

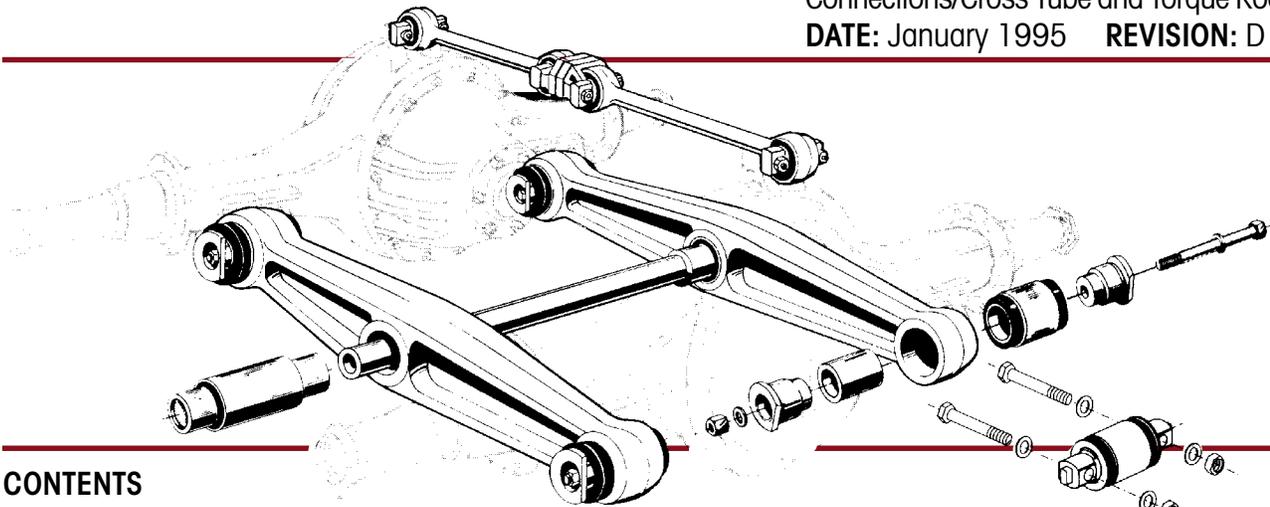
H TECHNICAL PUBLICATION

Basic Beam Components 340 Thru 520 Series

NO: 17730-190

SUBJECT: Equalizing Beams/Bushings/Beam End Connections/Cross Tube and Torque Rods

DATE: January 1995 REVISION: D



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The Hendrickson Bar Pin End Connection is manufactured under the following U.S. patent number 4699399.



Subject 1 INTRODUCTION

This publication is to acquaint and assist maintenance personnel in preventive maintenance and rebuild of common equalizing beam suspension components, including equalizing beam bushings, beam end connection hardware, torque rods, and cross tube. Use only genuine Hendrickson replacement parts for servicing these suspensions. Most Hendrickson parts can be identified by the Hendrickson  trademark.

Note the date of this publication. Hendrickson Suspension periodically revises and updates this publication. If this copy is more than one year old, contact Hendrickson Suspension to determine if a later copy is available.

Subject 2 IMPORTANT SAFETY NOTICE

Proper service and repair is important to the safe and reliable operation of the tandem suspension. The service procedures recommended by Hendrickson and described in this technical publication are effective methods of performing maintenance.

There are various warnings and cautions that should be read carefully to minimize the risk of personal injury and to assure that proper methods are used. Improper servicing may damage the vehicle or render it unsafe in operation.

WARNING:

HENDRICKSON SUSPENSION REMINDS USERS TO ADHERE TO THE PUBLISHED CAPACITY RATINGS FOR THE SUSPENSIONS. ADD-ON AXLE ATTACHMENTS AND OTHER LOAD TRANSFERRING DEVICES CAN INCREASE THE SUSPENSION LOAD ABOVE THE RATED AND APPROVED CAPACITIES WHICH COULD RESULT IN FAILURE AND LOSS OF VEHICLE CONTROL, POSSIBLY CAUSING PERSONAL INJURY OR PROPERTY DAMAGE.

ALUMINUM COMPONENTS WERE DESIGNED TO BE LIGHTWEIGHT OPTIONS WHERE WEIGHT REDUCTION IS DESIRABLE. THEIR USE SHALL BE CONFINED TO APPLICATIONS WHERE THE RATED CAPACITY OF THE SUSPENSION WILL NOT BE EXCEEDED. FAILURE TO LIMIT ALUMINUM COMPONENT APPLICATIONS TO RATED CAPACITY COULD RESULT IN CATASTROPHIC

FAILURE OF THE COMPONENT AND LOSS OF VEHICLE CONTROL, POSSIBLY CAUSING PERSONAL INJURY OR PROPERTY DAMAGE.

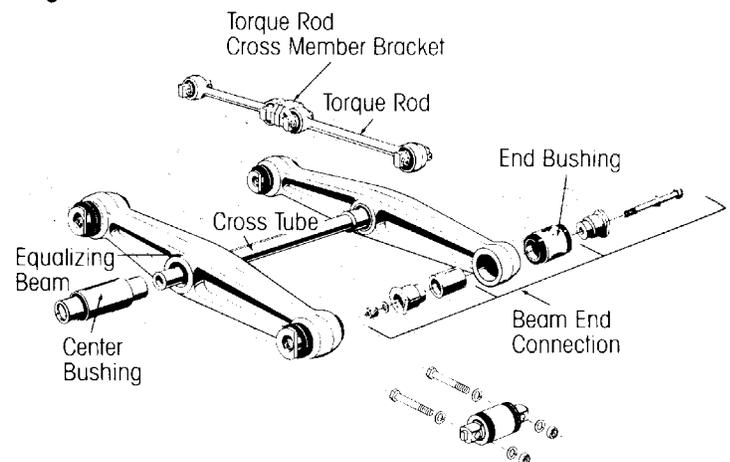
ALUMINUM COMPONENTS SUCH AS EQUALIZING BEAMS AND SADDLES CAN BE DAMAGED WITH PROLONGED EXPOSURE TO SALT, OR TO ACID WHICH IS SOMETIMES USED TO REMOVE CONCRETE. CONTINUED EXPOSURE COULD RESULT IN A FAILURE OF THESE PARTS AND LOSS OF VEHICLE CONTROL, POSSIBLY CAUSING PERSONAL INJURY OR PROPERTY DAMAGE.

ALUMINUM COMPONENTS CAN ALSO BE DAMAGED BY CONTACT WITH HARD OBJECTS WHICH GOUGE THESE PARTS. THESE CONDITIONS COULD RESULT IN A FAILURE OF THESE PARTS WHICH MAY RESULT IN THE LOSS OF VEHICLE CONTROL AND POSSIBLE PERSONAL INJURY OR PROPERTY DAMAGE.

DO NOT MODIFY OR REWORK PARTS. DO NOT USE SUBSTITUTE PARTS. USE OF A MODIFIED OR SUBSTITUTE PART IS NOT RECOMMENDED BECAUSE THE PART MAY NOT MEET HENDRICKSON'S SPECIFICATIONS, WHICH COULD RESULT IN FAILURE OF THE PART, LOSS OF VEHICLE CONTROL, AND POSSIBLE PERSONAL INJURY OR PROPERTY DAMAGE.

DO NOT USE A CUTTING TORCH TO REMOVE ANY ATTACHING FASTENERS. DO NOT USE A CUTTING TORCH TO REMOVE THE EQUALIZING BEAMS FROM THE AXLES OR TO REMOVE THE BUSHINGS FROM THE

Figure 1



The Boler Company
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Hendrickson Truck
Suspension Systems
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BEAM CENTERS OR ENDS. WELDING, TORCHING OR ATTACHING MATERIAL TO THE EQUALIZING BEAMS MUST NEVER BE PERFORMED. ALL HENDRICKSON EQUALIZING BEAMS ARE HEAT TREATED FOR STRENGTH AND SERVICE LIFE. THE USE OF HEAT ON SUSPENSION COMPONENTS WILL ADVERSELY AFFECT THE STRENGTH OF THESE PARTS. A COMPONENT DAMAGED IN THIS MANNER MAY RESULT IN THE LOSS OF VEHICLE CONTROL AND POSSIBLE PERSONAL INJURY OR PROPERTY DAMAGE.

A MECHANIC USING A SERVICE PROCEDURE OR TOOL WHICH HAS NOT BEEN RECOMMENDED BY HENDRICKSON MUST FIRST SATISFY HIMSELF THAT NEITHER HIS SAFETY NOR THE VEHICLE'S SAFETY WILL BE JEOPARDIZED BY THE METHOD OR TOOL SELECTED.

THE USE OF EXCHANGE EQUALIZING BEAMS IS STRICTLY DISCOURAGED UNLESS THE BEAMS WERE ORIGINALLY FROM THE SAME CUSTOMER WHERE THE HISTORY OF THEIR SERVICE IS SPECIFICALLY KNOWN. USING EXCHANGE BEAMS OF UNKNOWN ORIGIN, WHERE TIME IN SERVICE OR APPLICATION AND LOADINGS ARE NOT KNOWN, CAN LEAD TO FAILURE, RESULTING IN THE LOSS OF VEHICLE CONTROL AND POSSIBLE PERSONAL INJURY OR PROPERTY DAMAGE.

Subject 3 ALIGNMENT

The primary control for alignment is the location of the spring hangers on the frame rail by the vehicle manufacturer, and the location of the axle brackets as installed by the axle manufacturer.

Hendrickson has two styles of beam end connections. The most common connection uses rubber bushings with beam end adapters. The other style is a Bar Pin bushing discussed later in this publication which has an alignment feature. If you have the Bar Pin style end connection refer to Technical Publication 17730-213 for detailed alignment instructions.

Subject 4 DESCRIPTION

The rubber bushings in the equalizing beam centers and ends, and the torque rods, permit the articulation of the axles without friction or metal-to-metal contact.

During assembly of these bushings, the rubber is elongated and inserted between the inner and outer metals, creating a high pressure on the rubber which prevents slippage when subjected to torsional deflections. This design restricts excessive movement but allows sufficient movement to relieve stresses on the metal parts in cornering.

The two torque rods, together with the equalizing beams and connecting parts, make up a parallelogram style linkage as shown in Figure 2. This parallelogram arrangement assures positive axle alignment. Axle centers at the wheels always remain equidistant and therefore parallel.

On turns, the rubber bushed joints perform another function as shown in Figure 3. Through their

Figure 2—Parallel Alignment

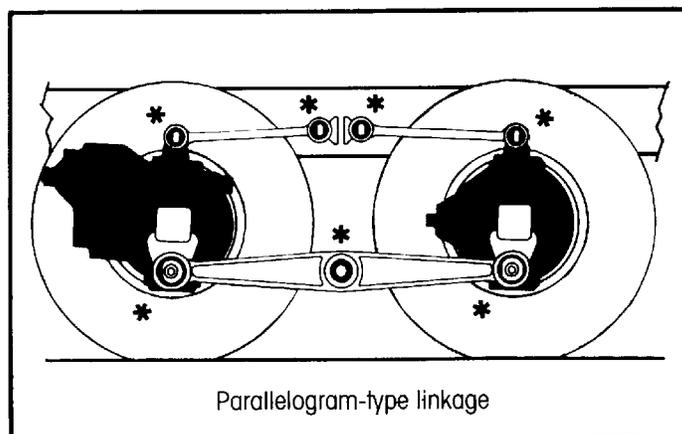
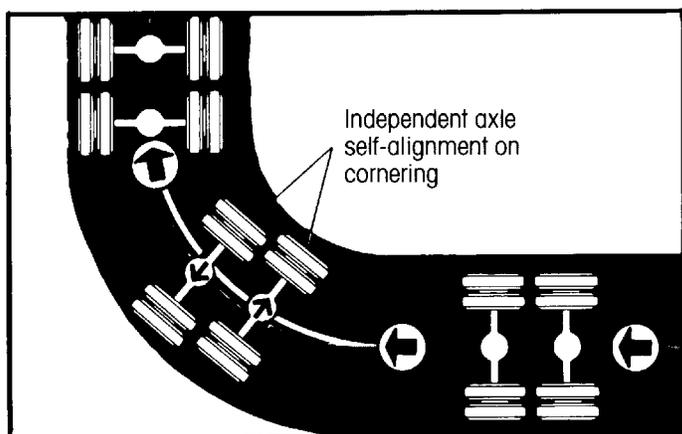


Figure 3—Self Alignment/Cornering





Subject 4 (continued)

DESCRIPTION

elasticity, each axle aligns itself independently on turns. The rubber bushings allow a certain amount of in-and-out movement of the axles from the staff to completion of a turn. This self-alignment feature permits each axle to follow its own natural course more closely. Once a straight line track is resumed, the action of the bushings squares off the tandem so that the leading tires set the tracking pattern for the rear tires. Rubber center bushings can allow each axle to move laterally up to 3" during a tight turn with a loaded vehicle.

Subject 5

TANDEM ARTICULATION

Suspension articulation is as shown in Figure 4.

Subject 6

TANDEM CROSS MEMBER RECOMMENDATION

Hendrickson recommends that a tandem cross member and frame liner assembly as shown in Figure 5 be installed in the chassis.

Subject 7

AXLE BRACKET WELDING RECOMMENDATION

The axle brackets on drive axles are furnished and welded into position on the axle by the axle manufacturer. The axle brackets on trailer axles may be furnished and welded into position on the axle by the axle manufacturer or by the trailer manufacturer. Hendrickson furnishes axle brackets for trailer axles only. When installing trailer axle brackets, the base of each axle bracket must fit flush and tight against the axle. The center lines of the left hand and right hand beam hanger brackets must be in absolute alignment and parallel with each other. They must also be parallel to the horizontal center line of the axle. The beam hanger brackets must be equally located from the center line of the axle and chassis. Any error in beam hanger bracket positions will result in misalignment of the suspension.

Figure 4—Tandem Articulation

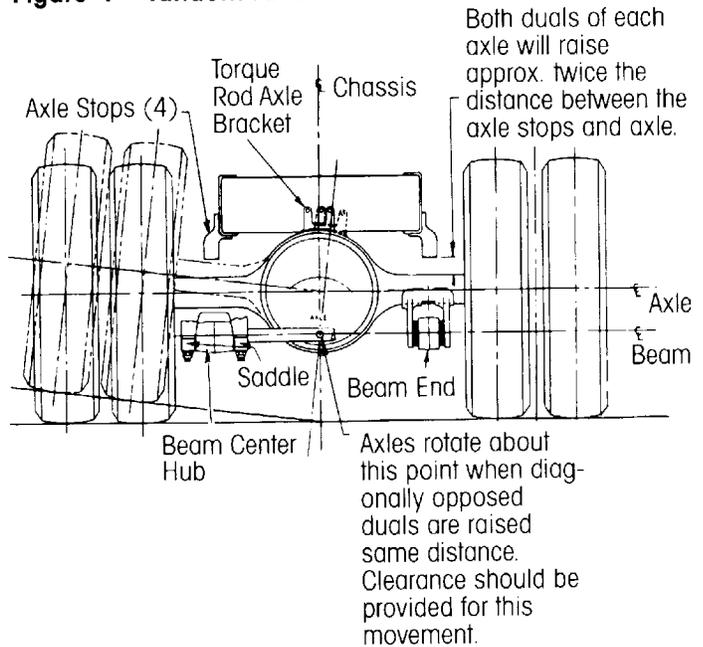
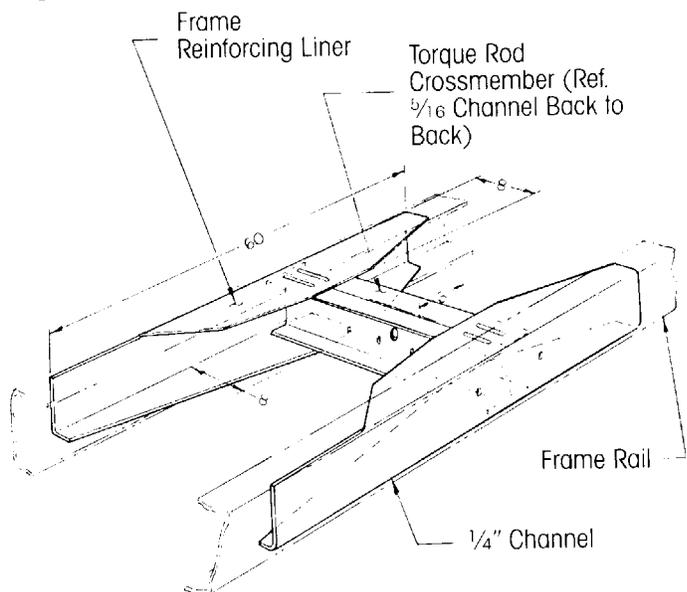


Figure 5





The torque rod axle bracket must be located on the vertical center line of the axle.

The following procedure is recommended when welding axle brackets to the axle as shown in Figure 6.

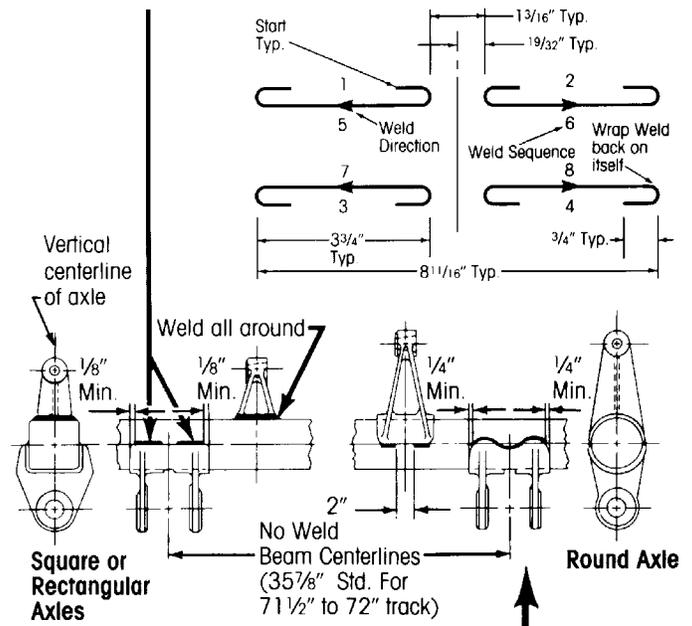
1. Axle and axle bracket must be at room temperature (50° F minimum).
2. Axle and axle bracket must be free from dirt, scale, paint, grease or any foreign substance which will adversely affect weld integrity.
3. Base of brackets must fit snugly against the axle.
4. Properly position axle brackets on axle to assure axle alignment.
5. The axle brackets may be tack welded to the axle provided the tack welds do not exceed 1" in length. Final welding must consume all tack welds.
6. Final weld size shall be 3/8" minimum fillet. Minimum weld length on beam hangers shall be per Figure 6.
7. All welds must be accomplished in the flat, horizontal position.
8. Clean weld between passes and after final pass.
9. Refer to Figure 6 for the direction and sequence of final weld. Minimize starts and stops during welding. Do not lay two (2) consecutive passes at the same location.
10. Recommended (or equivalent) consumables:
E70XX Oven-dried, low hydrogen electrode per AWS A5.1 or A5.5 E70S-X Wire per AWS A5.18
Electrode/wire diameter, voltage and amperage settings and gas mixture per manufacturer recommendations.

To insure compatibility between the suspension axle brackets and the axle, approval by the axle manufacturer is required.

Figure 6

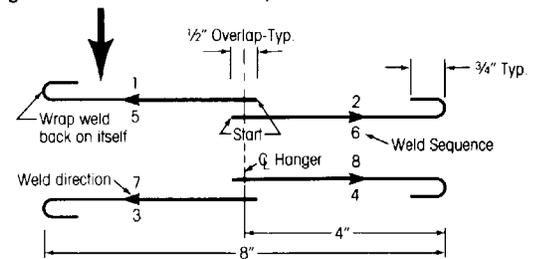
Square Axle Procedure

2 Welds 3 3/4" long per side. Do not carry welding past corner of bracket flange. See below for weld sequence and direction.



Round Axle Procedure

Weld 8" long both sides. Do not carry welding past corner of bracket flange. See below for weld sequence and direction.



Subject 8
PREVENTIVE MAINTENANCE

Proper preventive maintenance programs will help control repair costs and down time. This is important for safe and reliable operation. All new equipment should be given an initial pre-service inspection. This includes checking all the tightening torques of the Hendrickson tandem suspension as specified by the truck manufacturer, and as listed in the tightening torque specification chart at the end of the publication. We also recommend that all the tightening torques be checked with a torque wrench at least once a year.

BEAM END CONNECTIONS AND BEAM END BUSHINGS

There are five types of Hendrickson Beam End connections for rubber beam end bushings in suspension capacities of 34,000 through 52,000 pounds.

Three are Beam End Adapter connections and require that the fasteners be kept tight to maintain the clamp of the rubber bushing inner metals to the inside surface of the axle bracket legs. All bushing motion is accommodated by rubber deflection and there should be no motion between mating metal surfaces. The Beam End Adapter connections have the flange of the adapter cut off for assembly clearance with the axle housing bowl. The flat must be positioned vertically as shown in Figure 7 when the through bolt locknut is tightened.

The fourth is a Tube and Nut design. This Beam End connection requires that the locknuts be kept tight to maintain the clamp of the rubber bushing inner metals to the inside surface of the axle bracket legs. All bushing motion is accommodated by rubber deflection.

The fifth is a Bar Pin Style Beam End connection bushing. The bushing uses a beam hanger design as shown in Figure 10. This Beam End Bar Pin connection requires that the fasteners be kept tight to maintain the clamp of the axle bracket legs to the bushing inner metals. All bushing motion is accommodated by rubber deflection.

1. The three-piece design Beam End Adapter connection for suspension series 340 through 400, as shown in Figure 8, uses a $\frac{3}{4}$ " diameter Grade 8 through bolt. The two end adapters pilot into the bushing inner metal, and into the intermediate tube,

Figure 7

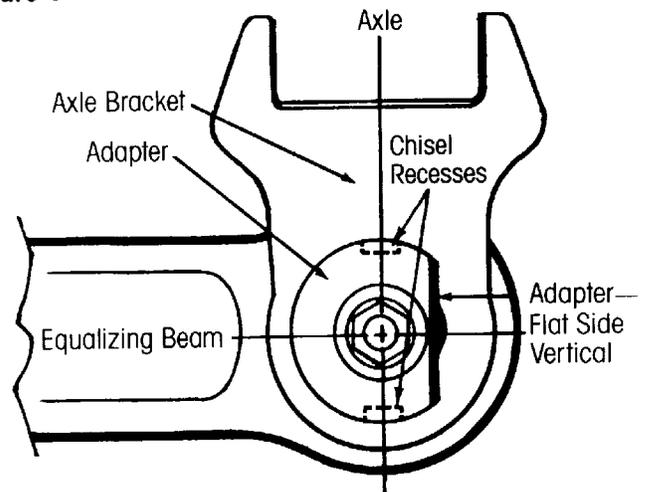
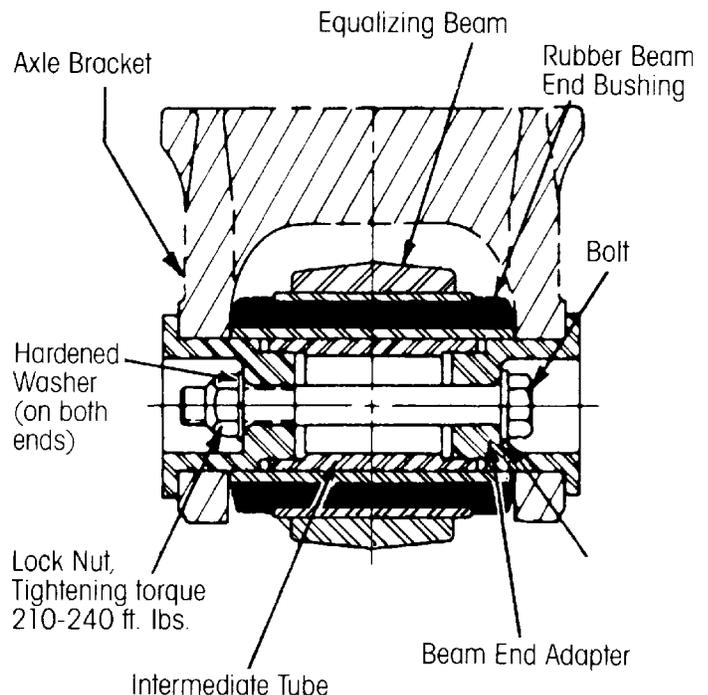


Figure 8

Three-Piece Adapter Connection, 340/400 Series.



Note: Adapters must not be used without intermediate tube.



giving full support to the bushing. The tightening torque for the through bolt locknut is 210 to 240 foot pounds.

2. The two-piece design Beam End Adapter connection for suspension series 340 and 380, as shown in Figure 9, uses a 3/4" diameter grade 8 through bolt. This beam end connection has been out of production since 1975. The two adapters pilot into the bushing inner metal. The tightening torque for the through bolt locknut is 210 to 240 foot pounds.
3. The Beam End Adapter connection for 460, 480, & 520 series suspensions and optional for 400 series suspensions, as shown in Figure 10, is a three-piece design with a 1" diameter grade 8 through bolt. The two end adapters pilot into the bushing inner metal, and into the intermediate tube, giving full support to the bushing. The tightening torque for the through bolt locknut is 445 to 495 foot pounds.
4. Also available as an option for 400 series suspensions is the tube and nut design as shown in Figure 11. The tube pilots through both axle bracket legs and the inner metal of the bushing. The tightening

Figure 9
Two-Piece Adapter Connection, 340/380 Series.

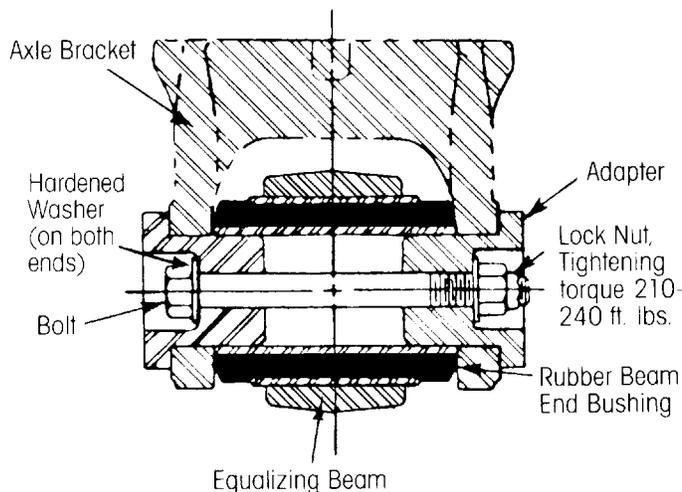


Figure 10
Three-Piece Adapter Connection, 460 Through 520 Series.

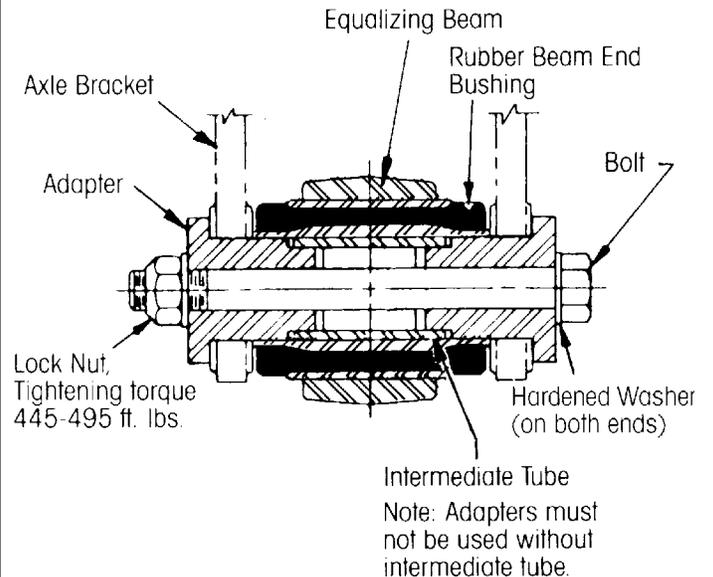
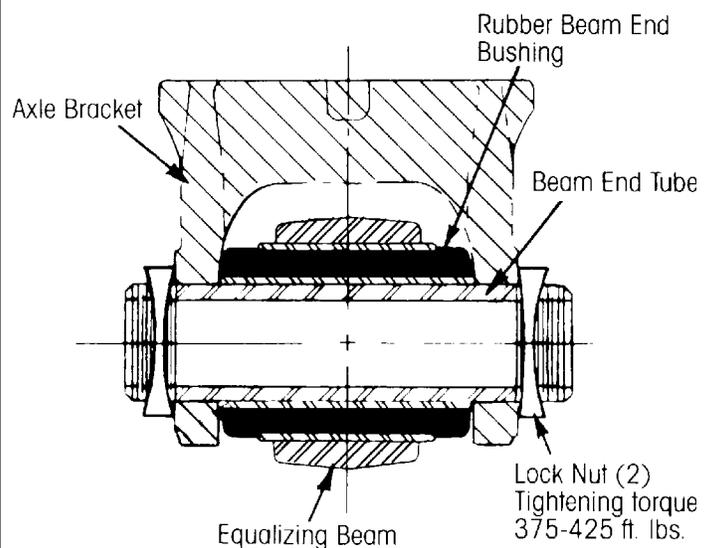
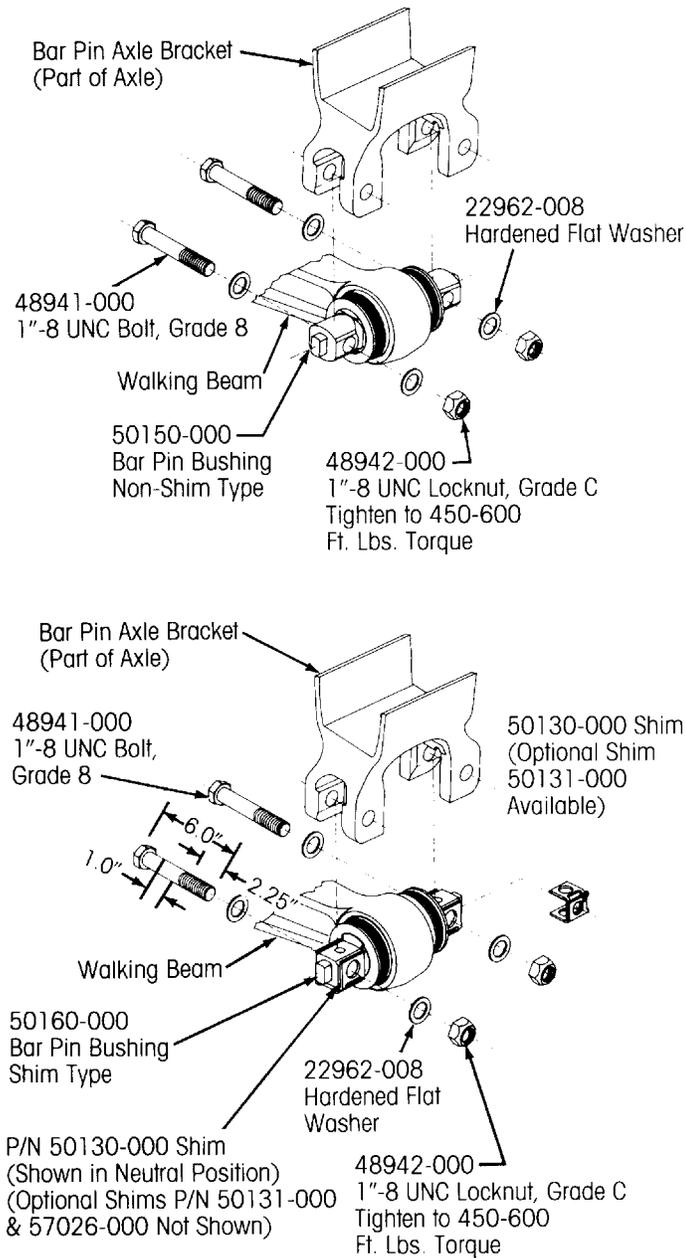


Figure 11
Tube & Nut Connection (Optional) 400 Series.



Subject 8 (continued)
PREVENTIVE MAINTENANCE

Figure 12



NOTE: Shim part number 50130-000 folded edge must be positioned away from confinement washer.

torque for the tube locknuts is 375 to 425 foot pounds. Properly tightened locknuts will partially flatten as shown in Figure 11.

- The Bar Pin Style Beam End connection for 340 through 520 Series suspensions, as shown in Figure 12, is a rubber bushing assembly consisting of a rubber insert, an outer metal tube, and an inner casting. It is fastened to the axle by two (2) one inch diameter, Grade 8 bolts and two (2) one inch, Grade C locknuts. One inch hardened, flat washers are located under both the bolt heads and the locknuts. The bolts are positioned parallel to the vehicle longitudinal axis making removal and assembly easy. The tightening torque for the Bar Pin connection with 1" bolts is 450 to 600 foot pounds.

For suspensions equipped with steel ball and bronze socket end bushings the Beam End connection is as shown in Figure 13. It uses a through shaft design with a 1 3/8" diameter shaft with slotted nuts.

This style requires periodic lubrication. The service life of the bushing depends on the severity of the operation and the frequency of lubrication.

The fasteners must be kept tight to maintain the clamp of the inside surface of the axle bracket legs against the shoulders of the steel ball. All bushing motion is accommodated between the bronze socket and the steel ball. There should be no motion between the steel ball and through shaft, or the axle bracket legs, or between the bronze socket and the beam end hub. The tightening torque for the through shaft nuts is 500 to 550 foot pounds. If the cotter pin holes in the shaft do not line up with the slots in the nuts, do not back off the nuts or increase the torque. The nuts may be tack welded to the shaft.

Most axle brackets have reducer spacers welded in place by the axle or vehicle manufacturer to accommodate the smaller through shaft diameter and narrower steel ball. There should be no movement of the reducer spacers in the axle bracket legs.

All types of beam end connections require that the fastener torque be checked with a torque wrench before a new or repaired vehicle is placed in service. Check the torque again after 1,000 miles of off-highway or severe service, or 10,000 miles of on-highway service. **DO NOT EXCEED TORQUE SPECIFICATIONS.**

NOTE: Hendrickson machines equalizing beams for



either rubber end bushings, or steel ball and bronze socket end bushings. Equalizing beams machined for rubber end bushings cannot be converted for use with steel ball and bronze socket end bushings. Equalizing beams machined for steel ball and bronze socket end bushings cannot be converted for use with rubber end bushings.

When it is necessary to have a vehicle in the shop for major repair work or preventive maintenance, place a jack under each beam end, as shown in Figures 14 & 15, to check for movement of the rubber end bushing inner metal. This movement cannot be eliminated by tightening the fasteners due to excessive wear to mating parts and increasing clearance tolerances. If movement is noted, do not operate the vehicle. Replace the rubber end bushing and all connecting parts.

Figure 13—Ball & Bronze Socket Beam End Connection

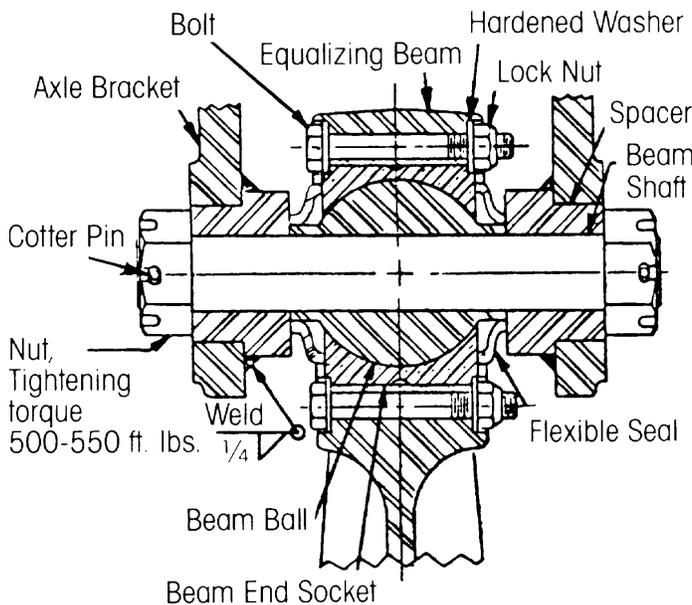


Figure 14—Beam/Beam End Bushing with three-piece adapter

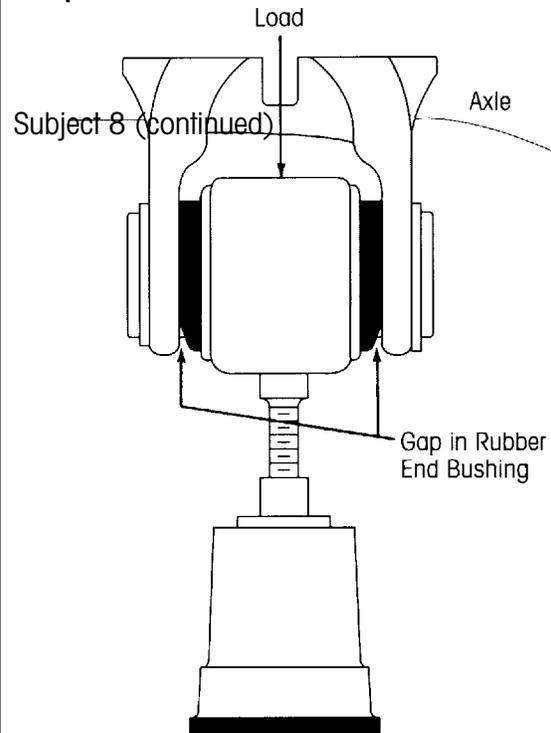
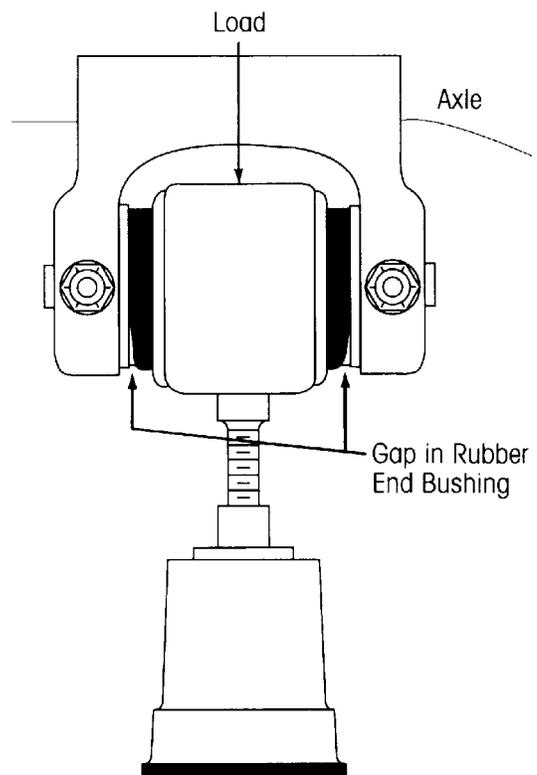


Figure 15—Beam with Bar Pin Type Bushing



PREVENTIVE MAINTENANCE

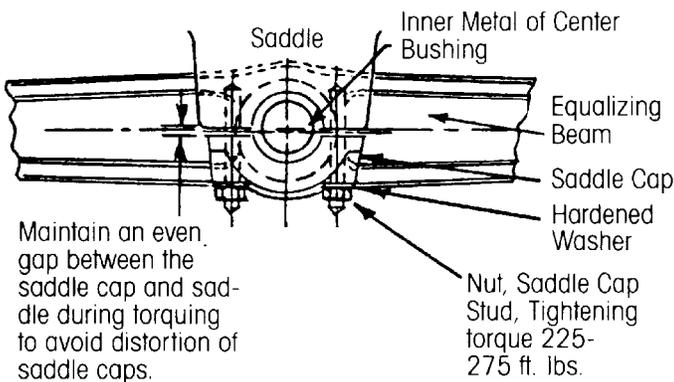
Periodic visual inspection by the driver and service personnel is also recommended. Look for the beam being lower in the beam hanger, or distorted or frayed rubber. Off-highway and severe service operating conditions require more frequent inspections than on-highway service operation.

The gap on each side of the visible rubber at the lower end of the end bushing is normal and not an indication to replace the bushing. Because all rubber end bushings are in compression, with the load bearing on the top side, the lower side of the rubber is slightly relieved, allowing the rubber to move inward, and a gap appears.

For vehicles equipped with bronze end bushings, raise each beam end with a jack. Movement of $\frac{1}{8}$ " or more before the axle is raised indicates excessive wear, and the bushing should be replaced.

RUBBER BEAM CENTER BUSHINGS

Figure 16—Equalizing Beam With Center Bushing Assembly To Saddle Assembly



NOTE: Axles must be in operating position before saddle cap fasteners are tightened (with rubber center bushings).

Exception: U/UE Series: Nut, saddle cap stud, tighten to 125-145 ft. lbs. torque.

The beam center bushings control the lateral movement of the axles during cornering. Rubber center bushings can allow up to 3" of lateral movement under load. The service life of the rubber center bushings depends on the style of operation. Normal wear is evidenced by the rubber shredding from each end of the bushings. Worn center bushings will allow increased lateral movement of the axles on turns beyond 3" and allow the inside walls of the tires to rub on the suspension frame hangers. This is a warning that the center bushings should be replaced before serious tire damage results.

The spring and saddle assemblies are attached to the center bushings of each equalizing beam with two saddle caps. Each cap clamps the center bushing inner metal to the saddle through studs in the saddle legs. The saddle caps must be installed so that there is an even gap between the caps and the base of the saddle legs as shown in Figure 16. If they are not installed evenly, they may become deformed, resulting in bent studs or damaged saddle cap stud threads.

BRONZE BEAM CENTER BUSHINGS

Bronze center bushings, as shown in Figure 17, are standard in the 460, 480, and 520 series, and are optional in most other series. They are not to be used with the U/UE and RU/RUE series suspensions.

Bronze center bushings are recommended for use on vehicles negotiating frequent tight turns or backing into position such as dump, transit mix, and refuse operations. However, if the vehicle is equipped with transverse rods, rubber center bushings must be used.

BRONZE CENTER BUSHINGS MUST NOT BE INSTALLED IN ALUMINUM EQUALIZING BEAMS. Use of bronze center bushings with aluminum beams could result in structural damage to the aluminum beam adversely affecting the strength of the beam which could result in failure, loss of vehicle control, and possible personal injury or property damage.

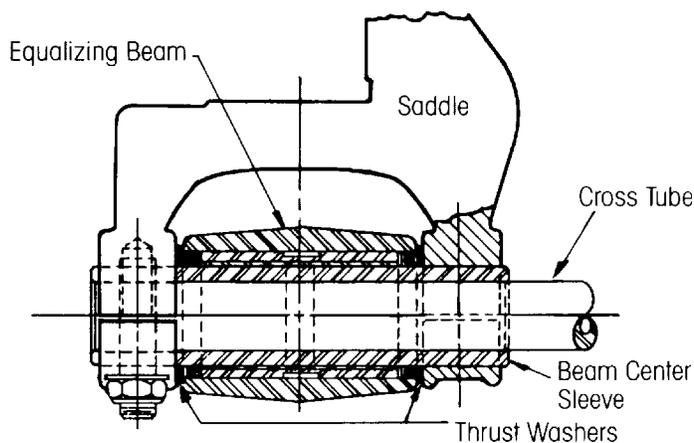
The lube fitting is located on the inside center hub area of the equalizing beam. Pressure lubricate with standard chassis lube until clean grease exits on both sides of the beam center hub. The rear of the chassis

should be raised to relieve load on the bushings to allow the proper flow of lubricant around the bushings. The interval of lubrication must be determined by the user taking into consideration the style of operating conditions in which the vehicle is used.

Original factory installations of bronze center bushings may have only one thrust washer on each side of each beam center hub. Often there is room for additional thrust washers. Also, there may be wear to the beam hub or the inside of the saddle legs. We recommend that in all cases additional washers be installed until the gap is less than the thickness of one thrust washer, i.e., install as many thrust washers as will fit. Operating a vehicle with an insufficient number of thrust washers may reduce the service life of the bronze bushings, and may allow the enough free side movement between the saddles and the beams to affect vehicle handling and steering "feel" by the operator.

Bronze center bushing wear can be checked by raising the saddle with a jack. Saddle movement of 0.125" or more before the beam raises indicates excessive wear, and the bushing should be replaced.

Figure 17—Bronze Center Bushings



BEAM CENTER CROSS TUBE

The beam center cross tube, as shown in Figure 17, connects the two equalizing beams through the inner metals of the beam center bushings. This tube restricts the side movement of the axles on turns.

The cross tube has clearance to float in the inner metals of the center bushings. In cornering it is clamped in position, maintaining suspension alignment. The length of the cross tube will allow side float of approximately 3". For this reason, the cross tube will appear polished at each end where it enters into the center bushing inner metal. This is normal.

A cross tube very seldom requires replacement, usually only when it has been bent, possibly due to hitting an unseen object. A bent cross tube will cause misalignment of the axles, and must be changed immediately to eliminate abnormal tire wear.

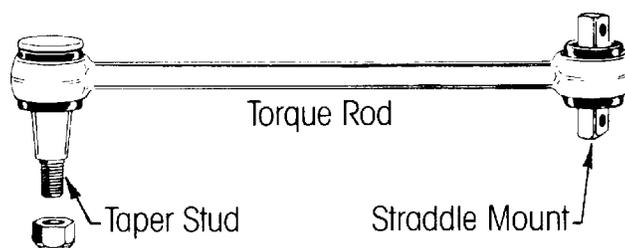
RUBBER BUSHED TORQUE RODS

The length of the torque rods is determined by the truck manufacturer for optimum drive line angles. The torque rods control these angles and also absorb driving and braking forces. The mounting brackets at the axle ends of the torque rods are furnished and welded into position on the axle housings by the axle manufacturer.

The torque rods, as shown in Figure 18, have attaching ends designated "straddle mount" and "tapered stud."

Straddle mount torque rod end attaching fasteners are furnished by the vehicle manufacturer. It is important that the tightening torque of the locknuts be checked during preventive maintenance service. Follow the vehicle manufacturer's specifications for tightening torque values. **NOTE:** Hendrickson Suspension recom-

Figure 18—Torque Rod End





Subject 8 (continued)

PREVENTIVE MAINTENANCE

mends Grade 8 bolts and Grade C locknuts be used for all straddle mount torque rod attachments.

Tapered stud torque rod locknuts also should be checked. The tightening torque is 175 to 225 foot pounds.

All torque rods can be inspected for looseness, or torn or shredded rubber. With brakes applied, slowly rock an empty vehicle with power while a mechanic visually checks the action at both ends. Or with the vehicle shut down, a lever check can be made with a long pry bar placed under each rod end and pressure applied.

Whether the ends are straddle mount or tapered stud, they can be renewed by pressing out the worn end and installing a cartridge style replacement. A two-piece torque rod is also available to cut and weld to the desired length.

Subject 9

REPLACING BEAM CENTER BUSHINGS

RUBBER CENTER BUSHING REPLACEMENT

Rubber equalizing beam center bushings for the 340 through the 520 series are available with the end plug as a separate item. These center bushings are designed for use with Owatonna Tool Company's portable hydraulic service tooling when only the beam center bushings require replacement. This job can be done without removing the equalizing beams or wheel equipment from the axles. A copy of the Owatonna Tool Company's bulletin covering their tools for servicing Hendrickson Suspensions is attached to this publication.

To replace rubber center bushings, block the front end of the vehicle to prevent movement of the vehicle during bushing removal and installation procedures. Remove the saddle caps and raise the rear of the truck frame until the saddle cap studs clear the equalizing beam.

The equalizing beam center bushings have a welded plug in the outside end of the inner metal to contain the cross tube as shown in Figure 19. Before service equipment can be used, this plug must be removed from both bushings. Use a 2" diameter hole

saw for 340 series center bushings, or a 2½" diameter hole saw for 400 through 520 series center bushings.

Before attempting to remove the beam center bushings, inspect the inside face of each equalizing beam center hub. If the outer metal of the center bushing is worn, the edge may have mushroomed over the face of the beam hub. This material must be removed with a chisel or disc sander before the tooling adapters can be positioned for bushing removal.

Follow Owatonna Tool Company's instructions to remove both rubber center bushings from the equalizing beams.

After removing the bushings, thoroughly inspect the beam bores. If torch undercutting is found from previous rebushing, replace with a new equalizing beam. DO NOT take the responsibility for possible road failure by rebushing a beam in this condition. Failure to replace an equalizing beam that has torch undercutting could result in the failure of that beam, leading to loss of vehicle control and possible personal injury or property damage.

When installing rubber center bushings the following steps will minimize the chance of spoiling a new bushing:

1. Clean the bores of the equalizing beams with emery cloth, removing any nicks or metal buildup from bushing removal.
2. The outer metals of new Hendrickson rubber bushings may have a phosphate coating which acts as a rust preventive. This coating must be removed with emery cloth before installation.
3. The equalizing beam bore may have a more substantial lead chamfer at one end of the bore than the other. Take advantage of the larger chamfer by pressing in the new bushing from this end.
4. Support the beam squarely at the bore area to avoid distortion of the beam bore or bending of the beam.
5. Lubricate the O.D. of the bushing and I.D. of the beam bore with white lead, grease, never seize, or other lubricant.
6. Make sure the bushing is square to the beam bore and press the bushing into beam.



The proportions of Hendrickson Suspension R-340 series rubber center bushings, 6664-000 and 22279-000, are long and slender as compared to our other bushings. This makes these bushings more difficult to install in equalizing beams. There is a tendency for the outer metals of these bushings to swell or "mushroom out" after they are partially pushed into the beam bores (this occasionally happens in our own factory when we press these bushings into new beams). In addition to following the steps above, measure the beam bore diameter and the bushing outside diameter. The Hendrickson specification for the beam bore diameter of new 340 series beams is 3.613/3.617". The bushing outside diameter specification is 3.620/3.622", and is to be taken as the mean of any two readings at 90 degrees, maximum ovality .010".

Install both rubber center bushings with Owatonna Tool Company's equipment.

Slide the beam center cross tube into the inner metals of the center bushings. The loose plugs received with the bushings must be arc welded to the tire side of each bushing inner metal. There is no heat effect to the beam or the new rubber bushing because of the distance from the point of welding.

Install the saddle caps, washers, and locknuts. Evenly tighten the locknuts as shown in Figure 20.

Figure 19—Rubber Center Bushing

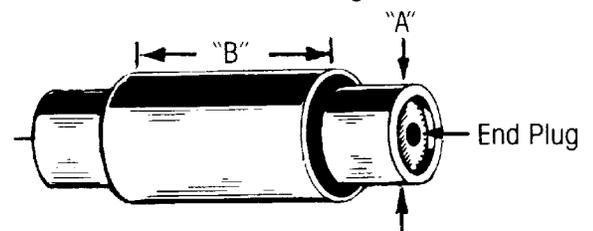
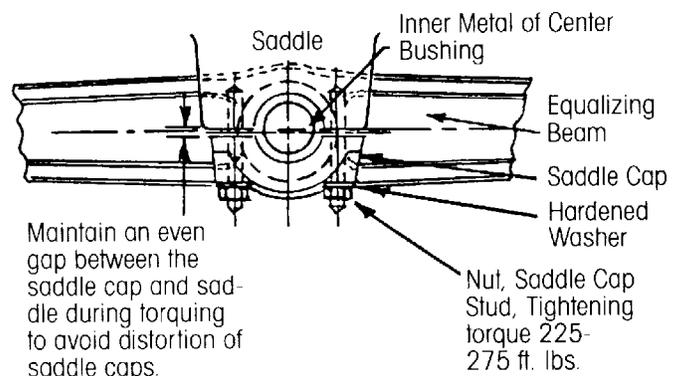


Figure 20—Equalizing Beam With Center Bushing Assembly To Saddle Assembly



NOTE: Axles must be in operating position before saddle cap fasteners are tightened (with rubber center bushings).

Exception: U/UE Series: Nut, saddle cap stud, tighten to 125-145 ft. lbs. torque.



SUBJECT 9 (continued)
REPLACING BEAM CENTER BUSHINGS

The part numbers and identification for rubber center bushings with loose end plugs as shown in Figure 19 are:

Part No. w/loose plug	Series	A Dim.	B Dim.	(Std. Part No. w/welded plug)
22279-000	340	2 ³ / ₄ "	7"	6664-000
22282-000	380	3 ¹ / ₂ "	7"	5919-000
49600-000	400	3 ¹ / ₂ "	7"	49400-000
28482-005	340	2 ³ / ₄ "	7"	29481-005
29484-005	460-520	3 ¹ / ₂ "	7"	29483-005

Note: 49600-000 may be used in place of 22282-000.

Standard rubber center bushings have the end plug welded in place. They should be used when it is necessary to remove the complete equalizing beam assemblies from the vehicle to replace both the center and end bushings.

Transverse rods are mandatory on 460, 480, and 520 series suspensions when the equalizing beams have rubber center bushings.

BRONZE CENTER BUSHING REPLACEMENT

To replace bronze center bushings, block the front end of the vehicle to prevent movement of the vehicle during bushing removal and installation procedures. Remove the saddle cops and raise the rear of the truck frame until the saddle cop studs clear the equalizing beam.

The center sleeves of the bronze bushing assembly and the cross tube can be removed by hand.

Follow Owatonna Tool Company's instructions to remove both bronze center bushings from the equalizing beams.

After removing the bushings, thoroughly inspect the beam bores. **If torch undercutting is found from previous rebushing, replace with a new equalizing beam. DO NOT take the responsibility for possible road failure by rebushing a beam in this condition. Failure to replace an equalizing beam that has torch undercutting could result in the failure of that beam, leading to loss of vehicle control and possible personal injury or property damage.**

Clean the bores of the equalizing beams with emery cloth, removing any nicks or metal buildup from bushing removal. Apply a coating of white lead or grease to the bushings and to the beam bores to facilitate pressing the new bushings into the beam bores.

Install both bronze center bushings and seals with Owatonna Tool Company's equipment as shown in Figure 21. Note that the seals are installed with their lips pointing outward. This allows grease to be purged past the seals during lubrication, and prevents outside contaminants from entering the bushings.

Assemble the beam center sleeves with the cross tube through both equalizing beam center bushings with thrust washers on each side of the beam center hub as shown in Figure 22. Install as many thrust washers as possible until the remaining gap is less

Figure 21—Bronze Center Bushings With Seals

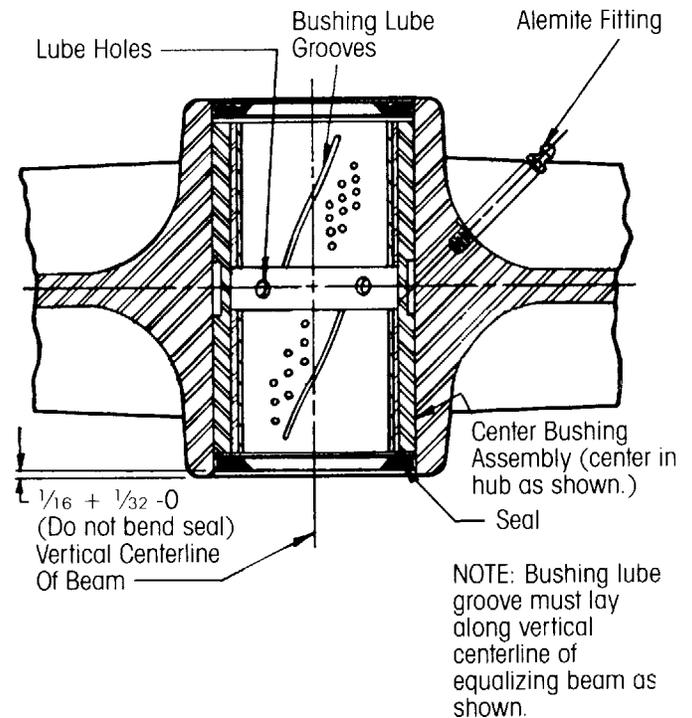
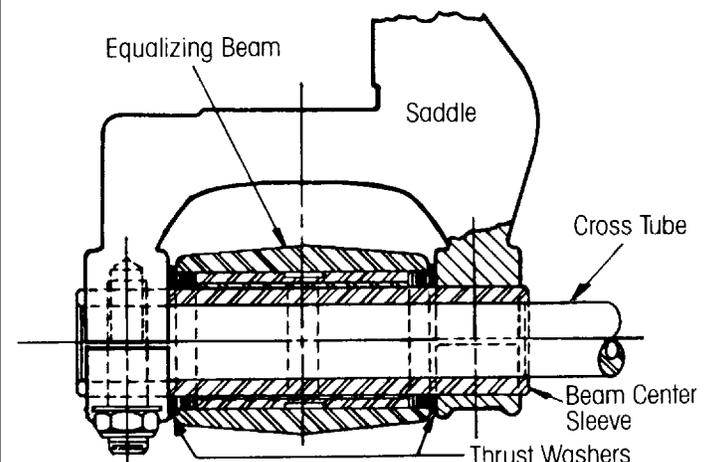


Figure 22—Beam Center Installed To Saddle



SUBJECT 9 (continued)

REPLACING BEAM CENTER BUSHINGS

than the thickness of one thrust washer. Each bronze center bushing kit, as shown in Figure 24, contains eight washers, enough for two washers at each side of each beam center hub. Operating a vehicle with an insufficient number of thrust washers may reduce the service life of the bronze bushings, and may allow the enough free side movement between the saddles and the beams to affect vehicle handling and steering "feel" by the operator.

Install the saddle cops, washers, and locknuts. Evenly tighten the locknuts as shown in Figure 23.

Pressure lubricate both bronze center bushings with standard chassis lube until clean grease exits on both sides of the beam center hub.

The equalizing beam bronze center bushing service kit part numbers are:

Kit Number	Series
30436-000	340
30437-000	400-520

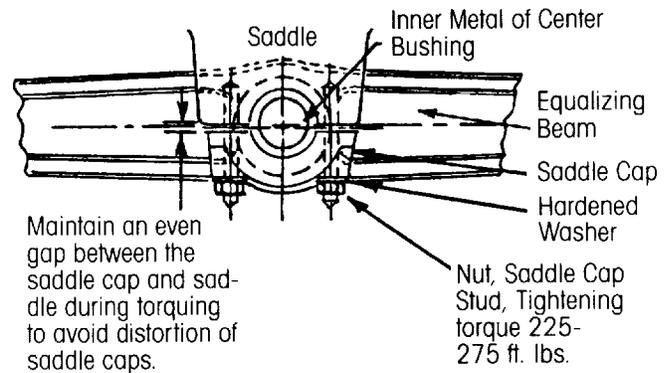
Each kit includes enough pods for one vehicle as shown in Figure 24.

CONVERSION FROM RUBBER TO BRONZE CENTER BUSHINGS

DO NOT INSTALL BRONZE CENTER BUSHINGS IN ALUMINUM EQUALIZING BEAMS, OR IN ALUMINUM OR STEEL EQUALIZING BEAMS IN U/UE AND RU/RUE SERIES SUSPENSIONS.

The inside of the equalizing beam center hubs must be drilled and tapped for the installation of the lube fittings as shown in Figure 25.

Figure 23—Equalizing Beam With Center Bushing Assembly To Saddle Assembly



NOTE: Axles must be in operating position before saddle cap fasteners are tightened (with rubber center bushings).

Exception: U/UE Series: Nut, saddle cap stud, tighten to 125-145 ft. lbs. torque.

Figure 24—Bronze Center Bushing Kit

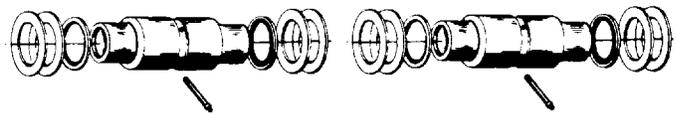
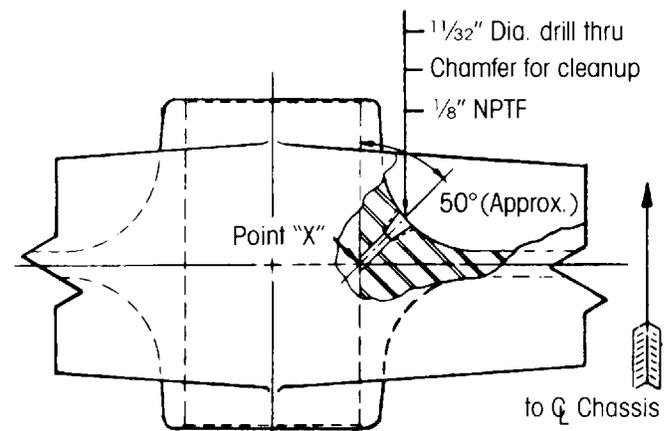


Figure 25—Hole Drilling Location/Lube Fitting



NOTE: Point X must fall on Q of beam center hub within $\pm 1/8$ ".



Subject 10

REPLACING TORQUE ROD BUSHINGS

Straddle mount torque rods ends, as shown in Figures 27 and 28, may be removed by removing the locknut, grade 8 bolts, washers, and any adjustment shims. Note the number of shims at each location as they must be reinstalled in the same manner to avoid affecting axle angle settings.

Tapered stud torque rod ends, as shown in Figure 29, may be removed from the bracket by loosening the locknut and rapping the axle bracket with a hammer to break the stud free.

Use Owatonna Tool Company's tool set to remove and install the torque rod bushings. Follow their instructions.

Straddle mount replacement cartridges as shown in Figure 26 are:

Part No.	Series	Outside Dia. (Dim. A)	Mounting Hole Dia.
44694-000	340	2.537/2.540"	5/8"
44695-000	400-520	2.755/2.758"	5/8"
49210-000	400-520	2.755/2.758"	3/4"

Figure 26

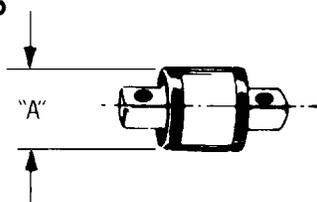


Figure 27—Torque Rod and Transverse Rod/Straddle Mount Installation

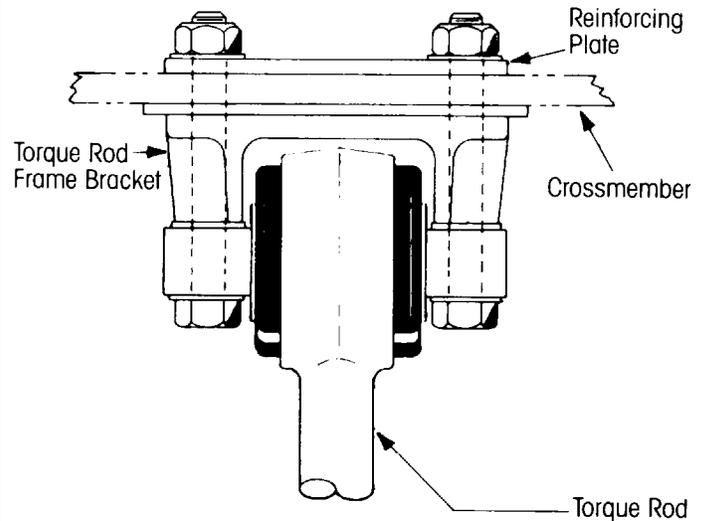
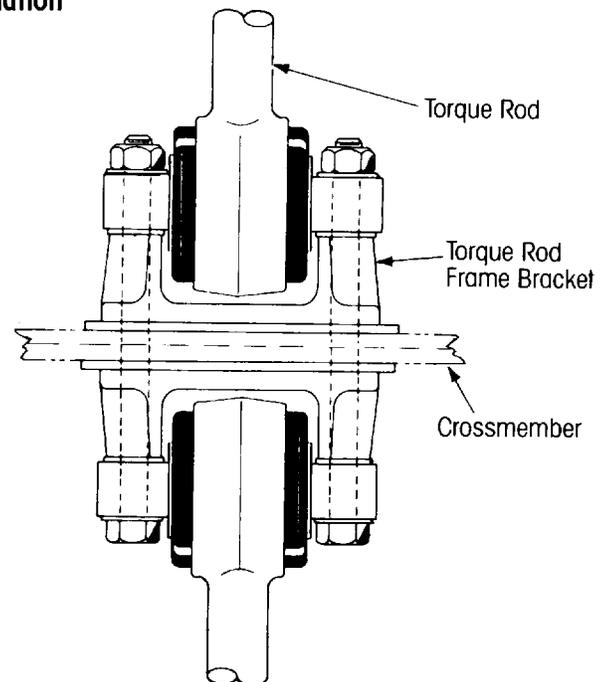


Figure 28—Back To Back/Straddle Mount End Installation





Subject 10 (continued)

REPLACING TORQUE ROD BUSHINGS

Tapered stud replacement cartridges as shown in Figure 30 are:

Part No.	Series	Outside Dia. (Dim. A)	Length (Dim. B)
44809-000	340	2.537/2.540"	2"
44697-000	380-520	2.755/2.758"	3"

The torque rod part number is stamped on the center of the shank as shown in Figure 31.

Two-piece torque rods with either tapered stud or straddle mount ends for 340 through 520 series are also available. They are cut and welded to the desired length in the field. See Hendrickson bulletin No. 45745-020 for complete details.

To install a straddle mount end, position the torque rod end at the bracket, and assemble the grade 8 bolts, washers, locknuts, and any adjustment shims as noted during disassembly. The vehicle manufacturer furnishes the attaching fasteners. Follow their tightening torque specifications.

To install a tapered stud end, the bracket hole must be free of all foreign matter. Place the stud in the bracket and assemble the locknut, with spacer washer if so equipped, and tighten the locknut to 175 to 225 foot pounds torque. After tightening, rap the bracket with a hammer as shown in Figure 29, and retighten to 175 to 225 foot pounds torque.

Figure 29—Tapered Stud Ends/Installation

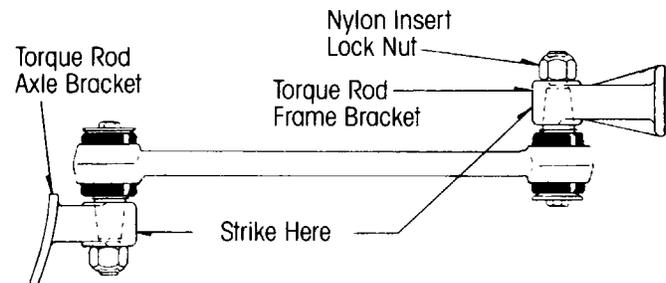


Figure 30

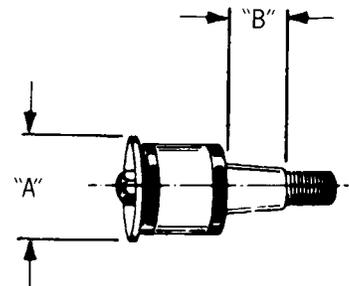
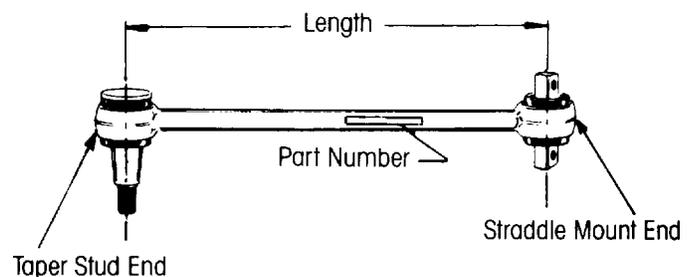


Figure 31





Subject 11

MAJOR REBUILD PROCEDURE

Experience in servicing Hendrickson equalizing beam suspensions indicates that when a major overhaul is required, the tandem axles with wheels and tires, and the equalizing beams should be removed as a complete unit as shown in Figure 32. However, the torque rods and other components may be removed separately as may be necessary.

Block the tires of the front steering axle and both tandem axles to prevent vehicle movement.

Drain the vehicle air system and disconnect all air lines leading to the rear axles. Mark the air lines for later assembly reference.

Unlock all spring parking brakes on the tandem axles and disconnect the drive shaft from the front of the forward drive axle.

Remove both torque rods at the axle bracket ends.

WARNING: IT IS POSSIBLE THAT THE EQUALIZING BEAM END CONNECTIONS TO THE AXLE BRACKETS ARE LOOSE. IF THEY ARE, THE AXLES COULD BE FREE TO PIVOT ON THE BEAM ENDS. USE NECESSARY BLOCKING TO PREVENT HARM TO PERSONNEL AND TO AVOID DAMAGE TO THE INTER-AXLE DRIVE LINE, POWER DIVIDER, AND DIFFERENTIAL CARRIERS. FAILURE TO DO SO COULD RESULT IN THE LOSS OF VEHICLE CONTROL AND POSSIBLE PERSONAL INJURY OR PROPERTY DAMAGE.

Remove the saddle cap locknuts, washers, and saddle caps as shown in Figure 33.

Raise the rear of the vehicle frame and roll the axles with the equalizing beams attached out from under the vehicle as shown in Figure 32. Replace the locknuts on the saddle cap studs to protect the threads.

Figure 32—Axles with Equalizing Beams Rolled Out

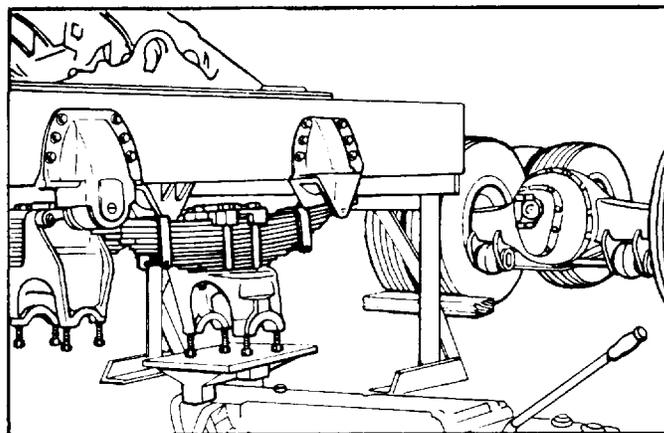
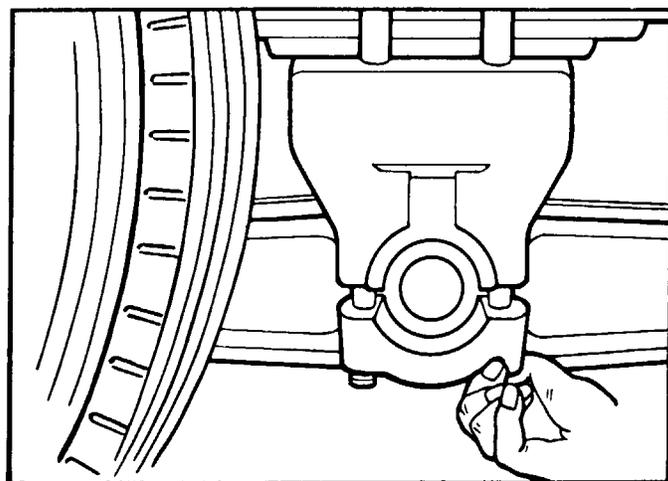


Figure 33—Removing Saddle Caps



Subject 11 (continued)
MAJOR REBUILD PROCEDURE

REMOVING BEAM END CONNECTIONS
340 THROUGH 400 ADAPTER REMOVAL

Removal of the 340 through 400 beam end adapters as shown in Figure 34 can be done with Owatonna Tool Company's beam end adapter puller set, or with an air hammer chisel. In either operation, it is recommended that a penetrating oil be applied to all beam end connections.

If Owatonna Tool Company's tooling is to be used, follow their instructions.

If the air hammer chisel method is to be used, begin by removing the through bolt locknut, washers and grade 8 bolt. The adapters have two chisel entry recesses located in their flanges as shown in Figure 35. With the air hammer chisel, turn the adapter to locate the recesses for entry of the chisel as shown in Figure 37.

Figure 34
Three-Piece Adapter Connection, 340 & 400 Series.

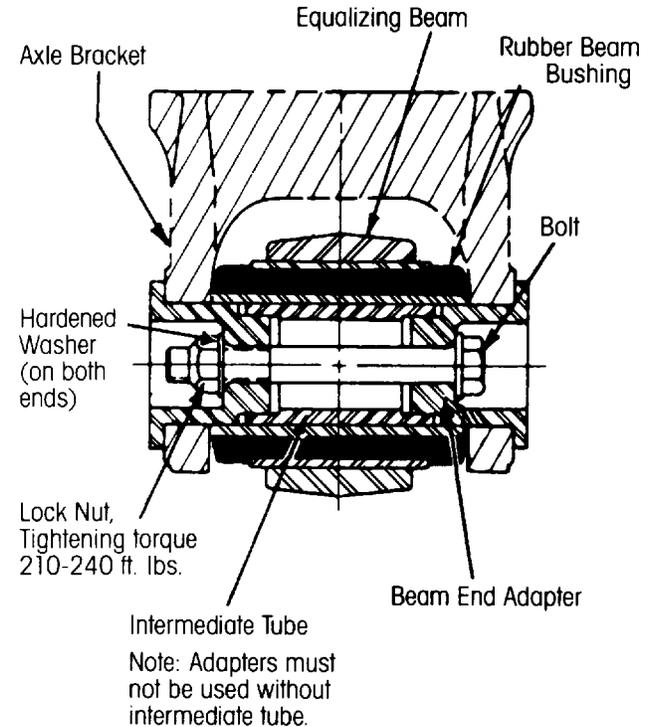
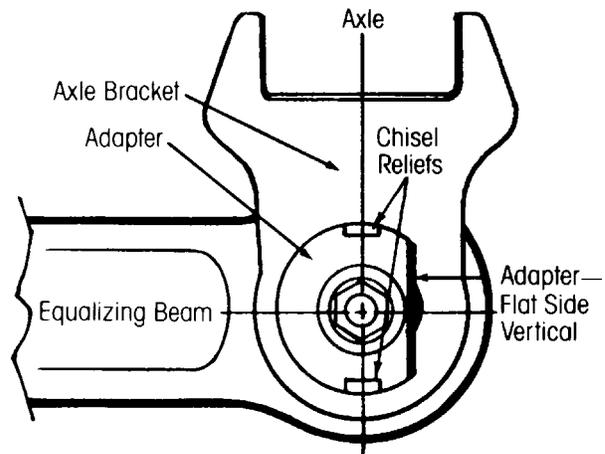


Figure 35
Adapter Flat/Vertical. Adapters shown in Figures 8, 9 and 12 (see pages 6 and 7) must be installed with flat in vertical position.



If the adapter does not turn, use a hammer to rap the outside of the axle bracket legs around the adapter area and repeat with the air hammer chisel. When the adapter has space between the axle bracket and the adapter flange, use a bent chisel as shown in Figure 36 to wedge and force the adapter out. Support the end of the beam as it may drop when the other adapter is removed. **Whether the adapters are removed with Owatonna Tool Company's tooling, or with the air hammer chisel, discard them, DO NOT REUSE THEM. Because the adapters which are removed may be worn or damaged in removal, reuse of such adapters could result in a failure leading to loss of vehicle control and possible personal injury.**

460-520 ADAPTER REMOVAL

Special tooling for removal of the 460 through 520 series beam end adapters as shown in Figure 38 is not available at this time. It will be necessary to use the air hammer chisel method suggested in the foregoing subject.

TUBE AND NUT REMOVAL

Removal of the tube and nut beam end connection as shown in Figure 39 can be done with Owatonna Tool Company's tube removal set, using one of the nuts with a spacer bushing as a puller, or with a powered portable reciprocating hacksaw.

In all operations, it is recommended that a penetrating oil be applied to all beam end connections.

If Owatonna Tool Company's tooling is to be used, follow their instructions.

If the spacer bushing method is to be used, begin by removing the two tube nuts. Use a spacer bushing between the hanger leg and one nut, tightening the nut to pull the tube loose.

If the powered reciprocating hacksaw method is to be used, saw through the tube along the inside surface of both axle bracket legs. Do not damage the axle bracket leg surfaces.

Figure 36—Air Hammer Chisel

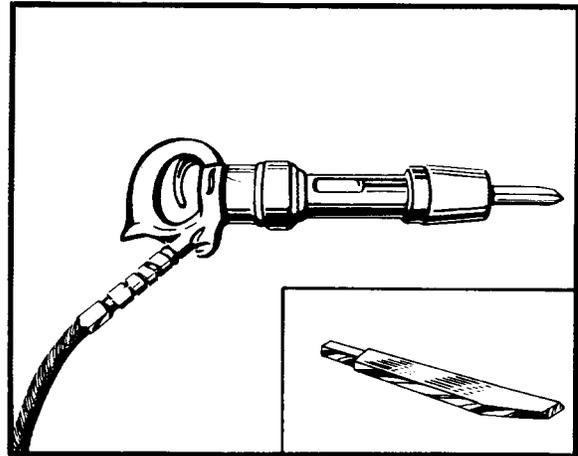
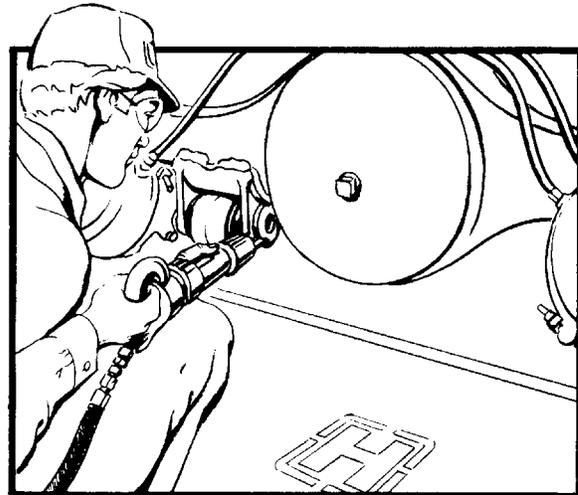


Figure 37—Air Chisel Removal of Adapters



Subject 11 (continued)
MAJOR REBUILD PROCEDURE

WARNING: In all cases, support the end of the beam as it may drop when the end connection is removed. Failure to do so could result in personal injury.

BAR PIN BEAM END CONNECTION REMOVAL

Begin removal of the bar pin beam end connection as shown in Figure 40 by applying a penetrating oil to the threads of 1" diameter bolts and locknuts that connect the end bushing inner casting to the axle bracket. While supporting the end of the beam, remove the bolts. If the fasteners are rusted in place, an air hammer chisel may be used to loosen the bolt from the axle bracket and bushing. Note: the upper torque rods may have to be disconnected at the top of the axle and the axle rotated to a more vertical position to assist in the removal of the bar pin bushing from the axle bracket. **CAUTION:** Support the end of the beam as it may drop when the through bolts are removed. After all fasteners are removed they should be discarded. **DO NOT REUSE THE FASTENERS.**

The rubber end bushings can be removed with Owatonna Tool Company's tooling or with shop made tools.

STEEL BALL WITH BRONZE SOCKET THROUGH SHAFT REMOVAL

Begin removal of the steel ball and bronze socket beam end connection as shown in Figure 41 by applying a penetrating oil on the slotted nuts, and between the axle bracket legs and the steel ball ends.

Remove the cotter pins from the nuts and remove the nuts on the through shaft on each side of the axle bracket. If the nuts are rusted to the shaft, chip them off with an air hammer chisel.

If the shaft is rusted to the axle bracket and the steel ball, use an air hammer with a blunt end punch, and drive it out. If this is unsuccessful, use a powered portable reciprocating hacksaw and saw through the steel beam ball shoulder and shaft on each side. **DO NOT** damage the axle bracket spacer end surfaces.

WARNING: In all cases, support the end of the beam as it may drop when the end connection is removed. Failure to do so could result in personal injury.

Figure 38
Three-Piece Adapter Connection, 460, 480 & 520 Series.

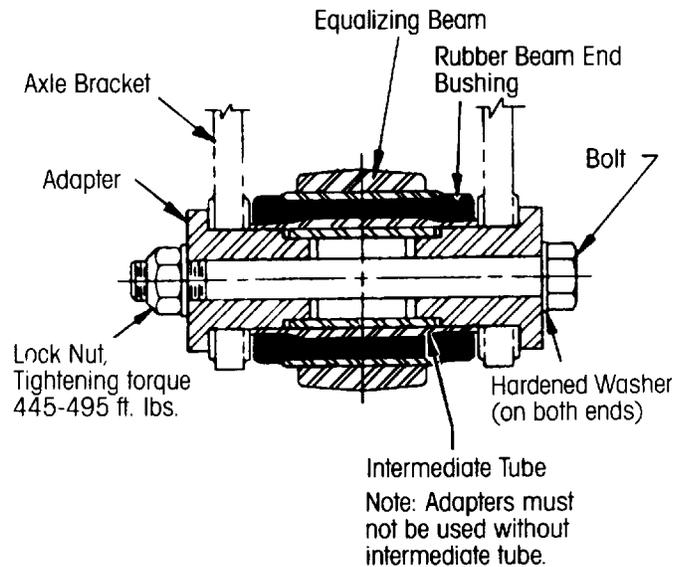


Figure 39
Tube & Nut Connection (Optional) 400 Series.

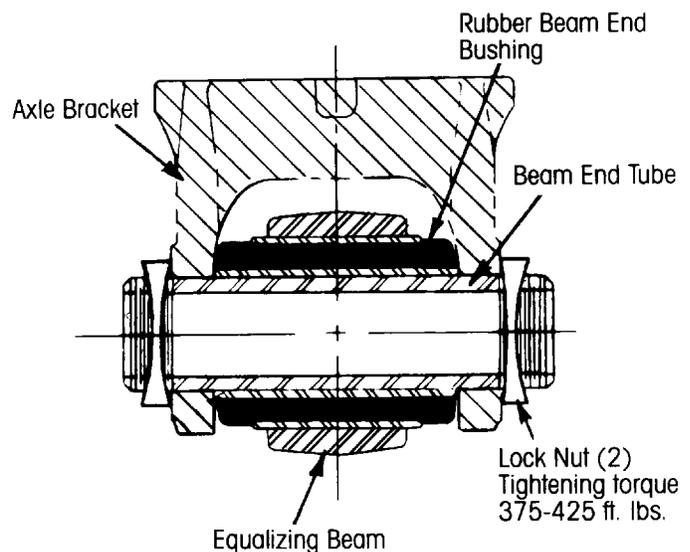
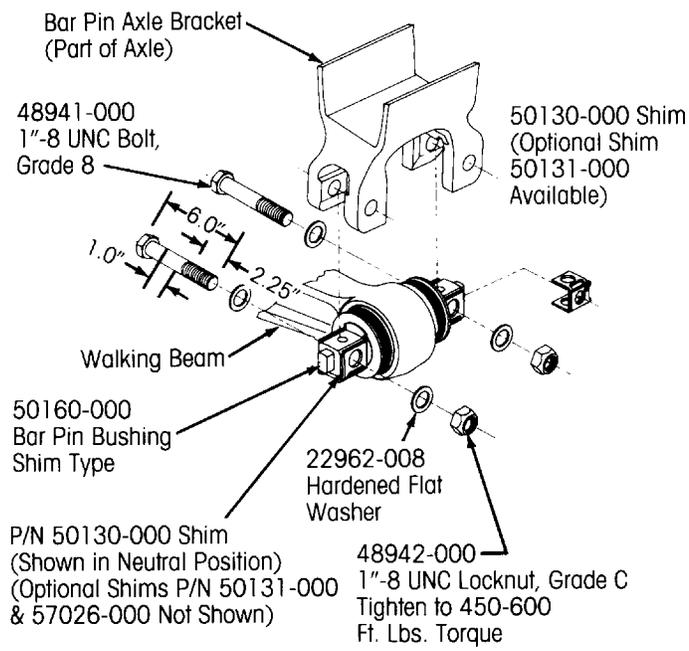
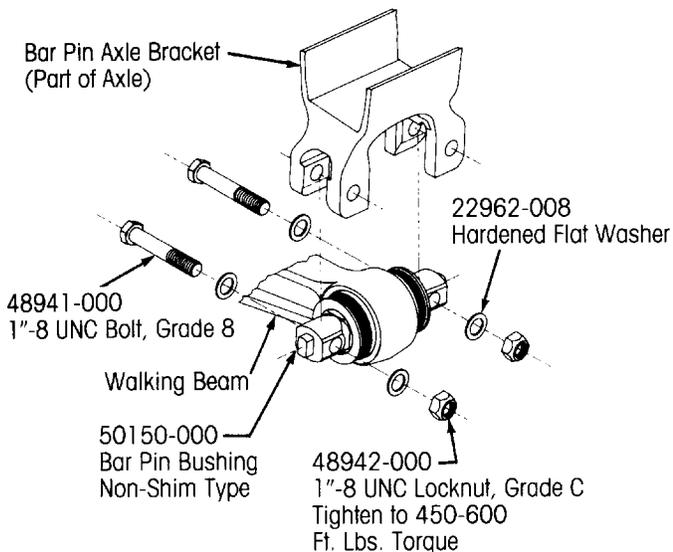


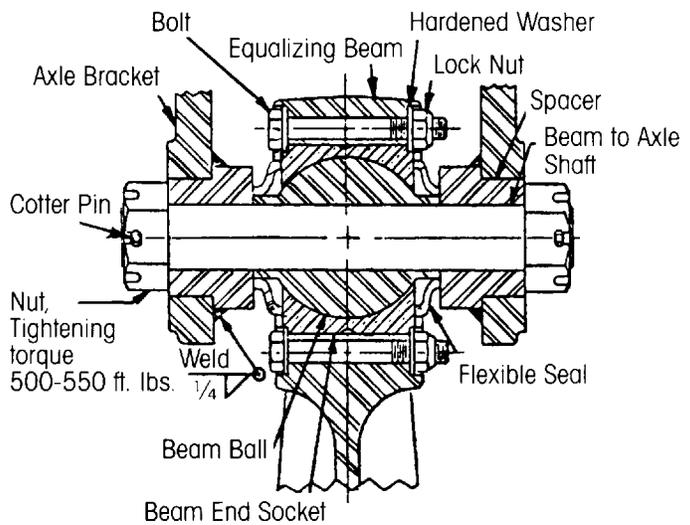


Figure 40



NOTE: Shim part number 50130-000 folded edge must be positioned away from confinement washer.

Figure 41—Ball & Bronze Socket Beam End Connection



BEAM CENTER CROSS TUBE REMOVAL

When the equalizing beam ends have been removed from the axles, the beams can be separated from the cross tube by pulling them apart by hand.

TORQUE ROD REMOVAL

Remove the torque rods from the cross member. Note the number of shims at each location as they must be reinstalled in the some manner to ovoid affecting axle angle settings.

EQUALIZING BEAM BUSHING REMOVAL

WARNING: When removing and installing bushings in equalizing beams, follow procedures outlined in this publication. **DO NOT USE A CUTTING TORCH** to remove the bushing outer metals pressed in the beam bores. **WELDING, TORCHING OR ATTACHING MATERIAL** to the equalizing beam must never be performed. All Hendrickson equalizing beams are heat treated for strength and service life. The use of heat adversely affects the strength of the beams. Damage to the beam caused by welding-torching or attaching material to the beam could result in a failure which may cause loss of vehicle control and possible personal injury or property damage.

After removing equalizing beam bushings, thoroughly inspect each beam bore. **If torch undercutting is found from previous rebushing, replace with a new**

Subject 11 (continued)
MAJOR REBUILD PROCEDURE

equalizing beam. DO NOT take the responsibility for possible road failure by rebushing a beam in this condition. Torch undercutting of a beam adversely affects its strength which could result in a loss of vehicle control in the event of a failure and possible personal injury or property damage.

Use a shop press with a capacity of at least 80 tons.

RUBBER END BUSHING REMOVAL

Rubber end bushings can be removed with Owatonna Tool Company's tooling, or with shop mode tools.

If Owatonna Tool Company's tooling is to be used, follow their instructions.

For Bar Pin style bushings begin by removing the confinement washer from one end of the bushing for pushing tool clearance. This may require the use of a chisel where the washer has been staked to the inner casting of the bushing as shown in Figure 42 & 43.

Then cut the protruding rubber on the same end of the beam end bushing as shown in Figure 44. This permits the pushing tool to contact the outer metal of the bushing.

A piece of 4¼" O.D. by 4" long steel tubing can be used to remove all 340 through 520 series rubber end bushings.

Use a shop press with a capacity of at least 80 tons. Place the equalizing beam in the shop press with the beam end bore squarely supported on the press bed for safety, and to avoid bending the equalizing beam.

Center the pushing tool on the outer metal of the bushing and push the bushing out of the beam bore.

Beam End Adopter style bushings can be removed with Owatonna Tool Company's tooling, or with shop mode tools.

If Owatonna Tool Company's tooling is to be used, follow their instructions.

If shop mode tools are to be used, begin by cutting the protruding rubber off one side of each beam end bushing as shown in Figure 44. This permits the pushing tool to contact the outer metal of the bushing.

A piece of 4¼" O.D. by 4" long steel tubing can be used to remove all 340 through 520 series rubber end bushings.

Figure 42

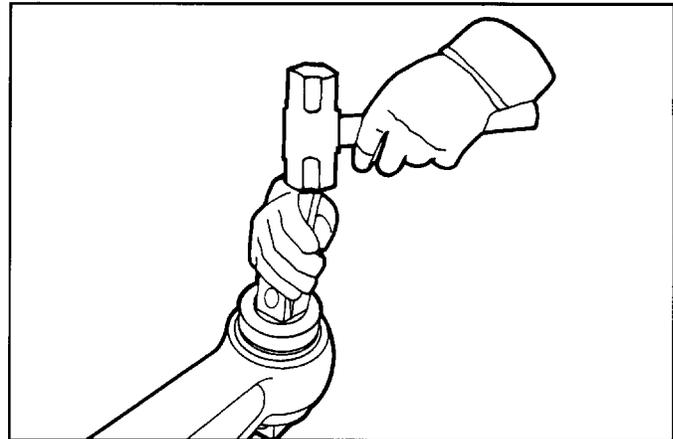


Figure 43

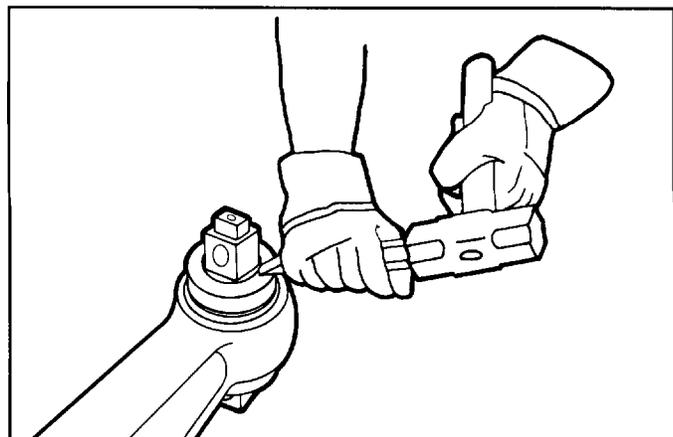
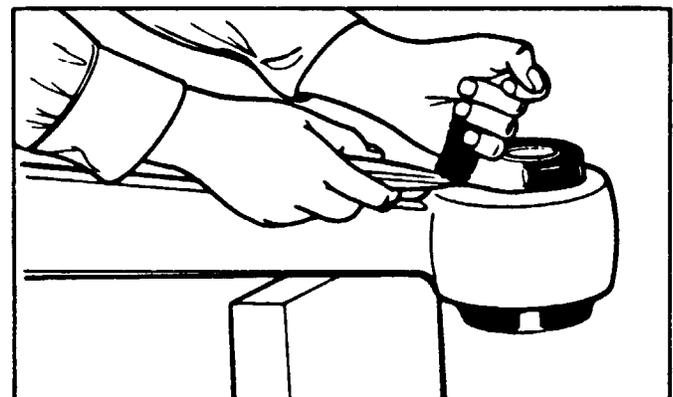


Figure 44—Cutting Off Rubber On One Side For Pushing Tool Clearance





Use a shop press with a capacity of at least 80 tons. Place the equalizing beam in the shop press with the beam end bore squarely supported on the press bed for safety, and to avoid bending the equalizing beam.

Center the pushing tool on the outer metal of the bushing and push the bushing out of the beam bore.

STEEL BALL AND BRONZE SOCKET END BUSHING REMOVAL

Remove the two grade 8 bolts, washers, and locknuts that key lock each bronze socket assembly to the equalizing beam.

A piece of 3½" O.D. by 7" long steel tubing will remove the bushing.

Place the equalizing beam in the shop press with the beam end bore squarely supported on the press bed for safety, and to avoid bending the equalizing beam.

Center the pushing tool on the bronze socket and push the bushing out of the beam bore.

RUBBER CENTER BUSHING REMOVAL

Before attempting to remove rubber center bushings, inspect the bushing outer metal for any mushrooming over the equalizing beam center hub. It will be necessary to remove that portion with a chisel or disc sander on the pushing tool side for even tool contact. Rubber center bushings can be removed with Owatonna Tool Company's tooling.

If Owatonna Tool Company's tooling is to be used, follow their instructions.

If shop made tools are to be used, begin by placing the equalizing beam in the shop press with the beam center bore squarely supported on the press bed for safety, and to avoid bending the equalizing beam.

For 340 series center bushings, a 3½" O.D. by 7" long piece of steel tubing will remove and install the bushings.

For 380 through 520 series center bushings, a 4 5/8" O.D. by 7" long piece of steel tubing will remove and install the bushings. Center the pushing tool on the outer metal of the rubber bushing and push the bushing out of the beam bore.

BRONZE CENTER BUSHING REMOVAL

Bronze center bushings can be removed with Owatonna Tool Company's tooling, or with shop made tools.

If Owatonna Tool Company's tooling is to be used, follow their instructions.

If shop made tools are to be used, the procedure and shop made pushing tools are the same as for rubber center bushings, except that the seal on the pushing side of the equalizing beam must be removed first.

CLEANING AND INSPECTION

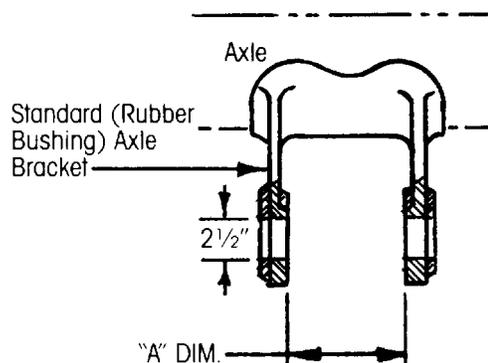
RUBBER END BUSHING/AXLE BRACKET INSPECTION

For Beam End Adapter style inspect the 2½" diameter holes in each of the axle bracket legs as shown in Figure 45. Remove any burrs or material left there by the old adapters. Use a new adapter as a gauge for fit, being sure it enters the holes from the outside of each bracket leg.

The dimension between the inside surfaces of the axle bracket legs for Beam End Adapter style, as shown in Figure 45 as dimension A, must be 5.260/5.270" for older 340 series suspensions with 5¼" long end bushings, or 5.760/5.770" for newer 340 series suspensions as well as 380 through 520 series suspensions with 5¾" long end bushings. 480 and 520 series suspensions with 6.00" long end bushings require dimension A to be 6.010/6.020".

For Beam End Bar Pin style inspect the 1³/₃₂" diameter holes in each of the four (4) axle bracket legs as shown in Figure 46. Look for hairline cracks

Figure 45



Subject 11 (continued)
MAJOR REBUILD PROCEDURE

between the edge of the axle bracket leg and the $1\frac{3}{32}$ " hole. Excessive wear caused by contact with the 1" diameter bar pin connection bolts should also be cause for axle bracket replacement. Contact the axle manufacturer for instructions.

The dimension between the inside surfaces of the axle bracket legs must be $2.313/2.263$ " as shown in Figure 46.

Any cracks detected near the top of the axle bracket legs require replacement of the axle bracket as shown in Figure 47.

STEEL BALL AND BRONZE SOCKET END BUSHING AXLE BRACKET INSPECTION

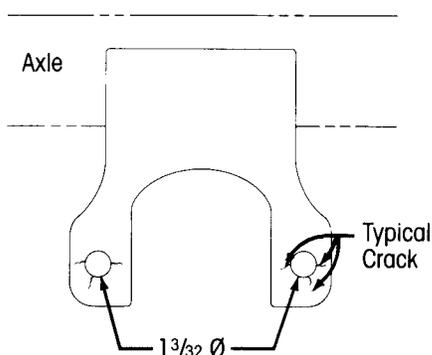
These suspensions have reducer adapters welded into the axle brackets by the axle manufacturer as shown in Figure 49.

Inspect the welds of the reducer spacers. There must be a continuous $\frac{1}{4}$ " fillet weld around the circumference of each reducer spacer.

If the reducer spacers are worn or elongated, they can be removed by cuffing through the welds at the inside face of the axle bracket legs.

DO NOT USE A CUTTING TORCH. Use of a cutting torch could damage the axle bracket legs adversely affecting their strength which could result in a failure, loss of vehicle control, and possible personal injury or property damage. Use a powered reciprocating hacksaw to cut the weld and knock out the reducer spacer from the outside of the axle bracket leg. Grind the inside surface of the axle bracket leg smooth

Figure 46



and weld the new reducer spacer in place as shown in Figure 48.

BEAM CENTER CROSS TUBE INSPECTION

Clean the cross tube and inspect it for cracks or excessive wear 8" to 10" from each end where it enters into the equalizing beam center bushings. Use a straight edge to check the straightness of the cross tube. If there is a doubt as to fracture, wear or straightness, replace it.

AXLE STOP INSPECTION

The four axle stops are furnished and installed on the frame by the truck manufacturer. The location of these

Figure 47

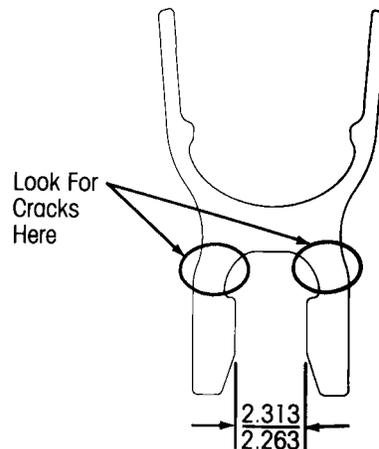
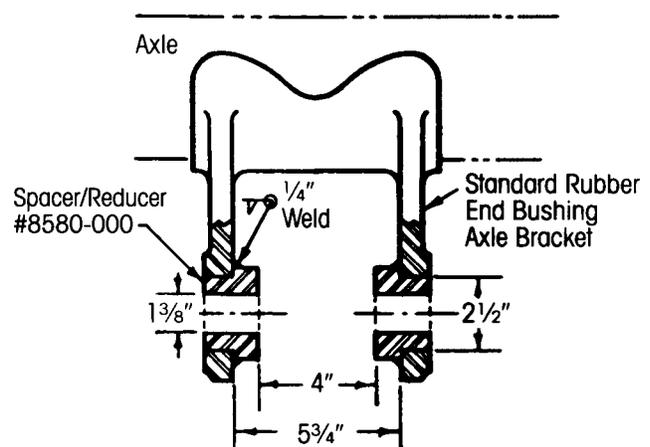


Figure 48—Axle Bracket With Reducer/Spacer





stops limits axle articulation so that drive line action and brake chamber clearance specifications are not exceeded.

Check the axle stop to frame fasteners for proper tightening torque. Follow the vehicle manufacturer's specifications.

If the axle stops are peening the top of the axle housing, contact the truck manufacturer, advising them of this condition.

INSTALLING NEW BUSHINGS

The outer metals of Hendrickson rubber bushings may be covered with a phosphate coating which acts as a rust preventive. This coating must be removed with emery cloth before installation.

Also apply a coating of white lead or grease to the cleaned outer metals of the bushings and to the beam bores to facilitate pressing the new bushings into the beam bores.

NOTE: Hendrickson machines equalizing beams for either rubber end bushings, or steel ball and bronze socket end bushings. Equalizing beams machined for rubber end bushings cannot be converted for use with steel ball and bronze socket end bushings. Equalizing beams machined for steel ball and bronze socket end bushings cannot be converted for use with rubber end bushings.

BEAM END ADAPTER STYLE BUSHING INSTALLATION

Rubber end bushings can be installed with Owatonna Tool Company's tooling, or with shop made tools.

If Owatonna Tool Company's tooling is to be used, follow their instructions.

If shop made tooling is to be used, a piece of 4½" I.D. by 4" long steel tubing will install all 340 through 520 series rubber end bushings. A sheave puller as shown in Figure 49 is required to compress the rubber to allow contact with the bushing outer metal.

Place the equalizing beam in the shop press with the beam end bore squarely supported on the press bed for safety, and to avoid bending the equalizing beam.

Press in the new end bushing as shown in Figure 49.

All 5¼" and 5¾" long end bushings must be centered within the beam end hub.

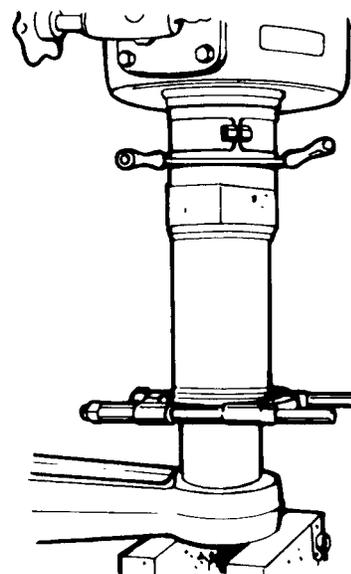
The 6" long 480 and 520 series end bushing must be installed offset 3/16" toward the center line of the chassis as shown in Figure 51. This offset is required for correct alignment with the axle brackets as shown in Figure 52. If the equalizing beams have rubber center bushings, be sure the center bushing inner metal open end is on the same side as the 3/16" end bushing offset.

The part numbers and identification for rubber end bushings as shown in Figure 50 are:

Part No.	Series	Inner Metal I.D. Overall Length	
		(Dim. A)	(Dim. B)
6969-000	340	2½"	5¼"
45900-000	340-460	2½"	5¾"
29878-001	480	2½"	5¾"
45407-000	520	2½"	6"

NOTE: All 460, 480 and 520 series end bushings must be used with 1" dia. Grade 8 bolt beam end adapters.

Figure 49



Subject 11 (continued)
MAJOR REBUILD PROCEDURE

BEAM END BAR PIN STYLE BUSHING INSTALLATION

The outer metals of some Hendrickson rubber bushings are covered with a phosphate coating which acts as a rust preventive. This coating must be removed with emery cloth before installation.

Also apply a coating of grease to the cleaned outer metals of the bushings and to the beam bores to

Figure 50

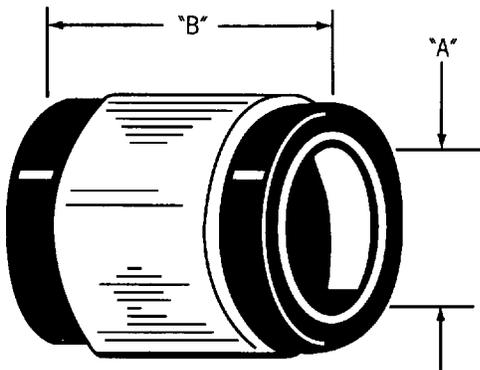


Figure 51—Offset Beam End Bushing Installation/45407 Bushing

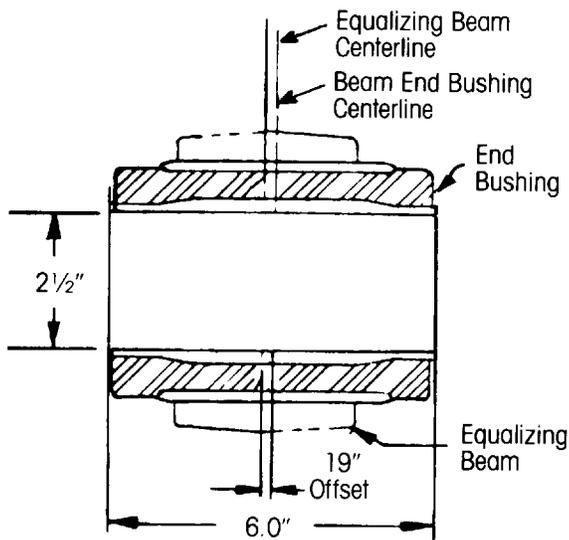


Figure 52—Installation of 6" Length Offset Beam End Bushings To Align With 35 1/2" Beam Hanger Axle Bracket Centers

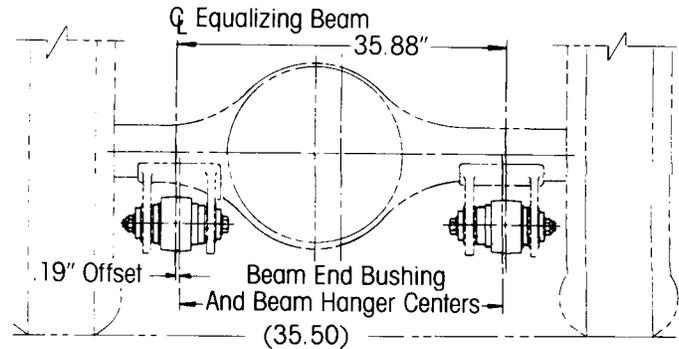
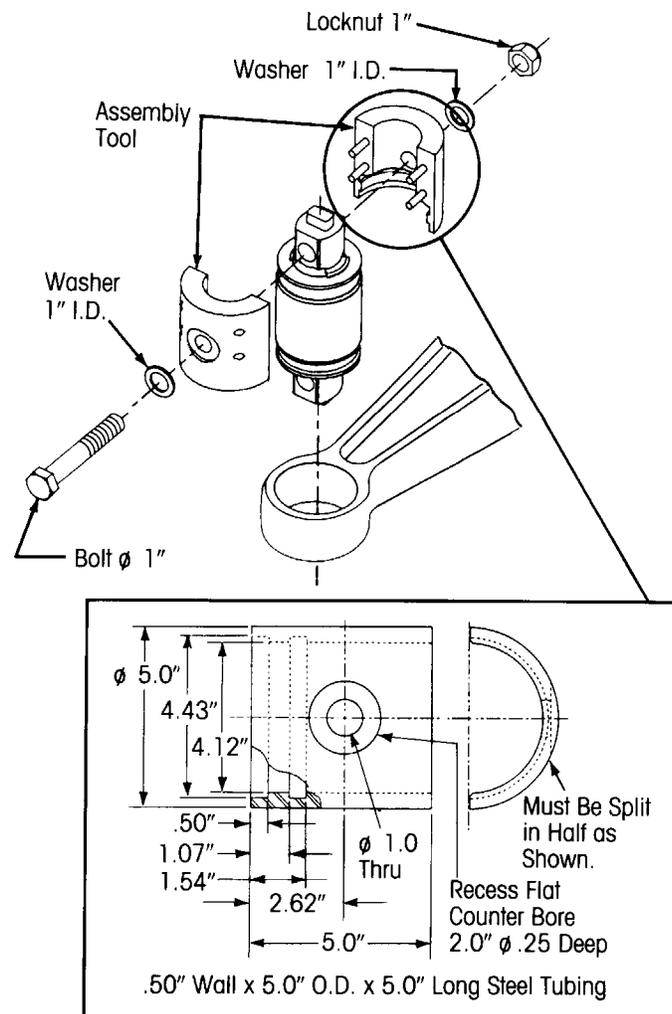


Figure 53—Detail View of Assembly Tool





facilitate pressing the new bushings into the beam bores.

Rubber end bushings can be installed with Owatonna Tool Company's tools or with shop made tools. If Owatonna Tool Company's tools are used, follow their instructions. Care must be taken during installation of the bushing. Do not push on the inner metal or bushing damage will result.

If shop made tooling is to be used, a piece of 1/2" wall by 5" O.D. by 5" long steel tubing, must be reworked as detailed in Figure 53, to install the bar pin end bushings. The assembly tool must be split in half then clamped or bolted together to compress the rubber to allow contact with the bushing outer metal, as shown in Figure 53.

Place the equalizing beam in the shop press with the beam end bore squarely supported on the bed for safety, and to avoid bending the equalizing beam.

Before pressing the bar pin bushing, the holes in the end of the bar pin bushing should be in line with the center line of the equalizing beam to facilitate assembly into the axle brackets on the vehicle. Care should be taken during the assembly process to assure the orientation of the bar pin bushing in the beam bore. See Figure 54. After installation, verify that the new bushings are centered in the end of the beam.

Bushing kits are available that include the bar pin bushing with or without alignment shims.

The bolts, locknuts and washers required for assembly and are included in the kits listed in the table below. Each kit includes enough parts for one end of the equalizing beam.

When using the 50160-000 bushing with alignment shims refer to technical publication 17730-213 for instructions. When using the bushings with the alignment shims it is mandatory that the shims be in place and fasteners properly torqued before operating the vehicle.

WARNING: A SHIM MUST BE INSTALLED AT EACH BOLT LOCATION. THE SAME PART NUMBER SHIM IN THE SAME ORIENTATION MUST BE USED AT BOTH BOLT

LOCATIONS ON ANY ONE BUSHING ASSEMBLY. DO NOT INSTALL OR STACK MORE THAN ONE SHIM AT EACH BOLT LOCATION. USE GENUINE HENDRICKSON SHIMS, DO NOT USE STANDARD WASHERS. THE FAILURE TO FOLLOW THESE WARNINGS MAY RESULT IN THE FRACTURE OF EITHER THE BRACKET OR BAR PIN WHICH COULD RESULT IN THE LOSS OF VEHICLE CONTROL AND POSSIBLE PERSONAL INJURY OR PROPERTY DAMAGE.

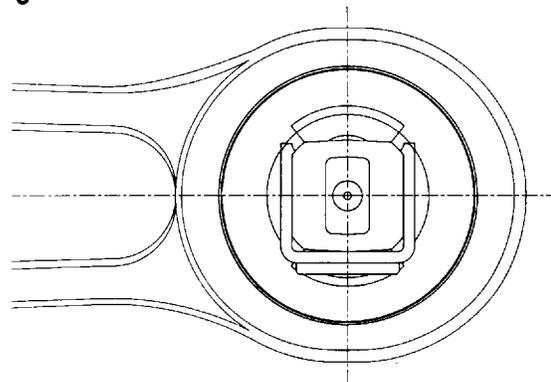
STEEL BALL AND BRONZE SOCKET END BUSHING INSTALLATION

Place the equalizing beam in the shop press with the beam end bore squarely supported on the press bed for safety, and to avoid bending the equalizing beam.

The bronze socket halves are machined in matched pairs and have serial numbers stamped on their end faces. They must be installed as matched pairs.

Lubricate the outside diameter of the steel ball and the inside diameter of the bronze socket halves with chassis lubricant. Position the socket halves on the steel ball and lubricate the outside diameter of the bronze socket halves and the beam end bore with white lead or grease.

Figure 54



	Kit #	Shim	Bushing	Bolt	Nut	Washer
No Shim	34013-087	None	50150-000	48942-000	48941-000	22962-008
With Shim	34013-088	50130-000	50160-000	48942-000	48941-000	22962-008

Subject 11 (continued)
MAJOR REBUILD PROCEDURE

A piece of 3½" O.D. by 7" long steel tubing will install the bushing.

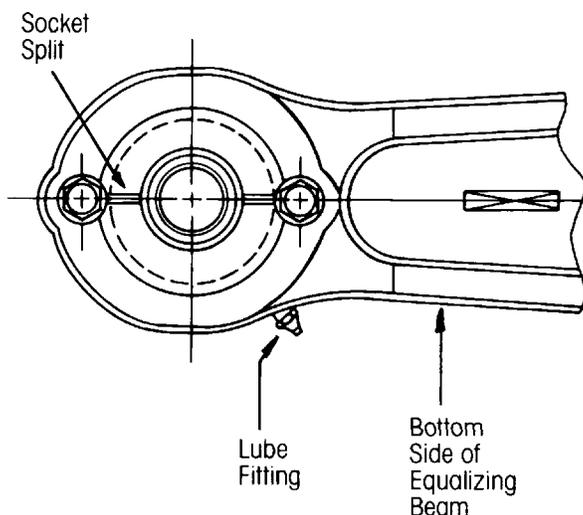
The split of the socket halves must be aligned with the two lock bolt holes in the beam end as shown in Figure 55.

Press in the new bushing. The bushing must be centered within the beam end bore.

Counter bore the bronze sockets with a counter bore tool as shown in Figure 57 using the counter bored holes in the beam end hub as a guide. Counter bore the sockets to the same depth as the beam end hub, 3/16", as shown in Figure 56. The counter bore tool shown is made up of two interchangeable pieces, the counter bore itself and the pilot, which are assembled together. Hendrickson Suspension does not manufacture or sell the tool. It is available from McMaster-Carr Supply Company located in Elmhurst IL, Santa Fe Springs CA, Dayton NJ, and Atlanta GA.

WARNING: DO NOT increase the counter bore depth in the beam end hub. Increasing the counter bore depth could structurally affect the beam which may result in failure, loss of vehicle control, and possible personal injury or property damage.

Figure 55—Bronze Socket Split



Assemble the two Grade 8 bolts, washers, and locknuts that key lock each bronze socket assembly to the equalizing beam as shown in Figure 58. Tighten the locknuts to 55 to 65 foot pounds torque.

A complete bronze socket and steel ball end bushing kit, including the beam to axle connecting pads, for one vehicle, is available under kit number 34013-040, as listed below:

Part No.	Qty.	Description
4990-000	4	Beam Ball
5059-000	4	Bronze Socket (2 matched halves)
30970-001	8	Grade 8 Lock Bolt
30978-000	8	Locknut
22962-014	16	Hardened Flat Washer
3350-000	4	Beam to Axle Shaft
8582-000	8	Hex Slotted Nut
17800-001	8	Coffer Pin
45229-000	8	Seal

Figure 56—Counter Bore Depth

NOTE: After assembly of new ball and socket in beam, counter bore 3/16" deep into socket—(both sides).

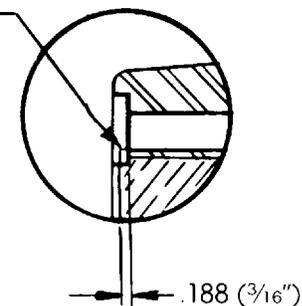
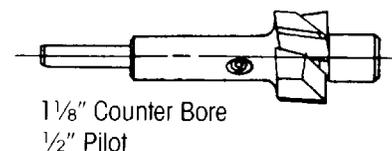


Figure 57—Counter Bore Tool



RUBBER CENTER BUSHING INSTALLATION

Rubber center bushings can be installed with Owatonna Tool Company's tooling, or with shop made tools.

If Owatonna Tool Company's tooling is to be used, follow their instructions.

If shop made tools are to be used, begin by placing the equalizing beam in the shop press with the beam center bore squarely supported on the press bed for safety, and to avoid bending the equalizing beam.

For 340 series center bushings, a 3½" O.D. by 7" long piece of steel tubing will install the bushings. For 380 through 520 series center bushings, a 4⁵/₈" O.D. by 7" long piece of steel tubing will install the bushings.

When installing rubber center bushings the following steps will minimize the chance of spoiling a new bushing:

1. Clean the bores of the equalizing beams with emery cloth, removing any nicks or metal buildup from bushing removal.
2. The outer metals of new Hendrickson rubber bushings may have a phosphate coating which acts as a rust preventive. This coating must be removed with emery cloth before installation.
3. The equalizing beam bore may have a more substantial lead chamfer at one end of the bore than the other. Take advantage of the larger chamfer by pressing in the new bushing from this end.
4. Support the beam squarely at the bore area to avoid distortion of the beam bore or bending of the beam.
5. Lubricate the O.D. of the bushing and I.D. of the beam bore with white lead, grease, never seize, or other lubricant.
6. Make sure the bushing is square to the beam bore and press the bushing into beam.

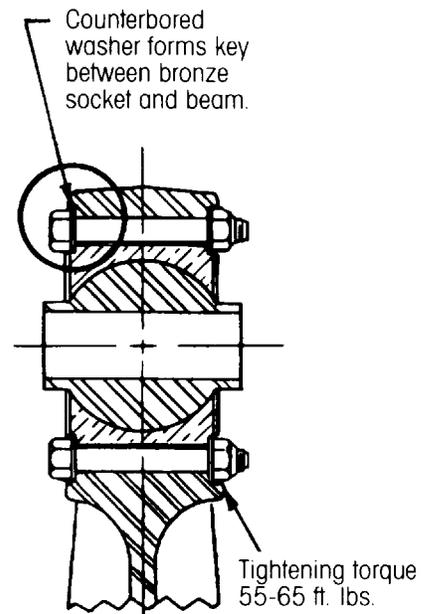
The proportions of Hendrickson Suspension R-340 series rubber center bushings, 6664-000 and 22279-000, are long and slender as compared to our other bushings. This makes these bushings more difficult to install in equalizing beams. There is a tendency for the outer metals of these bushings to swell or "mushroom out" after they are partially pushed into the beam bores (this occasionally happens in our own factory when we press these bushings into new beams).

In addition to following the steps above, measure the beam bore diameter and the bushing outside diameter. The Hendrickson specification for the beam bore diameter of new 340 series beams is 3.613/3.617". The bushing outside diameter specification is 3.620/3.622", and is to be taken as the mean of any two readings at 90 degrees, maximum ovality .010".

Center the pushing tool on the outer metal of the rubber bushing and push the bushing in the beam bore. All center bushings must be centered within the beam center hub.

If the beam has 6" long 480 or 520 series end bushings, the center bushing inner metal open end must be on the same side as the ³/₁₆" end bushing offset.

Figure 58—Bushing Assembly Installed in Beam End





Subject 11 (continued)
MAJOR REBUILD PROCEDURE

The part numbers and identification for rubber center bushings with welded end plugs as shown in Figure 59 are:

Part No.	Series	A Dim.	B Dim.
6664-000	340	2¾"	7"
591 9-000	380	3½"	7"
49400-000	400	3½"	7"
29481-005	340	2¾"	7"
29483-005	460-520	3½"	7"

Note: 49400-000 may be used in place of 5919-000.

BRONZE CENTER BUSHING INSTALLATION

DO NOT INSTALL BRONZE CENTER BUSHINGS IN ALUMINUM BEAMS. Use of bronze center bushings with aluminum beams could result in structural damage to the aluminum beam adversely affecting the strength of the beam which could result in failure, loss of vehicle control, and possible personal injury or property damage.

Bronze center bushings can be installed with Owatonna Tool Company's tooling, or with shop made tools.

If Owatonna Tool Company's tooling is to be used, follow their instructions.

If shop made tools are to be used, begin by placing the equalizing beam in the shop press with the beam center bore squarely supported on the press bed for safety, and to avoid bending the equalizing beam.

Apply a coating of white lead or grease to the bushings and to the beam bores to facilitate pressing the new bushings into the beam bores.

For 340 series center bushings, a 3½" O.D. by 7" long piece of steel tubing will install the bushings.

For 380 through 520 series center bushings, a 4⅝" O.D. by 7" long piece of steel tubing will install the bushings.

Center the pushing tool on bushing and push the bushing in the beam bore. All center bushings must be centered within the beam center hub as shown in Figure 61 to allow equal space at both ends of the bushing for placing the seals in position.

The seals must be inside the beam center hub faces ⅛" or they will be damaged when the beam is assembled into the saddle with thrust washers. Note that the seals are installed with their lips pointing outward. This allows grease to be purged past the seals during lubrication, and prevents outside contaminants from entering the bushings.

Figure 59—Rubber Center Bushing

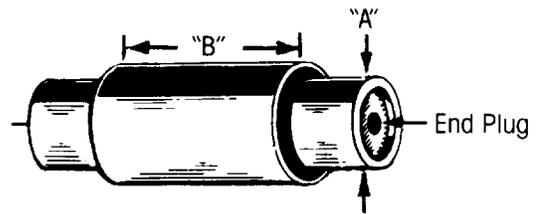


Figure 60—Bronze Center Bushing Kit

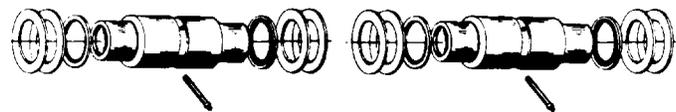
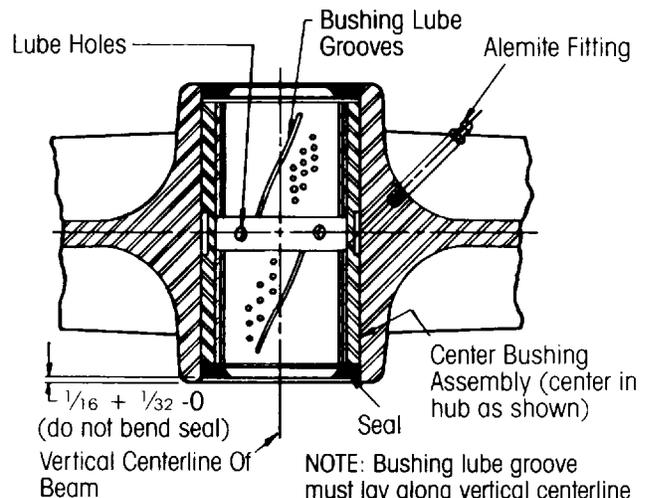


Figure 61—Bronze Center Bushings With Seals





The equalizing beam bronze center bushing service kit part numbers are:

Kit Number	Series
30436-000	340
30437-000	380-520

Each kit includes enough parts for one vehicle as shown in Figure 60.

INSTALLING BEAMS TO AXLES BEAM END ADAPTER STYLE

When installing beams with 6.00" long end bushings part number 45407-000, they must be assembled with the .19" bushing offset facing the chassis centerline as shown in Figure 68.

If the equalizing beams have bronze center bushings, apply chassis lube to the bronze linings and to the beam center sleeves. Assemble the sleeves with thrust washers into the center bushings. Assemble enough thrust washers so that any remaining gap with the saddle legs is less than the thickness of one thrust washer as shown in Figure 62.

With the two equalizing beams on the floor, insert the beam center cross tube into the rubber center bushing inner metals or the bronze center bushing sleeves.

Apply an anti-seize compound to all mating metal surfaces of the axle brackets, end bushings, and connecting hardware. This will aid in the assembly as well as prevent possible corrosion making future disassembly difficult.

THREE-PIECE ADAPTER INSTALLATION

Position all four intermediate tubes into the end bushing inner metals.

WARNING: ALL THREE-PIECE ADAPTER ASSEMBLIES MUST BE INSTALLED WITH INTERMEDIATE TUBES.

Raise one end of both beams with the cross tube installed, into the axle brackets on one axle. Install one adapter through the axle bracket leg at the wheel side, into the beam end bushing. Then install the other adapter through the axle bracket leg at the bowl side with the Grade 8 bolt and washer, taking advantage of the cut-off flange on the adapter to clear the bowl.

Split ring adapters are available where lack of clearance will not permit the use of standard adapters.

Rotate the adapters so that the adapter cut-off flats are vertical as shown in Figure 63.

If split ring adapters are used, rotate the split ring flanges so that the split is vertical.

Assemble the locknut and washer, but do not torque to specification yet.

Assemble the adapters, grade 8 bolt, locknut, and washers in the opposite axle bracket in the same manner. Raise the opposite ends of the beams into the axle brackets on the other axle and assemble the adapters, grade 8 bolts, locknuts, and washers in the same manner.

Figure 62—Beam Center Installed To Saddle

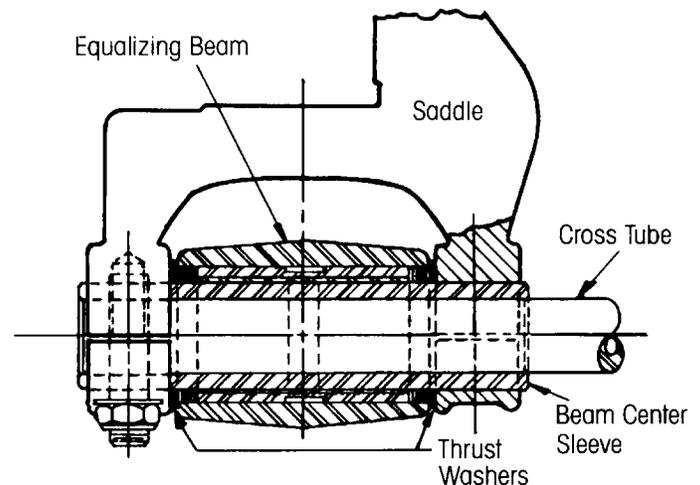
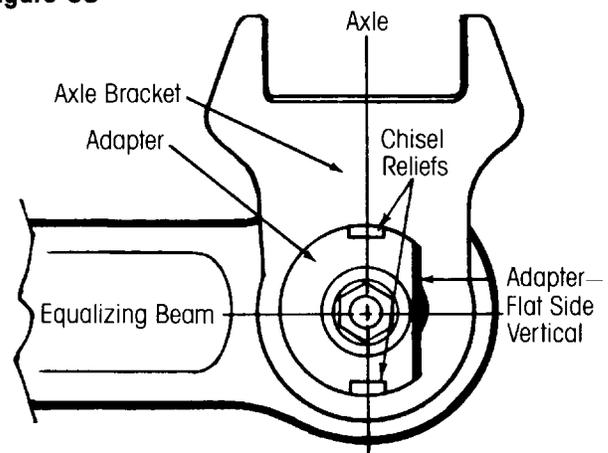


Figure 63





Subject 11 (continued)
MAJOR REBUILD PROCEDURE

Place the axles in their normal operating positions before the locknuts are torqued to specifications.

For 340 through 400 series three-piece adapter assemblies, as shown in Figure 64, with 3/4" diameter grade 8 bolts, tighten the locknuts to 210 to 240 foot pounds torque. **DO NOT EXCEED SPECIFIED TORQUE.**

Figure 65 shows the beam end components for 340 through 400 series suspensions that use 5 1/4" spacing of beam hanger legs. Figure 66 shows the beam end components for 340 through 400 series suspensions that use 5 3/4" spacing of beam hanger legs.

For 460 through 480 series three-piece adapter assemblies, as shown in Figure 67, with 1" diameter grade 8 bolts, tighten the locknuts to 445 to 495 foot pounds torque. **DO NOT EXCEED SPECIFIED TORQUE.**

When installing beams with 6.00" long end bushings part number 45407-000, they must be assembled with the .19" bushing offset facing the chassis centerline as shown in Figure 68. Figures 69, 70 and 71 show the possible combinations of beam end adapters and bushings for the 460 through 520 series suspensions.

WARNING: If the tightening torques recommended above are not achieved, metal surfaces will work and wear the axle bracket legs, holes, adapters and rubber bushing inner metals. Properly tightened end connections will eliminate costly repair, downtime and possible separation of components and loss of vehicle control, property damage or personal injury.

Figure 64—Adapter and Intermediate Tube Beam End Connection (340 & 400 Series)

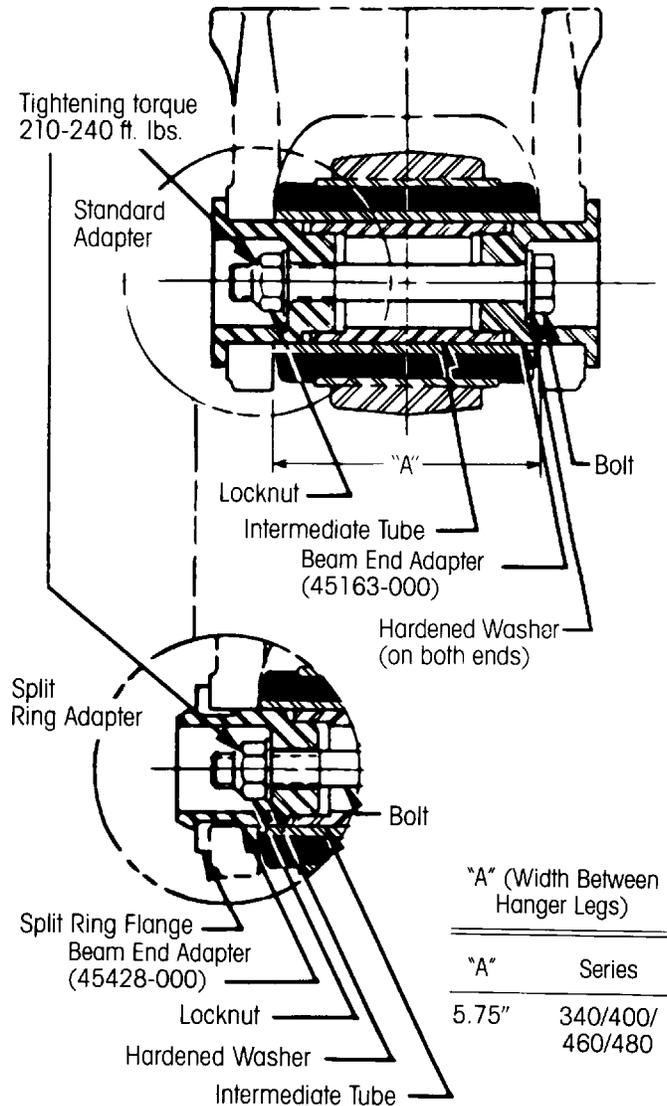
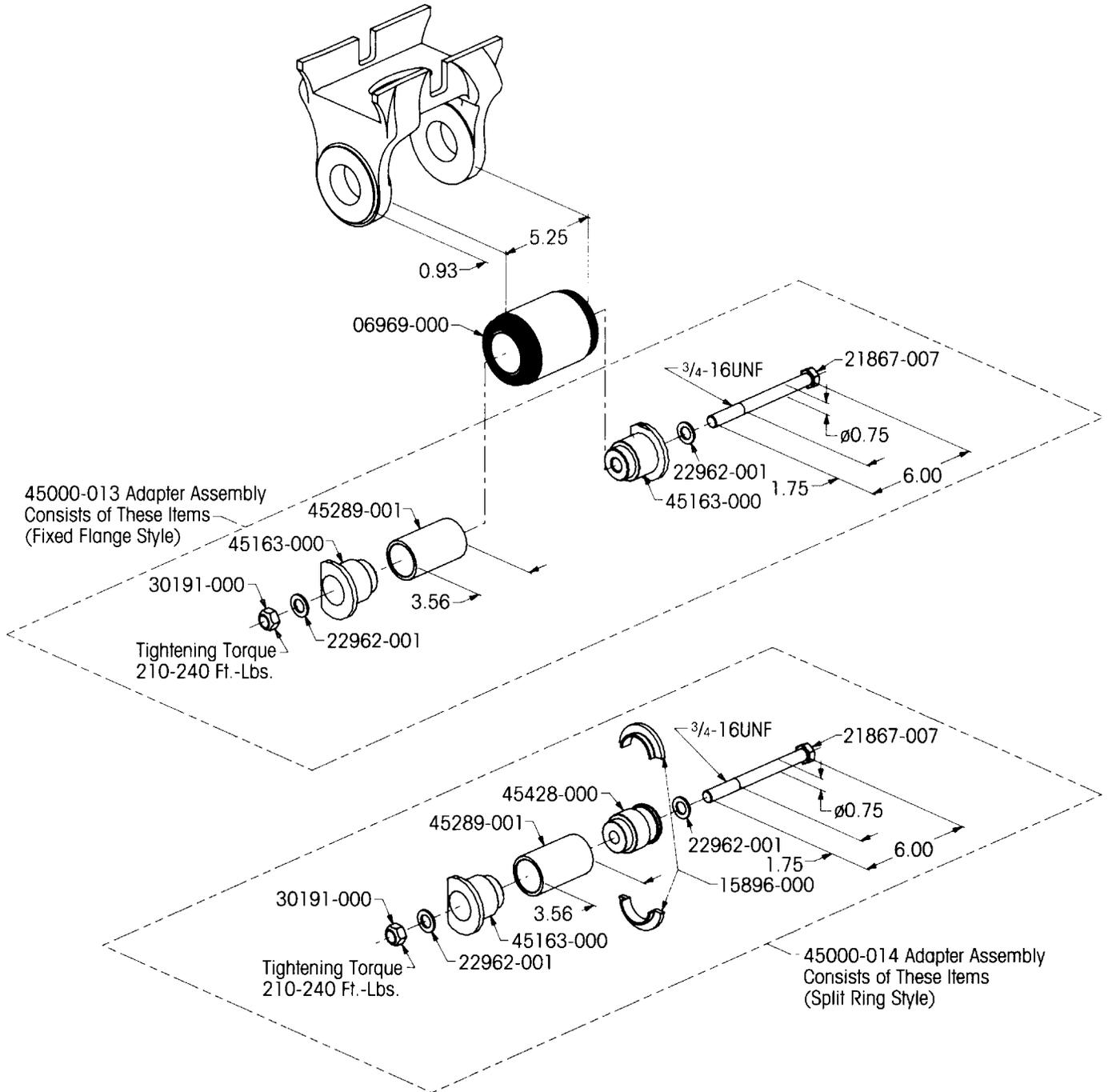




Figure 65—340 Series Beam End Bushing & Beam End Adapter Connection

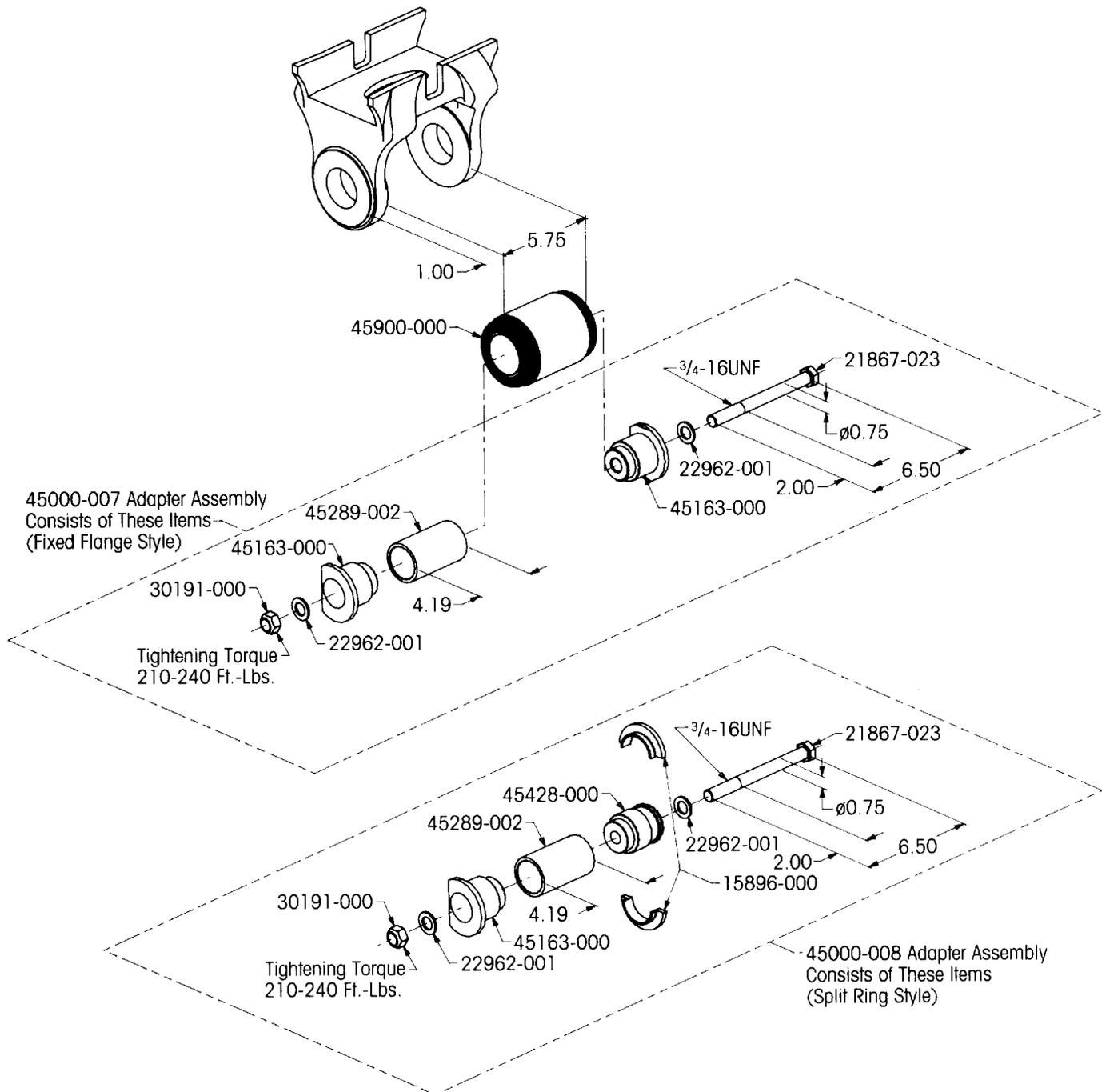


NOTE: Adapter assemblies must not be used without intermediate tube 45289-001.



Subject 11 (continued)
MAJOR REBUILD PROCEDURE

Figure 66—400 Series Beam End Bushing & Beam End Adapter Connection



NOTE: Adapter assemblies must not be used without intermediate tube 45289-002.

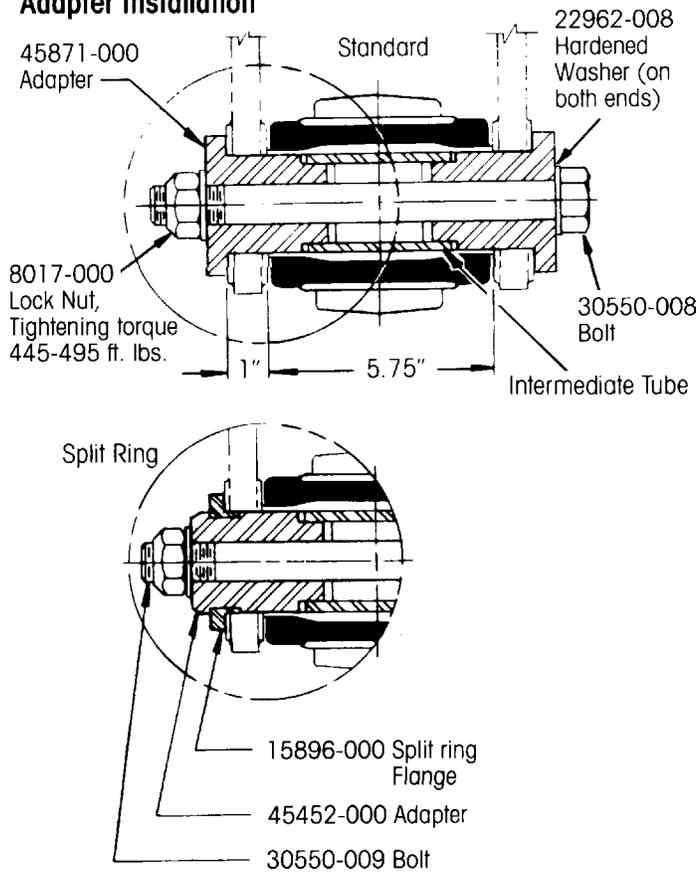


The part numbers and identification for three-piece adapter assemblies are:

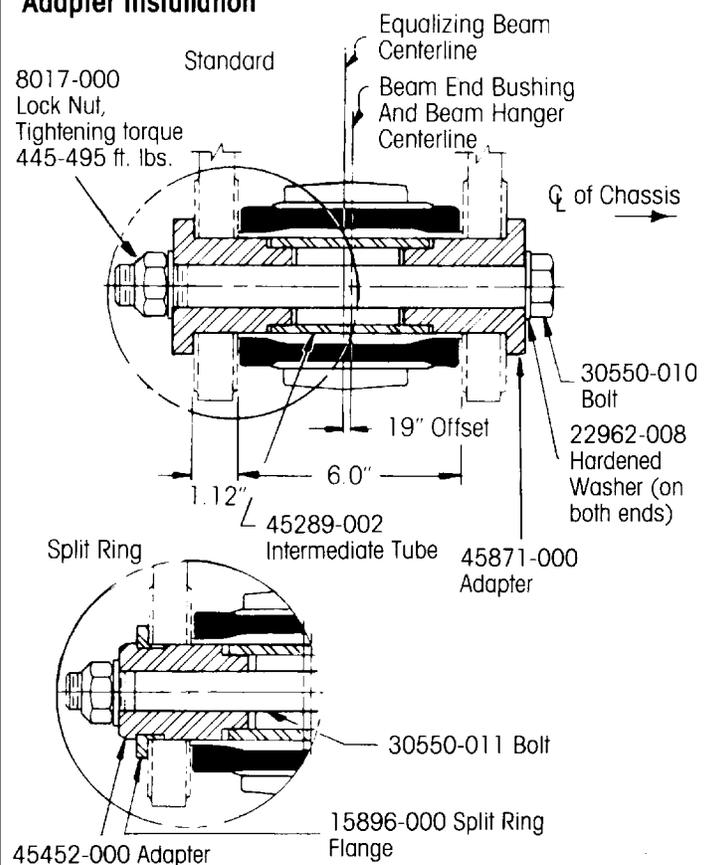
Part No.	Series	Description	Bolt Dia.	End Bushing Length
45000-013	340	Fixed Flange Assy.	3/4"	5 1/4"
45000-014	340	Split Ring Assy.	3/4"	5 1/4"
45000-007	340-400	Fixed Flange Assy.	3/4"	5 3/4"
45000-008	340-400	Split Ring Assy.	3/4"	5 3/4"
21140-034	460-520	Fixed Flange Assy.	1"	5 3/4"
21140-040	460-520	Split Ring Assy.	1"	5 3/4"
21140-033	480-520	Fixed Flange Assy.	1"	6"
21140-023	480-520	Split Ring Assy.	1"	6"

Each adapter assembly contains parts for one beam end connection.

**Figure 67—460-480 Series (5.75" Length Bushing)
Adapter Installation**



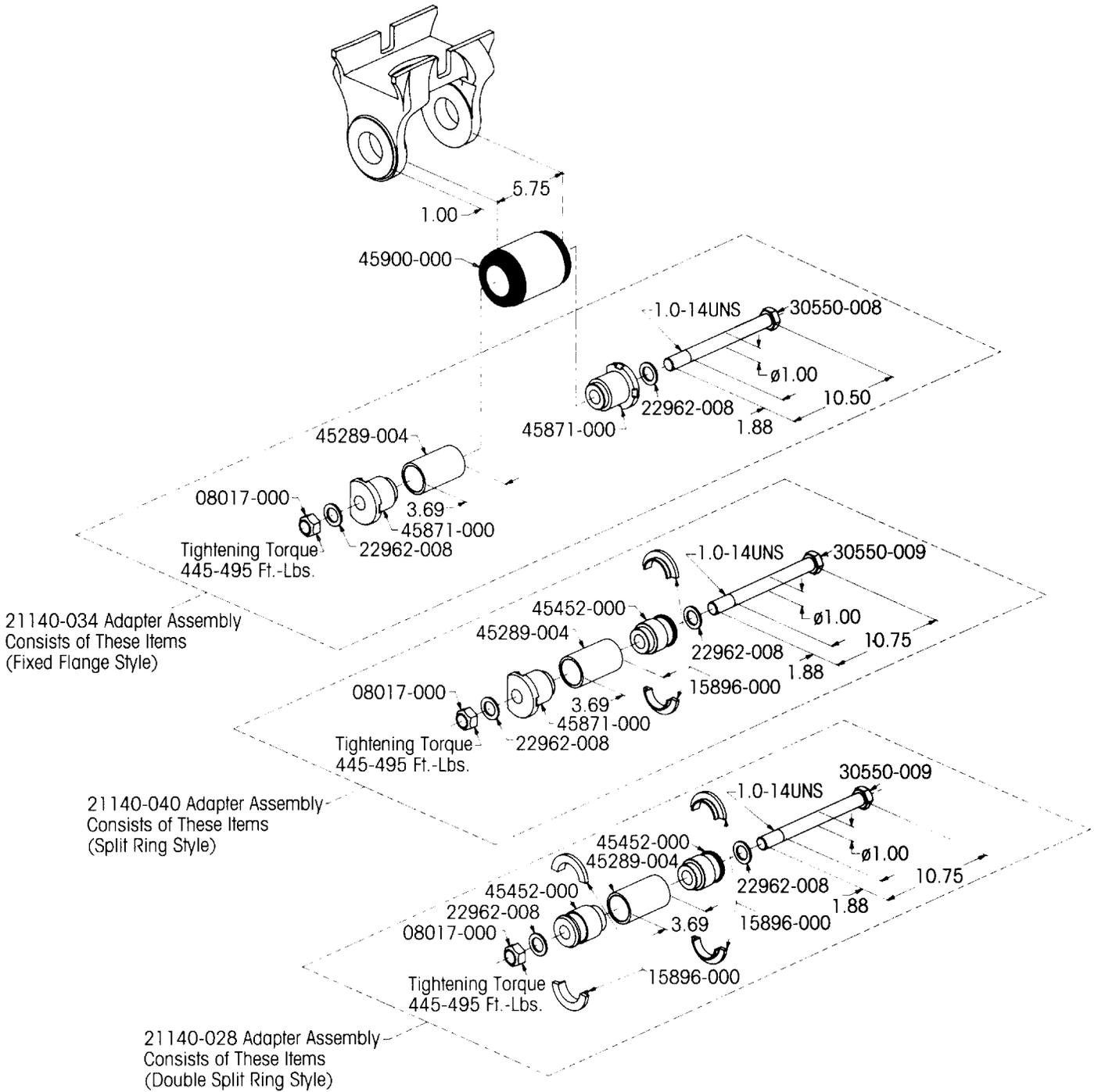
**Figure 68—520 Series (6.0" Length Bushing)
Adapter Installation**





Subject 11 (continued)
MAJOR REBUILD PROCEDURE

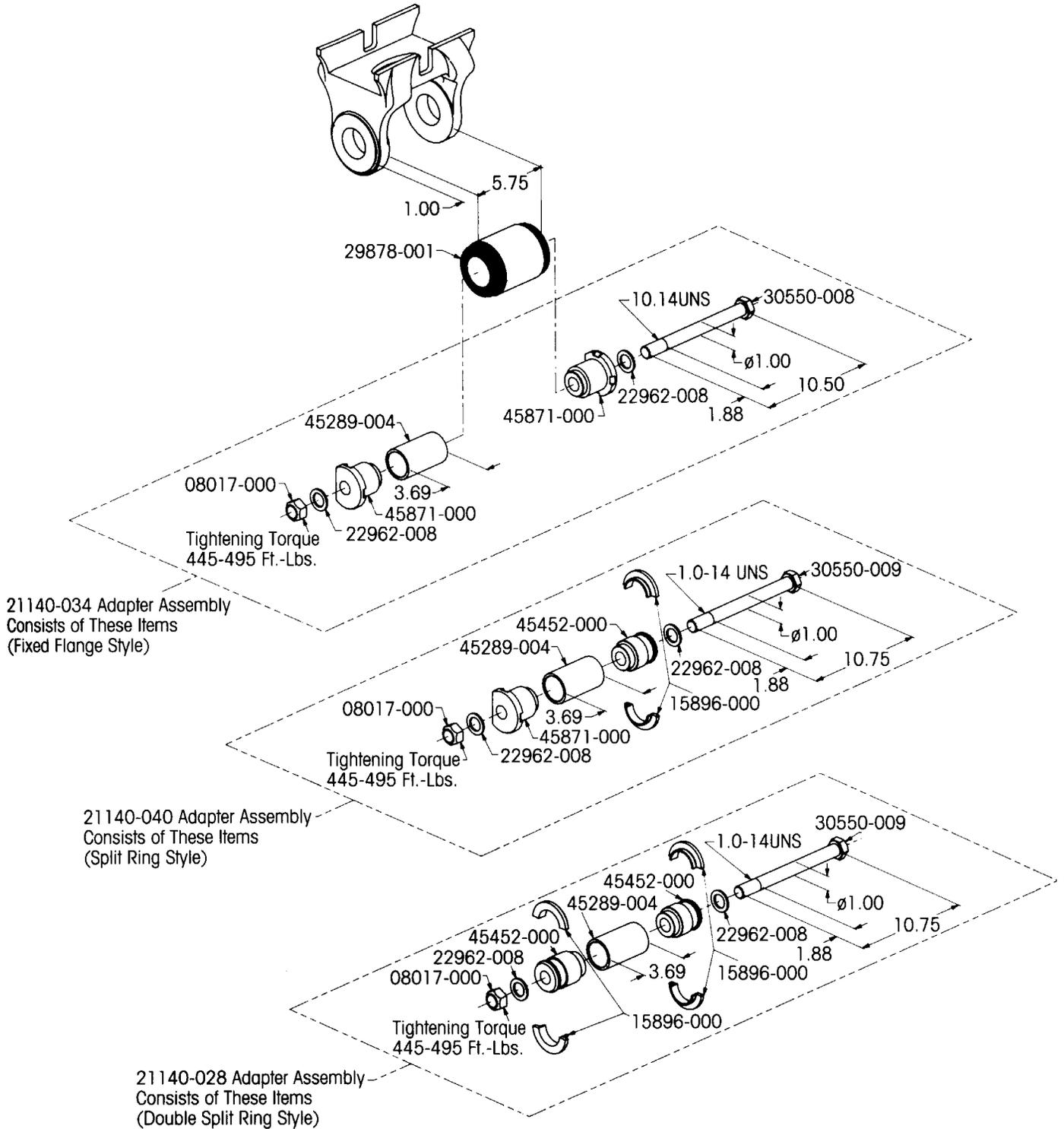
Figure 69—460 Series Beam End Bushing & Beam End Adapter Connection



NOTE: Adapter assemblies must not be used without intermediate tube 45289-004.



Figure 70—480 Series Beam End Bushing & Beam End Adapter Connection

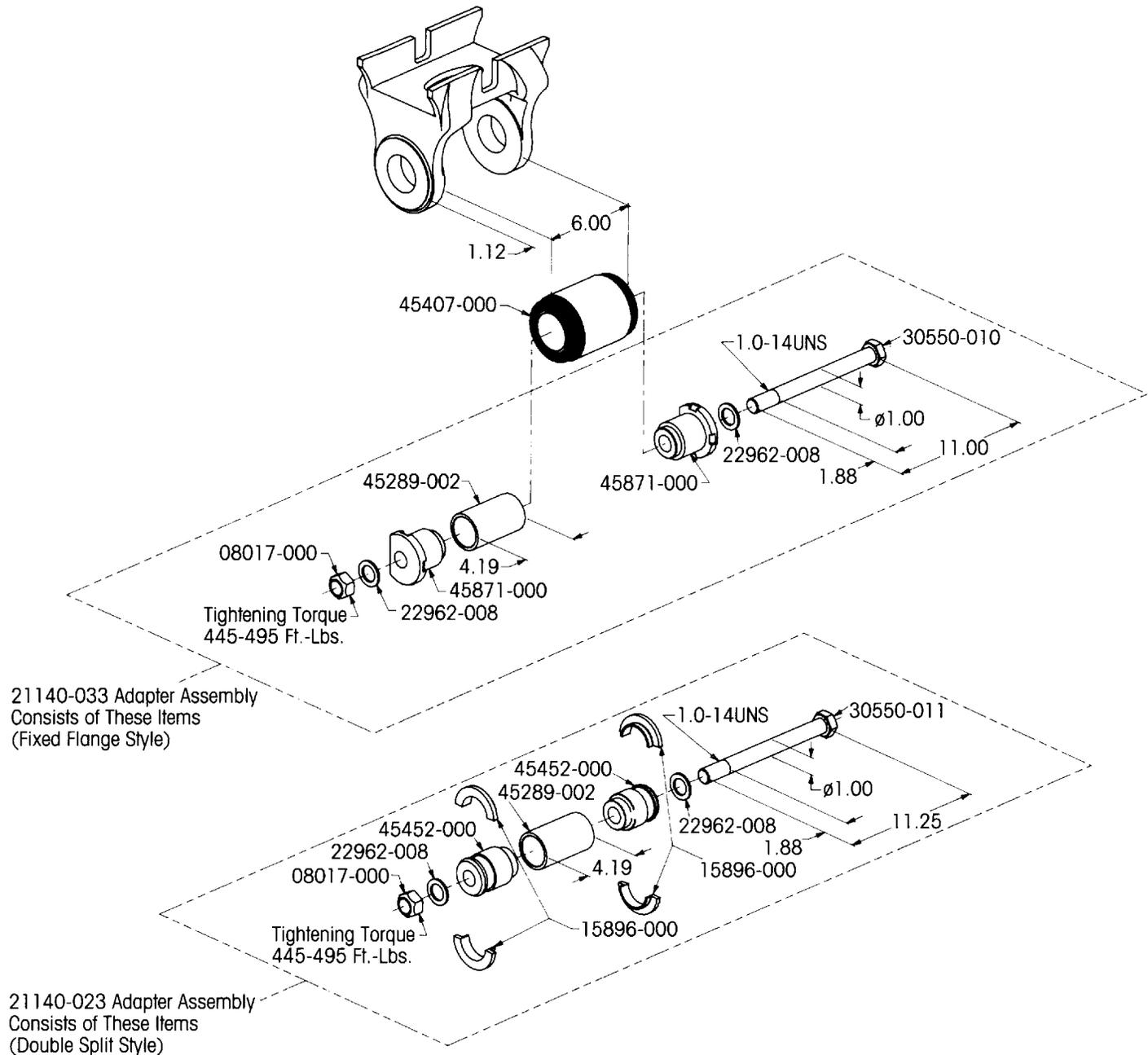


NOTE: Adapter assemblies must not be used without intermediate tube 45289-004.



Subject 11 (continued)
MAJOR REBUILD PROCEDURE

Figure 71—520 Series Beam End Bushing & Beam End Adapter Connection



NOTE: Adapter assemblies must not be used without intermediate tube 45289-002.



40

TUBE AND NUT INSTALLATION

Raise one end of both beams with the cross tube installed, into the axle brackets on one axle. Install the tube through the axle bracket legs and the end bushing. Center the tube within the axle bracket.

Hand start both locknuts on the tube but do not torque to specification yet.

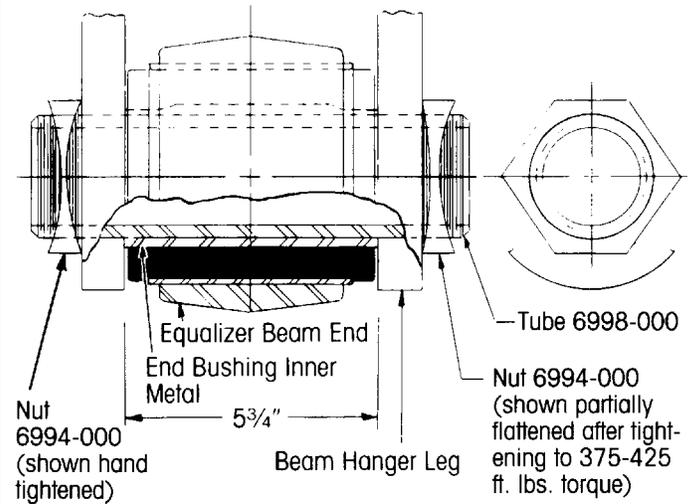
Assemble the tube and locknuts in the opposite axle bracket in the same manner.

Raise the opposite ends of the beams into the axle brackets on the other axle and assemble the tubes and locknuts in the same manner.

Place the axles in their normal operating positions before the locknuts are torqued to specifications.

Tighten the locknuts to 375 to 425 foot pounds torque. **DO NOT EXCEED SPECIFIED TORQUE.** Properly tightened locknuts will partially flatten against the axle bracket legs as shown in Figure 72.

Figure 72—Tube and Nut Beam End Connection
(Optional) 400 Series



Subject 11 (continued)
MAJOR REBUILD PROCEDURE

BEAM END/BAR PIN STYLE INSTALLATION

Prior to assembly, the mounting surfaces of the beam hanger legs of the axle bracket should be inspected.

If the holes appear to be worn or mounting faces are gouged, the axle bracket should be replaced. Contact the axle manufacturer for instructions.

Remove any burrs prior to assembly, this will aid in the assembly process.

Raise the beam end into the axle bracket and support it with jack. If the axle pinion angle causes difficulty in assembly, disconnect the upper torque rod and rotate the axle so that the bar pin slips into the bracket. For minor adjustments, there are lugs on the ends of the bar pin bushing. With an open end wrench or Owatonna Tool Company's tooling, the inner metal of the bushing can be rotated slightly to ease assembly.

Prior to assembly of the fasteners, the operator must reconfirm that if the shim style bar pin bushing is used, all the shims are installed.

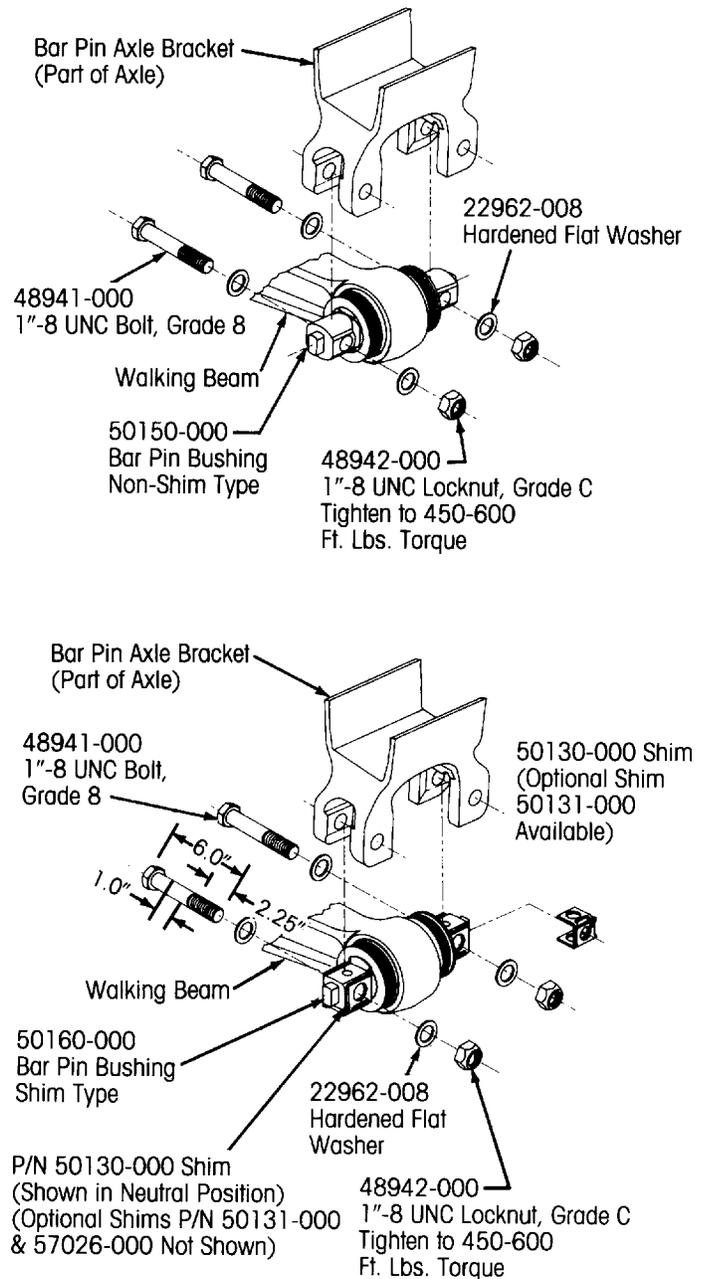
WARNING: A SHIM MUST BE INSTALLED AT EACH BOLT LOCATION. THE SAME PART NUMBER SHIM IN THE SAME ORIENTATION MUST BE USED AT BOTH BOLT LOCATIONS ON ANY ONE BUSHING ASSEMBLY. DO NOT INSTALL OR STACK MORE THAN ONE SHIM AT EACH BOLT LOCATION. USE GENUINE HENDRICKSON SHIMS, DO NOT USE STANDARD WASHERS. THE FAILURE TO FOLLOW THESE WARNINGS MAY RESULT IN THE FRACTURE OF EITHER THE BRACKET OR BAR PIN WHICH COULD RESULT IN THE LOSS OF VEHICLE CONTROL AND POSSIBLE PERSONAL INJURY OR PROPERTY DAMAGE.

With the longitudinal torque rods disconnected assembly the bolts, washers and locknuts. Tighten the locknuts to 450 to 600 foot pounds torque. Reconnect the torque rods prior to moving the vehicle.

For detailed alignment procedures and instructions, refer to Hendrickson technical publication 17730-213.

Figure 73 shows the part numbers for both styles of bar pin bushings along with attaching hardware. Each kit contains all the components required for one beam end.

Figure 73



NOTE: Shim part number 50130-000 folded edge must be positioned away from confinement washer.



Figure 74—Beam End Connection/Ball and Socket

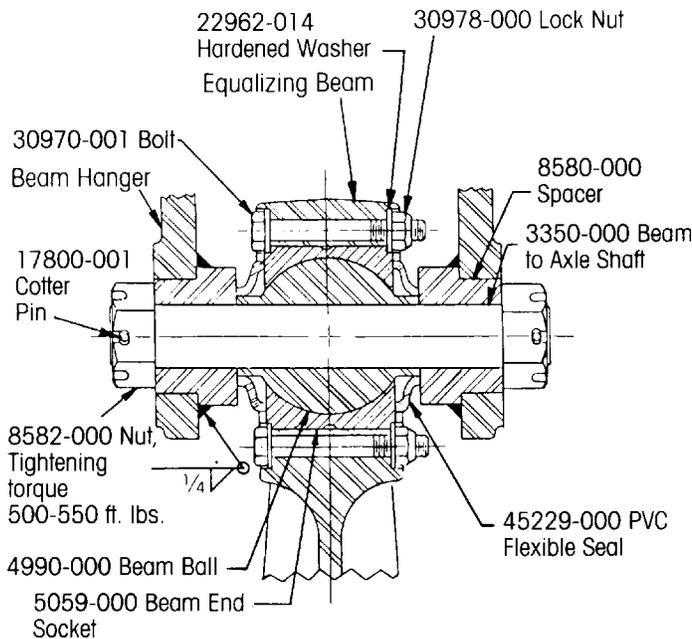
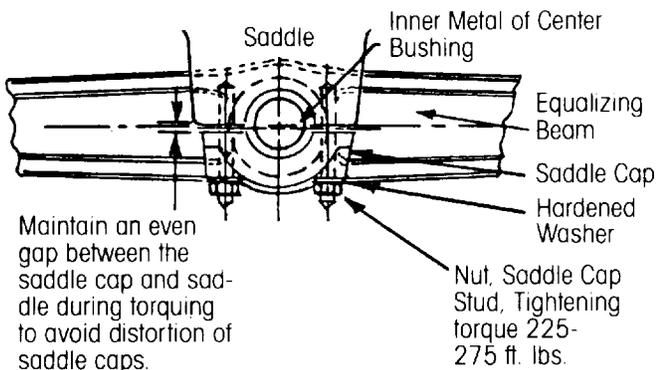


Figure 75—Ball & Bronze Socket Beam End Connection



NOTE: Axles must be in operating position before saddle cap fasteners are tightened (with rubber center bushings).

Exception: RU/RUE & U/UE Series: Nut, saddle cap stud, tighten to 125-145 ft. lbs. torque.

STEEL BALL WITH BRONZE SOCKET THROUGH SHAFT INSTALLATION

Raise one end of both beams with rubber seals in place on the shoulders of the steel ball, and with the cross tube installed, into the axle brackets on one axle.

Install the through shaft through the axle bracket legs and the end bushing. Center the shaft within the axle bracket. Assemble both slotted nuts on the through shaft and tighten to 500 to 550 foot pounds torque and install the cotter pins as shown in Figure 74.

If the cotter pin holes in the shaft do not line up with the slots in the nuts, do not back off the nuts or increase the torque. The nuts may be tack welded to the shaft.

Assemble the through shaft and slotted nuts in the opposite axle bracket in the same manner.

Raise the opposite ends of the beams into the axle brackets on the other axle and assemble the through shafts and slotted nuts in the same manner.

INSTALLING BEAMS TO SADDLES

With the equalizing beams attached to the axles, roll them under the center of the saddle making sure the beam center bushings are lined up with the center of the saddle legs.

Lower the frame, centering the saddles on the beam center bushings.

Install both torque rods at the frame bracket ends.

Install both torque rods at the axle bracket ends.

With the vehicle weight on the beam center bushings, install the saddle caps, washers, and locknuts.

For U/UE and RU/RUE suspensions with 3/4" diameter saddle cap studs, evenly tighten the saddle cap locknuts to 125 to 145 foot pounds torque.

For all other suspensions with 7/8" diameter saddle cap studs, evenly tighten the saddle cap locknuts to 225 to 275 foot pounds torque.

Maintain an even gap between the saddle caps and the base of the saddle legs to avoid possible distortion of the caps and bending of the studs as shown in Figure 75.

Reset all spring parking brakes on the tandem axles and connect the drive shaft to the front of the forward drive axle.

Connect all air lines leading to the rear axles and charge the vehicle air system.

Remove the blocks at the tires of the front steering axle.



Subject 12

TIGHTENING TORQUE SPECIFICATION CHART

Description	Hendrickson Part No.	Thread/Grade	Recommended Torque Ft./Lbs.
Saddle Cap Locknut (All except U/RU)	4842-000	7/8"- 14 UNF-2B Grade B	225-275
Saddle Cap Locknut (U/RU only)	30191-000	3/4"- 16 UNF-2B Grade C	125-145
Adapter Locknut (340 through 400)	30191-000	3/4"-16 UNF-2B Grade C	210-240
Adapter Locknut (460 through 520)	8017-000	1"- 14 UNS-2B Grade C	445-495
Beam End Tube Nut	6994-000	2 1/2"- 12 UN-2B	375-425
T Series End Nut	8582-000	1 3/8"- 12 UNF-2B	500-550
Torque Rod Locknut (340)	29896-000	1 1/8"- 12 UNF-3B Gr. 5	175-225
Torque Rod Locknut (380 through 520)	29749-000	1 1/4"-12 UNF-3B Gr. 5	175-225
Torque Rod Locknut (Straddle Mount)	none	Furnished and installed by Truck Mfg.	*Follow Vehicle Mfg. Specs.
Bar Pin Bushing Locknut	48942-000	1"-8 UNC Grade C	450-600

NOTE: Torque values listed above apply only if Hendrickson supplied fasteners are used. If non-Hendrickson fasteners are used, *follow torque specifications listed in vehicle manufacturer's service manual.

All threads must be clean and lubricated with SAE 20 oil before assembly to obtain the correct relationship of torque and fastener tension.

To obtain maximum service life from the suspension system, mounting bolts and nuts should be checked at least once a year and tightened to specified torque.

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