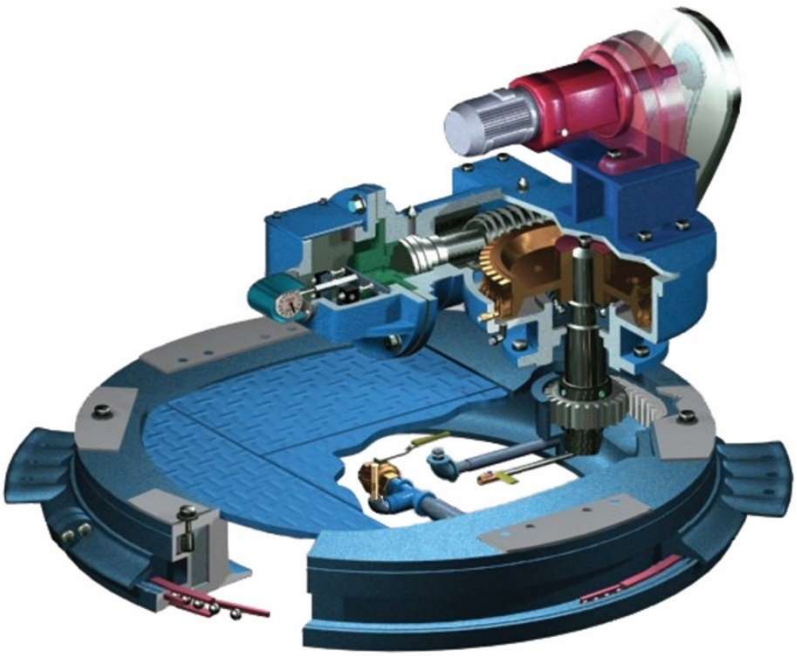
MAINTENANCE MANUAL



CIRCULAR COLLECTOR H DRIVE

MAINTENNACE MANUAL

evoqua WATER TECHNOLOGIES

Revision: Manual .081
12/22

CIRCULAR COLLECTOR, H-DRIVE

SAFETY PRECAUTIONS

The primary hazards associated with maintaining circular collectors are identified below.

POWER SOURCE LOCK-OUT

Failure to lock out all sources of power during maintenance procedures may result in serious personal injury. Following are the steps of a typical lock-out procedure that can be used by maintenance and repair crews:

1. Alert the operator and supervisor.
2. Identify all sources of residual energy.
3. Before starting work, place padlocks on the switch, lever or valve, locking it in the "off' position, installing tags at such locations to indicate maintenance in progress.
4. Insure that all power sources are off and “bleed off” hydraulic or pneumatic pressure or “bleed off” any electrical current (capacitance) as required, so machine components will not accidentally move.
5. Test operator controls.
6. After maintenance is completed, all machine safeguards that were removed should be replaced, secured and checked to be sure they are functioning properly.
7. Only after ascertaining that the machine is ready to perform safely should padlocks be removed and the machine cleared for operation.

(From Concepts and Techniques of Machine Safeguarding, 1980; U.S. Dept. of Labor OSHA).

TORQUE OVERLOAD CONTROL BOX

Electrical circuits may be energized in the torque overload control box even though the main power is off. Always check for live contacts before making adjustments within the box.

CHAIN GUARDS

Guards cover several points on circular collectors to prevent personal injury from moving parts. If guards must be removed during maintenance procedures, use caution when operating equipment and replace guards when maintenance has been completed.

OPERATING ENVIRONMENT

Circular collectors are usually exposed to the elements. The bridge and other access points may become slippery when wet or icy. Handrails and other safeguards must be in place when working on the equipment. Use care when access is necessary. **Do not work outside of the bridge handrails.** Wipe up grease and oil spills.

The access area for drive maintenance is below the bridge deck level. The difference in level will depend on the bridge design. A falling hazard exists. Use caution when in or near the access area.

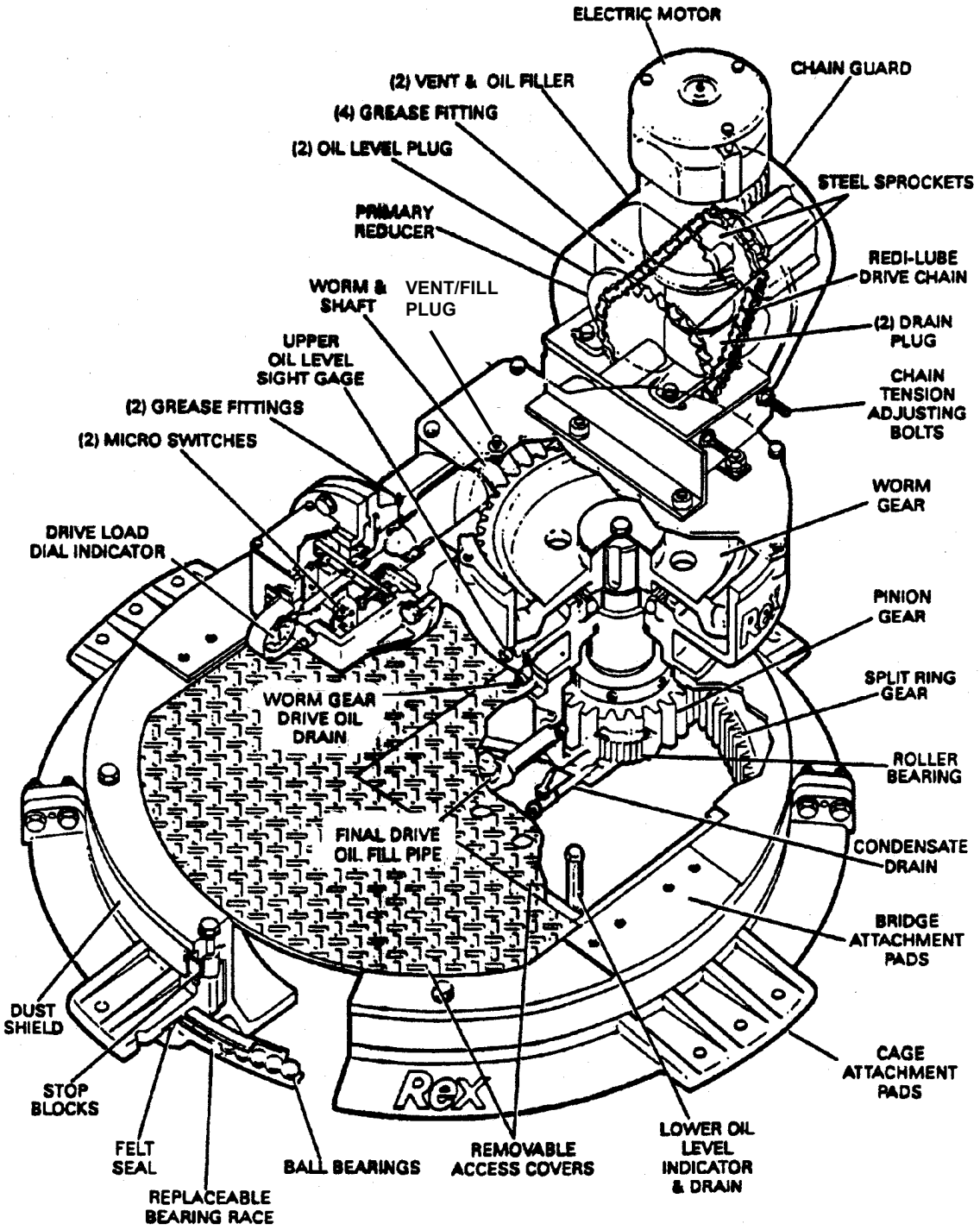
VENTILATION

Noxious fumes can be generated by septic sewage. Provide forced ventilation and exhaust facilities when workmen are in a drained tank.

FIRE

Torch cutting, welding and the use of solvents present fire hazards. Use care in these operations and provide fire control equipment in the working area.

NOTE: If field painting or touch-up is required, refer to "Drive Unit Protection for Blast Cleaning" in the INSTALLATION section.



H-DRIVE
Figure 12

GENERAL PRECAUTIONS

To obtain maximum equipment life, it is necessary to perform the preventive maintenance services outlined in this section. Maintenance recommendations are a guide for average operating conditions. Conditions which impose greater wear, loads or strain on the equipment may dictate increased maintenance. If needed, develop a revised schedule for site specific requirements. Refer to the manufacturers' bulletins for equipment not manufactured by **Evoqua.** These instructions take precedence over those in this manual should any discrepancy be noted.

The maintenance instructions incorporated throughout this manual are to be used by qualified service personnel only. Do not attempt to adjust or repair any components without thorough knowledge of this equipment. Read this manual completely. Practice preventive maintenance.

RECOMMENDED LITHIUM BASED GREASE

Any major brand of Lithium based grease No. 2 is recommended unless other lubricants are defined for specific applications in the INSTALLATION or MAINTENANCE sections of this manual.

For vendor supplied components (i.e. reducer, motor, etc.), see VENDOR INFORMATION section of this manual for suggested lubricant type and frequency.

LUBRICATION SUMMARY

Recommended lubricants for **Evoqua** upper housing (worm gear section of main drive) and lower housing (final section of main drive):

SUMMER: 40°F. (4°C.) or higher - Mobil Co. Mobil SHC-630* or equal
WINTER: 40°F. (4°C.) or lower - Mobil Co. Mobil SHC-629** or equal

Recommended lubricants for the primary reducer are in their bulletin in the VENDOR INFORMATION section of this manual.

Evoqua Drive Size	Approximate Oil Capacity Upper Housing (Worm Gear)	Approximate Oil Capacity Lower Housing (Final Drive)
H30 LT & HT	3-1/2 Qts. (3.3 Ltr.)	5 Qts. (4.7 Ltr.)
H30A LT & HT	3-1/2 Qts. (3.3 Ltr.)	6 Qts. (5.6 Ltr.)
H40 LT & HT	5 Qts. (4.7 Ltr.)	4 Qts. (3.7 Ltr.)
H40A LT & HT	5 Qts. (4.7 Ltr.)	8-1/2 Qts. (8 Ltr.)
H40 HD	10-1/2 Qts. (9.9 Ltr.)	4 Qts. (3.7 Ltr.)
H60 LT & HT	6 Qts. (5.6 Ltr.)	5 Qts. (4.7 Ltr.)
H60A LT & HT	6 Qts. (5.6 Ltr.)	16 Qts. (15.1 Ltr.)
H60A HD	12 Qts. (11.3 Ltr.)	16 Qts. (15.1 Ltr.)
H80 LT & HT	6 Qts. (5.6 Ltr.)	10 Qts. (9.4 Ltr.)
H80A LT & HT	6 Qts. (5.6 Ltr.)	16 Qts. (15.1 Ltr.)
H90 LT & HT	13 Qts. (12.3 Ltr.)	19 Qts. (17.9 Ltr.)
HD90 (2 Upper Housings and 1 Lower Housing)	13 Qts. (12.3 Ltr.) (each) Upper Housing	19 Qts. (17.9 Ltr.)
H90A LT & HT	13 Qts. (12.3 Ltr.)	24 Qts. (22.7 Ltr.)
HD90A (2 Upper Housings and 1 Lower Housing)	13 Qts. (12.3 Ltr.) (each) Upper Housing	24 Qts. (22.7 Ltr.)

NOTE: Due to the viscosity of the oil, it can take several hours for a true reading to occur at the sight gauge. Overfilling of oil will result in oil leaking into the collector.

*Viscosity 1045/1165 SUS @ 100°F. (38°C.) ISO Viscosity Grade 220
**Viscosity: 710/790 SUS @ 100°F. (38°C.) ISO Viscosity Grade 150

ROUTINE MAINTENANCE

ITEM	DESCRIPTION	INTERVAL
SURFACE SKIMMER	Check for smooth action on scum beach and re-entry into tank. Check for binding against scum baffle. During winter months, when icicng becomes prevalent, place skimmer in lock-out positon.	D
	Hose off the skimmer assembly and inspect. Tighten all loose connections, adjust for proper skimmer assembly blade submergence (3"(76mm) below maximum water surface or as indicated on the General Arrangement Drawings.). The spring loaded hinged guide should just contact the inner wall of the scum beach.	SA
	Replace any lost or worn parts such as neoprene wiper, polywear block or springs, if necessary	SA
WORM GEAR SUBASSEMBLY	Check oil level at sight gauge located on side of worm gear housing.	W*
	If low, check for leaking shaft seals at worm shaft near sprockets or remove torque overload housing cover and inspect inside for oil Replace seals as required. Add oil to proper level.**	
	If high, check for evidence of condenstae (water) in oil. Drain small amount of oil from housing and inspect. If clear water is present, drain until oil is draining. Refill to sight gauge wih proper grade of oil.** Check for damaged gasket, air vent, loose or missing cover bolts.	

*Or after severe weather or wash-down procedures.

**Due to the viscosity of the oil, it can take several hours for a true reading to occur at the sight gauge. Overfilling of oil will result in oil leaking into the collector.

D - Daily W - Weekly M - Monthly SA - Semi-Annually

ITEM	DESCRIPTION	INTERVAL
WORM GEAR SUB-ASSSEMBY (Continued)	Inspect and clean, if necessary, worm gear housing air vent.	M
	Grease worm gear bearing with a Lithium based #2 grease. Two fittings are located over worm gear on top of housing.Clean fittings, add approximately two pumps from grease gun to each fitting.	M
	Check condition of oil for condensate or other contaminants by draining a small amount and visual inspection. If clear water is present, drain until oil becomes present and refill oil to proper level.** Check for damaged gasket, air vent, loose or missing cover bolts. If oil is milky in color, drain, flush and refill with fresh oil.** Check for damaged gasket, air vent, loose or missing cover bolts. If metal contaminants are present, remove chain guard, chain, primary gear reducer and worm gear housing cover and inspect for damaged or worn parts. Flush, per procedure at end of this section, and clean housing, replace parts as necessay, reassemble. Add oil to proper level.**	M

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ITEM	DESCRIPTION	INTERVAL
WORM GEAR SUBASSEMBLY (Continued)	Seasonal change of oil	SA
	In preparation for changing the oil, drain out approximately 5% (1quart) and replace with Mobil Oil Corp. Mobil System Cleaner. Run the drive unit at minimum load condition (reduce sludge blanket) for approximately 48 hours. Shut off drive unit and rain. Replace with oil with proper viscosity for anticipated seasonal conditions. Summer: Mobil SHC-630 Winter: Mobil SHC-629 Drain by removing plug in street elbow located in underside of worm gear housing. Air vent/filler plug is located in cover plate.	
TORQUE OVERLOAD SWITCHES	Remove cover and inspect inside of housing for signs of condensate or oil. Inspect switches for signs of corrosion. Trip microswitch by placing screw driver in gap to verify alarm/shut-off systems are functional. Review warnings listed on next page.	SA

**Due to the viscosity of the oil, it can take several hours for a true reading to occur at the sight gauge. Overfilling of oil will result in oil leaking into the collector.

ITEM	DESCRIPTION	INTERVAL
TORQUE OVERLOAD SWITCHES (Continued)	DO NOT ADJUST GAPS WITHOUT CONSULTING FACTORY. Gap settings can only be verified after residual load against spring plate has been neutralized. This can be accomplished by draining the tank and removing any impediments or if draining is not possible, then by removing motor and rotating the input shaft of the primary reducer, releasing tension on drive chain. Continue to rotate input shaft until final gear starts to move opposite of normal rotation. Stop. Further rotation of input shaft will cause damage. Gap settings are indicated on the inside of the torque overload housing cover or on the General Arrangement Specification Drawing. **WARNING**: DO NOT OPERATE DRIVE IN THE REVERSE ROTATION. Torque overload switches are NOT operative during reverse rotation. Severe damage can occur to mechanism's structure and drive unit. Use reversing switch, if furnished, only for momentary jog to dislodge the rake arm from hang-up or to unload the drive unit.	
DRIVE CHAIN SPROCKETS	Check for loose bolts, setscrews or keys. If necessary, retorque to the correct torque value. Check teeth for wear. Replace when tooth wear presents an observable hooked profile.	M
DRIVE CHAIN	Check chain for excessive slack. Shift primary gear reducer or remove link when required. Check sprocket alignment by placing a straight edge across the machined surfaces of the sprockets. Check chain for wear.	M

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ITEM	DESCRIPTION	INTERVAL
SHEAR PIN SPROCKET	Grease fitting located on hub of shear pin sprocket. Check safety collar. Check for loose setscrews or loose key. Check teeth for wear. Replace when tooth wear presents an observable hooked profile.	M
	Remove chain and shear pin. Rotate hub to expose shear faces. Clean faces and swab with Lithium based #2 grease. Reassemble pin and chain. **CAUTION**: When reinstalling shear pin, necked down portion must be aligned in the shear plane.	SA
FINAL DRIVE ASSEMBLY	Check oil level at sight gauge located under floor plate cover. Final gear/oil condensate drain is the 1-1/2" (38 mm) ball valve located below sight gauge. Pinion oil/condensate drain is the 3/8" (10 mm) ball valve located at the pinion bearing hub. **NOTE**: Condensate can accumulate at all drain points, therefore, both final gear and pinion drains must be checked. If low, check for leaks in oil or condensate drain piping and final drive housing. Add oil to proper level.** If high, check for evidence of condensate (water) in oil. Drain small amount of oil through the oil and condensate drain valves and inspect. If clear water is present, drain until oil is draining. Refill to sight gauge with proper grade of oil.** Check for loose or damaged dust shield.	D*

*Or after severe weather or wash-down procedures.

**Due to the viscosity of the oil, it can take several hours for a true reading to occur at the sight gauge. Overfilling of oil will result in oil leaking into the collector.

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ITEM	DESCRIPTION	INTERVAL
FINAL DRIVE ASSEMBLY (Continued)	Check condition of oil for condensate or other contaminants by draining a small amount from both oil and condensate drains and visual inspection. If clear water is present, drain until oil becomes present and refill oil to proper level.** Check for damaged dust shield. If oil is milky in color, drain, flush and refill ** with fresh oil.Check for damaged dust shield. Some metal contaminants (fine particles,visual with the eye) are expected in the first six to twelve months of service due to initial groove formation of bearing races. If contaminates are high in concentration or if large metallic chips are present, take clarifier out of service. After locking out drive starter, inspect stop blocks by pulling back edge of neoprene drive dust seal.If bottoms of stop blocks show signs of contact with the top portion of the main gear or if a stop block is missing, **CALL FACTORY.**	M*
	Seasonal change of oil.	SA

*Or after severe weather or wash-down procedures.

**Due to the viscosity of the oil, it can take several hours for a true reading to occur at the sight gauge. Overfilling of oil will result in oil leaking into the collector.

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ITEM	DESCRIPTION	INTERVAL
FINAL DRIVE ASSEMBLY (Continued)	In preparation for changing the oil, drain out approximately 5% (1 quart) and replace with Mobil Oil Corp. Mobil System Cleaner. Run the drive unit at minimum load condition (reduce sludge blanket) for approximately 48 hours. Shut off drive unit and. drain. Replace with oil with proper viscosity for anticipated seasonal conditions.** Summer: Mobil SHC-630 Winter: Mobil SHC-629 Drain by opening 1-1/2" (38 mm) ball valve located under floor plate cover. Also, drain each condensate line. Filler plug is located in elbowed pipe located in pinion hub.	
	Check bearing race wear. Every third annual clarifier shut-down, lock out drive starter, inspect final drive stop blocks by pulling back edge of neoprene drive dustseal.. Please refer to "H-Drive Bearing Check Points" page at the end of this section.	Three Years
MOTOR	Refer to manufacturer's bulletins in VENDOR INFORMATION section.	M
PRIMARY REDUCER	Refer to manufacturer's bulletins in VENDOR INFORMATION section.	M

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ITEM	DESCRIPTION	INTERVAL
BRIDGE COMPONENTS	Check for and tighten any loose fasteners per the Fastener Installation Instructions. Special attention should be given to locating loose handrail and/or grating/floor plate connections. **NOTE**: Inspect and verify bridge base plate expansion connection is free to allow movement for the thermal expansion/contraction of the bridge structure.	M
SCUM TROUGH, SCUM BAFFLES, WEIRS	Before tank drain-down, inspect weirs for consistent water depth. Inspect one full rotation of skimmer assembly, checking if any binding occurs. At tank drain-down, hose off all components. Make any necessary adjustments. Replace and tighten any missing or loose bolts. Any mastic sealer or grouting that has cracked or come loose should be replaced.	SA
SCRAPER ARMS	When tank is drained for semi-annual inspection, remove all slime or sludge with a high pressure hose. Examine all bolted connections for loose or missing bolts or shims. Tighten and replace as necessary Inspect plow blades and squeegees. Replace any that are missing, badly bent or worn.	SA

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ITEM	DESCRIPTION	INTERVAL
OIL FLUSHING PROCEDURE FOR **EVOQUA** INTERMEDIATE AND FINAL HOUSINGS ONLY	Reduce loading on clarifier mechanism by lowering sludge blanket as a minimum. It is preferred to drain and clean tank. Stop and lock out drive motor. Drain existing oil. Refill with a mixture of 50% Mobil Oil Corp. Mobil System Cleaner and 50% of any gear lube oil. Run unit for 4 hours. Stop and drain. Refill with proper viscosity oil for anticipated weather.** For other gear reducers, see manufacturer's bulletins in VENDOR INFORMATION section.	As Required

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TROUBLESHOOTING GUIDE

PROBLEM	POSSIBLE CAUSE	CORRECTIVE ACTION
DRIVE OVERHEATING	Oil level too low.	Fill to correct level.
	Oil level too high.	Check for condensation or water present in oil reservoirs.
	Low oil level in high speed gear case.	Fill to proper level.
BROKEN SHEAR PINS OR ALARM BEING SET OFF	Solids build-up in tank	Drain tank and clean.
	Large debris in tank	Drain tank and remove.
	Grout on tank floor raised.	Drain tank, repair floor and regrout.
	Damaged/missing stop blocks.	Refer to H-Drive Bearing check poin sheet.
	Scraper making contact with tank floor.	Drain tank and adjust properly. Check for proper retaion of scraper for correct clearance.
	Bridge being locked down.	Loosen and check expansion slots for movement.
SKIMMER NOT SKIMMING PROPERLY	Blade not adjusted correctly	Adjust blade so it makes full contact with beach.
	Build-up of material on beach.	Clean and remove fibrous material.

H-DRIVE BEARING CHECK POINTS

DRIVE	BALL DIAMETER	STOP BLOCK GAP	MAXIMUM STOP BLOCK GAP	GEAR / HOUSING CLEARANCE
H30, H30A	1.00” 25.4 mm	0.07” 1.778 mm	.225” 5.715 mm	0.25” 6.35 mm
H40, H40A, H40HD	1.00” 25.4 mm	0.07” 1.778 mm	.225” 5.715 mm	0.25” 6.35 mm
H60, H60A, H60HD, H60AHD	1.25” 31.74 mm	0.093” 2.362 mm	.225” 5.715 mm	0.25” 6.35 mm
H80, H80A, H90, H90A, HD90, HD90A	1.50” 38.1 mm	0.093” 2.362 mm	.225” 5.715 mm	0.25” 6.35 mm

Notes:

1. When stop block gap approaches 0.200" (5.08 mm), replacement of strip liners is suggested
2. If stop block gap reaches the maximum allowable gap indicated, drive rebuild is recommended.
3. If top of main gear and under side of stop blocks are scored or worn, a detailed inspection of the drive mechanism by an **Evoqua** Field Technician is recommended.
4. If a stop block is missing, STOP the drive immediately, and contact sales representative or **Evoqua** Field Service Manager.