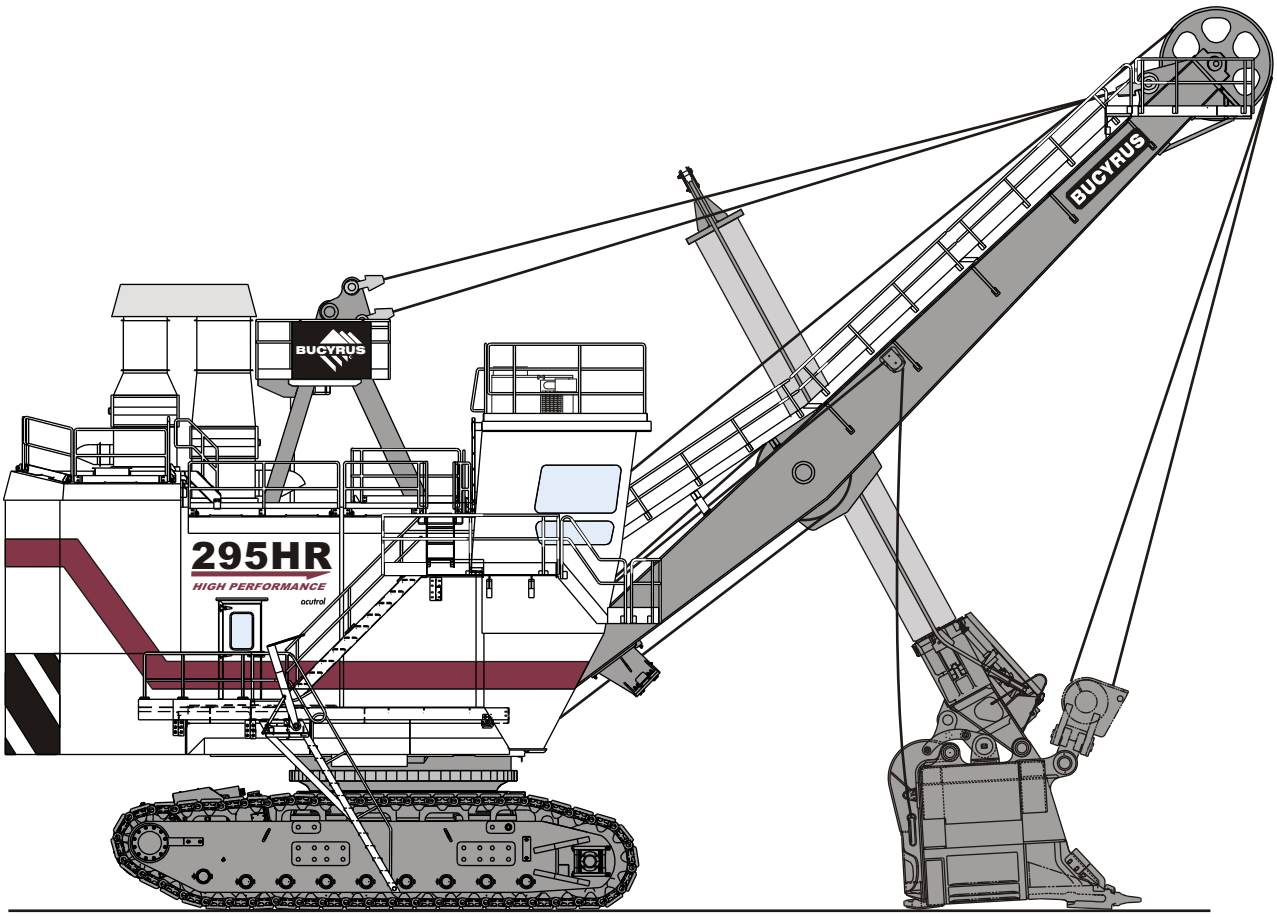
BUCYRUS®

295HR
MINING SHOVEL
MAINTENANCE and OPERATION MANUAL

SN:141346
SN:141347
SN:141350
SN:141351

Manual No. *10709*



Bucyrus International, Inc.

1100 Milwaukee Ave. • P.O.Box 500 • South Milwaukee, Wisconsin 53172-0500 USA

SAFETY - SWINGING RESTRAINT & BALLAST BOX SUPPORT

BALLAST BOX SUPPORT

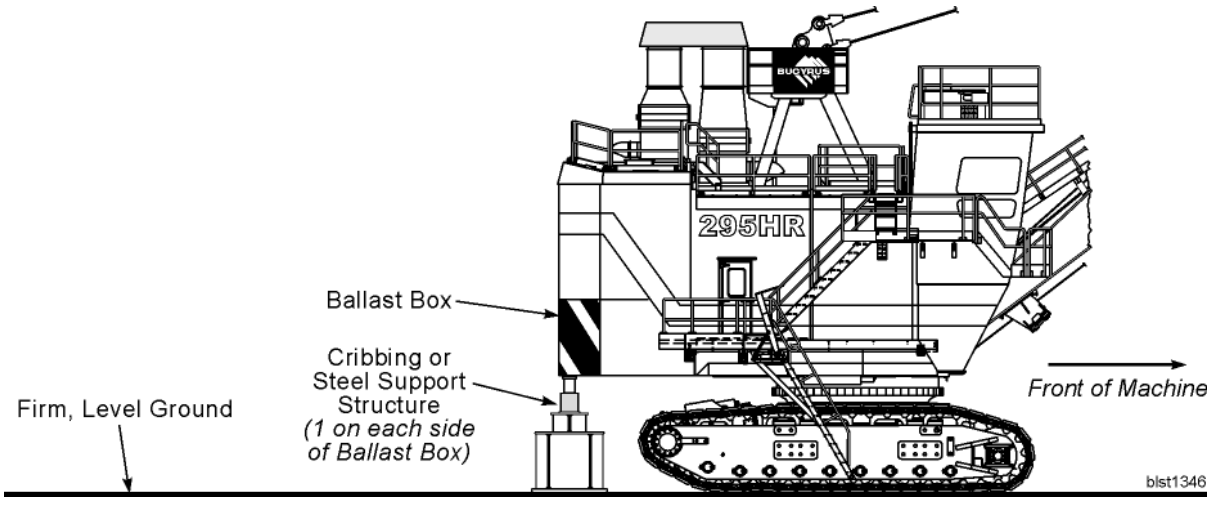
Before performing any maintenance on the mining shovel, it should be resting on a firm, level surface.

Any mining shovel field work that requires the removal or lowering of the boom must incorporate additional support of the ballast box. The supports may be wooden cribbing or steel structures. Two supports positioned side-by-side on level ground are recommended. These supports are intended to accept vertical loads only. To prevent machine rotation use the swing brakes, cable stays, welded ties, etc. Refer to “SWING RESTRAINT”.

When electric-powered, cable-style mining shovels are properly ballasted and operational, the center of gravity for the machine's upper works lies within the roller circle area. This assumes that the boom is attached to the machine and in its elevated, working position. As such, the machine should not be prone to tipping.

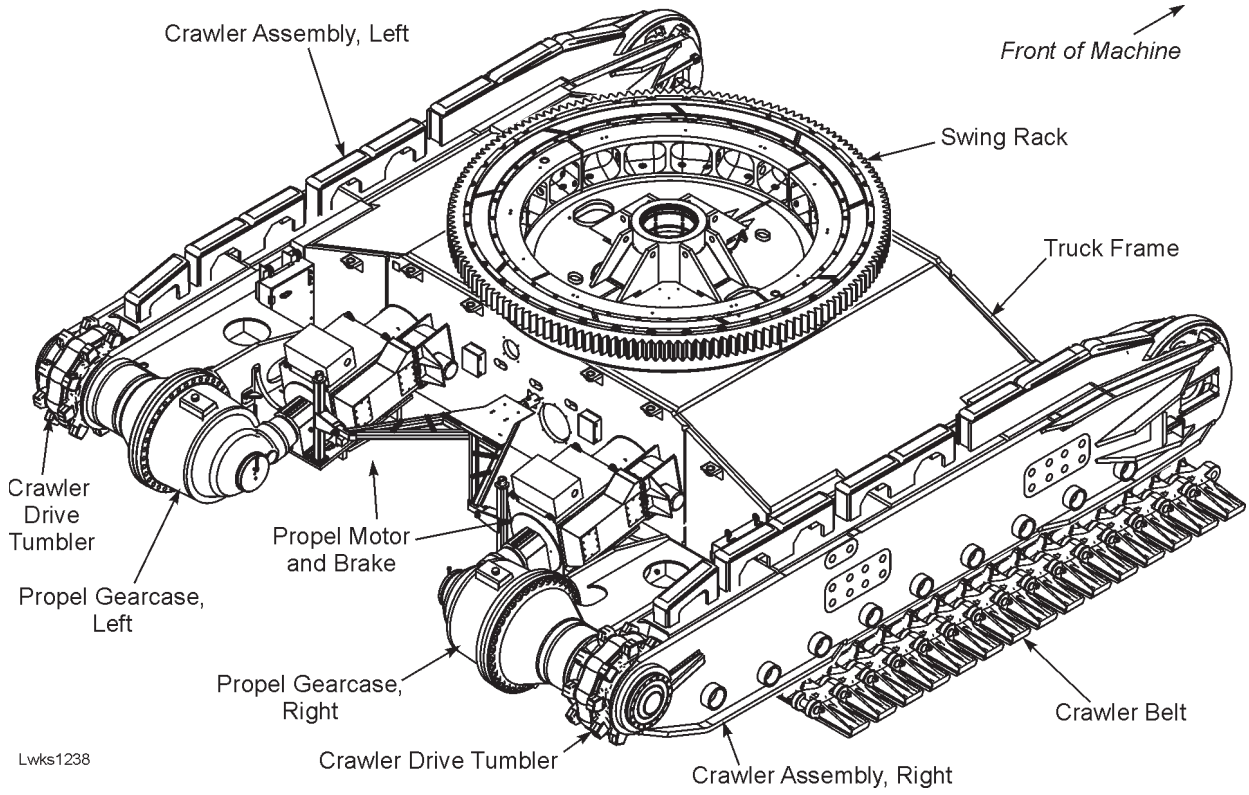
Boom removal or lowering will cause the center of gravity to shift toward the ballast box, decreasing machine stability. Stability is further dependent on the orientation of the upper works relative to the undercarriage. The machine may tip more easily over one of the four quadrants of the crawler mounting than it may over others.

Normally the machine is more likely to tip over the rear-most lower-roller than over the side of a crawler. Therefore, with the boom removed and the ballast box sitting over the rear of the crawlers, the machine may be unstable. Because ballast quantities differ from machine to machine and model to model, it is recommended that the ballast box be supported *before* beginning any procedure to lower and/or remove the boom.



LOWER WORKS

The lower works is comprised of the truck frame, right and left crawler frames, crawler belts, propel machinery, swing rack and roller circle.



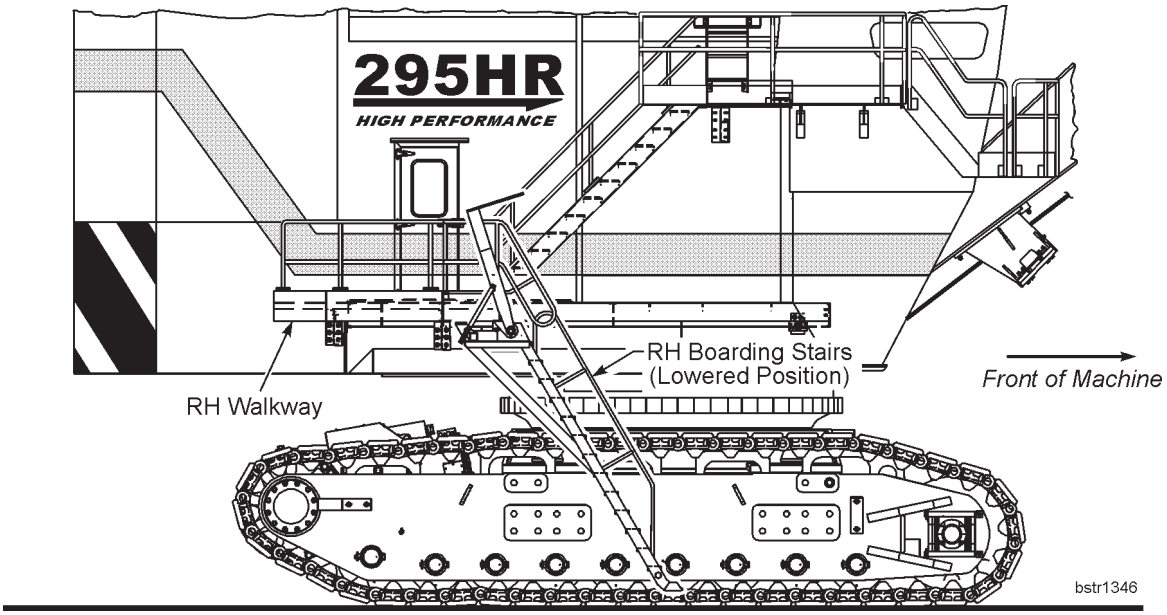
Truck Frame and Crawlers

MACHINERY HOUSE

The machinery house encloses the revolving frame, ballast box and deck extensions. It is constructed of self-supporting steel panels with built-in framing. Removable roof sections are provided over the swing machinery and to the side and rear of the A-frame. The house also provides mounting for the air ventilation and pressurization system. A separate electrical room is located over the ballast box. Platforms and stairs facilitate access to the sides and tops of the house for inspection and maintenance purposes. Boarding stairs permit easy access onto the machine.

BOARDING STAIRS

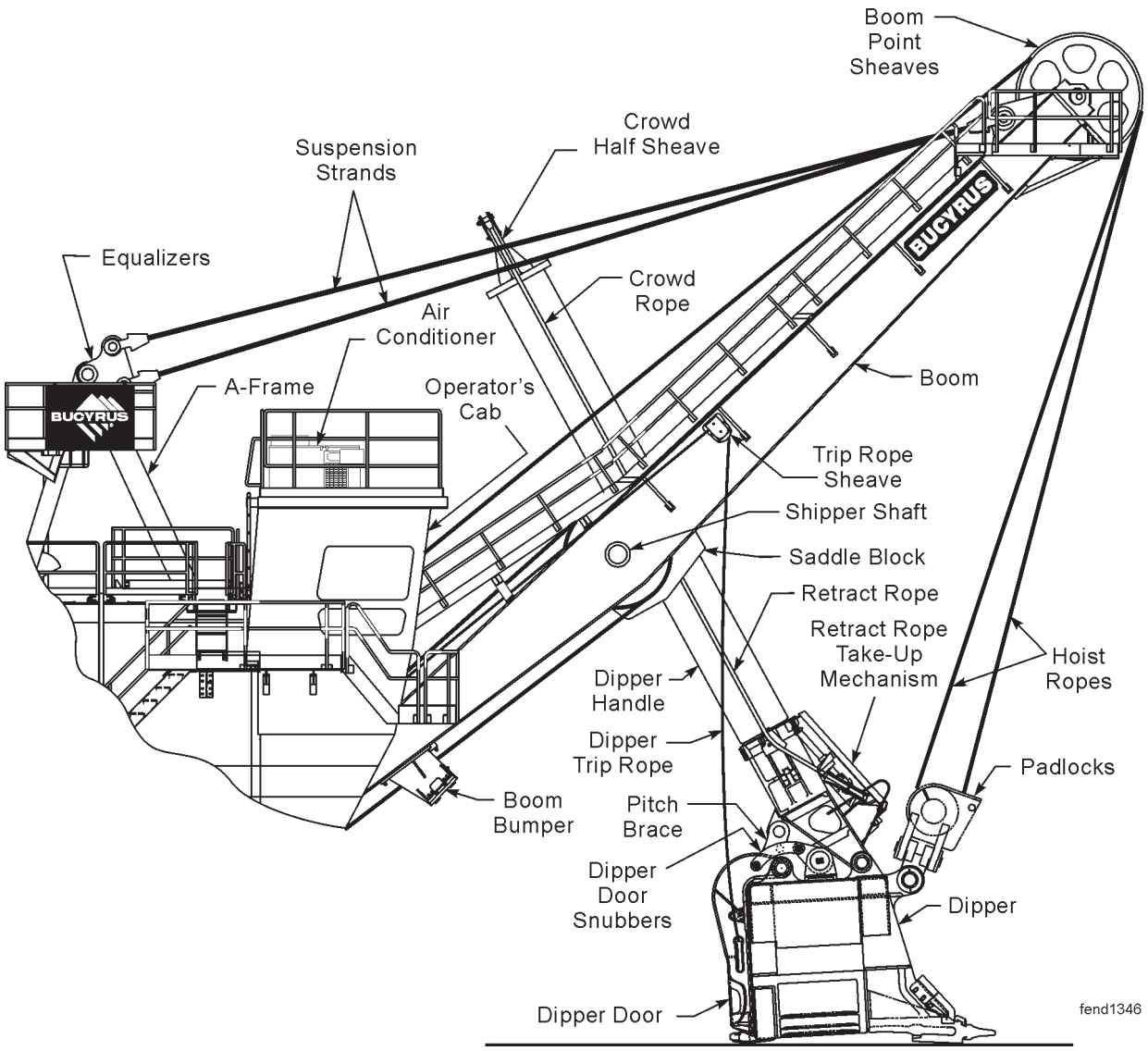
A set of boarding stairs is attached to the machinery house platform on the right side of the machine. When lowered, the stairs allow entrance to the machinery house from ground level. To lower the stairs, a chord attached to the stairway is reachable from the ground. The stairs must be in the raised position to enable the operator's controls.



RH Boarding Stairs

FRONT END EQUIPMENT

The front end equipment consists of the boom, the boom point sheaves, padlock, saddle block, dipper handle, dipper, dipper trip mechanisms, running ropes and boom suspension strands.



SUSPENSION STRANDS

The suspension strands are designed to maintain the proper boom angle. These are fixed-length strands that support the entire weight of the boom and the load.

	Quantity	Weight Each (U.S. Pounds)
Boom & Dipper Handle Components *(cont.)*		
Bearing, Boom Point	2	280
Shipper Shaft	1	4,500
Dipper Trip Components		
Base, Dipper Trip	1	750
Guard, Dipper Trip Drum	1	65
Drum, Dipper Trip	1	95
Gear, Machined Dipper Trip	1	160
Support, Deflector	1	95
Support, Dipper Trip	1	200
Pad, Mtg, Dipper Trip Rear	1	95
Pad, Mtg, Dipper Trip Front	1	125
Motor, Dipper Trip - 5hp	1	695
Rope, Dipper Trip	1	80
Swing Machinery		
Retainer, Brg, Vert. Swing Shaft	2	85
Pinion, Vert. Swing, Induct.	2	1,110
Gear, Swing - Machined 89T	2	1,710
Bearing, Taper Roller	2	100
Bearing, Roller	2	180
Guard, Swing Pinion	2	105
Retainer, Brg, Int.Shaft	2	100
Pinion Shaft, 2nd Red.,14T	2	220
Bearing, Taper, Roller	2	100
Gearcase & Cover	2	6,580
Cover, Swing Gearcase	2	1,670
Gearcase, Swing	2	5,880
Hub, Swing Gearcase	2	1,790
Gear, Int Swing Shaft	2	1,030
Motor, Swing - 505HP	2	3,600
Blower, Swing Motor	2	230
Adapter,Swing Blower	1	1,760
Swing Brake	2	490
Adapter,Swing Brake	2	210

DIG/PROPEL TRANSFER SWITCH

The Dig/Propel Transfer Switch is used to switch between the two primary operating modes of the machine. The current mode of operation will be indicated on the Operator's screen on the Operator's Display.

IMPORTANT:

- WHILE IN *THE DIG MODE,* THE PROPEL CONTROLS ARE DISABLED.
- WHILE IN *THE PROPEL MODE,* THE DIG CONTROLS ARE DISABLED.

The recommended procedure to transfer from dig to propel is to bring all motions to a controlled stop by the operator. Turn the hoist brake switch to the SET position and then press the control stop pushbutton. Turn the transfer switch from DIG to PROPEL. When the indicator on the Operator Display screen indicates that the transfer has been completed, turn the propel brake switch to release.

EMERGENCY STOP PUSHBUTTON

The machine stop/emergency stop pushbutton is located on the right operator's console. It is used to remove power from the machine motions after the motions have been stopped in the normal manner. A second purpose of the pushbutton is to stop the machine under operational emergency conditions. Pushing this button will provide electrical and immediate mechanical braking simultaneously. Therefore, this button should only be used if the operator intends the harshest braking of all motions. If the machine is in motion, power will remain on the motions in order to provide electrical braking for a few seconds. If the machine is in motion or stopped, this button will power the DC bus to approximately zero voltage quickly after the time delay.

CAUTION: PRESSING THIS BUTTON WHEN ANY DRIVE IS IN MOTION MAY RESULT IN COMPONENT DAMAGE.

A second pushbutton that also provides the functions as described above is located in the remote start console and is labeled "machine stop."

MAIN POWER OFF PUSHBUTTON

The main power off pushbutton is located on the right operator's console. It is used only to immediately remove power from the drives in case of an electrical emergency involving component failure or fire.

CAUTION: PUSHING THE "POWER OFF" PUSHBUTTON WHILE IN MOTION WILL IMMEDIATELY SET THE MECHANICAL BRAKES AND REMOVE INCOMING HIGH VOLTAGE FROM THE DRIVES. THIS ACTION MAY RESULT IN COMPONENT DAMAGE. It will also result in the inability to power the DC bus voltage down to a low value. This voltage will decay slowly, taking several minutes.

S-HCL_295HR

Limit Calibration Help

This screen will provide clarifying information on the calibration process.

4. At the AC control cabinet verify that the uninterruptable breaker is in the ON position. At the motor control cabinet, verify that all breakers are in the ON position.

5. At the remote starting console in the machinery house, use the following sequence to start the machine:

   a. Verify that the green AUXILIARY GROUND FAULT light is lit.

CAUTION: IF THE AUXILIARY GROUND FAULT LIGHT IS OFF, ALERT AN ELECTRICIAN AS SOON AS POSSIBLE. The machine may be operated with one fault but a second fault could cause damage to the machine and/or become a safety hazard. The fault should be cleared as soon as possible.

   b. Verify that the green PHASE SEQUENCE light is lit. This indicates that the incoming power sequence is correct. If not, the light will be out and the machine will not start. Electrical maintenance personnel must correct the problem.

NOTE: This PHASE SEQUENCE light also indicates auxiliary power phase unbalance, phase loss or under-voltage. Any of these faults occurring while the machine is running will produce an alarm. In the event of such an alarm an electrician should be notified, however the machine may be operated.

   c. Verify that the PLC and drive cabinets' green temperature lights are lit. If the cabinet temperature is too low or too high, the machine cannot be started.

   d. Press the UNINTERRUPTABLE POWER SUPPLY on pushbutton. A second start pushbutton is located on the UPS control cabinet.

   e. Verify that the green PLC POWER ON light is lit. This light should be on about 20 seconds after the UPS motor is started.

   f. Turn the AIR COMPRESSOR RUN switch to the run position or press the start pushbutton.

   g. Verify that the green SYSTEM READY light is lit.

   h. Press the SYSTEM RUN pushbutton. When this button is pressed, the system ready light will go out and the drive system will automatically power up.

   i. Verify that the red INCOMPLETE SEQUENCE light is out. If lit, call the electrician to troubleshoot the sequence.

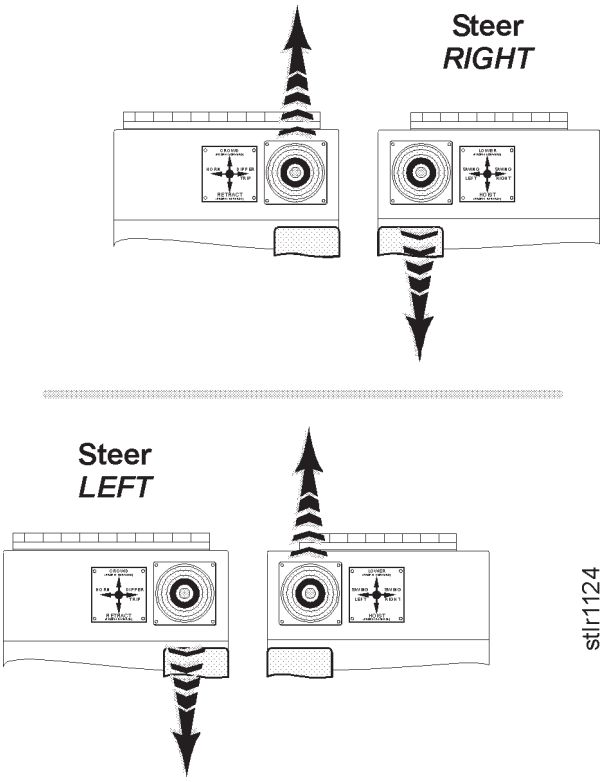
6. In the operator's cab, verify that the air pressure displayed on the operator's display is correct. The machine cannot be operated until the air pressure is at the specified rating.

COUNTER-ROTATION TURNS

Although possible, a single sharp turn should be avoided to minimize material build up on the crawler belt roller path. This results in high loading of the crawler belt and associated propel components.

To make a sharp right turn, move the LEFT joystick forward and pull the RIGHT joystick to the rear.

To make a sharp left turn, move the RIGHT joystick forward and pull the LEFT joystick to the rear.



CAUTION: When using the counter-rotation method for turning, have a helper ensure that the trail cable does not get fouled and/or torn from the machine.

NOTE: The ability of the machine to turn sharply is dependent on the surface on which the machine is setting. A soft surface will cause the crawlers to dig-in and machine to bog-down.

CAUTION: The propel brakes are released when either joystick is moved from neutral. The propel brakes are set when both joysticks are returned to neutral.

When moving the machine in a straight line, propel forward, which is in the direction of the take-up axle to reduce strain on the crawler belts and propel mechanism. When not possible and propelling to the rear, make sure the trail cable is clear of the machine and follow the signals given by the helper. The machine should be rotated in a position to allow the operator to face the direction of travel.

NOTE: Turning when propelling to the rear requires that the master control be positioned in a direction opposite the actual direction in which the turn takes place.

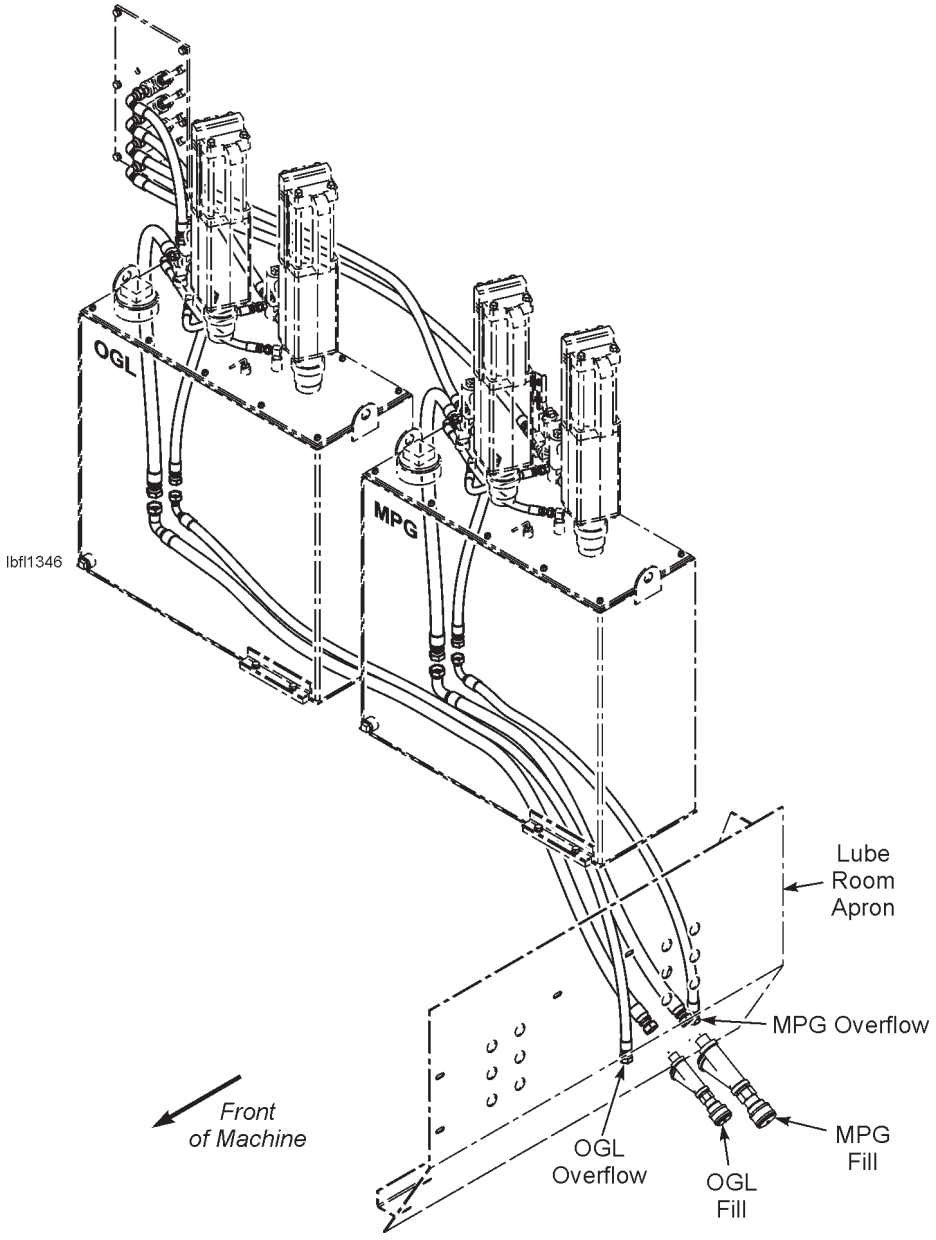
The machine should be moved close to the bank in short and frequent moves to maintain digging efficiency. Movement should occur between the loadings of haul units.

OPERATING HINTS

The following hints are reminders of the do's and don'ts related to excavator operation:

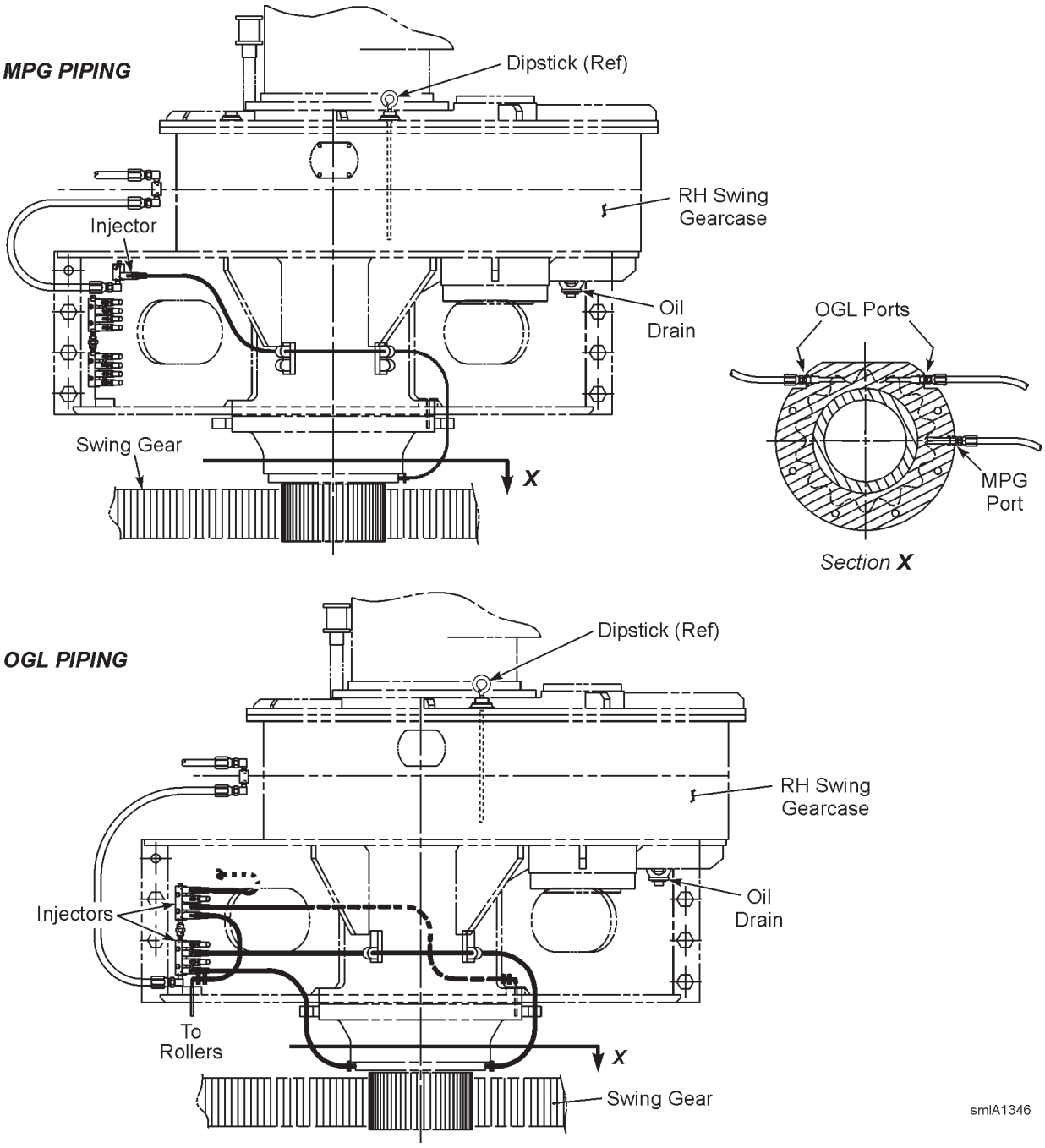
- Engage the bank properly.
- Load with the successive pass technique.
- Maintain a clean pit floor.
- Use proper hoist control.
- Make effective use of the hoist pull.
- Use proper crowd control.
- Force the dipper lip into the bank at the arc of entry.
- Crowd the dipper into the bank for deep penetration.
- Make full face cuts for faster loading cycles.
- Dig under the boom point.
- Make smooth, safe swing cycles.
- Keep swing arcs within 90°.
- "Spot" the haulage units properly.
- Keep the working faces free of projections.
- Propel forward whenever possible rather than backward.
- Move up to the bank frequently.
- Dig over the take-up axle end of the crawlers whenever possible.
- Make gradual turns when propelling.
- Do not suspend a loaded dipper for an extended time.
- Do not operate too close to material.
- Do not operate with missing dipper teeth.
- Do not stall hoist or crowd motions.
- Do not reach for material.
- Do not reach for haulage units.
- Do not overcrowd and jack the boom or machine.
- Do not make partial face cuts.
- Do not make shallow bank penetration.
- Do not make erratic swings.
- Do not swing until dipper is clear of the bank.
- Do not swing loaded or unloaded dippers over personnel or equipment.
- Do not "sweep" pit floor.
- Do not make sharp turns when propelling.
- Do not make long inefficient moves.
- Do not exceed swing arc of 90°.
- Do not spot haulage units inside or outside the boom point swing arc.
- Maintain adequate clearance between digging face and point sheaves.
- Do not allow the dipper to contact the crawler belts.

LUBE RESERVOIR FILL / OVERFLOW PLUMBING



Lube Reservoir Fill / Overflow Plumbing

The lube reservoir fill/overflow plumbing is located on the lube room apron at the front, left side of the machine. Lubricants can be added at this location. The overflow connections are also located here. DO NOT plug the overflow connections.



Swing Machinery MPG & OGL Lubrication Lines

A filter breather is provided on each planetary gearcase to allow air entry to equalize pressure differentials created by the warming and cooling of the gearcase. The filter breather allows moisture to escape and prevents contaminants from entering.

LUBRICANT SPECIFICATIONS

Planetary Propel and Swing Gearcases require ISO VG 220 Gear Oil.

Candidate products can be found in SPECIFICATION FOR ENCLOSED GEARCASE LUBRICANT for Rotary Blasthole Drills - SD4722.

Non-Planetary Hoist Gearcase requires ISO VG 1000 Gear Oil.

Candidate products can be found in SPECIFICATION FOR ENCLOSED GEARCASE LUBRICANT for Draglines - SD4721 Part A.

Non-Planetary Crowd Gearing uses “Open Gear Lubricant”.

Candidate products can be found in SPECIFICATION FOR OGL - OPEN GEAR LUBRICANT - SD4713.

Open Gear Lubricant

Candidate products can be found in CERTIFIED LUBRICANT LISTING FOR OGL, MPG AND EGL LUBRICANTS.

Multi-Purpose grease

Candidate products can be found in SPECIFICATION FOR MPG - MULTIPURPOSE GREASE - SD4711.

CERTIFIED LUBRICANTS:

Lubricants certified by their manufacturers as complying with this specification will be listed on the **"Certified Lubricants Listing for Multi-Purpose Grease"** (see the Bucyrus International, Inc. web site www.bucyrus.com for the latest listing). The use of non-certified lubricants may invalidate the Bucyrus International, Inc. product warranty obligation.

Specific product selection is the responsibility of the equipment operator/owner and is dependent on climate, application, performance and regional/local regulatory requirements.

Lubricant manufacturers seeking to certify their products should contact the following for direction:

Bucyrus International, Inc.
Engineering Services & Technical Support
1100 Milwaukee Avenue
South Milwaukee, Wisconsin 53172
Phone (414) 768-4000

SPECIFICATION REVISIONS:

This specification is subject to change without notice. Please contact the following for the latest specification:

Bucyrus International, Inc.
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1100 Milwaukee Avenue
South Milwaukee, Wisconsin 53172
Phone (414) 768-4000

Bucyrus International, Inc.

CERTIFIED LUBRICANTS LISTING
(January 22, 2007)

Mobil	Mobilgear SHC XMP 460 (ISO VG 460)
Mobil	Mobilgear SHC 460 (ISO VG 460)
Mobil	Mobil SHC 639 (ISO VG 1000)
Mobil	Mobilgear SHC 1000 (ISO VG 1000)
Mobil	Mobilgear SHC 1500 (ISO VG 1500)
Schaeffer Mfg.	#167 Pure Synthetic Gear Lube (ISO VG 460)
Schaeffer Mfg.	#167 Pure Synthetic Gear Lube (ISO VG 1000)
Shell	Omala HD 460 (ISO VG 460)
Shell	Omala HD 1000 (ISO VG 1000)
Whitmore Mfg. Co.	GF 365 Synthetic Gear Fluid (ISO VG 460)
Whitmore Mfg. Co.	GF 365 Synthetic Gear Fluid (ISO VG 1000)
Whitmore Mfg. Co.	Decathlon HD Series Synthetic Enclosed Gear Oil (ISO VG 460)
Whitmore Mfg. Co.	Decathlon HD Series Synthetic Enclosed Gear Oil (ISO VG 1000)

LUBRICANT CERTIFICATION PROCESS:

Lubricant manufacturers seeking to certify their products should contact the following for direction:

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South Milwaukee, Wisconsin 53172
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REVISIONS:

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DAILY Check Points *(cont.)*

6. Dipper Trip - Inspect the dipper trip mechanism, rope, latch bar and associated hardware for damage, adjustment and wear.

7. Dipper Door - Inspect the door structure, hardware and bumpers (if included) for damage and excessive wear.

8. Dipper Handle - Inspect the crowd and retract rope attachment points, take-up cylinders and spacers and dipper handle for damage, excessive wear and evidence of adequate lubrication.

9. Boom Bumpers - Inspect for security and damage.

10. Dipper - Inspect the dipper structure for cracks and deformations. Check the tooth adapters for security and excessive wear.

11. Padlocks - Inspect for damage, wear.

12. Ropes - Check both the running ropes and the boom structural strands for broken strands, loose sockets or any additional visual indications that would indicate a loss of structural integrity.

13. Gearcases - Visually inspect the swing, crowd and hoist gearcases for oil levels and leaks. Repair or service as required.

14. Gearcase Machinery - Visually inspect all machinery for loose bolts, nuts, clamps or unusual conditions. Repair as required.

Electric Mining Shovel

Preventive Maintenance

ITEM #	NOTED DISCREPANCY

pmc_1136

Date: _____

Shift: _____

Inspected By: _____

Supervisor: _____

1250 HOURS, OR QUARTERLY *(cont.)*

10. Warning/Safety Placards - Replace all missing safety and warning signs.

11. Left Hoist Drum Spider - Inspect the spider for cracks, the fit to the drum and bolt tension.

12. Hoist Drum Assembly Bearings - Inspect the bearings, retainers and seals for damage and correct as needed.

13. Hoist Motor Coupling - Inspect the coupling, replace as required.

14. Hoist Motor - Inspect the mounting bolts for security, the blower duct work for damage and security.

15. Hoist Brake Air System - Check the operation of the solenoid valve, release and set operations, hoses, fittings and quick release valve.

16. Crowd Machinery Frame - Inspect for loose bolts or chock blocks, worn mount pins and cracks. Repair as required.

17. Crowd Drum Bearing Journals - Inspect the retainer, bearing retainer bolts, seals and condition of bearings.

18. Bearing Cap Mounting Bolts - Check for tightness.

19. Crowd 1st Gear Reduction - Inspect the gear and pinion teeth for the proper wear pattern, excessive wear and alignment. Correct as required.

Electric Mining Shovel

Preventive Maintenance

ITEM #	NOTED DISCREPANCY

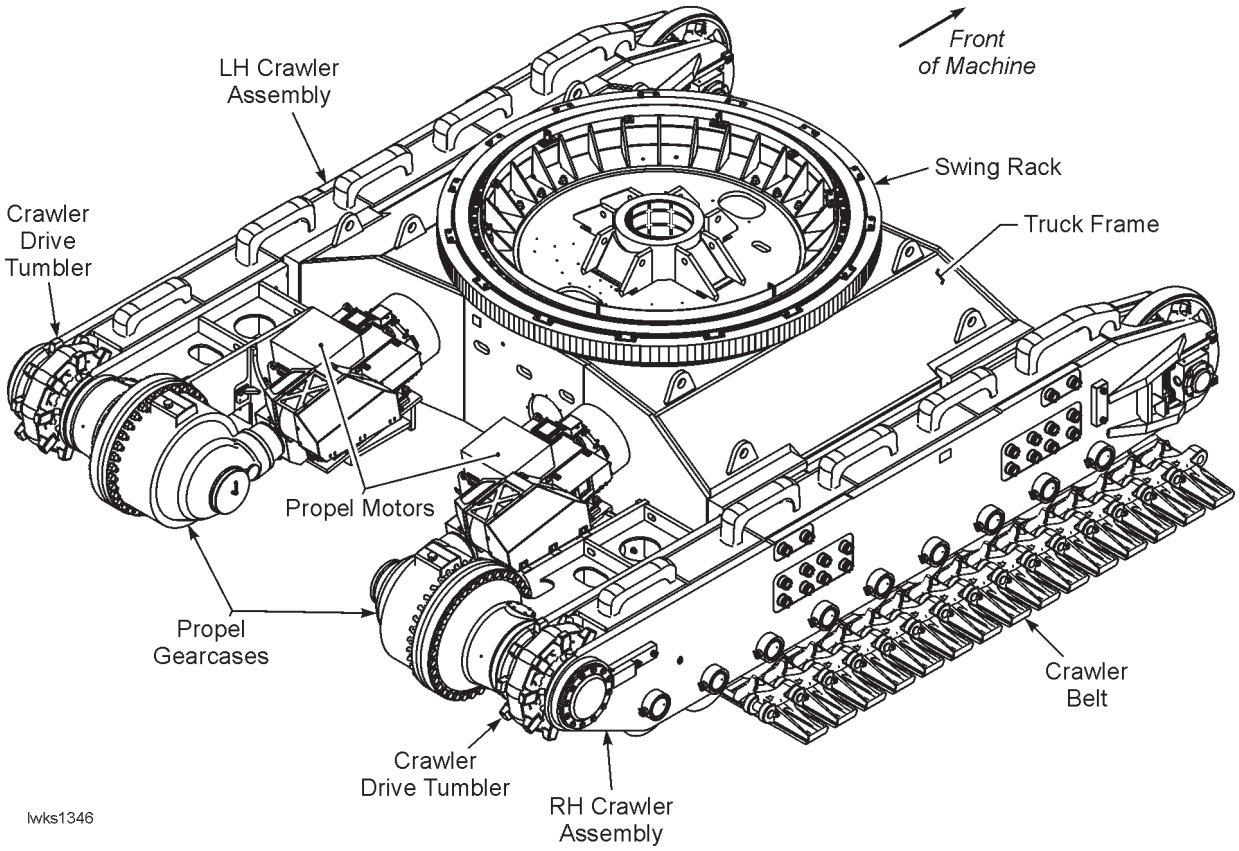
pmc_1136

Date: _____

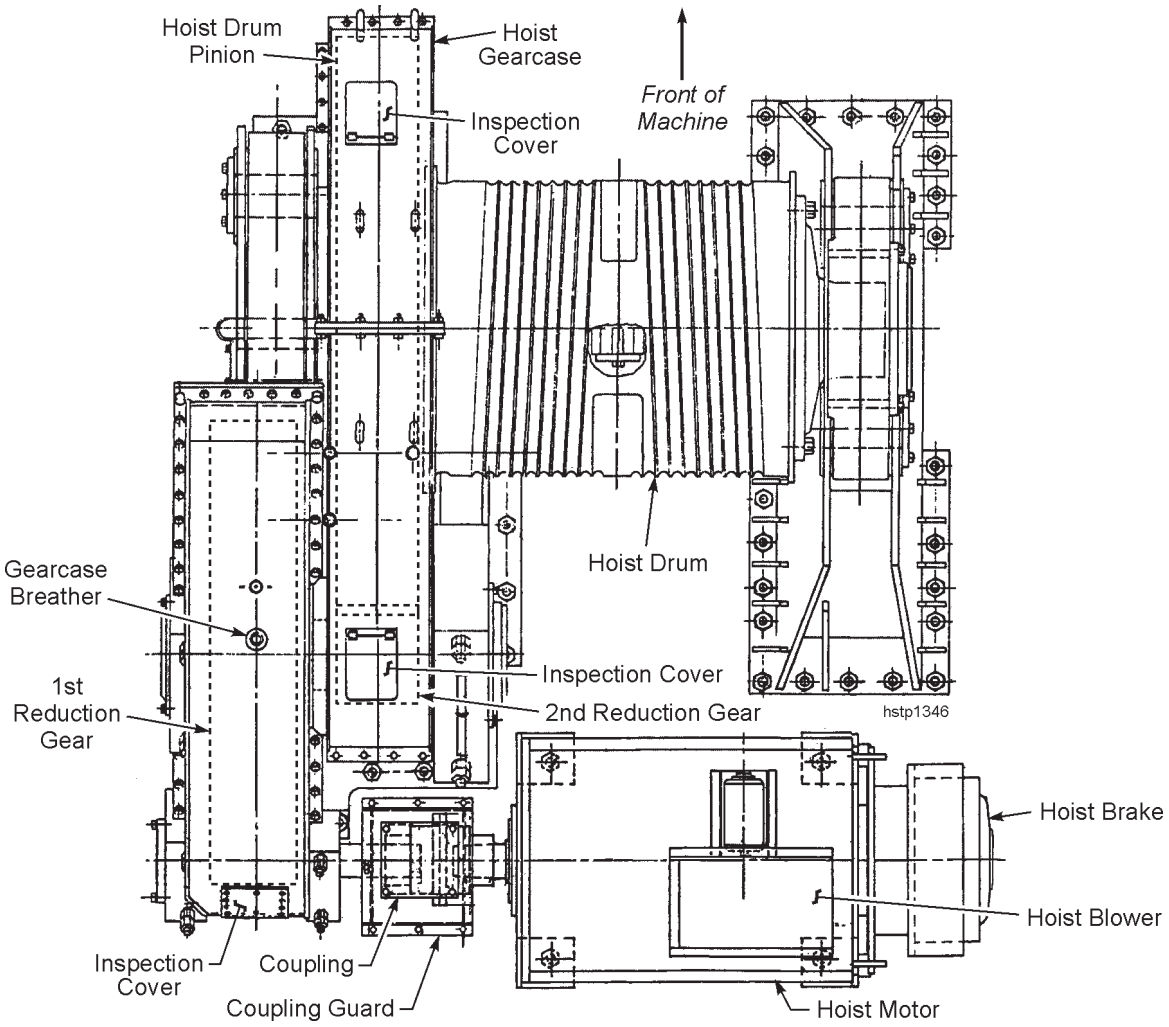
Shift: _____

Inspected By: _____

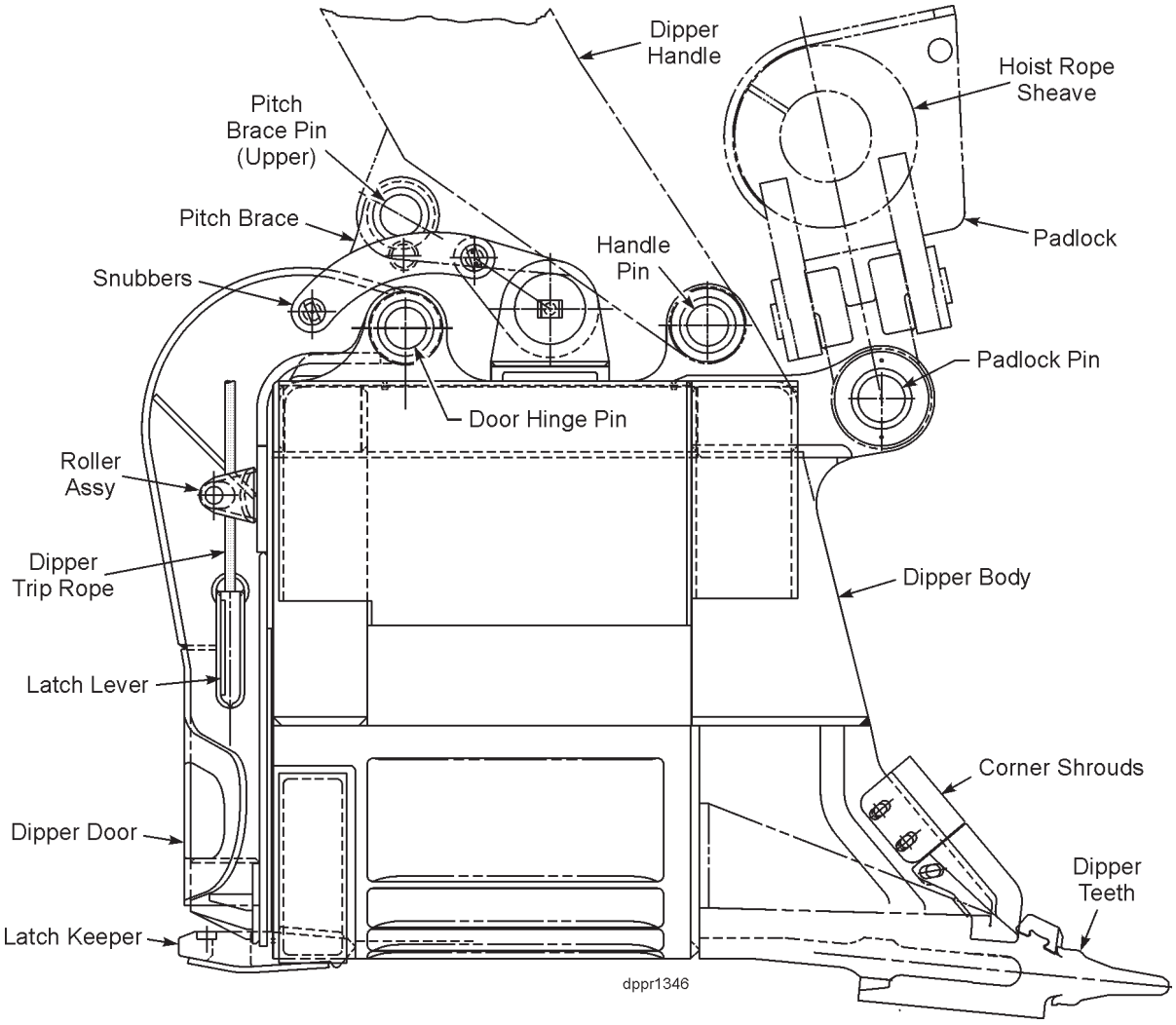
Supervisor: _____



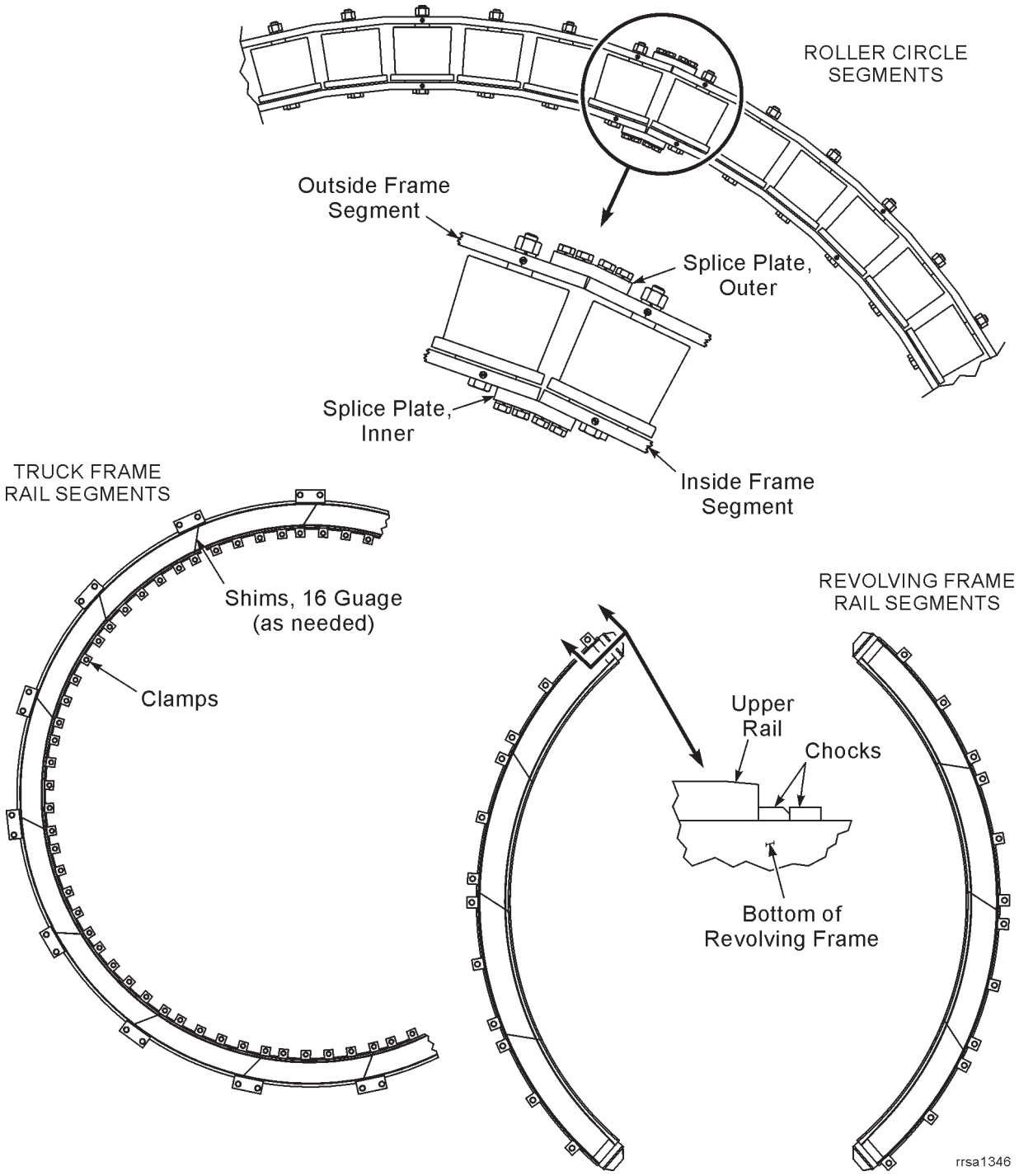
Lower Works and Crawlers



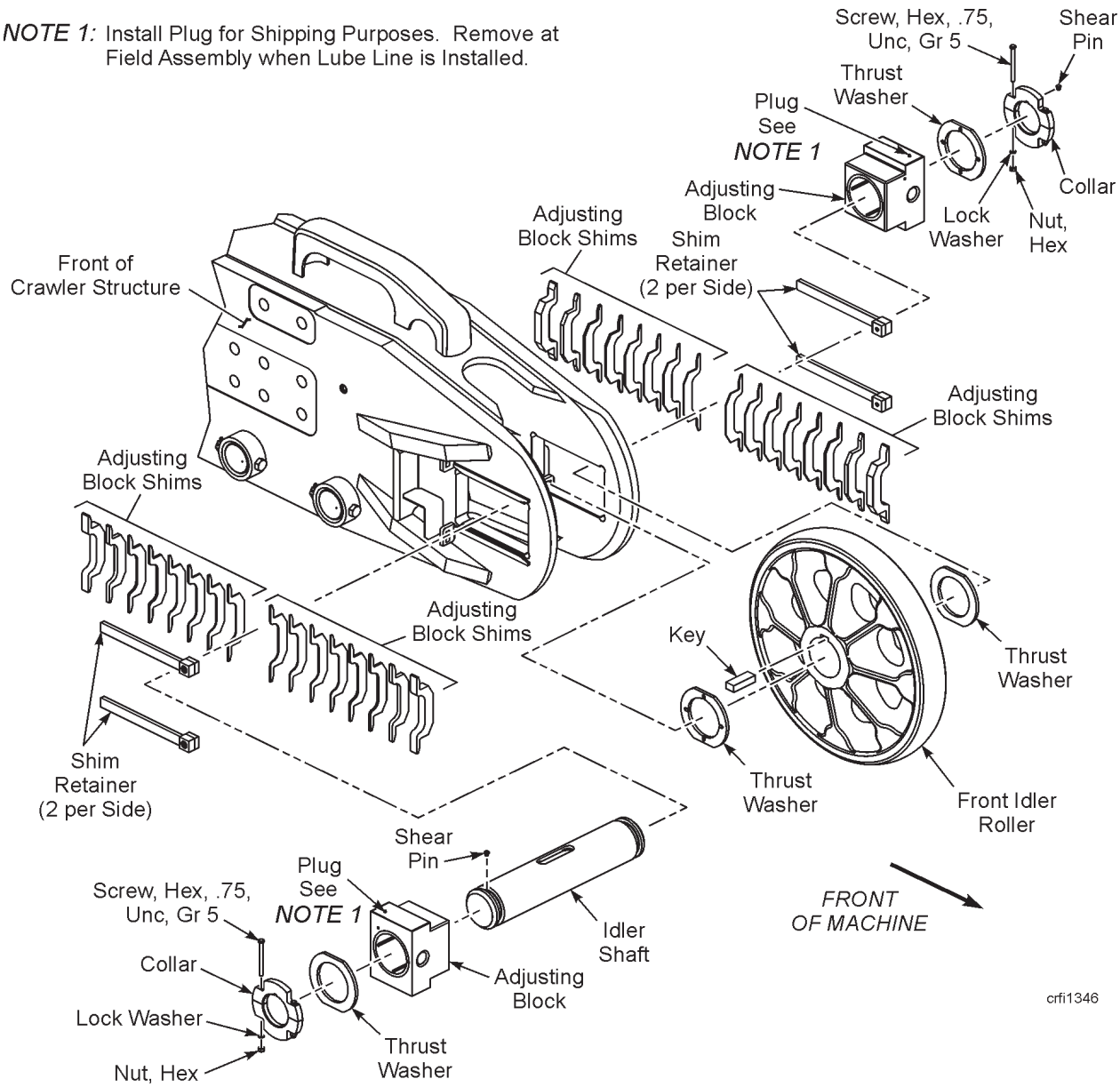
Hoist Machinery



Dipper Assembly



Roller Circle and Rails



Crawler Front Idler Assembly
(Left Shown, Right Opposite)

CRAWLER FRONT IDLER ROLLER ASSEMBLY

The front idler roller carries the machine weight in conjunction with the load rollers. The roller turns about the idler shaft on bronze bushings. The idler shaft mounting consists of a pair of adjusting blocks which can be moved to the front or rear to compensate for crawler belt wear. Shims located on either side of each adjusting block are used to maintain the roller position. *To remove the front idler:*

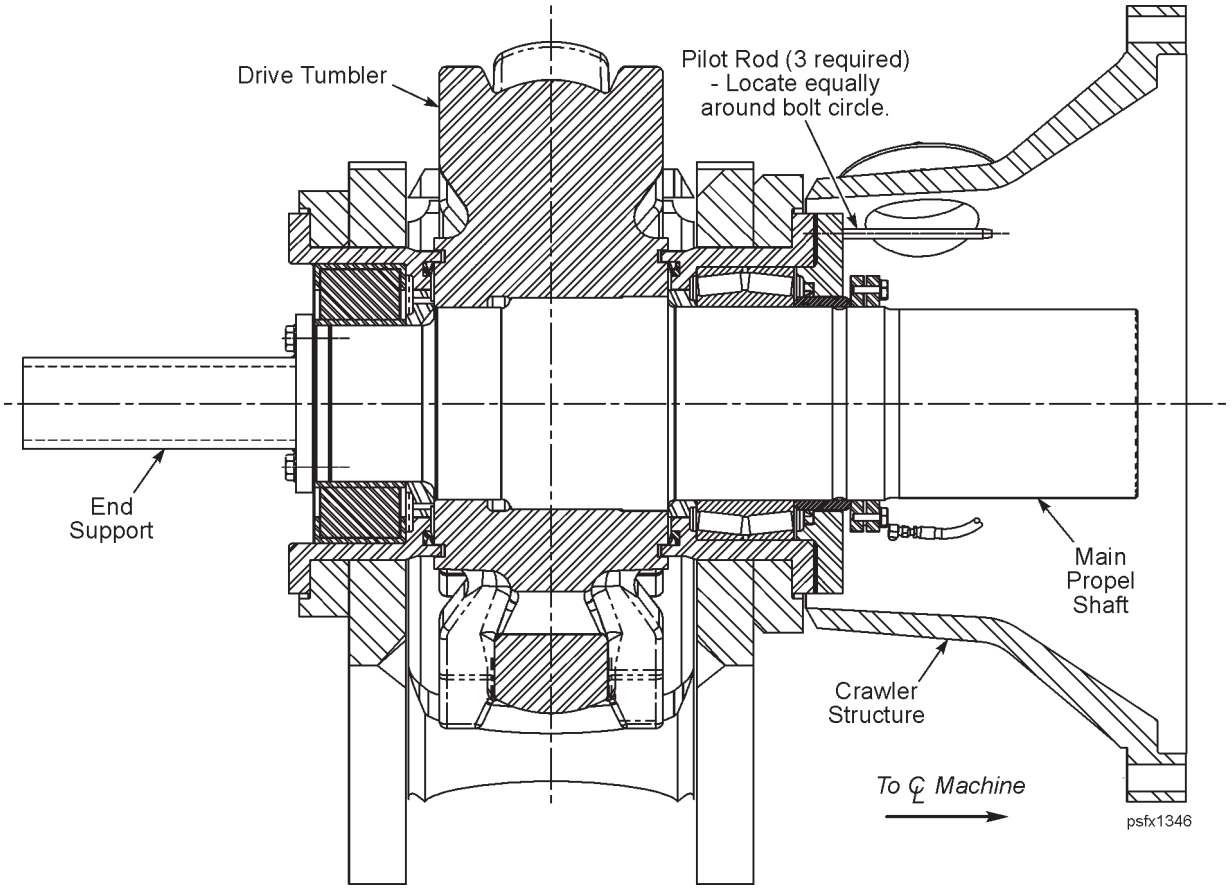
1. Park the machine level and leave several inches of clearance under the front idler.

2. Rotate the revolving frame to provide crane access to crawler belt and idler.

16. Use the spacer between the bearing race and shaft shoulder as a puller. Six tapped holes are provided in the spacer to attach the threaded rods and hardware required. Hydraulic expansion of the inner race is also provided to ease the pulling force. Attach the hydraulic pump provided with the machine to the .25 inch hole in the end of the drive shaft. Use hydraulic pressure and pulling force simultaneously to remove the bearing race.

17. Remove the 18 - 1 Inch capscrews which secure the cartridge and retainer to the crawler. *DO NOT* remove the 3 capscrews which secure the retainer to the cartridge.

18. Attach end support to the outboard end of shaft and install a pulling eye in the tapped hole provided on the inboard end of shaft. Remove the drive shaft assembly toward the CL machine.

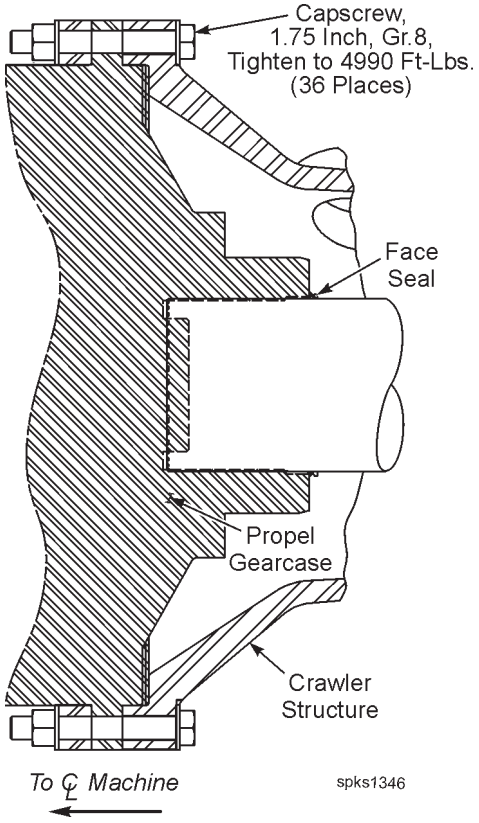


Fixture for the Main Propel Shaft

19. Lift the tumbler clear of the crawler after the shaft has been removed.

20. Inspect all parts for damage or wear. Replace or repair as required. Refer to the “Main Propel Shaft” for disassembly and rework.

2. Install the a new face seal onto the propel shaft as shown in the sketch.



3. Pack the rear of the spline cavity in the propel gearcase for the main propel shaft with 1 pint of Molub-Alloy grease paste (P/C 480206-3) or equivalent.

4. Coat the internal and external spline surfaces and all shaft pilot surfaces with Molub-Alloy grease paste or equivalent.

5. Install the gearcase by engaging the splines of the gearcase with the main propel shaft and the pilot register of the gearcase with the crawler housing. Install the spacer and 36 fasteners and tighten to 4,990 Ft-Lbs.

NOTE: Align the match marks if the same gearcase is being reinstalled. This will minimize the time required to align the coupling. If a *NEW* gearcase is being installed, add new match marks after the gearcase has been installed and the coupling aligned.

6. Fill the gearcase with the proper lubricant to the specified capacity. Refer to Section 3 - *LUBRICATION* in this manual. Be sure to install the breather and case plugs.

7. The reassembly of the propel motor coupling can be assisted by releasing the disc brake with the manual override on the air control valve. This will allow the rotation of the motor shaft.

8. Align the motor coupling per the specifications in Section 6 - *BRAKES AND COUPLINGS*, in this manual. Install the grids and cover.

9. Fill the propel motor coupling to the recommended level with special long term grease (P/C 295148-7).

10. Install the cable reel, if furnished with the machine and reconnect the trail cable.

DANGER: HIGH VOLTAGE! - RE-CONNECTION OF THE TRAIL CABLE SHOULD ONLY BE PERFORMED BY A QUALIFIED ELECTRICIAN. Failure to comply could result in severe bodily injury or death.

12. Remove the bolts, lockwashers and dowels that fasten the upper locknut to the revolving frame. Remove the upper lock bars and their hardware. Remove the upper locknut from the pintle sleeve.

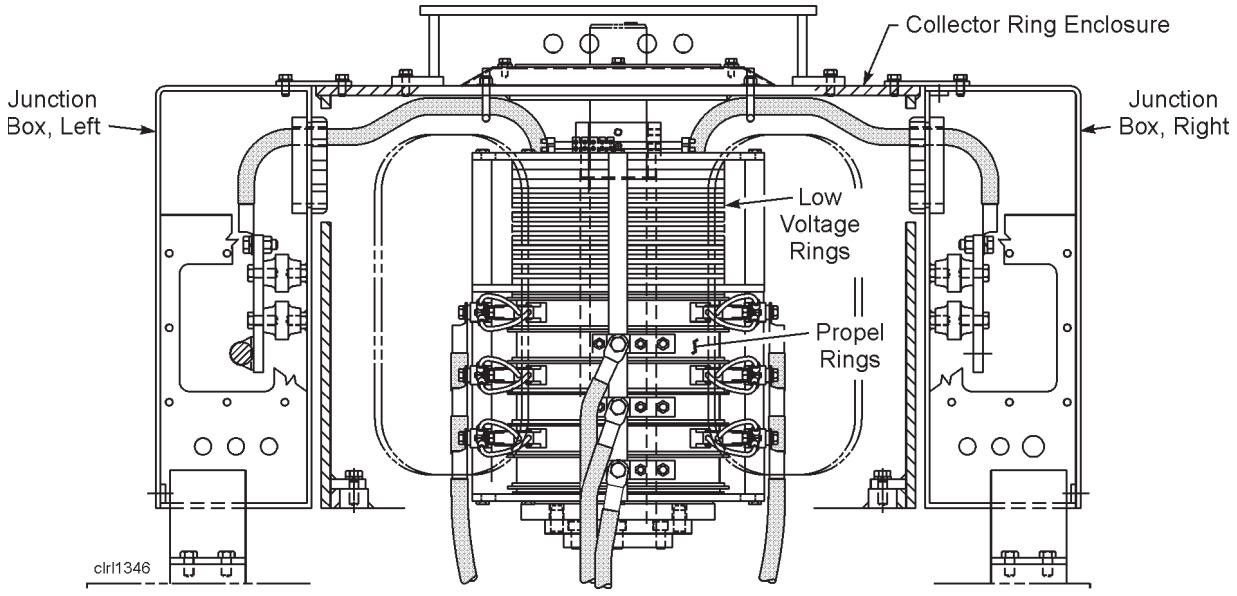
13. Using the auxiliary winch, lift the sleeve out of the revolving frame. Replace a worn or damaged sleeve with a new one. Check the pintle sleeve bushing for wear or damage. Replace if required. Check the truck frame around the pintle structure for cracks. If the pintle structure area needs repair, contact the Bucyrus International Service Department for instructions.

Center pintle sleeve installation is the reverse of disassembly.

DANGER: HIGH VOLTAGE! Be sure the electrical lines are correctly connected and all connections are tight. Also make sure that the air and lube lines are connected to the correct outlets in the swivel assembly and that the connections do not leak.

COLLECTOR RINGS

There are three sets of collector rings on the machine - low voltage, propel and high voltage. The low voltage collector rings transfer power from the revolving frame back to the propel motors. The propel collector rings provide control to the propel motors and power for the propel blower motor.



Collector Rings - Propel and Low Voltage
(Rear Section View)

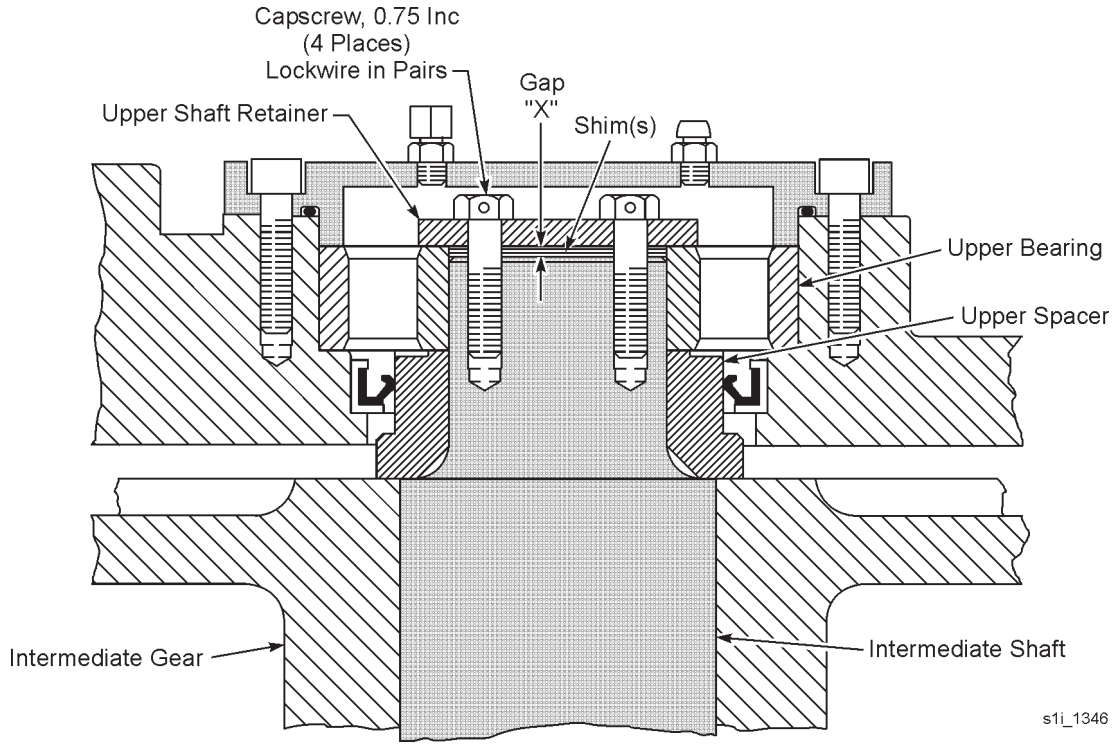
3. Remove lower shaft retainer and shims. Reinstall the lower bearing retainer and snug up the bolts.

4. Using a suitable lifting device, lift the intermediate shaft and gear as a unit from the gearcase.

5. Separate the upper bearing retainer, shims, bearing inner shaft race and upper shaft spacer from the shaft. Separate the lube fitting and upper retainer O-ring from the upper bearing retainer. The bearing inner race is interference fit to the shaft. Also remove the lower bearing spacer and lower bearing spacer key from the shaft. Press the gear from the shaft and remove the upper shaft key.

6. Remove the lower bearing retainer from the gearcase. The lower bearing retainer and spacer can now be removed. Separate the lower shaft bearing from the lower bearing spacer. The bearing is interference fit to the spacer.

INTERMEDIATE SHAFT AND GEAR ASSEMBLY RE-ASSEMBLY



HOIST MOTOR REMOVAL

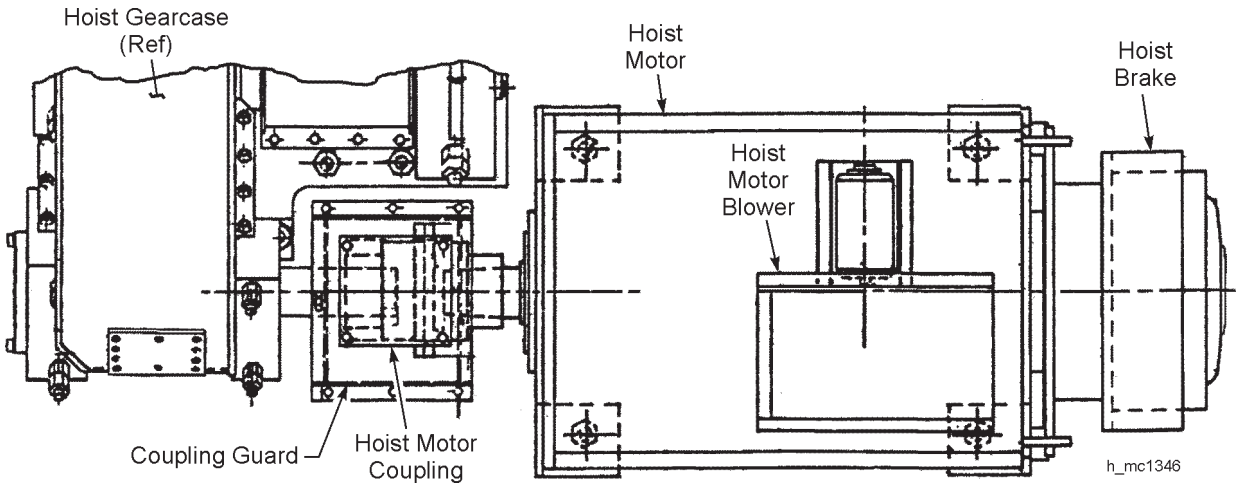
For lubrication of the drive motor, refer to *GREASING MAIN AC DRIVE MOTORS* in Section 3 of this manual. If removal of the hoist motor is required, *use the following procedure:*

1. Position the machine so that the dipper lip and front are flat on the ground.

2. Remove the appropriate roof panels above the hoist motor.

DANGER: BEFORE ATTEMPTING TO DISCONNECT ANY POWER LEADS, PRESS THE *MAIN POWER OFF* BUTTON AND TAG IT TO AVOID INADVERTENT ENERGIZING OF THE ELECTRICAL CIRCUIT. Electrocution or serious injury may occur if appropriate safety measures are not followed. Electrical connections should only be handled by trained electrical personnel.

3. Disconnect and identify the electrical leads to the hoist blower motor and the hoist motor.



Hoist Gearcase, Coupling and Motor Assembly
(Top View)

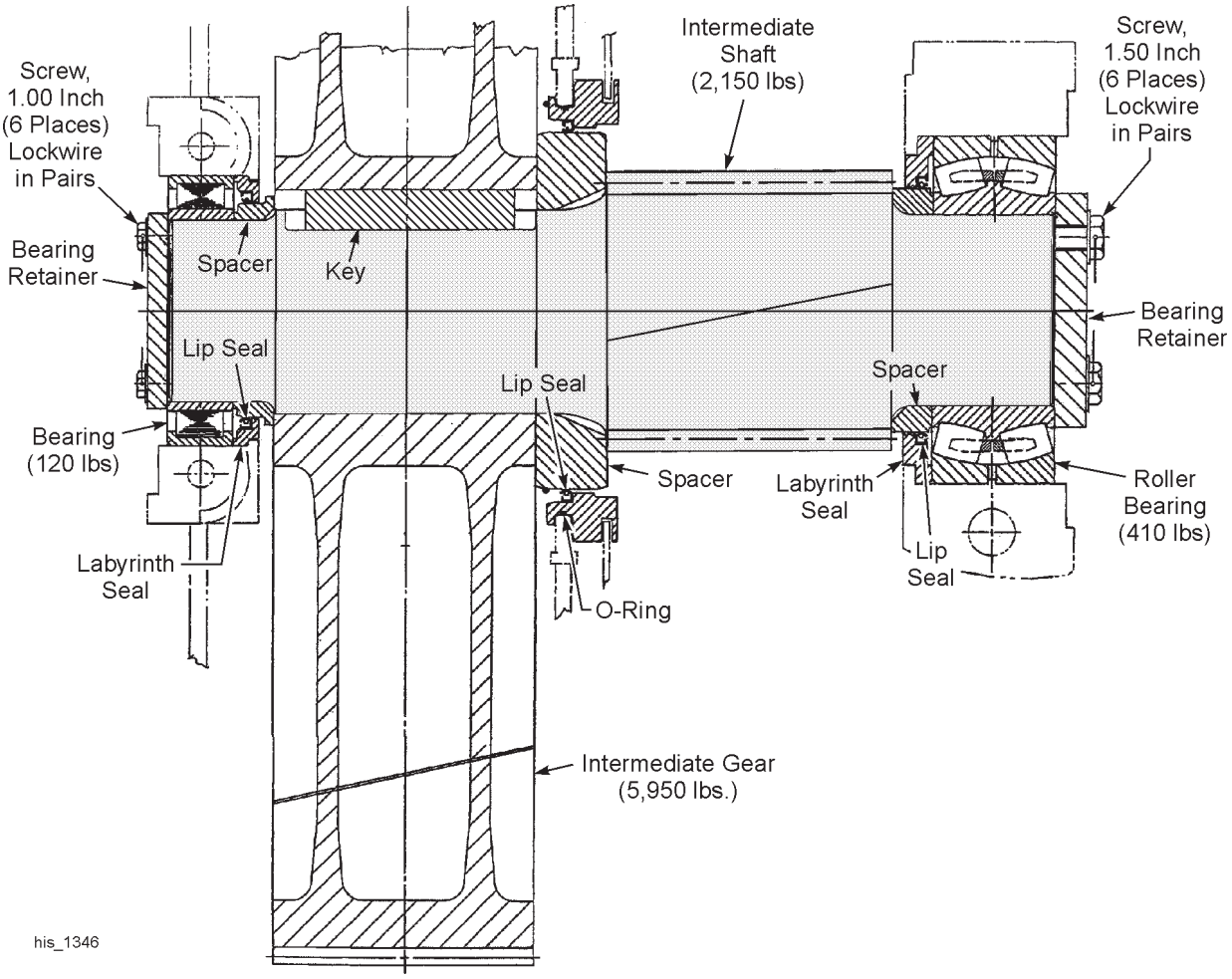
4. Remove the hoist blower motor and duct as a unit from the hoist motor.

5. Disconnect the piping to the hoist brake. Remove the brake from the motor. Refer to Section 6 - *BRAKES AND COUPLINGS*.

CAUTION: RELEASE THE HOIST BRAKE TO REMOVE ALL TENSION FROM THE HOIST DRUM BEFORE REMOVING THE BRAKE.

2. Attach a suitable lifting device and additional rigging necessary to safely remove the intermediate shaft, gear and all its components as a unit.

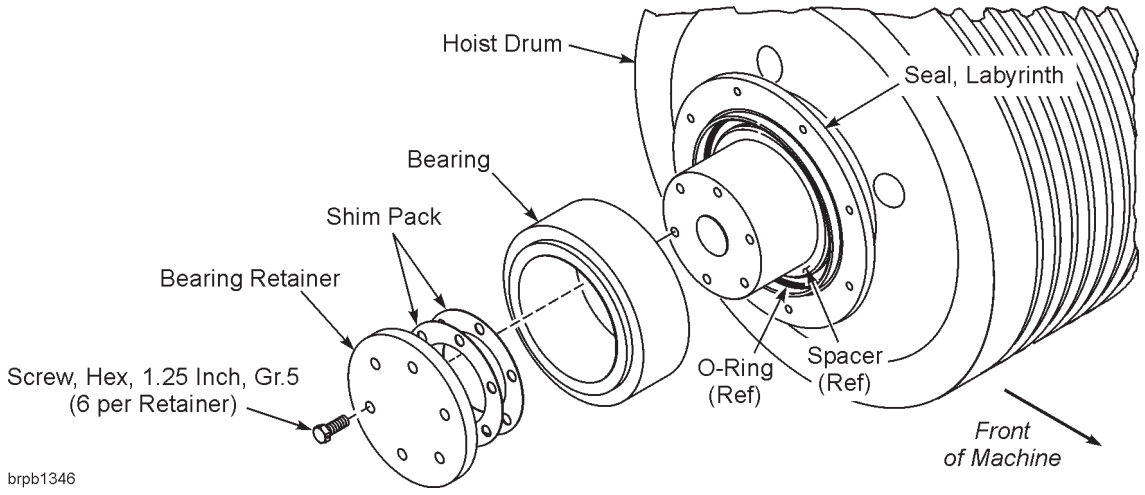
NOTE: One eyebolt can be attached to each end of the intermediate shaft to help support the assembly during removal. DO NOT remove any additional capscrews used to secure the bearing retainers in place.



3. Remove the intermediate shaft, gear and all its components as a unit.

4. Disassemble the shaft as needed for inspection and replacement of parts.

5. Clean and inspect the bearings for pitting, scoring, scratches, and other damage. Replace defective bearings. Check the seals for damage to the sealing surfaces. Replace seals and o-rings if necessary.



View B - Right Side Shown

6. Remove the lockwire from the bearing retainer capscrews (not shown). Remove the 6 - 1.25 inch capscrews that fasten each bearing retainer. Refer to View B.

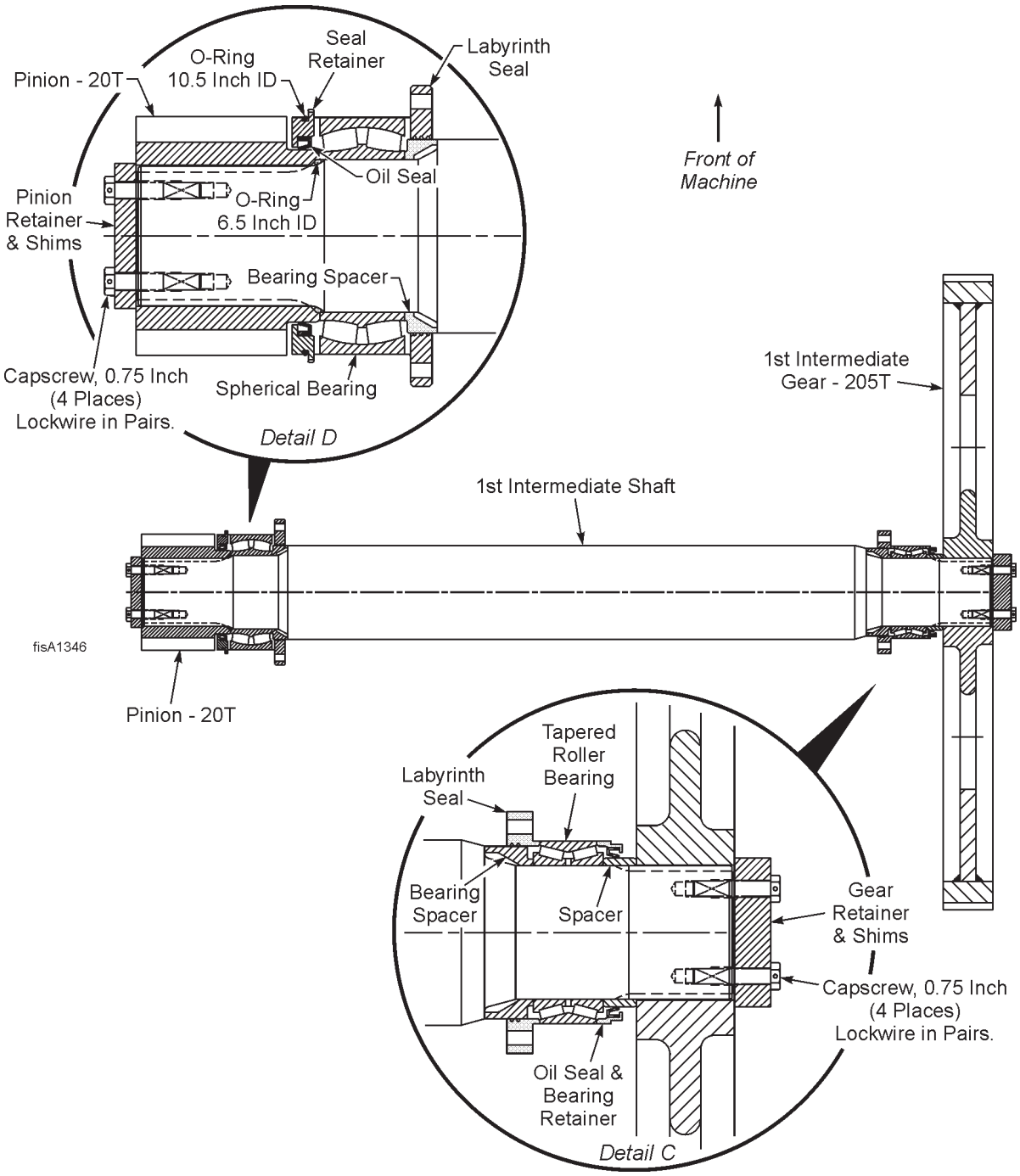
6. Mark then remove each bearing retainers (approximately 175-200 lbs each). Tag and save the shim packs for later reuse.

7. Use a bearing puller to pull each bearing from the shaft. Each roller bearing weighs approximately 510 lbs each.

Inspect the bearings, the spacer and seal remaining on the shaft ends, and the O-Ring on each seal. Repair or replace parts as needed.

4. Using a lifting sling and other additional rigging necessary, lift the shaft and gearing (approximately 3,000 lbs.) out of the crowd frame as a unit.

5. Relocate the shaft and gearing to a clean work area. Provide adequate cribbing to safely support the entire shaft assembly.



CROWD MOTOR INSTALLATION

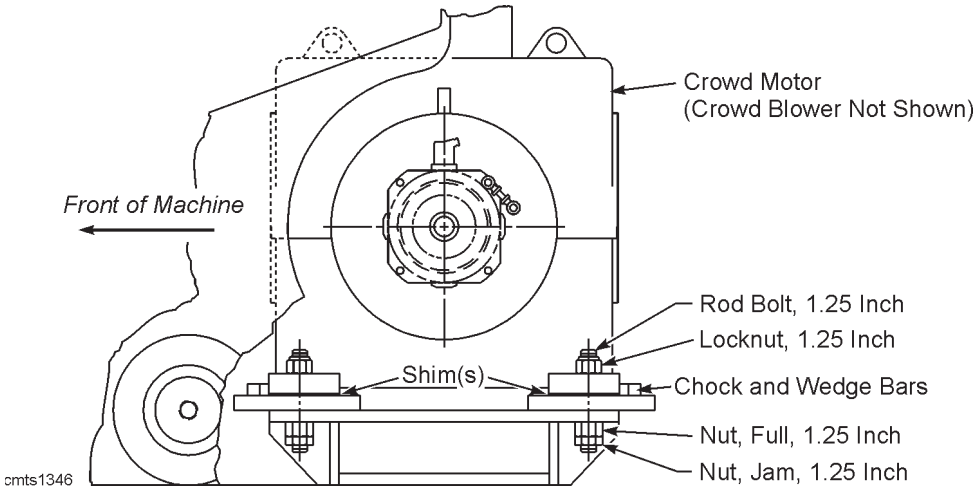
1. Using a suitable lifting device, lower the crowd motor onto the motor mounting pads.

2. Loosely assemble 4 sets of 1.25 inch attaching hardware. Do not tighten.

3. Align the crowd motor to drive pinion. Shim motor if necessary. Refer to alignment procedure in Section 6 - BRAKES and COUPLINGS.

4. Attach motor coupling, verify proper alignment.

5. Tighten the attaching hardware in the sequence shown below. Weld chock and wedge bars to secure the crowd motor if previously removed.



6. Attach the coupling guard.

7. Re-connect blower duct work. Apply silastic sealant (PN:82833855) for air-tight seal.

MACHINERY HOUSE

The machinery house has separate structural members consisting of front and rear main truss and interconnecting beams. These form the permanent house structure.

Roof panels are individually fastened to the interconnecting beams. Any panel can be removed separately to provide access to a machinery house unit. All roof panels are secured with hold down bolts on retainer bands. Vinyl tape weather stripping is installed between the retainer band and roof panel.

Shroud covers around the A-frame legs have vinyl tape between the leg and shroud. Shroud support joints are sealed with rubber cement or silicone caulking.

All mating surfaces of the machinery house wall panels are sealed with rubber cement or silicone caulking to ensure weather tight seal.

Frequently inspect all house panels and structural members for cracking. Include a close examination of all roof structures. Examine all struts, beams and braces used to reinforce the machinery house.

Always restore defective structural members to their original state by repair welding.

Periodically observe the hinges and closure mechanisms on all doors and windows to ensure they will remain closed during machine operation. Verify the sealing of the leg closures of the A-frame. Tighten all loose bolts and replace all missing hardware. The absence or looseness of these fasteners can result in excessive vibration and wear of house components. Individually, these faults can be considered minor, but taken collectively, they represent a major exposure of the electrical and mechanical elements of the house to dust and water.

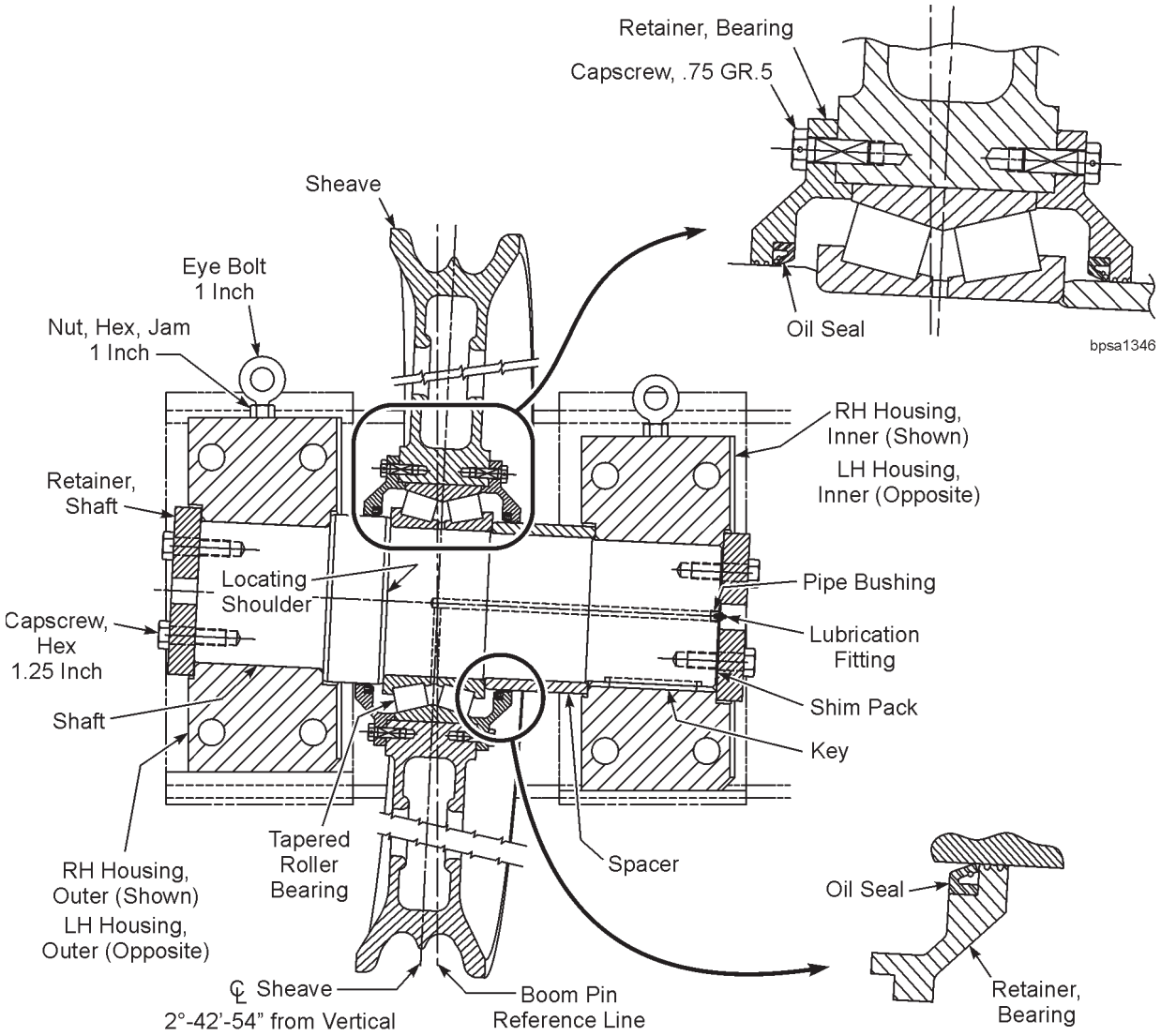
Check the condition of the house paint. Paint is not impervious to deterioration. A well-painted machine is less susceptible to rust, corrosion and progressive failure.

Be sure the pressurization system is functioning properly to keep the house well-ventilated at a pressure higher than atmospheric pressure.

To disassemble the boom point sheave:

1. Remove the bearing retainers, oil seals and bearing.

2. Inspect and repair all damaged or worn parts.



RH Boom Point Sheave Assembly Shown
LH Opposite

3. Unload retract rope using hydraulic jacks to remove shims as follows:

CAUTION: Oil within the needle valves is under high pressure. STAY CLEAR OF TAKE-UP NUT, SHIMS AND CYLINDERS WHEN OPERATING NEEDLE VALVE, AS THESE ITEMS COULD MOVE UNEXPECTEDLY AND CAUSE SERIOUS INJURY.

   a. Clean-up and grease sliding area on take-up nut, support and screw.

   b. Make sure the right needle valves are open and the left are closed.

   c. Extend cylinders by injecting hydraulic fluid into left fitting

   d. Remove desired amount of shims from cylinder side of take-up nut and store on opposite side of nut.

   e. Slowly open left valve. Stay clear of take-up nut because weight of rope may jerk take-up nut when valve is opened. Close right valve.

4. Release pressure from hydraulic jacks.

5. Repair or replace all damaged parts.

6. Retighten the retract rope as follows:

NOTE: Do not over-tighten the ropes. The ropes are properly adjusted when a very slight curvature is noticeable on the retract rope with a tight crowd rope.

   a. Be sure that the right needle valve is open and the left valve is closed.

   b. Extend the cylinders by injecting hydraulic fluid into the left fitting.

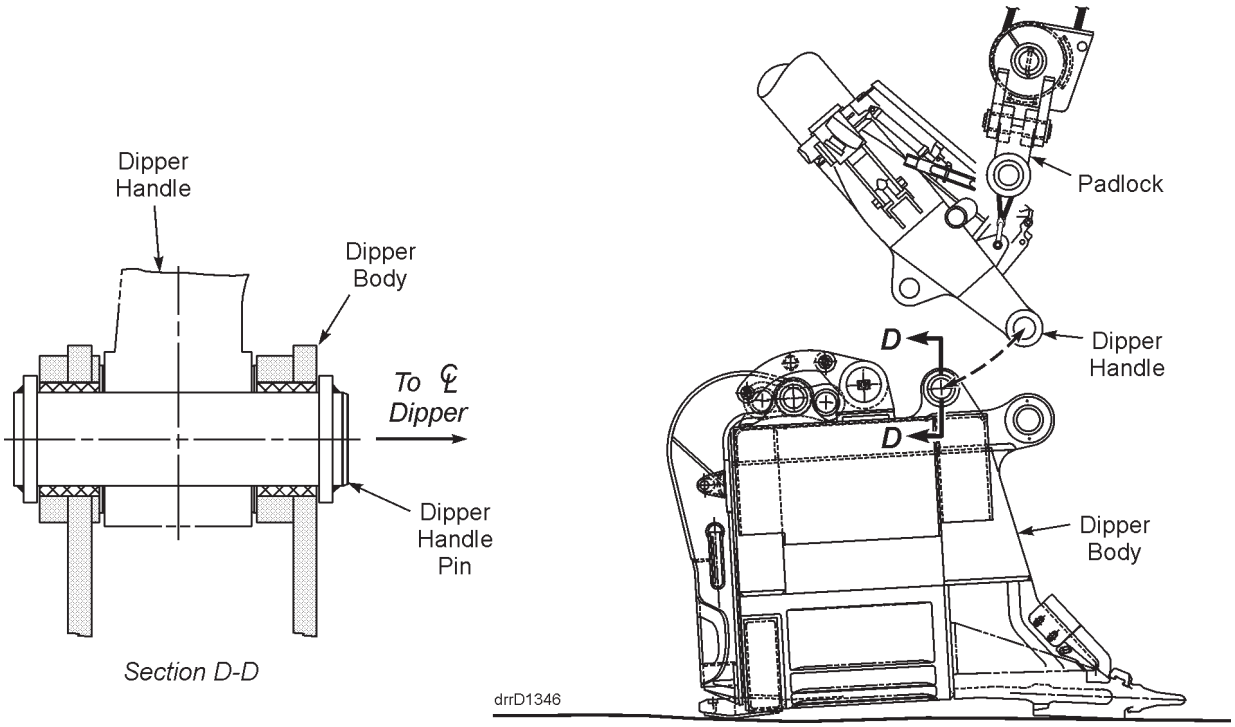
   c. Shim the take-up nut at the desired position.

CAUTION: The take-up nut must be shimmed tight, both fore and aft, using all shims originally provided with machine.

   d. Slowly open left valve to release pressure on cylinders.

CAUTION: Oil within the needle valves is under high pressure. Stay clear of take-up nut, shims and cylinders when operating needle valve, as these items could move unexpectedly and cause serious injury. STAY CLEAR OF TAKE-UP NUT, SHIMS AND CYLINDERS WHEN OPERATING NEEDLE VALVE, AS THESE ITEMS COULD MOVE UNEXPECTEDLY AND CAUSE SERIOUS INJURY.

7. Close and secure shim guard.



View D

16. Carefully move the machine away from the dipper by backing up.

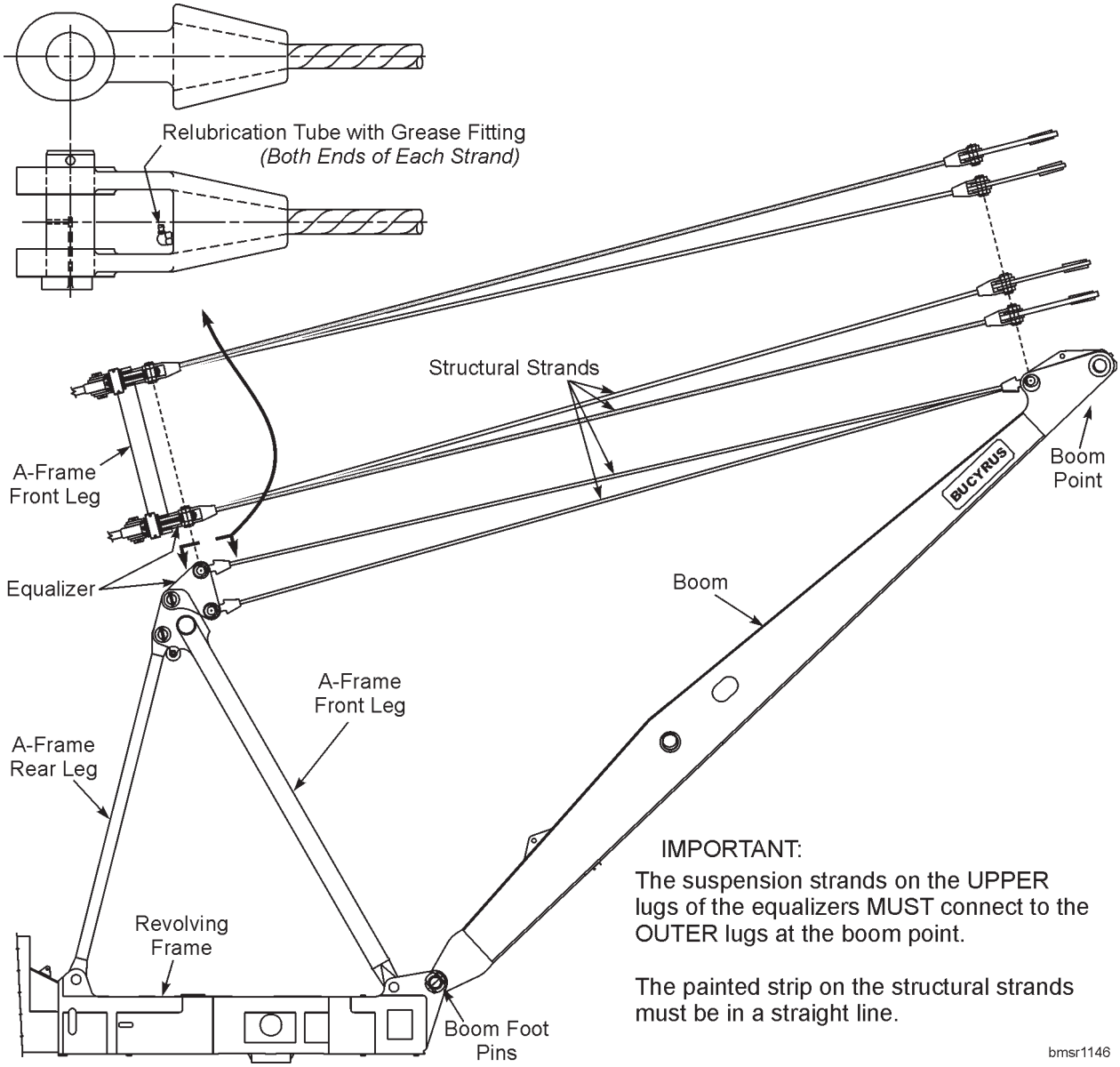
17. When replacing dippers, ensure that the replacement dipper is resting on flat, level ground. Carefully reposition the machine so the revolving frame is parallel with the crawlers and the dipper handle lined up with the dipper lugs.

Installation of the dipper is the reverse of removal.

BOOM SUSPENSION ROPES

Periodically inspect the outer layer of wires immediately adjacent to the sockets. If it is found that 30% of the outer wires are broken, or 10% of the total wires are broken, the strand must be replaced.

Lubricate the suspension rope sockets quarterly or after 1250 hours of machine operation.



DANGER: STORED ENERGY! Removal of equalizer pins requires the attached items to have proper support to release the load. Failure to comply could result in death, severe personal injury, or damage to the machine.

Additional, detailed information can be found in *WIRE ROPE CARE AND MAINTENANCE* in Section 9 - *ENGINEERING DATA*.

RETRACT ROPE REEVING & REPLACEMENT

NOTE: To use the procedure below the old retract rope must not be broken or severely frayed, the new retract rope should be wound on a shipping reel, and all tools and equipment specified must be on hand.

DANGER: AVOID ANY METHODS WHICH ALLOW THE ROPE TO UNWIND OR FALL UNCONTROLLED. An uncontrolled rope could cause death or serious injury.

NOTE: Should it be necessary to replace both the crowd and retract ropes, *THE CROWD ROPE SHOULD BE REPLACED FIRST.* The crowd rope has ferrules swaged onto the ends of the rope to the drum. These ferrules limit the amount of rope on the crowd drum in relationship to the handle position. Failure to install the crowd rope first may cause the ropes to be “out of time” and cause operating difficulties. Replacing both ropes simultaneously should not be attempted.

To replace the retract rope:

1. The machine should be in a clear, flat area with sufficient room to allow all of the steps in the procedure to be carried out. All applicable safety regulations should be followed. Only personnel directly connected with replacing the rope should be allowed on or near the machine.

CAUTION: The condition of the rope may make it necessary to modify the procedure described here, especially if the rope is broken or severely damaged. Be sure to follow all safety precautions when burning. Always maintain complete control over the rope and any burned section of rope.

2. Crowd and lower the dipper simultaneously until the rear stop of the dipper handle contacts the saddle block and the dipper heel is resting on the ground as shown in the figure.

3. Back off the retract take-up adjustment to its complete limit. Remove the rope retaining bolts on the take-up nut and the rope retainers on the front spreader.

4. Remove the retract rope from the drum.

5. Remove the old retract rope from the machine.

6. Position the reel of new retract rope directly under the saddle block.

DANGER: ROPE END(S) WILL FORCEFULLY UNCOIL IN RELEASE OF ENERGY WHEN SHIPPING RESTRAINTS ARE REMOVED.

HOIST SLOWDOWN/STOP LIMITS

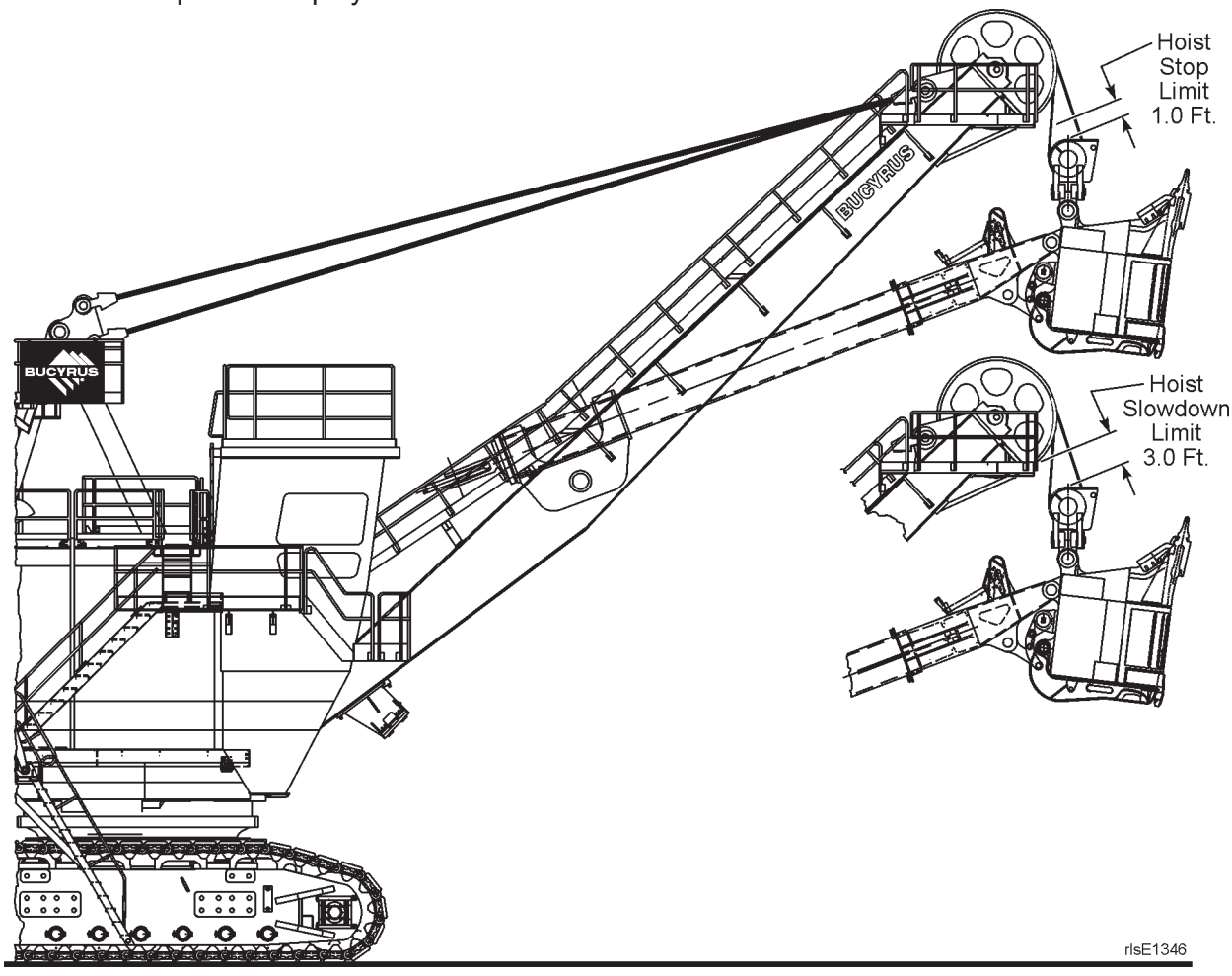
To set the hoist slowdown and stop limits:

1. With the handle at full crowd extension, hoist the dipper so the padlocks are approximately one foot from the boom point sheaves.

2. Press the HOIST STOP LIMIT button on the operator display.

btnB1209

3. Lower dipper until the padlocks are three feet from the boom point sheaves. Press the HOIST SLOWDOWN LIMIT button on the operator display.



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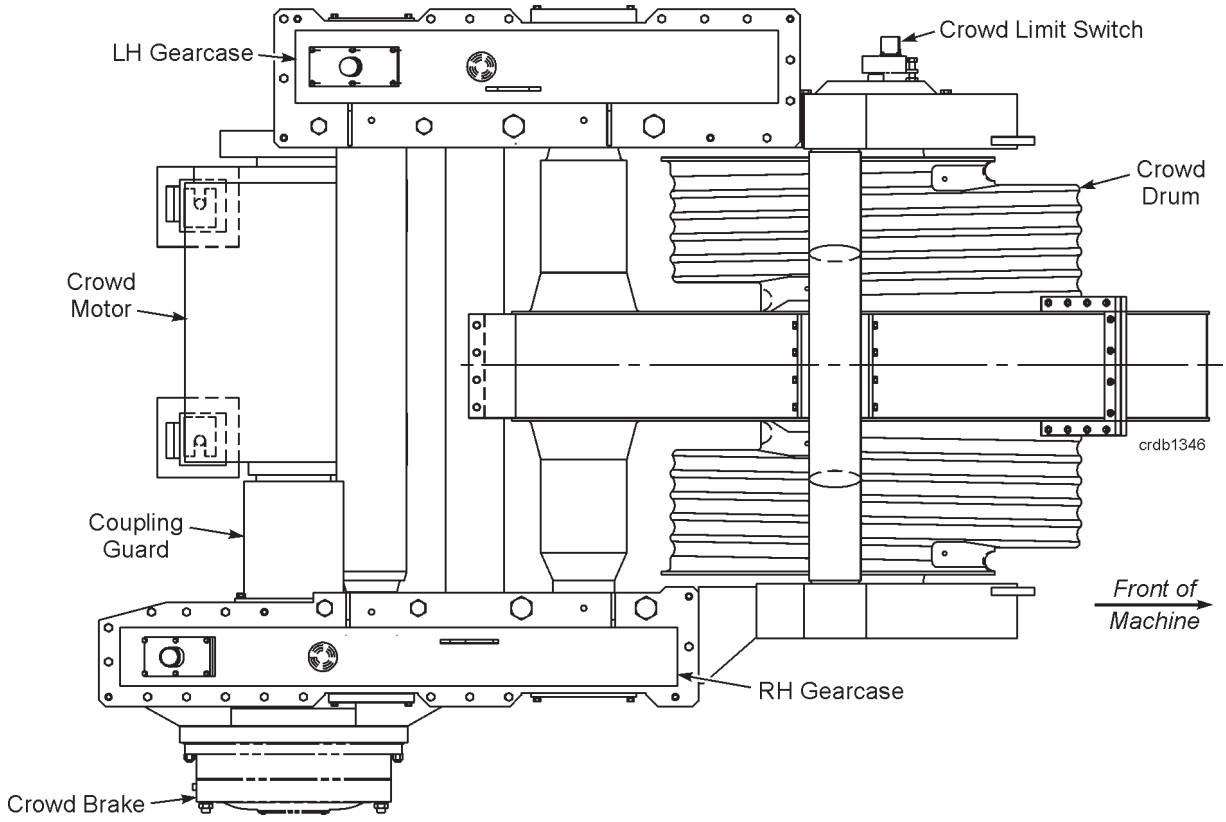
CROWD BRAKE



Crowd Brake Location
(TOP VIEW of CROWD MACHINERY)

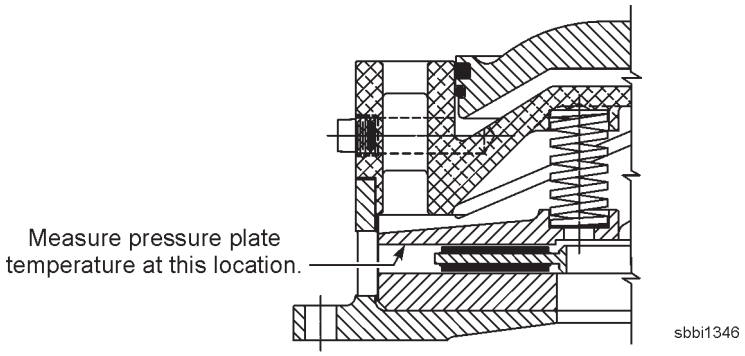
The crowd brake is located on the right side of the crowd motor. The crowd brake contains a single friction disc and is non adjustable; refer to Section View B-B. Once the stroke reaches 0.20 inch, the friction disc must be replaced. Visual inspection of the brake's internal components can be made after removing the brake guard. Periodically inspect the brake friction disc, wear plate, pressure plate and center plates for signs of uneven or excessive wear. If found, disassemble brake to determine the extent of damage.

DANGER: PRIOR TO INSPECTION OR MAINTENANCE ON A BRAKE, MAKE SURE THAT MACHINE OR MACHINERY IS BLOCKED TO PREVENT MOVEMENT. Failure to do so could result in serious personal injury or machine damage.

SWING BRAKE BURNISHING

The swing brake on this machine is a “single disc assembly” consisting of a ductile iron disc to which multiple metallic lining segments are riveted. The burnish-in procedure for a new or relined disc brake initiates a controlled wear process to develop the maximum contact area between braking surfaces. The burnish-in process will also start the formation of an oxide layer on the surface of the linings to stabilize and to establish the coefficient of friction.

Prior to beginning the burnish-in procedure check and record the brake pressure plate temperature with a hand held temperature measuring device. Between each stop, continue monitoring the pressure plate temperature. Do *not allow the pressure plate temperature to exceed 300° Fahrenheit (149°C).*



(Brake shown in SET position.)

NOTE: Check the temperature of each brake on the machine. If the temperature exceeds 300°F (149°C) stop the burnishing procedure and allow the brakes to cool to 200°F (93°C). If overheated or malfunctioning brakes are found, check if the brake is releasing properly. It is normal for a small amount of disc particles to be ejected from the brake and for sparking to occur during this operation. Large amounts of either situation may indicate overheating or improper release and should always be corrected prior to continuing.

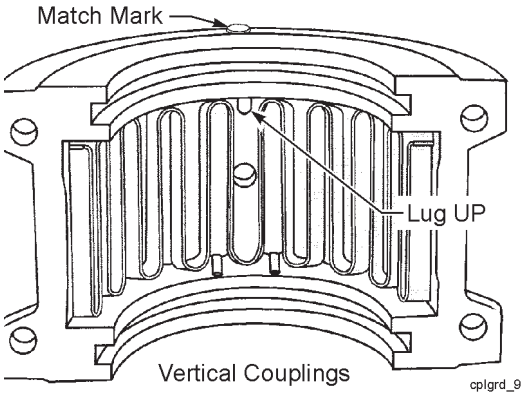
BURNISH-IN PROCEDURE (DIPPER EMPTY)

# of Stops at Speed	Time Between Stops
4 stops/1/4 speed	1 minute minimum
8 stops/1/2 speed	2 minutes minimum

Perform one additional full load, 3/4-speed stop with the dipper handle in the horizontal position and the hoist rope vertical on the swing motion. This will ensure that the brakes are functional. Record the swing stopping times and angles. Forward these recorded readings to the Bucyrus International service department.

5. Pack with Grease and Assemble Covers

Pack the spaces between and around the grid with as much lubricant as possible and wipe off excess flush with top of grid. Position seals on hubs to line up with grooves in cover. Position gaskets on flange of lower cover half and assemble covers so that the match marks are on the same side as shown above. If shafts are not level (horizontal) or coupling is to be used vertically, assembly cover halves with the lug and match mark up, or on the high side. Secure covers halves with fasteners and tighten to torque specified in the coupling data table. *MAKE SURE LUBE PLUGS ARE INSTALLED BEFORE OPERATING!*



6. Periodic Lubrication

Remove both lube plugs and insert a lube fitting. Fill with recommended lubricant until an excess appears at hole opposite; then insert plug. Lubricate couplings at least once ever year. Lubricate more frequently when exposed to excessive-moisture, extreme temperatures, rapid reversing or shock loads or excessive misalignment. It is not necessary to re-lube couplings filled with Long Term Grease (LTG) until disassembled for service to attached components.

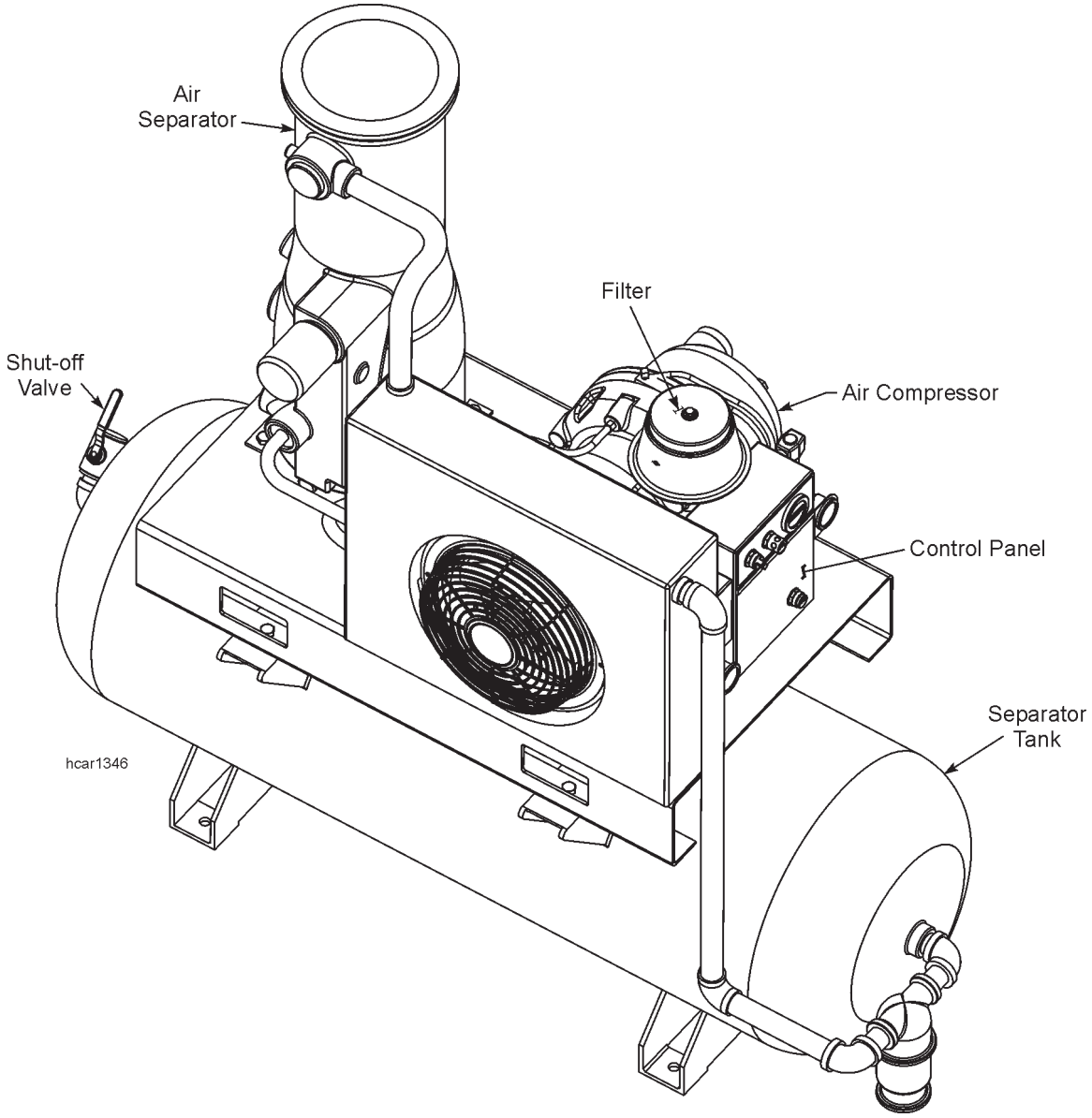
For Long Term Grease (LTG) use part no. MP295148.

SEAL REPLACEMENT WITHOUT HUB REMOVAL

The instructions below offer additional procedures that may be useful when replacing seals on an existing installation.

Replacement seals are continuous, one piece members. Unless the connected machines are being moved from their foundation for some other reason you need not disturb the existing mountings to get the new seals in place. The following cut and cement procedures offer a simple way to install new seals without moving machines or pulling coupling hubs.

Falk Steelflex and gear couplings are lubricated shaft connectors. In both designs, a metallic cover and elastomer seals contain the lubricant. Refer to the applicable Installation, Maintenance and Lubrication Instructions furnished with each coupling when replacing worn or damaged seals.

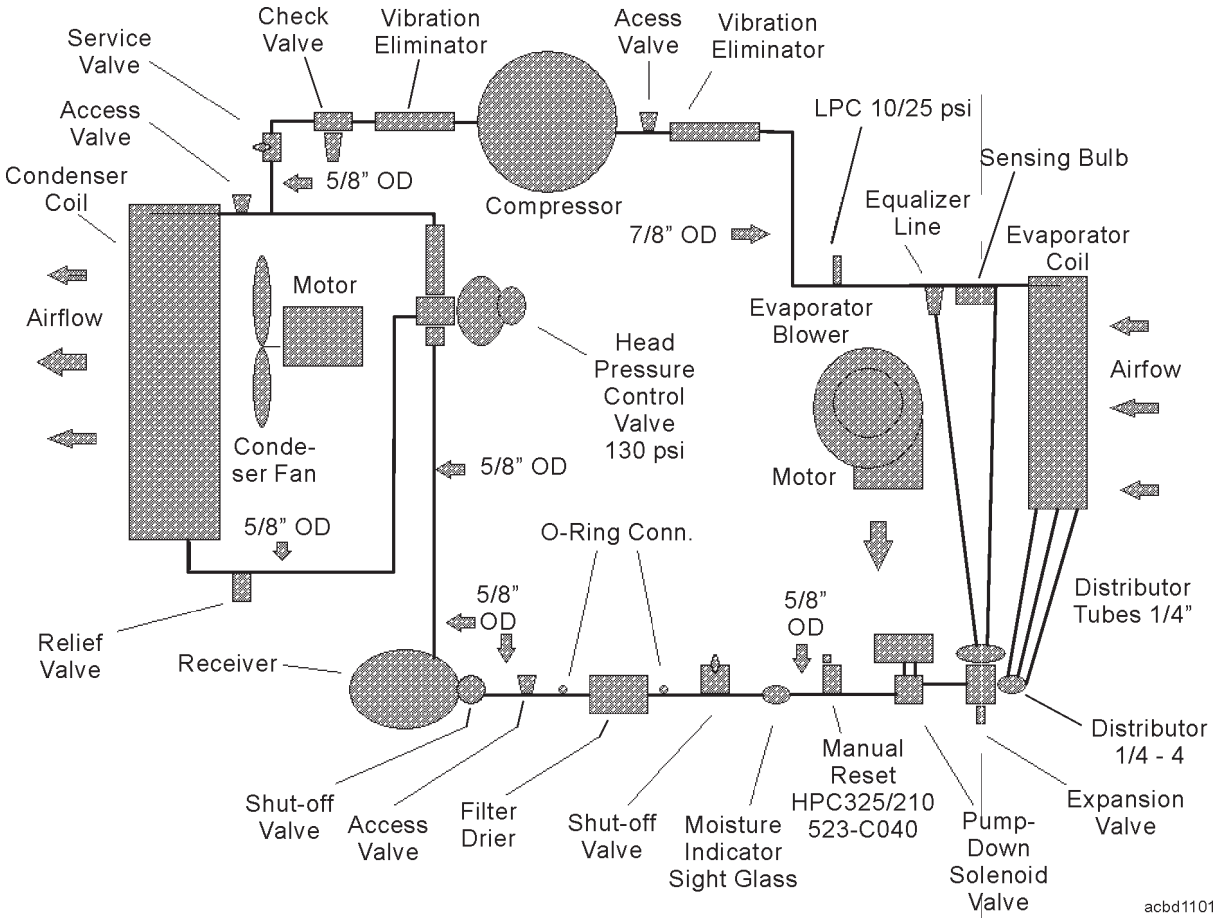


Air Compressor Assembly

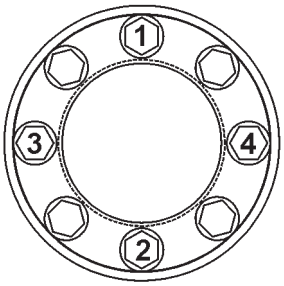
SPECIFICATIONS

Nominal Cooling Capacity	31,000 Btu/hr@460V/60Hz		
Power requirements	380V/3ph/50Hz	415V/3ph/50Hz	460V/3ph/60Hz
	17.5 Amps	19.0 Amps	21.0 Amps
Refrigerant	HFC 134a – 24 lbs.		
Oil	POE Variety Mobil Arctic EAL22CC or ICI Emcarate RL32CF		
Compressor	Fully sealed, scroll type		
Condenser Coil	5 row, 3/8 inch copper tube with 8 aluminum fins/inch		
Evaporator Coil	4 row, 3/8 inch copper tube with 10 aluminum fins/inch		

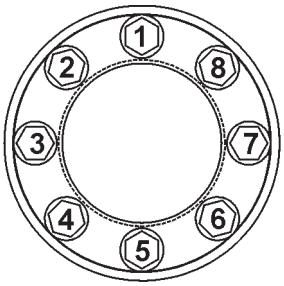
Detailed information on the MPV9 can be found in the vendor's documentation that accompanied the machine and the General Arrangement drawings provided by Bucyrus International.



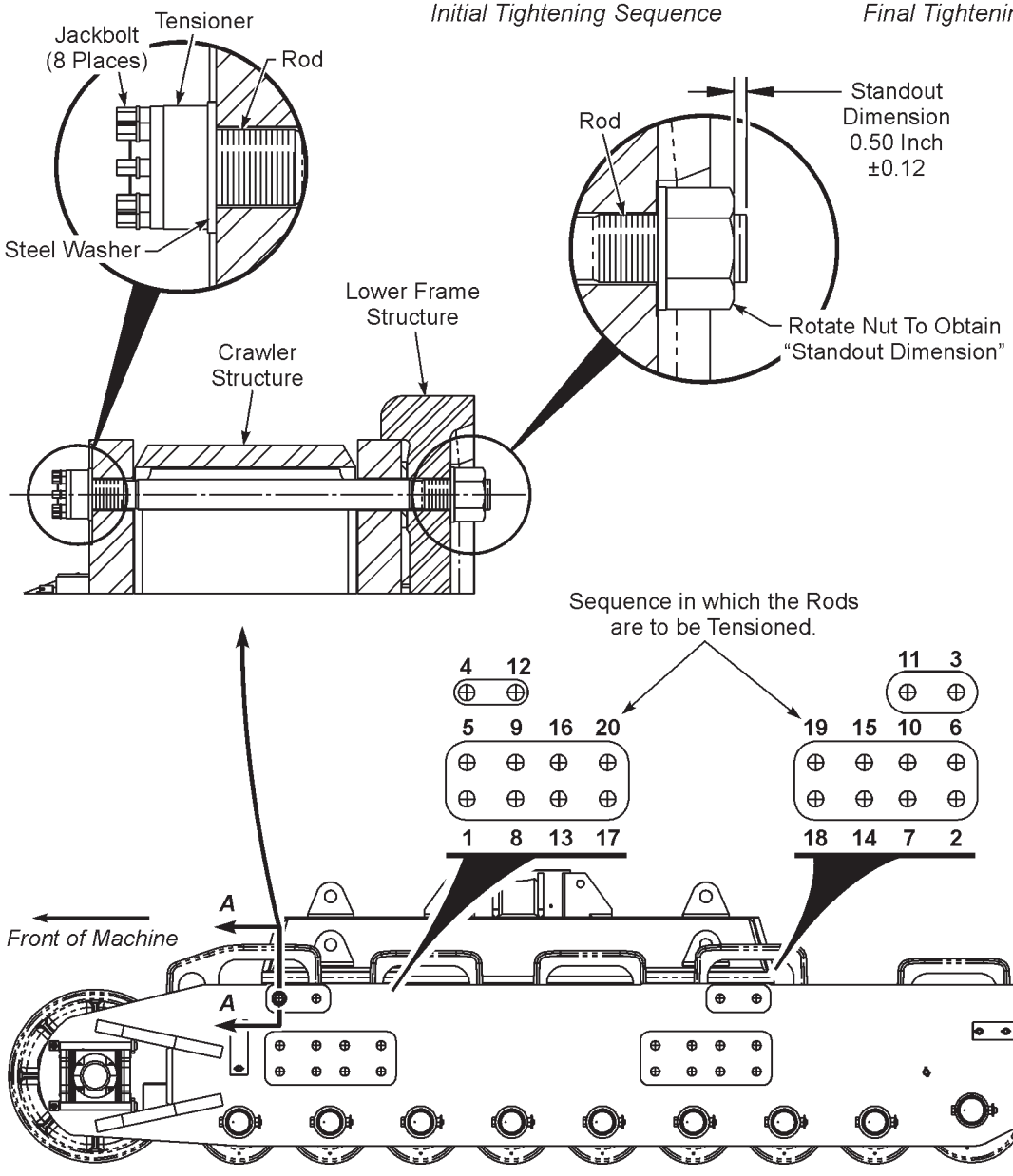
Air Conditioner - Block Diagram



Sequence Fig. 1
Initial Tightening Sequence



Sequence Fig. 2
Final Tightening Sequence



Connecting Rods - Crawlers to Truck Frame

Effective repair welding of cracked, broken or bent structural members of the machine involves knowledge of the types of steel used, proper welding electrodes and recognized good welding practice. The chemical composition, mechanical properties and thickness of the steel determine the welding electrode to be used and the preheat temperature required.

WELDING ELECTRODES

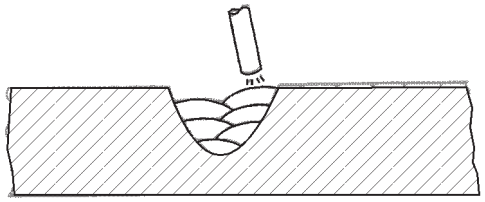
With the exception of the boom, weld repairs on the various structures of the machine can be made with two basic classifications of shielded metal arc electrodes: E7018 and E8018-C1. Both are low hydrogen electrodes which deposit weld metal having excellent properties at strength levels with 70,000 to 80,000 PSI, and impact properties from -20° to -75°F. These are all-position electrodes which produce high quality welds for repairing the structural components of heavy machinery.

NOTE: Although these electrodes are of superior quality, care must be exercised in their application. Low hydrogen electrodes are highly susceptible to moisture pickup after removal from sealed containers. To maintain low hydrogen, crack-resistant properties, they must be stored in electrode ovens at 250°F up to the time of use. Small portable rod ovens at the welder's side are ideal. Use of dry low hydrogen electrodes cannot be over-emphasized.

Cracks caused by hydrogen are extremely fine and occur invisibly below the surface in the base metal heat affected zone, as shown. Therefore, they are not detectable at the time of welding.

These cracks can propagate in service and lead to ultimate failure of the part. It is necessary to adhere strictly to recognized good welding practice regarding the handling, storage and use of low hydrogen electrodes. To avoid underbead cracks, remove all oil or grease or other contaminates from the surface and be sure the steel is dry.

Preheat to the required temperature. Use only dry electrodes taken from the electrode oven. After exposure to the air, the electrodes must be returned to the oven. Time limit outside the oven is four hours for E7018 and two hours for E8018-C1 electrodes.



1. Clean Steel - Remove all oil or grease.
2. Be sure steel is dry.
3. Pre-heat to required temperature.
4. Use dry low-hydrogen electrodes.
   Store in oven @ 250°F until time of use.
   Return to oven after:
   4 hours-E7018
   2 hours-E8018-C1
5. Discard any electrodes which have been wet.

wldrpr-a

WIRE ROPE CARE AND MAINTENANCE

STORAGE

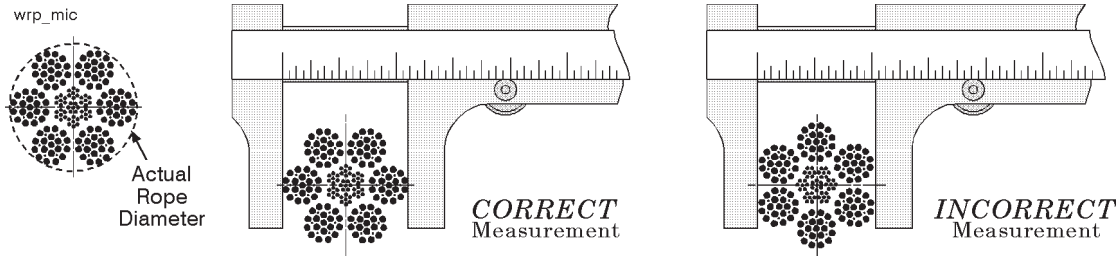
Reels of wire rope stock may be kept on hand for a considerable length of time. This is particularly true of slow-moving special ropes that may not be disposed of completely for several years. Consequently, wire rope should be stored in an area that is well-ventilated and stable with regard to temperature and humidity.

Do not store rope in contact with the bare ground or expose it to the elements. Excessive atmospheric vapors will condense moisture on the rope causing corrosion. If exposed to the direct sun, next to a boiler or in similarly warm conditions, the original lubrication will dry out and lose its preservation properties.

Similarly, storage in a dusty or chemical laden environment may coat the surface of the rope with corrosive materials or even deteriorate the fiber core. If it should be necessary to store rope outside, the reel should be set on blocks or raised off the ground, and covered with a waterproof covering.

CHECKING DIAMETER

It is critical to check the diameter of the delivered rope BEFORE installation on the machine. This is to ensure that the rope diameter meets the specified requirements for the given machine or equipment. An UNDERSIZE diameter rope will bring about a condition where stresses are exceeding design limitations. This will increase the possibility of injury or machine damage as the chances of breaking the rope will be increased. Use of an OVERSIZE diameter rope will bring about premature wear of that rope. The rope constantly being pinched and compressed in the grooves of the sheaves and drum causes this.



Correct Method for Checking Wire Rope Diameter

When checking it is imperative that the actual rope diameter is measured. This is defined as the diameter of the circumscribing circle, or its largest cross-sectional dimension. To ensure accuracy this measurement should be made with a wire rope caliper to obtain the outside dimension of 2 diametrically opposing strands of the rope. When measuring a rope with an odd number of outer strands, special techniques must be employed. Refer to the manufacturer of the product for accurate information.

GUIDELINE TO INSPECTIONS AND REPORTS

(Equipment, Wire Rope and Wire Rope Slings)

1. Maintain all inspection records and reports for the length of time deemed appropriate.

2. Prior to daily use, the following procedure should be followed.

    a. Check all equipment functions.

    b. Lower load blocks and check hooks for deformation or cracks.

    c. During lowering procedure and the following raising cycle, observe the rope and the reeving. Particular notice should be paid to kinking, twisting or other deformities. Drum winding conditions should also be noted.

    d. Check wire rope and slings for visual signs of any unsafe condition, including broken wires, excessive wear, kinking or twisting, and severe corrosion. Particular attention should be given to any new damage during operation.

3. Periodic inspections consistent with applicable standards are recommended with a signed report by an authorized and competent inspector. These Periodic Reports should include inspection of the following:

    a. All functional operating mechanisms for excessive wear of components, brake system parts and lubrication.

    b. Limit switches.

    c. Crane hooks for excessive throat opening or twisting, along with a visual for cracks.

    d. Wire rope and reeving for conditions causing possible removal.

    e. Wire rope slings for excessive wear, broken wires, kinking, twisting and mechanical abuse.

    f. All end connections such as hooks, shackles, turnbuckles, plate clamps, sockets, etc. for excessive wear, and distortion.

4. At least one annual inspection with signed report must be made for the following:

    a. Crane hook for cracks.

    b. Hoist drum for wear or cracks.

    c. Structural members for cracks, corrosion and distortion.

    d. For loose structural connections such as bolts, rivets, and weldments.