SR Jefe Taller Diesel - Coquimbo

M.I. 1518
*Rev. C

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

# WHEELS, AXLES, AXLE GEARS AND PINIONS

## GENERAL

Wheels and axles should be inspected for visible defects each trip. In the United States this is part of the inspection required by the Federal Locomotive Inspection Laws. Wheels are periodically checked for wear, sharp flanges, shelling, cracks, and flat spots to see that they are within the limits prescribed by the Federal Railroad Administration, Department of Transportation.

Wheel and axle defects which require the removal of any particular wheel set are fully defined and illustrated in the "Wheel And Axle Manual" published by the Association of American Railroads, 59 E. Van Buren St., Chicago, Illinois 60605.

NOTE: See AAR Wheel And Axle Manual for complete information, including use of gauges for checking wear and defects. The AAR gauge and the wheel defect gauge may be purchased from the Pratt & Whitney Company.

For convenience some of the most common wheel defects are illustrated in Figs. 2 through 16.

Axle defects may also require removal of wheel sets. Some of the most common are illustrated in Figs. 17 through 21.

## REMOVAL OF WHEEL SETS

Wheel sets may be removed while a truck is under the locomotive or the truck itself may be removed and taken to a truck overhaul section of the shop where wheel sets are removed for maintenance.

The weight of the locomotive should be supported on the locomotive jacking pads before dropping wheel sets. If this is not done, serious damage may result.

CAUTION: Axle journal bearing surfaces should be protected when the journal boxes are removed.

## REMOVAL OF WHEELS AND AXLE GEARS

After the wheel, gear and axle assembly, Fig. 1, has been removed from the locomotive, it may be necessary to press off the wheels and axle gear as well as to remove the roller bearing inner races for inspection and servicing.

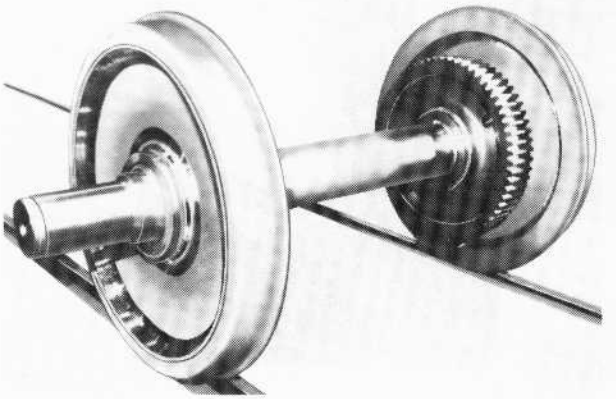

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Fig. 1 – Wheel, Gear And Axle Assembly

When the wheels are pressed off, be careful to apply the pressure uniformly over the end of the axle to avoid upsetting it. Always use a pressure block, Fig. 27, between the end of the axle and the ram of the press. An upset condition of the axle end will cause the journal to swell locally at the outer end, which would be transferred to the inner race as a high spot on the operating surface. This would cause early failure of the race, and might interfere with the application of the journal box to the journal.

The amount of pressure required for wheel and gear removal is disregarded when wheels and gears are removed from axles. The wheel at the gear

*This bulletin is revised and supersedes previous issues of this number.

end of the axle should be pressed off by removing the gear with it, using a press yoke against the gear. If the wheel press capacity is not sufficient to remove the wheel and gear simultaneously, the wheel may be removed first by use of blocks against the top and bottom of the wheel rim. The wheel should be rotated so the stampings on the wheel rim are under the blocks, lessening the possibility of cracking the wheel. Break the wheel loose. Remove the blocks and apply pressure to the gear hub. Break the gear loose and remove the wheel and gear separately.

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Fig. 2 – Burnt Rim

When inspection shows that a considerable reduction in one wheel diameter will be required to remedy a defect, it is economical to dismount just one wheel. If both wheels are turned to the required diameter, a considerable loss of service metal will be incured by the other wheel. An analysis of this condition is given in the AAR Wheel And Axle Manual, Paragraph 288.

If the axles are not magnafluxed, all wheel work may be done without disturbing the inner races. They should, however, be protected against damage by applying sheet copper or brass sleeves over them while the wheel work is in process.

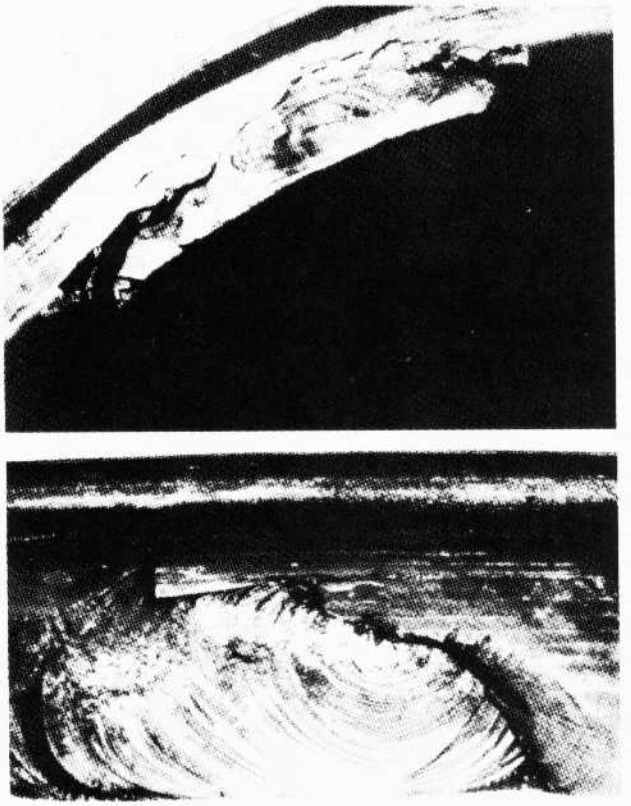

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Fig. 3 – Shattered Rim

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Fig. 4 – Shattered Rim

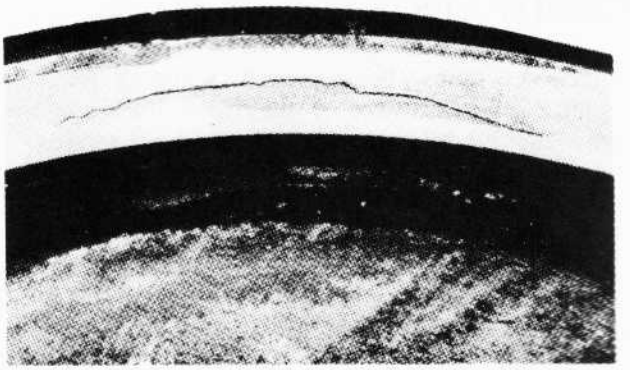

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Fig. 5 – Shattered Wheel Revealed By Crack

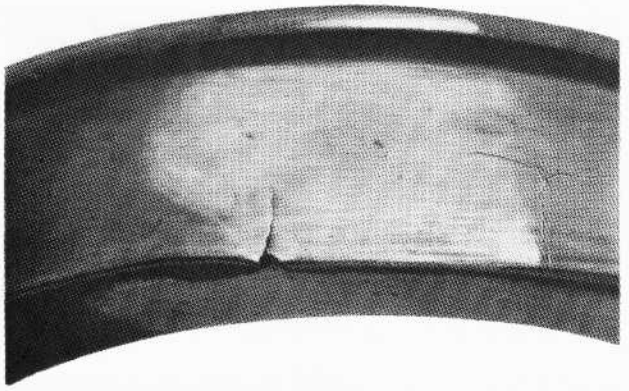

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Fig. 6 – Spread Rim

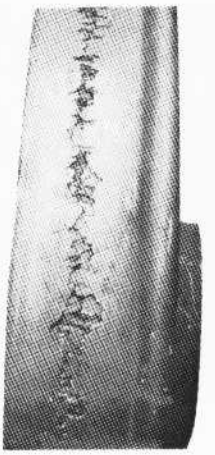

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Fig. 9 – Shelled Tread

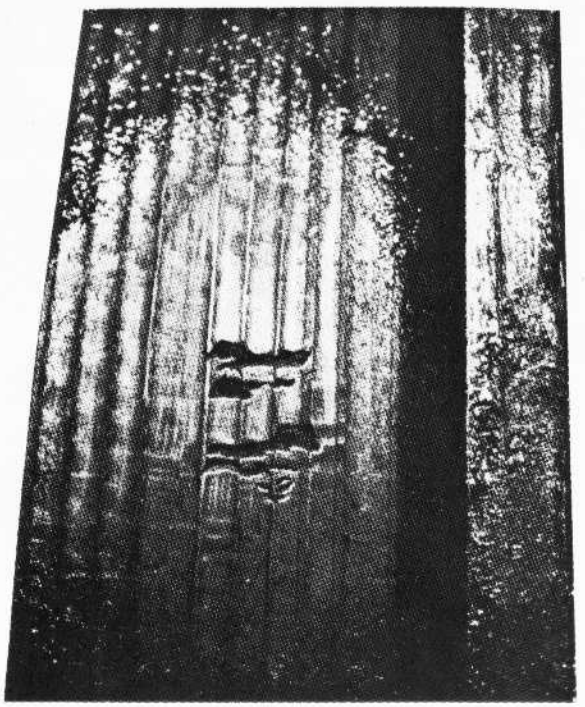

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Fig. 7 – Sub-Surface Defect, Found When Turning Wheel

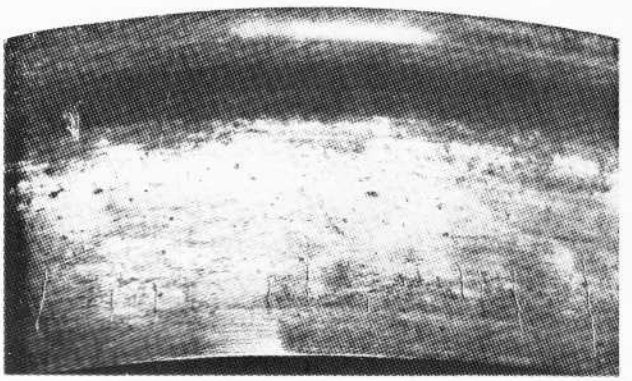

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Fig. 10 – Thermal Cracks

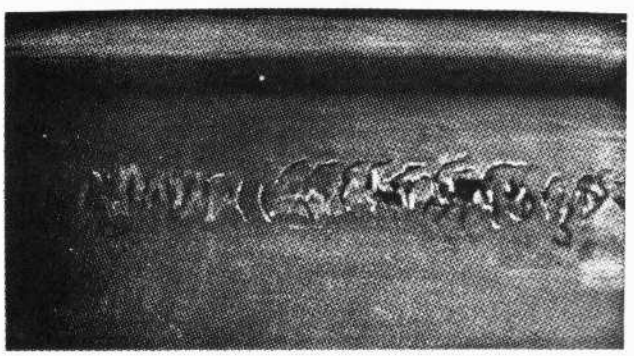

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Fig. 8 – Shelled Tread

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Fig. 11 – Thermal Cracks

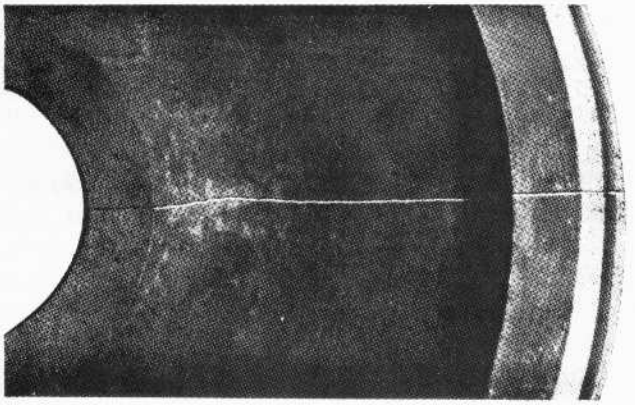

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Fig. 12 – Thermal Cracks

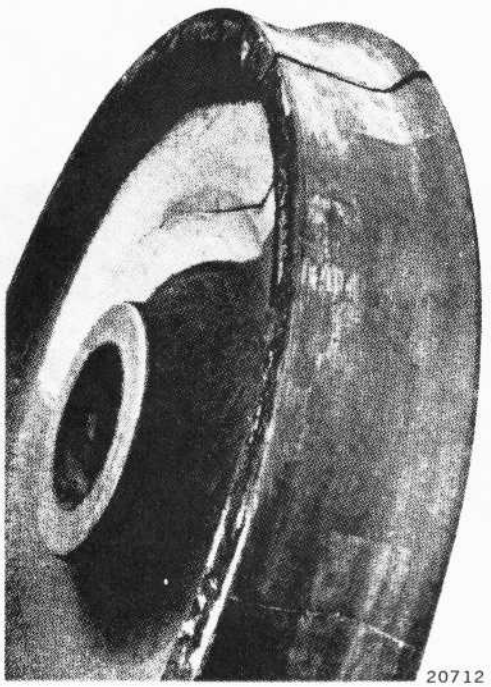

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Fig. 13 – Thermal Cracks

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Fig. 14 – Spalling Out Of Metal Between Fine Thermal Cracks (Top) Compared With True Shelling (Bottom)

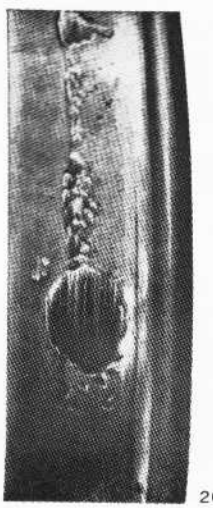

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Fig. 15 – Built-Up Tread And Slid Flat

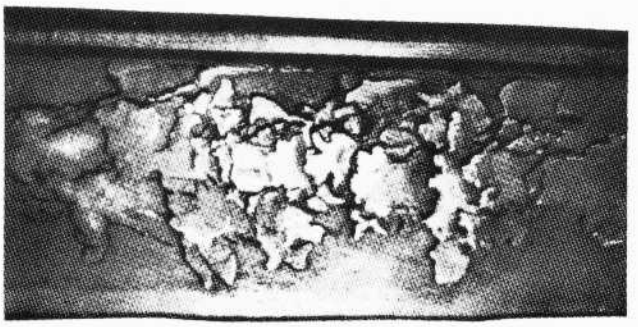

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Fig. 16 -- Built-Up Tread

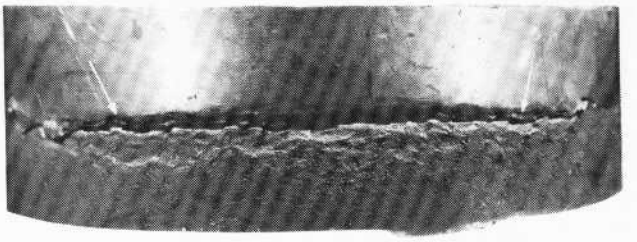

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Fig. 17 -- Corrosion Fatigue

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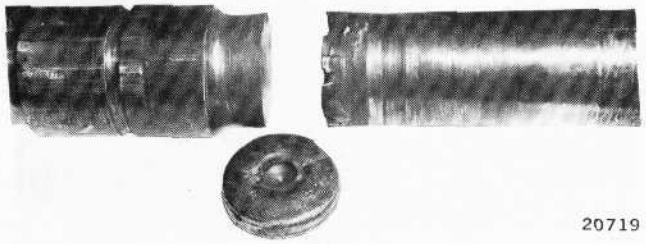
Fig. 18 -- Support Bearing Failure Due To Lack Of Lubrication



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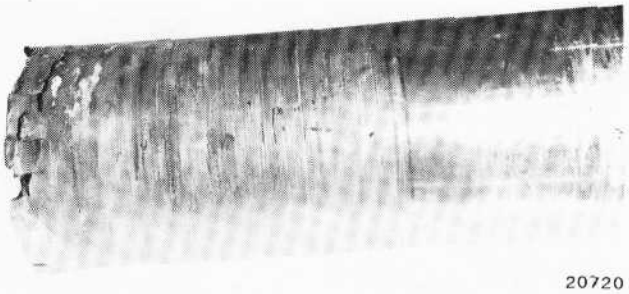

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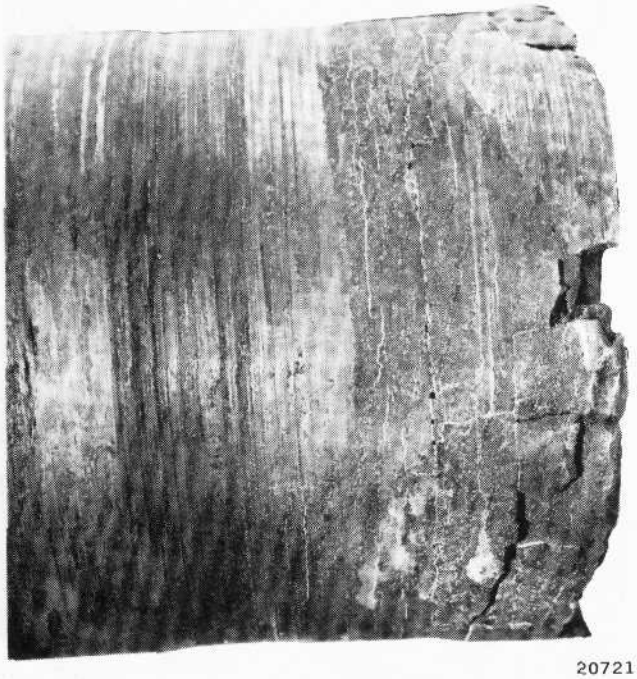

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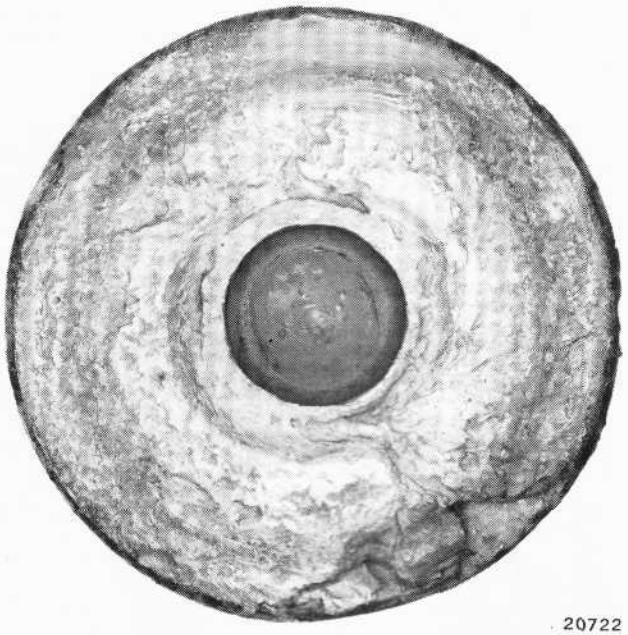

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Fig. 19 -- Support Bearing Failure Due To Lack Of Lubrication

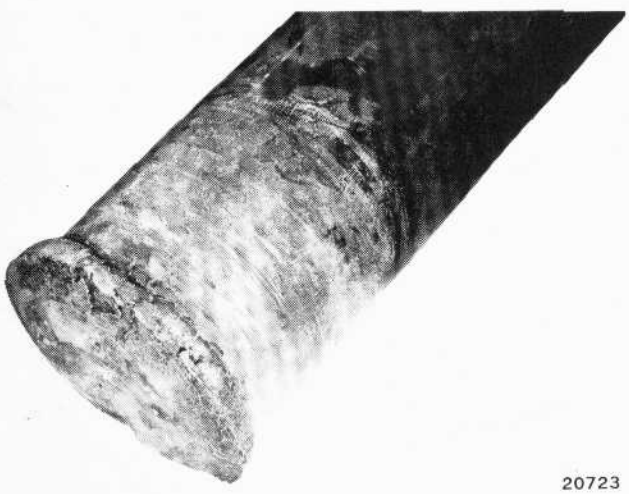

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Fig. 20 -- Support Bearing Failure Resulting From Repeated Heating And Cooling Cycle -- Lack Of Lubrication

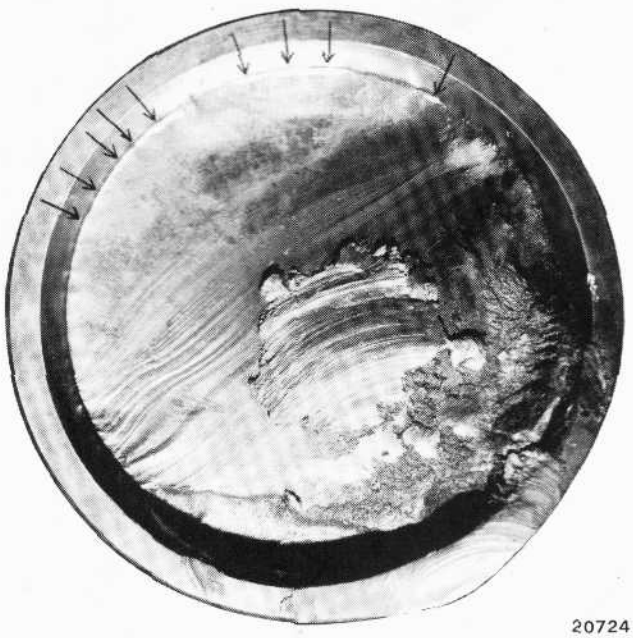

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Fig. 21 -- Corrosion Fretting Between The Radius Of Journal Bearing Inner Race And Axle Journal

## WHEELS

Wheels are made in two nominal diameters, 36" and 40". The 36" wheels are used on six wheel passenger locomotive swinghanger trucks with an idler axle. The 40" wheels are basic on all other applications.

Three types of wheel treads are available; a 1" in 20" taper, a 1" in 40" taper, and a cylindrical tread contour. 1" in 20" taper tread wheels are recommended for use on locomotives having maximum permissible speeds of 70 mph or less.

Cylindrical wheels are recommended for use on locomotives having maximum permissible speeds of over 70 mph, and recent tests have resulted in the recommendation to use the 1" in 40" taper wheels on locomotives equipped with 3-axle HT-C trucks and expected to operate at speeds above 90 mph.

An optional wheel design is available for use on locomotives operating under conditions where wheels are normally condemned for flange wear (thin flanges). This is the wide flange Uni-Point contour wheel and has a 1/16" wider flange. This contour provides a single point contact which distributes the wear more evenly over the tread flange area, work hardens the entire area at the same time, and confines the wear to that which results from microslip during stable operation. With these wheels the nominal back-to-back wheel spacing is 53-1/4", Fig. 31.

Both cast and wrought steel wheels are available and may be procured in three different classes of hardness range as described in AAR Specifications M-107 and M-208. These are:

Class AR - High speed service with severe braking conditions, but moderate wheel load.

Class BR - High speed service with moderate braking conditions and heavier wheel loads.

Class CR - (1) Service with light braking conditions and high wheel loads.

(2) Service with heavier braking conditions where off-tread brakes are employed. (Does not apply to locomotives.)

The letter "R" following the class designation on wrought steel wheels indicates that the wheels are rim quenched. The letter "R" is omitted from the class markings of cast steel wheels. The hardness for the various classes is given in the Service Data. The most commonly used class in locomotive service is the Class BR wheel and unless the customer specified otherwise, Electro-Motive will supply wheels on new locomotives which are in the high Class BR range (302-341 Brinell preferred).

## WHEEL WEAR LIMITS

Wheel wear limits are given in the Service Data. When determining wheel size, any accurate conventional method may be used. However, EMD recommends the "diameter-radius index groove" method, where a groove of known diameter is machined into the outer rim of the wheel, Fig. 22, prior to wheel mounting.

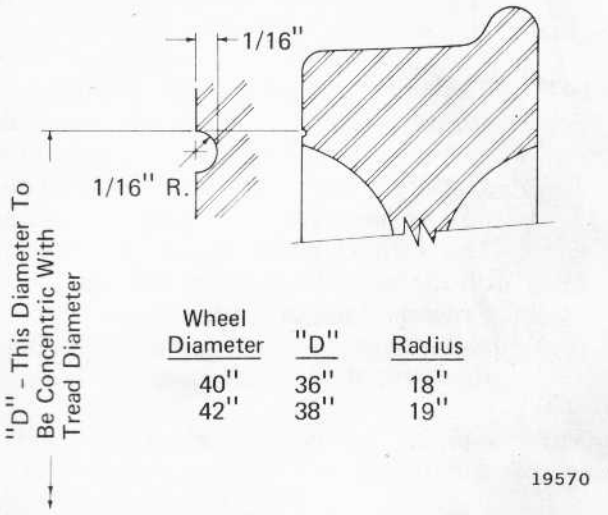



Fig. 22 – Index Groove For Multiple Wear Diesel Wheels

NOTE: The index groove is machined in all new EMD wheels.

Wear on wheels with index grooves can easily be determined by measuring the radius of the groove and then using an AAR wheel gauge to measure to the index groove, Fig. 23. The gauge measurement is added to the index groove radius to obtain the wheel radius. If wheels are worn beyond limits shown in the Service Data see "Compensating For Wheel Variations" near the end of this bulletin.

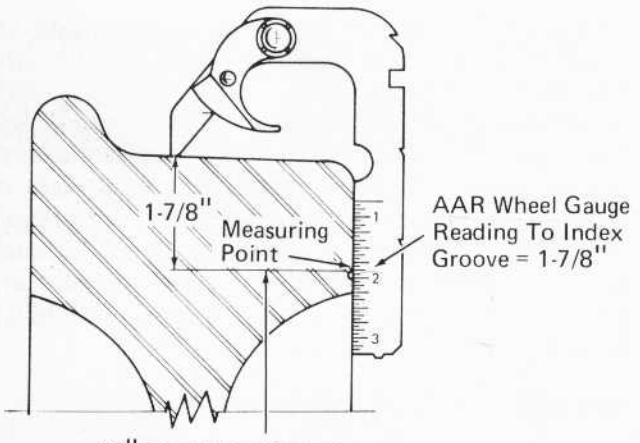



Fig. 23 -- Measuring Wheel Radius

NOTE: The only purpose of the diameter index groove is to provide a reference to easily measure the wheel diameter in order to simplify proper wheel matching. It should not be used for measuring rim thickness. The official measurement and evaluation of the rim thickness as specified by the Federal Railroad Administration can be accomplished only by measuring the rim thickness at the back face.

When applying all new wheels to a truck the following limits apply:

1. New wheels that are mounted on the same axle of locomotives in road service should be matched to the same wheel tape size within a maximum variation of 1/2 tape (0.010" on the radius).

2. On switcher locomotives equipped with rigid trucks the maximum variation for new wheels on the same axle is 1 tape (0.020" on the radius).

3. The maximum recommended new wheel variation between power axles in the same truck is 3 tapes (approximately 1/16" on radius) and between axles in different trucks is 14 tapes (approximately 1/4" on radius).

The wheel seat should be checked for taper and machined to AAR specifications if the wheel seat taper exceeds .002" per foot on diameter.

The microinch finish on the vertical surface of the hub of the flange side of the wheels must not be more than 15 microinches.

The wheel bore microinch finish should be held to 200 ± 75 microinches. A finish of 90 microinches or less is very undesirable.

## WATER GUARD

The water guard, Fig. 24, remains in place for the life of the wheel. The water guards can be pried off, after being heated sufficiently with a torch to release the shrink fit and reused on the new wheels. Remove the water guard from the wheel hub after the wheel has been removed from the axle. To apply the water guards, heat them in an open flame or by torch to a black heat at 500° F to 700° F and shrink them in place on the wheel hub. They should be pushed tightly against end of wheel hub.

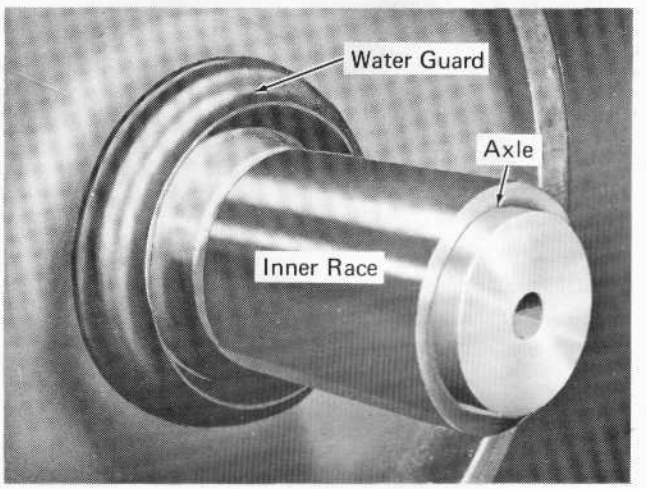



Fig. 24 -- Water Guard

## AXLES

Current domestic road locomotives are equipped with axles which have a cold rolled relief groove between the wheel and gear seat and a 6-7/8" journal bearing diameter rather than a 6-1/2" diameter. This improvement makes possible increased axle loading.

Because of possible dangers resulting from axle cracks, it is recommended that axles be given a magnaglo or magnaflux test whenever wheels are removed, regardless of length of service. The roller bearing inner races should also be removed so that the axle under the bearing race can be visually inspected for fretting and then magnaflux tested.

Axles that do not pass inspection standards shown in Fig. 25 or have circumferential defects on or below the surface should be scrapped. The axle should be scrapped if suspension bearing journals or the journals of axles for friction type boxes show evidence of bearing seizure accompanied by thermal cracks. Copper penetration makes the axle steel very brittle and subject to breakage. A distressed axle should never be reused until inspected for copper penetration and approved for use by the proper railroad authorities.

Axles should be checked for runout which should not exceed .030" total indicator reading with journal box bearing at zero. If the axle has over .030" total runout, it should be scrapped.

On switcher locomotives equipped with friction bearings, the journal taper should be checked. If the taper exceeds 1/32" it should be reworked. On switcher locomotives equipped with roller bearings the taper should be reworked if it exceeds .001".

New and service dimensions for axles are shown in the Service Data.

Axles and axle gears may be used until worn to maximum wear limits, if magnaflux inspection reveals no defects.

If axles are not magnafluxed at each wheel removal, it is recommended that the axle be scrapped after two pair of wheels have been worn to maximum wear limits.

In order to ensure accurate axle measurements, the micrometers used should be checked against a known standard.

NOTE: Axles and micrometers used for measuring should be allowed to stabilize at room temperature before measuring.

All fillets and axle ends must be polished free of tool marks and each time wheels are turned, all burrs or other irregularities should be polished off axle ends. If it is necessary to machine axle ends, the same amount should be removed from each end to ensure that the axle is centered in the truck after assembly.

If the axle has a spline for a speed governor drive, the spline should be visually inspected and replaced if any of the teeth are found broken, chipped, cracked or have rounded edges.

The journals should also be checked for taper and machined if the taper exceeds 1/32" for the length of the journal. The finish should be maintained at a maximum of 15 microinches.

If the wheel set has been removed from a truck involved in a wreck, the inner races should be removed and the journals of the axles should be magnaglo or magnaflux tested.

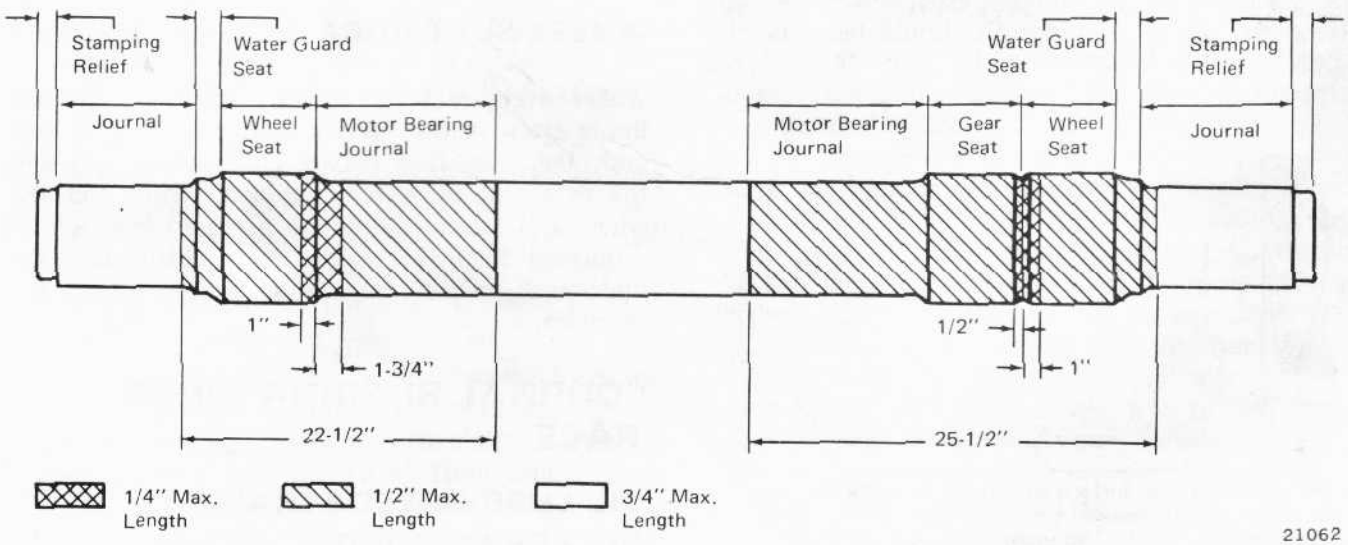



Fig. 25 – Longitudinal Axle Defect Limits

# AXLE JOURNAL

## OIL LUBRICATED STRAIGHT ROLLER BEARING

The minimum axle journal diameter is governed by the interference fit between the axle journal and the bearing inner race.

A new axle journal diameter is 6.878" to 6.879" (6.503" to 6.504" on 6-1/2" journal bearing axle). This provides a minimum interference fit of .003" to the inner race.

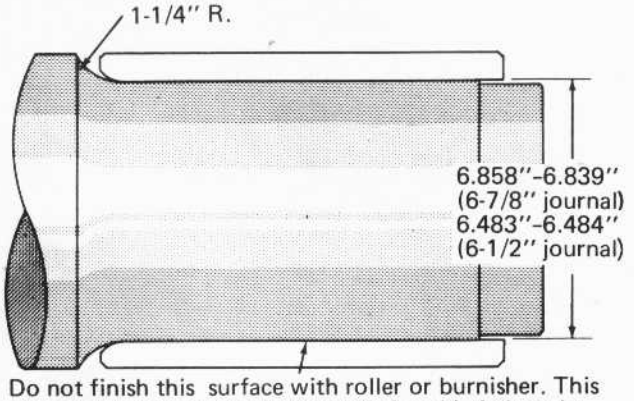
A service limit of 6.8765" (6.5015" for 6-1/2" journal bearing axle) minimum axle journal diameter provides an interchangeable interference fit of .0015". If it is desired to use a selective fit, an axle journal diameter of 6.8755" (6.5005" for 6-1/2" journal bearing axle) can be used with an inner race having a minimum I.D. of 6.8740" (6.499" on 6-1/2" journal bearing axle) to obtain the .0015".

The minimum interference fit of .0015" for any axle, is only permitted providing that:

1. Inner race does not show fretting in excess of 20% of total I.D. surface.

2. Axle journal surface does not show fretting in excess of 1" wide or 10% of the total surface.

If the .0015" interference fit cannot be obtained with a standard inner race, the axle journal can be machined to the dimensions shown in Fig. 26. However, the interference fit should be .003" to .005".




Do not finish this surface with roller or burnisher. This diameter to be measured when axle is cold. Axle to be round within 0.001 of an inch. Taper not to exceed 0.001 per foot on diameter.

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Fig. 26 – Axle Journal For .020" Undersized Inner Race

## TAPERED CARTRIDGE TYPE ROLLER BEARING

The minimum axle journal diameter is governed by the interference fit between the axle journal diameter and the bore of the bearing cone assembly.

A new axle journal diameter is 6.1915" to 6.1905" for the Class F bearing and 7.004" to 7.003" for the Class G bearing. This provides an interference fit of .004" maximum to .0015" minimum.

The new minimum interference fit of .0015" is also the service limit.

## FRICTION BEARING

Friction bearing axle journals that have been worn mechanically may be reduced to not less than 6.250" diameter and a 3/4" minimum fillet radius must be maintained. All tool marks must be polished from the fillet. If an axle journal has worn to 6.215" diameter, the axle should be scrapped.

## SUPPORT BEARING AREA

The maximum axle diameter reduction at the support bearings should not exceed 1/16" due to the axle loading on some locomotives. However, 3/32" and 1/8" undersize support bearings are available for railroads wanting bearings below the recommended minimum undersize of 1/16".

## WHEEL SEAT AREA

Wheel seats may be ground undersize to the limits given in the Service Data. However, at gear end, the transition between the wheel seat and the gear seat must be a smooth radius and the wheel seat length should be increased from 1/16" minimum to 5/32" maximum to ensure that the undersized wheel bore does not contact the shoulder.

# JOURNAL BEARING INNER RACE

## OIL LUBRICATED STRAIGHT ROLLER BEARING

Induction heater 8254202 is recommended for removing and installing the journal bearing inner race.

If an induction heater is not available, the inner race may be pressed off the wheel using split ring 8048302 between the race and the wheel hub, Fig. 27.

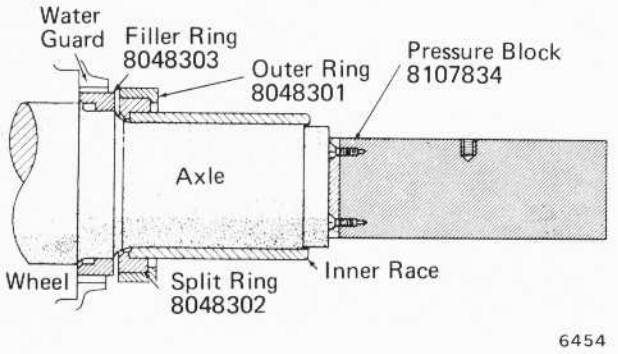


Fig. 27 -- Inner Race Removal

The race should be thoroughly inspected before reapplication, following the procedure below:

1. Inspect the I.D. surface for fretting. If fretting is evident on more than 20% of the total surface the race should be discarded. If the journal shows fretting not over an inch wide and O.D. of the axle measures the minimum diameter where fretting exists, either a new race, or a race that has been removed from another axle should be applied. When applying a used race to a used axle, it is preferable to use a race with little or no signs of fretting.

2. Inspect for indenting, scoring, or pitting on the O.D. surface. If any imperfections are found on the roller paths, reject the race for further use.

3. Measure the I.D. of the race with a micrometer. Dimensions are 6.8740" minimum and 6.8750" maximum (6.4990" minimum and 6.5000" maximum on 6-1/2" journal bearing axles). The maximum out of round limit is .001".

4. Inspect for hardness with a scleroscope, or other suitable hardness tester similar to the Ernst tester, in the approximate center of each roller path (3" to 4" from each end of the race). If a hardness tester is used which leaves an indentation larger than a Rockwell 15 N impression, the indentation must be stoned flat with a smooth stone. Hardness should not be below 75 Shore Scleroscope (Rockwell "C" 56).

The inner race is applied by heating it in an induction heater and shrinking it to the axle. If an induction heater is not available, heat inner race in oil to a maximum of 300° F and shrink to the axle. Wipe the oil from the inside of the race before it is reapplied. When heated, the race can be easily slid into place. Take care to properly position the race before it cools and seats on the axle. The use of asbestos gloves is recommended for handling the hot race. A split collar, shown in Fig. 28, clamped around the journal will space the race the proper distance from the journal fillet. See Service Data at the end of this bulletin for the correct split collar. Due to slight variations in axle length, it is preferable to locate the race from the fillet rather than from the end of the axle. Under no conditions should the shrink fit encroach upon the journal fillet. See Fig. 31 for dimension of inner race to fillet.

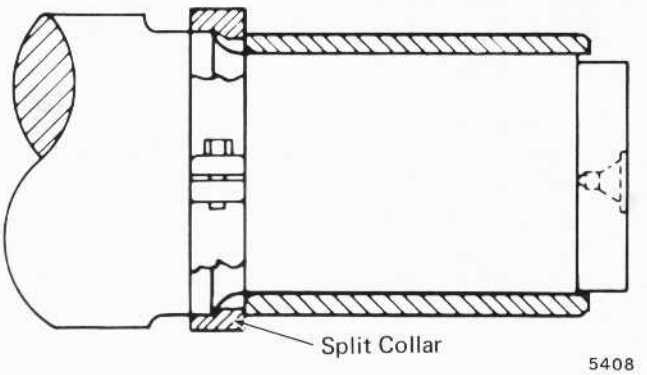


Fig. 28 -- Locating Inner Race

## AXLE GEARS AND TRACTION MOTOR PINIONS

Axle gears for all locomotives are the same design, the gears differing only in pitch diameter and number of teeth.

Each time a wheel set is removed from a truck for any reason, the gear should be thoroughly inspected. If axle gears and traction motor pinions with excessive wear on the tooth face are reused, high shock loads can be expected from the meshing gears. The resulting abnormally high vibrations are transmitted throughout the traction motor and can shorten the life of all motor components. EMD recommends that axle and pinion gears be checked for both tip wear and tooth contour prior to reuse.

1. After the gear has been removed, examine the inner face of the gear hub and polish off any marks that may have been made while removing gear.

2. Visually inspect for broken, chipped, spalled or pitted teeth. Pinions and axle gears should be rejected when more than 20% of the total working surface of tooth is spalled or pitted. Axle gears should be scrapped when either one of the working surfaces is worn to the point where a step 1/32" deep exists in the root of the gear tooth where contact with the pinion ends.

3. Use a tooth contour gauge and a .010" feeler wire to check the gear tooth involute profile, as shown in Fig. 29. The gear should be replaced if the total wear exceeds .064" when the deviation from the true involute profile along the face is within .010" as shown in Fig. 30, or if the total wear exceeds .040" when deviation from true involute profile is in excess of .010".

   All gears having total wear in excess of .100" must be replaced, regardless of the deviation from true involute profile.

   Axle gears with a tooth involute profile variation in excess of .010" can be reground provided the tooth wear does not exceed a total of .040".

   The minimum allowable axle gear tooth tip thickness is 5/16" for two piece gears and 1/4" for one piece gears. Minimum thickness limits for the traction motor pinions are as follows when the involute profile is within .010" of original contour:

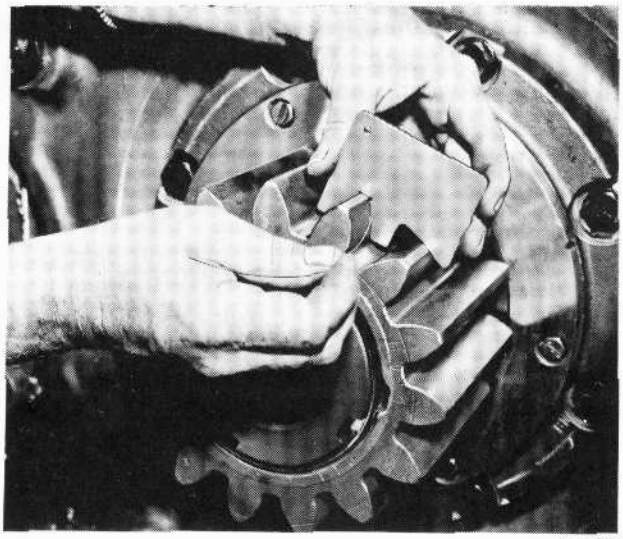

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Fig. 29 – Gear Tooth Contour Gauge

| NO. OF TEETH | MIN. TIP THICKNESS |
|---|---|
| 12, 13, 14 | 1/32" |
| 15, 16, 17, 18, 19 | 1/8" |
| 20, 21, 22 | 5/32" |
| 25 | 3/16" |


The above represents the most common wear condition.
However, the deviation from profile requirement applies in all cases even when the location of maximum wear is not as shown above.

Fig. 30 – Tooth Profile

AXLE GEAR USAGE RECOMMENDATION

| Deviation From True Involute Profile Less Than .010" | | Deviation From True Involute Profile Exceeds .010" | |
|---|---|---|---|
| Total Wear | Recommended Gear Disposition | Total Wear | Recommended Gear Disposition |
| Less Than .064" | Reuse | Less Than .040" | Regrind |
| Greater Than .064" | Replace | Greater Than .040" | Replace |

Traction motor pinions cannot be reground economically and those not meeting requirements should be scrapped.

Part numbers for the various tooth contour gauges are given in the Service Data.

4. Inspect the bore in the axle gear for scoring. To obtain the proper press-on tonnage for the axle gear, the bore surface must be in good condition. Inspect the gear hub wear face for grooving and microinch finish. The face must be free of grooves and the finish must not be more than 20 microinches.

5. Inspect for cracks by magnaglo or magnaflux.

   Fatigue cracks on axle gears and traction motor pinions usually start in the fillet at the root of the teeth on motor side, approximately 1/2" from the end, and progress to the side of the gear. Fatigue cracks in the axle gear or pinion at the root of the teeth are dangerous and the axle gear or pinion should be replaced.

   The axle gear, if not subjected to magnaglo or magnaflux, should not be used beyond the life of two axles.

## MOUNTING OF WHEELS AND AXLE GEARS ON AXLE

See AAR Wheel And Axle Manual, Section XV, for detailed information on mounting procedure.

The interference between the wheel bore and the wheel seat should be between .0095" and .0125". The interference between the gear bore and the gear seat should be between .010" and .012".

New wheel bore diameter should be 9.2205" + .000" - .002" and should be held square with the back face of the wheel rim within .006" per foot. Taper on the wheel bore should be held to a minimum and limited to a forward taper of .0015" or a reverse taper of .0003" as measured 1/2" from the edge of the hub.

The wheel hub offset from the back rim face should be held to 1.687" + .000" - .020".

Referring to Fig. 31 for mounting dimensions, assemble wheel set as follows:

1. To locate the center of the axle, mark the axle with chalk, and measuring from the ends of the axle, scribe the chalk with a blunt instrument. The center of the axle will be half the distance between the two marks. The metal of the axle must not be permanently marked in any way such as prick punching or scribing with a sharp instrument.

2. Press axle gear onto the axle with a pressure of between 55 and 125 tons. When reused axles or gears are assembled, the mating surface must not be scored.

3. Press on the wheel opposite the gear end.

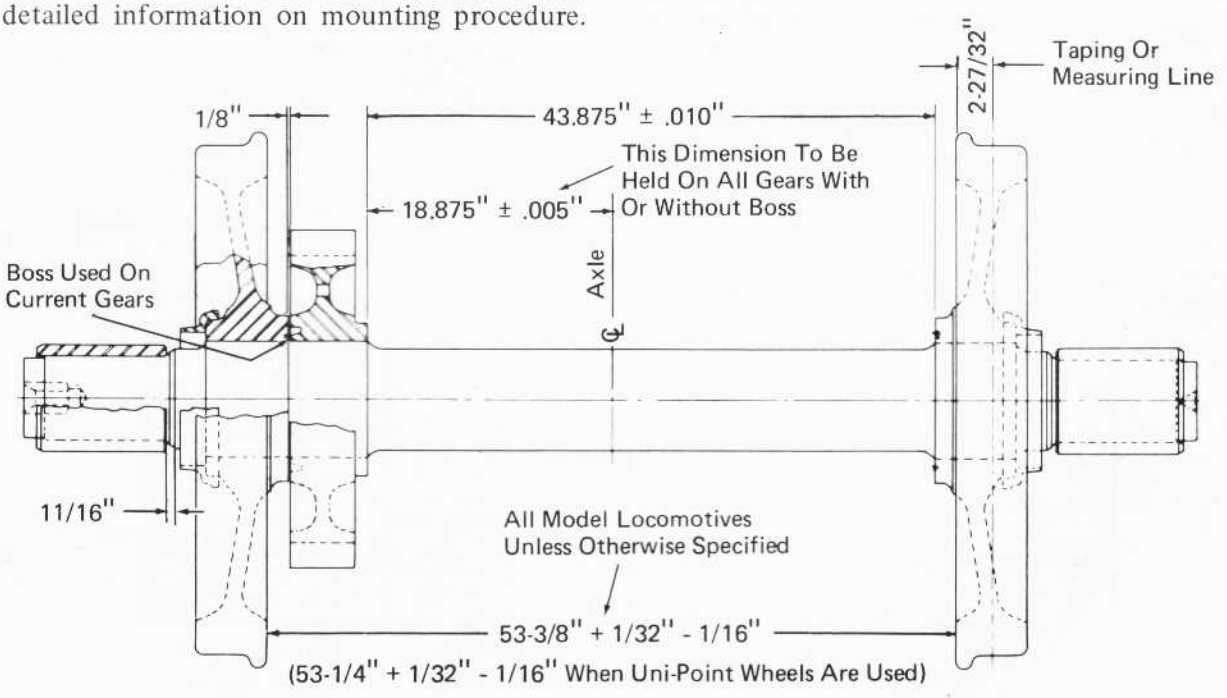



Fig. 31 – Dimensions For Assembling Wheel Sets

4. Press on the wheel next to the gear. For new or used wheels on a new axle with the wheel seat reground, the pressure required should be 90 to 140 tons.

NOTE: White lead may be used as a lubricant when mounting wheels and axle gears.

A permanent Record Of Pressure Graph should be made for every mounting operation. The pressure rise indicated on the graph should be gradual as shown in Fig. 32. The four graphs illustrate pressure curves ranging from ideal to acceptable.

All current axle gears have a boss on the spider, just above the axle bore. This boss protrudes 1/8" beyond the face of the gear hub. With the 1/8" clearance between the axle gear and the wheel. As the wheel is being pressed solid against this boss, this clearance will be attained automatically. On all axle gears which do not have this boss, it is necessary that this 1/8" clearance between wheel hub and gear hub be maintained. Wheels on idler axles are mounted according to standard wheel practice.

## COMPENSATING FOR WHEEL SIZE VARIATIONS

In order to maintain safe operation, optimum adhesion and tractive effort levels, it is important to maintain reasonably equal loading between axles. Load equalization can be accomplished by shimming between the journal spring seat and the journal box to compensate for wheel size difference.

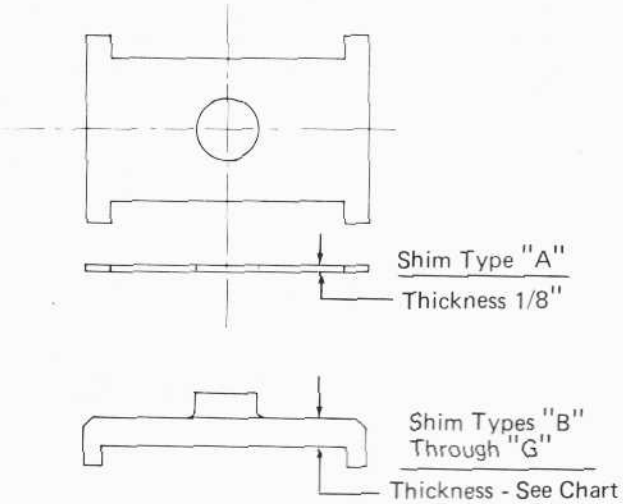
NOTE: Correct and properly qualified springs must be used or the entire shimming procedure is useless.

In order to determine the proper amount of shimming it will be necessary to measure all of the wheels on the truck. The average radius for each pair should be used. The radial difference between the largest pair of wheels and each other pair will indicate the amount of shimming required at each axle. An equal amount of shimming must be applied to both journal boxes on the same axle. There should be no shims added to the largest pair when shimming only to compensate for wheel size mismatch.

NOTE: If additional shimming is desirable for coupler, footboard and/or pilot height, an equal thickness of shims should be added to all journal boxes.

## APPLICATION OF SHIMS

The shims shown in Fig. 33 are designed for application between the journal box and the




| SHIM TYPE | THICKNESS | PART NUMBER |
|---|---|---|
| A | 1/8 | 8455980 |
| B | 1/2 | 8455981 |
| C | 3/4 | 8044686 |
| D | 1 | 8455982 |
| E | 1-1/4 | 8112192 |
| F | 1-1/2 | 8455983 |
| G | 1-3/4 | 8223384 |

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Fig. 33 – Wheel Size Compensating Shims

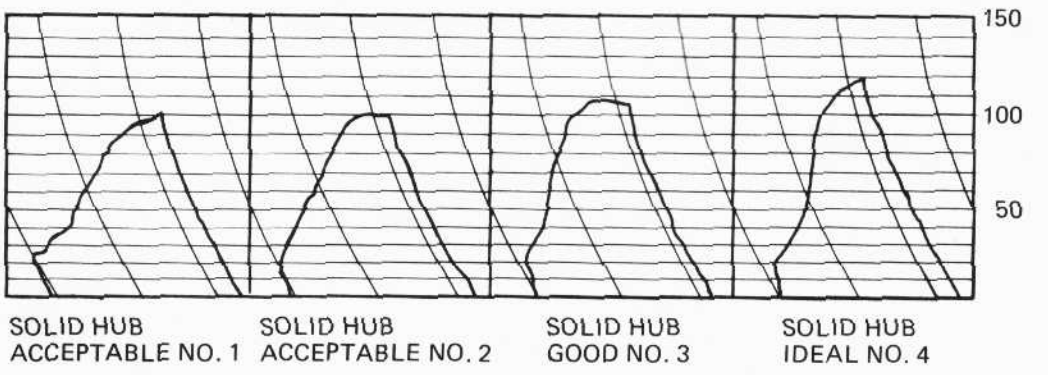


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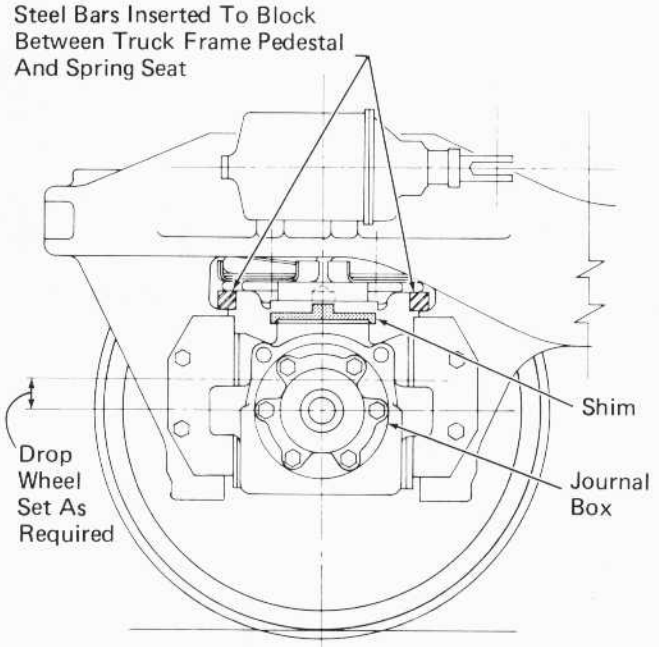
Fig. 32 – Typical Pressure Graph

journal spring seat. In order to apply the required shims at each journal box location, each axle requiring shimming should be moved over a single axle drop table. Suitable U-shaped steel bars should be placed between the truck frame pedestals and the spring seat as shown in Fig. 34. After removing the pedestal tie bars, the assembly can be lowered sufficiently to disengage each journal seat and permit the proper shim to be applied to the top of the journal box.




View Showing Axle, Wheel And Journal Box Lowered On Drop Table To Permit Application Of Shim

17056

Fig. 34 -- Application Of Shims

WARNING: Care should be exercised in securely blocking the spring seat due to the heavy spring forces involved. Blocking must be placed between the truck frame casting and the spring seat and not against the pedestal liners. This will prevent possible cracking of the pedestal liners as well as "cold flowing" of "Nylatron" pedestal liners which will result in short life. Special care should be taken when applying the bars to make sure they cannot "pop" out when the assembly is lowered causing possible injury.

After the shims are in place, the drop table is then raised to engage the journal box, shim and spring seat. The bars used to block the spring seat can then be removed. Journal boxes on the same axle must be shimmed equally.

Referring to Fig. 33, shim type "A" is designed to fit either directly on top of the journal box or on top of shim types "B" through "G." However, the number of shims type "A" applied directly on top of the journal box should be limited to a maximum of two and the number applied on top of shims "B" through "G" should be limited to one.

Shims "B" through "G" are designed to fit directly on top of the journal box. Therefore, any "A" type shims that may have been previously applied on top of the journal box should be removed before applying shims "B" through "G."

# SERVICE DATA

## REFERENCES

New Departure - Hyatt Journal Boxes With
Resilient Rubber Thrust Units . . . . . M.I. 1552
Grease Lubricated Cartridge - Type Journal Bearings . . . . . M.I. 1553

## SPECIFICATIONS

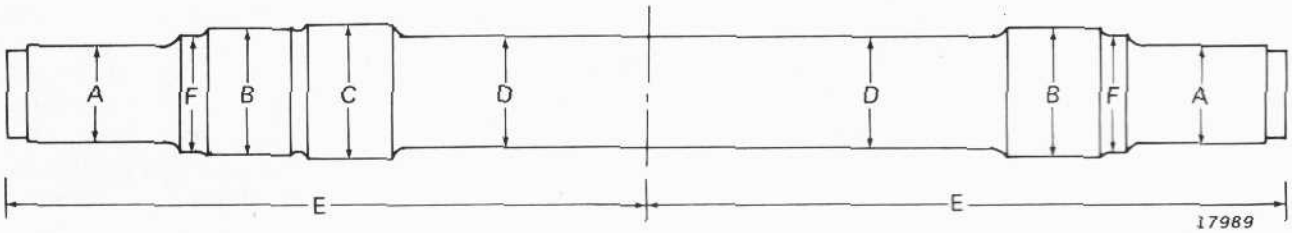
### RECOMMENDED WHEEL SIZE LIMITS (Tapes)

| | NEW | MAX. VARIATION |
|---|---|---|
| Wheels on same axle | | |
| GP, SD, DD | 1/2 | 2 |
| SW | 1 | 2 |
| Wheels on same truck | | |
| GP, SW | 3 | 20 (3/8" radius) |
| SD, DD | 3 | 14 (1/4" radius) |
| Wheels on same locomotive | | |
| GP, SD, SW | 14 | 32 (5/8" radius) |

WHEEL HARDNESS LIMITS

| CLASS | RANGE (BRINELL) |
|---|---|
| AR | 255-321 |
| BR | 277-341 |
| CR | 321-363 |

### REBUILD AXLE LIMITS




NOTE: All dimensions are in inches.

DIMENSION A

| | Friction Brg. Journal | 6-1/2" Straight Roller Bearing Journal | 6-7/8" Straight Roller Bearing Journal | Tapered Bearing | |
|---|---|---|---|---|---|
| | | | | Class F | Class G |
| New | 6.500<br>6.495 | 6.504<br>6.503 | 6.879<br>6.878 | 6.1915<br>6.1905 | 7.004<br>7.003 |
| Max. | 6.500 | 6.504 | 6.8795 | 6.1915 | 7.004 |
| Min. | 6.250 | 6.5015 | 6.8765 | 6.1905 | 7.003 |
| Max. Taper/Ft. | 1/32 | .001 | .001 | .001 | .001 |
| Max. Out-Of-Round | .005 | .001 | .001 | .001 | .001 |

# SERVICE DATA (CONT'D)

| | DIMENSION | | | | | |
|---|---|---|---|---|---|---|
| | B | | C | | D | |
| | SW Pass | F GP SD MP | SW Pass | F GP SD MP | SW | F GP SD MP |
| New | 9.231<br>9.230 | 9.231<br>9.230 | 9.251<br>9.250 | 9.251<br>9.250 | 8.525<br>8.248 | 8.002<br>7.998 |
| Max. | 9.231 | 9.231 | 9.251 | 9.251 | 8.252 | 8.002 |
| Min. | 9.000 | 9.125 | 9.250 | 9.250 | 8.125 | 7.875 |
| Max. Taper/Ft. | .002 | .002 | .002 | .002 | .005 | .005 |
| Max. Out-Of-Round | .002 | .002 | .002 | .002 | .005 | .005 |

DIMENSION E

| | SW Friction Bearings | SW Tapered Roller Bearings | Pass | F GP SD MP |
|---|---|---|---|---|
| New | 46-3/8<br>± 1/32 | 44-5/8<br>± 1/64 | 45<br>+0-1/64 | 45-1/2<br>+0-1/64 |
| Max. | 46-13/32 | 44-41/64 | 45 | 45-1/2 |
| Min. | 46-1/8 | 44-39/64 | 44-3/4 | 45-1/4 |

DIMENSION F

| | Friction Journal Bearing | 6-1/2 & 6-7/8 Roller Bearing Journal | Tapered Class F Bearing | Tapered Class G Bearing |
|---|---|---|---|---|
| New | 7.755<br>7.745 | 7.875<br>7.870 | 7.502<br>7.500 | 8.002<br>8.000 |
| Max. | 7.755 | 7.875 | 7.502 | 8.002 |
| Min. | 7.720 | 7.860 | 7.500 | 8.000 |

## EQUIPMENT LIST

Gauge, Split Collar Locating
- 6-1/2" Axle Journal Diameter . . . . . 8164608
- 6-7/8" Axle Journal Diameter . . . . . 8391625

# SERVICE DATA (CONT'D)

## TOOTH CONTOUR GAUGES

| Axle Gears | Teeth | Gauge |
|---|---|---|
| 8184378*-8306158** | 58 | 8370613 |
| 8184333 -8306159 | 59 | 8375379 |
| 8179295 -8306165 | 60 | 8342857 |
| 8184341 -8306164 | 61 | 8342857 |
| 8109579 -8299512 | 62 | 8342857 |
| 8200600 | 63 | 8361635† |
| 8428701 | 64 | 9098508† |
| 8178812 -8306163 | 65 | 8362635 |

| Pinion Gear | Teeth | Gauge |
|---|---|---|
| Integral with armature shaft | 12 | 8362636 |
| 8428702 | 13 | 9098509† |
| 8179135 | 14 | 8361636† |
| 8112029 | 15 | 8344485 |
| 8123881 | 16 | 8347119 |
| 8123883 | 17 | 8347120 |
| 8123884 | 18 | 8375380 |
| 8123885 | 19 | 8370612 |

*Without grease retainer rings.

**With grease retainer rings.

†Export only.

Axle gears within the regrinding limits may be returned to Electro-Motive La Grange for regrinding.

Figures 2 through 16 courtesy of The Association of American Railroads.