brake Rigging

Driving or braking forces are transferred from the frame transoms to the bolster. Wear plates on the inside surface of each transom contact mating wear surfaces on the bolster. The bolster center bearing, in turn, transfers these motive forces to the carbody center bearing. Matching side bearings on the truck bolster and the carbody limit the lean of the locomotive. Clips bolted to the carbody side bearings hook under the bolster side bearings to allow rotary movement between the carbody and truck bolsters but prevent separation of the truck bolster from the carbody underframe. They also provide anti-slewing protection in case of derailments.

Traction motors are supported on their respective drive axles and at the traction motor nose suspension assemblies mounted on the center transoms.

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

Brake cylinder pistons are connected to brake levers to actuate the brake rigging. One cylinder is mounted on each side of the truck frame at opposite corners and actuates the two brake shoes on that side of the truck.

NOTE: The single shoe brake system must be equipped with composition brake shoes.

MAINTENANCE

LUBRICATION

Periodic lubrication is not required on the truck assembly. However, the oil level in the journal boxes should be inspected periodically and oil added when necessary. If slack adjuster threads are found to be dry they should be lubricated.

The center bearing should have approximately 3-1/2 pints of oil added before the unit is trucked. This will be enough to cover the center bearing wear plate by approximately 5/16". Another 3-1/2 pints of oil should be added after the unit is trucked to make up the required 7 pints.

NOTE: Do not add all 7 pints of oil before the unit is trucked or a portion of the oil may be pumped out during trucking.

Special care should be taken to keep the journal box wear surfaces, pedestal jaw wear surfaces, and rubber bolster springs free of oil or grease.

TRUCK CLEANING UNDER LOCOMOTIVE

The trucks should be cleaned as often as needed while under the locomotive to remove heavy accumulations of oil, sand, dust and roadbed dirt.

The engine should be running to supply air under pressure to the traction motors when the trucks are cleaned under the locomotive in order to prevent any liquid spray from entering. Care should be taken that no spray is directed at the motor air discharge openings.

REMOVAL OF TRUCK FROM LOCOMOTIVE

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.

The truck side bearing clips must be removed before any attempt is made to separate the trucks from the carbody. The safety interlocks are bolted to the carbody side bearings and hook under the truck side bearings. Make sure that all other physical connections between the trucks and the carbody are disconnected, such as the air brake equipment, sanding equipment, traction motor cables, hand brake chain, and the speed recorder connection.

When lifting or jacking a locomotive to remove one or both trucks, all four corners should be raised equally to a height which will permit end removal of complete trucks. The locomotive should be supported on blocking located under the center sills near the jacking pads, if it is to be held in a raised position.

Various facility drawings are available covering items used in removing and handling of trucks. A listing of these blueprints and file drawing numbers is given in the Service Tools Catalog.

TANK CLEANING OF INDIVIDUAL TRUCKS

When the truck assembly is removed from the locomotive, the traction motors, wheels, gears, axles, journal boxes, rubber bolster springs, shock

absorbers, brake cylinders, phenolic or composition wear plates, and slack adjuster guides 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, bolster, and spring plank may be immersed in the cleaning solution. After allowing sufficient time to assure removal of all foreign material, the assemblies should be removed and rinsed with hot water. Brake slack adjuster screws should be greased immediately to prevent seizing.

COMPLETE TRUCK DISASSEMBLY

1. Remove the center bearing dust guard and wear plates and wipe up the oil in the center bearing. Also drain the oil from the traction motor support bearings.

2. Remove individual items such as shock absorbers, brake cylinders, piping and brake rigging, mounted on the truck frame.

3. If space and facilities are available, a considerable saving of time can be made by working the truck from this point on in an upside down position. A turnover fixture can be made for end over end turn over by obtaining File Drawing 250, available upon request from Electro-Motive Service Department, La Grange. This fixture is used in conjunction with an overhead crane. Sufficient overhead clearance must be available to accomodate the truck on end.

CAUTION: Before turning truck to an upside down position, wire the swing hangers to the safety straps. This will prevent hangers from swinging out when the truck is inverted.

It is now possible to remove the motor, axle, wheels, journal boxes and gear case as an assembly, rather than piece by piece. Removal of wear plates, springs, swing hangers, spring plank bolsters, and traction motor nose suspension packs will be accomplished with less labor and more safety in the upside down position.

If the upside down method cannot be used, the following procedure may be used.

4. Remove the traction motors from the wheel and axle assembly:

   a. Remove the bolted traction motor air duct and gear case.

   b. Remove the dust guards, traction motor bearing support caps, axle guard and outer bearing half.

   c. Apply the hoist lifting chains to the bails on the traction motor at the nose suspension side. After the suspension pin keeper bar is removed, and the keeper pins drop down, lift the motor to compress the springs of the suspension assembly. With the suspension assembly compressed, insert temporary blocks about 3/4" thick between the spring holder and bolts as indicated in Fig. 2.

   d. Lower the motor sufficiently to free the suspension assembly and remove the assembly by sliding it out of its place between the truck frame lugs.

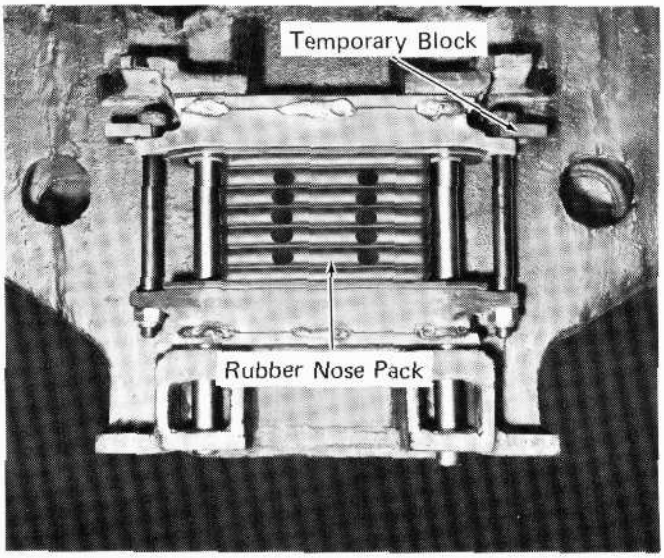
   e. After the suspension assembly is removed, again lift the motor, allowing it to rotate on the axle until the lower lip of the support bearing clears the axle, Fig. 2. The motor assembly is then free to be lifted clear of the axle.

NOTE: Use care in lifting the motor so the support bearings will not fall and be damaged. Pinion protector 8054871 should be applied to the motor to prevent damage to the motor after it has been removed. The support bearing caps should also be reapplied at their original location on the motor so the original alignment will be retained.

5. Remove the remaining brake equipment on the truck frame and turn it over with a hoisting crane.

6. Remove the pedestal tie bars and then the wheel, axle and journal box assemblies.

7. Remove the pedestal liners, spring seats and shims, and coil springs.



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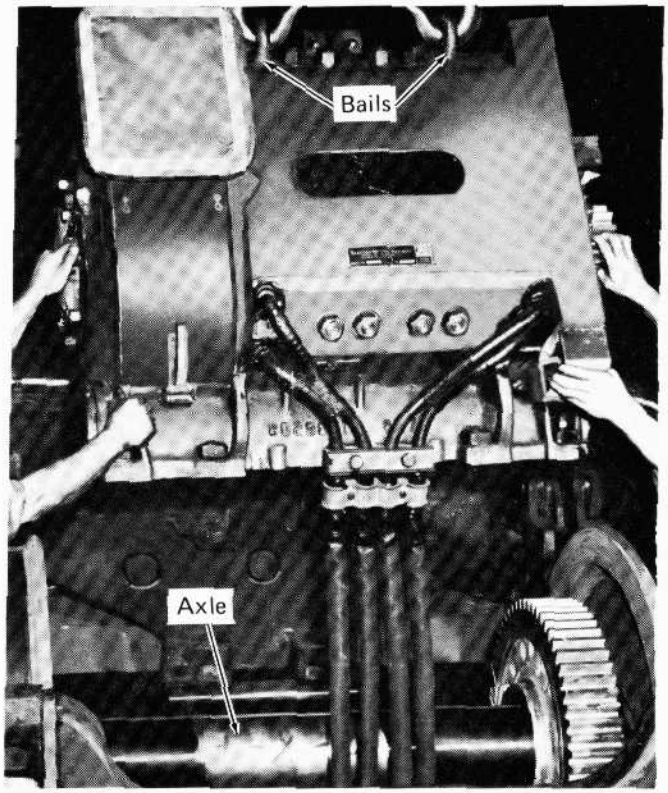

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Fig. 2 – Removing Traction Motor From Truck

8. Remove wires tying swing hangers to safety straps. Remove swing hangers, swing hanger blocks, and safety straps.

9. Remove the spring plank, rubber bolster springs, rubber bolster spring adapters, and bolster assembly.

GENERAL INSPECTION AND REPAIR

Make a thorough visual and magnetic particle inspection of the truck frame and bolster for the following items and repair as stated.

BROKEN OR CRACKED MEMBERS

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. Broken cast sections may be duplicated with a like shape made from SAE 1020 steel, and welded to the truck frame.

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.

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* 3/64" on the radius or 3/32" on the diameter.

Holes which are beyond these 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.

WORN BUSHINGS

Bushings worn 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.

MUTILATED THREADS

All threaded holes should be checked and re-tapped 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 accomodate 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 keys, and washers.

BOLSTER

The bolster, 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 neophrene rubber dust guard, Fig. 3, around the two mating parts 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.

The vertical height from the rubber bolster spring adapter seat to the center plate should be 14-7/16" to 14-13/16". If this dimension is 14-3/16" to 14-7/16" the bolster may be used

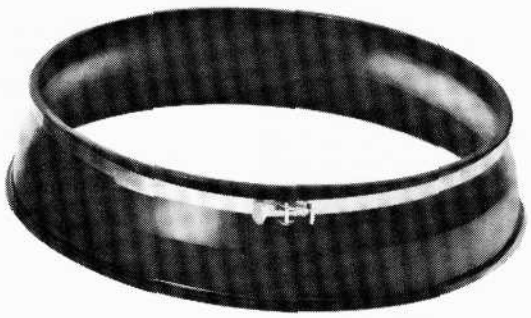

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Fig. 3 – Center Bearing Dust Guard

but must be coded for identification when assembling the truck so that a 1/4" thick shim can be applied between the swing hanger and the lower bearing block to compensate for the height deviation. If not corrected, this deviation will result in less clearance between the truck frame and the underframe and possibly cause interference.

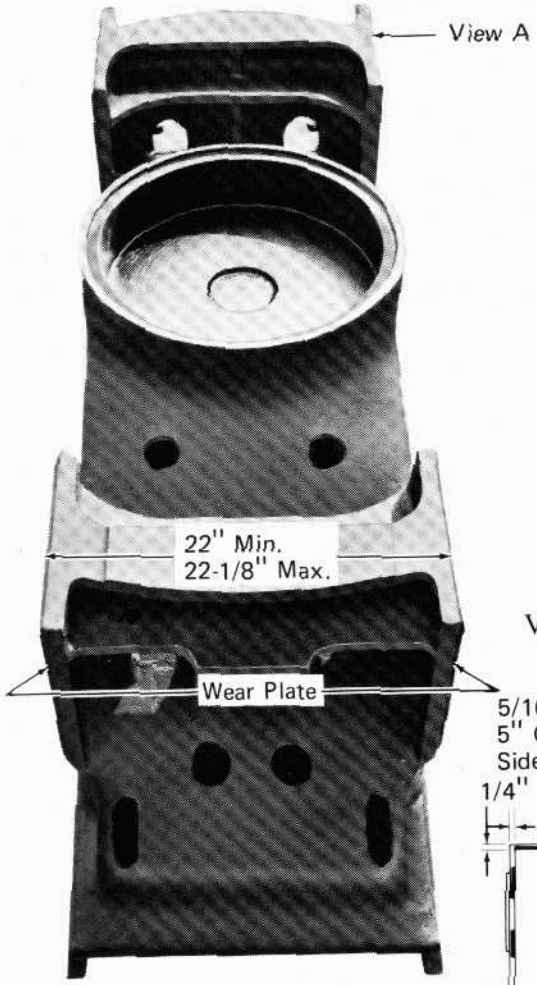
The vertical height from the bolster side bearing to the center plate should be maximum 4-5/16" to minimum 4-1/8". If the height exceeds 4-5/16" the side bearing can be machined or ground to within limits providing the side bearing section will not be less than 5/8".

FRAME AND BOLSTER
WEAR PLATES

The wear plates on the truck frame and bolster wear as a result of movement between these surfaces. If the clearance exceeds the limits given in Fig. 4, either the bolster or truck frame wear plates or both should be replaced. The wear plates and their welds should be inspected using the magnetic particle method of inspection. Generally, residual magnetism in these truck parts is sufficient to provide an indication when the inspection particles are applied to their surfaces. The wear plates can be removed by grinding or chipping off the fillet welds that secure the plates. If one wear plate is removed, the wear plate at the similar location on the other side of the truck frame or bolster should be removed, as these plate surfaces should be parallel within 1/32". The replacement wear plate should conform to the specifications of the original plate.

Prior to the application of the new plate be sure that the mating surfaces of the parts to be

Bolster



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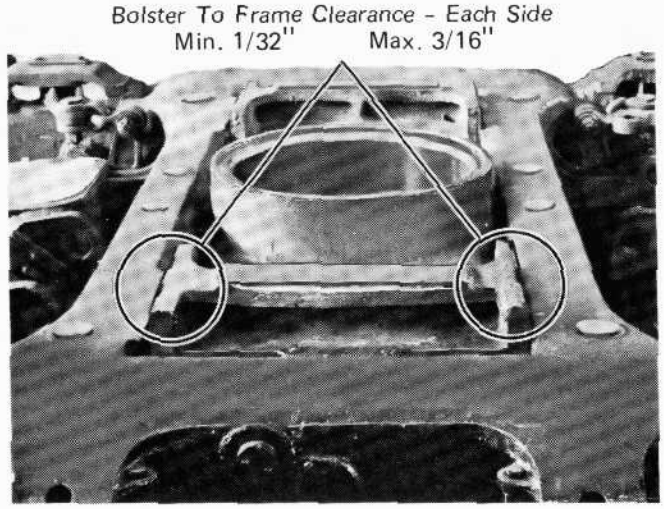
Bolster Installed



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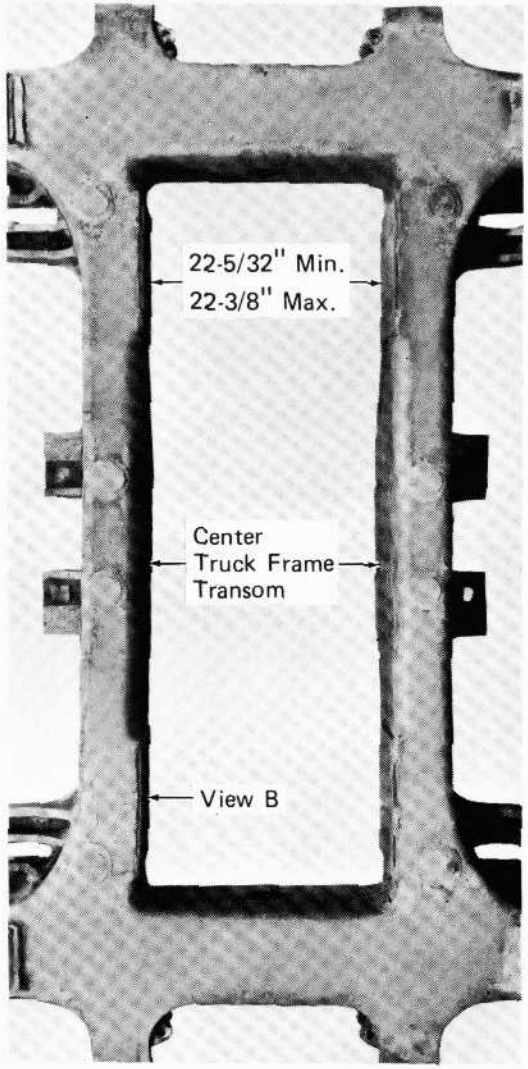
Bolster Pocket



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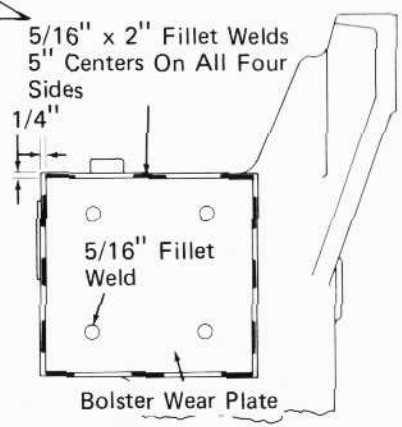
View A



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View B

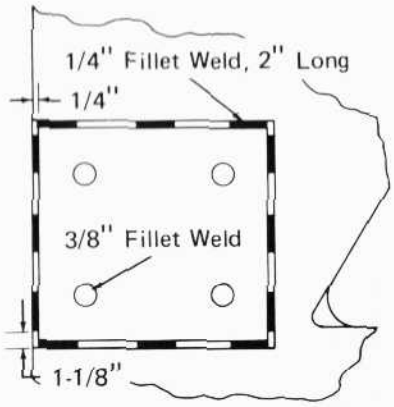

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Fig. 4 -- Frame And Bolster Wear Plates

welded are clean, smooth, and flat. Use American Welding Society E-7016 electrodes or equivalent for SAE 1060 heat treated steel wear plate.

NOTE: In some applications other types of wear plates may be used. For manganese wear plates, use AWS E-Fe Mn-A electrode and for SAE 1095 heat treated steel wear plates, use AWS E-310-16 stainless steel electrode.

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

SIDE BEARING WEAR PLATES

The side bearing surfaces on the bolster are designed to mate with similar side bearings mounted beneath the carbody underframe as indicated in Fig. 5.

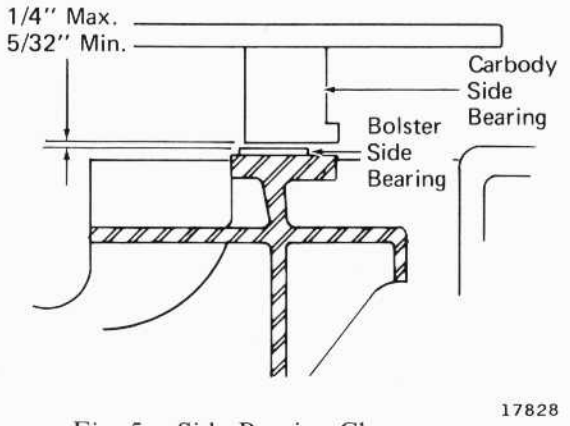


Fig. 5 – Side Bearing Clearances

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.

Side bearing clearance on a new assembly is 5/32" minimum to 1/4" maximum. The minimum side bearing clearance is 1/32", as shown in Fig. 5.

Any time the side bearing clearance approaches the minimum limit the bolster center bearing wear plate should be checked for wear. Side bearings should be flat and in the same plane within 1/32" as the side bearing on the opposite side of the truck. If bearing is misaligned or is uneven, it may be repaired by building up the surface with weld and grinding to a proper level.

The old wear plates can be removed by grinding off the fillet welds around the plate. New plates should be of mild steel material 1/4" to 3/8" thick depending on the thickness required to give the proper clearance.

Apply new wear plates using a 1/4" fillet weld 3" long on each end and two evenly spaced 2" long fillet welds on each side.

SPRING PLANK AND BOLSTER LATERAL STOPS

Stops are provided on the underside of the bolster, Fig. 6, which mate against stops on the spring plank to prevent excessive lateral movement of the spring plank. A 1/4" wear plate is welded to each stop. Replace the wear plates if wear exceeds 1/8" or if the wear limits shown in Fig. 6 are exceeded.

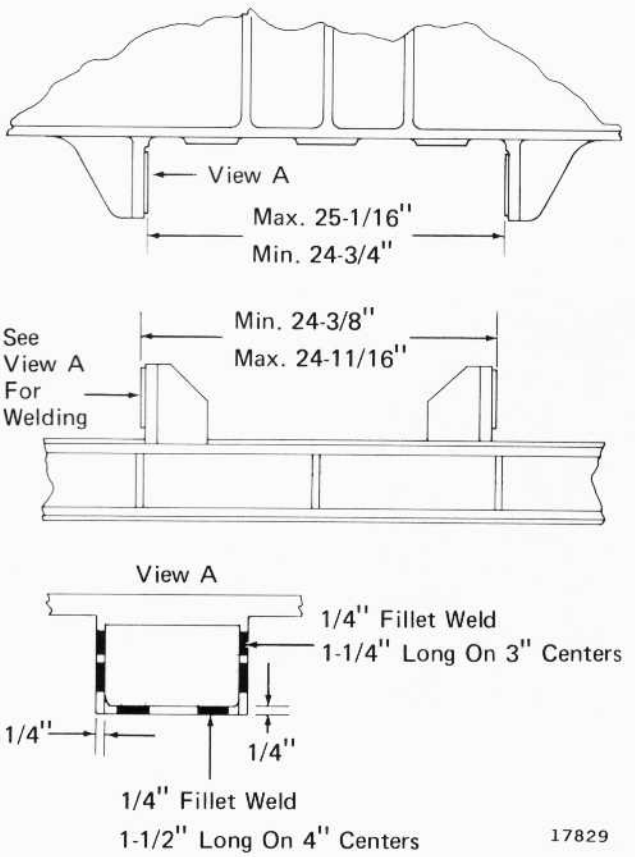


Fig. 6 – Lateral Bolster Stops

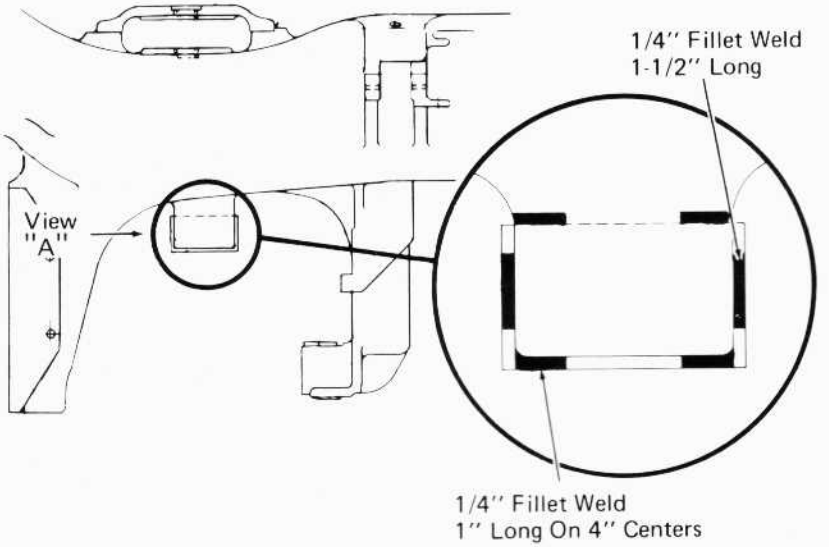
BRAKE LEVER LATERAL STOPS

Stops are provided on the underside of the truck frame at the two live brake lever locations. A 1/4" hardened steel wear plate is welded to each stop and mates against a 1-1/4" hardened steel wear block welded on the brake hanger lever to prevent excessive lateral movement of the brake lever assembly. If the wear limits shown in Fig. 7 are exceeded, replace the wear plate or block as necessary. Transverse alignment of the stop should be checked. As shown in Fig. 7, the surface of the stop (not including the wear plate) should be 2-3/16" ± 3/64" from the inside machined surface of the pedestal jaw.

CENTER BEARING WEAR PLATES AND WEAR RING

As mentioned previously, side bearing wear 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. 8. 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 outside diameter of the carbody center plate bushing and the inside diameter of the bolster center bearing wear half ring should be checked to determine the total clearance between them.



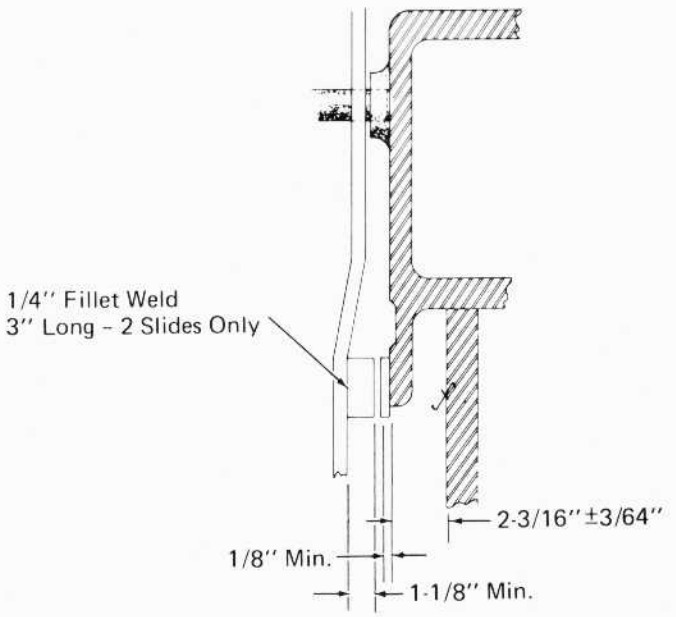


Fig. 7 – Brake Lever Lateral Stop

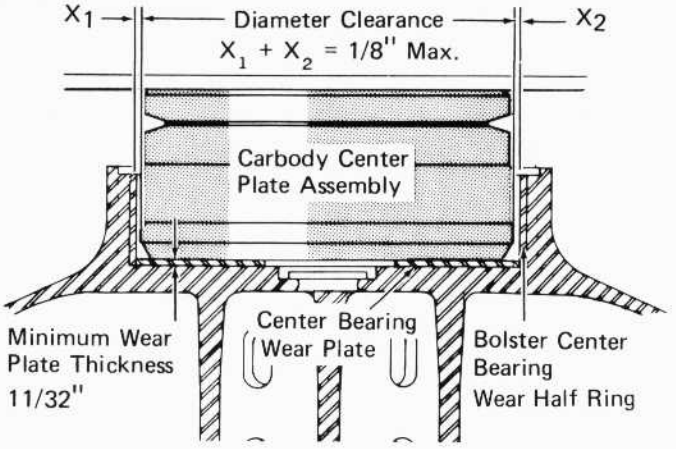


Fig. 8 – Bolster Center Bearing Clearance

The recommended clearance is shown in Fig. 8. The maximum clearance between these parts is 1/8", as indicated.

Current center wear plates and wear half rings, are made of 3/8" thick laminated phenolic material.

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 class E-7016 electrode. Peen the second weld pass and each pass thereafter to minimize distortion. Grind off excess weld metal so the bearing surface of the center plate is flat within .020".

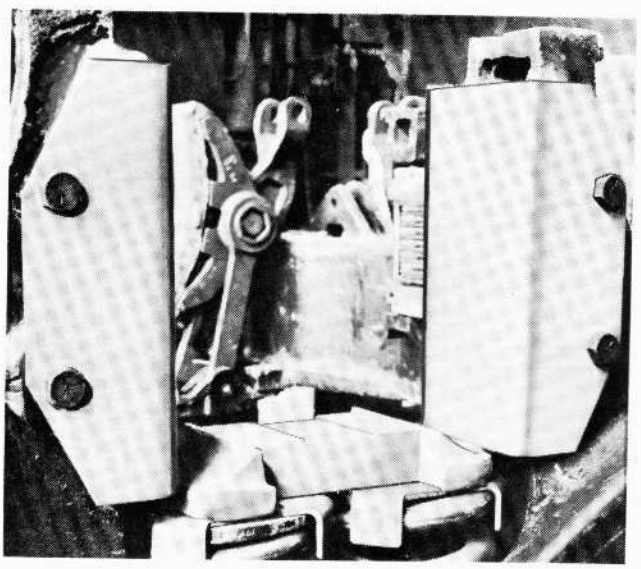
After the old wear plates and wear half rings are removed and the neccessary repairs made, the bearing bore should be cleaned and the surfaces smoothed so they offer little resistance to the application of the new replacement half rings. Check the replacement half ring surfaces to see that they are smooth. Apply a lubricant to the outside diameter of the half ring 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.

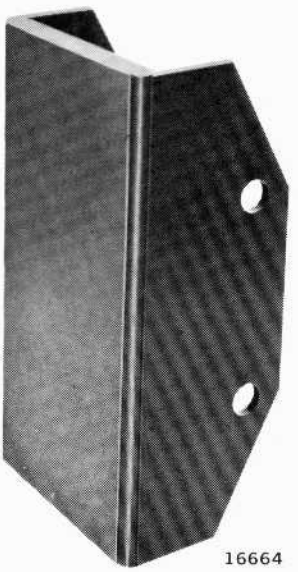
PEDESTAL LINERS

Pedestal liners, Fig. 9, are provided to absorb 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 equipment on all domestic trucks. Metallic liners are available upon request. See the Parts Catalog for the correct part numbers.

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 1/16" at each side of the pedestal as shown in Fig. 10. The truck





Face View

Interior View

Fig. 9 – Pedestal Liners

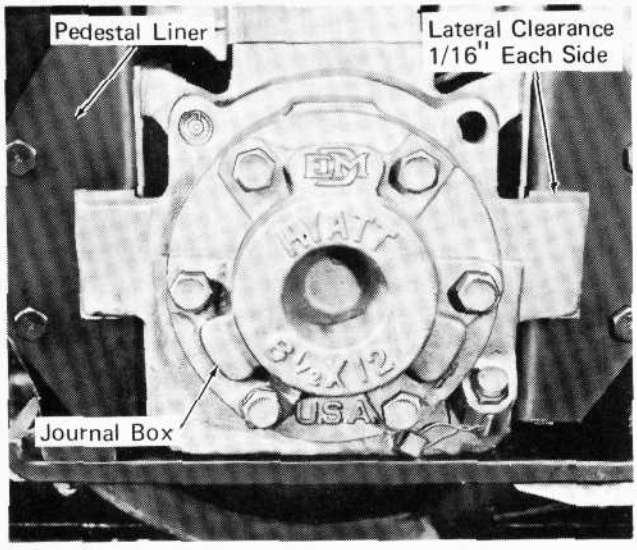


Fig. 10 – Pedestal Liner To Journal Box Clearance

pedestal to journal box wear limits are shown in Fig. 11. If the clearances are beyond the maximum limits, the wear plates must be replaced. The wear plates must be checked for possible breaks or nylatron cracks by visual inspection if they are to be reused.

The clearance between the journal box and the pedestal can be measured using feeler gauges. Feeler gauges must be approximately 1" wide and 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 is supported by the boxes.

PEDESTAL LINER APPLICATION

Inspect the pedestal jaws to be sure that the surfaces are smooth and free of any raised areas such as may be caused by nicks, that might interfere with the application of the liners. Chamfer any sharp corners on journal box liners. The liners should fit tightly on the pedestal jaw with the mounting holes mating with the pedestal bolt holes. The mounting bolts should enter the liner and pedestal bolt holes freely and should be thoroughly tightened. Particular attention should be given to the position of the worn pedestal liners before being removed so that the replacement liners can be applied in exactly the same position.

The dimension between the liner faces should be 15.011" minimum or 15.073" maximum. A special liner pressing tool, Fig. 12, may be made as outlined in File Drawing 649 to aid in the installation of the pedestal liners. This file drawing is available on request.

COIL SPRING SEAT

Spring seat 8354098 is used between the coil springs and journal box to provide a means to secure the springs to the journal box.

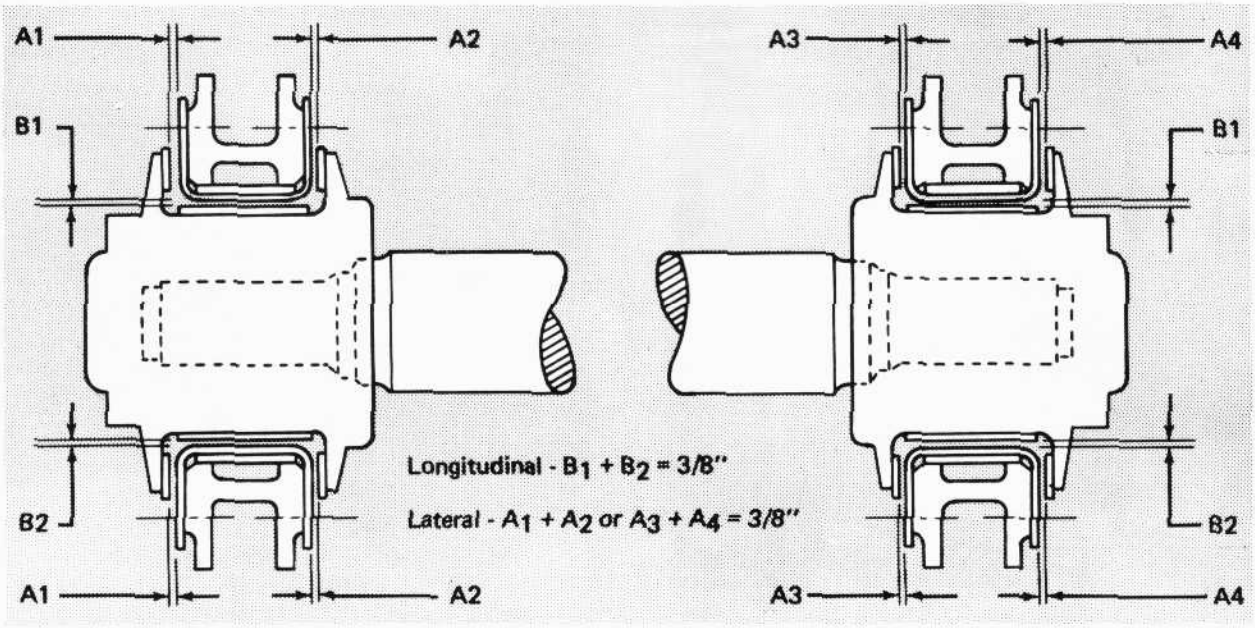


Fig. 11 -- Pedestal Liner To Journal Box Wear Limits

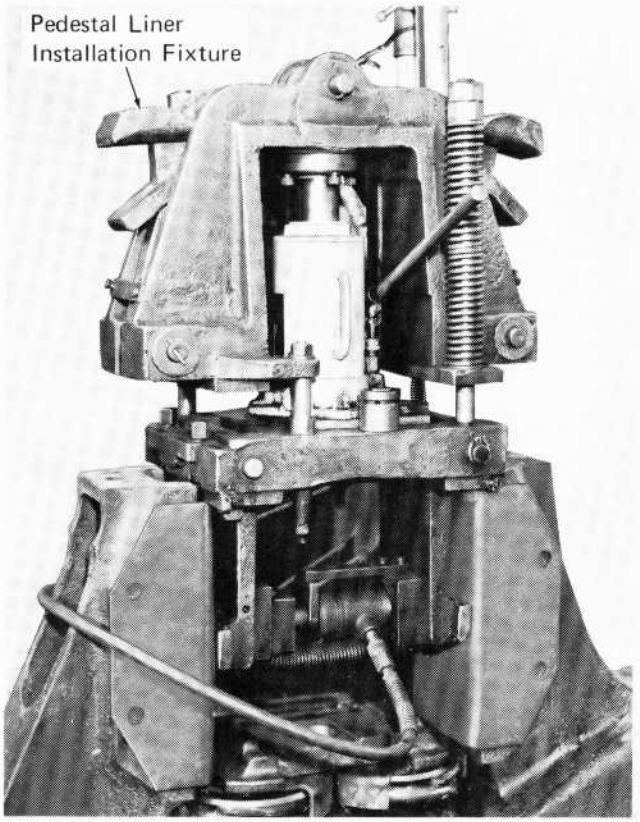


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Fig. 12 – Pedestal Liner Application

Shim plates are used between the spring seat and springs to maintain proper locomotive height for different weight locomotives. In addition to these shims, a 3/8" shim plate 8253876 is welded to the truck frame spring seat (above the coil springs) on applications with 40" diameter wheels.

A 2-axle locomotive using 40" diameter wheels, should maintain a height from the rail to the bottom of the underframe of 45-7/8". Shimming is provided to maintain the coupler height and a reasonably equal axle load distribution on the rail. For complete information on application of shims see M.I. 1518, Wheels, Axles, Axle Gears And Pinions.

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. 13.

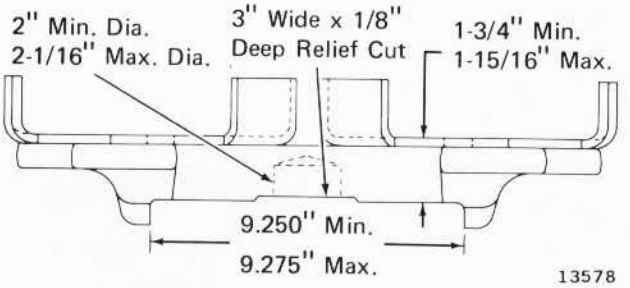

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Fig. 13 – Spring Seat Wear Limits

TRACTION MOTOR NOSE SUSPENSION ASSEMBLY

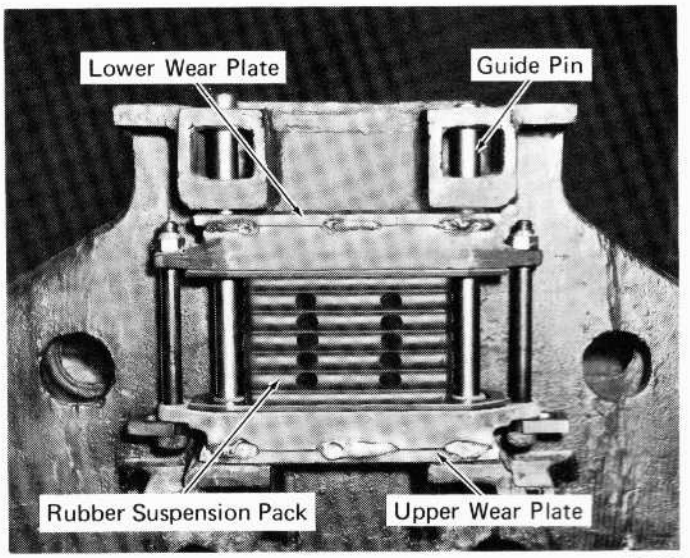
SUSPENSION PACKS

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 center truck frame transom through a shock dampening rubber suspension pack which is mounted as shown in Fig. 14.

WEAR PLATES

Suspension pack wear plates should be periodically replaced to ensure not more than 1/4" free movement in the traction motor nose suspension to obtain maximum cushioning effect from the suspension pack. If the wear plates, which are 1/2" thick when new, are worn enough to permit more than the 1/4" free movement or if the wear plates are worn more than the limits given in Fig. 14, the suspension pack should be removed and the wear plates replaced.

The old wear plate can be removed from the suspension pack by grinding or chipping off the tack welds holding it. The new wear plate should conform to the dimensions of the original plate. The hardened steel wear plate should be applied to the suspension pad with 3/8" fillet welds 2-1/4" long spaced 3-3/4" apart.



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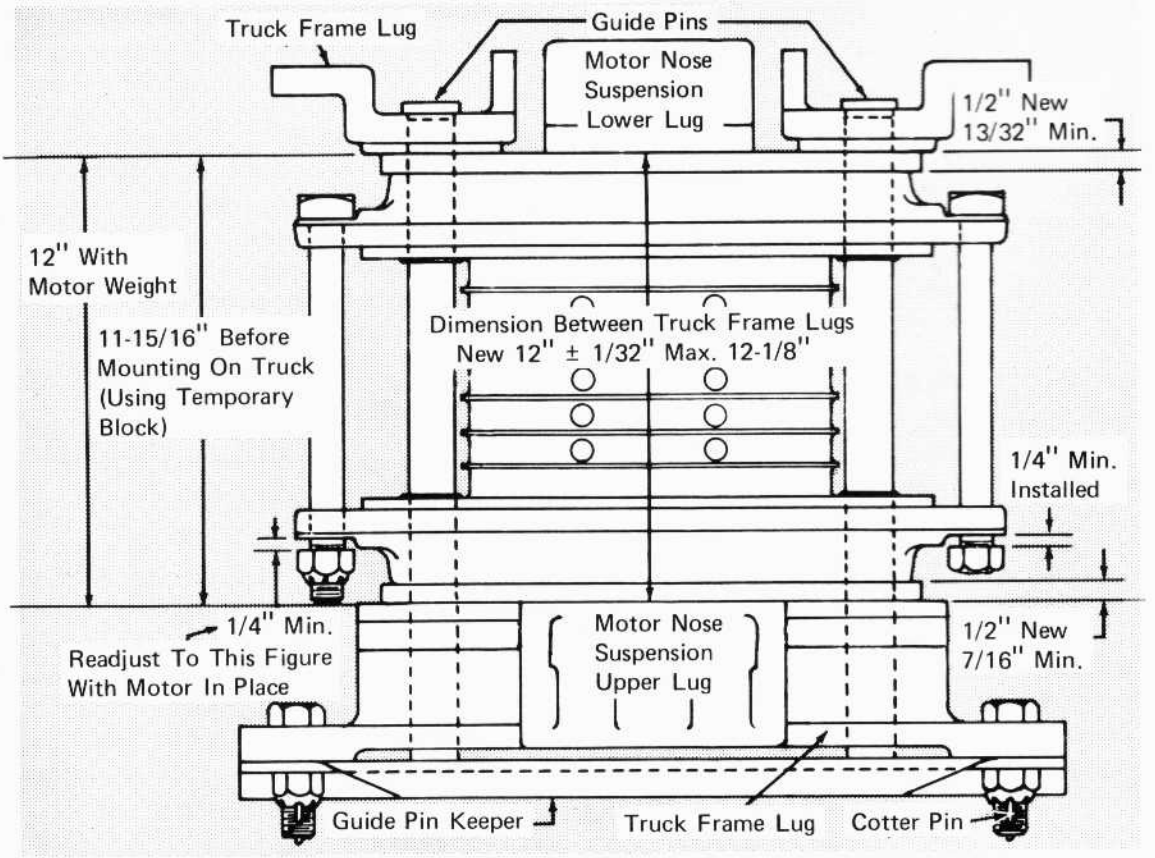

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Fig. 14 -- Traction Motor Nose Suspension

TRUCK FRAME MOTOR NOSE SUSPENSION LUGS

A 3/16" thick manganese steel wear plate is used on each of four truck frame motor nose suspension lugs, shown in Fig. 14. The maximum dimension between these surfaces is 12-1/8". If the limit is exceeded, replace the wear plates to obtain the original dimension of 12 + 1/32" - 1/16". The wear plates are applied to the lugs with a 3/16" fillet weld using an AWS E-FeMn-A welding rod. Weld the plate on three sides as shown in Fig. 15.

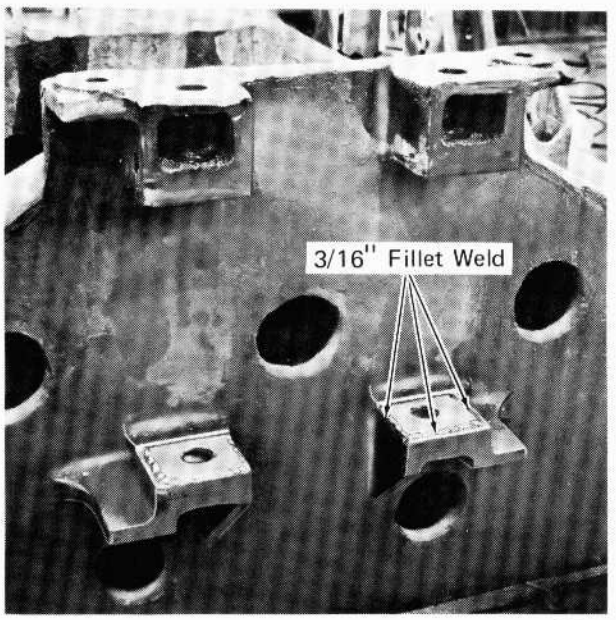


Fig. 15 -- Truck Frame Motor Nose Suspension

If there is any wear or damge on the lug surface, it will be necessary to build up the lug by welding and machining or grinding to obtain the original dimension of 12-3/8" + 0 - 1/32". The ground or machined surfaces should be in the same plane within 1/32". After the wear plates are applied, the surfaces must still be in the same plane within 1/32" and the dimension between the upper and lower lugs must still be 12 + 1/32 - 1/16".

The guide pin holes in the frame lugs should be checked for size. The holes are drilled to a nominal 1-5/16" diameter when new. If they become worn or elongated by 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 1.875" ± .002" and press in bushing 8308240. Weld the bushing to the support lug after it is pressed into position. The guide pins are 1.250" in diameter when new and should be replaced when they have worn to a diameter of 1.220".

TRUCK FRAME PEDESTAL REPAIR

WHEEL BASE SPACING

The wheel base spacing is the measured distance between the transverse centerline of the jaws of the pedestals or the dimension between the axle centerlines. These dimensions are shown in Fig. 16.

To obtain the wheelbase dimension, first place a straight edge along the inboard face of both pedestal jaws and measure the distance between them. To this measurement add 1/2 the distance between each pedestal jaw.

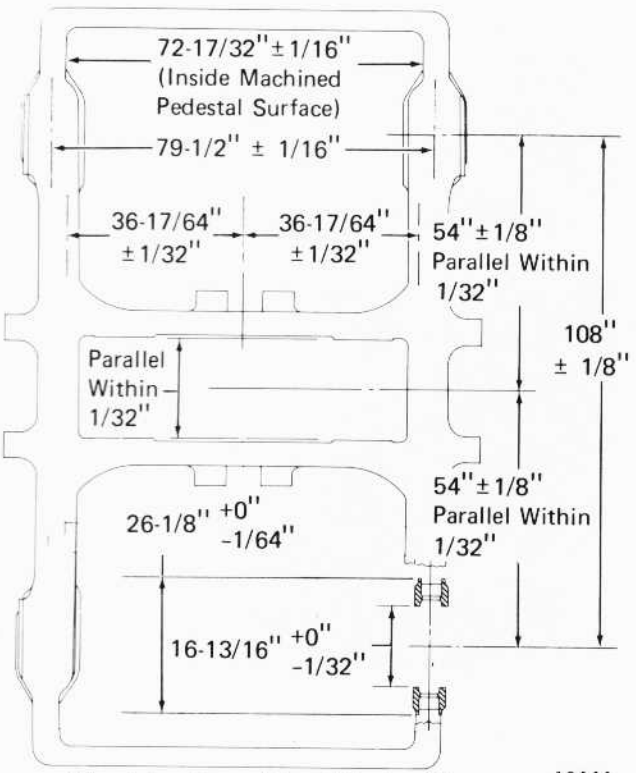


Fig. 16 -- Four Wheel Swing Hanger Frame Dimension

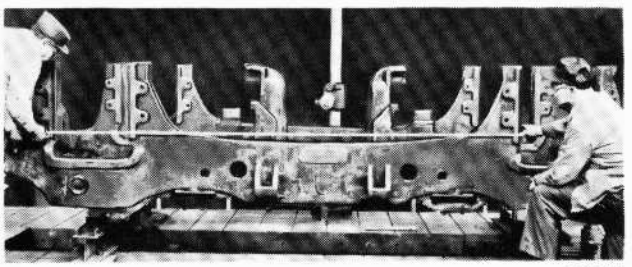
The wheelbase figures obtained should be within the limits given in Fig. 16. The transverse centerline of the pedestals or axle centerline must be parallel to the transverse centerline of the truck within 1/32".

TRANSVERSE PEDESTAL SPACING

The transverse pedestal spacing refers to the dimension between the inside machined surface of pedestal jaws on opposite sides of the truck, Fig. 16.

The transverse measurements may be made as shown in Fig. 17. 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 from the longitudinal centerline of the truck frame to the inside face of the pedestal.

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



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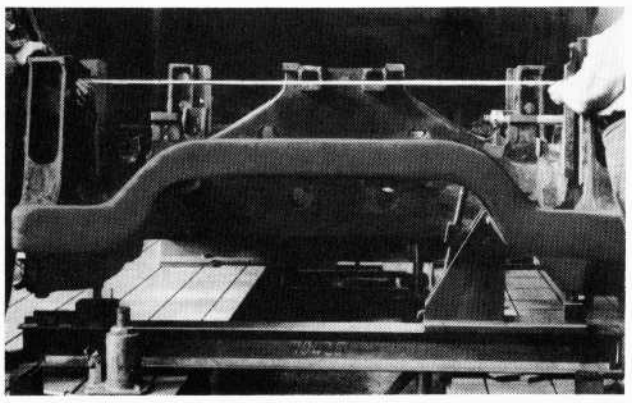

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Fig. 17 -- Measuring Wheelbase And Pedestal Spacing

LONGITUDINAL PEDESTAL SPACING

The longitudinal pedestal spacing refers to the distance between the inside surfaces or over the outside surfaces of the pedestal jaws on the same side of the truck as indicated in Fig. 16. Incorrect pedestal spacing is caused by a bent frame or bent pedestals, either of which requires straightening to obtain the correct pedestal spacing.

NOTE: With single shoe braking, the pedestal tie bar is a very important part of the load carrying system. Therefore, the dimension over the outside pedestal surfaces, 26-1/8" + 0 - 1/64", must be maintained so that the pedestal tie bar fits tightly over the pedestal jaws.

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. 18. This alignment can be determined by measuring from a straight edge tool or wire spanning the pedestals, as shown in Fig. 18. Misalignment may be no more than 1/8" above or below the pedestal baseline. A condition in excess of this can only be corrected by straightening the truck frame.

LOCATION OF TRUCK FRAME COIL SPRING SEATS

The coil spring seats welded to the truck frame should be checked for alignment after any rework is done to the pedestals. The spring seat centerlines should be 4-7/16" ± 1/8" from the centerline of the truck pedestal opening, as indicated in Fig. 18. If the misalignment is more than 1/8", it should be corrected by moving the spring seats. The distance between the two spring seat centerlines should be held within 8-7/8" ± 1/16", as indicated in Fig. 18.

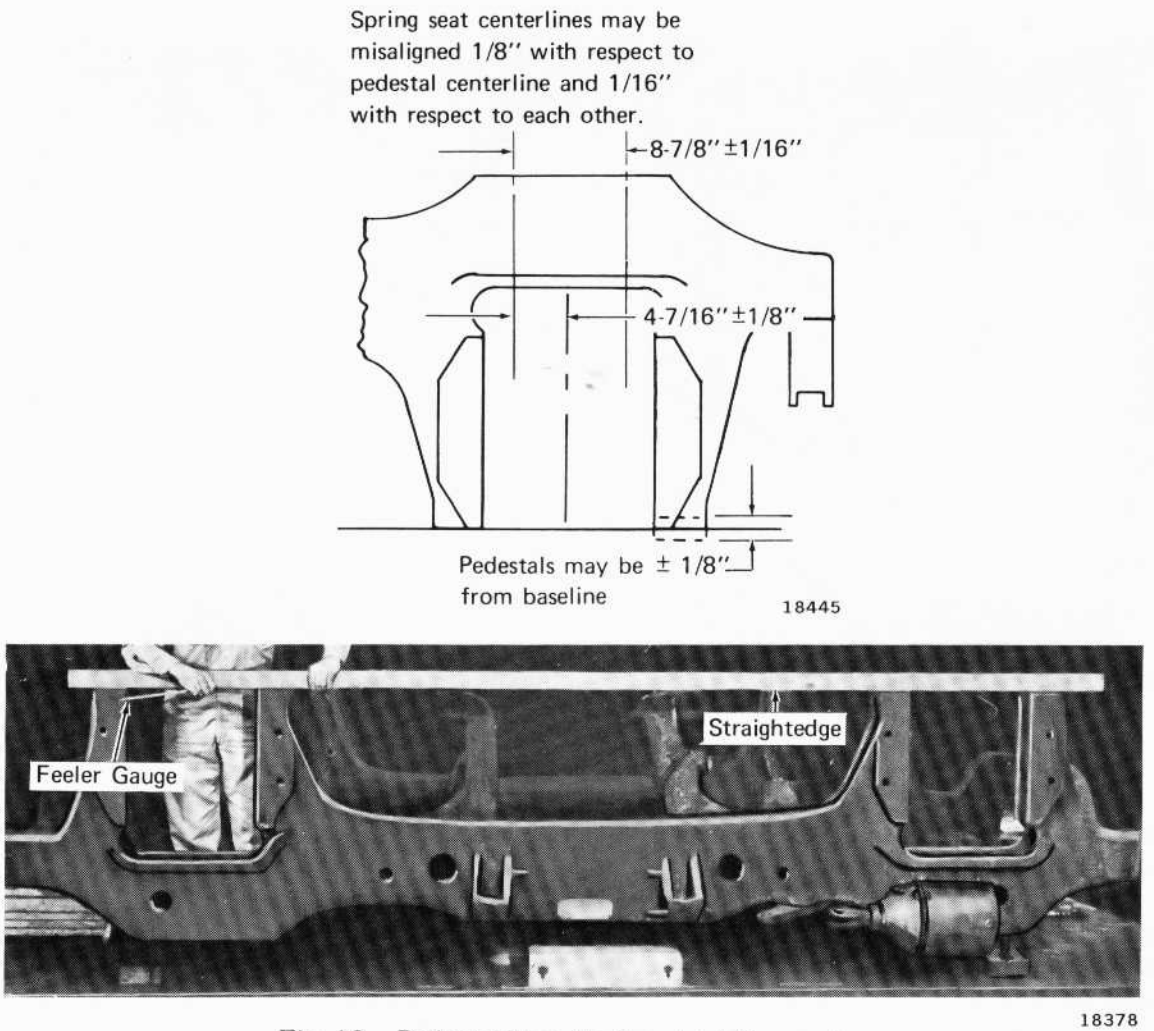


Fig. 18 -- Pedestal Base Horizontal Alignment

The spring seat can be removed by cutting the welds, and should be rewelded or a new spring seat applied, as shown in Fig. 19. Shims located between the spring seat and the truck frame provide the proper height from the spring seat to the bottom of the pedestal. Care should be taken to use the proper shims when replacing spring seats. The spring seats should be flat to prevent uneven loading on the coil springs.

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.

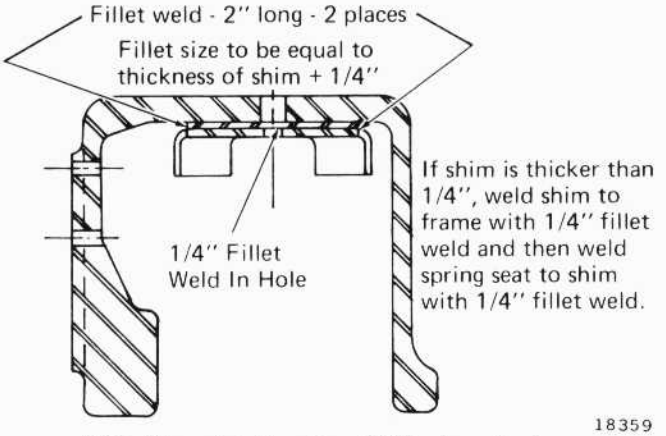


Fig. 19 -- Application Of Spring Seat

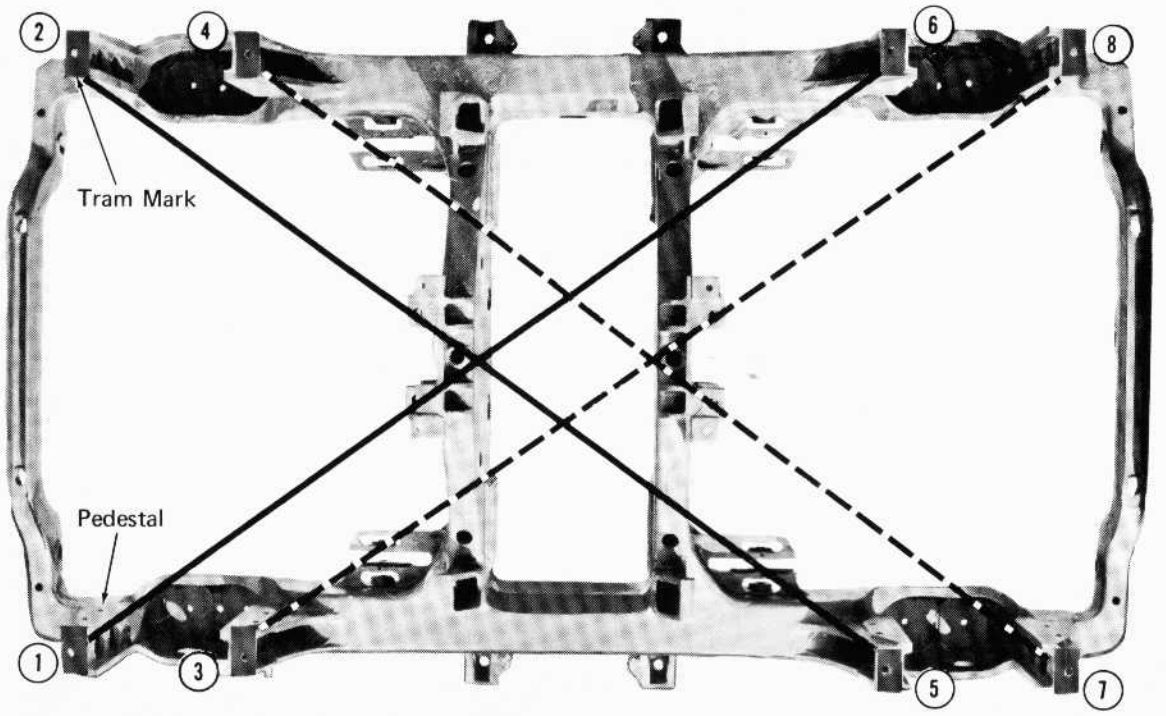
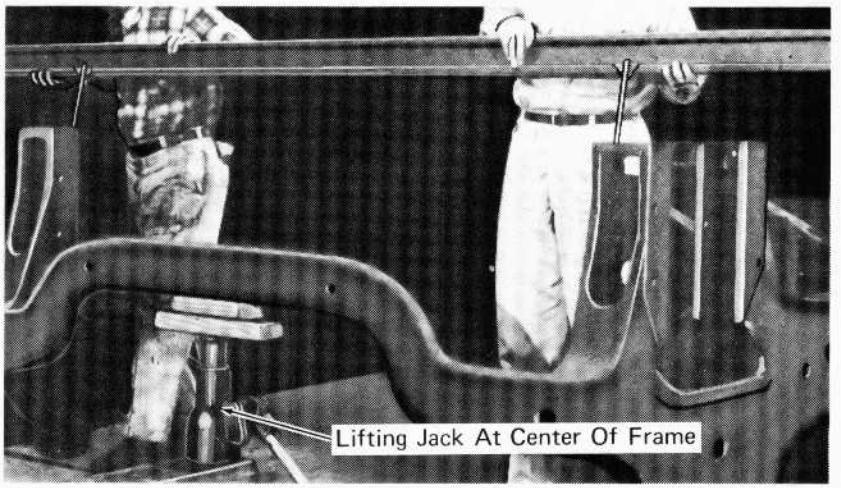


Fig. 20 -- Truck Frame Tramming Diagram 19032

Tramming is accomplished by using a trammel beam as shown in Fig. 21 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 as indicated in Fig. 21.

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.

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 identations, are placed at identical locations on each pedestal to assure an accurate comparison. They may be either 1-1/2" from each inside face 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.



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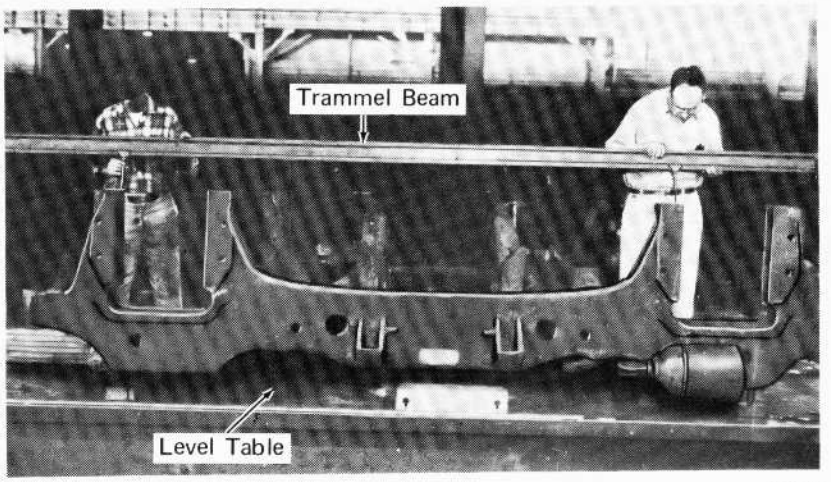

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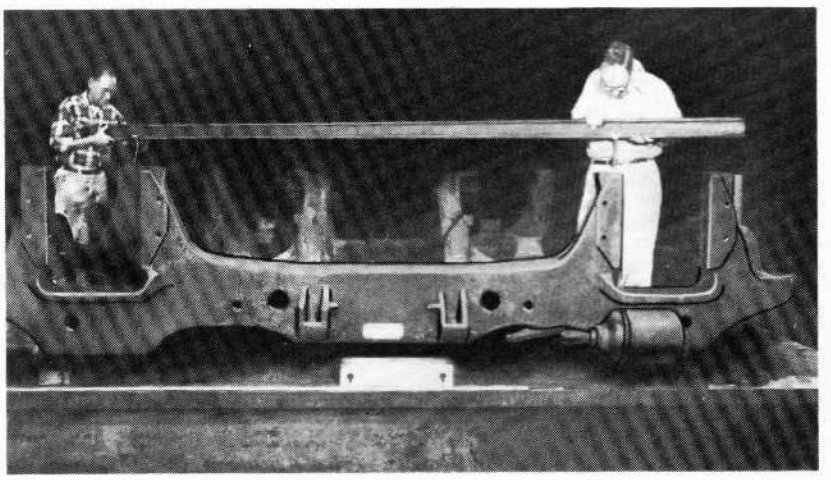

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Fig. 21 -- Application Of Trammel Beam
Between Pedestals

A special tool shown in Fig. 22 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 1-1/2" or other required dimension 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 relocate a new mark.

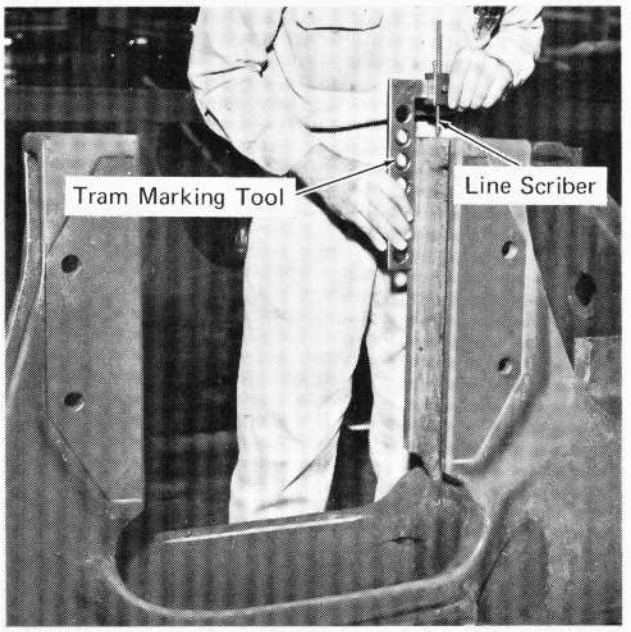

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Fig. 22 -- Tram Marking Tool

The truck frame should be leveled before tramming. Support the truck frame on two small jack screws under the end pedestal spring pockets at one end of the frame and by one jack screw or hydraulic jack placed on the longitudinal centerline at the opposite end of the frame, similar to the support shown in Fig. 21. The end supported by the two jacks is raised to any convenient height, and measured at the top of the end pedestals, Fig. 23. The end pedestals at the center supported end of the frame are raised to the same height as the other end. If one pedestal cannot be raised to a height equal to that of the other pedestal, it indicates that the frame has a slight twist at the end of the lower pedestal.

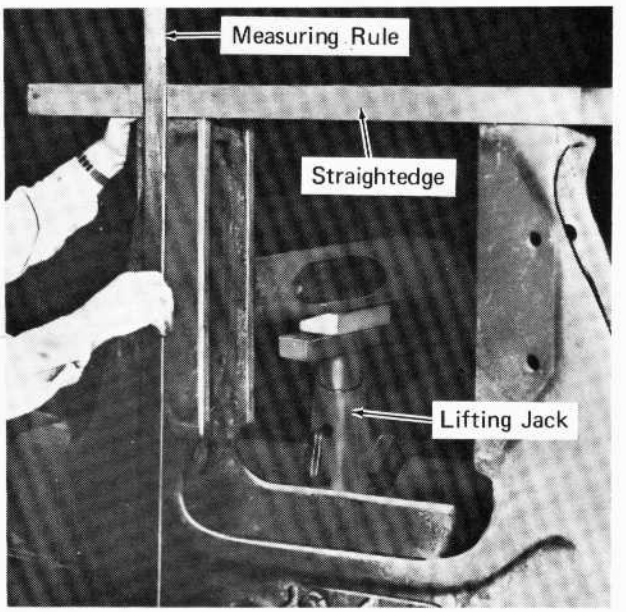

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Fig. 23 -- Leveling Truck Frame

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, Fig. 24.

If the diagonal measurements shown in Fig. 20 are not equal, it will be necessary to tram the pedestals longitudinally and transversely, Fig. 21, 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 are shown in Fig. 25. The diagonal trams 3-8, 1-6, 2-5, and 4-7 are shown to be unequal by plus 1/8", 0", plus 1/32" and plus 1/16" respectively. The diagonal trams are allowed a tolerance of ± 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 1/16" and 7/32" respectively.

Since pedestals 3-4 are plus 7/32" it accounts for the plus 1/8" and plus 1/16" length of the

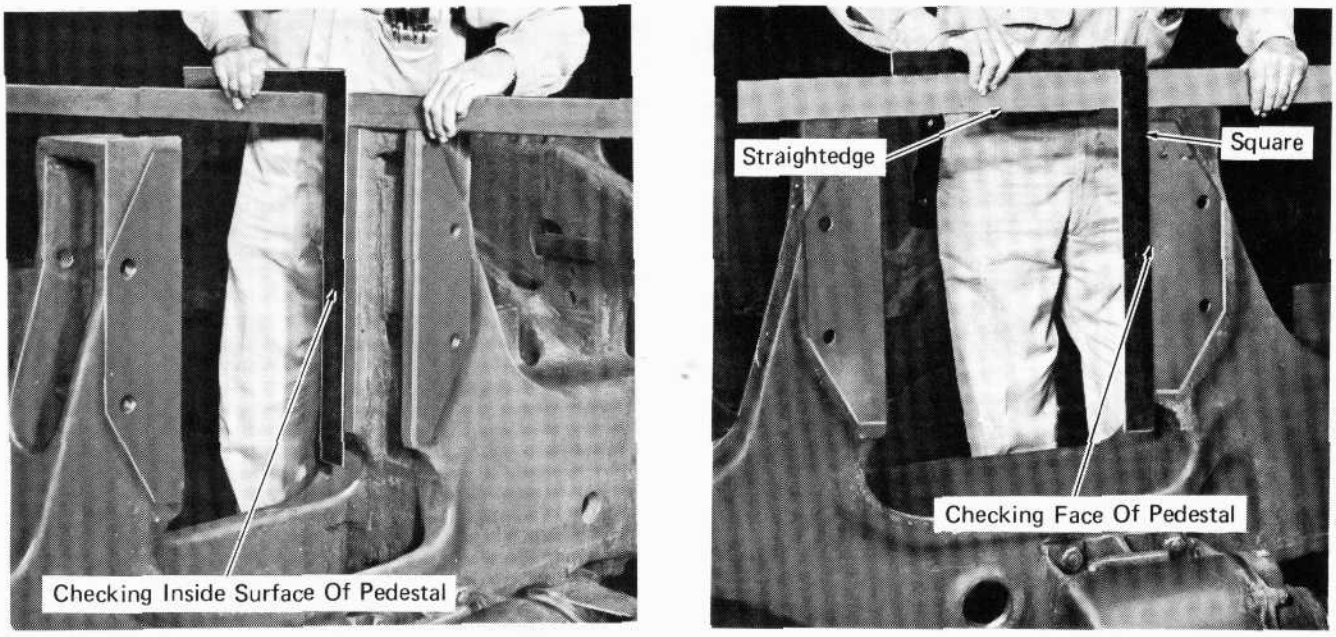


Fig. 24 -- Checking Pedestal Squareness

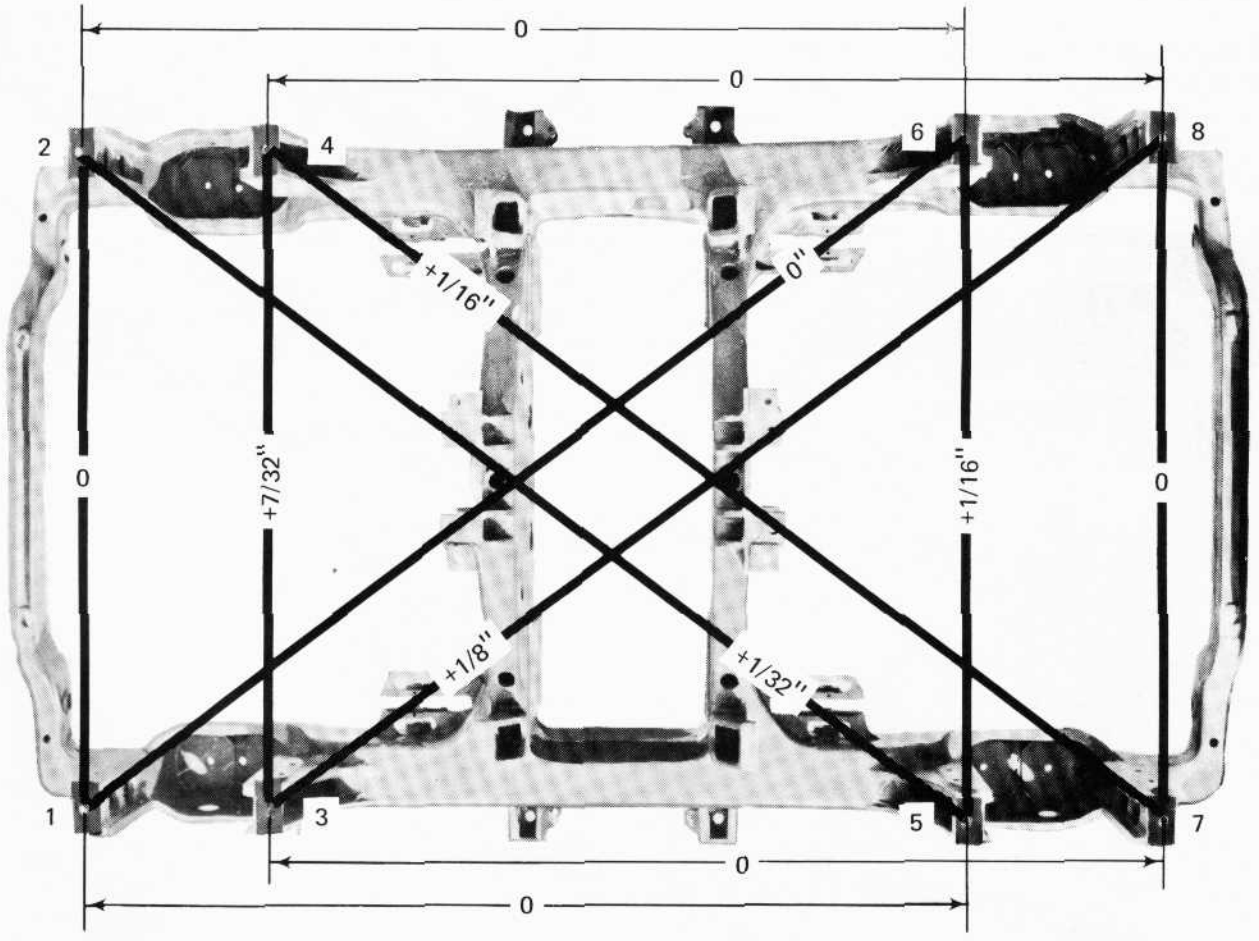


Fig. 25 -- Typical Example Of Tram Measurements

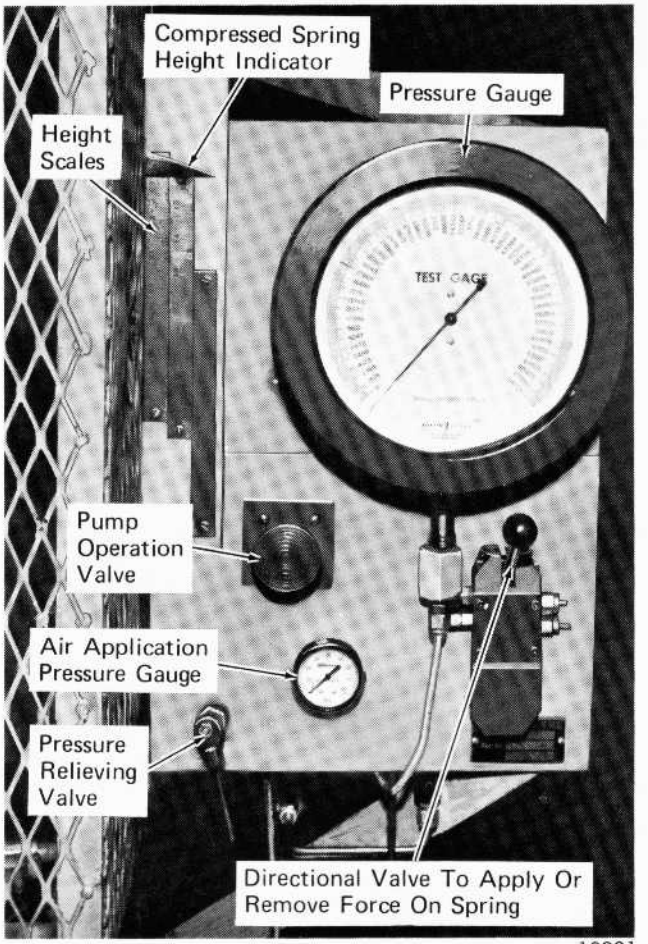
diagonal trams 3-8 and 4-7 going to these pedestals. Since 3-8 plus 1/8" is twice the plus 1/16" of 4-7, it can be seen that pedestal No. 3 needs to be bent inward twice as much as pedestal No. 4. If pedestal No. 3 is bent inward 5/32" and No. 4 is bent inward 1/16", the diagonals 3-8 and 4-7 will be reduced and diagonal 3-8 will be within the limit of 1/16". The same correction would be necessary for pedestals 5-6, if diagonals 1-6 or 2-5, 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 box and rubber springs between the bolster and spring plank. It is important to identify each of the springs according to part number so the spring may be tested at the proper value as listed in the table in the Service Data.

SPRING TESTING

Coil springs may be tested on any reliable calibration type testing press or a spring testing machine, Fig. 26, may be made as outlined in File Drawing 647, which is available upon request.



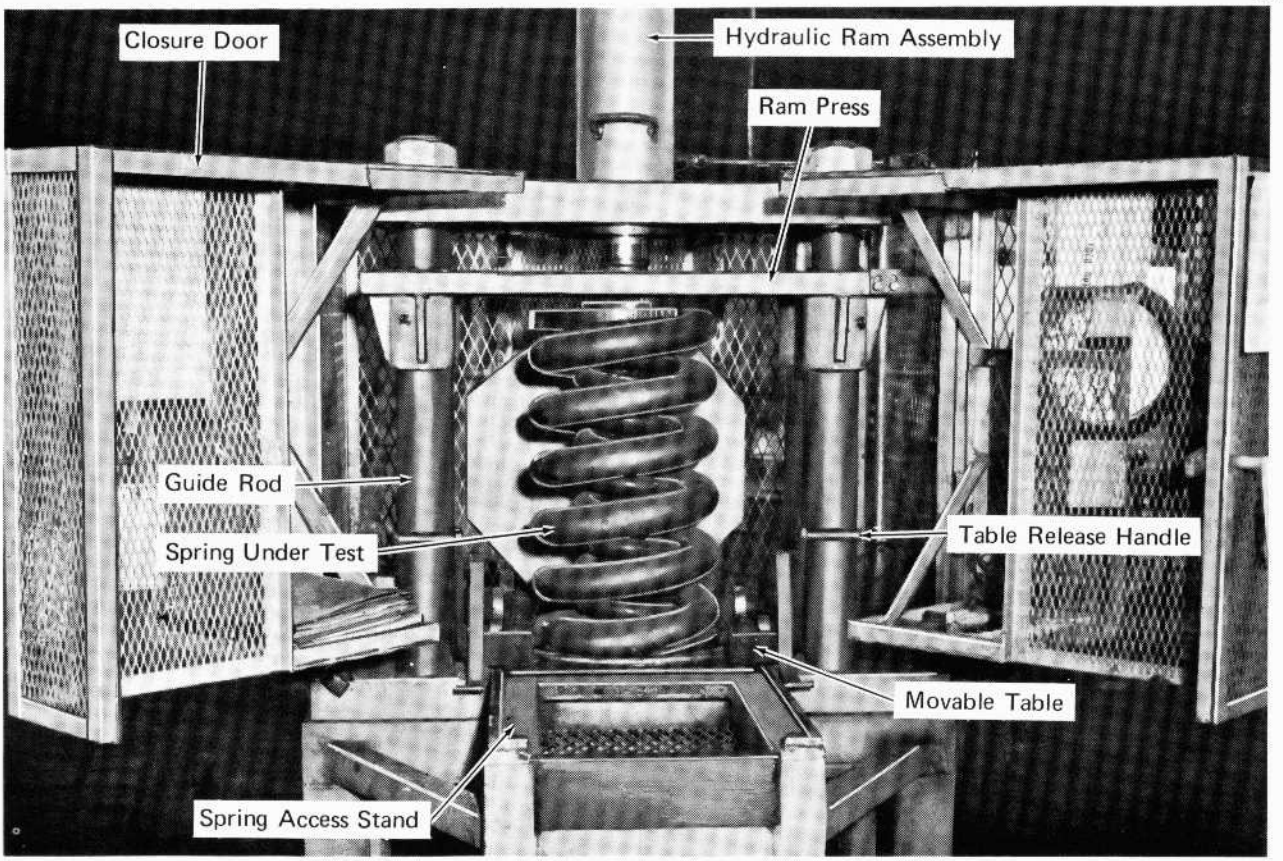


Fig. 26 -- Spring Testing Fixture

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. 26, 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 at the end of this bulletin. Record the spring set height on the initial compression and color code the springs as described below.

COLOR CODING 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 1/16" but do not exceed 3/16" limit above the nominal static height specified for the spring. Nominal 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 1/16" below to 1/16" above the nominal static height specified for the spring when under the specified static load. Green paint is applied on springs or spring assemblies that are more than 1/16" but do not exceed the 3/16" limit below the nominal static 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 3/16" to 5/16" below the nominal static 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 static 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.

COIL SPRINGS

Check the spring 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 secondary suspension includes rubber springs, Fig. 27, located at each end of the bolster, between the bolster and spring plank. Since oil has a detrimental effect on the life of the rubber pad, care should be taken to keep grease and oil deposits on the rubber pads at a minimum.

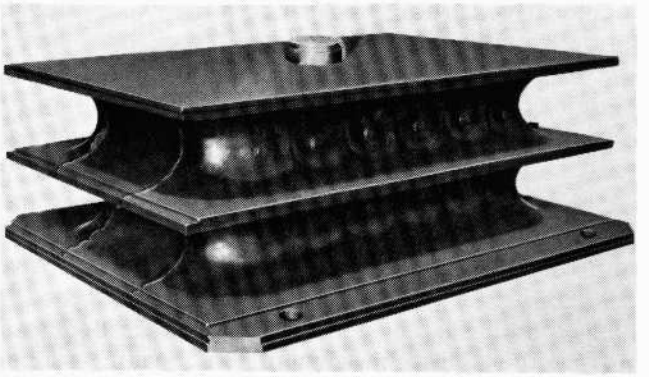


Fig. 27 -- Rubber Bolster Springs 17831

When rubber spring pads are removed from the truck, check them for cracks or tears in the rubber and replace the pad if found defective. Any pad which has a tear or cut which exceeds 1" length and 1/4" in depth should be replaced.

When replacing the pads the free height should not vary more than 3/16" between the two pads.

SWING HANGER ASSEMBLY

Swing hangers similar to the one shown in Fig. 28, support the spring planks, bolster springs, and bolster, and the entire weight of the locomotive supported by the truck. The locomotive weight is in turn transferred to the truck frame.

13039

Fig. 28 -- Swing Hanger Assembly

The swing hangers also function to stabilize the locomotive carbody. When the truck is moved laterally, either by a misaligned track or a curve, the swing hangers will swing like a pendulum, and permit the bolster, bolster springs, and spring plank to move with the carbody. However, as these items move, the lateral force is converted to an upward curved force by the swing hanger and the force is then absorbed in lifting the locomotive. This same action causes the locomotive to lean when going around a curve. The swing hanger and related items are designed to permit sufficient lateral movement to ensure proper lateral control of the locomotive.

The swing hanger and its associated components such as the swing hanger bearing and bearing block should be inspected and reconditioned, if necessary, prior to reuse.

SWING HANGER

To qualify for reuse the swing hanger should meet requirements for a new part with the following exceptions.

1. The swing hanger pin holes may not be more than .050" out of alignment with each other.

2. The horizontal centerline of the swing hanger pin holes must be parallel with the lower machined swing hanger surface within 1/32".

3. The dimension from the centerline of the swing hanger to the vertical centerline of each pin hole must be 13-1/16" + 1/16" - 1/32".

4. The swing hanger width at the machined faces of the pin hole may not be worn more than 1/32". In some instances a groove may be worn in this machined face by the truck frame bushing working out of place. This groove should not exceed 1/16".

5. If the swing hanger arms are skewed (not parallel to each other) or racked (parallel to each other but not perpendicular to the bottom machined swing hanger surface) beyond dimensional tolerance they must be scrapped.

6. If any indications of cracks are found, the swing hanger must be scrapped. Particular attention should be given to the two bottom corners of the swing hanger and the areas around the pin hole bushings when inspecting for cracks.

7. The area around the pin holes should be carefully inspected for gouges. If there are any gouges extending to or starting at the outer edges of the bore located in the "B" area, Fig. 29, or within the bore in area "A," the swing hanger must be scrapped.

   Gouges which are present in areas other than those described above and are not more than 3/32" deep or 1/2" long are acceptable. It will be necessary to stress relieve the swing hanger prior to machining if oversize bushings are to be applied.

   Stress relieve the swing hanger by heating in suitable furnace at 1100° to 1200° F. for a minimum period of 3 hours. Cool the swing

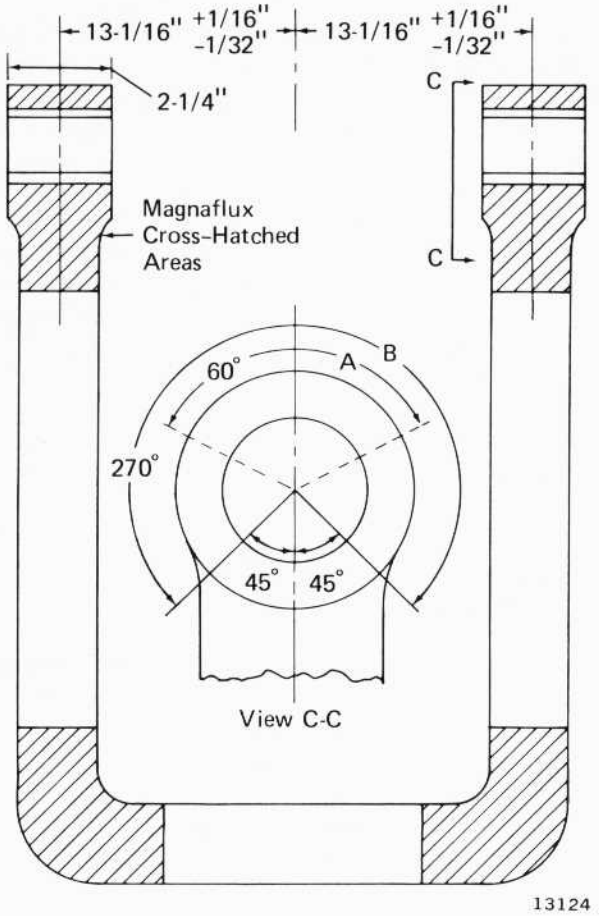


Fig. 29 -- Swing Hanger Wear Plates

hanger slowly in the furnace until the temperature is down to 400° F. then cool to ambient temperature outside the furnace.

8. If there are any gouges on the outside surface of the pin hole bore that are greater than .010" deep, they should be blended out by grinding. Thickness of the pin hole wall must be at least 15/16" after grinding or boring for oversize bushings.

When the swing hanger arms are bent in or out from the centerline they may be straightened by cold pressing to conform to the dimensions in Fig. 29. Any swing hanger which has been straightened must be magnaflux inspected before being used in a truck assembly.

SWING HANGER PIN AND BUSHINGS

The clearance between the swing hanger pin and bushing should be checked before disassembly. The maximum wear on the pin and bushing is determined by the maximum clearance between the two parts as indicated in Fig. 30. The clearance between these parts, when they are new is 1/32" and the maximum wear limit is 1/8".

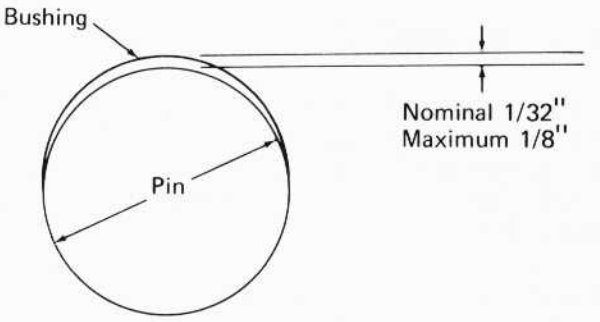


Fig. 30 -- Swing Hanger Pin And Bushing Wear Limit

If the clearance between the pin and bushing is 1/8" or more on either side of the swing hanger, all the pins and bushings must be removed and replaced with new parts. This includes both swinger hanger bushings as well as both the frame lug bushings. New parts should not be used on one side of the swing hanger and used parts on the other side, nor should new pins or bushings be mated with used pins or bushings.

If inspection was not performed before disassembly, the clearance can be checked by applying the pin to the bushing as in their normal operating position in the truck frame or swing hanger. If the clearance is more than 1/8" in either case, replace the used parts with new parts.

If it is desirable to qualify the swing hanger components in the disassembled condition, the maximum pin limit is 2.170". The maximum limit for bushing 8102087 is 2.298".

If the swing hanger bushings are to be replaced, the holes in the swing hanger must be 2.748" + .000" - .001" to use standard bushing 8102087. If the holes do not meet these requirements, the holes should be enlarged to one of the following diameters to accept one of the oversize bushings.

Diameter of bushing bore	Oversize bushing
2.756" + .000" - .001"	8309537
2.778" + .000" - .001"	8309538
2.798" + .000" - .001"	8309539

The bushing must have an interference press fit of .002" to .004" to prevent the bushing from working out. Caution should be taken not to

exceed the upper limit or a strain may be placed on the swing hanger eye which could cause the eye to fail in service.

BEARING BLOCKS

The clearance between the upper and lower halves of the bearing block should be checked before the truck is disassembled. If this measurement is less than 1/8", both halves of the bearing block should be replaced.

When qualifying the bearing blocks after the truck is disassembled, the nominal depth of the upper half at the point of contact with the lower half is 3/4". The maximum limit is 27/32" as indicated in Fig. 31.

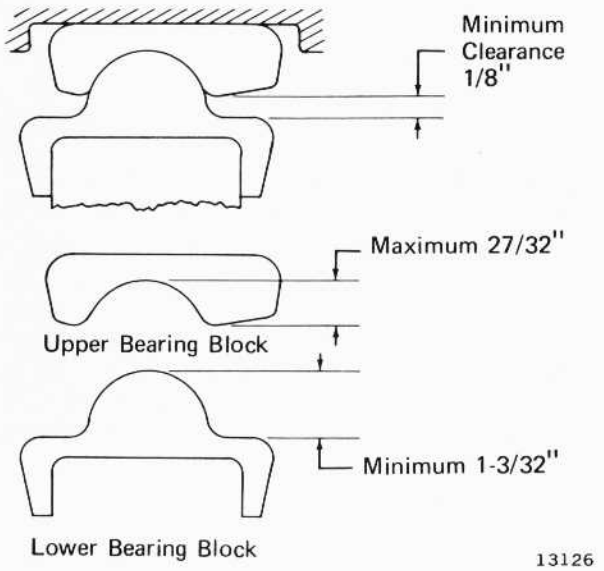


Fig. 31 -- Swing Hanger Bearing Block Wear Limits

The nominal height of the lower half crown is 1-3/16". The minimum limit is 1-3/32".

SPRING PLANK

The spring planks should be cleaned by degreasing in a hot caustic solution. Remove excessive rust and scale to expose the surface to be inspected.

Inspect the spring planks for cracks, bent sections or excessively worn areas. If possible cracks are suspected the spring plank should be magnaflux inspected. Bent sections may be straightened hot or cold.

Cracks should be completely removed by grinding, flame cutting or carbon arc gouging before welding repair is made. If the defect is accessible for welding at both sides, a double "V" scarf weld should be made. If only one side of the defect is accessible, a single "V" groove having a root opening large enough to accept a 3/16" backup plate should be provided. Scarf welds should equal a 60° included angle. During welding procedure the spring plank should be positioned to allow proper handling of the welding electrode and all welding should be in accordance with accepted welding standards.

SPRING PLANK SAFETY STRAPS

Safety straps are used to prevent the spring plank from dropping on the tracks in the event of a swinger hanger failure.

Inspect all safety straps for signs of damage which might lead to a strap failure if the spring hanger load should be imposed upon the safety strap. Also check to see that the load would be carried by the safety strap lips and not the holding bolts. If straps are bent they should be cold straightened before they are reused.

There should be at least 3/8" clearance between the safety strap and the spring plank. If clearance is not sufficient, check for worn swing hanger assembly parts or add a shim between the spring plank and upper bearing block.

SHOCK ABSORBER

The heavy duty shock absorbers, Fig. 32, mounted across the primary suspension at diagonally opposite corners of the truck frame, are designed to damp excessive vertical and rolling oscillations of the locomotive carbody.

Inspect the shock absorber periodically for oil leaks. Leaking oil indicates a faulty seal and the shock absorber should be replaced.

Check the shock absorbers to see that they are tight and are not allowed to rotate. The mounting bolts should be torqued to 270 ft-lbs. If the shock absorber is found to be loose, the rubber grommets and the metal insert bushings should be inspected. The rubber grommets will develop small cracks during normal use, due to weathering and wear, however, they should be inspected for excessive cracking. The metal insert

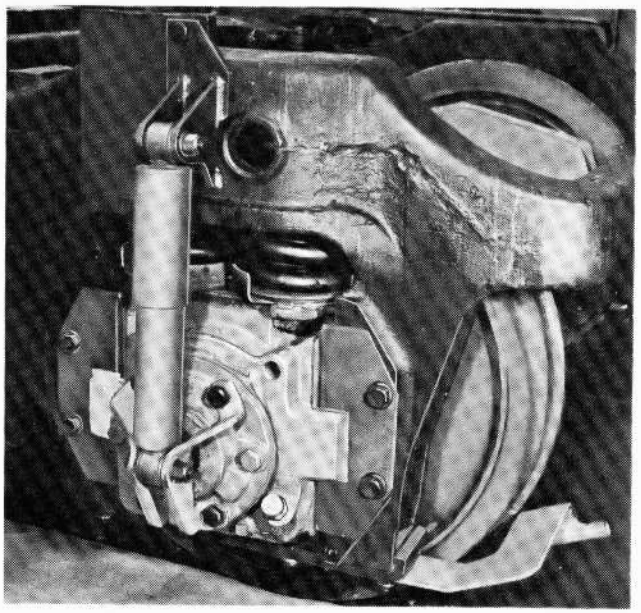


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Fig. 32 -- Shock Absorber Installation

bushing should also be inspected for cracks. If either excessive cracking or wear of the rubber grommets or insert bushing exists the shock absorber should be replaced.

To provide the longest possible service life, the shock absorbers should be kept free of excessive amounts of oil and dirt.

When truing the wheels, first loosen the upper mounting bolt of the hydraulic shock absorber, then remove the journal box cover. Next swing the shock absorber and the lower mounting bracket out of the way. Upon reassembly, the shock absorber mounting bolts must be torqued to the proper value as shown above.

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 1/16" should have both parts replaced. Never use a new pin with an old bushing or vice 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.

A composition brake shoe is used in the single shoe brake system. Since erroneous installation of cast iron brake shoes to the single shoe brake system would result in low braking effort, the brake heads have been designed so that application of the cast iron shoes is impossible.

Screw type and pin type brake shoe slack adjusters are available. Adjustment of the screw type slack adjuster, Fig. 33, can be made by raising the hinged lock and turning the slack adjuster screw until both brake shoes clear the wheels by 3/8". Brake cylinder piston travel should be 2-3/8".

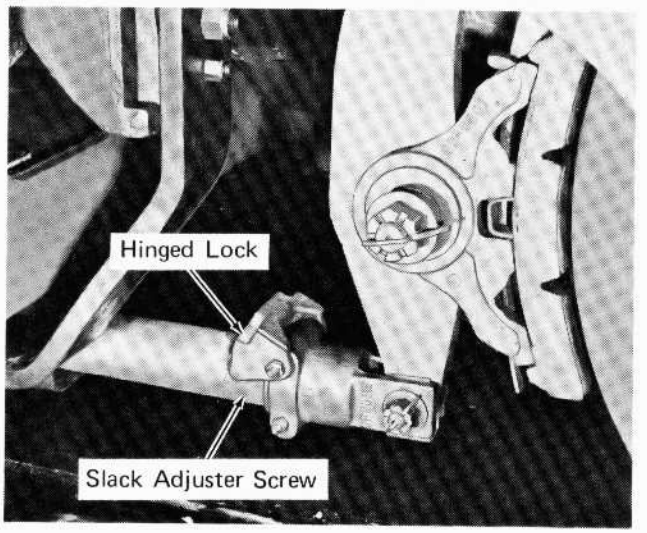

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Fig. 33 -- Screw Type Brake Shoe Slack Adjustment

To adjust the pin type slack adjuster, Fig. 34, unlock the pin lever and remove the pin. Move the rod assembly in or out of the tube assembly

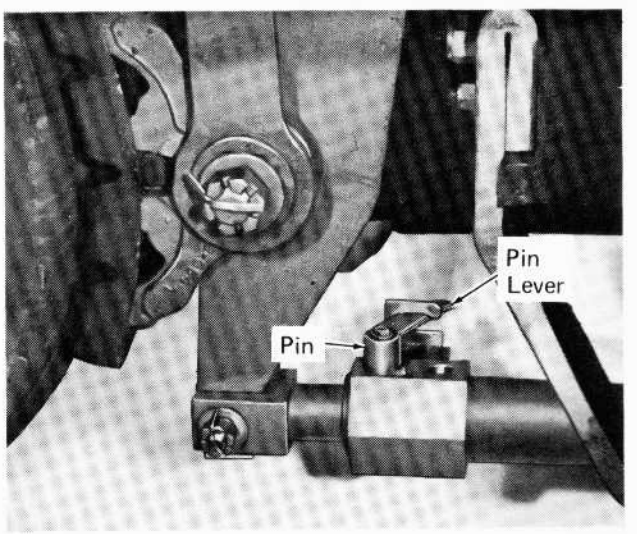

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Fig. 34 -- Pin Type Brake Shoe Slack Adjustment

until both brake shoes clear the wheels by at least 3/8". Align the pin holes in the rod and tube assemblies and re-install the pin. Turn the pin lever to the locked position.

ASSEMBLY OF TRUCK

1. Set the truck frame in an inverted position on the floor with one end sill resting on a turnover fixture and the other end blocked so the frame is relatively level. The turnover fixture can be made by using File Drawing 250 available on request.

2. Install the inverted bolster into its proper place between the frame transoms. Install coil spring assemblies, spring seats and shims, and pedestal liners to the truck frame and bolt in place where required.

3. Install the traction motor nose suspension assembly in place between the frame lugs, Fig. 14. Compress the suspension pack assembly by placing temporary blocks under the nose suspension assembly bolt heads and tightening the bolts. Install the suspension pack retainer pins and pin keepers.

4. Install the rubber bolster spring adapters in place on the inverted bolster. Bolt the rubber springs to the spring plank and set the spring plank assembly in place on the adapters.

5. Install safety straps and place upper and lower swing hanger bearing blocks in place on the spring plank.

NOTE: The wider portion of the upper bearing block should be on the inboard side.

6. Set swing hanger over bearing blocks and align the swing hanger pin holes with the truck frame boss pin holes. Insert the swing hanger pins. Wire the swing hanger to safety strap so that swing hanger remains in place over the bearing blocks.

7. Install brake levers in place, leaning them back to provide enough clearance for the wheel and axle assemblies to be installed.

8. Install pre-assembled wheel, axle and motor assemblies in place by lifting the assembly with a lifting fixture similar to the one in Fig. 35, and lowering between the truck frame pedestals until the journal boxes rest on the coil spring seats.

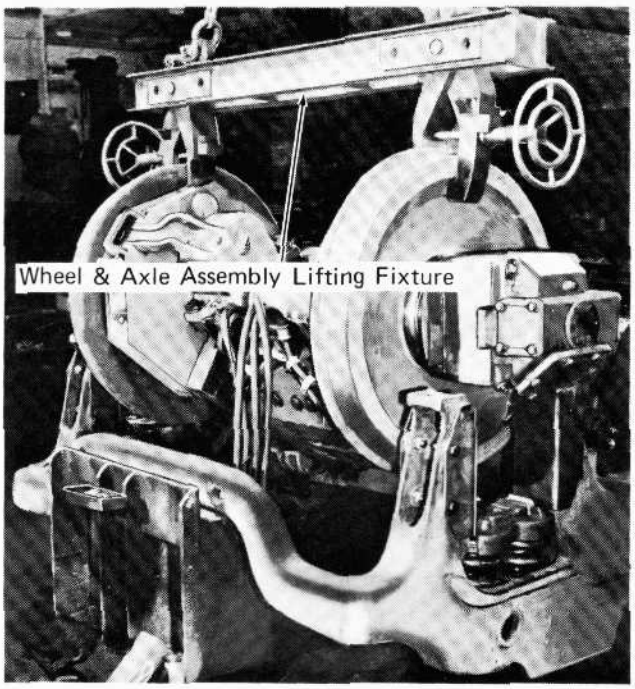

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Fig. 35 -- Installation Of Wheel And Axle Assembly

9. Install slack adjuster, slack adjuster guides, pedestal tie bars, and sander guide assemblies and bolt down firmly. Also remove temporary blocks from traction motor nose suspension assembly.

10. Turn the truck assembly over on its wheels by attaching a cable or chain to the end sill opposite the one resting on the turnover fixture and lifting as shown in Fig. 36, until the whole truck assembly rotates end over end 180° and is setting on its wheels. Remove the lifting cable and attach it to the end sill resting on the turnover fixture so that end of the truck can be raised enough to be removed from the fixture.

11. Remove wires tying swing hangers to safety straps. Install air brake piping, brake cylinders, brake cylinder levers, and shock absorbers.

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

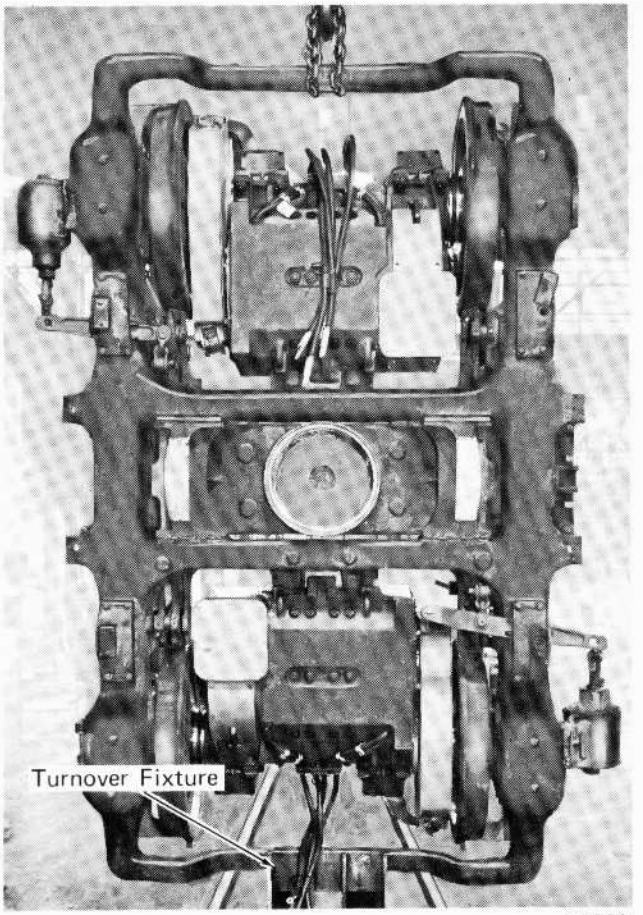

Fig. 36 -- Turning Over Truck Assembly

SERVICE DATA

SPECIFICATIONS

TRUCK SPRING DATA

	Part Number	Free Height (Approximate)	Nominal Static Height	Static Load (Lbs.)
Journal Springs				
Basic – 230,000 - 266,000 lbs. Locomotive Weight				
	8272084 (Assembly)	15"	11-3/4"	12,600
	8272255	15"	11-3/4"	8,350
	8272256	14-11/16"	11-3/4"	4,250
Heavy – 266,000 - 280,000 lbs. Locomotive Weight				
	8354464 (Assembly)	15-3/16"	11-3/4"	15,850
	8354466	15-3/16"	11-3/4"	10,470
	8354465	14-1/2"	11-3/4"	5,380
Extra Heavy – 280,000 - 300,000 lbs. Locomotive Weight				
	8413508 (Assembly)	15-3/16"	11-3/4"	16,600
	8354466	15-3/16"	11-3/4"	10,470
	8354465	14-1/2"	11-3/4"	5,380
	8413507	14-9/16"	11-3/4"	750
Rubber Bolster Spring				
	8442142	6-1/4"	4-7/8"	51,000

EQUIPMENT

Pinion Protector 8054871
Turnover Fixture . . . . . File 250
Tram Marking Tool . . . . . File 615
Spring Testing Machine . . . . . File 647
Pedestal Liner Pressing Tool . . . . . File 649

NOTE: File drawings can be obtained by contacting Electro-Motive Division Service Department, La Grange, Ill.

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