INSTALLATION, OPERATION AND MAINTENANCE FOR CENTRIFUGAL PUMPS TYPE - LR/LN/U

Split Case

CONTENTS

I. INTRODUCTION

1.1 General

Sterling products are the result years of experience in building pumps. With proper maintenance, this pump will give you trouble free service at a minimum of maintenance and repair costs.

This instruction book is directed to the engineering and maintenance personnel to give the most important details for installation, starting up and maintenance of these pumps to avoid trouble and to reduce costs to a minimum.

This instruction book contains a description and guide lines for the Horizontal Axial Split type Pumps and the most important special versions of this type. We have tried to make these instructions as complete as possible, but we could not go into every detail of construction within the scope of this instruction book. Therefore, if you need further information not contained in this book, we request you to contact the nearest Sterling Sales Office.

1.2 Guarantee

We take full guarantee as agreed with you on your order. If any of the conditions of service of your order are going to be changed for example, medium to be pumped, temperature, rated capacity & head, it is requested that before the start-up of the pump you ask for our written agreement.

We will not be responsible for any damages which happen because the instruction book was not chec ked.

Any changes and repairs during the time of guarantee have to be done through our service person or after written agreement from our side through other specia-lized personnel. If there is no experienced personnel available for repairs after the guarantee period, we recommend that you send the pump into our plant or request for a service person from us.

For the first start-up of the pump, we recommend that you order a service person from Sterling for checking the proper installation, to perform the proper start-up, and to teach the local maintenance people accordingly.

ATTENTION : Do not operate this equipment in excess of its rated capacity, speed, pressure and temperature, nor otherwise than in accordance with the instructions contained in this Mannual. This equipment (or a prototype) has been shop-tested and found satisfactory for the conditions for which it was sold, but its operation in excess of these conditions will subject it to stresses and strains which it was not designed to withstand. Failure to heed this warning may result in an accident causing personal injury.

1.3 Take Over

Immediately after receipt of the equipment it must be checked according to the shipping papers for quantities and to ensure that it has not been damaged in transit. Be sure to check the box, some parts or accessories might be packed separately or attached on the side walls of the box. Any damage or shortages to be immediately reported to transporter and transporter’s acknowledgement for same should be obtained.

1.4 Storage

If the pump will not be put immediately into service it should be stored in a dry room. It is important that the sealing faces of the flanges and all machined surfaces are protected properly against moisture with an anti-rust compound.

The bearing and coupling should be protected against intrusion of sand, grit or other foreign matter. If moisure is present apply heavy grease between watershield and bearing cover to avoid moisure entering bearing housing.

1.5 Extensive, Long Storage Period

Pump must be stored in dry environment away from any moisure. In case of long storage periods exceeding 3 months the preservation must be renewed. Moreover, we recommend to order a Sterling Service Engineer for checking the pump before first start-up. Water soluble rust preventive should be poured through casing vent holes until it appears from stuffing box.

II. INSTALLATION

2.1 Location of pump

The unit should be so placed that it is accessible; pay due attention to the simplification of the suction and discharge piping layout. In general, and particularly when the influence of suction pipe losses is a vital factor, pumps should be installed close to the liquid supply. Limit the use of elbows, tees, and other fittings to a minimum.

In order to prevent distortion and misalignment, support and brace all piping to counteract strains due to weight and pipe expansions when heated.

When pumps are of large size, provide head room and lifting apparatus for overhaul. Motor driven units, when used in an unusually damp atmosphere, should be given special consideration.

2.2 SUCTION LIFT & NPSH

In an ordinary individual pumping installation it is recommended that static suction lift does not exceed 10 feet and foot valve, pipe friction & strainer losses may amount to an additional 4 to 5 feet.

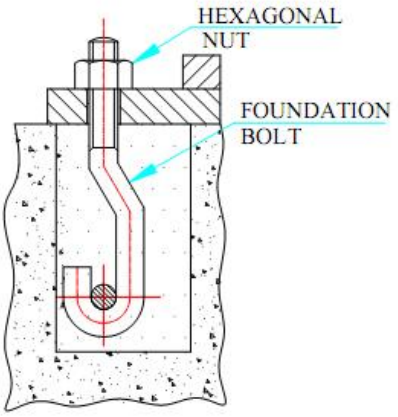
NET POSITIVE SUCTION HEAD

The NPSH required varies with every size of pump and for any given pump it varies with the capacity. The NPSH required by your unit can be obtained from the performance curves available from your Sterling representative.

2.3 FOUNDATION

The foundation should be made to form a permanent, rigid support for pump, driver and baseplate. the baseplate should be mounted on a raised pedestal above the ground level to protect the motor and pump from possible flooding. A concrete pedestal foundation on a solid base should be satisfactory. the pedestal foundation should extend 9” TO 12” beyond the baseplate ; the top of the pedestal should be rough for grouting.

The purpose of foundation bolts is to anchor the pump unit to the foundation, or pedestal, so that the foundation and pump unit become single structural unit. The foundation bolt should be enclosed in a pipe sleeve three or four diameters larger than the bolt. See Fig. 2 for typical design. The pipe sleeve allows the bolt to be moved to compensate the slight errors in bolt location. the foundation bolts are hold or supported by a wooden template or frame while the foundation is being built around them. The dimensions required to construct the frame of template should be obtained from the elevation drawing or by measuring the baseplate directly.



'J' TYPE FOUNDATION BOLT

Fig.1.

2.4 CONNECTION OF DELIVERY & SUCTION PIPE

Suction Piping - Experience has shown that the greatest amount of troubles with centri-gugal pumps by far outside of misalignment, can be traced to a faulty suction line. We would emphasize that attention be given to this point when installing a pump. The suction piping should never be less in diameter than the full size of the pump suction opening. It should be as short and direct as possible. In case where a long suction line cannot be avoided, the size of the piping should be increased. Air packets or high spots in a pump suction line will nvariably cause trouble. The piping must be laid so as to provide a continual rise without high spots from the source of supply to the pump. The suction pipe should project into the well or source of supply a sufficient amount to insure that the pipe is adequately submerged when the water is at its lowevet level, with the pump operating. Large pipes are usually submerged four times their diameter while small pipes require from two or three feet submergence. The suction pipe should be blanked off and hydrostatically tested for air leaks before starting up.

Foot valves are sometimes necessary but they add to the suction-side frictional losses.

On important installations it is recommended that automatic priming apparatus be employed instead of foot valves unless the use of same is imperative. When a foot valve is used on the end of the suction pipe, care should be exercised in the selection of size and type in order to avoid disproportionate friction losses.

Strainer - When a strainer is placed in the suction pipe to prevent lodgment of foreign material in the impeller, it should have a net area of from three to time times the area of suction pipe. The net area is understood to mean the clear and free opening through strainer. If the strainer is likely to become frequently closed, an accessible place should be selected for the suction pipe. Twin strainers located accessibly are recommended. For large pumps, removable or mechanically operated screens should be plaed at the entrance to the suction well.

NOTE: Strainers and other suction side fittings should be installed as free as practicable from high spots in which air can accumulate.

DISCHARGE PIPING - The discharge piping should be selected with a diameter one size larger than the discharge opening of the pump if economical practical. It is very important that the pipe be independently supported near the pump so that no strains will be transmitted to the unit. External loads caused by the pipe cause misalignment with subsequent failure of bearings and internal parts. Provisions that are made for pipe expansion on hot services should also avoid placing strain on the pump.

A check valve and a gate valve should be installed near the pump outlet. The check valve provides protection from back flo. On units having no suction foot valve, the check valve eiliminates thre possibility of the pump rotating in the wrong direction if for any reason the driver ceases to function. Before securing the piping, flush the pump and piping to be sure they are clear of foreign material. Also check the flanges for both lateral and angular misalignment. Piping must be concentric and square before final bolting.

Drain Piping - All drain connections should be piped to a pump pit or suction well so that the drain water will be properly carried away.

2.5 ALIGNMENT OF PUMP & MOTOR

Shaft alignment is the most important consideration in pump installation. Pump-driver combinations are aligned at the factory, but baseplates can be sprung the shipment or distorted by unequal tightening of foundation bolts, so they must be checked before are put in service.

Pumps of hot service must have final coupling alignment made with the unit at its operating temperature.

Pumps are generally shipped mounted, and it is usually unnecessary with units of moderate size to remove the pump or driver from its baseplate when leveling. The unit should be placed over the foundation bolts, allowing for grouting from three quarters to two inches space between the bottom of the baseplate and the top of the foundation.

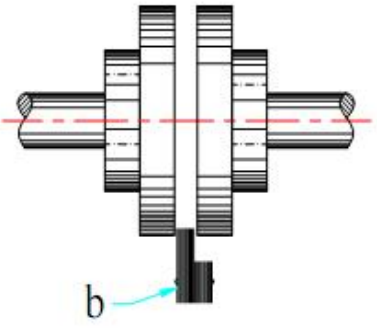
Remove coupling bolts before proceeding with leveling of unit and alignment of coupling halves.

Employing a small spirit level, the projecting edges of the pads supporting pump and motor feet when scrapped clean can be used for leveling the baseplate. Where possible, it is preferable to place the level on some exposed part of the pump shaft, sleeve or planed surface od casing. Adjust the wedges under baseplate till pump shaft is level and flanges of suction and discharge nozzles, vertical or horizontal as required, at same time observe that the pump is at the specified height, and location.

While proceeding with the leveling of pump and base, maintain at the same time accurate alignment of the unbolted coupling halves between pump and driver shafts.

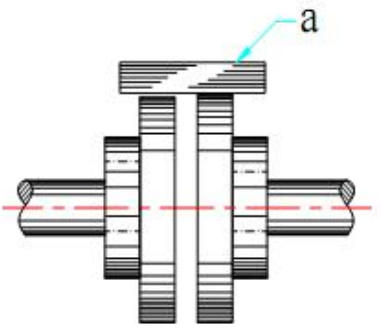
Alignment - The procedure followed when checking driver and driver shaft alignment is as follows:

Place a straight edge across the top and side of the coupling, and at the same time check the faces of the coupling halves for parallelism by means of a tapered thickness guage or feeler gauges, as shown in Fig. 2 and 3.



METHOD OF CHECKING COUPLING ALIGNMENT.

Fig.2.



METHOD OF CHECKING COUPLING ALIGNMENT.

Fig.3.

squarely across the rims at any point. If the faces are not parallel, the thickness gauge or feelers will show a variation at different points. If one coupling is higher than the other, the amount may be determined by the straight-edge and feller gauges.

Maximum coupling life with a minimum of maintenance may be obtained if the coupling is aligned properly at installation. Generally, permissible angular and parallel misalignment is 0.005" for motors up to 75 hp and 0.010" for motors above 75 hp.

Space between faces of coupling - The clearance between the faces of the couplings and the end of shafts should be set so that they cannot touch, rub or exert a pull on either pump or driver. The amount of this clearance may vary with the size and type of coupling used. The best rule to follow is to allow sufficient clearance for unhampered endwise movement of the shafts of the driving element to the limit of its bearing clearance. On motor driven units, the magnetic center of the motor will determine the running position of the motor half coupling. It is recommended that this position be checked by operating the motor while disconnected. At this time, check also direction of rotation of motor. If current is not available, move motor shaft in both directions as far as bearings will permit then adjust shaft centrally between these limits, thereafter assembling the unit with the cprrect gap between coupling halves. When the unit is accurately levelled and aligned, the holding down bolts should be gently and evenly tightened previous to grouting.

GROUTING

The purpose of grouting is to prevent lateral shifting of the baseplate, not to take up irregularities in the foundation. We recommend the following procedure:

The typical mixture for grouting-in a pump base is composed of one part pure portland cement and two parts building sand with sufficient water to cause the mixture to flow freely under the base.

The top of the rough concrete foundation should be well saturated with water before grouting. A wooden form should be built around the outside of the baseplate to contain the grout

(Fig. 4) In some cases this form is placed tightly against the lower edge of the base, and in other cases it is placed a slight distance from the edge of the baseplate. Grout is added until the entire space under the base is filled. The grout holes in the base are provided to serve as filling and vent holes. A stiff wire should be used to work the grout and release any air pockets.

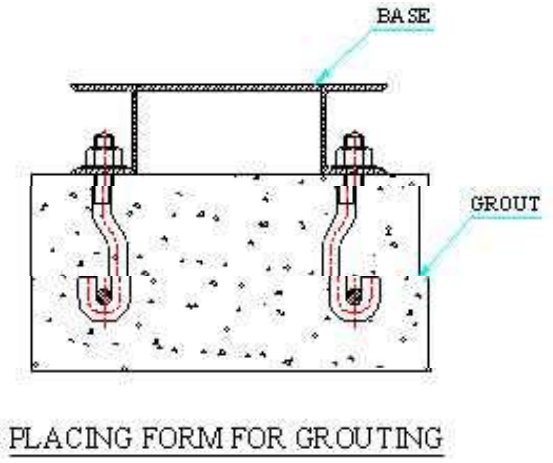


Fig.4.

After the grouting is poured, the exposed surface should be covered with wet burlap to effect slow drying to prevent cracking. When the grout is set (about 48 hours) remove the forms and smooth the exposed surface, if desired. The grout should be hard in approximately 72 hours.

IMPORTANT: Alignment must be rechecked, after suction and discharge piping have been bolted to pump, to test the effect of piping strains. When handling hot liquids, the nozzle flanges, after the unit has been in service, should be disconnected to check in which direction the expansion of the piping is acting, correct for the effect of the strains as required.

An approval method for finally putting the coupling halves in alignment is by the use of a dial test indicator.

1. Move the driver as required, including shimming from or back till the coupling faces are parallel.
2. Bolt the indicator to the pump half of the coupling. With the button resting on the other coupling periphery, set the dial to zero and chalk-mark the coupling half at the point where the button rests. For any check, top or bottom or sides, rotate both shafts by the same amount, i.e. all readings on the dial must be made with its button on the chalk mark.

The dial reading will indicate whether the driver has to be raised or lowered or moved to either side. After any movement, check that the coupling faces remain parallel to one another.

EXAMPLE: If the dial reading at the starting point is set to zero and the diametrically opposite reading at the bottom or sides shows a plus or minus 0.020 In. the driver has to be raised or lowered by shimming or moved to one side or the other by half of this reading.

NOTE: For all checks including that for parallelism of coupling faces, keep both shafts pressed hard over to one side when taking the readings.

III OPERATION

3.1 DRIVER:

For all driver information, reference should be made to the Manufacturer's instruction Tag or Booklet attached to the unit or crate.

On motor driven units check motor Characteristics on nameplate and connect wiring in accordance with attached instructions tag. Check rotation of shaft against direction arrow on pump casing.

3.2 PRIMING:

A centrifugal pump should never be operated unless first filled with water, as in addition to the impossibility of pump delivering water when operated dry, wearing rings are likely to seize and cause serious damage. There are two methods to prime a pump when operating on a suction lift. The first method is to fill casing with water from some outside source until suction pipe and casing are completely filled with water. This method requires a foot valve installed in suction line. Care must be taken to exhaust all air from suction pipe and pump casing, as any air that remains entrapped will interfere with operation or hinder pump from lifting its water. On fire pump installations it is generally recommended to fill suction pipe and casing from a priming tank located above pump and connected to discharge side of pump before check valve.

The second method of priming a pump when operating on a suction lift is by use of an ejector or exhauster. The motive source can be steam, high-pressure water or compressed air. The ejector is usually attached to casing vent hole, however, on fire pump installations ejector is installed on line connected to discharge pipe before check valve. With this method of priming foot valves are not necessary. Priming may also be accomplished by use of wet-type vacuum pump. The procedure is same as priming by ejector. Priming on pumps when operating on a positive head may be accomplished by opening suction valves and allowing casing to fill with liquid. Open vent valve on top of casing to release all entrapped air.

3.3 PRELIMINARY TO STARTING

Read the instruction book thoroughly before starting the unit. Make sure the following items are checked before starting:

1. Alignment
2. Check the direction of rotation of the drier with the coupling halves disconnected
3. Check bearing lubrication as indicated in "Maintenance" section. On lubricated pumps are shipped from the factory without oil.
4. For pumps equipped with packed boxes, the gland nuts must be loose.
5. The pump must be filled with liquid. If a priming device is used, it must be operating before the pump is started.

Starting & Operating - Connect a compound gauge to suction of pump and a pressure gauge to discharge flange of pump. Both flanges are drilled and tapped with 1/4-18 NPT. It is advisable to furnish shut-off valves between flange gauge connections and gauges. The gauge are necessary for an adequate check on pump performance.

Before starting and especially for the first time with oil-lubricated bearings, with the oil cold and bearing surfaces comparatively dry, it is important to revolve the rotor a few times either by hand or, with the pump filled with water, by momentarily operating the starting switch (if the procedure does not overload the motor). This starts a flow at oil to the bearing surfaces.

When satisfied that the pump may be put in the line, close vent valves and open the discharge valve slowly. At this point if the absolute pressure on suction gauge shows a considerable drop compared to the pressure with the pump at rest, or if discharge pressure does not register the moment the rotor is at or near operating speed, stop the driver and check up on all valve openings on suction side. Do not operate till certain there is a free and ample supply of water and no obstructions in piping.

In some installations after the first starting operation, the discharge line is full of liquid, this liquid on upper side of discharge check valve imposes a head on pump of sufficient magnitude for starting purposes. It is possible in these cases after priming or venting to fill casing with water, to start the pump with both suction and discharge gate valves open.

Bearings - The bearings should be carefully watched for signs of over-heating.

Glands - The glands should be scrutinized to make sure that they are not cracked and rubbing on shaft sleeves, causing cutting, overheating and overloading of motor. Always allow a drip or small stream of water to issue from glands, this lubricates the packing which will burn if dry. A seepage rate of 60 drops/min should assure proper packing lubrication.

Operating at low capacity - Do not operate a pump for long periods at low capacity on account of the possibility of overheating from churning. If this is necessary, install a permanent bypass from the discharge to the suction of a size equal to 1/5th the size of the discharge pipe. Regulate this bypass for extreme low capacity operation. Be prepared to close the bypass by hand or automatically if there should be a demand for greater capacity.

Gland nuts to be loose at starting - With a low suction pressure, the glands should be left quite loose with most forms of packing, until the pump is in operation. This allows liquid to flow freely through the stuffing box; do not repack a stuffing box on account at a slight burning at the packing at starting unless absolutely necessary to keep down excessive gland leakage.

Stopping - Normally there is a check valve in the discharge line close to to pump. In such a case the pump can be shut down by stopping the motor. The valves should then be closed in the following order: discharge, suction, and any other connections leading to the pump or system.

Pumps can usually be stopped in this manner with the discharge gate valve open. In some installations, however, surges in the piping may impose heavy shocks on both lines and pump. when the flow of high-pressure water is arrested. In such cases, it is good practice to first shut the discharge gate valve, this entirely eliminates shock.

A pump will partly drain through the glands if left standing for some time and for this reason, always prime the pump at starting up.

If the pump is required for emergency use, and is alays primed, if is not necessary to close suction and discharge valves. Under this condition, the glands may leak due to sustained pressure on a stationary shaft. Do not tighten the gland nuts unless prepared to loosen them again, at starting.

Centrifugal pumps should operate for long periods with practically an attention other than to observe that at all times there is a drip of liquid from the glands, and the bearings are properly lubricated.

Periodic examination - The pumps should be opened out for examination at intervals of about twelve months.

Pumps not in use - Rotors of pumps, for any reason not in service, should be revolved by hand or power one per week.

3.4 CHECKLIST FOR OPERATING DIFFICULTIES

TEN SYMPTOMS

1. Pump does not delivery water :	1-2, 3-4, 6-11-14-16-17-22-23
2. Insufficient capacity delivered :	2- 3-4-5-6-7-8-9-11-14-17-20-22-23-29-30-31
3. Insufficient pressure developed:	5-14-16-17-20-22-29-30-31
4. Pump loses prime after starting:	2-3-5-6-7-8-11,12-13
5. Pump requires excessive power:	15-16-17-18-19-20-23-24-26-27-29-33-34-37
6. Stuffing box leaks excessively:	13-24-26-32-33-24-35-36-38-39-40
7. Packing has short life:	12-13-24-26-28-32-33-34-35-36-37-38-39-40
8. Pump vibrates or is noisy:	2-3-4-9-10-11-21-23-24-25-26-27-28-30-35-36 41-42-43-44-45-46-47
9. Bearing have short life:	24-26-27-28-35-36-41-42-43-44-45-46-47
10. Pump overheats and seizes:	1-4-21-22-24-27-28-35-36-41

FORTY-SEVEN POSSIBLE CAUSES OF TROUBLE

Suction

1. Pump not primed.
2. Pump or suction pipe not completely filled with liquid.
3. Suction lift too high.
4. Insufficient margin between suction pressure and vapor pressure.
5. Excessive amount of air or gas in liquid.

suction line.
into suction line.
into pump through stuffing boxes.
small.
valve partially clogged.
of suction pipe insufficiently submerged.
Water-seal pipe plugged.
in stuffing box,
preventing sealing fluid entering space to seal.

System Troubles

14. Speed too low
15. Speed to high
16. Wrong direction of rotation.
17. Total head of system higher than design head of pump.
18. Total head of system lower than pump design head.
19. Specific gravity of liquid different from design.
20. Viscocity of liquid differs from that for which designed.
21. Operation at very low capacity.
22. Parallel operation of pumps unsuitable for operations.

Mechanical Troubles

23. Foreign matter in Impeller.
24. Misalignment.
25. Foundations not rigid.
26. Shaft bent.
27. Rotating part rubbing on stationary part.
28. Bearings worn.
29. Wearing rings worn.
30. Impeller damaged.
31. Casing gasket defective permitting internal leakage.
32. Shaft or shaft sleeves worn or scored at the packing.6. Air pocket in
33. Packing improlerly installed.7. Air leaks
34. Incorrect type of packing for8. Air leaks operating conditions.9. Foot valve too
35. Shaft running off center because10. Foot of worn bearings or misalignment.11. Inlet
36. Rotor out of balance resulting in12. vibration.13. Seal cage improperly located
37. Gland too tight resulting in no flow of liquid to lubricate packing. form the
38. Failure to provide cooling liquid to water-cooled stuffing boxes.
39. Excessive clearance at bottom of stuff ing box between shaft and casing, causing packing to be forced into pump interior.
40. Dirt or grit in scaling liquid, leading to scoring of shaft or shaft sleeve.
41. Excessive thrust caused by a mechani- cal failure inside the pump or by the failure of the hydraulic balancing
42. Excessive grease or oil in antifriction- bearing housing or lack of cooling, causing excessive bearing temperature.
43. Lack of lubrication.
44. Improper installation of antifriction bearings (damage during assembly, incorrect assembly of stacked brg., use of unmatched brgs. as a pair,etc)
45. Dirt getting into bearings.
46. Rusting of bearings due to water getting into housing.
47. Excessive cooling of water-cooled brg. resulting in condensation in the

IV. MAINTENANCE

4.1 ROUTINE MAINTENANCE

The following check should be carried out and records maintained as per details furnished hereunder :

DAILY CHECKS

i. Bearings Lubrication and Temperature
ii. Temperature of Motor Bearings.
iii. Ampere, Voltage, Suction & discharge pressure.

PERIODICAL MAINTENANCE

I. Change of oil/grease in Bearing housing as per instruction given in manual.
ii. Greasing of motor bearings as per motor manufacturer instruction
iii. Adjustment of Gland packing / change of Gland packing, in case of leakage.

OVERHAULING

We suggest that the pump should completely be dismantled after first 10000 hours of operation or 15 months from the date of commissioning whichever is earlier, to ascertain the nature of wear on pump parts etc. After overhauling one or two pumps the frequency of overhauling can be suitably determined, based on the wear of parts noticed during disassembling of first one or two pumps.

4.2 PACKING

The major part of the packing box troubles are due to excessively tight or unevenly tightened packing, especially during the first hours of operation.

WE WOULD CALL THE ATTENTION OF THE USER ON THE FOLLOWING RECOMMENDATIONS

Tighten moderately and gradually the packing box gland and allow drop by drop leak to lubricate, run-in and cool-down the packing.

Over tightening would immediately damage the packing.

Replace packing as packing box cap comes against the packing box. To replace packing, follow up this procedure.

- remove in succession gland, packing-ring and eventually lantern and end packing.
- prepare bevel cut packing rings carefully made at dimensions of recess. These packing rings should be of same grade as original packing.
- Insert the packing rings by staggering the bevel cuts and fit the lantern in original position. Re-install the gland and tighten down gradually.

4.3 BEARINGS

Grease lubricated bearings

Starting New Pumps - All pumps with grease-lubricated bearings are greased at the factory. As a secondary precaution, regrease the bearings before starting the unit so as to insure proper lubrication.

Lubrication Schedule - Grease-lubricated bearings should have grease added every 1,000 hr. depending on both the severity of the service and the surroundings.

Grease Specifications - Only bearing grade grease should be used. Never use Pink Grease. Use Lithium based grease suitable upto 100$_o$C.

Over and Under Lubrication - Care must be taken to avoid under and over-lubrication. While neglected bearings fare prematurely from contaminated old grease. Over- lubrication will cause the bearing to run hotter than normal. To remedy this condition, remove the 1/4 In. drain plugs from the bottom pf the housings and let the excess grease drain out while the pump is running. The temperature should stabilize after the pump is run for a while. If the heating persists, refer to instructions on coupling and piping alignment.

Greasing Instructions - 1/3 to 1/2 of the volume in the housing should be filled with grease for normal applications. This will give the most ideal operating conditions. The following greasing procedure is recommended. Remove the 1/4 In. pipe plugs from the top and bottom of both bearing brackets. While the pump is running, force new grease through the grease fittings until there is visual evidence that grease has been forced through the bearing. If necessary, shine a light into the housing through the opening on the top so that a visual observation can be made. As soon as grease is forced through the bearing do not add any more. In the event that too much grease has been added, let the pump run a while without the plugs until all of the excess grease has been expelled.

4.4PUMP INSPECTION AND DISASSEMBLY

INSPECTION

Hourly or daily observations should be made of pump operations to avoid trouble. Whether or not you consider a log of these inspections necessary, the operator must be alert for irregularities in the operation of the pumps. He should immediately report any trouble symptoms which he detects. Stuffing box operation and bearing temperatures should be checked once a day. An abrupt change in bearing temperature is much more indicative of trouble than a constant high temperature. A change in the sound of running pump is also a warning of possible trouble.

SEMI-ANNUAL AND ANNUAL INSPECTIONS

Check for free movement of the stuffing box glands and clean and oil the gland bolts and nuts. Closely observe the stuffing box for excessive leakage which cannot be reduced by gland adjustment and replace packing, if necessary. Check the pump for capacity and discharge pressure to determine, if new rings, bearings, etc. maybe required.

COMPLETE OVERHAULS

Frequency of a complete overhaul depends on the hours of operation of the pump, the severity of the condition of service, the materials used in the pump construction, and care the pump receives in operation. Do not open your pump for inspection, unless there is definite evidence that the capacity has fallen of excessively or unless there is indication of trouble inside the pump or in the bearings.

DISMANTLING PROCEDURE

Great care must be exercised in the dismantling operation. Close the suction and discharge valves and drain the liquid from the casing.

NOTE :- When dismantling, for convenience at reassembly, lay out all parts in the order in which they are removed. Protect all machined faces against metal-to metal contact and corrosion.

Proceed as follows:

1. If bearings are oil lubricated, drain housings and remove oilers.
2. Disconnect the coupling halves. If oil-lubricated couplings are used, drain the oil before unbolting.
3. Disconnect glands from casing by unscrewing nuts from gland studs. If glands are of the split type, remove completely. (Split glands are standard on LRG pumps)
4. With a suitable punch, drive out the two straight rull pins which are used at the horizontal split to align the upper and lover casing half.
5. Remove the bolts which hold the upper and lower half of the casing together and remove the upper half as described under section tilted " Method of Lifting Casing Upper Heaf"
6. Remove the three bolts on both sides of the pump which hold the bearing housing bracket to the casing. Remove dowel bushings as indicated under section tilted "Method of Removing Dowel Bushings".
7. Lift out rotor assembly. Use care in slinging and handling of the rotor.
8. Loosen bearing covers and remove bearing housing.
9. Remove ball bearings and covers.
10. Remove glands, packing and seal cages.
11. Remove shaft sleeve nuts and shaft sleeves.
12. Remove impeller, casing rings and impeller key.

As the pump and rotor are dismantled, all individual parts, all important joints and all wearing surfaces should be carefully examined. As a general rule, regardless of the performance of the unit, parts appreciably worn should be renewed if it is not intended to examine the pump unit the next overhaul period. It should be remembered that when parts (in new of good condition) with metal seats are assembled in contact with dirty or worn parts, the new parts are very likely to wear out rapidly.

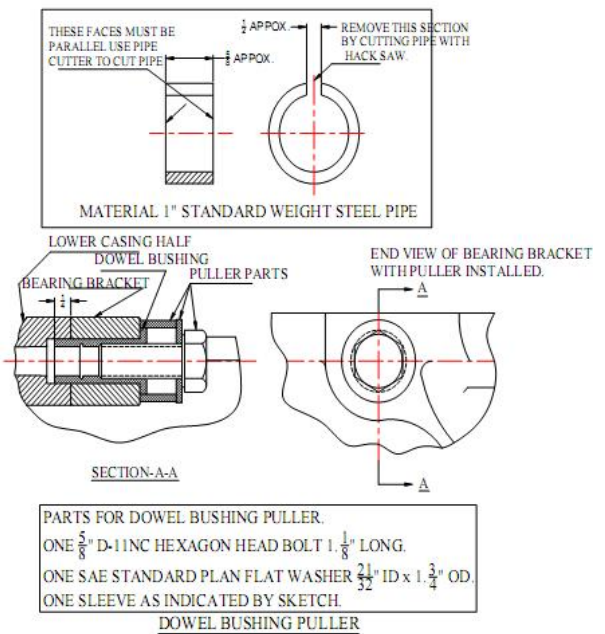


Fig.5.

Method of Removing Dowel Bushings -

As shown in sectional drawings, accurate alignment between the casing and brackets is obtained with the use of straight hollow dowel bushings. Two dowel bushings are used on each bearing housing bracket. A tool for removing the dowel bushings can be made very easily and cheaply as indicated in Fig. 6. The dowel bushings have internal threads (5/8 D 11-NC) which are used for milling the dowels. See Fig. 5 which shows the Dowel Bushing Puller installed in position as shown, tighten the hexagon head bolt to remove dowels.

Dowel bushings are made from a corrosion resistant steel. Before reinstalling the bushings, coat the O.D. with pipe compound. This will make it easier to remove the bushings the next time the pump is dismantled.

Method of Lifting Casing Upper Half:

To lift the casing upper half remove the pipe plug , If used, from the volute vent connection located on the top of the casing upper half. Install one of the following lifting devices:

a) Special steel eye bolt with a thread shank to match the pipe top opening in the casing.
b) Steel nipple and tee with a steel bar inserted thru the open ends of the tee for the sling attachment.

4.5 REASSEMLY

To assemble the pump reverse the dismantling procedure previously described, except for packing and seal cage instructions.
Before bolting the bearing housing brackets to the casing, coat the faces of the brackets with shellac or permatex. This will prevent leakage from the stuffing box from leaking thru the joint where the bracket joins the casing.

NOTE: When re-assembling the impeller on the shaft, it is important to mount the impeller so that the vane tips point away from the apparent flow direction. The rotor always rotates towards expanding sections of the volute.

Install the rotor in the casing and check to see that the rotor turns freely by hand. Wearing surfaces at the impeller must not touch. Allign the pump carefully. Install packing and seal cage (see packing procedure).

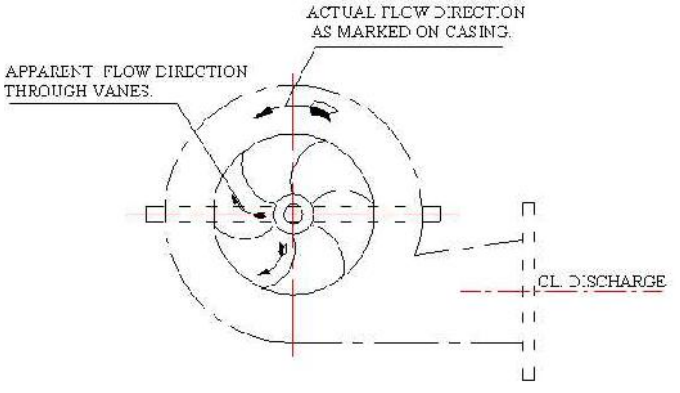


Fig.6.