



B-SERIES ELECTRIC SKE TECHNICAL MANUALS

Operations, Maintenance, Schematics, Parts, Safety



OPERATIONS/ MAINTENANCE

- Introduction
- Warranty
- Safety
- Operation
- Main Controls
- Priming
- Pumping
- Clean-up
- Maintenance
- Check-List

SCHEMATICS/ PARTS LISTS

- Pumping Train Group
- Power Train Group
- Main Hydraulic Pump
- Tanks
- Hydraulic Manifolds
- Accumulator
- Electrical Group
- PLC Controls
- Frame Installation
- Available Options

SAFETY MANUAL AMERICAN CONCRETE PUMPING ASSOCIATION



- Introduction
- General Safety Rules
- Appendix



OPERATION and MAINTENANCE

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INTRODUCTION

This manual introduces the warranty policy, safe operation, safe maintenance, parts, and other aspects of the concrete pump.

Reading and understanding this operation manual will help maximize performance and reliability, and help minimize dangers, improper operation, and repair costs. Contact REED Customer Service for additional replacement manuals.

All safety guidelines, product descriptions, illustrations, and specifications found throughout this manual were in effect at the time the manual was released for printing. It should be noted; REED RESERVES THE RIGHT TO MAKE CHANGES IN DESIGN OR TO MAKE ADDITIONS TO OR IMPROVEMENTS IN THE PRODUCT WITHOUT IMPOSING ANY OBLIGATIONS UPON ITSELF TO INSTALL THEM ON PRODUCTS PREVIOUSLY MANUFACTURED.

Everyone involved with the operation, maintenance, inspection, and repair of the concrete pump MUST READ and UNDERSTANDS this manual and the accompanying Safety Manual.



WARRANTY

REED warrants each new A, B, and C Series Concrete Pump to be free of defects in material and workmanship under normal use and service for a period as follows:

A Series Pumps

- 1 year or 1200 pumping hours whichever occurs first

B and C Series Pumps

- "Hitch to Hopper" for 1 year or 1200 pumping hours, whichever occurs first
- All Structural Parts for 3 years

The warranty is issued **ONLY** to the **INITIAL USER**. The warranty period begins when the product is delivered to the initial user or when first put into service, whichever occurs first. Said warranty is void if the machine is subject to misuse, neglect, accident, and/or abuse.

REED's obligation under this warranty is limited to correcting without charge, at its factory, any parts or parts thereof which shall be returned to its factory, transportation prepaid and upon **REED's** examination proves to have been originally defective. Correction of such defects by repair or replacement shall constitute fulfillment of all obligations to the initial user. This warranty does not include labor or transportation charges unless specifically identified and authorized in writing by **REED**. Nor does the warranty apply to any unit upon which repairs or unauthorized alterations have been made.

This warranty does not apply to normal maintenance service or to normal replacement of certain machine parts which are subject to normal wear (such as concrete cylinders and wear components, valve mechanisms, delivery systems, hopper grate, etc.) **REED** makes no warranty in respect to trade accessories or outside vendor components, such being subject to the warranties of their respective manufacturers.

THIS IS A LIMITED WARRANTY AND IS IN LIEU OF ANY OTHER WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING ANY WARRANTY OF MERCHANTABILITY OF FITNESS FOR A PARTICULAR PURPOSE. In no event shall **REED** be made liable for incidental, general or consequential damage, loss or any expense directly or indirectly related and resulting from use or lack of use caused by delay in delivery, parts failure, or any other causes associated with the product use. No person, firm or corporation is authorized to assume for **REED** any other liability in connection with the sale of **REED** products.

Effective April 2010



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WARRANTY CLAIM FORM

Claim Number:	Date:
Distributor Account Number:	End User Account Number:
Distributor:	End User:
Address:	Address:
City: State: Zip:	City: State: Zip:
Phone ()	Phone ()
Pump Model: _____ Pump Serial Number: _____	In Service Date: _____ Hours of Operation: _____ Failure Date: _____ Repair Date: _____

Do not send part(s) until requested by **REED** or until claim is approved. All parts requested to be returned must have a Return Authorization Number provided by **REED** and shipping freight prepaid. Parts must ship within 30 days from **REED** request.

Return Authorization Number:

Ship Date:

Part Number	Description	Qty	Unit Price	Total Price	Replacement Part Invoice No.

Failure Description and Cause: _____

REED Comments: _____

Claim Value Approved:\$_____ Claim Value Denied:\$_____

REED Print Name, Sign, and Date: _____

Dealer Print Name, Sign, and Date: _____



SAFETY

Everyone involved with the operation, maintenance, inspection, and repair of the concrete pump **MUST READ** and **UNDERSTANDS** this manual and the accompanying Safety Manual.

SAFETY ALERT SYMBOLS AND SIGNAL WORDS

The following safety alert symbols, signals, and explanations are intended to warn the operator of hazardous and potentially hazardous situations.

The triangle with the exclamation point inside is used to alert the operator to an important safety point, and is called a safety alert symbol. One of the following signal words will appear after the safety alert symbol:



If the safety alert symbol is followed by the signal word **DANGER**, the safety alert symbol indicates a hazardous situation which, if not avoided, **WILL** lead to death or serious injury.

If the safety alert symbol is followed by the signal word **WARNING**, the safety alert symbol indicates a potentially hazardous situation which, if not avoided, **COULD** result in death or serious injury.

If the safety alert symbol is followed by the signal word **CAUTION**, the safety alert symbol indicates a potentially hazardous situation which, if not avoided, **COULD** result in minor to moderate injury.

The signal word **CAUTION**, but without safety alert symbol means the safety symbol alert addresses a hazard which, if not avoided, **COULD** cause damage to equipment or property.



LOCKOUT / TAGOUT

The Lockout/Tagout procedure applies to all **REED** concrete placing equipment. Before performing any maintenance and/or repair on equipment;

1. Unit must be OFF and the ignition key must be removed from the control panel or dash.
2. Key must be securely stored in toolbox or with operator performing maintenance.
3. Signage must be posted to indicate machine is currently under Lockout/Tagout.

The following symbol is a reminder to Lock Out and Tag Out equipment before working on equipment.



GENERAL SAFETY GUIDELINES



Use Only Qualified, Experienced, and Trained Personnel
Wearing Protective Equipment At All Times



For Safe Use, Maintenance, Inspection, and Repair,
Only Operate, Maintain, Inspect, and Repair
In Accordance With This Operation Manual and the Safety Manual



Performance and Safety Features Must Never Be Altered, Disconnected, or Removed



Contact **REED** Technical Support and Service When Assistance Is Required



SAFETY DECALS

Decals and placement of decals are standardized by the Concrete Pump Manufacturers Association (CPMA) for your protection. They are placed at appropriate areas on the concrete pump to be constant warnings of dangers. Know and adhere to the information they provide. Contact **REED** Customer Service for complimentary replacements of safety decals, shipping charges may apply.

DECALS PLACED NEAR CONTROL BOX AREA



WARNING
Do not operate at pressures exceeding the rating of the entire material delivery system.

ADVERTENCIA
No operar a presiones que excedan la presión nominal de todo el material de la línea de entrega.

WARNING
Do not use the boom as a crane or hoist.

ADVERTENCIA
No usar la pluma como grúa o aparato de levante.

WARNING
Stay off hopper apron.

ADVERTENCIA
Manténgase siempre en la rejilla que cubre la tolva.

SAFETY MANUAL

⚠ WARNING

Do not operate this machine without training. Understand the warnings in safety manuals and on decals.

⚠ ADVERTENCIA

No use esta maquinaria sin estar capacitado. Entienda las advertencias de los manuales de seguridad y de las calcomanías.

Do not paint over this label/No pintar encima de ésta etiqueta

800925

IMPORTANT	IMPORTANTE
<p>You can order additional operation manuals, spare parts books, safety manuals and decal sets by contacting us at:</p> <p>REED Manufacturing 1-(888)-779-7333 7:00 AM to 5:00 PM Pacific Time Monday through Friday</p>	<p>Usted puede solicitar manuales de operacion, catalogos de refacciones, manuales de seguridad y juegos de calcomanias adicionales contactando a:</p> <p>REED Manufacturing 1-(888)-779-7333 DE 7:00 AM a 5:00 PM Hora Pacifico LUNES A VIERNES</p>

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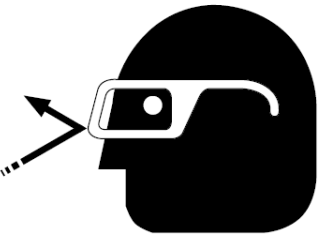
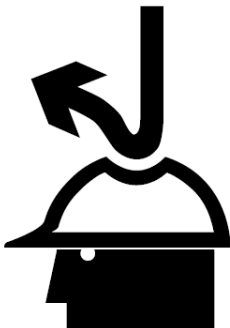


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⚠ WARNING			SAFETY INSTRUCTIONS
			<ol style="list-style-type: none">1. Relieve system pressure before opening any system or coupling.2. Regularly inspect system condition and wall thickness.3. Wear reduces system burst pressure.4. Use recommended clean out procedures - consult manufacturer.5. Use retaining pins in delivery system snap couplings.
<ul style="list-style-type: none">• Stay clear of pressurized concrete placing system.• Wear eye protection.• Do not operate at pressures exceeding the rating of any piece of the material delivery system.			INSTRUCCIONES DE SEGURIDAD
⚠ ADVERTENCIA <ul style="list-style-type: none">• Permanezca alejado del sistema de distribución de concreto presurizado.• Use protección para los ojos.• No opere a presiones mayores que las de la capacidad de cualquier pieza del sistema de descarga.			<ol style="list-style-type: none">1. Alivie la presión del sistema ante de abrir un sistema o un acoplamiento.2. Inspeccione periódicamente el estado del sistema y el espesor de las paredes.3. El desgaste reduce la presión de rotura por estallido.4. Use los procedimientos de limpieza recomendados, consulte con el fabricante.5. Use los pasadores de retención en los acoplamientos de fijación a presión.

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ADVERTENCIA ⚠ WARNING		
		
<small>Do not paint over this label/No pintar encima de ésta etiqueta</small>		

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INSTRUCCIONES DE SEGURIDAD				SAFETY INSTRUCTIONS		
 <div>Recommended hand signals Señales de mano recomendadas</div>						
 <p>1. START PUMP SPEED UP</p>	 <p>2. SLOW PUMP DOWN</p>	 <p>3. STOP PUMP</p>	 <p>4. LITTLE BIT</p>	 <p>(2 golpecitos) (2 taps) 5. RELIEVE PRESSURE</p>	 <p>6. ADD WATER 4-GALLONS</p>	 <p>7. ALL DONE CLEAN UP</p>
1. PRENDER LA BOMBA ACELERAR	2. BAJAR VELOCIDAD A LA BOMBA	3. PARAR LA BOMBA	4. UN POCO	5. ALIVIAR LA PRESIÓN	6. AÑADIR AGUA 4-GALONES	7. TERMINADO LIMPIAR
Do not paint over this label/No pintar encima de ésta etiqueta						
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DECALS PLACED NEAR HOPPER GRATE AREA

Do not paint over this label/No pintar encima de esta etiqueta

WARNING



Keep hands out of hopper and valve assembly. See operation manual if access is required.

ADVERTENCIA

No meta las manos a la tolva o válvula. Consulte el manual de operación si necesita tener acceso.

800917

Do not paint over this label/No pintar encima de esta etiqueta

WARNING



Stay off hopper grates.

ADVERTENCIA

Manténgase alejado de la rejilla que cubren la tolva.

800918



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 WARNING	
	
Cement dust is toxic. Use lung protection when exposed.	
 ADVERTENCIA	
El polvo de cemento es tóxico. Use protección para los pulmones cuando se exponga.	

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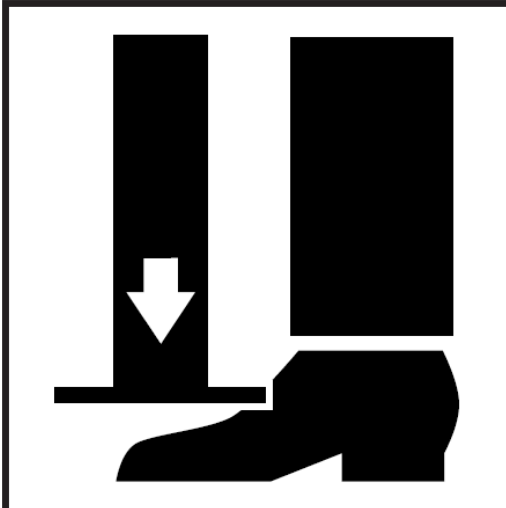


DECALS PLACED NEAR WATERBOX AREA

	 WARNING
	Keep hands out of waterbox. Stop motor if access is required. Keep guards in place.
	 ADVERTENCIA
	No meta las manos a la caja de agua. Pare el motor si necesita tener acceso. Mantenga las cubiertas cerradas.

Do not paint over this label/No pintar encima de ésta etiqueta

800916

DECALS PLACED NEAR OUTRIGGER CONTROL AREA

	 WARNING
	Clear area before activating outriggers.
	 ADVERTENCIA
	Despeje el área antes de activar los estabilizadores.

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DECALS PLACED NEAR HOPPER OUTLET AREA



WARNING

Do not operate at pressures exceeding the rating of the entire material delivery system.



ADVERTENCIA

No utilizar a presiones que excedan la presión nominal de todo el material de la línea de entrega.

Do not paint over this label/No pintar encima de ésta etiqueta

800921



WARNING

Before opening a blocked pipeline, relieve pressure by reversing pump. See manual.



ADVERTENCIA

Alivie la presión antes de destapar una tubería bloqueada, invirtiendo para ello la bomba. Vea el manual.

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DECALS PLACED ON SIDE PANEL AREA

	⚠ WARNING This machine is remote controlled and may start at any time. Stop engine before servicing unit.
	⚠ ADVERTENCIA Esta máquina funciona a control remoto y puede ponerse en marcha en cualquier momento. Apagar el motor antes de realizar el mantenimiento.

Do not paint over this label. No pintar encima de esta etiqueta. 800924

	⚠ WARNING
	Do not touch hydraulic oil leaks. Get immediate medical attention if oil penetrates skin.
	⚠ ADVERTENCIA No toque las fugas de aceite hidráulico. Obtenga atención médica inmediata si el aceite penetra en la piel.

Do not paint over this label. No pintar encima de esta etiqueta. 803225





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OPERATION

OPERATOR QUALIFICATIONS

Everyone involved with the operation, maintenance, inspection, and repair of the concrete pump MUST READ and UNDERSTANDS this operation manual and the accompanying Safety Manual.

The following are a few general warnings for operator qualifications outlined in the Safety Manual.



- Individuals who cannot read and understand this operation manual, Safety Manual, signs, warnings, notices, and operating instructions, in the language in which they are printed, must not be allowed to operate the concrete pump.
- Only qualified, experienced, and trained personnel may be allowed to operate the concrete pump.
- Operation, maintenance, inspections, and repair must only be made by qualified, experienced, and trained personnel.
- Obey all applicable local and government statutes and regulations applying to safe operation and towing of concrete pumps.

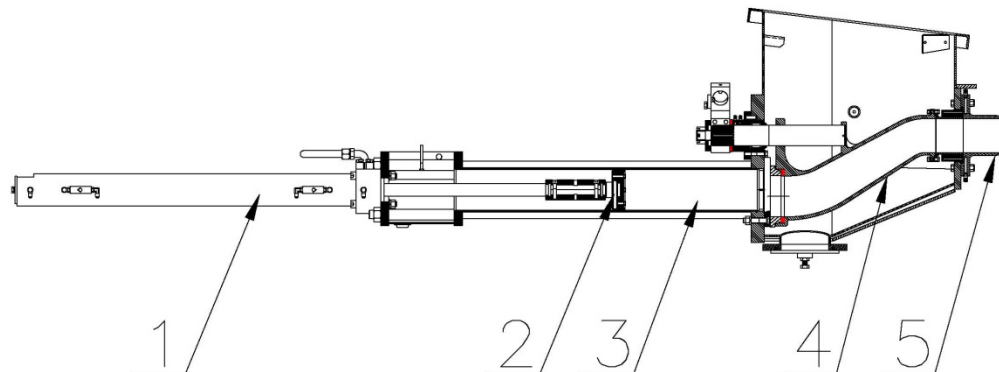


PRODUCT DESCRIPTION

The operation of the concrete pump encompasses the use of hydraulic and electrical systems. The concrete pump is designed to safely pump wet concrete through a delivery system of pipes and hoses within its published ratings and specifications.

Stability of the concrete pump during operation is provided by the outriggers and front jack. Controls for the outriggers are located on the sides of the concrete pump.

The pumping system employs an S-Tube design valve system. This system incorporates material cylinders linked to hydraulic cylinders that cycle alternately. With concrete material in the hopper and the pump operating, a material cylinder retracts, drawing material into the cylinder. At full retraction of the cylinder, a signal is sent to both the S-tube swing cylinder and the drive cylinder directional valves causing the s-tube to shift position to the fully loaded material cylinder and the drive cylinders to change direction. The concrete piston of the loaded cylinder then pushes the material through the s-tube and into the delivery lines. The shifting from one cylinder to the other cylinder takes place providing a continuous flow of material through the delivery piping system. The pump can be operated at the control panel or can be operated from the remote control.



The hydraulic oil flow created by the hydraulic pump pushes the drive cylinder pistons inside the drive cylinders (1) alternately back and forth. Because the drive cylinders and concrete pistons (2) inside the concrete cylinders (3) are linked together, the pistons move synchronously.

When a drive cylinder retracts along with the concrete piston, concrete will be sucked from the hopper into the concrete cylinder. Simultaneously, the other drive cylinder and concrete piston are extended toward the hopper. The concrete piston will push concrete from the concrete cylinders through the S-Tube (4) and out to delivery system (5).

Next, the pump switches at the end of the stroke, causing the s-tube valve to shift to the other concrete cylinder which has sucked and filled the cylinder with concrete, starting the next cycle.

Reverse pumping links the concrete piston in the suction stroke and S-Tube valve to suck concrete from the s-tube instead of the hopper. As a result, the concrete piston pumps concrete into the hopper.



The power for operation of the concrete pump is provided by the engine, which drives the hydraulic pumps.

All functions for operation of the concrete pump can be accomplished from the local controls mounted on the side of the unit. Optional hand-held cable or radio remotes enable the pump to be operated away from a remote distance.

HYDRAULIC SYSTEM DESCRIPTION

The hydraulic system of the concrete pump consists of three separate circuits and although integrated, each is designed to perform a particular function within the operation of the concrete pump. The three circuits utilized are:

- **Main Pump Circuit**
Controls operation of the hydraulic drive cylinders.
- **S-Tube Shift Circuit**
Controls operation of shifting the s-tube from one material cylinder to the other.
- **Auxiliary Circuit**
Controls the operation of the agitator and other auxiliary equipment.

For the purpose of making the operation of each circuit easier to understand, they are being described separately.

MAIN PUMP CIRCUIT

The main hydraulic pump is a variable displacement axial piston pump of swashplate design. The pistons run along the swashplate which is capable of being tilted. This tilting changes the angle of the swashplate and thus the stroke length of the pistons, which in turn varies the displacement of fluid. The larger the angle of the swashplate, the greater the flow. The angle of the swashplate is varied by the volume control that works in conjunction with the load sense feature of this pump.

The main hydraulic pump is driven directly by the engine or electric motor. When the engine is running, PUMP switch in the OFF position and the VOLUME control minimized, there is no demand placed on the pump. This is referred to as the pump being de-stroked, meaning, it is only producing a minimal amount of flow to enable the lubrication of the pump. This lubrication exists regardless of whether the engine is at idle or maximum RPM.

The main pump circuit is equipped with a manifold that is drilled and ported to accommodate the relief valve, check valve, flow control and the pilot operated directional valve. The cycle valve is a directional spool valve with electro hydraulic solenoid operation. Its purpose is to direct the flow of oil from the main hydraulic pump to one or



the other hydraulic drive cylinders.

To energize the pump circuit, use the adjustable throttle control to set the engine speed at maximum RPM. Open the VOLUME control to any range from 0 to FULL. In so doing, the load sense is alerted to the demand and places the pump on stroke. The pump will now produce the flow in proportion to the amount by which the volume control has been opened. Since the PUMP switch is OFF, the flow from the hydraulic pump is fed to the main directional valve, thru the valve, and then returns to the hydraulic tank.

To energize the cycling circuit, the PUMP switch must be ON. When this is done, an electrical signal is generated which in turn energizes the coils of the main directional pilot valve and also activates the S-Tube directional valve.

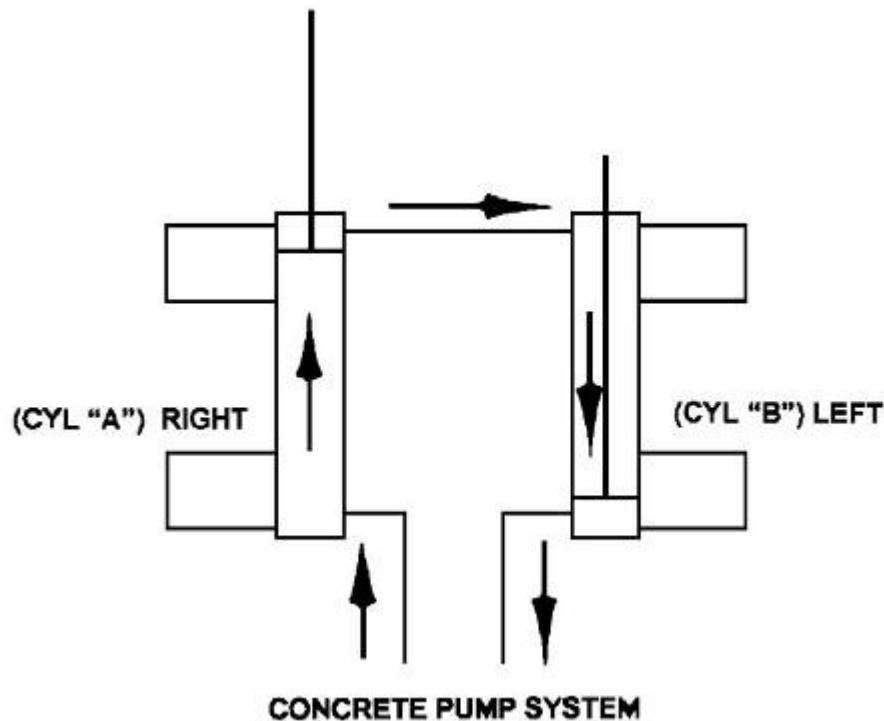
The material pumping action is the result of the two material cylinders cycling on an alternate basis. This alternating cycling is controlled by an electrical signal that is generated by the proximity sensors located in the flush box at the end of each material cylinder's suction or retraction stroke.

As the piston coupler passes under the proximity sensor, it generates an electrical input signal that is sent to the logic controller, designed to control the alternating action of the material cylinders and to synchronize the movement of the s-tube. The output signal from the logic controller is used to energize the coils of the main directional pilot valve as well as that of the s-tube directional valve.

As protection to the main pump circuit against excessive pressure, a relief valve has been installed and set. Thus when the system pressure reaches the maximum factory settings, the relief valve opens directing the oil back to the tank.

MAIN PUMP CIRCUIT OPERATIONAL SEQUENCE

It can be noted in the schematic and the diagram below that the main pressure and flow is only directed to one side of the hydraulic drive cylinder. In this instance, it is directed to the head side or piston side of the double acting drive cylinder.



The hydraulic drive cylinders are identical. Because only one cylinder is pressurized at a time, a means is required to assist in the retraction of the opposite cylinder. This is accomplished by connecting the rod sides of the cylinders together, forming a slave loop. In so doing, the hydraulic fluid that exists in the rod side of the extending cylinder (CYL "A") is transferred to the rod side of the other cylinder (CYL "B") causing it to retract simultaneously. The oil in the head side of CYL "B" is then forced out as it retracts and free flows through the directional valve back to the hydraulic tank or system.

With this arrangement of connecting the two cylinders together, it is possible for various reasons, such as leakage around the piston seals, that more oil exists on the rod side of the cylinder than is required. When this condition exists, some hydraulic oil remains at the rod end of the cylinder being extended while the other cylinder is fully retracted. As a result, the cylinder will not completely extend and thus short strokes, which will also happen to the other cylinder on the next cycle.

This condition can be corrected by actuating and holding the STROKE CHANGE switch on the electrical control box until extending cylinder is fully extended. Hydraulically, this is accomplished by use of the check valves installed on both cylinders. By holding the STROKE CHANGE switch, you have interrupted the cycle and are forcing more oil into



the head side of the extending cylinder. Since that cavity is full, pressure is built up in the rod side of the fully retracted cylinder, which unseats the head-side check valve and forces the excess oil out of the slave loop and back to the tank. Once the extending cylinder has reached its full stroke, regular operation can continue.

Short stroking can also occur from incorrect proximity sensor location or leaking check valves.

S-TUBE CIRCUIT

Since there is only one outlet for the pumping material, a means is required to transfer the material from the material cylinder to the outlet and into the delivery line. To accomplish this, an s-tube is installed in the hopper. Since there are two material cylinders and one s-tube, the s-tube must be shifted from one material cylinder to the other, whichever one is loaded with the pumping material.

The s-tube shift hydraulic circuit is of the open center type, meaning that when the control valves are in the neutral position, the internal passages of the valves are open, allowing the hydraulic fluid to return to the tank. With the engine running the hydraulic pump is operating, producing a flow of oil which, with no control energized, will pass through the shift circuit on its way back to tank.

To meet the flow and pressure requirements of the shift circuit, one section of a tandem pump is used. Note: a single pump may be used if unit is not required for auxiliary equipment. The tandem hydraulic pump is of the gear pump design with a fixed displacement, meaning it is designed to constantly produce the same displacement at a pre-set maximum, depending on engine rpm. The tandem gear pump is directly connected to and driven through the main hydraulic pump. In addition to the hydraulic pump, the s-tube shift circuit consists of a manifold, an accumulator, solenoid valve cartridges, a solenoid directional valve, and 1 or 2 hydraulic shift cylinders. The following is offered to describe the function of each in the system.

S-TUBE CIRCUIT MANIFOLD

Like the main hydraulic circuit, the shift circuit is also equipped with a manifold block. It contains an unloader cartridge, relief cartridge and solenoid valve cartridges. A solenoid operated directional valve is mounted on top of the block and an s-tube selector control valve is located on front of the block. Each of these components is designed to perform a particular function in the swing circuit as explained in the following descriptions:

- **RELIEF CARTRIDGE**

This cartridge is used to divert the pump flow from going to the accumulator once its capacity has been reached, directing it back to tank. It becomes operational when the unloader cartridge setting has been reached, acting as a dump valve.



- **UNLOADER CARTRIDGE**

This pressure sensitive cartridge is used to protect the system from excessive pressure and to limit the amount of pressure being applied to the accumulator by hydraulically signaling the relief cartridge to open once the unloader setting has been reached. The unloader will also redirect the oil back to the accumulator when it senses a drop in system pressure, when the hydraulic cylinder shifts for example.

- **SOLENOID VALVE CARTRIDGE**

There are two (2) of these cartridges used in the circuit. Both, which may be referred to as a dump valve, are designed into the circuit as SAFETY VALVES. Their purpose is to automatically relieve pressure from the shift circuit as commanded by the emergency stop circuit. At start up, the normally open cartridges are open to tank so the shift circuit can not build any pressure. When the emergency stop circuit is reset, an electrical signal is generated which energizes the solenoids, closing the cartridges and allowing the shift circuit to pressurize. When the emergency stop function is activated or the key switch turned off, the power is taken away from solenoids, causing the cartridges to open and dump shift circuit pressure back to tank.

- **SOLENOID DIRECTIONAL VALVE**

This valve is a directional control valve that is shifted by electronically activated solenoids. Its purpose is to direct the flow of oil stored in the accumulator to one or the other end of the shift cylinder based on the signal received by the logic controller that was generated by the proximity sensor.

- **SHIFT BALL VALVE**

This is a manual ball valve and is used to control the speed of the s-tube shift. With valve fully opened, the flow is unrestricted, causing a fast hard shift of the s-tube. When the valve is closed, the shift is slower as the flow must now pass through an orifice.

- **ACCUMULATOR**

The accumulator is incorporated into the shift circuit to provide instant pressure and volume for the shifting of the s-tube, which cannot be obtained under normal circumstances. An accumulator is a hydraulic reservoir that retains the hydraulic fluid under high pressure.

The accumulator contains a rubber bladder on the inside of the reservoir. The bladder is pre-charged with dry nitrogen. In the application of the shift circuit, the hydraulic fluid is pumped into the accumulator at a higher pressure than that inside the bladder. This compresses the bladder building up high pressure within the accumulator that is retained until released.



S-TUBE CIRCUIT OPERATIONAL SEQUENCE

In the operational sequence of the shift circuit with the engine at full RPM, the tandem pump is producing its rated displacement. The flow is going through the system and is being dumped or directed back to the tank thru the solenoid cartridges of the s-tube circuit manifold.

When the HORN/RESET switch is placed to RESET, an electrical signal closes the solenoid cartridges. When this occurs the hydraulic fluid is now directed to the accumulator where it starts compressing the bladder and building up pressure. When the pressure in the shift circuit reaches a setting of the unloader valve, the unloader valve activates causing the relief cartridge to open. The open relief valve now directs the oil flow from the pump back to the tank instead of continuing to pressurize the accumulator. A check valve retains the pressure in the swing circuit and prevents the fluid from going back into the pump line.

In the main pump circuit description it was described how an electrical signal was generated by the proximity sensor which was sent to the logic controller and used to control the alternating action of the hydraulic drive cylinders. This same signal is also used to shift the s-tube so that its movement is synchronized with that of the hydraulic drive cylinder, shifting the s-tube to the material cylinder which is ready to extend (normal forward operation).

The electrical signal activates the solenoid coil of the directional valve, shifting the spool to the appropriate side. The accumulator then releases, exhausting the fluid which flows through the directional valve and is directed to the appropriate side of the shift cylinder. As soon as the shift is made the accumulator is refilled immediately and the sequence starts all over again.

AUXILIARY CIRCUIT

The auxiliary circuit has been designed and installed for the purpose of operating the hydraulic function of the auxiliary equipment on the unit, primarily the agitator. This function is that of the agitator rotation for mixing the material in the hopper and feeding of the concrete cylinders.

The flow and pressure requirements for the auxiliary circuit are met by employing the second stage or section of the same tandem pump used on the s-tube shift circuit. With the engine running and throttle set to maximum RPM, the flow from the tandem pump is directed to a single spool directional control valve. This circuit also utilizes a solenoid valve cartridge or dump valve, designed as a safety valve with the purpose of preventing flow to the auxiliary circuit as commanded by the emergency stop circuit. At start up, the normally open cartridge directs the oil flow from the tandem pump to tank, prohibiting



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function of the auxiliary circuit. When the emergency stop circuit is reset, an electrical signal is generated to energize the solenoid, closing the cartridge and blocking flow directly back to tank, instead allowing the flow to the single spool directional control valve for operation. The directional control valve has relief cartridge to protect the system against excessive pressure

When the valve lever is activated the agitator will rotate in forward direction as hydraulic fluid is

directed to that side of the motor. Rotation can be reversed by moving lever in other direction.



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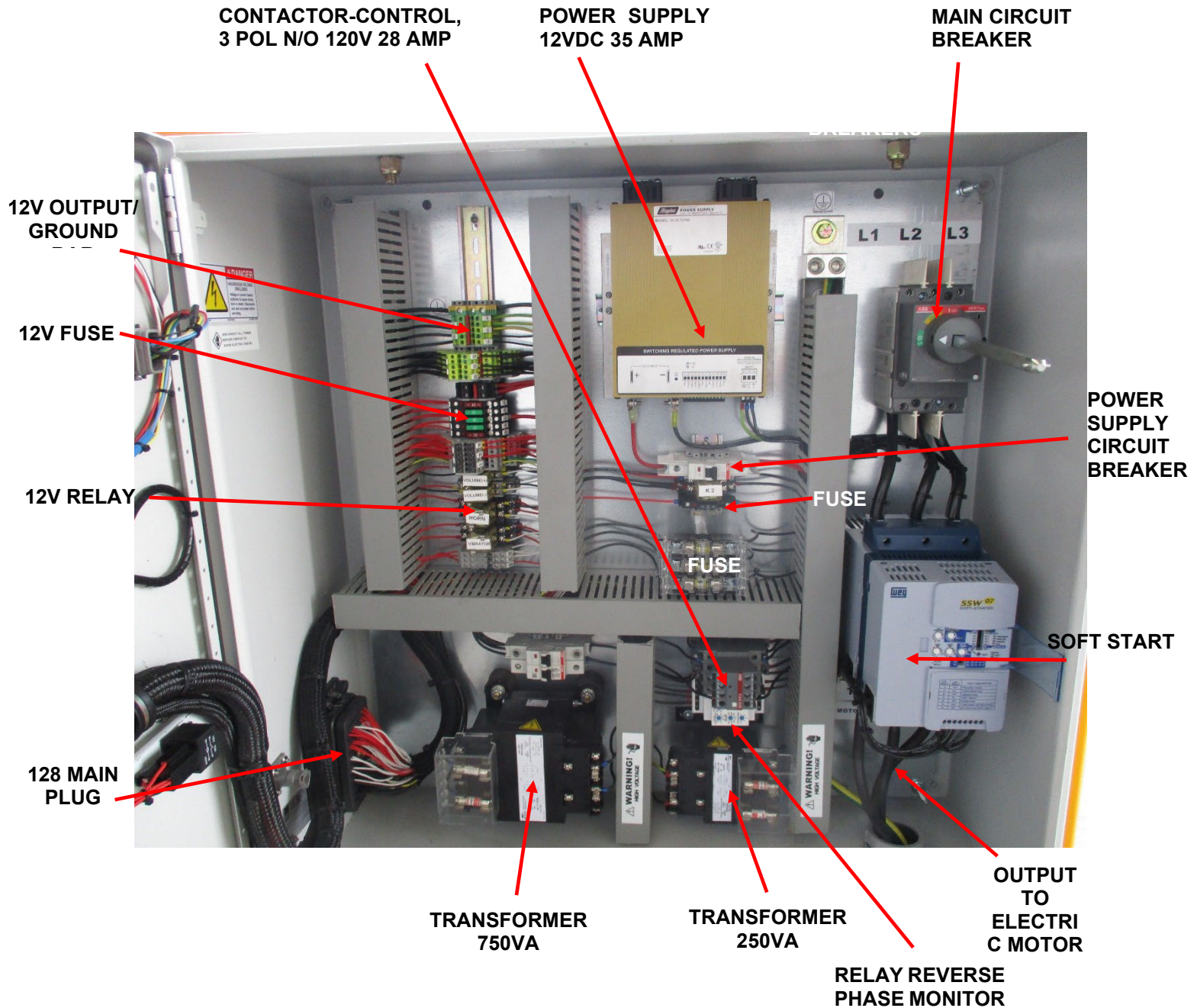
B20 SKE ELECTRIC FAMILIARIZATION





MAIN ELECTRIC CONTROL BOX FAMILIARIZATION

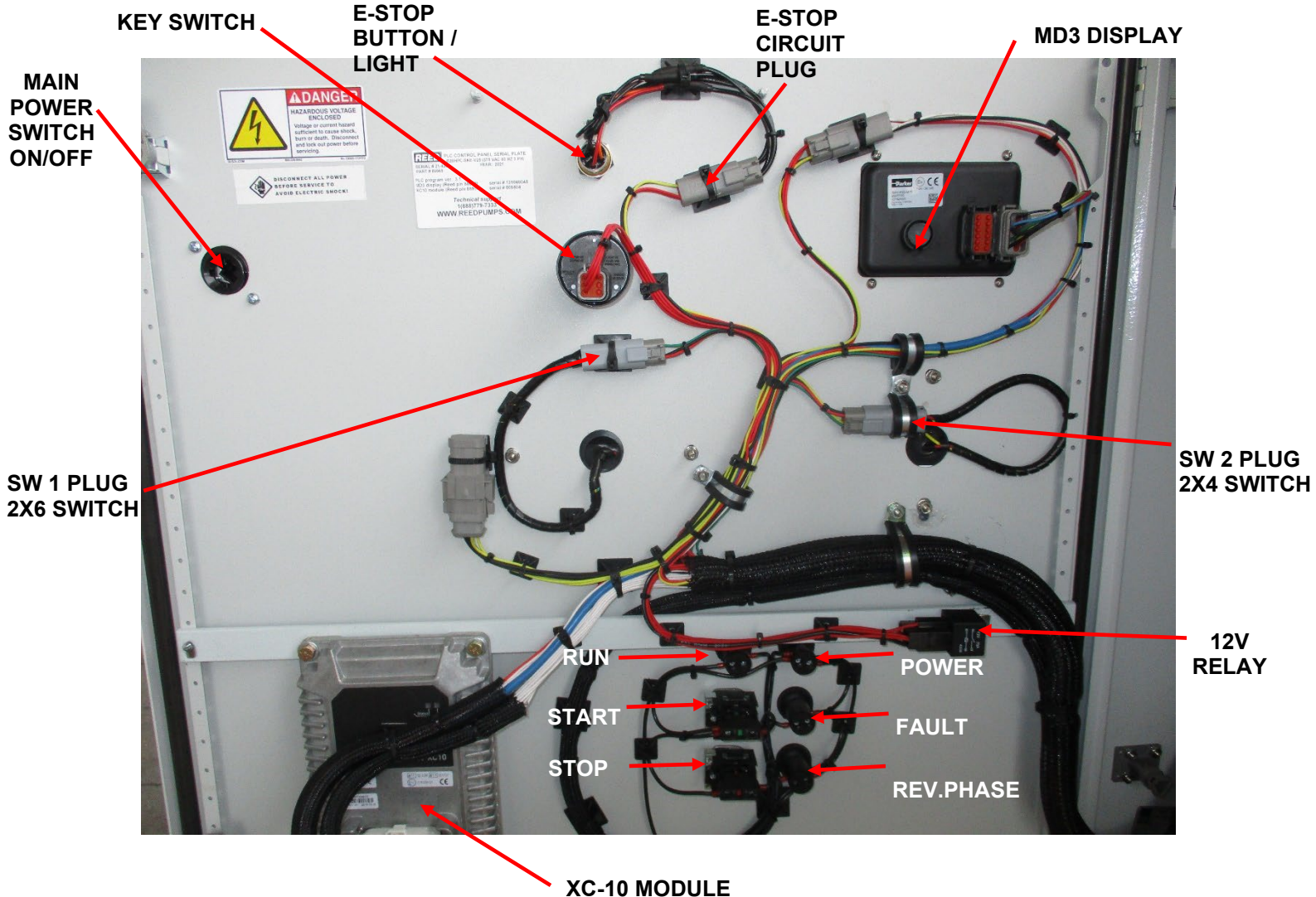
ELECTRIC PART LAYOUT





MAIN ELECTRIC CONTROL BOX FAMILIARIZATION

ELECTRIC DOOR LAYOUT





CONTROLS

PLC MAIN CONTROLS



1. MAIN ELECTRICAL PANEL CONTROL

This is two (2) position switch used to control energizing the main electrical hi-voltage system. Turn handle to the **ON** position to activate system from the external source.

2. MOTOR CONTROL SWITCH

Two (2) push button switches are provided and are used to control the 380V - 575V electric motor. To **START** push the green button, then release button. To **STOP** motor, PUSH black button until motor stops.

PLC MAIN CONTROLS





CABLE REMOTE (RADIO REMOTE OPTIONAL, CONTACT **REED** FOR INFORMATION)

1. **PUMP ON/OFF SWITCH** this is to turn the pump on and off. Press button **PUMP ON** to turn pump on, and press button **PUMP OFF** to turn pump off. It will be backlit when each function is engaged.
2. **PUMP DIRECTION SWITCHES** this is used to select and controls of the cycle direction of the concrete pump. Press button **FORWARD** to control pump forward, and press button **REVERSE** to control pump reverse functions. It will be backlit when each function is engaged.
3. **CONTROL SWITCH (LOCAL/REMOTE)** this is used to select the pump control location. Press button to **LOCAL** to enable operation of concrete pump for main stationary panel. Press button to **REMOTE** for operation using the remote control. It will be backlit when each function is engaged
4. **HORN/RESET** Press button down to activate horn/reset, it is used to reactivate the control and **PUMP CIRCUIT** after machine has been shut down using the **EMERGENCY STOP** switch or when you start the pump. Once the emergency stop has been depressed it will be necessary to press downs the **HORN** button to **RESET**. It will be backlit when engaged.
5. **STROKE-SWITCH** Press button to test stroke change. It is used for the purpose of pressure testing the main drive cylinders. Both main and swing cylinders reverse direction when button is depressed. When the main cylinders reach the end of the stroke they will "dead head" until the button is released.
6. **MAIN POWER SWITCH** this is a three (3) position key switch. Turn key to the **ON** position to power control box. Shut down power by turning key to **OFF** position.
7. **EMERGENCY STOP** This push/pull emergency switch is used to shut down the pump in an emergency situation by disabling the hydraulic systems. It does not shut the engine or motor off. Depress **PUSH** knob in to **STOP** operation. **PULL** knob out to **REACTIVATE** system. **NOTE:** the **HORN/RESET** must be switched one time to restart pump operation.
8. **MAIN DIGITAL DISPLAY** this is where all the pumping statues are displayed.
9. **INDICATOR LIGHTS**, The buttons will be backlit to indicate what function you are using

NOTE: Hopper grate safety switch engages **EMERGERGENCY STOP** when grate is lifted



PLC MAIN CONTROLS





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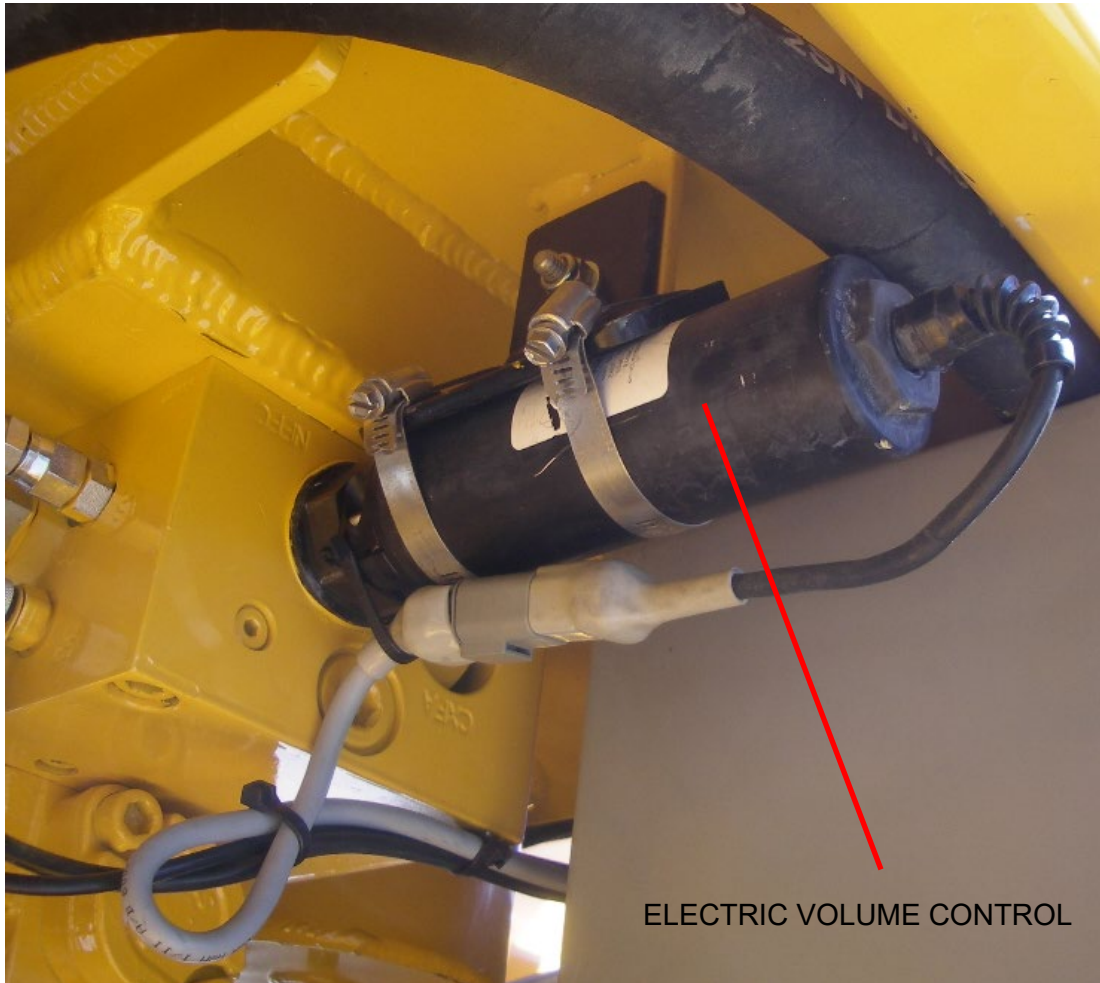
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10. RPM +/-, controls increase and decrease of engine RPM It will be backlit when each function is engaged.
11. PUMP VOLUME (OPTION), this is to turn the pump volume up or down. Press button **VOLUME UP** to increase volume, and press button **VOLUME DOWN** to reduce volume. It will be backlit when each function is engaged.
12. FAST CHANGE, (if equipped-closed loop only) controls the fast change feature for smoother operation under certain conditions
13. VIBRATOR, (if equipped-HOPPER OPTION) controls vibrator activation.
(AUTO/PUMP/ON/OFF)
14. CHEMICAL PUMP (OPTION)

THESE CONTROLS ARE USED FOR (OPTION SYNCHRONISED CHEMICAL PUMP)

- Manual mode is used when you can control the speed of the chemical pump.
- Auto mode is used when you need a specific amount of chemical to be pumped
With each stroke of the concrete pump.

ELECTRIC VOLUME (OPTION)



VOLUME CONTROL can adjust volume output of the material.
Electrically on the control panel or the cable remote To INCREASE/+ Volume
And to DECREASE/- Volume



SCREEN OPERATION INSTRUCTIONS

1). Turnkey switch on/system on, you will see REED logo on

GENERAL DESCRIPTION

This is the standard operation instructions and review of the PLC screen functions.

EMERGENCY AND ALTERNATE CONTROLS

These instructions are to be used in an Emergency situation with computer or communication failure, for back-up operation ONLY.

INITIALIZING SCREEN



2). Press "F4" to access main screen, pumping mode.

1. **Pump Key Switch Turn ON** –When power is first activated with key switch the Initializing screen will be visible to provide any possible start up issues with pump devices. Any non-typical device operation will trigger an ERROR popup providing more detailed information or providing alternate paths of operations.

READY TO START ENGINE



2. **Initializing routine complete** – When the REED Logo is present initialization is complete and engine is ready to start. Control button lights have been updated for a more consistent look and intuitive operation. If E-Stop function has Push Button pulled out and Grate sensor show grate as closed the Horn Button will flash Green showing ready to operate. If E-Stop is triggered Horn light will be Yellow. Stop buttons are always RED and control buttons are Yellow until pressed where they will turn Green showing Active.

ENGINE RUNNING PUMP READY TO OPERATE





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GRATE SENSOR



DEF TANK LEVEL

3. **Scrolling Screens** – Providing a Straightforward convenience for the operator and easier access to pump status items using the up and down arrows to scroll through the primary operational and status displays.

MAIN MENU DISPLAYS AND CONTROL



Press Menu Button for more pump options and info.

4. **Main Menu Screen** - After pressing the menu button a screen appears that provides the operator three options Adjust, Preferences, and Info



Selecting INFO provides the operator with 2 more options, See the list of Modules and status (Above) and See the system logs of operation and/or errors that have occurred during operation. (Below)



Selecting PREFERENCES provides the operator with 3 more options, Adjust the display (Above),
Setting the date and time (Useful for log entries) and selecting the language the software should display.
Currently English and Spanish are available (Below)





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Selecting ADJUST provides the operator the ability to make setting to basic pump features (Above)



EMERGENCY AND ALTERNATE CONTROLS

1. **Prox Sensor Fail / Engine Communication Loss Override** - If at any time the pump detects both prox Sensors are active at the same time it will assume there has been a failure of one or more of the sensors. When this happens, it will stop the pump from trying to stroke and provide the operator with a popup messages of the issue while providing a option to go into a OVERRIDE mode. If the Operator selects to go into the override mode, the operation of stroking the pump becomes only available in LOCAL and requires a Dead man operation of the Stroke button.





2. **PROX OVERRIDE MODE** - Select Override from the popup (above) Stroke button will be flashing to indication Override mode. (Below)

Blow Horn, Press and hold Stroke button to begin stroking. OPERATOR MUST RELEASE BUTTON WHEN PUMP BEGINS TO DEADHEAD! After release press and hold stroke button and pump will change direction and stroke until it begins to deadhead again.

PRESS HOLD STROKE BUTTON, RELEASE AT START OF DEADHEAD, PRESS AND HOLD STROKE BUTTON, REPEAT.

WARNING - THIS MODE IS ALSO AVAILABLE WHEN COMMUNICATION IS LOST TO THE ENGINE, ENGINE WILL ONLY BE AT IDLE AND USE THIS MODE FOR CLEAN OUT AND GET OUT. DO NOT OPERATE PUMP IN THIS MODE FOR ANY EXTENDED PERIOD OF TIME.



Alternate Control Mode - If at any time the pump detects a loss of communication to the 2X4 or 2X6 control button pads or with the MVEC relay box it will assume there has been a failure of one or more of these devices. When this happens, it will stop the pump from trying to stroke and provide the operator with a popup messages of the issue while providing a options to go into a ALTERNATE CONTROL or use REMOTE mode. If the Operator selects to go into the alternate control mode, the 2X4 and 2X6 control button pads will turn RED if possible and the alternate control will be available using the buttons on the main screen MD# display.



3. **ALTERNATE CONTROL MODE** - Selecting REMOTE when there is an error will allow normal remote controls. Pressing the OK Button toggles REMOTE and LOCAL.

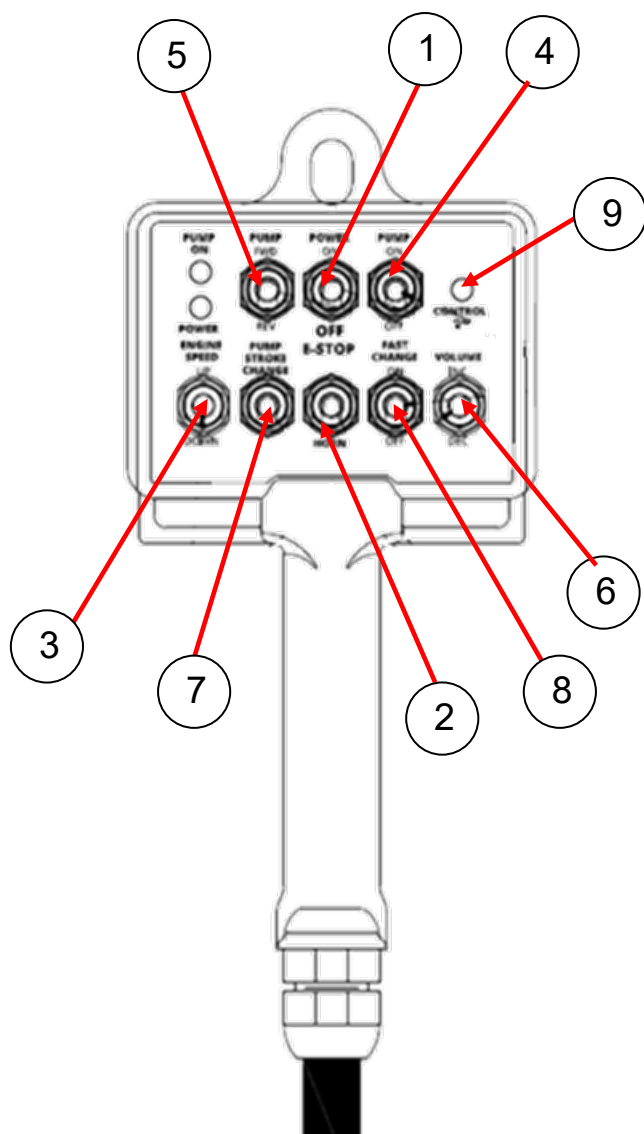
Selecting yes to go into Alternate control displays 2 screens on the main display which are navigated with the arrow buttons. Pump will operate normally using the alternate button but may not allow Horn to blow or Vibrator to operate.

It is possible to have both the need for alternate controls and override at the same time. Pump will operate as described on the override section but requires holding the alt control for stroke.



REMOTE CONTROL FAMILIARIZION

A remote control pistol grip console is provided and is used to enable the operation of the concrete pump away from the immediate vicinity of the unit. The remote is equipped with an umbilical cord that plugs into the side of the main control box. The console consists of the following functions:



1. EMERGENCY STOP SWITCH

POWER ON/EMERGENCY STOP switch stops all functions of the concrete pump in OFF position. Move the Emergency Stop switch to ON to enable system reset; Horn/Reset must be pressed to reset pump operation.

2. HORN/RESET

Activates system for operation

3. RPM +/-

Controls increase and decrease of engine RPM.

4. PUMP ON/OFF

Controls concrete pump ON/OFF function.

5. PUMP FORWARD/REVERSE

Controls pump direction.

6. VOLUME CONTROL

Electrically controls volume output of the concrete pump

7. STROKE CHANGE

Changes stroke direction and eliminates proximity sensor signal while activated.

8. FAST CHANGE

(if equipped-closed loop only) controls the fast change feature for smoother operation under certain conditions

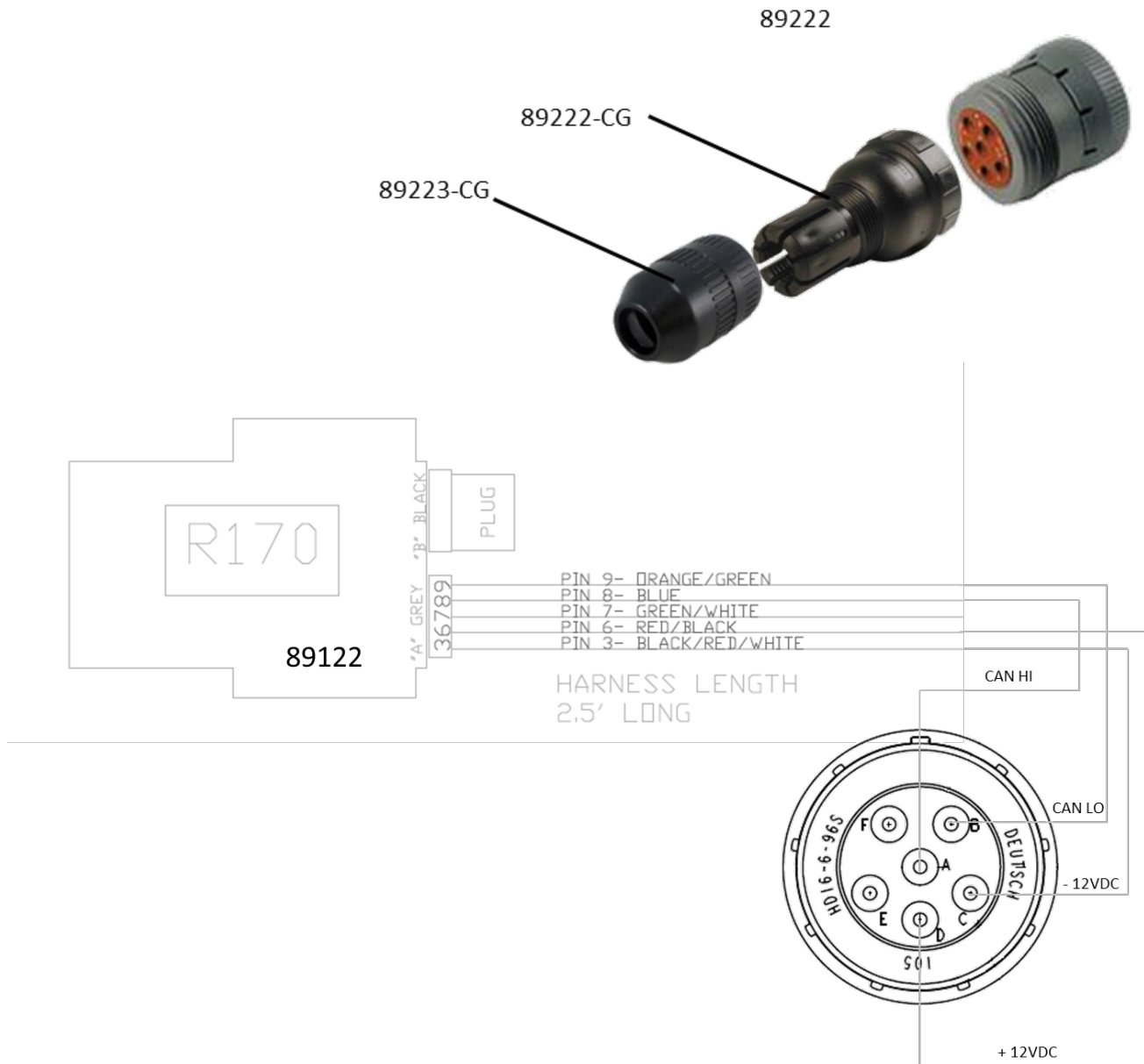
9. CONTROL

Indicates control circuit energized.





OMINEX RADIO REMOTE





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AGITATOR CONTROL controls agitator ON/OFF and FORWARD REVERSE functions.



C-SERIES (SHOWN)



GAUGES

PUMP or DRIVE CYLINDER GAUGE indicates the hydraulic pressure requirement of the pumping cylinders to push material. Gauge reading varies depending upon many circumstances such as: material slump, material line type, size and length, vertical, uphill, downhill or horizontal placement, pumping speed, etc.

S-TUBE GAUGE indicates amount of oil pressure stored in accumulator circuit. Pressure will build and stabilize at a set pressure once E-STOP is reset. Pressure will fluctuate as swing cylinder(s) shift but will always recharge to the same set pressure.

PILOT GAUGE (CLOSED LOOP ONLY) indicates volume adjustment of main hydraulic pump,
Works between a range of 90 PSI(6bar) min and 275 PSI (19 Bar max).



SET-UP

Refer to the Safety Manual for set-up safety precautions not limited to the following guidelines:



Ensure Machine Can Be Safely Operated In Set-Up Location
Away From Hazards and Dangers
Away From Slopes and Excavations



Position Machine On As Solid and Level Ground As Possible

PRIMING

Priming consists of pumping a lubricant to coat the s-tube and delivery lines to assist the initial concrete material in getting through the delivery lines and avoid blockages. Once the delivery lines are full of concrete, that material will supply the lubrication necessary for the material to flow through the delivery lines. However, it is imperative that a primer be used ahead of the initial concrete material to pre-lubricate the lines in order to avoid blockages.

A suggested grout to use for priming and lubrication may consist of 2 parts sand and 1 part cement and mixed to a consistency of a thick cream.

The amount of grout required depends on the length of the delivery line as well as the material being pumped. Operator experience will eventually indicate the amount to be required.

In addition to grout, there is a wide variety of priming products available on the market.



PUMPING

Everyone involved with the operation, maintenance, inspection, and repair of the concrete pump MUST READ and UNDERSTANDS this manual and the Safety Manual.

Refer to the Safety Manual for pumping and blockages safety precautions not limited to the following guidelines:



Perform Required Inspection, Lubrication, and Maintenance
Before, During, and After Pumping Operations



Do Not Remove Hopper Grate
Or Other Safety Components



Do Not Insert Body Parts into Hopper, S-Tube, or Waterbox
Or Other Moving Components



Turn Pump ON Only When Hopper Is Full Of Concrete



Ensure the following conditions are met before activating pump:

- PUMP Switch Is OFF
- VOLUME CONTROL Is Set To MINIMUM
- AGITATOR Control Is In OFF Position
- EMERGENCY STOPS Are Not Activated
- Controls On LOCAL Position



PUMPING Continued

1. Turn KEY operated SYSTEM POWER Switch to ON
2. Turn Key switch to start engine
3. Activate the HORN/RESET to prepare the concrete pump for operation
4. After engine warms up, increase RPM to desired engine RPM by adjusting THROTTLE CONTROL
5. Adjust VOLUME CONTROL to low output when starting pumping operations
6. Switch PUMP Switch to ON to pump concrete when hopper is full, maintain full level
7. Closely monitor the PUMP pressure gauge while pumping
8. Turn PUMP Switch to REVERSE to reverse the pumping action if necessary. REVERSE function is typically used to relieve pressure in the delivery line in the event of a blockage. A blockage will generally result in the main hydraulic system reaching maximum pressure as indicated on the PUMP PRESSURE GAUGE
9. Turn PUMP Switch OFF to stop cycling and stop pumping concrete
10. In the event of an emergency, push the EMERGENCY STOP Button IN to stop all functions of the concrete pump. Pull the EMERGENCY STOP Button OUT to enable system to reset; Horn/Reset function must be activated to reset pump operation.



CLEANING



Do Not Remove Hopper Grate
Or Other Safety Components



Do Not Insert Body Parts into Hopper, S-Tube, or Waterbox
Or Other Moving Components

1. Set VOLUME CONTROL to LOW
2. Pump as much material as possible out of the delivery system
3. Turn PUMP Switch OFF
4. Disconnect delivery system. Disconnect the line right after the reducer if a reducer is used
5. Open hopper door and empty hopper
6. Flush out hopper, S-Tube, and cylinders with water
7. Place DIRECTION Switch in REVERSE. Place no more than two feet of the water hose into the pump discharge outlet then turn the PUMP switch ON Water will drain into the material cylinders and as pump cycles, any sand and rocks will be forced out through the open clean out door.
8. Stroke the pump to make sure all sand and other material has been cleaned out, and then turn the pump off.
9. Close the hopper clean out door.
10. Place a clean out sponge into the disconnected delivery line. Reconnect the line to the hopper outlet or reducer with the sponge inserted as close to the hopper outlet as possible.
11. Fill the hopper with water. Place the DIRECTION Switch to the FORWARD position and check that VOLUME control is set at low speed. Turn PUMP Switch ON and cycle the pump until the sponge passes through the entire delivery system into a sponge catcher
12. Turn off the pump and allow the water to drain from the system
13. Clean up the remaining areas of the machine as needed
14. After clean up is complete lubricate all grease points to expel any grout before it cures



MAINTENANCE

RECOMMENDED MAINTENANCE PRACTICES

MAINTENANCE MANAGEMENT

Schedule lubrication and maintenance inspections to anticipate maintenance issues. Maintenance management requires the assignment of responsibilities to individual personnel, training of personnel, keeping of records, and the exercise of judgment.

INSPECTION AND LUBRICATION CHECKLISTS AND OPERATOR REPORTS

Utilize checklists for scheduled inspection and lubrication and maintain a written record regarding observations and actions performed. Maintain all scheduled maintenance reports by the operator listing any malfunctions and observations.

PUMP HISTORY FILE NOTING PUMP SERIAL NUMBER

File the operator reports, inspection and lubrication checklists, shop repair, work orders and tickets, parts replacement, and pump usage records. This file should also include the parts book for the specific serial number and engine.

ANNUAL REVIEW

Review the history records of each unit once every year to find evidence of repetitive failures, adjustments, problems, or excessive wear so that action can be taken to minimize breakdowns and reduce excessive maintenance costs. A review of the machine history will help in the stocking of spare parts and assemblies in advance of a possible need.



Engine Manufacturer Maintenance Schedule Must Be Followed
Read Engine Manufacturer Manual

REED has provided only general guidelines regarding engine maintenance, and will not cover engine warranty claims.

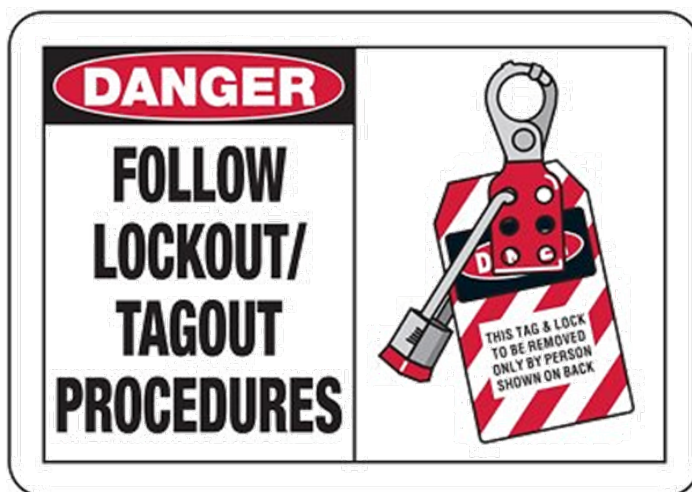
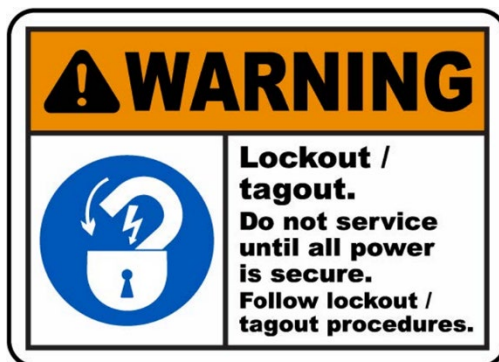


Accumulator Pressure Must Be ZERO
Before And During Any Maintenance Procedures



Engine Must Be Turned OFF and Lockout / Tagout Procedures Must Be Followed
Before And During Any Maintenance Procedures

Engine Must Be Turned OFF and Lockout / Tagout Procedures Must Be Followed
Before and During Any Maintenance Procedures





GENERAL MAINTENANCE AREAS

Perform scheduled inspections to identify and detect any potential problems. The list presented should be inspected and checked on a regular basis and is a recommended minimum.

TRAILER

- Frame integrity, visually check welds, cracks
- Torsion axle secure
- Wheels and tires, lug nuts tight, tire pressure
- Electric brakes, breakaway switch connected
- Front jack stand handle turns easily, smoothly
- Manual jacks slide freely, lock pins in place
- Lighting good condition, operational

ENGINE (refer to engine manufacturer manual)

- Inspect mounts, bolts, brackets and belts
- Oil and coolant fluids at proper level, check for leaks
- Fuel system, tank mounting, filter condition, leaks, damaged lines
- Battery hold down, condition, tightness of cables
- Key switch, indicator lights
- Throttle control functional
- Air cleaner and muffler securely mounted

PUMP CELL

- Visually check for structural damage, cracked welds
- Hydraulic drive cylinders in good condition, secure, check for leaks
- Material cylinders secure, tie rods tight
- Water box structurally sound, clean, cover in place
- S-Tube shift mechanism structurally sound, all pins and retainers in place
- Hydraulic shift cylinder(s) in good condition
- Bearing housing, seals etc. in good condition
- Hydraulic hoses secure no leaks

HOPPER ASSEMBLY

- Visually check for structural damage, cracked welds
- S-Tube secure, in good condition
- Check condition of wear plate, wear ring, seals
- Check connection of s-tube to outlet, seals, bearing
- Hopper drain is functional
- Cleaning hopper
- Zerk fittings accept grease



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MAIN CONTROLS

- Control box in good condition, sealed, not damaged
- All toggles in good condition, stay in position or momentarily return to center
- Control identification in good condition, legible
- Gauges in good condition

REMOTE CONTROLS

- Control console in good condition, not damaged
- Switch in good condition
- Cord in good condition, no cuts, securely mounted to box

HYDRAULIC SYSTEM

- Hydraulic tank securely mounted, covers tight
- Breather, filler cap and strainer in place, level sight gauge in proper condition
- Check filter condition indicators
- Hydraulic oil cooler securely mounted, connections tight
- Check accumulator condition, mounting brackets & clamps
- Hydraulic fluid to proper level and clean
- All hoses and tubing secure, check for leaks



LUBRICATION

The **REED** concrete pump is equipped with several components that require frequent lubrication. These areas involve the s-tube shifting mechanism, swing components, the shift and outlet bearings and agitator. To insure the economical service and the long life of these components, grease fittings are installed at each point.

Rapid wear and possible shutdown will result if the unit is operated with inadequate lubrication. Follow the recommendations stated herein, and if needed increase the application of lubricants above these recommendations when the equipment is subject to heavy usage.

MINIMUM LUBRICATING INTERVALS

Recommended lubrication intervals are based on normal use under normal conditions. The lubrication interval must be increased to meet more challenging uses and uses which subject the equipment to high and/or unusual concentration of forces. The lubrication interval must be increased if the pump has been exposed to environmental conditions such as low humidity, high humidity, excessive dust, high temperatures, low temperatures, heavy rainfall, long term storage, ocean air, etc...

1) every hour of operation

2) after completion of every job

All lubrication points must be greased on each and every interval as recommended.

TYPE OF LUBRICANT

- Use EP grease, extreme pressure grease available for wheel bearings, general purpose grease, Shell Alvania EP (LFH2), or equivalent if this lubricant is unavailable in your area
- Do NOT use Moly grease, grease with Moly additives

LUBRICATION POINTS

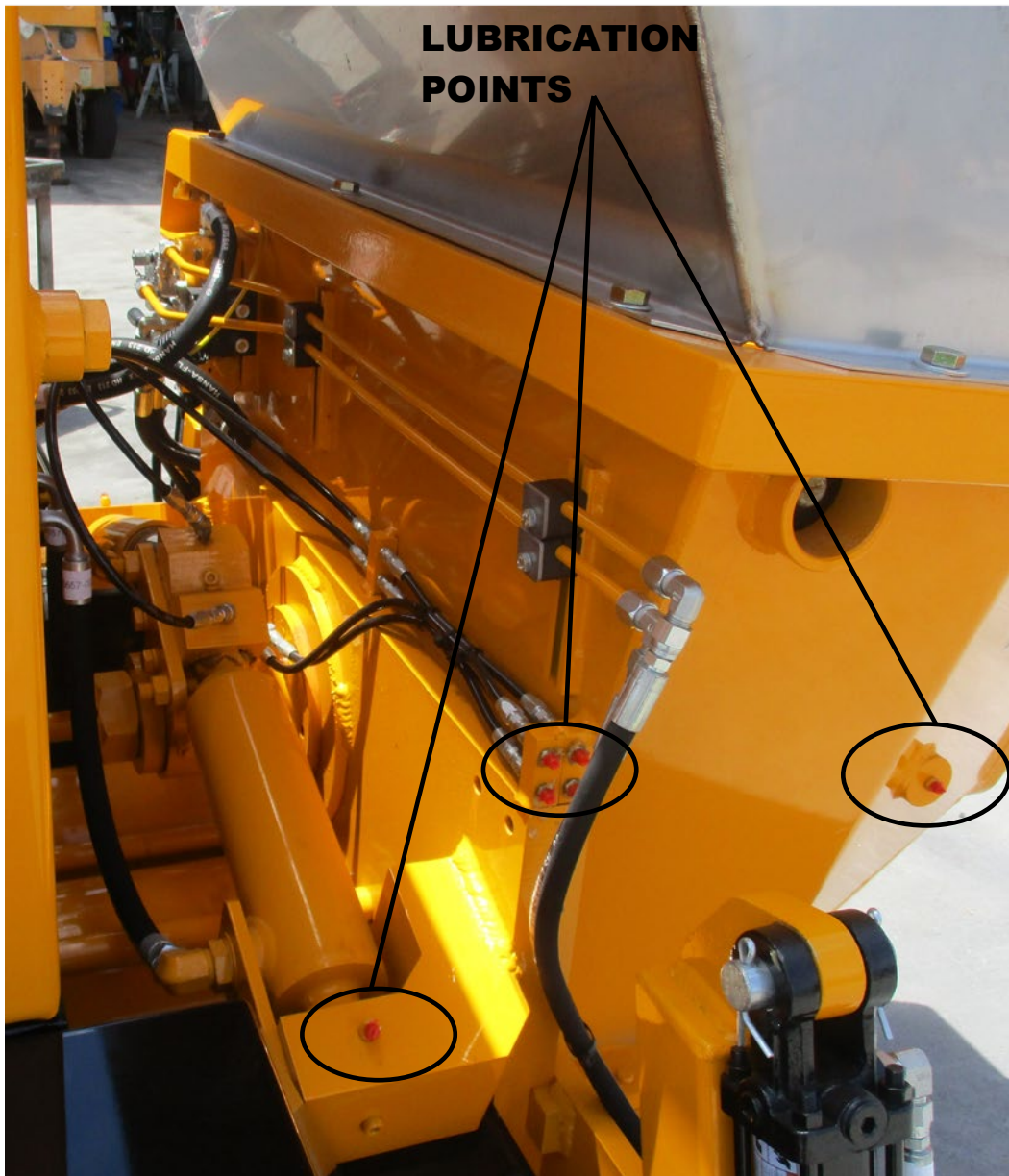
The following graphics are for REFERENCE ONLY.



S-TUBE SHIFT LUBRICATION

CAUTION

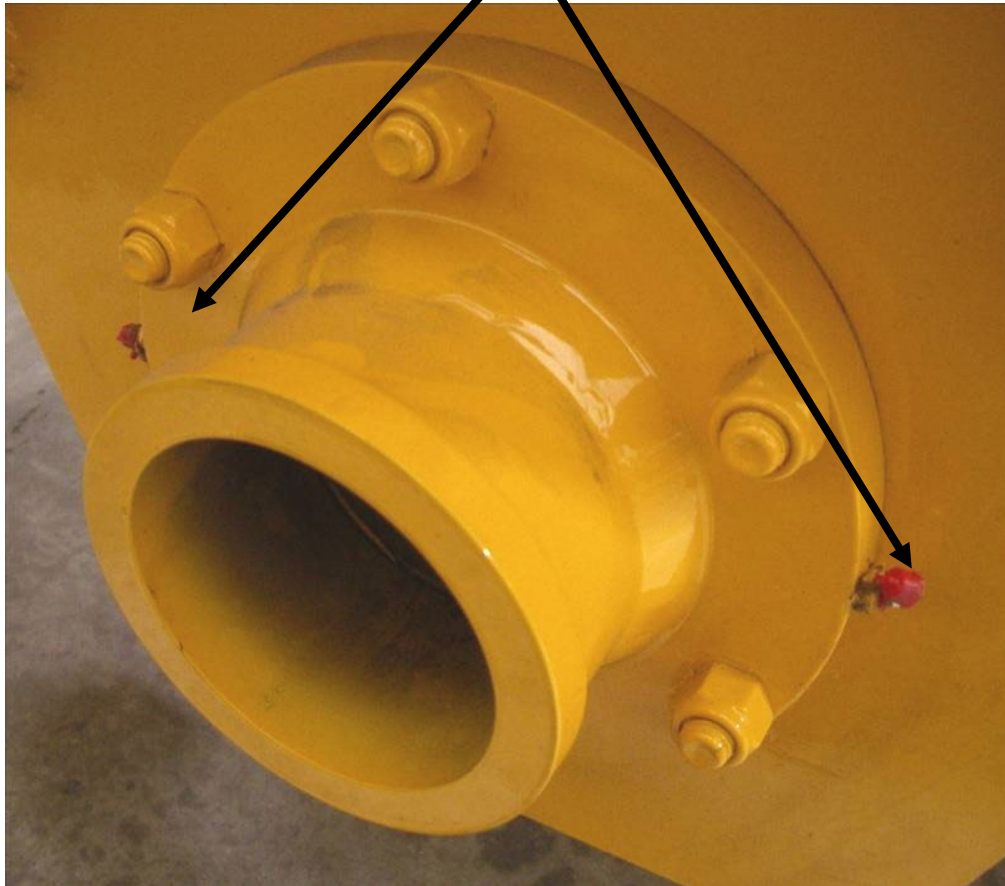
IF EQUIPPED WITH DUAL (2) HYDRAULIC SHIFT CYLINDERS,
RELIEVE SHIFT CIRCUIT HYDRAULIC PRESSURE TO PROPERLY GREASE
HYDRAULIC SHIFT CYLINDERS AND BELL CRANK





S-TUBE OUTLET LUBRICATION

S-TUBE OUTLET GREASE POINTS



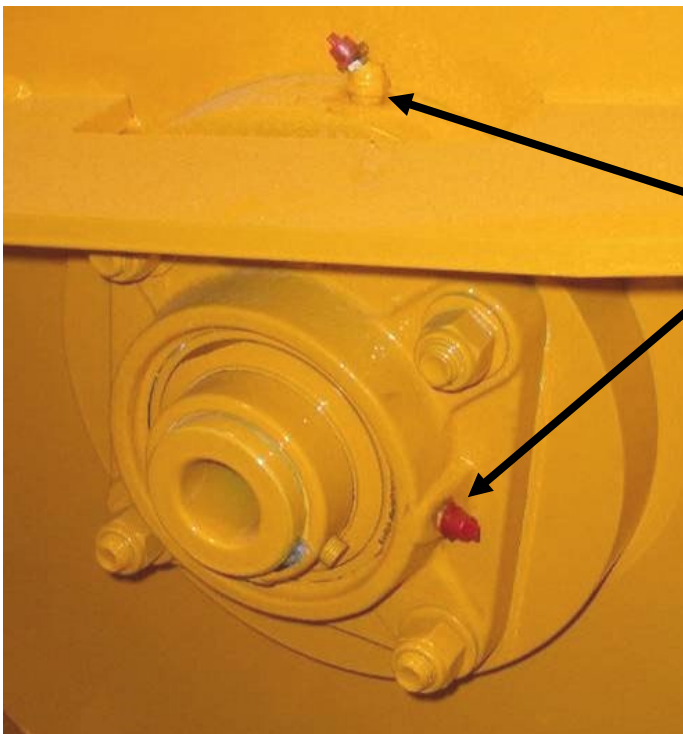


AGITATOR LUBRICATION

HYDRAULIC MOTOR SIDE
GREASE POINT



NON-HYDRAULIC MOTOR SIDE
GREASE POINTS





HYDRAULIC SYSTEM

Hydraulic pumps are used to supply the flow of oil necessary to operate actuators of the concrete pump.

CAUTION

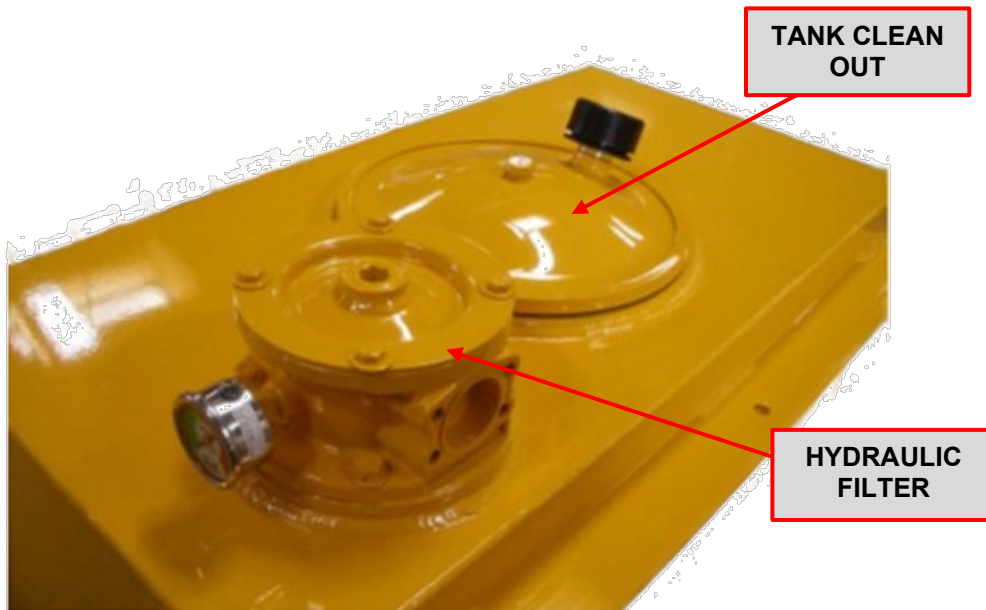
Contamination of the Oil Is the Leading Contributor to System Malfunctions

Extreme care must be exercised to prevent contaminants from entering the system. Always cap or plug open ports and hydraulic lines.

HYDRAULIC TANK

The hydraulic tank is equipped with an access cover with breather and magnetic suction strainers inside the tank. A sight and temperature gauge is installed on the tank to determine the fluid level and temperature inside the tank. The tank is also equipped with drain valve.

In addition to the magnetic suction strainers, filtration is accomplished by use of a hydraulic return filter located on top of the hydraulic tank. The return filter is equipped with an indicator gauge to monitor filter restriction. An oil cooler is adjacent to the engine cooling unit.





HYDRAULIC SYSTEM MAINTENANCE ITEM DESCRIPTIONS

FLUID

Check fluid level and oil clarity daily with sight gauge provided. Maintain level at full mark. Add hydraulic oil through the return filter fill port when necessary.

TANK BREATHER

Clean every 50 hours of operation. Remove from tank, clean with solvent and air blow dry.

FILTER

Change after first 50 hours of operation. Thereafter change every 250 hours of operation or when condition gauge indicates change is necessary.

HYDRAULIC TANK

Change oil in tank every 500 hours of operation or yearly, whichever comes first.

HYDRAULIC FLUID

The hydraulic system is filled with Shell Oil Company TELLUS #46. It is to be used in ambient temperatures of 39-90° F (4-32° C). The normal fluid temperature will range from 100-167° F (38-75° C).

For ambient temperatures of 90° F (32° C) and above, use fluid designated with an ISO rating of 68. Use ISO 32 for ambient temperatures of 32° F (4° C) and below.

CAUTION

Use Only Shell Tellus 46 or Equivalent
Never Mix With Other Types of Fluids

CAUTION

Always Use Clean and New Fluid

Using impure or other type of fluids not specified will contaminate the hydraulic system and lead to eventual system malfunction and/or damage.



ADDING HYDRAULIC FLUID

There are a few common methods for filling the hydraulic tank as described below. Exercise extreme care when adding fluid to the hydraulic tank to avoid contamination.

- To prevent any dirt or water from entering the hydraulic tank, thoroughly clean area around the return filter fill port plug, the vented fill cap or the inspection cover.
- Remove return filter fill port plug, vented cap or inspection cover.
- Fill system to MAX LEVEL mark on sight gauge with new clean hydraulic fluid.

If a pump is used to transfer the fluid, ensure the pump filter is clean. If pouring fluid from a container, pour it through a fine wire mesh screen, 200 mesh or finer.

- Replace filter fill port plug, vented cap or inspection cover immediately after filling tank to proper level.



CAUTION

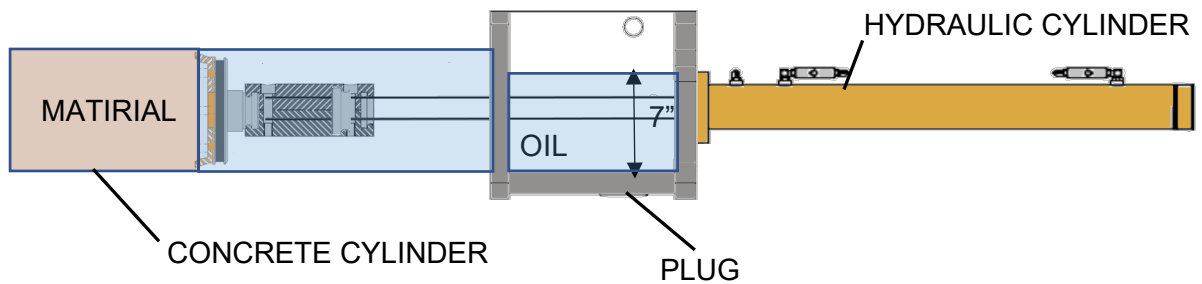
Do Not Use Cloth for Straining Fluid
Lint Is a Contaminant Harmful To the Hydraulic System

FILTER SERVICING**FILL PORT****GAUGE****FILTER
ELEMENT****GASKET**

Hydraulic filters provide a means of continuous hydraulic fluid filtration in an effort to prevent recirculation of contamination which will cause rapid wear and component

SERVICING FLUSH BOX

When servicing parts in flush box, drain old oil using plug underneath flush box. Clean out debris, fill with clean hydraulic fluid 7" as shown below.





breakdown.

The filter is equipped with a condition indicator gauge which should be checked daily and the element changed when indicated.

To change the filter elements:



1. Shut off machine.
2. VERIFY PRESSURES IN ALL CIRCUITS READ ZERO!
3. Wipe clean any dirt and grime from area surrounding filter housing
4. Loosen the filter cover plate bolts
5. Carefully remove cover so as not to damage the gasket or O-ring
6. Remove and element bypass valve (if equipped)
7. Discard only element and discard responsibly
8. Install bypass valve (if equipped) and new element and replace cover
9. Wipe clean any contaminants around high pressure filter
10. Remove filter housing then remove and discard filter element
11. Check and replace o-ring or gasket if necessary
12. Replace filter element and install filter housing
13. Start up machine and observe for leakage



Do Not Wash Out and Reuse Disposable Filter Elements

CLEANING THE HYDRAULIC TANK

The hydraulic tank should be drained and cleaned after 500 hours of operation or yearly, whichever occurs first, to assist in keeping the systems clean and in proper condition.

1. Shut off machine
2. VERIFY PRESSURES IN ALL CIRCUITS READ ZERO!
3. Place a suitable size container under the hydraulic tank drain fitting and then remove drain plug. Dispose of used oil responsibly
4. After draining, remove the access cover on the hydraulic tank being careful not to damage the gasket
5. Remove, disassemble and clean magnetic suction strainers before reassembly (if equipped)
6. Flush the inside of hydraulic tank with clean solvent and wipe clean with lint free cloths
7. Install suction strainers (if equipped)



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8. Replace sight gauge
9. Install the tank drain plug and access cover with gasket.
10. Change the hydraulic system filter element(s) and breather cap
11. Refill the hydraulic tank with new clean hydraulic fluid to MAX LEVEL mark
12. Start machine and check for leaks



COMPONENT REPLACEMENT

When parts are worn, do not delay in replacement. Continued usage with worn parts may lead to damage of other components.

This section is provided as a general guideline to assist in replacing major components that will wear. Please contact the **REED** Service Department or your local dealer for technical support.

S-TUBE, WEAR RING, AND WEAR PLATE

The sealing characteristics of the s-tube depend on the positive contact of the wear ring, located inside the s-tube, to the wear plate mounted inside of the hopper. The abrasiveness and friction of the concrete will cause wear and a breakdown of the sealing action. As this breakdown occurs, periodic adjustments to the s-tube can be made. This will help to improve the sealing quality; however, eventually the components will need to be replaced.

Adjustment or parts are required if:

- s-tube concrete build up
- deep grooves have developed on the face of the wear plate and/or on the wear ring
- When the output volume at the end of the delivery line noticeably begins to decrease or eventually stops
- When the material being pumped is being forced back into the hopper under pressure



Accumulator Pressure Must Be ZERO
BEFORE AND DURING Any Maintenance Procedures



Engine Must Be Turned OFF and Lockout / Tagout Procedures Must Be Followed
BEFORE AND DURING Any Maintenance Procedures

NOTE: The following graphics are for REFERENCE ONLY.



PUMP MAINTENANCE SCHEDULE AND CHECKLISTS

Providing a maintenance schedule defined specifically by run hours or yardage pumped serves only as a general guideline given the large number of variables a unit might be subject to, such as weather and ambient temperature conditions, jobsite conditions, material differences of concrete mix design, the load burden the unit is typically subject to, i.e. light, medium or heavy duty operation, etc.

The list that follows is to be used as a reference guide. However, the end user is encouraged to develop a preventative maintenance program that specifically suites their needs depending on the usage of the equipment.

DAILY PUMP MAINTENANCE CHECKLIST		
Actual Hours_____		Date___/___/___
#	Maintenance Description	Initials
1	Check hydraulic tank fluid levels	
2	Check condition of hydraulic oil for water or other contamination.	
3	Drain water from hydraulic tank	
4	Check engine fluid levels (see engine manufacturer maintenance schedule for additional requirements)	
	Additional Notes:	
5	Check hydraulic filter indicator condition	
6	Lubricate lubrication points, during and after pumping	
7	Inspect unit for fluid leaks, loose hoses, loose nuts, bolts, fasteners etc.	
	Additional Notes:	
8	Additional Notes:	



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INITIAL 50 HOUR MAINTENANCE CHECKLIST		
Actual Hours _____		Date ____/____/____
#	Maintenance Description	Initials
1	Change engine oil and filters (see engine manufacturer maintenance schedule for additional requirements) IF REQUIRED	
	Additional Notes:	
2	Change hydraulic oil filters	
3	Inspect hydraulic hoses and fittings for any signs of external wear or damage	
	Additional Notes:	



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EVERY 100 HOUR MAINTENANCE CHECKLIST		
Actual Hours _____		Date ____/____/____
#	Maintenance Description	Initials
1	Clean hydraulic tank breather	
2	Inspect all structural components (check frame, hopper, and other structural members for any damage)	
	Additional Notes:	
	Additional Notes:	
3	Check coolers and radiators for dirt or debris. Clean as necessary	
4	Check condition of engine drive belts. Change if necessary (see engine manufacturer maintenance schedule for additional requirements) IF REQUIRED	
Additional Notes:		



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EVERY 250 HOUR MAINTENANCE CHECKLIST		
Actual Hours _____		Date ____/____/____
#	Maintenance Description	Initials
1	Change hydraulic filters (or change more frequently as indicated by indicator gauge on filter)	
	Additional Notes:	
2	Check that all electrical wires, cables, terminals, plugs are in good condition	
	Additional Notes:	
3	Change engine oil and filters (see engine manufacturer guide for all engine requirements) IF REQUIRED	
	Additional Notes:	
4	Check condition of fuel hoses, fittings, and clamps	
	Additional Notes:	
5	Inspect all safety decals to ensure that they are completely visible and legible	
6	Perform complete inspection of the controls	
7	All toggles in good condition, stay in position or momentarily return to center	
8	Control identification in good condition, legible	
9	Perform complete inspection of the controls	
10	All toggles in good condition, stay in position or momentarily return to center	
11	Control identification in good condition, legible	
12	Gauges in good condition	
	Additional Notes:	



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EVERY 250 HOUR MAINTENANCE CHECKLIST		
Actual Hours _____		Date ____/____/____
#	Maintenance Description	Initials
13	Control console in good condition	
14	Switch in good condition	
	Additional Notes:	



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EVERY 500 HOUR MAINTENANCE CHECKLIST		
Actual Hours _____		Date ____/____/____
#	Maintenance Description	Initials
1	Inspect hydraulic hoses and fittings for any signs of external wear or damage	
	Additional Notes:	
2	Inspect all wear parts and change as necessary (excessive wear may cause inefficient performance and/or shutdown of operation)	
	Additional Notes:	
3	Change hydraulic fluid, clean the reservoir and the suction strainers within reservoir, and replace all hydraulic oil filters	
	Additional Notes:	
4	Complete inspection of the engine (refer to engine manufacturer maintenance schedule for details) IF REQUIRED	
5	Inspect mountings, bolts, brackets	
6	Oil level proper, coolant level proper, check for leaks	
7	Fuel system, tank mounting, filter condition, check for leaks, damaged lines	
11	Air cleaner and muffler securely mounted IF REQUIRED	
Additional Notes:		



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Actual Hours

Date / /

ADDITIONAL GENERAL NOTES:

[illegible]



NOTES

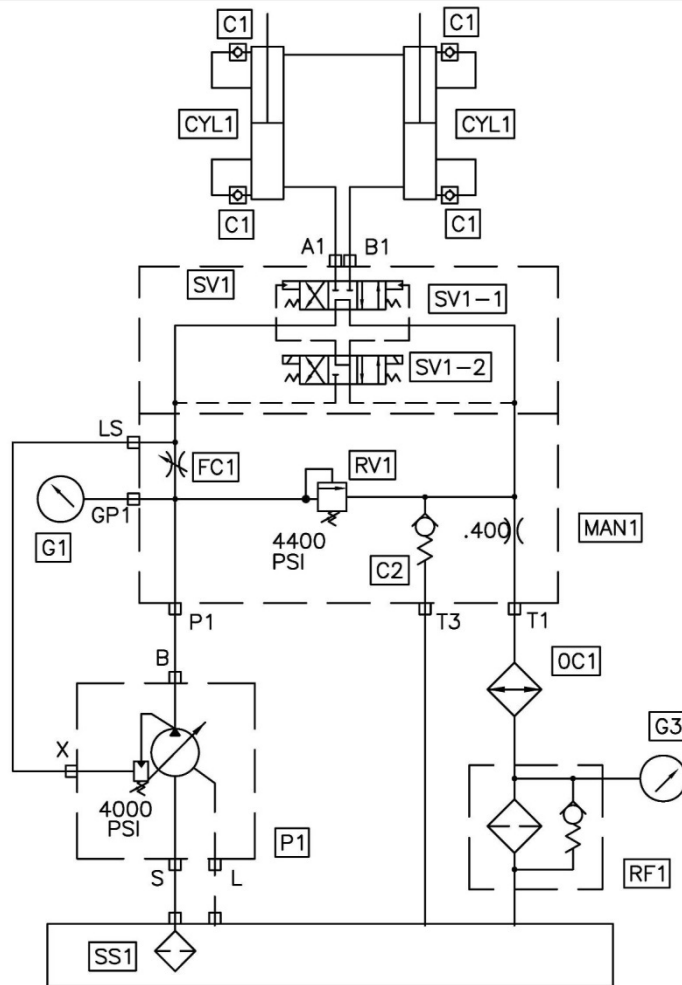
HYDRAULIC / ELECTRICAL SCHEMATICS

B SERIES DRIVE CYLINDER CIRCUIT HYDRAULIC SCHEMATIC

DATE
12/3/01

PART NO. REV.
86708 B

REED



CODE	DESCRIPTION	PART NO.	QTY.
P1	Main Pump		
CYL1	Hydraulic Drive Cylinder		
MAN1	Manifold Drive Cylinder Circuit	85248	1
SV1	Solenoid Valve, Drive Cylinder Circuit	85689	1
SV1-1	Valve Main	85690	1
	Seal Kit	74994	1
SV2-2	Solenoid Valve Pilot	85691	1
	Coil For SV2-2	85692	2
	Seal Kit	72313	1
RV1	Relief Valve Cartridge	85696	1
	Seal Kit	85696-SK	1
FC1	Flow Control Valve Cartridge	85697	1
	Seal Kit	85697-SK	1
C1	Check Valve	78961	4
C2	Check Valve Cartridge	85698	1
	Seal Kit	85698-SK	1
G1	Pressure Gauge 6000 psi	74562	1
G3	Pressure Gauge Return	85575	1
OC1	Oil Cooler	85713	1
RF1	Return Filter	85282	1
	Return Filter Element	85283	1
	Seal Kit Return Filter	BW10241	1
SS1	Magnetic Suction Strainer 3"	800230	1

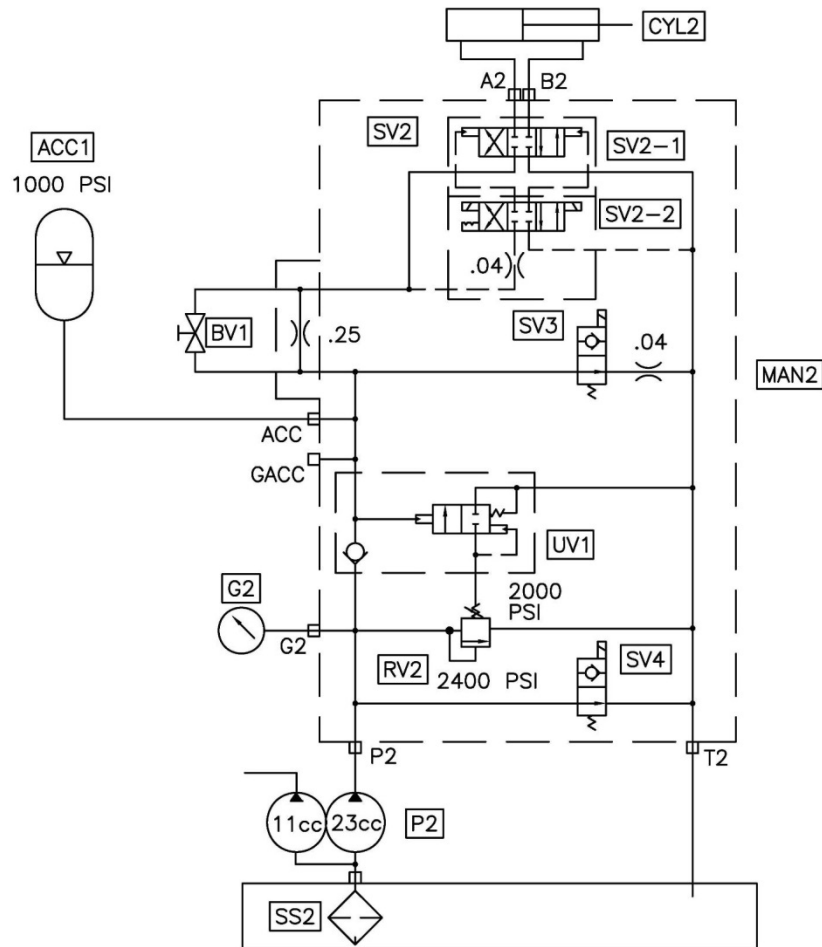
B50/60/70 SERIES SWING TUBE HYDRAULIC
SCHEMATIC, SINGLE SHIFT CYLINDER

DATE
11/7/01

REV.
B

PART NO.
86705

REED



CODE	DESCRIPTION	PART NO.	QTY.
P2	Gear Pump	87571-1	1
CYL2	S Tube Single Shift Cylinder	86221	1
	Seal Kit, GRATE BEND or TEXAS	86221-SK??	1
MAN2	Manifold S Tube Circuit	85249	1
SV2	Solenoid Valve S Tube Circuit	85693	1
SV2-1	Valve Main	85694	1
	Seal Kit	74994	1
SV2-2	Solenoid Valve Pilot	85695	1
	Seal Kit	72313	1
	Coil For SV2-2	85692	2
SV3	Solenoid Valve Cartridge	87246	1
	Coil For SV3	87247	1
SV4	Solenoid Valve Cartridge	87248	1
	Coil For SV4	87249	1
RV2	Relife Valve Cartridge	85703	1
	Seal Kit For Relife Valve	85703SK	1
UN1	Unlodng Valve Cartridge	85704	1
	Seal Kit For Unloder Valve	85704SK	1
BV1	Ball Valve	85705	1
AAC1	Accumulator	74515	1
	Accumulator, Bladder	74516	1
	Seal Kit Accumulator, Bladder	85812	1
G2	Pressure Gauge 3000 PSI	70366	1
SS2	Magnetic Suction Strainer 1 1/4"	79247	1

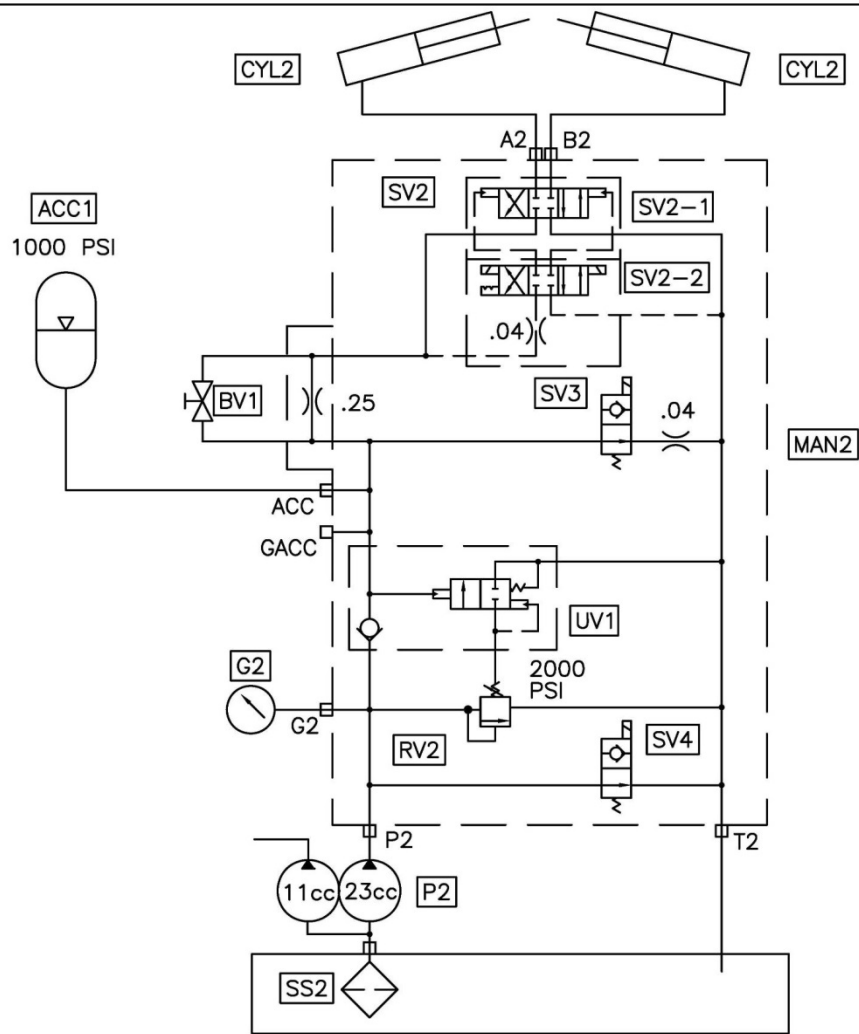
B SERIES SWING TUBE HYDRAULIC SCHEMATIC, DUAL SHIFT CYLINDER

DATE
11/7/01

REV.
B

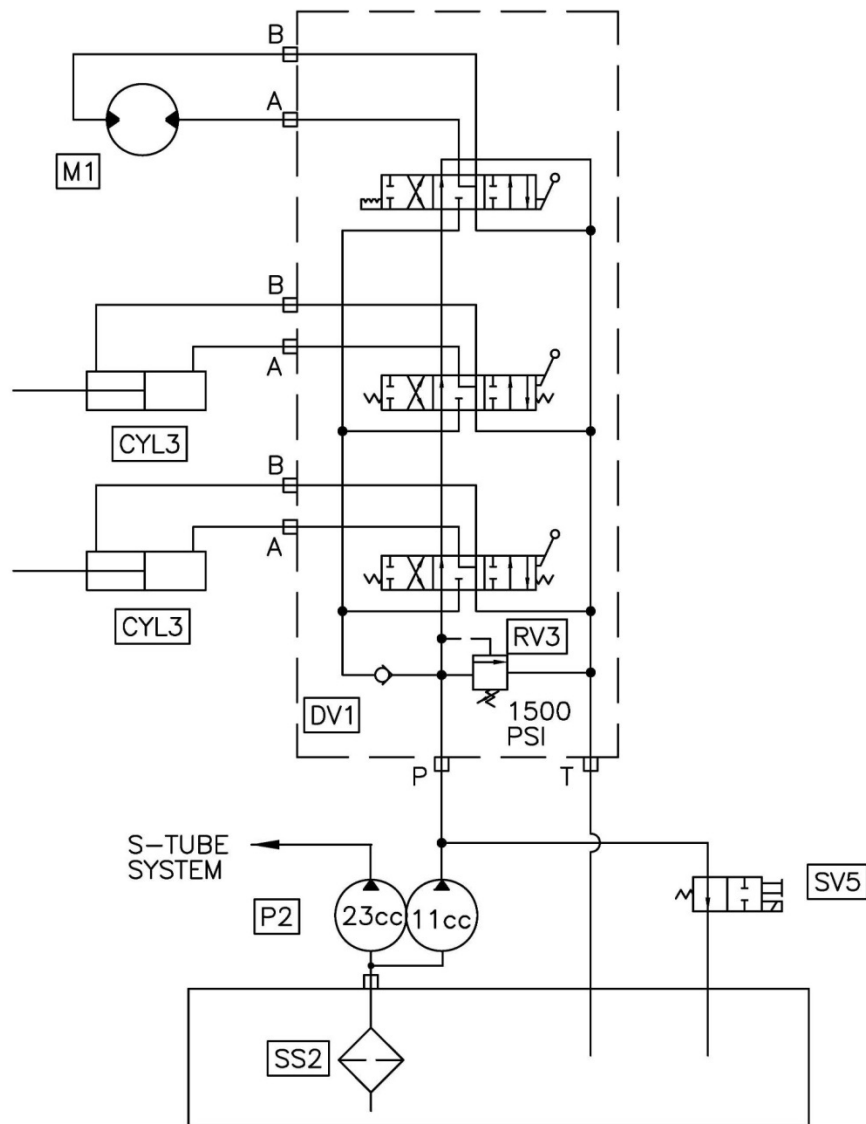
PART NO.
86706

REED



CODE	DESCRIPTION	PART NO.	QTY.
P2	Gear Pump		1
CYL2	S Tube Single Shift Cylinder	86220	2
	Seal Kit	86220-SKTX	1
MAN2	Manifold S Tube Circuit	85249	1
SV2	Solenoid Valve S Tube Circuit	85693	1
SV2-1	Valve Main	85694	1
	Seal Kit	74994	1
SV2-2	Solenoid Valve Pilot	85695	1
	Seal Kit	72313	1
	Coil For SV2-2	85692	2
SV3	Solenoid Valve Cartridge	87246	1
	Coil For SV3	87247	1
SV4	Solenoid Valve Cartridge	87248	1
	Coil For SV4	87249	1
RV2	Relife Valve Cartridge	85703	1
UN1	Unloading Valve Cartridge	85704	1
BV1	Ball Valve	85705	1
AAC1	Accumulator	74515	1
	Accumulator, Bladder	74516	1
	Seal Kit Accumulator, Bladder	85812	1
G2	Pressure Gauge 3000 PSI	70366	1
SS2	Magnetic Suction Strainer 1 1/4"	79247	1

REV B-5/7/2009

REEDPART NO.
86707REV.
BDATE
11/7/01B & C SERIES AGITATOR/OUTRIGGER
OPTION SCHEMATIC

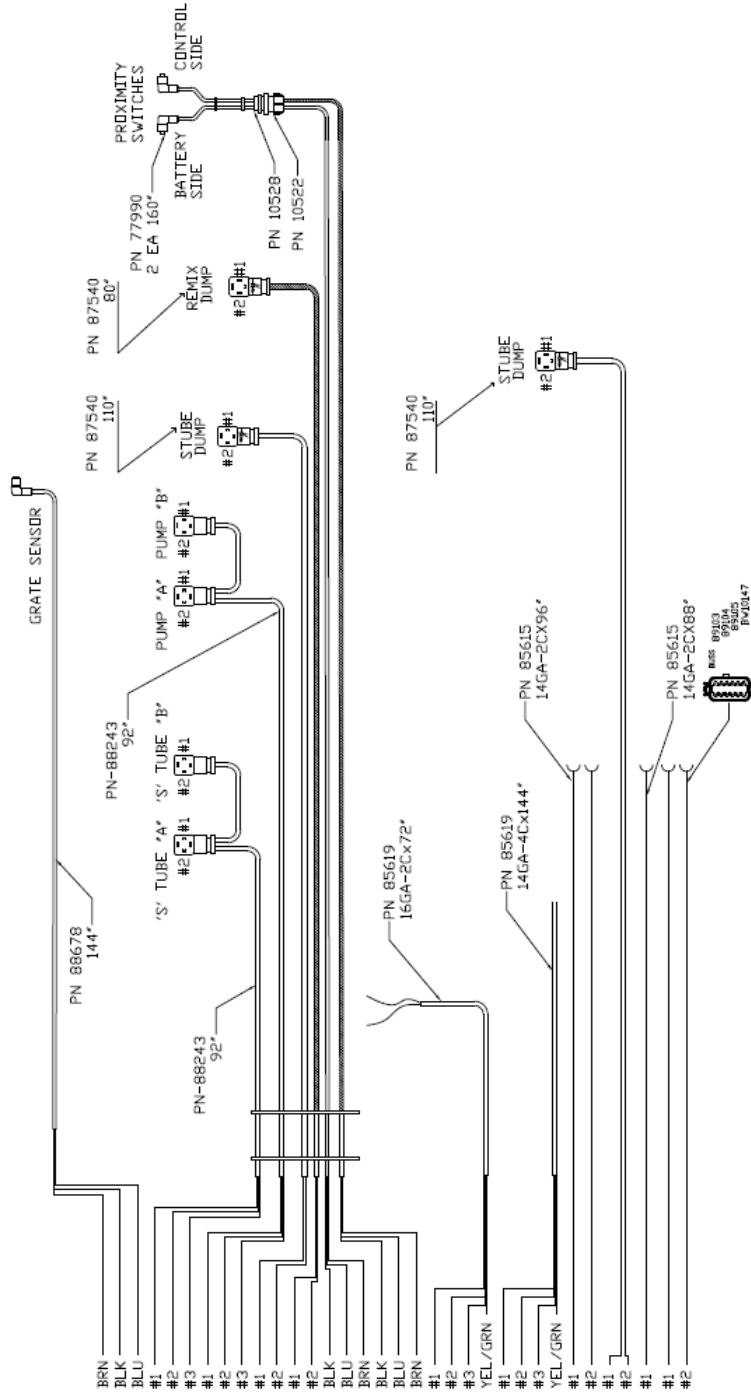
CODE	DESCRIPTION	PART NO.	QTY.
P2	Gear Pump		
CYL3	Hydraulic Outrigger Cylinder	86574	2
DV1	Directional Valve Agitator/Outrigger	74471	1
RV3	Relife Valve Cartrige	85706	1
M1	Agitator Motor	85811	1
	Seal Kit For 85811 Motor	85811SK	1
SV5	Solenoid Valve	87154	1
	Coil For SV5	87155	1
	Cartridge For SV5	87155-C	1
SS2	Magnetic Suction Strainer 1 1/4"	79247	1

REV B-5/7/2009

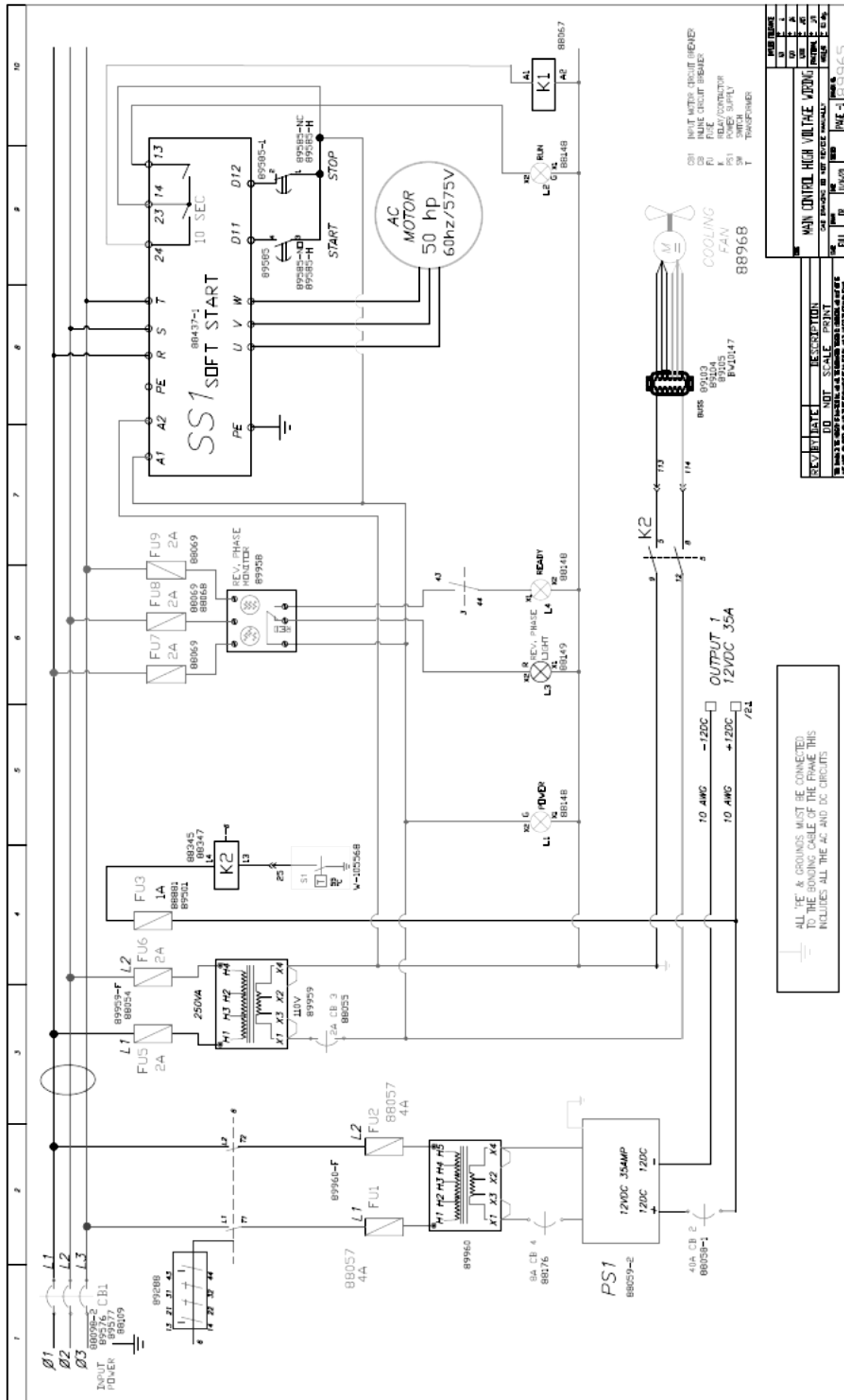
128 PLUG

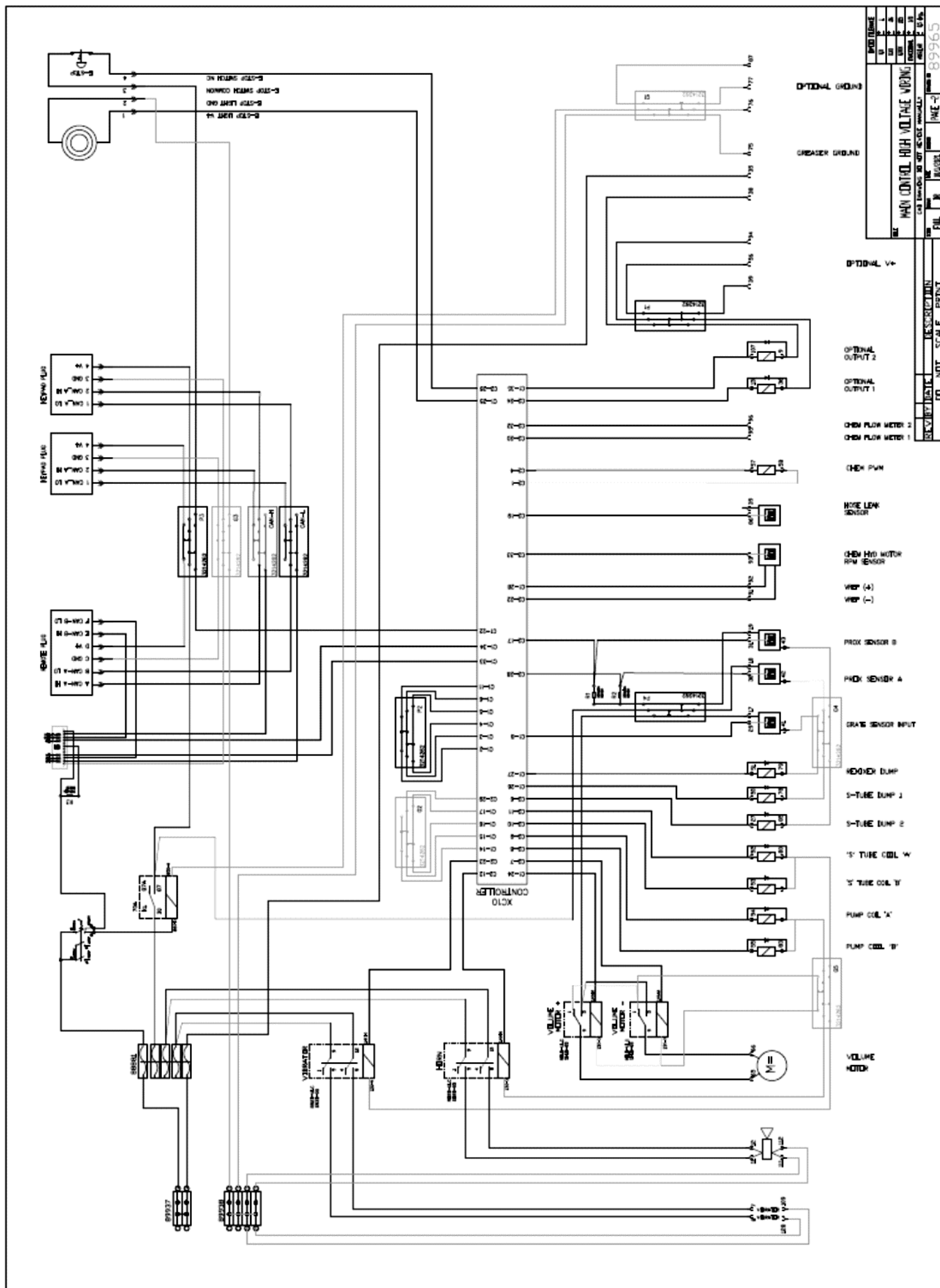
PN 89157 PLUG
PN 89116 WEDGE
PN 89107 16AWG SOCKET
PN 842047 16AWG SOCKET
PN 89109-B 100T

GRATE SENSOR + #17
GRATE SENSOR #29
GROUND #41
S TUBE COIL 'A' #52
S TUBE COIL 'B' #53
GROUND #80
PUMP COIL 'A' #54
PUMP COIL 'B' #55
GROUND #59
S TUBE DUMP + #50
GROUND #28
REMIX DUMP + #31
GROUND #79
PROX SWITCH 'B' #31
GROUND #42
BATTERY + #30
PROX SWITCH 'A' #30
GROUND #43
BATTERY + #19
HORN + #11
HORN - #12
HORN - #111
HORN - #112
VIBRATOR + #7
VIBRATOR + #8
VIBRATOR - #109
VIBRATOR - #128
VOLUME +/- #63
VOLUME +/- #66
S TUBE DUMP 2 + #27
GROUND #85
SENSOR ELECTRIC #25
COOLER MOTOR AC #13
COOLER MOTOR AC #14

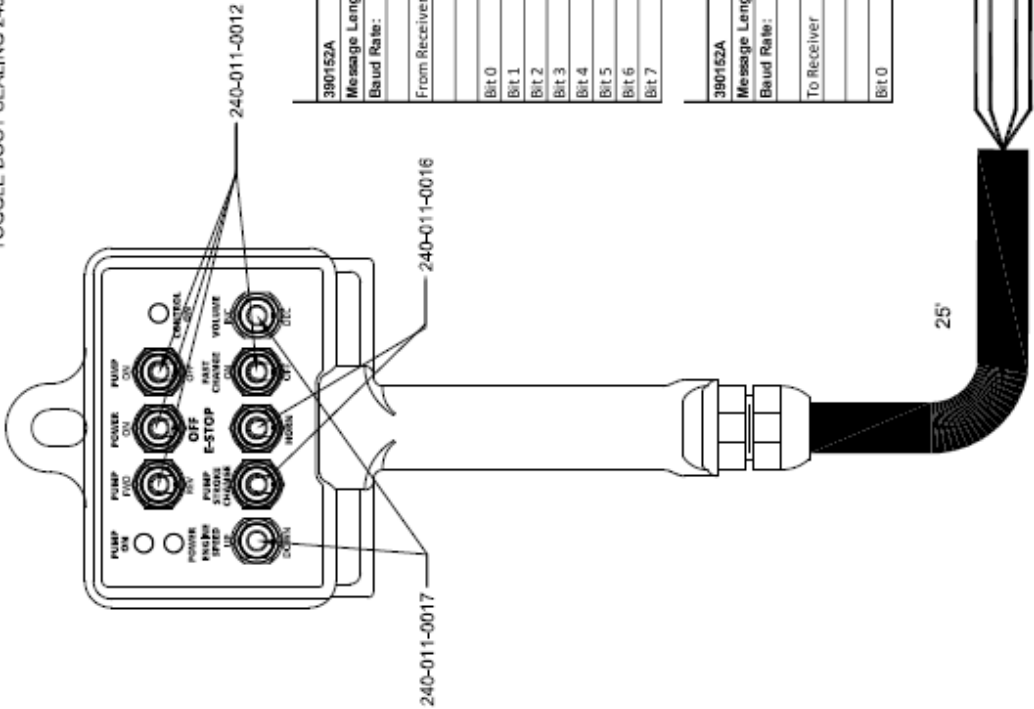


												UNLESS OTHERWISE SPECIFIED, DIMENSIONS ARE IN INCHES AND TOLERANCES ARE:				REED				CONCRETE PLACING EQUIPMENT							
																				CHIND, CA 91710							
																				TITLE WIRING HARNESS, B-SERIES, PLC							
																				MATERIAL				PART NUMBER		REV	
																								89498			





TOGGLE BOOT SEALING 240-015-0060



CAN Message				Tx Rate: 100 ms	
390152A	Kar-Tech Guider			CAN Language: J1939	
Message Length:	8 bytes				
Baud Rate:	250k				
From Receiver	PGN	DLC	Byte 1	Byte 2	Byte 3
Bit 0	0XFF0005		8 (0X94)	0X40	Byte 4
Bit 1					Engine Speed Up
Bit 2					Engine Speed Down
Bit 3					Volume Inc
Bit 4					Volume Dec
Bit 5					Pump On
Bit 6					Pump REV
Bit 7					Fast Change
					Horn

CAN Message				Tx Rate: 100 ms	
390152A	Kar-Tech Guider			CAN Language: J1939	
Message Length:	8 bytes				
Baud Rate:	250k				
To Receiver	PGN	DLC	Byte 1	Byte 2	Byte 3
Bit 0	0XFF0004		8 (0X14)	0X00	Byte 4
					PUMP LED

COLOR	DESCRIPTION
RED	POWER (9 - 30VDC)
BLACK	GROUND
WHITE	CAN H
GREEN	CAN L

KAR-TECH		Delafield, WI 53018		30-005-2-A-2 (4)	
TX, WIRE REMAIN (CAN CODEX, RED)		CAN CODEX, RED		30-005-2-A-2 (4)	
CAN CODEX, RED		CAN CODEX, RED		30-005-2-A-2 (4)	
CAN CODEX, RED		CAN CODEX, RED		30-005-2-A-2 (4)	
CAN CODEX, RED		CAN CODEX, RED		30-005-2-A-2 (4)	
CAN CODEX, RED		CAN CODEX, RED		30-005-2-A-2 (4)	
CAN CODEX, RED		CAN CODEX, RED		30-005-2-A-2 (4)	
CAN CODEX, RED		CAN CODEX, RED		30-005-2-A-2 (4)	
CAN CODEX, RED		CAN CODEX, RED		30-005-2-A-2 (4)	
CAN CODEX, RED		CAN CODEX, RED		30-005-2-A-2 (4)	



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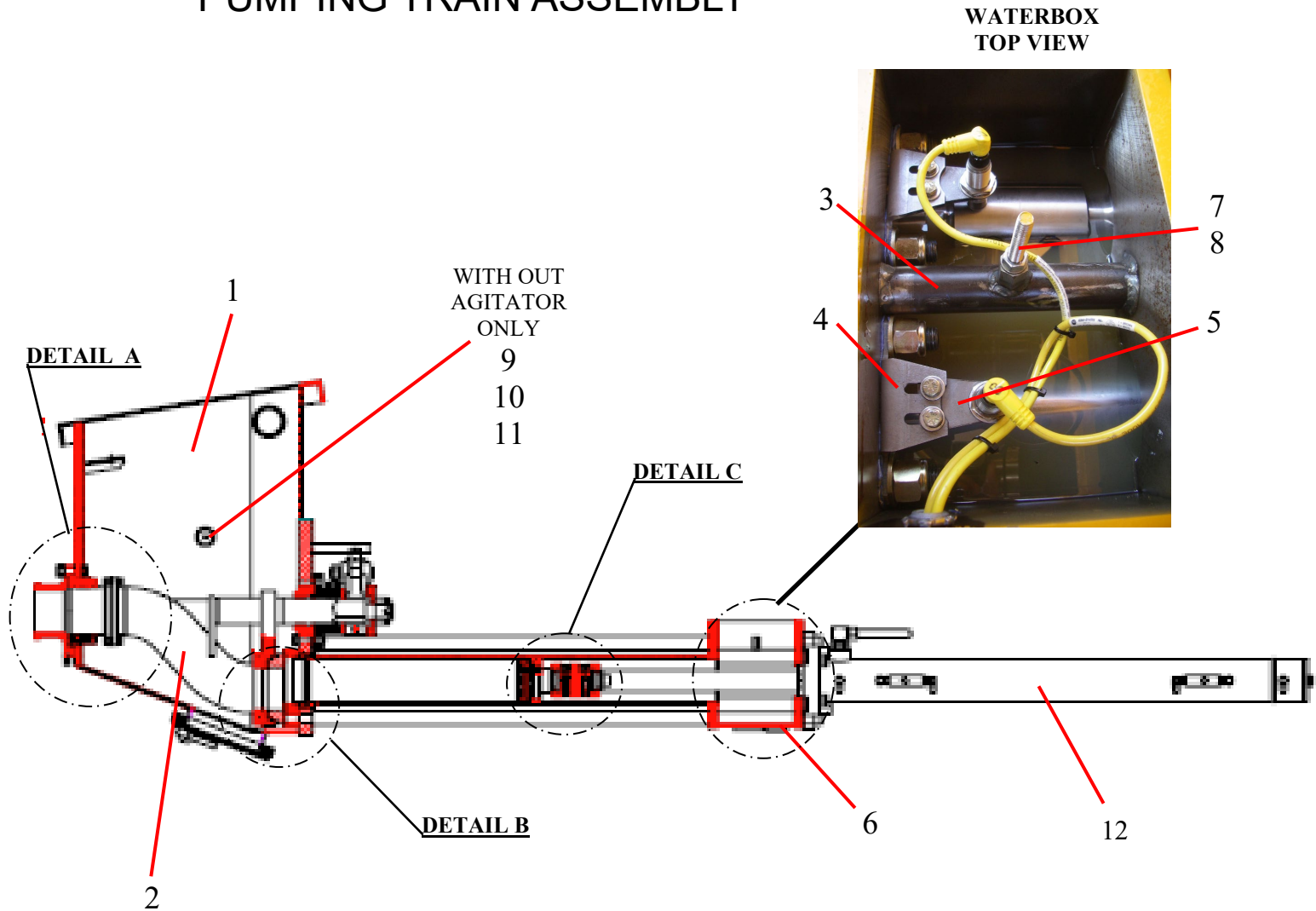
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REV	DATE	DESCRIPTION	NAME
B20HPC-SKE-V25	1/26/2022	INITIAL	J.SLACK

PARTS

PUMPING TRAIN ASSEMBLY



ID #	PART #	PART DESCRIPTION	QUANTITY	
	87894-8	DUAL SHIFT PUMPING TRAIN ASSEMBLY	1	EA
1	87893	HOPPER WELD MOD-B20 STD DUAL	1	EA
2	71349	S TUBE WLD, 4X4	1	EA
3	88172	FLUSH BOX WELDMENT, B20/B20HP	1	EA
4	88180	BKT-PROX SENSOR, FLUSH BOX	2	EA
5	88179	BRACKET PROXIMITY SWITCH MOUNT	2	EA
6	10282	PLUGS-PIPE GALV 1"	1	EA
7	86665	STUD, 3/8-16 X3" LONG	1	EA
8		3/8-16 JAM NUT	1	EA
9	73433	COVER REMIX (OUTSIDE)	1	EA
10	73434	COVER PLATE (INSIDE)	1	EA
11	86623	SEAL, AGITATOR (INSIDE)	1	EA
12	86224HT	DRIVE CYLINDER -3.25 X 2.00 X 35.75	2	EA

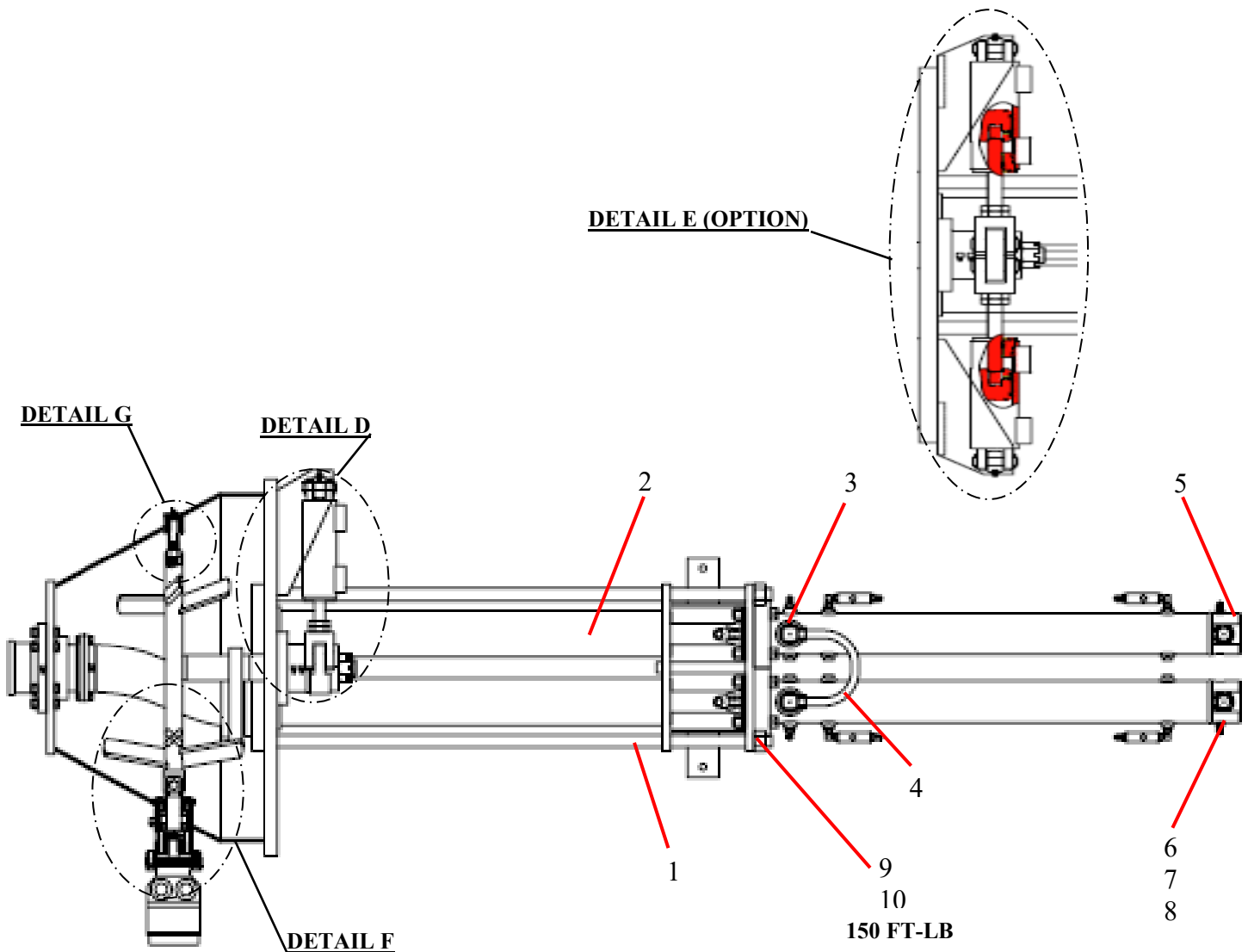


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PUMPING TRAIN ASSEMBLY CONTINUED

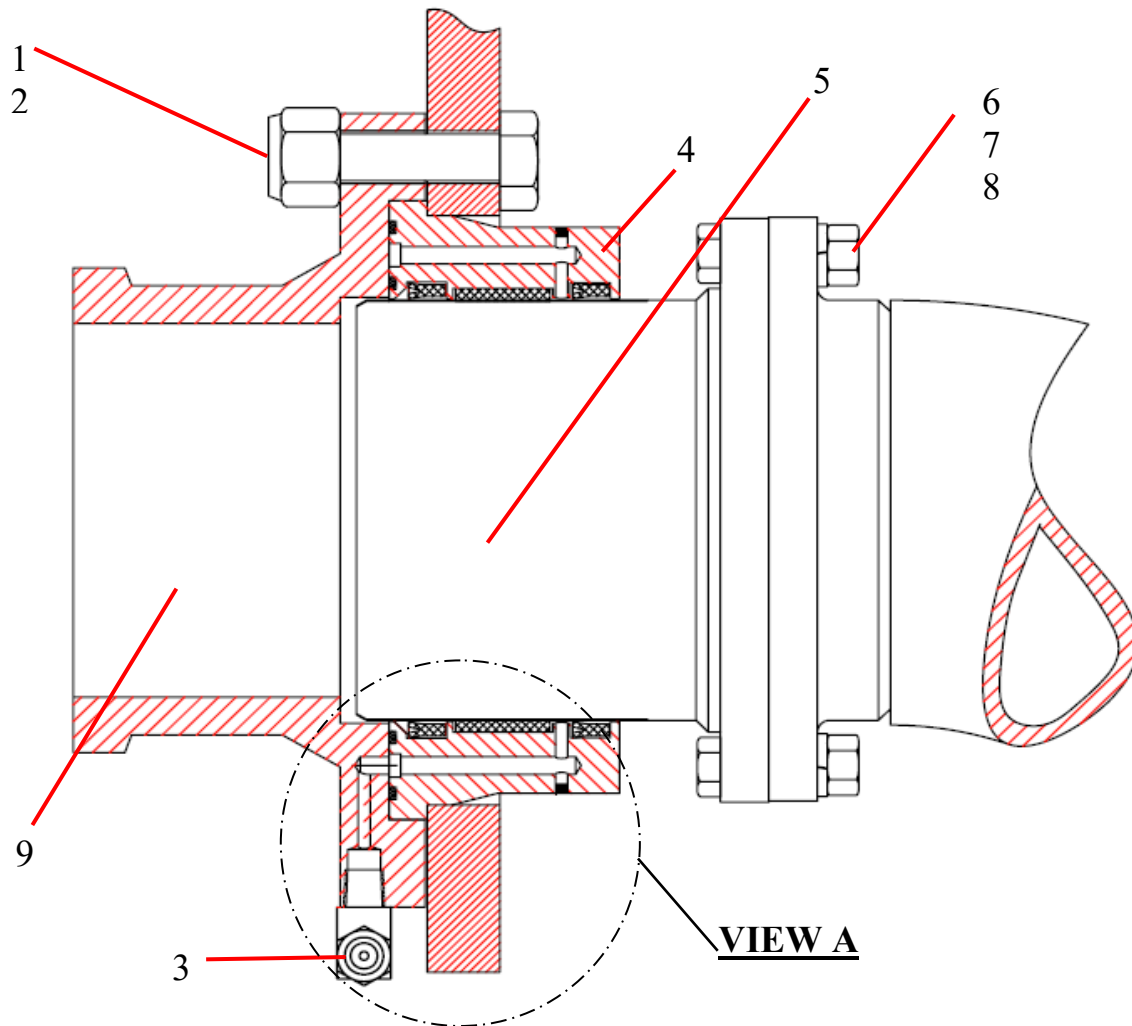


ID #	PART #	PART DESCRIPTION	QUANTITY	
1	70315	TIE ROD, 1 1/4" -12 X 48 1/2"	4	EA
2	71232	CONCRETE CYLINDER, 4" X 36"	2	EA
3		ELBOW, MB – MJ-16-16	2	EA
4	85688	TUBE, HYD, LOOP LINE	1	EA
5	71401	END PLATE – HYD.CYL, PAINTED	1	EA
6		HHCS, 1/2" – 13X1 1/4" GR	4	EA
7		LOCK WASHER, 1/2	4	EA
8		FLATWASHER, 1/2	4	EA
9		HEX NUT 1 1/4" - 12	4	EA
10		LOCK WASHER, 1 1/4"	4	EA

S-TUBE ASSEMBLY

4" OUTLET ASSEMBLY

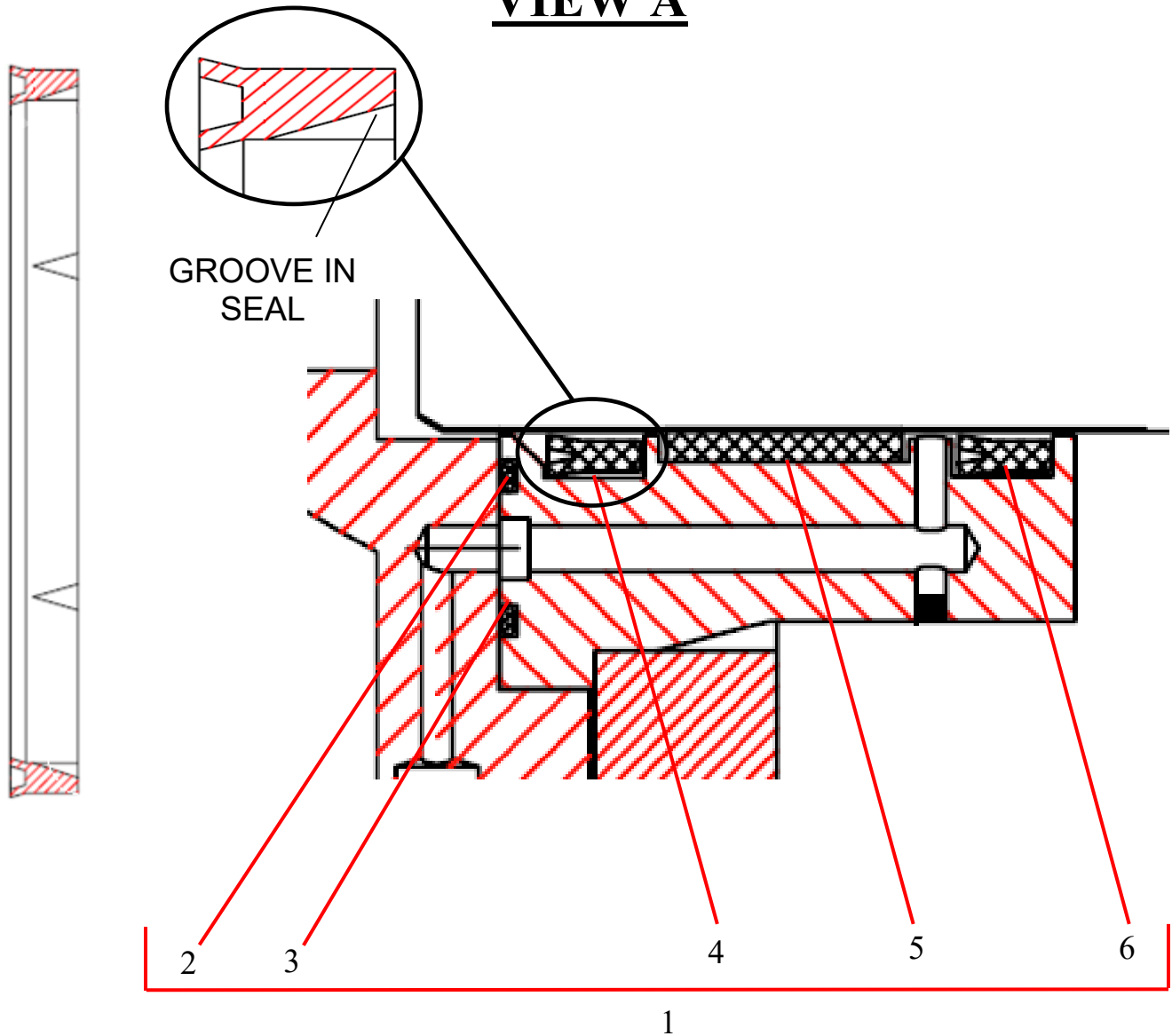
DETAIL A



ID #	PART #	PART DESCRIPTION	QUANTITY	
	86321	OUTLET ASSEMBLY	1	EA
1		HHCS, 9/16-12 X 2 1/2 GR/8	6	EA
2		LOCK NUT, 9/16 -12	6	EA
3		GREASE FITTING, 1/8" NPT 90°	2	EA
4	86335	OUTLET SEAL HOUSING- 4"	1	EA
5	71343	CHROMED OUTLET	1	EA
6		HHCS, 3/8 – 16X1 1/2" GR 8	6	EA
7		HEX NUT, 3/8" - 16	6	EA
8		LOCK WASHER, 3/8"	6	EA
9	86336	OUTLET, 4" (1-PIECE)	1	EA

4" OUTLET SEAL KIT INSTALLATION

VIEW A



ID #	PART #	PART DESCRIPTION	QUANTITY		
1	86621	SEAL KIT	1		EA
2	86369	O-RING-#158 BUNA 90	1		EA
3	86370	O-RING-#163 BUNA 90	1		EA
4	86614	SEAL-MODIFIED- 4 IN OUTLET	1		EA
5	86371	GUIDE BAND - 4.75 OD X 1.00W	1		EA
6	86372	LIP SEAL -4.50 ID X 4.88 OD X.38	1		EA

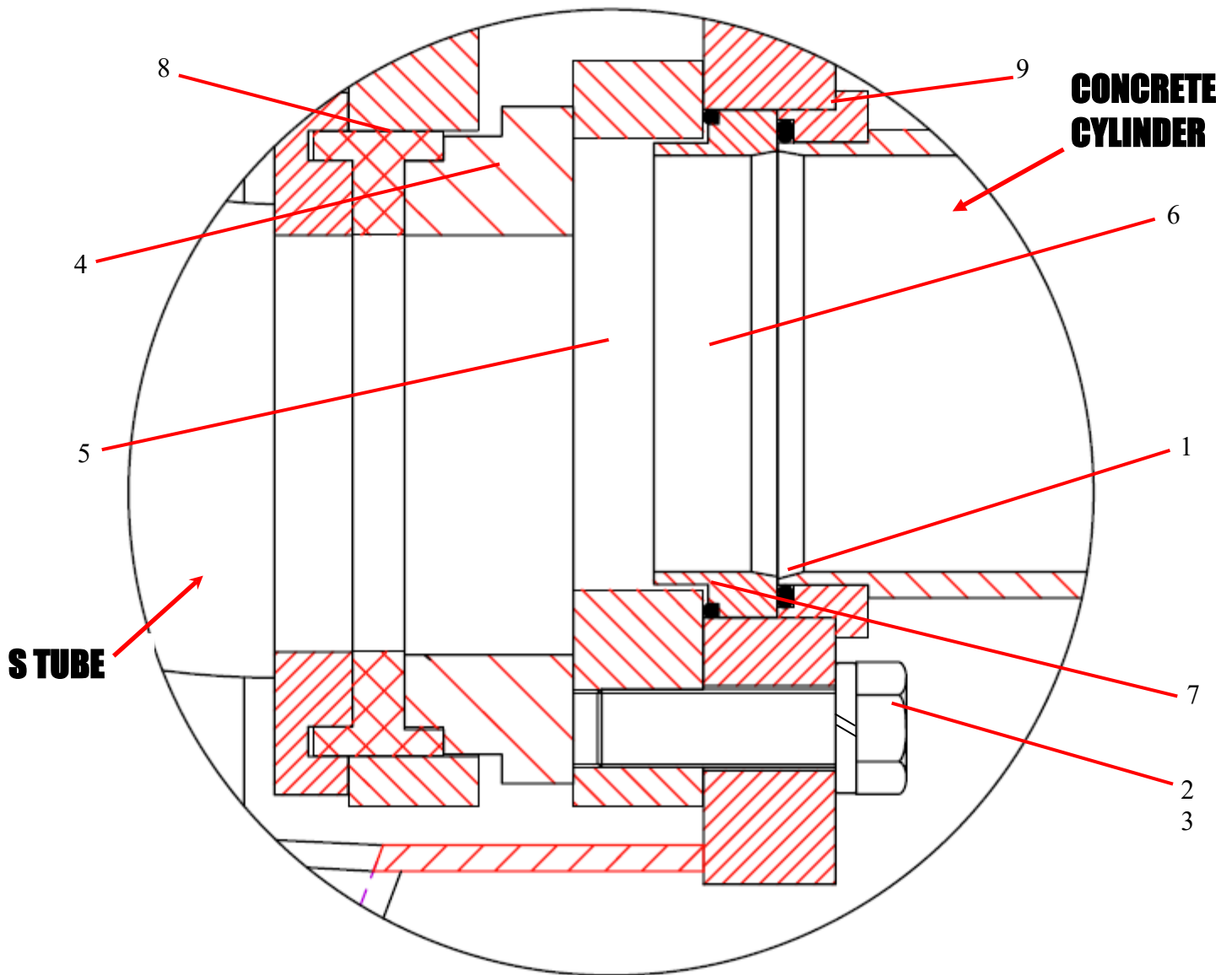
WEAR PLATE ASSEMBLY



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ID #	PART #	PART DESCRIPTION	QUANTITY	
1	71249	O-RING, #347 BUENA 70	2	EA
2		HHCS, 3/4 - 10X 2 1/2" GR 8	5	EA
3		LOCK WASHER, 3/4"	5	EA
4	72384	WEAR RING, 4" DOUBLE LIP, 26% CHROME	1	EA
5	71251	WEAR PLATE-CAST 4" M20	1	EA
6	71254	ANTI CHIP RING, 4"	2	EA
7	71247	O-RING FOR CHIP RING	2	EA
8	72285	SEAL, DOUBLE LIP 4"	1	EA
9	71257	CONC, CYL. ADAPTER	2	EA



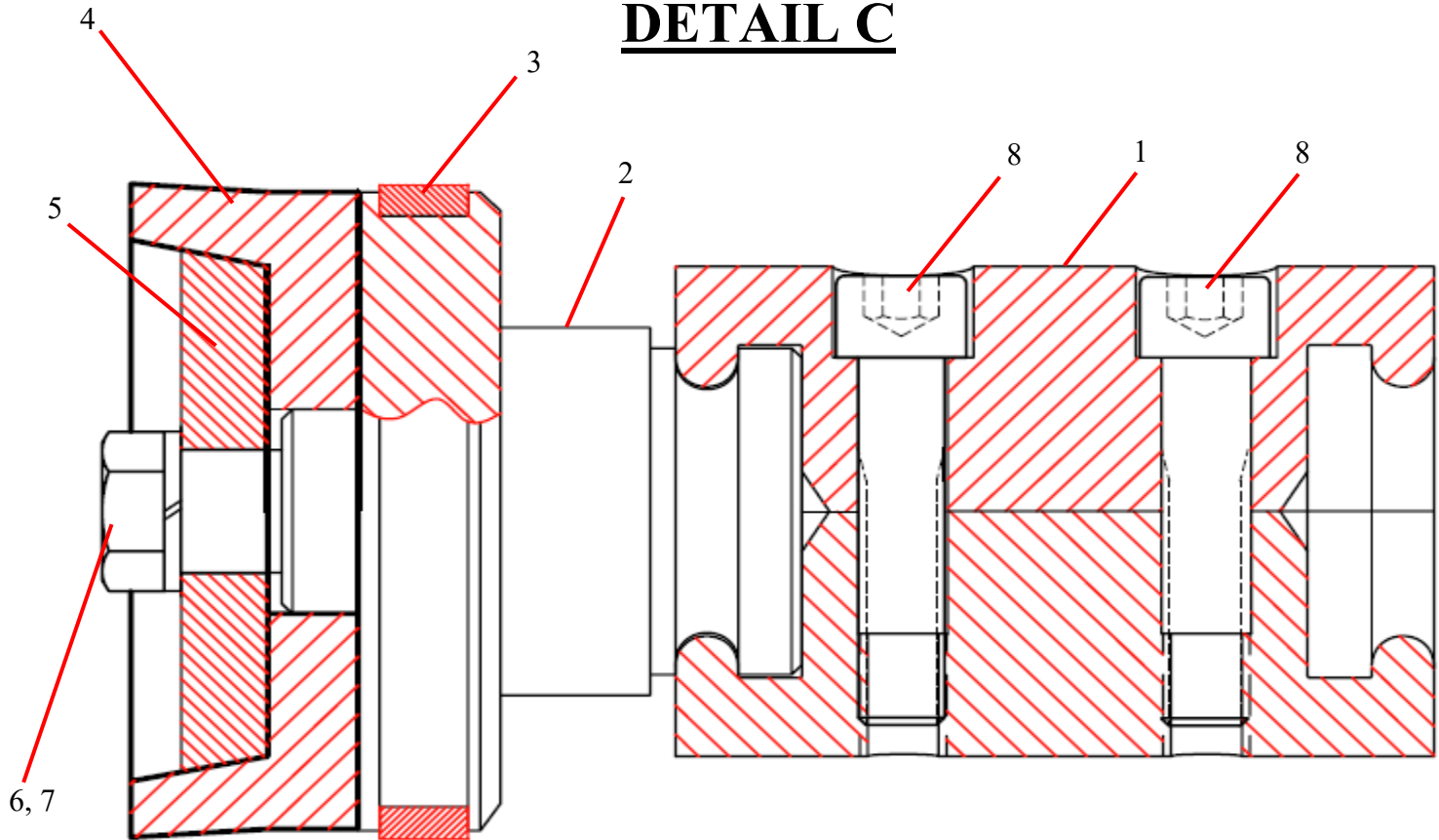
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PARTS

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4" PISTON CUP ASSEMBLY

DETAIL C



ID #	PART #	PART DESCRIPTION	QUANTITY	
1	70077	PISTON COUPLING,	1	EA
2	87940	PISTON ADAPTER 4" WITH GUIDE BAND	1	EA
3	87994	WEAR RING (GUIDE BAND) 4"	1	EA
4	76500	PISTON CUP, 4 IN	1	EA
5	88011	PISTON PLATE 4" SINGLE BOLT	1	EA
6	87982	HHCS 3/4-16 1.5" LONG GR8 PLATED	1	EA
7	80010	LOCKWASHER-3/4 STL ZINC PLATED	1	EA
8		SHCS 1/2 - 13 X 2 1/4"	2	EA

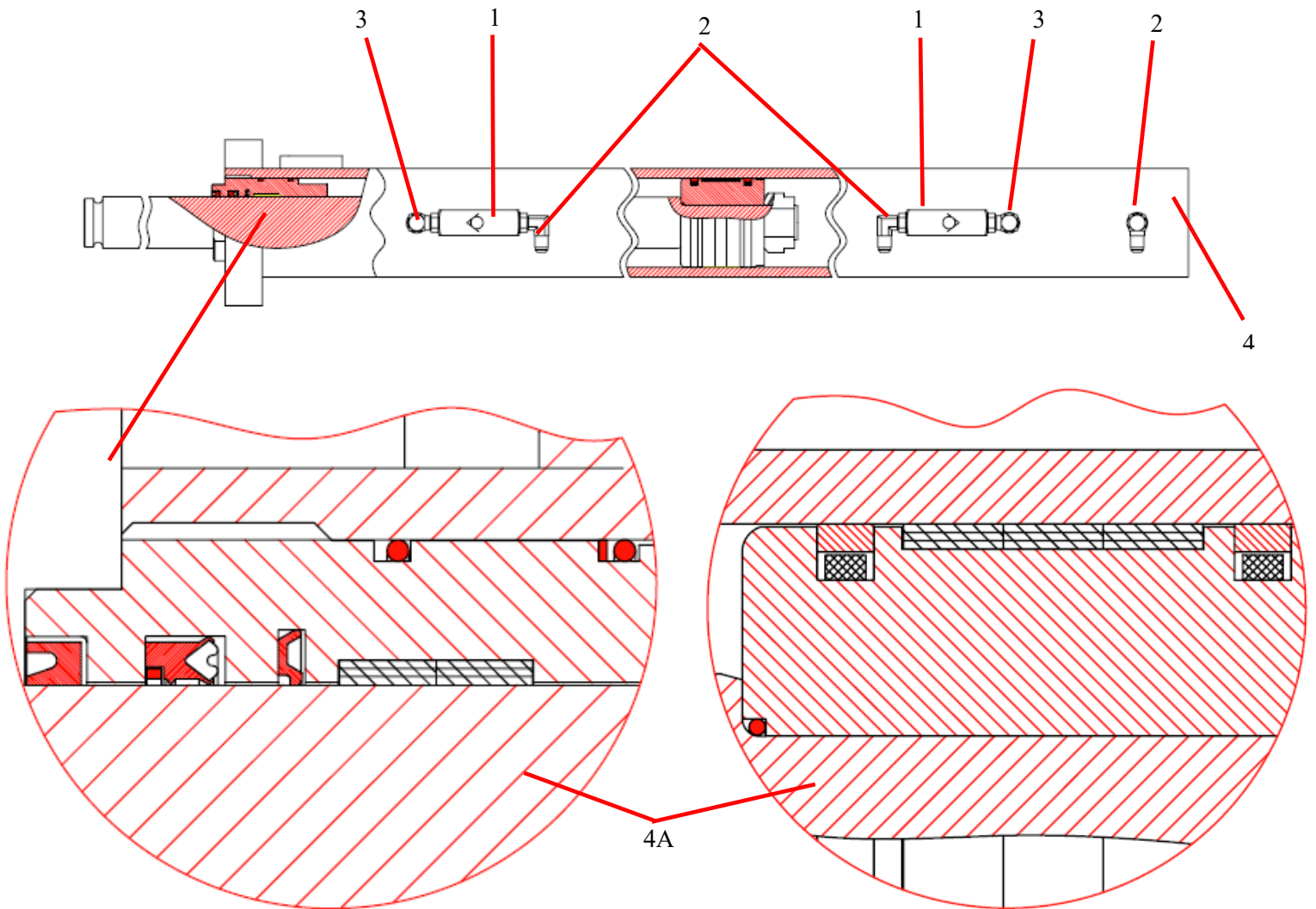


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DRIVE CYLINDER ASSEMBLY



ID #	PART #	PART DESCRIPTION	QUANTITY	
	86304-2	HYD CYLINDER GROUP	REF	
1	78961	CHECK VALVE-5K PSI O-RING	2	EA
2	86748	FITTING-MB-MJ90-6-6	3	EA
3		ELBOW, MB-MB90-6-6	2	EA
4	86223HT	HYDRAULIC CYLINDER 3.50 X 2.00 X 35.75	1	EA
4A	86222A-SK	SEAL KIT	1	EA



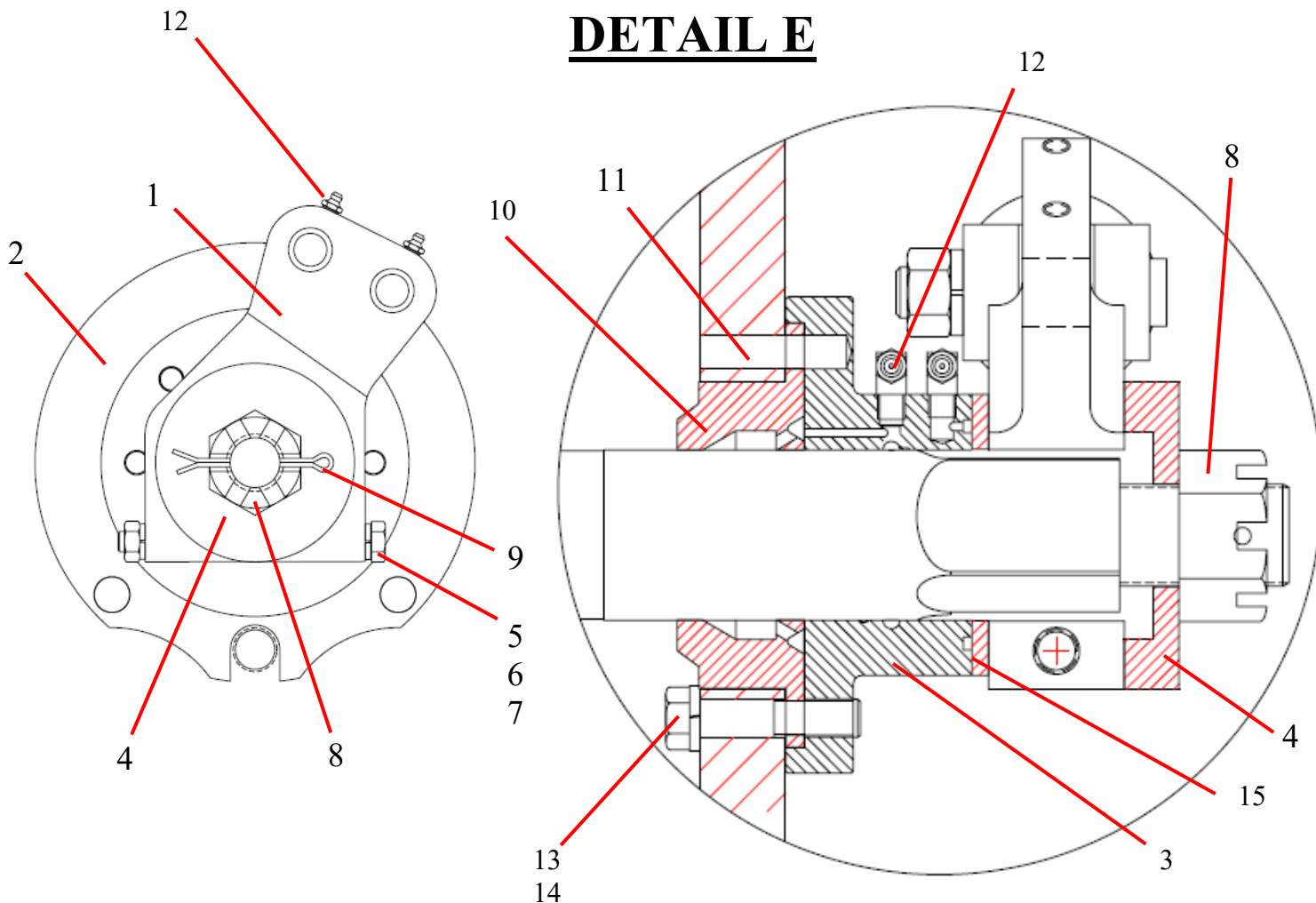
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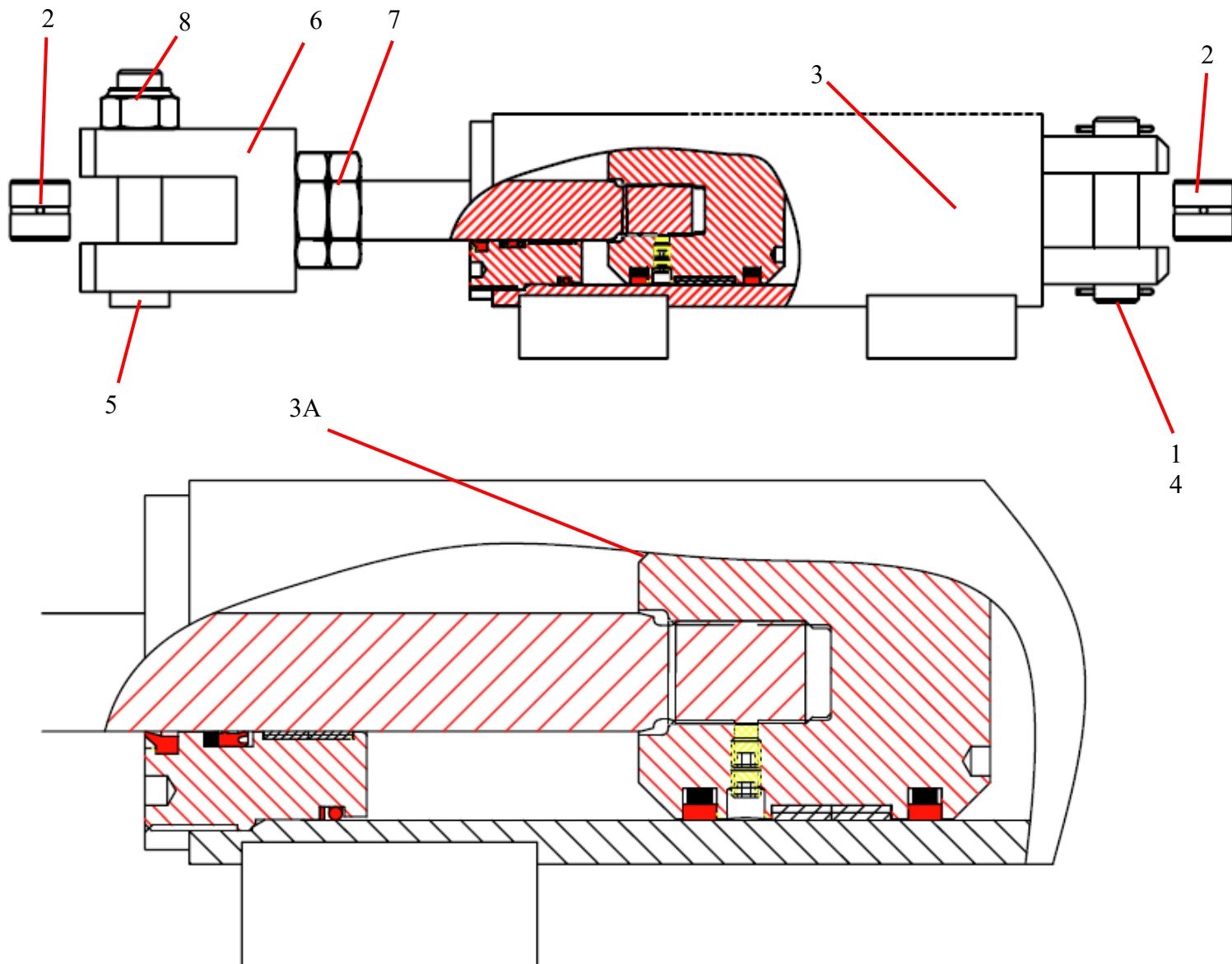
DUAL SHIFT BELL CRANK ASSEMBLY

DETAIL E



ID #	PART #	PART DESCRIPTION	QUANTITY	
1	85604	BELL CRANK,	1	EA
2	86502	LOCATOR RING- FLANGE BEARING	1	EA
3	70124	FLANGED BEARING	1	EA
4	70125	SPACER, S-TUBE NUT	1	EA
5		HHCS, 5/8"-18X5 1/2" GR 8	1	EA
6		LOCK WASHER, 5/8"	1	EA
7		JAM NUT, 5/8	1	EA
8	70825	NUT 1 1/2" - 12 CASTLE	1	EA
9		COTTER PIN, 1/4 X4"	1	EA
10	73564	SEAL, FLANGE BEARING 2.5 SHAFT	1	EA
11		DOWEL PIN, 1/2" DIA X 2"	2	EA
12		GREASE FITTING, 1/8" NPT	2	EA
13		HHCS, 9/16 - 12X3" GR 8	4	EA
14		LOCK WASHER, 9/16"	4	EA
15	70141	THRUST WASHER, S -TUBE	1	EA

DUAL SHIFT CYLINDER ASSEMBLY



ID #	PART #	PART DESCRIPTION	QUANTITY	
1	74207	PIN - CLEVIS - .750 DIA	1	EA
2	71011	BUSHING - SHIFT CYLINDER	1	EA
3	86221-1HT	SWING CYLINDER 2.50 X 1.00 X 5.00	2	EA
3A	86221A-SK	SEAL KIT	2	EA
4		COTTER PIN, 3/32X1 3/4"	2	EA
5	70142	PIN, CLEVIS	1	EA
6	70143	CLEVIS, SHIFT CYLINDER	1	EA
7		1"X14 JAM NUT	2	EA
8		3/4 - 10 LOCK NUT	1	EA



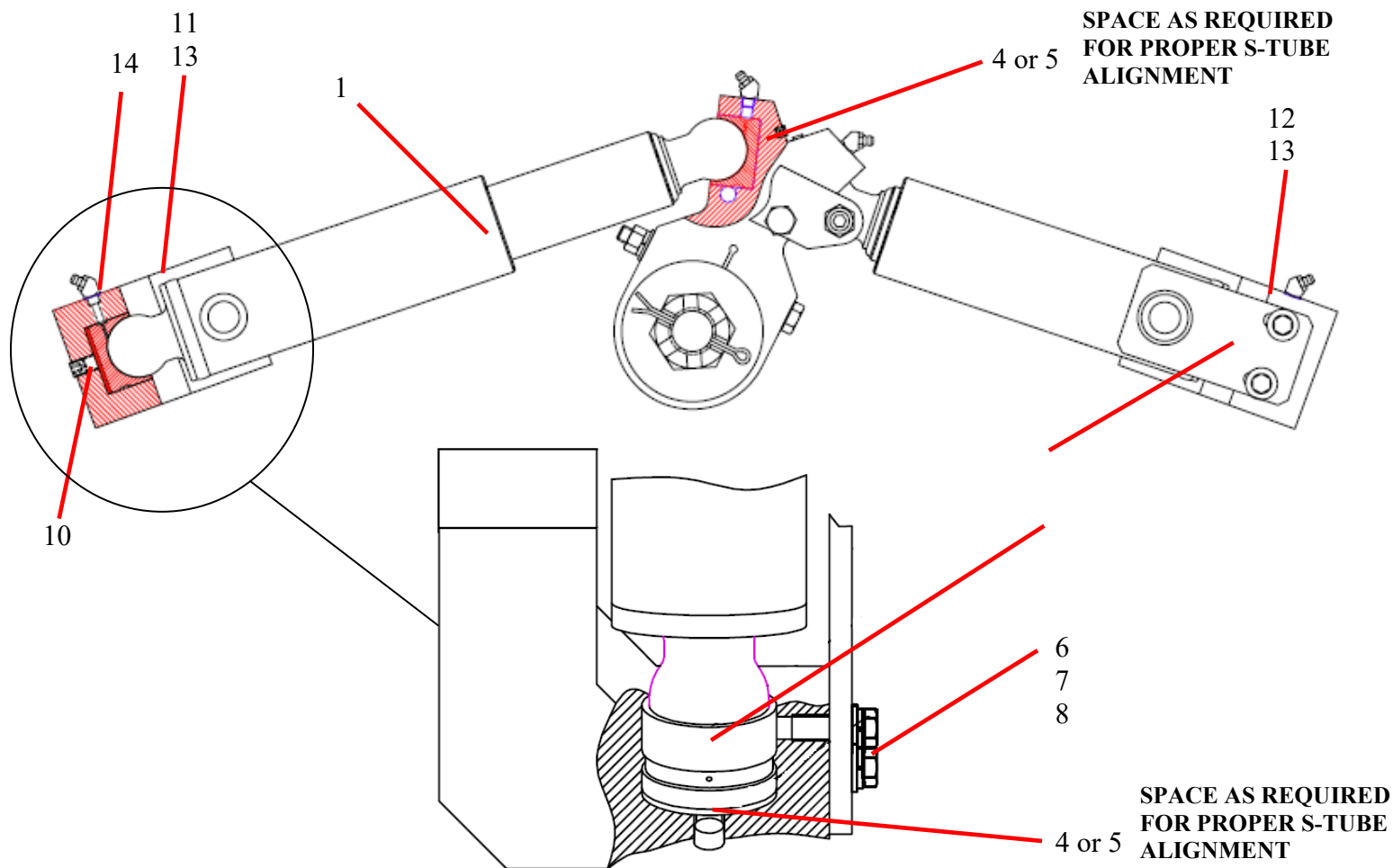
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DUAL SHIFT ASSEMBLY

DETAIL E



ID #	PART #	PART DESCRIPTION	QUANTITY	
1	86220HT	SWING RAM – 2.5 X 5.75 STROKE	REF	
2	86441	RETAINER, SWING RAM	2	EA
3	76798-1	BALL SOCKET, NYLON	4	EA
4	75501	SPACER 1/8"	A/R	EA
5	75502	SPACER 1/16"	A/R	EA
6		HHCS, 3/8-24X1 1/4" GR8	4	EA
7		WASHER, 3/8"	4	EA
8		LOCK WASHER, 3/8"	4	EA
10	86283	SETSCREW – 5/8 -11X2.00 CUP	2	EA
11	85941	HOUSING, RH SWING RAM	1	EA
12	85942	HOUSING, LH SWING RAM	1	EA
13	86052	DOWEL PIN, 1/2" DIA X 2"	4	EA
14		GREASE FITTING, 1/8" NPT	2	EA

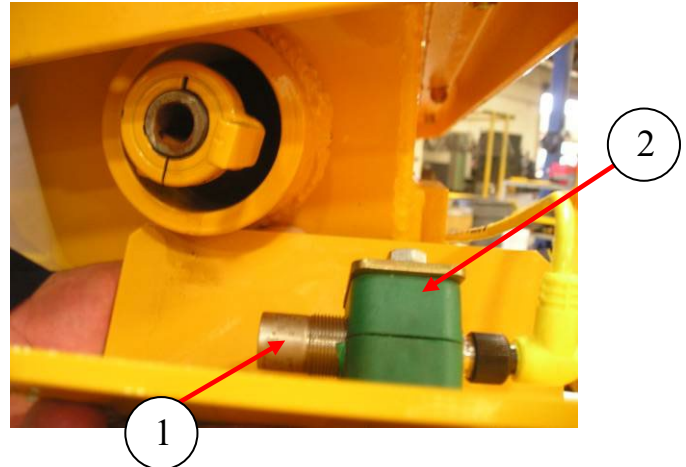


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SAFETY GRATE



ID #	PART #	PART DESCRIPTION	QUANTITY	
1	87369	PROXIMITY SENSOR PNP HOPPER GRATE	1	EA
2	801902-006	CLAMP,18MM TUBE CLAMP SET	1	EA
3	87997	COVER WELD PROX SWITCH HOPPER	1	EA

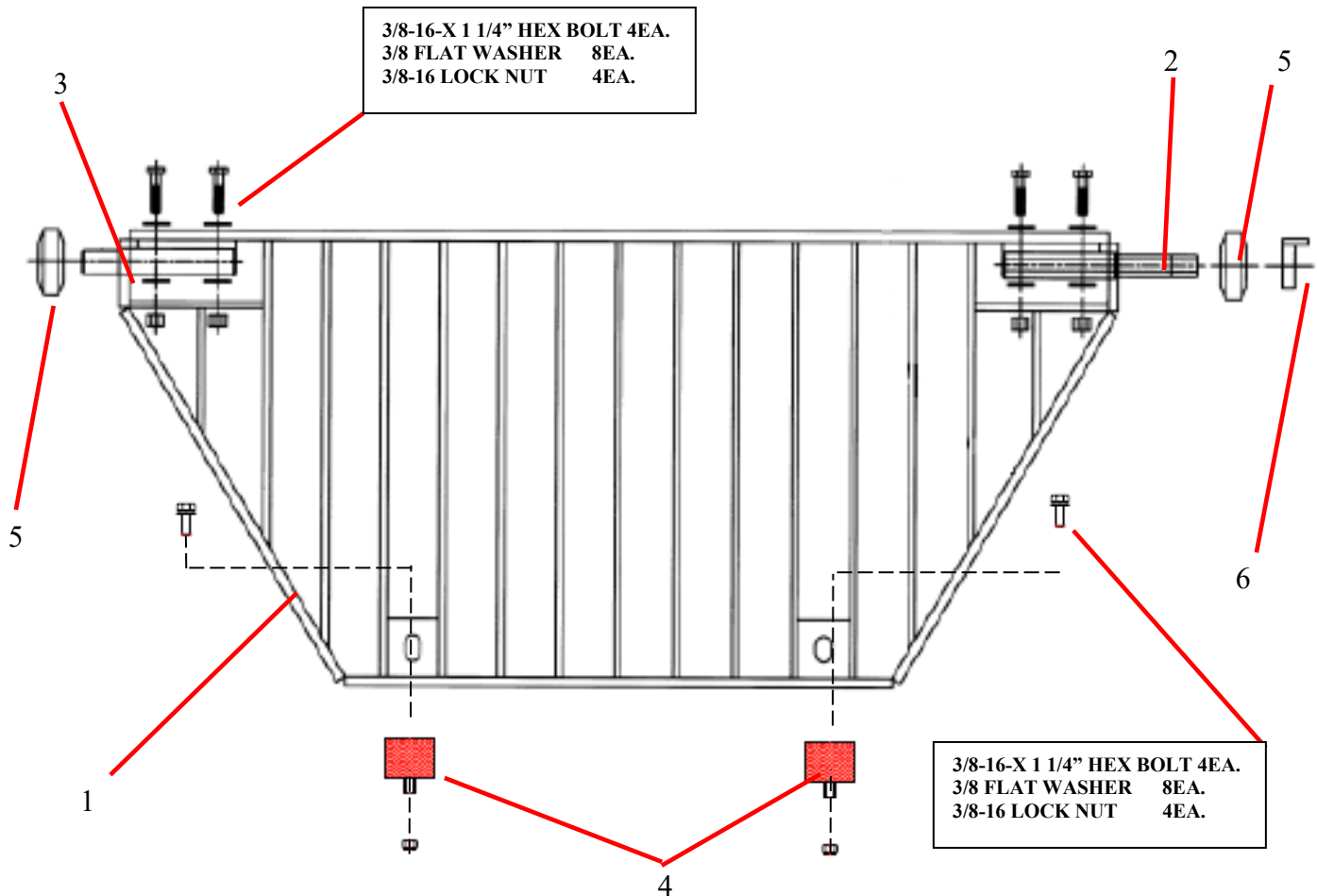


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PARTS

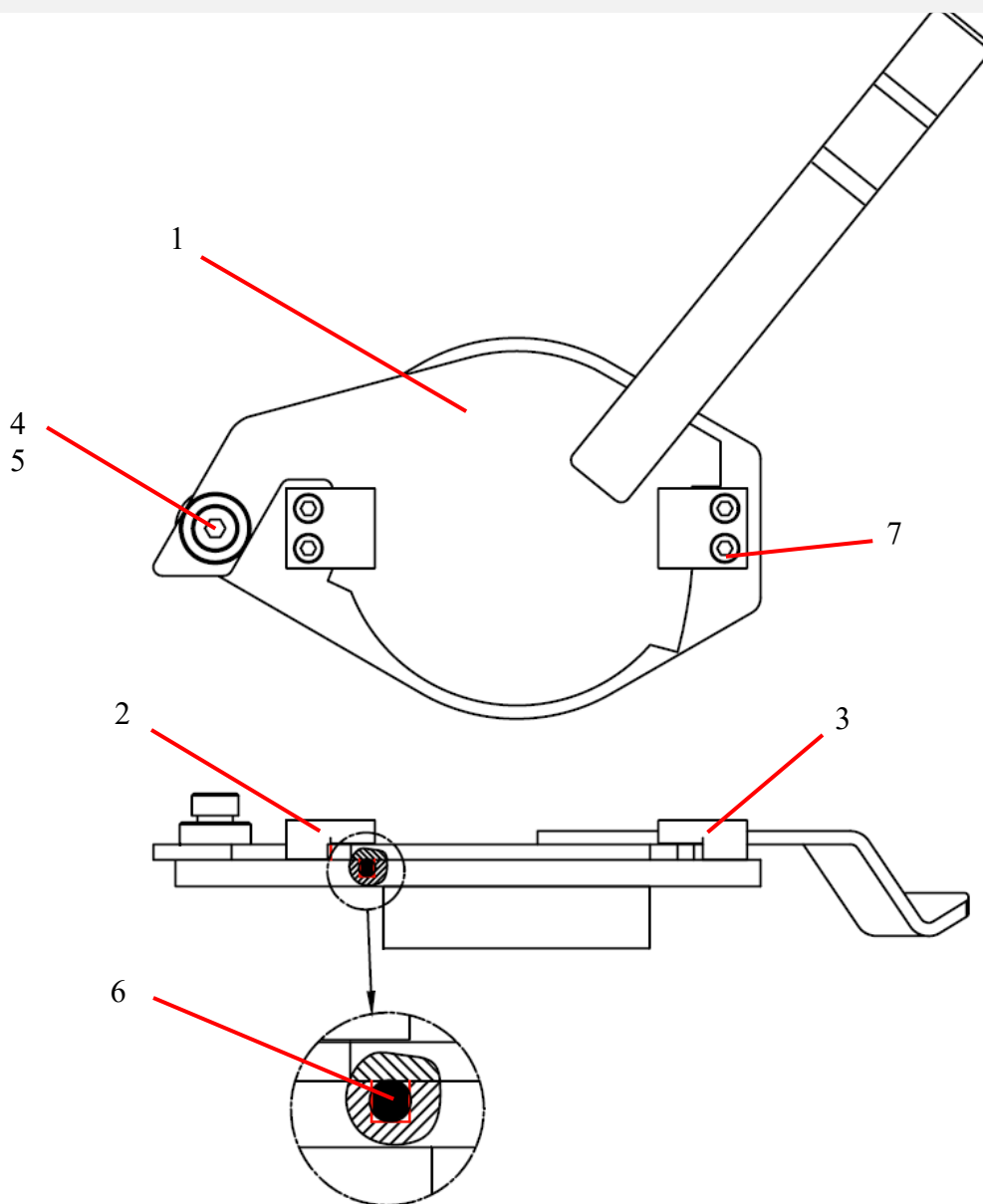
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GRATE ASSEMBLY



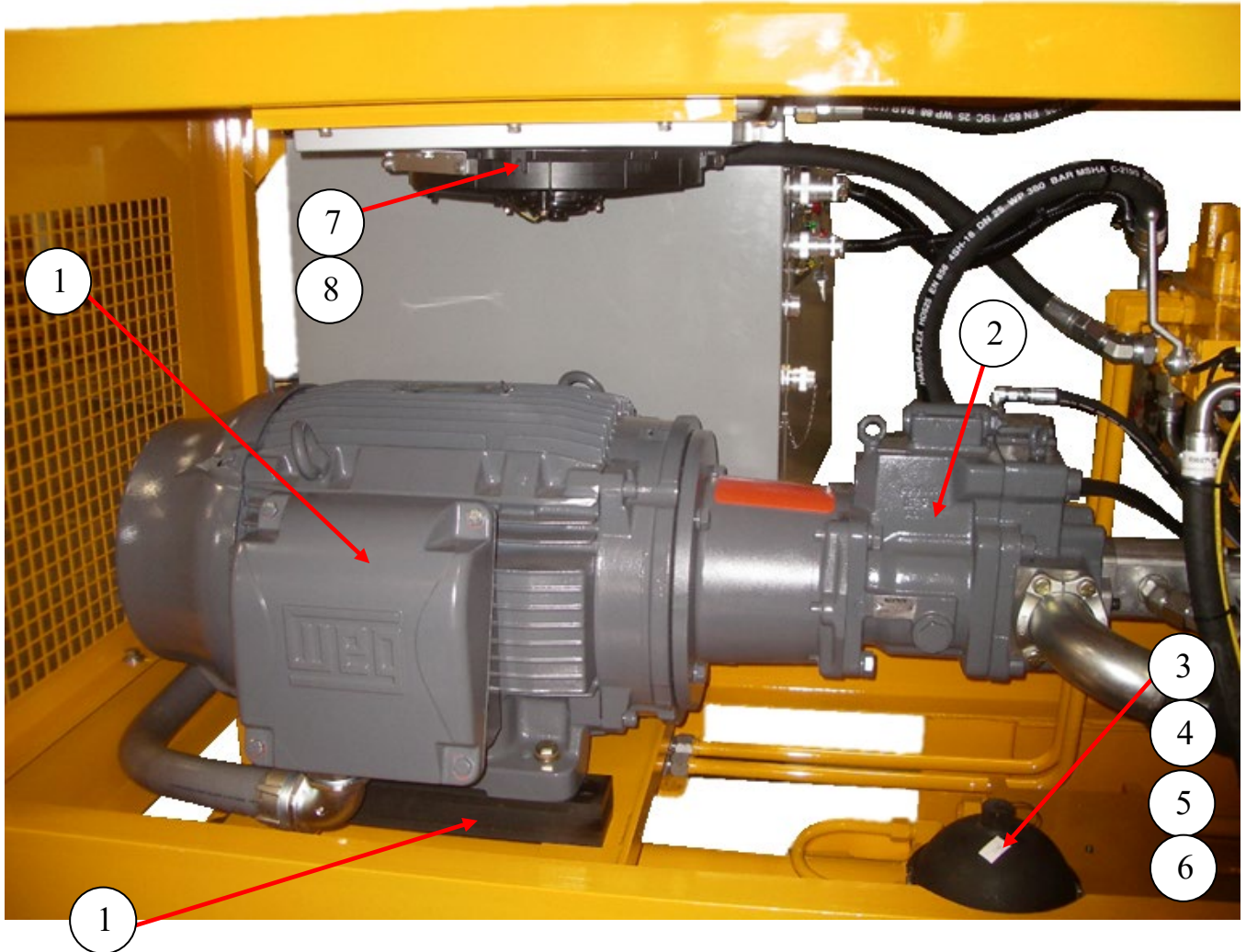
ID #	PART #	PART DESCRIPTION	QUANTITY	
1	87892	GRATE WELDMENT, STD HOPPER	1	EA
2	87857	PIN WELDMENT LONG	1	EA
3	87858	PIN WELDMENT SHORT	1	EA
4	86083	BUMPER, HOPPER GRATE	2	EA
5	W-102490	RUBBER BUFFER 65X22.5X26	2	EA
6	87769	COLLAR SHAFT, 7/8" DIA	1	EA

CLEAN OUT DOOR ASSEMBLY



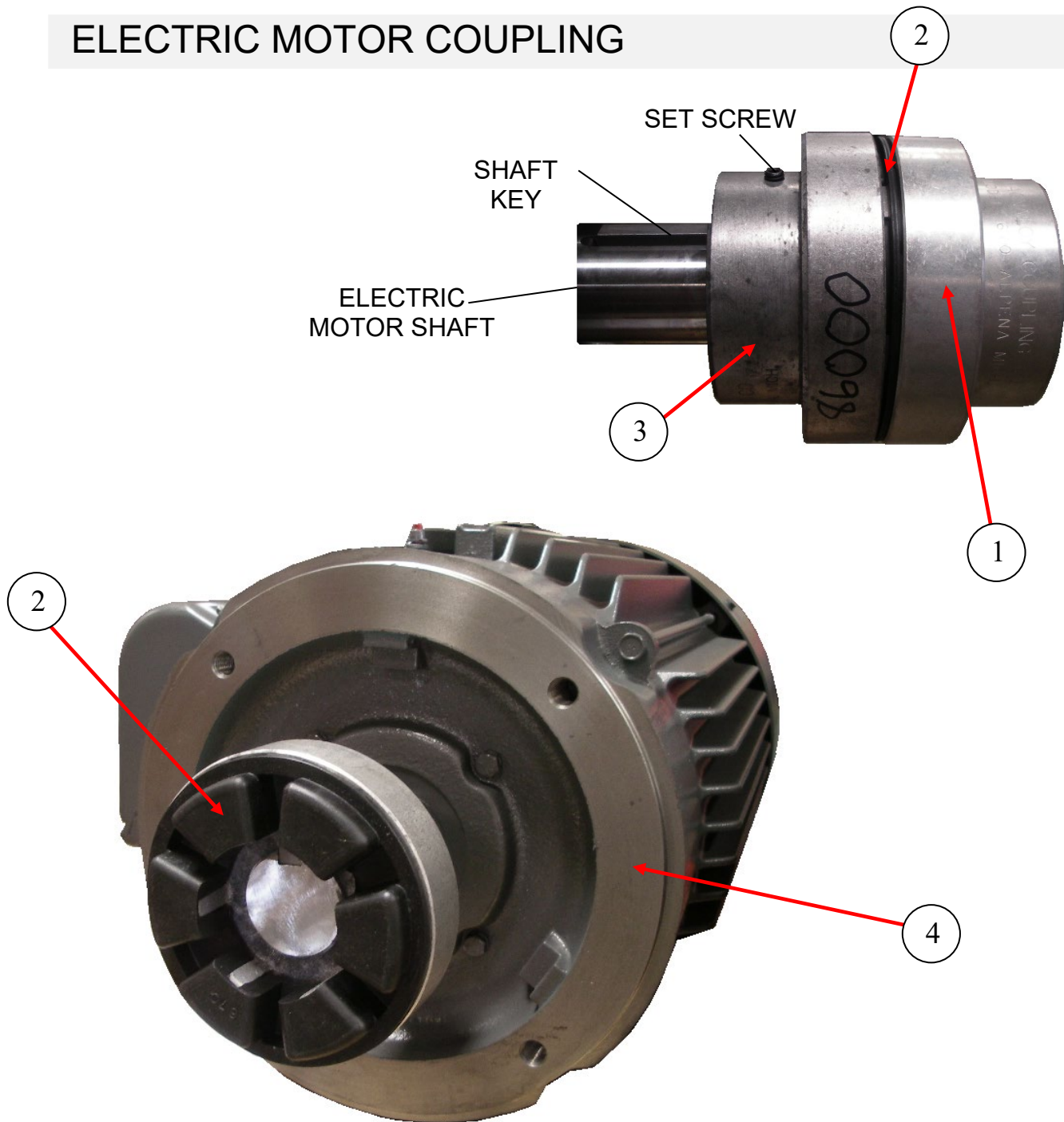
ID #	PART #	PART DESCRIPTION	QUANTITY	
	86542	CLEAN OUT DOOR WELDMENT PARTS KIT	REF	
1	86988	DOOR WELDMENT, CLEAN OUT	1	EA
2	86559	BLOCK, CLEAN OUT DOOR, LH	1	EA
3	86560	BLOCK, CLEAN OUT DOOR, RH	1	EA
4		SHOULDER SCREW 1" DIA-1 1/4"	1	EA
5	85367	BOSS, CLEAN OUT DOOR	1	EA
6	W-102908A	O-RING CORD, HOPPER DOOR	2.21	FT
7		SHCS 1/2"-13 X 1 1/4"	4	EA

POWER TRAIN ELECTRIC MOTOR AND PUMP



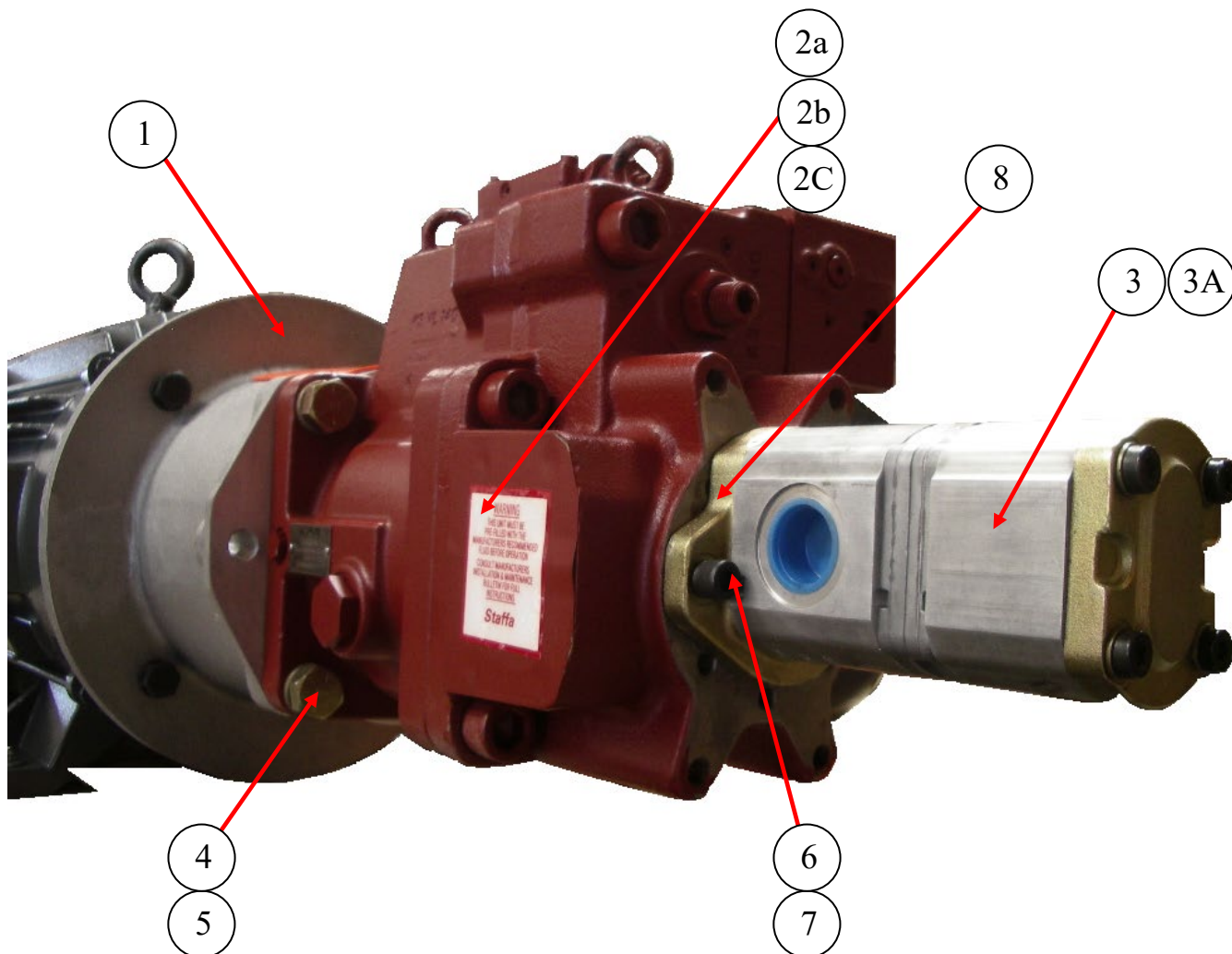
ID #	PART #	PART DESCRIPTION	QUANTITY	
	88027-7	POWER TRAIN ASSY B20 SKE	REF	REF
1	90055	MOTOR, 50HP, 575V,60HZ,3PH	1	EA
2	87153-001	PUMP, KAWASAKI, KV3L112,75HP	1	EA
3	71360	ACCUMULATOR	1	EA
4	73171	ACCUMULATOR BRK.W/CLOSING HARDWARE	1	EA
5	801028	GROMMET, ACCUMULATOR	1	EA
6	88748	BRACKET ACCUMULATOR MOUNT	1	EA
7	88749	BRACKET OIL COOLER MOUNT	1	
8	88968	HYD. OIL COOLER-ELECTRIC 120VAC	1	EA
9	86003	MOTOR MOUNTS	2	EA

ELECTRIC MOTOR COUPLING



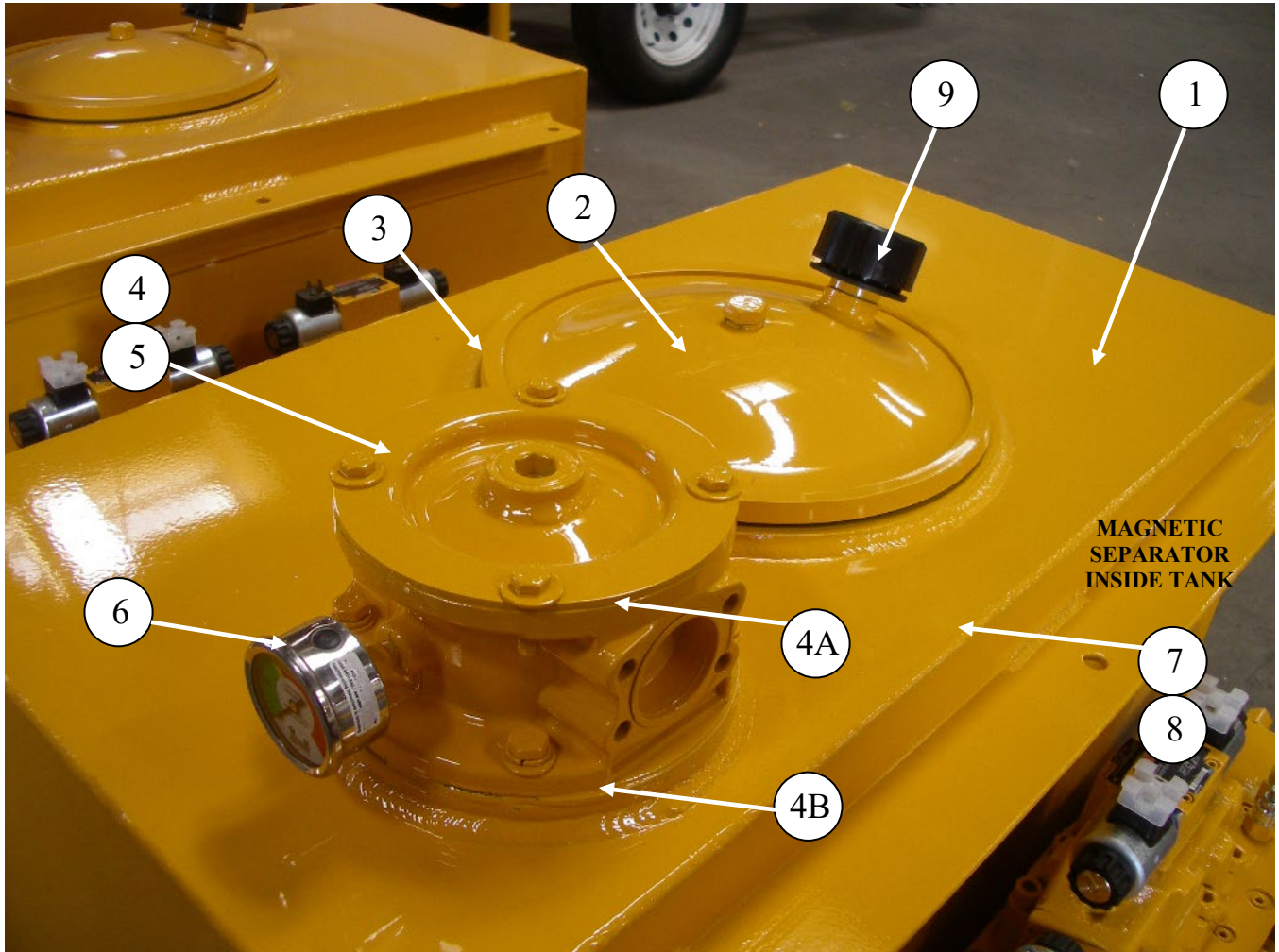
ID #	PART #	PART DESCRIPTION	QUANTITY	
1	88450	COUPLING HALF, SPLINE SAE C, 14 TH 12/24	1	EA
2	86002	COUPLING SPIDER, L190-NBR (USE P/N 87041)	1	EA
3	86000	COUPLING HALF, L190-2 1/2X1/2 (USE P/N 87039)	1	EA
4	90055	MOTOR, 50HP, 575V, 60HZ, 3PH	REF	EA

HYDRAULIC PUMP, GEAR BOX DETAIL



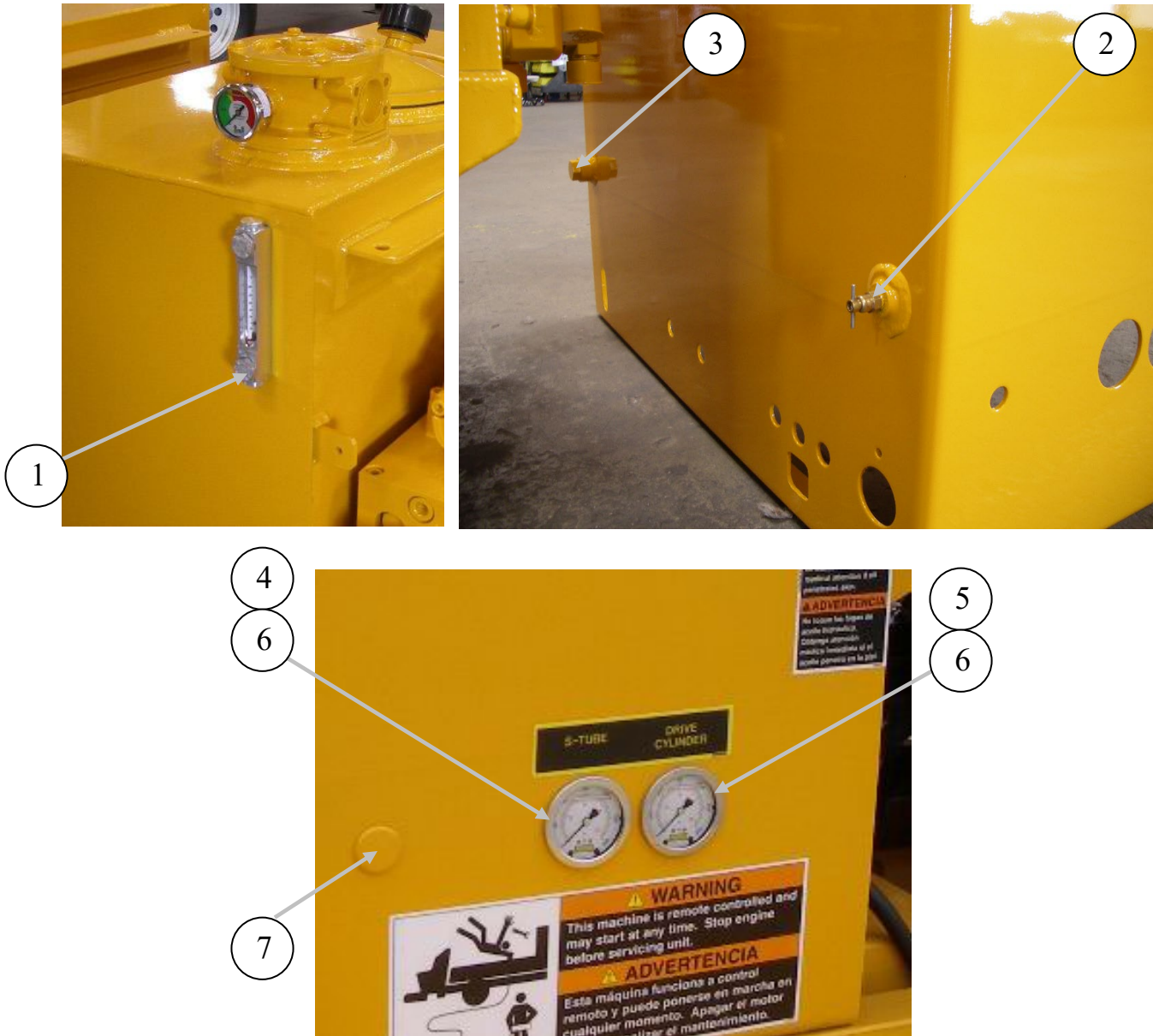
ID #	PART #	PART DESCRIPTION	QUANTITY	
1	87948	PUMP ADAPTER- FRAME 324/405TC X SAE-D	1	EA
2a	79560-K	PUMP, KAWASAKI, K3VL80, 62HP	REF	
2b	85124-004	PUMP, KAWASAKI, KV3L112,75HP	REF	
2c	85124-007	PUMP, PARKER, P2105	REF	
3	87153-001	PUMP-RH-DBLE GEAR, 11.3/8.2 CC BOSCH	1	EA
3A	88028	COUPLING, 13 TEETH 8/16 SAE-D	1	EA
4		3/4-2" BOLT	4	EA
5		3/4 LOCK WASHER	4	EA
6		M10 X 30 SHCS	2	EA
7		10MM HI COLLAR LOCK WASHER	2	EA
8	88174	O-RING	1	EA

HYDRAULIC TANK ASSEMBLY



ID #	PART #	PART DESCRIPTION	QUANTITY	
	85361	HYD TANK ASSY B-SERIES	1	EA
1	85102	HYDRAULIC TANK WELDMNT, B-SERIES	1	EA
2	85529	ENDCOVER KIT, 12 IN W/DRAIN	1	EA
3	85867	GASKET- END COVER 12"	1	EA
4	85282	FILTER, RETURN, TANK MOUNTED	1	EA
4A	BW10241	SEAL KIT FOR 85282 FILTER RETURNS	1	EA
4B	85282-G	GASKET-CORK	1	EA
5	85283	FILTER ELEMENT, PN 85282 FILTER	1	EA
6	85575	GAUGE, PN 85282 RETURN FILTER	1	EA
7	79247	MAGNETIC SEPERATOR 1 1/4 " NPT	1	EA
8	800230	MAGNETIC SEPARATOR, 3"NPT	1	EA
9	85537	FILLER BREATHER, 3/4 NPT	1	EA

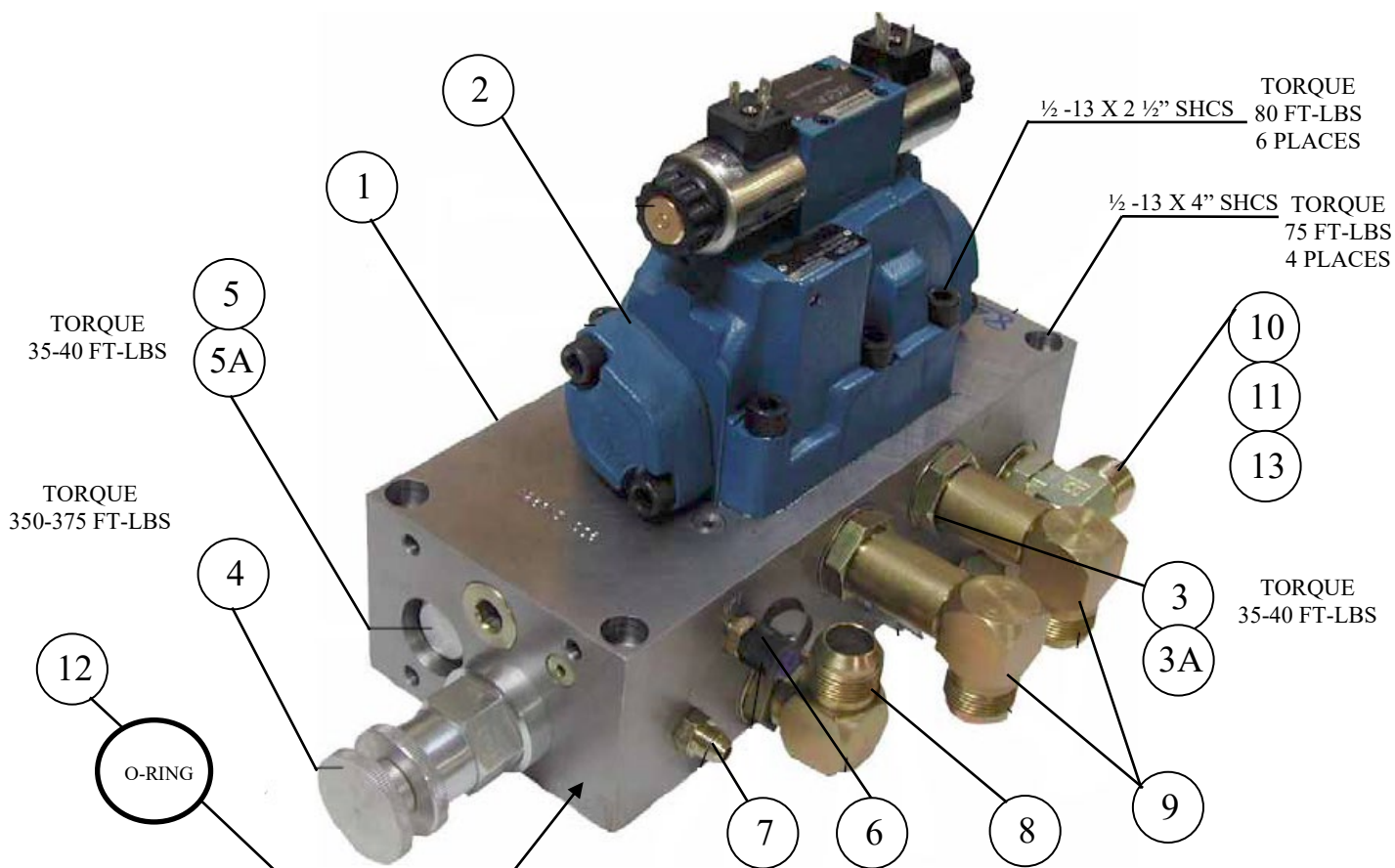
HYDRAULIC ASSEMBLY CONTINUE



ID #	PART #	PART DESCRIPTION	QUANTITY	
1	74509	GAUGE-SIGHT/TEMPERATURE	1	EA
2	801025	DRAIN COCK, 1/4 NPT	1	EA
3	BG-12	3/4" SAE PLUG	1	EA
4	70366	PRESSURE GAUGE, 3000 PSI/BAR	1	EA
5	74562	PRESSURE GAUGE, 6000 PSI/BAR	1	EA
6	78594	MINICHECK GAUGE ADAPTOR, 1/4 NPT	2	EA
7		HOFFMAN PLUG	1	A/R

MANIFOLDS

DRIVE CYLINDER CIRCUIT MANIFOLD ASSEMBLY



ID #	PART #	PART DESCRIPTION	QUANTITY	
	85248-M	MANIFOLD, CYLINDER CIRCUIT ASSEMBLY	1	EA
1	86820	MANIFOLD, MACHINED CYLINDER CIRCUIT	1	EA
2	85689	SOLENOID VALVE, DRIVE CYLINDER	1	EA
3	85696	RELIEF VALVE CARTRIDGE	1	EA
3A	85696-SK	SEAL KIT		
4	86952-003	MOTORIZED FLOW CONTROL FOR B SER	1	EA
5	85698	CHECK VALVE CARTRIDGE	1	EA
5A	85698-SK	SEAL KIT		
6	78593	MINICHECK ADAPTOR, SAE 4	1	EA
7	86900-002	ADAPTOR, MB-MJ-4-6	1	EA
8	86728-023	ELBOW, MB-MJ45-16-16	1	EA
9	86904-012	ELBOW, MB-MJ90LL-16-16	2	EA
10	86945-001	TEE, MJ-MB-MJT-16	1	EA
11	86905-016	ELBOW, MJ-FJX90-16-16	1	EA
12	86946	O-RING #230 BUNA 90DUR	1	EA
13	86948-001	REDUCER, JIC MJ-FJ-10-16	1	EA

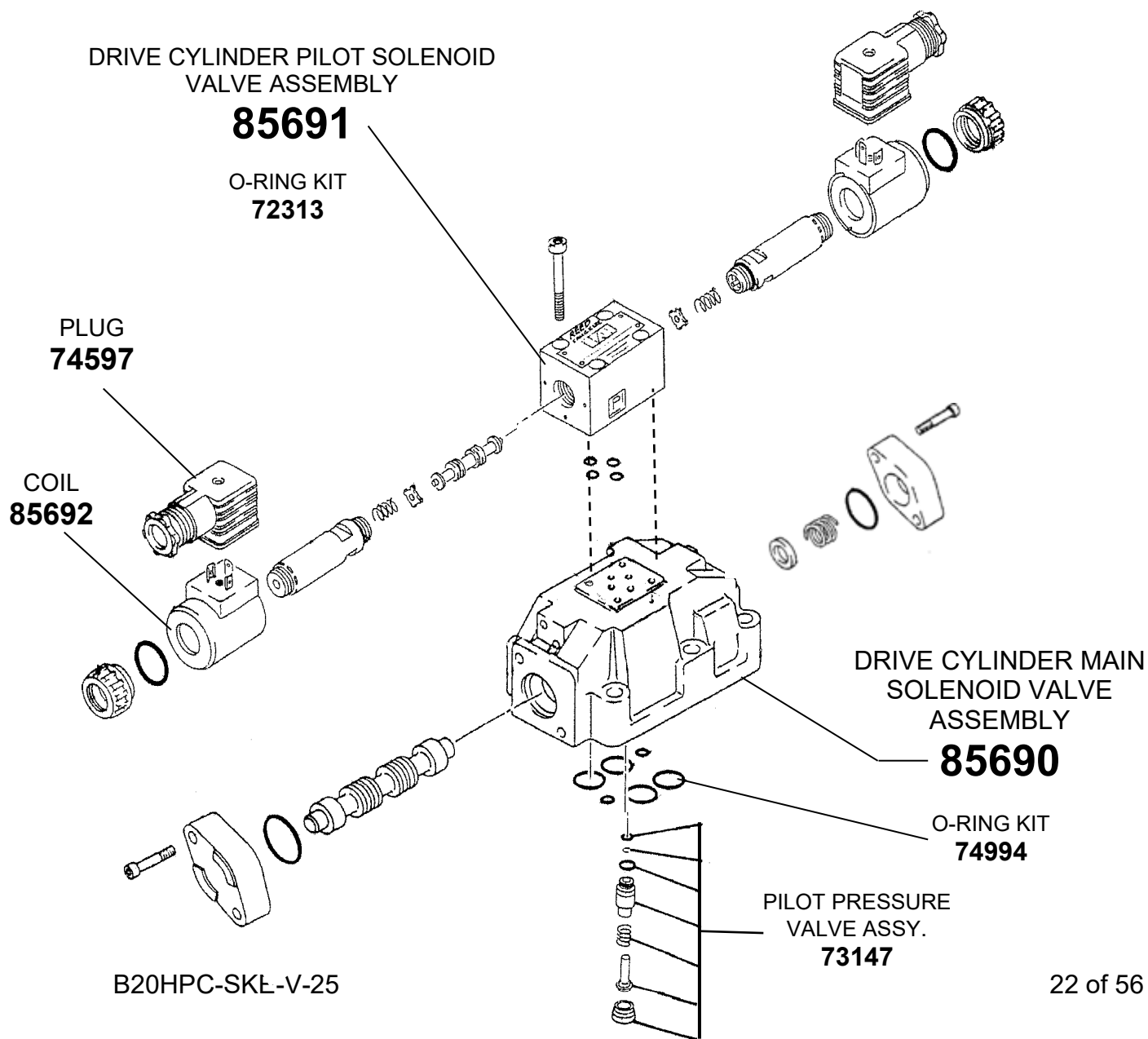
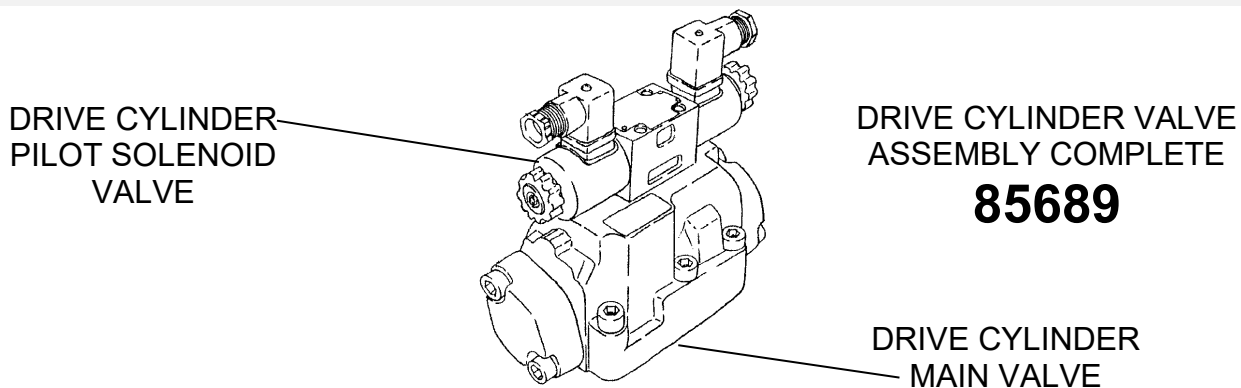


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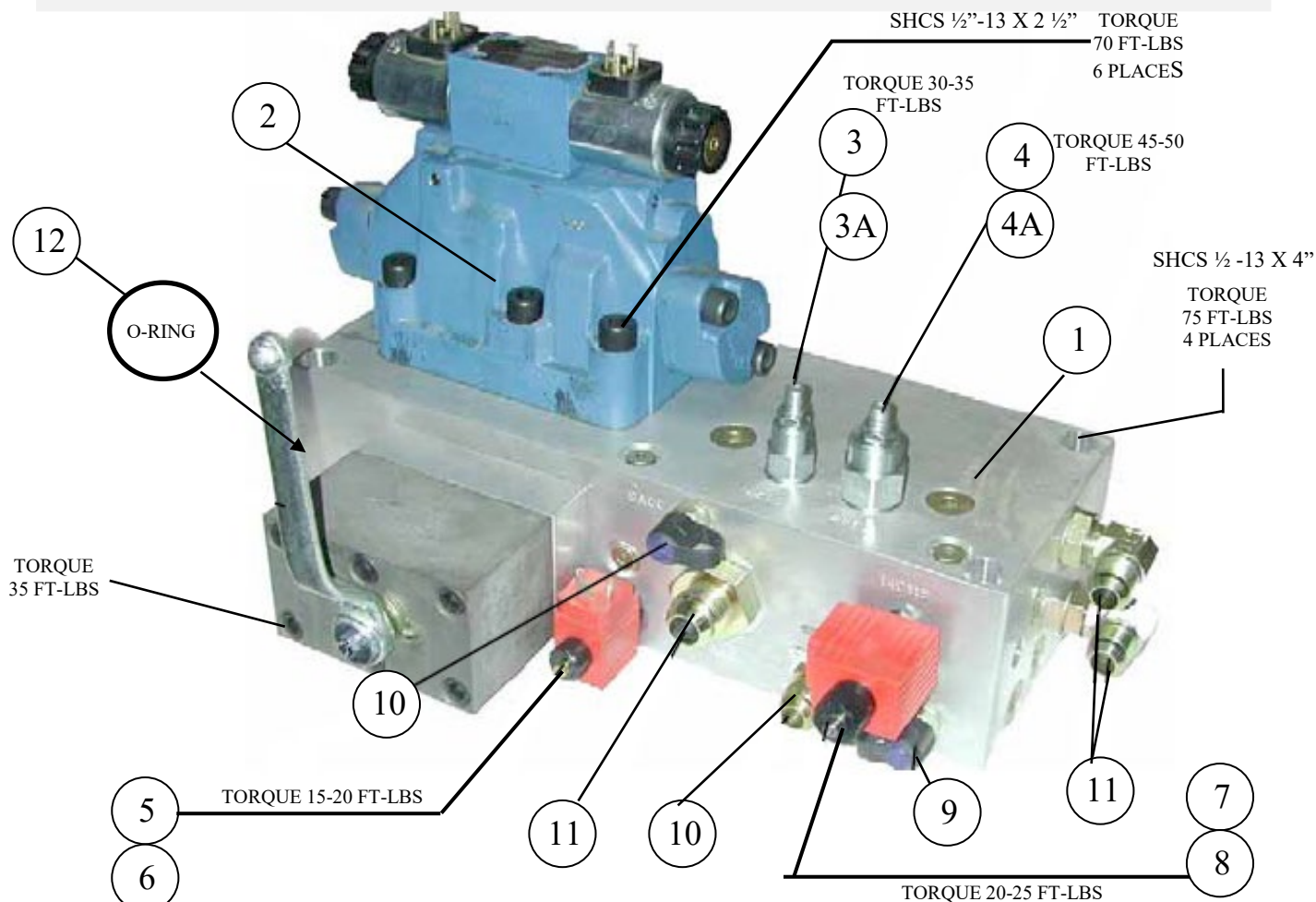
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DRIVE CYLINDER CIRCUIT MANIFOLD ASSEMBLY CONT.



S-TUBE CIRCUIT MANIFOLD ASSEMBLY



ID #	PART #	PART DESCRIPTION	QUANTITY	
	85249	MANIFOLD, S-TUBE CIRCUIT ASSEMBLY		
1	86821	MANIFOLD, MACHINED S-TUBE CIRCUIT	1	EA
2	85693	SOLENOID VALVE, S-TUBE SHIFT	1	EA
3	85704	UNLOADER VALVE CARTRIDGE, (QCDB)	1	EA
3A	85704-SK	SEAL KIT		
4	85703	RELIEF VALVE CARTRIDGE, (RVEA)	1	EA
4A	85703-SK	SEAL KIT		
5	87246	SOLENOID VALVE CARTRIDGE, (12CHS)	1	EA
6	87247	COIL, 12VDC,	1	EA
7	87248	SOLENOID VALVE CARTRIDGE, (14CHS)	1	EA
8	87249	COIL, 12V DC FOR PN-87248	1	EA
9	78593	MINICHECK ADAPTOR, SAE	2	EA
10	86728-014	ELBOW, MB-MJ90-10-10	2	EA
11	86900-027	ADAPTOR, MB-MJ-16-12	1	EA
12	86946	O-RING #230 BUNA 90DUR	1	EA



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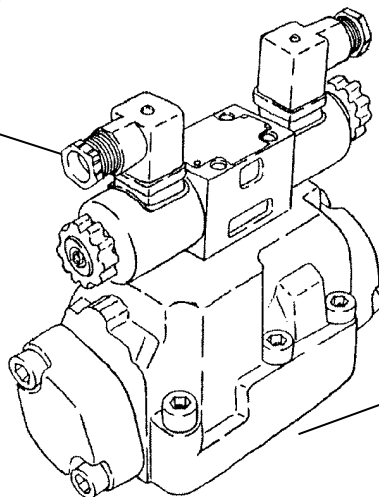
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S-TUBE CIRCUIT MANIFOLD ASSEMBLY CONT.

S-TUBE PILOT
SOLENOID
VALVE

SWING TUBE VALVE
ASSEMBLY COMPLETE

85693



S-TUBE MAIN
VALVE

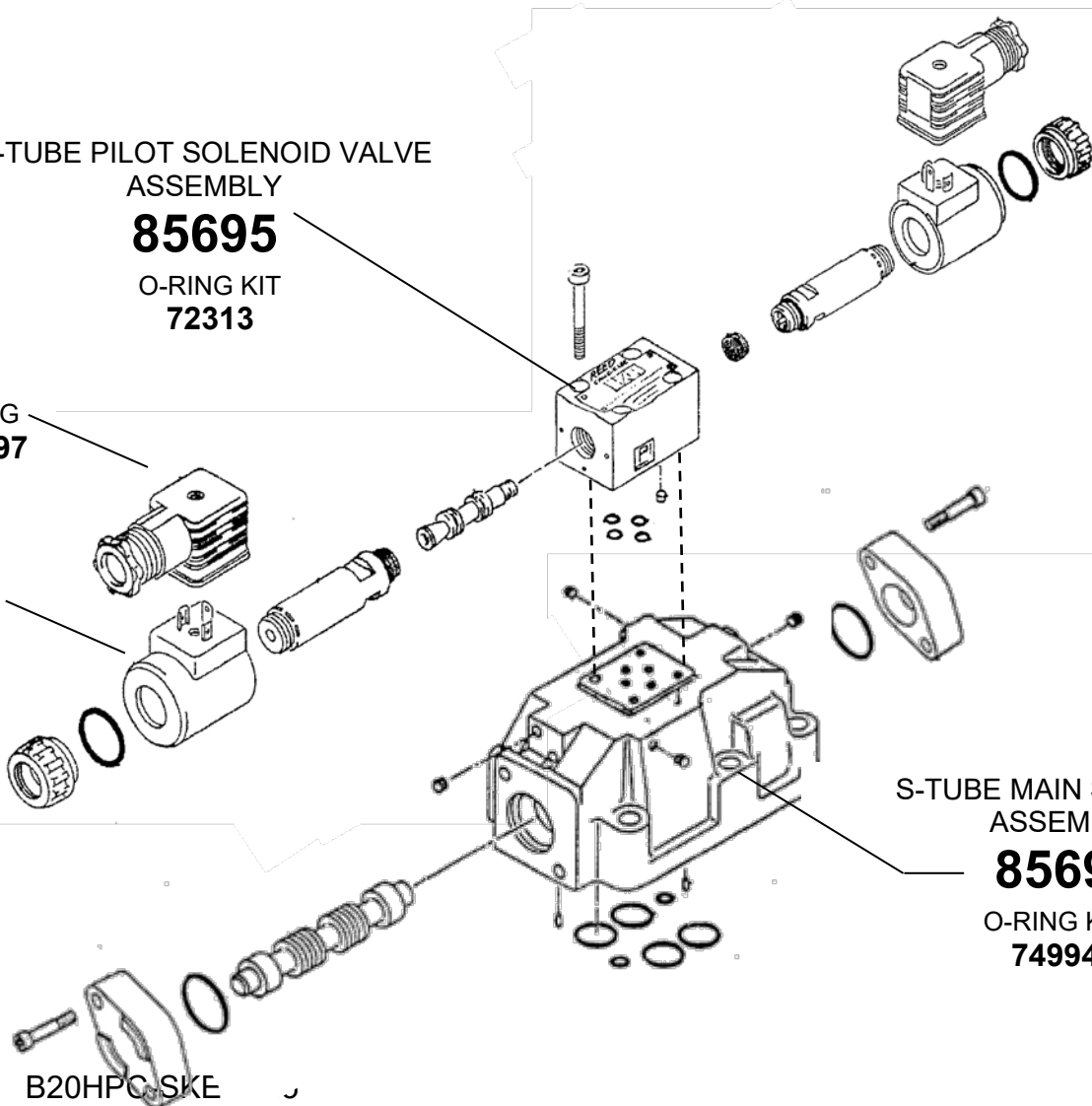
S-TUBE PILOT SOLENOID VALVE
ASSEMBLY

85695

O-RING KIT
72313

PLUG
74597

COIL
85692



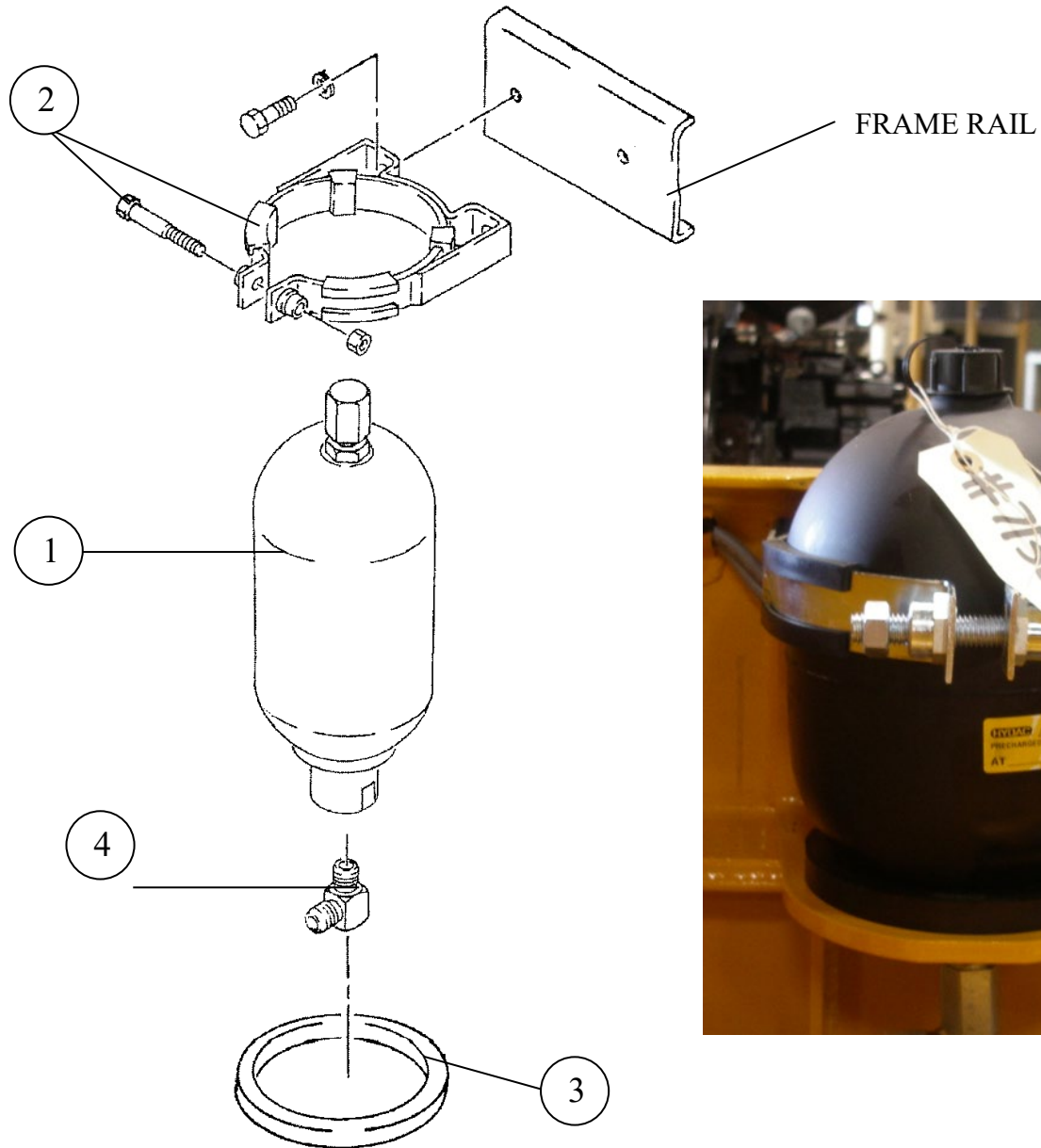
S-TUBE MAIN SOLENOID
ASSEMBLY

85694

O-RING KIT
74994

B20HPC-SKE

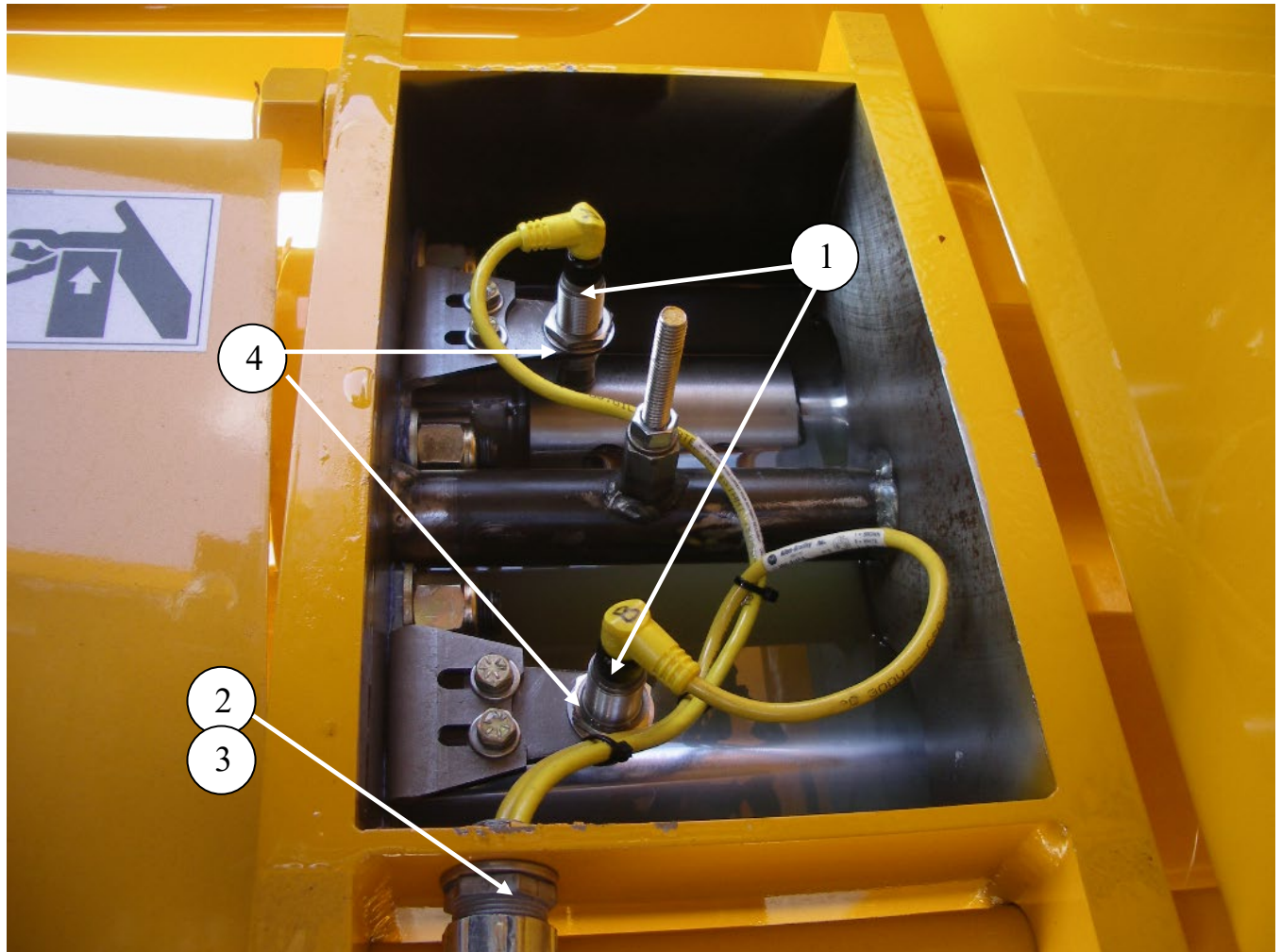
ACCUMULATOR ASSEMBLY



ID #	PART #	PART DESCRIPTION	QUANTITY	
1	71360	ACCUMULATOR	1	EA
2	73171	ACCUMULATOR BKT.W/CLOSING HARDWARE	1	EA
3	801028	GROMMET, ACCUMULATOR	1	EA
4	86728-019	ELBOW, MB-MJ90-12-12	1	EA

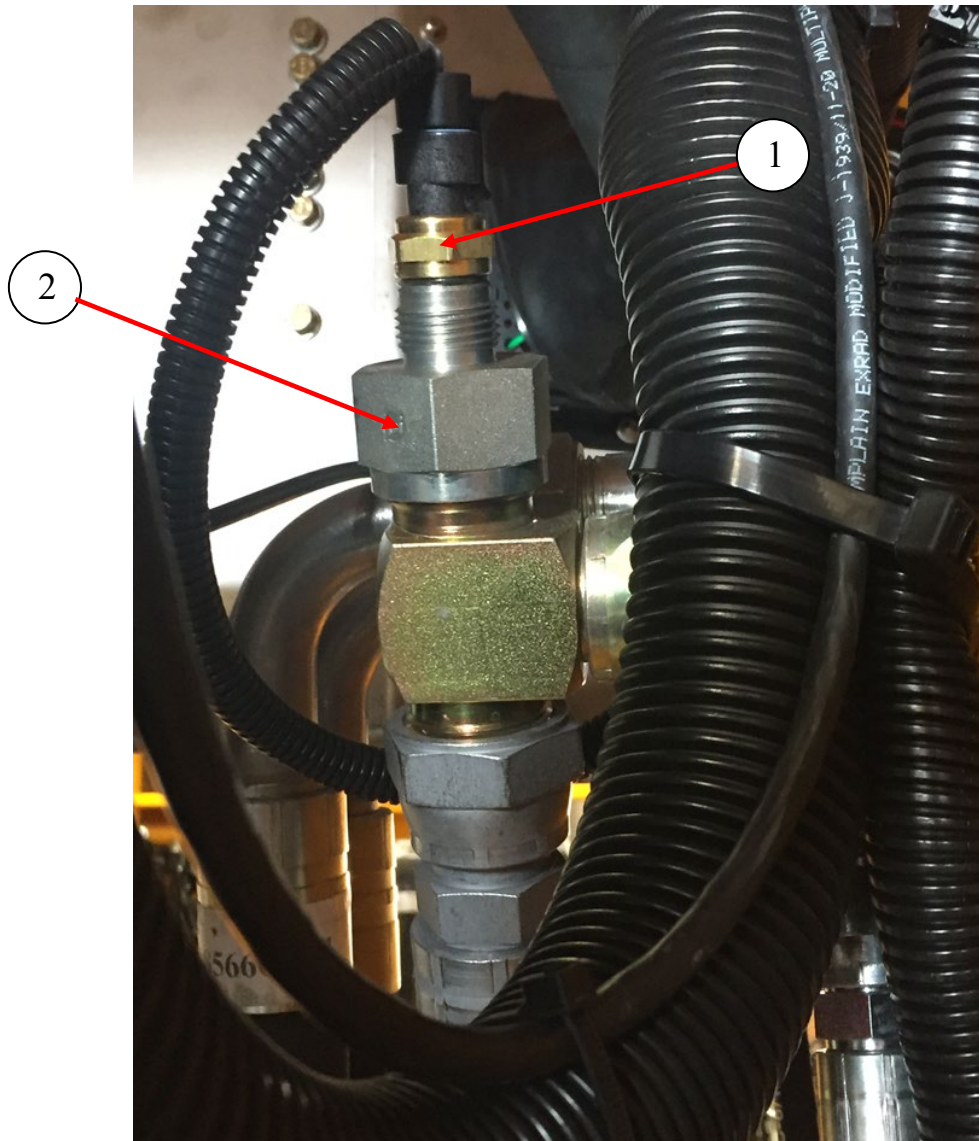
ELECTRICAL GROUP

PROXIMITY SWITCHES



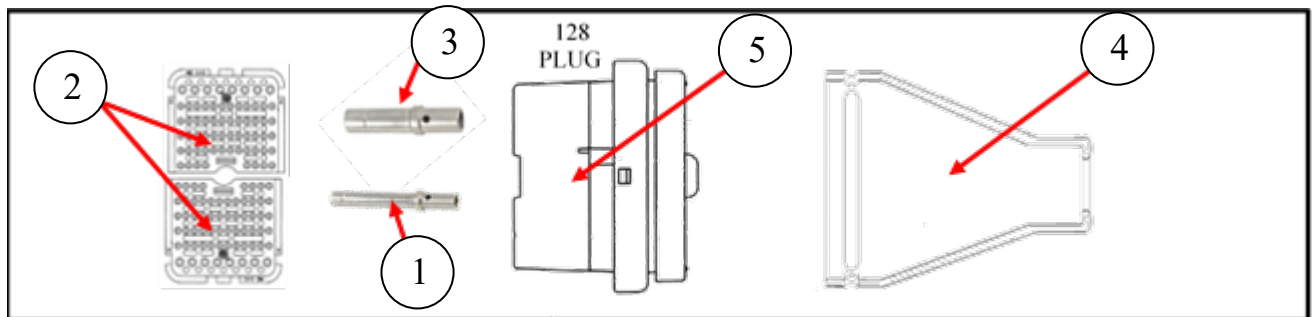
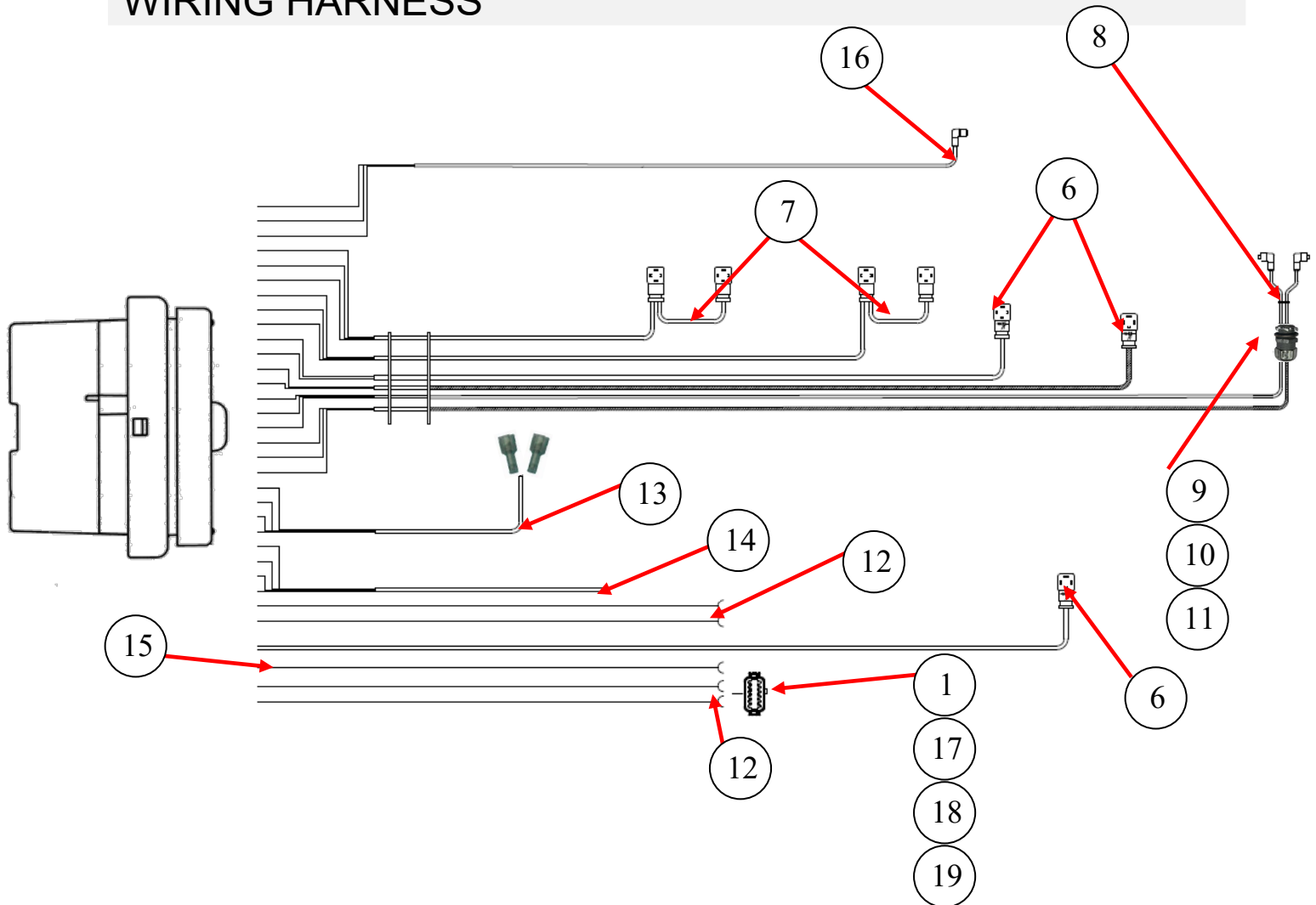
ID #	PART #	PART DESCRIPTION	QUANTITY	
1	77990	CABLE, PROXIMITY SWITCH	2	EA
2	10522	STRAIN RELIEF	1	EA
3	10528	NUT ½" BONDING TYPE LOCK	1	EA
4	77998	PROXIMITY SENSOR NPN	2	EA

TEMPERTURE SENSOR



ID #	PART #	PART DESCRIPTION	QUANTITY	
1	89279	SENSOR TEMPERTURE FOR TIER4 CUMMINS	1	EA
2	89633	ADAPTER TEMP SENSOR FOR 89279	1	EA

WIRING HARNESS



ENGINE HARNESS SIDE



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PARTS

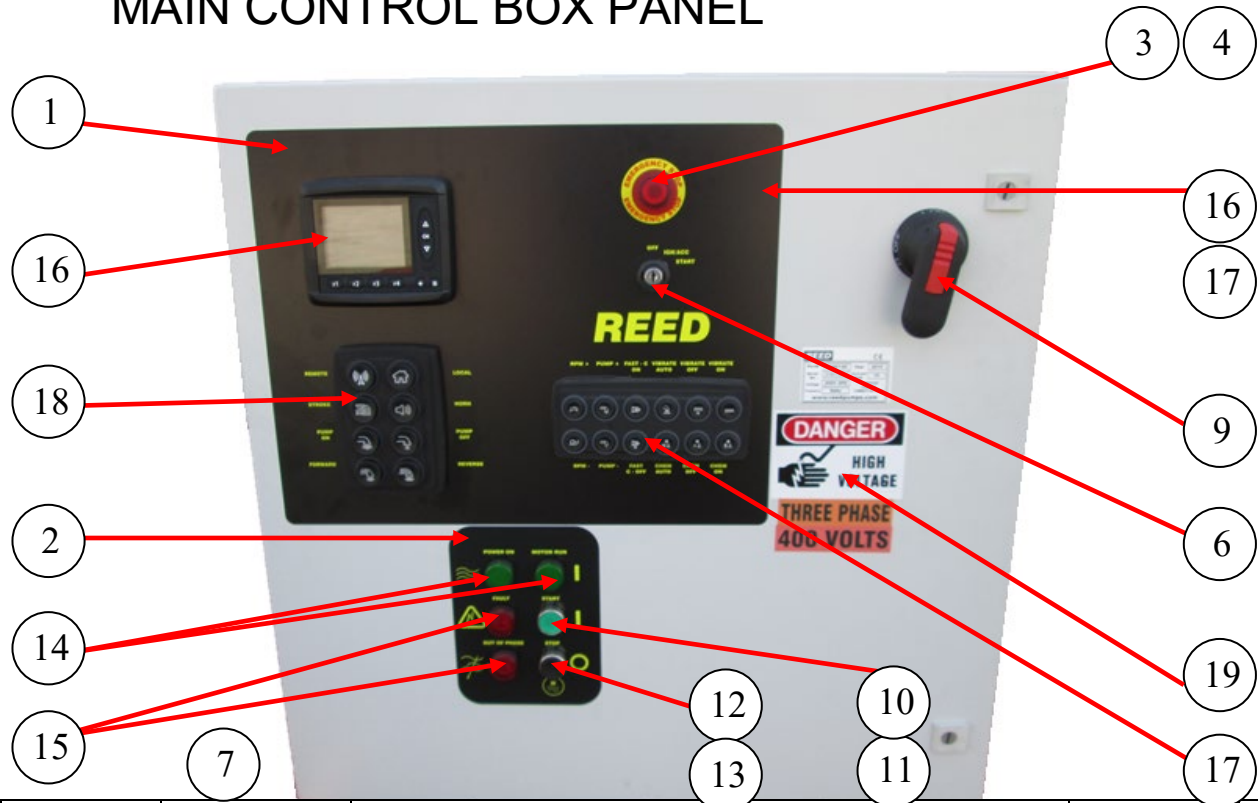
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WIRING HARNESS

ID #	PART #	PART DESCRIPTION	QUANTITY	
	89498	WIRING HARNESS B SER PLC, ELECTRIC	REF	
1	BW10147	CONTACT SOCKET SIZE 16	35	EA
2	89116	DEUTSCH WEDGE FOR 89109	2	EA
3	87457	PIN FOR 87456 PLUG	15	
4	89109-B	BOOT FOR 89109,89157	1	
5	89157	DEUTSCH RECEPTACLE 128 CONTACT	1	EA
6	87540	CABLE SOLENOID	3	EA
7	88243	CABLE WITH 2 DIN PLUGS 5M	2	EA
8	77990	CABLE, PROXIMITY SWITCH	3	EA
9	10522	STRAIN RELIEF	1	EA
10	10528	NUT 1/2" BONDING TYPE LOCK	1	FT
11	30240	GASKET-LIQUID 1/2"	1	FT
12	85615	CABLE, 14AWG-2C, PVC-GRY	6.5	EA
13	85617	CABLE, 14AWG-4C, PVC-GRY	8.1	FT
14	85619	CABLE,16AWG-4C, PVC-GRY	9	EA
15	20169	CABLE, 18AWG-3C PVC BLACK	10	FT
16	88678	HOPPER GRATE CABLE (SHIELDED)	1	FT
17	89103	DEUTSCH DT04 BUS, 2X6	1	EA
18	89104	DEUTSH DT06 PLUG, 2X6	1	EA
19	89105	DEUTSH WEDGE FOR 89104	1	EA

CONTROLS

MAIN CONTROL BOX PANEL



ID #	PART #	PART DESCRIPTION	QUANTITY	
	89965	CONTROL PANEL PLC. 50 HP 575V-/60HZ/3PH	REF	
1	89123	DECAL PLC CONTROL, ELECTRIC PUMPS	1	EA
2	89255	DECAL, START-STOP, ELECTRIC MOTOR	1	EA
3	89090	EMERGENCY STOPBUTTON HEAVY DUTY	1	EA
4	89090-L	ILLUMINATED E-STOP RING	1	EA
5	89090-C	DC/DC CONVERTER 12VDC TO 24VDC	1	EA
6	89004	KEY SWITCH SEALED	1	EA
7	85997-60B	BOX MACHINING WITH PLC	1	EA
8	88045	PANEL FOR 88044 ENCLOSURE	1	EA
9	89577	HANDLE FOR 88098-2 CIRCUIT BREAKERS	1	EA
10	88060	PUSHBUTTON GREEN	1	EA
11	88062	CONTACT BLOCK N.O. FOR 88060	1	EA
12	88061	PUSHBUTTON BLACK	1	EA
13	88063	CONTACT BLOCK N.C. FOR 88062	1	EA
14	88148	LIGHT GREEN 120VAC 22M	2	EA
15	88149	LIGHT RED 120VAC 22M	2	EA
16	88918	MD3, PARKER DISPLAY MODULE	1	EA
17	88978	KEYPAD 2X6 SWITCH, PROGRAMMABLE	1	EA
18	88979	KEYPAD 2X4 SWITCH, PROGRAMMABLE	1	EA
19	74306	DECAL, HIGH VOLTAGE	1	EA



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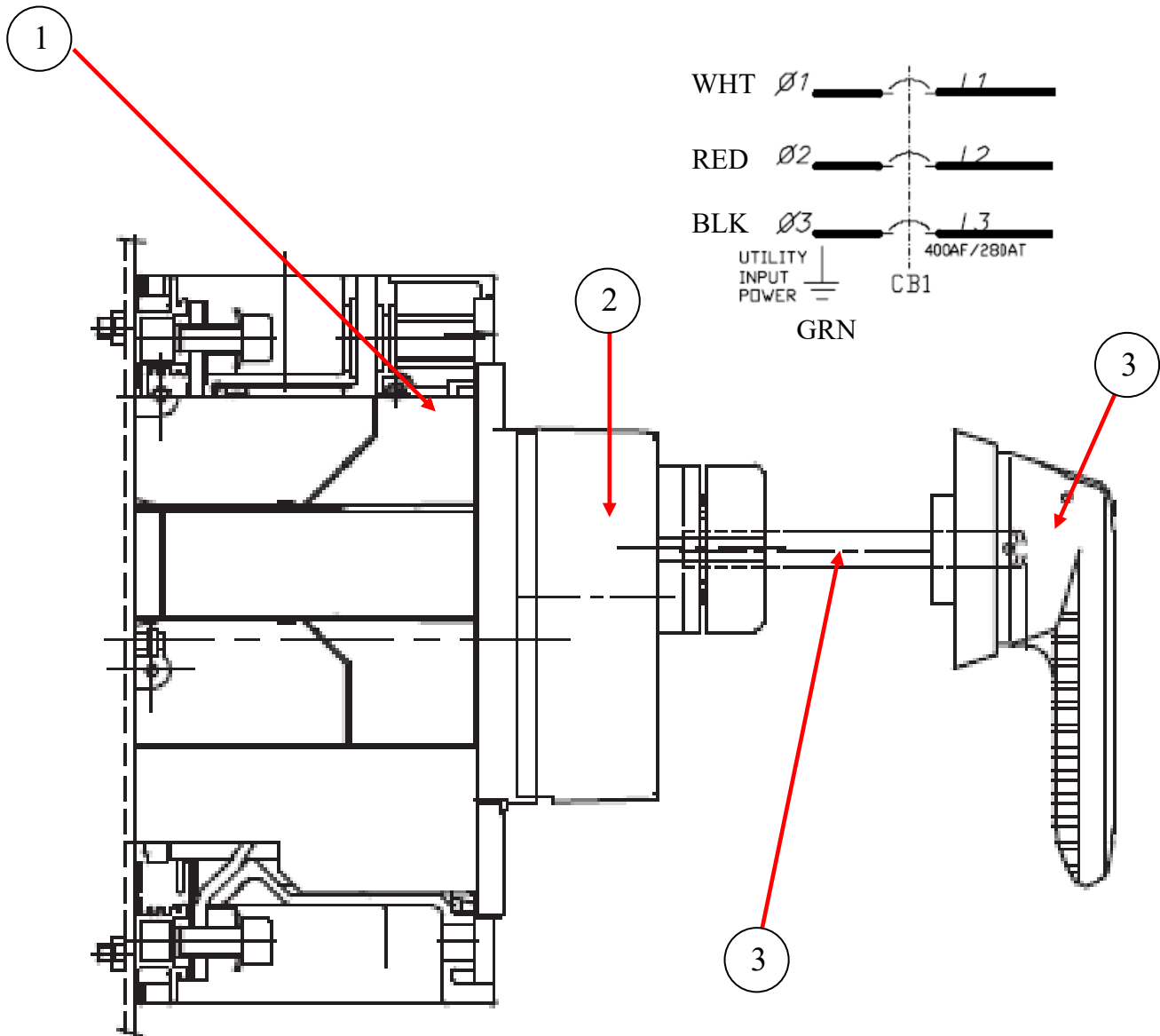
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12VDC-35 AMP POWER SUPPLY



ID #	PART #	PART DESCRIPTION	QUANTITY	
1	88059-2	POWER SUPPLY 12VDC 35 AMP (ACOPIAN) (PS1)	1	EA

MOTOR CIRCUIT BREAKER



ID #	PART #	PART DESCRIPTION	QUANTITY	
1	88098-22	CIRCUIT BREAKER 100 AMP 3 POLE LS/IU (CB1)	1	EA
2	89576	MECHANISM FOR CIRCUIT BREAKER	1	EA
3	88109	SHAFT FOR 88047 HANDLE	1	EA
4	89577	HANDLE CIRCUIT BREAKER	1	EA

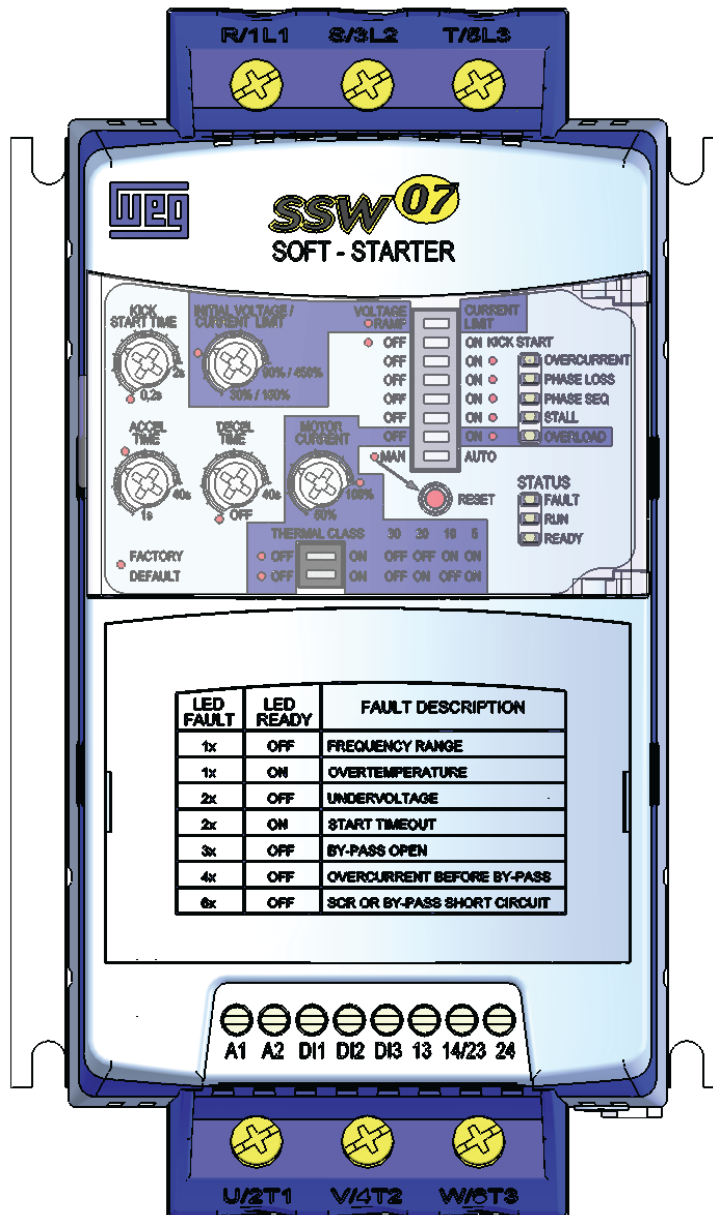


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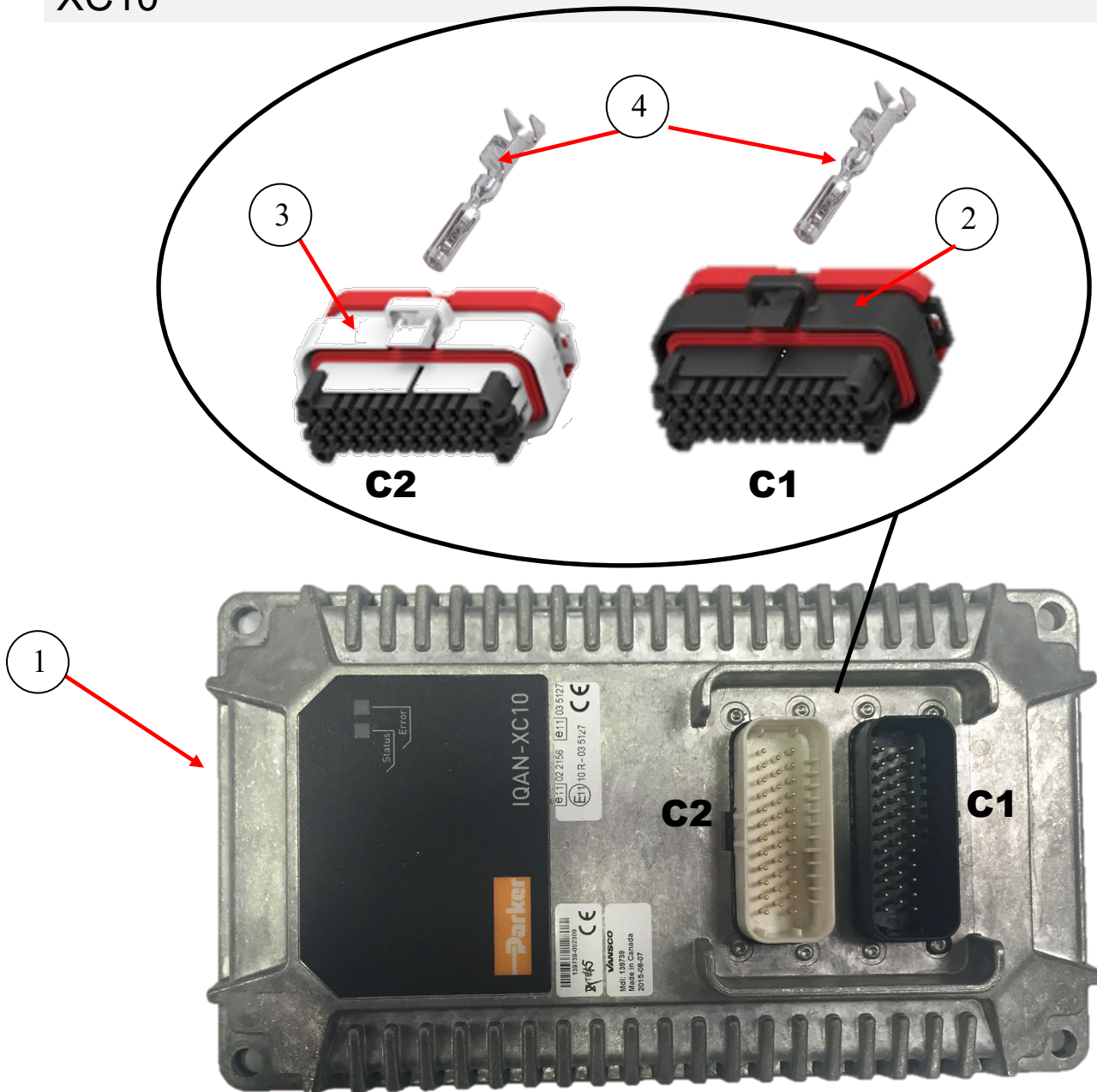
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SOFT START



ID #	PART #	PART DESCRIPTION	QUANTITY	
1	88437-1	SOFT START (SS1)	1	EA

XC10



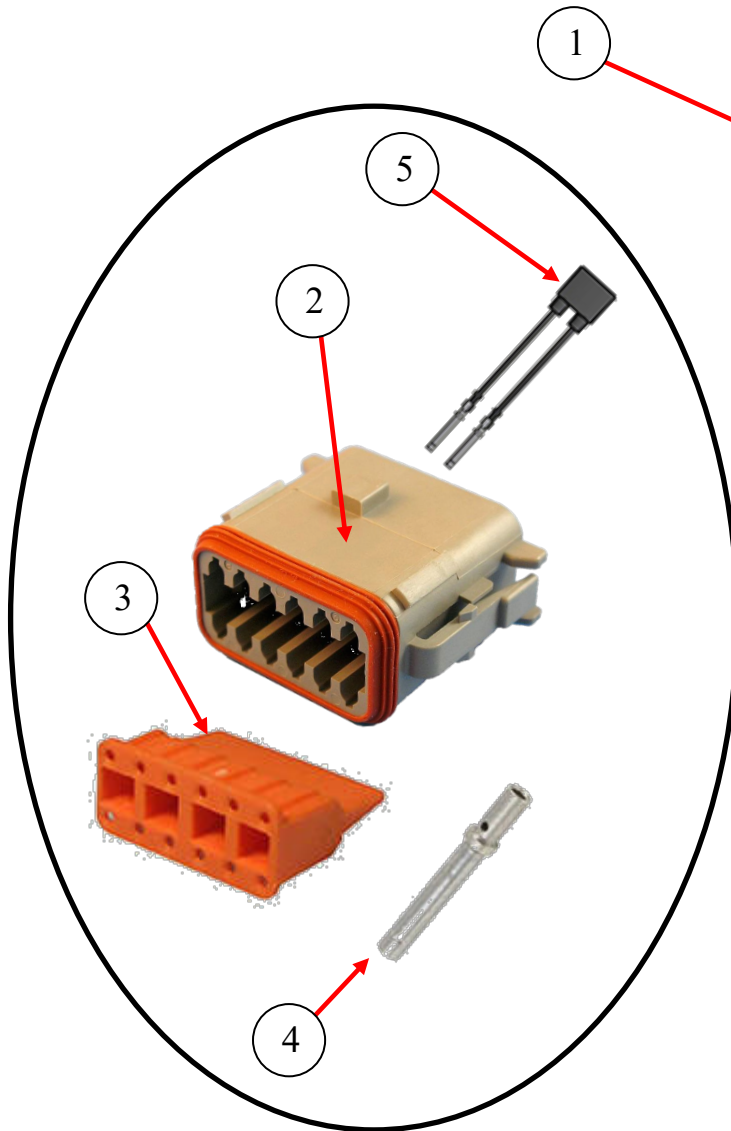
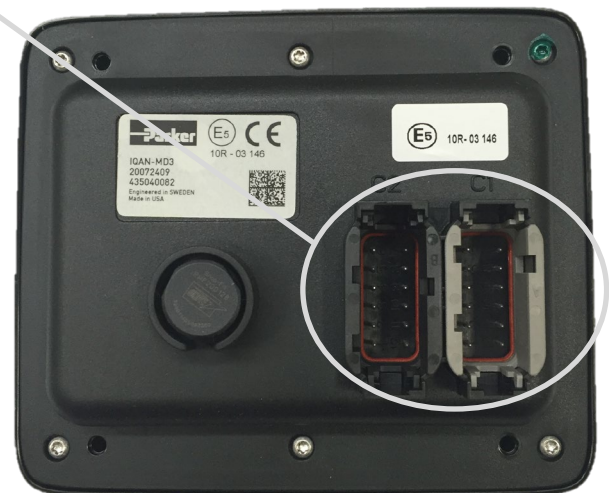
ID #	PART #	PART DESCRIPTION	QUANTITY	
1	88919	XC10, PARKER EXPANSION MODULE	1	EA
2	88945	AMP, 35 POS SEAL PLUG, BLACK (C1)	1	EA
3	88946	AMP, 35 POS SEAL PLUG, WHITE (C2)	1	EA
4	88945-S	AMP, CONTACT PIN (C1, C2)	38	EA

MD3 DISPLAY MODULE

FRONT

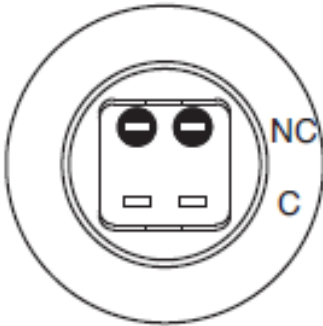


BACK

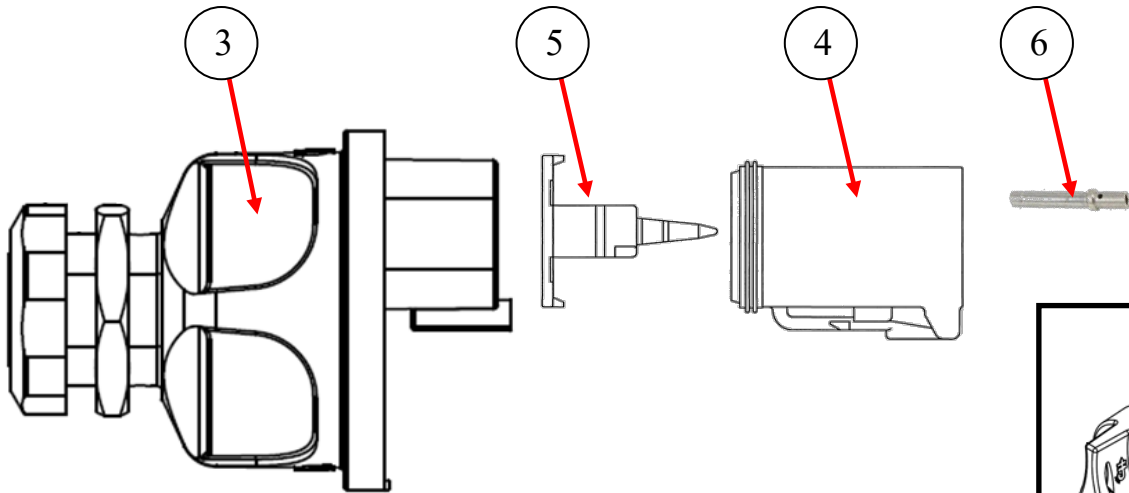
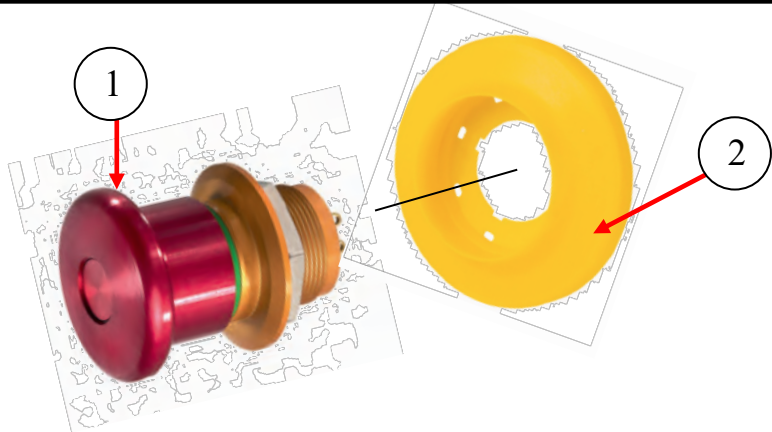


ID #	PART #	PART DESCRIPTION	QUANTITY	
1	88918	MD3, PARKER DISPLAY	1	EA
2	88653	PLUG DTM 12 WAY A KEY, GREY (C1)	1	EA
3	88653-2	WEDGELOCK DTM 12 WAY PLUG (C1)	1	EA
4	88959	CONTACT SOCKET SIZE 20 (7.5 AMP) (C1)	9	EA
5	89136	ADDRESS 3 IDTAG WITH DEUTSCH TERMINALS (1K OHM)	1	EA

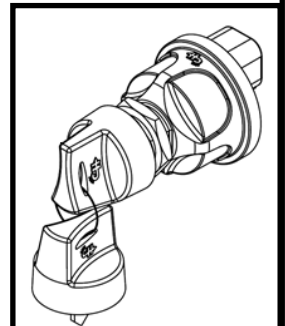
ESTOP, KEY ASSEMBLY, PLUGS



ESTOP ASSEMBLY



KEY ASSEMBLY



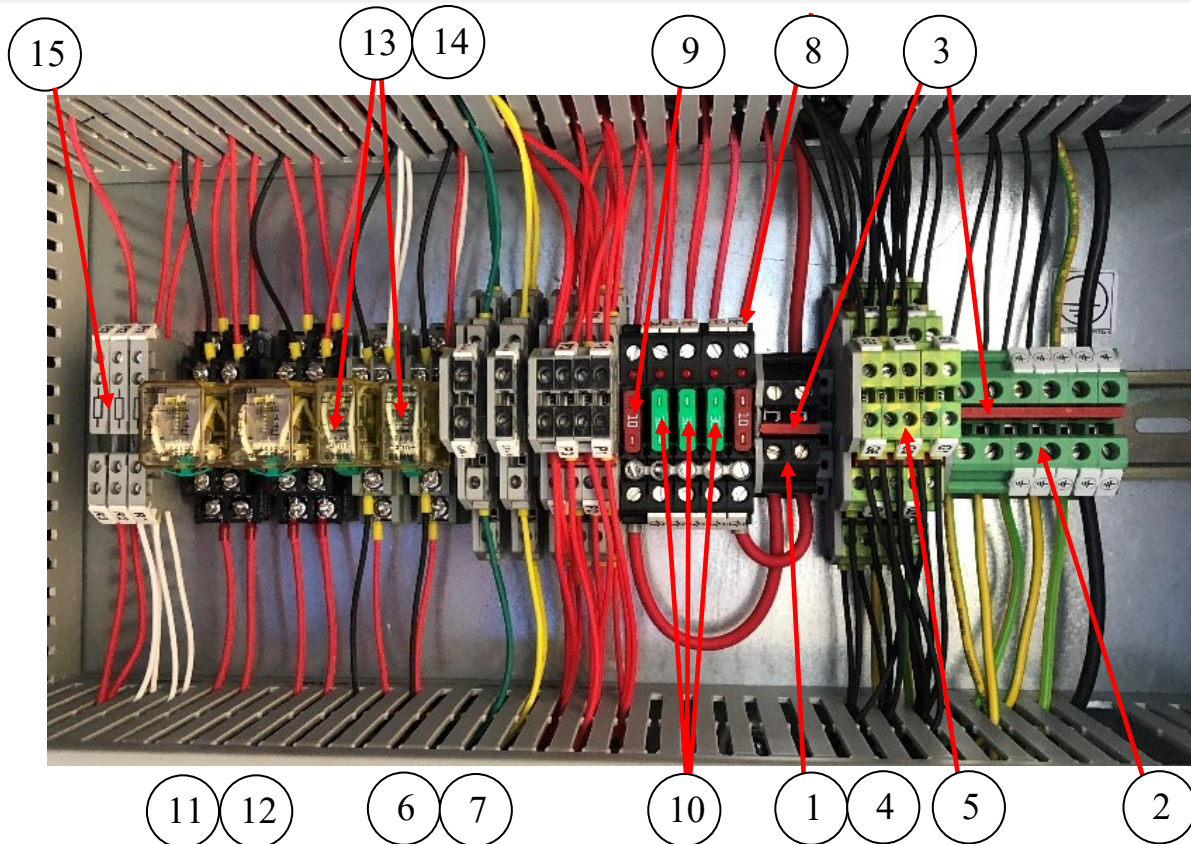
ID #	PART #	PART DESCRIPTION	QUANTITY	
1	89090	EMERGENCY STOP BUTTON HEAVY DUTY	1	REF
2	89090-L	ILLUMINATED E-STOP RING	1	REF
3	89004	KEY SWITCH SEALED	1	REF
4	89107	DEUSCH DT06, 1X6	1	QTY
5	89108	DEUTSCH WEDGE LOCK FOR 89107	1	QTY
6	BW10147	DEUTSCH CONTACT SOCKET, 16AWG	6	QTY



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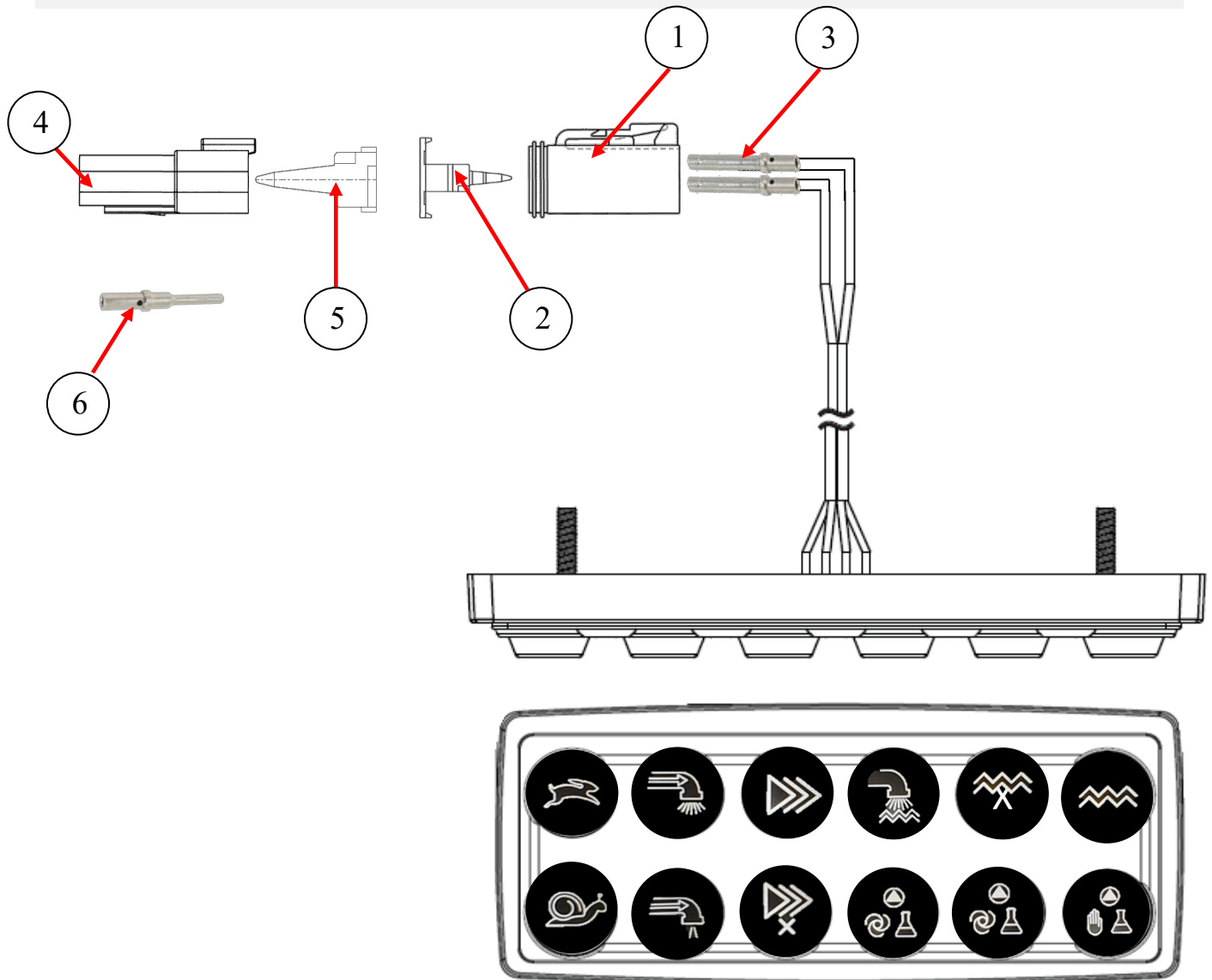
PARTS

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ID #	PART #	PART DESCRIPTION	QUANTITY	
1	89937	TERMINAL BLOCK, 2 POSITIONS	2	EA
2	89938	TERMINAL BLOCK, 2 POSITION, GND	6	EA
3	89939	BRIDGE, 8MM, FOR 89937	1	EA
4	89940	END COVER FOR 89937	2	EA
5	89922	TERMINAL BLOCK, 6 POSITION GND BUSS	5	EA
6	89921	TERMINAL BLOCK, 6 POSITION BUSS	6	EA
7	89926	END COVER FOR 89921	4	EA
8	88881	FUSE HOLDERS DIN RAIL MOUNT	5	EA
9	800449	FUSE, ATO 10 AMP	2	EA
10	90394	FUSE, ATO 30 AMP	3	EA
11	88346-1	RELAY, SPDT, 12VDC, W/CHECKBUTTON AND LED	2	EA
12	88348	BASE, RELAY FOR 88346	2	EA
13	88345	RELAY, 2PDT, 12VDC	2	EA
14	88347	BASE, RELAY FOR 88345	2	EA
15	89920	TERMINAL BLOCK, 249 OHM RESISTER	3	EA

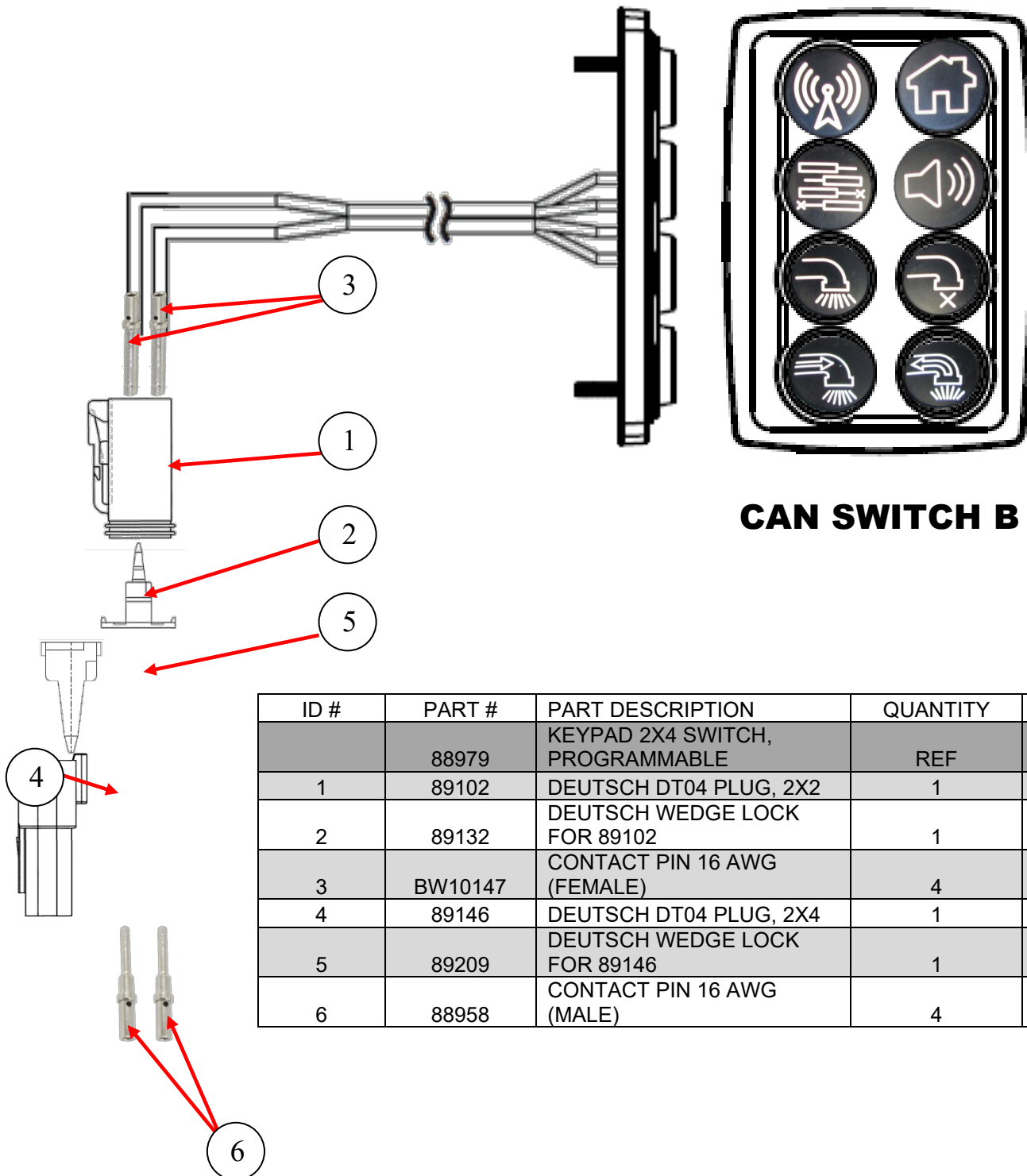
CAN PUSH BUTTON SWITCHES PLUGS



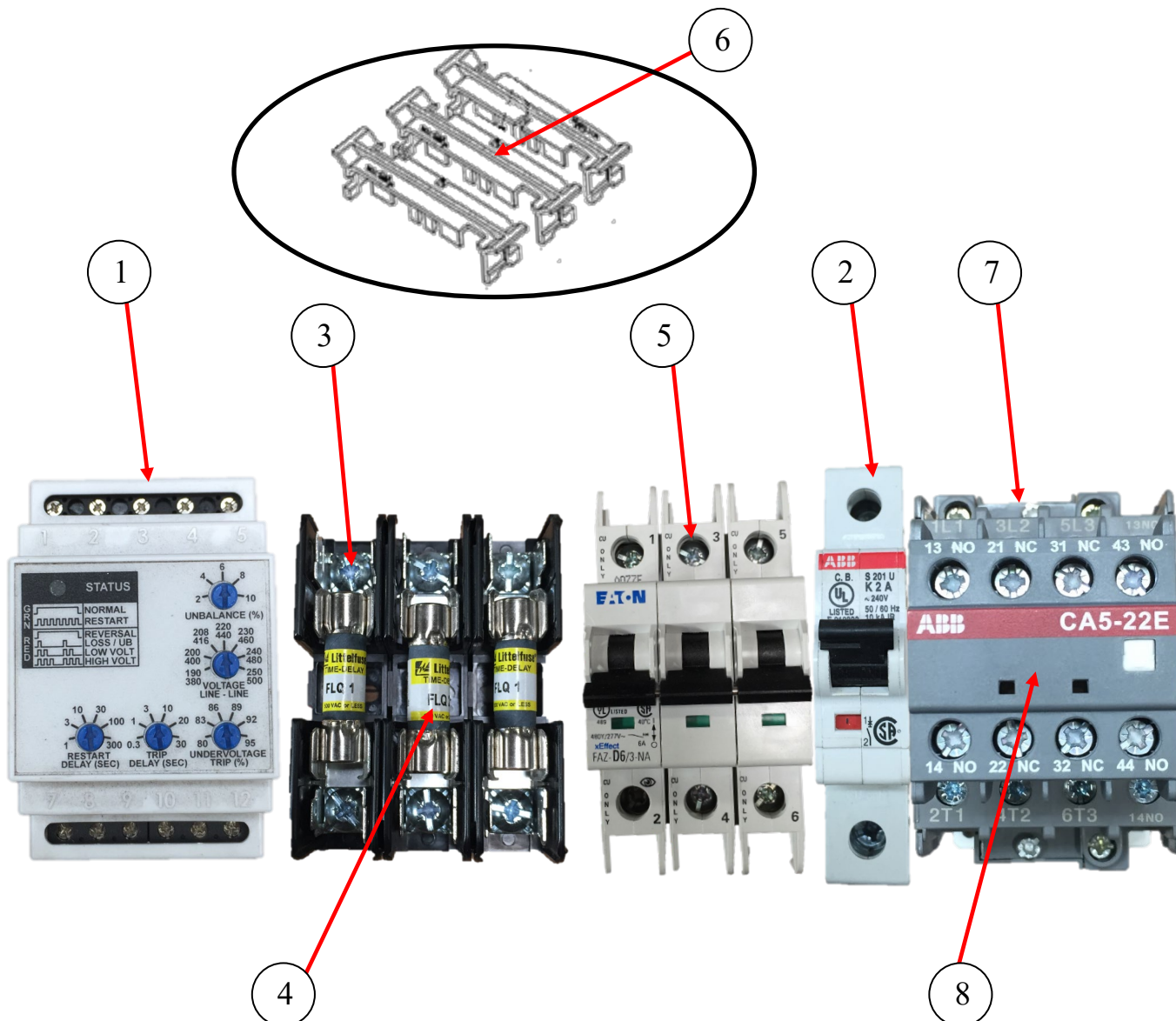
CAN SWITCH A

ID #	PART #	PART DESCRIPTION	QUANTITY	
	88978	KEYPAD 2X6 SWITCH, PROGRAMMABLE	REF	
1	89102	DEUTSCH DT04 PLUG, 2X2	1	EA
2	89132	DEUTSCH WEDGE LOCK FOR 89102	1	EA
3	BW10147	CONTACT PIN 16 AWG (FEMALE)	4	EA
4	89146	DEUTSCH DT04 PLUG, 2X4	1	EA
5	89209	DEUTSCH WEDGE LOCK FOR 89146	1	EA
6	88958	CONTACT PIN 16 AWG (MALE)	4	EA

CAN PUSH BUTTON SWITCH PLUGS



FUSES, CONTACTOR, PHASE MONITOR



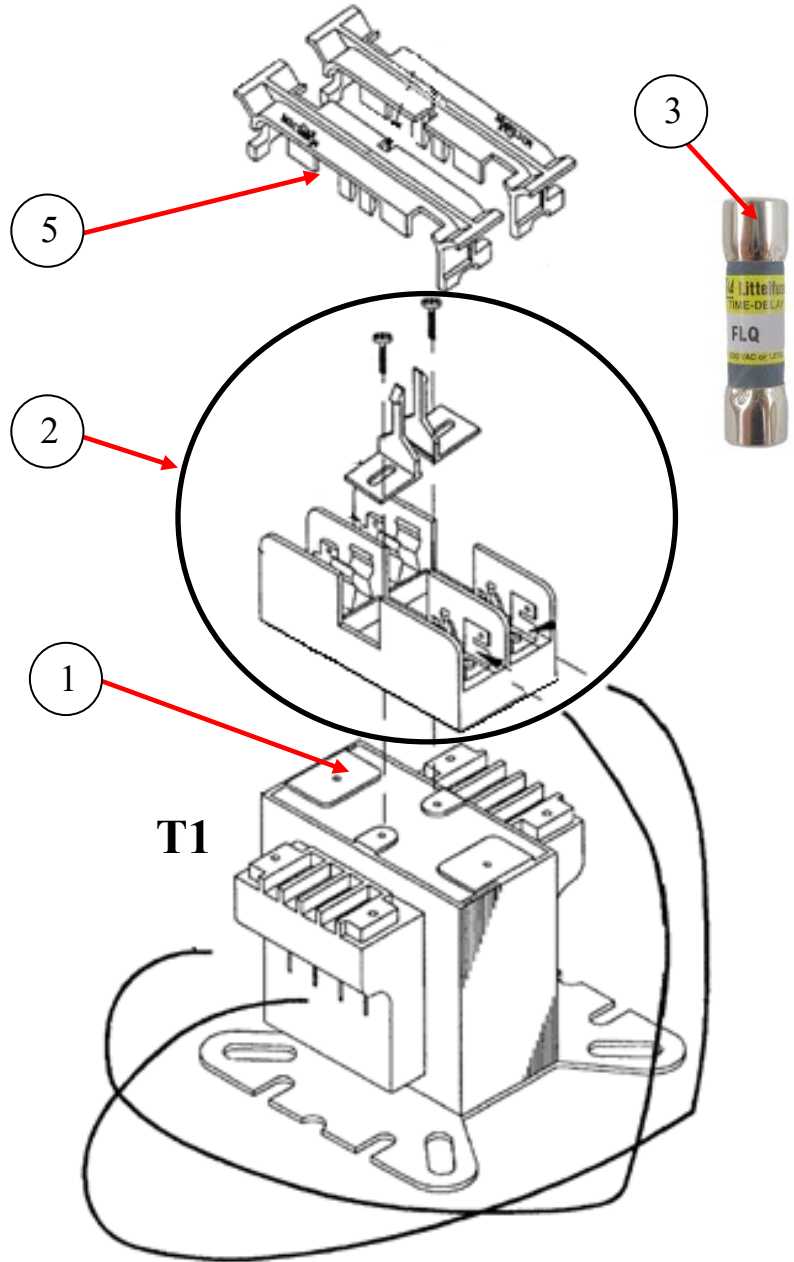
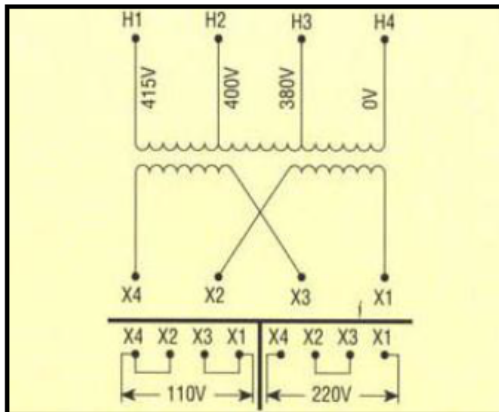
ID #	PART #	PART DESCRIPTION	QUANTITY	
1	88066	PHASE MONITOR 480 V (A1)	1	EA
2	88055	CIRCUIT BREAKER 2AMP (CB3)	1	EA
2A	88176	CIRCUIT BREAKER 8AMP (CB4)	1	EA
2B	88058-1	CIRCUIT BREAKER 40 AMP (CB2)	1	EA
3	88053	FUSE BLOCK	1	EA
4	88054-1	FUSE 1 AMP (FU7, FU8,FU9)	3	EA
5	88665	CIRCUIT BREAKER 3 POLE (ONLY FOR CEM PUMP)	REF	
6	88053-COVER	COVER FOR FUSE BLOCK KIT	3	EA
7	88067	CONTACTOR-CONTROL, 3 POL N/O	1	EA
8	89288	N/C CONTACT BLOCK (K1.1)		

TRANSFORMER 250VA

NOTE: MICRON
TRANSFORMER

FUSE KIT #FKTP-1001

COVER KIT #TPTC-2006



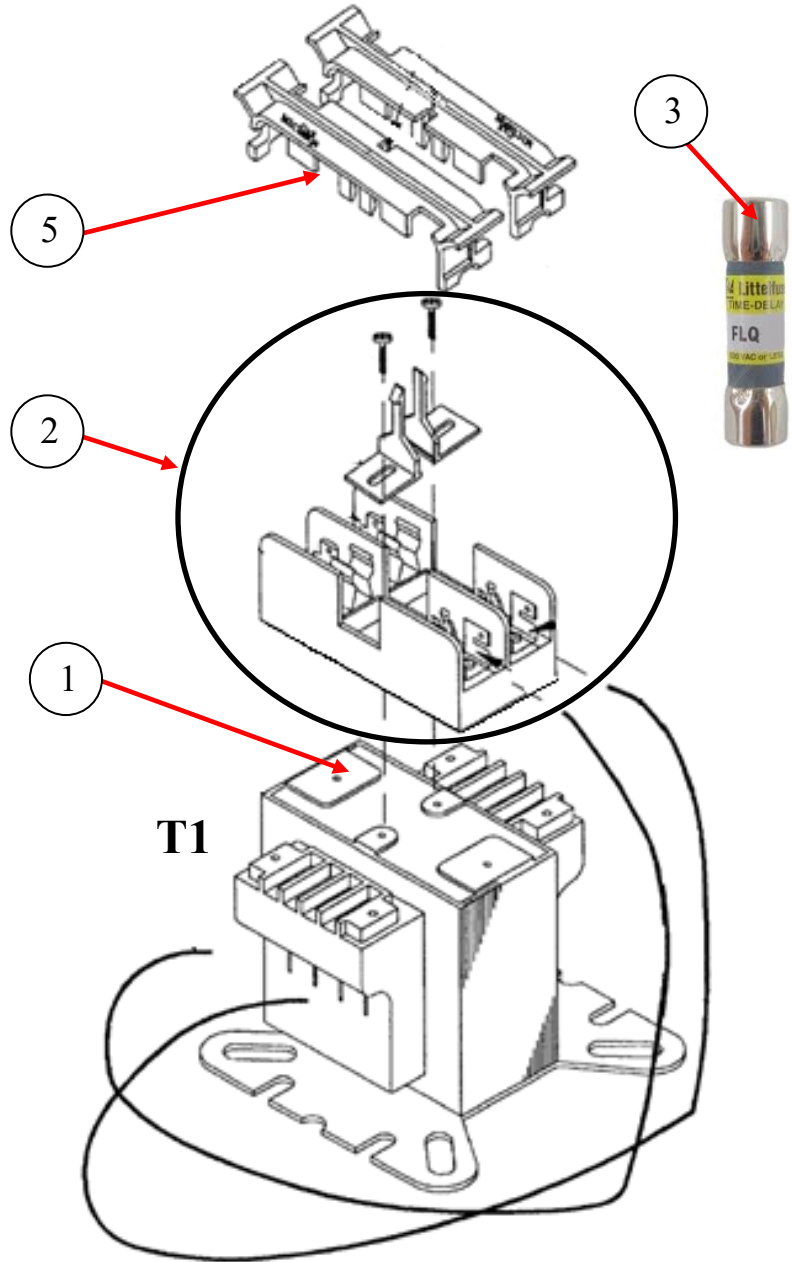
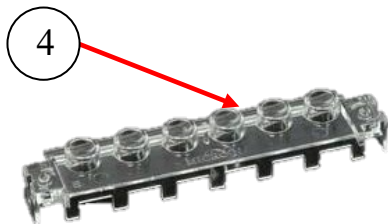
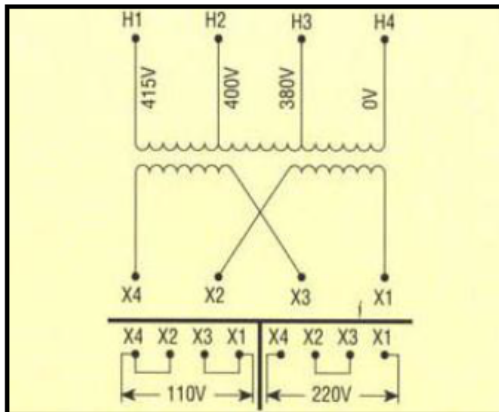
ID #	PART #	PART DESCRIPTION	QUANTITY	
1	89959	TRANSFORMER 250 KVA (460V/120V) (T1)	1	EA
2	88053	FUSE BLOCK KIT	1	EA
3	88054	FUSE 2 AMP	2	EA
4	88177-C	COVER KIT FOR TRANSFORMER	1	EA
5	88053-COVER	COVERKIT FOR 88053	1	EA

TRANSFORMER 750VA

NOTE: MICRON
TRANSFORMER

FUSE KIT #FKTP-1001

COVER KIT #TPTC-2006



ID #	PART #	PART DESCRIPTION	QUANTITY	
1	88177	TRANSFORMER 750 KVA (230/460-120V)	1	EA
2	88053	FUSE BLOCK KIT	1	EA
3	88175	FUSE 6 AMP	2	EA
4	88177-C	COVER KIT FOR TRANSFORMER	1	EA
5	88053-COVER	COVERKIT FOR 88053	1	EA

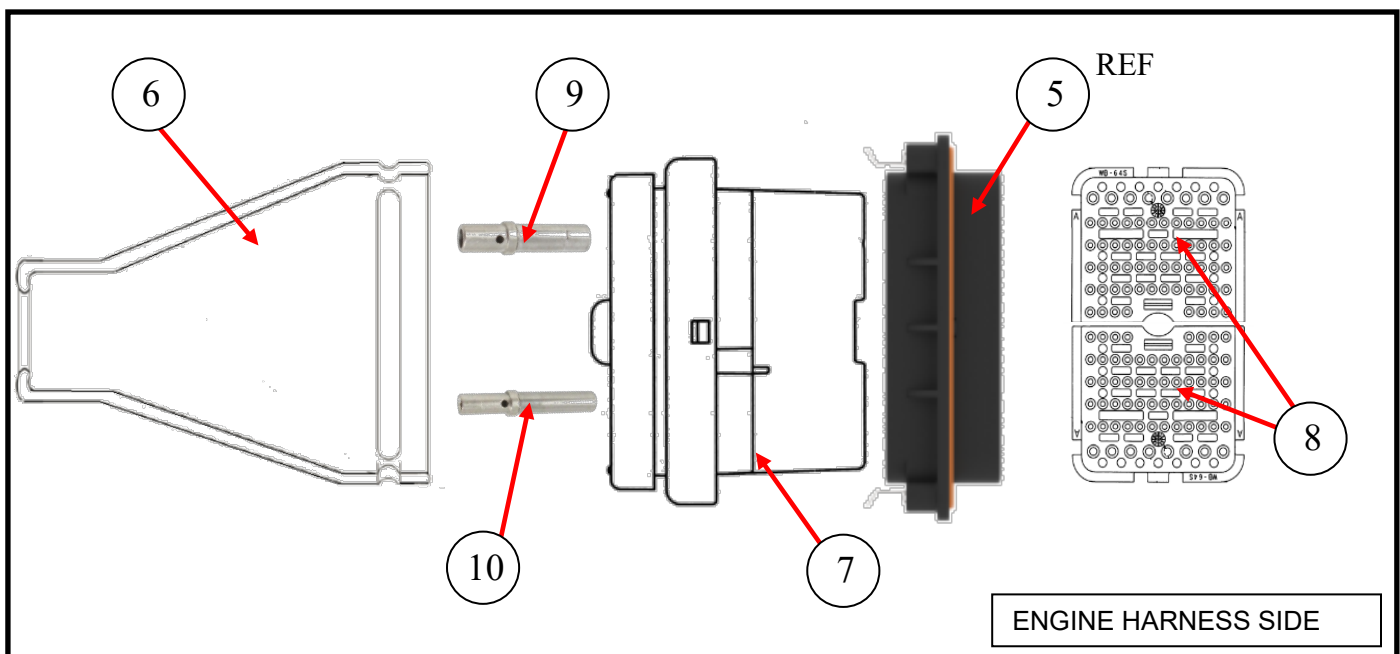
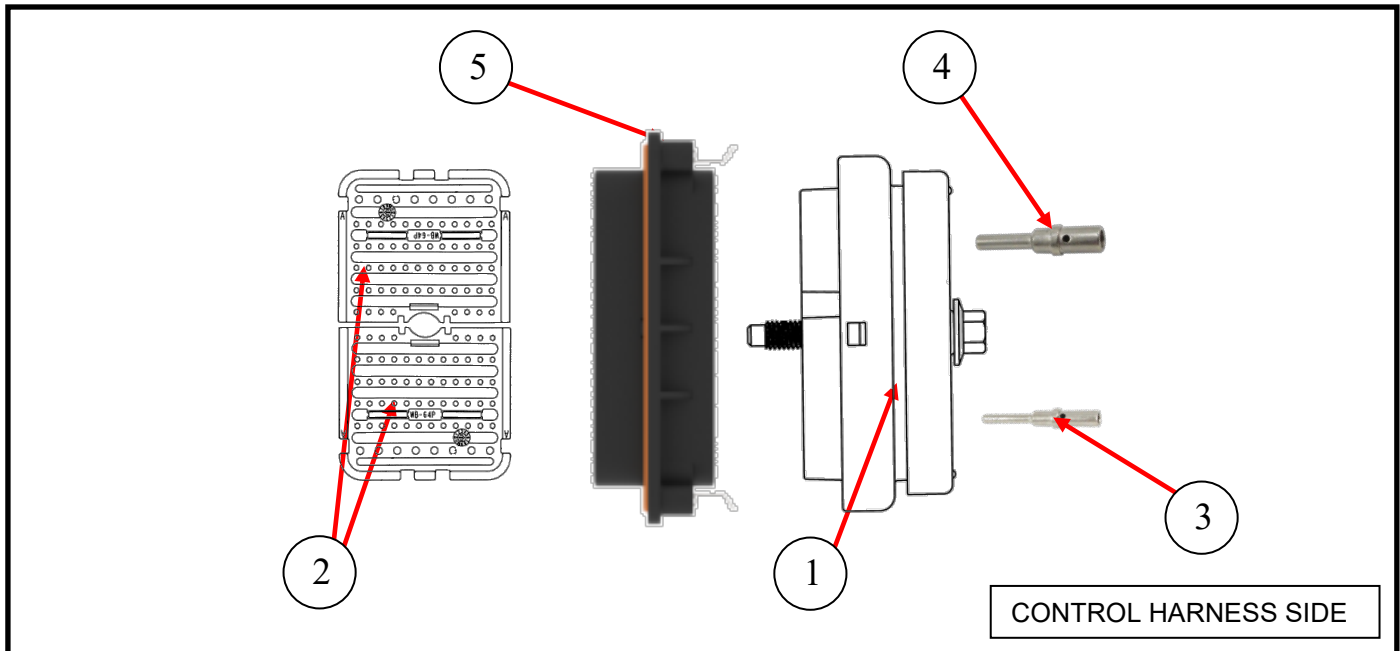


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DEUTSCH 128 PLUG ASSEMBLY



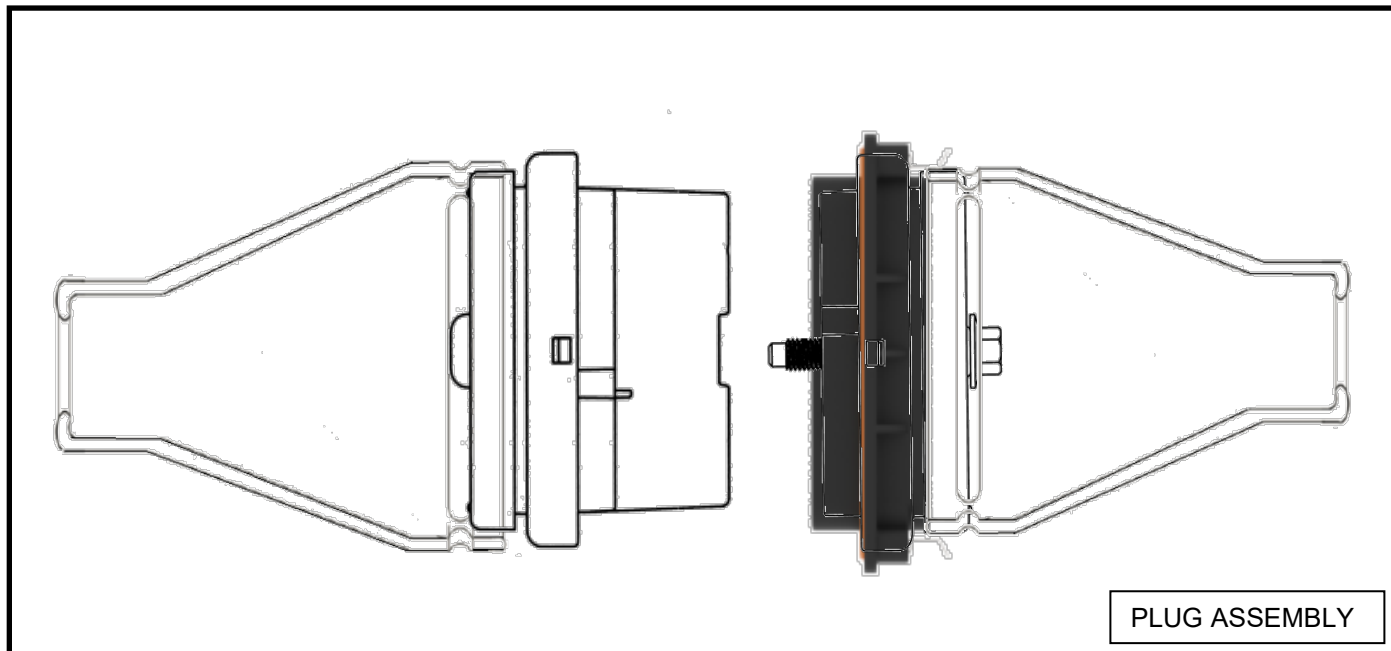


B20HPC-SKE-V25

PARTS

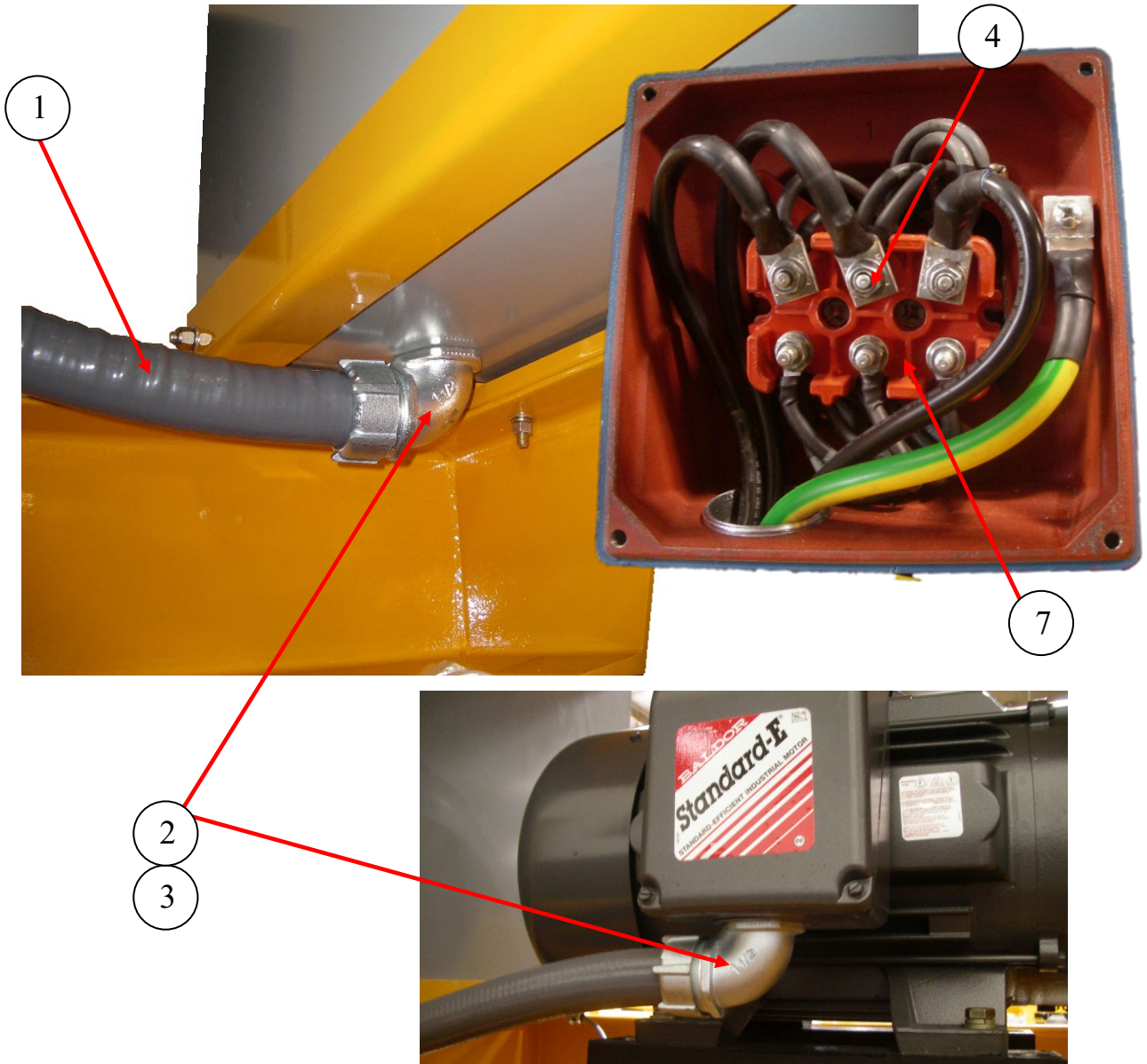
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DEUTSCH 128 PLUG ASSEMBLY CONT.



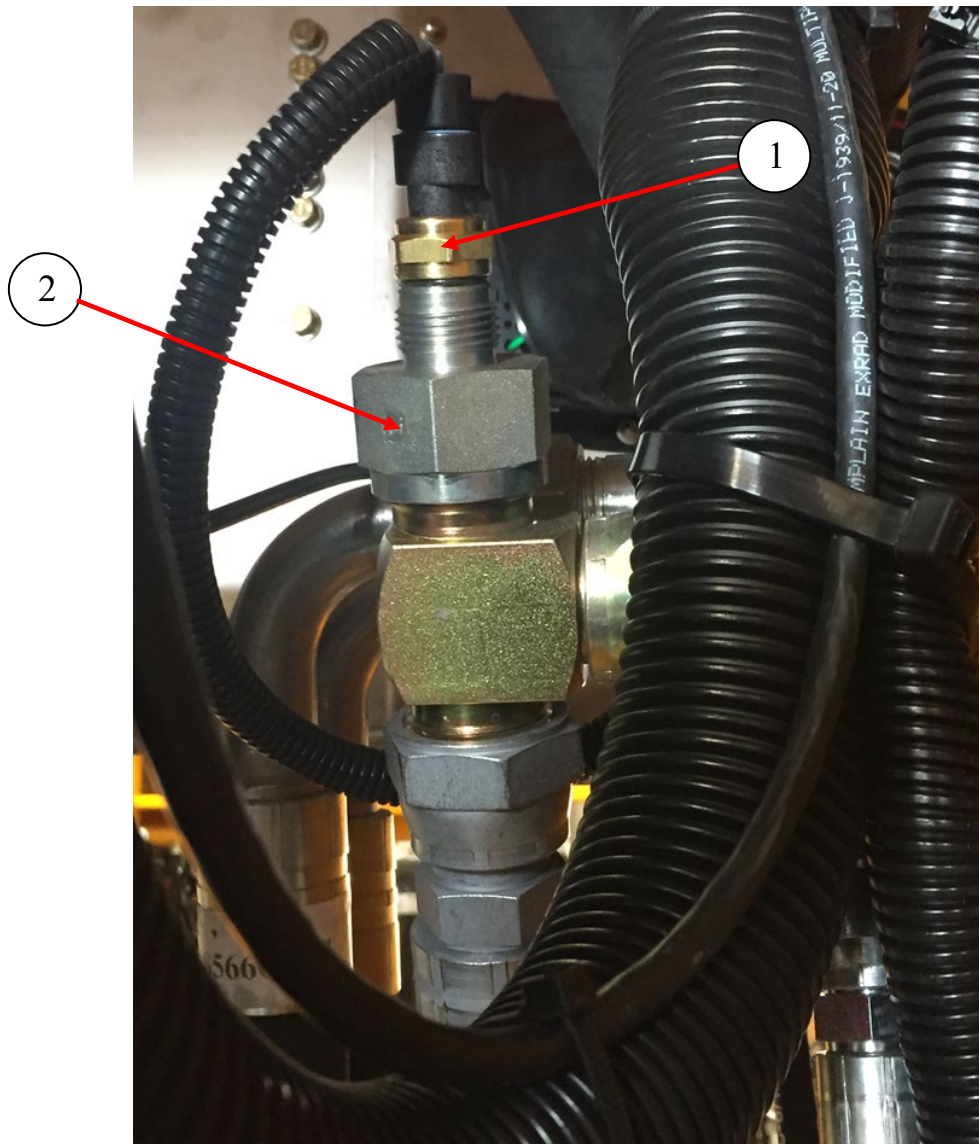
ID #	PART #	PART DESCRIPTION	QUANTITY	
1	89109	DEUTSCH RECEPTACLE 128 CONTACT, PIN	1	EA
2	89159	DEUTSCH WEDGE LOCK FOR 89157	2	EA
3	88958	CONTACT PIN SIZE 16 AWG, (MALE)	72	EA
4	87807	CONTACT PIN SIZE 12 AWG, (MALE)	16	EA
5	89158	DEUTSCH RECEPTACLE, FLANGE	1	EA
6	89109-B	DEUTSCH, BOOT COVER	1	EA
7	89157	DEUTSCH RECEPTACLE 128 CONTACT, SOCKET	1	EA
8	89116	DEUTSCH WEDGE LOCK FOR 89157	1	EA
9	87457	CONTACT SOCKET, SIZE 12 AWG, (FEMALE)	1	EA
10	BW10147	CONTACT SOCKET, SIZE 16 AWG, (FEMALE)	1	EA

CONDUIT, FITTING



ID #	PART #	PART DESCRIPTION	QUANTITY	
1	86518-1	CONDUIT – 2" IN LIQUID TITE	3	FT
2	86519-1	CONNECTOR 2" ELBOW 90°	2	EA
3	86520-1	INSULATED BUSHING 2"	4	EA
4	89150-2	WIRE LUG – 1 AWG 3/8 HOLE	6	EA
5	89902	CABLE, 2 AWG (GROUND)	9	FT
6	86523	CABLE, 2 AWG (POWER)	20	FT
7	88928	TERMINAL BLOCK MOTOR CONNECTION	1	EA

HYD TEMPERTURE SENSOR



ID #	PART #	PART DESCRIPTION	QUANTITY	
1	W-105568	SENSOR TEMPERTURE, 55 DEG	1	EA
2	89593	ADAPTER TEMP SENSOR	1	EA



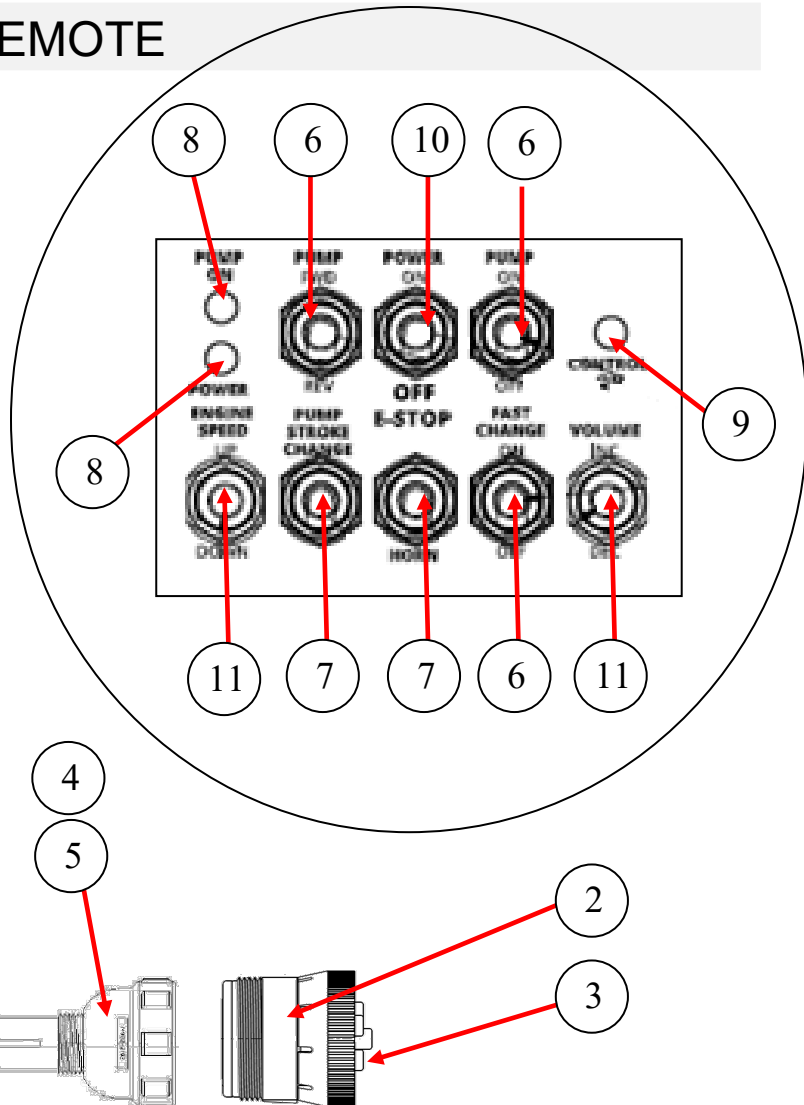
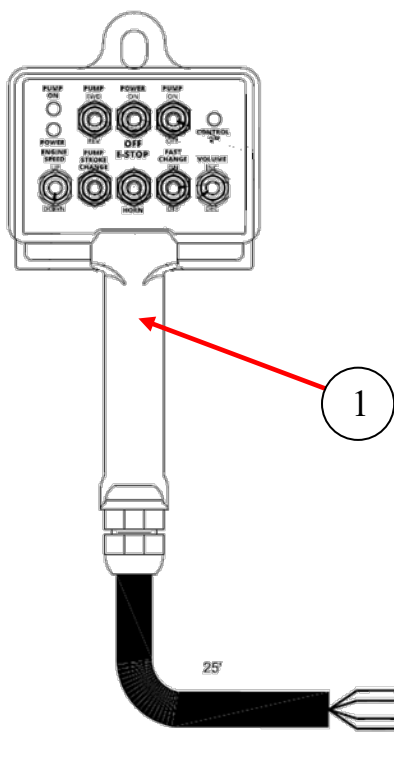
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OPTION 50FT CABLE REMOTE

COLOR	DESCRIPTION
RED	POWER (9-30VDC)
BLACK	GROUND
WHITE	CAN-H
GREEN	CAN-L



ID #	PART #	PART DESCRIPTION	QUANTITY	
1	89273	KAR TECH PLC REMOTE CONTROL, 25 FT	1	EA
2	89922	DEUTSCH CONNECTOR, 6 PIN	1	EA
3	BW10147	PINS (FEMALE)	6	EA
4	89222-CG	DEUTSCH BACK SHELL FOR 89922	1	EA
5	89223-CG	DEUTSCH COMPRESION NUT FOR 89922	1	EA
6	BW10207	SW, TOGGLE, (ON-OFF) PUMP ON/OFF & FWD/REV FAST CHANGE	3	EA
7	BW10206	SW, TOGGLE, (ON-OFF) HORN & STROKE CHANGE	2	
8	88170	LED, CONTROL ON (GREEN)	2	EA
9	88171	LED, CONTROL ON (RED)	1	EA
10	BW10223	SW, POWER ON/ OFF	1	EA
11	BW10205	SW, TOGGLE, (ON-OFF-ON) RPM+/- & VOLUME+/-	2	EA
12	87875	SPRING SNAP	1	EA
REF	BW10361	SW, SEALING BOOT	8	EA



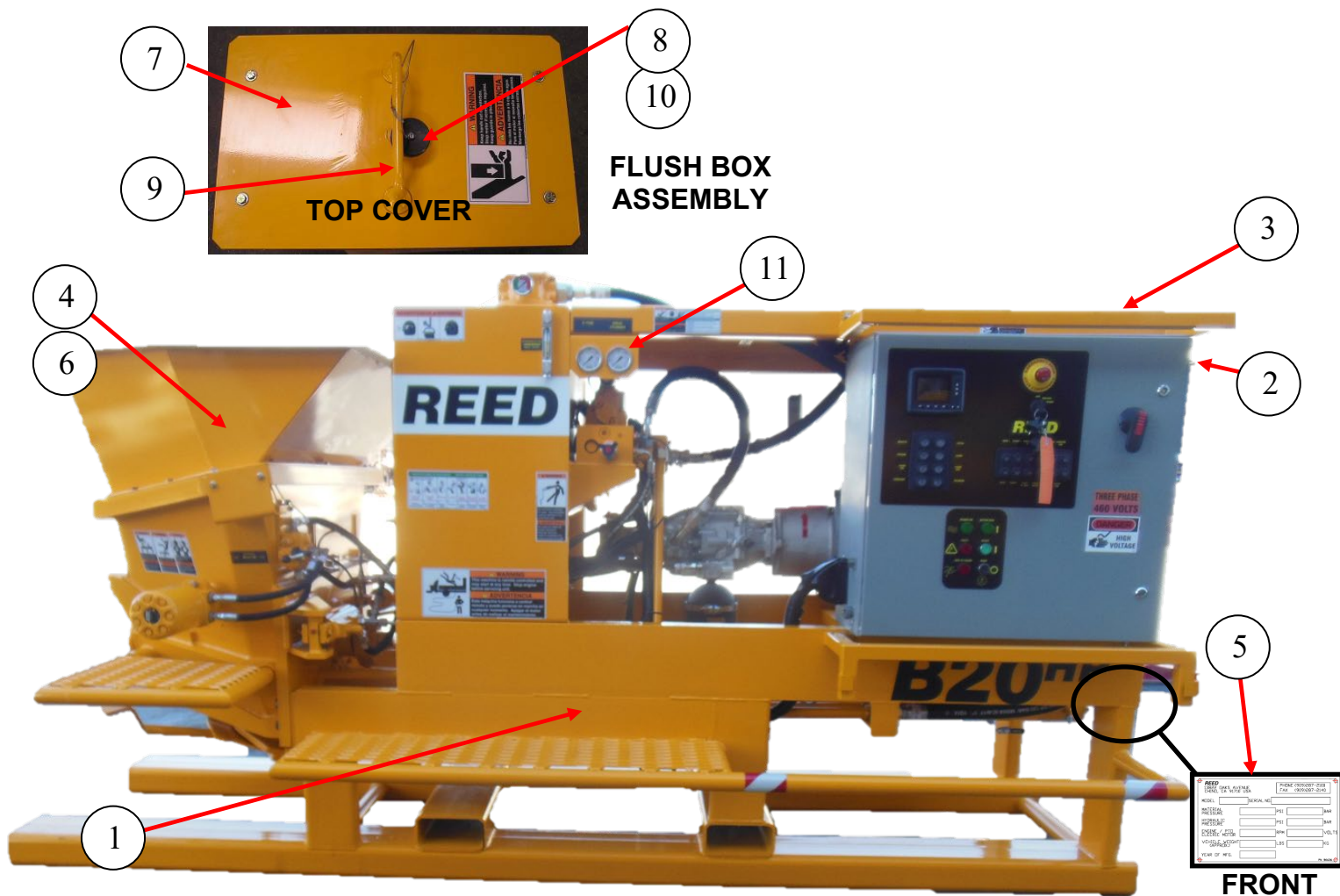
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PARTS

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FRAME

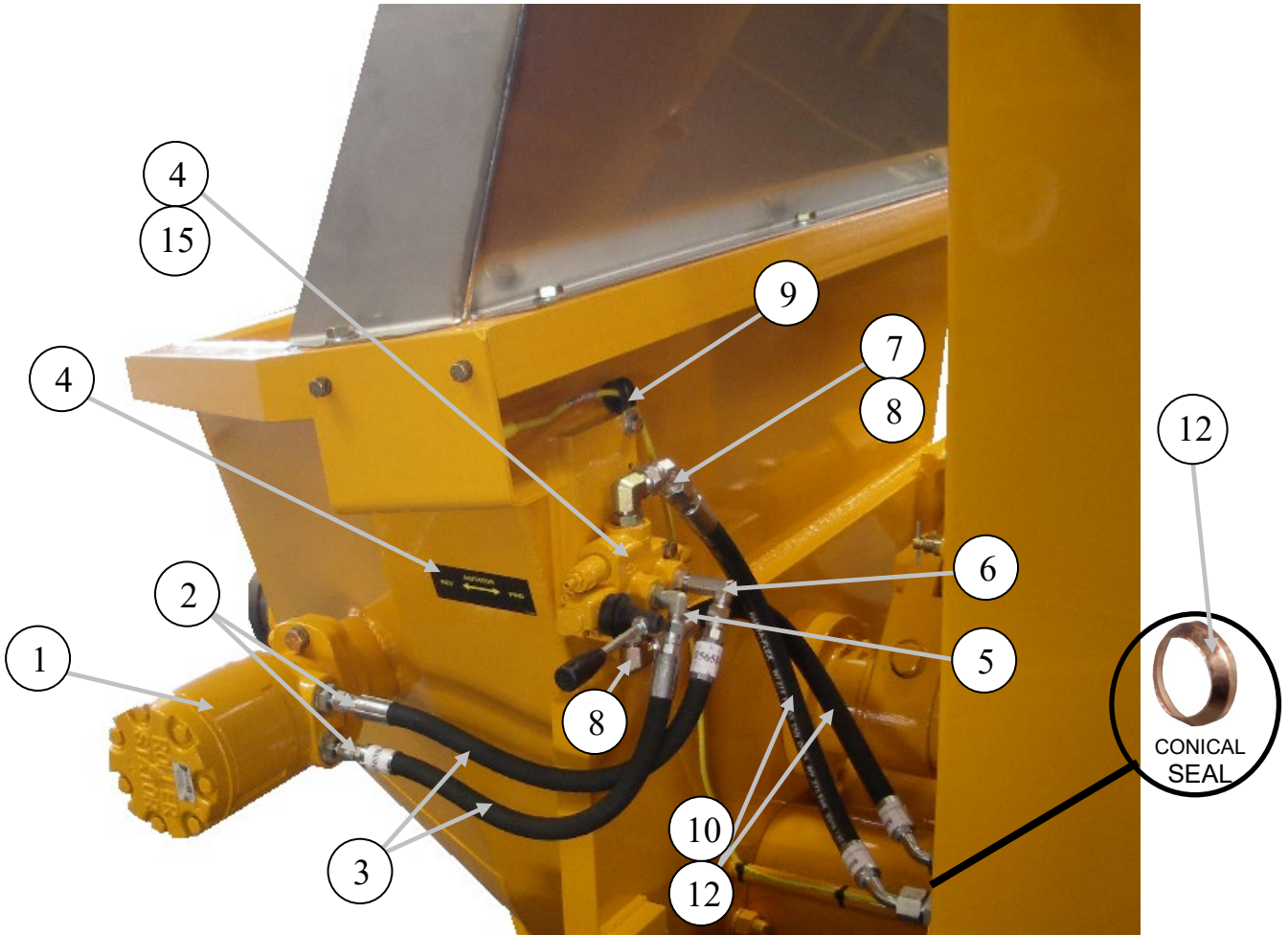
HOOD AND COVERS



ID #	PART #	PART DESCRIPTION	QUANTITY	
1	88644	SKID FRAME WELDMENT, B20 SER ELECTRIC	REF	
2	87060	FRONT SKID MESH SCREEN	1	EA
3	89539	TOP, B20 SER ELECTRIC	1	EA
4	85714-1	SPLASH GUARD, WITH HOPPER SAFTY GRATE	1	EA
5	803326	SERIAL NUMBER PLATE (BLANK)	1	EA
6	87126	HOPPER EXTENTION (OPTION)	REF	
7	88187	COVER WELDMENT, FLUSH BOX	1	EA
8	86105	KNOB	1	EA
9	79056	HANDLE	1	EA
10	800418	LANYARD, Q/R PIN	1	EA
11	87147	BRACKET, HYD GAUGE	1	EA

OPTIONS

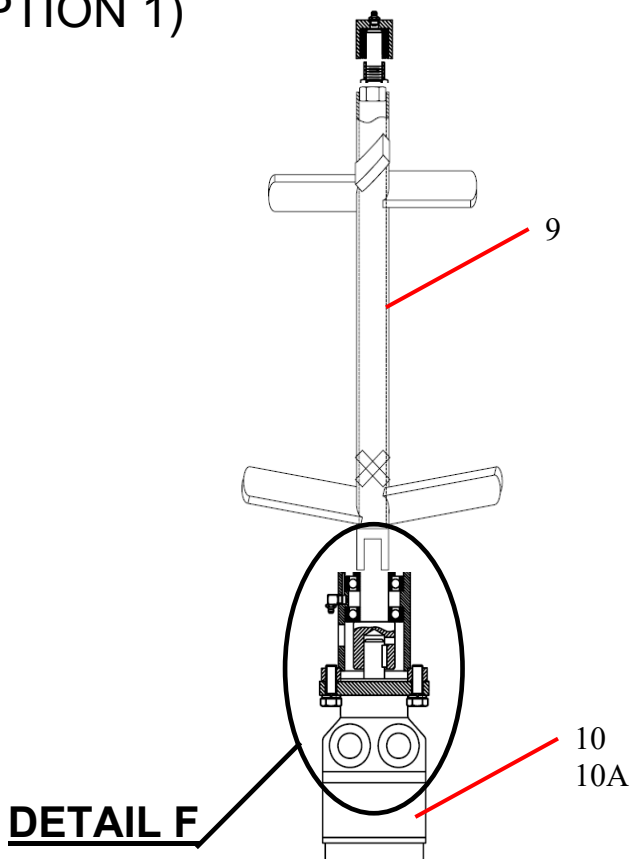
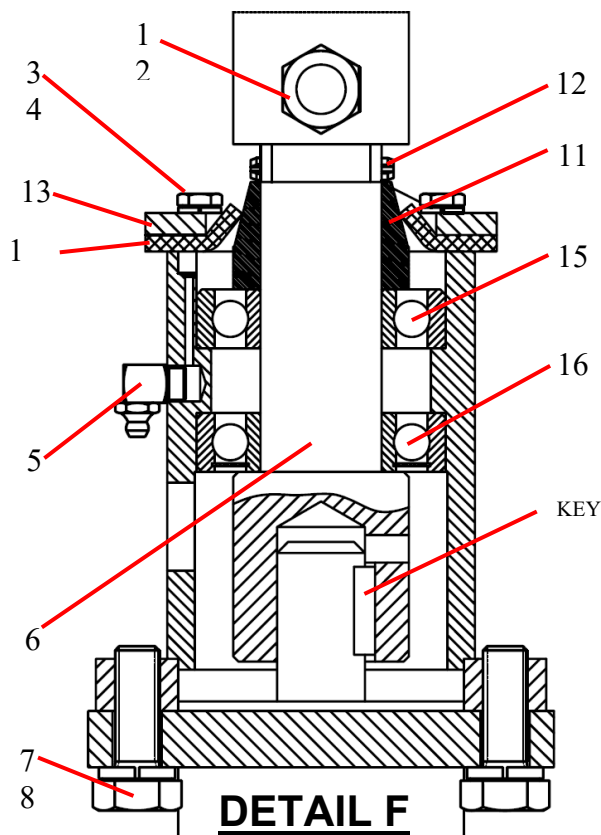
HYDRAULIC AGITATOR



ID #	PART #	PART DESCRIPTION	QUANTITY	
	89504-A2	AGITATOR ASSEMBLY	REF	
1	89455	HYD MOTOR, 45.6 CID, 1" SHAFT-PARKER	1	EA
2	86866	FITTING-MB-MJ-10-6	2	EA
3	85658-002	HOSE, 6M2T-6FJX-6FJX-17.00	2	EA
4	74584	VALVE 1 SPOOL, MANUAL PAINTED	1	EA
5	86748	FITTING-MB-MJ90-6-6	1	EA
6	86747	FITTING-MB-MJ90LL-6-6	1	EA
7	86749	FITTING-MJ-FJX45-10-10	1	EA
8	86746	FITTING-MB-MJ90-8-10	2	EA
9	800897	CLAMP, 3/4" TUBE, SINGLE	1	EA
10	85657-016	HOSE, 8M2T-10FJX-10FJX45-20.00	2	EA
11	85846	DECAL, ADGITATOR	1	EA
12	BW10229	CONICAL SEAL, SIZE 12	4	EA
13	85657-024	HOSE, 8M2T-10FJX-10FJX90S-24.50 (UNDER TANK)	1	EA
14	BW10407	TUBE HYD. AGITATOR PRESSURE (UNDER TANK)	1	EA
15	74471-017	HANDLE, VALVE	1	EA

OPTION

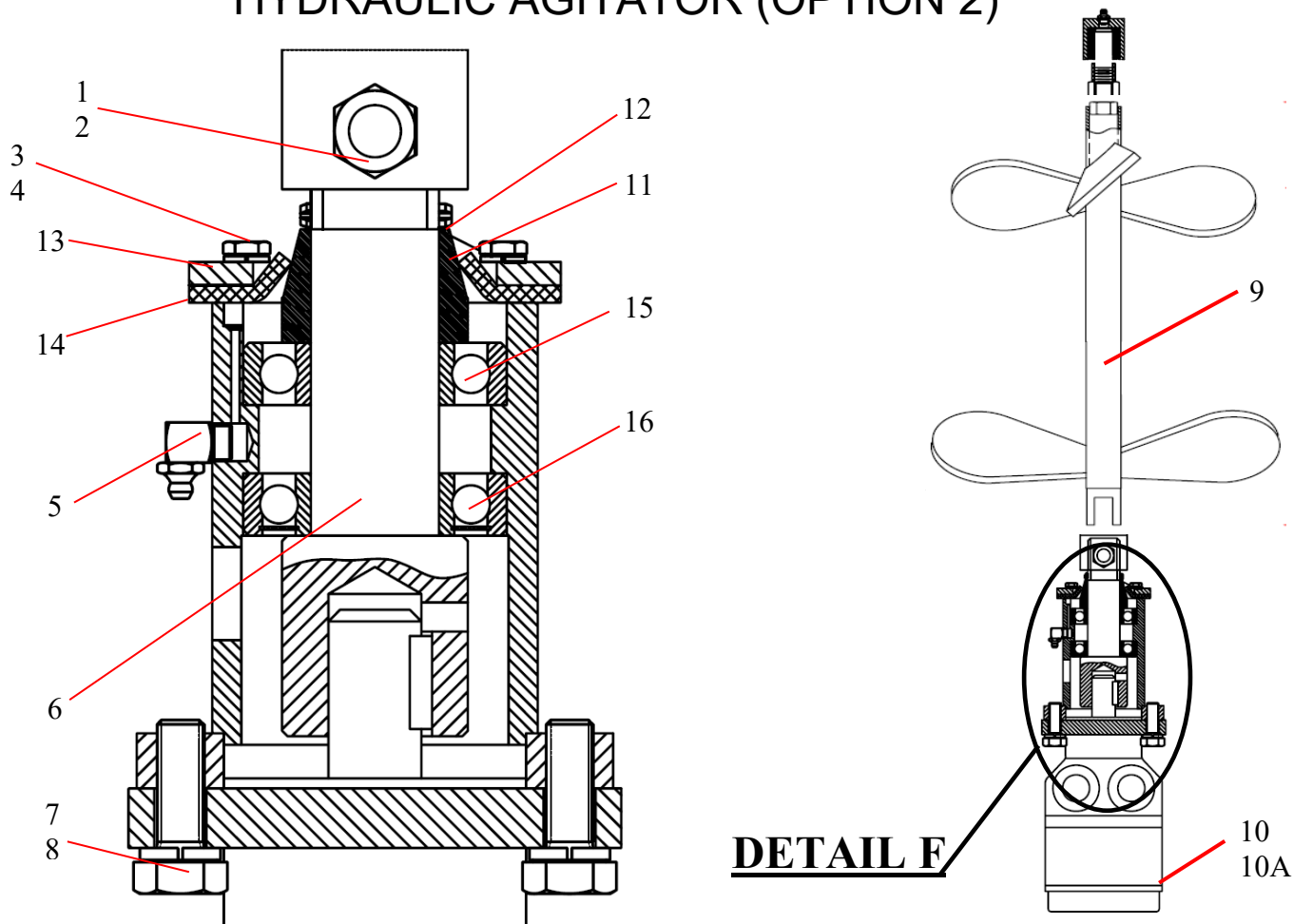
HYDRAULIC AGITATOR (OPTION 1)



ID#	PART #	PART DESCRIPTION	QUANTITY	
	88041-A1	AGITATOR ASSEMBLY		
1		HHCS, 1/2 -13X2 1/4" GR 8	1	EA
2		LOCK NUT, 1/2" -13	1	EA
3		1/4-28X3/4"	6	EA
4		LOCK WASHER, 1/4"	6	EA
5		GREASE FITTING, 1/8" NPT 90°	1	EA
6	85923	SHAFT, AGITATOR	1	EA
7		HHCS, 1/2 -20X1 1/2" GR 8	2	EA
8		LOCK WASHER, 1/2"	2	EA
9	85717	AGITATOR, PADDLE-B20	1	EA
10	89455	HYD MOTOR, 45.6 CID, 1" SHAF, PARKER	1	EA
10A	85809SK	SEAL KIT	1	EA
11	85976	WEAR RING, AGITATION	1	EA
12		SPRING PIN, 1/4" DIA X 1 3/4"	1	EA
13	70211	FLANGE SEAL S/W	1	EA
14	70212	SEAL REMIXER	1	EA
15	85978	BEARING, BALL, PLAIN	1	EA
16	85979	BEARING, BALL 1 SEAL	1	EA

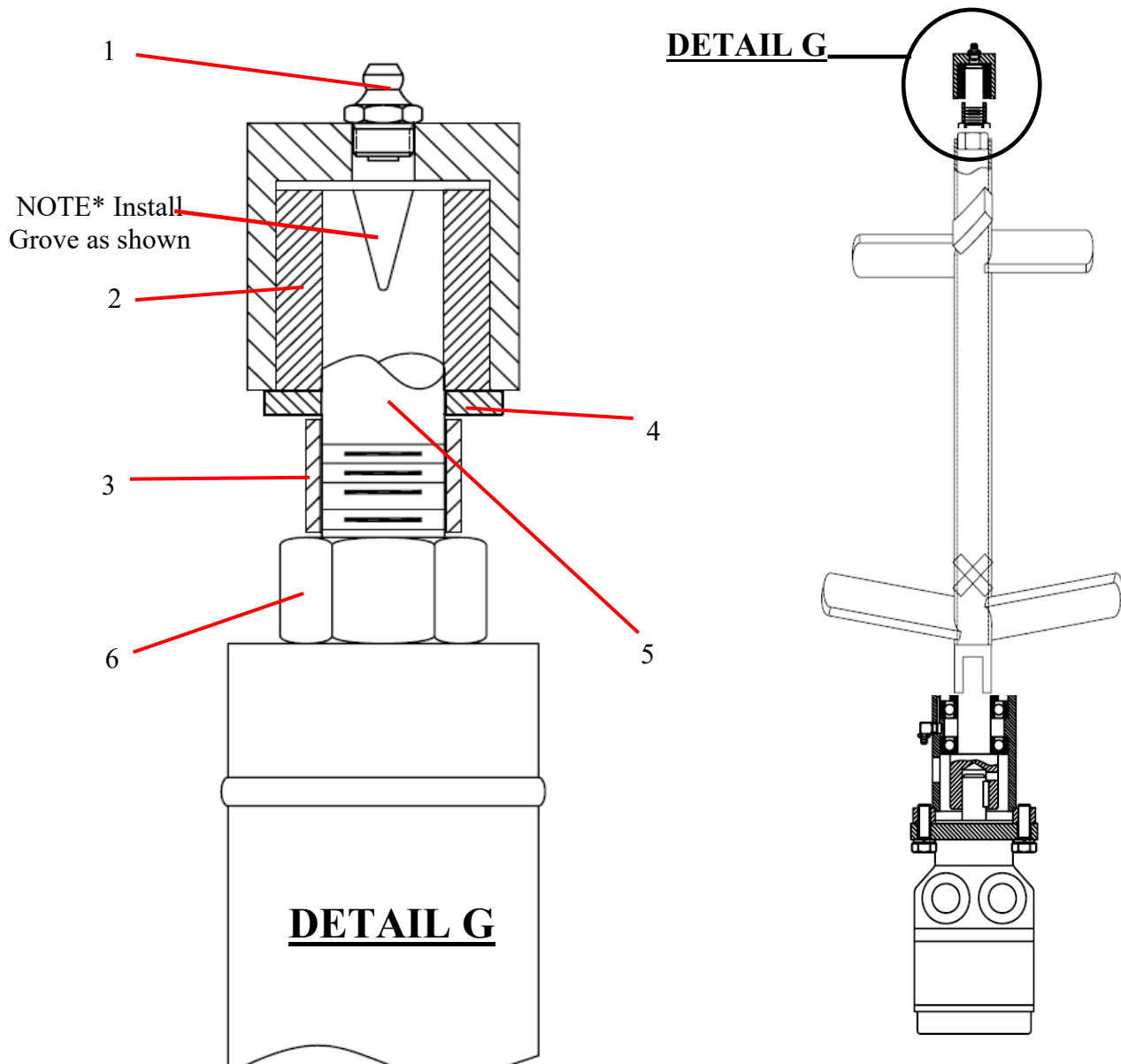
OPTION

HYDRAULIC AGITATOR (OPTION 2)



	85761	AGITATOR ASSEMBLY		
1		HHCS, 1/2 -13X2 1/4" GR 8	1	EA
2		LOCK NUT, 1/2" -13	1	EA
3		1/4-28X3/4"	6	EA
4		LOCK WASHER, 1/4"	6	EA
5		GREASE FITTING, 1/8" NPT 90°	1	EA
6	85923	SHAFT, AGITATOR	1	EA
7		HHCS, 1/2 -20X1 1/2" GR 8	2	EA
8		LOCK WASHER, 1/2"	2	EA
9	89948	AGITATOR, PADDLE-B20, A40,M30	1	EA
10	89455	HYD MOTOR, 45.6 CID, 1" SHAFT, PARKER	1	EA
10A	85809SK	SEAL KIT	1	EA
11	85976	WEAR RING, AGITATOR	1	EA
12		SPRING PIN, 1/4" DIA X 1 3/4"	1	EA
13	70211	FLANGE SEAL S/W	1	EA
14	70212	SEAL REMIXER	1	EA
15	85978	BEARING, BALL, PLAIN	1	EA
16	85979	BEARING, BALL 1 SEAL	1	EA

HYDRAULIC AGITATOR CONT.



ID #	PART #	PART DESCRIPTION	QUANTITY	
1		GREASE FITTING, 1/8" NPT STRAIT	1	EA
2	70219	REMIX SHAFT BUSHING	1	EA
3	77877	SPACER, REMIX	1	EA
4	86824	FLAT WASHER, 3/4" SAE	1	EA
5	70214	IDLER SHAFT, AGITATOR	1	EA
6	70210	IDLER BEARING HOUSING	1	EA
7	80030	HEX NUT-M20X2.5 PLATED	1	EA

OPTION

PERIFLO CHEMICAL PUMP



ID #	PART #	PART DESCRIPTION	QUANTITY	
	88421	PERISTALTIC PUMP 4380V, WITH VARIABLE FREQUENCY DRIVE	REF	EA
	88421-1	PERISTALTIC PUMP 460V, 115V INPUT TO X4, WITH VFD	REF	EA
	88421-1H	HOSE RUBBER	REF	EA
	88421-1-H-EPDM	HOSE, EPDM	REF	EA
	88421-1L	LUBRICATION GREASE FOR 88421/1 PUMPS		EA



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AVAILABLE OPTIONS

RADIO REMOTE

AARCOMM 2-WAY
RADIO W/STROKE
COUNTER AND
VOLUME INDICATOR
(IF EQUIPPED)

50' CABLE REMOTE,
100' CABLE REMOTE
AVAILABLE



LIFTING KIT



VIBRATOR KITS OLI KIT





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PARTS

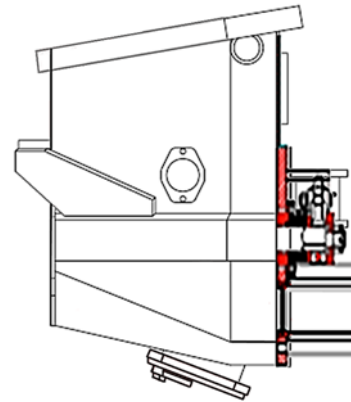
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AUTO LUBE
STEEL TUBING 12 PORT
PLASTIC TUBING 12 PORT

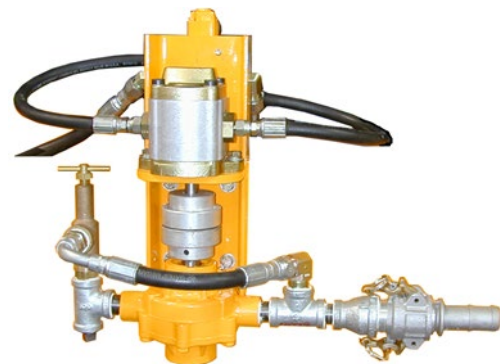
MANUAL LUBE BLOCK



REINFORCED HOPPER



WATER PUMP-WASH PUMP ASSY



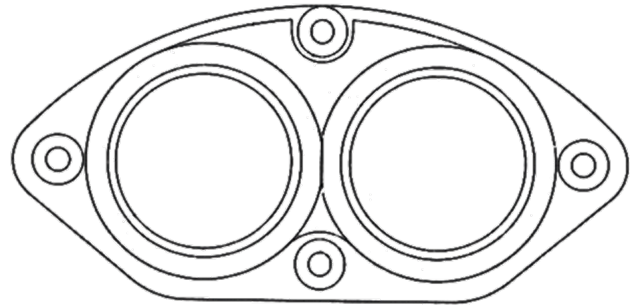


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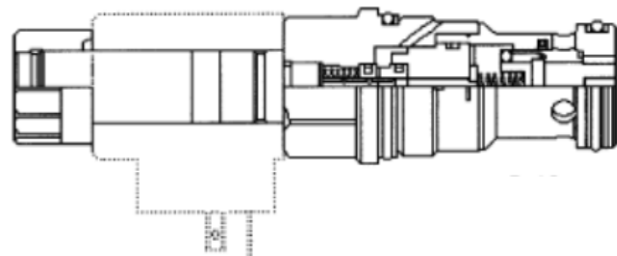
PARTS

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CARBIDE WEAR PARTS
WEAR RING/CARBIDE
WEAR PLATE/CARBIDE



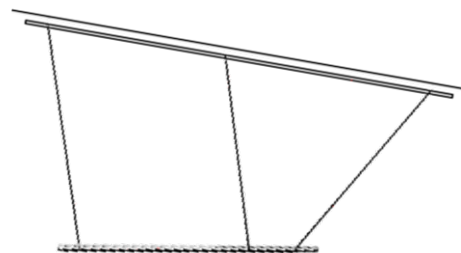
ELECTRIC VOLUME/FLOW CONTROL



E-STOP PLC KIT



HOPPER EXTENSION



LINE PUMP

SAFETY MANUAL 7

VERSION 7.0.1

A guide for the prevention of accidents when driving, operating, cleaning, and maintaining small line concrete pumps and related equipment.



AMERICAN CONCRETE PUMPING ASSOCIATION
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P: 614.431.5618 | F: 614.431.6944
WWW.CONCRETPUMPERS.COM

CALIFORNIA

Proposition 65 Warning

Diesel engine exhaust and some of its constituents are known to the State of California to cause cancer, birth defects, and other reproductive harm.

SAFETY MANUAL

SAFETY MANUAL

A GUIDE FOR THE PREVENTION OF ACCIDENTS WHEN DRIVING, OPERATING, CLEANING, AND MAINTAINING CONCRETE LINE PUMPS AND RELATED EQUIPMENT

Introduction

Safety is one of the major concerns of every person involved in the concrete pumping industry. Although much of the responsibility for everyday safety rests upon the pump operator, it is vital that everyone involved makes safety the top priority. This includes the owners, the mechanics, the ready mix drivers, the placing crew, the concrete contractors, and the machine manufacturers.

Although this *Safety Manual* covers a great deal of information regarding the prevention of accidents while operating a concrete pump, it is unlikely that every conceivable circumstance has been covered. Regardless of how thorough a manual like this may be, there is always the unexpected. Please understand that there is no substitute for **common sense** and dedication to the idea that **you are responsible for your own safety**, and affect the safety of those around you. You have to know the rules first, but you

must keep your mind on the job if knowledge of the rules is going to keep you and your coworkers alive and well. No attempt has been made in this *Safety Manual* to provide the highly specialized knowledge of the workings of the individual machines that is also critical for safe and proper operation. For that, you must **read and understand the operation manual for the machine(s) that you operate!**

This *Safety Manual* is a guide for the prevention of accidents and is to be used in conjunction with **professional training**. The ACPA now has an Operator Training Program. Additional information and materials are available through the American Concrete Pumping Association, including, specifically, an Operator Certification Program. Make the commitment to be professional - get your certification!

Version 7.0.1

February 2015

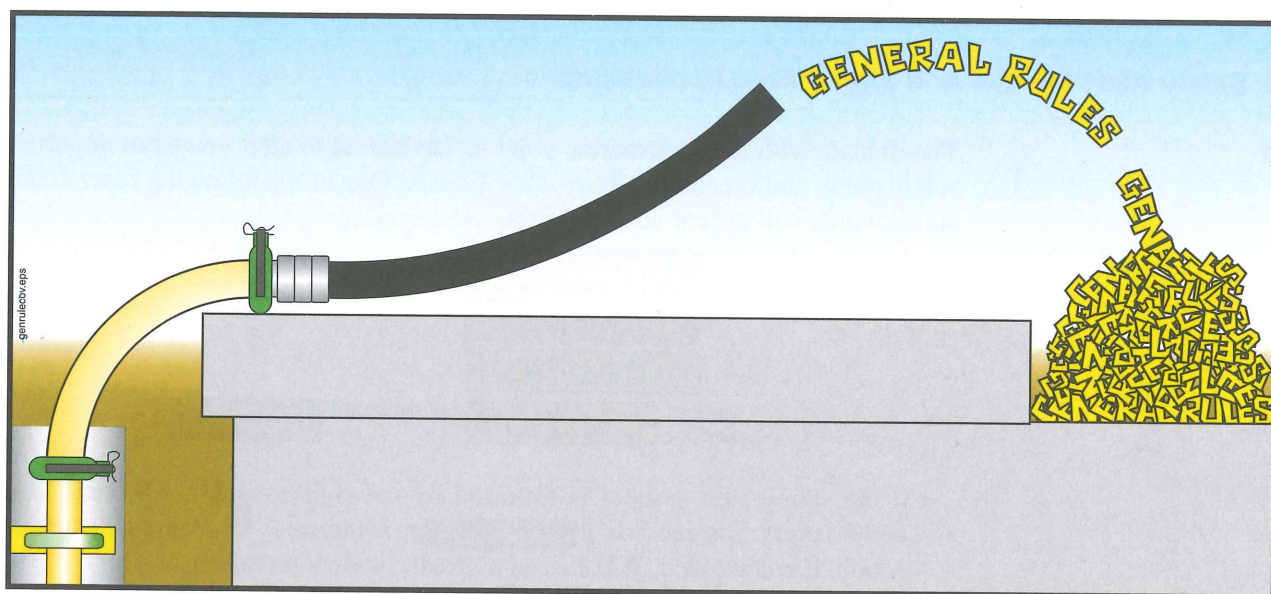
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SAFETY MANUAL

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I. Before You Leave The Yard

1. Safety Alert Symbol And Signal Word Explanation

1.1



The triangle with the exclamation point inside is used to alert you to an important safety point, and is called a *Safety Alert Symbol*. One of the following color-coded signal words will appear after the safety alert symbol:

or - without
the symbol:

is replaced
by:

- If the safety alert symbol is followed by the signal word **DANGER** with white letters in a red box (), it indicates a hazardous situation which, if not avoided, **WILL** lead to **death or serious injury**.
- If the safety alert symbol is followed by the signal word **WARNING** with black letters in an orange box (), it indicates a potentially hazardous situation which, if not avoided, **COULD** result in **death or serious injury**.
- If the safety alert symbol is followed by the signal word **CAUTION** with black letters in a yellow box (), it indicates a potentially hazardous situation which, if not avoided, **COULD** result in **minor to moderate injury**.
- The signal word **CAUTION**, used in a yellow box, but **without the safety alert symbol** (), means the point addresses a hazard which, if not avoided, **COULD** cause **damage to equipment or property**.
- The signal word **NOTICE** (), now replaces the signal word caution (without the safety alert symbol), above.

2. What To Do Before You Arrive At Work

2.1

Get enough sleep to be ready for the day's work. Accidents can happen when the body is on the job, but the mind is not.

2.2

Dress in appropriate apparel and Personal Protective Equipment (P.P.E. or just PPE.) See Figure1. You should always wear these items when pumping concrete:

- hard hat;
- safety glasses or goggles (plus a full face shield, when shotcreting);
- snug-fitting clothes;
- gloves;
- steel-toed shoes;

In addition, you should wear:

- hearing protection if you stand near the pump or any other source of noise;

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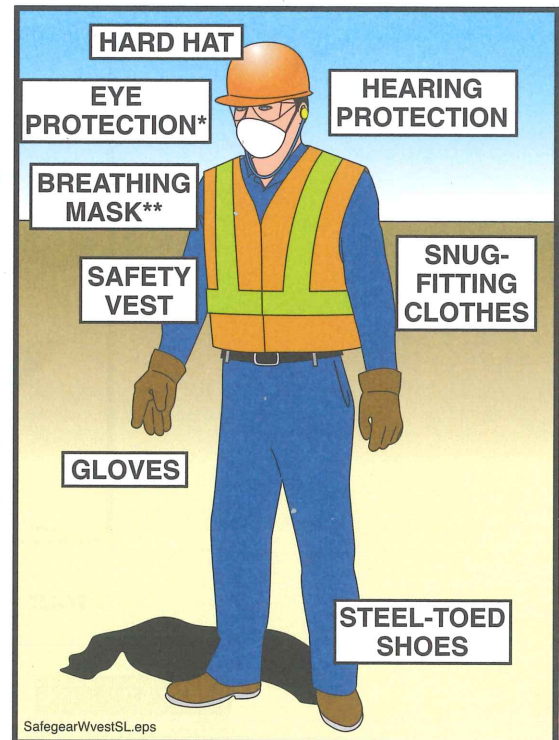
GENERAL RULES

- breathing mask whenever there is cement dust in the air;
- rubber gloves during cleanout or if you'll be touching wet concrete;
- rubber boots anytime you have to stand in concrete;
- full face-shield when shotcreting, or any time material is rebounding.

* Full face shield should be used in addition to safety glasses when shotcreting, or any time material is rebounding.

** Breathing mask needed when cement dust (or other toxic dust) is present in the air.

Figure 1
Personal Protective Equipment (PPE)



2.3

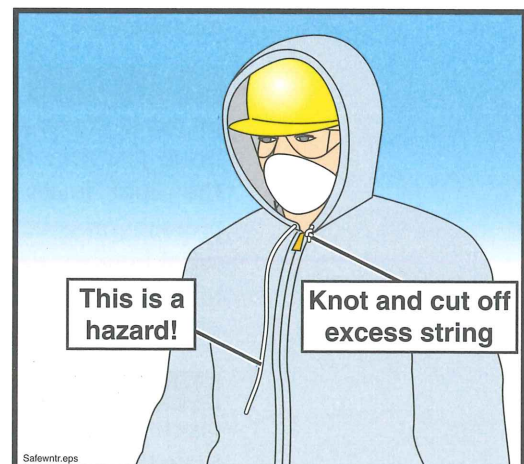
Jewelry, athletic shoes, sandals, and shorts are examples of clothing that should NOT be worn when pumping.

2.4



WARNING Be sure that any clothing you wear does not have strings, fringes, or other external tightening means that could be caught in moving parts (Figure 2).

Figure 2
No strings attached



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2.5

Arrive to work on time. Accidents can be caused by hurrying through procedures.

2.6

⚠ WARNING Never go to work on a construction site or work on, around or near a piece of machinery when under the influence of drugs or alcohol. Beware of prescription medications or over the counter drugs, many of which have specific warnings about operating machinery after taking the medication (Figure 3).

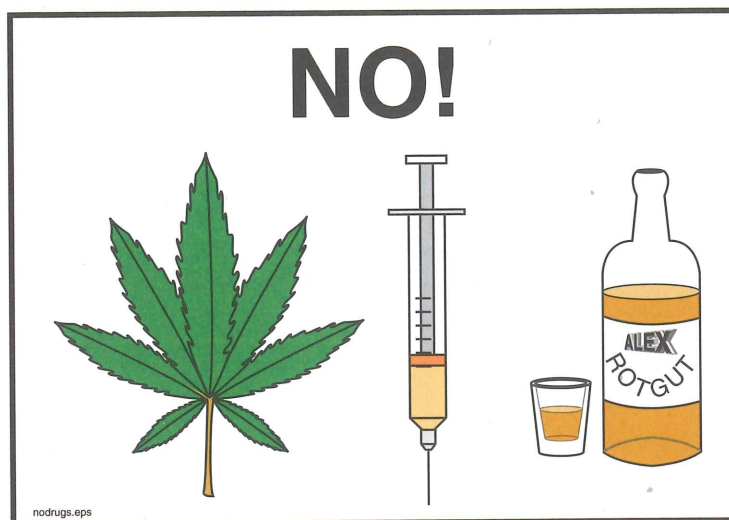


Figure 3

Your coworkers depend upon you for their safety

2.7

⚠ WARNING Don't bring your personal problems to work with you. In an office setting this may be annoying to coworkers, but on a construction site it can be deadly. The workers around you depend on you for their safety.

3. What To Check Before You Leave The Yard

3.1

⚠ WARNING Do not operate the machine until you read and understand the unit's operation manual. Lack of understanding of proper operating procedures could result in unsafe operation. Operation manuals are issued with each new unit. If you haven't seen it, ask your supervisor. Replacements are available from the manufacturer.

3.2

⚠ WARNING Inspect delivery pipes, concrete delivery hoses, and end hoses for wear. Never use a hose or pipe that is dented or worn out. **Know the maximum pressure that your machine can exert on the concrete, and be sure that the pipes, hoses and clamps are capable of handling the pressure.** Maximum pressure on concrete is stated in operation manuals, service manuals, and on the serial number plate of the machine. A chart showing the minimum wall thickness of pipeline versus maximum pressure is found on page 47 in the Appendix section of this *Safety Manual*.

3.3

⚠ WARNING If you will need to use compressed air to clean out the system pipeline, **BE SURE** that you have the proper training, equipment, and attachments to do this procedure safely! Proper attachments include:

- A blowout head with properly sized air discharge regulator valve and separate water/air inlet. The two openings should be spaced apart far enough that a blowout ball could not cover both openings at once.
- A *go-devil*, or a hard sponge ball. Regardless of which is used, it **must** fit into the pipeline tight enough that air cannot escape ahead of it.
- A ball or go-devil catcher that will catch the go-devil or ball when the line has been purged of all concrete, unless another method of controlling the outlet is used. There are two types of catchers (see paragraph 5.24 on page 13).
- A hose that is rated for the pressure of the air compressor you will use and that is able to connect with both the air compressor and the blowout head. The hose must be in good working condition and must be free of cracks, frays, tears or other damage. Do **NOT** improvise on this. **Make sure** you have the right part (Figure 4).

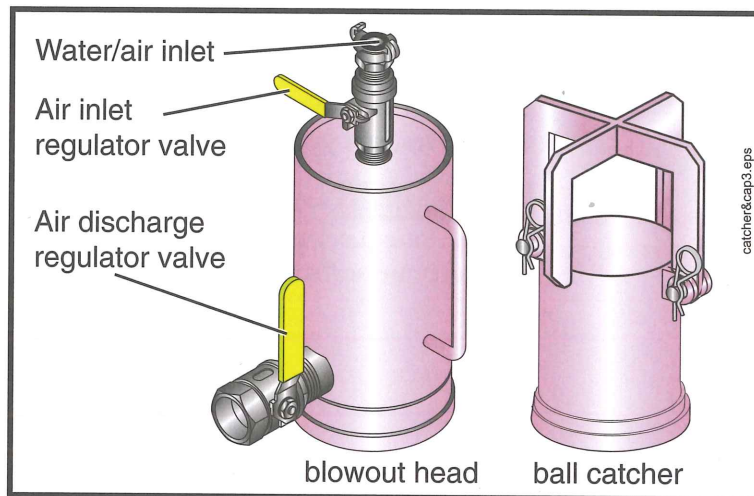


Figure 4
Compressed air accessories

- 3.4** **⚠ WARNING** Be sure that the unit is equipped with all the pipes, clamps, gaskets and hoses, blowout adapters, ball catchers, and other accessories that you will need for the day's work. Making do with inappropriate equipment could cause accidents.
- 3.5** On trailer-mounted units, check the oil and cooling system of the pump drive engine. Accidents could occur when lack of maintenance is causing a distraction while operating the equipment.
- 3.6** Be sure the battery has enough charge to start the pump drive engine. You will be rushed on the job if you have to do repair work before you can begin operation.
- 3.7** **⚠ WARNING** The operator is responsible for checking to see that the concrete pump, and delivery system are in safe and proper working condition. If an unsafe condition exists, **work must not begin** until necessary repairs have been completed, or until the machine can be operated safely.

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3.8

⚠ WARNING The operator is responsible for checking that all safety equipment and guards are in place and in good condition. If found to be missing, incomplete, or damaged, **work must not begin** until the situation has been made safe.

3.9

⚠ WARNING The operator is responsible for checking that all safety decals are in place and are in readable condition. If found to be missing or unreadable for any reason, steps should be taken to obtain replacements.

3.10

⚠ WARNING Inspect the tires and brakes on the truck. Never drive a truck with bald or cracked tires, or with weak or worn brakes. If you have air brakes, be sure that the air system is free from leaks and will maintain pressure when driving. Loss of air pressure will cause the brakes to be applied while driving. If driving continues after the brakes are applied, the resulting friction could cause enough heat to start a fire.

3.11

Drain moisture from the air tanks that supply the unit's brakes (if so equipped). This is especially important if weather conditions could cause the moisture to freeze. If you lose air pressure because of frozen moisture, the brakes will apply themselves, and you will have to stop driving until the unit is repaired.

3.12

⚠ WARNING (See Figure 5.) Mount or dismount the pump or truck using the *3-point Rule* (i.e. keep two hands and one foot or one hand and two feet in contact with a secure surface at ALL times).

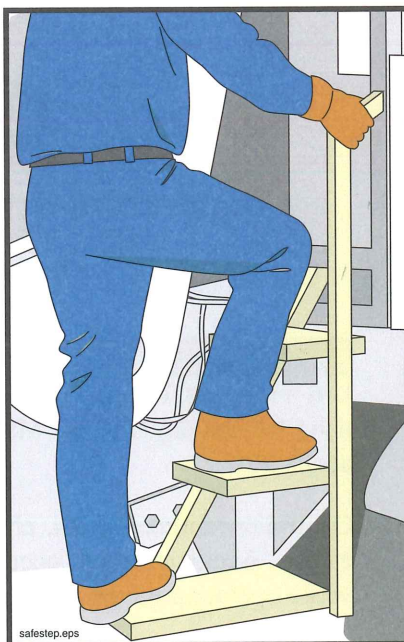


Figure 5
The 3-point Rule

3.13

⚠ WARNING Never mount or dismount the truck or pump while carrying objects that prevent you from using the 3-point Rule. Move the objects separately, if needed.

SAFETY MANUAL

GENERAL RULES

3.14

⚠ WARNING If applicable, be sure that outriggers are pinned and locked before traveling. If the locking device is damaged or worn, it should be repaired immediately and the unit **must not be driven until the outriggers can be positively locked** against accidental opening.

3.15

⚠ WARNING Be sure there is nothing in the cab of the truck (such as empty soda cans, loose tools, etc.) that could interfere with the operation of the vehicle.

3.16

Be sure that all road-related safety devices (warning signs, flares, fire extinguisher, etc.) are present and secured for travel.

3.17

Be sure all personal protective equipment (hard hat, safety goggles, rubber gloves, etc.) are secured for travel.

3.18

⚠ WARNING Be sure the windshield and mirrors are clean and free of frost or ice, and that the mirrors are properly adjusted.

3.19

⚠ WARNING Verify that head lights, tail lights, turn signals, brake lights, backup warning horn, and backup lights are operational.

3.20

In some cases you may be asked to operate a machine other than the one with which you are familiar. In these cases, be sure to:

- Know the weight, height, and width of the machine.
- Have a copy of the operation manual with you.
- Ask the machine's normal operator, the dispatcher, or your supervisor questions regarding any unusual or unique operational characteristics of the machine.
- Familiarize yourself with the machine by setting it up in the yard and running the functions, and by familiarizing yourself with the operation manual. This is especially important if the new machine is significantly different than the one you normally operate. Your coworkers depend on you to know the machine.

3.21

⚠ WARNING Be certain that all loose items on the unit are secured for travel before driving.

3.22

⚠ WARNING Emergency stop switches (E-stops) should be periodically checked by activating the switch in the yard and confirming that none of the pump functions operate electrically or manually.

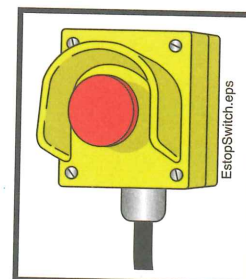


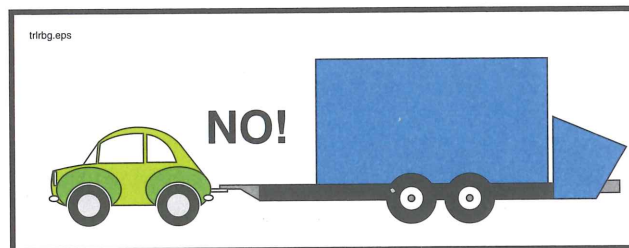
Figure 6
Periodically check your emergency stop switches (E-stops) for proper function

4. Safety Rules For Towing Trailer-Mounted Concrete Pumps

4.1

⚠ WARNING Be sure the towing vehicle is sized appropriately for the trailer. It must be heavy enough and have enough braking ability to maintain control at highway speeds and to stop—even on hills. If the trailer is heavier than the towing vehicle, braking distances will be greatly increased (Figure 7).

Figure 7
Do not under size the
towing vehicle



4.2

⚠ WARNING Never tow a trailer that has concrete in the hopper. The extra weight in the back of the machine will remove weight from the tongue and cause the trailer to fishtail.

4.3

⚠ WARNING Check the tires, tire pressure, and brakes on the trailer before towing. Never tow a vehicle with cracked or bald tires. A trailer tire blowout can cause loss of control in the towing vehicle.

4.4

⚠ WARNING Be especially careful on ice or slippery roads when towing a trailer. A skid that would normally be easily correctable can be multiplied by the trailer, causing loss of control.

4.5

⚠ WARNING Be sure the electrical connections between the towing vehicle and the trailer are sturdy and reliable, and that the lights on the towing vehicle and trailer are working.

4.6

⚠ WARNING Always use safety chains and break-away protection when towing a trailer.

4.7

⚠ CAUTION Be aware of local or state regulations regarding mirrors, lights and maximum speed when towing a trailer.

4.8

⚠ WARNING When towing a trailer, your stopping distance and turning radius are greatly increased. Be aware of this **at all times**.

4.9

⚠ WARNING When towing a trailer long distances, it is important to frequently check the hitch, hitch pins, couplers, safety clips, towing eyes, wiring, emergency breakaway switch, safety chains, and other accessories, as equipped.

4.10

⚠ WARNING Be aware of your length when towing a trailer. A common cause of trailer accidents is turning too close to curbs or objects.

4.11

⚠ WARNING Never back up a trailer without a guide.

4.12

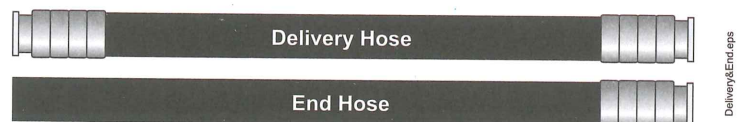
⚠ WARNING Frequently observe the trailer and watch for unusual swerving or indications of problems, such as a flat tire.

II. On The Job Site - Safety Rules For Job Setup

5. Setting Up A Trailer-Mounted Pump and/or A Separate Pipeline

- 5.1 The job setup phase sets the stage for most accidents. Taking a few extra moments to correctly set up the job will improve your chances of having a safe, trouble free day.
- 5.2 The operator is responsible for the safe operation of the machine. Notify your employer, the job superintendent, and/or O.S.H.A. if you are being asked to set up in an unsafe manner. **You are never required to take a chance with safety.** You are the **only** person who can determine that the job circumstances under your control are safe.
- 5.3 **⚠ WARNING** Any power connections above 28 volts must be made by a licensed electrician. The supply power and appropriate disconnect boxes are the responsibility of the contractor.
- 5.4 **⚠ WARNING** Electrical power on the job site may be taken only from a fused, grounded disconnect box with a disconnect switch that can be locked against activation. If you will be making repairs to the concrete pump or separate placing boom, first lock out the power at the disconnect box.
- 5.5 **⚠ WARNING** On units equipped with electric motors, **check the power cables every day.** If they are frayed or have open spots in the insulation, replace the wire. If the connectors are worn or loose, have repairs made by a licensed electrician.
- 5.6 **⚠ WARNING** Consider the safe approach and departure of the ready-mix trucks and adjust your setup accordingly. Adjusting your setup position by a few degrees one way or another could mean the difference between a safe approach and an unsafe approach. Some examples of unsafe approaches are: too near an excavation or sticking out into traffic.
- 5.7 **⚠ WARNING** Avoid collisions! Secure the immediate area of the machine from public traffic in accordance with all applicable regulations (warning lights, safety cones, barricades with flashers, etc.).
- 5.8 **⚠ WARNING** Pipelines, end hoses, couplings, and all other material delivery components must be able to withstand the maximum concrete pressure of the pump. Be sure of it! Read and understand the minimum wall thickness chart found in the *Appendix* of this manual. If you don't understand the chart, contact the pipe manufacturer for assistance.
- 5.9 A concrete delivery hose is a flexible concrete hose that has two end couplings. An end hose is a flexible concrete hose that has one end coupling. See Figure 8.

Figure 8
End hose vs delivery hose



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5.10

⚠ WARNING Do not use a piece of pipeline, end hose, coupling, or any other material delivery component that is not in good condition. **Replace, do not repair damaged pipes and hoses.** Concrete pipeline system is subject to wear, and the rate of wear is affected by pumping pressure, concrete composition, pipeline material, and other factors. Read and understand the minimum wall thickness chart in the *Appendix* of this manual. **Bursting pipes and concrete escaping under pressure is a serious safety hazard (Figure 9)!**



Figure 9
Delivery system components must be able to withstand maximum pump pressure

5.11

When laying out a pipeline, it is preferable to use an elbow instead of a hose to make direction changes. Elbows have less resistance to flow than hoses, and will therefore reduce the overall pressure required to push the concrete.

5.12

Always use the largest diameter pipeline that is practical, and use steel pipe instead of rubber hose. This will keep the pressure required to push the concrete to a minimum.

5.13

Support the delivery pipeline. Either an "S" transition pipe should be used to bring the pipe to ground level, or **each** section of the pipeline should be supported at the pump outlet level.

5.14

⚠ WARNING The sections of pipe nearest the pump are subjected to the highest pressure and the greatest wear. Because of this increase of pressure near the pump, you should install only thick-walled pipe, in like-new condition there. Read and understand the minimum wall thickness chart in the *Appendix* of this manual.

5.15

⚠ WARNING The maximum concrete pressure of the pump must be the only factor used to determine what thickness of pipe and what type of ends are needed. In the case of a rock jam or any other type of blockage, the maximum pressure of the pump will be exerted.

5.16

Grooved (Victaulic) ends are **not recommended** for concrete pumping. Read and understand the comparison between heavy duty raised, metric, and grooved ends in the *Appendix* of this manual.

5.17

⚠ WARNING If the pipeline remains on the job (as is the case when pumping a high-rise building), the operator is responsible for checking the pipeline for

dents, cracks, wear, and continuous connection each day before the pour begins.

5.18

WARNING In vertical runs, the weight of the vertical sections of pipe must be supported by a thrust block (often called a *deadman*, Figure 10) or other load-bearing device. **Each section of pipeline in a vertical run must be secured from lateral and horizontal movement.**

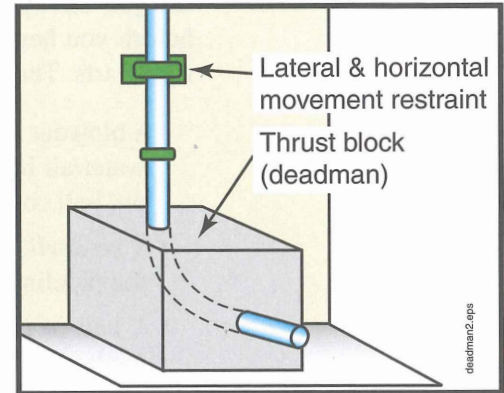


Figure 10
A thrust block (deadman)

5.19

WARNING If you will be unable to see the point of placement, establish a system of communications with the workmen who will be there. Arrange for radio communications, a system of visual or auditory signals (lights or bells), or a signaller (Figure 11). If a signaller is used, **agree on hand signals before beginning the pour!**

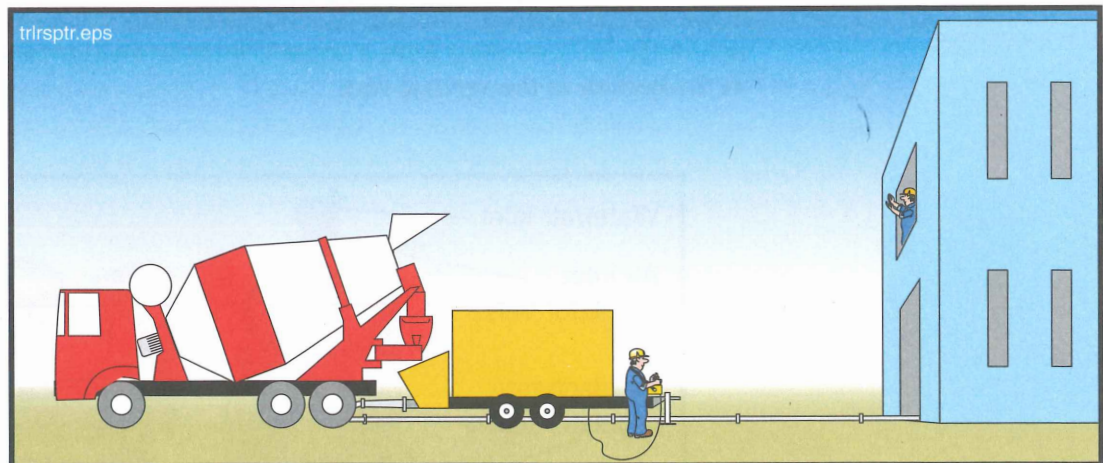


Figure 11
Arrange communications before starting

5.20

WARNING Never leave the machine unattended when it is running or ready to run. If you must leave the area, you must leave someone to monitor the unit. This is especially critical if there are children in the vicinity.

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5.21

⚠ WARNING Watch for children! It is possible for children to access the machine, but it is not safe for them to do so.

5.22

⚠ WARNING If spectators will be near the job, cordon off an area where they will be safe.

5.23

⚠ WARNING If you will be cleaning the pipeline with compressed air at the completion of the job, **be sure that you have all the necessary accessories to do the job safely.** If you don't have all of them, make arrangements to get them before you begin to pump. **Do not improvise on this. Make sure** you have the right parts. The minimum accessories include:

- A blowout head with properly sized air discharge regulator valve, and separate water/air inlet. The two openings must be spaced apart far enough that a blow-out ball could not cover both openings at once.
- A *go-devil*, or a hard sponge ball. Regardless of which is used, it **must** fit into the pipeline tight enough that air cannot escape ahead of it.
- A ball or go-devil catcher that will catch the go-devil or ball, or some other method of controlling the discharge while the line is being purged of material. There are two types of catchers (see paragraph 5.24).
- A hose that is rated for the pressure of the air compressor you will use and that is able to connect with both the air compressor and the blowout head. The hose must be in good working condition and must be free of cracks, frays, tears or other damage.
- If you will be cleaning the pipeline with compressed air at the completion of the job, be sure an adequate air compressor is available before starting the job.
- If you will be cleaning a vertical pipeline with compressed air at the completion of the job, you **must have a shutoff valve or switching valve installed at the bottom of the vertical run!**

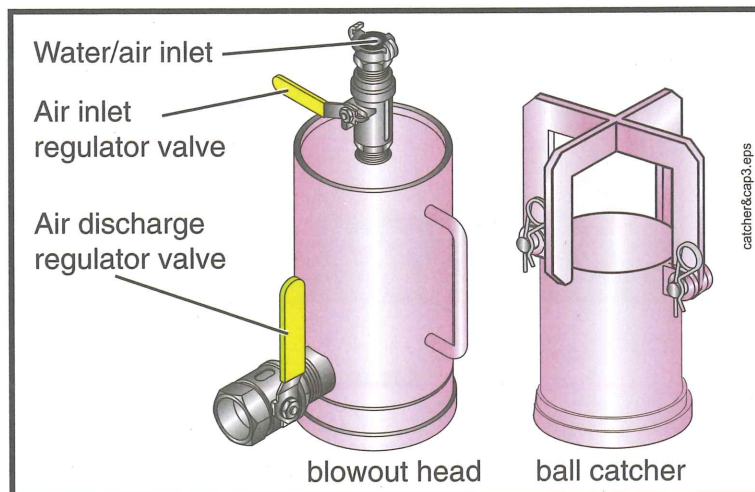


Figure 12
Ball catcher and blowout head

5.24

WARNING There are two types of ball catchers. Know which type of catcher you are using. You may need to adjust your cleanout procedure according to which type you have. The two types are as follows:

1. Catchers that stop the ball or go-devil before air can escape, and
2. Catchers that allow the air out of the pipeline after the ball or go-devil has reached the end.

Each type of catcher has advantages and disadvantages (Figure 13).

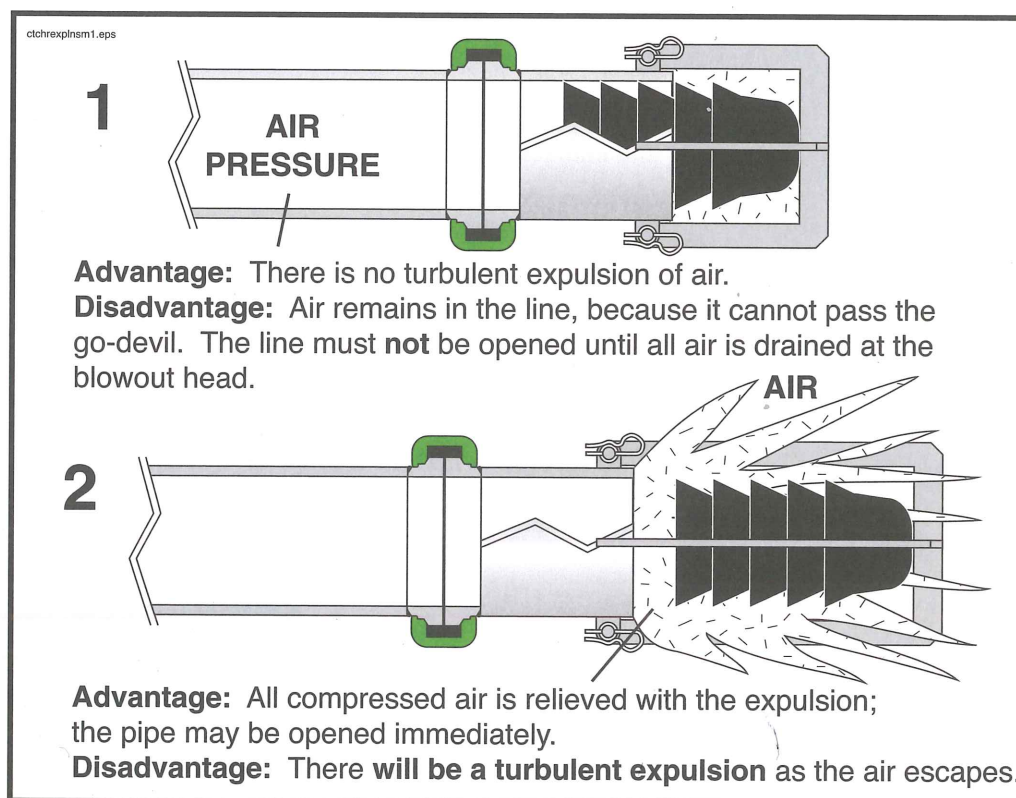


Figure 13
Types of catchers

With catcher type 1, the go-devil stops, but air is still trapped behind it. The advantage is prevention of the sometimes violent expulsion of air at the end of the pipe. The disadvantage is that the air must be drained from the blowout head before the pipe line is safe to open. The pipeline must be controlled; allow no one to open it until all compressed air is relieved.

Catcher type 2 is long enough that the compressed air escapes behind the go-devil. **Note!** This would happen with either catcher when used with a ball instead of a go-devil. The advantage of this is that once you hear the turbulent expulsion, there is no pressurized air remaining in the line, and the line may be opened immediately. The disadvantage is the expulsion itself. In this case, the end of the line must be controlled because flying concrete and aggregate pose a hazard.

Both catchers can be safely used if care is given to the hazards involved.

III. Concrete Pump Operation

6. Safety Rules For Pump Operators

6.1

WARNING Only qualified operators are allowed to operate the pump. A Qualified Operator is defined as someone who:

- has reached the age of 18 years (21 for interstate travel);
- is physically and mentally capable;
- has been trained in the operation and maintenance of the pump and the placing boom (if applicable);
- has demonstrated their capabilities to the employer in respect to the operation and maintenance of the pump and placing boom (if applicable); and
- can be expected to perform these duties, as assigned, in a reliable manner.

6.2

WARNING Because operators are responsible for the safe operation of the machine, it is crucial that they understand the proper operation of the machine and the safety rules that apply to the job at hand, so the course of action taken in unforeseen circumstances will be a safe one. Only thorough training and supervised job experience can supply the necessary understanding.

6.3

WARNING When operating the machine, wear **Personal Protective Equipment** (P.P.E., or just PPE). (Including *full face shield and/or ** breathing mask, when necessary, as shown in Figure 14.)

* Full face shield should be used in addition to safety glasses when shotcreting, or any time material is rebounding.

** Breathing mask needed when cement dust (or other toxic dust) is present in the air.

Figure 14
Wear Personal
Protective Equipment
(PPE)



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GENERAL RULES

- 6.4 **⚠ WARNING** All guards, covers, and service flaps must be secured in place during operation.
- 6.5 **⚠ WARNING** **Electrocution hazard!** If you are operating and lightning moves into the area, seek shelter until the lightning is gone.
- 6.6 **⚠ WARNING** **Crushing hazard!** Never, ever position yourself between a ready mix truck and the pump! Stand off to the side, so the ready mix driver can see you at all times (Figure 15).

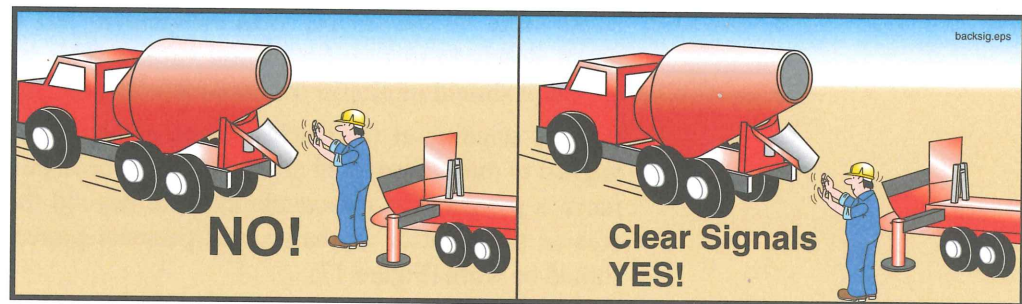


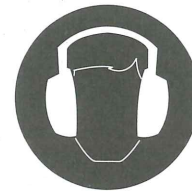
Figure 15
Never stand between the ready mix truck and the pump
Use clear and concise hand signals

- 6.7 **⚠ WARNING** When backing in ready mix trucks, use clear and concise hand signals (Figure 15).
- 6.8 **⚠ WARNING** If the job requires that you work above ground to operate your machine, an approved fall protection plan must be implemented.
- 6.9 **⚠ CAUTION** **Loss of hearing!** While standing near a working concrete pump, sound pressure levels may exceed O.S.H.A. standards for constant exposure (Figure 16).

PERMISSIBLE NOISE EXPOSURES*

*Under part 1910.95 Occupational Noise Exposure, (Dept. of Labor) of the Code of Federal Regulations, Chap. XVII of Title 29 (39 F.R. 7006).

DURATION per DAY in HOURS	Sound level in dB (A) Slow response
8	90
6	92
4	95
3	97
2	100
1 1/2	102
1	105
1/2	110
1/4 or LESS	115



WEAR HEARING PROTECTION!

Figure 16
Noise level and exposure time limits

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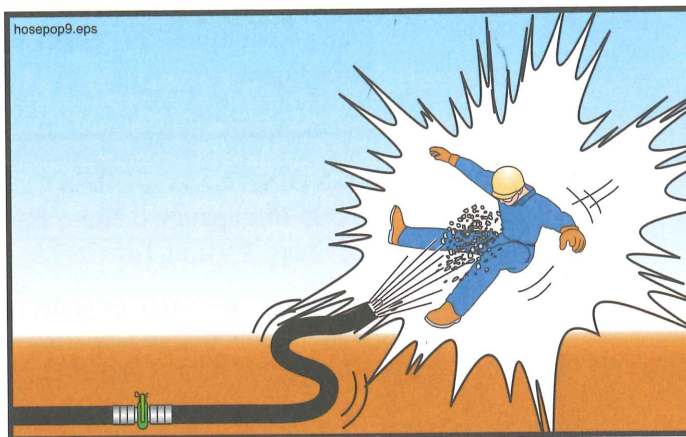
6.10

⚠ WARNING Do not let the concrete level in the hopper become low! If air is sucked into the material cylinders, the pump will compress the air. Compressed air always poses a hazard as it is expelled from the hopper or the delivery pipeline (Figure 17). If air is taken into the material cylinders, take the following steps to minimize the hazard:

1. Stop the pump immediately. Hit the emergency stop switch (E-Stop) if that is the quickest way to stop the pump. There will be an expulsion of compressed air the next time the concrete valve shifts, which can be safely absorbed by filling the hopper with concrete.
2. If possible, fill the hopper with concrete to just below the grate, then pump slowly in reverse for several strokes. This will not remove all the air, but it should minimize the amount left in the pipeline.
3. Persons standing at the discharge end or near the delivery line must be warned to move away until all of the air has been purged. Personnel should move a prudent and reasonable distance beyond the end-hose movement area or the point of discharge, and personal protective equipment (PPE) should be worn (Figure 17).
4. When the pump is restarted, pump forward slowly until **all** air is removed from the pipeline. Don't assume that the first little air bubble is the end of the compressed air.
5. Do not allow anyone near the discharge until concrete runs steadily from the end and there is no movement of the delivery system.

If workers are positioned in high or precarious places, warn them to expect a loud sound as the air escapes the pipeline. (Warn them even if they are well away from the discharge.) That way, we can prevent the worker from falling as a result of being startled by the noise.

Figure 17
Remove everyone from
the discharge area
whenever air is in the line



6.11

⚠ WARNING Air can be introduced into the delivery system in several ways besides being sucked in through the hopper.

For example:

- when initially priming the delivery system;
- when restarting after moving;

- when restarting after adding or removing delivery system;
- when attempting to remove a blockage by rocking the concrete;
- when opening the system to remove a blockage;
- when pumping is stopped and the pipeline is at a downward angle.

6.12

⚠ WARNING When initially priming the delivery system, when restarting after moving, when restarting after adding or removing hoses, when attempting to remove a blockage by rocking the concrete, or whenever air has been introduced into the line, warn everyone to stay away from the discharge until material runs steadily. Personnel should move a prudent and reasonable distance beyond the end-hose movement area or the point of discharge, and personal protective equipment (PPE) should be worn (Figure 17).

6.13

⚠ WARNING Blockages in the pump or delivery pipeline can create an unsafe condition. Blockages are caused by many different factors, as outlined below.

CAUSES OF BLOCKAGES


- **Faulty concrete mix design.** The concrete being supplied may not be a pumpable mix; for example there may be too much sand or too little cement. There may be bleeding or segregation. Some admixtures adversely affect pumpability (e.g., too much air entrainment). If the mix is not pumpable, no amount of operator expertise will make it so.
- **The line size may be inadequate.** The line size should always be at least 3 times larger than the largest aggregate being pumped, or blockages could occur.
- **Worn concrete valve parts.** Worn parts allow the finest material and water to escape back into the hopper when pressure is applied.
- **Pipeline and joint deficiencies.** This would include: dirty pipes (pipes that have not been cleaned properly); worn and leaking pipe joints that allow loss of concrete fines and water; pipes that haven't been properly primed before starting; and too many sections of rubber hose, which increases friction. These are all causes of blockages that can be controlled by the operator.
- **Pump inadequate for the application.** The pump selected for the job may not have enough pressure or horsepower available for the required duty.
- **Concrete setting up in the pipeline.** This may be caused by delays on site (e.g., repairing a broken form), or by attempting to pump old concrete (concrete that was batched hours before pumping and is being kept alive only by adding water and constant agitation). Weather conditions can also affect how quickly the concrete becomes hard. Companies should establish procedures for these situations. A good rule of thumb is: **If in doubt...wash out.**
- **Foreign matter in the concrete.** Pieces of old concrete that break away from mixer fins, unmixed clumps of cement, mixer fins, hammers, and furry mammals are examples of foreign matter that have caused blockages.
- **An inexperienced operator can cause blockages by setting up the job improperly.** For example, if the placing crew is forced to add hose or pipe to reach a far point after the pour is already in progress, there is a great chance of

SAFETY MANUAL


creating a blockage due to the dry conditions inside the pipe or hose. It is for this reason that the job should be set up so pipe or hose need only be removed (never added) as the day progresses. If dry pipe or hose must be added, it must be lubricated just like the rest of the pipe was lubricated when you first started.

- **An inexperienced or improperly trained placing crew can cause blockages by kinking the end hose.** This type of blockage can lead to serious accidents because the hose may unkink by the force of the pump.
- **The concrete becomes segregated in the hopper.**
 - a. If the concrete is too wet, the cement and fine material get washed from the stone and coarse sand. This mix will not pump. It is for this reason that you should cover the hopper as you wait out a passing storm, never allow a truck mixer to wash out in your hopper, and never add water to the mix.
 - b. If concrete is over vibrated, it will separate. Turn off the hopper vibrator when not actively pumping.


6.14

 **WARNING** Never try to remove a pipeline blockage by applying high pressure to it, because that will cause the blockage to become a plug. If you have a blockage, immediately stop the pump. Stroke the pump several times in reverse. Slowly stroke the pump in forward, and try to dislodge the blockage. If you are moving the blockage, continue to do so slowly and gently. While attempting to clear the blockage, remove all personnel from the discharge area, as air may be introduced into the placing line during this process. If you are unable to move the blockage after a couple of attempts, stop the pump. Continuing to apply high pressure could create a hazardous condition.

6.15

 **WARNING** If the pump or associated equipment develops a problem that creates an unsafe condition, you must stop pumping immediately! Do not restart until the unsafe condition has been remedied.

6.16

 **WARNING** The following points must be observed when locating a blockage.

- Pump in **reverse** for **at least two strokes**, then stop the pump. In the case of a mechanical pump (which cannot be reversed), it is important to carefully follow the manufacturer's instructions for relieving line pressure before any clamp is opened. **Do not allow anyone to open the pipeline** until the pressure is relieved (Figure 18).
- Wear personal protective equipment (PPE) when opening a blocked pipeline.
- Clear the area of nonessential personnel before opening the line.
- In all cases, the blockage must be removed before pumping again. Remember that air will be introduced when the system is taken apart, and keep personnel away from the discharge when restarting.
- Plugs will be found (in the order of likelihood): reducers, hoses, elbows, and pipe.
- If you are tapping the pipe to find the plug, the sound will be a dull thud (tik-tik) rather than a ringing sound (tong-tong) at the spot of the plug, because the

jammed material will keep the pipeline from vibrating. (This method won't find a plug in a hose.)

- To find a plug in a hose: with the pressure relieved, tap or step on the hose to locate the hard spot where the hose is plugged.

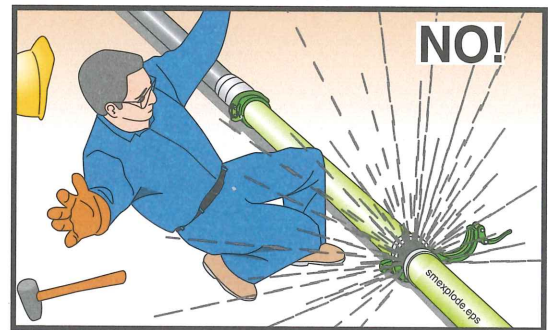


Figure 18
Never open a pressurized pipeline

6.17

⚠ WARNING It is possible that some pressure will remain in the pipeline after reversing the pump. Use a shovel or pry bar to open the clamps on a blocked pipeline. Wear face protection, and turn away from the pipeline when opening the clamp.

6.18

⚠ WARNING It would be better to let the pipe be ruined by setting concrete than to risk injury by ignoring safe procedures. Always use safe practices when cleaning pipe. Remember, pipeline is replaceable, you are not.

6.19

⚠ WARNING Do not kink hoses. Kinking will cause the pump to create maximum concrete pressure. The pump may unkink the hose with force! (See Figure 19.)

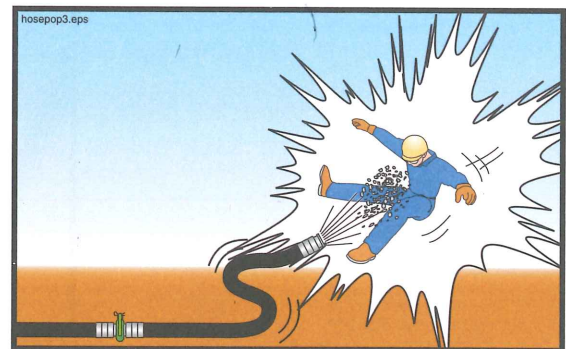


Figure 19
Kinking the hose creates a hazard

6.20

⚠ WARNING Never use compressed air to clear a blockage! It is unsafe and unnecessary. The pump can develop much more pressure than an air compressor. If the pump pressure cannot move it, air pressure won't either.

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6.21

⚠ WARNING Never stand on, sit on, or straddle a pipeline while it's in use, or whenever it is pressurized. Pipeline wears out with each stroke of the pump. If the pipe bursts, you want to be to the side of it, not on top of it (Figure 20).



Figure 20
Never straddle or sit on
a pressurized pipeline

6.22

⚠ WARNING Crushing/amputation hazard. Do not remove the water box covers or grates when the machine is stroking (Figure 21). If you must remove the water box cover (to add water, for example), and there is not a bolt-down grate over the water box, then stop the pump and activate the emergency stop (E-stop) so the pump cannot be restarted until you are finished and the covers are back in place. If a bolt-down grate is installed, you may simply stop the pump from stroking before removing the water box covers. Replace the covers before restarting the pump.

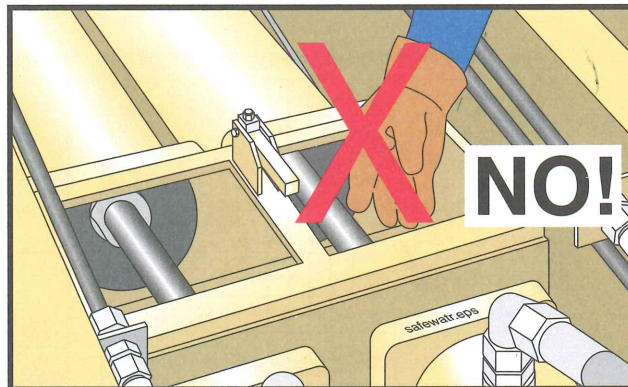


Figure 21
Keep your body out of the water box

6.23

⚠ WARNING Never leave the pump unattended! Before you leave a laborer, ready mix driver, or any other worker alone with the pump for any reason, make sure the worker who you leave with the pump knows:

- the safety rules for a person stationed at the pump (the rules are listed in this *Safety Manual*, beginning on page 35),

- how to stop the pump,
- the location of the emergency stop switches (E-stops),
- how to signal you.

6.24

⚠ WARNING To prevent any unintentional movements of the machine, **all** control devices on the operator's panel and the remote control box must be switched off before changing from remote control to local control, or vice-versa. Whenever you are connecting or disconnecting the remote cable, push in the emergency stop switch (E-stop).

6.25

⚠ WARNING Crushing/amputation hazard. Never put your hands, feet, or any other body part into the water box, concrete valve, or hopper when the hydraulic system is operational or ready to operate! (See Figure 22.)



Figure 22
Don't put your body in the machine

6.26

⚠ WARNING Do not work on the hopper, water box, concrete valve, or the hydraulic system unless the drive engine is turned off and the accumulator pressure (if so equipped) has been released! On units with internal combustion engines, the key must be removed. If there is more than one key, you should tag the ignition. On units driven by electric motors, the main disconnect must be locked out according to applicable standards.

6.27

⚠ WARNING Never operate the pump blind. If you can't see the point of placement, you must establish a system of communications with the workmen who can see the point of placement. Arrange for radio communications, a system of visual or auditory signals (lights or bells), or a signalperson. If a signalperson is used, **agree on hand signals before beginning the pour!** (Use of the ACPA standardized hand signals is highly recommended.)

7. Safety Rules For Shotcreting

7.1

Keep the pump clean. A clean machine runs more efficiently. To enhance the cleaning of your pump, it will help to spray some type of bond breaker on the entire unit before each use (form oil or equivalent). Do not put oil on surfaces that will become hot, such as exhaust manifolds.

7.2

⚠ WARNING The nozzle person and nearby personnel should protect themselves by wearing appropriate safety gear, including a full face shield to prevent rebounding concrete from injuring their face and eyes (Figure 23).

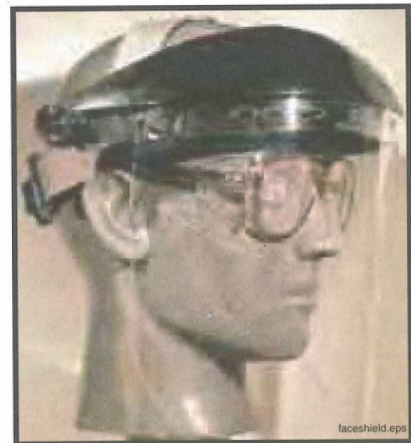


Figure 23
Wear a full face shield for
rebound protection

7.3

⚠ WARNING Direct the reducers away from the operator and the concrete mixer driver. The line pressures can be quite high during the shotcrete process (Figure 24).



Figure 24
Point reducers away from the
operator and driver

7.4

⚠ WARNING When practical, the nozzle man and the pump operator should use radios to communicate to facilitate a fast shut-down in the event of a line plug.

7.5

⚠ WARNING If setting up on a city street or some other obstacle prevents you from directing the reducers away from your work station, it can be helpful to use rubber matting and bungee cords to cover the reducers and act as a protective cover to protect you and the mixer driver in the event of a line rupture (Figure 25).

Figure 25
Cover reducers and use
containment boxes for cleanout



7.6

⚠ WARNING Crushing/amputation hazard! Always keep the hopper grate in place (Figure 26). Never put your hands, feet, or any other body part into the concrete valve, hopper, or water box when the hydraulic system is operational or ready to operate! Never stand on the hopper grate! In addition, the grate can keep many items from entering the hopper that would become blockages in the line.



Figure 26
Never remove the hopper grate
while the pump is operating

7.7

⚠ CAUTION Overspray always presents a problem during the shotcrete process. Protect personnel and equipment in the area by providing overspray protection, even when you are shooting on the inside. The most commonly used protection is plastic sheeting. It is easy to work with and can be nailed or fastened to almost any surface. Canvas tarps can be used in the same manner, but need to be cleaned frequently. Masonite and plywood also work well in some instances. It can help to over-form the area where shotcrete is to be applied. For example, if a wall is to be six feet high, you can form it to eight feet creating a two-foot area of protection. The same would apply to the end of a wall.

7.8

⚠ WARNING Check forms and rebar for stability—both backward and forward—before shotcreting. The rebar cage needs to be tied to something—usually the back form. When the shotcrete wall is being built up, the placed shotcrete wants to sag forward, bringing the rebar with it. If the rebar moves, the form may also move.

IV. Cleaning The Pump And System

8. Safety Rules For Cleaning The Concrete Valve And Hopper

8.1

⚠ WARNING Wear protective clothing and equipment when cleaning the concrete pump because the lime in concrete can burn your skin. Protect against concrete burns and concrete poisoning by wearing rubber boots and gloves during cleanout or any other time that you will be in contact with the concrete.

8.2

⚠ WARNING Crushing and amputation hazard! **Never put your hands or any other body part into the concrete valve.** Instead, use water jets and the supplied rake (Figure 27).

Figure 27
Keep your body parts
out of the machine



8.3

⚠ WARNING Never put your hands or any other body part into the machine when the hydraulic system is operational. If you must remove the grate to chip at hardened concrete, you must first disable the system by taking the transmission out of gear and locking the cab door, or stopping the engine, relieving pressure in the accumulator circuit (if so equipped) and securing the controls against unintended operation. Reinstall the grate before restarting the engine (Figure 27).

8.4

⚠ WARNING Never put a bar or other solid tool into the hopper, water box, or other working system while the hydraulics are operational (Figure 28).

9. Safety Rules For Cleaning The Water Box

9.1

⚠ WARNING Crushing and amputation hazard! Stop the concrete pump before removing the water box covers. If your unit has bolt-down guards, do not remove them for cleaning. If there is not a bolt-down guard over the water box, then stop the pump and activate the emergency stop (E-stop) so the pump cannot

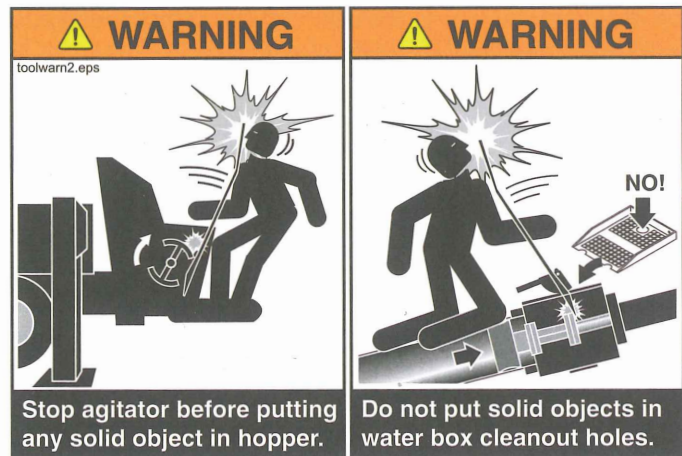


Figure 28
Don't put solid objects into working systems

be restarted until you are finished cleaning and the covers are back in place. If a bolt-down grate is installed, you may simply stop the pump from stroking before removing the water box covers. Replace the covers before restarting the pump.

9.2 **WARNING** Falling hazard! Be sure of your footing when cleaning the water box.

9.3 **WARNING** Crushing and amputation hazard! Do not remove the water box guards for cleaning. Clean the water box with water jets only. **Do not put your hands or any other body part into the water box for cleaning or at any other time when the hydraulic system is operational (Figure 29).**

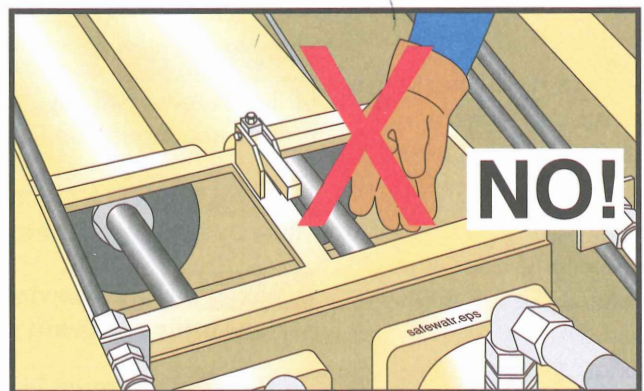


Figure 29
Keep your hands
out of the water box

10. Safety Rules For Cleaning A Separately Laid Pipeline

10.1 **WARNING** Flying particle hazard! Clear the discharge area of personnel and equipment before forcing a ball or go-devil through the pipeline, even if you are cleaning with water. Some air will be trapped in the pipeline, and the trapped air will become compressed before discharge.

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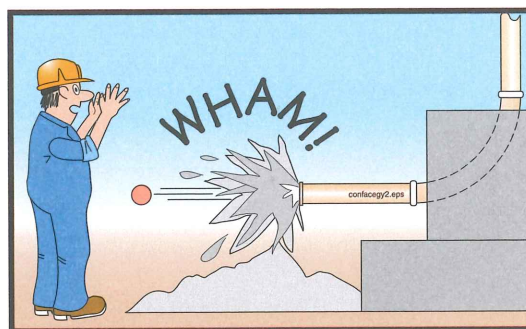
10.2

⚠ WARNING Using compressed air to clean the delivery system should only be done when no other method is practical, or as recommended by the manufacturer.

10.3

⚠ WARNING The point of discharge must be controlled. Use a ball catcher or some other containment device at the point of discharge, even when cleaning with water.

Figure 30
Cleaning with
compressed air can be
extremely hazardous if
you don't follow the
safety rules



10.4

⚠ WARNING If you have to use compressed air for cleaning the line you **must** have all of the necessary accessories. Read and understand the complete safety rules regarding cleaning out with compressed air in this section of this *Safety Manual* starting at paragraph 10.8 on page 26. Cleaning with compressed air should only be done by qualified people. See Figure 30.

10.5

⚠ WARNING If the ball or go-devil doesn't come out of the delivery system after applying compressed air, **you must relieve the pipe of air pressure before opening it.** If the bleed-off valve plugs when you are draining the air, the only safe way to proceed is to drill small holes into the pipeline, which will then allow the air to escape. Wear a full face shield when drilling the holes. Pipe you have drilled into is ruined and must be replaced. Drill the holes to relieve the air pressure even if the concrete has set up in the pipe. The pipe is hazardous until the pressure is relieved.

10.6

⚠ WARNING Exercise care when tapping on the pipeline to find the location of the cleanout ball. Applying too much force will dent a single wall pipe (making it weak and unsafe) and could break the carbide insert of double wall pipe.

10.7

⚠ WARNING It is better to let the pipe be ruined by setting concrete than to risk injury by ignoring safe procedures. Remember, pipeline is replaceable, you are not.

10.8

⚠ WARNING **Blowing out with compressed air creates potential hazards! Serious injury or death could result if you do not adhere to these safety points.**

- **Blowing out must be performed under the supervision of a qualified person.** (See the glossary for the definition of *qualified person*.)
- **Blowing out requires two people!** One trained person must be at the inlet end to operate the air insertion, and the other trained person must be near (but safely back from) the discharge point to monitor the discharge and to make sure that no one enters the hazard area.
- **No pipe bends or flexible delivery hoses may be connected to the end of the pipeline during the blowing out process,** unless there is a pre-planned

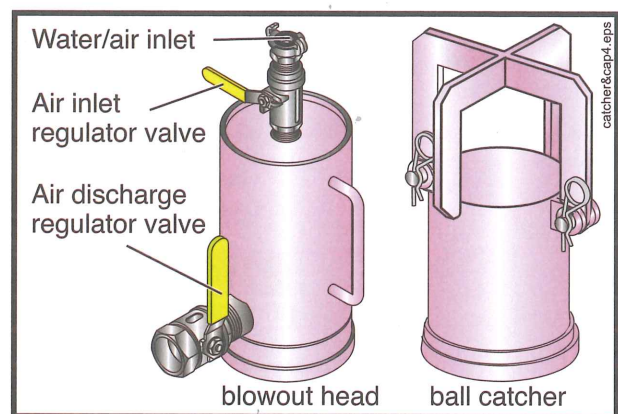
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GENERAL RULES

cleanout station erected to route the discharge into the ready mix truck.

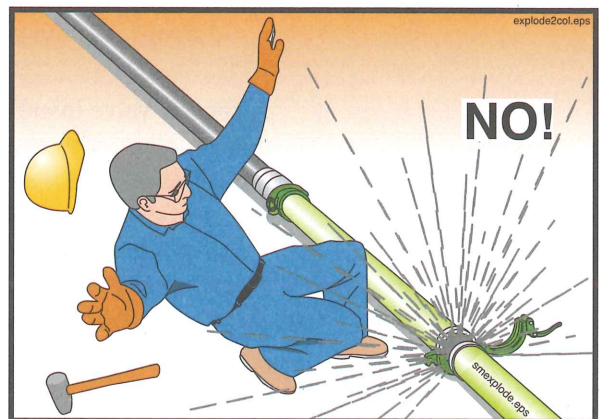
- **The point of discharge must be controlled. Clear the discharge area of personnel and equipment** before beginning the blowing out process. Do not allow anyone to enter the area during the blowout process. If a ball catcher is used, be aware of which type you have, and adjust your procedure accordingly. Ball catcher types are described in paragraph 5.24 on page 13.
- **The concrete outlet must be positioned high enough to permit easy discharge of the material.**
- If you are going to divert the discharge into a discharge pipe system, you must lubricate the discharge line with slurry, or a plug could occur.
- **The pipe cleaning blowout head must be equipped with a properly sized air discharge regulator valve and a separate water/air inlet.** The two openings should be spaced apart far enough that a blowout ball could not cover both openings at once (Figure 31).

Figure 31
Ball catcher and
blowout head



- The ball or go-devil must be large enough to prevent compressed air flow around and into the concrete.
- **The pipeline must not be disassembled until it has been completely relieved of air. Be sure of this! (See Figure 32.)**

Figure 32
Never open a
pressurized
pipeline



- **Do not use compressed air to blow out concrete delivery hose, single pipe sections and short pipelines up to a length of 40 feet.** Hoses will jump and

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move unpredictably; short pipelines don't have enough concrete to resist the force of the air, causing it to discharge too quickly, like a cannon (Figure 33).

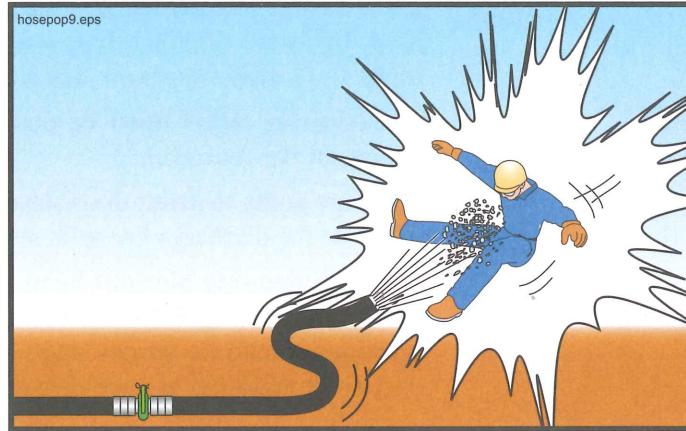


Figure 33
Never use air to blow out hoses or short pipelines

- **When air pressure begins to drop rapidly, shut off the air supply from the compressor, and immediately begin bleeding air out of the pipeline.** (The drop in pressure signifies that the pipeline is almost empty of concrete.)

10.9

⚠ WARNING When blowing out a vertical line, a shutoff valve is required to prevent the following scenario.

1. (See diagram A in Figure 34.) Without a shutoff valve installed, the pipeline is disconnected from the pump. Immediately, the concrete drains out of the vertical sections of pipe, leaving concrete in both horizontal sections, and air trapped in between.
2. (See diagram B in Figure 34.) The ball is inserted, and pushed with compressed air. This also compresses the air that is trapped in the vertical sections of pipe. The trapped air will be violently expelled when it reaches the end of the pipe, but the pipe will not yet be empty.

A shutoff valve installed at the bottom of the vertical run will prevent this hazardous situation. The shutoff valve must be capable of handling the maximum concrete pressure of the pump and, of course, must be installed before the pour begins. Several different styles are available, ranging from a manually operated flat gate that is put into place with a hammer to fully hydraulic types that will also divert the concrete to a different pipeline. With a shutoff valve installed, you can proceed as indicated below.

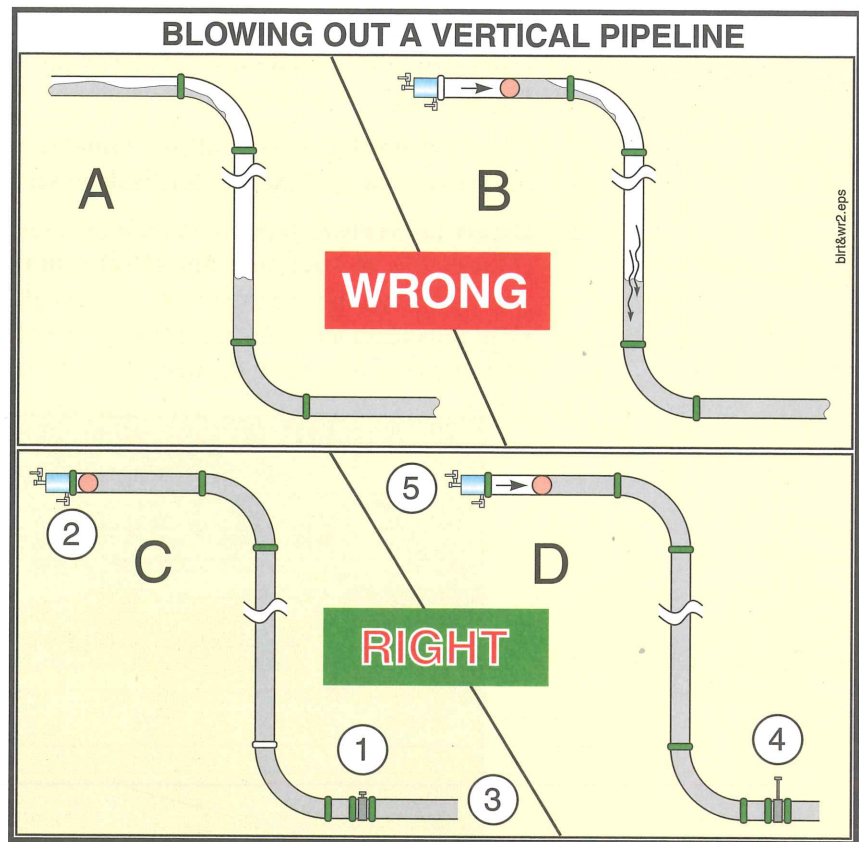


Figure 34
Blowout of a vertical line

10.10

⚠ WARNING Blowing out vertical sections of pipe (for example on a high-rise building) requires additional safety precautions.

1. **Know where the discharge area for blowing out will be before the pour begins.** Ready the area and accessories before the pour begins so you will not waste time when pumping is completed.
2. **Blowing out with compressed air requires two qualified persons.**
3. **The persons at both ends of the pipeline must be able to communicate without delays,** which means you must establish communications (for example, with a radio).
4. **When pumping is complete, close the shutoff valve before disconnecting the pipeline from the pump** (Item 1, Figure 34). Failure to do this will cause the concrete to fall out of the vertical sections of pipe, leaving concrete in the horizontal sections of pipe and an air pocket in the vertical sections. This does not apply if you are using a switching (diversion) valve.
5. **Install the ball(s) in the pipeline, secure the blowout head and hook up the air compressor. Do not apply the air yet!** (Item 2, Figure 34.)

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6. If you will be diverting the discharge to a cleanout area, lubricate the discharge line with slurry, or a plug could occur.
7. **Position the ready mix truck at the cleanout standpipe**, or install the ball catcher or other containment device at the end of the discharge line. (Item 3, Figure 34.)
8. **Clear the discharge area of personnel.** You must allow no one to enter the discharge area until the pipeline is depressurized.
9. **Divert the vertical pipe line to the cleanout area and secure the discharge (Figure 35), or open the shutoff valve in the delivery pipe line now.** Allow gravity to start the concrete moving through the discharge line. As the concrete falls from the vertical sections, it will take the ball with it, making it impossible to trap air in the line. (Item 4, Figure 34.)



Figure 35
Divert vertical pipeline to the cleanout area and be sure to secure the discharge before continuing

10. **Apply the compressed air to the pipeline.** Close communications must be maintained at this time. Add only enough air to keep the concrete moving. Do not allow the concrete to accelerate. (Item 5, Figure 34.)
11. **When concrete starts to accelerate, shut off the air supply from the compressor, and open the air regulator to bleed air from the line.** Rapidly accelerating concrete indicates that the pipeline is almost empty. After the ball has been expelled from the pipeline, leave the air regulator open to be sure that all air is removed from the system.
12. All the rules for blowing out found in Point 10.8 on page 26 also apply to blowing out a vertical pipe line. These rules are in addition to the general cleaning a pipeline with compressed air rules.

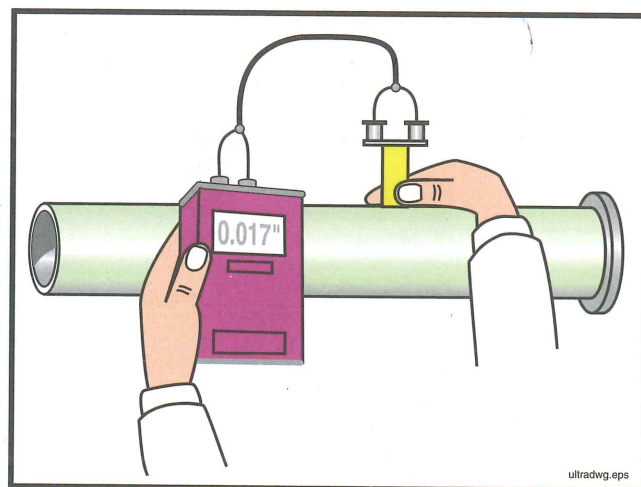
10.11

⚠ WARNING Never use compressed air to attempt to clear a blockage! It is unsafe and unnecessary. If the pump pressure can't move it, air pressure won't either.

V. Maintenance Of The Machinery

11. Safety Rules Regarding Inspection

- 11.1** **⚠ WARNING** Visually inspect your unit each day before it is put into operation. If any problem is found that will affect the safe operation of the pump, don't use the pump until it is repaired!
- 11.2** **⚠ WARNING** If safety decals are faded, missing, damaged, or otherwise unreadable, they must be replaced immediately. Contact the manufacturer of your unit to obtain replacements.
- 11.3** **⚠ WARNING** If safety devices or guards are removed for inspection purposes, they must be replaced before someone uses the machine.
- 11.4** **⚠ WARNING** Pay attention to the operation manual and manufacturers service bulletins regarding maintenance and inspection procedures and intervals.
- 11.5** **⚠ WARNING** If inspection reveals something that looks wrong, or even suspicious, report it to the manufacturer for consideration. Don't just assume that it's okay.
- 11.6** **⚠ WARNING** Visual inspection of the concrete pump circuits and safety devices should be done daily. Hands-on inspection and documentation of results should be done weekly, or at least when preventive maintenance is scheduled.
- 11.7** **⚠ WARNING** Do not neglect the delivery pipeline, clamps, or hoses. Check them often for wear, dents, and frays. Never send a unit to a job with a worn or damaged delivery system. For single wall pipes, ultrasonic thickness testers are more accurate than the tap method.



††

Figure 36
Check delivery system wall thickness with
an ultrasonic thickness tester

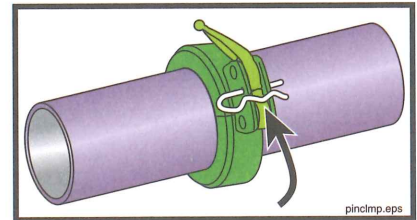
12. Safety Rules Regarding Scheduled Maintenance

12.1 **⚠ WARNING** Proper and timely maintenance is important to the safe operation of a concrete pump. The proper procedures are outlined in the operation manual supplied with the pump. Do not put it off. Do not treat it lightly. Do not fudge results. The lives of the operator, oiler, and workers on the job are depending on it.

12.2 **⚠ WARNING** Keep the machine clean! Oil spills, grease, loose tools, and displaced accessories are hazards.

12.3 **⚠ WARNING** Pins should be used on all delivery system clamps. Clamps that will hang over workers, and clamps used on system that will be dragged shall be pinned (Figure 37).

Figure 37
Pin the clamps



12.4 **⚠ WARNING** Be sure that you are installing the correct clamps for the types of pipe ends used. Never try to mate dissimilar pipe ends unless using a clamp specifically made for this purpose. See the comparison regarding weld-on ends on page 46 in the *Appendix* of this manual.

12.5 **⚠ WARNING** When using new pipe and/or hose on the machine, be sure that it is capable of handling the maximum concrete pressure of the pump.

12.6 **⚠ WARNING** If safety devices or guards are removed for servicing, they must be replaced before the machine is put back in service.

12.7 **⚠ WARNING** Do not change the maximum relief valve setting on any hydraulic circuit without permission from the manufacturer. **Never** change an accumulator circuit pressure setting without specific instructions from the manufacturer.

12.8 **⚠ WARNING** Never make unauthorized modifications to structural members or pressure circuits.

12.9 **⚠ WARNING** You must **replace, not repair** damaged hydraulic or concrete hoses or pipes.

12.10 **⚠ WARNING** Never try to repair a machine using worn, damaged, or defective components.

12.11 **NOTICE** Never allow welding current to travel through bearings or hydraulic cylinders. Keep the ground cable on the component that is being welded.

12.12

NOTICE Electronic components can be destroyed by welding current. Before welding on the unit, you must disconnect the battery cables, and unplug all radio remote control power wires. If in doubt, contact the Service Department of the manufacturer for instructions **before** proceeding.

13. Safety Rules When Servicing The Machinery

13.1

WARNING Repairs should be carried out by qualified workshop personnel. (See the glossary for the definition of *qualified personnel*.)

13.2

WARNING Read and understand the maintenance procedures in the operation manual of the machine before attempting any repairs. If in doubt, call the manufacturer. Incorrectly done repairs affect the safe use of the machine.

13.3

WARNING Burn hazard! Never work on a hot hydraulic system.

13.4

WARNING Falling hazard! If you cannot work at ground level, you must find and use a suitable work platform, a tie-off harness system, or otherwise secure yourself from falling.

13.5

WARNING If maintenance work requires that you use a crane, hoist, fork truck, or similar machine, read and understand the safety regulations for that equipment.

13.6

WARNING Only operators should operate the unit. If work on the machine requires that it be operated and you are not qualified as an operator, you must get someone who is qualified to assist you.

13.7

DANGER Electrocuting hazard! Repair work on electrical systems over 28 volts must be done by qualified electricians.

13.8

WARNING Explosion hazard! Be sure that you understand the potential danger of spring-loaded or compressed-gas components before you service them. (Examples: nitrogen accumulators, gas springs for toolbox doors, tires, brake chambers.) If you don't know the dangers, call the manufacturer **before** beginning work!

13.9

WARNING If you will be working in a hidden area inside the machine, lock it out as follows.

- With a gas or diesel engine, remove the ignition key and place a *Do Not Operate* sign on the controls. Carry the key with you.
- With an electrically driven pump, lock out the main breaker and tag the controls.

The above rules are one simple Lock Out-Tag Out procedure. A procedure may also be provided in the operation manual for the unit and there may be state or local regulations that require a more advanced or stringent Lock Out-Tag Out program. Be aware of the regulations in your area.

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13.10

⚠ WARNING Never activate the system hydraulics without checking if another workman is in a hidden position. Always yell “clear” before starting the engine or electric motor, and allow time for response.

13.11

⚠ WARNING Never work on a pressurized hydraulic system. Stop the engine or electric motor, relieve the accumulator circuit and verify zero pressure on the gauge (if so equipped), and be sure that no hydraulic components are loaded, (i.e., outrigger supporting the unit) before you open the hydraulic system.

13.12

⚠ WARNING Never use gasoline or diesel fuel as a cleaning solvent. This is critical to remember when cleaning hydraulic oil reservoirs, because gas and diesel fuels are highly explosive and traces left in the oil may ignite when compressed!

13.13

⚠ WARNING Remember to mount and dismount the unit using the 3-point Rule. One hand and two feet or two hands and one foot are to be in contact with a secure surface at all times (Figure 38).



Figure 38
The 3-point Rule

13.14

⚠ WARNING Always use the correct tools for the job. Tools should be kept clean and in good condition.

13.15

⚠ WARNING If you see a coworker engaging in an unsafe practice, warn him about the dangers. Safety is always in the hands of those on the job!

13.16

⚠ WARNING After any repair is completed, test the function of the repaired part to be sure that repairs were done correctly.

VI. Coworker Safety

14. Safety Rules For Workers Assigned To The Pump.

14.1

⚠ WARNING You must know how to stop the pump. Have the operator show you the locations of the emergency stop switches (E-stops) (Figure 39).

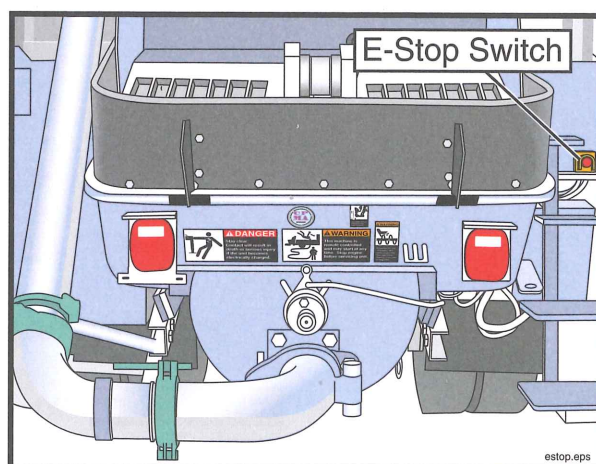


Figure 39
Know how to stop the unit in an emergency

14.2

⚠ DANGER You should wear the same personal protective equipment as the operator. Goggles, hard hat, ear protection, and rubber gloves are especially important when working near the hopper, (including *full face shield and/or **breathing mask, when necessary, as shown in Figure 40).

* Full face shield should be used in addition to safety glasses when shotcreting, or any time material is rebounding.

** Breathing mask needed when cement dust (or other toxic dust) is present in the air.

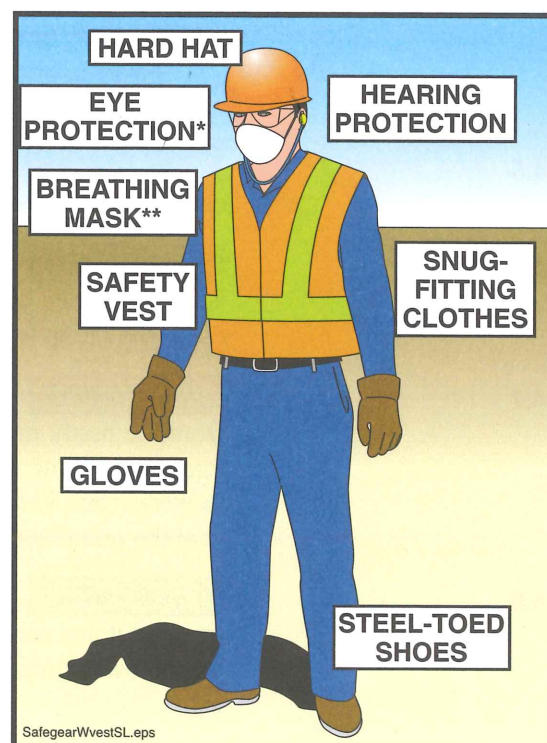


Figure 40
Wear the same personal protective equipment as the operator

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14.3

⚠ WARNING Crushing hazard. Never, ever position yourself between the ready mix truck and the pump! Stand to the side, where the driver can see you (Figure 41).



Figure 41
Never stand between the ready mix truck and the pump

14.4

⚠ WARNING When backing in ready mix trucks, use clear and concise hand signals (Figure 42).

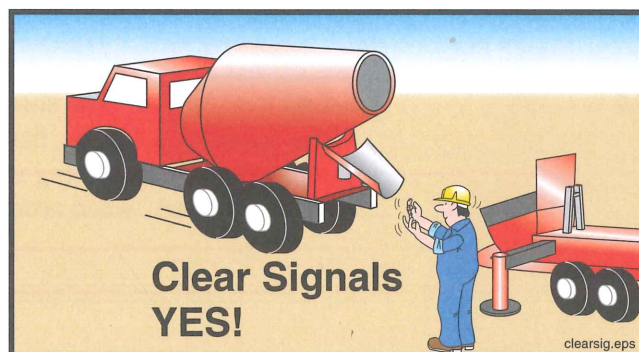


Figure 42
Use clear, concise
hand signals

14.5

⚠ WARNING If handling the chutes of a ready mix truck, keep your hands clear of the hinged areas.

14.6

⚠ WARNING Do not allow the ready mix driver to put concrete in the pump hopper until the pump operator gives him the 'okay.' Filling the hopper early can cause the pump to plug.

14.7

⚠ WARNING If you see foreign material that could create a blockage coming from the ready mix truck, alert the operator to stop the pump. Do not attempt to remove the material from the hopper or grate while the hydraulic system is ready to work. (See Point 14.16 on page 39.) If necessary, depress the E-stop button to stop the pump and alert the operator.

14.8

⚠ WARNING Never allow the ready mix driver to clean out in the hopper, because it can create a blockage. (Water will wash the cement and fine sand from the course aggregate causing segregation.)

14.9

⚠ WARNING Do not operate the pump unless you are also a trained operator and the regular operator has released the controls to you. **There must not be more than one operator at a time.** This does not apply to stopping the pump or boom if there is a need to do so.

14.10

⚠ WARNING Do not let the concrete level in the hopper become low! If air is sucked into the material cylinders, the pump will compress the air. Compressed air always poses a hazard as it is expelled from the hopper or the delivery pipeline (Figure 43). If air is taken into the material cylinders, take the following steps to minimize the hazard:

1. Stop the pump immediately. Hit the emergency stop switch (E-stop) if that is the quickest way to stop the pump. There will be an expulsion of compressed air the next time the concrete valve shifts. If possible, fill the hopper with concrete to help contain the expulsion. Do not put your face directly over the hopper.
 2. Alert the operator of the problem. It is the operator's job to know the procedures for safe removal of air from the pump and delivery system. These procedures include pumping in reverse for a couple of strokes.
 3. Persons standing at the discharge end or near the delivery line must be warned to move away until all of the air has been purged. Warn them to stay a reasonable and prudent distance beyond the reach of the end hose or point of discharge (Figure 43).
 4. When the pump is restarted, don't assume that the first little air bubble is the end of the compressed air.
 5. Do not allow anyone near the discharge until concrete runs steadily from the end and there is no movement of the delivery system.
- If workers are positioned in high or precarious places, warn them to expect a loud sound as the air escapes the pipeline. (Warn them even if they are well away from the discharge.) That way, we can prevent the worker from falling as a result of being startled by the noise.

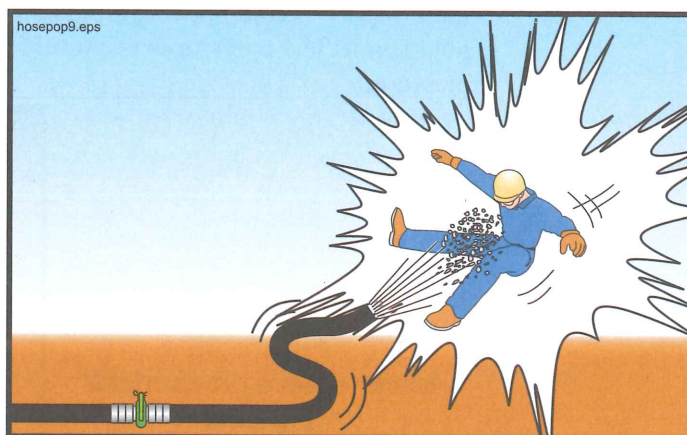


Figure 43
Remove everyone from the discharge area
whenever air has been introduced into the line

SAFETY MANUAL

14.11

⚠ WARNING When initially priming the delivery system, when restarting after moving, when restarting after adding or removing hoses, or whenever air has been introduced into the line, warn everyone to stay away from the discharge until concrete runs steadily and there is no movement of the delivery system. Personnel should stay back a reasonable and prudent distance beyond the reach of the end hose or point of discharge (Figure 43). Air will be in the line when first starting, when restarting after moving, when a blockage has been successfully removed by rocking the concrete, and after the line has been taken apart or opened for any reason.

14.12

⚠ WARNING Never use compressed air to clear a blockage! The operator is responsible for knowing the safe blockage removal procedures. It is unsafe and unnecessary to use compressed air. If the pump pressure cannot move it, air pressure won't either.

14.13

⚠ WARNING Never stand on, sit on, or straddle a pipeline while it's in use, or whenever it is pressurized. Pipeline wears out with each stroke of the pump. If the pipe bursts, you want to be to the side of it, not on top of it (Figure 44).



Figure 44
Never straddle or sit on
a pressurized pipeline

14.14

⚠ WARNING Expulsion hazard! Never open a pipeline that is under pressure (Figure 45). The pump must be run in reverse for at least two strokes and then stopped before opening a pipeline. If the pipeline is pressurized with air, do not open it. The operator is responsible for knowing how to safely release the air pressure.

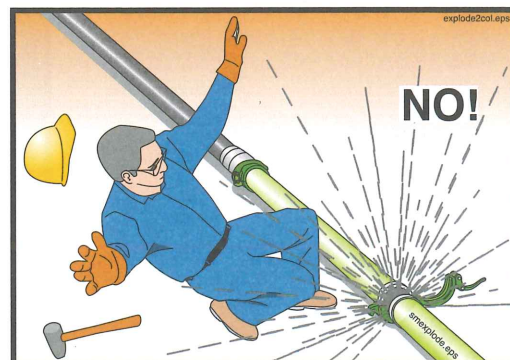


Figure 45
Never open a pressurized
pipeline

14.15

⚠ WARNING Be careful when handling pipeline or any other heavy object. Learn how to lift without using your back. Get assistance if needed.

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GENERAL RULES

14.16

⚠ WARNING Crushing/amputation hazard! Never put your hands, feet, or any other body part into the water box, concrete valve, or hopper when the hydraulic system is operational or ready to operate! Never stand on the hopper grate! (See Figure 46.)



Figure 46
Never put your body in the machine!

14.17

⚠ WARNING Never lift or remove the hopper grate for any reason (Figure 47).



Figure 47
Lifting hopper grate exposes the agitator and the concrete valve

SAFETY MANUAL

14.18

⚠ WARNING Do not remove the water box covers or grates when the machine is stroking (Figure 48). Do not remove the water box cover (to add water, for example), until the operator has disabled the machine. Replace the covers before the operator restarts the pump.

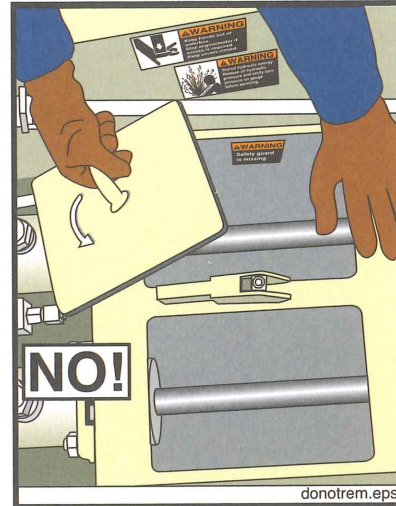


Figure 48
Do not remove the water
box covers when the
machine is stroking

14.19

⚠ WARNING Mount or dismount the pump or truck using the *3-point Rule*. One hand and two feet or two hands and one foot are to be in contact with a secure surface at all times (Figure 49).



Figure 49
The 3-point Rule

14.20

⚠ WARNING Keep unauthorized personnel off of the pump.

15. Safety Rules For The Placing Crew

15.1

⚠ WARNING Wear Personal Protective Equipment (P.P.E., or just PPE) when working around a concrete pump (Figure 50). The gloves should resist concrete lime burns. If you will be working **in** the concrete, protect your feet and hands with rubber boots and gloves (including *full face shield and/or ** breathing mask, when necessary, as shown below).

* Full face shield should be used in addition to safety glasses when shotcreting, or any time material is rebounding.

** Breathing mask needed when cement dust (or other toxic dust) is present in the air.



Figure 50
Wear Personal Protective Equipment (PPE)

15.2

⚠ WARNING When the operator is initially priming the delivery system, restarting after moving, restarting after adding or removing pipes or hoses, or any time that air has been introduced into the delivery system, stand a reasonable and prudent distance away from the tip hose or point of discharge. Do not get near the discharge until material runs steadily and there is no movement of the delivery system. (Figure 51). Compressed air in the line can cause rubber hose to move violently. If the operator tells you that air is coming in the delivery system, proceed as follows:

- Get to ground level (if in a high place) and remain well away from the discharge or at least take cover.
- Stay away from the discharge. Be sure that **all** the air is gone before getting near the point of discharge again. It is the operator's job to know when it's safe to go back to normal pumping.

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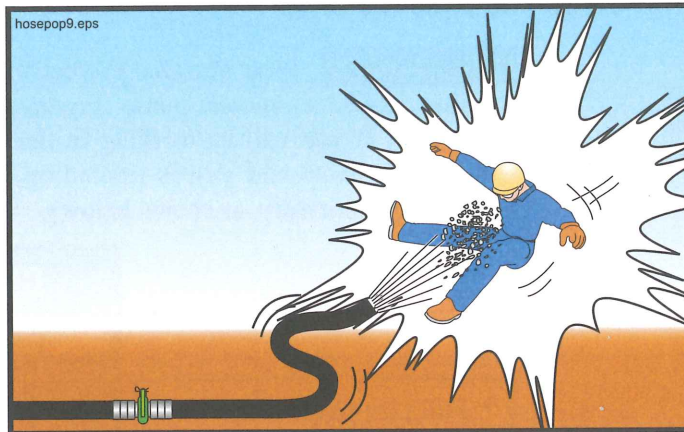


Figure 51
Stay away from the point of discharge when starting or restarting, and when there's air in the pipeline

- 15.3** **⚠ WARNING** Never use compressed air to clear a blockage! It is unsafe and unnecessary. If the pump pressure cannot move it, air pressure won't either. Stand away from the discharge and the line if anyone attempts to use compressed air in this manner.
- 15.4** **⚠ WARNING** Do not look into the end of a plugged hose or pipe!
- 15.5** **⚠ WARNING** When the pump crew is using compressed air to clean the boom or system pipeline, stay away from the discharge area. **Never try to hold down a pipe or hose that is being cleaned with air.**
- 15.6** **⚠ WARNING** Never open a pressurized pipeline (Figure 52). The pump operator must release the pressure before you open the line: If the line is pressurized with compressed air, let the operator release the pressure and verify that the air has escaped before you proceed.



Figure 52
Never open a pressurized pipeline

- 15.7** **⚠ WARNING** After removing pipe sections you must **reassemble using gaskets and clamps**. Pipelines assembled without gaskets will leak cement and water, which can cause a blockage.

- 15.8** **⚠ WARNING** Concrete is being moved through the delivery system by pressure. Failure of a pipe, clamp, hose, or elbow is possible. For this reason, spend as little time as possible standing near the pipeline, and wear protective clothing.
- 15.9** **⚠ WARNING** Do not kink the end hose. Kinking will cause the pump to create maximum concrete pressure. The pump may unkink the hose by force! (See Figure 53.)

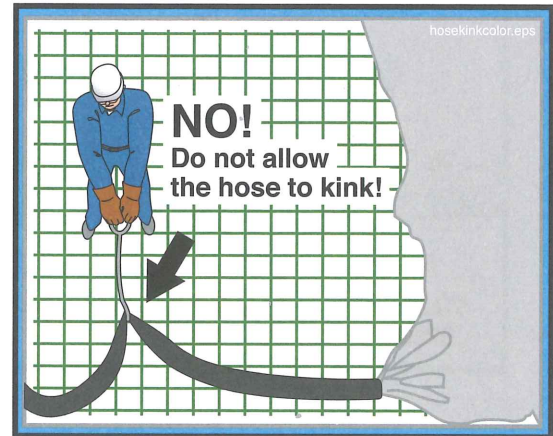


Figure 53
Never kink the hose;
Never hold the hose with your shoulder

- 15.10** **⚠ CAUTION** Be careful when handling pipeline or any other heavy object. Learn how to lift without using your back. Get assistance if needed.
- 15.11** **⚠ WARNING** Falling hazard! When pouring columns, slabs, or walls above ground, secure yourself from falling.
- 15.12** **⚠ WARNING** Never stand on, sit on, or straddle a pipeline while it's in use, or whenever it is pressurized (Figure 54). Pipeline wears out with each stroke of the pump. If the pipe bursts, you want to be to the side of it, not on top of it.



Figure 54
Never straddle or sit on a pressurized pipeline

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15.13

⚠ WARNING To avoid confusion and conflicting signals, only one person should act as a signalperson (give operational signals to the pump operator). However, the operator is trained to obey a stop signal from anyone and everyone.

15.14

⚠ WARNING Before the pour begins, the hose person, the signalperson, and the operator should agree on the hand signals (Figure 55).

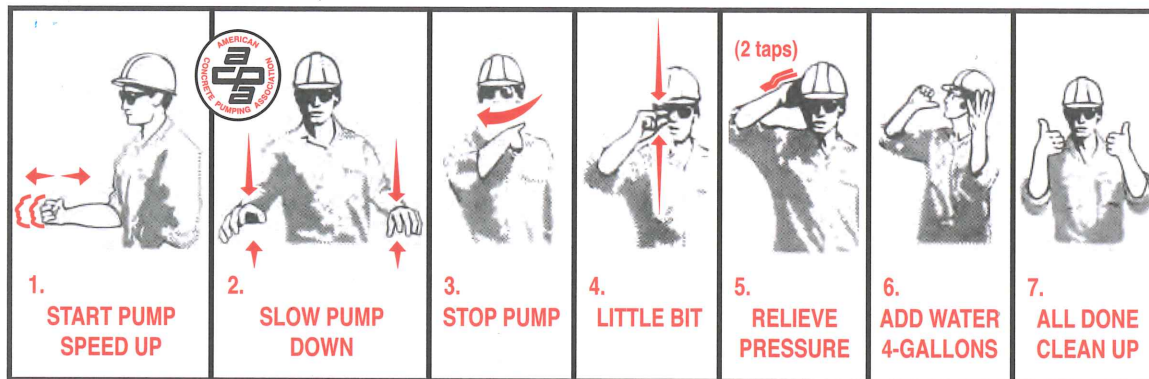
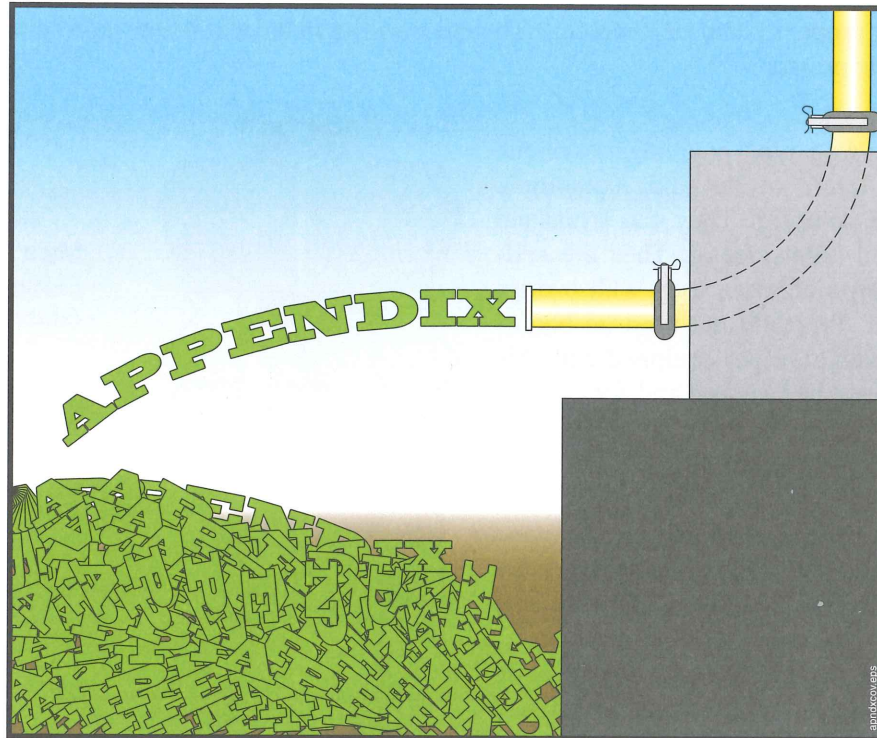


Figure 55
Recommended ACPA hand signals



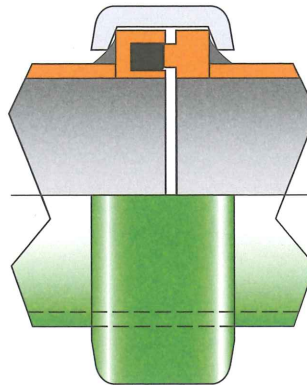
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VII. Weld-On Ends/Coupling Comparison

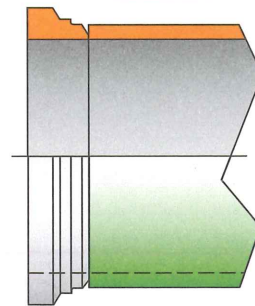
Shown is a comparison among commonly used ends/couplings. No two ends shown can be joined without the use of an adapter pipe or a special adapter clamp. Clamps and pipe strength must also be considered when determining proper system requirements. The ratios shown in the text below represent the safety factor from burst:working pressures.

1. Male/female o-ring type couplings have the highest pressure rating of the ends commonly used for concrete pumping. They can withstand 4350 PSI @ a 2:1 safety factor. They are self-aligning and waterproof when used with o-rings in good condition. Typically not used on booms because of their weight. Pipes equipped with this style coupling cannot be swapped end-for-end.



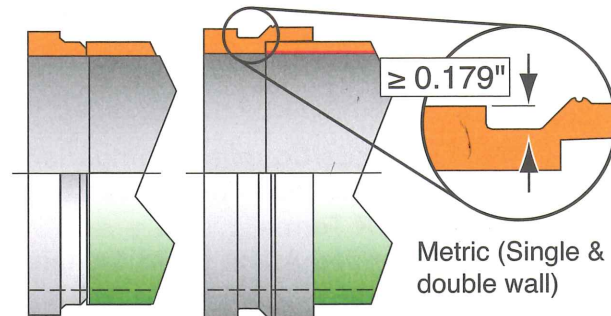
Male / Female
O-Ring
(shown with clamp)

2. Heavy-Duty couplings are designed for pressures up to 2250 PSI @ 2:1. They have 20% more contact area than metric couplings, and a tapered face that draws the pipe sections together during assembly. Both the ends and clamps weigh more than metric style, and therefore should not be used on booms without consulting the manufacturer.



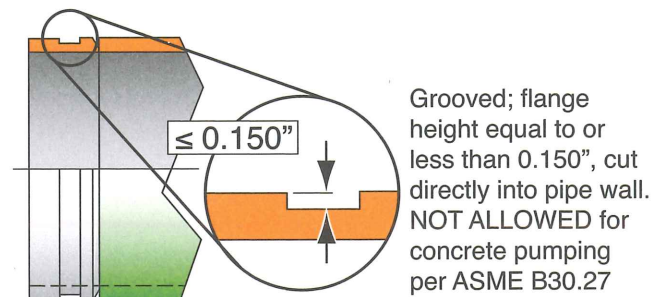
Heavy-Duty

3. Metric couplings are designed for pressures up to 1400 PSI @ 2:1. They have 85% more contact area than grooved couplings. The face is flat and will not draw pipe together. Although they have a raised edge, they are not compatible with Heavy-Duty couplings unless a special clamp or an adapter pipe is used to change from one style to the other. Metric connections are standard equipment on booms because of the weight savings compared with other styles.



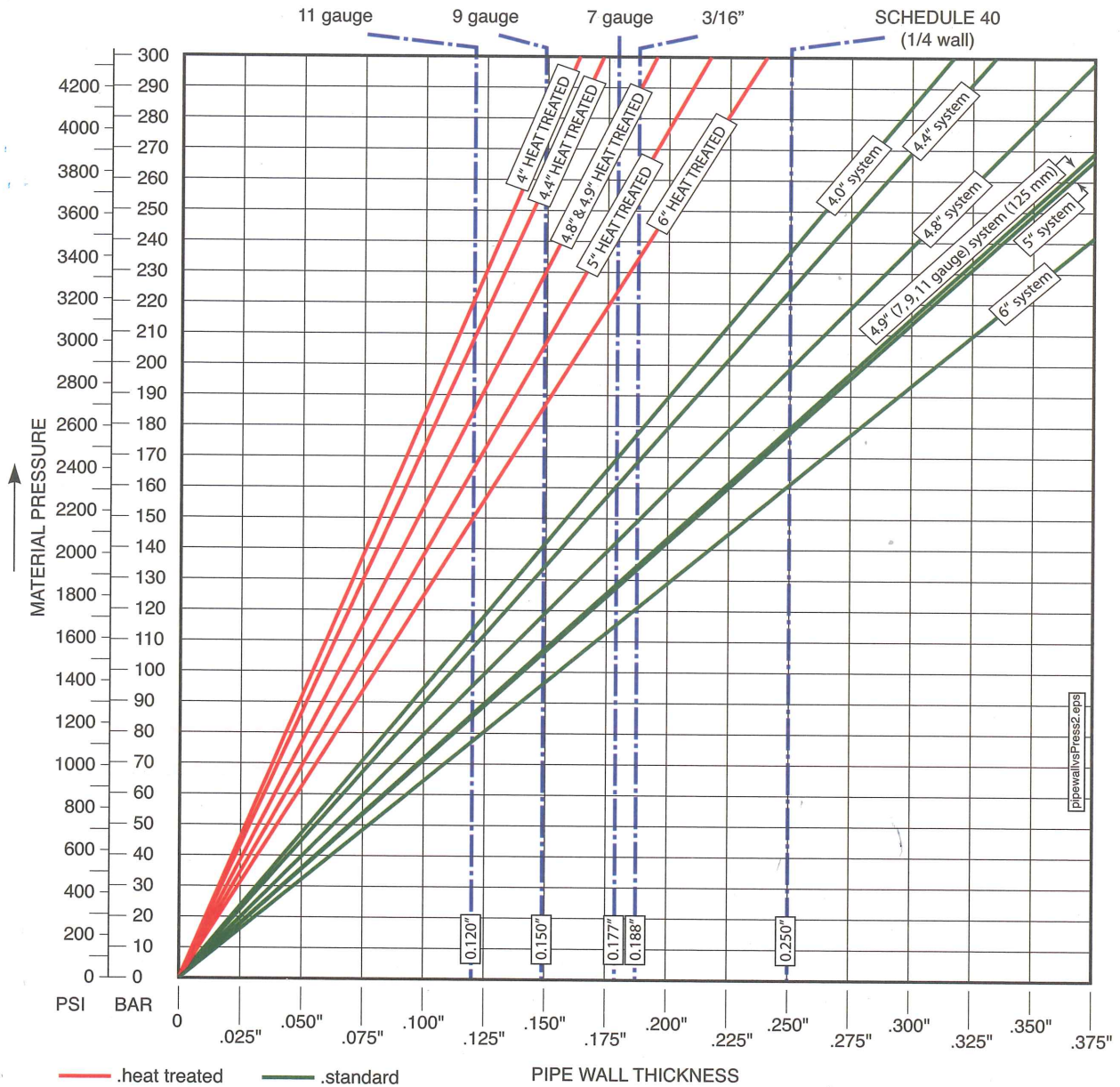
Metric (Single &
double wall)

4. Grooved (Victaulic) couplings (lip height of 0.15" or less) are designed for pressures only up to 750 PSI @ 2:1. The recessed groove is hard to clean when changing pipe on a job. The weld-on end fails before the pipe because the groove is cut into the pipe thickness, making it the weakest spot. Grooved couplings are not recommended for concrete pumping applications.



NOTE: All pressure ratings listed refer to 5-inch (125mm) diameters in like-new condition. Other pressures would apply to other diameters.

VIII. Minimum Pipe Wall Thickness Chart



1. This chart assumes a safety factor of 2:1. Higher safety factors may be required in some circumstances.
2. Wear reduces wall thickness. Thickness must be checked on a regular basis.
3. Pressures may be limited even more by clamp style or pipe end used.
4. The chart is based on 62,000 PSI tensile strength. Heat-treated calculations are based on 120,000 PSI tensile strength.
5. The chart is for pressure calculations ONLY. There is no allowance for mechanical forces other than pressure, and thicker walls may be needed for mechanical strength because of support or restraint considerations.
6. The chart does not take into account metal fatigue caused by pressure cycles.

Note! This chart is intended as a guide for concrete pumping applications and is subject to the notes, assumptions, and conditions listed above. Any other use of this chart is not recommended.

This chart does not apply to double-wall pipe. Double-wall pipe can be checked by inspecting the inside of the pipe. If the insert is intact, the pipe is okay. If the insert is worn through, the pipe must be replaced. Contact your pipe supplier for the pressure capacity of your double-wall pipe.

IX. Glossary Of Terms

Accumulator

A hydraulic device that stores fluid power energy in much the same way that a battery stores electrical energy. Because an accumulator will store energy, it **MUST** be drained and depressurized before work begins on an accumulator-equipped actuator or hydraulic system.

Agitator

A device that sits in the concrete hopper to keep concrete moving, preventing it from setting. It is typically a rotating shaft to which several paddles have been mounted. *See Also:* Hopper Grate

ASME B30.27

A safety standard for material placement systems (concrete pumps and material placement conveyors) that has been accepted by ANSI as an American National Standard.

Blanking Plate

Also known as a blanking plug or end cap. Its purpose is to prevent material from falling out of the delivery system when moving a boom with a full pipeline over personnel or property.

Blockage

Simply put, if the pump is pushing and concrete fails to come out at the point of discharge, it is called a blockage. Blockages can be removed with pump pressure, by rocking the pump between forward and reverse, or some other remedial measure. If the blockage cannot be removed in such a manner, it's called a plug. *See Also:* Plug, Rock Jam. The causes of blockages are detailed in Section 6.12 of this manual. In all cases, blockages create a hazard by causing high concrete pressure, combined with the sometimes uncoordinated efforts of untrained workmen to remedy the problem.

Bulk Density

The mass of a substance per volume. For example, one cubic foot of air weighs much less than one cubic foot of water. One cubic foot of lightweight concrete weighs less than one cubic foot of steel-entrained concrete. We could say that steel-entrained concrete has a higher bulk density than lightweight concrete. All calculations for the operation manuals and specifications of concrete pumps are based upon 150 pounds per cubic foot, which is the approximate mass of hard rock (normal) concrete.

Certified Operator

An operator that has been issued a certification card by the American Concrete Pumping Association. There are several classes of certification, each relating to a different category of pump. For an operator to become certified, he (she) must: pass the written tests regarding operation, setup, and cleanout for each category of pump; pass the safety rules test which is common to all certification categories; meet the experience requirements set forth for each category; and maintain a safe and clean driving record. The certification card only certifies that the operator has passed a written test administered by an ACPA certification proctor and does not attest to their ability to operate a concrete pump. *See Also:* Qualified Person, Qualified Operator.

Concrete Delivery Hose

A flexible concrete hose that has two end couplings.

Concrete Pressure

The force per square area that is exerted on the concrete. The concrete pressure will always be a ratio in direct proportion to the hydraulic oil pressure on the concrete pump circuit. *See Also:* Maximum Pressure

Decibels

One tenth of a bel. Abbreviated dB. It is a measurement of sound volume. As it applies to concrete pumps, it is a measurement of the sound pressure level one meter away from a noise source. O.S.H.A. has developed guidelines for time limits on exposure to sound at different volume levels. The chart can be found on page 15 of this manual.

Drive Engine

The primary source of power for a hydraulic system. Typically, the word “engine” denotes an internal combustion device, whereas the word “motor” denotes an electrical device.

End Hose

A flexible concrete hose that has one end coupling.

Foreign Material

Material that was never intended to be pumped, which ends up in the concrete hopper. Examples of foreign material include: small animals; hammers; ready mix truck fins; unmixed clumps of cement; hardened concrete that breaks away from ready mix truck fins; and soda pop cans. These items could create a blockage if pumped.

Go-devil

A plug made from a rubber composite, usually with several fins that expand to seal when pressure is applied. They are intended to be inserted in a steel delivery pipeline and pushed with water or compressed air for the purpose of cleaning the pipe. *See Also:* Sponge Ball

Guide

An assistant brought in to help in backing up a truck or trailer, or to help in other circumstances where the driver cannot see enough to assure safety. *See Also:* Signperson

High Voltage

For the purposes of this manual, anything over 28 volts is to be considered high voltage. In the U.S., electrically driven concrete pumps normally operate the motors at 480 volts AC (high voltage) and the controls at 24 volt DC (low voltage).

Hopper Grate

A meshwork placed over the concrete hopper, typically made from steel bars. It serves the functions of keeping human body parts away from the agitator (when left in its proper position) and keeping large foreign objects from falling into the hopper, which could cause blockages if they were pumped.

Jacking the Outriggers

Adjustment of the outriggers in the vertical direction.

Licensed Electrician

A qualified electrician licensed by the state, county or municipality where the connections are to be made. In some locations electricians are not required to be licensed, and in these cases the work should still be carried out by competent professionals. Under no circumstances should high-voltage connections be made by a concrete pump operator or related personnel.

Maintenance

All procedures for service, inspection, and repair of concrete pumps and related equipment and devices. Maintenance and inspection are methods of *maintaining* the desired state of the equipment. Repair is the method of *restoring* the desired state of the equipment.

Maximum Pressure

When talking about a hydraulic system, maximum pressure refers to the highest pressure that can be achieved with the settings of the circuit relief valves. When discussing concrete output, maximum pressure refers to the pressure that will be developed if the hydraulic system pressure

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reaches the relief valve setting. Concrete pressure is the force at which the differential cylinders are moving, divided by the cross sectional area of the concrete cylinder. Maximum concrete pressure, then, is developed when the differential cylinders are moving with maximum force, which is determined by the hydraulic system relief valve setting. *See Also:* Concrete Pressure.

Minimum Safety Distance

In this manual, the term “minimum safety distance” refers to the closest distance that you are allowed to approach an object, electrical wires, etc. and still leave room for errors in human judgement or machine malfunction. With electrical wires in the U.S., this distance is 20 feet from the wires (50 feet above 350 Kv), as recommended by the American Concrete Pumping Association. This distance may have other values in different locations. It is up to the operator to know the value for the place of operation.

Operational Area

The area around a working piece of equipment or point of discharge where hazards can be encountered due to the nature of the machinery or process in use.

O.S.H.A.

Occupational Safety and Health Administration. A branch of the United States federal government that deals with job safety. It establishes and enforces safety regulations for industry and business. Among the areas over which it has authority are construction job sites and work shops.

Personal Protective Equipment (P.P.E. or just PPE)

Things you can wear to protect yourself from potential dangers in a concrete placing environment. Examples are:

- Snug-fitting work clothes
- Steel-toed work boots
- Lime-resistant gloves
- Safety glasses
- Ear muffs or ear plugs
- Rubber boots when you have to stand in concrete
- Hard hat
- Breathing mask when working with cement dust

Plug

A plug is a blockage that cannot be removed with the pump pressure, or by other remedial measures. A plug must be removed manually. *See Also:* Blockage.

Point of Discharge

Also known as the point of placement. The location of concrete expulsion from a delivery system. This can be the point of placement (the actual form that is being filled with concrete) or the cleanout area after completion of the job.

Pour

Used by the concrete pumping industry and in this manual as a noun. It is the specific job for the pump during any given time period. (e.g. “We’ll grab lunch right after the pour.”)

Qualified Person

As used in this *Safety Manual*, a *qualified person* is defined as: a person who, by possession of a recognized degree of certificate of professional standing, or who by extensive knowledge, training, and experience, has successfully demonstrated the ability to solve or resolve problems relating to the subject matter and work. Other qualified persons may include master mechanics and after-sales service technicians of the manufacturer. *See Also:* Certified Operator

Qualified Operator

Operators shall be considered qualified when they have completed a program of training and supervised operation of concrete pumps and have passed a practical operating examination of their ability to operate a specific model and type of equipment as well as their understanding of the controls and operating procedures. Furthermore, the operator must meet the knowledge and physical requirement sections of the concrete pumping safety standard.

Qualified Personnel

A generic term used to describe a person who is qualified in the area of application. For example, having your boom repairs inspected by "qualified personnel" before use would refer to inspection by a certified welder or certified welding inspector. Having repairs to your hydraulic system done by "qualified personnel" would refer to repairs made by qualified workshop personnel.

Qualified Workshop Personnel

An individual who:

- has reached the age of 18 years,
- is physically and mentally capable,
- has been trained in proper repair, maintenance, and inspection procedures plus the pertinent safety rules for concrete pumps and related equipment,
- has demonstrated their capabilities to their company in regards to the above mentioned procedures and rules, and
- can be expected to perform these duties, as assigned, in a reliable manner.

Rock Jam

A specific type of blockage caused when the cement and fines of the concrete are not present in sufficient quantity to fully coat the larger aggregates and the walls of the delivery system. In these cases, the rock (larger aggregates of the mix) will form a wedge inside of the pipe. Resistance to movement then becomes overpowering and the concrete stops. *See Also:* Blockage.

Separate Pipeline

A pipeline that is laid between the concrete pump and the point of discharge, other than the placing boom pipeline.

Shutoff Valve

In hydraulics: a valve with the ability to stop the flow or pressure of hydraulic oil. It must be able to withstand the maximum pressure of the hydraulic circuit that it controls.

In concrete: A manually or hydraulically operated valve that will prevent the flow of concrete in either direction. The shutoff valve must be able to withstand the maximum pressure on the concrete of which the pump is capable of exerting.

Signalperson

A person positioned at a vantage point where both the point of discharge and the pump operator can be seen and who relays operational signals to the operator.

Soil Pressure

The force per square area that is exerted on the ground by the outrigger legs. The amount of pressure that the soil will support varies with the composition and compaction of the soil. To make a determination on the stability of the soil.

Sponge Ball

A medium to hard sponge formed into a sphere and used to clean the inside of delivery pipelines. *See Also:* Go-devil

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Spotter

A person positioned at a vantage point where the distance between a hazard and the pump can be clearly seen and evaluated and the pump operator can be alerted if a predetermined safety distance is compromised. *See Also:* Guide

Sucking Back

The act of putting the concrete pump into the reverse mode for any of several reasons.

Thrust Block

Also known as a "dead man". This is a large block of poured concrete, usually with one or more sweep elbows cast inside, placed at the bottom of a vertical run for the purpose of supporting the weight of the vertical run and for lateral stabilization of the pipeline. It stabilizes and supports the vertical run by virtue of its enormous mass (normally one cubic yard or larger).

Towing Vehicle

In this manual, *Towing Vehicle* applies only to vehicles that tow trailer-mounted concrete pumps. It is the vehicle that you will use to tow the trailer on the road, on the job site, or in the yard. See the safety rules regarding this subject on page 8 of this *Safety Manual*.

Transport Position

This relates to the position of the machinery when you will be driving or towing the unit. For example, the travel position of the engine hood is the position of the hood when it is completely lowered and latched into place.

Unauthorized

Without authority, without permission. Examples: Unauthorized operation of the boom could be operation by a passer-by, unauthorized repairs to the boom could be repairs designed without the manufacturer's knowledge.

Unintentional Movement

Movement of the pump, boom or related equipment without a specific intentional command by the operator. An example of an unintentional movement would be if an operator fell while walking with the remote control box and accidentally hit a joystick, causing a boom movement.

Vertical Run

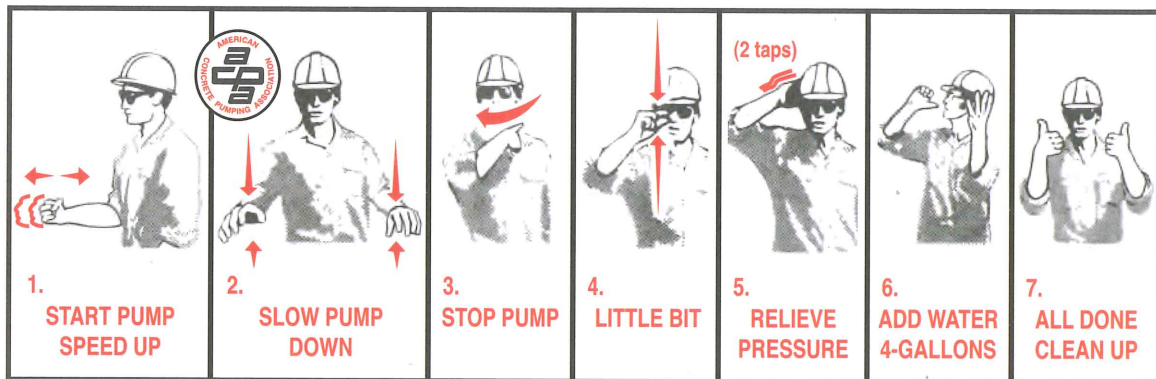
Sections of concrete delivery pipeline that are running in an up (or down) direction. Vertical runs have very specific procedures and rules for installation, support, cleaning, and inspection. Concrete pumping personnel should, therefore, have specific training in these procedures and rules before attempting to use them in a job setting.

Water Jet

The actual stream of water that comes out of the end of a water hose or pressure washer. This is the only part of the water system that needs to go into the hopper, concrete valve, or water box for cleaning.

X. Recommended ACPA Hand Signals

The American Concrete Pumping Association (ACPA) recommends using the following hand signals as standard procedure.



ACPAhandsgsmallline2.eps

XI. Bibliography

Further information regarding concrete pumping is available from the sources listed below. Information for this book was gathered from several different sources, including the following books:

PUMPING CONCRETE AND CONCRETE PUMPS © F. W. Schwing, GmbH

CONCRETE PUMP OPERATOR'S GUIDE TO SAFETY © British Concrete Pumping Association

The MANUAL and ADVISORY SAFETY CODE of PRACTICE for CONCRETE PUMPING © British Concrete Pumping Association

SAFETY STANDARD FOR CONCRETE PUMPS, PLACING BOOMS, AND DELIVERY SYSTEM by the Concrete Pump Manufacturers Bureau

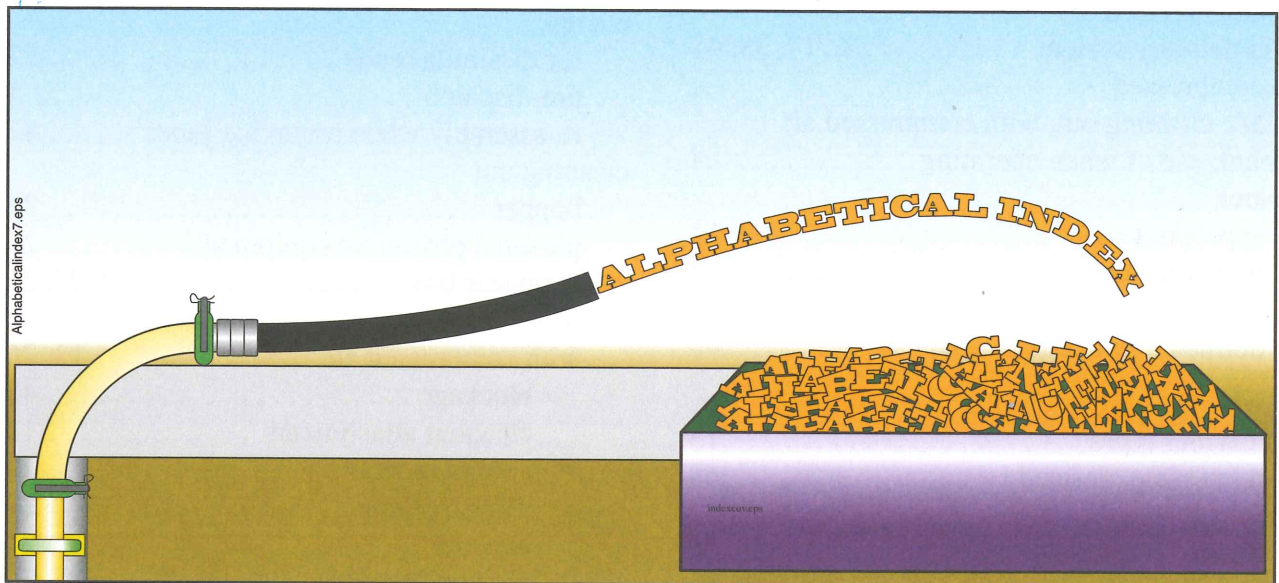
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Information contained in this Safety Manual is not intended to supercede the manufacturer's recommendations or company policies.



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