770714

GOULDS PUMPS, INC.

TYPE I MANUAL

DANIEL INTERNATIONAL

CUSTOMER: DETROIT EDISON COMPANY

P.O. # 1A 95618

S.O. # N302275-1, 2

ITEM: EMERGENCY EQUIPMENT SERVICE WATER PUMPS

ESTIMATED SHIPPING WEIGHT (EA.): 2950 LBS.

TABLE OF CONTENTS

CURVES SHOW APPROXIMATELY THE CHARACTERISTICS WHEN PUMPING CLEAR NON-AERATED WATER. NO GUARANTEE IS MADE EXCEPT FOR THE RATED POINT

NOTE: _____ COLUMN LOSSES ARE INCLUDED

CHANGE EFFICIENCY 1 POINT	NUMBER OF POINTS	FOR NUMBER OF STAGES

NOTE ANY CHANGE IN EFFICIENCY CHANGES EITHER THE HEAD OR POWER ABSORBED IN THE

SARGENT & LUNDY ENGINEERS

FOR: DETROIT EDISON COMPANY

P.O. No. 1A-95618

ITEM No. P4500-0002A

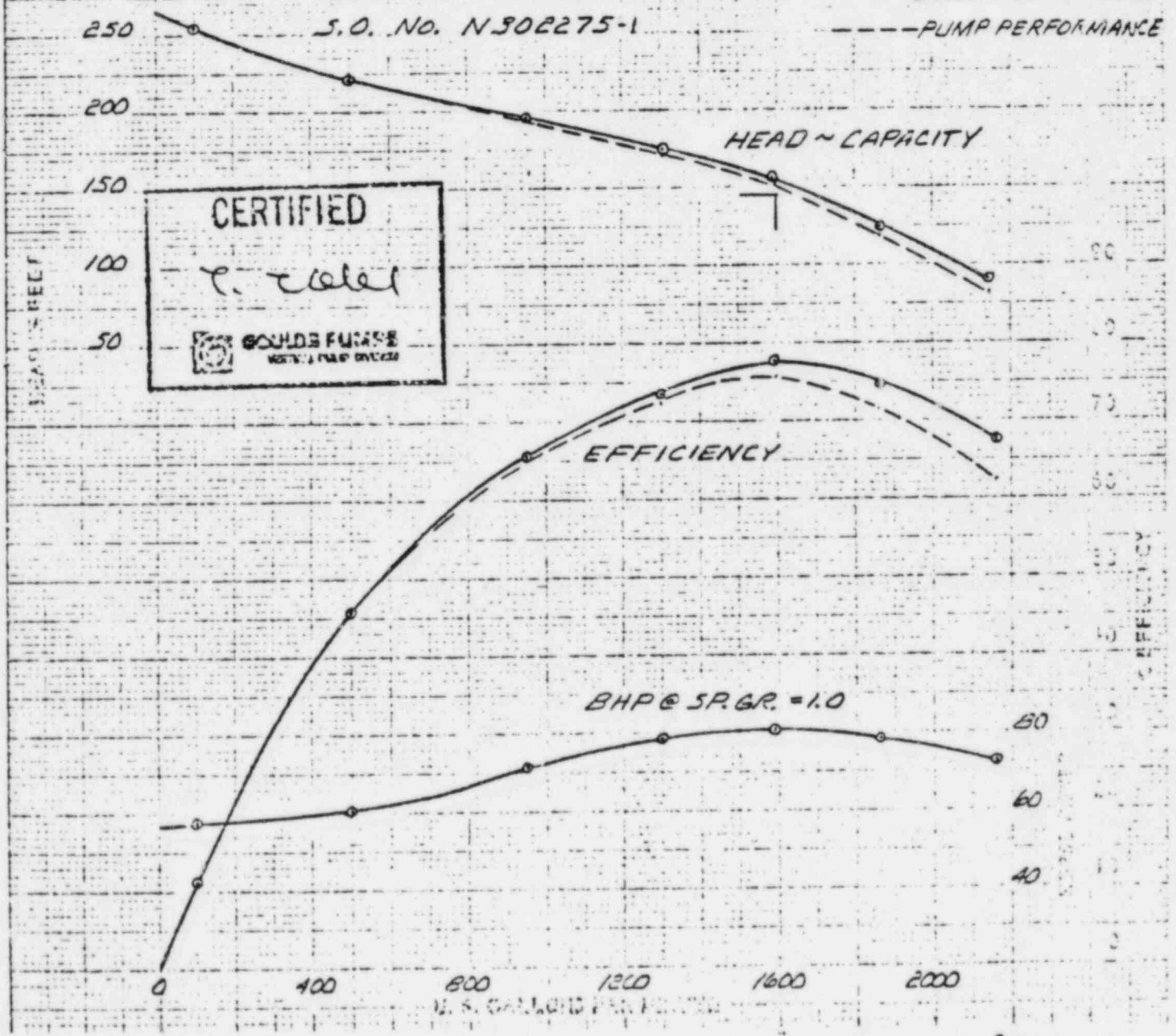
EMERGENCY EQUIPMENT SERVICE WATER PUMPS

T.C.N. No. N0006

S.O. No. N302275-1

—— BOWL PERFORMANCE

- - - - PUMP PERFORMANCE



CERTIFIED

GOULDS PUMPS

IMPELLER ENCLOSED

10 5/8 DIA.

UP 1/8 in.

DATE 6/24/77 BY P. LARSON

GOULDS PUMPS
VERTICAL PUMP DIVISION
INDUSTRY, CALIFORNIA

PERFORMANCE 2 STAGE

8 X 14 JMC — DEEP WELL TURBINE PUMP

1775 — R.P.M.

CURVE SHEET NO. T-77-209

CURVES SHOW APPROXIMATELY THE CHARACTERISTICS WHEN PUMPING CLEAR NON-AERATED WATER. NO GUARANTEE IS MADE EXCEPT FOR THE RATED POINT

NOTE: ___ COLUMN LOSSES ARE INCLUDED

CHANGE EFFICIENCY AS FOLLOWS	NUMBER OF POINTS	PER NUMBER OF STAGES

NOTE: ANY CHANGE IN EFFICIENCY CHANGES EITHER THE HEAD OR [illegible]

SARGENT AND LUNDY ENGINEERS

FOR: DETROIT EDISON COMPANY

P.O. No. 1A-95618

ITEM NO. P4500-0003B

EMERGENCY EQUIPMENT SERVICE WATER PUMPS

TCN. NO. N0006

S.O. NO. N.302275-2

— BOWL PERFORMANCE

--- PUMP PERFORMANCE

HEAD-CAPACITY

EFFICIENCY

B. HP. SP GR. 1.0

HEAD IN FEET

300
250
200
150
100
50

60
60
40

0
400
800
1200
1600
2000

U. S. GALLONS PER MINUTE

CERTIFIED
Roger Marshall
6-29-77
GOULDS PUMPS

PERFORMANCE ___ TWO ___ STAGE

8 x 14 JMC

DEEP WELL TURBINE PUMP

1775

R.P.M.

CURVE SHEET NO. T-77-292

IMPELLER CLOSED

10 5/8 DIA.

UP 1/8 IN.

DATE 6-24-77 BY R.M.

GOULDS PUMPS
VERTICAL PUMP DIVISION
INDUSTRY, CALIFORNIA

CURVES SHOW APPROXIMATELY THE CHARACTERISTICS WHEN PUMPING CLEAR NON-AERATED WATER. NO GUARANTEE IS MADE EXCEPT FOR THE RATED POINT

NOTE: NO COLUMN LOSSES ARE INCLUDED

CHANGE EFFICIENCY AS FOLLOWS	NUMBER OF POINTS	FOR NUMBER OF STAGES

NOTE ANY CHANGE IN EFFICIENCY CHANGES EITHER THE HEAD OR HORSE POWER IN PROPORTION

SARGENT AND LUNDY ENGINEERS

FOR: DETROIT EDISON COMPANY

P.O. NO. 1A [illegible]18

ITEM NO. P4500-0002A

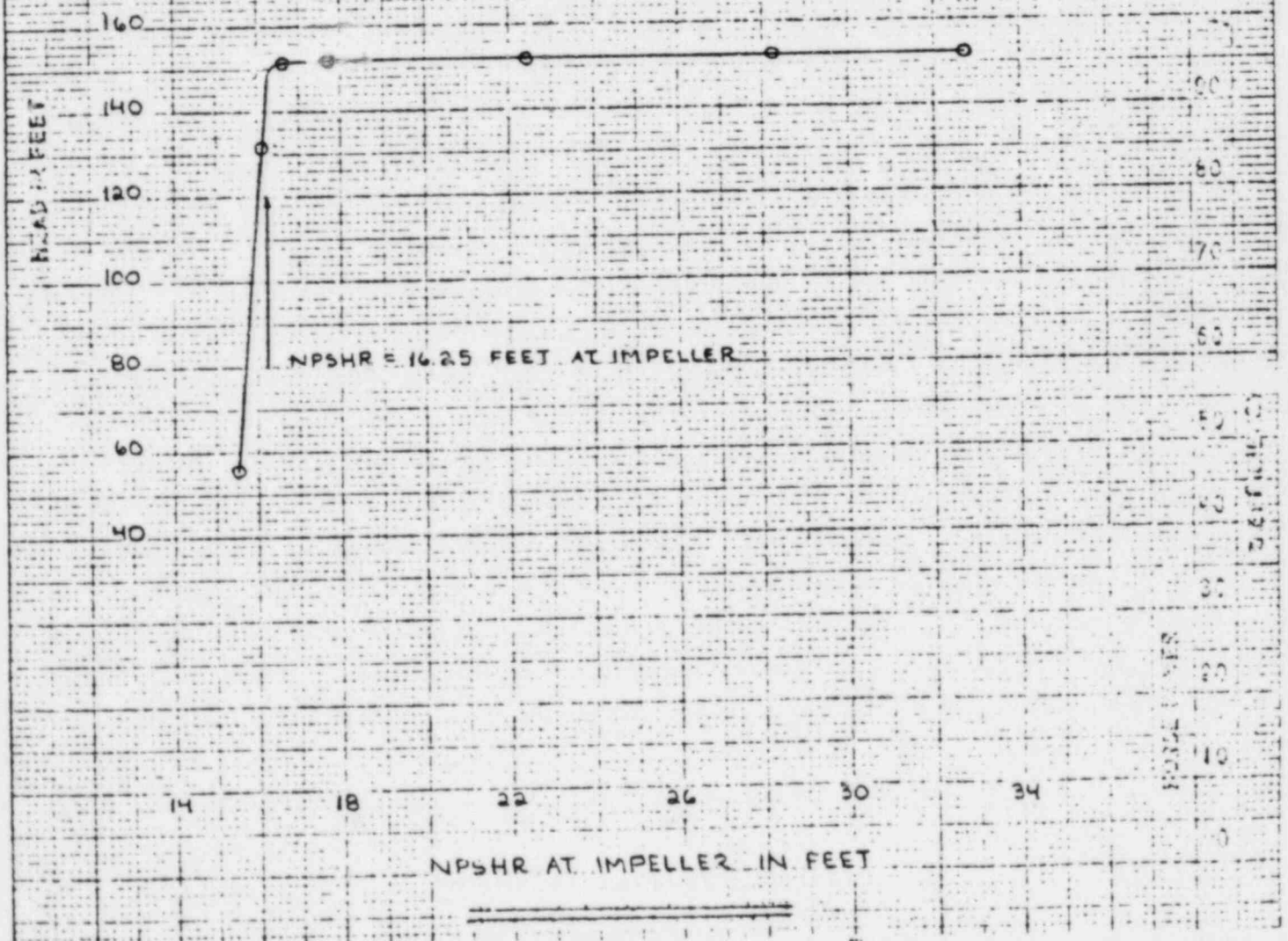
EMERGENCY EQUIPMENT SERVICE WATER PUMPS

TCN NO. N10006

S.O. NO. N302275-1

CERTIFIED
Roger Marshall
6-27-77
GOULDS PUMPS

HEAD-NPSHR AT 1592 GPM



PERFORMANCE TWO STAGES

IMPELLER CLOSED

10 3/8 DIA.

UP 1/8 IN

DATE 6-24-77 BY R.M.

GOULDS PUMPS
VERTICAL PUMP DIVISION
INDUSTRY, CALIFORNIA

8x14 JMC

DEEP WELL TURBINE PUMP

1775 R.P.M.

CURVE SHEET NO. T-77-290

CURVES SHOW APPROXIMATELY THE CHARACTERISTICS WHEN PUMPING CLEAR NON-AERATED WATER. NO GUARANTEE IS MADE EXCEPT FOR THE RATED POINT

NOTE: NO COLUMN LOSSES ARE INCLUDED

CHANGE OF SPEED AS TO LOSS	NUMBER OF POINTS	FOR NUMBER OF STAGES

FOR A SMALL CHANGE IN SPEED CORRECT EITHER THE HEAD OR CAPACITY AS FOLLOWS

SARGENT AND LUNDY ENGINEERS

FOR: DETROIT EDISON COMPANY

P.O. NO. 1A-95618

ITEM NO. P4500-0002B

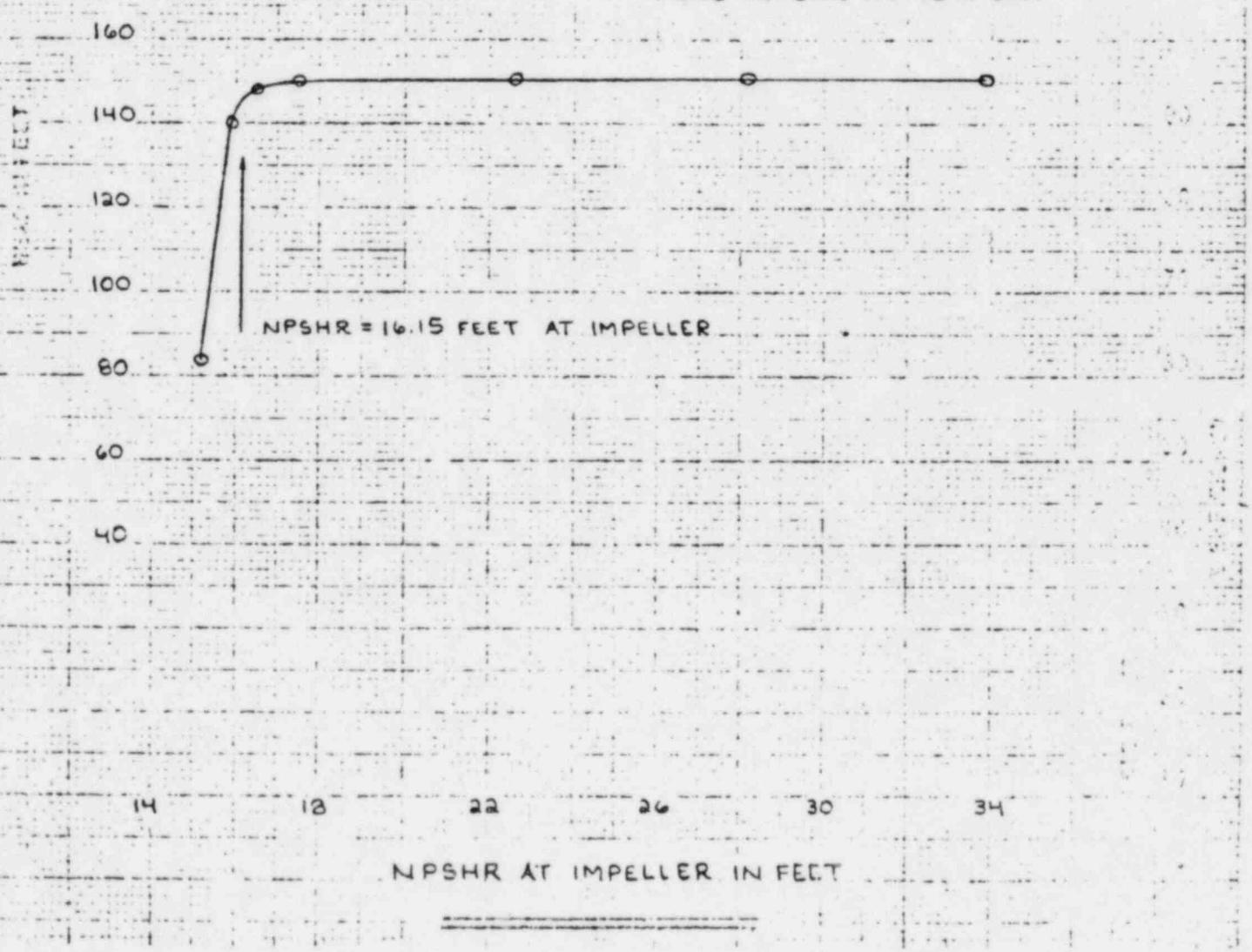
EMERGENCY EQUIPMENT SERVICE WATER PUMPS

TCN NO. N0006

S.O. NO. N302275-2

CERTIFIED
Roger Marshall
6-29-77
GOULDS PUMPS

HEAD-NPSHR AT 1591 GPM



IMPELLER CLOSED

10 5/8 DIA.

UP 1/8 IN

DATE 6-27-77 BY R.M.

GOULDS PUMPS
VERTICAL PUMP DIVISION
INDUSTRY, CALIFORNIA

PERFORMANCE TWO STAGES

8x14 JMC

DEEP WELL TURBINE PUMP

1775 R.P.M.

CURVE SHEET NO. T-77-294

COULDS PUMPS - VERTICAL PUMP DIVISION
PUMP TEST DATA

TEST NO. T-77-239

TYPE 8X14JMC STAGES 2
SERIAL NO. N 302275-1
2 IMP'S 10 5/8 DIA 1/8 UF b2
IMP'S DIA UF b2
AXIAL RUNNING CLEARANCE 0.100
BOWLS SA 316
IMPELLERS 316 5/8

GUARANTEED PERFORMANCE

	RPM	GPM	HEAD	HP	SP.GR.	VISC.
LAB						
FIELD	1775	1600	145	109/115	1.0	32.5SU

TEST MOTOR 125 HP 4 POLES
WATTMETER SCALE MULTIPLIER 160
LINE B " MAGN. FLOWTR d- [illegible] " C - 154.6

FOR: DETROIT EDISON CO.
SARGENT AND LUNDY ENGINEERS
P.O. NO. 1A-95618
ITEM NO. PH500-0002A
WITNESSED BY: E. [illegible]
TESTED BY P. LARSON DATE 6/24/77

READING	1	2	3	4	5	6	7	8	9	10	11	12
RPM	1795	1795	1791	1789	1787	1790	1791					
DISCH. PRESSURE-PSI	112.0	98.8	85.5	75.7	67.5	53.1	37.9					
DISCH. HEAD-FT.	258.7	228.6	198.2	174.9	155.5	122.6	87.5					
ELEVATION CORRECTION-FT.	1.2	1.2	1.2	1.2	1.2	1.2	1.2					
VELOCITY HEAD-FT.	.006	.16	.55	1.10	1.64	2.25	2.97					
TOTAL PUMP HEAD-FT.	257.9	227.1	197.9	177.2	155.3	126.1	91.7					
FLOW VELOCITY FT/SEC.	.65	3.26	6.18	8.50	10.55	12.14	14.01					
FLOW - INCHES OF Hg												
FLOW - INCHES OF BLUE												
FLOW - GPM	100.5	504.0	955.4	1314.1	1600.1	1876.5	2165.9					
WATTMETER READING	.277	.313	.367	.400	.411	.400	.572					
INPUT TO MOTOR - KW	47.8	50.1	58.7	64.0	65.8	64.0	57.5					
BRAKE HORSEPOWER	37.5	42.3	73.4	80.1	82.4	80.1	74.4					
PUMP EFFICIENCY - %	11.07	15.72	65.72	75.37	77.66	74.59	67.4					

CERTIFIED
T. [illegible]

PERFORMANCE CONVERTED TO 1775 RPM 1.0 SP.GR.

TOTAL PUMP HEAD-FT.	254.7	220.5	194.7	174.4	155.3	124.0	90.1					
FLOW-GPM	99.5	498.9	946.0	1300.8	1584.2	1857.6	2144.0					
BRAKE HORSEPOWER	37.1	40.5	71.5	78.3	80.3	78.1	72.5					
PUMP EFFICIENCY-%	11.07	15.72	65.72	75.37	77.66	74.59	67.4					

GOULDS PUMPS - VERTICAL PUMP DIVISION

PUMP TEST DATA

TEST NO. T-77-292

TYPE 8 x 14 JMC STAGES 2	GUARANTEED PERFORMANCE						FOR: DETROIT EDISON CO.
SERIAL NO. N 302275-2		RPM	GPM	HEAD	HP	SP.GR.	VISC.	SARGENT AND LUNDY ENGINEERS
2 IMP'S 10 5/6 DIA 1/16 UF b2	LAB							P.O. NO. 1A-95618
IMP'S DIA UF b2	FIELD	1775	1600	145	100	1.0	32.55u	ITEM NO. P45CO-0002B
AXIAL RUNNING CLEARANCE 0.100	TEST MOTOR 125 HP 4 POLES							EMERGENCY EQUIPMENT SERVICE WATER PUMPS
BOWLS SA 216	WATTMETER SCALE MULTIPLIER = 160							
IMPELLERS 316 SS	LINE 8 " MAGN. FLOWMTR d - 8 " C - 154.6							TESTED BY P. KAVANAUGH DATE 6-24-77

READING	1	2	3	4	5	6	7	8	9	10	11	12
RPM	1794	1794	1792	1791	1791	1792	1793					
DISCH. PRESSURE-PSI	109.7	95.2	84.4	76.8	66.2	52.0	35.2					
DISCH. HEAD-FT.	253.4	219.9	195.0	177.4	152.9	120.1	81.3					
ELEVATION CORRECTION-FT.	1.2	1.2	1.2	1.2	1.2	1.2	1.2					
VELOCITY HEAD-FT.	0.0	0.2	0.6	1.1	1.6	2.3	3.0					
TOTAL PUMP HEAD-FT.	254.6	221.3	196.8	179.7	155.8	123.6	85.5					
FLOW VELOCITY FT/SEC.	0.54	3.25	6.22	8.50	10.38	12.28	14.10					
FLOW - INCHES OF Hg												
FLOW - INCHES OF BLUE												
FLOW - GPM	83	502	962	1314	1605	1893	2180					
WATTMETER READING	0.288	0.300	0.358	0.401	0.408	0.400	0353					
INPUT TO MOTOR - KW	46.1	48.0	57.3	64.2	65.3	64.0	56.5					
BRAKE HORSEPOWER	57.2	59.7	71.6	80.3	81.8	80.1	70.6					
PUMP EFFICIENCY - %	9.39	47.06	66.75	74.23	77.21	73.96	66.74					

CERTIFIED
Logan Marshall
6-29-77

PERFORMANCE CONVERTED TO 1775 RPM. SP.GR. 1.0

TOTAL PUMP HEAD-FT.	249.2	216.6	193.0	176.5	153.0	121.3	83.8					
FLOW-GPM	83	497	952	1302	1590	1880	2158					
BRAKE HORSEPOWER	55.4	57.8	69.6	78.2	79.6	77.9	68.5					
PUMP EFFICIENCY-%	9.39	47.06	66.75	74.23	77.21	73.96	66.74					

GOULDS PUMPS - VERTICAL PUMP DIVISION

NPSH TEST DATA

I-77-290

TYPE 6X14 JMC STAGES 2	GUARANTEED PERFORMANCE						FOR: DETROIT EDISON CO.
SERIAL NO. N30275-1		RPM	GPM	HEAD	HP	SP.GR.	VISC.	SARGENT AND LUNDY ENGINEERS
2 IMP'S 10 3/8 DIA 1/8 UF b2	LAB							P.O. NO. 1A-95618
IMP'S DIA UF b2	FIELD	1775	1600	145	100 1/15	1.0	32.64	ITEM NO. P4500-0002A
AXIAL RUNNING CLEARANCE 0.120	TEST MOTOR 125 HP 4 POLES							WITNESSED BY: C. [illegible]
BOWLS SS 216	WATTMETER SCALE MULTIPLIER 160							
IMPELLER 316 SS	6 VENTURI ELEV. CORRECTION +1.75 FT.							TESTED BY P.LARSON DATE 6/24/77

READING	1	2	3	4	5	6	7	8	9	10	11	12
RPM	1790	1790	1790	1791	1790	1791	1794					
DISCHARGE PRESSURE-PSI	64.6	62.6	60.0	57.9	57.1	48.2	14.6					
SUCTION PRESSURE -IN Hg	-2.80	-6.80	-12.00	-16.2	-17.2	-17.6	-18.1					
TOTAL PUMP HEAD - FEET	154.9	154.8	154.7	154.6	153.9	133.8	56.8					
FLOW - INCHES OF BLUE												
FLOW - INCHES OF Hg	10.3	10.3	10.3	10.3	10.3	10.3	10.3					
FLOW-GPM	1605	—	—	—	—	—	→					
WATTMETER READING												
BRAKE HORSEPOWER												
PUMP EFFICIENCY												
VELOCITY HEAD-FEET	.33	—	—	—	—	—	→					
ATMOSPHERIC PRESSURE-IN Hg	29.74	—	—	—	—	—	→					
WATER TEMPERATURE- F	76.0	76.6	77.2	77.4	77.5	77.6	77.6					
VAPOR PRESSURE -FEET	1.03	1.05	1.07	1.07	1.08	1.08	1.08					
NPSH AT DATUM-FEET	33.27	28.71	22.79	18.01	16.88	16.42	15.85					
PERFORMANCE CONVERTED TO 1775 RPM SP.GR.												
FLOW-GPM	1592	1592	1592	1591	1592	1591	1583					
TOTAL PUMP HEAD-FEET	152.3	152.3	152.1	151.9	151.4	131.4	55.6					
BRAKE HORSEPOWER												
NPSH AT DATUM-FEET	32.71	28.23	22.41	17.69	16.59	16.13	15.59					

CERTIFIED

Roger Marshall

6-27-77

GOULDS PUMPS

COULDS PUMPS - VERTICAL PUMP DIVISION
NPSH TEST DATA

T-77 - 294

TYPE 8x14 JMC STAGES 2	GUARANTEED PERFORMANCE						FOR: DETROIT EDISON Co.
SERIAL NO. N302275-2		RPM	GPM	HEAD	HP	SP.GR.	VISC.	SARGENT AND LUNDY ENGINEERS
2 IMP'S 10 5/8 DIA UF b2	LAB							P.O. NO. 1A-95618
IMP'S DIA UF b2	FIELD	1775	1600	145	100	1.0	32 SSU	ITEM NO. P4500-0002B
AXIAL RUNNING CLEARANCE 0.100	TEST MOTOR 125 HP 4 POLES							EMERGENCY EQUIPEMENT SERVICE
BOWLS SA 216	WATTMETER SCALE MULTIPLIER							WATER PUMPS
IMPELLER 316 SS	8 VENTURI ELEV. CORRECTION 1.75 FT.							TESTED BY P. LARSON DATE 6-27-77

READING	1	2	3	4	5	6	7	8	9	10	11	12
RPM	1791	1791	1791	1792	1792	1793	1795					
DISCHARGE PRESSURE PSI	64.3	61.9	59.4	57.0	55.7	52.0	27.0					
SUCTION PRESSURE -IN Hg	-1.9	-7.0	-12.0	-16.5	-17.4	-17.9	-18.5					
TOTAL PUMP HEAD - FEET	153.2	153.4	153.3	152.9	150.9	142.9	85.9					
FLOW - INCHES OF BLUE												
FLOW - INCHES OF Hg	10.8	10.8	10.8	10.8	10.8	10.8	10.8					
FLOW-GPM	1605	1605	1605	1605	1605	1605	1605					
WATTMETER READING												
BRAKE HORSEPOWER												
PUMP EFFICIENCY												
VELOCITY HEAD-FEET	0.33	0.33	0.33	0.33	0.33	0.33	0.33					
ATMOSPHERIC PRESSURE-IN Hg	29.85											
WATER TEMPERATURE- F	74.2	74.7	75.0	75.9	76.6	76.8	77.1					
VAPOR PRESSURE -FEET	0.97	0.99	1.00	1.03	1.05	1.06	1.08					
NPSH AT DATUM-FEET	34.48	28.67	22.99	17.85	16.81	16.23	15.53					
PERFORMANCE CONVERTED TO 1775 RPM SP.GR.												
FLOW-GPM	1591	1591	1591	1590	1590	1589	1587					
TOTAL PUMP HEAD-FEET	150.5	150.7	150.6	150.0	148.1	140.1	84.0					
BRAKE HORSEPOWER												
NPSH AT DATUM-FEET	33.86	28.16	22.58	17.51	16.49	15.91	15.18					

CERTIFIED
6-27-77
COULDS PUMPS

GOULDS PUMPS
VERTICAL PUMP DIVISION
INDUSTRY, CALIFORNIA

RECOMMENDED SPARE PARTS - PER UNIT

CUSTOMER Detroit Edison Company

P.O. NO. 1A 95618 ITEM Emergency Equipment Service Water Pumps

PUMP SERIAL NO. N302275 MODEL VIT 8x14JMC/2

P.I.S. Nos. P45-00-C002A
P45-00-C002B

ITEM	PART	MTL.	DWG.	QTY.	NET $$ EACH.	DEL
609	Headshaft Sleeve	ASTM A-276 TP.410	A2290	1	$ 363.00	16 Wks. ARO
617	Stuffing Box Bearing	ASTM B-144-3B	IE 254	1	16.50	
620A	Packing Rings	Asbestos Graphite	90855	1 set of six	8.25/ set	
743B	O-Ring - Sleeve/Shaft	Buna-N	70721	1	3.30	
779A	Gasket - Stuff. Box/Head	Vellumoid	B2749	1	3.30	
653	Line Shaft Bearing	Rubber	C1086	8	6.60	
743	O-Ring - Col./Col./HD.	Buna-N	ARP-568-271	8	9.90	
672	Inter. Bowl Bearing	Rubber	A7391	2	6.60	
680	Wear Ring - Bowl	ASTM A-296 GR.CF8	A8819	2	95.70	
681	Wear Ring - Impeller	ASTM A-296 GR.CF8M	A2983	2	440.01	
690	Suction Bell Bearing	ASTM B-144-3B	IE253	1	31.35	
743D	O-Ring - Bowl Assembly	Buna-N	A9749	3	6.60	

BY M. J. Foster DATE June 28, 1977

NOTE- PRICE AND DELIVERY ARE EFFECTIVE 60 DAYS FROM QUOTATION DATE

INSTALLATION AND OPERATION INSTRUCTIONS

GOULDS MODEL

VIT

VERTICAL INDUSTRIAL TURBINE PUMP

TABLE OF CONTENTS

GOULDS PUMPS
VERTICAL PUMP DIVISION
City of Industry, California 91747

SECTION I INSTALLATION

I-A Receiving

The unit should be carefully supported and unloaded. Under no circumstances should it be dropped or receive rough handling. Exercise the same care with the pump as with other pieces of engineering equipment.

I-AI Checking Shipment

All parts should be inspected upon receipt for damaged or missing components, checking each item with the shipping manifest furnished. Any deficiency should be immediately reported to the local transportation office of the carrier responsible. This will prevent any controversy when claim is made and facilitate prompt and satisfactory adjustment.

I-B Storage

If the equipment must be stored for [illegible] length of time, adequate precautions must be taken against deterioration or damage. If storage is extensive, periodic inspection should be performed and prior to installation the pump should be flushed with clean water and cleaned thoroughly. Storage should be in a dry area where a reasonably constant temperature can be maintained. Mechanical seal, if provided, should not be installed before the pump is set in place.

I-C Location of Unit

The pump should be arranged so as to allow periodic inspection. Discharge piping should be independently supported near the pump and properly aligned so that no strain is transmitted to the pump when the flange bolts are tightened. Any misalignment in a column assembly can cause vibration in the unit and reduce the life of the bearings.

I-CI Foundations

The foundation should consist of material that will afford a permanent, rigid support for the baseplate. Concrete foundations should be level and built on solid ground. Foundation bolts of the proper size should be embedded in the concrete, located by a drawing or template. A pipe sleeve about two and one-half diameters larger than the bolt should be used to allow movement for the final positioning of the bolts.

When mounted directly on structural steel framework, the pump should be located directly over or as near as possible to the main building members, beams or walls. Baseplate should be bolted to the supports to avoid distortion, prevent vibration and retain proper alignment.

I-D Installation

If the unit is 20' or less, it is usually shipped completely assembled with exception of drivers, vent piping, mechanical seals or packing and in some cases, upper headshafts if a VHS driver is supplied. All bolts and nuts should be checked to insure that they are securely tightened. Care must be exercised in the handling of all parts, particularly the shaft, as it is machined to close tolerances for accurate alignment.

I-E Assembly

1. Open Lineshaft (Pump element not assembled to column & head) (Refer to Fig. 1)

A. After thoroughly checking the parts and inspecting the flanges, position a suitable lifting device over foundation opening.

B. Lower pumping unit (7) to a point where shaft can be readily coupled to pump shaft and then lower column section (5) with line shaft, aligning the bolt holes on the flanges. NOTE: Do not use pipe thread sealing compound on shaft or shaft coupling.

C. Make certain air relief hole in shaft coupling centers at the shaft ends.

D. Screw lineshaft into pumpshaft. Do not apply wrenches at the point where it may come in contact with bearings.

E. Place bearing spider (6) in recess of column flange.

F. Lower next section of column assembly making sure spider ring enters recess in bottom flange of section.

G. Extreme care should be taken in tightening flange bolts. Do not attempt to pull flanges together. When joint is assembled properly and bolts tight, there should be about 1/2" gap between flanges. Repeat the above procedure for all sections if pump length necessitates their use.

H. Screw lower headshaft in place. Remove packing box assembly (3) from discharge head (2) so as not to incur damage to the shaft.

I. Lower head carefully over headshaft, having first placed spider in recess of top column flange. Bolt column to head, then mount head to foundation.

J. Replace stuffing box assembly taking caution to insure that Flexitallic gasket is in its proper position. (Refer to Fig. V(a))

2. Assembly Enclosed Lineshaft (Fig. II)

A. After the parts have been checked for damage, and flanges have been inspected, slide shaft and tube into column pipe, taking care to protect threads. A clean rag wound around the end is ample protection against dirt and damage. Let the tube extend about 6" below the column pipe and the shaft about 6" below the tube.

B. Lower column assembly (1) to a point where the shaft is slightly above pump shaft coupling. Clean end of shaft and threads. Put a few drops of oil on the threads — DO NOT USE THREAD DOPE, then lower until shaft enters coupling and thread together.

C. Check the tube threads and end to be sure they are clean, then oil and lower until tube rests on bearing at top of bowl assembly (2) and couple together.

D. After tube (3) is in place, check flanges and coat face with thin coat of thread dope or white lead and oil.

E. Lower column (1) in place and bolt flanges together.

F. Remove bronze bearing (8) from tube and pour a few ounces of light turbine oil over shaft. DO NOT FILL THE TUBE. Dope threaded O.D. of bearing and replace in tube and thread coupling on shaft.

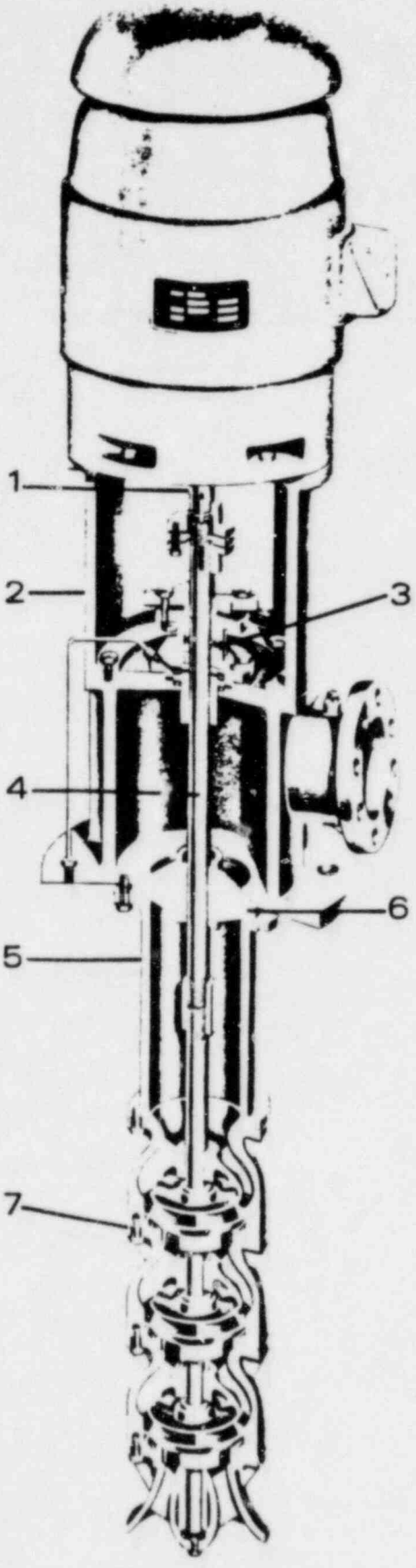


FIGURE I
Open Lineshaft

G. A steel spider is used to center the tube in the column pipe. These are placed in recess of column flange.

Repeat above operations until all column is installed.

H. Check position of shaft coupling. If coupling is in tube, the head shaft (9) is screwed into the coupling, then the tube is screwed onto the bearing. If the coupling is above the tube, screw the tube onto the bearing.

I. Place the head on the top column flange, bolt together then raise the head and lower it into the foundation. Bolt the head in place.

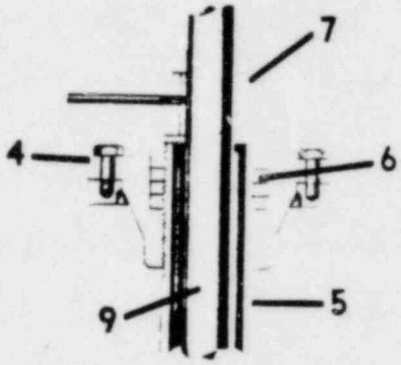
J. Dope the tube threads and the flange of the tension plate (4). Screw the plate onto the tube fairly tight so as to put considerable tension on the tube. Align the holes, insert capscrews and tighten.

K. The top of the tube nipple (5) should now be about even with the top of the tension plate; check to be sure that the tube nipple does not extend too far above the tension plate and that it will not butt on the shoulder of the tension nut. Install the tension plate packing (6) and thread the tension nut (7) down tight.

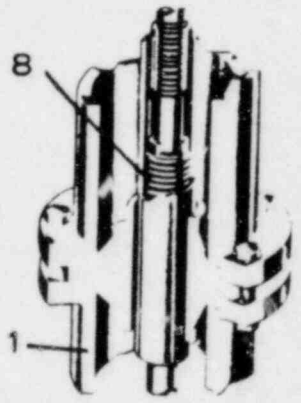
L. Refer to section II for driver mounting.

M. Connect the oil lines. Fill the automatic oiler, if electric pump drive is furnished, or oil cup for gear, with Gargoyle D.T.E. Light oil or equal. Do NOT use heavy oil, over SAE 10, in the bearings or line shafting. The leads of the automatic oiler are connected to any two leads of the motor.

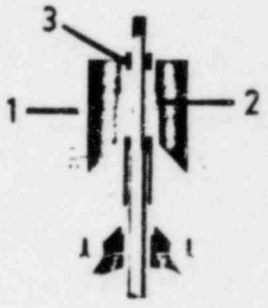
N. Check the lubricator feed and see that the oiler is flowing freely. Prior to setting proper drops per minute on the regulator, allow a generous amount of oil to flow freely down oil tube. Subsequently, the regulator can be set and, of course, this setting is dependent on the pump setting and size of shaft. The following table shows recommended regulator setting:



Stuffing Box



Enclosed Lineshaft—Water Flush



Discharge Bowl

FIGURE II
Enclosed Lineshaft

Drops per Minute	Shaft Range
8	3/4" to 1"
16	1 - 3/16" to 1 - 15/16"
20	2 - 3/16" and larger

3. Assembly Water Flush and Rifle Drilled Construction (Fig. II-A)

A. Assemble flush lines (10) to suction bowl as shown. Follow instructions in 2, A through J except F.

B. Place bushing retainer (11) into tension plate.

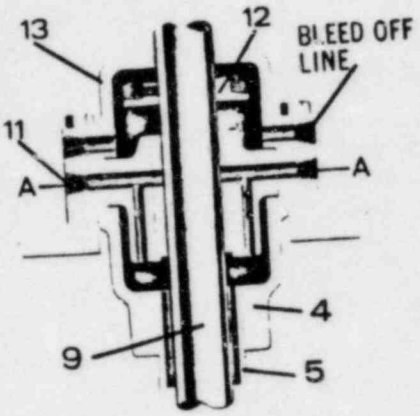
C. Secure flinger (12) onto shaft close to the top of the retainer.

D. Place bonnet (13) on top of retainer and bolt in place.

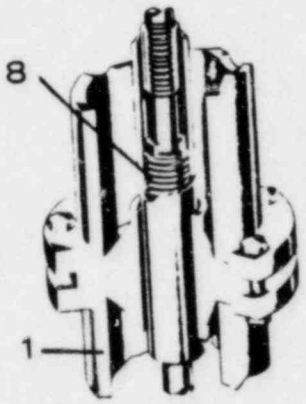
E. Refer to section II for driver mounting.

F. Connect flush lines to stuffing box at both connections at A and to the flush line to the suction bowl bearing. Connect bleedoff lines from the bonnet to the return lines in the baseplate of the discharge head.

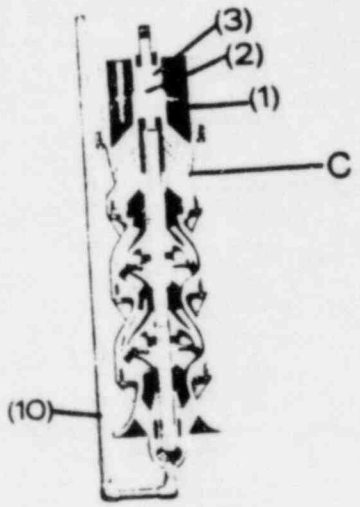
G. Turn on supply water to assure adequate flow to bearings. Flush water should be 20 psi above maximum pump discharge pressure.



Packless Stuffing Box



Enclosed Lineshaft - Water Flush



Bowl Assembly

FIGURE II-A

SECTION II DRIVER MOUNTING

II-A Vertical Hollow Shaft — Motor or Gear

A. Remove the drive coupling from the motor or gear drive and insert a cloth in the openings to prevent any foreign materials from falling into the driver.

B. Position the driver on the discharge head and bolt down, making sure the pump is vertically aligned.

C. Carefully lower the drive shaft through the hollow shaft on the driver.

D. Couple the shaft with the threaded coupling provided taking care to center the coupling between the two shafts. (See Fig. III if flanged coupling is furnished.) Drive shaft must be centered in driver bore. If shaft is not centered, check misalignment between driver and head, or check for bent head shaft. Correct misalignment.

E. For electric motor units, make electrical connections according to tagged leads or diagram attached to the motor. Check motor rotation. Be sure this is done before installing the drive coupling. CAUTION: DO NOT RUN IN REVERSE DIRECTION AS SHAFTING MAY UNTHREAD AND CAUSE SERIOUS DAMAGE TO THE DRIVE AND/OR PUMP. The motor must rotate counter-clockwise when looking down from above. See arrow on pump nameplate. If motor does not rotate counter-clockwise, change motor rotation by interchanging any two leads.

F. Slip on the drive coupling and install the gib head key. This key should be a slide fit, permitting adjustment of the pump headshaft by means of the adjusting nut. Secure the coupling, making certain coupling is properly seated.

G. Use the adjusting nut to adjust the impellers. (See instructions for impeller adjustment II-C).

H. Lock adjusting nut with capscrew provided.

VPD INSTRUCTION MANUAL ADDENDUM (Models VIT, DWT, VMP)

Modification: Type AR Rigid Flanged Coupling Assembly Procedure.

Manuals Affected:

VIT: Page 5, Paragraph II-A1, Figure III-3.
DWT: Where applicable—information not presently in Manual.
VMP: Pages 12 and 13, Paragraphs D through F, Figure 10-3.

Reason for Addendum: Redesign of Coupling.

Description: Refer also to Figure 1 below:

A) Disassemble Coupling. Be certain that all components are clean and that no foreign matter is lodged in any machined recesses or registers. Insert driver shaft key in driver shaft keyway and slide driver shaft hub onto driver shaft. Position hub such that threaded shaft end is exposed to allow mounting threaded sleeves on shaft end. If necessary for ease of assembly, temporarily secure hub in this position by means of tape, rope, or other convenient means.

B) Screw threaded sleeves onto the driver shaft until the sleeve extends beyond the shaft end between 1/16 and 3/32 inch. This insures that the driver and pump shaft ends will not contact each other when the coupling is completely assembled.

C) Insert pump shaft key in pump shaft keyway and slide pump shaft hub onto pump shaft. Position hub so threaded shaft end is exposed.

D) Screw threaded sleeve onto pump shaft until sleeve extends beyond shaft end between 1/16 and 3/32 inch.

E) Slide pump shaft hub toward threaded sleeve until threaded sleeve is fully seated in its register in the hub—hold hub in this position.

F) Insert Alignment Ring into its register in the pump shaft hub.

G) While holding pump shaft hub in position, slide the driver shaft hub towards pump shaft hub until the driver shaft threaded sleeve is fully seated in its register.

H) Insert all coupling hub capscrews and nuts and tighten *fingertight* only.

I) Measure the gap between the coupling hub faces. In a properly assembled coupling, this gap will be between 0.014 and 0.026 inch and assures proper clamping of the threaded sleeves. If the gap is not correct; disassemble the coupling and check that all parts are clean and free of foreign matter, then reassemble the coupling per steps A through I above.

J) Tighten all coupling hub capscrews.

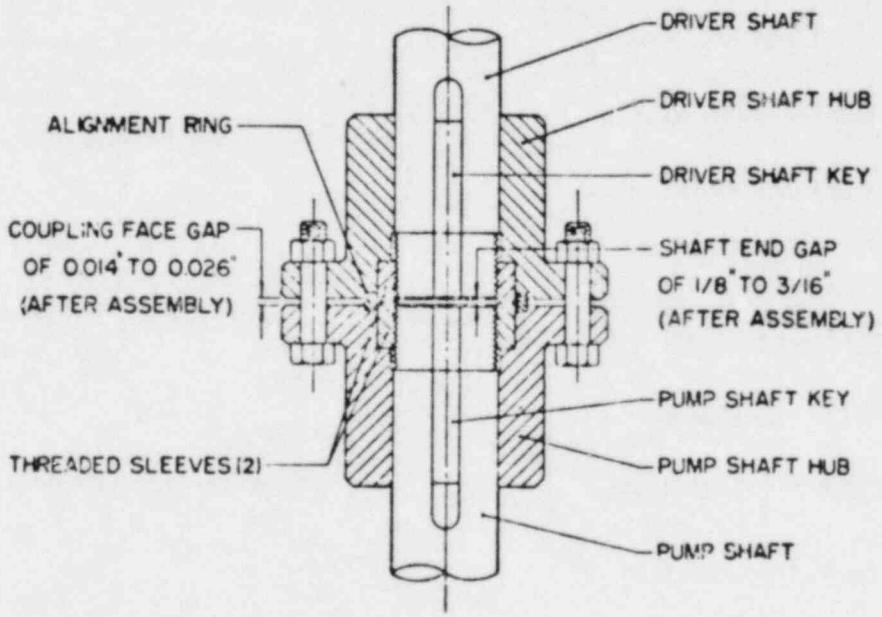


FIGURE 1

TYPE AR COUPLING ASSEMBLY

II-A1 Flanged Coupling (Fig. III-3)

A. Refer to A, B, & C above.

B. Disassemble the coupling and slide the upper half of the coupling onto the drive shaft with key in place and position split anular ring into anular groove. Slide the coupling half over the split rings in order to hold them in place.

C. Assemble lower coupling half on head shaft and raise over split rings as in B.

D. Bolt flange halves and proceed per E, F, G, H above.

II-B Gear Drive Units

A. Make cooling connections as required. Use tubing of flexible hose at the gear drive. The amount of water required may best be determined by regulating to the temperature on the discharge of the cooler.

B. Fill gear drive to proper level with oil recommended by the gear manufacturer.

C. The flexible shaft flanges should push fit on the gear drive and engine without the use of excess force. Hammering on the shafts will damage the bearings and destroy the adjustment of the gears in the gear drive. The shafts to be connected need not line up axially, but should be within two degrees parallel. Keep the lugs of the flange yokes in the same position as shipped from the factory. If slip joint is moved, be sure lugs are re-aligned. Use only a pure mineral oil of 140 S.A.E. grade when lubricating the universal joints.

D. Check the rotation of the power unit and pump in relation to that of the drive, as shown by arrows on the case. Rotate the drive by hand before applying power as a precaution against a bound or locked installation. The pump always rotates counter-clockwise as viewed from the top of the drive shaft. CAUTION: DO NOT RUN IN REVERSE DIRECTION AS SHAFTING MAY UNTHREAD AND CAUSE DAMAGE TO THE GEAR DRIVE AND/OR PUMP.

II-C Impeller Clearance for Open or Enclosed Impellers

Refer to figure IV.

II-C1 Vertical Hollowshaft Driver

Adjust impeller with the adjusting nut at top of driver —
Note: Thread is left hand.

A. With impellers touching bowl faces, turn adjusting nut C.C.W. until bottom face of nut makes contact with motor coupling.

B. Find hole "A" in adjusting nut which is closest to hole "C" in motor coupling and line them up.

C. Put capscrew in hole "B". Turn adjusting nut C.C.W. until "B" and "D" line up. This gives minimum adjustment 1/20 of one turn or .004" vertical movement.

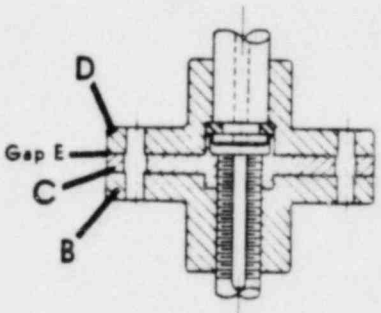


FIGURE III — 1

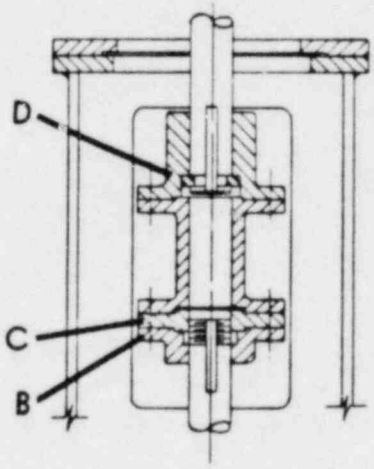


FIGURE III — 2

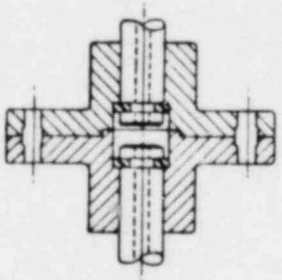


FIGURE III — 3

D. By turning adjusting nut still more and lining up holes "E" and "G" impellers are raised 2/20 turn or .008". Where holes "F" and "H" line up adjustment is 3/20 turn or .012" and so on.

E. Turn adjusting nut for impeller clearance of 0.015" for pumps with up to 10 feet of column, add 0.020" for each additional 10 feet of column. If pump performance is not satisfactory with specified clearance, lower impellers as required, but be sure not to allow impellers to drag. For enclosed impellers use 3/16" clearance.

II-C2 Vertical Solid Shaft — Motor or Gear (Fig. III-1-2)

A. Disassemble the coupling. Slide the upper half of the coupling (D) onto the driver shaft with key in place. Fit the split thrust rings into the shaft and slide the coupling down over the rings. If the coupling is the spacer type, assemble the spacer to the upper half with the studs provided.

B. Slide the bottom half coupling (B) and key onto the head shaft. Screw the adjusting nut (C) as far as possible on the head shaft.

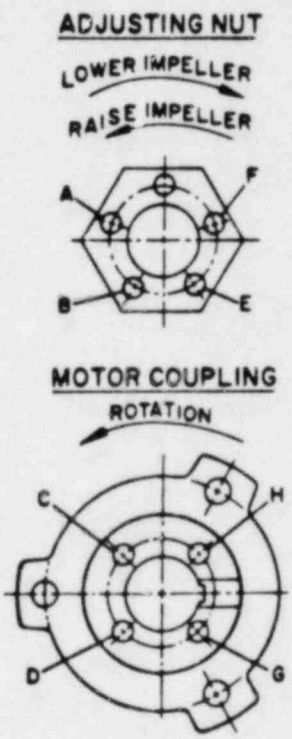


FIGURE IV
Impeller Adjustment VHS Driver

C. Hoist driver and set in place on pump head. Bolt down securely.

D. Rotate drive by hand before applying power as a precaution against a bound installation. Pump always rotates counter-clockwise as viewed from top of drive shaft.

CAUTION: DO NOT RUN IN REVERSE DIRECTION AS SHAFTING MAY UNTHREAD AND CAUSE SERIOUS DAMAGE.

E. For Electric Driver — Make electrical connections according to tagged leads or diagram attached to the motor. Do not connect drive coupling until motor rotation is checked. Motor must rotate counter-clockwise when looking down from above. See arrow on pump nameplate. If motor does not rotate counter-clockwise change motor rotation by interchanging and two leads. CAUTION: DO NOT RUN IN REVERSE DIRECTION AS SHAFTING MAY UNTHREAD AND CAUSE SERIOUS DAMAGE.

F. For gear drive units, see section II-B.

G. For steam turbine drivers — In connecting steam piping to turbine, be sure that adequate expansion joints are used, otherwise temperature changes may cause misalignment.

II-D Impeller Clearance for Open or Enclosed Impellers

II-DI Vertical Solid Shaft Driver

A. Refer to figure III-1 and 2. With pump installed and the impellers on the bottom turn the adjusting plate (C) on the thread to obtain .015" clearance between the flanges (gap-F) for pumps with up to 10' of column. Add an additional .020" for every additional 10' of column. If pump performance is not satisfactory with specified clearance, lower impellers as required, but be sure not to allow impellers to drag. For closed impellers use 3/16" gap.

B. Insert coupling bolts and pull coupling flanges together snugly. This raises the impellers the amount of the clearance between the flanges.

C. IF A MECHANICAL SEAL IS SUPPLIED, DO NOT SECURE SAME UNTIL AFTER THE IMPELLER ADJUSTMENT IS COMPLETE.

SECTION III PUMP START UP

III-A Priming

The first stage impeller must always be fully submerged.

If the pump is run dry, the rotating parts within the pump may gall and seize to the stationary parts as they depend on the liquid being pumped for lubrication.

III-B Check for Free Turning

Before the pump is started, turn pump over by hand to be sure it is free, and does not rub or bind.

SECTION IV OPERATION

IV-A Prior to Starting

1. Before the pump is started initially, make the following inspection:

A. Check alignment between pump and motor.

B. Assure that bearings are properly lubricated.

C. Check all connections to motor and starting device with wiring diagram.

Check voltage, phase, and frequency on motor nameplate with line circuit.

D. Check rotation — be sure that the pump operates in the direction indicated by the arrow on the pump head, as serious damage can result if the pump is operated with incorrect rotation.

E. Check impeller adjustment.

F. Turn rotating element by hand to assure that it rotates freely.

G. Check discharge piping and pressure gauges for proper operation.

H. If pump bearings are lubricated by water flush, allow water to lubricate bearings for two or three minutes before starting pump.

IV-B Starting

1. Follow the steps below in the order indicated to start pump:

A. Close valve in discharge line.

B. Turn on power to pump driver.

C. When pump is operating at full speed, open discharge valve slowly.

IV-C Stopping Pump

When stopping the pump, close the discharge valve first. The pump, however, should never run for any length of time with discharge valve closed due to danger of increased temperatures.

SECTION V
DISASSEMBLY & ASSEMBLY

V-A1 Product Lube

A. To disassemble the pump, remove canopy on motor to allow access to the drive coupling.

B. Remove the lockscrew from adjusting nut to allow removal of adjusting nut.

C. Remove adjusting nut.

D. The gib head key should then be removed and the upper headshaft can be uncoupled from the coupling located in discharge head, and removed by pulling up through driver.

E. Remove the driver and set aside for later inspection.

For solid shaft drivers remove coupling bolts and remove driver.

F. To remove the packing box, slide the packing gland (1) off the shaft and remove the packing (2) and lantern ring (5). Disconnect any bleed lines and remove the capscrews holding the assembly in the discharge head. Remove the stuffing box (3), taking caution not to damage the flexitallic gasket (6). Removal of the stuffing box bushing (7) can now be accomplished, and inspection can be performed.

G. Raise discharge head to allow access to the flange and disassemble the flange bolts. Secure column so it won't drop. Remove discharge head and bearing retainer. Care should be taken not to damage the shaft during this procedure.

H. The shaft coupling should now be exposed and strap wrenches can be used to disassemble the head shaft (NOTE: THREADS ARE LEFT HAND).

I. Continue the above procedure, one column section at a time, until removal of the entire bowl assembly can be accomplished.

V-A2 Oil Lube

A. Follow A, B, C, D and E above then disconnect oil line from tube tension nut (7) (Fig. V(b)).

B. Remove tube tension nut in order to accomplish removal of the packing.

C. Remove bolts holding tube tension plate (4) and unscrew tube tension plate from tube tension nipple (5).

D. Remove head mounting bolts and raise head in order to disconnect flange bolts, taking caution to adequately brace the pump.

E. Remove tube tension nipple (5) and lower headshaft.

F. Continue to remove enclosing tube column and lineshaft in sequence, until removal of the entire bowl assembly can be accomplished.

V-A3 Water Flush Arrangement (Figure V(c)).

A. Follow V-A1, A through E.

B. Disconnect flush lines and bleed off lines from bonnet.

C. Remove Bonnet (13)

D. Remove flinger (12)

E. Remove bushing retainer (11)

F. Remove tension plate (4) by unthreading from tube tension nipple (5). Follow V-A2, Items D, E and F.

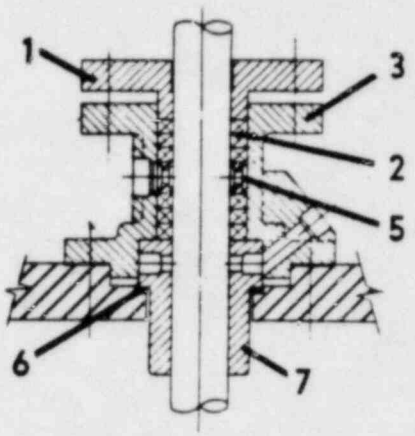


FIGURE V(a)
Product Lubricated Stuffing Box.

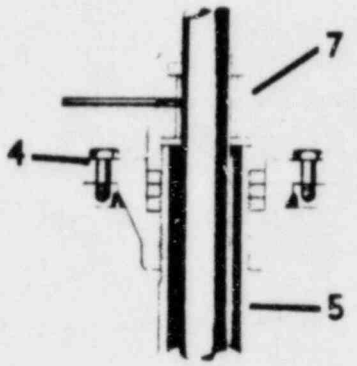


FIGURE V(b)
Oil Lubricated Stuffing Box

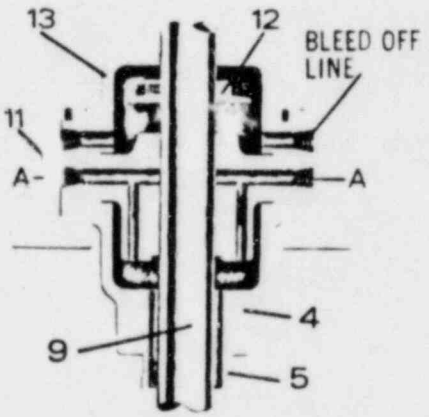


FIGURE V(c)
Water Flush Arrangement

V-B Disassembly Pump Bowls

V-B1 Product Lubrication (Figures VI(a) and (c))

A. Unscrew pump shaft coupling (3) and remove capscrews from top bowl.

B. Slide the discharge bowl (1) off the pump shaft (2) so impeller (4) is exposed. NOTE: To insure proper reassembly, flanges should be marked in sequence of disassembly.

C. Pull shaft out as far as possible, then strike the impeller hub using a collect hammer sliding on the shaft. This action drives the hub off the taper lock (5). Usually several blows are needed to free it.

D. When the impeller has been freed, insert a screwdriver into the slot in the taper lock to spread it. This allows removal off the shaft. The impeller can now be removed. Proceed in this manner until entire bowl unit is completely dismantled.

E. Remove pump shaft from suction bowl (9). Bronze sand collar must not be removed unless pump shaft is being replaced.

F. See section V-D and Figure IX for keyed impellers.

V-B2 Oil Lubrication Figures VI(b) and (c)

A. Unscrew pump shaft coupling (3) and remove.

B. Remove screw bearing (6) from discharge bowl (1).

C. Remove cap screws from top bowl (1) and remove top and discharge bowls from shaft (2).

D. Proceed per C, D and E above.

V-C Assembly — Figures VI, VII & VIII

A. Slide the pump shaft into bearing in suction bowl until the sand collar (8) rests on the hub of the bowl (9). (If new shaft is used contact nearest sales office for positioning sand collar.)

B. Holding the shaft in place with a washer and capscrew placed in suction bearing housing, slide the first impeller (4) over shaft until it seats on the bowl.

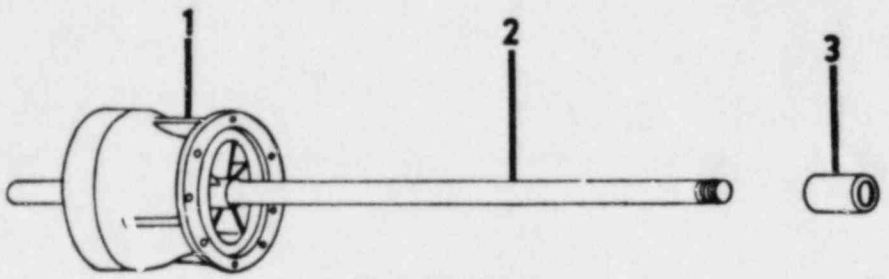


FIGURE VI(a)
Product Lubrication Bowl Assembly

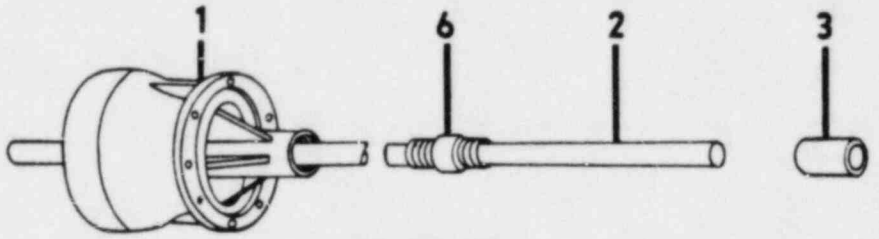


FIGURE VI(b)
Oil Lubrication Bowl Assembly

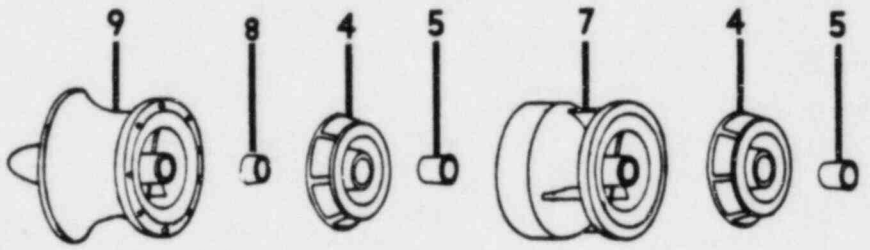


FIGURE VI(c)
Bowl Assembly

C. Drive a small wedge into slot of taper lock (5) spreading it to allow placement over the shaft. Holding the impeller against the bowl, slide taper lock into hub, removing the wedge after insertion.

D. Drive the lock in place with a collet hammer.

E. Slide first intermediate bowl (7) over impellers and bolt bowls together with capscrews.

F. Repeat the above procedure until all stages are assembled.

V-D Keyed Impellers

When furnished, the split ring collar may be of either the bolted or screwed type. (Figure IX)

Insert the lateral key into keyway on pumpshaft and slide impeller down over the key, making sure the anular groove for the split radial key is exposed above the impeller hub. Insert the split anular key and position the split ring collar either with capscrews or threads, tightening same until no lateral movement of the impeller is experienced.

V-E Bowl Wear Rings

V-E1 Removal

Using a diamond point chisel, cut two "V" shaped grooves approximately 180° apart. Extreme care should be taken so as not to damage the wear ring seat. Using the chisel, knock the ends of one half the ring in and pry ring out.

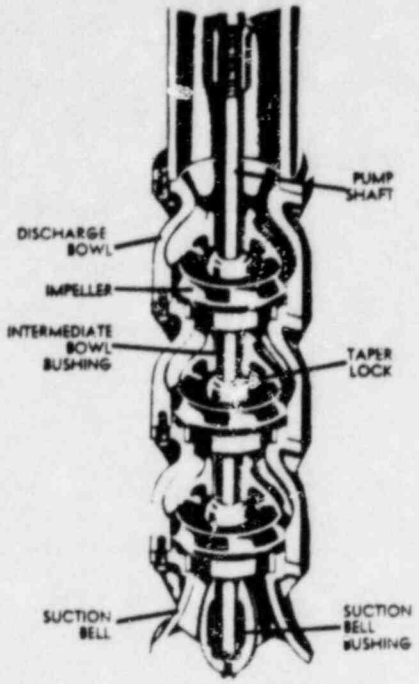


FIGURE VII
Product Lubrication

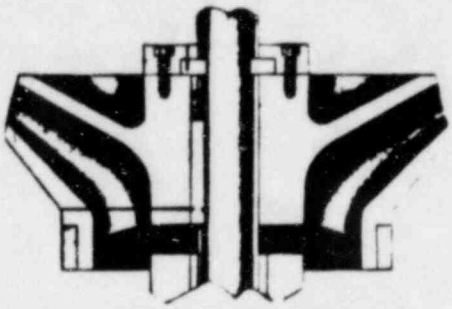


FIGURE IX(a)
Keyed Impellers
Bolted Type

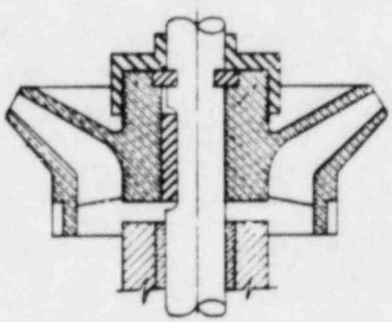


FIGURE IX(b)
Keyed Impellers
Screwed Type

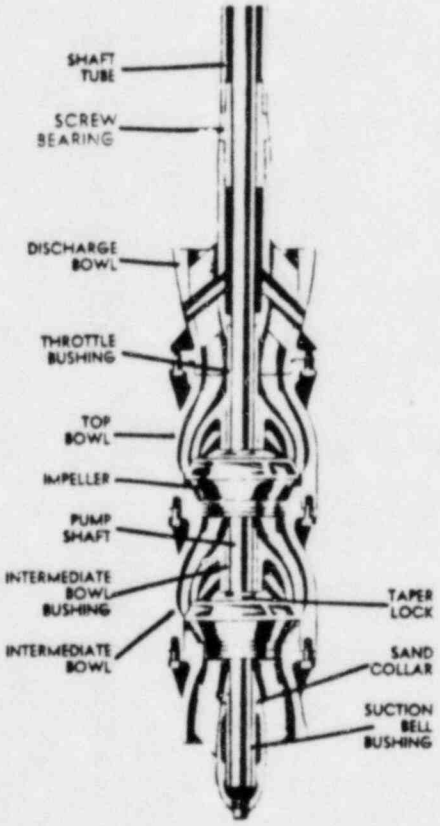


FIGURE VIII
Oil Lubrication

V-E2 Installation

Place the chamfered face of the bowl ring towards the ring seat and press into seat making sure it is flush with edge of wear ring seat.

Recommended clearance are as follows:

Model	Clearance
3 x 4 LC — 6 x 5 HC	.015
6 x 7 LC — 12 x 13 MC	.016 — .018
12 x 14 LC — 20 x 20 HC	.020 — .025

V-F Impeller Wear Rings

V-F1 Removal

The recommended method for removal of impeller rings is to set up the impeller in a lathe and machine the ring off, taking care not to machine or damage the ring seat or impeller hub.

V-F2 Installation

Follow procedure noted under bowl ring installation.

REPAIR PARTS ORDERING INFORMATION

Always give serial number of the pump as stamped on the nameplate. This is essential as similar pumps often differ according to conditions of service. Also, when ordering give the name and number of the parts as marked on the Sectional Drawing.

It is recommended that the spare parts be purchased in order to insure against costly delays. The service in which the particular pump is used will determine the number of parts which may be required. Any further information is available upon request from your area representative or the Sales Department, Goulds Pumps, Vertical Pump Division, Inc., City of Industry, California.

Returning Parts

All materials returned to factory must have a Return Material Order (R.M.O.) tag attached.

Consult the nearest factory representative or Sales Office for shipping instructions and an R.M.O. tag.

Articles being returned should be adequately packed to prevent damage in handling.

SECTION VI TROUBLE CHECK LIST

VI-A No Liquid Delivered

1. Lack of prime or break suction.
   Fill pump to a point above first stage impeller.
   Check for vapor bind.
   Plugged suction.

2. Speed too low.
   Check whether motor is directly across-the-line and receiving full voltage.

3. Discharge head too high.
   Check pipe friction losses. Larger piping may correct condition. Are valves wide open?

4. Suction lift too high.
   If no obstruction at inlet, check for pipe friction losses. However, static lift may be too great. Measure with mercury column or vacuum gauge while pump operates. If static lift is too high, liquid to be pumped must be raised or pump lowered.

5. Impeller completely plugged.
   Dismantle pump and clean impeller.

VI-B Not Enough Liquid Delivered

1. Speed too low.
   See item 2 above.

2. Discharge head too high.
   See item 3.

3. Suction lift too high.
   See item 4.

4. Impeller partially plugged.
   See item 5.

5. Incorrect rotation.

6. Cavitation.
   Insufficient NPSH available. Depending on installation, increase the positive suction head on the pump by lowering the pump, raising liquid level, increasing pressure on suction side or by lowering temperature of the liquid.

   Entrained air.

   Vortexing.

VI-C Not Enough Pressure

1. Speed too low.
   See item 2.

2. Air or gases in liquid (test in laboratory, reducing pressure on liquid to pressure in suction line. Watch for bubble formation.)
   May be possible to over rate pump to point where it will provide adequate pressure despite condition. Better to provide gas separation chamber on suction line near pump, and periodically exhaust accumulated gas.

3. Obstruction in liquid passages.
   Dismantle pump and inspect passages of impeller and bowl. Remove obstruction.

4. Too small impeller diameter.
   Check with nearest sales office to see if a larger impeller can be used. Otherwise, cut pipe losses, or increase speed, or both as needed. Be careful that driver is not overloaded.

5. Entrained air.
   NPSH. See VI-B6.

VI-D Pump Works for a While and Quits

1. Head lower than rating, pumping too much liquid.
   Turn down impeller outside diameter to size advised by nearest sales office.

2. Excessive required horsepower.
   Pump being used with a higher viscosity or specific gravity liquid then designed for.
   Use larger driver. Consult sales office for recommended size. Test liquid for viscosity and specific gravity.

3. Wrong direction of rotation.

4. Casing distorted by excessive strains from suction or discharge piping.
   Examine pump for friction between impellers and bowls; replace damaged parts.

5. Shaft bent due to thermal distortion, damage while overhaul, or improper assembly of rotating element.
   Check deflection by turning between lathe centers. Average total runout, should not exceed .002" on all pumps.

6. Mechanical failure of critical pump parts.
   Check bearings and impellers for damage. Any irregularity in these parts will cause a drag on the shaft.

7. Speed may be too high. (Brake horsepower of pump varies as the cube of the speed; therefore, any increase in speed means considerable increase in power demand).
   Check voltage on motor.

8. Misalignment.
   Realign pump and driver.

9. Electrical defects.
   The voltage and frequency of the electric current may be lower than that for which the motor was designed, or there may be defects in the motor. The motor may not be ventilated properly due to a poor location.

10. Mechanical defects in turbine, engine, or other type. If trouble cannot be located, call in factory service engineer.

VI-E Pump Takes Too Much Power

1. Defective impeller.
   Inspect, replace if damaged or vane sections badly eroded.

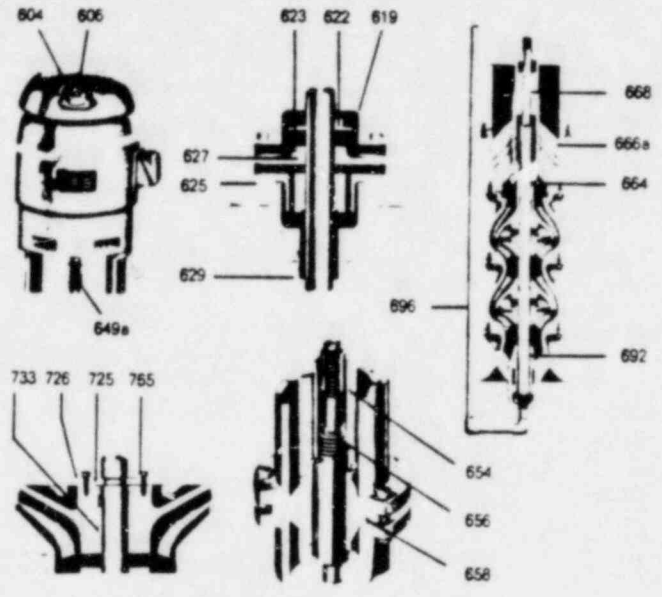
2. High specific gravity.

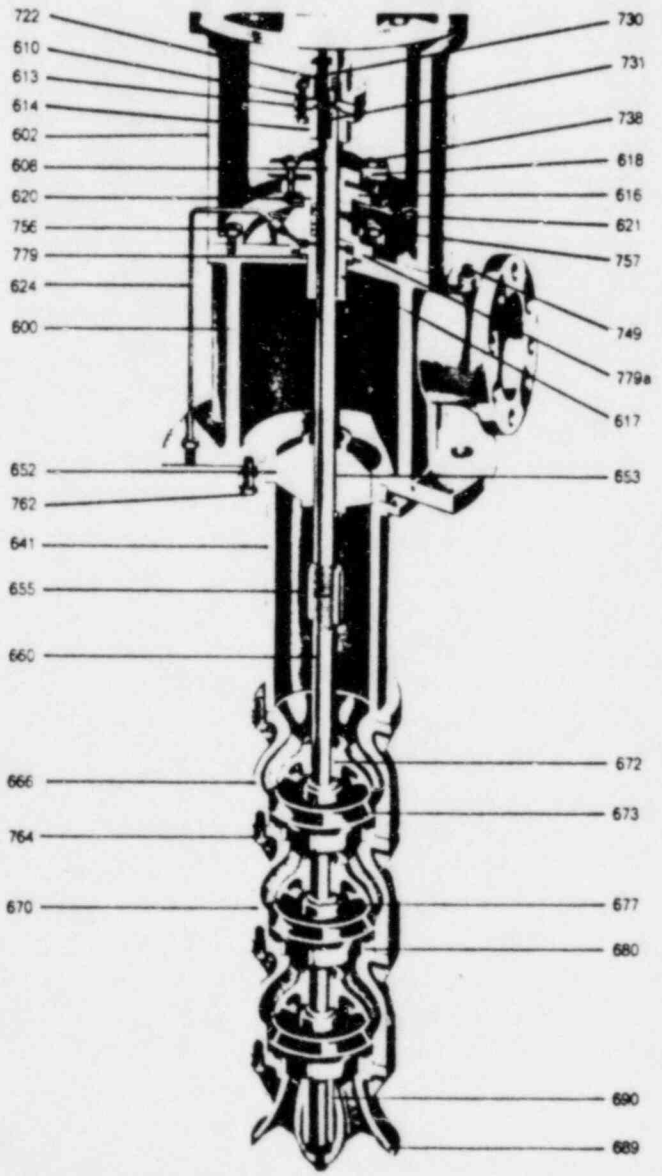
3. Head lower than rating — pumps too much liquid.
   See item 1, section VI-D.

4. High viscosity, partial freezing of pumped liquid.
   Check. Both can cause high drag on the impeller.

5. Defective bearing.
   Replace bearing. Check shaft or shaft sleeve for scoring.

SECTION VII PARTS LIST





Materials of Construction and Parts List

ITEM NO.	NO. REQ'D. PER PUMP	PART NAME	MATERIAL CONSTRUCTION	
			BRONZE FITTED	ALL IRON
600	1	Discharge head	FAB. STL	
602	1	Motor stand	FAB. STL	
604	1 (n)	Adjusting nut	SAE-1018	
606	1 (n)	Drive shaft	SAE-1045	
608	1	Headshaft	416 SS	
610	1 (k)	Upper half coupling	SAE-1018	
613	1 (k)	Adjusting plate	SAE-1018	
614	1 (k)	Lower half coupling	SAE-1018	
616	1	Stuffing box	CI	
617	1	Throttle bushing	Brz. #15	CI
618	2	Split stuffing box gland	Brz. #15	CI
619	1 (m)	Bonnet	CI	
620	1 set	Packing	Graphitized asbestos	
621	1	Lantern ring	Brz. #15	CI
622	1 (m)	Slinger	Brz. #15	
623	1 (m)	Bushing retainer	CI	
624	1	Bypass pipe	Copper Tub.	Steel Tub
625	1 (m)	Tube tension plate	CI	
627	1 (m)	Bushing	Brz. #15	
629	1 (m)	Tube tension nipple	STL. #37	
641	(g)	Column pipe	STL. #37	
649a	1 (n)	Headshaft coupling	416 SS	
652	(g)	Bearing retainer	Cast Steel	
653	(g)	Lineshaft bearing	Brz. #15	CI
654	(g) (m)	Shaft enclosing tube	STL. #37	
655	1	Pump shaft coupling	416 SS	
656	(g) (m)	Tube shaft bearing	Brz. #15	Brz. #15
658	(g) (m)	Tube stabilizer	Cast Steel	
660	1	Pump shaft	416 SS	
664	1 (m)	Dischg bowl throttle bushing	Brz. #15	CI
666	1 (p)	Discharge bowl	CI	
666a	1 (m)	Discharge bowl w/ports	CI	
668	1 (m)	Tube adapter bushing	Brz. #15	Brz. #15
670	1 (a) (p)	Intermediate bowl	CI	
672	1 (b)	Bowl bearing	Brz. #15	CI
673	1 (b) (p)	Impeller	Brz. #11	CI
677	1 (b) (e)	Taper lock	SAE-1018	
680	1 (b) (c)	Bowl wear ring	Al. Brz.	CI
689	1	Suction bell	CI	
690	1	Suction bell bearing	Brz. #15	CI
692	1	Sand collar	Brz.	
696	1 (m)	Flush line	Galv. Steel Pipe	
722	2 (k)	Split ring—upper half cplg	SAE-1018	
725	2 (b) (f)	Split ring—impeller	416 SS	
726	2 (b) (f)	Split ring collar	416 SS	
730	1 (k)	Key motor shaft	SAE-1018	
731	1 (k)	Key headshaft	SAE-1018	
733	1 (b) (f)	Impeller key	416 SS	
738	2	Gland stud	SAE-1018	
749	1	Pipe plug	Galv. Steel	
756	(q)	Capscrew—motor stand	SAE-1018	
757	(q)	Capscrew—stuffing box	SAE-1018	
762	(g)	Column flange bolt	SAE-1018	
764	(q)	Bowl stud	SAE-1018	
765	4 (b) (f)	Cap screw, split ring collar	416 SS	
779	1	Gasket, stuffing box	Flexitallic 316 SS	
779a	1	Stuffing box gasket	Vellumoid	

Material Specification

Code	Specification
CI	ASTM A278-64 CL30
BRZ #11	ASTM B145-52-4A (SAE40)
BRZ #15	ASTM B144-52-3B (SAE660)
AL. BRZ	ASTM B148-52-9A (SAE68E)
CAST STEEL	ASTM A216 Gr. WCB
STL. #37	ASTM 120 Gr. B

(a) 1 each additional stage
(b) per stage
(c) optional
(e) standard 3x3 through 12x11 sizes
(f) standard on 12x13 size and above
(g) dependent upon pump length
(k) standard on VSS drive only
(m) enclosed lineshaft only
(n) standard on VHS drive only
(p) C.I. Bowls and C.I. enclosed impellers through 12x13 are glass lined
(q) dependent upon pump size

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ALLIS-CHALMERS

INSTRUCTIONS

VERTICAL "P" FLANGED

(NORMAL & MEDIUM THRUST)

INDUCTION MOTORS

51 X 4159-03

TABLE OF CONTENTS

NOTE: The illustrations, descriptions and instructions in this book include the standard design of the equipment and any common deviations when possible. This book *does not cover all design details* and variations nor does it provide for possible contingency which may be encountered. When information cannot be found in this book, contact the nearest Allis-Chalmers office. See Directory 25X8109.

INTRODUCTION

This manual is furnished to advise you of some of the practical ways to install, operate, and maintain your equipment. Keep it handy for future reference. Additional information may be obtained from the nearest Allis-Chalmers representative. The standards of the National Electrical Manufacturers Association (NEMA) are an excellent source for more detailed advice.

WARRANTY

See your sales contract for coverages.

RECEIVING

Common dangers during unpacking are mechanical damage and moisture condensation.

The unit should be unpacked with these checks in mind:

(1) Unload and handle the unit carefully.

(2) Check for shortage and damage immediately. (A prompt report, with *notations on the freight bill*, should expedite adjustments by the carrier.)

CAUTION

Remove only the shipping invoice. Do not remove tags pertaining to lubrication, operation and storage instruction. They should be left on motor. Read all tags and instruction to insure no damage to motor bearings (due to condensation) and windings during storage.

CAUTION

Use lifting lugs, NOT attachments. Do not lift by flanges. Check drawings for construction.

TEMPORARY STORAGE

If the equipment is not to be installed and operated soon after arrival, store it in a clean, dry, well-ventilated place free from vibrations and rapid or wide variations in temperature. Rotate the shaft a minimum of 10 complete revolutions monthly to coat the bearings with lubricant, and prevent possible false brinelling, retard oxidation, or corrosion.

(1) It has been delivered to the job site and is awaiting installation.

(2) It has been installed; but operation is delayed pending completion of plant construction.

(3) There are long, (30 days) periods, between operating cycles.

(4) The plant (or department) is shut down.

Storage requirements vary depending on the length of storage and the climatic environment. For storage periods longer than 3 months or special conditions consult factory instructions 51X3963.

DESCRIPTION

"P" flanged, vertical type motors within NEMA frames 140TP thru 445TP are the subjects of this manual. The instructions include normal thrust motors with grease lubricated, deep-groove ball bearings capable of accepting small values of up and down thrust. Also included are medium thrust type motors in which angular contact thrust bearings are substituted for the deep-grooved bearings. Angular contact bearings are capable of taking higher down-thrust, *but* only momentary up-thrust. Values of thrust, "NORMAL" and "HIGH", are published in the Allis-Chalmers price book. "MEDIUM" thrust values are usually one-half of the "HIGH" thrust values.

There are many variations just within these three classifications. Check the name plate for your particular type of construction.

NOTE: High thrust oil lubricated bearings, or hollow shaft motors *are not* included in these instructions. (See special insert.)

MOTOR TYPE DESIGNATIONS

Type designations are formed by combining letters in this order: basic, mechanical, and electrical (see following table).

Example Motor Designation:
RGZV RG — Basic Type Z — TEFC V — Vertical Design

Some of the mechanical and electrical modifications we may encounter are listed below.

Z — Totally-enclosed, fan-cooled, standard, (TEFC)

ZZ — Totally-enclosed, fan-cooled, explosion-proof.

V — Vertical motors of normal, medium and high-thrust type with drip covers. This applies to solid shaft type with; C, D, or P flange.

T — High locked-rotor torque and normal slip squirrel-cage motors. In general purpose ratings this indicates a NEMA design C motor.

H — High locked-rotor and break down torque, high slip, squirrel-cage motor. This letter denotes a NEMA design "D" motor, often used for elevator and punch-press service.

INSTALLATION

CAUTION

The information contained in this book is intended to assist operating personnel by providing information on the general characteristics of the purchased equipment. *It does not* relieve the user of the responsibility of using accepted engineering practices in the installation, operation and maintenance of this equipment.

LOCATION

Select a location for the unit that will:

(1) Be clean, dry, well ventilated, properly drained, and provide accessibility for inspection, lubrication, and maintenance (see dimensions). Out-door installations may require protection from the elements.

(2) Provide adequate space for motor removal without shifting the driven unit.

(3) Permit the motor to safely deliver adequate power. Temperature rise of a standard motor is based on operation at an altitude not higher than 3,300 feet above sea level.

CAUTION

Motors should be located in an area that is not subject to rapid temperature change when unit is not in operation.

FOUNDATION

A foundation is required to support the unit to which the flanged motor attaches. Concrete (reinforced as necessary or required) makes the best foundation, particularly for large units. In sufficient mass, concrete provides rigid support that minimizes deflection and vibration. It may be located on; soil, structural steel, or building floors, provided the total weight — (motor, driven unit, and foundation) — does not exceed the allowable bearing load of the support. Allowable bearing loads of structural steel and floors can be obtained from Engineering Handbooks; Building codes of local communities give the recommended allowable bearing loads for different types of soil. For rough calculations the sub foundation should be approximately 2.5 times the total unit weight.

NOTE: If vibration or noise will be objectionable (as in office buildings), it may be advisable to use vibration dampeners between the motor or driven unit, and the foundation.

MOTOR MOUNTING

Mount the machine securely and align accurately with the driven equipment.

(1) Direct mounted to driven equipment; the two units must be firmly secured and the driven equipment placed on an adequate foundation.

(2) Floor plate mounted; equipment must be very rigid and free from vibration.

Any excessive vibration of either method will cause loss of alignment, premature bearing wear and eventual break down.

NOTE: If motor is driving a pump and the back pressure is maintained after shut-down, protect the motor with quick-acting check valves.

FLANGE MOUNTING

To mount round frame motor to driven unit, proceed as follows:

NOTE: Round frame motors can be rotated within flange mounting bolt spacing to gain a satisfactory position for grease fittings, conduit attachments, and mate run-out differences to avoid shimming flange fits. Conduit box can be turned to four equally spaced positions for access to conduit system; arrange the system so that water will not accumulate and drain into motor connection box.

(1) Use a hoist; rig a sling around the stator yoke assembly or lifting lugs if provided. Use a spreader bar to prevent damage to fabricated motor parts.

(2) Position motor (per note above) and move toward driven unit — engaging flange surfaces.

(3) Insert flange mounting bolts and snug.

(4) Secure attachments between motor shaft and load. (*i.e.* set screws tightened against shaft key).

(5) Turn shaft by hand; check for free rotation; binding; scraping; sticking.

(6) Tighten all flange bolts. (Tighten bolts in pairs; 180° from each other to avoid warping or springing the flange).

(7) Turn shaft again to check for free rotation.

CAUTION

External connections, i.e. suction or discharge piping for a pump, or shafting to a gear box, are not to impart a strain on the drive unit. Such strains can cause shaft misalignment or preload bearing, which shows up as noisy operation, excessive vibration, or premature bearing failure.

External Wiring. Starting and over-load control devices must be matched to motor rating. For safety or convenience they may need to be installed some distance from the motor. Follow the control manufacturer's instructions to make proper installation and connections. Observe the following:

(1) Connect electrical power supply to conform with National Electrical Code and any local regulations. Line voltage and wire capacity must match motor rating stamped on the nameplate.

(2) Momentarily energize the motor to check that rotation is in the proper direction.

(3) If motor is three-phase type, reverse rotation (if required) by inter-changing any two of the three power leads. If two-phase, inter-change stator leads of either phase, being careful not to change leads from one phase to the other.

VIBRATION

After flange mounting bolts have been tightened, run the motor at no load (or minimum possible). Check for vibration.

The standard vibration limits (NEMA-MGI-12.05) are:

SPEED (RPM)	MAXIMUM APPLITUDE
3500 and above	.001 inches
1700 — 3499 incl.	.0015 inches
Less than 1700	.002 inches

If vibration is excessive, loosen flange mounting bolts and shift within mounting flange clearance. If this shifting does not reduce vibration to acceptable limit, and motor is coupled to load, check shaft alignment.

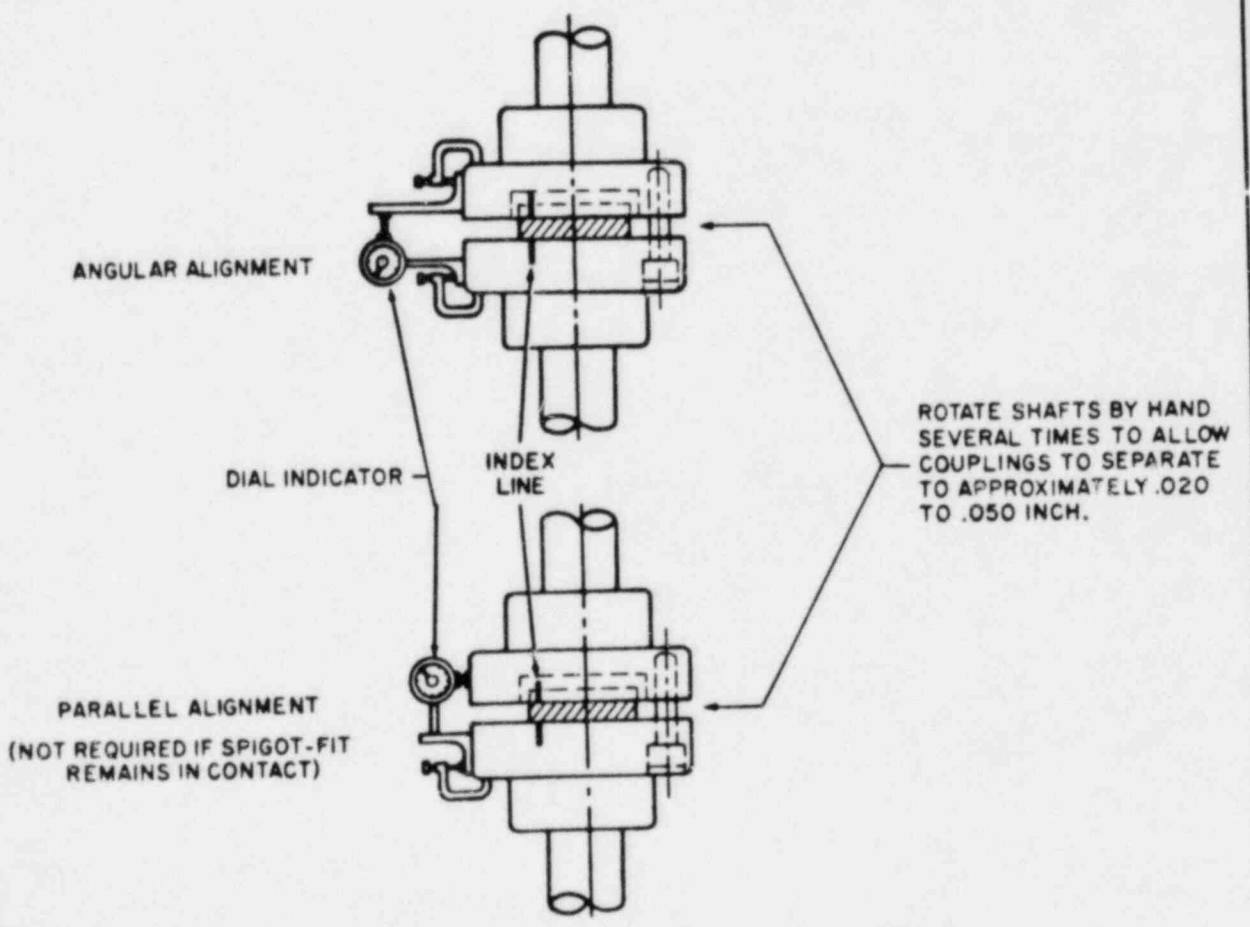


FIG. 2-1 TEST ALIGNMENT WITH DIAL INDICATOR (SOLID COUPLING)

2698

ALIGNMENT PROCEDURE

The following checking procedure applies to a unit consisting of motor, flexible coupling, and a driven component. Although applicable to all types of flexible couplings, it is primarily intended for the pin and rubber bushing type. For other types, where the procedures differ, refer to the coupling manufacturer's Installation and Maintenance Instructions. Check alignment as follows:

Disconnect the coupling halves.

Test for parallel and angular alignment with a dial indicator mounted as shown in Figure 2-1. Proceed as follows:

(1) Scribe index lines on the coupling halves (as shown) or mark where the indicator point rests.

(2) Set indicator dial to zero.

(3) Slowly turn BOTH coupling halves so that index lines remain matched, or indicator point is always on the mark.

(4) Observe dial reading to determine whether motor or driven unit needs adjustment.

(5) Acceptable parallel alignment occurs when the total indicator reading (complete turn) does not exceed 0.002 in.; acceptable angular alignment occurs when one-half of the total indicator reading does not exceed 0.001 in./ft. (Radius to dial indicator = one foot.)

Small, excess misalignment may be corrected by inserting shims between flanged faces. Such shims may also compensate for flanges being out of plane. (Fig. 2-2)

CAUTION

Shims must be notched to span the bolts only.

A GOOD SHIMMING TECHNIQUE

To avoid the possibility of twisting the flange when shimming between the flanges, minor shims should be one-half the thickness of the major shim. Shims should not penetrate deeper than the bolt hole circle and not be wider than twice the penetration distance. (Fig. 2-2)

When alignment and vibration of motor are within limits, engage drive. Run unit at minimum load possible — check for vibration — continue to increase load and check for vibration until full load is obtained.

CAUTION

Do not operate unit with excessive vibration. If shaft alignment is acceptable, and vibration exceeds the limit, investigate for other causes. See "TROUBLE". (See pg. 10)

GROUTING

Grout compensates for unevenness in the foundation and base. It distributes the weight of the unit uniformly over the foundation, and prevents the unit from shifting after mounting and alignment. It is essential that the unit be expertly grouted by use of non-shrinking grout. The mix required varies with the type of unit to be grouted, location and amount of grout. The instructions included with the non-shrinking grout package will provide the required information for the proper mix for individual applications.

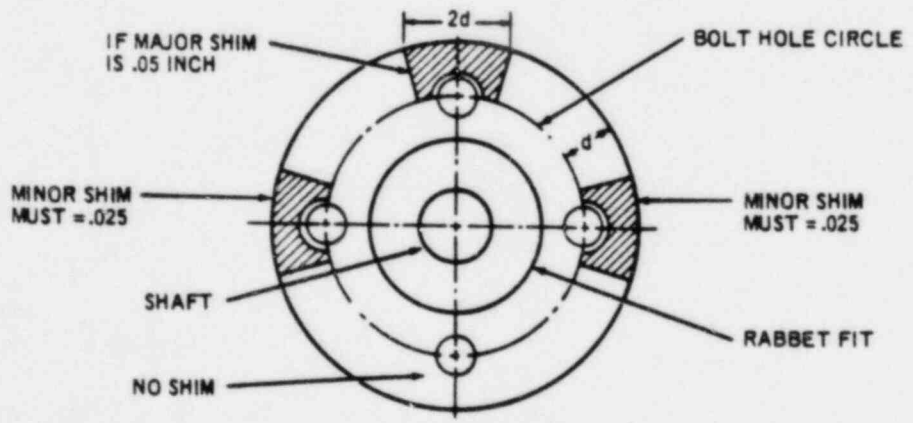


FIG. 2-2 SHIMMING

26925

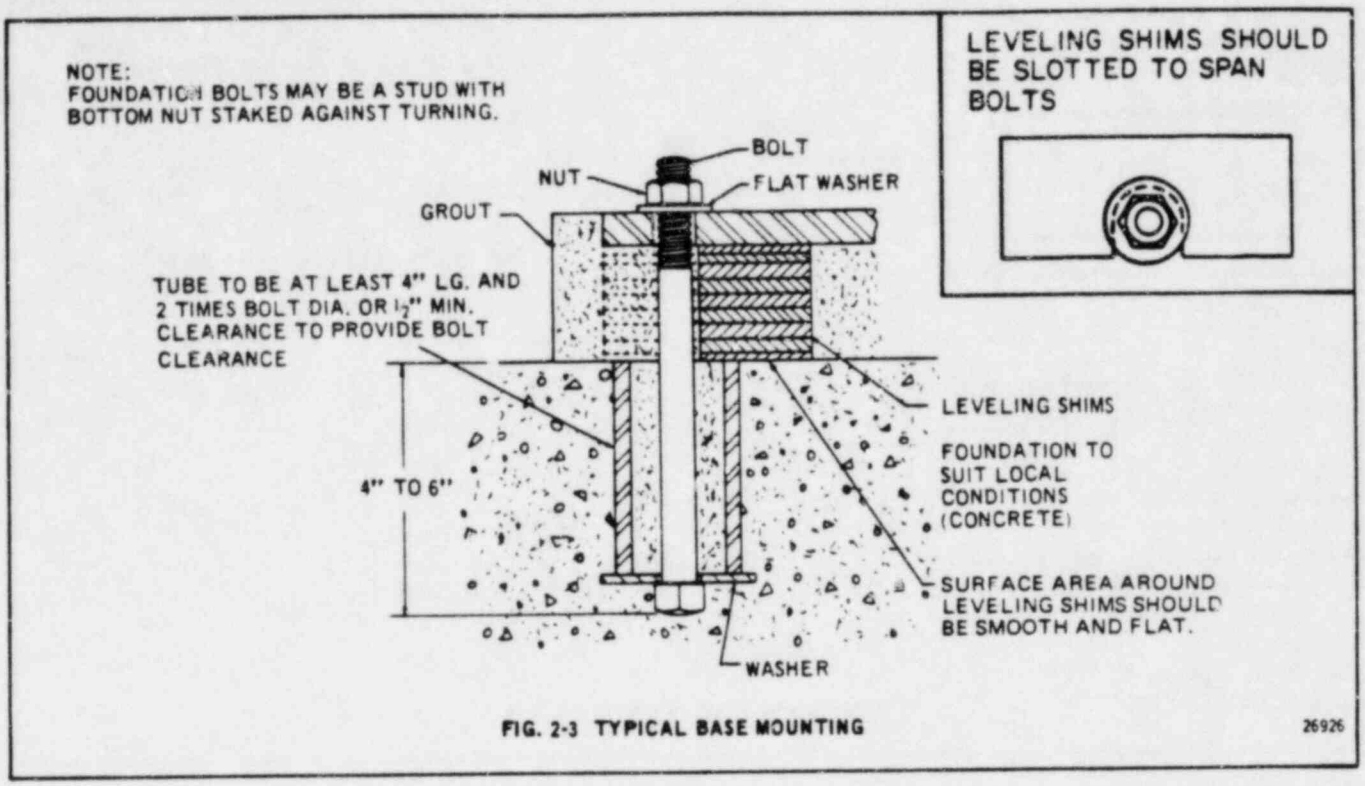


FIG. 2-3 TYPICAL BASE MOUNTING 26926

Grout the unit as follows:

(1) Build a form of plywood or thin planking around the foundation to contain the grout. Support the planking to prevent deformation.

(2) Soak the top of the concrete pad thoroughly with water before grouting. Remove all surface water before pouring.

A recommended mix of grout that is satisfactory for most applications is as follows:

Dry Mix. One sack Portland Cement. Two parts well graded, clean, dry sand. One-pound bag grout additive.

This additive is one way to counteract the plastic shrinkage and settlement of a cement-sand mix.

To make grout additive, add 2 grams of unpolished aluminum powder (Merck Co. #0770, or equivalent, available at local pharmacists) to 1 lb. of clean dry flint sand (50 mesh screen passing 25% preferred). Mix thoroughly and seal in a plastic bag. Keep additive dry until ready for use.

NOTE: The effect of the aluminum powder is lost if the mix is allowed to stand, uncast, for 45 minutes after adding water to the dry mix.

(3) Pour the grout through the openings in the base. While pouring, tamp liberally in order to fill all cavities and prevent air pockets. The grout thickness under the base must be a minimum of 1 inch. In order to prevent the base from shifting, fill under the base-plate at least 4 inches in from all four edges. Take care that grout will not interfere with motor or driven unit mounting bolts, to allow shifting as necessary.

NOTE: If pouring and tamping the grout will trap air in some places, temporarily place small diameter tubes (thick-walled rubber hose) to provide venting. Remove the tubes after grout has filled the cavity, before pouring the remainder.

(4) After the grout has thoroughly hardened retighten the foundation bolts.

(5) Check the alignment after the foundation bolts are tightened.

Approximately fourteen days after the grout has been poured or when the grout has thoroughly dried, apply an oil base paint to the exposed edges of the grout to prevent air and moisture from coming in contact with the grout.

(6) After grout has thoroughly cured, tap on top of base to be sure grout has adhered. If vibration occurs, check base with vibration analyzer. If indication warrants, pumping epoxy grout through the base plate will eliminate voids and adhere base to original grout.

EXTREME SERVICE

If motor application is abnormal (high temperature, extreme vibration, etc.), consult Norwood Plant for special instructions for installation.

OPERATION

WARNING

Do not operate this equipment in excess of the values given on nameplate or contrary to the instructions contained in this manual.

The equipment (or a prototype) has been shop tested and found satisfactory for the conditions for which it was sold; but operating in excess of these conditions can cause stresses and strains beyond design limitations.

Failure to heed this warning may result in equipment damage and possible personal injury.

INITIAL START

After installation is completed, but before motor is put in regular service, make an initial start as follows:

Check that motor, starting, and control device connections agree with wiring diagrams.

Check that voltage, phase, and frequency of line circuit (power supply) agree with motor nameplate.

If motor has been in storage, either before or after installation, refer to storage instructions to prepare for service.

Check motor service record and tags accompanying motor to be certain bearings have been properly lubricated. (When shipped from the factory, ball bearings have been lubricated to give 6 months satisfactory service.)

If possible, remove external load (disconnect drive) and turn shaft by hand to insure free rotation. This may have been done during installation procedure; if so, and conditions have not changed since, this check may not be necessary.

Start motor at no load long enough to check rotation and to be certain that no unusual condition exists. Listen and feel for excessive noise, vibration, clicking, or pounding. If present, de-energize motor immediately. Carefully observe for unusual conditions as motor coasts to a stop. Investigate the cause and correct before putting motor in service.

CAUTION

Repeated trial starts can over-heat the motor. Starting currents are several times running current; heating varies as the *SQUARE* of the current. Allow time between starts so that windings cool.

When checks are satisfactory to this point, operate at lowest load possible and look for any unusual condition. Increase load slowly to maximum, checking unit for satisfactory operation.

NORMAL OPERATION

Start the motor in accordance with standard instructions for the starting equipment used. Sometimes the load should be reduced to the minimum, particularly for reduced voltage starting, and/or high inertia connected loads.

VOLTAGE REGULATION

Motors will operate successfully under the following conditions of voltage and frequency variation; but not necessarily in accordance with the standards established for operation under rated conditions:

(1) If the variation in voltage does not exceed 10% above or below normal, with all phases balanced.

(2) If the variation in frequency does not exceed 5% above or below normal.

(3) If the sum of the voltage and frequency variations does not exceed 10% above or below normal (provided the frequency variation does not exceed 5%).

TROUBLE SHOOTING

Between regular maintenance inspections, be alert for signs of motor trouble. Common symptoms are listed in the TROUBLE table. Correct any trouble immediately and AVOID COSTLY REPAIR AND DOWN TIME.

TROUBLE SHOOTING

SYMPTOM	POSSIBLE CAUSES	CURE
Motor won't start.	Usually line trouble — single-phasing at starter.	De-energize and correct! Check source of power supply. (Don't check with motor energized!) Check overloads, controls, and fuses. Check voltage and compare with rating plate.
	Improper connection.	Check connections with diagram.
	Load too heavy.	Disconnect motor to see if it starts without load. Reduce load — or replace motor with unit of greater capacity.
Excessive hum.	High voltage.	Check input voltage and for proper connections.
Regular clicking.	Foreign matter in air gap.	Take out rotor; remove matter.
Rapid knocking.	Bad bearing, dirt in grease.	Replace bearing; renew grease.
Motor overheating. (Check with thermometer or thermocouple; don't depend on hand). See pg. 11 maintenance.	Overload.	Measure load: compare with nameplate rating. Check for excessive friction in motor, drive or machine. Reduce load, or replace motor with unit of greater capacity.
	Single phase.	Check current, all phases.
	Dirt in motor.	Check air flow at ventilation ducts. Blow out motor. Use solvent on wound section if necessary.
	Unbalanced voltage.	Check voltage, all phases.
	Rotor rubbing on stator.	1) Check alignment. 2) Clean air gap. 3) Check and replace bearings, if necessary.
	Open stator windings.	Disconnect motor from load. Check idle amps balance in all three phases. Check stator resistance in all three phases for balance.
	Over voltage, or under voltage.	Check voltage and compare to rating plate.
	Ground.	Locate with test lamp or megger and repair.
	Improper connections.	Recheck connections.

(Continued)

TROUBLE SHOOTING (CONTD.)

SYMPTOM	POSSIBLE CAUSES	CURE
Bearing over-heating.	Misalignment.	Check mounting and flange alignment.
	Excessive end thrust.	Reduce thrust from drive or machine.
	Too much grease (ball or roller bearing).	Relieve supply to point set by manufacturer.
	Insufficient lubricant.	Add — up to point set by table.
Vibration.	Misalignment.	Re-align units.
	Twisted base or flange.	Check flange alignment and shims.
	In driven machine (disconnect motor from load and run idle).	Eliminate source in load.
	Excessive dirt on fan blades.	Clean rotating members.
	Rotor out of balance (after repair).	Balance rotor.
	Shaft bent or flange face run out.	See maintenance.
	System natural frequency. (Resonance)	Alter rigidity of base structure.

GENERAL

Routine, regular maintenance is the best assurance of trouble-free, long-life operation. It prevents costly shutdown and repairs. Two major elements of a controlled maintenance program are:

Trained personnel who KNOW the work.

Systematic records, which contain at least the following:

Complete nameplate data (Service Record).

Prints (Wiring diagrams, certified outline, sectional view).

Parts list (see rear of this section).

Stock of essential parts.

List of spare units in storage.

Alignment data (departures from perfect alignment, allowance for high temperature).

Results of regular inspection (Service Record).

Repairs (Service Record).

Lubrication data:

Method of application.

Types of grease for wet, dry, hot, or adverse locations.

Stock of greases.

Maintenance cycle by locations (Some require more frequent lubrication).

Record for each unit (Service Record).

PREVENTIVE MAINTENANCE

Several of the more important items of good maintenance are discussed in the following paragraphs. Others should be added when adverse or unusual conditions exist.

Inspection. Each machine should be inspected at regular intervals. The frequency and thoroughness will depend on the amount of operation, nature of service, and the environment. Inspect for:

CLEANLINESS. The exterior should be kept free of oil, dust, dirt, water, and chemicals. For a fan-cooled machine it is particularly important to keep the air intake opening free of foreign material. Do not block air outlet.

MOISTURE. On non-explosion proof TEFC motors, a removable plug permits removal of any accumulated moisture. Drain regularly.

NOTE: If equipment is operated intermittentiy in very damp locations, it should be protected by space heaters. To retard corrosion, grease all machined fits when the unit is reassembled after a maintenance check.

LOADING. Guard against improper loading. Overloading causes overheating and, overheating will shortened insulation life. A winding subjected to a 10° temperature rise above the maximum limit for its class will have its insulation life halved.

While somewhat less serious, underloading a motor is improper. It does lower the power factor which results in higher power cost. Any motor consistently underloaded should be replaced by one of lower power rating.

TEMPERATURE. Electrical apparatus operating under normal conditions become quite warm. Although some places may feel hot to the touch the unit may be within guaranteed limits. *Use a thermocouple to measure winding temperature.*

The Total Temperature — not the temperature rise, is the measure of safe operation. Investigate the operating conditions if the *Total Temperature* measured by the *Temperature Detector* placed on the winding exceeds:

230° F (110° C) for Class "B" insulation.
275° F (135° C) for Class "F" insulation.
302° F (150° C) for Class "H" insulation.

If checking total temperature by winding resistance or imbedded detector, total temperature should not exceed the following as they represent maximum insulation temperature. *If operation occurs above these temperatures, insulation life is shortened.

*266°F (130°C)	Class "B" insulation
*312°F (155°C)	Class "F" insulation
*356°F (180°C)	Class "H" insulation

LOW INSULATION RESISTANCE (see Corrective Maintenance.)

Vibration

Most problems can be detected when inspected visually. Check for:

Loose or missing parts, such as — fan blades, nuts, bolts, screws, couplings, etc.

Accumulation of dirt on fan or rotor.

Foundation construction — Base, grouting and associated equipment supporting drives. Vibration can be amplified by weak construction.

Associated equipment — Disconnect equipment to determine where the vibration is being generated.

History — When was vibration first noted? If there was a change in loading and/or duty of equipment. If ambient vibration has changed.

Often, more important than the actual vibration itself, is — the *change of vibration* over a period of time.

CORRECTIVE MAINTENANCE

Two factors that usually cause corrective maintenance are electrical failure or mechanical failure. The first sign of electrical failure is usually indicated by low insulation resistance. Mechanical failures are usually preceded by excessive bearing noise and heat.

Low Insulation Resistance

Factors that usually cause low insulation readings are:

(1) Dirty windings (oil, dust, grease, salt, etc.).

(2) Excessive moisture.

(3) Mechanically damaged insulation.

(4) Heat deterioration.

Factors three and four require extensive repairs by a competent service shop. Dirty windings can be cleaned and moisture laden windings can be dried.

Cleaning

Clean the motor, inside and outside, regularly. Actual conditions existing around the motor dictate the frequency of cleaning operations. Use the following procedures as they apply:

Wipe off — dust, dirt, oil, water, etc. from external surfaces of the machine. These materials can work into, or be carried into, the windings and may cause over heating or insulation breakdown.

Remove dirt, dust, other debris from ventilating air inlet. Do not permit such matter to accumulate near the inlet. Do not operate motor with air outlet blocked. Clean open motors internally by blowing with clean, dry compressed air at 40 to 60 psi. If the conditions warrant, use a vacuum cleaner.

When dirt and dust are solidly packed, or windings are coated with oil or greasy grime, disassemble the motor and clean with solvent. Use only high-flash naptha, mineral spirits, or Stoddard solvent. Wipe with solvent dampened cloth, or use suitable soft bristle brush. DO NOT SOAK. Oven dry (150° F) solvent-cleaned windings thoroughly before reassembly.

Windings of SUPER-SEAL® (encapsulated stator) motors may be rinsed or sprayed with solvent, and immediately wiped dry with a cloth. These windings may be cleaned with water and a fugitive detergent (ammonium oleate), or common household detergents. Rinse with clean, clear water to remove all detergent. Hot water or low-pressure steam may be used. Wipe excess water from metal surfaces and oven dry at 200° F.

After solvent cleaning and drying windings, check the insulation resistance.

WARNING

EXPLOSION-PROOF MOTORS:
These motors are constructed to comply with the U/L Label Service Procedure Manual. When reassembling a motor that has the Underwriters' label, it is imperative that:

(1) The original fits and tolerances be maintained.

(2) *All* plugs and hardware be securely fastened.

(3) Any part replacements are accurate duplicates of the original.

(4) Motor enclosure must be verified by Underwriters Laboratories and if approved a licensed service shop will relabel the motor.

To violate any of the above will invalidate the significance of this label.

Insulation Resistance

Check insulation resistance periodically.

A hand cranked megger, not over 500 volts, is the most convenient and safest device to use.

CAUTION

Semi-conductors, small transformers, voltage regulators and other devices that may be injured by the high voltage, must not be in the circuit.

The standards of the Institute of Electrical and Electronic Engineers (IEEE) No. 43 is an excellent reference for the testing of insulation resistance. Very briefly, the publication recommends that stator winding insulation resistance, (at 75° C) measured with 500 volts D.C. — after one minute, should not be less than;

$$\frac{\text{Rated Voltage} + 1000}{1000} = \text{Resistance in Megohms}$$

This formula is satisfactory for most checks.

Allis Chalmers reprint of publication 43 is 05R7728.

DRYING INSULATION

If the megger reading is less than satisfactory, and the cause is excessive moisture in the windings; dry the windings by applying heat from:

(1) A warm air oven.

(2) Electric strip heaters.

(3) Circulating currents through the coils.

The heat should be applied slowly so the desired temperature will not be obtained in less than six hours.

TABLE 5-1

INSULATION DRYING TEMPERATURES*			
CLASS "A"	CLASS "B"	CLASS "F"*	CLASS "H"*
167° F	200° F	245° F	275° F
75° C	94° C	118° C	135° C

*Class "F" and "H" Insulated Units should be baked at 70% specified temperature (to avoid steam inside winding) for about six hours, before temperature is raised to drying temperature.

Insulation resistance should be measured before the heat is applied, and every six to eight hours thereafter.

NOTE: Insulation resistance will decrease as the machine warms up; but will begin to increase shortly as the dryout continues.

A uniform temperature must be maintained in the machine to obtain constant resistance readings. When the megger readings reach a constant value, the drying out process is complete and may be discontinued. If readings are not satisfactory (high enough), check for other causes.

WARM AIR OVEN DRYING

(1) Remove bearing housings.

(2) Remove rotor.

Bake in oven at temperatures specified in Table 5-1 and follow procedures described for drying insulation.

STRIP HEATER DRYING

(1) Remove bearing housings.

(2) Remove rotor.

(3) Direct a fan on stator to carry away the moisture.

(4) Attach temperature indicators to winding and apply heat as specified in Table 5-1. Follow procedures described for drying insulation.

CAUTION

Temperatures must be carefully controlled. Avoid hot spots. Do not use radiant type heat such that some parts become scorched before remote parts reach desired temperature.

CIRCULATING CURRENT DRYING

(1) Remove bearing housings.

(2) CENTER the rotor in the stator core.

(3) WEDGE fiber strips into the lower part of the air gap, so that rotor is not touching stator.

(4) Direct fan on unit to blow away excessive moisture.

(5) Attach temperature indicators to windings and follow the procedures prescribed for drying insulation. Do not exceed the drying temperatures in the table.

(6) Apply a controlled current of the same number of phases, and the same, or less than rated frequency to the windings. The voltage used should not be more than 10% of normal, nor should it cause more than 60% of normal full load current to pass through the windings.

CAUTION

Insulation resistance will decrease as the machine warms up; but will begin to increase as the drying process continues.

When the insulation resistance has reached one-half of the minimum value determined by the formula, a voltage of 15% of normal may be applied.

NOTE: For more detailed information about insulation maintenance, see factory instructions 05X7391.

BEARINGS

Long life of bearings is assured only by maintaining proper alignment, and good lubrication at all times. Some factors that can cause excessive bearing noise and heat are:

(1) Incorrect alignment of solid couplings.

(2) Incorrect alignment of flexible couplings.

(3) Excessive, or wrong direction of thrust.

(4) Improper greasing.

Bearing Lubricants — Grease: Prior to shipment, motor bearings are lubricated with the proper amount and grade of grease to provide six months of satisfactory service under normal operation and conditions. It is good practice, however, to check bearings of newly installed motors for proper lubrication.

For best results, grease should be compounded from a lithium soap base and a good grade of petroleum oil.

It should be of No. 2 consistency for double-shielded, No. 3 consistency for open or single-shielded bearings, and stabilized against oxidation. Operating temperature range should be from −15° to +250° F for Class B insulation, and to +300° F for Class "F" and "H". Most leading oil companies have special bearing greases that are satisfactory.

For specific recommendations, consult the factory.

BEARING RELUBRICATION

The frequency of relubricating bearings and the amount added each time, depends on two factors — speed and service. As a guide the following is recommended.

SPEED (RPM)	RELUBRICATING FREQUENCY*
3600	6 Months (4,000 Hours)
1800 or Less	12 Months (8,000 Hours)

*Operating environment may dictate more frequent lubrication.

NOTE: A common mistake is daily lubrication of bearings. As well as being wrong, it is a dangerous practice, particularly when grease is added without removing the drain plug. The excess grease must go somewhere and usually it is forced into and through the inner bearing cap and is then thrown into the windings. Proper lubrication is desired, but some under-lubrication is less dangerous than over-lubrication.

Relubricate bearings with the proper grade of grease as follows:

(1) Stop the motor and lock out the switch.

(2) Thoroughly clean off and remove grease inlet plug, drain pipe and plug from the outer bearing caps.

NOTE: Drain pipes do not always permit satisfactory escape for displaced grease. It is a good practice to remove drain pipes, if practical, and visually check the drain outlet for grease.

(3) Add grease to inlet with hand gun until small amount of new grease is forced out drain. Catch used grease in suitable container.

NOTE: For vertical shaft motors, it is wise to check the inner cap of the top bearing for grease slumping through the bearing and filling the inner cap grease reservoir. Since it is necessary to remove the housing, this check is best done during periodic shut down inspections.

(4) Remove excess grease from parts and replace inlet plug.

(5) Replace cleaned drain pipe and run unit at least one hour to expell any excess grease.

(6) Replace drain plug.

(7) Put unit back in operation.

CAUTION

Avoid adding lubricant to bearings while unit is running.

If it is mandatory to add grease while the unit is running, the following instructions must be followed carefully.

The correct amount of grease must be predetermined. The object is to avoid overgreasing. Since a bearing acts as a pump when running, the initial measurements must be made with the unit at a stand still.

(1) Stop the unit, lock out the switch and remove inlet pipe plug and outlet drain pipe, as previously described.

(2) Add small, *measured amounts* of grease to inlet until it is evident that new grease is entering the drain opening.

(3) Insert the inlet pipe plug; run the unit one hour to expel excessive grease.

(4) Replace clean drain pipe and plug.

Subsequent regreasings with the unit running, the grease added should be not more than ⅔ the amount needed to make the grease come out the drain when the unit was stationary.

BEARING REPLACEMENT

Replacement bearings may be of a different manufacturer; but must be equal to the originals used in the motor. When ordering bearings specify as follows:

(1) Identifying numerals and manufacturer stamp on the bearing (number is also on motor name plate).

(2) Bearing Tolerance Class, *i.e.* (A.B.E.C.-1) Annular Bearing Engineers' Committee — Tolerance Class One.

(3) Electric motor quality.

(4) Internal Radial Clearance, *i.e.* (A.F.B.M.A.-3) Anti-Friction Bearing Manufacturers Association, Clearance Class Three.

CAUTION

Never use A.F.B.M.A.-0 Bearings on **enclosed** motors with Class "F" or "H" insulation.

For angular contact type bearings, replacements must be equivalent in angle of contact. Following is an interchangeability table:

MRC	SKF	New Departure	Fafnir
7300 P	7300 G	30300	7300 PW

TO REPLACE BEARINGS

(1) Remove bolts holding bearing housings to yoke. If motor has stationary inner end caps, remove bolts holding end caps to housings.

(2) Remove end housings.

(3) Remove snap ring in front of bearing.

(4) Use bearing puller and exert force only on inner race to remove bearing from shaft.

NOTE: Protect the shaft end with a cap (Fig. 5-1). If bearing is to be reused make certain the puller applies pressure against the inner bearing race only. If puller will not hook the bearing inner race, fabricate a split bushing and install it between the bearing and the puller hooks.

(5) Check shaft diameter for proper size with micrometer. Clean or replace inner bearing cap and slide cap onto shaft.

(6) Heat the new bearing in an oven (200° F.). While it is hot, slide the bearing onto shaft — make certain that the inner race makes a firm even contact with shaft shoulder.

CAUTION

Do not subject bearing to impact.

(7) Let bearing cool — pack bearing caps per table (5-2) with the proper grade of grease.

(8) Reassemble end caps and end housings.

When repacking bearings, consult the accompanying table for the proper amount of lubricant. Pack all open bearings full between balls or rollers, but remove excess grease from the outside of the retainers. Full packing of a cap or bearing housing cavity should be done with a grease gun.

GREASE REPACKING TABLE 5-2

Type of Bearing	Operating Position	Front or Top		Rear or Bottom	
		Outer Cap	Inner Cap	Inner Cap	Outer Cap
Double Shielded	Vertical	Full	None	⅓ Full	Full
Open Deep Groove	Vertical	⅓ Full	⅓ Full	⅓ Full	Full
Angular Contact	Vertical	⅓ Full	⅓ Full	⅓ Full	Full

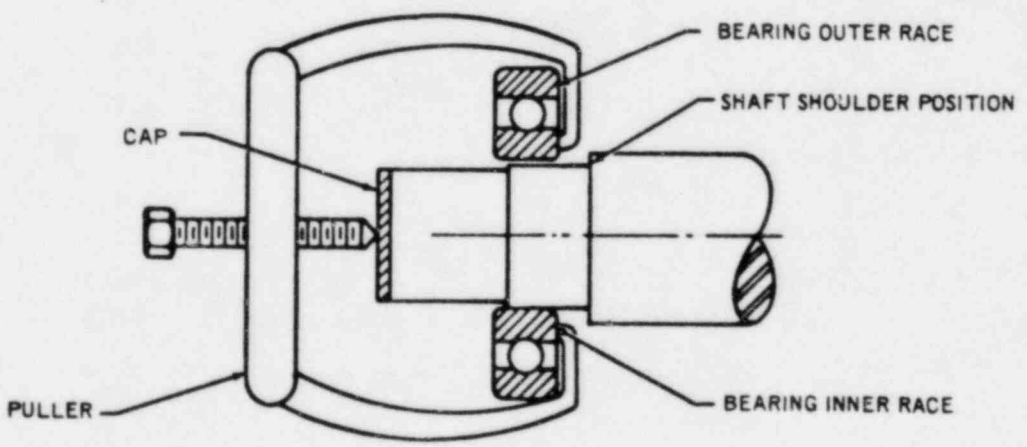


FIG. 5-1 REMOVING BEARING

26914

WARNING

EXPLOSION-PROOF MOTORS:
These motors are constructed to comply with the U/L Label Service Procedure Manual. When reassembling a motor that has the Underwriters' label, it is imperative that:

(1) The original fits and tolerances be maintained.

(2) *All* plugs and hardware be securely fastened.

(3) Any part replacements are accurate duplicates of the original.

To violate any of the above will invalidate the significance of this label.

SHAFT OR FLANGE FACE RUNOUT

Because inspection of flange faces, eccentricity and shaft runout, is rigorously enforced at the factory, vibrations caused by this alignment problem are rare and usually if shaft runout, face runout, or eccentricity are excessive; the equipment has been mistreated in some way.

The NEMA method for checking shaft and flange faces is as follows:

NOTE: On ball-bearing motors, it is recommended that the test be made with the shaft vertical to minimize the effect of bearing clearances.

SHAFT RUNOUT

The shaft runout is measured with the indicator stationary with respect to the motor and with its point at the end of the finished surface of the shaft. See Fig. 5-2 for typical fixture.

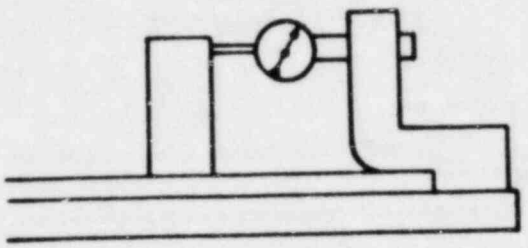


FIG. 5-2 SHAFT RUNOUT CHECK 26927

Read the maximum and minimum values on the indicator as the shaft is rotated slowly through 360 degrees. The difference between the readings shall not exceed:

.002 inch — frame 140 thru 280
.003 inch — frame 320 thru 445

ECCENTRICITY AND FACE RUNOUT OF MOUNTING SURFACES

The eccentricity and face runout of the mounting surfaces is measured with indicators mounted on the shaft extension. The point of the eccentricity indicator shall be at approximately the middle of the rabbet surface, and the point of the face runout indicator shall be at approximately the outer diameter of the mounting face. See Fig. 5-3 for typical fixture.

Read the maximum and minimum values on the indicators as the shaft is rotated slowly through 360 degrees. The difference between the readings shall not exceed:

.004 inch for 140 thru 280 frame
.007 inch for 320 thru 445 frame

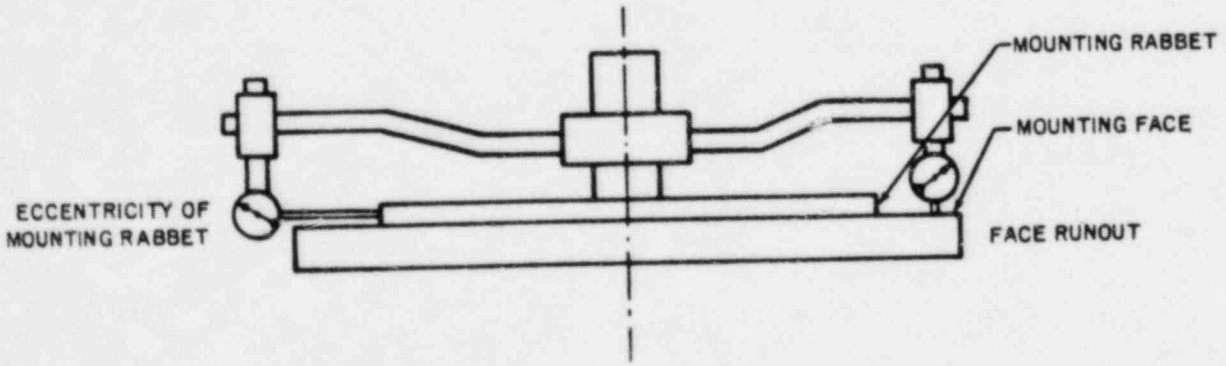


FIG. 5-3 ECCENTRICITY AND FACE RUNOUT CHECK 26928

SQUIRREL-CAGE INDUCTION AND *SYNDUCTION*® MOTORS

Item	Description of Part	Recommended Minimum Stock			
		Number of Units in Operation			
		1 to 4	5 to 9	10 to 20[1]	10 to 20
1	Motor Complete	0	0	0	1
2	Stator Coils with Winding Supplies[2]	1 Set	1 Set	2 Sets	1 Set
3	Bearings	1 Set	2 Sets	2 Sets	1 Set
4	Oil Rings (where used)	1 Set	1 Set	2 Sets	1 Set
5	End Cap (Anti-friction Bearings)	1 Set	1 Set	2 Sets	1 Set

Synduction is an Allis-Chalmers trademark.

[1]This column to be used when complete machine is not stocked.
[2]This does not apply for motors with POXEAL® encapsulated-stator, in which case one complete stator is recommended.

IDENTIFICATION

All units have an identification (name) plate affixed to the frame (Fig 6-1). All the necessary information pertaining to the machine can be found on this plate. Permanent records are kept by the factory and filed by:

(1) Serial number.

(2) Type and frame size.

(3) Horsepower and speed.

(4) Model number

It is important when ordering spare parts or refering to your machine, to record as much data from this plate as possible.

PARTS IDENTIFICATION

The drawings in this book are of the standard design. Most of the parts should be easy to identify, if however, there is some deviation from your actual machine, consult the factory or the drawings supplied with your unit.

Order these and other parts, as required, from Allis-Chalmers, 400-440 Frames, 4620 Forest Ave., Norwood, Ohio 45212, 140-360 Frames, 1400 Dineen Drive, Little Rock, Arkansas 72206, or through the nearest sales office. Give the identifying information from the name plate (Fig. 6-1).

NOTE: IF MOTOR HAS MORE THAN THREE LEADS, THE CONNECTION DIAGRAMS ARE USUALLY STAMPED ON THE NAME PLATE OR ON A SEPARATE CONNECTION PLATE

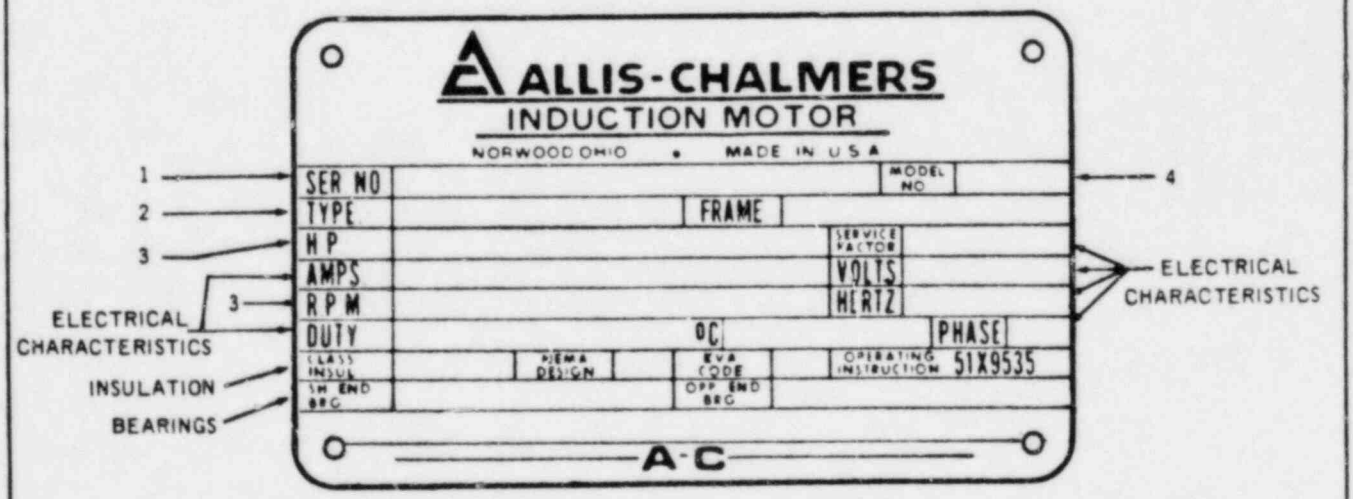
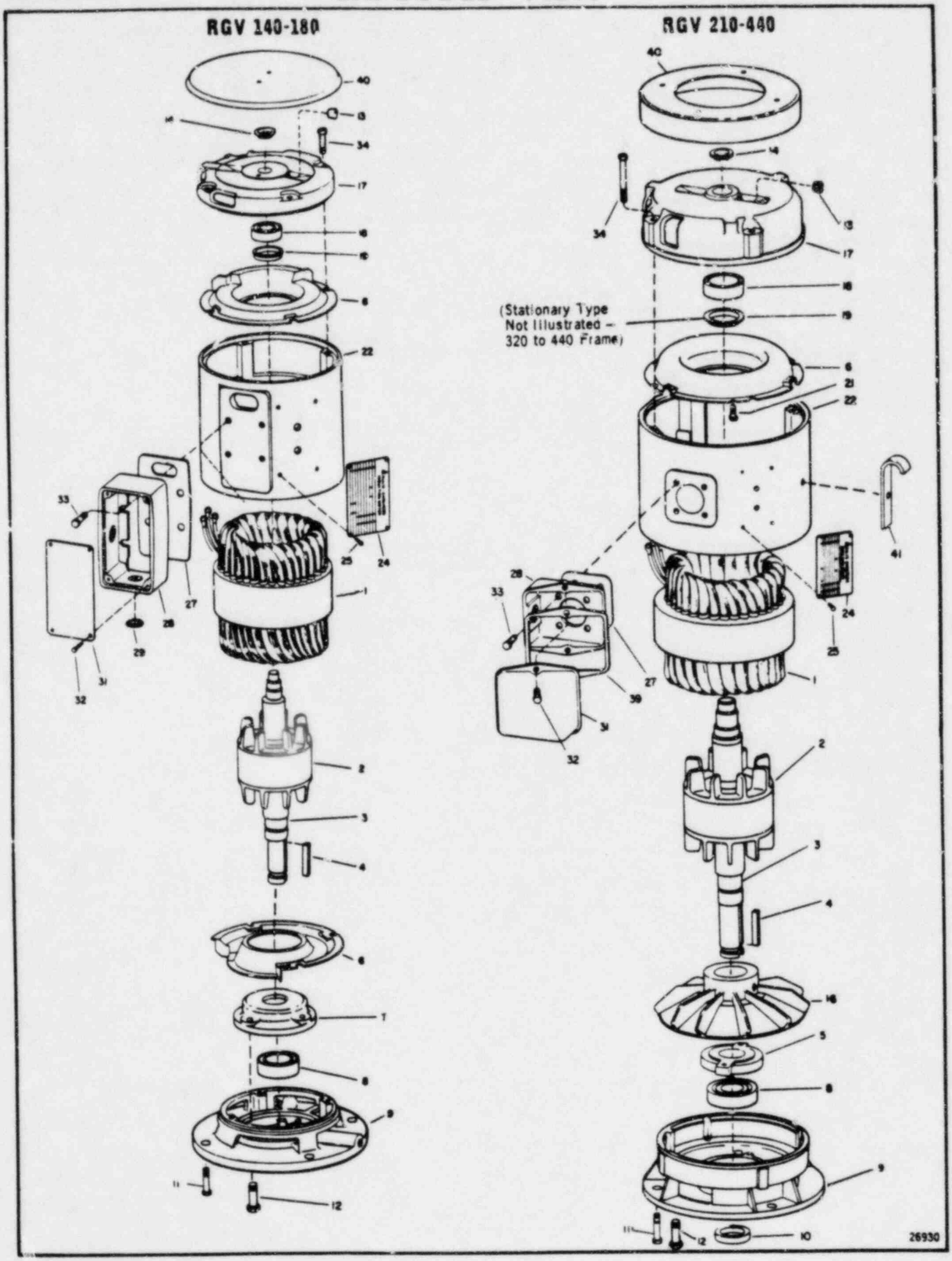


FIG. 6-1 IDENTIFICATION PLATE

26929

EXPLODED VIEW



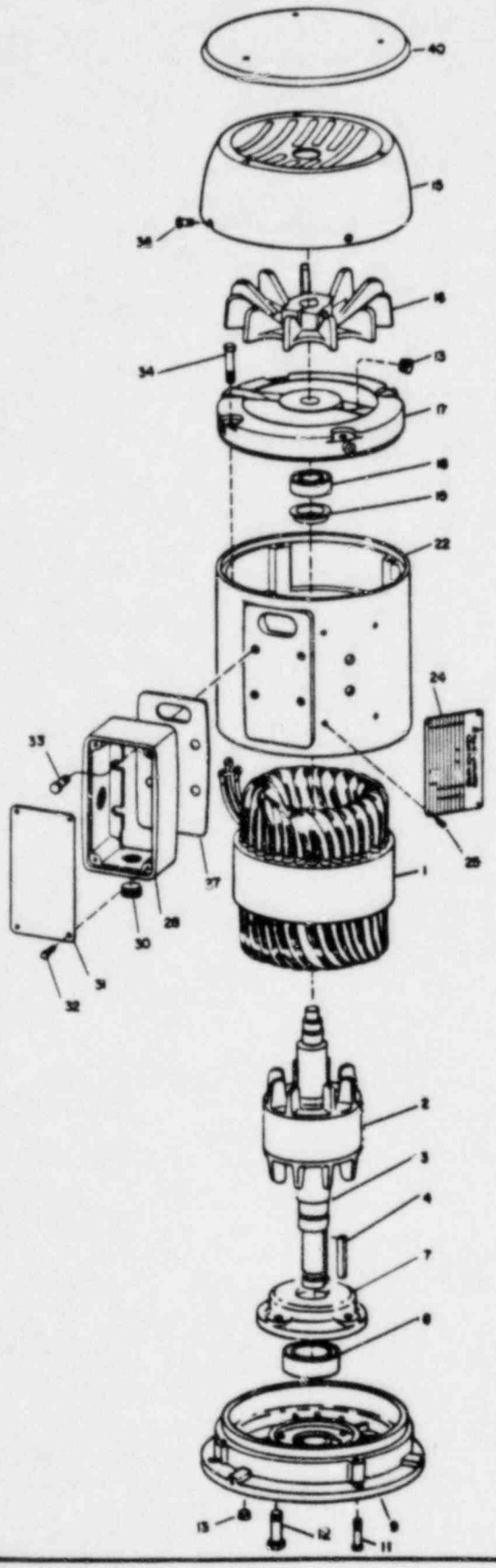
PARTS LIST

KEY NO.	CATALOG NO.	PART NAME
1	71000	Stator Assembly
2	70520	Rotor Core
3	70510	Shaft, Rotor
4	70660	Key, Square
5	72014	Cap, End - Rear
6	72320	Deflector, Air
7	72014	Cap, End - Rear
8	72054	Bearing - Rear
9	72004	Housing, Bearing - Rear
10	72330	Seal, Shaft
11	72220	Bolt, Hex Head (Rear Bearing Housing)
12	72220	Bolt, Hex Head (Rear End Cap)
13	72270	Plug, Pipe
14	72040	Plug, End Cap
15 *	72090	Bowl, Fan and Grid
16	72080	Fan (210 – 250 Round Frame Only)
17	72003	Housing, Bearing - Front
18	72053	Bearing - Front
19	72013	Cap, End - Front
20	72013	Cap, End - Front (Stationary Type Not Illustrated - 320 to 440 Frame)
21	72220	Bolt, Hex Head (Front Air Deflector)
22	71010	Yoke Stator (Typical 210-320 yoke shown)
23 *	72210	Eyebolt, Lifting
24	72340	Plate, Rating
25	72220	Pin, Escutcheon
26 *	72220	Bolt, Hex Head (Air Deflector - Rear)
27	70930	Gasket (Conduit Box to Yoke)
28	70900	Box Conduit
29	70960	Plug - Conduit Box
30 *	72270	Plug, Pipe Conduit Box
31	70910	Cover, Conduit Box
32	72220	Bolt, Hex Head (Conduit Box Cover)
33	72220	Bolt, Hex Head (Conduit Box)
34	72220	Bolt, Hex Head (Front Bearing Housing)
35	72220	Bolt, Hex Head (Front End Cap, Not Illustrated)
36 *	72220	Bolt, Hex Head (Fan Bowl)
37 *	72260	Coupling Pipe
38 *	72250	Nipple Pipe
39	70930	Gasket, Cond. Box Parting
40	72120	Drip Cover
41	72210	Lift Hook

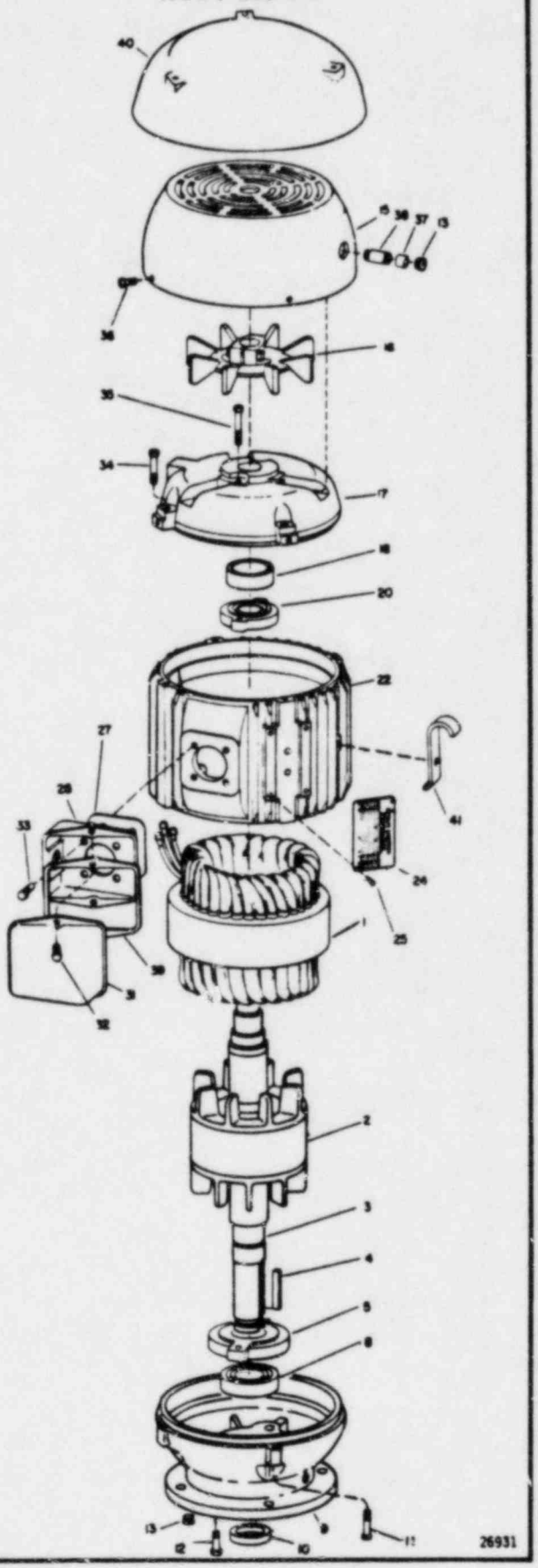
* Not Required for Type RGV

EXPLODED VIEW

RGZV 140-180



RGZV 210-440

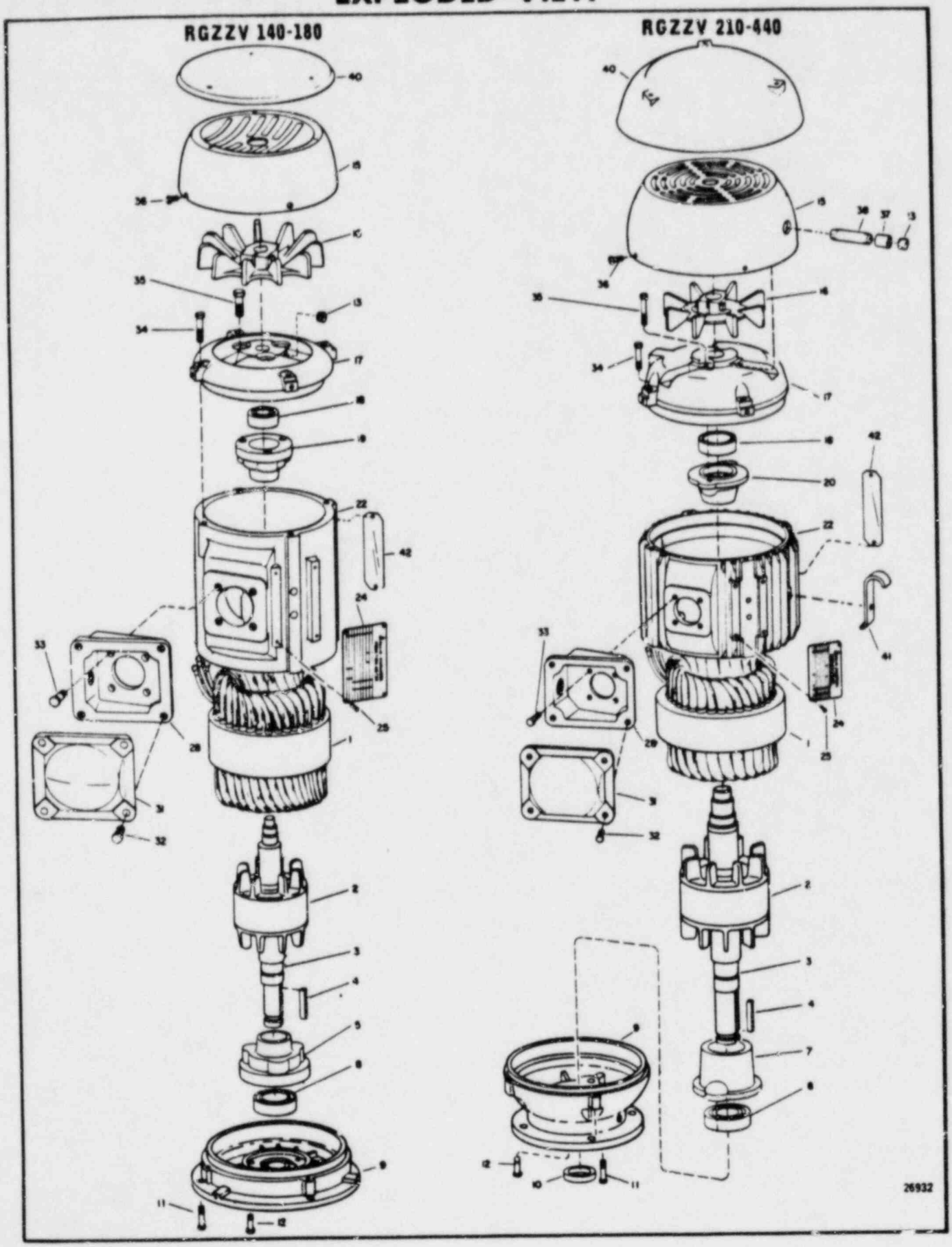


PARTS LIST

KEY NO.	CATALOG NO.	PART NAME
1	71000	Stator Assembly
2	70520	Rotor Core
3	70510	Shaft, Rotor
4	70660	Key, Square
5	72014	Cap, End - Rear
6*	72320	Deflector, Air
7	72014	Cap, End - Rear
8	72054	Bearing - Rear
9	72004	Housing, Bearing - Rear
10	72330	Seal, Shaft
11	72220	Bolt, Hex Head (Rear Bearing Housing)
12	72220	Bolt, Hex Head (End Cap)
13	72270	Plug, Pipe
14*	72040	Plug, End Cap
15	72090	Bowl, Fan and Grid
16	72080	Fan
17	72003	Housing, Bearing - Front
18	72053	Bearing - Front
19	72013	Cap, End - Front
20	72013	Cap End - Front
21*	72220	Bolt, Hex Head (Front Air Deflector)
22	71010	Yoke Stator
23*	72210	Eyebolt, Lifting
24	72340	Plate, Rating
25	72220	Pin, Escutcheon
26*	72220	Bolt, Hex Head (Air Deflector - Rear)
27	70930	Gasket (Conduit Box to Yoke)
28	70900	Box Conduit
29*	70960	Plug - Conduit Box
30	72270	Plug, Pipe Conduit Box
31	70910	Cover, Conduit Box
32	72220	Bolt, Hex Head (Conduit Box Cover)
33	72220	Bolt, Hex Head (Conduit Box)
34	72220	Bolt, Hex Head (Front Bearing Housing)
35	72220	Bolt, Hex Head (Front End Cap)
36	72220	Bolt, Hex Head (Fan Bowl)
37	72260	Coupling Pipe
38	72250	Nipple Pipe
39	70930	Gasket, Cond. Box Parting
40	72120	Drip Cover
41	72210	Lift Hook

* Items not required for Type RGZV

EXPLODED VIEW



PARTS LIST

KEY NO.	CATALOG NO.	PART NAME
1	71000	Stator Assembly
2	70520	Rotor Core
3	70510	Shaft, Rotor
4	70660	Key, Squa[illegible]
5	72014	Cap, End - Rear
6*	72320	Deflector, Air
7	72014	Cap, End - Rear
8	72054	Bearing - Rear
9	72004	Housing, Bearing - Rear
10	72330	Sea[illegible] Shaft
11	72220	Bolt, Hex Head (Rear Bearing Housing)
12	72220	Bolt, Hex Head (Rear End Cap)
13	72270	Plug, Pipe
14*	72040	Plug, End Cap
15	72090	Bowl, Fan and Grid
16	72080	Fan
17	72003	Housing, Bearing - Front
18	72053	Bearing - Front
19	72013	Cap, End - Front
20	72013	Cap, End - Front
21*	72220	Bolt, Hex Head (Front Air Deflector)
22	71010	Yoke Stator
23*	72210	Eyebolt, Lifting
24	72340	Plate, Rating
25	72220	Pin, Escutcheon
26*	72220	Bolt, Hex Head (Air Deflector - Rear)
27*	70930	Gasket (Conduit Box to Yoke)
28	70900	Box Conduit
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30*	72270	Plug, Pipe Conduit Box
31	70910	Cover, Conduit Box
32	72220	Bolt, Hex Head (Conduit Box Cover)
33	72220	Bolt, Hex Head (Conduit Box)
34	72220	Bolt, Hex Head (Front Bearing Housing)
35	72220	Bolt, Hex Head (Front End Cap)
36	72220	Bolt, Hex Head (Fan Bowl)
37	72260	Coupling Pipe
38	72250	Nipple Pipe
39*	70930	Gasket, Cond. Box Parting
40	72120	Drip Cover
41	72210	Lift Hook
42	–	Underwriters' Plate

* Items not required for Type RGZZV

MOTOR SERVICE RECORD (51X2285)

Serial No. _____ Horsepower _____ Type _____

Speed _____ Volts _____ Amperes _____ Phase _____ Cycles _____

Insulation Class _____ Temperature Rise _____ °C Frame Size _____

Connection Diagram - Rotor _____ Stator _____

Owner Order No. _____ Item No. _____ Date Purchased _____

MACHINE TYPE	BEARINGS	SHAFT EXTENSION
☐ Horizontal ☐ Vertical ☐ Moisture-Resistant ☐ Open Drip-Proof ☐ Super-Seal ☐ Totally-Enclosed ☐ Explosion Proof	☐ Ball ☐ Roller ☐ Sleeve Size: Front _____ Rear _____ Lubrication _____	Length _____ Diameter _____ Internal Thread _____ External Thread _____ Keyway _____

Date Installed	Location	Application

Date Repaired or Replaced	Repairs or Parts Replaced (1)	Fault	Repaired by	Total Cost

(1) Name of Part	No. Per Machine	Manufacturer's No.	Date	Quan. Repl.	Cost	Date	Quan. Repl.	Cost	Date	Quan. Repl.	Cost
Rotor											
Stator Coils											
Bearing, Front											
Rear											
Other											

INSPECTION

Date Checked												
Bearings												
Lubrication												
Excess Heat												
Excess Noise												
Speed												
Voltage												
Amps												
Insulation												
Clean												
Alignment												
Vibration												
Temperature												

ALLIS-CHALMERS
MOTOR AND GENERATOR DIVISIONS
NORWOOD, OHIO 45212

Litho in U.S.A.

ALLIS-CHALMERS
NORWOOD, OHIO

PRICED RECOMMENDED SPARE PARTS

CUSTOMER: Goulds Pumps DATE: 1-8-76

CUSTOMER P. O. # 39936 A-C S.O. # [illegible]

ITEM NO.	#1
HP	100
TYPE	RGV
RPM	1800
VOLTS	460
FRAME	444UP

COILS W/WINDING SUPPLIES	
STATOR & YOKE	$1622.00
SHAFT END BEARING	$42.76
OPPOSITE END BEARING	$703.80

REMARKS:

DELIVERY: COILS: 10 to 12 weeks if copper is in stock at entry of order.

BEARINGS: 2 to 3 weeks

RECOMMENDED MINIMUM STOCK

NO, OF UNITS IN OPERATION

1 TO 4	5 TO 9	10 TO 20
1 OF EACH	1 OF EACH EXCEPT 2 EA. BEARINGS	2 OF EACH

ABOVE PRICES ARE NET EACH

F.O.B. NORWOOD, NO FREIGHT ALLO.

CC:

GOULDS PUMPS
VERTICAL PUMP DIVISION

LONG TERM STORAGE/DEFERRED WARRANTY PROCEDURE

SCOPE

This procedure describes preservation, packaging, storage and inspection/refurbishment activities to be implemented in order to provide extended warranty coverage for equipment offered by this proposal.

PRESERVATION/PACKAGING

A. All exposed interior and exterior non-coated carbon steel surfaces are sprayed with water displacement rust preventative, RUST BAN 392 or equal.
B. Coat carbon steel stuffing box with crusting grease, RUST BAN 326 or equal. Cover top of stuffing box with waterproof paper and seal with waterproof tape.
C. Coat exposed carbon steel machined surfaces with firm film rust preventative, RUST BAN 373 or equal.
D. Exposed flanges are covered with hardboard flange protectors held in place by wire or clips.
E. Apply film of compatible lube oil, RUST BAN 632 or equal over the water displacement rust preventative.
F. Cover pump suction with plastic sheet and tape in place.
G. Plug all tapped openings, coating threads with thread compound.
H. Skid mounted for fork lift handling.
I. Covered with a plastic sheet open on the bottom to allow breathing.
J. NOTE: Stainless steel components shall not be painted and require no preservation.

STORAGE

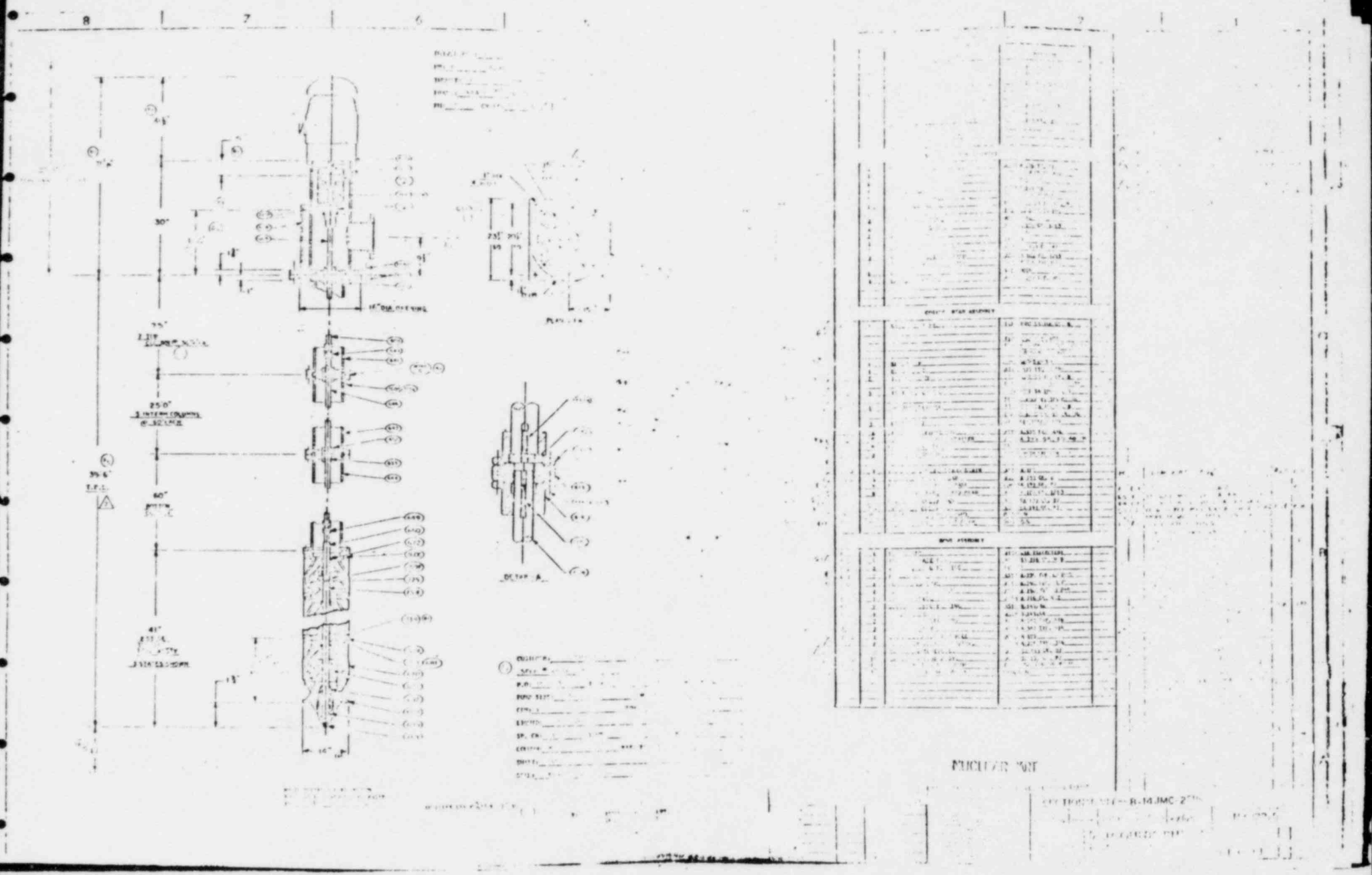
Store the pump indoors in a clean, dry environment. During storage rotate shaft counter clockwise once a month and check that shaft is not in an extreme raised or lowered lateral condition.

INSPECTION/REFURBISHMENT

Prior to installation of the pump, Goulds will provide services for disassembly and inspection of the pump. Service charges for this service will be in accordance with Goulds' published service charges in effect at the time of disassembly and inspection. If any pump components or parts are deemed by Goulds Pumps to be deteriorated during storage and unfit for pump service, those parts will be replaced at prices in effect at the time of their replacement. The inspector shall be satisfied that the equipment has been stored in the above specified location and the proper attention has been given to the equipment as specified above. The inspector shall be satisfied that the equipment has not been subject to abnormal abuse.

DEFERRED WARRANTY

After completion of inpsection/refurbishment described above, the equipment warranty (as defined in Goulds Pumps, Inc. Terms and Conditions) shall be in effect for a period of twelve (12) months from pump installation and start-up. This warranty period is not to exceed eighteen (18) months from the inspection date described above.



VERTICAL SQUIRREL-CAGE INDUCTION MOTORS

MG 1.6
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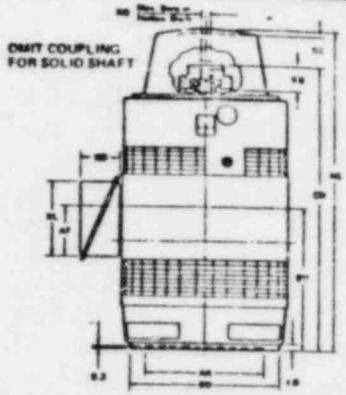
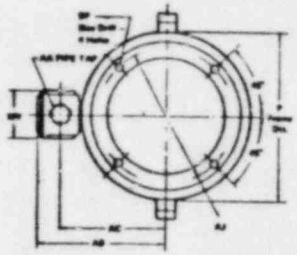
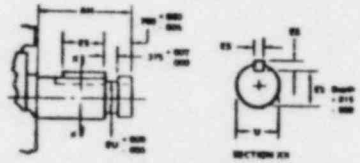
dimensions

High Thrust WP1 Enclosure
Hollow Shaft Type HSRG & HSRG S
Solid Shaft Type RGV & RGV S

JANUARY 1973







STANDARD DIMENSIONS—IN INCHES

	Standard BD			Alternate BD		
	444 TP	445 TP	447 TP	444 TP	445 TP	447 TP
P	22.0	22.0	22.0	22.0	22.0	22.0
AG	41.1	43.1	46.6	41.1	43.1	46.6
AJ	14.750	14.750	14.750	14.750	14.750	14.750
AK	13.500	13.500	13.500	13.500	13.500	13.500
BD	16.5	16.5	16.5	20.0	20.0	20.0
BF	6.87	6.87	6.87	6.87	6.87	6.87
SV	19.4	21.4	24.9	19.4	21.4	24.9
CD	36.2	40.2	43.7	38.2	40.2	43.7
XB	3.4	3.4	3.4	3.4	3.4	3.4
XC	2.6	2.6	2.6	2.6	2.6	2.6
XG	2.5 max	2.5 max	2.5 max	2.5 max	2.5 max	2.5 max
Approx. Shipping Weights in lbs.	1295	1410	1790	1295	1410	1790

SHAFT DIMENSIONS FOR VERTICAL SOLID SHAFT-VP

	U	2.125	2.125	2.125	2.125	2.125	2.125
	EU	1.750	1.750	1.750	1.750	1.750	1.750
	AH	4½	4½	4½	4½	4½	4½
Key	Hgt.	½	½	½	½	½	½
KEYSEAT ES	Width	½	½	½	½	½	½
	Lgth.	3	3	3	3	3	3
	Dpth.	1.830	1.830	1.830	1.830	1.830	1.830

COUPLING SIZES

	BX Bore	BY Tap	BZ Bolt Circle	SQ. KEY
CP1	1.438	.25-20	2⅛	⅛
CP2	1.501	.25-20	2⅛	⅛
CP3	1.689	.25-20	2½	⅛
CP4	1.751	.25-20	2½	⅛
CP5	1.938	.25-20	2⅝	.50
CP6	2.188	⅛-16	3¼	.50
CP7	2.251	⅛-16	3¼	.50

TERMINAL BOX

Item	AA	AB	AC	AF	XD	XL	XW
A	3.0	19.3	15.1	7.5	7.0	10.8	6.8
B	3.5	19.3	15.1	10.0	8.0	13.5	8.0
C	4.0	21.9	16.9	12.0	10.0	15.0	10.0

CERTIFIED FOR

Your order 39938 Our order 90236
Frame No. 444VP Hp 100 Rpm 1800
Volts 460 Phase 3 Hertz 60
ALLIS-CHALMERS, per [illegible] Date 5/5/75

NOT FOR CONSTRUCTION, INSTALLATION OR APPLICATION PURPOSES UNLESS CERTIFIED

51D 4985

REVIEWED FOR
ENRICO FERMI ATOMIC
POWER PLANT — UNIT 2
THE DETROIT EDISON COMPANY

SARGENT & LUNDY
ENGINEERS

1. [X] NO EXCEPTION TAKEN, CONTRACTOR CAN PROCEED WITH FABRICATION OR CONSTRUCTION
2. [ ] CONTRACTOR CAN PROCEED BASED ON MAKING REVISIONS NOTED AND RESUBMIT
3. [ ] REVISE AS NOTED AND RESUBMIT
   HOLD FABRICATION

ANY ACTION SHOWN ABOVE IS SUBJECT TO THE TERMS OF THE CONTRACT, AND DOES NOT RELIEVE CONTRACTOR FROM HIS OBLIGATIONS UNDER THE CONTRACT, INCLUDING DESIGN AND DETAILING.

FOR E.E.S.W. PUMP MOTOR
EQUIPMENT NO P4500C002A,B
BY D. J. RAEF DATE SEP 2 1975
SPEC NO 3071-134 PROJ NO 5068-1C

J. A. JOHNSTON

SEP 22 1975

NJ302275

TCN N0006