Attachment 5

DELTA

MAINTENANCE
VEHICLE ARREST SYSTEM

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MAINTENANCE
DELTA PHALANX® STYLE BARRIER SYSTEMS

Safety Precautions

At all times observe good safety practices when working on either the electrical or mechanical system. Particular attention should be paid to the danger of working on the Barrier when the power is on. Barriers are powerful hydraulic presses that can easily crush anything in their way. Keep hands free of the mechanism when the power is on or the HPU is up to pressure. Turn off the electric power and bleed the hydraulic pressure down to zero before working on any part of the system. Traffic should be controlled around the Barrier during any work so that vehicular accidents do not occur if the Barrier should happen to rise. After work is complete, do not allow traffic over the Barrier until all control and safety functions have been verified to be properly working.

Barrier Disassembly, Service and Assembly

The Barrier assembly is designed to facilitate easy repair and maintenance. Depending on the environmental conditions, we recommend at least a one month interval of inspection to conform that no debris, sand or dirt is accumulated inside the Barrier that would interfere with its operation. This can be easily checked by removing the top plates on the ram and conducting a visual inspection. During the inspection, grease the bearing blocks if equipped with grease fittings. Remove cylinder clevis pins and lubricate. Also examine the hydraulic cylinders to confirm that the seals are tight and are not leaking.

Should disassembly be necessary:

1) Remove Barrier top plates and access box plates.

2) Remove the bearing block bolts at the rear hinge area.

3) Remove hydraulic cylinder clevis pins at the ram attachment point. Using suitable wire, tie the cylinders up so that they do not interfere with the removal of the barrier ram.

4) Using suitable rope, chain or sling through the barrier ram structural tubes, lift ram rearward and then up, being careful not to damage the paint on the ram front surface. A forklift or loader arm can be used for lifting.

5) Place ram on suitable surface.

Full access to the hydraulic lines and the cylinders is now possible. These can be inspected, repaired or replaced as required. Before reassembly, any rust or other corrosion should be removed and the area coated with sealer or rust inhibiting paint. The foundation can be vacuumed of debris and the drain can be cleared as required.

When all is well, replace parts in reverse order. Inspect and lubricate all bronze style bearings and pins. Graphite/fiberglass bearings should be inspected for any damage and replaced as necessary, lubrication of these style bearings is optional. Anti-seize compound has been used on

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the bearing block bolts at factory assembly, reapply if you remove the bolts. The proper torque value is 45 foot-lbs [60 N-M]. Check for sand and construction debris about the bearings and shafts and clean if necessary.

Hydraulic System Cleanliness

The cleanliness of the hydraulic fluid directly affects the reliability of the hydraulic system and the longevity of the components. When contaminates are present, component wear and fatigue are accelerated, performance is degraded, valves, hydraulic motors and cylinders can malfunction and the hydraulic fluid may break down.

To maintain system efficiency and reliability great care must be taken to prevent any form of dirt, sand or grit from entering the hydraulic system. Only new, clean filtered hydraulic oil should be used for charging the unit. Unless specifically ordered as filtered, new oil should be pumped through a 25 micron filter when charging. See Commercial Hydraulic Oil Interchangeability Chart in the **Mechanical Theory** section of this manual for our recommended oils. The tests conducted at the factory on the system have been done with the HPU charged with Shell 'Tellus' 46. This grade is for moderate temperatures and is available in most of the worlds leading cities. Hydraulic oil is subject to degradation and contamination with age or if subject to high temperatures (above 180°F [82°C]. The contamination can be from the following sources:

1) Particulate (dust, dirt, sand, rust, fibers, paint chips, etc.)

2) Wear metals, silicon and excessive oil additives.

3) Water.

4) Sealants (Teflon tape and pastes).

5) Sludge, oxidation and other corrosion products.

6) Acids and other chemicals.

7) Biological and microbes (for high water based fluids or other biodegradable fluids).

The hydraulic fluid should be sampled and tested periodically to ensure contamination and fluid properties are within acceptable levels. We suggest that the first test be done after one year's operation. The frequency of testing will depend upon the results of that test. Most major cities will have hydraulic fluid testing commercially available.

Filters

A filter element is furnished to filter the oil as it is being returned to the oil reservoir. The oil filter housing is only rated at 150 psig [10 bar] or less as the oil in the return line has only to overcome the pressure drop through the filter itself. If the filter should become clogged with particulates from the system, a bypass check valve inside the filter will open and allow the dirty oil to circulate back to the reservoir. For this reason, frequent inspection of the filter is required.

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A visual determination of the filter's degree of contamination should be made during filter change outs. Adjust the interval between changes if a high degree of particulates are found.

Pump Motor

Electric motors are basically dependable machines and require little maintenance. Too much attention may be worse than none. The following should be helpful in reducing maintenance.

Wherever possible, prevent:

1) Dampness and dripping water.

2) Dirt, especially dust, which may block ventilation.

3) Inaccessible position, in case maintenance is necessary.

4) Excessive heat. Surrounding air (ambient) temperatures must not exceed 104°F [40°C). Overloading a motor or operating it in an area where the temperature exceeds 104°F [40°C], may cause it to overheat. Frequent or prolonged starting periods or blocked ventilation are other causes of overheating.

The motor has front and rear ball bearings. The bearings have been given initial lubrication at the factory. Motors without regreasing capability are factory lubricated for normal bearing life. Motors having regreasing capability should be relubricated by the procedure noted below if they have been in storage for over one year and at the following service intervals:

1) Every five years based on 5000 hours per year operation.

2) Every two years based on continuous operation.

3) Every six months for continuously high ambient temperature and or dirty or moist locations.

Greasing procedure:

1) Keep grease clean. Lubricate motors at standstill. Do not mix petroleum grease and silicone grease in motor bearings.

2) Use Shell Oil Company "Dolium R", Chevron "SRI No. 2" or Texaco Inc. "Premium RB".

3) Overgreasing bearings can cause premature bearing failure. If motor is equipped with an Alemite type fitting, clean tip of fitting and apply grease gun. Use only one to two full strokes.

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Pump Replacement

The following recommendations are given should replacement of the pump be required:

1) Damage to this component is generally caused by debris contamination in the oil. Replacement of the pump is an indication that the oil must be drained and replaced with clean **filtered** oil. A check of the filter and your filter changing procedures is also in order.

2) When changing out the pump, avoid contamination. Do not remove the plastic port plugs until just prior to installing the fittings and hoses. The pump mounting flange must make full contact with the pump/motor adapter. Do not use the pump mounting bolts to force the pump pilot into the pilot hole or to align the pump. To avoid damaging the pump seals and bearings, do not hammer on the pump or shaft to install or remove the pump/motor couplings.

System Maintenance

The following maintenance procedures and schedules should be adhered to in order to assure safe, long and trouble free service from your Delta Barrier System:

REMEMBER: SAFETY FIRST !!!

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SUMMARY OF SAFETY ASPECTS REGARDING MAINTENANCE ON OR ABOUT THE BARRIERS

General

At all times observe good safety practices when working on either the electrical or mechanical system. **Particular attention should be paid to the danger of working on the Barrier when the power is on.** Barriers are powerful hydraulic presses that can easily crush anything in their way. Keep hands free of the mechanism when the power is on or the HPU is up to pressure. Turn off the electric power and bleed the hydraulic pressure down to zero before working on any part of the system. Traffic should be controlled around the Barrier during any work so that vehicular accidents do not occur if the Barrier should happen to rise. After work is complete, do not allow traffic over the Barrier until all control and safety functions have been verified to be properly working.

Maintenance Work In the Area About Barrier

1) Select Barrier UP or DOWN position as desired from the control panel.

2) Turn control panel key switch to OFF position and remove key.

3) Turn system power OFF at the disconnect on the hydraulic power unit (HPU). Padlock the disconnect with your personnel lock.

4) Proceed with maintenance. **DO NOT PERFORM ANY WORK UNDER THE BARRIER OR INSIDE THE BARRIER ACCESS AREAS!** Should work be required under the Barrier or inside the access areas, follow the procedures in the next section.

5) When all work is finished, remove padlock and turn HPU disconnect ON. Return panel key to the control panel.

Maintenance Work Under the Barrier or in the Barrier Access Areas

1) Select Barrier UP or DOWN position as desired from the control panel.

2) Turn control panel key switch to OFF position and remove key.

3) Turn system power OFF at the disconnect on the hydraulic power unit. Padlock the disconnect with your personnel lock.

4) If Barrier is in the UP position, securely block Barrier to prevent falling. Note: Lifting eyes secured in the tapped holes provided in the top plates can be used for chaining the Barrier in the UP position.

5) Bleed down the system:

   A) If system is equipped with the optional auxiliary emergency fast operate system, release the auxiliary EFO valve override pin by twisting and pulling to the out position.

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B) Release set screw (or lock nut) on the system bleed down valve. Turn (anti-clockwise) the handle on the valve slightly until hissing sound is heard. Continue to open slowly until pressure on gage reads zero.

C) For added safety, leave valve open while performing maintenance.

6) Check that the Barrier is firmly held against movement.

7) Proceed with maintenance. Minimize any exposure to working under the Barrier by using when ever possible tools with handle extensions.

8) When all work is finished, remove padlock and turn HPU disconnect ON. Close any valves opened in the bleed down procedure. Return panel key to the control panel.

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MAINTENANCE SCHEDULE

FIRST WEEK

Check operation of the Barrier at least once daily. Have the guards or operators report if Barrier fails to operate, or operates with a jerky motion. It is recommended that someone be on call who can explain the operation of the Barrier system to each new guard or operator.

Daily Check

1) Log pressure settings on sheet supplied in this section.

2) Check for leaks around all fittings. Tighten where necessary.

3) Check that hydraulic hoses (if used) are not rubbing on any hard or sharp surfaces. Especially check where hose enters conduit or where it may contact the ground.

4) Check oil level in the site glass after the pump/motor has run to full pressure and shutoff. If level appears to be falling, investigate the HPU and Barrier fittings and the hydraulic lines.

5) See appropriate Trouble Shooting section of the manual if any faults are observed.

6) Check all control functions for complete operation of all features.

7) Replace the oil filter at the end of the first week of operation.

8) At the start and end of the first week's operation, check the tightness of each of the sixteen hardened steel cap screws holding the four bearing blocks. Anti-seize compound has been used on the bolts, reapply if you remove the bolts. The proper torque value is 45 foot-lbs [60 N-M]. Check for sand and debris about the bearings and shafts and clean if necessary. Inspect and lubricate all bronze style bearings and pins. Graphite/fiberglass bearings should be inspected for any damage and replaced as necessary, lubrication of these style bearings is optional.

9) Check all top plate bolts for tightness. Note any tendencies for the top plate bolts to loosen.

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MAINTENANCE SCHEDULE

MONTHLY

Check and service the following at monthly service intervals:

Note: Block traffic during maintenance to prevent accidents.

1) Shut system off and drop system pressure to zero.

2) Replace the oil filter at first monthly maintenance. For systems that are cycled less than 100 cycles per day, replace every third month there after. If system is cycled above this rate, or the location is in a high dust environment, replace filter monthly.

3) Check the accumulator pressure while the system is at zero pressure using Delta Charging Kit 2469-31 or equal. If tool is not available, observe the value that the pressure gage jumps to when power is again turned on. (See Hydraulic Section for details.) Log value and pressure setting on Log sheet provided.

4) Confirm that the Barrier operates smoothly during the raise and lower cycle. Adjust speeds as desired.

6) Remove Barrier top plates and check for debris build up in the bottom of the foundation frame. Check for indications of oil leaks around the cylinders and Barrier header fittings. Tighten fittings and clean debris as necessary.

5) Check the tightness of each of the sixteen hardened steel cap screws holding the four bearing blocks. Anti-seize compound has been used on the bolts, reapply if you remove the bolts. The proper torque value is 45 foot-lbs [60 N-M]. Check for sand and debris about the bearings and shafts and clean if necessary. Inspect and lubricate all bronze style bearings and pins. Graphite/fiberglass bearings should be inspected for any damage and replaced as necessary, lubrication of these style bearings is optional. Reinstall top plates; check all top plate bolts for tightness. Note any tendencies for the top plate bolts to loosen.

7) Check the operation of the Barrier heaters if so equipped. They should get warm in approximately one minute after energization.

8) Check all control functions for complete operation of all features.

9) Turn off pump/motor power, bleed system pressure to zero and add clean, filtered oil to the top of the site glass.

10) Clean dust and debris from around HPU tank and hydraulic lines. Wipe up any spilled oil.

11) Turn power on and bring system back to operation.

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MAINTENANCE SCHEDULE

YEARLY

Check and service the following at yearly service intervals in addition to the monthly check:

Note: Block traffic during maintenance to prevent accidents.

1) Drain the oil from the reservoir and flush with mineral spirits or clean oil. After wiping down the tank sides and bottom to assure that no contamination remains, replace with clean filtered oil.

2) Remove Barrier top plates, check that the hydraulic cylinders are not leaking internally (see Hydraulic Trouble Shooting section for details). Replace cylinder seals or cylinder as necessary.

3) Check cylinder clevis pins for wear, replace as necessary.

4) Examine the foundation frame for debris buildup, check drain lines and sump wells for drainage. Clean debris.

5) Tighten or replace any loose top plate bolts. Drill and tap to next size or use inserts if threads are stripped.

6) Check condition of the Barrier paint surface. Prepare, prime and touch up areas where the paint has be chipped or worn away. Apply new reflective tape as necessary.

7) Check hydraulic interconnect lines for kinks, contact wear or bulging. Replace or protect hoses as required.

8) Thoroughly clean the HPU, removing dust and spilled oil. Remove any rust build up on components. Touch up paint where necessary.

9) Check the accumulator pressure while the system is at zero pressure using Delta Charging Kit 2469-31 or equal. If tool is not available, observe the value that the pressure gage jumps to when power is again turned on. (See Hydraulic Section for details.) Log value and pressure setting on Log sheet provided.

10) Test motor starter overloads by pressing the test button. Replace if necessary or press reset. Auto/Manual switch should be in the **Manual** position.

11) Check the pressure relief valve by depressing the starter armature and allowing unit to run to the relief pressure value of 2200 psig [152 bar]. Adjust as necessary.

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