2021

Installation and Operations Manual: ELS Pumps

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(Click on hyperlinks below)

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INTRODUCTION

This manual provides important information for installing and operating your Peerless vertical turbine pump. As you store, handle, and work with the various components, please keep in mind that the pipes, shafts, enclosing tubes, bearings, bowl unit parts, etc. are all precision-machined items and should be handled as such. The straightness of shafts, the squareness and flatness of flange faces, the roundness and concentricity of register (rabbet) fits are all crucial to the proper assembly and trouble-free operation of the pump.

Take care to follow the detailed instructions in this manual.

Proper installation, operation, and maintenance of this pump will contribute to maximum operating efficiency and long trouble-free life. Read the following instructions carefully, with frequent reference to the assembly drawing, before starting the installation. Then re-read each section as the work progresses.

Keep this manual available at the job site for handy reference for operation, service and maintenance.

IMPORTANT SAFETY PRECAUTIONS

Pump parts, tools, and rigging equipment used in installing pumps are heavy and may easily cause personal injury if dropped or carelessly handled. The normal precautions and safety rules associated with the erection of heavy machinery, use of power equipment, manual lifting, and handling of tools must be observed in the installation of this pump.

Do not work under a heavy suspended object unless there is a positive support under it to stop its fall in event of sling or hoist failure. Disregard of this warning could result in grave personal injury.

Before opening the conduit box of an electric motor, be certain that the current to the motor is shut off and the breakers are locked out. An electrical shock from contact with live motor leads can be fatal.

The motor canopy (cover) must be in place when the pump is in operation. If exposed, rotating parts below this cover could cause grave personal injury.

Petroleum-based cleaning solvents are flammable. Smoking by personnel in the vicinity of these solvents is extremely hazardous and must not be permitted. Also, in many areas, the use of these contaminating and hazardous solvents is illegal. Consult the local

EPA/Air Quality officials for instructions.

The pumps described in this manual should not be installed in any manner except as specified herein, and must not be operated at speeds, capacities, pressures, or temperatures other than those specified on the order.

These pumps must not be used to pump any fluid other than those specified for the order.

Lubricants which can contaminate the water to be pumped or which are soluble in water must not be used in these pumps.

Violation of these warnings will void the manufacturer's warranty and may result in serious property damage or grave personal injury.

WARNING: DO NOT WORK UNDER OVERHANGING EQUIPMENT.

MATERIALS AND EQUIPMENT REQUIRED

The materials and equipment necessary for installation will vary with the size of the pump and the type of the installation. The following list is offered as a guide only.

1. Bulk Material

- Pipe thread compound (sealant)
- Lubricating oil
- Grease (see Table 3a on page 32).
- Turbine oil (see Table 3b on page 33).
- Lubricant (see Recommended Lubricants on page 32)
- Petroleum-based solvent (if permissible by local EPA codes)
- Non-shrinking grouting material
- Anti-seize or anti-galling compound (for shaft and bolt threads)

2. Rigging Material

- Mobile power hoist or traveling crane
- Box clamps (2 pairs) - for flanged columns
- Slings - wire and nylon; appropriate for equipment being lifted
- Eyebolts
- Clevises (shackles) - for use with eye-bolts
- Lumber - sized to support pump shaft sections to maintain straightness and protect threads
- Support beams - size, length and quantity required to use with elevator or box clamps and support the weight of the assembled pump less the driver

3. Hand Tools

- Pipe wrench (minimum of 2) - sizes appropriate to equipment
- Chain tongs (minimum of 2) - sizes appropriate to equipment
- Pipe cutter or hacksaw
- Clean rags
- Feeler gauges
- Set of mechanic's hand tools, including: files, scrapers, wire brush, pliers, wire cutters, pocket knife, wrenches
- Dial indicator and mounting base
- Machinist's level (carpenter's level not sufficiently accurate)

CHECKING THE WELL OR SUMP

Before any attempt is made to install the pump, the well or sump should be carefully checked to determine that the casing is of the proper diameter, depth, and straightness.

A suggested method of doing this is to lower into the well a pipe that is the same diameter as the bowl unit of the intended pump and 1½ times the length of the bowl unit.

If this test pipe can be lowered into the required depth, it may be assumed that the sump is suitable for the pump.

Do not install the pump in a well into which the test pipe cannot be lowered to the required depth.

DEVELOPING THE WELL

Developing the well and freeing it from sand is part of the well driller's job, and should be done with a test pump reserved for this service. These instructions are provided as a guideline only.

If a test pump is not available and there is no alternative except to use the new pump, raise the impellers at least 3/16 inch above their normal running position. (See Impeller Clearances on pps. 35-39). Once started, the pump must not be stopped until the water is free of sand.

Despite these precautions, the pump may still be damaged by water-borne abrasives.

If, for any reason, the pump is stopped while pumping water containing sand, the pump may become "sand-locked". Sand-locking is the condition that occurs when the clearances between the impellers and bowls are packed with sand, which settles in the bowl unit after the pump stops rotating and the water drains back into the well.

If a sand-locked pump is restarted, severe damage may result.

If a pump is accidentally stopped while pumping sandy water, sand-locking may be overcome by the following procedure:

1. As soon as the pump shaft stops rotating, raise the impellers to their top position.
2. Alternately raise and lower the impeller a small amount to loosen the trapped sand.
3. Rotate the shaft alternately clockwise and counterclockwise by applying a wrench to the drive coupling. This too has the effect of loosening the sand, permitting it to fall back into the well.
4. If a separate water supply is available, flush the pump with clear water.

If all attempts to free the impellers fail, it will be necessary to pull the pump. The obstruction can then be cleared by back-flushing, or, if necessary, by disassembling the bowl unit.

BUILDING THE FOUNDATION

It is strongly recommended that a substantial concrete foundation be built around the well or sump before the pump is installed. The original pump shaft alignment will last only as long as the foundation supports the pump in a stable position.

For well installation only:

If the pump discharge head has a protrusion below the base that is wider than the well casing, the top of the casing must be far enough below the foundation surface to clear such a protrusion. In this case, a dam must be provided around the well casing to retain the grout that will later be poured between the discharge head and the foundation. If the well casing is wider than any protrusion of the discharge head below the base, the casing itself can be used as a dam for the grout.

The thickness of the foundation must be adequate for inherent stiffness, and the ground area sufficient to provide a stable footing. Minimum thickness and ground area are determined by two factors:

1. The firmness of the supporting earth, considering adverse effects of rain and flooding.
2. The total weight of the complete pumping unit when full of water. **Total load on foundation = Weight of all parts + Weight of water in column.** Table 1, below, may be used for reference in figuring the size of the foundation. See the construction drawing for weights of all pump components.

Table 1. Approximate Weight of Water-Filled Pump Column (lbs.)

Nom. Pipe Size	Schedule (Wall Thickness)	Wt. per Ft. of Pipe	Wt. of Water per Ft. of Pipe	Total Wt. per Ft.*
3	40	7.58	3.0	10.6
4	40	10.79	5.0	15.8
5	40	14.62	8.0	22.6
6	40	18.97	12.0	31.0
8	30	24.70	20.0	44.7
10	(.279)	34.24	23.0	57.2
12	30	43.77	48.0	91.8
14	30	54.57	57.0	111.6
16	30	62.58	76.0	138.6
18	(.375)	82.06	97.0	179.1
20	20	104.13	120.0	224.1
24	20	125.49	177.0	302.5

* Multiply the appropriate figure by the total length of the column, and add the weight of the shafting, discharge head and the driver to obtain the total load on the foundation.

Note: Also refer to Table 2 on page 25 for weight of enclosing tube to add into the equation.

The pump must be installed on a foundation rigid enough to support the entire weight of the pump plus the weight of the fluid contained in it. Weight data for the pump is given in the assembly drawing. Weak foundations or foundations spread on unstable ground can cause misalignment, vibration, and even total foundation failure. Foundation bolts must be provided to firmly anchor the pump to its foundation.

Dimensions for the location and size of the foundation bolts may be obtained from the assembly drawing.

It is recommended that a template be made for accurately locating the foundation bolts. See the construction drawing for the correct placement of the anchor bolts.

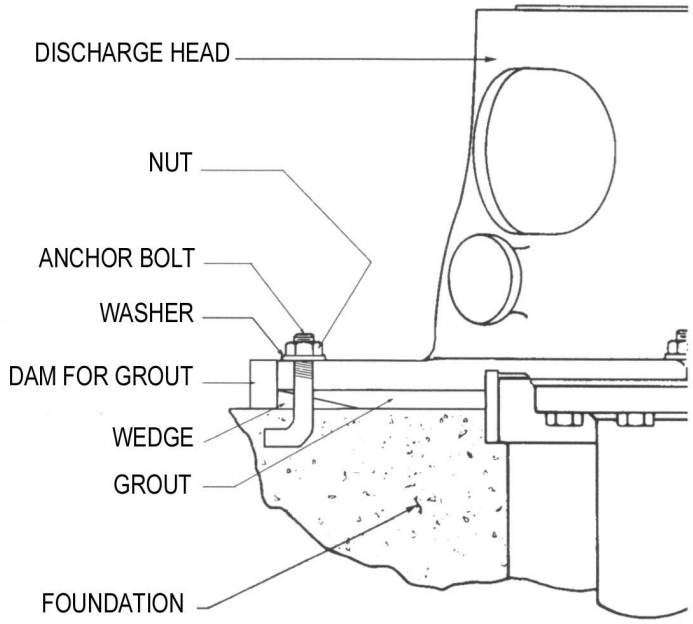


Figure 1a. Typical foundation detail (no sole plate).

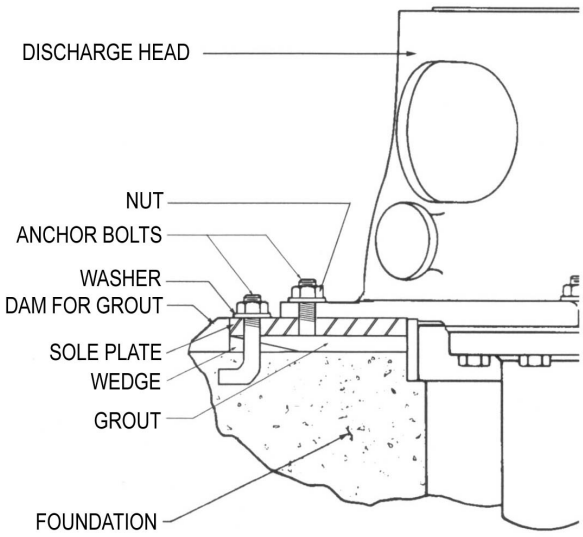


Figure 1b. Typical foundation detail (with sole plate).

A barrier or frame to retain the grout which will be later poured between the pump base and the foundation must be provided around the hole for the pump column.

Some pumps are provided with a sole plate that fits between the discharge head and the foundation. In this case, the foundation bolts must align with the holes in the sole plate rather than those in the discharge head. The sole plate is normally installed with the pump, but you may choose to install it beforehand.

Whether the sole plate is installed prior to the pump installation or at the same time, the discharge head must be attached to the sole plate. Inspect the bottom of the discharge head to verify that it has been machined over its entire surface and that it is clean and free of burrs and nicks. The machined surface of the sole plate is installed against the machined surface of the discharge head.

Failure to have each component's surface machined will result in excessive vibration.

Follow the instructions on page 23 for leveling and page 24 for grouting. After the grout is cured (a minimum of 48 hours), the discharge head may be removed to start the pump installation. Peerless Pump does not recommend installation of the sole plate without the discharge head; however, if there is no choice except to install the sole plate alone, use the machined surface at the top of the sole plate (the discharge mounting surface) for leveling. Due to manufacturing tolerances, the levelness of the assembled pump may vary from that of the sole plate.

Be sure to position the foundation and locate the foundation bolts so that the discharge head will be in accurate alignment with the discharge piping.

UNLOADING THE PARTS

For a relatively short pump, it may be convenient to install the column and shaft sections directly from the transporting vehicle. This might be true, for example, of a pump whose overall length is 25 feet or less.

For pumps that will be installed in a vertical position, all the parts should be located close to the location where the pump will be installed. Clear a large area around the well or sump as a working space for laying out the pump parts to prepare them for installation. Arrange timbers parallel on the ground in the cleared area to support the pump column and shafts.

Prior to installation, take inventory of the shipment to insure that the parts received match the list of parts on your order. If the shaft sections were shipped crated, one end of the crate may be opened for a count. Leave the rest of the crate intact to protect the shaft sections during unloading.

It is strongly recommended that the pump parts that are too heavy to be lifted by hand be lifted from the transporting vehicle with a suitable hoist. If this is impossible, they may be unloaded by slowly and **CAREFULLY** skidding them down an incline. Lifting chains or cables must not be allowed to contact machined surfaces. If the shaft sections were shipped crated, they should be unloaded from the vehicle in the crate and not be uncrated until ready for installation.

Parts which are provided with lifting lugs, lifting ears, or eye bolts must be lifted by these points only.

Column, tube, and shaft sections must be handled with extreme care. These parts are machined to achieve precision alignment. If dropped, bent, or otherwise mistreated, misalignment and pump malfunction will occur. Shafts are especially sensitive to abuse. Bent or dropped shafts must not be used; they are certain to cause pump failure.

Certain extra-long, relatively small-diameter bowl units are shipped attached to skids bearing this special notation:

CAUTION-DO NOT REMOVE THIS PROTECTIVE SKID UNTIL THE BOWL UNIT IS IN A VERTICAL POSITION, READY TO BE INSTALLED IN THE WELL OR SUMP. RETAIN THIS SKID FOR USE WHEN REMOVING THE BOWL UNIT FROM THE WELL OR SUMP.

Detach basket strainer from suction manifold prior to lifting the pump assembly. This action will prevent damage to the strainer, ensuring the mesh device is not used as a pivot point during lifting. It is very important that this precaution be observed in handling these units.

PREPARING THE PARTS FOR INSTALLATION

All of the pump parts were carefully inspected before leaving the factory, but may have become soiled or damaged in shipping and handling. Therefore, all parts must be inspected by the installer to verify that they are clean and undamaged before installing them. **Check all column, tube, and shaft sections to ensure that they have not been bent**, and that machined surfaces are not marred in any way, especially the mating surfaces and threads. A procedure for testing shaft straightness is specified on the following page.

If the shaft sections were shipped crated, they should be removed from the crate at this time. The top shaft section can be identified by the keyseat and extra long threaded section at the upper end. Some pumps have a short shaft section just below the top shaft section, which is called the head shaft (or "second top shaft"). The shaft ends may be threaded to engage in a threaded coupling, or they may have a keyway (keyseat) and ring groove (annular keyway) for a split-ring coupling.

Lay the shaft sections across the parallel timbers previously placed on the ground.

Do not step or walk on the shafts. Do not place other parts or equipment on the shafts. Use appropriate solvent to wash off any protective coating from the shaft sections, and wipe thoroughly clean and dry. Clean the shaft coupling threads using a wire brush and solvent, cover both ends, and store couplings in a clean place until ready for use.

Unless the pump is a short setting unit and was shipped from the factory pre-assembled, ALL installation and assembly must be done vertically. If the unit was shipped assembled from the factory, check all pump, tube (if applicable) and column joints for tightness with the pump in the vertical position and with its weight borne by support clamps around the well or sump opening.

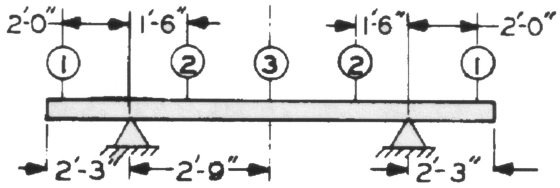
Do not attempt to assemble the bowl, column, enclosing tube, shaft, and discharge head horizontally on the ground before installation. Horizontal assembly risks damage to the shaft sections, tubing, and possibly the column pipe. Bending of any of these components will cause malfunction of the pump.

The well or sump must be thoroughly cleaned of dirt, debris and contaminants before installing the pump. After the installation, the well or sump should again be inspected for foreign matter, and cleaned if necessary. If it is suspected that the fluid will contain sizable solid particles or that foreign objects may enter the sump or well, a suction strainer should be installed with the pump and cleaned periodically. Your Peerless Pump dealer will be glad to advise you on the need for a suction strainer. Dirt, sand, etc. in the sump or well will cause premature wear on the critical pump internal surfaces, resulting in reduced pump performance.

Preparation of shaft sections:

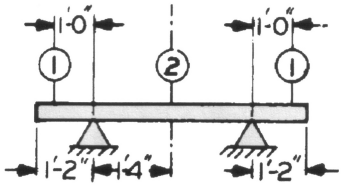
Before beginning the installation of the shaft sections, inspect them for straightness: verify that they have not been bent in shipping or handling. Set a pair of rollers or vee-blocks on a firm base next to the pump site to support one shaft section as shown in Fig. 2.

Provide a solid mounting for a dial indicator at the points labeled 1, 2, and 3 in Fig. 2. Place a shaft on the rollers or vee-blocks and rotate it slowly by hand while checking the eccentricity (run-out) at points 1, 2 and 3.



10 FOOT SHAFT SECTION

MAX. PERMISSIBLE RUN-OUT TOTAL INDICATOR READING (inches)		
LOCATION	5 FT.	10 FT.
①	.002	.004
②	.004	.004
③	----	.006



5 FOOT SHAFT SECTION

Figure 2. Verification of shaft straightness.

Check all of the shaft sections in this manner. Do not use any shaft section that exceeds the limits given in Fig. 2. Rejected shaft sections may be straightened.

All re-straightened shaft sections must have a cleanup cut machined on both ends. Re-straightened shaft sections must be rechecked for eccentricity.

Larger shafts and shafts for non-threaded (split-ring) couplings may have an internal threaded section on one end; this end goes up. In a flanged column pump, the intermediate column sections have identical ends; either end may be upward. However, the top and bottom sections may not have identical ends. Refer to the assembly drawing for the proper orientation.

The preferred method is to install the shaft and couple it, then install the tube and column over the shaft--provided that head room permits. If head room is limited, insert the shaft and tube sections into the column sections so that the shaft extends about a foot above the top end of the column. This will make it convenient for tying later.

When inserting the shaft and tube sections into the column sections, take care not to bend the shaft or damage the threads.

Preparation of tube sections:

Prior to assembling the tube sections, inspect the tube faces to ensure that they are free of nicks or burrs. Any flaws on the tube end faces must be removed prior to assembly, to ensure proper mating of tube surfaces.

The tube sections are coupled by tube bearings. Lubricate tube bearing threads. Assemble the tube bearing onto one tube, threading it in one-half of its total length. Tube sections are furnished in two different lengths: ten feet and twenty feet. The ten-foot sections are actually two five-foot sections, internally threaded and coupled by an externally threaded tube bearing; likewise, the twenty-foot sections consist of four coupled five-foot sections (see Fig. 3).

The top tube section is different and may be identified by the external thread at the upper end. It may be one piece or coupled by means of a threaded tube bearing to a "second top tube" combining for a length that may be different than the standard section lengths. The tube section just below the top tube is shorter than standard—usually 3′4″. The top column section is never fitted with a coupling, since the upper end screws directly into the discharge head or into a special flange.

While the bowl assembly is still in a horizontal position, push the shaft down as far as it will go and measure the distance from the top bowl flange to the top of the shaft. The normal measurement is 20″. The distance from that same flange to the top of the tube adaptor face should be 10″. This dimension is frequently referred to as "10/20 stickup".

If the dimensions on the bowl assembly are different than those stated above, do not proceed with installation; contact a Peerless Pump representative as there may be special instructions for your bowl assembly.

Having recorded the first measurement, now pull the shaft toward you (or up) as far as you can and take a second measurement. The difference between the first and second measurements is the total axial movement of the impeller. This clearance is normally ½″ ± ⅛″ (see Table 4 on pages 37-39 for specific dimensions).

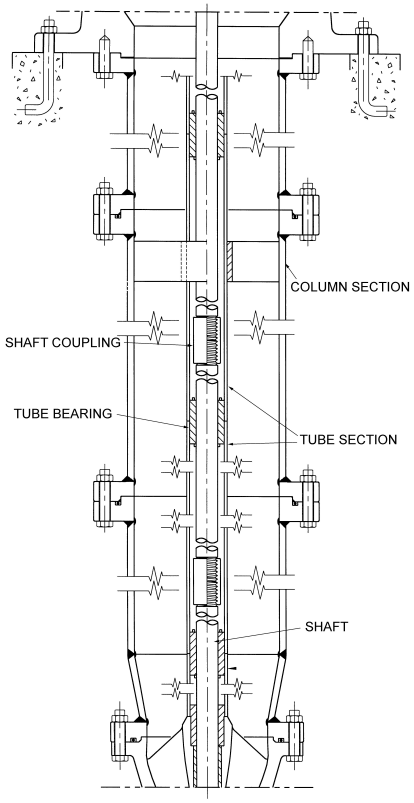


Figure 3. Sectional view through enclosed lineshaft column.

Inspect the top bowl and/or discharge manifold to determine if the bypass ports are open or plugged. In some cases, it may be necessary to unbolt the top bowl/discharge manifold from the bowl assembly and remove it from the shaft, in order to determine whether the bypass ports are open or closed. An open bypass port can be verified by sticking a welding rod from the outside of the bowl inward, making sure that it comes out in the area where the shaft rotates, and is not blocked by a bearing that has been installed over the area of the bypass port.

If the lineshaft bearings are to be oil-lubricated, the bypass ports **must be open**. If the lineshaft bearings are to be water-flushed, the bypass ports must be closed.

Remove the shaft coupling and upper tube bearing from the pump bowl unit. Do not plug the ports with any solid material.

For oil-lubricated pumps, fill the oil groove in the lower tube bearing with a medium-weight water proof grease. A list of recommended greases is given in Table 3a on page 32. If the bearing has a longitudinal hole parallel to the bore, plug that with grease also. Pack the top bearing adaptor tube approximately half-full with the same grease. This will prevent loss of lubricating oil into the well or sump and entry of pumping liquid into the enclosing tube. Replace the bearing and the coupling.

If the tube bearings are to be fresh water lubricated, (refer to the assembly drawing), there is no special preparation before installation, except to be certain that the bearings AND the inside enclosing tubing are clean and free of any dirt or debris. Do not put any other lubricants in the bearings or tubing.Check the total length of the pump bowl unit, suction pipe, and strainer (if furnished) to see whether the hoist clearance is sufficient to handle these assembled parts as a unit. If the clearance is sufficient, assemble the strainer to the suction pipe and the suction pipe to the bowl unit. Lay this assembly across the timbers, close to the sump, ready for installation.

When head room is limited, assemble all the standard shaft, tube, and column sections. Insert one of the shaft sections through the bearings in one of the tube sections. Next, insert the assembled shaft and tube through a column section, with the tube bearing at the same end as the column coupling (or flange). This end is the upper end. Arrange the shaft, tube, and column sections so that the lower end of the shaft protrudes about a foot beyond the lower end of the tube, and the lower end of the tube protrudes about a foot beyond the lower end of the column. This will make them convenient for tying later. ***When inserting the shaft and tube sections into the column sections, take care not to bend the shaft, damage the threads, or scrape the bearings.*** Assemble all of the standard column, tube, and shaft sections—except the top section—in this manner and arrange them on parallel timbers, next to the bowl unit, with the coupling ends nearest to the well or sump.

Do not insert the top shaft section into the top tube and column sections at this time. Before proceeding with the actual installation, check to see that all the pump parts and equipment have been prepared according to the directions given in this section (pp. 9-12).

INSTALLING THE BOWL UNIT

Place two eyebolts diametrically opposite in the upper flange of the bowl unit. Attach a sling to the eyebolts, using suitable shackles, and pass the looped end of the sling over the hoist hook (see Fig. 4). Lift the bowl unit in such a way so that it is not dragged or bumped in order to prevent damage to any part of the pump. While the bowl is in the vertical position, install the strainer, if provided.

Fasten a box-type clamp or elevator clamp to the bowl unit, just below the upper flange (see Fig. 5).

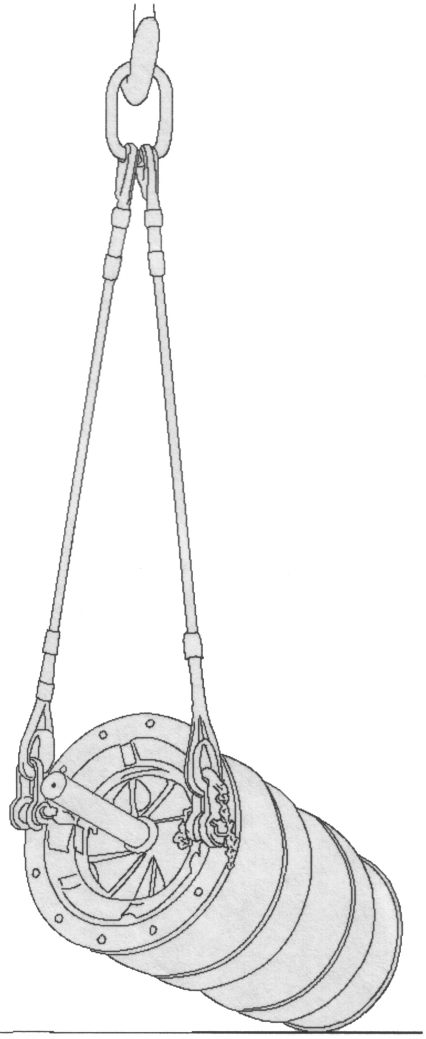


Figure 4. Proper method of lifting pump bowl assembly.

Never attempt to handle or lift the bowl unit by the shaft protruding from the upper end. This could result in bending of the shaft.

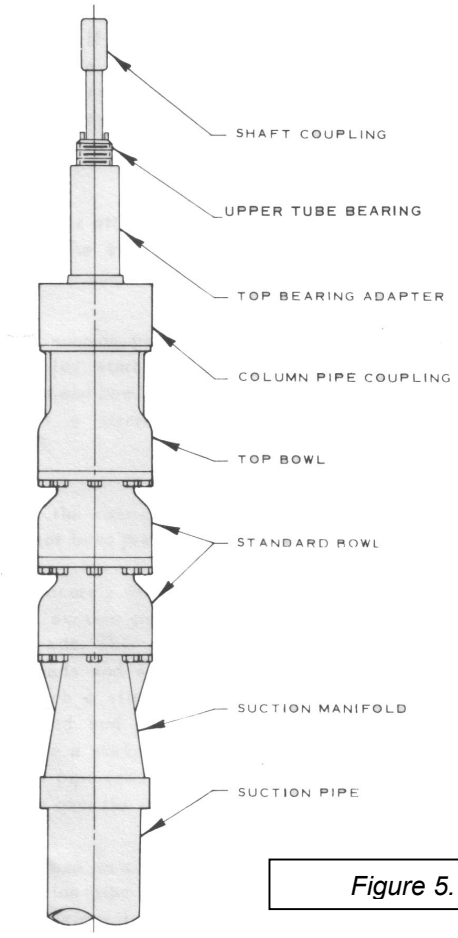


Figure 5. Typical ELS bowl

Lower the bowl assembly until it rests securely on the support beams (see Fig. 6).

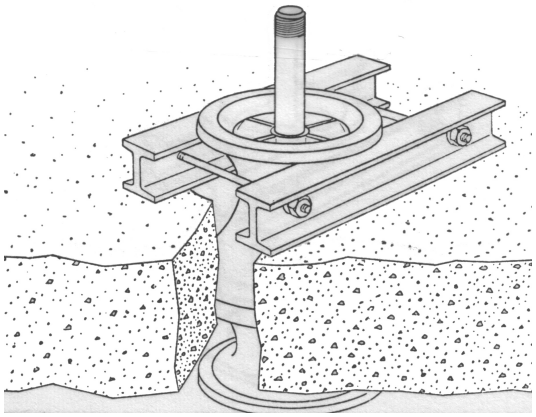
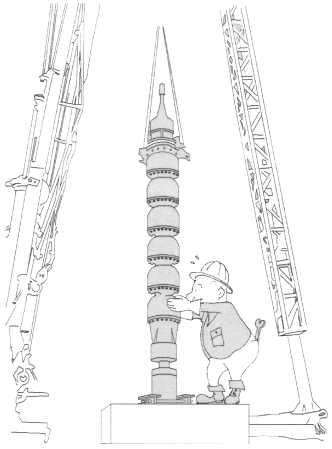


Figure 6. Bowl unit supported over well or sump by a box-type clamp.

Take care not to drop tools, screws, nuts, or any other foreign objects into the bowl unit or sump. Such an object could impair pump performance or ruin the impellers. If passed by the pump into the discharge piping, a solid object could cause serious damage to downstream components.

Any foreign object dropped into the pump column must be retrieved before proceeding with the pump installation.

If any foreign object is dropped into the sump, it must be retrieved *prior* to starting the pump.



Place over the top of the bowl unit a specially made wood or metal apron that covers the opening and fits closely around the impeller shaft. Wrap a clean rag tightly around the shaft, over the apron (see Fig. 7). This will prevent entry of foreign matter into the bowl unit.

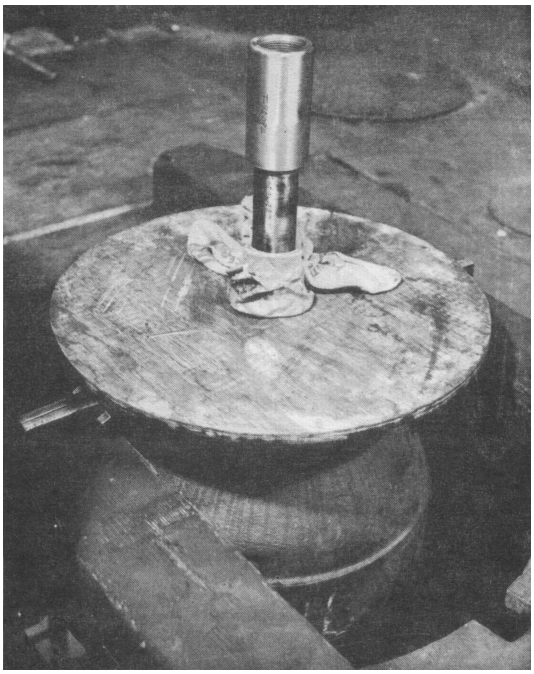


Figure 7. Protect the top of the bowl assembly to prevent the entry of foreign objects.

INSTALLATION OF SHAFT, ENCLOSING TUBE, AND COLUMN

Preferred method:

Head room permitting, lift the appropriate-length shaft into a vertical and plumb position. Check shaft threads for any foreign materials or damage, and clean threads with a wire brush and solvent as required.

Shaft threads are left-hand, and must be clean and de-burred!

Coat the shaft face and threads with anti-seize compound. Check the shaft coupling for any damage or foreign material, and clean if necessary.

Screw coupling onto shaft for half its distance. Approximately 1½ shaft threads will be visible when coupling is in half-way position. Another check for correct positioning of the coupling on the shaft is to insert a fine wire into the drilled hole in the center of the coupling.

Visually inspect the shaft threads and face of the mating shaft. Coat them with anti-seize compound.

Lower the shaft and coupling onto the lower (bowl unit) shaft. Manually screw coupling until tight. If resistance is encountered, remove the coupling and shaft, and inspect the threads at both the coupling and shaft to determine the problem. Because the threads of the shaft and coupling are straight (not tapered), you should be able to tighten them by hand until the two faces mate. Check the tightness of the mating by using two pipe wrenches as shown in Fig. 8.

No noticeable movement should occur when the pipe wrenches are used to check the tightness of the hand-mating. If movement is noticed, it would

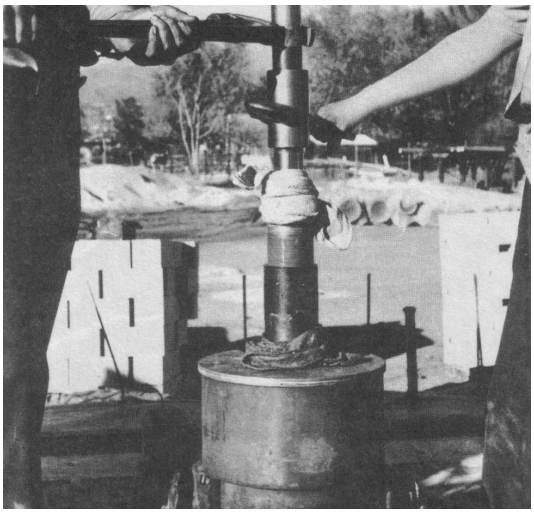


Figure 8. Making a shaft joint. Note the clean rag and wooden apron protecting bowl unit and tube bearing.

be an indication that foreign material has gotten between the faces of the two shafts and, by using the wrenches, you are causing movement by compressing the foreign material. This is not acceptable: the shafts should be disassembled, the foreign material removed, and any scoring on the shaft faces should be corrected.

Check to make sure that the threads on the first enclosing tube section are clean and free of damage. Lift the five-foot tube section over the shaft and lower it onto the upper tube adaptor bearing.

Using two large pipe wrenches or chain wrenches, tighten the five-foot tube section against the tube adaptor (see Fig. 9). Note that subsequent tube/bearing assemblies will be completed horizontally (before hoisting the sections).

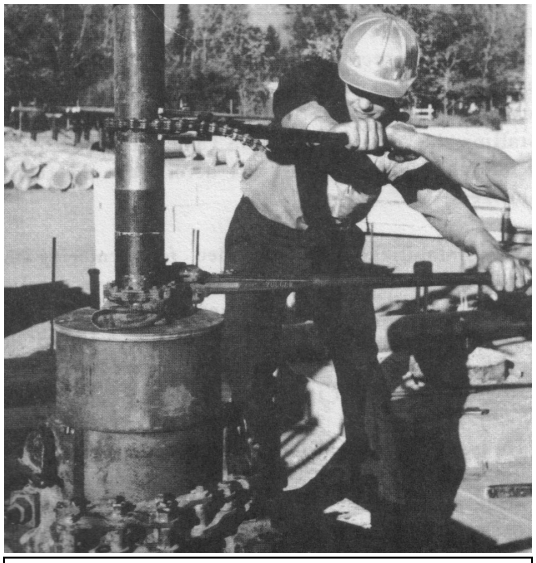


Figure 9. Making a tube joint.

Fill the first five-foot section with the same heavy-weight oil that was installed on the tube adaptor. This oil, being more viscous than the turbine oil that will used from this point forward, will act as a barrier to prevent the lighter-weight turbine oil from leaking out through the bypass ports. At the same time, as the pump is lowered into the sump, this will help prevent the water in the sump from entering the enclosing tube through the open bypass ports.

Install the tube bearing into the section five-foot tube section, screwing coupling halfway in. Lower the tube/bearing assembly over the shaft onto the tube bearing of the first five-foot section and tighten.

Connect a dragline to the lower end of the column flange, to be used in guiding and aligning the column over the shaft (see Fig. 10).

The use of the dragline will prevent accidental bumping of the shaft by the column that could bend the shaft.

If gaskets or O-rings are used between the flange joints, install the appropriate gasket/O-ring on the bowl flange.

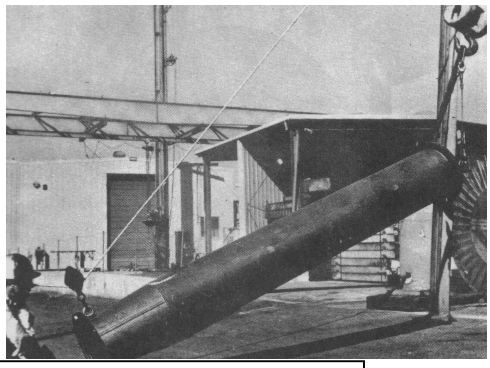


Figure 10. Hoisting column section.

Lift the first column section (usually tapered) over the shaft, and then lower it onto the top bowl/discharge manifold flange. After ensuring that the two flanges are properly registered, install fasteners and tighten in an alternating pattern.

At this time perform another measurement check from the column flange to the top of the enclosing tube and to the face of the lineshaft; these dimensions should be 10 and 20 inches, respectively. If your measurements differ from the standard 10/20 stickup, do not proceed until you are able to determine why you do not have a 10/20 stickup. Consult Table 4 on pps. 37-39 for precise dimensions for your pump.

Prior to installing the second lineshaft, pour turbine oil down the enclosing tube before installing the tube bearing. After the enclosing tube is filled with oil, screw the tube bearing into the enclosing tube.

Install shaft coupling to next shaft section as directed above. Assemble the next two five-foot sections of enclosing tube with a tube bearing connecting them. Tighten the two five-foot sections of inner column horizontally and install over the shaft, being careful not to bump or damage the shaft.

Continue installation of remaining sections, filling each enclosing tube section with turbine oil prior to installation of the next section.

Alternate method of installation of shaft and column in places where head room is limited:

Move the first column section (shaft and tube sections inside) into position for hoisting, and fasten an elevator clamp to the upper end, just below the flange. Attach the sling to the clamp and to the hoist hook as before.

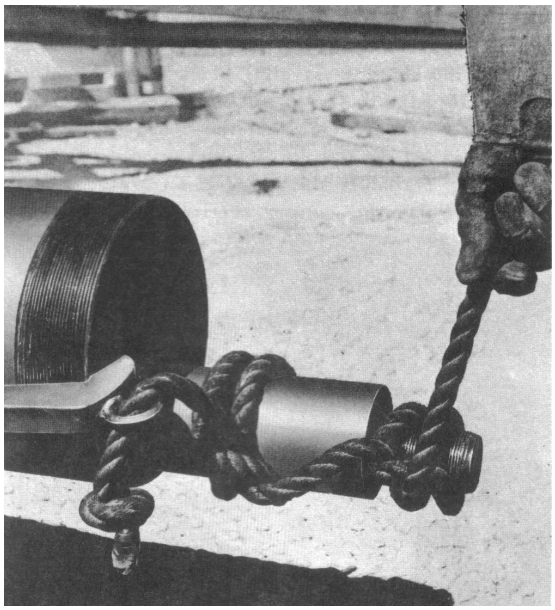


Figure 11. Preparing to lift column section with shaft and tube sections inside (the type of hoisting clamp will differ on pumps with flanged column).

Fasten the shaft section to the column section by tying with a suitable rope (a “tail rope”). Tie one end of the tail rope to the hoist hook using a clove or timber hitch.

With the same rope, take a double half-hitch around the upper end of the shaft in the threaded area, pass the rope through the inside of the column section, and take a reverse double half hitch near the bottom of the shaft section, in the threaded area (see Fig. 11).

When hoisting the column section, the lower end should be guided by a dragline that is pulled by the hoist (see Fig. 10).

Tension must be maintained on the tail rope while hoisting, to prevent the shaft and tube sections from slipping out.

Hoist the column section over the pump. Take care not to let the column, tube, or shaft sections drag or bump against any object.

If the shaft is damaged or bent, it must be repaired or replaced before it is installed in the pump.

Position the column/tube/shaft assembly vertically over the bowl unit.

Do not work under a heavy suspended object unless there is a positive support under it to stop its fall in the event of sling or hoist failure. Disregard of this warning could result in grave personal injury.

Wipe the bowl unit upper flange and column lower flange with a clean rag. Clean off any nicks or burrs. Place a gasket or O-ring on top of the bowl unit flange, or if gaskets or O-rings are not required, coat both flanges with sealant, taking care that no loose brush bristles are left on the coated surfaces.

Carefully lower the column section until the lower end of the shaft section stabs into the coupling, resting squarely on the impeller shaft coupling. Untie the tail rope from the shaft section. Clean the shaft section threads and lubricate them. Start the shaft section into the coupling by hand. Clean threads will allow the shaft to screw in all the way by hand. Then use a pair of pipe wrenches to screw the joint tight, butting the bottom of the shaft section firmly against the top of the impeller shaft (see Fig. 8).

Shaft threads are left-hand, and must be clean and de-burred!

File smooth any burrs which may have been raised on the shaft section, and wipe off metal chips with a clean rag. Remove the apron and rag that had been protecting the top of the bowl unit.

Carefully lower the column section until the lower end of the tube rests squarely on the bearing. Untie the tail rope or remove the clamp. Clean the threads on the outside of the bearing and lubricate them with engine oil.

Start the tube section thread over the bearing thread by hand; then use a pair of pipe wrenches or chain tongs to screw the joint tight, butting the end of the tube firmly against the upper end of the top bearing adaptor (see Fig. 9).

Clean the threads at the lower end of the column section and lubricate them with thread compound or engine oil. Lower the column section and engage it with the coupling by hand. Continue tightening joint using a pair of pipe wrenches or chain tongs, until the end of the column section is butted tightly against the tube adaptor on top of the bowl unit.

Engage the two flanges, and install bolts in all the holes not obstructed by the box clamp (see Fig. 12).

Tighten the bolts gradually in

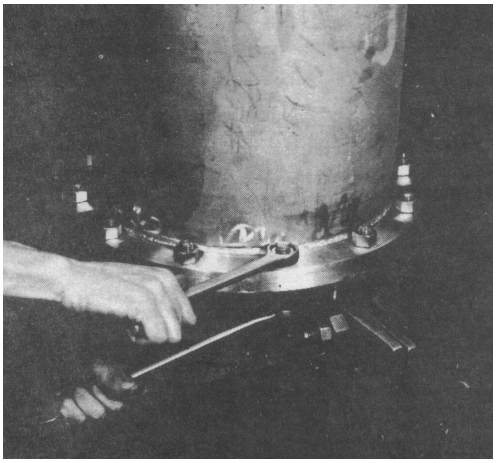


Figure 12. Bolting column section flanges.

diametrically opposite pairs until all are uniformly snug but not fully tightened yet. Raise the entire unit a few inches and remove the box clamp. Install remaining bolts in the mated flanges, tightening gradually and uniformly as before. Tighten all bolts at this time.

Place the protective apron over the top of the column flange and around the protruding tube. Wrap a clean rag tightly around the shaft, over the bearing.

Install the remaining standard-length column, tube, and shaft sections in the same manner. When each new shaft section is suspended over the pump, ready to be installed, clean and lubricate the thread at the upper end of the shaft section already in the pump. Attach a coupling to the lubricated thread, screwing it on for one-half its length. A fine wire inserted in the drilled hole at the center of the coupling can be used as a gauge to determine when the coupling is correctly positioned. **Be sure to remove the wire after installing the coupling.**

For pumps having a head shaft ("second top shaft") just below the top shaft, install it with the top column section; the top shaft will be installed after the driver. When the column section has been bolted into place, replace the box clamp under the newly made flange joint and allow the unit to rest on the clamp. Do not lower the top column section into the sump yet to facilitate installation of the discharge head. Remove eyebolts and sling.

If, for any reason, the site is left unattended before the installation is complete, all openings must be covered to prevent entry of children, animals, stones, or any other foreign objects, either by accident or by vandalism. Use unbreakable covers that cannot be removed without tools. Violation of this warning could result in severe property damage or grave personal injury.

INSTALLATION OF THE DISCHARGE HEAD

With the pump and all the standard-length column and shaft sections installed in the well or sump, the next step is to prepare the discharge head and top column section for installation.

Exceeding the load limitations of the hoist may result in failure of the discharge head, serious damage to other parts of the pump, and grave injury to nearby personnel. Refer to the construction drawing for weights of pump components.

The size designation of the discharge head is given in raised numbers cast on the side or top of the mounting plate. The discharge head may be shipped from the factory without the driver assembled to it. Place the discharge head on a clean work surface near the sump. If the discharge head has become soiled in shipping and handling, clean it thoroughly, inside and outside.

If a sole plate is to be used and has not yet been installed and grouted, check the mounting surface at the top of the sole plate for possible damage or debris. Remove any burrs and clean the surface thoroughly. If the sole plate has been painted, remove the paint from **both** the machined and the non-machined sides. Mount the discharge head on the machined side of the sole plate, and fasten it with the bolts or cap screws provided.

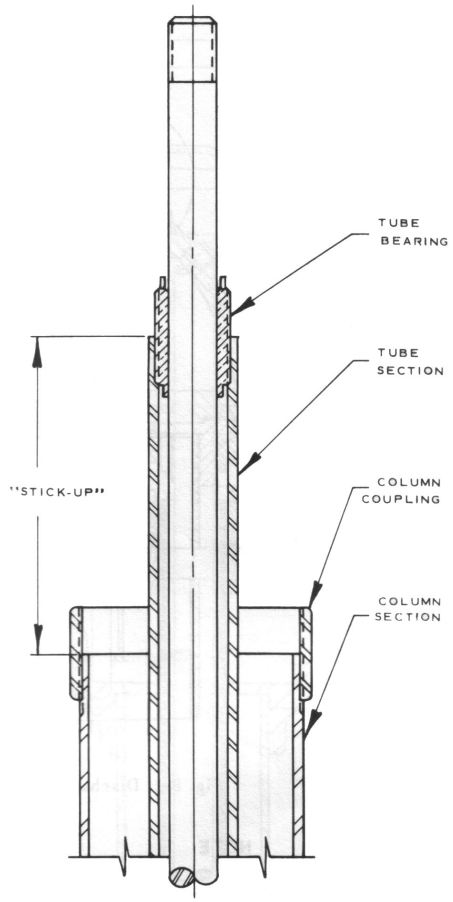
When the discharge outlet of the pump is a plain pipe (no threads or flange) and a flexible discharge coupling is to be used, the parts of the coupling must be installed on the pump outlet and/or discharge piping before locating the discharge head in its final position.

The top tube section consists of three distinct pieces of tubing coupled by means of two shaft bearings. The lower tube is a standard 5′ length; the middle tube is similar to a standard tube except for its length, 3′4″. The upper tube can be identified by the external thread at the top end. The two lower pieces should be butted tightly together, but the upper piece should be left loose enough to be removed easily.

Carefully measure the overall length of the assembled top tube section, deducting an amount for the looseness of the top piece, if necessary. In most installations, it will be necessary to cut the top tube section to suit the job. The measurements described below will be used to determine the amount (if any) to be cut off. Lay a straight edge across the top of the last installed standard tube section (not including the bearing), and measure its “stick-up”) above the top of the column section (see Fig. 13). This measurement should be approximately 10 inches. Add the **actual** measurement to the overall length of the three-piece top tube assembly.

Next, measure the distance from the upper surface of the top column flange to the lower end of the top column section. Add this measurement to the dimension measured in the previous paragraph: the total length of the top tube assembly and the stick-up should not exceed the sum of your measurements by more than ½″. If the difference is greater than ½″, the upper end of the top tube section must be cut off to keep within the ½″ limit.

Remove the upper piece of the top tube assembly and cut off the necessary amount of tube. Do this on a convenient



workstand away from the pump. File the cut smooth, and file the thread at the new end so it will engage easily. Clean the tube thoroughly, inside and outside, then screw it back in place and tighten it securely.

Install the top shaft (or head shaft) and the top column section in the same manner as for the standard sections. DO NOT LOWER THE TOP COLUMN SECTION INTO THE SUMP AT THIS TIME.

When lowering the top column section over the top shaft (or head shaft), take care not to bump or scrape the shaft. This could bend the shaft and/or damage the shaft threads.

Install eyebolts in two of the driver mounting holes on the top of the discharge head. For proper balance, use the hole over the discharge opening and the hole diametrically opposite. Attach the sling to the eyebolts and hoist the discharge head over the pump (the lifting ears are NOT used to lift the discharge head when not attached to the pump because the discharge head is heavier on the discharge side and would tip).

Figure 13. Illustration of tube section "stick-up".

Very large discharge heads that are too heavy to lift by the driver mounting holes may be lifted via slings through the hand holes, or by passing a bar through the hand holes (see Figs. 14 and 15).

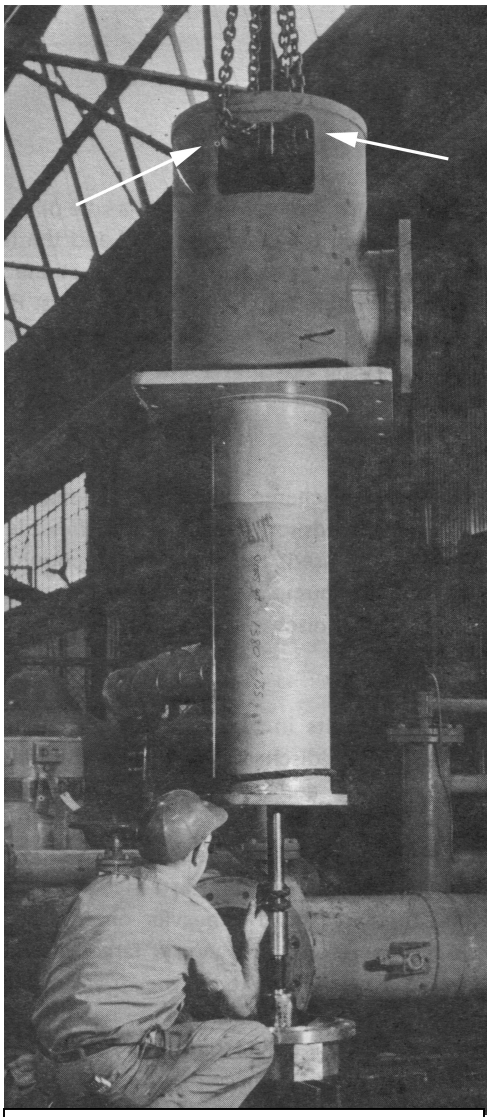


Figure 14. Lifting large discharge heads using slings.

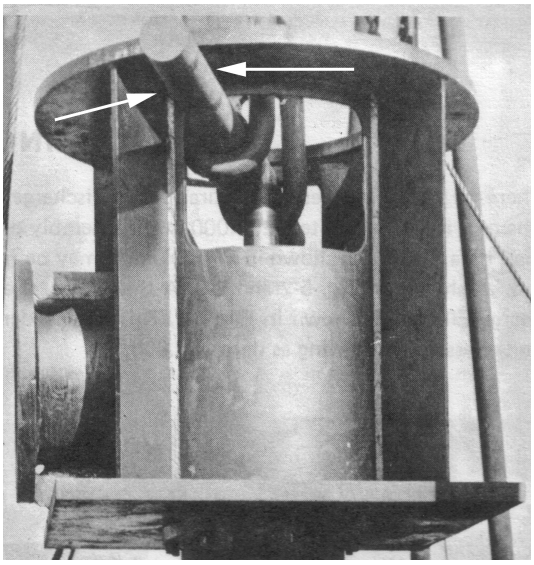


Figure 15. Lifting large discharge head using bar.

If gaskets or O-ring are furnished, place one on the upper flange of the top column section. If gaskets or O-rings are not required, coat the mating surfaces of the column flange and the discharge head flange with flange sealant.

Lower the discharge head slowly, centering the shaft in the discharge head so that there will no bumping or scraping as the shaft enters and passes through the hole. Continue to lower the discharge head until the studs enter the holes in the flange of the top column section and the discharge head is correctly seated in place. Install the nuts on the studs, tightening them gradually and uniformly. Raise the entire unit a few inches and remove the box clamp.

After the discharge head is installed on the pump column, always use the lifting ears on the discharge head for hoisting the pump. If the discharge head does not have lifting ears, pass the slings through the hand holes, taking care that the slings do not interfere with the shaft.

Never attempt to lift the pump by means of eyebolts screwed into the driver mounting holes because the bolts are not strong enough to carry the weight of the entire pump.

LEVELING THE PUMP

Remove the supporting timbers, rope and any other equipment from the top of the foundation. Cover the discharge head to protect it from dust, and sweep the foundation clean.

If the sole plate is not already grouted in place, be certain that the grouting dam around the foundation opening is in place before lowering the pump assembly onto the foundation.

Lower the pump until the base of the discharge head or sole plate is just above the foundation bolts; then orient the pump so that the discharge outlet is in the desired direction and the holes in the base align with the foundation bolts. Continue to lower the pump until the bolts just enter the holes in the base.

If the foundation is concrete, place the wedges (furnished with the pump) under the discharge head or sole plate, adjacent to the bolt holes, one under each of the four sides. For structural foundations (made up of I-beams or H-beams), use flat shims under the corners.

Continue to slowly lower the pump until the base of the discharge head or sole plate rests on the shims or anchor bolts with washers and nuts.

Accurate alignment of the discharge head in relation to the pump shaft is absolutely essential for a smoothly-operating and trouble free pumping system**.**

By using the wedges or washers and nuts on the anchor bolts, adjust the discharge head flange centerline to the correct elevation.

While maintaining the correct elevation, adjust the nuts and washers or shims to achieve the specified levelness (0.0005" per foot) in both directions, as shown in Figure 16. The levelness should be measured by placing a precision level on the machined face of the discharge head motor register.

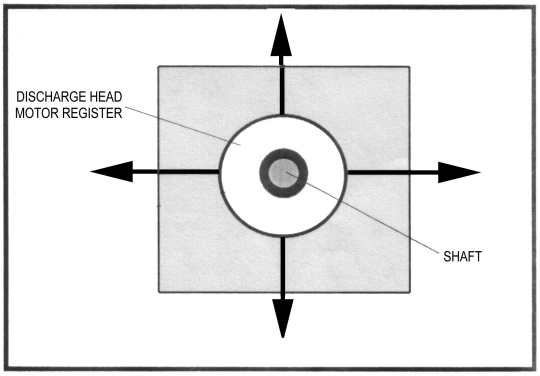


Figure 16. Check for levelness in two directions.

<u>Never</u> attempt to align the discharge head using a spirit (carpenter's) level. If the pump column does not hang freely in the well, as might be the case when the well is drilled at a slight slant, leveling the discharge head will not insure the necessary shaft alignment and clearance in the driver spindle. The discharge head base must be square with the pump shaft regardless of the result indicated by a spirit level. A bent shaft could occur, causing early pump failure and expensive repair.

Place a machinist's level on the driver mounting surface of the discharge head, orienting it parallel with one of the edges of the base. Move the wedges or add more shims as necessary until the level reading reaches 0.0005" per foot.

Reorient the level on the same surface, 90º from the original position. Again adjust the wedges or shims until a 0.0005" level reading is reached, taking care not to upset the levelness is the first direction. After each adjustment, check for levelness in both directions. Push in or add to any loose shims to distribute the weight evenly. The discharge head must be level within 0.0005" with all wedges or shims bearing tightly against the base or sole plate.

Install nuts on the foundation bolts and tighten them gradually and uniformly. Re-check the level readings in both directions. If necessary, loosen the foundation bolts and re-adjust the wedges or shims, tighten the bolts again and re-check the level readings.

GROUTING THE DISCHARGE HEAD/SOLE PLATE

After the discharge head is at the correct location and leveled with a precision level, the discharge head and/or sole plate need to be grouted to the foundation.

Use only non-shrinking grouting material for grouting the discharge head/ sole plate to the foundation.

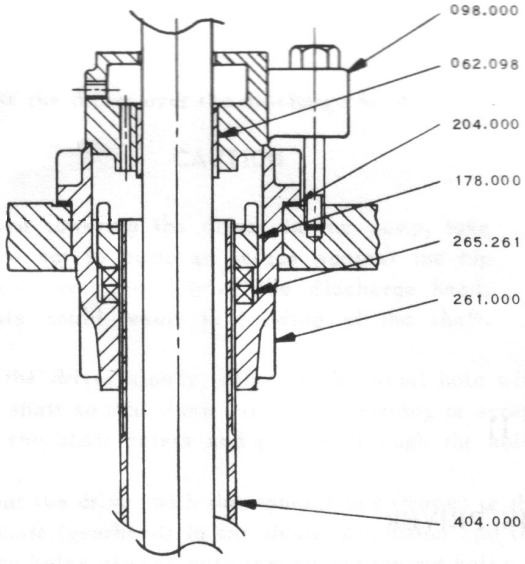
Build a dam on the foundation, enclosing an area around the discharge head that includes all of the alignment wedges. The top of the dam should be approximately ½ inch above the bottom of the discharge head base (see Figs. 1a and 1b on page 6).

Pour the grouting material into the dammed-in area, and force it between the discharge head and the foundation all around. Level off the grout flush with the top of the dam. Allow the grout to cure at least 48 hours before tightening the foundation bolts or starting the pump.

TENSIONING THE TUBE NUT

The enclosing tube sags slightly from its own weight as it is installed, and must be pulled tight (tensioned) to make it straight. The tube nut (see Fig. 15) holds the tube in its straightened position. This section describes two methods of tensioning the tube. The second method (the "wrenching method") is given as an alternative for use with pumps having settings less than 500 feet.

Note: The correct tension is the weight of the enclosing tube plus 10%.



ITEM NO.	DESCRIPTION
265.261	Packing
098.000	Cap, Tube Nut
178.000	Follower, Packing
204.000	Gasket, Tube Nut
261.000	Tube Nut
404.000	Tube, Top
062.098	Bearing, Sleeve

Figure 17. Typical tube nut assembly.

Weights-per-foot for each tube size are given in Table 2. Multiply by the total length of tube to determine the total weight.

Table 2. Weight per Foot of Enclosing Tube

Tube size (in.)	Weight per foot (lb.)
1 ¼	2.99
1 ½	3.63
2	5.02
2 ½	7.66
3	10.25
3 ½	12.50
4	14.98
5	20.78
6	28.57

Apply a generous coating of grease to both sides of the gasket and place the gasket on the discharge head. Install the tube nut, screwing it down manually until its shoulder rests firmly on the gasket.

The upper end of the tube may be pulled by the hoist to obtain the predetermined tension value. This requires the use of a dynamometer scale and a specially-made fitting to grip the tube. The fitting may be a short tube with welded-on lugs for gripping with a sling and an internal thread to mate with the tube thread.

With the tube nut installed manually but not tightened, screw the special fitting onto the top of the tube to its full engagement. Attach the dynamometer scale to the lugs, and connect the upper end of the scale to the hoist hook (see Fig. 18). Operate the hoist to apply the required tension. This will pull the tube nut up off the gasket. Manually screw down the tube nut to reseat it. Reduce the tension to zero. Remove the dynamometer scale and the special fitting.

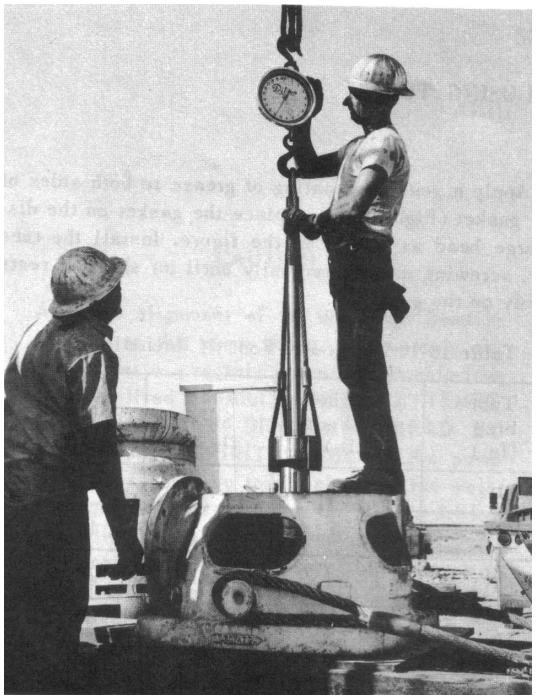


Figure18. Tensioning the tube nut.

If a dynamometer scale is not available, the tube can be tensioned by wrenching the tube nut. **This is permissible only for pumps with settings under 500 feet.** A special wrench for tightening the tube nut may be obtained from the dealer. Apply the special wrench to the tube nut so that the slots in the wrench engage the lugs at the top of the tube nut. Using chain tongs strapped around the special wrench, turn the tube nut to take all of the slack out of the tube and induce a reasonable amount of tension in it. The tube nut is properly torqued if it forms an effective seal with the gasket. This can only be determined when the pump is started (see Starting the Pump on page 40).

Insert the two packings (see Fig. 17) into the recess in the tube nut. Screw the packing follower on the tube threads, tightening it firmly against the packings. Use the small end of the special tube nut wrench and a pipe wrench to turn the follower.

Place the tube nut cap in position over the tube nut and fasten it to the discharge head with the cap screws provided.

INSTALLING THE VERTICAL HOLLOW SHAFT (VHS) MOTOR

On pumps with two-piece top shafts, the top shaft should not be installed yet. The head shaft threads and face should be checked for any nicks or burrs. If any are found, correct them with the use of a mill file. Fig. 19 shows a typical motor; refer to manufacturer instructions for proper dimensions and installation. These instructions are offered as guidelines only.

Clean the coupling threads with a wire brush and solvent. Coat the threads and face of the coupling with anti-seize compound.

Screw the coupling on until its center hole is in line with the face of the head shaft. Cover the coupling top opening with plastic or a clean rag to prevent the entry of any foreign material into the coupling while the motor is being lowered into position.

If the pump is constructed with a one-piece top shaft, care must be taken when lowering the motor onto the discharge head, to prevent it from bumping against the top shaft protruding above the discharge head. Any contact of the motor with the one-piece top shaft could result in bending of the shaft.

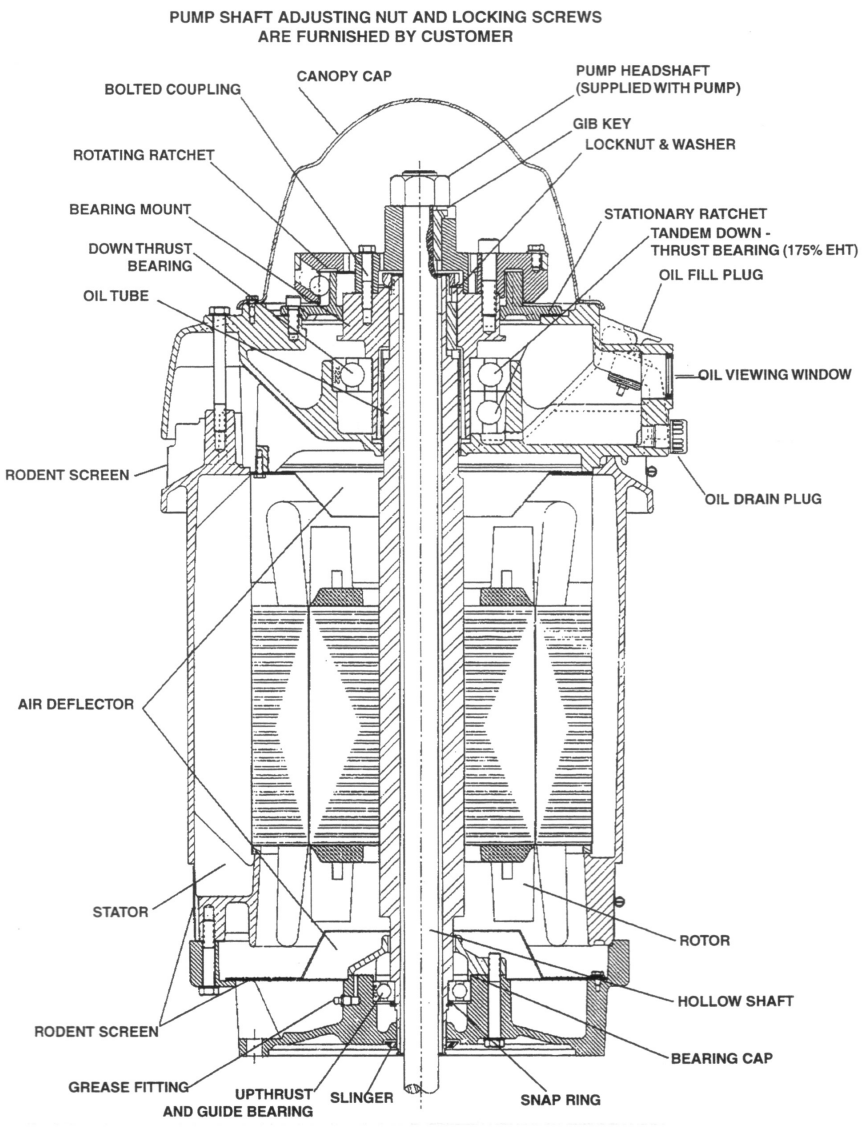


Figure 19. Typical motor construction; refer to assembly drawing and information provided by the motor manufacturer for details on your particular motor.

Prior to removing the top drive coupling hub from the motor rotor, be sure to scribe a line with a marking pen (match mark) on the drive hub location and the rotor.

Remove the bolts holding the top drive coupling and lift it off. On larger motors, the top drive coupling may be of such size and weight that an overhead crane and eyebolts (screwed into the coupling for lifting) will be required to move the coupling.

On one-piece top shaft construction, lower the motor slowly, aligning the axial hole of the hollow shaft with the top shaft so that there will be no bumping as the shaft enters and passes through the motor hollow shaft.

Place the motor mounting bolts into the holes of the motor end bell. Lower the motor until it is approximately ¼" to ⅜" away from the discharge flange face. Orient the motor with the conduit box in the desired position and the mounting holes aligned with the mating tapped holes in the discharge head.

Do not work under a heavy suspended object unless there is a positive support under it to stop its fall in even of sling or hoist failure. Disregard of this warning could result in grave personal injury.

At this time, engage the motor mounting bolts in the tapped holes of the discharge head. This will help align the motor register to the discharge register.

Prior to lowering the motor onto the register, check to make sure no foreign material has gotten between the motor and discharge head faces.

When lowering the motor to the pump, take care not to bump or scrape against the top shaft protruding above the discharge head. This could result in bending of the shaft.

Lower the motor until the registers engage and the motor rests firmly on the discharge head. Tighten the motor mounting bolts that have already been engaged.

If the pump has a head shaft just below the top shaft, only the head shaft will be installed at this time. The top shaft will be inserted through the motor later, after the motor has been tested for direction of rotation.

Match mark the top drive coupling relative to the motor rotor. Remove the bolts holding the top drive coupling, and lift it off. On larger motors, the top drive coupling may be of such size and weight that an overhead crane and eyebolts (to screw into the top drive coupling) will be required to move the coupling.

Check the threads and faces of the bottom of the top shaft for any nicks or burrs, and correct as required. Wire brush and clean the threads with solvent. Coat the threads and face with anti-seize compound.

Lift the top shaft up and center it in the hollow shaft of the motor prior to lowering it. Lower it slowly through the motor hollow shaft.

As the lower end of the shaft comes out the bottom of the motor hollow shaft, check for any foreign material on the face and threads of the shaft that may have been picked up while the shaft was being lowered.

Prior to lowering the shaft into the coupling, remove the protective plastic or cloth. Check to be sure the coupling center hole is still at the face of the head shaft.

While holding the coupling in place, screw the top shaft into the coupling until the faces mate. Approximately the same number of threads should be exposed outside the coupling on both ends, if the coupling is properly centered.

With the top shaft tightened to the head shaft, go to the top of the motor and check to see if the top shaft is concentric with the motor hollow shaft, and that the motor shaft rotates freely when turned by hand.

If the top shaft is not concentric with the hollow shaft of the motor, determine the cause of the eccentricity. Eccentricity may be due to a bent shaft section or to misalignment caused by foreign particles between butting ends of shaft sections or between the discharge head and column flange.

Mark where the shaft is leaning toward the motor hollow shaft, lift up on the pump shaft, and rotate it 180°. If the lean follows the rotation of the shaft, it is due either to a defective coupling or a bent shaft. If the lean remains at the same location, it would be due to eccentricity or “out-of-squareness” of the mating surfaces of the discharge head and column. If either condition exists, it must be investigated and corrected prior to proceeding with the installation.

Prior to energizing the motor for rotation check, be sure the motor has been properly lubricated as per the manufacturer’s instructions.

If the motor is oil lubricated, the drain plug should be removed and a sample of the oil inspected for condensation or foreign material. If any contaminants or condensation is found in the oil sample, the oil reservoir needs to be flushed with clean oil until all evidence of contamination is removed. Replace the drain plug and fill the oil reservoir in accordance with manufacturer’s specifications for type and quantity of oil.

Make temporary wiring connections to the motor. The motor voltage rating is given on the nameplate. DO NOT USE ANY OTHER VOLTAGE.

The motor can now be checked for proper rotation (counter-clockwise, when viewed from above). When checking direction of rotation, simply “bump” the power; do not hold the switch closed.

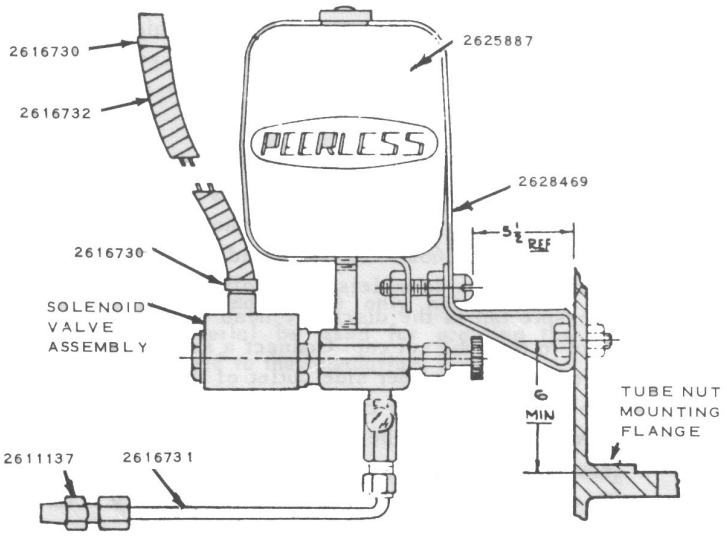
Motors having spring-loaded spherical roller bearings must not be allowed to run at normal speed without a load. When checking direction of rotating, do not hold the switch closed—just "tap" it.

If the direction of rotation is not correct, reverse it by changing the wiring connections to the motor. For a three-phase motor, interchange any two of the three leads. If the motor is single-phase, directions for reversing rotation are given on the nameplate. MARK THE LEADS TO INDICATE THE CORRECT CONNECTIONS.

The motor must not be tested for direction of rotation when coupled to the pump. If the pump should rotate in the wrong direction, serious damage to the pump and motor and grave injury to nearby personnel could result.

Once the motor rotation is confirmed to be correct, make the final electrical connections to the motor. All connections must be insulated in accordance with local electrical codes.

At this time the top drive coupling can be reinstalled in its original location, using anti-seize compound on the registers between the top drive coupling and the motor rotor.



PART NO.	NAME
2611137	Connector, Tubing
2616730	Connector, Conduit
2616731	Tubing, 1/4 O.D. x 36
2616732	Conduit, Flexible, 1/2 x 36
2625887	Container, Oil, 2 Gal.
2628469	Bracket, Oil Container

Figure 20. Automatic oiler.

INSTALLATION OF LUBRICATION SYSTEM

The oil reservoir may be integral with the discharge head or it may be a separate tank. Inspect the inside of the reservoir for cleanliness. If necessary, flush it out with petroleum-base solvent (if permissible by local EPA codes).

If a separate tank is supplied with the pump, attach it to the side of the discharge head, using the brackets and cap screws provided.

The oil system from the reservoir to the pump is depicted in Fig. 20. Connect the solenoid valve (if used) and the sight feed oil valve (either plain or temperature-compensated) to the reservoir as shown in the appropriate figure. Connect a short length of tubing from the bottom of the sight feed oil valve to the ¼ NPT hole in the side of the tube nut cap.

The solenoid valve is designed to open, permitting oil to flow, whenever the pump driver is started. The voltage rating of the solenoid valve is shown on the nameplate. **Do not use any other voltage.**

If the pump is to be motor-driven and the correct voltage for the solenoid is available at the motor, connect the two solenoid leads to any two motor leads having the correct voltage. If the motor voltage is too high, the solenoid may be wired to suitable low voltage taps at the control panel, or a separate transformer may be used.

Use only high quality turbine oil. A list of acceptable oils is given in Table 3b. Fill the reservoir with oil. Adjust the sight feed oil valve for a flow of 5 to 6 drops per minute for each hundred feet of pump depth. After two weeks of operation, reduce the flow to approximately 3 drops per minute for each hundred feet.

Keep the reservoir cover tightly in place at all times to prevent entry of dirt

into the oil system. Maintain the oil level in the reservoir at least one-quarter full.

RECOMMENDED LUBRICANTS

The products listed in the following tables are recommended for the applications noted. Other lubricants, not listed but of equal quality, may also be used.

Table 3a

GREASES FOR LUBRICATION OF LINESHAFT BEARINGS, SUCTION MANIFOLD BEARINGS AND SHAFT PACKINGS 3600 RPM MAXIMUM -20 degree to +120 degrees Fahrenheit

MANUFACTURER	PRODUCT
American Oil Co	AMOCO Lithium Grease All- Weather
Atlantic Richfield Co.	ARCO Multipurpose Grease
Cato Oil & Grease Co.	Mystik JT-6
Cities Service Oil Co.	Citgo H-2
Continental Oil Co.	EP Conolith No. 1 (- 20 degree F to +40 degree F.) EP Conolith No. 2 (+40 degree F to +120 degree F.)
Gulf Oil Co.	Gulfcrown No. 2 or Ep 2
E.F. Houghton & Co.	Cosmolube No. 2
Exxon	Lidok Ep 2
Hydrotex	Deluxe No. M-33 Super Shield
Imperial Oil & Grease Co.	Molub-Alloy No. 1
Keystone Div., Pennwalt Corp.	80 X LT
Mobil Oil Corp.	Mobilux Ep No. 2
The Pennzoil Co.	Pennzoil 705 HDW
Phillips Petroleum Co.	Philube IB & RB
Shell Oil Co.	Alvania EP Grease or Alvania EP Grease 1 for prolonged ambient below 0 degree F.
Sun Oil Co.	Sunaplex No. 2 EP Prestige 42
Texaco, Inc.	Novatex Grease No. 2
Union Oil Co.	Unoba Ep-2

Table 3b

TURBINE OILS FOR LUBRICATION OF LINESHAFT BEARINGS, SUCTION MANIFOLD BEARINGS, AND SIMILAR APPLICATIONS

3600 RPM MAXIMUM

MANUFACTURER	PRODUCTS	
	TEMPERATURES BELOW 32 F.	TEMPERATURES ABOVE 32 F.
American Oil Co.	Rykon Industrial Oil No. 11	Rykon Industrial Oil No. 31
Atlantic Richfield Corp.	Duro S-150	Duro S-150
Cato Oil & Grease Co.	2107 Water Well Turbine Oil or 1872 Antiwear H yd. /Ind. Oil A.5	2107 Water Well Turbine Oil or 1872 Antiwear H d./Ind. Oil A.5
Cities Service Oil Co.	Citgo Pacemaker 15	Citgo Pacemaker 15
Continental Oil Co.	Dectol 15 R & 0	Dectol 33 R & 0
Gulf Oil Co.	Paramount 39	Harmony 44 or 43 AW
E.F. Houghton & Co.	Cosmolubric 1133-A	Hi-Temp Oil 102
Exxon	Nuto 32 or Esstic 32	Teresstic 32 or Nuto 32
Hydrotex	Deluxe No. 216	Deluxe No. 216
Imperial Oil & Grease Co.	Molub-Alloy No. 588	Molub-Alloy No. 603
Keystone Div., Pennwalt Corp.	49X Light or KSL-213 (very low temperature)	KLC-6 or KSL (very high temperature)
Mobil Oil Corp.	DTE 13	Vactra Heavy Duty
The Pennzoil Co.	Pennbell No. 1	Pennbell No. 2
Phillips Petroleum Co.	Magnus Oil 150	Magnus Oil 700
Shell Oil Co.	Tellus Oil 22	Tellus Oil 32
Sun Oil Co.	Sunvis 916 or Sunvis 816 WR	Sunvis 916 or Sunvis 816 WR
Texaco. Inc	Regal Oil R & 32	Regal Oil R & 0 32
Union Oil Co. Western Region	Unax AW 150 or Turbine Oil 150	Unax AW 315 or Turbine Oil 315
Union Oil Co. Eastern Region	Unax AW 150	Unax AW 315

TABLE 3c

FOOD GRADE (H-1 RATED) GREASES FOR LUBRICATION OF LINESHAFT BEARINGS, SUCTION MANIFOLD BEARINGS, AND SIMILAR APPLICATIONS.

3600 RPM MAXIMUM.

MANUFACTURER	PRODUCT
Husk-Itt	Huskey Lube “0" Seal
Texaco	Cygnus
Royal	FG 32

TABLE 3d

FOOD GRADE (H-1 RATED) OILS FOR LUBRICATION OF LINESHAFT BEARINGS, SUCTION MANIFOLD BEARINGS, AND SIMILAR APPLICATIONS
3600 RPM MAXIMUM

MANUFACTURER	PRODUCT
Husk-Itt Corporation	Huskey 15 A 14
Royal	400 FG

Table 3e

SEALANTS FOR USE ON LOW PRESSURE FLANGED JOINTS AND SIMILAR APPLICATIONS

MANUFACTURER	PRODUCT
Loctite Corporation	Loctite #515

IMPELLER CLEARANCE ADJUSTMENT

Lock out the electrical power source before working on the pump.

With the top drive coupling securely fastened to the motor rotor, check the gib key fit to the top shaft keyway. The key fit should be such that one can slide the key inside the shaft keyway by hand.

Rotate the top drive coupling until its keyway is aligned with the top shaft keyway. The key must fit snugly against the sides of the keyways, but must have a slight clearance with the bottom of each keyway. File the key, if necessary, with a smooth mill file to obtain the proper fit. Coat the gib key with anti-seize compound and install in keyway (see Fig. 21).

Prior to installing the brass adjusting nut, take a marking pen and scribe radial marks from of all the drilled and tapped holes to the outside circumference. These marks will allow you to more easily locate the holes after the top adjusting nut is installed.

At this time, attempt to manually rotate the pump and motor counter-clockwise. No rotation should be possible if all the threaded line shaft is mated and the impeller is resting on the suction manifold. If any free rotation of the pump and motor can be made, it is an indication that the line shaft has come unscrewed. If possible, try to determine the location of the loose line shaft. If this is not possible, continue to rotate the pump and motor counter-clockwise until it stops.

On small pumps at short settings where the rotating element of the pump is relatively light, rotation of the shaft may be felt but some resistance would be encountered (shaft would not freely spin).

Install the brass adjusting nut on the top shaft and screw down until it makes light contact with the face of the top drive coupling. Do not tighten yet.

Measure the distance from the face of the motor top drive coupling to the top of the top shaft. **Record this measurement.**

Turn the adjusting nut in a right-hand rotation until the dimension that was recorded is increased by 3/16", or by the recommended impeller clearance as shown in Table 4 on pps. 37-39 (see Fig. 21). After the pump has operated for a minimum of one hour, or when the water is clear of foreign material, the impeller clearance can be reset if so desired, but this is not required for normal pump operation.

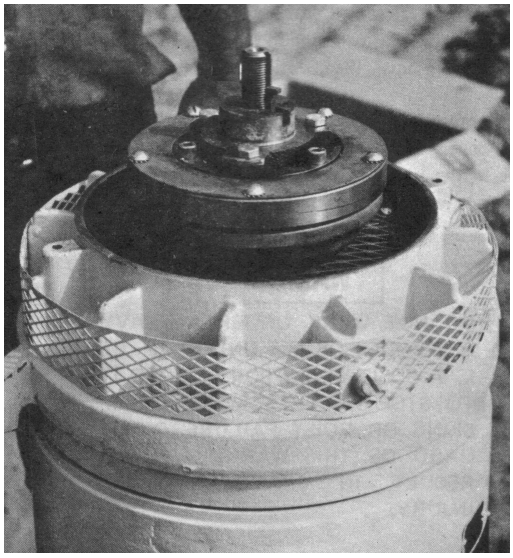


Figure 21. Gib key inserted into top shaft and top drive coupling.

A pump operating in a new well or sump should be run with its impellers in the mid-position, which is approximately 3/16 inch above the lateral bowl wear rings. This is to minimize the possibility of damage due to sand in the water. When the water is clear of sand, the impellers should be reset to the most efficient pumping position.

Verify free rotation of pump-motor shaft. It should rotate by hand freely. Align the holes in the adjusting nut with the radial marks indicating the location of the tapped holes in the top drive coupling.

Turn the nut slightly in either direction, if necessary, to align two of the holes 180° apart in the adjusting nut with the tapped holes in the top drive coupling.

Install the adjusting nut retaining bolts and tighten.

Replace the motor canopy prior to putting the pump in operation.

Note: The impellers must be adjusted before any attempt is made to start the pump.

After freedom of rotation is verified, the lock out on the electrical power should be removed and the pump is now ready for start-up.

The driver cover must be in place when the pump is in operation. Rotating parts below this cover could cause grave personal injury if exposed.

Table 4. Most Efficient Bearing and Impeller Clearances

All current vertical turbine pump models are represented, and some obsolete models are also shown.

B = DISTANCE FROM BOTTOM OF IMPELLER TO END OF SHAFT (SUCTION CASE)
C = DISTANCE FROM BOTTOM OF IMPELLER TO END OF SHAFT (SUCTION BELL)
D = DIAMETRAL CLEARANCE BETWEEN SHAFT AND BEARINGS
E = DIAMETRAL CLEARANCE BETWEEN IMPELLER SKIRT AND BOWL SIDE SEAL

(Dimensional references only; no guarantees implied. Information subject to change without notice.)

Size	Model	Shaft Dia.	B	C	D (max.)	D (min.)	E (max.)	E (min.)	Best Lateral
4	LE	0.75	5.19	-	0.006	0.005	0.010	0.006	0.125
6	HXB	0.88	4.56	-	0.007	0.006	0.012	0.008	0.125
6	LB	0.88	3.38	3.38	0.007	0.006	0.011	0.007	0.063
6	MA	0.88	6.56	3.69	0.007	0.006	0.015	0.010	0.125
7	HXB	1.00	5.63	-	0.007	0.006	0.012	0.008	0.125
7	LA	1.00	6.50	4.06	0.007	0.006	0.012	0.008	0.125
7	LB	1.00	7.00	7.00	0.007	0.006	0.018	0.012	0.125
8	HDX	1.19	6.38	-	0.007	0.006	0.018	0.012	0.063
8	HDX (w/o ring)	1.19	6.13	-	0.007	0.006	0.018	0.012	0.063
8	HXB	1.19	5.44	-	0.007	0.006	0.012	0.008	0.063
8	LB	1.19	4.38	4.38	0.007	0.006	0.012	0.008	0.125
8	MA	1.19	7.63	3.94	0.007	0.006	0.012	0.008	0.125
8	MFH	1.19	Keyed	-	0.007	0.006	-	-	0.012
9	LA	1.19	8.00	4.75	0.007	0.006	0.012	0.008	0.125
10	HH	1.50	8.88	8.88	0.007	0.006	0.012	0.008	0.125
10	HXB	1.50	8.25	4.81	0.007	0.006	0.012	0.008	0.188
10	LB	1.19	8.19	8.19	0.007	0.006	0.012	0.008	0.125
10	MA	1.19	8.00	4.31	0.007	0.006	0.012	0.008	0.125
10	MF	1.00	Keyed	Keyed	0.007	0.006	-	-	0.012
10	MFH	1.50	Keyed	Keyed	0.007	0.006	-	-	0.125
10	PL	1.19	Keyed	Keyed	0.007	0.006	-	-	0.125
11	MB	1.94	9.25	-	0.007	0.006	0.015	0.011	0.125
12	HD	1.94	8.88	-	0.009	0.006	0.012	0.008	0.125
12	HD (w/o ring)	1.94	8.63	-	0.009	0.006	0.012	0.008	0.125
12	HXB	1.50	9.75	2.25	0.009	0.006	0.012	0.008	0.125
12	HXH	1.94	8.44	8.44	0.009	0.006	0.012	0.008	0.063
12	LB	1.50	7.81	7.81	0.007	0.006	0.013	0.008	0.125
12	LD	1.50	7.06	7.06	0.011	0.009	0.015	0.010	0.188
12	LD (w/o ring)	1.50	6.75	6.75	0.011	0.009	0.015	0.010	0.188
12	LDT	1.50	7.13	7.13	0.011	0.009	0.015	0.010	0.125
12	LDT (w/o ring)	1.50	6.88	6.88	0.011	0.009	0.015	0.010	0.125
12	MB	1.50	9.38	3.13	0.007	0.006	0.015	0.011	0.188
12	MF	1.19	Keyed	Keyed	0.007	0.006	-	-	0.012
12	PL	1.19	Keyed	Keyed	0.007	0.006	-	-	MIDDLE
14	HH	1.69	9.00	9.00	0.007	0.006	0.015	0.011	0.063
14	HXB	1.94	9.72	3.44	0.008	0.007	0.016	0.010	0.125
14	LA	1.94	10.38	7.06	0.008	0.007	0.012	0.008	0.125
14	LC	1.94	9.56	9.56	0.008	0.007	0.012	0.008	0.125
14	LD	1.94	8.38	8.38	0.009	0.008	0.017	0.013	0.063

Size	Model	Shaft Dia.	B	C	D (max.)	D (min.)	E (max.)	E (min.)	Best Lateral
14	LD (w/o ring)	1.94	8.06	8.06	0.009	0.008	0.017	0.013	0.063
14	MD	1.94	9.88	7.50	0.010	0.007	0.016	0.010	0.125
14	MF	1.50	Keyed	Keyed	0.007	0.006	-	-	0.015
14	MFAH	1.50	Keyed	Keyed	0.007	0.006	-	-	0.015
14	PL	1.50	Keyed	Keyed	0.007	0.006	-	-	MIDDLE
15	LC	2.19	9.25	9.81	0.012	0.010	0.012	0.008	0.125
15	MA	2.19	9.81	-	0.012	0.010	0.015	0.011	0.125
16	HH	1.94	9.75	9.75	0.008	0.007	0.015	0.011	0.063
16	HXB	1.94	9.50	9.50	0.008	0.007	0.015	0.011	0.125
16	MC	1.94	9.75	9.75	0.008	0.007	0.018	0.012	0.063
16	MF	1.69	Keyed	Keyed	0.007	0.006	-	-	0.018
16	PL	1.50	Keyed	Keyed	0.007	0.006	-	-	MIDDLE
18	HH	2.19	Keyed	Keyed	0.012	0.010	0.019	0.012	0.063
18	HXB	1.94	8.38	8.38	0.008	0.007	0.015	0.011	0.063
18	MA	1.94	11.13	6.31	0.012	0.010	0.021	0.015	0.063
18	MF	1.94	Keyed	Keyed	0.010	0.007	-	-	0.018
18	MFAL	-	Keyed	Keyed	0.010	0.007	-	-	0.018
18	PL	1.50	Keyed	Keyed	0.007	0.006	-	-	MIDDLE
20	HH	2.19	Keyed	Keyed	0.013	0.010	0.019	0.015	0.063
20	HXB	2.19	10.56	10.56	0.013	0.010	0.018	0.014	0.063
20	MA	2.19	11.75	11.75	0.012	0.010	0.015	0.010	0.063
20	MF	1.69	Keyed	Keyed	0.007	0.006	-	-	0.020
20	MFAL	2.19	Keyed	Keyed	0.013	0.010	-	-	0.020
20	PL	1.50	Keyed	Keyed	0.007	0.006	-	-	MIDDLE
24	HH	2.44	Keyed	Keyed	0.013	0.010	0.019	0.015	0.031
24	HHOH	2.44	Keyed	Keyed	0.013	0.010	-	-	0.125
24	HXB	2.19	Keyed	Keyed	0.013	0.010	0.019	0.015	0.125
24	HXC	2.19	Keyed	Keyed	0.013	0.010	0.019	0.015	0.125
24	MA	2.44	Keyed	Keyed	0.013	0.010	0.018	0.014	0.063
24	MF	2.44	Keyed	Keyed	0.013	0.010	-	-	0.020
24	MFH	2.44	Keyed	Keyed	0.013	0.010	-	-	0.020
24	PL	1.69	Keyed	Keyed	0.007	0.006	-	-	MIDDLE
26	HH	2.94	Keyed	Keyed	0.013	0.010	0.019	0.015	0.125
26	HHOH	2.94	Keyed	Keyed	0.013	0.010	-	-	0.031
26	HXB	2.94	Keyed	Keyed	0.013	0.010	0.019	0.015	0.063
27	MA	2.94	Keyed	Keyed	0.013	0.010	0.020	0.016	0.063
28	HXB	2.94	Keyed	Keyed	0.013	0.010	0.021	0.017	0.031
30	HH	2.94	Keyed	Keyed	0.013	0.010	0.022	0.018	0.125
30	HHOH	2.94	Keyed	Keyed	0.013	0.010	-	-	0.031
30	LA	2.69	Keyed	Keyed	0.013	0.010	0.021	0.015	0.063
30	MF	1.69	Keyed	Keyed	0.007	0.006	-	-	0.026
30	MFAH	2.44	Keyed	Keyed	0.013	0.010	-	-	0.026
30	MFH	-	Keyed	Keyed	0.013	0.010	-	-	0.026
30	PL	2.19	Keyed	Keyed	0.013	0.010	-	-	MIDDLE
32	HXB	3.69	Keyed	Keyed	0.014	0.012	0.021	0.017	0.031
36	HH	3.69	Keyed	Keyed	0.014	0.012	0.025	0.015	0.125
36	HHOH	3.69	Keyed	Keyed	0.014	0.012	-	-	0.031
36	HXB	3.94	Keyed	Keyed	0.014	0.012	0.022	0.018	0.125
36	MA	3.69	Keyed	Keyed	0.014	0.012	0.018	0.014	0.125
36	MF	3.44	Keyed	Keyed	0.013	0.010	-	-	0.029
36	MFH	3.44	Keyed	Keyed	0.013	0.010	-	-	0.029
36	PL	2.44	Keyed	Keyed	0.013	0.010	-	-	MIDDLE
42	HH	-	Keyed	Keyed	0.014	0.012	0.025	0.015	0.125
42	HXB	3.94	Keyed	Keyed	0.014	0.012	0.022	0.018	0.125
42	MF	3.44	Keyed	Keyed	0.013	0.010	-	-	0.036

42	MFH	3.44	Keyed	Keyed	0.013	0.010	-	-	0.036
Size	**Model**	**Shaft Dia.**	**B**	**C**	**D (max.)**	**D (min.)**	**E (max.)**	**E (min.)**	**Best Lateral**
42	PL	2.44	Keyed	Keyed	0.013	0.010	-	-	MIDDLE
48	HH	3.94	Keyed	Keyed	0.016	0.012	0.028	0.019	0.125
48	HHOH	3.94	Keyed	Keyed	0.016	0.012	-	-	0.047
48	HXB	3.94	Keyed	Keyed	0.014	0.012	0.025	0.019	0.125
48	MF	3.44	Keyed	Keyed	0.013	0.010	-	-	0.042
48	PL	2.69	Keyed	Keyed	0.013	0.010	-	-	MIDDLE
54	MF	3.94	Keyed	Keyed	0.014	0.012	-	-	0.048
54	PL	3.19	Keyed	Keyed	0.013	0.010	-	-	MIDDLE
56	HH	4.25	Keyed	Keyed	-	-	-	-	0.063
56	HHOH	4.25	Keyed	Keyed	0.016	0.012	-	-	0.047
60	PL	3.94	Keyed	Keyed	0.014	0.012	-	-	MIDDLE
66	HH	-	Keyed	Keyed	-	-	-	-	0.063
66	MF	4.94	Keyed	Keyed	0.016	0.012	-	-	0.054

STARTING THE PUMP

Before attempting to start the pump, check the water level in the well or sump to be sure that the first impeller of the pump is submerged. **Do not operate the pump if the first impeller is above the standing water level. In this condition, the pump cannot be expected to pump water, and severe damage to the pump may result.**

Before attempting to start the pump, check the readiness of the following items:

- Level of oil in the reservoir
- Lubrication of the driver
- Oil-cooling connections for the driver (if applicable)
- Wiring of electric motor (if applicable)
- Impeller adjustment
- Discharge piping connection
- Shut-off valve in discharge pipe – should be ¼ open

Allow the sight valve to operate for approximately ½ hour before starting the pump. This is especially important if the pump has been sitting idle for some time after installation.

If the pump does not discharge air or fluid immediately after start-up, shut it down.

For pumps in which the enclosing tube was tensioned by wrenching the tube nut, check for leakage at the tube nut gasket. If the gasket does not seal properly, the tube nut must be tightened. With the pump shut down, work through the hand holes to tighten the tube nut to ensure adequate seal at the gasket.

After the pump is started, check for any unusual noises and excessive vibration. If either is present, shut the pump down and investigate the cause of the problem.

If the pump is started with the check valve open and the pump is operating against the system head, slowly open the discharge valve until the pump is operating at its designed dis-charge pressure. If the system head was correctly calculated, the pump should operate at its design condition with the discharge valve completely open.

Operation of the pump away from its intended design conditions could have adverse effects on its efficiency and service life.

LONG-TERM STORAGE OF VERTICAL PUMPS

Preservation/packaging:

1. Coat exposed/extended section of impeller shaft, shaft coupling, column pipe coupling (or flange) and all exposed machine surfaces that are not painted. Coating shall be KENDCOTE – 60 or equal.
2. Coat column threads and inside couplings (or flange) faces with KENDCOTE – 60 or equal.
3. Coat column shafting if steel or 400 series stainless on all surfaces with KENDCOTE – 60 or equal.
4. Coat discharge head machined surfaces I.E. flange face and register surface for top column flange, motor and packing container with KENDCOTE – 60 or equal.
5. Apply KENDCOTE – 60 or equal to all machined surfaces of packing container if not installed.
6. Place packing rings in plastic bag and secure to pump discharge head.
7. Cover pump suction with cardboard or wood, do not seal air tight.
8. Cover equipment with a vented or breathable material to prohibit the build up of dust and dirt.

NOTES:

Stainless steel 300 series or better components should not be painted and do not require the above preservation.

KENDCOTE – 60 is removed by using petroleum-based solvent.

Storage:

Store the equipment in as protected an area as is available. If the pump **is not** designed for water flush to the bearings, before placing the pump in service, remove the suction manifold. Remove and flush out all of the original grease. Install new grease in the bearings and reinstall the suction manifold.

NOTICE:

Materials of construction, specifications, dimensions, design features, and application information, where shown in this manual, are subject to change and/or modification without notice by Peerless Pump at their option.

WARRANTY:

New equipment manufactured by Seller is warranted to be free from defects in material and workmanship under normal use and service for a period of one year from date of shipment; Seller's obligation under this warranty being limited to repairing or replacing at its option any part found to its satisfaction to be so defective provided that such part is, upon request, returned to Seller's factory from which it was shipped, transportation prepaid. This warranty does not cover parts damaged by decomposition from chemical action or wear caused by abrasive materials, nor does it cover damage resulting from misuse, accident, neglect, or from improper operations, maintenance, installation, modification or adjustment. This warranty does not cover parts repaired outside Seller's factory without prior written approval. Seller makes no warranty as to starting equipment, electrical apparatus or other material not of its manufacture, since the same are usually covered by warranties of the respective manufacturers thereof.
In the event, notwithstanding the terms of this agreement, it is determined by a court of competent jurisdiction that an expressed warranty has been given by Seller to Purchaser with respect to the head, capacity or other like performance characteristics of said equipment, Seller's liability for breach of the same shall be limited to accepting return of such equipment F.O.B. plant of manufacture, refunding any amount paid thereon by Purchaser (less depreciation at the rate of 15% per year) if Purchaser has used equipment for more than thirty (30) days and canceling any balance still owing on the equipment.
THIS WARRANTY IS EXPRESSLY IN LIEU OF OTHER WARRANTIES, EXPRESSED OR IMPLIED, AND SELLER SPECIFICALLY DISCLAIMS ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

Rev. 7/27/21