www.sintechpumps.com

Sintech Precision Products Limited
C-189/190, Bulandshahar Road Industrial Area,
Site No. 1, Ghaziabad – 201001 (U.P.), INDIA.
Ph.: +91-120-4176000, 3290637/38, 2866320/21
Fax: +91-120-2867715
Email: sales@sintechpumps.com

INSTALLATION OPERATION AND MAINTENANCE MANUAL FOR SINTECH VERTICAL TURBINE PUMPS

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WARRANTY

1. SINTECH PRICISION PRODUCTS LIMITED warrants products of its own manufacture only against defects in materials and workmanship under normal use and service for one year from the date of installation, commissioning but not more than eighteen months from the date of shipment from factory which ever is earlier.
2. Our liability in respect of any complaint is limited to replacing part / parts only to the extent that such replacement / repair are attributable to or arise solely from facility workmanship or defective material.
3. Accessories and component not manufactured by SINTECH are warranted only to the extent of the original manufacture's warranty.
4. No allowance will be made for repairs or alteration affected without specific written authorization from SINTECH.
5. The equipment as manufactured by SINTECH is precision machinery. Proper care can give a lifetime of **satisfactory service. Guarantee of performance and warranties** are based on the use of original equipment manufactured (OEM) parts. SINTECH takes no responsibility, when alteration none authorized design changes and / or none OEM replacement parts are incorporated.
6. This warranty is void unless purchases provides proper storage, installs and maintains the equipment in accordance with manufactures instructions.
7. Under the terms of this warranty SINTECH will not be responsible nor liable for-
    (a) Consequential special looser damages.
    (b) Equipment condition caused by fair wear and tear, abnormal conditions of use, accident, misuse or neglect of equipment.
    (c) Labor charges, loss or damage resulting from supplying defective parts or improper repairs by unauthorized person.
    (d) Damage caused by abrasive materials, chemicals, scale deposit, corrosion, lighting, improper voltage or mishandling.
    (e) Labor charges for installation or removal or reinstallation of equipment.

Immediately on receipt a complete inspection and accounting against the packing list should be made and accompanying boxes and crates. All material is shipped FOB our factory or our vendor's shipping point unless other contractual arrangements are made under these terms; any claim for loss or damage in transit should be made to the delivering freight casing and copy to shipping party.

NOTE:-

AS PER THE COMPANY'S POLICY OF CONTINUOUS IMPROVEMENT, THE SPECIFICATIONS & DATA GIVEN IN THIS MANUAL ARE SUBJECT TO CHANGE FROM TIME TO TIME WITHOUT NOTICE.

TABLE OF CONTENTS:

WARRANTY:

INSTRUCTION FOR ERECTION OPERATING MAINTENANCE OF VERTICAL PUMP

1. INTRODUCTION.

These vertical turbine pumps are manufactured to close tolerances and rigid specification. Hence proper erection and maintenances is equally important to ensure trouble free service.

This manual covers important guidelines and instructions on erection, operation and maintenances. This instruction should be followed carefully failing which may result in the unsatisfactory performance/damage to the pump.

Only mechanical aspects are dealt in this manual. Civil and electrical engineering details are to be finalized by client.

This manual covers instruction for vertical turbine pump with following constructional features:

1. **Self water lubricated pump.**
2. External forced water lubricated pump.
3. Oil Lubricated pumps.
4. Delivery above ground level.
5. Delivery below ground level.
6. Grease lubricated anti friction thrust bearing.
7. Oil lubricated Mitchell type thrust bearing.
8. Solid shaft motor drive.
9. Hollow shaft motor drive.
10. Right angle gear drive
11. Belt drive

2. Pre Requisites for satisfactory working:

For satisfactory operation the pump must work under specific condition given below:

A) The pump handles the liquid as specified in the order.

B) The pumps operate at the duty point specified in the order.

C) Minimum submergences is kept as shown in the outline dimension drawing supplied against the order.

D) Operating & maintenance instruction are followed as given in this manual.

E) Load of delivery pipe and other accessories such as sluice valve, reflux valve do not come directly on motor stool or pump column.

F) The erection is carried out by the experienced skilled personal.

Prior confirmation must be taken from the manufacture /supplier, if the pump is to be used for the condition other than specified in the order.

3. PUMP HOUSE LAYOUT.

The layout of pump station involves consideration of:

3.1 Water inlet to the sump:

The water inlet to the sump is to be located as to make provision to avoid.

1.1 Turbulence

1.2 High velocity

1.3 Silt deposition

1.4 Air entrainment

Difference between the levels of inlet source and sump water level and sump dimension for satisfactory operation of pump. Please refer fig 1,2&3

3.2 Suction sump:

The sump should be so designed as to provide:

3.2.1 Enough water storage capacity to avoid:.

2.1.1 Sudden fluctuations in water levels.

2.1.2 Kinematics disturbances at the bell mouth such as turbulence, eddies, vortices etc.

2.1.3 Air entrainment.

3.2.2. Low water velocity:

The maximum water velocity in sump should not exceed one meter per second in any case normally this is achieved by-------

2.2.1 Drawing the water from the source in the direction opposite to that of the source of flow.

2.2.2 Looping the flow drawn.

2.2.3 Baffling the flow passages.

2.2.4 Avoiding difference in the level of source of water and sump water. For this the intake pipes or channels of enough cross- sectional are to be provided.

3.2.3 Minimum or No silt deposition:

As for as possible silt deposition should not be permitted in the sump.. however where deposition is unavoidable the maximum deposition level should be maintained at least one diameter length below at the end of the bell mouth (in case of strainer).

3.2.4 Individual flow pattern:

Where one sump is having more than one pump set every pump should have its individual flow pattern undisturbed by the other. While locating the pump in the sump. Minimum distances from walls floor and adjacent pipes as given by manufactures should be maintained.

3.2.5 Pump submergence:

The lowest water level in the sump should keep the lowest bowl submerged in order to avoid air entering the bell mouth & forming vortices. How ever submergence depends upon the pump capacity. The minimum submergence to be kept is shown in the outline drawing supplied against the order. The maximum level in the sump should be lower than the pump floor level i.e. during the floods.

3.3.Pump house Requirement :

These cover mainly the following aspects

3.1 Strength of the building.

3.2 Sufficient floor area for working and overhauling

3.3 Sufficient head room for erection

3.4 Ventilation.

3.5 Provision for store room.

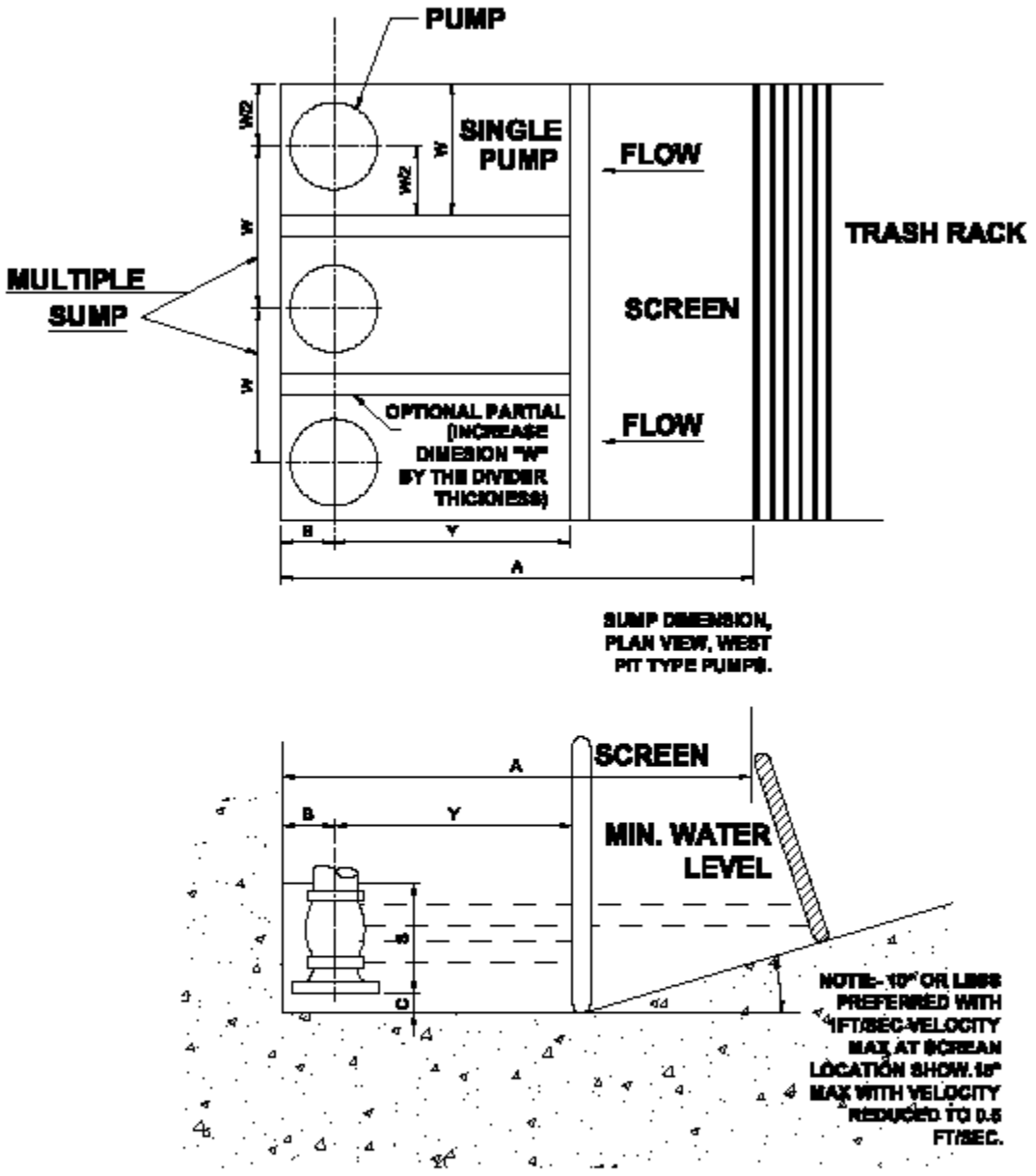


FIG-1 SUMP DIMENSIONS, ELEVATION VIEW WET PLT TYPE PUMPS.

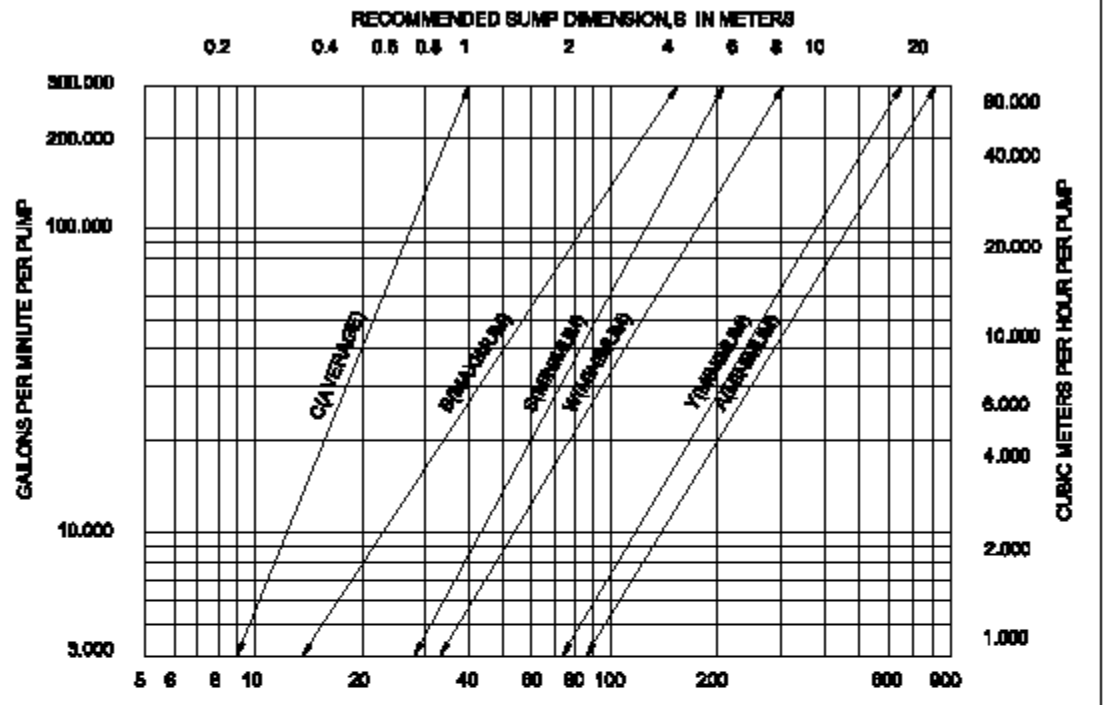


FIG-2 SUMP DIMENSIONS VERSUS FLOW.

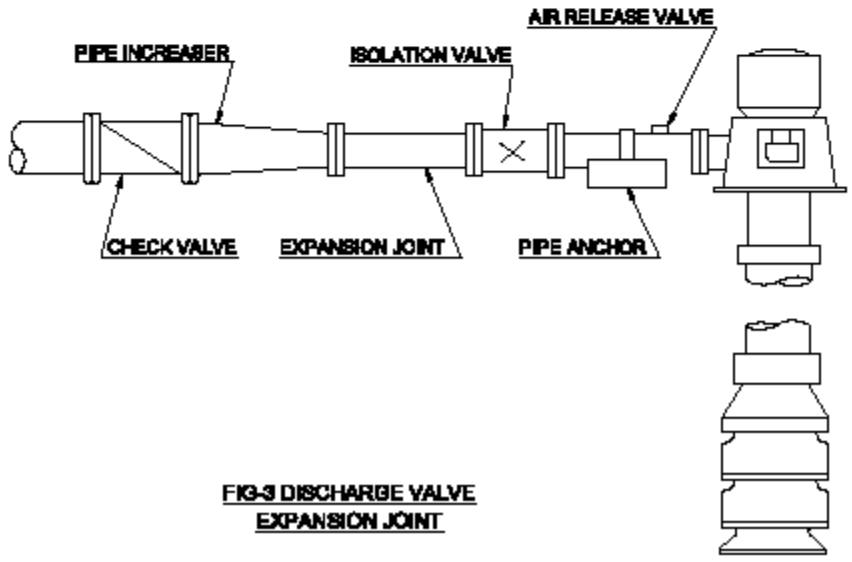


FIG-3 DISCHARGE VALVE
EXPANSION JOINT

3.4. Drawing:

Before proceeding with instruction for pump erection laid down in following pages. it is advisable to study the drawing of vertical turbine pump/fig 4,5,6,7,8,9 & 10 which cover all part and their assembly as well as name of all parts. This will make easier to understand the erection procedure.

5. Storage and handling:

A. On receiving the material:

(To avoid damages during transit the pump is supplied in partially assembled condition)

1. Check that all packages are intact and that open parts are not damaged in transit.
2. Open the packing & check content of each packing against delivery note packing list.
3. Check specifically line shaft and verify that these are not bent and are in good condition.
4. Report immediately discrepancies, if any to the supplier.
5. Unless the pump is to be installed immediately repack the material in respect vie cases after the content have been verified.
6. Do not open the package again unless ready for erection.

B. Storage:

(a)Storing place should be adequately clean. Store room should have sufficient space for movement and stacking of material. The floor of the store room should be hard and plain.

(b)Do not place the package one cover other inconveniently. Keep the parts on wooden logs and properly leveled.

(c)Keep the parts in the proper sequence so that during erection they can be taken out in an orderly fashion.

C. Handling:

1. All machined parts are coated with a special antirust coat. if any parts is found exposed clean it and apply a thick coating of grease or anti rust compound and then wrap it with wax paper to prevent further rusting .

2. Never try to drag any part or package of parts for any reason. Dragging sets in intrinsic vibration which distorts the accuracies parallelism etc of machined surface distortion of accuracies might cause serious functional and operation troubles.

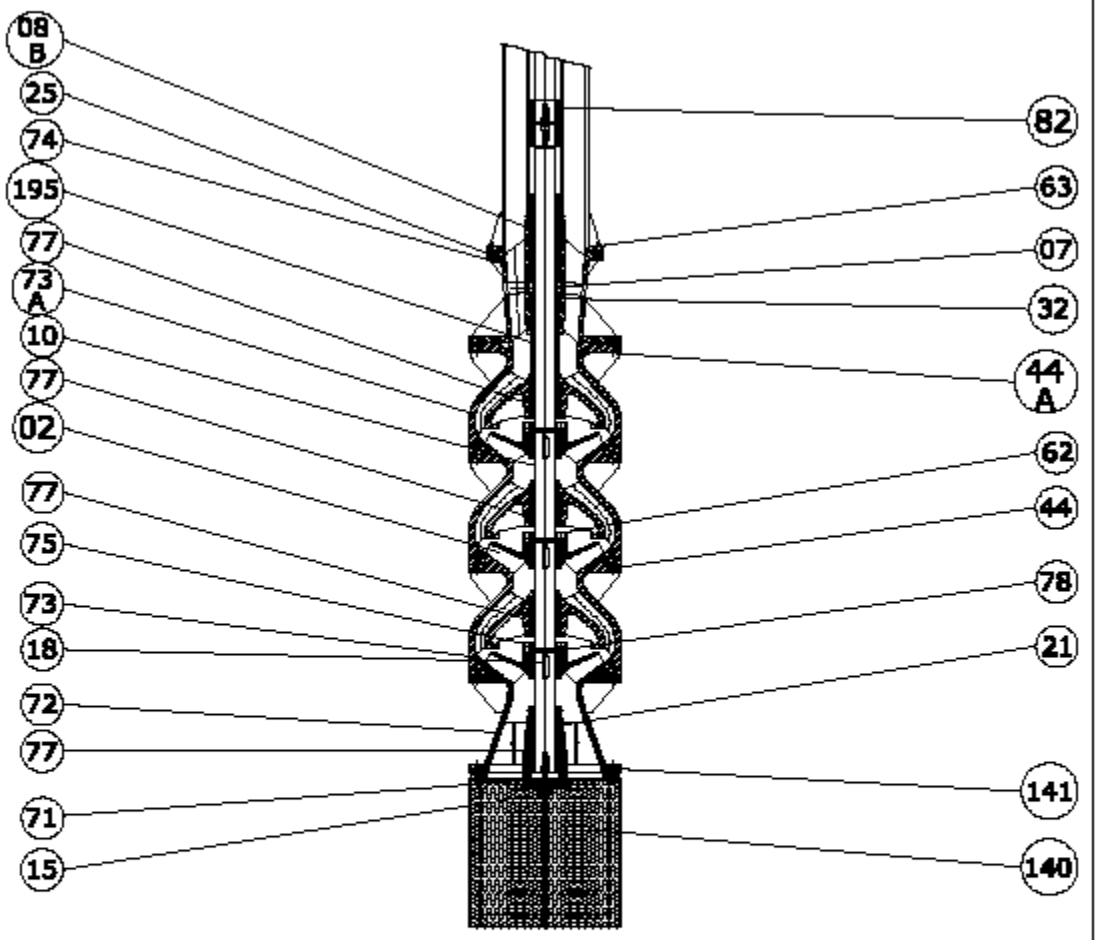


FIG-4 BOWL ASSEMBLY SEMI OPEN IMPELLER
OIL LUBRICATED OF VERTICAL TURBINE PUMP

25	GASKET
08B	TUBE CONNECTOR BRG.
74	TAPER PIPE (DISCH. CASE)
77	BUSH (SUC. BELL, DIFFUSER)
73A	TOP DIFFUSER
10	PUMP SHAFT
02	IMPELLER
75	GUARD RING
73	DIFFUSER
18	IMP KEY(BOTH END ROUND)
72	SUCTION BELL
71	SUCTION CAP
15	ASSY BOLT
82	LINE SHAFT COUPLING
63C	HEX. BOLTS WITH NUTS & SP. WASHER
07	LANTERN RING
32	OIL SEAL
44A	HEX. BOLTS WITH NUTS & SP. WASHER
62	ALLEN CAP SCREW
44	STUD WITH NUT & SP. WASHER
78	SPLIT RING (SET)
21	SUCTION BUSH
141	STUD WITH NUT & SP.WASHER
140	STRAINER
195	THROTTLE BUSH
P.No.	**PART NAME**

(FIG-4)

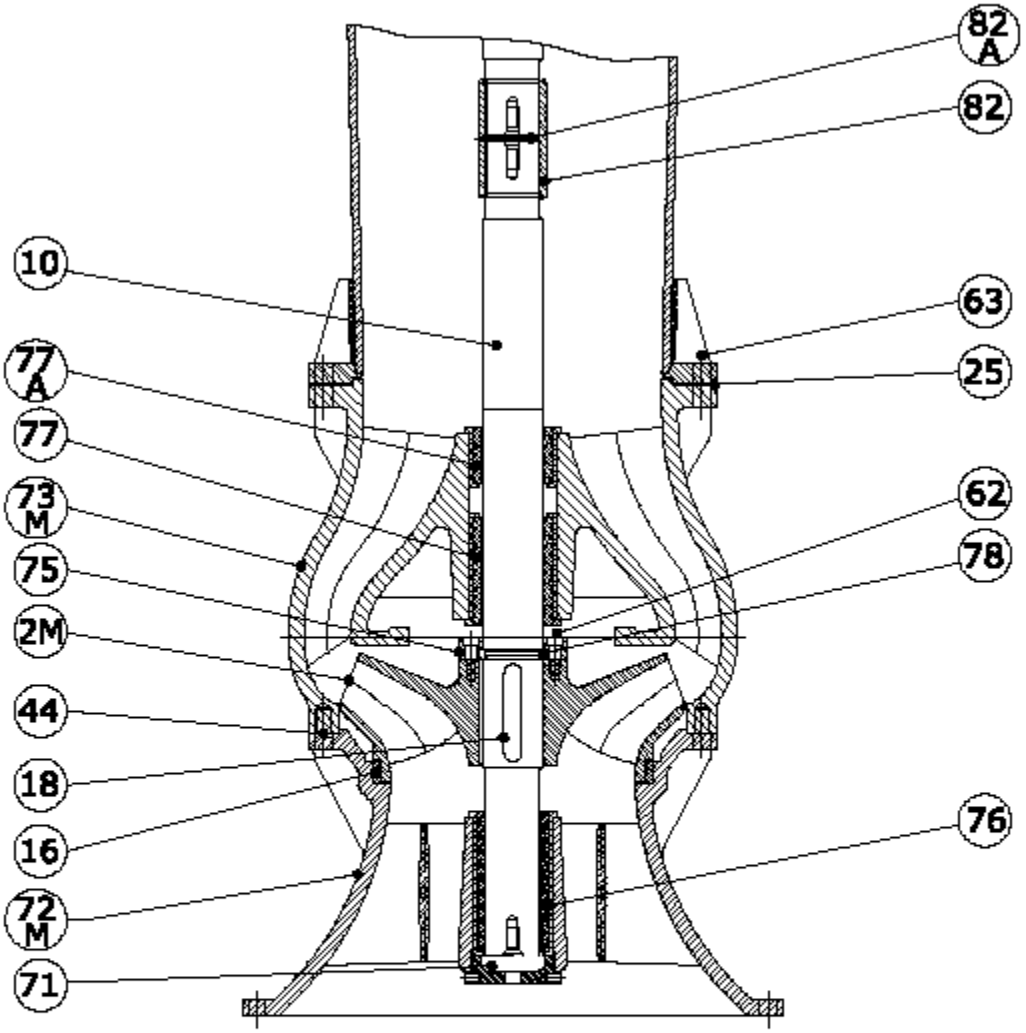


FIG-5 BOWL ASSEMBLY OF ENCLOSED IMPELLER

SELF LUBRICATED VERTICLE TURBINE PUMP

10	PUMP SHAFT
77A	BUSH WITH CAGE(DIFFUSER)
77	BUSH WITH CAGE(DIFFUSER)
73M	DIFFUSER
75	GUARD RING
2M	IMPELLER
44	STUD WITH NUT & SP. WASHER
18	IMP KEY(BOTH END ROUND)
72M	SUCTION BELL
16	WEAR RING
71	SUCTION CAP
82A	SPACER
82	LINE SHAFT COUPLING
63	HEX BOLT WITH NUT & SP WASHER
25	GASKET
78	SPLIT RING(SET)
62	ALLEN CAP SCREW
76	BUSH WITH CAGE (SUCTION)
P.NO.	PART NAME

(FIG-5)

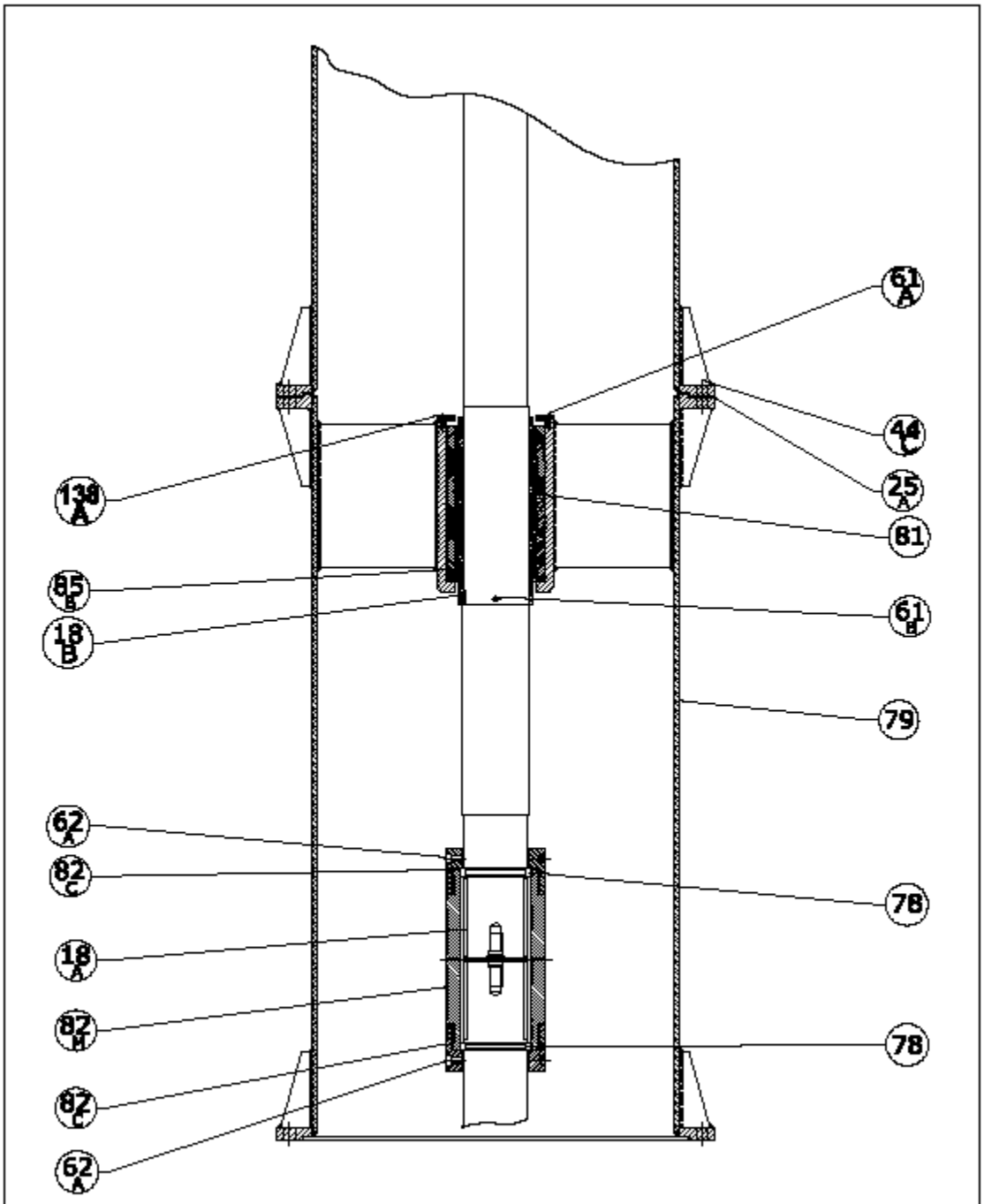
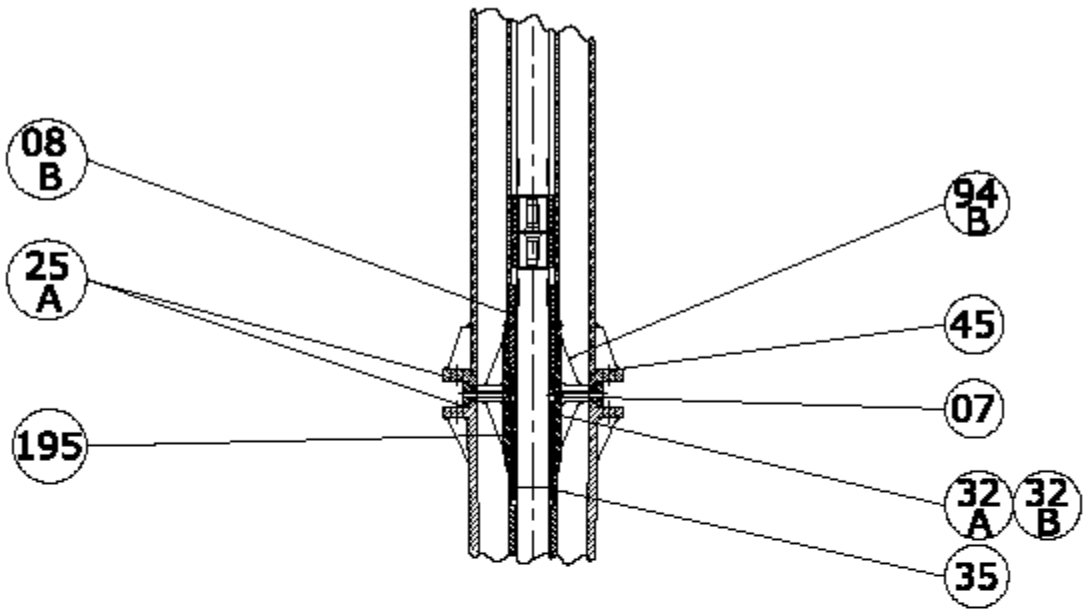


FIG-6 OPEN LINE SHAFT
(SELF LUBRICATED)

138	COVER PLATE for TAPER PIPE
85B	LINE SHAFT SLEEVE (Bottom)
18B	KEY (L.Shaft)
62A	HEX. SOCKET GRUB SCREW
82C	MUFF COUPLING CAP
18A	KEY (L.Shaft) (BOTH END ROUND)
82M	MUFF COUPLING BODY
82C	MUFF COUPLING CAP
62A	HEX. SOCKET GRUB SCREW (Type - A)
61A	HEX. HD. CAP SCREW with SP. WASHER
25A	GASKET (Column Pipe to Disch. Elbow)
44C	BOLTS WITH NUT & SP. WASHER
61B	HEX. SOCKET GRUB SCREW
79	COLUMN PIPE
81	RUBBER BUSH(SPIDER)
P.NO.	PART NAME

(FIG-6)



P.No.	PART NAME
08B	TUBE CONNECTOR BRG.
25A	GASKET
195	THYROIDAL BUSH
94B	BOTTOM SPIDER
45	HEX. BOLTS WITH NUTS & SP. WASHER
07	LANTERN RING
32A	"U" TYPE CUP SEAL
35	"O" RING

FIG-7 ENCLOSED LINE SHAFT
OIL LUBRICATED FLANGED COLUMN

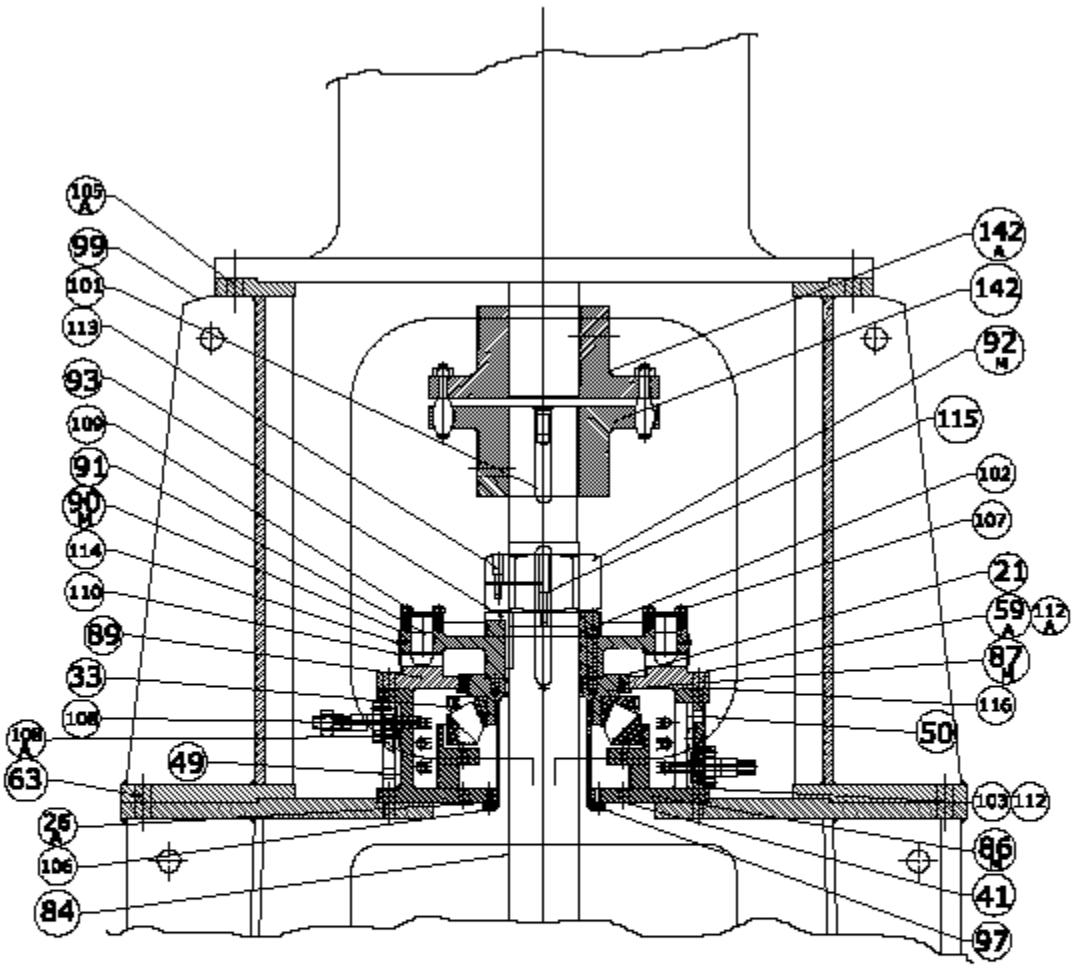
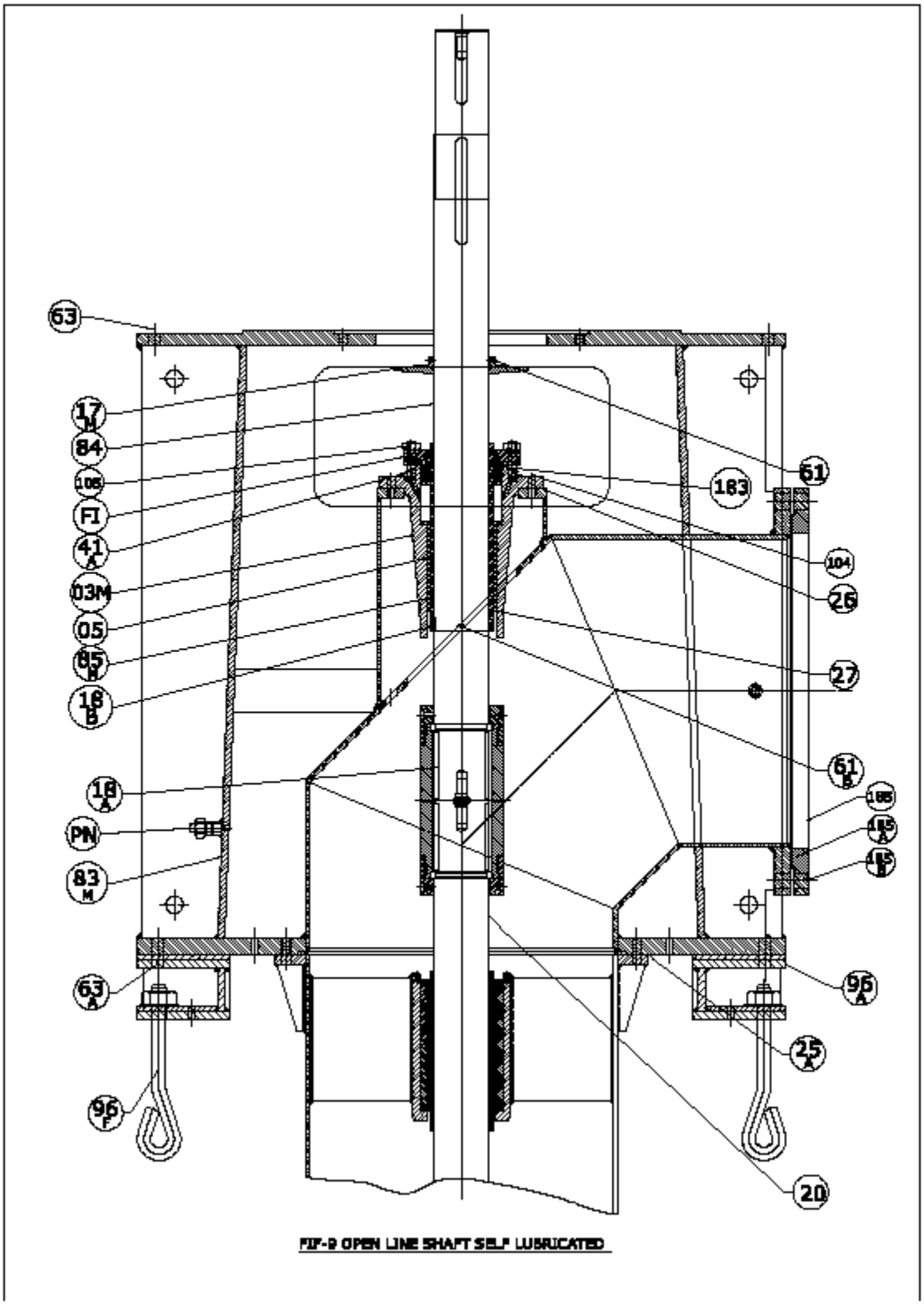


FIG-8 CROSS SECTIONAL VIEW OF THRUST STAND ASSEMBLY

105A	HEX BOLT WITH NUTS & SP. WASHER
99	MOTOR STOOL
101	PUMP COUPLING KEY
113	ALLEN CAP SCREW
93	GIP KEY (28x100)
109	PLATE FOR RATCHET PIN
91	RATCHET PIN Ø38x60
114	HEX. HD. CAP SCREW
90M	RATCHET COVER
110	RATCHET COVER SHEET
89	RATCHET
33	BEARING (SKF/FAG Make)
108	COOLING COIL ASSY.
108A	HEX. HD CAP SCREW WITH SP. WASHER
63	HEX BOLT WITH NUTS & SP. WASHER
26A	GASKET (BRG. HOUS. to OIL RETAINING RING)
106	HEX. HD CAP SCREW WITH SP. WASHER
84	TOP SHAFT
142A	HEX. SOCKET GRUB SCREW
142	PIN BUSH COUPLING
92M	TOP ADJUSTING NUT
115	ALLEN CAP SCREW
102	ALLEN CAP SCREW
107	HEX. HD CAP SCREW WITH SP. WASHER
21	BUSH FOR THRUST BRG. HG.(Ratchet Cover)
59A	HEX. HD. CAP SCREW with SP. WASHER
87M	THRUST BRG. HUB(SLEEVE)
116	GASKET
50	PLUG
103	STUD WITH NUT & SP. WASHER
86M	THRUST BRG. HOUSING
41	PLUG
97	OIL RETAINING RING
P.NO.	PART NAME

(FIG-8)



FIF-9 OPEN LINE SHAFT SELF LUBRICATED

P.NO.	PART NAME
FI	FLUSHING INLET
PN	HEX. PIPE NIPPLE
185B	HEX BOLT WITH NUTS & M/C WASHER
185A	GASKET (COMPANION FLANGE)
185	COMPANION FLANGE
105	STUD WITH NUT & SP. WASHER
104	HEX. HD CAP SCREW WITH SP. WASHER
96F	***Foundation Bolts***
85M	SLEEVE GLAND
84	TOP SHAFT
83M	DISCHARGE ELBOW
63A	HEX BOLT WITH NUTS SPRING WASHER & M/C WASHER
63	HEX BOLT WITH NUTS & SP. WASHER
61B	HEX. SOCKET GRUB SCREW (Type - A)
61	HEX. SOCKET GRUB SCREW (Type - A)
44B	STUD WITH NUT & SP. WASHER
41A	PLUG
27	O-RING
26	GASKET (Disch. Elbow to Gland Hous.)
25A	GASKET (Column Pipe to Disch. Elbow)
20	LINE SHAFT
18B	KEY (L.Shaft) (BOTH END ROUND)
18A	KEY (L.Shaft) (BOTH END ROUND)
17M	SLINGER
05	GLAND BUSH
03M	GLAND HOUSING

(FIG-9)

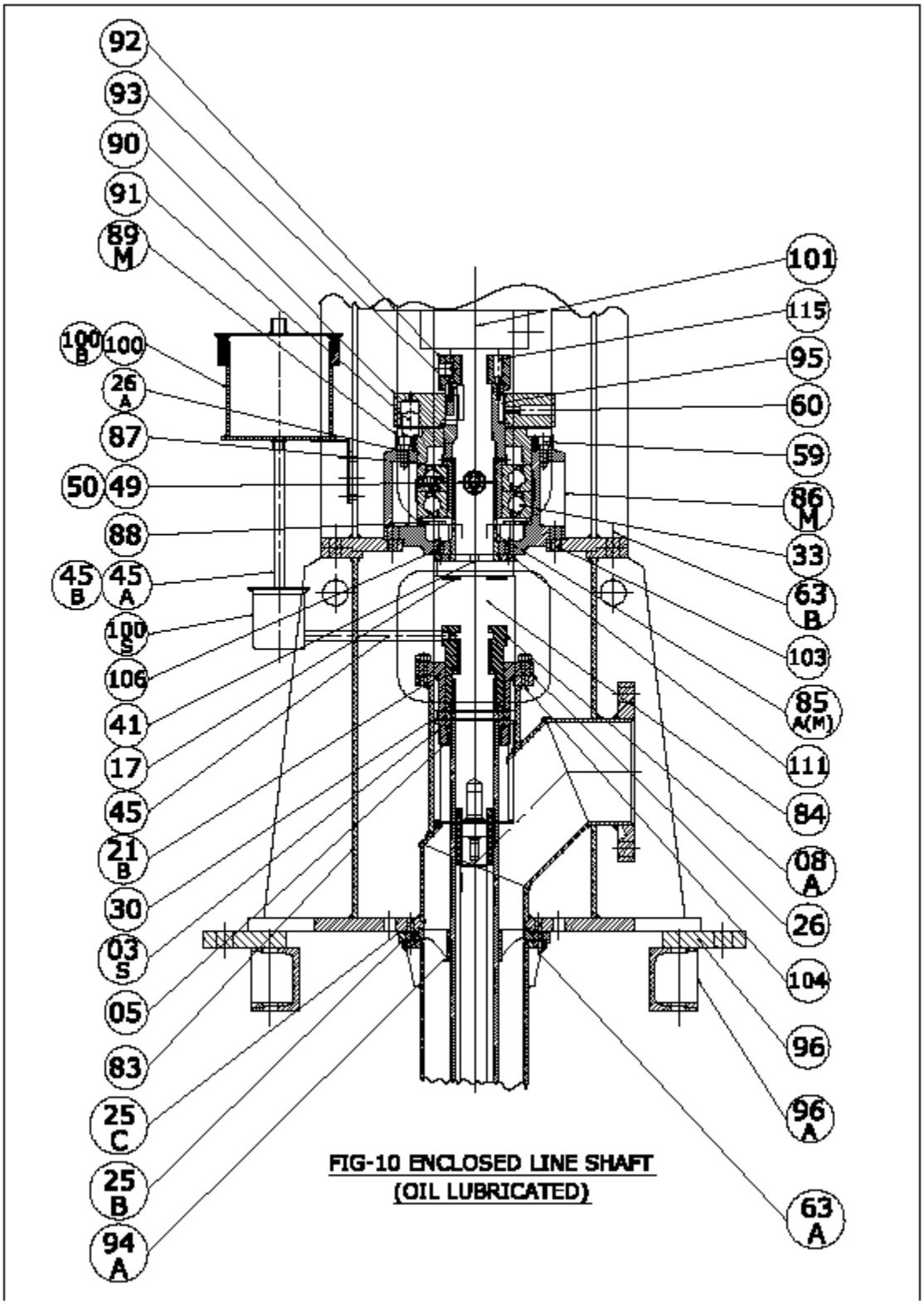


FIG-10 ENCLOSED LINE SHAFT
(OIL LUBRICATED)

P.No.	PART NAME
93	GIB KEY
92	TOP ADJUSTING NUT
91	RATCHET PIN (Ø28x38)
90	RATCHET COVER
89M	RATCHET
100	OIL TANK ASSY.
100B	HEX. HD CAP SCREW with SP. WASHER
26A	GASKET
87	BRG. SLEEVE (THRUST HUB)
50	OIL FILLING PLUG with ELBOW & NIPPLE
49	OIL LEVEL INDICATOR with ELBOW & NIPPLE
88	BRG. SUPPORT DISC
45B	ELBOW
45A	PIPE NIPPLE
100S	SOLENOID OILER ASSY.
106	HEX. HD CAP SCREW with SP. WASHER
41	OIL DRAIN PLUG
17	SLINGER
21B	BUSH for TUBE TENSION NUT
45	PIPE NIPPLE
30	GLAND PACKING
03S	GLAND HOUSING
05	GLAND BUSH
83	DISCHARGE HEAD(Elbow)
25C	GASKET
25B	GASKET
94A	TOP SPIDER
101	PUMP COUPLING KEY
115	ALLEN CAP SCREW
95	STRAIGHT KEY(20x12x45)
60	ALLEN SET SCREW (CUP POINT)
59	ALLEN CAP SCREW
86M	THRUST BRG. HOUSING
33	BEARING (SKF/FAG MAKE)
63B	HEX. BOLTS WITH NUTS & SP. WASHER
103	HEX. HD CAP SCREW with SP. WASHER
85A(M)	OIL SLEEVE
111	GASKET
84	TOP SHAFT
08A	TUBE TENSION NUT
26	GASKET
104	HEX. HD CAP SCREW with SP. WASHER
96A	BASE PLATE
96	SOLE PLATE
63A	STUD WITH NUT & SP. WASHER

(FIG-10)

3. Over hanging should be avoided as far as possible. While lifting the part by the ropes they should be properly balanced.

4. Transportation should be free from jerks long parts be handled without due supports.

5. Open parts must be transported on soft and well supported bedding to prevent scratches.

Note: Care must be exercised in handling of all parts particularly the shaft, column pipe enclosing tubes. They are machined to close tolerance and carefully, inspected at factory and if bent can cause trouble bent shaft or pipe should never be installed in the well.

3.6 Equipment and Tools-:

1. Overhead Crane / chain Pulley Block:

The Crane/ chain pulley blocks should be of ample capacity to take the load of the complete. Pump. There should be a minimum clear height between foundation & top most position of pulley block as indicated on outline drawing supplied against the order to facilitate easy erection. The pulley block should have the lift of 5-6 meters and the hand chains provided should be long enough to operate it conveniently from the floor.

2. Chains & lifting hooks, shackles
3. Jute ropes crow bars and small pipes for leverage.
4. Light but accurate straight edge.
5. Spirit level having the accuracy of 0.02mm / meter.
6. Kerosene and thinner for cleaning of parts.
7. Threading compound to prevent rusting.
8. Feeler gauge and shims for adjustment of level.
9. “V” blocks and dial gauge with magnetic stand to check the trueness of the shaft etc.
10. Small wire brush for cleaning of thread of shaft and coupling.
11. Lubricant oil required for erection.
12. Special spanners and clamps for erection are generally supplied against specific order and depending upon type of pump supplied.

a. 2 pairs of clamps of column shaft.

b. One pair of clamps for shaft enclosing tubes.

c. One eye bolt for head shafts.

d. One set of clamps for line shafts.

e. One spanner for impeller nut.

f. One spanner for thread barrel coupling.

g. One spanner for line shaft

h. One spanner for nuts of thrust collar.

i. Two spanners for coupling shafts.

Besides, above the erector must have the following standard tools equipment for smooth erection:

1. Files triangular half round & flat.
2. Triangular scraper.
3. Two sets of standard or ring spanners
4. Adjustable spanner screw drivers of 300 mm (12") and 150 mm (6")
5. Steel rule tape.
6. Hand drill
7. Set of taps and dies up to 25mm (1")
8. Chisel machinist hammer, hacksaw vice etc.
9. Emery paper grease gun thin rolled sheets of brass 0.03 to 0.005 mm thickness for cutting shims

3.7 Foundation

The foundation layout & design should be considered from the following aspects:

1.Foundation

A. Foundation is required for sintech vertical pump. The foundation must be enough built to support the weight of the entire pump full of water and should be rigid enough to withstand and prevent vibration simple but substantial concrete foundation should be built around the well casing at the surface. The casing should not be extended above the top of the foundation and space must be provided is the foundation to receive the projecting hub or pipe flange at the bottom of discharge head.

B. Foundation for vertical turbine pump to be installed in well two pedestals may be built either side of main hole or an I beam is centrally mounted on these pedestals; beam should have enough strength to take the load of pump unit. A chain pulley block of ample strength may then be hung from this beam and centered above tube well. Whatever instrument is used it should

be of sufficient height to accommodate section of column pipe with ease a minimum of 5.5 meter or above to clearance of is required for speedy installation. Tools needed for installation are listed below but these may be varied to suit the particular installations.

SUB BASE (SOLE PLATE) :

Sub base and sole plate is common term in use to describe a general class of solid steel plates mounted in grout (or bolted to steel structures) at the pump foundation surface.

1. Remove the sub base from the pump discharge head when shipped assembled.
2. Completely clean the underside of sub base. It is sometimes necessary to coat the underside of the sub base with an epoxy primer.
3. Remove the rust preventive solution from the machined top side with an appropriate solution.

SITE WITH CONCRETE FOUNDATION:

1. A pump house should have sufficient space for operation, maintenance and inspection.
2. Sub-base mounted pumps are manually grouted on a concrete foundation, which has been poured on a solid footing. The foundation must be able to absorb any vibration and to form a permanent, rigid support for the pumping unit.
3. The foundation must be of a sufficient Strength to support the complete weight of the pump plus the weight of liquid passing through it. A typical installation will have bolts with a pipe sleeve 2½ times the bolt diameter embedded in concrete. Bolts should be sized and located in accordance with the dimensions given in the certified pump outline drawing, if provided the pipe sleeve allows movement for the final positioning of the foundation bolts to conform to the holes in the sub-base flange. (fig.-11)
4. Remove water and / or debris from anchor bolt holes / sleeve prior to grouting. If sleeve type bolts are being used, fill the sleeve with packing or rags to prevent grout from entering.
5. Carefully lower the sub-base on to the foundation bolts hand tightens the nuts.
6. Leveling sub-base / sole plate may be done by several methods. Two common methods are :-

   (A) Using level wedges (Shown in fig-12.).

   (B) Leveling nuts on the anchor bolts regardless of the method, a machinist level must be used for leveling.

NOTE:-

When using a machinist level, it is important the surface being leveled is free of all contaminants, such as dust, to suture are accurate reading.

7. Level the sub-base in two directions at 90 degree on the machined surface. The levelness tolerance is 0.005 inches per foot for commercial and 0.001 inches per foot for API.

   (C) Using level wedges (Shown in fig.-12)

(D) Leveling nuts on the anchor bolts regardless of the method, a machinist level must be used for leveling

SUB-BASE GROUTING:-

1. Inspect foundation for dust dirt, oil, chips, wolver etc and remove any contaminants. Do not use oil based cleanness as grout will not bond to them.

2. Build dam around the foundation (See fig.-12). Thoroughly wet foundation.

3. Pour grout between sub-base and concrete foundation, up to the level of dam. Remove air bubbles from grout as it is poured by pudding. Using a vibrator or pumping the grout in the place. Non shrink is recommended.

4. Allow grout to set at least 48 hours.

5. Tighten foundation bolts.

II. For Sump:

The foundation lay out design should be considered from the following aspects.

3.7.1 Dimensional Requirement:

1.1 The location and grouting of the foundation bolts should be marked out as per location drawing which is supplied n advance. Pumps mounted on girders < the foundation bolt holes should come on the beam center.

1.2 The foundation opening should be large enough so that the bell mouth and outlet "T" will pass easily through the bore.

3.7.2 Strength of foundation:

2.1 The foundation should be sufficient strong to take load of motor Tea to absorb any vibration and to from a permanent rigid support. The weight of the pump is given in G.A drawing. The total load is borne by foundation plates/ base plate. in order to take this load (including safety foundation plate should be welded to the reinforcement of the concrete. Foundation plates should not lose or form pockets with the parent foundation.

2.2 For the pumps mounted on girders, the foundation plates should be properly welded on girders should be firmly embedded in the walls of the house.

3.7.3 Leveling the foundation:

3.1 The guidelines about to check the level of the foundation plates individually and in combination.Fig.12

The top surface of the foundation plates should be leveled to the accuracy of 0.05 mm/ m all foundation plates should be adjusted for height leveled by putting shim below it. Other foundation plates should be leveled with respect to this foundation plates with help of straight edge and spirit level.

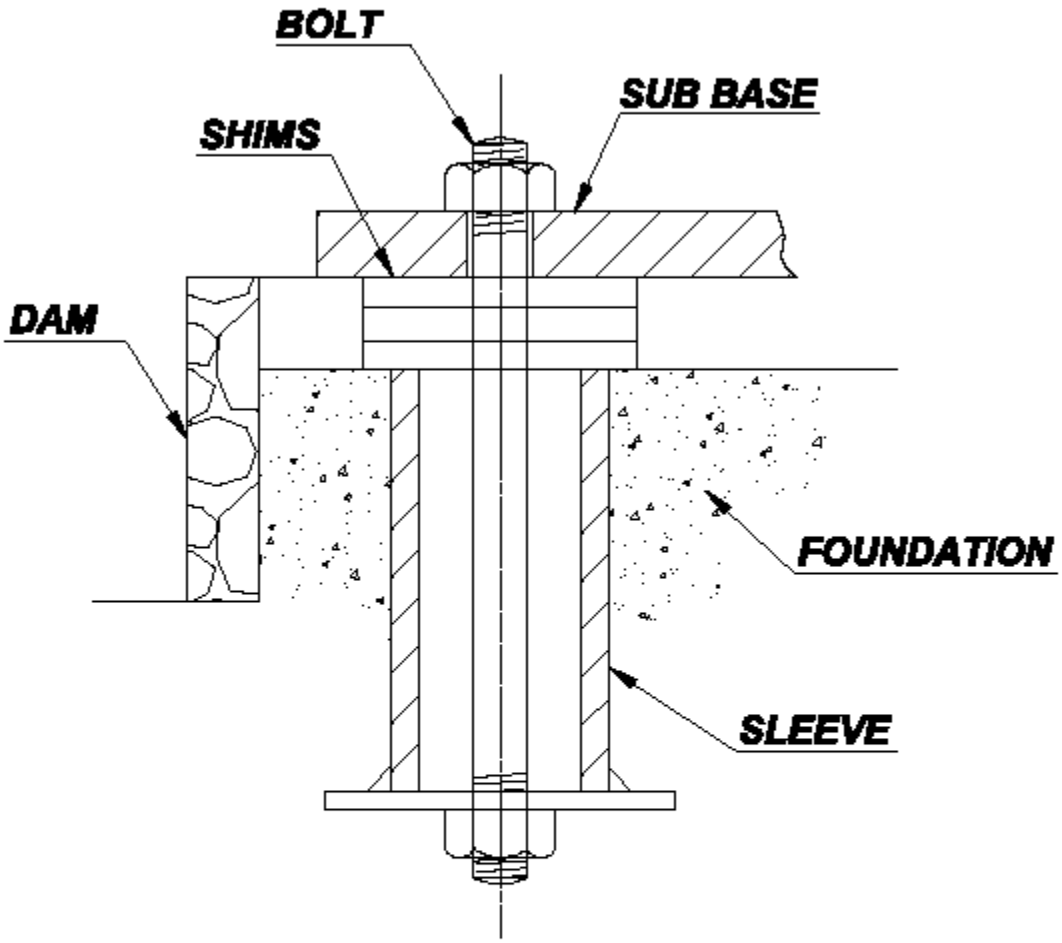


FIG11- FOUNDATION BOLT ARRANGEMENT.

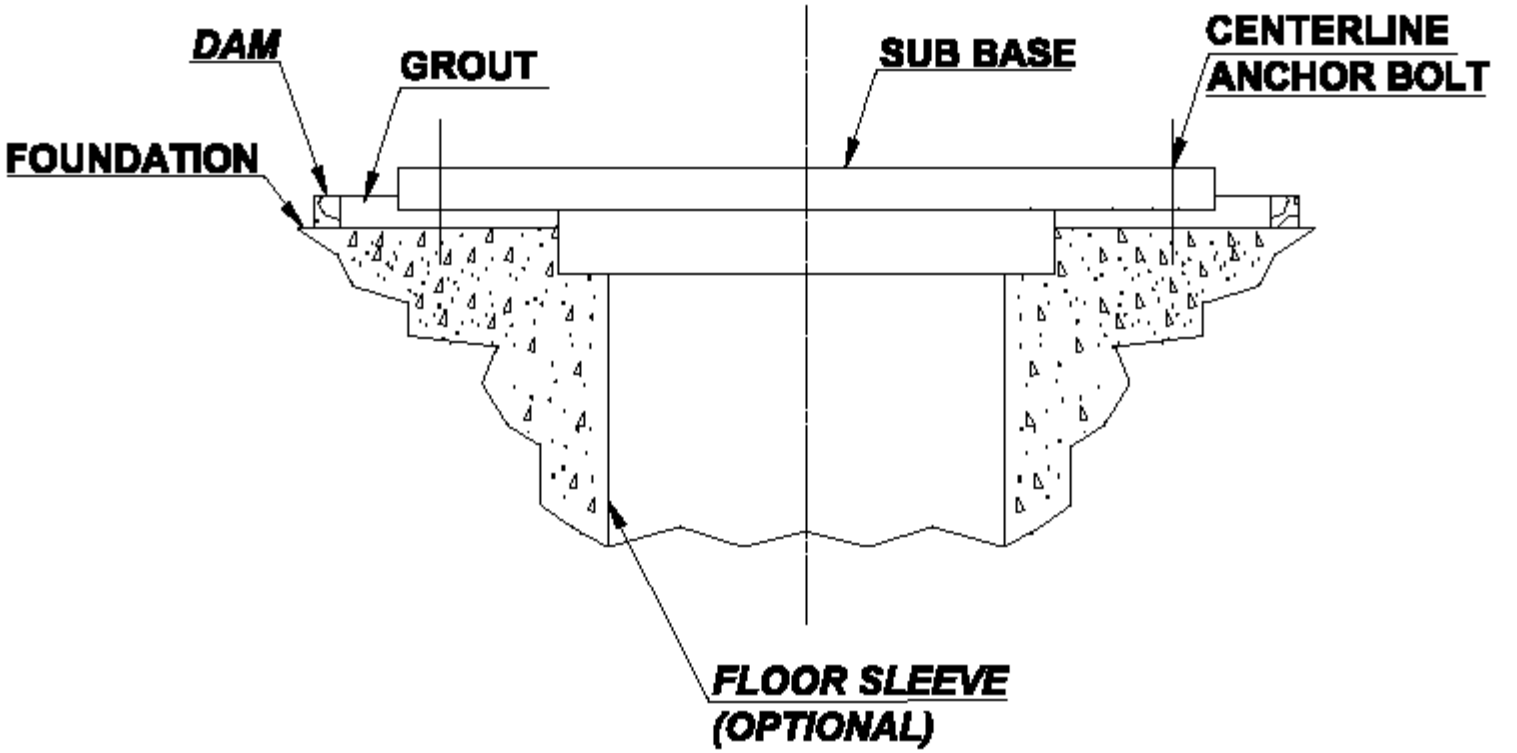


FIG-12 GROUTING AND LEVELING OF BASE PLATE.

The straight edge used for checking the level should be long enough to cover the entire cross length of the foundation plates and it should not rest any where but on the machined surface of the foundation plates.

After pouring the concrete;

3.2 Before allowing the concrete to set check the level of the foundation plates individually and in combination as there is a possibility of distortion while pouring the concrete.

3.3 After setting of the concrete recheck the level of the surface of foundation plates bring the sole plates in level to the accuracy of 005 mm/m by grinding or scraping if the distortion is taken place due to setting.

3.4 For the pumps mounted on girders, similar check about individual I and in combination level to be made before and after welding of the foundation plates to the girders .

(If the foundation plates procured by the client directly at their and then ensure that foundation plates are machined to close tolerance.)

3.5 Due to Resetting:

After the installation is completed and the operation is commenced it is likely that the concrete supports suffer deformations due to resting. This can happen due to the internal stresses in the concrete which get relived with time and due to operating condition. Hence frequent check is needed on the level of the foundation plates on which the entire pumps assembly is mounted and the alignment of the delivery pipe line and delivery "T" are not disturbed. During the readjustment of level or alignment of delivery flanges use of shims may be necessary. In such cases surface contact between the foundation plates shims and lower motor stool should be ensured.

3.7.4 connecting to the delivery pipe line:

After mounting the lower motor stool on the foundation plates delivery pipe flange should perfectly match with flange of outline pipe. Alignment is not perfect it will disturb the pump. Due care should be taken to see that load of delivery piping and accessories such as sluice valve etc is not coming on pump column / motor stool separate firm support should be given to delivery pipe and accessories. For underground discharge elbow the opening should be large enough to permit passage of the discharge elbow. The pump can be supported at the base plate with I beam. In order to take the load of pump the foundation plate should be firmly grouted in the concrete or bolted with I beam it should not be loose.

Note:

When a belt driven pump is installed on beam or timbers the driver should always be parallel to the beam never at right angle.

4.INSTRUCTION FOR PUMP INSTALLATION:

GENERAL

Inspect or check report of well before starting installation of pump to standing at letter stage .Sintech pumps are designed for operation only with all parts in correct alignment. The well must be free of send and casing per formation should not be closed the new pump should no be used to develop and test the tube well. Examine whether well is straight enough to permit the column shafting and bowl assembly to hang vertically in the well. Check well suitable diameter to accommodate the pump. Check the total depth of the well and water level.

The pump must be installed in the well or sump so that it is submerged in water. Check whether well is capable of delivery the quantity of water necessary to supply to pump. The pump should not be permitted to run otherwise serious damage may occur. The water must be free of gas from underground and be tested for purity. Air or gas in water may result in a result in reduced capacity or unbalanced condition that sets up vibration which may result in damage to pump. Completely remove oil from water surface by sailing as oil may damage rubber bearing in pump.

No Guarantee can be made by sintech

1. if pump handles liquid other than clear fresh non aerated water at a temperature not exceeding 30 c
2. If pump is handling sand or other material and is damage by erosion corrosion electrolysis or graphitization.
3. If the pump is installed in well which has and is of not sufficient diameter tp provide proper clearance so that pump can hung free and plumb in well.
4. If section pressure at the lowest impeller drops below atmosphere pressure.
5. If motor or engine speed is slow for reason beyond control.

4.1 INSTALLATION AND START UP CHECK LIST:

1. Verify the pump foundation head sub base/sole plate is level within 0.005 inch per foot (0.375 mm per meter)of diameter note that on API units level requirement is 0.001 inch per foot (0.075 mm per meter) of diameter.
2. Inspect the foundation to determine whether it appears adequately designed to handle the weight and loading if the pump. Note that sintech does not design foundation and is not responsible for foundation failures.
3. Insure that the head sub base sole plate etc. is properly grouted using high quality non shrink grout. This can be verified by sounding the foundation.
4. Insure oil anchor bolt are tight.

5. Insure that discharge piping is properly supported and there is no excess nozzle loading on the discharge flange. Verify this by loosening and then checking freedom of flange bolting.

6. Insure that all valves operate freely and are properly installed for direction of flow also insure that they have the proper pressure rating.

7. Verify where the pump page is going and system is lined up for the test.

8. Verify that the pump page supply will be continuously available for the duration of test. it is very important that the initial rum is for at least ten minutes duration in order to completely flush the pump.

9. If possible verify the cleanliness of the pump page and piping. If on hand during installation insure that the sump well and piping are clean.

10. Verify that the drivers (motor, grease engine etc.) are properly lubricated before start up on drivers with grease lubricated motor bearing check and re grease motor bearing.

11. Determine the allowable number of cold/ not starts with the motor manufacturer / supplier. This very important especially during initial start up when number of start /stop have to be worked oil of the system and control. The general rule of thumb is two cold or one not start per hour. Exceeding the recommend start break downs the motor insulation and can cause failure.

12. Prior to coupling the driver to the pump verify proper rotation of the driver by 'bumping' it. Note that the proper rotation for our vertical pump is CCW when viewed from top. In additional to verifying rotation run uncoupled to insure that the driver runs smooth and sounds normal. Note that on units with VHS motors, must remove the drive shaft, if coupling is provided on drivers with NRR'S, remove ratchet pins, if possible, otherwise rotate the drive coupling clockwise until pin stops tight against ratchet plate.

13. Only after verifying the proper rotation of the drivers, proceed with the coupling of the pump to the driver. On VSS units with flanged coupling, set the impeller lift using adjusting nut a top the motor after making up the threaded coupling.

4.2 Preparatory for erection:

Cleaning of parts:

During transit and storage of equipment after it has reached destination considerable dust and foreign material may have lodged on the various parts of the pump. After the equipment has been taken to site and just before erection all parts must be cleaned with great care, some of the precautions that must be observed are as follows.

General:

All the machined surface should be cleaned with kerosene/ thinner to remove the antirust coat applied.

Pump unit assembly:

Rotate the impeller shaft by hand to see that impeller is free and rotating properly. Pull the shaft and press it back again. The shaft should move freely if there is no damage or dislocation in the bowls.

If pump unit is stored for long period of time, check gland packing in the pump assembly under bearing housing of oil lubricated pump only. If it has dried up replace the same.

Column Unit:

1. Shaft:

The threads on shaft and coupling should be cleaned with kerosene/ thinner using a wire brush or old tooth brush.

2. Shaft Enclosing Tubes /pipes:

Clean the shaft from inside with the help of long stick wound cloth.

3.Rubber bearings:

The rubber bearing are to be cleaned with clear water. In any case these rubber bearing should not come in contact with oil grease or paint.

4. Metallic bearing:

The machined surface should be cleaned to remove anti-rust coat . the oil grooves should be free from dirt & metal particles

5. Head unit:

(A) **Motor Stool**:

Clean the discharge head/ lower motor stool removing all dirt especially around the water way section. For oil lubricated model, check all connections for tank feed line. The parts required are:

1. Oil tank
2. Solenoid valve (if ordered)
3. Oil feeding valve
4. Plastic pipe
5. G.I Pipes

(B) Thrust bearing Housing:

Thrust Bearing housing to be cleaned thoroughly. Thrust bearing housing and bearing parts should be absolutely free from dust particles, hence these are to be suitably lubricated till they are actually used in the assembly.

(C) Cooling coil/ other pipe connection for the pump with Mitchell thrust be Bearing:

Cooling coil should be checked with water connection for leakage and blockage. Other pipe connection also should be flushed and checked for leakage etc.

ALL THE BURRS AND SHARP EDGES FOR MACHINE SURFACE SHOULD BE REMOVED WITH SCRAPER OR SMOOTH FILE.

4.3 Checking:

Through all the parts are duly packed while dispatching from works, there is a possibility of bending of shaft and damage to the threaded and machined portions during transit . Hence following checks should be made.

1. Threaded portions of shaft and coupling are not damaged.

2. Threaded barrel coupling fits properly on the shaft. Coupling is not too tight or too loose on the shaft.

3.All the shaft to be checked for run out with help of "V" block and dial gauge or preferably on center lathe if available . The shaft run out should not exceed 0.08 mm at bearing portions and 0.125 mm on the other portions.

Care to be taken during erection:

1. Threaded portions of shaft and coupling are not damaged.

2. Avoid use of hammer.

3. Ensure perfect matching of contact surfaces.

4. Each and every part should be free from high points, burs, dust etc

5. Take care that no parts is left out through oversight. Every single item. However small has an important role in the proper function of the pump.

6. Take care that no foreign substance is dropped or left inside. It will get stick up and cause jamming.

7. While fitting the rubber rings care should be taken not to twist them or stress the joints. The rings prevent hydraulic leakage and hence their non- twisting is important (following method of fitting of rubber ring is convenient hold one side of the jointing in the hand and insert the opposite portion of the ring in the groove. Apply light tension along the ring a gentle pull by fingers and place it in position last.)

8. All tools equipment should be kept ready before starting the erection. Cross sectional drawing and erection instructions should be referred to during erection.

9. Erection should be done by specialized experienced personal.

4.4 INSTALLATION PROCEDURE (PUMP UNIT ASSEMBLY OIL LUBRICATED):

(A) Pump unit is sent from works in assembled condition. The pump unit assembly includes bell mouth diffuser impeller (depending upon no. of stage) impeller shaft enclosing tube taper/column to the suction pipe make sure that clamp do not slip

(B) Connect bell mouth/ strainer to suction pipe on ground use lead compound on thread. now lift the assembly and lower it on to the tube well resting the clamp on two wooden pieces so that the clamps are not resting on the foundation (fig. 13)

(C) Lift the pump unit by using chain pulley. Lower end of the pump unit should not be dragged on the ground while lifting. Lower end can be lifted off the ground with help of rope.

(D) Suspend the bowl unit assembly in vertical position. Fix the strainer to the bell mouth (if supplied against order/ screw suction pipe to bowl assembly (fig.14)

(E) Lower the complete unit in to the pit till rests on the clamp.

(F) Put the rubber rings on the bearing holder for shaft enclosing tube and column pipe care should be taken not to twist or stress the joint.

4.5 COLUMN ASSEMBLY (OIL LUBRICATED):

The lowest column now can be assembled, in assembling it will necessary to slide the tube and shaft assembly into the column pipe, in doing so take care threads of the shaft are not damaged. Temporally wrapping thread ends with cloth will protect them from damage or dirt use 12 mm rope to tie the shaft and tube to the column pipe as shown in fig 15and16 let the shaft extend one foot from the lower end of pipe and tube.

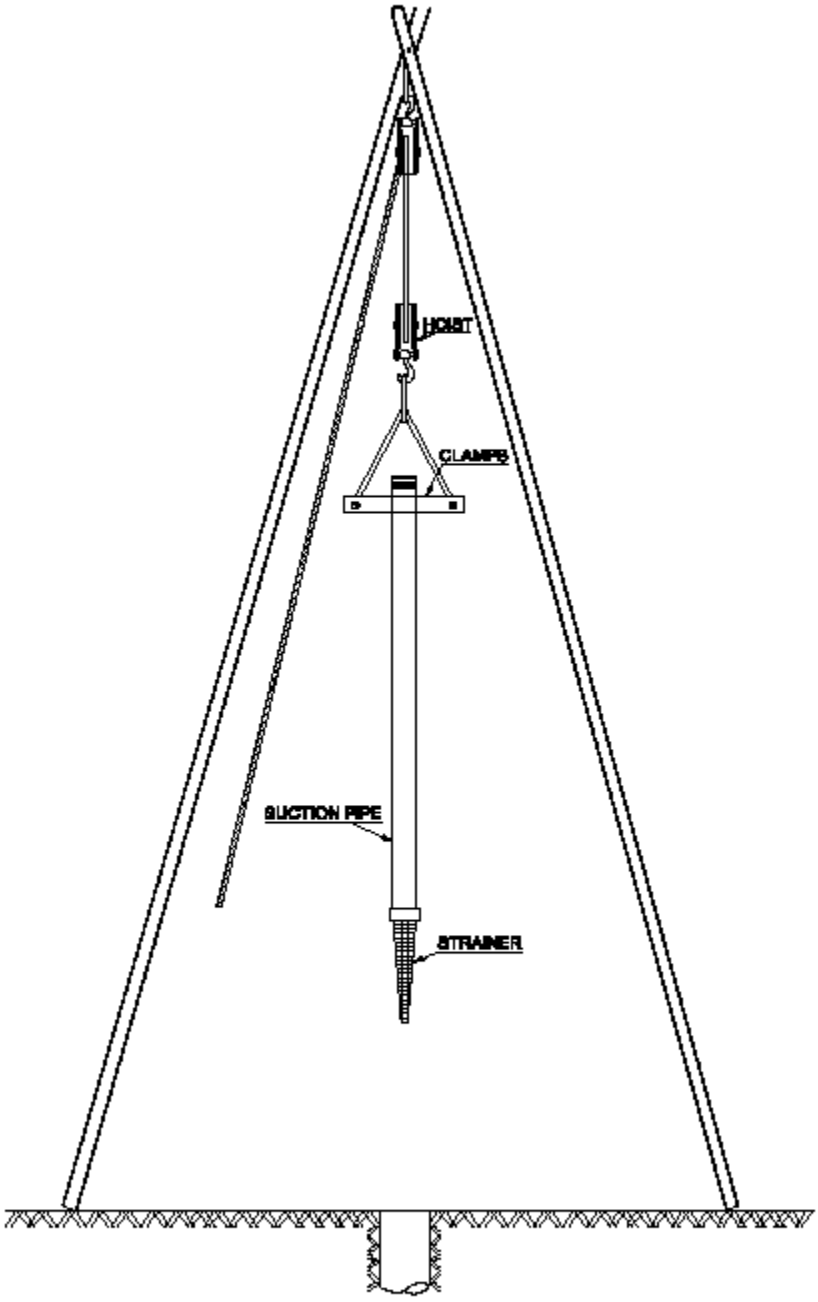


FIG-13 INSTALLATION OF SUCTION PIPE AND STRAINER.

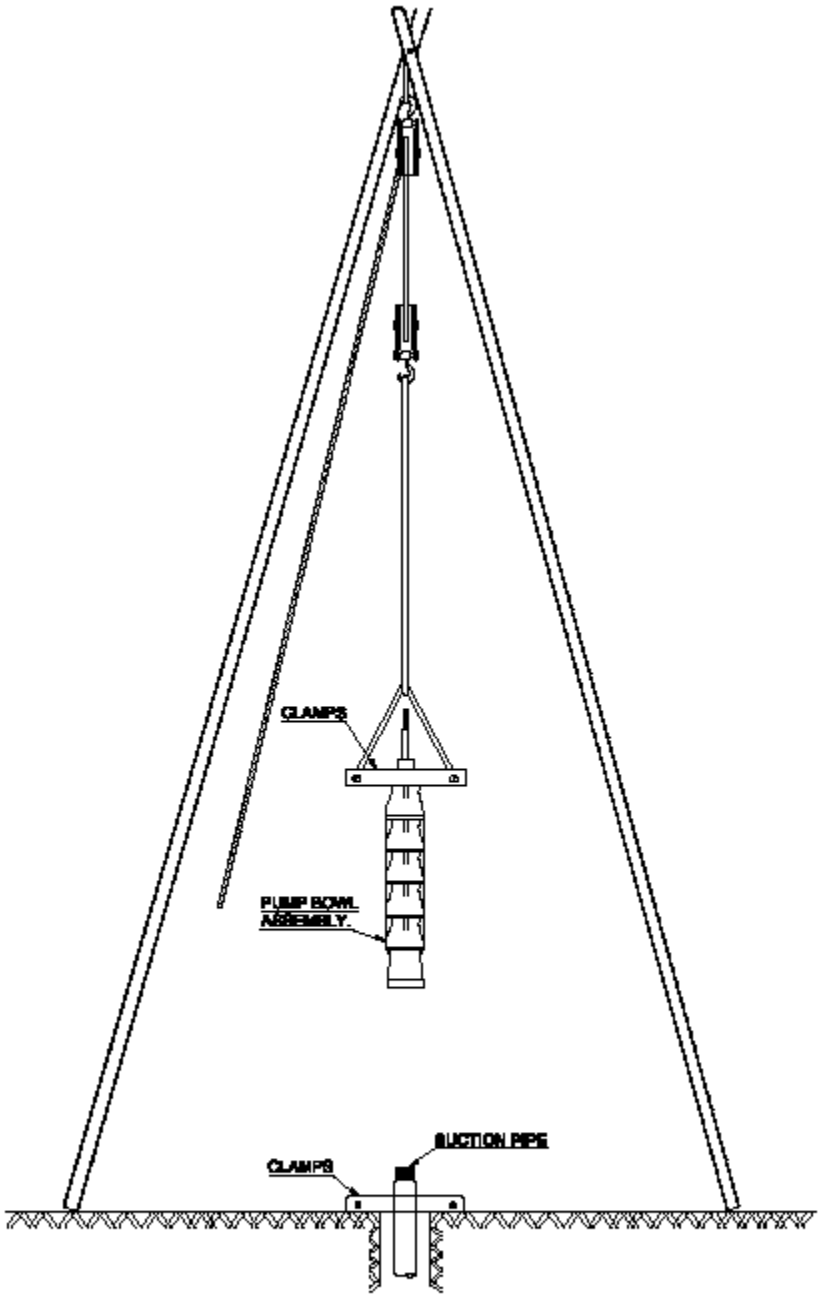


FIG-14 INSTALLATION OF BOWL ASSEMBLY WITH SUCTION PIPE AND STRAINER.

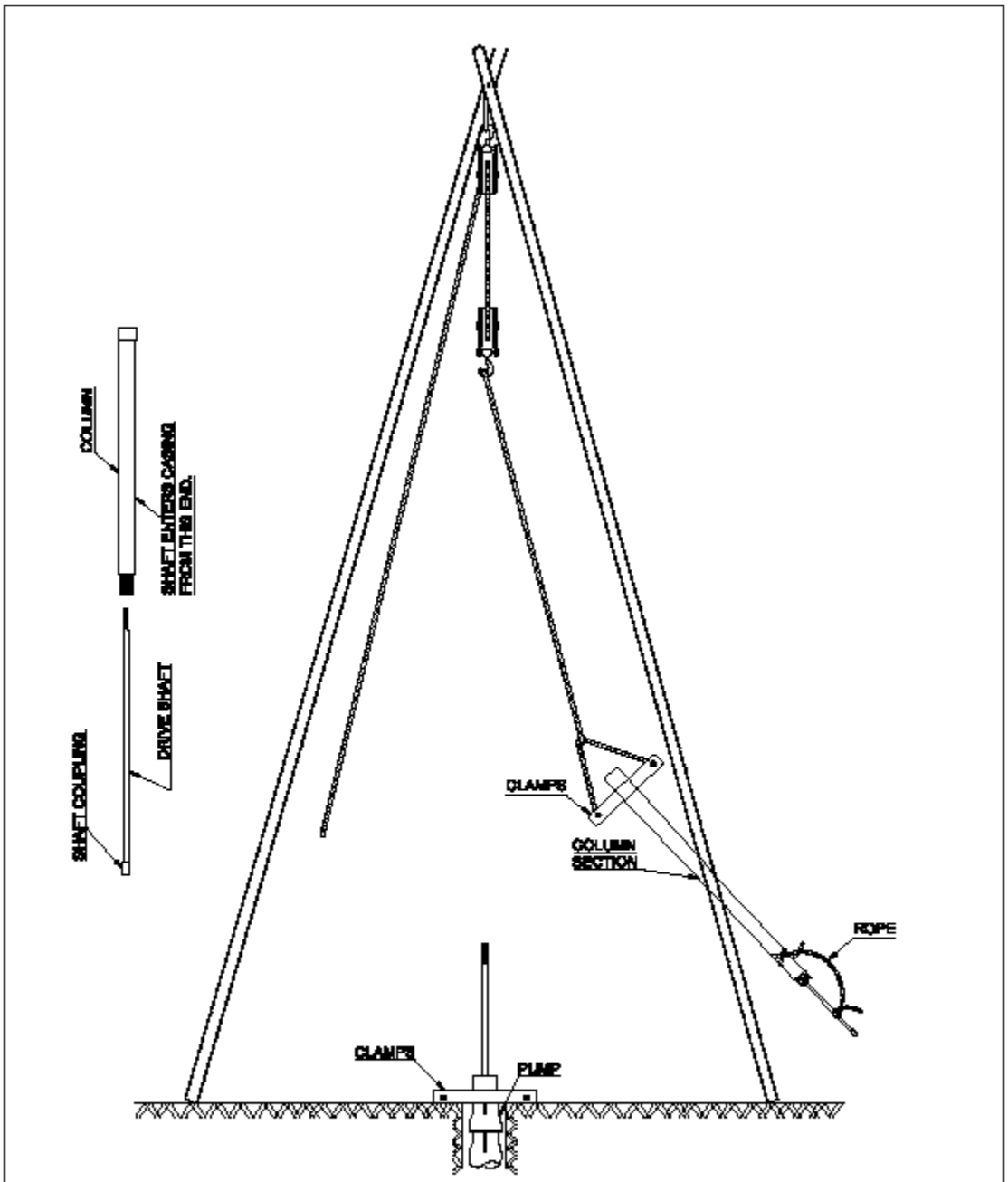


FIG-15 INSTALLATION OF COLUMN ASSEMBLY. (WATER LUBRICATED)

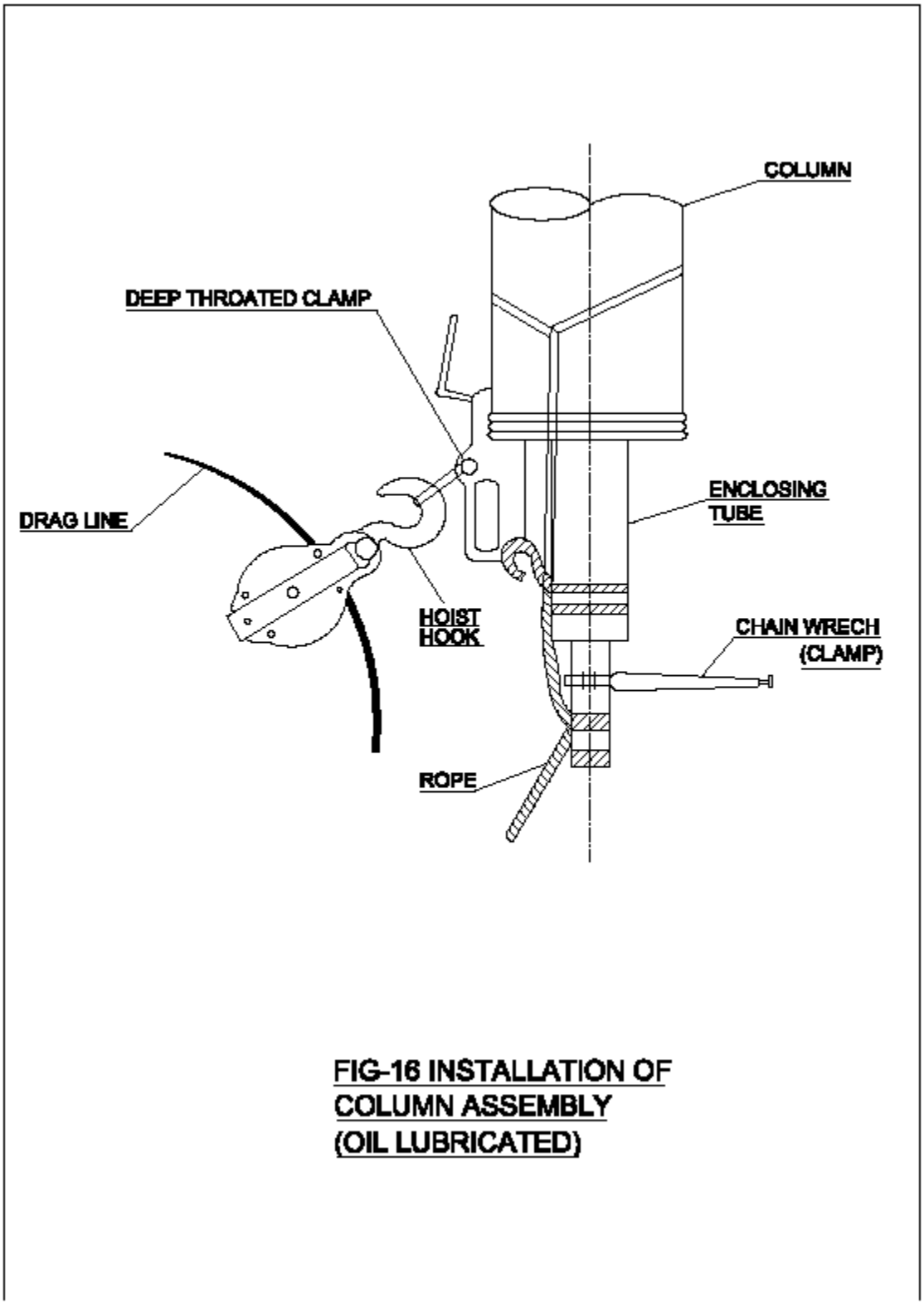


FIG-16 INSTALLATION OF COLUMN ASSEMBLY (OIL LUBRICATED)

Note:

Does not strain the shaft if bent it will cause serious trouble during operation of pump.

1. Clamp the column pipe below the coupling and raise the column assembly over the well, tailing the column pipe with rope sling this will prevent the threads of the pipe and shaft from getting damaged, remove wrapping protecting the shaft threads clean threads apply light grease . Remove the rope from the line shaft carefully because it may slip if not supported. Lower the assembly and screw it in remaining shaft of the pump shaft coupling and tighten it till shaft are butted. Check the coupling length is approximately equally divided.

2. Apply white lead or good grade of grease on the projecting half of the line shaft bearing /screw bearing on the bowl assembly. Now remove rope from the tube carefully, it may slip if not supported properly, clean the threads and tighten it over the screw bearing in bowl assembly with wrenches.

3. After screwing the first tube lower the column pipe with coupling and clamp top end and screw connect it with discharge case of bowl assembly with chain wrenches.

4. Now raise the assembly slightly and remove the bottom clamps and lower the pump assembly in the well till the top clamps rest on the foundation or beams.

5. Now slide tube stabilizer on the shaft tube.

6. As each length of column assembly is installed remove shaft coupling and tube bearing from top end oil tube and fill the tube with good grade of oil and refit the screw bearing and shaft coupling.

7. Continue assembly column assembly till the required length of column is obtained.

NOTE:

After the installation of each column assembly check the shaft projection and tube projection over tube.

NOTE:

1.	Threads of line shaft and tubes are left hand. When connecting piping to the pump do not put a strain on the pump as this may cause misalignment.
2.	Care must be taken not to damage the bearing in the tube with the shaft threads.
3.	Check after assembly of every section of column and shaft assembly shaft is centered in the column, if not centered it has bent and must be removed.
4.	All shaft and column joints butt squarely metal to metal any dirt will prevent proper joints and result in unsatisfactory services all shaft joints should be tight use good grade of pipe compound / Teflon tape on each join of column / tube.

4.6 TOP COLUMN ASSEMBLY (OIL LUBRICATED):

16. Top column pipe is without coupling insert top shaft/ head shaft inside top shaft enclosing tube and the top column pipe after cleaning the threads at both ends of the shaft, tube and pipe and repeat the procedure for assembly.

17. Fill Lubricating oil in head shaft enclosing tube for pre lubrication.

4.7 DISCHARGE HEAD ASSEMBLY (OIL LUBRICATED):

18. Clean discharge head remove tube tension plate now put rope through the discharge head and lift. Lower it over top shaft taking care not be damage top shaft threads of shaft and tube. Align discharge head over top of column pipe and screw until the pipe end butts / align holes of discharge head and top column flange and tighten with cap screw. (fig.17)

19. Raise the pump head slightly remove pipe clamps lower the assembly on foundation with discharge opening on the desired side.

20. Clean the seat for tube tension plate on discharge head apply light grease and put on gasket and apply grease on to gasket. Now clean tube tension plate and lower it over the shaft and align with top tube and screw it on gasket using the tube tension plate wrench adjust the tube tension by tightening the T.T plate (approximately 1/6th of a turn of the tension plate per 3m of tube will give correct adjustment. Fasten tube tension plate to discharge head with cap screw. Fill rings of packing inside the tube tension plate. Clean and apply grease to threads of shaft enclosing tube and T.T. nut and slip TT Nut over shaft and screw with shaft enclosing tube and tighten with wrench.FIG-17A

Connect oil line to the tube tension nut.

Connect the lubricating system and fill the oil reservoir. Adjust the lubricator valve to permit oil to drip at one drop per adjust the valve to insure adequate supply of oil at each bearing.

4.8 COLUMN ASSEMBLY (WATER LUBRICATED):

The lowest column can now be assembled in assembling column section it will be necessary to the slide the shaft into the column pipe in doing so take care not to damage the threads of shaft, temporary wrapping of threads end with cloth will protect them from damage or dirt . Use 12mm rope to tie the shaft to the column pipe as shown in fig 15 let the shaft extend about one foot from the lower end of the column pipe.

NOTE:

Does not strain the shaft if bent it will cause serious trouble during the operation of pump.

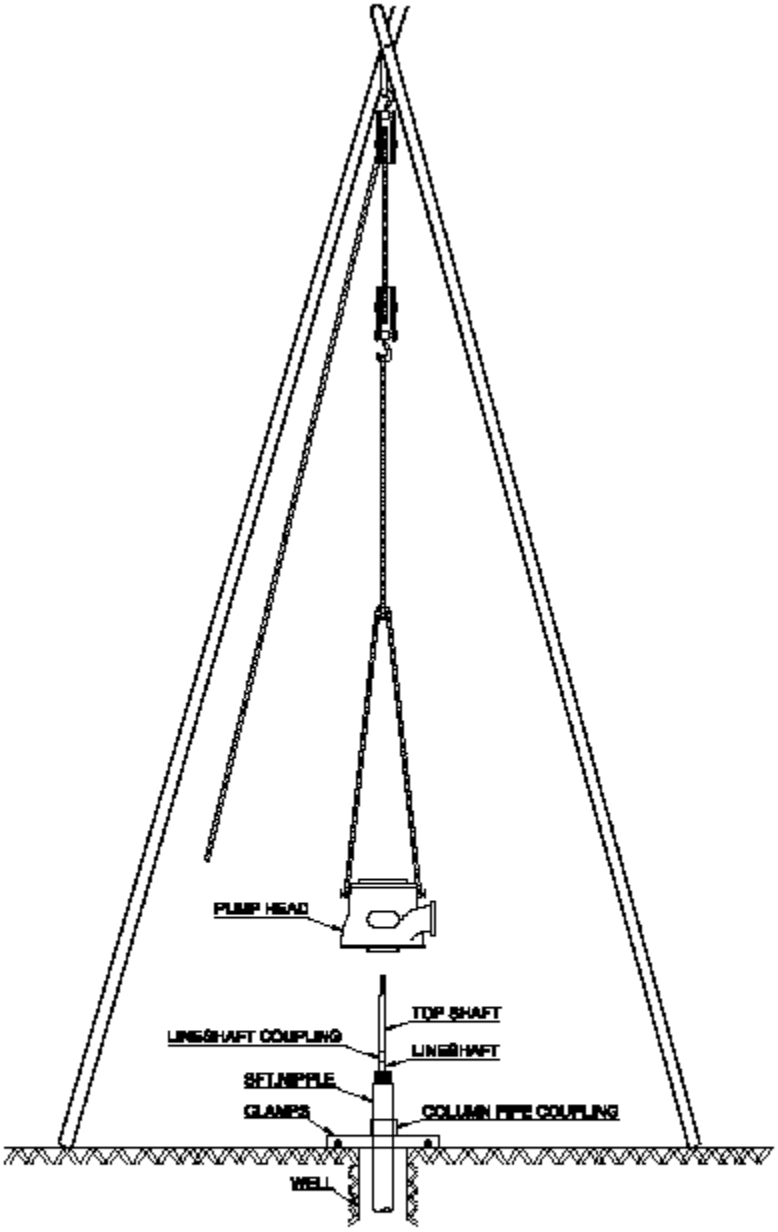


FIG-17 INSTALLATION OF DISCHARGE HEAD.

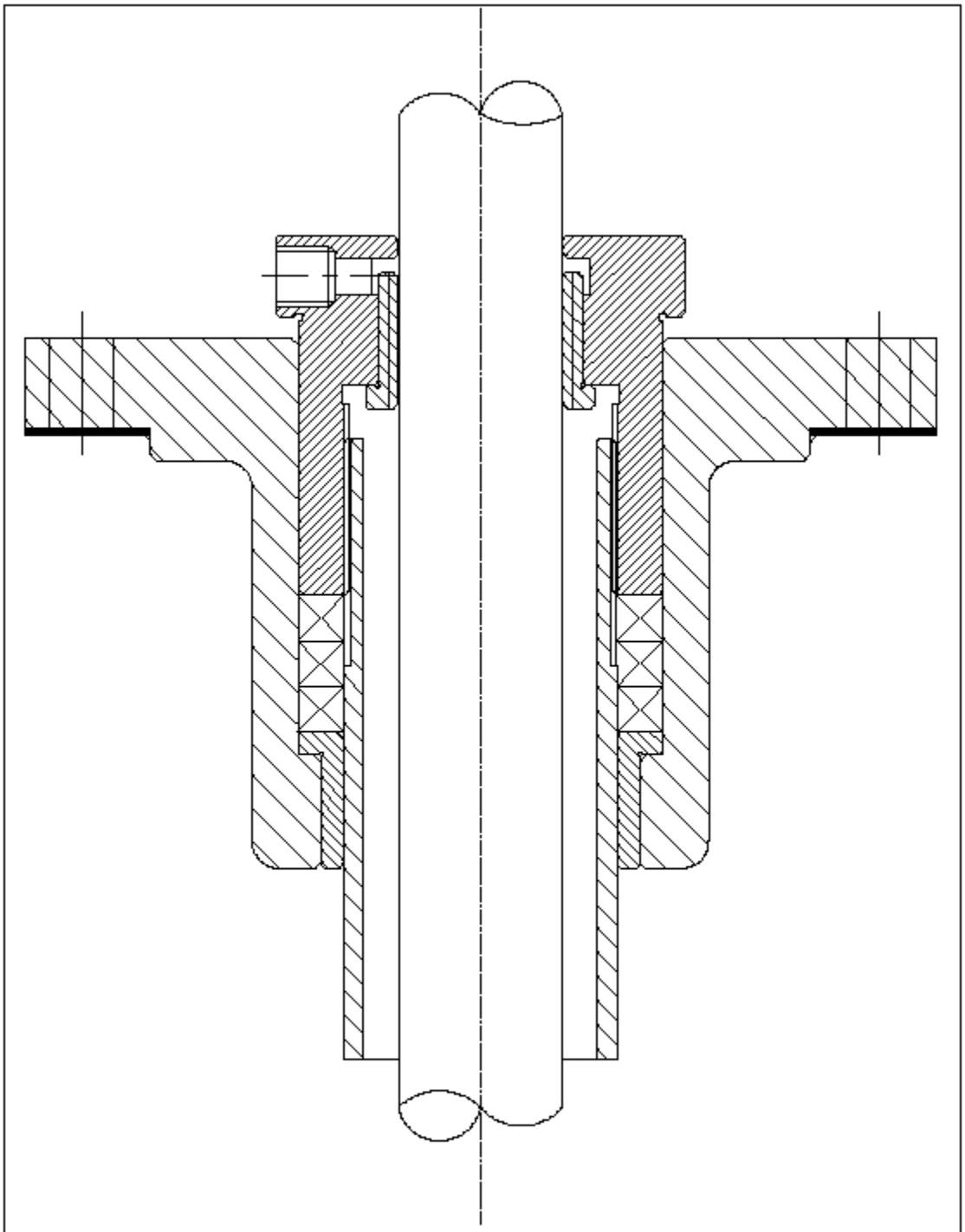


FIG-17A OIL LUBRICATED CONSTRUCTION
TUBE TENSION PLATE AND NUT ASSEMBLY.

Clamp the column pipe below the coupling and raise the column assembly over well. Tailing the column pipe with a rope sling will prevent the damaging threads of pipe and shaft. Remove wrapping protecting the shaft threads. Remove rope from the line shaft carefully because shaft will slip from the column pipe if not supported. Lower the assembly and screw the line shaft in the remaining halfof the pump shaft coupling and tighten them till the line shaft is butted with bowl assembly shaft. Check the coupling length is approximately equally divided.

8. Now suspend the first column pipe with coupling at the top end and screws connect it in the discharge case of the bowl assembly with chain tong.

9. After a column length is added, fix another set of clamps at the top of column pipe. Raise the pump assembly with the aid of top clamps and the lifting tackle. Remove the bottom clamps and lower the pump in the well till the top clamps rest on the foundation or beams.

10. Now tighten the coupling on shaft and slide bearing retainer with bearing /spider over sleeve and in to column coupling between column section.

NOTE:

The sleeves should not be held by wrenches otherwise it will loose surface smoothness and rubber bearing will get soon worn out
1. Continue assembling column assembly till the required length of column is obtained.
2. After the installation of each column assembly check the shaft projection over column face this shaft projection and end play should be maintained through out the assembly

4.9 TOP COLUMN ASSEMBLY (WATER LUBRICATED)

Top column pipe is without coupling, insert top shaft inside the pipe after cleaning threads at both the ends of the shaft and repeat above procedure for assembly.

4.10 DISCHARGE HEAD ASSEMBLY (WATER LUBRICATED):

Clean discharge head remove stuffing box now put rope through the top of discharge head and lift lower it over top shaft taking care not to damage shaft or shaft threads align discharge head on the top of column and screw remember to use lead compound /Teflon tape over pipe thread. Rotate discharge head on the top column pipe till the pipe end butts.

Raise the pump head slightly remove pipe clamps lower the head on foundation with discharge opening in the desired direction.

Clean the seat for stuffing box on discharge head, apply light grease and put on stuffing box gasket and apply grease on top of gasket, now clean stuffing box and lower it over head shaft and set it on gasket align holes and tighten in position with cap screw. Stuffing box is equipped with packing and lantern ring for grease lubrication to prevent excessive leakage of water through glands. Now put the glands in position and tighten the nuts or studs. These are only to be hand tight. Fig 18

Slip on the water deflector on the shaft almost 5 mm above the gland.

Note:

Discharge head top face must be leveled so that head shaft is aligned.

4.11 EXTRENAL CLEAR WATER LUBRICATION:

Procedure is similar to self water lubrication pumps the only difference being that the bearing holder are lubricated by external clear waters, shaft enclosing tubes are similar to those in oil lubricate pump.

1. Pressure of the external clear water should be 1 kg/cm more then the shut off pressure developed by the pump.

2. Auxiliary supply of water should be given before main pump starts make necessary arrangement of auxiliary to main pump so that the main pump should automatically stop if the auxiliary supply of water is stopped due to any reason.

3. Pre lubrication is not required for these pumps.

4.12 DRIVER:

A). VERTICAL HOLLOW SHAFT MOTOR.

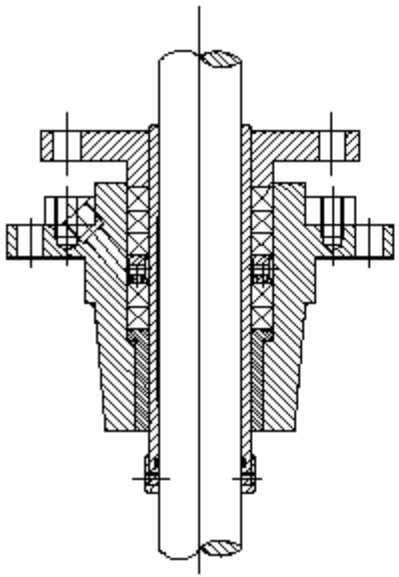
a. Remove the top cover of motor and motor coupling lift motor using eye bolts or hooks and clean bottom seat of motor .

b. Raise motor to about 150mm above top shaft lower care fully on to discharge elbow/discharge head. Take care not to damage the shaft.

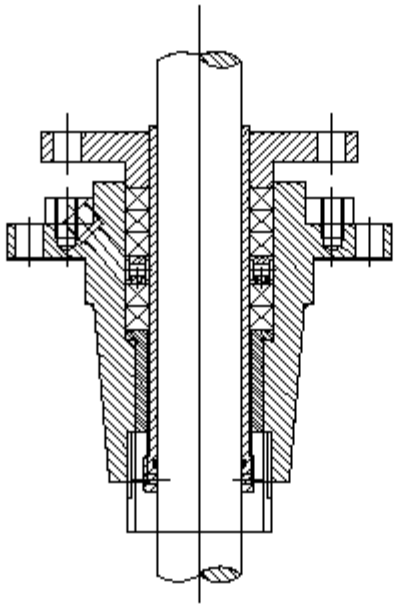
c. If the hollow shaft of motor does not slip over the top shaft easily the top shaft will probably be bent during the operation.

d. Make sure pump is aligned with the foundation and pump shaft is centered in the motor hollow shaft.

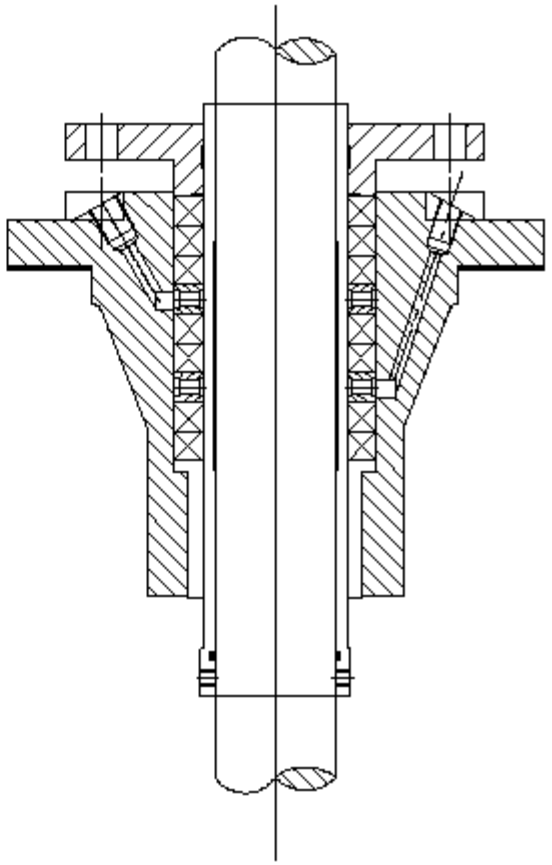
e. Do not shim or install any packing between elbow and motor adjust level by using steel wedges or shims between base plate and foundation so that top shaft is centered in the motor hollow shaft.



STANDARD PACKING BOX



MEDIUM PRESSURE PACKING BOX



HIGH PRESSURE PACKING BOX

(FIG-18) PACKING BOX ARRANGEMENT.

PACKING BOX						
SN.	STUFFING BOX TYPE	SERIAL	MAXIMUM PRESSURE	LUBRICATION	REMARKS	
1	STANDERD	GENERAL	12.5KG/CM^2	PRODUCT		
2	MEDIUM PRESSURE	MEDIUM PRESSURE	20KG/CM^2	PRODUCT		
3	STANDERD SHAFT& TUBE	OIL TUBE GENERAL	9KG/CM^2	OIL TUBE		
4	SHAFT&TUBE EXTERNAL WATER	ABRASSIVE	12.5KG/CM^2	EXTERNAL FLUID	FLUIDE PRESSURE MUST BE 1KG/CM^2 MORE THAN SHUT OFF PRESSURE	
5	HIGH PRESSURE	HIGH PRESSURE	40KG/CM^2	PRODUCT		

f. Rotate the motor so that the terminal box is in desired direction. Match the holes of motor and elbow and tighten with bolts nuts.

g. Check the oil levels to the grease on the motor bearing. If required grease must be added while adding grease be sure to open the grease relief valve first.

h. Now connect the motor terminals to the leads from starter panel.

I. Start the motor and check rotation of motor and if required correct the rotation.

j. After checking the rotation place the drive coupling by slipping it over the top shaft. This must be a sliding fit, if necessary file dress and scrap but do not use force

k. Now remove coupling and check key way in coupling and top shaft with key to be fitted, it should be slide fit but not loose.

l. Put the coupling in place and insert the key.

m. The top of the key should be level with or slightly below the top of coupling. Threads the adjusting nut on the top shaft by hand.

B. VERTICAL SOLID SHAFT MOTOR:

Vertical solid shaft motors are used with thrust bearing housing. Theses are of following types.

1 Anti friction type

2 Tilting pad type.

(Oil lubricated Mitchell type)

Clean the thrust bearing housing assembly bottom face and check grease and oil level in bearing housing.

Remove coupling from the thrust bearing housing raise bearing housing assembly above top shaft and lower carefully on to the discharge elbow/head take care not to damage the top shaft.

3 Make sure pump is aligned with the foundation and pump shaft is centered in the thrust bearing housing assembly.

4 After the TBH assembly is centered match the holes with elbow/ head and faster with bolts and nuts.

5 Now raise motor stool over assembly clean bottom face and lower carefully on to the discharge elbow/head take care not to damage TBH assembly and tighten with bolts and nuts.

6 Remove drive coupling and proceed as mentioned in hollow shaft motor.

7 Check the parallel and angular alignment of coupling. There should be gap of 6mm between coupling faces. As mentioned in G.A. drg. Supplied with pump.

C. GEAR DRIVE:

Remove the gear drive cover and coupling and proceed as outlined above for vertical hollow shaft motor, except starter panel connection, if connection to drive by a flexible shaft follow instruction accompanying the shaft.

D. BELT DRIVES:

Remove belt pulley by loosing cap screw in top of pulley. Also removed the drive coupling and adjusting nut and precede as outlined for electric motor except for wiring.

4.13 ADJUSTMENT OF IMPELLER:

A. Enclosed type:

1 Install the gib key in the head shaft and screw on adjusting nut. Raise the impeller as for as it will go. Drop back one half the distances to center impeller bowl.

2 Install two lock screws in adjusting nut, it may be necessary to turn the nut match the tapped holes.

3. Rotate the pump shaft by hand and make sure it turns freely.

B. SEMI OPENS TYPE:

Adjustment of impeller is very sensitive and requires certain trial and error.

1 By having two suitable wrenches one on the drive coupling to keep the pump from rotating and the other on adjusting nuts raise line shaft by turning the adjusting nut by 1/6 turn at time until impeller breaks free .

2 The pump will turn free usually by hand at this point. This is the lowest point of adjustment. Install two lock screws in adjusting nut; it may be necessary to turn the nut to match the topped boles. Rotate the pump shaft by hand make sure it turns freely.

4.14 PIPE CONNECTIONS:

A. For oil lubricated pump:

1. Delivery pressure gauge connection.

2. Oil lubrication connection for line shaft bearings.

3. Air vents connection for column pipe.

4. Cooling water inlet and outlet connection only of Mitchell thrust bearing.

5. If solenoid valve is used it is to be energized with separate electric connection so that pre lubrication to the bearing can be made before staring the pump.

B. For self water lubricated pumps:

1. Delivery pressure gauge connection.
2. Pre lubrication tank connection.
3. Air vents connection for column pipe.
4. Cooling water inlet & outlet connection (only for Mitchell thrust bearing)

C. External clear water Lubricated pumps:

1. Pressure gauge for connection.
2. Pressure gauge & inlet water connection for shaft enclosing pipe.
3. Cooling water inlet outlet connection (only for Mitchell thrust bearing)
4. Air vents connection for column pipe and for shaft enclosing tube.

D. PIPE CONNECTION:

Pipe connection is to be according to outline drawing supplied with the pump.

5 OPERATION.

5.1COMMISSIONING

a. Oil lubrication pumps:

For first starting one liter of lubricating oil should be poured as a pre lubrication of bearing holders. The oil can be poured directly from the plastic pipe or through solenoid & feed valve. Oil should be poured slowly as it has to pass through grooves of bearing. It takes approx 3-4 hours to pass 1 liter of lubricating oil. While pouring the oil coupling should be rotated slowly by hand for subsequent starting: the oils should be fed 5 minute before starting the main pump.fig-24.

Pump with oil lubrication

specification of lubricating oil are as under.

SAE 10 or Equivalent

Viscosity	35 CST at 38 Deg.
	53 ST at 99 Deg.
flash point	193°.c
pour point	6.c
water content	not above 0.1%
ash content	not above 0.05%
Hard As Phalt	Neutralization no
Neutralization no	Not Above 0.3 MGR

one liter oil should be poured if pump is I olle for about a week before stating.

Oil feed rate	-	10-15 drops per min
oil tank capacity	-	2.5 ltr.

b. Self water lubricated pumps:

The bearing holders are lubricated by self water when the pumps are in operation. Hence for pre-lubrication clear cold water from pre lubrication should be given for about 5 minute before switching on the pump. The coupling should be rotated slowly by hand.fig-23-25&26.

c. External water lubricated:

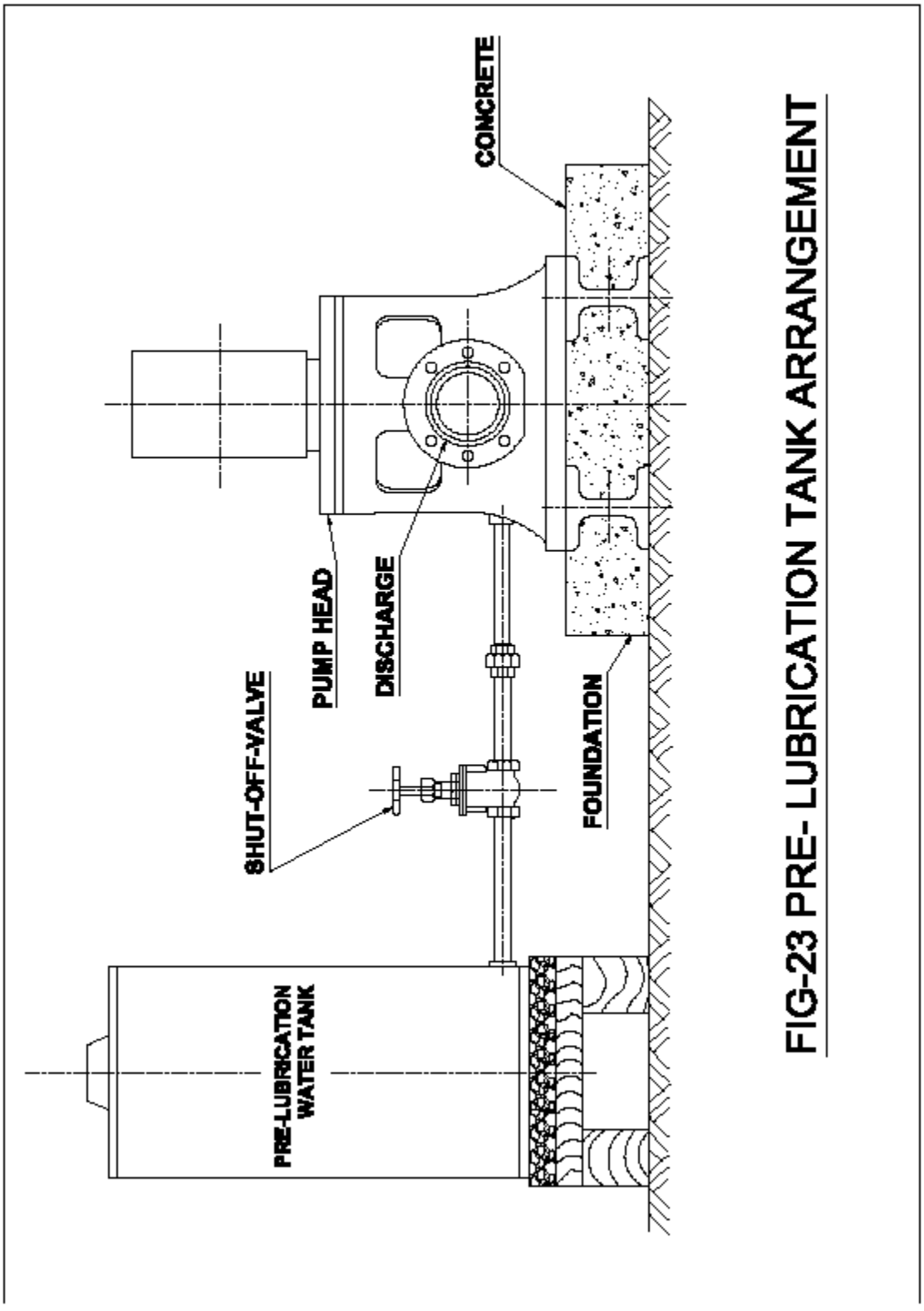
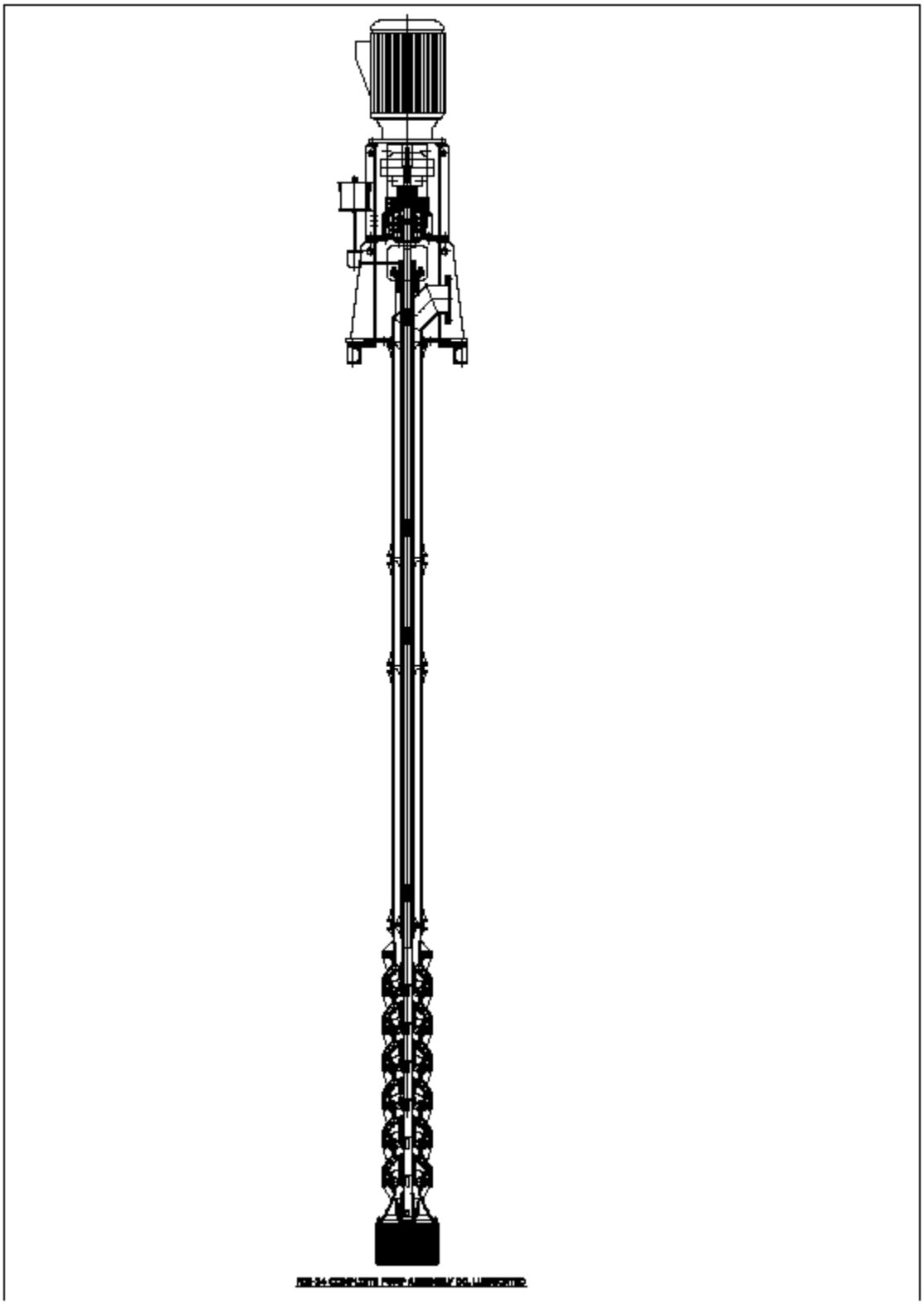
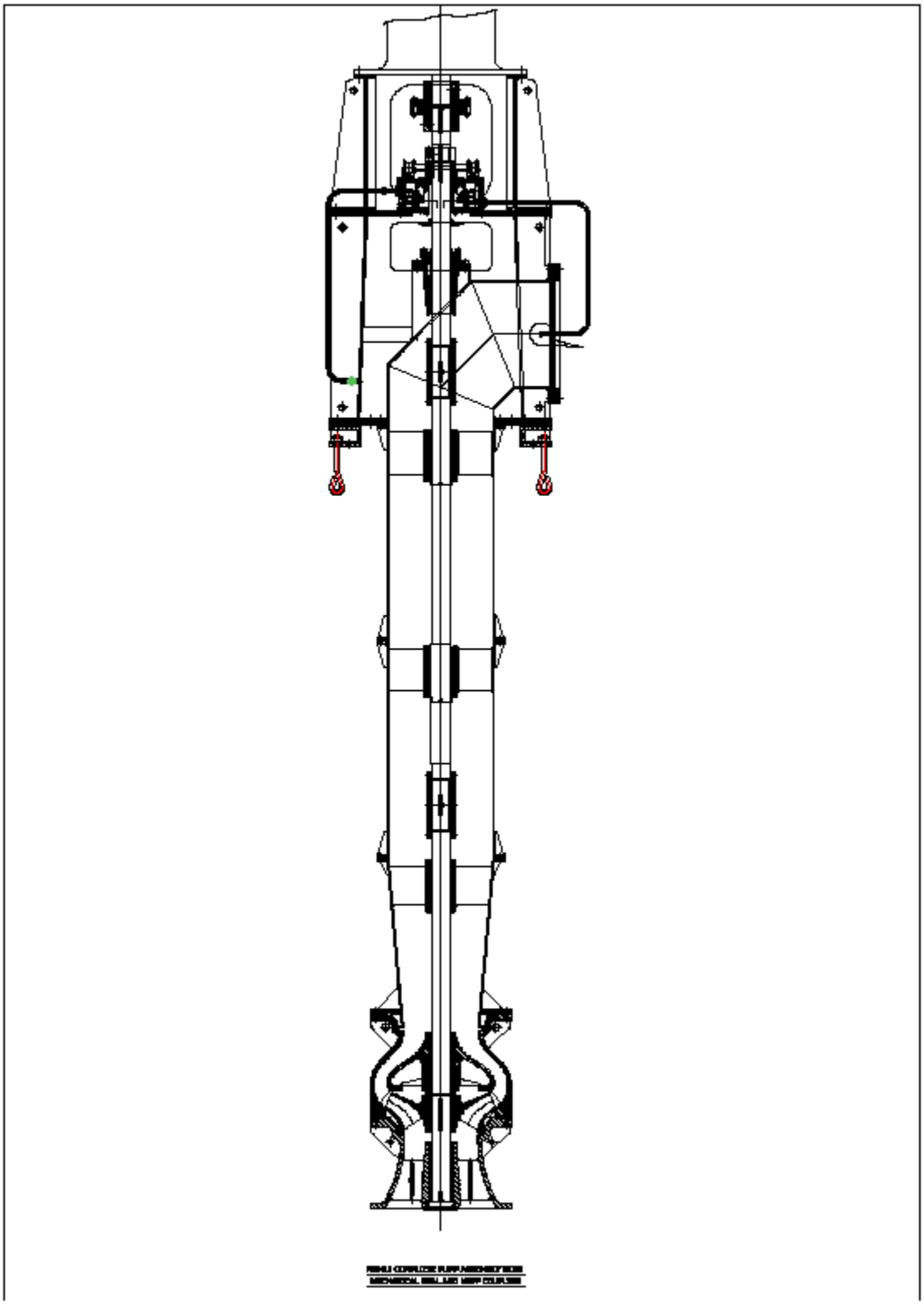


FIG-23 PRE- LUBRICATION TANK ARRANGEMENT





In these types bearing are lubricated with clear cold water from external source. Before staring the pump, starting the pump keep the air vent for enclosing tube open and feed external water till all air is

vented out and clear water comes out smoothly from the air vent . if possible, make arrangement to interlock the external water source to the main pump such that main pump will stop immediately if external water supply fails for any reason.

5.2 PRIOR TO STARTING

Before staring the pump make sure that:

1. The rotor assembly rotates freely by hand or lever.
2. Minimum submergence is maintained as specified.
3. All air vents are open.
4. Inlet cock for Mitchell thrust bearing cooling is open.
5. Pre lubrication is made as per instruction given above.
6. The supply voltage is within the 5% of the voltage indicated on the name plate of the motor .
7. The cock of pressure gauge connection is closed.
8. The oil feed valve has oil feed of 10/15 drop per minute (for oil lubricated pumps)
9. The pressure of the external water in case of external water lubricated pumps is 1 kg/cm (one atmosphere above the full valve close pressure.
10. Coupling is properly aligned.
11. The discharge valve is in fully closed condition.
12. The discharge valve is in fully open condition.
13. The oil filled in the Mitchell

Thrust bearing is up to the mark on the oil level indicator.

14. In the case of water lubricated pumps the stuffing box packing is inserted in such a way that their joints are staggered. The gland is not too tight.

15. Start the pump; Let the motor pick up full speed.

5.3 PUTTING THE PUMP IN OPERATION:

1. Ensure that pump installation is complete.
2. Ensure that all the auxiliary equipment have been installed serviced and ready for operation.
3. Service the driver as recommended by the manufacturer.
4. Pre lubricant rubber bearing before staring the pump.

5. Start the pump, these pump are equipped with a stuffing box adjust stuffing box packing gland to allow a liberal amount of leakage part the packing a small taxable is desirable momentarily .

6. Momentarily bump start the driver to tighten all the line shaft coupling then immediately stop the pump. This step is necessary only on the initial start up after pump installation.

7. Recheck the impeller adjustment making sure that the rotating element turns freely by hand

8. Set the discharge valve to a nearly closed position before starting the pump new installation. Head and capacity developed by the pump is as specified on the name plate of the pump.

9. Check the temperature of the pump and the motor bearing, temperature of the Mitchell thrust bearing should not exceed 50*c. temperature of the thrust ball bearing should not be more that 75*c.

   Stop the pump immediately if any defects, discrepancies are detected and must not be started again unless they are rectified, report immediately to the supplier if it's not possible to rectify the defect.

10. Close the air release valve after air is vented out.

11. Close the cock of pre –lubrication (self lubricated pumps)

12. Adjust the discharge valve for specify duty condition.

13. Check the flow of water in the flow indicator provided on the outlet.

5.4 CHECK DURING RUNING:

Check the following things and regulate if necessary:

1. UN interrupted flow of cooling water with Mitchell thrust bearing. Also check the temperature of the cooling water at outlet. It should not exceed 50 c.

2. Pump is running smooth. Check vibration and noise. Vibration should not exceed 0.1 mm vibration can be checked with vibrometer or dial gauge indicator.

3. The gland is not too tight (for water lubricated pumps) there should be a slight leakage through stuffing box.

4. Power consummation is within the limit. Check the current; it should not exceed the value given on the name plate of the motor.

5. Ensure that there is no mechanical friction in the pump.

6. There is a constant flow of lubrication to the bearing holder and thrust bearings.

IMPORTANT POINTS TO KNOWN / REMEMBERED:
1. Daily turn grease cup to force grease in to the packing box.
2. Check at regular intervals the oil level in the oil box and fill if necessary. (Change the oil after 500 hours of operation.)
3. Check packing for water leaking and tighten packing nut by hand only (never use a wrench). Allow some water to leak.
4. Do not continue to run the pump dry in case it looses its prime because this may damage the impeller and line shaft bearings.
5. Do not attempt to start pump before pre-lubricating line shaft bearing with one half of the water quantity stored in the tank.
6. Do not try to run the pump. If possible without suction lift. The lowest bowl should always be submerged in the water. In fact ideal operation conditions will be secured when then top bowl is also submerged. this may of course, vary according to the installation because a small capacity located in a large well will require less submerge than a large capacity pump in a small well.
7. Do not let the pump break suction if its capacity is too large for the well because this may cause vibration and damage to the column bearing. In this case it is better to throttle the pump through the discharge line valve.
8. Do not stop the pump if it delivers water with sand or mud. If so the sand and mud suspended in the water will settle in the bowls and impeller a cause them to stick. Throttle the pump by closing the discharge line valve and wait until water clear before stopping.
9. Do not attempt to restart the pump if it has been shaft or other serious damage for the following reason. When pump is stopped the water in the column backs down through impeller and tends to relate the pump backwards for a short period of time, depending upon the height of the column or the depth of pump setting. This backward rotation may or may not be noticed in pumps operated with belt drive. Wait until comes to a complete stop before restarting.
10. Just stopped because this strains the unit severely and may cause the breaking of the shaft or other serious damage to pump.

6 TROUBLE SHOOTING.

Operation troub	Possible cause	Remedy :
1. In case pump can not be started	a. Engine or motor treble	1. Check speed of engine and in the case of electric motor, Whether voltage is low. 2.Check compression of engine 3. Check fuel supply. 4. Check if fuses are burned out.
	b. Power transmission trouble	5. Check position of overload relay. 6. Check if motor is defective. 7. Follow up instruction given by engine or motor manufacturing.
	c. Pump trouble	8. Check clutch equipment. 9. Check belt slip. 10. Check angle gear drive if available.
	d. Well is not straight	11. Check whether pump is sand locked (try to loose it through pipe wrench) 12. Check whether packing too tight. 13. Check adjustment of impellers in proceeding as above outlined.
II. In case pump	A .Pump trouble	14. This appears when a new pump has been just installed and starts opening. It can only

does not deliver any water	b. other cause	avoid if well condition are proper.
	a. Pump trouble	Check whether pump impellers column pipe or strainer is clogged up.' 1. Check whether lineshaft is broken. 2. Check whether pump suction was broken up. 3. Check whether discharge pipe valve has been opened . 4. Check whether discharge pipe valve has been opened. 5. Check whether pump speed is too low (engine revolutions or voltage too low.) 6. Check if pumping head is too high.
	b. Other cause	7. Check water level in the well. 8. Lowest bowl may not be submerged . 9. Check whether water in well Contains too much gas or air.
III in case water delivered is not sufficient.	a. Pump trouble	1. Check whether pump rotates in right direction. 1. Check whether pump impeller column pipe or strainer are partially clogged up. 2. Check whether discharge pipe or column pipe are leaking. 3. Check whether pump bowl are worn out. 4. Check whether impellers are loose or partially damaged.
	b. Other cause	5. Check adjustment of impellers. 6. Check whether pump speed too low (engine revolution, low Voltage. low (engine revolution, low voltage. , low frequency or belt slip)> 7. Check whether discharge valve is fully opened.

		8. Check whether drawdown impeller operate under suction lift. 9. Check whether suction pipe is leaking in case water level is below lowest impeller.
IV. In case pressure developed is not sufficient	a. Prime mover or pump trouble.	ck whether pumping head too great. 9. Check whether water contains gas or air. 10. Check accuracy of capacity measuring device. 1. Check for column pipe leaks. 2. Check whether impellers damaged. 3. Check whether line shaft bearing are worn out. 4. Check adequate speed of pump (see above) 5. Check whether air in the water or air or gas in the well. 6. Check whether impellers are submerged or not.
v. in case pump uses to much power.	b. Other cause c. engine or motor trouble	1. Check whether speed too high .(may be due to high voltage voltage Voltage or to wrong selection of pulleys.) 2.Check whether line shaft is crooked. 3.Check whether vibration of pump to high. 4.Check whether packing too tight and if so loosen the packing nut. 5.Check adjustment of impeller and condition of Same. 6.Check alignment of pump head. 7.Check whether bearing are worn out.
	e. Pumps trouble g.Other cause	8.Check whether water contains too much sand or other foreign matter. 9. Check whether total pumping head is different

VI. In case of excessive pump vibration	a. Pump trouble	From that the pump was designed for. 10.Check whether well is corked and throws line shaft Bearing out at alignment.
	b. Other causes	1. Check whether engine or motor coupling is Out of balance. 2. Check whether voltage is varying. 3. Check the engine speed. 4. Check whether in shaft in bent. 5. Check whether bearing are worn out. 6.check whether impellers are out of balance due to foreign Matter caught in them. 7. Check alignment of pump head. 8.check alignment of pump with engine or motor. 9. Check whether well is crooked. 10. Check whether water contains too much air or gas.
VII. In case excessive wear is noticeds	a. motor b. pump Other causes	1 Check whether line shaft is bent. 2 Check whether lubrication is proper. 3. Check whether vibration is too excessive. 4. Check alignment of pump. 5. Check whether well is crooked. 1. Check whether water contains too much sand foreign matter and gas or air.

VIII In case of excessive noise.	Motor Pump	1. Motor noise bearing running dry. 2. Pump bearing running dry. 3. Broken column bearing returns. 4. Broken shaft or shaft enclosing tube. 5. Impeller running on beat. 6. Cavitations due to low submergence or operation Beyond maximum capacity. 7. Foreign material in pump.
IX. Stuffing box a. Over heating.		1. Packing is to tight. 2. Packing is not lubricated. 3. Wrong grade of packing. 4. Stuffing box. In propery packed.
b. Packing wears too fast.		1. Shaft or shaft sleeve surface rough or worn out. 2. In sufficient or no lubrication. 3. In properly packed. 4a. Wrong grade of packing. B.Defective packing.
c. Leaks excessively at stuffing box.		

7. MAINTENANCE:

7.1 DAILY CHECKS:

1. Pressure gauge reading.
2. Water level in the sump.
3. Voltage & current.
4. Pumps motor bearing temperature.
5. Oil level in the Mitchell type thrust bearing.
6. Rate of flow of lubricating oil.
7. Leakage through stuffing box.

7.2 PERIODICAL/PREVENTIVE MAINTENANCE:

Replenish the lubricating oil.

Replenish the grease for pump & motor bearings.

Change the stuffing box packing.

Check the strainer (if supplied) is not choked or damaged.

Check silt deposition.

Check the measuring instrument.

Check the level on the motor stool as there is a possibility of resetting of foundation in the course of time or disturbance in delivery pipe line.

IMPORTANT:
If the pump stand idle for a long period, it is to run a short period once in a week at its max. Speed to prevent the shafts and impeller from sticking.
Pump should never run dry. Dry running will result into seizing bearing and other mating surface.

PREVENTIVE MAINTENANCE:

To ensure satisfactory operation of the pump scheduled inspection and periodic maintenance are required. Sintech suggests an inspection and maintenance log be kept and the inspector reports any problems.

A guide for preventive maintenance for normal applications is given below unusual application with abnormal heat, moisture, dust etc may required more frequent inspection and service.

ITEMS	ACTION REQUIRED
Stuffing box & mechanical seal	Inspect every 100 hrs of operation for excessive leakage. Adjust of replace packing as required. Replace mechanical seal.
Pump alignment	Check for changes annually and care it as required.
Noise level & pump vibration	Check for changes annually and care it as required.
Replenish the lubricating oil	As required.
Replenish grease for pump & motor	As required
Check for strainer	Whether it is choked or damage at the time of over hauling.
Check silt deposition	Every 24 hrs..
Check for measuring instruments	
Check the level on motor stool as there is possibilities of resetting of foundation in course of fine or disturbance in delivery pipe line.	First check in 3 months
Clean dirt, oil & grease from discharge head and driver Clean driver ventilation passes	As required. As required.
Check oil level in reservoir, it should never be loess ½ full, refill check drip rate.	Every 24 hrs of operation.
Check oil in thrust bearing housing	Change after 500 hrs of operation or six months or it turns blackish.
Tighten all loose bolts and check for excessive vibration If packing is grease lubricated add as required	As required. 100 hrs.

8. OVERHAULING:

1. With normal daily operating speed the pump will due for overhaul after about every three years. This work should be carried out be specialized fitters.

2. As the parts are to be cleaned and to be checked thoroughly for wear & tear after dismantling below following parts are to be checked for clearance, If it exceeds those limit given table the parts are to be replaced.

Max clearance in mm

a. Impeller & casing ring 1mm

b. Impeller & impeller guide piece 2mm

c. Shaft & bearing bush 0.8 mm

NOTE:- MAXIMUM CLEARANCE SHOULD NOT BE MORE THAN DOUBLE OF NORMAL CLEARANCE.

2.The rubber rings, rubber bearing used for water lubricated pumps must not come in contact with grease oil petrol paint are to be cleaned in clear cold water.

3. While ordering for spare parts the details of the name plate must be quoted in full particular the name of the pump order no. pump machine No. and the name of the spares parts required and quantity. Cross drawing & spare parts list are given on previous pages

Keep the sufficient stock of spare parts in order to meet the emergency requirement.

WEAR RING AND BEARIG CLEARANCE (TABLE-5)

THE FOLLOWING ARE AVERAGE CLEARANCE FOR BRONZE BEARING AND BRONZE WEAR RING

SN.	BOWL SIZE	DIMETERAL BOWL AND IMPELLER WEAR CLEARANCES(MM)		SHAFT DIA(mm)	DIMETERAL BOWL BEARING CLEARANCE(MM)			
					BRONZE		RUBBER	
		NORMAL	REPLACEMENT		NORMAL	REPLACEMENT	NORMAL	REPLACEMENT
1	250 TO 350	0.350	0.500	38-50	0.250	0.350	0.400	0.550
2	400 TO 500	0.450	0.600	50-62	0.275	0.375	0.450	0.700
3	600	0.650	0.850	68	0.300	0.400	0.600	0.825
4	625 TO 900	0.800	1.000	68-100	0.300	0.400	0.800	1.00

NOTE-

SPECIAL MATERIAL STAINLESS STEEL WEAR RING AND HIGH TEMPERATURE LIQUIDS ABOVE 180°F REQUIRE SPECIAL CLEARANCES

These thrust bearing housings are supplied with vertical solid shaft motors which are not taking vertical thrust load.

These are of following types-

(A) Oil lubricated

(B) Oil lubricated (Water cooled)

(C) Grease lubricated

(D) Mitchell type thrust bearing flossing

#Most thrust bearings are lubricated by a positive circulating of oil through the bearings. Which are mounted in sealed oil reserve oil?

Thrust bearing housings are supplied without oil. Before first time operations and at the oil changes to reserve oil grit particles oil reservoir sump. Use same type of oil to flush reserve oil as specified for lubrication. Remove drain plug before flushing. Flushing oil may be poured through oil fill opening after removing oil fill plug. The proper oil level when unit is not running shall not be more than 3mm to 6mm from the top of the oil sight gauge. Over filling may result in overheating of the unit.

During operation the oil level in sight gauge may be higher than the recommended range material above. Under no circumstances it is allowed rotate unit when oil level is below required level. To avoid oxidation of the antifriction bearings during shut down period lasting more than a week. It is recommended to fill up the oil reservoir until the oil sums over the oil retainer tube so that bearings remain completely immersed in the oil before startup do not forget to drain the excess oil to its required level.

IMPORTANT:-

The oil in bearing housing should be filled up to the mark on the oil level indicator with the pump in idle condition oil should not be replaced during operation. Maximum temperature of oil should not exceed 50° C. Replace the oil before it becomes black and oil reservoir should cleaned at the same time. Change oil once every six months provided the operating temperature does not exceed 50°C. For operating temperature around 100°C the oil should be changed every two/three months or 500Hrs operation.

A paraffin base non emulsifying light motor oil 5AE-10 or SAE may be used for thrust bearing housing oil.

SPECIFICATION OF OIL For Bearing lubrication:-

For lubrication of bearing use oil as per SAE 20w / 20or. CLP 68 to DIN 5157 or ISO – VG 46 having properties as given blow.

Kinematic viscosity at 40°C Min – 41.4 mm²/sec and max 50.6 mm²/sec.

Flash point +175°C, Solidification point -15°C

Pour point - 0 - 5°C

Water content - Not above 0.1%

Ash content - Not above 0.05%

Hard asphalt - 0% Neutralization member not above 0.3 mgr

The lubrication oil should be confirmed to following grades of oil available in market or equivalent

Manufacturer	Speed 1450 RPM	Speed 2900 RPM
Indian Oil	Servo system 81	Servo system 57
Hindustan petroleum	ENKLO 57	ENKLO 53
ESSO	TERESSO-68	TERESSO-46
SHELL	TELLUS-68	TELLUS- S 46
CASTROL	HYS PIN AWS 68	HYS PIN AWS 68
MOBIL OIL	DTE 26	DTE 24
TEXACO PROMAX	REGAL R&O 68	REGAL R&O 46

The similar drives have the thrust bearings cooled by air circulation and need no attention as oil temp is below 50°C, except to check the oil level is at the proper level.

If operating temp of oil exceeds 50°C the thrust bearings are provided with water cooling system, the regulating volume should be adjusted so that water feels cool to hand when leaving the bearing. This can be checked by removing plug from the tee or overflow and feeling water. The approx rate of flow in cooling system is given in following table:

COOLING WATER REQUIRED FOR MITCHELL THRUST BEARING / OIL LUBRICATED THRUST BEARING (LPM)

SPEED RPM	THRUST LOAD IN KG			
	5000	7000	10,000	12,000
1460	8	11	22	25
960	6	10	19	22
730	5	9	17	20
585	4	8	15	18
Shaft Dia.(mm)	70	90	120	150

GREASE LUBRICATED THRUST BEARING:-

The bearings are pre-lubricated at factory. Re grease the bearing according to the following procedure and per the schedule given in table.

1. Whip dirt from grease fitting.
2. Check relief port 180° a part from fitting to make sure it is fitting.
3. Fill the grease cavity through the fitting until fresh grease comes out from the relief hole.

4. Ensure after re greasing relief port is plugged.

NOTE:

The bearing temperature usually rises after re greasing due to an excess supply of grease temperature will return to normal after the pump has over flow the excess grease from the bearings usually it takes two to four hours.

For most operating conditions lithium based grease is recommended. This grease is acceptable for bearing temperatures of 5°C to 150°C.

The normal running conditions when the bearing housing perfect temp. Is as below 80°C, we recommend lithium or lithium calcium based mineral grease for roller/ (ball bearing such as.

Manufacturer	**Grade**
Bharat	MP-3 Grease
HP	Lithon3/NATRB-3
Cortex	Star Fak-3
Indian oil	Servogem-3
Esso	Beacon 2, Unirex N3
Shell	Alvania Ep2, Limona LX1

The first Re-lubrication should be done before the initial commissioning of pump then after words every 1000 hrs of operation or 6 Months whichever is earlier**.**

REFILLING PERIOD (IN OPERATING….)

SHAFT SIZE	THRUST LOAD (KG)	THRUST BRG. NO. (KG)	SPEED (R P M)			
			1460	960	730	585
36	600	SKF7312 SKF6215	900	1000	1100	1200
38	1100	SKF7214BG	900	1000	1100	1100
45	1600	7317	800	900	1000	1000
55	2000	SKF7316 SKF6219	700	800	900	9000

The frequency of lubrication depends on the operating condition; however as a general guide line the re- lubrication period is given in table:

NOTE:-

VERTICAL SOLID SHAFT MOTOR:

When pump is supplied with thrust bearing housing, do not secure driver to discharge head until thrust bearing housing and flexible coupling are installed.

8B.ALIGNMENT

The coupling between the drive shaft and discharge head shaft is a non spacer type or a spacer. The latter type is used on pumps furnished with mechanical seal to permit servicing of the seal without removal of the driver.

6. Attach a sling to lifting lugs of driver, hoist motor, inspect the mounting surface, register and shaft extension and clean these surfaces thornily. If burrs are found, clean with smooth file and clean thoroughly.
7. Orient the motor conduit box in the required position. Align the motor mounting holes with matching holes on the discharge head / motor pedestal louvers the motor until the register engages and motor pedestal. Secure motor with bolt and nuts.
8. Remove drive coupling and proceed as mentioned in the hollow shaft motor.

COUPLING INSTALLATION:

1. Apply a thin layer of oil on the pump key and insert key in to head shaft key way seat.
2. Gently lower pump hub coupling in to head shaft.
3. Thread on the adjusting nut on to the head shaft until flush with top of the head shaft.
4. Apply thin layer of oil on the driver key and insert key in to the driver shaft key way seat. Place with driver hub on to the drive shaft and key slide it up the drive shaft.
5. Adjust the impeller and slide driver hub down and check the parallel and angular alignment of coupling. There should be gap of 6mm between coupling faces couple coupling helps with pin bush bolts.

a) Flexible coupling

A flexible coupling will not compensate for misalignment of the pump and driver shaft. The Purpose of the flexible coupling is to compensate for temperature changes and permit the movement of the shaft without interference with each other while transmitting power from driver to the pump.fig 9&10

Type of misalignment

There are two types of misalignment between the pump shaft and driver shaft.

a. Angular misalignment.
   Shaft with axis concentric but not parallel.
b. Parallel misalignment.
   Shaft axis parallel but not concentric.

The two halves of the coupling should be at least 4-6 MM apart so that they cannot touch each other when the drive shaft is rotated. Necessary tool for checking is straight edge and an outside caliper. For gap between faces coupling halves refer G.A. DRG.

A Check for parallel alignment is made by placing straight edge across both coupling periphery at the top, bottom and both the sides, the unit will be in parallel alignment when straight edge reset evenly on the coupling periphery at all positions , Care must be taken to have the straight edge parallel to the axis of the shafts.

B check for angular alignment is made by using outside caliper across the width of the coupling faces at various points.

factors that may disturb alignment.

The unit should periodically checked for alignment, If unit does not stay in line after being properly, installed. The following are possible causes.

1) Setting seasoning of the foundation.
2) Pipe strains, distorting or shifting of the pump.
3) Wear of the bearing.

final coupling alignment

The final coupling alignment must be made after the piping has been connection. If realignment is required, disconnect the piping first, these proceed with alignment. Reconnected the piping after alignment has been completed and recheck the alignment before connecting the coupling.

A flexible coupling must not be used to compensate for misalignment resulting from poor installation or temperature changes.

Note for maximum life keep misalignment valve as near to zero as possible

A) Check parallel alignment by placing straight edge across to the coupling flanges and measuring the maximum offset at various points around the periphery of the coupling. Do Not Rotate the coupling. It the maximum offset exceed the figure in table, realign the coupling (FIG-19,20&21)

B) Check angular alignment with caliper measure from the outside of one flange to the outside of one flange to the outside of the other at interval of approx 90. Around the periphery of the coupling .The difference between maximum and minimum must not exceed the figure shown in table. It correction is required, check the parallel alignment (FIG-19,20&21)

PUMP ALIGNMENT:

Check the pump shaft alignment just below the pump coupling half by means of dial indicator. The maximum total indicated run out at this point should not be more than 0.125mm for 2900 RPM or 0.200 for slower speed. Preferably run out should be 0.075mm and 0.125mm. Care must be used when rotating shaft so the play in the lower driver bearing does not give a false reading.

NOTE:

Removing the coupling bolts and rotating the driver coupling half relative adjusting nut can result in lower run out.

IMPORTANT:

The Mitchell thrust bearing in the housing should fill up to the mark on the oil level indicator with the pump idle. Oil should not be replenished during the operation. Maximum temperature of the oil should not exceed 50˚C the oil should be removed before it becomes black and oil reservoir should be cleaned at the same time as a rough guide the oil should be changed every two months.

LUBRICATION FOR OIL LUBRICATED PUMPS (LUBRICATION FOR LINE SHAFT BEARING):

The oil for lubrication of bearing holders should conform to grade SAE/10 or its equivalent. Following grades of oil available in the market are suitable.fig-24.

Indian oil corporation servo system 311

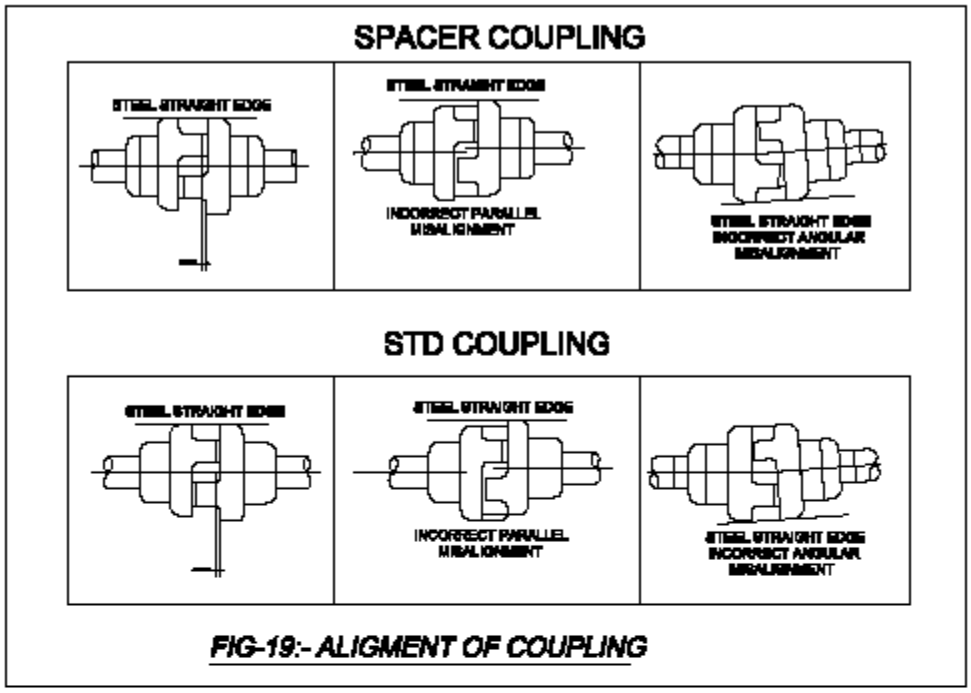


FIG-19:- ALIGMENT OF COUPLING

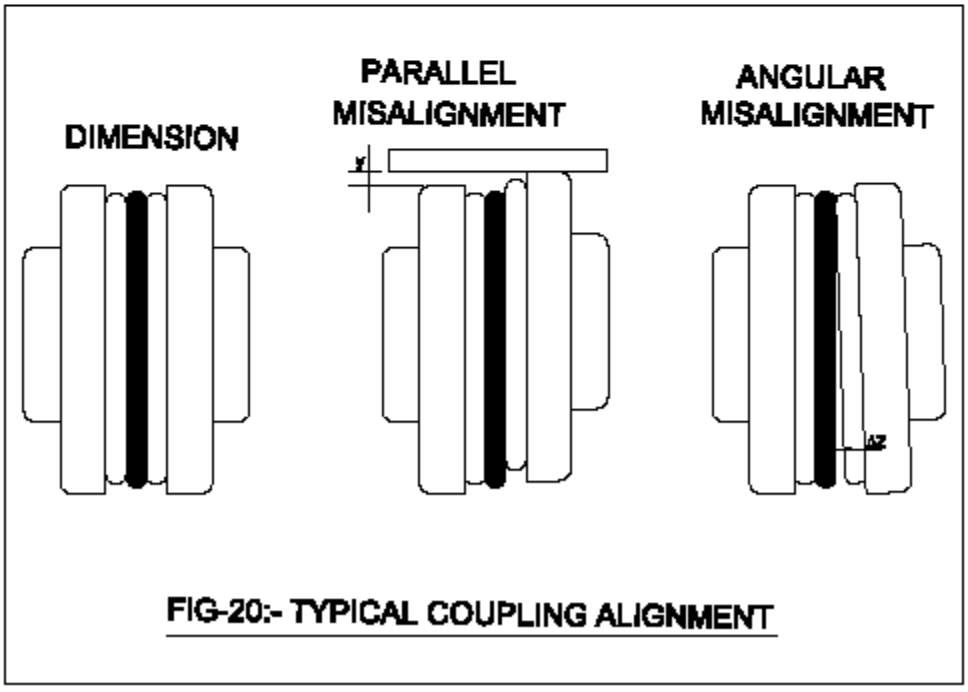


FIG-20:- TYPICAL COUPLING ALIGNMENT

COUPLING DIAMETER D.	SPEED			
	<1500 RPM		>1500 RPM	
	ΔZ MAX	Y MAX	ΔZ MAX	Y MAX
100	0.08	0.10	0.05	0.08
101-200	0.11	0.15	0.08	0.10
201-300	0.15	0.20	0.10	0.15
301-400	0.20	0.25	0.10	0.15

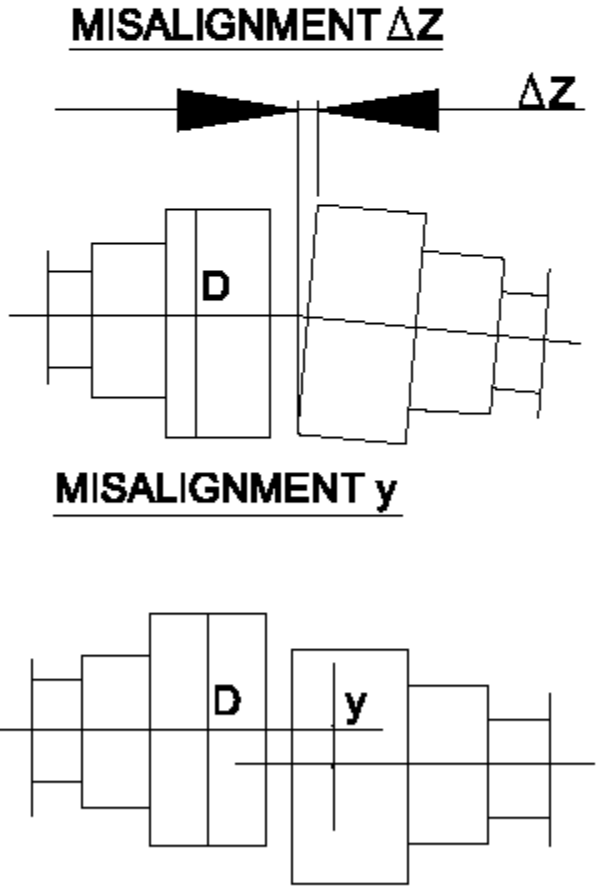


FIG-21:- PERMISSIBLE MIS ALIGNMENT.

Tide water oil company	veedol Avalon So
Caltex	regal oil (R & O)

Important

1. Pump should never run without lubrication.
2. Oil should be free from dirt and dust particles while pouring the oil I the tank, it should be poured through the filter provided in the oil tank.
3. During periodical maintenance the oil tank is cleaned thoroughly. Also the filter should be cleaned and checked for any damage etc.
4. It solenoid value is supplied ,it should be connect to an independent supply, prior to starting the pump, start the solenoid valve and ensure that it is operating .
5. Oil feed rate should be 10/15 drop per minute. In any case it should not be below 10 drops minute. Check the oil feed rate regularly at the interval of one hour.

STUFFING BOX PACKING:

The stuffing box packing should conform to champion's type No. 32116. The packing should be changed before it gets hard. The gland should not be tightened too much and should leak slightly. Ensure that the water does not splash up through gland and enter thrust bearing housing through lower bearing cover and mix with oil.

PUMPS WITH EXTERNAL WATER LUBRICATION:

The external water provided for holder must be clear cold water. The pressure of the external water must be atmosphere above the close valve pressure of the pump. This pressure should be about 30 lits/min.

The pump should not be started unless all air is vented out through shaft enclosing tubes by feeding external pressurized water. It is essential to expel the air from shaft enclosing tubes from time to time by operating air vent when the pump is in operation.FIG-22

The Rubber bearing should never run dry.

NOTE:

If the delivered water quantity starts decreasing close gradually the discharge line valve until pump deliver a steady flow if pump runs dry stop the operation of pump immediately because otherwise impeller and rubber bearing may be seriously damaged.

Watch closely a new pump during its hours of operation for smooth noiseless and vibration free running.

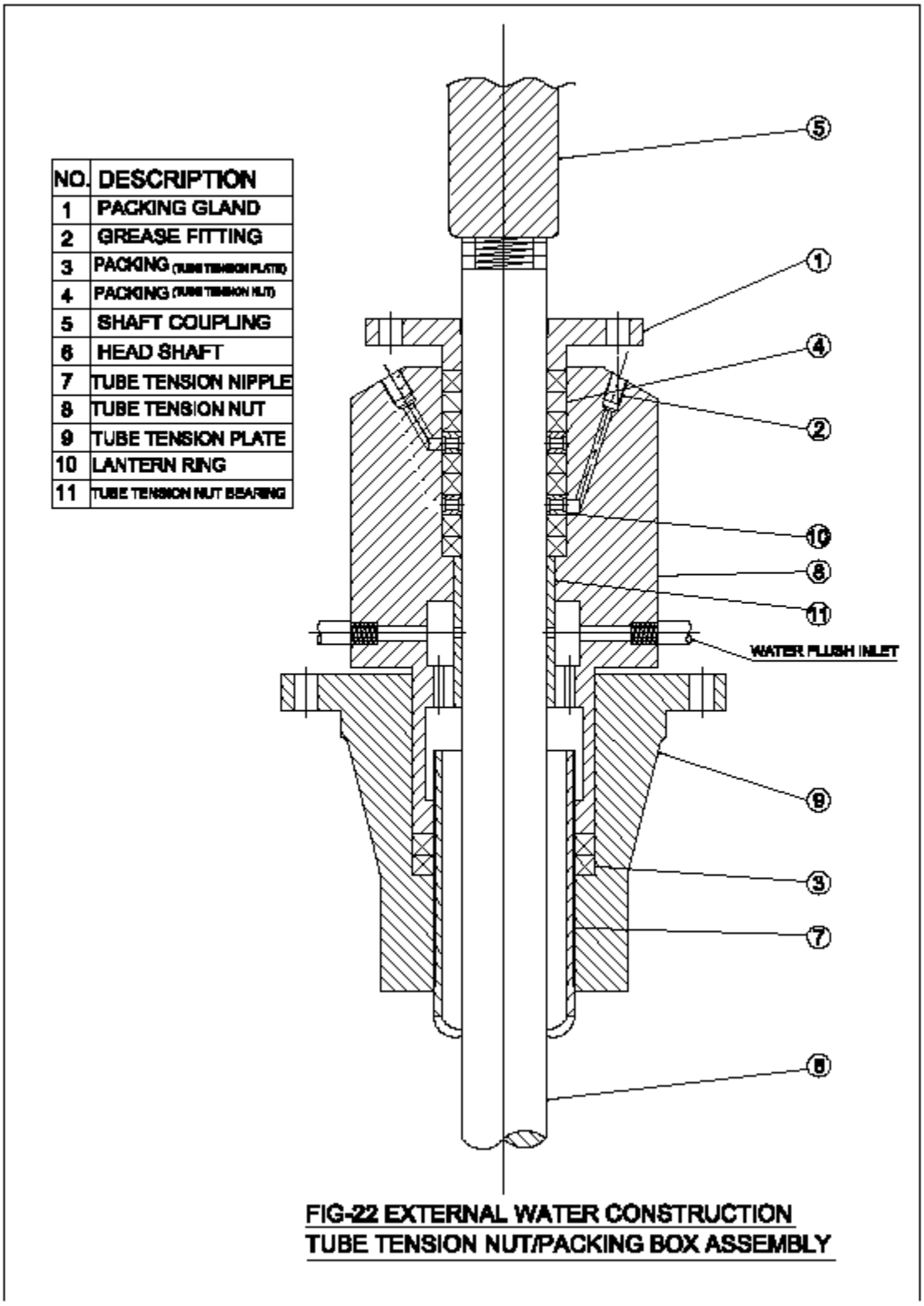


FIG-22 EXTERNAL WATER CONSTRUCTION
TUBE TENSION NUT/PACKING BOX ASSEMBLY

8C.MECHANICAL SEAL:

Properly installed mechanical seal will give satisfactory performance. To ensure proper installation, following instruction should be followed.

GENERAL APPLICATION:

The seals described in these instructions are acceptable for use in pumps handling water. It is not recommended for handling fluids which are highly acidic. Highly alkaline or contains dissolved substance that tend to crystallize, water containing abrasive.

INSTALATION:

NOTE:

Seal faces are lapped and polished to a mirror finish. It is important that sealing faces be handled with care and perfectly clean. Do not touch the sealing faces.

Prior to installation:

A. Check surfaces at the face of the seal housing and at the bottom of the seal housing to ensure that they are clean flats and free of the dirt and burrs. The face surface must be smooth to form a good sealing surface for 'o'-ring.

B. Check that shaft/ shaft sleeve is smooth and free of burrs nicks and sharp corners that could damage the "O" ring or shaft packing. When further clean up is required protect the seal remove burrs, sharp/corners by using a strip of emery paper/cloth over the shaft threads. File threads around the key way with a smooth mill file. Sharp edges must be removed.

   Remove all chips and dust from the shaft area.

C. Check that all rotary unit parts of the seal fit over shaft. A pre check may be made by removing the "o" ring from the seal and then installing seal on the shaft. Further shaft clean up will be necessary when seal will not pass all the way in seal housing.

D. Remove the seal after the pre check and reinstall the sleeve "o" ring.

E. Lubricate the shaft and sleeve ID with the lubricant recommended by manufacturer. When no lubricant is recommend by mechanical seal manufacturer, Use any one of following.

   1. Light oil (SAE-10)
   2. Silicone lubricant.
   3. Soapy water/ Liquid detergent.

Oil based lubricants will damage EPR /EPDM elastomer "O"ring. Silicone and soapy water are safe for EPR/EPDM elastomer "O" rings.

F. Install the “o” ring between the seal housing and seal. Install seal cover over the shaft and slide in to position against the face of the seal box. Take care when passing the sleeve and “o” ring over the key ways or threads to avoid damaging the “o” ring.

G. Position seal gland on discharge head seal housing and secure with cap screw. Tighten cap screw gradually and uniformly.

NOTE:

1. Do not bump carbon members against the shaft as they may chip, crack or break .

2. Do not over lighten cap screw on gland. This can distort seal seat and cause seal failure.

H. Install all seal piping as required prior to making connection of seal liquid pressurizing lines, make sure seal housing and all sealing liquid lines are flushed free of dirt scale and other particles that would be abrasive to the sealing faces .

I. Impeller adjustment is required prior to installation.

J. Secure collar set screw, set proper spring compression.

OPERATION:

A. The seal should never run dry even to check for rotation. A water source must be provided to cool and lubricate faces during pump operation the lubricating media or external water source.

B. Lubrication via pump media is not recommended for vertical turbine pumps in which

1. Lift is more than 10 meters (30 ft).

2. They are to be started by soft start or variable frequency drive.

The excessive time required for the pumped media to reach the seal at each start will result in premature seal failure. In these circumstances an eternal water source is required.

C. If an external water source is used it must be clean to within 100 microns and introduced to the seal prior to each motor start.

Adequate flow must be provided to maintain (I S F P S) minimum velocity between the bushing and shaft. Refer to the following table -

SHAFT OR SLEEVE DIA. (mm)	FLOW RATE (LPM)
25	3 - 5
32	4 - 6
38	5 – 7
43	6 – 8
49	7 – 9
55	7 – 10
62	8 – 10
70	10 – 11
75	11 – 13
80	13 – 15
90	14 – 16
100	15 – 17
115	17 - 19

D. Some seal may swet at initial stage this condition should cease after a short period as the seal faces lap to gather. Operate and monitor the seal until leakage subsides. In no case it should exceed 40 drop per minute.

ROUTINE MAINTENCE:

Periodically (100 hours of operation) once a week check seal for leakage.

SEAL REMOVAL:

Stop the driver and lock out the power so that driver cannot start accidentally.

A. Disconnect piping to seal gland

B. Release spring tension to retain proper position loosen the collar set screws.

C. Unscrew adjusting nut and lower impellers so that they rest on bowl seats.

D. Loosen the shaft coupling remove the top shaft or VHS motor or hanged coupling if VSS motor.

E. Loosen the cap screws screwing the gland to the seal housing. Remove seal assembly.

F. Insect all parts of the seal, if any parts show sign of wear the complete seal should be replaced.

Install the new seal as per procedure given above.-

MECHANICAL SEAL MAINTENANCE AND TROUBLESHOOTING:

A mechanical seal is another device designed to seal off the pressure of the pumped liquid and eliminate leakage. Considering the many variables encountered in mechanical seal applications, we suggest you contact your local mechanical seal service representative for assistance if you have problems. We highly recommend that all mechanical seal installations be backed up with a spare mechanical seal kit. There are also special seal cartridge designs which permit removing a complete cartridge and replacing it with a new one. The old cartridge can be repaired and placed back on the shelf, ready for use.

Checklist for Identifying Causes of Seal Failure:

Symptom	Probable Caused	Remedy
Seal leakage steadily	Faces not flat Blistered carbon graphite seal faces	Check for incorrect dimensions. 1. Check for gland plate distortion due to over torque of gland bolts. 2. Improve cooling flush line, if over heated. 3. Check gland gasket for proper compression. 4. Clean out any to reign particles between seat faces, Re-lap faces if necessary. 5. Check for cracks and chips at seal faces during installation. 6. Replace primary and mating rings, if damaged.
	Secondary seals nicked or scratched during installation.	Replace secondary seals.
	Worm out or damaged “O” rings.	Check for proper seals with seal manufacturer.
	Compression set of secondary seals (Hard and brittle).	Check for proper lead in on chamfers, burr, etc.
	Chemical attack (Soft and sticky).	Check seal manufacturer for

	Spring failure. Erosion damage of hardware and/or corrosion of drive mechanism.	alternative materials. Replace parts. Check seal manufacturer for alternative materials.
Carbon dust accumulating on outside of gland plate.	Inadequate amount of liquid to lubricate seal faces. Liquid film evaporating between seal face.	1. Flush line may be needed (If not use). 2. Enlarge flush line and/or orifices in gland plate. Check for proper seal design with seal manufacturer if pressure in mechanical seal box is excessively high.
Seal squeals during operation	Inadequate amount of liquid to lubricate seal faces.	1. Flush line may be needed (If not used). 2. Enlarge flush line and/or orifices in gland plate.
Seal leaks intermittently	See causes listed under "Seal leaks steadily".	1. Refer to list under "Seal leaks steadily". 2. Check for squarness of mechanical seal box to shaft. 3. Align shaft, impeller and bearing to prevent shaft vibration and/or distortion of gland plate and/or mating ring.
Short seal life	Abrasive particles in fluid. Seal running too hot. Equipment mechanically misalignment.	1. Prevent abrasives from accumulating at seal faces. 2. Flush line may be needed (If not use). Use abrasive separator or filter. 1. Increase cooling of seal faces (for example, by increasing flush line flow). 2. Check for obstructed flow in cooling lines. Align properly. Check for rubbing of seal on shaft.

8D.Stuffing box

Stuffing boxes are packed at the factory all packing is subjected to wear and should be given regular inspection generally packing boxes in pumps should be checked for excessive leakage every 150 hours of operation and gland should be readjustment if necessary.

Adjustment is accomplished by lightly tightening gland nuts, and then loosening them so they can be adjusted with figure pressure to allow a small flow of liquid to lubricate the packing 30-60 drops per minute If the flow of liquid has increased and cannot be reduced by lightly tightening of the gland replace the packing and /or shaft sleeve.

Note

Do not tighten gland to stop all leakage, leakage is necessary to ensure cooling ,flushing and lubrication of the packing and to prevent shaft sleeve damage

The stuffing box is fitted with lantern /water seal ring .The sealing chamber should be connected to a source of clear, fresh water. The recommend water pressure is 1kg / cm 2 above the maximum discharge pressure.
If water is not available grease lubrication is acceptable

Packing replacement

Use genuine packing suitable for handling liquid at required temperature, Pumping conditions, and the replacement procedure is as under.

1) Stop the pump.
2) Unbolt and remove gland
3) Use a flexible packing tool with hook/ wood screw attachment for removal of the packing and water seal ring.
4) Clean packing box and shaft sleeve.
5) Inspect shaft sleeve for wear or rough finish and replace if necessary. Sleeve should have smooth surface.
6) Install the packing box with new packing and lantern ring in the following order 2 ring + 1 lantern ring + 3 rings packing + gland.
7) For renewing packing rings of suitable quality and dimension. It should be at cut clean in an oblique manner, the ends of the ring laid around the shaft should slightly touch. If necessary, measure the ring length on the shaft out Side the pump.
8) Before inserting the turns clean the gland space. Apply light grease on gland packing and individual rings are to be placed with joints staggered by 90ºc and are to be pushed backwards with the gland, consider the sequence as mentioned above for lantern ring.
9) Slightly tighten by hand the gland nuts, during operation carefully tighten nut. The glands need certain time to set. A correctly maintained gland should leak 30 to 60 drops per minute.
10) After prolonged stand skill of the during which the gland may set hardened, they have to be freed and turn shaft by hand.
11) Too heavily tightened gland would result in dry running, heating up, burning of the packing material, and damage to the shaft/shaft sleeve. In such case the shaft with sleeve and gland with have to be replaced.
12) The gland can only be tightened it the shaft surface is perfect (Ground or polished), the bearing are correct and sleeve are concentric. Maximum eccentricity of about 0.075 mm to 0.125 mm depending on size and operating condition is permissible.
13) Packing base data given in table 3 In

THE GLAND SHOULD MOVER RUN DRY

14) Usual causes of packing failure

a. Packing has not been installed properly.
b. Packing used is not suitable for the temperature and pressure involved or may be subject to attack by the liquid being handled.
c. Inner rings are not properly seated so that the outer rings are carrying the entire load.
d. Dist or foreign Material in the stuffing box are causing repaid wear of shaft or shaft sleeve.
e. Lantern ring not in line with the tapped hole sealing connection.

Pump takes too Much power	**Packing too tight**	**Release gland pressure. Retighten reasonably. Keep leakage flowing-if none; check packing, sleeve or shaft**
Pump leaks excessively at stuffing box	**Defective packing**	**Replace worn packing. Replace packing damaged by lack of lubrication.**
	Wrong type of packing	**Replace packing not properly installed or run-in. Replace improper packing with correct grade for liquid being handled.**
	Scored shaft or shaft sleeves	**Put in lathe and machine true and smooth or replace.**
Stuffing box overheating	**Packing too tight**	**Release gland pressure.**
	Packing not lubricated	**Release gland pressure and replace all packing if any burnt or damaged.**
	Wrong grade of packing	**Check with pump or packing manufacturer for correct grade.**
	Insufficient cooling water to jackets	**Check if supply line valves opened or line clogged.**
	Stuffing box improperly packed	**Repack**
Packing wears too fast	**Shaft or shaft sleeve worn or scored**	**Re-machine or replace.**
	Insufficient or no lubrication	**Repack and make sure packing loose enough to allow some leakage.**
	Improperly packed	**Repack properly making sure all old packing removed and box clean.**
	Wrong grade packing	**Check with pump or packing manufacturer.**
	Pulsating pressure on external seal	**Makes packing move and prevents it taking a 'set'. Remove cause of pulsation.**

The Rubber bearing should never run dry.

NOTE:

If the delivered water quantity starts decreasing close gradually the discharge line valve until pump deliver a steady flow if pump runs dry stop the operation of pump immediately because otherwise impeller and rubber bearing may be seriously damaged.

Watch closely a new pump during its hours of operation for smooth noiseless and vibration free running.

STUFFING BOX/ PACKING BOX:

All packing is subject to wear and should be given regular inspection. Generally stuffing box of pumps should be checked every 150 hours of operation or weekly and gland should be readjusted if necessary. Initial adjustment is accomplished by tightening gland nuts finger tight.

NOTE: Excessive tightening of the gland may cause shaft sleeve damage.

PACKING REPLACEMENT:

For general service application with pump temperature 0 c- 90 c use a good grade of soft square asbestos long fiber packing thoroughly lubricated and graphite.

The replacement procedure should be as under.

1. Stop the pump

NOTE: Lock out electrical power to prevent accidental starting and causing possible injury.

2. Unbolt and remove gland.
3. Remove packing with flexible packing tool with hook.
4. Clean the packing box and shaft sleeve.
5. Inspect the shaft sleeve for wear or rough finish and replace the sleeve if necessary.
6. Install the new packing stagger the packing end joints 180˚ and firmly seat each ring of packing.
7. Reinstall the gland and tighten. After the pump has started adjust the gland so that there is a steady leakage.

8E.PUMP DISASSEMBLY & REASSEMBLY:

Major maintenance beyond lubrication adjustment of impeller or wear ring clearance and replacement or an adjustment of the packing will require disassembly of the pump. The following are step by step instruction procedure.

CAUTION:

Before working on motor or pump lock out driver power to prevent accidental starts up and physical injury .

NOTE:

Pump components should be match marked prior to disassembly to ensure they are assembled in correct location.

DRIVER REMOVAL:

VERTICAL HOLLOW SHAFT (VHS) MOTOR:

A. Stop the pump and cut the power to the motor close the discharge valve. Disconnect the electrical cables from the motor. Disconnect and remove gauges and all other auxiliary piping (stuffing box lubrication, oil grease lines etc.) FIG-27

   Tag the electrical leads so that they can be reassembled the same way they were disassembled.

B. Remove the driver cover adjusting nut lock screw and gib key. Fig-28 Remove adjusting nut and driver coupling.

C. Disconnect the shaft coupling under the driver (if used) and remove top shaft. Remove the cap screw holding driver to discharge head or pedestal. Lift the motor driver from the head and set aside.

VERTICAL SOLID SHAFT (VSS) MOTOR DRIVER:

A. Stop the pump and cut the power to the VSS motor /driver. Close the discharge valve .disconnect the electrical cables from driver and tag the electrical leads so they can be assembled the same way they were disassembled.FIG-27

CAUTION:

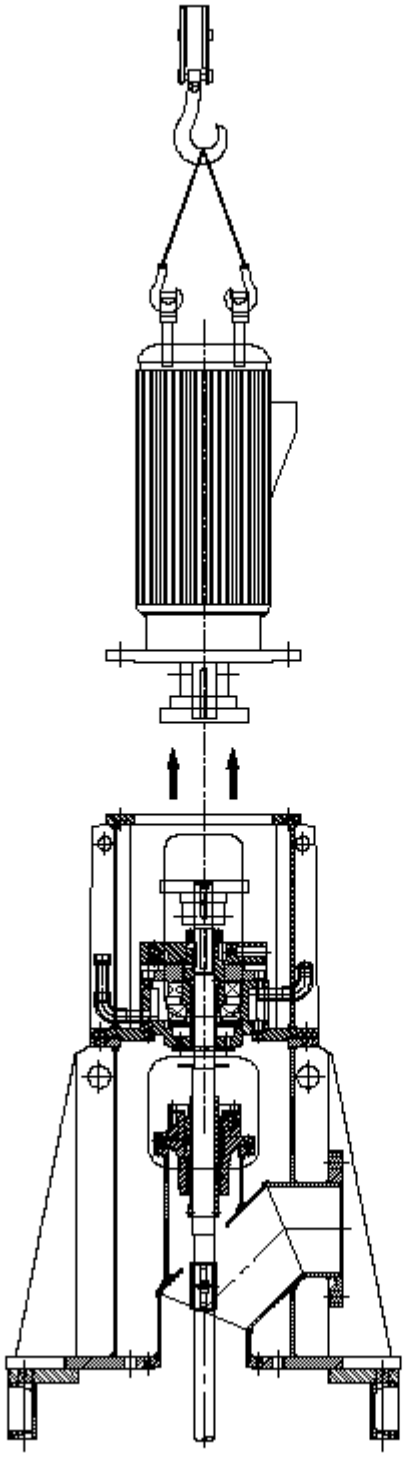


FIG-27 REMOVAL OF MOTOR.

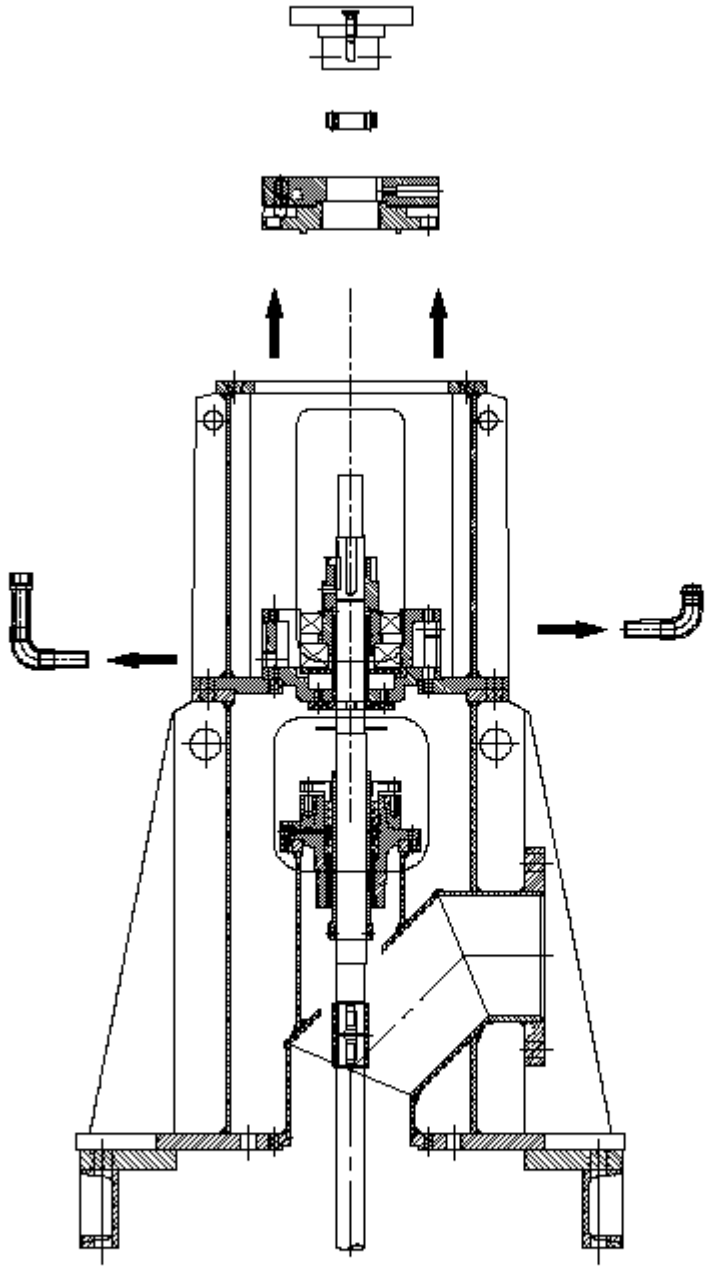


FIG-28 REMOVAL OF COUPLING, ADJUSTING NUT AND NRR ASSEMBLY.

Check with proper electrical testing equipment to be certain all electrical power to the driver and accessories associated with the pump is disconnected.

B. Remove the bolts holding the coupling halves together slowly so that the impeller does not drop.

C. Remove bolts and nuts holding the driver to discharge head or pedestal.

D. Lift the driver from the head and set aside.

E. Disconnect bearing housing and remove spindle with bearing and bearing housing with oil sleeve. Fig-29.

GEAR HEAD DRIVE:

A. Pumps which are driven through a gear drive, remove the driver shaft between the gear and prime mover.

B. Uncouple gear head from pump shaft and mounting flanges and lift off with lifting lugs or eye bolts and set aside.

HEAD AND COLUMN ASSEMBLY :

WATER/SELF LUBRICATED:

A. Remove and disassemble the pump head the column. Packing box and shafting according to the following procedure which is essentially the reverse of the installation procedure.

B. Remove the packing gland bolts gland water slinger and packing.

C. Loosen and remove all the discharge piping flange bolts.

D. Lift entire unit with lifting lugs and install a column clamp just below upper column flange leaving space to remove flange bolting .lower the unit so that the column clamps rests on adequate supports. Fig-30

E. Remove the head lift the discharge head of the unit and set aside.

F. Remove the packing box bolts and remove the box from the discharged head and shaft to a work area for inspection and cleaning. Fig-31.

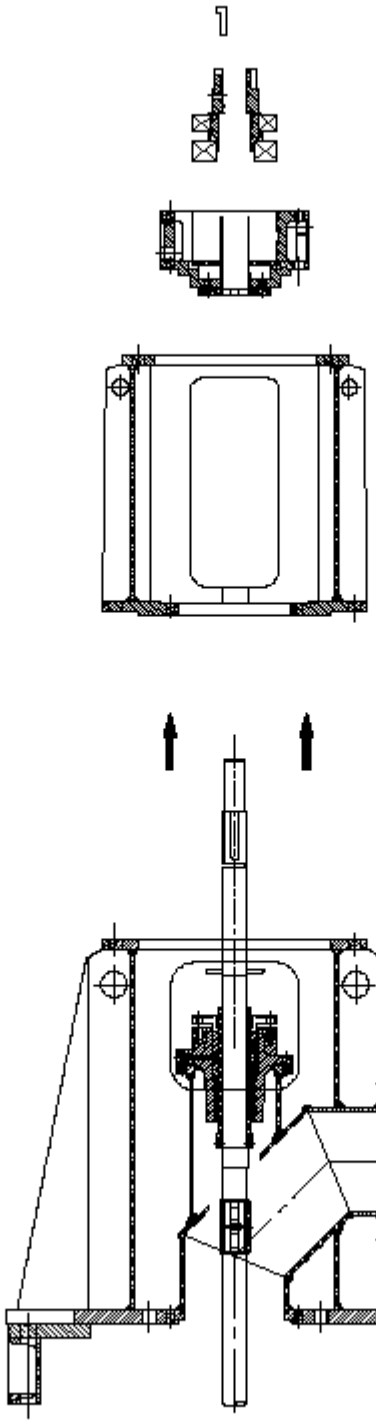


FIG-29 REMOVAL OF GIB KEY, SPINDLE WITH BEARING AND BEARING HOUSING WITH OIL RETAINER SLEEVE.

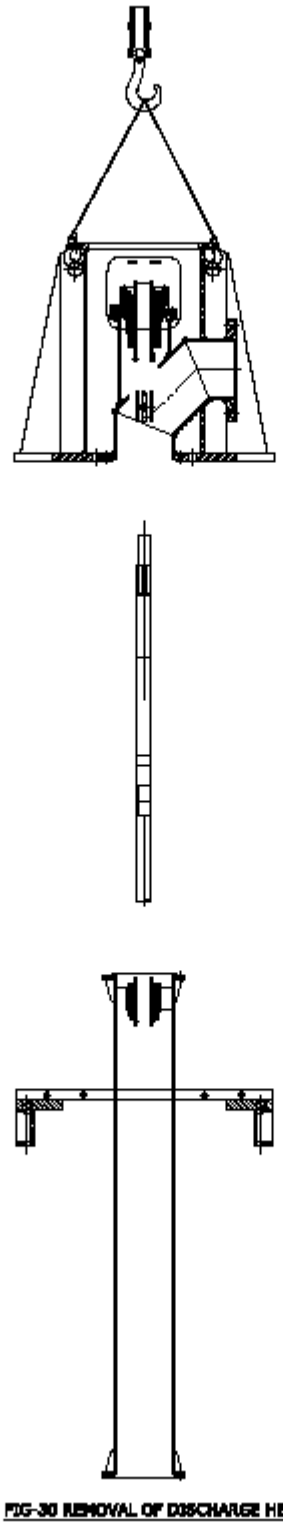


FIG-30 REMOVAL OF DISCHARGE HEAD.

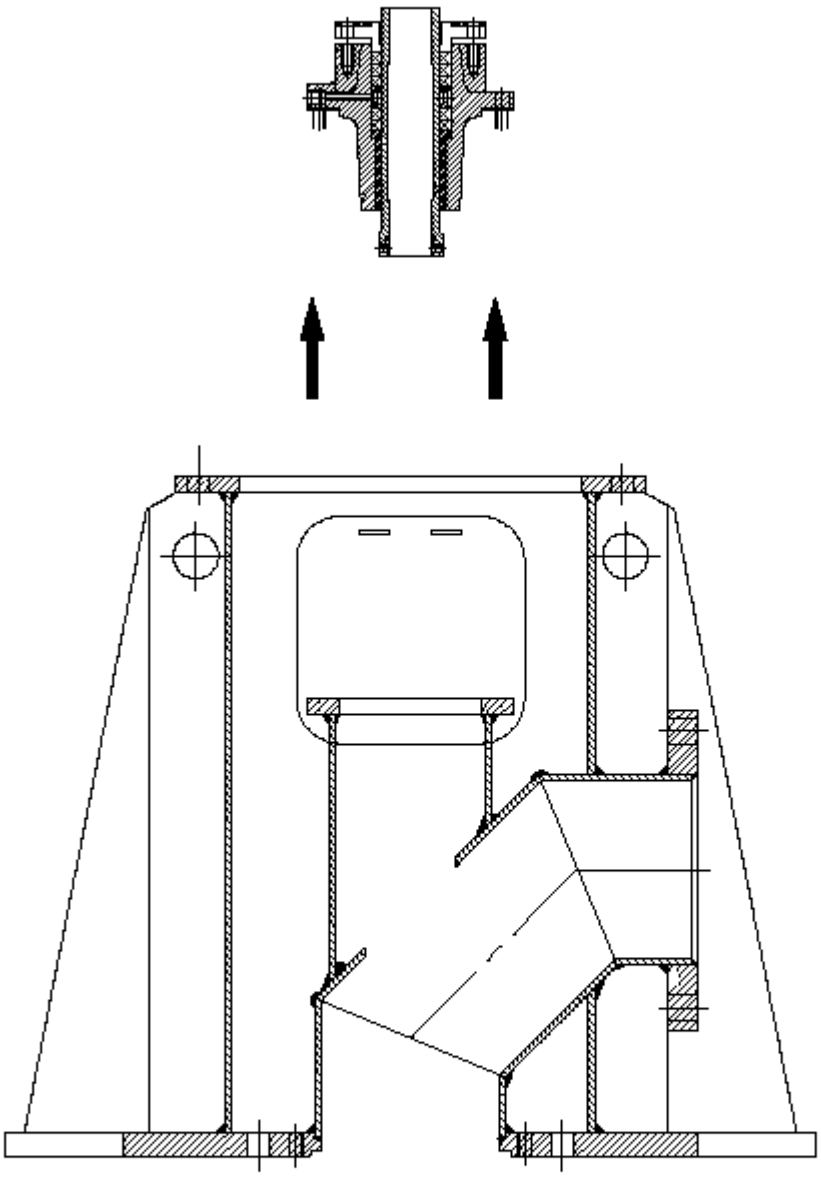


FIG-31 REMOVAL OF PACKING BOX FROM DISCHARGE HEAD.

G. Disconnect and remove muff coupling. Fig-32.

H. If packing box bearing is found to be worn out which is or interference fit in the packing box. The remove al of this bearing will require use of mechanical press or bearing may be removed by machinery use care when recoming bearing not to damage bores or hubs.

FLANGE COLUMN:

A. Install eyebolts of sufficient size in the column flange holes and lift the unit and reposition the clamps below the next column flange.

B. Use column and shaft clamps or other acceptable method to safety support and lift this assembly.

C. Unbolts column flange and lift column enough to loosen the shaft coupling, when all component are loose carefully lift this assembly from the pump unit. With soft skid boards under the column to protect the flange, slowly lower the column and shaft onto the floor and more to a convenient work area.fig-33.

Note: Shaft threads are left hand.

D. Repeat above step A, B and C until all column and shaft sections have been removed from the unit.

E. Remove the bearing retainer assembly for cleaning and inspection.

F. Remove shaft section from column pipe remove coupling from shaft and inspect for wear or damage.

G. Inspect bearing and retainers for damage.

H. If the top and intermediate drive shaft sleeves show wear or damage remove the sleeve.

NOTE:

Measure and record the position of the sleeve on the shaft before removal. They must be put back in exactly same place.

THREADED COLUMN:

A. Install eyebolts of sufficient size in the column flange holes and lift the unit and reposition the clamps below the next column coupling.

B. Use column and shaft clamps to safety support and lift this assembly.

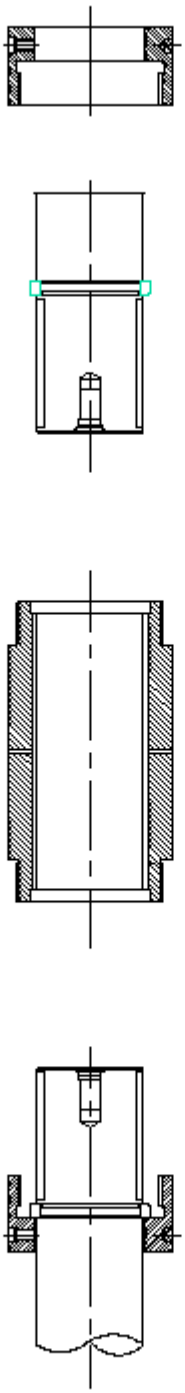


FIG-32 DISCONNECTED MUFF COUPLING.

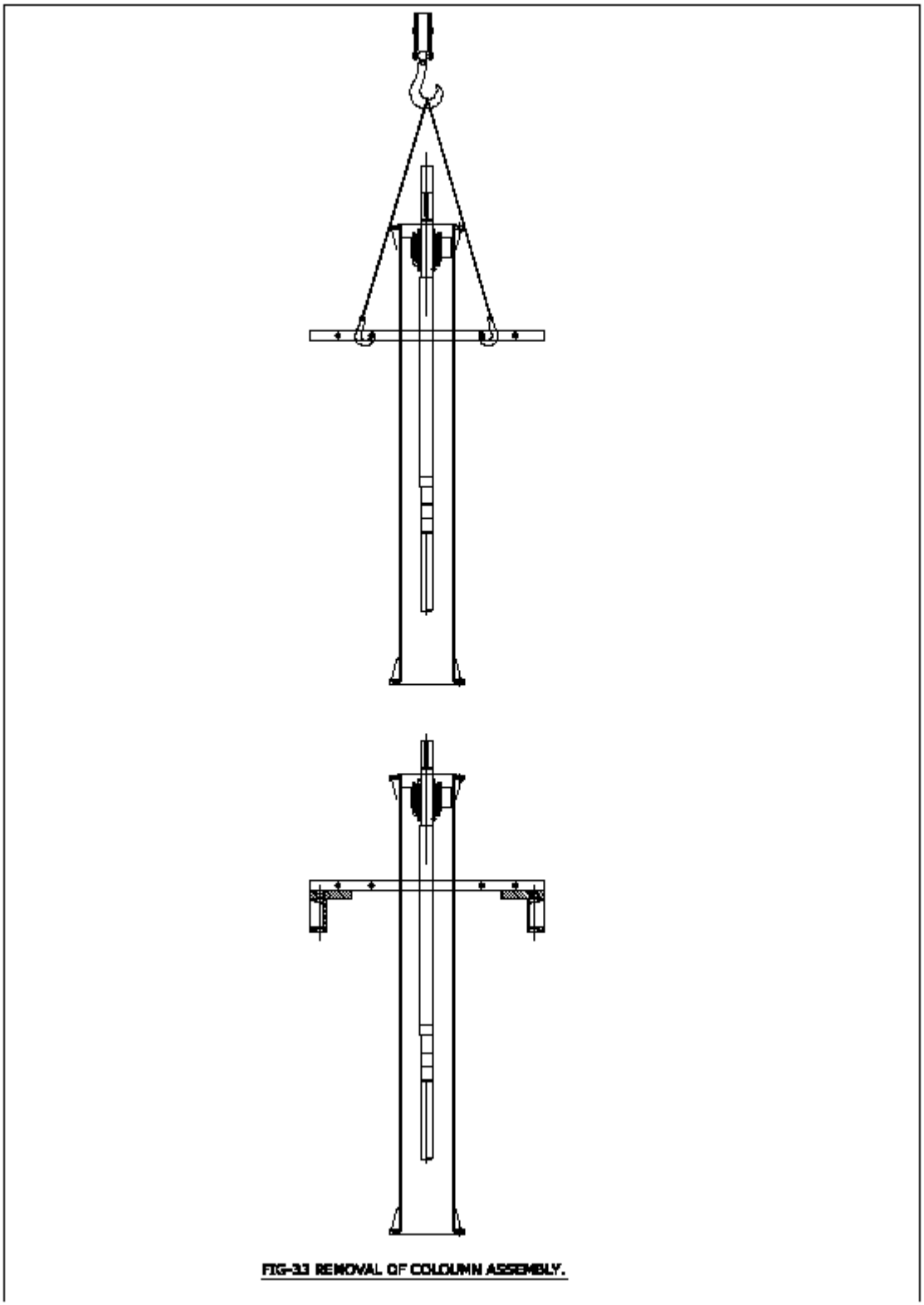


FIG-33 REMOVAL OF COLOUMN ASSEMBLY.

C. Unscrew the column coupling and lift column enough to loose shaft coupling. When all components are loose carefully lift this assembly from the pump unit. With soft skid boards under the column to

protect the threads, slowly lower the column and shaft assembly onto the floor and move to a convenient area.

NOTE: Shaft threads are left hand & column threads are right hand.

D. Repeat above steps A, B and C until all column and shaft section have been removed from the unit.

F. Remove the bearing retainer assembly for inspection and cleaning.

G. Remove shaft section from column pipe remove coupling from shaft and inspect for wear or damage.

H. Inspect bearing and retainer for damage.

I. If top and intermediate drive shaft sleeves show wear or damage remove the sleeve.

HEAD AND COLUMN (OIL LUBRICATED)

A. Remove and disassembled the pump head the column tube tension nut and shafting according to the following procedure which is essentially the reverse of the installation procedure.

B. Loosen and remove the tube tension nut and set aside for inspection.

C. Loosen and remove all the discharge piping flange bolts.

D. Lift entire unit with the lifting lugs and install a column clamp just below the upper column flange leaving space to remove the flange bolting. Lower unit so that the column clamp rests on adequate supports.

E. Remove the bolts holding the column to the discharge head. Lift discharge head off the unit and set aside.

FLANGED COLUMN (OIL LUBRICATED)

A. Install eye bolts of sufficient size in the column flange and lift the unit and reposition the clamp below the next column flange.

B. Use column and shaft clamps to safety support and lift the assembly.

C. Unbolt column flange and lift column enough to loosen the enclosing tube and shaft coupling. When all components are loose carefully lift this assembly from the pump unit. Slowly lower the column, tube and shaft assembly onto floor and shift to convenient place.

NOTE: Shaft threads are left hand & Enclosing tube threads are left hand.

D. Repeat above steps until all column tube shaft section have been removed.

E. Remove shaft and tube section from column pipe. Remove shaft from tube section remove coupling from shaft and inspect for wear or damage.

F. Inspect connector bearing for wear or damage.

THREADED COULUMN (OIL LUBRICATED)

A. Install eyebolts of sufficient size in the column flange holes .lift the unit and reposition the clamp below the next column coupling.

B. Use column and shaft clamps to safety support and lift assembly.

C. Unscrew the column coupling and lift column enough to loosen the enclosing tube. Continue to lift the assembly until the shaft coupling can be loosened. When all components are loose, carefully lift this assembly from the l pump unit with soft skid boards under the column to protect the threads slowly lower the column tube and shaft assembly onto floor and shift to convenient works area.

NOTE: Shaft threads are left hand. Enclosing tube threads are left hand. Column threads are right hand.

D. Repeat steps A, B and c until all column and shaft section have been removed from the unit.

E. Remove shaft and tube section from column pipe. Remove shaft from tube section. Remove coupling from shaft and inspect for wear and damage.

F. Inspect connection bearing for wear and damage.fig-34.

PUMP BOWL DISASSEMBLY:

For disassembly of the pump bowl proceed in accordance with steps listed below. Select clean place for work refer to assembly and part list for part identification.

The bowl assembly consists of a suction bell/ case intermediate bowls top bowl impellers and securing hardware bearing and pump shaft.

Turbine impellers are secured t o the shaft by either a taper per lock or key and split thrust ring. Follow only those procedures that apply to the particular construction supplied.

NOTE: Match mark bowl assembly in sequence of disassembly to aid in the reassembly procedure.

FLANGED BOWLS:

A. Place the bowl assembly in a horizontal position blocked to prevent rolling.

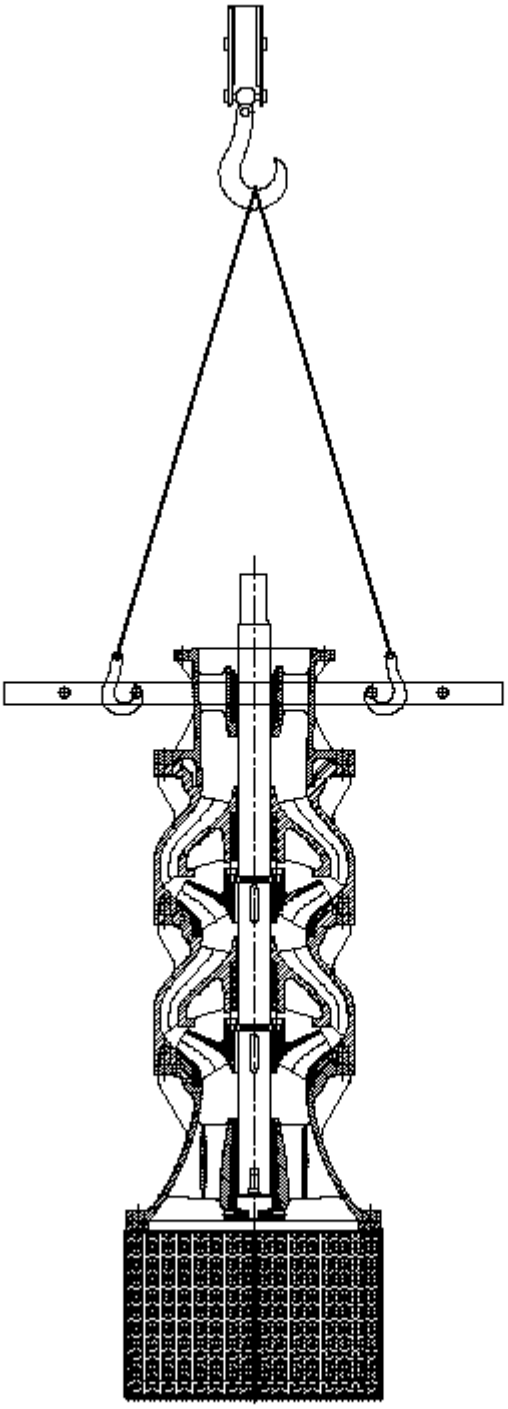


FIG-34 REMOVAL OF BOWL ASSEMBLY.

B. Measure and record axial end play. This must be checked on reassembly of the bowls.

C. Remove the shaft coupling measure and record shaft projection over column seat. This must be checked on assembly.

TAPER LOCK CONSTRUCTION DISASSEMBLY:

A. Remove cap screw holding the discharge case and to inter mediate bowl and remove from the pump shaft and keep aside for inspection fig-35a.

B. Pull the shaft upward until the impeller is in its up most position and strike the hub of the impeller by taper collect driver until the impeller is off the taper collect (see fig :-35g)

C. To remove the collate insert a screw driver in the collate slit and spread open slide the collate and impeller off the pump shaft.

D. Repeat the above procedure C, D, E, & F until the bowl assembly is completely disassembled.

E. If impeller is to be reused they should be marked so that they are re installed in the same bowl.

F. Remove the shaft from suction bell/suction case.

G. Measured and record the location of the sand color, remove the sand color only if it is damaged and replacement is required.

H. Check wear ring on bowl/impeller (if supplied) for wear and damage. if required then replaces the same.

THREADED BOWLS:

For this assembly of the pump bowls proceed in accordance with steps listed below.

A. Place the bowl assembly in a horizontal position blocked to prevent rolling.

B. Remove shaft coupling.

C. Measure and record axial end play of the shaft and shaft projection above the column seat. This must be checked on reassembly of the bowls.

D. Pump models sizes for through 8” have bowl which are threaded directly together rather than bolted. All bowl thread is right hand. To prevent the possibility of bowl threads loosening during operation all such bowls are drilled and pinned at the parting line with 5mm pin. Disassembly of threaded bowl requires that the pins to be drilled out. At reassembly the bowls should be repined for security.

E. Unscrew the discharge case and remove the discharge case from the pump shaft and send for inspection.

F. Unscrew top bowl and remove from pump shaft for inspection.

G. Remove the collate and the impeller from the pump shaft according to following procedure.

A. To remove the collet from the impeller pull the shaft upward until the impeller is in the up most position using collet driver (see fig.-35g) drive the impeller off the collet.

B. To remove collet slit and wedge a part. The collate will slide easily off the shaft.

C. If impeller is to be reused they should be marked so that they are installed in the same bowl.

H. Unscrew the next intermediate bowl remove the intermediate bowl from the pump shaft and keep aside for inspection.

I. Repeat steps G & H until all bowl and impellers have been removed.

J. Remove the shaft from the suction bell/suction case.

K. Measure and record the location of the sand color. Remove sand collar only if it is damaged and to be replaced.

L. The pump bowl assembly is disassembled and ready for inspection.

M. Check wear ring on bowl / impeller (if supplied) for wear and damage. If supplied) for wear and damage. It required then replaces them.

KEYED BOWL ASSEMBLY:

1. Remove cap screw that screw top bowl to intermediate bowl.fig-35a&b.
2. Slide off top bowl from the pump shaft.
3. Remove cap screw and split thrust ring from pump shaft.fig-35c.
4. Slide impeller off the pump shaft and remove the key. If impeller is seized to the shaft strike impeller with mallet (fiber) and drive impeller off the pump shaft.fig-35d
5. Repeat the above procedure will bowl assembly is completely disassembled.
6. Remove the shaft from the suction bell/suction case.fig-35e&f.
7. Measure and record the location of the sand collar only if it is damaged and replacement is required.
8. Pump bowl assembly is now disassembled and ready for inspection.
9. Check wear rings on bowl /impeller (if supplied) for wear and damage, required then replace them.

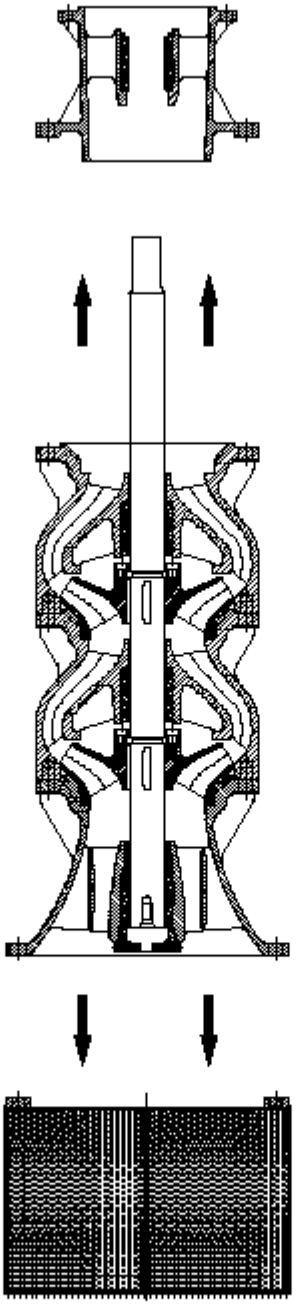


FIG-35 DIS ASSEMBLY OF BOWL ASSEMBLY.
A-REMOVAL OF DISCHARGF CASE AND STRAINER.

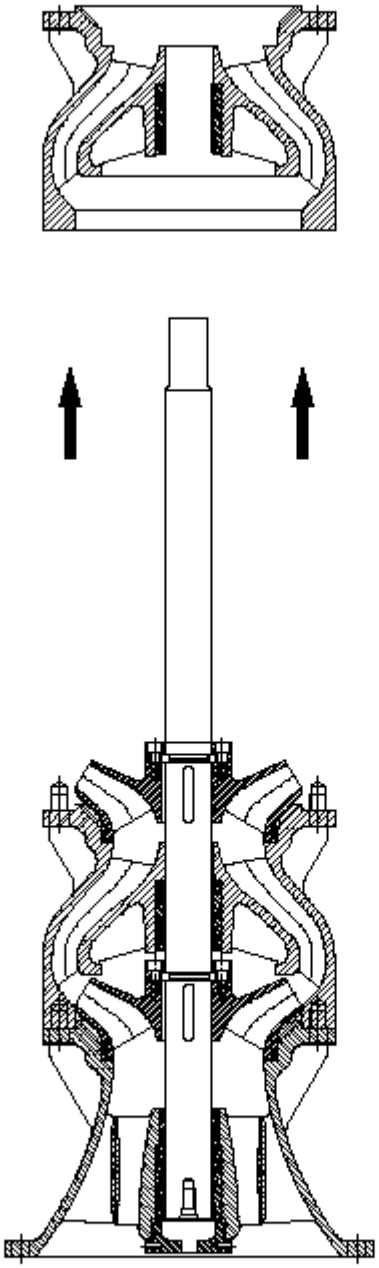


FIG-35 DIS ASSEMBLY OF BOWL ASSEMBLY.
B-REMOVAL OF INTERMEDIATE BOWL.

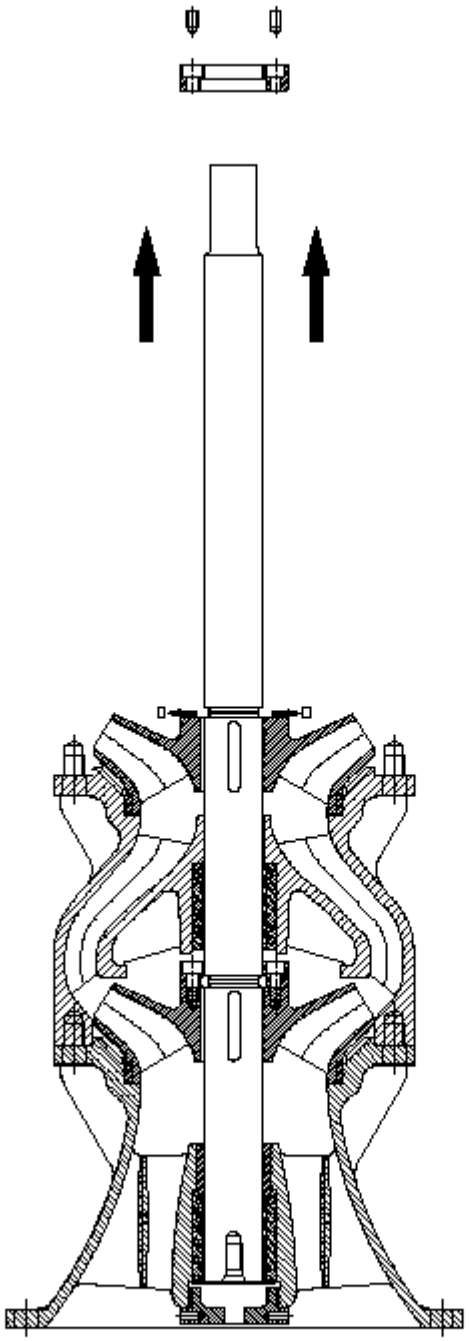


FIG-35 DIS ASSEMBLY OF BOWL ASSEMBLY
C-REMOVAL OF THRUST RING AND RETAINER PLATE.

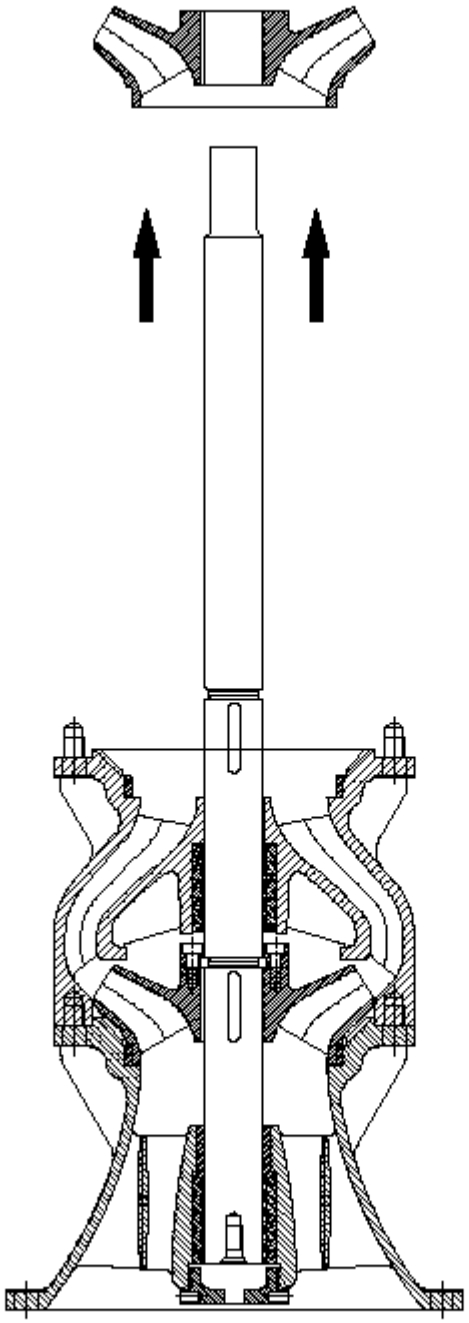


FIG-35 DIS ASSEMBLY OF BOWL ASSEMBLY
D-REMOVAL OF IMPELLER.

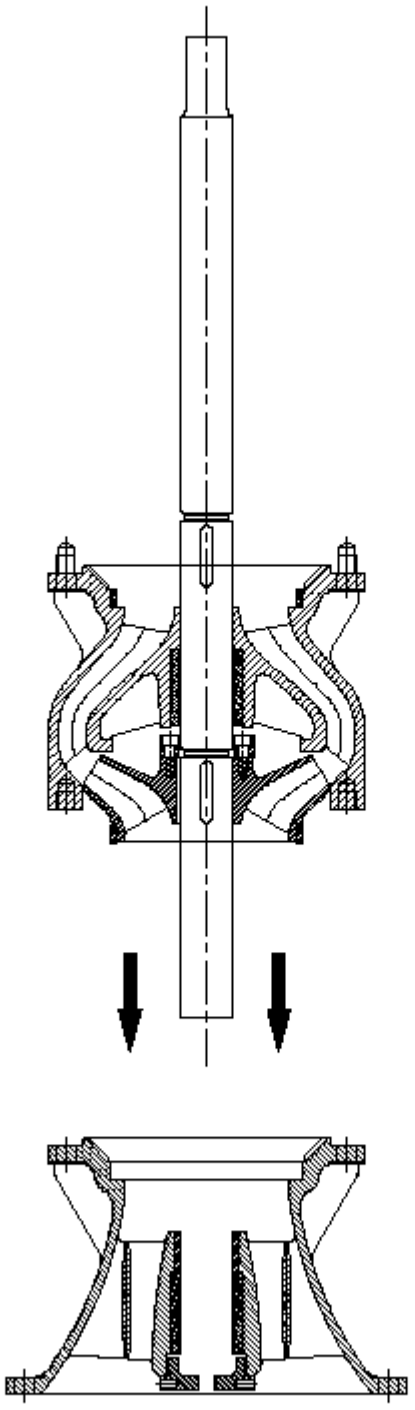


FIG-35 DIS ASSEMBLY OF BOWL ASSEMBLY
E-REMOVAL OF SUCTION BELL.

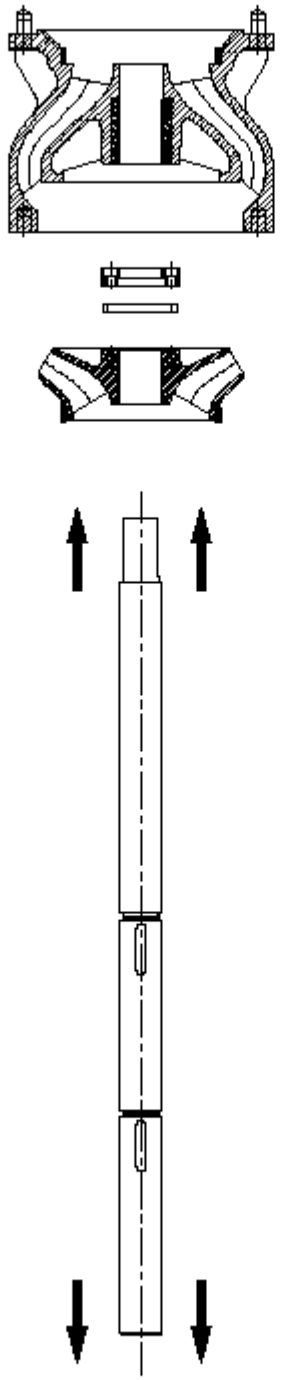


FIG-35 DIS ASSEMBLY OF BOWL ASSEMBLY
F-REMOVAL OF PUMP SHAFT.

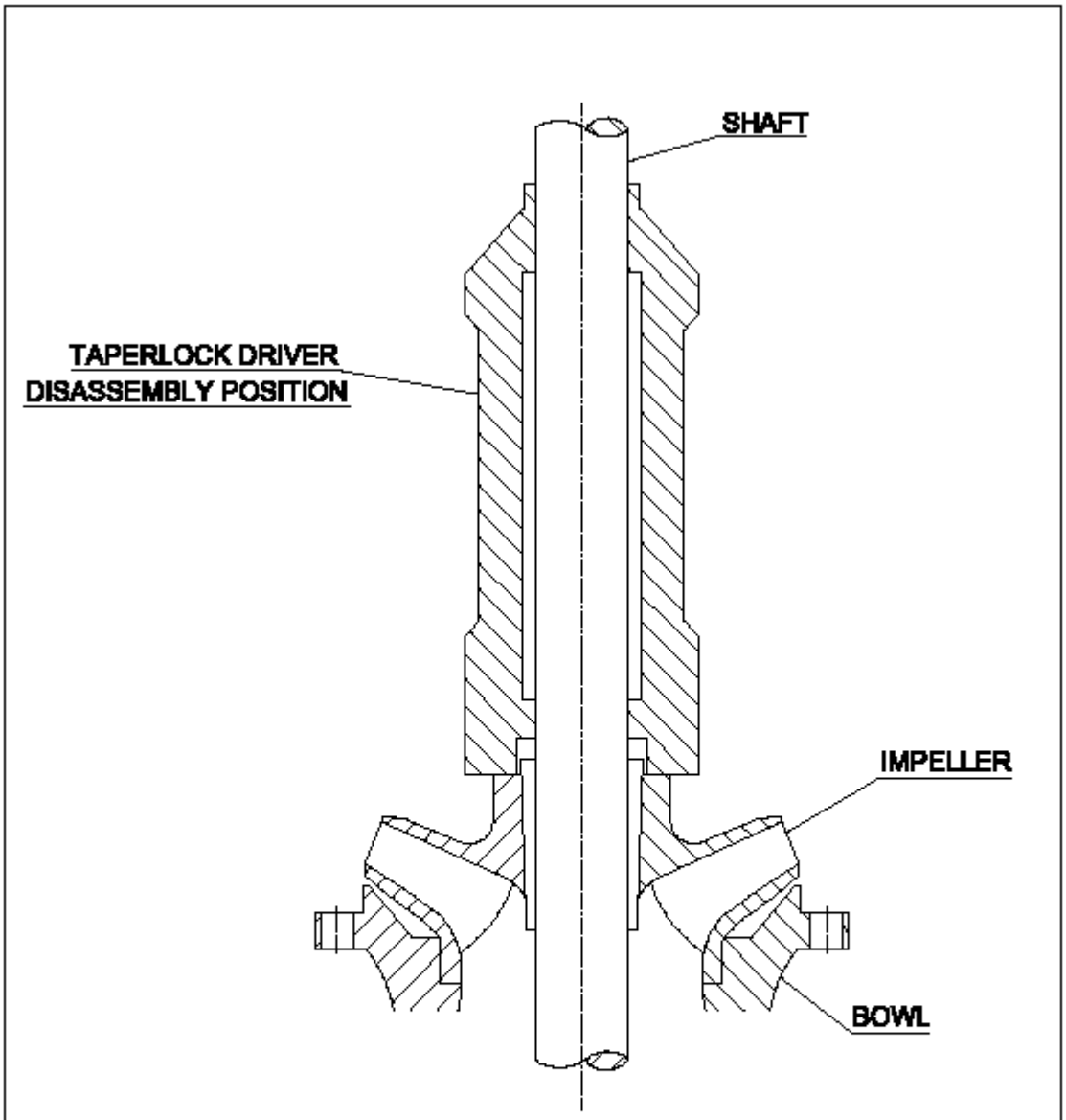


FIG-35G DIS ASSEMBLY OF BOWL ASSEMBLY REMOVAL OF IMPELLER WITH TAPER COLLET ARRANGEMENT.

INSPECTION FOR REPLACEMENT:

After the components are disassembled each part should be thoroughly cleaned and inspected for wear and damage. Do not clean rubber bearing with petroleum based solvents. It is not necessary to remove bearing and wear ring unless inspection indicates replacement is necessary .

WEAR RING REMOVAL:

A. BOWL:

1. Remove set screw or grind off tack weld when wear ring are furnished with these locking methods.
2. With point chisel cut two "V" shaped grooves on the bowl wear ring approximately 180˚ a part. Take care not to damage wear ring seat.
3. With a chisel, knock the end of one half of the ring in and take the ring out.
4. Special material such as chrome steel, set up the bowl in a lathe and machine the wear ring off taking care wear ring seat is not damaged.

B. IMPELLER:

1. Utilizing point chisel cut two "V" shaped grooves on the impeller wear ring approximately 180˚ a part. Take extreme care not to damage the wear ring seat.
2. With chisel the end of one half of the ring and take the ring off.
3. On special material such as a chrome steel set up the impeller in lathe and machine the wear ring off using extreme care not to machine or damage the ring seat.

BOWL AND LINE SHAFT BREAKING REMOVAL:

Using an arbor press and a piece of pipe or sleeve with outside diameter slightly less than the outside diameter of the bearing to press the bearing out.

NOTE:

Bowl bearing are press fit do not remove unless replacement is necessary.

INSPECTION AND REASSEMBLE:

1. Clean all pump parts thoroughly with suitable cleaner.
2. Check bearing retainer for deformation and wear.
3. Check shaft for straightness and excessive wear on bearing surface. The maximum allowable total indicator run out must be less than 0.041mm per meter or not 0.125mm for every 3 meter of shafting.fig-36
4. Visually check impeller and bowls for damage. Check all bowl bearing for excessive wear and corrosion.

5. Replace all badly worm or damage parts with new parts in addition. Replace all gasket and packing as required.

WATER RING INSTALLATION:

Place chamfered face of the bowl or impeller wear ring to ward the ring seat and press the ring in to the seat. Use arbor press or equal methods making sure the ring is flush the edge or the wear ring seat.

INSTALLATION OF BOWL AND:

LINE SHAFT BEARING:

1. Press bearing into retainer using an arbor or equivalent method.
2. Press bearing in suction bell/case by using an arbor press or equivalent method top of the bearing should project above suction hub equal to the depth of the counter bore in the sand collar.
3. Place the bowl with flange chamfered and press bearing thoroughly chamfered side of bowl hub until the bearing is flush with the hub by using an arbor press or equivalent method.

REASSEMLY OF THE BOWL ASSEMBLY:

WITH TAPER COLLECT CONSTRUCTION:

1. In reassembly apply a thin film of turbine oil to mating and threaded parts.
2. If the collar is not assembled to the shaft install the sand collar. The sand collar is attached to the shaft with lock screw the larger end of the counter bore of the sand collar goes toward the suction bell /case bearing. Slip the sand collar over the shaft and position it so that bottom of the sand collar is set and sand collar is locked with lock screw. Slide the plain end of the pump shaft into the suction bell/case bearing until the sand collar rests against the suction bell/case hub.
3. Hold the shaft in position by inserting a long cap screw with an assembly jig in to the bottom end of the suction hub and screw tight into the threaded hole at the end of the shaft. Be sure that shaft has been cleaned and checked for straightness.
4. Slide the first impeller over the shaft and it seats on the suction case/bell set.
5. Insert a screw driver into the slot in the taper lock to spread the slot and slide taper lock over the pump shaft. Holds the impeller against bowl and slide the taper lock in to the impeller hub be sure to taper lock have been cleaned.fig-37a.
6. Hold impeller firmly against the suction bell/case seat and drive the taper lock into the place with taper lock driver after the impeller is secured in position the top end of the taper lock should be 3mm above the impeller hub.
7. Slide intermediate bowl into shaft and screw with cap screw to suction bell.
8. Repeat above procedure for no of stages required.

9. Remove long cap screw and the assembly jig at the end of suction hub.
10. Check shaft rotates freely without rubbing. Also check for adequate lateral movement (end play).
11. With impeller in lowest position and measure the shaft projection over the column seat.
12. Fill suction bell case bottom end with water proof grease and fix pipe plug. The shaft should be in lowest position while filling grease. Now bowl assembly is ready for installation.

KEYED CONSTRUCTION BOWL ASSEMBLY:

1. Install key in to pump shaft key way slide impeller over shaft and locate it on the key way.
2. Install split thrust ring on pump shaft groove and secure to impeller with cap screw.

   If the sand color is not installed to the shaft. The sand color is attached it to the shaft with lock screw. The larger end of the counter bore o the sand color goes towards suction belt/ case bearing. Slip the sand color over the shaft and position it so that bottom sand color is set in with the y dimension and sand color is locked with lock screw. Slide the plain end of shaft in to the suction bell case bearing until the sand color rest against the suction case hub
3. Slide inter mediate bowl on to the shaft and secure with cap screw to the suction bell/ Case.fig-37,38a&38b.
4. Repeat above procedure for number of stage required.
5. Check that shaft rotates freely without rubbing. Also check for lateral end play.
6. With impeller in lowest position and measure the shaft projection over the column seat.
7. Fill suction bell case bottom end with water proof grease and fix pipe play. The shaft should be in lowest position while filling grease.fig-39.

Now bowl assembly is ready for installation

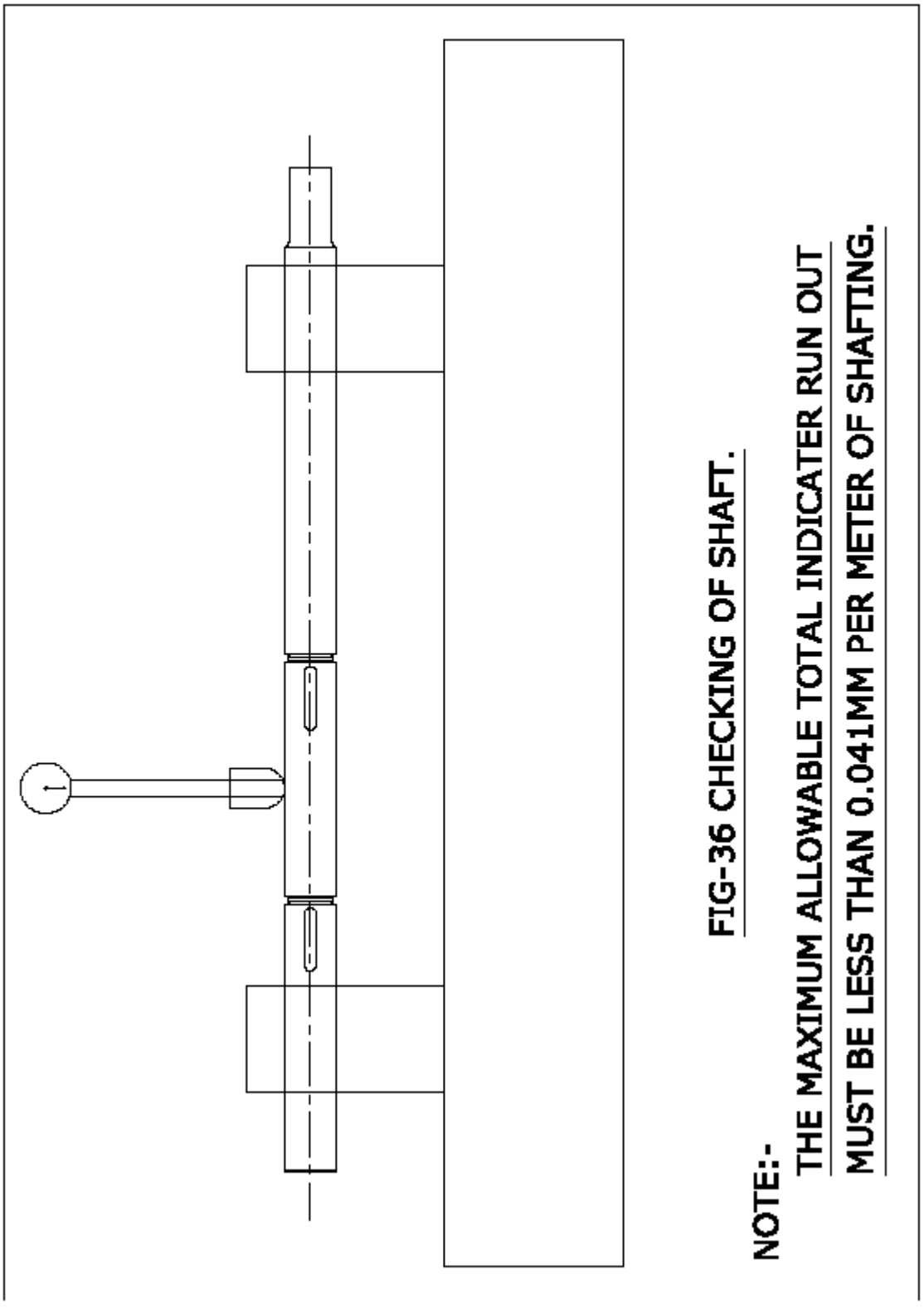


FIG-36 CHECKING OF SHAFT.

NOTE:-

THE MAXIMUM ALLOWABLE TOTAL INDICATER RUN OUT MUST BE LESS THAN 0.041MM PER METER OF SHAFTING.

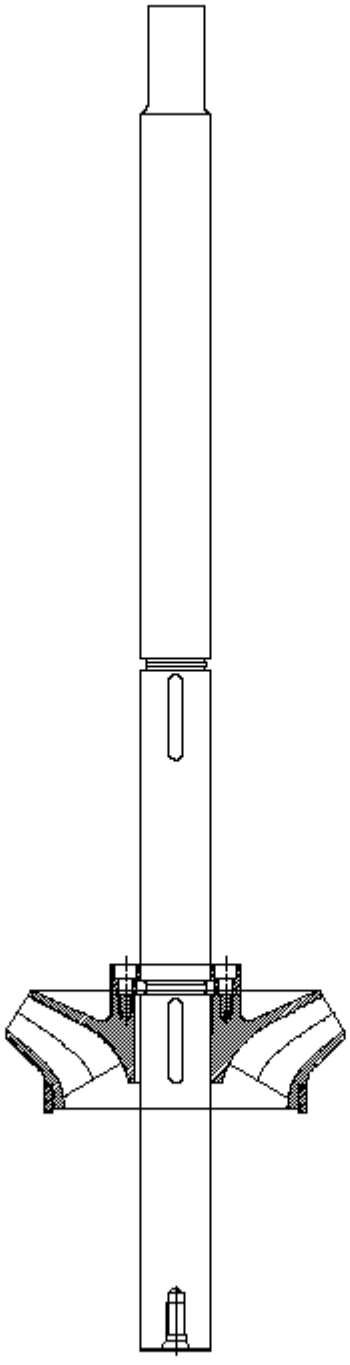


FIG-37 ASSEMBLY OF IMPELLER WITH PUMP SHAFT.

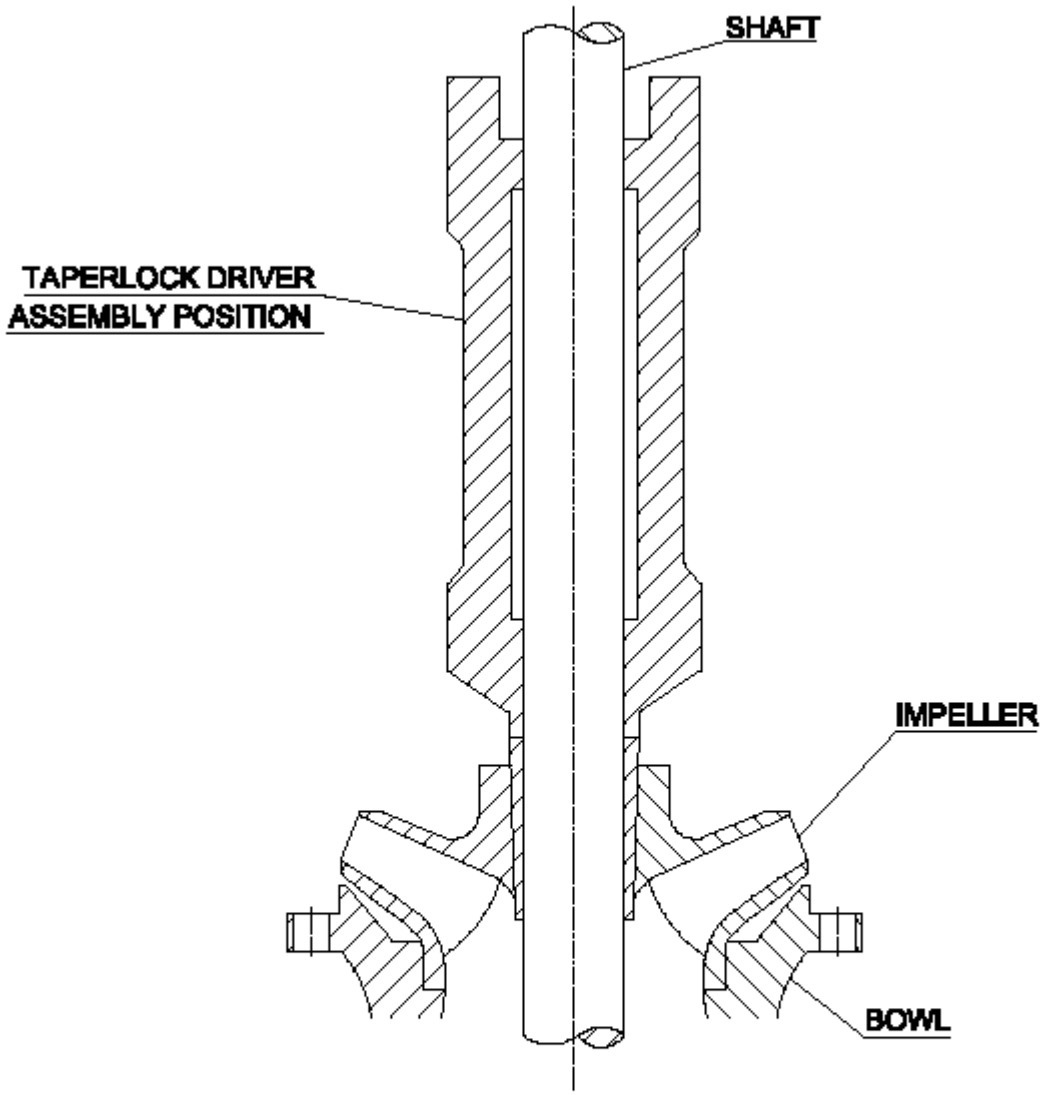


FIG-37A- ASSEMBLY OF IMPELLER WITH TAPER LOCK COLLET.

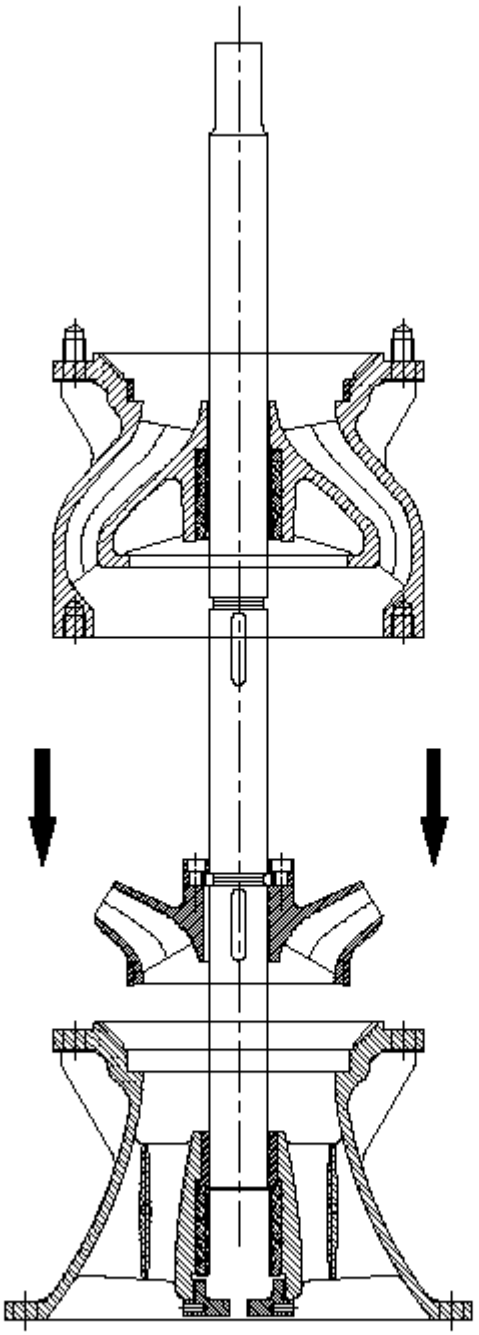


FIG-38 ASSEMBLY OF BOWL ASSEMBLY

A-ASSEMBLY OF FIRST STAGE.

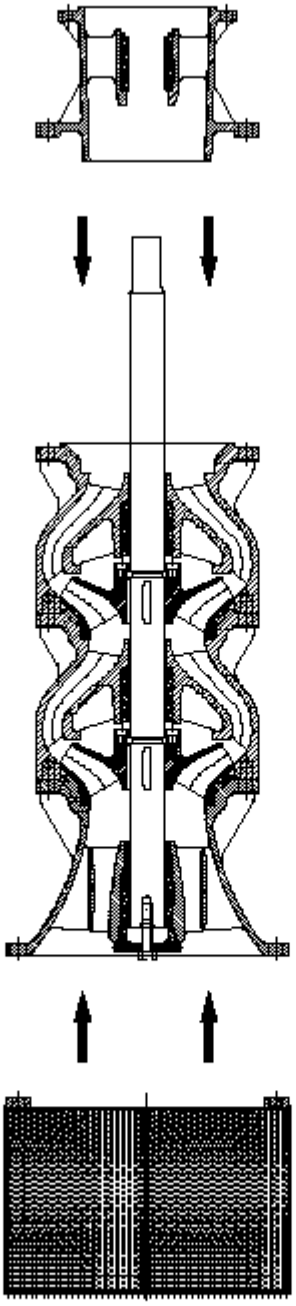


FIG-38 ASSEMBLY OF BOWL ASSEMBLY.
B-ASSEMBLY OF DISCHARGF CASE AND STRAINER.

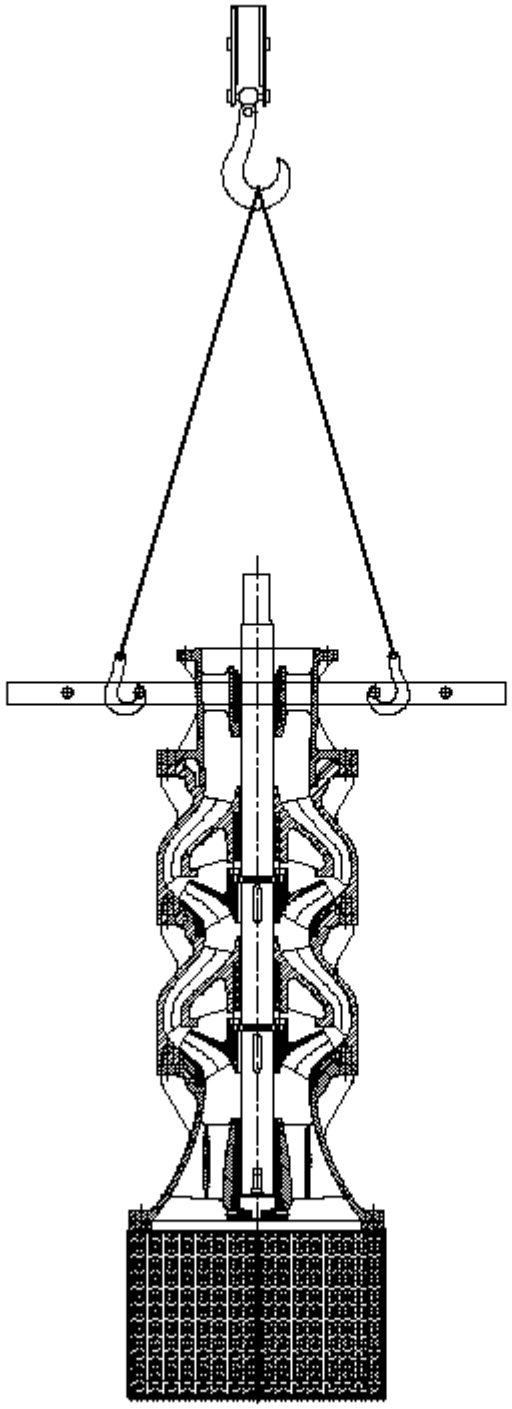


FIG-39 BOWL ASSEMBLY READY FOR INSTALLATION.

9 SPARE PARTS

RECOMMENDED SPARE PARTS FOR

2YEARS OF NORMAL OPERATION

Refer fig 4 to 10

1 Impellers	50%
2 Wear Ring	100%
3 Shaft sleeves	100%
4 Bushes	100%
5 Gaskets	100%
6 Bearings	100%
7 Pump shaft	50%
8 Couplings	30%
9 Keys	50%
10 Collets	50%
11 Spider bush	50%
12 Line shaft	30%
13 Packing box Assembly	30%
14 Inter Bowl	30%
15 Screw bearing	50%
16 Packing	400%
17 Oil seal	100% s

10 TECHNICAL DATA

SELECTION OF SHAFT (TABLE-1)

From the shaft rating chart, select a size of shaft that seams to be

Proper for the pump speed and bowl

Horse power/kw requirements

Calculate Total thrust load as follows

1. Hydraulic thrust

=TDHxThrust factor k

2. Weight of line shaft

=Pump setting x Weight of shaft per meter

+Number of coupling x Weight of one coupling

3. Weight of impeller

=No of impellers x weight of one impeller

4. Weight of impeller shaft

=Length of shaft x weight of shaft per meter

Total thrust load=sum of 1, 2, 3&4 above

KW loss from thrust

$$\frac{=0.0009225 \times T \times n}{100 \times 50}$$

T = Thrust Load in kg

n = Speed in RPM

Horse Power loss from thrust

$$= 0.0075 \times \frac{\text{RPM} \times \text{Thrust load}}{100 \quad 1000}$$

Calculate line shaft horse power loss due to friction

Line shaft friction power loss

$$= (\text{line shaft loss}) \times \frac{\text{Pump setting}}{\text{Per 100ft} \quad 100}$$

Calculate total horse power requirement

Total horse power requirement

= (Bowl requirement + thrust loss + shaft friction loss) x

Sp. Gravity of liquid being handled

The viscosity of liquid and safety factor of 1.05 should be

Considered for selecting shaft size

The allowable line shaft horse power must be selected on

The basis of field total horse power requirement and total

Thrust load.

Select proper size of shaft from line shaft rating tabulation For

C-1045/AISI-410 line shafts

Technical Data
Table-2A
LINE SHAFT SELECTION CHART
kW RATINGS
For -C-1045 LINE SHAFT

Shaft Dia.	Shaft Weight	Max Thrust	Max. kW RATING at RPM shown							
(mm)	(kg/m)	(kg f)	1460	980	730	590	490	420	370	330
25	4.19	1700	29	24						
30	5.93	2500	52	37						
32	6.57	2700	65	45						
36	8.5	3400	92	61						
38	9.39	3500	104	69	58					
43	11.93	4000	156	102	76					
45	12.9	5000	178	140	105					
50	15.87	6000	243	160	118	109	91			
55	20.04	75000	357	235	174	162	135	116	102	
60	23.33	10000	505	331	245	180	155	135	115	
65	28.08	11500		382.5	283	220	185	160	139	
70	30.99	13000	662	434	320	259	215	184	163	
75	41.13	16000		560	438	352	292	251	221	
80	47.05	17500		760	564	453	376	323	284	
85	52.26	20000			633	550	422	362	319	
90	57.47	23000			702	563	468	400	353	312
95	65.9	24000			877	704	585	501	441	391
100	79.67	29000				893	742	636	560	447
105	86.42	29667					849	729	642	536
115	99.93	31000					1062	915	806	714
125	127.3	34000					1465	1256	1107	981
140	154.2	39000						1682	1482	1313
150	140.5	45000							1929	1705

KW MULTIPLIER SHAFTS (TABLE-2b)

SN.	SHAFT SIZE	SS-316	SS-410	SS-304	C-1020
1	25MM TO 60MM	0.75	1.00	0.75	0.50
2	ABOVE 60 MM	0.9	1.05	0.9	0.55

SS

SHAFT KW LOSSES PER 30 METER OF LINE SHAFT (TABLE-3)

SN.	SHAFT SIZE	SPEED					
		1460	980	730	590	490	420
1	25	0.33	0.22	0.165	0.13	0.11	0.09
2	30	0.45	0.30	0.23	0.18	0.16	0.13
3	32	0.52	0.34	0.25	0.20	0.18	0.15
4	36	0.64	0.42	0.32	0.25	0.22	0.19
5	38	0.71	0.46	0.36	0.28	0.24	0.21
6	43	0.89	0.57	0.43	0.34	0.29	0.25
7	45	0.94	0.62	0.48	0.38	0.33	0.28
8	50	1.19	0.75	0.57	0.46	0.39	0.34
9	55	1.49	0.97	0.74	0.57	0.48	0.43
10	60	1.71	1.19	0.89	0.71	0.60	0.46
11	70	2.19	1.72	1.04	0.82	0.70	0.61
12	75	2.61	1.71	1.27	1.0	0.85	0.75
13	80	2.98	1.94	1.49	1.18	1.0	0.88
14	85		2.13	1.64	1.27	1.3	0.94
15	90		2.31	1.79	1.35	1.15	1.0
16	95		2.61	1.94	1.52	1.3	5.14
17	100		2.98	2.74	1.76	1.5	1.27
18	105		3.24	2.44	1.90	1.69	1.38
19	115		3.76	2.83	2.26	1.88	1.61
20	125			3.4	2.76	2.29	1.97
21	140			4.12	3.31	2.75	2.36
22	150				3.75	3.11	2.66

Vertical Pump Shafting (TABLE-4)

Proper selection of shaft materials, shaft finish under bearings

Machining and straightening are vital functions of vertical

Pump manufacturing.

Vertical pump shafting materials are carefully selected for

Physical properties and micro-finish to operate under sleeve

Bearings.

Shaft threads must be machined parallel and concentric, and

Shaft ends must be machined and faced perfectly square. The

Shaft end centers must also be properly machined to remove

Any raised area that would prevent proper face-to-face contact

Between mating shafts.

Shafts must be straightened to 0.13 mm per 305 mm or 0.0005

In/ft in total run out. Example: A ten-foot shaft cannot exceed

0.005 In total run out.

Finally, careful handing of all shafting prior to and during

Assembly and installation is necessary to avoid bent shafting

Which will cause premature pump failure.

RECOMMENDED TIGHTENING TORQUE FOR BOLTS &NUTS **TABLE-5**

Thread size	High tensile grade 8.8 / AISI-410		AISI-316 / AISI-304	
	Rated kgm	Maxm kgm	Rated kgm	Maxm kgm
M-6	1.05	1.19	0.79	0.95
M-8	2.27	2.9	1.11	1.7
M-10	5.38	5.74	2.2	4
M-12	9.36	10	3.8	7
M-16	23.68	25	9.6	17.76
M-22	64.68	66	26	48
M-24	82.08	84	33	60
M-30	160	164	63	120
M-36	275	285	106	210
M-42	430	456	166	335
M-56	950	1000	365	700

Wear Ring and Bearing Clearances **TABLE-6**

The following are average clearances for bronze bearings and bronze or cast iron wear rings. Special materials. Stainless steel wear rings,and high-temperature liquids (above 180 deg F/82 degC) require special clearances. All clearances shown are diametrical.

Bowl size mm	Standard wear ring clearance. mm	Special wear ring clearance.mm	Bearing clearance mm
100			0.15
150	0.31-0.36	0.41-0.46	0.18
200	0.31	0.41	0.2
255	0.33	0.41-0.43	0.2
305	0.33-0.38	0.43-0.46	0.2
355	0.38	0.43-0.46	0.23
405	0.38	0.46-0.56	0.25
460	0.46	0.51-0.56	0.28
510	0.46	0.56	0.28
560	0.46	0.56-0.61	0.31
610	0.66	0.56	0.31
635	0.66	0.76	0.31
685	0.66	0.76	0.31
710	0.66	0.76	0.31
760	0.81	0.91	0.31
810	0.81	0.76	0.31
840	0.81	0.91	0.31
915	0.81	0.91	0.31
1065	0.86	0.99	0.31
1220	0.86	0.99	0.31
1420	0.91	1.04	0.38
1625	0.91	1.04	0.38

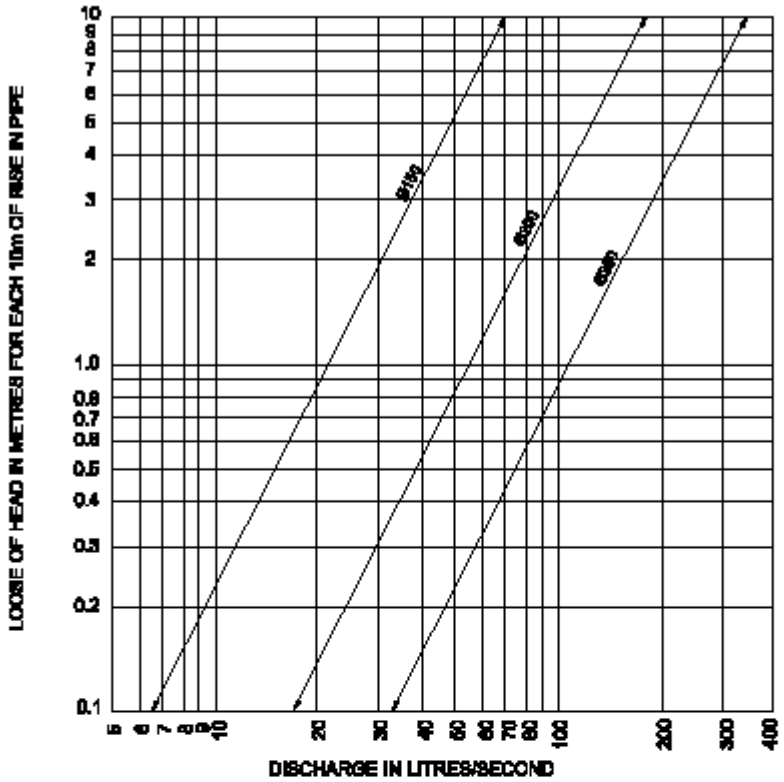


CHART-1 PRESSURE LOSSES IN COLUMN PIPES CONSISTING OF THREADED PIPES

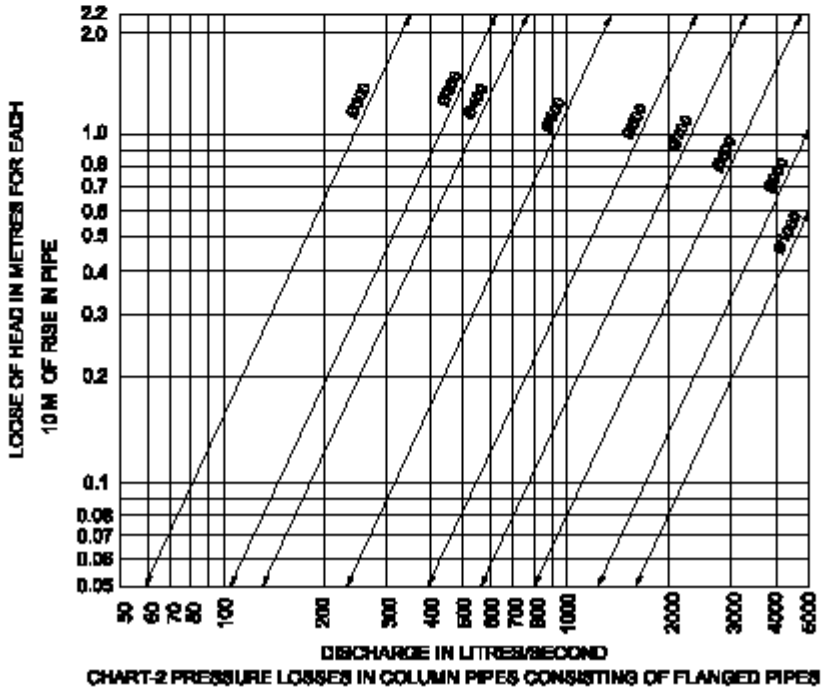


CHART-2 PRESSURE LOSSES IN COLUMN PIPES CONSISTING OF FLANGED PIPES

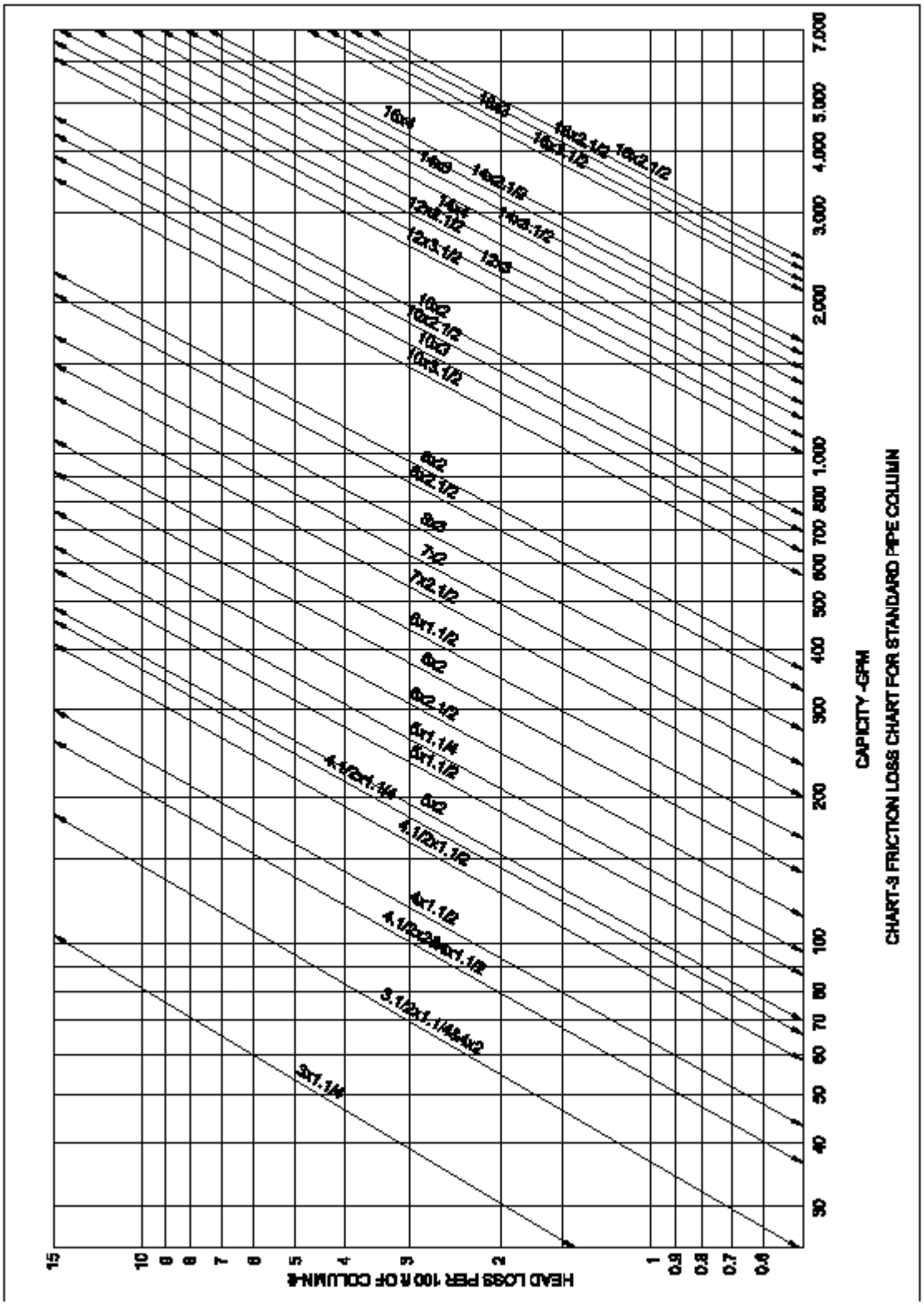


CHART-3 FRICTION LOSS CHART FOR STANDARD PIPE COLUMN
CAPICITY -GPM
HEAD LOSS PER 100 ft OF COLUMN#
16x4
16x3
16x2.1/2
16x2.1/2
14x3
14x2.1/2
14x3.1/2
12x3
12x3.1/2
12x2.1/2
10x3
10x3.1/2
8x3
8x2.1/2
7x2
7x2.1/2
6x1.1/2
6x2
6x2.1/2
5x1.1/4
5x1.1/2
5x2
4.1/2x1.1/2
4x1.1/2
4.1/2x2/4x1.1/2
3.1/2x1.1/4&4x2
3x1.1/4

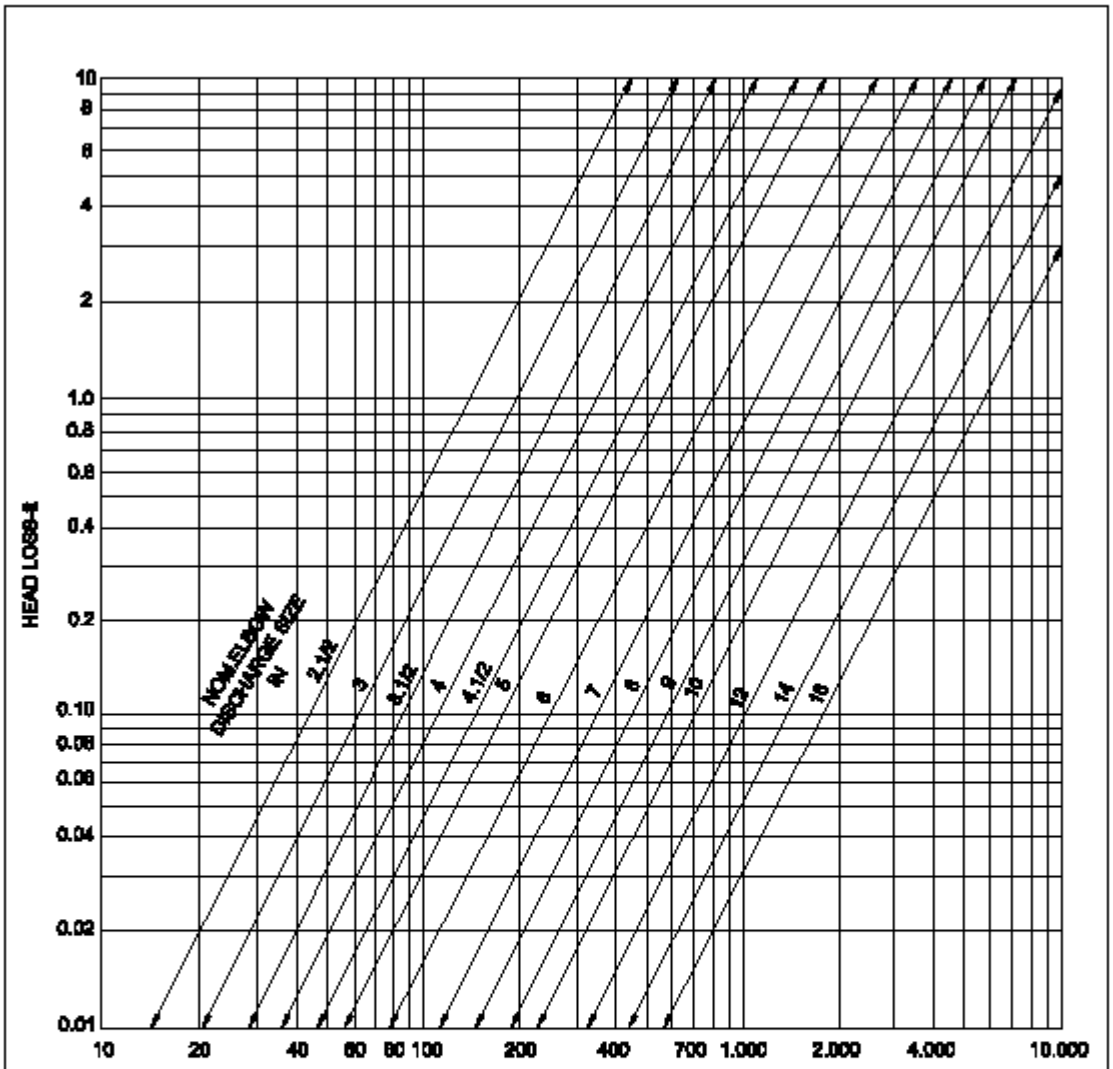


CHART-4 HEAD LOSS DISCHARGE HEADS

USEFUL FORMULAE

Total Bowl Head (TBH) in MLC

= Total Dynamic Head MLC+ (TDH) +

Pump internal Roses in MLC

Pump out put = $\frac{QxTDHxSp\ Gr}{}$ KW

Bowl Assy input = $\frac{QxTBHxSp\ Gr}{367.2xBowl\ Effy}$

Pump input =Bowl Assy out put in KW

+Shaft loss in KW

+ Thrust Brg loss in KW

Motor input = $\frac{Pump\ input}{Motor\ Effy}$ KW

$/\frac{3xVxIxPF}{1000}$ KW

Pump Effy = $\frac{Pump\ output}{Pump\ input}$ x 100%

Over all plant Effy = $\frac{Pump\ output}{Motor\ input}$ x100%

Q = Pump flow Rate M3 /Hr

V = Motor voltage in volts

I = Current in Amp

TDH = Total dynamic Head in MLC

TDH = Total Bowl head in MLC

CONVERSION TABLES

UNITS OF FLOW					
UNITS	U.S GALLON PER MINUTE	MILLION U.S GALLONS PER DAY	CUBIC FEET PER SECOND	CUBIC METERS PER HOUR	LITERS PER SECOND
1 U.S GALLON PER MINUTE	1	.001440	.00223	.2270	.0631
1 MILLION U.S GALLONS PER DAY	694.5	1	1.547	157.73	43.8
1 CU. FOOT PER SEC.	448.8	.646	1	101.9	28.32
1 CU. METER PER HOUR	4.403	.00634	.00981	1	.2778
1 LITER PER SEC.	15.85	.0228	.0353	3.60	1

UNITS OF POWER						
UNIT	HORSE POWER	FT.-LBS. PER MINUTE	WATTS	KILOWATTS	METRIC HORSE POWER	B.T.U PER MINUTE
1 HORSEPOWER	1	33,000	746	.746	1.014	42.4
1 FT.-LB. PER MINUTE	.0000303	1	.0226	.0000226	.0000307	.001285
1 WATT	.001340	44.2	1	.001	.001360	.0568
1 KILOWATT	1.341	44,250	1000	1	1.360	56.8
1 METRIC HORSEPOWER	.986	32,550	736	.736	1	41.8
1 BTU PER MINUTE	.0236	778.4	17.6	.0176	.0239	1

UNITS OF LENGTH
1 Inch=.0833ft.=.0278yd.=25.4 millimeters=2.54 centimeters 1 Foot=12 inches=.333yd.=30.48 centimeters=.3048 meter 1 Yard=36 inches=3 feet=91.44 centimeters =.9144 meter 1 Mile=5280 ft.=1760 yds.=1.61 kilometer=1609 meter 1 Meter=3.281ft.=39.37 in.=.000622 miles=.001 kilometers 1 Kilometer=1000meter=1093.61yds.=.62137 miles=3281 feet

CONVERSION TABLES

UNITS OF PRESSURE & HEAD						
UNIT	Lbs. per Square Inch	Feet of water	Meters of water	Inches of Mercury	Atmos-pheres	Kilograms PER Sq.c.m.
1 LB. PER SQ. INCH	1	2.31	.704	2.04	.0681	.0703
1 FT.OF WATER	.433	1	.305	.882	.02947	.0305
1 METER OF WATER	1.421	3.28	1	2.89	.0967	.1
1 INCH OF MERCURY	.491	1.134	.3456	1	.0334	.0345
1 ATMOSPHERE (AT SEALEVEL)	14.70	33.93	10.34	29.92	1	1.033
1 KILOGRAM PER SQ.C.M.	14.22	32.8	10	28.96	.968	1

Equivalent units are based on density of fresh water at from 32to62F.
Equivalent units are based on density of mercury at from 32 to 62F.-sufficient accuracy.
Each 1000 ft. of ascent decreases pressure about 1/2 lb./sq.in.

UNITS OF VOLUME & WEIGHT								
Units	U.s. Gallons	Imperial Gallons	Cubic Inches	Cubic Feet	Acre Feet	Pounds	Cubic Meters	Liters
1 U.S. GSLLON	1	.833	231	.1337	.00000307	8.35	.003785	3.785
1 IMPERIAL GALLON	1.201	1	277.4	.1605	.00000369	10.02	.004546	4.546
1 CUBIC INCH	.00433	.00360	1	.000579		.0361		.0164
1 CUBIC FOOT	7.48	6.23	1728	1	.0000230	62.4	.02832	28.32
1 ACRE-FOOT	325.850	271.335		43.560	1		1233.5	
1 POUND	.120	.0998	27.7	.0160		1		.454
1 CUBIC METER	264.2	220	61.023	35.314	.000811	2205	1	1000
1 LITER	.2642	.220	.061023	.0353		2.205		1

UNITS OF AREA								
Units	Square Inch	Square Feet	Square Yard	Acres	Square Miles	Square centi-meter	Square Meters	Hectares
1 SQUARE INCH	1	.00694	.00077			6.452		
1 SQUARE FOOT	144	1	.111			929	.0929	
1 SQUARE YARD	1296	9	1	.000207		8361	0.836	
1 ACRE		43,560	4840	1	.00156		4049	0.405
1 SQUARE MILE		27.9x10'	3,097,600	640	1		2.58x10'	258
1 SQUARE CENTIMETER	.155	.001076				1	.0001	1x10'
1 SQUARE METER	1549	10.76	1.196	.000247		10.000	1	.0001
1 HECTARE		107,639	11,960	2.471	.00386	1x10'	10,000	1

GENERAL INFORMATION & SAFETY INSTRUCTIONS:

1. The products supplied by **SPPL** have been designed with safety in mind. Where hazards cannot be eliminated, the risk has been minimized by the use of guards and other design features. Some hazards cannot be guarded against and the instructions below **must be complied with** for safe operation. These instructions cannot cover all circumstances. Installation, operation and maintenance personal must be use safe working practices at all the times.

2. **SPPL** products are designed for installation in designated areas, which are to be kept clean and free of obstructions that may restrict safe access to the controls and maintenance access points. A pump duty nameplate is fitted on the unit and must not be removed. Loss of this plate could make identification impossible. This in turn could affect safety and cause difficulty in obtaining spare parts. If accidental loss or damage occurs, contact **SPPL** immediately.

3. Access to the equipment should be restricted to the person not responsible for installation, operation and maintenance and they must be trained, adequately qualified and supplied with appropriate tools for their respective tasks.

4. Most accidents involving product operation, maintenance and repair are cased by failure to observe safety rules or precautions. An accident can often be avoided by recognizing potential situations before an accident occurs. A person must be aware of potential hazards associated in activities of installation, operation and maintenance of equipments.

5. **SPPL** requires that, all personnel that are responsible for installation, operation or maintenance of the equipment, have access to and study the product instruction manual before any work is done and that they will comply with all local and industry based safety instructions and regulations.

6. Ear defenders should be worn where the specified equipment noise level exceeds locally defined safe levels. Safety glasses or goggles or face shield should be worn where working with pressurized systems and hazardous substances. Other personal protection equipment must be worn where local rules apply. Wear safety shoes, helmets and cotton overalls (apron) when you enter pump house. Noise level should not exceed 90 dbA and 100 dbA for motor driven and engine driven pumps respectively.

7. Do not wear loose clothing or Jewell, which could catch on the controls or become trapped in the equipment.

8. Read the instruction manual before installation, operation or maintenance of the equipment. Check and conform that he manual is relevant copy of comparing pump type on the nameplate and with that on the manual.

9. Note that “limits of product application permissible use” specified in the manual. Operation of the equipment beyond these limits will increase the risk from hazards noted below and may lead to premature and hazardous pump failure.

10. Clear and easy access to all controls, gauges and dials etc. must be maintained at all times. Hazardous or flammable materials must not be stored in pump rooms unless safe area or racking and suitable containers have been provided.

11. Use suitable earth and tripping devices for electrical equipments.

12. Improper installation, operation, maintenance, lubrication, repair of this SPPL product could result in injury or fatal.

If tool, procedure, work methods are operating technique not specifically recommended by SINTECH PRECISION PRODUCTS LIMITED is used, it should be ensured that it is a safe for personnel around and others. It should be ensured that the product will not be damaged or made unsafe by the operation, lubrication and maintenance or repair procedure you choose.

SAFETY INSTRUCTIONS WHILE HANDLING AND STORAGE:

When lifting the pump, use the lifting points specified on general arrangement drawing. Use lifting equipment having a safe working load rating suitable for the weight specified. Use suitable slings for lifting pump which is not provided with lifting points. The use of fork-lift truck and chain crane sling equipment is recommended but locally approved equipment of suitable rating may be used

Do not place fingers or hands etc. into the suction or discharge pipe outlets and do not touch the impeller, if rotated this may cause severe injury. To prevent ingress of any objects, retain the Protection covers or packaging in place until removal is necessary for installation. If the packaging or suction and discharge covers are removed for inspection purposes, replace afterwards to protect the pump and maintain safety.

SAFETY INSTRUCTIONS WHILE ASSEMBLY & INSTALLATION

Do not place fingers or hands etc. into the suction or discharge pipe outlets and do not touch the impeller. If rotated this may cause severe injury. To prevent ingress of any objects, retain the Protection covers or packaging in place unit removal is necessary for installation.

Do not touch any moving or rotating parts. Guards are provided to prevent access to these parts. Where they have been removed for maintenance they must be replaced before operating the Equipment.

Shaft alignment must be checked again after the final positioning of the pump unit and connection to pipe work as this may have disturbed the pump or motor mounting position. If hot liquids (above 80ºC) are being pumped. Alignment should be

checked and reset with pump and motor at their normal operating temperature. If this is not possible, SINTECH can supply estimated initial Offset figures to suit extreme operating temperatures.

Failure to support suction and delivery pipe work may result in distortion of the pump casing with the possibility of pump failure.

SAFETY INSTRUCTIONS WHILE COMMISSIONING & OPERATION

Do not touch any moving or rotating parts. Guards are provided to prevent access to these parts, where they have been removed for maintenance they must be replaced before operating the equipment.

Check that the pump is primed. Pump should never be run dry as the pumped liquid acts, as lubricant for the close running fits surrounding impeller and damage will be incurred.

Failure to supply the stuffing box mechanical seal with cooling of flush water may result in damage and premature failure of the pump.

Do not touch surfaces which during normal running will be sufficiently hot to cause injury. Note that these surfaces will remain hot after the pump has stopped; allow sufficient time for cooling before maintenance. Be cautious and note that other parts of the pump may become hot if a fault is developing.

Do not operate water pumps in temperatures below freezing point, without first checking that the pumped fluid is not frozen and the pump is free to turn. Pumps in these environments should be Drained down during inactivity and re-primed before starting.

In addition to local or site regulations for noise protection, SINTECH the use of personal ear protection equipment in all enclosed pump rooms and particularly those containing diesel engines car must be taken to ensure that any audible alarm or warning signal can be heard with ear defenders worn.

Be aware of the hazards relating to the pumped fluid, especially the danger from inhalation of noxious and toxic gases, skin and eye contact or penetration. Obtain and

understand the hazardous substance data sheets relating to the pumped fluid and note the recommended emergency and first aid procedures.

SAFETY INSTRUCTIONS WHILE MAINTENANCE & SERVICING

Before attempting any maintenance on a pump particularly if it has been handling any form of hazardous liquid. It should be ensure that the unit is safe to work on. The pump must be flushed thoroughly with suitable cleaner to purge away any of the product left in the pump components. This should be carried out by the plant operator and a certificate of cleanliness obtained before Starting work. To avoid any risk to health it is also advisable to wear protective clothing as recommended by the site safety officer especially when removing old packing which may be contaminated

Check and ensure that the pump operates at below the maximum working pressure specified in the manual or on the pump nameplate and before maintenance, ensure that the pump is drained down.

Wear a suitable mask or respirator when working with packing and gasket components which contain fibrous material, as these can be hazardous when the fibrous dust is inhaled. Be cautions, if other supplier's components have been substituted for genuine SINTECH parts, these may then contain hazardous materials.

Be aware of the hazards relating to the pumped fluid, especially the danger from inhalation of noxious and toxic gases, skin and eye contact or penetration. Obtain and understand the hazardous Substance data sheets relating to the pumped fluid and note the recommended emergency and first aid procedures.

Isolate the equipment before any maintenance work is done. Switch off the mains supply remove fuses, apply lock-outs where applicable and affix suitable isolation warning signs to prevent inadvertent reconnection. In order to avoid the possibility of maintenance personnel inhaling dangerous fumes or vapors, it is recommended that the maintenance work be carried out away from the pump locations by removal of bearing housing and shaft assembly to a suitable to a suitable maintenance area.

ANNEX - 1

ORDER FORM FOR PUMP SPARE PARTS

ORDERING INSTRUCTION

1. Date of order / Enquiry. ____

2. Your reference. ____

3. Name plate information.

(Every pump has the following plate fastened to the Pump providing necessary identification of the Pump.)

A. W.O. ____

B. Model ____

C. S. No. ____

D. M³/HR ____

E. MWC ____

F. Motor kw. ____

G. RPM ____

H. SUC ____

I. DEL ____

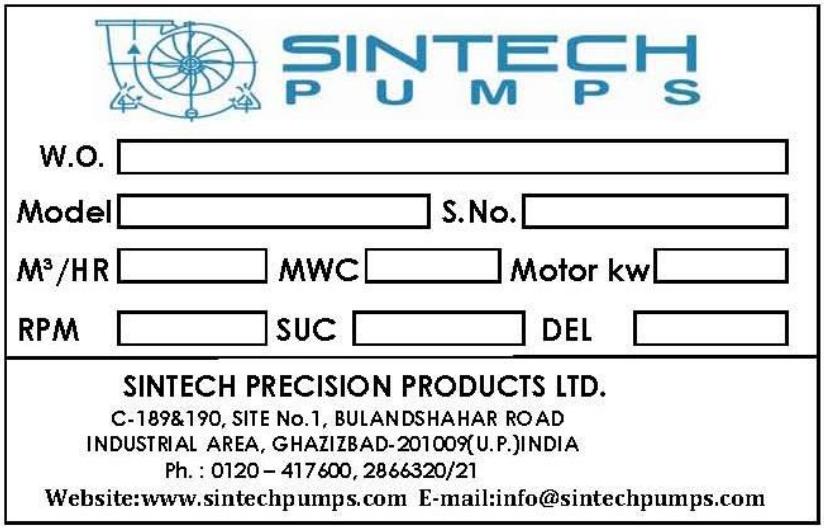


Image of Name Plate

4. Part Name (Refer to cross section drawing.) ____

5. Part No. ____

6. Pump Application. ____

7. MOC of required Part. ____

8. Quantity. ____

NOTE –

Diagrams given in this manual are only for reference and are indicative. The actual product may differ from this Technical data and product design / drawings are subject to change without notice.