HI-VISIBILITY MASTS

The Yale Hi-Vis® masts are of a high visibility design. This means that there is an unobstructed view through the mast uprights when the mast is lowered, unlike previous designs. It is a parallel channel system rather than a tapered channel system of previous designs. In this design, the I-Beam sections are set at the same width over the entire length of the upright rather than narrowing at the top. This provides closer fit between uprights, thereby reducing mast rattle.

There are four mast types used. They are the Hi-Vis Simplex, Hi-Vis Duplex, Hi-Vis Triplex and Hi-Vis Quadplex with model designations of V, F, E, and Q respectively. The Hi-Vis Simplex is a two stage mast with a minimal amount of free fork height. The Hi-Vis Duplex is a two-stage mast with a free fork height equal to the carriage travel inside the elevating upright. The Hi-Vis Triplex three-stage mast and Hi-Vis Quadplex four-stage mast have free fork heights equal to the carriage travel inside the primary upright. Each of these masts are available in different sizes depending upon the truck model and capacity. They are the 4-1/2, 5-1/2 and 6-7/8 inch mast. The size of the mast is determined by measuring the width of the I-Beam, not the stationary channel.

All 4-1/2 masts are equipped with widely-spaced, full-faced load rollers and wear plugs. The load rollers require no shimming and the wear plugs can be easily adjusted without the use of special tools or mast disassembly. The load rollers, side rollers, wear plugs, chains and cylinders can be serviced with only partial mast disassembly.

All carriages are equipped with load rollers, side rollers and wear plugs. On the Duplex and Triplex masts, articulating chain anchors have been added to the carriage to maintain proper alignment.

The hydraulic cylinders are all chrome-plated and full-floating mounted to help prevent cylinder wear due to off-center loading.

Lowering speeds are controlled by a flow regulator located in the manifold block mounted on the back of the mast. Duplex and Triplex masts are equipped with a sequence valve to ensure proper mast staging. The sequence valve is equipped with a relief valve that blocks the oil to the dual hoist cylinders until the freelift cylinder is fully extended. All cylinders are equipped with velocity fuses. Velocity fuses control the lowering of the mast in case a hose ruptures.

This book covers Hi-Vis Simplex, Duplex and Triplex masts. For information about the Hi-Vis Quadplex, refer to Quad Maintenance Module 3J001.

Read and observe the following before doing any work on these masts.

1. Be certain to refer to description of parts on all illustrations. We are using primarily **Metric** threaded screws on this assembly and there is the possibility of stripping threads by installing the wrong screw, stud or nut when these parts are replaced.

2. For all torque specifications unless otherwise listed in this booklet, refer to the Torque Specification Charts that can be found in all Service Maintenance Manuals.

3. Refer to **Hints For Safe Maintenance** also found in all Service Manuals.

4. **WARNING:** Yale Industrial trucks are equipped with certain safety devices as standard equipment, for example; overhead guards, load backrest extensions, finger guards, etc. If for any reason these safety devices are removed when the truck is being adjusted, repaired, or overhauled, these safety devices **must be** properly reinstalled before any testing or operation of the truck is to be done. Failure to comply with this warning could result in serious injury to the mechanic and/or operator.

5. **WARNING:** Never run hands or fingers, along any tubes, pipes, or hoses while looking for a system leak as some of these lines (diesel fuel, hydraulic, steering, etc.) contain extremely high pressure and if leaking through a pin hole will cause the oil to penetrate the skin.

GENERAL

OBSERVE THESE RULES WHEN REMOVING, REPAIRING OR ADJUSTING THE MAST ASSEMBLY

1. Only qualified and authorized personnel should be permitted to maintain, repair, adjust and inspect the mast assembly.

2. The recommended Schedule of Maintenance should be used as a guide for inspection of the mast.

3. Wear protective clothing such as safety shoes, eyeglasses, etc.

4. Use proper capacity hoisting equipment, lifting chains and slings. Some mast's weigh in excess of 3500 lbs. without forks and load backrest.

5. Before working on the mast, raise drive wheels free of floor, disconnect battery and use chocks or other positive truck positioning devices.

6. Be sure engine is turned off, mast is in its lowered position and all hydraulic pressure is released in the system before working on the mast.

7. Place blocks under counterweight when removing the mast assembly.

8. When it is necessary to work with the mast in an elevated position, always place blocks under all elevated parts.

9. No welding is to be done on the mast assemblies without receiving specific written approval and instructions from the manufacturer.

10. Welding must be done by a certified welder.

11. Use a ladder or maintenance platform to work on the mast when it is elevated. Do not climb up on the mast, cowl or overhead guard.

12. Never make adjustments when the mast is elevated and the chains are slack.

13. Keep hands, arms and legs from between uprights.

14. Do not ride on forks or elevate mast with a person on the forks.

15. Attach a **DO NOT OPERATE** tag to the vehicle if the truck is disabled or is in the process of repair.

16. After adjustments and repairs, test mast first without a load and then with a full rated load on the forks.

17. Modifications and additions which affect capacity and safe truck operation should not be performed without the manufacturer's written approval. Capacity plates may be obtained through your local Yale dealer.

18. Capacity, operation and maintenance instruction plates, tags and decals should be maintained in legible condition.

19. Always use Yale replacement parts to be sure they are interchangeable with the original parts and are of a quality equal to that provided in the original equipment.

MAST ASSEMBLY — REMOVAL AND INSTALLATION — GAS AND ELECTRIC RIDER EXCEPT ESC-A AND ERC-TAN

1. Center the truck under a suitable chain hoist and lower the mast fully.

2. Disconnect the hoist hose and drain back hoses (if equipped).

3. Raise the front of the truck to gain access to the trunnion cap bolts.

4. Support the truck using approved stands.

5. Secure a lifting chain to the mast in the lift holes provided in the top cross member and remove the slack from the chain.

6. Remove the (2) mast trunnion caps.

7. Remove the tilt cylinder rod end pins.

8. Lift the mast off of the drive axle housing using the chain hoist.

9. Reverse the procedure to install the mast. Apply Loctite (P/N 5017029-02) to the threads, and torque the trunnion cap bolts to 160 ft-lbs.

MAST ASSEMBLY — REMOVAL AND INSTALLATION — ESC-A AND ERC-TAN

1. Center the truck under a suitable chain hoist and lower the mast fully.

2. Disconnect the hoist hose.

3. Secure a lifting chain to the mast in the lift holes provided.

4. Lift the load wheels off of the ground.

5. Support the truck frame using approved stands.

6. Remove the tilt cylinder rod end pins from the mast.

7. Remove the brake hose from the manifold.

8. Remove the (8) bolts securing the (2) tilt pivoting brackets.

NOTE. It will be necessary to remove the (2) cover plates on the ESC-A trucks.

9. Move the mast away from the truck.

10. Reverse the procedure to reinstall the mast and bleed the load wheel brakes. Torque the tilt pivot bracket bolts to 90 ft-lbs.

LOAD FORKS — REMOVAL AND INSTALLATION

1. Lower the carriage until the forks are approximately 1 inch off of the ground.

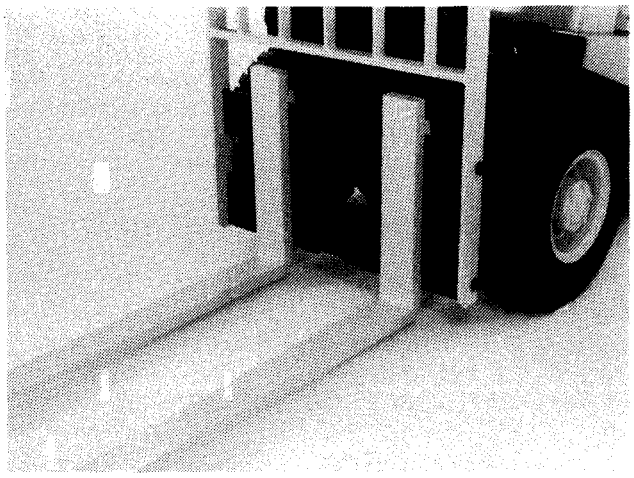


Figure 1 — Load Forks

2. Raise the lever on the fork keeper pins.

3. Move the fork to the center of the carriage so that the bottom fork clip lines up with notch in the bottom plate of the carriage.

4. Lift fork tip so that bottom comes away from the carriage and remove.

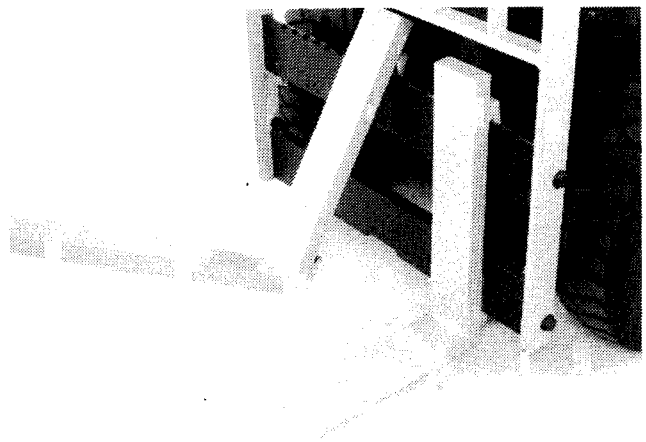


Figure 2 — Removing The Forks

5. Repeat the procedure for the other fork.

6. Reverse the procedure to install.

LOAD BACKREST — REMOVAL AND INSTALLATION

1. Loosen the (2) upper mounting bolts.

2. Remove the (2) upper mounting bolts and lay the backrest on the forks.

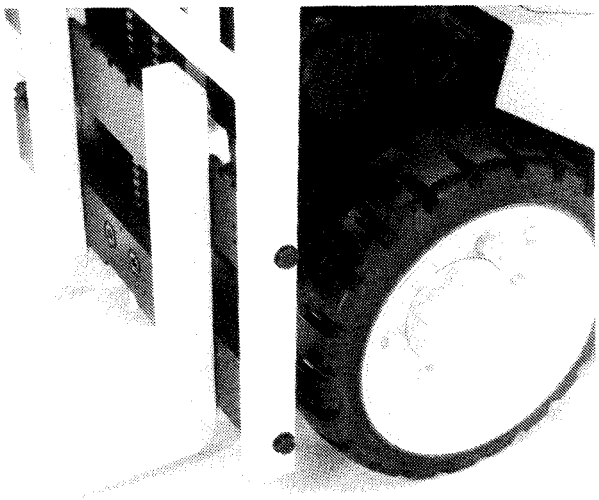


Figure 3 — Load Backrest Mounting Bolts

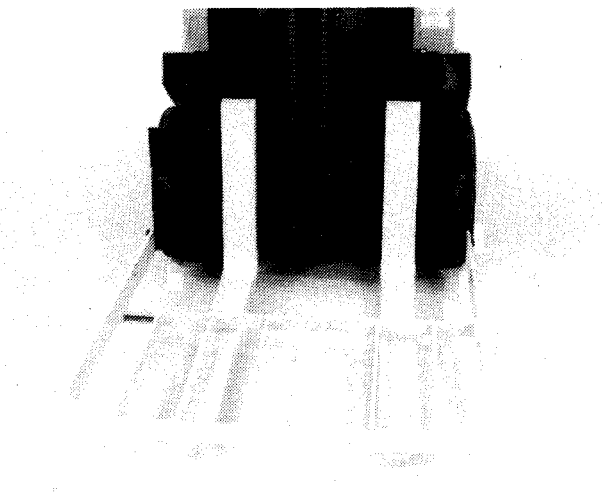


Figure 4 — Removing The Load Backrest

3. Remove the (2) lower mounting bolts.

4. Lift the backrest off the forks.

5. Reverse the procedure to reinstall. Torque the bolts to 150 ft-lbs.

CARRIAGE ASSEMBLY — REMOVAL AND INSTALLATION

1. On trucks equipped with 5-1/2 inch masts and 10,000 and 12,000 lbs. trucks equipped with 6-7/8 inch masts it will be necessary to remove the thrust rollers and studs.

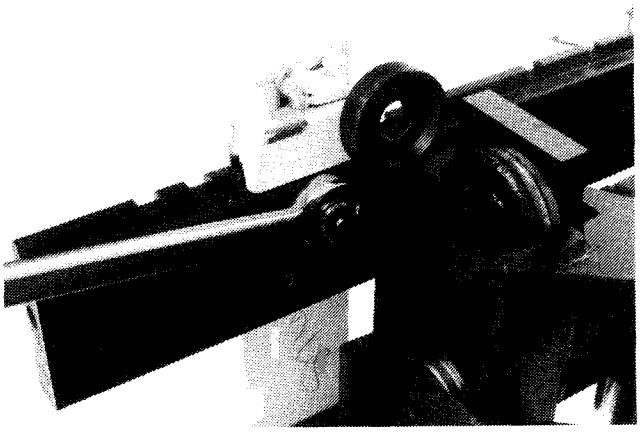


Figure 5 — Removing The Carriage Thrust Rollers

2. With the mast vertical, place blocks under the forks and lower the carriage until the chain is slack. Support the carriage assembly so it cannot tip over.

3. Remove the cotter pins from the rear chain anchor pins.

4. Pull the chains out of the sheaves and drape them over the front of the carriage.

5. Raise the elevating upright high enough to clear the top of the carriage and move the truck away from the carriage.

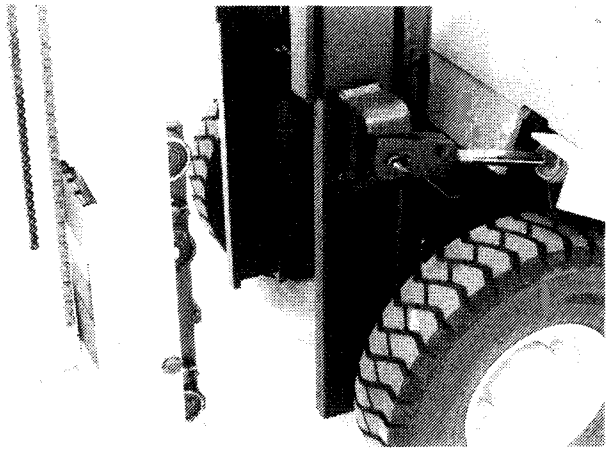


Figure 6 — Removing The Carriage

6. Reverse the procedure to install the carriage. Always use new cotter pins when reinstalling the chains. Torque the thrust studs to 250 ft-lbs on 5-1/2 inch masts and 660 ft-lbs on 6-7/8 inch masts. Use a torque multiplier, part no. 5188968-46. Apply Loctite to thrust roller studs upon reinstallation.

CARRIAGE LOAD ROLLERS — REMOVAL AND INSTALLATION

1. Remove the carriage (See Carriage—Removal and Installation).

2. Remove the jam nuts and set screws from the load roller brackets.

3. Push out and replace the wear plugs if necessary.

4. Remove the snap rings from the load roller bracket.

5. Pry the load roller off the load roller bracket.

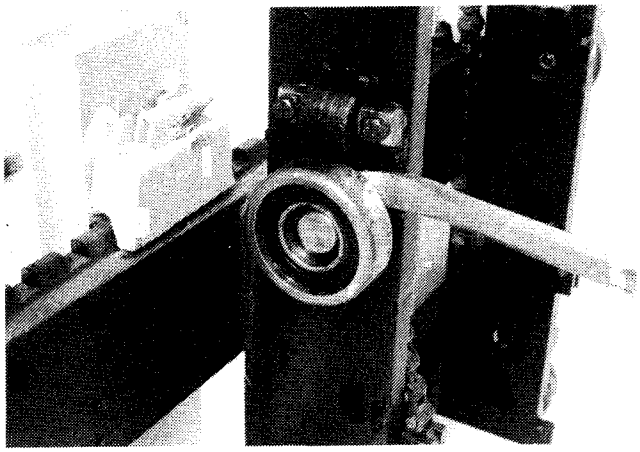


Figure 7 — Removing The Carriage Load Roller

6. Clean and inspect each load roller. Replace each roller that shows signs of wear or is damaged.

7. Reverse the procedure to reinstall.

8. Check the outside thrust roller clearance. Replace the thrust rollers with the next larger size if the clearance exceeds 1/32" each side.

NOTE: Some mast carriages are not equiped with outside thrust rollers.

9. Adjust the carriage wear plugs after installation.

CARRIAGE SIDE ROLLERS — REMOVAL AND INSTALLATION

1. Remove the carriage (See Carriage—Removal and Installation).

2. Remove the hex head bolts securing the side roller bracket.

NOTE: Observe the position of the shims.

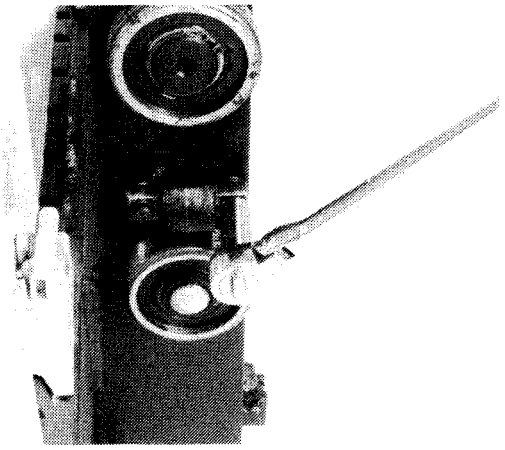


Figure 8 — Removing The Carriage Side Roller

3. Inspect and replace all damaged or worn parts.

4. Reverse the procedure to reinstall.

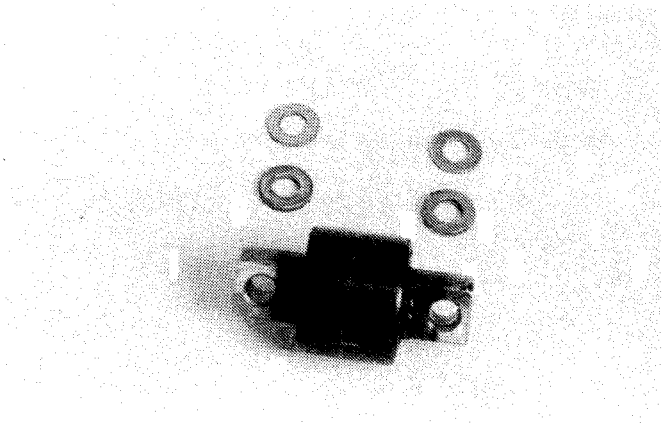


Figure 9 — Side Roller

CARRIAGE SIDE ROLLER ADJUST

1. Measure the width of the inside face of the elevating upright in several places and note the smallest measurement.

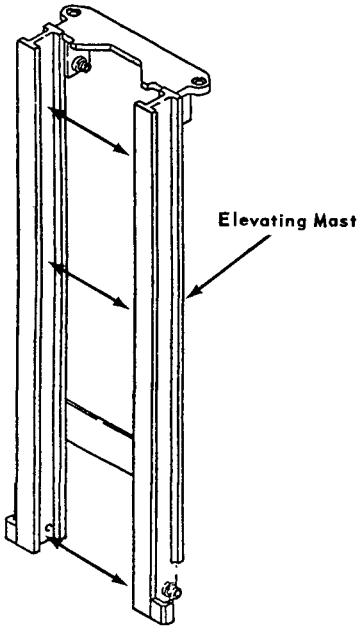


Figure 10 - Measuring Channel Width

2. Measure the distance across the upper and lower side rollers.

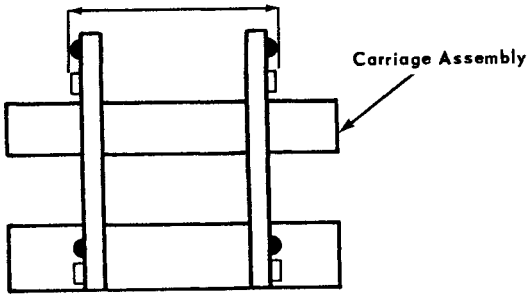


Figure 11 — Setting Side Roller Width

3. Increase or decrease the shim thickness so that the distance across the rollers is 1/64 inch less than the measurement recorded in Step 1.

NOTE: It is important to keep the amount of shims on each side of the carriage equal so that carriage will be centered in the primary channel.

WEAR PLUG ADJUSTMENT

In back of the wear plug is a socket head set screw and jam nut. By loosening the jam nut and turning the set screw in or out, the wear plug can be adjusted to provide minimum clearances. A special tool (part number 5062050-00) is available which makes the wear plug adjustment easier. This tool can be obtained by contacting your nearest Yale dealer.

After each stage has been adjusted, test the operation by raising and lowering the mast assembly first without a load. That way, if the mast binds or hangs up, the binding area can be pinpointed immediately. If the mast binds, **NEVER** loosen the wear plugs without first raising the mast again to take the slack out of the chains. Failure to do this will allow a sudden drop of the binding upright member which may cause injury. Next test with a load.

1. Loosen all of the jam nuts on the wear plugs, if not already done.

2. Adjust the wear plugs to center the elevating upright and provide zero clearance between the wear plug and corresponding upright.

3. Back off each wear plug 1/8 turn to allow for approximately 1/64" total clearance.

4. Tighten the jam nuts.

5. Test the operation of the mast.

6. Repeat this procedure for each upright.

CARRIAGE WEAR PLUG ADJUSTMENT

1. Loosen the jam nuts and back the set screws out slightly.

2. Turn the set screws in until the wear plugs contact the mast.

NOTE: Be sure the carriage remains centered in the primary channel.

3. Back the set screw out a 1/8 of a turn to allow for proper clearance.

4. Tighten the jam nut.

5. Run the carriage up and down in the primary channel. Make sure the carriage runs smoothly and does not bind.

6. Adjust the chains if there appears to be unequal loading on the chains.

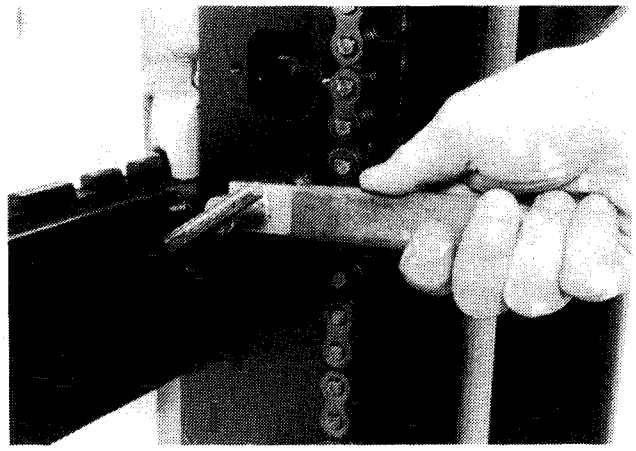
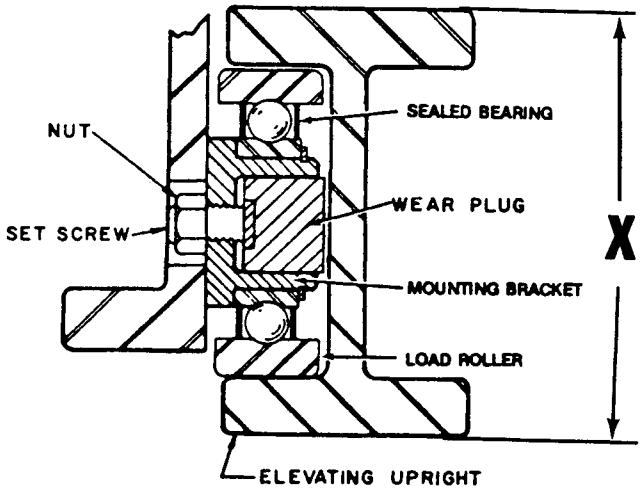


Figure 12 — Adjusting Carriage Wear Plugs



X — Indicates Mast Size, 4-1/2, 5-1/2, 6-7/8 Inch

Figure 13 — Typical Load Roller and Wear Plug Assembly

WEAR STRIPS (SIMPLEX AND DUPLEX MAST) — REMOVAL AND INSTALLATION

All movable upright members on 5-1/2 masts contain wear strips which are mounted on the lower guide blocks. Behind the wear strips are shims that determine the position of the wear strips. These strips are used as a guide when the elevating mast section is fully extended with an off-center load. These shims keep the elevating mast section in a vertical position.

Therefore, wear strips should not be adjusted too close to cause binding or too loose to cause the mast to cock when elevated.

NOTE: Shims and wear strips are RIGHT and LEFT handed and are **not** interchangeable.

1. Raise and block the carriage high enough to make the wear strips easily accessible.

2. Remove the hex. hd. bolts, hardened washers, wear strips and shims. Replace all worn or damaged parts.

NOTE: Usually one wear strip and one shim on each side are sufficient, both sides should be shimmed equally to center mast.

3. Reverse the procedure to reinstall.

4. Raise and lower the elevating mast a few times to be certain wear strips are free and do not rub on the stationary mast section.

LOAD ROLLERS (ALL MODELS)

Load rollers are found on each upright member and carriage assembly. These rollers allow the uprights and carriage to slide up and down inside one another smoothly. The load roller assembly is comprised of an outer roller shell, a grease sealed ball bearing and an inner wear plug. The load roller is mounted on a bracket which is welded to the upright assembly or the carriage. The roller is retained on the bracket with a snap ring.

LOAD ROLLER INSPECTION & MAINTENANCE

Since the load roller contains a grease sealed bearing, no lubrication of the roller itself is necessary. However, the wear plugs themselves come in contact with the central portion of the upright I-beam. It is necessary to periodically apply grease to this area. In many applications, dirt from the environment collects on the greased uprights and creates hardened accumulations of dirt and grease which interferes with free movement of the rollers. If this condition is allowed to exist, the rollers will slide instead of roll up and down in the mast creating flat spots on the roller shell.

Periodically steam clean the mast assembly to remove these dirt accumulations and apply new grease to all friction areas. Inspect the rollers for cracks, flat spots and frozen bearings.

If the load rollers must be replaced, refer to the appropriate Mast Section for removal and installation.

These masts are designed to allow load roller replacement without removing any of the uprights.

ADJUSTMENTS

The only adjustments necessary on the load rollers is the adjustment of the wear plugs. Adjustments are made to keep side play to a minimum and to keep the uprights and carriage centered within their respective channels.