

# OPERATION MANUAL



## **MAYCO SERIES MODEL ST-45HRM CONCRETE PUMP (Hatz 3M41 DIESEL ENGINE) FINAL REVISION**

Revision #5 (12/09/21)

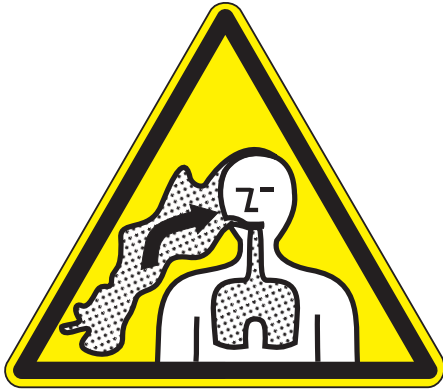
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publication, visit our website at:  
[www.multiquip.com](http://www.multiquip.com)



**THIS MANUAL MUST ACCOMPANY THE EQUIPMENT AT ALL TIMES.**



## **WARNING**



### **SILICOSIS WARNING**

Grinding/cutting/drilling of masonry, concrete, metal and other materials with silica in their composition may give off dust or mists containing crystalline silica. Silica is a basic component of sand, quartz, brick clay, granite and numerous other minerals and rocks. Repeated and/or substantial inhalation of airborne crystalline silica can cause serious or fatal respiratory diseases, including silicosis. In addition, California and some other authorities have listed respirable crystalline silica as a substance known to cause cancer. When cutting such materials, always follow the respiratory precautions mentioned above.

## **WARNING**



### **RESPIRATORY HAZARDS**

Grinding/cutting/drilling of masonry, concrete, metal and other materials can generate dust, mists and fumes containing chemicals known to cause serious or fatal injury or illness, such as respiratory disease, cancer, birth defects or other reproductive harm. If you are unfamiliar with the risks associated with the particular process and/or material being cut or the composition of the tool being used, review the material safety data sheet and/or consult your employer, the material manufacturer/supplier, governmental agencies such as OSHA and NIOSH and other sources on hazardous materials. California and some other authorities, for instance, have published lists of substances known to cause cancer, reproductive toxicity, or other harmful effects.

Control dust, mist and fumes at the source where possible. In this regard use good work practices and follow the recommendations of the manufacturers or suppliers, OSHA/NIOSH, and occupational and trade associations. Water should be used for dust suppression when wet cutting is feasible. When the hazards from inhalation of dust, mists and fumes cannot be eliminated, the operator and any bystanders should always wear a respirator approved by NIOSH/MSHA for the materials being used.

**MAYCO ST-45HRM  
CONCRETE PUMP**

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**NOTICE**

*Specification and part number are subject to change without notice.*



## Table 1. ST-45 Pump Specifications

Pumping Method	Reciprocating Piston
Pumping Rate	Up to 45 cu. yds. per hour*
Maximum Aggregate Size	1-1/2 in. minus (38mm)
Vertical Pumping Height	Up to Excess of 250 ft. (76m)
Horizontal Pumping Distance	1000 ft. (305m)*
Cylinder Lubrication Box Capacity	7 Gallons (26.5 Liters)
Hydraulic Fluid Capacity	58 Gallons (219 Liters)
Fuel Tank Capacity	20 Gallons (76 Liters)
Hopper Capacity	10 cu. ft. with optional fwd/rev remixer
Material Hose	3 in., 4 in., 5 in. dia. (76.2mm, 101.6 mm, 127 mm)
Remote Control (25 ft. cable)	optional
Dimensions	See Page 16
Weight (with fluids)	4,206 lbs. (9,274 kg)
Weight (dry/shipping)	4,040 lbs. (8,908 kg)
Tire Size	7.35 in. x 14 in. (187 mm x 356 mm)

\* Volume output will vary depending on mix design, slump, line size used and job site condititons

## Table 2. Engine Specifications

	Model	HATZ 3M41 57HP DIESEL ENGINE
Engine	Bore X Stroke	4.02 in. x 4.13 in. (102 x 105 mm)
	Compression Ratio	18.7
	Displacement	157 cu. (2,573 cc)
	Lube Oil Capacity Max/Min	9.1 qt. / 5.4 qt. (8.6 L / 5.1 L)
	Engine Speed Full Idle	875 rpm $\pm$ 100
	Battery Type	12 V (88/143 Ah)
	Engine Lubrication	SAE 10W-30 (Oil Grade) SG or SF (Service Class)
	Starting Method	Electric Start
	Dry Net Weight	562 lbs (255 kg)

# ST-45 PUMP — DIMENSIONS

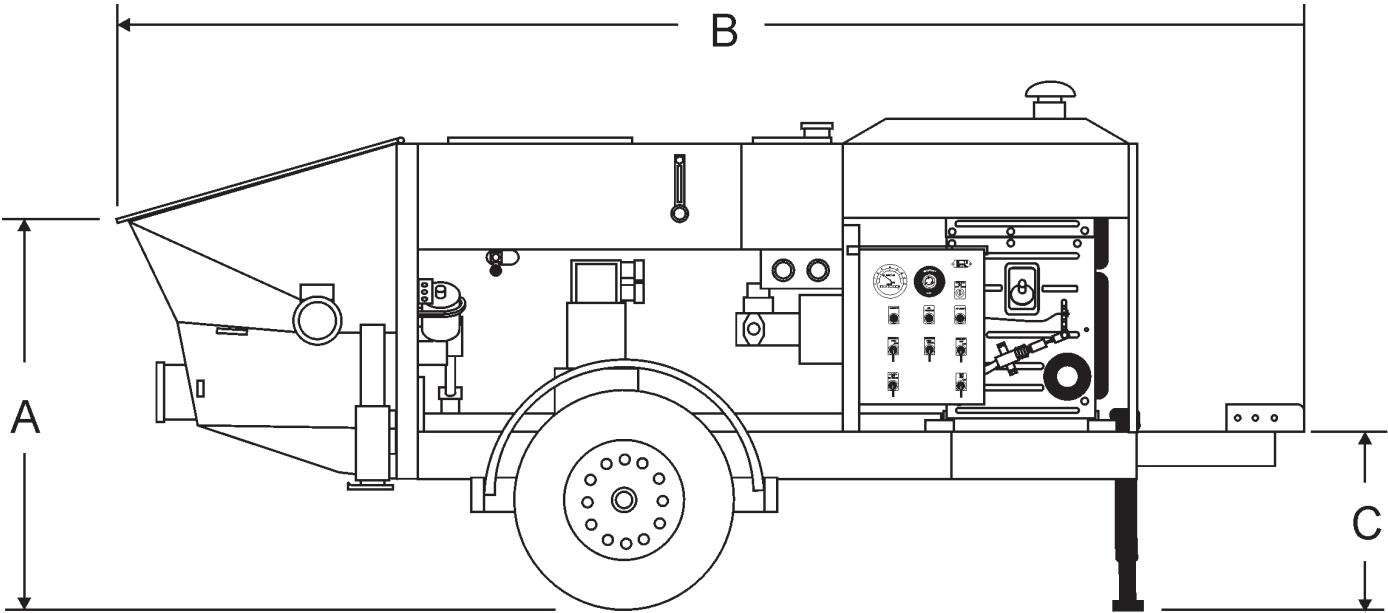


TABLE 3. DIMENSIONS	
REF.	DIMENSIONS
A	45 in. (114.3 cm.)
B	162 in. (411.5 cm.)
C	24 in. (61 cm.)
D	73 in. (185.4 cm.)
E	68 in. (172.2 cm.)

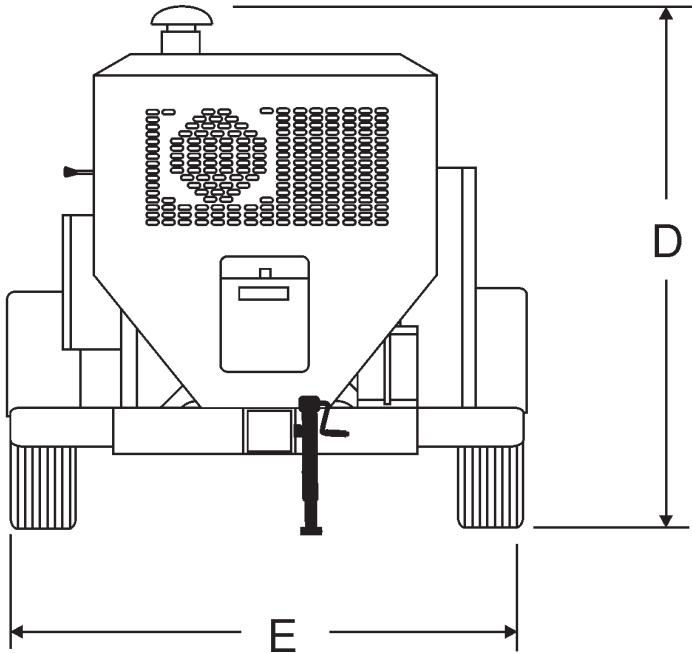
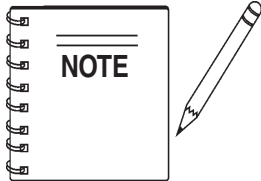


Figure 1. ST-45 Structural Concrete Pump Dimensions

# ST-45 PUMP — SAFETY MESSAGE ALERT SYMBOLS

## FOR YOUR SAFETY AND THE SAFETY OF OTHERS!

Safety precautions should be followed at all times when operating this equipment. Failure to read and understand the Safety Messages and Operating Instructions could result in injury to yourself and others.



This Owner's Manual has been developed to provide complete instructions for the safe and efficient operation of the **Multiquip Mayco ST-45 Structural Concrete** pump. Refer to the engine manufacturers instructions for data relative to its safe operation.

**Before using this pump, ensure that the operating individual has read and understands all instructions in this manual.**

## SAFETY MESSAGE ALERT SYMBOLS

The three (3) Safety Messages shown below will inform you about potential hazards that could injure you or others. The Safety Messages specifically address the level of exposure to the operator, and are preceded by one of three words: **DANGER**,



**DANGER:** You **WILL** be **KILLED** or **SERIOUSLY** injured if you do not follow directions.



**WARNING:** You **CAN** be **KILLED** or **SERIOUSLY** injured if you do not follow directions.



**CAUTION:** You **CAN** be injured if you do not follow directions

Potential hazards associated with operation of the pump will be referenced with Hazard Symbols which appear throughout this manual, and will be referenced in conjunction with Safety Message Alert Symbols.

## HAZARD SYMBOLS



### Lethal Exhaust Gases



Diesel engine exhaust gases contain poisonous carbon monoxide. This gas is colorless and odorless, and can cause death if inhaled. **NEVER** operate this equipment in a confined area or enclosed structure that does not provide ample free flow air.



### Explosive Fuel



**Diesel fuel** is extremely flammable, and its vapors can cause an explosion if ignited. **DO NOT** start the engine near spilled fuel or combustible fluids. **DO NOT** fill the fuel tank while the engine is running or hot. **DO NOT** overfill tank, since spilled fuel could ignite if it comes into contact with hot engine parts or sparks from the ignition system. Store fuel in approved containers, in well-ventilated areas and away from sparks and flames. **NEVER** use fuel as a cleaning agent.



### Burn Hazards



Engine components can generate extreme heat. To prevent burns, **DO NOT** touch these areas while the engine is running or immediately after operations. **NEVER** operate the engine with heat shields or heat guards removed.



### Rotating Parts



**NEVER** operate equipment with covers, or guards removed. Keep **fingers, hands, hair** and clothing away from all moving parts to prevent injury.

# ST-45 PUMP — SAFETY MESSAGE ALERT SYMBOLS



## Accidental Starting



OFF

**ALWAYS** place the **ON/OFF** switch in the **OFF** position. **NEVER** perform maintenance on the unit with the ignition key in the **ON** position.



## Respiratory Hazard



**ALWAYS** wear approved *respiratory* protection.



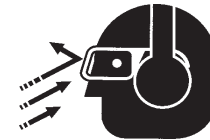
## Over Speed Conditions



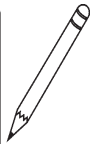
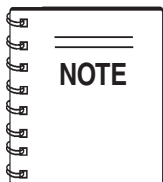
**NEVER** tamper with the factory settings of the engine governor or settings. Personal injury and damage to the engine or equipment can result if operating in speed ranges above maximum allowable.



## Sight and Hearing hazard



**ALWAYS** wear approved *eye* and *hearing* protection.



This *pump*, other property, or the surrounding environment could be damaged if you do not follow instructions.



## Equipment Damage Messages

Other important messages are provided throughout this manual to help prevent damage to your concrete pump, other property, or the surrounding environment.

# ST-45 PUMP — RULES FOR SAFE OPERATION

## CAUTION:



Failure to follow instructions in this manual may lead to serious injury or even **death!** This equipment is to be operated by trained and qualified personnel only! This equipment is for industrial use only.

The following safety guidelines should always be used when operating the ST-45 structural concrete ump:

### GENERAL SAFETY

- **DO NOT** operate or service this equipment before reading this entire manual.



- This equipment should not be operated by persons under 18 years of age.
- **NEVER** operate this equipment without proper protective clothing, shatterproof glasses, steel-toed boots and other protective devices required by the job.



- **NEVER** operate this equipment when not feeling well due to fatigue, illness or taking medicine.



- **NEVER** operate this equipment under the influence of drugs or alcohol.



- **ALWAYS** check the machine for loosened threads or bolts before starting.
- **ALWAYS** wear proper **respiratory** (mask), **hearing** and **eye** protection equipment when operating the pump.

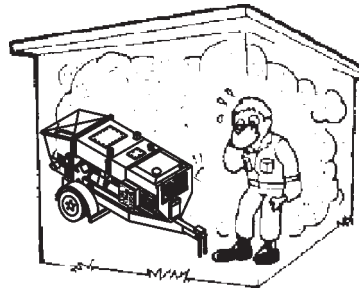


- Whenever necessary, replace nameplate, operation and safety decals when they become difficult read.
- Manufacture does not assume responsibility for any accident due to equipment modifications.
- **NEVER** use accessories or attachments, which are not recommended by Multiquip for this equipment. Damage to the equipment and/or injury to user may result.
- **NEVER** touch the hot exhaust manifold, muffler or cylinder. Allow these parts to cool before servicing engine or pump.



- **High Temperatures** – Allow the engine to cool before adding fuel or performing service and maintenance functions. Contact with **hot!** components can cause serious burns.

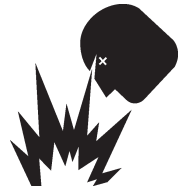
- The engine section of this pump requires an adequate free flow of cooling air. **NEVER** operate the pump in any enclosed



or narrow area where free flow of the air is restricted. If the air flow is restricted it will cause serious damage to the pump or engine and may cause injury to people. Remember the pump's engine gives off **DEADLY** carbon monoxide gas.

- **ALWAYS** refuel in a well-ventilated area, away from sparks and open flames.

- **ALWAYS** use extreme caution when working with **flammable** liquids. When refueling, **stop the engine** and allow it to cool.



- **NEVER smoke** around or near the machine. Fire or explosion could result from **fuel vapors**, or if fuel is spilled on a **hot!** engine.



- **NEVER** operate the pump in an explosive atmosphere or near combustible materials. An explosion or fire could result causing severe **bodily harm or even death.**

- Topping-off to filler port is dangerous, as it tends to spill fuel.

## ST-45 PUMP — RULES FOR SAFE OPERATION

- **ALWAYS** remove the *ignition key* when leaving the pump unattended.
- **ALWAYS** block the *wheels* on the unit when using on a slope.
- **ALWAYS** maintain this equipment in a safe operating condition at all times.
- **ALWAYS** stop the engine before servicing, adding fuel or oil.
- **NEVER** run engine without air filter. Severe engine damage may occur.
- **ALWAYS** be sure the operator is familiar with proper safety precautions and operation techniques before using pump.
- **ALWAYS** store equipment properly when it is not being used. Equipment should be stored in a clean, dry location out of the reach of children.
- **DO NOT** operate this equipment unless all guards and safety devices are attached and in place.
- **CAUTION** must be exercised while servicing this equipment. Rotating and moving parts can cause injury if contacted.
- Keep all *inexperienced* and *unauthorized* people away from the equipment at all times.
- Before start-up, check the hopper and remove all foreign matter and debris.
- **DO NOT** use worn or damaged hose couplings, inspect all hoses and couplings for wear. Replace any worn or defective hose or couplings immediately.
- Keep hands out of the hopper when the engine is running.
- **DO NOT** operate unit with the *hood open*.
- **DO NOT** disconnect hose couplings or nozzle while under pressure. Relieve pressure by manually activating pressure relief valve at manifold.
- Unauthorized equipment modifications will void all warranties.
- Check all fasteners periodically for tightness. Also check towing tongue bolt, lock nut and wheel lug nuts for wear.
- Test the *pump's ON/OFF* switch. The purpose of this test is to shut down the engine.
- Refer to the *HATZ Engine Owner's Manual* for engine technical questions or information recommended by Multiquip for this equipment. Damage to the equipment and or injury to user may result.

### Transporting

- **ALWAYS** shutdown engine before transporting the pump.
- Tighten fuel tank cap securely and close fuel valve to prevent fuel from spilling.
- Drain fuel when transporting pump over long distances or bad roads.

### Towing

- Before towing, check the hitch and secure the safety chain to the towing vehicle.
- When towing, an adequate safety chain must be fastened to the frame, refer to Towing Guidelines.
- Tow only with a vehicle and hitch rated to pull a 5,000 lbs. load.
- If unit is equipped with ball hitch coupler, use only 2" all steel ball rated for minimum of 5,000 lbs. Use 1" hardened steel pull pin, if not equipped with ball hitch.
- This equipment shall not be towed or operated by individuals who cannot read understand the signs, decals or operating instructions.
- When towing at night, **always** have rear tail lights **ON**.
- **DO NOT** tow unit with hopper full of material.
- **DO NOT** tow unit with hoses attached.
- **DO NOT** tow unit in excess of **45 MPH** on highways..

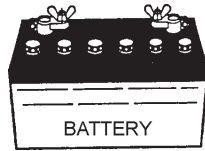
### Maintenance Safety

- **NEVER** lubricate components or attempt service on a running pump .
- **ALWAYS** allow the pump a proper amount of time to cool before servicing.
- Keep the pump in proper running condition.
- Fix damage to the pump immediately and always replace broken parts.
- Dispose of hazardous waste properly. Examples of potentially hazardous waste are used motor oil, fuel and fuel filters.
- **DO NOT** use plastic containers to dispose of hazardous waste.

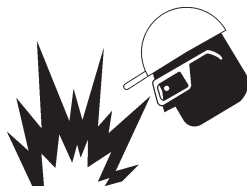
# ST-45 PUMP — RULES FOR SAFE OPERATION

## Battery

The battery contains acids that can cause injury to the eyes and skin. To avoid eye irritation, **always** wear safety glasses. Use well insulated gloves when picking up the battery. Use the following guidelines when handling the battery:



1. **DO NOT** drop the battery. There is the possibility of risk that the battery may explode.
2. **DO NOT** expose the battery to open flames, sparks, cigarettes etc. The battery contains combustible gases and liquids. If these gases and liquids come in contact with a flame or spark, an explosion could occur.
3. **ALWAYS** keep the battery charged. If the battery is not charged a buildup of combustible gas will occur.
4. **ALWAYS** keep battery charging and cables in good working condition. Repair or replace all worn cables.
5. **ALWAYS** recharge the battery in an vented air environment, to avoid risk of a dangerous concentration of combustible gases.
6. In case the battery liquid (dilute sulfuric acid) comes in contact with **clothing or skin**, rinse skin or clothing immediately with plenty of water.
7. In case the battery liquid (dilute sulfuric acid) comes in contact with your **eyes**, rinse eyes immediately with plenty of water, then contact the nearest doctor or hospital, and seek medical attention.



## Emergencies

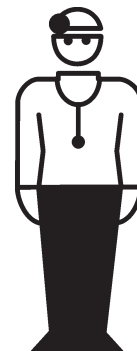
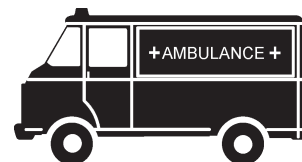
- **ALWAYS** know the location of the nearest **fire extinguisher**.



- **ALWAYS** know the location of the nearest and **first aid kit**.



- In emergencies **always** know the location of the nearest phone or **keep a phone on the job site**. Also know the phone numbers of the nearest **ambulance**, **doctor** and **fire department**. This information will be invaluable in the case of an emergency.



# ST-45 PUMP — OPERATION AND SAFETY DECALS

## Machine Safety Decals

The ST-45 structural concrete pump is equipped with a number of safety decals. These decals are provided for operator safety and maintenance information. Figure 1 below illustrates these decals as they appear on the machine. Should any of these decals become unreadable, replacements can be obtained from your dealer.

# 800-30-MAYCO

P/N: 511091

# MAYCO

P/N: EM1023

# ST-45

P/N: EM97082

**ACCUMULATOR  
PRESSURE**

P/N: EM97070

**PUMPING  
PRESSURE**

P/N: EM97070


**WARNING**

- REFER TO THE OWNERS MANUAL FOR SAFE OPERATING PROCEDURES.
- WELDING ON THE MAIN FRAME OR OTHER COMPONENTS MAY VOID WARRANTY.
- REFER TO OWNERS MANUAL FOR THE PROPER USE OF THE PISTON LUBRICATION SYSTEMS.
- FAILURE TO UTILIZE THE REAR STABILIZING LEG WHILE PUMPING COULD DAMAGE THE AXLE.

EM98022

P/N: EM98022

**CAUTION!**




1. Before setup and operation of this equipment, the designated operator **MUST** read and completely understand the operating instruction manual.
2. Keep unauthorized and untrained people away from the machine during operation.
3. Rotating or moving parts will cause serious injury. Before servicing or cleaning, turn off the engine and check accumulator pressure gauge for Zero pressure reading.
4. Do not place hands in lubrication box at any time.
5. Keep hands out of hopper when engine is running. Do not remove or stand on hopper grates.
6. Check hopper for obstructions before operating machine.
7. This machine is remotely controlled and may start at any time.
8. Stop engine before adding fuel or oil.
9. When the pump, manifold or delivery system plugs, do NOT disconnect the delivery system clamps or open the manifold. A plug has occurred when the pump is running but not concrete is discharging from the end of delivery system; Immediately switch the engine OFF. Consult your operating and instruction manual before proceeding.

Great care must be taken to clear a plug as a dangerous condition exists, due to high pressure build-up, inside the pump and delivery system.

97072

P/N: EM97072



**OWNER'S MANUAL**

345336

P/N: 345336

**CAUTION**

**Grease every  
two hours  
of operation**

P/N: EM98000

**CAUTION TOWING**

1. USE ONLY 2" STEEL BALL.
2. TOWING VEHICLE AND HITCH MUST BE RATED TO TOW 4300 LB. LOAD.
3. ALWAYS USE SAFETY CHAIN AND BREAKAWAY CHAIN WHEN TOWING UNIT.
4. INSPECT ACTUATOR AND BREAKS BEFORE TOWING UNIT. REFER TO ATWOOD MANUAL AND DECAL (ON HITCH).

P/N: EM969

**HOPPER REMIXER**


**PUSH TO OPERATE  
PULL TO REVERSE**

P/N: TBD

Figure 2. ST-45 Operation and Safety Decals

# ST-45 PUMP — OPERATION AND SAFETY DECALS

**MAINTENANCE**

 **Grease daily:**

- Main hydraulic cylinders (2 places)
- Remix bearing (2 places)
- Axle crank bushing (1 place)
- Axle crank (1 place)

Grease type: Lithium based EP, Texaco multitak 20 or Lubriplate EP-2

**Check daily:**

- Main hydraulic reservoir. Use Shell Oil Tellus 68 or Mobil DFE26
- Lubrication box
- Diesel engine

Refer to operator manual for complete maintenance schedule.

P/N EM97084


**WARNING**

Explosion caused by improper accumulator charging can result in serious injury or death

- Follow charging instructions exactly (Refer to Service Manual)
- Never use Oxygen or compressed air to charge the accumulator
- Use only Dry Nitrogen to charge the accumulator

EM97083

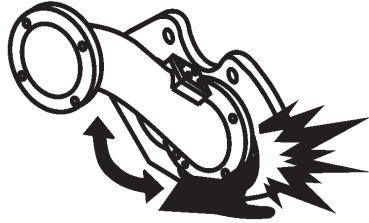
**CAUTION**

 Refer to manual for service instructions. Charge only with dry nitrogen.

P/N: EM955

**DANGER**

**AMPUTATION DANGER!**  
KEEP HANDS CLEAR



SHUTTLE TUBE PIVOTS RAPIDLY AND WILL CRUSH OR CUT. KEEP ANY BODY PARTS OUT OF HOPPER UNTIL MACHINE IS COMPLETELY SHUT DOWN AND THE ACCUMULATOR PRESSURE GAUGE READS ZERO

P/N: EM97083

P/N: TBD

**REMOTE  
OUTLET**

P/N: TBD

**VOLUME CONTROL**

INCREASE ← → DECREASE

P/N: EM985

**CAUTION**

 **USE DIESEL FUEL ONLY**  
(Read Operator's book)

P/N: EM995

**CAUTION**

**MINIMUM  
← OIL LEVEL**

Oil level below minimum can cause hydraulic pump and system damage. Oil temperature should not exceed 170°F (77°C)

P/N: EM97071

**HYDRAULIC  
OIL ONLY**

P/N: TBD

Figure 3. ST-45 Operation and Safety Decals

# ST-45 PUMP — IMPORTANT HAND SIGNALS

Figure 1 display's the basic hand signals commonly used in concrete pumping operations.

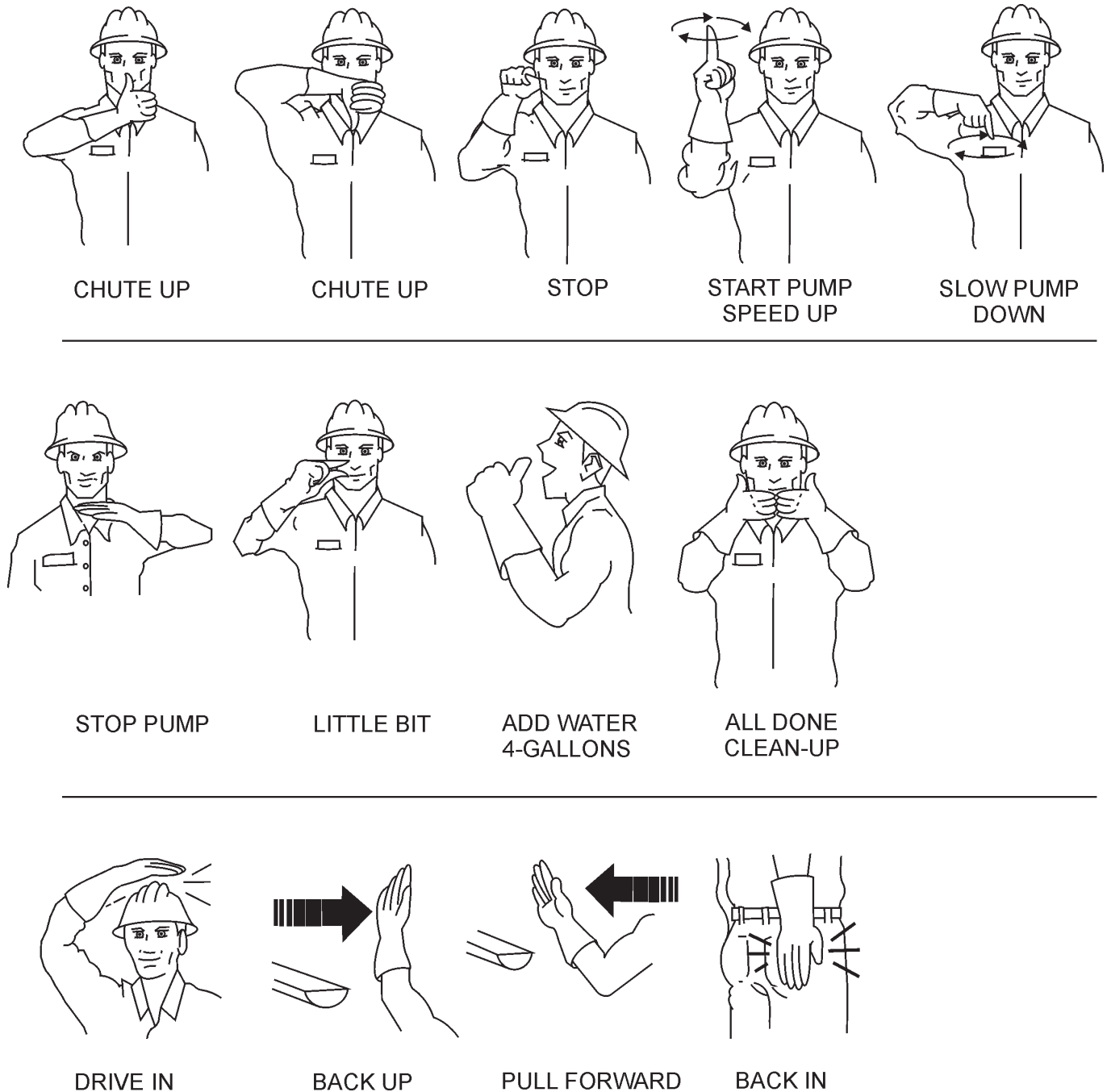


Figure 4 Operation Hand Signals

# ST-45 PUMP — GENERAL INFORMATION

## Concrete Mix Design

Mix design is most important to achieve maximum pumpability. Pumpability is affected by, among other factors, the type and gradation of aggregate used. Natural aggregates make a more workable mix and pump more readily than crushed aggregates. A blend of natural and crushed aggregates will produce a workable mix. The type and gradation of aggregates is equally important for workability as the size and percentage of coarse aggregates in the mix.

The term “aggregates” describes all of the solid materials, from the largest rock to the smallest grain of sand, contained in the concrete mix.

Concrete mixes with a consistency as dry as one-inch slump and as wet as ten-inch slump have been pumped; but for maximum efficiency from the pump, a slump ranging from two to six inches will produce a more workable mix than one that contains more or less water.

The principle of concrete pumping is based on self-lubrication. As it moves through the transfer line, the concrete takes the shape of a plastic cylinder. It is forced through the transfer line on a film of mortar that is self-troweled to the service of the transfer line around its full periphery by the slug of concrete itself.

A slump rating should be used with discretion; it is not always a real indication of the pumpability of the mix. The concrete may be workable in the sense that it will readily flow into place, but the same mix may not respond to pressure. Overly wet mixes tend to separate. In addition to affecting the strength and quality of the concrete, the delivery system will not tolerate separation. Overly dry mixes are similarly unsatisfactory if they lack plasticity and tend to be crumbly. To be properly pumped, the mix must be able to continuously coat the inside of the line with a lubricating seal of mortar.

There are four ways in which this seal can be lost:

1. By pumping excessively wet mixes which do not have enough cohesion to hold together.
2. By pumping harsh undersanded concrete with poorly graded aggregates which can jam together when the pressure becomes too great for the insufficient amount of sand to hold the aggregates apart.
3. By getting a rock pocket, such as mixer tailings, into the pump valve. This rock pocket will have an insufficient coating of mortar and the mix will not be plastic enough to allow the valve to operate or the mix to move in the line.
4. Through excessive bleeding. If the mix is short or fines, but the sand is otherwise fairly well graded, bleeding will not normally create any problems as long as the pump continues operation. But, if the pump is shut down, bleeding can result in a loss of lubrication and blocked erratic flow.

The above are bad concrete practices, regardless of how the mix is to be placed. But, these points do show that special mixes are not always needed, within limits, for pumping concrete. Good aggregate gradation is most important to pump concrete the maximum distance.

The use of admixtures can have a beneficial effect on pumpability. Most of the dispersing agents will fatten, retard bleeding, and increase workability. Thus, the average concrete can be pumped for appreciably longer distances. Air entraining agents will also improve workability, although they cannot be used as a substitute for good gradation of the aggregate. Pumping will not appreciably affect the final air content of the mix. High-early cement tends to give a more readily pumpable mix with superior water retaining qualities. However, if delays are likely to occur, extra care must be exercised due to the faster setting time over regular cement.

The Mayco Model ST-45 will pump a wide variety of concrete pump mixes. But, there are guidelines that must be followed. Use this information in conjunction with the ***Operating Procedures*** (pages 24-28).

# ST-45 PUMP — GENERAL INFORMATION

## Regional Differences

Concrete is made by mixing locally available rock and sand with cement and water. For this reason there are great differences in the pumpability of concrete from one region of the country to another.

It is impossible to define a specific mix for each region that the Model ST-45 will be working in. Therefore, the mixes on pages 58-59 will provide a basic guideline for establishing the proper mix design for your area.

Use this information to specify your requirements to your local ready-mix batch plant, contractor and civil engineer. It may take minor adjustments to make a mix pumpable, so you should explain your needs.

The elements that have to be controlled and consistently maintained by the batch plant are:

1. The sizing and mix percentage of rocks, gap graded from the largest down through the smallest sizes.
2. Sand with a sieve analysis that has the proper percentage of fines, ASTM C33 spec.
3. Sufficient cement to produce the required design strength of the concrete and provide the lubricating binder to pump the concrete through the delivery system.

Use a minimum of:

500 lbs. of cement/cu yd for 2500 p.s.i. concrete after 28 days.

530 lbs. of cement/cu yd for 3000 p.s.i. concrete after 28 days.

600 lbs. of cement/cu yd for 4000 p.s.i. concrete after 28 days.

4. Admixture pump-aid if necessary.

5. The proper amount of water to make a workable slump and plasticize the mix.

In addition, the Mayco Structural Concrete ST-45 Pump can be used to pump a large aggregate hard rock as follows:

1. Pea rock (1/2" minus) pump with mixes being as low as 30% rock and 70% sand. (See page 44, for comments on cleaning the pump.)
2. Shortening pea rock when used with an air compressor and nozzle. (See back pages for recommended set-up.)
3. "Mud Jacking", high pressure grouting.

# ST-45 PUMP — HOW IT WORKS

The following is a brief explanation of how the concrete cylinders, hydraulic cylinders, shuttle tube, valves and hopper work in sequence to pump concrete.

The hydraulic pressure is generated by a variable volume, pressure compensated, axial piston pump that is driven by a diesel engine. The rod sides of the drive cylinders are hydraulically connected together creating a “slave circuit,” which allows hydraulic oil to transfer from one piston to the other.

The two part cycling sequence is initiated by an electrical signal generated by two proximity switches located in the drive cylinder. The proximity switches are normally open, magnetically sensing the movement of the main drive cylinder. As the drive cylinder piston head passes the proximity switch, an electrical signal is sent to the solenoid operated pilot valve which in turn directs pilot oil to the four valves controlling the drive cylinder and the shuttle cylinder.

A one-gallon accumulator assists the movement of the shuttle tube. This circuit assures that the shuttle tube will throw with the same intensity of each stroke regardless of how fast the main drive cylinders are cycling.

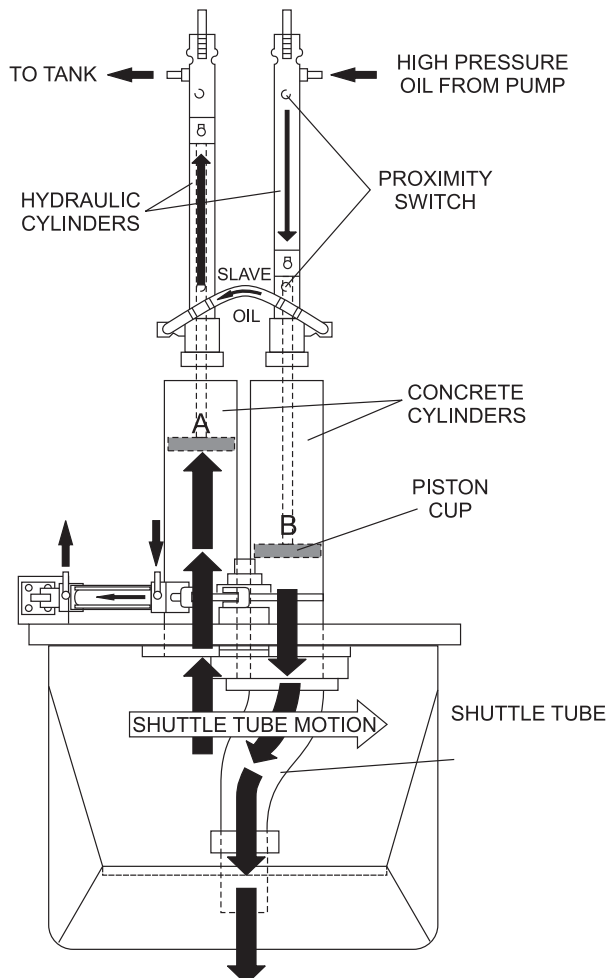


Figure 5. Pumping Cycle 1

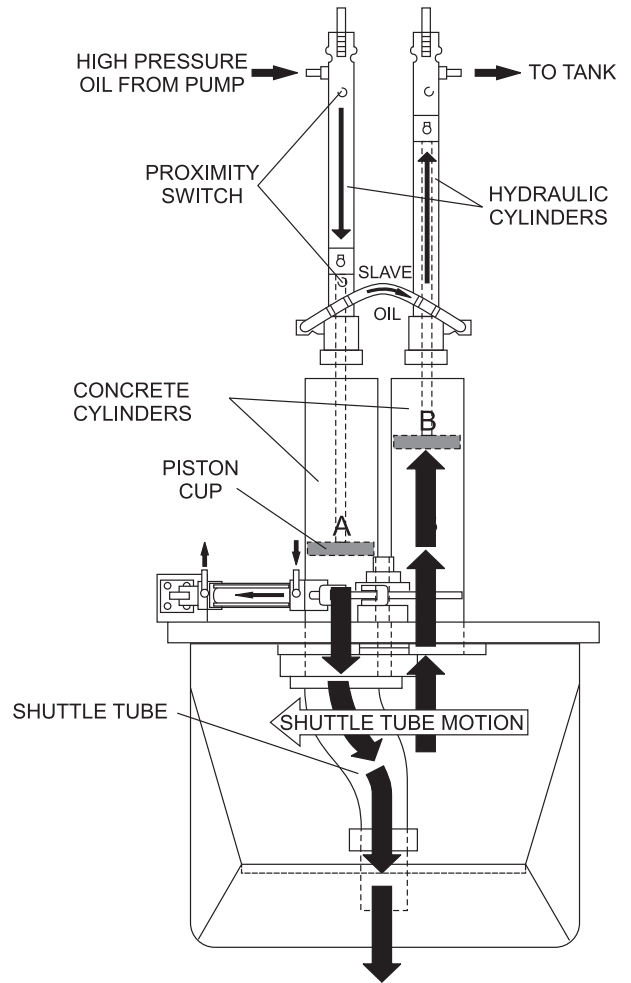


Figure 6. Pumping Cycle 2

In the first cycle, hydraulic pressure is applied to cylinder (B), causing the hydraulic piston, which is connected to the concrete piston and piston cup, to discharge concrete into the delivery line (Figure 5).

As one cylinder is discharging concrete, the hydraulic oil from the rod side (B) of the drive cylinders is being transferred through the slave circuit causing the opposite cylinder (A) to move back on the suction stroke, filling the cylinder with concrete.

The shuttle tube is sequenced to pivot to each concrete cylinder as the drive cylinders stroke to push concrete. As the second cycling sequence begins (Figure 6), the shuttle tube pivots to the opposite cylinder (A). The hydraulic piston passes under the proximity switch and sends pressure to the piston, causing it to stroke and discharge concrete into the delivery line. Hydraulic oil is transferred through the slave circuit to cylinder B, causing it to start a suction stroke, refilling it with concrete. The pumping sequence then repeats for the duration of the operation.

# ST-45 PUMP — PUMP COMPONENTS

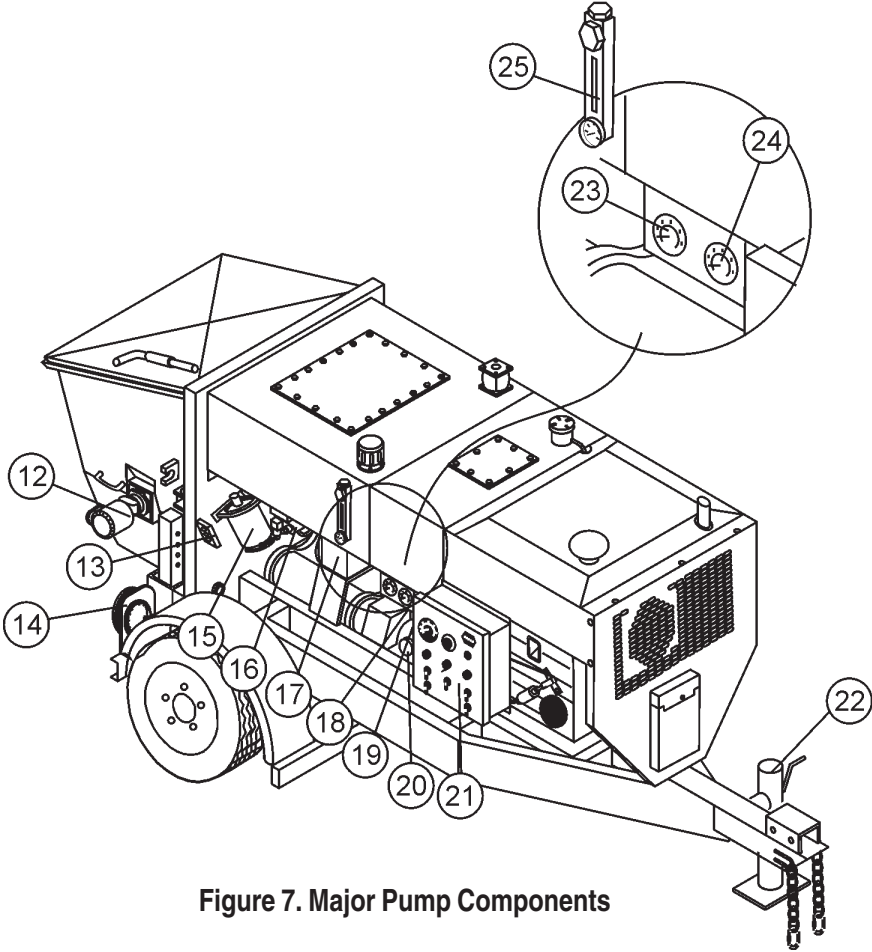
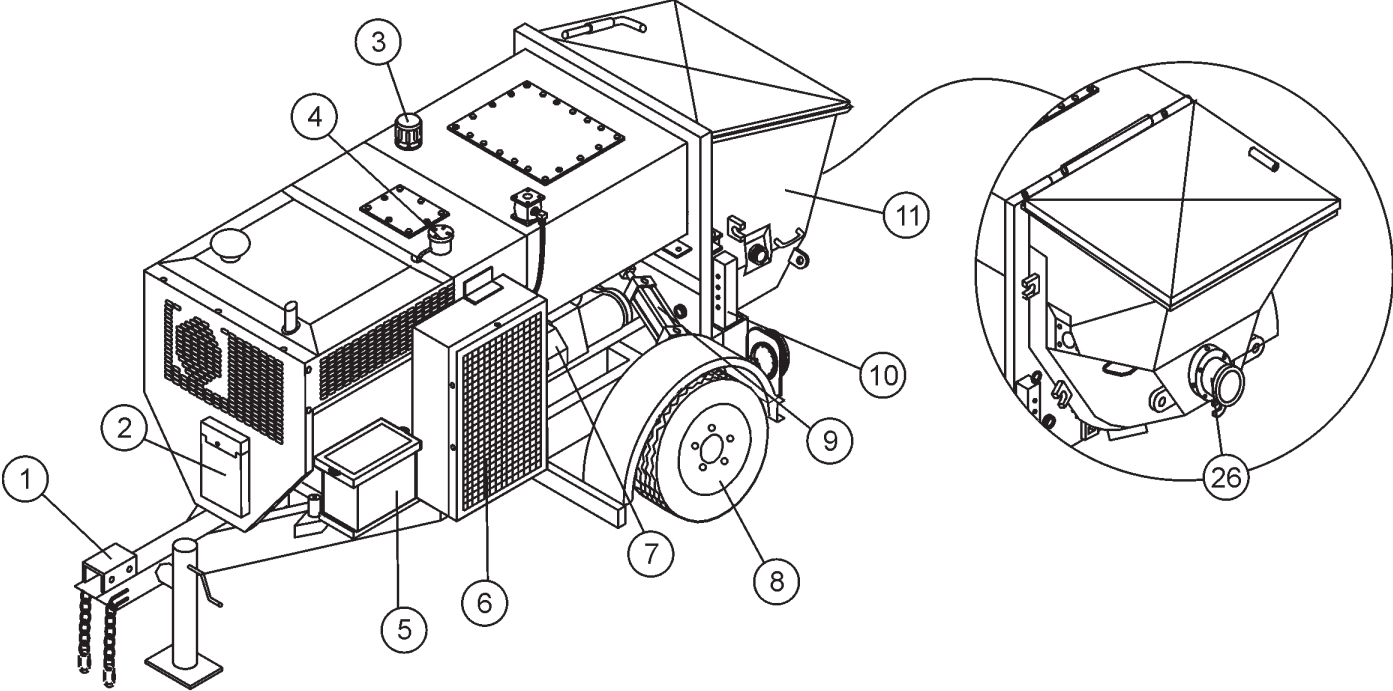


Figure 7. Major Pump Components

## ST-45 PUMP — PUMP COMPONENTS

Figure 7 illustrates the location of the major components for the ST-45 Structural Concrete Pump. The function of each component is described below:

1. **Tow Hitch Coupler** – Requires a 2-inch ball hitch or a 3-inch pintle. Capable of towing 5,000 lbs.
2. **Documentation Box** – Contains engine and pump operation, parts and maintenance information.
3. **Hydraulic Oil Tank/Cap**– Remove cap to add hydraulic fluid. Fill with Shell Oil Tellus 68 or Mobil Oil DFE26 if level is low.
4. **Fuel Tank/Cap** – Fill with diesel fuel. Fuel tank (cell) holds approximately 20 gallons (88 liters). **DO NOT** top off fuel. Wipe up any spilled fuel immediately
5. **Battery** – This unit uses a +12 VDC type battery. **ALWAYS** use gloves and eye protection when handling the battery.
6. **Heat Exchanger** – Reduces temperature of the hydraulic oil. The exchanger draws oil from the hydraulic tank through a filter and into the heat exchanger before allowing it to flow into the hydraulic system.
7. **Lubrication Box** – This box is empty when shipped from the factory. Please fill with 7 gallons ( 26.5 liters) of SAE motor oil for first time use. Also check the dual clean-out point on bottom of lubrication box for a secure tight fit.
8. **Tires** — This trailer uses two ST205-750 x14C type tires. Tire inflation pressure is the most important factor in tire life. Pressure should be checked to **50 psi cold** before operation. **DO NOT** bleed air from tires when they are hot. Check inflation pressure weekly during use to insure the maximum tire life and tread wear.
9. **Shuttle Cylinder** – Under pressure, the shuttle cylinder shears concrete passing from the concrete cylinder to the delivery line during the cycle phase. The Accumulator provides the pressure needed to ensure enough force is provided during cycle.
10. **Pump End Jack Stand** – Use this jack stand to level and support the rear end of the pump. **NEVER** deploy on un-level ground and always check for firmness of ground.
11. **Hopper/Hood** – Lift hood to fill. Concrete from a Redi-Mix truck is poured into this hopper. The hopper can hold 10 cu. ft of concrete with optional forward/reverse mixer. **NEVER** put hands or any other parts of your body into the hopper.
12. **Remixer Motor** – Drives the remixer paddles inside the hopper. The motor direction is controlled by the remixer control lever.
13. **Lubrication Panel** – This console allows for the remote lubrication of components on the pump.
14. **Rear Running Lights** – **ALWAYS** check and make sure both the right and left running lights are functioning correctly before towing the pump.
15. **Accumulator** – Stores hydraulic oil under pressure and releases it to the shuttle cylinder and provides the required pressure to activate the hydraulic system.
16. **Remixer Control Lever** – Controls the forward/reverse motion of the hopper remixer paddles.
17. **Manifold** – Aluminum block that controls the flow of hydraulic pressure to the various hydraulic motors and other components required to control the pump.
18. **Hydraulic Pump** – This unit incorporates an axial variable displacement hydraulic piston pump.
19. **Throttle Control Knob** – This is a variable speed type control. Turning the throttle lock (CCW) left unlocks the throttle allowing the throttle control cable to be pulled out to the desired position. Once the desired throttle position (speed) has been achieved, turning the throttle lock to the (CW) right locks it in place. Use the fine tune adjustment knob to fine tune the engine rpm's.  
  
To place the engine in idle, press the top button inward all the way..
20. **Stroke Volume Control Dial** – Turns CW/CCW to increase or decrease the number of strokes per minute of the pump.
21. **Control Box** – Contains the mechanical and electrical components required to run the pump. See page 22 for components.
22. **Tow End Jack Stand** – Use this jack stand to level and support the tow end of the pump.
23. **Pumping Pressure Gauge** – Used to monitor pressure in the concrete cylinders and shuttle tube.
24. **Accumulator Pressure Gauge**– Used to monitor accumulator pressure. Pressure should read at least 1750 psi for correct pump operation.
25. **Hydraulic Oil Sight Glass** – Use to determine the amount of hydraulic oil remaining in tank. The sight glass also contains a temperature gauge for monitoring the temperature of the hydraulic oil.
26. **Hopper Discharge Sleeve** – Connect hoses or steel pipes to the discharge sleeve for pouring concrete.

# ST-45 PUMP — CONTROL BOX COMPONENTS

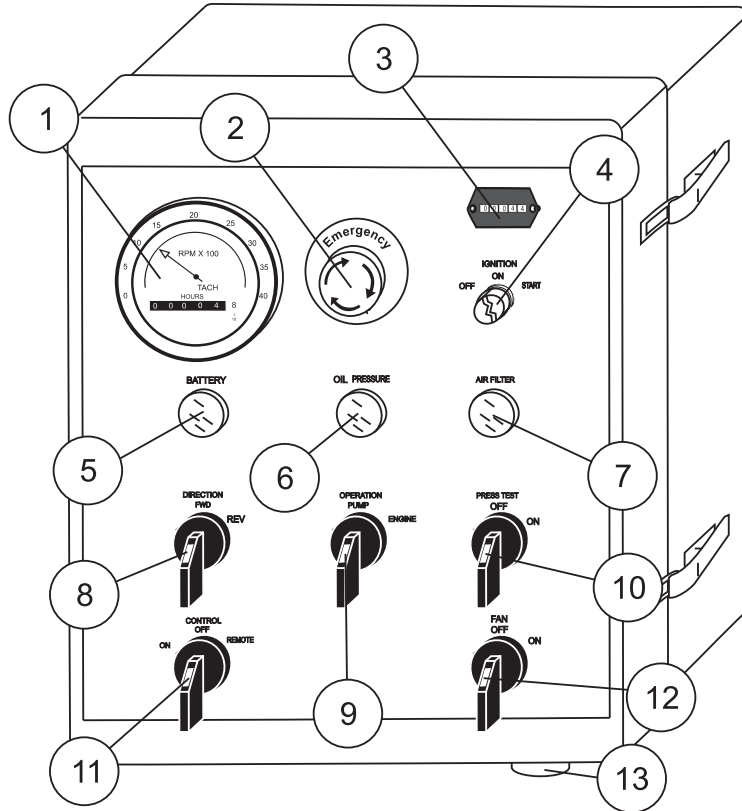


Figure 8. Pump Control Box Components

1. **Engine Tachometer** – Monitors the engine RPM's and hours of operation for the engine.
2. **Emergency Stop Button** – Press emergency stop button to stop pump in an emergency. Turn knob counter clockwise to disengage the stop button.
3. **Hourmeter** – Display's the number of hours the pump has been in use.
4. **Ignition Switch** – Insert the ignition key here to start the engine. Turn the key clockwise to the “ON” position, then continue turning clockwise to the “START” position and release. To stop the engine turn the key fully counter-clockwise to the “STOP” position.
5. **Battery Indicator Lamp**– Indicates a low battery charge. Replace or charge battery. **NEVER** operate the ST-45 when this lamp is on.
6. **Oil Pressure Indicator Lamp**– When lit, indicates correct operational pressure for running the ST-45. **NEVER** operate the ST-45 if this lamp is off.
7. **Air Filter Indicator Lamp** – Indicates the engine air filter is functioning properly. **NEVER** operate the ST-45 if this lamp is off.
8. **Direction Control Switch**– This 2 position switch controls the direction of flow for any mix in the pump. The **center** position sets the pumping direction to forward and the **right most** position sets the pumping direction to reverse.
9. **Pump Operation Switch**– This 2 position switch controls the operation of the pumping components and engine. The **center** position allows the operation of the pump and engine and the **right most** position allows only the engine to operate.
10. **Pressure Test Switch**– Activates a self-diagnostic routine which tests the pressure of the pumping system, which can be read on the Pumping Pressure Gauge.
11. **Pumping Control Switch** – This 3-position switch controls the pumping of the pump. The **left most** position is for use with the remote control unit, the **center** position is for normal pumping operation, and the **right most** position (OFF) prevents pumping.
12. **Cooling Fan Switch** – If hydraulic oil temperature exceeds 75° F, set the pump operation switch to engine and turn the cooling fan switch to the right most position to activate cooling fan.
13. **Remote Cable Connector** – Insert the remote control input cable into this connector.

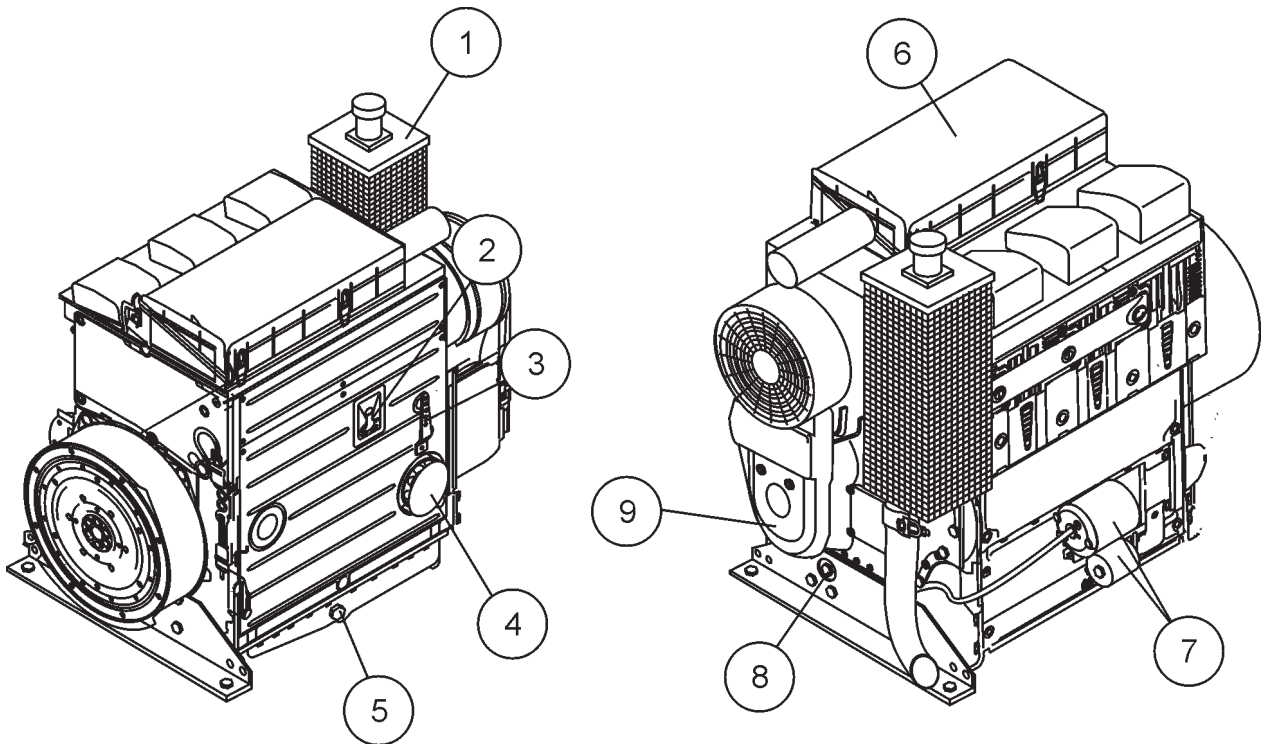


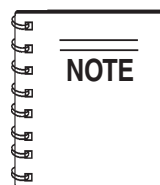
Figure 9. Pump Control Box Components

## INITIAL SERVICING

The *pump's* engine (Figure 9) must be checked for proper lubrication and filled with fuel prior to operation. Refer to the manufacturers Engine manual for instructions & details of operation and servicing.

1. **Muffler** – Used to reduce noise and emissions. **NEVER** touch the muffler while it is hot! Serious burns can result. **NEVER** operate the engine with the muffler removed.
2. **Dip Stick** – Remove dipstick to determine if the engine oil level is low. If low add oil as specified in Table 4, page 30.
3. **Speed Control Lever** – This lever is connected to the throttle control which is located on the side of the engine compartment cover. Use this lever to control engine speed.
4. **Oil Filter** – Prevents dirt and other debris from entering the engine. Service the oil filter as recommended in the maintenance section of this manual.
5. **Side Oil Drain Plug** – Remove this plug to drain engine oil from the engine crankcase. For best results drain engine oil when oil is warm.

6. **Air Filter/Cover** – Prevents dirt and other debris from entering the fuel system. Release the latches on the side of the air filter cover to gain access to filter element.
7. **Starter/Solenoid** – This engine uses a 12 VDC , 2.7kW (3.7 HP) starter motor with solenoid.
8. **Front Oil Drain Plug** – Remove this plug to drain engine oil from the engine crankcase. For best results drain engine oil when oil is warm.
9. **V-Belt Cover** – Remove this cover to gain access to the V-belt. When replacing V-belt , use only recommended type V-belt.

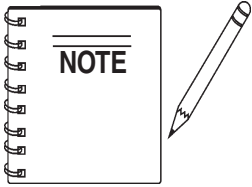


Operating the engine without an air filter, with a damaged air filter, or a filter in need of replacement will allow dirt to enter the engine, causing rapid engine wear.

# ST-45 PUMP — OPERATING PROCEDURES

## OPERATING SUGGESTIONS

1. A well-planned location of the pump and routing of the hose before starting a pour may save subsequent moves throughout the job.
2. Before concrete is discharged into the hopper, it is suggested that 3 to 4 gallons of water be sprayed into the hopper, followed by approximately 5 gallons of a creamy cement and water slurry (1/2 bag of cement to 5 gallons of water). This procedure lubricates the hose and prevents separation and blockages in the hose.



Getting the concrete to flow through the hose at the start of the pumping cycle can be one of the most critical operations of the pour. (**Manually** operate the throttle when starting, **NOT REMOTELY**)

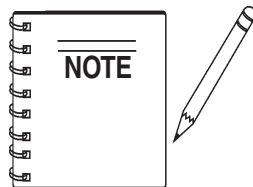
## CAUTION



If hoses or lines are **blocked** for any reason, or if the lines are **kinked** when starting up or during the pumping cycle, the pump pressure could straighten out the kink or force out the blockage. This rapid surge of material could cause the lines to **whip** or **move** in a manner that could cause injury to personnel.

### Inspect the lines at all times to prevent the above conditions

3. It is important that once the slurry procedure is completed, and you have started concrete flowing through the hose, do not stop the pour until all the slurry is pumped out and the concrete has reached the end of the hose. The only time to stop the pump at the start is if a blockage occurs.
4. When the pump is stopped for any reason during a pour; e.g., moving hose, waiting for redi-mix truck, the following suggestions are offered:
  - A. Leave the hopper full of concrete at the time of shutdown. It is important not to let the **redi-mix** driver wash too much water into the hopper, as this could cause separation of the concrete in the hopper.
  - B. If the **shutdown** period exceeds 2 to 3 minutes, turn off the engine so the vibration does not separate the mix in the hopper which can cause a blockage in the manifold when the pump is started.
5. Following the pump operation, proper wash out of all materials or “build-up” within the pump manifold and hoses will prevent problems when starting the next job.
6. A thorough inspection of the drive components and greasing of all bearings after each job will ensure adequate lubrication and service to the pump which is normally operating in wet, gritty conditions.



Over-greasing any **bearing** on your Mayco pump will not damage the bearing.

- C. If it is necessary to wait 10 minutes or more for another load of concrete, it is wise to start the pump and pump 6 or 8 strokes every 5 minutes to prevent setting of the mix in the system. If waiting time is excessive, it would be wise to wash out the pump and hoses and start over when the new truck arrives.
- D. When pumping stiff mixes and there is waiting time between redi-mix trucks, it is advisable to add some water to the last hopper of material and “hand mix” to ensure an easier start with the following load.
- E. When the pumping job requires a stiffer mix, the following method is suggested for starting: Take a water hose with a nozzle on it and apply water with a fine spray to the concrete as it comes down the redi-mix chute into the pump hopper after the slurry procedure is completed and you are ready to start pumping.

Using this procedure will make it easier to pump through the clean hose. Note: Once the concrete has reached the end of the hose, do not apply any more water in this manner as this procedure is used for starting only.

- F. Hose sizing is very important: We strongly recommend on harsh mixes, vertical pushes, stiff concrete, shotcrete, long pushes, that a 2-1/2” line be used as far as possible. The advantages of using the 2-1/2” line are improved pumpability, less pumping pressure and less wear on the pump.

# ST-45 PUMP — OPERATING PROCEDURES

## WARNING



Common sense tells us that if you drive a truck into a brick wall, something is going to be damaged. The same holds true with your concrete pump. If you repeatedly pull the throttle all the way out and try to force your pump to push through **blockages** due to separation of material in the hose or manifold, you will soon have breakdowns and costly repairs which are not covered under warranty. If a blockage occurs, find where it is and clear it before further pumping. **DO NOT** increase the engine speed to clear the blockage. Increasing the engine speed will only compound the problem.

## WARNING



It will be necessary at times to move your pump from one job site location to another. Before moving the pump, make sure to pump the remaining concrete out of the hopper. Moving the pump with a **full hopper** of concrete can cause severe damage or breakage of the axle and axle springs, excess strain and pressure on the hub and bearing assembly.

### Pumping Tips

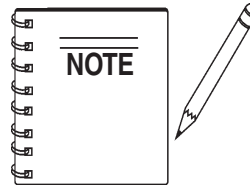
#### The effects of heat and excessive time on concrete:

- Hot concrete, commonly referred to as a hot load, is concrete that has been in the redi-mix truck in excess of 2 to 3 hours. On a hot day, this amount of time is even less. A brief explanation of why heat and time affect concrete:
- Concrete starts setting by drying up through a chemical reaction. The catalyst to this reaction is heat. When pumping a hot load, it is important to remember that when you have to stop pumping for any reason, add water to the concrete in the hopper and hand mix and move concrete in the hose every 5 minutes. If the shut down time becomes too long, wash out immediately.

#### Admixtures:

- Remixtures that are designed into the concrete mix by the redi-mix company or an architectural engineering company. This section lists common admixtures and a brief explanation of their functions:
  - Pozzolith 300** – or the equivalent acts as a water retarder and a lubricant. On a lean mix, long pushes, stiff mixes, and vertical pushes, Pozzolith 300R helps pumpability.

- MBVR** – air entraining, acts as a lubricant.
- Calcium Chloride** – commonly referred to as C.C., is used as an accelerator. When pumping a load with calcium chloride, it is recommended that you wash out if the waiting time between delivery trucks becomes too long.
- Super Plasticizers** – acts as an accelerator. The concrete will look very wet after the super plasticizer is added, but will begin to set up very fast. Wash out immediately if you do not have a truck waiting. Super plasticizers are used mainly on commercial jobs.
- Red Label** – acts as a water retarder and an accelerator. Red label will be used mainly on commercial jobs.
- Fly Ash** – is used to help increase the strength of the concrete and decrease the cement content per yard. This is one of the most common admixtures used.



All admixtures will be shown on the redi-mix concrete ticket. Before starting the pumping job, ask the driver of the redi-mix truck to see the concrete ticket and note the admixtures that exist and take the proper action.

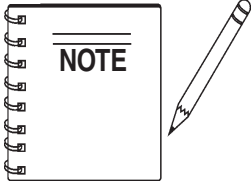
- When pumping long distance or pumping stiff mixes, you can expect a drop in volume compared to shorter lines and wetter mixes due to the change in valve efficiency or cavitation.
- Leaking manifold seals or hose coupling gaskets which leak water can cause separation and subsequent jamming at that point.

#### Priming the Pump and Delivery System with Slurry

- It is **CRITICAL** to the successful operation of a concrete pump that the manifold and all delivery hose, pipe and elbows are coated with a film of lubrication **BEFORE** you attempt to pump concrete. Failure to properly prepare the pump and system will result in a “dry pack” of concrete, blocking the shuttle valve tube or delivery line.
  - With the entire delivery system connected to the pump. Except for the first hose. Pour 5 gallons of water into the second hose and push in your clean out ball and reconnect. This will help hold back the prime.
  - There are several things you can use for the prime. A few examples are Cement and lime at a 50/50 mixture, slick pac, bentonite clay.

# ST-45 PUMP — OPERATING PROCEDURES

- C. Mix the prime to the consistency of a smooth batter.
- D. Position the first ready-mix truck at the hopper. Check the concrete. **DO NOT** discharge concrete into hopper at this time.



The bentonite is not compatible with concrete. **DO NOT** pump it into the forms discharge it out of the formed area.

- E. Pour approximately two 5 gallon buckets of prime into the first hose and connect it to the pump.
- F. With the pump in **FORWARD** at 25-30 strokes per minute, slowly discharge the concrete from the ready-mix truck into the hopper and completely fill it. Keep the pump running continuously until concrete is discharging at the end of the delivery system. If the pump is stopped during this procedure, a blockage may occur.
- G. If it is necessary to replace or add a section of delivery system, after the initial lubrication procedure, wet the inside area of the hose, pipe or elbow with 5 gallons of water per 25 foot length, before adding it to the system.

## Clearing Concrete Blockage

- 13. Damaged hoses with internal restrictions can cause blockages.
- 14. If a blockage occurs in a hose, **walk the hose** until you find the point of trouble. The hose will be soft immediately past the blockage. If this happens at the start, disconnect the hose at the first coupling past the blockage.
- 15. Elevate the hose at that point with the blockage area hanging down. Using a hammer, you can pound the down-stream edge of the packed area until it is free to flow. Shake all of the sand and gravel out to the end of the hose. Before reconnecting the hose, start the pump and run a small amount of concrete out to the end of the hose. This will assure that all of the separation is out of the hose.

## CAUTION



Use extreme care! The hose line is under pressure and can cause serious injury.

- 16. The shuttle tube is plugged if volume at the discharge end of the hose stops, the hose is soft and the hydraulic oil pressure gauge reads 3000 psi or more.

To clear a plug in the shuttle tube, great care must be taken as a dangerous condition will exist from pressure build-up inside the shuttle tube. (With the shuttle valve, the concrete can be pumped in reverse.) Use the following procedures to clear the shuttle tubes.

## WARNING



**DO NOT** open any of the delivery system joint clamps.

### “Reverse” Pumping Procedure

- A. Switch the pump into **reverse**. With pump speed at a medium-slow (approx. 12 strokes per min.) try to pull the “pack” back into the hopper with **5 or 6 reverse strokes**.
- B. Remix the concrete in the hopper.
- C. Switch the pump into **forward**. If it is still plugged, repeat “Reversing” procedure three times.

If concrete still does not move, proceed to the Shuttle Tube Inspection Procedure.

### Shuttle Tube Inspection Procedure

- A. Stop the pump. Switch off the engine.
- B. The senior or most experienced operator must warn all others to stand at least **20 feet** away from the machine and turn their heads to face away from the pump.

## CAUTION



Safety glasses **MUST** be worn at all times when operating the ST-45. Failure to follow safety guidelines can result in serious injury.

- C. The operator will position themselves beside the reducing elbow at the pump outlet. Wearing **safety glasses**, slip the end of a pry bar (24" length of reinforcing steel rod) under the latch of the hose clamp and flip it up.

# ST-45 PUMP — OPERATING PROCEDURES

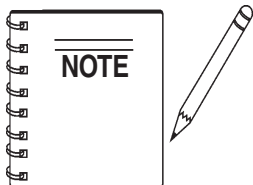
- D. Carefully knock the end of the hose away from the reducer.
- E. Chip the concrete out of the reducer with the pry bar.
- F. Remove the reducer. From the discharge end, chip the concrete out of the shuttle tube with the pry-bar. If concrete cannot be loosened from the outlet of the shuttle tube, remove the clean-out plug on the bottom of the hopper to discharge the concrete.
- G. The **senior operator** may then remove the inspection cover plate from the shuttle tube by using a long extension wrench and the 24" pry bar.

## WARNING



Make sure the accumulator pressure gauge reads **ZERO psi.** prior to performing any maintenance or inspection.

- H. Chip the blockage out with the pry-bar.
  - I. Flush the shuttle tube with water.
  - J. Replace and seal the inspection cover plate on the shuttle tube.
  - K. Before resuming operation of the pump, perform the "Reverse" Pumping Procedure to relieve pressure on the shuttle tubes.
17. If it is necessary to wait 1/2 hour or more for another load of concrete, and to prevent setting of the mix in the system, it is advisable to consider the following factors (**A through D**) affecting the concrete :
- A. How old is the concrete?
  - B. Is there an accelerator, calcium chloride, red label, etc., in the concrete?
  - C. The temperature of the day, 80, 90, degrees?
  - D. How much system you have out and how stiff was the mix you were pumping?



**When disconnecting hoses, use EXTREME CAUTION! The hose is under pressure!**

If, for any reason, the mix should set up in the system, the following procedure (**E through H**) is suggested:

- E. Disconnect the hose from the pump and wash the pump out immediately.
- F. Reconnect the hose and fill the hopper with water.
- G. Reconnect the hose and fill the hopper with water. **DO NOT** try to push all the concrete out of all of the hose lines at one time.

For example: If you had 200 ft. of system out, you would disconnect each hose. Clean it out by pushing water through the first hose off the pump, then continue progressing through all the hoses, until all the system is clean.

- H. If waiting time is excessive, it would be wise to wash out the pump and hoses and start over when the new truck arrives. This can be avoided by being observant to the pump and system, also taking into consideration the above factors (E through H) affecting the mix.

18. **Down-Hill Pumping** – can be difficult on some jobs. The slurry procedure would be the same as explained on the pages titled Operating Suggestions. It is suggested that a sponge 2"x 4"x 6" be placed in the hose before the start of pumping. Wet the sponge before placing it in the hose.

The reason for using the wet sponge is to keep the slurry from running too far ahead of the concrete and so reducing the possibility of separation. When the pump is stopped, the material can flow slowly down, due to gravity, and cause the hose to collapse.

When pumping is resumed, you can expect blockage at the point of hose collapse. To prevent this from happening, the hose can be "kinked off" at the discharge end when the pump is stopped to prevent the gravity flow of the material in the hose.

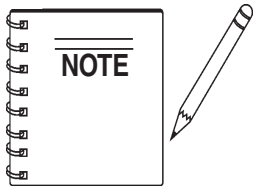
The use of stiffer mixes when pumping down-hill will decrease gravity flow of the material in the hose and will assure a smoother operation between the cam roller bearing and cam plate. As with any job, make sure that the hose and the couplings are in good workable shape.

19. **Vertical Pumping** – When pumping vertically up the side of a building, above 40 feet, we would recommend the installation of **steel pipe** securely fastened at intervals as necessary to support the pipe. Ninety degree, long radius pipe sweeps should be installed at the top and bottom of the steel line.

## ST-45 PUMP — OPERATING PROCEDURES

Use a 25 ft. hose, or short section, off the pump; and for the balance of the horizontal distance to the vertical line, use steel pipe. This type of installation has been satisfactory on many jobs being pumped in excess of 100 feet high. Line pressures are always less using steel pipe as compared to hose.

When pumping vertically, using **all hose**, it is recommended not to go higher than 50 feet with hose. The hose should be tied off at intervals of 10 feet, if possible. Special attention should be given when tying the hose off at the top as the hose will have a tendency to stretch when filled with concrete. This will increase the possibility of a blockage at the point where the hose is tied off. To avoid this, a long radius of 90 degree elbow is recommended. The suggested place to tie off is on the hose, under the clamp.



*It is strongly recommended that **steel pipe** be used on all vertical pumping for safety and convenience.*

20. **Pulsation** – A slight pulsation of the hose will always be noticeable near the pump. Excessive pulsation of the hose near the pump is normally due to higher than average line pressures caused by stiff, harsh mixes, or extremely long pumping distances.

The use of 2-1/2" I.D. hose in these extreme cases reduces line pressures or the addition of slight amounts of water to the mix, if permissible, will permit easier pumping. The use of certain pumping admixtures may help.

If excessive pulsation exists in the hose, it is advisable to use burlap or some means of wear protection under the hose at points where the hose may wear through the outer cover; e.g. over forms, steel or sharp curbs.

21. **Snap-Joint** – When using Snap-Joint couplings with gaskets to join hose, see that they are washed clean after each job. Keeping the hose ends clean (heavy duty) is very important for the best job setup. A thin coat of grease on the rubber gasket or dipping both coupling and gasket in water before coupling the hose will make for easier installation.

22. **New Pumps** – All new pumps are 'water pressure tested' at the factory. This procedure permits a thorough inspection of

entire drive system and valving under simulated full load conditions. The pump owner can do the same by making an adapter to couple to the end of the discharge cone: e.g., the use of a standard 2" pipe cap with a 3/8" drilled hole in the center, screwed on to the end of hinged cone or reducer at the pump.

Fill hopper with water after making sure that all sand and rock have been removed from manifold. Operate pump at full throttle and the 3/8" diameter hole restriction will create sufficient back pressure to make thorough inspection of all moving parts.

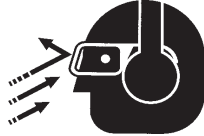
## CAUTION



**NEVER** operate the pump in a confined area or enclosed area structure that does not provide ample **free flow of air**.

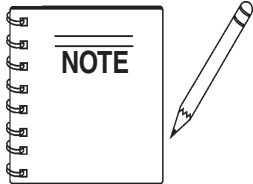


**ALWAYS** wear approved **eye** and **hearing** protection before operating the pump .



**NEVER** place hands or feet inside the **hopper**. **ALWAYS** make while the engine is running. **ALWAYS** shut-down the engine before performing any kind of maintenance service on the pump.

**NEVER** operate the pumps's engine with the engine hood removed. The possibility exists of **hands, long hair, and clothing** becoming entangled with the V-belt, causing injury and bodily harm.



See Figures 5 & 6 on pages 20-22 for the location of any control or component referenced in this section.

## Before Starting

1. Read safety instructions at the beginning of manual.
2. Clean the **entire pump**, removing dirt and dust, particularly the engine cooling air inlet, and air filter.
3. Check the **air filter** for dirt and dust. If air filter is dirty, replace air filter with a new one as required.
4. Check fastening nuts and bolts for tightness.



## CAUTION:



Handle fuel safely. Diesel fuel is highly **flammable** and can be dangerous if mishandled. **DO NOT smoke** while refueling. **DO NOT** attempt to refuel mixer if the engine is hot or running. **ALWAYS** allow engine to **cool** before refueling.

## FUEL CHECK

5. Read the fuel sight tube (Figure 10) on top of the fuel tank to determine if the pump's engine fuel is low .

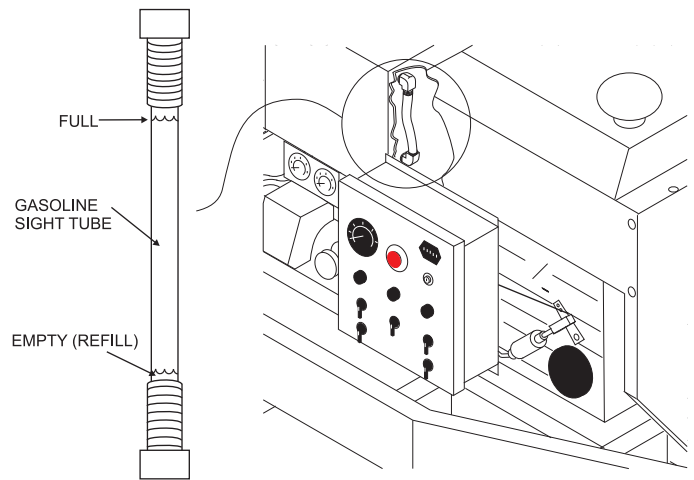


Figure 10. Fuel Sight Tube

6. If fuel is low, remove fuel filler cap and fill with **#2 diesel fuel** (Figure 11).

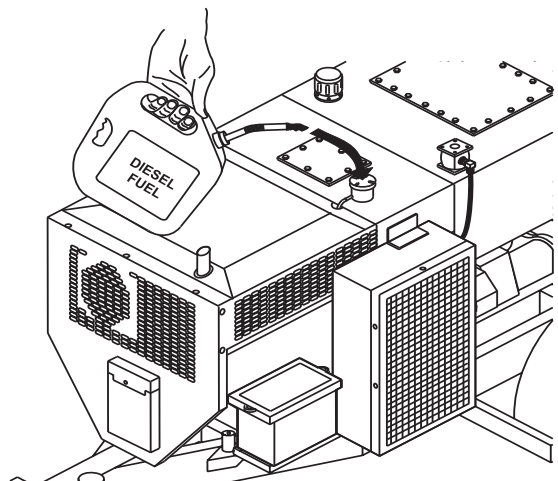


Figure 11. Adding Diesel Fuel

# ST-45 PUMP — INSPECTION

## ENGINE OIL CHECK

- Remove the engine oil dipstick from its holder (Figure 12).

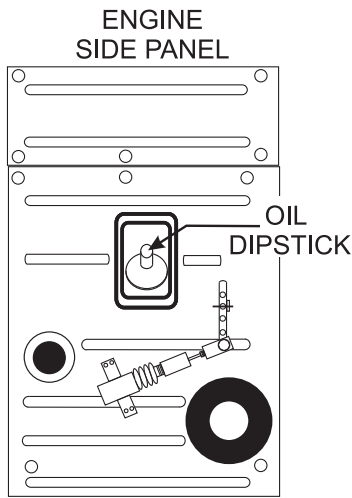


Figure 12. Engine Oil Dipstick

- Make sure pump/engine is placed on level ground.
- Pull the engine oil dipstick (Figure 13) from its holder.

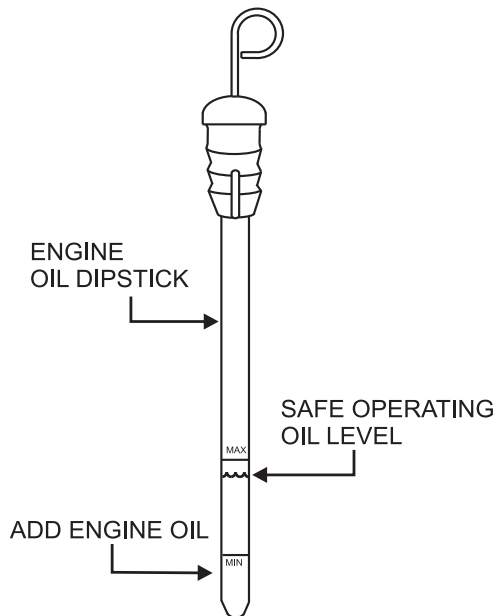
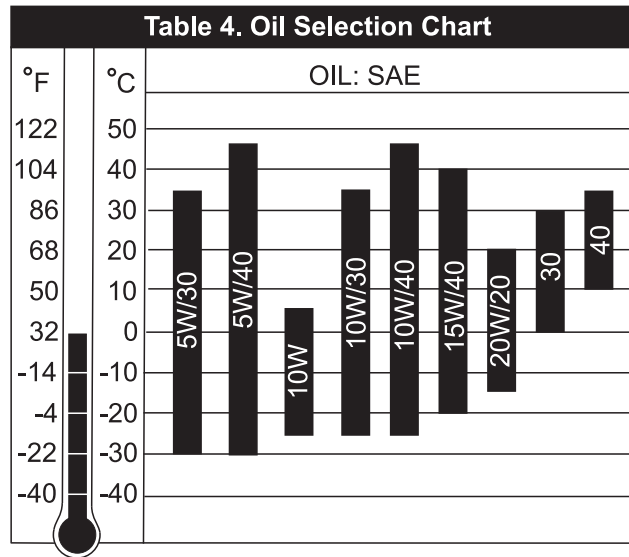


Figure 13. Engine Oil Dipstick

- Verify that oil level (Figure 13) is maintained between the two notches on the dipstick.
- If the pump's engine oil is low, fill engine crankcase with lubricating oil through filler hole, but **DO NOT** overfill.

- The oil listed in Table 47 is recommended to ensure better engine performance. Use class CD or higher grade motor oil.



## Hydraulic Oil

- Determine if the hydraulic oil level is low by observing the level of the oil in the **Hydraulic Oil Sight Glass** (Figure 14).

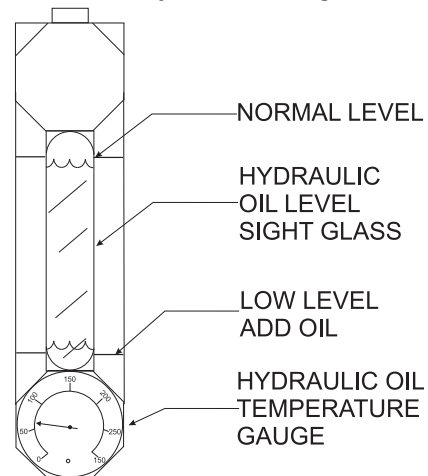


Figure 14. Hydraulic Oil Sight Glass

# ST-45 PUMP — INSPECTION

- If the hydraulic oil level is low, remove the cap just above the oil level sight glass (Figure 15) and add the correct amount of hydraulic oil to bring the hydraulic oil level to a normal safe operating level. (Use Shell oil Tellus 68 or Mobil oil DFE26).

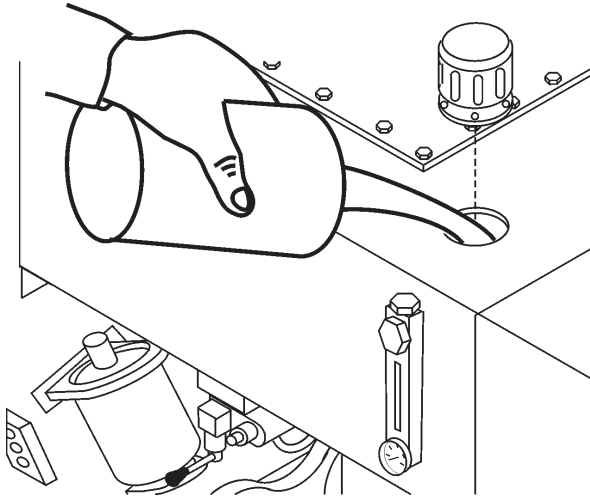


Figure 15. Hydraulic Oil Filler Hole

## REAR STABILIZER STAND

To reduce excessive vibration and rocking of the ST-45 Concrete Pump, set the rear stabilizers as follows:

- Locate both the left and right rear stabilizer stands (Figure 16).

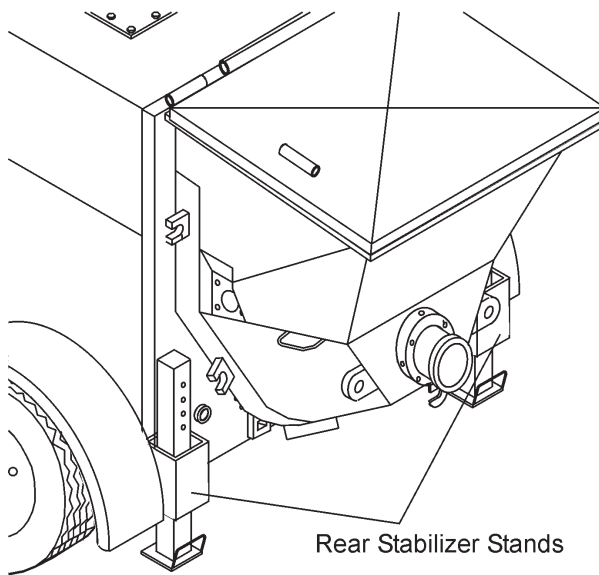


Figure 16. Locating Rear Stabilizer Stands

- Remove the **cotter pin** from the handle tee bolt eye, and then **pull** the handle tee to release the stabilizer stand (Figure 17).
- Position both rear stabilizer stands on firm (not loose) **level** ground (Figure 18).
- Align the hole on the stabilizer stand with the hole on the frame body and **insert** handle tee bolt.
- Insert the cotter pin into handle tee bolt eye to lock the stabilizer stand.

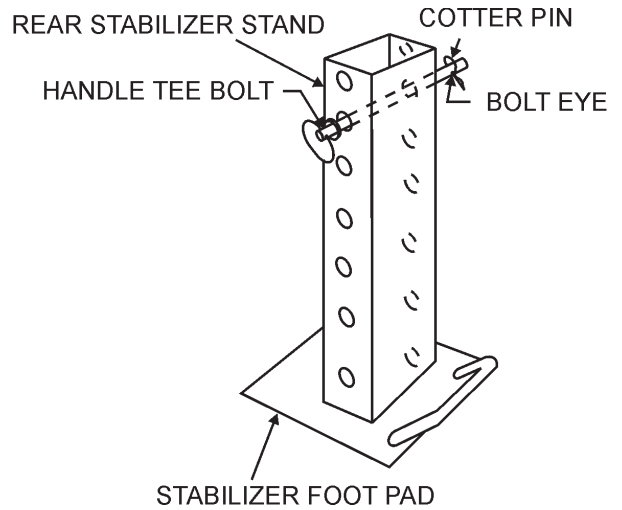


Figure 17. Rear Stabilizer Stand

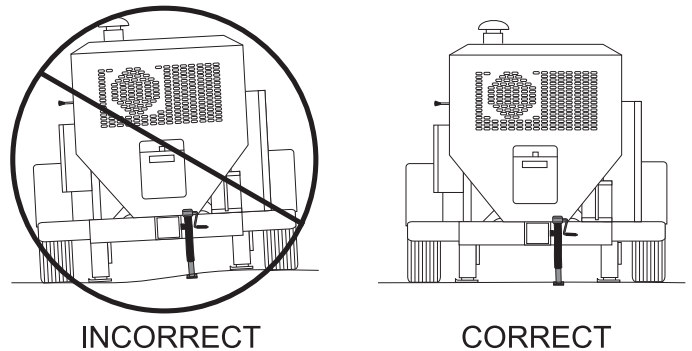


Figure 18. Rear Stabilizer Stand Deployment

# ST-45 PUMP — INITIAL START-UP PROCEDURE

## Starting

### CAUTION :



**DO NOT** attempt to operate this concrete pump until the Safety, General Information and Inspection sections have been read and understood.

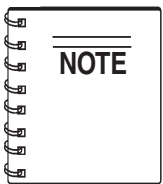
### EMERGENCY STOP SWITCH

1. Locate the Emergency Stop Switch (Figure 19) on the Hydraulic Pump Control Box. Use this switch in the event of an emergency.

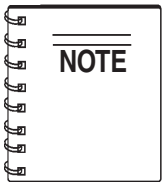


Figure 19. Emergency Stop Switch

2. Turn the Emergency Stop switch counter-clockwise (open). This will allow the engine to start.



If the Emergency Stop switch is in the “**CLOSED**” position (stop), engine will not start. To start the engine, make sure the Emergency Stop switch is in the “**OPEN**” position (fully extended).



Place all switches on the Hydraulic Control Box in the “**OFF**” (up) position).

### IGNITION SWITCH

3. To start the engine, insert the key (Figure 20) into the ignition switch and turn the key to the ON position.

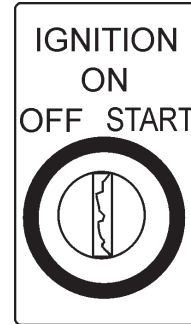


Figure 20. Ignition Switch

4. Observe that the **Battery**, **Air Filter** and **Oil Pressure** status indicator lights are “**ON**” (Figure 21).

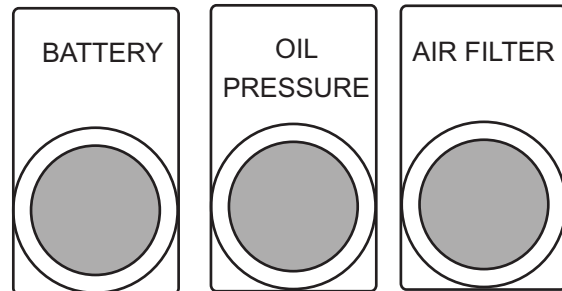
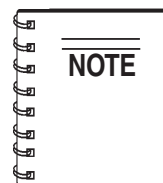


Figure 21. Status Indicator Lights

- A. Turn the key to the “**START**” position and listen for the engine to start.
- B. In warm weather let engine warm-up for 5 minutes. In cold weather let engine warm-up for 10 minutes.
- C. The **Air Filter**, **Oil Pressure** and **Battery** indicator lights (Figure 21) should all be “**OFF**”.



The battery indicator light may remain on if the engine is idling, or on some models of the ST-45. Increasing the engine RPM's slightly should correct the problem.

### CAUTION :



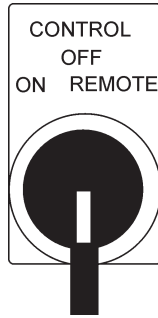
If any of the status indicator lights referenced in the ignition section (step 4) remain “**ON**”, turn off the engine and correct the problem. **DO NOT** continue to run the equipment.

# ST-45 PUMP — INITIAL START-UP PROCEDURE

## CONTROL SWITCH

- Turn the Pump Control switch (Figure 22) to the "ON" position, a **thumping** sound (cylinder stroke) should be heard. The thumping sound represents the number of strokes per minute (volume) of the pump.

Figure 22. Pump Control Switch



- Turn the Volume Control (Figure 23), **lock nut** counterclockwise (CCW) to release the volume control knob.

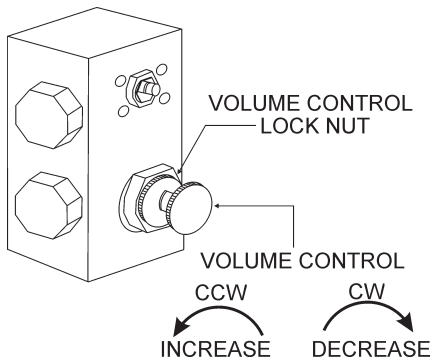


Figure 23. Volume Control

- Use the volume control, to set the pump volume to approximately **10 strokes per minute**. Turning the volume control clockwise (CW) will **decrease** pump volume, and counterclockwise (CCW) will **increase pump** volume.

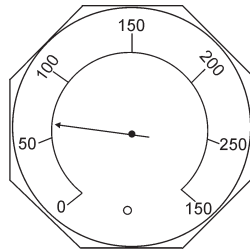
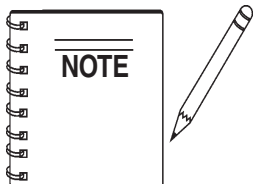


Figure 24. Hydraulic Oil Temperature Gauge

- Let the pump cycle until the hydraulic oil temperature (Figure 24) is approximately 50 to 60 degrees Fahrenheit.



Use a wristwatch or stop watch to determine the number of pump strokes within 1 minute.

- While monitoring the tachometer, (Figure 25) use the Engine Throttle Control to set the engine speed to 1500 RPM by following steps 8A-8C.

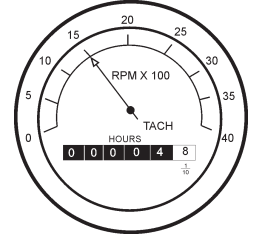


Figure 25. Engine Tachometer

- Unlock the throttle cable. To unlock the throttle cable, turn the inner most knob counterclockwise (Figure 26.)

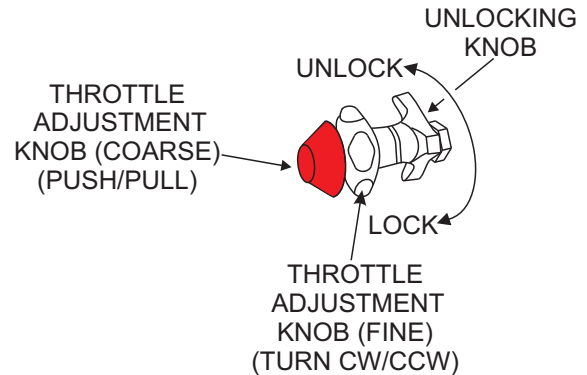


Figure 26. Throttle Control Knob (Un-locking)

- Push the outermost button, Figure 27 (coarse adjustment) inward, then pull outward until engine RPM reaches desired speed.
- Turn the unlocking knob (figure 26) clockwise to lock engine RPM in place.

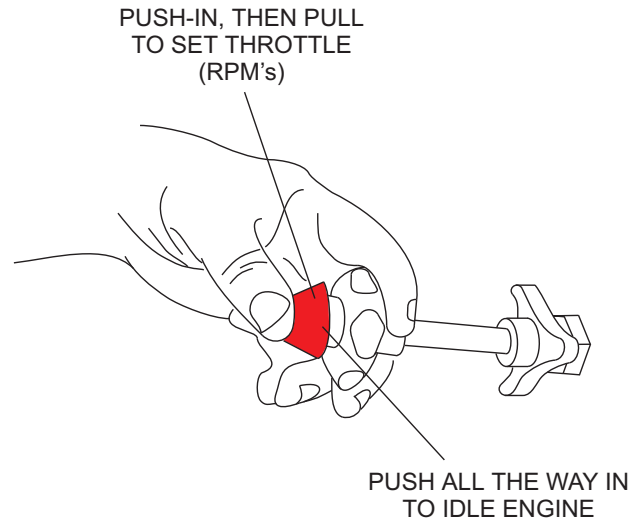


Figure 27. Throttle Control Knob (RPM Adjust)

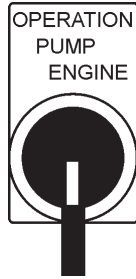
- Turn the Control Off switch (Figure 10) to the "OFF" position.

# ST-45 PUMP — INITIAL START-UP PROCEDURE

## ENGINE SPEED

- Turn the **Operation Pump/Engine** switch to the “ENGINE” position (Figure 28).

**Figure 28. Operation Pump Engine Switch**

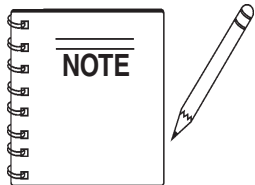


- Make sure the Operation Pump/Engine switch is in the “ENGINE” position (Figure 28), and that only the engine is running.

- Turn the **fan switch** (Figure 30) to the “ON” position and listen for fan to start.



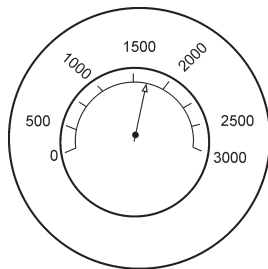
**Figure 30. Fan On/Off Switch**



The pump should not be cycling at this time. Only the **ENGINE** should be running.

- Turn the **fan switch** to the “OFF” position and listen for fan to stop. If machine exceeds 170°F or to cool the machine down, turn the operation switch (Figure 28) back to the “ENGINE” position. Run engine at high RPM with cooling fan on for 10 to 15 minutes.

- While monitoring the tachometer (Figure 25), use the **Engine Throttle Control** to set the engine speed to 2550 RPM (maximum speed) using steps 8A-8C



ACCUMULATOR PRESSURE GAUGE  
0-3000 PSI

- The **Accumulator Pressure Gauge** (Figure 29) should read approximately 1750 pounds per square inch (psi).

**Figure 29. Accumulator Pressure Gauge**

## PRESSURE TEST

- The Pressure Test switch (Figure 31) is a self-diagnostic test switch, that when activated will test the pressure of the system. This switch will be discussed in the maintenance and troubleshooting section of this manual.



**Figure 31. Pressure Test On/Off Switch**

## COOLING FAN

This section is intended to make sure the fan is working properly. Under normal conditions the fan should be turned on when the hydraulic oil temperature begins to approach 75 degrees fahrenheit.

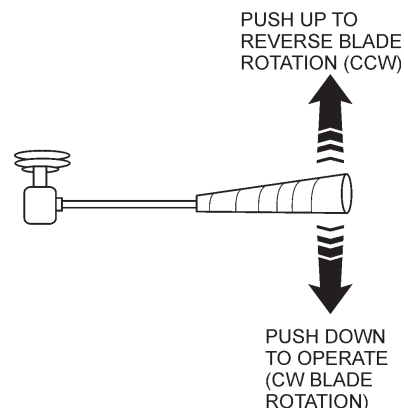
## CAUTION



If the hydraulic oil temperature exceeds 170 degrees fahrenheit, **shut down the pump. DO NOT** continue to operate the pump. Failure to shut down the pump will result in severe damage to the pump.

## HOPPER REMIXER CONTROL

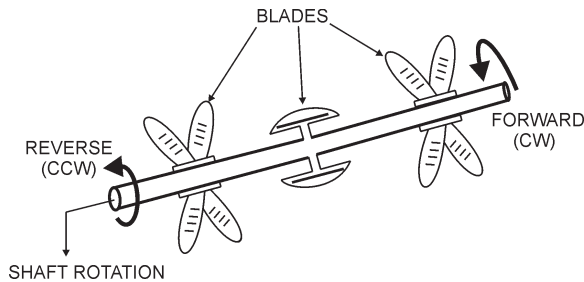
- Located to the left of the Hydraulic Temperature gauge is the Hopper Remixer Control lever (Figure 32).
- Turn the Operation Pump/Engine switch to the “ENGINE” position (only the engine should be running).



**Figure 32. Hopper Remixer Control Lever**

# ST-45 PUMP — INITIAL START-UP PROCEDURE

- C. Push the Hopper Remixer Control lever “**DOWNWARD**” (Figure 31) and observe that the blades (Figure 33) inside the hopper are turning in a clockwise direction (forward).

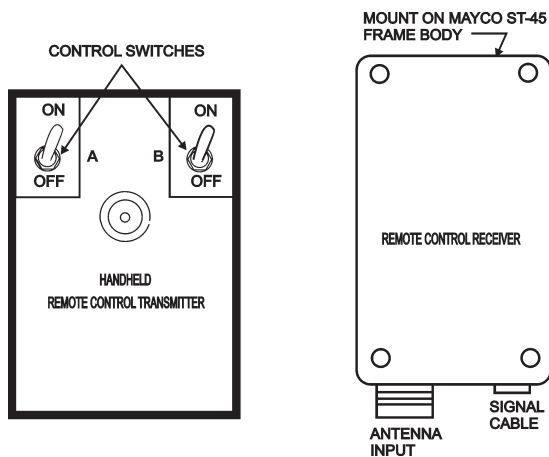


**Figure 33. Hopper Remixer Blades (Rotation)**

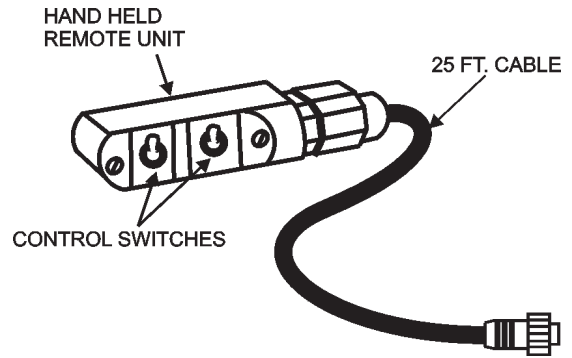
- D. Push the Hopper Remixer Control lever “**UPWARD**” (Figure 32) and observe that the blades (Figure 33) inside the hopper are turning in a counter-clockwise direction (reverse).

## OPTIONAL RADIO REMOTE CONTROL

14. The MAYCO ST-45 Concrete Pump has a remote control feature that allows the pump to be remotely controlled. If desired, the pump can be operated via a receiver/transmitter method (Figure 34) or a hardwire method, which utilizes a 25-ft. extension cable. The manual remote cord (Figure 35) should be installed under the main control box. Contact your MAYCO representative for further information.



**Figure 34. Handheld Receiver/Transmitter**



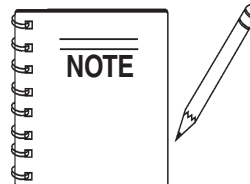
**Figure 35. Handheld Remote Cable Unit**

## CYLINDER LUBRICATION BOX

### WARNING



Before checking lubrication level, stop the engine and remove the engine starter key. We recommend using soluble type oil (water & oil mixture). The oil level should be checked every day prior to pumping. The oil level should be maintained at a height of 5 inches or about 1/2 the concrete cylinder height.



**Important Notice!** During freezing temperature after pumping, completely drain the water box and cover the hopper. Frozen liquid will restrict the piston travel and cause severe damage to the pump.

15. As the rubber piston cups naturally wear, fine cement particles will accumulate in the box. Once the concrete paste reaches a height of about 1/2 inch from the bottom. The box should be drained and cleaned. To clean, remove the drain plug located at the bottom of the box.

Once the box is drained, start the engine and stroke the cylinder (keep hands out of box) ten to fifteen times. While stroking, spray water inside of the box to thoroughly clean out all contamination. When the box is clean, replace drain plug, add new lubrication and install the top cover.

## Towing Safety Precautions

### CAUTION



- Check with your county or state safety towing regulations department before towing your **concrete pump**.

To reduce the possibility of an accident while transporting the pump on public roads, always make sure that the trailer and the towing vehicle are in good operating condition and both units are mechanically sound.

The following list of suggestions should be used when towing the pump:

- Make sure that the hitch and coupling of the towing vehicle are rated equal to, or greater than the trailer "gross vehicle weight rating" (GVWR).
- **ALWAYS** inspect the hitch and coupling for wear. **NEVER** tow the light tower's trailer with defective hitches, couplings, chains etc.
- **CHECK** the tire air pressure on both the towing vehicle and the trailer. Also check the tire tread wear on both vehicles.
- **ALWAYS** make sure the trailer section of the pump is equipped with a "**Safety Chain**".
- **ALWAYS** attach trailer's safety chain to frame of towing vehicle.
- **ALWAYS** make sure that the vehicle and trailer directional, backup, brake, and trailer lights are connected properly and are working properly.
- Remember in most cases the maximum speed unless otherwise posted for highway towing is 45 MPH, however before towing your pump, check your local state, and county vehicle towing requirements. Recommended off-road towing is not to exceed **10 MPH** or less depending on type of terrain.
- Place *chocked blocks* underneath wheel to prevent **rolling**, while parked.
- Depending on soil conditions and location it may be necessary to place *support blocks* underneath the trailer's bumper to prevent **tipping**, while parked.
- Inflate tires to correct pressure, inspect tires for cuts, and excessive wear. See Table 5 (Tire Wear Troubleshooting).

- Check wheel mounting lug nuts with a **torque wrench**. Torque wheel lug nuts as described in the "**Lug Nut Torque Requirements**", Table 7.
- Make sure brakes are synchronized and functioning properly.
- Check tightness of suspension hardware (nuts and bolts).
- Avoid sudden stops and starts. This can cause skidding, or jackknifing. Smooth, gradual starts and stops will improve gas mileage.
- Avoid sharp turns to prevent rolling.
- Retract wheel stand when transporting.
- **DO NOT** transport pump with fuel in the fuel tank.

### CAUTION



If the trailer coupler is deformed replace entire coupler. **NEVER** tow the pump with a defective trailer coupler. There exist the possibility of the trailer separating from the towing vehicle.

#### Pump Trailer Vehicle Connection

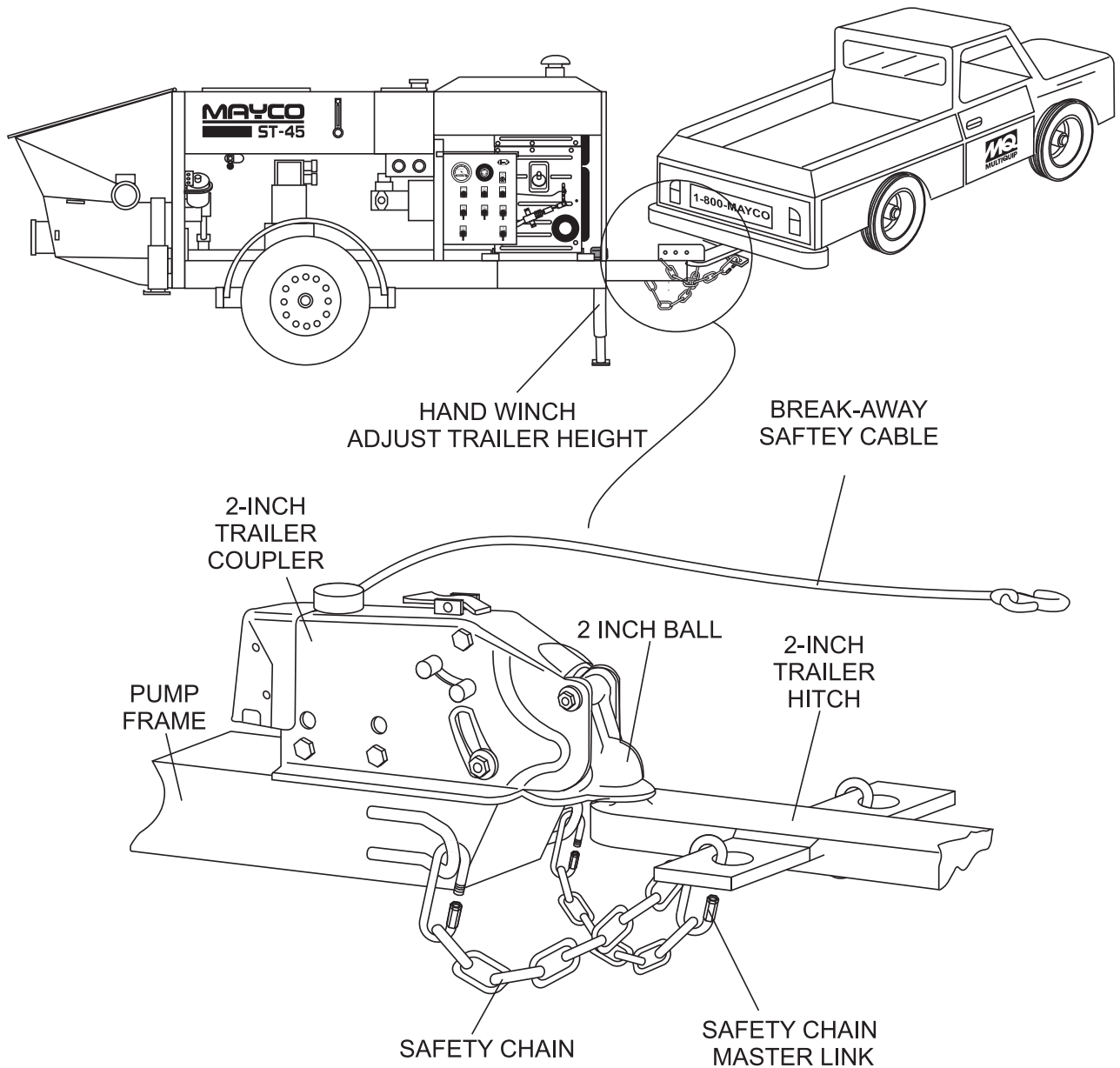
1. Check the vehicle hitch ball, and trailer coupler for signs of wear or damage. Replace any parts that are worn or damaged before towing.
2. Use only the 2-inch ball diameter with a towing capability of 5,000 lbs. (2,268 kg) as indicated on the trailer's coupler. Use of any other ball diameter will create an extremely dangerous condition which can result in separation of the coupler and ball or ball failure.
3. Be sure the coupler is secured to the hitch ball and the lock lever is down (locked).
4. Attach safety chains as shown in Figure 36. Remember to **cross** the safety chains.
5. After towing for about 50 miles recheck the entire towing system for tightness.

#### Recommended Maintenance

1. Smear ball socket and clamp face with chassis grease. Periodically oil pivot points and wear surfaces of coupler with SAE 30 W motor oil.
2. When parking or storing the concrete pump, keep the coupler off the ground so dirt and other debris will not build up in the ball socket.

# ST-45 PUMP — TOWING GUIDELINES

Figure 36 shown below illustrates the typical towing application that should be used when towing the pump.



**IMPORTANT!**

CROSS BOTH  
SAFETY CHAINS

Figure 36. Towing Applications

# ST-45 PUMP — TRAILER SAFETY GUIDELINES

## Trailer Safety Precautions

### CAUTION



**ALWAYS** make sure that the trailer is in good operating condition. Check the tires for proper inflation and wear. Also check the wheel lug nuts for proper tightness.

This section is intended to provide the user with trailer service and maintenance information. Remember periodic inspection of the trailer will ensure safe towing of the equipment and will prevent damage to the equipment and personal injury.

It is the purpose of this section to cover the major maintenance components of the trailer. The following trailer components will be discussed in this section:

- Tires
- Lug Nut Torquing
- Suspension
- Electrical

The following list defines the major trailer components:

1. **Frame Length** – This measurement is from the ball hitch to the rear bumper (reflector).
3. **Frame Width** – This measurement is from fender to fender.
4. **Jack Stand** – Trailer support device with maximum pound requirement from the tongue of the trailer.
5. **Coupler** – Type of hitch used on the trailer for towing. This unit employs a 2" ball.
6. **Tires Size** – Indicates the diameter of the tire in inches (10, 12, 13, 14, etc. ), and the width in millimeters (175, 185, 205 etc.). The tire diameter must match the diameter of the tire rim. This unit employs 7.35" X 14" tires.
7. **Tires Ply** – The tire ply (layers) number is rated in letters; 2-ply, 4-ply, 6-ply, 8-ply, 10-ply etc. This unit employs 4-ply tires.

8. **Wheel Hub** – The wheel hub is connected to the trailer's axle.
9. **Tire Rim** – Tires are mounted on a tire rim. The tire rim must match the size of the tire.
10. **Lug Nuts** – Used to secure the wheel to the wheel hub. Always use a torque wrench to tighten down the lug nuts. See Table 7 and Figure 38 for lug nut tightening and sequence.
11. **Axle** – This trailer employs a torsion bar type suspension, which can support 3,500 lbs.
12. **Electrical** – Electrical connectors (looms) are provided with the trailer so that brake lights and turn signal lights can be connected to the towing vehicle. See Figure 43 for proper wiring connections.

# ST-45 PUMP — TRAILER SAFETY GUIDELINES

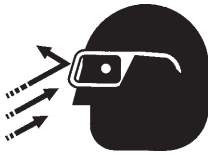
## Tires/Wheels/Lug Nuts

Tires and wheels are a very important and critical components of the trailer. When specifying or replacing the trailer wheels it is important the wheels, tires, and axle are properly matched.

### CAUTION



**DO NOT** attempt to repair or modify a wheel. **DO NOT** install an inter-tube to correct a leak through the rim. If the rim is cracked, the air pressure in the inter-tube may cause pieces of the rim to explode (break-off) with great force and can cause serious eye or bodily injury.



## Tires Wear/Inflation

Tire inflation pressure is the most important factor in tire life. Pressure should be checked cold before operation. **DO NOT** bleed air from tires when they are hot. Check inflation pressure weekly during use to insure the maximum tire life and tread wear.

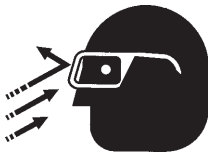






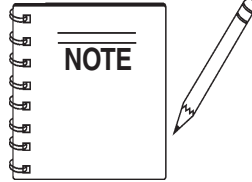


Table 5 (Tire Wear Troubleshooting) will help pinpoint the causes and solutions of tire wear problems.



TABLE 5. TIRE WEAR TROUBLESHOOTING			
WEAR PATTERN	CAUSE	SOLUTION	
	Center Wear	Over Inflation	Adjust pressure to particular load per tire manufacturer.
	Edge Wear	Under Inflation	Adjust pressure to particular load per tire manufacturer.
	Side Wear	Loss of chamber or overloading.	Make sure load does not exceed axle rating. Align wheels.
	Toe Wear	Incorrect toe-in	Align wheels.
	Cupping	Out-of balance	Check bearing adjustment and balance tires.
	Flat Spots	Wheel lockup & tire skidding.	Avoid sudden stops when possible and adjust brakes.



**ALWAYS** wear safety glasses when removing or installing force fitted parts. Failure to comply may result in serious injury.

Table 6. Suspension Torque Requirements	
3/8" U-BOLT	MIN-30 MAX-35
7/16" U-BOLT	MIN-45 MAX-60
1/2" U-BOLT	MIN-45 MAX-50
SHACKLE BOLT SPRING EYE BOLT	SNUG FIT ONLY. PARTS MUST ROTATE FREELY. LOCKING NUTS OR COTTER PINS ARE PROVIDED TO RETAIN NUT-BOLT ASSEMBLY
SHOULDER TYPE SHACKLE BOLT	MIN-30 MAX-50

## Suspension

The leaf suspension springs and associated components (Figure 37) should be visually inspected every 6,000 miles for signs of excessive wear, elongation of bolt holes, and loosening of fasteners. Replace all damaged parts (suspension) immediately. Torqued suspension components as detailed in Table 6.

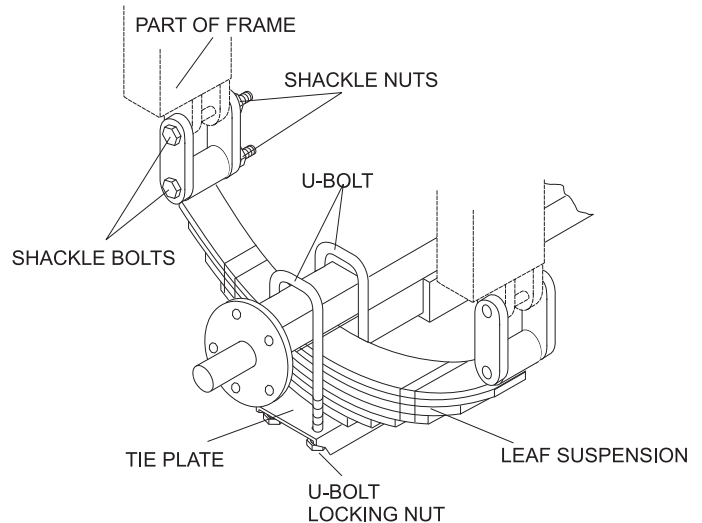


Figure 37. Major Suspension Components

# ST-45 PUMP — TRAILER SAFETY GUIDELINES

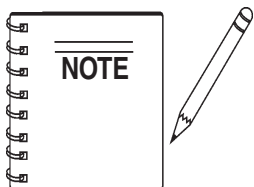
## Lug Nut Torque Requirements

It is extremely important to apply and maintain proper wheel mounting torque on the trailer. Be sure to use only the fasteners matched to the cone angle of the wheel. Proper procedure for attachment of the wheels is as follows:

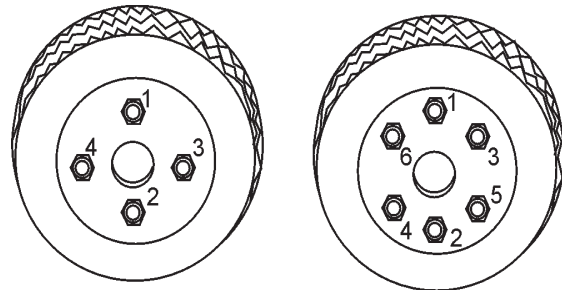
1. Start all wheel lug nuts by hand.
2. Torque all lug nuts in sequence. See Figure 38. **DO NOT** torque the wheel lug nuts all the way down. Tighten each lug nut in 3 separate passes as defined by Table 7.

Wheel Size	First Pass FT-LBS	Second Pass FT-LBS	Third Pass FT-LBS
12"	20-25	35-40	50-65
13"	20-25	35-40	50-65
14"	20-25	50-60	90-120
15"	20-25	50-60	90-120
16"	20-25	50-60	90-120

3. After first road use, retorque all lug nuts in sequence. Check all wheel lug nuts periodically.

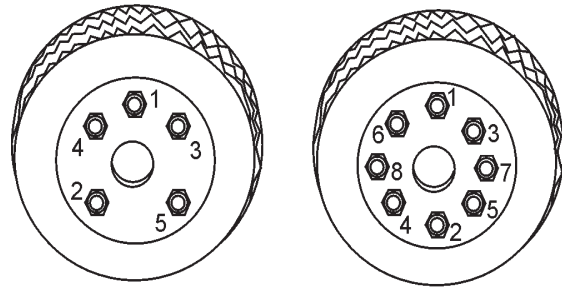


**NEVER!** use an pneumatic air gun to tighten wheel lug nuts.



4-LUG NUTS

6-LUG NUTS



5-LUG NUTS

8-LUG NUTS

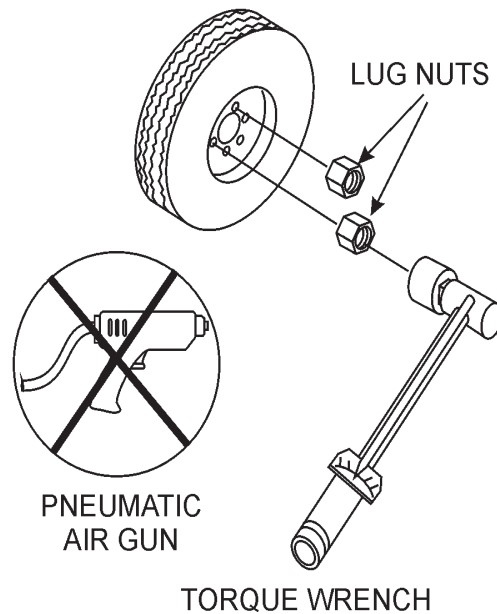


Figure 38. Wheel Lug Nuts Tightening Sequence

## Towing Information

### WARNING

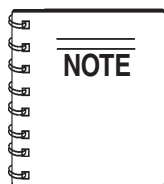


Use jack stand to lift tongue. **DO NOT** lift by hand as back injury could result.

### CAUTION



The ball capacity must be greater than or equal to the trailer GVWR. Do not use a worn hitch ball, it is unsafe and must be replaced. **USE 2" BALL ONLY**



Take care not to damage the actuator when backing up the towing vehicle for hook-up.

1. Position actuator ball socket above 2" ball.
2. Hold the release lever in the open position (Figure 39).
3. Lower the trailer tongue until the ball rests in the ball socket.
4. Close the release lever.

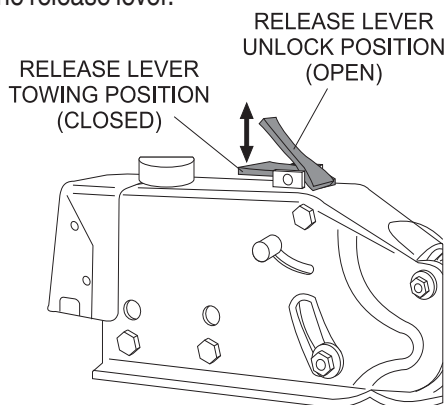


Figure 39. Trailer Hitch Release Lever

### CAUTION



The release lever will close freely with finger pressure when the ball is properly inserted into ball socket. If the release lever does not close freely, do not tow the pump. **DO NOT** force the release handle into the closed position.

5. To make sure that the actuator is securely latched onto the ball, extend the trailer tongue jack to the ground and lift the truck and trailer combination 2" to 4". If the ball does not disengage, the actuator is securely attached.
6. Insert a padlock or bolt through the lock hole for added protection.
7. Connect the break-away cable solidly to the bumper or frame of the tow vehicle as near to the center as possible. The cable must hang clear of the trailer tongue and be long enough to permit short radius turns without pulling the breakaway cable forward.
8. Make sure the breakaway cable is in a released position with the indicator bead touching or resting against the cable spring stop. (Figure 40).

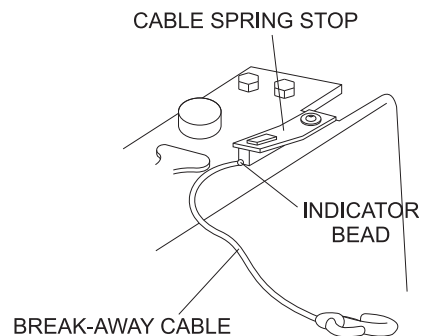


Figure 40. Trailer Hitch Release Handle

### CAUTION



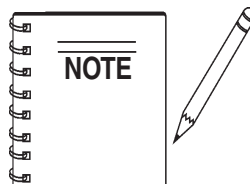
**DO NOT** use the breakaway cable as a parking brake.

9. Cross the safety chains under the tongue and securely attach them to the bumper or frame of the tow vehicle. Check with local and state laws for proper compliance.

### CAUTION



Safety chains must **ALWAYS** be used.



Check the location of the breakaway cable periodically during each trip. The indicator should rest against the spring stop. Accidental application will cause the brakes to drag and heat up, causing a failure.

## ST-45 — TOWING INFORMATION

10. Retract the jack fully. Remove and store the caster, if applicable.
11. Check for proper truck-trailer hook-up; the tow vehicle and trailer should be level with a positive tongue load. For further information, consult a dealer or Atwood Service Center.
12. The direction lever must be positioned in the “Towing Position” (Figure 41).
5. If the pump is to be uncoupled from the tow vehicle after backing with the lever knob engaged, block all pump wheels and pull forward slightly to take strain off of the actuator. Uncouple the actuator by lifting the release handle and raising the trailer tongue. Make sure the lever knob is in the “Towing Position” when uncoupling from the trailer.

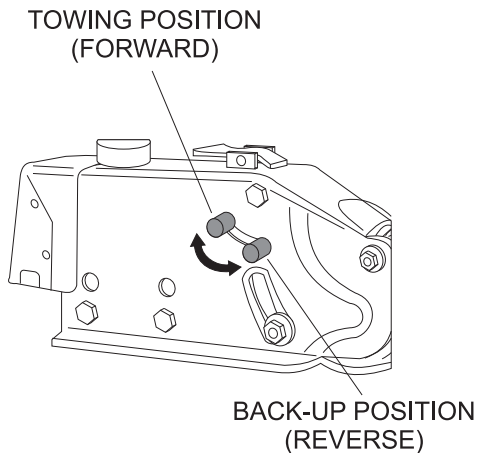


Figure 41. Towing Hitch Direction Lever

13. Do not use the Atwood brake actuator with a sway controller, unless prior Atwood Engineering approval of the sway control system has been received.
14. You are now ready to tow your pump.

### CAUTION



Avoid sharp turns. This could bend, create extreme stress or fracture either the actuator or trailer tongue.

### BACKING UP

1. Refer to the previous steps 1 through 14 for Towing.
2. Before backing up a slope or through soft ground, pull the trailer forward slightly to assure that the actuator socket is in the fully forward position.
3. Move the directional lever on the side of the actuator downward from the “**TOWING**” position along the curved slot in the actuator frame to the “**BACK-UP**” position (Figure 41). The slot has a notch at the bottom of its travel. Push the directional lever down to engage the locking notch.
4. Back the trailer up.

### CAUTION



Before towing the pump, always ensure that the **directional lever** (Figure 41) has been disengaged and is in the “Towing Position.”

# ST-45 PUMP — WIRING DIAGRAM (TAIL LIGHTS)

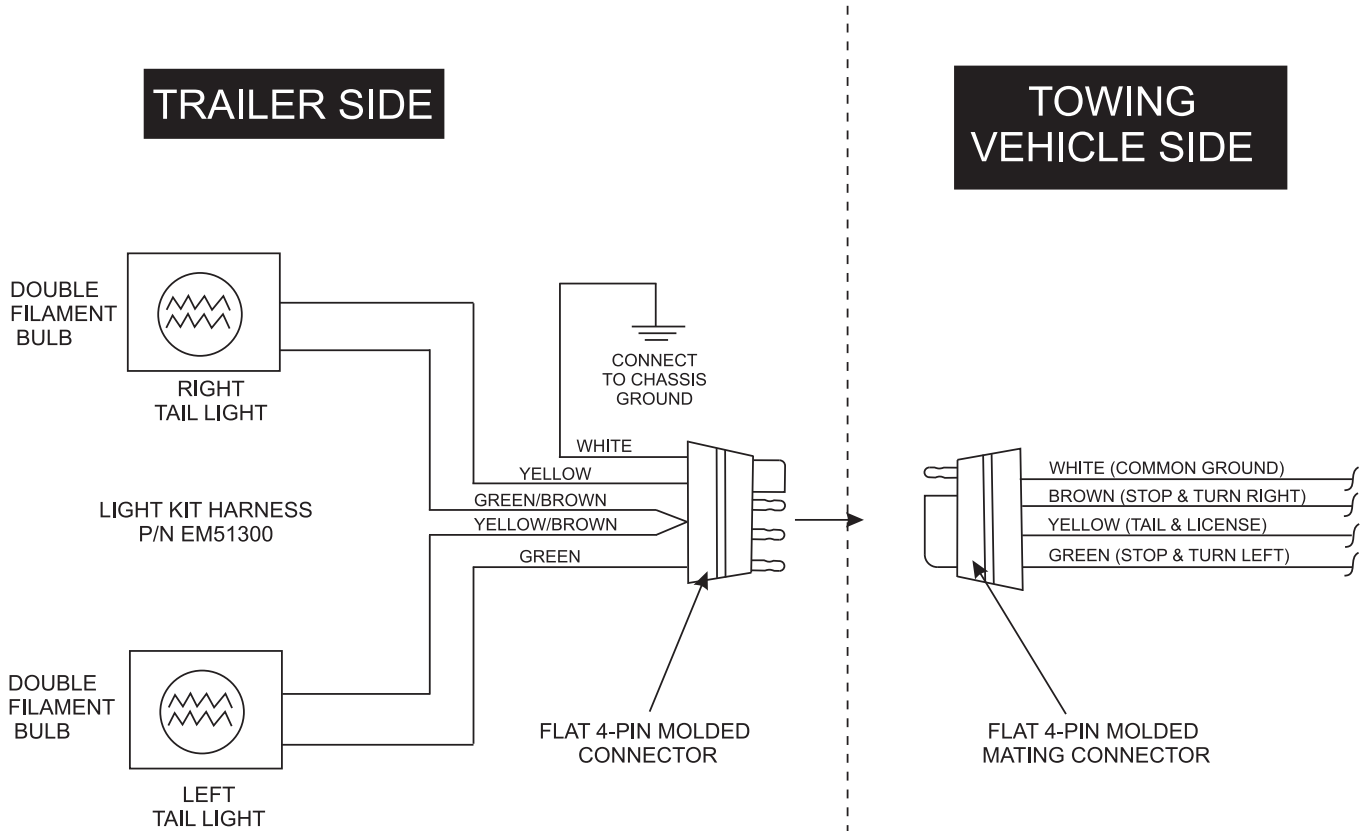


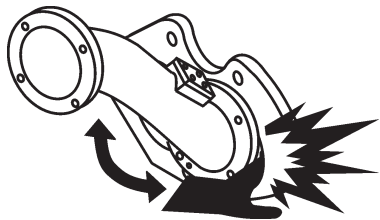
Figure 42. Trailer Tail Lights Wiring Diagram

# ST-45 PUMP — MAINTENANCE (PUMP)

**TABLE 8. ST-45 MAINTENANCE CHECK SCHEDULE**

	Daily	Hourly	Weekly	Monthly	6-Months	Operational Hours
Engine Oil	X			X		
Engine Air Filter				X		
Fuel Filter				X		
Hydraulic Oil Level	X					500 hrs.
Lubrication Box		X				
Replace Hydraulic Oil						
Clean Hydraulic Filters				X		2100 hrs.
Axle Crank	X					
Grease Shuttle Tube Zerk Points		X				2 hrs
Grease Remix Bearing	X					
Check System Pressure			X			40 hrs.
Check Hardware for Tightness			X			40 hrs.
Check Cutting Ware Ring			X			
Check Trailer Brakes Function	X					
Check Brake Lights	X					
Check Tire Conditions	X					
Inspect Safety Devices / Decals	X					
Check Wheel Bearings					X	
Check Battery				X		
Inspect Brake Lining					X	
Visually Check for Oil Leaks	X					

## DANGER



You will be required to put your hand in the concrete cylinders or near the shuttle tube. You are at **EXTREME RISK** of injury or **AMPUTATION** if the engine is running or if pressure is in the hydraulic system.

Prior to performing any maintenance on the pump, stop the engine by turning off the ignition switch and remove the starter key. Place a “**DO NOT OPERATE**” tag over the switch and disconnect the battery. The pressure reading on the accumulator pressure gauge **MUST** read **ZERO**. **ALWAYS** relieve the accumulator circuit to zero pressure prior to performing any maintenance on the pump.

## CLEANING THE PUMP AND DELIVERY SYSTEM

Cleaning the pump is a very important operation as it determines how the machine will pump the next time it is used.

At the end of every pour, or because of long delays during a pour, the pump and delivery system must be thoroughly cleaned by removing all concrete material.

1. Following the “**Clearing Concrete Blockage**” operating procedure on page 26, ensure that there is no blockage in the hose and line or in the shuttle tube (using the **Shuttle Tube Inspection Procedure**, page 26-27). If a blockage exists, clear it.
2. Pump concrete until the opening of the concrete cylinder intake in the hopper is visible.
3. Stop the pump.
4. Carefully disconnect the first hose joint at the shuttle tube discharge elbow.

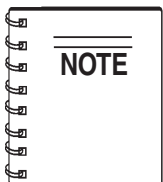
# ST-45 PUMP — MAINTENANCE (PUMP)

5. Add water to the hopper. Pump and flush clean the entire hopper, shuttle tube and discharge elbow with water.
6. Scoop out 12 inches of concrete from the inboard end of the delivery hose. "Cork screw" a 6" x 6" x 8" sponge into the end of the first hose section. Reconnect the hose to the discharge elbow.
7. Fill hopper with water. Pump until sponge and clean water come out the discharge end of the hose and line system.
8. When the Model ST-45 has been used to pump small aggregate concrete (pea rock, ½" minus) or mixes with high fines content (60% or more sand) there will be a tendency for hardened concrete to build up on the inside surface of the shuttle tube. Therefore, at the end of every such pour, after the pump and system have been cleaned and the engine shut off, remove the shuttle tube inspection plate (follow the **Shuttle Tube Inspection Procedure**, page 26-27) and remove all remaining concrete.
9. When the Model ST-45 has been used to pump large aggregate concrete (¾" to 1 ½") follow the instructions in step 8 once per week.

## WARNING



**NEVER** use muriatic acid to clean the pump. Acid will dissolve the chrome finish on material cylinder bore and main hydraulic cylinder rods.



Use only a 2½" diameter clean-out hook when back-pumping into redi-mix truck. Use a safety chain to secure the clean-out hook to some solid part of the mixer truck to prevent hook from jumping off of the drum. Run the pump at 6 strokes per minute maximum speed.

## ENGINE (Hatz Model 3M41 57HP Diesel)

The ST-45 is equipped with a Model 3M41 57HP diesel engine. For information concerning the procedure in checking, removing, cleaning, etc. of the various engine parts or any other information on the engine not contained herein, refer to the engine manufacturer's instruction manual.

## HYDRAULIC OIL SYSTEM MAINTENANCE

1. When changing the hydraulic oil or topping off the reservoir, use only the following type. (Reservoir capacity 58 gal.)

Hydraulic oil: Shell Oil Tellus 68 or  
Mobil DFE 26  
Texaco Rand HDC

The Mayco pump is equipped with an in-tank return hydraulic filter with a 10 micron cleanable filter. The element has been designed to remove all particles large enough to cause wear and job break down. Under normal conditions, we recommend replacement every 6 month.

## WARNING



**DO NOT** mix oil brands! This may impair quality.

The most important factor to keep in mind is the effect of cold weather on the hydraulic oil. The viscosity (thickness) of the hydraulic oil will be much heavier.

Always run machine until oil temperature reaches a minimum of 50°F. before pumping. Damage to the main piston pump will occur if the machine is cycled too fast before the oil temperature reaches the minimum of 50°F. Cycle the machine at 6-8 strokes per minute at approximately 1/3 throttle.

In areas where the weather normally remains under 50°F., use Shell Oil Tellus – 46, or the equivalent. The above steps must be followed or severe damage to the main axial piston pump will be the end result.

2. Lubrication: Grease daily/Hour

■ Main hydraulic cylinders	- 2 Place
■ Remix bearings	- 2 Place
■ Axle crank	- 1 Place
■ Suttle cylinders	- 2 Place
■ "S" tube outlet flange	- 3 Place

Grease Type: Lithium Based EP  
Texaco Multitak 20  
Lubriplate ED-2

# ST-45 PUMP — MAINTENANCE (PUMP)

## BATTERY MAINTENANCE

Mishandling of the battery shortens the service life of the battery and adds to maintenance cost. When handling the battery do the following:

- Be careful not to let the battery electrolyte come in contact with your body or clothing.
- Always wear **eye protection** and **rubber gloves**, since the battery contains sulfuric acid which burns skin and eats through clothing.
- Always check the battery terminals periodically to ensure that they are in good condition.
- Use wire brush or sand paper to clean the battery terminals.
- Always check battery for cracks or any other damage. If white pattern appears inside the battery or paste has accumulated at the bottom, replace the battery.
- If the pump will not be in operation for a long period of time, store in cool dry place and check the battery charge level every month to maintain the performance of the battery.

## CAUTION :



Wear **safety glasses** or **face mask**, **protective clothes**, and **rubber gloves** when working with battery.



- Check the battery regularly and make sure that each electrolyte level is to the bottom of the vent well (Figure 43). If necessary add only distilled water in a well-ventilated area.

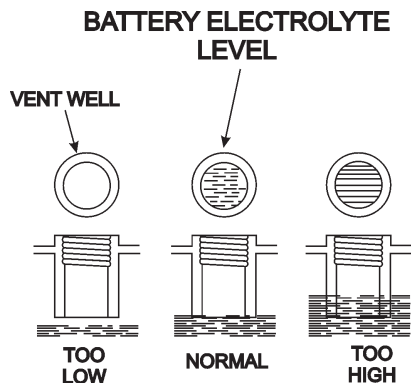
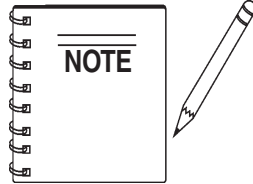


Figure 43. Battery Electrolyte Levels

## BRAKE SYSTEM

The brake system should be periodically checked. Look for fluid leaks worn or cracked hoses. Check the reservoir for proper fluid levels. The Atwood surge brake should be checked for damage. Make sure that all links and pivots are kept lubricated. See Figure 16 for troubleshooting tips.

1. Keep all links and pivots lubricated to prevent rusting and ensure ease of operation. Using SAE 30 oil, lubricate inside the release handle and inside the actuator body. This can be reached from the underside of the actuator.



Lubricate the hitch ball with conventional automotive grease or a lubricant made for hitch balls.

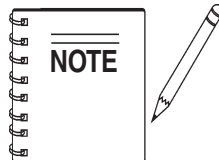
2. Check for any leaks in the brake system. Periodic checks should be made on all hoses to guard against cuts and worn hoses which may cause failure (leaks, rupturing under pressure, and collapsing). Replace defective hoses.

## CAUTION



**DO NOT** fill the master cylinder reservoir with used brake fluid. **DO NOT** fill the reservoir beyond 1/2" from top. **DO NOT** overfill; brake fluid will damage paint.

3. Check the brake fluid level in the master cylinder reservoir. Keep it filled to within 1/2" from the top of the reservoir.
4. At the beginning of each year, inspect the brakes for excessive wear, replace the linings if necessary.



Wheel bearings and seals should be inspected and packed at this time.

# ST-45 PUMP — MAINTENANCE (PUMP)

## ST45 PRESSURE SETTING SEQUENCE

To set **maximum** pump pressure:

1. With the engine turned “OFF”, loosen the ¼” hydraulic hose attached to the compensator valve located on the top of the Main Delta Q Pump.

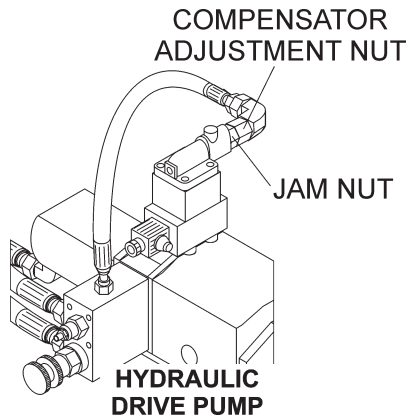


Figure 44. Compensator Valve

2. Loosen the **jam nut** located on the end of the compensator valve (Figure 44).
3. Turn the **compensator adjustment nut** (Figure 44) **clockwise** until tight. Tighten the ¼” hose leading to the compensator.
4. Start the engine and loosen the jam nut located on the **maximum relief valve cartridge** (Figure 45).
5. Run the engine at maximum RPM (2550) and turn the volume control knob **counter-clockwise** to maximum volume position (Figure 45).

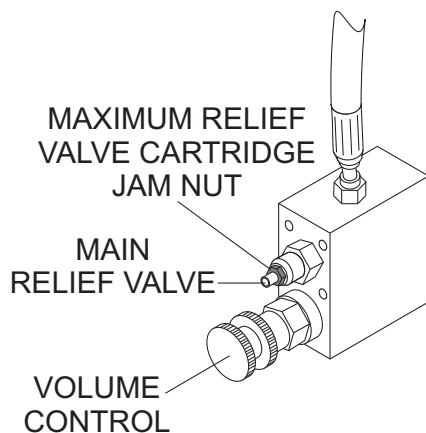


Figure 45. Hydraulic Drive Pump Manifold

6. On the electrical control panel, turn the **pump control switch** (Figure 22) and the **test switch** (Figure 31) to the “ON” position. Using an allen wrench, adjust the **main relief valve** (Figure 45) to **3500 PSI**. The reading can be taken from the **pumping pressure gauge** (Figure 46).
7. Hold the main relief valve adjusting bolt with a wrench and tighten the jam nut. Using the test switch, double check the pressure reading to make sure the setting has not changed.

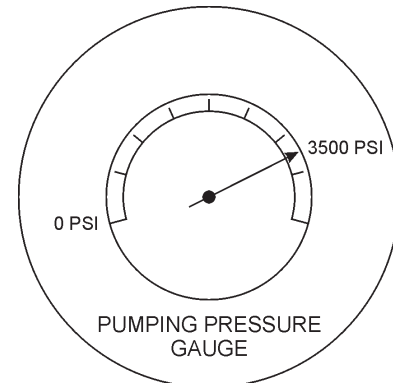


Figure 46. Pumping Pressure Gauge

8. Turn the engine off and loosen the hose from the compensator valve. Loosen the jam nut and turn the **compensator adjustment nut** (Figure 44) **counter-clockwise ½ turn**. Tighten the ¼” hydraulic hose.
9. Start engine and run at maximum RPM with volume control at maximum volume (fully **counter-clockwise**). Turn the **pressure test switch** (Figure 31) to the “ON” position. The pumping pressure gauge should now read **3300 PSI**. It may be necessary to repeat the above steps to achieve the proper pressure settings. After the adjustment, make sure the compensator valve jam nut is locked tight.

# ST-45 PUMP — MAINTENANCE (PUMP)

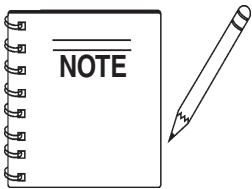
## CYLINDER LUBRICATION BOX

### CAUTION



Before checking lubrication level, stop the engine and remove the engine starter key.

1. The lubrication level should be checked everyday prior to pumping and maintained at a height of 5 inches or about  $\frac{1}{2}$  the concrete cylinder height. We recommend using a soluble type oil (water & oil mixture)



**Important notice!** During freezing temperatures, completely drain the Lubrication Box and cover the hopper after each use. Frozen liquid will restrict the piston travel and cause damage to the pump.

2. As the rubber piston cups naturally wear, fine cement particles will accumulate in the box. Once the concrete paste reaches a height of about  $\frac{1}{2}$  inch from the bottom of the box, drain and clean the lubrication box.

## CLEANING THE LUBRICATION BOX

1. Remove the top cover and the drain plug (Figure 47) located at the bottom of the box and fully drain the inside of the box.
2. Once the box is drained, start the engine and stroke the cylinder (**keep hands out of box**) ten to fifteen times.
3. While stroking, spray water inside of the box to thoroughly clean out all contamination (Figure 47).
4. When the box is clean replace drain plug, add new lubrication and install the top cover.

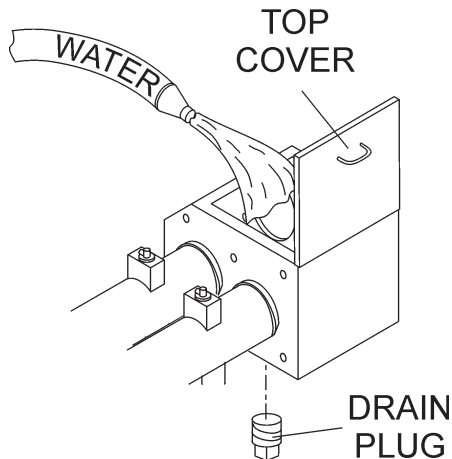
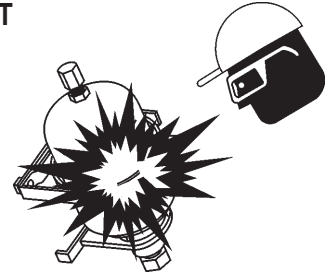


Figure 47. Cleaning the Lubrication Box

## ST45 ACCUMULATOR CIRCUIT

### DANGER



Improper accumulator charging can result in an explosion causing serious injury or death! **NEVER** use oxygen or compressed air to charge the accumulator! Only qualified personnel should perform this procedure. Use only **dry nitrogen** to charge the accumulator. Contact your Mayco service department or your local Hydac representative for proper charging procedure.

The accumulator circuit has two functions in the hydraulic system.

- The accumulator circuit furnishes the hydraulic pressure to cycle the shuttle tube.
- The accumulator circuit also furnishes the pilot pressure necessary to activate the hydraulic system.

The accumulator circuit is equipped with a bladder type accumulator (Figure 48) charged with **1100 PSI** of dry nitrogen. The accumulator stores one gallon of hydraulic oil, which is, under **1750 PSI** of pressure.

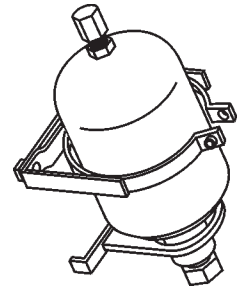


Figure 48. Accumulator

When the pump cycles, a part of the stored oil is released to the shuttle cylinder. This pressure release assures the shuttle tube has enough force to shear the cylinder of concrete passing from the concrete cylinder to the concrete delivery line during the cycle phase.

## CHECKING ACCUMULATOR BLADDER PRESSURE

The normal accumulator charge pressure should be approximately **1100 PSI**. To check the accumulator pressure:

1. Start the engine and stroke the pump. The **accumulator pressure gauge** (Figure 29) should read **1750 PSI**.
2. To determine the **actual** accumulator PSI, stop the engine and observe the pressure gauge. As the PSI reading slowly decreases, it will reach a point where there will be a sudden drop in the PSI. The PSI reading should be taken just prior to this sudden drop. If you do not read 1100 PSI, the accumulator may require charging or bladder replacement.

# ST-45 PUMP — MAINTENANCE (PUMP)

## SETTING PRESSURE IN THE ACCUMULATOR CIRCUIT

1. Attach a **3000 PSI test gauge** (Mayco P/N 98016) to port **G2** of the main manifold block (Figure 49).

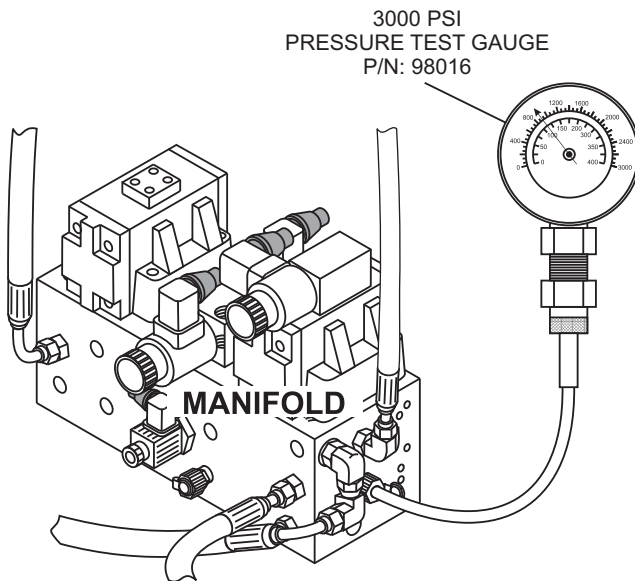


Figure 49. Accumulator Circuit Pressure Test Gauge

2. Loosen the lock nut on the **unloading valve cartridge** (Figure 50) and using an allen wrench, turn the adjusting screw **clockwise** until it is completely closed.

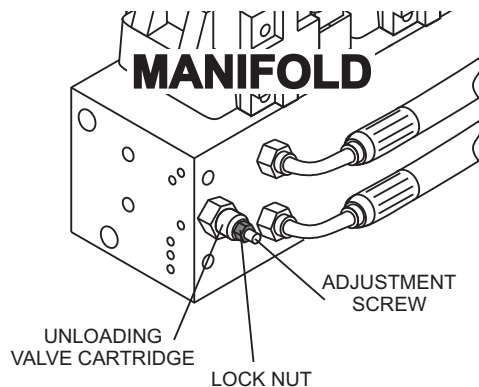


Figure 50. Unloading Valve Cartridge Adjustment

3. Turn the **pump control switch** (Figure 22) to the "ON" position and run engine at **2550 RPM**.

4. Loosen the lock nut for the the accumulator circuit **pilot relief valve cartridge** (Figure 51), located at port **G4**. Using an allen wrench, turn the adjusting screw until pressure gauge reads **1950 PSI** and tighten lock nut. Turn the engine off and on several times to make the pressure continues to read 1950 PSI.

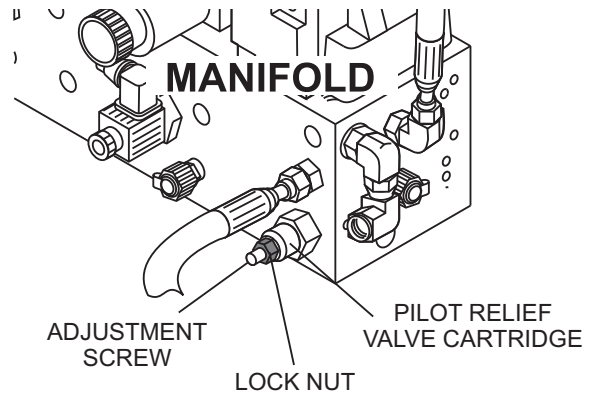


Figure 51. Pilot Relief Valve Cartridge Adjustment

5. Turn the **unloading valve cartridge** adjusting screw **counter-clockwise** until the pressure reaches **1750 PSI** on the accumulator pressure gauge (Figure 29). Start and stop the pump several times to make sure the accumulator circuit pressure is holding at 1750 PSI.
6. Tighten the lock nut on the unloading valve cartridge. Your accumulator circuit pressure should now be properly adjusted.

# ST-45 PUMP — MAINTENANCE (PUMP)

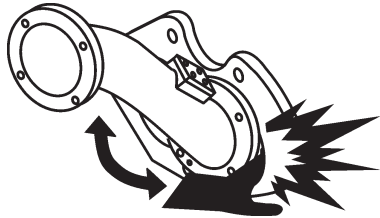
## CHANGING THE CONCRETE CYLINDER PISTON CUPS

The Rubber piston cups will occasionally require replacement depending on the following factors.

- The fluid level and cleanliness of the lubrication box.
- The size and type of aggregate.
- The type of concrete being pumped.

It is time to replace the cups when increasingly large particles of sand and cement pass into the lubrication box. Do not allow the cups to become so worn that they begin to pass lubrication into the material cylinders. If the liquid level of the lubrication box becomes too low, the rubber cups will severely deform due to excessive heat. Whenever replacement is due, both cylinder cups should be replaced.

## WARNING



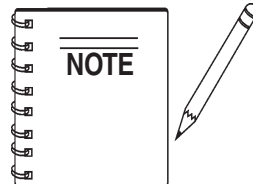
**ALWAYS** relieve the accumulator circuit to **ZERO** pressure prior to performing any maintenance on the pump.

## CYLINDER CUP REPLACEMENT PROCEDURE

1. Remove the two hydraulic hoses (Hopper Assy., Item 34) connected to the remix motor. Plug the ports with fittings (not provided) to prevent hydraulic hose leakage.
2. Remove the hopper discharge nipple (Hopper Interior Assembly, Item 21) and loosen sleeve seal. Inspect and replace if wear is excessive.
3. Remove the two tie rod nuts (Hopper Attachment, Item 19) and the four eyebolt nuts (Hopper Attachment, Item 22) securing the hopper to the pump frame.
4. Using an approved lifting device, remove the hopper (Hopper Assy, Item 1) using extreme care not to damage the hopper seal (Hopper Assy, Item 2).
5. Start the engine and turn on the pressure test switch (Figure 31). Cycle pump in reverse until hydraulic system obtains maximum pressure, then turn pump and engine off.

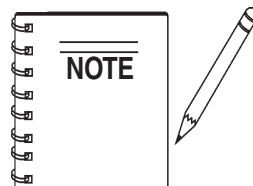
Remove ignition key and disconnect battery. **Think safety!** Check the hydraulic gauges (Figure 29) on panel and make sure accumulator pressure reads zero. One piston should be in the fully discharged position at the end of the concrete cylinder.

6. Remove the three 3/8 – 16 x 3” bolts (Lubrication Pistons Assy, Item 20) from the piston. Remove the front faceplate (Lubrication Pistons Assy, Item 19).
7. Install two the 3/8’ 16x3” bolts (Lubrication Pistons Assy, Item 20) back into the piston – do not tighten. Use the two bolts as leverage to remove the rubber piston cup (Lubrication Pistons Assy, Item 17) and rear components.
8. Obtain two 3/8 16x7” full thread studs (these studs will be used to assist in assembly alignment) insert the two studs into the piston adapter P/N 16460. Coat the concrete cylinder with grease.
9. The new “O” ring (Lubrication Pistons Assy, Item 12) must now be modified. Using a sharp knife cut four oil passage grooves into the ring. the grooves should be placed at a distance of 90° apart. The cut should be a v-shaped design, 0.059” deep and 0.157” wide at the top.
10. Install the “O” Ring P/N 14407 around the oiler plate (Lubrication Pistons Assy, Item 13). Install the plate into the concrete cylinder utilizing the studs for alignment.
11. Install the felt holder (Lubrication Pistons Assy, Item 14) over the oiler plate. Install felt ring (Lubrication Pistons Assy, Item 15) into felt holder. Install the bronze ring (Lubrication Pistons Assy, Item 16)



Felt ring must be saturated with 30 wt. oil prior to installation.

12. Using silicon sealant place a small bead of sealant material on the front of the rubber piston cup and the rear of the face plate. Install over alignment studs and into concrete cylinders.
13. Insert one 3/8” 16x3” bolt into the open bolt hole, remove the alignment studs one at a time and install the remaining 3/8” 16x3” bolts.



Before installing 3/8” bolt, coat the back of bolt heads with silicon sealant. Torque all three bolts equal at 55 ft. lbs. each.

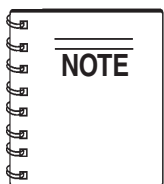
## CHANGING THE WEAR PLATE AND RING

Due to the swinging motion of the Nun-plate and the abrasive nature of concrete, it is normal for the cutting ring to wear on the side that shears through the concrete inside the hopper. If the wear ring and wear plate do not fully seat against each other the concrete slurry will pump into the hopper. This condition can be easily observed by the sudden change of the level of concrete inside the hopper during each stroke.

### Wear Plate and Ring Replacement Procedure

1. Remove the two hydraulic hoses (Hopper Assy., Item 34) connected to the remix motor. Plug the ports with fittings(not provided) to prevent hydraulic hose leakage.
2. Remove the hopper discharge nipple (Hopper Interior Assembly, Item 21) and loosen sleeve seal. Inspect and replace if wear is excessive.
3. Remove the two tie rod nuts (Hopper Attachment, Item 19) and the four eyebolt nuts (Hopper Attachment, Item 22) securing the hopper to the pump frame.
4. Using an approved lifting device, remove the hopper (Hopper Assy, Item 1) using extreme care not to damage the hopper seal (Hopper Assy, Item 2).
5. Remove the four 1/2" 1 1/4 " bolts (Hopper Interior Assy, Item 43) that hold the shuttle tube to the nun-plate and remove shuttle tube (Hopper Interior Assy, Item 41).

Using two small pry bars remove the rubber energizer ring (Hopper Interior Assy, Item 13B), steel insert ring (Hopper Interior Assy, Item A) and wear ring (Hopper Interior Assy, Item 13).



The energizer ring and wear ring will normally have concrete contamination holding them in position. It will be required to chip some of the concrete loose to better expose the energizer ring.

6. Clean out all concrete build up in and around the nun-plate area with a wire brush.
7. Inspect the wear components for indications of wear. The wear plate (Hopper Interior Assy, Item 52) has two wear surfaces. If it becomes necessary to replace, the plate can be reversed to the opposite side to expose a new flat surface. To replace or reverse the plate, remove the five allen head counter sink bolts. Then remove the two cylinder "O" rings and clean the entire back surface.

### Wear Plate Installation

1. Install the two cylinder "O" rings (Hopper Interior Assy, Item 10).
2. Using silicon sealant, coat the circumference of the concrete cylinders, the back of the wear plate and around the five bolt holes. Next, install the wear plate and the five bolts. The bolts must all be equally snugged and tightened to 100 foot pounds each.

### Wear Ring installation

1. Install the wear ring (Hopper Interior Assy, Item 13) into the nun plate.
2. Install the steel insert ring (Hopper Interior Assy, Item A) inside of the rubber energizer ring (Hopper Interior Assy, Item 13B).
3. Install the energizer ring assembly into the nun-plate.

After installing the above mentioned components the machine can be re-assembled by reversing steps 1 through 5 of the Wear Plate and Ring Replacement Procedure.

# ST-45 PUMP — MAINTENANCE (PUMP)

## WHEEL BEARINGS

After every 6 months of operation inspect the wheel bearings. Once a year, or when required, disassemble the wheel hubs remove the old grease and repack the bearings forcing grease between rollers, cone and cage with a good grade of high speed wheel bearing greases (never use grease heavier than 265 A.S.T.M. penetration "No. 2").

1. Fill the wheel hub with grease to the inside diameter of the outer races and also fill the hub grease cap.
2. Reassemble the hub and mount the wheel. Then tighten the adjusting nut, at the same time turn the wheel in both directions, until there is a slight bind to be sure all the bearing surfaces are in contact.
3. Back off the adjusting nut 1/6 to 1/4 turn or to the nearest locking hole or sufficiently to allow the wheel to rotate freely within limits of .001" to .010" end play. Lock the nut at this position.
4. Install the cotter pin and dust cap, and tighten all hardware.

## EXTENDED STORAGE INSTRUCTIONS

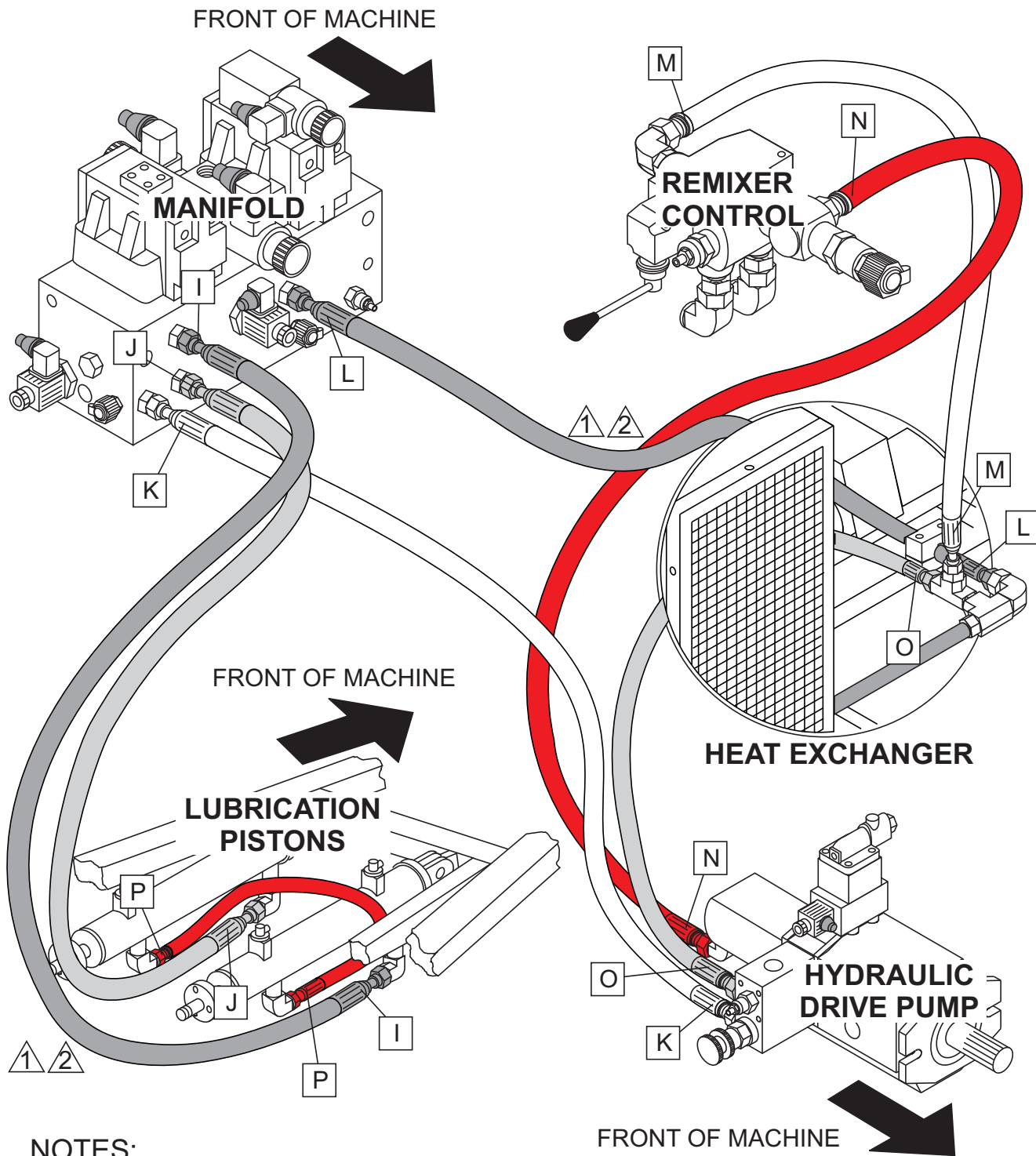
The following preventative maintenance is recommended for extended periods of storage.

1. Check brake system for proper fluid level in master cylinder and bleed all lines.
2. Lubricate all links and pivots to prevent any rusting.
3. Remove wheel and drum assemblies and spray a good anti-corrosion compound (CRC formula 5-56) under rubber boot on forward end of brake wheel cylinder. Avoid spraying drum and brake lining.
4. Grease all bearings and reinstall wheel and drum assemblies.
5. Make sure breakaway cable is fully released.
6. After extended storage, refer to the Maintenance Steps listed above to insure that the trailer is ready for towing.



# ST-45 PUMP — HYDRAULIC HOSE CONNECTIONS

Figure 53 is provided to show the hydraulic hose connections on the ST-45 for reference when performing inspections and maintenance on the pump.



**NOTES:**

- ① HOSES SHADED FOR VISUAL CLARITY.
- ② REFERENCE PARTS MANUAL FOR HOSE PART NUMBER.

Figure 53. Hydraulic Hose Connections

# ST-45 PUMP — HYDRAULIC HOSE CONNECTIONS

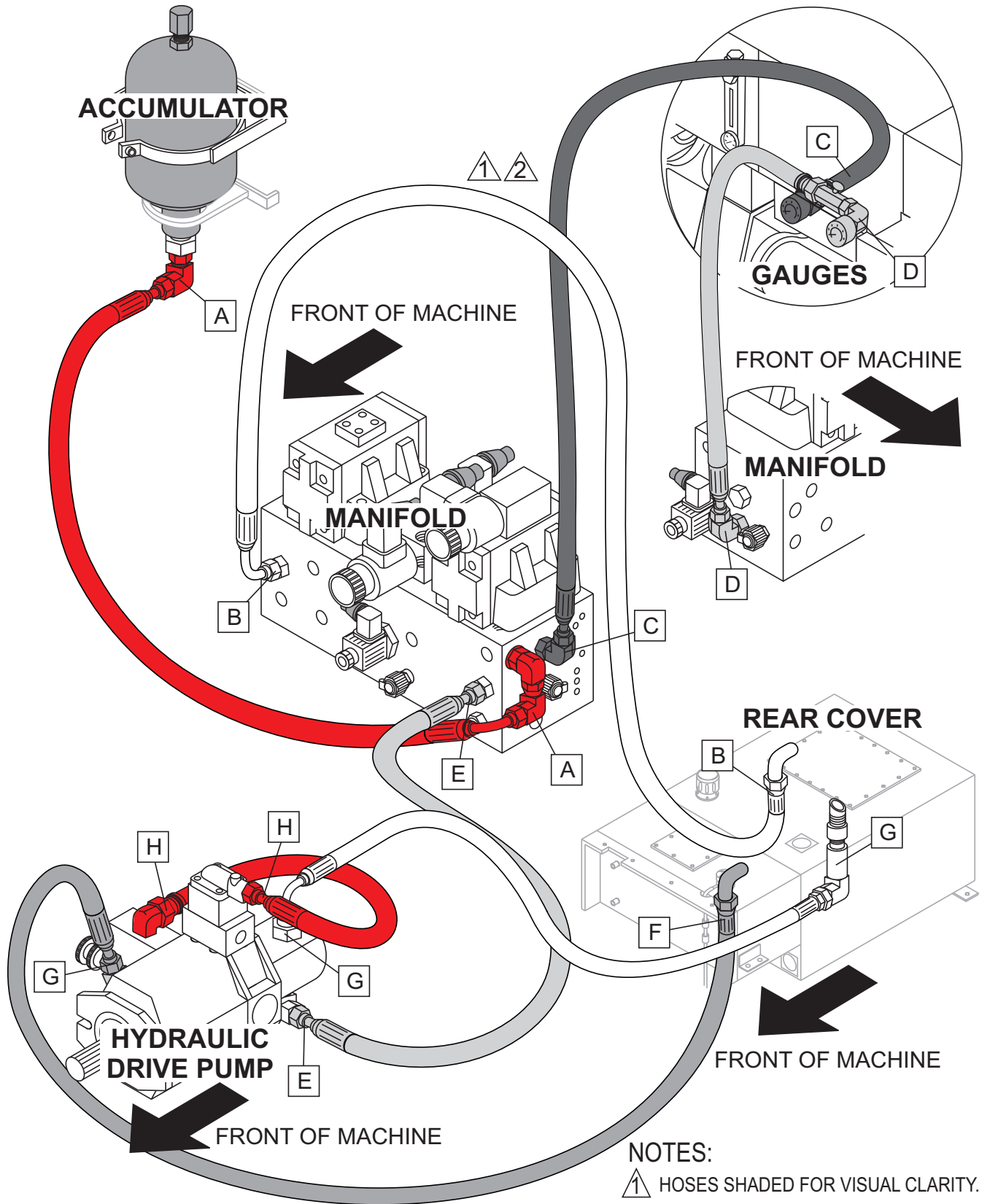
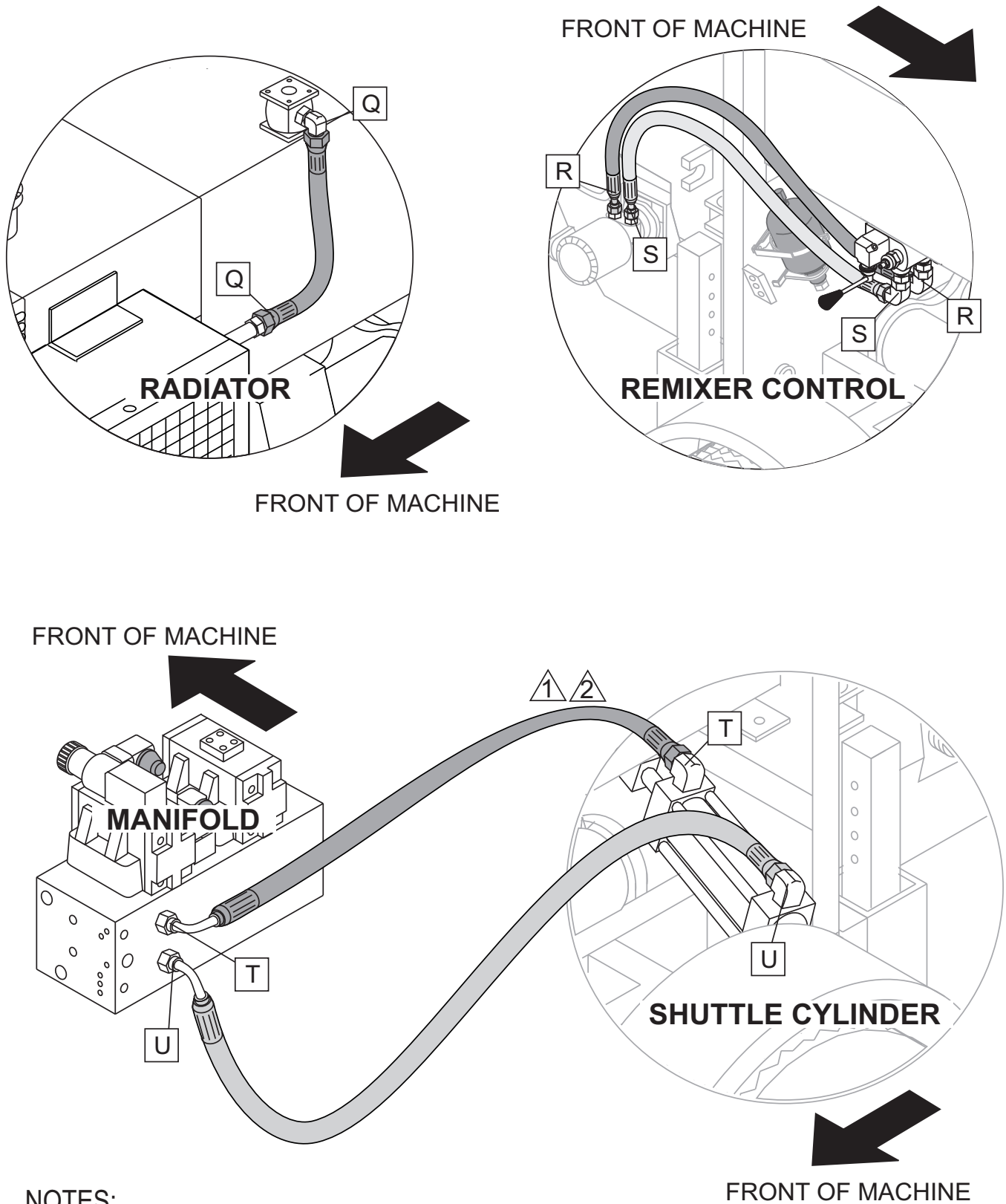


Figure 53. Hydraulic Hose Connections (Continued)

# ST-45 PUMP — HYDRAULIC HOSE CONNECTIONS



**NOTES:**

- ⚠️ HOSES SHADED FOR VISUAL CLARITY.
- ⚠️ REFERENCE PARTS MANUAL FOR HOSE PART NUMBER.

Figure 53. Hydraulic Hose Connections (Continued)

# ST-45 — MANIFOLD PORT LOCATIONS

Figure 54 is provided to show the locations and names for the two manifold block ports on the ST-45 for reference when performing maintenance on the pump.

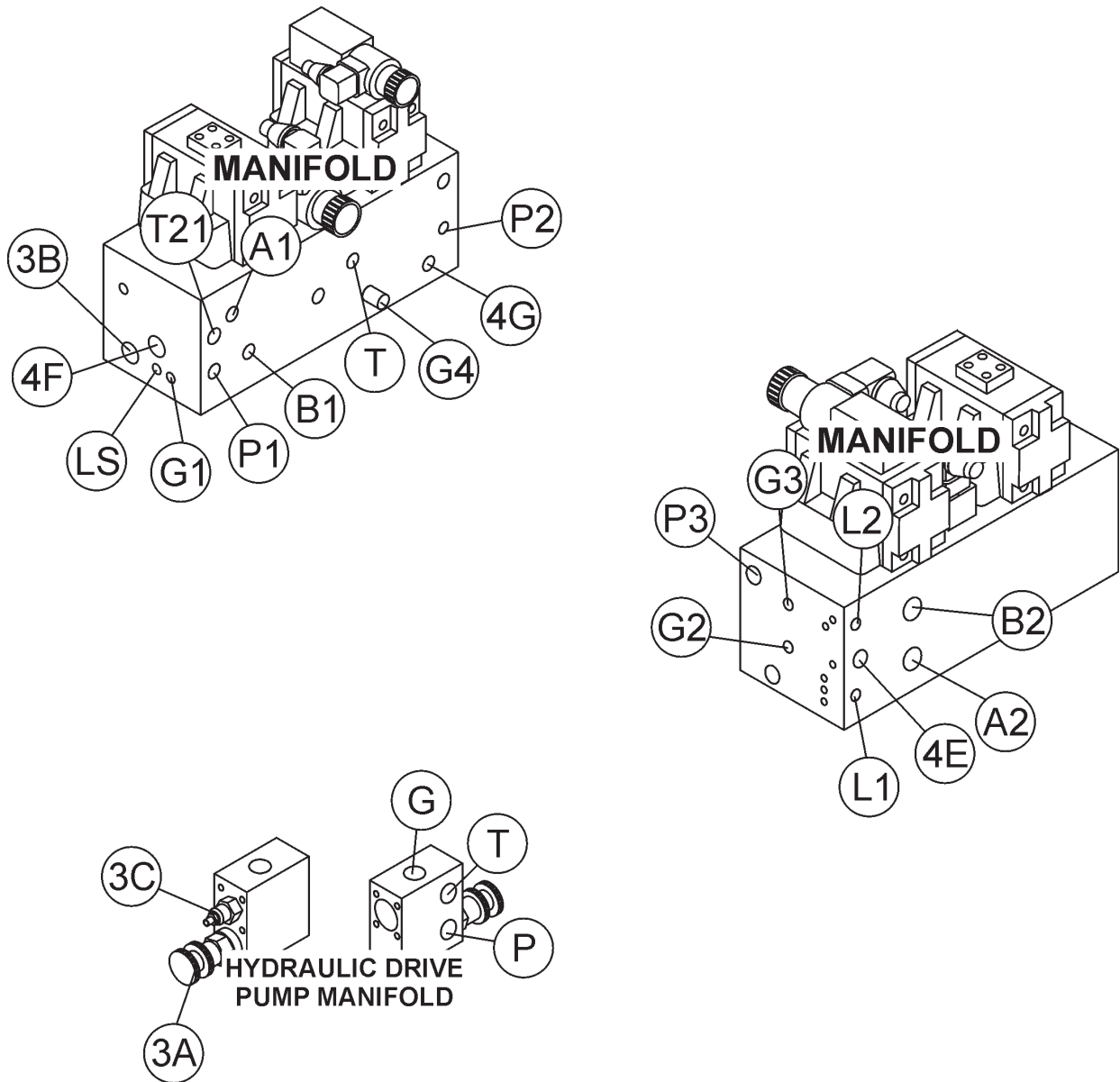


Figure 54. Manifold Ports

## APPENDIX — ST-45 PUMP CONCRETE MIX INFORMATION

The following information has been extracted from actual testing laboratory reports. The purpose of this printing is only to help create a better understanding of the importance of uniform gradation and proportioning of materials which affect pumpability of concrete mixes. These weights and proportions illustrate that when the sieve analysis is ideal, the sand/rock ratio can be adjusted (65% sand 35% rock) and pumpability should be excellent.

EXAMPLE #1 (A California Test Lab. Report)

JOB: Building Foundations (Water Project)

Sacks per cu./yd.	6.5 designed for 2,500 lbs. in 28 days
Gallons per sack	7.1
Washed Sand-#200 wash	1.3
Organic matter-OK	
Specific gravity (SSD)	Sand-2.58; Pea Gravel-2.60

### Sieve analysis-percent passing

Material	1.5"	1"	3/4"	3/8"	#4	#8	#16	#30	#50	#100	#200
W.C. Sand				100	99.7	79.1	60.4	36.5	14.3	4.0	1.1
Pea Gravel				100	3.0						
% Comb.				100	66	51	39	23	9	3	1.0

### DESIGN FOR ONE YARD OF CONCRETE (SATURATED & SURFACE DRY):

Absolute volume of aggregate in one cu. yard: 17.78 cu. ft.













Specific gravity of aggregates in one cu. yard: 2.58

Weight of aggregates in one cu. yard batch: 2850 lbs.

	<u>%</u>	<u>BATCH</u>	<u>SPEC. GRAVITY</u>	<u>ABS. VOL.</u>
W.C. Sand	65	1800	2.58	11.56
PEA GRAVEL	35	1000	2.60	6.22
WATER 46 gal.		1		
CEMENT 6.5 sk.		611		
TOTAL				27.00
ADMIXTURE:		None		
SLUMP		4"		
REMARKS		This mix designed for pumping		
NOTE:		Due to the availability of well-graded sand as shown in the above sieve analysis, this mix pumped very successfully.		

# APPENDIX — ST-45 PUMP CONCRETE MIX INFORMATION

## A.S.T.M. STANDARD SPECIFICATION FOR GRADING AGGREGATE

SCREEN TYPE	U.S.	METRIC	PERCENTAGE PASSING BY WEIGHT
<b>FINE AGGREGATE:</b> Referred to as washed concrete sand.			
3/8" 	3/8"	9.50 mm	100%
#4 	4,760 microns	4.76 mm	95 to 100%
#8 	2,380 microns	2.38 mm	80 to 100%
#16 	1,190 microns	1.19 mm	50 to 85%
#30 	590 microns	.59 mm	50 to 85 %
#50 	297 microns	297 μm	10 to 30%
#100 	149 microns	149 μm	2 to 10%
<b>3/8 (9.51 mm) PEA GRAVEL AGGREGATE:</b> Referred to as #4 Rock or Gravel or 1/2" minus (12.7 mm) size			
1/2" 	1/2"	12.70 mm	100%
3/8" 	3/8"	9.51 mm	85 to 100%
#4 	4,760 microns	4.76 mm	10 to 30%
#8 	2,380 micron	2.38 mm	0 to 10%
#16 	1,190 microns	1.19 mm	0 to 5%

# APPENDIX — ST-45 PUMP SLUMP TEST PROCEDURE

1. To obtain a representative sample (concrete), take several samples at three or more regular intervals throughout the discharge of the mixer or truck. **DO NOT** take samples at the beginning or end of the discharge.
2. Dampen the inside of the cone and place it on a smooth, moist, nonabsorbent, level surface large enough to accommodate both the slumped concrete and the slump cone. Stand on the “foot pieces” throughout the test procedure to hold the cone firmly in place.
3. Fill the cone 1/3 full by volume (Figure 41-A) and rod 25 times with a 1/2” dia x 24” lg. bullet-pointed steel rod. (This is a specific requirement which will produce non-standard results unless followed exactly.) Distribute rodding evenly over the entire cross section of the sample.
4. Fill cone another 1/3 (Figure 41-B) which will make the cone 2/3 full by volume. Rod this second layer 25 times with the rod penetrating into, but not through, the first layer. Distribute rodding evenly over the entire cross section of the layer.
5. Fill cone to overflowing (Figure 41-C). Rod this layer 25 times with rod penetrating into but not through, the second layer. Distribute rodding evenly over the entire cross section of this layer.
6. Remove the excess concrete (Figure 41-D) from the top of the cone, using the tamping rod as a screed.
7. Lift the cone vertically (Figure 41-E) with a slow even motion. **DO NOT** jar the concrete or tilt the cone during this process. ( Invert the withdrawn cone, and place it next to, but not touching the slumped concrete.
8. Lay a straight edge (Figure 41-F) across the top of the slumped cone. Measure the amount of slump in inches from the bottom of the straight edge to the top of the slumped concrete at a point over the original center of the base . The slump operation must be complete in a maxi

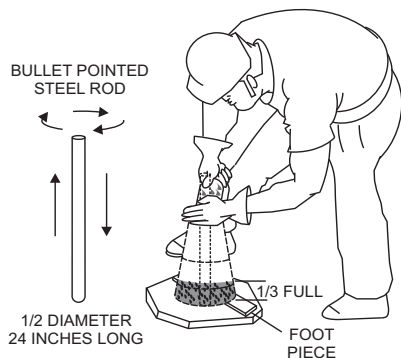


Figure 41-A. Slump Test (1/3 Full)

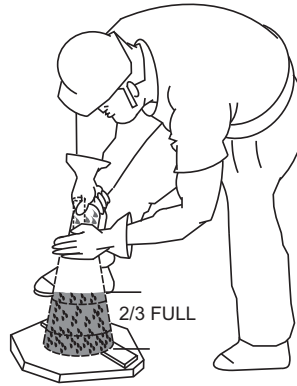


Figure 41-C. Slump Test (Full-Overflow)

Figure 41-B. Slump Test (2/3 Full)

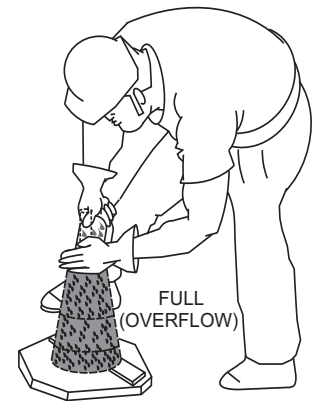


Figure 41-D. Slump Test (Removing Excess Concrete)

Figure 41-E. Slump Test (Cone Invert)

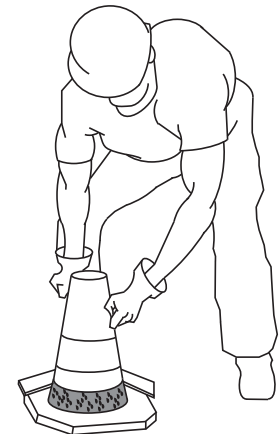


Figure 41-F. Slump Test (Measurement)

## ST-45 PUMP — TROUBLESHOOTING (ENGINE)

Practically all breakdowns can be prevented by proper handling and maintenance inspections, but in the event of a breakdown, please take a remedial action following the diagnosis based on the Engine Troubleshooting (Table 9) information shown below and on the proceeding page. If the problem cannot be remedied, please leave the unit just as it is and consult our company's business office or service plant.

TABLE 9. ENGINE TROUBLESHOOTING		
SYMPTOM	POSSIBLE PROBLEM	SOLUTION
Engine will not start or start is delayed, although engine can be turned over.	Speed control lever is in "STOP" position?	Set speed control lever to "START" position.
	No fuel reaching injection pump?	Add fuel. Check entire fuel system.
	Defective fuel pump?	Replace fuel pump.
	Fuel filter clogged?	Replace fuel filter and clean tank.
	Faulty fuel supply line?	Replace or repair fuel line.
	Compression too low?	Check piston, cylinder and valves. Adjust or repair per engine repair manual.
	Fuel injector not working correctly?	Repair or replace injector in accordance with engine repair manual.
	Oil pressure too low?	Check engine oil pressure.
	Low starting temperature limit exceeded	Comply with cold starting instructions and proper oil viscosity.
At low temperatures engine will not start.	Fuel separates has inadequate resistance to low temperatures?	Check whether clear (not turbid) fuel emerges from the fuel line (detach from injection pump). If the fuel is turbid or separated, warm up the engine or drain the complete fuel supply system. Refuel with winter grade diesel fuel.
	Engine oil too thick?	Refill engine crankcase with correct type of oil for winter environment.
Engine fires but stops soon as starter is switched off.	Throttle lever in STOP position?	Reposition throttle lever to RUN position.
	Fuel filter blocked?	Replace fuel filter.
	Fuel supply blocked?	Check the entire fuel system.
Engine stops by itself during normal operation.	Fuel tank empty?	Add fuel.
	Fuel filter blocked?	Replace fuel filter.
Low engine power, output and speed.	Fuel tank empty?	Replace fuel filter.
	Fuel filter clogged?	Replace fuel filter.
	Fuel tank venting is inadequate?	Ensure that tank is adequately vented.
	Speed control lever does not remain in selected position?	See engine manual for corrective action.
	Engine oil level too full?	Correct engine oil level?
Low engine power output and low speed, black exhaust smoke.	Air filter blocked?	Clean or replace air filter.
	Incorrect valve clearances?	Adjust valves per engine specification.
	Malfunction at injector?	See engine manual.

## ST-45 PUMP — TROUBLESHOOTING (HYDRAULIC SYSTEM)

Practically all breakdowns can be prevented by proper handling and maintenance inspections, but in the event of a breakdown, please take a remedial action following the diagnosis based on the Hydraulic System Troubleshooting (Table 10) information shown below and on the proceeding page. If the problem cannot be remedied, please leave the unit just as it is and consult our company's business office or service plant.

**TABLE 10. HYDRAULIC SYSTEM TROUBLESHOOTING**

SYMPTOM	POSSIBLE PROBLEM	SOLUTION
No hydraulic oil flow from axial piston pump.	Delta "Q" compensator not de-energized when pump is energized?	Check TB1 terminal #17. If this terminal is energized when the pump is turned on, the pump will not cycle because the compensator is dumping control pressure to the accumulator tank. Check K-3 relay and replace if necessary.
	Volume control not turned open?	Turn volume control valve counter-clockwise to open.
	Hydraulic oil level low?	Fill reservoir to proper level.
	Restricted suction screen?	Clean suction screen.
	Main pressure relief valve open	Remove cartridge. Clean and reset. Replace cartridge if necessary.
Drive cylinders will not cycle	Proximity switch is not sending a signal?	This emergency cycle switch, located in the control box, can be used to determine which switch is faulty. Determine malfunctioning proximity switch and replace.
	Pilot cycle valve malfunction?	Turn on pump switch. Check TB1 terminal #35 and #36 to determine if current is flowing to valve. Check detents in valve for proper operation.
	K-4 relay faulty?	Check the proximity switch enclosure.
	Main cycle valve(manifold) faulty?	Check spool or centering springs. Replace or repair as necessary.
Accumulator pressure drops to zero on every cycle	Low nitrogen charge in accumulator bladder?	Re-charge accumulator bladder with nitrogen to 1100 PSI.
Accumulator pressure is below 1750 PSI.	Unloading valve setting too low?	Adjust unloading valve until 1750 PSI is reached.
Accumulator pressure is not discharging when switch is turned off	Cartridge at port 4-D on manifold block is not working?	Check solenoid and cartridge. Replace if necessary

# ST-45 PUMP — TROUBLESHOOTING (ELECTRICAL SYSTEM)

Practically all breakdowns can be prevented by proper handling and maintenance inspections, but in the event of a breakdown, please take a remedial action following the diagnosis based on the Electrical System Troubleshooting (Table 11) information shown below and on the proceeding page. If the problem cannot be remedied, please leave the unit just as it is and consult our company's business office or service plant.

**TABLE 11. ELECTRICAL SYSTEM TROUBLESHOOTING**

SYMPTOM	POSSIBLE PROBLEM	SOLUTION
After completion of a pumping stroke, pumping pressure gauge indicates high pressure and cycle stops.	Proximity switch is not emitting a radio frequency?	If the hydraulic system is in a maximum pressure condition, pull the toggle on the emergency cycle switch (located inside the control box) towards you. If the pump cycles, replace the proximity switch at the lubrication box. If the pump cycles when you push the toggle down, replace the proximity switch on the towing end of the pump.
Emergency cycle switch does not cycle pump	Faulty K-4 relay?	Use a hot jumper wire. Connect (jumper wire) to terminals #35 and #36 on terminal block #1. When contact is made between these two terminals and the pump cycles. This would indicate that you have a faulty K-4 relay.
Starter switch is activated and pump does not start	Faulty fuses?	Check fuse box in control panel. Replace blown fuses.
		Check fuse link below engine solenoid, next to batter.
Hatz engine will not continue to run after key is released	D-1 diode has failed?	Check D1 diode in control box. Replace if needed with 6 amp diode P/N EGG5815 or equivalent.
Hatz engine will not start	No power to TB-5, conductor #3?	Check and replace K1 relay if necessary
	No power to magnet valve start/stop?	
Engine runs, but no current travels to circuits #32-47	Faulty K-2 relay?	Check and replace K-2 relay if necessary
When pump is turned on, engine RPM's will not increase	K-6 relay not completing the circuit?	Check and replace K-6 relay if necessary
	Open circuit at TB1-24?	
The pump will not reverse when operated by remote control	K-5 relay failure?	Check and replace K-5 relay if necessary
Engine oil pressure light will not de-activate	Oil pressure sending unit failure?	Check and replace sending unit if necessary
Battery charge light wont de-activate	Faulty D-2 diode?	Replace with diode 1U404-C
	Alternator not charging battery?	Check and repair/replace alternator unit.

## ST-45 PUMP — TROUBLESHOOTING (BRAKE SYSTEM)

Practically all breakdowns can be prevented by proper handling and maintenance inspections, but in the event of a breakdown, please take a remedial action following the diagnosis based on the Brake System Troubleshooting (Table 11) information shown below and on the proceeding page. If the problem cannot be remedied, please leave the unit just as it is and consult our company's business office or service plant.

**TABLE 12. BRAKE SYSTEM TROUBLESHOOTING**

SYMPTOM	POSSIBLE PROBLEM	SOLUTION
Brakes squeak, chatter or chuck.	Overheated wheel bearing?	Replace wheel bearing and pack with grease.
	Low brake fluid?	Fill and bleed brake system.
	Seized actuator master cylinder?	Replace/Rebuild master cylinder.
	Brake shoe noise?	Inspect drums. Adjust shoes or replace if necessary.
Brakes overheat, fail to operate, pull to the side, or function poorly	Leaking wheel cylinder?	Check and replace wheel cylinder and bleed brake system.
	Low brake fluid level?	Fill with dot approved brake fluid and bleed brake system.
	Brake actuator frame damage?	Replace complete actuator unit.
	Brake line being pinched?	Replace brake line.
	Seized actuator?	Replace or rebuild actuator.
	Broken return spring?	Replace spring.
	Brakes improperly adjusted?	Check adjustment.
	Break-away cable system partially activated?	Break-away cable might be pulled. Determine cause and correct. Pry up on cable until indicator bead touches or rests against cable spring stop. This will fully release the frame brakes and prevent drag.



# OPERATION MANUAL

## HERE'S HOW TO GET HELP

PLEASE HAVE THE MODEL AND SERIAL  
NUMBER ON-HAND WHEN CALLING

### UNITED STATES

#### *Multiquip Inc.*

(310) 537- 3700  
6141 Katella Avenue Suite 200  
Cypress, CA 90630  
E-MAIL: mq@multiquip.com  
WEBSITE: www.multiquip.com

### CANADA

#### *Multiquip*

(450) 625-2244  
4110 Industriel Boul.  
Laval, Quebec, Canada H7L 6V3  
E-MAIL: infocanada@multiquip.com

### UNITED KINGDOM

#### *Multiquip (UK) Limited Head Office*

0161 339 2223  
Unit 2, Northpoint Industrial Estate,  
Globe Lane,  
Dukinfield, Cheshire SK16 4UJ  
E-MAIL: sales@multiquip.co.uk

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This manual MUST accompany the equipment at all times. This manual is considered a permanent part of the equipment and should remain with the unit if resold.

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