# I. SAFETY

## *A. General Warning*

It is the responsibility of the owner and operator of this equipment to know the safety codes; insurance requirements; and national, federal, provincial, state, and local laws and regulations affecting all uses of the equipment. This technical manual does not provide regulatory information because regulations are subject to change and different from location to location.

It is the responsibility of the owner and user of the equipment to obtain, read, and understand the latest revision of the American National Standard for Base Mounted Drum Hoists, ANSI B30.7 (published by the American Society of Mechanical Engineers, 345 East 47$^{th}$ Street, New York, NY 10017, USA).

Not using the equipment according to these regulations can result in death, serious personal injury, or other damage.

Conmaco/Rector L.P. provides technical manuals for the different types of equipment it manufactures and sells. The owner and user must use these technical manuals to give the correct information and training to the people who will operate, maintain, or supervise the use of the equipment.

This equipment is designed to do heavy-duty work and will wear during normal use. Therefore, the owner and user must establish a regularly scheduled inspection and maintenance program based on the information in the Conmaco/Rector L.P. technical manual. Inspection and maintenance programs help prevent accidents and keep the equipment operating efficiently.

Correct training, inspection, and maintenance programs are important to avoid personal injury, damage to equipment, high maintenance cost, and lost production.

Any performance ratings and specifications for this equipment are valid only when the equipment is used according to the manufacturer's operating and maintenance procedures. Read and understand the technical manuals provided with this equipment before operating or doing maintenance to the equipment. Assistance is available from the Conmaco/Rector L.P. Service Department.

The operator must know all the main parts, controls, and safety features of the equipment before operating it. The operator must know the correct operation and inspection procedures of the equipment before operating it.

The operator is responsible for the safe operating of the equipment, including the safety of others in the work area.

### *B. General Safety Rules*

Conmaco/Rector L.P. equipment, as designed, can be used safely; however, no equipment, regardless of design, can prevent injury or damage because of operator error or carelessness.

This safety section includes information from many sources. It gives examples of basic safety rules. Additional safety rules may be necessary for safe operation of the equipment. The information in this section is not meant to replace safety codes; insurance requirements; or national, federal, provincial, state, and local laws and regulations.

1. DO NOT USE THIS EQUIPMENT TO LIFT OR LOWER PERSONNEL. THIS EQUIPMENT IS MADE FOR MATERIAL HANDLING ONLY.

2. Wear protective clothing and safety equipment as required by job conditions when operating the equipment or working in the area of the equipment. Do not wear loose clothing that could catch on controls or moving equipment parts.

3. Keep the operator's area and the work area clean and free of debris.

4. Keep the equipment clean and free of dirt and debris in order to permit a good inspection of the equipment.

5. Do not weld on hooks or shackles. Welding on these items can weaken the material causing failure.

6. Adequate fire protection equipment must be available and in satisfactory operating condition. Operating and maintenance personnel must be familiar with the use and care of the fire protection equipment.

## C. *Operating Safety Rules*

1. Do not operate this equipment under any condition or in any manner other than those for which the equipment has been specified, sold, and described in this technical manual.

2. This equipment must be operated only by personnel who are trained and authorized for its operation.

3. Do not operate this equipment if you are ill or physically or mentally not fit to operate it correctly and safely.

4. Do not exceed the available line pull of the equipment.

5. Operate the equipment with no load at the start of each workday to make sure all functions work correctly.

6. Do not pull or payout a load after the hoist has been standing during damp weather (example: rain, sleet, snow, heavy fog) without first "riding" the brakes and clutches to evaporate moisture. Wet linings can prevent the brakes and clutches from holding a load that is near the load capacity of the hoist.

7. The operator must watch the load at all times. Do not operate the equipment if the operator's vision is restricted. Some applications require a signal person. The signal person must be visible to the operator at all times. The operator and the signal person must agree on the signals to be used before operating the equipment.

8. Communication must be maintained between all personnel involved in any operation. The operator must obey a signal to stop from anyone in the area. The signal person must give all other signals.

9. Do not permit personnel to get on or off the equipment while it is operating.

10. Do not operate the equipment with any personnel near the wire rope or moving equipment parts.

11. Do not operate the equipment without the safety guards installed.

12. Do not bypass, disconnect, or ignore safety and warning devices of the equipment. If there is a problem with the equipment, safely shut down the equipment and investigate. Correct the problem before continuing operation.

13. Do not operate the equipment after an inspection reveals a possible safety hazard or if any equipment parts require replacement or maintenance. Always look for equipment damage during operation. If damage is found, safely shut down the equipment and correct the damage before continuing operation.

14. Operate the equipment at a slow speed when first learning.

15. The operator must not leave the control station until the equipment has been shut down and is completely stopped.

16. The drum dogs (pawls) must be engaged when the drums are to be kept from rotating for a period of time.

17. The hoist must have at least three wraps of wire rope on the drums at all times during operation.

18. Do not permit the wire rope to wind incorrectly on the drum.

### *D. Maintenance Safety Rules*

1. Shut down the equipment before doing maintenance. Only qualified, trained maintenance personnel must do maintenance, adjustment, and inspection procedures, following the procedures outlined in the technical manual.

2. After making a repair or adjustment, always check the functioning of the equipment parts before putting the machine into full operation.

3. The brakes and clutches of the hoist must always be dry, correctly adjusted, and free from lubricant contamination. Injury to personnel or damage to the equipment can result if the brake and clutch adjustments are not correct.

4. Do not make modifications to the equipment unless approved in writing by Conmaco/Rector L.P.

# II. OPERATING INSTRUCTIONS

## *A. STARTING PROCEDURE*

**Important:** See the "Important Suggestions" section in the "Maintenance" section for additional information.

1. Check to be sure the rigging is free of any restraints.

2. Check to be sure the fleeting sheaves, deck guide sheaves, fleet angle compensators, fairleaders, and other accessories are lubricated.

3. Inspect the operating ropes for damage or deterioration.

4. Close the drain valves on the air reservoir and control console air manifold.

5. Make sure that the ball valves on the hydraulic pump suction lines are open and locked open with either a pad lock or wire and lead.

6. Make sure all hydraulic hoses and the one electrical cable are connected to the winch.

7. Check the gear reducer and hydraulic tank oil levels. Check the gears for lubrication. Inspect the hoist for leaks, adjustments, and unusual conditions. Ensure that the service schedule has been followed.

***NOTE:*** *See the "Maintenance" section for lubrication, service instructions, and maintenance schedule.*

8. Check the engine oil, fuel, and coolant fluid levels. Inspect the engine for leaks, adjustments, or unusual conditions.

***NOTE:*** *Refer to the engine operating and service manual for starting, operating, and servicing instructions.*

9. Make sure the joystick is centered, the motor control dial is at MAX TORQUE (turned fully counter-clockwise), the drum clutch is DISENGAGED, and the parking brake is APPLIED.

10. Set the throttle to run the engine at IDLE.

11. Press and hold in the reset button while starting the engine with the key or selector switch. If the engine does not start within 30 seconds, release the

button and allow the starter to cool for a few minutes. If the engine does not start after four attempts, determine the cause.

12. Observe the engine oil pressure gauge. Stop the engine if no pressure is indicated within 10-15 seconds. The oil pressure must be above 20 psi for the engine to operate with the reset button out.

13. Watch the engine and hydraulic gauges for normal operating ranges. If gauges are not in their normal operating range, stop the engine and correct the problem before resuming operation.

14. The engine oil pressure should be 35-65 psi. After the engine has warmed up, the coolant temperature should be 180-202°F and is not to exceed 220°F. Under no load, the two high pressure hydraulic gauges should read approximately 400 psi and the one low pressure hydraulic gauge should read approximately 350 psi. The hydraulic oil temperature is not to exceed 190°F. The voltmeter should read 24-28 volts. If the engine coolant temperature or the hydraulic oil temperature rises above a predetermined limit, the diesel engine will automatically shut down.

15. Make sure the air system pressure gauge on control console reads 105-125 psi (7.4- 8.8 kg/sq. cm.)

## *B. HOISTING LOADS*

1. Set the throttle control to run the engine at 2200 rpm.

2. ENGAGE the drum clutch.

3. APPLY the service brake fully, pull the parking brake valve knob to the RELEASED position, and move dog valve handle to the OUT position.

**CAUTION** *Visually inspect that the dog is released. It may be necessary to hoist the load slightly to completely release the dog.*

4. Slowly pull the joystick towards the INHAUL direction while RELEASING the service brake to start hoisting the load. Once the load starts to move, RELEASE the service brake completely to avoid brake dragging and heating. Adjust the hoisting speed with the joystick. The further the joystick is pulled towards the INHAUL direction the faster the drum will rotate. If the load is light, more speed can be obtained by turning the motor control dial towards MAX SPEED.

***NOTE***: *The hydraulic hoist motor is equipped with a counter-balance valve that will hold the load when the joystick is in the center position and the brakes are released, but due to internal hydraulic leakages the load may slowly lower unless the brakes are applied.*

***NOTE***: *The joystick controls the hydraulic pump displacement and the motor control dial controls the hydraulic motor displacement. Once the operator is completely comfortable with the operation of the hoist and the loads, he may choose to position the motor dial to MAX SPEED (turned clockwise fully) while hoisting to utilize the full horsepower of the hoist at all times. This sets the motor to its minimum displacement for maximum speed, but when the load on the motor increases due to increasing wraps on the drum, the motor will automatically increase its displacement to hoist the given load as fast as possible without exceeding the engine's horsepower.*

5. To stop hoisting, return the motor control dial to the MAX TORQUE position (if necessary) and slowly return the joystick to the centered position. APPLY the service brake fully to keep the load from moving and return the throttle to IDLE.

6. Refer to section F for load parking instructions.

## *C. GENERAL LOWERING INFORMATION*

**CAUTION** *The operator should consider safety of the crew, value of the load, operator's ability, weather conditions and the following information before deciding to use the drum brakes only for lowering a load or to use power load lowering.*

*Lowering any load develops energy that must be dissipated (usually in the form of heat energy) from the hoist brakes or the power unit (when power load lowering). The method of lowering to use is the one that will safely dissipate the heat energy generated.*

*Using only the brakes for lowering offers faster lowering speeds and quicker response to the operator's control changes. The disadvantage of this method is that the build-up of heat resulting from repeated use or heavy loads can cause brake fade. As with any other friction brake, when fade occurs, the stopping power is severely reduced even though greater brake pressure is applied. Remember, the parking brake uses the same set of bands as the*

*service brake so it is not available as a back-up if the service brake fades.*

*The power load lowering method utilizes a counter-balance valve in the hydraulic circuit to safely lower the load. The counter-balance valve is directly mounted to the hydraulic motor and must be powered open to allow the motor to rotate to lower the load. If there is a loss of power or the load begins to run, the counter-balance valve will close to keep the motor and the load from moving. The counter-balance valve generates heat in the hydraulic oil which is removed by an air-to-oil heat exchanger. This method is slower but can lower heavier loads without overheating the brakes.*

## *D. LOWERING LIGHT LOADS (BRAKES ONLY, CLUTCH DISENGAGED)*

1. APPLY the service brake fully, pull the parking brake valve knob to the RELEASED position, and move the dog valve handle to the OUT position.

**WARNING** *It may be necessary to raise the load slightly to allow the dog to DISENGAGE from the drum. Never power into the dog and always visually inspect that the dog is DISENGAGED.*

2. Slowly RELEASE the service brake until the load starts to move downward. Lower the load at a reasonable speed using the service brake to control the line speed.

3. Gradually APPLY the service brake to stop the load smoothly. Refer to section F for load parking instructions.

## *E. LOWERING HEAVY LOADS (POWER LOAD LOWERING)*

1. Set the throttle control to run the engine at 2200 rpm.

2. Make sure that the motor control dial is set to MAX TORQUE (turned fully counter-clockwise).

3. ENGAGE the drum clutch, APPLY the service brake fully, pull the parking brake knob to the RELEASED position, and move the dog valve handle to the OUT position.

4. Slowly pull the joystick towards the INHAUL direction while RELEASING the service brake to start hoisting the load. It will be necessary to rotate the drum slightly in order for the dog to DISENGAGE.

**CAUTION** *Never power into the dog and always visually inspect that the dog is DISENGAGED.*

5. Once the dog is DISENGAGED, return the joystick to the centered position, to stop the drum.

6. To start lowering the load, slowly push the joystick towards the PAYOUT direction. The further the joystick is pushed towards the PAYOUT direction, the faster the drum will rotate. Lower the load at a reasonable speed. For light loads, the lowering speed may be further increased by adjusting the motor control dial towards MAX SPEED.

**CAUTION** *Lowering loads too quickly can generate more heat in the hydraulic oil than the heat exchanger is capable of removing. Always monitor the hydraulic oil temperature while lowering loads. If the hydraulic oil temperature is approaching 180°F, reduce the lowering speed.*

7. To stop the load, return the motor control dial to the MAX TORQUE position (if necessary) and slowly return the joystick to the center position. APPLY the service brake fully to keep the load from moving and return the throttle to IDLE.

8. Refer to section F for load parking instructions.

## *F. PARKING*

1. With the service brake APPLIED to hold the load, move the dog valve handle to the IN position to engage the drum dog.

2. ENGAGE the clutch if it is not already engaged.

3. Set the throttle control to run the engine at 2200 rpm.

4. Slowly pull the joystick towards the INHAUL direction while RELEASING the service brake to start hoisting the load.

5. After the dog falls into the pocket on the drum flange, return the joystick to the centered position.

6. Slightly push the joystick to the PAYOUT direction. Once the drum is seated against the dog, immediately return the joystick to the center position.

**CAUTION** *Never power into the dog and visually inspect that the drum is seated on the dog.*

7. When the drum is seated on the dog, push the parking brake knob to the APPLIED position.

8. DISENGAGE the clutch and return the throttle to IDLE.

***NOTE:*** *It is not recommended that the machine be left unattended while a load is suspended from the hook.*

## *G. STOPPING AND SHUTDOWN INSTRUCTIONS*

1. Park any hooks, anchors, or other equipment being handled by the drum lines. Make sure the dog is properly engaged.

2. Run the engine at idle for a few minutes. Not doing so can cause serious damage to the engine.

3. Stop the engine by turning the key or selector switch at the power unit or by pressing the stop button at the operator's console. The key or selector switch at the power unit still needs to be turned to the off position even if the engine is stopped at the operator's console. This will keep the gauges from draining the battery while not in use.

4. Open the drain valves on the control console air manifold and the hoist air reservoir. Leave the drain valves open to allow any condensation to escape during shutdown.

5. Inspect the air filter near the air reservoir for foreign material. Clean if necessary.

6. Inspect fuel and oil levels. Refill if necessary.

7. See the "Storage of Hoist" section in the "Maintenance" section if the hoist is not to be used for a long period of time.

8. Write down any difficulties encountered, adjustments, or changes that should be made before resuming operation.

# III. SPECIFICATIONS

**DRUM DIMENSIONS:**

| | |
|---|---|
| Flange Diameter | 49.50 in (1257mm) |
| Drum Diameter | 18.00 in (457mm) |
| Drum Length | 45.38 in (1152mm) |

**SPOOLING CAPACITIES:**

| | |
|---|---|
| 7/8 in. Wire Rope | 8,728 ft (2,660 M) |
| 1 in. Wire Rope | 6,569 ft (2,002 M) |
| 1-1/8 in. Wire Rope | 5,195 ft (1,583 M) |
| 1-1/4 in. Wire Rope | 4,072 ft (1,241 M) |
| 1-3/8 in. Wire Rope | 3,467 ft (1,057 M) |
| 1-1/2 in. Wire Rope | 2,959 ft (902 M) |

**MAXIMUM RATED LINE PULL (Anchor Duty)**

| | |
|---|---|
| 1-1/2 in. wire rope on the 1st layer. | 120,00 lbs (54.4 MT) |

**MAXIMUM RATED LINE PULL (Hoisting Duty)**

| | |
|---|---|
| 1-1/2 in. wire rope up to the 10th layer. | 40,700 lbs (18.4 MT) |

**DRUM BRAKE**

| | |
|---|---|
| Air applied with spring set parking brake feature. | Standard |
| Static Holding Capacity 1st layer | 150,000 lbs (68 MT) |

**DRUM CLUTCH**

| | |
|---|---|
| Air actuated and spring release. | Standard |

**DRUM DOG**

| | |
|---|---|
| Air applied and spring release. | Standard |

**CONTROL CONSOLE**

| | |
|---|---|
| Side mounted stand-up type. | Standard |

**PERFORMANCE AT MAXIMUM LINE PULL (1-1/2 in. Wire Rope)**

| *Layer* | *Total Storage (ft)* | *Line Pull (lbs)* | *Line Speed (ft/min)* |
|---|---|---|---|
| 1 | 143 | 120,073 | 40 |
| 2 | 305 | 106,138 | 45 |
| 3 | 486 | 95,102 | 51 |
| 4 | 686 | 86,145 | 56 |
| 5 | 904 | 78,729 | 61 |
| 6 | 1,141 | 72,490 | 66 |
| 7 | 1,397 | 67,166 | 72 |
| 8 | 1,672 | 62,571 | 77 |
| 9 | 1,966 | 58,550 | 82 |
| 10 | 2,278 | 55,027 | 87 |

**PERFORMANCE AT MAXIMUM LINE SPEED (1-1/2 in. Wire Rope)**

| *Layer* | *Total Storage (ft)* | *Line Pull (lbs)* | *Line Speed (ft/min)* |
|---|---|---|---|
| 1 | 143 | 29,023 | 166 |
| 2 | 305 | 25,655 | 187 |
| 3 | 486 | 22,988 | 209 |
| 4 | 686 | 20,822 | 231 |
| 5 | 904 | 19,030 | 253 |
| 6 | 1,141 | 17,522 | 274 |
| 7 | 1,397 | 16,235 | 296 |
| 8 | 1,672 | 15,124 | 318 |
| 9 | 1,966 | 14,152 | 340 |
| 10 | 2,278 | 13,301 | 361 |

## AMCON 385 HDS SMOOTH DRUM SPOOLING CAPACITY

| | |
|---|---|
| Rope Diameter : | 0.88 in. |
| Flange Diameter : | 49.50 in. |
| Drum Barrel Diameter : | 18.00 in. |
| Drum Length : | 45.38 in. |

| *Layer* | *Pitch Dia.(in)* | *ft/layer* | *Total stor.(ft.)* |
|---|---|---|---|
| 1 | 18.88 | 233 | 233 |
| 2 | 20.35 | 251 | 484 |
| 3 | 21.83 | 270 | 754 |
| 4 | 23.31 | 288 | 1042 |
| 5 | 24.79 | 306 | 1348 |
| 6 | 26.26 | 324 | 1672 |
| 7 | 27.74 | 343 | 2015 |
| 8 | 29.22 | 361 | 2376 |
| 9 | 30.70 | 379 | 2755 |
| 10 | 32.17 | 397 | 3152 |
| 11 | 33.65 | 416 | 3568 |
| 12 | 35.13 | 434 | 4001 |
| 13 | 36.61 | 452 | 4453 |
| 14 | 38.09 | 470 | 4924 |
| 15 | 39.57 | 489 | 5412 |
| 16 | 41.05 | 507 | 5919 |
| 17 | 42.53 | 525 | 6445 |
| 18 | 44.01 | 543 | 6988 |
| 19 | 45.49 | 562 | 7550 |
| 20 | 46.97 | 580 | 8130 |
| 21 | 48.45 | 598 | 8728 |

## AMCON 385 HDS SMOOTH DRUM SPOOLING CAPACITY

| | |
|---|---|
| Rope Diameter : | 1.00 in. |
| Flange Diameter : | 49.50 in. |
| Drum Barrel Diameter : | 18.00 in. |
| Drum Length : | 45.38 in. |

| *Layer* | *Pitch Dia.(in)* | *ft/layer* | *Total stor.(ft.)* |
|---|---|---|---|
| 1 | 19.00 | 208 | 208 |
| 2 | 20.69 | 226 | 434 |
| 3 | 22.39 | 245 | 678 |
| 4 | 24.08 | 263 | 941 |
| 5 | 25.78 | 282 | 1223 |
| 6 | 27.47 | 300 | 1523 |
| 7 | 29.17 | 319 | 1842 |
| 8 | 30.86 | 337 | 2179 |
| 9 | 32.56 | 356 | 2534 |
| 10 | 34.25 | 374 | 2908 |
| 11 | 35.94 | 393 | 3301 |
| 12 | 37.64 | 411 | 3712 |
| 13 | 39.33 | 430 | 4142 |
| 14 | 41.03 | 448 | 4590 |
| 15 | 42.73 | 467 | 5057 |
| 16 | 44.43 | 485 | 5542 |
| 17 | 46.13 | 504 | 6046 |
| 18 | 47.83 | 522 | 6569 |

## AMCON 385 HDS SMOOTH DRUM SPOOLING CAPACITY

| | |
|---|---|
| Rope Diameter : | 1.13 in. |
| Flange Diameter : | 49.50 in. |
| Drum Barrel Diameter : | 18.00 in. |
| Drum Length : | 45.38 in. |

| *Layer* | *Pitch Dia.(in)* | *ft/layer* | *Total stor.(ft.)* |
|---|---|---|---|
| 1 | 19.13 | 186 | 186 |
| 2 | 21.04 | 204 | 390 |
| 3 | 22.95 | 223 | 613 |
| 4 | 24.86 | 241 | 854 |
| 5 | 26.77 | 260 | 1114 |
| 6 | 28.68 | 278 | 1392 |
| 7 | 30.59 | 297 | 1689 |
| 8 | 32.50 | 315 | 2004 |
| 9 | 34.41 | 334 | 2338 |
| 10 | 36.32 | 352 | 2690 |
| 11 | 38.24 | 371 | 3061 |
| 12 | 40.15 | 390 | 3451 |
| 13 | 42.06 | 408 | 3859 |
| 14 | 43.97 | 427 | 4286 |
| 15 | 45.88 | 445 | 4731 |
| 16 | 47.79 | 464 | 5195 |

## AMCON 385 HDS SMOOTH DRUM SPOOLING CAPACITY

| | |
|---|---|
| Rope Diameter : | 1.25 in. |
| Flange Diameter : | 49.50 in. |
| Drum Barrel Diameter : | 18.00 in. |
| Drum Length : | 45.38 in. |

| *Layer* | *Pitch Dia.(in)* | *ft/layer* | *Total stor.(ft.)* |
|---|---|---|---|
| 1 | 19.25 | 169 | 169 |
| 2 | 21.38 | 188 | 357 |
| 3 | 23.51 | 207 | 564 |
| 4 | 25.63 | 225 | 789 |
| 5 | 27.76 | 244 | 1033 |
| 6 | 29.89 | 263 | 1296 |
| 7 | 32.02 | 282 | 1578 |
| 8 | 34.14 | 300 | 1878 |
| 9 | 36.27 | 319 | 2197 |
| 10 | 38.40 | 338 | 2534 |
| 11 | 40.53 | 356 | 2891 |
| 12 | 42.66 | 375 | 3266 |
| 13 | 44.78 | 394 | 3660 |
| 14 | 46.91 | 412 | 4072 |

## AMCON 385 HDS SMOOTH DRUM SPOOLING CAPACITY

| | |
|---|---|
| Rope Diameter : | 1.38 in. |
| Flange Diameter : | 49.50 in. |
| Drum Barrel Diameter : | 18.00 in. |
| Drum Length : | 45.38 in. |

| *Layer* | *Pitch Dia.(in)* | *ft/layer* | *Total stor.(ft.)* |
|---|---|---|---|
| 1 | 19.38 | 155 | 155 |
| 2 | 21.72 | 173 | 328 |
| 3 | 24.06 | 192 | 520 |
| 4 | 26.40 | 211 | 730 |
| 5 | 28.75 | 229 | 960 |
| 6 | 31.10 | 248 | 1208 |
| 7 | 33.44 | 267 | 1474 |
| 8 | 35.79 | 285 | 1760 |
| 9 | 38.13 | 304 | 2064 |
| 10 | 40.47 | 323 | 2387 |
| 11 | 42.82 | 342 | 2728 |
| 12 | 45.16 | 360 | 3089 |
| 13 | 47.50 | 379 | 3467 |

## AMCON 385 HDS SMOOTH DRUM SPOOLING CAPACITY

| | |
|---|---|
| Rope Diameter : | 1.50 in. |
| Flange Diameter : | 49.50 in. |
| Drum Barrel Diameter : | 18.00 in. |
| Drum Length : | 45.38 in. |

| *Layer* | *Pitch Dia.(in)* | *ft/layer* | *Total stor.(ft.)* |
|---|---|---|---|
| 1 | 19.50 | 143 | 143 |
| 2 | 22.06 | 162 | 305 |
| 3 | 24.62 | 181 | 486 |
| 4 | 27.18 | 200 | 686 |
| 5 | 29.74 | 218 | 904 |
| 6 | 32.30 | 237 | 1141 |
| 7 | 34.86 | 256 | 1397 |
| 8 | 37.42 | 275 | 1672 |
| 9 | 39.99 | 294 | 1966 |
| 10 | 42.55 | 312 | 2278 |
| 11 | 45.11 | 331 | 2609 |
| 12 | 47.67 | 350 | 2959 |

# IV. MAINTENANCE

## *A. HOIST DESCRIPTION*

The CONMACO/RECTOR L.P. hoist is a heavy duty unit designed for anchor handling and hoisting operations. The hoist is not designed for hoisting personnel and does not meet the safety requirements for personnel hoists.

The following is a brief general description of the major components making up the CONMACO/RECTOR L.P. Hoist.

DRUM

The drum is of welded steel construction and mounted on roller bearings. The wire rope (right lay) is anchored to the drum by passing it through the flange and securing it with clamp blocks. The drum flanges with integral brake and clutch rings are designed to withstand the wedging stresses resulting from hoisting the full rated line pull.

MACHINERY BED

The machinery bed is a rigid steel weldment and arranged so that the wire rope can fleet out the front or the back of the machine. Two bulkheads are incorporated into the machinery bed, making the connection of the power unit hoses to the winch and the console hoses to the winch easy.

GEAR DRIVE

The gear drive consists of a three stage planetary gear reducer, a hardened alloy steel pinion, and heat treated alloy steel drum gear. The gear reducer is driven by a hydraulic motor and has the pinion mounted on it's output shaft. The pinion drives the drum gear which turns the drum shaft.

CLUTCH

A single air-actuated, spring-released clutch powers the drum. The clutch is an internal-expanding band-type with the friction linings running on the internal side of the clutch ring. The clutch is rated for the full torque of the machine and when disengaged will allow the drum to free spool.

DRUM BRAKES

The drum is equipped with a single external-contracting band-type brake with the live end connected to the crank arm the dead end connected to the hoist bed. For parking, the brake band is set by a large spring integral to the brake chamber connected to the crank arm. Air pressure is required to compress the springs and release the parking brake. In this configuration, a complete loss of system air pressure will set the brake. Additionally, in the same brake chamber is an air chamber whose connecting rod & clevis is mechanically attached to the brake

crank arm for graduated control of the brakes during hoisting operations. This is the service brake.

DRUM DOG

The drum is equipped with an air-actuated ratcheting drum dog. The dog fits into pockets integrated into the drum flange to securely lock the drum in position. The dog holding power is in excess of the breaking strength of 1 1/2 in. wire rope.

CONTROLS AND INSTRUMENTATION

The standard hoist controls are pneumatic and hydraulic and are located on a single stand-up type console mounted to the side of the winch. The console is able to be remotely mounted to obtain a better vantage point if necessary. At the winch, the operator is able to control the parking and service brakes, clutch, dog, engine throttle, winch inhaul/payout, hydraulic motor speed, and kill the diesel engine. The operator is also able to monitor the system air pressure, system hydraulic pressure, service brake air pressure, and the throttle air pressure while operating the winch.

The engine controls are located at the power unit and include the diesel engine ignition switch, oil pressure gauge, water temperature gauge, combination tachometer/hourmeter, and voltmeter. Additional hydraulic oil pressure and temperature gauges are located at the power unit.

## *B. AIR SYSTEM DESCRIPTION*

The air system of the hoist operates on air pressure of 105 to 125 PSI (7.4 to 8.8 $KG/CM^2$) with the compressor supplying air at a rate of 13.5 cfm to the reservoir.

An air line filter/separator is installed in the air line ahead of the control console (the filter element should be 75 micron - maximum - nominal rating with 50 micron recommended). This filter/separator collects moisture from condensation in the lines and impurities in the system.

The clutch and dog are air-actuated and spring-released. The service brake is air-actuated and spring-released while the parking brake is spring-actuated and air-released. In the event of a complete loss of operating air pressure, the following will occur:

1. The drum parking brake will set
2. The drum dog will disengage if the drum is not seated on the dog
3. The clutch will release
4. The drum service brake will release

The brakes are air controlled through the use of diaphragm type brake chambers. Service required on these chambers includes replacement of the rubber diaphragm if ruptured, and stroking rod adjustments if a unit is replaced. Air piping to the

drum clutch is accomplished through a swivel joint at the end of the drum shaft. This swivel joint requires no service except replacement, if it starts to leak.

## C. HYDRAULIC SYSTEM DESCRIPTION

The hydraulic system of the hoist is a closed loop configuration (hydrostatic transmission) consisting of a variable displacement axial piston pump and motor. The pump's displacement is proportionally controlled by a hydraulic joystick at the operator's station. The pump's displacement increases as the joystick is moved from the center position until it reaches its maximum displacement (maximum drum speed) when the joystick is at the end of its travel. The motor's displacement is proportionally controlled by a dial at the operator's station. When the dial is rotated fully counterclockwise, the motor is at maximum displacement (maximum drum torque and minimum drum speed) and when the dial is rotated fully clockwise, the motor is at minimum displacement (maximum drum speed and minimum drum torque). If the motor displacement is set too low for the given load, a valve built into the hydraulic circuit will override the signal from the dial and increase the motor displacement to a point where the winch has enough torque to move the load.

A second pump is directly mounted to the back of the closed loop pump. This pump supplies flushing flow to the closed loop circuit, supplies flow to the motor control port, and provides flow for a continuous filtration loop.

For safety when load lowering, the hydraulic motor has a counter-balance valve directly mounted to it. The counter-balance valve acts as a brake in the hydraulic circuit if the load starts to "run away." When lowering loads, the counter-balance valve generates heat in the hydraulic oil and the heat is taken out of the closed loop by a flushing valve. The hot oil then is cooled in an air-to-oil heat exchanger mounted beside the engine radiator. If the oil is cool, a thermostat valve will direct the oil back to the tank bypassing the radiator. This helps the oil to heat up to an optimal working temperature when the oil is cool.

Many filters are used in the hydraulic system to help keep the oil clean, protecting the hydraulic components. Cleanable suction strainers are installed in the hydraulic tank and a tank breather/drier is installed in the top of the hydraulic tank. The strainers protect the pumps from large particles that may accidentally get in the tank and the breather/drier filters out dirt and water from the air going into the tank when the tank breathes. A spin on type filter is mounted directly on the pump and filters the charge pump oil before it goes into the closed loop pump. Two low pressure filters, one at the winch and one at the power unit, filter the flushing oil before it goes back to tank and four high pressure filters are installed in the main lines to filter the oil in the closed loop, protecting the pump and motor.

## *D. IMPORTANT SUGGESTIONS*

Read this manual to learn the proper operation and maintenance procedures. Keep the manual available at all times for quick reference.

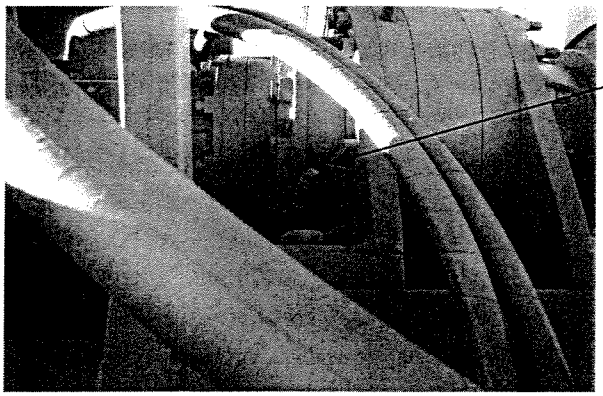
- Keep the hoist clean. Dirt covers up trouble in the making. Quick inspection is possible on a clean hoist.
- All guards and covers must be in place while operating the hoist. Make sure the guards and covers are securely fastened before operating the hoist.
- Use only clean and uncontaminated engine fuels and lubricants. Use only clean, soft water and recommended coolants in the engine cooling system. See engine operators manual for specific instructions.
- Lubricate the hoist and drive train regularly. See the hoist lubrication section and the engine operator manual for specific instructions.
- Do not change engine governor speed, injectors, or fuel pump setting without first consulting with Conmaco/Rector L.P.'s Engineering Department.
- Check the hoist's engine fuel, oil, and coolant levels as well as the hydraulic oil fluid level and gear reducer fluid level before the start of each work shift.
- Inspect the engine and hydraulic components/hoses for leaks, adjustments, and unusual conditions. Refer to the engine manual for specific instructions pertaining to the engine.
- Check the hoist gear lubrication before the start of each shift. Inspect the hoist for leaks, adjustments, loose fasteners, or unusual conditions.
- Check the wire rope for wear, breaks, and lubrication requirements before starting each work shift.
- Make sure the hydraulic joystick is centered and the motor dial is set to maximum torque before starting the engine.
- Make sure the rope leads (or single line pulls) do not exceed the rated capacity of the hoist. See the specifications section for rating information.
- If the brake is wet after the hoist has been standing overnight or during rainy weather, dry the brake linings by feathering (lightly applying) the service brake while turning the drum.
- Do not ride the service brake with the clutches engaged, except as mentioned above, because the brakes may fade with excessive heat and the braking capability lost.
- Check the brake, clutch, wire rope, and rigging before operation.
- NEVER ENGAGE THE DRUM DOG WHEN LOWERING. The sudden stop will overload the equipment and could cause severe damage.
- When engaging the drum dog, make sure the drum is not turning. When the drum is seated on the dog, the dog cannot be disengaged until the drum is rotated slightly away from the dog.
- NEVER USE THE PARKING BRAKE OR THE DOG TO STOP THE LOAD. Use the hydraulic controls and the service brake.
- Do not leave the hoist unless the drum dog is engaged and the parking brake is set.

## *E. ENGINE MAINTENANCE*

Refer to the engine manual for engine maintenance and service intervals.

## *F. GEAR REDUCER MAINTENANCE*

Refer to the gear reducer literature for maintenance and service intervals.

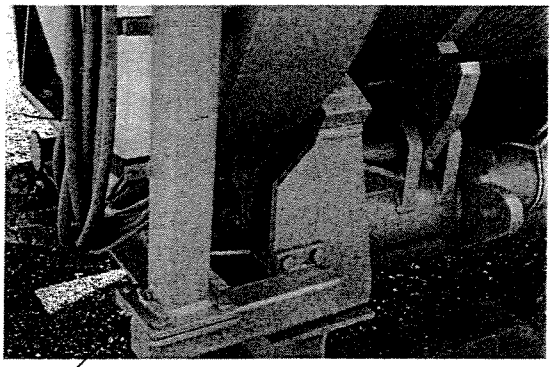


Gear reducer
fill/level point

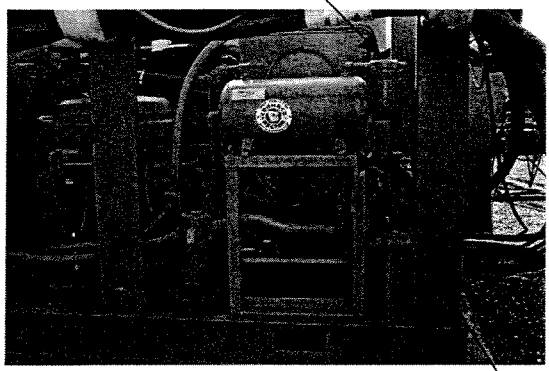
## *G. AIR SYSTEM MAINTENANCE*

Drain water from the air reservoir, console stand, and filter/separator daily. Check filter cleanliness every 250 hours and replace the filter element if necessary.

Air Filter/Separator



Console Drain

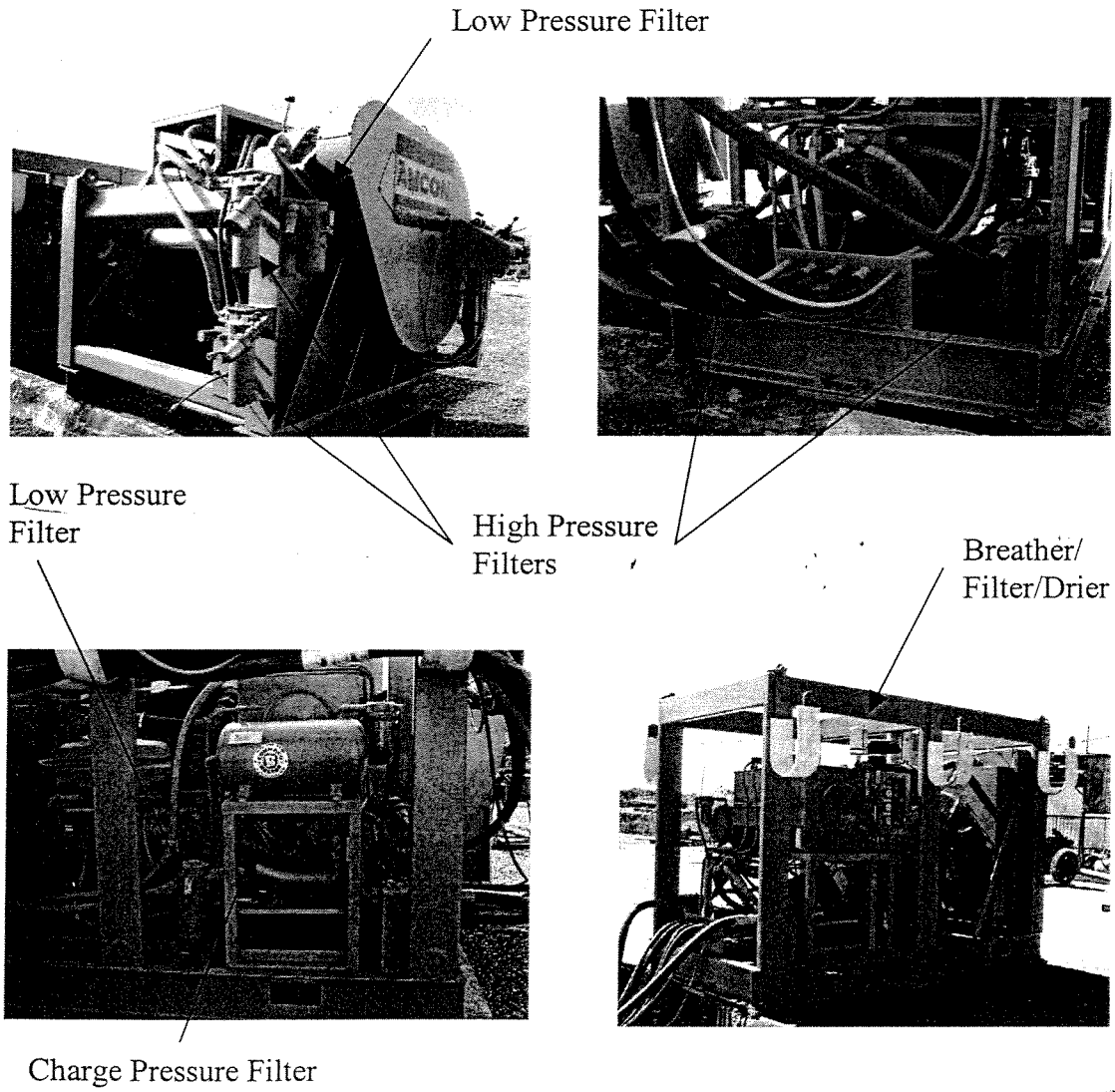


Air Reservoir
Drain

## *H. HYDRAULIC SYSTEM MAINTENANCE*

Within the first 100 hours of operation, replace all four high pressure filter elements, both low pressure filter elements, and the charge pressure filter element. After the first 100 hours of operation, replace all seven filters every 500 hours of operation or sooner as shown by indicators. Replace the tank breather/filter/drier yearly or sooner as shown by the moisture indicator. Depending on operating conditions, change the hydraulic oil within 1000-2000 hours of operation. Sending a hydraulic oil sample to a laboratory for examination will tell you if the oil needs to be changed or not. Inquire about this service from any hydraulic oil distributor. When changing the hydraulic oil or at least once a year, inspect the two suction strainers mounted inside the tank and if necessary, clean them. ***Use only Chevron Clarity hydraulic oil in the hydraulic system.***

If there is a hydraulic component failure, it may be necessary to change the fluid, replace all filters, and clean/flush all hydraulic components before the system is started once the failure is corrected.



## *I. HOIST LUBRICATION INTERVALS*

| LOCATION | LUBE TYPE NO. | QUANTITY OF LUBE | INTERVAL | PARTS LUBRICATED |
|---|---|---|---|---|
| A | 1 | Replenish Supply | Every 3 Months | Drum Shaft Pillow Block Bearings |
| B | 1 | Replenish Supply | Every 3 Months | Drum Shaft Drum Bearings |
| C | 1 | 1-2 Shots | Every 3 Months | Brake Crank Pin |
| D | 1 | 1-2 Shots | Every 3 Months | Dog Crank |
| E | 5 | | Daily | Drum Gears & Pinion (Brush on, or apply heated lubricant with a paddle to maintain a film on the teeth) |
| F | 4 | A few drops | Monthly | Lubricate all clutch, brake, & dog pins and bushings with Molycote grease or other suitable rust preventative lubricant.* |

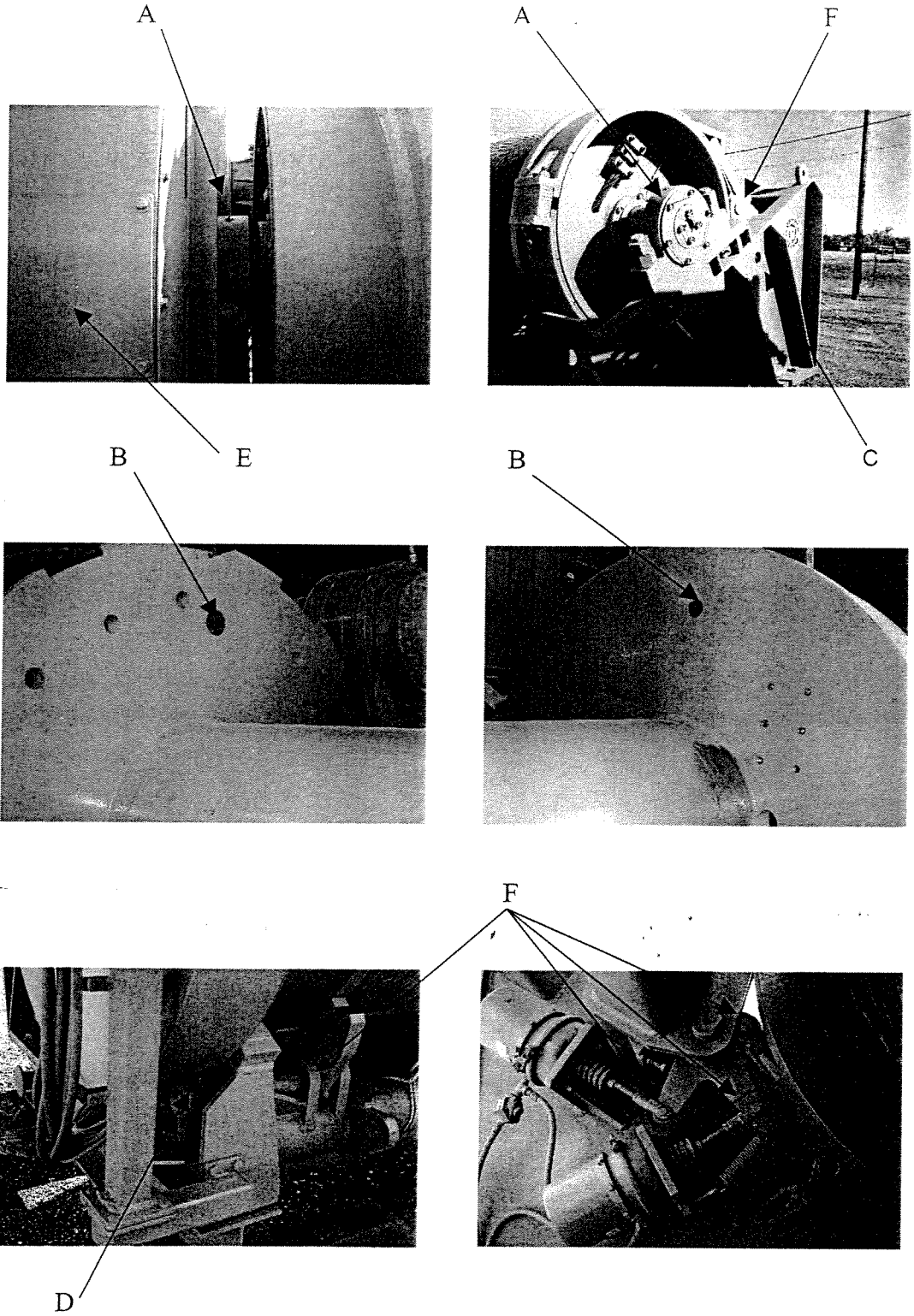
**NOTE: When lubricating clutch and brake pins, ensure that no lubricant contacts or will contact the linings or lining surfaces. Lubricant on the linings or lining surfaces can severely reduce the performance of the clutch or brake.*

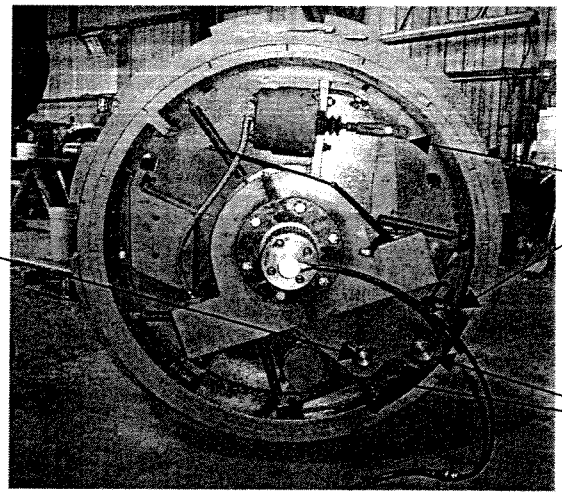
**LUBRICATION INTERVALS**

DAILY means every 8 hours of operation.
WEEKLY means every 40 hours of operation.
MONTHLY means every 160 hours of operation.
MAINTAIN means do not allow the supply to disappear; the interval will vary depending on climate and use. Check daily.

These intervals represent periods of time during normal operation. If the machine is used more than normal or in a rough climate, it will naturally become necessary to lubricate the machine more frequently. If the machine is idled for long periods of time, lubrication will have to be done before it is put in service each time. It will also have to be lubricated before storing to prevent corrosion and weathering.

Proper lubrication will contribute to the smooth functioning of parts as well as protecting those parts from corrosion and wear.






## *J. LUBRICATION*

The following is a random selection of brand names for use as a guide line in selecting lubricants. The presence or omission of a brand name on this list is not a guarantee of any petroleum product by CONMACO/RECTOR L.P. and other brands with the same properties may be cross referenced and used. Responsibility of quality and performance lies with the oil supplier.

Selection of a reliable oil and grease supplier, strict observation of lubrication requirements, cleanliness, and proper application will assure good lubrication which contributes to longer machinery life.

*Type 1:* Plain, Ball or Roller Bearings, Slides and Guides
BP Energrease LS-EP2
Standard Oil Co. Rykon Grease No. EP
Shell Oil Co. Super Duty Grease

*Type 2:* Enclosed Gears and Wire Rope
BP Energrease GG (Summer)
BP Engergol GR (Summer)
Standard Oil Co. Amovis Lube No. 10-X (Summer)
Standard Oil Co. Amovis Lube No. 5-X (Winter)
Shell Oil Co. Omala Oil 96 (Summer and Winter)

*Type 3:* Roller Chain Baths
BP Energol HD 20W *
BP Energol HD 30 **
BP Energol HD 50 ***
Standard Oil Co. SAE 20 *
Standard Oil Co. SAE 30 **
Standard Oil Co. SAE 50 ***

*Type 4:* Roller Tath and Axles, Oil Grooves, Swivel Joints
BP Energol-HLP 150 (Summer)
BP Energol-HLP 80 (Winter)
Standard Oil Co. Permalube Motor Oil #30 (Summer)
Standard Oil Co. Permalube Motor Oil #20 (Winter)
Shell Oil Co. Rotella Oil 20-20W *
Shell Oil Co. Rotella Oil SAE 30 **
Shell Oil co. Rotella Oil SAE 50 ***

*Type 5:* Open Gears and Wire Rope
Texaco Crater Series
Chevron Open Gear Grease Series
Mobile Mobiletac Series

** Ambient Temperature of 20° F (-7°C) to 40° F (4°C)*
*** Ambient Temperature of 40° F (4°C) to 100° F (38°)*
**** Ambient Temperature Above 100° F (38°C)*

## *K. MAINTENANCE SUGGESTIONS*

- The methods of removing shaft assemblies, guards, cab panels, etc. is left to the discretion of the customer and depends on the type of overhaul equipment at hand.
- Keep parts in order when a large unit is disassembled, especially when it has a large number of similar parts. Loosely reassemble parts whenever possible to prevent small parts from being mislaid. Keep sub-assembly parts together, but be careful not to get right hand and left hand parts mixed up.
- When an assembly is removed to correct only one difficulty, it is good practice to recondition the whole assembly at the time thus avoiding repetition of work at a later date.
- Bolts and nuts should be placed into one of their respective holes when removing guards, cases, etc. so that the proper bolt will be on hand when reassembling these parts.
- Because most gears are heat treated and flame hardened, it is not a good practice to remove a gear by heating unless absolutely necessary. If a gear has to be heated to be removed, great care must be taken so as not to get the gear too hot; otherwise the heat treatment may be destroyed. Use a gear puller whenever possible.
- When removing cranks or other parts with split hubs, loosen the clamp bolt and expand the hub by driving in a small wedge.
- All parts that require a press fit can be more readily assembled if the shaft is coated with white lead.
- When bevel gears are replaced, care must be exercised in aligning the teeth. They should be adjusted for proper tooth contact and backlash by means of shims.

- All bolts should be replaced that are defective in any way, especially pillow block bolts.
- Oil seals should be carefully installed as instructed on the shaft assembly drawings that are in the parts section.
- After any shaft assembly has been reconditioned, great care must be taken when replacing it in the machine. After it is installed, the alignment and possible interference should be inspected in relationship to other adjoining assemblies before the machine is set in operation.
- Lubricate all bearings thoroughly before the machine resumes operation.
- Tighten all bolts and check a reconditioned shaft assembly after operating the machine for a few hours.
- When replacement parts are required, it is essential for maximum performance that only genuine CONMACO/RECTOR L.P. parts be used. See the parts section for part numbers.

## *L. BEARING MAINTENANCE*

Keep bearings clean: More than 90% of bearing failures are due to dirt which has been allowed to get into the bearing. When new bearings are received, do not remove them from the wrapper until the moment they are to be installed. Use clean hands, clean tools, and plenty of clean rags, not waste. Waste has lint and short strands which may get into a bearing. If it is necessary to leave a bearing partially assembled for some time, it must be thoroughly covered with clean rags or newspaper. Do not wash the lubricant out of a new bearing unless absolutely necessary. If it is necessary to wash a new or used bearing, use a clean pail and clean kerosene. If the bearing has been used and is very dirty, two or more clean baths may be necessary. Dip the bearing into the kerosene and spin it slowly. Blow it dry with an air hose and oil it immediately to prevent corrosion.

### 1. BEARING REMOVAL

Housing and bearing seats are made to the proper sizes at the factory. These seats should not be relieved at assembly to obtain an easier fit, since the tight fits used are necessary for satisfactory bearing life. Loosening the fits will seriously shorten the bearing's life.

It is much more difficult to remove a bearing than to install one. Do not use a hammer and cold chisel, because the heavy blows will cause the balls to dent the race grooves, and the force applied at one side of the race may crack it. Do not pull a bearing inner race by applying force to the outer race unless it is absolutely necessary. If there is no other way, be careful to keep the load on the outer race square and steady. Use a bearing puller or place the assembly in a press. Obtain pressure on the full circumference of the race whenever possible by using a pipe, split ring, or circular type puller. Self-aligning type bearings should never be

pulled by pressure on the outer race, and bearings having a shallow shoulder on one side should never be pulled by pressure on the shallow side.

If a bearing is to be used again, it must be kept absolutely clean during removal. After removal, it should be inspected for nicked or dented races or cracked ball or roller cages. Damaged bearings should never be reinstalled, since they may fail quickly.

### 2. BEARING INSTALLATION

Do not attempt to dress a bearing seat with emery cloth, since such a practice will reduce the shaft diameter and will destroy the roundness of the seat.

Remove all burrs on the shaft shoulder and clean all parts thoroughly. Start the bearing squarely on its seat and force it home with a press or a drift pipe and hammer. Use pressure only on the inner race when installing bearings on the shaft seat. Do not use a hammer and cold chisel, since the sharp blows will tend to dent the bearing races and the force applied only at a single point will cock the race in its seat, possibly cracking it.

Bearings may be assembled by heating them in oil. This method, however, is not recommended, since the bearings may be overheated and softened. Also it is very difficult to keep the heating oil and bearings clean. If this method is used, the oil should never be heated above 225° F., and the bearings should never be allowed to rest on the bottom of the oil tank. They would then become dirty and may be overheated if in contact with the tank bottom. Support the bearings on hooks or racks, or on a screen held some distance from the bottom. Keep the oil tank covered.

### 3. BEARING CHECKS

Be sure that the bearing bottoms against the shaft spacer or shoulder at all points. This may be checked by seeing if a light will penetrate between the bearing and should or spacer. Make sure that the outer race is free on the inner race. If the bearing is too tight, it will bind and fail early.

Check to make sure that all lock nuts are tight, and that all spacers, etc. are firmly in place.

## *M. ROLLER CHAIN GUIDELINES*

The main reasons for abnormal operating characteristics are usually found through investigation into handling, installation, lubrication, or maintenance procedures. For example, when picking up a strand of chain, support the entire coil, instead of hooking into the center. Twisting or other damage will be prevented.

When it is necessary to store a chain prior to use, keep it clean, well lubricated and away from abrasive or corrosive elements. If possible, store it indoors in its

original carton. If it must be stored outside, it should be under a tarpaulin or other suitable cover. When storage is prolonged, re-lubricate the chain periodically, to protect it. Another point to keep in mind is that high temperatures can reduce the lubricants effectiveness.

The same principles hold true for chain that is installed but not operated for long periods. During prolonged idleness, operate the chain periodically and keep it lubricated. If the chain cannot be operated, remove it, clean it with a solvent and re-lubricate before starting up again.

Be sure the chain is clean before installing it. Although, most chain is lubricated before delivery, subsequent handling may dictate cleaning and re-lubrication. Run the chain drive, without a load, for a short time to get the joint components "run in" and working together smoothly.

A prime contributor to chain life is adequate lubrication. Lubricant performs several functions on chain drives. Its main purpose is to prevent metal-to-metal contact and thus reduce friction. In addition, it softens impact between joint parts and between chain and sprocket. It also carries heat and foreign matter away from the joint parts. To do its job, the lubricant must reach the joint parts via spaces between the sidebars. If it doesn't, accelerated wear of the joint parts leads to shortened chain life.

Several methods can be used to apply lubricant to chains. Normally, chain drives require continuous, automatic lubrication. Manual or semi-automatic methods are suited to drives in the lower load and speed ranges. Manual methods include application by brush, oil can, or a pressurized grease gun. Alemite fittings give direct access to internal bearing surfaces, so that abrasive particles are flushed out. Automatic lubrication includes splash, oil disc, and forced spray.

Relationship between shafts and sprockets should be as precise as possible to insure proper contact between chain and sprockets and even load distribution. All chain has a balanced design with components meant to share the load equally. Proper alignment will insure that they do.

Proper chain tension is also an important point. If the drive chain is too loose, it can cause surging, vibration, or shock loading. If a drive chain is too tight, additional work loads are imposed on chain, shafts, and bearings.

For most horizontal and inclined drives, the chain should be installed with a sag of about two percent of the sprocket centers. Chain should be almost taut, for drives on vertical centers, and those subject to unusual shock loads, rotation reversals, or dynamic braking.

Chain tighteners help maintain optimum tension on drive chains when shafts cannot be adjusted. They eliminate the wiping action sometimes found in drives

with long centers. The tightener should be located near the drive sprocket on the inside or outside of the slack span of chain. To preserve the press fit in many chain types, links should be coupled and uncoupled as little as possible.

Four typical take-ups are available. They include the screw type for manual adjustments, spring type for shock loads, gravity type for continuous compensation for chain wear, and catenary type for automatic tensioning on long conveyors.

When ordering links for chain, always specify the name of the chain manufacturer as stamped on chain or parts of chain.

## *N. BRAKE MAINTENANCE*

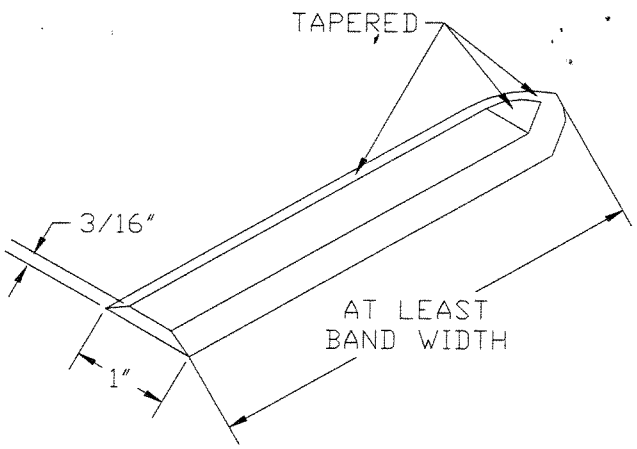
The following information does not tell the specific adjustment needed for a particular brake, but rather general information which applies to all brakes.

### 1. REPLACING LININGS

The linings should be examined periodically for wear and be replaced before they become thin enough to permit the rivets to score the brake drum. All brake linings should be ordered from Continental Machine Co., Inc. to insure proper type and grade for satisfactory operation. After replacing the lining and during reinstallation of bands, care should be taken in centering the band assembly on the brake surface. Many brakes have washers to be positioned on both sides of the band end on the band pin.

### 2. "OUT-OF-ROUND" BANDS

After replacing the band, it must be checked for "out-or-round", and if necessary, carefully hammered (to prevent band failure) back to shape to secure good contact at all points. Always set the brake before hammering on the band. On bands with block linings, hammer between the blocks, not on top of them. When a band has a low spot, use a "Spoon" (shown below) and use the following procedure:



a) Tap the spoon between the drum and the unset brake or clutch lining.

b) Set the brake.

c) Remove spoon, and if necessary, carefully hammer down the high spot.

### 3. CLEANING LININGS

If a brake fails to operate properly, it should be checked for adjustment and for the presence of grease or foreign material on the lining. Clean the linings by the following procedure:

a) Remove the bands.

b) Scrape grease and foreign material off.

c) Thoroughly clean the linings with acetone or M.E.K. (Methy-Ethyl-Ketone)

d) Clean the surface that the lining comes in contact with (brake or clutch ring) with acetone or M.E.K. (Do not use carbon-tetra chloride because of possible personal physical damage).

e) Apply 3M "Safety Walk" (Type B, 4" (10.16 cm) wide, self adhesive sandpaper to a cold drum and "feather" (bring in contact lightly) the brake or clutch to remove glaze.

f) Remove the 3M "Safety Walk" and thoroughly clean with acetone, M.E.K., or clean air.

### 4. LUBRICATING PINS AND SETSCREWS

All pivot pins should be lubricated and free from bind. On brakes the pins should be removed and coated with a thin layer of grease. If time does not permit this, carefully lubricate pins with a few drops of oil. CAUTION: Do not over oil pins because the oil will spread and get on the linings. If a brake squeaks when first applied, a thin layer of grease on the end of the setscrew may correct this.

### 5. REVERSING LININGS

Some bands are made with both ends alike, so that they may be reversed to secure additional service life.

***IMPORTANT:*** *Before reversing any lining, the rivets must be replaced. On blocked linings, the rivets should be replaced 1/2 block at a time to prevent any change in the orientation of the worn blocks. Whether reversal is any more economical than lining replacement, is dependent on the operational circumstance.*

## *O. TROUBLE SHOOTING GUIDE FOR CLUTCHES*

The drum clutches are air-actuated, spring-released, and controlled by a hand operated clutch valve.

1. If the drum clutches do not engage when the clutch handle is pulled back:

   a) Check the manifold air pressure. (See the operating instructions for the correct air pressure.)

   b) Check the clutch control line for pressure. (No air pressure indicates a faulty clutch valve.)

   c) Check for air pressure at the relay valve delivery port. (No air pressure indicates a faulty clutch valve.)

   d) Check for air pressure at the clutch air chamber. (No air leaking indicates a faulty quick-release valve.)

   e) Check the air chamber travel. The chamber plunger may be striking the bottom of the air chamber.

   f) Check the air chamber for a ruptured diaphragm.

2. If the drum clutches are slow to engage or slip excessively:

   a) Check the manifold air pressure and the control air reservoir pressure. (See the operating instructions for the correct air pressure.)

   b) Check the clutch valve output pressure. The output pressure should be within 5 PSI of the lever stand pressure. (Low air pressure indicates a faulty clutch valve.)

c) Check the relay valve output (delivery) pressure. (Low air pressure indicates a low relay supply pressure or a faulty relay valve.)

d) Check the relay supply pressure.

## *P. TROUBLE SHOOTING GUIDE FOR BRAKES*

The drum parking (or safety) brake is spring-actuated, air-released, and controlled by a hand operated parking brake valve. The service brake is air-actuated, spring-released, and controlled by hand operated graduated service brake valve.

1. If the brakes do not release enough to pay-out the cable:

a) Check the manifold air pressure. (See the operating instructions for the correct air pressure.)

b) Check the parking brake to make sure it is released.

c) Check for air pressure at the outlet port of the parking brake valve. (No air pressure indicates a faulty parking brake valve.)

d) Check for air pressure at parking brake chamber. (No air indicates faulty piping.)

e) Check the service brake valve and make sure the handle is fully released.

f) Check for air pressure at the service valve outlet. (Air pressure indicates a faulty valve.)

g) Check the air pressure at the brake relay valve control port. (This valve is mounted on the hoist bed.) (Air pressure indicates a piping problem.)

h) Check for air pressure at the brake air chamber. (Air pressure indicates a faulty relay valve.)

i) Check the brake crank travel.

2. If the service brake does not hold the load:

a) Check the manifold air pressure. (See the operating instructions for the correct air pressure.)

b) Check the air pressure at the brake valve outlet when the valve handle pedal is fully engaged. (Low air pressure indicates a faulty valve.)

c) Check the air pressure at the brake chamber when the brake valve is fully engaged. (Low air pressure indicates a faulty relay valve or piping trouble.)

d) Check the brake spring rod motion for signs of binding and the brake shaft for signs of binding.

e) Check the brake lining and surface and make sure they are clean and dry.

3. If the parking brake (set position) does not hold the load:

a) Check for air pressure at the outlet port of the parking brake valve. (Air pressure indicates a faulty parking brake valve).

b) Check the air pressure at the parking brake chamber. (Air pressure indicates piping trouble.)

c) Check the spring parking chamber for travel.

d) Check the brake lining and surface and make sure they are clean and dry.

4. SERVICE SUGGESTIONS

To clean the drum brake surface, attach an abrasive cloth sheet with adhesive back (3M "Safety Walk" Type B Medium) to the brake band lining near the band live end. Apply the brake and rotate the drum several revolutions. Remove the abrasive sheet from the brake lining and blow the rust and debris from the brake. Use cleaning fluid to remove oil or grease. Clean thoroughly.

To remove high spots from the new brake lining or oil and glaze from a used lining, attach an abrasive cloth sheet with an adhesive back (3M "Safety Walk" Type B Medium) to the brake drum surface. A piece of abrasive sheet 4" X 5 1/2" (10.16 cm C 13.97 cm) is sufficient. Lightly apply the brake and slip the brake three or four revolutions of the drum. Remove the abrasive sheet from the brake drum and blow the dirt and lining debris from the band. Clean thoroughly.

5. PROBLEM: BRAKE "GRABS"

*Cause and Remedy:*

a) The brake crank arm is in the wrong position causing the band live end to contact the brake drum too soon. (See brake adjustment instructions.)

b) Brake drum is rusted or contaminated. (See service suggestions.)

6. PROBLEM: "ALL ON OR ALL OFF"

*Cause and Remedy:*

a) The brake crank arm is in the wrong position causing the band live end to contact the brake drum too soon. (See brake adjustment instructions.)

b) The brake release spring is not compressed far enough allowing the brake band to remain in contact with the brake drum when brake air pressure (Service, not parking air pressure) is reduced or removed. Shorten the release spring.

c) A Quick release valve is in the service chamber air line. A quick release valve traps small amounts of air in the service chamber and has a small pressure difference between inlet and outlet that is detrimental to fine brake control. Do not use quick release valves. For long control lines, use relay air valves on the hoist bed close to the service air chamber with a bleed screw in the outlet line. The service air line should be 3/8" (.95 cm) inside diameter or larger.

d) No bleed screw is in outlet of lever stand brake valve. The bleed screw reduces brake valve hysteresis to improve fine control of outlet pressure.

e) The cranks and clevises or the band ends are not turning free. Check the pins when the brake is released.

7. PROBLEM: "DOES NOT HOLD THE LOAD"

*Cause and Remedy:*

a) The brake overheated. Overheating causes loss of brake friction or fading. Fading may occur very fast when slowing or stopping heavy loads or fading may gradually appear when braking light loads over several minutes on a repetitive cycle. (See brake overheating.)

b) The brake lining is glazed. See the service suggestions on removing lining glaze.

c) The brake drum surface is contaminated. See the service suggestions on cleaning the brake drum surface.

d) The air service chamber or spring chamber is bottoming out due to improper linkage adjustment. (See brake adjustment instructions.)

8. PROBLEM: BRAKE "OVERHEATS"

*Cause and Remedy:*

a) Use power lowering to lower heavy loads.

b) Lower heavy loads at slow speeds being careful to keep brake heating down to avoid fading.

c) Reduce the lowering speed of light loads.

d) Increase the cycle time for repetitive cycles to allow the brake to cool down.

e) Use fan cooling of brakes where high ambient temperatures prevail or where cooling air flow available to the brake is insufficient.

f) There is insufficient clearance between the brake drum and the brake band when the brake is released. Sufficient clearance is allowed for brake drum expansion at normal operating temperatures. If operating temperatures are above normal and brake fading is not imminent, increase clearance slightly. Insufficient clearance may cause the brake to drag when hoisting further increasing brake temperature.

g) Excessive deflection of the drum shaft assembly due to heavy loads may decrease clearance to allow brake to drag when hoisting. Check brake clearance with drum dog engaged to hold the load and the brake released.

h) Air is not fully exhausted from the service air chamber causing the brake to drag when hoisting. A quick release valve in the service brake air line or a faulty lever stand air valve may be at fault. Remove the quick release valve or replace the air valve.

i) Low console stand air pressure may not release the parking spring chamber completely, allowing the brake to drag during hoisting.

## *Q. TROUBLE SHOOTING GUIDE FOR DRUM DOGS*

The drum dog is air set and spring released. The dog is controlled by a two-way valve on the lever stand.

1. If the dog does not go in (into the notch on the drum flange), when the dog air valve handle is moved to the "IN" position:

   a) Check the air pressure in the dog control line. (No air pressure indicates a faulty dog valve.)

   b) Check the dog air cylinder and the dog linkage for binding or interference. (The dog can be moved by hand to check for binding or interference.)

   c) Check the alignment of the dog and the drum.

2. If the dog does not disengage with the drum when the dog air valve handle is in the "OUT" position, make sure the drum is rotated slightly away from the dog to allow the dog to drop away and:

   a) Check for air pressure in the dog control line. (Air pressure indicates a faulty dog air valve.)

   b) Check the dog air chamber and dog linkage for binding or interference.

## *R. WIRE ROPE HANDLING AND CARE*

When removing wire rope from a reel or coil, it is imperative that the reel or coil be rotated as the rope unwinds. If the rope is to be removed from a reel, the reel may be mounted on a horizontal or vertical axle and the rope then peeled off, or the end of the rope may be held and the reel rolled along the ground. If the rope is to be removed from a coil, there is only one correct method of uncoiling. The end of the rope must be held and the coil rolled on the ground like a hoop. Attempts to unwind rope from a stationary coil or reel will invariably result in a kinked rope, and once a kink is formed, the rope at the point is ruined beyond repair. Kinks start as loops and are caused by pulling the loop. Never pull out a loop, always unfold it.

Wire rope should be handled in such a way that it is neither twisted or untwisted.

### 1. CUTTING BACK & REVERSING

To increase rope life, a short length may be cut from either the drum end or running ropes. This practice changes the position of the rope and subjects a different section of the rope to maximum wear and fatigue conditions. In order to take advantage of this method of obtaining increased service life, it is often advisable to use a length of rope slightly longer than normally required.

The life of running ropes may also be increased by changing the rope end for end.

Maximum wear and fatigue occurs usually on one end of the rope, and reversing the rope permits both ends to be subjected to maximum operating conditions.

2. ROPE MEASUREMENT

Care must be exercised in measuring wire rope to be sure that proper sizes are used. Incorrect measurement may result in the use of a rope too large for the grooves of the running sheaves.

The diameter of a wire rope is the diameter of a circle which will just enclose all of the strands. It is, therefore, the maximum possible measurement across opposite strands.

3. SAFETY

To insure safety, all wire ropes should be frequently examined, and new ropes should be installed before the old ones have reached the danger point. High grade ropes of the correct size and quality as originally furnished with the hoist must be used.

4. SHEAVES AND DRUMS

Sheave grooves and drum barrels should be inspected regularly, and especially at the time ropes are replaced. If the drum barrels have become badly scored, they should be dressed smooth, since the rough barrel will cause rapid wear of the rope. If the old rope has left a sharp imprint on the drum barrel, a new rope will not accurately fit the oil imprint and the sharp impressions will seriously damage the new rope.

During service, the sheave grooves wear down and become corrugated. Since the old rope diameter was smaller than normal because of its stretched condition, the groove worn by it will be narrower than that required by a new normal size rope. The tight groove will result in pinching and rapid rope wear. Worn grooves should be turned smooth and to the correct size, or the sheaves should be replaced.

5. LUBRICATION

All ropes must be regularly lubricated to reduce wear and corrosion. The lubricant used should be free from acids and alkalies; should have sufficient adhesive strength to stay on the rope; should be able to penetrate between the wires and strands; should have a high film strength; and should resist oxidation.

Used rope should be thoroughly cleaned before lubrication, by means of brushes or scrapers, compressed air, or steam. The lubricant may be brushed onto the rope with a stiff brush; applied by passing the rope through saturated waste or through a trough or box of lubricant; or by dripping onto the running rope. If this latter method is used, the lubricant should be applied at a point where the rope opens slightly from bending. The object is to apply a uniform coating to the entire length of the rope.

## *S. STORAGE OF HOIST*

A suitable enclosure should be provided over the hoist and controls to protect the equipment from the weather.

A monthly inspection of all mechanical and electrical equipment and a short operation is recommended as the best way to keep the equipment in serviceable condition. This operation will work lubricant into the bearings and redistribute the oil on the gears, sprockets an chain to prevent rusting. The following items should be performed. Any defective parts should be corrected or replaced as soon as noticed. (Check items 1-6 before beginning operation.)

1. Thoroughly lubricate all grease points, oil all pins and linkages.

2. Drain moisture from chain and gear cases. (Replacing the drain plugs with drain cocks will facilitate draining the cases.) Fill chain and gear cases with lubricant to proper level.

3. Check the following items on hoists with electric motor and controls.

   a) Lubricate motor and check motor condition. See manufacturer's motor maintenance and lubrication instructions for details.

   b) Check electric brake operation before and after operating hoist. See manufacturer's brake instructions for check points.

   c) Inspect control panels before operating hoist. Visibly check for evidence of moisture and corrosion. De-moisturizing and protective sprays are commercially available.

   d) Inspect all moving control devices for condition of contact tips, freedom of linkages and armatures, loose connections, etc. See manufacturer's maintenance instructions for details.

4. Hoists with diesel or gasoline engines have the following items to perform.

   a) Check engine lubricating oil level, coolant level, and prime engine fuel system. See engine manufacturer's operating and maintenance manual for instructions.

   b) Check torque converter or transmission oil level. See manufacturer's operating and maintenance manual for instructions.

   c) Check operation of power train controls. See manufacturer's instructions for details.

5. Check operation of brake foot valves, clutch hand valves and parking brake valves.

6. Check operation and adjustment of each drum clutch and brake. Check for leaks in air lines and air chambers. (If clutch and brake surfaces need cleaning for operation, see Item 8.)

7. After operation open all air drains and leave open. Cover openings and protect exposed surfaces to prevent damage from moisture.

8. Brake and clutch surfaces can be cleaned with abrasive sheets that have adhesive backs (such as 3M "Safety Walk"). Attach the sheet to the lining lightly apply the brake (or clutch) and slip the brake or clutch three or four revolutions. Remove and repeat the above procedure to remove lining glaze and roughen band lining. Remove the adhesive sheet and check clearances before beginning operation.

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