

BENTOGROUT MIXER AND INJECTION PUMP OPERATING & MAINTENANCE MANUAL



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WARRANTY STATEMENT

CETCO warrants that equipment shall be free from defects in material, workmanship or components.

The period of this warranty shall be limited to 90 days from the date of purchase and the extent of CETCO's liability shall be limited to replacement of components that have been proven faulty. No claims in excess of component replacement value will be recognized.

Specifically excluded from this warranty is normal wear resulting from the mixing and pumping of abrasive slurries or damage to the equipment as a result of improper use.

SAFETY

Various guards, shields, grates and screens are provided over moving parts such as: sheaves, couplings, augers, paddles, belts, etc. to guard against injury to operators while the equipment is in operation.

Warning stickers are provided to remind operators of the potential hazards.

Operators are advised to utilize appropriate personal safety equipment including, but not limited to, safety glasses or goggles, dust masks or respirators, gloves and/or rain gear and hard hats when operating this equipment

LIABILITY

It is understood and agreed that CETCO is relieved of any and all liability that may arise from personal injury or damage to property as a direct or proximate result of the removal of protective guards, shields, etc., the ignoring of warning signs and the lack of common sense procedures.

SAFETY DATA

PLEASE READ AND HEED THE FOLLOWING IMPORTANT SAFETY NOTICES BEFORE PLACING MACHINE IN SERVICE.

*** * * * NOTICE * * * ***

PROPER PERSONAL PROTECTIVE EQUIPMENT, INCLUDING, BUT NOT LIMITED TO: GOGGLES, DUST MASKS OR RESPIRATORS, GLOVES, HARD HAT, BOOTS AND RAINGEAR MUST BE WORN WHEN OPERATING THIS EQUIPMENT.

*** * * * NOTICE * * * ***

FOLLOW MATERIAL MANUFACTURER'S INSTRUCTIONS FOR PROPER MATERIAL USE AND RECOMMENDATIONS FOR SAFETY EQUIPMENT AND PROCEDURES.

*** * * * WARNING * * * ***

NEVER PUT HANDS OR TOOLS IN MIXERS OR PUMP UNLESS PRIMARY POWER SOURCE IS SHUT OFF AND DISCONNECTED AND KINETIC ENERGY DISSIPATED. ON ELECTRICALLY POWERED EQUIPMENT, USE PROPER LOCK OUT/TAG OUT PROCEDURES. FAILURE TO OBSERVE THIS WARNING COULD RESULT IN SERIOUS PERSONAL INJURY AND/OR DAMAGE TO THE MACHINE.

*** * * * WARNING * * * ***

NEVER ATTEMPT TO DISCONNECT OR OPEN THE COUPLING ON ANY PART OF THE PUMP DISCHARGE SYSTEM WHILE PUMP IS IN OPERATION, OR IF THE DISCHARGE SYSTEM IS UNDER PRESSURE FOR ANY REASON.

*** * * * WARNING * * * ***

NEVER OPERATE MACHINE WITHOUT THE VARIOUS GUARDS, SHIELDS AND OTHER SAFETY EQUIPMENT WITH WHICH THE MACHINE WAS ORIGINALLY EQUIPPED IN PLACE AND FUNCTIONAL.

*** * * * WARNING * * * ***

ALL ELECTRICAL CONNECTIONS MUST BE MADE BY A QUALIFIED ELECTRICIAN.

*** * * * WARNING * * * ***

HYDRAULIC COMPONENTS, INCLUDING, BUT NOT LIMITED TO VALVES, FITTINGS, HOSES, MOTORS, RESERVOIR AND FILTERS MAY BE HOT. TO PREVENT INJURY, TOUCH ONLY THE HANDLES PROVIDED. LET THE HYDRAULIC COMPONENTS COOL BEFORE SERVICING THE EQUIPMENT.

SECTION 1

GENERAL DESCRIPTIONS

BENTOGROUT MIXER

The CETCO BENTOGROUT MIXER is an electrically powered vertical shaft paddle mixer capable of mixing both slurries and sanded Portland cement based grouts, including pre-blended proprietary materials.

Although the loading height has been kept as low as possible to minimize operator fatigue, the generously sized mixer will efficiently mix up to 2 cubic feet of material and while still retaining sufficient bottom clearance to discharge into a pump hopper.

The BENTOGROUT MIXER has been configured to run on a 110 VAC, 60 Hz, 15 Amp circuit, which is standard residential current. Care should be exercised to prevent overloading the mixer as doing so will cause the motor protection device in the starter to open. Wheels have been provided to make moving the mixer from location to location relatively easy.

Simplicity of operation and maintenance were primary design considerations; thus, the unit will deliver years of dependable service with a minimum of normal maintenance.

BENTOGROUT INJECTION PUMP

The CETCO BENTOGROUT INJECTION PUMP is a portable electrically powered open throat style cementitious grout pump, specifically designed for the application of CETCO's BENTOGROUT.

A compact assembly with integral wheelbarrow style handles and wheels, the BENTOGROUT INJECTION PUMP is easily transported, and is small enough to permit access through narrow doorways in industrial plants, residences, offices and commercial buildings where the machine is intended for use.

In recognition that industrial type electric service is not always available at locations in which this unit is intended for service, the pump has been crafted to operate efficiently at 110 VAC, 60 Hz, 15 Amp electrical service (standard residential electric service).

The 2C3 progressive cavity type pump is constructed upon a C4 frame, and will deliver mixed, fluid materials to the placement site at a rate of up to 2.5 gallons per minute, depending upon the viscosity of the product. The pump develops sufficient pressure to pump most materials for horizontal distances of up to 50 feet.

SECTION 2 OPERATING INSTRUCTIONS

BENTOGROUT MIXER

The BENTOGROUT MIXER is extremely easy to operate, requiring only that the unit be placed in a convenient position and properly connected to a 110 Volt (AC), single phase electric power source. (Additional information regarding connection specifics is given elsewhere in this manual.)

Once the mixer is properly located and connected to power, the operator need only start the unit by turning the knob or depressing the button on the control box marked "START" and begin adding the specified quantity of materials as required by his application.

In paddle type mixers, the fluid portion of the material is always batched first, followed by the solid materials, added carefully so as not to overstress the mixer.

When materials have been completely mixed, the batch is discharged by opening the discharge valve located on the front of the mixing tank near the bottom. When the tank is thus emptied, the valve may be closed, and the tank is then ready for the next batch of material.

At the end of each production shift, the mixer should be thoroughly washed with clean, fresh water, making sure that no residual materials are left either on the paddles or any portion of the mixing tank to harden and possibly clog the pump during subsequent operations. Be especially careful to wash under the mixer baffles. At this time, the discharge valve should be lubricated with a heavy grease to prevent sticking and the gearbox oil level should be checked and replenished, if necessary.

BENTOGROUT INJECTION PUMP

*** * * * WARNING * * * ***

NEVER PUT HANDS OR TOOLS IN MIXERS OR PUMP UNLESS PRIMARY POWER SOURCE IS SHUT OFF AND DISCONNECTED. FAILURE TO OBSERVE THIS WARNING COULD RESULT IN SERIOUS PERSONAL INJURY AND/OR DAMAGE TO THE MACHINE. NEVER RUN PUMP WITHOUT FLUID AS IT WILL CAUSE SEVERE DAMAGE TO STATOR AND ROTOR.

SET-UP

In general, the most important factors in setting up are proximity to the work and access to materials and water supply; consideration should be given to the disposal of waste materials and wash-out residue.

It is always best to keep grout lines as short as possible to reduce pumping distances. This is particularly important when pumping hard-to-pump materials, such as sanded grouts and pre-blended materials.



The source of solid materials (i.e. Bentogrout) should be readily accessible and an adequate supply of water should be available for mixing and clean-up.

START-UP

After set up, visually inspect that there are no foreign objects or old set up materials in either the pump or the mixer(s), then make all necessary connections.

With operating levers, valves, handles or switches in either "NEUTRAL" or "OFF" position and the primary power source turned OFF, fill the pump hopper with clear water.

Turn on the primary power source and observe that conditions are normal and machine is ready to run.

Check each mixer for proper operation by running the mixer in both forward and reverse directions, if unit is so constructed as to allow reverse direction.

Next, start the delivery pump to discharge the water that was previously introduced into the pump hopper. This is an ideal opportunity to check the grouting system to determine that all lines and hoses are clear and unobstructed. Pump condition may also be checked at this time by testing discharge pressure.

When it is determined that all systems are normal, shut off the pump and drain the water from the pump and all lines.

PRODUCTION

During the production phase of the work, monitor pump and mixer performance continuously, being alert to any signs of abnormality.

Keep mixers free of material build-up, keep the outside of the machine clean, and keep pump packing lubricated and just tight enough to prevent leakage. (Section 4)

CLEAN-UP

After disposing of excess production material, carefully wash out mixer tanks, paddles and baffles into the pump hopper and pump the resulting washout material through the grout hoses to a suitable disposal site. Continue this operation until only clear water is discharged.

It is advisable to drain all residual wash water from the pump and all hoses when washout is complete.

SECTION 3 MIXING AND PUMPING PROCEDURES

BENTOGROUT MIXING PROCEDURE

1. Add water into mixer. Utilize 14 gallons of water per 50 lb. bag of BentogROUT used.
2. Activate paddle mixer.
3. Add BentogROUT into mixer. The bag can be pre-opened and then poured in, or this can be done by using the points on top of the mixer safety grate. Drop a whole bag oriented so that the length of the bag goes across the forks, this cuts the bag open. Wiggle the ends of the bag to widen the holes and allow for grout to pour into the mixer, and continue until the contents of the bag are completely within the mixer.



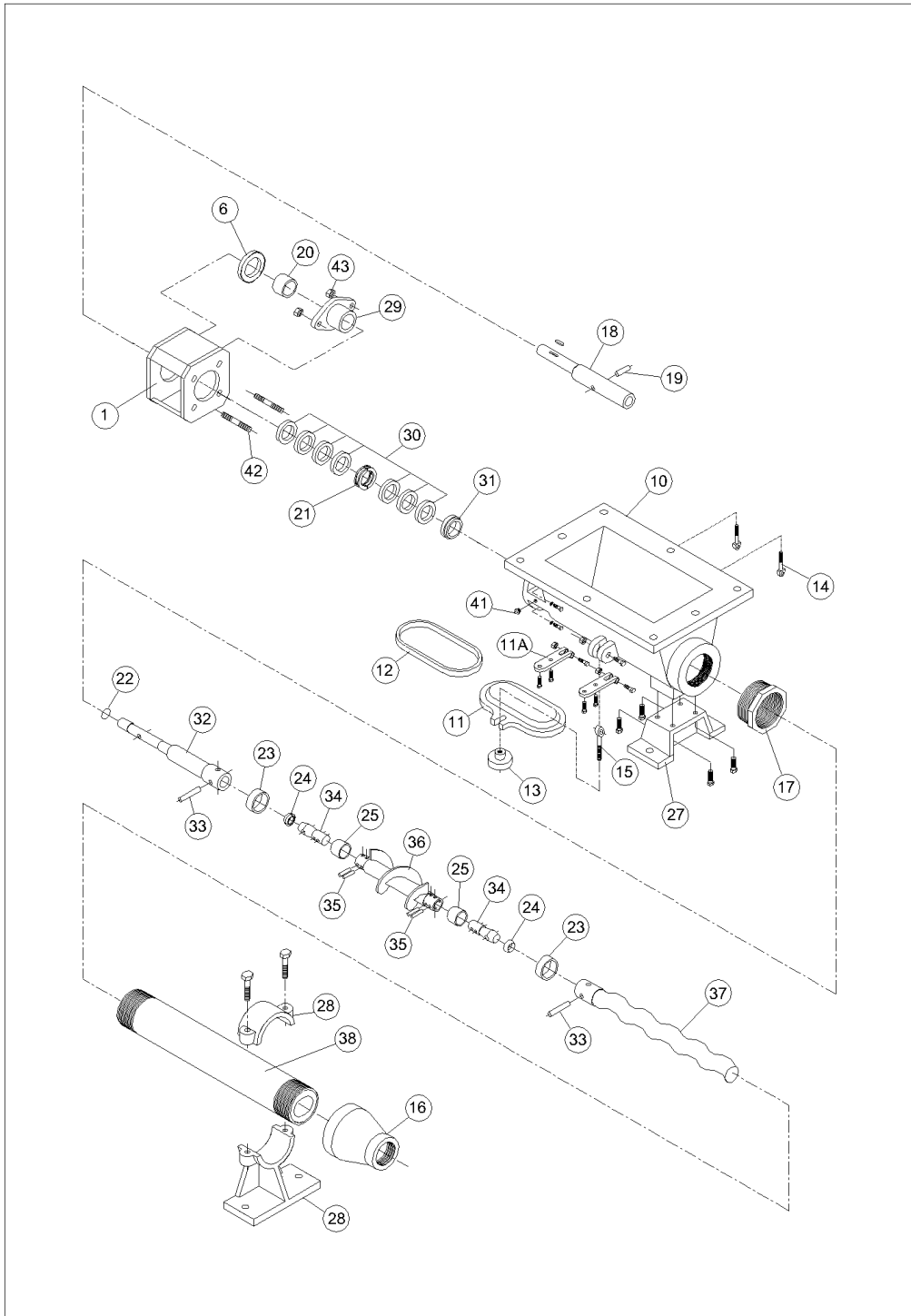
Utilizing the forks on the covering grate to open BentogROUT bag.

4. Allow to mix continuously for approximately 8 minutes for mixture to achieve a creamy appearance for pumping. See Figures below.



Left: Chunky, undesirable consistency for pumping. Right: Creamy consistency desirable for BentogROUT Injection Pumping.

BENTOGROUT INJECTION PUMP PROCEDURES



Exploded view of BentogROUT Injection Pump

START-UP

1. The suction housing should be filled with liquid prior to starting to lubricate the rotor and stator until flow is established.
2. Start Pump.
3. If excessive leakage is present after 15 minutes of operation, tighten the gland nuts 1/6 of a turn. Tighten the gland nuts 1/6 of a turn after an additional 15 minutes if necessary, and repeat until desired leakage of 1-2 drops per minute is obtained. Do not tighten until zero leakage is obtained.

DISASSEMBLY

A. Before you begin...

1. Operate pump (preferably with clean water) to ensure rotor and stator are lubricated.
2. Shut off pump.
3. Disconnect power source.
4. Drain any fluid in suction housing.

B. When removing stator...

1. Complete Section A.
2. Remove discharge hose attached to discharge reducer (16).
3. Remove discharge reducer (16) by unthreading from stator (38).
4. Remove top half of stator support (28).
5. Secure conveyor tube (36) to prevent it from turning, unthread stator (38) from suction housing (10) and pull stator (38) off rotor (37).
6. Check rotor (37) and stator (38) for wear (See STATOR AND ROTOR WEAR Section for instructions).

C. When removing rotor, drive train and/or intermediate drive shaft...

1. Complete Sections A and B.
2. Slide drive shaft pin retainer (20) toward stuffing box to expose pin (19). Using a punch, drive out pin (19).
3. Loosen packing gland nuts and pull entire rotor, conveyor assembly and intermediate drive shaft assembly from pump.
4. If space is not allotted for the above, pull assembly free from suction housing (10) far enough so that the rotor pin (33) can be removed, disconnecting the rotor (37) from the conveyor assembly (36).

D. When disassembling rotor, conveyor assembly and/or intermediate drive shaft...

1. Complete Section A, B and C.
2. Slide pin retainers (23) toward the conveyor assembly (36) to expose rotor pins (33). Using a punch, drive out pins (33), and separate rotor, intermediate drive shaft and conveyor assembly.
3. Remove "O" ring (22) from intermediate drive shaft (32) and one connecting rod washer (24) from each end of conveyor assembly.
4. Slide pin retainers (25) from each end of conveyor assembly. Using a punch, drive out connecting rod pins (35) and remove connecting rod ends (34) from conveyor tube (36).

E. When removing packing....

1. Stop pump.
2. Complete Section A.
3. Remove gland adjustment nuts and packing gland (29) from stuffing box.
4. Remove packing rings (30). This is best done by using flexible packing extractors. Use two extractors simultaneously on opposite sides of each ring. Pull evenly.
5. Remove lantern rings (21) in similar fashion. Twist split ring to remove from shaft. Remove remaining packing.

ASSEMBLY

The pump is reassembled in reverse order of dismantling. The following suggestions are offered:

Note: While pump is dismantled, check all gaskets, "O" rings and packing. Replace all worn items. Connecting rod washers (24) should be replaced each time conveyor assembly is disconnected from the rotor or intermediate drive shaft.

A. Packing assembly...

1. Insert packing rings (30) and lantern ring halves (21) into stuffing box and around the drive shaft (18), using quantities and positioning as shown in packing diagram for your specific size pump.
2. Insure that the packing rings are installed with splits staggered at 90 degree intervals and that the flat side of the lantern ring halves face the packing.
3. All but the last packing ring may fit into the stuffing box. As the pump operates, the packing will compress and the last ring can be added.

B. Assembly of rotor (37), conveyor tube (36) and/or intermediate drive shaft...

1. Insert connecting rod ends (34) into ends of conveyor tube (36), aligning retaining pin holes and inserting lightly lubricated pins (35).
1. Note: Two sets of holes are provided in ends of the conveyor tube (36). Should one set of holes become elongated by wear, rotate the rod ends (34) to align with the unused holes.

2. Slide pin retainers (25) into place on each end of the conveyor tube (36).
3. Seat on connecting rod washers (24) on each end of the conveyor assembly.
4. Slip pin retainer (23) over end of conveyor assembly and insert that end of the conveyor assembly into intermediate shaft (32). Align pin holes and install lightly lubricated pin (33). Slide pin retainer (23) into place on intermediate shaft to secure the connecting pin.
5. If space is available to install all rotating parts as one unit, install the rotor (37) on the opposite end of conveyor assembly in the same manner as the intermediate shaft.

C. Installation of intermediate drive shaft (32), conveyor assembly (36), and rotor (37)...

1. Lightly lubricate "O" ring (22) and seat on the intermediate drive shaft (32), next to the shoulder that will butt against end of drive shaft (18).
2. Space permitting, the complete rotating assembly can be installed as a unit, inserting the intermediate drive shaft end, through the suction housing (10) and seating in the drive shaft (18). Proceed to step 4, below.
3. Limited space that will not allow step 2, above, requires that the assembled intermediate drive shaft (18) and conveyor assembly (36) be partially inserted in the suction housing (10) and then install the rotor (37) to the conveyor assembly as instructed in Section B, above. Extreme limited space installations, may require that the stator be installed on the rotor before installing rotor on the conveyor assembly.
4. Align holes through drive shaft (18) and intermediate drive shaft (32). Install pin (19) and slide pin retainer (20) over pin holes.

D. Installation of stator (38)...

1. Coat rotor (37) and interior of stator (38) with a generous amount of waterless hand cleaner, baby oil or other lubricant compatible with rubber. Grease or motor oil is not recommended.
2. Thread stator (38) onto rotor (37) and into suction housing (10).
3. Install top half of stator support (28).
4. Thread discharge reducer (16) on end of stator. Install all discharge hoses removed at disassembly.

SECTION 4

BENTOGROUT INJECTION PUMP MAINTENANCE

The pump has been designed for a minimum of maintenance, the extent of which is routine lubrication of the bearings. The pump is one of the easiest to work on in that the main elements are very accessible and require few tools to disassemble.

PACKING

The packing is lubricated through a grease fitting in the stuffing box. Packing gland adjusting nuts should be evenly adjusted so they are little more than finger tight. Over-tightening of the packing gland may result in premature packing failure and possible damage to the shaft and gland. When the packing is new, frequent minor adjustments are recommended for the first few hours of operation in order to compress and seat the packing. Greasing the packing often but with limited quantities of grease is the best practice. This can be done through a grease fitting which leads to a lantern ring in the mid-section of the packing. Do not use a one-piece spiral wrap of packing.

ROTOR WEAR

The rotor should be replaced if:

- The rotor pin hole is excessively worn.
- The rotor surface is cracked, pitted, deeply grooved (1/32" or more), corroded or if the finish has been worn off.

STATOR WEAR

If the stator is worn and in need of replacement, its surface may be worn. Test wear by noting how easily the rotor can be removed. If the rotor slips out too easily the stator should be replaced.

RECOMMENDED SPARE PARTS

The pump has been designed and built with all wearable parts replaceable. A recommended inventory of spare parts is dependent upon the application and importance of continued operation.

For the shortest possible downtime, we recommend the following parts to be stocked:

- 1 - Rotor
- 1 - Stator

The above is only a suggested list. For further assistance in determining what you'll need for your application contact your local CETCO representative.

SHORT TERM STORAGE

Storage of six months or less will not damage the Open Throat type pump. However, to ensure the best possible protection, the following is advised:

- Store unit inside whenever possible or cover with some type of protective covering. Do not allow moisture to collect around pump.
- Remove drain plug and both inspection plates allowing the suction housing to drain and dry completely. Replace inspection plates.
- Loosen the packing gland and inject a liberal amount of grease into the stuffing box. Tighten the gland nut only hand tight. When water flush systems are to be used, do not use grease. A small amount of light oil is recommended.

SEAL & LUBRICATION

The standard and most common sealing used on Open Throat type pumps is graphite impregnated packing with a lantern ring. Tapped holes on the side ribs of the suction housing provide access to the lantern ring for grease lubrication. Lubrication of the packing is essential.

When new packing is placed on the drive shaft, often all but one ring will fit until pump operation compacts them. In such cases, a single packing ring is included in a small bag attached to the packing gland nut.

After the pump has run and the packing has compressed, the final packing ring can be added.

TROUBLESHOOTING CHART

SYMPTOMS:	POSSIBLE CAUSE OF TROUBLE [NUMBERS DEFINED BELOW]
Pump fails to discharge	1, 2, 3, 4, 5, 6, 13
Pump is noisy	4, 7, 8, 14, 15
Pump wears rapidly	8, 9, 10, 18
Pump not up to capacity	3, 4, 6, 13, 16
Pump starts, then loses suction	1, 2, 4, 7
Pump takes excessive power	11, 12, 14, 17
<p>Suction Troubles:</p> <ol style="list-style-type: none"> 1. Not properly primed 2. Suction not submerged 3. Suction lift too high 4. Air leaks in suction 	
<p>System Problems:</p> <ol style="list-style-type: none"> 5. Wrong direction of rotation 6. Low speed 7. Insufficient liquid supply 8. Excessive pressure 9. Grit or dirt in liquid 10. Pump runs dry 11. Viscosity higher than specified 12. Obstruction in discharge line 	
<p>Mechanical Troubles:</p> <ol style="list-style-type: none"> 13. Pump worn 14. Bent drive shaft 15. Coupling out of balance or alignment 16. Air leak at packing 17. Packing too tight 18. Corrosion 	

SECTION 5

SPECIAL INSTRUCTIONS

SPECIAL INSTRUCTIONS FOR ELECTRICALLY POWERED EQUIPMENT

Some models of CETCO equipment are electrically powered, either direct drive through belts and sheaves or gearboxes, or electric primary power with hydraulic final drives; in either case, all of the normal precautions when using any electrically powered equipment apply.

The purpose of this instruction is to alert the user to some of the more common problems that can occur when using this type of equipment; it is not intended, and is not to be construed as a complete document regarding electrical safety. It is recommended that all electrical connections and installations be accomplished by a qualified electrician with knowledge of local electrical codes.

All CETCO electrical equipment is factory wired with integral grounding conductors; these must be intact and operational to insure safe operation.

SETUP CHECK LIST

1. Check power source to insure compatibility with the equipment. Domestic equipment may be 110 volts AC single phase, 230 volts AC single phase, 230 volts AC three phase or 460 volts AC, three phase. Export models will be constructed to comply with destination power source.
2. Be sure that grounding conductors are attached to a proper external ground source. For added safety when the machine is being used outdoors, a ground rod may be driven with a conductor to the machine frame.
3. After setup, always check motors for proper rotation. Reverse rotation of hydraulically driven equipment can damage hydraulic pumps. If no hydraulic pressure appears immediately after starting the drive motor, shut the unit down and reverse rotation by appropriate means.

OPERATION

1. Although totally enclosed motors are installed on the equipment, care should be exercised to avoid splashing electrical components with water or grout materials.
2. If overload relays disengage frequently, check for proper voltage to the motor; long extension cords will cause voltage drop which results in a motor overload. In some cases, pumping difficult materials over long distances will also produce an overload condition.