AURORA PUMP A member of PENTAIR PUMP GROUP

AURORA PUMP

BULLETIN 610M

610 SERIES SINGLE STAGE NON-CLOG PUMPS "SPHER-FLO"

CAPACITIES TO 20000 G.P.M.
HEADS TO 250 FEET
TEMPERATURES TO 250° F
DISCHARGE SIZES 6" THRU 20"

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INTRODUCTION
NON-CLOG PUMPS

MODEL 612A

The population explosion along with a broader understanding of the water pollution problem has brought about the need for more and better sewage treatment facilities. The installations of today and tomorrow demand more economical and reliable sewage pumping equipment. Longer life has become essential to overall pump performance. Aurora Pump has recognized the need for heavy duty, efficient, non-clog pumps for the wastewater industry. With over 45 years of experience, Aurora Pump is proud to present this bulletin featuring the new Series 610 Spher-Flo heavy duty horizontal and vertical non-clog pumps. This is the Aurora solution to wastewater pumping problems.

SPHER-FLO 610 SERIES PUMPS ARE AVAILABLE IN FOUR MODELS:

MODEL 614A

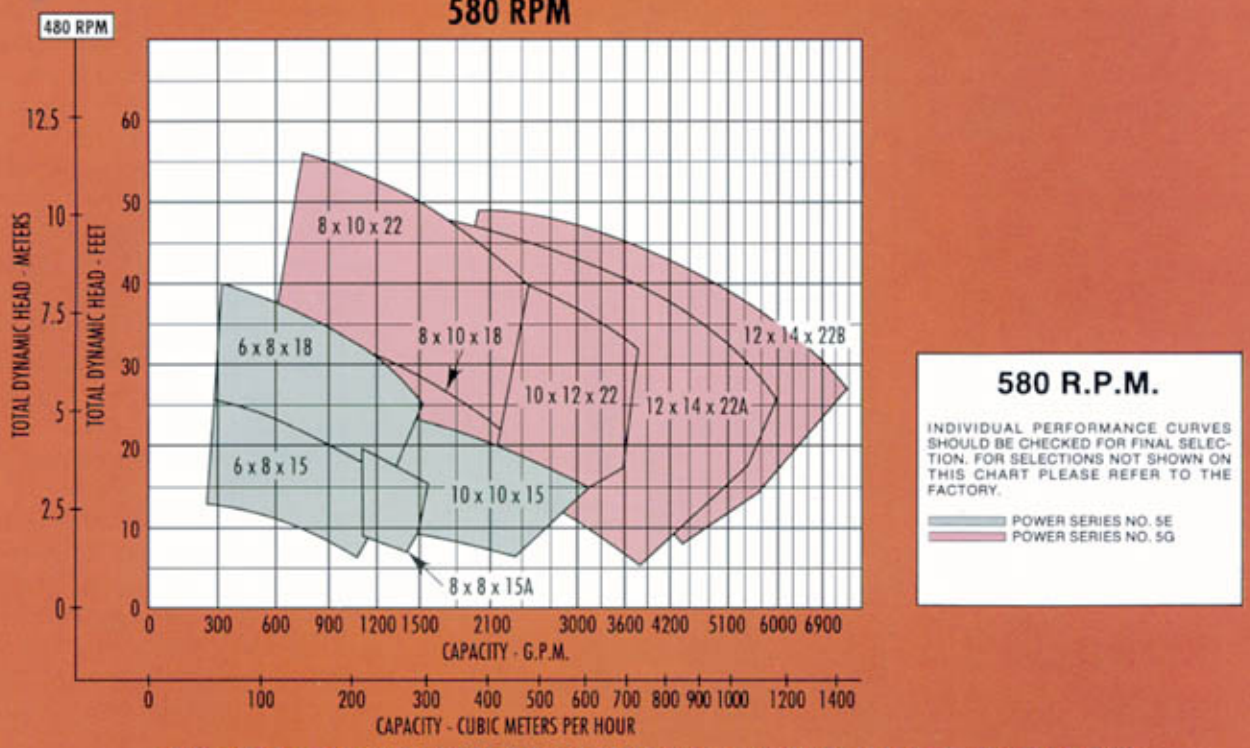
QUICK REFERENCE 610 SERIES *SPHER-FLO* NON-CLOG FEATURE SELECTOR

STANDARD

- 3" to 6" sphere capacity
- All iron fitted pump
- Regreaseable bearings
- 100,000 hour average bearing life
- Hardened stainless steel (450 min. Brinell) shaft sleeve (pumps with packing)
- External impeller clearance (cartridge type) adjustment
- Taper shaft fit at impeller
- Carbon steel shaft and impeller key
- Front or back impeller pullout
- Enclosed non-clog impeller
- Dynamically balanced impeller
- Centerline discharge casing
- Hydrostatic test all pumps
- Interchangeable packing and mechanical seal inserts
- Interwoven graphite/Teflon lubricated acrylic yarn packing, diagonally split
- Lantern ring liquid seal for packed stuffing boxes
- Gasket sealed pump shaft stuffing box extension
- Leakage accumulator packing gland (Power Frames 4, 5 & 6 only) (Models 612A and 613A)
- Suction elbow with clean out (Models 612A-613A-614A)
- Coupling Guard

OPTIONAL

- Stainless steel case wear ring
- Stainless steel impeller wear ring
- Single or Double mechanical seals
- Stainless steel shaft
- Alloy shaft sleeve (standard with mechanical seal)
- Impeller and case wear ring face flush line
- External stuffing box piping with filter or valve
- Automatic stuffing box grease seal lubricator
- Spacer type coupling (Horizontal Model 611A only)
- Flexible shaft drive with guard (Model 612A only)
- Water Seal Unit (Refer to Bulletin 680 for details)
- Constant liquid level system (Apco-Trol Variable Speed — Refer to the Apco-Matic Bulletin 700 for details)
- Certified test report — witnessed or unwitnessed
- Special alloy pump construction
- Alternate discharge positions
- Suction increasing elbow with clean out (Models 612A-613A-614A)
- Eccentric suction increasers (Model 611A)
- Removable split packing box

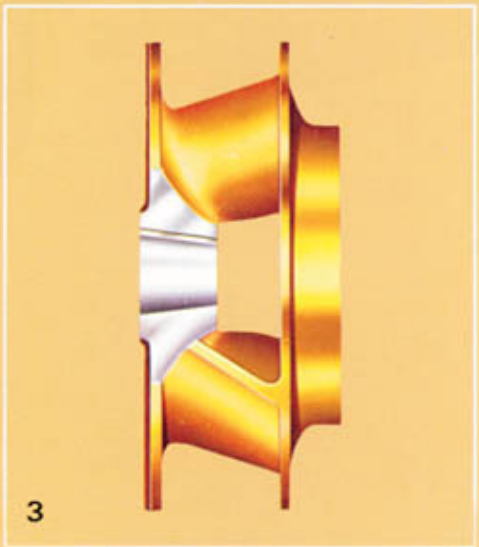


SEE PAGES 7, 8 AND 10 FOR ADDITIONAL RANGE CHART SELECTIONS

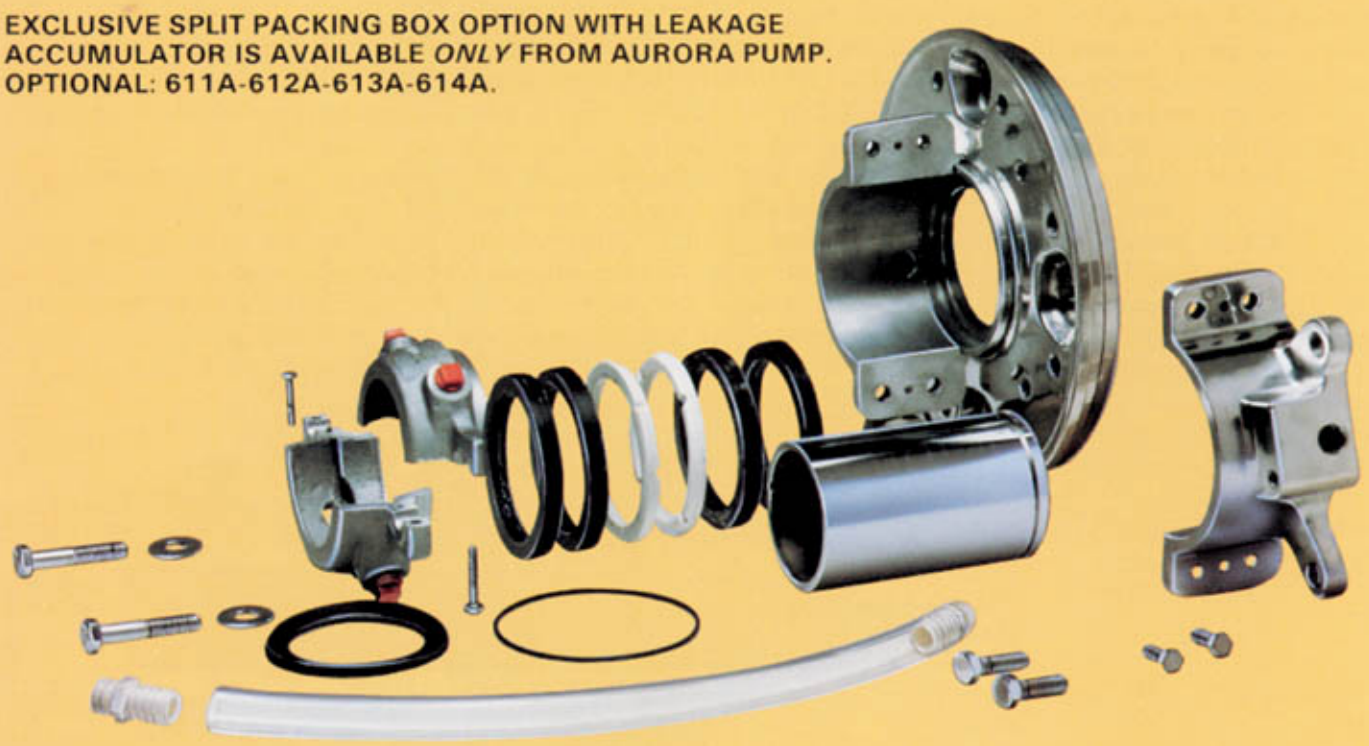
AURORA SPHER-FLO pumps are available for capacities to 20,000 gallons per minute and heads to 250 feet. The smallest pumps will pass a 3 inch diameter sphere and the largest passes a 7 inch diameter sphere. See factory for details. **1** EFFICIENT SKEWED VANE IMPELLER provides smooth flow and maximum ability to avoid clogging. This design also minimizes operating noise. The SPHER-FLO impeller is an exclusive Aurora hydraulic design. **2** CENTERLINE DISCHARGE CASINGS are self venting and eliminate the need for left hand pumps. Oversize cleanout openings near the casing cutwater simplify cleaning. The minimum cleanout size is 3" x 5". The casing discharge can be mounted on 45° increments. **3** TAPERED IMPELLER FIT assures tight impeller to shaft and facilitates impeller removal. Back wiper vanes balance thrust bearing loads and prevent clogging behind impeller. Enclosed impeller provides highest efficiency and rugged construction for long service life and reliable pump operation. BEARINGS are selected for 2 year minimum life at worst conditions of load. Average bearing life is 10 years. See page 12 for additional bearing details.


1


2


3

EXCLUSIVE SPLIT PACKING BOX OPTION WITH LEAKAGE ACCUMULATOR IS AVAILABLE *ONLY* FROM AURORA PUMP. OPTIONAL: 611A-612A-613A-614A.

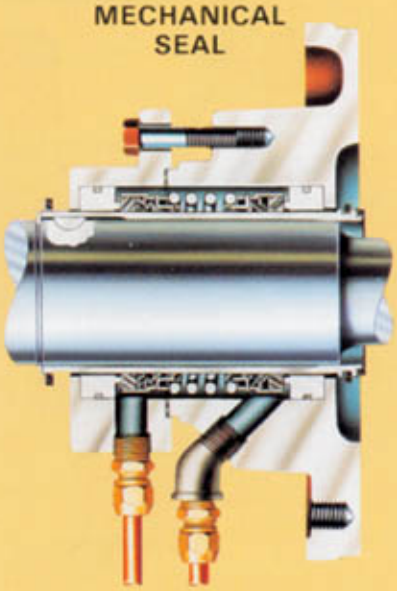


SPLIT PACKING BOXES separate vertically through the packing insert to simplify packing replacement and shaft sleeve inspection. The insert halves are doweled, aligned registered fit to prevent leakage. Only six bolts have to be removed to disassemble the insert from the pump assembly. DOUBLE MECHANICAL SEALS must be recommended for gritty or abrasive applications. Seal faces are protected by clear water under pressure, injected directly into the seal cavity. The seal box design allows speedy seal maintenance. Single mech. seals are available. LEAKAGE ACCUMULATOR for vertical pump models with packed stuffing boxes collects leakage for controlled drainage assuring effective odor control. The gland halves are dowel aligned.

PACKING BOX

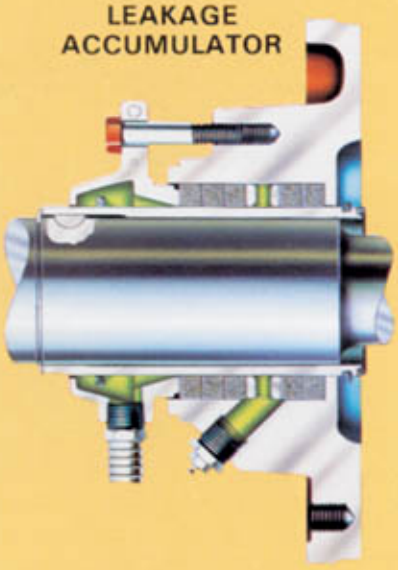
STANDARD: 611A
OPTIONAL: NONE

MECHANICAL SEAL



STANDARD: 614A
OPTIONAL: 611A-612A-613A

LEAKAGE ACCUMULATOR

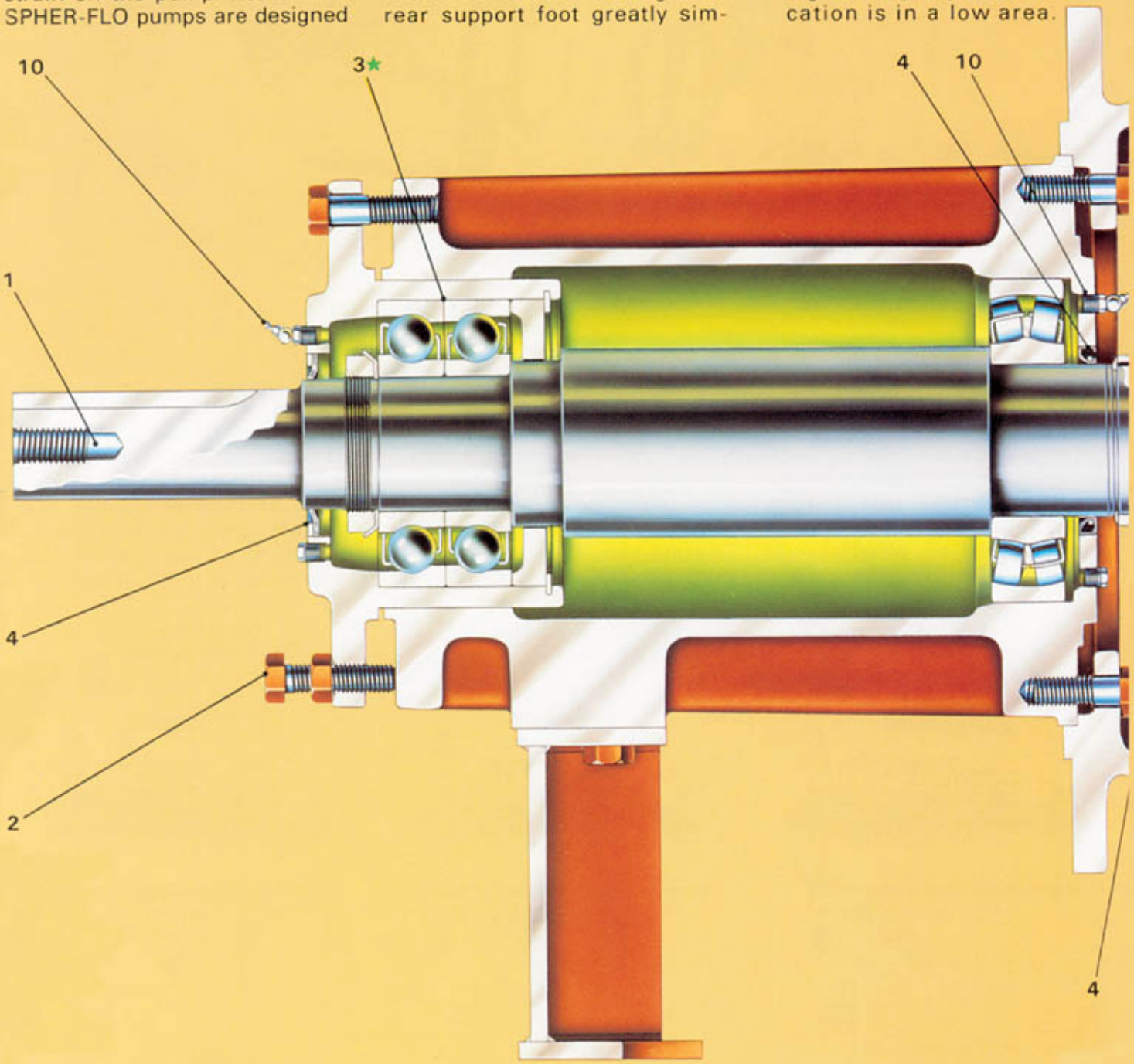


STANDARD: 612A-613A
OPTIONAL: 614A

PUMP FEATURES

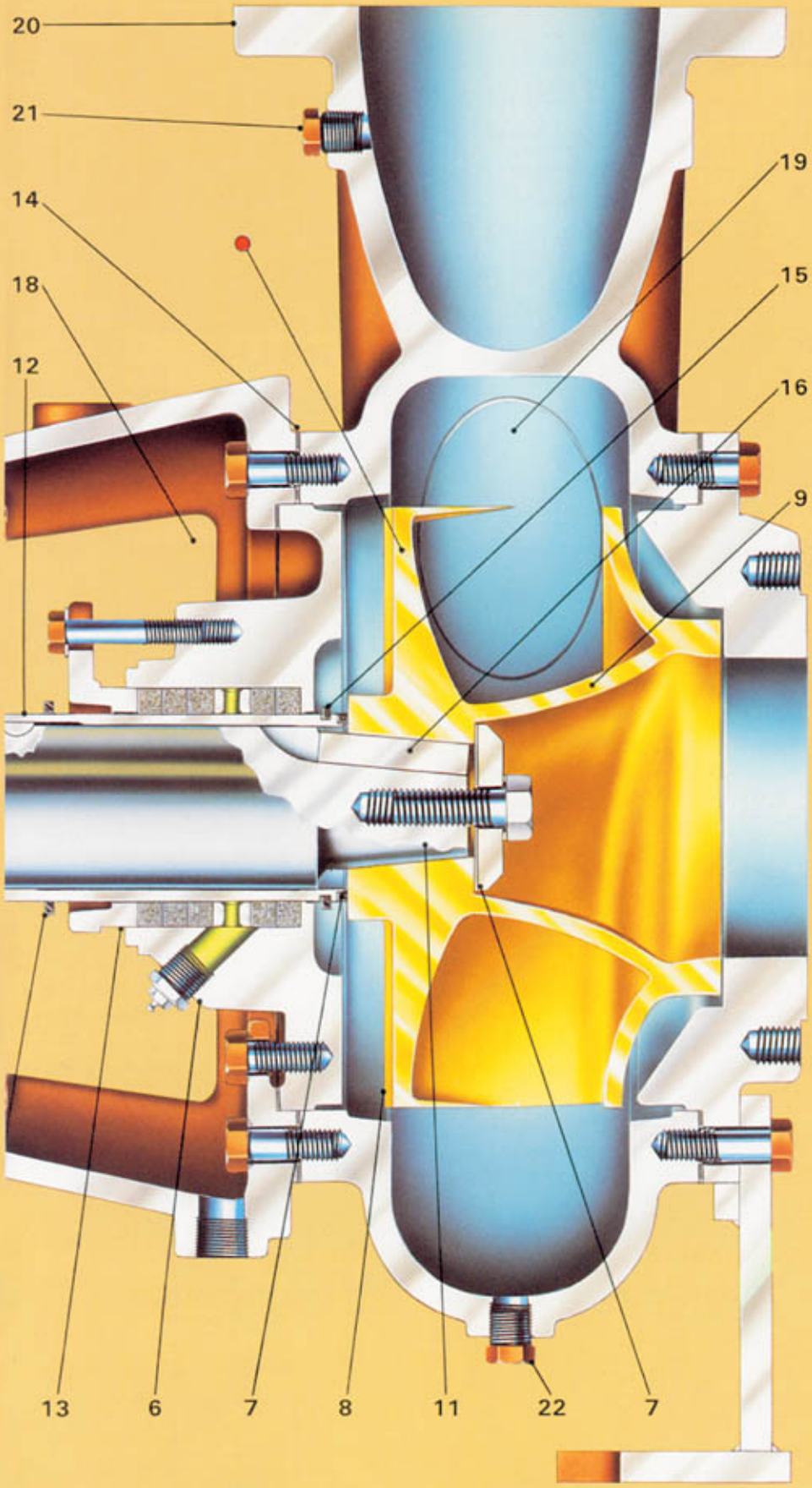
MODELS 611A are horizontally baseplate mounted with a driver flexibly coupled to the pump. This design is recommended where floor space is readily available and where flooding of the installation is not possible. SUPPORT of various pump components is important. Inadequate mounting designs impose unnecessary stress and strain on the pump installation. SPHER-FLO pumps are designed to provide the best component support and serviceability, and is an important feature of the Aurora SPHER-FLO pump design. HORIZONTAL 611A UNITS are supported at both pump and coupling end. This, with centerline discharge support, provides protection against pipe strain and maintains casing support when the drive end of the pump is removed for servicing. The rear support foot greatly simplifies shaft coupling alignment. Aurora Pump offers a complete line of vertical non-clog pumps. There are two distinct advantages over horizontal pump constructions:

- Less floor space required. Two vertical pumps will fit in the same space as one.
- An elevated motor will protect against potential flooding if the pump station location is in a low area.



★ Power Series 4 has a single double row thrust bearing. The back to back thrust bearings illustrated are standard on Power Series 5 and 6.

HORIZONTAL MODEL 611A ILLUSTRATED



● = OPTIONAL ALL BRONZE IMPELLER IS ILLUSTRATED. STANDARD MATERIAL IS IRON.

MODELS 612A are vertically mounted and utilize flexible shafting between the driver and the pump. Vertically mounted models are frequently used on lift station applications where flooding of the installation is a possibility. MODELS 613A are vertically mounted with an elevated driver coupled directly to the pump thru a flexible coupling. Model 613A is very popular for installations where available floor space is limited and where flooding is marginal. Model 614A driver couples directly to the pump. On VERTICAL 613A UNITS, the steel motor base has a registered fit at the motor end and is fastened to a separate motor support. This arrangement assures alignment and concentrates loads on the separate pump adapter thereby elimating strain and misalignment of the bearing housing. This is another exclusive feature of the Aurora SPHER-FLO pump. On 612A, 613A & 614A UNITS a steel suction base is registered to the suction cover assuring adequate support for the pump unit. STANDARD "SPHER-FLO" PUMPS are designed for the requirements of the majority of applications. However, to meet special requirements, a number of optional features are available. For requirements not handled by the following list of options refer to the local sales office.

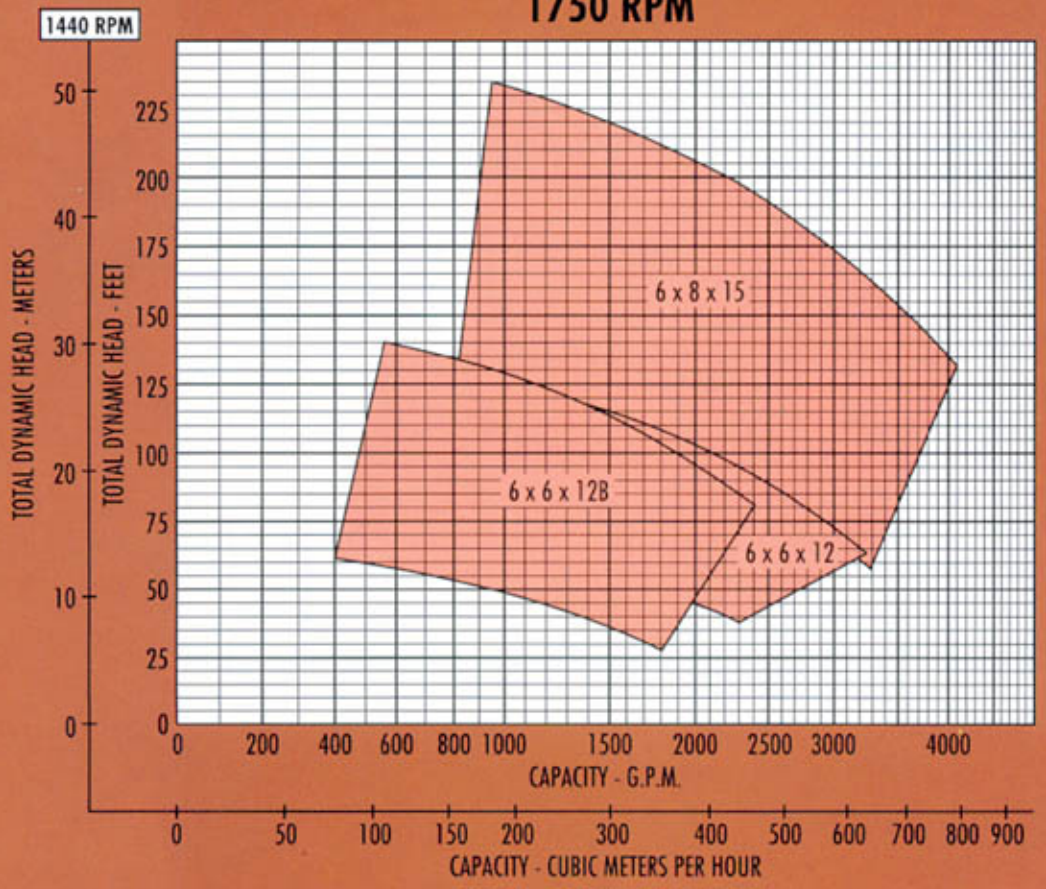
SUCTION NOZZLES for Model 611A series pumps have hand-size inspection openings to allow access to the impeller.

REPLACEABLE WEAR RING available individually or together, protects the impeller and/or casing from wear.

SPACER COUPLINGS are recommended for horizontal pump applications where it is desirable to remove the bearing assembly without disturbing the pump casing or motor.

SHAFT AND SLEEVE are available in special alloy construction for difficult pumping applications.

1750 RPM

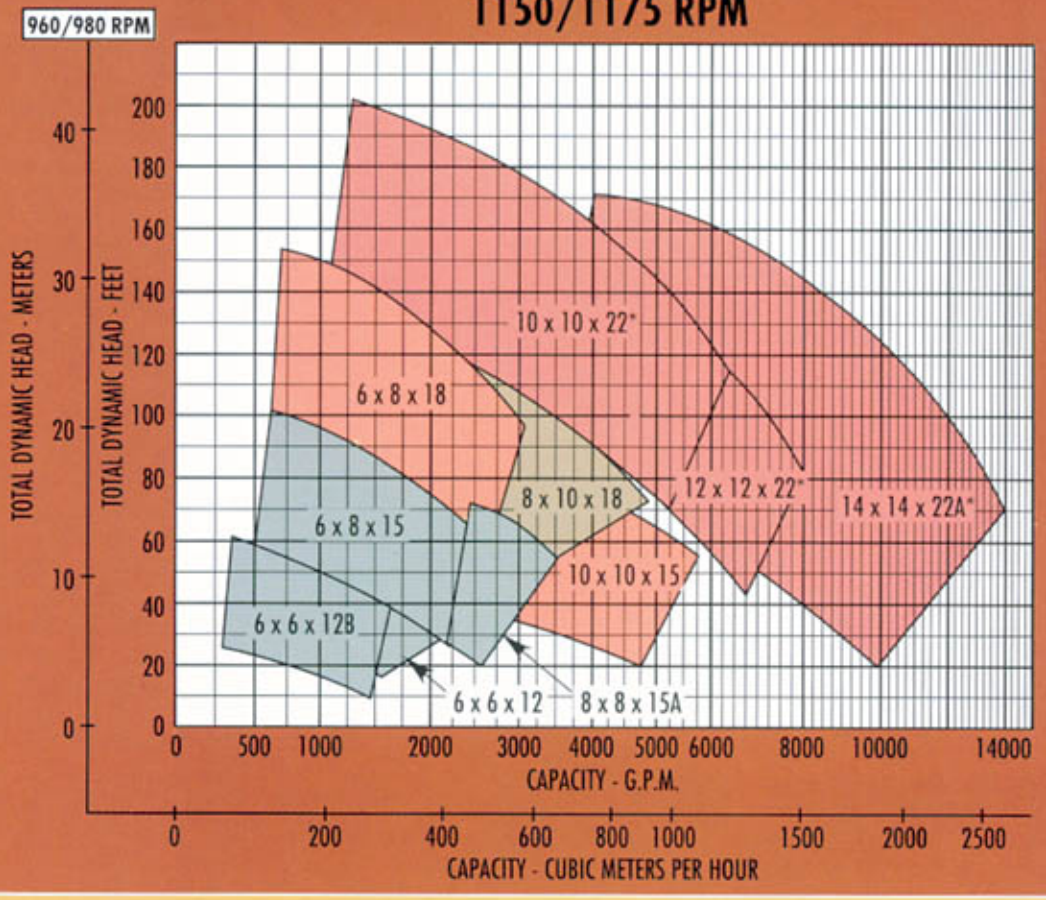


1750 R.P.M.

INDIVIDUAL PERFORMANCE CURVES SHOULD BE CHECKED FOR FINAL SELECTION. FOR SELECTIONS NOT SHOWN ON THIS CHART PLEASE REFER TO THE FACTORY.

POWER SERIES NO. 5F

1150/1175 RPM

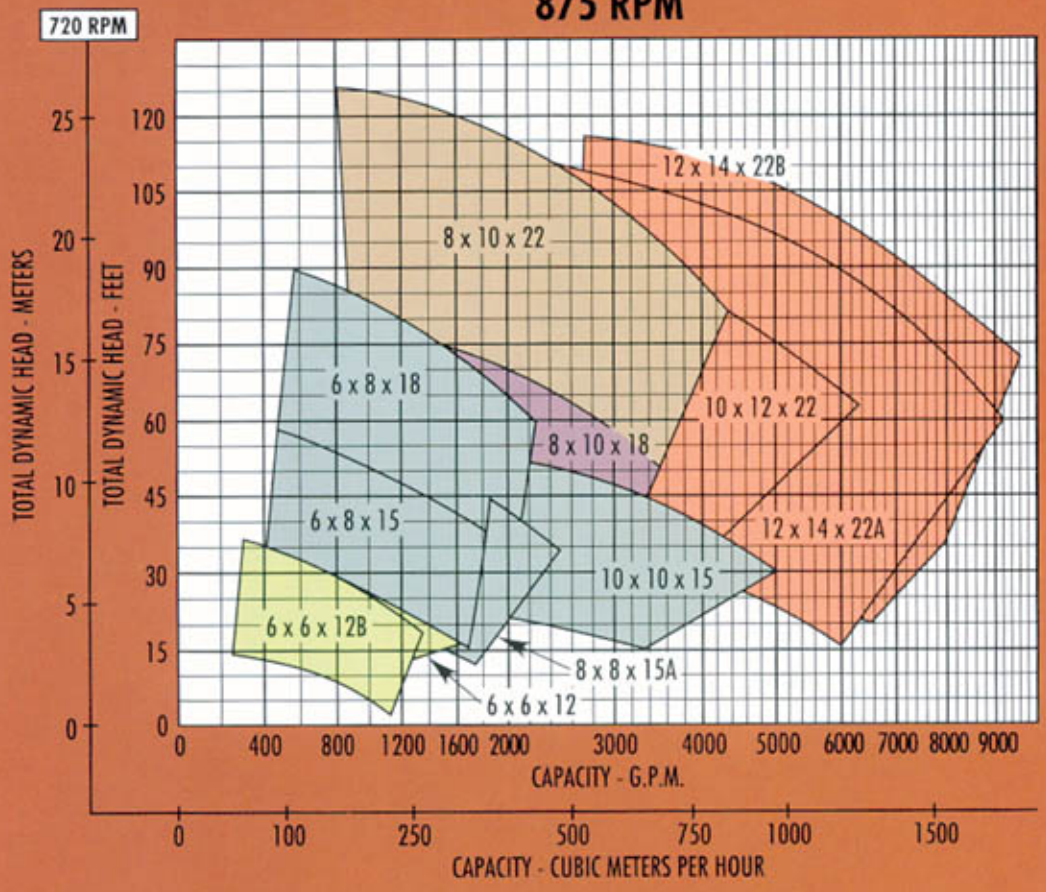


1150/1175* R.P.M.

INDIVIDUAL PERFORMANCE CURVES SHOULD BE CHECKED FOR FINAL SELECTION. FOR SELECTIONS NOT SHOWN ON THIS CHART PLEASE REFER TO THE FACTORY.

POWER SERIES NO. 5E
POWER SERIES NO. 5F
POWER SERIES NO. 5H
POWER SERIES NO. 6E

875 RPM

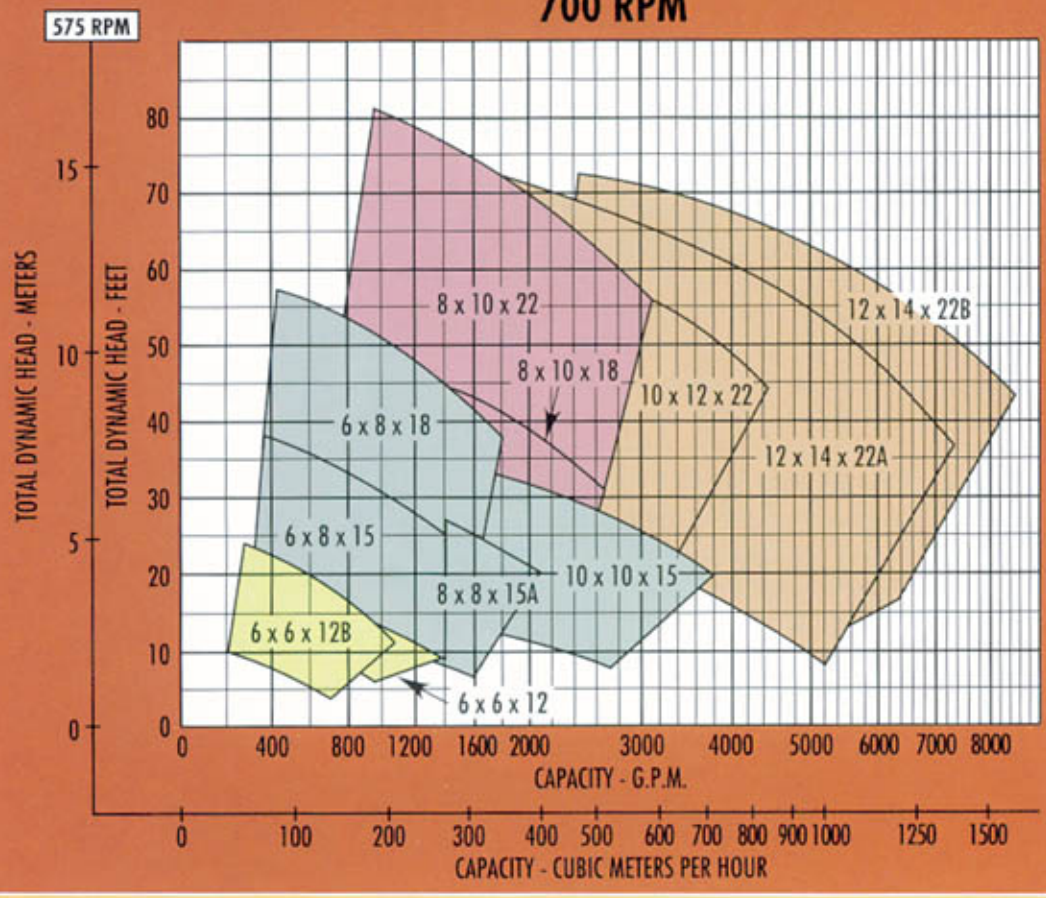


875 R.P.M.

INDIVIDUAL PERFORMANCE CURVES SHOULD BE CHECKED FOR FINAL SELECTION. FOR SELECTIONS NOT SHOWN ON THIS CHART PLEASE REFER TO THE FACTORY.

- POWER SERIES NO. 4C
- POWER SERIES NO. 5E
- POWER SERIES NO. 5G
- POWER SERIES NO. 5H
- POWER SERIES NO. 6D

700 RPM

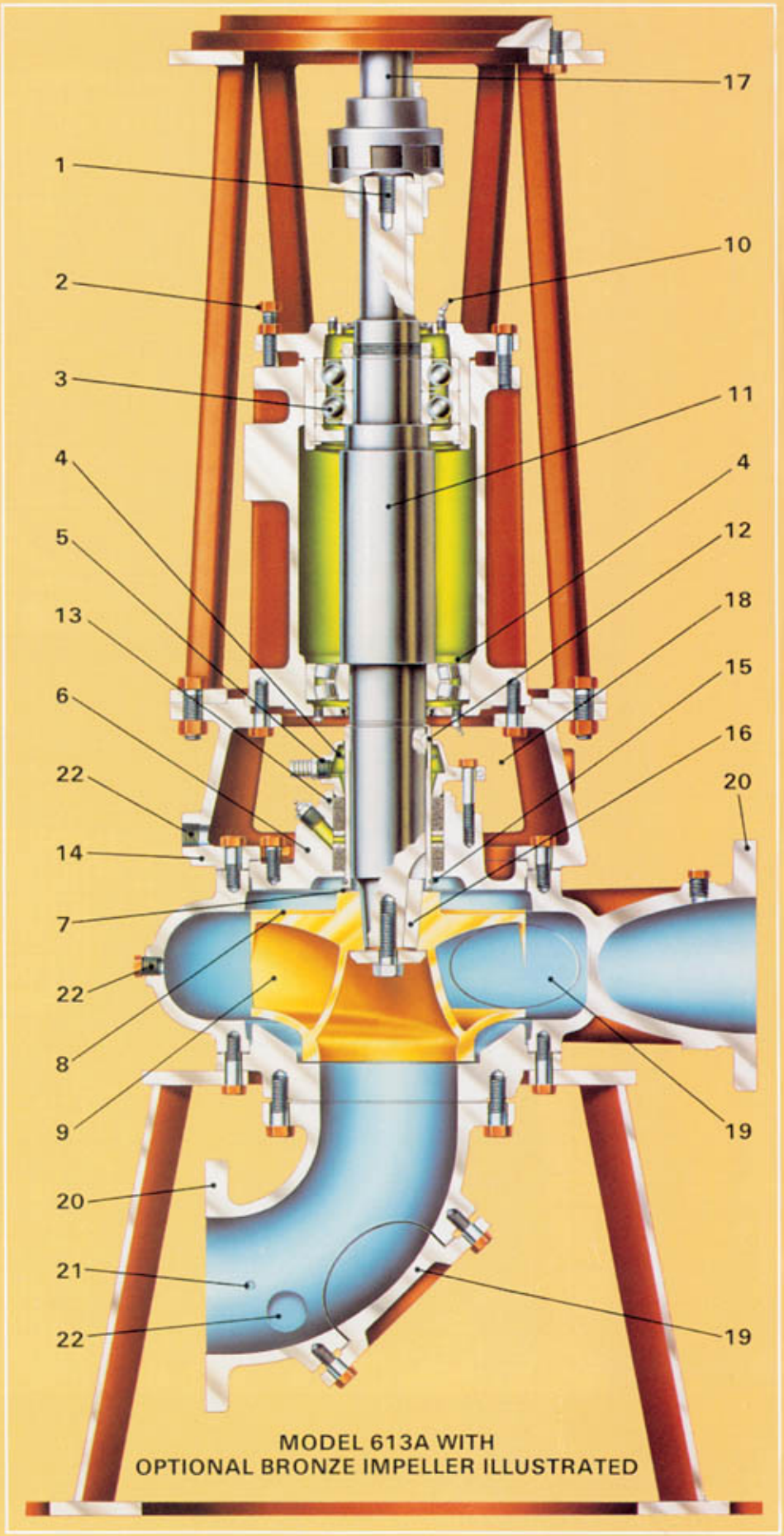


700 R.P.M.

INDIVIDUAL PERFORMANCE CURVES SHOULD BE CHECKED FOR FINAL SELECTION. FOR SELECTIONS NOT SHOWN ON THIS CHART PLEASE REFER TO THE FACTORY.

- POWER SERIES NO. 4C
- POWER SERIES NO. 5E
- POWER SERIES NO. 5G
- POWER SERIES NO. 5H

1 LIFTING EYE tap in shaft end simplifies disassembly.
2 EXTERNAL SHAFT ADJUSTMENT provides for renewing impeller clearance and maintaining pump efficiency.
3 DOUBLE ROW THRUST BEARINGS are added protection for high loads. Average bearing life is 10 years.
4 WATER SLINGER, and grease seals protect both bearings from moisture.
5 LEAKAGE ACCUMULATOR GLAND option to siphon off packing leakage.
6 STUFFING BOXES are machined for mechanical seals or packing. Either may be used without modification.
7 GASKETS protect shaft from pumped liquid corrosion and contamination.
8 IMPELLER WIPER VANES minimize stuffing box pressure and clogging.
9 IMPELLER VANES brought well into the inlet eye to pick up liquid early and to minimize clogging.
10 GREASE LUBRICATION purges old grease from both bearings.
11 RUGGED SHAFT with taper for easy impeller removal and minimum deflection.
12 HARDENED STAINLESS STEEL SLEEVE on packed pump is securely key locked to the shaft.
13 .002 MAXIMUM SHAFT DEFLECTION at stuffing box face extends packing and mechanical seal life.
14 BACK PULLOUT DESIGN for pump maintenance, does not disturb suction or discharge piping.
15 SNAP RING groove is provided for a snap ring to aid in sleeve removal during preventative maintenance period.
16 STEEL IMPELLER KEY, capscrew and washer secures impeller to shaft.
17 NEMA STANDARD "HP" mounting face and shaft extension motors.
18 LARGE ACCESS OPENINGS provide adequate visibility and working room.
19 OVAL CLEANOUTS are large, HAND SIZE and located to provide visibility and accessibility to the impeller blades and the casing cutwater.
20 DISCHARGE flanges can be located in 45° increments for 8 different positions. (suction in 90°-vertical pumps)
21 STANDARD GAUGE TAPS are conveniently located at both the discharge and suction flange openings.
22 STANDARD DRAIN TAPS are located conveniently in the adapter bracket, suction elbow, and casing.



MODEL 613A WITH
OPTIONAL BRONZE IMPELLER ILLUSTRATED

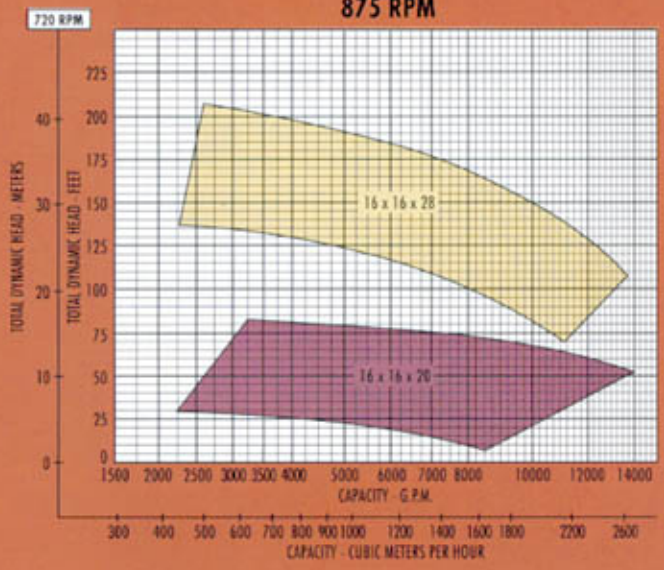
RANGE CHARTS
16''-18''-20'' PUMPS

INDIVIDUAL PERFORMANCE CURVES SHOULD BE CHECKED FOR FINAL SELECTION. FOR SELECTIONS NOT SHOWN ON THIS CHART PLEASE REFER TO THE FACTORY.

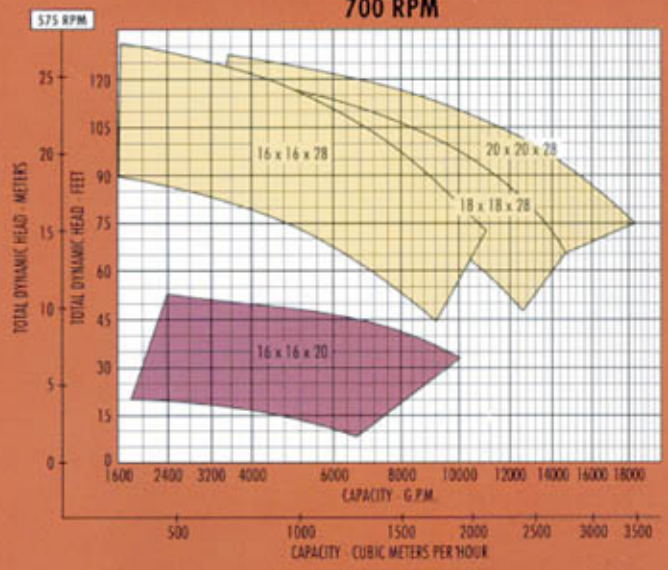
POWER SERIES NO. 6F

POWER SERIES NO. 8

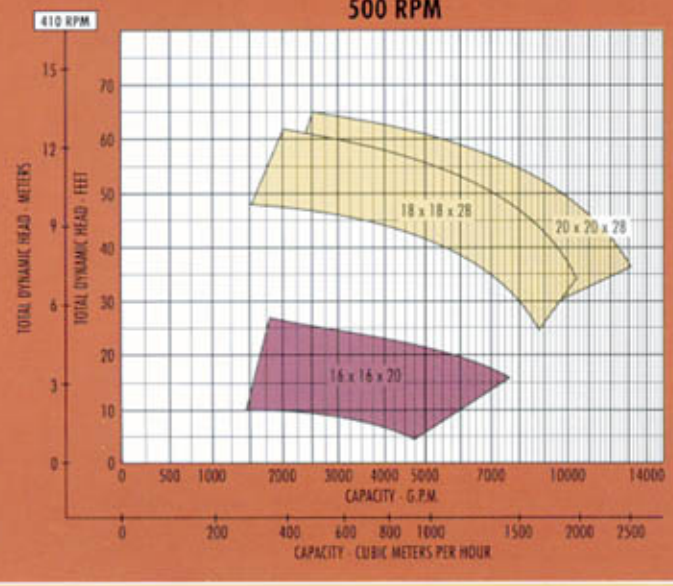
875 RPM

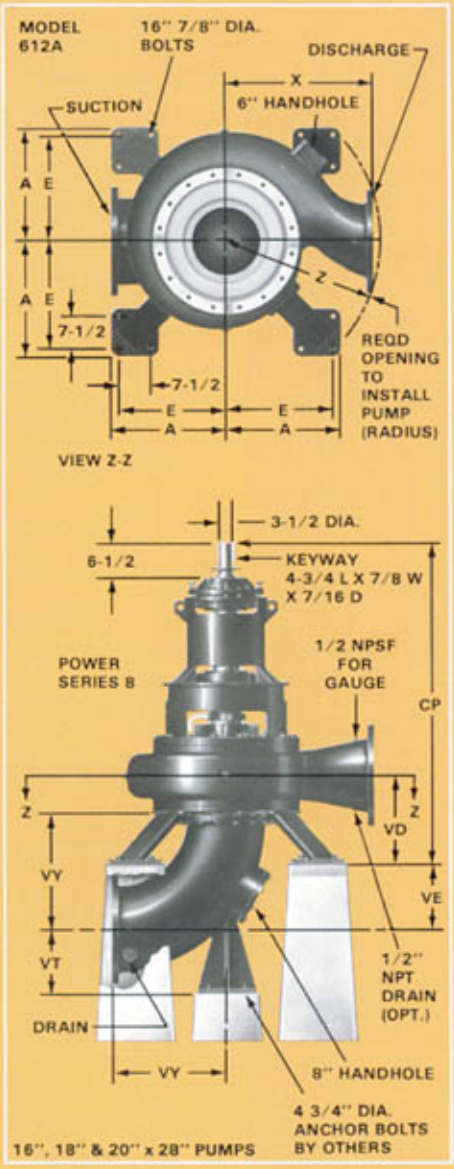


700 RPM



500 RPM





NOTES: 1. Dimensions and weights are approximate. 2. Refer to factory for base dimensions when spacer couplings are specified. 3. Not for construction purposes unless certified. 4. Frame sizes shown are for open dripproof motors only. 5. Conduit box is shown in approximate position. Dimensions are not specified as they vary with each motor manufacturer. 6. Add pump, base and motor weight for unit weight. 7. Discharge position 1 is shown. Alternate discharge positions are available. 8. Refer to factory for Model 614A weight.

CASE BORE SUCT. DISCH.	16 x 16 x 28	18 x 18 x 28	20 x 20 x 28
A	26-1/2	26-1/2	26-1/2
E	24-3/4	24-3/4	24-3/4
X	34	37	42
Z	36	39	44-1/4
CP	74-1/2	78	77-11/16
VD	20-1/8	22-7/8	22-1/16
SUCT. ELBOW	16 x 16	18 x 18	20 x 20
VE	12-15/16	14-1/8	21-15/16
VT	13-3/4	15	16
VY	24	26-1/2	29

611A - 612A - 613A - 614A DIMENSIONS — PUMP

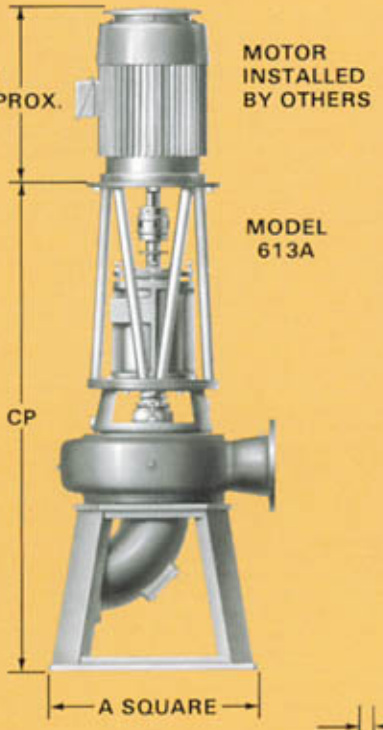
PUMP SIZE				PUMP WEIGHT								CP						
DISCH	SUCT	CASE BORE	POWER FRAME	611A	612A	613A	A	D	U	X	Y	611A	612A	613A	614A	VD	VE	VY
6	6	12	4C-D	580	830	1080	24	13-1/2	1-1/4	14	6-3/16	29-1/2	47-11/16	52-3/16	34-1/8	24-5/16	10-1/8	8
			5F	845	1100	1325	24	13-1/2	2-3/8	14	6-3/16	40-3/8	58-9/16	64-1/8	35-1/4	24-5/16	10-1/8	8
6	6	12B	4C-D	580	830	1080	24	13-1/2	1-1/4	16	6-1/16	29-1/2	47-11/16	52-3/16	34-1/8	24-1/16	10-1/8	8
			5F	845	1100	1325	24	13-1/2	2-3/8	16	6-1/16	40-3/8	58-9/16	64-1/8	35-1/4	24-1/16	10-1/8	8
6	8	15	5E-F	850	1100	1350	30	15-1/4	2-3/8	16	6-1/8	39-7/8	65-7/8	71-7/16	38-1/2	32-1/8	17	9
8	8	18	5E-F	915	1235	1530	30	17-1/2	2-3/8	18	6-7/16	40-1/2	66-1/2	72-1/16	...	32-3/8	17	9
8	8	15A	5E	920	1245	1470	30	15-1/4	2-3/8	19	9-1/8	43-1/4	66-1/2	72-1/16	32-3/8	32-3/8	14-1/4	9
8	10	18	5G-H	1055	1375	1675	30	17-1/2	2-3/8	19	6-3/4	41-3/8	67-5/8	73-3/16	...	33	16	11
8	10	22	5G-H	1260	1930	2220	37	21	2-3/8	22	6-7/8	41-1/2	69-1/8	74-11/16	...	34-1/2	16-5/8	11
10	10	15	5E-F	925	1510	1830	30	15-1/4	2-3/8	20	10-1/16	44-7/8	67-5/8	73-3/16	44	32-15/16	11-7/8	11
10	10	22	6E	1430	2100	...	37	21	2-7/8	22	6-7/8	44	71-5/8	77-3/16	...	34-1/2	16-5/8	11
10	12	22	5G-H	1390	2060	2360	37	21	2-3/8	22-1/2	7-3/16	42-1/4	70-1/4	75-13/16	...	35-1/8	15-9/16	12
			6D	1510	2180	2480	37	21	2-7/8	22-1/2	7-3/16	44-3/4	72-3/4	78-5/16	...	35-1/8	15-9/16	12
12	12	22	6E	1560	2230	...	37	21	2-7/8	22-1/2	7-1/4	44-3/8	72-3/4	78-5/16	...	35-1/8	15-9/16	12
12	14	22	5G-H	1460	2135	2435	37	21	2-3/8	24	7-1/4	42-3/8	70-1/4	75-13/16	...	35-1/8	13-7/8	14
	A & B		6D	1580	2250	2550	37	21	2-7/8	24	7-1/4	44-3/8	72-3/4	78-5/16	...	35-1/8	13-7/8	14
14	14	22A	6E	1630	2300	...	37	21	2-7/8	24	7-1/4	44-3/8	72-3/4	78-5/16	...	35-1/8	13-7/8	14
16	16	20	6F	2500	...	...	...	24	2-7/8	32	23-1/2	63-3/8	...	...	...	...	...	...

611A — DIMENSIONS — BASE

PUMP SIZE	MOTOR FRAMES	HA	HB	HG	HO	HY	BASE WGT.
6x6x12	254T-286T	20	56	1-1/2	32	10	131
	324T	25-5/8	72	2	32	7	272
	284T-365T	25-5/8	72	2	32	7	272
6x6x12B	254T-286T	20	56	1-1/2	32	10	131
	324T	25-5/8	72	2	32	7	272
	284T-365T	25-5/8	72	2	32	7	272
6x8x15	284T-365T	25-5/8	72	2	36	8	272
	404T-405T	29-5/8	82	2	35	8	437
	444T-445T	29-5/8	90	2	35	8	477
6x8x18	284T-365T	25-5/8	72	2	40	9	272
	404T-405T	29-5/8	82	2	40	9	437
	444T-445T	29-5/8	82	2	40	9	437
8x8x15A	256T-326T	25-5/8	72	2	36	9	272
	364T-365T	29-5/8	74	2	36	9	381
	404T-405T	29-5/8	82	2	36	9	437
8x10x18	284T-326T	25-5/8	72	2	41	9	272
	364T-365T	29-5/8	74	2	41	9	381
	404T-444T	29-5/8	82	2	41	9	437
	445T & LGR	29-5/8	90	2	41	9	477
8x10x22	324T-326T	29-5/8	74	2	47	12	381
	364T-405T	29-5/8	82	2	47	12	437
	444T & LGR	29-5/8	90	2	47	12	477
10x10x15	284T-326T	29-5/8	74	2	39	9	381
	364T-444T	29-5/8	82	2	39	9	437
	445T & 365TS	29-5/8	90	2	39	9	477
10x10x22	445T & LGR	37	110	2	48	13	735
10x12x22	364T-365T	29-5/8	74	2	48	13	381
	404T-405T	29-5/8	82	2	48	13	437
	444T-445T	29-5/8	90	2	48	13	477
	404T-405T	29-5/8	82	2	48	13	437
	444T-445T	29-5/8	90	2	48	13	477
12x12x22	445T & LGR	37	110	2	48	13	735
12x14x22 A & B	364T-365T	29-5/8	74	2	49	13	381
	404T-405T	29-5/8	82	2	49	13	437
	444T-445T	29-5/8	90	2	49	13	477
	404T-405T	29-5/8	82	2	49	13	437
	444T & LGR	29-5/8	90	2	49	13	477
14x14x22A	445T & LGR	37	110	2	50	13	735
16x16x20	364T-365T	29-5/8	82	2	60-1/2	11-1/2	437
	404T-405T	29-5/8	90	2	60-1/2	11-1/2	477
	444-445T	29-5/8	90	2	60-1/2	11-1/2	477
	445T & LGR	37	110	2	61	11-1/2	735

MOTOR FRAME*	HORSE POWER AT RPM				MOTOR WGT. IN LBS.	C	AG
	1750	1150	875	700			
184T	5	—	—	—	85	14	14
213T	7-1/2	—	—	—	150	16	16
215T	10	5	—	—	190	18	17
254T	15	7-1/2	—	—	230	21	19
256T	20	10	7-1/2	5	250	23	21
284T	25	15	10	7-1/2	350	24	22
286T	30	20	15	10	380	25	23
324T	40	25	20	15	475	26	24
326T	50	30	25	20	525	28	26
364T	—	40	30	25	630	29	25
364TS	60	—	—	—	630	27	25
365T	—	50	40	30	690	30	25
365TS	75	—	—	—	690	28	25
404T	—	60	50	40	830	33	28
404TS	100	—	—	—	830	30	28
405T	—	75	60	50	915	34	28
405TS	125	—	—	—	915	31	28
444T	—	100	75	60	1000	38	32
444TS	150	—	—	—	1000	34	32
445T	200 250	125 150	100 125	75 100	1100	40	32

*NOTE: Frame sizes listed are for O.D.P. motors. Model 611A pumps use "T" frame motors. Models 612A and 613A use "HP" frame motors. Model 614A pumps use "TCV" frame motors.

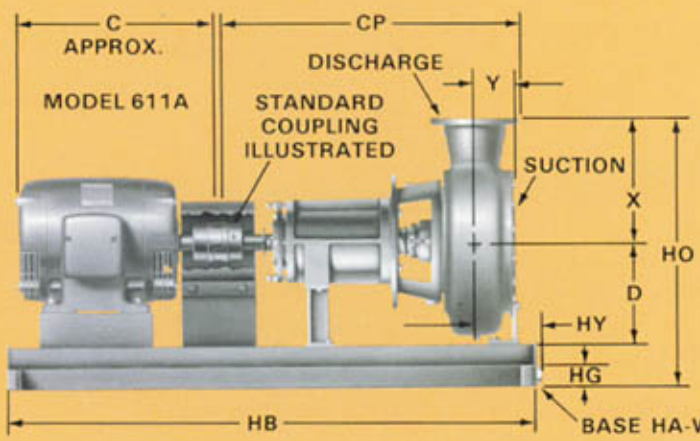


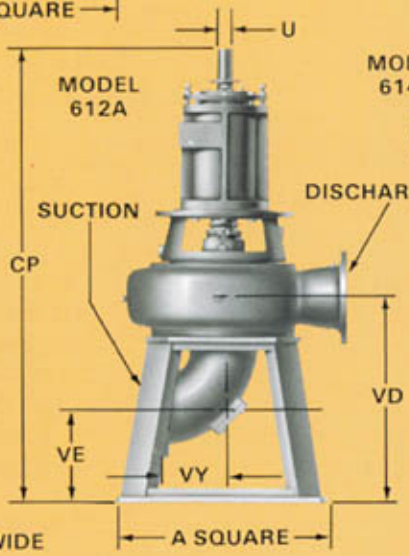
LIMITATIONS

Maximum hydrostatic test pressure ..... 125 PSI++
Maximum recommended case work pressure ..... 100 PSI++
Maximum suction pressure ..... 100 PSI++
Maximum temperature packing ..... 250°F
Maximum temperature mechanical seal ..... 225°F
Maximum operation speed ..... 1800 RPM

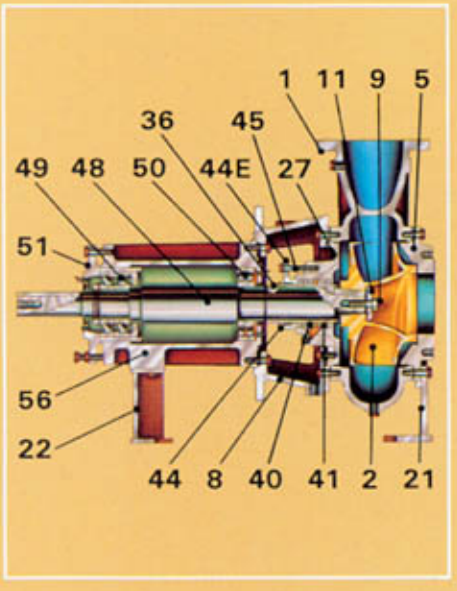
++For pump size 6 x 8 x 15 at 1750 RPM with shut-off TDH greater than 231 feet the following limitations apply:

1. Maximum hydrostatic test pressure ..... 150 PSI
2. Maximum recommended case working pressure ..... 125 PSI
3. Maximum suction pressure ..... 125 PSI





ENGINEERING SPECIFICATIONS



AREA	DESCRIPTION		POWER SERIES *Indicates Back to Back Bearings Quantity 2. 4C	4D	5E	5F	5G	5H	6D-6F	6E	8
STUFFING BOX	Stuffing Box Bore Dia.	PACKING	3-9/32	3-9/32	4-25/32	4-25/32	4-25/32	4-25/32	6-25/32	6-25/32	8-17/32
	Stuffing Box Depth		2-3/4	2-3/4	3-1/2	3-1/2	3-1/2	3-1/2	5-1/4	5-1/4	8-1/8
	Outside Dia., Sleeve for Packing		2-1/2	2-1/2	3-3/4	3-3/4	3-3/4	3-3/4	5-1/4	5-1/4	7
	Total No. of Pack. Rings w/Lantern Ring		5	5	5	5	5	5	5	5	5
	No. of Rings in Front of Lantern Ring		2	2	2	2	2	2	2	2	2
	Packing Size		3/8 x 3/8		1/2 x 1/2		1/2 x 1/2		3/4 x 3/4		3/4 x 3/4
	Width of Lantern Ring		5/8	5/8	3/4	3/4	3/4	3/4	1-1/8	1-1/8	1-1/8
	Distance from Box to Nearest Obstruction		2-15/16	2-15/16	2-3/4	2-3/4	2-3/4	2-3/4	3-5/16	3-5/16	2-1/2
	Length of Mech. Seal	M SEAL	REFER TO FACTORY								
	Outside Dia., Sleeve for Mechanical Seal		2-1/4	2-1/4	3-5/8	3-5/8	3-5/8	3-5/8	5	5	N/A
SHAFT	Diameter at Impeller (Taper Average)		1-7/16	1-7/16	2-1/4	2-1/4	2-7/8	2-7/8	2-7/8	2-7/8	3-1/2
	Dia. at Shaft Sleeve		1-7/8	1-7/8	3-1/4	3-1/4	3-1/4	3-1/4	4-1/2	4-1/2	6
	Dia. Between Bearings (Max. Shaft Dia.)		3-5/16	3-5/16	4-1/8	4-1/8	4-1/8	4-1/8	5-1/4	5-1/4	7-1/2
	Dia. at Coupling End		1-1/4	1-1/4	2-3/8	2-3/8	2-3/8	2-3/8	2-7/8	2-7/8	3-1/2
	Maximum Deflection at Stuffing Box Face		.002	.002	.002	.002	.002	.002	.002	.002	.002
BEARINGS	Bearing Number (Inboard Radial)		6311	21311	6317	21317	6317	21317	23024	22224	22232
	Bearing Number (Outboard Thrust)		3309	3309	7315*	7315*	7315*	7315*	7222*	7322*	22326
	Bearing Centers		7-3/4	7-3/4	12-11/16	12-11/16	12-11/16	12-11/16	12-5/8	12-3/4	21
	Min. Life of Brg. Under Worst Conditions of Load in Years (2)		2	2	2	2	2	2	2	2	2

PC NO.	DESCRIPTION	FITTED	MAT'L OF CONST.
1	Casing	Iron	Cast Iron ASTM A48
2	Impeller	Iron	Cast Iron ASTM A48
+3	Wear Ring (Impeller)	Iron	Stainless Steel AISI 420
5	Cover	Iron	Cast Iron ASTM A48
+6	Wear Ring (Cover)	Iron	Stainless Steel AISI 420
8	Bracket	Iron	Cast Iron ASTM A48
9	Imp. Screw	Iron	Cadmium Plated Steel
11	Washer	Iron	Steel
21	Support	Iron	Steel ASTM A-36
22	Support - 611A	Iron	Steel ASTM A-36
+22	Motor Support - 613A	Iron	Steel ASTM A-36
27	Stuffing Box	Iron	Cast Iron ASTM A48
36	Sleeve (Pack)	Iron	Hard. Stn. Steel AISI 440C
	Sleeve (Seal)	Iron	Bronze ASTM B62
	Sleeve (Seal)	Stainless	Stainless Steel AISI 316
40	Packing	Iron	Graphite/Teflon lube acrylic yarn
41	Lant. Ring	Iron	Teflon
		Stainless	Stainless Steel AISI 316
44	Gland	Iron	Cast Aluminum A356-T6
44E	Clamp	Iron	Cadmium Plated Stl.
		Stainless	Stainless Steel AISI 18-8
45	Stud (Optional)	Iron	Steel
	Capscrew (Standard)	Stainless	Stainless Steel AISI 18-8
48	Shaft	Iron	Steel SAE 1045
49	Bearing	Iron	Steel
50	Bearing	Iron	Steel
51	Brg. Cap	Iron	Cast Iron ASTM A48
56	Frame	Iron	Cast Iron ASTM A48
+65	Elbow	Iron	Cast Iron ASTM A48

+Not Illustrated (optional)
All iron pump construction is furnished unless specified.

MODEL 611A, 612A, 613A, AND 614A — Furnish and install as shown on the plans. Aurora Model . . . . (Horizontal-611A) (Vertical-613A Flexible Coupled) (Vertical 612A Open Shaft) (Vertical 614A Close Coupled) type Non-Clog Centrifugal pump. The pump shall be capable of delivering a capacity of . . . . GPM when operating against a total dynamic head of . . . . feet. The pump shall also deliver a maximum of . . . . GPM when operating against a head of . . . . feet. The minimum shut-off head acceptable will be . . . . feet. — The pump shall operate at a maximum speed of . . . . RPM. A unit operating at a lesser rotative speed will be considered, but in no event will a pump operating at more than the maximum speed specified be acceptable. **PUMP CASING** — The pump casing shall be of the top centerline design and will be constructed of "APCO-LOY 33," and shall be of sufficient thickness to withstand stresses and strains at full operating pressures. Casings shall be subject to a hydrostatic pressure test of 125 lbs. A minimum size handhole 3" x 5" is to be provided in the casings for clean out purposes. The casing design shall allow front or rear impeller pullout. **BEARING HOUSING** — The bearing housing is to be of cast iron and shall be furnished with a set of regreaseable bearings for both radial and thrust loads. The bearings shall have an average life of 100,000 hours and shall be mounted in a machined, moisture and dust proof housing. The housing is to have register fit and then be bolted to the pump casing to insure permanent alignment. An extra deep (split) packing box simplifying packing replacement and shaft sleeve inspection is to be provided and must be so arranged with a lantern ring for either grease lubrication or tapped connections for water sealing from an outside source. A 3/4" drain opening must be provided to facilitate removal of lubricating liquid. **IMPELLER** — The impeller shall be of the enclosed type with wiper blades located on the back shroud to prevent accumulation of solids behind the impeller. The vanes shall be skewed to reduce noise. The impeller is to be of "APCO-LOY 33" and shall be capable of passing a minimum sphere size of . . . . inches. The impeller shall be dynamically balanced before assembly into the pump and shall be securely fastened to the shaft by means of a stainless steel key and impeller locknut. Axial adjustment of the impeller is to be external and a minimum clearance of . . . . thousands should be maintained between the impeller and suction wearplate. **PUMP SHAFT** — The pump shaft shall be constructed of high grade carbon steel having a tapered impeller extension and accurately machined. The minimum diameter acceptable will be . . . . inches. The pump shaft shall be protected from wear by a corrosion and wear resisting hardened stainless steel shaft sleeve having a 450 minimum brinnel hardness. An "O" ring type gasket must be provided between the impeller hub and the shaft sleeve to prevent pumped liquid from corroding the shaft. **MODEL 611A** — The pump and motor shall be mounted on a common base (formed steel) (structural steel) with drip rim. Alignment shall be checked in accordance with the Standards of the Hydraulic Institute after installation and there shall be no strain transmitted to the pumps. **MODEL 612A** — Vertical open shaft pumps are to be driven through flexible shafting with . . . . dia. tubing, and intermediate bearings. Shafting must be of sufficient size to transmit required horsepower and must be provided with a slip spline which will permit removal of the pump rotating assembly without removing any section of intermediate shafting, bearings, suction or discharge piping. **MODEL 613A** — Vertical flexible coupled pumps shall be furnished with a steel fab. motor bracket which is to be bolted to a separate pump adapter. **MODEL 610A-614A** — The motor bracket must be machined with a register fit to insure proper alignment of motor and pump shaft. **MODEL 612A, 613A AND 614A** — The pump shall be supported by a fab. steel pedestal base and shall be fab. with a square footing to prevent legs being broken during shipment. The pedestal shall have openings large enough to permit access to the suction line. A handhole of not less than 5" in diameter must be provided in the suction elbow. The pedestal must be of sufficient height so that the suction elbow will not touch the foundation upon which it stands.

The Engineering Specification has been condensed from a very comprehensive specification. Additional information is available from any Aurora Pump Sales Office. Aurora Pump reserves the right to make revisions to its products and their specifications, and to this bulletin and related information without notice.

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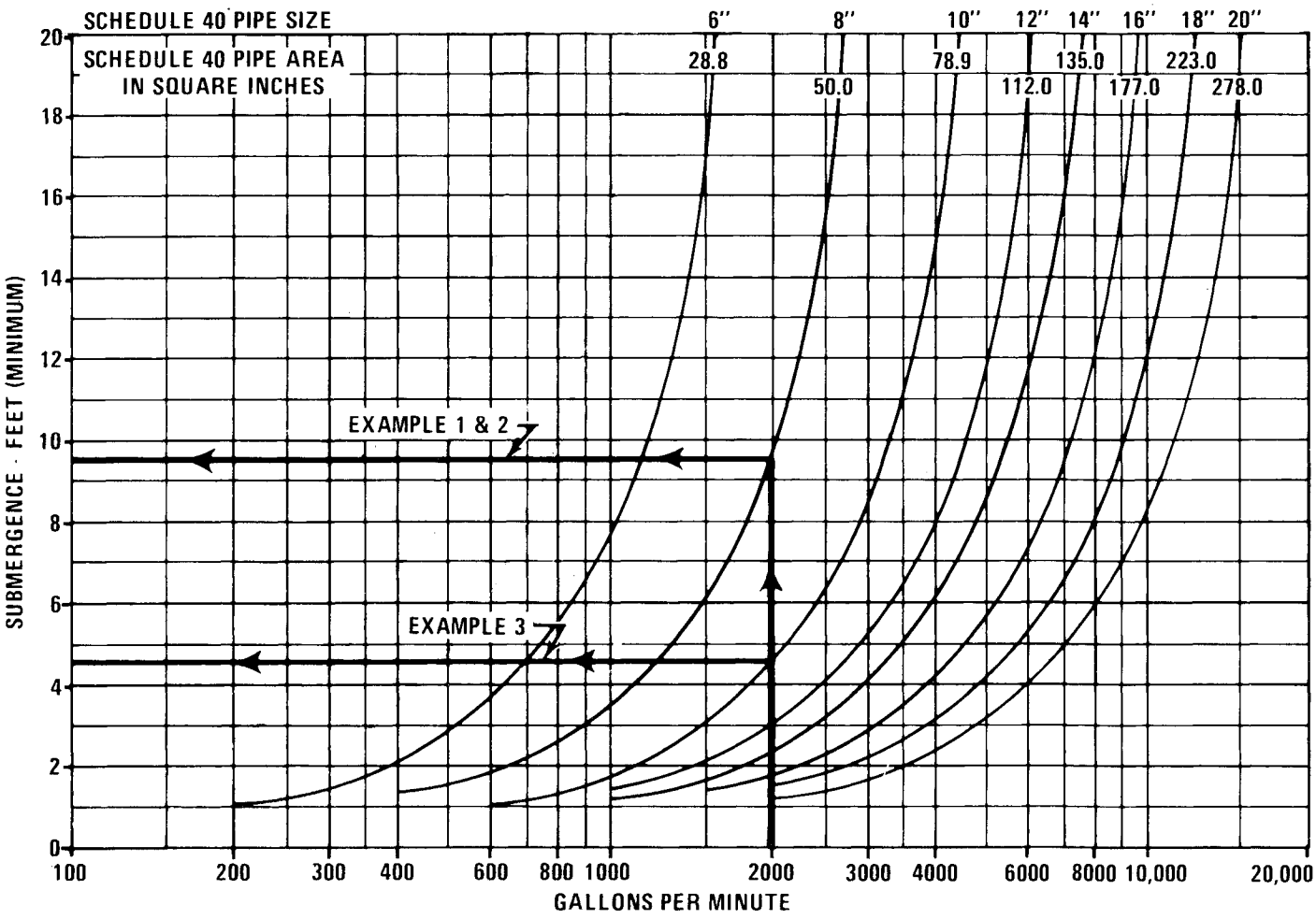


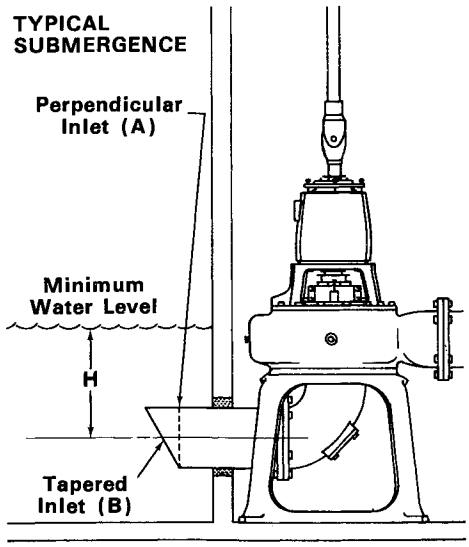
SUBMERGENCE

Air may be entrained in the pumped liquid if the pump suction is located too close to the free liquid surface in the suction source. Pumping liquid with entrained air can cause a reduction of capacity, rough and noisy operation, vibration, loss of efficiency and wasted power. Excessive wear of close running parts, bearing stresses and shaft damage are also subsequent effects.

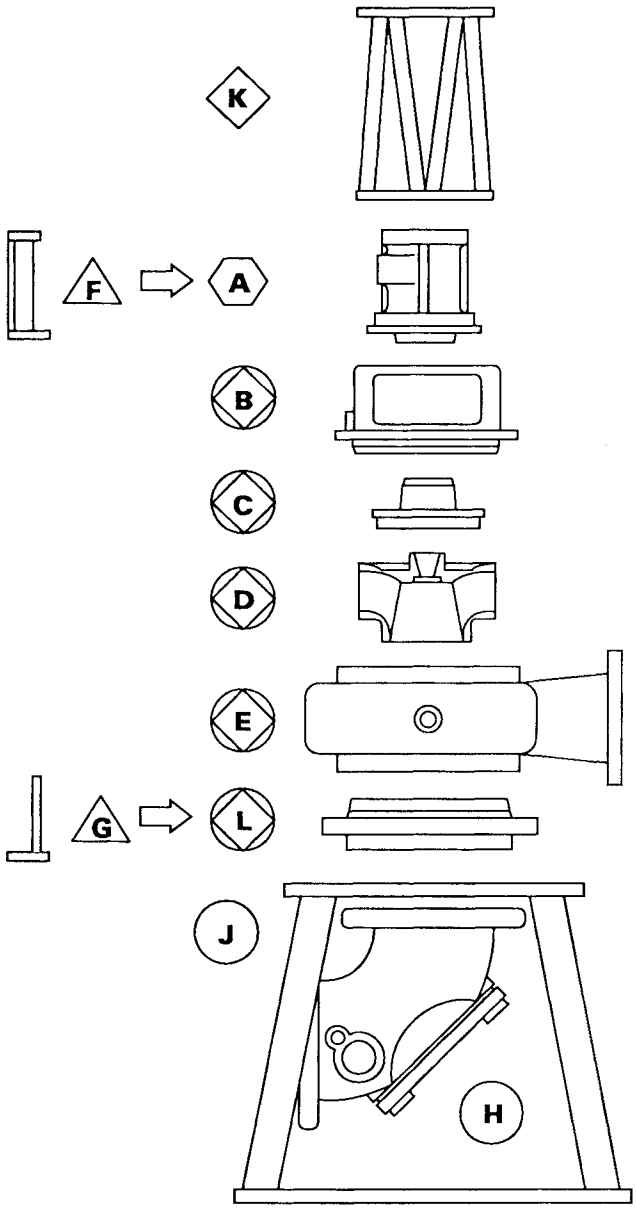
EXAMPLES:

1. When the pipe size is known, the minimum submergence required for 2000 GPM through an 8" pipe is 9.6 feet.
2. When the inlet area is known, the minimum submergence required for 2000 GPM through a 50 square inch outlet is 9.6 feet. Minimum submergence requirements may exceed the available space requirements. When this occurs a larger pipe size or inlet will reduce the required submergence.
3. The minimum submergence required for 2000 GPM through a 10" pipe is 4.6 feet (5.0 feet less than required for an 8" pipe).

TYPICAL SUBMERGENCE



INTERCHANGEABILITY



Spher-Flo pumps are designed for maximum interchangeability. Model 611A is available in 14 sizes. Model 612A in 17 sizes, Model 613A in 14 sizes, and Model 614A in 6 sizes, offering a model and size precisely fitted to the installation requirements over a wide range of capacities. The 17 sizes are divided into 9 "Power Frames." All parts are interchangeable within a given power frame except for the liquid end and supports. The chart illustrates the degree of interchangeability achieved with the standard Spher-Flo pumps.

Model 611A Only .....
Model 612A Only .....
Model 613A Only .....
Models 612A, 613A, & 614A .....
Models 611A, 612A, & 613A .....
Models 611A, 612A, 613A, & 614A .....

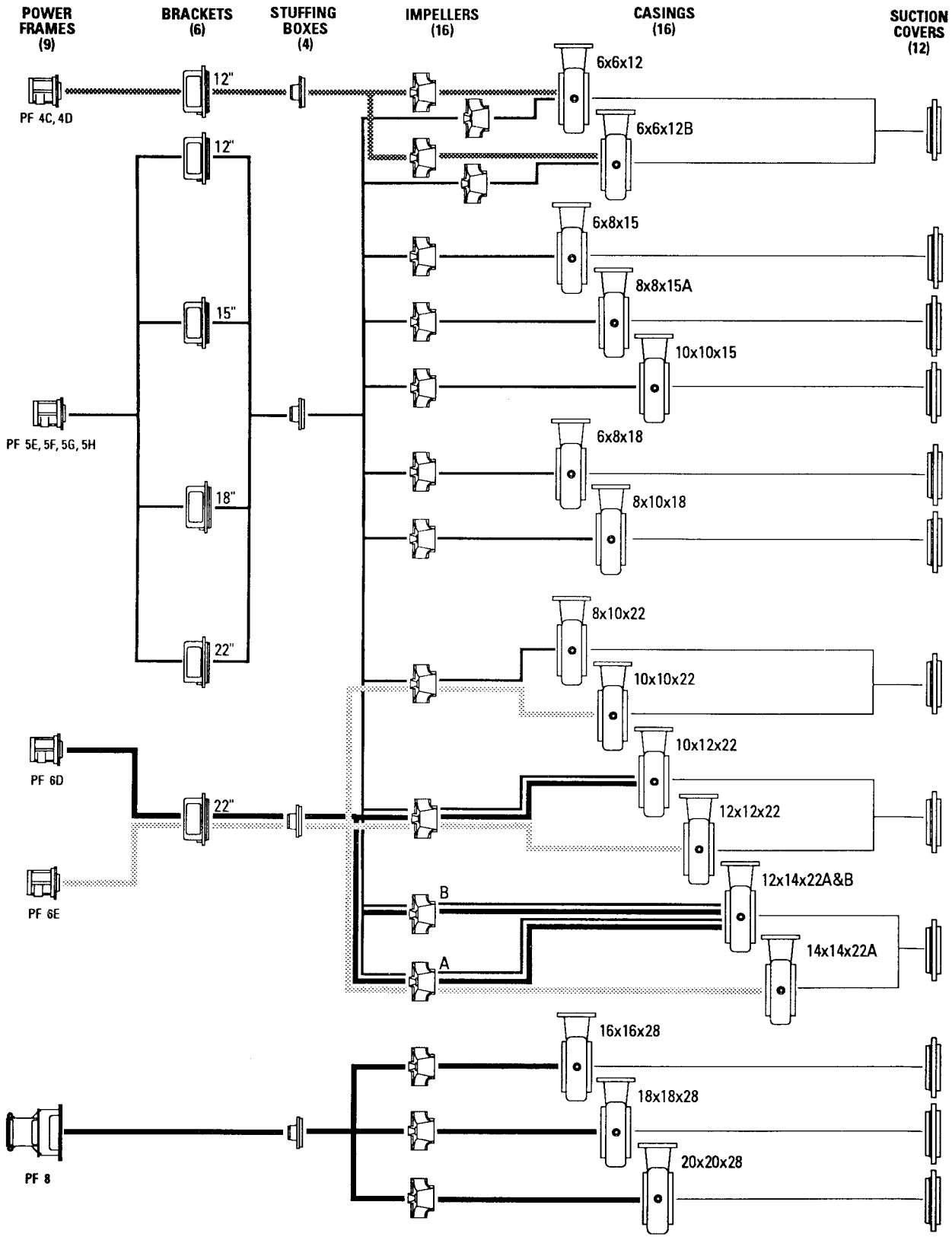
	Qty
A - Power Frames	9
B - Brackets	6
C - Stuffing Boxes	4
D - Impellers	16
E - Casings	16
F - Mounting Feet (Rear)	5
G - Mounting Feet (Front)	4
H - Elbows	13
J - Bases	6
K - Motor Supports	3
L - Suction Covers	12

POWER FRAME SELECTION

PUMP SIZE	POWER FRAME	RPM 1750	1175	1150	875	700	585	580	500
6x6x12		5F		4D	4C	4C			
6x6x12B		5F		4D	4C	4C			
6x8x15		5F		5E	5E	5E		5E	
8x8x15A				5E	5E	5E		5E	
10x10x15				5F	5E	5E		5E	
6x8x18				5F	5E	5E		5E	
8x10x18				5H	5G	5G		5G	
8x10x22					5H	5G		5G	
10x10x22			6E						
10x12x22					6D	5H		5G	
12x12x22			6E						
12x14x22A					6D	5H		5G	
12x14x22B					6D	5H		5G	
14x14x22A			6E						
16x16x28					8	8	8		
18x18x28						8	8		8
20x20x28						8	8		8

AURORA 610A SERIES ENGINEERING DATA

INTERCHANGEABILITY



AURORA MODEL 610 PUMP
SPLIT PACKING BOX OPTION
POWER FRAMES 4, 5 & 6 ONLY

Optional Split Packing Box With Leakage Accumulator Gland Illustrated

Split packing boxes separate vertically through the packing insert to simplify packing replacement and shaft sleeve inspection. The insert halves are dowled, register aligned and gasketed to prevent leakage. Only six bolts need be removed to expose all of the packing and lantern ring. Remove two more bolts and the remaining packing box insert half can be removed.

The completely exposed packing and sleeve area coupled with the extra large access openings in the pump adapter provides the ultimate in packing accessibility.

Five (5) die-molded, diagonally split, packing rings complete with lantern ring line the stuffing box. The general service packing consists of graphited fiber.

The stuffing box length, bore, sleeve diameters and lantern ring width conform with the recommended standard of the Mechanical Packing Association (MPA).

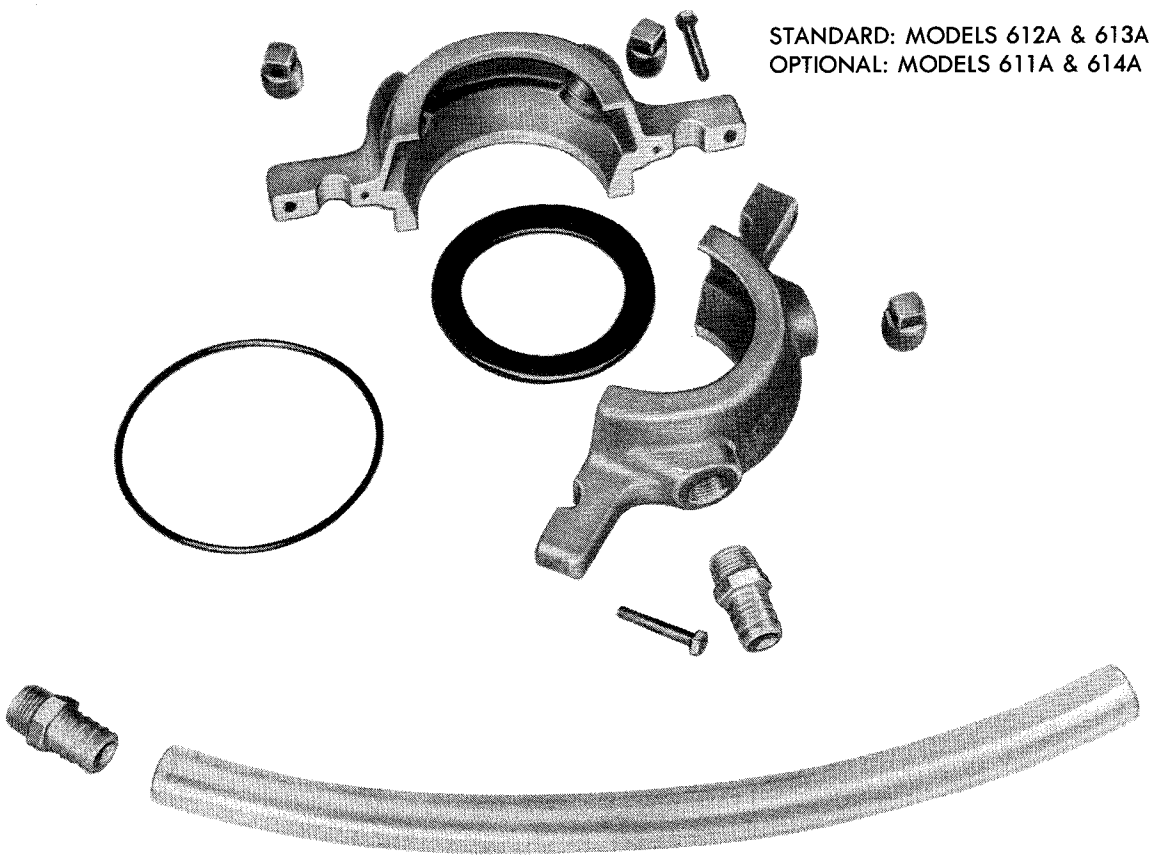
A tapped opening is provided for lubricating the stuffing box. Lubrication is accomplished by adding grease directly into the lantern ring cavity through a grease fitting or by connecting a by-pass line between the pump discharge and the stuffing box. Automatic grease seals as well as other flushing options are also available.

The standard 450 minimum brinnel hardened stainless steel shaft sleeve extends through the entire length of the box and gland and is provided with a snap ring. This snap ring design allows the sleeve and the completely assembled packing box to be removed intact. Reassembly can be accomplished in the same manner. Assemble the complete stuffing box at the convenience of the work bench, install and adjust the packing for proper lubrication leakage (5-10 drops per minute after run-in).

DATED NOVEMBER 1988
SUPERSEDES PAGE 166
DATED OCTOBER 1982

AURORA MODEL 610 PUMP
LEAKAGE ACCUMULATOR
POWER FRAMES 4, 5 & 6 ONLY

STANDARD: MODELS 612A & 613A
OPTIONAL: MODELS 611A & 614A

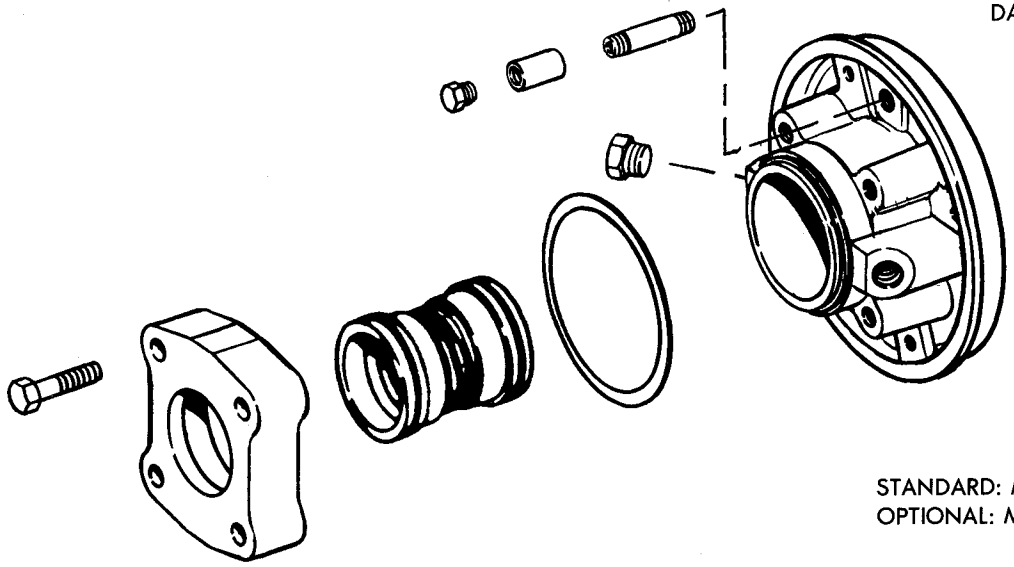


The leakage accumulator gland (sprayless, dripless packing gland) is designed and constructed to prevent the collection of packing leakage in the pump bracket of a vertical or horizontally mounted pump. The leakage accumulator gland has a volute shape with two symetrical halves. This gland encloses the water slinger preventing any spray from escaping and contaminating the area. The leakage is efficiently directed to a drain connection.

The two gland halves are doweled, bolted together, and sealed at the parting line with a soft liquid sealant. An "O" ring seal between the gland and packing box prevents any leakage in this area. One of the pipe tap ports on the side of the gland is fitted with a hose connector and a clear plastic section of hose, to both drain off and allow visual inspection of the leakage. The remaining ports have pipe plugs, but may be used for maintenance purposes to flush & drain debris from the accumulator.

AURORA MODEL 610 PUMP
DOUBLE MECHANICAL SEAL

DATED **NOVEMBER 1988**
SUPERSEDES PAGE 167
DATED JUNE 1972



STANDARD: MODEL 614A
OPTIONAL: MODELS 611A, 612A & 613A

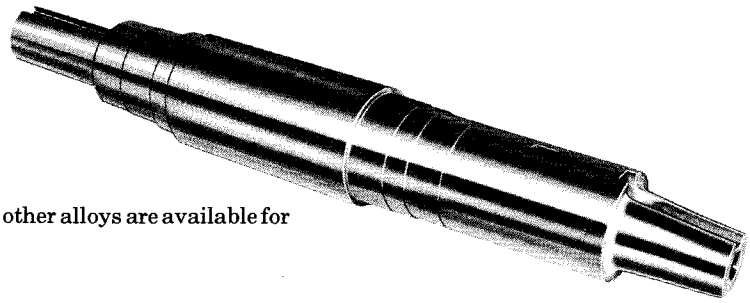
Double mechanical seals are recommended for gritty or abrasive applications. Seal faces are protected by clear water under pressure, injected directly into the seal cavity. Pressure in the seal box must be fifteen (15) lbs. higher than the operating pressure at the stuffing box of the pump. This forces the inner sealing faces closed and provides both faces with a film of clear sealant. If this is not done, abrasive particles may be forced under the sealing faces hastening wear. Even when the pump is not running, a pressure differential, or at least equal pressure in the seal box, is desirable. The sealant circulation for most pumping operations may be dead ended in the stuffing box. Pressures over 30 psi or RPM of 1200 max. require constant circulation to prevent overheating.

The seal box is designed for the compressed seal length and does not require any adjustments. The seal housing is extra large to provide excellent circulation of clear sealing liquid. The housing also has two tapped openings 180° apart for the flushing connections.

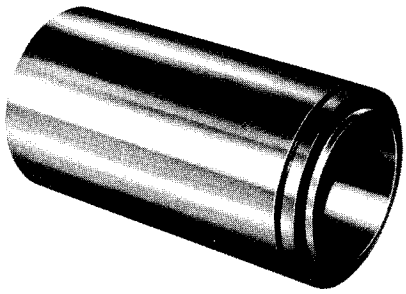
The standard shaft sleeve design is provided with a snap ring which allows the sleeve and the completely assembled seal box to be removed intact. Reassembly can be accomplished in the same manner. Assemble the complete seal box at the convenience of the work bench and install.

AURORA MODEL 610 PUMP OPTIONS

SHAFTS



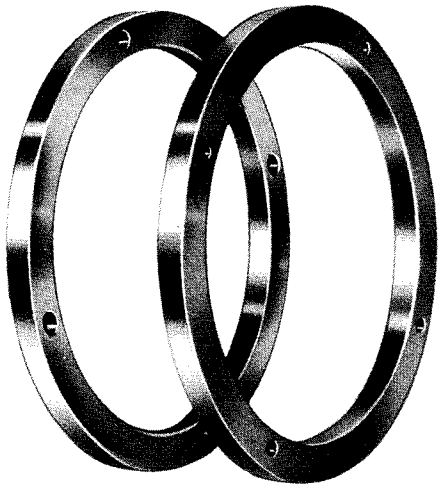
Precision machined shafts of stainless steel, monel and other alloys are available for difficult application.



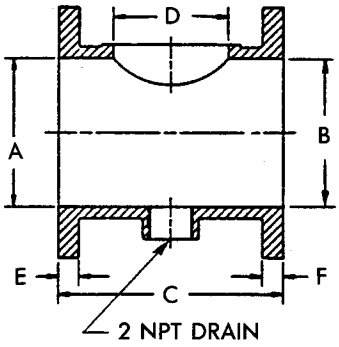
SLEEVES

Shaft sleeves, machined to close tolerances are optionally available in either bronze, 316 stainless steel, or monel.

WEAR RINGS



Replaceable stainless steel wear rings available individually or together, protect the impeller and/or casing from wear. The rings are secured and aligned by 4 flat head machine screws that are easily removed. The ring running clearances are adjusted externally by the bearing cap. External flushing of the ring faces is available.



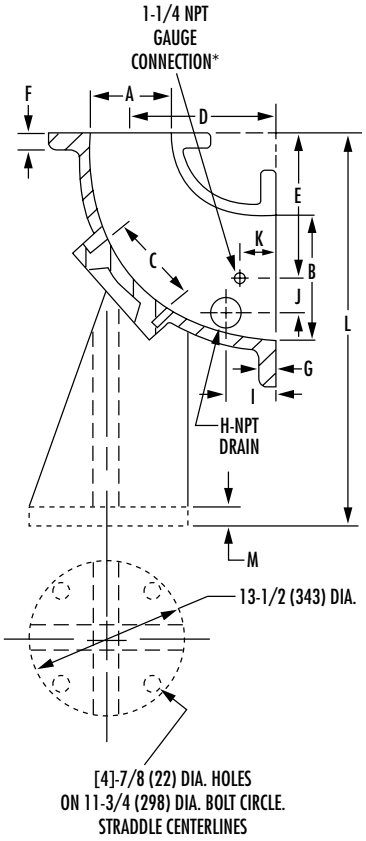
SIZE	A	B	C	D	E	F
6 x 6	6	6	12	5	1-1/8	1-1/8
8 x 8	8	8	12	6-1/8	1-1/8	1-1/8
10 x 10	10	10	12	6-1/8	1-3/16	1-3/16
12 x 12	12	12	13	6-1/8	1-1/4	1-1/4
14 x 14	14	14	13	6-1/8	1-3/8	1-3/8

SUCTION NOZZLES

Suction nozzles are available on Model 611A pumps only. They have hand-size inspection openings to allow access to the impeller and an oversize pipe tap conveniently located for draining purposes. This same pipe tap can be utilized for high pressure flushing or cleaning purposes.

Suction nozzles, when removed, allow the impeller and stuffing box to be removed without disturbing the suction and discharge piping or coupling alignment. Gauge connection taps can be furnished.

The table illustrates the sizes that are available. The "A" dimension must be the same size as the suction opening on the applicable pump size.



ELBOWS

Suction elbows, size on size (example 6 x 6), are furnished as standard on Models 612A, 613A and 614A pumps. Increaser type suction elbows are optionally available. Suction elbows, as standard, have a 1/4" (6) pipe tap for gauge connections and hand-size inspection openings to allow access to the impeller. An oversize pipe tap is conveniently located for draining purposes. This same pipe tap can be utilized for high pressure flushing or cleaning purposes.

The table below illustrates the sizes that are available. The "A" dimension must be the same size as the suction opening on the applicable pump size.

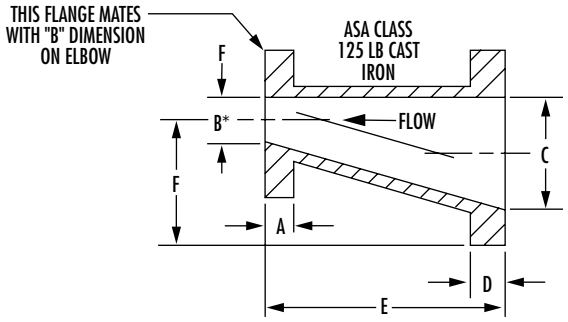
SIZE	A	B	C	D	E	F	G	H	I	J	K	L	M
4 x 4	4 (102)	4 (102)	4 (102)	6-1/2 (165)	6-1/2 (165)	15/16 (24)	7/8 (22)	1-1/2 (38)	4-19/32 (117)	1-1/2 (38)	2-1/4 (57)	-	-
4 x 6	4 (102)	6 (152)	4 (102)	8 (203)	7 (178)	15/16 (24)	7/8 (22)	1-1/2 (38)	2-3/8 (60)	1-11/16 (43)	3-3/4 (95)	-	-
6 x 6	6 (152)	6 (152)	6 (152)	8 (203)	8 (203)	1 (25)	1 (25)	1-1/2 (38)	3-1/2 (89)	1-1/8 (29)	2-1/8 (54)	-	-
6 x 8	6 (152)	8 (203)	6 (152)	9 (229)	9 (229)	1 (25)	1-1/8 (29)	1-1/2 (38)	3-5/8 (92)	2 (51)	2-1/4 (57)	-	-
8 x 8	8 (203)	8 (203)	6 (152)	9 (229)	9 (229)	1-1/8 (29)	1-1/8 (29)	1-1/2 (38)	3-5/8 (92)	2-1/8 (54)	2-1/4 (57)	-	-
8 x 10	8 (203)	10 (254)	8 (203)	11 (279)	11 (279)	1-1/8 (29)	1-3/16 (30)	1-1/2 (38)	3-11/16 (94)	3-1/4 (83)	2-5/16 (59)	-	-
10 x 10	10 (254)	10 (254)	6 (152)	11 (279)	11 (279)	1-3/16 (30)	1-3/16 (30)	1-1/2 (38)	3-11/16 (94)	3 (76)	2-7/16 (59)	-	-
10 x 12	10 (254)	12 (305)	6 (152)	12 (305)	12 (305)	1-3/16 (30)	1-1/4 (32)	1-1/2 (38)	3-3/4 (95)	4-1/2 (114)	2-1/2 (64)	-	-
12 x 12	12 (305)	12 (305)	8 (203)	12 (305)	12 (305)	1-1/4 (32)	1-1/4 (32)	1-1/2 (38)	3-3/4 (95)	4-1/2 (114)	2-1/2 (64)	-	-
12 x 14	12 (305)	14 (356)	8 (203)	14 (356)	12 (305)	1-1/4 (32)	1-1/4 (32)	2-1/2 (64)	3-3/4 (95)	5-3/8 (137)	2-1/2 (64)	-	-
14 x 14	14 (356)	14 (356)	8 (203)	14 (356)	14 (356)	1-3/8 (35)	1-3/8 (35)	2-1/2 (64)	3-7/8 (98)	5 (127)	2-5/8 (67)	-	-
14 x 16	14 (356)	16 (406)	6 (152)	15 (381)	15 (381)	1-3/8 (35)	1-7/16 (37)	2-1/2 (64)	5 (127)	5-1/2 (140)	2-1/2 (64)	-	-
16 x 16 **	16 (406)	16 (406)	8 (203)	24 (610)	24 (610)	1-7/16 (37)	1-7/16 (37)	2-1/2 (64)	4-1/4 (108)	5-1/2 (140)	2-5/8 (67)	37-3/4 (959)	1-1/8 (29)
16 x 18 **	16 (406)	18 (457)	8 (203)	26-1/2 (673)	26-1/2 (673)	1-7/16 (37)	1-9/16 (40)	2-1/2 (64)	4-1/4 (108)	5-1/2 (140)	2-5/8 (67)	41-1/2 (1054)	1-1/8 (29)
18 x 18 **	18 (457)	18 (457)	8 (203)	26-1/2 (673)	26-1/2 (673)	1-9/16 (40)	1-9/16 (40)	2-1/2 (64)	4-1/4 (108)	5-1/2 (140)	2-5/8 (67)	41-1/2 (1054)	1-1/8 (29)
18 x 20 **	18 (457)	20 (508)	8 (203)	29 (737)	29 (737)	1-9/16 (40)	1-11/16 (43)	2-1/2 (64)	4-1/2 (114)	6 (152)	2-3/4 (70)	45 (1143)	1-1/8 (29)
20 x 20 **	20 (508)	20 (508)	8 (203)	29 (737)	29 (737)	1-11/16 (43)	1-11/16 (43)	2-1/2 (64)	4-1/2 (114)	6 (152)	2-3/4 (70)	45 (1143)	1-1/8 (29)
20 x 24 **	20 (508)	24 (610)	8 (203)	34 (864)	34 (864)	1-11/16 (43)	1-7/8 (48)	2-1/2 (64)	6 (152)	7-3/8 (187)	4 (102)	52-1/2 (1334)	1-1/8 (29)

* 2 gauge bosses are cast on the elbow, only one is drilled and tapped as standard. The other is drilled and tapped only on request.

** These elbows are equipped with support foot (shown in phantom). The handhole is above support on these sizes.

NOTES:
1. All dimensions in inches (mm).
2. Dimensions may vary ± 1/8" (3).
3. Pump should be elevated a minimum of 2" (51) to provide flange to floor clearance when using this option.

ECCENTRIC SUCTION INCREASERS



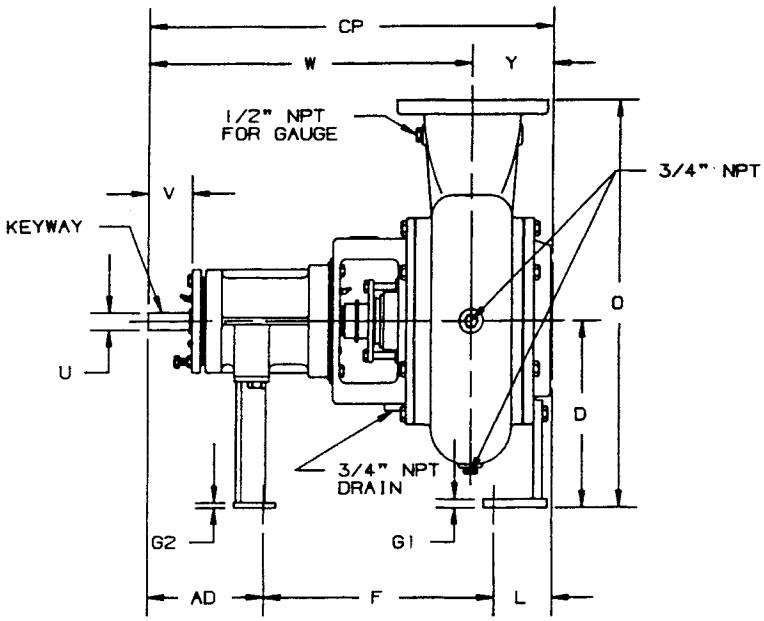
Eccentric suction increasers are optionally available for use on Models 612A, 613A and 614A pumps in conjunction with suction elbows. Larger suction line diameters are easily accommodated by these combined options. (Example: A pump with 8" (203) suction can be connected to a 12" (305) suction line by using an 8" x 10" (203 x 254) suction increasing elbow and a 10" x 12" (254 x 305) eccentric suction increaser.

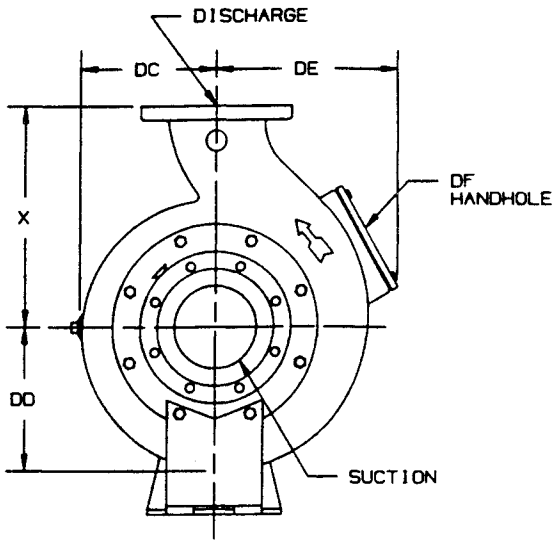
SIZE	A	B*	C	D	E	F
8 x 10	1-1/8 (29)	8 (203)	10 (254)	1-3/16 (30)	12 (305)	9 (229)
10 x 12	1-3/16 (30)	10 (254)	12 (305)	1-1/4 (32)	14 (356)	10-1/2 (267)
12 x 14	1-1/4 (32)	12 (305)	14 (356)	1-3/8 (35)	16 (406)	11-1/2 (292)
14 x 16	1-3/8 (35)	14 (356)	16 (406)	1-7/16 (37)	18 (457)	12-3/4 (324)
16 x 18	1-7/16 (37)	16 (406)	18 (457)	1-9/16 (40)	19 (483)	13-1/2 (343)

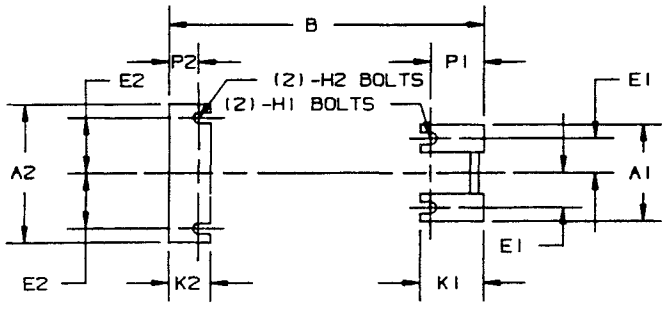
* "B" Dimension must be same as "B" Dimension of elbow.

NOTES:
1. All dimensions in inches (mm).
2. Dimensions may vary ± 1/8" (3).
3. Pump should be elevated a minimum of 2" (51) to provide flange to floor clearance when using this option.

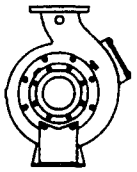
AURORA MODEL 611A PUMP
6" & 8" PUMPS



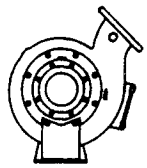




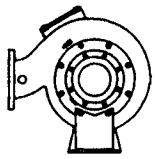
(MOUNTING SUPPORT)



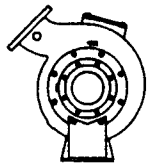
DISCHARGE POSITION 1



DISCHARGE POSITION 2



DISCHARGE POSITION 7



DISCHARGE POSITION 8

DISCHARGE POSITIONS AVAILABLE
(VIEWED FROM SUCTION END)

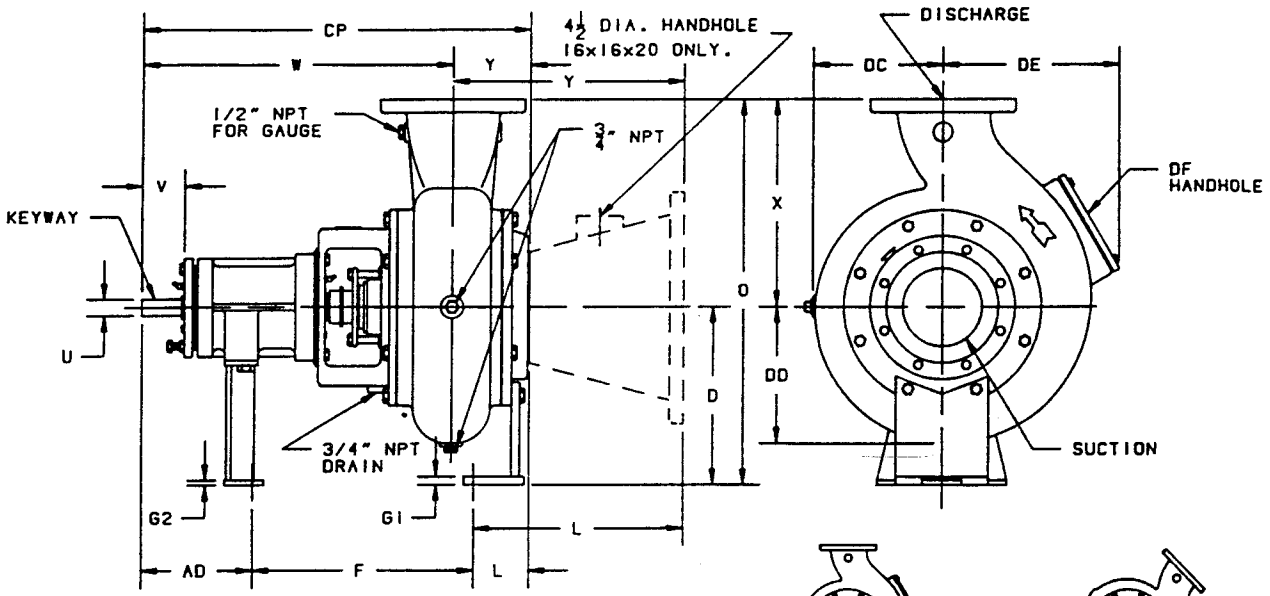
NOTES:
1. ALL DIMENSIONS IN INCHES.
2. DIMENSIONS MAY VARY ± 1/2".
3. NOT FOR CONSTRUCTION PURPOSES UNLESS CERTIFIED.
4. TWO (2) 1/2" NPT CONNECTIONS 180° APART, ON THE STUFFING BOX FOR LUBRICATION PURPOSES ARE FURNISHED AS STANDARD. ON PACKED PUMPS AN ALEMITE FITTING IS PROVIDED IN ONE TAP AND THE REMAINING TAP IS PLUGGED.
5. DISCHARGE POSITION 1 IS FURNISHED AS STANDARD UNLESS SPECIFIED.
6. SUCTION AND DISCHARGE FLANGES ARE AMERICAN STANDARD 125 LBS.

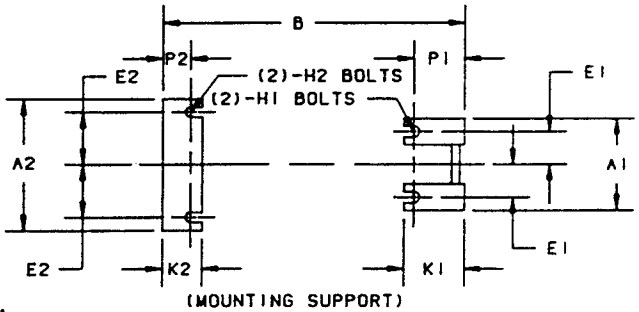
POWER FRAME	U	V	KEYWAY		
			LENGTH	WIDTH	DEPTH
4C, 4D	1 1/4	3 3/16	2	1/4	1/8
5E, 5F 5G, 5H	2 3/8	6 3/8	4	5/8	5/16

DISCH SUCT CASE BORE	POWER FRAME	A1	A2	B	D	E1	E2	F	G1	G2	H1	H2	K1	K2
6x6x12	4C, 4D	7	10	22 7/8	13 1/2	2 1/2	4	16 7/8	5/8	3/8	5/8	5/8	4 5/8	3
6x6x12	5E, 5F	7	10	28 15/16	13 1/2	2 1/2	3 3/4	22 5/16	5/8	3/8	3/4	3/4	4 5/8	4
6x6X12B	4C, 4D	7	10	22 7/8	13 1/2	2 1/2	4	16 7/8	5/8	3/8	5/8	5/8	4 5/8	3
6x6x12B	5E, 5F	7	10	28 15/16	13 1/2	2 1/2	3 3/4	22 5/16	5/8	3/8	3/4	3/4	4 5/8	4
6x8x15	5E, 5F	11 1/2	11	29 1/8	15 1/4	4 1/4	4 1/4	20 7/8	5/8	3/8	7/8	7/8	7	3 1/2
6x8x18	5E, 5F	11 1/2	12 1/2	29 7/8	17 1/2	4 1/4	5	20 5/8	3/4	1/2	7/8	7/8	7	4 1/2
8x8x15A	5E	11 1/2	11	29 13/16	15 1/4	4 1/4	4 1/4	21 9/16	5/8	3/8	7/8	7/8	7	3 1/2
8x10x18	5G, 5H	11 1/2	12 1/2	31	17 1/2	4 1/4	6	21 3/4	3/4	1/2	7/8	7/8	7	4 1/2
8x10x22	5G, 5H	11	15	31 1/4	21	4	6 1/4	21 3/4	3/4	1/2	7/8	7/8	7 1/4	4 1/2

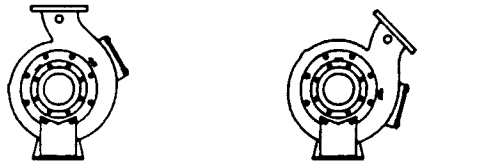
DISCH SUCT CASE BORE	POWER FRAME	L	O	P1	P2	W	X	Y	AD	CP	DC	DD	DE	DF
6x6x12	4C, 4D	4 1/4	27 1/2	3 7/8	2 1/8	23 5/16	14	6 3/16	8 3/8	29 1/2	9 1/2	10 1/2	13 7/8	5x5
6x6x12	5E, 5F	4 1/4	27 1/2	3 7/8	2 3/4	34 3/16	14	6 3/16	13 13/16	40 3/8	9 1/2	10 1/2	13 7/8	5x5
6x6X12B	4C, 4D	4 1/4	29 1/2	3 7/8	2 1/8	23 7/16	16	6 1/16	8 3/8	29 1/2	10 3/8	11 1/16	13 7/8	5x5
6x6x12B	5E, 5F	4 1/4	29 1/2	3 7/8	2 3/4	34 5/16	16	6 1/16	13 13/16	40 3/8	10 3/8	11 1/16	13 7/8	5x5
6x8x15	5E, 5F	5 3/4	31 1/4	6	2 1/4	33 3/4	16	6 1/8	13 1/4	39 7/8	11 3/8	12 1/2	15 3/8	5x5
6x8x18	5E, 5F	5 3/4	35 1/2	6	3 1/4	34 1/16	18	6 7/16	14 1/8	40 1/2	13	14 3/8	16 7/8	5x5
8x8x15A	5E	8 7/16	34 1/4	6	2 1/4	34 1/8	19	9 1/8	13 1/4	43 1/4	12 5/8	13 1/2	15 3/4	5x7
8x10x18	5G, 5H	5 1/2	36 1/2	6	3 1/4	34 5/8	19	6 3/4	14 1/8	41 3/8	12 7/8	14 9/16	16	5x7
8x10x22	5G, 5H	5 5/8	43	6 1/4	3 1/4	34 5/8	22	6 7/8	14 1/8	41 1/2	14 7/8	16 1/2	17 7/8	5x7

AURORA MODEL 611A PUMP
10" - 12" - 14" - 16" PUMPS





(MOUNTING SUPPORT)



DISCHARGE POSITION 1 DISCHARGE POSITION 2

DISCHARGE POSITION 7 DISCHARGE POSITION 8

DISCHARGE POSITIONS AVAILABLE
(VIEWED FROM SUCTION END)

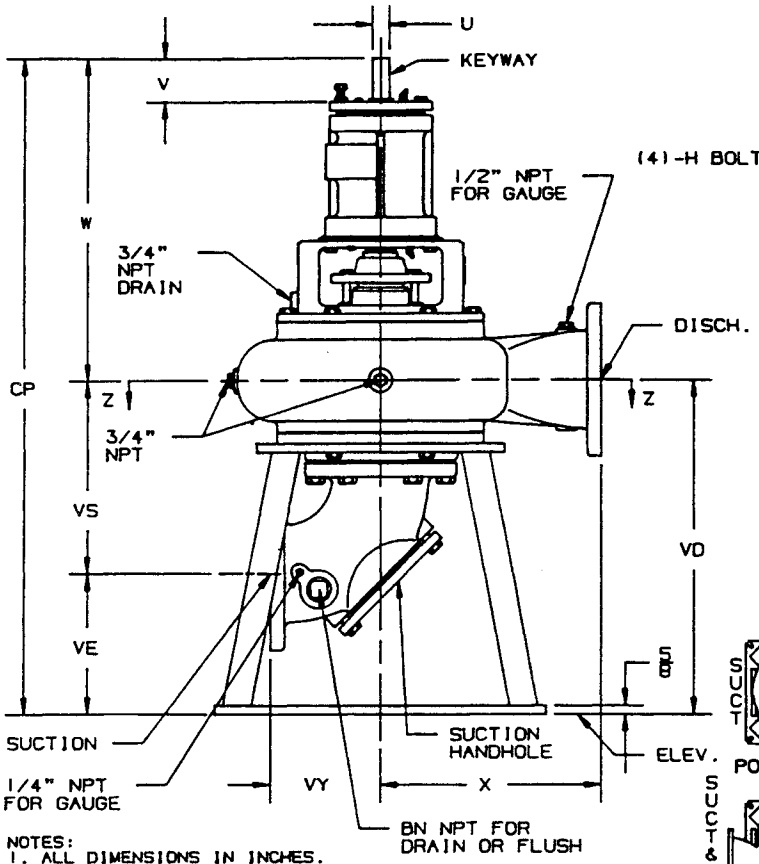
NOTES:
1. ALL DIMENSIONS IN INCHES.
2. DIMENSIONS MAY VARY ± 1/2".
3. NOT FOR CONSTRUCTION PURPOSES UNLESS CERTIFIED.
4. TWO (2) 1/2" NPT CONNECTIONS 180° APART, ON THE STUFFING BOX FOR LUBRICATION PURPOSES ARE FURNISHED AS STANDARD. ON PACKED PUMPS AN ALEMITE FITTING IS PROVIDED IN ONE TAP AND THE REMAINING TAP IS PLUGGED.
5. DISCHARGE POSITION 1 IS FURNISHED AS STANDARD UNLESS SPECIFIED.
6. SUCTION AND DISCHARGE FLANGES ARE AMERICAN STANDARD 125 LBS.

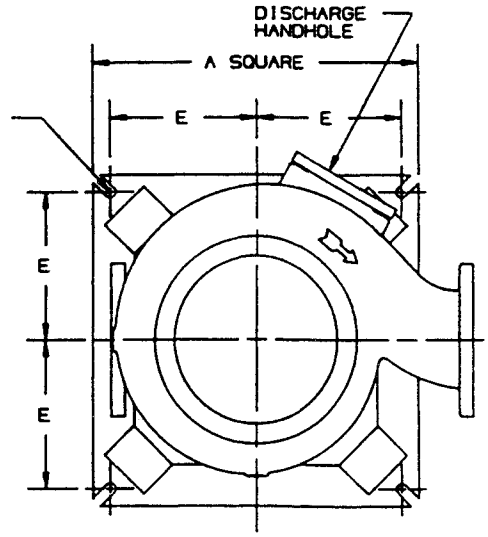
POWER FRAME	U	V	KEYWAY		
			LENGTH	WIDTH	DEPTH
5E,5F 5G,5H	2 3/8	6 3/8	4	5/8	5/16
6D,6F	2 7/8	6 5/8	5	3/4	3/8
6E	2 7/8	5 3/4	4	3/4	3/8

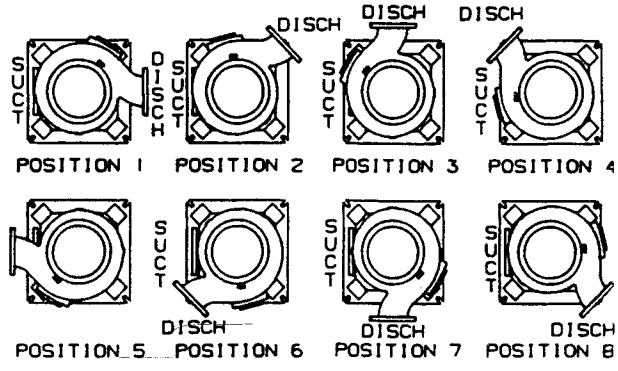
DISCH SUCT CASE BORE	POWER FRAME	A1	A2	B	D	E1	E2	F	G1	G2	H1	H2	K1	K2
10x10x15	5E,5F	11 1/2	11	31	15 1/4	4 1/4	4 1/4	22 3/4	5/8	3/8	7/8	7/8	7	3 1/2
10x10x22	6E	11	15	33 3/4	21	4	6 1/4	24 1/8	3/4	1/2	7/8	7/8	7 1/4	4 1/2
10x12x22	5G,5H	11	15	32 5/16	21	4	6 1/4	22 3/4	3/4	1/2	7/8	7/8	7 1/4	4 1/2
10x12x22	6D	11	15	34 13/16	21	4	6 1/4	25 1/8	3/4	1/2	7/8	7/8	7 1/4	4 1/2
12x12x22	6E	11	15	34 1/4	21	4	6 1/4	25 1/4	3/4	1/2	7/8	7/8	7 1/4	4 1/2
12x14x22A	5G,5H	11	15	32 3/8	21	4	6 1/4	22 7/8	3/4	1/2	7/8	7/8	7 1/4	4 1/2
12x14x22A	6D	11	15	34 1/4	21	4	6 1/4	25 1/4	3/4	1/2	7/8	7/8	7 1/4	4 1/2
12x14x22B	5G,5H	11	15	32 3/8	21	4	6 1/4	22 7/8	3/4	1/2	7/8	7/8	7 1/4	4 1/2
12x14x22B	6D	11	15	34 1/4	21	4	6 1/4	25 1/4	3/4	1/2	7/8	7/8	7 1/4	4 1/2
14x14x22A	6E	11	15	34 1/4	21	4	6 1/4	25 1/4	3/4	1/2	7/8	7/8	7 1/4	4 1/2
16x16x20	6F	11	15	39	24	4	6 1/4	29 1/2	3/4	1/2	7/8	7/8	7 1/4	4 1/2

DISCH SUCT CASE BORE	POWER FRAME	L	O	P1	P2	W	X	Y	AD	CP	DC	DD	DE	DF
10x10x15	5E,5F	8 7/8	35 1/4	6	2 1/4	34 13/16	20	10 1/16	13 1/4	44 7/8	11 5/8	13 5/8	17 1/2	5x7
10x10x22	6E	5 5/8	43	6 1/4	3 1/4	37 1/8	22	6 7/8	14 1/4	44	15	16 1/2	18 1/2	5x7
10x12x22	5G,5H	5 3/8	43 1/2	6 1/4	3 1/4	35 1/16	22 1/2	7 3/16	14 1/8	42 1/4	15 1/2	17 7/8	20 1/8	5x7
10x12x22	6D	5 3/8	43 1/2	6 1/4	3 1/4	37 9/16	22 1/2	7 3/16	14 1/4	44 3/4	15 1/2	17 7/8	20 1/8	5x7
12x12x22	6E	5 3/8	43 1/2	6 1/4	3 1/4	37 5/8	22 1/2	7 1/4	14 1/4	44 7/8	15 5/8	17 3/4	21	5x7
12x14x22A	5G,5H	5 3/8	45	6 1/4	3 1/4	35 1/8	24	7 1/4	14 1/8	42 3/8	15 7/8	18 3/4	22 1/4	5x7
12x14x22A	6D	5 3/8	45	6 1/4	3 1/4	37 5/8	24	7 1/4	14 1/4	44 7/8	15 7/8	18 3/4	22 1/4	5x7
12x14x22B	5G,5H	5 3/8	45	6 1/4	3 1/4	35 1/8	24	7 1/4	14 1/8	42 3/8	15 7/8	18 3/4	22 1/4	5x7
12x14x22B	6D	5 3/8	45	6 1/4	3 1/4	37 5/8	24	7 1/4	14 1/4	44 7/8	15 7/8	18 3/4	22 1/4	5x7
14x14x22A	6E	5 3/8	45	6 1/4	3 1/4	37 5/8	24	7 1/4	14 1/4	44 7/8	15 7/8	18 3/4	22 1/4	5x7
16x16x20	6F	19 1/2	56	6 1/4	3 1/4	39 7/8	32	23 1/2	14 1/8	63 3/8	17 3/4	20 1/2	24	6 DIA

AURORA MODEL 612A PUMP
6", 8", 10", 12" & 14" PUMPS







DISCHARGE POSITIONS AVAILABLE (VIEW Z-Z)

NOTES:
1. ALL DIMENSIONS IN INCHES.
2. DIMENSIONS MAY VARY ± 1/2".
3. NOT FOR CONSTRUCTION PURPOSES UNLESS CERTIFIED.
4. TWO (2) 1/2" NPT CONNECTIONS 180° APART, ON THE STUFFING BOX FOR LUBRICATION PURPOSES ARE FURNISHED AS STANDARD. ON PACKED PUMPS AN ALEMITE FITTING IS PROVIDED IN ONE TAP AND THE REMAINING TAP IS PLUGGED.
5. DISCHARGE POSITION 1 IS FURNISHED AS STANDARD UNLESS SPECIFIED.
6. SUCTION AND DISCHARGE FLANGES ARE AMERICAN STANDARD 125 LBS.

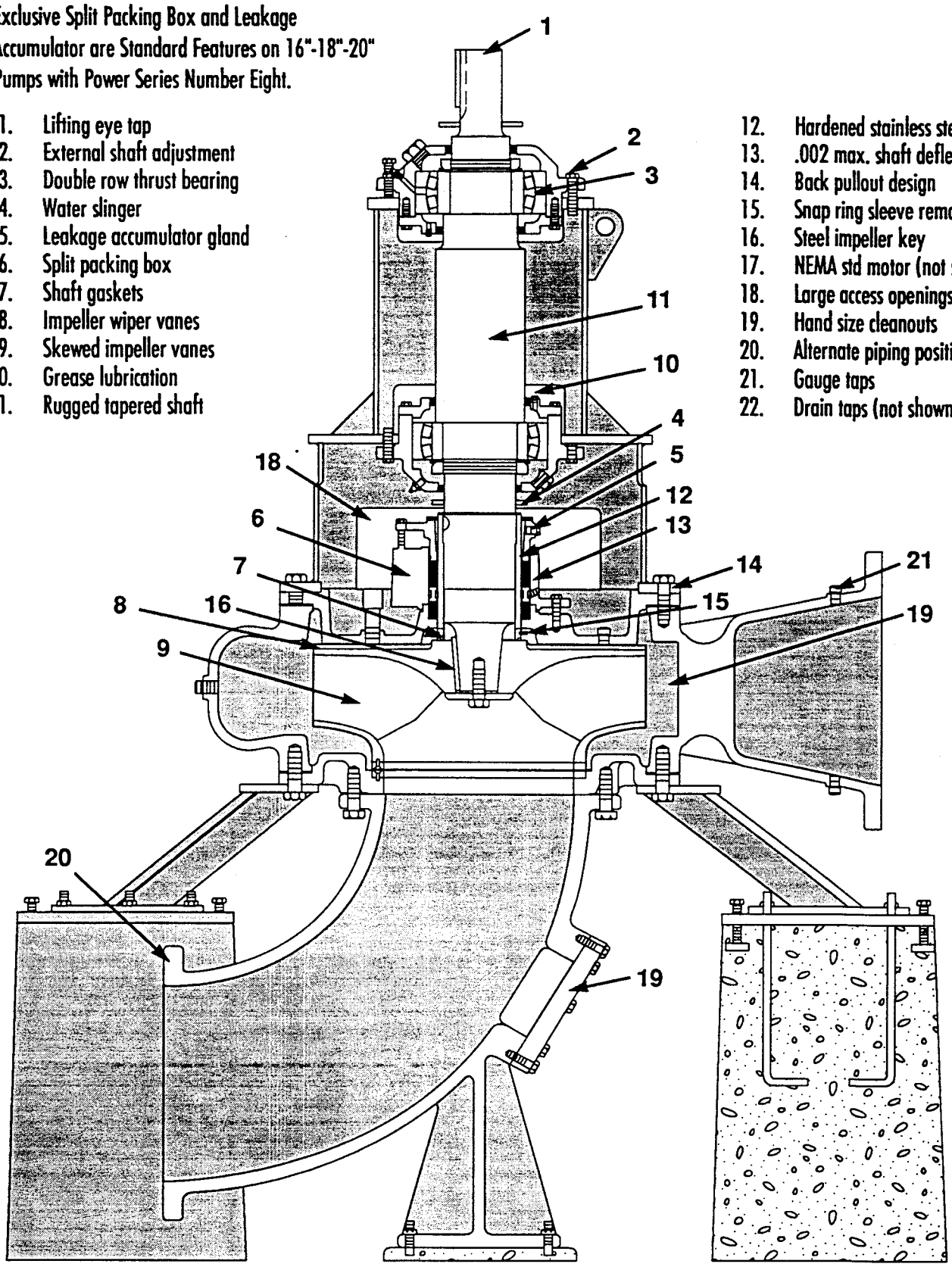
POWER FRAME	U	V	KEYWAY LENGTH	KEYWAY WIDTH	KEYWAY DEPTH
4C, 4D	1 1/4	3 3/16	2	1/4	1/8
5E, 5F 5G, 5H	2 3/8	6 3/8	4	5/8	5/16
6D	2 7/8	6 5/8	5	3/4	3/8
6E	2 7/8	5 3/4	4	3/4	3/8

DISCH SUCT CASE BORE	POWER FRAME	A	BN	E	H	VY	W	X	CP	VD	VE	VS	HANDHOLE DISCH.	HANDHOLE SUCT.
6x6x12	4C, 4D	24	1 1/2	10 3/4	5/8	8	23 5/16	14	47 9/16	24 1/4	10 1/8	14 1/8	5x5	6
6x6x12	5E, 5F	24	1 1/2	10 3/4	5/8	8	34 3/16	14	58 7/16	24 1/4	10 1/8	14 1/8	5x5	6
6x6x12B	4C, 4D	24	1 1/2	10 3/4	5/8	8	23 7/16	16	47 9/16	24 1/8	10 1/8	14	5x5	6
6x6x12B	5E, 5F	24	1 1/2	10 3/4	5/8	8	34 5/16	16	58 7/16	24 1/8	10 1/8	14	5x5	6
6x8x15	5E, 5F	30	1 1/2	13 3/4	3/4	9	33 3/4	16	65 7/8	32 1/8	17	15 1/8	5x5	6
6x8x18	5E, 5F	30	1 1/2	13 3/4	3/4	9	34 1/16	18	66 7/16	32 3/8	17	15 3/8	5x5	6
8x8x15A	5E	30	1 1/2	13 3/4	3/4	9	34 1/8	19	66 1/2	32 3/8	14 1/4	18 1/8	5x7	6
8x10x18	5G, 5H	30	1 1/2	13 3/4	3/4	11	34 5/8	19	67 5/8	33	15 3/16	17 13/16	5x7	6
8x10x22	5G, 5H	37	1 1/2	17	7/8	11	34 5/8	22	69 1/8	34 1/2	16 5/8	17 7/8	5x7	6
10x10x15	5E, 5F	30	1 1/2	13 3/4	3/4	11	34 13/16	20	67 3/4	32 15/16	11 7/8	21 1/16	5x7	6
10x10x22	6E	37	1 1/2	17	7/8	11	37 1/8	22 1/2	71 5/8	34 1/2	16 5/8	17 7/8	5x7	6
10x12x22	5G, 5H	37	1 1/2	17	7/8	12	35 1/16	22 1/2	70 3/16	35 1/8	15 9/16	19 9/16	5x7	8
10x12x22	6D	37	1 1/2	17	7/8	12	37 9/16	22 1/2	72 11/16	35 1/8	15 9/16	19 9/16	5x7	8
12x12x22	6E	37	1 1/2	17	7/8	12	37 5/8	22 1/2	72 3/4	35 1/8	15 9/16	19 9/16	5x7	8
12x14x22A	5G, 5H	37	2 1/2	17	7/8	14	35 1/8	24	70 1/4	35 1/8	13 7/8	21 1/4	5x7	8
12x14x22A	6D	37	2 1/2	17	7/8	14	37 5/8	24	72 3/4	35 1/8	13 7/8	21 1/4	5x7	8
12x14x22B	5G, 5H	37	2 1/2	17	7/8	14	35 1/8	24	70 1/4	35 1/8	13 7/8	21 1/4	5x7	8
12x14x22B	6D	37	2 1/2	17	7/8	14	37 5/8	24	72 3/4	35 1/8	13 7/8	21 1/4	5x7	8
14x14x22A	6E	37	2 1/2	17	7/8	14	37 5/8	24	72 3/4	35 1/8	13 7/8	21 1/4	5x7	8

PUMP FEATURES
MODEL 612A
16"-18"-20" PUMPS

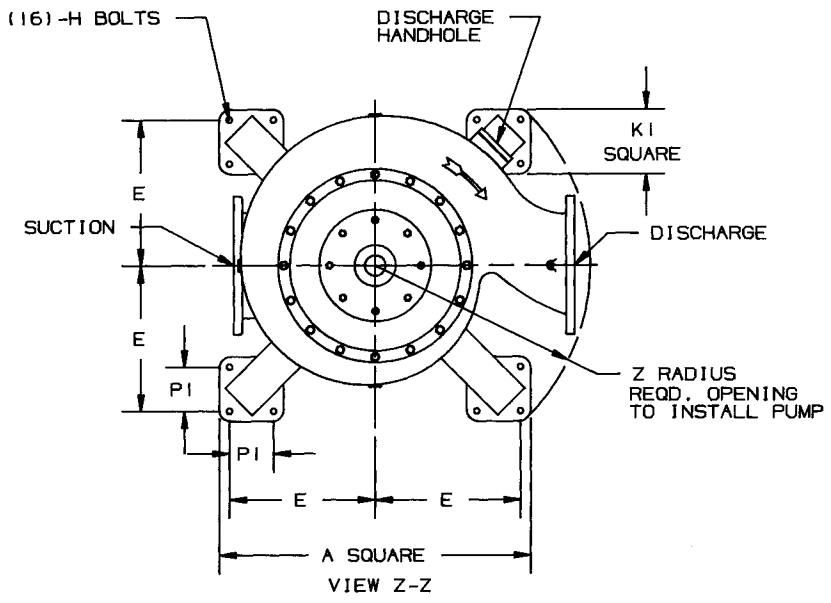
Exclusive Split Packing Box and Leakage Accumulator are Standard Features on 16"-18"-20" Pumps with Power Series Number Eight.

1. Lifting eye tap
2. External shaft adjustment
3. Double row thrust bearing
4. Water slinger
5. Leakage accumulator gland
6. Split packing box
7. Shaft gaskets
8. Impeller wiper vanes
9. Skewed impeller vanes
10. Grease lubrication
11. Rugged tapered shaft
12. Hardened stainless steel sleeve
13. .002 max. shaft deflection
14. Back pullout design
15. Snap ring sleeve removal
16. Steel impeller key
17. NEMA std motor (not shown)
18. Large access openings
19. Hand size cleanouts
20. Alternate piping positions
21. Gauge taps
22. Drain taps (not shown)



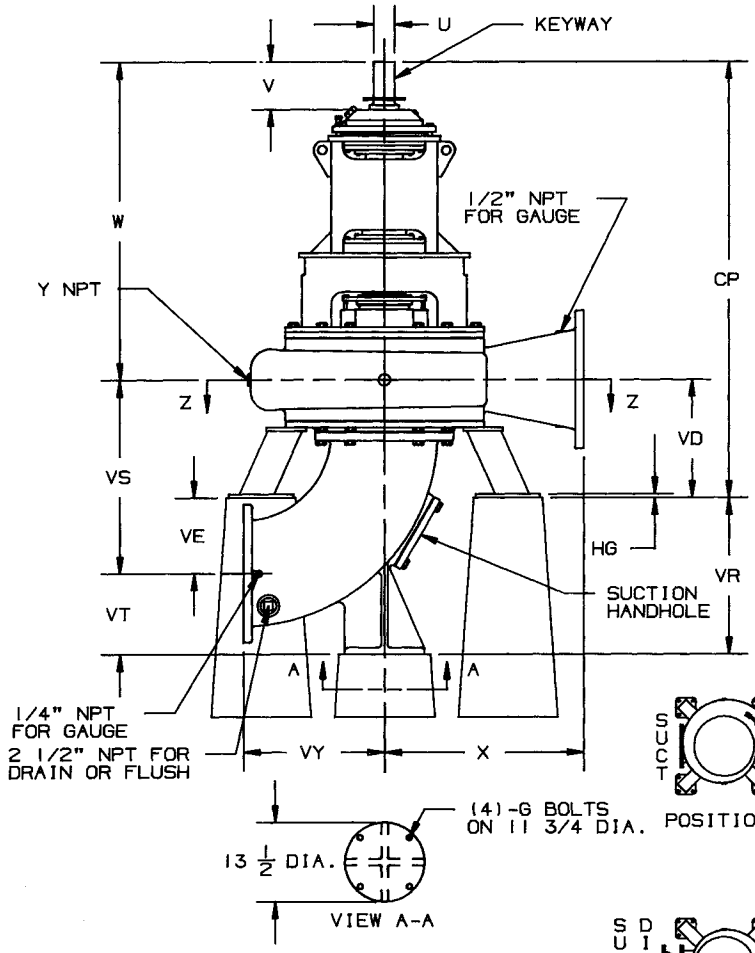
AURORA MODEL 612A PUMP

16", 18" & 20" PUMPS

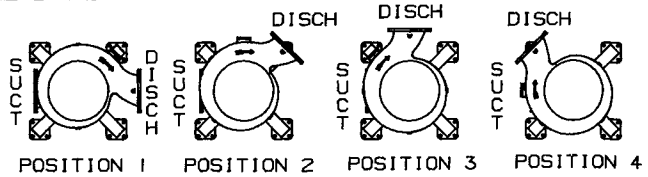


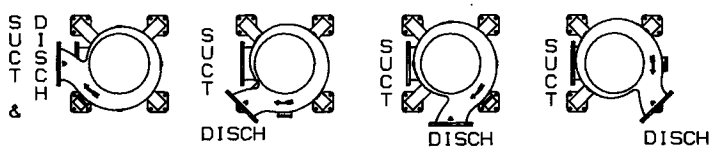
CASE BORE SUCT. DISCH.	16x16x28	18x18x28	20x20x28
POWER FRAME	8	8	8
A	53	53	53
E	24 3/4	24 3/4	24 3/4
G	3/4	3/4	3/4
H	7/8	7/8	7/8
K1	11	11	11
P1	7 1/2	7 1/2	7 1/2
W	54 3/8	55 1/8	55 5/8
X	34	37	42
Y	3/4	1	1
Z	36	38	44 1/4
CP	74 1/2	78	77 11/16
HG	5/8	5/8	5/8
VD	20 1/8	22 7/8	22 1/16
VE	12 15/16	14 1/8	21 15/16
VR	26 11/16	29 1/8	37 15/16
VS	33 1/16	37	44
VT	13 3/4	15	16
VY	24	26 1/2	29
HANDHOLE DISCH.	6	6	6
HANDHOLE SUCT.	8	8	8

U	V	KEYWAY		
		LENGTH	WIDTH	DEPTH
3 1/2	6 1/2	4 3/4	7/8	7/16



NOTES:
1. ALL DIMENSIONS IN INCHES.
2. DIMENSIONS MAY VARY ± 1/2".
3. NOT FOR CONSTRUCTION PURPOSES UNLESS CERTIFIED.
4. TWO (2) 1/2" NPT CONNECTIONS 180° APART, ON THE STUFFING BOX FOR LUBRICATION PURPOSES ARE FURNISHED AS STANDARD. ON PACKED PUMPS AN ALEMITE FITTING IS PROVIDED IN ONE TAP AND THE REMAINING TAP IS PLUGGED.
5. DISCHARGE POSITION 1 IS FURNISHED AS STANDARD UNLESS SPECIFIED.
6. SUCTION AND DISCHARGE FLANGES ARE AMERICAN STANDARD 125 LBS.

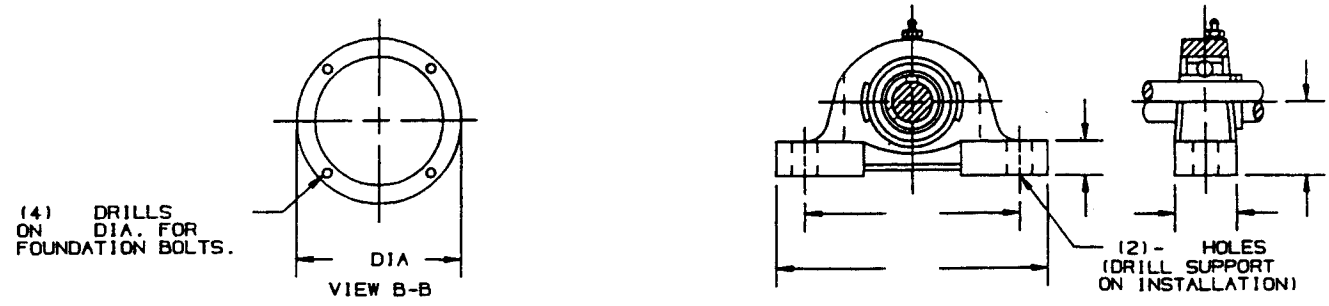


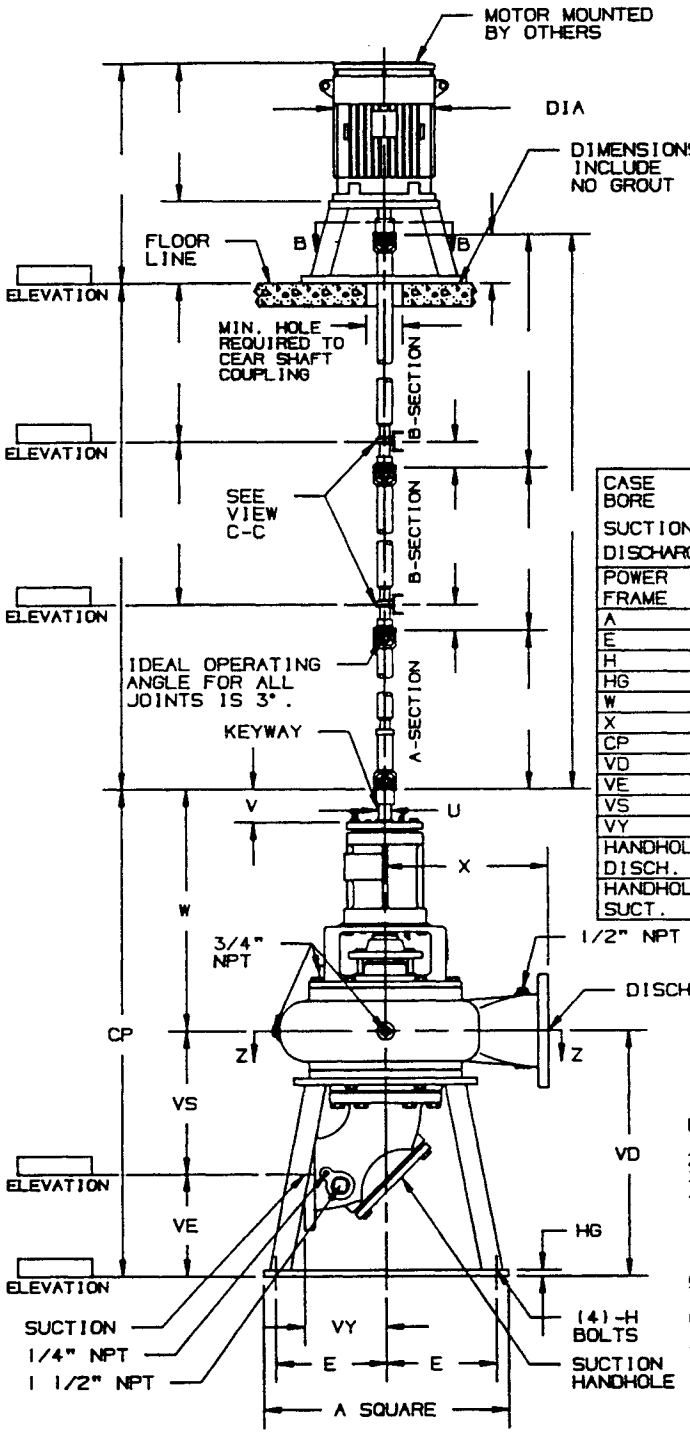


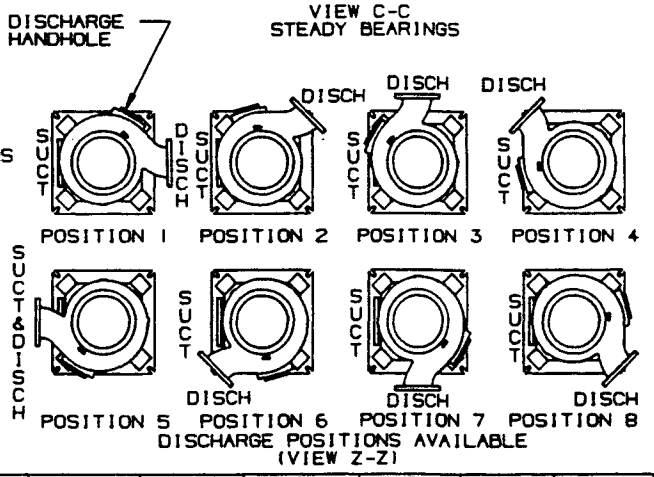
VIEW Z-Z

AURORA®
PENTAIR PUMP GROUP

AURORA MODEL 612A PUMP
6" PUMPS - FLEXIBLE SHAFT







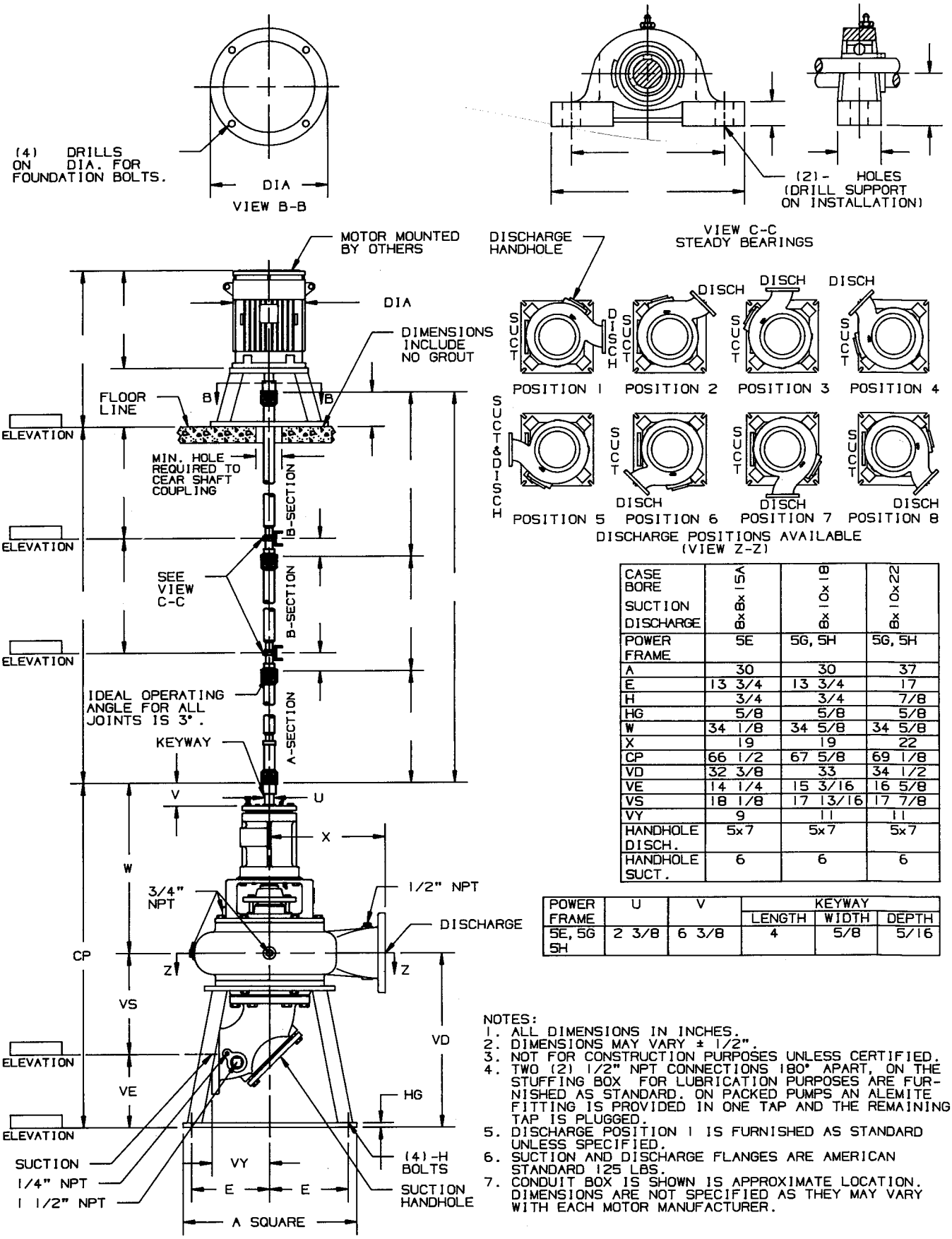
CASE BORE / SUCTION / DISCHARGE	6x6x12	6x6x12	6x6x12B	6x6x12B	6x8x15	6x8x18
POWER FRAME	4C, 4D	5E, 5F	4C, 4D	5F	5E, 5F	5E, 5F
A	24	24	24	24	30	30
E	10 3/4	10 3/4	10 3/4	10 3/4	13 3/4	13 3/4
H	5/8	5/8	5/8	5/8	3/4	3/4
HG	5/8	5/8	5/8	5/8	5/8	5/8
W	23 5/16	34 3/16	23 7/16	34 5/16	33 3/4	34 1/16
X	14	14	16	16	16	18
CP	47 9/16	58 7/16	47 9/16	58 7/16	65 7/8	66 7/16
VD	24 1/4	24 1/4	24 1/8	24 1/8	32 1/8	32 3/8
VE	10 1/8	10 1/8	10 1/8	10 1/8	17	17
VS	14 1/8	14 1/8	14	14	15 1/8	15 3/8
VY	8	8	8	8	9	9
HANDHOLE DISCH.	5x5	5x5	5x5	5x5	5x5	5x5
HANDHOLE SUCT.	6	6	6	6	6	6

POWER FRAME	U	V	KEYWAY		
			LENGTH	WIDTH	DEPTH
4C, 4D	1 1/4	3 3/16	2	1/4	1/8
5E, 5F	2 3/8	6 3/8	4	5/8	5/16

NOTES:
1. ALL DIMENSIONS IN INCHES.
2. DIMENSIONS MAY VARY ± 1/2".
3. NOT FOR CONSTRUCTION PURPOSES UNLESS CERTIFIED.
4. TWO (2) 1/2" NPT CONNECTIONS 180° APART, ON THE STUFFING BOX FOR LUBRICATION PURPOSES ARE FURNISHED AS STANDARD. ON PACKED PUMPS AN ALEMITE FITTING IS PROVIDED IN ONE TAP AND THE REMAINING TAP IS PLUGGED.
5. DISCHARGE POSITION 1 IS FURNISHED AS STANDARD UNLESS SPECIFIED.
6. SUCTION AND DISCHARGE FLANGES ARE AMERICAN STANDARD 125 LBS.
7. CONDUIT BOX IS SHOWN IS APPROXIMATE LOCATION. DIMENSIONS ARE NOT SPECIFIED AS THEY MAY VARY WITH EACH MOTOR MANUFACTURER.

AURORA MODEL 612A PUMP

8" PUMPS
FLEXIBLE SHAFT



CASE BORE / SUCTION / DISCHARGE	8x8x15A	8x10x18	8x10x22
POWER FRAME	5E	5G, 5H	5G, 5H
A	30	30	37
E	13 3/4	13 3/4	17
H	3/4	3/4	7/8
HG	5/8	5/8	5/8
W	34 1/8	34 5/8	34 5/8
X	19	19	22
CP	66 1/2	67 5/8	69 1/8
VD	32 3/8	33	34 1/2
VE	14 1/4	15 3/16	16 5/8
VS	18 1/8	17 13/16	17 7/8
VY	9	11	11
HANDHOLE DISCH.	5x7	5x7	5x7
HANDHOLE SUCT.	6	6	6

POWER FRAME	U	V	KEYWAY		
			LENGTH	WIDTH	DEPTH
5E, 5G 5H	2 3/8	6 3/8	4	5/8	5/16

NOTES:
1. ALL DIMENSIONS IN INCHES.
2. DIMENSIONS MAY VARY ± 1/2".
3. NOT FOR CONSTRUCTION PURPOSES UNLESS CERTIFIED.
4. TWO (2) 1/2" NPT CONNECTIONS 180° APART, ON THE STUFFING BOX FOR LUBRICATION PURPOSES ARE FURNISHED AS STANDARD. ON PACKED PUMPS AN ALEMITE FITTING IS PROVIDED IN ONE TAP AND THE REMAINING TAP IS PLUGGED.
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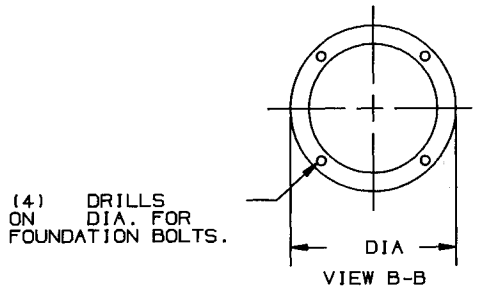
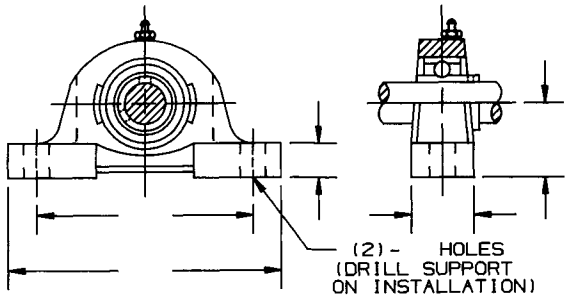
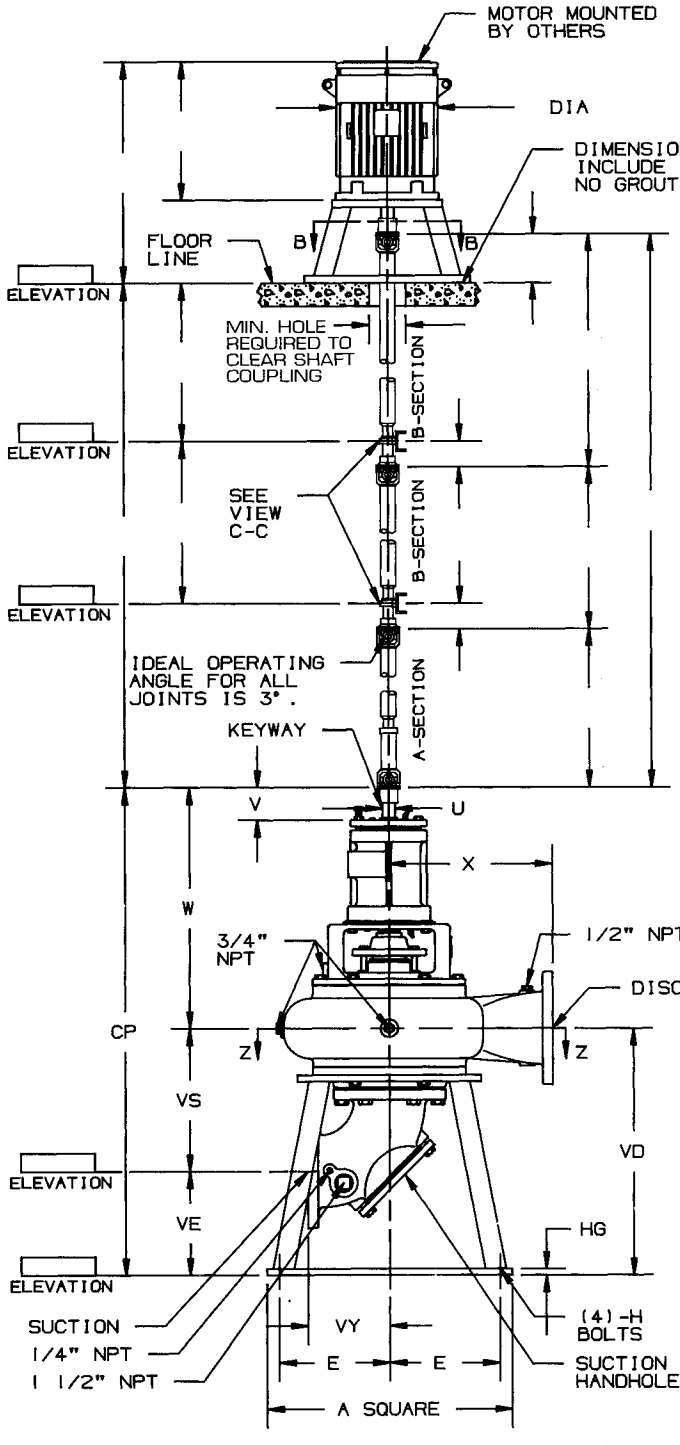
6. SUCTION AND DISCHARGE FLANGES ARE AMERICAN STANDARD 125 LBS.
7. CONDUIT BOX IS SHOWN IS APPROXIMATE LOCATION. DIMENSIONS ARE NOT SPECIFIED AS THEY MAY VARY WITH EACH MOTOR MANUFACTURER.

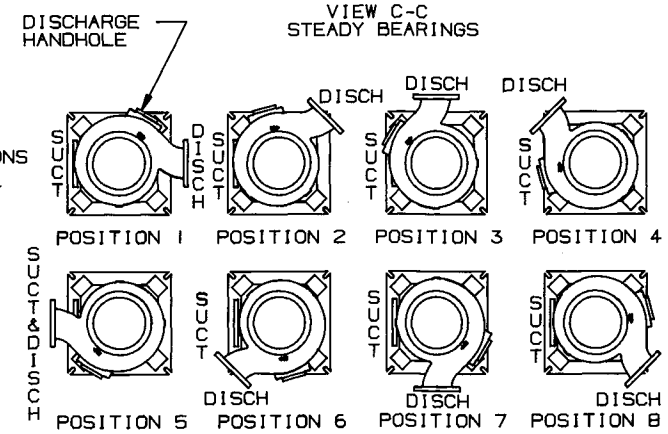
AURORA MODEL 612A PUMP

10" PUMPS
FLEXIBLE SHAFT









CASE BORE / SUCTION / DISCHARGE	10x10x15	10x10x22	10x12x22	10x12x22
POWER FRAME	5E, 5F	6E	5G, 5H	6D
A	30	37	37	37
E	13 3/4	17	17	17
H	3/4	7/8	7/8	7/8
HG	5/8	5/8	5/8	5/8
W	34 13/16	37 1/8	35 1/16	37 9/16
X	20	22 1/2	22 1/2	22 1/2
CP	67 3/4	71 5/8	70 3/16	72 11/16
VD	32 15/16	34 1/2	35 1/8	35 1/8
VE	11 7/8	16 5/8	15 9/16	15 9/16
VS	21 1/16	17 7/8	19 9/16	19 9/16
VY	11	11	12	12
HANDHOLE DISCH.	5x7	5x7	5x7	5x7
HANDHOLE SUCT.	6	6	8	8

POWER FRAME	U	V	KEYWAY		
			LENGTH	WIDTH	DEPTH
5E, 5F 5G, 5H	2 3/8	6 3/8	4	5/8	5/16
6D	2 7/8	6 5/8	5	3/4	3/8
6E	2 7/8	5 3/4	4	3/4	3/8

NOTES:
1. ALL DIMENSIONS IN INCHES.
2. DIMENSIONS MAY VARY ± 1/2".
3. NOT FOR CONSTRUCTION PURPOSES UNLESS CERTIFIED.
4. TWO (2) 1/2" NPT CONNECTIONS 180° APART, ON THE STUFFING BOX FOR LUBRICATION PURPOSES ARE FURNISHED AS STANDARD. ON PACKED PUMPS AN ALEMITE FITTING IS PROVIDED IN ONE TAP AND THE REMAINING TAP IS PLUGGED.
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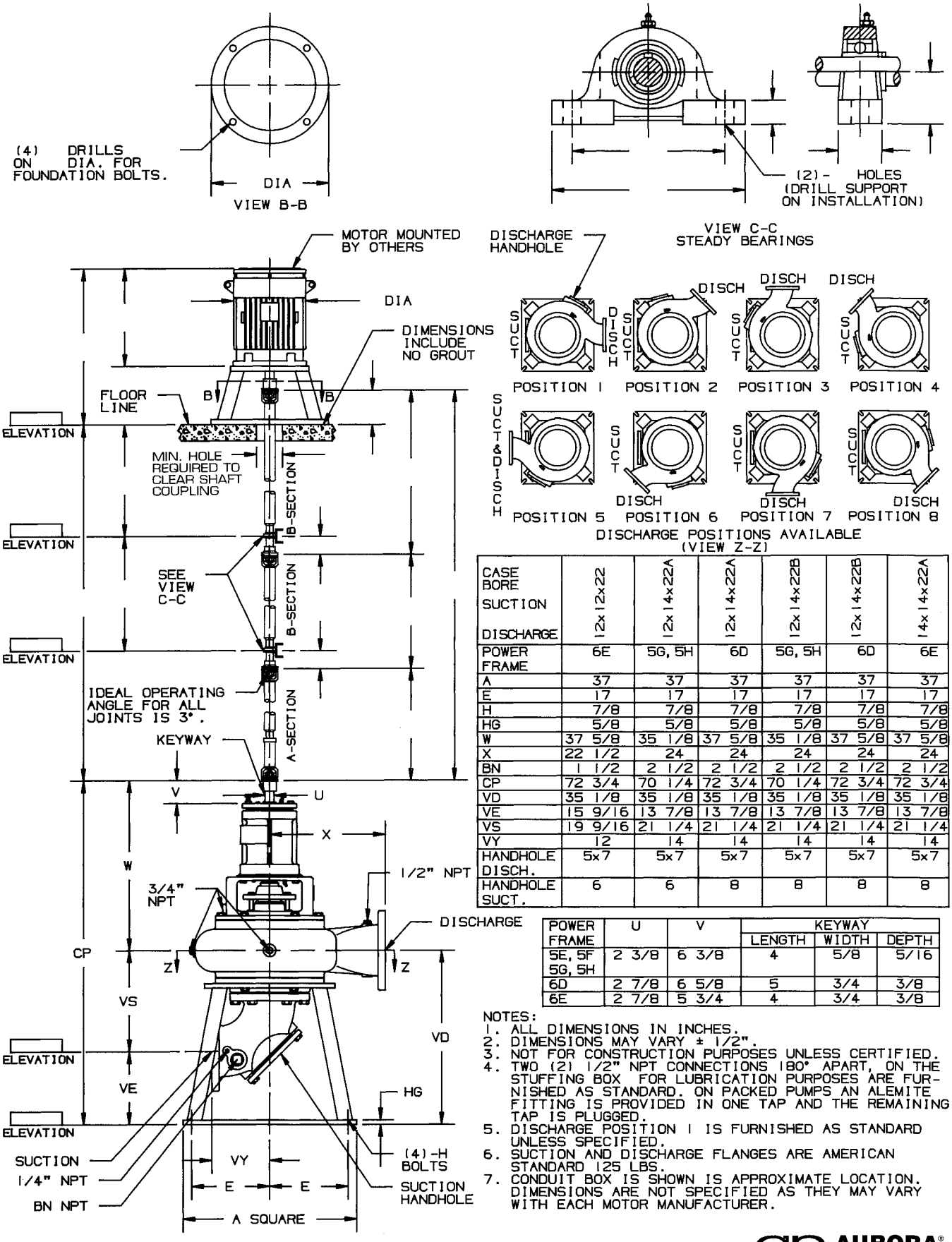
6. SUCTION AND DISCHARGE FLANGES ARE AMERICAN STANDARD 125 LBS.
7. CONDUIT BOX IS SHOWN IS APPROXIMATE LOCATION. DIMENSIONS ARE NOT SPECIFIED AS THEY MAY VARY WITH EACH MOTOR MANUFACTURER.

AURORA MODEL 612A PUMP

12" & 14" PUMPS

FLEXIBLE SHAFT



CASE BORE / SUCTION / DISCHARGE	12x12x22	12x14x22A	12x14x22A	12x14x22B	12x14x22B	14x14x22A
POWER FRAME	6E	5G, 5H	6D	5G, 5H	6D	6E
A	37	37	37	37	37	37
E	17	17	17	17	17	17
H	7/8	7/8	7/8	7/8	7/8	7/8
HG	5/8	5/8	5/8	5/8	5/8	5/8
W	37 5/8	35 1/8	37 5/8	35 1/8	37 5/8	37 5/8
X	22 1/2	24	24	24	24	24
BN	1 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2
CP	72 3/4	70 1/4	72 3/4	70 1/4	72 3/4	72 3/4
VD	35 1/8	35 1/8	35 1/8	35 1/8	35 1/8	35 1/8
VE	15 9/16	13 7/8	13 7/8	13 7/8	13 7/8	13 7/8
VS	19 9/16	21 1/4	21 1/4	21 1/4	21 1/4	21 1/4
VY	12	14	14	14	14	14
HANDHOLE DISCH.	5x7	5x7	5x7	5x7	5x7	5x7
HANDHOLE SUCT.	6	6	8	8	8	8

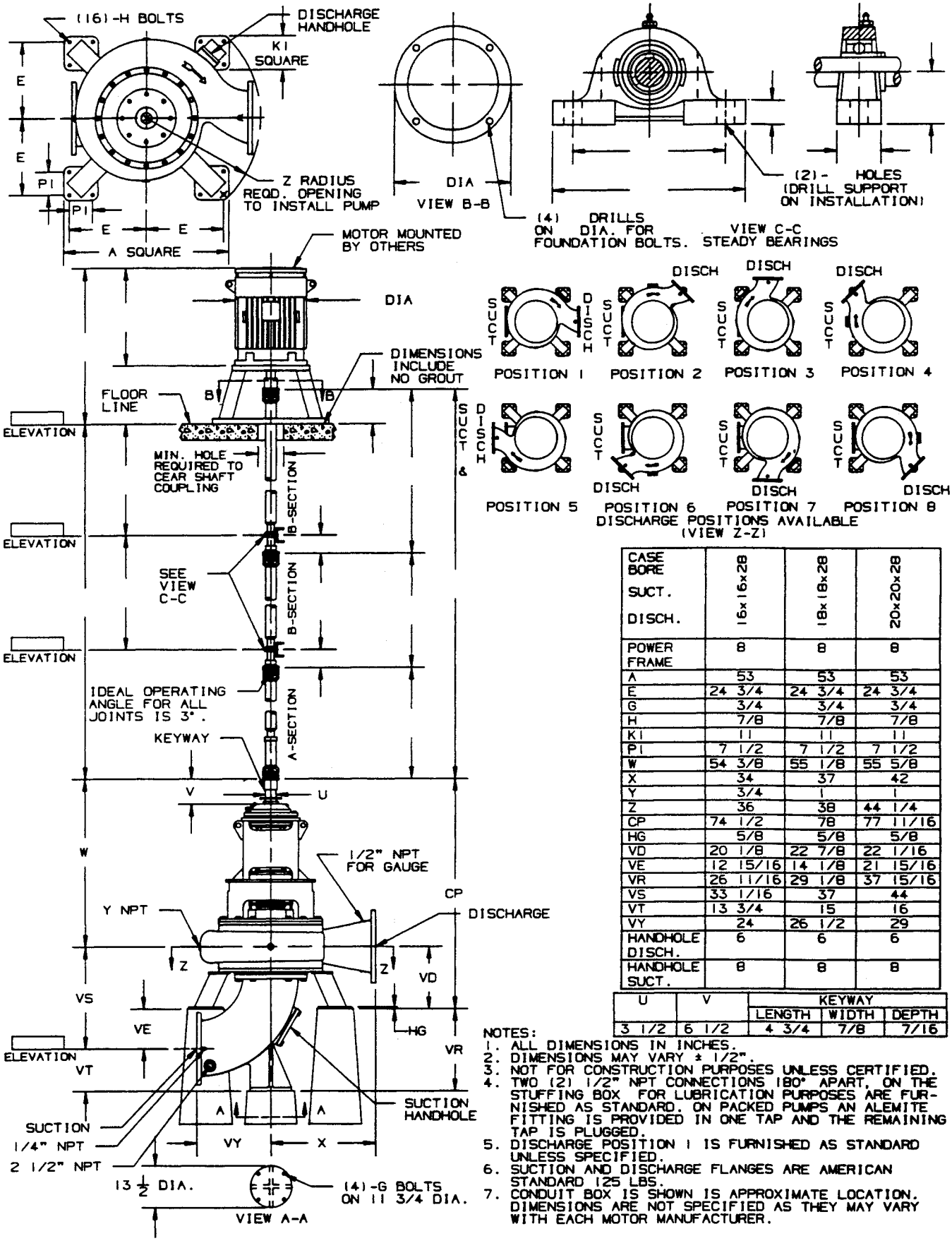
POWER FRAME	U	V	KEYWAY LENGTH	KEYWAY WIDTH	KEYWAY DEPTH
5E, 5F 5G, 5H	2 3/8	6 3/8	4	5/8	5/16
6D	2 7/8	6 5/8	5	3/4	3/8
6E	2 7/8	5 3/4	4	3/4	3/8

NOTES:
1. ALL DIMENSIONS IN INCHES.
2. DIMENSIONS MAY VARY ± 1/2".
3. NOT FOR CONSTRUCTION PURPOSES UNLESS CERTIFIED.
4. TWO (2) 1/2" NPT CONNECTIONS 180° APART, ON THE STUFFING BOX FOR LUBRICATION PURPOSES ARE FURNISHED AS STANDARD. ON PACKED PUMPS AN ALEMITE FITTING IS PROVIDED IN ONE TAP AND THE REMAINING TAP IS PLUGGED.
5. DISCHARGE POSITION 1 IS FURNISHED AS STANDARD UNLESS SPECIFIED.
6. SUCTION AND DISCHARGE FLANGES ARE AMERICAN STANDARD 125 LBS.
7. CONDUIT BOX IS SHOWN IS APPROXIMATE LOCATION. DIMENSIONS ARE NOT SPECIFIED AS THEY MAY VARY WITH EACH MOTOR MANUFACTURER.

AURORA MODEL 612A PUMP

16", 18" & 20" PUMPS

FLEXIBLE SHAFT



CASE BORE / SUCT. / DISCH.	16x16x28	18x18x28	20x20x28
POWER FRAME	8	8	8
A	53	53	53
E	24 3/4	24 3/4	24 3/4
G	3/4	3/4	3/4
H	7/8	7/8	7/8
K1	11	11	11
P1	7 1/2	7 1/2	7 1/2
W	54 3/8	55 1/8	55 5/8
X	34	37	42
Y	3/4	1	1
Z	36	38	44 1/4
CP	74 1/2	78	77 11/16
HG	5/8	5/8	5/8
VD	20 1/8	22 7/8	22 1/16
VE	12 15/16	14 1/8	21 15/16
VR	26 11/16	29 1/8	37 15/16
VS	33 1/16	37	44
VT	13 3/4	15	16
VY	24	26 1/2	29
HANDHOLE DISCH.	6	6	6
HANDHOLE SUCT.	8	8	8

U	V	KEYWAY		
		LENGTH	WIDTH	DEPTH
3 1/2	6 1/2	4 3/4	7/8	7/16

NOTES:
1. ALL DIMENSIONS IN INCHES.
2. DIMENSIONS MAY VARY ± 1/2".
3. NOT FOR CONSTRUCTION PURPOSES UNLESS CERTIFIED.
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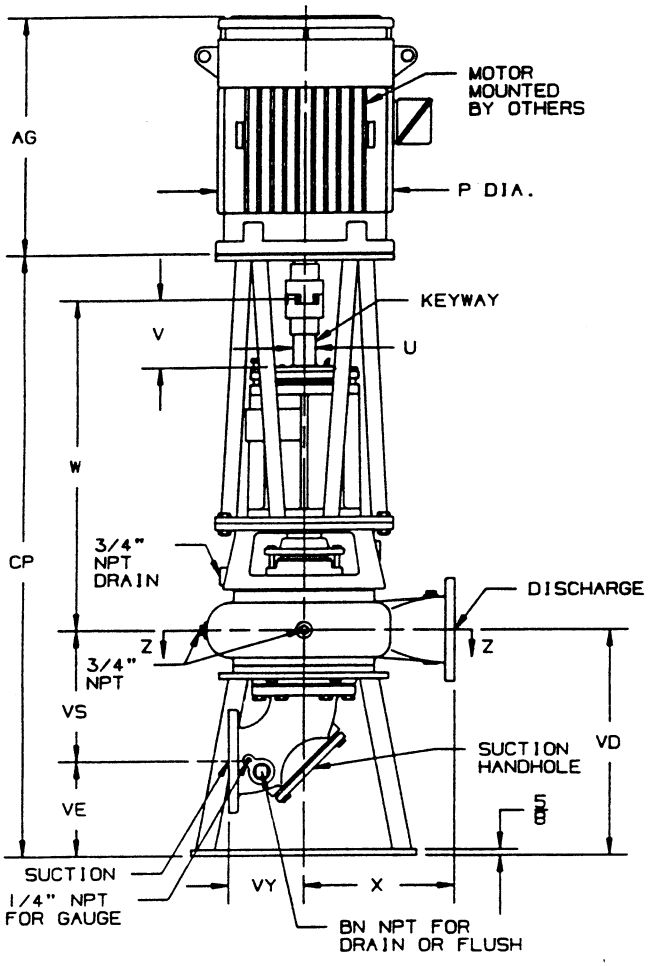
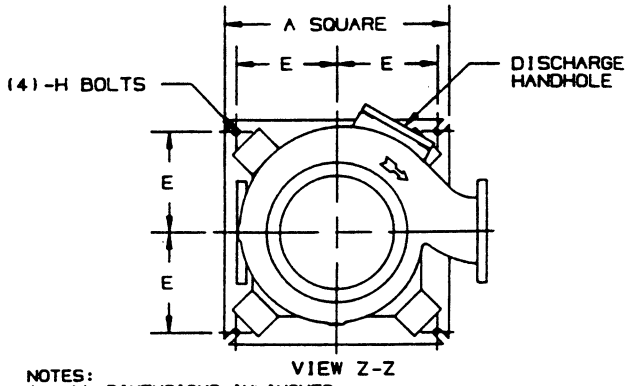
AURORA MODEL 613A PUMP





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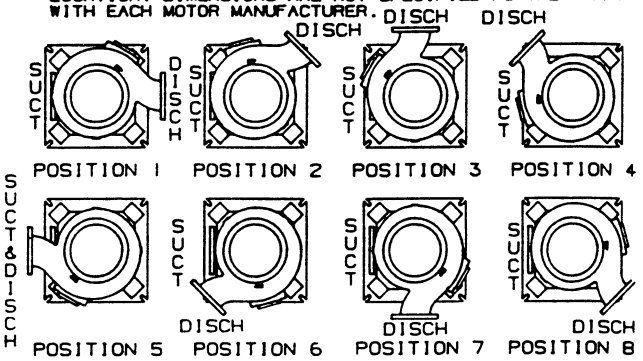
5. DISCHARGE POSITION 1 IS FURNISHED AS STANDARD UNLESS SPECIFIED.
6. SUCTION AND DISCHARGE FLANGES ARE AMERICAN STANDARD 125 LBS.
7. HEIGHT (AG) AND DIAMETERS (P) DIMENSIONS OF MOTOR WILL VARY BASED ON MAKE AND STYLE OF MOTOR. DIMENSIONS SHOWN REFLECT AURORA STANDARD MOTORS. SEE INDIVIDUAL MOTOR SUPPLIER DIMENSIONAL DATA SHEETS FOR YOUR APPLICATION. CONDUIT BOX IS SHOWN IN APPROXIMATE LOCATION. DIMENSIONS ARE NOT SPECIFIED AS THEY VARY WITH EACH MOTOR MANUFACTURER.



DISCHARGE POSITIONS AVAILABLE (VIEW Z-Z)

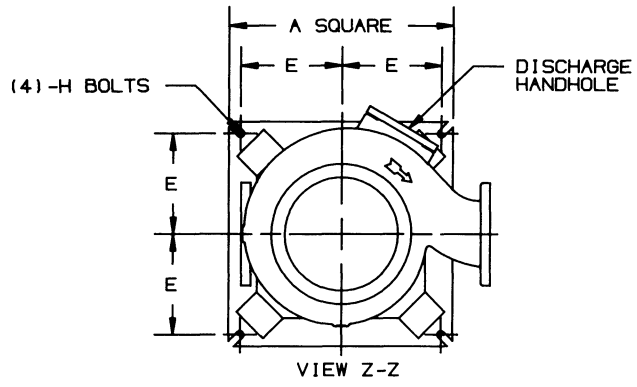
POWER FRAME	U	V	KEYWAY LENGTH	KEYWAY WIDTH	KEYWAY DEPTH
4C, 4D	1 1/4	3 3/16	2	1/4	1/8
5E, 5F 5G, 5H	2 3/8	6 3/8	4	5/8	5/16
6D	2 7/8	6 5/8	5	3/4	3/8
6E	2 7/8	5 3/4	4	3/4	3/8

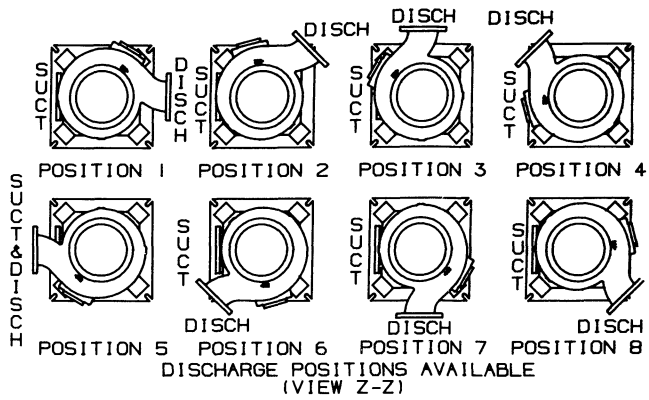
MOTOR FRAME	254HP TO 256HP	284HPH TO 286HPH	324HP TO 326HP	364HP TO 365HP	404HP TO 405HP	LARGER THAN 405HP
P APPROX.	13	16	18	21	22	REFER TO FACTORY
AG APPROX.	20 21	22 23	25 26	25	28	

DISCH SUCT CASE BORE	POWER FRAME	A	BN	E	H	VY	W	X	CP	VD	VE	VS	HANDHOLE DISCH.	HANDHOLE SUCT.
6x6x12	4C, 4D	24	1 1/2	10 3/4	5/8	8	23 5/16	14	51 5/16	24 1/4	10 1/8	14 1/8	5x5	6
6x6x12	5E,5F	24	1 1/2	10 3/4	5/8	8	34 3/16	14	64	24 1/4	10 1/8	14 1/8	5x5	6
6x6x12B	4C, 4D	24	1 1/2	10 3/4	5/8	8	23 7/16	16	51 5/16	24 1/8	10 1/8	14	5x5	6
6x6x12B	5E,5F	24	1 1/2	10 3/4	5/8	8	34 5/16	16	64	24 1/8	10 1/8	14	5x5	6
6x8x15	5E, 5F	30	1 1/2	13 3/4	3/4	9	33 3/4	16	71 7/16	32 1/8	17	15 1/8	5x5	6
6x8x18	5E, 5F	30	1 1/2	13 3/4	3/4	9	34 1/16	18	72	32 3/8	17	15 3/8	5x5	6
8x8x15A	5E	30	1 1/2	13 3/4	3/4	9	34 1/8	19	72 1/16	32 3/8	14 1/4	18 1/8	5x7	6
8x10x18	5G, 5H	30	1 1/2	13 3/4	3/4	11	34 5/8	19	73 3/16	33	15 3/16	17 13/16	5x7	6
8x10x22	5G, 5H	37	1 1/2	17	7/8	11	34 5/8	22	74 11/16	34 1/2	16 5/8	17 7/8	5x7	6
10x10x15	5E, 5F	30	1 1/2	13 3/4	3/4	11	34 13/16	20	73 5/16	32 15/16	11 7/8	21 1/16	5x7	6
10x10x22	6E	37	1 1/2	17	7/8	11	37 1/8	22 1/2	77 1/16	34 1/2	16 5/8	17 7/8	5x7	6
10x12x22	5G, 5H	37	1 1/2	17	7/8	12	35 1/16	22 1/2	75 3/4	35 1/8	15 9/16	19 9/16	5x7	8
10x12x22	6D	37	1 1/2	17	7/8	12	37 9/16	22 1/2	78 1/8	35 1/8	15 9/16	19 9/16	5x7	8
12x12x22	6E	37	1 1/2	17	7/8	12	37 5/8	22 1/2	78 3/16	35 1/8	15 9/16	19 9/16	5x7	8
12x14x22A	5G, 5H	37	2 1/2	17	7/8	14	35 1/8	24	75 13/16	35 1/8	13 7/8	21 1/4	5x7	8
12x14x22A	6D	37	2 1/2	17	7/8	14	37 5/8	24	78 3/16	35 1/8	13 7/8	21 1/4	5x7	8
12x14x22B	5G, 5H	37	2 1/2	17	7/8	14	35 1/8	24	75 13/16	35 1/8	13 7/8	21 1/4	5x7	8
12x14x22B	6D	37	2 1/2	17	7/8	14	37 5/8	24	78 3/16	35 1/8	13 7/8	21 1/4	5x7	8
14x14x22A	6E	37	2 1/2	17	7/8	14	37 5/8	24	78 3/16	35 1/8	13 7/8	21 1/4	5x7	8

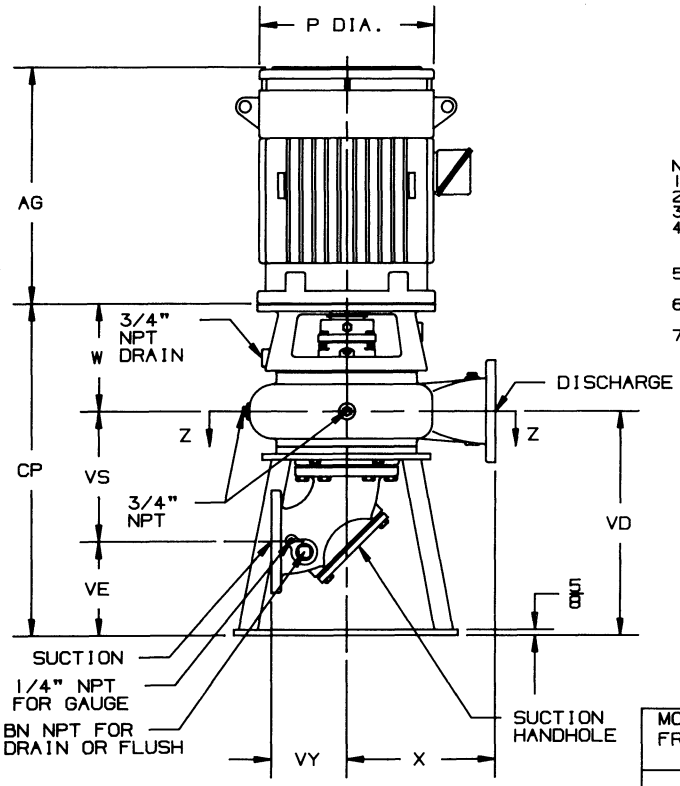
ADD 3/4" TO CP FOR PUMPS ON P.F. 4C, 4D WITH MOTOR FRAMES 284 HPH TO 324 HP.

AURORA MODEL 614A PUMP
6", 8" & 10" PUMPS





DISCHARGE POSITIONS AVAILABLE
(VIEW Z-Z)

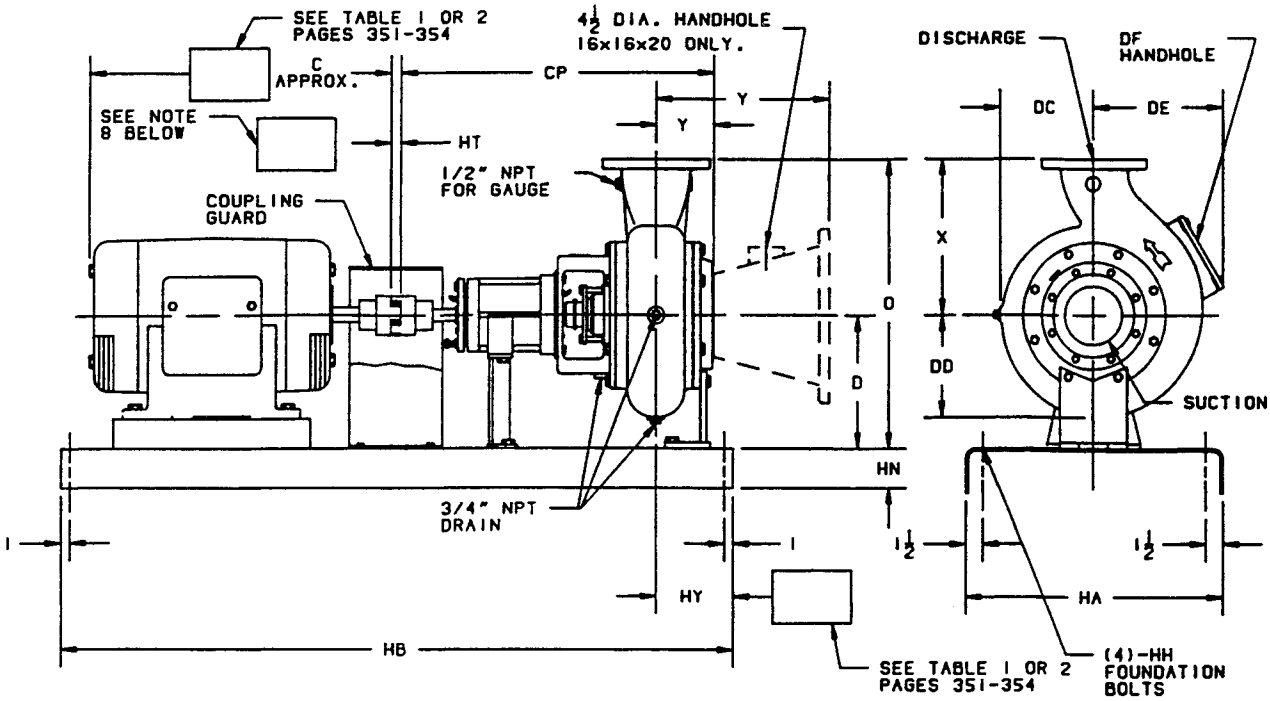


NOTES:
1. ALL DIMENSIONS IN INCHES.
2. DIMENSIONS MAY VARY ± 1/2".
3. NOT FOR CONSTRUCTION PURPOSES UNLESS CERTIFIED.
4. TWO (2) 1/2" NPT CONNECTIONS 180° APART, ON THE STUFFING BOX FOR LUBRICATION PURPOSES ARE FURNISHED AS STANDARD.
5. DISCHARGE POSITION 1 IS FURNISHED AS STANDARD UNLESS SPECIFIED.
6. SUCTION AND DISCHARGE FLANGES ARE AMERICAN STANDARD 125 LBS.
7. HEIGHT (AG) AND DIAMETERS (P) DIMENSIONS OF MOTOR WILL VARY BASED ON MAKE AND STYLE OF MOTOR. DIMENSIONS SHOWN REFLECT AURORA STANDARD MOTORS. SEE INDIVIDUAL MOTOR SUPPLIER DIMENSIONAL DATA SHEETS FOR YOUR APPLICATION. CONDUIT BOX IS SHOWN IN APPROXIMATE LOCATION. DIMENSIONS ARE NOT SPECIFIED AS THEY VARY WITH EACH MOTOR MANUFACTURER.

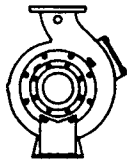
MOTOR FRAME	254TCV TO 256TCV	284TCV TO 286TCV	324TCV TO 326TCV	364TCV TO 365TCV	404TCV TO 405TCV	LARGER THAN 405TCV
P APPROX.	13	16	18	21	22	REFER TO FACTORY
AG APPROX.	20 21	22 23	25 26	25	28	

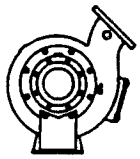
DISCH SUCT CASE BORE	MOTOR SHAFT EXT. TYPE	A	BN	E	H	VY	W	X	CP	VD	VE	VS	HANDHOLE DISCH.	HANDHOLE SUCT.
6x6x12	4C, 4D	24	1 1/2	10 3/4	5/8	8	10 1/8	14	34 3/8	24 1/4	10 1/8	14 1/8	5x5	6
6x6x12	5E, 5F	24	1 1/2	10 3/4	5/8	8	11 3/16	14	35 7/16	24 1/4	10 1/8	14 1/8	5x5	6
6x6x12B	4C, 4D	24	1 1/2	10 3/4	5/8	8	10 1/4	16	34 3/8	24 1/8	10 1/8	14	5x5	6
6x6x12B	5E, 5F	24	1 1/2	10 3/4	5/8	8	11 5/16	16	35 7/16	24 1/8	10 1/8	14	5x5	6
6x8x15	5E, 5F	30	1 1/2	13 3/4	3/4	9	10 3/4	16	42 7/8	32 1/8	17	15 1/8	5x5	6
6x8x18	5E, 5F	30	1 1/2	13 3/4	3/4	9	11 1/16	18	43 7/16	32 3/8	17	15 3/8	5x5	6
8x8x15A	5E, 5F	30	1 1/2	13 3/4	3/4	9	11 1/8	19	43 1/2	32 3/8	14 1/4	18 1/8	5x7	6
10x10x15	5E, 5F	30	1 1/2	13 3/4	3/4	11	11 11/16	20	44 5/8	32 15/16	11 7/8	21 1/16	5x7	6

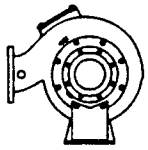
AURORA MODEL 611A PUMP
FORMED STEEL BASE

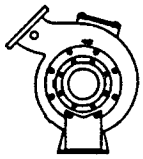


NOTES:
1. ALL DIMENSIONS IN INCHES.
2. DIMENSIONS MAY VARY ± 1/2".
3. NOT FOR CONSTRUCTION PURPOSES UNLESS CERTIFIED.
4. TWO (2) 1/2" NPT CONNECTIONS 180° APART, ON THE STUFFING BOX FOR LUBRICATION PURPOSES ARE FURNISHED AS STANDARD. ON PACKED PUMPS AN ALEMITE FITTING IS PROVIDED IN ONE TAP AND THE REMAINING TAP IS PLUGGED.
5. DISCHARGE POSITION 1 IS FURNISHED AS STANDARD UNLESS SPECIFIED.
6. SUCTION AND DISCHARGE FLANGES ARE AMERICAN STANDARD 125 LBS.
7. CONDUIT BOX IS SHOWN IS APPROXIMATE LOCATION. DIMENSIONS ARE NOT SPECIFIED AS THEY MAY VARY WITH EACH MOTOR MANUFACTURER.
8. STANDARD COUPLING ILLUSTRATED. "HT" DIMENSION 1" MAXIMUM. FOR SPACER COUPLING SIZE AND "HT" DIMENSION REFER TO PAGES 355-356 (TABLE 3).


DISCHARGE POSITION 1


DISCHARGE POSITION 2


DISCHARGE POSITION 7

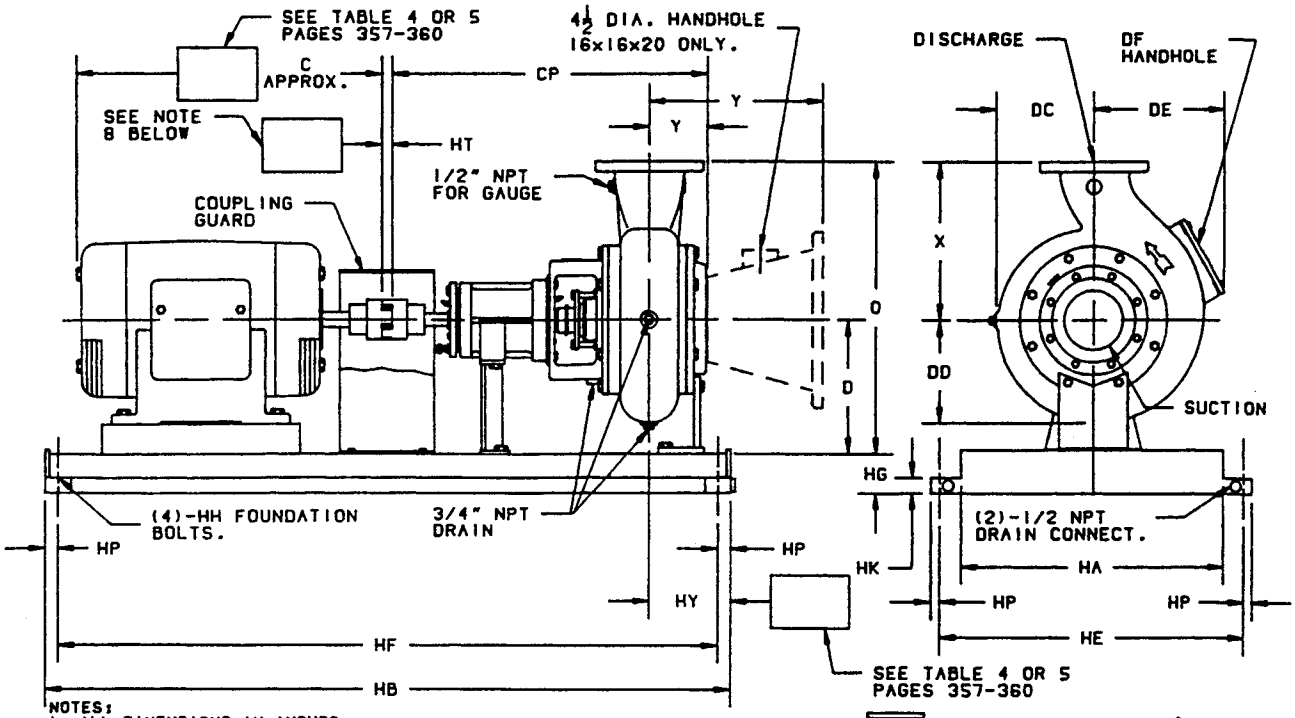

DISCHARGE POSITION 8

DISCHARGE POSITIONS AVAILABLE
(VIEWED FROM SUCTION END)

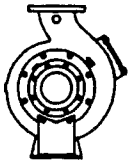
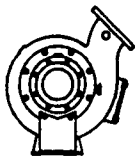
DISCH SUCT CASE BORE	POWER FRAME	D	O	X	Y	CP	DC	DD	DE	DF
6x6x12	4C,4D	13 1/2	27 1/2	14	6 3/16	29 1/2	9 1/2	10 1/2	13 7/8	5x5
6x6x12	5E,5F	13 1/2	27 1/2	14	6 3/16	40 3/8	9 1/2	10 1/2	13 7/8	5x5
6x6x12B	4C,4D	13 1/2	29 1/2	16	6 1/16	29 1/2	10 3/8	11 1/16	13 7/8	5x5
6x6x12B	5E,5F	13 1/2	29 1/2	16	6 1/16	40 3/8	10 3/8	11 1/16	13 7/8	5x5
6x8x15	5E,5F	15 1/4	31 1/4	16	6 1/8	39 7/8	11 3/8	12 1/2	15 3/8	5x5
6x8x18	5E,5F	17 1/2	35 1/2	18	6 7/16	40 1/2	13	14 3/8	16 7/8	5x5
8x8x15A	5E	15 1/4	34 1/4	19	9 1/8	43 1/4	12 5/8	13 1/2	15 3/4	5x7
8x10x18	5G,5H	17 1/2	36 1/2	19	6 3/4	41 3/8	12 7/8	14 9/16	16	5x7
8x10x22	5G,5H	21	43	22	6 7/8	41 1/2	14 7/8	16 1/2	17 7/8	5x7
10x10x15	5E,5F	15 1/4	35 1/4	20	10 1/16	44 7/8	11 5/8	13 5/8	17 1/2	5x7
10x10x22	6E	21	43	22	6 7/8	44	15	16 1/2	18 1/2	5x7
10x12x22	5G,5H	21	43 1/2	22 1/2	7 3/16	42 1/4	15 1/2	17 7/8	20 1/8	5x7
10x12x22	6D	21	43 1/2	22 1/2	7 3/16	44 3/4	15 1/2	17 7/8	20 1/8	5x7
12x12x22	6E	21	43 1/2	22 1/2	7 1/4	44 7/8	15 5/8	17 3/4	21	5x7
12x14x22A	5G,5H	21	45	24	7 1/4	42 3/8	15 7/8	18 3/4	22 1/4	5x7
12x14x22A	6D	21	45	24	7 1/4	44 7/8	15 7/8	18 3/4	22 1/4	5x7
12x14x22B	5G,5H	21	45	24	7 1/4	42 3/8	15 7/8	18 3/4	22 1/4	5x7
12x14x22B	6D	21	45	24	7 1/4	44 7/8	15 7/8	18 3/4	22 1/4	5x7
14x14x22A	6E	21	45	24	7 1/4	44 7/8	15 7/8	18 3/4	22 1/4	5x7
16x16x20	6F	24	56	32	23 1/2	63 3/8	17 3/4	20 1/2	24	6 DIA

BASE	HA	HB	HH	HN
3	15	54	5/8	3 3/8
4	15	60	5/8	3 3/8
5	15	64	5/8	3 3/8
6	15	70	5/8	3 3/8
8	18	68	5/8	4
9	18	76	5/8	4
10	18	84	5/8	4
16	22	72	5/8	4
17	22	84	5/8	4
18	22	96	5/8	4

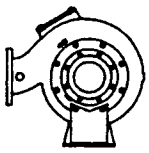
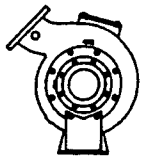
AURORA MODEL 611A PUMP
STEEL DRIP RIM BASE



NOTES:
1. ALL DIMENSIONS IN INCHES.
2. DIMENSIONS MAY VARY ± 1/2".
3. NOT FOR CONSTRUCTION PURPOSES UNLESS CERTIFIED.
4. TWO (2) 1/2" NPT CONNECTIONS 180° APART, ON THE STUFFING BOX FOR LUBRICATION PURPOSES ARE FURNISHED AS STANDARD. ON PACKED PUMPS AN ALEMITE FITTING IS PROVIDED IN ONE TAP AND THE REMAINING TAP IS PLUGGED.
5. DISCHARGE POSITION 1 IS FURNISHED AS STANDARD UNLESS SPECIFIED.
6. SUCTION AND DISCHARGE FLANGES ARE AMERICAN STANDARD 125 LBS.
7. CONDUIT BOX IS SHOWN IS APPROXIMATE LOCATION. DIMENSIONS ARE NOT SPECIFIED AS THEY MAY VARY WITH EACH MOTOR MANUFACTURER.
8. STANDARD COUPLING ILLUSTRATED. "HT" DIMENSION 1" MAXIMUM. FOR SPACER COUPLING SIZE AND "HT" DIMENSION REFER TO PAGES 355-356 (TABLE 3).
9. 3 GROUT HOLES ARE PROVIDED IN TOP OF BASE.

DISCHARGE POSITION 1 DISCHARGE POSITION 2

DISCHARGE POSITION 7 DISCHARGE POSITION 8

DISCHARGE POSITIONS AVAILABLE
(VIEWED FROM SUCTION END)

BASE	SIZE	HA	HB	HE	HF	HG	HH	HK	HP
10	14x56	14	56 1/2	19	55	3	5/8	1 1/2	3/4
13	18x64	18	64 1/2	25 1/8	62 7/8	4	3/4	2	13/16
14	18x72	18	72 1/2	25 1/8	70 7/8	4	3/4	2	13/16
17	22x74	22	74 1/2	29 1/8	72 7/8	4 1/2	3/4	2	13/16
18	22x82	22	82 1/2	29 1/8	80 7/8	4 1/2	3/4	2	13/16
19	22x90	22	90 1/2	29 1/8	88 7/8	4 1/2	3/4	2	13/16
21	30x110	30	110 1/2	37 1/8	108 7/8	4 1/2	3/4	2	13/16

DISCH / SUCT / CASE BORE	POWER FRAME	D	O	X	Y	CP	DC	DD	DE	DF
6x6x12	4C,4D	13 1/2	27 1/2	14	6 3/16	29 1/2	9 1/2	10 1/2	13 7/8	5x5
6x6x12	5E,5F	13 1/2	27 1/2	14	6 3/16	40 3/8	9 1/2	10 1/2	13 7/8	5x5
6x6x12B	4C,4D	13 1/2	29 1/2	16	6 1/16	29 1/2	10 3/8	11 1/16	13 7/8	5x5
6x6x12B	5E,5F	13 1/2	29 1/2	16	6 1/16	40 3/8	10 3/8	11 1/16	13 7/8	5x5
6x8x15	5E,5F	15 1/4	31 1/4	16	6 1/8	39 7/8	11 3/8	12 1/2	15 3/8	5x5
6x8x18	5E,5F	17 1/2	35 1/2	18	6 7/16	40 1/2	13	14 3/8	16 7/8	5x5
8x8x15A	5E	15 1/4	34 1/4	19	9 1/8	43 1/4	12 5/8	13 1/2	15 3/4	5x7
8x10x18	5G,5H	17 1/2	36 1/2	19	6 3/4	41 3/8	12 7/8	14 9/16	16	5x7
8x10x22	5G,5H	21	43	22	6 7/8	41 1/2	14 7/8	16 1/2	17 7/8	5x7
10x10x15	5E,5F	15 1/4	35 1/4	20	10 1/16	44 7/8	11 5/8	13 5/8	17 1/2	5x7
10x10x22	6E	21	43	22	6 7/8	44	15	16 1/2	18 1/2	5x7
10x12x22	5G,5H	21	43 1/2	22 1/2	7 3/16	42 1/4	15 1/2	17 7/8	20 1/8	5x7
10x12x22	6D	21	43 1/2	22 1/2	7 3/16	44 3/4	15 1/2	17 7/8	20 1/8	5x7
12x12x22	6E	21	43 1/2	22 1/2	7 1/4	44 7/8	15 5/8	17 3/4	21	5x7
12x14x22A	5G,5H	21	45	24	7 1/4	42 3/8	15 7/8	18 3/4	22 1/4	5x7
12x14x22A	6D	21	45	24	7 1/4	44 7/8	15 7/8	18 3/4	22 1/4	5x7
12x14x22B	5G,5H	21	45	24	7 1/4	42 3/8	15 7/8	18 3/4	22 1/4	5x7
12x14x22B	6D	21	45	24	7 1/4	44 7/8	15 7/8	18 3/4	22 1/4	5x7
14x14x22A	6E	21	45	24	7 1/4	44 7/8	15 7/8	18 3/4	22 1/4	5x7
16x16x20	6F	24	56	32	23 1/2	63 3/8	17 3/4	20 1/2	24	6 DIA

AURORA MODEL 611A PUMP
FORMED STEEL BASE

TABLE 1

CASE BORE SUCT. DISCH.	POWER FRAME	MOTOR FRAME	254T	256T	284TS	284T	286TS	286T
		C	21	23	22	24	24	25
6x6x12	4	BASE	3	3	3	4	4	4
		HY	8	8	8	8	8	8
6x6x12B	4	BASE	3	3	3	4	4	4
		HY	8	8	8	8	8	8
6x6x12	5	BASE			5	6	6	6
		HY			8	8	8	8
6x6x12B	5	BASE			5	6	6	6
		HY			8	8	8	8
6x8x15	5	BASE			5	6	6	6
		HY			8	8	8	8
6x8x18	5	BASE			8	8	8	8
		HY			8	8	8	8
8x8x15A	5	BASE		6	6	6	6	6
		HY		9 3/4	9 3/4	9 3/4	9 3/4	9 3/4
8x10x18	5	BASE			8	8	8	8
		HY			8	8	8	8
8x10x22	5	BASE						
		HY						
10x10x15	5	BASE			6	6	6	6
		HY			10	10	10	10
10x12x22	5	BASE						
		HY						
12x14x22A	5	BASE						
		HY						
12x14x22B	5	BASE						
		HY						
16x16x20	6	BASE						
		HY						

CASE BORE SUCT. DISCH.	POWER FRAME	MOTOR FRAME	324TS	324T	326TS	326T	364TS	364T	365TS	365T
		C	25	26	26	28	27	29	28	30
6x6x12	4	BASE	4	4						
		HY	8	8						
6x6x12B	4	BASE	4	4						
		HY	8	8						
6x6x12	5	BASE	8	8	8	9	16	16	16	16
		HY	8	8	8	8	8	8	8	8
6x6x12B	5	BASE	8	8	8	9	16	16	16	16
		HY	8	8	8	8	8	8	8	8
6x8x15	5	BASE	8	8	8	9	9	9	9	17
		HY	8	8	8	8	8	8	8	8
6x8x18	5	BASE	8	8	8	9	16	16	16	16
		HY	8	8	8	8	8	8	8	8
8x8x15A	5	BASE	9	9	9	9	16	16	16	16
		HY	9 3/4	9 3/4	9 3/4	9 3/4	9 3/4	9 3/4	9 3/4	9 3/4
8x10x18	5	BASE	8	8	8	9	16	16	16	16
		HY	8	8	8	8	8	8	8	8
8x10x22	5	BASE	16	16	16	16	16	16	16	16
		HY	8	8	8	8	8	8	8	8
10x10x15	5	BASE	9	9	9	9	17	17	17	17
		HY	10	10	10	10	10	10	10	10
10x12x22	5	BASE					16	16	16	17
		HY					8	8	8	8
12x14x22A	5	BASE					16	16	16	17
		HY					8	8	8	8
12x14x22B	5	BASE					16	16	16	17
		HY					8	8	8	8
16x16x20	6	BASE					17	17	17	17
		HY					10 1/4	10 1/4	10 1/4	10 1/4

NOTES:
1. ALL DIMENSIONS IN INCHES.
2. NOT FOR CONSTRUCTION PURPOSES UNLESS CERTIFIED.

AURORA MODEL 611A PUMP
FORMED STEEL BASE
STANDARD COUPLING

TABLE 1 (CONTINUED)

CASE BORE SUCT. DISCH.	POWER FRAME	MOTOR FRAME	404TS	404T	405TS	405T	444TS	444T	445TS	445T
		C	30	33	31	34	34	38	36	40
6x8x15	5	BASE	17	17	17	17	17	17	17	17
		HY	8	8	8	8	8	8	8	8
6x8x18	5	BASE	16	17	17	17	17	17	17	17
		HY	8	8	8	8	8	8	8	8
8x8x15A	5	BASE	17	17	17	17				
		HY	9 3/4	9 3/4	9 3/4	9 3/4				
8x10x18	5	BASE	16	17	17	17	17	17	17	17
		HY	8	8	8	8	8	8	8	8
8x10x22	5	BASE	16	17	17	17	17	17	17	17
		HY	8	8	8	8	8	8	8	8
10x10x15	5	BASE	17	17	17	17	17	17	17	17
		HY	10	10	10	10	10	10	10	10
10x10x22	6	BASE								17
		HY								8
10x12x22	5	BASE	17	17	17	17	17	17	17	17
		HY	8	8	8	8	8	8	8	8
10x12x22	6	BASE	17	17	17	17	17	17	17	17
		HY	8	8	8	8	8	8	8	8
12x12x22	6	BASE								17
		HY								8
12x14x22A	5	BASE	17	17	17	17	17	17	17	17
		HY	8	8	8	8	8	8	8	8
12x14x22A	6	BASE	17	17	17	17	17	17	17	17
		HY	8	8	8	8	8	8	8	8
12x14x22B	5	BASE	17	17	17	17	17	17	17	17
		HY	8	8	8	8	8	8	8	8
12x14x22B	6	BASE	17	17	17	17	17	17	17	17
		HY	8	8	8	8	8	8	8	8
14x14x22A	6	BASE								17
		HY								8
16x16x20	6	BASE	17	18	18	18	18	18	18	18
		HY	10 1/4	10 1/4	10 1/4	10 1/4	10 1/4	10 1/4	10 1/4	10 1/4

NOTES:
1. ALL DIMENSIONS IN INCHES.
2. NOT FOR CONSTRUCTION PURPOSES UNLESS CERTIFIED.

AURORA MODEL 611A PUMP
FORMED STEEL BASE
SPACER COUPLING

TABLE 2

CASE BORE SUCT. DISCH.	POWER FRAME	MOTOR FRAME	254T	256T	284TS	284T	286TS	286T
		C	21	23	22	24	24	25
6x6x12	4	BASE	4	4	4	4	4	4
		HY	8	8	8	8	8	8
6x6x12B	4	BASE	4	4	4	4	4	4
		HY	8	8	8	8	8	8
6x6x12	5	BASE			9	9	9	9
		HY			8	8	8	8
6x6x12B	5	BASE			9	9	9	9
		HY			8	8	8	8
6x8x15	5	BASE			6	9	9	9
		HY			8	8	8	8
6x8x18	5	BASE			9	9	9	9
		HY			8	8	8	8
8x8x15A	5	BASE		9	9	9	9	9
		HY		9 3/4	9 3/4	9 3/4	9 3/4	9 3/4
8x10x18	5	BASE			9	9	9	9
		HY			8	8	8	8
8x10x22	5	BASE						
		HY						
10x10x15	5	BASE			9	9	9	9
		HY			10	10	10	10
10x12x22	5	BASE						
		HY						
12x14x22A	5	BASE						
		HY						
12x14x22B	5	BASE						
		HY						
16x16x20	6	BASE						
		HY						

CASE BORE SUCT. DISCH.	POWER FRAME	MOTOR FRAME	324TS	324T	326TS	326T	364TS	364T	365TS	365T
		C	25	26	26	28	27	29	28	30
6x6x12	4	BASE	4	5						
		HY	8	8						
6x6x12B	4	BASE	4	5						
		HY	8	8						
6x6x12	5	BASE	9	9	9	9	17	17	17	17
		HY	8	8	8	8	8	8	8	8
6x6x12B	5	BASE	9	9	9	9	17	17	17	17
		HY	8	8	8	8	8	8	8	8
6x8x15	5	BASE	9	9	9	10	17	17	17	17
		HY	8	8	8	8	8	8	8	8
6x8x18	5	BASE	9	9	9	9	17	17	17	17
		HY	8	8	8	8	8	8	8	8
8x8x15A	5	BASE	9	10	10	10	17	17	17	17
		HY	9 3/4	9 3/4	9 3/4	9 3/4	9 3/4	9 3/4	9 3/4	9 3/4
8x10x18	5	BASE	9	9	9	10	17	17	17	17
		HY	8	8	8	8	8	8	8	8
8x10x22	5	BASE	17	17	17	17	17	17	17	17
		HY	8	8	8	8	8	8	8	8
10x10x15	5	BASE	9	10	10	10	17	17	17	17
		HY	0	10	10	10	10	10	10	10
10x12x22	5	BASE					17	17	17	17
		HY					8	8	8	8
12x14x22A	5	BASE					17	17	17	17
		HY					8	8	8	8
12x14x22B	5	BASE					17	17	17	17
		HY					8	8	8	8
16x16x20	6	BASE					18	18	18	18
		HY					10 1/4	10 1/4	10 1/4	10 1/4

NOTES:
1. ALL DIMENSIONS IN INCHES.
2. NOT FOR CONSTRUCTION PURPOSES UNLESS CERTIFIED.

AURORA MODEL 611A PUMP
FORMED STEEL BASE
STANDARD COUPLING

TABLE 2 (CONTINUED)

CASE BORE SUCT. DISCH.	POWER FRAME	MOTOR FRAME	404TS	404T	405TS	405T	444TS	444T	445TS	445T
		C	30	33	31	34	34	38	36	40
6x8x15	5	BASE	17	17	17	17	17	18	17	18
		HY	8	8	8	8	8	8	8	8
6x8x18	5	BASE	17	17	17	17	17	18	17	18
		HY	8	8	8	8	8	8	8	8
8x8x15A	5	BASE	17	17	17	17				
		HY	9 3/4	9 3/4	9 3/4	9 3/4				
8x10x18	5	BASE	17	17	17	17	17	18	18	18
		HY	8	8	8	8	8	8	8	8
8x10x22	5	BASE	17	17	17	17	17	18	18	18
		HY	8	8	8	8	8	8	8	8
10x10x15	5	BASE	17	18	17	18	18	18	18	18
		HY	10	10	10	10	10	10	10	10
10x10x22	6	BASE								18
		HY								8
10x12x22	5	BASE	17	17	17	18	18	18	18	18
		HY	8	8	8	8	8	8	8	8
10x12x22	6	BASE	17	18	17	18	18	18	18	18
		HY	8	8	8	8	8	8	8	8
12x12x22	6	BASE								18
		HY								8
12x14x22A	5	BASE	17	17	17	18	18	18	18	18
		HY	8	8	8	8	8	8	8	8
12x14x22A	6	BASE	17	17	17	18	18	18	18	18
		HY	8	8	8	8	8	8	8	8
12x14x22B	5	BASE	17	17	17	18	18	18	18	18
		HY	8	8	8	8	8	8	8	8
12x14x22B	6	BASE	17	17	17	18	18	18	18	18
		HY	8	8	8	8	8	8	8	8
14x14x22A	6	BASE								18
		HY								8
16x16x20	6	BASE	18	18	18	18	18	18	18	18
		HY	10 1/4	10 1/4	10 1/4	10 1/4	10 1/4	10 1/4	10 1/4	10 1/4

NOTES:
1. ALL DIMENSIONS IN INCHES.
2. NOT FOR CONTRUCTION PURPOSES UNLESS CERTIFIED.

TABLE 3

CASE BORE SUCT. DISCH.	POWER FRAME	MOTOR FRAME	254T	256T	284TS	284T	286TS	286T	324TS	324T	326TS	326T	364TS	364T	365TS	365T
6x6x12	4	SIZE	7	8	8	8	9	9	9	9						
		HT	5	5	5	5	5	5	5	5						
6x6x12B	4	SIZE	7	8	8	8	9	9	9	9						
		HT	5	5	5	5	5	5	5	5						
6x6x12	5	SIZE			9	9	9	9	9	9	10	10	12	12	12	12
		HT			7 3/4	7 3/4	7 3/4	7 3/4	7 3/4	7 3/4	7 3/4	7 3/4	7 3/4	7 3/4	7 3/4	7 3/4
6x6x12B	5	SIZE			9	9	9	9	9	9	10	10	12	12	12	12
		HT			7 3/4	7 3/4	7 3/4	7 3/4	7 3/4	7 3/4	7 3/4	7 3/4	7 3/4	7 3/4	7 3/4	7 3/4
6x8x15	5	SIZE			9	9	9	9	9	9	10	10	12	10	12	12
		HT			7 3/4	7 3/4	7 3/4	7 3/4	7 3/4	7 3/4	7 3/4	7 3/4	7 3/4	7 3/4	7 3/4	7 3/4
6x8x18	5	SIZE			9	9	9	9	9	9	10	10	10	10	12	12
		HT			7 3/4	7 3/4	7 3/4	7 3/4	7 3/4	7 3/4	7 3/4	7 3/4	7 3/4	7 3/4	7 3/4	7 3/4
8x8x15A	5	SIZE		9	9	9	9	9	9	9	10	10	12	10	12	12
		HT		7 3/4	7 3/4	7 3/4	7 3/4	7 3/4	7 3/4	7 3/4	7 3/4	7 3/4	7 3/4	7 3/4	7 3/4	7 3/4
8x10x18	5	SIZE			9	9	9	9	9	9	10	10	10	10	12	12
		HT			7 3/4	7 3/4	7 3/4	7 3/4	7 3/4	7 3/4	7 3/4	7 3/4	7 3/4	7 3/4	7 3/4	7 3/4
8x10x22	5	SIZE			10	10	10	10	10	10	10	10	10	10	11	11
		HT			9	9	9	9	9	9	9	9	9	9	9	9
10x10x15	5	SIZE			10	10	10	10	10	10	10	10	10	10	11	11
		HT			9	9	9	9	9	9	9	9	9	9	9	9
10x12x22	5	SIZE											10	10	11	11
		HT											9	9	9	9
12x14x22A	5	SIZE											10	10	11	11
		HT											9	9	9	9
12x14x22B	5	SIZE											10	10	11	11
		HT											9	9	9	9
16x16x20	6	SIZE											11	11	11	11
		HT											9	9	9	9

NOTES:
1. ALL DIMENSIONS IN INCHES.
2. NOT FOR CONSTRUCTION PURPOSES UNLESS CERTIFIED.
3. SIZE: COUPLING SIZE FOR TYPE SC WOODS SURE-FLEX SPACER COUPLINGS.
4. HT: COUPLING GAP (DISTANCE BETWEEN SHAFTS)

AURORA MODEL 611A PUMP
SPACER COUPLING

TABLE 3 (CONTINUED)

CASE BORE SUCT. DISCH.	POWER FRAME	MOTOR FRAME	404TS	404T	405TS	405T	444TS	444T	445TS	445T
6x8x15	5	SIZE	12	12	12	12	12	12	13	13
		HT	7 3/4	7 3/4	7 3/4	7 3/4	7 3/4	7 3/4	7 3/4	7 3/4
6x8x18	5	SIZE	12	12	12	12	12	12	13	13
		HT	7 3/4	7 3/4	7 3/4	7 3/4	7 3/4	7 3/4	7 3/4	7 3/4
8x8x15A	5	SIZE	12	12	12	12				
		HT	7 3/4	7 3/4	7 3/4	7 3/4				
8x10x18	5	SIZE	12	12	12	12	12	12	13	13
		HT	7 3/4	7 3/4	7 3/4	7 3/4	7 3/4	7 3/4	7 3/4	7 3/4
8x10x22	5	SIZE	11	11	11	11	13	13	13	13
		HT	9	9	9	9	9	9	9	9
10x10x15	5	SIZE	11	11	12	12	13	13	13	13
		HT	9	9	9	9	9	9	9	9
10x10x22	6	SIZE								13
		HT								7 3/4
10x12x22	5	SIZE	12	12	12	12	12	12	13	13
		HT	9	9	9	9	9	9	9	9
10x12x22	6	SIZE	12	12	12	12	12	12	13	13
		HT	9	9	9	9	9	9	9	9
12x12x22	6	SIZE								13
		HT								7 3/4
12x14x22A	5	SIZE	12	12	12	12	12	12	13	13
		HT	9	9	9	9	9	9	9	9
12x14x22A	6	SIZE	12	12	12	12	12	12	13	13
		HT	9	9	9	9	9	9	9	9
12x14x22B	5	SIZE	12	12	12	12	12	12	13	13
		HT	9	9	9	9	9	9	9	9
12x14x22B	6	SIZE	12	12	12	12	12	12	13	13
		HT	9	9	9	9	9	9	9	9
14x14x22A	6	SIZE								13
		HT								7 3/4
16x16x20	6	SIZE	11	11	11	11	11	11	11	11
		HT	9	9	9	9	9	9	9	9

NOTES:
1. ALL DIMENSIONS IN INCHES.
2. NOT FOR CONSTRUCTION PURPOSE UNLESS CERTIFIED.
3. SIZE: COUPLING SIZE FOR TYPE SC WOODS SURE-FLEX SPACER COUPLINGS.
4. HT: COUPLING GAP (DISTANCE BETWEEN SHAFTS)

AURORA MODEL 611A PUMP
DRIP RIM STEEL BASE
STANDARD COUPLING

TABLE 4

CASE BORE SUCT. DISCH.	POWER FRAME	MOTOR FRAME	254T	256T	284TS	284T	286TS	286T
		C	21	23	22	24	24	25
6x6x12	4	BASE	10	10	10	10	10	10
		HY	8	8	8	8	8	8
6x6x12B	4	BASE	10	10	10	10	10	10
		HY	8	8	8	8	8	8
6x6x12	5	BASE			14	14	14	14
		HY			8	8	8	8
6x6x12B	5	BASE			14	14	14	14
		HY			8	8	8	8
6x8x15	5	BASE			14	14	14	14
		HY			8	8	8	8
6x8x18	5	BASE			14	14	14	14
		HY			8	8	8	8
8x8x15A•	5	BASE		14	14	14	14	14
		HY		9 3/4	9 3/4	9 3/4	9 3/4	9 3/4
8x10x18	5	BASE			14	14	14	14
		HY			8	8	8	8
8x10x22	5	BASE						
		HY						
10x10x15	5	BASE			17	17	17	17
		HY			11	11	11	11
10x12x22	5	BASE						
		HY						
12x14x22A	5	BASE						
		HY						
12x14x22B	5	BASE						
		HY						
16x16x20	6	BASE						
		HY						

CASE BORE SUCT. DISCH.	POWER FRAME	MOTOR FRAME	324TS	324T	326TS	326T	364TS	364T	365TS	365T
		C	25	26	26	28	27	29	28	30
6x6x12	4	BASE	10	10						
		HY	8	8						
6x6x12B	4	BASE	10	10						
		HY	8	8						
6x6x12	5	BASE	14	14	14	14	14	14	14	14
		HY	8	8	8	8	8	8	8	8
6x6x12B	5	BASE	14	14	14	14	14	14	14	14
		HY	8	8	8	8	8	8	8	8
6x8x15	5	BASE	14	14	14	14	14	14	14	14
		HY	8	8	8	8	8	8	8	8
6x8x18	5	BASE	14	14	14	14	14	14	14	14
		HY	8	8	8	8	8	8	8	8
8x8x15A	5	BASE	14	14	14	14	17	17	17	17
		HY	9 3/4	9 3/4	9 3/4	9 3/4	9 3/4	9 3/4	9 3/4	9 3/4
8x10x18	5	BASE	14	14	14	14	17	17	17	17
		HY	8	8	8	8	8	8	8	8
8x10x22	5	BASE	17	17	17	17	18	18	18	18
		HY	8	8	8	8	8	8	8	8
10x10x15	5	BASE	17	17	17	17	18	18	18	18
		HY	11	11	11	11	11	11	11	11
10x12x22	5	BASE					17	17	17	17
		HY					10	10	10	10
12x14x22A	5	BASE					18	18	18	18
		HY					10	10	10	10
12x14x22B	5	BASE					18	18	18	18
		HY					10	10	10	10
16x16x20	6	BASE					13	13	13	13
		HY					11 1/2	11 1/2	11 1/2	11 1/2

NOTES:
1. ALL DIMENSIONS IN INCHES.
2. NOT FOR CONSTRUCTION PURPOSES UNLESS CERTIFIED.

AURORA MODEL 611A PUMP
DRIP RIM STEEL BASE
STANDARD COUPLING

TABLE 4 (CONTINUED)

CASE BORE SUCT. DISCH.	POWER FRAME	MOTOR FRAME	404TS	404T	405TS	405T	444TS	444T	445TS	445T
		C	30	33	31	34	34	38	36	40
6x8x15	5	BASE	18	18	18	18	19	19	19	19
		HY	8	8	8	8	8	8	8	8
6x8x18	5	BASE	18	18	18	18	18	18	19	19
		HY	8	8	8	8	8	8	8	8
8x8x15A	5	BASE	18	18	18	18				
		HY	9 3/4	9 3/4	9 3/4	9 3/4				
8x10x18	5	BASE	18	18	18	18	18	18	19	19
		HY	8	8	8	8	8	8	8	8
8x10x22	5	BASE	18	18	18	18	19	19	19	19
		HY	8	8	8	8	8	8	8	8
10x10x15	5	BASE	18	18	18	18	19	19	19	19
		HY	11	11	11	11	11	11	11	11
10x10x22	6	BASE								21
		HY								10
10x12x22	5	BASE	18	18	18	18	18	18	19	19
		HY	10	10	10	10	10	10	10	10
10x12x22	6	BASE	18	18	18	18	19	19	19	19
		HY	10	10	10	10	10	10	10	10
12x12x22	6	BASE								21
		HY								10
12x14x22A	5	BASE	18	18	18	18	19	19	19	19
		HY	10	10	10	10	10	10	10	10
12x14x22A	6	BASE	18	18	18	18	19	19	19	19
		HY	10	10	10	10	10	10	10	10
12x14x22B	5	BASE	18	18	18	18	19	19	19	19
		HY	10	10	10	10	10	10	10	10
12x14x22B	6	BASE	18	18	18	18	19	19	19	19
		HY	10	10	10	10	10	10	10	10
14x14x22A	6	BASE								21
		HY								10
16x16x20	6	BASE	18	19	19	19	19	19	19	19
		HY	11 1/2	11 1/2	11 1/2	11 1/2	11 1/2	11 1/2	11 1/2	11 1/2

NOTES:
1. ALL DIMENSIONS IN INCHES.
2. NOT FOR CONSTRUCTION PURPOSES UNLESS CERTIFIED.

AURORA MODEL 611A PUMP
DRIP RIM STEEL BASE
SPACER COUPLING

TABLE 5

CASE BORE SUCT. DISCH.	POWER FRAME	MOTOR FRAME	254T	256T	284TS	284T	286TS	286T
		C	21	23	22	24	24	25
6x6x12	4	BASE	10	13	13	13	13	13
		HY	8	8	8	8	8	8
6x6x12B	4	BASE	10	13	13	13	13	13
		HY	8	8	8	8	8	8
6x6x12	5	BASE			14	14	17	17
		HY			8	8	8	8
6x6x12B	5	BASE			14	14	17	17
		HY			8	8	8	8
6x8x15	5	BASE			14	14	17	17
		HY			8	8	8	8
6x8x18	5	BASE			14	14	17	17
		HY			8	8	8	8
8x8x15A	5	BASE		17	17	17	17	17
		HY		9 3/4	9 3/4	9 3/4	9 3/4	9 3/4
8x10x18	5	BASE			17	17	17	17
		HY			8	8	8	8
8x10x22	5	BASE						
		HY						
10x10x15	5	BASE			18	18	18	18
		HY			11	11	11	11
10x12x22	5	BASE						
		HY						
12x14x22A	5	BASE						
		HY						
12x14x22B	5	BASE						
		HY						
16x16x20	6	BASE						
		HY						

CASE BORE SUCT. DISCH.	POWER FRAME	MOTOR FRAME	324TS	324T	326TS	326T	364TS	364T	365TS	365T
		C	25	26	26	28	27	29	28	30
6x6x12	4	BASE	13	13						
		HY	8	8						
6x6x12B	4	BASE	13	13						
		HY	8	8						
6x6x12	5	BASE	17	17	18	18	18	18	18	18
		HY	8	8	8	8	8	8	8	8
6x6x12B	5	BASE	17	17	18	18	18	18	18	18
		HY	8	8	8	8	8	8	8	8
6x8x15	5	BASE	17	17	18	18	18	18	18	18
		HY	8	8	8	8	8	8	8	8
6x8x18	5	BASE	17	17	18	18	18	18	18	18
		HY	8	8	8	8	8	8	8	8
8x8x15A	5	BASE	18	18	18	18	18	18	18	18
		HY	9 3/4	9 3/4	9 3/4	9 3/4	9 3/4	9 3/4	9 3/4	9 3/4
8x10x18	5	BASE	18	18	18	18	18	18	18	18
		HY	8	8	8	8	8	8	8	8
8x10x22	5	BASE	18	18	18	18	18	18	19	19
		HY	8	8	8	8	8	8	8	8
10x10x15	5	BASE	18	18	18	18	18	18	18	18
		HY	11	11	11	11	11	11	11	11
10x12x22	5	BASE					18	18	18	18
		HY					10	10	10	10
12x14x22A	5	BASE					18	18	18	18
		HY					10	10	10	10
12x14x22B	5	BASE					18	18	18	18
		HY					10	10	10	10
16x16x20	6	BASE					19	19	19	19
		HY					11 1/2	11 1/2	11 1/2	11 1/2

NOTES:
1. ALL DIMENSIONS IN INCHES.
2. NOT FOR CONSTRUCTION PURPOSES UNLESS CERTIFIED.

AURORA MODEL 611A PUMP
DRIP RIM STEEL BASE
SPACER COUPLING

TABLE 5 (CONTINUED)

CASE BORE SUCT. DISCH.	POWER FRAME	MOTOR FRAME	404TS	404T	405TS	405T	444TS	444T	445TS	445T
		C	30	33	31	34	34	38	36	40
6x8x15	5	BASE	18	18	18	18	19	19	19	19
		HY	8	8	8	8	8	8	8	8
6x8x18	5	BASE	18	18	18	18	19	19	19	19
		HY	8	8	8	8	8	8	8	8
8x8x15A	5	BASE	18	18	19	19				
		HY	9 3/4	9 3/4	9 3/4	9 3/4				
8x10x18	5	BASE	18	18	19	19	19	19	19	19
		HY	8	8	8	8	8	8	8	8
8x10x22	5	BASE	19	19	19	19	19	19	19	19
		HY	8	8	8	8	8	8	8	8
10x10x15	5	BASE	19	19	19	19	19	19	19	19
		HY	11	11	11	11	11	11	11	11
10x10x22	6	BASE								21
		HY								10
10x12x22	5	BASE	19	19	19	19	19	19	19	19
		HY	10	10	10	10	10	10	10	10
10x12x22	6	BASE	19	19	19	19	19	19	19	19
		HY	8	8	8	8	8	8	8	8
12x12x22	6	BASE								21
		HY								10
12x14x22A	5	BASE	19	19	19	19	19	19	19	19
		HY	10	10	10	10	10	10	10	10
12x14x22A	6	BASE	19	19	19	19	19	19	19	19
		HY	8	8	8	8	8	8	8	8
12x14x22B	5	BASE	19	19	19	19	19	19	19	19
		HY	10	10	10	10	10	10	10	10
12x14x22B	6	BASE	19	19	19	19	19	19	19	19
		HY	8	8	8	8	8	8	8	8
14x14x22A	6	BASE								21
		HY								10
16x16x20	6	BASE	21	21	21	21	21	21	21	21
		HY	11 1/2	11 1/2	11 1/2	11 1/2	11 1/2	11 1/2	11 1/2	11 1/2

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AURORA®
Pentair Pump Group

INSTRUCTION MANUAL
REPAIR
MODEL 611A (SPHER-FLO)

6

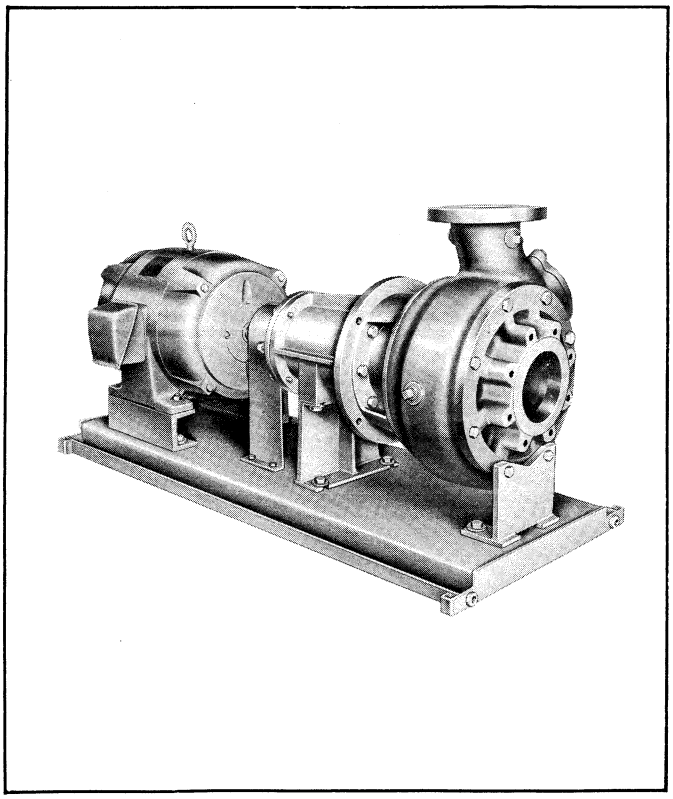
SERVICE

Your Aurora pump requires no maintenance other than periodic inspection, lubrication and occasional cleaning. The intent of inspection is to prevent breakdown, thus obtaining optimum service life.

LUBRICATION OF BEARINGS

Regreasable bearings require periodic lubrication, which can be accomplished by using the lubrication fittings in the cartridge cap and power frame. Lubricate the bearings at regular intervals using a grease of high quality.

At the time of initial start-up it is important to note that the pump bearings have been factory lubricated. Do not add additional lubrication until completion of initial break-in period, which is the first 10 hours of continuous operation, or an equivalent intermittent operation. After break-in period, while unit is operating, add fresh grease (American Oil Company's Rykon #2 or equivalent) through zerk fitting near bearings.



Lithium-base grease is recommended as a lubricant for pumps operating in both wet and dry locations. Mixing of different brands of grease should be avoided due to possible chemical reactions between the brands, which could damage the bearings. Avoid vegetable- or animal-base grease, which can develop acids; as well as grease containing rosin, graphite, talc and other impurities. Under no circumstances should grease be reused.

Over lubrication should be avoided, as it may result in overheating and possible bearing failure. Under normal application, adequate lubrication is assured if the amount of grease is maintained at 1/3 to 1/2 the capacity of the bearing and adjacent space surrounding it.

In dry locations, each bearing will need lubrication at least every 2,000 hours of running time or every 6 to 12 months, whichever is more frequent. In wet locations the bearings should be lubricated at least every 1,000 hours of running time or every 4 to 6 months, whichever is more frequent. A unit is considered to be installed in a wet location if the pump and motor are exposed to dripping water, the weather, or heavy condensation such as is found in unheated and poorly ventilated underground locations.

The 5E, 5F, 5G, 5H, 6D and 6E bearing frames have back-to-back angular contact bearings as the outboard thrust bearing (50). This style bearing requires more frequent lubrication intervals. It is suggested that it be lubricated every 1,000 hours of running time.

The 4D, 5F, 5H, 6D and 6E power frames have a spherical roller bearing as the inboard radial bearing (49). This style bearing requires lubrication every 500 hours.

At times it may be necessary to clean the bearings due to accumulated dirt or deteriorated lubricants. This can be accomplished by flushing the bearing with a light oil heated to 180 to 200°F. While rotating it on a spindle, wipe the bearing housing with a clean rag soaked in a cleaning solvent and flush all surfaces.

Dry the bearing thoroughly before relubricating. Compressed air can be used to speed drying, but care should be taken not to let bearings rotate while being dried.

CAUTION

Use normal fire caution procedures when using any petroleum cleaner.

The motor that drives your Aurora pump may or may not require lubrication. Consult the manufacturer's recommendations for proper maintenance instructions.

REPAIRS

The pump may be disassembled using the illustrations and text provided. Although complete disassembly is covered, it

will seldom be necessary to completely disassemble your Aurora pump.

The illustration accompanying the disassembly instructions shows an exploded view of the pump. The illustration is intended to aid in the correct identification of the parts mentioned in the text.

Inspect parts removed at disassembly to determine their reusability. Cracked castings should never be reused. All packing and gaskets should be replaced at reassembly simply as a matter of economy–they are much less expensive to replace routinely than to replace as the need occurs. In general, it is economical to return the motor and motor controller to the manufacturer for repair.

SPHER-FLOW MODELS 611A DISASSEMBLY

This pump has been designed with back pull-out features, which allow the frame and rotating element to be removed without disturbing the suction and discharge piping.

1. Disconnect power so that drive unit cannot be accidentally energized during disassembly.

2. Close all valves or flow devices that control movement of liquids to or from the pump. Drain pump by removing drain plug (70) from suction nozzle (65). Remove any flushing, lubrication, pressurization, venting, drain or cooling lines from pump. Remove handhole cover (19) and gasket (18) from casing by removing capscrews (20).

3. Loosen capscrews from each hub of spacer-type coupling and remove coupling flanges and rubber insert. This leaves a 3-1/2 in. space between end of motor shaft and pump shaft to facilitate back pull-out of pump.

4. Remove capscrew (34) that holds casing (1) to bracket (8). With the aid of a rope sling and a crane or hoist, carefully slide power frame and rotating element away from casing.

5. Remove gasket (17) from its position between bracket (8) and casing (1). Inspect the sealing surface to insure that it is clean and free of any gasket material that has stuck to parting surfaces. Replace this gasket with a new one when pump is reassembled. Remove capscrews (23) and remove support (22) and washers (24).

6. Inspect casing and impeller wearing rings (3 & 6) (optional) and replace if necessary. Removal can be accomplished by removing capscrews (4 & 7).

7. Remove capscrew (10), o-ring gasket (11), washer (12) gasket (13), which allow impeller (2), key (14), and gasket (38) to be removed.

NOTE

Spher-Flo Pumps have a tapered hub impeller to facilitate impeller removal. Use caution in removal of impeller as it only has to be moved a few thousandths of an inch to become entirely free.

The easiest method for removing impeller is to suspend entire power frame and rotating element about 1/32 of an inch above floor or work area.

Eyebolt size is:

a. Power Frames 4C and 4D require 5/8-11NC eyebolt.

b. Power Frames 5E and 5F require 3/4-10NC eyebolt.

c. Power Frames 5G, 5H, 6D and 6E require 1-8NC eyebolt.

Apply pressure to impeller by means of jackscrews (60 and 61) located on bearing cap (51). When impeller is firmly against bracket (8) it should drop free after turning the jackscrews evenly, a flat at a time, three or four flats.

8. Insure external retaining ring (snap ring, 39) is located in the groove on the inboard side of the shaft sleeve. Unscrew capscrews (34) to allow removal of stuffing box (27), shaft sleeve (36), gland (44) and seal or packing (47, 40).

NOTE

The shaft sleeve incorporates a snap ring designed to interfere with the base of the seal box assembly. When removing the stuffing box the shaft sleeve is also removed.

Slide complete assembly including shaft sleeve (36) off the shaft (48) with the aid of a pinch bar or other lever. Place the stuffing box assembly on a suitable work surface for further disassembly.

For further disassembly of the stuffing box proceed as follows:

a. Packing box (Standard)

Remove cap screws (45), and split accumulator gland halves (44) from stuffing box. Slinger (43) is now exposed and can be removed from shaft sleeve. Remove O-ring gasket (42) from the stuffing box. Remove and discard old packing (40). Clean all parts to remove any packing that may have adhered during removal. Leakage accumulator gland (44) on vertical units, may be further disassembled by moving cap screws (44A), pipe plugs (44D), tubing (44C) and hose connectors (44B).

B. Double Seal (optional).

1. Remove seal gland bolts (45) and remove gland (44) carefully exposing seal (47).

2. Stationary insert can now be carefully pressed out of the gland (44).

3. The exposed outboard seal ring in the stuffing box may be removed at this time if seal O-ring has not locked it into place. Do not attempt to pry the rotating face out of the stuffing box, leave rotating face in place if it cannot be readily removed. Liberally apply either a commercial mechanical seal lubricant or a non-abrasive liquid dish washing soap to the seal/shaft sleeve area.

4. Press the shaft sleeve (36), pressing from the outboard end of the sleeve, out of the stuffing box (27). Care should be taken to protect the rotating face from damage if the O-ring under the face should break loose and spring pressure force the face upward.

5. The stationary insert can now be carefully pressed out of the stuffing box (27).

The retaining ring (37) can be removed from the groove in the shaft by twisting it in a spiral movement toward the end of the shaft. Remove grease seal (53).

11. Remove capscrews (59) and lift out shaft assembly from the power frame.

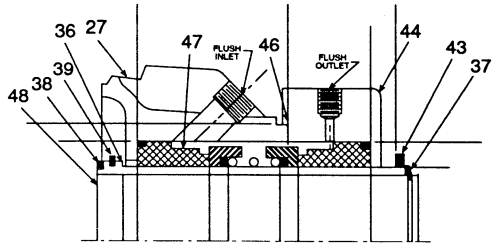
12. The inboard radial bearing is either a ball bearing or spherical roller bearing design and can be identified by power frame as listed below.

4C, 5E, 5G power frames use a ball bearing.

4D, 5F, 5H, 6D and 6E use a spherical roller bearing.

13. Remove coupling half and key (55) from shaft. Remove plug (57) and zerk fitting (58).

Typical DBL Seal Stuffing Box Cross Section



14. Retainer ring (50B) is removed with a pair of truarc internal pliers so that grease retainer (50A) can be removed allowing bearing cap (51) to be removed from shaft assembly. Grease seal (52) may be removed if necessary.

15. With a pair of truarc external pliers, remove snap ring (50C) (PF#4 only), or remove locknut (50D) and lockwasher (50C) on power frame(s) #5, and #6.

16. Both inboard bearing (49) and outboard bearing (50) are pressed onto shaft. To remove bearings, use a wheel puller or press them off the shaft.

NOTE

When removing the inboard bearing (49), avoid damaging the separate grease shield (49A). This shield can be removed when bearing is removed from shaft.

17. If total disassembly is required, break connections to suction and discharge pipe and remove capscrews that hold support (21) to pump base.

18. Secure casing and support assembly in sling and move it away from piping. Invert this assembly and set casing (1) on wood blocks, so as not to mar surface that mates bracket (8).

19. Unscrew capscrews (69), washers (69B), and nuts (69A), and remove handhole cover (68) and gasket (67) from suction nozzle (65).

20. Place rope sling through nozzle and cover opening. Remove capscrews (66) and lift suction nozzle (65) away from cover (5). Remove gasket (64).

21. Unscrew capscrews (15 & 15A), which hold support (21), cover (5) and casing (1) together. Lift support away and then set casing with discharge up. Gently tap cover loose with a rubber mallet. Remove gasket (16) to complete disassembly.

SPHER-FLOW MODEL 611A REASSEMBLY

These instructions are for a pump that has been completely disassembled. Use those parts that apply to your reassembly program.

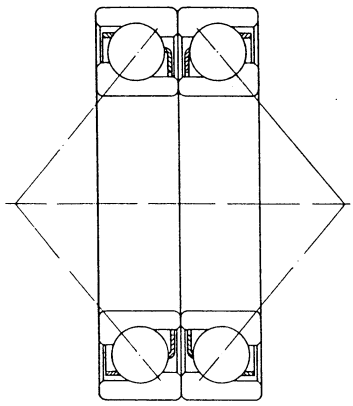
1. Place casing (1) with its outboard side down and position gasket (16) in place. Set cover (5) in place so the gasket position is neither lost nor damaged. Next align support (21) on cover. Use care not to disturb location of other parts. When all the above parts have been aligned, they are fastened together with capscrews (15 & 15A). Tighten capscrews evenly to insure perfect register of mating parts. Replace pipe plugs (25) and (26) in casing.

2. Position gasket (64) on cover and carefully lower suction nozzle (65) into place. Fasten suction nozzle in place with capscrews (66).

3. Slip gasket (67) onto shoulder of handhole cover (68) and secure it to suction nozzle (65) with capscrews (69), washer (69B) and nuts (69A). Place drain plug (70) back into suction nozzle.

4. Return casing and support assembly to its normal position. Fasten suction and discharge piping to pump. Secure this assembly in place by tightening nuts on foundation bolts. If pump has wearing rings (6), fasten it to cover (5) with screws (7). If handhole cover (19) was removed, place gasket (18) on cover and secure with capscrews (20).

5. Hand pack the outboard bearing (50) with grease and pack the grease retainer (50A) cavity half full. Slide the grease retainer onto the shaft. Press the outboard bearing onto the shaft until it hits the shoulder of the shaft. Make sure the outboard bearing set is properly matched with back-to-back configuation before pressing on shaft. Assemble snap ring (50C) onto the shaft with the beveled side outward to match the bevel in the shaft groove (PF#4 only). Install lockwasher (50C) and locknut (50D) to secure outboard bearing (50) to shaft (48) for P.F. #5 and 6. Torque to approximately 100 ft. lbs. Press or gently tap grease seal (52) into bearing cap (51). Slide the bearing cap (51) over the bearings. Lock in the assembly with snap ring (50B), matching the snap ring bevel to the groove bevel.



Back-to-Back
Bearing Configuration

6. Hand pack the inboard bearing (49) and the recessed area of its grease shield (49A). Slide the grease shield onto the shaft with the raised lip toward the bearing. Press on the bearing. Press the bearing on until all parts are shouldered tight together on the shaft. The grease shield may wear into the bearing outer race during break-in and is considered normal.

7. Place grease seal (53) into place on inboard end of power frame (56).

8. Lower the sub-assembly from steps 5 through 7 into outboard end of power frame (56), which has been set on a bench with a hole in it to accomodate the shaft.

9. Position jack screws (60) so that they extend past the bearing cap as given in the following chart. This will position the impeller hub end of the shaft in a axial position that will allow the mounting of impeller and closing down of liquid end without any adjustment during the intermediate assembly step. Final adjustment will have to made by evenly tightening capscrews (59).

	Gap Clearance	Bolt Extension
Power Frame #4	1/8 in.	1/4 in.
Power Frame #5	1/4 in.	9/16 in.
Power Frame #6	1/4 in.	9/16 in.

10. Place plug (57) and zerk (58) back in bearing cap (51).

11. Place plug (62) and zerk (63 or 62A) back on inboard end of power frame (56).

12. Retaining ring (37) can be set in its groove by turning it in a spiral motion up shaft. When in position, the outside diameter of this ring should slope toward inboard tapered shank end of shaft.

13. Position bracket (8) to power frame (56) and secure in place by evenly tightening capscrews (35).

14. The following procedure is used in assembling the appropriate sealing box:

A. Packing Box (Standard)

I. Place two pieces of packing (40) into the stuffing box cavity (27) being careful to get each piece firmly in place. Install lantern ring (41), then add remaining three pieces of packing. When packing is tightened, lantern ring should align with holes for bushing (29), flushing lines, or cooling lines.

NOTE

Be sure to stagger joints of packing rings to avoid excessive leakage.

II. Replace bushing (29) and grease zerk (30) in body of stuffing box (27).

III. Snap retainer ring (39) onto shaft sleeve (36) with a pair of truarc external snap ring pliers. Slide shaft sleeve carefully into inboard end of packing box.

IV. Thread capscrews (45) into stuffing box (27) approximately ¼ in. Insert both halves of gland (44) into stuffing box (27). Insert gland clamps (44E) and tighten packing adjusting capscrews (45) to obtain proper sealing.

V. Ensure capscrews (45) are now tightened enough to hold assembled gland in place. Final adjustment of packing box will have to be made after pump is returned to operation.

When pump is running, gland capscrews (45) should be evenly turned down a flat at a time, allowing packing to work in until a leakage rate of approximately 60 to 120 drops per minute is obtained.

NOTE

Do not over tighten packing as this will cause packing box to overheat and the shaft sleeve (36) to wear excessively.

VI. Place gasket (38) in radial corner groove that is machined on the end of the shaft sleeve (36) to complete assembly.

B. Double Seal Box (Optional)

NOTE

Do not put mechanical seal back into service until seal ring and stationary seat faces have been relapped or replaced.

I. Thoroughly inspect the seal box cavity (27), checking for burrs or nicks, which could damage the o-ring of the mechanical seal. Apply a film of liquid dishwashing detergent or rubber lubricant (do not use oil or grease) to the O-ring and seal seat. Press one stationary seat with O-ring gently into the seal box cavity (27) and other into the gland plate (44).

II. Place gasket (46) in position in the gland register.

III. Snap retaining ring (39) onto sleeve (36) with a pair of truarc external pliers.

IV. Slide sleeve through bottom of stuffing box and place one seal ring (47) over sleeve and slide it down to the stationary seat. Place metal parts over shaft and then second seal ring.

V. Position gland over shaft sleeve and fasten to seal box with capscrews (45).

15. Place gasket (32) in groove of bracket (8).

16. Place key (54) in its keyway on shaft. Slide stuffing box assembly onto shaft, so that key and keyway in the shaft sleeve mate. Continue to slide assembly forward until shaft sleeve is in contact with retaining ring (37).

17. Align seal box (27) with gasket (32) and bracket (8) Fasten seal box to bracket with capscrews (33).

18. If pump has impeller wearing ring (3) fasten it to suction face of impeller (2) with setcrews (4).

19. Place impeller key (14) in keyway on the tapered portion of shaft (48) and set impeller (2) in position. Put gasket (13) inside impeller suction eye washer (12) next and o-ring gasket (11) last. Secure impeller in place with capscrew (10) according to the following chart.

IMPELLER BOLT TORQUE

Power Frame	Impeller Bolt Size	Torque Value
4C, 4D	⅝ in.	75 FT-LBS
5E, 5F	¾ in.	100 FT-LBS
5G, 5H	1 in.	100 FT—LBS
6D, 6E	1 in.	125 FT-LBS

20. Place gasket (17) on casing (1) and lower power frame (56) and rotating element assembly into place; fasten this assembly to casing with capscrews (34).

Attach support (22) to power frame (56) with capscrews (23) and washers (24). Remove eyebolt assembly and place a rope sling on assembly. Carefully lower assembly to a horizontal position.

21. Using jackscrews (60) and nuts (61) located on bearing cap (51), adjust impeller and shaft assembly axially down until impeller bottoms out on its suction cover (5) or wearing rings (3) and (6). Then, loosen capscrews (59) and turn jacking screws (60) inward 3 or 4 flats to raise impeller to running clearance of .015/.025. Tighten jam nuts (61) and capscrews (59) to lock in adjustment.

22. Make one last check that all parts of the rotating element turn freely. Return spacer coupling between pump and motor using key (55).

23. Connect any flushing lines or cooling lines that were removed.

24. Open all valves or flow devices that control flow of liquid to and from pump.

25. Connect power.

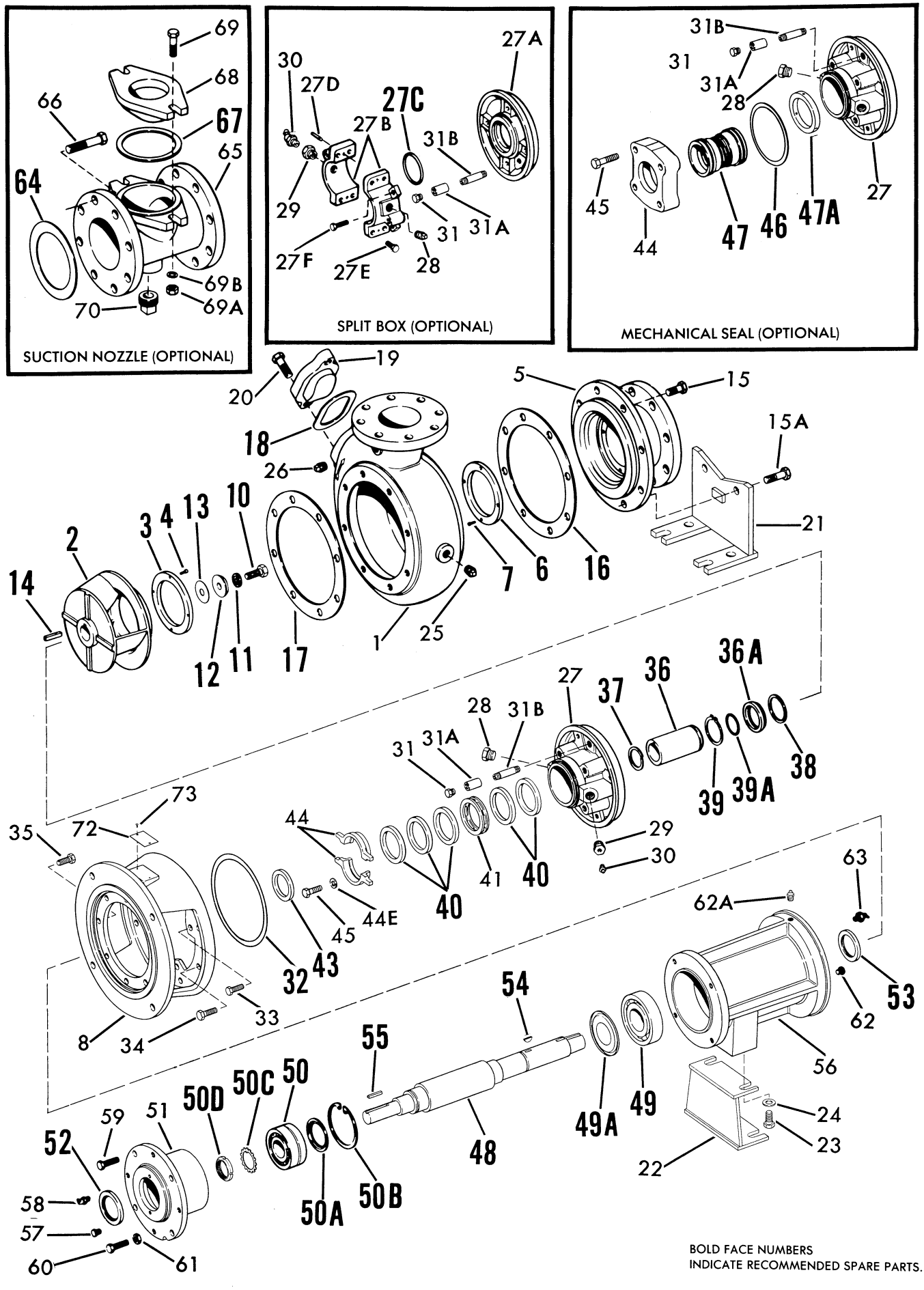
NOTE

Do not start up a pump until all air and vapor have been bled, making sure that there is liquid in the pump to provide the necessary lubrication. It is possible that the mechanical seal may drip during the first few minutes of operation.

Turn on power momentarily to check for proper rotation. Rotation should be clockwise as viewed from driver (see arrow on casing).

MODEL 611A LIST OF PARTS

1. Casing
2. Impeller
3. Wear Ring
4. Set Screw
5. Suction Cover
6. Wear Ring
7. Set Screw
8. Bracket
10. Imp. Bolt
11. Imp. Bolt Seal
12. Imp. Washer
13. Imp. Washer Gasket
14. Impeller Key
15. Capscrew
15A. Capscrew
16. Gasket
17. Gasket
18. Gasket
19. Handhole Cover
20. Capscrew
21. Pump Support
22. Pump Support
23. Capscrew
24. Washer
25. Pipe Plug
26. Pipe Plug
27. Stuffing Box
27A. Adapter Plate
27B. Split Packing Box
27C. Gasket
27D. Pin
27E. Capscrews
27F. Capscrew
28. Pipe Plug
29. Bushing
30. Fitting
31. Pipe Plug
31A. Pipe Coupling
31B. Nipple
32. Gasket
33. Capscrew
34. Capscrew
35. Capscrew
36. Sleeve
36A. Sleeve Adapter
37. Retaining Ring
38. Gasket
39. Retaining Ring
39A. O-Ring
40. Packing
41. Lantern Ring
43. Slinger
44. Gland
44E. Gland Clamp
45. Capscrew
46. Gasket
47. Mechanical Seal
48. Shaft
49. Inboard Bearing
49A. Grease Shield
50. Outboard Bearing
50A. Grease Shield
50B Retaining Ring or Capscrew
50C. Lockwasher or Retaining Ring
50D. Locknut
50E. Washers
51. Bearing Cartridge
52. Grease Seal
53. Grease Seal
54. Sleeve Key
55. Shaft Key
56. Power Frame
57. Pipe Plug
58. Grease Fitting
59. Capscrew
60. Capscrew
61. Jam Nut
62. Pipe Plug
62A. Fitting Grease
63. Grease Fitting or Pipe Plug
64. Gasket
65. Suction Nozzle
66. Capscrew
67. Gasket
68. Handhole Cover
69. Capscrew
69A. Nut
69B. Washer
70. Pipe Plug
72. Drive Pins
73. Name Plate


SUCTION NOZZLE (OPTIONAL)
SPLIT BOX (OPTIONAL)
MECHANICAL SEAL (OPTIONAL)
BOLD FACE NUMBERS
INDICATE RECOMMENDED SPARE PARTS.

AURORA PUMP
A member of the PENTAIR PUMP GROUP

INSTRUCTION MANUAL
REPAIR
MODEL 612A (SPHER-FLO)

6

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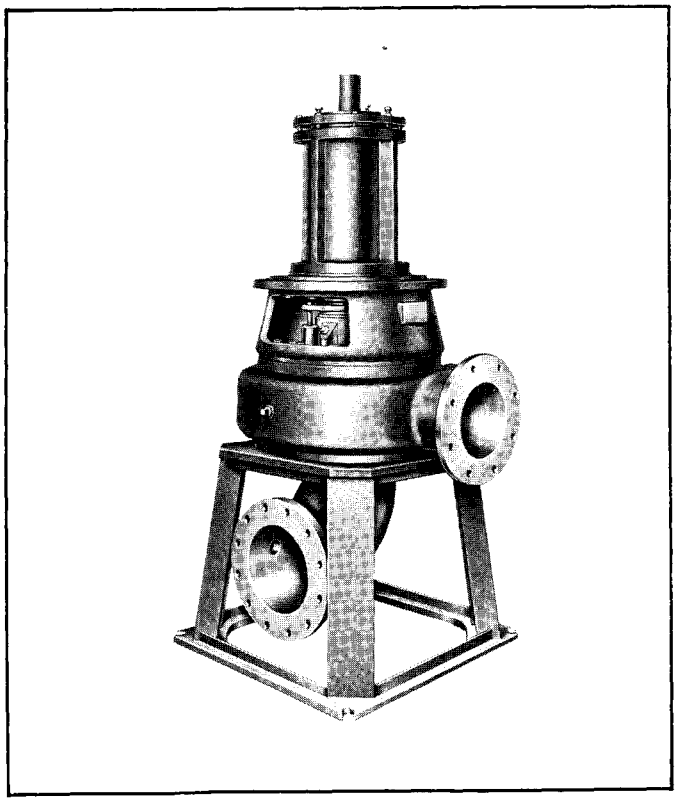
LUBRICATION OF BEARINGS

Regreasable bearings require periodic lubrication, which can be accomplished by using the lubrication fittings in the cartridge cap and power frame. Lubricate the bearings at regular intervals using a grease of high quality.

At the time of initial start-up it is important to note that the pump bearings have been factory lubricated. Do not add additional lubrication until completion of initial break-in period, which is the first 10 hours of continuous operation, or an equivalent intermittent operation. After break-in period, while unit is operating, add fresh grease (American Oil Company's Rykon #2 or equivalent) through zerk fitting near bearings.



Lithium-base grease is recommended as a lubricant for pumps operating in both wet and dry locations. Mixing of different brands of grease should be avoided due to possible chemical reactions between the brands, which could damage the bearings. Avoid vegetable- or animal-base grease, which can develop acids; as well as grease containing rosin, graphite, talc and other impurities. Under no circumstances should grease be reused.

Over lubrication should be avoided, as it may result in overheating and possible bearing failure. Under normal application, adequate lubrication is assured if the amount of grease is maintained at 1/3 to 1/2 the capacity of the bearing and adjacent space surrounding it.

In dry locations, each bearing will need lubrication at least every 2,000 hours of running time or every 6 to 12 months, whichever is more frequent. In wet locations the bearings should be lubricated at least every 1,000 hours of running time or every 4 to 6 months, whichever is more frequent. A unit is considered to be installed in a wet location if the pump and motor are exposed to dripping water, the weather, or heavy condensation such as is found in unheated and poorly ventilated underground locations.

The 5E, 5F, 5G, 5H, 6D and 6E bearing frames have back-to-back angular contact bearings as the outboard thrust bearing (50). This style bearing requires more frequent lubrication intervals. It is suggested that it be lubricated every 1,000 hours of running time.

The 4D, 5F, 5H, 6D and 6E power frames have a spherical roller bearing as the inboard radial bearing (49). This style bearing requires lubrication every 500 hours.

At times it may be necessary to clean the bearings due to accumulated dirt or deteriorated lubricants. This can be accomplished by flushing the bearing with a light oil heated to 180 to 200°F. While rotating it on a spindle, wipe the bearing housing with a clean rag soaked in a cleaning solvent, and flush all surfaces.

Dry the bearing thoroughly before relubricating. Compressed air can be used to speed drying, but care should be taken not to let bearings rotate while being dried.

CAUTION

Use normal fire caution procedures when using any petroleum cleaner.

The motor that drives your Aurora pump may or may not require lubrication. Consult the manufacturer's recommendations for proper maintenance instructions.

REPAIRS

The pump may be disassembled using the illustrations and text provided. Although complete disassembly is covered, it will seldom be necessary to completely disassemble your Aurora pump.

The illustration accompanying the disassembly instructions shows an exploded view of the pump. The illustrations are intended to aid in the correct identification of the parts mentioned in the text.

Inspect parts removed at disassembly to determine their reusability. Cracked castings should never be reused. All packing and gaskets should be replaced at reassembly simply as a matter of economy they are much less expensive to replace routinely than to replace as the need occurs. In general, it is economical to return the motor and motor controller to the manufacturer for repair.

SPHER-FLOW MODELS 612A DISASSEMBLY

This pump has been designed with back pull-out features, which allow the frame and rotating element to be removed without disturbing the suction and discharge piping.

1. Disconnect power so that drive unit cannot be accidentally energized during disassembly.

2. Close all valves or flow devices that control movement of liquids to or from the pump. Drain pump by removing drain plug (70) from suction elbow (65). Remove any flushing, lubrication, pressurization, venting, drain or cooling lines from pump. Remove handhole cover (19) and gasket (18) from casing (I) by removing capscrews (20).

3. Disconnect flexible shafting from pump. This may be accomplished by removing caps screws from flanged point adjacent to universal joint. It is recommended that flexible shafting be swung out of the way to allow removal of power frame and rotating element.

4. Remove capscrews (34) that secure bracket (8) to casing (1). Screw an eyebolt into outboard end of shaft (48) to aid in lifting power frame and rotating element from casing. The size of eyebolt is as follows:

a. Power Frames 4C and 4D require 5/8-11 NC eyebolt.

b. Power Frames 5E and 5F require 3/4-10NC eyebolt.

c. Power Frames 5G, 5H, 6D and 6E require 1-8NC eyebolt.

5. Remove gasket (17) from its position between bracket (8) and casing (1). Inspect the sealing surface to ensure that it is clean and free of any gasket material that has stuck to parting surfaces. Replace this gasket with a new one when pump is reassembled.

6. Inspect casing and impeller wearing rings (3 & 6) (optional) and replace if necessary. Removal can be accomplished by removing capscrews (4 & 7).

7. Remove capscrews (10), o-ring gasket (11), washer (12) gasket (13) which allow impeller (2), key (14), and gasket (38) to be removed.

NOTE

Spher-Flo Pumps have a tapered hub impeller to facilitate impeller removal. Use caution in removal of impeller as it only has to be moved only a few thousandths of an inch to become entirely free.

The easiest method for removing impeller is to suspend entire power frame and rotating element about 1/32 of an inch above floor or work area. Apply pressure to impeller by means of jackscrews (60 and 61) located on bearing cap (50). When impeller is firmly against bracket (8) it should drop free after turning the jackscrews evenly, a flat at a time, three or four flats.

8. Insure external retaining ring (snap ring, 39) is located in the groove on the inboard side of the shaft sleeve. Unscrew capscrews (34) to allow removal of stuffing box (27), shaft sleeve (36), gland (44) and seal or packing (47, 40).

NOTE

The shaft sleeve incorporates a snap ring designed to interfere with the base of the seal box assembly. When removing the stuffing box the shaft sleeve is also removed.

Slide complete assembly including shaft sleeve (36) off the shaft (48) with the aid of a pinch bar or other lever. Place the stuffing box assembly on a suitable work surface for further disassembly.

For further disassembly of the stuffing box proceed as follows:

a. Packing box (Standard)

Remove cap screws (45), and split accumulator gland halves (44) from stuffing box. Slinger (43) is now exposed and can be removed from shaft sleeve. Remove O-ring gasket (42) from the stuffing box. Remove and discard old packing (40). Clean all parts to remove any packing that may have adhered during removal. Leakage accumulator gland (44) on vertical units, may be further disassembled by moving cap screws (44A), pipe plugs (44D), tubing (44C) and hose connectors (44B).

B. Double Seal (optional).

1. Remove seal gland bolts (45) and remove gland (44) carefully exposing seal (47).

2. Stationary insert can now be carefully pressed out of the gland (44).

3. The exposed outboard seal ring in the stuffing box may be removed at this time if seal O-ring has not locked it into place. Do not attempt to pry the rotating face out of the stuffing box, leave rotating face in place if it cannot be readily removed. Liberally apply either a commercial mechanical seal lubricant or a non-abrasive liquid dish washing soap to the seal/shaft sleeve area.

4. Press the shaft sleeve (36), pressing from the outboard end of the sleeve, out of the stuffing box (27). Care should be taken to protect the rotating face from damage if the O-ring under the face should break loose and spring pressure force the face upward.

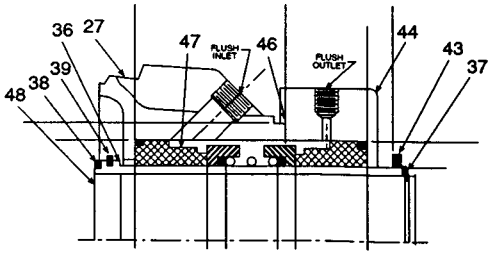
5. The stationary insert can now be carefully pressed out of the stuffing box (27).

The retaining ring (37) can be removed from the groove in the shaft by twisting it in a spiral movement toward the end of the shaft. Remove grease seal (53).

10. Place power frame on two benches, so that its shaft rests between them or on a bench with a hole cut in it large enough for shaft.

11. Remove capscrews (59) and lift out shaft assembly from the power frame.

12. The inboard radial bearing is either a ball bearing or spherical roller bearing design and can be identified by power frame as listed below.



Typical DBL Seal Stuffing Box Cross Section

4C, 5E, 5G Power Frames use ball bearings.

4D, 5F, 5H, 6D and 6E use spherical roller bearings.

13. Remove coupling half and key (55) from shaft. Remove plug (57) and zerk fitting (58).

14. Retainer ring (50B) is removed with a pair of truarc internal pliers so that grease retainer (50A) can be removed allowing bearing cap (51) to be removed from shaft assembly. Grease seal (52) may be removed if necessary.

15. With a pair of truarc external pliers, remove snap ring (50C) (PF#4 only), or remove locknut (50D) and lockwasher (50C) on power frame(s) #5 and #6.

16. Both inboard bearing (49) and outboard bearing (50) are pressed onto shaft. To remove bearings, use a wheel puller or press them off the shaft.

NOTE

When removing the inboard bearing (49) avoid damaging the separate grease shield (49A). This shield can be removed when bearing is removed from shaft.

17. If total disassembly is required, break connections to suction and discharge pipe and remove nuts from foundation bolts that hold support (21) to its foundation.

18. Secure casing and support assembly in sling and move it away from piping. Invert this assembly and set casing (1) on wood blocks, so as not to mar surface that mates bracket (8).

19. Suction gage (71) can now be removed from suction elbow (65). Unscrew capscrews (69), washers (69B), and nuts (69A), and remove handhole cover (68) and gasket (67) from suction elbow (65).

20. Place rope sling through elbow and cover opening. Remove capscrews (66) and lift suction elbow (65) away from cover (5). Remove gasket (64).

21. Unscrew capscrews (15) that hold support (21), cover (5) and casing (1) together. Lift support away and then set casing with discharge up. Gently tap cover loose with a rubber mallet. Remove gasket (16) to complete disassembly.

SPHER-FLOW MODEL 612A REASSEMBLY

These instructions are for a pump that has been completely disassembled. Use those parts that apply to your reassembly program.

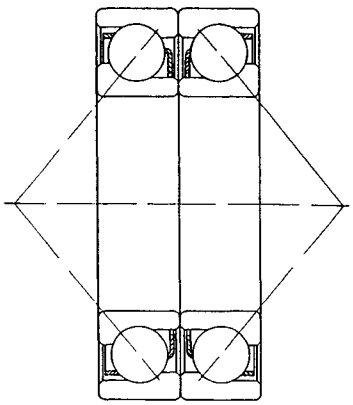
1. Place casing (1) with its outboard side down and position gasket (16) in place. Set cover (5) in place so the gasket position is neither lost nor damaged. Next align support (21) on cover. Use care not to disturb location of other parts. When all the above parts have been aligned, they are fastened together with capscrews (15). Tighten capscrews evenly to insure perfect register of mating parts. Replace pipe plugs (25) and (26) in casing.

2. Position gasket (64) on cover and carefully lower suction elbow (65) into place. Fasten suction elbow in place with capscrews (66).

3. Slip gasket (67) onto shoulder of handhole cover (68) and secure it to suction elbow (65) with capscrews (69), washers (69B) and nuts (69A). Place pipe plug or suction gauge (71) and drain plug (70) back into suction elbow.

4. Return casing and support assembly to its normal position. Fasten suction and discharge piping to pump. Secure this assembly in place by tightening nuts on foundation bolts. If pump has wearing ring (6) fasten it to cover (5) with screws (7). If handhole cover (19) was removed, place gasket (18) on cover and secure with capscrews (20).

5. Hand pack the outboard bearing (50) with grease and pack the grease retainer (50A) cavity one half full. Slide the grease retainer onto the shaft. Press the outboard bearing onto the shaft until it hits the shoulder of the shaft. Make sure outboard bearing set is properly matched with back-to-back configuation before pressing on shaft. Assemble snap ring (50C) onto the shaft with the beveled side outward to match the bevel in the shaft groove (PF#4 only). Install lockwasher (50C) and locknut (50D) to secure outboard bearing (50) to shaft (48) for P.F. #5 and 6. Torque to approximately 100 ft. lbs. Press or gently tap grease seal (52) into bearing cap (51). Slide the bearing cap (51) over the bearing (50). Lock in the assembly with snap ring (50B), matching the snap ring bevel to the groove bevel.



Back-to-Back
Bearing Configuration

6. Hand pack the inboard bearing (49) and the recessed area of its grease shield (49A). Slide the grease shield onto the shaft with the raised lip toward the bearing. Press on the bearing. Press the bearing on until all parts are shouldered tight together on the shaft. The grease shield may wear into the bearing outer race during break-in and is considered normal.

7. Place grease seal (53) into place on inboard end of power frame (56).

8. Lower sub-assembly from steps 5 through 7 into outboard end of power frame (56), which has been set on a bench with hole in it to accomodate the shaft.

9. Position jack screws so that they extend past the bearing caps as given in the following chart. This will position impeller hub end of the shaft in a axial position which will allow mounting impeller and closing down liquid end without any adjustment during the intermediate assembly

step. Final adjustment will have to be made by evenly tightening capscrews (59)

	Gap Clearance	Bolt Extension
Power Frame #4	1/8 in.	1/4 in.
Power Frame #5	1/4 in.	9/16 in.
Power Frame #6	1/4 in.	9/16 in.

10. Place plug (57) and zerk (58) back in bearing cap (51).

11. Place plug (62) and zerk (62A or 63) back on inboard end of power frame (56).

12. Retaining ring (37) can be set in its groove by turning it in a spiral motion up shaft. When in position, the outside diameter of this ring should slope toward inboard tapered shank end of shaft.

13. Position bracket (8) to power frame (56) and secure in place by evenly tightening capscrews (35).

14. The following procedure is used in assembling the appropriate sealing box:

A. Packing Box (Standard)

I. Place two pieces of packing (40) into the stuffing box cavity (27) being careful to get each piece firmly in place. Install lantern ring (41), then add remaining three pieces of packing. When packing is tightened, lantern ring should align with holes for bushing (29), flushing lines, or cooling lines.

NOTE

Be sure to stagger joints of packing rings to avoid excessive leakage.

II. Replace bushing (29) and grease zerk (30) in body of stuffing box (27).

III. Snap retainer ring (39) onto shaft sleeve (36) with a pair of truarc external snap ring pliers. Slide shaft sleeve carefully into inboard end of packing box.

IV. Place o-ring gasket (42) in stuffing box on top ring of packing (40). Be sure o-ring remains concentric against inside diameter of the stuffing box. Slide slinger (43) over shaft extension and adjust to ¼ in. below top of leakage accumulator after stuffing box assembly has been reattached to bracket. For pumps on #6 power frames, place slinger (43) over shaft sleeve (36), ⅛ in. from outboard end of sleeve. Replace pipe plugs (44D), hose connector (44B) and tubing (44C) in leakage accumulator gland (44). Place one half of leakage accumulator gland in stuffing box with connection for hose to drain positioned properly. Apply General Electric* Silicon Rubber Sealant (75) on both ends of this gland half. Thread capscrews (45) into stuffing box (27) approximately ¼ in. Insert other half of gland (44) into stuffing box being careful not to disturb o-ring gasket (42). Insert capscrews (44A) into each side of gland (44) to hold the two halves together. Tighten packing adjusting capscrews (45) to obtain proper sealing.

V. Ensure capscrews (45) are now tightened enough to hold assembled gland in place. Final adjustment of packing box will have to be made after pump is returned to operation.

When pump is running, gland capscrews (45) should be evenly turned down a flat at a time, allowing packing to work in until a leakage rate of approximately 60 to 120 drops per minute is obtained.

NOTE

Do not over tighten packing as this will cause packing box to overheat and the shaft sleeve (36) to wear excessively.

VI. Place gasket (38) in radial corner groove that is machined on the end of the shaft sleeve to complete assembly.

B. Double Seal (Optional)

NOTE

Do not put mechanical seal back into service until seal ring and stationary seat faces have been relapped or replaced.

I. Thoroughly inspect the seal box cavity (27), checking for burrs or nicks which could damage the ō-ring of the mechanical seal. Apply a film of liquid dishwashing detergent or rubber lubricant (do not use oil or grease) to the o-ring and seal seat. Press one stationary seat with o-ring gently into the seal box cavity (27) and the other into the gland plate (44).

II. Place gasket (46) in position in the gland register.

III. Snap retaining ring (39) onto sleeve (36) with a pair of truarc external pliers.

IV. Slide sleeve through bottom of stuffing box and place one seal ring (47) over sleeve and slide it down to the stationary seat. Place metal parts over shaft and then second seal ring.

V. Position gland over shaft sleeve and fasten to seal box with capscrews (45).

15. Place gasket (32) in groove of bracket (8).

16. Place key (54) in its keyway on shaft. Slide stuffing box assembly onto shaft, so that key and keyway in the shaft sleeve mate. Continue to slide assembly forward until shaft sleeve is in contact with retaining ring (37).

17. Align seal box (27) with gasket (32) and bracket (8). Fasten seal box to bracket with capscrews (33).

18. If pump has impeller wearing ring (3) fasten it to suction face of impeller (2) with setscrew (4).

19. Place impeller key (14) in keyway on the tapered portion of shaft (48) and set impeller (2) in position. Put gasket (13) inside impeller suction eye with washer (12) next and o-ring gasket (11) last. Secure impeller in place with capscrew (10) according to the following chart.

IMPELLER BOLT TORQUE

Power Frame	Impeller Bolt Size	Torque Value
4C, 4D	⅝ in.	75 FT-LBS
5E, 5F	¾ in.	100 FT-LBS
5G, 5H	1 in.	100 FT-LBS
6D, 6E	1 in.	125 FT-LBS

20. Place gasket (17) on casing (1) and lower power frame (56) and rotating element assembly into place; fasten this assembly to casing with capscrews (34).

21. Using jackscrews (60) and nuts (61) located on bearing cap (51), adjust impeller and shaft assembly axially down until impeller bottoms out on its suction cover (5) or wearing rings (3) and (6). Then, loosen capscrews (59) and turn jacking screws (60) inward 3 or 4 flats ro raise impeller to running clearance of .015/.025. Tighten jam nuts (61) and capscrews (59) to lock in adjustment.

22. Make one last check that all parts of the rotating element turn freely.

23. Connect any flushing lines or cooling lines that were removed. Remove the lifting eye and secure the flexible shafting in place. Ideal joint operating angle is 1° to 5°.

24. Open all valves or flow devices that control flow of liquid to and from pump.

25. Connect Power.

NOTE

Do not start up a pump until all air and vapor have been bled, making sure that there is liquid in the pump to provide the necessary lubrication. It is possible that the mechanical seal may drip during the first few minutes of operation.

Turn on power momentarily to check for proper rotation. Rotation should be clockwise as viewed from driver (see arrow on casing).

*General Electric is a registered trademark of the General Electric Corporation.

MODEL 612A LIST OF PARTS

1. Casing
2. Impeller
3. Wear Ring
4. Set Screw
5. Suction Cover
6. Wear Ring
7. Set Screw
8. Bracket
10. Imp. Bolt
11. Imp. Bolt Seal
12. Imp. Washer
13. Imp. Washer Gasket
14. Impeller Key
15. Capscrew
16. Gasket
17. Gasket
18. Gasket
19. Handhole Cover
20. Capscrew
21. Pump Support
25. Pipe Plug
26. Pipe Plug
27. Stuffing Box
27A. Adapter Plate
27B. Split Packing Box
27C. Gasket
27D. Pin
27E. Capscrews
27F. Capscrews
28. Pipe Plug
29. Bushing
30. Fitting
31. Pipe Plug
31A. Pipe Coupling
31B. Nipple
32. Gasket
33. Capscrew
34. Capscrew
35. Capscrew
36. Sleeve
36A. Sleeve Adapter
37. Retaining Ring
38. Gasket
39. Retaining Ring
39A. O-Ring
40. Packing
41. Lantern Ring
42. O-Ring
43. Slinger
44. Gland
44A. Capscrew
44B. Hose Connector
44C. Hose
44D. Pipe Plug
45. Capscrew
46. Gasket
47. Mechanical Seal
48. Shaft
49. Inboard Bearing
49A. Grease Shield
50. Outboard Bearing
50A. Grease Shield
50B Retaining Ring or Capscrew (P.F. 6E)
50C. Lockwasher or Retaining Ring
50D. Locknut
51. Bearing Cartridge
52. Grease Seal
53. Grease Seal
54. Sleeve Key
55. Shaft Key
56. Power Frame
57. Pipe Plug
58. Grease Fitting
59. Capscrew
60. Capscrew
61. Jam Nut
62. Pipe Plug
62A. Fitting Grease (P.F. 6&6E Only)
63. Grease Fitting or Pipe Plug
64. Gasket
65. Suction Elbow
66. Capscrew
67. Gasket
68. Handhole Cover
69. Capscrew
69A. Nut
69B. Washer
70. Pipe Plug
71. Suction Gauge or Pipe Plug
72. Drive Pins
73. Name Plate
75. Sealant

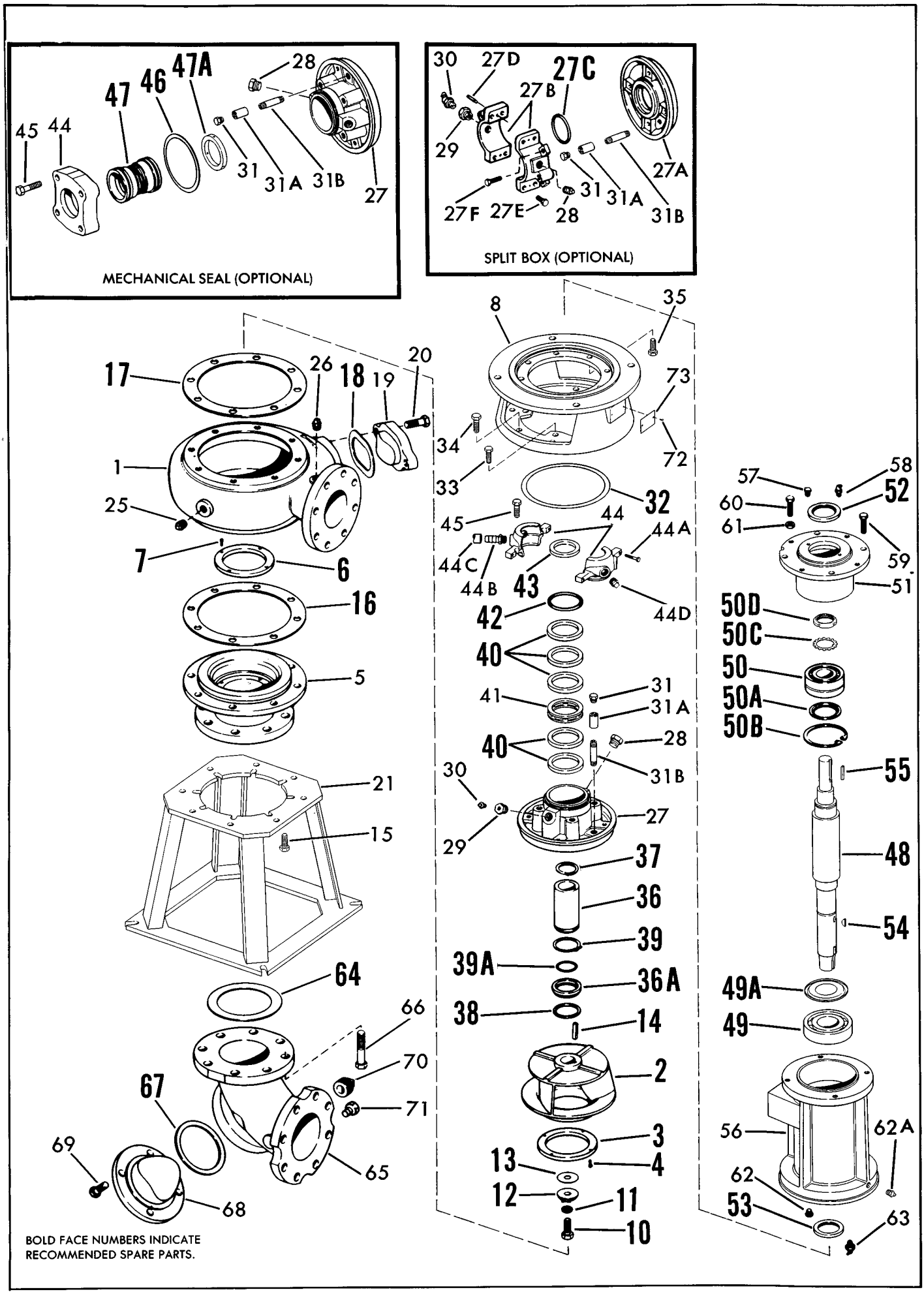


Figure 3. Model 612A Exploded View

AURORA®
Pentair Pump Group

INSTRUCTION MANUAL
REPAIR
MODEL 613A (SPHER-FLO)

6

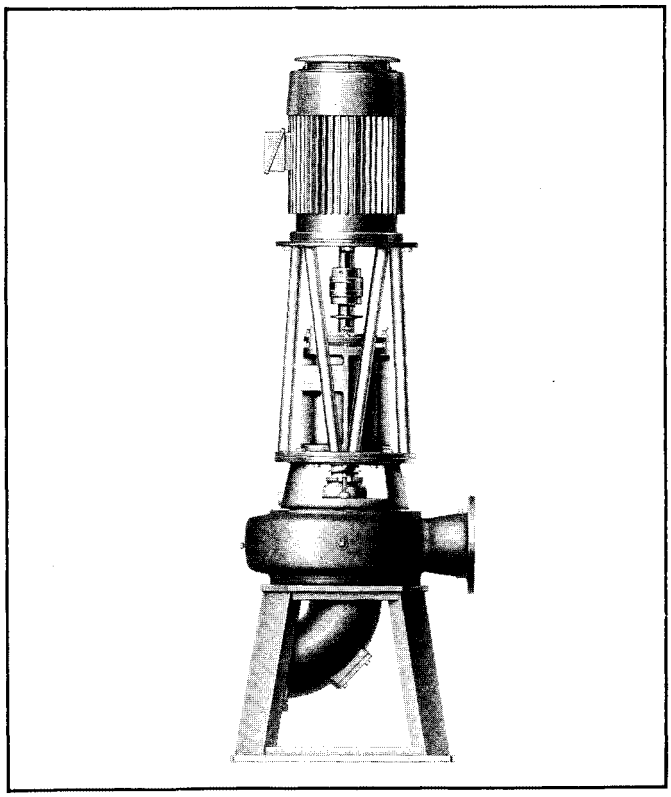
SERVICE

Your Aurora pump requires no maintenance other than periodic inspection, lubrication and occasional cleaning. The intent of inspection is to prevent breakdown, thus obtaining optimum service life.

LUBRICATION OF BEARINGS

Regreasable bearings require periodic lubrication, which can be accomplished by using the lubrication fittings in the cartridge cap and power frame. Lubricate the bearings at regular intervals using a grease of high quality.

At the time of initial start-up it is important to note that the pump bearings have been factory lubricated. Do not add additional lubrication until completion of initial break-in period, which is the first 10 hours of continuous operation, or an equivalent intermittent operation. After break-in period, while unit is operating, add fresh grease (American Oil Company's Rykon #2 or equivalent) through zerk fitting near bearings.



Lithium-base grease is recommended as a lubricant for pumps operating in both wet and dry locations. Mixing of different brands of grease should be avoided due to possible chemical reactions between the brands, which could damage the bearings. Avoid vegetable- or animal-base grease, which can develop acids, as well as grease containing rosin, graphite, talc and other impurities. Under no circumstances should grease be reused.

Over lubrication should be avoided, as it may result in overheating and possible bearing failure. Under normal application, adequate lubrication is assured if the amount of grease is maintained at 1/3 to 1/2 the capacity of the bearing and adjacent space surrounding it.

In dry locations, each bearing will need lubrication at least every 2,000 hours of running time or every 6 to 12 months, whichever is more frequent. In wet locations the bearings should be lubricated at least every 1,000 hours of running time or every 4 to 6 months, whichever is more frequent. A unit is considered to be installed in a wet location if the pump and motor are exposed to dripping water, the weather, or heavy condensation such as is found in unheated and poorly ventilated underground locations.

The 5E, 5F, 5G, 5H, 6D and 6E bearing frames have back-to-back angular contact bearings as the outboard thrust bearing (50). This style bearing requires more frequent lubrication intervals. It is suggested that it be lubricated every 1,000 hours of running time.

The 4D, 5F, 5H, 6D and 6E power frames have a spherical roller bearing as the inboard radial bearing (49). This style bearing requires lubrication every 500 hours.

At times it may be necessary to clean the bearings due to accumulated dirt or deteriorated lubricants. This can be accomplished by flushing the bearing with a light oil heated to 180 to 200°F. While rotating it on a spindle, wipe the bearing housing with a clean rag soaked in a cleaning solvent, and flush all surfaces.

Dry the bearing thoroughly before relubricating. Compressed air can be used to speed drying, but care should be taken not to let bearings rotate while being dried.

CAUTION

Use normal fire caution procedures when using any petroleum cleaner.

The motor that drives your Aurora pump may or may not require lubrication. Consult the manufacturer's recommendations for proper maintenance instructions.

REPAIRS

The pump may be disassembled using the illustrations and text provided. Although complete disassembly is covered, it will seldom be necessary to completely disassemble your Aurora pump.

The illustration accompanying the disassembly instructions shows an exploded view of the pump. The illustration is intended to aid in the correct identification of the parts mentioned in the text.

Inspect parts removed at disassembly to determine their reusability. Cracked castings should never be reused. All packing and gaskets should be replaced at reassembly simply as a matter of economy–they are much less expensive to replace routinely than to replace as the need occurs. In general, it is economical to return the motor and motor controller to the manufacturer for repair.

SPHER-FLOW MODELS 613A DISASSEMBLY

This pump has been designed with back pull-out features, which allow the frame and rotating element to be removed without disturbing the suction and discharge piping.

1. Disconnect power so that drive unit cannot be accidentally energized during disassembly.

2. Close all valves or flow devices that control movement of liquids to or from the pump. Drain pump by removing drain plug (70) from suction elbow (65). Remove any flushing, lubrication, pressurization, venting, drain or cooling lines from pump. Remove handhole cover (19) and gasket (18) from casing (1) by removing capscrews (20).

3. Remove capscrews (23) and nuts (24) from bracket (8), which allow motor, motor support (22), and flexible coupling to be lifted off at this point.

NOTE

On some sizes, adapter (22A) is required and can be removed from motor with capscrews.

The motor can be removed from motor support (22) by unscrewing capscrews (22B).

4. Remove capscrews (34) that secure bracket (8) to casing (1). Screw an eyebolt into outboard end of shaft (48) to aid in lifting power frame and rotating element from casing. The size of eyebolt is as follows:

a. Power Frames 4C and 4D require 5/8-1 INC eyebolt.

b. Power Frames 5E and 5F require 3/4-10NC eyebolt.

c. Power Frames 5G, 5H, 6D and 6E require 1-8NC eyebolt.

5. Remove gasket (17) from its position between bracket (8) and casing (1). Inspect the sealing surface to ensure that it is clean and free of any gasket material that has stuck to parting surfaces. Replace this gasket with a new one when pump is reassembled.

6. Inspect casing and impeller wearing rings (3 & 6) (optional) and replace if necessary. Removal can be accomplished by removing capscrews (4 & 7).

7. Remove capscrew (10), o-ring gasket (11), washer (12) gasket (13) which allow impeller (2), key (14), and gasket (38) to be removed.

NOTE

Spher-Flo Pumps have a tapered hub impeller to facilitate impeller removal. Use caution in removal of impeller as it only has to be moved a few thousandths of an inch to become entirely free.

The easiest method for removing impeller is to suspend entire power frame and rotating element about 1/32 of an inch above floor or work area. Apply pressure to impeller by means of jackscrews (60 and 61) located on bearing cap (51). When impeller is firmly against bracket (8) it should drop free after turning the jackscrews evenly, a flat at a time, three or four flats.

8. Insure external retaining ring (snap ring, 39) is located in the groove on the inboard side of the shaft sleeve. Unscrew capscrews (34) to allow removal of stuffing box (27), shaft sleeve (36), gland (44) and seal or packing (47, 40).

NOTE

The shaft sleeve incorporates a snap ring designed to interfere with the base of the seal box assembly. When removing the stuffing box the shaft sleeve is also removed.

Slide complete assembly including shaft sleeve (36) off the shaft (48) with the aid of a pinch bar or other lever. Place the stuffing box assembly on a suitable work surface for further disassembly.

For further disassembly of the stuffing box proceed as follows:

a. Packing box (Standard)

Remove cap screws (45), and split accumulator gland halves (44) from stuffing box. Slinger (43) is now exposed and can be removed from shaft sleeve. Remove O-ring gasket (42) from the stuffing box. Remove and discard old packing (40). Clean all parts to remove any packing that may have adhered during removal. Leakage accumulator gland (44) on vertical units, may be further disassembled by moving cap screws (44A), pipe plugs (44D), tubing (44C) and hose connectors (44B).

B. Double Seal (optional).

1. Remove seal gland bolts (45) and remove gland (44) carefully exposing seal (47).

2. Stationary insert can now be carefully pressed out of the gland (44).

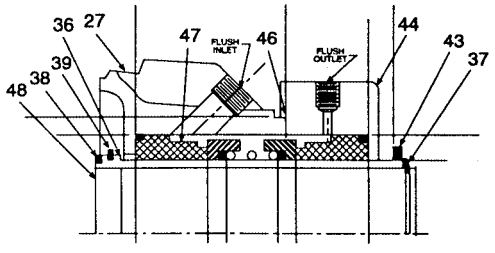
3. The exposed outboard seal ring in the stuffing box may be removed at this time if seal O-ring has not locked it into place. Do not attempt to pry the rotating face out of the stuffing box, leave rotating face in place if it cannot be readily removed. Liberally apply either a commercial mechanical seal lubricant or a non-abrasive liquid dish washing soap to the seal/shaft sleeve area.

4. Press the shaft sleeve (36), pressing from the outboard end of the sleeve, out of the stuffing box (27). Care should be taken to protect the rotating face from damage if the O-ring under the face should break loose and spring pressure force the face upward.

5. The stationary insert can now be carefully pressed out of the stuffing box (27).

The retaining ring (37) can be removed from the groove in the shaft by twisting it in a spiral movement toward the end of the shaft. Remove grease seal (53).10. Place power frame on two benches, so that its shaft rests between them or on a bench with a hole cut in it large enough for shaft.

11. Remove capscrews (59) and lift out shaft assembly from the power frame.



Typical DBL Seal Stuffing Box Cross Section

12. The inboard radial bearing is either a ball bearing or spherical roller bearing design and can be identified by power frame as listed below.

4C, 5E, 5G Power Frames use ball bearings.

4D, 5F, 5H, 6D and 6E use spherical roller bearings.

13. Remove coupling halve and key (55) from shaft. Remove plug (57) and zerk fitting (58).

14. Retainer ring (50B) is removed with a pair of truarc internal pliers so that grease retainer (50A) can be removed allowing bearing cap (51) to be removed from shaft assembly. Grease seal (52) may be removed if necessary.

15. With a pair of truarc external pliers, remove snap ring (50C) (PF#4 only), or remove locknut (50D) and lockwasher (50C) on power frame(s) #5 and #6.

16. Both inboard bearing (49) and outboard bearing (50) are pressed onto shaft. To remove bearings, use a wheel puller or press them off the shaft.

NOTE

When removing the inboard bearing (49) avoid damaging the separate grease shield (49A). This shield can be removed when bearing is removed from shaft.

17. If total disassembly is required, break connections to suction and discharge pipe and remove nuts from foundation bolts that hold support (21) to its foundation.

18. Secure casing and support assembly in sling and move it away from piping. Invert this assembly and set casing (1) on wood blocks, so as not to mar surface that mates bracket (8).

19. Suction gage (71) can now be removed from suction elbow or nozzle (65). Unscrew capscrews (69), washers (69B), and nuts (69A), and remove handhole cover (68) and gasket (67) from suction elbow (65).

20. Place rope sling through elbow and cover opening. Remove capscrews (66) and lift suction elbow (65) away from cover (5). Remove gasket (64).

21. Unscrew capscrews (15) which hold support (21), cover (5) and casing (1) together. Lift support away and then set casing with discharge up. Gently tap cover loose with a rubber mallet. Remove gasket (16) to complete disassembly.

SPHER-FLOW MODEL 613A REASSEMBLY

These instructions are for a pump that has been completely disassembled. Use those parts that apply to your reassembly program.

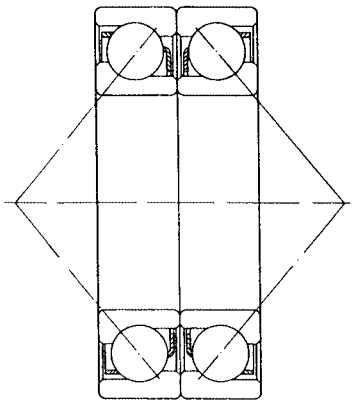
1. Place casing (1) with its outboard side down and position gasket (16) in place. Set cover (5) in place so the gasket position is neither lost nor damaged. Next align support (21) on cover. Use care not to disturb location of other parts. When all the above parts have been aligned, they are fastened together with capscrews (15). Tighten capscrews evenly to insure perfect register of mating parts. Replace pipe plugs (25) and (26) in casing.

2. Position gasket (64) on cover and carefully lower suction elbow (65) into place. Fasten suction elbow in place with capscrews (66).

3. Slip gasket (67) onto shoulder of handhole cover (68) and secure it to suction elbow (65) with capscrews (69), washers (69B) and nuts (69A). Place pipe plug or suction gage (71) and drain plug (70) back into suction elbow.

4. Return casing and support assembly to its normal position. Fasten suction and discharge piping to pump. Secure this assembly in place by tightening nuts on foundation bolts. If pump has wearing ring (6) fasten it to cover (5) with screws (7). If handhole cover (19) was removed, place gasket (18) on cover and secure with capscrews (20).

5. Hand pack the outboard bearing (50) with grease and pack the grease retainer (50A) cavity half full. Slide the grease retainer onto the shaft. Press the outboard bearing onto the shaft until it hits the shoulder of the shaft. Make sure outboard bearing set is properly matched with back-to-back configuation before pressing on shaft. Assemble snap ring (50C) onto the shaft with the beveled side outward to match the bevel in the shaft groove (PF#4 only). Install lockwasher (50C) and locknut (50D) to secure outboard bearing (50) to shaft (48) for P.F. #5 and 6. Torque to approximately 100 ft. lbs. Press or gently tap grease seal (52) into bearing cap (51). Slide the bearing cap (51) over the bearings (50). Lock in the assembly with snap ring (50B), matching the snap ring bevel to the groove bevel.



Back-to-Back
Bearing Configuration

6. Hand pack the inboard bearing (49) and the recessed area of its grease shield (49A). Slide the grease shield onto the shaft with the raised lip toward the bearing. Press on the bearing. Press the bearing on until all parts are shouldered tight together on the shaft. The grease shield may wear into the bearing outer race during break-in and is considered normal.

7. Place grease seal (53) into place on inboard end of power frame (56).

8. Lower sub-assembly from steps 5 through 7 into outboard end of power frame (56), which has been set on a bench with hole in it to accomodate the shaft.

9. Position jack screws so that they extend past the bearing cap as given in the following chart. This will position

impeller hub end of the shaft in a axial position which will allow mounting impeller and closing down liquid end without any adjustment during the intermediate assembly step. Final adjustment will have to be made by evenly tightening capscrews (59)

	Gap Clearance	Bolt Extension
Power Frame #4	1/8 in.	1/4 in.
Power Frame #5	1/4 in.	9/16 in.
Power Frame #6	1/4 in.	9/16 in.

10. Place plug (57) and zerk (58) back in bearing cap (51).

11. Place plug (62) and zerk (62A or 63) back on inboard end of power frame (56).

12. Retaining ring (37) can be set in its groove by turning it in a spiral motion up shaft. When in position, the outside diameter of this ring should slope toward inboard tapered shank end of shaft.

13. Position bracket (8) to power frame (56) and secure in place by evenly tightening capscrews (35).

14. The following procedure is used in assembling the appropriate sealing box:

A. Packing Box (Standard)

I. Place two pieces of packing (40) into the stuffing box cavity (27) being careful to get each piece firmly in place. Install lantern ring (41), then add remaining three pieces of packing. When packing is tightened, lantern ring should align with holes for bushing (29), flushing lines, or cooling lines.

NOTE

Be sure to stagger joints of packing rings to avoid excessive leakage.

II. Replace bushing (29) and grease zerk (30) in body of stuffing box (27).

III. Snap retainer ring (39) onto shaft sleeve (36) with a pair of truarc external snap ring pliers. Slide shaft sleeve carefully into inboard end of packing box.

IV. Place o-ring gasket (42) in stuffing box on top ring of packing (40). Be sure o-ring remains concentric against inside diameter of the stuffing box. Slide slinger (43) over shaft extension and adjust to ¼ in. below top of leakage accumulator after stuffing box assembly has been reattached to bracket. For pumps on #6 Power Frames place slinger (43) over shaft sleeve (36), ⅛ in. from outboard end of sleeve. Replace pipe plugs (44D), hose connector (44B) and tubing (44C) in leakage accumulator gland (44), Place one half of leakage accumulator gland in stuffing box with connection for hose to drain positioned properly. Apply General Electric* Silicon Rubber Sealant (75) on both ends of this gland half. Thread capscrews (45) into stuffing box (27) approximately ¼ in. Insert other half of gland (44) into stuffing box being careful not to disturb o-ring gasket (42). Insert capscrews (44A) into each side of gland (44) to hold the two halves together. Tighten packing adjusting capscrews (45) to obtain proper sealing.

V. Ensure capscrews (45) are now tightened enough to hold assembled gland in place. Final adjustment of packing box will have to be made after pump is returned to operation.

When pump is running, gland capscrews (45) should be evenly turned down a flat at a time, allowing packing to work in until a leakage rate of approximately 60 to 120 drops per minute is obtained.

NOTE

Do not over tighten packing as this will cause packing box to overheat and the shaft sleeve (36) to wear excessively.

VI. Place gasket (38) in radial corner groove that is machined on the end of the shaft sleeve to complete assembly.

B. Double Seal Box (Optional)

NOTE

Do not put mechanical seal back into service until seal ring and stationary seat faces have been relapped or replaced.

I. Thoroughly inspect the seal box cavity (27), checking for burrs or nicks which could damage the o-ring of the mechanical seal. Apply a film of liquid dishwashing detergent or rubber lubricant (do not use oil or grease) to the o-ring and seal seat. Press one stationary seat with o-ring gently into the seal box cavity (27) and the other into the gland plate (44).

II. Place gasket (46) in position in the gland register.

III. Snap retaining ring (39) onto sleeve (36) with a pair of truarc external pliers.

IV. Slide sleeve through bottom of stuffing box and place one seal ring (47) over sleeve and slide it down to the stationary seat. Place metal parts over shaft and then second seal ring.

V. Position gland over shaft sleeve and fasten to seal box with capscrews (45).

15. Place gasket (32) in groove of bracket (8).

16. Place key (54) in its keyway on shaft. Slide stuffing box assembly onto shaft, so that key and keyway in the shaft sleeve mate. Continue to slide assembly forward until shaft sleeve is in contact with retaining ring (37).

17. Align seal box (27) with gasket (32) and bracket (8) Fasten seal box to bracket with capscrews (33).

18. If pump has impeller wearing ring (3) fasten it to suction face of impeller (2) with setcrews (4).

19. Place impeller key (14) in keyway on the tapered portion of shaft (48) and set Impeller (2) in position. Put gasket (13) inside impeller suction eye with washer (12) next and o-ring gasket (11) last. Secure impeller in place with capscrew (10) according to the following chart.

IMPELLER BOLT TORQUE

Power Frame	Impeller Bolt Size	Torque Value
4C, 4D	⅝ in.	75 FT-LBS
5E, 5H	¾ in.	100 FT-LBS
5G, 5H	1 in.	100 FT-LBS
6D, 6E	1 in.	125 FT-LBS

20. Place gasket (17) on casing (1) and lower power frame (56) and rotating element assembly into place; fasten this assembly to casing with capscrews (34).

21. Using jackscrews (60) and nuts (61) located on bearing cap (51), adjust impeller and shaft assembly axially down until impeller bottoms out on its suction cover (5) or wearing rings (3) and (6). Then, loosen capscrews (59) and turn jacking screws (60) inward 3 or 4 flats ro raise impeller to running clearance of .015/.025. Tighten jam nuts (61) and capscrews (59) to lock in adjustment.

22. Make one last check that all parts of the rotating element turn freely.

23. Connect any flushing lines or cooling lines that were removed. Remove lifting eye and set motor and motor support (22) on bracket (8). After securing flexible coupling in place, fasten motor support to bracket with capscrews (23). Some sizes require adapter (22A). This is fastened to support (22) with capscrews (22B). Motor is held with capscrews supplied with motor.

24. Open all valves or flow devices that control flow of liquid to and from pump.

25. Connect Power.

NOTE

Do not start up a pump until all air and vapor have been bled, and making sure that there is liquid in the pump to provide the necessary lubrication. It is possible that the mechanical seal may drip during the first few minutes of operation.

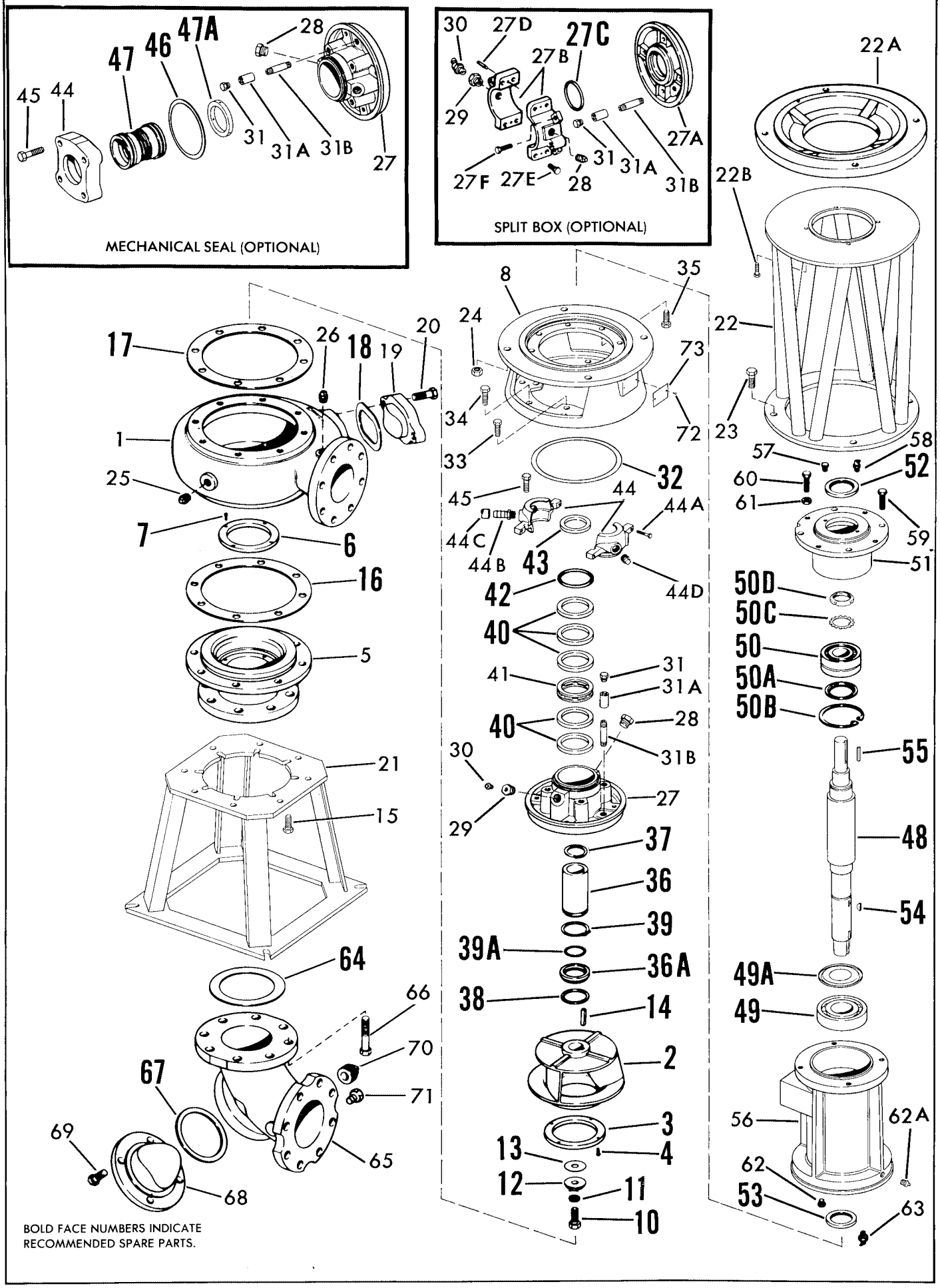
Turn on power momentarily to check for proper rotation. Rotation should be clockwise as viewed from driver (see arrow on casing).

*General Electric is a registered trademark of the General Electric Corporation.

MODEL 613A

MODEL 613A LIST OF PARTS

1. Casing
2. Impeller
3. Wear Ring
4. Set Screw
5. Suction Cover
6. Wear Ring
7. Set Screw
8. Bracket
10. Imp. Bolt
11. Imp. Bolt Seal
12. Imp. Washer
12. Imp. Washer Gasket
14. Impeller Key
15. Capscrew
16. Gasket
17. Gasket
18. Gasket
19. Handhole Cover
20. Capscrew
21. Pump Support
22. Motor Support
22A. Adapter
22B. Capscrew
23. Capscrew
24. Nut
25. Pipe Plug
26. Pipe Plug
27. Stuffing Box
27A. Adapter Plate
27B. Split Packing Box
27C. Gasket
27D. Pin
27E. Capscrews
27F. Capscrew
28. Pipe Plug
29. Bushing
30. Fitting
31. Pipe Plug
31A. Pipe Coupling
31B. Nipple
32. Gasket
33. Capscrew
34. Capscrew
35. Capscrew
36. Sleeve
36A. Sleeve Adapter
37. Retaining Ring
38. Gasket
39. Retaining Ring
39A. O-Ring
40. Packing
41. Lantern Ring
42. O-Ring
43. Slinger
44. Gland
44A. Capscrew
44B. Hose Connector
44C. Hose
44D. Pipe Plug
45. Capscrew
46. Gasket
47. Mechanical Seal
48. Shaft
49. Inboard Bearing
49A. Grease Shield
50. Outboard Bearing
50A. Grease Shield
50B Retaining Ring or Capscrew (P.F. 6E)
50C. Lockwasher or Retaining Ring
50D. Locknut
51. Bearing Cartridge
52. Grease Seal
53. Grease Seal
54. Sleeve Key
55. Shaft Key
56. Power Frame
57. Pipe Plug
58. Grease Fitting
59. Capscrew
60. Capscrew
61. Jam Nut
62. Pipe Plug
62A. Fitting Grease (P.F. 6&6E Only)
63. Grease Fitting or Pipe Plug
64. Gasket
65. Suction Elbow
66. Capscrew
67. Gasket
68. Handhole Cover
69. Capscrew
69A. Nut
69B. Washer
70. Pipe Plug
71. Suction Gauge or Pipe Plug
72. Drive Pins
73. Name Plate
75. Sealant


MECHANICAL SEAL (OPTIONAL)
SPLIT BOX (OPTIONAL)
BOLD FACE NUMBERS INDICATE
RECOMMENDED SPARE PARTS.

AURORA®
Pentair Pump Group

INSTRUCTION MANUAL
REPAIR
MODEL 614A (SPHER-FLO)

6

SERVICE

Your Aurora pump requires no maintenance other than periodic inspection, lubrication and occasional cleaning. The intent of inspection is to prevent breakdown, thus obtaining optimum service life.

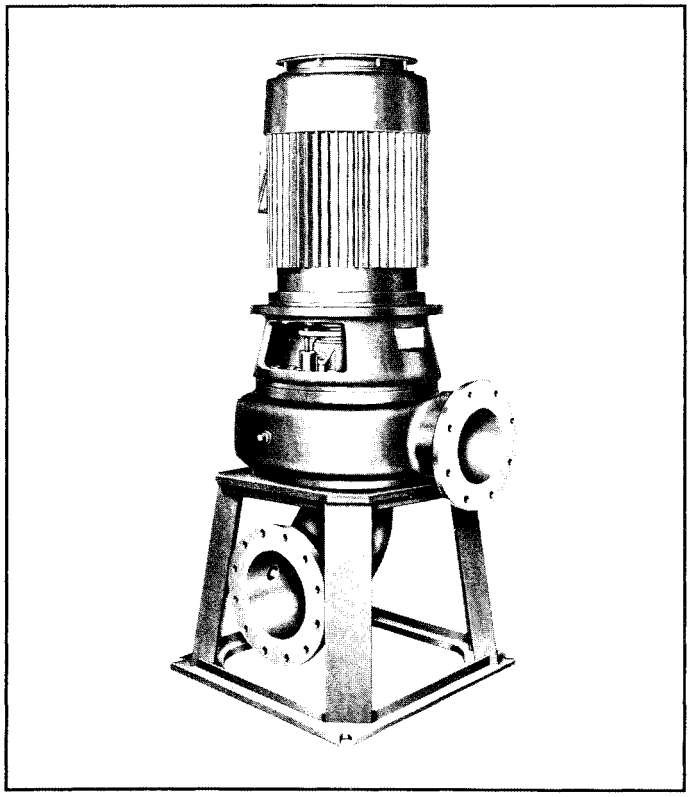
LUBRICATION

The motor that drives your Aurora pump may or may not require lubrication. Consult the manufacturer's recommendations for proper maintenance instructions.

REPAIRS

The pump may be disassembled using the illustrations and text provided. Although complete disassembly is covered, it will seldom be necessary to completely disassemble your Aurora pump.

The illustrations accompanying the disassembly instructions show the pump at various stages of disassembly. The illustrations are intended to aid in the correct identification of the parts mentioned in the text.



Inspect removed parts at disassembly to determine their reusability. Cracked castings should never be reused. All packing and gaskets should be replaced with new ones at reassembly simply as a matter of economy; they are much less expensive to replace routinely than to replace as the need occurs. In general it is economical to return the motor and motor controller to the manufacturer for repair.

SPHER-FLOW MODELS 614A DISASSEMBLY

This pump has been designed with back pull-out features, which allow the motor and rotating element to be removed without disturbing the suction and discharge piping.

1. Disconnect power so that drive unit can not be accidently energized during disassembly.

2. Close all valves or flow devices that control movement of liquids to or from pump. Drain pump by removing drain plug (70) from suction elbow (65). Remove any flushing, lubrication, pressurization, venting, drain, or cooling lines from pump. Remove handhole cover (19) and gasket (18) from casing (1) by removing capscrews (20).

3. Remove capscrews (34) that secure bracket (8) to casing (1). Screw an eyebolt into outboard end of the close coupled motor or use a sling under the motor lifting lugs to aid in lifting motor and rotating element from casing.

4. Remove gasket (17) from its position between bracket (8) and casing (1). Once the motor and rotating element have been withdrawn, inspect the sealing surface to ensure that it is clean and free of any gasket material, which may have stuck to parting surfaces. Replace this gasket with a new one when pump is reassembled.

5. Inspect casing and impeller wearing rings (3 & 6) (optional) and replace if necessary. Removal can be accomplished by removing setscrews (4 & 7).

6. Remove capscrew (10), o-ring gasket (11), washer (12) gasket (13) which allows impeller (2), key (14), and gasket (38) to be removed.

NOTE

Spher-Flo Pumps have a tapered hub impeller to facilitate impeller removal. Use caution in removal of impeller, as it has to be moved only a few thousandths of an inch to become entirely free.

8. Insure external retaining ring (snap ring, 39) is located in the groove on the inboard side of the shaft sleeve. Unscrew capscrews (34) to allow removal of stuffing box (27), shaft sleeve (36), gland (44) and seal or packing (47, 40).

NOTE

The shaft sleeve incorporates a snap ring designed to interfere with the base of the seal box assembly. When removing the stuffing box the shaft sleeve is also removed.

Slide complete assembly including shaft sleeve (36) off the shaft (48) with the aid of a pinch bar or other lever. Place the stuffing box assembly on a suitable work surface for further disassembly.

For further disassembly of the stuffing box proceed as follows:

a. Packing box (Standard)

Remove cap screws (45), and split accumulator gland halves (44) from stuffing box. Slinger (43) is now exposed and can be removed from shaft sleeve. Remove O-ring gasket (42) from the stuffing box. Remove and discard old packing (40). Clean all parts to remove any packing that may have adhered during removal. Leakage accumulator

gland (44) on vertical units, may be further disassembled by moving cap screws (44A), pipe plugs (44D), tubing (44C) and hose connectors (44B).

B. Double Seal (optional).

1. Remove seal gland bolts (45) and remove gland (44) carefully exposing seal (47).

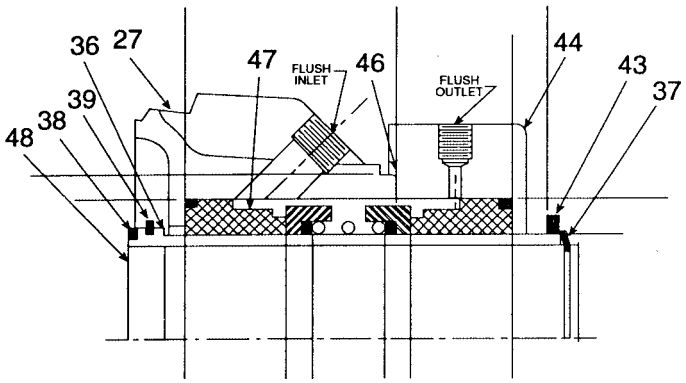
2. Stationary insert can now be carefully pressed out of the gland (44).

3. The exposed outboard seal ring in the stuffing box may be removed at this time if seal O-ring has not locked it into place. Do not attempt to pry the rotating face out of the stuffing box, leave rotating face in place if it cannot be readily removed. Liberally apply either a commercial mechanical seal lubricant or a non-abrasive liquid dish washing soap to the seal/shaft sleeve area.

4. Press the shaft sleeve (36), pressing from the outboard end of the sleeve, out of the stuffing box (27). Care should be taken to protect the rotating face from damage if the O-ring under the face should break loose and spring pressure force the face upward.

5. The stationary insert can now be carefully pressed out of the stuffing box (27).

The retaining ring (37) can be removed from the groove in the shaft by twisting it in a spiral movement toward the end of



Typical DBL Seal Stuffing Box Cross Section

the shaft. Remove grease seal (53).

9. Place 614A close-coupled motor on two benches, so that its shaft rests between them or on a bench with a hole cut in it large enough for shaft.

10. If total disassembly is required, break connections to suction and discharge pipe and remove nuts from foundation bolts that hold support (21) to its foundation.

11. Secure casing and support assembly in sling and move it away from piping. Invert this assembly and set casing (1) on wood blocks, so as not to mar surface that mates bracket (8).

12. Suction gage (71) can now be removed from suction elbow (65). Unscrew capscrew (69), washers (69B), and nuts (69A), and remove handhole cover (68) and gasket (67) from suction elbow (65).

13. Place rope sling through elbow and cover opening. Remove capscrews (66) and lift suction elbow (65) away from cover (5). Remove gasket (64).

14. Unscrew capscrews (15) that hold support (21), cover (5) and casing (1) together. Lift support away and then set casing with discharge up. Gently tap cover loose with a rubber mallet. Remove gasket (16) to complete disassembly.

SPHER-FLOW MODEL 614A REASSEMBLY

These instructions are for a pump that has been completely disassembled. Use those parts that apply to your reassembly program.

1 . Place casing (1) with its outboard side down and position gasket (16) in place. Set cover (5) in place so the gasket position is neither lost nor damaged. Next, align support (21) on cover.

Use care not to disturb location of other parts. When all the above parts have been aligned, they are fastened together with capscrews (15). Tighten capscrews evenly to insure perfect register of mating parts. Replace pipe plugs (25) and (26) in casing.

2. Position gasket (64) on cover and carefully lower suction elbow (65) into place. Fasten suction elbow in place with capscrews (66).

3. Slip gasket (67) onto shoulder of handhole cover (68) and secure it to suction elbow (65) with capscrews (69), washers (69B) and nuts (69A). Place pipe plug or suction gauge (71) and drain plug (70) back into suction elbow (65).

4. Return casing and support assembly to its normal position. Fasten suction and discharge piping to pump. Secure this assembly in place by tightening nuts on foundation bolts. If pump has wearing ring (6), fasten it to cover (5) with screws (7). If hand hole cover (19) was removed, place gasket (18) on cover and secure with capscrews (20).

5. Retaining ring (37) can be set in its groove by turning it in a spiral motion up shaft. When in position, the outside diameter of this ring should slope toward inboard tapered shank end of shaft.

6. Position bracket (8) to close-coupled motor and secure in place by evenly tightening capscrews (35).

7. The following procedure is used in assembling the appropriate sealing box:

A. Double Seal Box (Standard)

NOTE

Do not put mechanical seal back into service until seal ring and stationary seat faces have been relapped or replaced.

I. Thoroughly inspect the seal box cavity (27), checking for burrs or nicks, which could damage the o-ring of the mechanical seal. Apply a film of liquid dishwashing detergent or rubber lubricant (do not use oil or grease) to the o-ring and seal seat. Press one stationary seat with o-ring gently into the seal box cavity (27) and the other into the gland plate (44).

II. Place gasket (46) in position in the gland register.

III. Snap retaining ring (39) onto sleeve (36) with a pair of truarc external pliers.

IV. Slide sleeve through bottom of stuffing box and place one seal ring (47) over sleeve and slide it down to the stationary seat. Place metal parts over shaft and then second seal ring.

V. Position gland over shaft sleeve and fasten to seal box with capscrews (45).

B. Packing Box, (Optional)

I. Place two pieces of packing (40) into the stuffing box cavity (27) being careful to get each piece firmly in place. Install lantern ring (41), then add

remaining three pieces of packing. When packing is tightened, lantern ring should align with holes for bushing (29), flushing lines, or cooling lines.

NOTE

Be sure to stagger joints of packing rings to avoid excessive leakage.

II. Replace bushing (29) and grease zerk (30) in body of stuffing box (27).

III. Snap retainer ring (39) onto shaft sleeve (36) with a pair of truarc external snap ring pliers. Slide shaft sleeve carefully into inboard end of packing box.

IV. Place o-ring gasket (42) in stuffing box on top ring of packing (40). Be sure o-ring remains concentric against inside diameter of the stuffing box. Slide slinger (43) over shaft extension and adjust to ¼ in. below top of leakage accumulator after stuffing box assembly has been reattached to bracket. For pumps on #6 power frames place slinger (43) over shaft sleeve (36), ⅛ in. from outboard end of sleeve. Replace pipe plugs (44D), hose connector (44B) and tubing (44C) in leakage accumulator gland (44). Place one half of leakage accumulator gland in stuffing box with connection for hose to drain positioned properly. Apply General Electric* Silicon Rubber Sealant (75) on both ends of this gland half. Thread capscrews (45) into stuffing box (27) approximately ¼ in. Insert other half of gland (44) into stuffing box being careful not to disturb o-ring gasket (42). Insert capscrews (44A) into each side of gland (44) to hold the two halves together. Tighten packing adjusting capscrews (45) to obtain proper sealing.

V. Ensure capscrews (45) are now tightened enough to hold assembled gland in place. Final adjustment of packing box will have to be made after pump is returned to operation.

When pump is running, gland capscrews (45) should be evenly turned down a flat at a time, allowing packing to work in until a leakage rate of approximately 60 to 120 drops per minute is obtained.

NOTE

Do not over tighten packing as this will cause packing box to overheat and the shaft sleeve (36) to wear excessively.

VI. Place gasket (38) in radial corner groove that is machined on the end of the shaft sleeve to complete assembly.

8. Place gasket (32) in groove of bracket (8).

9. Place key (54) in its keyway on shaft. Slide stuffing box assembly onto shaft, so that key and keyway in the shaft sleeve mate. Continue to slide assembly forward until shaft sleeve is in contact with retaining ring (37).

10. Align seal box (27) with gasket (32) and bracket (8) Fasten seal box to bracket with capscrews (33).

11. If pump has impeller wearing ring (3) fasten it to suction face of impeller (2) with setcrews (4).

12. Place impeller key (14) in keyway on the tapered portion of shaft (48) and set impeller (2) in position. Put gasket (13) inside impeller suction eye with washer (12) next and o-ring gasket (11) last. Secure impeller in place with capscrew (10) according to the following chart.

IMPELLER BOLT TORQUE

Close Coupled Motor Register	Impeller Bolt	Torque Value
8½	⅝ in.	75 FT-LBS.
12½	¾ in.	100 FT-LBS.

13. Place gasket (17) on casing (1) and lower close coupled motor assembly into place; fasten this assembly to casing with capscrews (34).

14. Make one last check that all parts of the rotating element turn freely. If binding occurs, add additional shim gasket (17) between bracket (8) and casing (1) to obtain clearance between impeller (2) and suction cover (5).

15. Connect any flushing lines or cooling lines that were removed.

16. Open all valves or flow devices that control flow of liquid to and from pump.

17. Connect Power.

NOTE

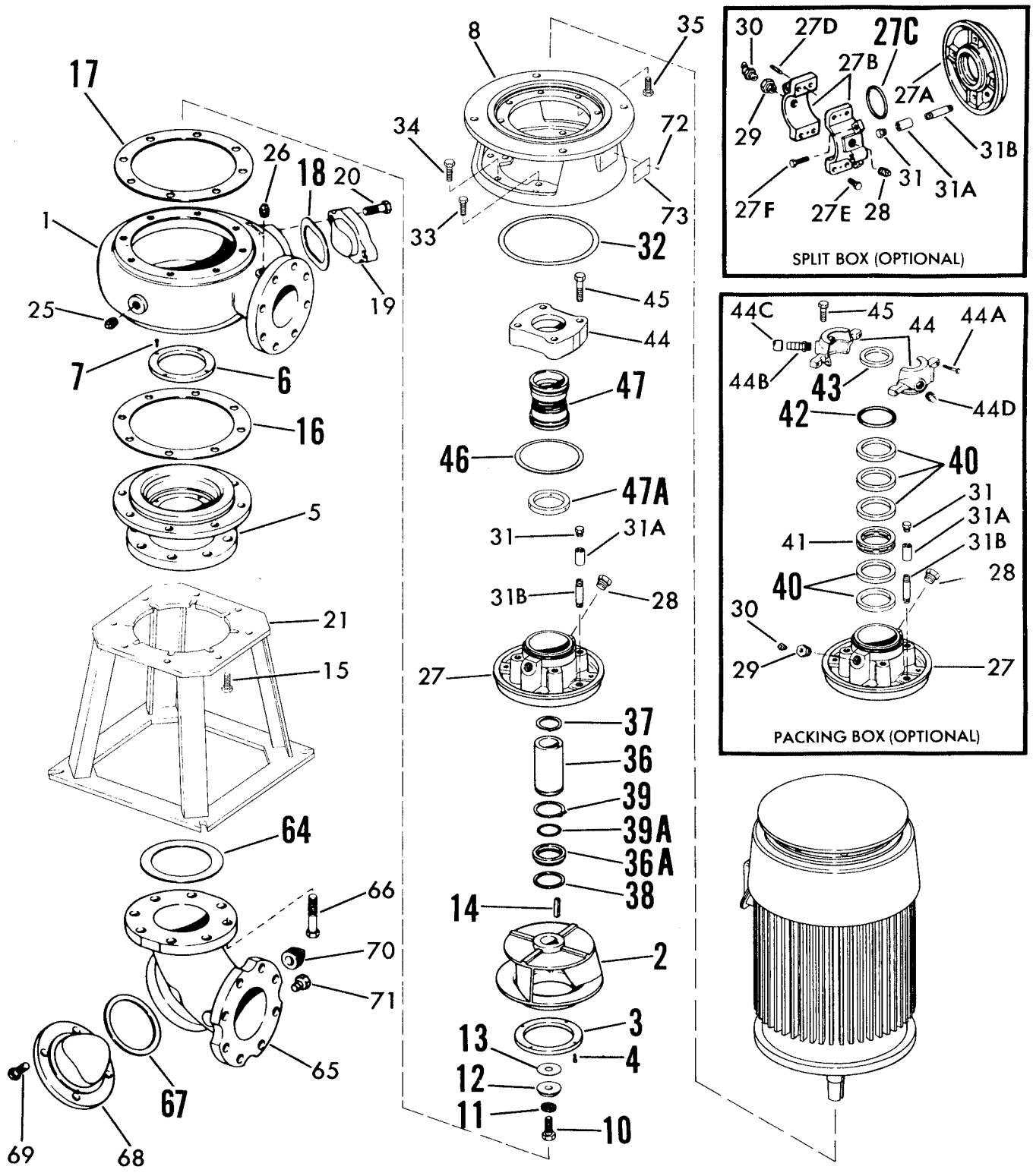
Do not start up a pump until all air and vapor have been bled, making sure that there is liquid in the pump to provide the necessary lubrication. It is possible that the mechanical seal may drip during the first few minutes of operation.

Turn on power momentarily to check for proper rotation. Rotation should be clockwise as viewed from driver (see arrow on casing).

*General Electric is a registered trademark of the General Electric Corporation.

MODEL 614A LIST OF PARTS

1. Casing
2. Impeller
3. Wear Ring
4. Set Screw
5. Suction Cover
6. Wear Ring
7. Set Screw
8. Bracket
10. Imp. Bolt
11. Imp. Bolt Seal
12. Imp. Washer
13. Imp. Washer Gasket
14. Impeller Key
15. Capscrew
16. Gasket
17. Gasket
18. Gasket
19. Handhole Cover
20. Capscrew
21. Pump Support
25. Pipe Plug
26. Pipe Plug
27. Stuffing Box
27A. Adapter Plate
27B. Split Packing Box
27C. Gasket
27D. Pin
27E. Capscrews
27F. Capscrew
28. Pipe Plug
29. Bushing
30. Fitting
31. Pipe Plug
31A. Pipe Coupling
31B. Nipple
32. Gasket
33. Capscrew
34. Capscrew
35. Capscrew
36. Sleeve
37. Retaining Ring
38. Gasket
39. Retaining Ring
40. Packing
41. Lantern Ring
42. O-Ring
43. Slinger
44. Gland
44A. Capscrew
44B. Hose Connector
44C. Hose
44D. Pipe Plug
45. Capscrew
46. Gasket
47. Mechanical Seal
54. Sleeve Key
64. Gasket
65. Elbow
66. Capscrew
67. Gasket
68. Handhole Cover
69. Capscrew
69A. Nut
69B. Washer
70. Pipe Plug
71. Suction Gauge or Pipe Plug
72. Drive Pins
73. Name Plate
75. Sealant



BOLD FACE NUMBERS INDICATE
RECOMMENDED SPARE PARTS

PC NO. 54 Sleeve Key Not Illustrated

610A SERIES
REPAIR PARTS INDEX

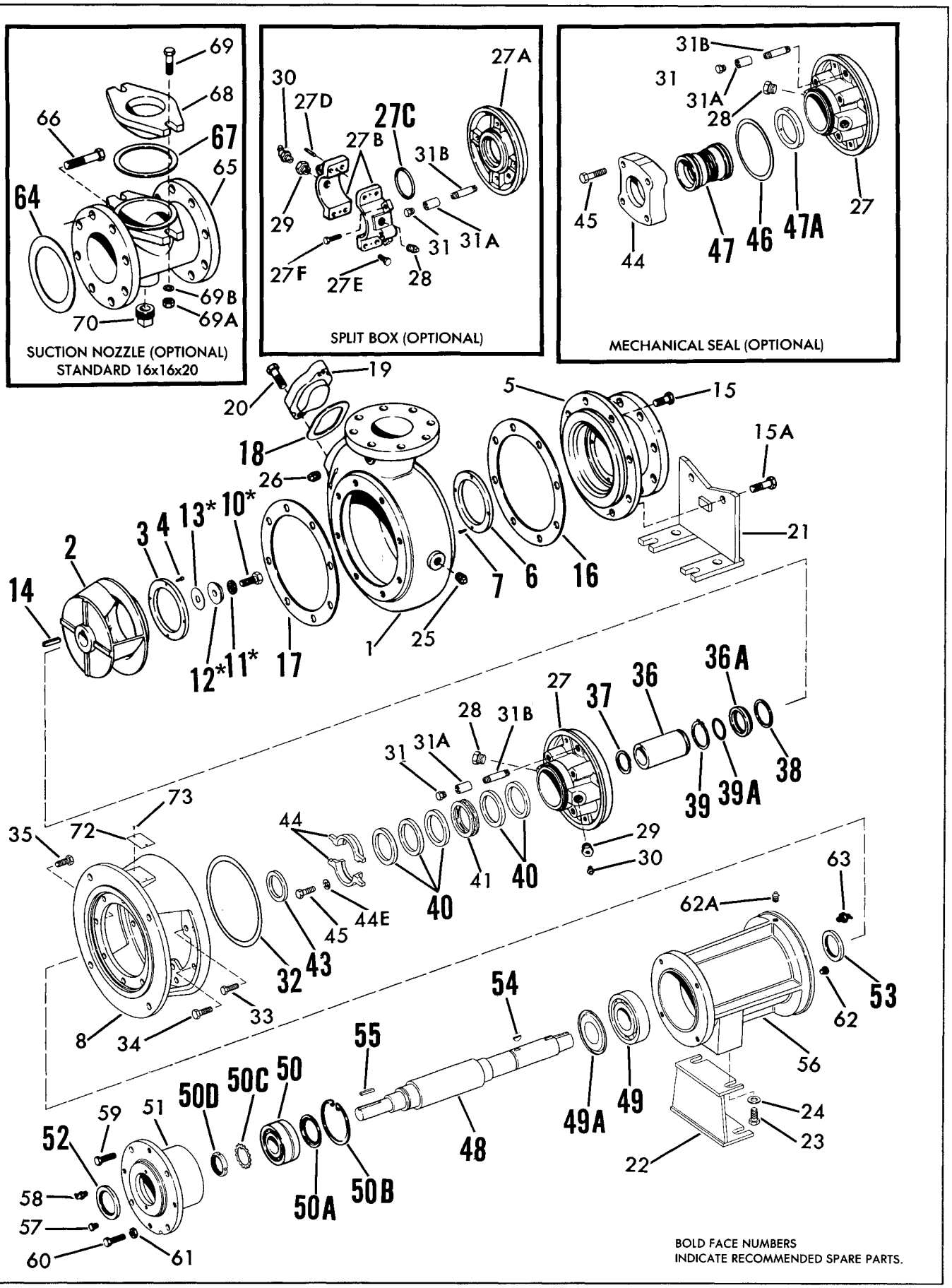
PARTS ARE LISTED BY POWER FRAME AND LIQUID ENDS. SELECT POWER FRAME BY PUMP SIZE AND SPEED FROM CHART BELOW.

MODEL 611A, 612A AND 613A**

PUMP SIZE	RPM							
	1750	1175	1150	875	700	585	580	500
6x6x12	5F		5E ‡	4C	4C			
6x6x12B	5F		5E ‡	4C	4C			
6x8x15	5F		5E	5E	5E		5E	
8x8x15A			5E	5E	5E		5E	
10x10x15			5F	5E	5E		5E	
6x8x18			5F	5E	5E		5E	
8x10x18			5H	5G	5G		5G	
8x10x22				5H	5G		5G	
10x10x22		6E						
10x12x22				6D	5H		5G	
12x12x22		6E						
12x14x22A				6D	5H		5G	
12x14x22B				6D	5H		5G	
14x14x22A		6E						
16x16x20*				6F	6F	6F		6F
16x16x28				8	8	8		
18x18x28					8	8		8
20x20x28					8	8		8

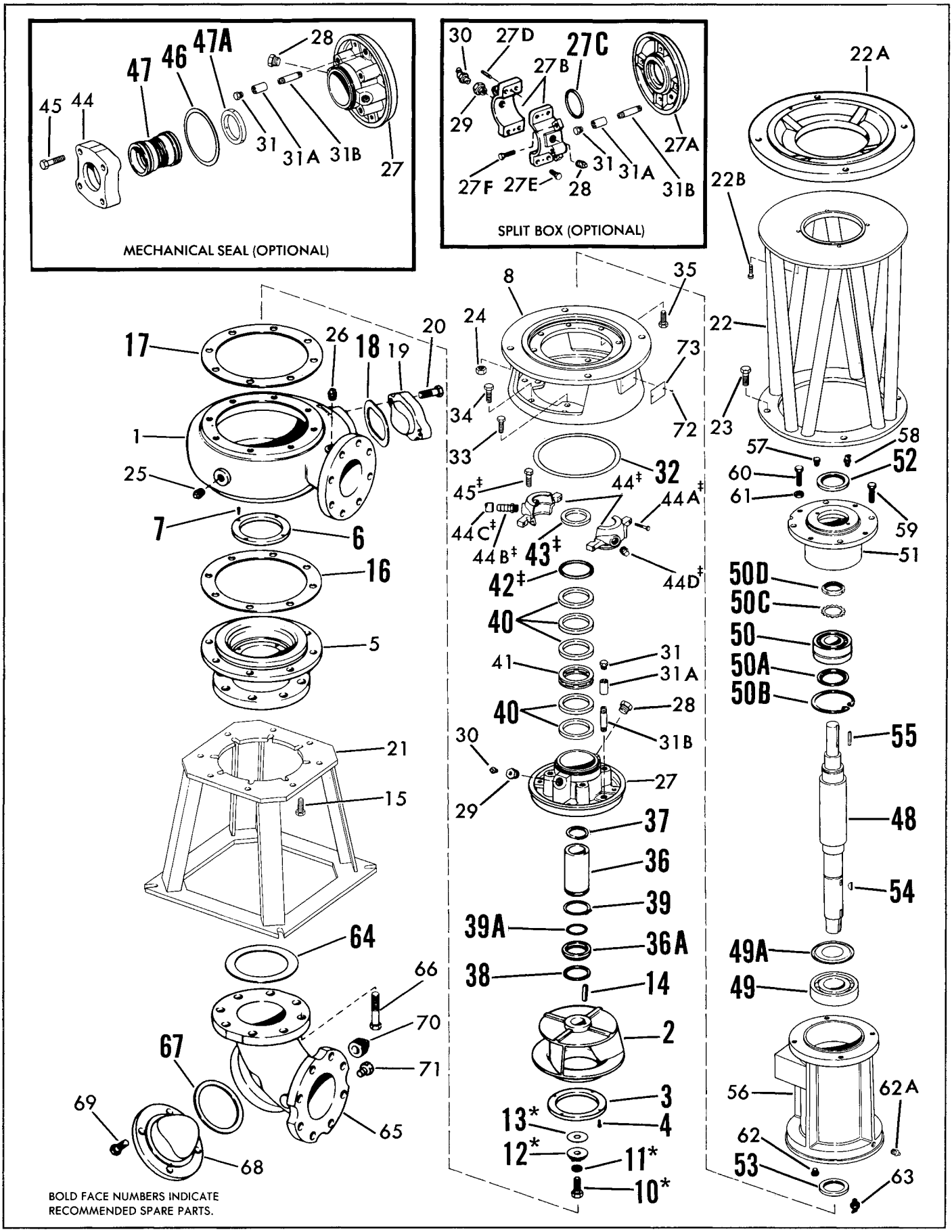
* Available as model 611A only.
‡ Prior to June 1, 1992, these 610A pumps were mounted on power frame 4D.
** For 614A pumps power frame determined by impeller trim. Please consult factory for power frame/impeller trim combinations.

610A SERIES
MODEL 611A
PIECE NUMBERS



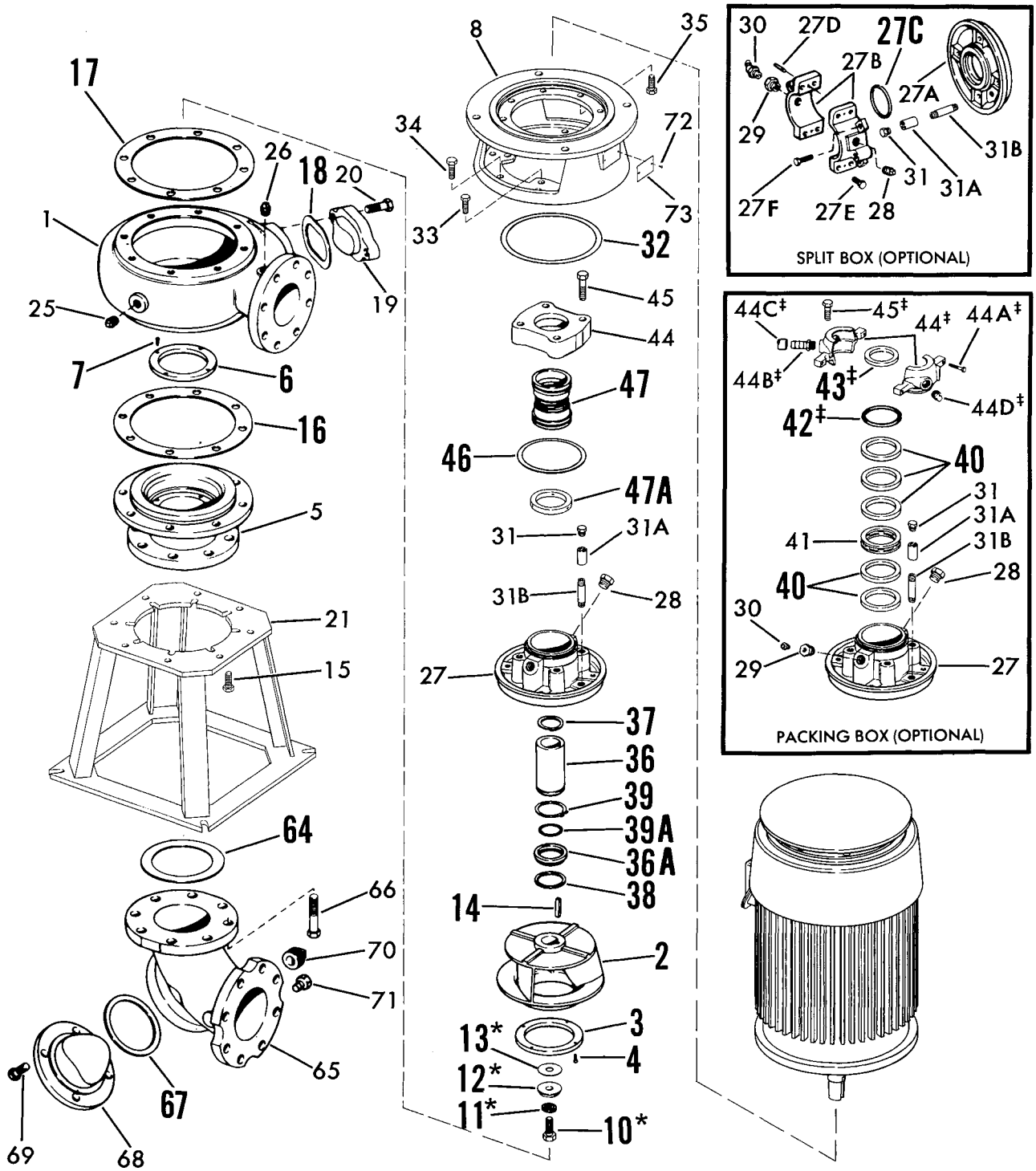
*These items are available as a kit, refer to PC. NO. 9.

610A SERIES
MODEL 612A & 613A
PIECE NUMBERS



*These items are available as a kit, refer to PC. NO.9 ‡These items are available as a kit, refer to PC. NO. 74

610A SERIES
MODEL 614A
PIECE NUMBERS

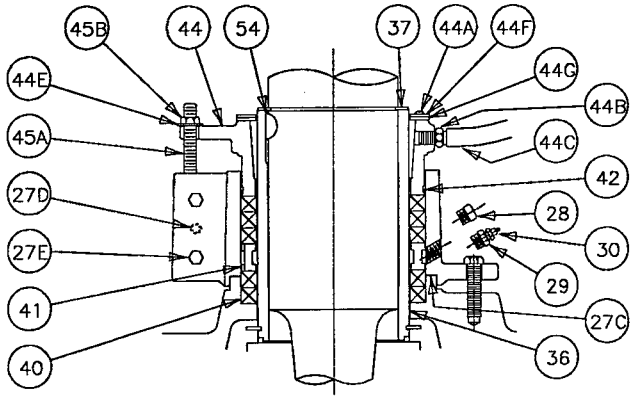


BOLD FACE NUMBERS INDICATE
RECOMMENDED SPARE PARTS

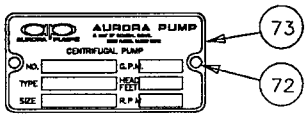
*These items are available as a kit, refer to PC. NO.9

‡These items are available as a kit, refer to PC. NO. 74

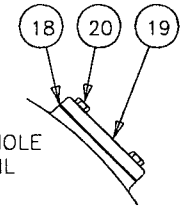
610A SERIES
MODEL612A
POWER FRAME 8
PIECE NUMBERS



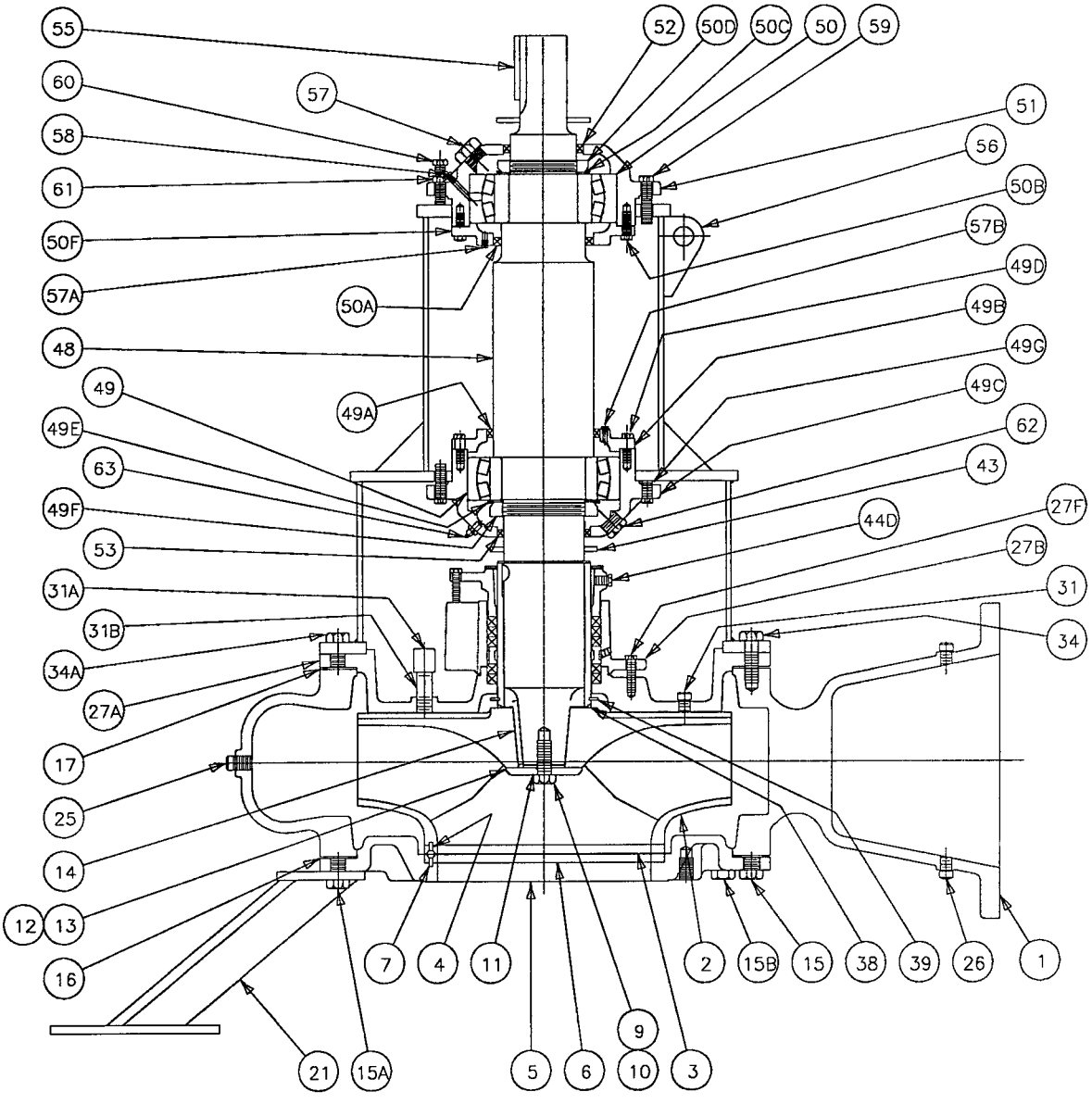
PACKING BOX DETAILS



NAMEPLATE DETAIL



CASING HANDHOLE
COVER DETAIL



610A SERIES

PARTS LIST

PC. NO.	DESCRIPTION	QTY	PART NO.	MATERIAL			
				B.F.	A.B.	A.I.	S.S.
1	CASING						
	6x6x12	1	180-1888	010			
	6x6x12B	1	180-2395	010			
	6x8x15	1	180-1889	010			
	8x8x15A	1	180-2385	010			
	10x10x15	1	180-1898	010			
	6x8x18	1	180-1890	010			
	8x10x18	1	180-1892	010			
	8x10x22	1	180-1893	010			
	10x10x22	1	180-0648	010			
	10x12x22	1	180-1894	010			
	12x12x22	1	180-0649	010			
	12x14x22A	1	180-1895	010			
	12x14x22B	1	180-1895	010			
	14x14x22A	1	180-1811	010			
	16x16x20	1	180-2450	010			
	16x16x28	1	180-2245	010			
	18x18x28	1	180-2246	010			
	20x20x28	1	180-2247	010			
2	IMPELLER 611A,						
	612A, 613A						
	6x6x12 PF 4	1	443-2541	010			
	6x6x12 PF 5	1	443-2077	010			
	6x6x12B PF 4	1	443-2543	010			
	6x6x12B PF 5	1	443-2434	010			
	6x8x15	1	443-2078	010			
	8x8x15A	1	443-2442	010			
	10x10x15	1	443-2086	010			
	6x8x18	1	443-2079	010			
	8x10x18	1	443-2081	010			
	8x10x22	1	443-2082	010			
	10x10x22	1	443-2082	010			
	10x12x22	1	443-2083	010			
	12x12x22	1	443-2083	010			
	12x14x22A	1	443-2084	010			
	12x14x22B	1	443-2333	010			
	14x14x22A	1	443-2084	010			
	16x16x20		REFER IMP WITH WR/RG				
	16x16x28	1	443-2305	010			
	18x18x28	1	443-2306	010			
	20x20x28	1	443-2307	010			
2	IMPELLER 614A						
	6x6x12 PF 4	1	443-2643	010			
	6x6x12 PF 5	1	443-2077	010			
	6x6x12B PF 4	1	443-2645	010			

PC. NO.	DESCRIPTION	QTY	PART NO.	MATERIAL			
				B.F.	A.B.	A.I.	S.S.
2	IMPELLER 614A						
	(CONT'D)						
	6x6x12B PF 5	1	443-2434	010			
	6x8x15	1	443-2078	010			
	8x8x15A	1	443-2442	010			
	10x10x15	1	443-2086	010			
	6x8x18	1	443-2079	010			
2	IMPELLER 611A,					*	
	612A, 613A WITH						
	WEARING RING						
	6x6x12 PF 4	1	443-2542	644		646	
	6x6x12 PF 5	1	443-2316	644		646	
	6x6x12B PF 4	1	443-2544	644		646	
	6x6x12B PF 5	1	443-2435	644		646	
	6x8x15	1	443-2317	644		646	
	8x8x15A	1	443-2443	644		646	
	10x10x15	1	443-2322	644		646	
	6x8x18	1	443-2318	644		646	
	8x10x18	1	443-2320	644		646	
	8x10x22	1	443-2321	644		646	
	10x10x22	1	443-2321	644		646	
	10x12x22	1	443-2323	644		646	
	12x12x22	1	443-2323	644		646	
	12x14x22A	1	443-2324	644		646	
	12x14x22B	1	443-2325	644		646	
	14x14x22A	1	443-2324	644		646	
	16x16x20	1	443-2631	644		646	
	16x16x28	1	443-2634	644		646	
	18x18x28	1	443-2635	644		646	
	20x20x28	1	443-2636	644		646	
2	IMPELLER 614A					*	
	WITH WEARING RING						
	6x6x12 PF 4	1	443-2644	644		646	
	6x6x12 PF 5	1	443-2316	644		646	
	6x6x12B PF 4	1	443-2646	644		646	
	6x6x12B PF 5	1	443-2435	644		646	
	6x8x15	1	443-2317	644		646	
	8x8x15A	1	443-2443	644		646	
	10x10x15	1	443-2322	644		646	
	6x8x18	1	443-2318	644		646	
3	IMPELLER					*	
	WEARING RING						
	6x6x12B, 6x6x12	1	676-1918	208		108	
	6x8x15, 6x8x18	1	676-1911	208		108	
	8x8x15A	1	676-2035	208		108	

*HARDENED STAINLESS STEEL WEARING RING OPTION.

PARTS LIST

PC. NO.	DESCRIPTION	QTY	PART NO.	MATERIAL			
				B.F.	A.B.	A.I.	S.S.
3	IMPELLER WEARING					*	
	RING (CONT'D)						
	10x10x15, 8x10x18	1	676-1915	208		108	
	8x10x22, 10x10x22	1	676-1912	208		108	
	10x12x22	1	676-1913	208		108	
	12x12x22	1	676-1913	208		108	
	12x14x22A	1	676-1914	208		108	
	12x14x22B	1	676-1914	208		108	
	14x14x22A	1	676-1914	208		108	
	16x16x20	1	676-2085	208		108	
	16x16x28	1	676-1110	208		108	
	18x18x28	1	676-1110	208		108	
	20x20x28	1	676-1110	208		108	
4	SETSCREW						
	6x6x12B, 6x8x15	4	708-0406	104			
	8x8x15A, 10x10x15	4	708-0406	104			
	6x8x18, 6x6x12	4	708-0406	104			
	8x10x18, 8x10x22	8	708-0406	104			
	10x10x22,	8	708-0406	104			
	10x12x22,	8	708-0406	104			
	12x12x22,	8	708-0406	104			
	12x14x22A	8	708-0406	104			
	12x14x22B	8	708-0406	104			
	14x14x22A	8	708-0406	104			
	16x16x20	8	708-0406	104			
	16x16x28	8	708-0410	104			
	18x18x28	8	708-0410	104			
	20x20x28	8	708-0410	104			
5	SUCTION COVER						
	6x6x12, 6x6x12B	1	816-1133	010			
	6x8x15	1	816-1116	010			
	8x8x15A	1	816-1230	010			
	10x10x15	1	816-1182	010			
	6x8x18	1	816-1117	010			
	8x10x18	1	815-1119	010			
	8x10x22	1	816-1120	010			
	10x10x22	1	816-1120	010			
	10x12x22	1	816-1121	010			
	12x12x22	1	816-1121	010			
	12x14x22A	1	816-1122	010			
	12x14x22B	1	816-1122	010			
	14x14x22A	1	816-1122	010			

PC. NO.	DESCRIPTION	QTY	PART NO.	MATERIAL			
				B.F.	A.B.	A.I.	S.S.
5	SUCTION COVER						
	(CONT'D)						
	16x16x28	1	816-0502	010			
	18x18x28	1	816-0503	010			
	20x20x28	1	816-0504	010			
	SUCTION COVER						
	WITH IMP. RING						
	6x6x12, 6x6x12B	1	816-1143	010			
	6x8x15	1	816-1145	010			
	8x8x15A	1	816-1231	010			
	10x10x15	1	816-1183	010			
	6x8x18	1	816-1147	010			
	8x10x18	1	816-1151	010			
	8x10x22	1	816-1153	010			
	10x10x22	1	816-1153	010			
	10x12x22	1	816-1155	010			
	12x12x22	1	816-1155	010			
	12x14x22A	1	816-1157	010			
	12x14x22B	1	816-1157	010			
	14x14x22A	1	816-1157	010			
	16x16x28	1	816-0648	010			
	18x18x28	1	816-0662	010			
	20x20x28	1	816-0664	010			
	SUCTION COVER					*	
	WITH IMP. AND						
	CASE RINGS						
	6x6x12, 6x6x12B	1	816-1144	644		646	
	6x8x15		816-1146	644		646	
	8x8x15A	1	816-1232	644		646	
	10x10x15	1	816-1184	644		646	
	6x8x18	1	816-1148	644		646	
	8x10x18	1	816-1152	644		646	
	8x10x22	1	816-1154	644		646	
	10x10x22	1	816-1154	644		646	
	10x12x22	1	816-1156	644		646	
	12x12x22	1	816-1156	644		646	
	12x14x22A	1	816-1158	644		646	
	12x14x22B	1	816-1158	644		646	
	14x14x22A	1	816-1158	644		646	
	16x16x20	1	816-1281	644		646	
	16x16x28	1	816-0770	644		646	
	18x18x28	1	816-0771	644		646	
	20x20x28	1	816-0772	644		646	

* HARDENED STAINLESS STEEL WEARING RING OPTION.

610A SERIES

PARTS LIST

PC. NO.	DESCRIPTION	QTY	PART NO.	MATERIAL			
				B.F.	A.B.	A.I.	S.S.
6	CASE WEARING					*	
	RING						
	6x6x12B, 6x6x12	1	676-1918	208		108	
	6x8x15, 6x8x18	1	676-1911	208		108	
	8x8x15A	1	676-2035	208		108	
	10x10x15, 8x10x18	1	676-1915	208		108	
	8x10x22, 10x10x22	1	676-1912	208		108	
	10x12x22,	1	676-1913	208		108	
	12x12x22	1	676-1913	208		108	
	12x14x22A,	1	676-1914	208		108	
	12x14x22B,	1	676-1914	208		108	
	14x14x22A	1	676-1914	208		108	
	16x16x20	1	676-2085	208		108	
	16x16x28,	1	676-1110	208		108	
	18x18x28,	1	676-1110	208		108	
	20x20x28	1	676-1110	208		108	
7	SETSCREW						
	6x6x12B, 6x8x15	4	708-0406	104			
	8x8x15A, 10x10x15	4	708-0406	104			
	6x8x18, 6x6x12	4	708-0406	104			
	8x10x18, 8x10x22	8	708-0406	104			
	10x10x22,	8	708-0406	104			
	10x12x22,	8	708-0406	104			
	12x12x22,	8	708-0406	104			
	12x14x22A,	8	708-0406	104			
	12x14x22B,	8	708-0406	104			
	14x14x22A	8	708-0406	104			
	16x16x20	8	708-0406	104			
	16x16x28	8	708-0410	104			
	18x18x28	8	708-0410	104			
	20x20x28	8	708-0410	104			
8	BRACKET						
	12" CASE BORE PF4	1	116-0490	010			
	12" CASE BORE PF5	1	116-0491	010			
	15" CASE BORE	1	116-0492	010			
	18" CASE BORE	1	116-0495	010			
	20" CASE BORE	1	116-0499	010			
	22" CASE BORE PF5	1	116-0493	010			
	22" CASE BORE PF6	1	116-0496	010			
	28" CASE BORE		INCLUDED WITH NO. 56				
9	IMPELLER FASTENER						
	KIT (PC. NO. 10, 11, 12, 13)						
	PF 4C, D	1	476-0030	644			
	PF 5E, F	1	476-0031	644			
	PF 5G, H-6D, E, F-8	1	476-0032	644			

PC. NO.	DESCRIPTION	QTY	PART NO.	MATERIAL			
				B.F.	A.B.	A.I.	S.S.
10	IMPELLER SCREW						
	PF 4C, D	1	168-1008	082			
	PF 5E, F	1	168-1009	082			
	PF 5G, H-6D, E, F-8	1	168-1010	082			
11	IMPELLER SCREW						
	SEAL						
	PF 4C, D	1	908-1283	999			
	PF 5E, F	1	908-1284	999			
	PF 5G, H-6D, E, F-8	1	908-1286	999			
12	IMPELLER WASHER						
	PF 4C, D	1	908-0457	062			
	PF 5E, F	1	908-0458	062			
	PF 5G, H	1	908-0459	062			
	PF 6D, E, F	1	908-0459	062			
	16x16x28 PF 8	1	908-0460	062			
	18x18x28 PF 8	1	908-0461	062			
	20x20x28 PF 8	1	908-0461	062			
13	IMPELLER						
	WASHER GASKET						
	PF 4C, D	1	364-2025	803			
	PF 5E, F	1	364-2029	803			
	PF 5G, H	1	364-2032	803			
	PF 6D, E, F	1	364-2032	803			
	16x16x28 PF 8	1	364-0068	803			
	18x18x28 PF 8	1	364-0069	803			
	20x20x28 PF 8	1	364-0069	803			
14	IMPELLER KEY						
	PF 4C, D	1	472-0250	087			
	PF 5E, F	1	472-0391	087			
	PF 5G, H	1	472-0408	087			
	PF 6D, E	1	472-0408	087			
	PF 6F	1	472-0420	087			
	PF 8	1	472-0419	087			
15	CAPSCREW 611A						
	12" CASE BORE PF4	6	168-0560	082			
	12" CASE BORE PF5	6	168-0560	082			
	15" CASE BORE	6	168-0632	082			
	18" CASE BORE	6	168-0632	082			
	20" CASE BORE	14	168-0670	082			
	22" CASE BORE	12	168-0670	082			
	612A, 613A, 614A						
	6" SUCTION	8	168-0566	082			
	8" SUCTION	6	168-0636	082			
	10" SUC. 15 & 18						
	BORE	8	168-0638	082			

* HARDENED STAINLESS STEEL WEARING RING OPTION.

PARTS LIST

PC. NO.	DESCRIPTION	QTY	PART NO.	MATERIAL			
				B.F.	A.B.	A.I.	S.S.
	612A, 613A, 614A						
	(CONT'D)						
	10" SUC. 22" BORE	16	168-0676	082			
	12" SUCTION	16	168-0676	082			
	28" CASE BORE	8	168-0825	082			
15A	CAPSCREW 611A						
	12" CASE BORE PF4	2	168-0564	082			
	12" CASE BORE PF5	2	168-0564	082			
	15" CASE BORE	2	168-0636	082			
	18" CASE BORE	2	168-0636	082			
	20" CASE BORE	2	168-0676	082			
	22" CASE BORE	4	168-0674	082			
	28" CASE BORE	8	168-0831	082			
15B	CAPSCREW						
	612A PF 8	4	168-0819	082			
16	GASKET						
	12" CASE BORE	1	364-1326	803			
	15" CASE BORE	1	364-1327	803			
	18" CASE BORE	1	364-1328	803			
	20" & 22" CASE BORE	1	364-1329	803			
	28" CASE BORE	4	364-1032	803			
17	GASKET *						
	12" CASE BORE	1	364-1326	803			
	15" CASE BORE	1	364-1327	803			
	18" CASE BORE	1	364-1328	803			
	20" & 22" CASE BORE	1	364-1329	803			
	28" CASE BORE	4	364-1032	803			
18	GASKET 6x6x12	1	364-2039	457			
	6x6x12B	1	364-1046	457			
	6x8x15	1	364-2039	457			
	8x8x15A	1	364-1322	457			
	10x10x15	1	364-1322	457			
	6x8x18	1	364-2039	457			
	8x10x18	1	364-1322	457			
	8x10x22	1	364-1322	457			
	10x10x22	1	364-1322	457			
	10x12x22	1	364-1322	457			
	12x12x22	1	364-1322	457			
	12x14x22A	1	364-1322	457			
	12x14x22B	1	364-1322	457			
	14x14x22A	1	364-1322	457			
	16x16x20	1	364-1048	457			
	16x16x28	1	364-1048	457			
	18x18x28	1	364-1048	457			
	20x20x28	1	364-1048	457			

PC. NO.	DESCRIPTION	QTY	PART NO.	MATERIAL			
				B.F.	A.B.	A.I.	S.S.
19	HANDHOLE COVER						
	6x6x12	1	260-0657	010			
	6x6x12B	1	260-0734	010			
	6x8x15	1	260-0657	010			
	8x8x15A	1	260-0729	010			
	10x10x15	1	260-0663	010			
	6x8x18	1	260-0657	010			
	8x10x18	1	260-0660	010			
	8x10x22	1	260-0067	010			
	10x10x22	1	260-0064	010			
	10x12x22	1	260-0068	010			
	12x12x22	1	260-0072	010			
	12x14x22A	1	260-0072	010			
	12x14x22B	1	260-0072	010			
	14x14x22A	1	260-0725	010			
	16x16x20	1	260-5091	010			
	16x16x28	1	260-0061	010			
	18x18x28	1	260-0062	010			
	20x20x28	1	260-0063	010			
20	CAPSCREW						
	6x6x12	2	168-0562	082			
	6x6x12B	2	168-0564	082			
	6x8x15	2	168-0562	082			
	8x8x15A	2	168-0562	082			
	10x10x15	2	168-0562	082			
	6x8x18	2	168-0562	082			
	8x10x18	2	168-0562	082			
	8x10x22	4	168-0562	082			
	10x10x22	4	168-0564	082			
	10x12x22	4	168-0562	082			
	12x12x22	4	168-0564	082			
	12x14x22A	4	168-0562	082			
	12x14x22B	4	168-0562	082			
	14x14x22A	4	168-0564	082			
	16x16x20	4	168-0560	082			
	16x16x28	4	168-0562	082			
	18x18x28	4	168-0562	082			
	20x20x28	4	168-0562	082			
21	PUMP SUPPORT						
	FRONT FOOT 611A						
	12" CASE BORE	1	820-0507	087			
	15" CASE BORE	1	820-0505	087			
	18" CASE BORE	1	820-0508	087			
	20" CASE BORE	1	820-1693	087			
	22" CASE BORE	1	820-0506	087			

*FOR MODEL 614A REFER TO FACTORY FOR SHIM GASKETS.

610A SERIES

PARTS LIST

PC. NO.	DESCRIPTION	QTY	PART NO.	MATERIAL B.F.	A.B.	A.I.	S.S.
	PUMP BASE						
	612A, 613A, 614A						
	12" CASE BORE	1	060-1388	087			
	15 & 18" CASE BORE	1	060-1389	087			
	22" CASE BORE	1	060-1390	087			
	16x16x28	3	820-0511	087			
	18x18x28	3	820-0991	087			
	20x20x28	3	820-0992	087			
22	PUMP SUPPORT						
	REAR FOOT 611A						
	12" CASE BORE PF 4	1	820-1628	087			
	12" CASE BORE PF 5	1	820-1629	087			
	15" CASE BORE	1	820-1625	087			
	18" CASE BORE	1	820-1626	087			
	20" CASE BORE	1	820-1694	087			
	22" CASE BORE	1	820-1627	087			
	MOTOR SUPPORT						
	613A PF 4	1	820-1397	010			
	< 284 HPH PF 5 & 6	1	820-1617	087			
	≥ 284 HPH PF 5 & 6	1	820-1620	087			
22A	ADAPTOR 613A						
	≥ 284 HPH PF 4	1	008-0340	010			
22B	CAPSCREW 613A						
	≥ 284 HPH PF 4	1	168-0562	082			
23	CAPSCREW						
	REAR FOOT 611A						
	PF 4	2	168-0560	082			
	PF 5	2	168-0668	082			
	18" CASE BORE PF 6	2	168-0668	082			
	20" CASE BORE PF 6	2	168-0670	082			
	22" CASE BORE PF 6	2	168-0670	082			
	CAPSCREW 613A						
	PF 4	4	168-0494	082			
	PF 5 & 6	4	168-0640	082			
24	WASHER						
	REAR FOOT 611A						
	PF 4	2	908-0116	080			
	PF 5 & 6	2	908-0118	080			
	NUT 613A						
	PF 4	4	544-0113	080			
	PF 5 & 6	4	544-0117	080			

PC. NO.	DESCRIPTION	QTY	PART NO.	MATERIAL B.F.	A.B.	A.I.	S.S.
25	PIPE PLUG						
	PF 4, 5 & 6	2	600-0005	028			
	16x16x20 PF 6F	5	600-0006	028			
	16x16x28 PF 8	3	600-0005	028			
	18x18x28 PF 8	3	600-0006	028			
	20x20x28 PF 8	3	600-0006	028			
26	PIPE PLUG						
	PF 4, 5, 6, & 8	1	600-0004	028			
27	STUFFING BOX						
	STANDARD PF 4	1	812-1084	010			
	STANDARD PF 5	1	812-1085	010			
	STANDARD PF 6D, E	1	812-1086	010			
	STANDARD PF 6F	1	812-1087	010			
27A	STUFFING BOX						
	ADAPTOR						
	OPTIONAL PF 4	1	008-0564	010			
	OPTIONAL PF 5	1	008-0565	010			
	OPTIONAL PF 6D, E	1	008-0566	010			
	STANDARD PF 8	1	008-0020	010			
27B	SPLIT STUFFING						
	BOX						
	OPTIONAL PF 4	1	812-0305	010			
	OPTIONAL PF 5	1	812-0309	010			
	OPTIONAL PF 6D, E	1	812-0312	010			
	STANDARD PF 8	1	812-0069	010			
27C	GASKET OPT. PF 4	1	364-2006	803			
	OPTIONAL PF 5	1	364-2027	803			
	OPTIONAL PF 6D, E	1	364-2031	803			
	STANDARD PF 8	1	364-1131	803			
27D	PIN OPT. PF 4	2	592-0361	107			
	OPTIONAL PF 5	2	592-0361	107			
	OPTIONAL PF 6D, E	2	592-0361	107			
	STANDARD PF 8	2	592-0838	104			
27E	CAPSCREW OPT. PF4	4	168-0382	082			
	OPTIONAL PF 5	4	168-0382	082			
	OPTIONAL PF 6D, E	4	168-0490	082			
	STANDARD PF 8	4	168-0562	082			
27F	CAPSCREW OPT. PF4	4	168-0382	082			
	OPTIONAL PF 5	4	168-0492	082			
	OPTIONAL PF 6D, E	8	168-0562	082			
	STANDARD PF 8	8	168-0568	082			
28	PIPE PLUG	1	600-0004	028			
29	BUSHING (PACK)	1	600-0905	387			
	PF 8	1	600-0906	387			

< = LESS THAN ≥ = GREATER THAN OR EQUAL TO

PARTS LIST

PC. NO.	DESCRIPTION	QTY	PART NO.	MATERIAL			
				B.F.	A.B.	A.I.	S.S.
30	FITTING (PACK)	1	508-0012	651			
	PF 8	1	508-0015	651			
31	PIPE PLUG						
	PF 4	2	600-0002	087			
	PF 5	2	600-0003	087			
	PF 6	2	600-0004	028			
	PF 8	2	600-0006	028			
31A	PIPE COUPLING						
	PF 4	1	600-0721	387			
	PF 5	1	600-0722	387			
	PF 6	1	600-0723	387			
	PF 8	1	600-0725	387			
31B	NIPPLE						
	PF 4	1	600-1103	387			
	PF 5	1	600-1254	387			
	PF 6	1	600-1304	387			
	PF 8	1	600-1412	387			
32	GASKET PF 4	1	364-1344	803			
	PF 5	1	364-1345	803			
	PF 6	1	364-1346	803			
33	CAPSCREW PF 4	1	168-0382	082			
	PF 5	4	168-0560	082			
	PF 6	4	168-0564	082			
	PF 6F	8	168-0564	082			
34	CAPSCREW						
	6x6x12 PF 4	8	168-0560	082			
	6x6x12B PF 4	8	168-0560	082			
	6x6x12 PF 5	8	168-0562	082			
	6x6x12B PF 5	8	168-0562	082			
	6x8x15	8	168-0632	082			
	8x8x15A	8	168-0632	082			
	10x10x15	8	168-0632	082			
	6x8x18	8	168-0632	082			
	8x10x18	8	168-0632	082			
	8x10x22	16	168-0670	082			
	10x10x22	16	168-0670	082			
	10x12x22	16	168-0670	082			
	12x12x22	16	168-0670	082			
	12x14x22A	16	168-0670	082			
	12x14x22B	16	168-0670	082			
	14x14x22A	16	168-0670	082			
	16x16x20	16	168-0670	082			
	16x16x28	16	168-0833	082			
	18x18x28	16	168-0833	082			
	20x20x28	16	168-0833	082			

PC. NO.	DESCRIPTION	QTY	PART NO.	MATERIAL			
				B.F.	A.B.	A.I.	S.S.
34A	CAPSCREW PF 8	4	168-0636	082			
35	CAPSCREW PF 4	4	168-0490	082			
	PF 5	4	168-0564	082			
	PF 6D, F	8	168-0564	082			
	PF 6E	8	168-0566	082			
36	SLEEVE (PACK)						
	PF 4	1	756-0414	108			
	PF 5	1	756-0415	108			
	PF 6D, E	1	756-0416	108			
	PF 6F	1	756-0576	108			
	PF 8	1	756-0339	108			
	CERAMIC COATED						
	PF 4	1	756-0554	548			
	PF 5	1	756-0555	548			
	PF 6D, E	1	756-0556	548			
	PF 6F	1	756-0582	548			
	PF 8	1	756-0534	548			
	SLEEVE						
	(MECHANICAL SEALS)						
	PF 4	1	756-0411	208			
	PF 5	1	756-0412	208			
	DURA BRO PF 5	1	756-0578	208			
	PF 6D, E	1	756-0413	208			
	PF 6F	1	756-0580	208			
	DURA BRO PF 6	1	756-0579	208			
	PF 6F	1	756-0581	208			
36A	SLEEVE ADAPTOR						
	PF 5G & 5H	1	756-0417	104			
37	RETAINING RING						
	PF 4	1	676-0470	088			
	PF 5	1	676-0471	088			
	PF 6	1	676-0472	088			
	PF 8	1	676-0467	088			
38	GASKET PF 4	1	364-0581	457			
	PF 5E & 5F	1	364-0584	457			
	PF 5G & 5H	1	364-0582	457			
	PF 6	1	364-0586	457			
	PF 8	1	364-0585	457			
39	RETAINING RING						
	PF 4	1	676-0294	088			
	PF 5E & 5F	1	676-0460	088			
	PF 5G & 5H		NOT REQUIRED				
	PF 6D, E		NOT REQUIRED				
	PF 6F	1	676-0469	088			
	PF 8	1	676-0468	088			

610A SERIES

PARTS LIST

PC. NO.	DESCRIPTION	QTY	PART NO.	MATERIAL			
				B.F.	A.B.	A.I.	S.S.
39A	O-RING PF 5G & H	1	364-0429	457			
40	PACKING						
	PF 4	5	564-0114	802			
	PF 5	5	564-0183	802			
	PF 6	5	564-0003	802			
	PF 8	5	564-0005	802			
41	LANTERN RING						
	PF 4	1	676-1105	512			
	PF 5	1	676-1106	512			
	PF 6	1	676-1107	010			
	PF 8	1	676-1108	010			
42	O-RING (PACK)						
	PF 4	1	364-0425	457			
	PF 5	1	364-2101	457			
	PF 6	1	364-0451	457			
	PF 8	1	364-0548	457			
43	SLINGER (PACK)						
	PF 4	1	764-0021	478			
	PF 5	1	764-0023	478			
	PF 6	1	764-0184	478			
	PF 8	1	764-0180	478			
	MECHANICAL SEAL SLINGER						
	PF 4	1	764-0020	478			
	PF 5	1	764-0022	478			
	PF 6	1	764-0024	478			
	PF 8	1	764-0180	478			
44	GLAND						
	611A PACKING						
	PF 4	1	372-0320	010			
	PF 5	1	372-0321	010			
	PF 6	1	372-0322	010			
	612A & 613A PACKING						
	PF 4	1	372-0515	319			
	PF 5	1	372-0516	319			
	PF 6D, E	1	372-0477	319			
	PF 8	1	372-0163	010			
	MECHANICAL SEAL GLAND FOR JOHN CRANE TYPE 1, 21, 8TD						
	PF 4	1	372-0518	010			
	PF 5	1	372-0520	010			
	PF 6	1	372-0522	010			

PC. NO.	DESCRIPTION	QTY	PART NO.	MATERIAL			
				B.F.	A.B.	A.I.	S.S.
	JOHN CRANE TYPE						
	8B2 PF 4	1	372-0519	104			
	PF 5	1	372-0521	104			
	PF 6	1	372-0523	104			
	MECHANICAL SEAL GLAND FOR DURAMETALLIC TYPE CRO, BRO						
	PF 4	1	372-0524	010			
	PF 5	1	372-0520	010			
	PF 6	1	372-0528	010			
	DURAMETALLIC SEAL TYPE RA						
	PF 4	1	372-0525	104			
	PF 5	1	372-0527	104			
	PF 6	1	372-0529	104			
	MECHANICAL SEAL GLAND FOR CHESTERTON TYPE						
	880 PF 4	1	372-0530	104			
	PF 5	1	372-0531	104			
	PF 6	1	372-0532	104			
44A	CAPSCREW (PACK)						
	PF 4, 5 & 6	2	168-0718	080			
	PF 8	10	708-0246	080			
44B	HOSE CONNECTOR						
	(PACK) PF 4 & 5	1	600-2966	503			
	PF 6	1	600-2967	503			
	PF 8	1	600-2966	503			
44C	HOSE (PACK)	1	872-0005	505			
44D	PIPE PLUG (PACK)						
	PF 4 & 5	3	600-0004	511			
	PF 6	3	600-5104	511			
	PF 8	1	600-0004	511			
44E	GLAND CLAMP						
	611A (PACK)						
	PF 4	2	204-0116	360			
	PF 5	2	204-0121	360			
	PF 6	2	204-0121	360			
	WASHER						
	612A PF 8	2	908-0114	104			
44F	GLAND COVER PF 8	1	260-5072	104			

PARTS LIST

PC. NO.	DESCRIPTION	QTY	PART NO.	MATERIAL			
				B.F.	A.B.	A.I.	S.S.
44G	GLAND COVER						
	GASKET PF 8	1	364-0044	803			
45	CAPSCREW						
	611A PACKING	2	168-0500	082			
	612A & 613A						
	PACKING	2	168-0502	082			
	MECH. SEAL SCREWS		REFER TO FACTORY				
45A	STUD PF 8	2	808-0322	082			
45B	NUT PF 8	2	544-0113	080			
46	GASKET (SEAL)						
	PF 4	1	364-0074	803			
	PF 5	1	364-0075	803			
	PF 6	1	364-0076	803			
47	MECHANICAL SEAL						
	POWER FRAME 4						
	J.C. 21 DBL.	1	712-6410	749			
	J.C. 8TD DBL.	1	712-6411	749			
	J.C. 88 CART.	1	712-6413	767			
	* J.C. 1 SINGLE	1	712-6409	678			
	J.C. 8B2 OUT.	1	712-6412	678			
	DURA CRO DBL.	1	712-6424	773			
	DURA X-200 CART.	1	712-6431	586			
	DURA RA OUT.	1	712-6425	566			
	CHEST. 241 CART.	1	712-6433	571			
	CHEST. 880 SINGLE	1	712-6435	571			
	POWER FRAME 5						
	J.C. 1 DBL.	1	712-6415	749			
	J.C. 8TD DBL.	1	712-6416	749			
	J.C. 88 CART.	1	712-6418	767			
	* J.C. 1 SINGLE	1	712-6414	678			
	J.C. 8B2 OUT.	1	712-6417	678			
	DURA CRO DBL.	1	712-6426	772			
	DURA BRO DBL.	1	712-6427	741			
	DURA RA OUT.	1	712-6428	566			
	CHEST. 241 CART.	1	712-6434	571			
	CHEST. 880 SINGLE	1	712-6436	571			
	POWER FRAME 6						
	J.C. 21 DBL.	1	712-6420	749			
	J.C. 8TD DBL.	1	712-6421	749			
	J.C. 88 CART.	1	712-6423	767			
	* J.C. 1 SINGLE	1	712-6419	678			
	J.C. 8B2 OUT.	1	712-6422	678			
	DURA BRO DBL.	1	712-6429	741			
	DURA RA OUT.	1	712-6430	566			
	CHEST. 880 SINGLE	1	712-6437	571			

PC. NO.	DESCRIPTION	QTY	PART NO.	MATERIAL			
				B.F.	A.B.	A.I.	S.S.
47A	BUSHING						
	FOR SINGLE SEALS						
	PF 4	1	224-0223	208			
	PF 5	1	224-0224	208			
	PF 6	1	224-0225	208			
48	SHAFT						
	PF 4C, 4D	1	728-0514	063			
	PF 5E, 5F	1	728-0515	063			
	PF 5G, 5H	1	728-0528	063			
	PF 6D	1	728-0526	063			
	PF 6E	1	728-0527	063			
	PF 6F	1	728-0586	063			
	PF 8	1	728-0599	063			
49	BEARING INBOARD						
	PF 4C	1	068-0162	647			
	PF 4D	1	068-2999	647			
	PF 5E, 5G	1	068-0168	647			
	PF 5F, 5H	1	068-0046	647			
	PF 6D, 6F	1	068-3000	647			
	PF 6E	1	068-3001	647			
	PF 8	1	068-0594	647			
49A	GREASE SHIELD						
	PF 4C, 4D	1	712-0280	087			
	PF 5E, 5F, 5G & 5H	1	712-0281	087			
	PF 6D, 6F	1	712-0286	087			
	PF 6E	1	712-0282	087			
	PF 8	1	712-0133	653			
49B	BEARING CAP PF 8	1	164-0102	010			
49C	BEARING						
	CARTRIDGE PF 8	1	164-0105	010			
49D	CAPSCREW PF 8	8	168-0562	082			
49E	LOCK WASHER PF 8	1	908-0428	080			
49F	LOCK NUT PF 8	1	544-0728	080			
49G	CAPSCREWS PF 8	1	168-0636	082			
50	BEARING OUTBOARD						
	PF 4C & 4D	1	068-3004	647			
	PF 5E, 5F, 5G, & 5H	2	068-2996	647			
	PF 6D, 6F	2	068-2997	647			
	PF 6E	2	068-2998	647			
	PF 8	1	068-0592	647			

*REFER TO FACTORY FOR J.C. 1 SINGLE SEALS, COLLARS & SETSCREWS.

610A SERIES

PARTS LIST

PC. NO.	DESCRIPTION	QTY	PART NO.	MATERIAL			
				B.F.	A.B.	A.I.	S.S.
50A	GREASE SHIELD						
	PF 4C & 4D	1	676-0560	087			
	PF 5E, 5F, 5G & 5H	1	676-0398	010			
	PF 6D, 6F	1	676-2071	010			
	PF 6E	1	672-0010	010			
	PF 8	1	712-0131	653			
50B	RETAINING RING						
	PF 4C, 4D	1	676-0446	088			
	PF 5E, 5F, 5G & 5H	1	676-0447	088			
	PF 6D, 6F	1	676-0448	088			
	CAPSCREW PF 6E	8	168-0258	082			
	PF 8	8	168-0562	082			
50C	RETAINING RING						
	PF 4C, 4D	1	676-0943	088			
	LOCK WASHER						
	PF 5E, 5F, 5G, & 5H	1	908-0416	080			
	PF 6D, 6E & 6F	1	908-0423	080			
	PF 8	1	908-0425	080			
50D	LOCKNUT						
	PF 5E, 5F, 5G & 5H	1	544-0716	080			
	PF 6D, 6E & 6F	1	544-0723	080			
	PF 8	1	544-0725	080			
50E	WASHERS PF 6E	8	908-0159	088			
50F	BEARING CAP PF 8	1	164-0101	010			
51	BEARING CARTRIDGE						
	PF 4C, 4D	1	164-0447	010			
	PF 5E, 5F, 5G & 5H	1	164-0448	010			
	PF 6D, 6F	1	164-0449	010			
	PF 6E	1	164-0450	010			
	PF 8	1	164-0100	010			
52	GREASE SEAL						
	PF 4C, 4D	1	712-6327	653			
	PF 5E, 5F, 5G & 5H	1	712-0241	653			
	PF 6D, 6F	1	712-0048	653			
	PF 6E	1	712-0048	653			
	PF 8	1	712-0132	653			
53	GREASE SEAL						
	PF 4C, 4D	1	712-6330	653			
	PF 5E, 5F, 5G & 5H	1	712-0265	653			
	PF 6D, 6F	1	712-0243	653			
	PF 6E	1	712-0243	653			
	PF 8	1	712-0134	653			
54	KEY, SLEEVE						
	PF 4, 5 & 6	1	472-0010	087			
	PF 8	1	472-0128	087			

PC. NO.	DESCRIPTION	QTY	PART NO.	MATERIAL			
				B.F.	A.B.	A.I.	S.S.
55	KEY, SHAFT						
	PF 4	1	472-0250	087			
	PF 5	1	472-0390	087			
	PF 6	1	472-0401	087			
	PF 8	1	472-0419	087			
56	POWER FRAME						
	HOUSING						
	PF 4C, 4D	1	356-0044	010			
	PF 5E, 5F, 5G & 5H	1	356-0045	010			
	PF 6D, 6F	1	356-0046	010			
	PF 6E	1	356-0047	010			
	PF 8	1	356-0298	087			
57	PIPE PLUG						
	PF 4	1	600-0001	087			
	PF 5	1	600-0001	087			
	PF 6	1	600-0001	087			
	PF 8	1	600-0007	087			
57A	PIPE PLUG PF 8	2	600-0001	087			
57B	PIPE PLUG PF 8	2	600-0001	087			
58	GREASE FITTING						
	PF 4	1	508-0015	651			
	PF 5	1	508-0010	651			
	PF 6	1	508-0010	651			
	PF 8	1	508-0001	651			
59	CAPSCREW						
	PF 4	3	168-0492	082			
	PF 5	4	168-0564	082			
	PF 6	4	168-0566	082			
	PF 8	8	168-0644	082			
60	CAPSCREW						
	PF 4	3	168-0201	080			
	PF 5	4	168-0202	080			
	PF 6	4	168-0202	080			
	PF 8	4	168-0203	080			
61	JAM NUT						
	PF 4	3	544-0312	080			
	PF 5	4	544-0316	080			
	PF 6	4	544-0316	080			
	PF 8	4	544-0318	080			
62	PIPE PLUG						
	PF 4	1	600-0001	087			
	PF 5	1	600-0001	087			
	PF 6	1	600-0001	087			
	PF 8	1	600-0007	087			

PARTS LIST

PC. NO.	DESCRIPTION	QTY	PART NO.	MATERIAL B.F.	A.B.	A.I.	S.S.
62A	FITTING PF 6	1	508-0002	651			
	PIPE PLUG PF 8	2	600-0001	087			
63	GREASE FITTING						
	PF 4	1	508-0015	651			
	PF 5	1	508-0010	651			
	PIPE PLUG PF 6	1	600-0001	087			
	FITTING PF 8	1	508-0015	651			
64	GASKET						
	6" SUCTION	1	364-0609	603			
	8" SUCTION	1	364-0610	803			
	10" SUCTION	1	364-0611	803			
	12" SUCTION	1	364-0612	803			
	14" SUCTION	1	364-0613	803			
	16" SUCTION	1	364-0614	803			
	16x16x20	1	364-1341	803			
	18" SUCTION	1	364-0615	803			
	20" SUCTION	1	364-0616	803			
65	SUCTION NOZZLE						
	611A 6x6	1	816-1162	010			
	8x8	1	816-1128	010			
	10x10	1	816-1129	010			
	12x12	1	816-1130	010			
	14x14	1	816-1131	010			
	16x16x20	1	816-1282	010			
	SUCTION ELBOW						
	612A, 613A & 614A						
	6x6	1	816-1018	010			
	6x8	1	816-1019	010			
	8x8	1	816-1207	010			
	8x10	1	816-1208	010			
	10x10	1	816-0726	010			
	10x12	1	816-0647	010			
	12x12	1	816-1209	010			
	12x14	1	816-1210	010			
	14x14	1	816-1211	010			
	14x16	1	816-0670	010			
	16x16	1	816-0747	010			
	18x18	1	816-0748	010			
	20x20	1	816-0749	010			
66	CAPSCREW						
	6" SUCTION	8	168-0636	082			
	8" SUCTION	8	168-0638	082			
	10" SUCTION	12	168-0674	082			
	12" SUCTION	12	168-0674	082			
	14" SUCTION	12	168-0743	082			

PC. NO.	DESCRIPTION	QTY	PART NO.	MATERIAL B.F.	A.B.	A.I.	S.S.
66	CAPSCREW						
	CONT'D						
	16" SUCTION	16	168-0743	082			
	16x16x20	12	168-0676	082			
	18" SUCTION	16	168-0743	082			
	20" SUCTION	20	168-0743	082			
67	GASKET 611A						
	6x6	1	364-1053	453			
	8x8	1	364-1048	478			
	10x10	1	364-1048	478			
	12x12	1	364-1048	478			
	14x14	1	364-1048	478			
	16x16x20	1	364-1046	457			
	GASKET 612A, 613A						
	& 614A 6x6	1	364-1048	478			
	6x8	1	364-1048	478			
	8x8	1	364-1048	478			
	8x10	1	364-2041	457			
	10x10	1	364-1048	478			
	10x12	1	364-1048	478			
	12x12	1	364-2041	457			
	12x14	1	364-2041	457			
	14x14	1	364-2041	457			
	14x16	1	364-1048	478			
	16x16	1	364-2041	457			
	18x18	1	364-2041	457			
	20x20	1	364-2041	457			
68	HANDHOLE COVER						
	611A 6x6	1	260-0667	010			
	8x8	1	260-0668	010			
	10x10	1	260-0668	010			
	12x12	1	260-0668	010			
	14x14	1	260-0668	010			
	16x16x20	1	260-5089	010			
	612A, 613A & 614A						
	6x6	1	260-0649	010			
	6x8	1	260-0649	010			
	8x8	1	260-0649	010			
	8x10	1	260-0678	010			
	10x10	1	260-0649	010			
	10x12	1	260-0649	010			
	12x12	1	260-0679	010			
	12x14	1	260-0679	010			
	14x14	1	260-0679	010			
	14x16	1	260-0069	010			

610A SERIES

PARTS LIST

PC. NO.	DESCRIPTION	QTY	PART NO.	MATERIAL B.F.	A.B.	A.I.	S.S.
	612A, 613A & 614A						
	CONT'D 16x16	1	260-0673	010			
	18x18	1	260-0674	010			
	20x20	1	260-0675	010			
69	CAPSCREW 611A						
	6x6	2	168-0572	082			
	8x8	4	168-0566	082			
	10x10	4	168-0566	082			
	12x12	4	168-0566	082			
	14x14	4	168-0566	082			
	16x16x20	2	168-0562	082			
	CAPSCREW						
	612A, 613A & 614A						
	6x6	4	168-0562	082			
	6x8	4	168-0562	082			
	8x8	4	168-0562	082			
	8x10	4	168-0562	082			
	10x10	4	168-0562	082			
	10x12	4	168-0562	082			
	12x12	4	168-0562	082			
	12x14	4	168-0562	082			
	14x14	4	168-0562	082			
	14x16	4	168-0562	082			
	16x16	8	168-0636	082			
	18x18	8	168-0636	082			
	20x20	8	168-0636	082			
69A	NUT 611A 6x6	2	544-0115	080			
69B	WASHER 611A 6x6	4	908-0116	080			
70	PIPE PLUG 611A						
	6x6	1	600-0009	028			
	8x8	1	600-0009	028			
	10x10	1	600-0009	028			
	12x12	1	600-0009	028			
	14x14	1	600-0009	028			
70	PIPE PLUG						
	612A, 613A & 614A						
	6x6	1	600-0008	028			
	6x8	1	600-0008	028			
	8x8	1	600-0008	028			
	8x10	1	600-0008	028			
	10x10	1	600-0008	028			
	10x12	1	600-0008	028			
	12x12	1	600-0008	028			
	12x14	1	600-0008	028			
	14x14	1	600-0010	028			

PC. NO.	DESCRIPTION	QTY	PART NO.	MATERIAL B.F.	A.B.	A.I.	S.S.
70	PIPE PLUG						
	CONT'D 14x16	1	600-0010	028			
	16x16	1	600-0010	028			
	18x18	1	600-0010	028			
	20x20	1	600-0010	028			
71	PIPE PLUG						
	612A, 613A & 614A						
	6x6	1	600-0002	087			
	6x8	1	600-0002	087			
	8x8	1	600-0002	087			
	8x10	1	600-0002	087			
	10x10	1	600-0002	087			
	10x12	1	600-0002	087			
	12x12	1	600-0002	087			
	12x14	1	600-0002	087			
	14x14	1	600-0002	087			
	14x16	1	600-0002	087			
	16x16	2	600-0002	087			
	18x18	2	600-0002	087			
	20x20	2	600-0002	087			
72	DRIVE PINS	2	708-0013	365			
73	NAMEPLATE	1	532-0045	114			
74	LEAKAGE						
	ACCUMULATOR KIT						
	612A & 613A PF 4	1	476-0395	645			
	612A & 613A PF 5	1	476-0396	645			
	612A & 613A PF 6	1	476-0397	645			
	(INCLUDES PIECE						
	NO'S 42, 43, 44, 44A						
	44B, 44C, 44D, 44E,						
	45 & 75)						
75	SEALANT	1	716-0025	621			
	(REQUIRED WITH						
	PIECE 44 PACKED						
	612A & 613A)						

Performance Curves for the 610 Series

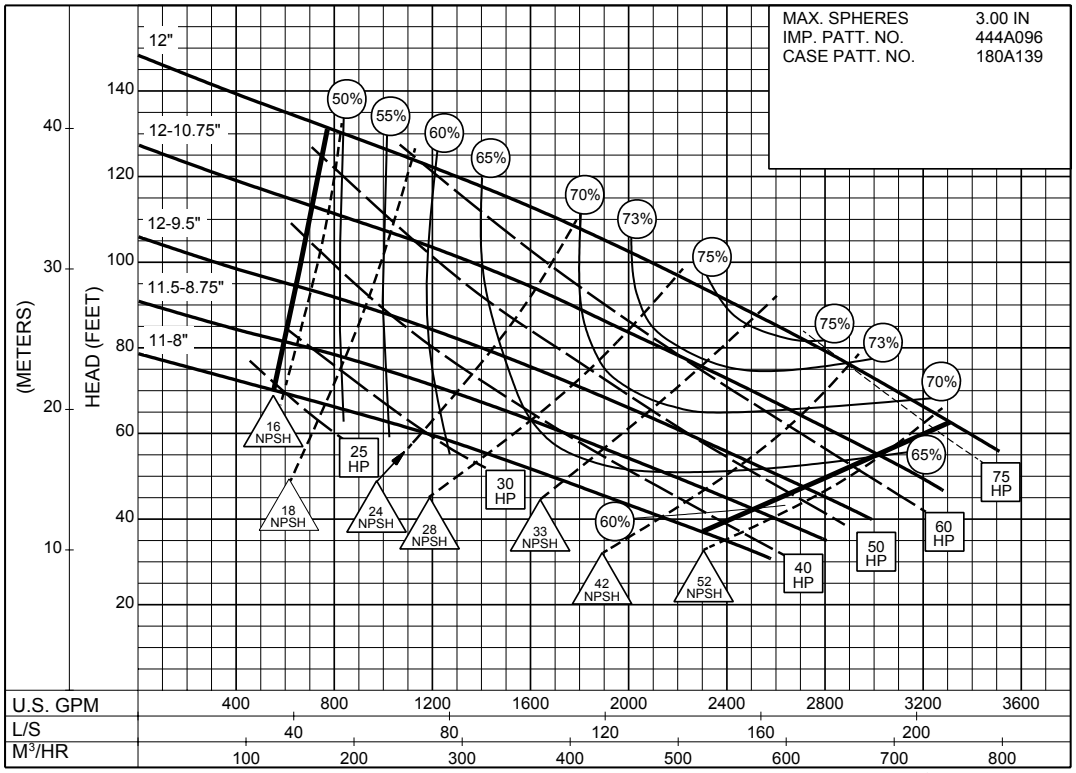
MODEL/SIZE	R.P.M.	CATALOG PAGE	PDF PAGE
6 x 6 x 12	1750/1150	401	2
6 x 6 x 12B	1750/1150	402	3
6 x 6 x 12B	875/700	403	4
6 x 6 x 12	875/700	404	5
6 x 8 x 15	1750/1150	405	6
6 x 8 x 15	875/700	406	7
6 x 8 x 15	580	407	8
6 x 8 x 18	1150/875	408	9
6 x 8 x 18	700/580	409	10
8 x 8 x 15A	1150/875	410	11
8 x 8 x 15A	700/580	411	12
8 x 10 x 18	1150/875	412	13
8 x 10 x 18	700/580	413	14
8 x 10 x 22	875/700	414	15
8 x 10 x 22	580	415	16
10 x 10 x 15	1150/875	416	17
10 x 10 x 15	700/580	417	18
10 x 10 x 22	1175	418	19
10 x 12 x 22	875/700	419	20
10 x 12 x 22	580	420	21
12 x 12 x 22	1175	421	22
12 x 14 x 22A	875/700	422	23
12 x 14 x 22A	580	423	24
12 x 14 x 22B	875/700	424	25
12 x 14 x 22B	580	425	26
14 x 14 x 22A	1175	426	27
16 x 16 x 20	875/700	427	28
16 x 16 x 20	585/500	428	29
16 x 16 x 28	875/700	429	30
16 x 16 x 28	585	430	31
18 x 18 x 28	700/585	431	32
18 x 18 x 28	500	432	33
20 x 20 x 28	700/585	433	34
20 x 20 x 28	500	434	35

6 x 6 x 12
SERIES 610

ENCLOSED IMPELLER

Supersedes Section 610 Page 408
Dated March 1983

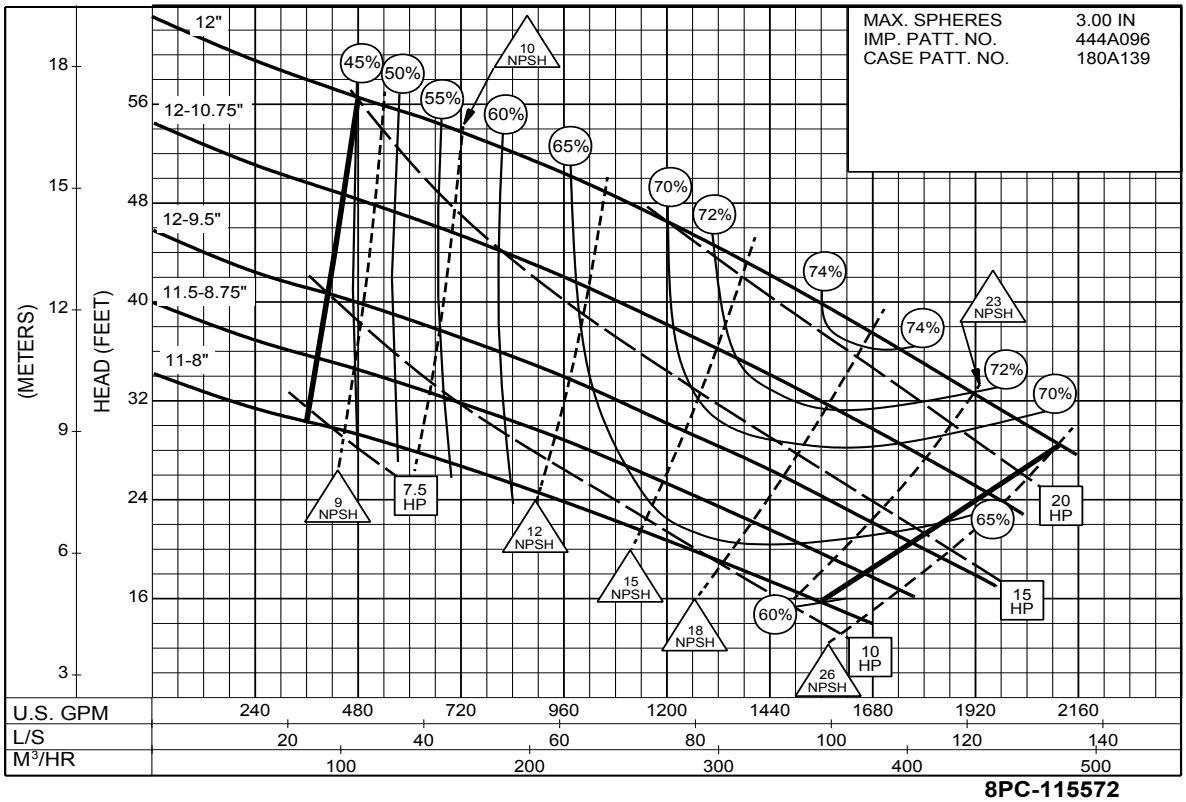
SIZE : 6x6x12 **TYPE : 610** **IMPELLER : Enclosed** **R. P. M. : 1750**



8PC-115571

1750 RPM

SIZE : 6x6x12 **TYPE : 610** **IMPELLER : Enclosed** **R. P. M. : 1150**



8PC-115572

1150 RPM

AURORA®
Pentair Pump Group

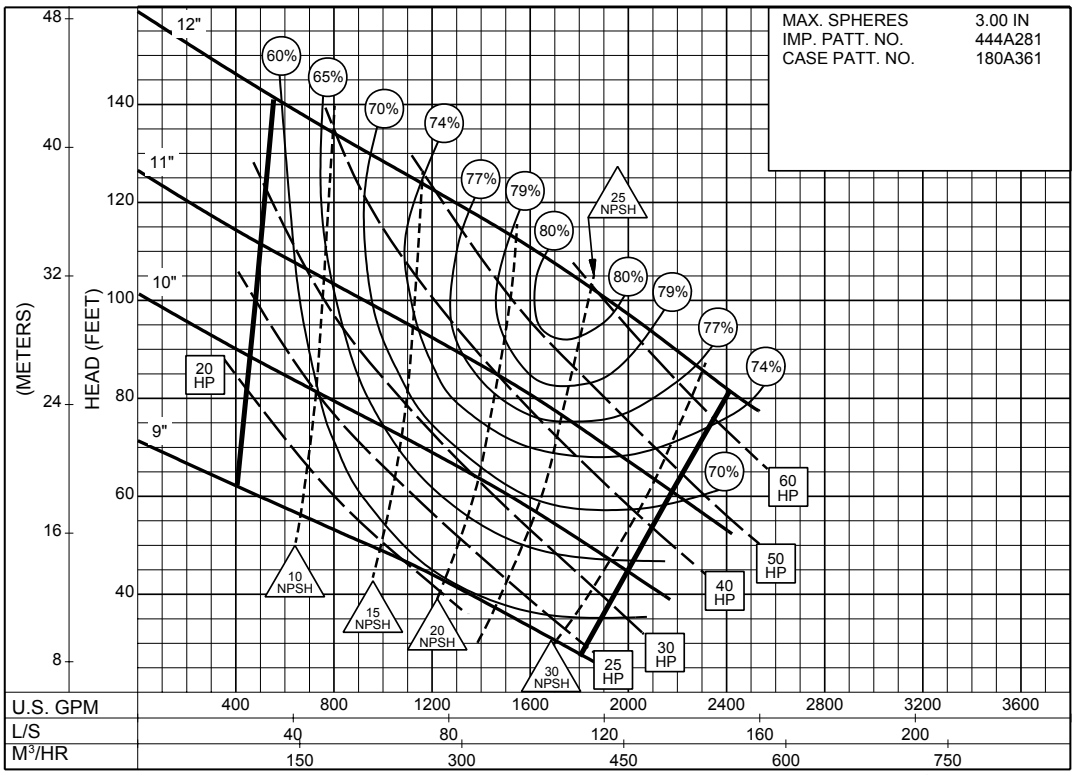
Supersedes Section 610 Page 408A
Dated May 1991

6 x 6 x 12B
SERIES 610

ENCLOSED IMPELLER

1750 RPM

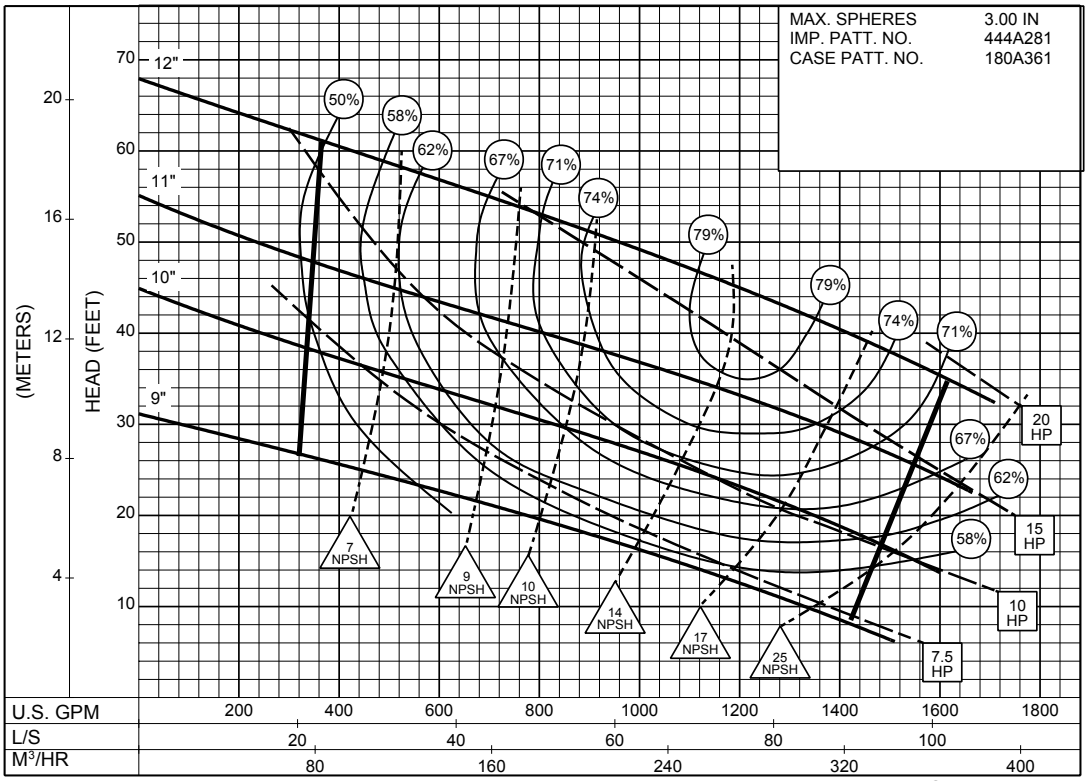
SIZE : 6x6x12B **TYPE : 610** **IMPELLER : Enclosed** **R. P. M. : 1750**



8PC-144962

1150 RPM

SIZE : 6x6x12B **TYPE : 610** **IMPELLER : Enclosed** **R. P. M. : 1150**



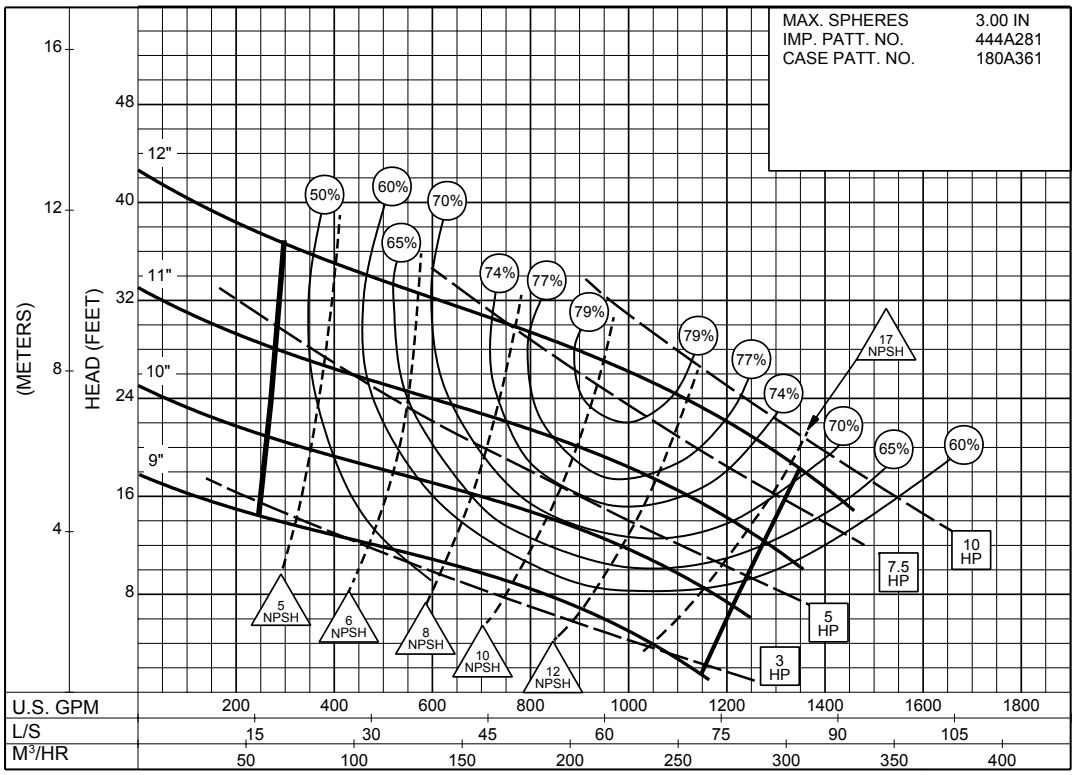
8PC-151595

6 x 6 x 12B
SERIES 610

ENCLOSED IMPELLER

Supersedes Section 610 Page 408B
Dated March 1987

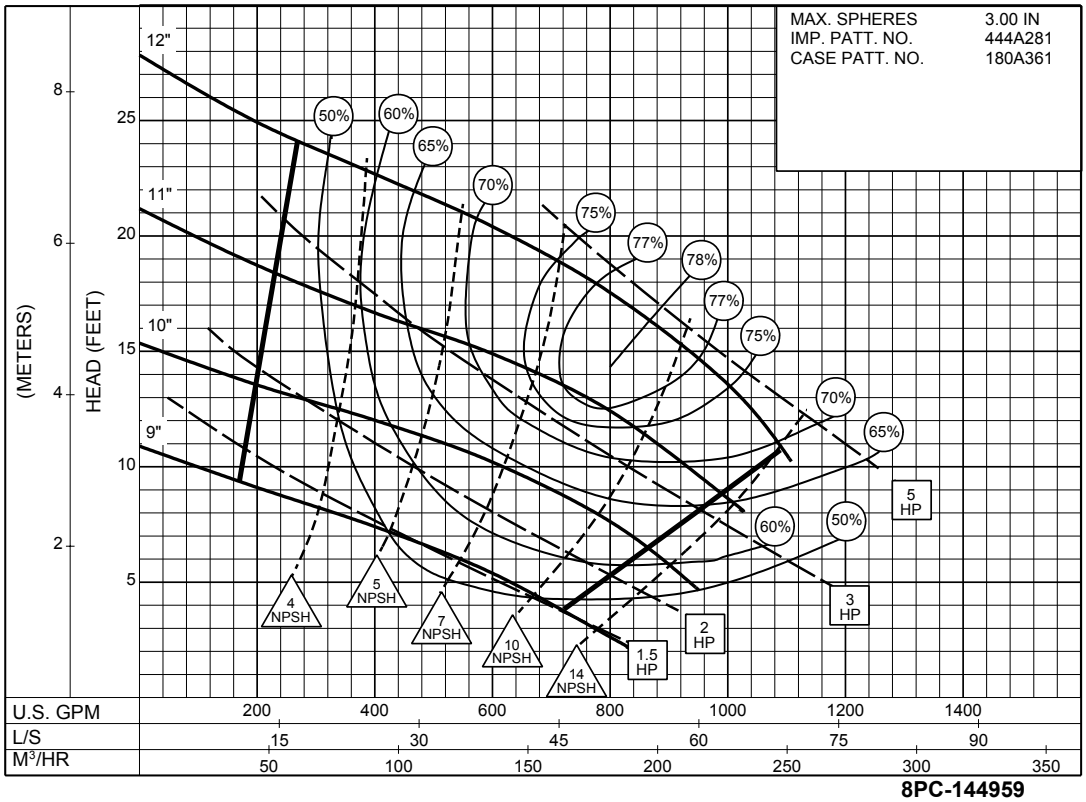
SIZE : 6x6x12B **TYPE : 610** **IMPELLER : Enclosed** **R. P. M. : 875**



8PC-144960

875 RPM

SIZE : 6x6x12B **TYPE : 610** **IMPELLER : Enclosed** **R. P. M. : 700**



8PC-144959

700 RPM

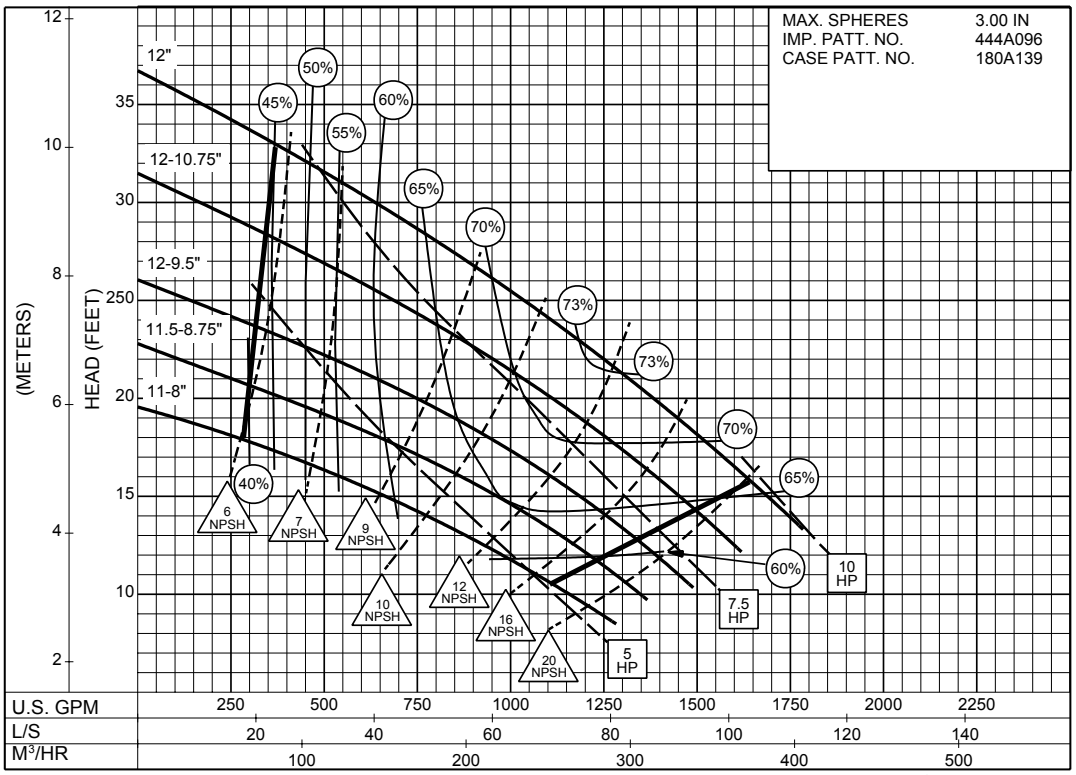
AURORA®
Pentair Pump Group

Supersedes Section 610 Page 409
Dated March 1983

6 x 6 x 12
SERIES 610
ENCLOSED IMPELLER

875 RPM

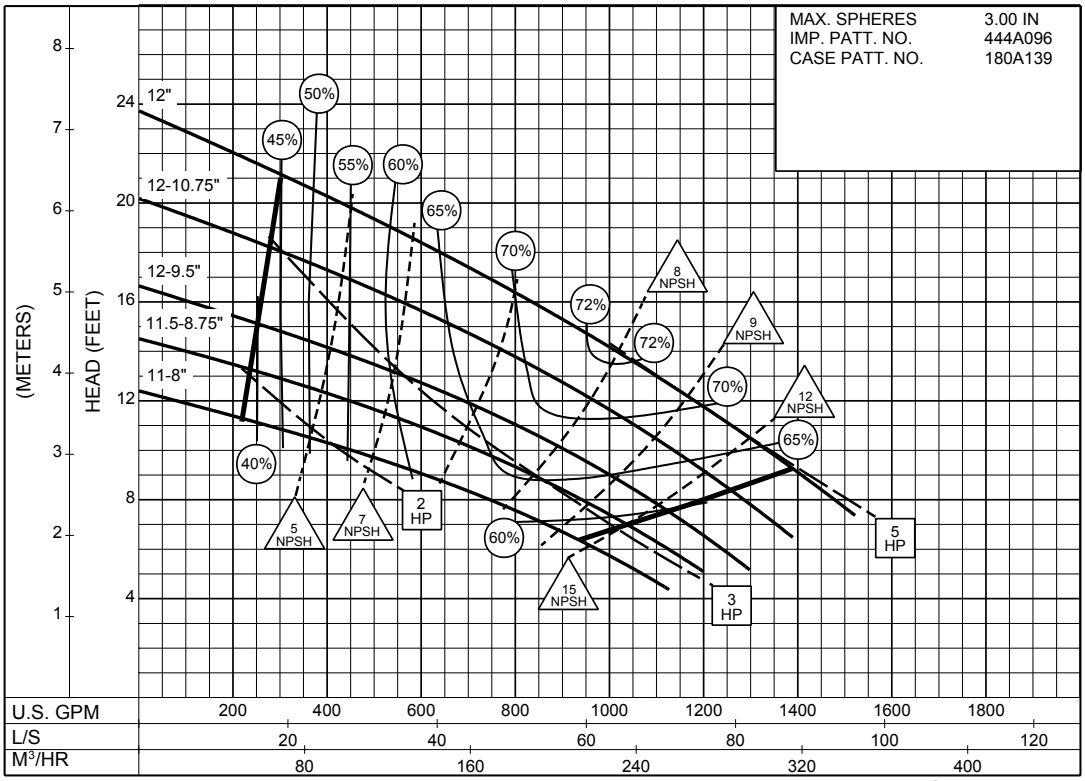
SIZE : 6x6x12 **TYPE : 610** **IMPELLER : Enclosed** **R. P. M. : 875**



8PC-115573

700 RPM

SIZE : 6x6x12 **TYPE : 610** **IMPELLER : Enclosed** **R. P. M. : 700**



8PC-115574

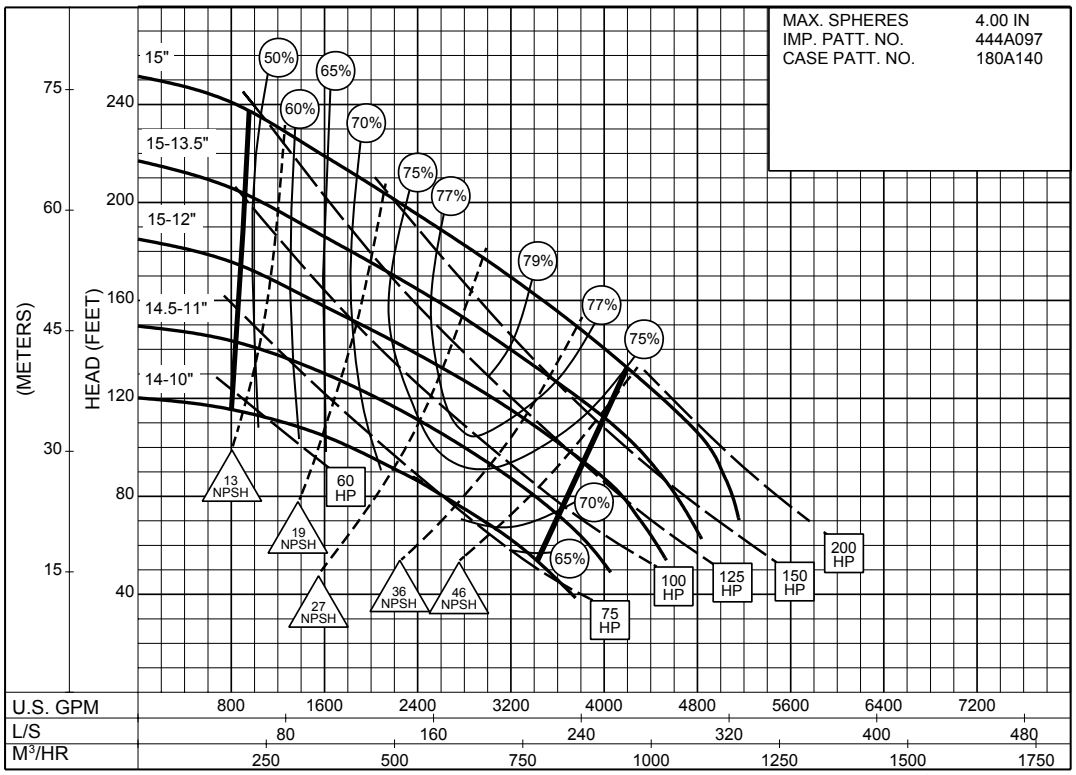
AURORA®
Pentair Pump Group

6 x 8 x 15
SERIES 610

ENCLOSED IMPELLER

Supersedes Section 610 Page 410
Dated March 1983

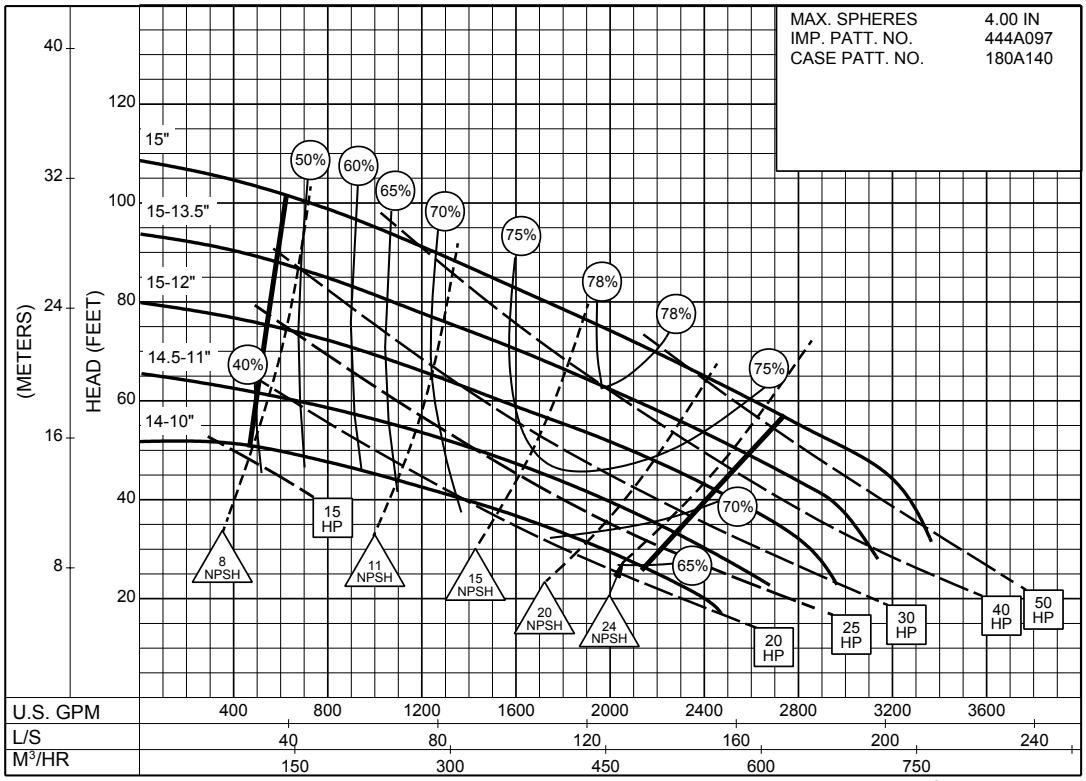
SIZE : 6x8x15 **TYPE : 610** **IMPELLER : Enclosed** **R. P. M. : 1750**



8PC-115575

1750 RPM

SIZE : 6x8x15 **TYPE : 610** **IMPELLER : Enclosed** **R. P. M. : 1150**



8PC-115576

1150 RPM

AURORA®
Pentair Pump Group

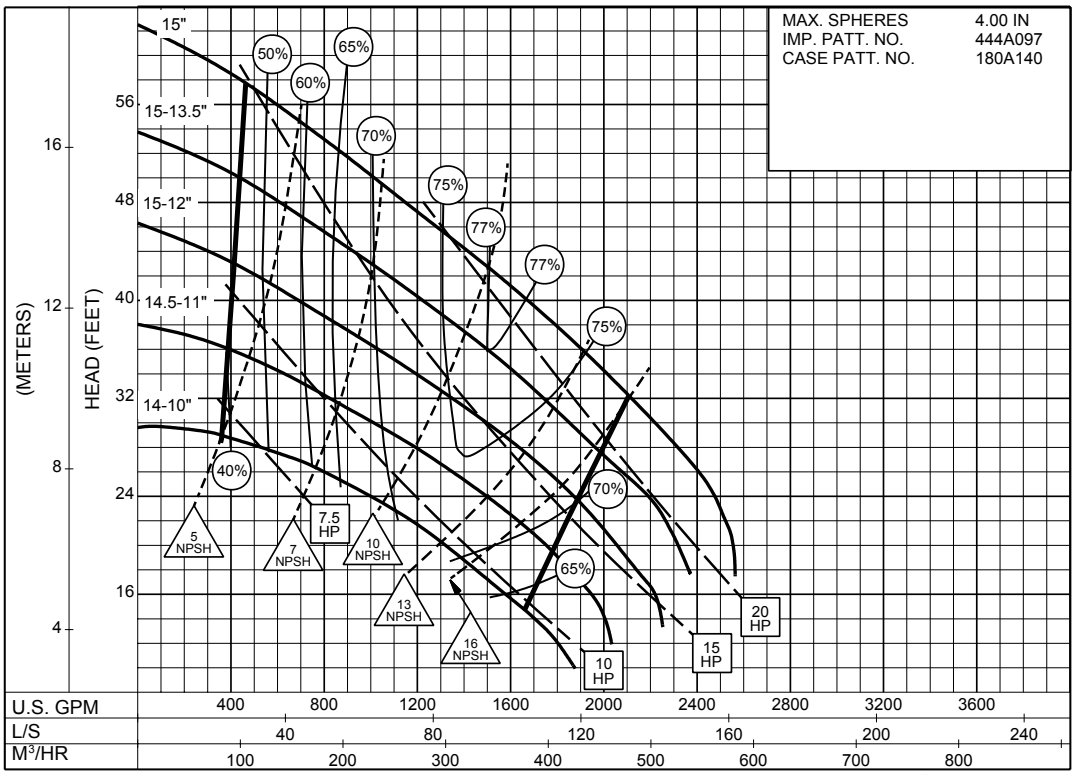
Supersedes Section 610 Page 411
Dated March 1983

6 x 8 x 15
SERIES 610

ENCLOSED IMPELLER

875 RPM

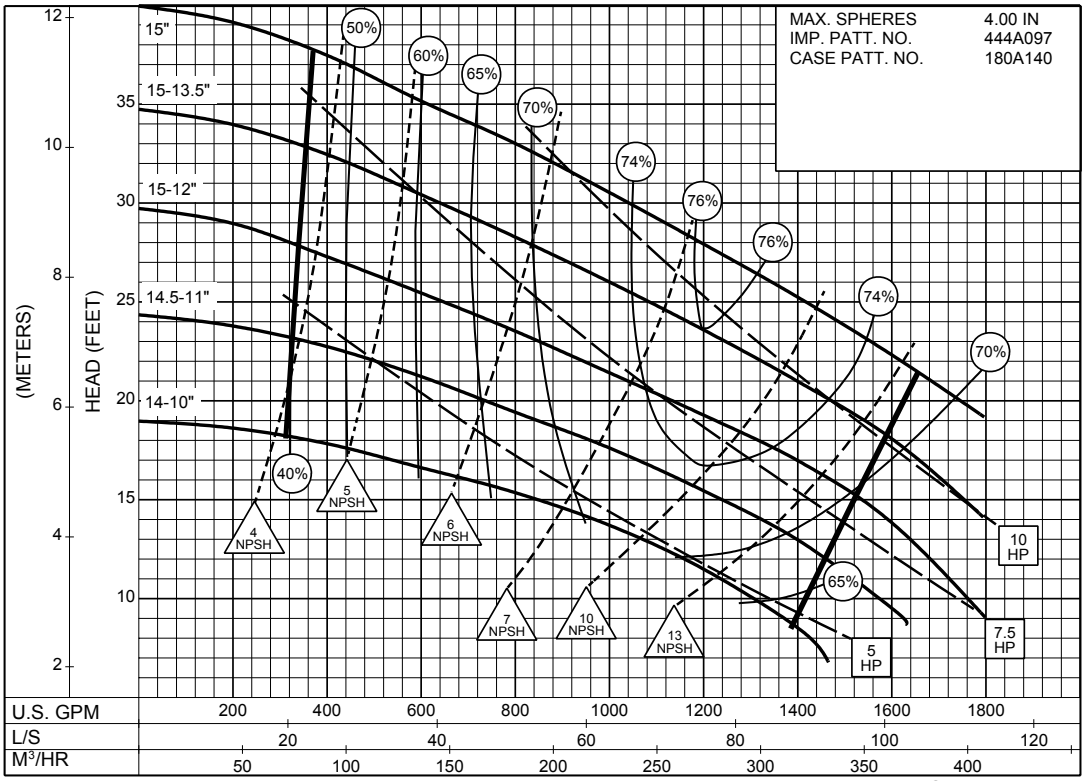
SIZE : 6x8x15 **TYPE : 610** **IMPELLER : Enclosed** **R. P. M. : 875**



8PC-115577

700 RPM

SIZE : 6x8x15 **TYPE : 610** **IMPELLER : Enclosed** **R. P. M. : 700**



8PC-115578

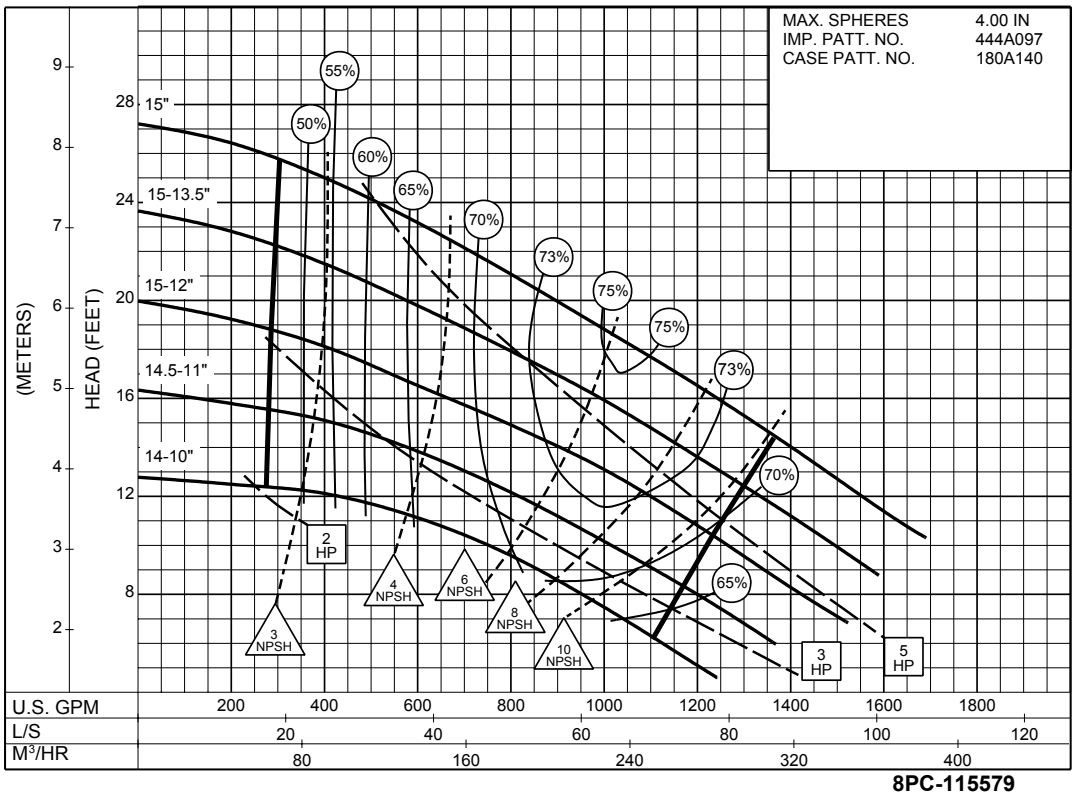
AURORA®
Pentair Pump Group

6 x 8 x 15
SERIES 610

ENCLOSED IMPELLER

Supersedes Section 610 Page 412
Dated March 1983

SIZE : 6x8x15 **TYPE : 610** **IMPELLER : Enclosed** **R. P. M. : 580**



8PC-115579

580 RPM

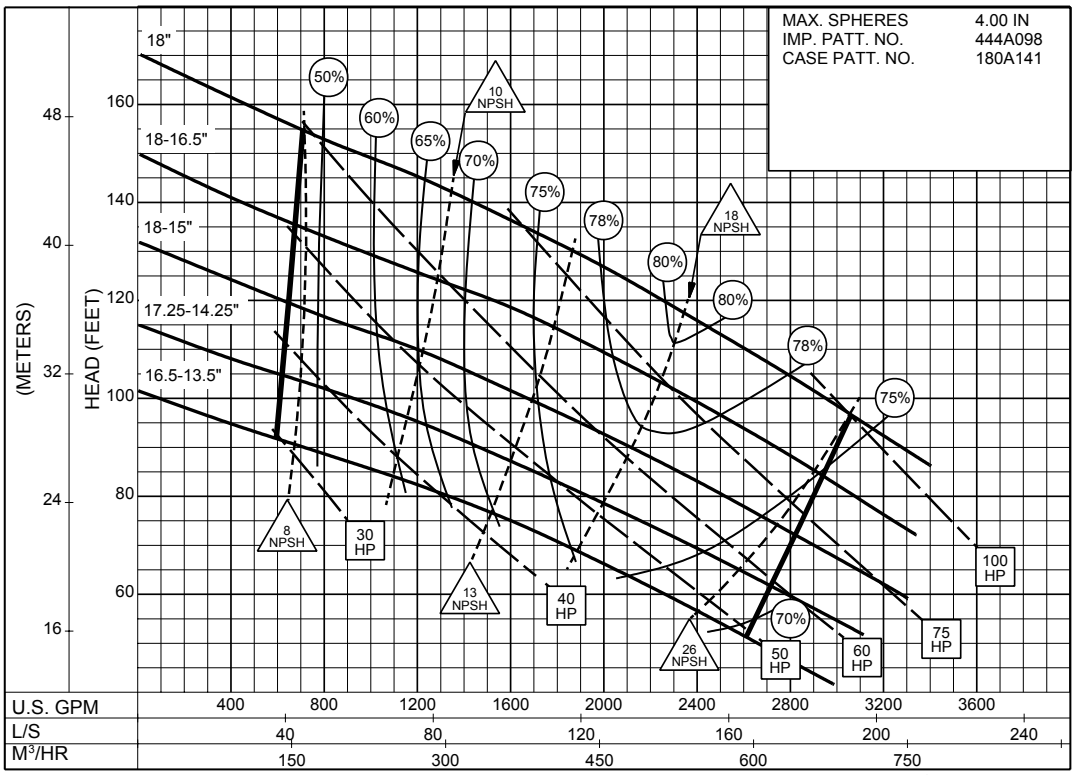
Supersedes Section 610 Page 413
Dated March 1983

6 x 8 x 18
SERIES 610

ENCLOSED IMPELLER

1150 RPM

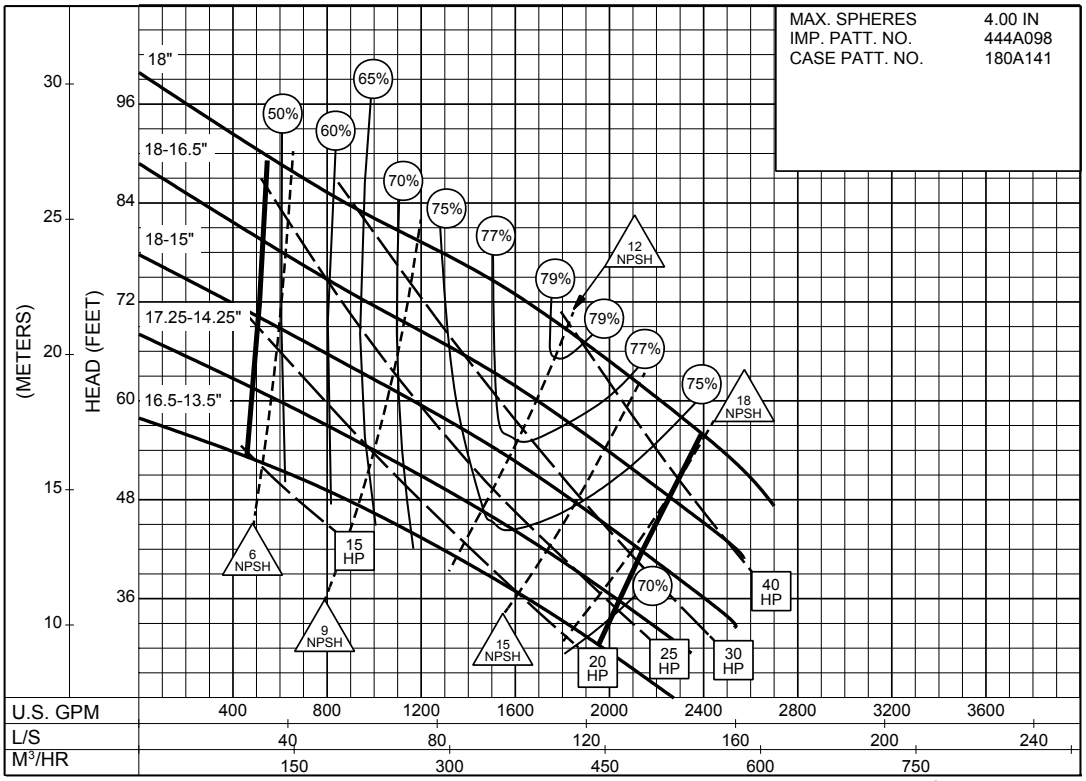
SIZE : 6x8x18 **TYPE : 610** **IMPELLER : Enclosed** **R. P. M. : 1150**



8PC-115580

875 RPM

SIZE : 6x8x18 **TYPE : 610** **IMPELLER : Enclosed** **R. P. M. : 875**



8PC-115581

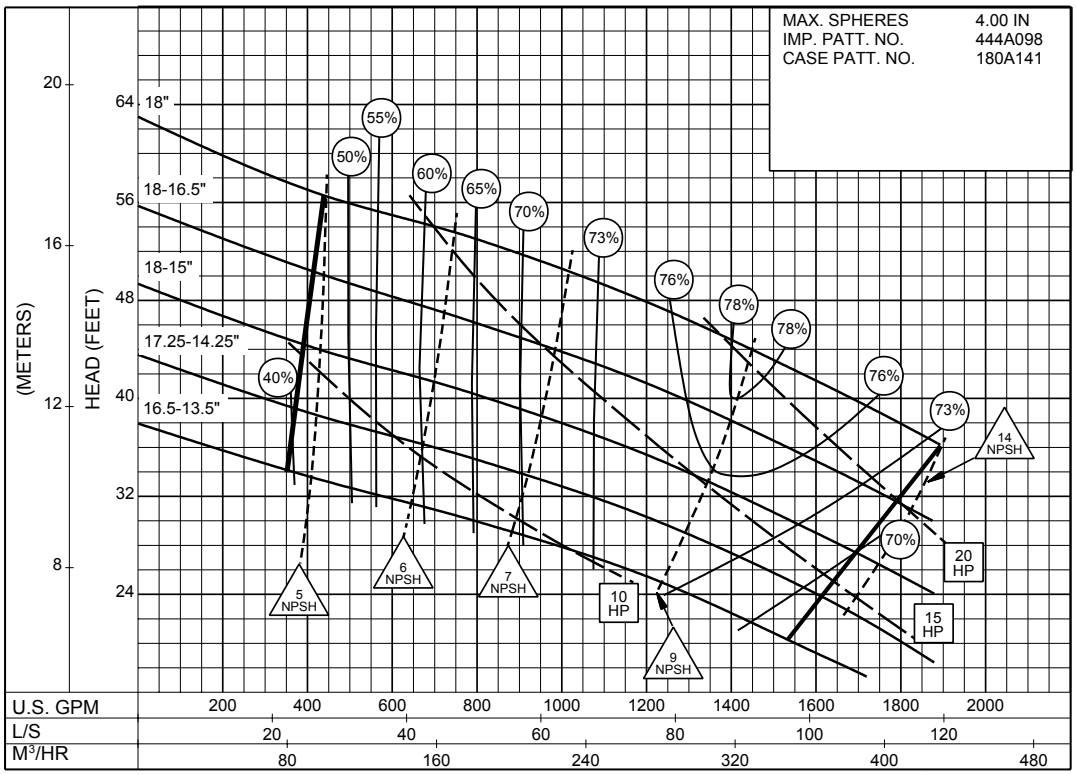
AURORA®
Pentair Pump Group

6 x 8 x 18
SERIES 610

ENCLOSED IMPELLER

Supersedes Section 610 Page 414
Dated May 1991

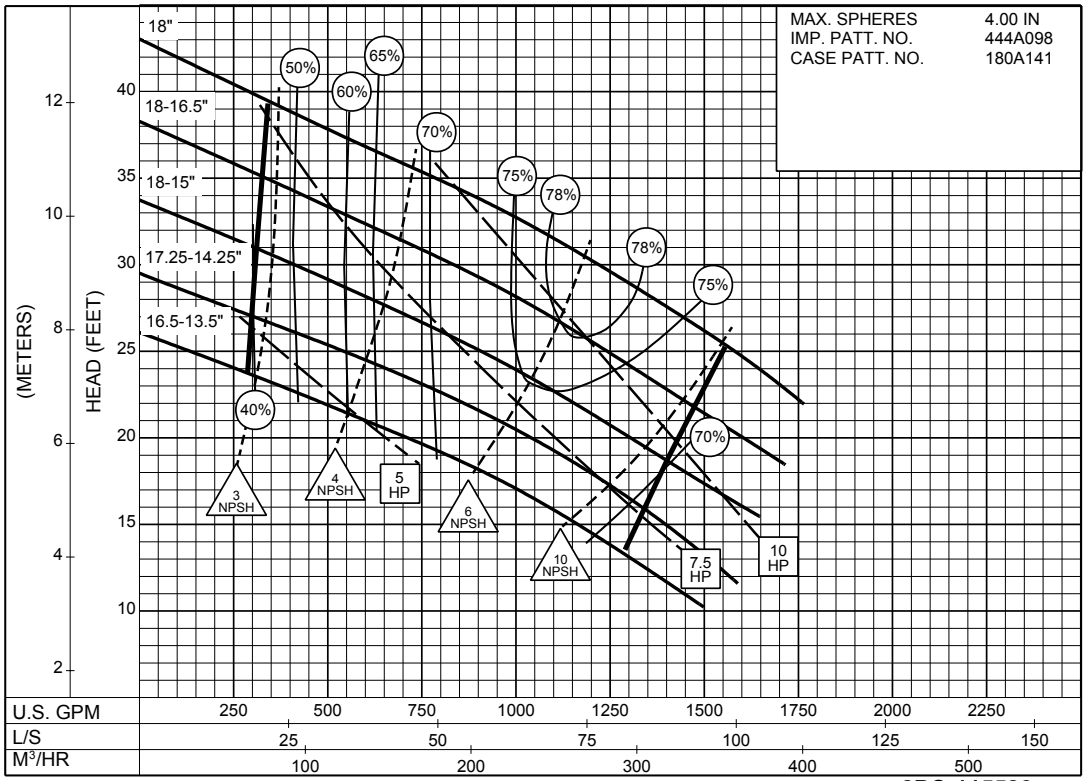
SIZE : 6x8x18 **TYPE : 610** **IMPELLER : Enclosed** **R. P. M. : 700**



8PC-115582

700 RPM

SIZE : 6x8x18 **TYPE : 610** **IMPELLER : Enclosed** **R. P. M. : 580**



8PC-115583

580 RPM

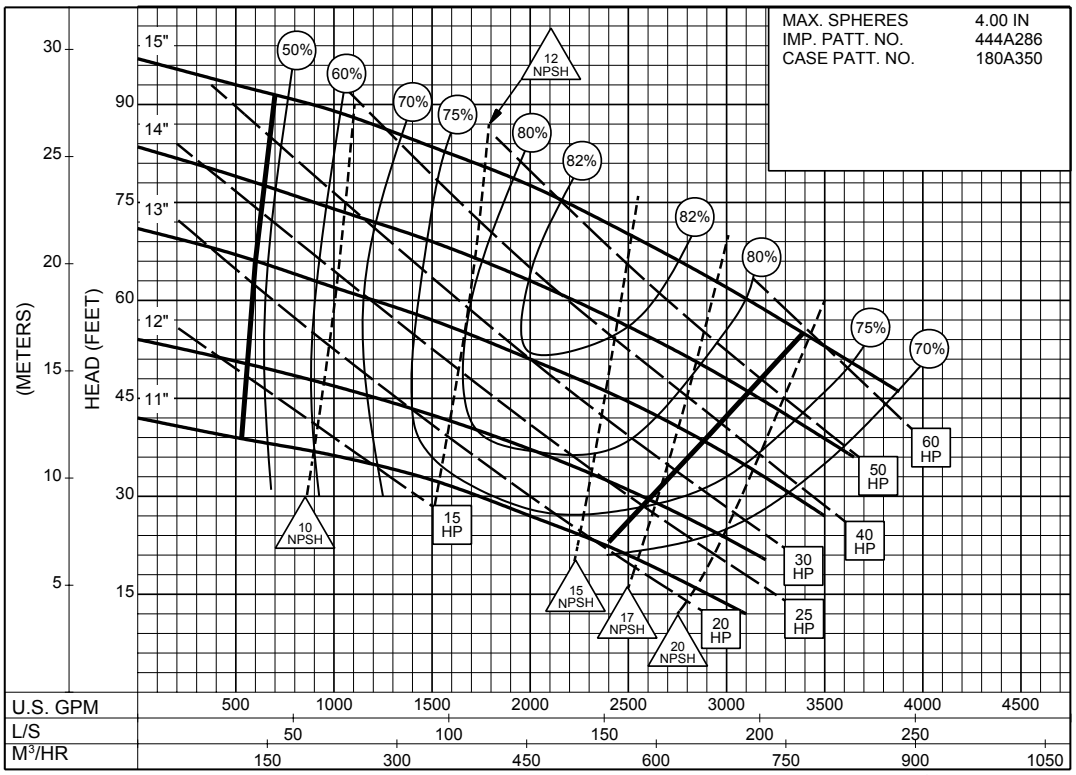
AURORA®
Pentair Pump Group

8 x 8 x 15A
SERIES 610

ENCLOSED IMPELLER

1150 RPM

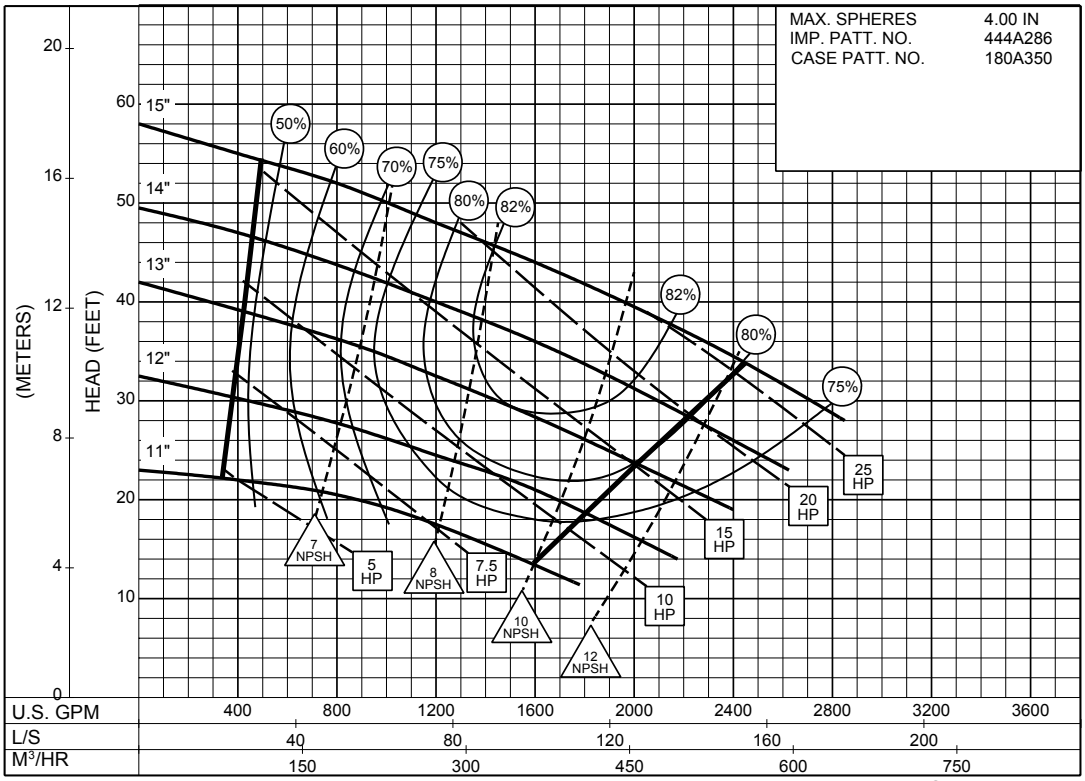
SIZE : 8x8x15A **TYPE : 610** **IMPELLER : Enclosed** **R. P. M. : 1150**



8PC-142576

875 RPM

SIZE : 8x8x15A **TYPE : 610** **IMPELLER : Enclosed** **R. P. M. : 875**



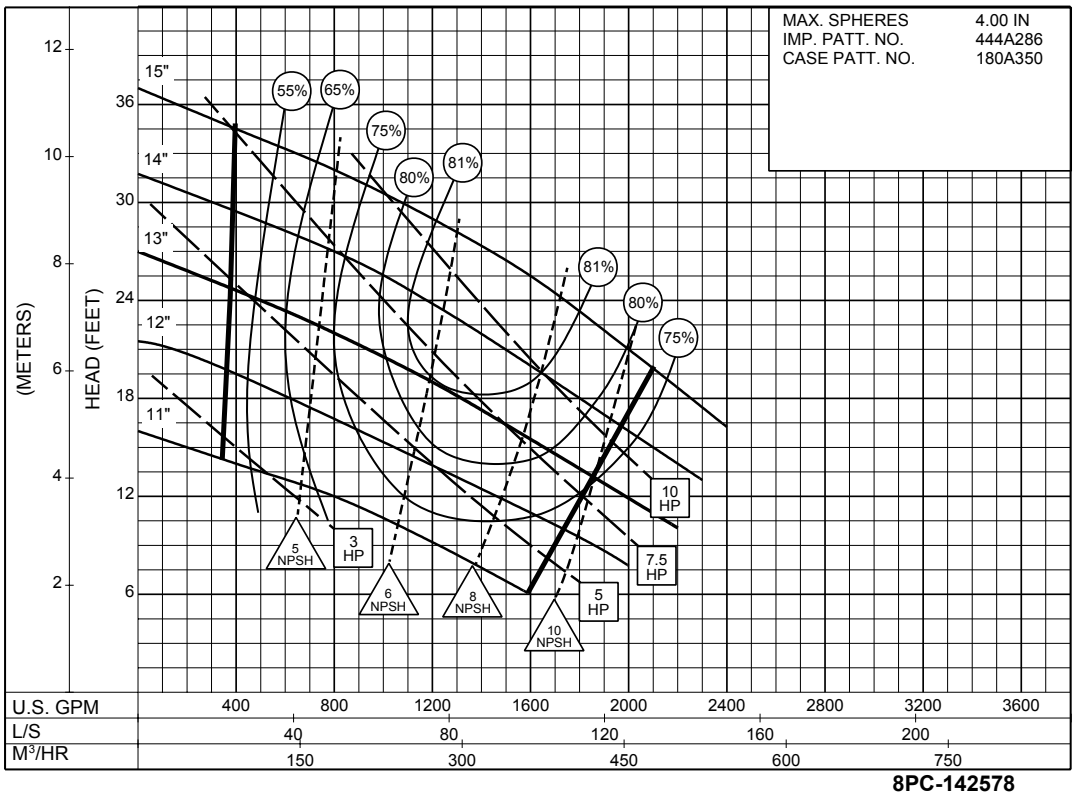
8PC-142577

8 x 8 x 15A
SERIES 610

ENCLOSED IMPELLER

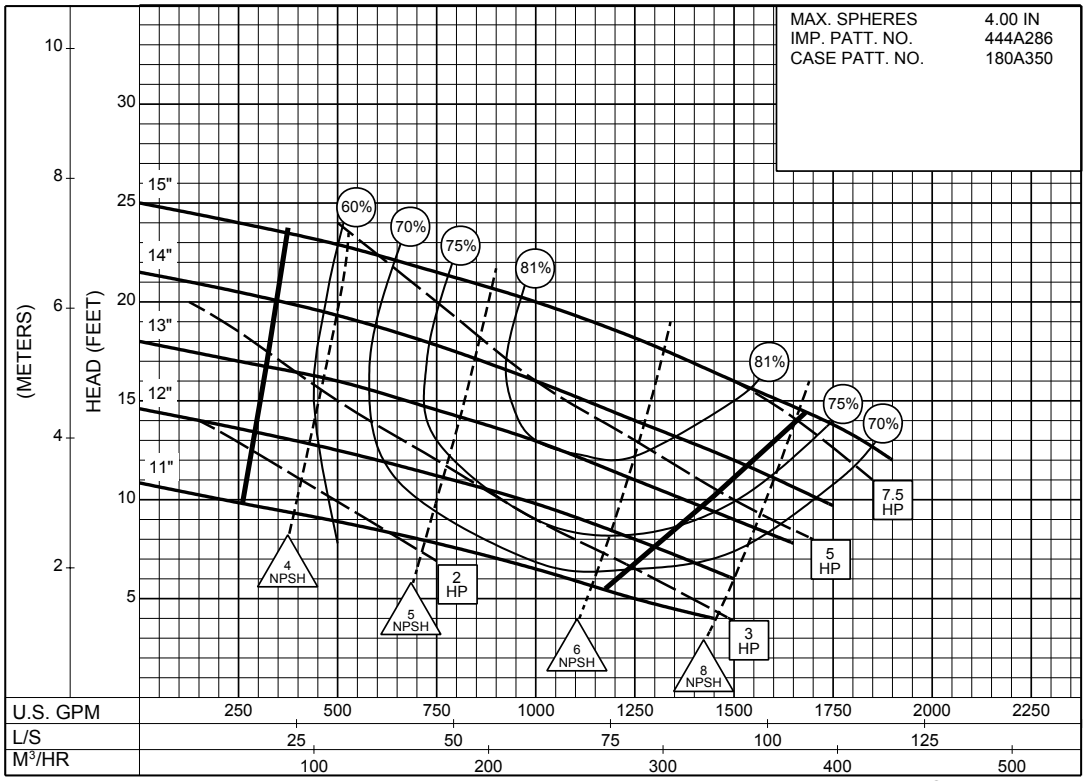
Supersedes Section 610 Page 416A
Dated August 1985

SIZE : 8x8x15A **TYPE : 610** **IMPELLER : Enclosed** **R. P. M. : 700**



8PC-142578

SIZE : 8x8x15A **TYPE : 610** **IMPELLER : Enclosed** **R. P. M. : 580**



8PC-142579

700 RPM

580 RPM

AURORA®
Pentair Pump Group

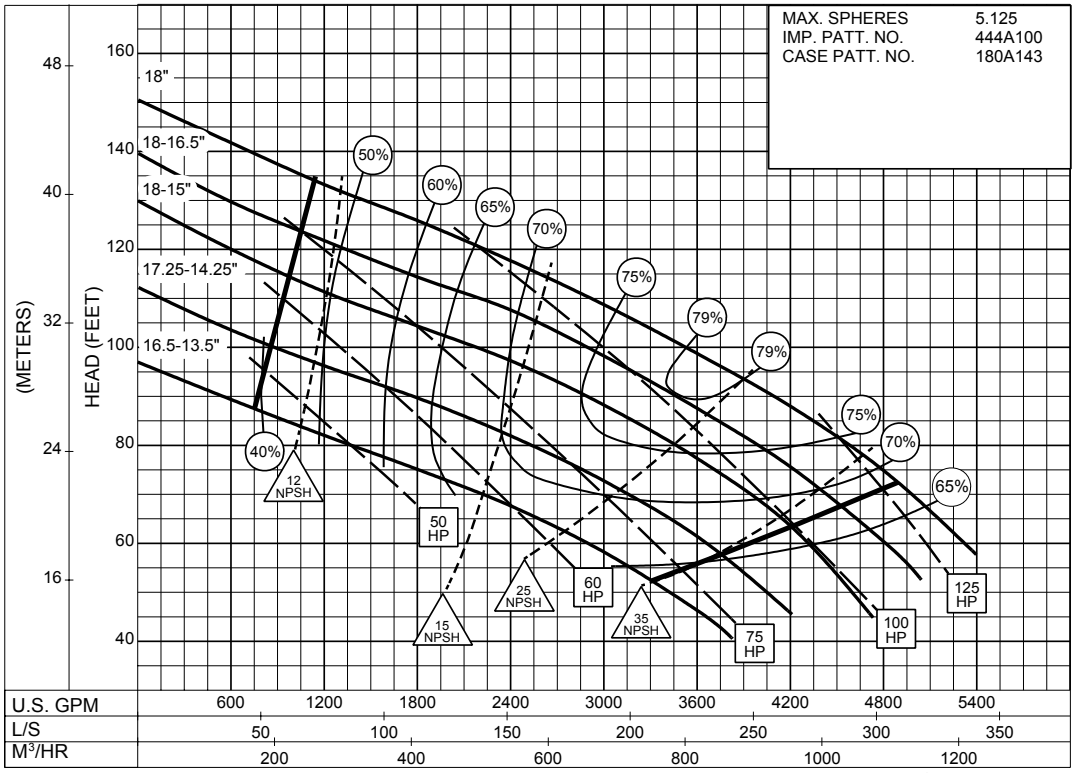
Supersedes Section 610 Page 417
Dated March 1983

8 x 10 x 18
SERIES 610

ENCLOSED IMPELLER

1150 RPM

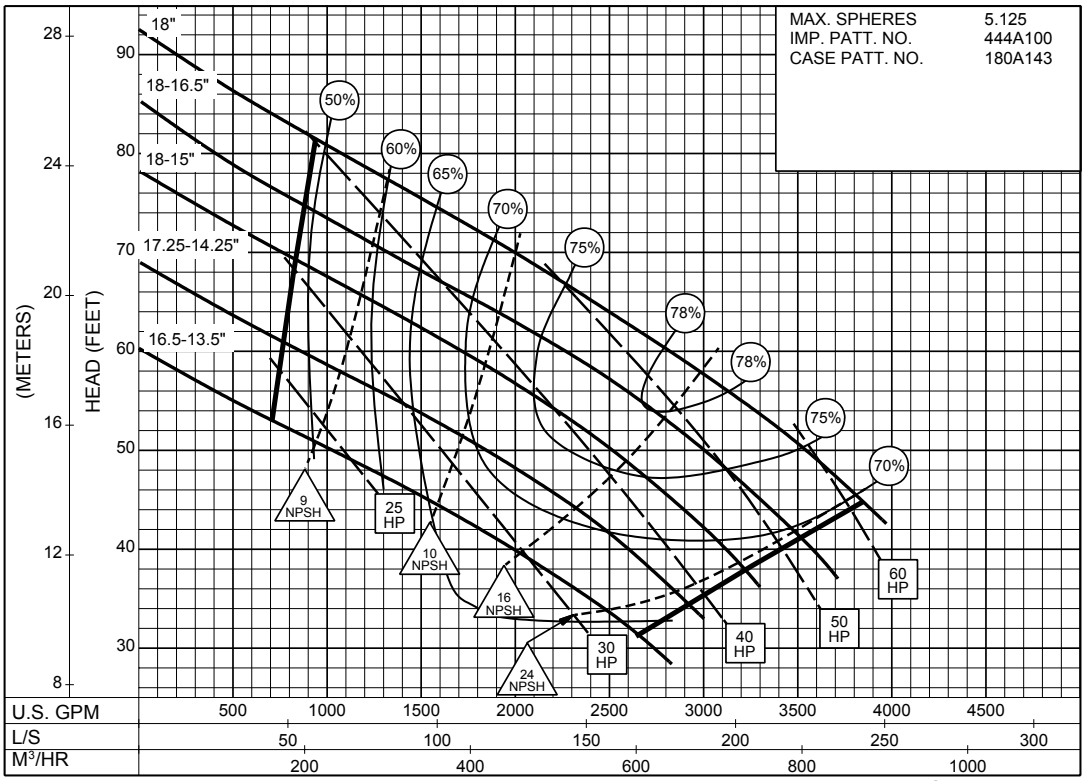
SIZE : 8x10x18 **TYPE : 610** **IMPELLER : Enclosed** **R. P. M. : 1150**



8PC-115588

875 RPM

SIZE : 8x10x18 **TYPE : 610** **IMPELLER : Enclosed** **R. P. M. : 875**



8PC-115589

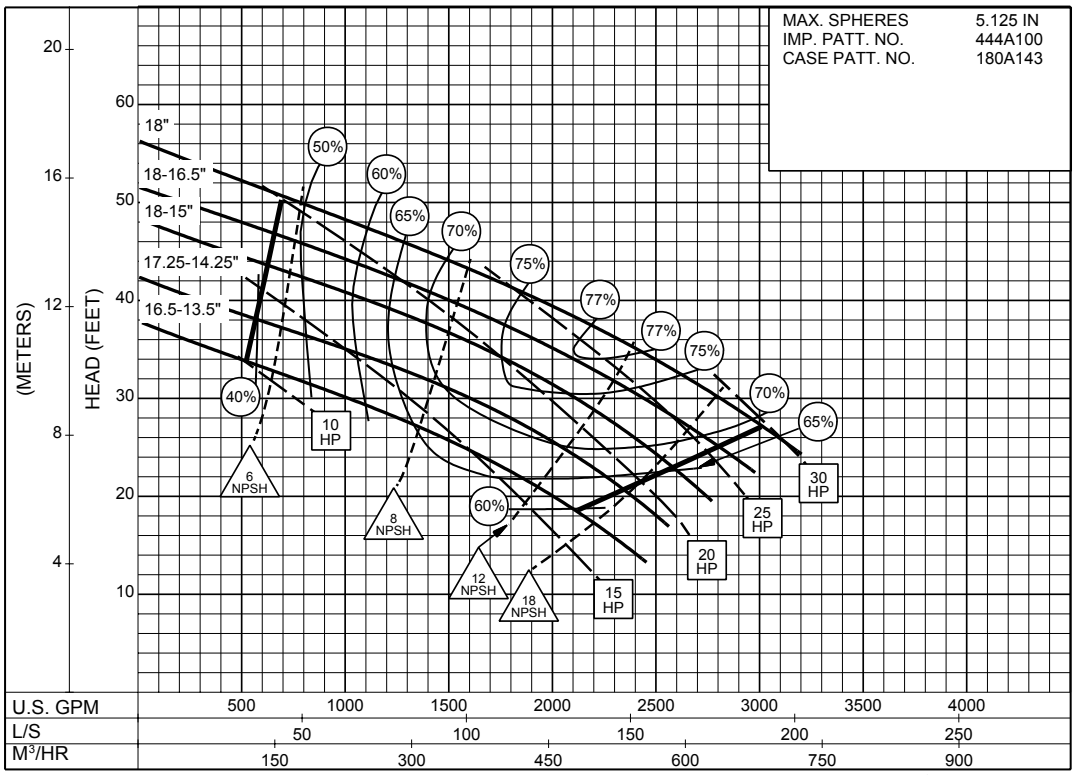
AURORA®
Pentair Pump Group

8 x 10 x 18
SERIES 610

ENCLOSED IMPELLER

Supersedes Section 610 Page 418
Dated March 1983

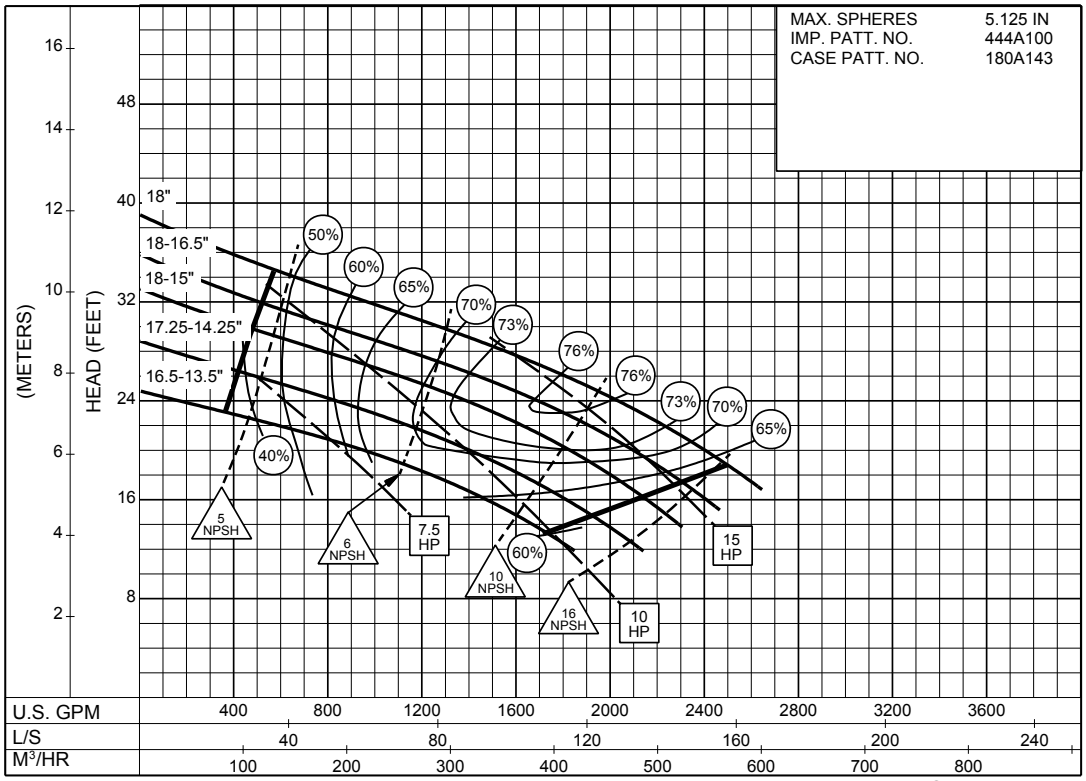
SIZE : 8x10x18 **TYPE : 610** **IMPELLER : Enclosed** **R. P. M. : 700**



8PC-115590

700 RPM

SIZE : 8x10x18 **TYPE : 610** **IMPELLER : Enclosed** **R. P. M. : 580**



8PC-115591

580 RPM

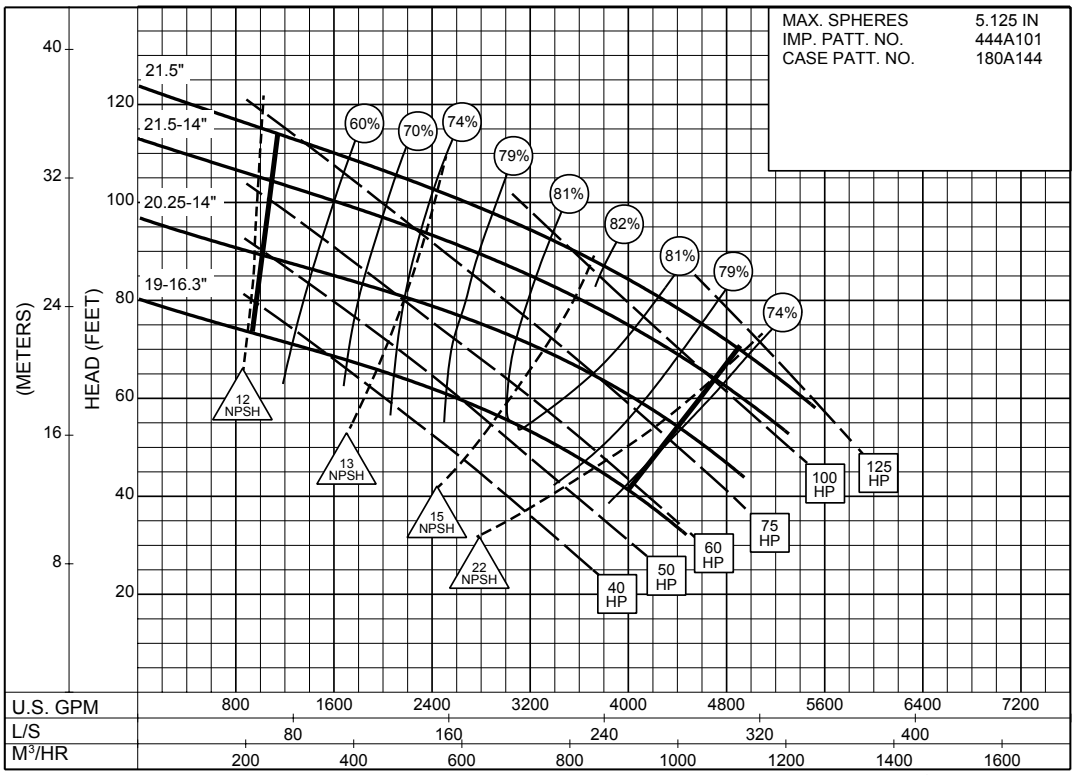
AURORA®
Pentair Pump Group

8 x 10 x 22
SERIES 610

ENCLOSED IMPELLER

875 RPM

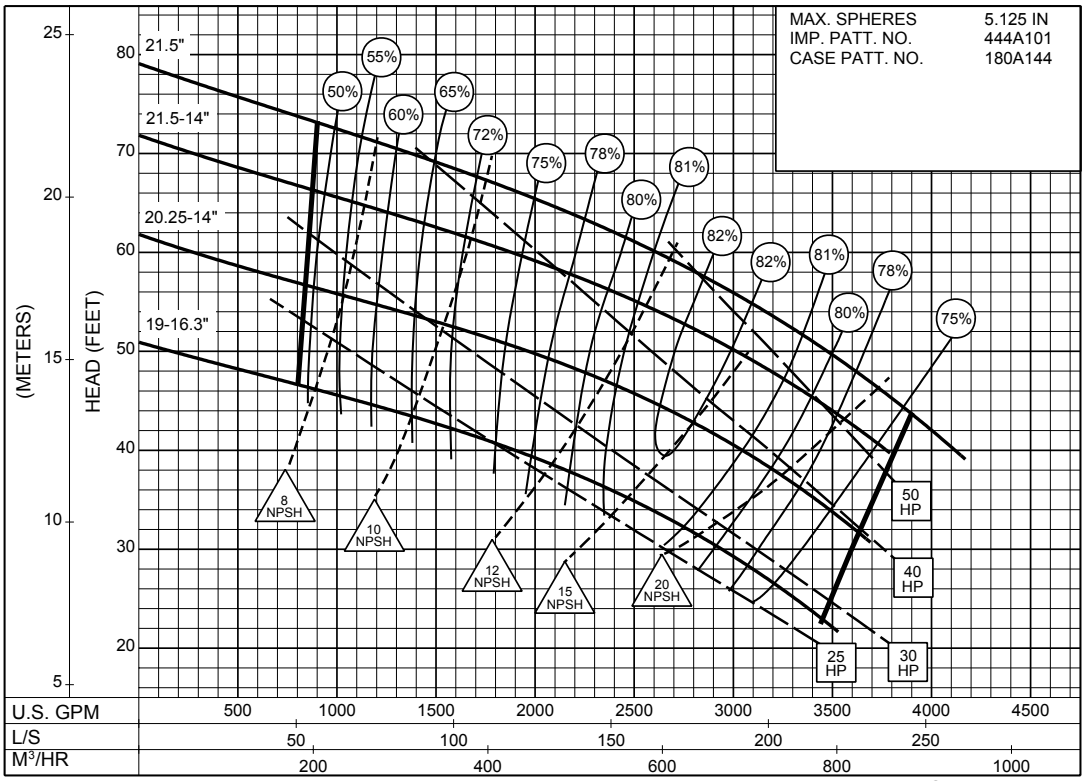
SIZE : 8x10x22 **TYPE : 610** **IMPELLER : Enclosed** **R. P. M. : 875**



8PC-115592B

700 RPM

SIZE : 8x10x22 **TYPE : 610** **IMPELLER : Enclosed** **R. P. M. : 700**



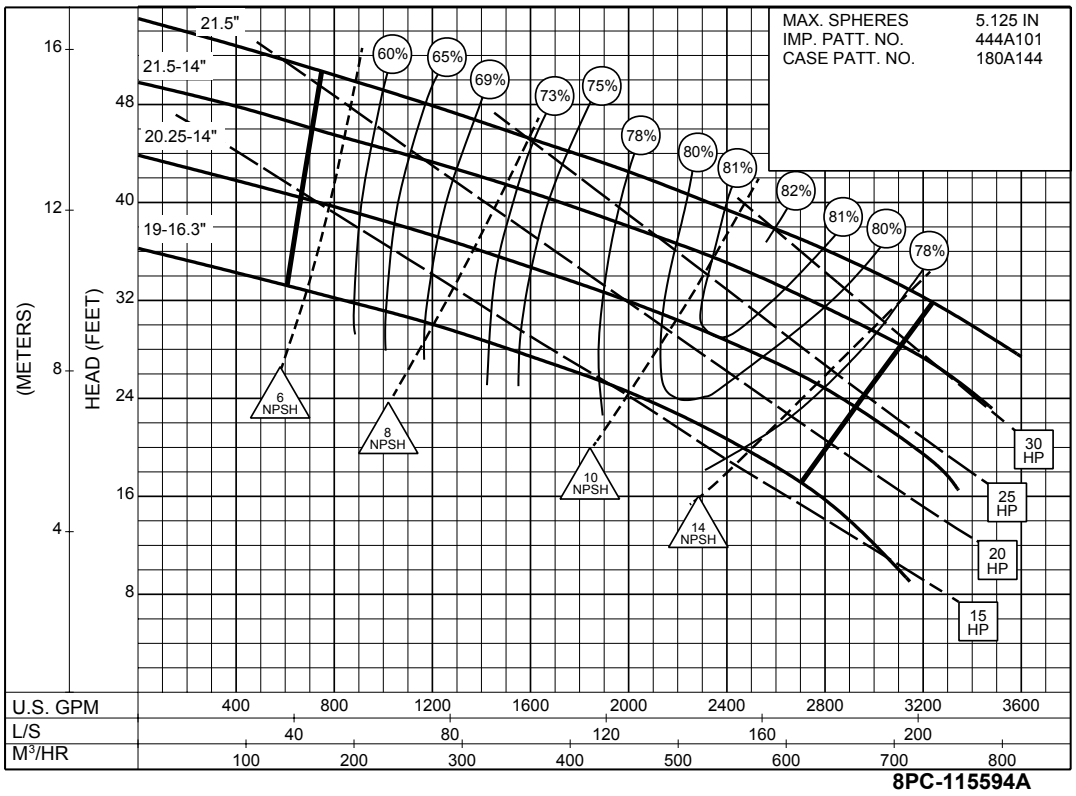
8PC-115593A

8 x 10 x 22
SERIES 610

ENCLOSED IMPELLER

Supersedes Section 610 Page 420
Dated March 1987

SIZE : 8x10x22 **TYPE : 610** **IMPELLER : Enclosed** **R. P. M. : 580**



8PC-115594A

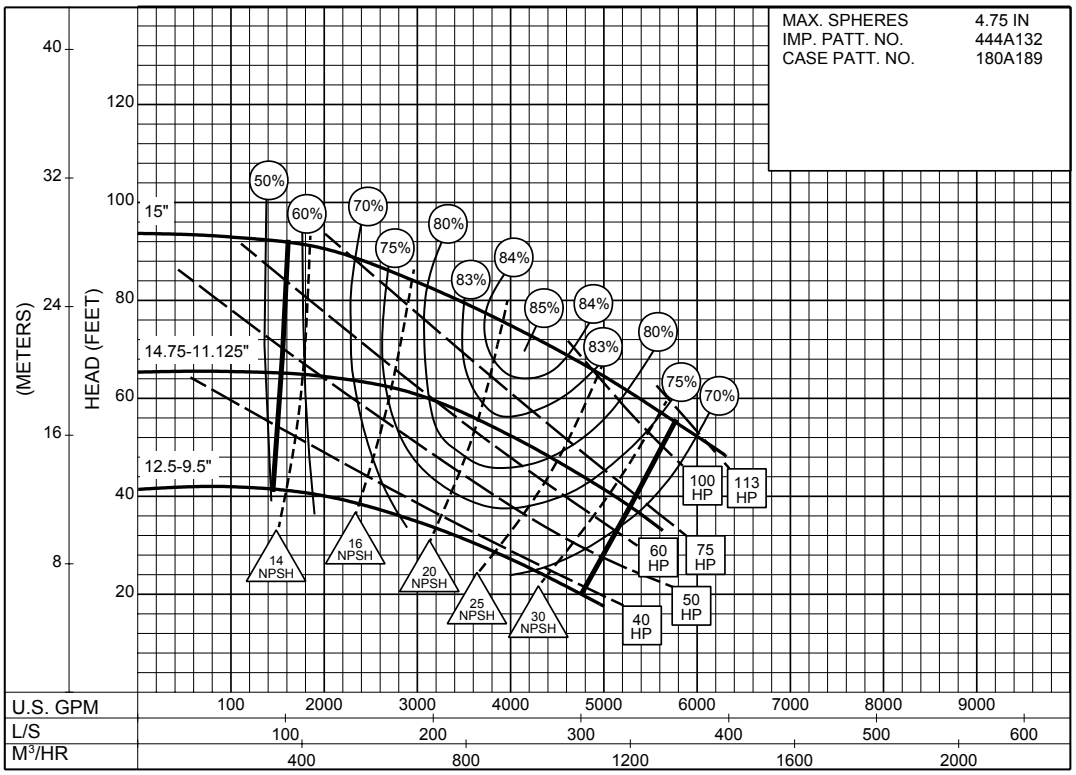
580 RPM

10 x 10 x 15
SERIES 610

ENCLOSED IMPELLER

1150 RPM

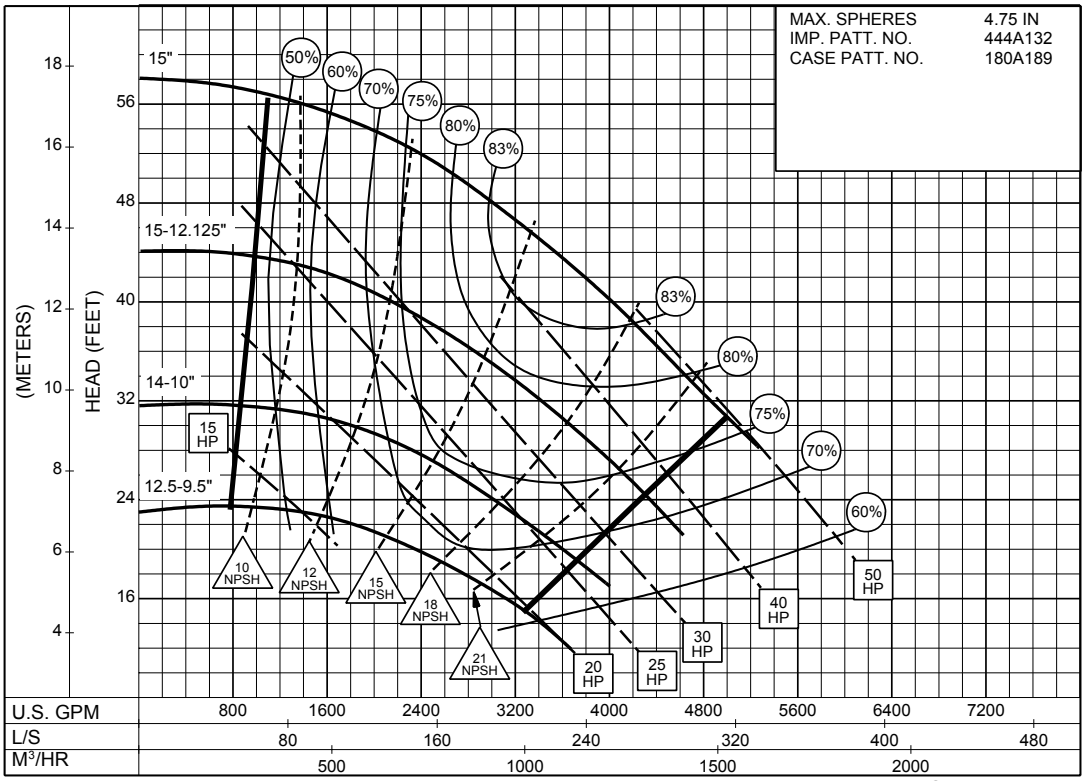
SIZE : 10x10x15 **TYPE : 610** **IMPELLER : Enclosed** **R. P. M. : 1150**



8PC-126742

875 RPM

SIZE : 10x10x15 **TYPE : 610** **IMPELLER : Enclosed** **R. P. M. : 875**



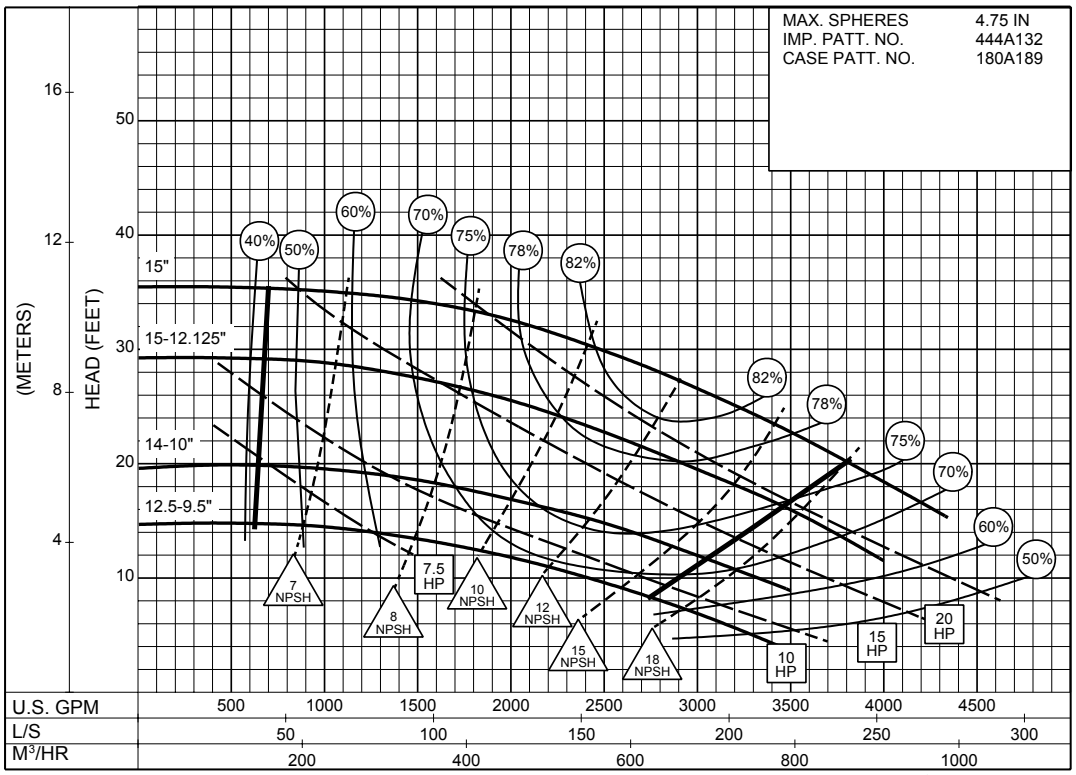
8PC-116809

10 x 10 x 15
SERIES 610

ENCLOSED IMPELLER

Supersedes Section 610 Page 422
Dated March 1983

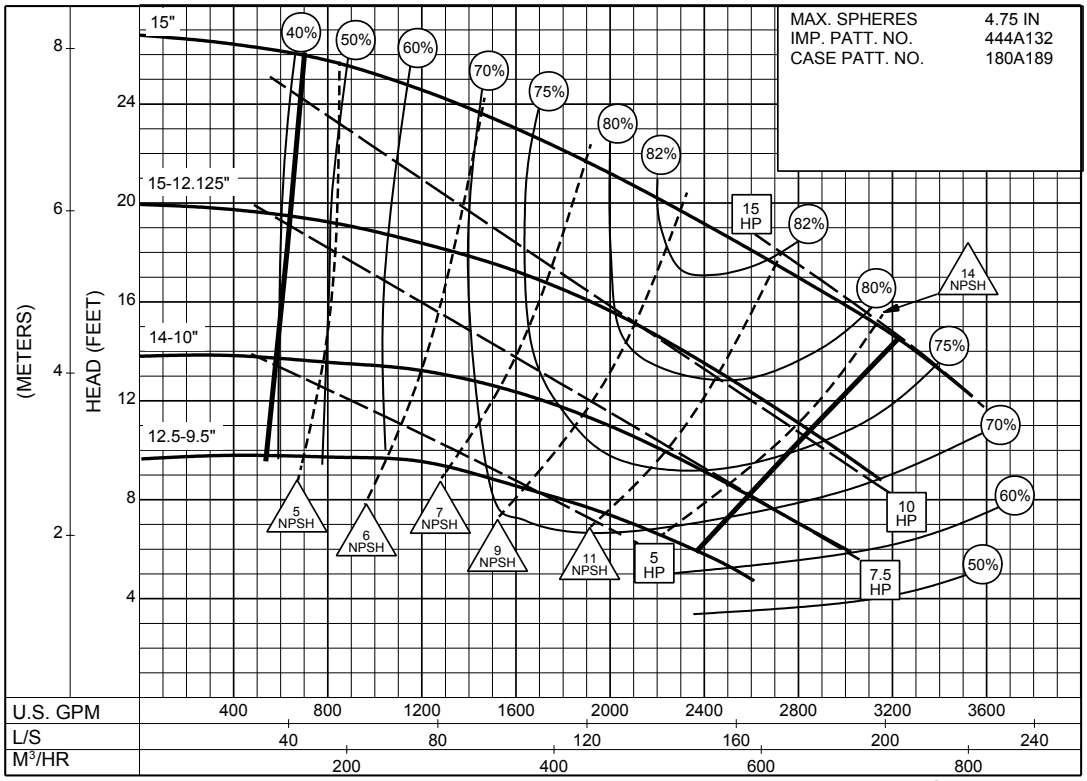
SIZE : 10x10x15 **TYPE : 610** **IMPELLER : Enclosed** **R. P. M. : 700**



8PC-116810

700 RPM

SIZE : 10x10x15 **TYPE : 610** **IMPELLER : Enclosed** **R. P. M. : 580**



8PC-116811

580 RPM

AURORA®
Pentair Pump Group

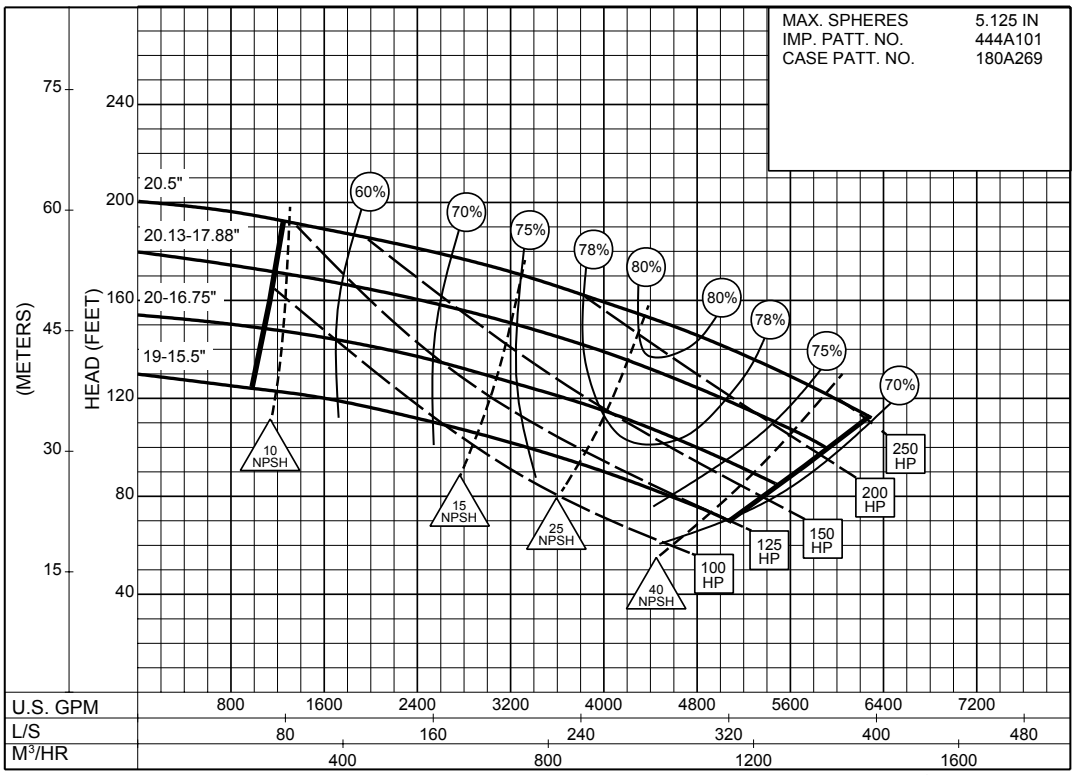
Supersedes Section 610 Page 422A
Dated March 1983

10 x 10 x 22
SERIES 610

ENCLOSED IMPELLER

1175
RPM

SIZE : 10x10x22 **TYPE : 610** **IMPELLER : Enclosed** **R. P. M. : 1175**



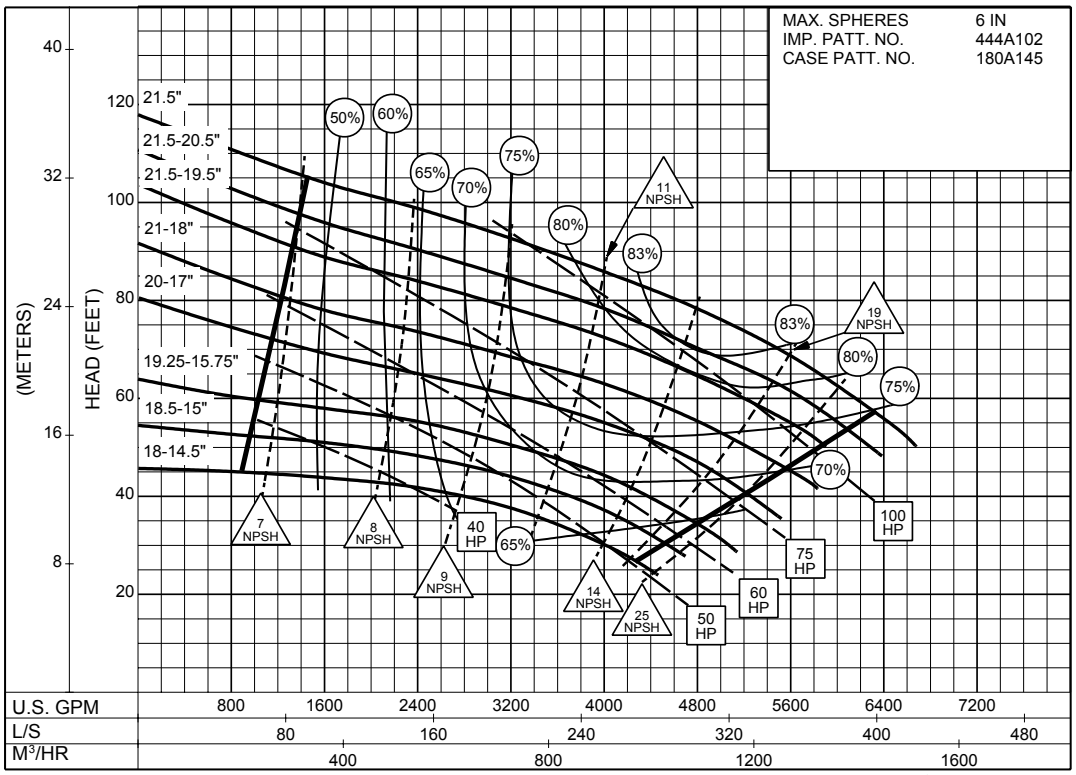
8PC-134351

10 x 12 x 22
SERIES 610

ENCLOSED IMPELLER

Supersedes Section 610 Page 423
Dated March 1983

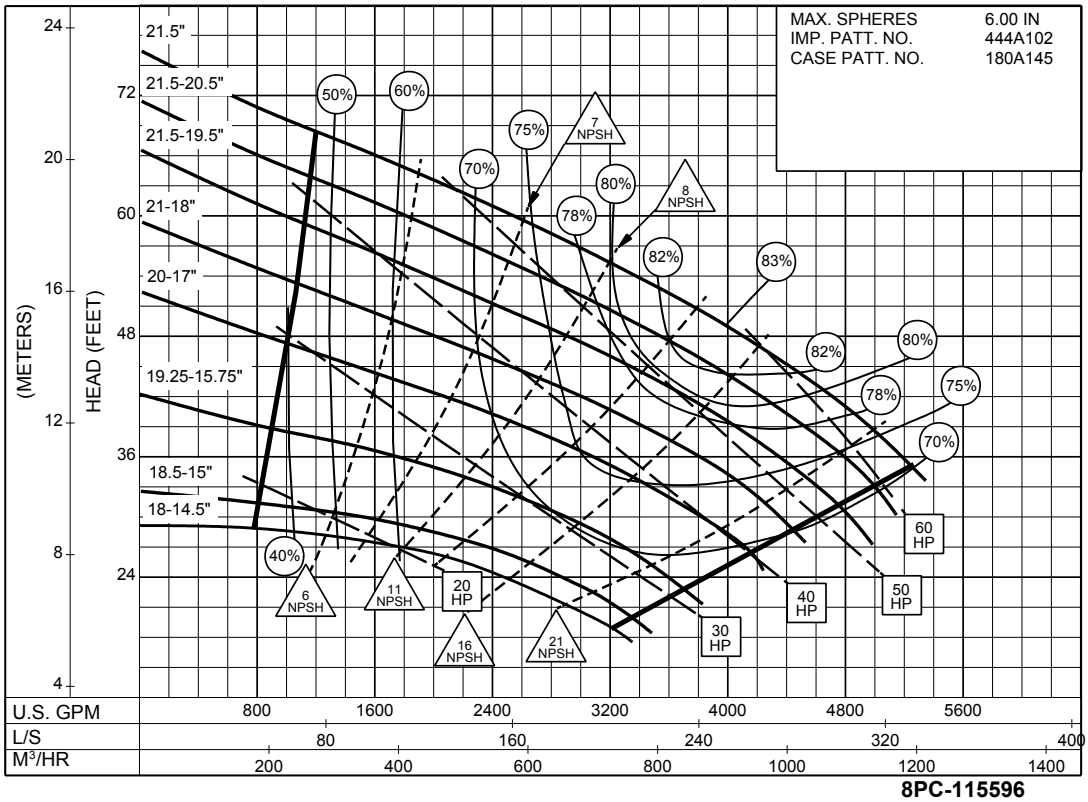
SIZE : 10x12x22 **TYPE : 610** **IMPELLER : Enclosed** **R. P. M. : 875**



8PC-115595

875 RPM

SIZE : 10x12x22 **TYPE : 610** **IMPELLER : Enclosed** **R. P. M. : 700**



8PC-115596

700 RPM

AURORA®
Pentair Pump Group

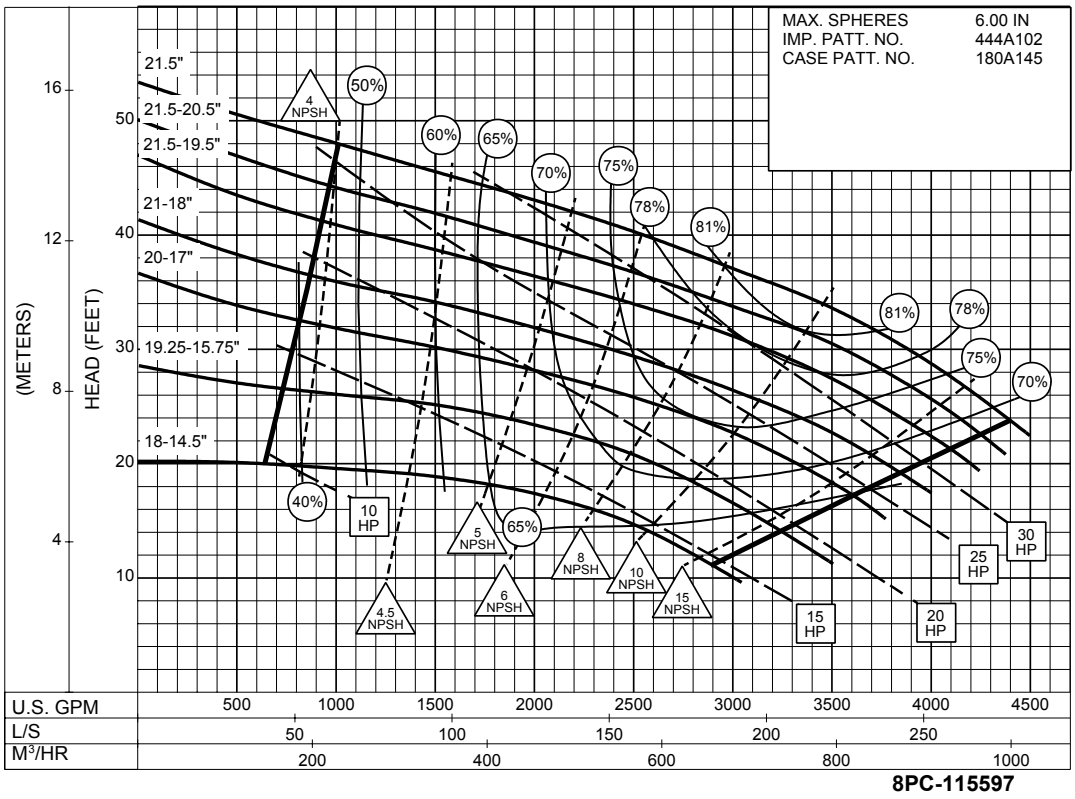
Supersedes Section 610 Page 424
Dated March 1983

10 x 12 x 22
SERIES 610

ENCLOSED IMPELLER

580
RPM

SIZE : 10x12x22 **TYPE : 610** **IMPELLER : Enclosed** **R. P. M. : 580**



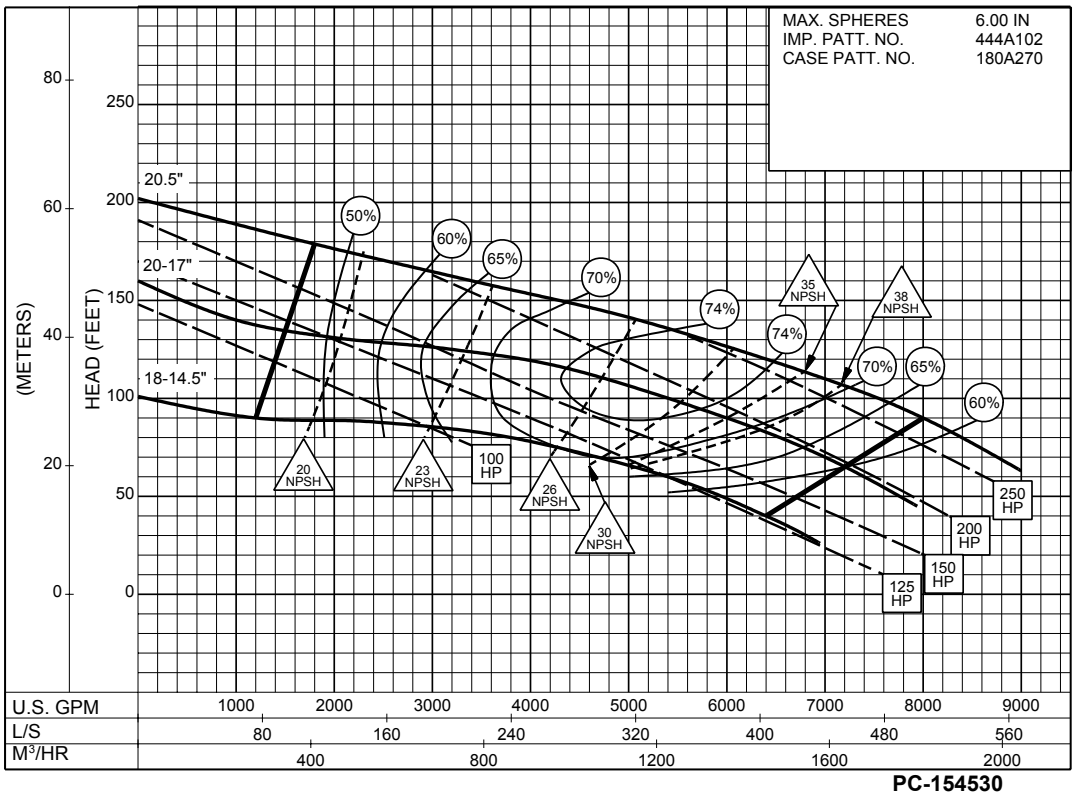
8PC-115597

12 x 12 x 22
SERIES 610

ENCLOSED IMPELLER

Supersedes Section 610 Page 424A
Dated November 1992

SIZE : 12x12x22 **TYPE : 610** **IMPELLER : Enclosed** **R. P. M. : 1175**



PC-154530

1175 RPM

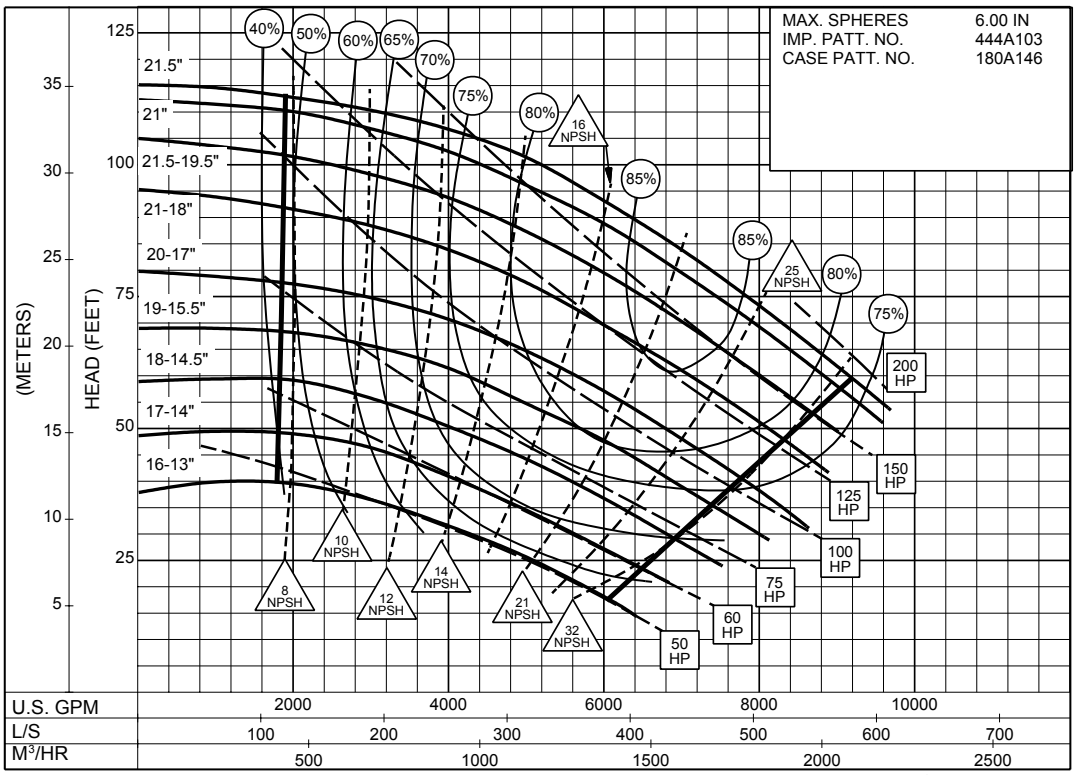
Supersedes Section 610 Page 425
Dated March 1983

12 x 14 x 22A
SERIES 610

ENCLOSED IMPELLER

875 RPM

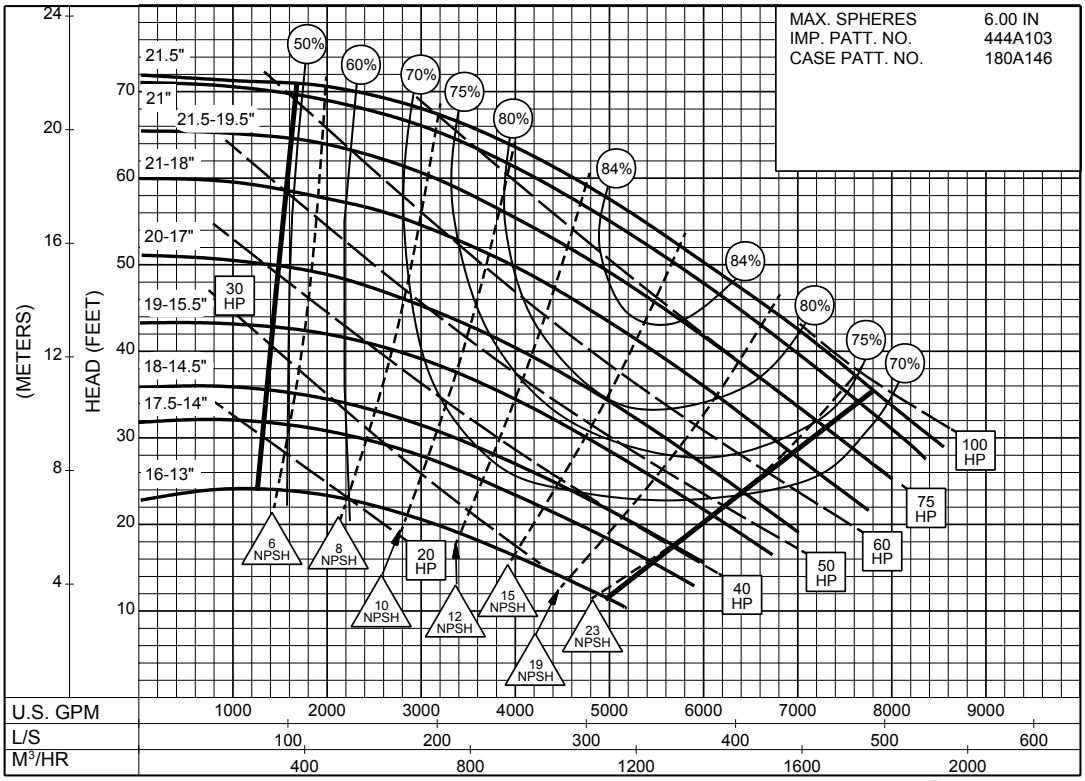
SIZE : 12x14x22A TYPE : 610 IMPELLER : Enclosed R. P. M. : 875



8PC-126830

700 RPM

SIZE : 12x14x22A TYPE : 610 IMPELLER : Enclosed R. P. M. : 700



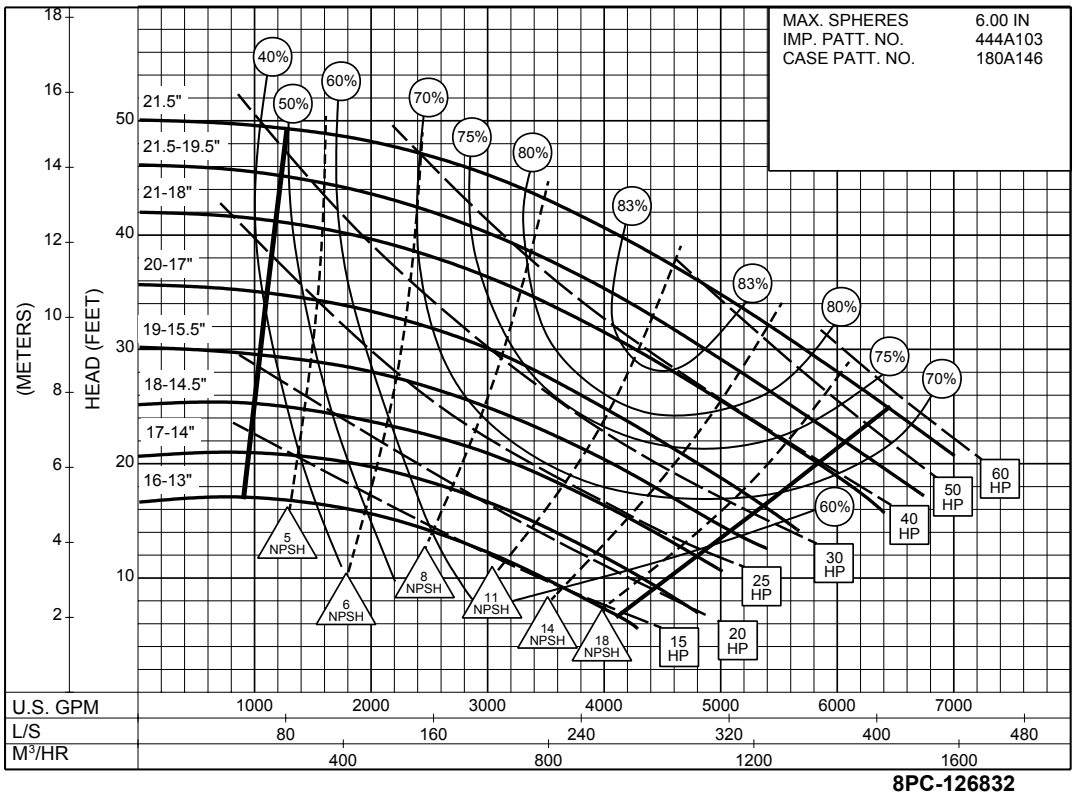
8PC-126831

12 x 14 x 22A
SERIES 610

ENCLOSED IMPELLER

Supersedes Section 610 Page 426
Dated March 1983

SIZE : 12x14x22A **TYPE : 610** **IMPELLER : Enclosed** **R. P. M. : 580**



8PC-126832

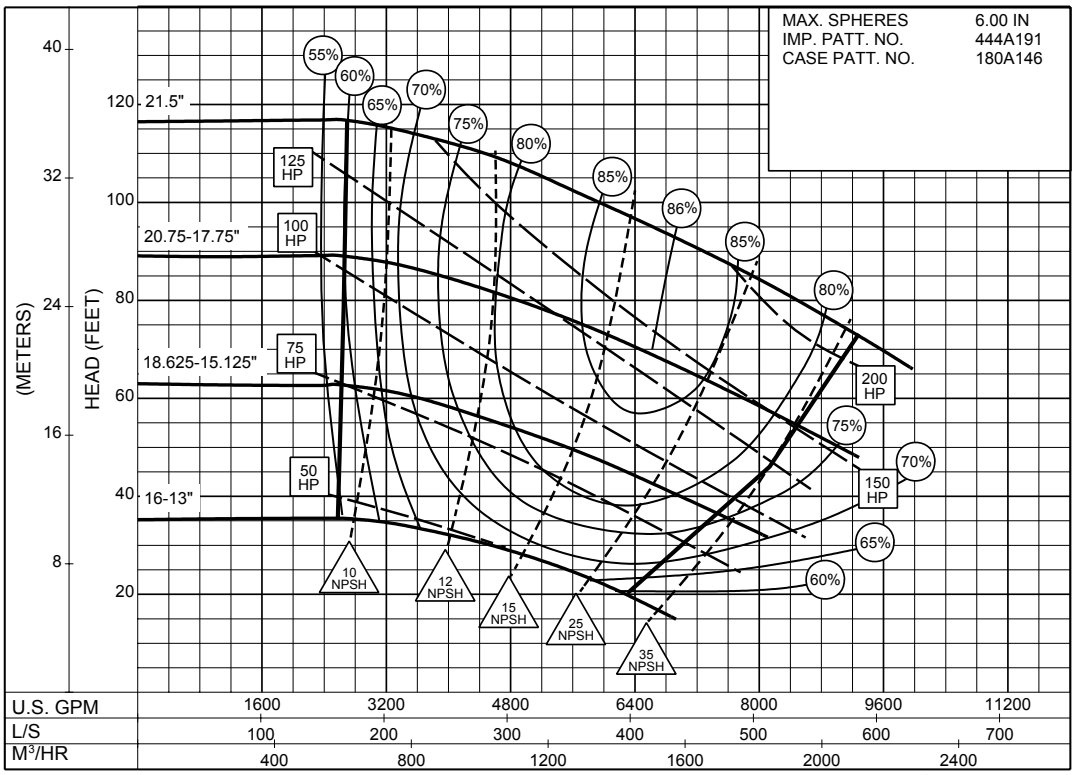
580 RPM

12 x 14 x 22B
SERIES 610

ENCLOSED IMPELLER

875 RPM

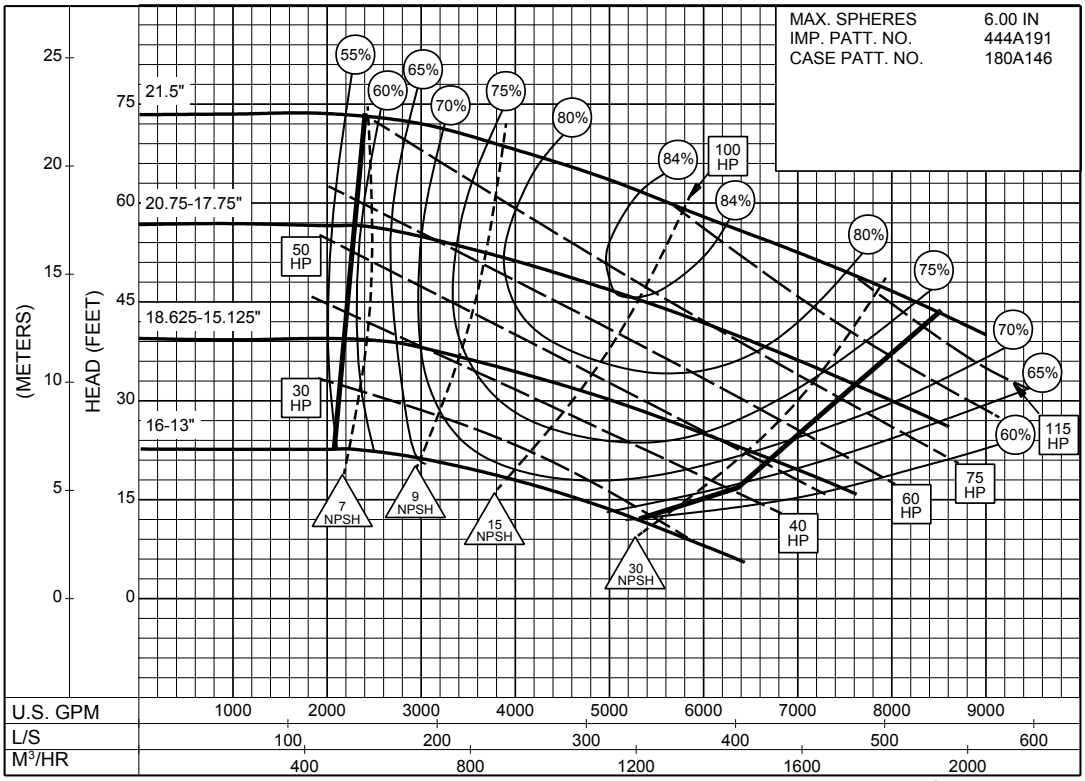
SIZE : 12x14x22B **TYPE : 610** **IMPELLER : Enclosed** **R. P. M. : 875**



8PC-132458

700 RPM

SIZE : 12x14x22B **TYPE : 610** **IMPELLER : Enclosed** **R. P. M. : 700**



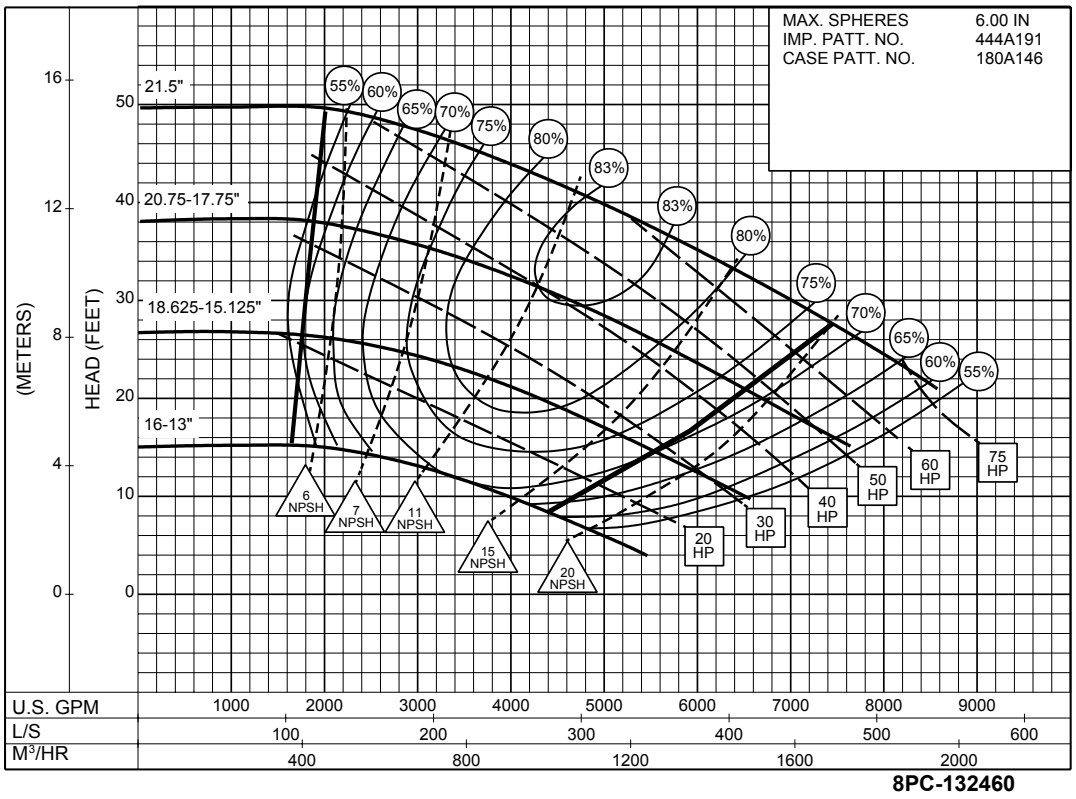
8PC-132459

12 x 14 x 22B
SERIES 610

ENCLOSED IMPELLER

Supersedes Section 610 Page 428
Dated March 1983

SIZE : 12x14x22B **TYPE : 610** **IMPELLER : Enclosed** **R. P. M. : 580**



8PC-132460

580 RPM

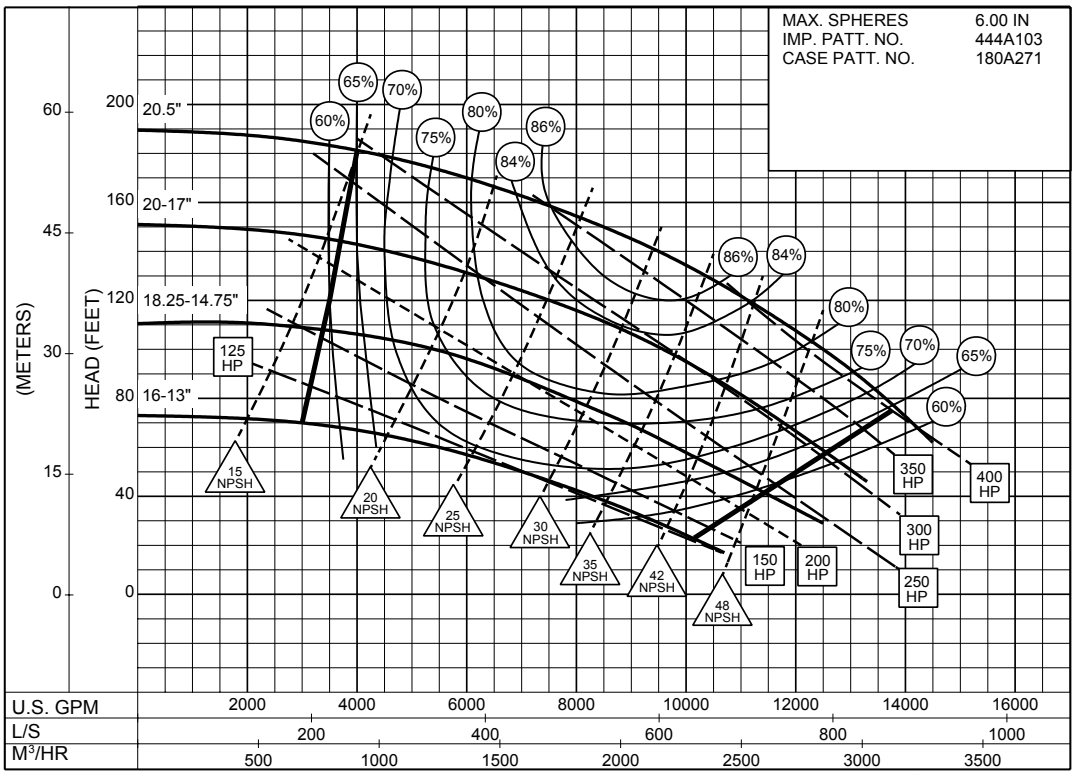
Supersedes Section 610 Page 429
Dated September 1992

14 x 14 x 22A
SERIES 610

ENCLOSED IMPELLER

1175
RPM

SIZE : 14x14x22A **TYPE : 610** **IMPELLER : Enclosed** **R. P. M. : 1175**



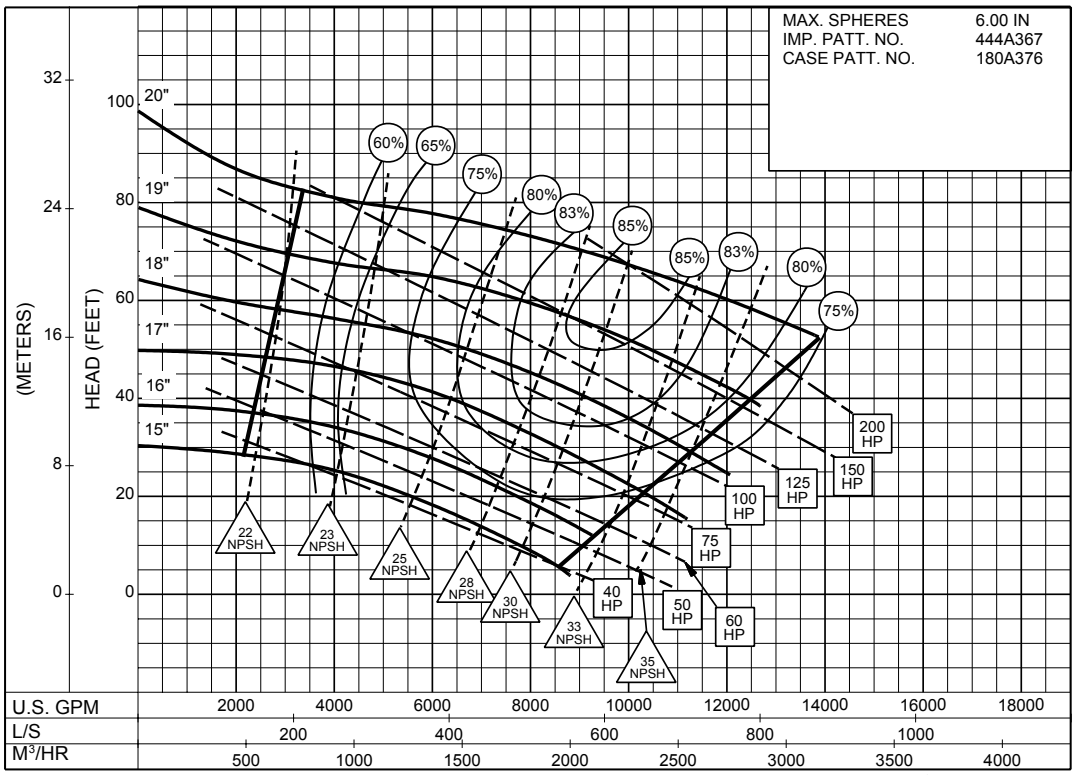
PC-150828

16 x 16 x 20
SERIES 610

ENCLOSED IMPELLER

Supersedes Section 610 Page 431
Dated October 1992

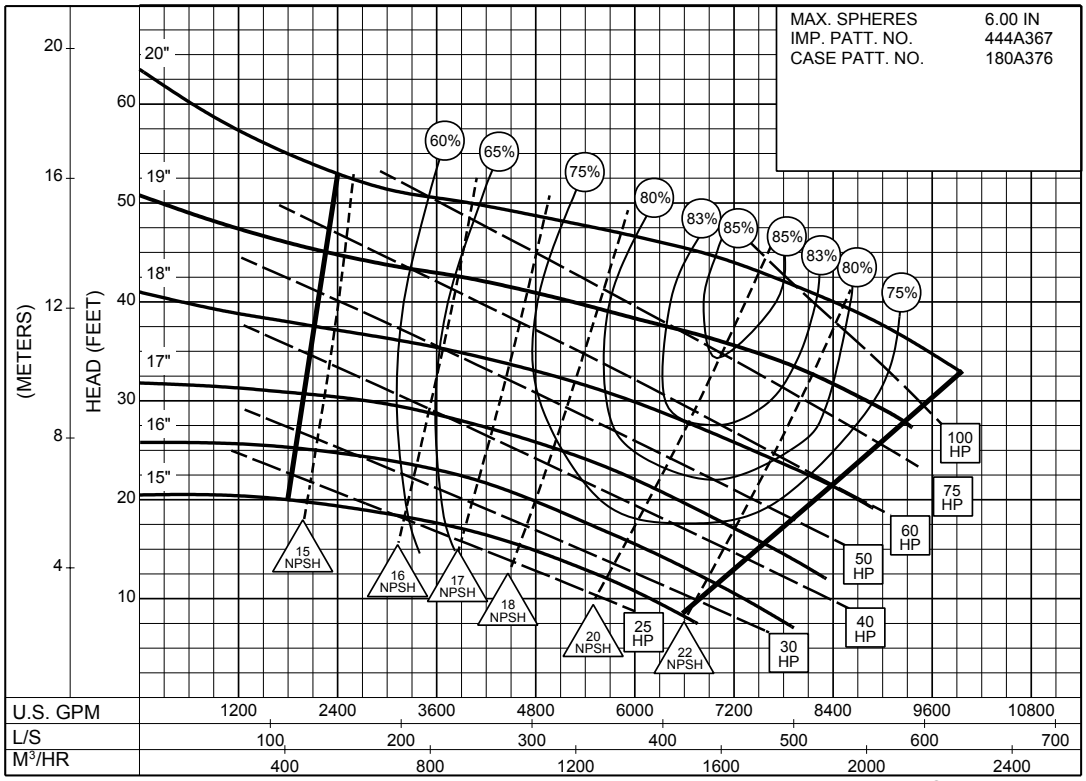
SIZE : 16x16x20 **TYPE : 610** **IMPELLER : Enclosed** **R. P. M. : 875**



8PC-152485

875 RPM

SIZE : 16x16x20 **TYPE : 610** **IMPELLER : Enclosed** **R. P. M. : 700**



8PC-152486

700 RPM

AURORA®
Pentair Pump Group

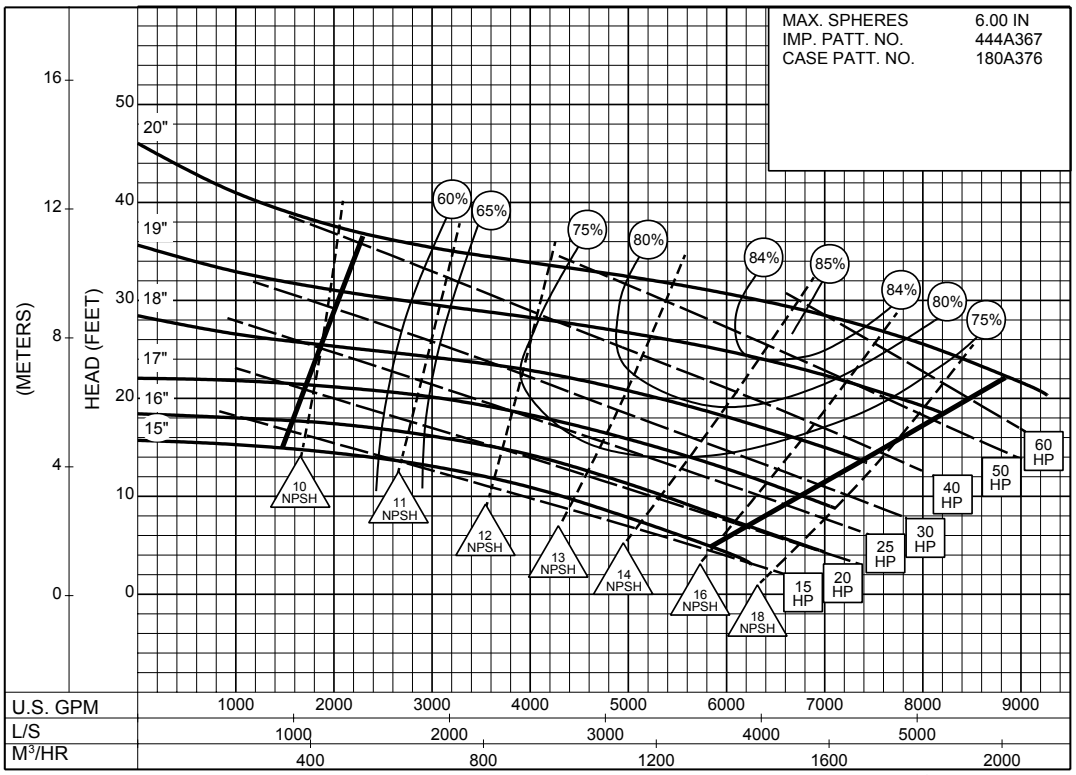
Supersedes Section 610 Page 432
Dated October 1992

16 x 16 x 20
SERIES 610

ENCLOSED IMPELLER

585 RPM

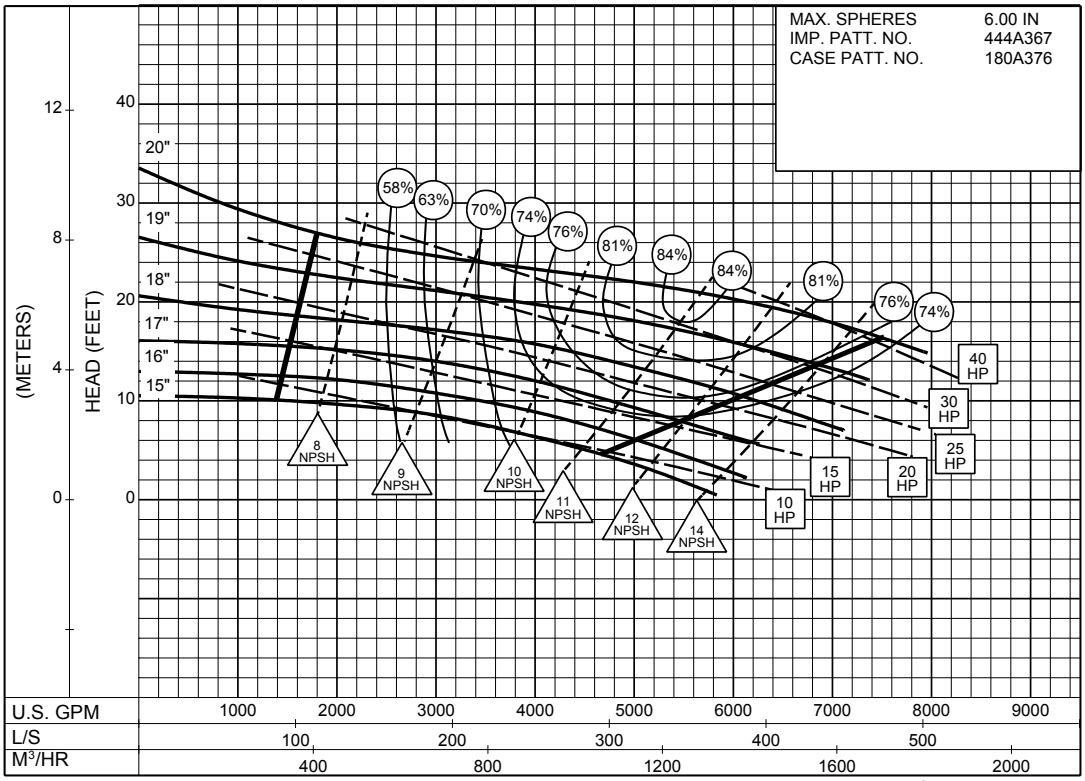
SIZE : 16x16x20 **TYPE : 610** **IMPELLER : Enclosed** **R. P. M. : 585**



8PC-152487

500 RPM

SIZE : 16x16x20 **TYPE : 610** **IMPELLER : Enclosed** **R. P. M. : 500**



PC-152488

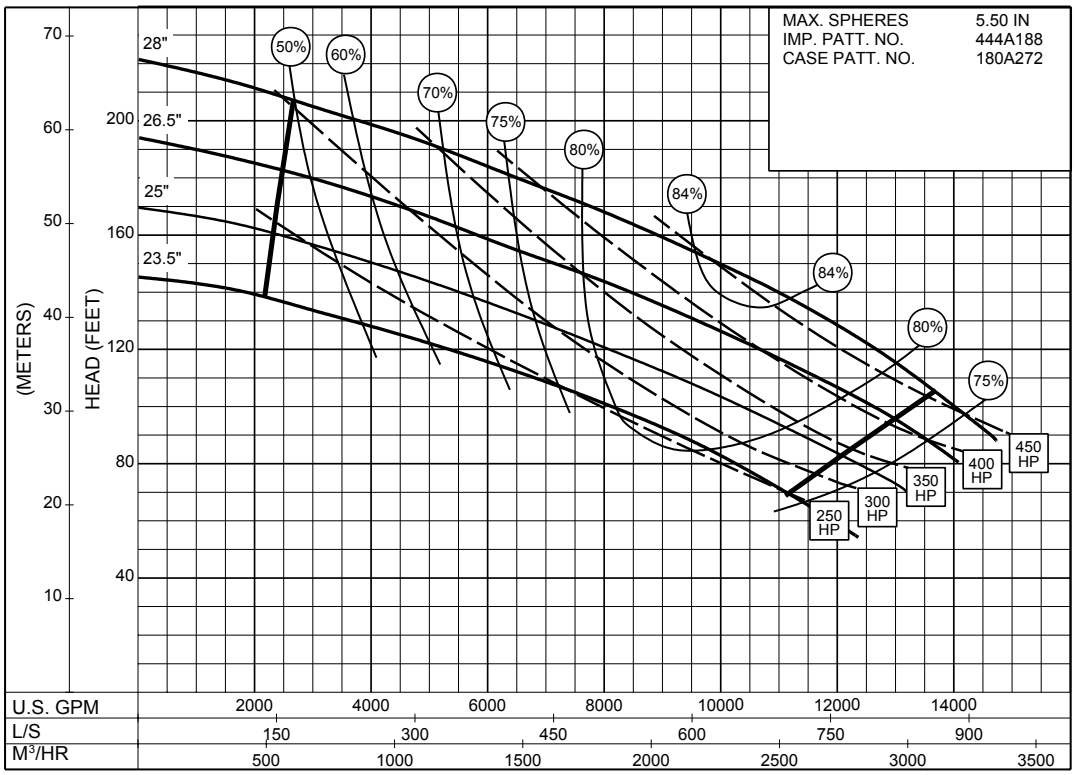
AURORA®
Pentair Pump Group

16 x 16 x 28
SERIES 610

ENCLOSED IMPELLER

Supersedes Section 610 Page 435
Dated April 2001

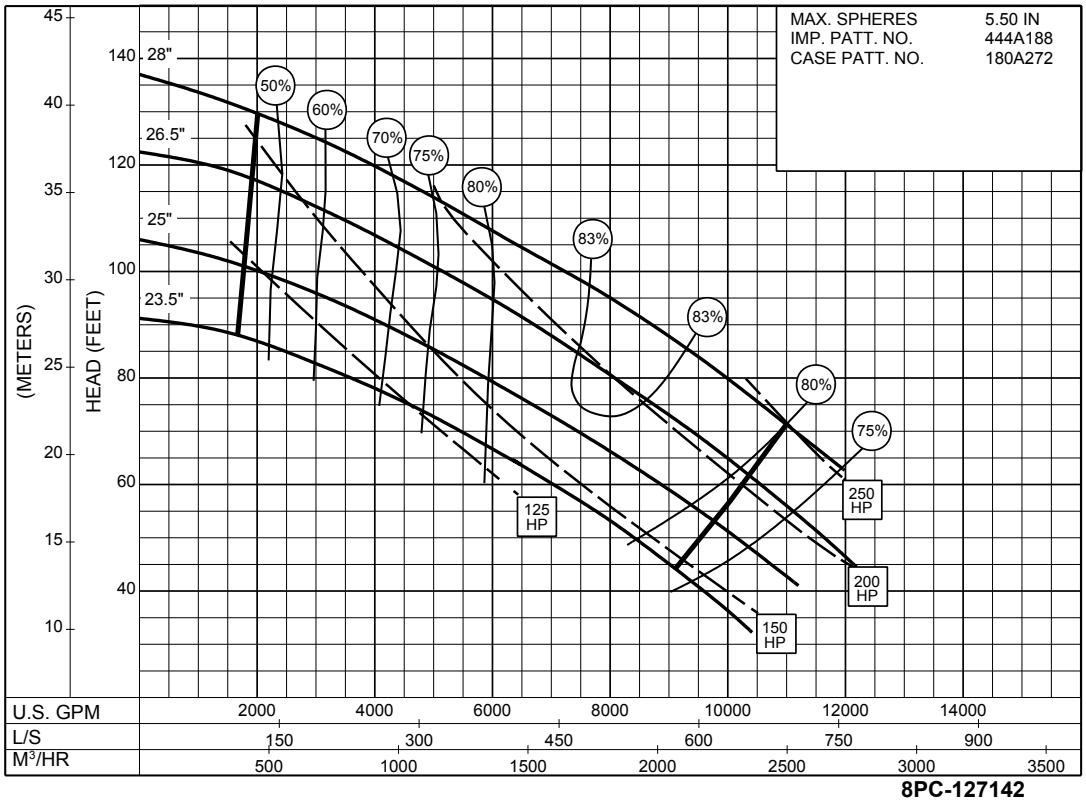
SIZE : 16x16x28 **TYPE : 610** **IMPELLER : Enclosed** **R. P. M. : 875**



8PC-127141

875 RPM

SIZE : 16x16x28 **TYPE : 610** **IMPELLER : Enclosed** **R. P. M. : 700**



8PC-127142

700 RPM

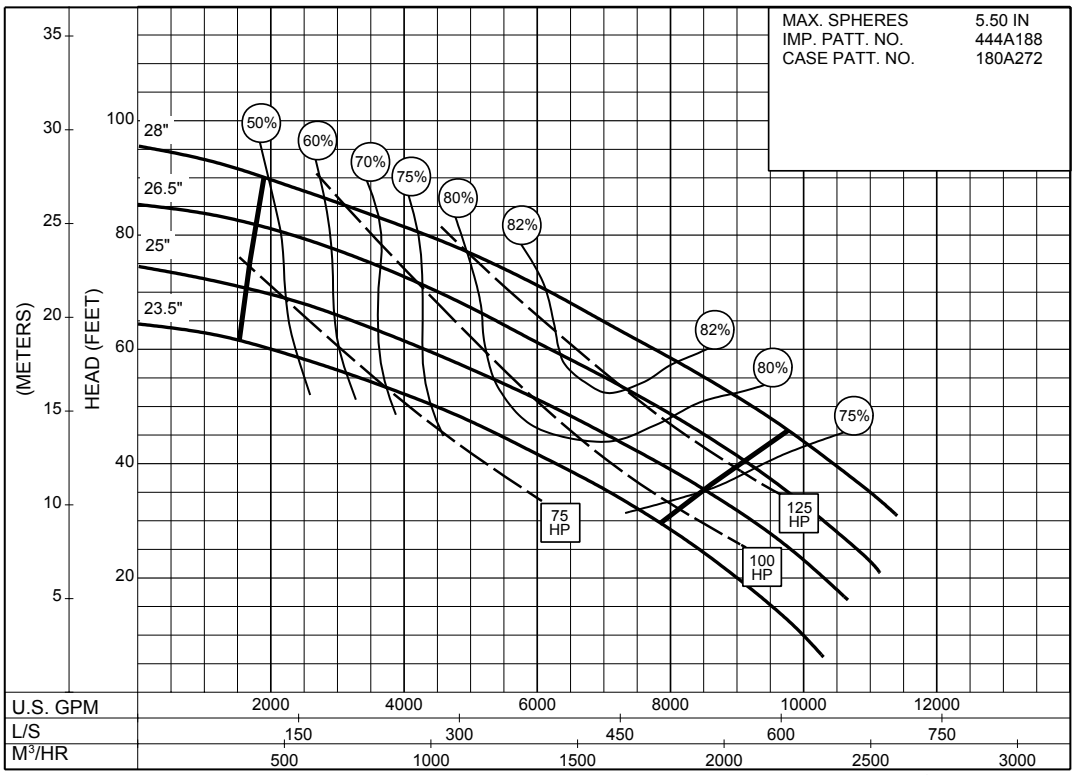
AURORA®
Pentair Pump Group

16 x 16 x 28
SERIES 610

ENCLOSED IMPELLER

585
RPM

SIZE : 16x16x28 **TYPE : 610** **IMPELLER : Enclosed** **R. P. M. : 585**



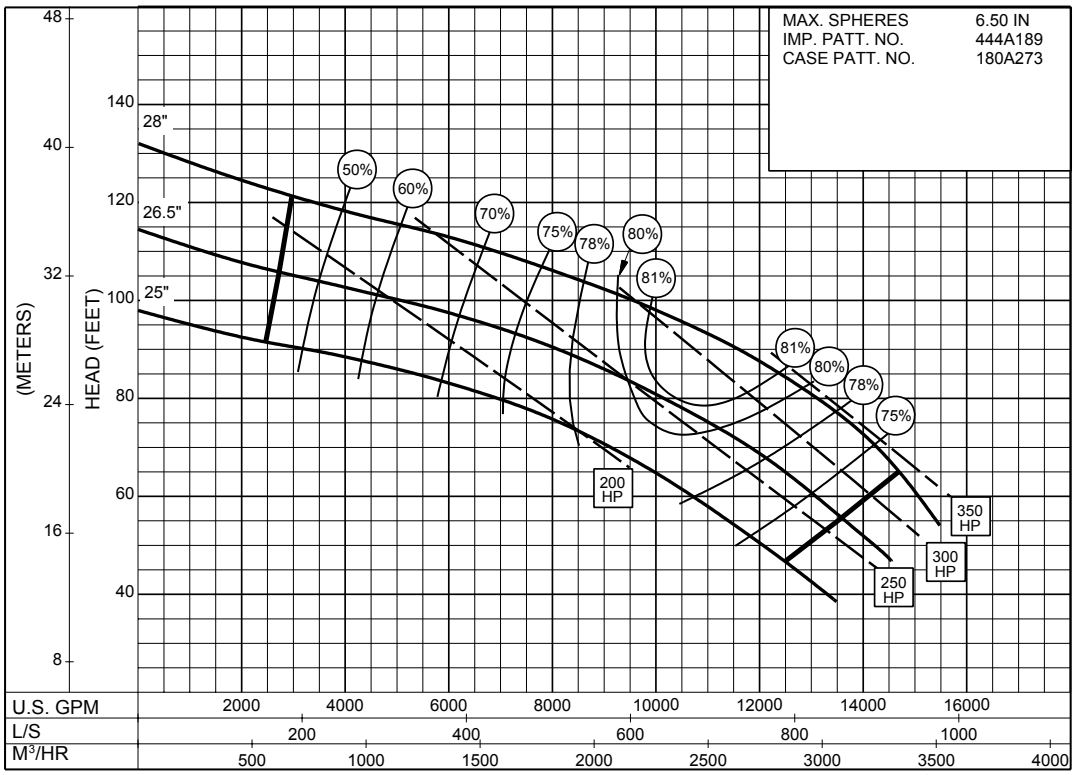
8PC-127143

18 x 18 x 28
SERIES 610

ENCLOSED IMPELLER

Supersedes Section 610 Page 437
Dated May 1980

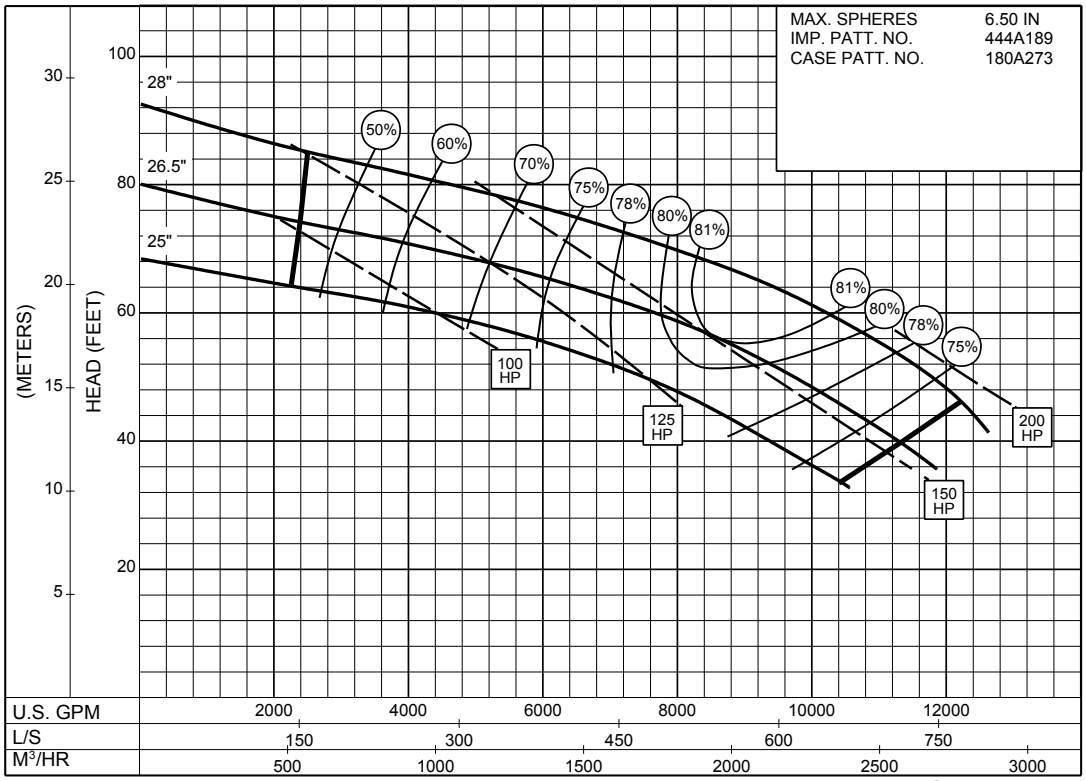
SIZE : 18x18x28 **TYPE : 610** **IMPELLER : Enclosed** **R. P. M. : 700**



8PC-127144

700 RPM

SIZE : 18x18x28 **TYPE : 610** **IMPELLER : Enclosed** **R. P. M. : 585**



8PC-127145

585 RPM

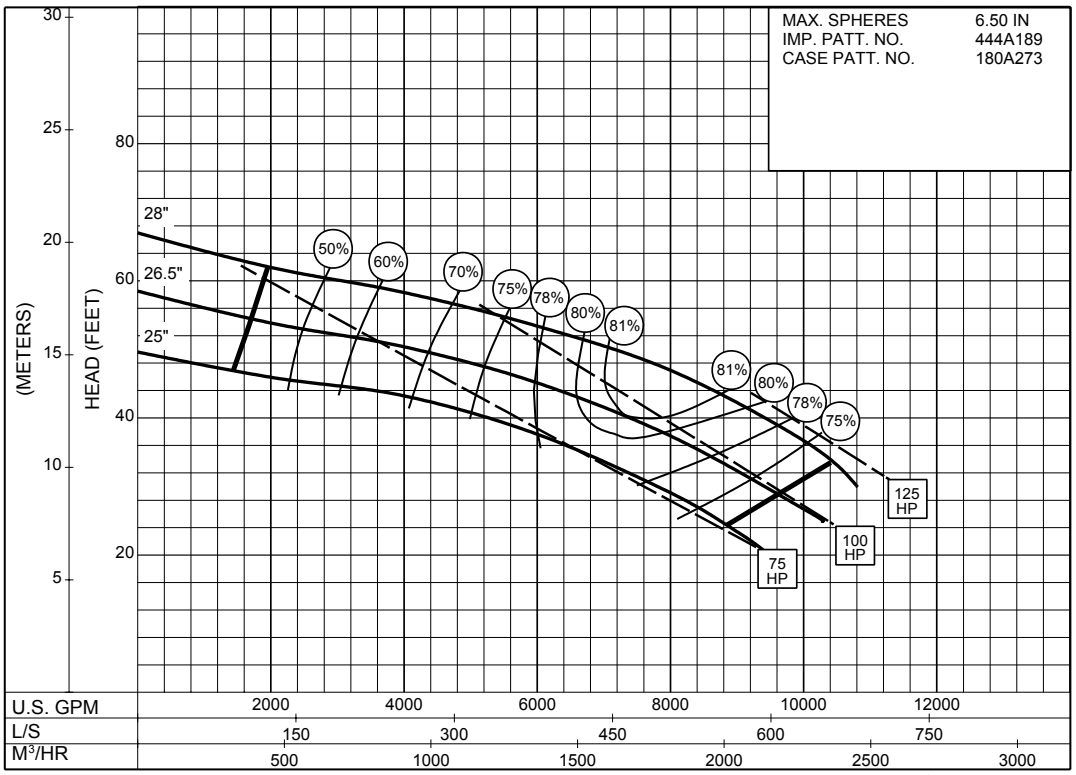
AURORA®
Pentair Pump Group

18 x 18 x 28
SERIES 610

ENCLOSED IMPELLER

500
RPM

SIZE : 18x18x28 **TYPE : 610** **IMPELLER : Enclosed** **R. P. M. : 500**



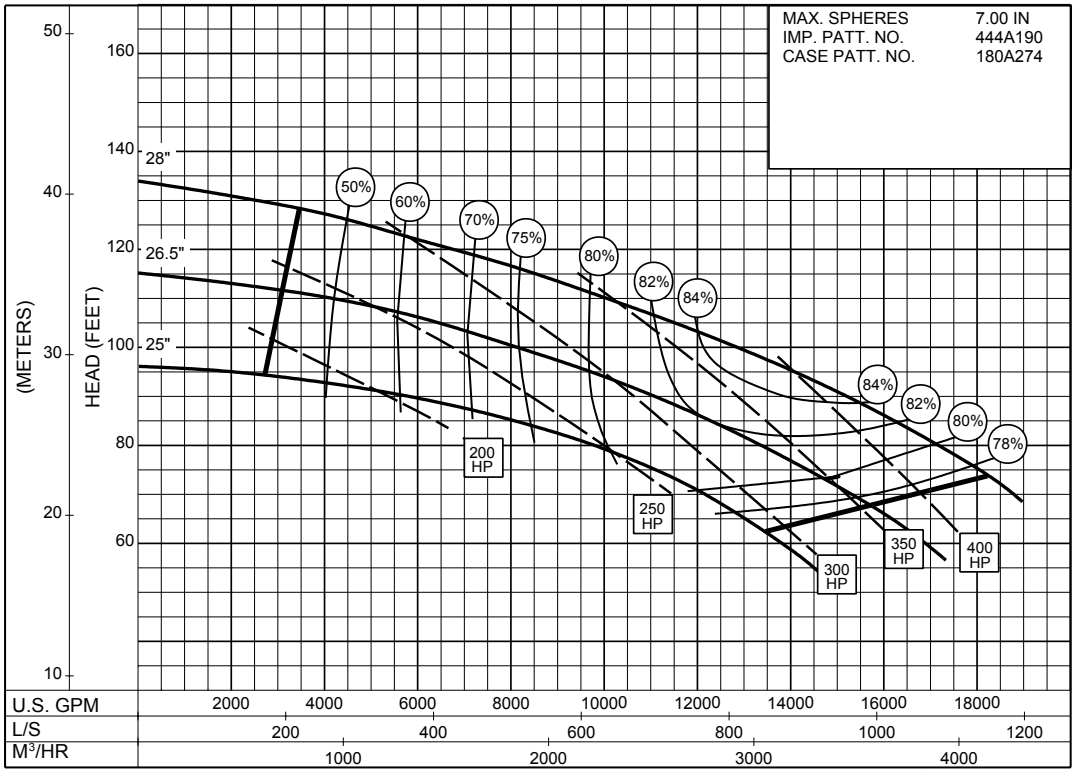
8PC-127146

20 x 20 x 28
SERIES 610

ENCLOSED IMPELLER

Supersedes Section 610 Page 439
Dated May 1980

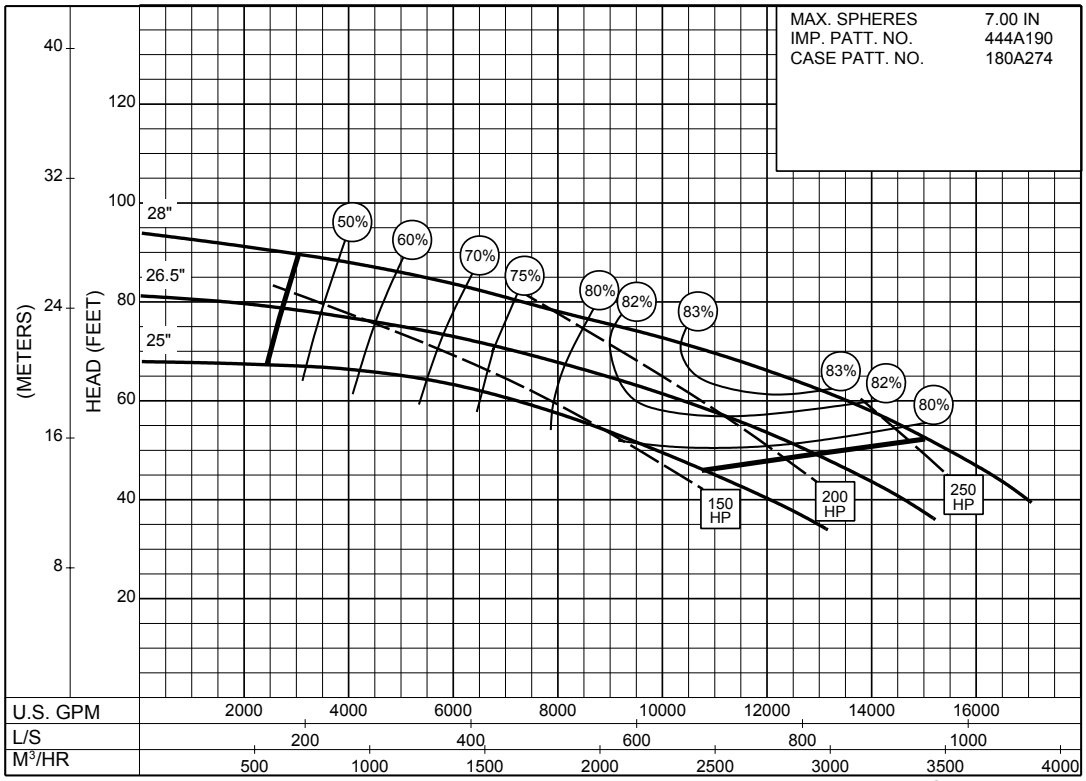
SIZE : 20x20x28 **TYPE : 610** **IMPELLER : Enclosed** **R. P. M. : 700**



8PC-127147

700 RPM

SIZE : 20x20x28 **TYPE : 610** **IMPELLER : Enclosed** **R. P. M. : 585**



8PC-127148

585 RPM

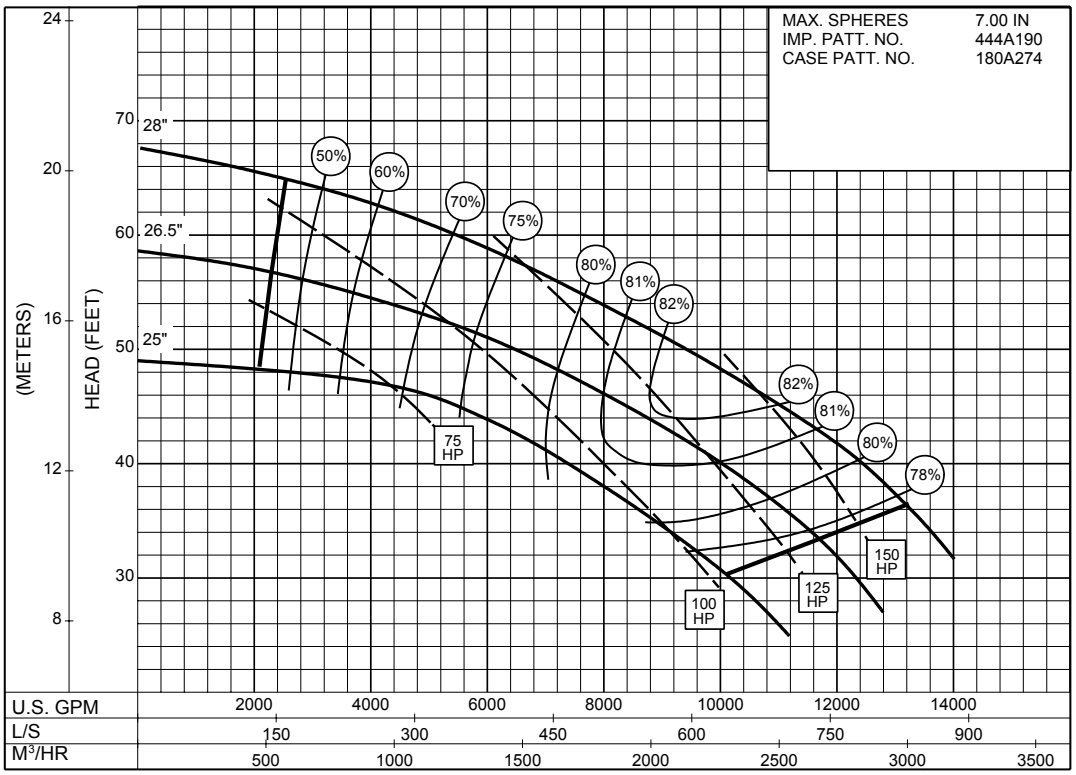
AURORA®
Pentair Pump Group

20 x 20 x 28
SERIES 610

ENCLOSED IMPELLER

500
RPM

SIZE : 20x20x28 **TYPE : 610** **IMPELLER : Enclosed** **R. P. M. : 500**



8PC-127149

Performance Curves for the 610 Series (50 Hz)

Continued next page

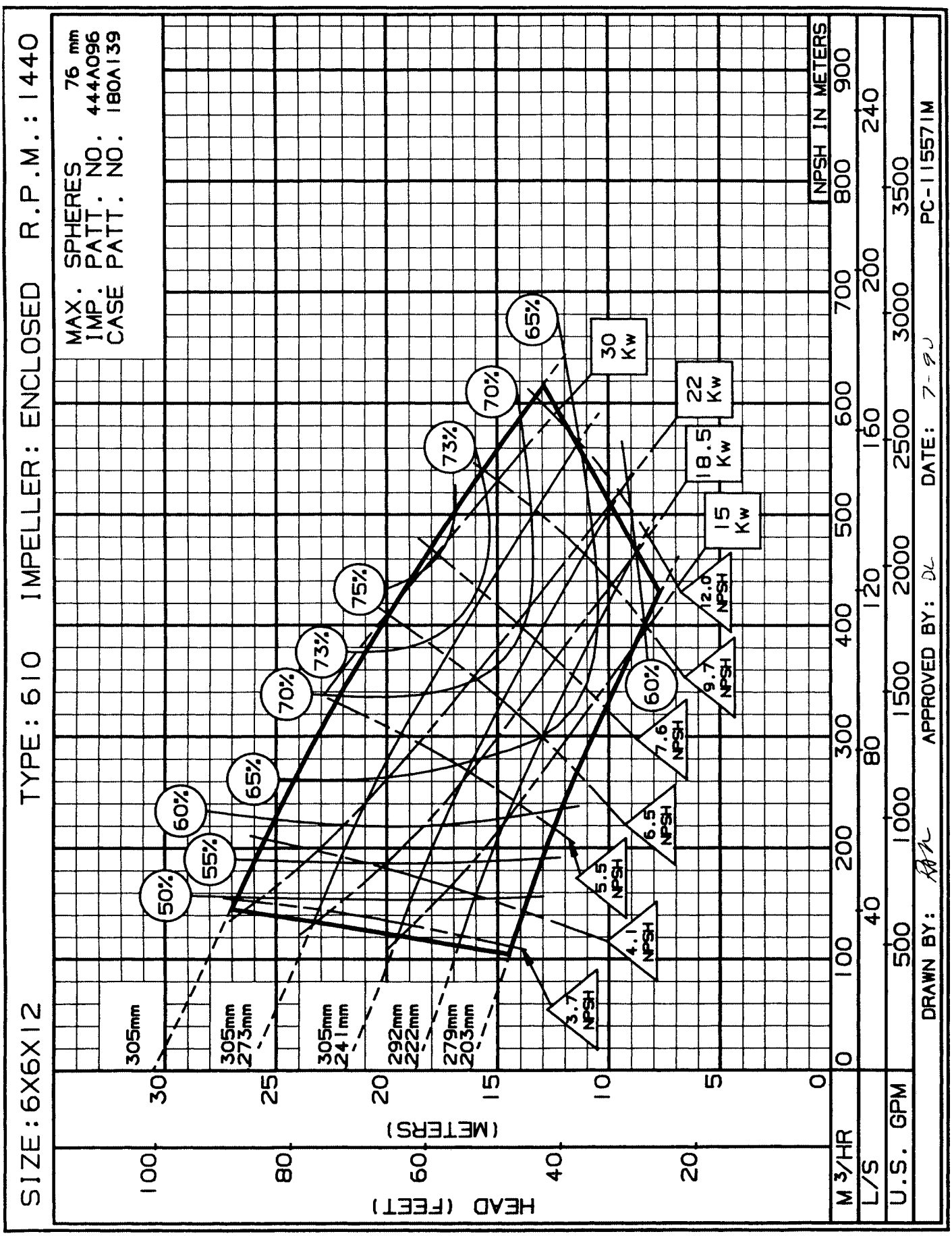
Performance Curves for the 610 Series (50 Hz) (cont.)

MODEL/SIZE	R.P.M.	PDF PAGE
16x16x28	735	46
16x16x28	575	47
16x16x28	480	48
18x18x28	575	49
18x18x28	480	50
18x18x28	410	51
20x20x28	575	52
20x20x28	480	53
20x20x28	410	54

AURORA®
Pentair Pump Group

6x6x12 - 1440 RPM
ENCLOSED IMPELLER

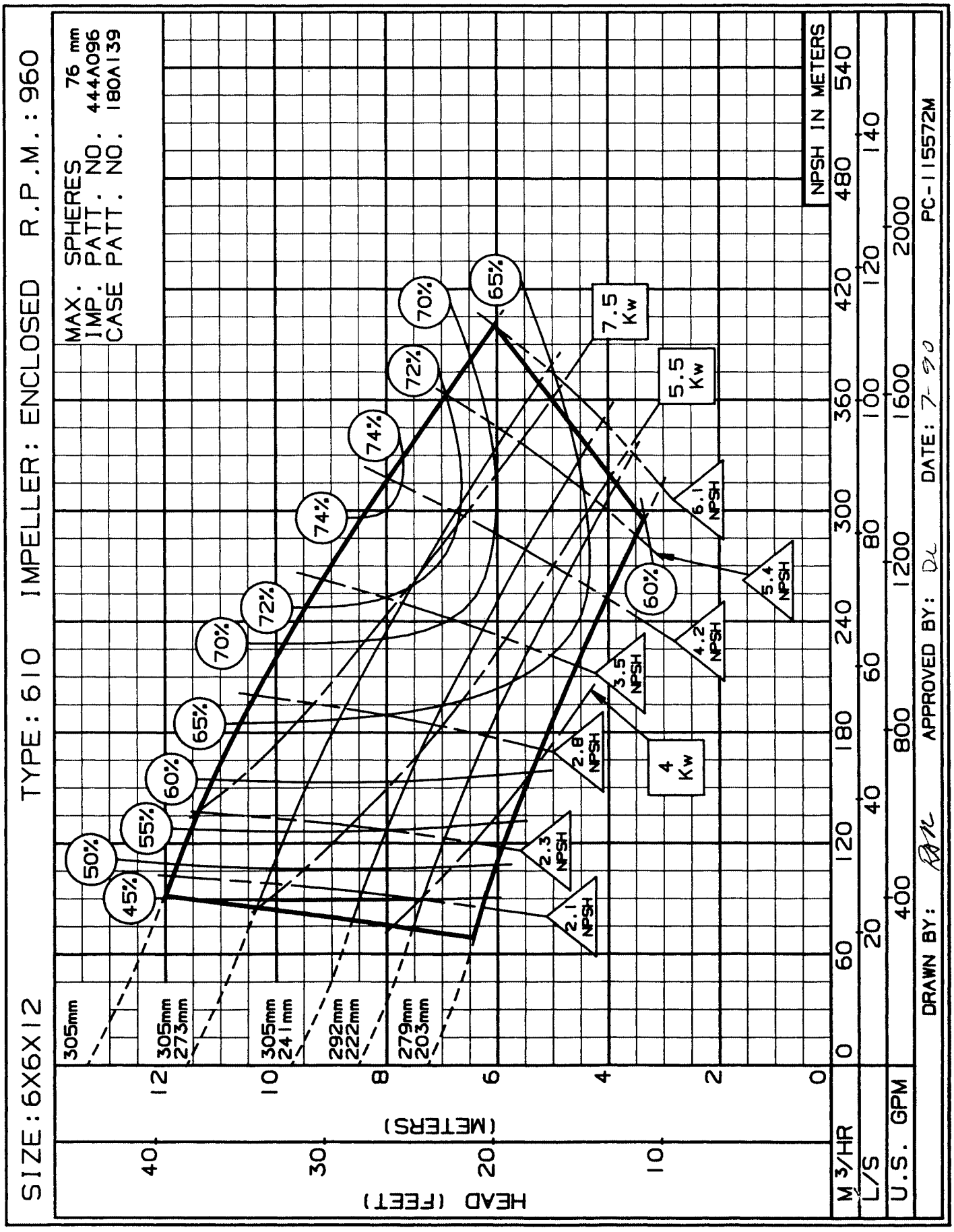
SECTION 610 (Metric 50Hz)
DATE JULY 1994
SUPERCEDES MARCH 1986



SECTION 610 (Metric 50Hz)
DATE JULY 1994
SUPERCEDES MARCH 1986

6x6x12 - 960 RPM
ENCLOSED IMPELLER

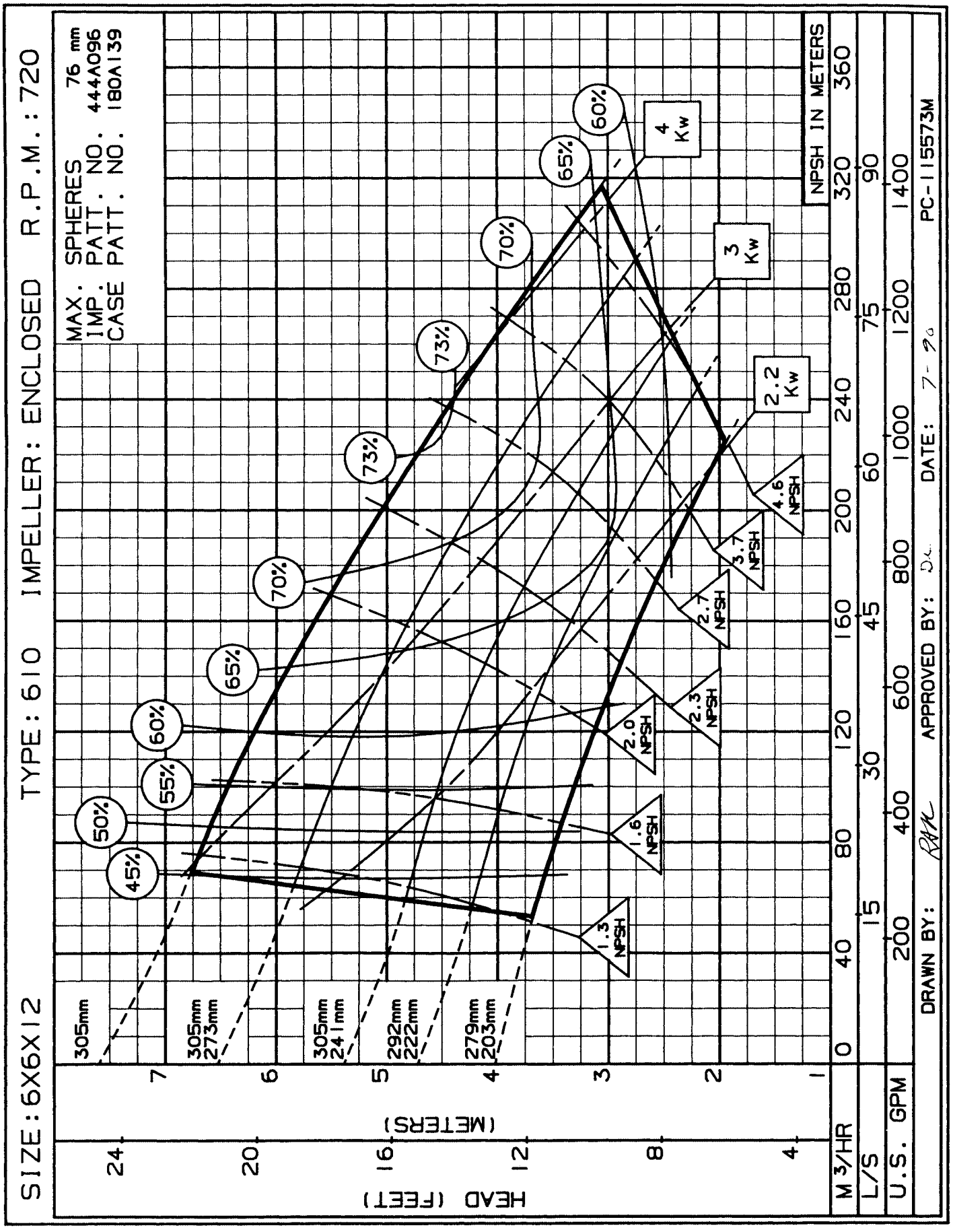
AURORA®
Pentair Pump Group



AURORA®
Pentair Pump Group

6x6x12 - 720 RPM
ENCLOSED IMPELLER

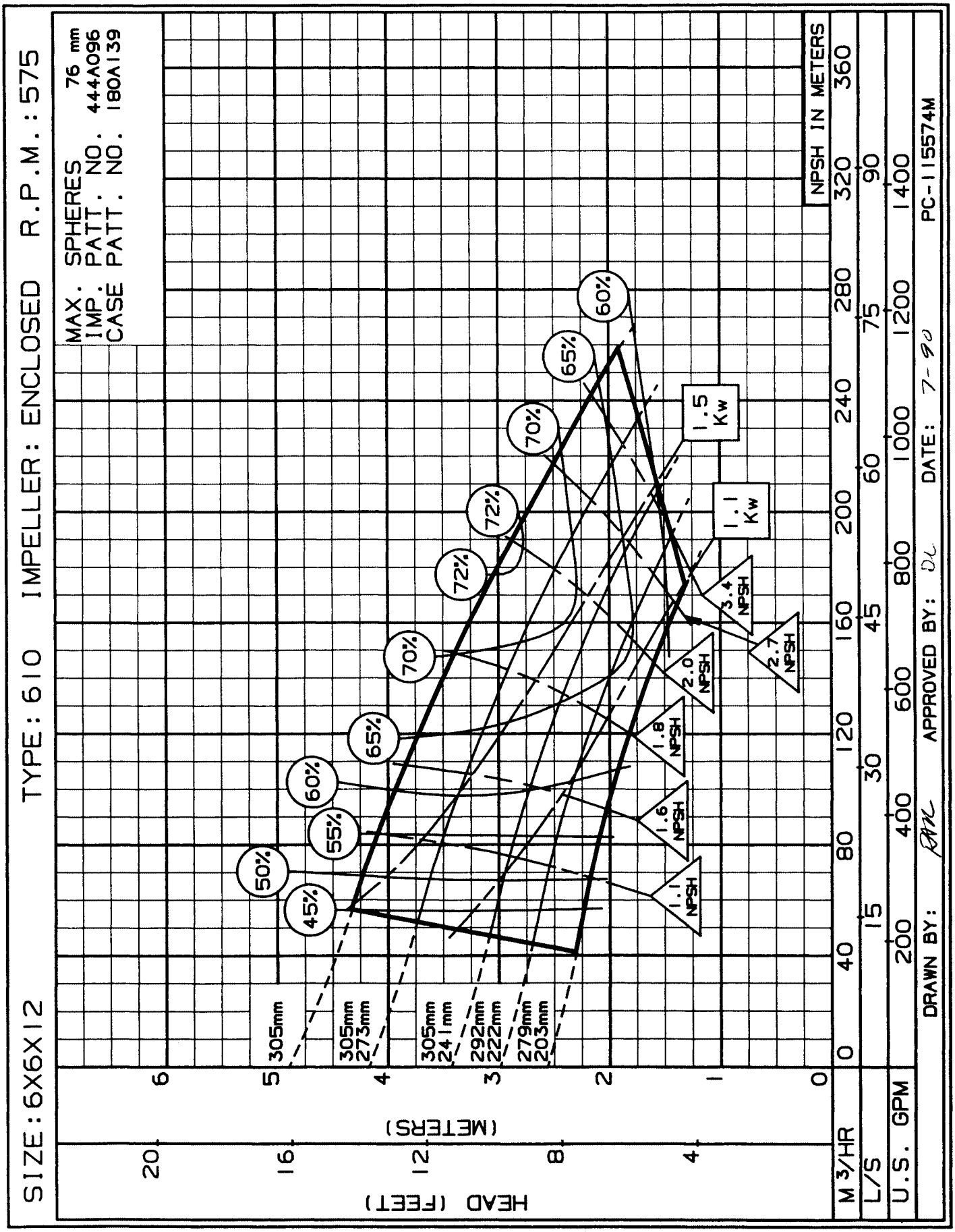
SECTION 610 (Metric 50Hz)
DATE JULY 1994
SUPERCEDES MARCH 1986



SECTION 610 (Metric 50Hz)
DATE JULY 1994
SUPERCEDES MARCH 1986

6x6x12 - 575 RPM
ENCLOSED IMPELLER

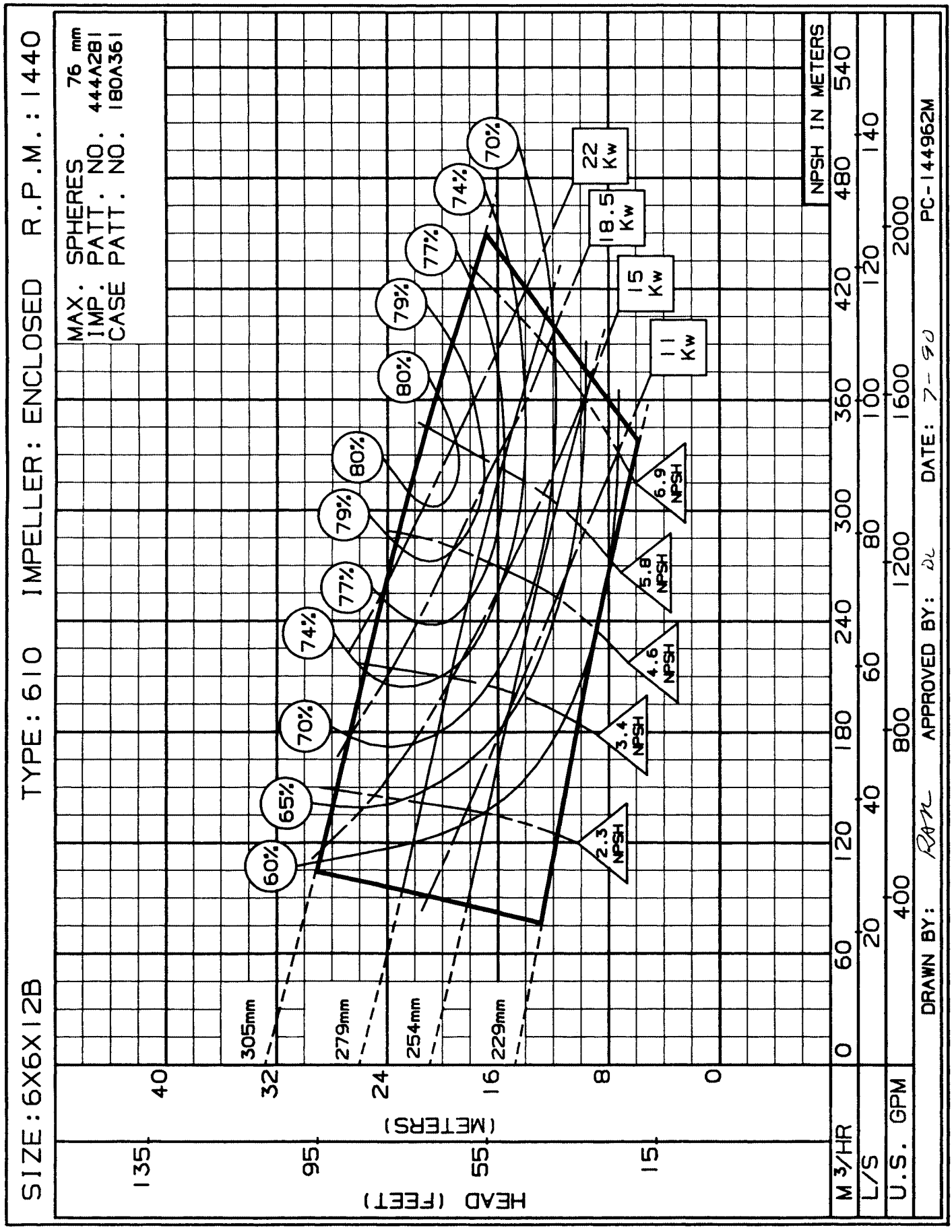
AURORA®
Pentair Pump Group



AURORA®
Pentair Pump Group

6x6x12B - 1440 RPM
ENCLOSED IMPELLER

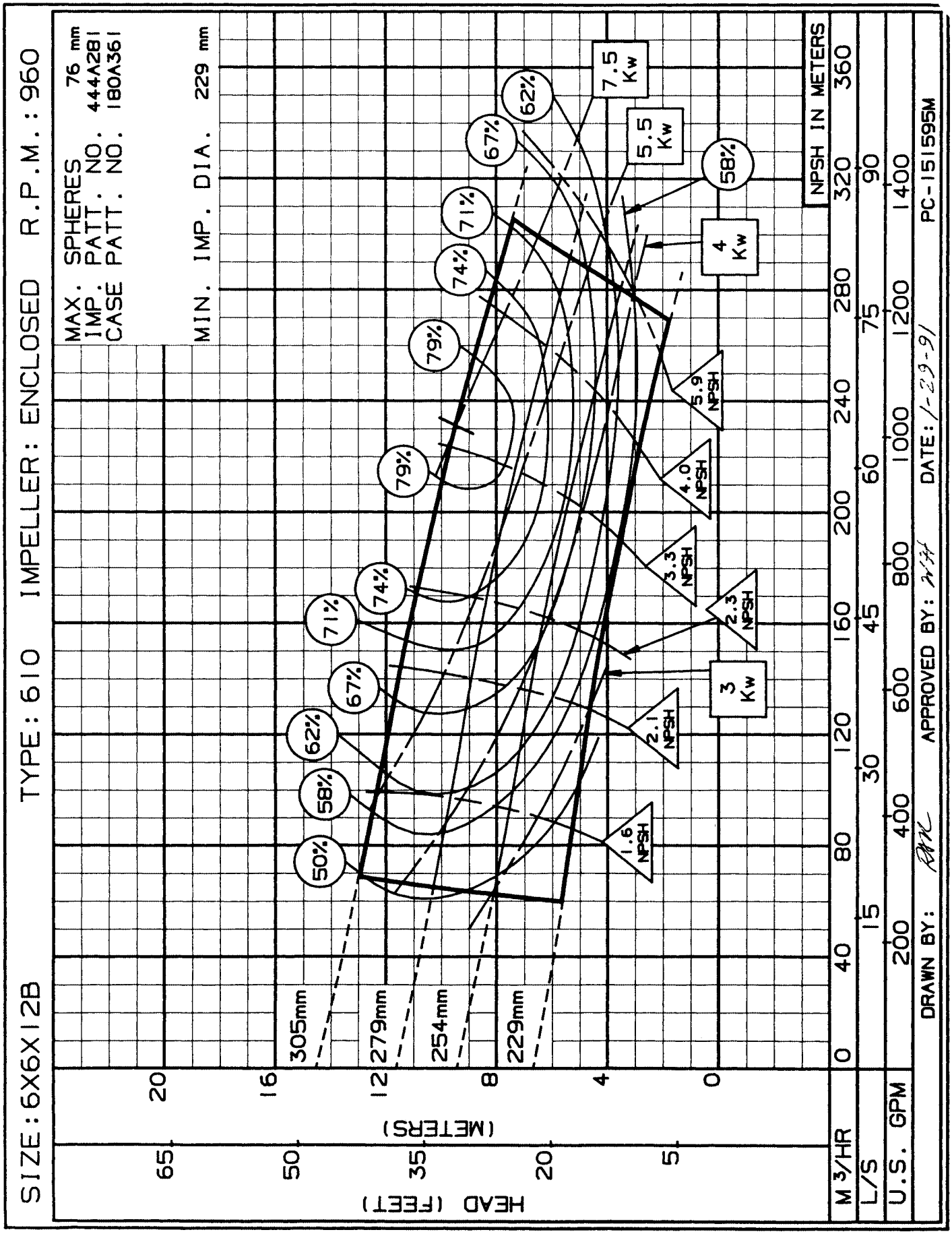
SECTION 610 (Metric 50Hz)
DATE JULY 1994
SUPERCEDES MARCH 1986



SECTION 610 (Metric 50Hz)
DATE JULY 1994
SUPERCEDES MARCH 1986

6x6x12B - 960 RPM
ENCLOSED IMPELLER

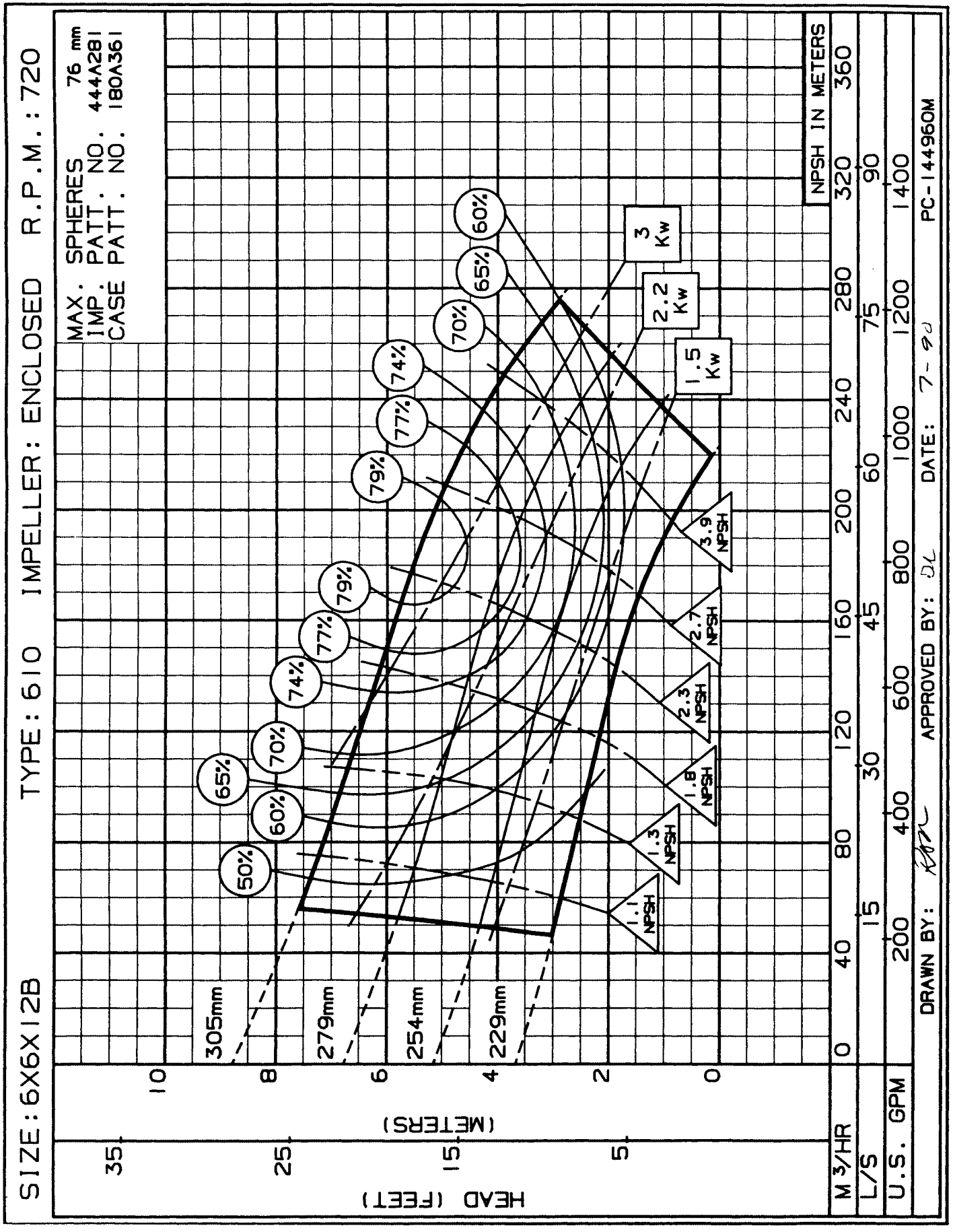
AURORA®
Pentair Pump Group



AURORA®
Pentair Pump Group

6x6x12B - 720 RPM
ENCLOSED IMPELLER

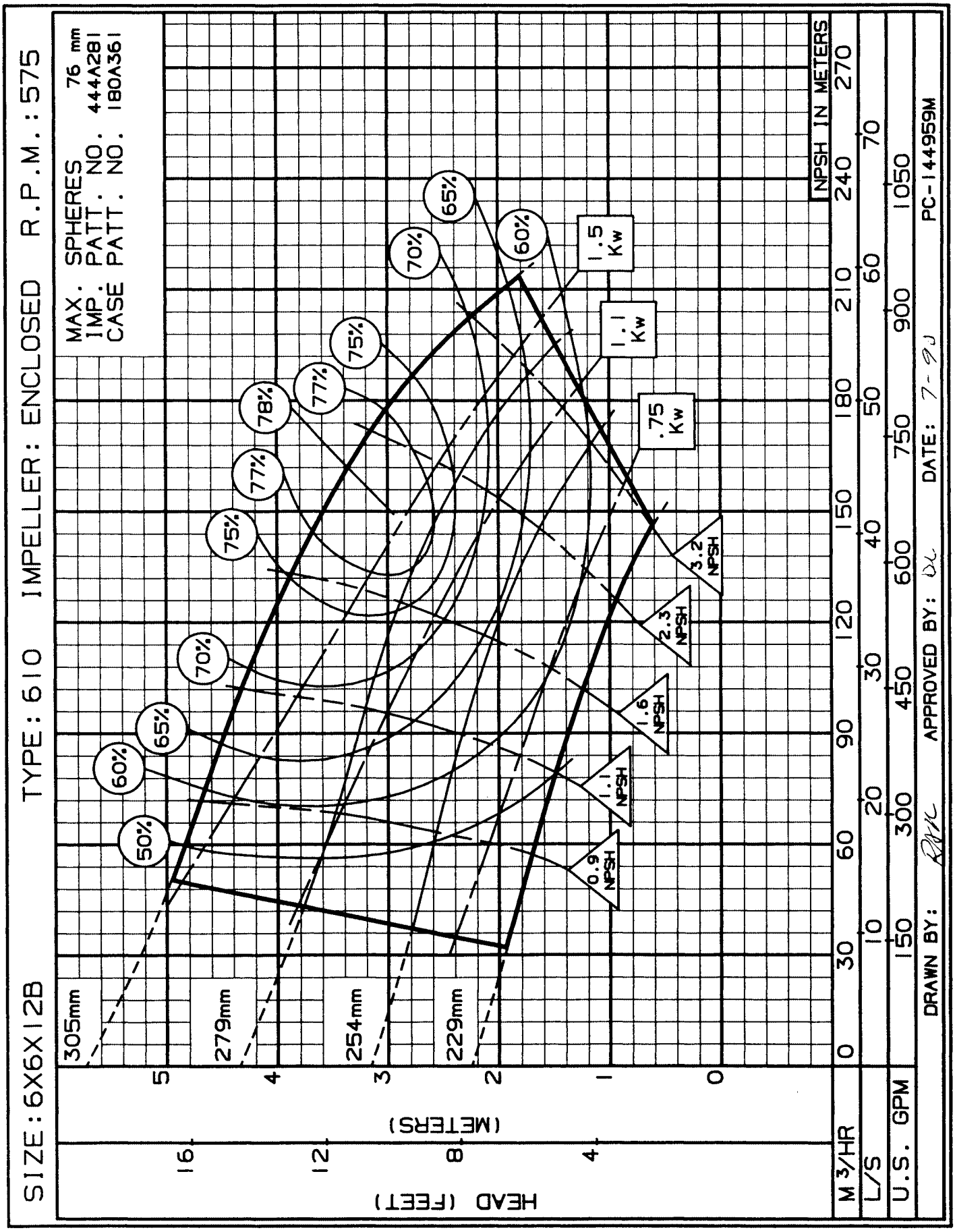
SECTION 610 (Metric 50Hz)
DATE JULY 1994
SUPERCEDES MARCH 1986



SECTION 610 (Metric 50Hz)
DATE JULY 1994
SUPERCEDES MARCH 1986

6x6x12B - 575 RPM
ENCLOSED IMPELLER

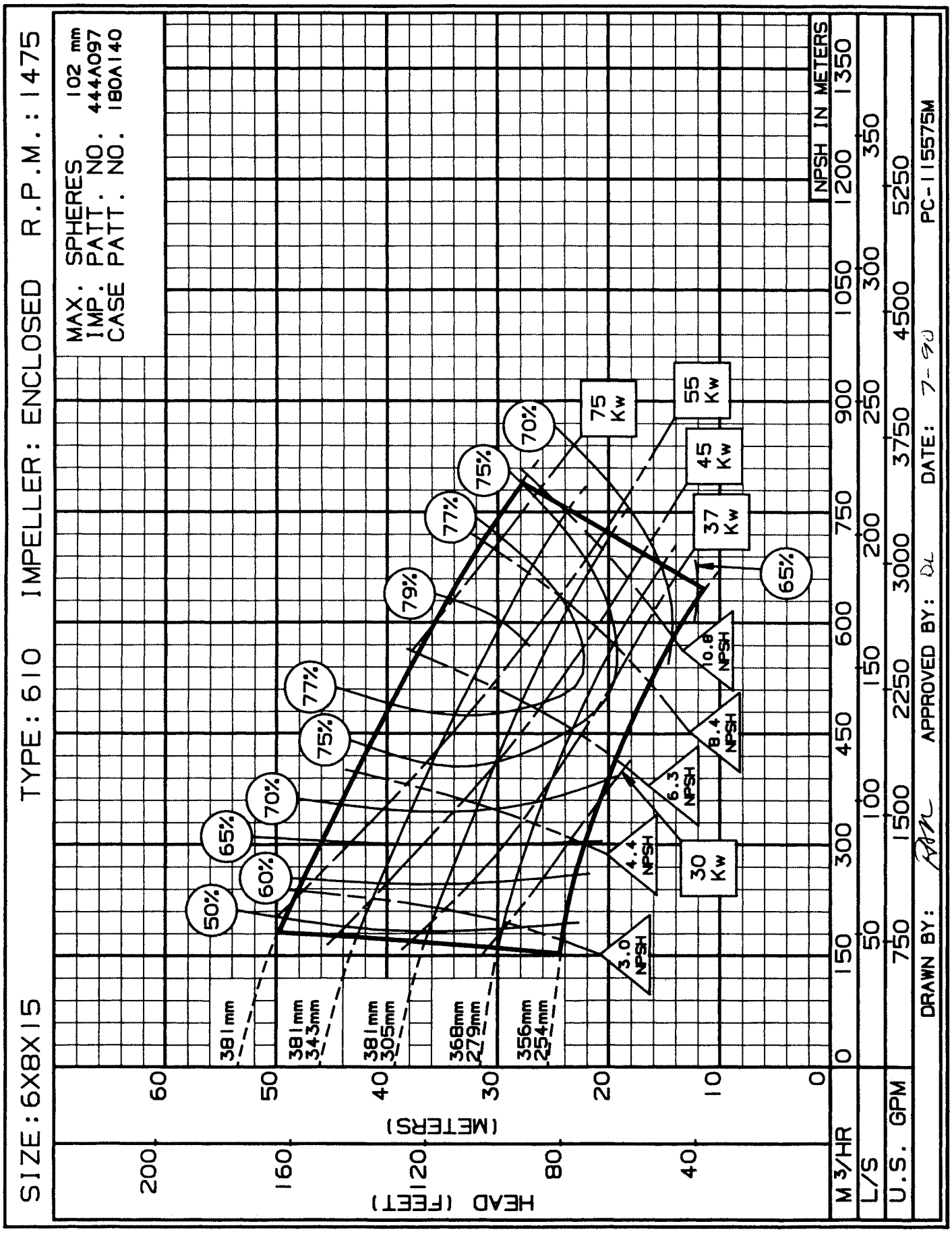
AURORA®
Pentair Pump Group



AURORA®
Pentair Pump Group

6x8x15 - 1475 RPM
ENCLOSED IMPELLER

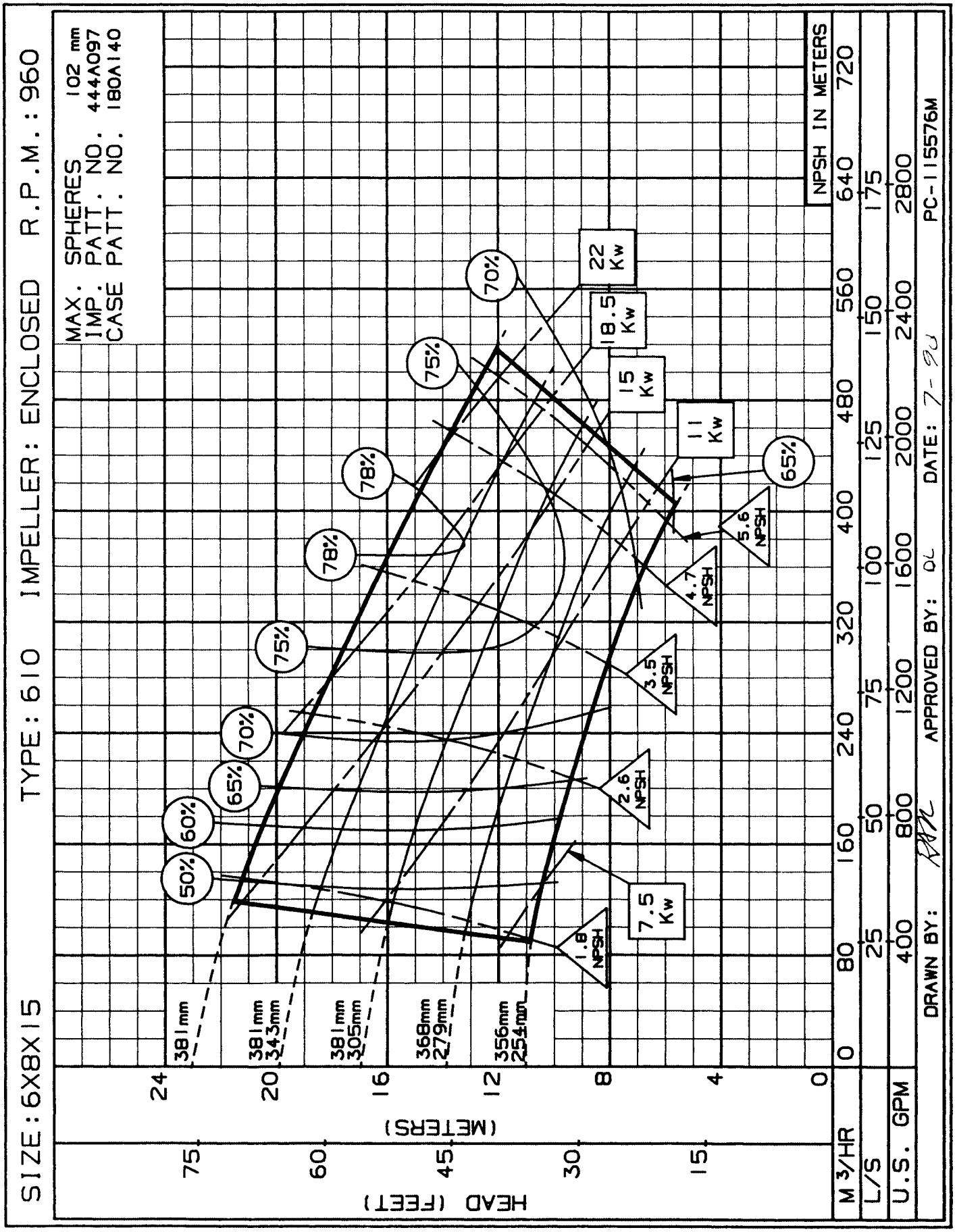
SECTION 610 (Metric 50Hz)
DATE JULY 1994
SUPERCEDES MARCH 1986



SECTION **610 (Metric 50Hz)**
DATE **JULY 1994**
SUPERCEDES MARCH 1986

6x6x15 - 960 RPM
ENCLOSED IMPELLER

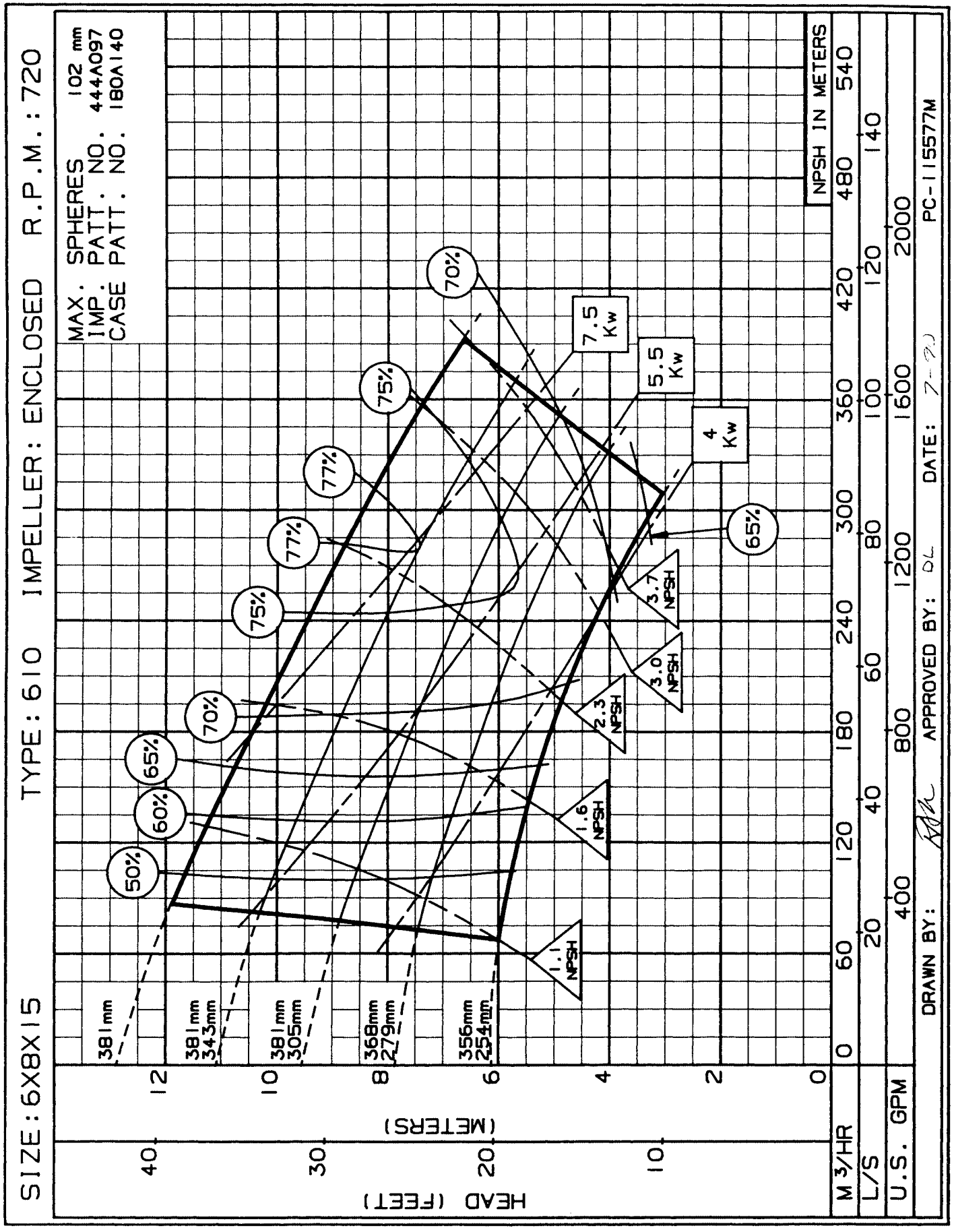
AURORA®
Pentair Pump Group



AURORA®
Pentair Pump Group

6x8x15 - 720 RPM
ENCLOSED IMPELLER

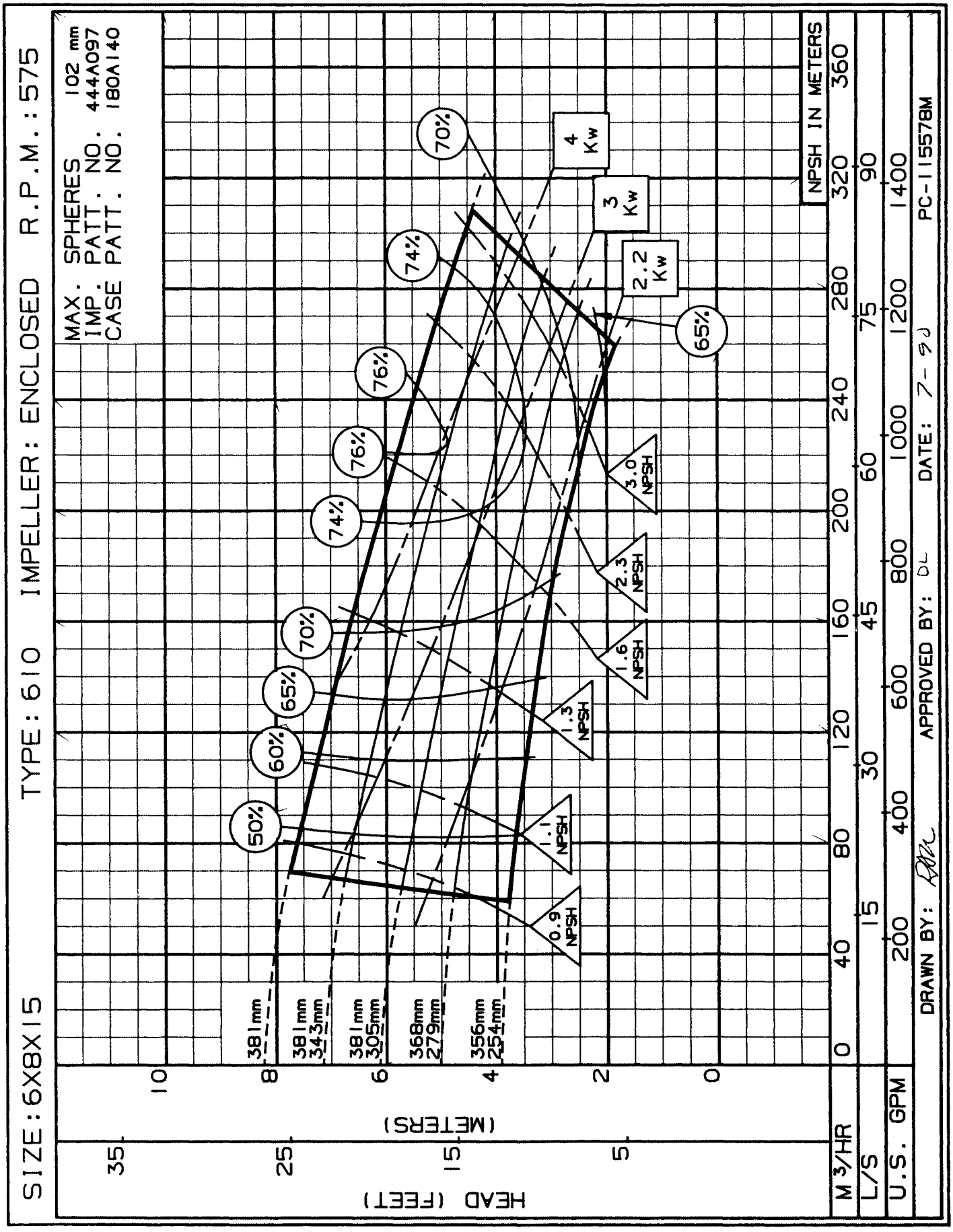
SECTION 610 (Metric 50Hz)
DATE JULY 1994
SUPERCEDES MARCH 1986



SECTION **610 (Metric 50Hz)**
DATE **JULY 1994**
SUPERCEDES MARCH 1986

6x8x15 - 575 RPM
ENCLOSED IMPELLER

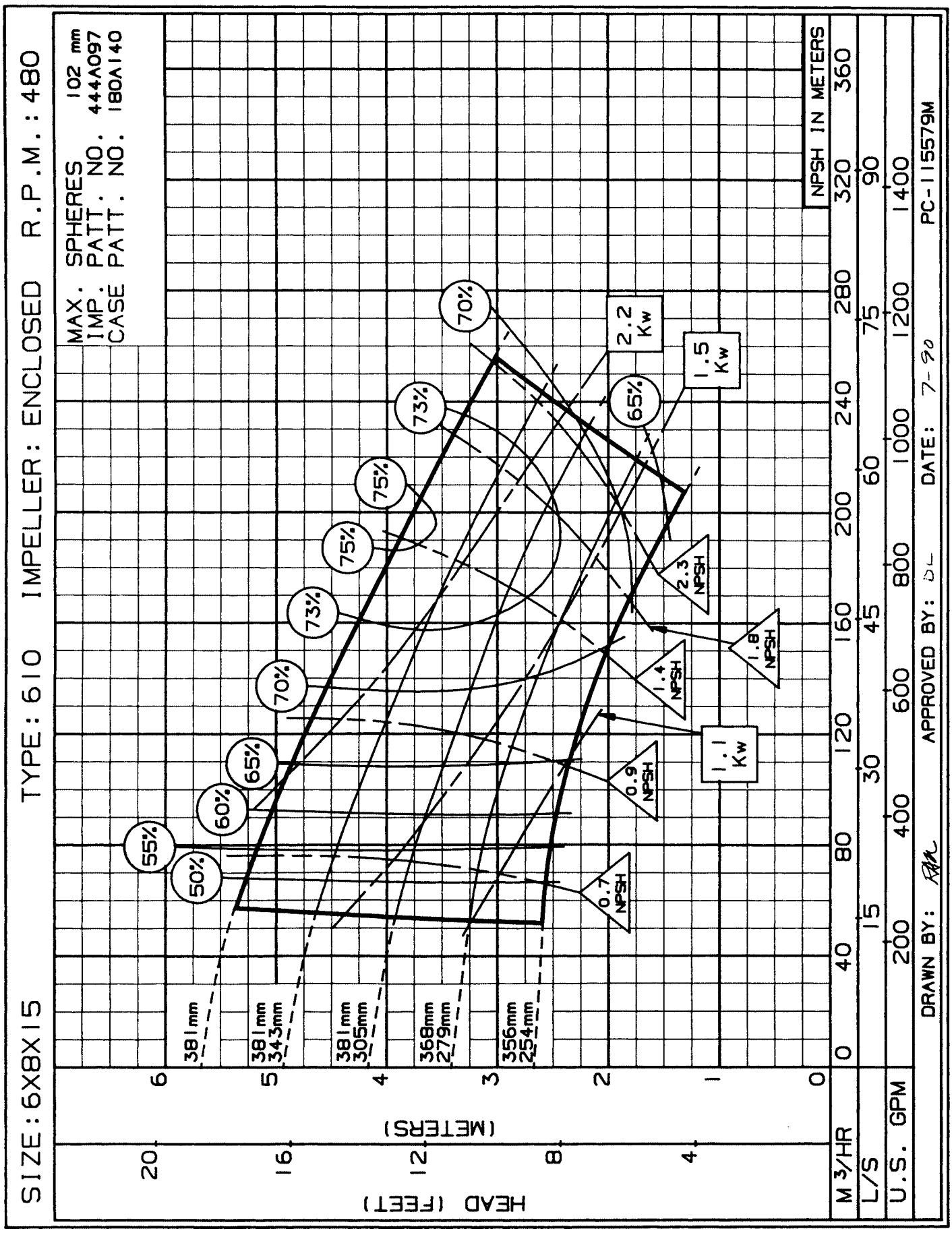
AURORA®
Pentair Pump Group



AURORA®
Pentair Pump Group

6x8x15 - 480 RPM
ENCLOSED IMPELLER

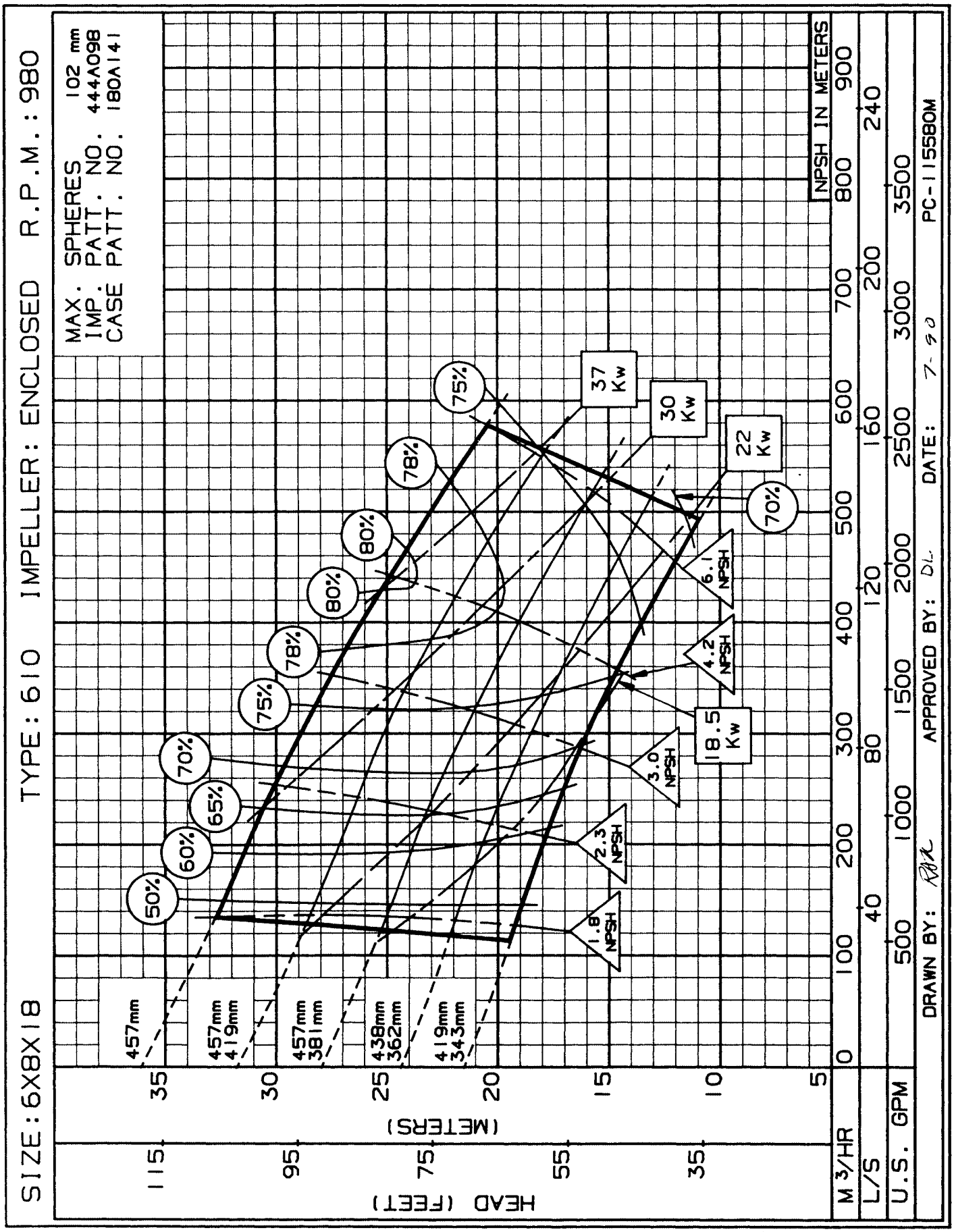
SECTION 610 (Metric 50Hz)
DATE JULY 1994
SUPERCEDES MARCH 1986



SECTION **610 (Metric 50Hz)**
DATE **JULY 1994**
SUPERCEDES MARCH 1986

6x8x18 - 980 RPM
ENCLOSED IMPELLER

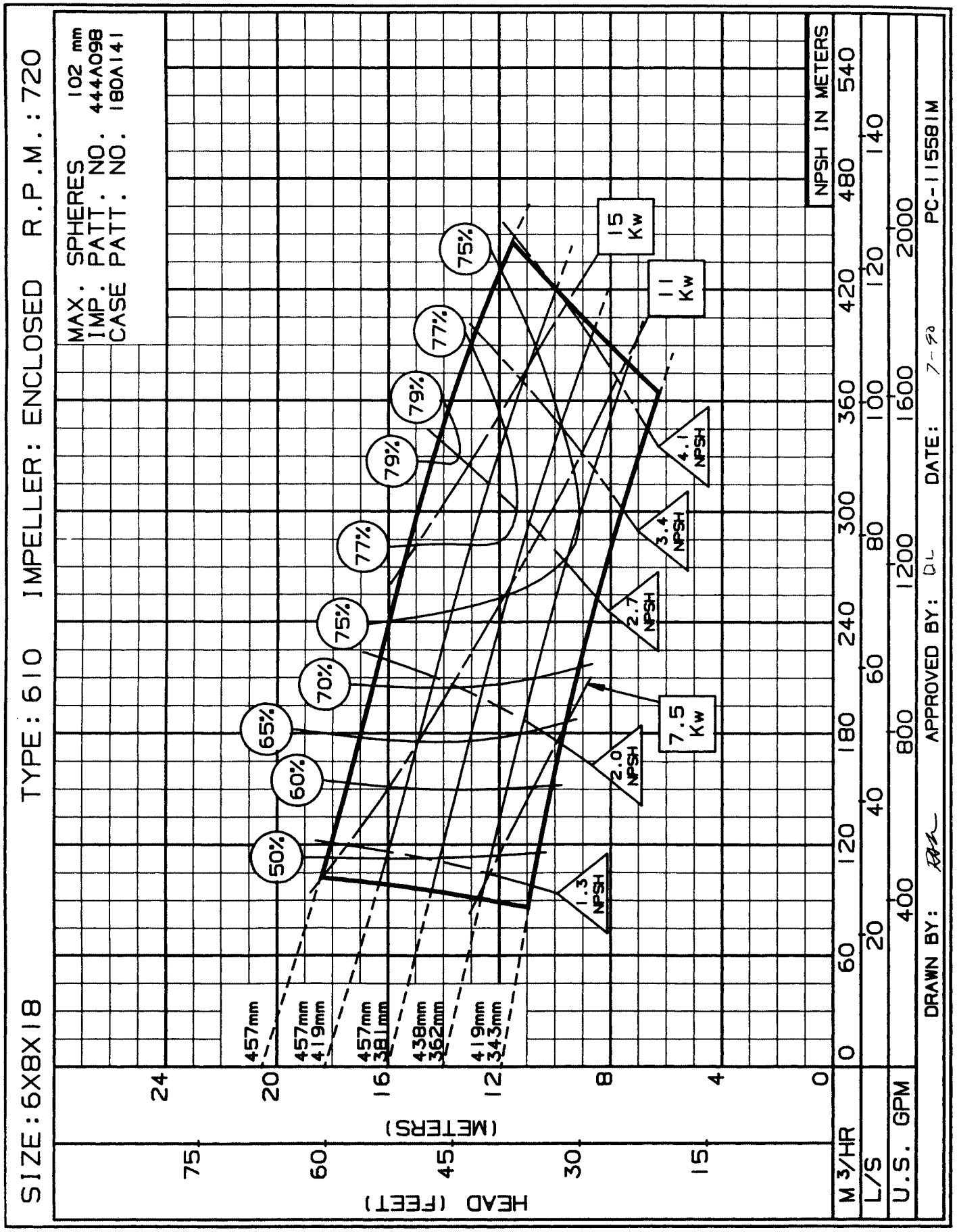
AURORA®
Pentair Pump Group



AURORA®
Pentair Pump Group

6x8x18 - 720 RPM
ENCLOSED IMPELLER

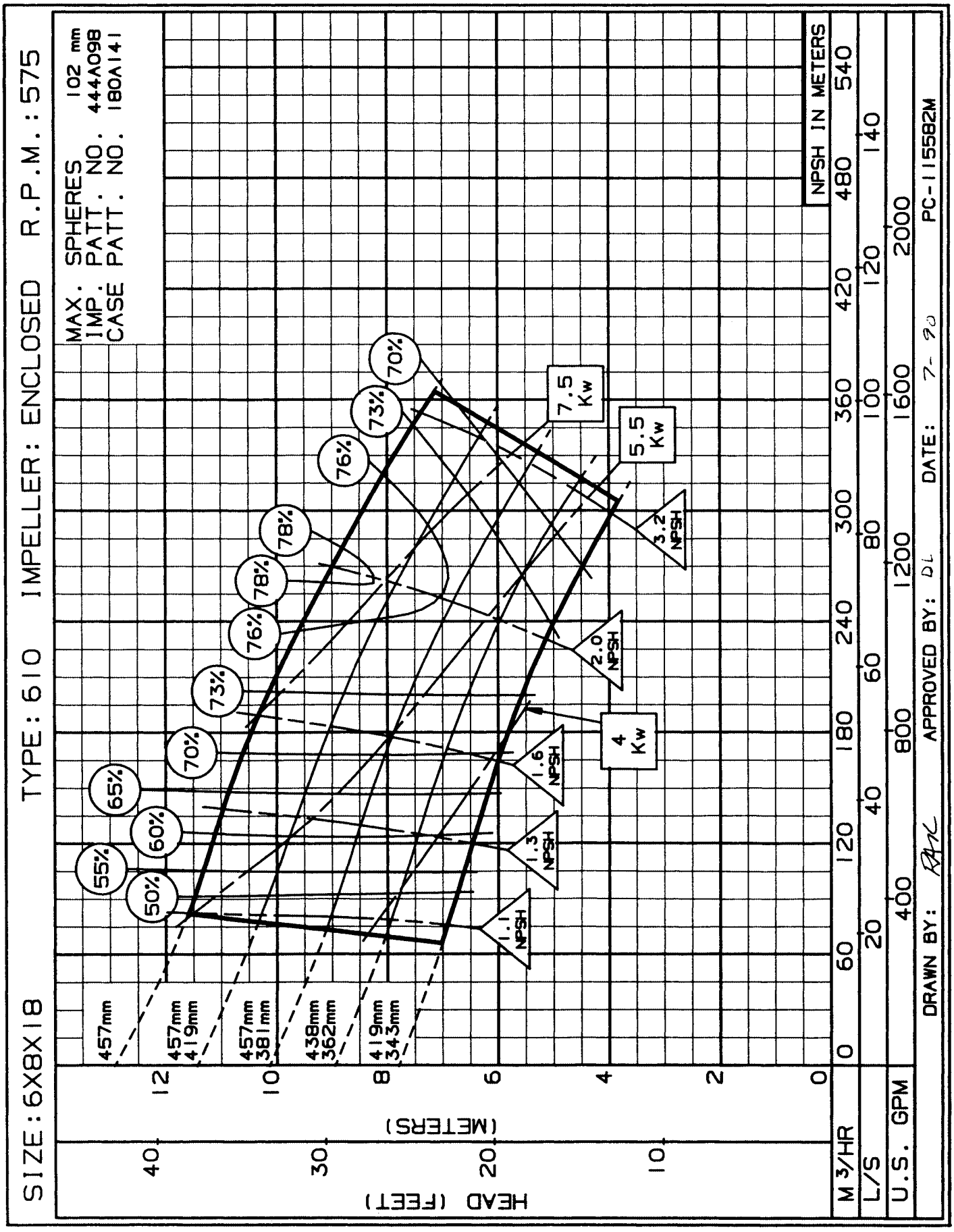
SECTION 610 (Metric 50Hz)
DATE JULY 1994
SUPERCEDES MARCH 1986



SECTION 610 (Metric 50Hz)
DATE JULY 1994
SUPERCEDES MARCH 1986

6x8x18 - 575 RPM
ENCLOSED IMPELLER

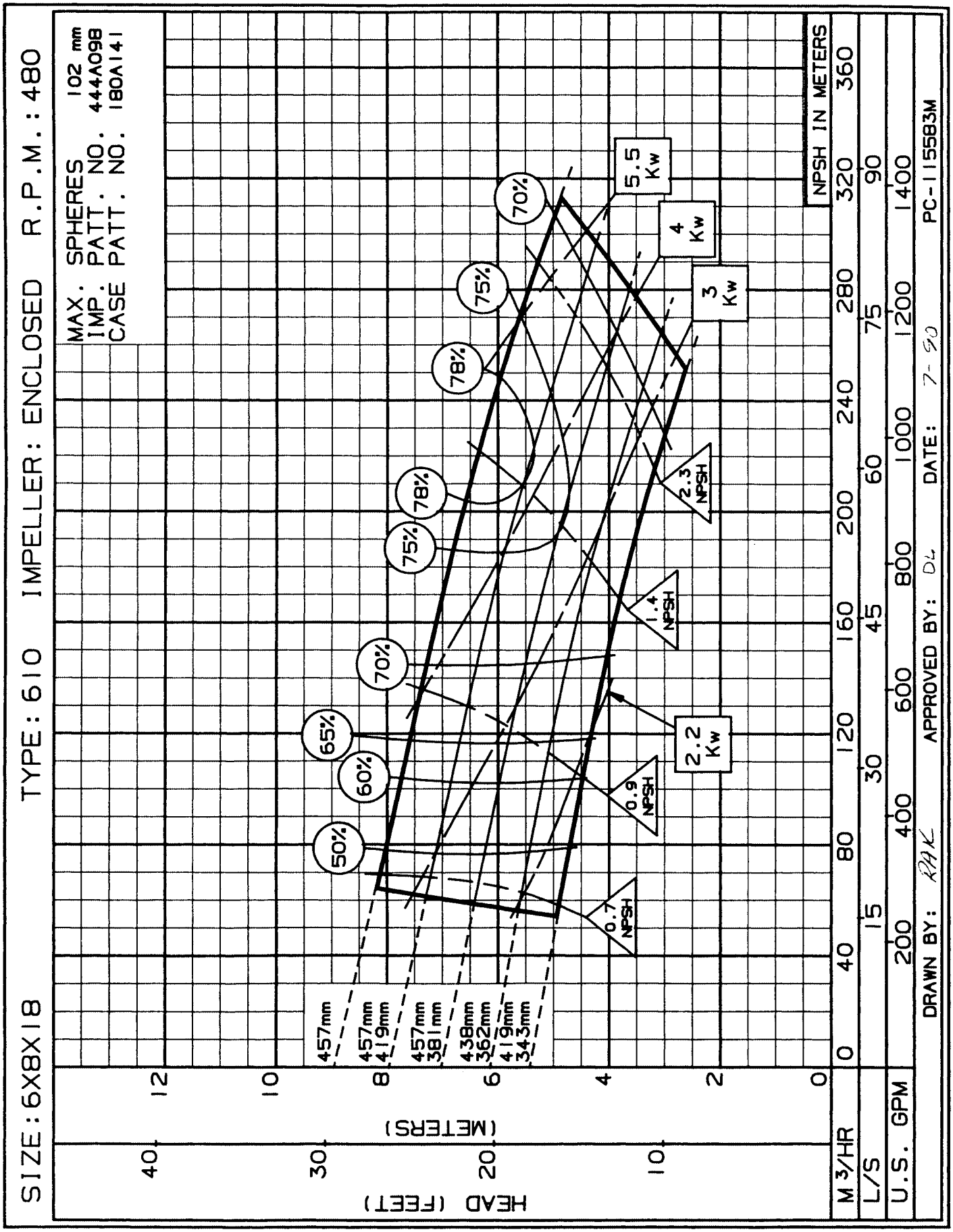
AURORA®
Pentair Pump Group



AURORA®
Pentair Pump Group

6x8x18 - 480 RPM
ENCLOSED IMPELLER

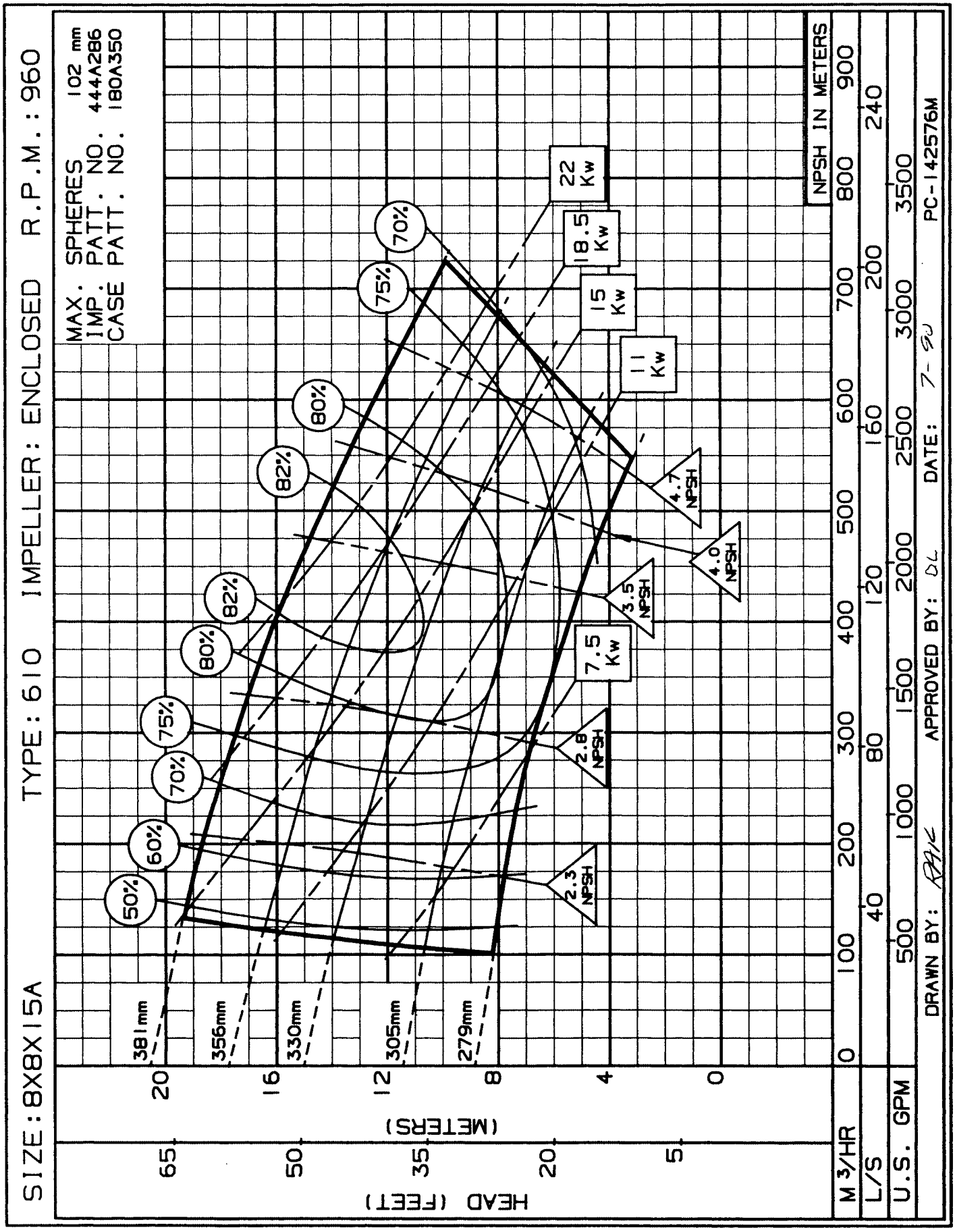
SECTION 610 (Metric 50Hz)
DATE JULY 1994
SUPERCEDES MARCH 1986



SECTION 610 (Metric 50Hz)
DATE JULY 1994
SUPERCEDES MARCH 1986

8x8x15A - 960 RPM
ENCLOSED IMPELLER

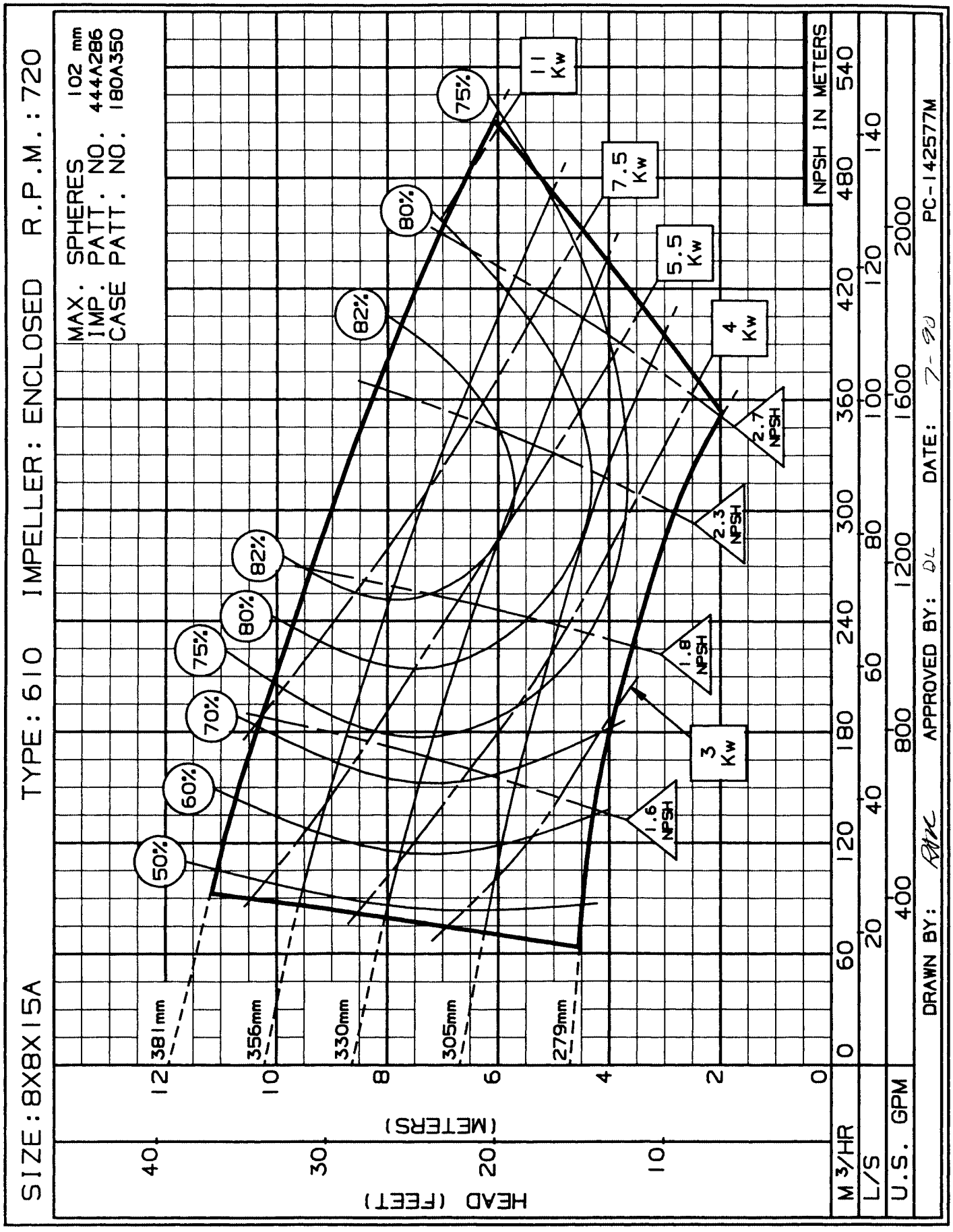
AURORA®
Pentair Pump Group



AURORA®
Pentair Pump Group

8x8x15A - 720 RPM
ENCLOSED IMPELLER

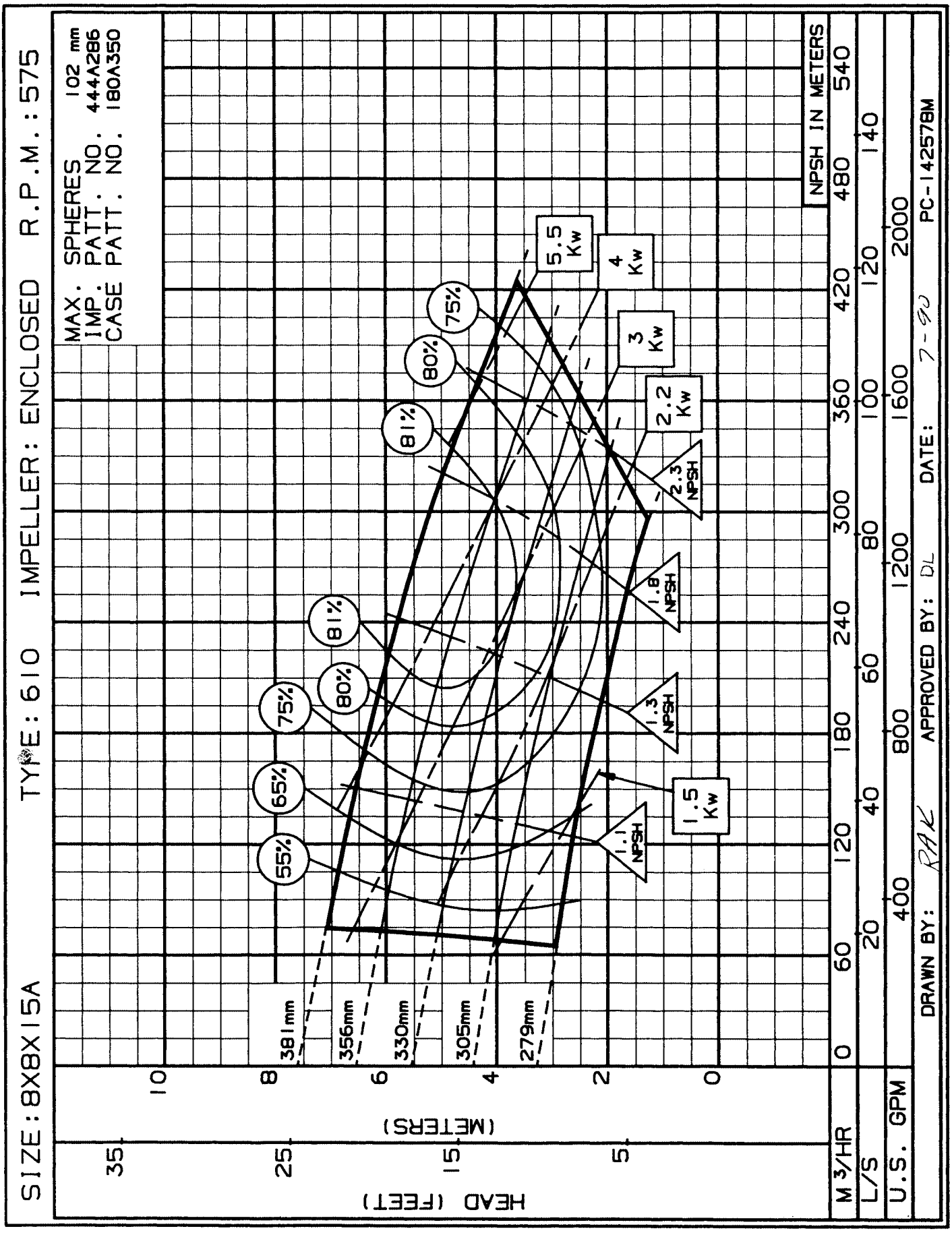
SECTION 610 (Metric 50Hz)
DATE JULY 1994
SUPERCEDES MARCH 1986



SECTION 610 (Metric 50Hz)
DATE JULY 1994
SUPERCEDES MARCH 1986

8x8x15A - 575 RPM
ENCLOSED IMPELLER

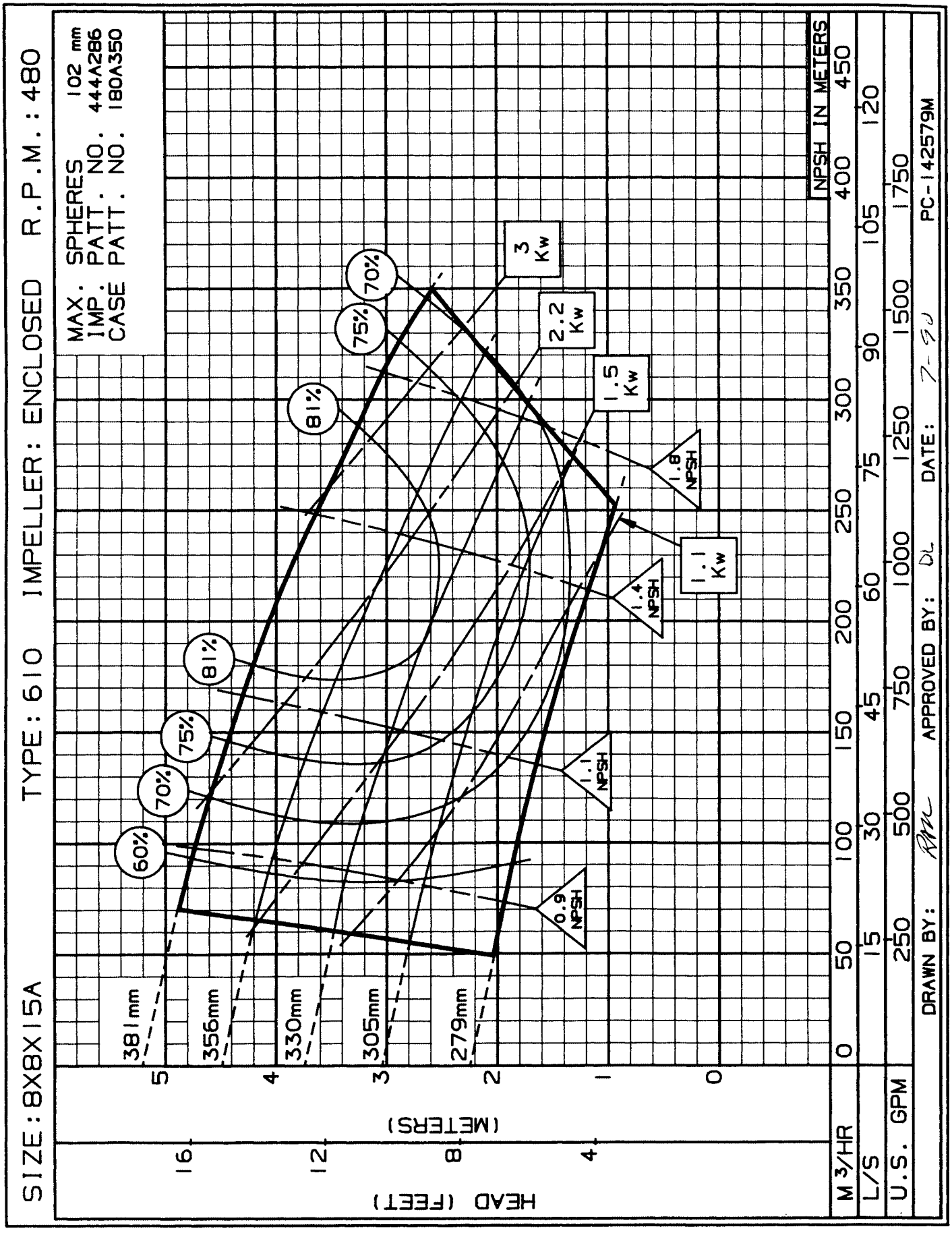
AURORA®
Pentair Pump Group



AURORA®
Pentair Pump Group

8x8x15A - 480 RPM
ENCLOSED IMPELLER

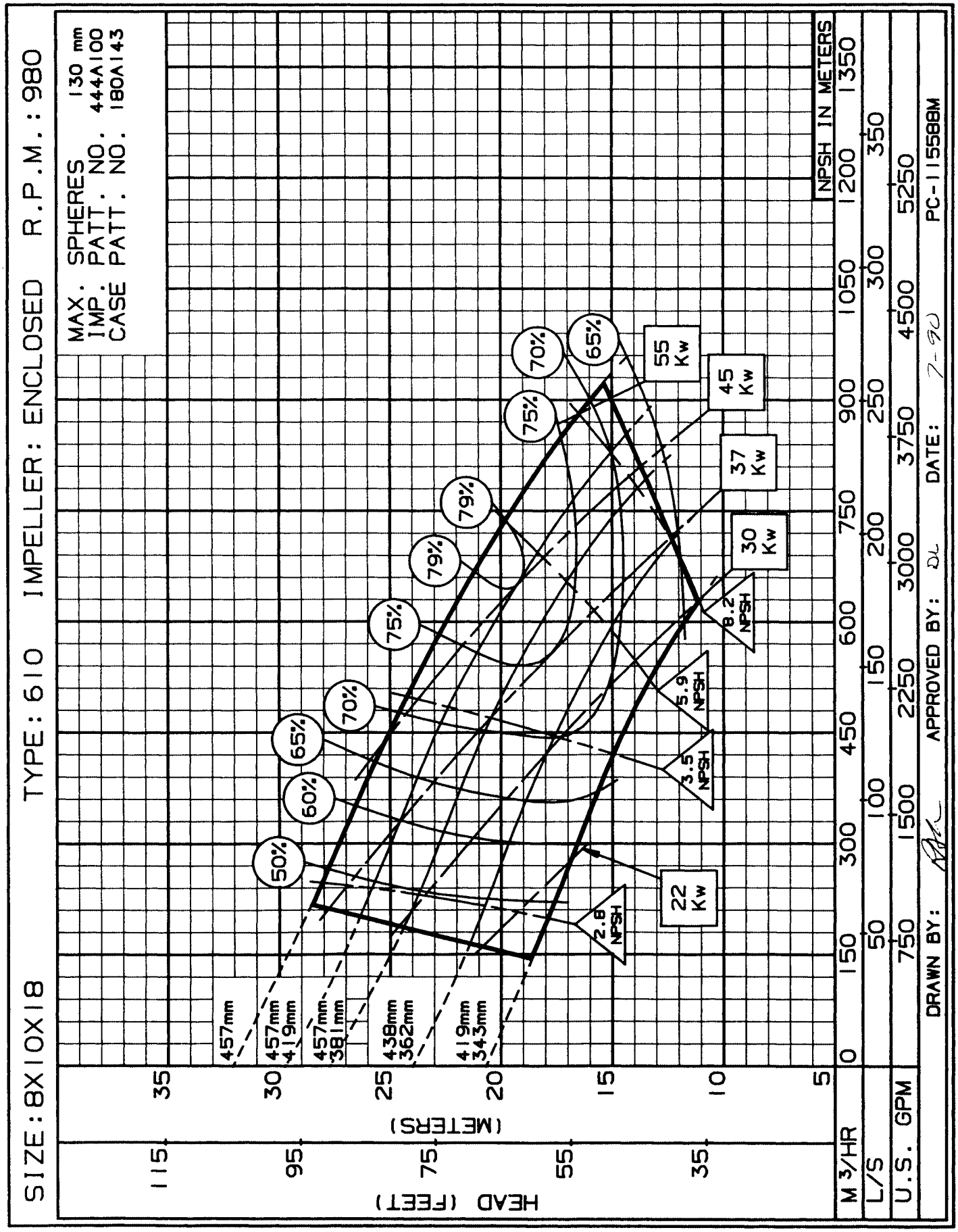
SECTION 610 (Metric 50Hz)
DATE JULY 1994
SUPERCEDES MARCH 1986



SECTION 610 (Metric 50Hz)
DATE JULY 1994
SUPERCEDES MARCH 1986

8x10x18 - 980 RPM
ENCLOSED IMPELLER

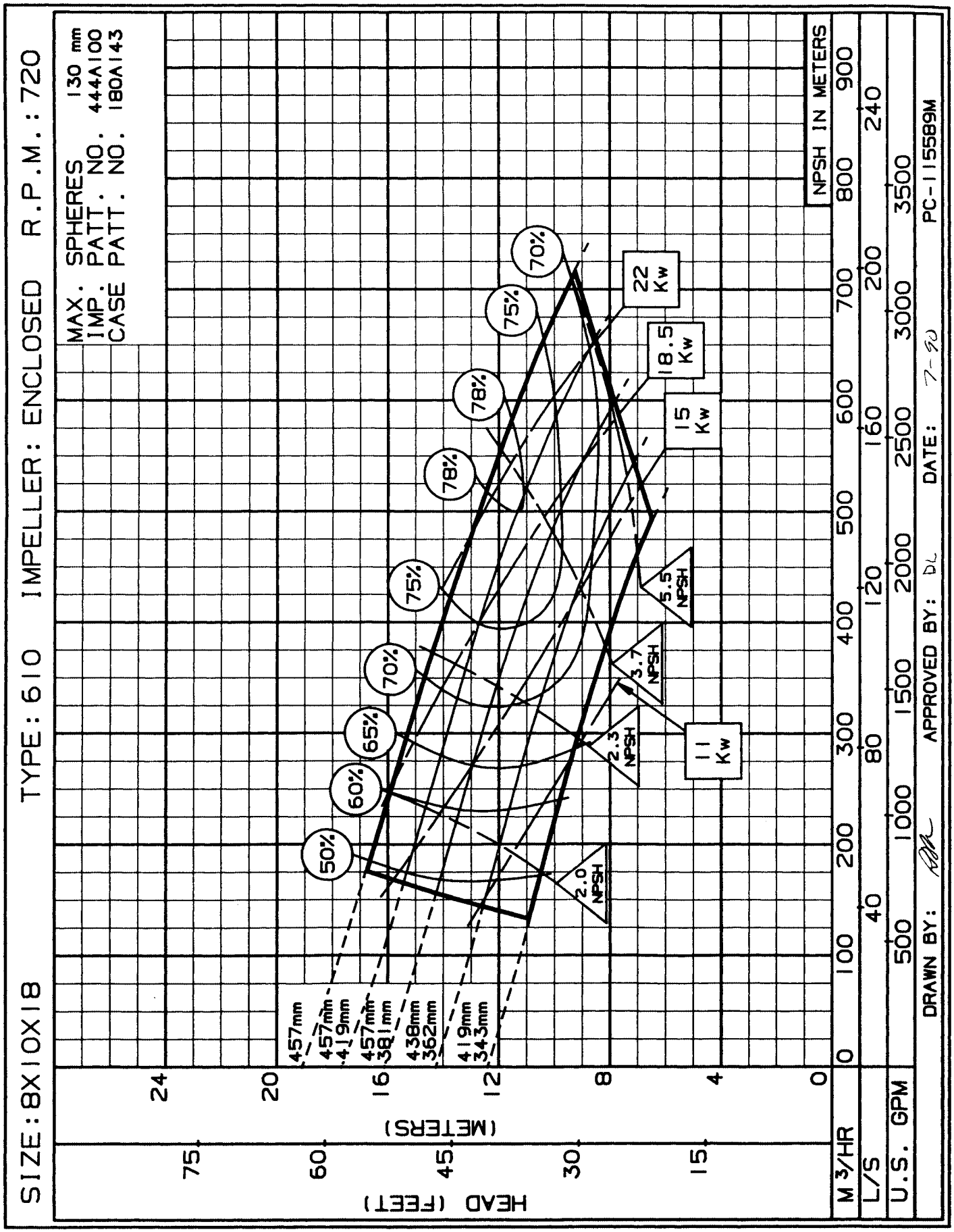
AURORA®
Pentair Pump Group



AURORA®
Pentair Pump Group

8x10x18 - 720 RPM
ENCLOSED IMPELLER

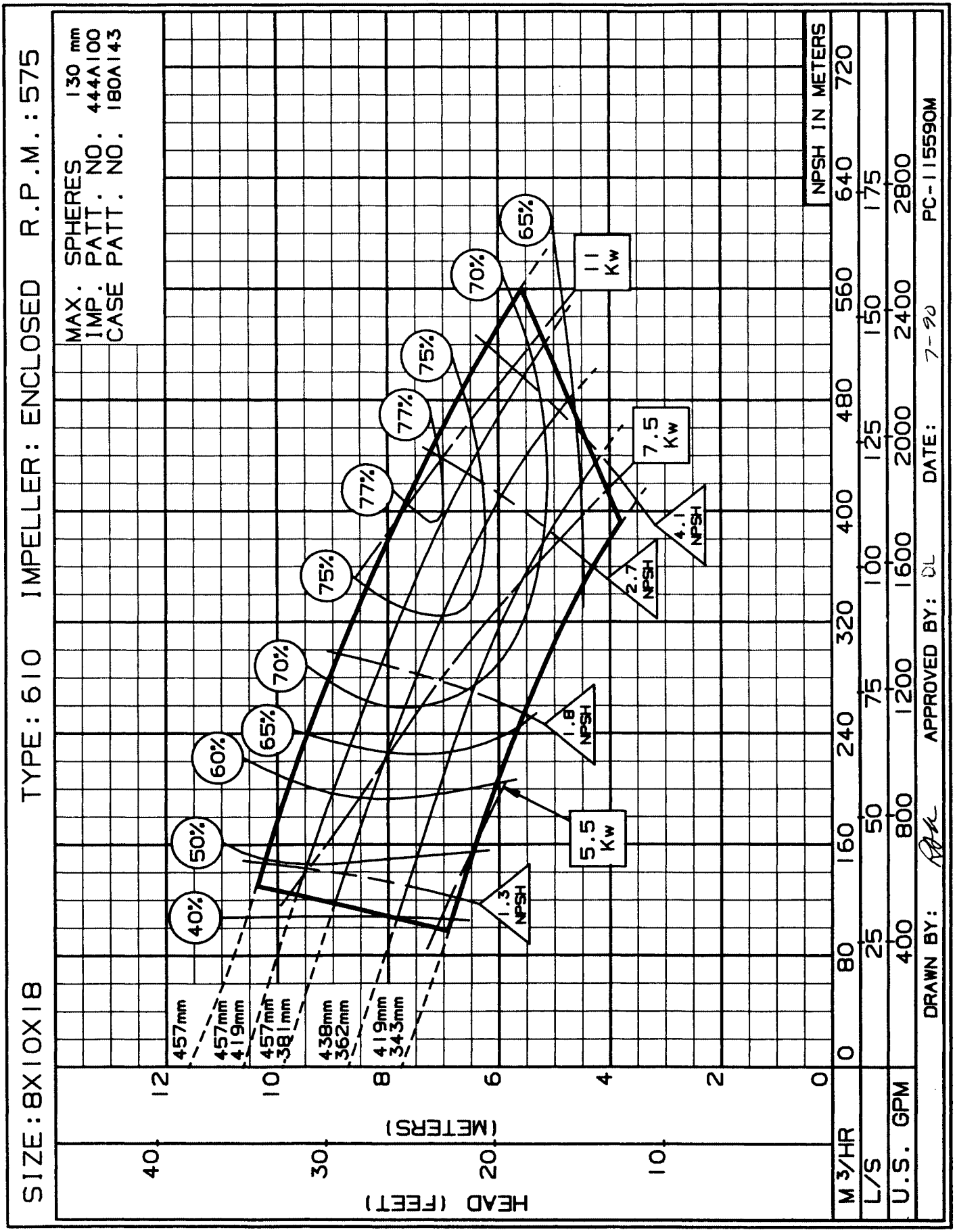
SECTION 610 (Metric 50Hz)
DATE JULY 1994
SUPERCEDES MARCH 1986



SECTION 610 (Metric 50Hz)
DATE JULY 1994
SUPERCEDES MARCH 1986

8x10x18 - 575 RPM
ENCLOSED IMPELLER

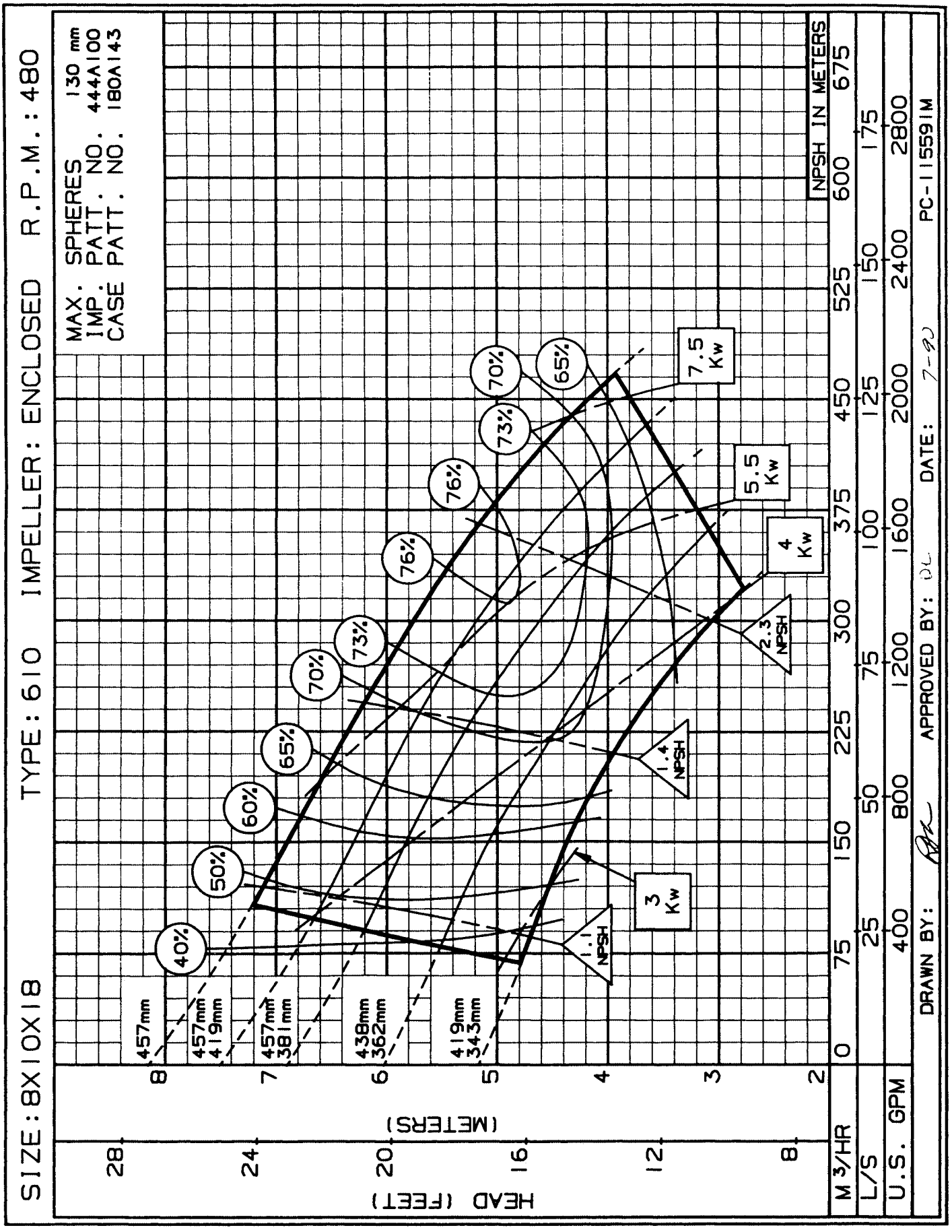
AURORA®
Pentair Pump Group



AURORA®
Pentair Pump Group

8x10x18 - 480 RPM
ENCLOSED IMPELLER

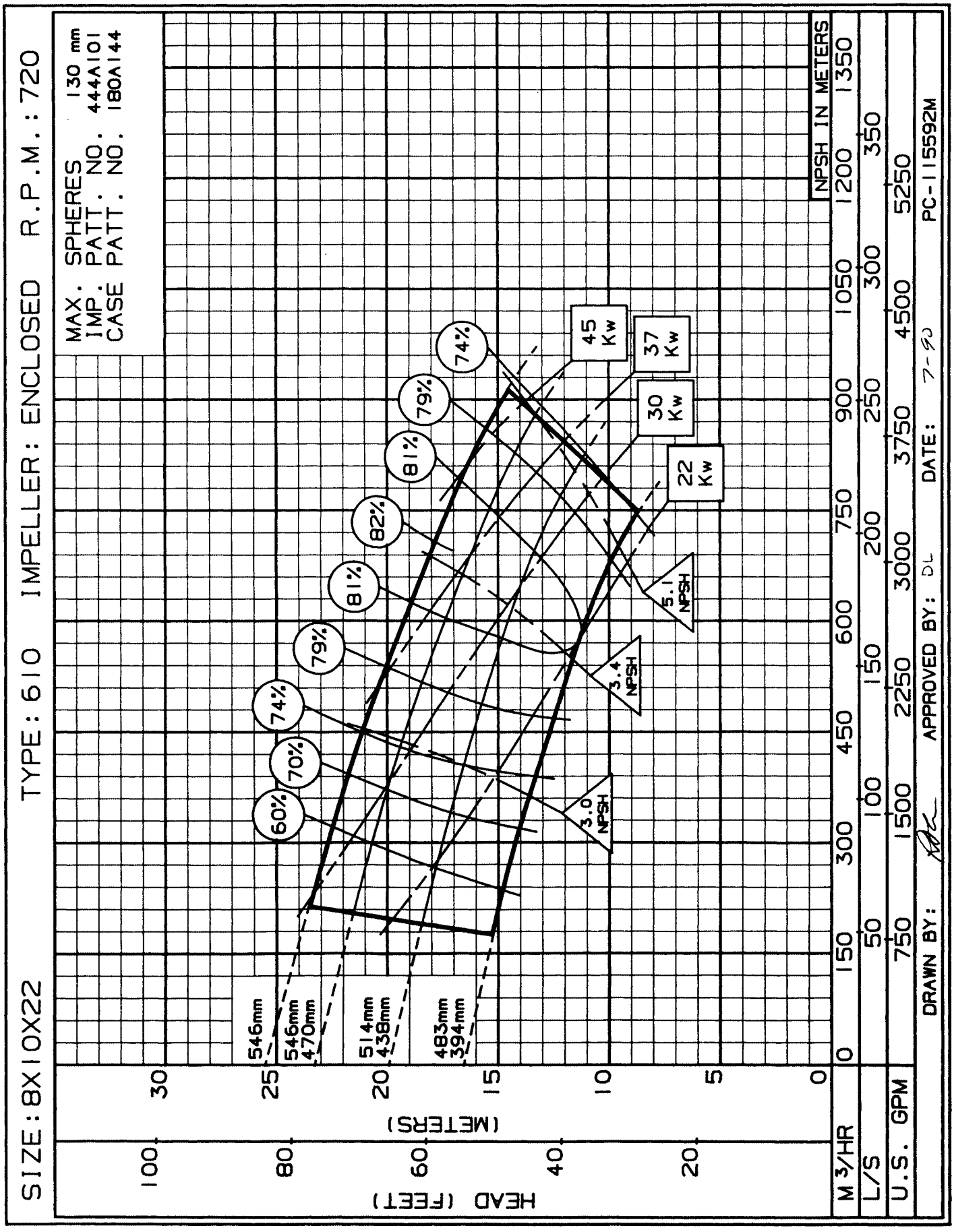
SECTION 610 (Metric 50Hz)
DATE JULY 1994
SUPERCEDES MARCH 1986



SECTION 610 (Metric 50Hz)
DATE JULY 1994
SUPERCEDES MARCH 1986

8x10x22 - 720 RPM
ENCLOSED IMPELLER

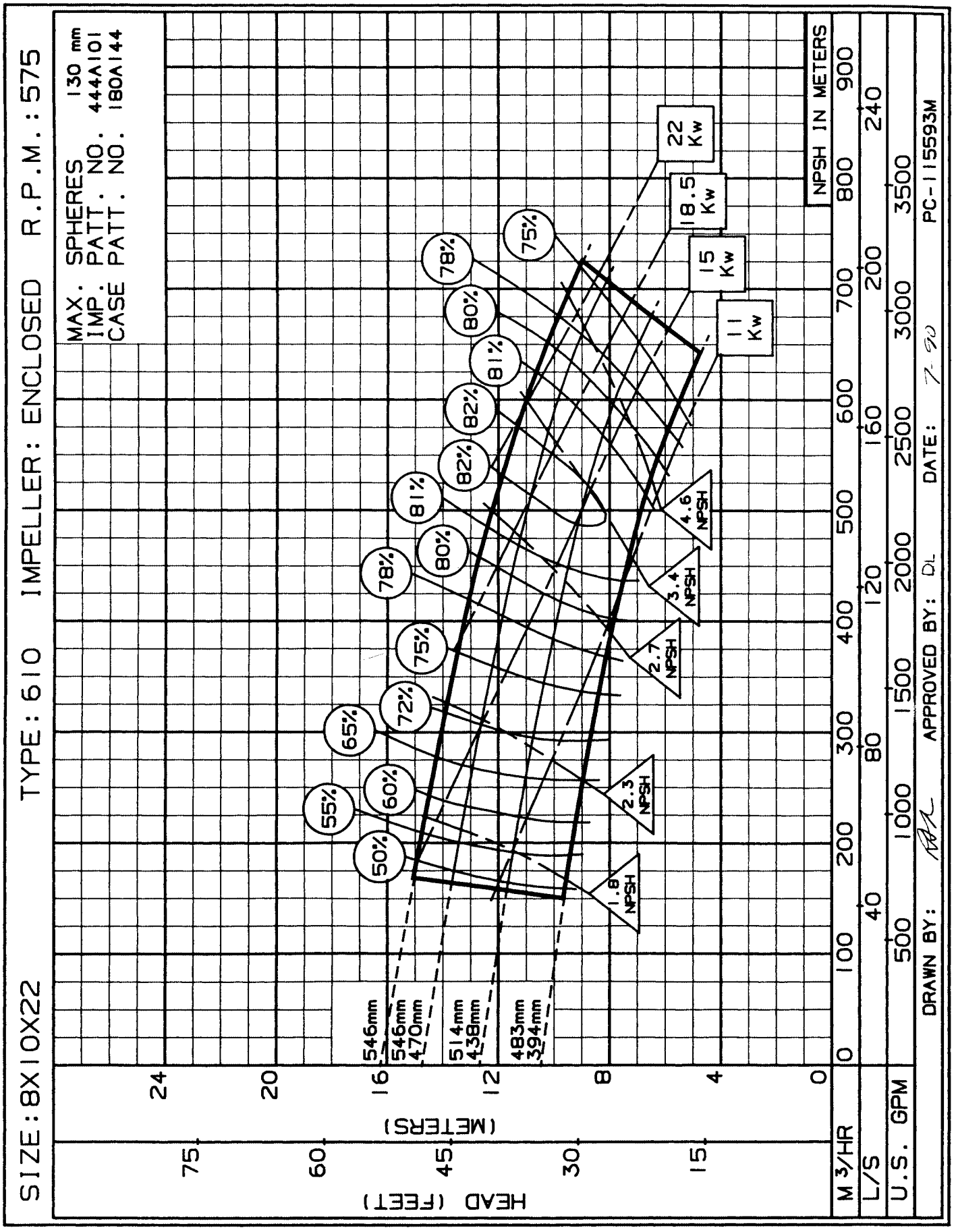
AURORA®
Pentair Pump Group



AURORA®
Pentair Pump Group

8x10x22 - 575 RPM
ENCLOSED IMPELLER

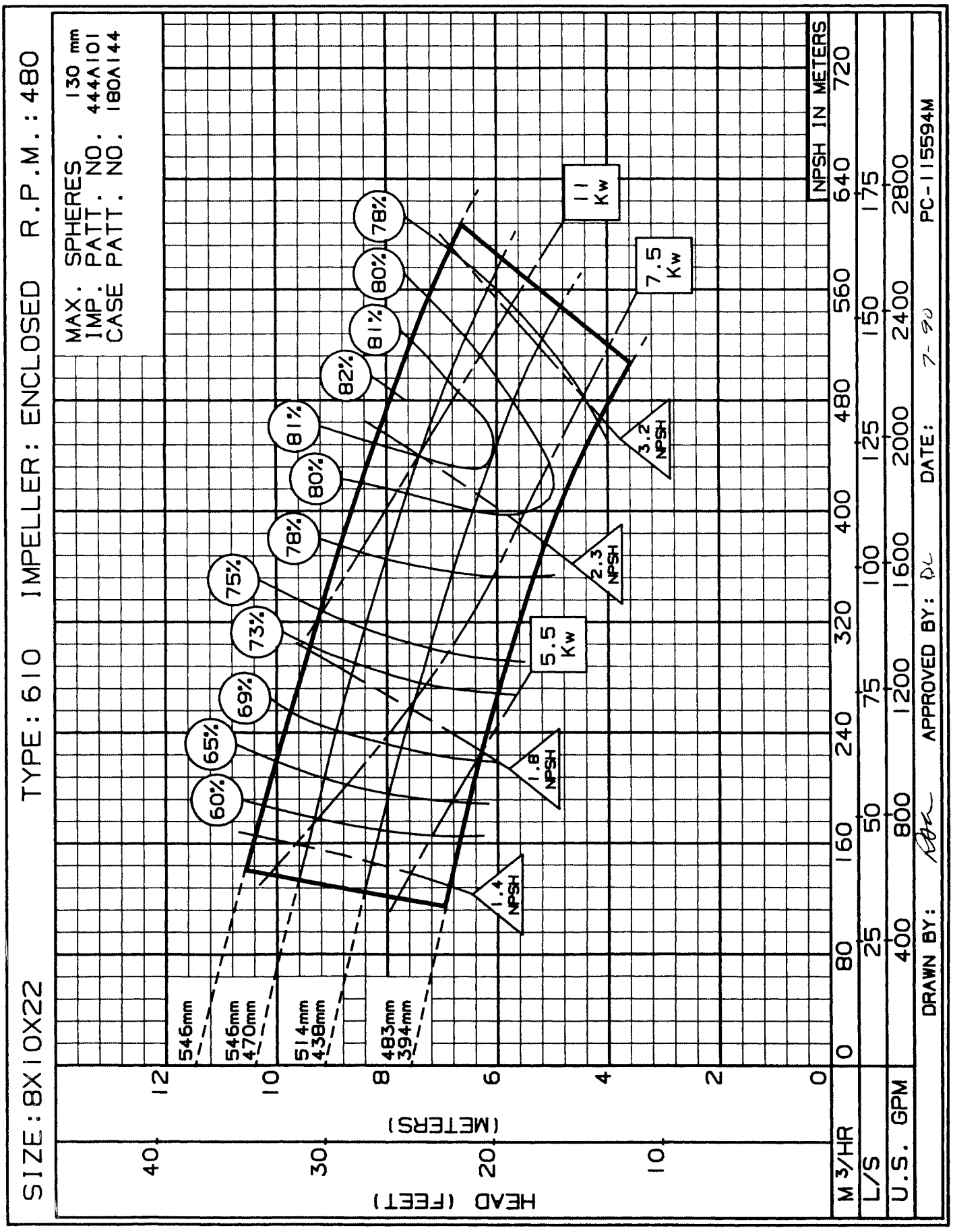
SECTION 610 (Metric 50Hz)
DATE JULY 1994
SUPERCEDES MARCH 1986



SECTION 610 (Metric 50Hz)
DATE JULY 1994
SUPERCEDES MARCH 1986

8x10x22 - 480 RPM
ENCLOSED IMPELLER

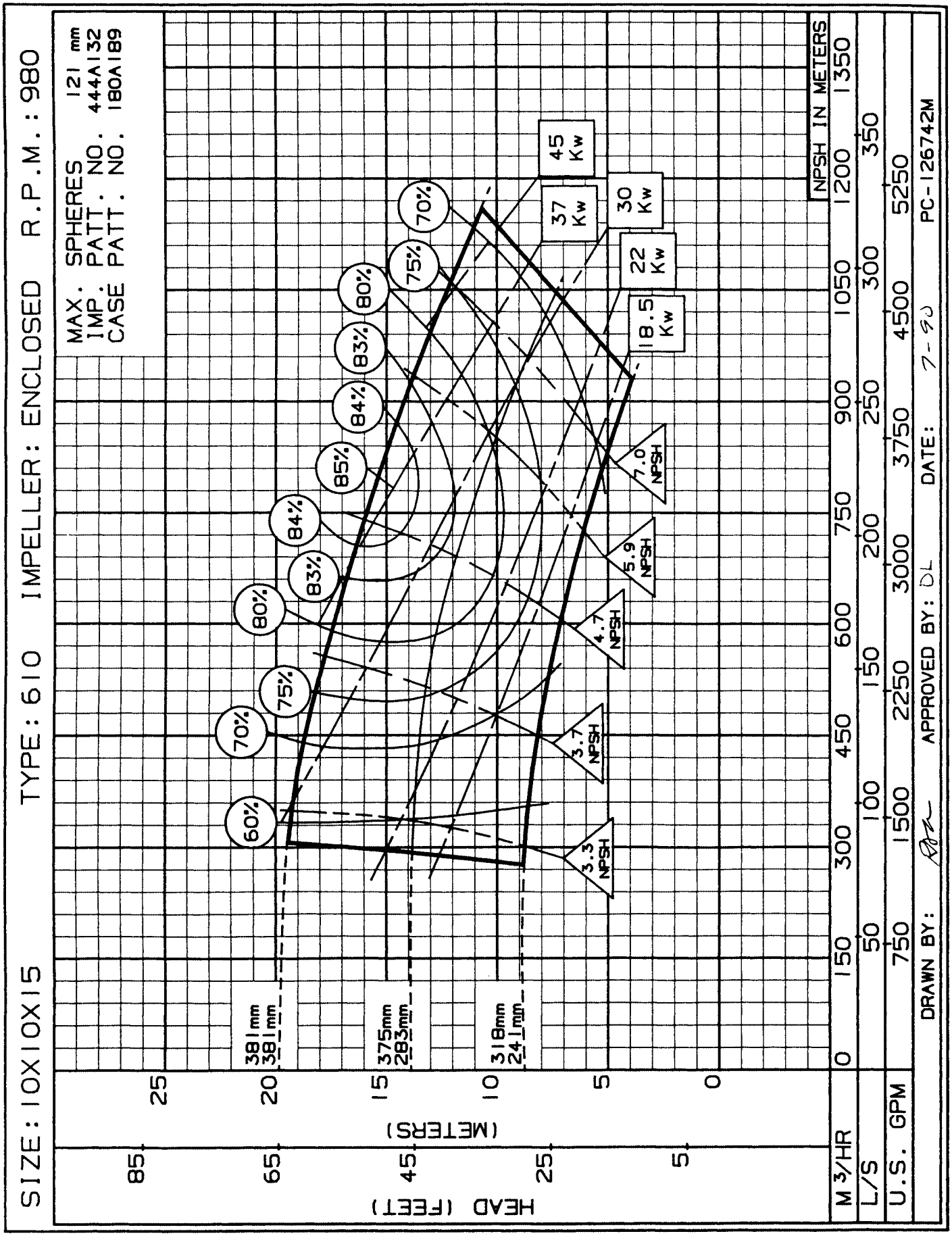
AURORA®
Pentair Pump Group



AURORA®
Pentair Pump Group

10x10x15 - 980 RPM
ENCLOSED IMPELLER

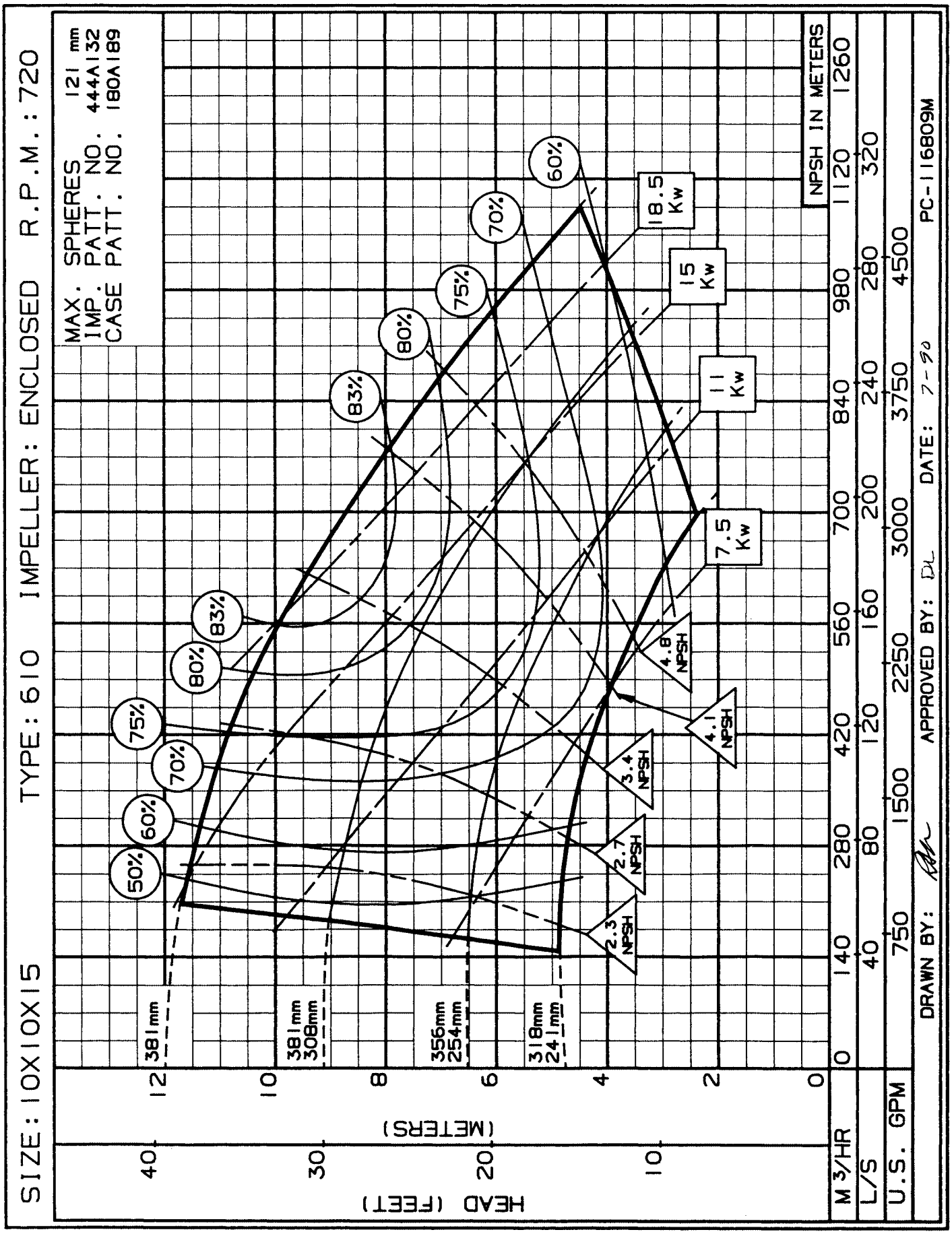
SECTION 610 (Metric 50Hz)
DATE JULY 1994
SUPERCEDES MARCH 1986



SECTION **610 (Metric 50Hz)**
DATE **JULY 1994**
SUPERCEDES MARCH 1986

10x10x15 - 720 RPM
ENCLOSED IMPELLER

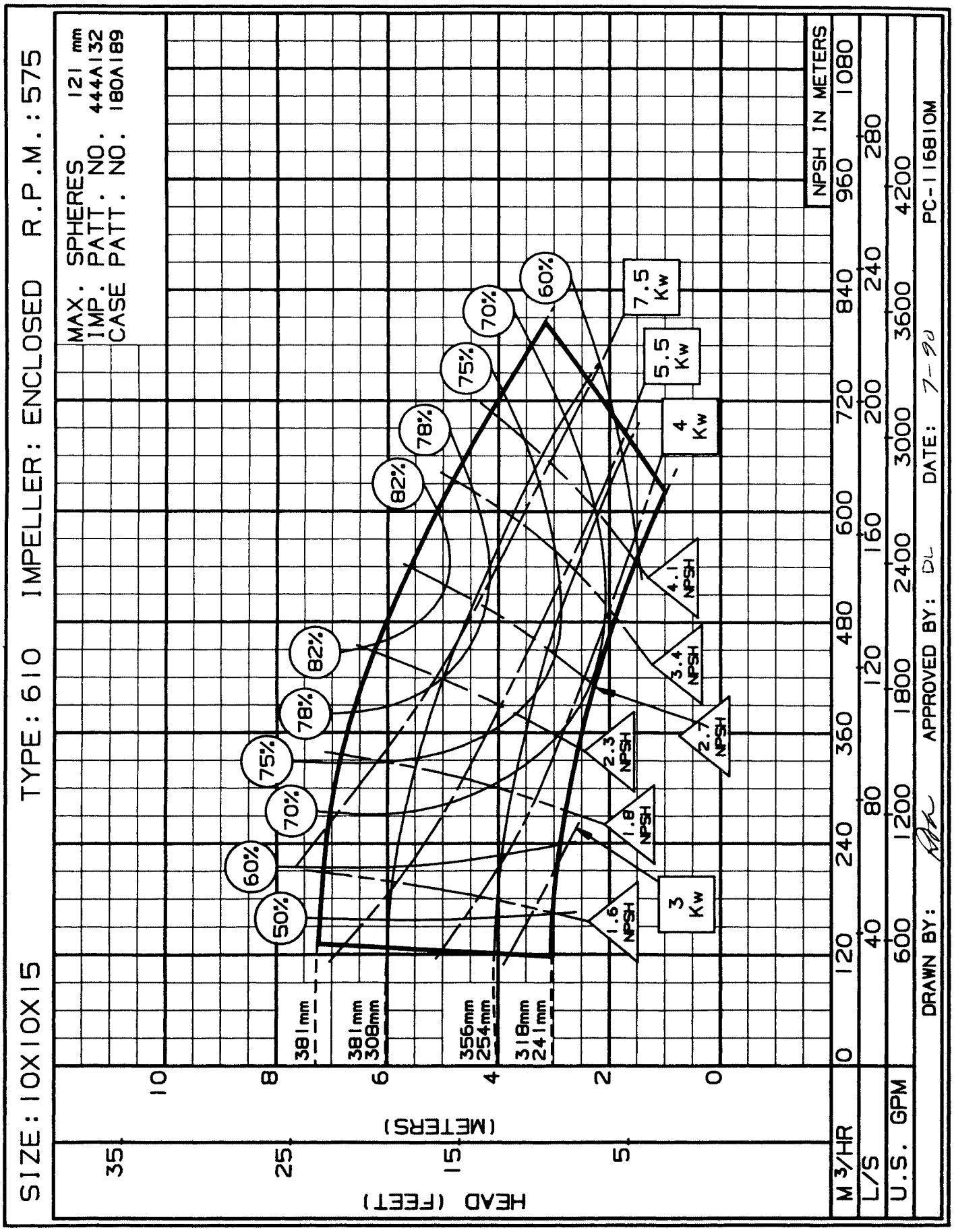
AURORA®
Pentair Pump Group



AURORA®
Pentair Pump Group

10x10x15 - 575 RPM
ENCLOSED IMPELLER

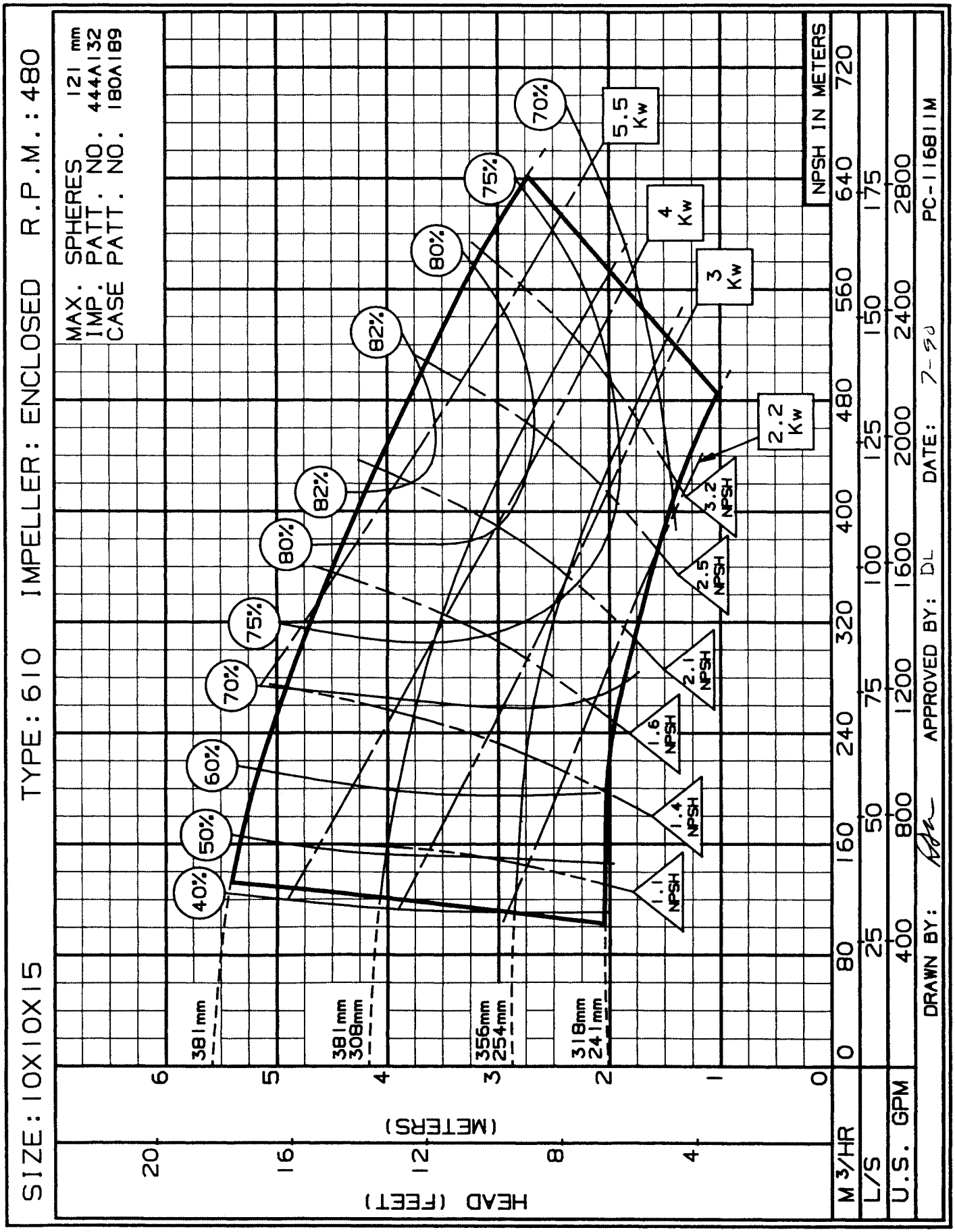
SECTION 610 (Metric 50Hz)
DATE JULY 1994
SUPERCEDES MARCH 1986



SECTION 610 (Metric 50Hz)
DATE JULY 1994
SUPERCEDES MARCH 1986

10x10x15 - 480 RPM
ENCLOSED IMPELLER

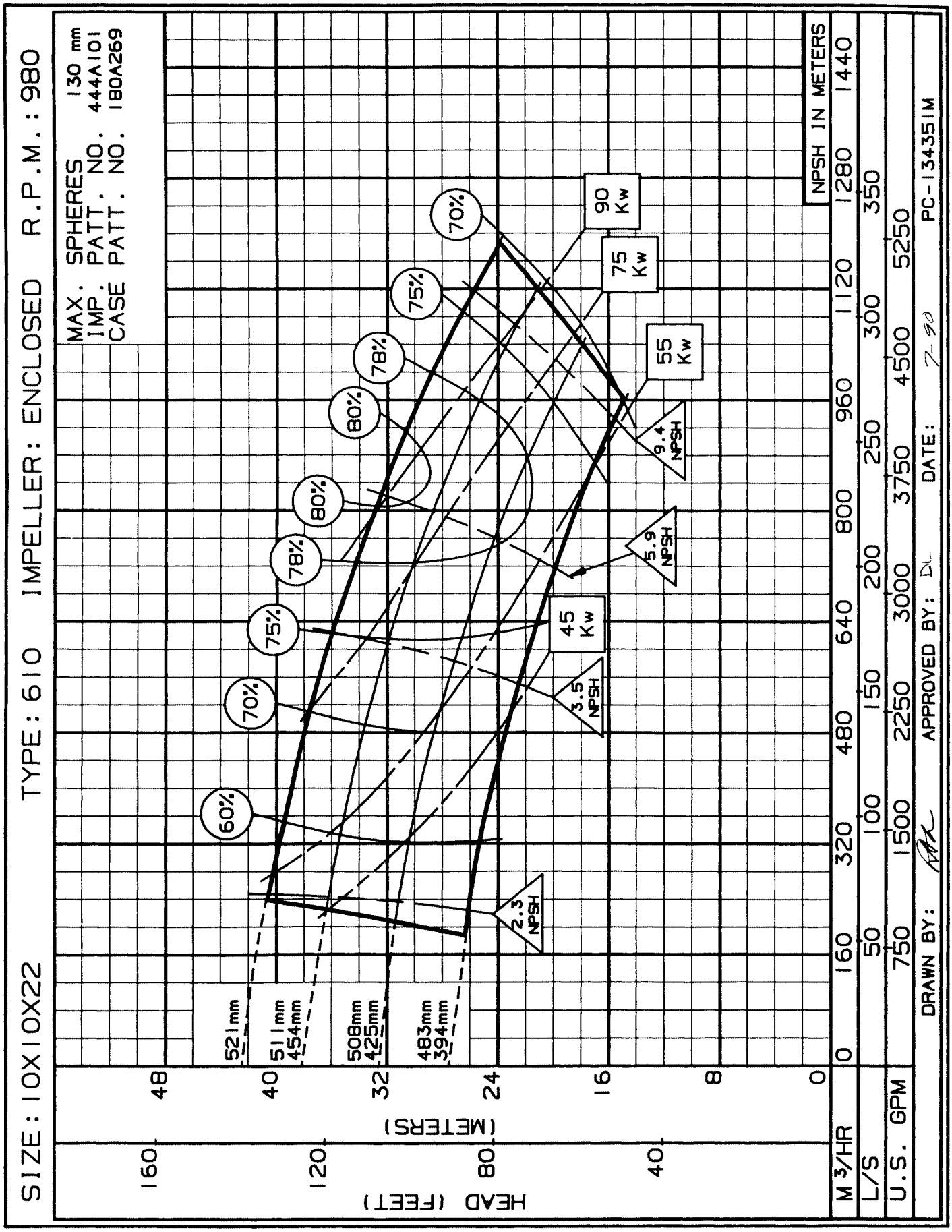
AURORA®
Pentair Pump Group



AURORA®
Pentair Pump Group

10x10x22 - 980 RPM
ENCLOSED IMPELLER

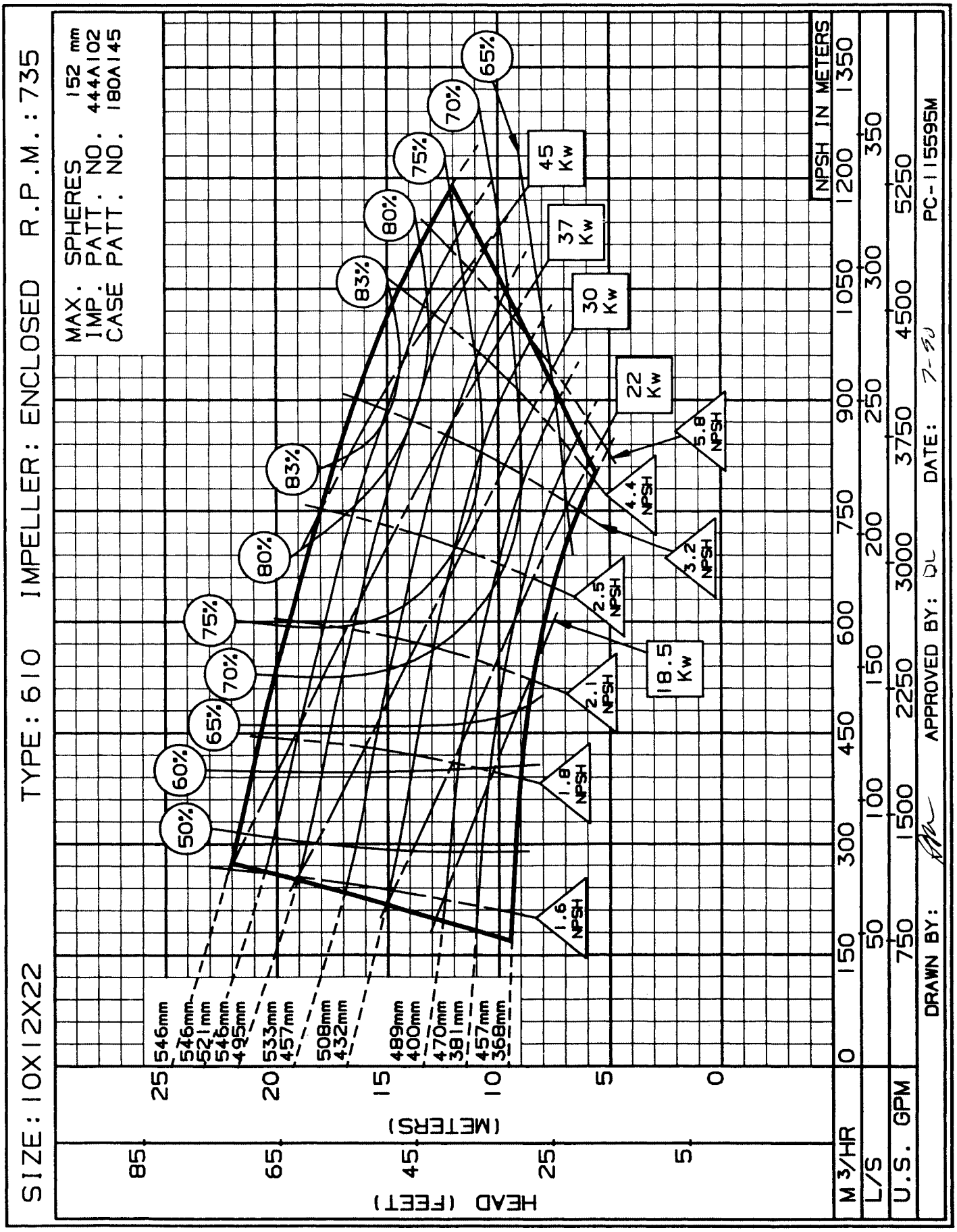
SECTION 610 (Metric 50Hz)
DATE JULY 1994
SUPERCEDES MARCH 1986



SECTION **610 (Metric 50Hz)**
DATE **JULY 1994**
SUPERCEDES MARCH 1986

10x12x22 - 735 RPM
ENCLOSED IMPELLER

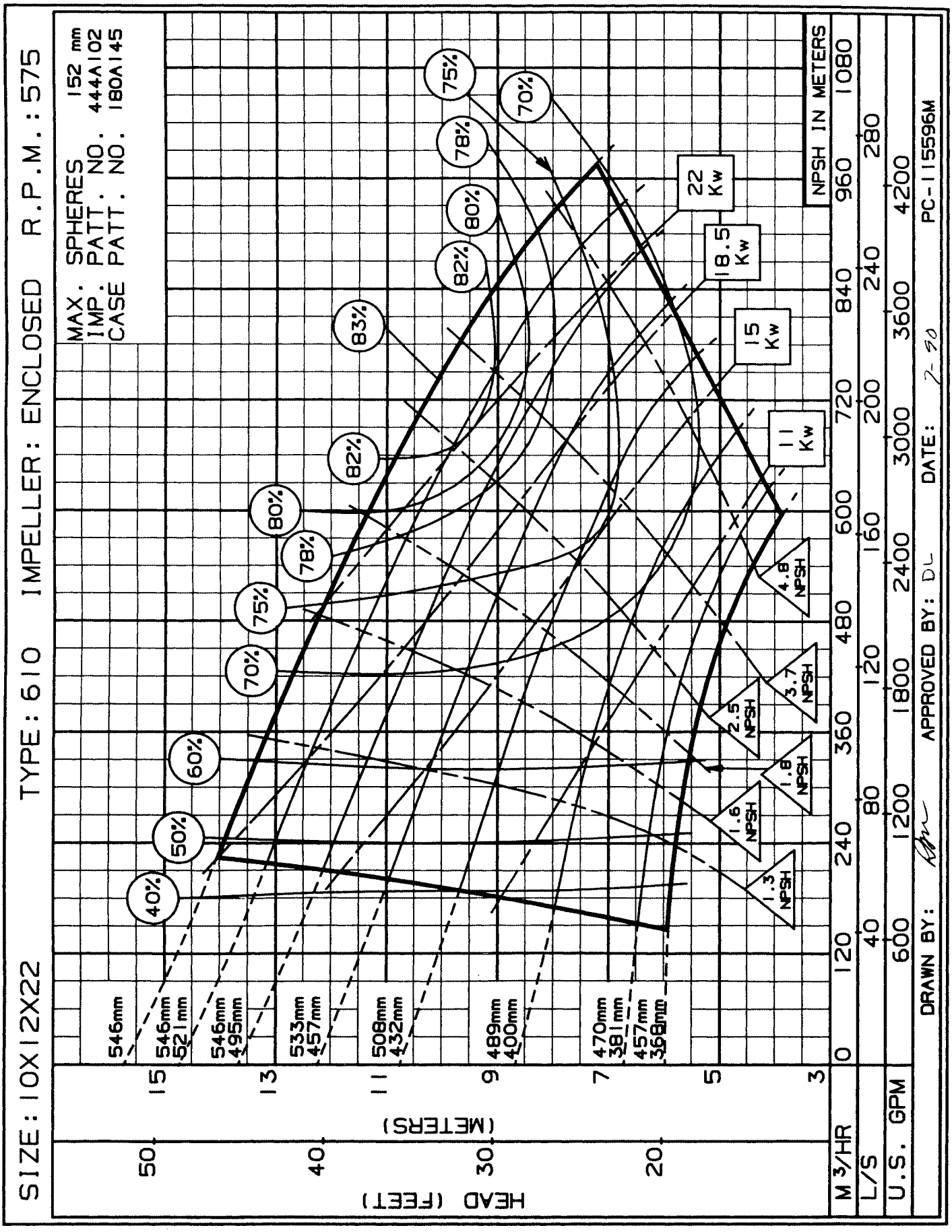
AURORA®
Pentair Pump Group



AURORA®
Pentair Pump Group

10x12x22 - 575 RPM
ENCLOSED IMPELLER

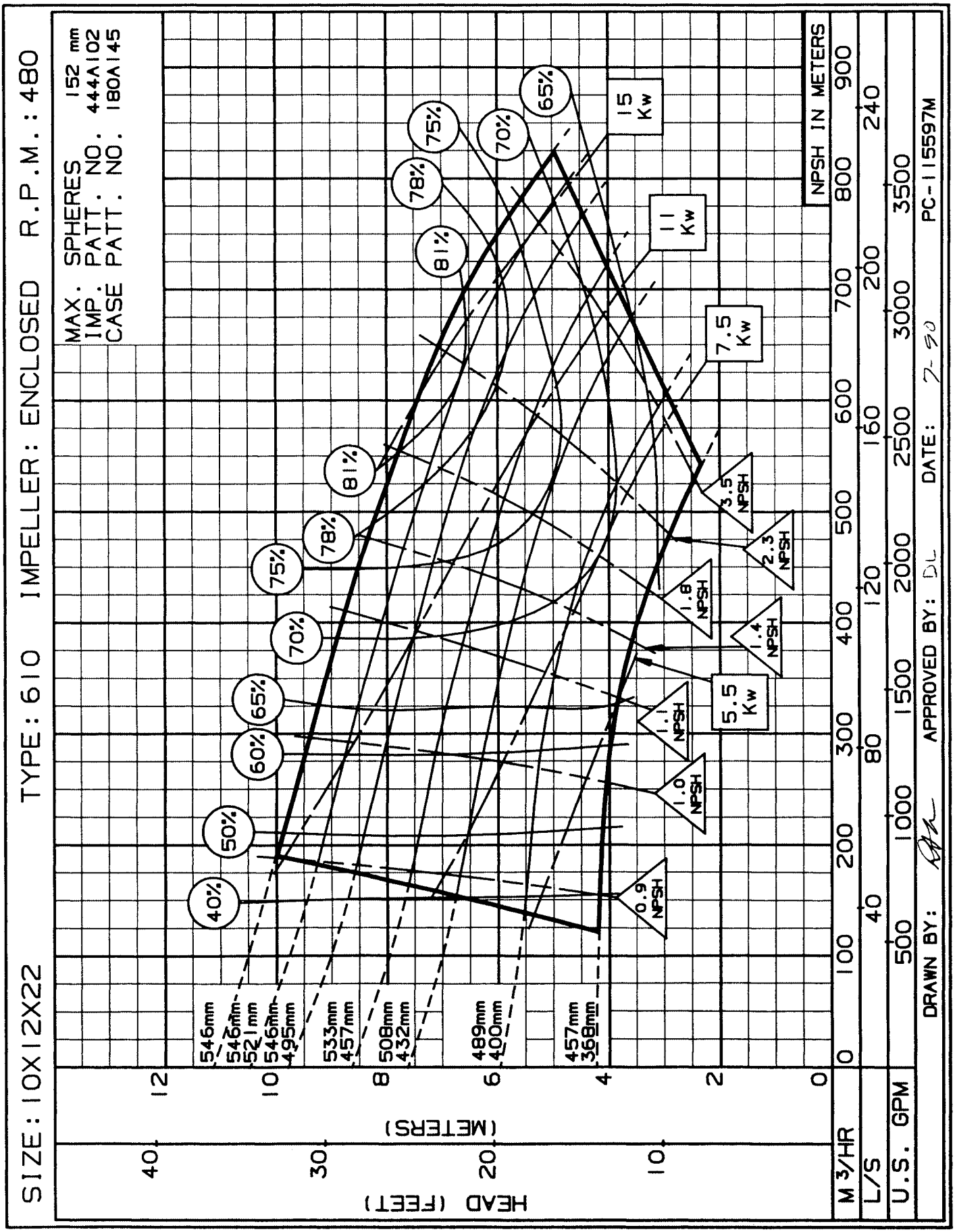
SECTION 610 (Metric 50Hz)
DATE JULY 1994
SUPERCEDES MARCH 1986



SECTION 610 (Metric 50Hz)
DATE JULY 1994
SUPERCEDES MARCH 1986

10x12x22 - 480 RPM
ENCLOSED IMPELLER

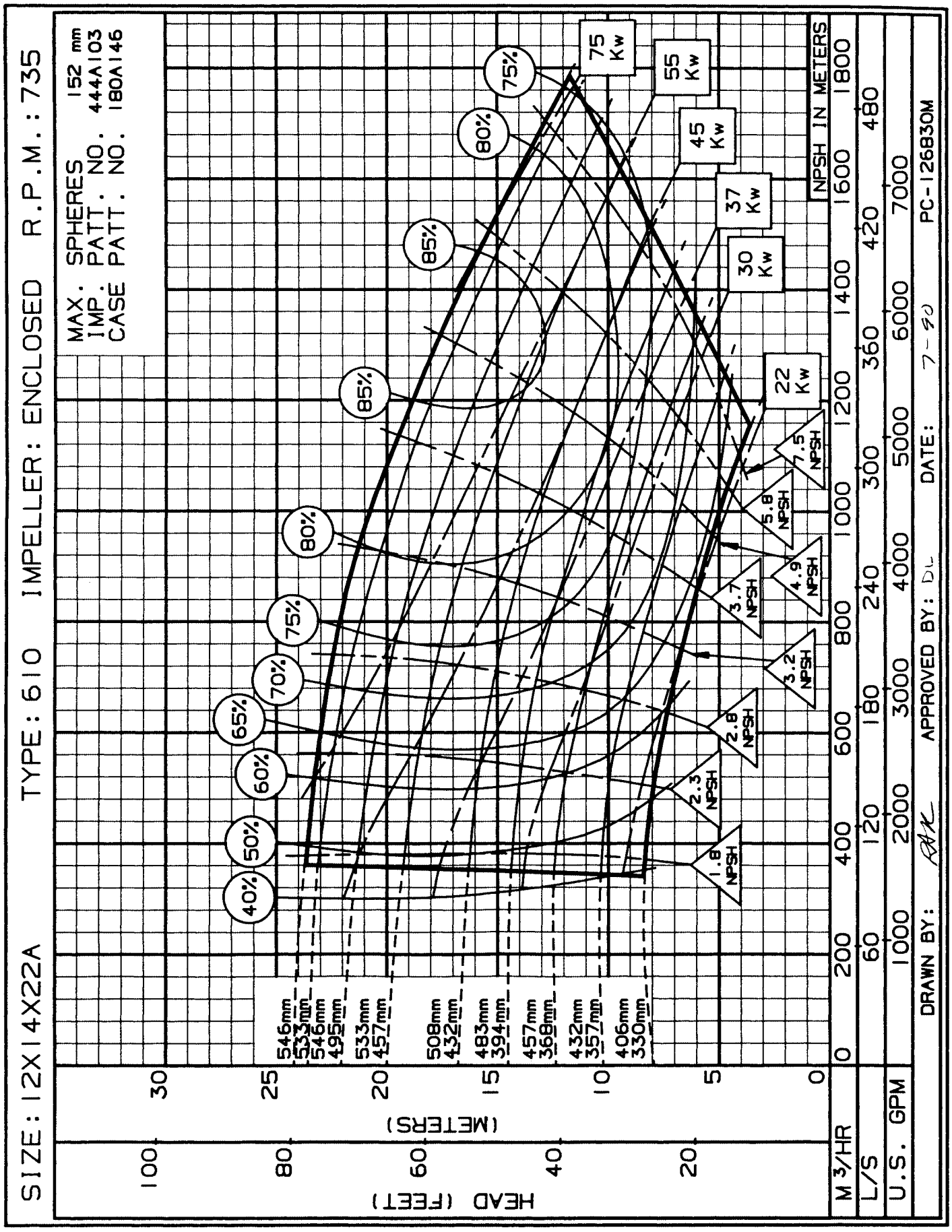
AURORA®
Pentair Pump Group



AURORA®
Pentair Pump Group

12x14x22A - 735 RPM
ENCLOSED IMPELLER

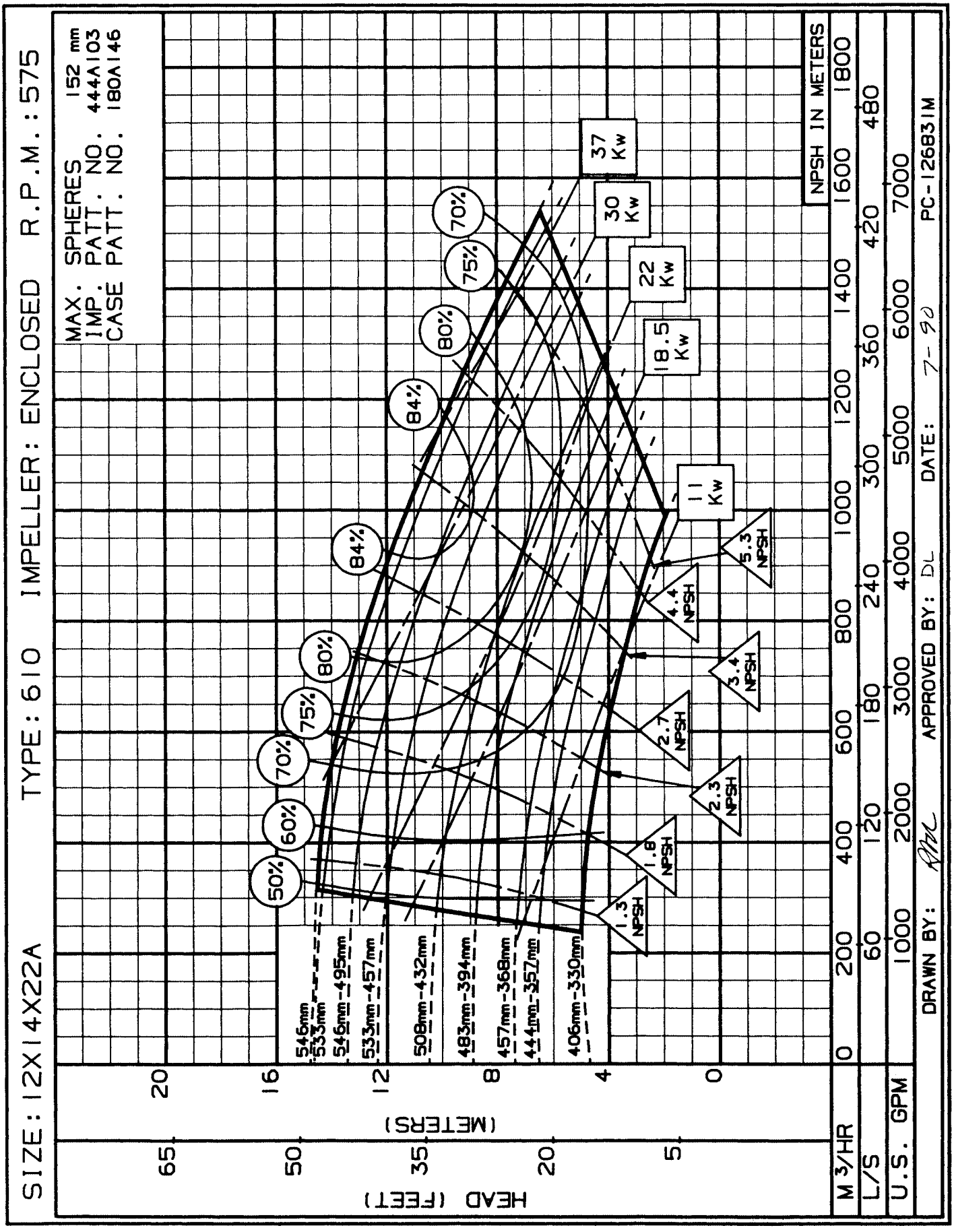
SECTION 610 (Metric 50Hz)
DATE JULY 1994
SUPERCEDES MARCH 1986



SECTION 610 (Metric 50Hz)
DATE JULY 1994
SUPERCEDES MARCH 1986

12x14x22A - 575 RPM
ENCLOSED IMPELLER

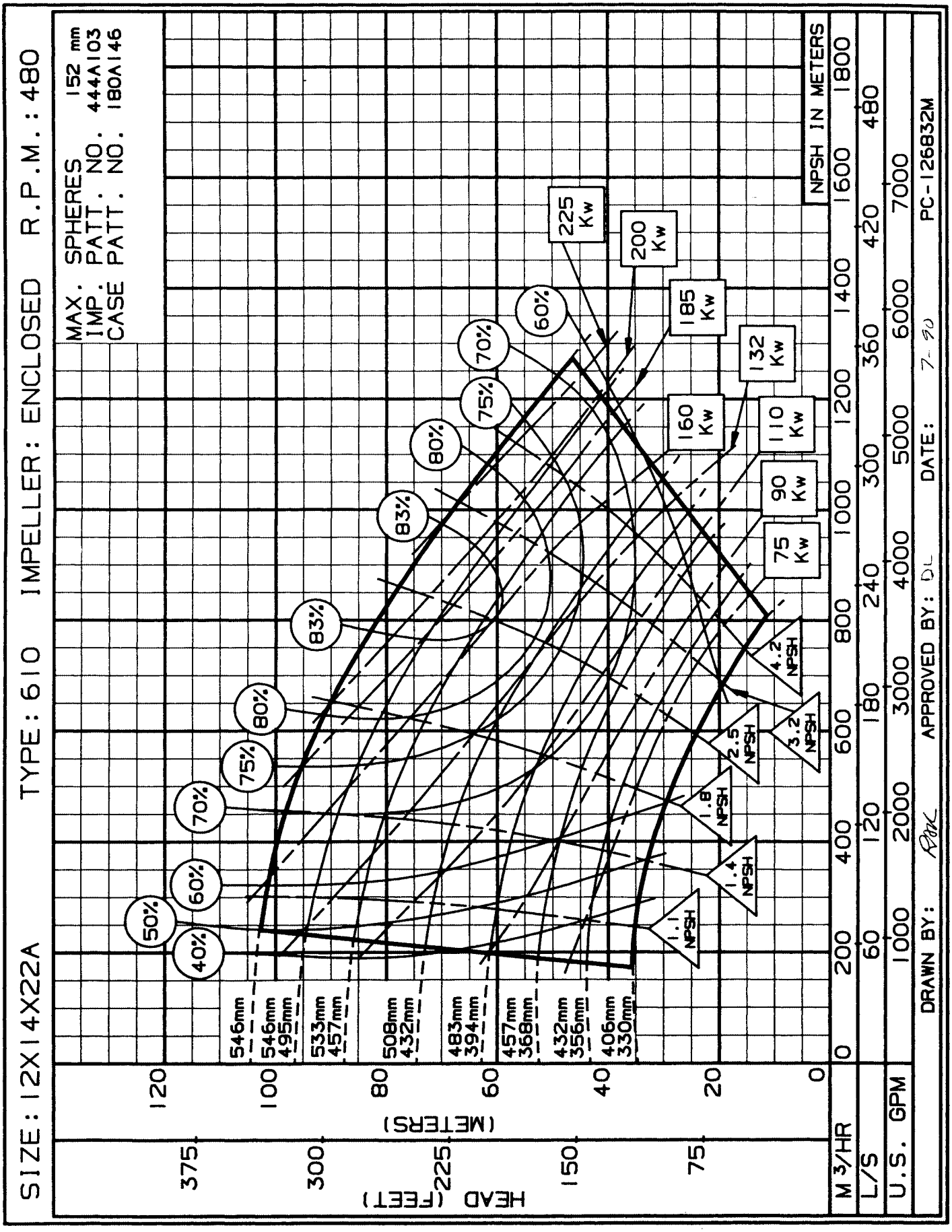
AURORA®
Pentair Pump Group



AURORA®
Pentair Pump Group

12x14x22A - 480 RPM
ENCLOSED IMPELLER

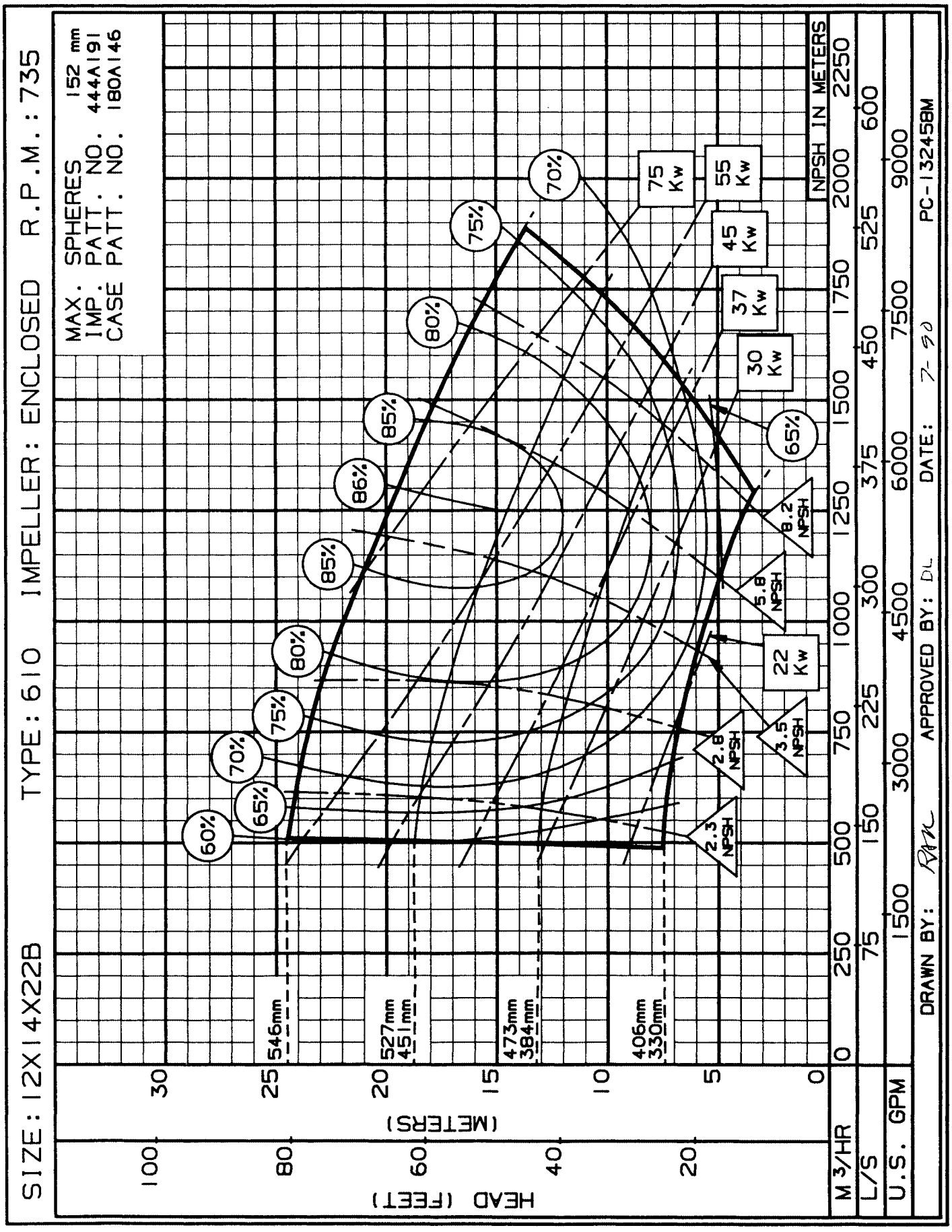
SECTION 610 (Metric 50Hz)
DATE JULY 1994
SUPERCEDES MARCH 1986



SECTION 610 (Metric 50Hz)
DATE JULY 1994
SUPERCEDES MARCH 1986

12x14x22B - 735 RPM
ENCLOSED IMPELLER

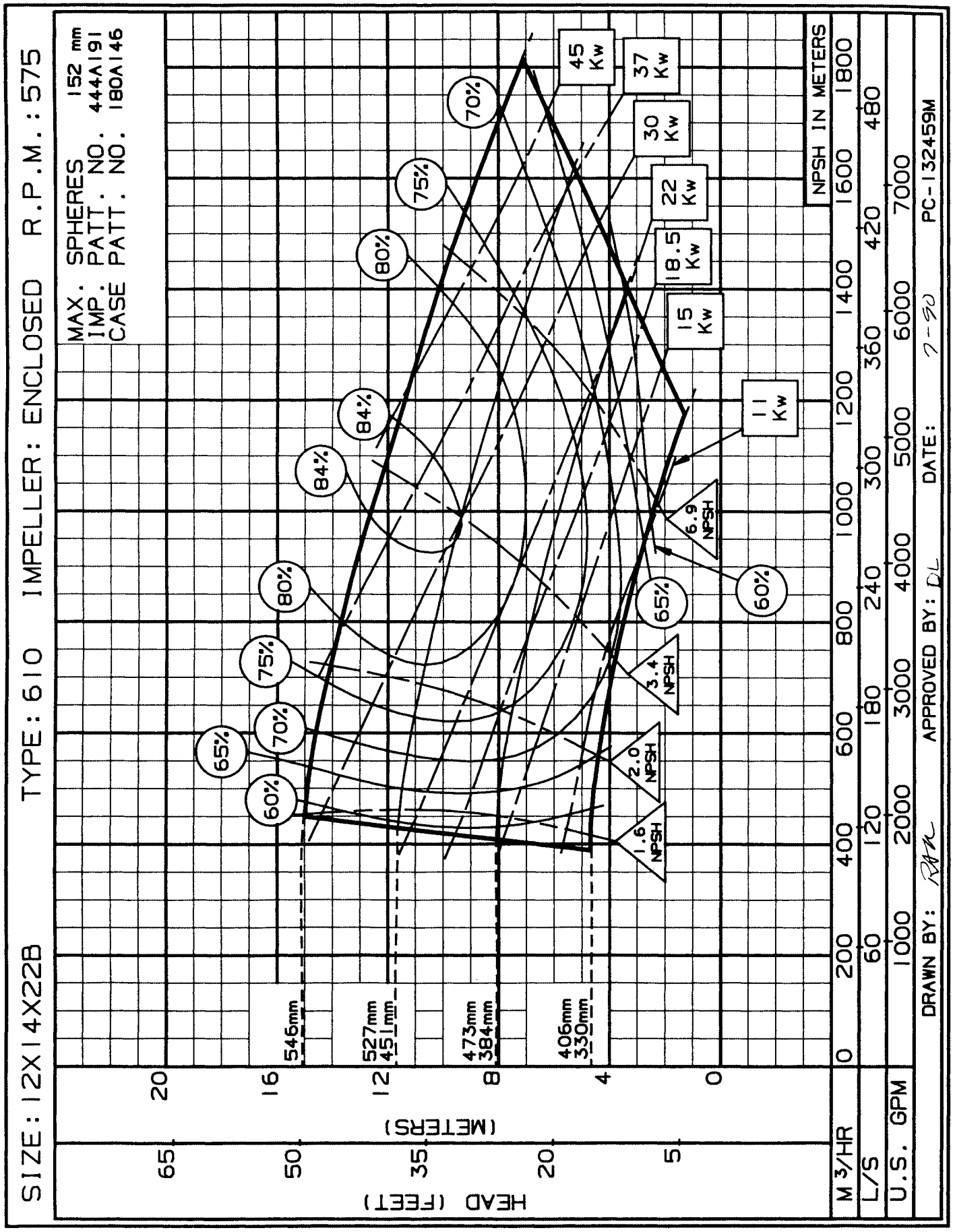
AURORA®
Pentair Pump Group



AURORA®
Pentair Pump Group

12x14x22B - 575 RPM
ENCLOSED IMPELLER

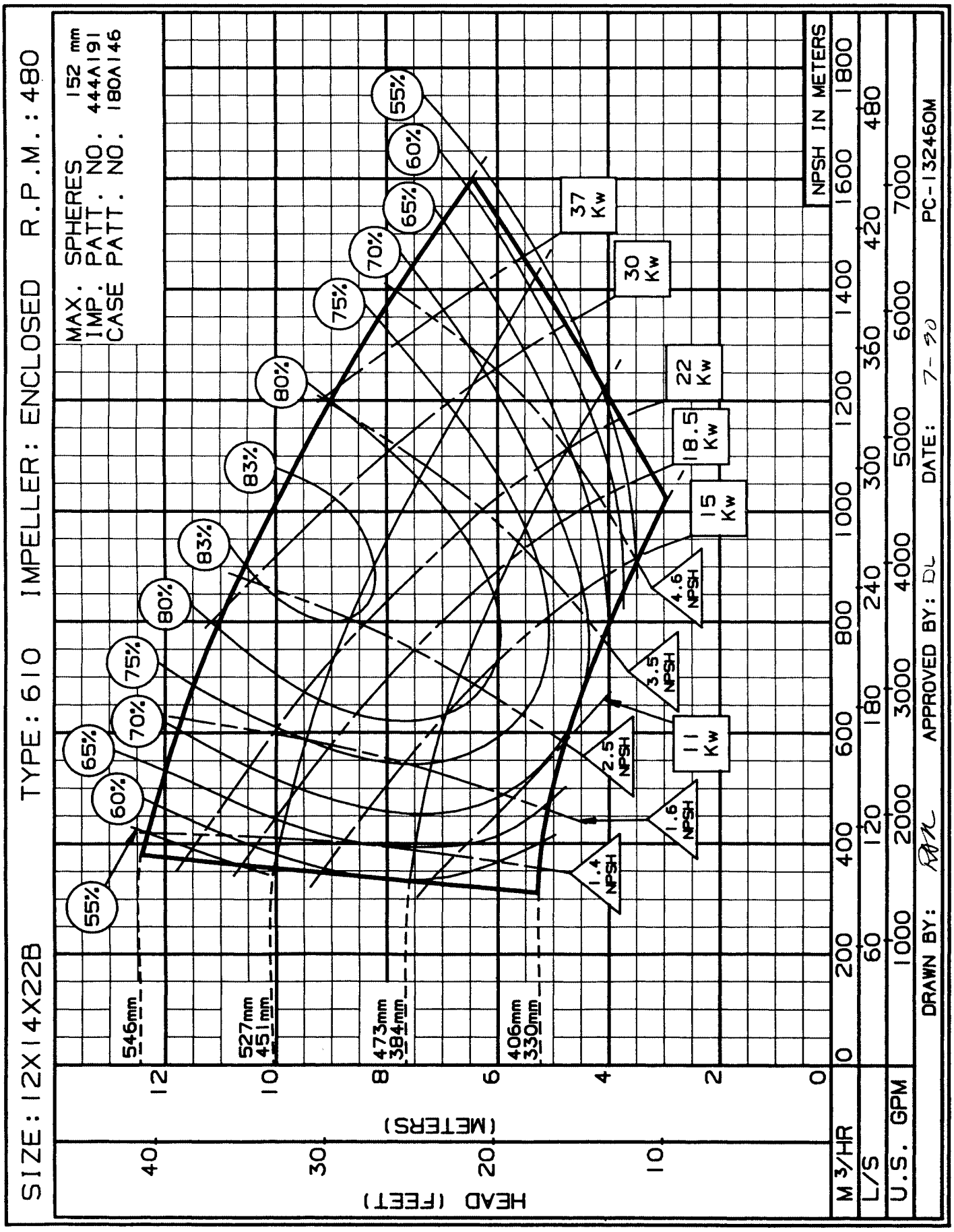
SECTION 610 (Metric 50Hz)
DATE JULY 1994
SUPERCEDES MARCH 1986



SECTION 610 (Metric 50Hz)
DATE JULY 1994
SUPERCEDES MARCH 1986

12x14x22B - 480 RPM
ENCLOSED IMPELLER

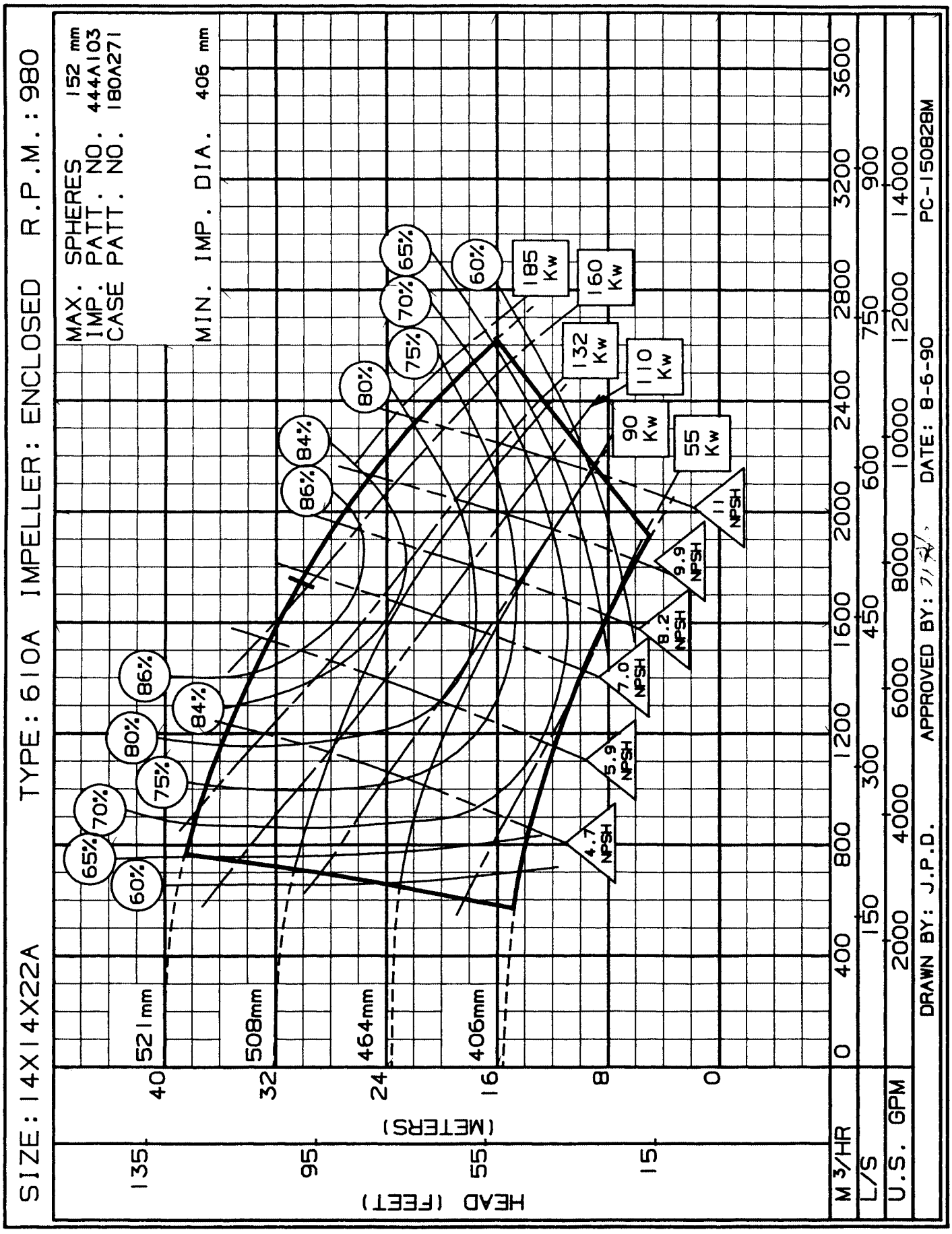
AURORA®
Pentair Pump Group



AURORA®
Pentair Pump Group

14x14x22A - 980 RPM
ENCLOSED IMPELLER

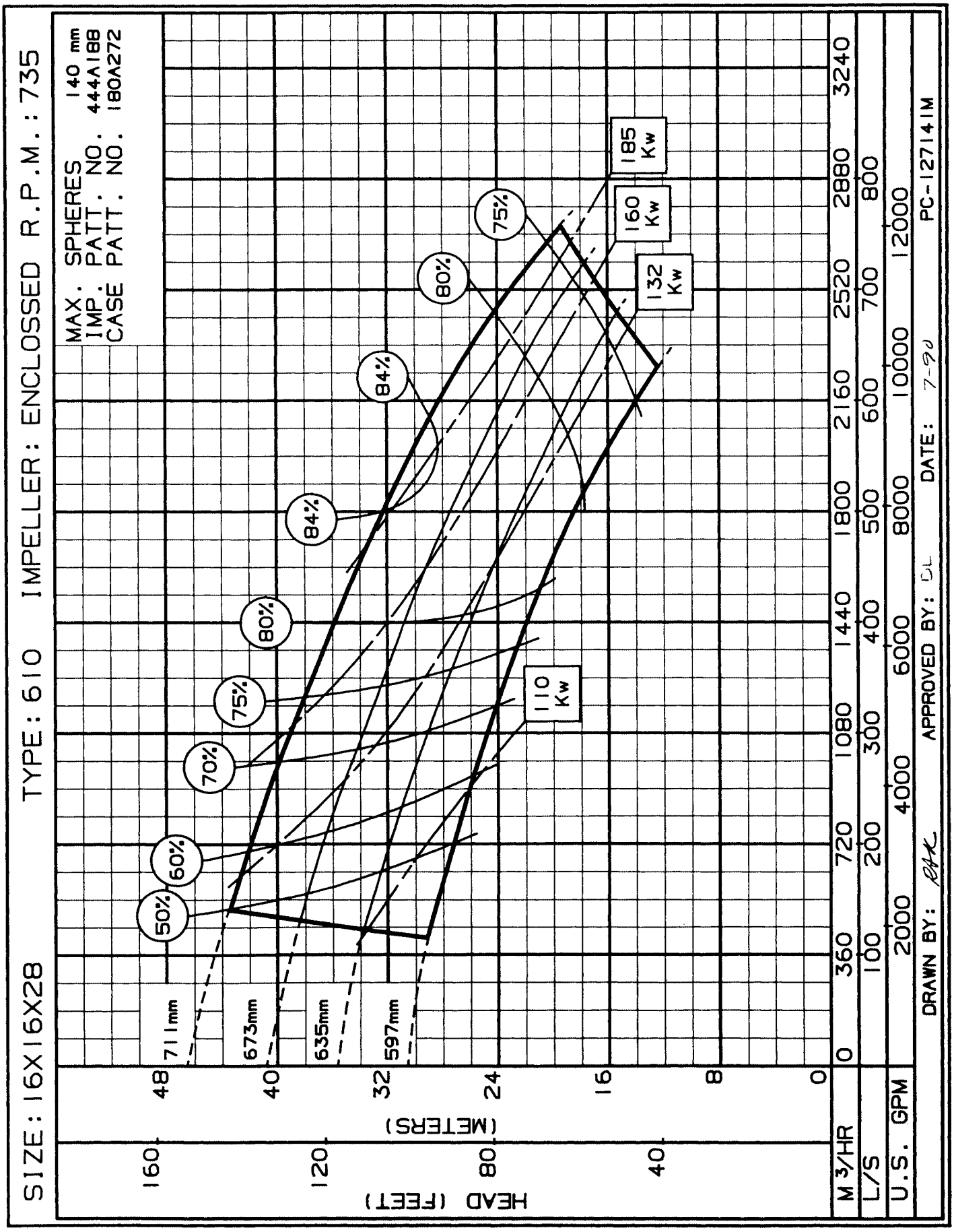
SECTION 610 (Metric 50Hz)
DATE JULY 1994
SUPERCEDES MARCH 1986



SECTION 610 (Metric 50Hz)
DATE JULY 1994
SUPERCEDES MARCH 1986

16x16x28 - 735 RPM
ENCLOSED IMPELLER

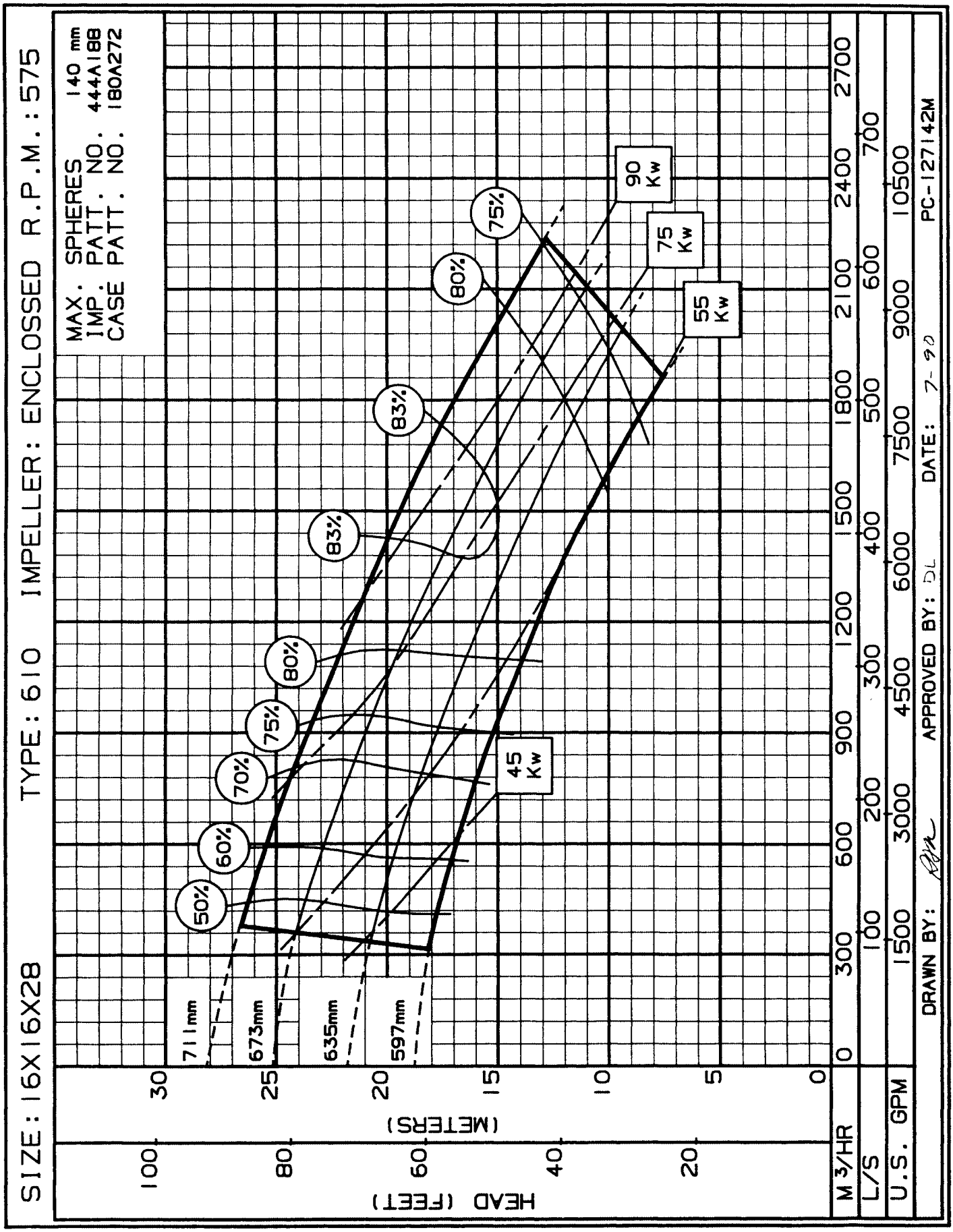
AURORA®
Pentair Pump Group



AURORA®
Pentair Pump Group

16x16x28 - 575 RPM
ENCLOSED IMPELLER

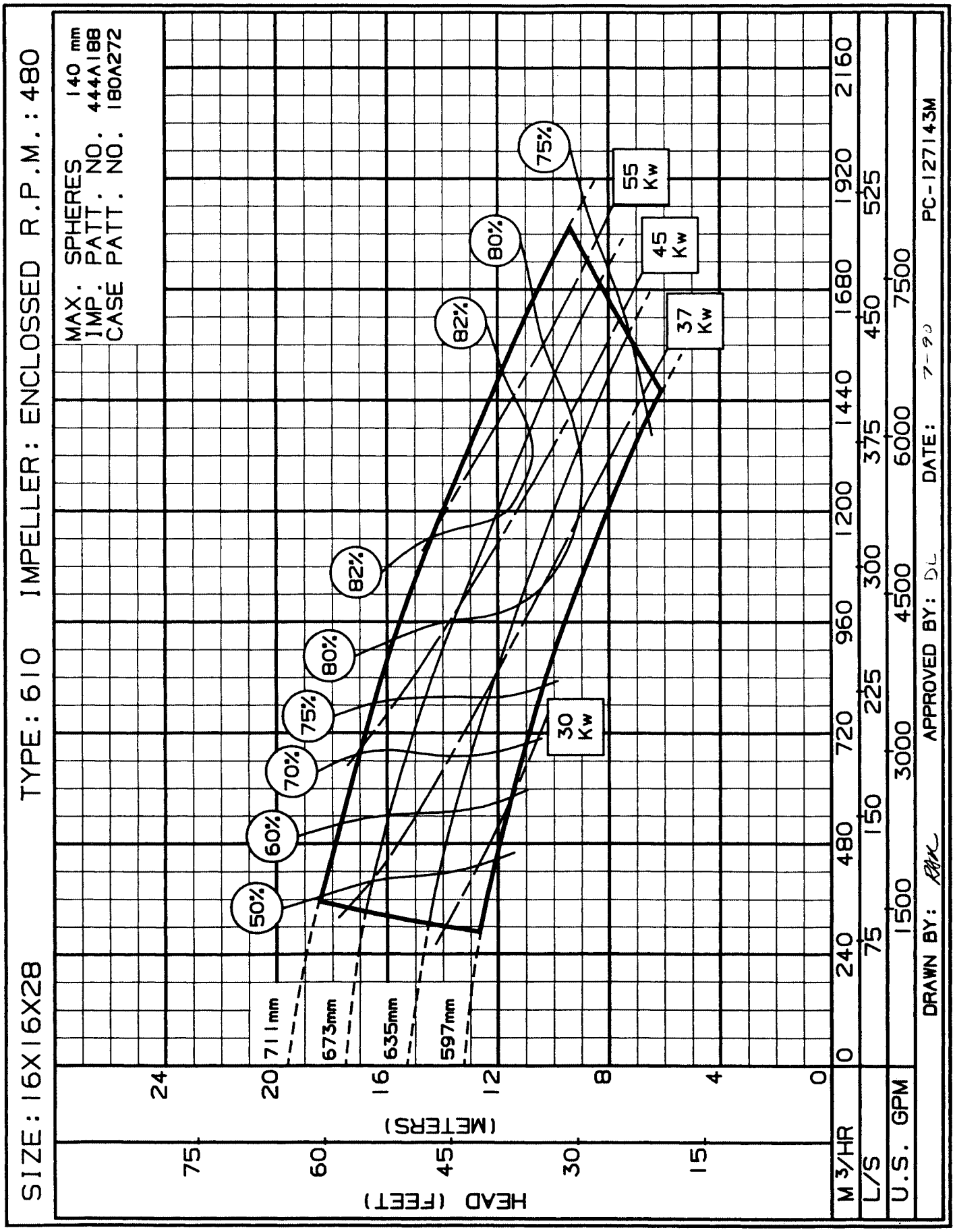
SECTION 610 (Metric 50Hz)
DATE JULY 1994
SUPERCEDES MARCH 1986



SECTION 610 (Metric 50Hz)
DATE JULY 1994
SUPERCEDES MARCH 1986

16x16x28 - 480 RPM
ENCLOSED IMPELLER

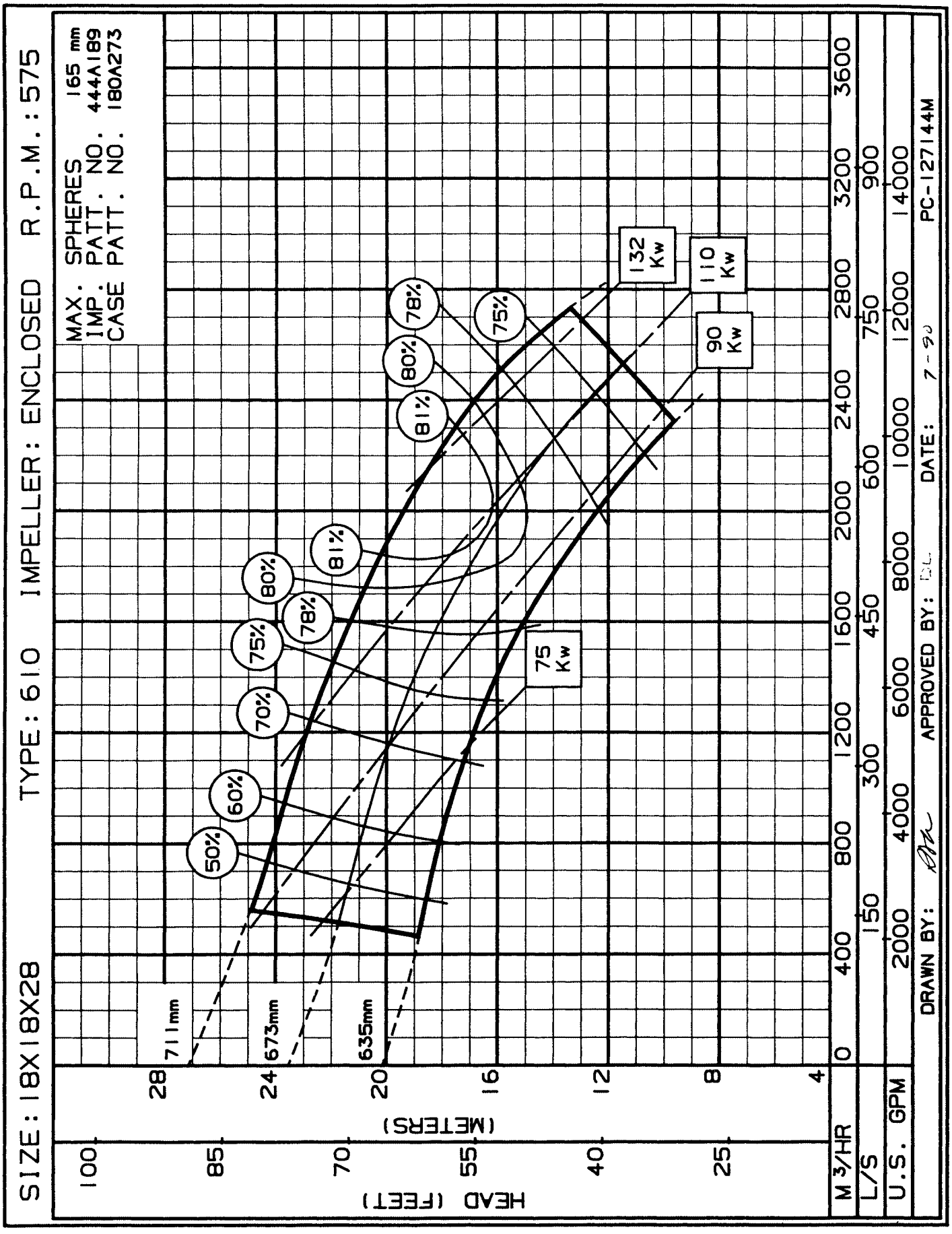
AURORA®
Pentair Pump Group



AURORA®
Pentair Pump Group

18x18x28 - 575 RPM
ENCLOSED IMPELLER

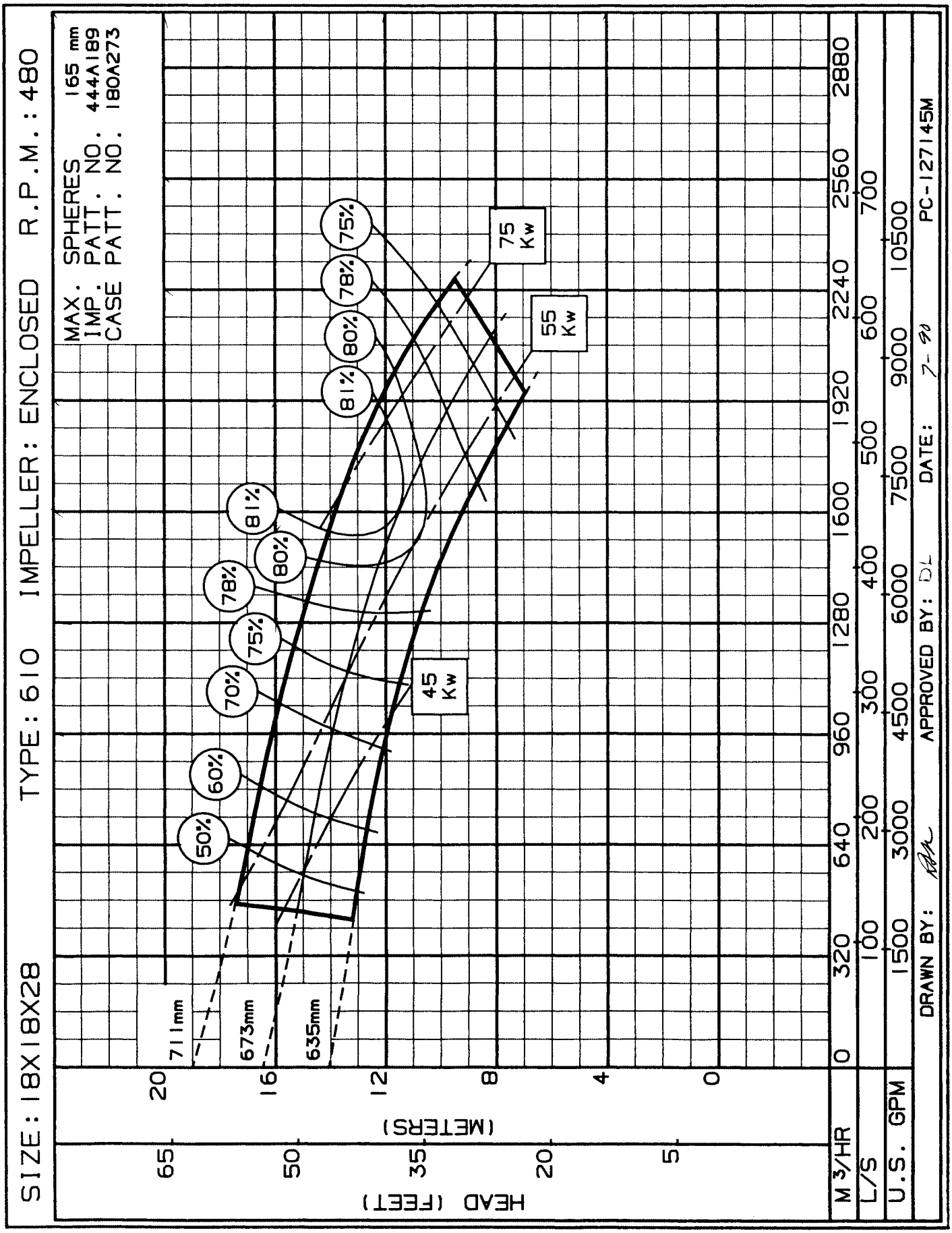
SECTION 610 (Metric 50Hz)
DATE JULY 1994
SUPERCEDES MARCH 1986



SECTION 610 (Metric 50Hz)
DATE JULY 1994
SUPERCEDES MARCH 1986

18x18x28 - 480 RPM
ENCLOSED IMPELLER

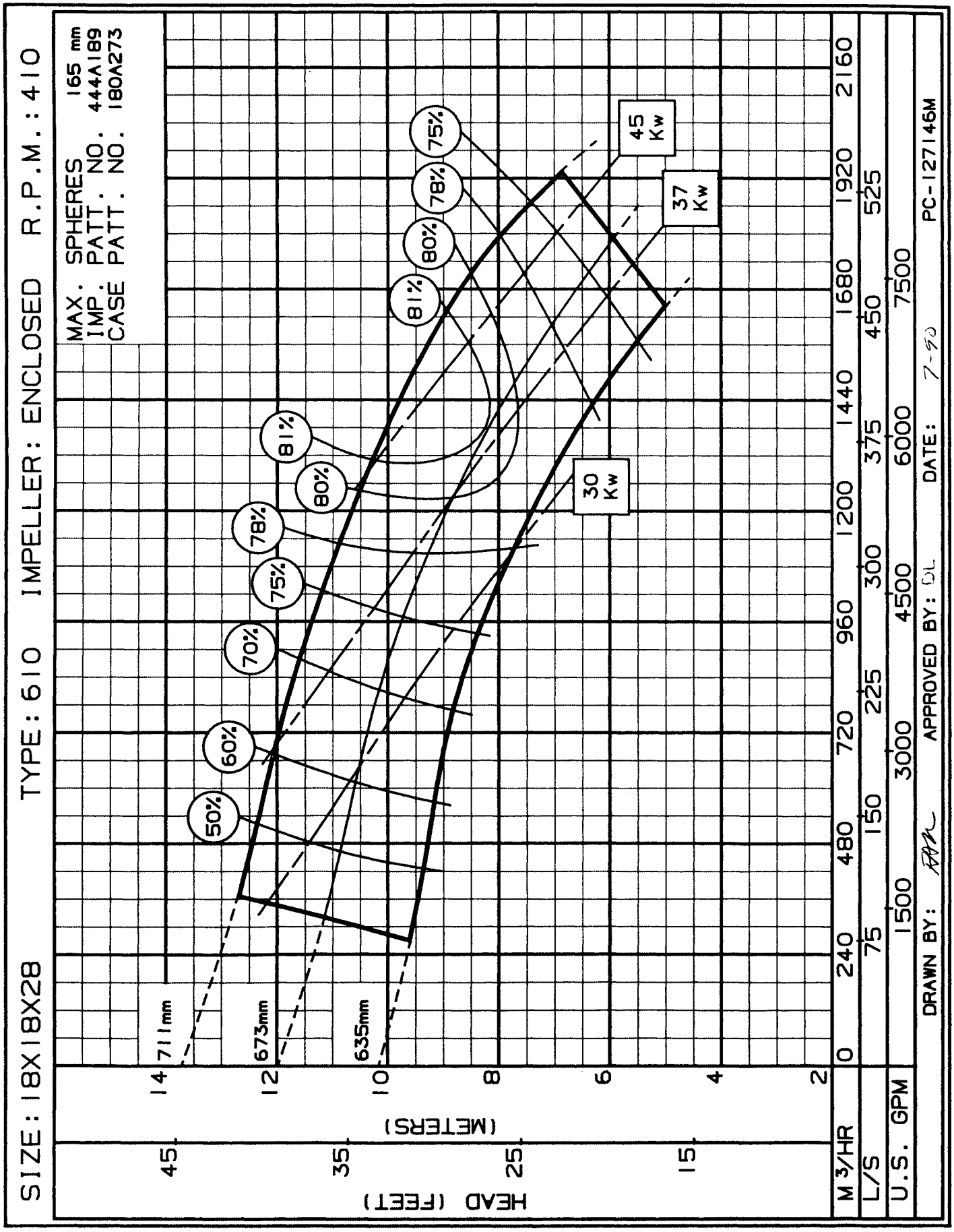
AURORA®
Pentair Pump Group



AURORA®
Pentair Pump Group

18x18x28 - 410 RPM
ENCLOSED IMPELLER

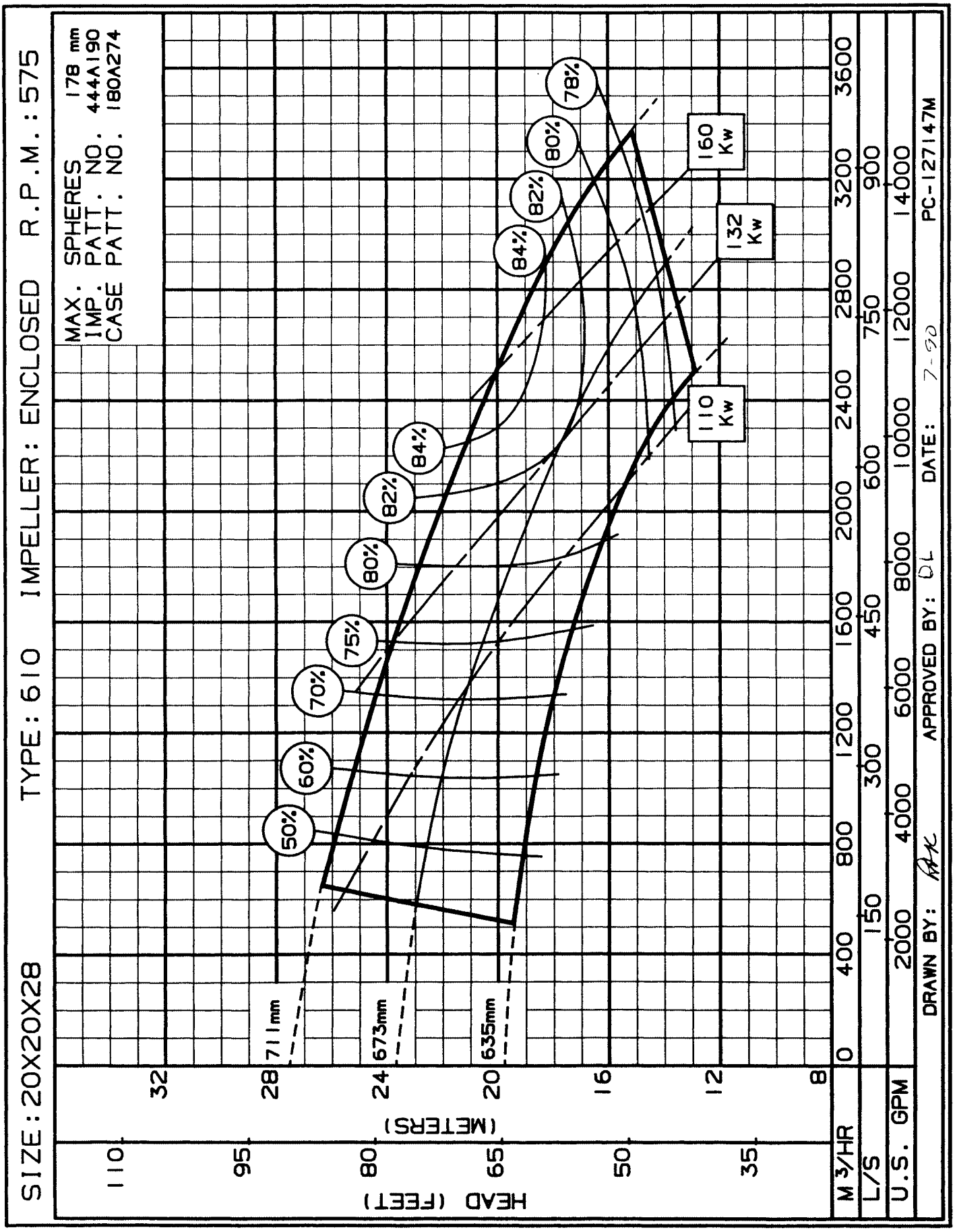
SECTION 610 (Metric 50Hz)
DATE JULY 1994
SUPERCEDES MARCH 1986



SECTION 610 (Metric 50Hz)
DATE JULY 1994
SUPERCEDES MARCH 1986

20x20x28 - 575 RPM
ENCLOSED IMPELLER

AURORA®
Pentair Pump Group



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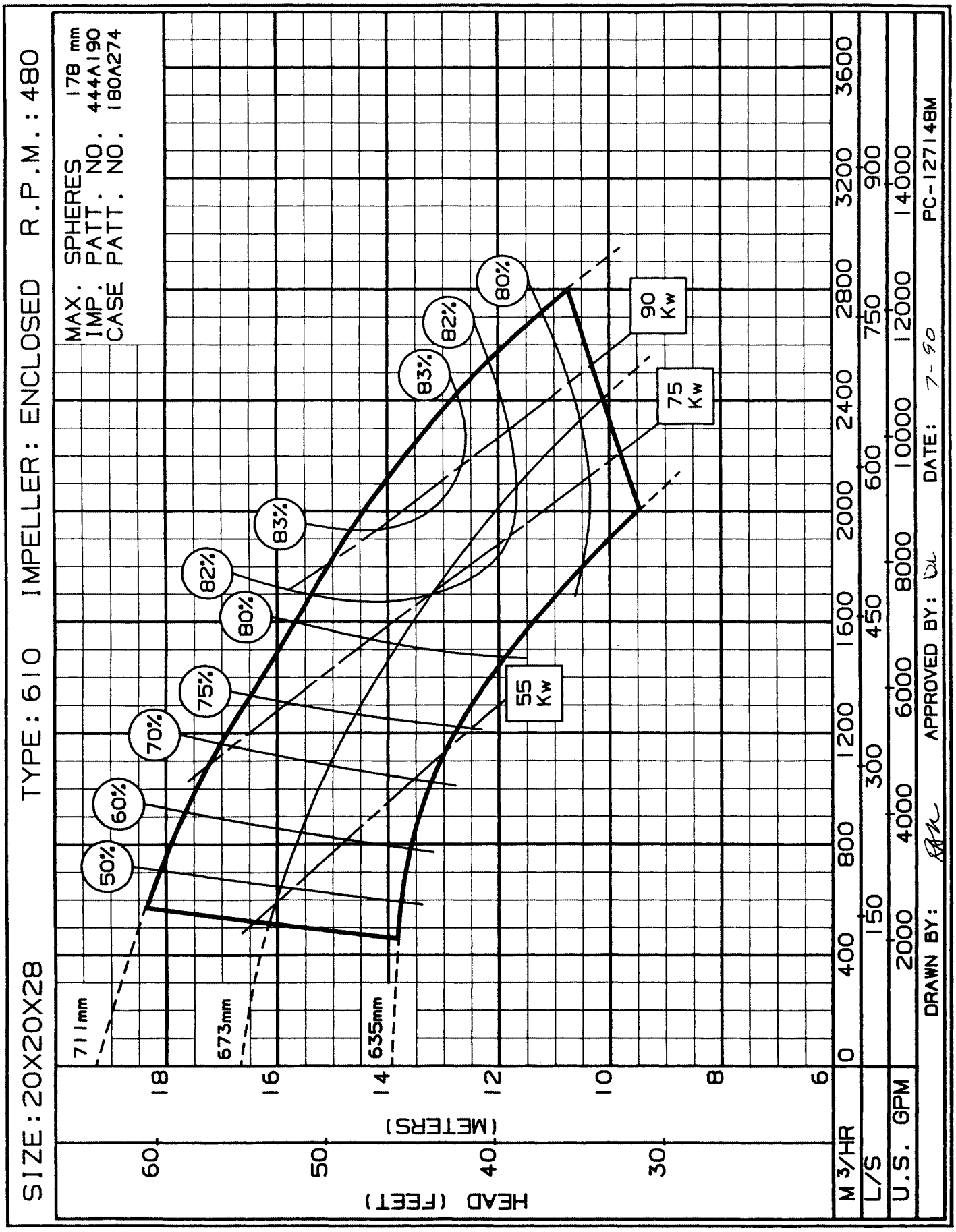

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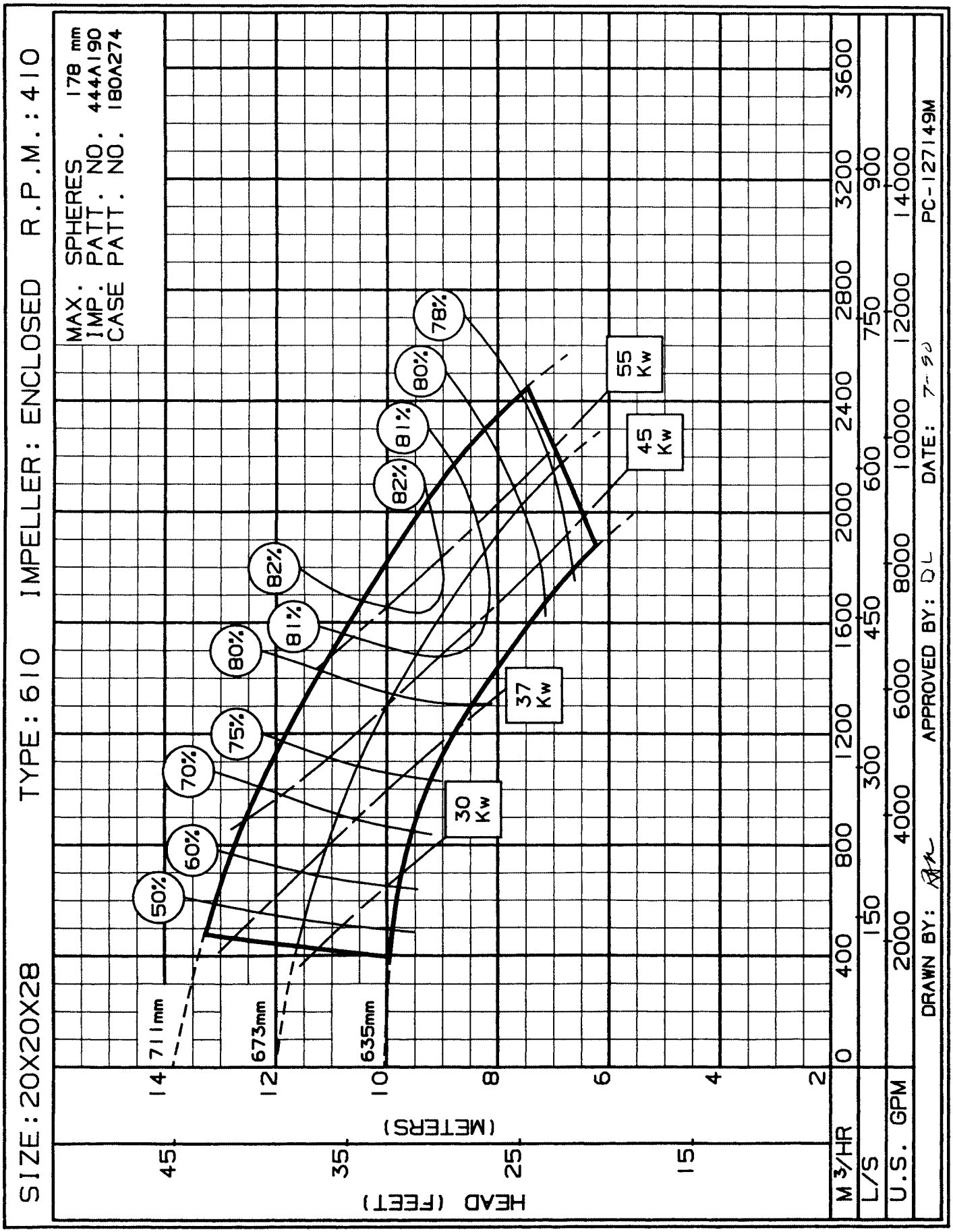


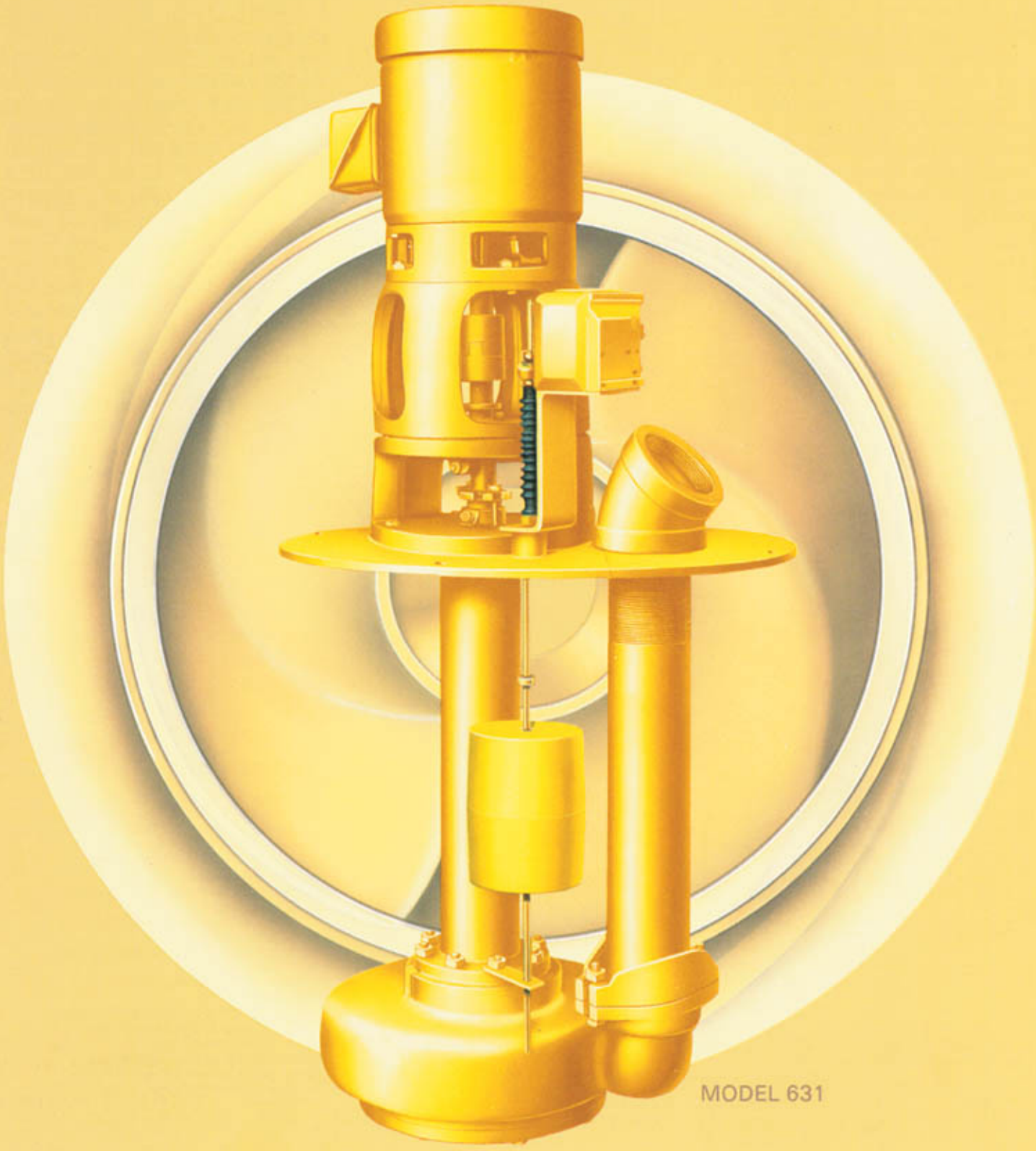
AURORA PUMP A member of PENTAIR PUMP GROUP

AURORA PUMP

BULLETIN 630I

630 SERIES SINGLE STAGE SEWAGE PUMPS

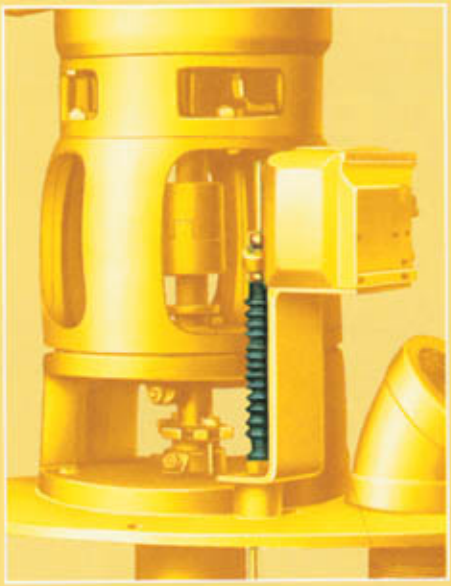
CAPACITIES TO 1000 G.P.M.
HEADS TO 80 FEET
TEMPERATURES TO 140° F.
DISCHARGE SIZES 4" AND 6"



MODEL 631

INTRODUCTION AURORA 630 SERIES PUMPS

Water pollution and its effect on our environment is on everyone's mind. This is particularly true today and for the future generations. The population explosion along with a broader understanding of the water pollution problem has brought about the need for more and better sewage treatment facilities. The installations of today and tomorrow demand more reliable sewage pumping equipment. Longer life has become essential to over-all pump performance. Aurora Pump recognizes this need, and with this bulletin offers the 630 Series of heavy duty vertical wet pit nonclog pumps as our solution to your sewage pumping problems. Contact your Aurora Pump representative for added details. 1 MOTOR MOUNTING bracket that assures alignment of motor and pump shaft with tongue and groove machining. Motors are of standard "HP" manufacture. 2 EXTERNAL IMPELLER ADJUSTMENT is accomplished with hexagon shaped adjusting nut. A lock nut secures the bearing collar to the shaft. 3 THRUST BEARING is regreaseable and is protected from contamination by grease seals on both sides and a water slinger. The bearing is elevated 6" above the floor level for easy servicing and added protection from washdown, flooding, etc. 4 STUFFING BOX is standard with packing, lantern ring, and a split gland for gastight construction. The lantern ring can also be used for packing lubrication from an external source. 5 STEEL OVAL BASEPLATE is standard and eliminates removing the complete cover plate. 6 ELEVATED FLOAT SWITCH ASSEMBLY is standard. Several enclosures are available. Refer to page 6 for additional details. 7 BEARING ASSEMBLIES available in several arrangements and materials to suit difficult applications. Line bearings are provided on 6'-2" settings and deeper. One bearing is provided for each additional 5' of setting. All the standard bearings are grease lubricated. 8 POSITIVE ALIGNMENT THROUGHOUT utilizes tongue and groove registered design. 9 PUMP SHAFT 1-7/16" in diameter is provided to minimize deflection and bearing wear. 10 LIQUID END includes a nonclog impeller as standard and will PASS a 3 INCH SPHERE. 11 DISCHARGE PIPE is securely locked to the baseplate. A 45° elbow is threaded for easy system piping. A below surface discharge is optionally available.



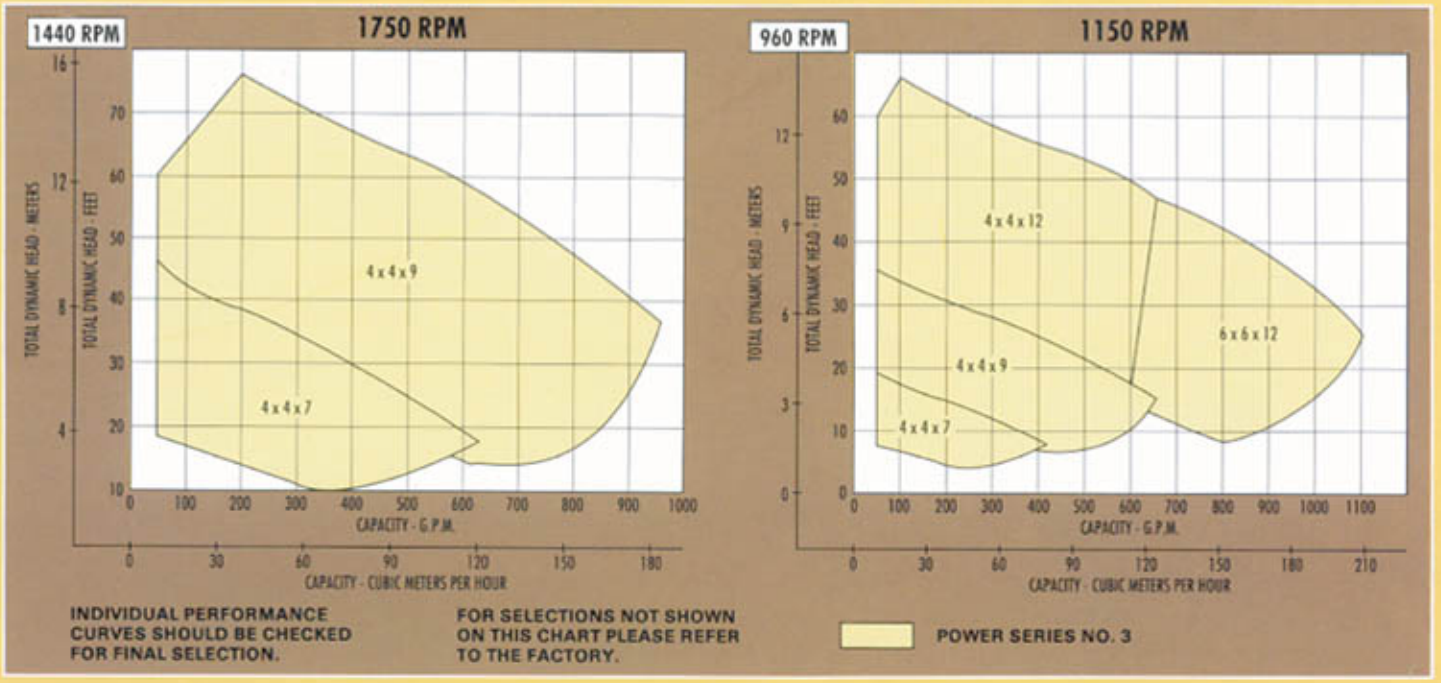
QUICK REFERENCE 630 SERIES FEATURE SELECTOR

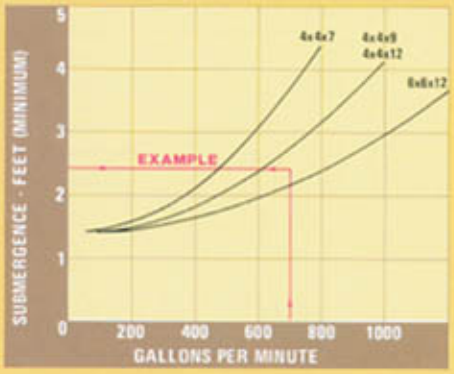
STANDARD

- Bronze fitted construction
- Bronze pump bearings
- Bronze line bearings (6'-2" settings and deeper)
- Dynamically balanced non-clog impeller passes 3" sphere
- Elevated regreaseable thrust ball bearing
- Grease lubricated pump and line bearings
- Standard "HP" base motors
- Carbon steel shaft
- Packing box with split gland and lantern ring
- Oval baseplate
- Gastight construction
- 4" Vent — 34" baseplate and larger
- Float switch
- Plastic float and rod
- Elevated switch support
- External adjustment of impeller
- Pump setting increments of 6"
- Pump settings up to 15'-8"

OPTIONAL

- All iron or all bronze construction
- Bronze impeller
- Various pump and line bearing types
- Drip oiler for line bearings
- Solenoid oiler for line bearings
- Stainless steel shaft
- Round, square or special baseplates
- Steel curb rings
- Various float switch enclosures
- Electric alternator
- Stainless steel or bronze float and rod
- High water alarm
- Alarm bells and horns
- Float guard
- 4" Vent — 28" baseplate and smaller
- Flushing lines to sleeve bearings
- Electric controllers
- Special pump setting increments
- Pump settings over 15'-8"
- Suction cover wear ring





Air may be entrained in the pumped liquid if the pump suction is located too close to the free liquid surface in the suction source. Pumping liquid with entrained air can cause a reduction of capacity, vibration, loss of efficiency and wasted power. Excessive wear of close running parts, bearing stresses and shaft damage are also subsequent effects. If the capacity in gallons per minute and the pump size are known, the minimum height of the liquid above the suction inlet (submergence) can be determined. A properly designed suction inlet and sump can be accomplished with the help of the submergence chart.

EXAMPLE

The recommended minimum submergence for a 4"x4"x9" Model 630 pump operating at 700 gallons per minute (G.P.M.), from water level to suction flange is 2.4 feet.

STANDARD MATERIAL OF CONSTRUCTION

DESCRIPTION	MATERIAL
BASEPLATE	STEEL-WRT
PUMP BEARING	BRONZE ASTM B62
BEARING COLLAR	BRONZE ASTM B62
CASING	CAST IRON ASTM A48
DISCHARGE PIPE	STEEL WRT. SCH'D. 40
HEAD-LOWER	CAST IRON ASTM A48
HEAD-UPPER	CAST IRON ASTM A48
IMPELLER	CAST IRON ASTM A48
PACKING	GRAPHITED FIBER
SHAFT	STEEL AISI C1040
SUCTION COVER	CAST IRON ASTM A48
SUPPORT PIPE	STEEL WRT. SCH'D. 40

INTERMEDIATE LINE SHAFT BEARINGS

PIT DEPTHS	PUMP SETTING	NO. OF LINE SHAFT BRG.
6'-6"	6'-2"	1
11'-6"	11'-2"	2
16'-6"	16'-2"	4

PIT DEPTH OR PUMP SETTING (APPROX.)

LENGTH IN FT.		LENGTH IN FT.		LENGTH IN FT.	
PIT DEPTH	PUMP SETTING	PIT DEPTH	PUMP SETTING	PIT DEPTH	PUMP SETTING
2'	1'-8"	7'	6'-8"	12'	11'-8"
2'-6"	2'-2"	7'-6"	7'-2"	12'-6"	12'-2"
3'	2'-8"	8'	7'-8"	13'	12'-8"
3'-6"	3'-2"	8'-6"	8'-2"	13'-6"	13'-2"
4'	3'-8"	9'	8'-8"	14'	13'-8"
4'-6"	4'-2"	9'-6"	9'-2"	14'-6"	14'-2"
5'	4'-8"	10'	9'-8"	15'	14'-8"
5'-6"	5'-2"	10'-6"	10'-2"	15'-6"	15'-2"
6'	5'-8"	11'	10'-8"	16'	15'-8"
6'-6"	6'-2"	11'-6"	11'-2"	REFER TO FACTORY	

DESIGN DETAILS

AREA	DESCRIPTION	POWER SERIES 3
PUMP SHAFT	DIAMETER AT IMPELLER	1¼
	DIAMETER BETWEEN COUPLING AND IMPELLER	1 7/16
	DIAMETER AT COUPLING END	1¼
BEARINGS	BEARING (BALL) — HEAD	311
	BEARING (SLEEVE) — PUMP	6" LG.
SUPPORT PIPE SIZE		4"
POWER SERIES		3

LIMITATIONS

MAXIMUM LIMITATIONS BASED ON STANDARD MATERIALS AND PUMPING CLEAR WATER

SPEED — R.P.M.		1750
MINIMUM HORSEPOWER	1750 R.P.M.	1
	1150 R.P.M.	¾
TEMPERATURE °F.		140
BASIN PRESSURE — P.S.I.		2
BASIN COVER SIZE	W/O OVAL OR MANHOLE	28
	W OR W/O OVAL OR MANHOLE	78

PUMP SELECTION

Sewage Ejectors are required for handling sewage and other liquids that contain solids and unscreened wastes where gravity drainage is impossible or impractical. Maximum dependability and performance is assured by calculations and selection of the system components. Information required for selecting pump capacity includes the number and type of fixtures, and type of facilities serviced. Elevation to the highest point of discharge and friction losses in the piping system determines the pump discharge head required. Tank or basin size is calculated from the pump capacity requirement.

IMPORTANT NOTE: According to the National Plumbing Code, a Duplex Sewage Ejector is required whenever the pit or basin services more than 6 toilets. Each pump in a duplex system must be large enough to handle the entire flow by itself. This is a safety precaution in the event of failure of one of the pumps. PUMPS THAT HANDLE 3" SOLIDS ARE RECOMMENDED.

DETERMINING PUMP CAPACITY: A simplified procedure in the selection of sewage ejectors places all types of buildings into a single classification with the capacity of the pump determined by the number of toilets serviced (see table). In addition, the minimum velocity required to keep solids moving through the pipe lines must be considered. A pump capacity of less than 50 gallons per minute in a 4" pipe line or 100 gallons per minute in a 6" pipe line would permit solids to settle out.

MAX. NO. OF TOILETS	1 or 2	3 or 4	5 or 6	7 to 10	11 to 14	15 to 20	21 to 25	26 to 30
GALLONS PER MINUTE (G.P.M.)	75	100	125	150	200	250	300	350

ADDITIONAL WATER DRAINAGE: Under normal conditions there will also be clear water drainage from fixtures such as sinks, lavatories, floor drains, etc. This drainage into the sewage ejector basin is highly desired to dilute the raw sewage so that it may be more easily handled. In establishing the capacity recommendations in the above chart, an allowance for fixtures up to four times the number of toilets is included. Where the number of fixtures exceeds that allowance, 3 gallons per minute for each additional fixture must be added to the pump capacity.

EXAMPLE A:

Capacity of 5 toilets	125 G.P.M.
No. of fixtures to be handled in addition to toilets	25
Deduct number of fixtures that can be handled by pump (4 times no. of toilets) (4 × 5 toilets)	20
Excess fixtures	5
fixtures @ 3 G.P.M. each =	15 G.P.M.
Total capacity required	140 G.P.M.

WATER SEEPAGE: Water seepage in amounts up to 50% of the sewage capacity can be safely handled by sewage ejectors selected on the basis of the above chart. Where seepage exceeds 50%, the additional amount must be added to the pump capacity to determine the required pump size. Water seepage delivered to the sewage basin through drain tile from drainage beds will vary according to local soil conditions. As a guide to safe calculations, the following may be used: a) Sandy Soil-14 G.P.M. per 1000 sq. ft. of bed; b) Clay Soil-8 G.P.M. per 1000 sq. ft. of bed.

EXAMPLE B:

Total sewage and clear water drainage from fixtures	140 G.P.M.
Water seepage	80 G.P.M.
Allowance for handling seepage up to 50% of sewage total	70 G.P.M.
Additional capacity required	10 G.P.M.
Total pump capacity required	150 G.P.M.

UNUSUAL ADDITIONAL SERVICE FLOW: Careful consideration should be given to real or potential additional flow from unusual or abnormal additions to the service flow as determined by the method of calculation outlined above. This would include flow from such services as boiler drainage, air conditioning drainage water, etc. All of this service flow must be added to the projected pump capacity requirement.

DETERMINING PUMP DISCHARGE HEAD: The pump discharge head may be calculated by determining the distance from the lowest *level of water in the basin* to the street level. By using the street level in place of the sewer line as point of reference, a reasonable factor of safety is established, accounting for the possibility of back pressure. To this you must add the friction loss in the discharge pipe line and fittings.

EXAMPLE C:

Distance from lowest level of water to street level	26 ft.
Friction of discharge pipe (150 G.P.M. 4" pipe 150' long)	2 ft.
Friction of pipe fittings (elbows, check valves, gate valves, Y-branch, etc.)	2 ft.
Total discharge head	30 ft.

DETERMINING TANK OR BASIN SIZE: The size of the sewage basin should be selected to prevent both short cycling of the pumping operation and excessive settling out of solids. A drawn down rato of 3:1 is recommended . . . this means that the basin volume between the low sewage level and the high sewage level should accommodate 3 times the capacity of the pump before the pumping cycle begins. A minimum distance of 1 foot between the lowest sewage level and the basin floor should be allowed. In addition, the distance between the maximum sewage level and the basin cover should be ⅓ of the storage volume between the high and low sewage levels, but not less than 2 feet. Where conditions limit the basin depth, the required capacity may be obtained by using a larger basin diameter.

EXAMPLE D:

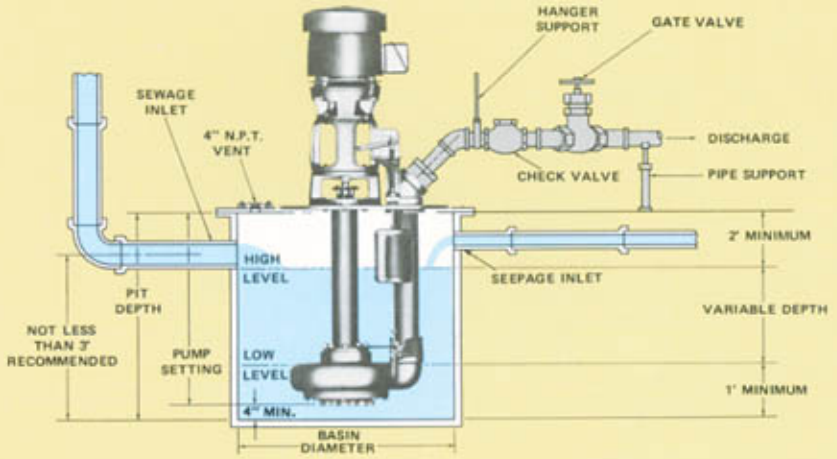
Total pump capacity	150 G.P.M.
Basin to hold 3 times pump capacity (3 × 150 Gal.)	450 Gal.
From table below a 48" dia basin will hold 95 Gal. per foot of depth. Therefore, basin depth is (450 ÷ 95)	4.74 ft.
Add approx. ⅓ to depth for storage between high level of sewage and basin cover or (minimum 2 ft.)	2.00 ft.
Add approx. 1 ft. to depth for distance between lowest level of sewage and basin floor	1.00 ft.
Total pit depth required	7.74 ft.
Recommended pit depth (next standard 6" increment)	8 ft.

CALCULATING ROUND TANK OR BASIN CAPACITIES Per Foot of Depth:

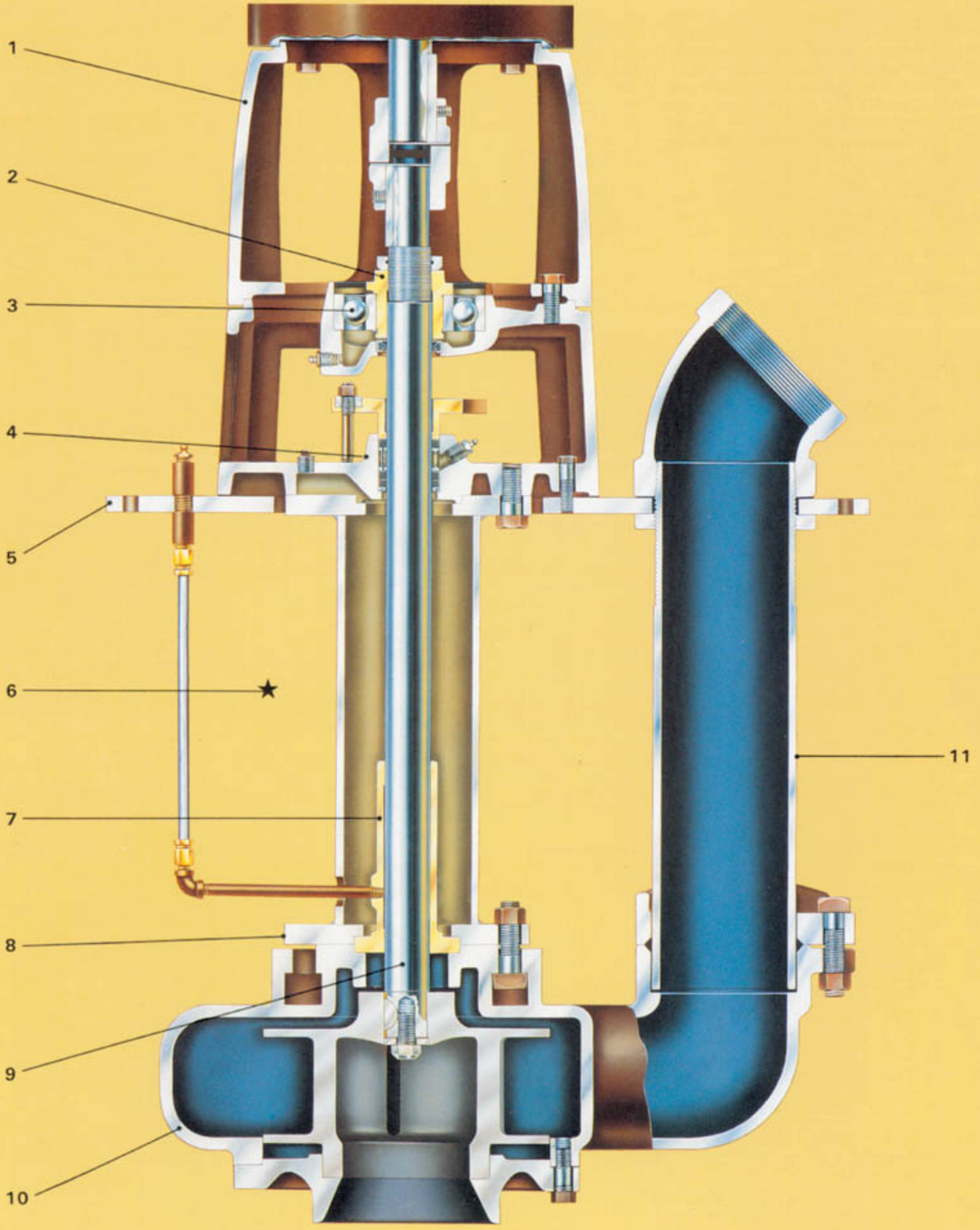
PUMP	SIMPLEX					DUPLEX		
BASIN DIA. INCHES	24	30	36	42	48	54	60	72
CAPACITY PER FOOT IN GALLONS	24	38	53	77	95	119	150	212

NOTE: TANKS ARE AVAILABLE IN DEPTHS OF 6" INCREMENTS.

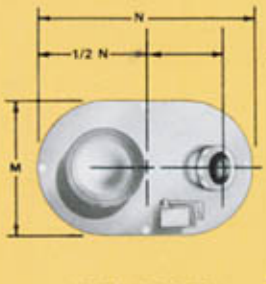
CALCULATING SQUARE PIT CAPACITIES: To determine the size of a square or rectangular pit commonly used in concrete construction the same procedure as outlined in example D may be followed. To calculate the capacity of a pit other than a round one, use the following formula: Cubic content in cu. ft. × 7.48 = the number of gallons.



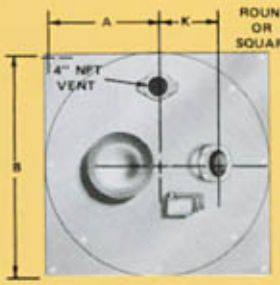
TYPICAL INSTALLATION
The piping layout shown here is of a conventional installation. Specific applications accommodating the individual service conditions, basin capacity, etc., will be reflected in change in diameter sizes of the basins and covers along with the basin depth.


1
2
3
4
5
6
7
8
9
10
11

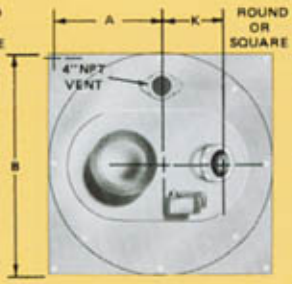
ENGINEERING SPECIFICATIONS AND DIMENSIONS



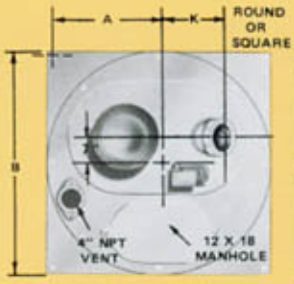
BASEPLATE - TYPE 1
STANDARD OVAL



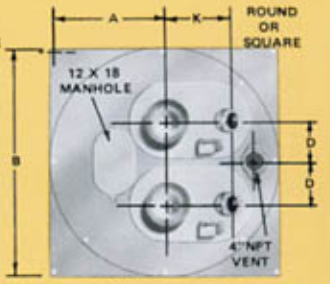
BASEPLATE - TYPE 2
OPTIONAL SIMPLEX
PLATE ONLY



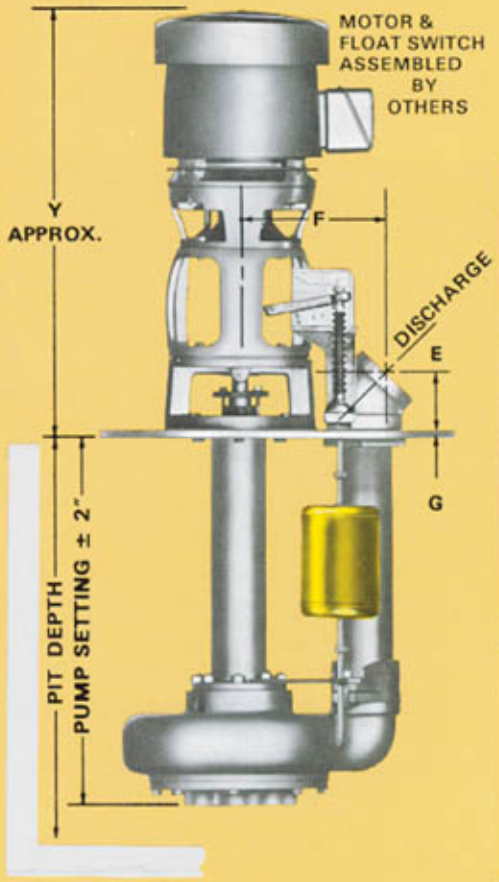
BASEPLATE - TYPE 3
OPTIONAL SIMPLEX
WITH OVAL



BASEPLATE - TYPE 4
OPTIONAL SIMPLEX
WITH OVAL & MANHOLE



BASEPLATE - TYPE 5
OPTIONAL DUPLEX
WITH OVALS & MANHOLE



NOTES:
1. Dimensions and weights are approximate.
2. All dimensions are in inches and may vary ± ½".
3. Frame sizes, "Y" dimension and motor weight are for open drip-proof motors only.
4. Conduit box is shown in approximate position. Dimensions are not specified as they vary with each motor manufacturer.
5. Add pump(s), base(s), upper head(s) and motor weight(s) for unit weight.
6. Not for construction purposes unless certified.
7. Motor H.P. will increase due to friction when multiple line shaft bearings are used.
8. Refer to factory for float suitability for liquids other than water.

BASEPLATE — OVAL — STEEL

NO.	TYPE	G	M	N	WGT
1	20 x 24	⅜	20	24	36
2	22 x 28	½	22	28	63

BASEPLATES — ROUND OR SQUARE — STEEL

		TYPE 2				TYPE 4				TYPE 5			
A	B	OVAL NO.	G	WGT. RD.	WGT. SQ.	OVAL NO.	G	WGT. RD.	WGT. SQ.	OVAL NO.	G	WGT. RD.	WGT. SQ.
15	24	N.A.	⅜	61	54								
13	28	N.A.	⅜	58	76								
		TYPE 3											
16	24	1	⅜	89	115								
19	40	2	⅜	126	162	1	⅜	136	171				
20	44	2	½	225	299	2	½	235	306	1	½	245	309
25½	53	2	½	302	387	2	½	312	397	2	½	397	504
29	60	2	⅝	497	623	2	⅝	497	634	2	⅝	507	643
32	66	2	⅝	592	755	2	⅝	603	765	2	⅝	720	927
36	78	2	⅝	832	1060	2	⅝	842	1070	2	⅝	1016	1295

MOTOR

FRAME	HORSEPOWER 1750	HORSEPOWER 1150	MOTOR WGT (LBS)	UPPER HEAD WGT (LBS)	Y APPROX
143 HP	1	¾	40	21	25
145 HP	1½ 2	1	45	21	26
182 HP	3	1½	72	21	27
184 HP	5	2	80	21	28
213 HP	7½	3	130	21	30
215 HP	10	5	145	21	32
254 HP	15	7½	220	21	34
256 HP	20	10	240	21	36
284 HPH	25	15	330	42	39

PUMP SIZE DISCH.	SUC-TION	CASE BORE	PUMP WGT. IN LBS. 5'-8" SET-TING	FOR EA. ADD. 1' SET-TING	D	E	F	MINIMUM BASEPLATE SIZE TYPE 1 SIZE	TYPE 1 K	TYPE 2 SIZE	TYPE 2 K	*TYPE 3 SIZE	*TYPE 3 K	**TYPE 4 SIZE	**TYPE 4 K	TYPE 5 SIZE	TYPE 5 K
4	4	7	542	30	10½	4½	11⅞	20 x 24	9⅛	24	9⅛	34	9⅛	40	9⅛	46	12⅛
4	4	9	562	30	10½	4½	11⅞	20 x 24	9⅛	24	9⅛	34	9⅛	40	9⅛	46	12⅛
4	4	12	610	30	11½	4½	11⅞	22 x 28	8⅛	34	9⅛	36	8⅛	42	8⅛	53	11⅛
6	6	12	655	30	11½	6	13½	22 x 28	10½	34	11	36	10½	42	10½	53	13

*All bases 36" and larger — use 22 x 28 oval only. **All bases 42" and larger — use 22 x 28 oval only.

The contractor shall furnish (and install as shown on the plans) Aurora Model (631 Simplex) (632 Duplex) centrifugal sewage pumps size . . . x . . . x . . . of (bronze fitted) (all iron) construction. Each pump shall have a capacity of . . . G.P.M. at . . . ft. total head, with a temperature of . . . °F., . . . specific gravity. The units shall be designed for a sump depth of . . . feet and shall be furnished with an (above the floor discharge terminating at the baseplate with a 45° threaded elbow) (below the floor discharge terminating with a threaded connection). A steel baseplate; (oval); (round) (square) — (Simplex) (Simplex with oval) (Simplex with oval and manhole) (Duplex with ovals and manhole) will be provided. A 4" vent will be provided on all round or square baseplates. The pump casing and suction cover shall be cast iron. The casing is to be provided with a cast integral discharge elbow. The cast iron impeller is of the enclosed non-clog type and shall be capable of passing a 3" diameter sphere. The impeller running clearances will be of the face type to provide simple adjustments axially to compensate for wear. The impeller is to be dynamically balanced and keyed to the pump shaft. The column pipe must be 4" diameter having machined tongue and grooved joints to insure shaft alignment. A pump bearing will be located directly above the impeller and shall be (bronze sleeve) (iron sleeve) or relief type with (iron) (bronze) (cutless rubber) bushing. Spool bearing with steel housing with (iron) (bronze) (cutless rubber) bushing. Line bearings must be provided with a setting of 6'-2" and one bearing for each additional 5' of setting thereafter. All standard sleeve or relief pump and line bearings must be (grease) (oil) (water) lubricated through separate Nylon tube lubrication lines terminating at the (baseplate) (discharge pipe). Standard bearings will be grease lubricated (unless otherwise specified). The motor pedestal is to be of cast iron, two piece construction, fitted with a sealed thrust ball bearing located 6" above the baseplate. The ball bearing collar will be arranged to allow external axial adjustment of the shaft and impeller. Grease seals shall be provided to retain grease and to prevent contamination of the vertically mounted ball bearing. A grease fitting will be provided to allow regreasing of the bearing. A packed stuffing box complete with a split gland shall be provided for gastight construction. The upper head shall be of sufficient height to elevate the motor shaft extension should the motor be removed for servicing. The pump shall be controlled by an enclosed (heavy duty) (watertight and explosion resisting) (explosion proof) type float operated switch 6" above the baseplate with plastic float and float rod. A flexible bellows will provide gastight construction. An automatic alternator shall be furnished on duplex pumps to allow the pumps to alternate on each successive cycle of operation. The pumps are to be driven by and flexible coupled to a standard "HP" . . . H.P., . . . volt, . . . phase, . . . Hertz, . . . R.P.M., . . . vertical solid shaft (open drip-proof) (totally enclosed) (explosion proof) electric motor. A conduit box will be provided as well as a drip cover.

NOTE: Aurora Pump reserves the right to make revisions to its products and their specifications, and to this bulletin and related information without notice.

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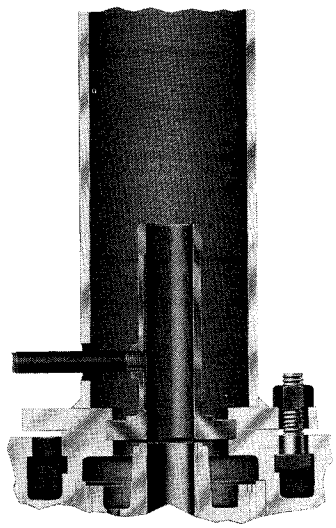
BEARING TYPE	PUMP CONSTRUCTION	BEARING HOUSING MATERIAL	BUSHING MATERIAL		
			IRON	BRONZE	CUTLESS RUBBER
STANDARD BEARING FOR PIT DEPTHS UNDER 10'	BRONZE FITTED	BRONZE	NO BUSHINGS REQUIRED	NO BUSHINGS REQUIRED	REFER TO OPTIONAL BEARINGS
	ALL BRONZE	BRONZE			
	ALL IRON	IRON			
RELIEF BEARING STANDARD FOR PIT DEPTHS 10' AND DEEPER	BRONZE FITTED	STEEL		X	
	ALL BRONZE	BRONZE		X	
	ALL IRON	STEEL	X		
STANDARD LUBRICATION			GREASE		PUMPED LIQUID
OPTIONAL LUBRICATION			WATER FLUSH- OIL (1)		WATER - FLUSH (2)

(1) OIL - FOR LINESHAFT BEARINGS ONLY.
(2) WATER FLUSH- RELIEF HOUSING ONLY.

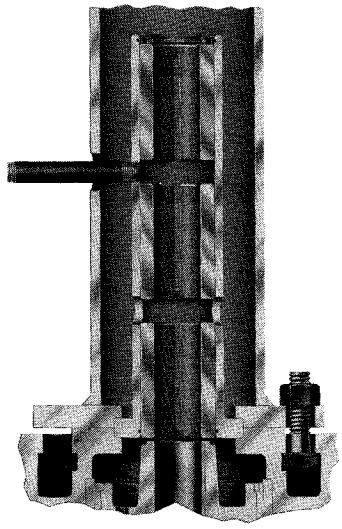
Two important parts in any sump pump construction are the pump and line bearings as they are immersed in the liquid. The line bearings frequently run wet or dry depending on the varying liquid level in the sump. A complete line of bearings for all types of service conditions is available. Line bearings are provided as standard on 6'-2" pump settings and for each additional 5' setting thereafter.

STANDARD



STANDARD
All 630 Series pumps (except for 10 foot and deeper settings at 1750 R.P.M.) are furnished with bronze sleeve type bearing unless an optional style is specified and is also the standard lineshaft bearing for all settings. The bearing is mounted directly above the impeller and receives lubrication from individual external grease lines. This bearing is also available in cast iron or ni-resist material. The majority of all vertical wet pit pump applications can be handled by this standard bearing. However, when pumping conditions are severe, abrasives are present in the liquid or the liquid temperature exceeds 140°F., one of the following optional bearings should be selected.

RELIEF



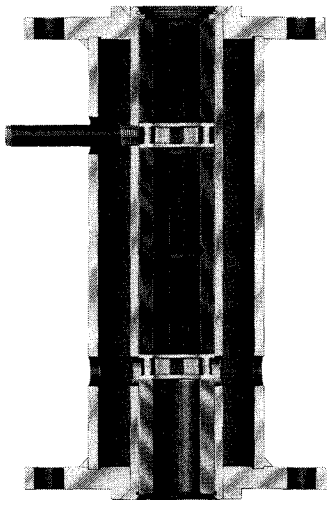
RELIEF
A RELIEF-TYPE PUMP BEARING WILL BE SUPPLIED AS STANDARD FOR 10 FOOT AND DEEPER SETTINGS AT 1750 R.P.M., and is otherwise optionally available. The relief-type bearing housing has three metal bushings inserted into the housing. When in operation, the liquid being pumped goes through the lower portion of the bearing under pressure and is vented to the sump through the annular ring. This venting action permits only a small amount of liquid, with a fraction of the abrasive content, to enter into the top half of the bearing housing; as a result, the upper portion which is not subject to pumping pressure wears at a much slower rate. The life expectancy of this optional design will be two to four times longer than the standard bearing. Since this relief-type bearing housing is also used with the other bushing materials (Iron, Bronze, or Cutless Rubber) the same venting principle applies to these bushing materials. All three bushings can be constructed of different materials, therefore opening a wide range of applications. The STANDARD bearing is normally provided with this option on all lineshaft bearings; however, the IRON, BRONZE, or CUTLESS RUBBER options can also be provided for use as relief-type lineshaft bearings. The liquid being pumped provides the required lubrication for the lower bushing. An external grease line lubricates the upper bushings when bronze or iron bushings are provided. When other bushing materials are specified, they are water-flush lubricated from either the pump discharge pipe or a secondary city water supply, depending upon the application.

MODEL 631 - 632
ENGINEERING DATA
PUMP AND LINE BEARINGS

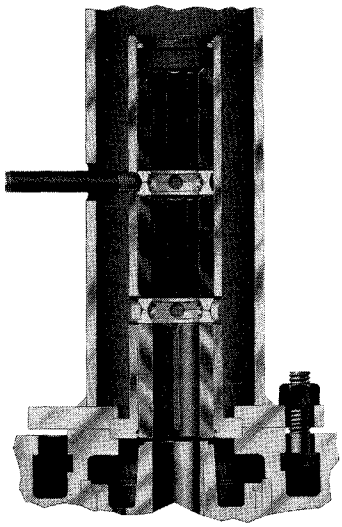
BEARING TYPE	PUMP CONSTRUCTION	BEARING HOUSING MATERIAL	BUSHING MATERIAL		
			IRON	BRONZE	CUTLESS RUBBER
OPTIONAL RELIEF BEARING	BRONZE FITTED	STEEL		X	X
	ALL BRONZE	BRONZE		X	X
	ALL IRON	STEEL	X		X
OPTIONAL SPOOL BEARING	BRONZE FITTED	STEEL		X	X
	ALL IRON	STEEL	X		X
STANDARD LUBRICATION			GREASE		PUMPED LIQUID
OPTIONAL LUBRICATION			WATER FLUSH OIL (1)		WATER - FLUSH (2)

(1) OIL - FOR LINESHAFT BEARINGS ONLY.
(2) WATER FLUSH - RELIEF HOUSING ONLY.

SPOOL

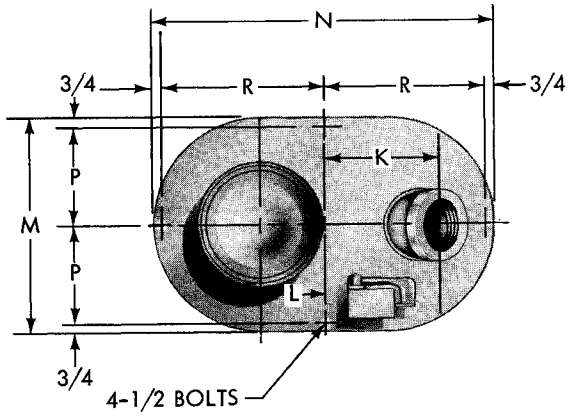


CUTLESS RUBBER



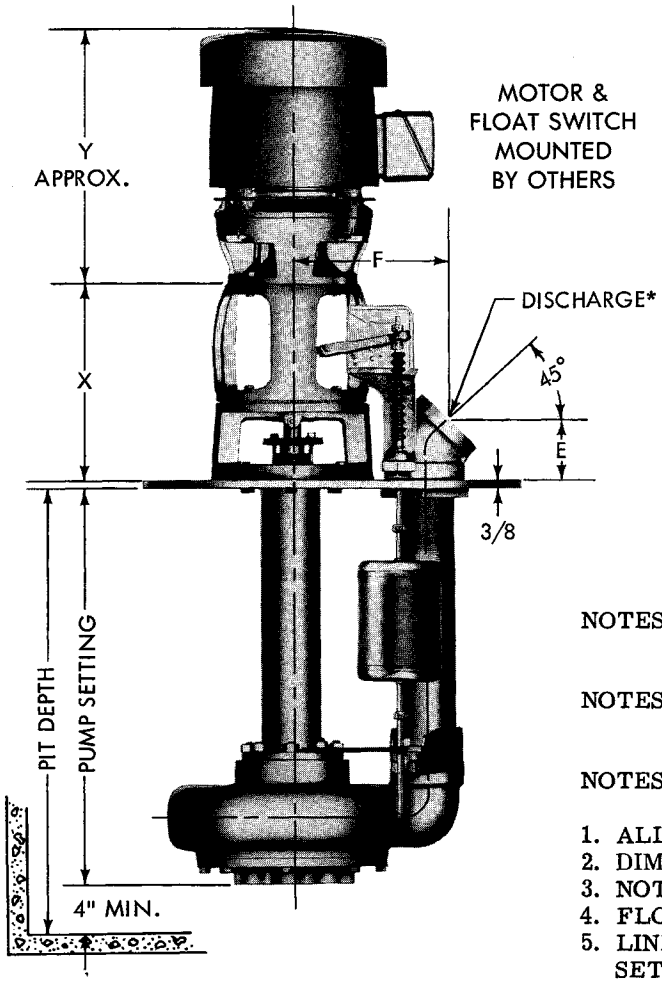
CUTLESS RUBBER (OPTIONAL BEARING)
This bearing consists of a carbon steel relief-type bearing housing and two cutless rubber bushings. A third bushing located at bottom of bearing housing is made of metal. This metal is bronze or iron, depending upon the pump construction material. This metal bushing carries most of the shaft bearing loads. As wear occurs, the bearing loads are gradually distributed among the remaining cutless rubber bushings, thus increasing total bearing life. Lubrication can be supplied by the liquid being pumped when used as a pump bearing. When used as an optional lineshaft bearing, water flush lubrication is provided. The water flush lines may be connected to the pump discharge pipe or a secondary city water supply, depending upon the application. Grease lubrication is not recommended. Cutless rubber bearings may be used in conjunction with STANDARD lineshaft bearings which are also capable of water flush lubrication. This option is recommended for applications where abrasives are held in suspension in the liquid pumped. The excellent abrasive-resistant characteristics of rubber give this bearing several times the wear life of a standard bearing. Stainless steel shafting is recommended. DO NOT APPLY THIS OPTION WHEN THE LIQUID TEMPERATURE EXCEEDS 140°F.; IN SUCH CASES, SELECT ONE OF THE OTHER BEARING OPTIONS.

SPOOL (OPTIONAL BEARING)
This bearing can be supplied as an optional bearing for any pump setting. It is intended for use as a rigid pump bearing for unusually rugged pump applications. It retains the lubrication characteristics of the relief bearing previously discussed. The housing can be equipped with different bushing materials (Iron, Bronze, or Cutless Rubber) depending upon the application. The bearing housing is of rigid "double-wall" metal construction and is flanged at each end. The outer pipe acts as a rigid support while the inner pipe serves as a bushing carrier. This construction allows the bearing housing to be bolted to the support pipe at the upper flange and to the pump casing at the lower flange, thus making this housing a rigid and integral part of the pump support piping system. Undesirable bearing housing deflections under high shaft loads are eliminated by this rigid construction thus providing positive pump shaft guidance. The additional length of this bearing provides increased bearing area for rugged applications. A lubrication line attached to the bearing housing may be connected to the pump discharge pipe or a secondary city water supply, or grease lubricated, depending upon the application. This bearing may be used in conjunction with STANDARD lineshaft bearings which are also capable of water flush lubrication.



PUMP SIZE			E	F	K	OVAL SIZE
DISCH	SUCTION	CASE BORE				
4	4	7	4-1/2	11-7/8	9-3/8	**20 x 24
4	4	9	4-1/2	11-7/8	9-3/8	**20 x 24
4	4	12	4-1/2	11-7/8	8-7/8	22 x 28
6	6	12	6	13-1/2	10-1/2	22 x 28

OVAL	L	M	N	P	R
**20 x 24	2-1/2	20	24	9-1/4	11-1/4
22 x 28	3	22	28	10-1/4	13-1/4



FRAME	X	Y
143HP	13-7/8	11
145HP	13-7/8	12
182HP	13-7/8	13
184HP	13-7/8	14
213HP	13-7/8	16
215HP	13-7/8	17
254HP	13-7/8	19
256HP	13-7/8	21
284HPH	15-5/8	21
286HPH	15-5/8	23
324HP	15-5/8	24
326HP	15-5/8	25

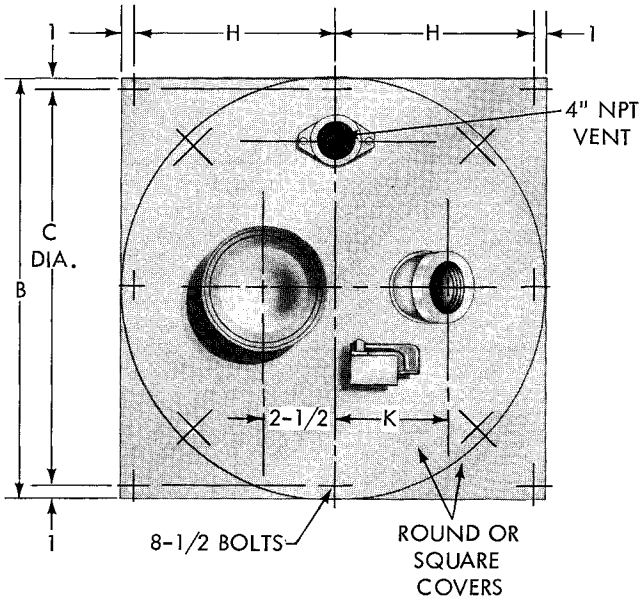
NOTES: * STD DISCHARGE ELBOW IS THREADED (FLANGED ELBOW CONNECTIONS AVAILABLE).

NOTES: ** 20 x 24 OVAL AVAILABLE ONLY WITH 4 x 4 x 7 AND 4 x 4 x 9 PUMPS.

NOTES:

1. ALL DIMENSIONS IN INCHES.
2. DIMENSIONS MAY VARY ± 3/8".
3. NOT FOR CONSTRUCTION PURPOSES UNLESS CERTIFIED.
4. FLOAT SWITCH FURNISHED ONLY WHEN SPECIFIED.
5. LINE SHAFT BEARING FURNISHED ON 6' 2" PUMP SETTINGS AND LONGER.
6. 22 x 28 OVAL IS STD FOR ALL PUMPS WHEN USED ON BASIN COVERS OF 52" DIA. AND LARGER.
7. 22 x 28 OVALS ARE ALSO AVAILABLE WHERE 20 x 24 OVALS ARE SHOWN.

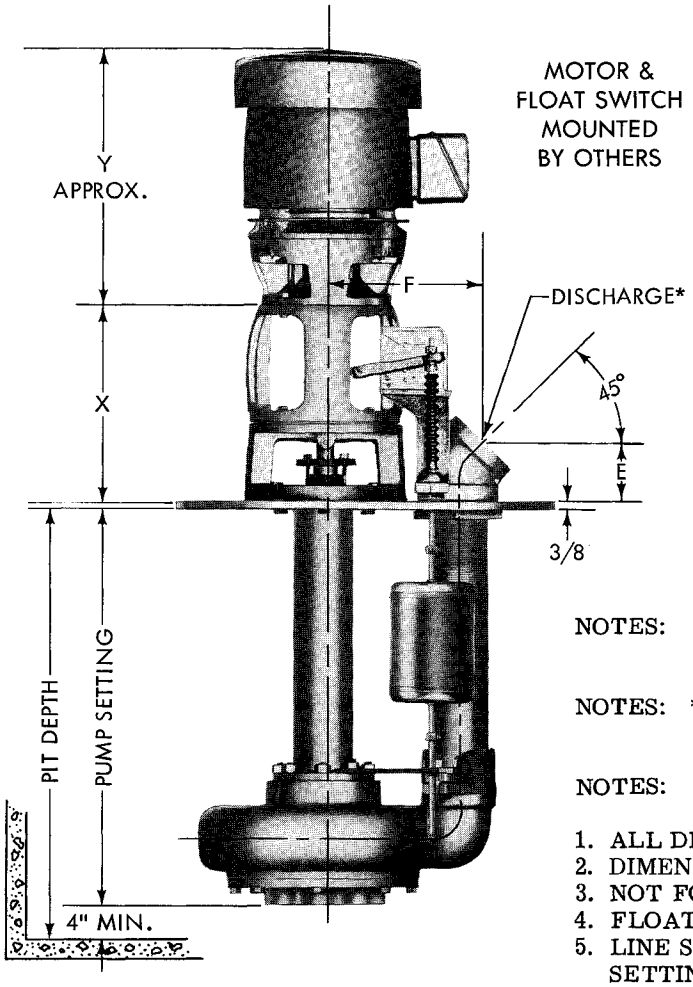
AURORA MODEL 631 PUMP
ON SIMPLEX PLATE



PUMP SIZE			E	F	K
DISCH	SUCTION	CASE BORE			
4	4	7	4-1/2	11-7/8	9-3/8
4	4	9	4-1/2	11-7/8	9-3/8
4	4	12	4-1/2	11-7/8	9-3/8
6	6	12	6	13-1/2	11

COVER SIZE B	C	H
24	22	11
28	26	13

FRAME	X	Y
143HP	13-7/8	11
145HP	13-7/8	12
182HP	13-7/8	13
184HP	13-7/8	14
213HP	13-7/8	16
215HP	13-7/8	17
254HP	13-7/8	19
256HP	13-7/8	21
284HPH	15-5/8	21
286HPH	15-5/8	23
324HP	15-5/8	24
326HP	15-5/8	25



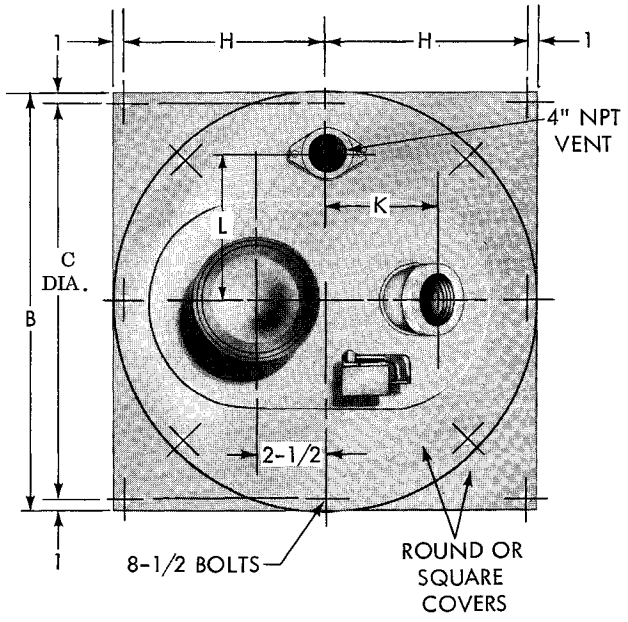
NOTES: * STD DISCHARGE ELBOW IS THREADED (FLANGED ELBOW CONNECTIONS AVAILABLE).

NOTES: ** 4 x 4 x 12 PUMP NOT AVAILABLE ON 28" BASIN COVERS.

NOTES:

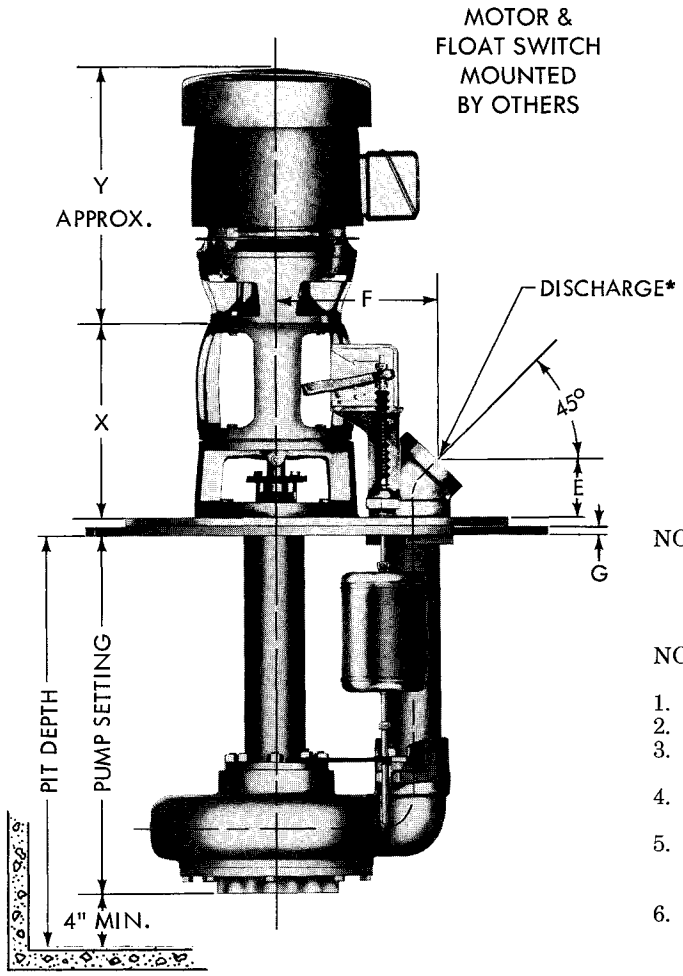
1. ALL DIMENSIONS IN INCHES.
2. DIMENSIONS MAY VARY ± 3/8".
3. NOT FOR CONSTRUCTION PURPOSES UNLESS CERTIFIED.
4. FLOAT SWITCH FURNISHED ONLY WHEN SPECIFIED.
5. LINE SHAFT BEARING FURNISHED ON 6' 2" PUMP SETTINGS AND LONGER.

AURORA MODEL 631 PUMP
ON SIMPLEX PLATE WITH OVAL



PUMP SIZE			E	F	K	OVAL SIZE
DISCH	SUCTION	CASE BASE				
4	4	7	4-1/2	11-7/8	9-3/8	20 x 24
4	4	9	4-1/2	11-7/8	9-3/8	20 x 24
4	4	12	4-1/2	11-7/8	9-3/8	22 x 28
6	6	12	6	13-1/2	11	22 x 28

COVER SIZE B	C	H	G	L
			STEEL	
34	32	16	3/8	12-3/4
40	38	19	3/8	14-1/2
46	44	22	1/2	16
53	51	25-1/2	1/2	17-3/4
60	58	29	5/8	19-1/2
66	64	32	5/8	21
78	76	38	5/8	24



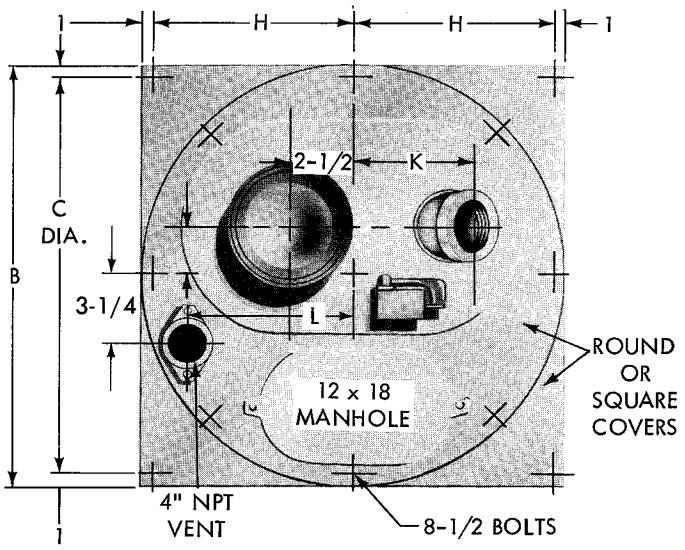
NOTES: * STD DISCHARGE ELBOW IS THREADED (FLANGED ELBOW CONNECTIONS AVAILABLE)

NOTES:

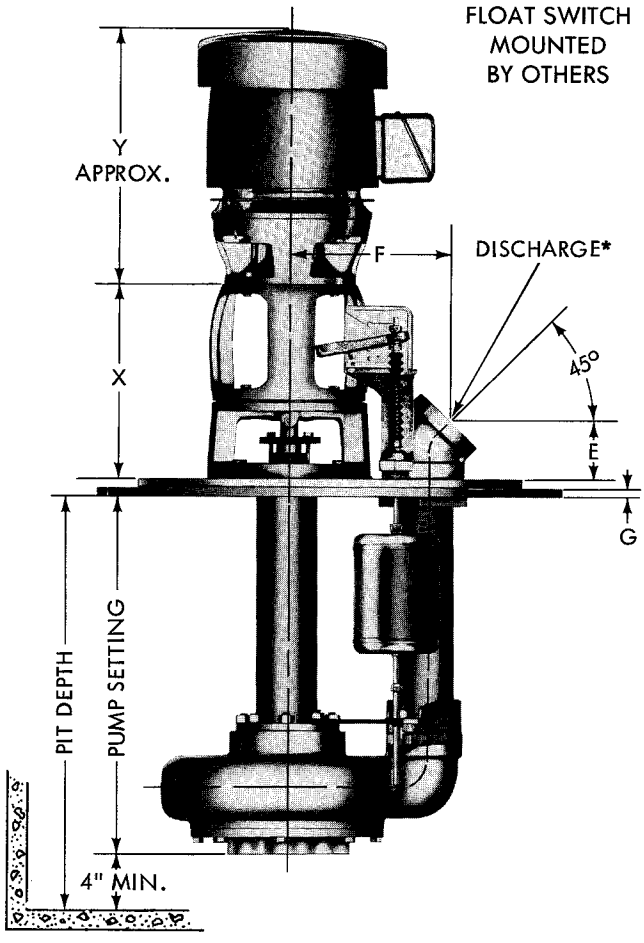
1. ALL DIMENSIONS IN INCHES.
2. DIMENSIONS MAY VARY ± 3/8".
3. NOT FOR CONSTRUCTION PURPOSES UNLESS CERTIFIED.
4. FLOAT SWITCH FURNISHED ONLY WHEN SPECIFIED.
5. LINE SHAFT BEARING FURNISHED ON 6' 2" PUMP SETTINGS AND LONGER.
6. 22 x 28 OVALS ARE ALSO AVAILABLE WHERE 20 x 24 OVALS ARE SHOWN.

FRAME	X	Y
143HP	13-7/8	11
145HP	13-7/8	12
182HP	13-7/8	13
184HP	13-7/8	14
213HP	13-7/8	16
215HP		17
254HP	13-7/8	19
256HP	13-7/8	21
284HPH	15-5/8	21
286HPH	15-5/8	23
324HP	15-5/8	24
326HP	15-5/8	25

AURORA MODEL 631 PUMP
ON SIMPLEX PLATE WITH OVAL AND MANHOLE



PUMP SIZE			E	F	K	OVAL SIZE
DISCH	SUCTION	CASE BORE				
4	4	7	4-1/2	11-7/8	9-3/8	20 x 24
4	4	9	4-1/2	11-7/8	9-3/8	20 x 24
4	4	12	4-1/2	11-7/8	9-3/8	22 x 28
6	6	12	6	13-1/2	11	22 x 28



COVER SIZE B	C	H	G STEEL	L
40	38	19	3/8	14-1/2
46	44	22	1/2	17
53	51	25-1/2	1/2	18-3/4
60	58	29	5/8	20-1/2
66	64	32	5/8	22
78	76	38	5/8	25

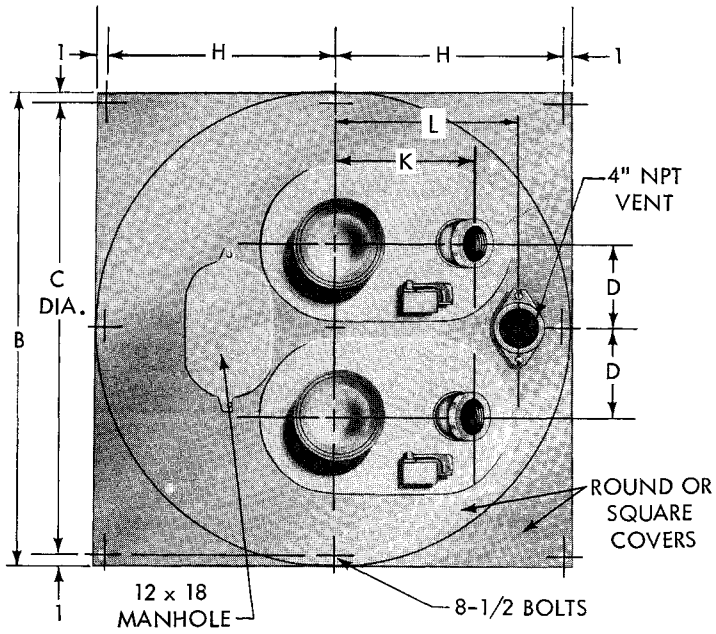
FRAME	X	Y
143HP	13-7/8	11
145HP	13-7/8	12
182HP	13-7/8	13
184HP	13-7/8	14
213HP	13-7/8	16
215HP	13-7/8	17
254HP	13-7/8	19
256HP	13-7/8	21
284HPH	15-5/8	21
286HPH	15-5/8	23
324HP	15-5/8	24
326HP	15-5/8	25

NOTES: * STD DISCHARGE ELBOW IS THREADED (FLANGED ELBOW CONNECTIONS AVAILABLE)

NOTES:

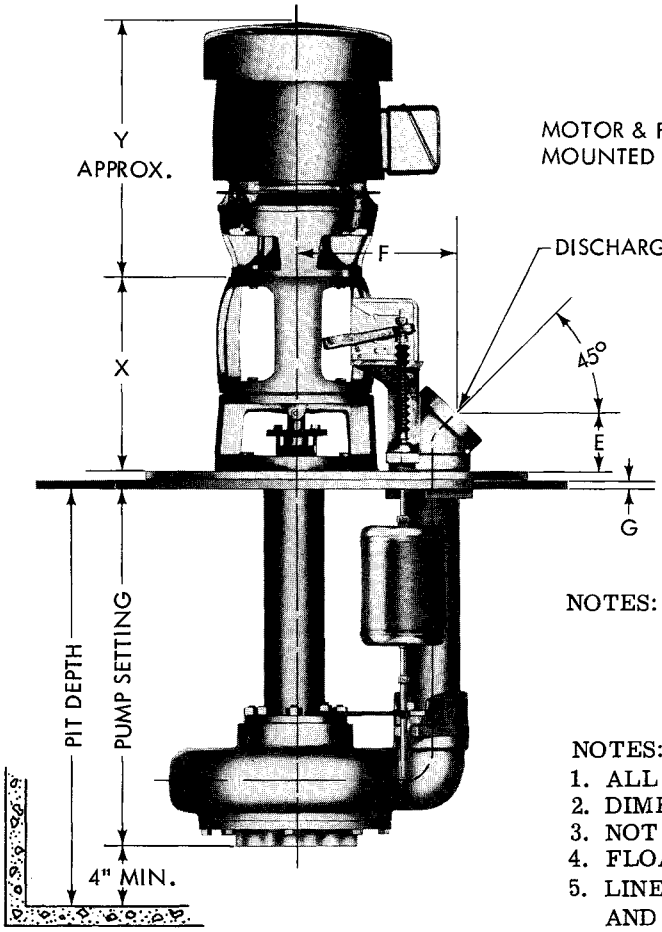
1. ALL DIMENSIONS IN INCHES.
2. DIMENSIONS MAY VARY ± 3/8.
3. NOT FOR CONSTRUCTION PURPOSES UNLESS CERTIFIED.
4. FLOAT SWITCH FURNISHED ONLY WHEN SPECIFIED.
5. LINE SHAFT BEARING FURNISHED ON 6' 2" PUMP SETTINGS AND LONGER.
6. 22 x 28 OVAL IS STD FOR ALL PUMPS WHEN USED ON BASIN COVERS OF 52" DIA. AND LARGER.
7. 22 x 28 OVALS ARE ALSO AVAILABLE WHERE 20 x 24 OVALS ARE SHOWN.

AURORA MODEL 632 PUMP
ON DUPLEX PLATE WITH TWO OVALS AND MANHOLE



PUMP SIZE			E	F	K	
DISCH	SUCTION	CASE BORE			20 X 24 OVAL	22 X 28 OVAL
4	4	7	4-1/2	11-7/8	12-3/8	11-3/8
4	4	9	4-1/2	11-7/8	12-3/8	11-3/8
4	4	12	4-1/2	11-7/8		11-3/8
6	6	12	5-7/8†	13-7/16†		13

COVER SIZE B Rd. or sq.	C ROUND	H SQUARE	G STL	OVAL USED	D	L
46**	44	22	1/2	20 x 24	10-1/2	17
53	51	25-1/2	5/8	22 x 28	11-1/2	19
60	58	29	5/8	22 x 28	11-1/2	19
66	64	32	3/4	22 x 28	11-1/2	19
78	76	38	3/4	22 x 28	11-1/2	19



FRAME	X	Y
143HP	13-7/8	11
145HP	13-7/8	12
182HP	13-7/8	13
184HP	13-7/8	14
213HP	13-7/8	16
215HP	13-7/8	17
254HP	13-7/8	19
256HP	13-7/8	21
284HPH	15-5/8	21
286HPH	15-5/8	23
324HP	15-5/8	24
326HP	15-5/8	25

NOTES: * STD DISCHARGE ELBOW IS THREADED (FLANGED ELBOW CONNECTIONS AVAILABLE).

** 4 x 4 x 12 AND 6 x 6 x 12 PUMPS NOT AVAILABLE ON 46" BASIN COVERS.

† FLANGED ELBOW STANDARD

NOTES:
1. ALL DIMENSIONS IN INCHES.
2. DIMENSIONS MAY VARY ± 3/8.
3. NOT FOR CONSTRUCTION PURPOSES UNLESS CERTIFIED.
4. FLOAT SWITCH FURNISHED ONLY WHEN SPECIFIED.
5. LINE SHAFT BEARING FURNISHED ON 6' 2" PUMP SETTINGS AND LONGER.
6. SQUARE COVERS AVAILABLE ONLY IN STEEL.

AURORA®
Pentair Pump Group

INSTRUCTION MANUAL
REPAIR
MODEL 631-632 (KSB)

6

SERVICE

Your Aurora pump requires no maintenance other than periodic inspection, occasional cleaning and lubrication. The intent of inspection is to prevent breakdown, thus obtaining optimum service life. The pumped liquid determines the type of pump and line bearings supplied and method of bearing lubrication. Refer to lubrication section for specific instruction. The motor may also require lubrication, in which case the motor manufacturer's recommendation should be followed.

LUBRICATION (BALL BEARINGS)

Regreasable bearings will require periodic lubrication and can be accomplished by using the zerk or lubrication fittings in the lower head assembly. Lubricate the bearings at regular intervals using a grease of high quality. Lithium, lithium soda or calcium base grease is recommended as lubricants for pumps operating in both wet and dry locations. Mixing of different brands of grease should be avoided due to possible chemical reactions between the brands which could damage the bearing. Accordingly, avoid grease of vegetable or animal base which can develop acids, as well as grease containing rosin, graphite, talc and other impurities. Under no circumstances should grease be reused.

Over lubrication should be avoided as it may result in overheating and possible bearing failure. Under normal application, adequate lubrication is assured if the amount of grease is maintained at 1/3 to 1/2 the capacity of the bearing and adjacent space surrounding it.

In dry locations each bearing will need lubrication at least every 4,000 hours of running time or every 6 to 12 months, whichever is more frequent. In wet locations the bearings should be lubricated at least after every 2,000 hours of running time or every 4 to 6 months, whichever is more frequent. A unit is considered to be installed in a wet location if the head assembly and motor are exposed to dripping water, to the weather, or to heavy condensation such as is found in unheated and poorly ventilated underground locations.

At times it may be necessary to clean the bearings due to accumulated dirt or deteriorated lubricants. This can be accomplished by flushing the bearing with a light oil heated to 180 to 200° F. while rotating it on a spindle. Wipe the bearing housing with a clean rag soaked in a cleaning solvent, and flush all surfaces.

Dry bearing thoroughly before relubricating. Compressed air can be used to speed drying, but care should be taken not to let bearings rotate while being dried.

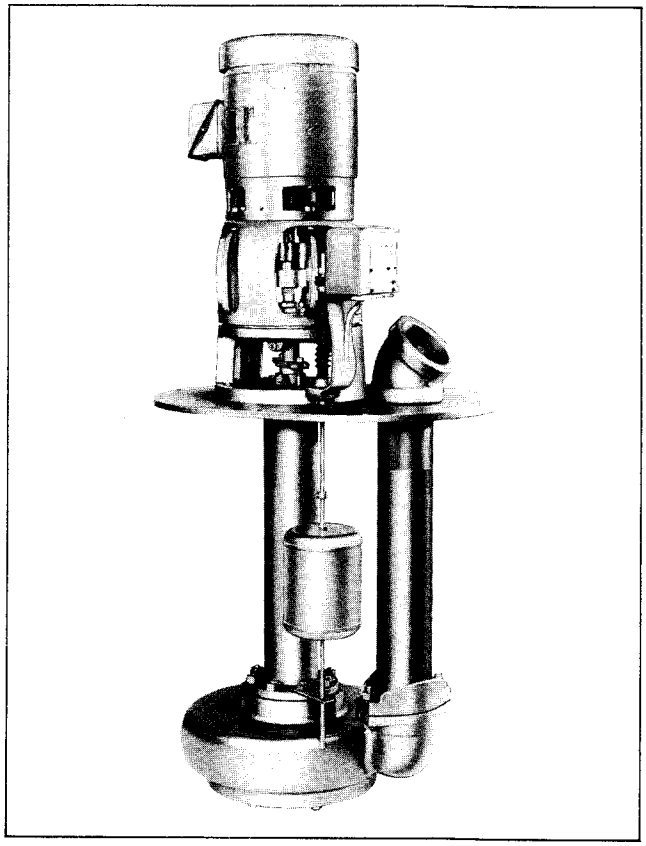
CAUTION

Use normal fire caution procedures when using any petroleum cleaner.

LUBRICATION (LINE SHAFT & PUMP BEARINGS)

Grease lubricated sleeve bearings (standard and relief type) will require frequent lubrication which can be accomplished by using the zerk fitting(s) located on the pump base. It is suggested that relubrication intervals be every 20 hours of running time.

Graphitar, cutless rubber and teflon bearings are lubricated with a water flush. The required number of lube line connections are provided on the pump base.



A. Complete unit assembly.

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AURORA, ILLINOIS

REPAIRS

The pump may be disassembled using the illustrations and text provided. Although complete disassembly is covered, it will seldom be necessary to completely disassemble your Aurora pump.

The illustrations accompanying the disassembly instructions show the pump at various stages of disassembly. The illustrations are intended to aid in the correct identification of the parts mentioned in the text.

Inspect removed parts at disassembly to determine their reusability. Pump or line shaft bearings that are scored or noticeably out of round should not be reassembled. Cracked castings should never be reused and scored or worn pump shafts should be replaced.

All packings and gaskets should be replaced with new ones at reassembly simply as a matter of economy. They are much less expensive to replace routinely than to replace singly as the need arises. In general, it is economical to return to the manufacturer for repair only the motor and motor controller.

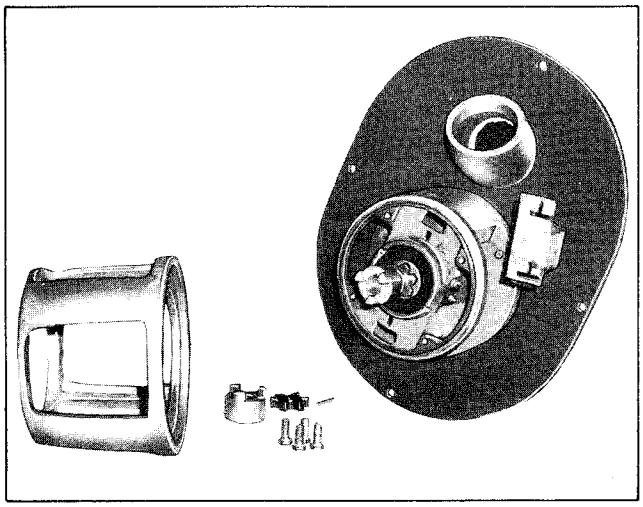
DISASSEMBLY

Disassemble only what is needed to make repairs or accomplish inspection. Proceed to disassemble the pump as follows: (refer to figure 1.)

1. Disconnect wiring from motor control panel to motor and float switch. Take any other steps needed to prevent drive unit from being unintentionally energized during disassembly.

2. Remove the float switch. For instructions, refer to the repair notes on float switches.

3. Pump motor (33) and upper head (34) are best removed as a unit. The upper head serves to protect the motor output shaft from accidental damage. Therefore, remove bolts (25) and lift the unit free from lower head (63) and lower half of coupling (29).



B. Upper head, coupling half, pin and insert removed.

4. Coupling half (29) is removed by loosening setscrew (66). Similarly, setscrew (65) will free upper coupling half (27). Remove coupling keys (28 and 30).

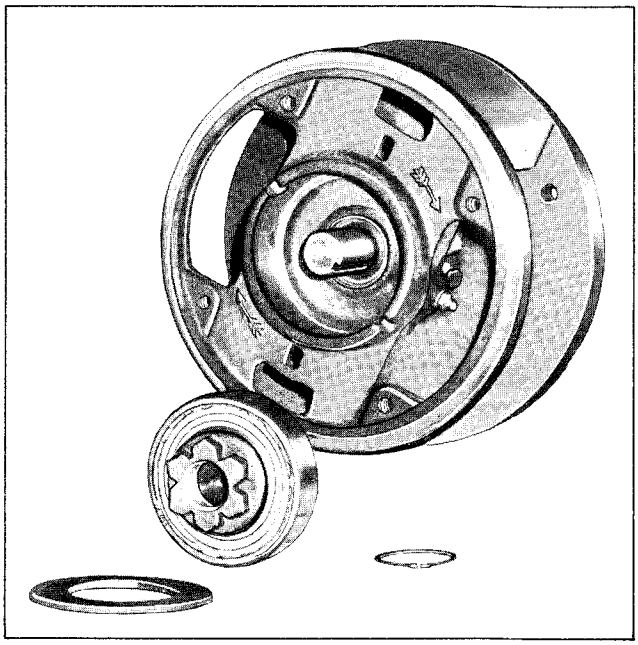
5. Remove remaining pump and connected parts from basin to continue disassembly.

NOTE

However, if ventilation piping is used, remove it before lifting off plate.

6. Locknut (36) can be unthreaded, exposing slinger (35) for removal. Then bearing collar (37) with ball bearing (39) is unthreaded from pump shaft. Retaining ring (38) must be removed from collar (37) with a pair of Truarc pliers, if bearing (39) is to be pressed off collar (37).

7. Remove grease seal (40) if necessary.



C. Slinger, bearing collar, bearing and retaining ring removed.

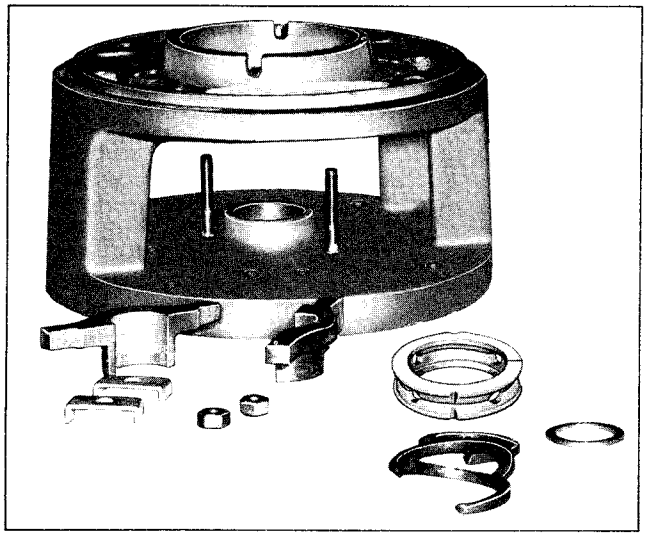
NOTE

Grease seal (40) should not be removed except for replacement because it's case is easily damaged. When removal is necessary, it can be tapped out of its seat in the lower head with coupling key (30) used as a driving tool.

8. Remove nuts (44) and clamps (45) from studs (47) and slide gland (46) off shaft (43). Remove packing (48), lantern ring (50) and packing ring (49).

NOTE

This stuffing box arrangement is standard.



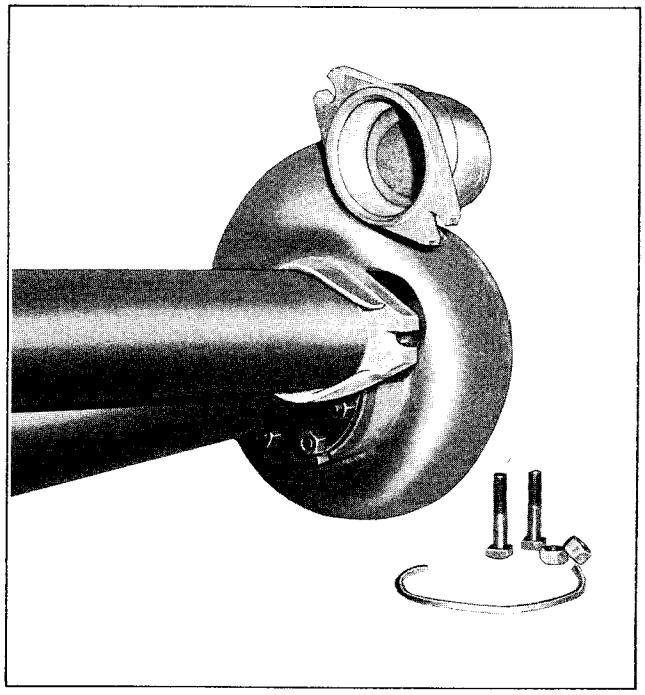
D. Nuts, clamps, gland halves, packing, lantern ring and packing ring removed from lower head.

9. Remove grease fitting (41), and pipe plug (53). Also disconnect any lubrication line used to lubricate line shaft bearings or piping for pressurized support column water supply.

10. Unscrew capscrews (62 and 56) to remove lower head (63).

11. Remove locknut (57) and elbow (58) from discharge piping (59). Then plate can be lifted off.

Remove gaskets (64 and 13). Also remove pins (61) and nameplate (60) only if they need replacing.



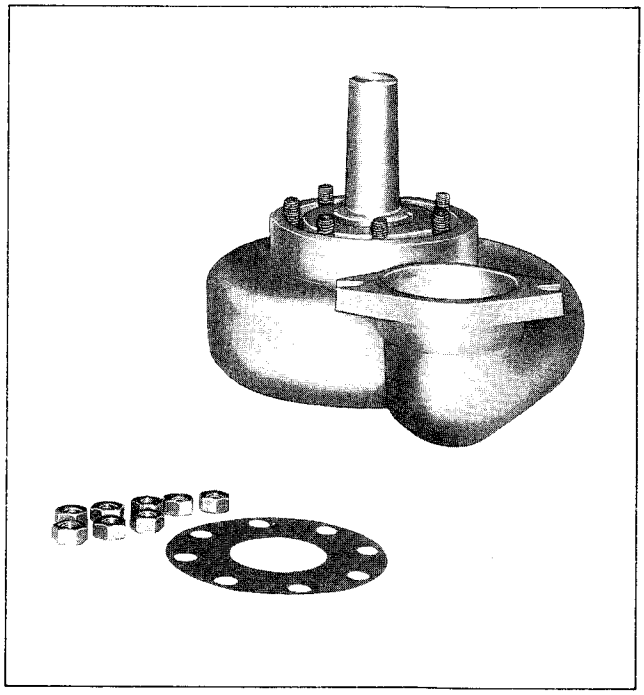
E. Nuts, bolts and packing removed from gland halves to free discharge piping.

12. Successive lengths of piping and shafting are disassembled as follows:

a. If a line shaft bearing is lubricated through a lubrication line, detach the line and elbow from pipe nipple in upper support section and then remove nipple.

b. Unscrew bolts (22) and nuts (9) to lift top support pipe section and expose shaft coupling (42). Use a wrench to hold shaft (43) and a second wrench to unscrew coupling (42). Remove gasket (13).

c. Remove pipe plug (16) if used, then slide line shaft bearing (24) off shaft.



F. Nuts, support piping and gasket removed from casing.

CAUTION

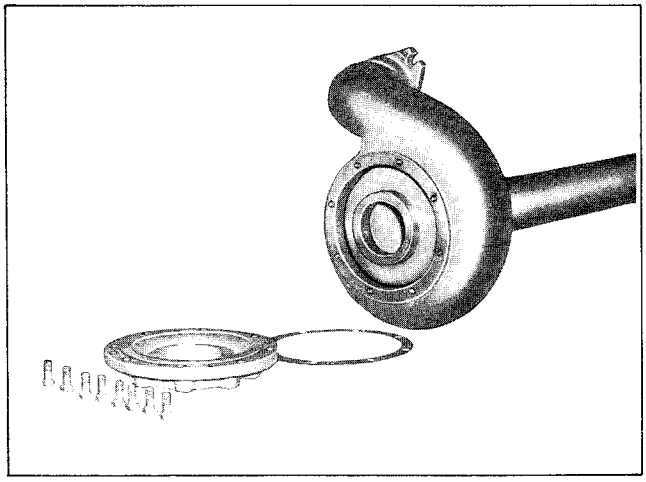
To protect a bearing that can be reused, tape the threaded section of the shaft end before removing bearing.

13. Discharge piping (59) can be removed from casing (11) by unthreading bolts (10) and nuts (9), and removing gland (15) and packing (14).

14. To lift off remaining support piping (23), unscrew nuts (9). Then remove gasket (13) and slide bolts (12) out.

15. Unthread capscrews (4) to remove suction cover (2) and gasket (3), exposing impeller.

16. Unscrew impeller capscrew (5), remove washer (6), impeller (7) and impeller key (8).



G. Capscrews, suction cover and gasket removed to expose impeller.

17. Lift remaining shafting (43) and pump bearing (17) from casing (11). Remove pipe plug (16) from bearing (17), then slide bearing off end of the shaft, using the above caution.

REASSEMBLY

Reassembly will generally be in reverse order of disassembly. If disassembly was not complete, use only those steps related to your particular repair program.

1. Slide pump bearing (17) onto pump end of shafting (43) using the last caution mentioned in disassembly with the flanged end of bearing toward the bottom end of shaft. If bearing is not to be lubricated through a lubrication line, place pipe plug (16) in tapped hole in bearing.

2. Slide pump shaft into pump end of support piping (23). Position pump bearing against pump flange of support piping. If bearing is to be lubricated through a lubrication line, align tapped opening in the bearing with vent opening in the support pipe, and install an 1/8 inch pipe nipple to maintain the alignment.

3. Place bolts (12) in slot in casing (11) and hold them in place with gasket (13). Position pump casing (11) against the flange of the support pipe with discharge outlet aligned with vent opening in support pipe. Bolt casing to flange with nuts (9).

4. Assemble impeller (7) with its key (8) on the end of shaft (43) and secure it by means of capscrew (5) and washer (6).

5. Secure suction cover (2) with gasket (3) on pump casing by threading on cover capscrews (4). If used, install float control guide under nut located 45° clockwise (as seen from top) from discharge outlet.

6. Slide discharge pipe gland (15) and packing (14) over unthreaded end of discharge piping (59), slip unthreaded end of pipe into discharge elbow of pump casing (11), and tighten gland on casing by means of bolts (10) and nuts (9).

NOTE

If pump bearing is to be lubricated through a lubrication line, assemble the required elbow and tubing on previously installed nipple. If support column is to be pressurized with a flow of fresh water, connect the required 3/4 inch pipe nipple, elbow and pipe to support piping, and ascertain that other vent openings are plugged.

7. Successive lengths of piping and shafting are assembled as follows: (Ejectors designed for pump settings* deeper than 6 feet, 2 inches are provided with multiple part discharge and support piping and with line shaft bearings at each support piping joint.)

a. Slide a line shaft bearing (24) down pump shaft, with tapped opening toward upper end until it seats against the flange of the previously assembled section of support piping (23).

b. To add successive lengths of pump shafting, thread shaft coupling (42) onto threaded end of one shaft until shaft is visible through small hole drilled through middle of coupling, and thread the next length of shafting into coupling. Do not use pipe wrenches on shafting. It is not necessary to tighten shafts in their couplings because the torque of the pump motor will tighten them in operation.

c. If line shaft bearing is to be lubricated through a lubrication line, turn bearing as required to align tapped opening with lubricant piping. Position support pipe gasket (13) against support pipe flange, and lower the next section of support piping into place. Turn it to align vent opening with tapped opening in line shaft bearing, and secure it by installing bolts (22) and nuts (9). Install any 1/8 inch pipe nipple in tapped opening of line bearing if required, and connect it to previously assembled lubrication piping.

d. If necessary, screw a discharge pipe coupling onto threaded end of previously assembled section of discharge piping, and thread the next section of piping into coupling. Tighten with a pipe wrench, using a second wrench to hold the previously assembled section.

---

*"Pump Setting" is the distance from bottom of suction cover (2) to bottom of lower head (63). This measurement is normally 4 inches less than "Pit Depth", the distance from bottom of basin to top face of basin.

8. Thread locknut (57) on discharge piping (59) approximately 2". Lower pump support plate over support piping (23) and discharge piping (59). Position gasket (13) on support pipe flange and gasket (64) on top face of pump support plate and slide lower head (63) into place.

NOTE

Install float control at this time if liquid end is not accessible when ejector is lowered into basin.

9. Install a discharge pipe elbow (58) on threaded top end of discharge piping, using a pipe wrench on elbow and another to hold previously assembled piping from turning.

10. Lift pump support plate into position against lower head (63) gasket (64) and discharge elbow (58), and install capscrews (62). Connect pressurization or lubrication piping at this time by using opening provided in pump support plate. For pressurization piping, a 3/4 inch line to water supply is connected to tapped opening in lower head. For lubrication piping, line is connected to fittings in support plate. Pump support plate and ejector assembly may now be lowered into place on basin cover and can be bolted down.

11. Install pump shaft packing ring (49)* around shaft in lower head. Assemble packing gland halves (46) on gland studs (47), and secure with gland clamps (45) and nuts (44). Do not tighten nuts more than finger tight unless ejector support piping is to be pressurized with fresh water.

12. Seat grease seal (40) with sealing edge upward in its seat in lower head.

NOTE

Cover threads of pump shaft temporarily with a tape or some other means before sliding on grease seal to prevent threads from damaging seal.

13. Press ball bearing (39) onto bearing collar (37) with ball bearing seal facing flange on collar, and secure bearing on collar by installing retaining ring (38).

*One ring or packing (48), lantern ring (50) and two more rings of packing (48).

14. Thread bearing collar onto pump shaft with bearing surface downward. Turn collar clockwise until bearing seats in lower head, then turn it an additional one-half turn. This will raise shaft and impeller approximately 1/64 inch off suction cover, providing the correct clearance for efficient pump operation.

15. Hold bearing collar (37) and install locknut (36) against collar. Ascertain that pump shaft turns freely by hand. Press rubber slinger (35) into place on bearing collar.

16. Install coupling half (29) and key (30) on upper end of pump shaft, and tighten coupling setscrew temporarily to prevent its slipping down shaft.

17. Position coupling insert (26) in lower half of coupling and secure upper coupling half (27) with its key (28) on motor output shaft. Align bottom end of key with key slot in the end surface of motor shaft, and secure by tightening setscrew.

18. Lower motor (33) and upper head (34) carefully into position on lower head while engaging coupling halves with coupling insert. Bolt assembly to lower head with capscrews (25).

19. Loosen setscrew (66) in lower coupling half (29), and slide coupling half and key (30) upward until they engage coupling insert (26) with proper clearance as shown in Section 2, Item 4 of this Instruction Manual.

NOTE

Install float switch at this time. For instructions refer to the repair notes on float switches.

20. Connect wiring from motor control panel to motor and float switch, following exactly the instructions provided by their respective manufacturers. Also connect solenoid valve at this time if used, using diagrams provided. All wiring must comply with applicable electrical code requirements for type of duty ejector is to perform.

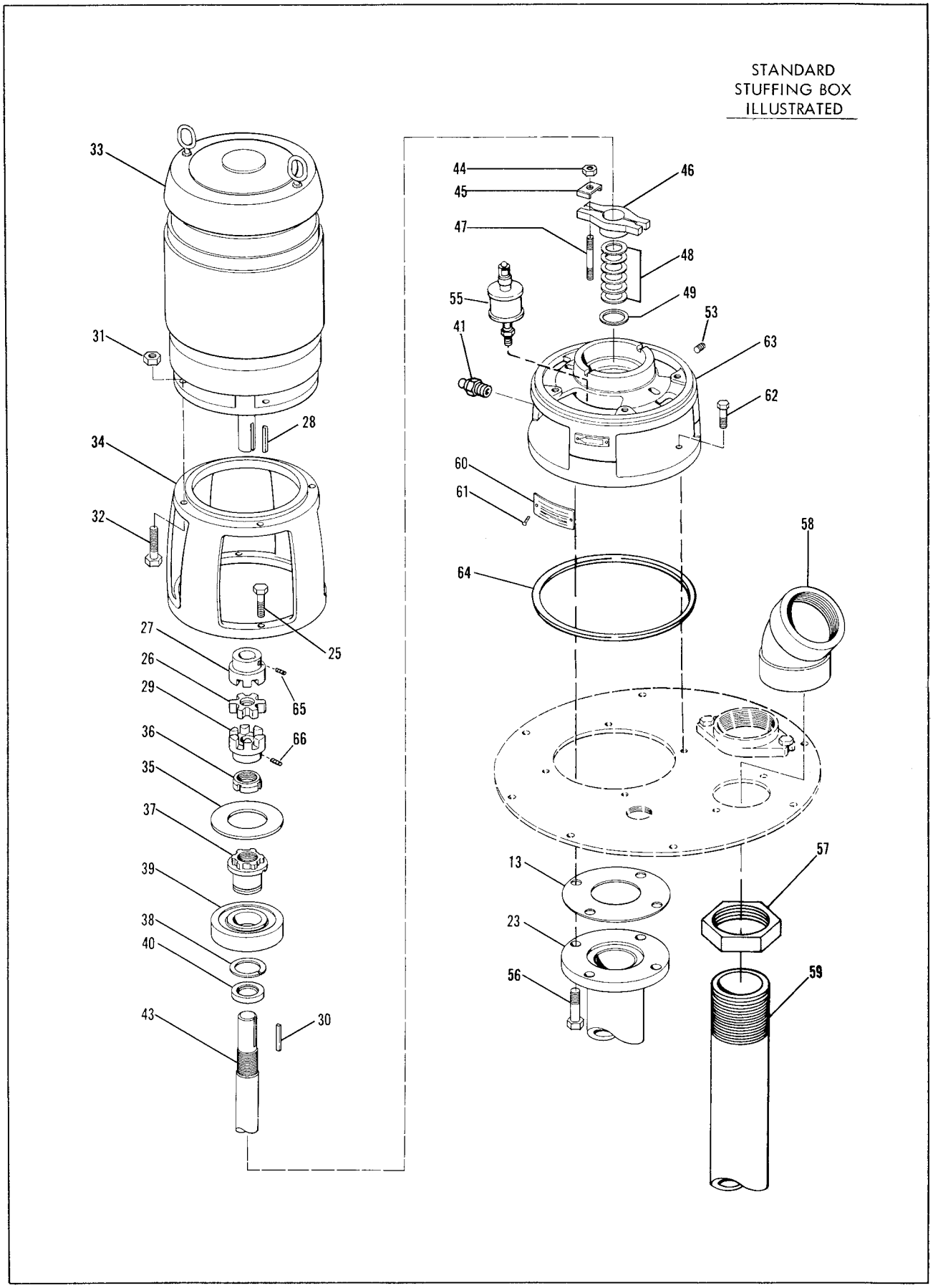


Figure 1. Model 631-632 Exploded View (Sheet 1 of 3)

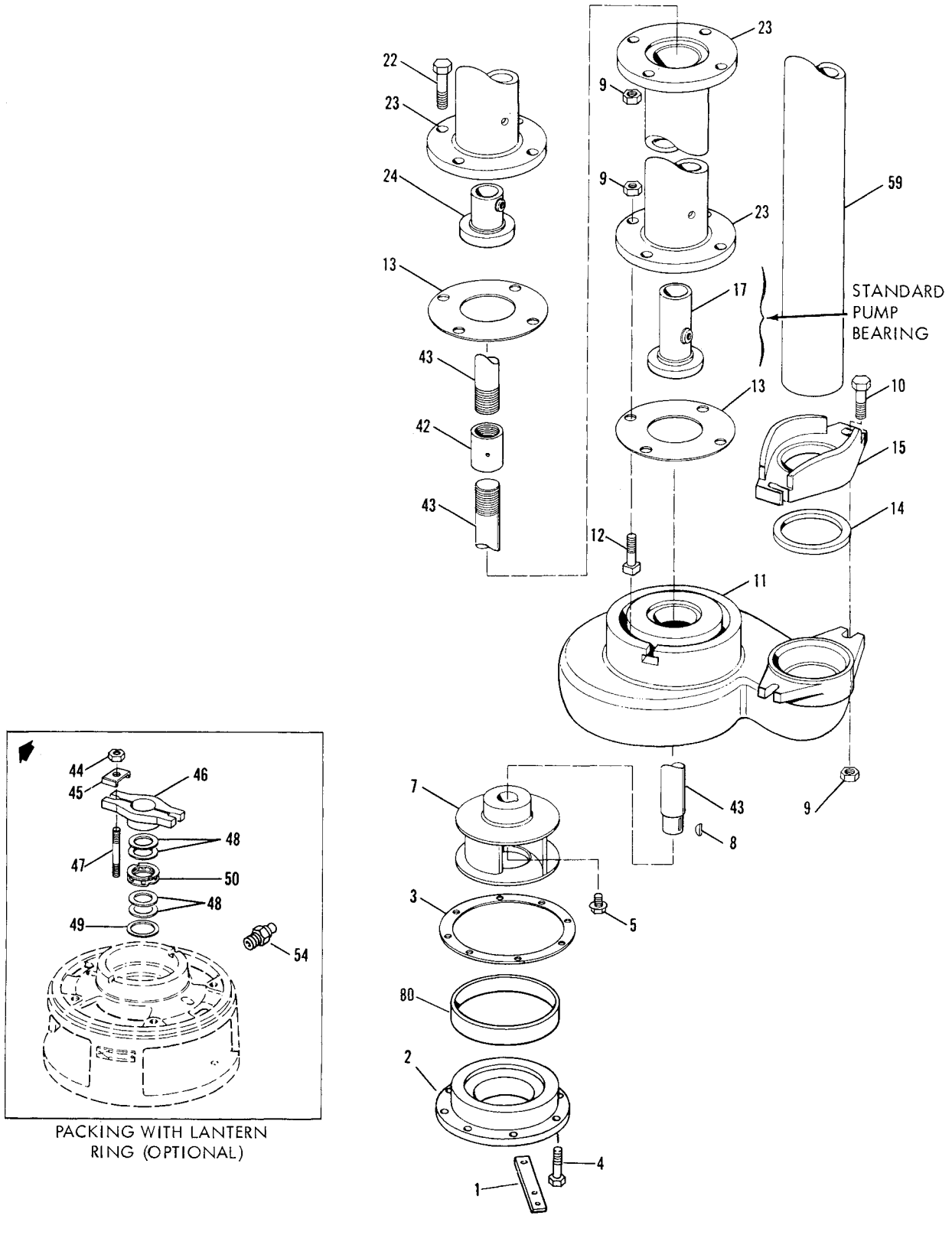
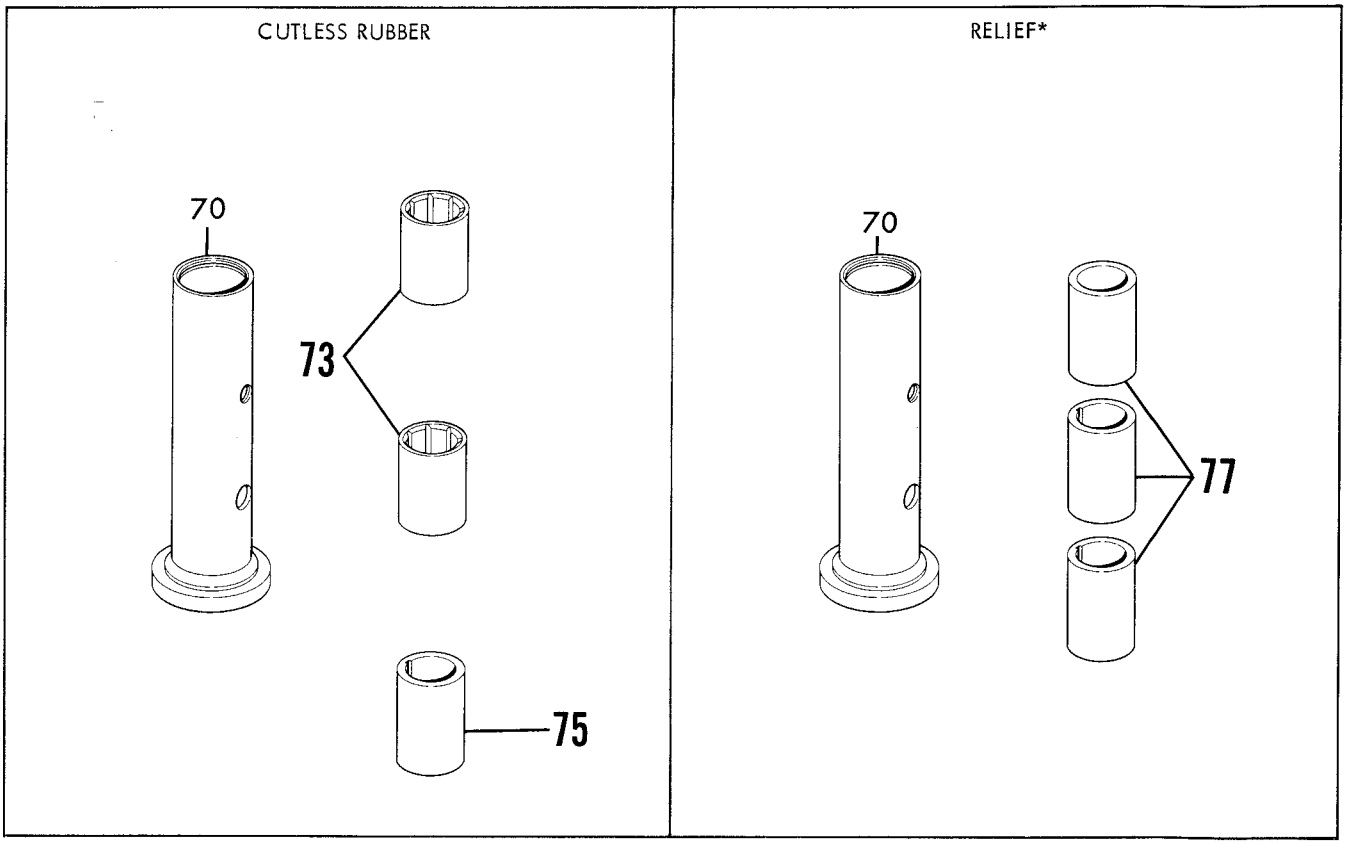


Figure 1. Model 631-632 Exploded View (Sheet 2 of 3)

MODEL 631-632

OPTIONAL RELIEF HOUSING



*Standard for pump settings over 10 feet.

OPTIONAL SPOOL HOUSING

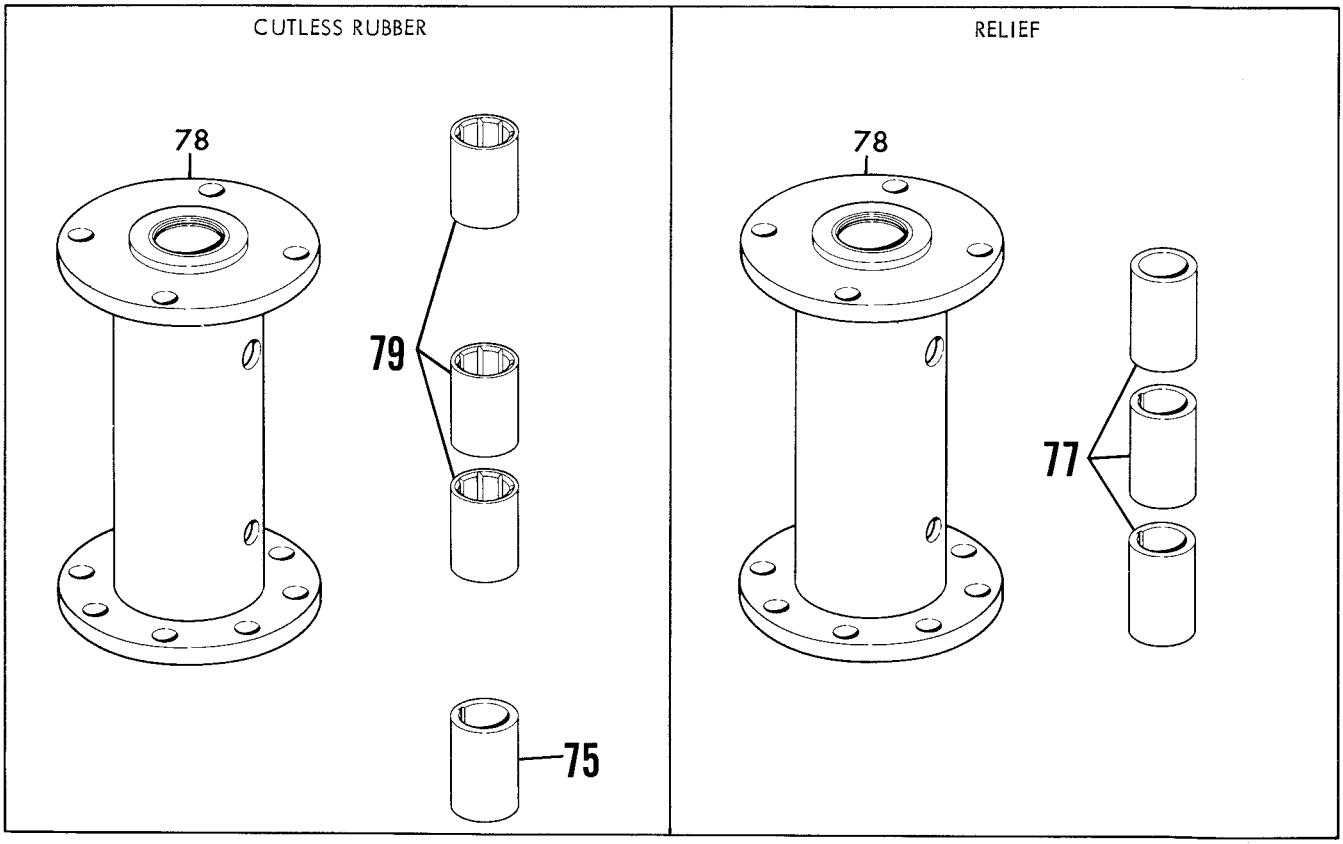


Figure 1. Model 631-632 Exploded View (Sheet 3 of 3)

Model 631-632 List of Parts (See Figure 1)

1. Float rod guide
2. Suction cover
3. Gasket
4. Capscrew
5. Capscrew
7. Impeller
8. Key
9. Nut
10. Bolt
11. Casing
12. Bolt
13. Gasket
14. Packing
15. Gland
16. Plug, pipe
17. Bearing
22. Bolt
23. Piping, support
24. Bearing, line shaft
25. Capscrew
26. Insert
27. Coupling half
28. Key, motor shaft
29. Coupling half
30. Key, coupling
31. Nut
32. Capscrew
33. Motor
34. Upper head
35. Slinger
36. Locknut
37. Collar
38. Ring
39. Bearing
40. Seal, grease
41. Grease fitting
42. Coupling, shaft
43. Shaft
44. Nut
45. Clamp, gland
46. Gland, packing
47. Stud
48. Packing
49. Ring, packing
50. Ring, lantern
51. Seal, shaft
52. Slinger
54. Grease fitting
55. Oiler (opt)
56. Capscrew
57. Locknut
58. Elbow, discharge
59. Piping, discharge
60. Nameplate
61. U Drive screws
62. Capscrew
63. Lower head
64. Gasket
65. Setscrew
66. Setscrew
70. Bearing housing (opt)
73. Bushing (opt)
75. Bushing (opt)
77. Bushing (opt)
78. Spool bearing housing (opt)
79. Bushing (opt)
80. Wear ring (opt)
90. Grease fitting
91. Elbow
92. Coupling
93. Close nipple
94. Nipple
95. Comp. fitting
96. Comp. fitting
97. Nylon tube

NOTE

WHEN ORDERING SPARE PARTS ALWAYS INCLUDE THE PUMP TYPE, SIZE, SERIAL NUMBER, AND THE PIECE NUMBER FROM THE EXPLODED VIEW IN THIS MANUAL.

ORDER ALL PARTS FROM YOUR LOCAL AUTHORIZED DISTRIBUTOR, FACTORY BRANCH SALES OFFICE OR THE FACTORY AT NORTH AURORA, ILLINOIS

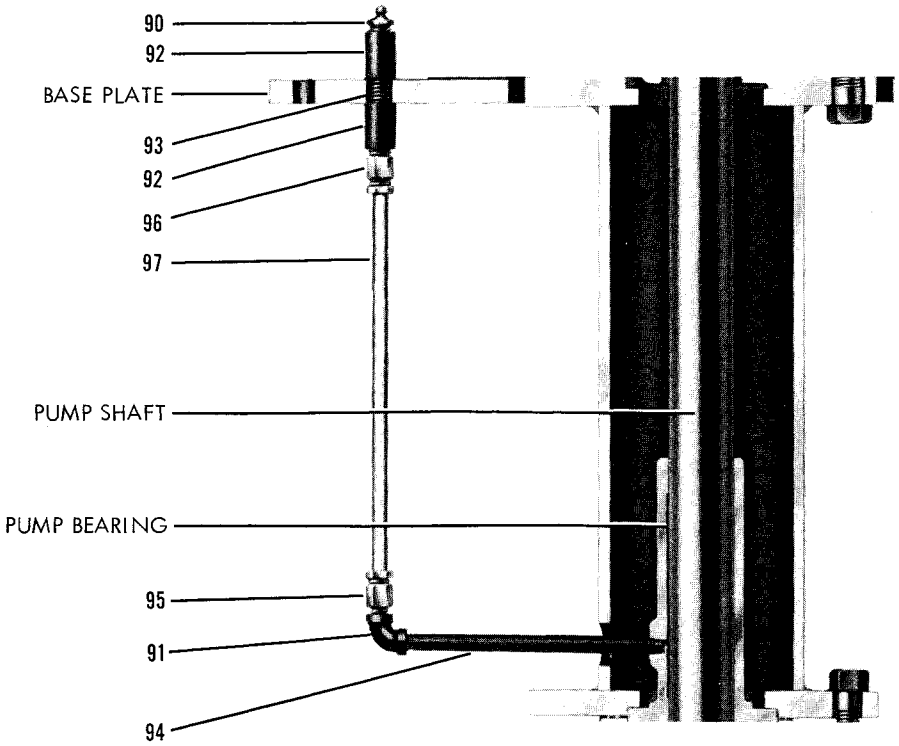


Figure 2.

630 SERIES
REPAIR PARTS INDEX

PARTS LISTED ARE FOR STANDARD PUMPS AND SOME OPTIONAL PUMP BEARINGS.

PUMP SIZE	PAGE
4X4X7 4X4X9 4X4X12 6X6X12	4-5

PIECE NO.

1 – A ROD GUIDE IS REQUIRED ON ALL REPLACEMENT COVERS.

17 – STANDARD PUMP BEARING IS LISTED. REFER TO PART NUMBERS 70 THRU 130 FOR SPECIAL OPTION BEARINGS. ALL PUMPS FOR 10'-0" PIT DEPTH AND DEEPER ARE MADE WITH RELIEF TYPE PUMP BEARING.

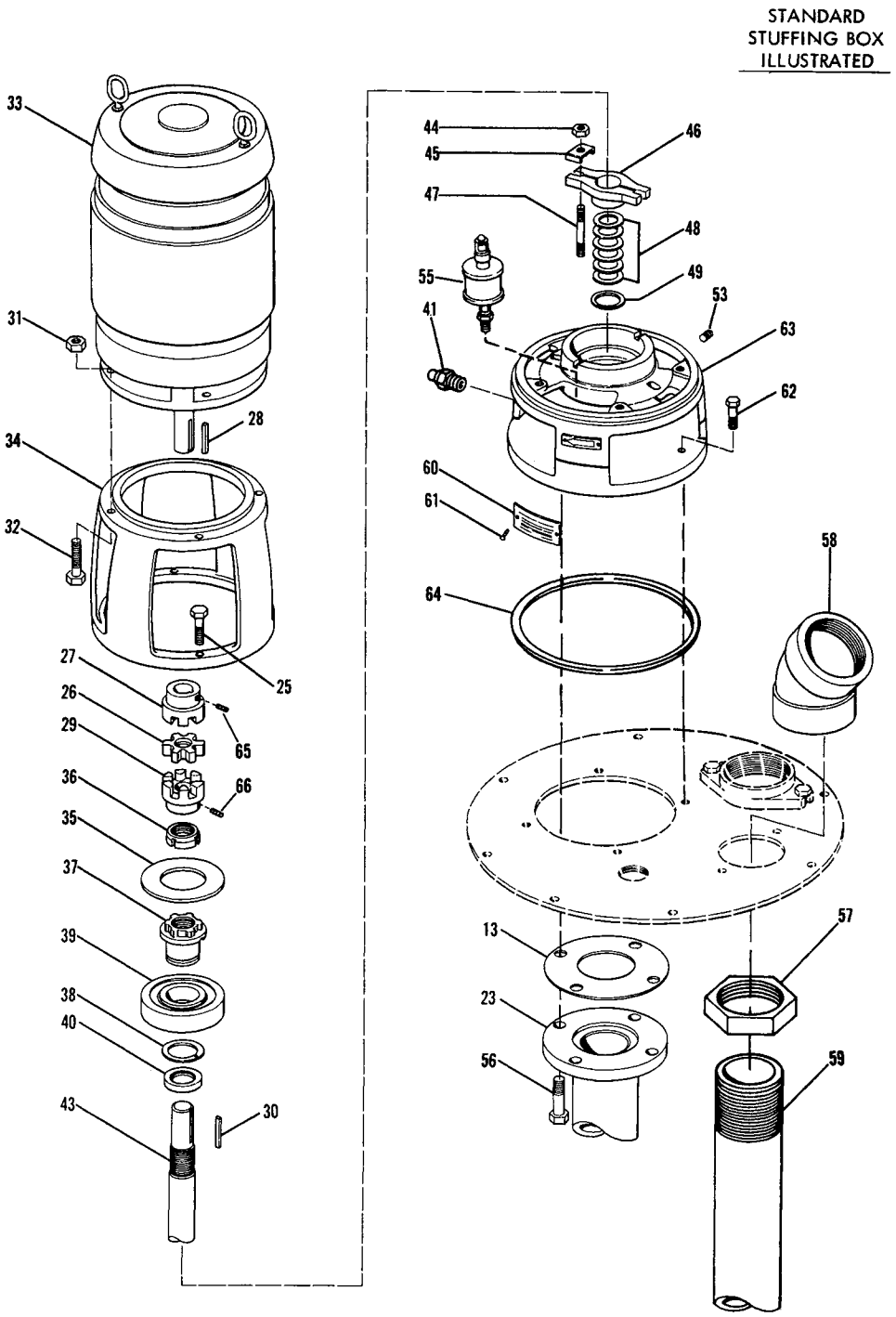
22 – ONE SET OF FOUR (4) CPASCREWS AND NUTS IS REQUIRED FOR EACH GUIDE BEARING JOINT.

23 – ONE SUPPORT PIPE IS REQUIRED FOR PIT DEPTHS UP TO 6'-0".
TWO SUPPORT PIPES ARE REQUIRED FOR PIT DEPTHS 6'-6" TO 11'-0".
THREE SUPPORT PIPES ARE REQUIRED FOR PIT DEPTHS 11'-6" TO 16'-0".

24 – ONE GUIDE BEARING IS REQUIRED FOR PIT DEPTHS 6'-6" TO 11'-0".
TWO GUIDE BEARINGS ARE REQUIRED FOR PIT DEPTHS 11'-6" TO 16'-0".

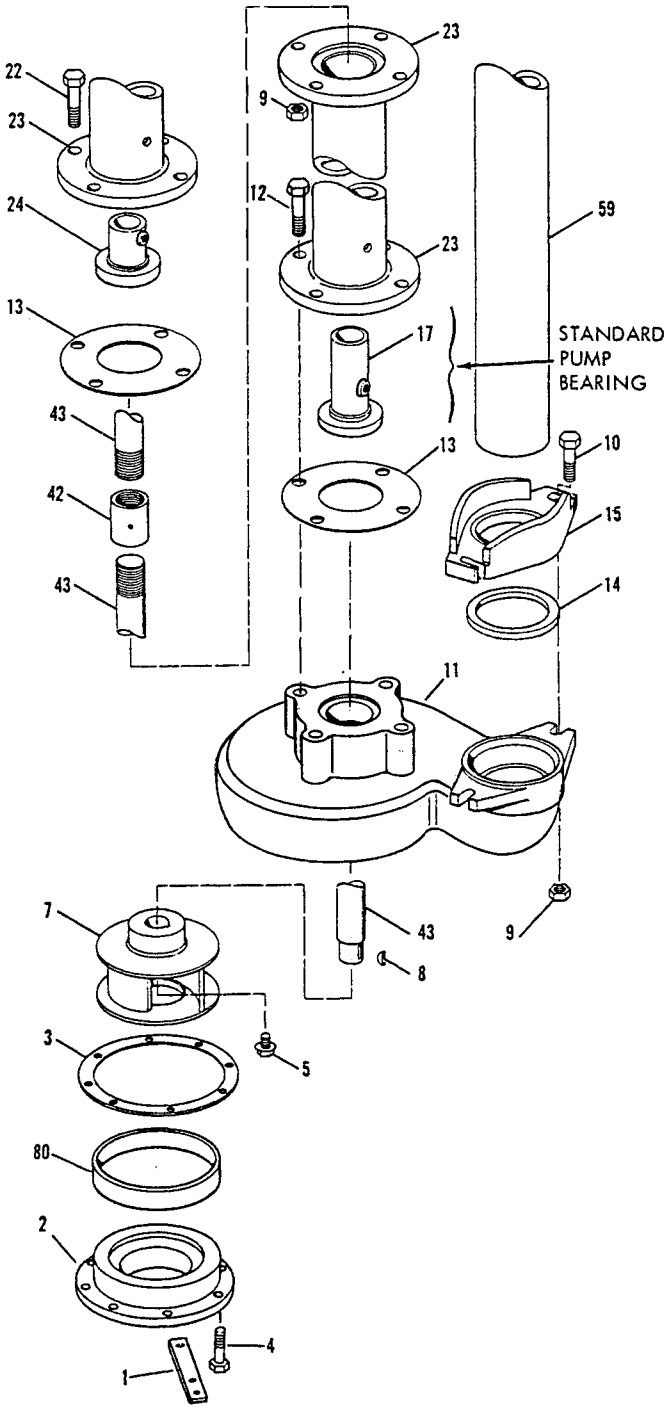
42 & 43 – PIT DEPTHS TO 11'-6" REQUIRE ONE SHAFT (43).
PIT DEPTHS 12'-0" TO 17'-6" REQUIRE ONE PUMP SHAFT (43C), ONE HEAD SHAFT (43A) AND ONE LINE COUPLING (42).

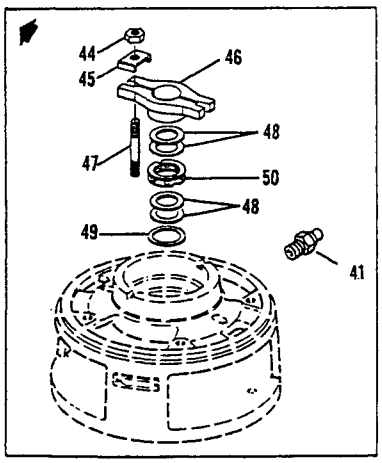
630 SERIES
MODEL 631-632
PIECE NUMBERS



630 SERIES
MODEL 631-632
PIECE NUMBERS

4x4x7 & 4x4x9

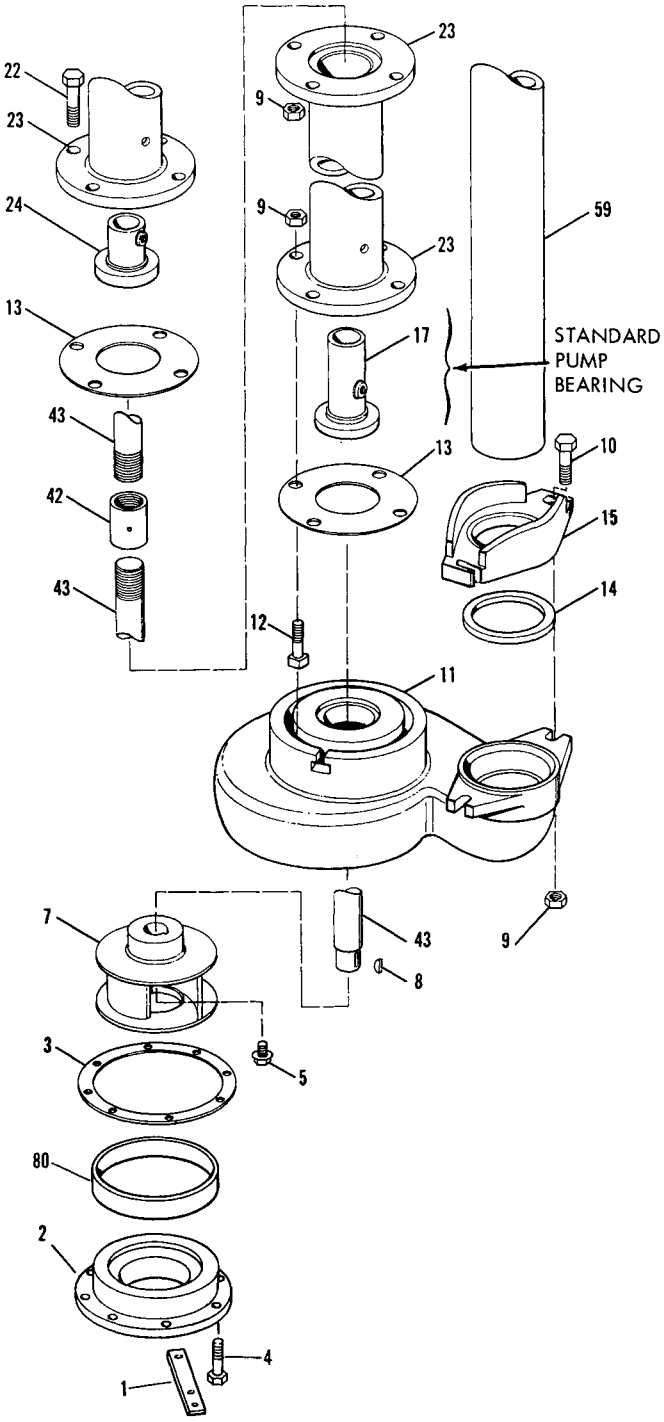


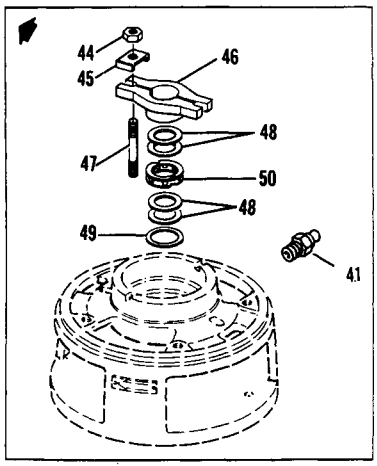


PACKING WITH LANTERN RING (OPTIONAL)

630 SERIES
MODEL 631-632
PIECE NUMBERS

4x4x12 & 6x6x12

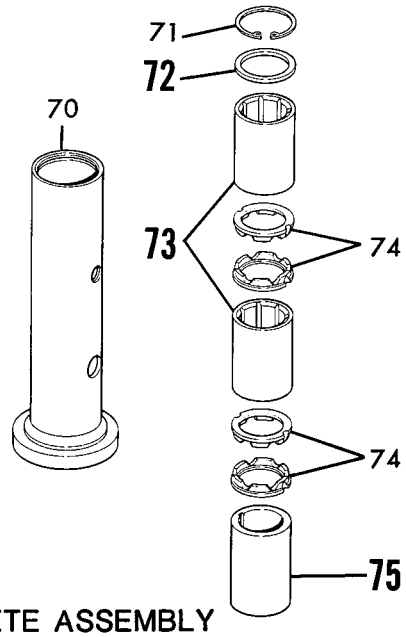




PACKING WITH LANTERN
RING (OPTIONAL)

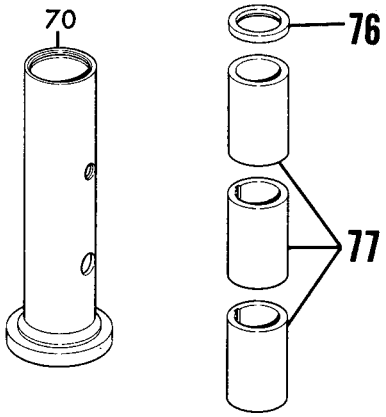
OPTIONAL RELIEF TYPE BEARINGS

CUTLESS RUBBER



70A-COMPLETE ASSEMBLY

METAL BUSHING*

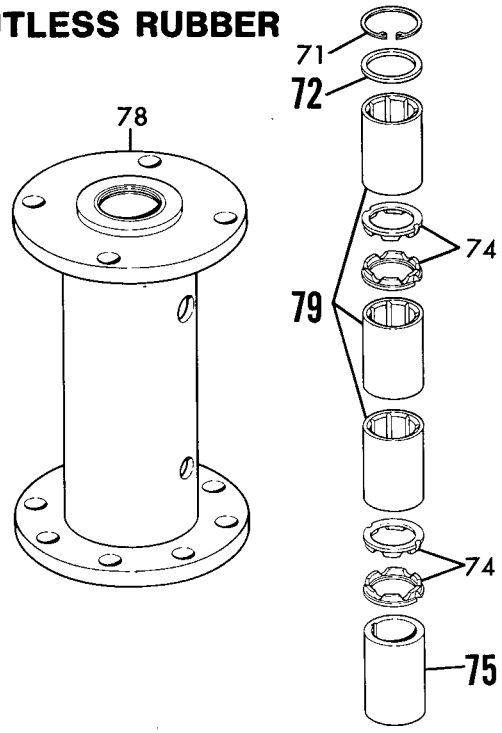


70B-COMPLETE ASSEMBLY

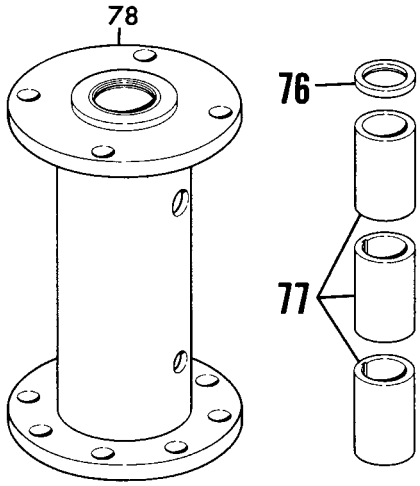
*Standard for pump settings over 10 feet.

OPTIONAL SPOOL TYPE BEARINGS

CUTLESS RUBBER



METAL BUSHING



630 SERIES

MODELS 631-632
4x4x7-4x4x9-4x4x12-6x6x12

PARTS LIST

PC. NO.	DESCRIPTION	QTY	PART NO.	MATERIAL			
				B.F.	A.B.	A.I.	S.S.
1	ROD GUIDE	1	396-0009	087	190	087	104
2	SUCTION COVER						
	4x7	1	816-0716	010	208	010	104
	4x9	1	816-0717	010	208	010	104
	4x12	1	816-0718	010	208	010	104
	6x12	1	816-0719	010	208	010	104
	FOR PUMPS WITH						
	SEMI-OPEN IMPELLER						
	4x9	1	816-0653	010	208	010	104
	6x12	1	816-0655	010	208	010	104
3	GASKET 4x7	1	364-1014	603	603	603	603
	4x9	1	364-1015	603	603	603	603
	4x12, 6x12	1	364-1016	603	603	603	603
4	CAPSCREW 4x7	8	168-0377	080	109	080	104
	4x9, 4x12, 6x12	8	168-0489	080	190	080	104
5	IMPELLER NUT	1	544-2047	104	104	104	104
6	WASHER		INCLUDED WITH NO. 5				
7	IMPELLER 4x7	1	443-0703	010	208	010	104
	4x9	1	443-0662	010	208	010	104
	4x12	1	443-1080	010	208	010	104
	6x12	1	443-0705	010	208	010	104
	SEMI-OPEN 4x9	1	443-0612	010	208	010	104
	6x12	1	443-0614	010	208	010	104
8	IMPELLER KEY	1	472-0018	087	104	087	104
9	NUT 4x4x7, 4x4x9	2	544-0115	080	190	080	104
9	NUT 4x4x12, 6x6x12	10	544-0115	080	190	080	104
10	BOLT	2	100-0515	080	190	080	104
11	CASING 4x7	1	180-2403	010	208	010	104
	4x9	1	180-2404	010	208	010	104
	4x12	1	180-0394	010	208	010	104
	6x12	1	180-0380	010	208	010	104
12	CAPSCREW						
	4x4x7, 4x4x9	4	168-0562	082	190	082	104
12	BOLT4x4x12, 6x6x12	8	100-0511	080	190	080	104
13	GASKET		364-1021	588	588	588	588
14	PACKING						
	4x7, 4x9, 4x12	1	564-0346	730	730	730	730
	6x12	1	564-0347	802	802	802	802
15	GLAND						
	4x7, 4x9, 4x12	1	372-0071	010	208	010	104
	6x12	1	372-0074	010	208	010	104
17	PUMP BEARING	1	136-1402	208	208	010	
22	CAPSCREW	4	168-0562	087	190	087	104
23	SUPPORT PIPE		REFER TO FACTORY				
24	GUIDE BEARING		136-1402	208	208	010	

PC. NO.	DESCRIPTION	QTY	PART NO.	MATERIAL			
				B.F.	A.B.	A.I.	S.S.
25	CAPSCREW	4	168-0490	080	080	080	104
26	COUPLING INSERT		REFER TO SECTION 1000P				
27	COUPLING HALF		REFER TO SECTION 1000P				
28	COUPLING KEY		REFER TO FACTORY				
29	COUPLING HALF		REFER TO SECTION 1000P				
30	COUPLING KEY	1	472-0250	087	087	087	087
31	NUT		REFER TO FACTORY				
32	CAPSCREW		REFER TO FACTORY				
33	MOTOR		REFER TO FACTORY				
34	UPPER HEAD						
	143HP-256HP	1	116-0346	010	010	010	010
	284HPH-326HP	1	116-0347	010	010	010	010
35	SLINGER	1	764-0401	478	478	478	478
36	LOCKNUT	1	544-1108	080	080	080	080
37	BEARING COLLAR	1	224-0163	208	208	208	208
38	RETAINING RING	1	676-0289	088	088	088	088
39	BALL BEARING	1	068-2023	647	647	647	647
40	GREASE SEAL	1	712-0146	653	653	653	653
41	GREASE FITTING	1	508-0002	651	651	651	651
42	COUPLING	1	256-2014	062	104	062	104
43	SHAFT		REFER TO FACTORY				
43A	HEAD SHAFT		REFER TO FACTORY				
43B	LINE SHAFT		REFER TO FACTORY				
43C	PUMP SHAFT		REFER TO FACTORY				
44	NUT	2	544-0109	190	190	190	104
45	GLAND CLAMP	2	204-0120	360	190	360	104
46	GLAND	1	372-0220	010	208	010	104
47	STUD	2	808-0017	082	082	082	104
48	PACKING	6	564-0037	802	802	802	802
49	PACKING RING	1	676-1232	190	190	087	104
50	LANTERN RING	1	676-1681	512	512	512	512
53	PLUG	1	600-0002	087	190	087	104
55	OILER	1	552-0102	652	652	652	652
56	CAPSCREW	4	168-0562	080	080	080	080
57	LOCKNUT						
	4x7, 4x9, 4x12	1	544-2037	087	190	087	104
	6x12	1	544-2039	087	190	087	104
58	ELBOW						
	4x7, 4x9, 4x12	1	600-0365	028	190	028	104
	6x12	1	600-0367	028	190	028	104
59	DISCHARGE PIPE		REFER TO FACTORY				
60	NAMEPLATE	1	532-0045	114	114	114	114
61	DRIVE SCREW	2	708-0013	365	365	365	365
62	CAPSCREW	4	168-0388	080	080	080	080

630 SERIES

MODELS 631-632
4x4x7-4x4x9-4x4x12-6x6x12

PARTS LIST

PC. NO.	DESCRIPTION	QTY	PART NO.	MATERIAL			
				B.F.	A.B.	A.I.	S.S.
63	LOWER HEAD	1	116-0439	010	010	010	010
		1	116-0440	010	010	010	010
		4	168-0378	082	082	082	082
64	GASKET	1	364-1254	481	481	481	481
65	SETSCREW		INCLUDED WITH NO. 27				
66	SETSCREW		INCLUDED WITH NO. 29				
70	BEARING HOUSING	1	260-0701	087	208	087	
	OPTIONAL RELIEF						
	TYPE BEARINGS-						
	COMPLETE ASSY.						
			BEFORE MARCH 1986				
70A	CUTLESS RUBBER	1	032-1245	NOT AVAILABLE			
70B	METAL BUSHING	1	032-1247	USE NEW DESIGN			
71	SNAP RING	1	676-0220	088	104	088	
72	RETAINING RING	1	676-1996	079	190	079	
73	BUSHING	2	136-1379	457	457	457	
74	LANTERN RING	2	676-1681	512	512	512	
75	BUSHING	1	136-1172	208	208	010	
76	SEAL	1	712-0047	653	653	653	
77	BUSHING	3	136-1172	208	208	010	
78	SPOOL HOUSING	1	260-0726	087	087	087	
79	BUSHING	3	136-1379	457	457	457	
			AFTER MARCH 1986				
70A	CUTLESS RUBBER	1	032-1245	644	643	642	
70B	METAL BUSHING	1	032-1247	644	643	642	
73	BUSHING	2	136-1617	486	486	487	
75	BUSHING	1	136-1172	208	208	010	
77	BUSHING	3	136-1172	208	208	010	
78	SPOOL HOUSING	1	260-0726	087	087	087	
79	BUSHING	3	136-1617	486	486	486	
80	CASE RING 4x7	1	676-0495	010	208	010	
	4x9	1	676-0496	010	208	010	
	4x12	1	676-0497	010	208	010	
	6x12	1	676-0498	010	208	010	
	PARTS NOT SHOWN ON EXPLODED VIEW						
	FLOAT ROD		REFER TO				
	FLOAT STOP		SECTION 1020P FOR				
	FLOAT		FLOAT SWITCH ASSY.				

PC. NO.	DESCRIPTION	QTY	PART NO.	MATERIAL			
				B.F.	A.B.	A.I.	S.S.

Performance Curves for the 630 Series

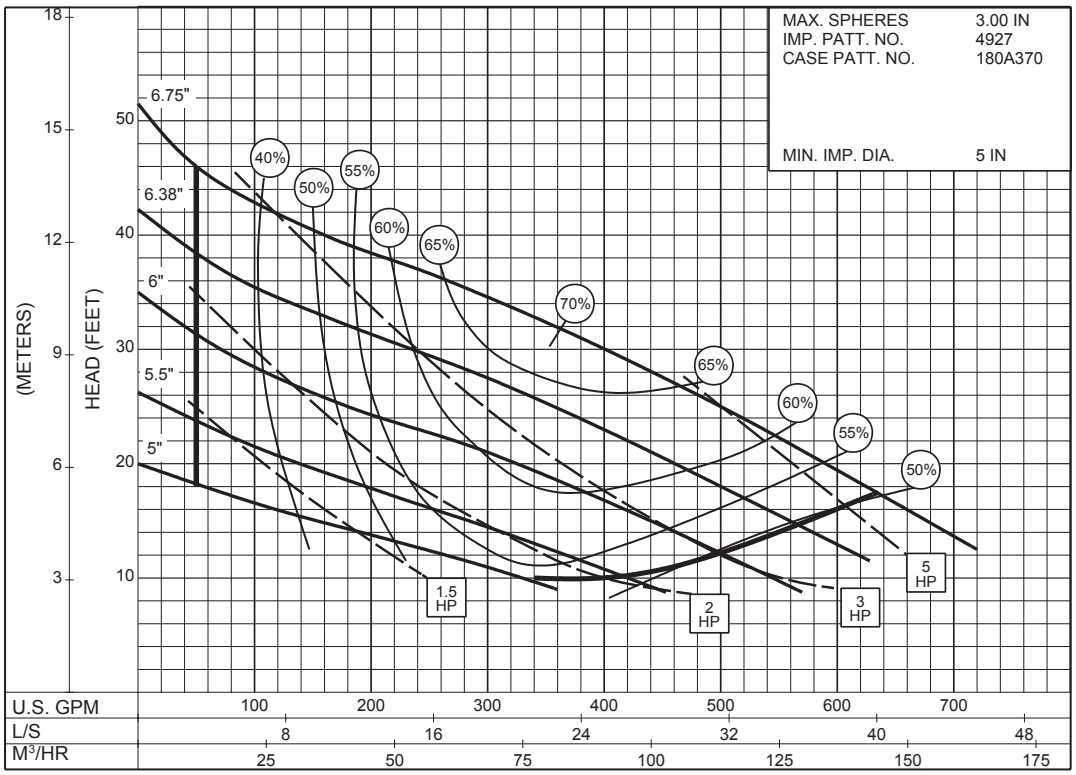
MODEL/SIZE	R.P.M.	CATALOG PAGE	PDF PAGE
4 x 4 x 7	1750/1150	401	2
4 x 4 x 9	1750/1150	402	3
4 x 4 x 12	1150	403	4
6 x 6 x 12	1150	404	5

4 x 4 x 7
SERIES 630

ENCLOSED IMPELLER

Supersedes Section 630 Page 401
Dated December 1971

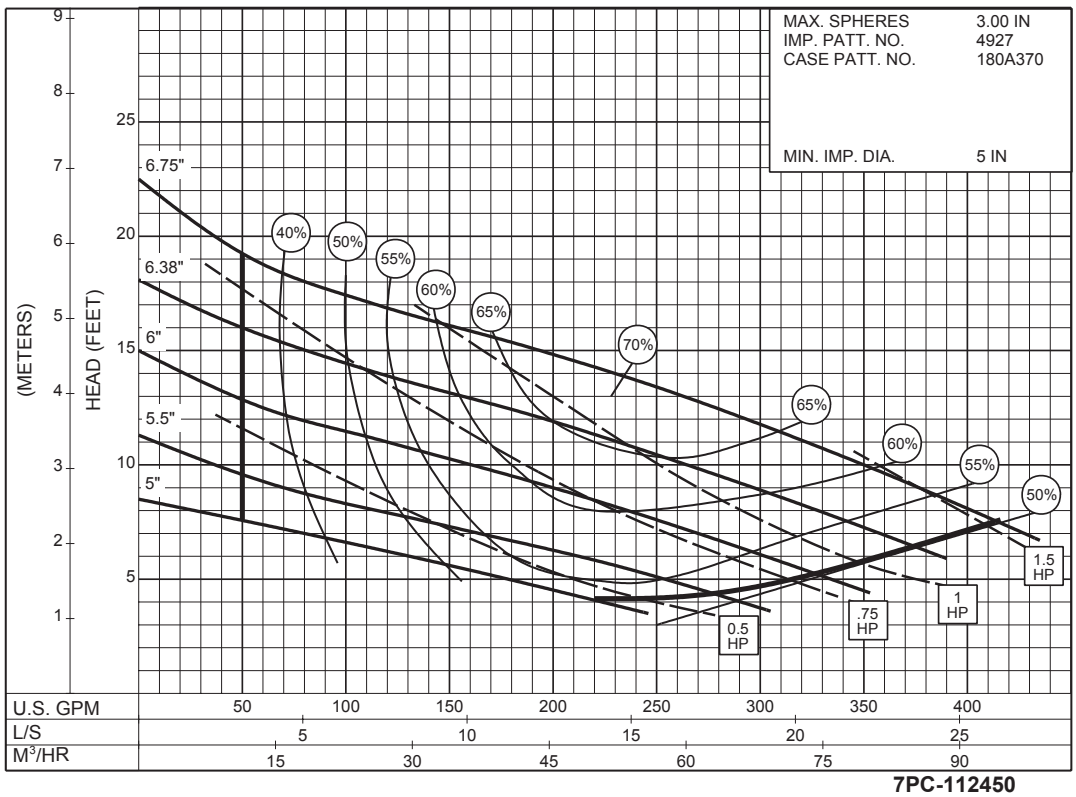
SIZE : 4x4x7 **TYPE : 630** **IMPELLER : Enclosed** **R. P. M. : 1750**



7PC-112449

1750 RPM

SIZE : 4x4x7 **TYPE : 630** **IMPELLER : Enclosed** **R. P. M. : 1150**



7PC-112450

1150 RPM

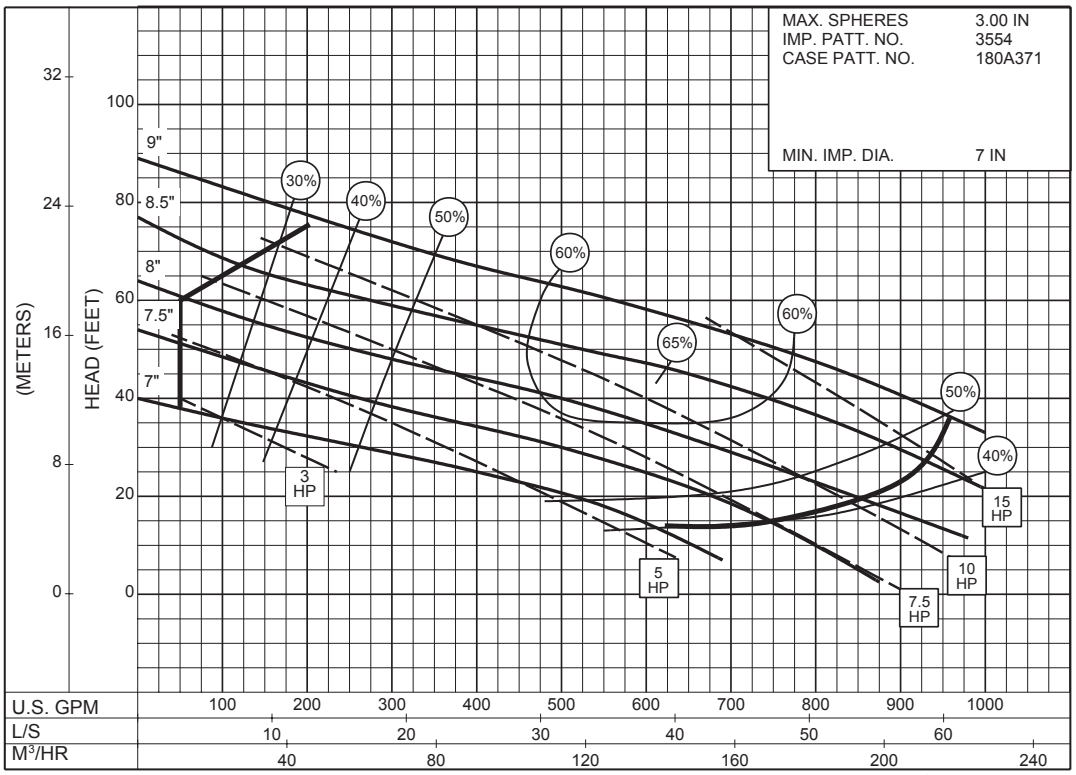
AURORA®
Pentair Pump Group

4 x 4 x 9
SERIES 630

ENCLOSED IMPELLER

1750 RPM

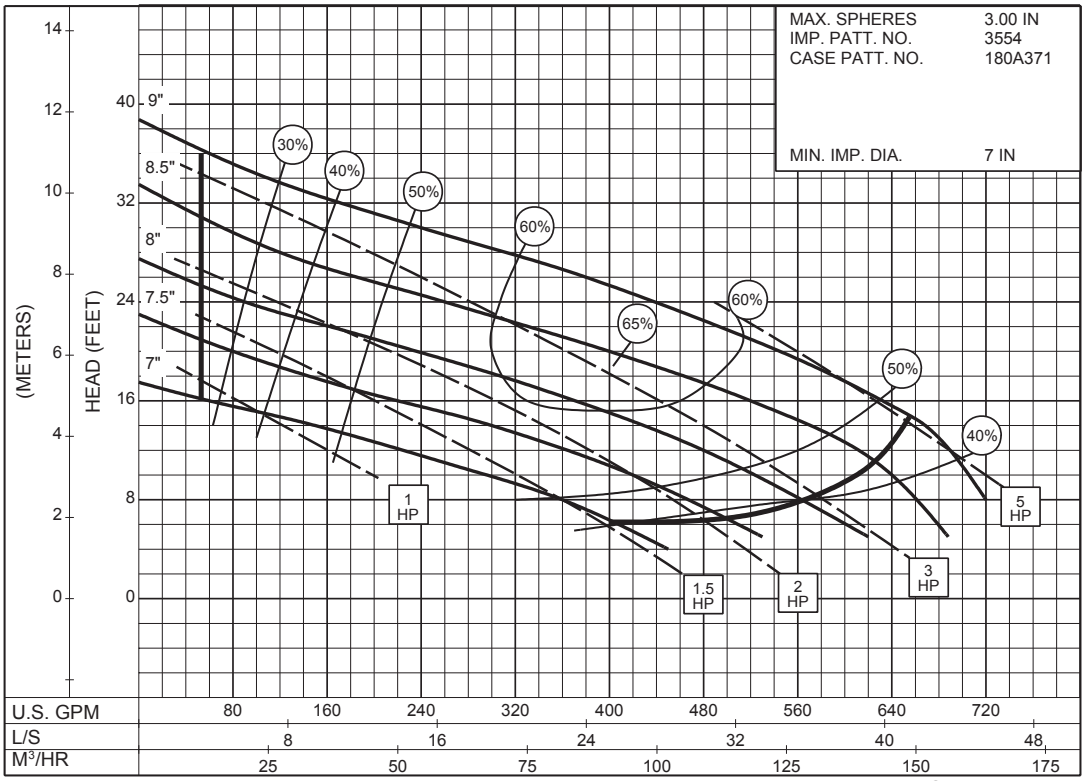
SIZE : 4x4x9 **TYPE : 630** **IMPELLER : Enclosed** **R. P. M. : 1750**



7PC-112452

1150 RPM

SIZE : 4x4x9 **TYPE : 630** **IMPELLER : Enclosed** **R. P. M. : 1150**



7PC-112453

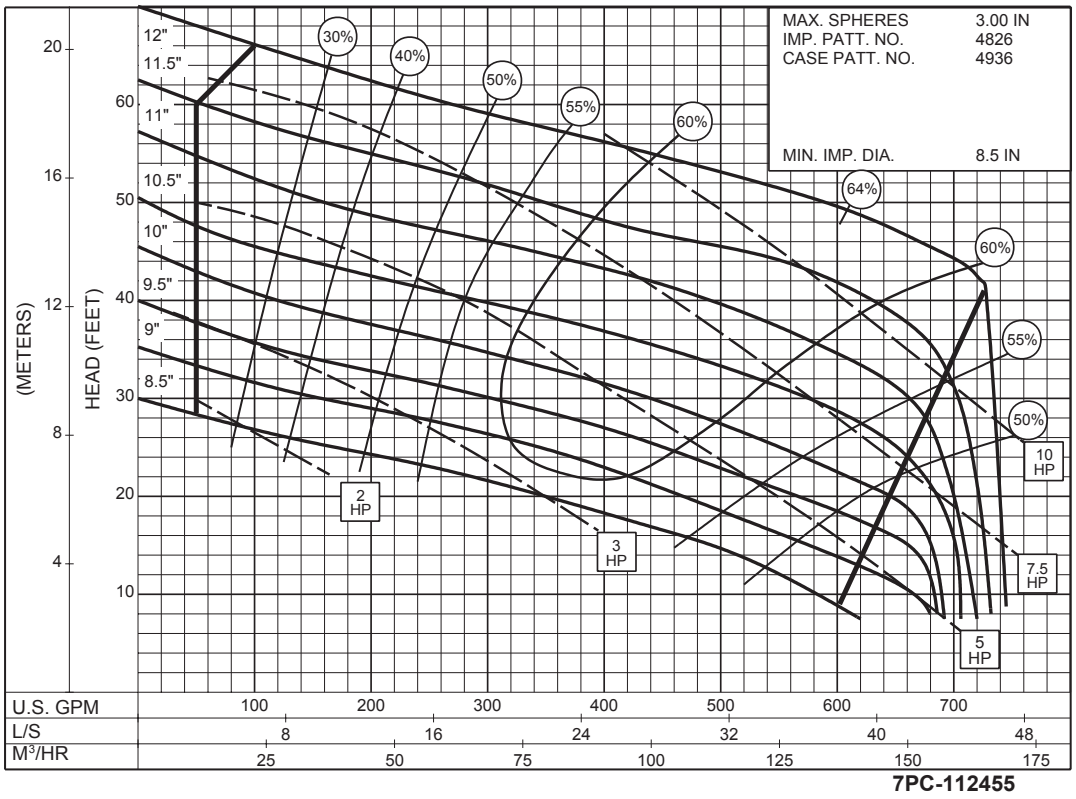
AURORA®
Pentair Pump Group

4 x 4 x 12
SERIES 630

ENCLOSED IMPELLER

Supersedes Section 630 Page 403
Dated December 1971

SIZE : 4x4x12 **TYPE : 630** **IMPELLER : Enclosed** **R. P. M. : 1150**



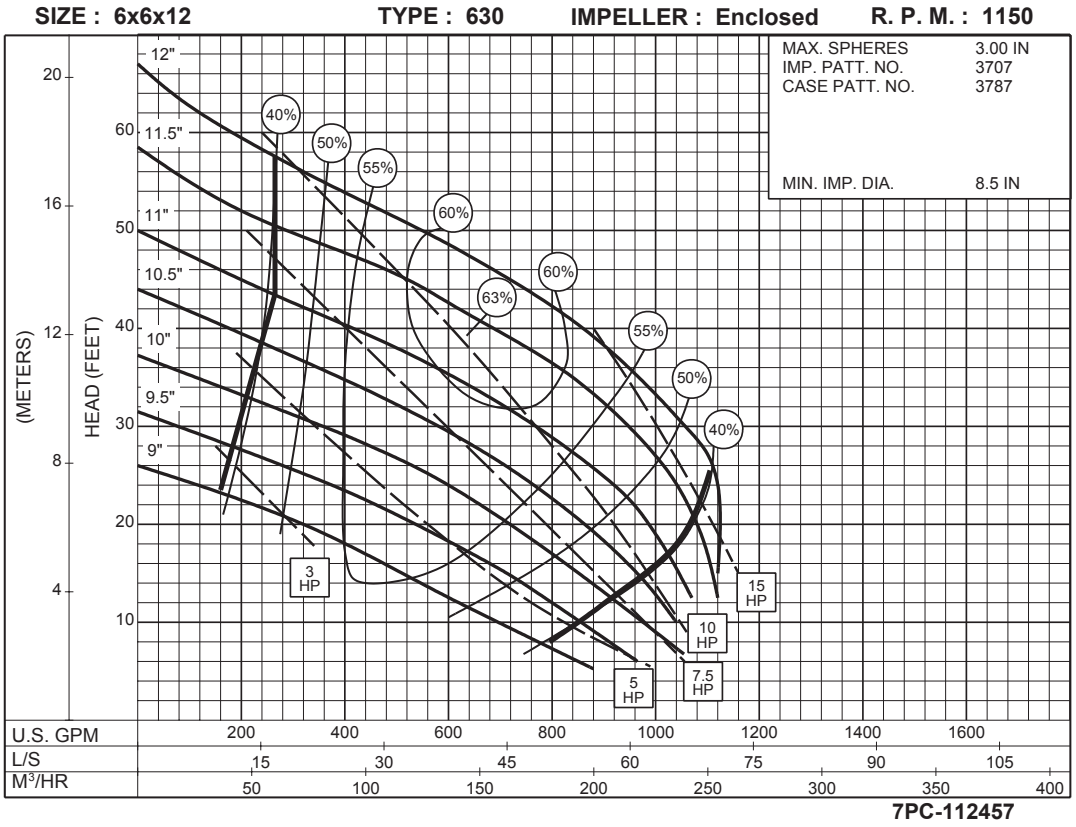
7PC-112455

1150 RPM

6 x 6 x 12
SERIES 630

ENCLOSED IMPELLER

1150
RPM



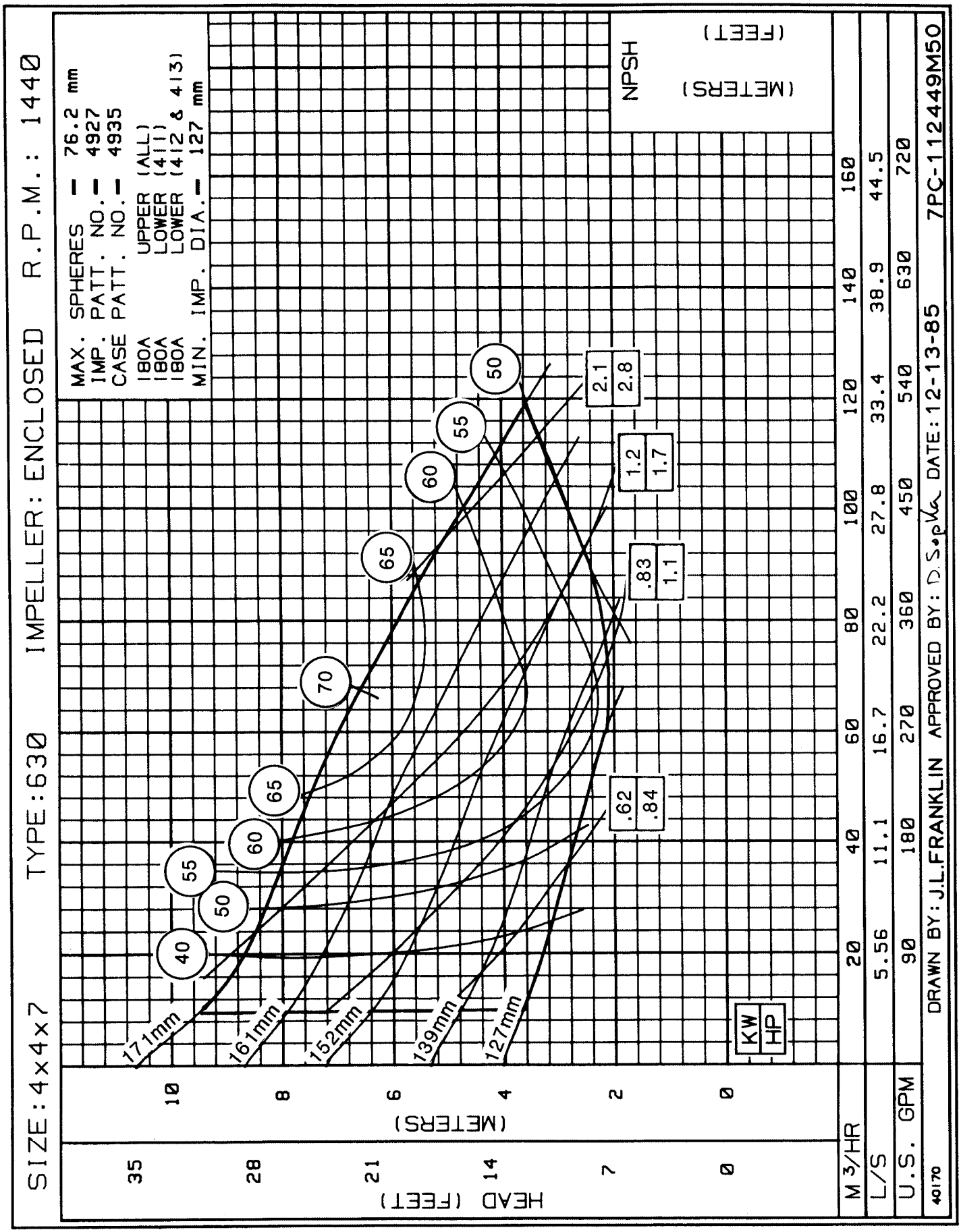
Performance Curves for the 630 Series (50 Hz)

MODEL/SIZE	R.P.M.	PDF PAGE
4x4x7	1440	2
4x4x7	960	3
4x4x9	1440	4
4x4x9	960	5
4x4x12	960	6
6x6x12	960	7

AURORA®
Pentair Pump Group

4x4x7 - 1440 RPM
ENCLOSED IMPELLER

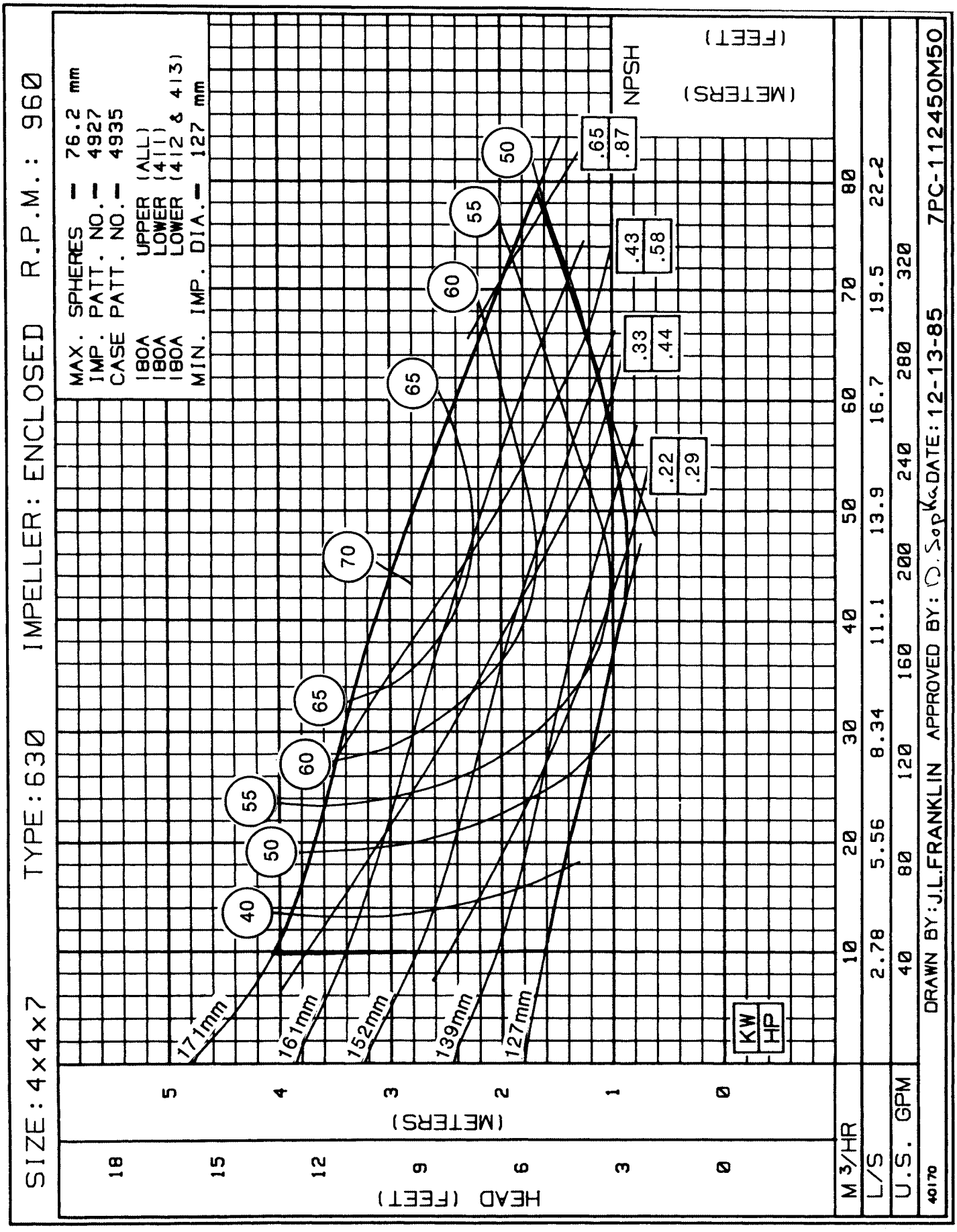
SECTION **630 (Metric 50Hz)**
DATE **JULY 1994**
SUPERCEDES MARCH 1986



SECTION 630 (Metric 50Hz)
DATE JULY 1994
SUPERCEDES MARCH 1986

4x4x7 - 960 RPM
ENCLOSED IMPELLER

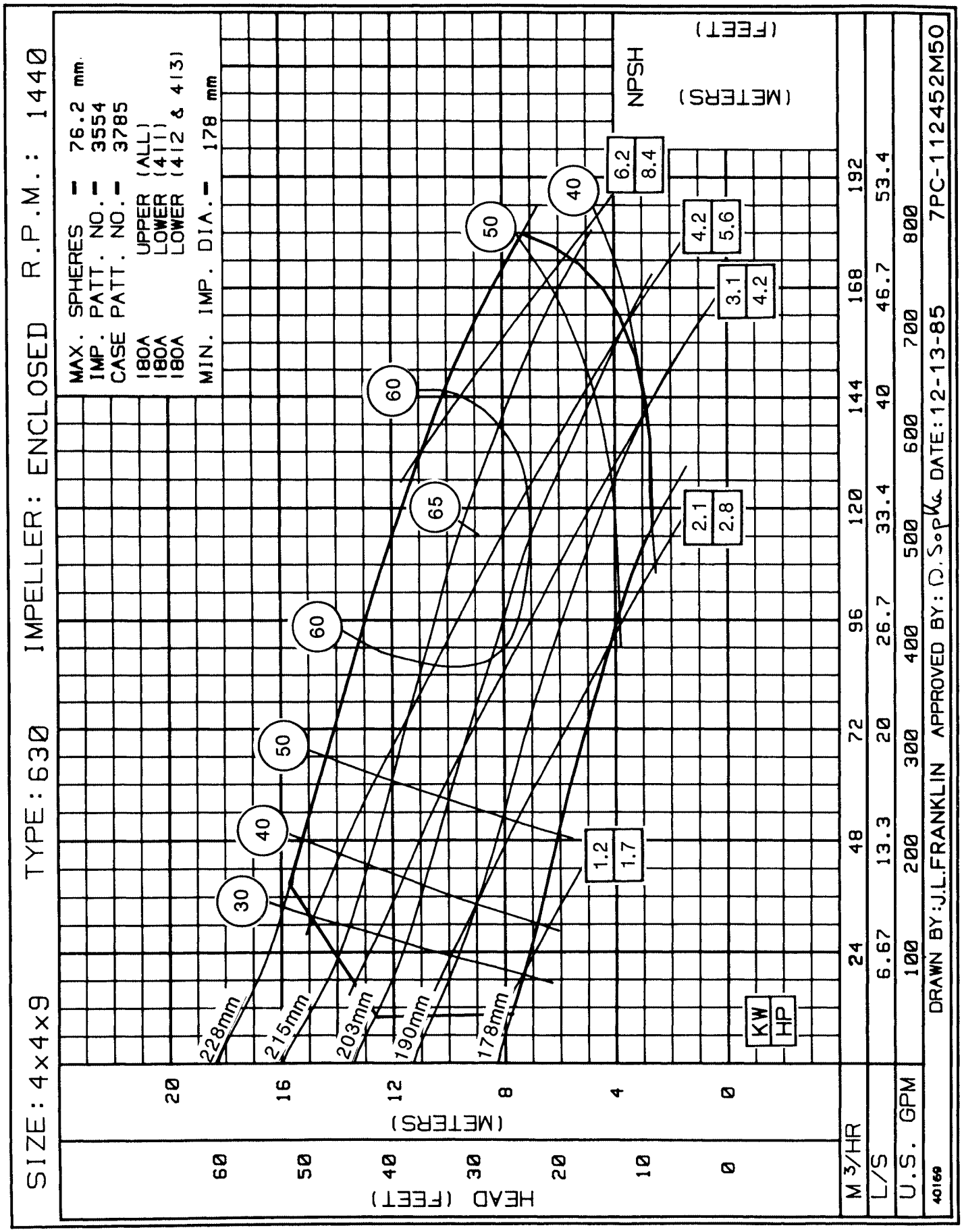
AURORA®
Pentair Pump Group



AURORA®
Pentair Pump Group

4x4x9 - 1440 RPM
ENCLOSED IMPELLER

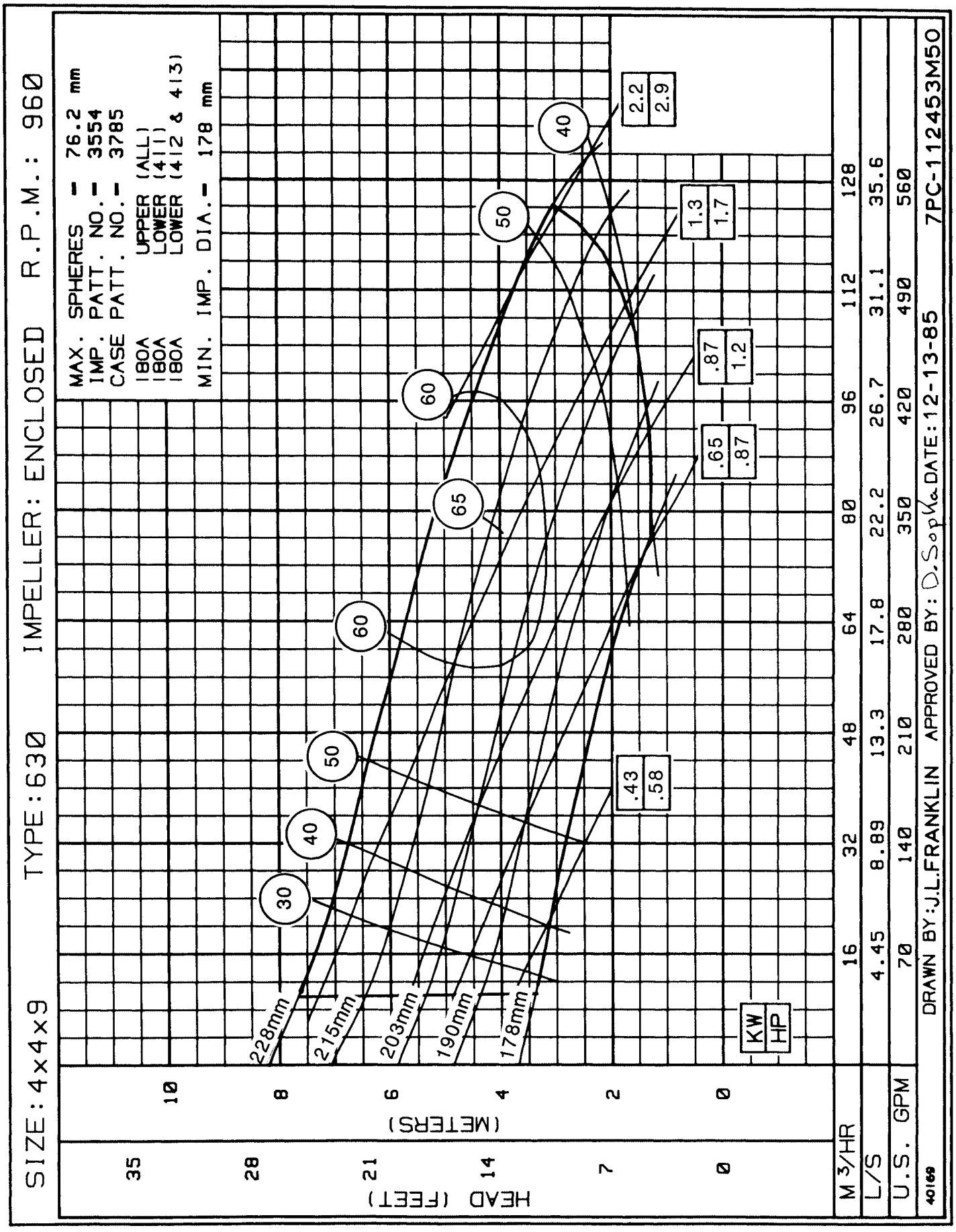
SECTION 630 (Metric 50Hz)
DATE JULY 1994
SUPERCEDES MARCH 1986



SECTION 630 (Metric 50Hz)
DATE JULY 1994
SUPERCEDES MARCH 1986

4x4x9 - 960 RPM
ENCLOSED IMPELLER

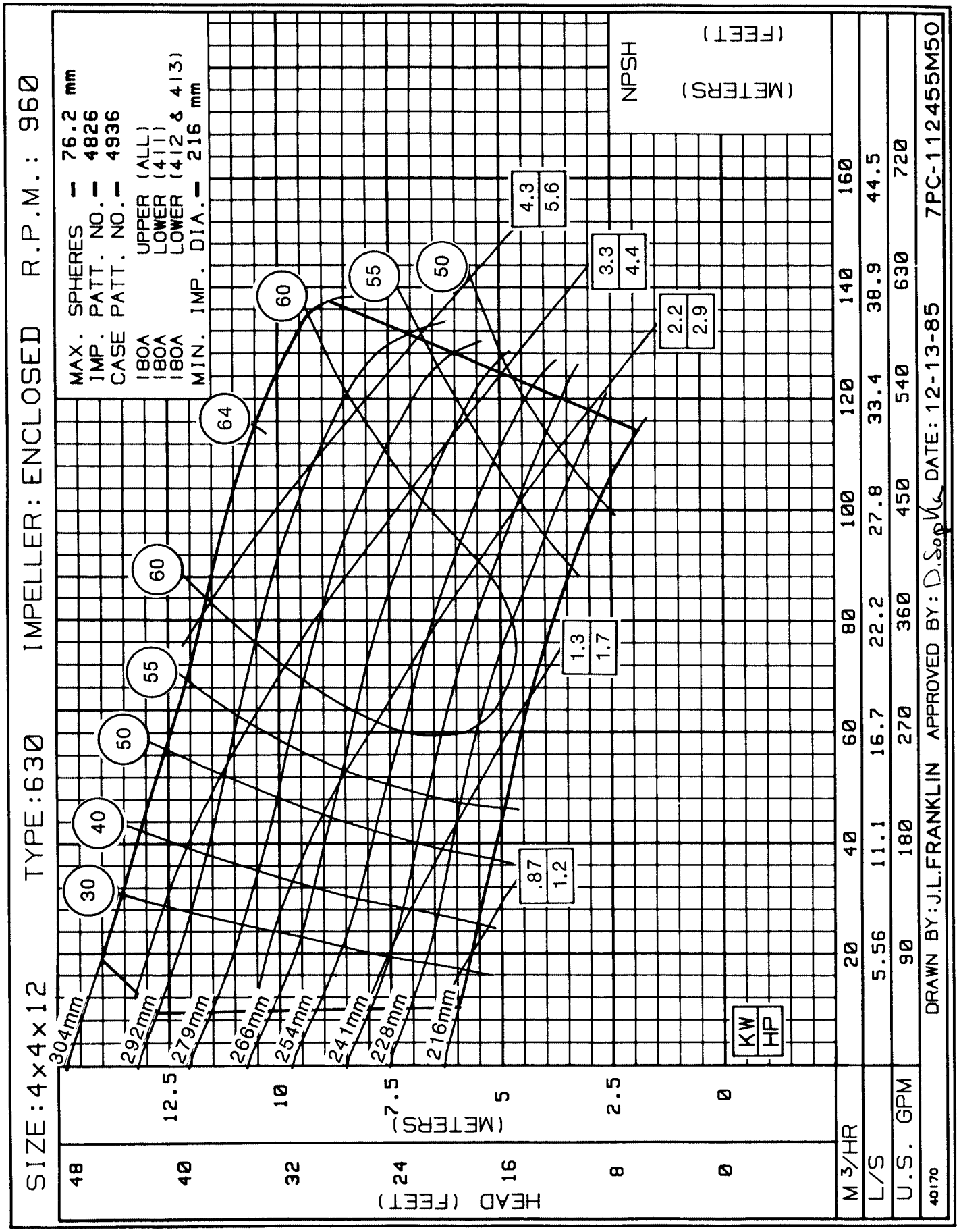
AURORA®
Pentair Pump Group



AURORA®
Pentair Pump Group

4x4x12 - 960 RPM
ENCLOSED IMPELLER

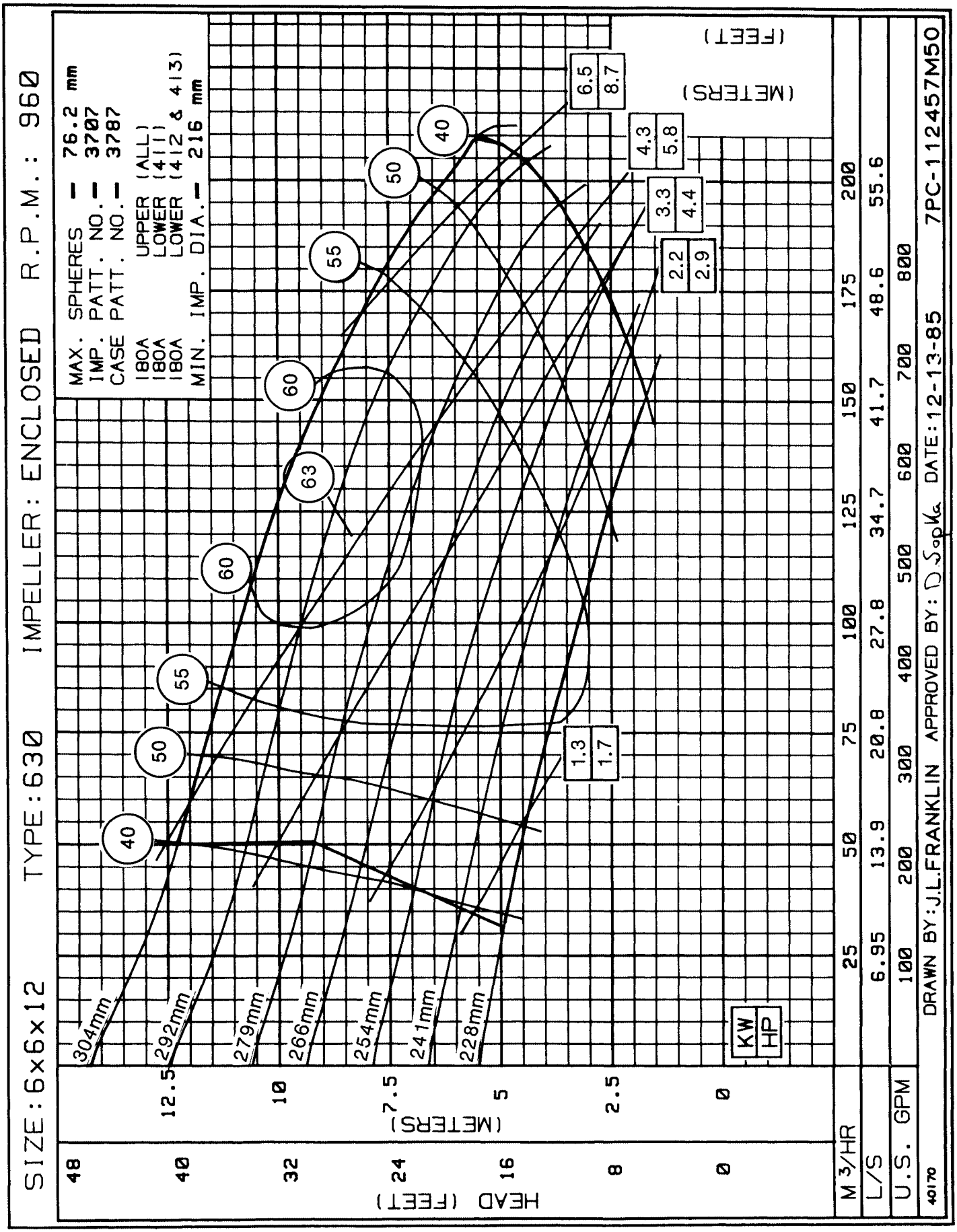
SECTION 630 (Metric 50Hz)
DATE JULY 1994
SUPERCEDES MARCH 1986



SECTION **630 (Metric 50Hz)**
DATE **JULY 1994**
SUPERCEDES MARCH 1986

6x6x12 - 960 RPM
ENCLOSED IMPELLER

AURORA®
Pentair Pump Group



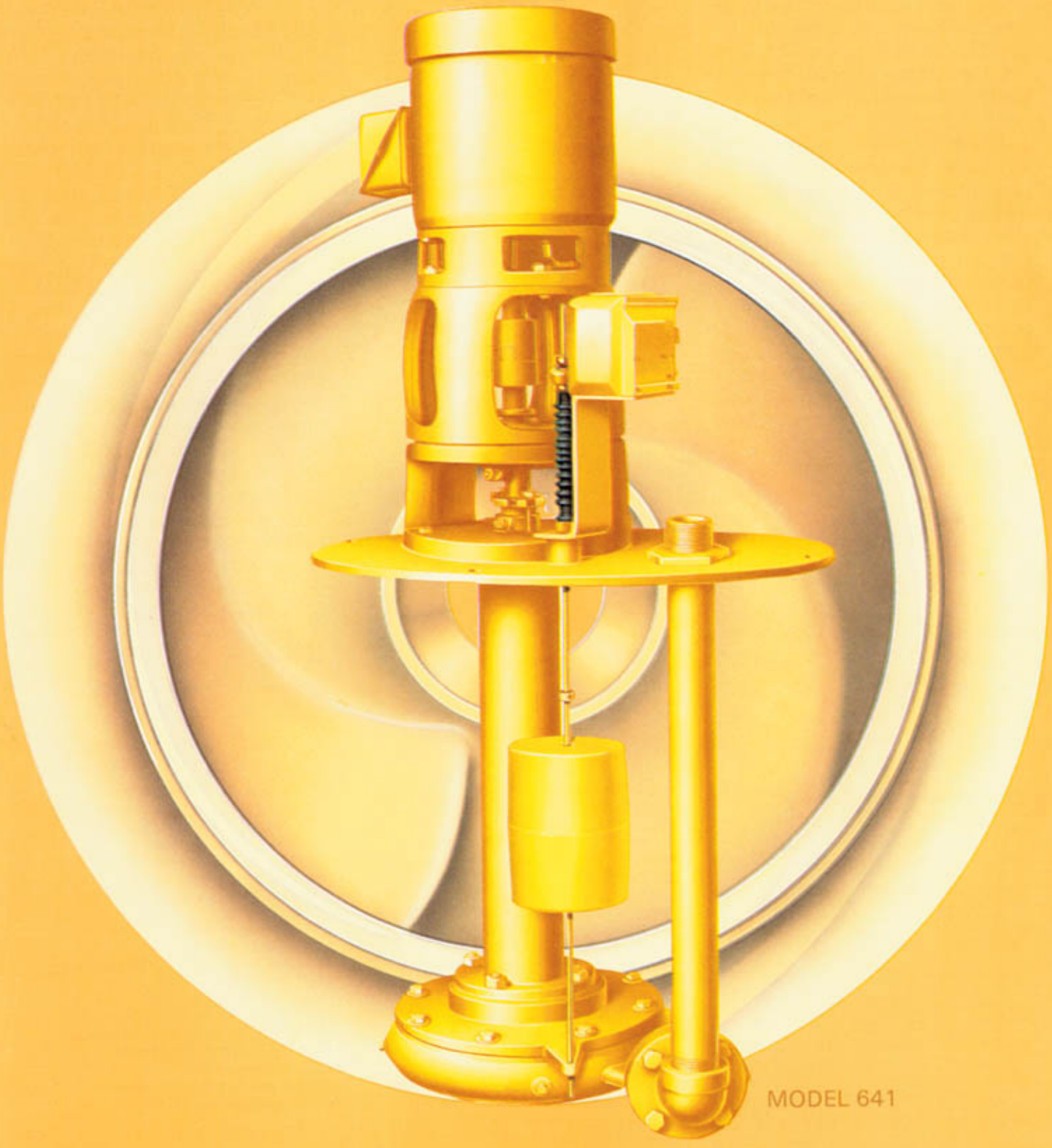
AURORA PUMP A member of PENTAIR PUMP GROUP

AURORA PUMP

BULLETIN 640/Rev. J

640 SERIES SINGLE STAGE SEWAGE PUMPS—"KSS"

CAPACITIES TO 350 G.P.M.
HEADS TO 90 FEET
TEMPERATURES TO 180°F.
DISCHARGE SIZES 2" THRU 4"



MODEL 641

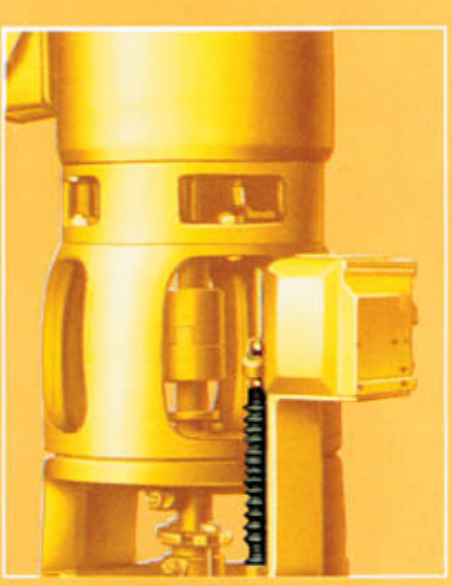
INTRODUCTION AURORA 640 SERIES PUMPS

Water pollution and its effect on our environment is on everyone's mind. This is particularly true today and for the future generations. The population explosion, along with a broader understanding of the water pollution problem, has brought about the need for more and better sewage treatment facilities. The installations of today and tomorrow demand more reliable sewage pumping equipment. Long life has become essential to overall pump performance. Aurora Pump recognizes this need, and with this bulletin offers the 640 Series of heavy duty vertical wet pit nonclog pumps as our solution to your sewage pumping problems. Contact your Aurora Pump representative for added details.

1 MOTOR MOUNTING bracket that assures alignment of motor and pump shaft with tongue and groove machining. Motors are of standard "HP" manufacture.

2 EXTERNAL IMPELLER ADJUSTMENT is accomplished with hexagon shaped adjusting nut. A lock nut secures the bearing collar to the shaft.

3 THRUST BEARING is regreaseable and is protected from contamination by grease seals on both sides and a water slinger. The bearing is elevated 6" above the floor level for easy servicing and added protection from washdown, flooding, etc.



4 STUFFING BOX is furnished with packing and a split gland for gastight construction. A lantern ring is also optionally available for packing lubrication.

5 ELEVATED FLOAT SWITCH ASSEMBLY is standard. Several enclosures are available. Refer to page 6 for additional details.

6 STEEL OVAL BASEPLATE is standard and eliminates removing the complete cover plate.

7 BEARING ASSEMBLIES available in several arrangements and materials to suit difficult applications. Line bearings are provided on 6'-2" settings and deeper. One bearing is provided for each additional 5' of setting. All the standard bearings are grease lubricated.

8 PUMP SHAFT 1-3/16" in diameter is provided to minimize deflection and bearing wear.

9 POSITIVE ALIGNMENT THROUGHOUT utilizes tongue and groove registered design.

10 LIQUID END includes a nonclog impeller that passes up to 3" spheres depending on pump size.

11 DISCHARGE PIPE is securely locked to the baseplate. The pipe end is threaded for easy system piping. A below surface discharge is optionally available.

QUICK REFERENCE 640 SERIES FEATURE SELECTOR

STANDARD

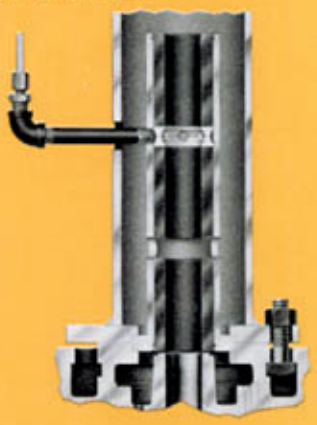
- Bronze fitted construction
- Bronze pump bearings
- Bronze line bearings (6'-2" settings and deeper)
- Dynamically balanced non-clog impeller passes 2" to 3" spheres depending on pump size
- Elevated regreaseable thrust ball bearing
- Grease lubricated pump and line bearings
- Standard "HP" base motors
- Carbon steel shaft
- Packing box with split gland & lantern ring
- Oval baseplate
- Gastight construction
- 4" Vent — 34" baseplate and larger
- Float switch
- Plastic float and rod
- Elevated switch support
- External adjustment of impeller
- Pump setting increments of 6"
- Pump settings up to 15'-8"

OPTIONAL

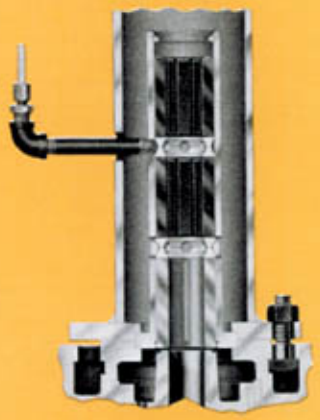
- All iron or all bronze construction
- Bronze impeller
- Various pump and line bearing types
- Drip oiler for line bearings
- Solenoid oiler for line bearings
- Stainless steel shaft
- Round, square or special baseplates
- Steel curb rings
- Various float switch enclosures
- Electric alternator
- Stainless steel or bronze float and rod
- High water alarm
- Alarm bells and horn
- Float guard
- 4" Vent — 28" baseplate and smaller
- Flushing lines to sleeve bearings
- Electric controllers
- Special pump setting increments
- Pump settings over 15'-8"

STANDARD

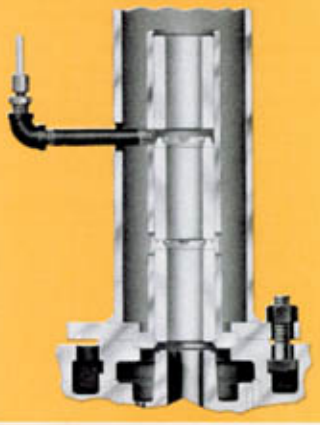
GRAPHITAR



CUTLESS RUBBER



GLASS-FILLED TEFLON*



Two important parts in any sump pump construction are the pump and line bearings as they are immersed in the liquid. The line bearings frequently run wet or dry depending on the varying liquid level in the sump. A complete line of bearings for all types of service conditions is available. Line bearings are provided as standard on 6'-6" pump settings and for each additional 5' of setting.

STANDARD—All 640 Series pumps (except for 10 foot and deeper settings at 1750 R.P.M.) are furnished with bronze sleeve type bearing unless an optional style is specified and is also the standard lineshaft bearing for all settings. This bearing is also available in cast iron or Ni-resist material. When pumping conditions are severe, abrasives are present in the liquid or the liquid temperature exceeds 140°F., specify one of the following optional bearings.

GRAPHITAR (OPTIONAL BEARING)—The wearing surface of the graphitar bearing is made of non-metallic material. It consists of a carbon steel relief-type bearing housing and three graphitar bushings. The graphitar bearing configuration is recommended for use on applications where the temperature of the liquid exceeds 140°F. Stainless steel shafting is recommended. DO NOT APPLY THIS OPTION WHEN LIQUID BEING PUMPED CONTAINS ABRASIVES; IN SUCH CASES, SELECT ONE OF THE OTHER BEARING OPTIONS.

CUTLESS RUBBER (OPTIONAL BEARING)—This bearing consists of a metal relief-type bearing housing and two cutless rubber bushings. A third bushing located at the bottom of the bearing housing is made of metal. Lubrication can be supplied by the liquid being pumped when used as a pump bearing. When used as an optional lineshaft bearing, water flush lubrication is provided. Grease lubrication is not recommended. This option is recommended for applications where abrasives are held in suspension in the liquid pumped. Stainless steel shafting is recommended. Do not apply this option when the liquid temperature exceeds 140°F.; in such cases, select one of the other bearing options.

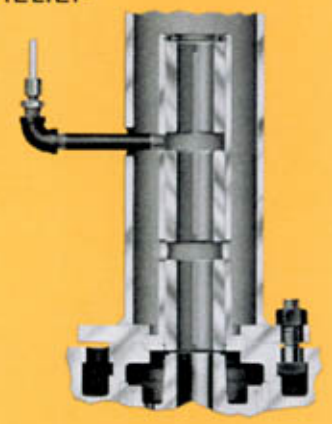
GLASS-FILLED TEFLON* (OPTIONAL BEARING)—This bearing consists of a carbon steel relief-type bearing housing with three glass-filled Teflon* bushings as the bearing surface. The self-lubricating, low-friction and inert qualities of filled Teflon* make it ideal for handling hot liquids, chemicals and solvents which may attack standard bearing materials. Stainless steel shafting is recommended.

RELIEF—A RELIEF-TYPE BEARING WILL BE SUPPLIED AS STANDARD FOR 10'-6" AND DEEPER SETTINGS AT 1750 R.P.M., and is otherwise optionally available. The relief-type bearing housing has three metal bushings. Since this relief-type bearing housing is also used with the other bushing materials (Graphitar, Cutless Rubber and Teflon*), the same venting principle applies to these bushing materials.

SPOOL (OPTIONAL BEARING)—This bearing can be supplied as an optional bearing for any pump setting. It is intended for use as a rigid pump bearing for unusually rugged pump applications. The housing can be equipped with different bushing materials (Iron, Bronze, Graphitar, Cutless Rubber or Glass-Filled Teflon*) depending upon the application. The bearing housing is of rigid "double-wall" metal construction and is flanged at each end.

*Teflon is a registered trademark of E.I. duPont

RELIEF

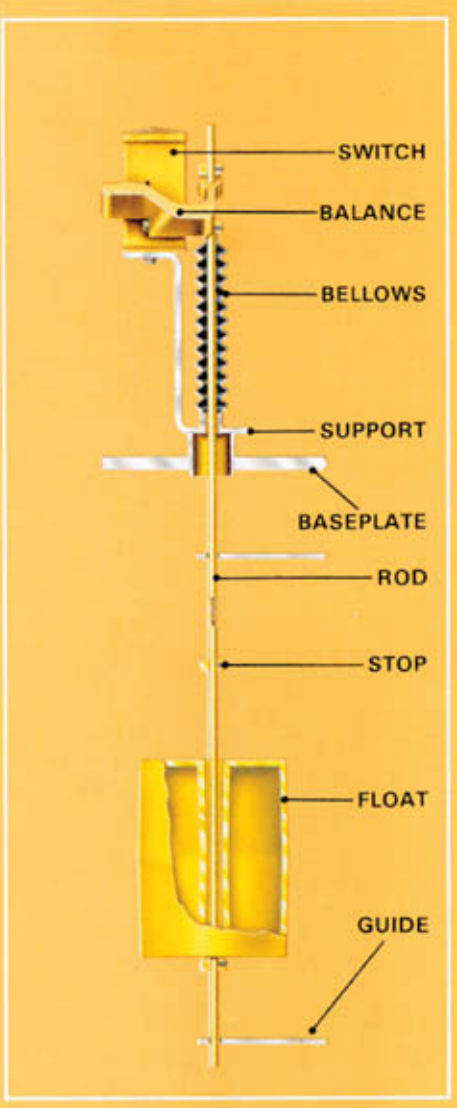


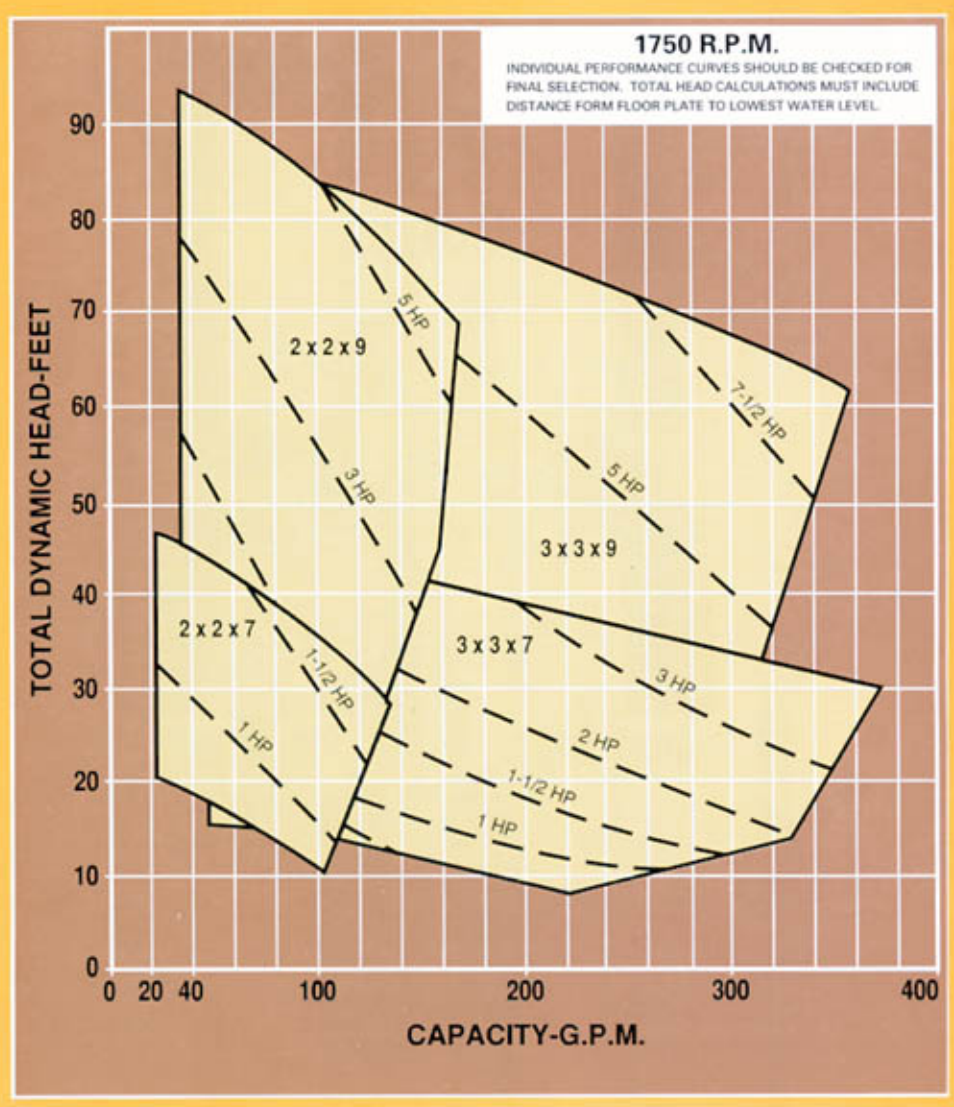
SPOOL

MATERIALS OF CONSTRUCTION

BEARING TYPE	PUMP CONSTRUCTION	BEARING HOUSING MATERIAL	BUSHING MATERIAL				
			IRON	BRONZE	CUTLESS RUBBER	GRAPHITAR	FILLED TEFLON
STANDARD BEARING FOR PIT DEPTHS UNDER 10'	BRONZE FITTED	BRONZE	NO BUSHINGS REQUIRED				
	ALL BRONZE	BRONZE					
	ALL IRON	IRON					
	STAINLESS STEEL	STAINLESS STEEL					X
RELIEF BEARING STANDARD FOR PIT DEPTHS 10' AND DEEPER	BRONZE FITTED	STEEL		X			
	ALL BRONZE	BRONZE		X			
	ALL IRON	STEEL	X				
	STAINLESS STEEL	STAINLESS STEEL					X
OPTIONAL RELIEF BEARING	BRONZE FITTED	STEEL		X	X	X	X
	ALL BRONZE	BRONZE		X	X	X	X
	ALL IRON	STEEL	X		X	X	X
	STAINLESS STEEL	STAINLESS STEEL			X	X	X
OPTIONAL SPOOL BEARING	BRONZE FITTED	STEEL		X	X	X	X
	ALL IRON	STEEL	X		X	X	X
	STAINLESS STEEL	STAINLESS STEEL			X	X	X
STANDARD LUBRICATION			GREASE		PUMPED LIQUID		
OPTIONAL LUBRICATION			WATER FLUSH OIL (1)		WATER FLUSH (2)	WATER FLUSH GREASE (2)	WATER FLUSH

(1) OIL—FOR LINE SHAFT BEARINGS ONLY.
(2)—WATER FLUSH—RELIEF HOUSING ONLY.





STANDARD MATERIAL OF CONSTRUCTION

DESCRIPTION	MATERIAL
BASEPLATE	STEEL-WRT
SLEEVE BEARINGS	BRONZE ASTM B62
BEARING COLLAR	BRONZE ASTM B62
CASING	CAST IRON ASTM A48
DISCHARGE PIPE	STEEL WRT. SCH'D. 40
HEAD-LOWER	CAST IRON ASTM A48
HEAD-UPPER	CAST IRON ASTM A48
IMPELLER	CAST IRON ASTM A48
PACKING	GRAPHITE IMPREG. T.F.E.
SHAFT	STEEL AISI C1040
BEARING COVER	CAST IRON ASTM A48
SUPPORT PIPE	STEEL WRT. SCH'D. 40

INTERMEDIATE LINE SHAFT BEARINGS

PIT DEPTHS	PUMP SETTING	NO. OF LINE SHAFT BRG.
7'-0"	6'-6"	1
12'-0"	11'-6"	2
17'-0"	16'-6"	3

PIT DEPTH OR PUMP SETTING

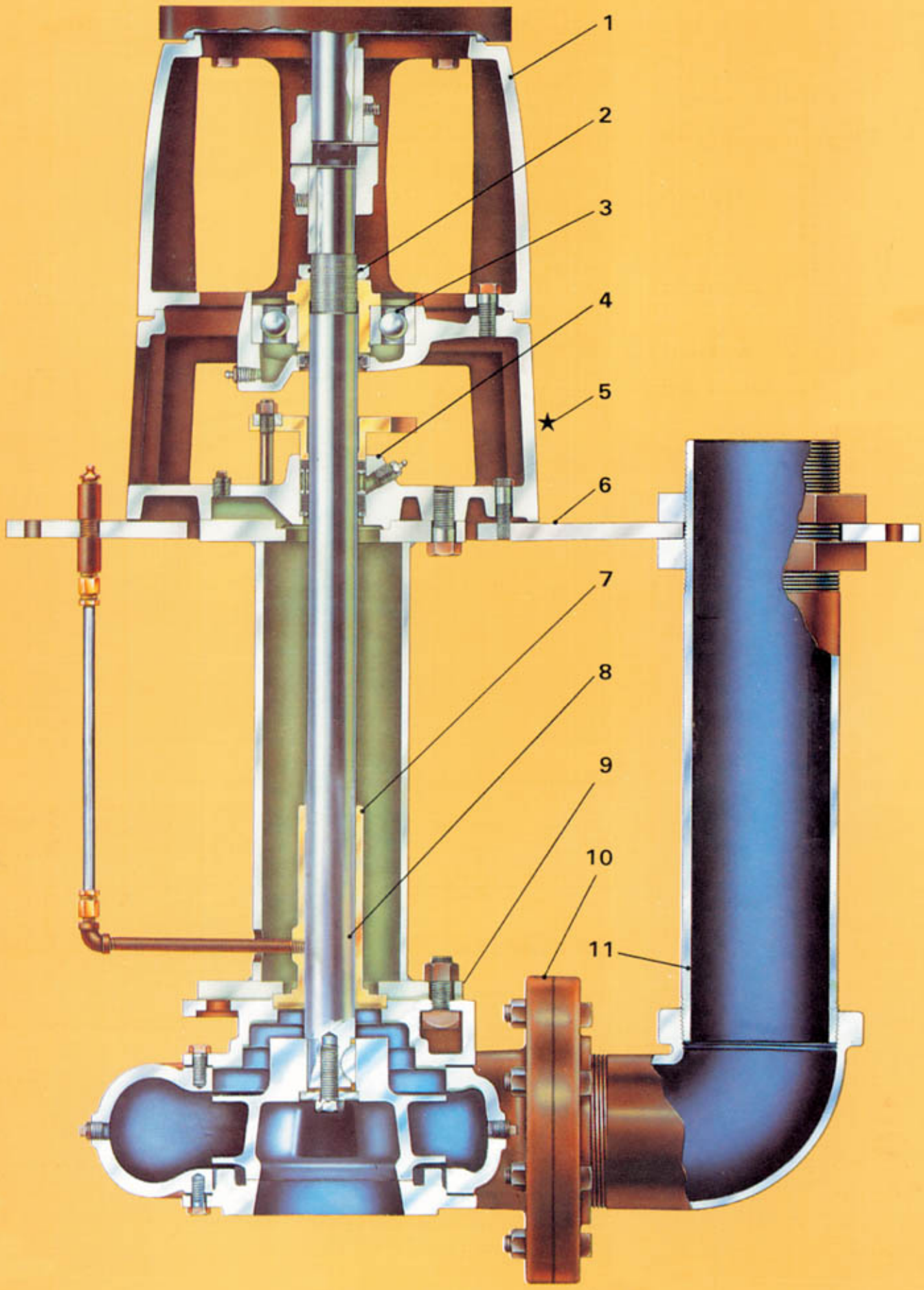
LENGTH IN FT.		LENGTH IN FT.		LENGTH IN FT.	
PIT DEPTH	PUMP SETTING	PIT DEPTH	PUMP SETTING	PIT DEPTH	PUMP SETTING
2'-6"	2'-0"	7'-6"	7'-0"	12'-6"	12'-0"
3'-0"	2'-6"	8'-0"	7'-6"	13'-0"	12'-6"
3'-6"	3"'0"	8'-6"	8'-0"	13'-6"	13'-0"
4'-0"	3'-6"	9'-0"	8'-6"	14'-0"	13'-6"
4'-6"	4'-0"	9'-6"	9'-0"	14'-6"	14'-0"
5'-0"	4'-6"	10'-0"	9'-6"	15'-0"	14'-6"
5'-6"	5'-0"	10'-6"	10'-0"	15'-6"	15'-0"
6'-0"	5'-6"	11'-0"	10'-6"	16'-0"	15'-6"
6'-6"	6'-0"	11'-6"	11'-0"	16'-6"	16'-0"
7'-0"	6'-6"	12'-0"	11'-6"	17'-0"	16'-6"

DESIGN DETAILS

AREA	DESCRIPTION	POWER SERIES 3
PUMP SHAFT	DIAMETER AT IMPELLER	7/8"
	SHAFT DIAMETER	1-3/16"
	DIAMETER AT COUPLING END	1"
BEARINGS	BEARING (BALL) — HEAD	7311
	BEARING (SLEEVE) — PUMP	6" LG.
SUPPORT PIPE SIZE TO 10 FEET		2-1/2"

LIMITATIONS

MAXIMUM LIMITATIONS BASED ON STANDARD MATERIALS AND PUMPING CLEAR WATER		
SPEED — R.P.M.		1750
MAXIMUM HORSEPOWER	1750 R.P.M.	10
	1150 R.P.M.	5
TEMPERATURE °F.		180
BASIN PRESSURE — P.S.I.		2
BASIN COVER SIZE	MINIMUM W/O OVAL OR MANHOLE	28"
	MAXIMUM W OR W/O OVAL OR MANHOLE	78"


1
2
3
4
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★
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9
10
11

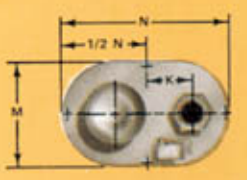
ENGINEERING SPECIFICATIONS AND DIMENSIONS

AREA	DESCRIPTION	DIM.	LIMITATIONS								
			MAX. BASIN PRESS.	MAX. STD. PIT DEPTH	MAX. SOLID HAND. SIZE	MAX. TEMP	MAX. MOTOR SPEED	MIN. MOTOR SIZE 1750 RPM	MIN. MOTOR SIZE 1150 RPM	MAX. COVER SIZE OVAL	MAX. COVER SIZE RD. OR SQ.
PUMP SHAFT	ROTATION FROM DRIVER END	CW	2PSI	16 FEET CONSULT FACTORY FOR DEEPER SETTINGS	2-1/2"	180°F	1750 RPM	1 HP	¾ HP	22" x 28"	78"
	DIAMETER AT IMPELLER	7/8									
	DIAMETER BETWEEN COUPLING & IMPELLER	1-3/16									
	DIAMETER AT COUPLING END	1									
	BALL BEARING HEAD	311									
	SLEEVE BEARING PUMP	6" LG.									
	SUPPORT PIPE SIZE	2-1/2	ALL LIMITATIONS GIVEN ARE FOR WATER.								
	POWER SERIES	1									

NOTES:
1. All dimensions and weights are approximate.
2. Not for construction purposes unless certified.
3. All horsepower ratings shown are for open drip-proof motors only.
4. Add pump, motor and cover weights for unit weight.
5. Standard pump length designed to clear bottom of pit 2" to 5".
*3x3x7 and 3x3x9 pump not available on 20x24 oval.

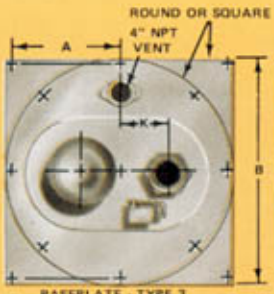
OVAL

OVAL NO.	SIZE	WEIGHT (LBS.)	M	N
1	20 x 24*	34	20	24
2	22 x 28	63	22	28

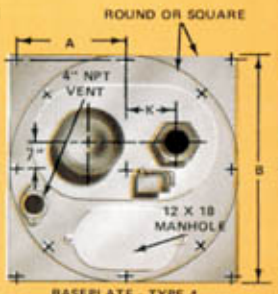


BASEPLATE - TYPE 1
STANDARD OVAL

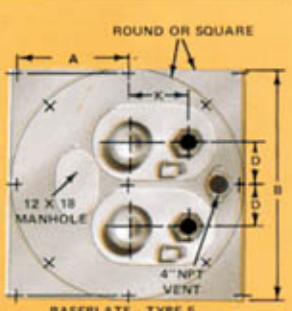
BASEPLATE - TYPE 2
OPTIONAL SIMPLEX
PLATE ONLY



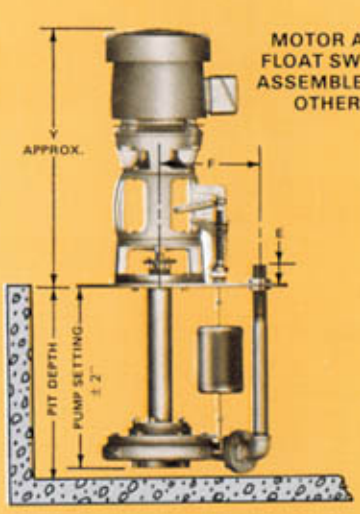
BASEPLATE - TYPE 3
OPTIONAL SIMPLEX
WITH OVAL



BASEPLATE - TYPE 4
OPTIONAL SIMPLEX
WITH OVAL & MANHOLE



BASEPLATE - TYPE 5
OPTIONAL DUPLEX
WITH OVALS & MANHOLE



MOTOR AND FLOAT SWITCH ASSEMBLED BY OTHERS

PUMP SIZE DISCHARGE	PUMP SIZE CASE BORE	SPHERE SIZES	PUMP WGT. (LBS.) 2'0" PIT DEPTH	PUMP WGT. (LBS.) EACH ADD'L. 6" OF PIT DEPTH	E	F	D DUPLEX	K OVAL	K SIMPLEX	K DUPLEX
2	7	1½	191	16	4 1/16	9¼	10½	6¼	6¼	9¼
2	9	1½	222	18	4½	10¾	10½	8¼	8¼	10¾
3	7	2½	223	25	4¼	11⅛	11½	6¾	9¾	8¾
3	9	2	258	25	4 1/16	13¼	11½	7¾	10¾	10¼

MOTOR FRAME	MOTOR HORSE-POWER 1750 RPM	MOTOR HORSE-POWER 1150 RPM	MOTOR WGT. (LBS.)	Y APPROX.	STEEL BASEPLATES — ROUND OR SQUARE A	B	TYPE 2 WGT. RD	TYPE 2 WGT. SQ	TYPE 3 OVAL NO.	TYPE 3 WGT. RD	TYPE 3 WGT. SQ	TYPE 4 OVAL NO.	TYPE 4 WGT. RD	TYPE 4 WGT. SQ	TYPE 5 OVAL NO.	TYPE 5 WGT RD	TYPE 5 WGT SQ
143 HP	1	¾	40	25	11	24	41	54									
145 HP	1½-2	1	45	26	13	28	58	76									
182 HP	3	1½	72	27	16	34			1	89	115						
184 HP	5	2	80	28	19	40			2	126	163	1	136	173			
213 HP	7½	3	130	30	22	46			2	225	289	2	235	299	1	245	309
215 HP	10	5	145	32	25½	53			2	302	387	2	312	397	2	397	504
					29	60			2	487	623	2	497	633	2	507	643
					32	66			2	592	755	2	602	765	2	730	927
					38	78			2	832	1060	2	842	1070	2	1016	1290

The contractor shall furnish (and install as shown on the plans) Aurora Model (641 Simplex) (642 Duplex) front or back pull out centrifugal non-clog pumps size . . . . . X . . . . . X . . . . . of (bronze fitted) (all bronze) (all iron) (stainless steel) construction. Each pump shall have a capacity of . . . . . GPM at . . . . . ft. total head, with a temperature of . . . . °F., ... specific gravity. The units shall be designed for a pit depth of . . . . . feet and shall be furnished with an (above the floor discharge terminating at the baseplate with a male threaded connection) (below the floor discharge terminating at the baseplate with a female threaded connection). A steel baseplate (oval); (round) (square) —(Simplex) (Simplex with oval) (Simplex with oval and manhole) (Duplex with ovals and manhole) will be provided. The pump casing, bearing cover and suction cover shall be of high tensile strength cast iron. The casing is to be of the single stage design. The cast iron impeller is of the (enclosed) (semi-open) non-clog type and shall be capable of passing a . . . . . " diameter sphere. Optional wearing rings of iron are to be furnished and shall be held in place by means of machine screws. The impeller running clearances will be of the face type to provide simple adjustments axially to compensate for wear. The impeller is to be dynamically balanced before it is keyed and secured to the pump shaft. The column pipe must be heavy duty with a minimum diameter of . . . . " having machined tongue and grooved joints to insure perfect shaft alignment. The pump shaft shall be a minimum of 1-3/16" diameter. A pump bearing will be located directly above the impeller and shall be of the heavy duty (bronze sleeve) (cutless rubber) (relief) (spool) type. Line bearings must be provided on pumps designed for a pit depth 6'-2" and one bearing for each additional 5' thereafter. All standard sleeve or relief pump and line bearings must be (grease) (oil) (water) lubricated by separate Nylon tube lubrication lines terminating at the baseplate. Standard bearings will be grease lubricated (unless otherwise specified). The bearings must have internal lubrication grooves to provide adequate lubrication of the complete bearing running surface. The motor pedestal is to be of cast iron, two piece construction, fitted with a sealed thrust ball bearing located 6" above the baseplate. The ball bearing collar is to have a hexagonal arrangement to allow external axial adjustment of the shaft and impeller. Grease seals shall be provided to retain grease and to prevent contamination of the vertical mounted ball bearing. A grease fitting will be provided to allow regreasing of the bearing. A packed stuffing box complete with a split gland shall be provided for gas tight construction. The upper head shall be of sufficient height to elevate the motor shaft extension should the motor be removed for servicing. The pump shall be controlled by an enclosed (heavy duty) (water tight) (explosion resisting) (explosion proof) type float operated switch 6" above the baseplate with fiberglass reinforced float and float rod. A flexible bellows will provide gas tight construction. An automatic alternator shall be furnished on duplex pumps to allow the pumps to alternate on each successive cycle of operation. The pumps are to be driven by and flexible coupled to a standard "HP" . . . horsepower, ... volt, ... Hertz, ... RPM vertical electric open drip-proof motor.

NOTE: Aurora Pump reserves the right to make revisions to its products and their specifications, and to this bulletin and related information without notice.

— Your Authorized Local Distributor —

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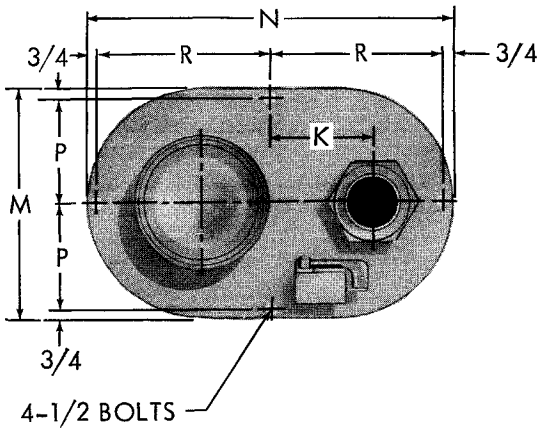
WWEMA

ISO 9001 REGISTERED QUALITY SYSTEM AURORA PUMP

ap AURORA® Pentair Pump Group

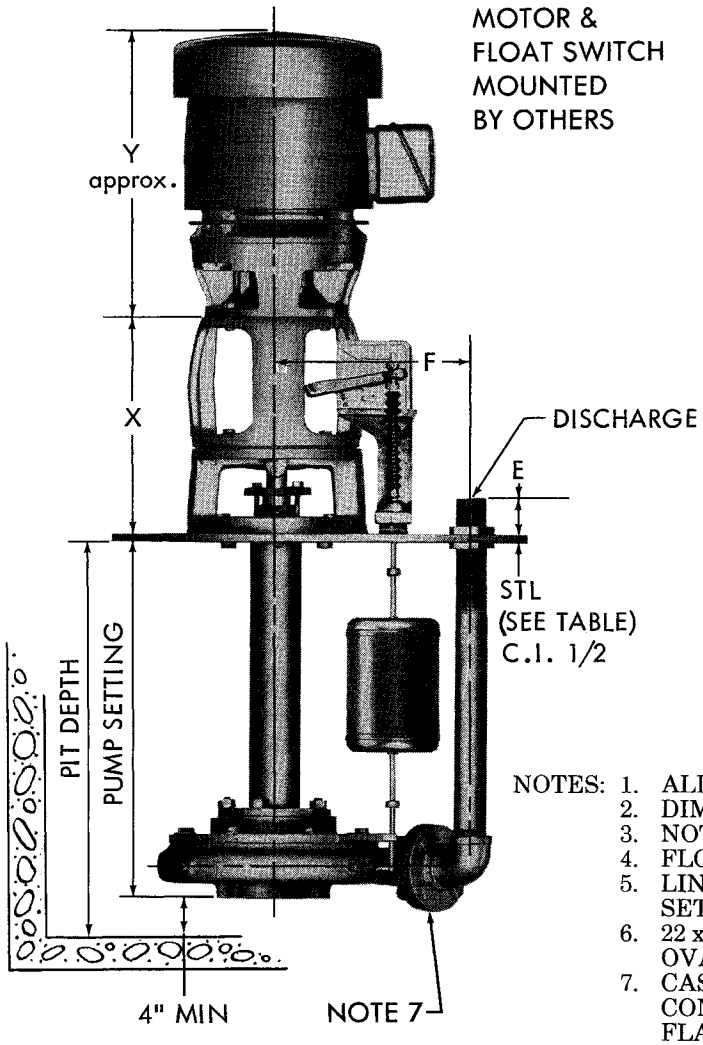
ON OVAL PLATE

DATED DECEMBER 1971
SUPERSEDES PAGE 251
DATED DECEMBER 1970



PUMP SIZE						
DISCH.	CASE BORE	E	F	K	OVAL SIZE	
2	7	4-1/16	9-1/4	6-3/4	20 x 24	3/8
2	9	4-1/2	10-3/4	8-1/4	20 x 24	3/8
3*	7	4-1/4	11-7/8	6-3/8	22 x 28	1/2
3*	9	4-5/16	13-1/4	7-3/4	22 x 28	1/2

OVAL	M	N	P	R
20 x 24	20	24	9-1/4	11-1/4
22 x 28	22	28	10-1/4	13-1/4

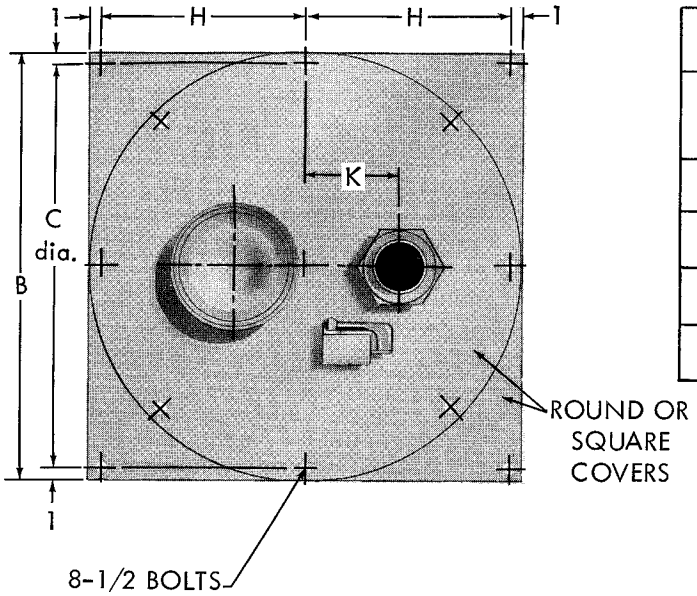


FRAME	X	Y
143HP	13-7/8	11
145HP	13-7/8	12
182HP	13-7/8	13
184HP	13-7/8	14
213HP	13-7/8	16
215HP	13-7/8	17
254HP	13-7/8	19
256HP	13-7/8	21

NOTES:
1. ALL DIMENSIONS IN INCHES.
2. DIMENSIONS MAY VARY ± 3/8.
3. NOT FOR CONSTRUCTION PURPOSES UNLESS CERTIFIED.
4. FLOAT SWITCH FURNISHED ONLY WHEN SPECIFIED.
5. LINE SHAFT BEARINGS FURNISHED ON 6' 2" PUMP SETTINGS AND LONGER.
6. 22 x 28 OVALS ARE ALSO AVAILABLE WHERE 20 x 24 OVALS ARE SHOWN.
7. CASINGS WITH 2" DISCHARGE HAVE THREADED CONNECTIONS. CASINGS WITH 3" DISCHARGE HAVE FLANGED CONNECTIONS.

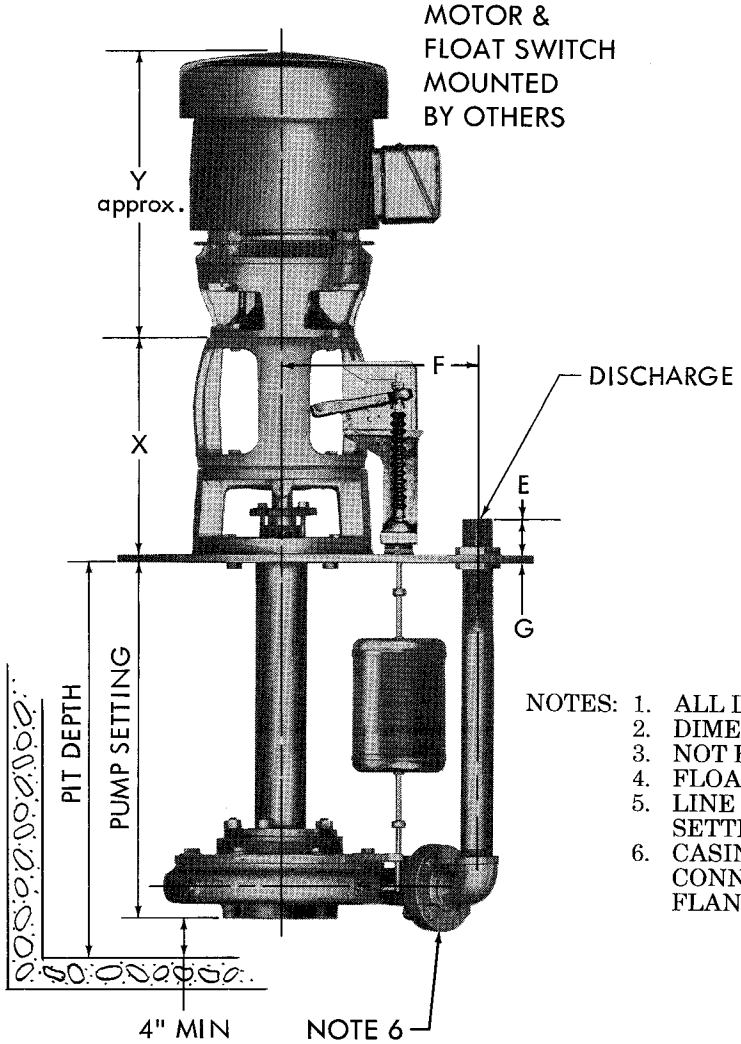
*3" PUMPS NOT AVAILABLE ON 20" x 24" OVAL.

AURORA MODEL 641 PUMP
ON SIMPLEX PLATE



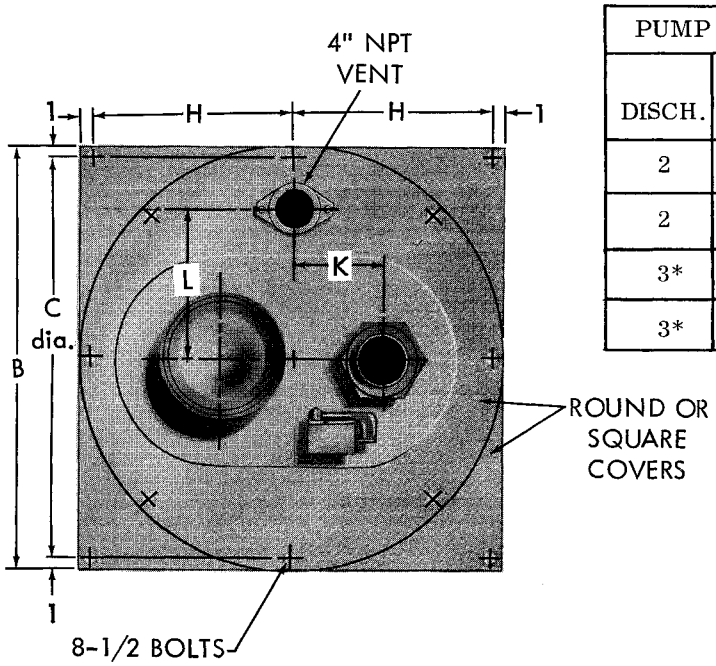
PUMP SIZE		E	F	K	MINIMUM COVER SIZE
DISCH.	CASE BORE				
2	7	4-1/16	9-1/4	6-3/4	24
2	9	4-1/2	10-3/4	8-1/4	26
3	7	4-1/4	11-7/8	9-3/8	32
3	9	4-5/16	13-1/4	10-3/4	32

COVER SIZE B	C ROUND	H SQUARE	G STEEL
24	22	11	3/8
28	26	13	3/8



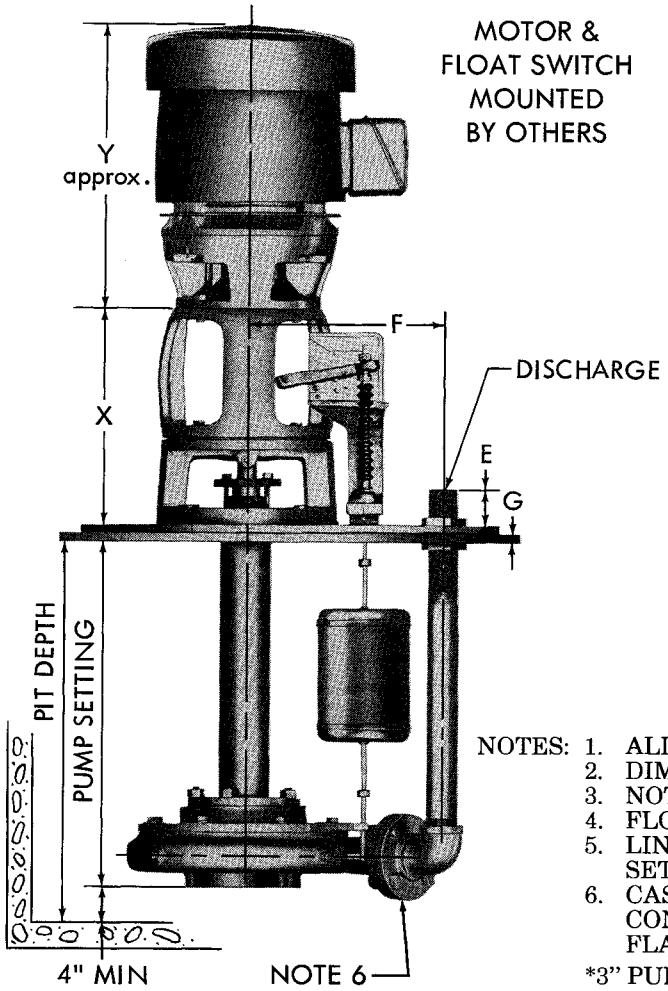
FRAME	X	Y
143HP	13-7/8	11
145HP	13-7/8	12
182HP	13-7/8	13
184HP	13-7/8	14
213HP	13-7/8	16
215HP	13-7/8	17
254HP	13-7/8	19
256HP	13-7/8	21

NOTES:
1. ALL DIMENSIONS IN INCHES.
2. DIMENSIONS MAY VARY ± 3/8.
3. NOT FOR CONSTRUCTION PURPOSES UNLESS CERTIFIED.
4. FLOAT SWITCH FURNISHED ONLY WHEN SPECIFIED.
5. LINE SHAFT BEARINGS FURNISHED ON 6' 2" PUMP SETTINGS AND LONGER.
6. CASINGS WITH 2" DISCHARGE HAVE THREADED CONNECTIONS. CASINGS WITH 3" DISCHARGE HAVE FLANGED CONNECTIONS.



PUMP SIZE						
DISCH.	CASE BORE	E	F	K	OVAL SIZE	MINIMUM COVER SIZE
2	7	4-1/16	9-1/4	6-3/4	20 x 24	34
2	9	4-1/2	10-3/4	8-1/4	20 x 24	34
3*	7	4-1/4	11-7/8	6-3/8	22 x 28	36
3*	9	4-5/16	13-1/4	7-3/4	22 x 28	36

COVER SIZE B	C ROUND	H SQUARE	G STEEL	L
34	32	16	3/8	12-3/4
40	38	19	3/8	14-1/2
46	44	22	1/2	16
53	51	25-1/2	1/2	17-3/4
60	58	29	5/8	19-1/2
66	64	32	5/8	21
78	76	38	5/8	24

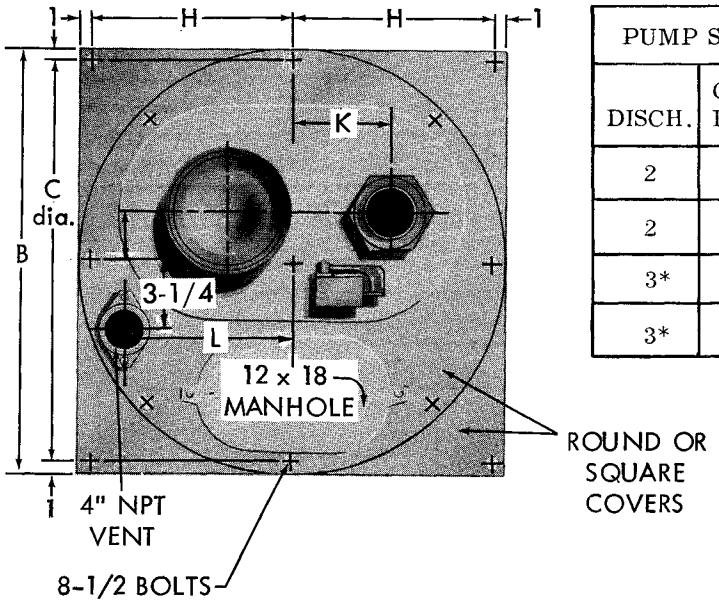


FRAME	X	Y
143HP	13-7/8	11
145HP	13-7/8	12
182HP	13-7/8	13
184HP	13-7/8	14
213HP	13-7/8	16
215HP	13-7/8	17
254HP	13-7/8	19
256HP	13-7/8	21

NOTES:
1. ALL DIMENSIONS IN INCHES.
2. DIMENSIONS MAY VARY ± 3/8.
3. NOT FOR CONSTRUCTION PURPOSES UNLESS CERTIFIED.
4. FLOAT SWITCH FURNISHED ONLY WHEN SPECIFIED.
5. LINE SHAFT BEARINGS FURNISHED ON 6' 2" PUMP SETTINGS AND LONGER.
6. CASINGS WITH 2" DISCHARGE HAVE THREADED CONNECTIONS. CASINGS WITH 3" DISCHARGE HAVE FLANGED CONNECTIONS.

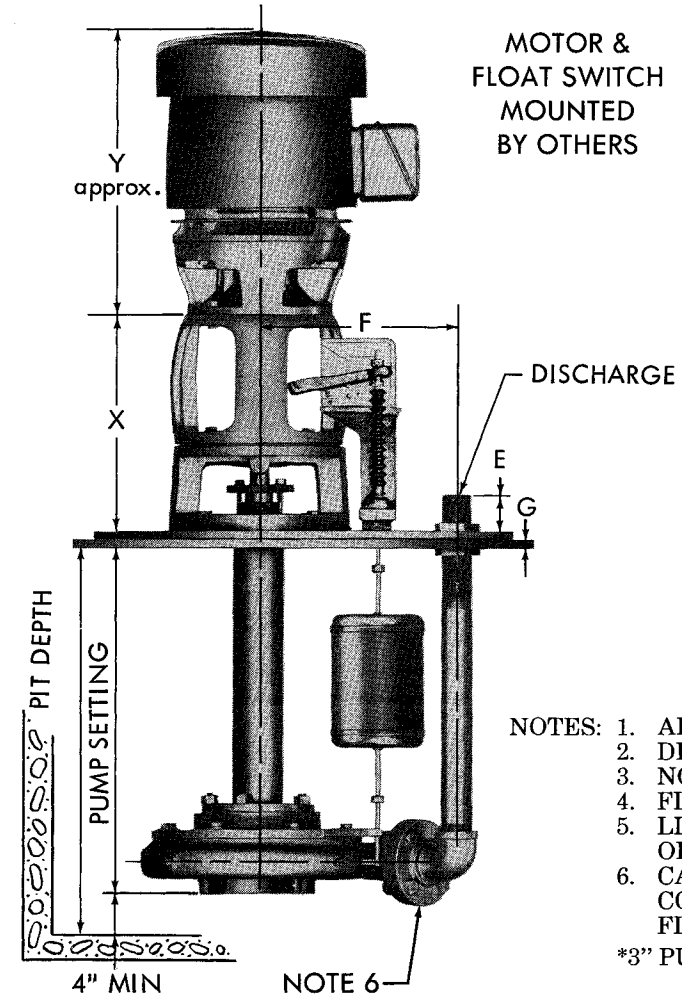
*3" PUMPS NOT AVAILABLE ON 20" x 24" OVAL.

AURORA MODEL 641 PUMP
ON SIMPLEX PLATE WITH OVAL AND MANHOLE



PUMP SIZE		E	F	K	OVAL SIZE	MINIMUM COVER SIZE
DISCH.	CASE BORE					
2	7	4-1/16	9-1/4	6-3/4	20 x 24	40
2	9	4-1/2	10-3/4	8-1/4	20 x 24	40
3*	7	4-1/4	11-7/8	6-3/8	22 x 28	42
3*	9	4-5/16	13-1/4	7-3/4	22 x 28	42

COVER SIZE B	C ROUND	H SQUARE	G STEEL	L
40	38	19	3/8	14-1/2
46	44	22	1/2	17
53	51	25-1/2	1/2	18-3/4
60	58	29	5/8	20-1/2
66	64	32	5/8	22
78	76	38	5/8	25

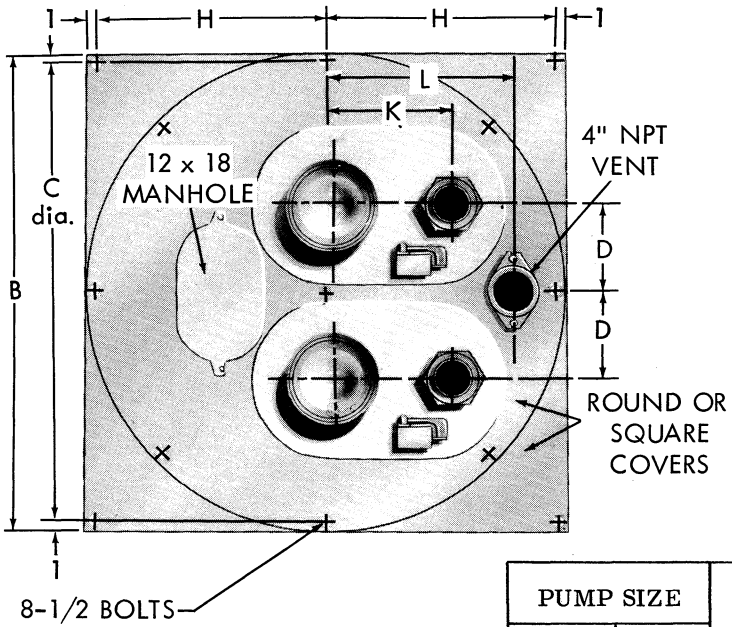


FRAME	X	Y
143HP	13-7/8	11
145HP	13-7/8	12
182HP	13-7/8	13
184HP	13-7/8	14
213HP	13-7/8	16
215HP	13-7/8	17
254HP	13-7/8	19
256HP	13-7/8	21

NOTES:
1. ALL DIMENSIONS IN INCHES.
2. DIMENSIONS MAY VARY ± 3/8.
3. NOT FOR CONSTRUCTION PURPOSES UNLESS CERTIFIED.
4. FLOAT SWITCH FURNISHED ONLY WHEN SPECIFIED.
5. LINE SHAFT BEARINGS FURNISHED ON PUMP SETTINGS OF 6' 2" AND LONGER.
6. CASINGS WITH 2" DISCHARGE HAVE THREADED CONNECTIONS. CASINGS WITH 3" DISCHARGE HAVE FLANGED CONNECTIONS.

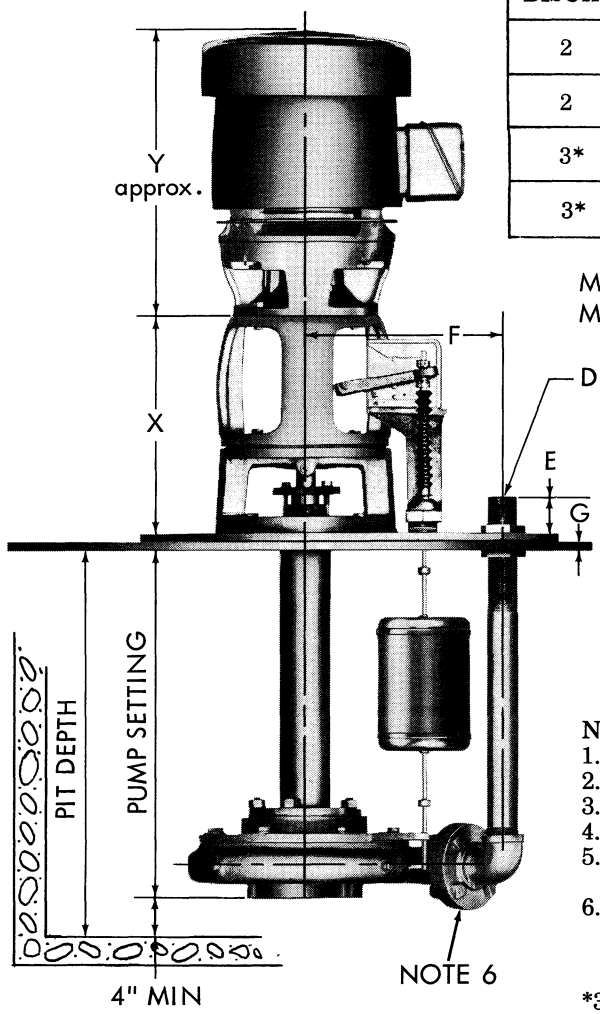
*3" PUMPS NOT AVAILABLE ON 20" x 24" OVAL.

AURORA MODEL 642 PUMP
ON DUPLEX PLATE WITH TWO OVALS AND MANHOLE



COVER SIZE B	C ROUND	H SQUARE	G STEEL	L
46	44	22	1/2	17
53	51	25-1/2	5/8	19
60	58	29	5/8	19
66	64	32	3/4	19
78	76	38	3/4	19

PUMP SIZE					OVAL		MINIMUM COVER SIZE
DISCH.	CASE BORE	E	F	K	SIZE	D	
2	7	4-1/16	9-1/4	9-3/4	20 x 24	10-1/2	46
2	9	4-1/2	10-3/4	10-3/4	20 x 24	10-1/2	46
3*	7	4-1/4	11-7/8	8-7/8	22 x 28	11-1/2	50
3*	9	4-5/16	13-1/4	10-1/4	22 x 28	11-1/2	50



MOTOR & FLOAT SWITCH MOUNTED BY OTHERS

FRAME	X	Y
143HP	13-7/8	11
145HP	13-7/8	12
182HP	13-7/8	13
184HP	13-7/8	14
213HP	13-7/8	16
215HP	13-7/8	17
254HP	13-7/8	19
256HP	13-7/8	21

NOTES:
1. ALL DIMENSIONS IN INCHES.
2. DIMENSIONS MAY VARY ± 1/2.
3. NOT FOR CONSTRUCTION PURPOSES UNLESS CERTIFIED.
4. FLOAT SWITCH FURNISHED ONLY WHEN SPECIFIED.
5. LINE SHAFT BEARINGS FURNISHED ON 6' 2" PUMP SETTINGS AND LONGER.
6. CASINGS WITH 2" DISCHARGE HAVE THREADED CONNECTIONS. CASINGS WITH 3" DISCHARGE HAVE FLANGED CONNECTIONS.

*3" PUMPS NOT AVAILABLE ON 20" x 24" OVAL.

SECTION 6 ITEM 641-642
DATED APRIL 1983
SUPERSEDES SECTION 6 ITEM 641-642
DATED JANUARY 1980

AURORA®
Pentair Pump Group

INSTRUCTION MANUAL
REPAIR
MODEL 641-642 (KSS)

SERVICE

Your Aurora pump requires no maintenance other than periodic inspection, occasional cleaning and lubrication. The intent of inspection is to prevent breakdown, thus obtaining optimum service life. The pumped liquid determines the type of pump and line bearings supplied and method of bearing lubrication. Refer to lubrication section for specific instruction. The lower head bearing, however, does require lubrication. The motor may also require lubrication, in which case, the motor manufacturer's recommendation should be followed.

LUBRICATION (BALL BEARINGS)

Regreasable bearings will require periodic lubrication and can be accomplished by using the zerk or lubrication fittings in the lower head assembly. Lubricate the bearings at regular intervals using a grease of high quality. Lithium, lithium soda or calcium base grease is recommended as lubricants for pumps operating in both wet and dry locations. Mixing of different brands of grease should be avoided due to possible chemical reactions between the brands which could damage the bearing. Accordingly, avoid grease of vegetable or animal base which can develop acids, as well as grease containing rosin, graphite, talc and other impurities. Under no circumstances should grease be reused.

Over lubrication should be avoided as it may result in overheating and possible bearing failure. Under normal application, adequate lubrication is assured if the amount of grease is maintained at 1/3 to 1/2 the capacity of the bearing and adjacent space surrounding it.

In dry locations each bearing will need lubrication at least every 4,000 hours of running time or every 6 to 12 months, whichever is more frequent. In wet locations the bearings should be lubricated at least after every 2,000 hours of running time or every 4 to 6 months, whichever is more frequent. A unit is considered to be installed in a wet location if the head assembly and motor are exposed to dripping water, to the weather, or to heavy condensation such as is found in unheated and poorly ventilated underground locations.

At times it may be necessary to clean the bearings due to accumulated dirt or deteriorated lubricants. This can be accomplished by flushing the bearing with a light oil heated to 180 to 200° F. while rotating it on a spindle. Wipe the bearing housing with a clean rag soaked in a cleaning solvent, and flush all surfaces.

Dry bearing thoroughly before relubricating. Compressed air can be used to speed drying, but care should be taken not to let bearings rotate while being dried.

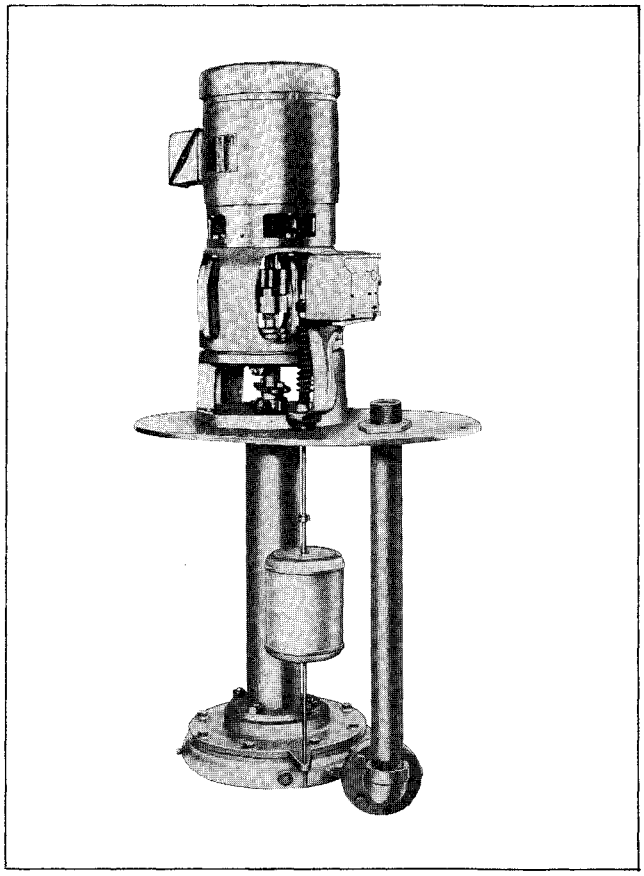
CAUTION

Use normal fire caution procedures when using any petroleum cleaner.

LUBRICATION (LINE SHAFT & PUMP BEARINGS)

Grease lubricated sleeve bearings (standard and relief type) will require frequent lubrication which can be accomplished by using the zerk fitting(s) located on the pump base. It is suggested that relubrication intervals be every 20 hours of running time.

Graphitar, cutless rubber and teflon bearings are lubricated with a water flush. The required number of lube line connections are provided on the pump base.



A. Complete unit assembly.

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NO. AURORA, ILLINOIS

REPAIRS

The pump may be disassembled using the illustrations and text provided. Although complete disassembly is covered, it will seldom be necessary to completely disassemble your Aurora pump.

The illustrations accompanying the disassembly instructions show the pump at various stages of disassembly. The illustrations are intended to aid in the correct identification of the parts mentioned in the text.

Inspect removed parts at disassembly to determine their reusability. Pump or line shaft bearings that are scored or noticeably out of round should not be reassembled. Cracked castings should never be reused and scored or worn pump shafts should be replaced.

All packings and gaskets should be replaced with new ones at reassembly simply as a matter of economy. They are much less expensive to replace routinely than to replace singly as the need arises. In general, it is economical to return to the manufacturer for repair only the motor and motor controller.

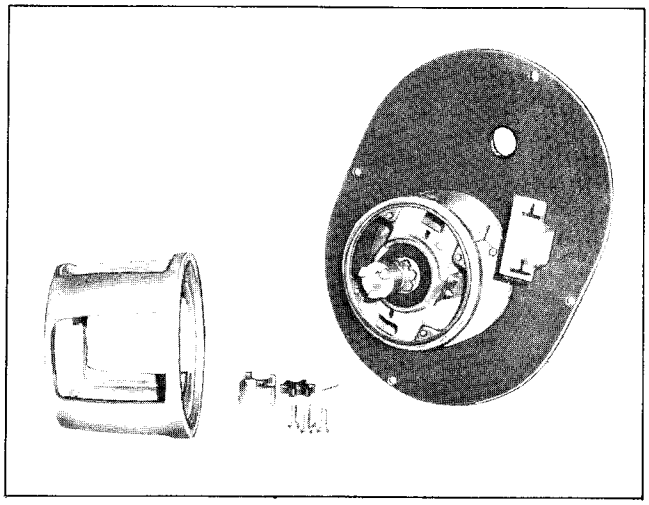
DISASSEMBLY

Disassemble only what is needed to make repairs or accomplish inspection. Proceed to disassemble the pump as follows: (Refer to figure 1.)

1. Disconnect wiring from motor control panel to motor and float switch. Take any other steps needed to prevent drive unit from being unintentionally energized during disassembly.

2. Remove the float switch. For instructions, refer to the repair notes on float switches.

3. Pump motor (52) and upper head (53) are best removed as a unit. The upper head serves to protect the motor output shaft from accidental damage. Therefore, remove capscrews (42) and lift the unit free from lower head (84) and lower half of coupling (48). If necessary, upper head (53) may be removed from motor (52) by unthreading capscrews (51) and removing nuts (50).



B. Upper head, coupling half, key and insert removed.

4. Coupling half (48) is removed by loosening setscrew (47). Similarly, setscrew (44) will free upper coupling half (45). Remove coupling keys (46 and 49) and insert (43).

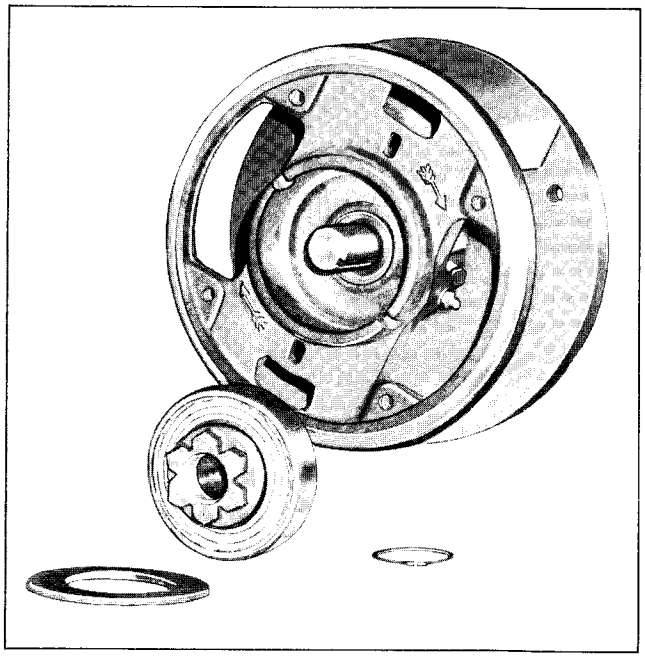
5. Remove remaining pump and connected parts from basin to continue disassembly.

NOTE

However, if ventilation piping is used, remove it before lifting off plate.

6. Locknut (55) can be unthreaded, exposing slinger (54) for removal. Then bearing collar (56) with ball bearing (58) is unthreaded from pump shaft. Retaining ring (57) must be removed from collar (56) with a pair of Truarc pliers, if bearing (58) is to be pressed off collar (56).

7. Remove grease seal (59) if necessary.

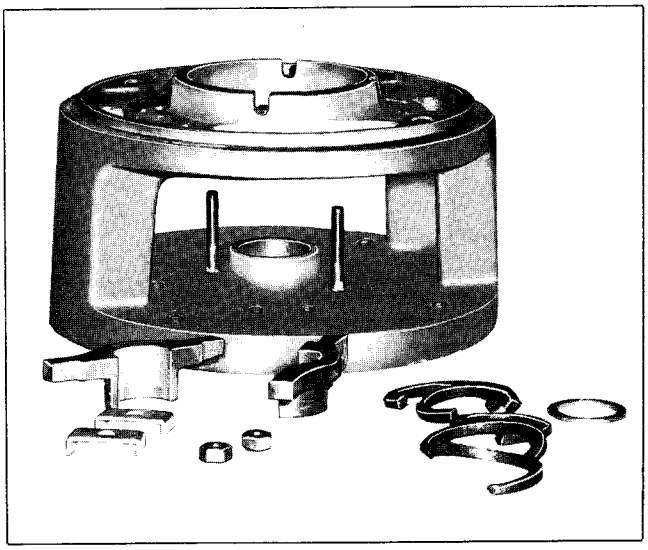


C. Slinger, bearing collar, bearing and retaining ring removed.

NOTE

Grease seal (59) should not be removed except for replacement because it's case is easily damaged. When removal is necessary, it can be tapped out of its seat in the lower head with coupling key (49) used as a driving tool.

8. Remove nuts (66) and clamps (67) from studs (69) and slide gland (68) off shaft (61). Remove packing (70) and packing ring (71).



D. Nuts, clamps, gland halves, packing and packing ring removed from lower head.

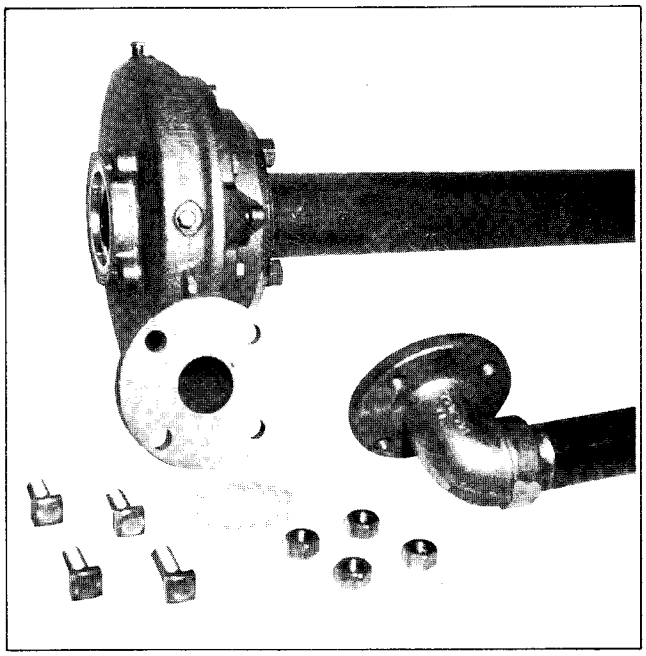
NOTE

This stuffing box arrangement is Option #3. For other options, refer to figure 1.

9. Remove oiler (73) if used and pipe plug (63). Also disconnect any lubrication line used to lubricate line shaft bearings or piping for pressurized support column water supply.

10. Unscrew capscrews (80 and 81) to remove lower head (84). Remove gasket (85).

11. Remove upper locknut (77) from discharge piping (78). Then plate can be lifted off.



E. Nuts, capscrews and gasket removed to free discharge piping.

Remove gasket (23). Remove screws (83) and nameplate (82) only if replacement is necessary.

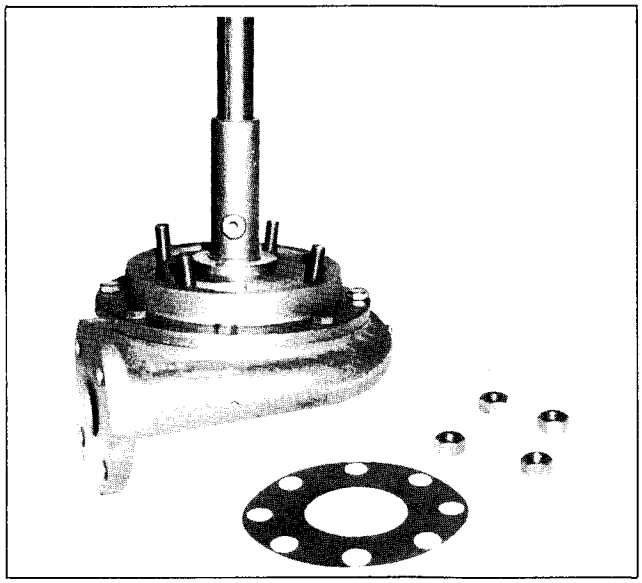
12. Successive lengths of piping and shafting are disassembled as follows:

a. If a line shaft bearing is lubricated through an oil or grease line, detach the line and elbow from pipe nipple in upper support section and then remove nipple.

b. Unscrew capscrews (39) and nuts (38) to lift top support pipe section and expose shaft coupling (60). Use a wrench to hold shaft (61) and a second wrench to unscrew coupling (60). Remove gasket (23).

c. Remove pipe plug (25) if used, then slide line shaft bearing (41) off shaft.

d. For additional lengths of discharge pipe (78) use a large pipe wrench to hold discharge pipe and a second wrench to unscrew coupling (79).



F. Nuts, support piping and gasket removed from cover.

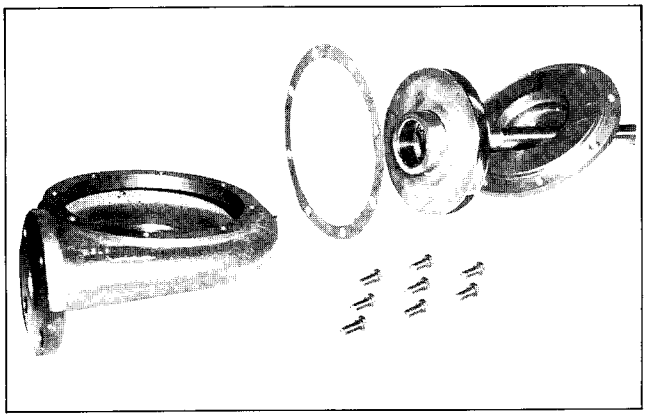
CAUTION

To protect a bearing that can be reused, tape the threaded section of the shaft end before removing bearing.

13. Discharge piping (78) and flanged elbow (76) can be removed from casing (8) by unthreading capscrews (5) and nuts (6). Remove gasket (9).

14. To lift off remaining support piping (40) unscrew nuts (20). Then remove gasket (23) and slide bolts (21) out.

15. Unthread capscrews (7) to remove cover (22) and gasket (10) exposing impeller.



G. Capscrews, cover, casing and gasket removed to reveal impeller.

16. Lift remaining shafting (61), impeller (15) and pump bearing (26) from casing (8). Remove pipe plug (25) from bearing (26), then slide bearing off end of the shaft, using the afore mentioned caution.

17. Unscrew impeller capscrew (13), remove gasket (14), impeller (15) and impeller key (16).

18. Remove pipe plug(s) (12) from casing (8). The hand hole cover (17) is removed from casing (8) by unscrewing capscrews (19) and nuts (18).

19. To remove suction cover (3) unscrew capscrews (1) and slide cover (3) and gasket (10) from casing (8).

REASSEMBLY

Reassembly will generally be in reverse order of disassembly. If disassembly was not complete, use only those steps related to your particular repair program.

1. Slide pump bearing (26) onto pump end of shafting (61) using the last caution mentioned in disassembly with the flanged end of bearing toward the bottom end of shaft. If bearing is not to be lubricated through a lubricating line, place pipe plug (25) in tapped hole in bearing.

2. Slide pump shaft (61) into pump end of support piping (40). Position pump bearing against pump flange of support piping. If bearing is to be lubricated through a lubrication line, align tapped opening in the bearing with vent opening in the support pipe, and install an 1/8 inch pipe nipple to maintain the alignment.

3. Slide cover (22) onto shaft (61). Place impeller key (16) in shaft and replace impeller (15) on shaft. Secure impeller with impeller capscrew (13) and gasket (14).

4. Position gasket (10) on cover (22) and bolt to casing (8) with capscrews (7). If hand hole cover (17) was removed from casing (8) replace gasket (24) and secure with nuts (18) and capscrews (19).

5. Place bolts (21) in slot in cover (22) and hold them in place with gasket (23). With discharge outlet aligned with vent opening in support pipe, bolt cover to flanged support pipe (40) with nuts (20).

6. Bolt discharge flanged elbow (76), with gasket (9) in place, to casing with capscrews (5) and nuts (6). Lengths of discharge pipe (78) may now be replaced in flanged elbow (76).

NOTE

If pump bearing is to be lubricated through a lubrication line, assemble the required elbow and tubing on previously installed nipple. If support column is to be pressurized with a flow of fresh water, connect the required 3/4 inch pipe nipple, elbow and pipe to support piping, and ascertain that other vent openings are plugged.

7. Successive lengths of piping and shafting are assembled as follows: (Pumps designed for pump settings* deeper than 6 feet, 2 inches are provided with multiple part discharge and support piping and with line shaft bearings at each support piping joint.)

a. Slide a line shaft bearing (41) down pump shaft, with tapped opening toward upper end until it seats against the flange of the previously assembled section of support piping (40).

b. To add successive lengths of pump shafting, thread shaft coupling (60) onto threaded end of one shaft (61). Start second piece of shafting into opposite end of coupling. Tighten bolt shafts evenly into coupling with pipe wrenches being careful not to score shafting excessively. There should be an even amount of shaft threads showing on either side of the coupling after tightening.

c. If line shaft bearing is to be lubricated through a lubrication line, turn bearing as required to align tapped opening with lubricant piping. Position support pipe gasket (23) against support pipe flange, and lower the next section of support piping into place. Turn it to align vent opening with tapped opening in line shaft bearing, and secure it by installing bolts (39) and nuts (38). Install any 1/8 inch pipe nipple in tapped opening of line bearing if required, and connect it to previously assembled lubrication piping.

d. If necessary, screw a discharge pipe coupling (79) onto threaded end of previously assembled section of discharge piping, and thread the next section of piping into coupling. Tighten with a pipe wrench, using a second wrench to hold the previously assembled section.

*"Pump Setting" is the distance from bottom of suction cover (3) to bottom of lower head (84). This measurement is normally 4 inches less than "Pit Depth," the distance from bottom of basin to top face of basin.

8. Place locknut (77) on discharge pipe (78) and thread down approximately 1 inch.

9. Lower pump support plate over support piping (40) and discharge piping (78). Position gasket (23) on support pipe flange, gasket (85) on lower head and slide lower head (84) into place.

NOTE

Install float control at this time if liquid end is not accessible when ejector is lowered into basin.

10. Lift pump support plate into position against lower head (84) and install capscrews (80 and 81). Place locknut (77) on discharge pipe (78) and tighten locknuts above and below the plate to secure discharge piping in place. Place gasket (10) on suction cover (3) and secure to casing (8) with capscrews (1). If pipe plugs (12) were removed, replace in casing (8). Pump support plate and pump assembly may now be lowered into place on basin cover and can be bolted down.

11. Install pump shaft packing ring (71) and packing (70) around shaft in lower head. Assemble packing gland halves (68) on gland studs (69) and secure with gland clamps (67) and nuts (66). Do not tighten nuts more than finger tight unless pump support piping is to be pressurized with fresh water.

12. Seat grease seal (59) with sealing edge upward in its seat in lower head.

NOTE

Cover threads of pump shaft temporarily with a tape or some other means before sliding on grease seal to prevent threads from damaging seal.

13. Press ball bearing (58) onto bearing collar (56) with ball bearing seal facing flange on collar, and secure bearing on collar by installing retaining ring (57).

14. Thread bearing collar onto pump shaft with bearing surface downward. Turn collar clockwise until bearing seats in lower head, then turn it an additional one-half turn. This will raise shaft and impeller approximately 1/64 inch off suction cover, providing the correct clearance for efficient pump operation.

15. Hold bearing collar (56) and install locknut (55) against collar. Ascertain that pump shaft turns freely by hand. Press rubber slinger (54) into place on bearing collar. If pipe plug (63) was removed replace in lower head (84).

NOTE

Connect pressurization or lubrication piping at this time by using opening provided in pump support plate. For pressurization piping, a 3/4 inch line to water supply is connected to tapped opening in lower head. For lubrication piping, line is connected to lubrication device. If no lubrication line is required and there are line shaft bearings, install oiler (73) and pipe plug (63) in openings provided in lower head.

16. Install coupling half (48) and key (49) on upper end of pump shaft, and tighten coupling setscrew (47) temporarily to prevent its slipping down shaft.

17. Position coupling insert (43) in lower half of coupling and secure upper coupling half (45) with its key (46) on motor output shaft. Align bottom end of key with key slot in the end surface of motor shaft, and secure by tightening setscrew (44).

18. If upper head (53) was removed from motor (52) replace with capscrews (51) and nuts (50). Lower motor (52) and upper head (53) carefully into position on lower head while engaging coupling halves with coupling insert. Bolt assembly to lower head with capscrews (42).

19. Loosen setscrew (47) in lower coupling half (48) and slide coupling half and key (49) upward until they engage coupling insert (43) with proper clearance as shown in Section 2, Item 4 of this Instruction Manual.

20. If nameplate (82) was removed replace at this time with screws (83).

NOTE

Install float switch at this time. For instructions refer to the repair notes on float switches.

21. Connect wiring from motor control panel to motor and float switch, following exactly the instructions provided by their respective manufacturers. Also connect solenoid valve or oiler at this time if used, using diagrams provided. All wiring must comply with applicable electrical code requirements for type of duty pump is to perform.

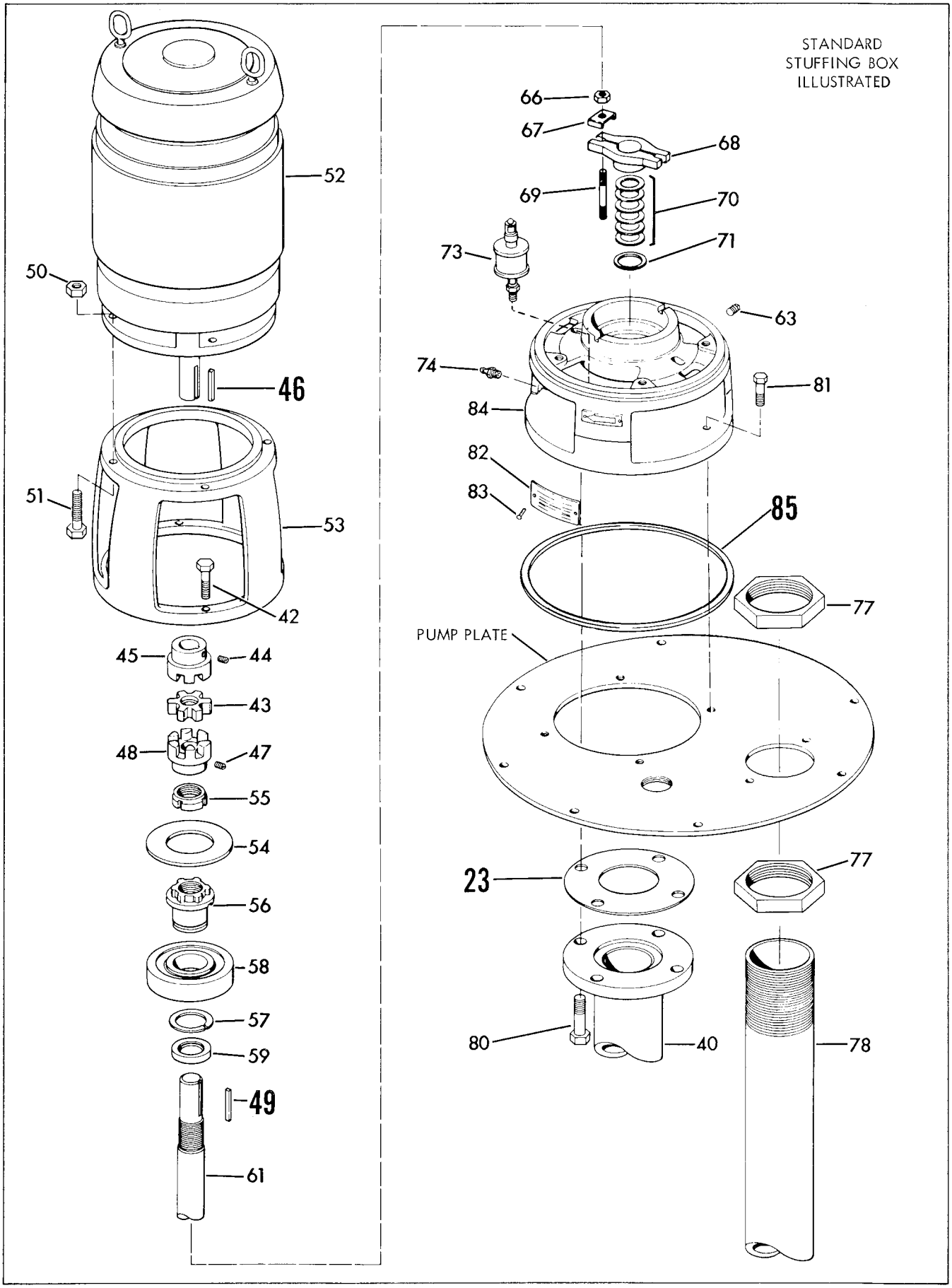
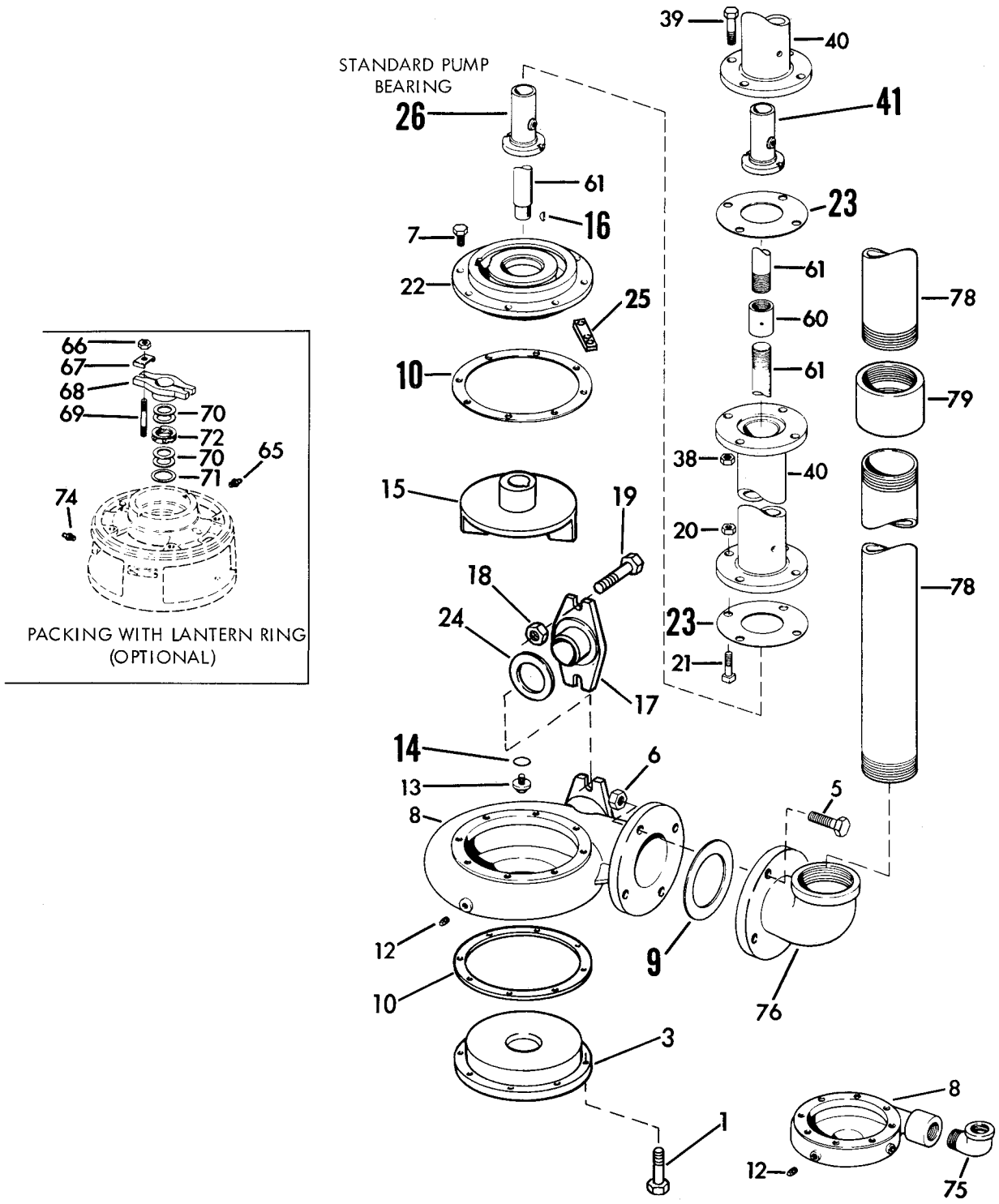


Figure 1. Model 641-642 Exploded View (Sheet 1 of 3)

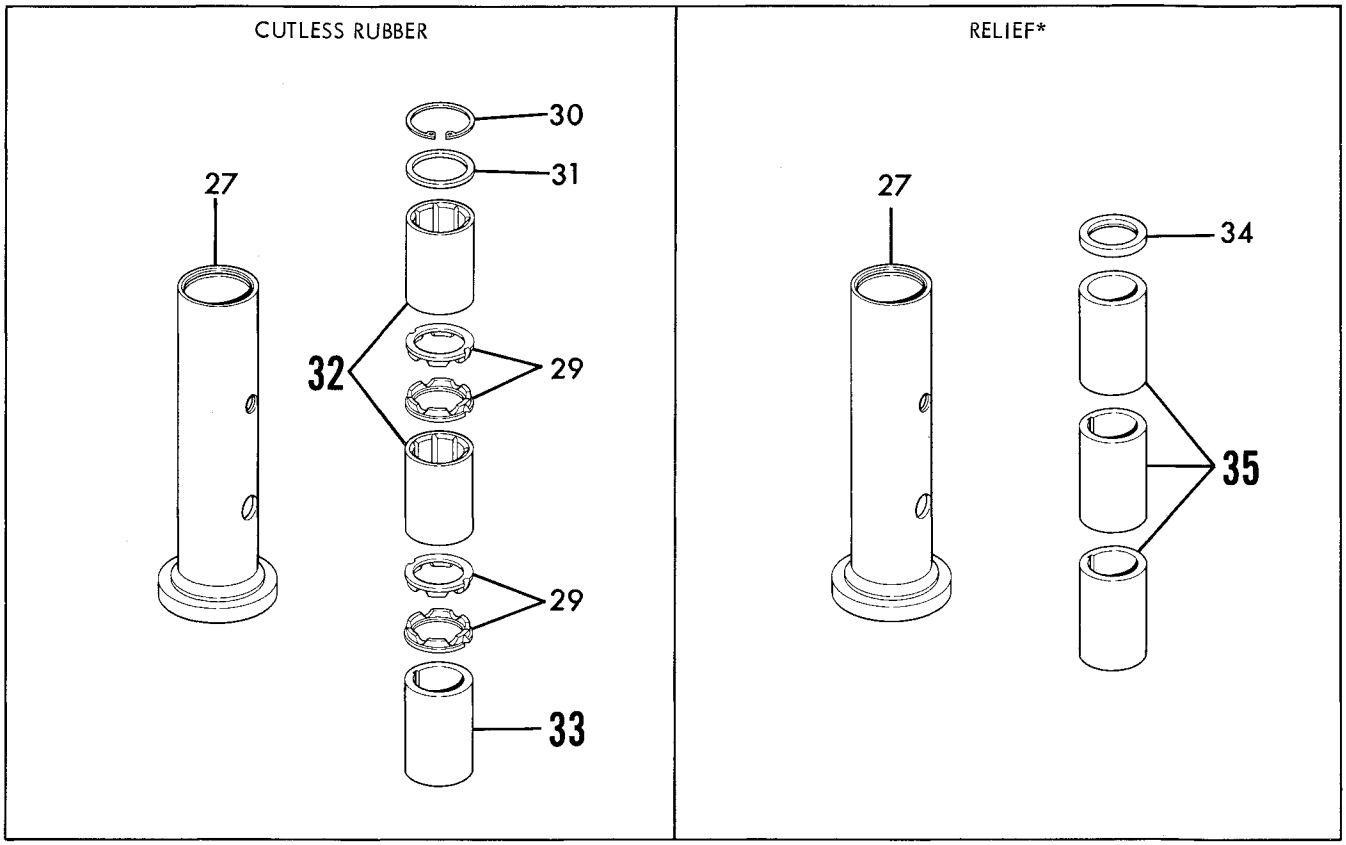


NOTE: Recommended spare parts shown in bold face type.

Figure 1. Model 641-642 Exploded View (Sheet 2 of 3)

MODEL 641-642

OPTIONAL RELIEF HOUSING



*Standard for pump settings over 10 feet.

OPTIONAL SPOOL HOUSING

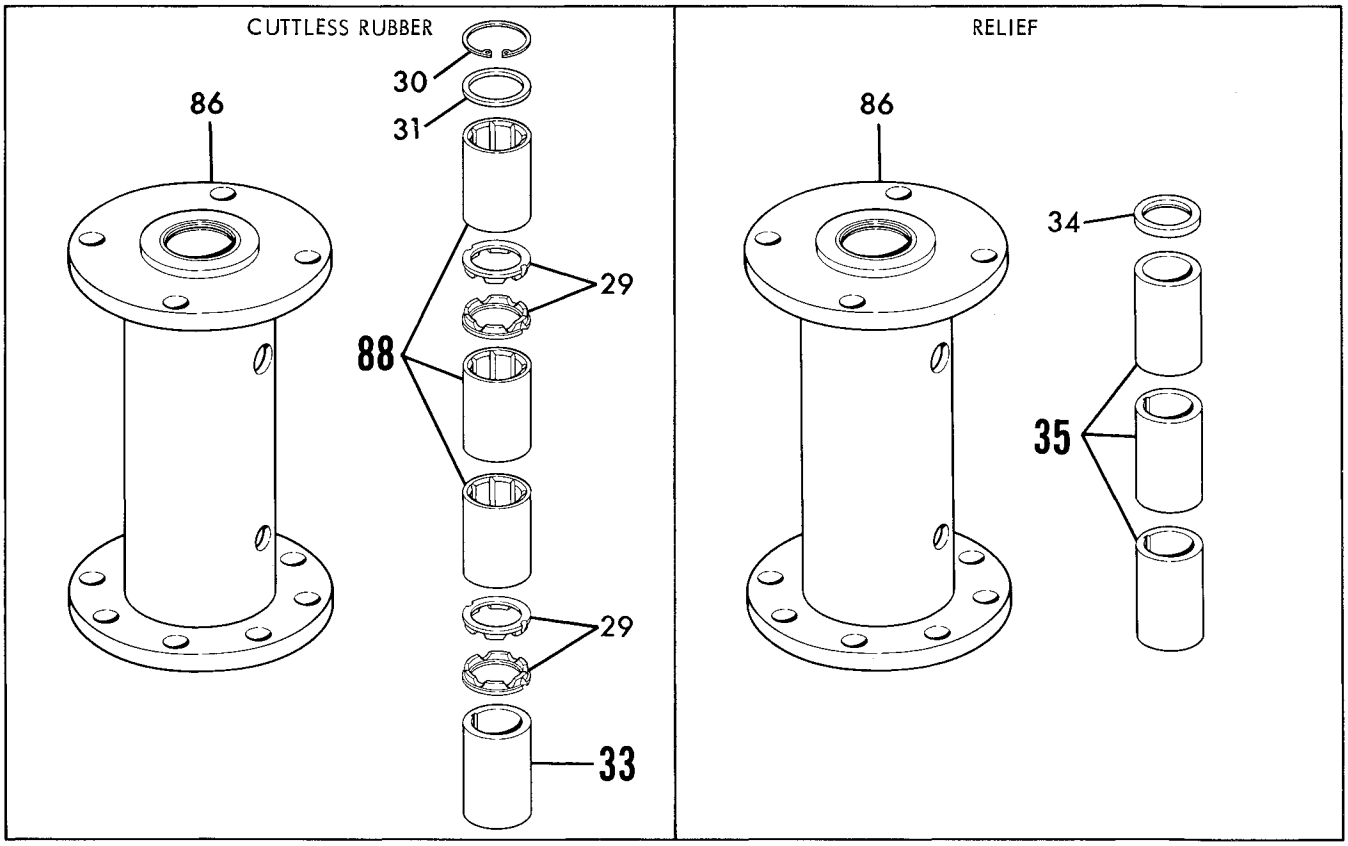


Figure 1. Model 641-642 Exploded View (Sheet 3 of 3)

Model 641-642 List of Parts (See Figures 1 & 2)

1. Capscrew
3. Suction cover
5. Capscrew
6. Nut
7. Capscrew
8. Casing
9. Gasket
10. Gasket
12. Plug, pipe
13. Impeller capscrew
14. Gasket
15. Impeller
16. Impeller key
17. Hand hole cover
18. Nut
19. Capscrew
20. Nut
21. Bolt
22. Cover
23. Gasket
24. Gasket
25. Float rod guide
26. Pump bearing
27. Bearing housing (opt)
29. Lantern ring (opt)
30. Snap ring (opt)
31. Retainer ring (opt)
32. Bushing (opt)
33. Bushing (opt)
34. Seal (opt)
35. Bushing (opt)
38. Nut
39. Capscrew
40. Support pipe
41. Bearing
42. Capscrew
43. Insert
44. Setscrew
45. Coupling half
46. Key
47. Setscrew
48. Coupling half
49. Key
50. Nut
51. Capscrew
52. Motor
53. Upper head
54. Slinger
55. Locknut
56. Bearing collar
57. Retaining ring
58. Bearing
59. Seal
60. Coupling, shaft
61. Shaft
62. Slinger
63. Plug, pipe
64. Seal
65. Fitting
66. Nut
67. Clamp
68. Gland
69. Stud
70. Packing
71. Packing ring
72. Lantern ring
73. Oiler (opt)
74. Fitting
75. Street elbow
76. Flanged elbow
77. Locknut
78. Discharge pipe
79. Coupling, pipe
80. Capscrew
81. Capscrew
82. Nameplate
83. Screw
84. Lower head
85. Gasket
86. Spool bearing housing (opt)
88. Bushing (opt)
90. Grease fitting
91. Elbow
92. Coupling
93. Close nipple
94. Nipple
95. Comp. fitting
96. Comp. fitting
97. Nylon tube

NOTE

WHEN ORDERING SPARE PARTS ALWAYS INCLUDE THE PUMP TYPE, SIZE, SERIAL NUMBER, AND THE PIECE NUMBER FROM THE EXPLODED VIEW IN THIS MANUAL.

ORDER ALL PARTS FROM YOUR LOCAL AUTHORIZED DISTRIBUTOR, FACTORY BRANCH SALES OFFICE OR THE FACTORY AT NORTH AURORA, ILLINOIS.

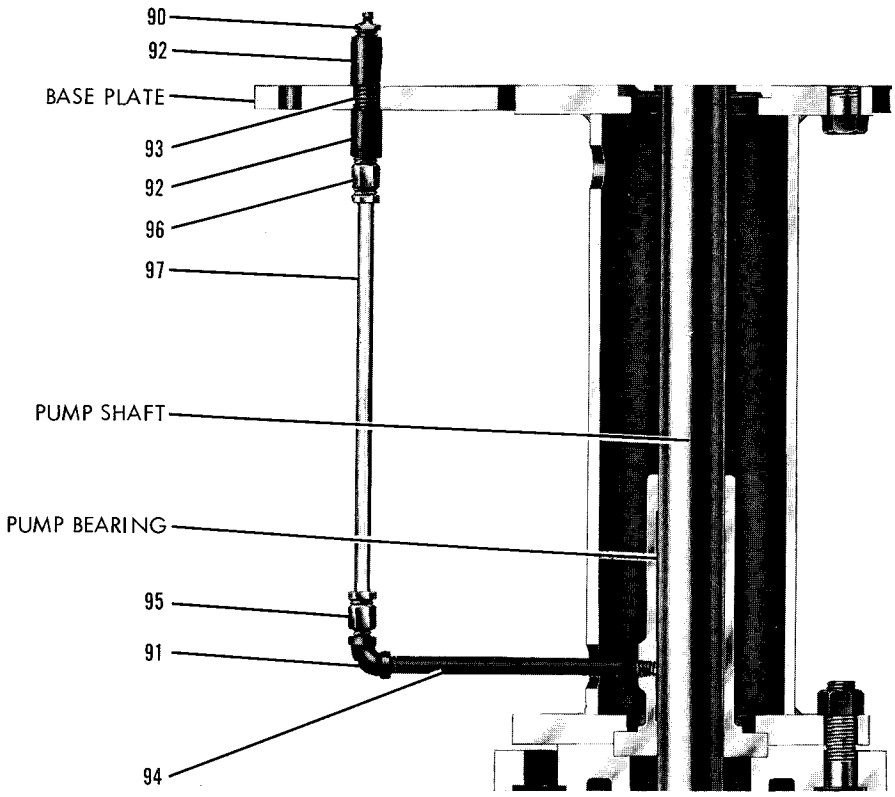


Figure 2.

640 SERIES
REPAIR PARTS INDEX

PARTS LISTED ARE FOR STANDARD PUMPS AND SOME OPTIONAL PUMP BEARINGS.

PUMP SIZE	PAGE
2 x 2 x 7 3 x 3 x 7 2 x 2 x 9 3 x 3 x 9	5-6

PIECE NO.

22A - A ROD GUIDE IS REQUIRED ON ALL REPLACEMENT COVERS.

26 - STANDARD PUMP BEARING IS LISTED. REFER TO PART NUMBERS 27 THRU 37 FOR SPECIAL OPTION BEARINGS. FOR ALL PIT DEPTHS 10' AND DEEPER, A RELIEF TYPE PUMP BEARING IS STANDARD.

39 - ONE SET OF FOUR (4) CAPSCREWS AND NUTS REQUIRED FOR EACH GUIDE BEARING JOINT.

40 - ONE SUPPORT PIPE IS REQUIRED FOR PIT DEPTHS UP TO 6'0". TWO SUPPORT PIPES ARE REQUIRED FOR PIT DEPTHS 6'-6" TO 11'-0". THREE SUPPORT PIPES ARE REQUIRED FOR PIT DEPTHS 11'-6" TO 16'-0"

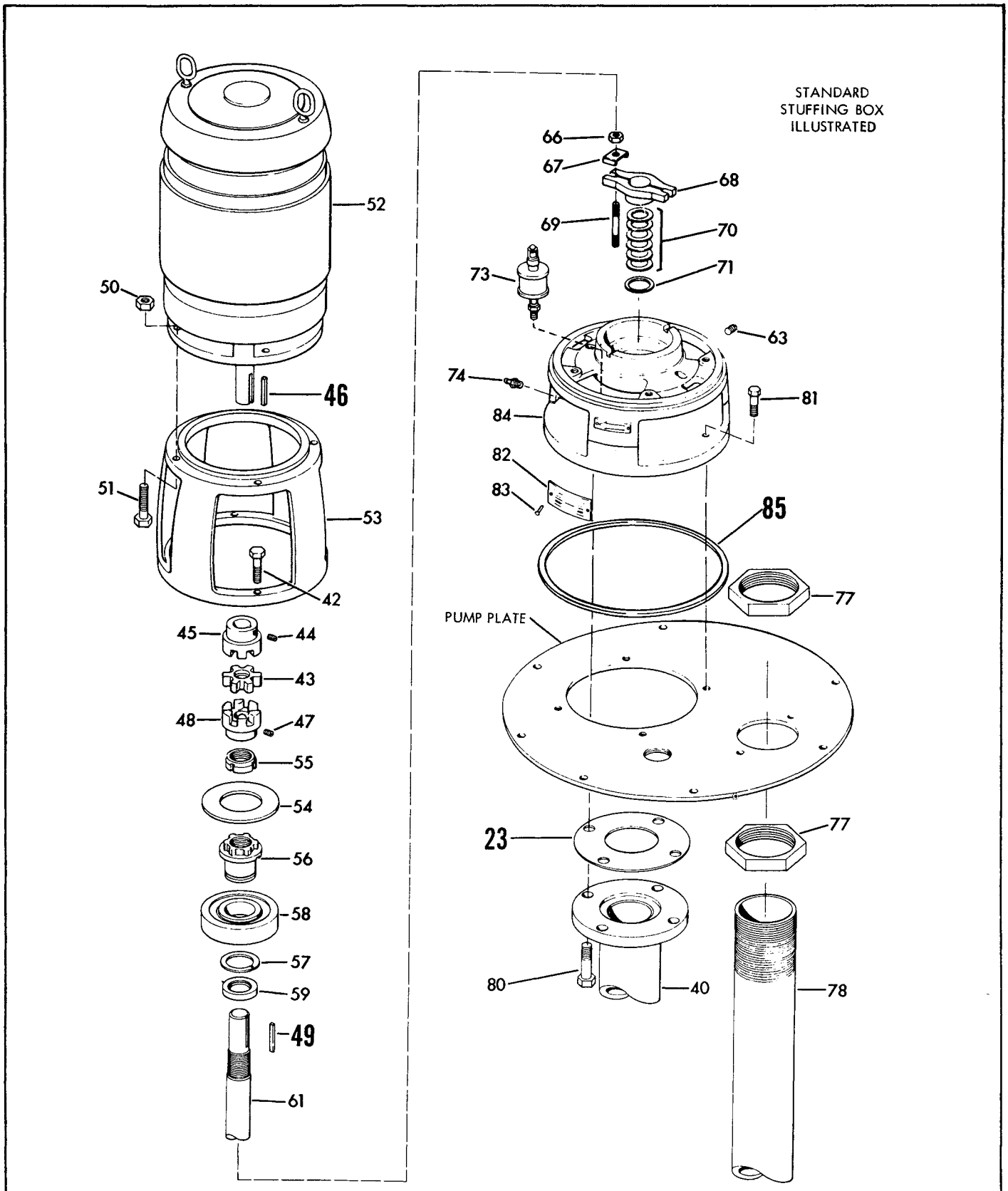
41 - ONE GUIDE BEARING IS REQUIRED FOR PIT DEPTHS 6'-6" TO 11'-0". TWO GUIDE BEARINGS ARE REQUIRED FOR PIT DEPTHS 11'-6" TO 16'-0".

60-61 - PIT DEPTHS TO 11'-6" REQUIRED ONE SHAFT (61). PIT DEPTHS 12'-0" TO 17'-6" REQUIRES ONE PUMP SHAFT (61C), ONE HEAD SHAFT (61A) AND ONE LINE COUPLING (60).

640 SERIES

MODEL 641-642

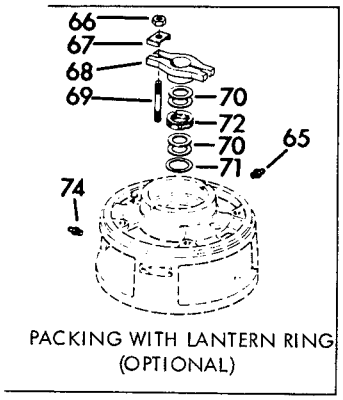
PIECE NUMBERS

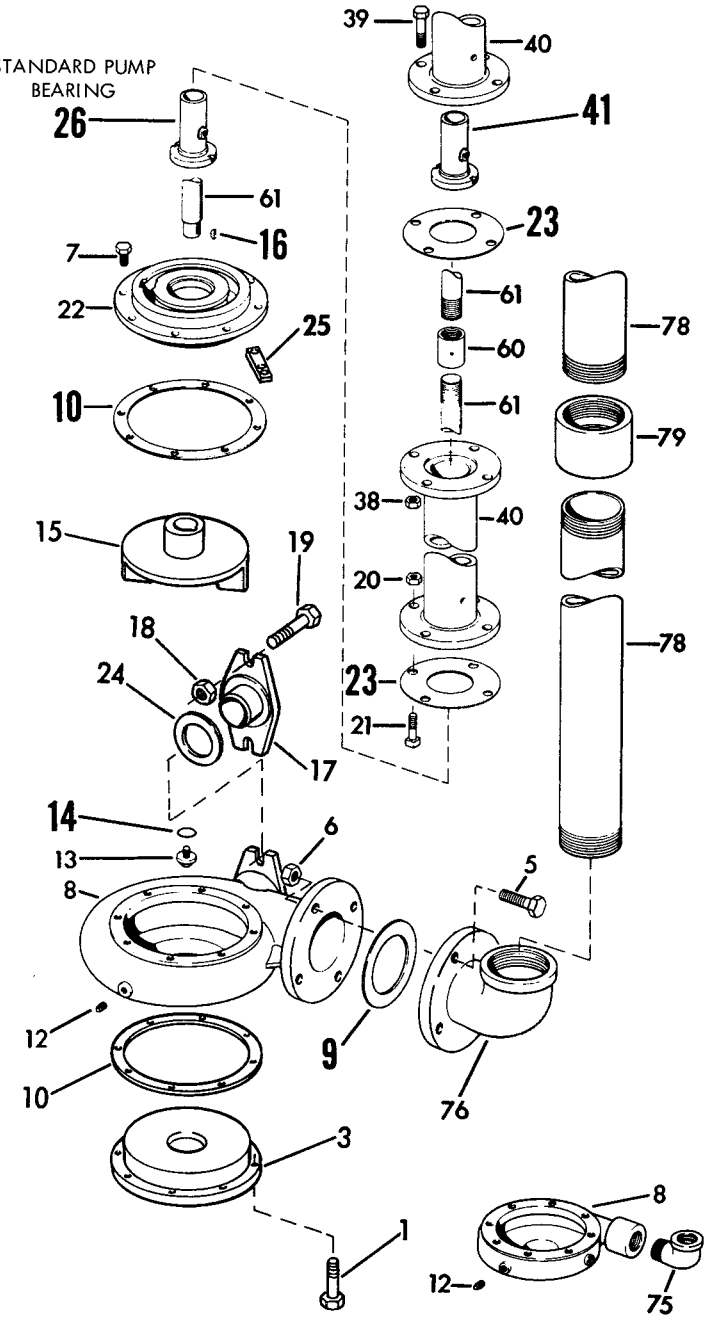


640 SERIES

MODEL 641-642

PIECE NUMBERS





NOTE: Recommended spare parts shown in bold face type.

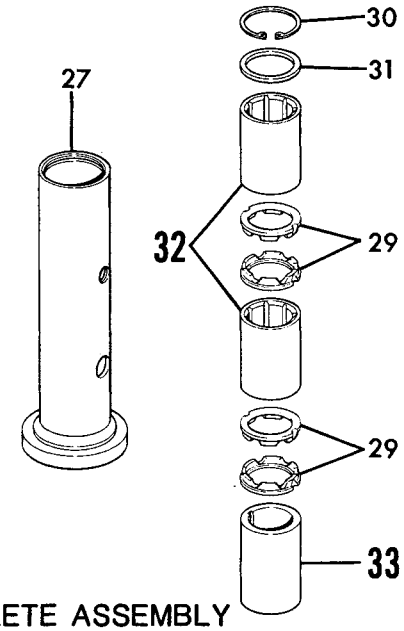
640 SERIES

MODEL 641-642

PIECE NUMBERS

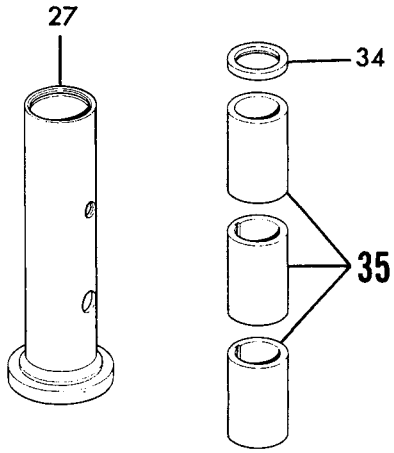
OPTIONAL RELIEF TYPE BEARINGS

CUTLESS RUBBER



27A-COMPLETE ASSEMBLY

METAL BUSHING *

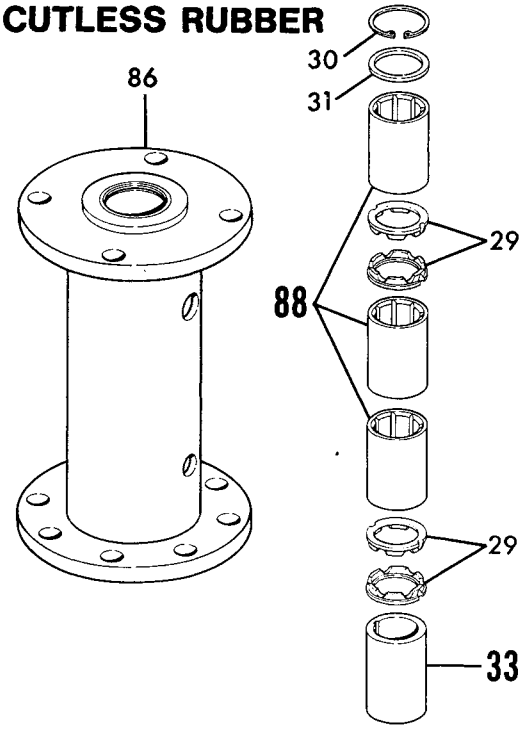


27B-COMPLETE ASSEMBLY

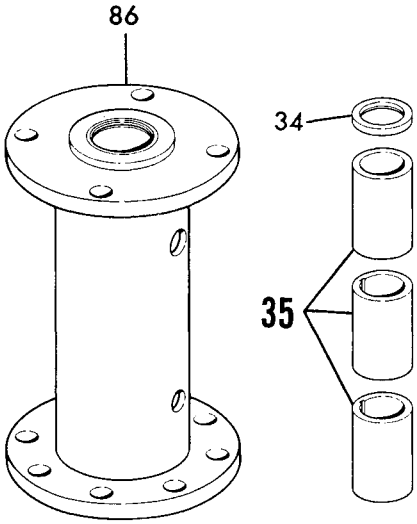
*Standard for pump settings over 10 feet.

OPTIONAL SPOOL TYPE BEARINGS

CUTLESS RUBBER



METAL BUSHING



640 SERIES

MODELS 641-642
2x2x7-3x3x7-2x2x9-3x3x9

PARTS LIST

PC. NO.	DESCRIPTION	QTY	PART NO.	MATERIAL			
				B.F.	A.B.	A.I.	S.S.
1	CAPSCREW 2x7,3x7		NOT REQUIRED				
	2x9,3x9	8	168-0489	080	190	080	104
	SEMI-OPEN 2x9,3x9	8	168-0487	080	190	080	104
2	ROD GUIDE	1	396-0010	087	190	087	104
3	SUCTION COVER						
	2x7,3x7		NOT REQUIRED				
	2x9	1	816-1185	010	208	010	104
	SEMI-OPEN						
	3x9	1	816-0652	010	208	010	104
5	BOLT 2x7,2x9		NOT REQUIRED				
	3x7	4	168-0568	087	190	087	104
	3x9	4	100-0511	087	190	087	104
6	NUT 2x7,2x9		NOT REQUIRED				
	3x7,3x9	4	544-0115	080	190	080	104
7	CAPSCREW 2x7,3x7	8	168-0377	080	190	080	104
	2x9,3x9	8	168-0487	080	190	080	104
8	CASING 2x7	1	180-0633	010	208	010	104
	2x9	1	180-1862	010	208	010	104
	3x7	1	180-0427	010	208	010	104
	3x9	1	180-0632	010	208	010	104
9	GASKET 2x7,2x9		NOT REQUIRED				
	3x7,3x9	1	364-1021	588	588	588	588
10	GASKET 2x7, 3x7	1	364-1014	603	603	603	603
	2x9,3x9	2	364-1015	603	603	603	603
12	PLUG	3	600-0002	087	190	087	104
13	IMPELLER NUT	1	544-0039	104	104	104	104
15	ENCLOSED IMPELLER 2x7	1	443-1871	010	208	010	104
	2x9	1	443-2221	010	208	010	104
	3x7	1	443-2290	010	208	010	104
	SEMI-OPEN 3x9	1	443-1873	010	208	010	104
16	IMPELLER KEY	1	472-0010	087	104	087	104
17	H.H.COVER 2x7,2x9		NOT REQUIRED				
	3x7	1	260-0098	010	208	010	104
	3x9	1	260-0101	010	208	010	104

PC. NO.	DESCRIPTION	QTY	PART NO.	MATERIAL			
				B.F.	A.B.	A.I.	S.S.
18	NUT 2x7, 2x9		NOT REQUIRED				
	3x7	2	544-0113	080	190	080	104
	3x9	2	544-0109	080	190	080	104
19	CAPSCREW 2x7,2x9		NOT REQUIRED				
	3x7	2	168-0494	080	190	080	104
	3x9	2	168-0390	080	190	080	104
20	NUT	4	544-0115	080	190	080	104
21	BOLT 2x7,2x9	4	100-0507	087	190	087	104
	3x7,3x9	4	100-0511	087	190	087	104
22	COVER 2x7,3x7	1	260-0012	010	208	010	104
	2x9,3x9	1	260-0013	010	208	010	104
23	GASKET		364-1021	588	588	588	588
24	GASKET 2x7,2x9		NOT REQUIRED				
	3x7,3x9	1	364-1041	453	453	453	453
25	WASHER 2x7,2x9		NOT REQUIRED				
	3x7	4	908-0114	080	190	080	104
	3x9	4	908-0112	080	190	080	104
26	PUMP BEARING	1	136-1405	208	208	010	
27	BEARING HOUSING	1	260-0701	087	208	087	104
	OPTIONAL RELIEF TYPE BEARINGS-COMPLETE ASSY.						
	BEFORE MARCH 1986						
27A	CUTLESS RUBBER	1	032-0679	NOT AVAILABLE			
27B	METAL BUSHING	1	032-0681	USE NEW DESIGN			
29	LANTERN RING	2	676-1680	512	512	512	512
30	SNAP RING	1	676-0220	088	104	088	104
31	RETAINING RING	1	676-1996	079	190	079	104
32	BUSHING	2	136-1378	457	457	457	457
33	BUSHING	1	136-1173	208	208	010	104
34	SEAL	1	712-0069	653	653	653	
35	BUSHING	3	136-1173	208	208	010	
	AFTER MARCH 1986						
27A	CUTLESS RUBBER	1	032-1423	644	643	642	646
27B	METAL BUSHING	1	032-1427	644	643	642	
32	BUSHING	2	136-1616	486	486	486	486
33	BUSHING	1	136-1173	208	208	010	104
35	BUSHING	3	136-1173	208	208	010	
38	NUT	4	544-0115	080	190	080	104
39	CAPSCREW	4	168-0564	080	190	080	104
40	SUPPORT PIPE		REFER TO FACTORY				
41	GUIDE BEARING		136-1405	208	208	010	

640 SERIES

MODELS 641-642
2x2x7-3x3x7-2x2x9-3x3x9

PARTS LIST

PC. NO.	DESCRIPTION	QTY	PART NO.	MATERIAL			
				B.F.	A.B.	A.I.	S.S.
42	CAPSCREW	4	168-0388	080	080	080	080
43	COUPLING INSERT		REFER TO	SECTION	1000P		
44	SETSCREW		INCLUDED	WITH NO.	45		
45	COUPLING HALF		REFER TO	SECTION	1000P		
46	COUPLING KEY		REFER TO	FACTORY			
47	SETSCREW		INCLUDED	WITH NO.	48		
48	COUPLING HALF		REFER TO	SECTION	1000P		
49	COUPLING KEY	1	472-0250	087	087	087	087
50	NUT		REFER TO	FACTORY			
51	CAPSCREW		REFER TO	FACTORY			
52	MOTOR		REFER TO	FACTORY			
53	UPPER HEAD	1	116-0346	010	010	010	010
54	SLINGER	1	764-0401	478	478	478	478
55	LOCKNUT	1	544-1107	080	080	080	080
56	BEARING COLLAR	1	224-0162	208	208	208	208
57	RETAINING RING	1	676-0289	088	088	088	088
58	BALL BEARING	1	068-2023	647	647	647	647
59	GREASE SEAL	1	712-0144	653	653	653	653
69	COUPLING	1	256-2013	062	104	062	104
61	SHAFT		REFER TO	FACTORY			
61A	HEAD SHAFT		REFER TO	FACTORY			
61B	LINE SHAFT		REFER TO	FACTORY			
61C	PUMP SHAFT		REFER TO	FACTORY			
62	SLINGER	1	764-1005	478	478	478	478
63	PLUG	1	600-0002	087	190	087	104
64	OIL SEAL	2	712-0069	653	653	653	653
65	GREASE FITTING	1	508-0002	651	651	651	651
66	NUT	2	544-0109	080	190	080	104
67	CLAMP	2	204-0120	360	190	360	104
68	GLAND	1	372-0219	010	208	010	104
69	STUD	2	808-0114	082	082	082	104
70	PACKING	3	564-0120	802	802	802	802
71	RING	1	676-1231	190	190	087	104
72	LANTERN RING	1	676-1680	512	512	512	512
73	OILER	1	552-0102	652	652	652	652
74	GREASE FITTING	1	508-0002	651	651	651	651
75	ELBOW 2x7,2x9	1	600-0210	387	190	387	104
	3x7,3x9		NOT REQUIRED				
76	ELBOW 2x7,2x9		NOT REQUIRED				
	3x7,3x9	1	300-0011	010	208	010	104
77	LOCKNUT 2x7,2x9	2	544-0958	028	190	028	104
	3x7,3x9	2	544-0960	028	190	028	104
78	DISCHARGE PIPE		REFER TO	FACTORY			
79	COUPLING		REFER TO	FACTORY			
80	CAPSCREW	4	168-0562	080	080	080	080
81	CAPSCREW	4	168-0388	080	080	080	080
82	NAMEPLATE	1	532-0045	114	114	114	114
83	DRIVE SCREW	2	708-0013	365	365	365	365
84	LOWER HEAD	1	116-0439	010	010	010	010
		1	116-0440	010	010	010	010
		4	168-0378	080	080	080	080
85	GASKET	1	364-1254	481	481	481	481
	BEFORE MARCH 1986						
86	SPOOL HOUSING	1	260-0726	087	087	087	104
88	BUSHING	3	136-1378	457	457	457	457
	AFTER MARCH 1986						
86	SPOOL HOUSING	1	260-0726	087	087	087	104
88	BUSHING	3	136-1616	486	486	486	486
	PARTS NOT SHOWN ON EXPLODED VIEW						
	FLOAT ROD		REFER TO				
	FLOAT STOP		SECTION 1020P FOR				
	FLOAT		FLOAT SWITCH ASSY.				

Performance Curves for the 640 Series (60 Hz)

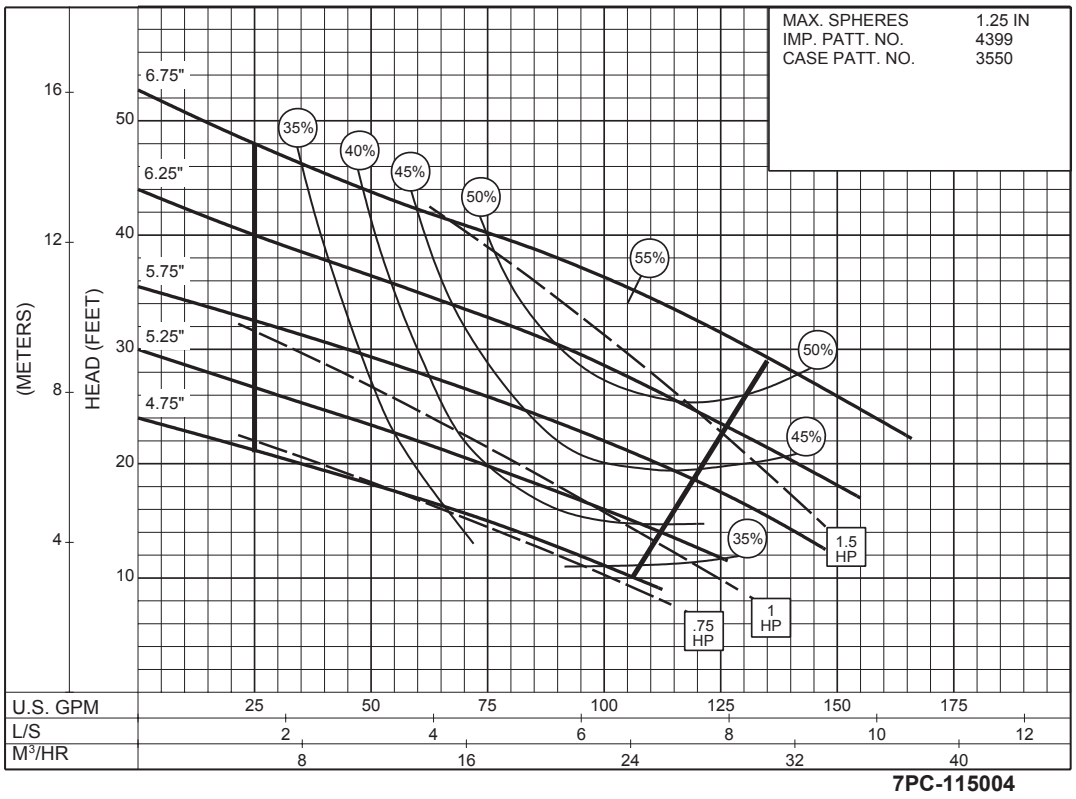
MODEL/SIZE	R.P.M.	PAGE	PDF PAGE
2 x 2 x 7	1750	401	2
2 x 2 x 9	1750/1150	402	3
3 x 3 x 7	1750/1150	403	4
3 x 3 x 9	1750/1150	501	5

2 x 2 x 7
SERIES 640

ENCLOSED IMPELLER

Supersedes Section 640 Page 401
Dated July 1976

SIZE : 2x2x7 **TYPE : 640** **IMPELLER : Enclosed** **R. P. M. : 1750**



7PC-115004

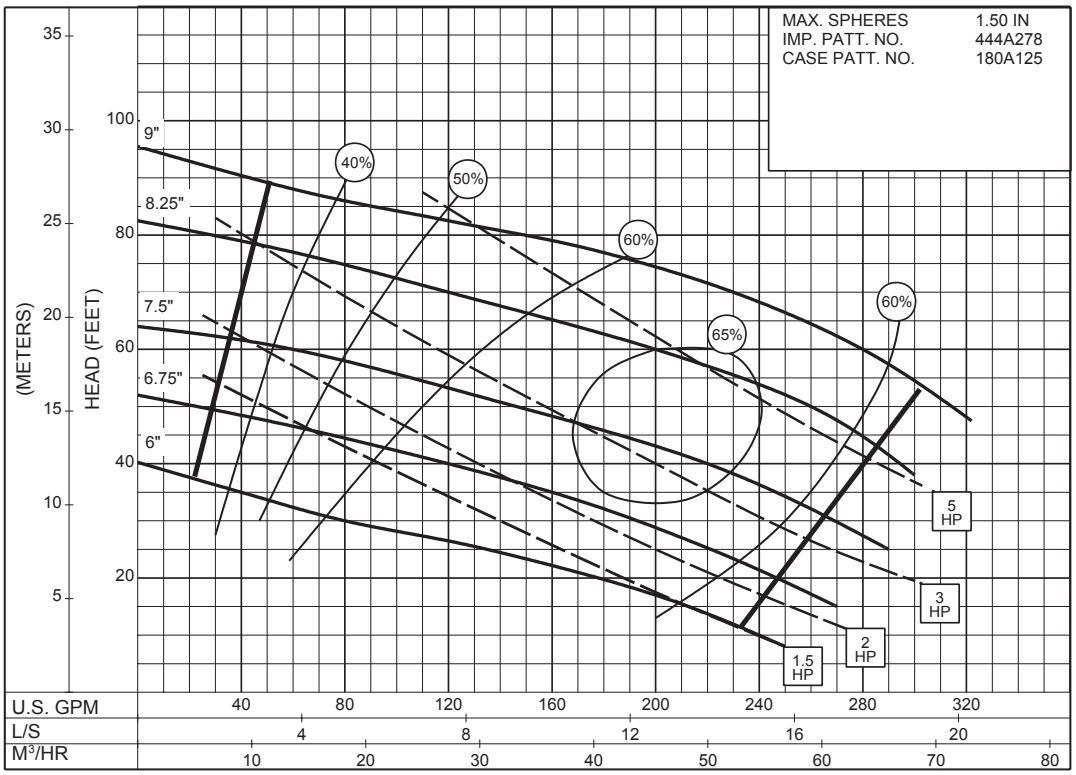
1750 RPM

2 x 2 x 9
SERIES 640

ENCLOSED IMPELLER

1750 RPM

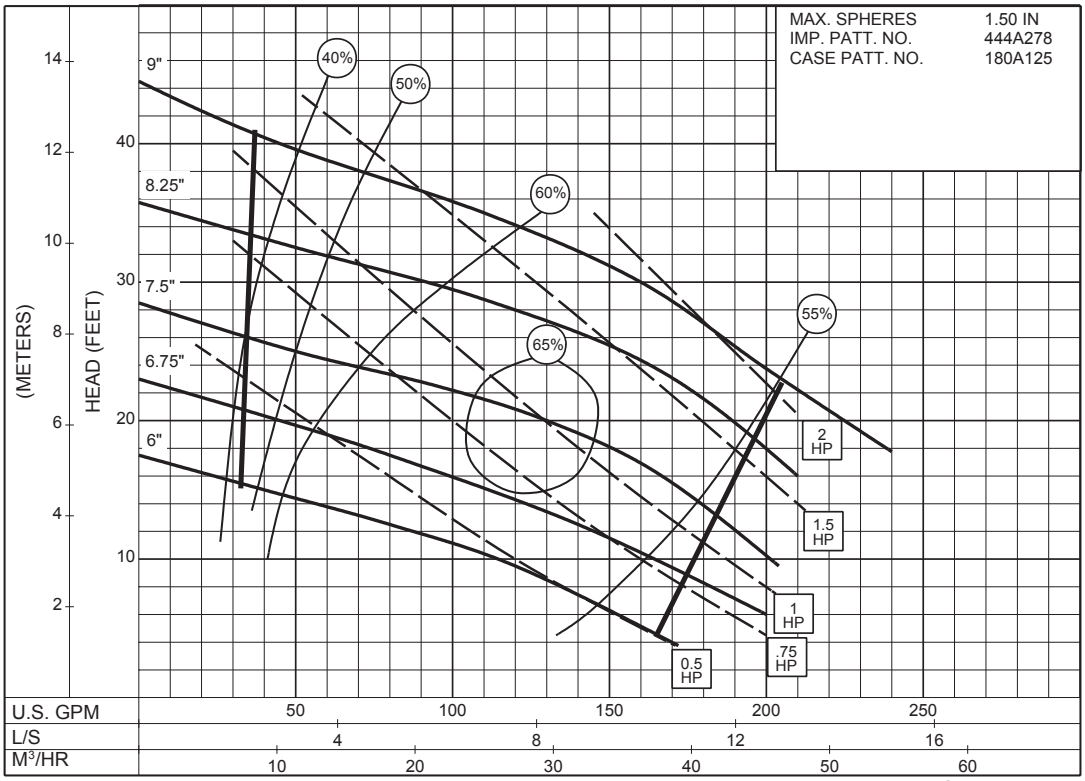
SIZE : 2x2x9 **TYPE : 640** **IMPELLER : Enclosed** **R. P. M. : 1750**



13PC-124595

1150 RPM

SIZE : 2x2x9 **TYPE : 640** **IMPELLER : Enclosed** **R. P. M. : 1150**



13PC-124594

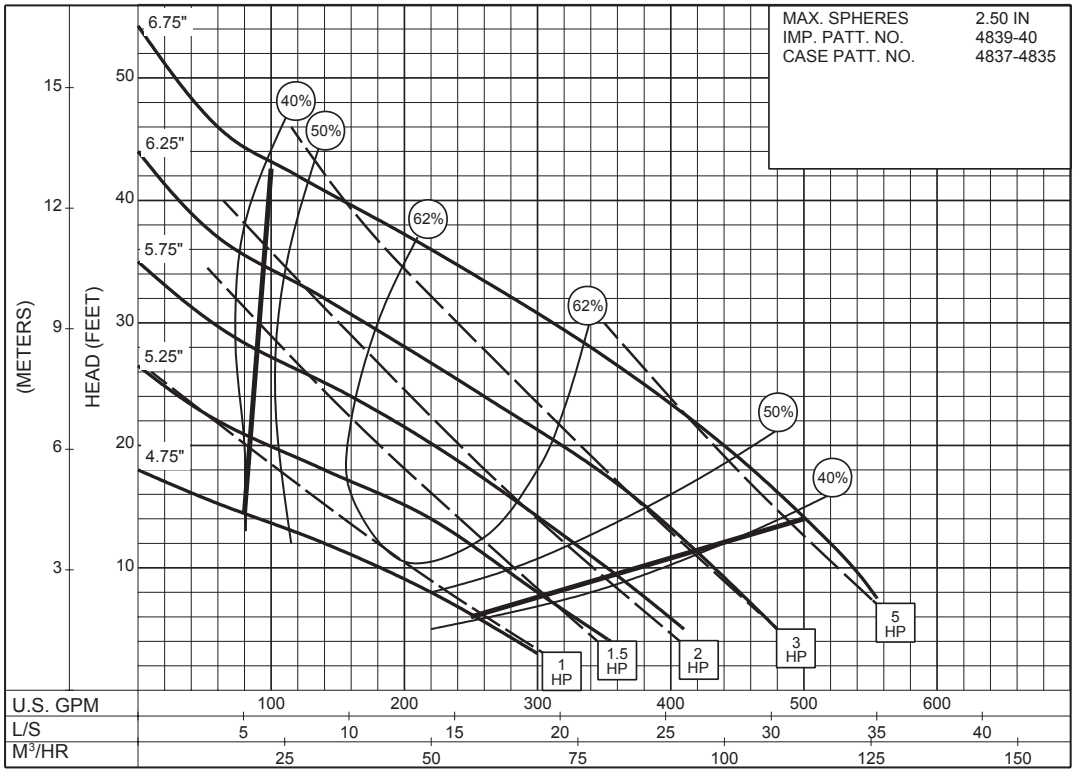
AURORA®
Pentair Pump Group

3 x 3 x 7
SERIES 640

ENCLOSED IMPELLER

Supersedes Section 640 Page 403
Dated July 1976

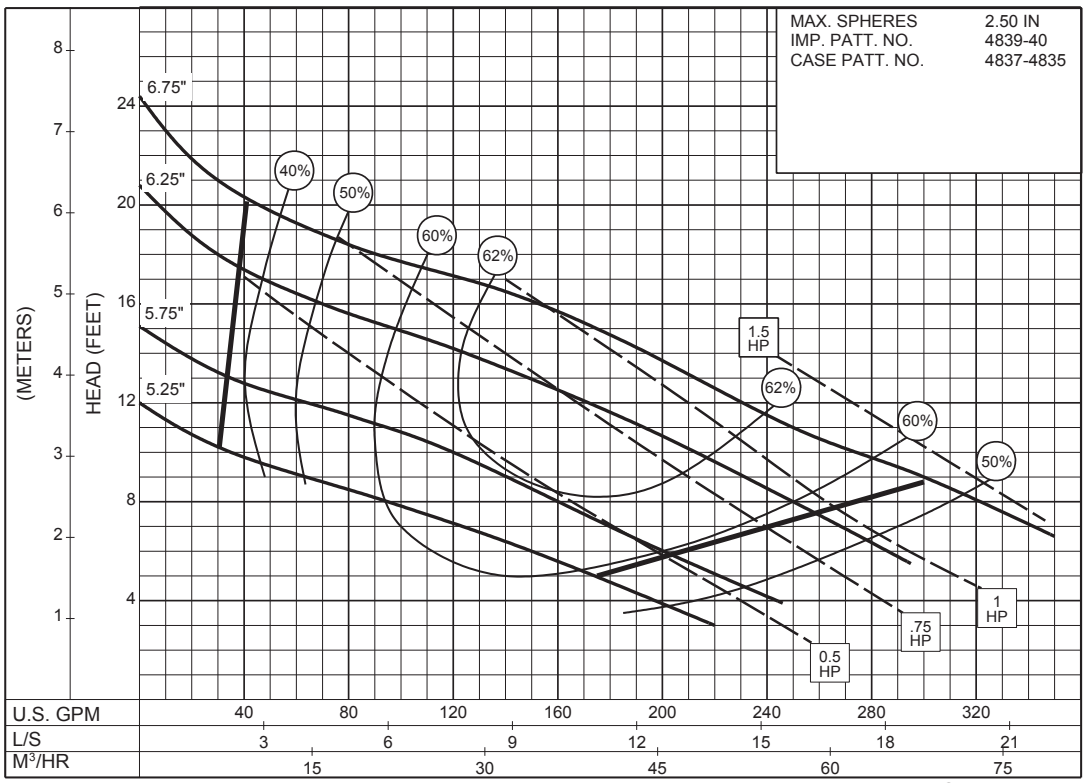
SIZE : 3x3x7 **TYPE : 640** **IMPELLER : Enclosed** **R. P. M. : 1750**



13PC-124592

1750 RPM

SIZE : 3x3x7 **TYPE : 640** **IMPELLER : Enclosed** **R. P. M. : 1150**



13PC-124591

1150 RPM

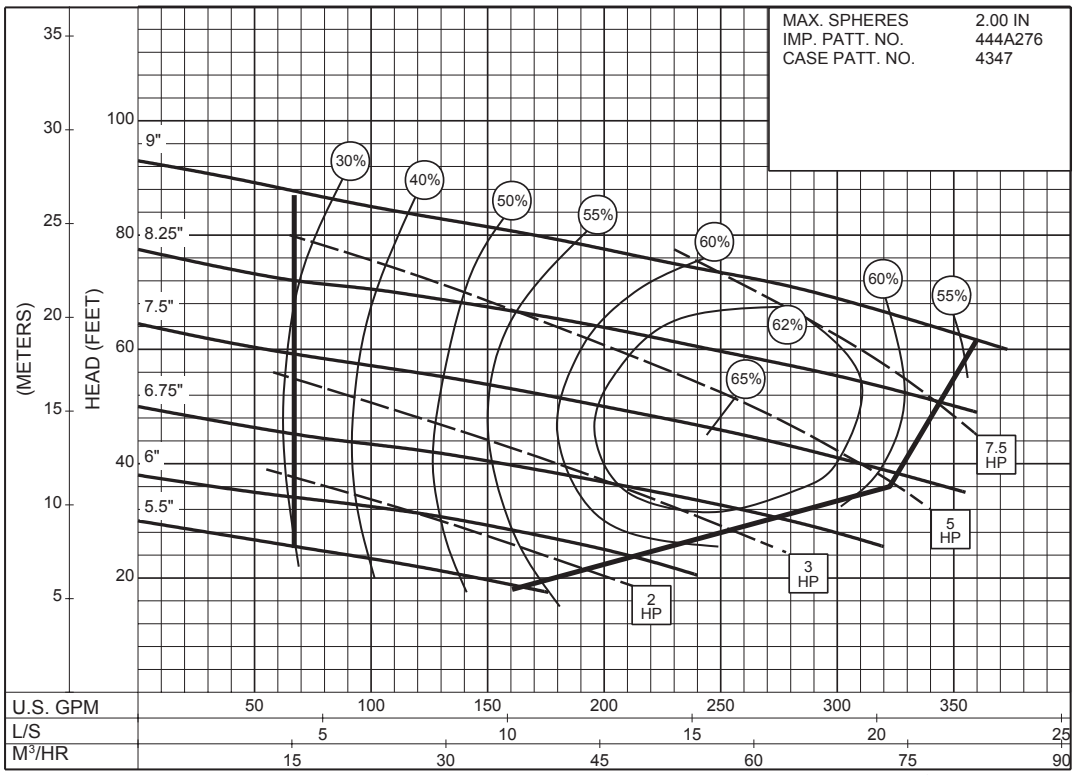
AURORA®
Pentair Pump Group

3 x 3 x 9
SERIES 640

SEMI-OPEN IMPELLER

Supersedes Section 640 Page 501
Dated July 1991

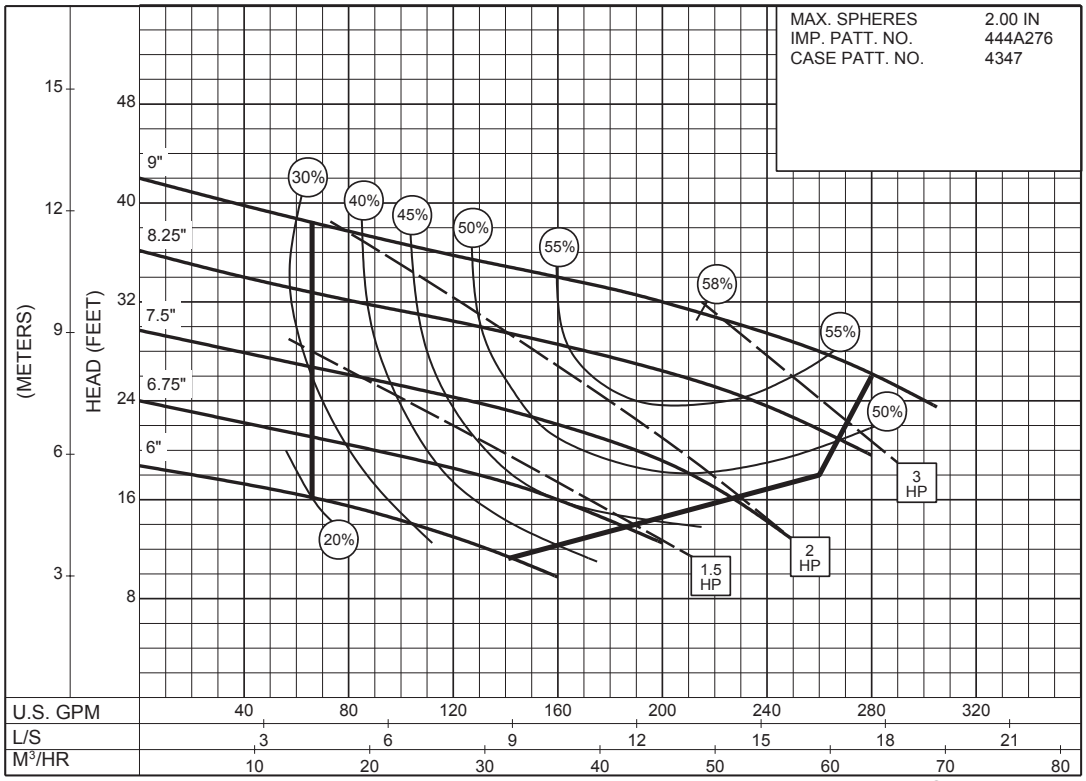
SIZE : 3x3x9 **TYPE : 640** **IMPELLER : Enclosed** **R. P. M. : 1750**



7PC-115007

1750 RPM

SIZE : 3x3x9 **TYPE : 640** **IMPELLER : Enclosed** **R. P. M. : 1150**



7PC-115008

1150 RPM

AURORA®
Pentair Pump Group

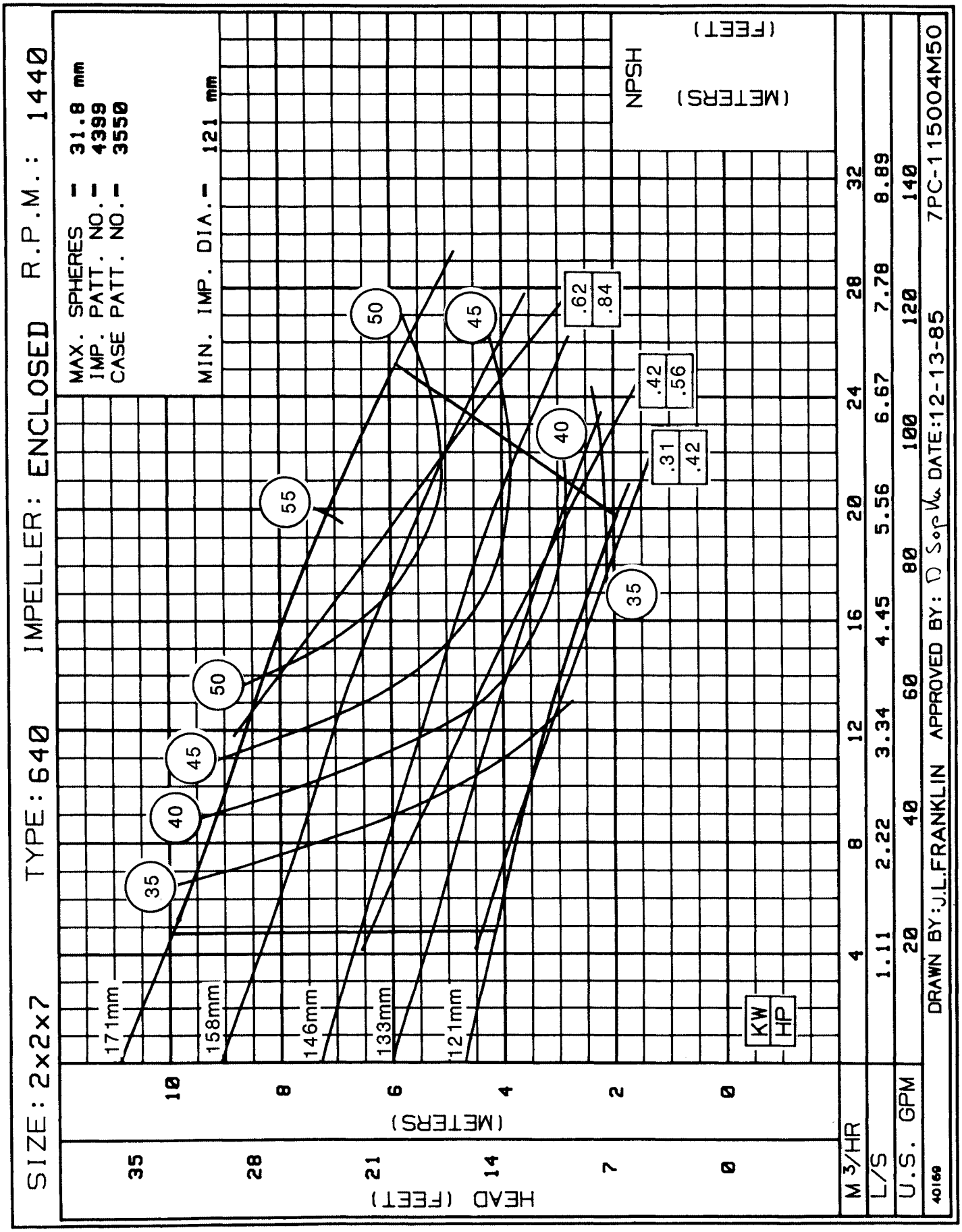
Performance Curves for the 640 Series (50 Hz)

MODEL/SIZE	R.P.M.	PDF PAGE
2x2x7	1440	2
2x2x9	1440	3
2x2x9	960	4
3x3x7	1440	5
3x3x7	960	6
3x3x9	1440	7
3x3x9	960	8

AURORA®
Pentair Pump Group

2x2x7 - 1440 RPM
ENCLOSED IMPELLER

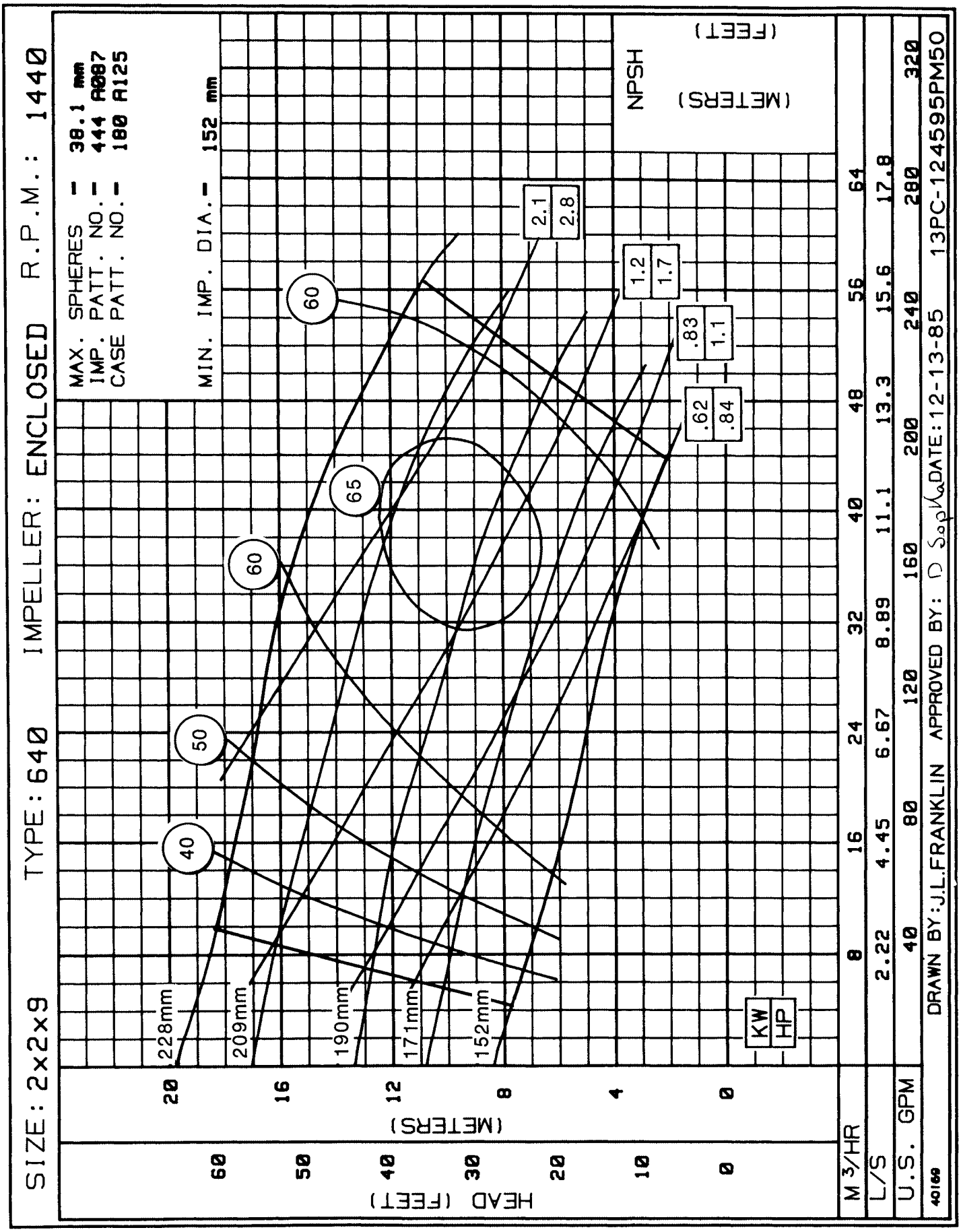
SECTION 640 (Metric 50Hz)
DATE JULY 1994
SUPERCEDES MARCH 1986



SECTION 640 (Metric 50Hz)
DATE JULY 1994
SUPERCEDES MARCH 1986

2x2x9 - 1440 RPM
ENCLOSED IMPELLER

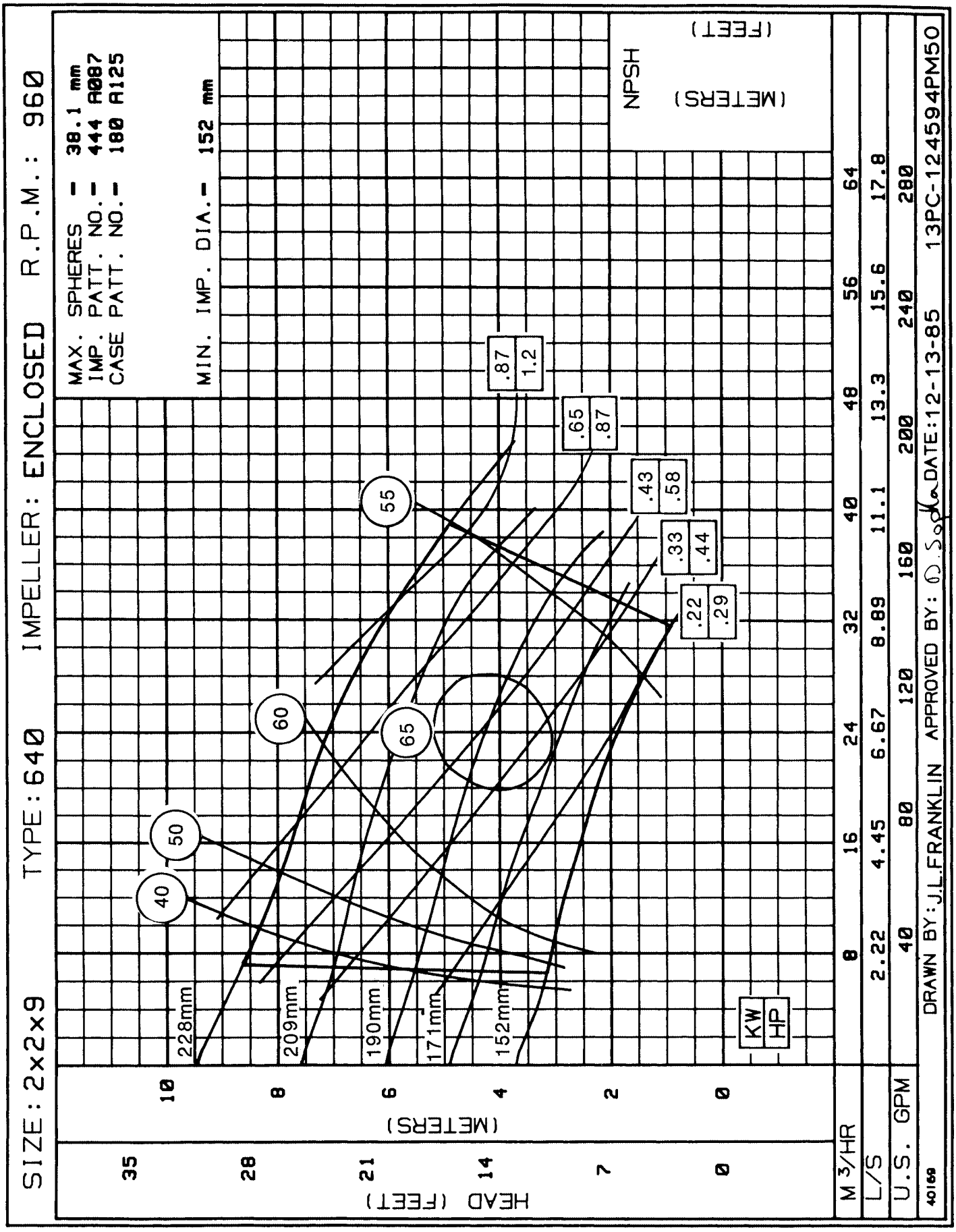
AURORA®
Pentair Pump Group



AURORA®
Pentair Pump Group

2x2x9 - 960 RPM
ENCLOSED IMPELLER

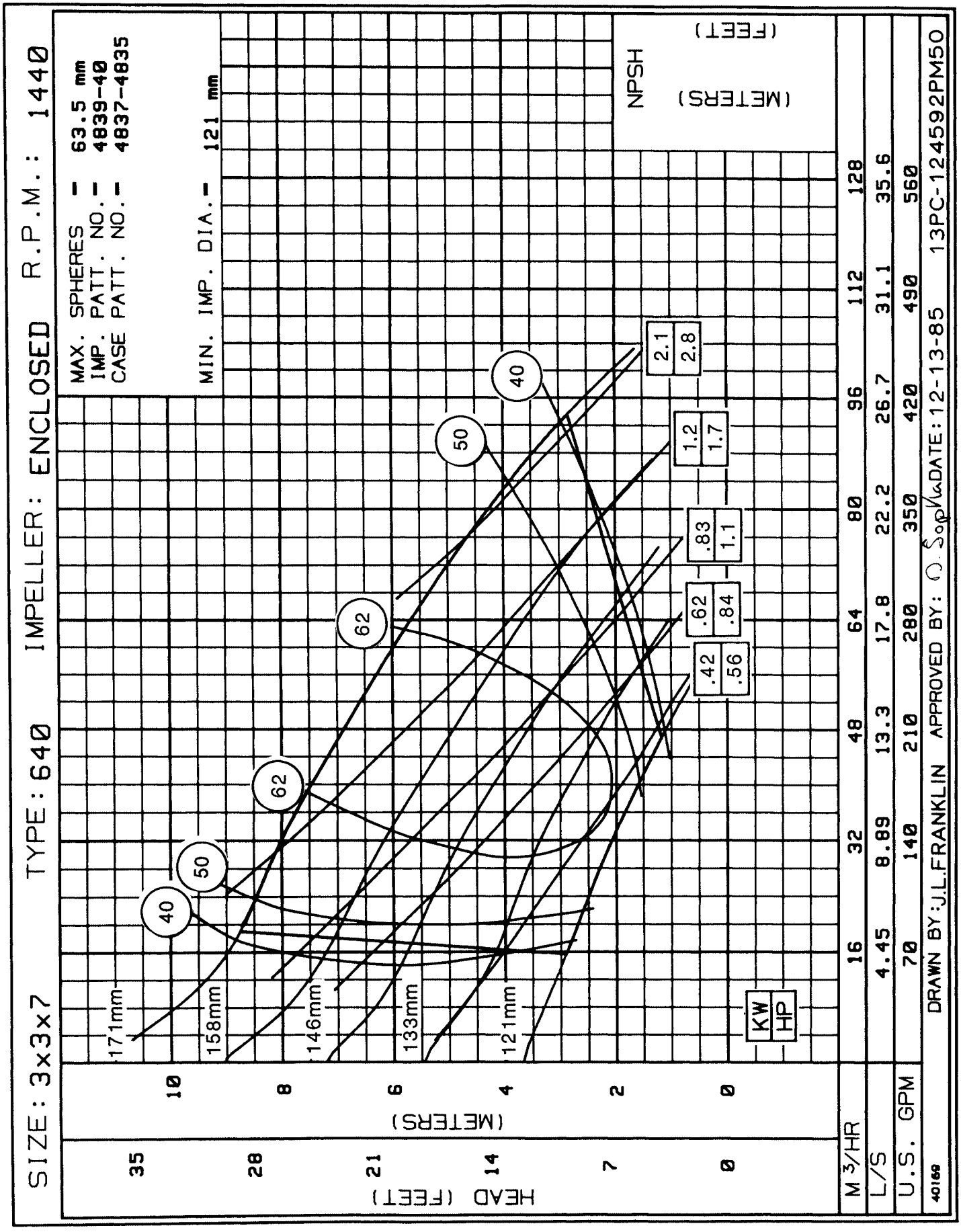
SECTION **640 (Metric 50Hz)**
DATE **JULY 1994**
SUPERCEDES MARCH 1986



SECTION 640 (Metric 50Hz)
DATE JULY 1994
SUPERCEDES MARCH 1986

3x3x7 - 1440 RPM
ENCLOSED IMPELLER

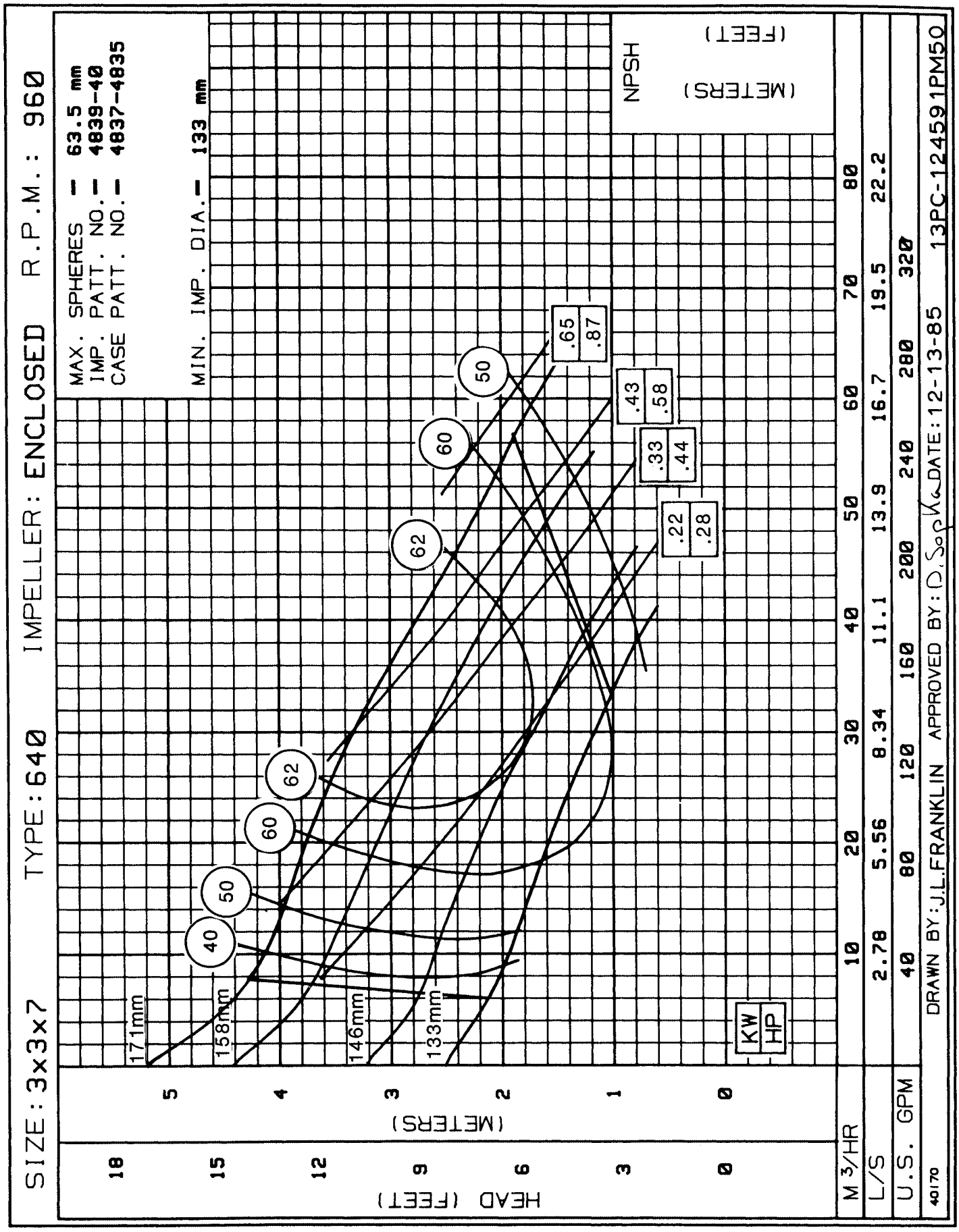
AURORA®
Pentair Pump Group



AURORA®
Pentair Pump Group

3x3x7 - 960 RPM
ENCLOSED IMPELLER

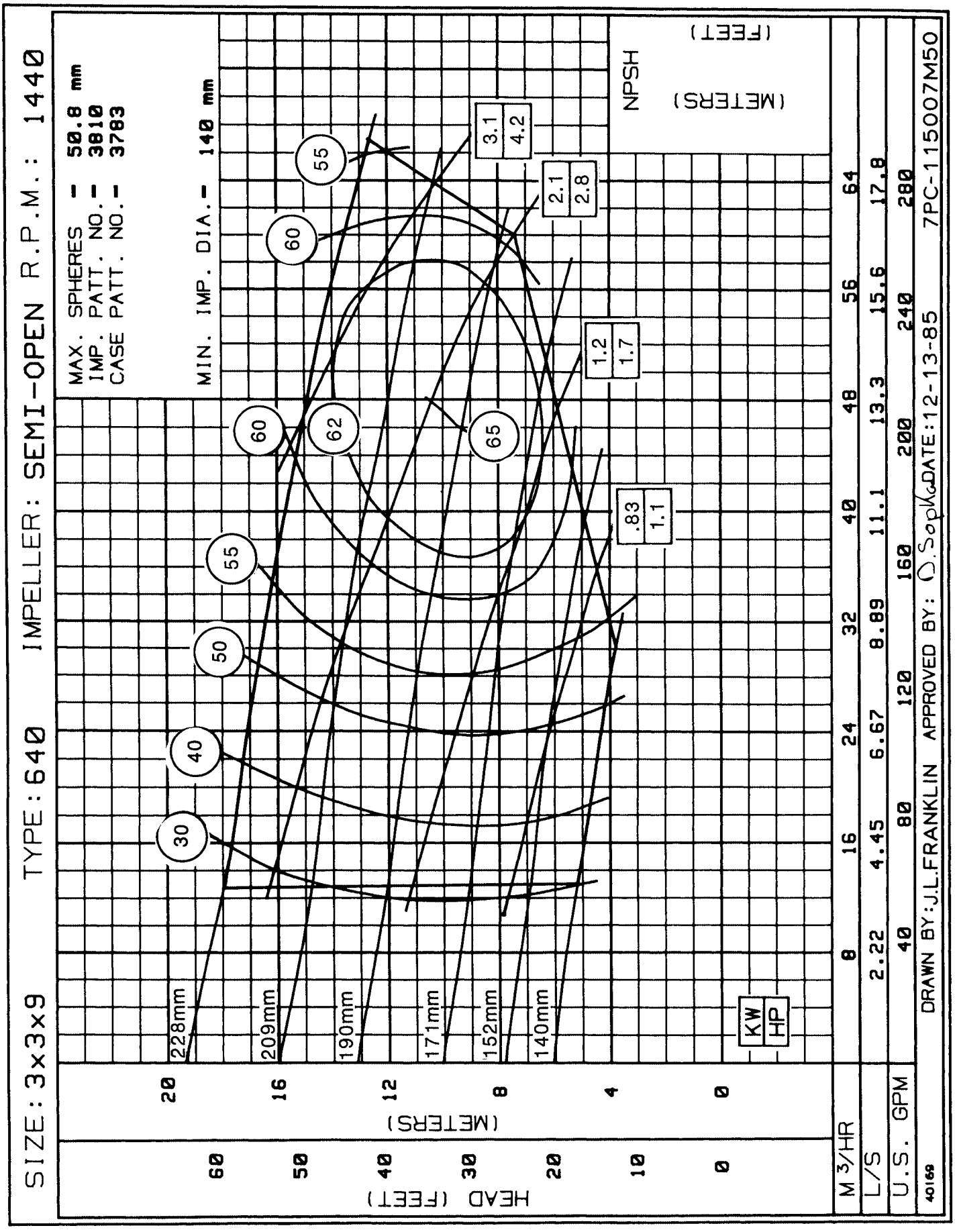
SECTION **640 (Metric 50Hz)**
DATE **JULY 1994**
SUPERCEDES MARCH 1986



SECTION 640 (Metric 50Hz)
DATE JULY 1994
SUPERCEDES MARCH 1986

3x3x9 - 1440 RPM
SEMI-OPEN IMPELLER

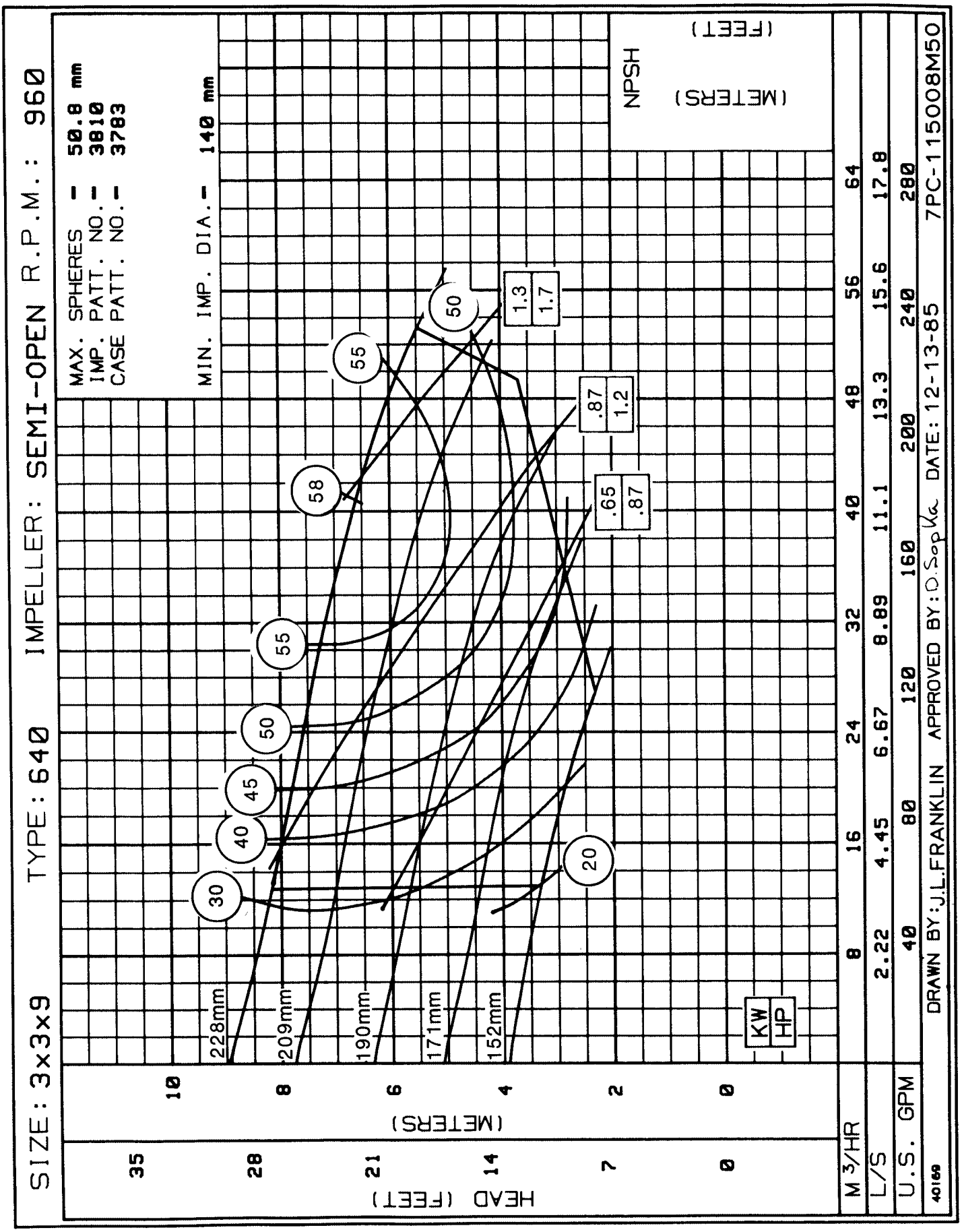
AURORA®
Pentair Pump Group



AURORA®
Pentair Pump Group

3x3x9 - 960 RPM
SEMI-OPEN IMPELLER

SECTION 640 (Metric 50Hz)
DATE JULY 1994
SUPERCEDES MARCH 1986



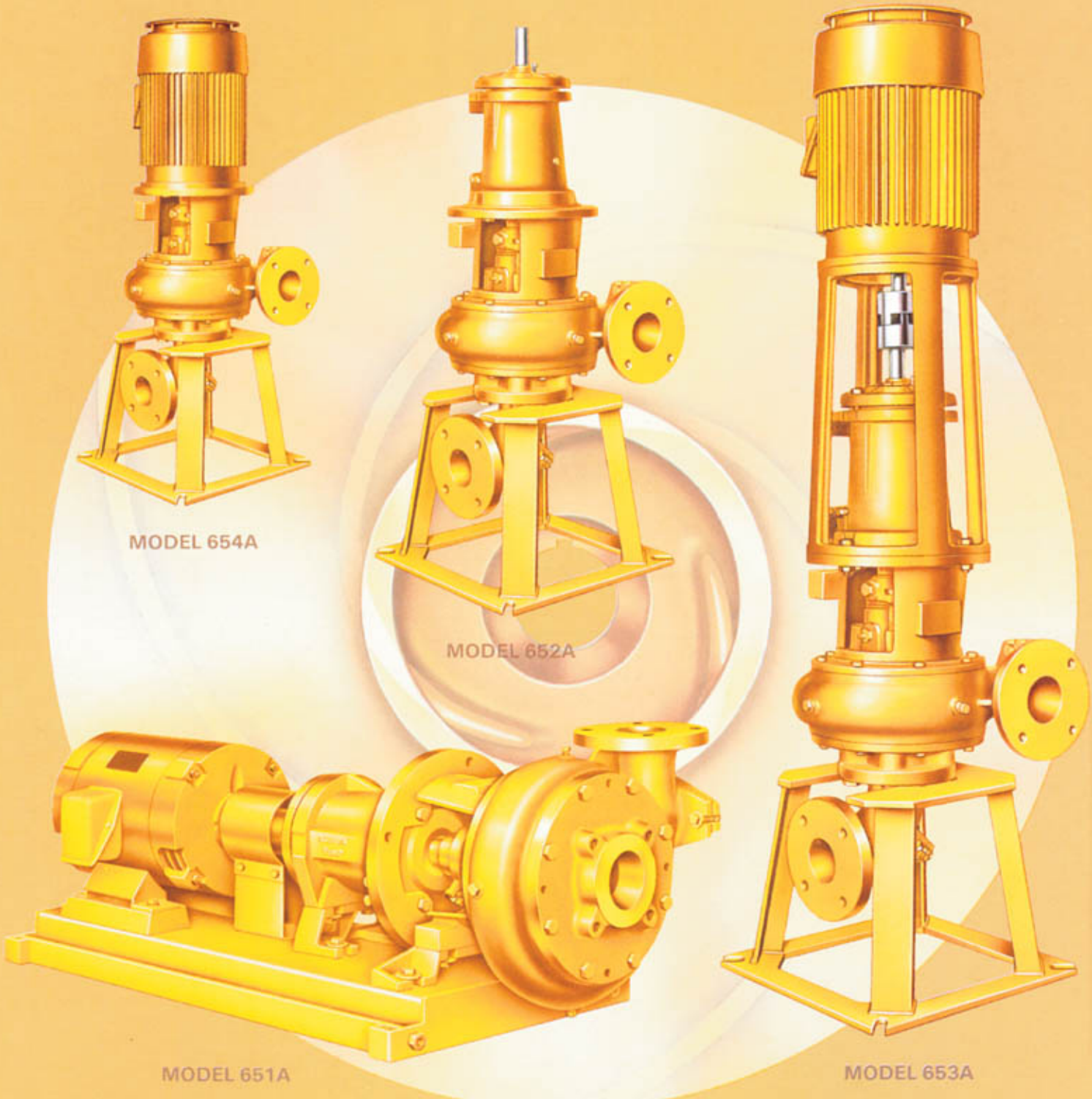
AURORA PUMP A member of **PENTAIR PUMP GROUP**

AURORA PUMP

BULLETIN 650A/Rev. F

650 SERIES SINGLE STAGE NON-CLOG PUMPS

CAPACITIES TO 2000 G.P.M.
HEADS TO 240 FEET
TEMPERATURES TO 250°F.
DISCHARGE SIZES 3" AND 4"



MODEL 654A

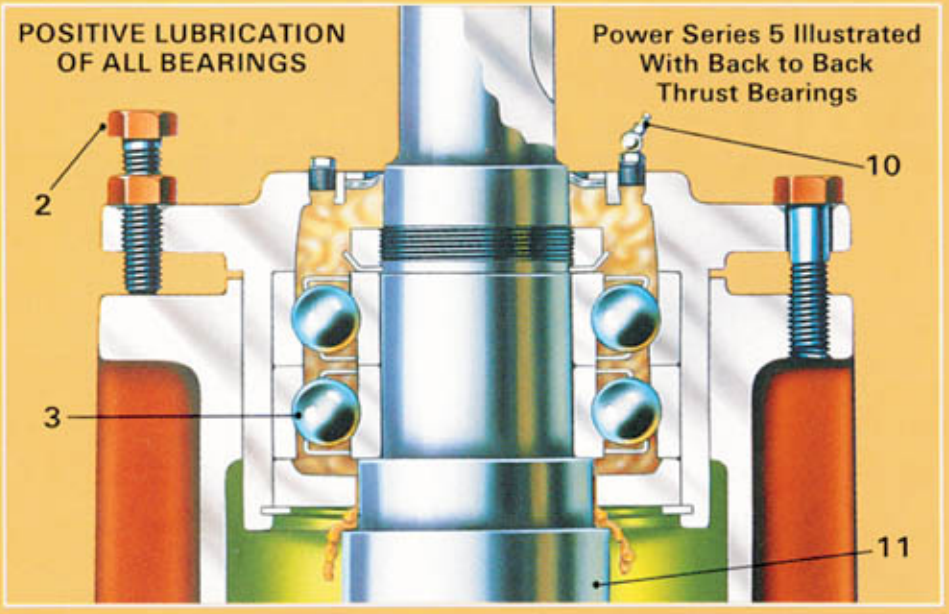
MODEL 652A

MODEL 651A

MODEL 653A

INTRODUCTION
NON-CLOG PUMPS

The population explosion along with a broader understanding of the water pollution problem has brought about the need for more and better sewage treatment facilities. The installations of today and tomorrow demand more economical and reliable sewage pumping equipment. Longer life has become essential to pump performance. Aurora Pump recognizes this need, and with this bulletin offers the 650 Series of the medium duty horizontal and vertical pumps as our solution to your pumping problems.



MODELS 651A are horizontally baseplate mounted with a driver flexibly coupled to the pump. This easy to service design is recommended where floor space is readily available or where flooding of the installation is not possible.

MODELS 652A are vertically mounted and utilize flexible shafting between the driver and the pump. This model is frequently used on lift station applications where flooding of the installation is possible. The driver is remote.

MODELS 653A and 654A are vertically mounted with an elevated driver coupled directly to the pump (Model 653A thru a flexible coupling). 653A-654A are popular for installations where floor space is limited and flooding is marginal.

QUICK REFERENCE 650 SERIES FEATURE SELECTOR

STANDARD

- 1-1/2" to 3" sphere capacity
- All iron fitted pump construction
- Regreaseable bearings
- Double row outboard thrust bearing
- Single row inboard radial bearing
- Hardened stainless steel (450 min. Brinell) shaft sleeve (pumps with packing)
- Leakage accumulator packing gland (Model 652A-653A)
- Impeller clearance adjustment
- Taper shaft fit at impeller
- Carbon steel shaft and impeller key
- Front or back impeller pull out
- Non-clog impeller
- Dynamically balanced impeller
- Suction elbow w/hand hole (Model 652A-653A-654A)
- Tangential discharge casing
- Hydrostatic test all pumps
- Interwoven graphite/Teflon lubricated acrylic yarn packing
- Lantern ring
- Discharge position No. 1
- Right hand (cw) pump rotation
- Gasket sealed pump shaft
- Coupling Guard (Model 651A)

OPTIONAL

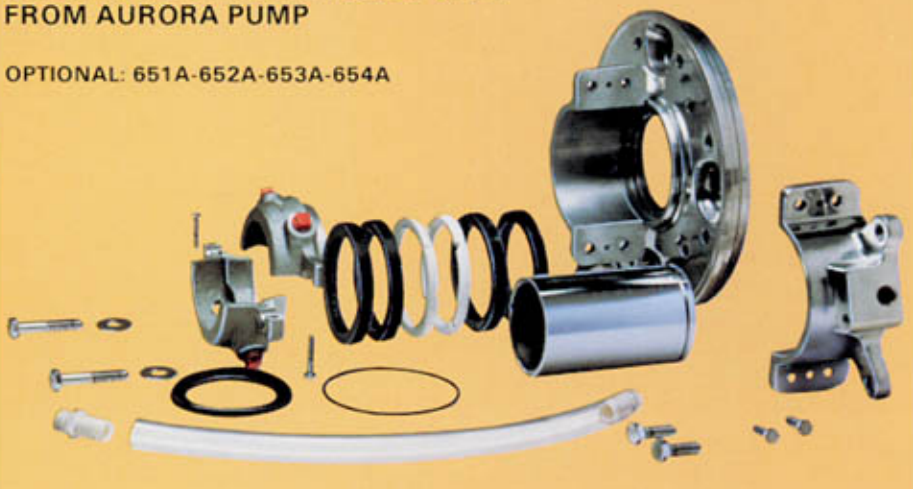
- Removable split packing box
- Stainless steel case wear ring
- Stainless steel impeller wear ring
- Single mechanical seal
- Stainless steel shaft
- External stuffing box piping with filter or valve
- Automatic stuffing box grease seal lubricator
- Spacer type coupling (Model 651A only)
- Flexible shaft drive with or without guard (Model 652A only)
- Water Seal Unit Assembly (See Bulletin 680)
- Constant liquid level system (Apco-Matic Variable Speed — See Bulletin 700)
- Certified test report — witnessed or unwitnessed (clear water)
- Special alloy pump construction
- Alternate discharge positions
- Alloy shaft sleeve (standard with mechanical seal)
- Double mechanical seal (std. 654A)
- Suction increasing elbow with clean out (Models 652A-653A-654A)
- Left hand (ccw) pump rotation

TANGENTIAL DISCHARGE

Optional discharge position illustrated

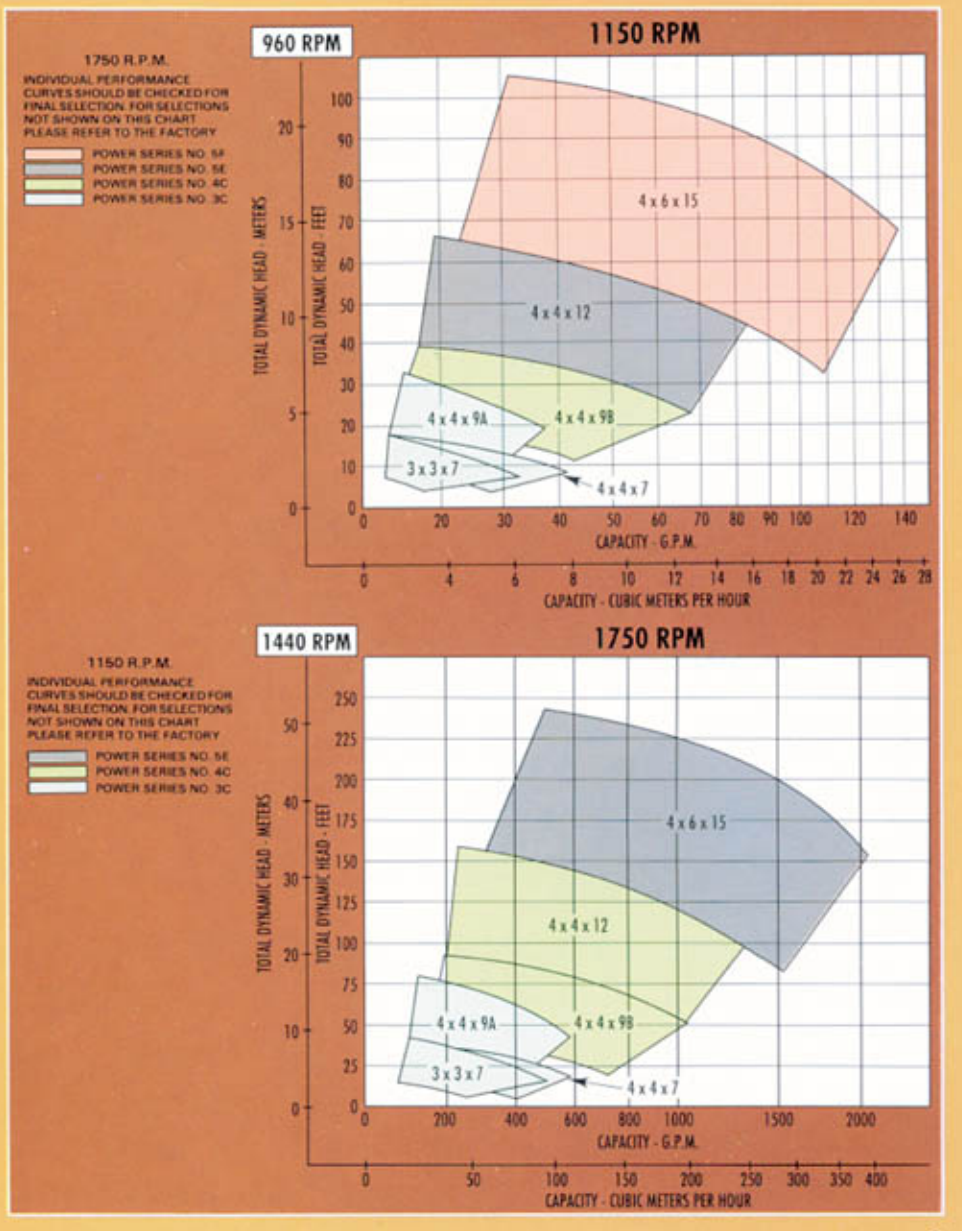
EXCLUSIVE SPLIT PACKING BOX OPTION WITH LEAKAGE ACCUMULATOR IS AVAILABLE *ONLY* FROM AURORA PUMP

OPTIONAL: 651A-652A-653A-654A



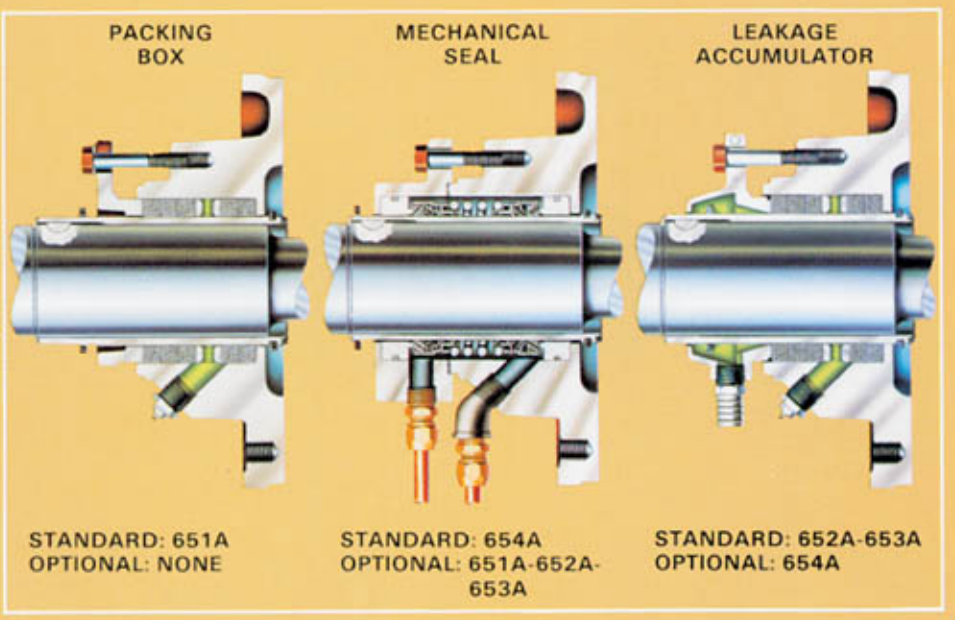
SPECIAL PUMP FEATURES

Efficient tangential discharge. MODELS 651A are horizontally baseplate mounted with a driver flexibly coupled to the pump. SUPPORT of various pump components is important. Inadequate mounting designs impose unnecessary stress and strain on the entire pump and installation. Vibration results. AURORA tangential pumps designed to provide the best available component support. HORIZONTAL 651A UNITS are supported at both pump and coupling end. This, with tangential discharge support, provides protection against pipe strain and maintains casing support when the drive end of the pump is removed for servicing. The rear support foot greatly simplifies coupling alignment and is an important Aurora feature. On VERTICAL 653A UNITS, the steel motor base has a tangential pump registered fit at the motor end and is fastened to a separate pump adapter. This exclusive arrangement assures alignment and concentrates loads on the separate pump adapter eliminating strain and misalignment of the bearing housing. On 652A-653A-654A UNITS the steel base provides a rigid support for the complete pump unit. 654A is close coupled.



OPTIONAL EQUIPMENT AND DIMENSIONS

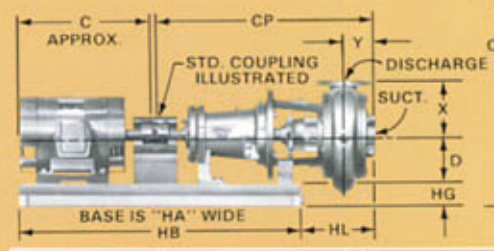
SPLIT PACKING BOXES separate vertically through the packing insert to simplify packing replacement and shaft sleeve inspection. The insert halves are doweled, register aligned and gasketed to prevent leakage. Only six bolts need be removed to disassemble the insert from the pump assembly. DOUBLE MECHANICAL SEALS must be recommended for gritty or abrasive applications. Seal faces are protected by clear water under pressure, injected directly into the seal cavity. The seal box design allows speedy seal maintenance. Single mechanical seals are available. LEAKAGE ACCUMULATOR for vertical pump models with packed stuffing boxes collects seepage for easy drain off. The gland halves are dowel aligned.



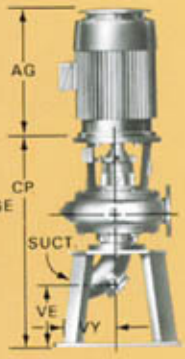
NOTES:

1. Dimensions and weights are approximate.
2. Refer to factory for base dimensions when spacer couplings are specified.
3. Not for construction purposes unless certified.
4. Frame sizes shown are for open drip-proof motors only.
5. Suction and discharge flanges are American Standard 125#.
6. Conduit box is shown in approximate position. Dimensions are not specified as they vary with each motor manufacturer.
7. Add pump, base and motor weight for unit weight.
8. Horizontal motors are "T" frame as shown — Vertical motors are "HP" frame.

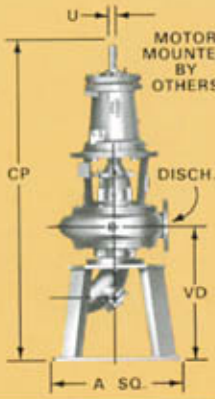
MODEL 651A



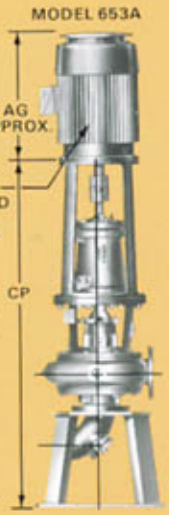
MODEL 654A



MODEL 652A



MODEL 653A



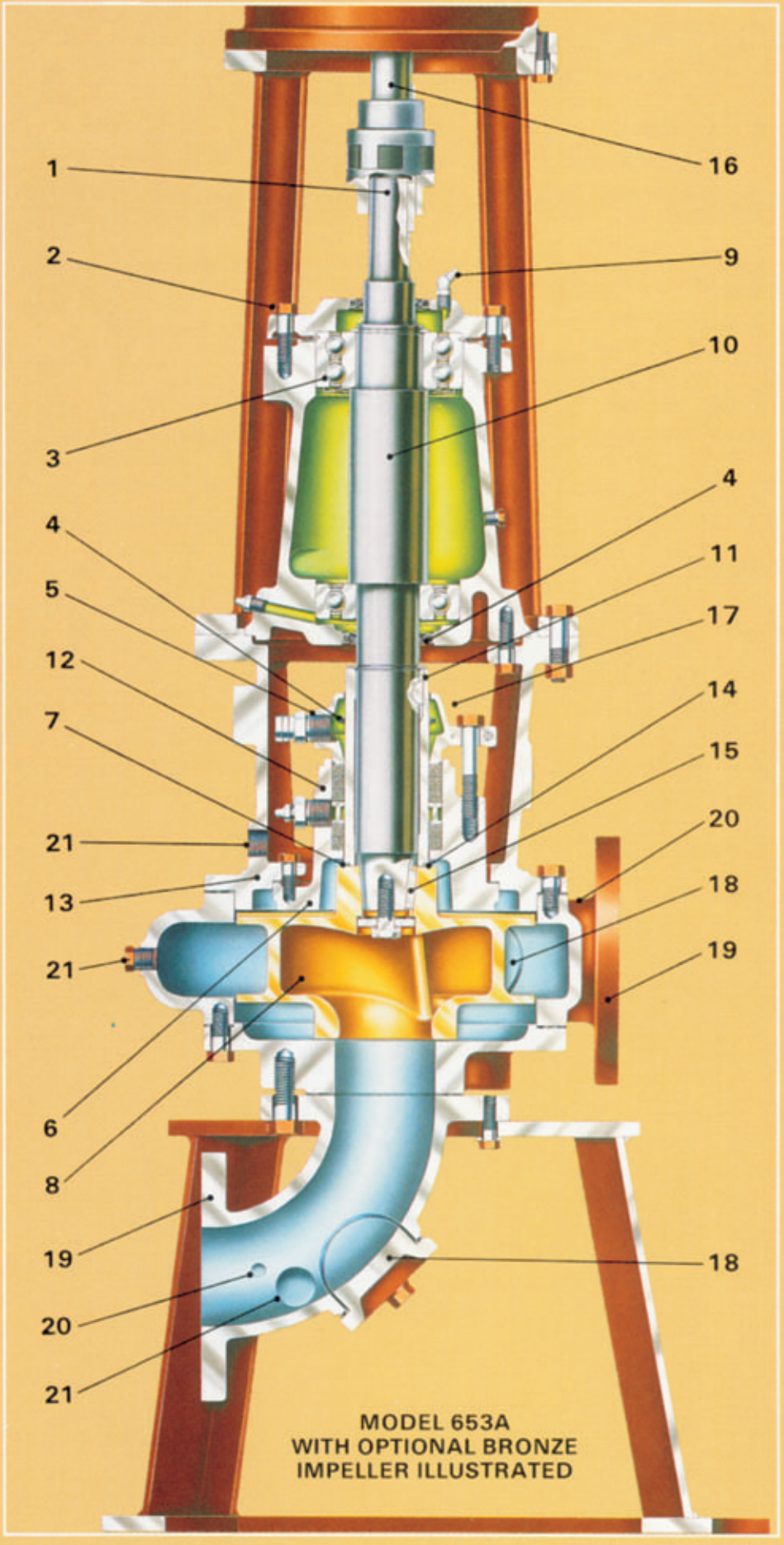
MOTOR FRAME (note 8)	HORSEPOWER RPM 1750	HORSEPOWER RPM 1150	WGT. IN LBS.	C	AG
143T	1	3/4	40	12	11
145T	1-1/2-2	1	45	13	12
182T	3	1-1/2	72	13	13
184T	5	—	85	14	14
213T	7-1/2	—	150	16	16
215T	10	5	190	18	17
254T	15	7-1/2	230	21	19
256T	20	10	250	23	21
284T	25	15	350	24	22
286T	30	20	380	25	23
324T	40	25	475	26	24
326T	50	30	525	28	26
364T	—	40	630	29	25
364TS	60	—	630	27	25
365T	—	50	690	30	25
365TS	75	—	690	28	25
404T	—	60	830	33	28
404TS	100	—	830	30	28
405T	—	75	915	34	28
405TS	125	—	915	31	28
444T	—	100	1000	38	32
444TS	150	—	1000	34	32
445T	—	125	1100	40	32
445TS				36	

651A-652A-653A-654A — DIMENSIONS — PUMP *Add 2" w/Frame 284 HPH or larger

PUMP SIZE DISCH.	SUCT.	CASE	PWR. SER.	PUMP WEIGHT 651A	652A	653A	A	D	U	X	Y	Z	CP 651A	652A	653A	654A	VD	VE	VY
3	3	7	3C	192	257	291	17	6-1/4	1-1/4	6	3	5	26-5/8	39-7/8	43-1/2	26-9/16	16-1/4	7-3/4	5-1/2
3	3	9	3C	238	303	337	17	6-1/4	1-1/4	7	4-1/16	6-1/8	28-3/8	41-5/8	45-1/4	28-5/16	17-5/16	7-3/4	5-1/2
4	4	7	3C	207	293	327	17	6-1/4	1-1/4	7	4-1/2	5-3/8	28-3/8	41-7/8	45-1/2	28-9/16	18	6-15/16	6-1/2
4	4	9A	3C	232	318	351	17	6-1/4	1-1/4	8-1/4	4-1/4	7-1/16	27-1/2	41	44-5/8	27-11/16	17-3/4	6-15/16	6-1/2
4	4	9B	4C	242	328	361	17	11	1-1/4	10	6-3/16	7-7/8	28-7/8	42-3/8	46-1/8	29-3/16	19-11/16	6-15/16	6-1/2
4	4	12	4C	317	402	435	17	13-1/2	1-1/4	10-1/2	6-1/4	9	28-7/8	42-3/8	46-1/8	29-3/16	19-3/4	6-15/16	6-1/2
4	4	12	5E	327	412	445	17	13-1/2	2-3/8	10-1/2	6-1/4	9	39-7/8	53-3/8	*56-15/16	30-3/8	19-3/4	6-15/16	6-1/2
4	5	15	5E 5F	797	1060	1292	24	15-1/4	2-3/8	10-1/2	8-3/16	10-1/4	39-1/2	57-3/8	*60-15/16	34-3/8	24-1/16	9-7/8	8

651A — DIMENSIONS — BASE

MOTOR FRAMES	BASE	HA	HB	HD	HG	HL	BASE WT. LBS.
56-215T	7	20-1/2	36-1/2	9-1/4	3	10-5/16	92
254T	8	20-1/2	42-1/2	9-1/4	3	10-5/16	106
56-215T	7	20-1/2	36-1/2	9-1/4	3	12-3/16	92
254T	8	20-1/2	42-1/2	9-1/4	3	12-3/16	106
56-215T	7	20-1/2	36-1/2	9-1/4	3	12-3/16	92
254T	8	20-1/2	42-1/2	9-1/4	3	12-3/16	106
56-215T	7	20-1/2	36-1/2	9-1/4	3	11-7/16	92
254T	8	20-1/2	42-1/2	9-1/4	3	11-7/16	106
182T-213T	9	20-1/2	48-1/2	14	3	-2-15/16	121
215T-286T	10	20-1/2	56-1/2	14	3	-2-15/16	140
182T-215T	9	20-1/2	48-1/2	16-1/2	3	- 5/8	121
254T-286T	10	20-1/2	56-1/2	16-1/2	3	- 5/8	140
213T-256T	13	26-3/4	64-1/2	17-1/2	4	- 5/8	256
284TS-326T	14	26-3/4	72-1/2	17-1/2	4	- 5/8	287
213T-365T	14	26-3/4	72-1/2	19-1/4	4	-1-9/16	287
404TS-444T	18	29-1/8	82-1/2	19-1/4	4	-1-9/16	491



MODEL 653A
WITH OPTIONAL BRONZE
IMPELLER ILLUSTRATED

1 LIFTING EYE tap in shaft end simplifies disassembly.
2 EXTERNAL SHAFT ADJUSTMENT provides for renewing impeller clearance and maintaining pump efficiency.
3 DOUBLE ROW THRUST BEARINGS are added protection for high loads. Average bearing life is 10 years.
4 WATER SLINGER, and grease seals protect both bearings from moisture.
5 LEAKAGE ACCUMULATOR GLAND option to siphon off packing leakage.
6 STUFFING BOXES are machined for mechanical seals or packing. Either may be used without modification.
7 GASKETS protect shaft from pumped liquid corrosion and contamination.
8 IMPELLER VANES brought well into the inlet eye to pick up liquid early and to minimize clogging.
9 GREASE LUBRICATION purges old grease from both bearings.
10 RUGGED SHAFT with taper for easy impeller removal and minimum deflection.
11 HARDENED STAINLESS STEEL SLEEVE on packed pumps is securely key locked to the shaft.
12 .002 MAXIMUM SHAFT DEFLECTION at stuffing box face extends packing and mechanical seal life.
13 BACK PULLOUT DESIGN for pump maintenance, does not disturb suction or discharge piping.
14 SNAP RING groove is provided for a snap ring to aid in sleeve removal during preventative maintenance period.
15 STEEL IMPELLER KEY, capscrew and washer secures impeller to shaft.
16 NEMA STANDARD "HP" mounting face and shaft extension motors.
17 LARGE ACCESS OPENINGS provide adequate visibility and working room.
18 OVAL CLEANOUTS are large, HAND SIZE and located to provide visibility and accessibility to the impeller blades and the casing cutwater.
19 DISCHARGE flanges can be located in 45° increments for 8 different positions. (suction in 90° -vert. pumps)
20 STANDARD GAUGE TAPS are conveniently located at both the discharge and suction flange openings.
21 STANDARD DRAIN TAPS are located conveniently in the adapter bracket, suction elbow, and casing.

ENGINEERING SPECIFICATIONS

STUFFING BOX, SHAFT AND BEARING DIMENSIONS * Indicates Back to Back Bearings Qty. 2

AREA	DESCRIPTION		POWER SERIES 3C	4C	5E/5F
STUFFING BOX	Stuffing Box Bore Diameter	PACKING	3-9/32	3-9/32	4-25/32
	Stuffing Box Depth		2-3/4	2-3/4	3-1/2
	Outside Dia., Sleeve for Packing		2-1/2	2-1/2	3-3/4
	Total Number of Packing Rings With Lantern Ring		5	5	5
	No. of Rings in Front of Lantern Ring		2	2	2
	Packing Size		3/8	3/8	1/2
	Width of Lantern Ring		5/8	5/8	3/4
	Distance From Box to Nearest Obstruction		2-15/16	2-15/16	2-3/4
	Dia. of Mech. Seal (Bore)	M. SEAL	3-9/32	3-9/32	4-25/32
	Length of Mechanical Seal		3-1/4	3-1/4	4-7/16
	Outside Dia., Sleeve for Mechanical Seal		2-1/4	2-1/4	3-5/8

AREA	DESCRIPTION	POWER SERIES 3C	4C	5E/5F
SHAFT	Dia. at Impeller (Average of Taper)	1-7/16	1-7/16	2-1/4
	Diameter at Shaft Sleeve	1-7/8	1-7/8	3-1/4
	Diameter Between Bearings (Max. Shaft Dia.)	2-3/8	3-5/16	4-1/8
	Diameter at Coupling End	1-1/4	1-1/4	2-3/8
	Max. Deflection at Stuffing Box Face	.002"	.002"	.002"
BEARINGS	Bearing No. (Inboard Radial)	6310	6311	6317 (5E) 21317 (5F)
	Bearing No. (Outboard Thrust)	3310	3309	7315*
	Bearing Centers	7-9/32	7-3/4	12-11/16
	Minimum Life of Bearing Under Worst Conditions of Load	2 Years	2 Years	2 Years

LIMITATIONS (Maximum)

Hydrostatic test pressure	150 PSI
Case working pressure	125 PSI
Suction pressure	125 PSI
Temperature-Packing	250°F
Temperature-Mech. Seal	225°F
Operating speed	1775 RPM

DESCRIPTION	FITTED	MATERIAL OF CONSTRUCTION
Impeller	Iron	Cast Iron ASTM A48
Gland	Iron	Cast Iron ASTM A48
Packing	Iron	Graphite/Teflon Lubricated Acrylic Yarn
Insert	Iron	Cast Iron ASTM A48
Lant. Ring	Iron	Teflon
	Stainless	Stainless Steel AISI 316
Sleeve (Pack)	Iron	Hard. Stn. Steel AISI 440C
Sleeve (Seal	Iron	Bronze ASTM B62
Sleeve (Seal)	Stainless	Stainless Steel AISI 316
Impeller Screw	Iron	Steel SAE Grade 5
Shaft	Iron	Steel SAE 1045
Frame	Iron	Cast Iron ASTM A48
Casing	Iron	Cast Iron ASTM A48
Cover	Iron	Cast Iron ASTM A48
Supports	Iron	Steel

Furnish and install as shown on the plans, Aurora Model . . . . (Horizontal-651A) (Vertical-653A Flexible Coupled) (Vertical-652A Open Shaft) (Vertical-654A-Close Coupled) type Non-Clog Centrifugal pump. The pump shall be capable of delivering a capacity of . . . . GPM when operating against a total dynamic head of . . . . feet. The pump shall also deliver a maximum of . . . . GPM when operating against a head of . . . . feet. The minimum shut-off head acceptable will be . . . . feet.

The pump shall operate at a maximum speed of . . . . RPM. A unit operating at a lesser rotative speed will be considered, but in no event will a pump operating at more than the maximum speed specified be acceptable.

The pump casing shall be of the tangential design and will be constructed of cast iron and shall be of sufficient thickness to withstand stresses and strains at full operating pressures. Casings shall be subject to a hydrostatic pressure test of 125 lbs. A handhole is to be provided in the 3" and 4" casings for clean out purposes. The casing design shall allow front or rear impeller pullout.

The bearing housing is to be of cast iron and shall be furnished with a set of regreaseable bearings for both radial and thrust loads. A double row thrust bearing is to be provided to ensure maximum bearing life under extreme thrust loads. The bearings shall have an average life of 100,000 hours and shall be mounted in a machined, moisture and dust proof housing. The housing is to have a register fit and then bolted to the pump casing to insure permanent alignment.

An extra deep (split) packing box simplifying packing replacement and shaft sleeve inspection is to be provided and must be so arranged with a lantern ring for either grease lubrication or tapped connections for water sealing from an outside source. A 3/8" drain opening must be provided to facilitate removal of lubricating liquid.

The impeller to be of cast iron and shall be capable of passing a maximum sphere size of . . . . inches. The impeller shall be dynamically balanced before assembly into the pump and shall be securely fastened to the shaft by means of a steel key and impeller locknut. Axial adjustment of the impeller is to be external and a minimum clearance of . . . . thousands should be maintained between the impeller and suction wearplate. The pump shaft shall be constructed of high grade carbon steel having a tapered impeller extension and accurately machined. The minimum diameter acceptable between bearings will be 2-3/8 inches. The pump shaft shall be protected from wear by a corrosion and wear resisting hardened stainless steel shaft sleeve having a 450 minimum Brinell hardness. An "O" ring type gasket must be provided between the impeller hub and the shaft sleeve to prevent pumped liquid from corroding the shaft.

MODEL 651A HORIZONTAL

The pump and motor shall be mounted on a common (steel) (steel drip rim) base. Alignment shall be checked in accordance with the Standards of the Hydraulic Institute after installation and there shall be no strain transmitted to the pumps.

MODEL 652A VERTICAL OPEN SHAFT, 653A VERTICAL FLEXIBLE COUPLED AND 654A CLOSE COUPLED VERTICAL PUMPS

The pump shall be supported by a fab. steel pedestal base. The pedestal shall have openings large enough to permit access to the suction line. An optional handhole of not less than 3" in diameter must be provided in the suction elbow on 3" and 4" pumps. The pedestal must be of sufficient height so that the suction elbow will not touch the floor or foundation upon which it stands.

Vertical flexible coupled pumps shall be furnished with a fab. steel motor bracket which is to be bolted to a separate pump adapter. The motor bracket must be machined with a register fit to insure proper alignment of motor shaft and pump shaft. 654A is coupled directly to the motor shaft extension.

Vertical open shaft pumps are to be driven through flexible shafting with . . . . dia. tubing, and intermediate bearings. Shafting must be of sufficient size to transmit required horsepower and must be provided with a slip spline which will permit removal of the pump rotating assembly without removing any section of intermediate shafting, bearings, suction or discharge piping(. . . . sections required).

The Engineering Specification has been condensed from a very comprehensive specification. Additional information is available from any Aurora Pump Sales Office. Aurora Pump reserves the right to make revisions to its products and their specifications, and to this bulletin and related information without notice.

NOTE: Aurora Pump reserves the right to make revisions to its products and their specifications, and to this bulletin and related information without notice.

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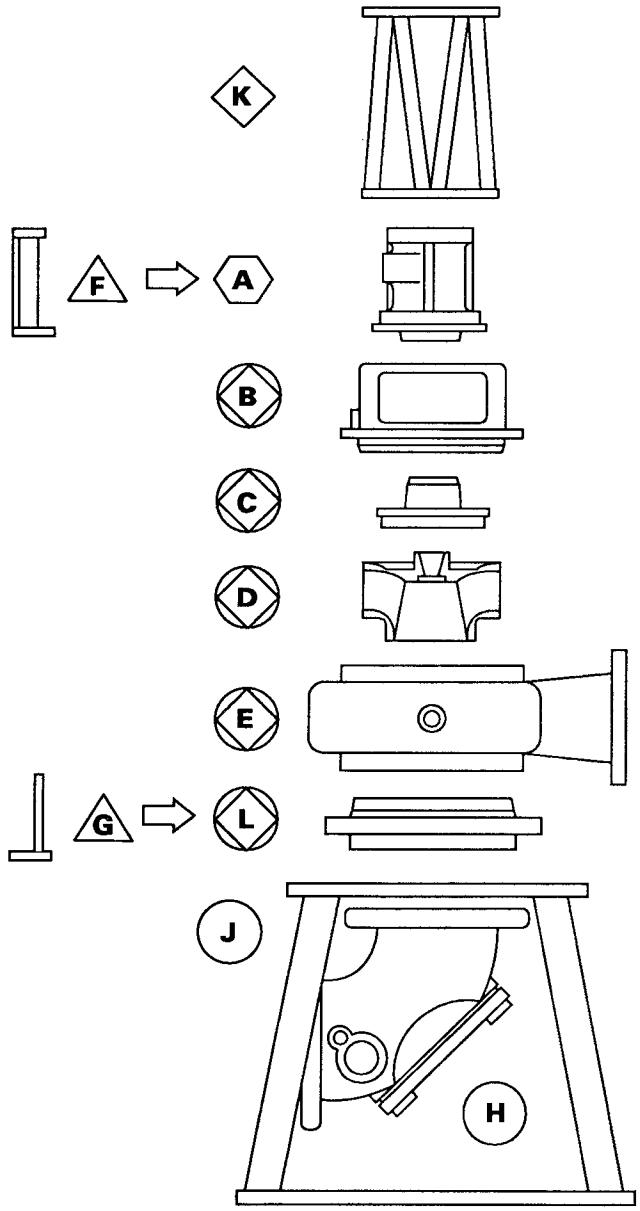


Non-Clog pumps are designed for maximum interchangeability. All models are available in all 7 sizes, offering a model and size precisely fitted to the installation requirements over a wide range of capacities. The 7 sizes are divided into 4 "Power Frames". Within a given power frame, all parts are interchangeable except for the liquid end and supports. The chart illustrates the degree of interchageability achieved with the standard non-clog pumps.

Model 651A Only ..... △
Model 653A Only ..... ◇
Models 652A, 653A, & 654A ..... ○
Models 651A, 652A, & 653A ..... ⬡
Models 651A, 652A, 653A, & 654A ..... ⊘

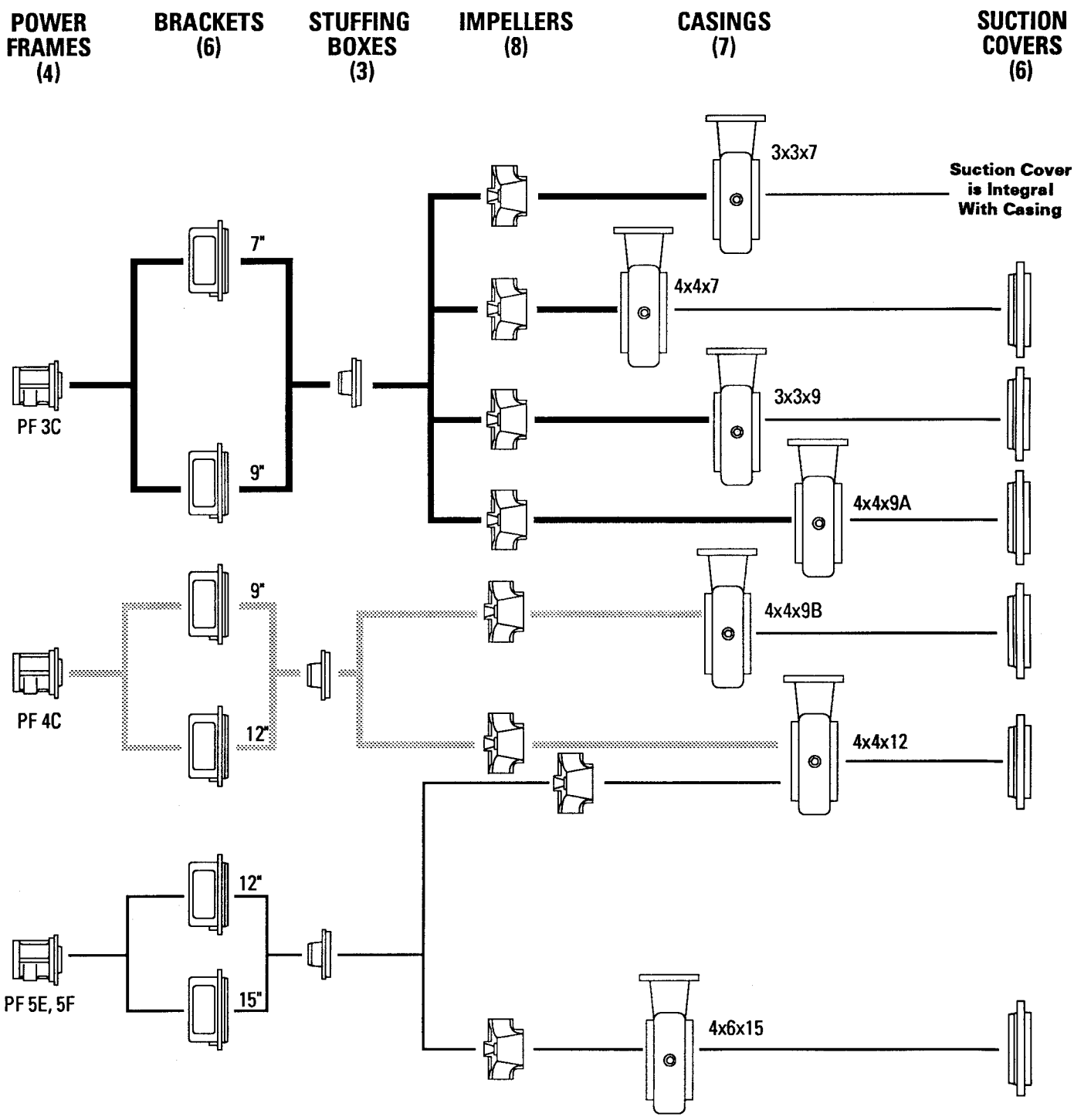
	Qty
A - Power Frames	4
B - Brackets	6
C - Stuffing Boxes	3
D - Impellers	8
E - Casings	7
F - Mounting Feet (Rear)	5
G - Mounting Feet (Front)	4
H - Elbows	3
J - Bases	2
K - Motor Supports	3
L - Suction Covers	6

POWER FRAME SELECTION

	PUMP SIZE	POWER FRAME	RPM 1750	1150	875	700
⊘	3x3x7		3C	3C		
⊘	4x4x7		3C	3C		
⊘	3x3x9		3C	3C		
⊘	4x4x9A		3C	3C	3C	
⊘	4x4x9B		4C	4C	4C	4C
⊘	4x4x12		5E	4C	4C	4C
⊘	4x6x15		5F	5E	5E	5E

AURORA 650A SERIES
ENGINEERING DATA

INTERCHANGEABILITY



AURORA MODEL 650 PUMP
SPLIT PACKING BOX OPTION

POWER FRAMES 4 & 5 ONLY

Optional Split Packing Box With Leakage Accumulator Gland Illustrated

Split packing boxes separate vertically through the packing insert to simplify packing replacement and shaft sleeve inspection. The insert halves are dowled, register aligned and gasketed to prevent leakage. Only six bolts need be removed to expose all of the packing and lantern ring. Remove two more bolts and the remaining packing box insert half can be removed.

The completely exposed packing and sleeve area coupled with the extra large access openings in the pump adapter provides the ultimate in packing accessibility.

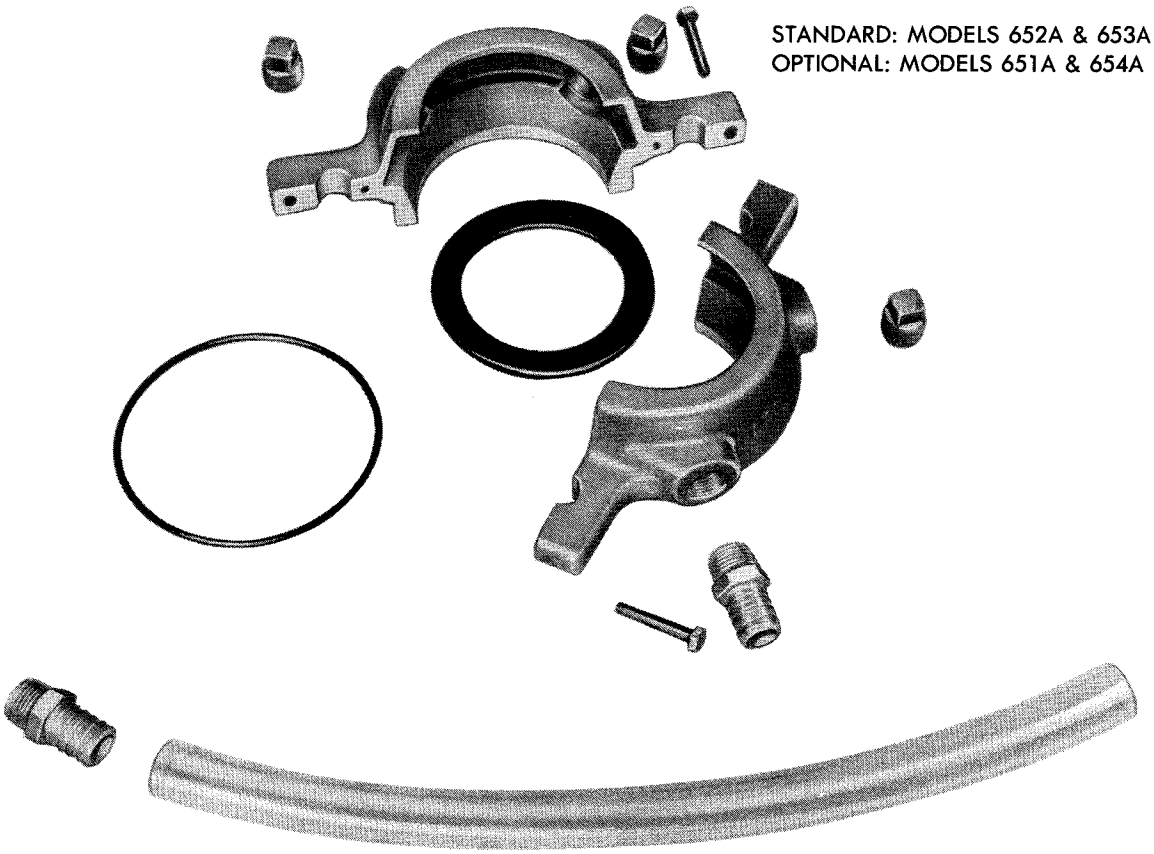
Five (5) die-molded, diagonally split, packing rings complete with lantern ring line the stuffing box. The general service packing consists of graphited fiber.

The stuffing box length, bore, sleeve diameters and lantern ring width conform with the recommended standard of the Mechanical Packing Association (MPA).

A tapped opening is provided for lubricating the stuffing box. Lubrication is accomplished by adding grease directly into the lantern ring cavity through a grease fitting or by connecting a by-pass line between the pump discharge and the stuffing box. Automatic grease seals as well as other flushing options are also available.

The standard 450 minimum brinnel hardened stainless steel shaft sleeve extends through the entire length of the box and gland and is provided with a snap ring. This snap ring design allows the sleeve and the completely assembled packing box to be removed intact. Reassembly can be accomplished in the same manner. Assemble the complete stuffing box at the convenience of the work bench, install and adjust the packing for proper lubrication leakage (5-10 drops per minute after run-in).

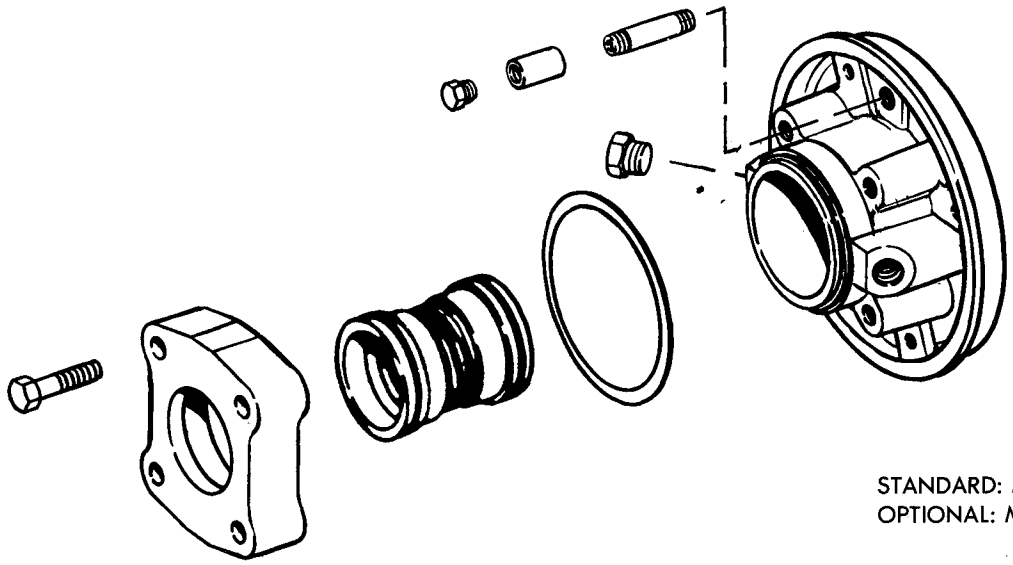
AURORA MODEL 650 PUMP
LEAKAGE ACCUMULATOR



STANDARD: MODELS 652A & 653A
OPTIONAL: MODELS 651A & 654A

The leakage accumulator gland (sprayless, dripless packing gland) is designed and constructed to prevent the collection of packing leakage in the pump bracket of a vertical or horizontally mounted pump. The leakage accumulator gland has a volute shape with two symetrical halves. This gland encloses the water slinger preventing any spray from escaping and contaminating the area. The leakage is efficiently directed to a drain connection.

The two gland halves are doweled, bolted together, and sealed at the parting line with a soft liquid sealant. An "O" ring seal between the gland and packing box prevents any leakage in this area. One of the pipe tap ports on the side of the gland is fitted with a hose connector and a clear plastic section of hose, to both drain off and allow visual inspection of the leakage. The remaining ports have pipe plugs, but may be used for maintenance purposes to flush & drain debris from the accumulator.



STANDARD: MODEL 654A
OPTIONAL: MODELS 651A, 652A & 653A

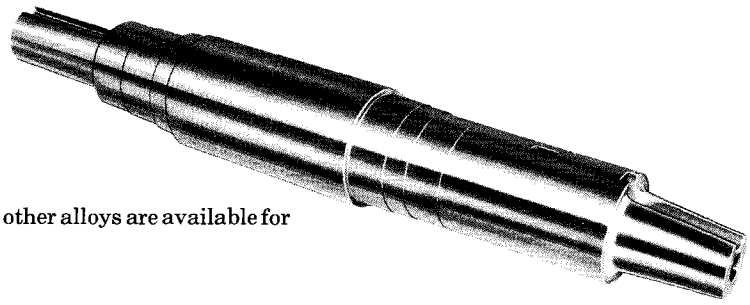
Double mechanical seals are recommended for gritty or abrasive applications. Seal faces are protected by clear water under pressure, injected directly into the seal cavity. Pressure in the seal box must be fifteen (15) lbs. higher than the operating pressure at the stuffing box of the pump. This forces the inner sealing faces closed and provides both faces with a film of clear sealant. If this is not done, abrasive particles may be forced under the sealing faces hastening wear. Even when the pump is not running, a pressure differential, or at least equal pressure in the seal box, is desirable. The sealant circulation for most pumping operations may be dead ended in the stuffing box. Pressures over 30 psi or RPM of 1200 max. require constant circulation to prevent overheating.

The seal box is designed for the compressed seal length and does not require any adjustments. The seal housing is extra large to provide excellent circulation of clear sealing liquid. The housing also has two tapped openings 180° apart for the flushing connections.

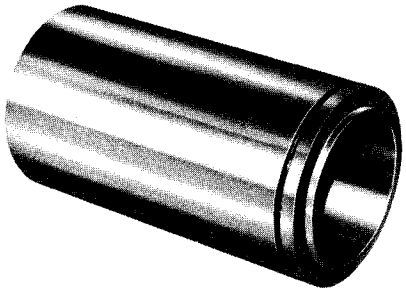
The standard shaft sleeve design is provided with a snap ring which allows the sleeve and the completely assembled seal box to be removed intact. Reassembly can be accomplished in the same manner. Assemble the complete seal box at the convenience of the work bench and install.

AURORA MODEL 650 PUMP OPTIONS

SHAFTS



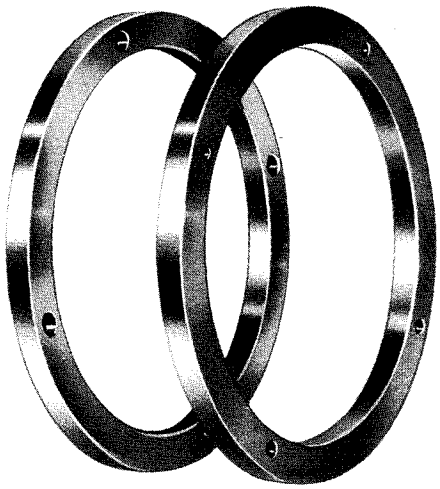
Precision machined shafts of stainless steel, monel and other alloys are available for difficult application.



SLEEVES

Shaft sleeves, machined to close tolerances are optionally available in either bronze, 316 stainless steel, or monel.

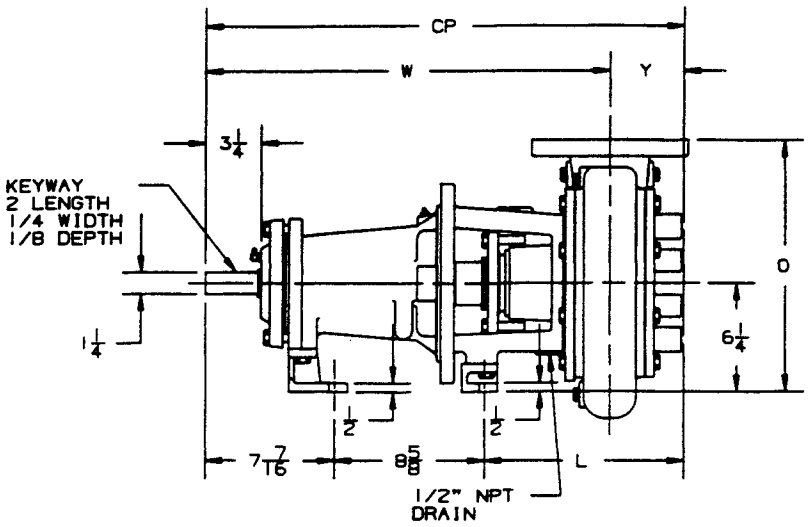
WEAR RINGS

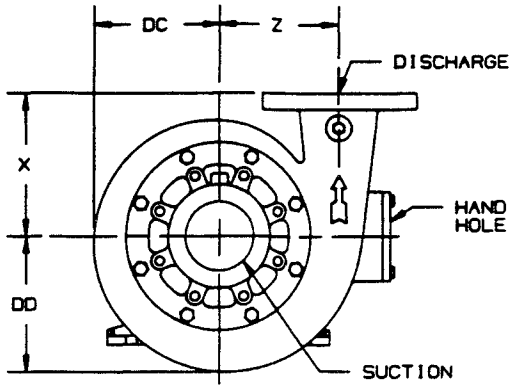


Replaceable stainless steel wear rings available individually or together, protect the impeller and/or casing from wear. The rings are secured and aligned by 4 flat head machine screws that are easily removed. The ring running clearances are adjusted externally by the bearing cap. External flushing of the ring faces is available.

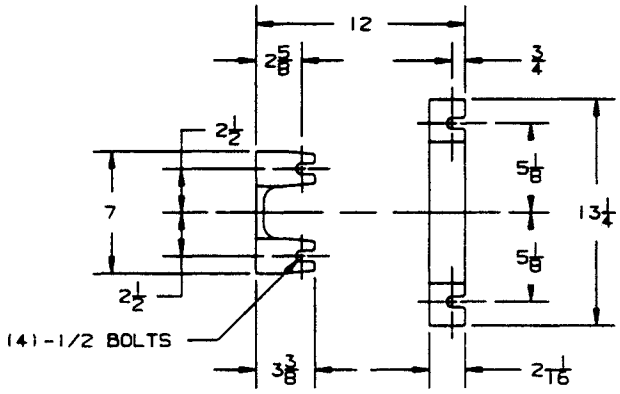
AURORA MODEL 651A PUMP

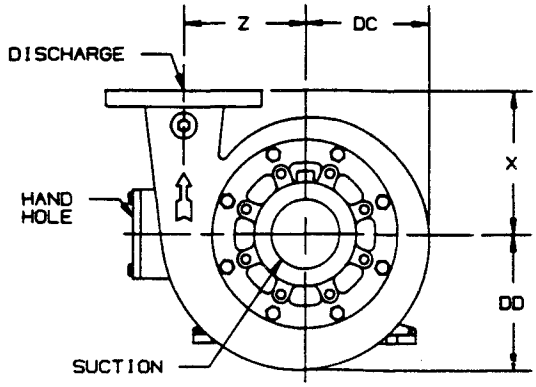
POWER FRAME 3C



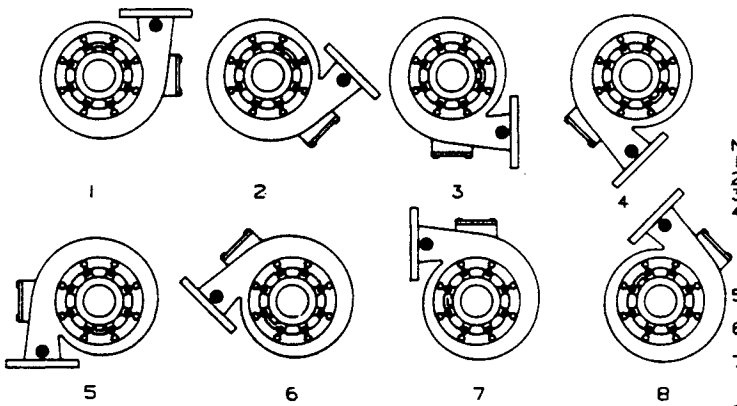


RIGHT HAND ROTATION
CCW VIEW TOWARD SUCTION





LEFT HAND ROTATION
CW VIEW TOWARD SUCTION
POSITION 9 SHOWN
(FOR AVAILABLE LEFT HAND
POSITIONS SEE PAGE 301)

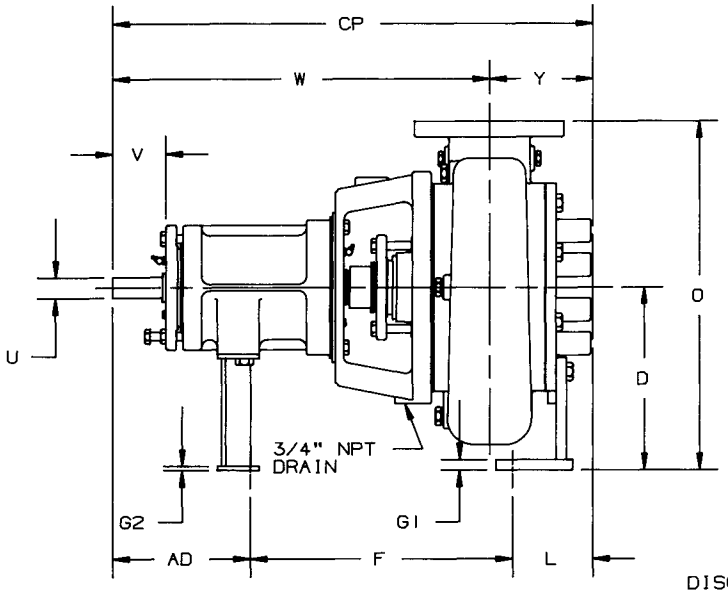


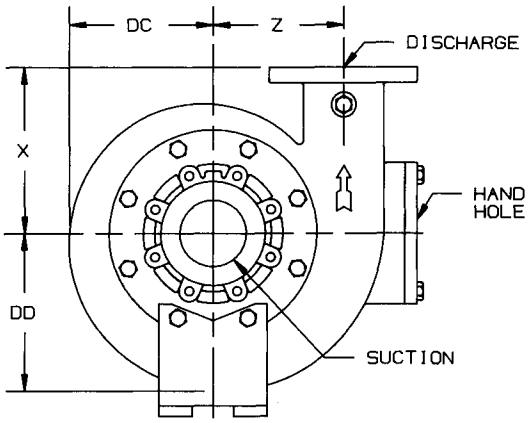
DISCHARGE POSITIONS AVAILABLE
(RIGHT HAND PUMP VIEWED FROM SUCTION END
FOR LEFT HAND POSITIONS SEE PAGE 301)

NOTES:
1. ALL DIMENSIONS IN INCHES.
2. DIMENSIONS MAY VARY ± 1/4.
3. NOT FOR CONSTRUCTION PURPOSES UNLESS CERTIFIED.
4. TWO (2) 1/2" NPT CONNECTIONS 180° APART, ON THE STUFFING BOX FOR LUBRICATION PURPOSES ARE FURNISHED AS STANDARD. ON PACKED PUMPS AN ALEMITE FITTING IS PROVIDED IN ONE TAP AND THE REMAINING TAP IS PLUGGED.
5. DISCHARGE POSITION 1 IS FURNISHED AS STANDARD UNLESS SPECIFIED.
6. SUCTION AND DISCHARGE FLANGES ARE AMERICAN STANDARD 125 LBS.
7. CHECK DISCHARGE POSITION, CASING DIMENSIONS WHICH EXCEED 6 1/4" MAY REQUIRE PADS FOR THE PUMP AND/OR MOTOR.
8. 3x3x7 PUMP NOT AVAILABLE IN LEFT HAND CONFIGURATION.

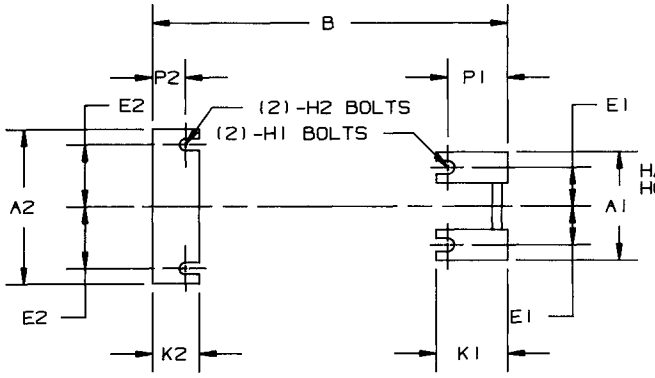
DISCH SUCT CASE BORE	POWER FRAME	L	O	W	X	Y	Z	CP	DC	DD
3x3x7	3C	10 9/16	12 1/4	23 5/8	6	3	5	26 5/8	5 1/2	6 1/8
3x3x9	3C	11 5/16	13 1/4	23 5/16	7	4 1/16	6 1/8	27 3/8	6 5/8	7 3/16
4x4x7	3C	12 5/16	13 1/4	23 7/8	7	4 1/2	5 3/8	28 3/8	6	6 13/16
4X4x9A	3C	11 7/16	14 1/2	23 1/4	8 1/4	4 1/4	7 1/16	27 1/2	7 1/4	7 13/16

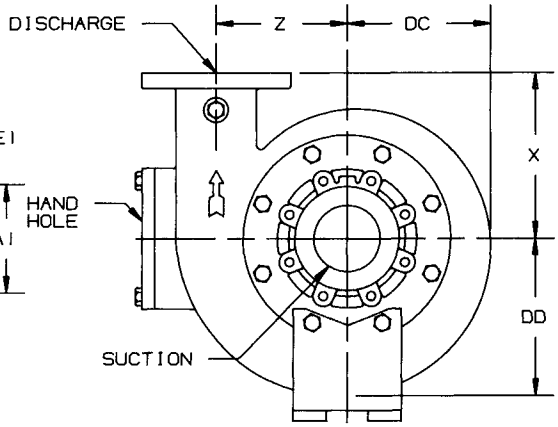
AURORA MODEL 651A PUMP
POWER FRAMES 4C, 5E & 5F



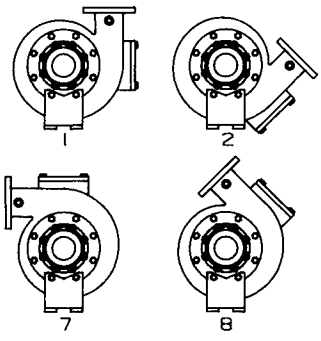


RIGHT HAND ROTATION
CCW VIEW TOWARD SUCTION





LEFT HAND ROTATION
CW VIEW TOWARD SUCTION
POSITION 9 SHOWN



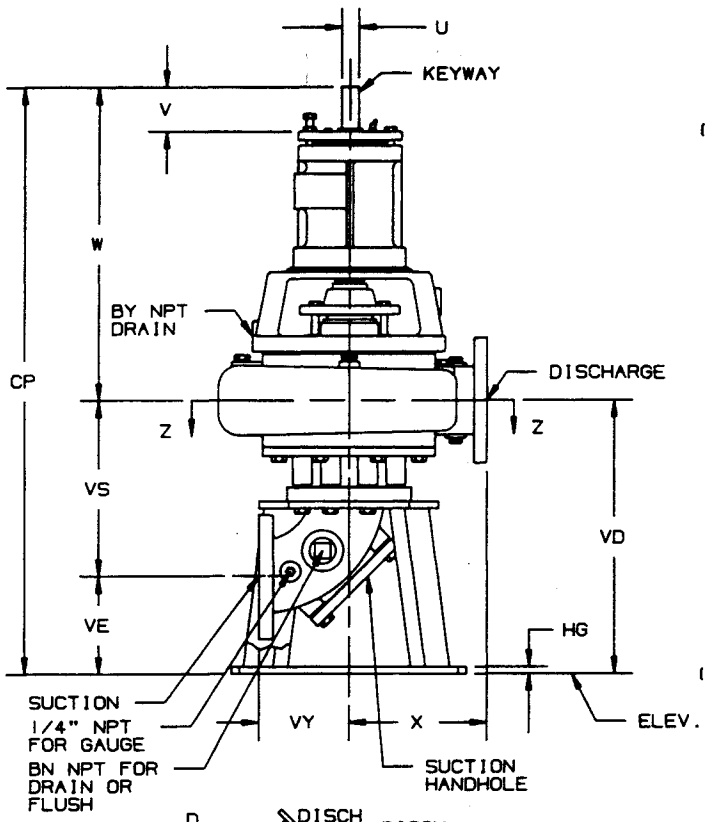
DISCHARGE POSITIONS AVAILABLE
(RIGHT HAND PUMP VIEWED FROM SUCTION END
FOR LEFT HAND POSITIONS SEE PAGE 3011

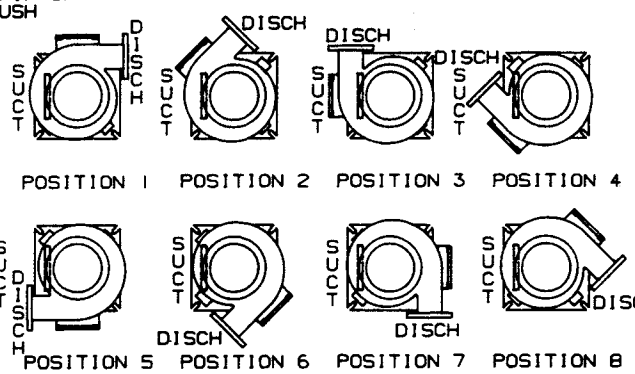
NOTES:
1. ALL DIMENSIONS IN INCHES.
2. DIMENSIONS MAY VARY ± 1/4.
3. NOT FOR CONSTRUCTION PURPOSES UNLESS CERTIFIED.
4. TWO (2) 1/2" NPT CONNECTIONS 180° APART, ON THE STUFFING BOX FOR LUBRICATION PURPOSES ARE FURNISHED AS STANDARD. ON PACKED PUMPS AN ALEMITE FITTING IS PROVIDED IN ONE TAP AND THE REMAINING TAP IS PLUGGED.
5. DISCHARGE POSITION 1 IS FURNISHED AS STANDARD UNLESS SPECIFIED.
6. SUCTION AND DISCHARGE FLANGES ARE AMERICAN STANDARD 125 LBS.

POWER FRAME	U	V	KEYWAY		
			LENGTH	WIDTH	DEPTH
4C	1 1/4	3 3/16	2	1/4	1/8
5E, 5F	2 3/8	6 3/8	4	5/8	5/16

DISCH SUCT CASE BORE	POWER FRAME	A1	A2	B	D	E1	E2	F	G1	G2	H1	H2	K1	K2
4x4x9B	4C	6 1/2	8 1/4	21 3/8	11	2 1/4	3 1/8	15 7/8	5/8	1/4	5/8	5/8	4 5/8	2 1/2
4x4x12	4C	7	10	21 3/8	13 1/2	2 1/2	4	15 3/8	5/8	3/8	5/8	5/8	4 5/8	3
4x4x12	5E	7	10	27 5/8	13 1/2	2 1/2	3 3/4	21	5/8	3/8	3/4	3/4	4 5/8	4
4x6x15	5E, 5F	11 1/2	11	27 15/16	15 1/4	4 1/4	4 1/4	19 11/16	5/8	3/8	3/4	3/4	7	3 1/2

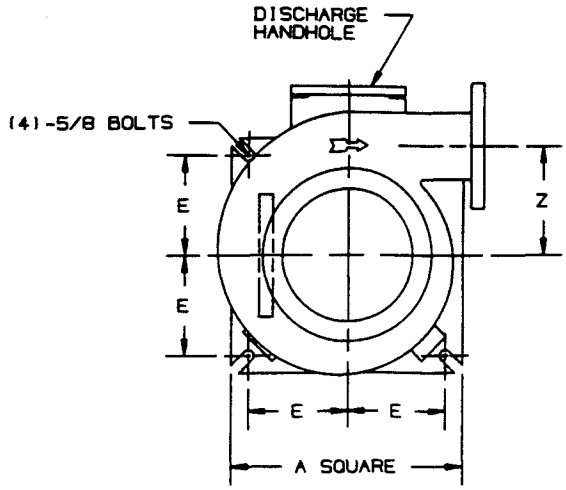
DISCH SUCT CASE BORE	POWER FRAME	L	O	P1	P2	W	X	Y	Z	AD	CP	DC	DD
4x4x9B	4C	5 1/8	21	3 7/8	1 5/8	22 11/16	10	6 3/16	7 7/8	7 7/8	28 7/8	8 15/16	9 13/16
4x4x12	4C	5 1/8	25	3 7/8	2 1/8	22 5/8	10 1/2	6 1/4	9	8 3/8	28 7/8	9 7/8	10 3/8
4x4x12	5E	5 1/8	25	3 7/8	2 3/4	33 5/8	10 1/2	6 1/4	9	13 3/4	39 7/8	9 7/8	10 3/8
4x6x15	5E, 5F	6 7/16	25 3/4	6	2 1/4	33 5/16	10 1/2	6 3/16	10 1/4	13 3/8	39 1/2	11 1/8	11 5/8



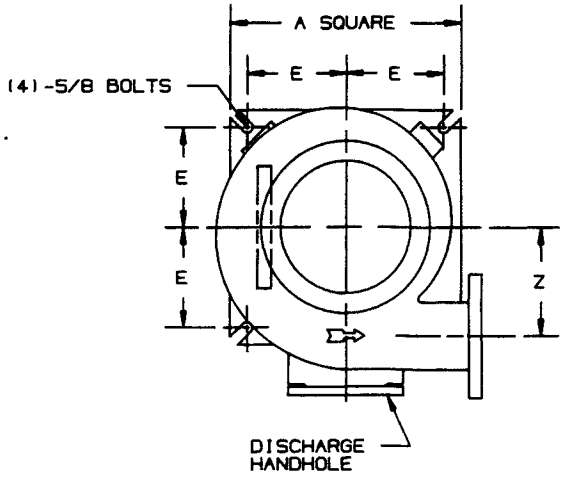


DISCHARGE POSITIONS AVAILABLE
(RIGHT HAND PUMP VIEWED FROM DRIVER END
FOR LEFT HAND POSITIONS SEE PAGE 302)

NOTE:
PUMP SIZES 3x3x7 AND 3x3x9 DISCHARGE POSITIONS AVAILABLE ONLY IN 1, 3, 5, AND 7.



RIGHT HAND ROTATION
CW VIEWED FROM DRIVER END
VIEW Z-Z



LEFT HAND ROTATION
CCW VIEWED FROM DRIVER END
VIEW Z-Z
POSITION 9 SHOWN
(FOR AVAILABLE LEFT HAND POSITIONS SEE PAGE 302)

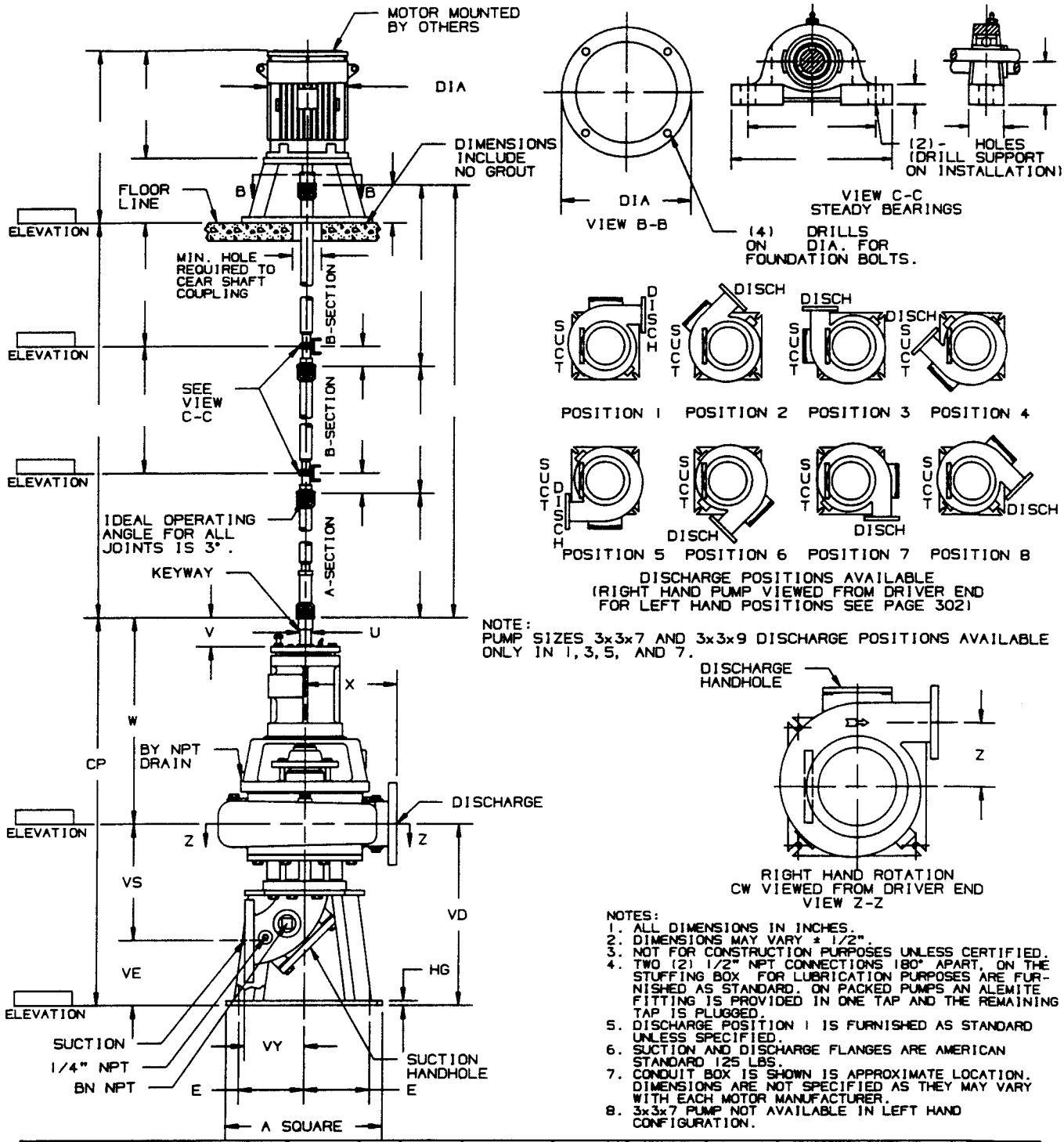
NOTES:
1. ALL DIMENSIONS IN INCHES.
2. DIMENSIONS MAY VARY ± 1/4".
3. NOT FOR CONSTRUCTION PURPOSES UNLESS CERTIFIED.
4. TWO (2) 1/2" NPT CONNECTIONS 180° APART, ON THE STUFFING BOX FOR LUBRICATION PURPOSES ARE FURNISHED AS STANDARD. ON PACKED PUMPS AN ALEMITE FITTING IS PROVIDED IN ONE TAP AND THE REMAINING TAP IS PLUGGED.
5. DISCHARGE POSITION 1 IS FURNISHED AS STANDARD UNLESS SPECIFIED.
6. SUCTION AND DISCHARGE FLANGES ARE AMERICAN STANDARD 125 LBS.
7. 3x3x7 PUMP NOT AVAILABLE IN LEFT HAND CONFIGURATION.

POWER FRAME	U	V	KEYWAY		
			LENGTH	WIDTH	DEPTH
3C, 4C	1 1/4	3 3/16	2	1/4	1/8
5E, 5F	2 3/8	6 3/8	4	5/8	5/16

DISCH SUCT CASE BORE	POWER FRAME	A	BN	BY	E	HG	VY	W	X	Z	CP	VD	VE	VS
3x3x7	3C	17	1	1/2	7 1/4	1/2	6 1/2	23 5/8	6	5	39 7/8	16 1/4	6 3/4	9 1/2
3x3x9	3C	17	1	1/2	7 1/4	1/2	6 1/2	23 5/16	7	6 1/8	40 5/8	17 5/16	6 3/4	10 9/16
4x4x7	3C	17	1 1/2	1/2	7 1/4	1/2	6 1/2	23 7/8	7	5 3/8	41 7/8	18	6 15/16	11 1/16
4x4x9A	3C	17	1 1/2	1/2	7 1/4	1/2	6 1/2	23 1/4	8 1/4	7 1/16	41	17 3/4	6 15/16	10 13/16
4x4x9B	4C	17	1 1/2	3/4	7 1/4	1/2	6 1/2	22 11/16	10	7 7/8	42 3/8	19 11/16	6 15/16	12 3/4
4x4x12	4C	17	1 1/2	3/4	7 1/4	1/2	6 1/2	22 5/8	10 1/2	9	42 3/8	19 3/4	6 15/16	12 13/16
4x4x12	5E	17	1 1/2	3/4	7 1/4	1/2	6 1/2	33 5/8	10 1/2	9	53 3/8	19 3/4	6 15/16	12 13/16
4x6x15	5E, 5F	24	1 1/2	3/4	10 3/4	5/8	8	33 5/16	10 1/2	10 1/4	57 3/8	24 1/16	9 7/8	14 3/16

AURORA MODEL 652A PUMP

FLEXIBLE SHAFT

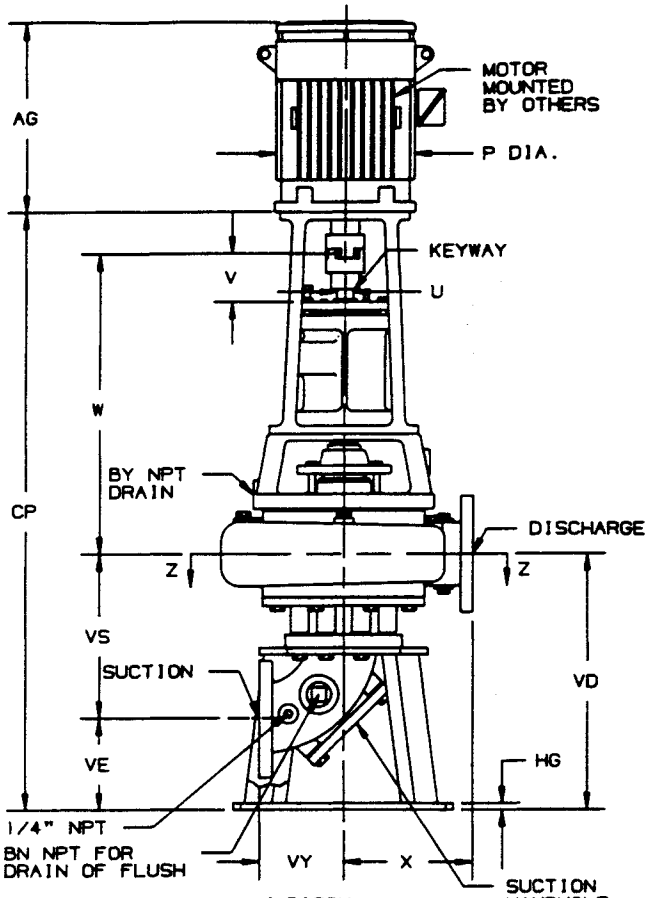


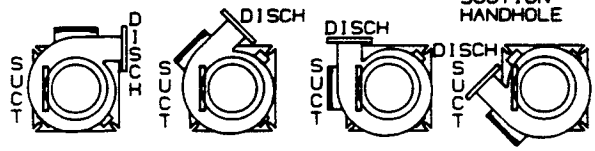
NOTE:
PUMP SIZES 3x3x7 AND 3x3x9 DISCHARGE POSITIONS AVAILABLE ONLY IN 1, 3, 5, AND 7.

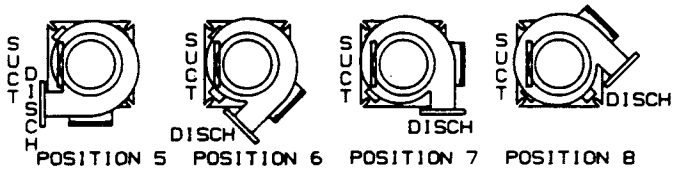
NOTES:
1. ALL DIMENSIONS IN INCHES.
2. DIMENSIONS MAY VARY ± 1/2".
3. NOT FOR CONSTRUCTION PURPOSES UNLESS CERTIFIED.
4. TWO (2) 1/2" NPT CONNECTIONS 180° APART, ON THE STUFFING BOX FOR LUBRICATION PURPOSES ARE FURNISHED AS STANDARD. ON PACKED PUMPS AN ALEMITE FITTING IS PROVIDED IN ONE TAP AND THE REMAINING TAP IS PLUGGED.
5. DISCHARGE POSITION 1 IS FURNISHED AS STANDARD UNLESS SPECIFIED.
6. SUCTION AND DISCHARGE FLANGES ARE AMERICAN STANDARD 125 LBS.
7. CONDUIT BOX IS SHOWN IS APPROXIMATE LOCATION. DIMENSIONS ARE NOT SPECIFIED AS THEY MAY VARY WITH EACH MOTOR MANUFACTURER.
8. 3x3x7 PUMP NOT AVAILABLE IN LEFT HAND CONFIGURATION.

DISCH SUCT CASE BORE	POWER FRAME	A	BN	BY	E	HG	VY	W	X	Z	CP	VD	VE	VS
3x3x7	3C	17	1	1/2	7 1/4	1/2	6 1/2	23 5/8	6	5	39 7/8	16 1/4	6 3/4	9 1/2
3x3x9	3C	17	1	1/2	7 1/4	1/2	6 1/2	23 5/16	7	6 1/8	40 5/8	17 5/16	6 3/4	10 9/16
4x4x7	3C	17	1 1/2	1/2	7 1/4	1/2	6 1/2	23 7/8	7	5 3/8	41 7/8	18	6 15/16	11 1/16
4x4x9A	3C	17	1 1/2	1/2	7 1/4	1/2	6 1/2	23 1/4	8 1/4	7 1/16	41	17 3/4	6 15/16	10 13/16
4x4x9B	4C	17	1 1/2	3/4	7 1/4	1/2	6 1/2	22 11/16	10	7 7/8	42 3/8	19 11/16	6 15/16	12 3/4
4x4x12	4C	17	1 1/2	3/4	7 1/4	1/2	6 1/2	22 5/8	10 1/2	9	42 3/8	19 3/4	6 15/16	12 13/16
4x4x12	5E	17	1 1/2	3/4	7 1/4	1/2	6 1/2	33 5/8	10 1/2	9	53 3/8	19 3/4	6 15/16	12 13/16
4x6x15	5E, 5F	24	1 1/2	3/4	10 3/4	5/8	8	33 5/16	10 1/2	10 1/4	57 3/8	24 1/16	9 7/8	14 3/16

POWER FRAME	U	V	KEYWAY		
			LENGTH	WIDTH	DEPTH
3C, 4C	1 1/4	3 3/16	2	1/4	1/8
5E, 5F	2 3/8	6 3/8	4	5/8	5/16

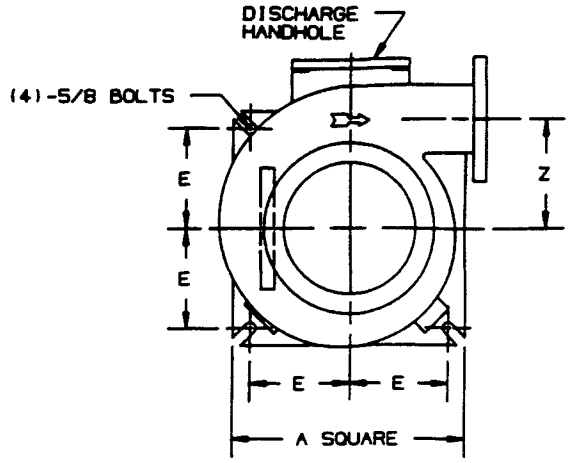




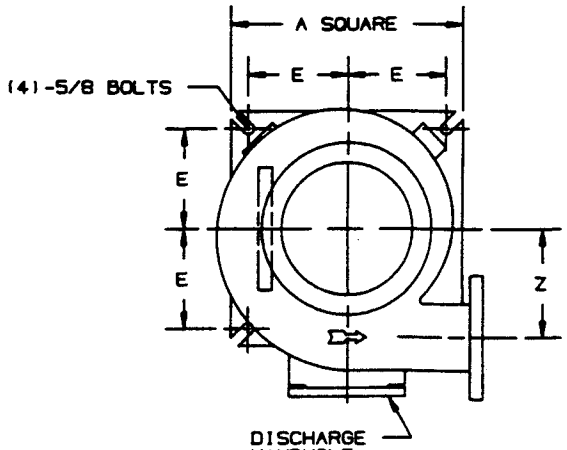


DISCHARGE POSITIONS AVAILABLE
(RIGHT HAND PUMP VIEWED FROM DRIVER END
FOR LEFT HAND POSITIONS SEE PAGE 302)

NOTE:
PUMP SIZE 3x3x7 AND 3x3x9 DISCHARGE POSITIONS AVAILABLE ONLY IN 1, 3, 5, AND 7.



RIGHT HAND ROTATION
CW VIEWED FROM DRIVER END
VIEW Z-Z



LEFT HAND ROTATION
CCW VIEWED FROM DRIVER END
VIEW Z-Z
POSITION 9 SHOWN
(FOR AVAILABLE LEFT HAND POSITIONS SEE PAGE 302)

NOTES:
1. ALL DIMENSIONS IN INCHES.
2. DIMENSIONS MAY VARY ± 1/4".
3. NOT FOR CONSTRUCTION PURPOSES UNLESS CERTIFIED.
4. TWO (2) 1/2" NPT CONNECTIONS 180° APART, ON THE STUFFING BOX FOR LUBRICATION PURPOSES ARE FURNISHED AS STANDARD. ON PACKED PUMPS AN ALEMITE FITTING IS PROVIDED IN ONE TAP AND THE REMAINING TAP IS PLUGGED.
5. DISCHARGE POSITION 1 IS FURNISHED AS STANDARD UNLESS SPECIFIED.
6. SUCTION AND DISCHARGE FLANGES ARE AMERICAN STANDARD 125 LBS.
7. 3x3x7 PUMP NOT AVAILABLE IN LEFT HAND CONFIGURATION.

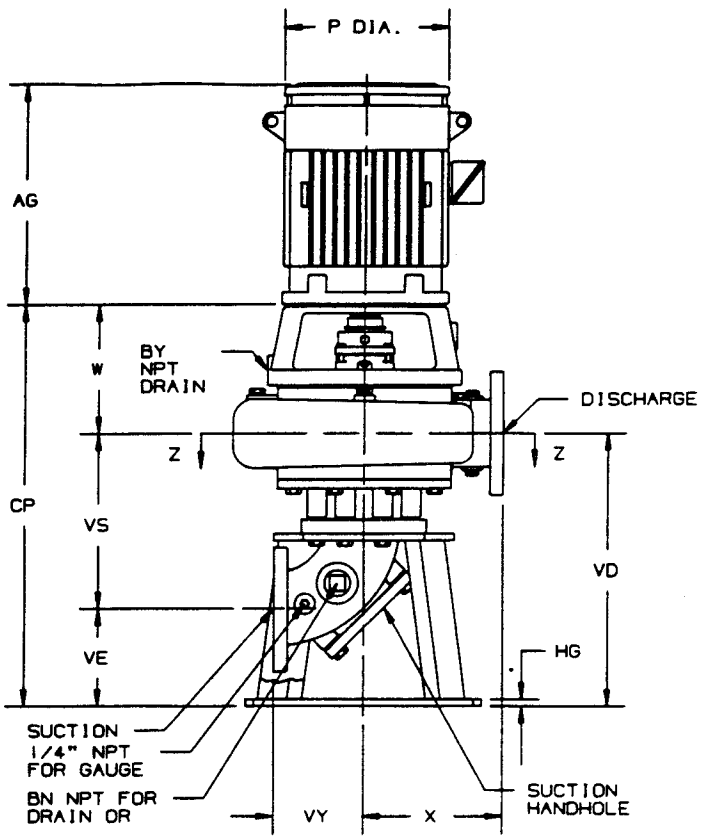
MOTOR FRAME	143HP TO 145HP	182HP TO 184HP	213HP TO 215HP	254HP TO 256HP	284HPH TO 286HPH	324HP TO 326HP	364HP TO 365HP	404HP TO 405HP
P APPROX.	8	10	11	13	16	18	21	22
AG APPROX.	11 12	13 14	16 18	20 21	22 23	25 26	25	28

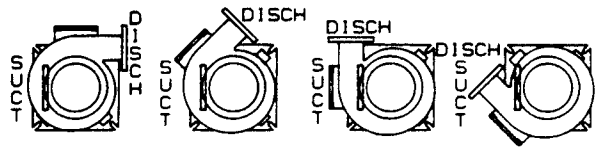
POWER FRAME	U	V	KEYWAY LENGTH	KEYWAY WIDTH	KEYWAY DEPTH
3C, 4C	1 1/4	3 3/16	2	1/4	1/8
5E, 5F	2 3/8	6 3/8	4	5/8	5/16

DISCH SUCT CASE BORE	POWER FRAME	A	BN	BY	E	HG	VY	W	X	Z	CP	VD	VE	VS
3x3x7	3C	17	1	1/2	7 1/4	1/2	6 1/2	23 5/8	6	5	43 1/2	16 1/4	6 3/4	9 1/2
3x3x9	3C	17	1	1/2	7 1/4	1/2	6 1/2	23 5/16	7	6 1/8	44 1/4	17 5/16	6 3/4	10 9/16
4x4x7	3C	17	1 1/2	1/2	7 1/4	1/2	6 1/2	23 7/8	7	5 3/8	45 1/2	18	6 15/16	11 1/16
4x4x9A	3C	17	1 1/2	1/2	7 1/4	1/2	6 1/2	23 1/4	8 1/4	7 1/16	44 5/8	17 3/4	6 15/16	10 13/16
4x4x9B	4C	17	1 1/2	3/4	7 1/4	1/2	6 1/2	22 11/16	10	7 7/8	46 1/8	19 11/16	6 15/16	12 3/4
4x4x12	4C	17	1 1/2	3/4	7 1/4	1/2	6 1/2	22 5/8	10 1/2	9	46 1/8	19 3/4	6 15/16	12 13/16
4x4x12	5E	17	1 1/2	3/4	7 1/4	1/2	6 1/2	33 5/8	10 1/2	9	58 7/8	19 3/4	6 15/16	12 13/16
4x6x15	5E, 5F	24	1 1/2	3/4	10 3/4	5/8	8	33 5/16	10 1/2	10 1/4	62 7/8	24 1/16	9 7/8	14 3/16

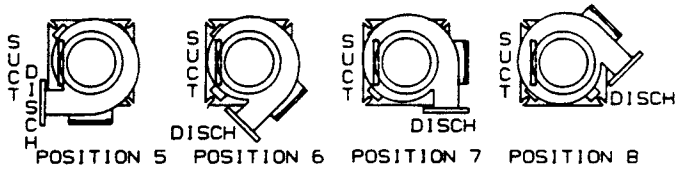
ADD 3/4" TO CP FOR PUMPS ON P.F. 4C WITH MOTOR FRAMES 284HPH TO 324HP. SUBTRACT 2" FROM CP FOR PUMPS ON P.F. 5E AND 5F WITH MOTOR FRAMES SMALLER THAN 284HPH.

AURORA MODEL 654A PUMP





POSITION 1 POSITION 2 POSITION 3 POSITION 4

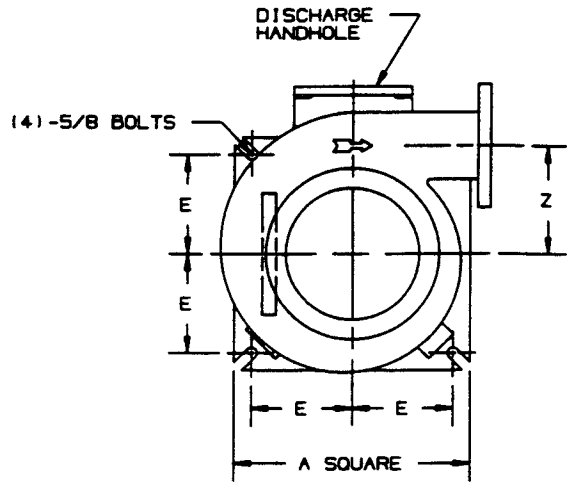


POSITION 5 POSITION 6 POSITION 7 POSITION 8

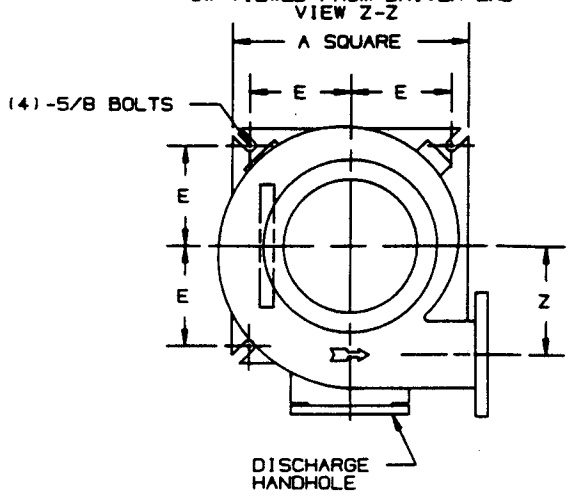
DISCHARGE POSITIONS AVAILABLE
(RIGHT HAND PUMP VIEWED FROM DRIVER END
FOR LEFT HAND POSITIONS SEE PAGE 302)

NOTE:
PUMP SIZES 3x3x7 AND 3x3x9 DISCHARGE POSITIONS AVAILAVLE ONLY IN 1, 3, 5, AND 7.

MOTOR FRAME	143TCV TO 145TCV	182TCV TO 184TCV	213TCV TO 215TCV	254TCV TO 256TCV	284TCV TO 286TCV	324TCV TO 326TCV	364TCV TO 365TCV	404TCV TO 405TCV
P APPROX.	8	10	11	13	16	18	21	22
AG APPROX.	11 12	13 14	16 18	20 21	22 23	25 26	25	28



RIGHT HAND ROTATION
CW VIEWED FROM DRIVER END
VIEW Z-Z



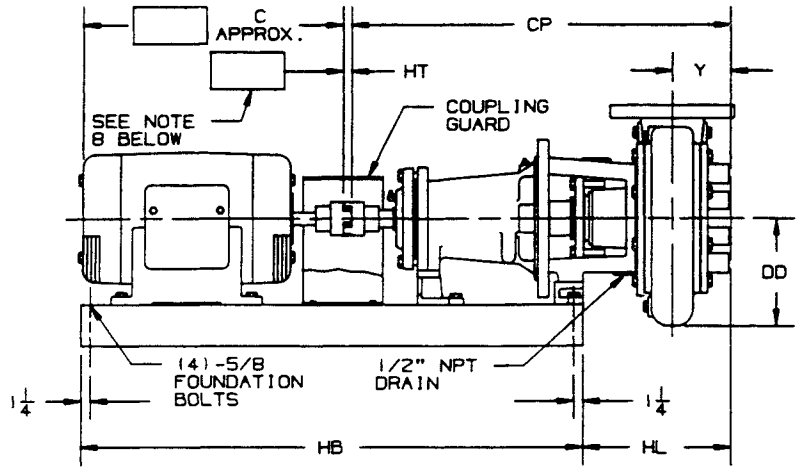
LEFT HAND ROTATION
CCW VIEWED FROM DRIVER END
VIEW Z-Z
POSITION 9 SHOWN
(FOR AVAILABLE LEFT HAND
POSITIONS SEE PAGE 302)

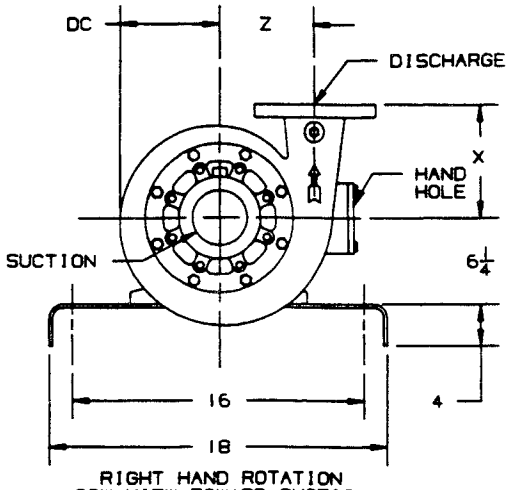
NOTES:
1. ALL DIMENSIONS IN INCHES.
4. DIMENSIONS MAY VARY ± 1/4".
3. NOT FOR CONSTRUCTION PURPOSES UNLESS CERTIFIED.
4. TWO (2) 1/2" NPT CONNECTIONS 180° APART, ON THE STUFFING BOX FOR LUBRICATION PURPOSES ARE FURNISHED AS STANDARD.
5. DISCHARGE POSITION 1 IS FURNISHED AS STANDARD UNLESS SPECIFIED.
6. SUCTION AND DISCHARGE FLANGES ARE AMERICAN STANDARD 125 LBS.
7. HEIGHT (AG) AND DIAMETERS (P) DIMENSIONS OF MOTOR WILL VARY BASED ON MAKE AND STYLE OF MOTOR. DIMENSIONS SHOWN REFLECT AURORA STANDARD MOTORS. SEE INDIVIDUAL MOTOR SUPPLIER DIMENSIONAL DATA SHEETS FOR YOUR APPLICATION. CONDUIT BOX IS SHOWN IN APPROXIMATE LOCATION. DIMENSIONS ARE NOT SPECIFIED AS THEY VARY WITH EACH MOTOR MANUFACTURER.
8. 3x3x7 PUMP NOT AVAILABLE IN LEFT HAND CONFIGURATION.

DISCH SUCT CASE BORE	MOTOR SHAFT EXT. TYPE	A	BN	BY	E	HG	VY	W	X	Z	CP	VD	VE	VS
3x3x7	3C, 4C	17	1	1/2	7 1/4	1/2	6 1/2	10 5/16	6	5	26 9/16	16 1/4	6 3/4	9 1/2
3x3x9	3C, 4C	17	1	1/2	7 1/4	1/2	6 1/2	10	7	6 1/8	27 5/16	17 5/16	6 3/4	10 9/16
4x4x7	3C, 4C	17	1 1/2	1/2	7 1/4	1/2	6 1/2	10 9/16	7	5 3/8	28 9/16	18	6 15/16	11 1/16
4x4x9A	3C, 4C	17	1 1/2	1/2	7 1/4	1/2	6 1/2	9 15/16	8 1/4	7 1/16	27 11/16	17 3/4	6 15/16	10 13/16
4x4x9B	3C, 4C	17	1 1/2	3/4	7 1/4	1/2	6 1/2	9 1/2	10	7 7/8	29 3/16	19 11/16	6 15/16	12 3/4
4x4x12	3C, 4C	17	1 1/2	3/4	7 1/4	1/2	6 1/2	9 7/16	10 1/2	9	29 3/16	19 3/4	6 15/16	12 13/16
4x4x12	5E, 5F	17	1 1/2	3/4	7 1/4	1/2	6 1/2	10 5/8	10 1/2	9	30 3/8	19 3/4	6 15/16	12 13/16
4x6x15	5E, 5F	24	1 1/2	3/4	10 3/4	5/8	8	10 5/16	10 1/2	10 1/4	34 3/8	24 1/16	9 7/8	14 3/16

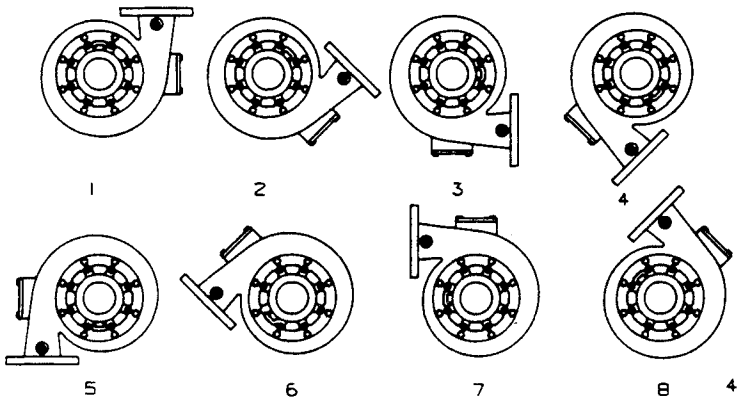
AURORA MODEL 651A PUMP

POWER FRAME 3C
FORMED STEEL BASE

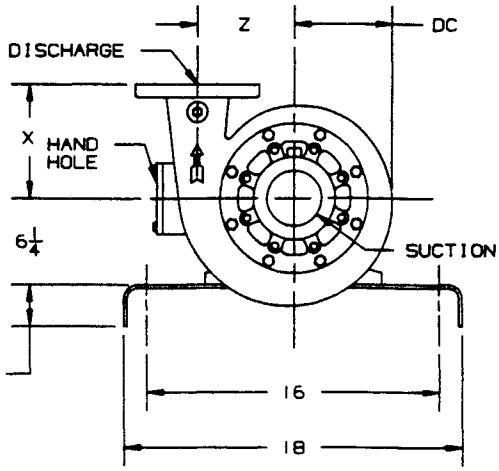




RIGHT HAND ROTATION
CCW VIEW TOWARD SUCTION



DISCHARGE POSITIONS AVAILABLE
(RIGHT HAND PUMP VIEWED FROM SUCTION END
FOR LEFT HAND POSITIONS SEE PAGE 301)



LEFT HAND ROTATION
CW VIEW TOWARD SUCTION
POSITION 9 SHOWN
(FOR AVAILABLE LEFT HAND
POSITIONS SEE PAGE 301)

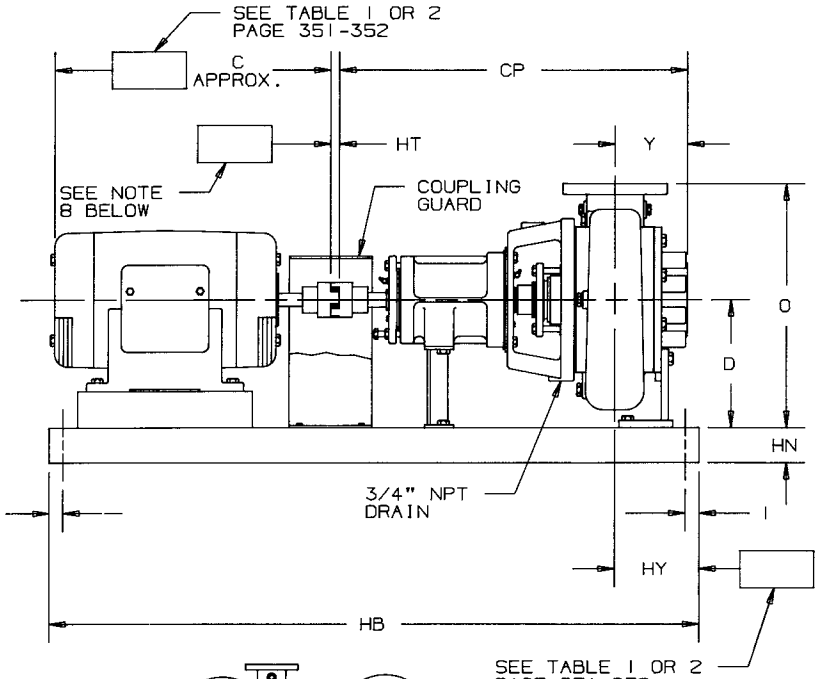
NOTES:
1. ALL DIMENSIONS IN INCHES.
2. DIMENSIONS MAY VARY ± 1/4".
3. NOT FOR CONSTRUCTION PURPOSES UNLESS CERTIFIED.
4. TWO (2) 1/2" NPT CONNECTIONS 180° APART, ON THE STUFFING BOX FOR LUBRICATION PURPOSES ARE FURNISHED AS STANDARD. ON PACKED PUMPS AN ALEMITE FITTING IS PROVIDED IN ONE TAP AND THE REMAINING TAP IS PLUGGED.
5. DISCHARGE POSITION 1 IS FURNISHED AS STANDARD UNLESS SPECIFIED.
6. SUCTION AND DISCHARGE FLANGES ARE AMERICAN STANDARD 125 LBS.
7. CONDUIT BOX IS SHOWN IS APPROXIMATE LOCATION. DIMENSIONS ARE NOT SPECIFIED AS THEY MAY VARY WITH EACH MOTOR MANUFACTURER.
8. STANDARD COUPLING ILLUSTRATED. "HT" DIMENSION MAY VARY 1/8" TO 1". SPACER COUPLING "HT" DIMENSION IS 3 1/2".
9. 3x3x7 PUMP NOT AVAILABLE IN LEFT HAND CONFIGURATION.

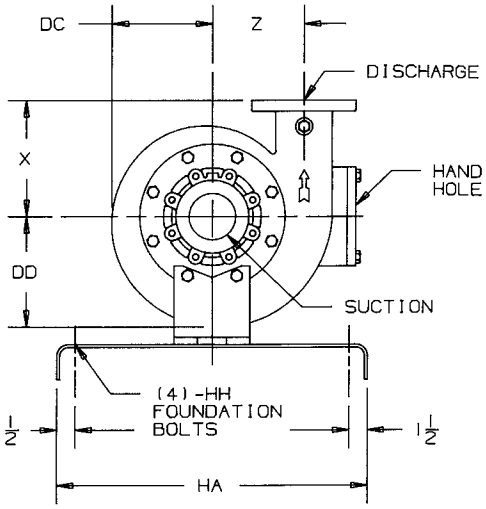
MOTOR FRAME	C APPROX.	HB STD. CPLG.	HB SPCR. CPLG.
56	12	38	38
143T	11	38	38
145T	12	38	38
182T	13	38	38
184T	14	38	38
213T	16	38	38
215T	18	38	38
254T	21	38	42

DISCH SUCT CASE BORE	POWER FRAME	HL	X	Y	Z	CP	DC	DD
3x3x7	3C	9 13/16	6	3	5	26 5/8	5 1/2	6 1/8
3x3x9	3C	10 9/16	7	4 1/16	6 1/8	27 3/8	6 5/8	7 3/16
4x4x7	3C	11 9/16	7	4 1/2	5 3/8	28 3/8	6	6 13/16
4X4x9A	3C	10 11/16	8 1/4	4 1/4	7 1/16	27 1/2	7 1/4	7 13/16

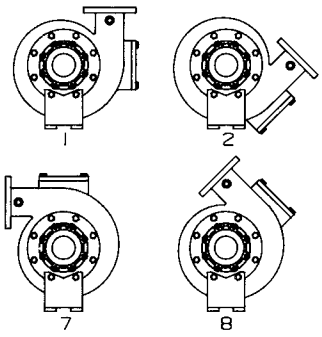
AURORA MODEL 651A PUMP

POWER FRAMES 4C, 5E & 5F
FORMED STEEL BASE

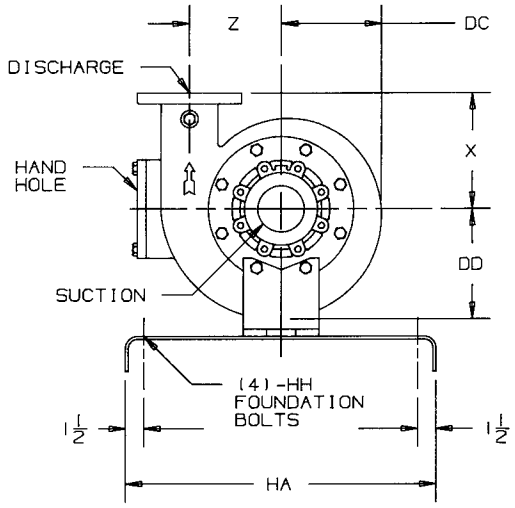




RIGHT HAND ROTATION
CCW VIEW TOWARD SUCTION



DISCHARGE POSITIONS AVAILABLE
(RIGHT HAND PUMP VIEWED FROM SUCTION END
FOR LEFT HAND POSITIONS SEE PAGE 301)



LEFT HAND ROTATION
CW VIEW TOWARD SUCTION
POSITION 9 SHOWN
(FOR AVAILABLE LEFT HAND
POSITIONS SEE PAGE 301)

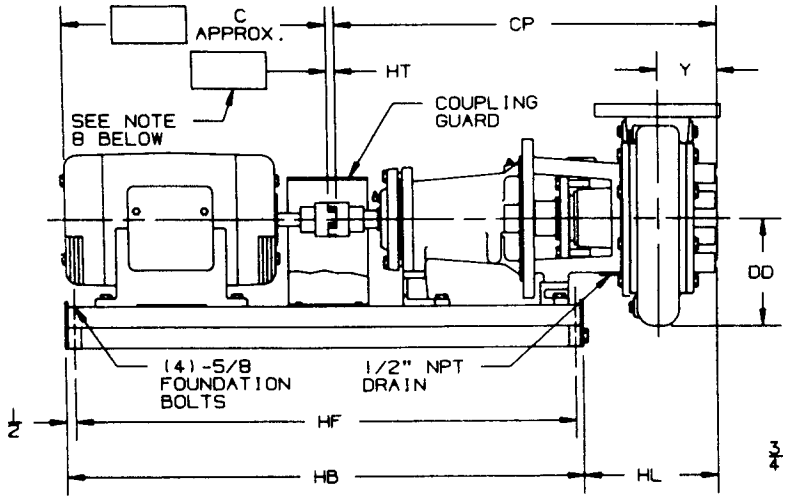
NOTES:
1. ALL DIMENSIONS IN INCHES.
2. DIMENSIONS MAY VARY ± 1/4".
3. NOT FOR CONSTRUCTION PURPOSES UNLESS CERTIFIED.
4. TWO (2) 1/2" NPT CONNECTIONS 180° APART, ON THE STUFFING BOX FOR LUBRICATION PURPOSES ARE FURNISHED AS STANDARD. ON PACKED PUMPS AN ALEMITE FITTING IS PROVIDED IN ONE TAP AND THE REMAINING TAP IS PLUGGED.
5. DISCHARGE POSITION 1 IS FURNISHED AS STANDARD UNLESS SPECIFIED.
6. SUCTION AND DISCHARGE FLANGES ARE AMERICAN STANDARD 125 LBS.
7. CONDUIT BOX IS SHOWN IS APPROXIMATE LOCATION. DIMENSIONS ARE NOT SPECIFIED AS THEY MAY VARY WITH EACH MOTOR MANUFACTURER.
8. STANDARD COUPLING ILLUSTRATED."HT" DIMENSION 1" MAXIMUM. FOR SPACER COUPLING SIZE AND "HT" DIMENSION REFER TO PAGE 353 (TABLE 3).

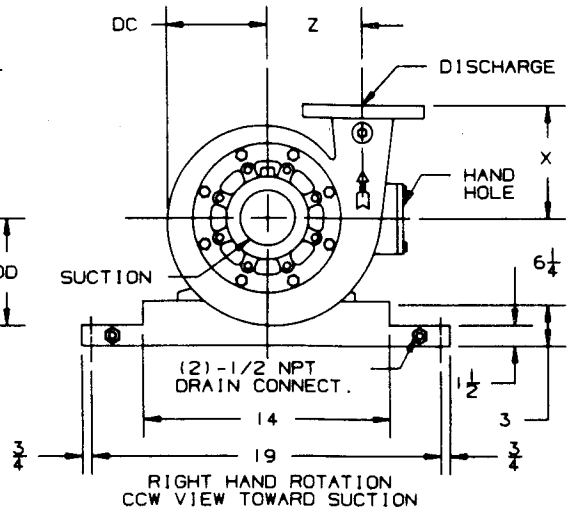
BASE	HA	HB	HH	HN
2	15	48	5/8	3 3/8
3	15	54	5/8	3 3/8
4	15	60	5/8	3 3/8
5	15	64	5/8	3 3/8
6	15	70	5/8	3 3/8
8	18	68	5/8	4
9	18	76	5/8	4
16	22	72	5/8	4
17	22	84	5/8	4

DISCH SUCT CASE BORE	POWER FRAME	D	O	X	Y	Z	CP	DC	DD
4x4x9B	4C	11	21	10	6 3/16	7 7/8	28 7/8	8 15/16	9 13/16
4x4x12	4C	13 1/2	25	10 1/2	6 1/4	9	28 7/8	9 7/8	10 3/8
4x4x12	5E	13 1/2	25	10 1/2	6 1/4	9	39 7/8	9 7/8	10 3/8
4x6x15	5E, 5F	15 1/4	25 3/4	10 1/2	6 3/16	10 1/4	39 1/2	11 1/8	11 5/8

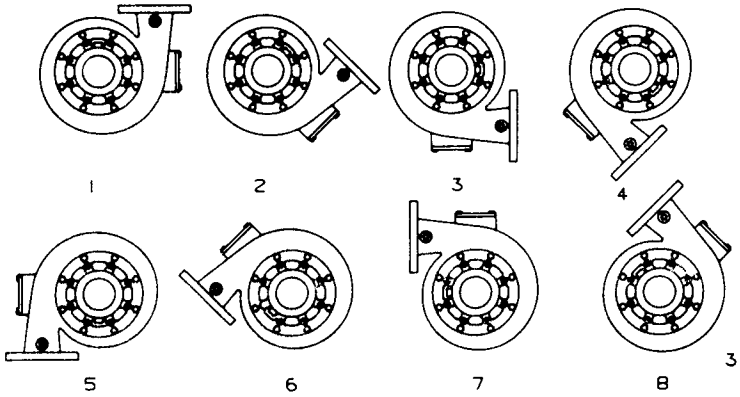
AURORA MODEL 651A PUMP

POWER FRAME 3C
DRIP RIM STEEL BASE

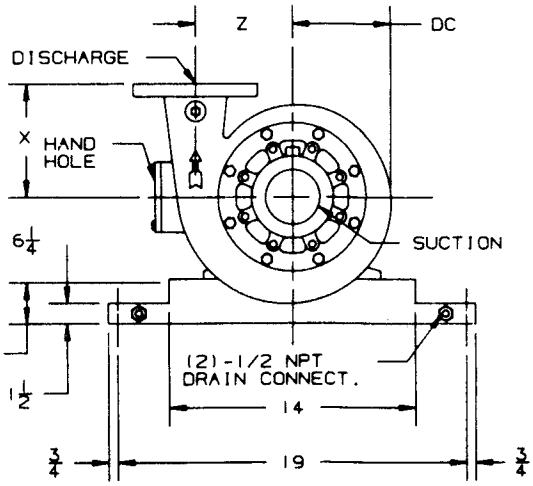




RIGHT HAND ROTATION
CCW VIEW TOWARD SUCTION



DISCHARGE POSITIONS AVAILABLE
(RIGHT HAND PUMP VIEWED FROM SUCTION END
FOR LEFT HAND POSITIONS SEE PAGE 301)



LEFT HAND ROTATION
CW VIEW TOWARD SUCTION
POSITION 9 SHOWN
(FOR AVAILABLE LEFT HAND
POSITIONS SEE PAGE 301)

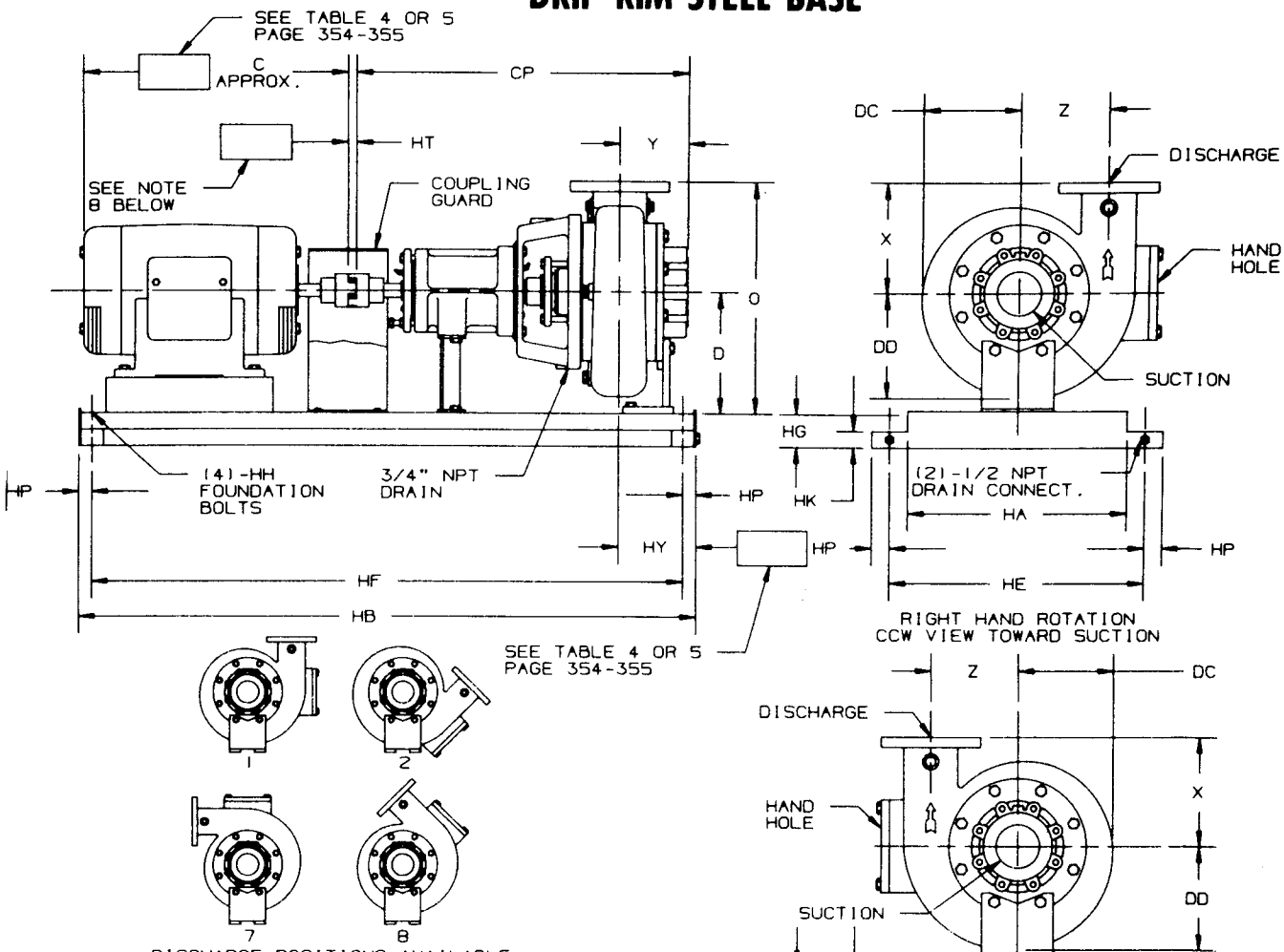
NOTES:
1. ALL DIMENSIONS IN INCHES.
2. DIMENSIONS MAY VARY ± 1/4".
3. NOT FOR CONSTRUCTION PURPOSES UNLESS CERTIFIED.
4. TWO (2) 1/2" NPT CONNECTIONS 180° APART, ON THE STUFFING BOX FOR LUBRICATION PURPOSES ARE FURNISHED AS STANDARD. ON PACKED PUMPS AN ALEMITE FITTING IS PROVIDED IN ONE TAP AND THE REMAINING TAP IS PLUGGED.
5. DISCHARGE POSITION 1 IS FURNISHED AS STANDARD UNLESS SPECIFIED.
6. SUCTION AND DISCHARGE FLANGES ARE AMERICAN STANDARD 125 LBS.
7. CONDUIT BOX IS SHOWN IS APPROXIMATE LOCATION. DIMENSIONS ARE NOT SPECIFIED AS THEY MAY VARY WITH EACH MOTOR MANUFACTURER.
8. STANDARD COUPLING ILLUSTRATED. "HT" DIMENSION MAY VARY 1/8" TO 1". SPACER COUPLING "HT" DIMENSION IS 3 1/2".
9. 3x3x7 PUMP NOT AVAILABLE IN LEFT HAND CONFIGURATION.

BASE	SIZE	HB	HF
7	14x36	36 1/2	35
8	14x46	42 1/2	41

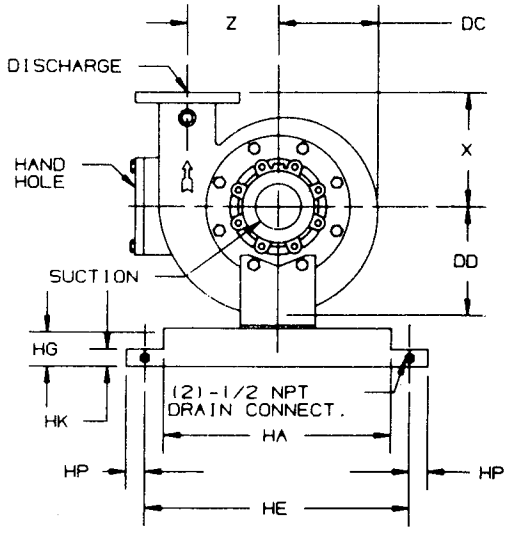
MOTOR FRAME	C APPROX.	BASE STD. CPLG.	BASE SPCR. CPLG.
56	12	7	7
143T	11	7	7
145T	12	7	7
182T	13	7	7
184T	14	7	7
213T	16	7	7
215T	18	7	8
254T	21	8	8

DISCH SUCT CASE BORE	POWER FRAME	HL	X	Y	Z	CP	DC	DD
3x3x7	3C	9 5/16	6	3	5	26 5/8	5 1/2	6 1/8
3x3x9	3C	10 1/4	7	4 1/16	6 1/8	28 3/8	6 5/8	7 3/16
4x4x7	3C	11 1/16	7	4 1/2	5 3/8	28 3/8	6	6 13/16
4x4x9A	3C	10 3/16	8 1/4	4 1/4	7 1/16	27 1/2	7 1/4	7 13/16

POWER FRAMES 4C, 5E & 5F
DRIP RIM STEEL BASE



DISCHARGE POSITIONS AVAILABLE
(RIGHT HAND PUMP VIEWED FROM SUCTION END
FOR LEFT HAND POSITIONS SEE PAGE 301)

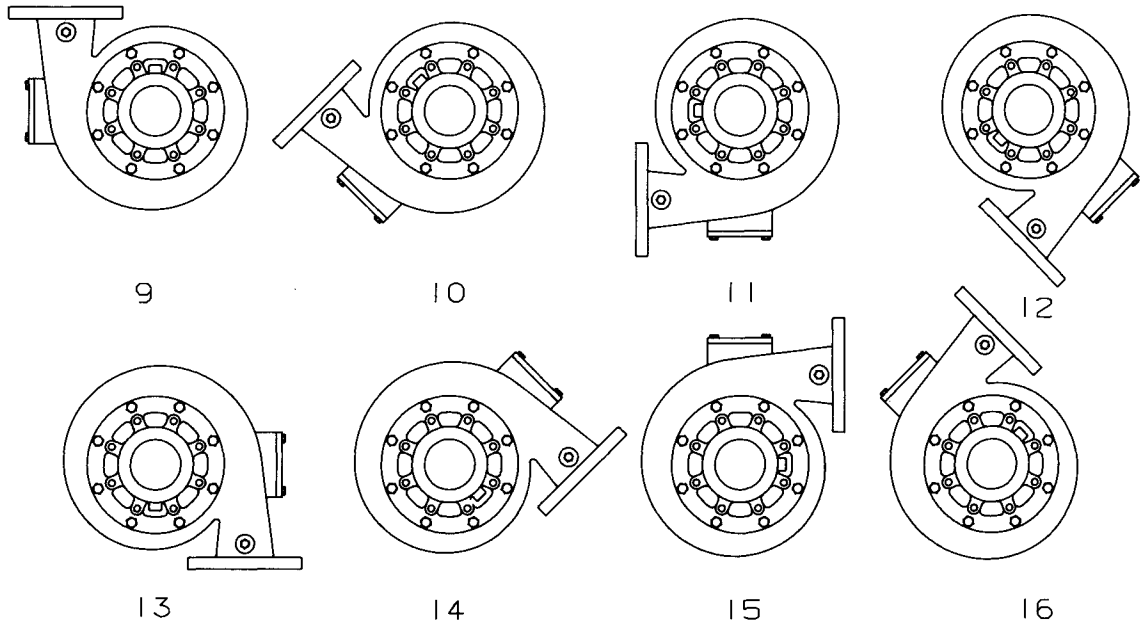


NOTES:
1. ALL DIMENSIONS IN INCHES.
2. DIMENSIONS MAY VARY ± 1/4".
3. NOT FOR CONSTRUCTION PURPOSES UNLESS CERTIFIED.
4. TWO (2) 1/2" NPT CONNECTIONS 180° APART, ON THE STUFFING BOX FOR LUBRICATION PURPOSES ARE FURNISHED AS STANDARD. ON PACKED PUMPS AN ALEMITE FITTING IS PROVIDED IN ONE TAP AND THE REMAINING TAP IS PLUGGED.
5. DISCHARGE POSITION 1 IS FURNISHED AS STANDARD UNLESS SPECIFIED.
6. SUCTION AND DISCHARGE FLANGES ARE AMERICAN STANDARD 125 LBS.
7. CONDUIT BOX IS SHOWN IS APPROXIMATE LOCATION. DIMENSIONS ARE NOT SPECIFIED AS THEY MAY VARY WITH EACH MOTOR MANUFACTURER.
8. STANDARD COUPLING ILLUSTRATED. "HT" DIMENSION 1" MAXIMUM. FOR SPACER COUPLING SIZE AND "HT" DIMENSION REFER TO PAGE 353 (TABLE 3).
9. 3 GROUT HOLES ARE PROVIDED IN TOP OF BASE.

BASE	SIZE	HA	HB	HE	HF	HG	HH	HK	HP
9	14x48	14	48 1/2	19	47	3	5/8	1 1/2	3/4
10	14x56	14	56 1/2	19	55	3	5/8	1 1/2	3/4
13	18x64	18	64 1/2	25 1/8	62 7/8	4	3/4	2	13/16
14	18x72	18	72 1/2	25 1/8	70 7/8	4	3/4	2	13/16
17	22x74	22	74 1/2	29 1/8	72 7/8	4 1/2	3/4	2	13/16
18	22x82	22	82 1/2	29 1/8	80 7/8	4 1/2	3/4	2	13/16

DISCH SUCT CASE BORE	POWER FRAME	D	O	X	Y	Z	CP	DC	DD
4x4x9B	4C	11	21	10	6 3/16	7 7/8	28 7/8	8 15/16	9 13/16
4x4x12	4C	13 1/2	25	10 1/2	6 1/4	9	28 7/8	9 7/8	10 3/8
4x4x12	5E	13 1/2	25	10 1/2	6 1/4	9	39 7/8	9 7/8	10 3/8
4x6x15	5E, 5F	15 1/4	25 3/4	10 1/2	6 3/16	10 1/4	39 1/2	11 1/8	11 5/8

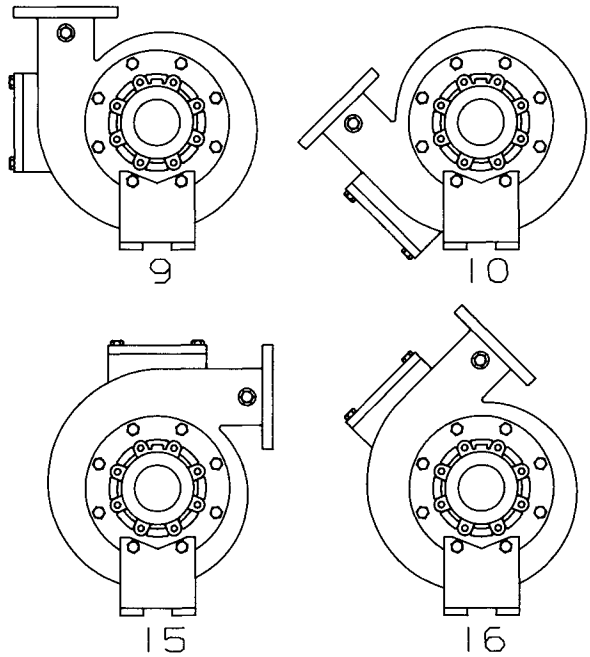
LEFT HAND DISCHARGE POSITIONS
3 x 3 x 9, 4 x 4 x 7 AND 4 x 4 x 9A ONLY



DISCHARGE POSITIONS AVAILABLE
(LEFT HAND PUMP VIEWED FROM SUCTION END)

NOTES:
1. THIS PAGE IS FOR LEFT HAND DISCHARGE POSITIONS; FOR RIGHT HAND POSITIONS REFER TO INDIVIDUAL DIMENSION PAGES.
2. THE 3x3x7 PUMP IS NOT AVAILABLE IN LEFT HAND CONFIGURATION.
3. THE ABOVE EIGHT POSITIONS ARE ONLY AVAILABLE ON THE FOLLOWING PUMPS: 3x3x9, 4x4x7, AND 4x4x9A.
4. THE BELOW FOUR POSITIONS ARE THE ONLY AVAILABLE POSITIONS ON THE FOLLOWING PUMPS: 4x4x9B, 4x4x12, AND 4x6x15.

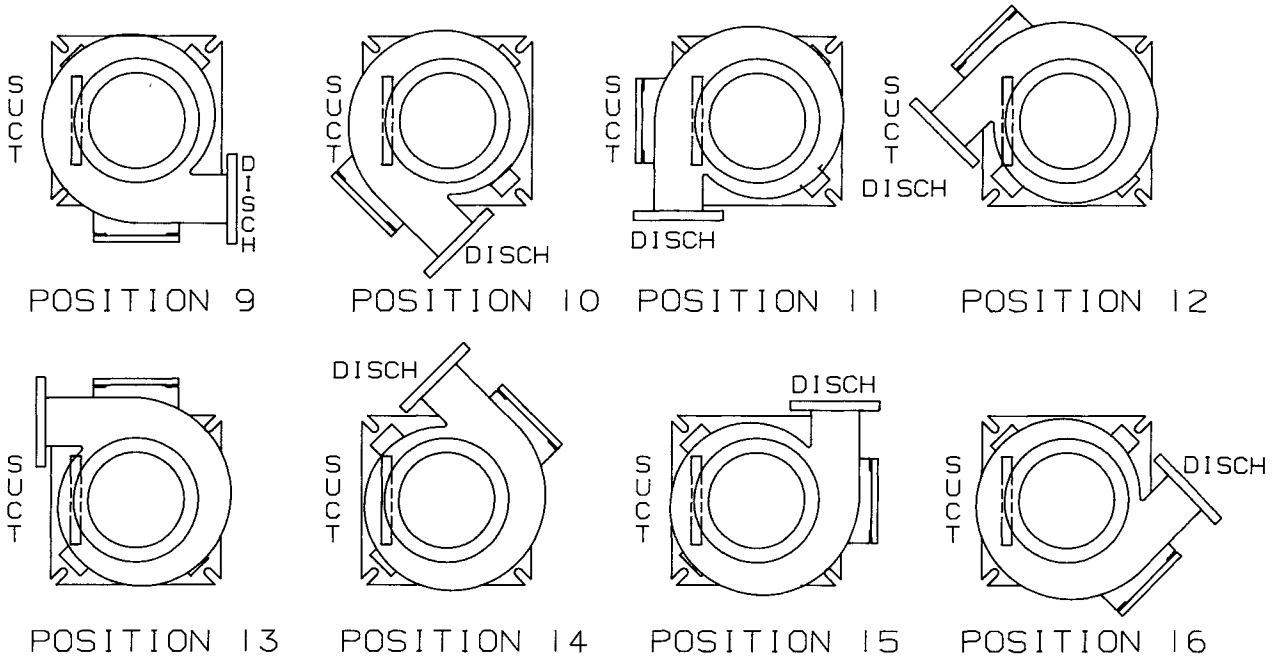
4 x 4 x 9B, 4 x 4 x 12 AND 4 x 6 x 15 ONLY



DISCHARGE POSITIONS AVAILABLE
(LEFT HAND PUMP VIEWED FROM SUCTION END)

AURORA MODEL 652A, 653A, 654A PUMP

LEFT HAND DISCHARGE POSITIONS



DISCHARGE POSITIONS AVAILABLE
(LEFT HAND PUMP VIEWED FROM DRIVER END)

NOTES:
1. THIS PAGE IS FOR LEFT HAND DISCHARGE POSITIONS; FOR RIGHT HAND POSITIONS REFER TO INDIVIDUAL DIMENSION PAGES.
2. THE 3x3x7 PUMP IS NOT AVAILABLE IN LEFT HAND CONFIGURATION.
3. THE 3x3x9 PUMP IS AVAILABLE ONLY IN POSITIONS 9, 11, 13, AND 15.

AURORA MODEL 651A PUMP
FORMED STEEL BASE
STANDARD COUPLING

TABLE 1

POWER SERIES	CASE BORE SUCT. DISCH.	MOTOR FRAME	182T	184T	213T	215T	254T	256T	284TS	284T	286TS	286T	324TS	324T	326TS	326T	364TS	364T	365TS	365T
		C	13	14	16	18	21	23	22	24	24	25	25	26	26	28	27	29	28	30
4	4x4x9B	BASE	2	2	3	3	3	3	3	3	3	4								
		HY	8	8	8	8	8	8	8	8	8	8								
4	4x4x12	BASE	2	2	3	3	3	3	3	3	3	4								
		HY	8	8	8	8	8	8	8	8	8	8								
5	4x4x12	BASE			4	4	5	5	5	6	6	8	8	8	8	9				
		HY			8	8	8	8	8	8	8	8	8	8	8	8				
5	4x6x15	BASE			5	5	6	6	6	6	6	6	8	8	8	16	16	16	16	16
		HY			8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8

POWER SERIES	CASE BORE SUCT. DISCH.	MOTOR FRAME	404TS	404T	405TS	405T	444TS	444T
		C	30	33	31	34	34	38
5	4x6x15	BASE	16	16	16	16	16	17
		HY	8	8	8	8	8	8

NOTES:
1. ALL DIMENSIONS IN INCHES.
2. NOT FOR CONSTRUCTION PURPOSES UNLESS CERTIFIED.

AURORA MODEL 651A PUMP
FORMED STEEL BASE
SPACER COUPLING

TABLE 2

CASE BORE SUCT. DISCH.	POWER SERIES	MOTOR FRAME C	182T	184T	213T	215T	254T	256T	284TS	284T	286TS	286T	324TS	324T	326TS	326T	364TS	364T	365TS	365T
4x4x9B	4	BASE	2	2	3	3	4	4	4	4	4	4								
		HY	8	8	8	8	8	8	8	8	8	8								
4x4x12	4	BASE	2	2	3	3	4	4	4	4	4	4								
		HY	8	8	8	8	8	8	8	8	8	8								
4x4x12	5	BASE			5	5	6	6	6	6	6	9	9	9	9	9				
		HY			8	8	8	8	8	8	8	8	8	8	8	8				
4x6x15	5	BASE			5	6	6	6	6	9	9	9	9	9	9	9	17	17	17	17
		HY			8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8

CASE BORE SUCT. DISCH.	POWER SERIES	MOTOR FRAME C	404TS	404T	405TS	405T	444TS	444T
4x6x15	5	BASE	17	17	17	17	17	17
		HY	8	8	8	8	8	8

NOTES:
1. ALL DIMENSIONS IN INCHES.
2. NOT FOR CONSTRUCTION PURPOSES UNLESS CERTIFIED.

TABLE 3

CASE BORE SUCT. DISCH.	POWER SERIES	MOTOR FRAME	182T	184T	213T	215T	254T	256T	284T	286T	324T	326T	364TS	364T	365TS	365T	404TS	404T	405TS	405T	444T
4x4x9B	4	SIZE	6	6	6	6	7	8	8												
		HT	5	5	5	5	5	5	5												
4x4x12	4	SIZE	6	6	6	6	7	8	8												
		HT	5	5	5	5	5	5	5												
4x4x12	5	SIZE					9	9	9	9	9	10									
		HT					5	5	5	5	5	5									
4x6x15	5	SIZE				9	9	9	9	9	9	10	12	10	12	12	12	12	12	12	12
		HT				7 3/4	7 3/4	7 3/4	7 3/4	7 3/4	7 3/4	7 3/4	7 3/4	7 3/4	7 3/4	7 3/4	7 3/4	7 3/4	7 3/4	7 3/4	7 3/4

NOTES:
1. ALL DIMENSIONS IN INCHES.
2. NOT FOR CONSTRUCTION PURPOSES UNLESS CERTIFIED.
3. SIZE: COUPLING SIZE FOR TYPE SC WOODS SURE-FLEX SPACER COUPLINGS.
4. HT: COUPLING GAP (DISTANCE BETWEEN SHAFTS)

AURORA MODEL 651A PUMP
DRIP RIM STEEL BASE
STANDARD COUPLING

TABLE 4

CASE BORE SUCT. DISCH.	POWER SERIES	MOTOR FRAME	182T	184T	213T	215T	254T	256T	284TS	284T	286TS	286T	324TS	324T	326TS	326T	364TS	364T	365TS	365T
4x4x9B	4	C	13	14	16	18	21	23	22	24	24	25	25	26	26	28	27	29	28	30
		BASE	9	9	9	9	10	10	10	10										
		HY	8	8	8	8	8	8	8	8										
4x4x12	4	BASE	9	9	9	9	10	10	10	10										
		HY	8	8	8	8	8	8	8	8										
4x4x12	5	BASE					13	13	14	14	14	14	14	14	14	14				
		HY					8	8	8	8	8	8	8	8	8	8				
4x6x15	5	BASE				13	13	13	13	14	14	14	14	14	14	14	14	14	14	14
		HY				8	8	8	8	8	8	8	8	8	8	8	8	8	8	8

CASE BORE SUCT. DISCH.	POWER SERIES	MOTOR FRAME	404TS	404T	405TS	405T	444TS	444T
4x6x15	5	C	30	33	31	34	34	38
		BASE	17	17	17	18	18	18
		HY	8	8	8	8	8	8

NOTES:
1. ALL DIMENSIONS IN INCHES.
2. NOT FOR CONSTRUCTION PURPOSES UNLESS CERTIFIED.

TABLE 5

CASE BORE SUCT. DISCH.	POWER SERIES	MOTOR FRAME	182T	184T	213T	215T	254T	256T	284TS	284T	286TS	286T	324TS	324T	326TS	326T	364TS	364T	365TS	365T
		C	13	14	16	18	21	23	22	24	24	25	25	26	26	28	27	29	28	30
4x4x9B	4	BASE	9	9	10	10	10	13	13	13										
		HY	8	8	8	8	8	8	8	8										
4x4x12	4	BASE	9	9	10	10	10	13	13	13										
		HY	8	8	8	8	8	8	8	8										
4x4x12	5	BASE			13	13	14	14	14	14	14	14	14	14	14	17				
		HY			8	8	8	8	8	8	8	8	8	8	8	8				
4x6x15	5	BASE			13	14	14	14	14	14	17	17	17	17	17	18	18	18	18	18
		HY			8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8

CASE BORE SUCT. DISCH.	POWER SERIES	MOTOR FRAME	404TS	404T	405TS	405T	444TS	444T
		C	30	33	31	34	34	38
4x6x15	5	BASE	18	18	18	18	18	18
		HY	8	8	8	8	8	8

NOTES:
1. ALL DIMENSIONS IN INCHES.
2. NOT FOR CONSTRUCTION PURPOSES UNLESS CERTIFIED.

AURORA®
Pentair Pump Group

INSTRUCTION MANUAL
REPAIR
MODEL 651A

6

SERVICE

Your Aurora pump requires no maintenance other than periodic inspection, occasional cleaning and lubrication of bearings. The intent of inspection is to prevent breakdown, thus obtaining optimum service life. The liquid end of the pump is lubricated by the fluid being pumped and therefore does not require periodic lubrication. The motor, however, may require lubrication, in which case, the motor manufacturer's recommendations should be followed.

LUBRICATION OF BEARINGS

The 650 Series pumps are available with regreasable shaft bearings as standard.

Regreasable bearings require periodic lubrication, which can be accomplished by using the lubrication fittings in the cartridge cap and power frame. Lubricate the bearings at regular intervals using a grease of high quality. Lithium grease is recommended as a lubricant for pumps operating in both wet and dry locations. Mixing of different brands of grease should be avoided due to possible chemical reactions between the brands which could damage the bearings. Avoid vegetable- or animal-base greases, which can develop acids, as well as grease containing rosin, graphite, talc and other impurities. Under no circumstances should used grease be reused.

Over lubrication should be avoided as it may result in overheating and possible bearing failure. Under normal application, adequate lubrication is assured if the amount of grease is maintained at 1/3 to 1/2 the capacity of the bearing and adjacent space surrounding it.

In dry locations, the power frame 3C bearings will need lubrication at least every 600 hours of running time or every 6 to 12 months, whichever is more frequent. In wet locations the bearings should be lubricated at least every 300 hours of running time or every 4 to 6 months, whichever is more frequent. A unit is considered to be installed in a wet location if the pump and motor are exposed to dripping water, to the weather, or to heavy condensation such as is found in unheated and poorly ventilated underground locations.

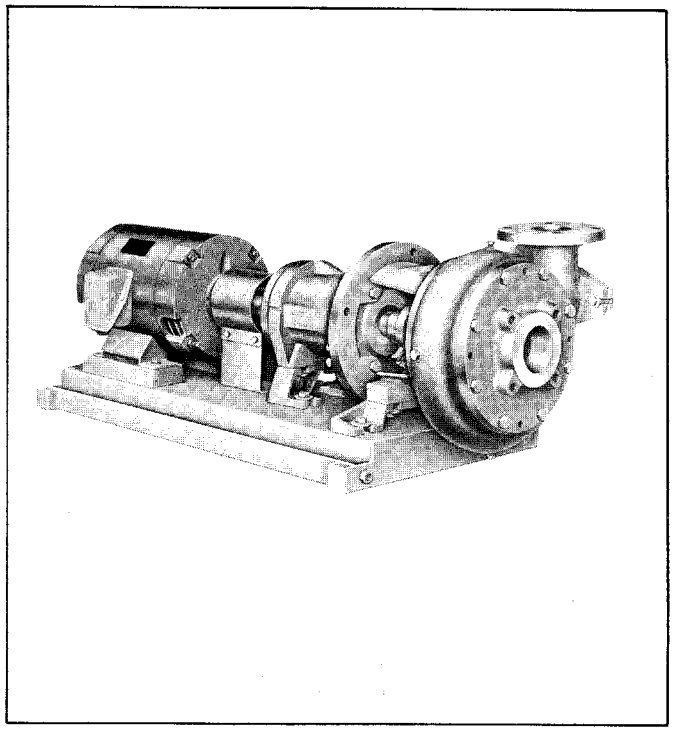
In dry locations, the power frame 4C bearings will need lubrication at least every 2,000 hours of running or every 6 to 12 months, whichever is more frequent. In wet locations the bearings should be lubricated at least every 1,000 hours of running time or every 4 to 6 months, whichever is more frequent.

The 5E and 5F bearing frames have back-to-back angular contact bearings (50). This style bearing requires more frequent lubrication intervals. It is suggested that this bearing be lubricated every 1,000 hours.

The 5F power frame has a spherical roller bearing as the inboard bearing. This bearing should be lubricated every 500 hours.

At times it may be necessary to clean the bearings due to accumulated dirt or deteriorated lubricants. This can be accomplished by flushing the bearing with a light oil heated to 180 to 200°F. While rotating it on a spindle, wipe the bearing housing with a clean rag soaked in a cleaning solvent and flush all surfaces.

Dry the bearing thoroughly before relubricating. Compressed air can be used to speed drying, but care should be taken not to let bearings rotate while being dried.



CAUTION

Use normal fire caution procedures when using any petroleum cleaner.

The motor that drives your Aurora pump may or may not require lubrication. Consult the manufacturer's recommendations for proper maintenance instructions.

REPAIRS

The pump may be disassembled using the illustrations and text provided. Although complete disassembly is covered, it will seldom be necessary to completely disassemble your Aurora pump.

The illustration accompanying the disassembly instructions show an explosed view of the pump. The illustration is intended to aid in the correct identification of the parts mentioned in the text.

Inspect parts removed at disassembly to determine their reusability. Cracked castings should never be reused. Gaskets should be replaced at reassembly simply as a matter of economy; they are much less expensive to replace routinely than to replace as the need occurs. In general, it is economical to return the motor and motor controller to the manufacturer for repair.

POWER FRAME 3C PUMP DISASSEMBLY

This pump has been designed with back pull-out features, which allow the power frame and rotating element to be removed without disturbing the suction and discharge piping.

Disassemble only what is needed to make repairs or accomplish inspection.

1. Break electrical connections to prevent drive unit from being energized during disassembly.

2. Close all valves or flow devices that control movement of liquids to or from pump. Remove drain plugs (25) from casing (1).

3. Remove all relief, cooling, flushing or drain lines from pump. Remove handhole cover (19) by removing capscrews (20), nuts (20A), washers (20B) and gasket (18). Break suction and discharge connections unless it is intended to remove only the power frame assembly and leave the casing (1) in the line.

4. Remove the flexible coupling from between the pump and motor. Next unscrew the bolts that hold support(s) (21 & 22) to the base and slide the pump out to be worked on.

5. Remove capscrews (34) and slide casing (1) from bracket (8) and stuffing box (27). Remove gasket (17). Should suction cover (5) need to be removed, unscrew capscrews (15) and remove gasket (16).

6. Unscrew impeller screw (10) and remove o-ring gasket (11) and washer (12), taking care not to damage gasket (13).

NOTE

650A Pumps have a tapered shank impeller to facilitate impeller removal. Use caution in the removal of impeller as it has to be moved only a few thousandths of an inch to become entirely free.

7. Slide impeller (2) and impeller key (14) from the shaft, again taking care not to damage gasket (38) located behind impeller. Remove gasket (38).

8. The various types of stuffing boxes may be disassembled as follows:

PACKING WITH LANTERN RING (STANDARD)

A. Remove capscrews (45), gland clamps (44E), and split gland halves (44).

B. Remove and discard old packing (40). Clean all parts to remove any packing that may have adhered.

C. Unscrew capscrews (33) and remove stuffing box (27) from bracket (8). Remove gasket (32).

D. Shaft sleeve (36) is a slip fit on the shaft and should be easily removed unless the pump has been in service for a long time. In this case it may be necessary to use a puller. A snap ring may be installed in the sleeve groove to ease disassembly. Take care to prevent damaging the surface of the sleeve. Replace the sleeve if it is grooved from wear. Remove key (54) and retaining ring (37) from shaft.

MECHANICAL SEAL (OPTIONAL)

CAUTION

The mechanical seal is a precision product and must be treated as such. During removal great care must be taken to avoid dropping any part of the seal. Take particular care not to scratch the lapped faces on the washer or the sealing seat. Do not put a seal back into service until the sealing faces of the washer and seat have been lapped or replaced

A. Remove seal gland bolts (45) and remove gland (44) carefully exposing seal (47).

B. Unscrew capscrews (33), and remove stuffing box assembly (27). Remove gasket (32).

C. Slide sleeve (36) with rotating parts of mechanical seal (47) from the shaft. Remove ceramic seal rings and stainless steel parts from sleeve with great care as ceramic parts are easily damaged.

The sleeve should be carefully cleaned to remove any residue that may be remaining in the seal area. The rubber in the seal may have become partially adhered to the sleeve. The sleeve must also be checked for abrasion or corrosion that can occur when fluid residue penetrates between the seal (47) and sleeve (36). The sleeve under the seal may be polished lightly to a 32 RMS finish before reassembly. Do not reuse a pitted sleeve. Remove retaining ring (37) and key (54).

D. Remove stationary seats and o-rings from gland (44) and stuffing box (27), using care not to damage these parts.

9. Remove capscrews (15A and 23) and washers (15B and 24) to take off support feet (21 and 22).

10. Unscrew capscrews (35) to remove bracket (8) from power frame (56).

11. Remove key (55) from the shaft.

12. Unscrew capscrews (59) and remove bearing cap (51). Remove o-ring (51A) and retaining ring (50C).

13. Slide out shaft (48) and bearings (49 and 50). Remove shim (60). Since bearings (49 and 50) are press fitted on the shaft, they will have to be pulled or pressed off the shaft. Remove grease seals (52) and (53) from frame (56) and bearing cap (51).

14. Remove screws (72) and nameplate (73) only if replacement is necessary.

POWER FRAME 3C
REASSEMBLY

Reassembly will generally be in reverse order of disassembly. If disassembly was not complete, use only those steps related to your paraticular repair program.

1. Press grease seals (52) and (53) into frame (56) and bearing cap (51).

2. Press bearings (50 and 49) onto shaft (48) Snap retaining ring (50C) into place.

3. Slide shaft (48) and bearings (50 and 49) into frame (56). Do not install o-ring (51A), shim (60) or bearing cap (51) at this point.

4. Position slinger (43) on the shaft sleeve.

5. Position bracket (8) on the power frame (56) and secure with capscrews (35). Tighten capscrews evenly to assure proper alignment.

6. If nameplate (73) was removed, install and attach with screws (72).

7. Reassemble the various types of stuffing boxes as follows:

PACKING WITH LANTERN RING (STANDARD)

A. Place gasket (32) on stuffing box (27), slide over shaft secure to bracket (8) with capscrews (33).

B. Install retaining ring (37), place key (54) in shaft and slide sleeve (36) over shaft. Packing (40) and lantern ring (41) may be replaced at this time. From impeller end of shaft, place two new rings of packing (40) around shaft sleeve, slide lantern ring (41) back in position and place remaining three rings of packing on shaft sleeve. Be sure to stagger joints of packing rings to avoid excessive leakage through the packing.

C. Thread capscrews (45) into stuffing box (27) approximately ¼ in. Insert both halves of gland (44) into stuffing box (27). Insert gland clamps (44E) and tighten packing, adjusting capscrews (45) to obtain proper sealing. Ensure Capscrews (45) are tightened enough to hold parts in place. Final adjustment of packing box will have to be made after pump is returned to operation.

When the pump is returned to service, additional care must be given the packing box to ensure proper packing life. It is necessary to allow 60 to 120 drops leakage per minute through the packing for lubrication purposes. If the flow rate is other than this, capscrews (45) should be either loosened or tightened one quarter turn at a time to acquire the correct leakage (capscrews must be turned equally to prevent cocking of the gland). It will take approximately ten minutes at any gland setting before the leakage rate will stabilize. When in doubt, choose the greater leakage rate since overly tight packing will ruin not only the packing, but the sleeve as well.

MECHANICAL SEAL (OPTIONAL)

NOTE

The mechanical seal (47) cannot be installed as an assembly. It is neccessary to have the seal seats properly in place before the balance of parts can be added.

A. Install retaining ring (37) and key (54) in shaft.

B. Wipe the sealing faces of the seat and seal washer clean. Lubricate the shaft sleeve (36) with a silicone-base lubricant. Slide the entire rotating assembly onto the sleeve.

C. Thoroughly inspect the seal box cavity checking for burrs or nicks that could damage the seat of the seal. Apply a film of liquid dishwashing detergent or rubber lubricant, (do not use oil or grease) to the seal seats. Replace stationary seats and o-rings in gland (44) and stuffing box (27).

NOTE

If it is not possible to insert seat with fingers, place cardboard protecting ring furnished with seal over lapped face of seat and press into place with a piece of tubing having an end cut square. The tubing should be slightly larger than the diameter of the shaft. Remove cardboard after seat is firmly in place. Carefully slip the stuffing box assembly (27) over the shaft sleeve with the stationary seat facing away from the motor. Install gasket (46) into gland (44).

Apply a film of liquid dishwashing detergent or rubber lubricant to the washer and bellows of the seal, and slide the remaining seal parts onto the shaft, making sure the washer is seated against the seal seat.

D. The shaft sleeve (36) with the seal rotating assembly on it may now be placed on the shaft. The shaft sleeve (36) should slide over shaft with keyway for key (54) toward power frame (56).

E. Replace gasket (32) on bracket (8) and carefully slip stuffing box (27) with stationary seal seat toward power frame (56), over the shaft and secure with capscrews (33).

F. Position gland (44) onto stuffing box (27) taking care to seat it evenly and squarely. Secure by tightening capscrews (45) evenly, being careful not to damage gasket (46) between them.

8. Carefully place square o-ring gasket (38) on shaft sleeve (36). Assemble key (14) and impeller (2) to shaft. Secure impeller with gasket (13), washer (12), impeller screw o-ring gasket (11) and impeller screw (10).

9. Fasten the supports (21 and 22) to bracket (8) and frame (56) with capscrews (15A and 23) and washers (15B and 24).

10. Install pipe plugs (25) in the pump casing (1). Position gasket (17) and casing (1) against the bracket (8) and secure with capscrews (34).

11. Place casing gasket (16) on suction cover (5) and bolt to casing (1) with capscrew (15).

LAMINATED SHIM IMPELLER ADJUSTMENT

12. Push the shaft and impeller assembly completely forward until the impeller contacts either the suction cover (5) or inside front surface of casing (1).

With a feeler gauge measure the clearance between the back machined surface of the power frame (56) and the snap ring in the outer race of the outboard bearing (50). This measurement plus the desired clearance between the impeller and casing will give the total required shim thickness. Example: It is recommended to have 0.016 in. clearance between the impeller and casing. With the impeller and shaft assembly moved completely forward and flush with the inside of the casing there is 0.008 in. clearance between the snap ring and the power frame. Therefore, the required shim thickness is: 0.008 in. + 0.016 in. = 0.024 in. or 12 shims.

Remove snap ring on outer race of outboard bearing (50) and install proper shim. Replace snap ring.

13. Install gasket (51A) and fasten bearing cap (51) in position with capscrews (59). Position key (55) and coupling. Replace all pipe plugs and grease fittings.

14. Place handhole cover gasket (18) on handhole cover (19) and bolt to casing (1) with capscrews (20), washers (20B) and nuts (20A). Replace all relief, cooling, flushing or drain lines from the pump.

15. Secure suction and discharge piping to the pump. Make sure to install gaskets on flanged connections.

16. Connect electricity to the motor.

17. Open all valves or flow devices that control flow of liquids to and from pump.

STARTING PUMP AFTER REASSEMBLY

Do not start pump until all air and vapor have been bled, making sure that there is liquid in the pump to provide the necessary lubrication. Without the fluid around it, a seal may be ruined in a few seconds of operation. It is possible that the mechanical seal may drip during the first few minutes to one hour of operation.

Packing should be adjusted as previously discussed in this manual.

POWER FRAME 4C, 5E and 5F
DISASSEMBLY

1. Disconnect power so that pump can not be accidently energized during disassembly.

2. Close all valves or flow devices that control movement of liquids to or from pump. Drain pump by removing drain plug (25) from casing (1). Remove any flushing, drain, or cooling lines from pump. Remove handhole cover (19) from casing by removing capscrews (20) and gasket (18).

3. Loosen capscrews from each hub of spacer type coupling and remove coupling flanges and rubber insert. This leaves a 3-1/2 in. space between end of motor shaft and pump shaft to facilitate back pull-out of pump.

4. Unscrew capscrews that hold support (22) to base. Remove capscrews (34). With the aid of a rope sling and a crane or hoist, carefully slide power frame and rotating element away from casing.

5. Remove gasket (17) from its position between bracket (8) and casing (1). Once the power frame and rotating element have been withdrawn, inspect the sealing surface to ensure that it is clean and free of any gasket material, which may have stuck to parting surfaces. Replace this gasket with a new one when pump is reassembled. Unscrew capscrews (23) and remove support (22) and washers (24).

6. Inspect casing wearing ring (optional) (6) and replace if necessary. Removal can be accomplished by removing capscrews (7).

7. Remove capscrews (10), o-ring gasket (11), washer (12) and gasket (13), which allow impeller (2), key (14), and gasket (38) to be removed.

NOTE

Pumps have a tapered hub impeller to facilitate impeller removal. Use caution in removal of impeller as it has to be moved only a few thousanths of an inch to become entirely free.

The easiest method for removing impeller is to suspend entire power frame and rotating element about 1/32 of an inch above floor or work area. Apply pressure to impeller by means of jackscrews (60 and 61) (located on bearing cap (51)). When impeller is firmly against bracket (8) it should drop free after turning the jackscrews evenly, a flat at a time, three or four flats.

8. Unscrew capscrews (35) to allow removal of bracket (8), stuffing box (27), and shft sleeve (36) from the power frame (56). Remove truarc snap ring (37) from the inboard end of the shaft sleeve (36). Lift bracket and stuffing box from shaft extension (48).

For further disassembly of sealing box proceed as follows:

A. Packing Box (STANDARD)

I. Remove capscrews (45), gland clamps (44E), and split gland halves (44).

Remove and discard old packing (40). Clean all parts to remove any packing that may have adhered during removal.

B. Double Seal

I. Remove seal gland bolts (45) and remove gland (44) carefully exposing seal (47).

II. Use great care in removing ceramic seal rings and stainless steel metal parts from sealing box, as ceramic parts are easily chipped or cracked.

III. Remove carbon station seats and o-rings only if necessary, using care not to damage these parts.

9. Place power frame on two benches, so that its shaft rests between them or on a bench with a hole cut in it large enough for shaft.

Remove grease zerk (63) and pipe plug (62) from inboard end of power frame. Remove retainer ring (37) by twisting it in a spiral movement toward end of shaft. Also remove grease seal (53).

10. Pull shaft sleeve (36) from pump shaft (48) using gear puller with jaws firmly secure behind sleeve.

11. Remove capscrews (59) and lift out shaft assembly from the power frame (56).

12. The inboard radial bearings are either ball bearings or spherical roller bearings and can be identified by power frame as listed below.

4C, 5E Power Frames have ball bearings.

5F has spherical roller bearings.

13. Remove coupling halve and key (55) from shaft. Remove plug (57) and zerk fitting (58).

14. Retainer ring (50B) is removed with a pair of truarc internal pliers so that grease retainer (50A) can be removed allowing bearing cap (51) to be removed from shaft assembly. Grease seal (52) may be removed if necessary.

15. With a pair of truarc external pliers, remove snap ring (50C) (PF #4 only) or remove locknut (50D) and lockwasher (50C) (P.F. #5).

16. Both inboard bearing (49) and outboard bearing (50) are pressed onto shaft. To remove bearings, use a wheel puller or press them off shaft.

NOTE

When removing the inboard bearing (49) avoid damaging the separate grease shield (49A). This shield can be removed when bearing is removed from shaft.

17. If total disassembly is required, break connections to suction and discharge pipe and remove nuts from foundation bolts that hold support (21) to the pump base.

18. Secure casing and support assembly in sling and move it away from piping. Invert this assembly and set casing (1) on wood blocks, so as not to mar surface that mates with bracket (8).

19. Pipe plug or suction gage (71) can now be removed from suction nozzle (65). Unscrew capscrews (69) and nuts (69A), and remove cover (68) and gasket (67) from suction elbow or nozzle (65).

20. Place rope sling through nozzle and cover opening. Remove capscrews (66) and lift suction nozzle (65) away from cover (5). Remove gasket (64).

21. Unscrew capscrews (15 & 15A) which hold support (21), cover (5) and casing (1) together. Lift support away and then set casing with discharge up. Gently tap cover loose with a rubber mallet. Remove gasket (16) to complete disassembly.

POWER FRAME 4C, 5E & 5F REASSEMBLY

These instructions are for a pump that has been completely disassembled. Use those parts that apply to your resassembly program.

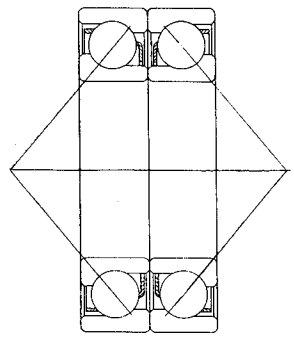
1. Place casing (1) with its outboard side down and position gasket (16) in place. Set cover (5) in place so neither the gasket position is lost nor damaged. Next align support (21) on cover. Use care not to disturb location of other parts. When all the above parts have been aligned, they are fastened together with capscrews (15 & 15A). Tighten capscrews evenly to insure perfect register of mating parts. Replace pipe plugs (25) and (26) in casing.

2. Position gasket (64) on cover and carefully lower suction nozzle (65) into place. Fasten suction elbow in place with capscrews (66).

3. Slip gasket (67) onto shoulder of cover (68) and secure it to suction nozzle (65) with capscrews (69) and nuts (69A). Place drain plug (70) back into suction nozzle (65).

4. Return casing and support assembly to its normal position. Fasten suction and discharge piping to pump. Secure this assembly in place by tightening nuts on foundation bolts. If pump has wearing ring (6) fasten it to cover (5) with screws (7). If handhole cover (19) was removed, place gasket (18) on cover and secure with capscrews (20).

5. Hand pack the outboard bearings (50) with grease and pack the grease retainer (50A) cavity one half full. Slide the grease retainer onto the shaft. Press the outboard bearing onto the shaft until it hits the shoulder of the shaft. Make sure outboard bearing set is properly matched with back-to-back configuration before pressing on shaft. Assemble snap ring (50C) onto the shaft with the beveled side outward to match the bevel in the shaft groove (PF4 only). Install lockwasher (50C) and locknut (50D) to secure outboard bearing (50) to shaft (48) for PF 5. Press or gently tap grease seal (52) into bearing cap (51). Slide the bearing cap (51) over the bearings. Lock in the assembly with snap ring (50B), matching the snap ring bevel to the groove bevel.



Back-to-Back
Bearing Configuration

6. Handpack the inboard bearing (49) and the recessed area of its grease shield (49A). Slide the grease shield onto the shaft with the raised lip toward the bearing. Press the bearing on until all parts are shouldered tight together on the shaft. The grease shield may wear into the outer race during break-in and is considered normal.

7. Place grease seal (53) into place on inboard end of power frame (56).

8. Lower sub-assembly from steps 5 through 7 into outboard end of power frame (56), which has been set on a bench with hole in it to accomodate shaft.

9. Position jack screws so that they extend past bearing caps as given below. This will position impeller hub end of the shaft in a axial position which will allow mounting impeller and closing down liquid end without any adjustment during the intermediate assembly step. Final adjustment will have to be made by evenly tightening capscrews (59) (step 22).

	Gap Clearance	Bolt Extension
Power Frame #4	1/8 in.	1/4 in.
Power Frame #5	1/4 in.	9/16 in.

10. Place plug (57) and grease zerk (58) back in bearing cap.

11. Place plug (62) and grease zerk (63) back on inboard end of power frame (56).

12. Retaining ring (37) can be set in its groove by turning it in a spiral motion up shaft. When in position, the outside diameter of this ring should slope toward impeller end of shaft.

13. Position bracket (8) to power frame (56) and secure in place by evenly tightening capscrews (35).

14. The following procedure is used in assembling sealing box:

A. Packing Box

I. Place two pieces of packing (40) into stuffing box cavity (27) being careful to get each piece firmly in place. Position lantern ring (41), then add remaining three pieces of packing. When packing is tightened lantern ring should align with holes for plug (29), flushing lines, or cooling lines.

NOTE

Be sure to stagger joints of packing rings to avoid excessive leakage.

II. Replace bushing (29) and grease zerk (30) in body of stuffing box (27).

III. Snap retaining ring (39) onto shaft sleeve (36) with a pair of truarc external snap ring pliers. Slide shaft sleeve carefully into inboard end of packing box.

IV. Thread capscrews (45) into stuffing box (27) approximately ¼ in. Insert both halves of gland (44) into stuffing box. Insert gland clamps (44E) and tighten packing adjusting capscrews (45) to obtain proper sealing.

V. Ensure capscrews (45) are tightened enough to hold parts in place. Final adjustment of packing box will have to be made after pump is returned to operation.

When pump is running, gland capscrews (45) should be evenly turned down a flat at a time, allowing packing to work in until a leakage rate of approximatley 60 to 120 drops per minute is obtained.

NOTE

Do not over tighten packing as this will cause packing box to over-heat and the shaft sleeve (36) to wear excessively.

VI. Place gasket (38) in radial corner groove that is machined on the inboard end of the shaft sleeve to complete assembly.

B. Double Seal Box

I. Thoroughly inspect the seal box cavity (27) checking for burrs or nicks which could damage the o-ring of mechanical seal. Apply a film of liquid dishwashing detergent or rubber lubricant (do not use oil or grease) to the o-ring and seal seat. Press one stationary seat with o-ring gently into the seal box cavity and other into gland (44). Replace pipe plug (28) in seal box.

II. Place gasket (46) in position in the gland register.

III. Snap retainer ring (39) onto sleeve (36) with a pair of truarc number 8 or 10 external pliers.

IV. Slide sleeve through bottom of stuffing box and place one seal (47) over sleeve and slide it down to stationary seat. Place metal parts over shaft and then second seal ring.

V. Position gland (44) over shaft sleeve and fasten to seal box with capscrews (45).

NOTE

Do not put mechanical seal back into service until seal ring and stationary seat faces have been relapped or replaced.

15. Place gasket (32) in groove of bracket (8).

16. Place key (54) in its keyway on shaft. Slide stuffing box assembly onto shaft so that key and keyway in the shaft sleeve mate. Continue to slide assembly forward until shaft sleeve is in contact with retainer ring (37).

17. Align stuffing box (27) with gasket (32) and bracket (8). Fasten with capscrews (33).

18. If pump has impeller wearing ring (3), fasten it to suction end of impeller (2) with capscrews (4).

19. Place impeller key (14) in keyway on the tapered portion of shaft (48), and set impeller (2) in position. Position gasket (13) inside impeller suction eye with washer (12) next, and o-ring gasket (11) last. Secure impeller in place with capscrew (10) to the following chart.

IMPELLER BOLT TORQUE

Power Frame	Impeller Bolt Size	Torque Value
4C	⅝ in.	75 FT-LBS
5E, 5F	¾ in.	100FT-LBS

20. Place gasket (17) on casing (1) and lower power frame (56) and rotating element assembly into place; fasten this assembly to casing with capscrews (34).

21. Attach support (22) to power frame (56) with capscrews (23) and washers (24). Remove eyebolt that has been used to handle power frame and rotating assembly and place a rope sling on assembly. Carefully lower assembly to a horizontal position.

22. Using jackscrews (60) and nuts (61) located on bearing cap (51), adjust impeller and shaft assembly axially down until impeller bottoms outs on its suction cover (5) or wearing rings (3) and (6). Then, loosen capscrews (59) and turn jacking screws (60) inward 3 or 4 flats to raise impeller to running clearance of .015/.025 in. Tighten jam nuts (61) and capscrews (59) to lock in adjustment.

23. Make one last check that all parts of the rotating element turn freely. Return spacer coupling between pump and motor using key (55).

24. Connect any flushing lines or cooling lines that were removed.

25. Open all valves or flow devices that control flow of to and from pump.

26. Connect Power.

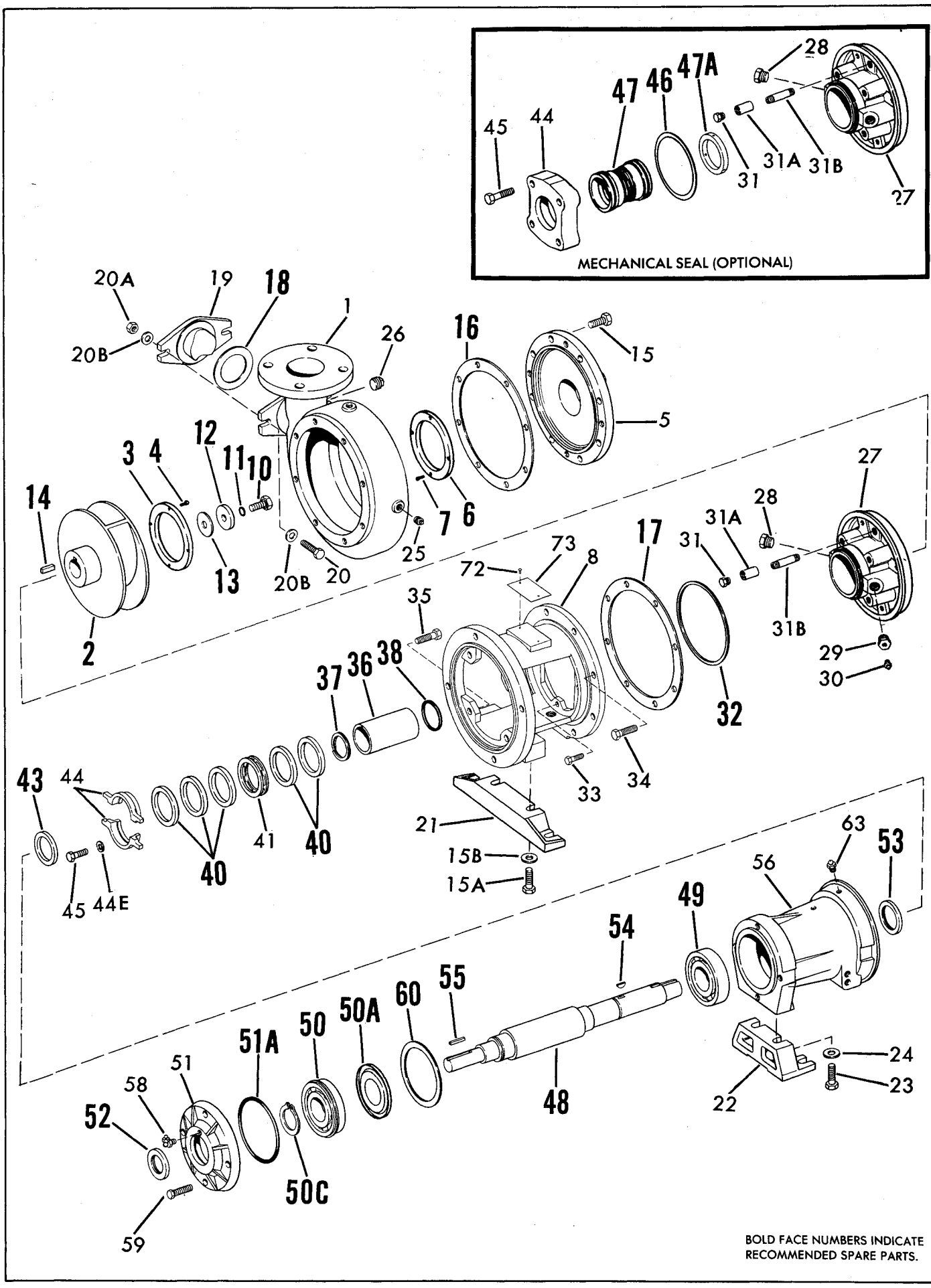
NOTE

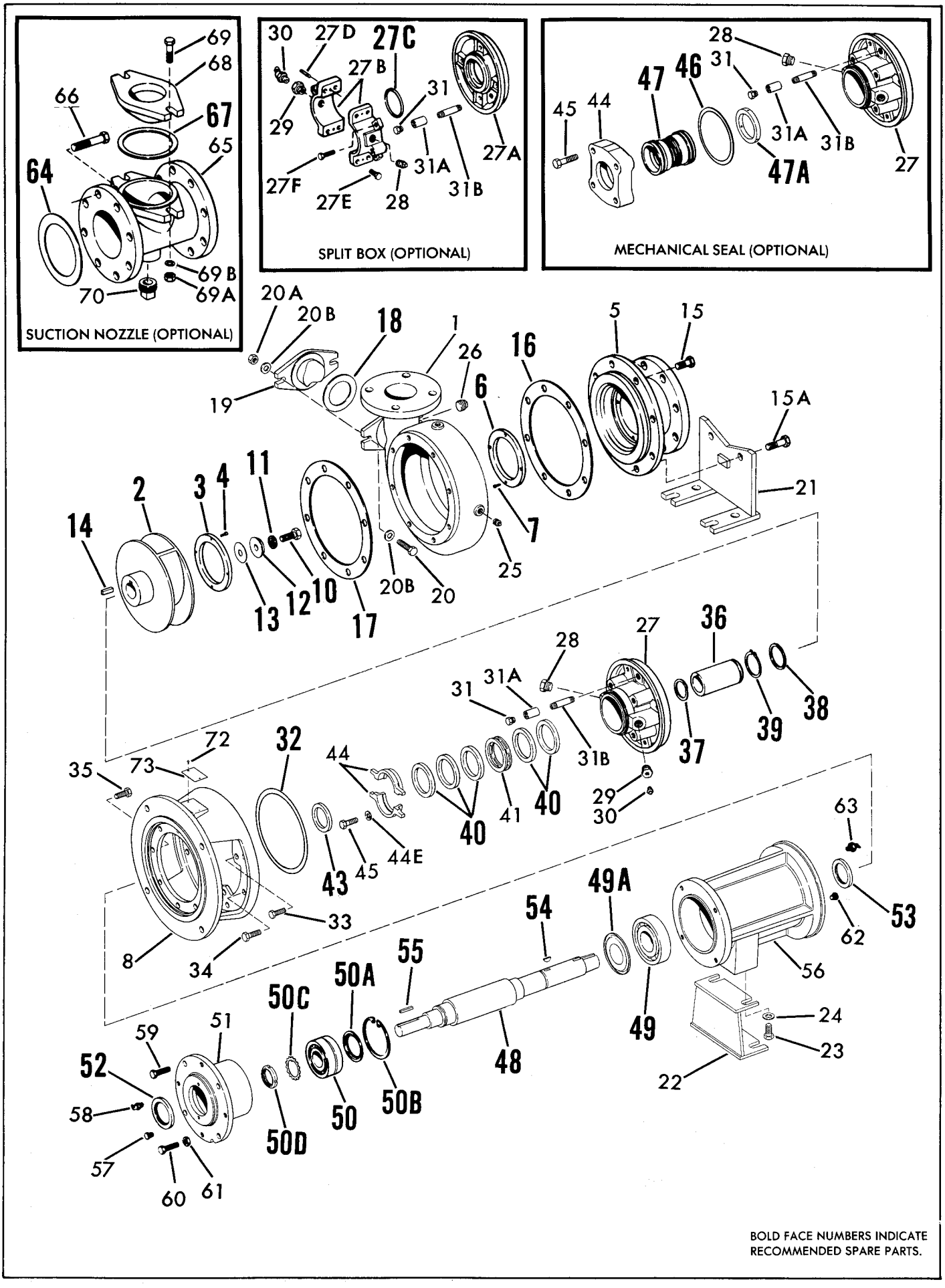
Do not start up a pump until all air and vapor have been bled, making sure that there is liquid in the pump to provide the necessary lubrication. It is possible that the mechanical seal may drip during the first few minutes of operation.

Turn on power momentarily to check for proper rotation. Rotation should be clockwise as viewed from driver (See arrow on casing).

MODEL 651A LIST OF PARTS

1. Casing
2. Impeller
3. Wear Ring
4. Set Screw
5. Suction Cover
6. Wear Ring
7. Set Screw
8. Bracket
10. Imp. Bolt
11. Imp. Bolt Seal
12. Imp. Washer
13. Imp. Washer Gasket
14. Impeller Key
15. Capscrew
15A. Capscrew
15B. Washer
16. Gasket
17. Gasket
18. Gasket
19. Handhole Cover
20. Capscrew
20A. Nut
20B. Washer
21. Pump Support
22. Pump Support
23. Capscrew
24. Washer
25. Pipe Plug
26. Pipe Plug
27. Stuffing Box
27A. Adapter Plate
27B. Split Packing Box
27C. Gasket
27D. Pin
27E. Capscrew
27F. Capscrew
28. Pipe Plug
29. Bushing
30. Fitting
31. Pipe Plug
31A. Pipe Coupling
31B. Nipple
32. Gasket
33. Capscrew
34. Capscrew
35. Capscrew
36. Sleeve
37. Retaining Ring
38. Gasket
39. Retaining Ring
40. Packing
41. Lantern Ring
43. Slinger
44. Gland
44E. Gland Clamp
45. Capscrew
46. Gasket
47. Mechanical Seal
47A. Bushing
48. Shaft
49. Inboard Bearing
49A. Grease Shield
50. Outboard Bearing
50A. Grease Shield
50B Retaining Ring
50C. Lockwasher or Retaining Ring
50D. Locknut
51. Bearing Cartridge
51A. O-Ring
52. Grease Seal
53. Grease Seal
54. Sleeve Key
55. Shaft Key
56. Power Frame
57. Pipe Plug
58. Grease Fitting
59. Capscrew
60. Shim Pack or Capscrew
61. Jam Nut
62. Pipe Plug
63. Grease Fitting
64. Gasket
65. Suction Nozzle
66. Capscrew
67. Gasket
68. Handhole Cover
69. Capscrew
69A. Nut
69B. Washer
70. Pipe Plug
72. Drive Pins
73. Name Plate


MECHANICAL SEAL (OPTIONAL)
BOLD FACE NUMBERS INDICATE RECOMMENDED SPARE PARTS.


SUCTION NOZZLE (OPTIONAL)
SPLIT BOX (OPTIONAL)
MECHANICAL SEAL (OPTIONAL)
BOLD FACE NUMBERS INDICATE RECOMMENDED SPARE PARTS.

AURORA®
Pentair Pump Group

INSTRUCTION MANUAL
REPAIR
MODEL 652A

6

SERVICE

Your Aurora pump requires no maintenance other than periodic inspection, occasional cleaning and lubrication of bearings. The intent of inspection is to prevent breakdown, thus obtaining optimum service life. The liquid end of the pump is lubricated by the fluid being pumped and therefore does not require periodic lubrication. The motor, however, may require lubrication, in which case, the motor manufacturer's recommendations should be followed.

LUBRICATION OF BEARINGS

The 650 Series pumps are available with regreasable shaft bearings as standard.

Regreasable bearings require periodic lubrication, which can be accomplished by using the lubrication fittings in the cartridge cap and power frame. Lubricate the bearings at regular intervals using a grease of high quality. Lithium grease is recommended as a lubricant for pumps operating in both wet and dry locations. Mixing of different brands of grease should be avoided due to possible chemical reactions between the brands which could damage the bearings. Avoid vegetable- or animal-base grease, which can develop acids, as well as grease containing rosin, graphite, talc and other impurities. Under no circumstances should used grease be reused.

Over lubrication should be avoided as it may result in overheating and possible bearing failure. Under normal application, adequate lubrication is assured if the amount of grease is maintained at 1/3 to 1/2 the capacity of the bearing and adjacent space surrounding it.

In dry locations, the power frame 3C bearings will need lubrication at least every 600 hours of running time or every 6 to 12 months, whichever is more frequent. In wet locations the bearings should be lubricated at least every 300 hours of running time or every 4 to 6 months, whichever is more frequent. A unit is considered to be installed in a wet location if the pump and motor are exposed to dripping water, to the weather, or to heavy condensation such as is found in unheated and poorly ventilated underground locations.

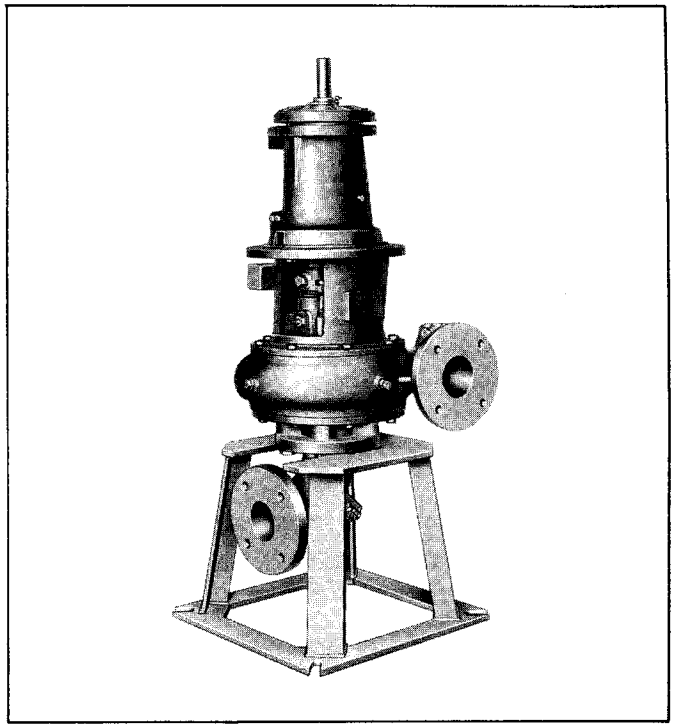
In dry locations, the power frame 4C bearings will need lubrication at least every 2,000 hours of running or every 6 to 12 months, whichever is more frequent. In wet locations the bearings should be lubricated at least after every 1,000 hours of running time or every 4 to 6 months, whichever is more frequent.

The 5E and 5F bearing frames have back-to-back angular contact bearings (50). This style bearing requires more frequent lubrication intervals. It is suggested that this bearing be lubricated every 1,000 hours.

The 5F power frame has a spherical roller bearing as the inboard bearing. This bearing should be relubricated every 500 hours.

At times it may be necessary to clean the bearings due to accumulated dirt or deteriorated lubricants. This can be accomplished by flushing the bearing with a light oil heated to 180 to 200°F. While rotating it on a spindle, wipe the bearing housing with a clean rag soaked in a cleaning solvent and flush all surfaces.

Dry the bearing thoroughly before relubricating. Compressed air can be used to speed drying, but care should be taken not to let bearings rotate while being dried.



CAUTION

Use normal fire caution procedures when using any petroleum cleaner.

The motor that drives your Aurora pump may or may not require lubrication. Consult the manufacturer's recommendations for proper maintenance instructions.

REPAIRS

The pump may be disassembled using the illustrations and text provided. Although complete disassembly is covered, it will seldom be necessary to completely disassemble your Aurora pump.

The illustration accompanying the disassembly instructions shows an exploded view of the pump. The illustration is intended to aid in the correct identification of the parts mentioned in the text.

Inspect parts removed at disassembly to determine their reusability. Cracked castings should never be reused. Gaskets should be replaced at reassembly simply as a matter of economy; they are much less expensive to replace routinely than to replace as the need occurs. In general, it is economical to return the motor and motor controller to the manufacturer for repair.

POWER FRAME 3C PUMP DISASSEMBLY

This pump has been designed with back pull-out features, which allow the power frame and rotating element to be removed without disturbing the suction and discharge piping.

Disassemble only what is needed to make repairs or accomplish inspection.

1. Break electrical connections to prevent drive unit from being energized during disassembly.

2. Close all valves or flow devices that control movement of liquids to or from pump. Remove drain plug (70) from suction elbow (65).

3. Remove all relief, cooling, flushing or drain lines from pump. Remove handhole cover (19) by removing capscrews (20), nuts (20A), washers (20B) and gasket (18). Break suction and discharge connections unless it is intended to remove only the power frame assembly and leave the casing (1) in the line.

4. On Model 652A pumps you will have to disconnect flexible shafting from pump. This may be accomplished by removing capscrews from flanged point adjacent to universal joint. It is recommended that flexible shafting be swung out of the way to allow removal of power frame and rotating element.

Unscrew capscrews (66B) to remove pump from base (21). The pump elbow (65) is removed by loosening of capscrews (66). Gasket (64) may now be removed.

If required, handhole cover (68) may be removed from elbow (65), by removing capscrews (69), nuts (69A), washers (69B) and gasket (67).

5. Remove capscrews (34) and slide casing (1) from bracket (8) and stuffing box (27). Remove gasket (17). Should suction cover (5) need to be removed, unscrew capscrews (15) and remove gasket (16).

6. Unscrew impeller screw (10) and remove o-ring gasket (11) and washer (12), taking care not to damage gasket (13).

NOTE

650A Pumps have a tapered shank impeller to facilitate impeller removal. Use caution in the removal of impeller as it has to be moved only a few thousandths of an inch to become entirely free.

7. Slide impeller (2) and impeller key (14) from the shaft, again taking care not to damage gasket (38) located behind impeller. Remove gasket (38).

8. The various types of stuffing boxes may be disassembled as follows:

PACKING WITH LANTERN RING (STANDARD)

A. Remove capscrews (44A and 45), and split accumulator gland halves (44). Remove o-ring gasket (42) from stuffing box.

B. Remove and discard old packing (40). Clean all parts to remove any packing that may have adhered. Leakage accumulator gland (44) may be further disassembled by removing pipe plugs (44D), tubing (44C) and hose connector (44B).

C. Unscrew capscrews (33) and remove stuffing box (27) from bracket (8). Remove gasket (32).

D. Shaft sleeve (36) is a slip fit on the shaft and should be easily removed unless the pump has been in service for a long time. In this case it may be necessary to use a puller. A snap ring may be installed in the sleeve (36) groove to ease disassembly. Take care to prevent damaging the surface of the sleeve. Replace the sleeve if it is grooved from wear. Remove key (54) and retaining ring (37) from shaft.

MECHANICAL SEAL (OPTIONAL)

CAUTION

The mechanical seal is a precision product and must be treated as such. During removal great care must be taken to avoid dropping any part of the seal. Take particular care not to scratch the lapped faces on the washer or the sealing seat. Do not put a seal back into service until the sealing faces of the washer and seat have been lapped or replaced

A. Remove seal gland bolts (45) and remove gland (44) carefully exposing seal (47).

B. Unscrew capscrews (33), and remove stuffing box assembly (27). Remove gasket (32).

C. Slide sleeve (36) with rotating parts of mechanical seal (47) from the shaft. Remove ceramic seal rings and stainless steel parts from sleeve with great care as ceramic parts are easily damaged.

The sleeve should be carefully cleaned to remove any residue that may be remaining in the seal area. The rubber in the seal may have become partially adhered to the sleeve. The sleeve must also be checked for abrasion or corrosion that can occur when fluid residue penetrates between the seal (47) and sleeve

(36). The sleeve under the seal may be polished lightly to a 32 RMS finish before reassembly. Do not reuse a pitted sleeve. Remove retaining ring (37) and key (54).

D. Remove stationary seats and o-rings from gland (44) and stuffing box (27), using care not to damage these parts.

9. Unscrew capscrews (35) to remove bracket (8) from power frame (56).

10. Remove key (55) from the shaft (48).

11. Unscrew capscrews (59) and remove bearing cap (51). Remove o-ring (51A) and retaining ring (50C).

12. Slide out shaft (48) and bearings (49 and 50). Remove shim (60). Since bearings (49 and 50) are press fitted on the shaft, they will have to be pulled or pressed off the shaft. Remove grease seals (52) and (53) from frame (56) and bearing cap (51).

13. Remove screws (72) and nameplate (73) only if replacement is necessary.

POWER FRAME 3C REASSEMBLY

Reassembly will generally be in reverse order of disassembly. If disassembly was not complete, use only those steps related to your paraticular repair program.

1. Press grease seals (52) and (53) into frame (56) and bearing cap (51).

2. Press bearings (50 and 49) onto shaft (48). Snap retaining ring (50C) into place.

3. Slide shaft (48) and bearings (50 and 49) into frame (56). Do not install o-ring (51A), shim (60) or bearing cap (51) at this point.

4. Position slinger (43) on the shaft sleeve.

5. Position bracket (8) on the power frame (56) and secure with capscrews (35). Tighten capscrews evenly to assure proper alignment.

6. If nameplate (73) was removed, install and attach with screws (72).

7. Reassemble the various types of stuffing boxes as follows:

PACKING WITH LANTERN RING (STANDARD)

A. Place gasket (32) on stuffing box (27), slide over shaft and secure to bracket (8) with capscrews (33).

B. Install retaining ring (37), place key (54) in shaft and slide sleeve (36) over shaft. Packing (40) and lantern ring (41) may be replaced at this time. From impeller end of shaft, place two new rings of packing (40) around shaft sleeve, slide lantern ring (41) back in position and place remaining three rings of packing on shaft sleeve. Be sure to stagger joints of packing rings to avoid excessive leakage through the packing.

C. Place o-ring gasket (42) in stuffing box on top ring of packing (40). Be sure o-ring remains concentric against inside diameter of the stuffing box. Slide slinger (43) over shaft extension and adjust to ¼ in. below top of leakage accumulator after stuffing box assembly has been reattached to bracket. Replace pipe plugs (44D), hose connector (44B) and tubing (44C) in leakage accumulator glands (44). Place one half of leakage accumulator gland in stuffing box with connection for hose positioned to drain properly.

Apply General Electric* Silicon Rubber Sealant on both ends of this gland half. Thread capscrews (45) into stuffing box (27) approximately ¼ in. Insert other half of gland (44) in stuffing box being careful not to disturb o-ring gasket (42). Insert capscrews (44A) into each side of gland (44) to hold the two halves together. Tighten capscrews (44A) before tightening packing adjusting capscrews (45) to obtain proper sealing.

Ensure capscrews (45) are tightened enough to hold parts in place. Final adjustment of packing box will have to be made after pump is returned to operation.

When the pump is returned to service, additional care must be given the packing box to ensure proper packing life. It is necessary to allow 60 to 120 drops leakage per minute through the packing for lubrication purposes. If the flow rate is other than this, capscrews (45) should be either loosened or tightened one quarter turn at a time to acquire the correct leakage (capscrews must be turned equally to prevent cocking of the gland). It will take approximately ten minutes at any one gland setting before the leakage rate will stabilize. When in doubt, choose the greater leakage rate since overly tight packing will ruin not only the packing, but the sleeve as well.

MECHANICAL SEAL (OPTIONAL)

NOTE

The mechanical seal (47) cannot be installed as an assembly. It is necessary to have the seal seats properly in place before the balance of parts can be added.

A. Install retaining ring (37) and key (54) in shaft.

B. Wipe the sealing faces of the seat and seal washer clean. Lubricate the shaft sleeve (36) with a silicone base lubricant. Slide the entire rotating assembly onto the sleeve.

C. Thoroughly inspect the seal box cavity checking for burrs or nicks that could damage the seat of the seal. Apply a film of liquid dishwashing detergent or rubber lubricant, (do not use oil or grease) to the seal seats. Replace stationary seats and o-rings in gland (44) and stuffing box (27).

NOTE

If it is not possible to insert seat with fingers, place cardboard protecting ring furnished with seal over lapped face of seat and press into place with a piece of tubing having an end cut square. The tubing should be slightly larger than the diameter of the shaft. Remove cardboard after seat is firmly in place. Carefully slip the stuffing box assembly (27) over the shaft sleeve with the stationary seat facing away from the motor. Install gasket (46) into gland (44).

Apply a film of liquid dishwashing detergent or rubber lubricant to the washer and bellows of the seal, and slide the remaining seal parts onto the shaft, making sure the washer is

seated against the seal seat.

D. The shaft sleeve (36) with the seal rotating assembly on it may now be placed on the shaft. The shaft sleeve (36) should slide over shaft with keyway for key (54) toward power frame (56).

E. Replace gasket (32) on bracket (8) and carefully slip stuffing box (27) with stationary seal seat toward power frame (56), over the shaft and secure with capscrews (33).

F. Position gland (44) onto stuffing box (27) taking care to seat it evenly and squarely. Secure by tightening capscrews (45) evenly, being careful not to damage gasket (46) between them.

8. Carefully place square o-ring gasket (38) on shaft sleeve (36). Assemble key (14) and impeller (2) to shaft. Secure impeller with gasket (13), washer (12), impeller screw o-ring gasket (11) and impeller screw (10).

9. Install pipe plugs (25) in the pump casing (1). Position gasket (17) and casing (1) against the bracket (8) and secure with capscrews (34).

10. Place casing gasket (16) on suction cover (5) and bolt to casing (1) with capscrew (15).

LAMINATED SHIM IMPELLER ADJUSTMENT

11. Push the shaft and impeller assembly completely forward until the impeller contacts either the suction cover (5) or inside front surface of casing (1).

With a feeler gauge measure the clearance between the back machined surface of the power frame (56) and the snap ring in the outer race of the outboard bearing (50), (See Figure 2). This measurement plus the desired clearance between the impeller and casing will give the total required shim thickness. Example: It is recommended to have 0.016 in. clearance* between the impeller and casing. With the impeller and shaft assembly moved completely forward and flush with the inside of the casing there is 0.008 in. clearance between the snap ring and the power frame. Therefore, the required shim thickness is: 0.008 in. + 0.016 in. = 0.024 in. or 12 shims.

Remove snap ring on outer race of outboard bearing (50) and install proper shim. Replace snap ring.

12. Install gasket (51A) and fasten bearing cap (51) in position with capscrews (59). Position key (55) and coupling. Replace all pipe plugs and grease fittings.

13. Place handhole cover gasket (18) on handhole cover (19) and bolt to casing (1) with capscrews (20), washers (20B) and nuts (20A). Replace all relief, cooling, flushing or drain lines from the pump. Place gasket (64) on elbow (65) and secure to pump. Pump may now be replaced on base (21) and secured with capscrews (66B) and washers (66A). If handhole cover (68) was removed from elbow (65), replace using gasket (67), capscrews (69), washers (69B) and nuts (69A).

14. Secure suction and discharge piping to the pump. Make sure to install gaskets on flanged connections. Connect flexible shafting to pump. Ideal joint operating angle is 1° to 5°.

15. Connect electricity to the motor.

16. Open all valves or flow devices that control flow of liquids to and from pump.

STARTING PUMP AFTER REASSEMBLY

Do not start pump until all air and vapor have been bled, making sure that there is liquid in the pump to provide the necessary lubrication. Without the fluid around it, a seal may be ruined in a few seconds of operation. It is possible that the mechanical seal may drip during the first few minutes to one hour of operation.

Packing should be adjusted as previously discussed in this manual.

POWER FRAME 4C, 5E and 5F
DISASSEMBLY

1. Disconnect power so that pump can not be accidently energized during disassembly.

2. Close all valves or flow devices that control movement of liquids to or from pump. Drain pump by removing drain plug (70) from suction elbow (65). Remove any flushing, drain, or cooling lines from pump. Remove handhole cover (19) from casing by removing capscrews (20) and gasket (18).

3. Disconnect flexible shafting from pump. This may be accomplished by removing capscrews from flanged point adjacent to universal joint. It is recommended that flexible shafting be swung out of the way to allow removal of power frame and rotating element.

4. Remove capscrews (34) that secure bracket (8) to casing (1). Screw an eyebolt into outboard end of shaft (48) to aid in lifting power frame and rotating element from casing. The size of eyebolt is as follows.

a. Power Frame 4C requires 5/8-11NC eyebolt.

b. Power Frames 5E and 5F require 3/4-10NC eyebolt.

5. Remove gasket (17) from its position between bracket (8) and casing (1). Once the power frame and rotating element have been withdrawn, inspect the sealing surface to ensure that it is clean and free of any gasket material, which may have stuck to parting surfaces. Replace this gasket with a new one when pump is reassembled.

6. Inspect casing wearing ring (optional) (6) and replace if necessary. Removal can be accomplished by removing capscrews (7).

7. Remove capscrews (10), o-ring gasket (11), washer (12) and gasket (13), which allow impeller (2), key (14), and gasket (38) to be removed.

NOTE

Pumps have a tapered hub impeller to facilitate impeller removal. Use caution in removal of impeller as it has to be moved only a few thousanths of an inch to become entirely free.

The easiest method for removing impeller is to suspend entire power frame and rotating element with the eyebolt about 1/32 of an inch above floor or work area. Apply pressure to impeller by means of jackscrews (60 and 61) (located on bearing cap (51)). When impeller is firmly against bracket (8) it should drop free after turning the jackscrews evenly, a flat at a time, three or four flats.

8. Unscrew capscrews (35) to allow removal of bracket (8), stuffing box (27), and shaft sleeve (36) from the power frame (56). Remove truarc snap ring (37) from the inboard end of the shaft sleeve (36). Lift bracket and stuffing box from shaft extension.

For further disassembly of sealing box proceed as follows:

A. Packing Box (STANDARD)

I. Remove capscrews (45), and split accumulator gland halves (44). Slinger (43) is now exposed and can be removed from shaft sleeve. Remove o-ring gasket (42) from stuffing box.

Remove and discard old packing (40). Clean all parts to remove any packing that may have adhered during removal. Leakage accumulator gland (44), may be further disassembled by removing capscrews (44A), pipe plugs (44D), tubing (44C) and hose connectors (44B).

B. Double Seal (Optional)

I. Remove seal gland bolts (45) and remove gland (44) carefully exposing seal (47).

II. Use great care in removing ceramic seal rings and stainless steel metal parts from sealing box, as ceramic parts are easily chipped or cracked.

III. Remove carbon station seats and o-rings only if necessary, using care not to damage these parts.

9. Place power frame on two benches, so that its shaft rests between them or on a bench with a hole cut in it large enough for shaft.

10. Remove grease zerk (63) and pipe plug (62) from inboard end of power frame. Remove retainer ring (37) by twisting it in a spiral movement toward end of shaft. Also remove grease seal (53).

11. Remove capscrews (59) and lift out shaft assembly from the power frame (56).

12. The inboard radial bearings are either ball bearings or spherical roller bearings and can be identified by power frame as listed below.

4C, 5E Power Frames have ball bearings.

5F has spherical roller bearings.

13. Remove coupling halve and key (55) from shaft. Remove plug (57) and zerk fitting (58).

14. Retainer ring (50B) is removed with a pair of truarc internal pliers so that grease retainer (50A) can be removed allowing bearing cap (51) to be removed from shaft assembly. Grease seal (52) may be removed if necessary.

15. With a pair of truarc external pliers, remove snap ring (50C) (PF #4 only) or remove locknut (50D) and lockwasher (50C) (P.F. #5).

16. Both inboard bearing (49) and outboard bearing (50) are pressed onto shaft. To remove bearings, use a wheel puller or press them off shaft.

NOTE

When removing the inboard bearing (49) avoid damaging the separate grease shield (49A). This shield can be removed when bearing is removed from shaft.

17. If total disassembly is required, break connections to suction and discharge pipe and remove nuts from foundation bolts that hold support (21) to its foundation.

18. Secure casing and support assembly in sling and move it away from piping. Invert this assembly and set casing (1) on wood blocks, so as not to mar surface that mates with bracket (8).

19. Pipe plug or suction gage (71) can now be removed from suction elbow (65). Unscrew capscrews (69) and nuts (69A), and remove cover (68) and gasket (67) from suction elbow (65).

20. Place rope sling through elbow and cover opening. Remove capscrews (66) and lift suction elbow or nozzle (65) away from cover (5). Remove gasket (64).

21. Unscrew capscrews (15), which hold support (21), cover (5) and casing (1) together. Lift support away and then set casing with discharge up. Gently tap cover loose with a rubber mallet. Remove gasket (16) to complete disassembly.

POWER FRAME 4C, 5E & 5F
REASSEMBLY

These instructions are for a pump that has been completely disassembled. Use those parts that apply to your resassembly program.

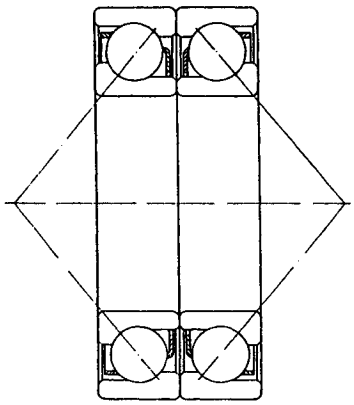
1. Place casing (1) with its outboard side down and position gasket (16) in place. Set cover (5) in place so neither the gaskets position is lost nor damaged. Next align support (21) on cover. Use care not to disturb location of other parts. When all the above parts have been aligned, they are fastened together with capscrews (15). Tighten capscrews evenly to insure perfect register of mating parts. Replace pipe plugs (25) and (26) in casing.

2. Position gasket (64) on cover and carefully lower suction elbow (65) into place. Fasten suction elbow in place with capscrews (66).

3. Slip gasket (67) onto shoulder of cover (68) and secure it to suction elbow (65) with capscrews (69) and nuts (69A). Place plug or suction gauge (71) and drain plug (70) back into suction elbow (65).

4. Return casing and support assembly to its normal position. Fasten suction and discharge piping to pump. Secure this assembly in place by tightening nuts on foundation bolts. If pump has optional wearing ring (6) fasten it to cover (5) with screws (7). If handhole cover (19) was removed, place gasket (18) on cover and secure with capscrews (20).

5. Hand pack the outboard bearings (50) with grease and pack the grease retainer (50A) cavity one half full. Slide the grease retainer onto the shaft. Press the outboard bearing onto the shaft until it hits the shoulder of the shaft. Make sure outboard bearing set is properly matched with back to back configuration before pressing on shaft. Assemble snap ring (50C) onto the shaft with the beveled side outward to match the bevel in the shaft groove (PF4 only). Install lockwasher (50C) and locknut (50D) to secure outboard bearing (50) to shaft (48) for PF 5. Press or gently tap grease seal (52) into bearing cap (51). Slide the bearing cap (51) over the bearings. Lock in the assembly with snap ring (50B), matching the snap ring bevel to the groove bevel.



Back-to-Back
Bearing Configuration

6. Handpack the inboard bearing (49) and the recessed area of its grease shield (49A). Slide the grease shield onto the shaft with the raised lip toward the bearing. Press the bearing on until all parts are shouldered tight together on the shaft. The grease shield may wear into the outer race during break-in and is considered normal.

7. Place grease seal (53) into place on inboard end of power frame (56).

8. Lower sub-assembly from steps 5 through 7 into outboard end of power frame (56), which has been set on a bench with hole in it to accomodate shaft.

9. Position jack screws so that they extend past bearing caps as given below. This will position impeller hub end of the shaft in a axial position which will allow mounting impeller and closing down liquid end without any adjustment during the intermediate assembly step. Final adjustment will have to be made by evenly tightening capscrews (59).

	Gap Clearance	Bolt Extension
Power Frame #4	1/8 in	1/4 in.
Power Frame #5	1/4 in.	9/16 in.

10. Place plug (57) and grease zerk (58) back in bearing cap.

11. Place plug (62) and grease zerk (63) back on inboard end of power frame (56).

12. Retaining ring (37) can be set in its groove by turning it in a spiral motion up shaft. When in position, the outside diameter of this ring should slope toward impeller end of shaft.

13. Position bracket (8) to power frame (56) and secure in place by evenly tightening capscrews (35).

14. The following procedure is used in assembling sealing box:

A. Packing Box (Standard)

I. Place two pieces of packing (40) into stuffing box cavity (27) being careful to get each piece firmly in place. Position lantern ring (41), then add remaining three pieces of packing. When packing is tightened lantern ring should align with holes for plug (29), flushing lines, or cooling lines.

NOTE

Be sure to stagger joints of packing rings to avoid excessive leakage.

II. Replace bushing (29) and grease zerk (30) in body of stuffing box (27).

III. Snap retaining ring (39) onto shaft sleeve (36) with a pair of truarc external snap ring pliers. Slide shaft sleeve carefully into inboard end of packing box.

IV. Place o-ring gasket (42) in stuffing box on top ring of packing (40). Be sure O-ring remains concentric against inside diameter of the stuffing box. Slide slinger (43) over shaft extension and adjust to ¼ in. below top of leakage accumulator after stuffing box assembly has been reattached to bracket. Replace pipe plugs (44D), hose connector (44B) and tubing (44C) in leakage accumulator glands (44). Place one half of leakage accumulator gland in stuffing box with connection for hose to drain positioned properly. Apply General Electric* Silicon Rubber Sealant (75) on both ends of this gland half. Thread capscrews (45) into stuffing box (27) approximately ¼ in. Insert other half of gland (44) into stuffing box being careful not to disturb o-ring gasket (42). Insert capscrews (44A) into each side of gland (44) to hold the two halves together. Tighten capscrews (44A) before tightening packing adjusting cap-screws (45) to obtain proper sealing.

V. Ensure capscrews (45) are tightened enough to hold parts in place. Final adjustment of packing box will have to be made after pump is returned to operation.

When pump is running, gland capscrews (45) should be evenly turned down a flat at a time, allowing packing to work in until a leakage rate of approximatley 60 to 120 drops per minute is obtained.

NOTE

Do not over tighten packing, as this will cause packing box to over-heat and the shaft sleeve (36) to wear excessively.

VI. Place gasket (38) in radial corner groove that is machined on the inboard end of the shaft sleeve to complete assembly.

B. Double Seal Box (Optional)

I. Thoroughly inspect the seal box cavity (27) checking for burrs or nicks which could damage the o-ring of mechanical seal. Apply a film of liquid dishwashing detergent or rubber lubricant (do not use oil or grease) to the o-ring and seal seat. Press one stationary seat with o-ring gently into the seal box cavity and other into gland (44). Replace pipe plug (28) in seal box.

II. Place gasket (46) in position in the gland register.

III. Snap retainer ring (39) onto sleeve (36) with a pair of truarc number 8 or 10 external pliers.

IV. Slide sleeve through bottom of stuffing box and place one seal (47) over sleeve and slide it down to stationary seat. Place metal parts over shaft and then second seal ring.

V. Position gland (44) over shaft sleeve and fasten to seal box with capscrews (45).

NOTE

Do not put mechanical seal back into service until seal ring and stationary seat faces have been relapped or replaced.

15. Place gasket (32) in groove of bracket (8).

16. Place key (54) in its keyway on shaft. Slide stuffing box assembly onto shaft so that key and keyway in the shaft sleeve mate. Continue to slide assembly forward until shaft sleeve is in contact with retainer ring (37).

17. Align stuffing box (27) with gasket (32) and bracket (8). Fasten with capscrews (33).

18. If pump has impeller wearing ring (3), fasten it to suction end of impeller (2) with capscrews (4).

19. Place impeller key (14) in keyway on the tapered portion of shaft (48), and set impeller (2) in position. Position gasket (13) inside impeller suction eye with washer (12) next, and o-ring gasket (11) last. Secure impeller in place with capscrew (10) according to the following chart.

IMPELLER BOLT TORQUE

Power Frame	Impeller Bolt Size	Torque Value
4C	⅝ in.	75 FT-LBS
5E, 5F	¾ in.	100FT-LBS

20. Place gasket (17) on casing (1) and lower power frame (56) and rotating element assembly into place; fasten this assembly to casing with capscrews (34).

21. Using jackscrews (60) and nuts (61) located on bearing cap (51), adjust impeller and shaft assembly axially down until impeller bottoms outs on its suction cover (5) or wearing rings (3) and (6). Then, loosen capscrews (59) and turn jacking screws (60) inward 3 or 4 flats to raise impeller to running clearance of .015/.025 in. Tighten jam nuts (61) and capscrews (59) to lock in adjustment.

22. Make one last check that all parts of the rotating element turn freely.

23. Connect any flushing lines or cooling lines that were removed. Remove the lifting eye and secure the flexible shafting in place. Ideal joint operating angle is 1° to 5°.

24. Open all valves or flow devices that control flow of to and from pump.

25. Connect Power.

NOTE

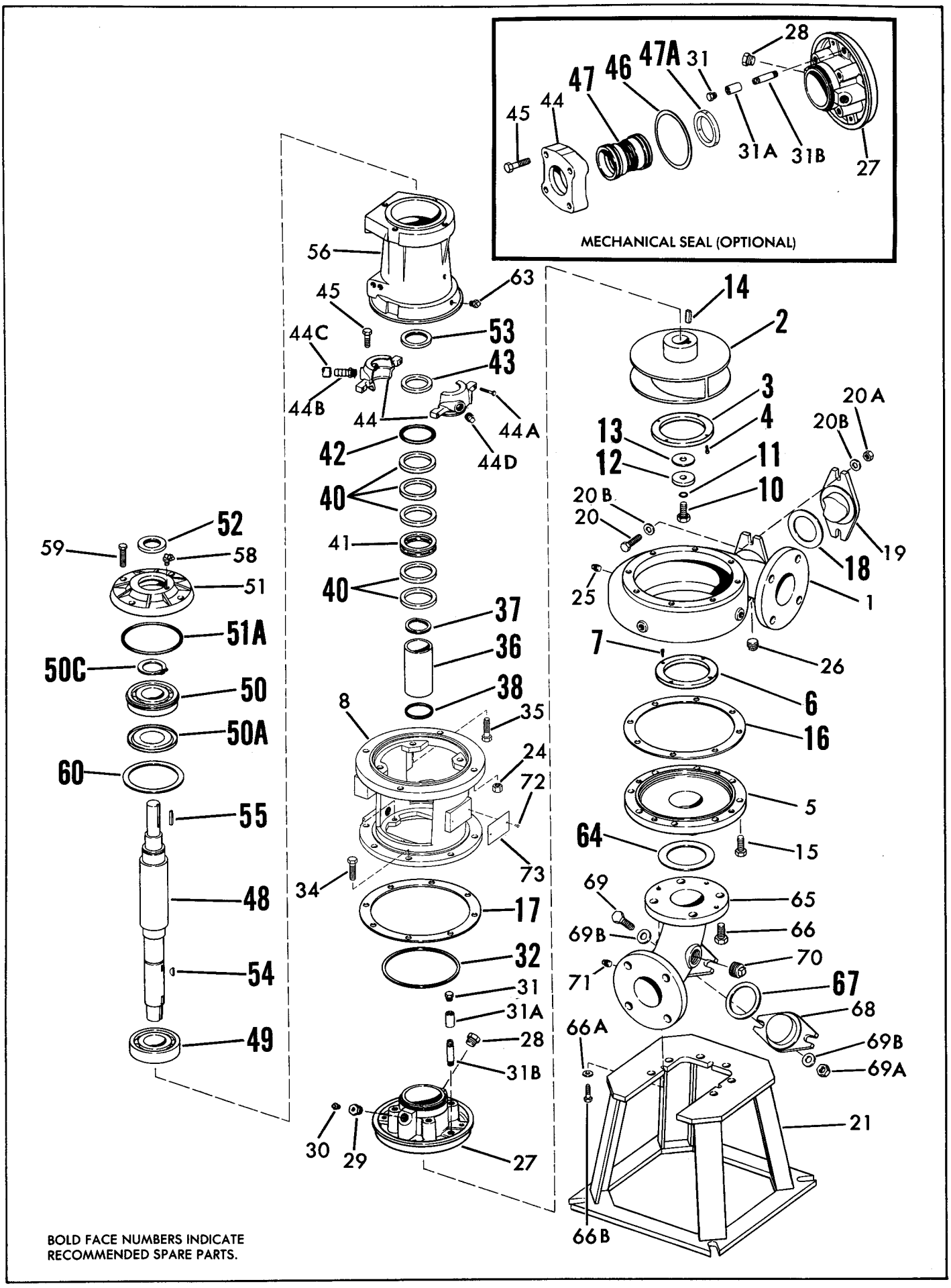
Do not start up a pump until all air and vapor have been bled, making sure that there is liquid in the pump to provide the necessary lubrication. It is possible that the mechanical seal may drip during the first few minutes of operation.

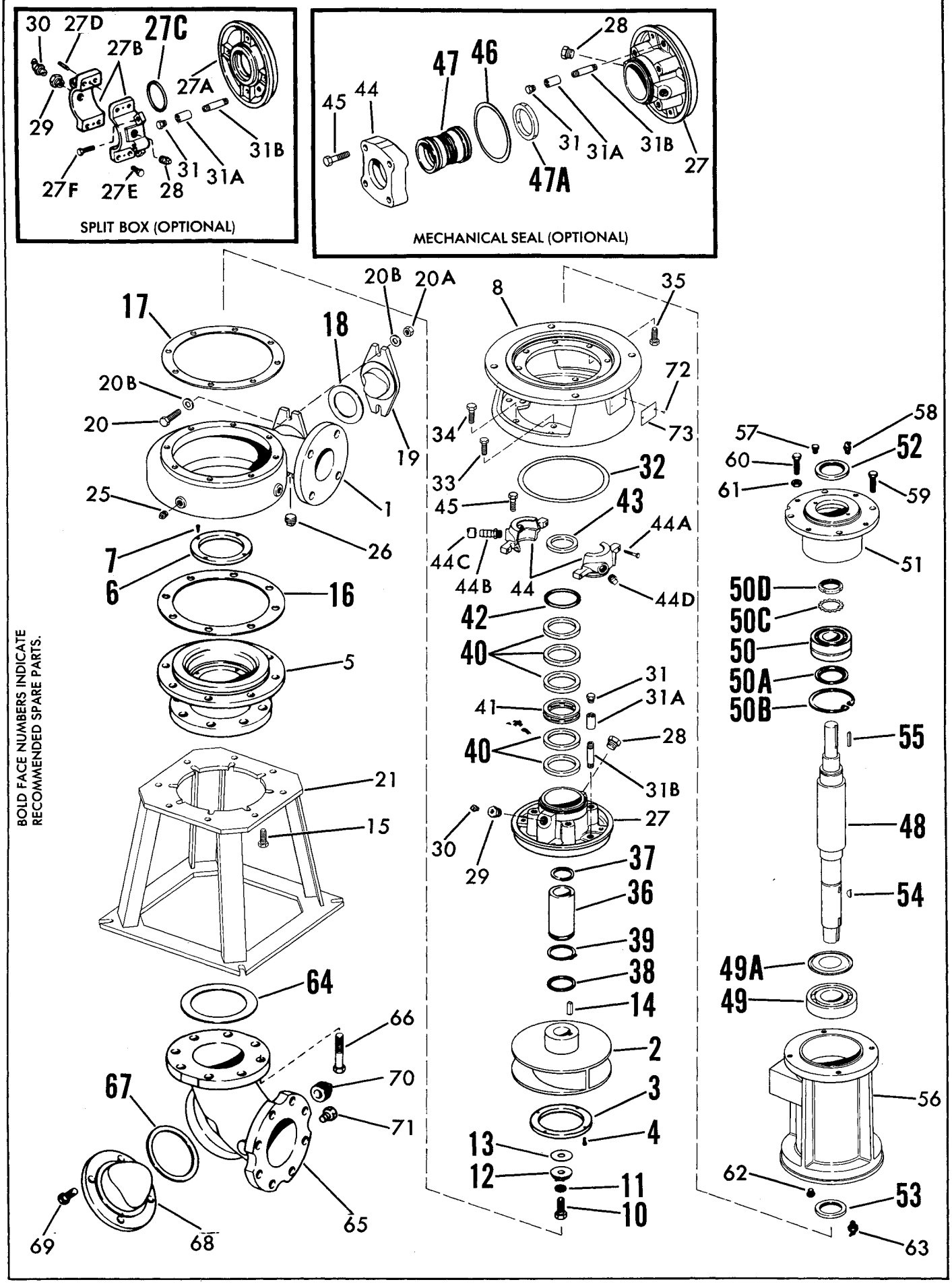
Turn on power momentarily to check for proper rotation. Rotation should be clockwise as viewed from driver (See arrow on casing).

*General Electric is a registered trademark of General Electric Corporation.

MODEL 652A LIST OF PARTS

1. Casing
2. Impeller
3. Wear Ring
4. Set Screw
5. Suction Cover
6. Wear Ring
7. Set Screw
8. Bracket
10. Imp. Bolt
11. Imp. Bolt Seal
12. Imp. Washer
13. Imp. Washer Gasket
14. Impeller Key
15. Capscrew
16. Gasket
17. Gasket
18. Gasket
19. Handhole Cover
20. Capscrew
20A. Nut
20B. Washer
21. Pump Base
23. Capscrew
24. Nut
25. Pipe Plug
27. Stuffing Box
27A. Adapter Plate
27B. Split Packing Box
27C. Gasket
27D. Pin
27E. Capscrew
27F. Capscrew
28. Pipe Plug
30. Fitting
31. Pipe Plug
31A. Pipe Coupling
31B. Pipe Nipple
32. Gasket
33. Capscrew
34. Capscrew
35. Capscrew
36. Sleeve
37. Retaining Ring
38. Gasket
39. Retaining Ring
40. Packing
41. Lantern Ring
42. O-Ring
43. Slinger
44. Accumulator Gland
44A. Capscrew
44B. Hose Connector
44C. Hose
44D. Pipe Plug
45. Capscrew
46. Gasket
47. Mechanical Seal
47A. Bushing
48. Shaft
49. Inboard Bearing
49A. Grease Shield
50. Outboard Bearing
50A. Grease Shield
50B Retaining Ring
50C. Lockwasher or Retaining Ring
50D. Locknut
51. Bearing Cartridge
51A. O-Ring
52. Grease Seal
53. Grease Seal
54. Sleeve Key
55. Shaft Key
56. Power Frame
57. Pipe Plug
58. Grease Fitting
59. Capscrew
60. Shim Pack or Capscrew
61. Jam Nut
62. Pipe Plug
63. Grease Fitting
64. Gasket
65. Suction Elbow
66. Capscrew
66A. Washer
66B. Capscrew
67. Gasket
68. Handhole Cover
69. Capscrew
69A. Nut
69B. Washer
70. Pipe Plug
71. Pipe plug
72. Drive Pins
73. Name Plate


MECHANICAL SEAL (OPTIONAL)
28
47A
31
47
46
45
44
31A
31B
27
56
63
45
53
44C
43
44B
44
44A
42
44D
40
41
40
37
36
38
8
35
24
72
73
34
17
32
31
31A
28
31B
30
29
27
14
2
3
4
13
12
11
10
20A
20B
20B
20
19
18
25
1
7
26
6
16
5
64
15
69
65
69B
66
70
71
67
68
66A
69B
69A
21
66B
52
59
58
51
51A
50C
50
50A
60
55
48
54
49
BOLD FACE NUMBERS INDICATE
RECOMMENDED SPARE PARTS.


30
27D
27C
27B
27A
29
31B
31
31A
27F
27E
28
SPLIT BOX (OPTIONAL)
28
47
46
45
44
31
31A
31B
27
47A
MECHANICAL SEAL (OPTIONAL)
BOLD FACE NUMBERS INDICATE
RECOMMENDED SPARE PARTS.
17
20B
20A
18
20B
20
19
25
1
26
7
6
16
5
21
15
64
66
70
67
71
65
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72
73
34
33
32
45
43
44A
44C
44B
44
44D
42
40
31
31A
41
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31B
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13
12
11
10
58
57
52
60
61
59
51
50D
50C
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50A
50B
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48
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49A
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56
62
53
63

AURORA PUMP
A member of the PENTAIR PUMP GROUP

INSTRUCTION MANUAL
REPAIR
MODEL 653A

6

SERVICE

Your Aurora pump requires no maintenance other than periodic inspection, occasional cleaning and lubrication of bearings. The intent of inspection is to prevent breakdown, thus obtaining optimum service life. The liquid end of the pump is lubricated by the fluid being pumped and therefore does not require periodic lubrication. The motor, however,, may require lubrication, in which case, the motor manufacturer's recommendations should be followed.

LUBRICATION OF BEARINGS

The 650 Series pumps are available with regreasable shaft bearings as standard.

Regreasable bearings require periodic lubrication, which can be accomplished by using the lubrication fittings in the cartridge cap and power frame. Lubricate the bearings at regular intervals using a grease of high quality. Lithium grease is recommended as a lubricant for pumps operating in both wet and dry locations. Mixing of different brands of grease should be avoided due to possible chemical reactions between the brands, which could damage the bearings. Avoid vegetable- or animal-base grease, which can develop acids, as well as grease containing rosin, graphite, talc and other impurities. Under no circumstances should used grease be reused.

Over lubrication should be avoided as it may result in overheating and possible bearing failure. Under normal application, adequate lubrication is assured if the amount of grease is maintained at 1/3 to 1/2 the capacity of the bearing and adjacent space surrounding it.

In dry locations, the power frame 3C bearings will need lubrication at least every 600 hours of running time or every 6 to 12 months, whichever is more frequent. In wet locations the bearings should be lubricated at least every 300 hours of running time or every 4 to 6 months, whichever is more frequent. A unit is considered to be installed in a wet location if the pump and motor are exposed to dripping water, the weather, or heavy condensation such as is found in unheated and poorly ventilated underground locations.

In dry locations, the power frame 4C bearings will need lubrication at least every 2,000 hours of running time or every 6 to 12 months, whichever is more frequent. In wet locations the bearings should be lubricated at least every 1,000 hours of running time or every 4 to 6 months, whichever is more frequent.

The 5E and 5F bearing frames have back-to-back angular contact bearings (50). This style bearing requires more frequent lubrication intervals. It is suggested that this bearing be lubricated every 1,000 hours.

The 5F power frame has a spherical roller bearing as the inboard bearing. This bearing should be relubricated every 500 hours.

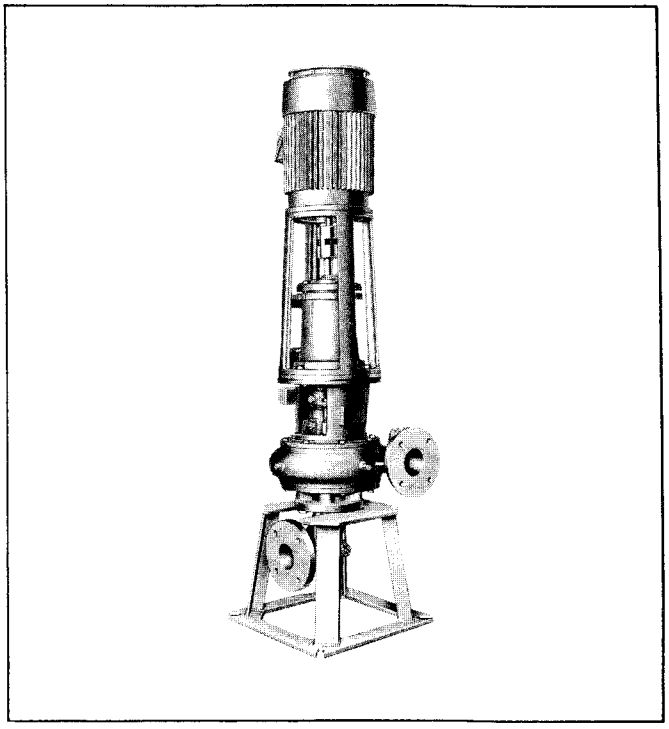
At times it may be necessary to clean the bearings due to accumulated dirt or deteriorated lubricants. This can be accomplished by flushing the bearing with a light oil heated to 180 to 200°F. While rotating it on a spindle, wipe the bearing housing with a clean rag soaked in a cleaning solvent and flush all surfaces.

Dry bearing thoroughly before relubricating. Compressed air can be used to speed drying, but care should be taken not to let bearings rotate while being dried.

CAUTION

Use normal fire caution procedures when using any petroleum cleaner.

The motor which drives your Aurora pump may or may not require lubrication. Consult the manufacturer's recommendations for proper maintenance instructions.



REPAIRS

The pump may be disassembled using the illustrations and text provided. Although complete disassembly is covered, it will seldom be necessary to completely disassemble your Aurora pump.

The illustration accompanying the disassembly instructions shows an exploded view of the pump. The illustration is intended to aid in the correct identification of the parts mentioned in the text.

Inspect removed parts at disassembly to determine their reusability. Cracked castings should never be reused. Gaskets should be replaced at reassembly simply as a matter of economy; they are much less expensive to replace routinely than to replace as the need occurs. In general it is economical to return the motor and motor controller to the manufacturer for repair.

POWER FRAME 3C PUMP DISASSEMBLY

This pump has been designed with back pull-out features, which allow the power frame and rotating element to be removed without disturbing the suction and discharge piping.

Disassemble only what is needed to make repairs or accomplish inspection.

1. Break electrical connections to prevent drive unit from being energized during disassembly.

2. Close all valves or flow devices that control movement of liquids to or from pump. Remove drain plug (70) from suction elbow (65).

3. Remove all relief, cooling, flushing or drain lines from pump. Remove handhole cover (19) by removing capscrews (20), nuts (20A), washers (20B) and gasket (18). Break suction and discharge connections unless it is intended to remove the power frame assembly and leave the casing (1) in the line.

Remove capscrews and nuts (23 and 24) from bracket (8), which allows motor, motor support (22) and flexible coupling half to be lifted off at this point.

NOTE

The motor can be removed from motor support (22) by unscrewing additional capscrews and nuts.

4. Unscrew capscrews (66B) to remove pump from base (21). The pump elbow (65) is removed by loosening capscrews (66). Gasket (64) may now be removed.

If required, handhole cover (68) may be removed from elbow (65), by removing capscrews (69), nuts (69A), washers (69B) and gasket (67).

5. Remove capscrews (34) and slide casing (1) from bracket (8) and stuffing box (27). Remove gasket (17). Should suction cover (5) need to be removed, unscrew capscrews (15) and remove gasket (16).

6. Unscrew impeller screw (10) and remove o-ring gasket (11) and washer (12), taking care not to damage gasket (13).

NOTE

650A Pumps have a tapered hub impeller to facilitate impeller removal. Use caution in the removal of impeller as it has to be moved only a few thousandths of an inch to become entirely free.

7. Slide impeller (2) and impeller key (14) from the shaft, again taking care not to damage gasket (38) located behind impeller. Remove gasket (38).

8. The various types of stuffing boxes may be disassembled as follows:

PACKING WITH LANTERN RING (STANDARD)

A. Remove capscrews (44A and 45), and split accumualtor gland halves (44). Remove o-ring gasket (42) from stuffing box.

B. Remove and discard old packing (40). Clean all parts to remove any packing that may have adhered. Leakage accumulator gland (44) may be further disassembled by removing pipe plugs (44D), tubing (44C) and hose connector (44B).

C. Unscrew capscrews (33) and remove stuffing box (27) from bracket (8). Remove gasket (32).

D. Shaft sleeve (36) is a slip fit on the shaft and should be easily removed unless the pump has been in service for a long time. In this case it may be necessary to use a puller. A snap ring may be installed in the sleeve groove to ease disassembly. Take care to prevent damaging the surface of the sleeve. Replace the sleeve if it is grooved from wear. Remove key (54) and retaining ring (37) from shaft.

MECHANICAL SEAL (OPTIONAL)

CAUTION

The mechanical seal is a precision product and must be treated as such. During removal great care must be taken to avoid dropping any part of the seal. Take particular care not to scratch the lapped faces on the washer or the sealing seat. Do not put a seal back into service until the sealing faces of the washer and seat have been lapped or replaced.

A. Remove seal gland bolts (45) and remove gland (44) carefully exposing seal (47).

B. Unscrew capscrews (33), and remove stuffing box assembly (27). Remove gasket (32).

C. Slide sleeve (36) with rotating parts of mechanical seal (47) from the shaft. Remove ceramic seal rings and stainless steel parts from sleeve with great care, as ceramic parts are easily damaged.

The sleeve should be carefully cleaned to remove any residue that may be remaining in the seal area. The rubber in the seal may have become partially adhered to the sleeve. The sleeve must also be checked for abrasion or corrosion that can occur when fluid residue penetrates between the seal (47) and sleeve (36). The sleeve under the seal may be polished lightly to a 32 RMS finish before reassembly. Do not reuse a pitted sleeve. Remove retaining ring (37) and key (54).

D. Remove stationary seats and o-rings from gland (44) and stuffing box (27), using care not to damage these parts.

9. Unscrew capscrews (35) to remove bracket (8) from power frame (56).

10. Remove key (55) from the shaft.

11. Unscrew capscrews (59) and remove bearing cap (51). Remove o-ring (51A) and retaining ring (50C).

12. Slide out shaft (48) and bearings (49 and 50). Remove shim (60). Since bearings (49 and 50) are press fitted on the shaft, they will have to be pulled or pressed off the shaft. Remove grease seals (52) and (53) from frame (56) and bearing cap (51).

13. Remove screws (72) and nameplate (73) only if replacement is necessary.

POWER FRAME 3C REASSEMBLY

Reassembly will generally be in reverse order of disassembly. If disassembly was not complete, use only those steps related to your paraticular repair program.

1. Press grease seals (52) and (53) into frame (56) and bearing cap (51).

2. Press bearings (50 and 49) onto shaft (48). Snap retaining ring (50C) into place.

3. Slide shaft (48) and bearings (50 and 49) into frame (56). Do not install o-ring (51A), shim (60) or bearing cap (51) at this point.

4. Position slinger (43) on the shaft sleeve.

5. Position bracket (8) on the power frame (56) and secure with capscrews (35). Tighten capscrews evenly to assure proper alignment.

6. If nameplate (73) was removed, install and attach with screws (72).

7. Reassemble the various types of stuffing boxes as follows:

PACKING WITH LANTERN RING (STANDARD)

A. Place gasket (32) on stuffing box (27), slide over shaft and secure to bracket (8) with capscrews (33).

B. Install retaining ring (37), place key (54) in shaft and slide sleeve (36) over shaft. Packing (40) and lantern ring (41) may be replaced at this time. From impeller end of shaft, place two new rings of packing (40) around shaft sleeve, slide lantern ring (41) back in position and place remaining three rings of packing on shaft sleeve. Be sure to stagger joints of packing rings to avoid excessive leakage through the packing.

C. Place o-ring gasket (42) in stuffing box on top ring of packing (40). Be sure o-ring remains concentric against inside diameter of the stuffing box. Slide slinger (43) over shaft extension and adjust to ¼ in. below top of leakage accumulator after stuffing box assembly has been reattached to bracket. Replace pipe plugs (44D), hose connector (44B) and tubing (44C) in leakage accumulator glands (44). Place one half of leakage accumulator gland in stuffing box with connection for hose to drain positioned properly. Apply General Electric* Silicon Rubber Sealant on both ends of this gland half. Thread capscrews (45) into stuffing box (27) approximately ¼ in. Insert other half of gland (44) in stuffing box being careful not to disturb o-ring gasket (42). Insert capscrews (44A) into each side of gland (44) to hold the two halves together. Tighten capscrews (44A) before tightening packing adjusting capscrews (45) to obtain proper sealing.

> Ensure capscrews (45) are tightened enough to hold parts in place. Final adjustment of packing box will have to be made after pump is returned to operation.

MECHANICAL SEAL (OPTIONAL)

NOTE

> The mechanical seal (47) cannot be installed as an assembly. It is necessary to have the seal seats properly in place before the balance of parts can be added.

A. Install retaining ring (37) and key (54) in shaft.

B. Wipe the sealing faces of the seat and seal washer clean. lubricate the shaft sleeve (36) with a silicone base lubricant. Slide the entire rotating assembly onto the sleeve.

C. Thoroughly inspect the seal box cavity checking for burrs or nicks which could damage the seat of the seal. Apply a film of liquid dishwashing detergent or rubber lubricant, (do not use oil or grease) to the seal seats. Replace stationary seats and o-rings in gland (44) and stuffing box (27).

NOTE

> If it is not possible to insert seat with fingers, place cardboard protecting ring furnished with seal over lapped face of seat and press into place with a piece of tubing having end cut square. The tubing should be slightly larger than the diameter of the shaft. Remove cardboard after seat is firmly in place. Carefully slip the stuffing box assembly (27) over the shaft sleeve with the stationary seat facing away from the motor. Install gasket (46) into gland (44).

Apply a film of liquid dishwashing detergent or rubber lubricant to the washer and bellows of the seal, and slide the remaining seal parts onto the shaft, making sure the washer is seated against the seal seat.

D. The shaft sleeve (36) with the seal rotating assembly on it may now be placed on the shaft. The shaft sleeve (36) should slide over shaft with keyway for key (54) toward power frame (56).

E. Replace gasket (32) on bracket (8) and carefully slip stuffing box (27) with stationary seal seat toward power frame (56), over the shaft and secure with capscrews (33).

F. Position gland (44) onto stuffing box (27) taking care to seat it evenly and squarely. Secure by tightening capscrews (45) evenly, being careful not to damage gasket (46) between them.

8. Carefully place o-ring gasket (38) on shaft sleeve (48). Assemble key (14) and impeller (2) to shaft. Secure impeller with gasket (13), washer (12), impeller screw o-ring gasket (11) and impeller screw (10).

9. Install pipe plugs (25) in the pump casing (1). Position gasket (17) and casing (1) against the bracket (8) and secure with capscrews (34).

10. Place casing gasket (16) on suction cover (5) and bolt to casing (1) with capscrew (15).

LAMINATED SHIM IMPELLER ADJUSTMENT

11. Push the shaft and impeller assembly completely forward until the impeller contacts either the suction cover (5) or inside front surface of casing (1).

With a feeler gauge measure the clearance between the back machined surface of the power frame (56) and the snap ring in the outer race of the outboard bearing (50). This measurement plus the desired clearance between the impeller and casing will give the total required shim thickness. Example: - It is recommended to have 0.016 in. clearance between the impeller and casing. With the impeller and shaft assembly moved completely forward and flush with the inside of the casing there is 0.008 in. clearance between the snap ring and the power frame. Therefore, the required shim thickness is: 0.0008 in. + 0.016 in. = 0.024 in. or 12 shims.

Remove snap ring on outer race of outboard bearing (50) and install proper shim. Replace snap ring.

12. Install gasket (51A) and fasten bearing cap (51) in position with capscrews (59). Position key (55) and coupling half. Replace all pipe plugs and grease fittings.

13. Place handhole cover gasket (18) on handhole cover (19) and bolt to casing (1) with capscrews (20), washers (20B) and nuts (20A). Replace all relief, cooling, flushing or drain lines from the pump. Place gasket (64) on elbow (65) and secure to pump. Pump may now be replaced on base (21) and secured with capscrews (66B) and washers (66A). If handhole cover (68) was removed from elbow (65), replace using gasket (67), capscrews (69), washers (69B) and nuts (69A).

14. Secure suction and discharge piping to the pump. Make sure to install gaskets on flanged connections. Secure motor support (22) to bracket (8) with capscrews (23) and nuts (24). If motor was removed from motor support (22) position it on support and secure with capscrews and nuts.

15. Connect electricity to the motor.

16. Open all valves or flow devices that control flow of liquids to and from pump.

STARTING PUMP AFTER REASSEMBLY

Do not start pump until all air and vapor have been bled making sure that there is liquid in the pump to provide the necessary lubrication. Without the fluid around it, a seal may be ruined in a few seconds of operation. It is possible that the mechanical seal may drip during the first few minutes to one hour of operation.

Packing should be adjusted as previously discussed in this manual.

POWER FRAME 4C, 5E and 5F DISASSEMBLY

1. Disconnect power so that pump can not be accidently energized during disassembly.

2. Close all valves or flow devices that cotrol movement of liquids to or from pump. Drain pump by removing drain plug (70) from suction elbow (65). Remove any flushing, drain, or cooling lines from pump. Remove handhole cover (19) from casing by removing capscrews (20) and gasket (18).

3. Remove capscrews (23) and nuts (24) from bracket (8), which allow motor, motor support (22), and flexible coupling half to be lifted off at this point, to allow removal of power frame and rotating element.

NOTE

On some sizes, adapter (22A) is required and can be removed from motor with capscrews.

The motor can be removed from motor support (22) by unscrewing additional capscrews and nuts.

4. Remove capscrews (34) that secure bracket (8) to casing (1). Screw an eyebolt into outboard end of shaft (48) to aid in lifting power frame and rotating element from casing. The size of eyebolt is as follows.

a. Power Frame 4C requires 5/8-11NC eyebolt.

b. Power Frames 5E and 5F require 3/4-10NC eyebolt.

5. Remove gasket (17) from its position between bracket (8) and casing (1). Once the power frame and rotating element have been withdrawn, inspect the sealing surface to ensure that it is clean and free of any gasket material, which may have stuck to parting surfaces. Replace this gasket with a new one when pump is reassembled.

6. Inspect casing wearing ring (optional) (6) and replace if necessary. Removal can be accomplished by removing capscrews (7).

7. Remove capscrews (10), o-ring gasket (11), washer (12) and gasket (13) which allows impeller (2), key (14), and gasket (38) to be removed.

NOTE

Pumps have a tapered hub impeller to facilitate impeller removal. Use caution in removal of impeller as it has to be moved only a few thousanths of an inch to become entirely free.

The easiest method for removing impeller is to suspend entire power frame and rotating element with the eyebolt about 1/32 of an inch above floor or work area. Apply pressure to impeller by means of jackscrews (60 and 61) (located on bearing cap (51)). When impeller is firmly against bracket (8) it should drop free after turning the jackscrews evenly, a flat at a time, three or four flats.

8. Unscrew capscrews (35) to allow removal of bracket (8), stuffing box (27), and shaft sleeve (36) from the power frame (56). Remove truarc snap ring (37) from the inboard end of the shaft sleeve (36). Remove bracket and stuffing box from shaft extension (48).

For further disassembly of sealing box proceed as follows:

A. PACKING BOX (STANDARD)

I. Remove capscrews (45), and split accumulator gland halves (44) Slinger (43) is now exposed and can be removed from shaft sleeve. Remove O—ring gasket (42) from stuffing box.

Remove and discard old packing (40). Clean all parts to remove any packing that may have adhered during removal. Leakage accumulator gland (44) may be further disassembled by removing capscrews (44A), pipe plugs (44D), tubing (44C) and hose connectors (44B).

B. DOUBLE SEAL (OPTIONAL)

I. Remove seal gland bolts (45) and remove gland (44) carefully exposing seal (47).

II. Use great care in removing ceramic seal rings and stainless steel metal parts from sealing box as ceramic parts are easily chipped or cracked.

III. Remove carbon station seats and o-rings only if necessary, using care not to damage these parts.

9. Place power frame on two benches, so that its shaft rests between them or on a bench with a hole cut in it large enough for shaft.

10. Remove grease zerk (63) and pipe plug (62) from inboard end of power frame. Remove retainer ring (37) by twisting it in a spiral movement toward end of shaft. Also remove grease seal (53).

11. Remove capscrews (59) and lift out shaft assembly from the power frame (56).

12. The inboard radial bearings are either ball bearings or spherical roller bearings and can be identified by power frame as listed below.

4C, 5E Power Frames have ball bearings.

5F has a spherical roller bearing.

13. Remove coupling half and key (55) from shaft. Remove plug (57) and zerk fitting (58).

14. Retainer ring (50B) is removed with a pair of truarc internal pliers so that grease retainer (50A) can be removed allowing bearing cap (51) to be removed from shaft assembly. grease seal (52) may be removed if necessary.

15. With a pair of truarc external pliers, remove snap ring (50C) (PF #4 only) or remove locknut (50D) and lockwasher (50C) (P.F. #5).

16. Both inboard bearing (49) and outboard bearing (50) are pressed onto shaft. To remove bearings, use a wheel puller or press them off shaft.

NOTE

When removing the inboard bearing (49) avoid damaging the separate grease shield (49A). This shield can be removed when bearing is removed from shaft.

17. If total disassembly is required, break connections to suction and discharge pipe and remove nuts from foundation bolts that hold support (21) to its foundation.

18. Secure casing and support assembly in sling and move it away from piping. Invert this assembly and set casing (1) on wood blocks, so as not to mar surface that mates with bracket (8).

19. Pipe plug or suction gage (71) can now be removed from suction elbow or nozzle (65). Unscrew capscrews (69) and nuts (69A), and remove cover (68) and gasket (67) from suction elbow or nozzle (65).

20. Place rope sling through elbow and cover opening. Remove capscrews (66) and lift suction elbow (65) away from cover (5). Remove gasket (64).

21. Unscrew capscrews (15) which hold support (21), cover (5) and casing (1) together. Lift support away and then set casing with discharge up. Gently tap cover loose with a rubber mallet. Remove gasket (16) to complete disassembly.

POWER FRAME 4C, 5E & 5F
REASSEMBLY

These instructions are for a pump that has been completely disassembled. Use those parts that apply to your reassembly program.

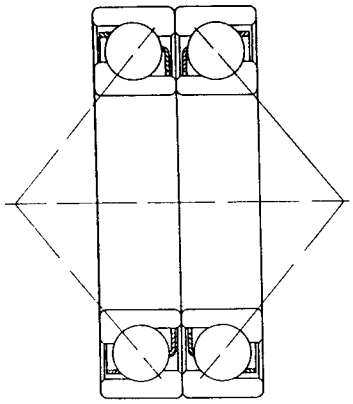
1. Place casing (1) with its outboard side down and position gasket (16) in place. Set cover (5) in place so neither the gaskets position is lost nor damaged. Next align support (21) on cover. Use care not to disturb location of other parts. When all the above parts have been aligned, they are fastened together with capscrews (15). Tighten capscrews evenly to ensure perfect register of mating parts. Replace pipe plugs (25) and (26) in casing.

2. Position gasket (64) on cover and carefully lower suction elbow (65) into place. Fasten suction elbow in place with capscrews (66).

3. Slip gasket (67) onto shoulder of cover (68) and secure it to suction elbow (65) with capscrews (69) and nuts (69A). Place plug or suction gauge (71) and drain plug (70) back into suction elbow (65).

4. Return casing and support assembly to its normal position. Fasten suction and discharge piping to pump. Secure this assembly in place by tightening nuts on foundation bolts. If pump has optional wearing ring (6) fasten it to cover (5) with screws (7). If handhole cover (19) was removed, place gasket (18) on cover and secure with capscrews (20), washers (20B) and nuts (20A).

5. Hand pack the outboard bearings (50) with grease and pack the grease retainer cavity half full. Slide the grease retainer (50A) onto the shaft. Press the outboard bearing onto the shaft until it hits the shoulder of the shaft. Make sure outboard bearing set is properly matched with back-to-back configuration before pressing on shaft. Assemble snap ring (50C) onto the shaft with the beveled side outward to match the bevel in the shaft groove (PF4 only). Install lockwasher (50C) and locknut (50D) to secure outboard bearing (50) to shaft (48) for PF 5. Press or gently tap grease seal (52) into bearing cap (51). Slide the bearing cap over the bearings. Lock in the assembly with snap ring (50B), matching the snap ring bevel to the groove bevel.



Back-to-Back
Bearing Configuration

6. Handpack the inboard bearing (49) and the recessed area of its grease shield (49A). Slide the grease shield onto the shaft with the raised lip toward the bearing. Press the bearing on until all parts are shouldered tight together on the shaft. The grease shield may wear into the outer race during break-in and is considered normal.

7. Place grease seal (53) into place on inboard end of power frame (56).

8. Lower sub-assembly from steps 5 through 7 into outboard end of power frame (56), which has been set on a bench with hole in it to accomodate shaft.

9. Position jack screws so that they extend past bearing caps as given below. This will position impeller hub end of the shaft in a axial position, which will allow mounting impeller and closing down liquid end without any adjustment during the intermediate assembly step. Final adjustment will have to be made by evenly tightening capscrews (59) (step 21).

	Gap Clearance	Bolt Extension
Power Frame #4	1/8 in.	1/4 in.
Power Frame #5	1/4 in.	9/16 in.

10. Place plug (57) and grease zerk (58) back in bearing cap.

11. Place plug (62) and grease zerk (63) back on inboard end of power frame (56).

12. Retaining ring (37) can be set in its groove by turning it in a spiral motion up shaft. When in position, the outside diameter of this ring should slope toward impeller end of shaft.

13. Position bracket (8) to power frame (56) and secure in place by evenly tightening capscrews (35).

14. The following procedure is used in assembling sealing box:

A. PACKING BOX

I. Place two pieces of packing (40) into stuffing box cavity (27) being careful to get each piece firmly in place. Position lantern ring (41), then add remaining three pieces of packing. When packing is tightened lantern ring should align with holes for plug (28), flushing lines, or cooling lines.

NOTE

Be sure to stagger joints of packing rings to avoid excessive leakage.

II. Replace bushing (29) and grease zerk (30) in body of stuffing box (27).

III. Snap retaining ring (39) onto shaft sleeve (36) with a pair of truarc external snap ring pliers. Slide shaft sleeve carefully into inboard end of packing box.

IV. Place o-ring gasket (42) in stuffing box on top ring of packing (40). Be sure o- ring remains concentric against inside diameter of the stuffing box. Slide slinger (43) over shaft extension and adjust to ¼ in. below top of leakage accumulator after stuffing box assembly has been reattached to bracket. Replace pipe plugs (44D), hose connector (44B) and tubing (44C) in leakage accumulator glands (44). Place one half of leakage accumulator gland in stuffing box with connection for hose to drain positioned properly. Apply General Electric* Silicon Rubber Sealant (75) on both ends of this gland half. Thread capscrews (45) into stuffing box (27) approximately ¼ in. Insert other half of gland (44) into stuffing box being careful not to disturb o-ring gasket (42). Insert capscrews (44A) into each side of gland (44) to hold the two halves together. Tighten capscrews (44A) before tightening packing adjusting capscrews (45) to obtain proper sealing.

V. Ensure capscrews (45) are tightened enough to hold parts in place. Final adjustment of packing box will have to be made after pump is returned to operation.

When the pump is returned to service, additional care must be given the packing box to insure proper packing life. It is necessary to allow 60 to 120 drops leakage per minute through the packing for lubrication purposes. If the flow rate is other than this, capscrews (45) should be either loosened or tightened one quarter turn at a time to acquire the correct leakage (capscrews must be turned equally to prevent cocking of the gland). It will take approximately ten minutes at any one gland setting before the leakage rate will stabilize. When in doubt, choose the greater leakage rate since overly tight packing will ruin not only the packing, but the sleeve as well.

NOTE

Do not over tighten packing as this will cause packing box to over-heat and the shaft sleeve (36) to wear excessively.

VI. Place gasket (38) in radial corner groove that is machined on the inboard end of the shaft sleeve to complete assembly.

B. DOUBLE SEAL BOX

I. Thoroughly inspect the seal box cavity (27) checking for burrs or nicks which could damage the o-ring of mechanical seal. Apply a film of liquid dishwashing detergent or rubber lubricant (do not use oil or grease) to the o-ring and seal seat. Press one stationary seat with o-ring gently into the seal box cavity and the other into gland (44). Replace pipe plug (28) in seal box.

II. Place gasket (46) in position in the gland register.

III. Snap retainer ring (39) onto sleeve (36) with a pair of truarc number 8 or 10 external pliers.

IV. Slide sleeve through bottom of stuffing box and place one seal (47) over sleeve and slide it down to stationary seat. Place metal parts over shaft and then second seal ring.

V. Position gland (44) over shaft sleeve and fasten to box with capscrews (45).

NOTE

Do not put mechanical seal back into service until seal ring and stationary seat faces have been relapped or replaced.

15. Place gasket (32) in groove of bracket (8).

16. Place key (54) in its keyway on shaft. Slide stuffing box assembly onto shaft so that key and keyway in the shaft sleeve mate. Continue to slide assembly forward until shaft sleeve is in with retainer ring (37).

17. Align stuffing box (27) with gasket (32) and bracket (8). with capscrews (33).

18. If pump has impeller wearing ring (3), fasten it to suction end of impeller (2) with capscrews (4).

19. Place impeller key (14) in keyway on the tapered portion of shaft (48), and set impeller (2) in position. Position gasket (13) inside impeller suction eye with washer (12) next, and o-ring gasket (11) last. Secure impeller in place with capscrew (10) according to the following chart.

IMPELLER BOLT TORQUE

Power Frame	Impeller Bolt Size	Torque Value
4C	⅜ in.	75 FT-LBS.
5E, 5F	¾ in.	100 FT-LBS.

20. Place gasket (17) on casing (1) and lower power frame (56) and rotating element motor assembly into place; fasten this assembly to casing with capscrews (34).

21. Using jackscrews (60) and nuts (61) located on bearing cap (51), adjust impeller and shaft assembly axially down until impeller bottoms outs on its suction cover (5) or wearing rings (3) and (6). Then, loosen capscrews (59) and jacking screws (60) inward 3 or 4 flats to raise impeller to clearance of .015/.025. Tighten jam nuts (61) and capscrews (59) to lock in adjustment.

22. Make one last check that all parts of the rotating element turn freely.

23. Connect any flushing lines or cooling lines that were removed. Remove lifting eye and set motor and motor support (22) on bracket (8). After securing flexible coupling in place, motor support to adapter with capscrews (23). Some sizes require adapter (22A). This is fastened to support (22) capscrews (22B). Motor is held with capscrews supplied with motor.

24. Open all valves or flow devices that control flow of liquid to and from pump.

25. Connect power.

NOTE

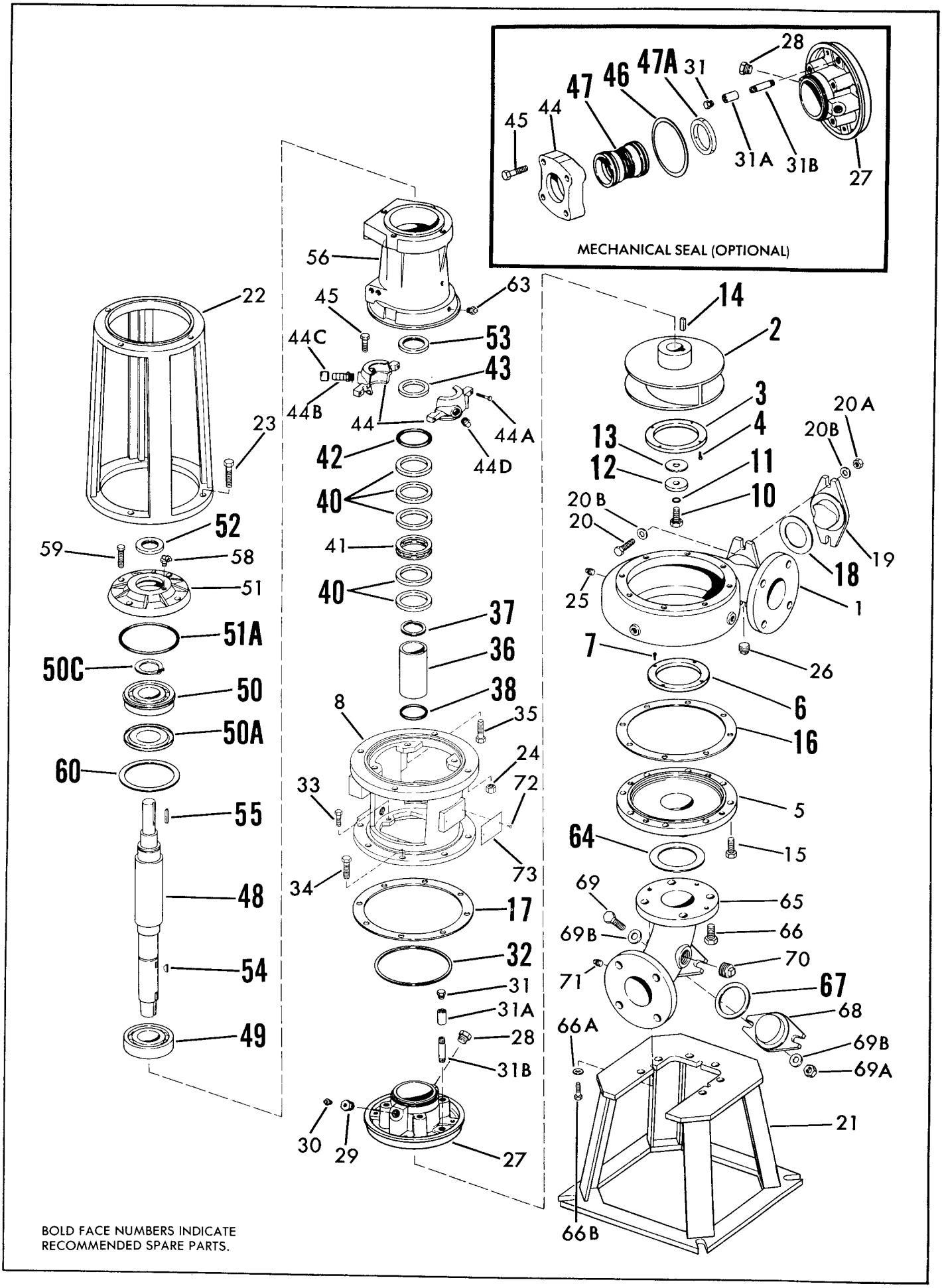
Do not start up a pump until all air and vapor have been bled, making sure that there is liquid in the pump to provide the necessary lubrication. It is possible that the mechanical seal may drip during the first few minutes of operation.

Turn on power momentarily to check for proper rotation. Rotation should be clockwise as viewed from driver (See arrow on casing).

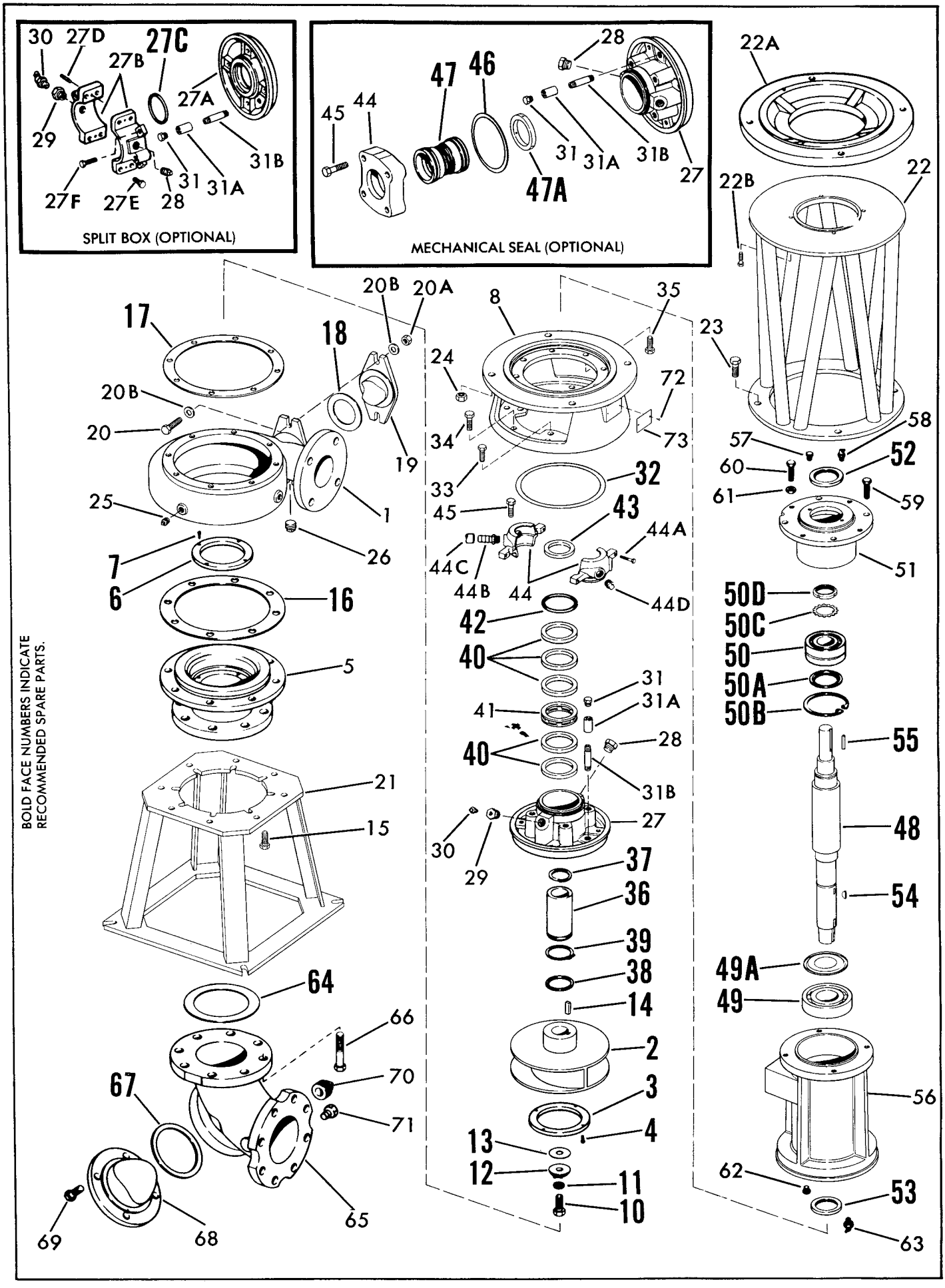
*General Electric is a registered trademark of General Electric Corporation.

MODEL 653A LIST OF PARTS (SEE FIGURE 3)

1. Casing
2. Impeller
3. Wear Ring
4. Set Screw
5. Suction Cover
6. Wear Ring
7. Set Screw
8. Bracket
10. Imp. Bolt
11. Imp. Bolt Seal
12. Imp. Washer
13. Imp. Washer Gasket
14. Impeller Key
15. Capscrew
16. Gasket
17. Gasket
18. Gasket
19. Handhole Cover
20. Capscrew
20A. Nut
20B. Washer
21. Pump Base
22. Motor Support
22A. Adapter
22B. Capscrew
23. Capscrew
24. Nut
25. Pipe Plug
27. Stuffing Box
27A. Adapter Plate
27B. Split Packing Box
27C. Gasket
27D. Pin
27E. Capscrews
27F. Capscrews
28. Pipe Plug
29. Bushing
30. Fitting
31. Pipe Plug
31A. Pipe Coupling
31B. Pipe Nipple
32. Gasket
33. Capscrew
34. Capscrew
35. Capscrew
36. Sleeve
37. Retaining Ring
38. Gasket
39. Retaining Ring
40. Packing
41. Lantern Ring
42. O-Ring
43. Slinger
44. Accumulator Gland
44A. Capscrew
44B. Hose Connector
44C. Hose
44D. Pipe Plug
45. Capscrew
46. Gasket
47. Mechanical Seal
47A. Bushing
48. Shaft
49. Inboard Bearing
49A. Grease Shield
50. Outboard Bearing
50A. Grease Shield
50B Retaining Ring
50C. Lockwasher or Retaining Ring
50D. Locknut
51. Bearing Cartridge
51A. O-Ring
52. Grease Seal
53. Grease Seal
54. Sleeve Key
55. Shaft Key
56. Power Frame
57. Pipe Plug
58. Grease Fitting
59. Capscrew
60. Shim Pack or Capscrew
61. Jam Nut
62. Pipe Plug
63. Grease Fitting
64. Gasket
65. Suction Elbow
66. Capscrew
66A. Washer
66B. Capscrew
67. Gasket
68. Handhole Cover
69. Capscrew
69A. Nut
69B. Washer
70. Pipe Plug
71.Pipe Plug
72. Drive Pins
73. Name Plate



BOLD FACE NUMBERS INDICATE
RECOMMENDED SPARE PARTS.


SPLIT BOX (OPTIONAL)
MECHANICAL SEAL (OPTIONAL)
BOLD FACE NUMBERS INDICATE RECOMMENDED SPARE PARTS.

AURORA®
Pentair Pump Group

INSTRUCTION MANUAL
REPAIR
MODEL 654A

6

SERVICE

Your Aurora pump requires no maintenance other than periodic inspection, occasional cleaning and lubrication of bearings. The intent of inspection is to prevent breakdown, thus obtaining optimum service life. The liquid end of the pump is lubricated by the fluid being pumped and therefore does not require periodic lubrication. The motor, however, may require lubrication, in which case, the motor manufacturer's recommendations should be followed.

REPAIRS

The pump may be disassembled using the illustrations and text provided. Although complete disassembly is covered, it will seldom be necessary to completely disassemble your Aurora pump.

The illustration accompanying the disassembly instructions shows an exploded view of the pump. The illustration is intended to aid in the correct identification of the parts mentioned in the text.

Inspect removed parts at disassembly to determine their reusability. Cracked castings should never be reused. Gaskets should be replaced at reassembly simply as a matter of economy; they are much less expensive to replace routinely than to replace as the need occurs. In general, it is economical to return the motor and motor controller to the manufacturer for repair.

PUMP MODEL 654A DISASSEMBLY
(Motor Frame 250 or Smaller)

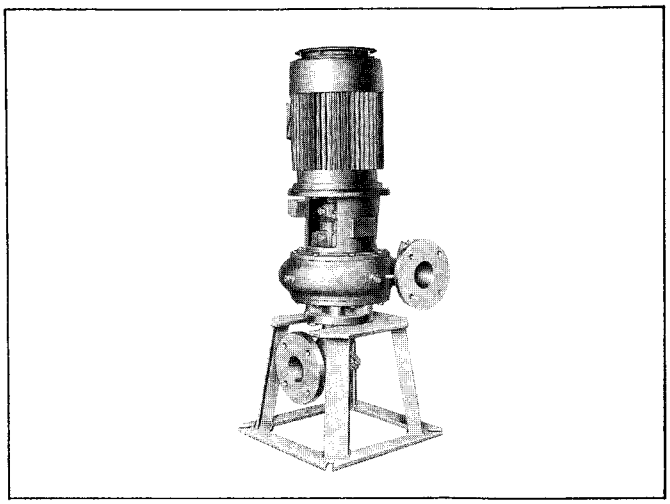
This pump has been designed with back pull-out features, which allow the power frame and rotating element to be removed without disturbing the suction and discharge piping.

Disassemble only what is needed to make repairs or accomplish inspection.

1. Break electrical connections to prevent drive unit from being energized during disassembly.

2. Close all valves or flow devices that control movement of liquids to or from pump. Remove drain plug (70) from suction elbow (65).

3. Remove all relief, cooling, flushing or drain lines from pump. Remove handhole cover (19) by removing capscrews (20), nuts (20A), washers (20B) and gasket (18). Break suction and discharge connections, unless the intention is to remove the entire motor and motor bracket assembly, and leave the casing (1) in the line.



4. Unscrew capscrews (66B) to remove pump from base (21). The pump elbow (65) is removed by the loosening of capscrews (66). Gasket (64) may now be removed. If required, handhole cover (68) may be removed from elbow (65), by removing capscrews (69), nuts (69A), washers (69B) and gasket (67).

5. Remove capscrews (34) and slide casing (1) from bracket (8) and stuffing box (27). Remove gasket (17). Should suction cover (5) need to be removed, unscrew capscrews (15) and remove gasket (16).

6. Unscrew impeller screw (10) and remove o-ring gasket (11) and washer (12), taking care not to damage gasket (13).

NOTE

650A Pumps have a tapered shank impeller to facilitate impeller removal. Use caution in the removal of impeller, as it has to be moved only a few thousandths of an inch to become entirely free.

7. Slide impeller (2) and impeller key (14) from the shaft, again taking care not to damage gasket (38) located behind impeller. Remove gasket (38).

8. The various types of stuffing boxes may be disassembled as follows:

MECHANICAL SEAL (STANDARD)

CAUTION

The mechanical seal is a precision product and must be treated as such. During removal great care must be taken to avoid dropping any part of the seal. Take

particular care not to scratch the lapped faces on the washer or the sealing seat. Do not put a seal back into service until the sealing faces of the washer and seat have been lapped or replaced

A. Remove seal gland bolts (45) and remove gland (44) carefully exposing seal (47).

B. Unscrew capscrews (33), and remove stuffing box assembly (27). Remove gasket (32).

C. Slide sleeve (36) with rotating parts of mechanical seal (47) from the shaft. Remove ceramic seal rings and stainless steel parts from sleeve with great care as ceramic parts are easily damaged.

The sleeve should be carefully cleaned to remove any residue that may be remaining in the seal area, as the rubber in the seal may have become partially adhered to the sleeve. The sleeve must also be checked for abrasion or corrosion that can occur when fluid residue penetrates between the seal (47) and sleeve (36). The sleeve under the seal may be polished lightly to a 32 RMS finish before reassembly. Do not reuse a pitted sleeve. Remove retaining ring (37).

D. Remove stationary seats and o-rings from gland (44) and stuffing box (27), using care not to damage these parts.

PACKING WITH LANTERN RING (OPTIONAL)

A. Remove capscrews (45), and split accumualtor gland halves (44). Remove o-ring gasket (42) from stuffing box.

B. Remove and discard old packing (40). Clean all parts to remove any packing that may have adhered. Leakage accumulator gland (44) may be further disassembled by removing capscrews (44A), pipe plugs (44D), tubing (44C) and hose connector (44B).

C. Unscrew capscrews (33) and remove stuffing box (27) from bracket (8). Remove gasket (32).

D. Shaft sleeve (36) is a slip fit on the shaft and should be easily removed unless the pump has been in service for a long time. In this case it may be necessary to use a puller. A snap ring may be installed in the sleeve groove to ease disassembly. Take care to prevent damaging the surface of the sleeve. Replace the sleeve if it is grooved from wear. Remove key (54) and retaining ring (37) from shaft.

9. Unscrew capscrews (35) to remove bracket (8) from close-coupled motor.

10. Remove screws (72) and nameplate (73) only if replacement is necessary.

REASSEMBLY PUMP MODEL 654A
(Motor Frame 250 or Smaller)

Reassembly will generally be in reverse order of disassembly. If disassembly was not complete, use only those steps related to your paraticular repair program.

1. Position bracket (8) on the close coupled motor and secure with capscrews (35). Tighten capscrews evenly to assure proper alignment.

2. If name plate (73) was removed, install and attach with screws (72).

3. Reassemble the various types of stuffing boxes as follows:

MECHANICAL SEAL (STANDARD)

NOTE

The mechanical seal (47) cannot be installed as an assembly. It is necessary to have the seal seats properly in place before the balance of parts can be added.

A. Install retaining ring (37) and key (54) in shaft.

B. Wipe the sealing faces of the seat and seal washer clean. Lubricate the shaft sleeve (36) with a silicone-based lubricant. Slide the entire rotating assembly onto the sleeve.

C. Thoroughly inspect the seal box cavity checking for burrs or nicks that could damage the seat of the seal. Apply a film of liquid dishwashing detergent or rubber lubricant, (do not use oil or grease) to the seal seats. Replace stationary seats and o-rings in gland (44) and stuffing box (27).

NOTE

If it is not possible to insert seat with fingers, place cardboard protecting ring furnished with seal over lapped face of seat and press into place with a piece of tubing having an end cut square. The tubing should be slightly larger than the diameter of the shaft. Remove cardboard after seat is firmly in place. Carefully slip the stuffing box assembly (27) over the shaft sleeve with the stationary seat facing away from the motor. Install gasket (46) into gland (44).

Apply a film of liquid dishwashing detergent or rubber lubricant to the washer and bellows of the seal, and slide the remaining seal parts onto the shaft, making sure the washer is seated against the seal seat.

D. The shaft sleeve (36) with the seal rotating assembly on it may now be placed on the shaft. The shaft sleeve (36) should slide over shaft with keyway for key (54) toward close-coupled motor.

E. Replace gasket (32) on bracket (8) and carefully slip stuffing box (27) with stationary seal seat toward motor over the shaft and secure with capscrews (33).

F. Position gland (44) onto stuffing box (27) taking care to seat it evenly and squarely. Secure by tightening capscrews (45) evenly, being careful not to damage gasket (46) between them.

PACKING WITH LANTERN RING (OPTIONAL)

A. Place gasket (32) on stuffing box (27), slide over shaft and secure to bracket (8) with capscrews (33).

B. Install retaining ring (37), place key (54) in shaft and slide sleeve (36) over shaft. Packing (40) and lantern ring (41) may be replaced at this time. From impeller end of shaft, place two new rings of packing (40) around shaft sleeve, slide lantern ring (41) back in position and place remaining three rings of packing on shaft sleeve. Be sure to stagger joints of packing rings to avoid excessive leakage through the packing.

C. Place o-ring gasket (42) in stuffing box on top ring of packing (40). Be sure o-ring remains concentric against inside diameter of the stuffing box. Slide slinger (43) over shaft extension and adjust to ¼ in. below top of leakage accumulator after stuffing box assembly has been reattached to bracket. Replace pipe plugs (44D), hose connector (44B) and tubing (44C) in leakage accumulator glands (44). Place one half of leakage accumulator gland in stuffing box with connection for hose positioned to drain properly.

Apply General Electric* Silicon Rubber Sealant on both ends of this gland half. Thread capscrews (45) into stuffing box (27) approximately ¼ in. Insert other half of gland (44) in stuffing box being careful not to disturb o-ring gasket (42). Insert capscrews (44A) into each side of gland (44) to hold the two halves together. Tighten capscrews (44A) before tightening packing, adjusting capscrews (45A) to obtain proper sealing.

Ensure capscrews (45) are tightened enough to hold parts in place. Final adjustment of packing box will have to be made after pump is returned to operation.

When the pump is returned to service, additional care must be given the packing box to ensure proper packing life. It is necessary to allow 60 to 120 drops leakage per minute through the packing for lubrication purposes. If the flow rate is other than this, capscrews (45) should be either loosened or tightened one quarter turn at a time to acquire the correct leakage (capscrews must be turned equally to prevent cocking of the gland). It will take approximately ten minutes at any one gland setting before the leakage rate will stabilize. When in doubt, choose the greater leakage rate since overly tight packing will ruin not only the packing, but the sleeve as well.

4. Carefully place o-ring gasket (38) on shaft sleeve (36). Assemble key (14) and impeller (2) to shaft. Secure impeller with gasket (13), washer (12), o-ring gasket (11) and impeller screw (10). Torque impeller bolt to 75 ft. lbs.

5. Install pipe plugs (25) in the pump casing (1). Position gasket (17) and casing (1) against the bracket (8) and secure with capscrews (34).

6. Place casing gasket (16) on suction cover (5) and bolt to casing (1) with capscrews (15).

7. Place handhole cover gasket (18) on handhole cover (19) and bolt to casing (1) with capscrews (20), washers (20B) and nuts (20A). Replace all relief, cooling, flushing or drain lines from the pump. Place gasket (64) on elbow (65) and secure to pump. Pump may now be replaced on base (21) and secured with capscrews (66B) and washers (66A). If handhole cover (68) was removed from elbow (65), replace using gasket (67), capscrews (69), whashers (69B) and nuts (69A).

8. Secure suction and discharge piping to the pump. Make sure to install gaskets on flanged connections.

9. Connect electricity to the motor.

10. Open all valves or flow devices that control flow of liquids to and from pump.

STARTING PUMP AFTER REASSEMBLY

Do not start pump until all air and vapor have been bled, making sure that there is liquid in the pump to provide the necessary lubrication. Without the fluid around it, a seal may be ruined in a few seconds of operation. It is possible that the mechanical seal may drip during the first few minutes to one hour of operation.

Packing should be adjusted as previously discussed in this manual.

PUMP MODEL 654A DISASSEMBLY
(Motor Frame 284 and Larger)

1. Disconnect power so that pump can not be accidently energized during disassembly.

2. Close all valves or flow devices that control movement of liquids to or from pump. Drain pump by removing drain plug (70) from suction elbow (65). Remove any flushing, drain, or cooling lines from pump. Remove handhole cover (19) from casing by removing capscrews (20) and gasket (18).

3. Remove capscrews (34) that secure bracket (8) to casing (1). Screw an eyebolt into outboard end of the close-coupled motor or use sling under the motor lifting lugs to aid in lifting motor and rotating element from casing.

4. Remove gasket (17) from its position between bracket (8) and casing (1). Once the motor and rotating element have been withdrawn, inspect the sealing surface to ensure that it is clean and free of any gasket material which may have stuck to parting surfaces. Replace this gasket with a new one when pump is reassembled.

5. Inspect casing wearing ring (6) (optional) and replace if necessary. Removal can be accomplished by removing capscrews (7).

6. Remove capscrews (10), o-ring gasket (11), washer (12) and gasket (13), which allow impeller (2), key (14), and gasket (38) to be removed.

NOTE

Pumps have a tapered hub impeller to facilitate impeller removal. Use caution in removal of impeller as it has to be moved only a few thousanths of an inch to become entirely free.

7. Unscrew capscrews (35) to allow removal of bracket (8), stuffing box (27), and shaft sleeve (36) from the motor. Remove truarc snap ring (37) from the inboard end of the shaft sleeve (36). Lift bracket and stuffing box from shaft extension.

For further disassembly of sealing box proceed as follows:

A. Double Seal (Standard)

I. Remove seal gland bolts (45) and remove gland (44) carefully exposing seal (47).

II. Use great care in removing ceramic seal rings and stainless steel metal parts from sealing box, as ceramic parts are easily chipped or cracked.

III. Remove carbon station seats and o-rings only if necessary, using care not to damage these parts.

B. Packing Box (Optional)

I. Remove capscrews (45), and split accumulator gland halves (44). Slinger (43) is now exposed and can be removed from shaft sleeve. Remove o-ring gasket (42) from stuffing box.

Remove and discard old packing. Clean all parts to remove any packing that may have adhered during removal. Leakage accumulator gland (44), may be further disassembled by removing capscrews (44A), pipe plugs (44D), tubing (44C) and hose connectors (44B).

8. Place close-coupled motor on two benches, so that its shaft rests between them or on a bench with a hole cut in it large enough for shaft.

Remove retainer ring (37) by twisting it in a spiral movement toward end of shaft.

9. Pull shaft sleeve (36) from motor shaft using gear puller with jaws firmly secure behind sleeve.

10. If total disassembly is required, break connections to suction and discharge pipe and remove nuts from foundation bolts that hold support (21) to its foundation.

11. Secure casing and support assembly in sling and move it away from piping. Invert this assembly and set casing (1) on wood blocks, so as not to mar surface that mates with bracket (8).

12. Pipe plug or suction gage (71) can now be removed from suction elbow (65). Unscrew capscrews (69) and nuts (69A), and remove cover (68) and gasket (67) from suction elbow (65).

13. Place rope sling through elbow and cover opening. Remove capscrews (66) and lift suction elbow (65) away from cover (5). Remove gasket (64).

14. Unscrew capscrews (15) that hold support (21), cover (5) and casing (1) together. Lift support away and then set casing with discharge up. Gently tap cover loose with a rubber mallet. Remove gasket (16) to complete disassembly.

PUMP MODEL 654A REASSEMBLY
(Motor Frame 284 and Larger)

These instructions are for a pump that has been completely disassembled. Use those parts that apply to your reassembly program.

1. Place casing (1) with its outboard side down and position gasket (16) in place. Set cover (5) in place so the gasket position is neither lost nor damaged. Next align support (21) on cover. Use care not to disturb location of other parts. When all the above parts have been aligned, they are fastened together with capscrews (15). Tighten capscrews evenly to insure perfect register of mating parts. Replace pipe plugs (25) and (26) in casing.

2. Position gasket (64) on cover and carefully lower suction elbow (65) into place. Fasten suction elbow in place with capscrews (66).

3. Slip gasket (67) onto shoulder of cover (68) and secure it to suction elbow (65) with capscrews (69) and nuts (69A). Place plug or suction gauge (71) and drain plug (70) back into suction elbow (65).

4. Return casing and support assembly to its normal position. Fasten suction and discharge piping to pump. Secure this assembly in place by tightening nuts on foundation bolts. If pump has wearing ring (6), fasten it to cover (5) with screws (7). If handhole cover (19) was removed, place gasket (18) on cover and secure with capscrews (20).

5. Retaining ring (37) can be set in its groove by turning it in a spiral motion up shaft. When in position, the outside diameter of this ring should slope toward impeller end of shaft.

6. Position bracket (8) to close-coupled motor and secure in place by evenly tightening capscrews (35).

7. The following procedure is used in assembling sealing box:

A. Double Seal Box (Standard)

I. Thoroughly inspect the seal box cavity (27) checking for burrs or nicks that could damage the O-ring of mechanical seal. Apply a film of liquid dishwashing detergent or rubber lubricant (do not use oil or grease) to the o-ring and seal seat. Press one stationary seat with o-ring gently into the seal box cavity and other into gland (44). Replace pipe plug (28) in seal box.

II. Place gasket (46) in position in the gland register.

III. Snap retainer ring (39) onto sleeve (36) with a pair of truarc number 8 or 10 external pliers.

IV. Slide sleeve through bottom of stuffing box and place one seal (47) over sleeve and slide it down to stationary seat. Place metal parts over shaft and then second seal ring.

V. Position gland (44) over shaft sleeve and fasten to seal box with capscrews (45).

NOTE

Do not put mechanical seal back into service until seal ring and stationary seat faces have been relapped or replaced.

B. Packing Box (Optional)

I. Place two pieces of packing (40) into stuffing box cavity (27) being careful to get each piece firmly in place. Position lantern ring (41), then add remaining three pieces of packing. When packing is tightened lantern ring should align with holes for plug (29), flushing lines, or cooling lines.

NOTE

Be sure to stagger joints of packing rings to avoid excessive leakage.

II. Replace bushing (29) and grease zerk (30) in body of stuffing box (27).

III. Snap retaining ring (39) onto shaft sleeve (36) with a pair of truarc external snap ring pliers. Slide shaft sleeve carefully into inboard end of packing box.

IV. Place o-ring gasket (42) in stuffing box on top ring of packing (40). Be sure o-ring remains concentric against inside diameter of the stuffing box. Slide slinger (43) over shaft extension and adjust to ¼ in. below top of leakage accumulator after stuffing box assembly has been reattached to bracket. Replace pipe plugs (44D), hose connector (44B) and tubing (44C) in leakage accumulator glands (44). Place one half of leakage accumulator gland in stuffing box with connection for hose positioned to drain properly. Apply General Electric* Silicon Rubber Sealant (75) on both ends of this gland half. Thread capscrews (45) into stuffing box (27) approximately ¼ in. Insert other half of gland (44) into stuffing box being careful not to disturb o-ring gasket (42). Insert capscrews (44A) into each side of gland (44) to hold the two halves together. Tighten capscrews (44A) before tightening packing adjusting cap-screws (45) to obtain proper sealing.

V. Ensure capscrews (45) are tightened enough to hold parts in place. Final adjustment of packing box will have to be made after pump is returned to operation.

When pump is running, gland capscrews (45) should be evenly turned down a flat at a time, allowing packing to work in until a leakage rate of approximatley 60 to 120 drops per minute is obtained.

NOTE

Do not over tighten packing, as this will cause packing box to over-heat and the shaft sleeve (36) to wear excessively.

VI. Place gasket (38) in radial corner groove that is machined on the inboard end of the shaft sleeve to complete assembly.

8. Place gasket (32) in groove of bracket (8).

9. Place key (54) in its keyway on shaft. Slide stuffing box assembly onto shaft so that key and keyway in the shaft sleeve mate. Continue to slide assembly forward until shaft sleeve is in contact with retainer ring (37).

10. Align stuffing box (27) with gasket (32) and bracket (8). Fasten with capscrews (33).

11. If pump has impeller wearing ring (3), fasten it to suction end of impeller (2) with capscrews (4).

12. Place impeller key (14) in keyway on the tapered portion of motor shaft, and set impeller (2) in position. Position gasket (13) inside impeller suction eye with washer (12) next, and o-ring gasket (11) last. Secure impeller in place with capscrew (10).

IMPELLER BOLT TORQUE

Close Coupled Motor Register	Impeller Bolt Size	Torque Value
8½	⅝ in.	75 FT-LBS
12½	¾ in.	100 FT-LBS

13. Place gasket (17) on casing (1) and lower close-coupled motor assembly into place; fasten this assembly to casing with capscrews (34).

14. Make one last check that all parts of the rotating element turn freely. If binding occurs, add additional shim gaskets (17) between bracket (8) and casing (1) to obtain clearance between impeller (2) and suction cover (5).

15. Connect any flushing lines or cooling lines that were removed.

16. Open all valves or flow devices that control flow of to and from pump.

17. Connect power.

NOTE

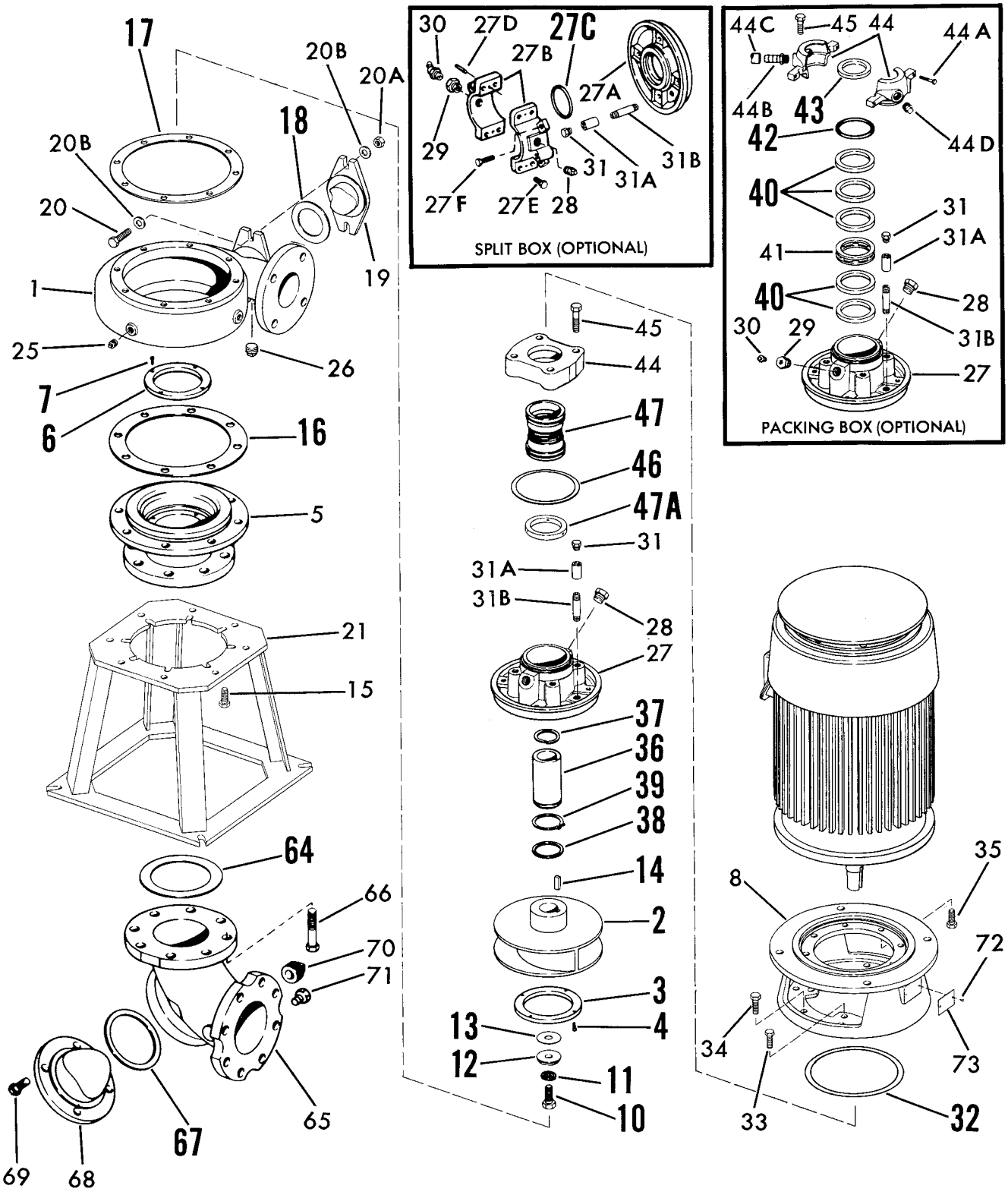
Do not start up a pump until all air and vapor have been bled, making sure that there is liquid in the pump to provide the necessary lubrication. It is possible that the mechanical seal may drip during the first few minutes of operation.

Turn on power momentarily to check for proper rotation. Rotation should be clockwise as viewed from driver (See arrow on casing).

*General Electric is a registered trademark of General Electric Corporation.

MODEL 654A LIST OF PARTS

1. Casing
2. Impeller
3. Wear Ring
4. Set Screw
5. Suction Cover
6. Wear Ring
7. Set Screw
8. Bracket
10. Imp. Bolt
11. Imp. Bolt Seal
12. Imp. Washer
13. Imp. Washer Gasket
14. Impeller Key
15. Capscrew
16. Gasket
17. Gasket
18. Gasket
19. Handhole Cover
20. Capscrew
20A. Nut
20B. Washer
21. Pump Base
25. Pipe Plug
26. Pipe Plug
27. Stuffing Box
27A. Adapter Plate
27B. Split Packing Box
27C. Gasket
27D. Pin
27E. Capscrew
27F. Capscrew
28. Pipe Plug
29. Bushing
30. Fitting
31. Pipe Plug
31A. Pipe Coupling
31B. Pipe Nipple
32. Gasket
33. Capscrew
34. Capscrew
35. Capscrew
36. Sleeve
37. Retaining Ring
38. Gasket
39. Retaining Ring
40. Packing
41. Lantern Ring
42. O-Ring
43. Slinger
44. Gland
44A. Capscrew
44B. Hose Connector
44C. Hose
44D. Pipe Plug
45. Capscrew
46. Gasket
47. Mechanical Seal
47A. Bushing
54. Sleeve Key
64. Gasket
65. Suction Elbow
66. Capscrew
66A. Washer
66B. Capscrew
67. Gasket
68. Handhole Cover
69. Capscrew
69A. Nut
69B. Washer
70. Pipe Plug
71. Pipe Plug
72. Drive Pins
73. Name Plate



BOLD FACE NUMBERS INDICATE RECOMMENDED SPARE PARTS.

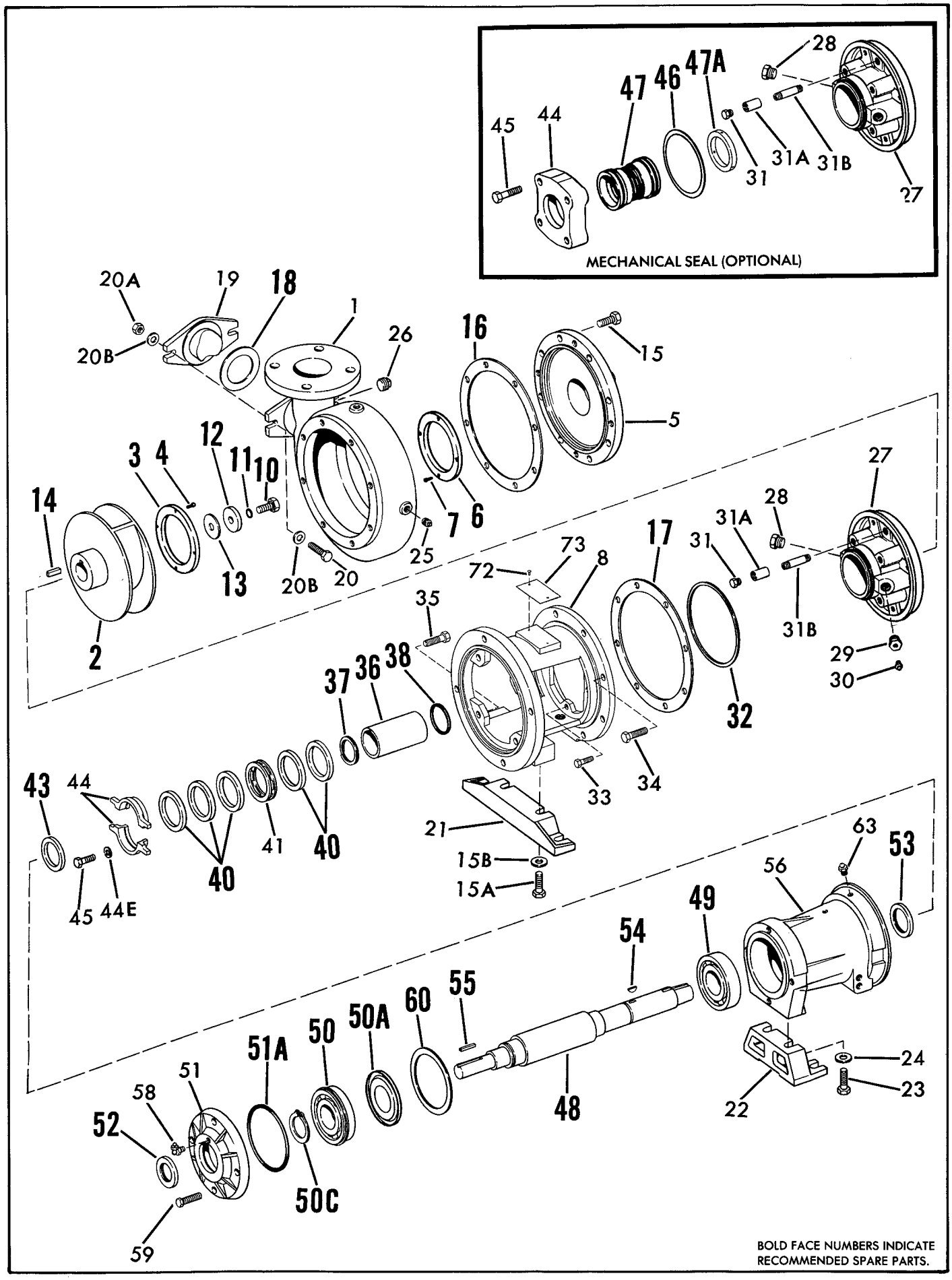
650A SERIES

REPAIR PARTS INDEX

PARTS ARE LISTED BY POWER FRAME AND LIQUID ENDS. SELECT POWER FRAME BY PUMP SIZE AND SPEED FROM CHART BELOW.

PUMP SIZE	RPM			
	1750	1150	875	700
3x3x7	3C	3C		
4x4x7	3C	3C		
3x3x9	3C	3C		
4x4x9A	3C	3C	3C	
4x4x9B	4C	4C	4C	4C
4x4x12	5E	4C	4C	4C
4x6x15	5F	5E	5E	5E

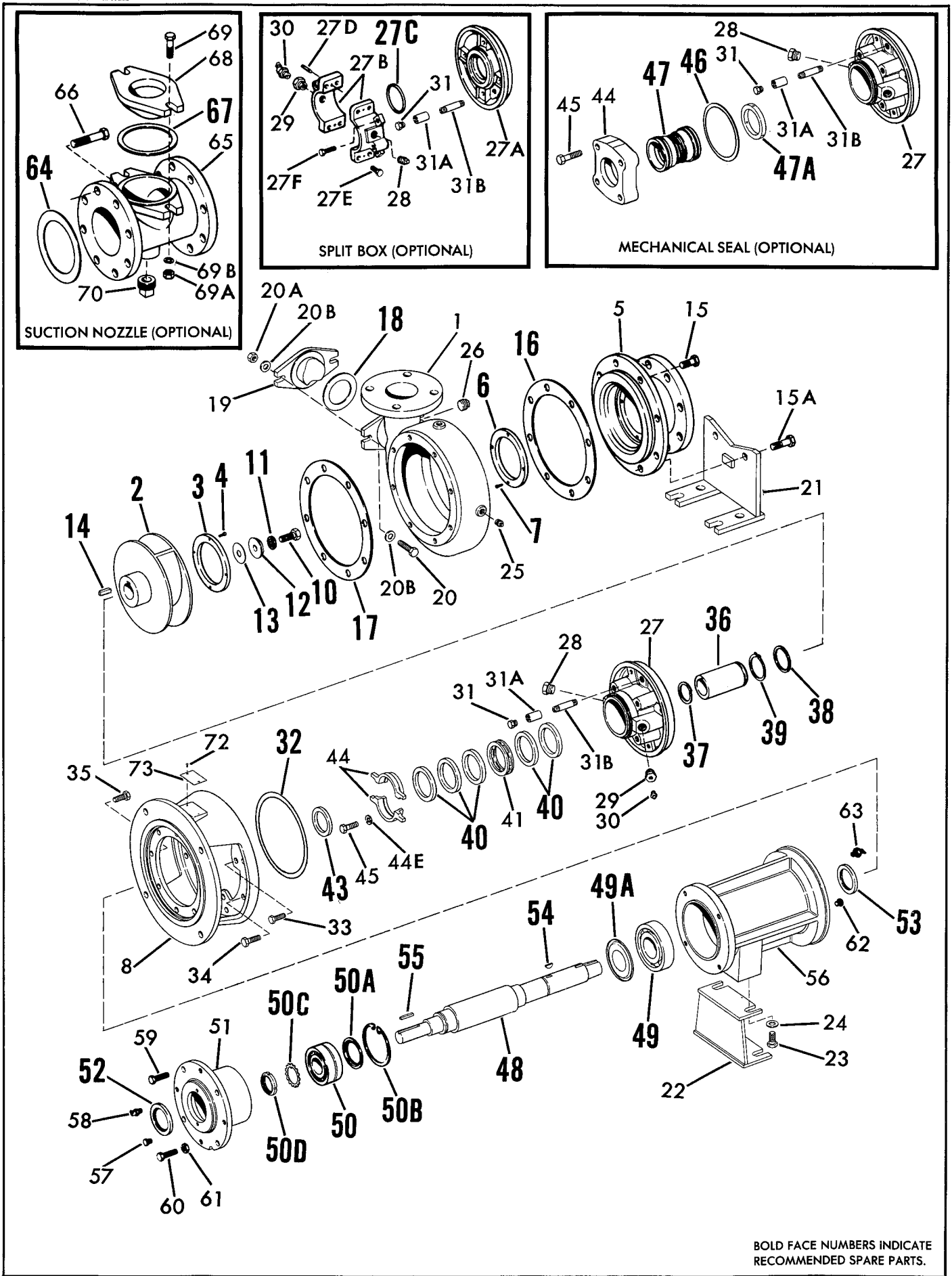
650A SERIES
MODEL 651A PF 3C
PIECE NUMBERS



650A SERIES

MODEL 651A PF4 & 5

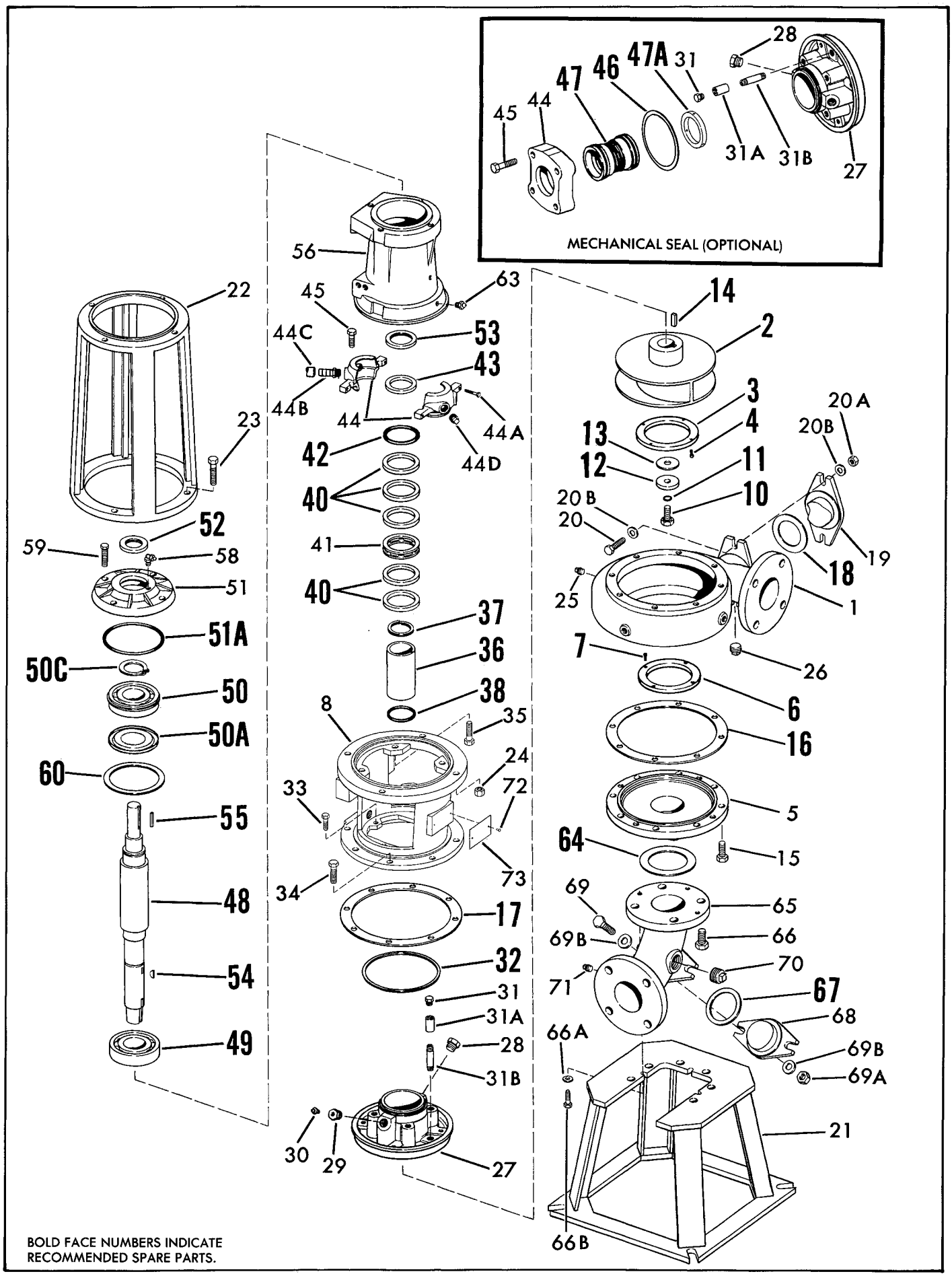
PIECE NUMBERS



650A SERIES

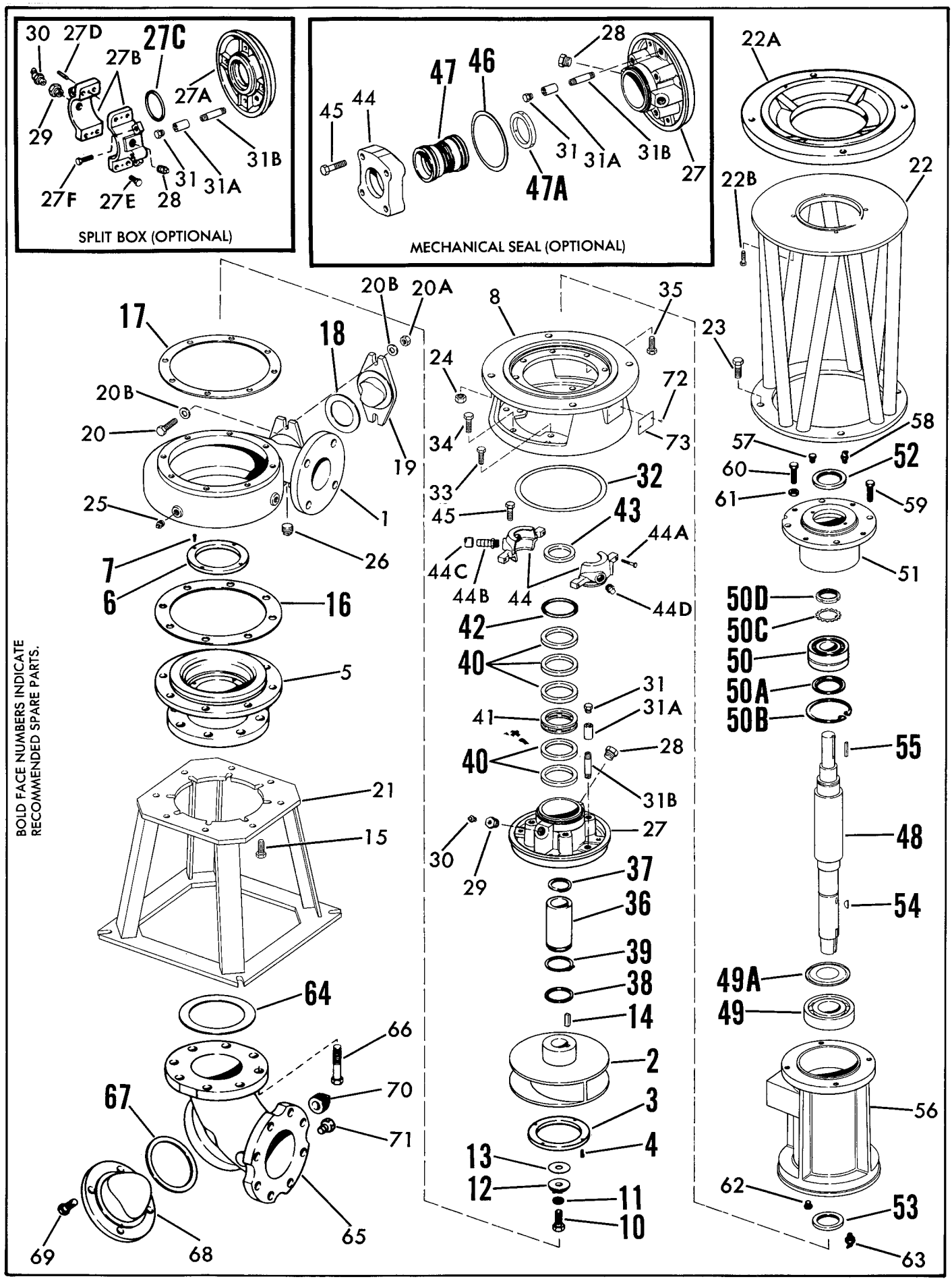
MODEL 652A-653A PF 3C

PIECE NUMBERS



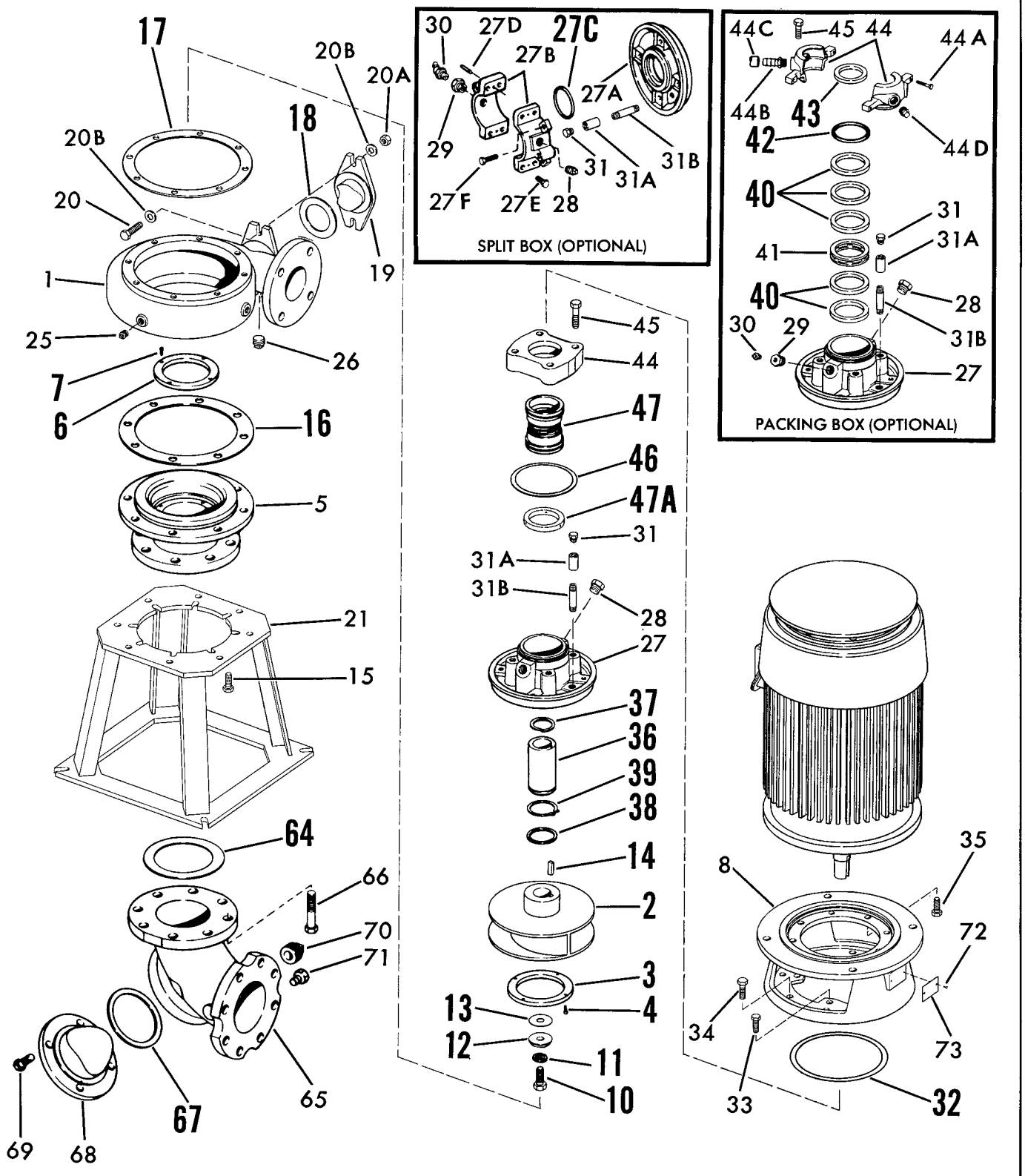
650A SERIES

MODEL 652A-653A PF 4 & 5
PIECE NUMBERS



650A SERIES

MODEL 654A
PIECE NUMBERS



BOLD FACE NUMBERS INDICATE
RECOMMENDED SPARE PARTS.

PARTS LIST

PC. NO.	DESCRIPTION	QTY	PART NO.	MATERIAL			
				B.F.	A.B.	A.I.	S.S.
1	CASING						
	3x3x7	1	180-2405	010			
	4x4x7	1	180-2398	010			
	3x3x9	1	180-0632	010			
	4x4x9A	1	180-2399	010			
	4x4x9B	1	180-2400	010			
	4x4x12	1	180-2401	010			
	4x4x15	1	180-2402	010			
	CASING WITH IMP. & CASE WEARING RINGS						
	3x3x7	1	180-2406	010			
2	IMPELLER						
	3x3x7	1	443-2515	010			
	4x4x7	1	443-2487	010			
	3x3x9	1	443-2549	010			
	4x4x9A	1	443-2489	010			
	4x4x9B	1	443-2491	010			
	4x4x12 PF 4	1	443-2497	010			
	4x4x12 PF 5	1	443-2493	010			
	4x6x15	1	443-2495	010			
	IMPELLER WITH WEARING RING						
	3x3x7	1	443-2517	644		646	
	4x4x7	1	443-2488	644		646	
	3x3x9	1	443-2550	644		646	
	4x4x9A	1	443-2490	644		646	
	4x4x9B	1	443-2492	644		646	
	4x4x12, PF 4	1	443-2498	644		646	
	4x4x12, PF 5	1	443-2494	644		646	
	4x6x15	1	443-2496	644		646	
3	IMPELLER WEARING RING						
	3x3x7	1	676-1949	208		108	
	4x4x7	1	676-2065	208		108	
	3x3x9	1	676-1292	208		108	
	4x4x9A	1	676-2065	208		108	
	4x4x9B	1	676-2064	208		108	
	4x4x12, PF 4	1	676-2064	208		108	
	4x4x12, PF 5	1	676-2064	208		108	
	4x6x15	1	676-1918	208		108	

PC. NO.	DESCRIPTION	QTY	PART NO.	MATERIAL			
				B.F.	A.B.	A.I.	S.S.
4	SETSCREW						
	3x3x7	4	708-0061	104			
	4x4x7	4	708-0067	104			
	3x3x9	4	168-0010	104			
	4x4x9A	4	708-0067	104			
	4x4x9B	4	168-0217	104			
	4x4x12 PF 4	4	168-0217	104			
	4x4x12 PF 5	4	168-0217	104			
	4x6x15	4	168-0045	104			
5	SUCTION COVER						
	3x3x7		NOT REQUIRED				
	4x4x7	1	816-1236	010			
	3x3x9	1	816-0695	010			
	4x4x9A	1	816-1239	010			
	4x4x9B	1	816-1242	010			
	4x4x12	1	816-1245	010			
	4x6x15	1	816-1248	010			
	SUCTION COVER WITH IMP. RING						
	3x3x7		NOT REQUIRED				
	4x4x7	1	816-1237	010			
	3x3x9		NOT AVAILABLE				
	4x4x9A	1	816-1240	010			
	4x4x9B	1	816-1243	010			
	4x4x12	1	816-1246	010			
	4x6x15	1	816-1249	010			
	SUCTION COVER WITH IMP. RING AND CASE RING						
	3x3x7		NOT REQUIRED				
	4x4x7	1	816-1238	644		646	
	3x3x9	1	816-0501	644		646	
	4x4x9A	1	816-1241	644		646	
	4x4x9B	1	816-1244	644		646	
	4x4x12	1	816-1247	644		646	
	4x6x15	1	816-1250	644		646	
6	SUCTION COVER WEARING RING						
	3x3x7	1	676-1950	208		108	
	4x4x7	1	676-2065	208		108	

* HARDENED STAINLESS STEEL WEARING RING OPTION

650A SERIES

PARTS LIST

PC. NO.	DESCRIPTION	QTY	PART NO.	MATERIAL B.F.	A.B.	A.I.	S.S.
6	SUCTION COVER						
	WEARING RING						
	(CONT'D)						
	3x3x9	1	676-1260	208		108	
	4x4x9A	1	676-2065	208		108	
	4x4x9B	1	676-2064	208		108	
	4x4x12	1	676-2064	208		108	
	4x6x15	1	676-1918	208		108	
7	SETSCREW						
	3x3x7	4	708-0061	104			
	4x4x7	4	708-0067	104			
	3x3x9	4	168-0010	104			
	4x4x9A	4	708-0067	104			
	4x4x9B	4	168-0217	104			
	4x4x12	4	168-0217	104			
	4x6x15	4	168-0045	104			
8	BRACKET						
	3x3x7	1	116-0486	010			
	4x4x7	1	116-0486	010			
	3x3x9	1	116-0487	010			
	4x4x9A	1	116-0487	010			
	4x4x9B	1	116-0489	010			
	4x4x12, PF 4	1	116-0490	010			
	4x4x12, PF 5	1	116-0491	010			
	4x6x15	1	116-0492	010			
10	IMPELLER SCREW						
	PF 3C & 4C	1	168-1008	082			
	PF 5E & 5F	1	168-1009	082			
11	IMP SCREW SEAL						
	PF 3C & 4C	1	908-1283	999			
	PF 5E & 5F	1	908-1284	999			
12	IMPELLER WASHER						
	PF 3C	1	908-0605	087			
	PF 4C	1	908-0457	062			
	PF 5E & 5F	1	908-0458	062			
13	IMPELLER						
	WASHER GASKET						
	PF 3C	1	364-2038	803			
	PF 4C	1	364-2025	803			
	PF 5E & 5F	1	364-2029	803			
14	IMPELLER KEY						
	PF 3C & 4C	1	472-0250	087			
	PF 5E & 5F	1	472-0391	087			
15	CAPSCREW 651A						
	3x3x7		NOT REQUIRED				
	4x4x7	8	168-0382	082			
	3x3x9	8	168-0489	082			
	4x4x9A	8	168-0488	082			
	4x4x9B	6	168-0560	082			
	4x4x12	6	168-0560	082			
	4x6x15	6	168-0632	082			
	652A,653A &654A						
	3x3x7		NOT REQUIRED				
	4x4x7	8	168-0382	082			
	3x3x9	8	168-0489	082			
	4x4x9A	8	168-0488	082			
	4x4x9B	8	168-0560	082			
	4x4x12	8	168-0560	082			
	4x6x15	8	168-0636	082			
15A	CAPSCREW 651A						
	3x3x7	2	168-0488	082			
	4x4x7	2	168-0488	082			
	3x3x9	2	168-0488	082			
	4x4x9A	2	168-0488	082			
	4x4x9B	2	168-0564	082			
	4x4x12	2	168-0564	082			
	4x6x15	2	168-0636	082			
15B	WASHER 651A						
	3x3x7	2	908-0114	080			
	4x4x7	2	908-0114	080			
	3x3x9	2	908-0114	080			
	4x4x9A	2	908-0114	080			
16	GASKET						
	3x3x7		NOT REQUIRED				
	4x4x7	1	364-1014	603			
	9&9A CASE BORE	1	364-1015	603			
	9B CASE BORE	1	364-1324	803			
	12" CASE BORE	1	364-1326	803			
	15" CASE BORE	1	364-1327	803			

* HARDENED STAINLESS STEEL WEARING RING OPTION

PARTS LIST

PC. NO.	DESCRIPTION	QTY	PART NO.	MATERIAL B.F.	A.B.	A.I.	S.S.
17	GASKET *						
	7" CASE BORE	1	364-1014	603			
	9&9A CASE BORE	1	364-1015	603			
	9B CASE BORE	1	364-1324	803			
	12" CASE BORE	1	364-1326	803			
	15" CASE BORE	1	364-1327	803			
18	GASKET						
	3x3x7	1	364-1041	453			
	4x4x7	1	364-1041	453			
	3x3x9	1	364-1041	453			
	4x4x9A	1	364-1041	453			
	4x4x9B	1	364-1320	457			
	4x4x12	1	364-1320	457			
	4x6x15	1	364-1320	457			
19	HANDHOLE COVER						
	3x3x7	1	260-0098	010			
	4x4x7	1	260-0735	010			
	3x3x9	1	260-0101	010			
	4x4x9A	1	260-0736	010			
	4x4x9B	1	260-0737	010			
	4x4x12	1	260-0738	010			
	4x6x15	1	260-0738	010			
20	CAPSCREW						
	3x3x7	2	168-0388	082			
	4x4x7	2	168-0382	082			
	3x3x9	2	168-0388	082			
	4x4x9A	2	168-0382	082			
	4x4x9B	2	168-0562	082			
	4x4x12	2	168-0562	082			
	4x6x15	2	168-0562	082			
20A	NUT 3x3x7	2	544-0109	080			
	3x3x9	2	544-0109	080			
20B	WASHER 3x3x7	4	908-0112	080			
	3x3x9	4	908-0112	080			
21	PUMP SUPPORT FRONT FOOT 651A						
	7" CASE BORE	1	820-0186	010			
	9 & 9A CASE BORE	1	820-0186	010			
	9B CASE BORE	1	820-0509	087			
	12" CASE BORE	1	820-0507	087			
	15" CASE BORE	1	820-0505	087			

PC. NO.	DESCRIPTION	QTY	PART NO.	MATERIAL B.F.	A.B.	A.I.	S.S.
21	PUMP BASE						
	652A,653A & 654A						
	7" CASE BORE	1	060-1387	087			
	9 & 9A CASE BORE	1	060-1387	087			
	9B CASE BORE	1	060-1387	087			
	12" CASE BORE	1	060-1387	087			
	15" CASE BORE	1	060-1388	087			
22	PUMP SUPPORT						
	REAR FOOT 651A						
	7" CASE BORE	1	820-0188	010			
	9 & 9A CASE BORE	1	820-0188	010			
	9B CASE BORE	1	820-1624	087			
	12"CASE BORE PF4	1	820-1628	087			
	12"CASE BORE PF5	1	820-1629	087			
	15" CASE BORE	1	820-1625	087			
	MOTOR SUPPORT						
	653A						
	PF 3 & 4	1	820-1397	010			
	< 284 HPH PF 5	1	820-1617	087			
	≥ 284 HPH PF 5	1	820-1620	087			
22A	ADAPTOR 653A						
	≥ 284 HPH PF 3&4	1	008-0340	010			
22B	CAPSCREW 653A						
	≥ 284 HPH PF 3&4	1	168-0562	082			
23	CAPSCREW						
	REAR FOOT 651A						
	PF 3C	2	168-0490	082			
	PF 4C	2	168-0560	082			
	PF 5E & 5F	2	168-0668	082			
	CAPSCREW 653A						
	PF 3C & 4C	4	168-0494	082			
	PF 5E & 5F	4	168-0640	082			
24	WASHER						
	REAR FOOT 651A						
	PF 3C	2	908-0114	080			
	PF 4C	2	908-0116	080			
	PF 5E & 5F	2	908-0118	080			
	NUT 653A						
	PF 3C & 4C	4	544-0113	080			
	PF 5E & 5F	4	544-0117	080			

*FOR MODEL 654A REFER TO FACTORY FOR SHIM GASKETS.

< = LESS THAN ≥ = GREATER THAN OR EQUAL TO

650A SERIES

PARTS LIST

PC. NO.	DESCRIPTION	QTY	PART NO.	MATERIAL B.F.	A.B.	A.I.	S.S.
25	PIPE PLUG						
	3x3x7	3	600-0002	087			
	4x4x7	3	600-0004	028			
	3x3x9	3	600-0002	087			
	4x4x9A	3	600-0003	087			
	4x4x9B	3	600-0005	028			
	4x4x12	3	600-0005	028			
	4x6x15	2	600-0005	028			
	4x6x15	1	600-0003	087			
26	PIPE PLUG						
	3x3x7		NOT REQUIRED				
	4x4x7	2	600-0004	028			
	3x3x9		NOT REQUIRED				
	4x4x9A	2	600-0003	087			
	4x4x9B	2	600-0004	028			
	4x4x12	2	600-0004	028			
	4x6x15	2	600-0004	028			
27	STUFFING BOX						
	STANDARD PF 3	1	812-1083	010			
	STANDARD PF 4	1	812-1084	010			
	STANDARD PF 5	1	812-1085	010			
27A	STUFFING BOX ADAPTOR						
	OPTIONAL PF 4	1	008-0564	010			
	OPTIONAL PF 5	1	008-0565	010			
27B	SPLIT STUFFING BOX						
	OPTIONAL PF 4	1	812-0305	010			
	OPTIONAL PF 5	1	812-0309	010			
27C	GASKET OPT.PF 4	1	364-2006	803			
	OPTIONAL PF 5	1	364-2027	803			
27D	PIN OPT. PF 4	2	592-0836	104			
	OPTIONAL PF 5	2	592-0361	107			
27E	CAPSCRW OPT.PF 4	4	168-0382	082			
	OPTIONAL PF 5	4	168-0382	082			
27F	CAPSCRW OPT.PF 4	4	468-0382	082			
	OPTIONAL PF 5	4	168-0492	082			
28	PIPE PLUG	1	600-0004	028			
29	BUSHING (PACK)	1	600-0905	387			
30	FITTING (PACK)	1	508-0012	651			

PC. NO.	DESCRIPTION	QTY	PART NO.	MATERIAL B.F.	A.B.	A.I.	S.S.
31	PIPE PLUG						
	PF 3	1	600-0002	087			
	PF 4	2	600-0002	087			
	PF 5	2	600-0003	087			
31A	PIPE COUPLING						
	PF 3	1	600-0721	387			
	PF 4	1	600-0721	387			
	PF 5	1	600-0722	387			
31B	NIPPLE						
	PF 3	1	600-1103	387			
	PF 4	1	600-1103	387			
	PF 5	1	600-1254	387			
32	GASKET						
	PF 3	1	364-1343	803			
	PF 4	1	364-1344	803			
	PF 5	1	364-1345	803			
33	CAPSCREW						
	PF 3	4	168-0382	082			
	PF 4	4	168-0382	082			
	PF 5	4	168-0560	082			
34	CAPSCREW						
	3x3x7	8	168-0385	082			
	4x4x7	8	168-0386	082			
	3x3x9	8	168-0387	082			
	4x4x9A	8	168-0488	082			
	4x4x9B	8	168-0562	082			
	4x4x12	8	168-0560	082			
	4x6x15	8	168-0632	082			
35	CAPSCREW						
	PF 3	4	168-0490	082			
	PF 4	4	168-0490	082			
	PF 5	8	168-0560	082			
36	SLEEVE (PACK)						
	PF 3 & 4	1	756-0414	108			
	PF 5	1	756-0415	108			
	CERAMIC COATED						
	PF 3 & 4	1	756-0554	548			
	PF 5	1	756-0555	548			

PARTS LIST

PC. NO.	DESCRIPTION	QTY	PART NO.	MATERIAL			
				B.F.	A.B.	A.I.	S.S.
36	SLEEVE (CONT'D)						
	MECHANICAL SEALS						
	PF 3 & 4	1	756-0411	208			
	PF 5	1	756-0412	208			
	DURA BRO PF 5	1	756-0578	208			
37	RETAINING RING						
	PF 3 & 4	1	676-0470	088			
	PF 5	1	676-0471	088			
38	GASKET						
	PF 3 & 4	1	364-0581	457			
	PF 5	1	364-0584	457			
39	RETAINING RING						
	PF 3		NOT REQUIRED				
	PF 4	1	676-0294	088			
	PF 5	1	676-0460	088			
40	PACKING						
	PF 3 & 4	5	564-0114	802			
	PF 5	5	564-0183	802			
41	LANTERN RING						
	PF 3 & 4	1	676-1105	512			
	PF 5	1	676-1106	512			
42	O-RING (PACK)						
	PF 3 & 4	1	364-0425	457			
	PF 5	1	364-2101	457			
43	SLINGER (PACK)						
	PF 3 & 4	1	764-0021	478			
	PF 5	1	764-0023	478			
	MECHANICAL SEALS						
	SLINGER						
	PF 3 & 4	1	764-0020	478			
	PF 5	1	764-0022	478			
44	GLAND						
	651A PACK						
	PF 3 & 4	1	372-0320	010			
	PF 5	1	372-0321	010			
	652A & 653A PACK						
	PF 3 & 4	1	372-0515	319			
	PF 5	1	372-0516	319			

PC. NO.	DESCRIPTION	QTY	PART NO.	MATERIAL			
				B.F.	A.B.	A.I.	S.S.
44	GLAND (CONT'D)						
	MECHANICAL SEAL						
	GLAND FOR						
	JOHN CRANE						
	TYPE 1,21,8TD						
	PF 3 & 4	1	372-0518	010			
	PF 5	1	372-0520	010			
	JOHN CRANE						
	TYPE 8B2						
	PF 3 & 4	1	372-0519	104			
	PF 5	1	372-0521	104			
	DURAMETALLIC						
	TYPE CRO, BRO						
	PF 3 & 4	1	372-0524	010			
	PF 5	1	372-0520	010			
	DURAMETALLIC						
	TYPE RA						
	PF 3 & 4	1	372-0525	104			
	PF 5	1	372-0527	104			
	CHESTERTON						
	TYPE 880						
	PF 3 & 4	1	372-0530	104			
	PF 5	1	372-0531	104			
44A	CAPSCREW (PACK)	2	168-0718	080			
44B	HOSE CONNECTOR						
	(PACK) PF 3,4&5	1	600-2966	503			
44C	HOSE (PACK)	1	872-0005	505			
44D	PIPE PLUG (PACK)	3	600-0004	511			
44E	GLAND CLAMP						
	651A (PACK)						
	PF 3 & 4	2	204-0116	360			
	PF 5	2	204-0121	360			
45	CAPSCREW						
	651A PACKING	2	168-0500	082			
	652A & 653A						
	PACKING	2	168-0502	082			
	MECH. SEAL SCREWS		REFER TO FACTORY				
46	GASKET (SEAL)						
	PF 3 & 4	1	364-0074	803			
	PF 5	1	364-0075	803			

650A SERIES

PARTS LIST

PC. NO.	DESCRIPTION	QTY	PART NO.	MATERIAL B.F.	A.B.	A.I.	S.S.
47	MECHANICAL SEAL						
	POWER FRAME 3&4						
	J.C. 21 DBL.	1	712-6410	749			
	J.C. 8TD DBL.	1	712-6411	749			
	J.C. 88 CART.	1	712-6413	767			
	* J.C. 1 SINGLE	1	712-6409	678			
	J.C. 8B2 OUT.	1	712-6412	678			
	DURA CRO DBL.	1	712-6424	772			
	DURA X200 CART.	1	712-6431	519			
	DURA RA OUT.	1	712-6425	566			
	CHEST. 241 CART.	1	712-6433	571			
	CHEST. 880 SINGLE	1	712-6435	571			
	POWER FRAME 5						
	J.C. 1 DBL.	1	712-6415	749			
	J.C. 8TD DBL.	7	712-6416	749			
	J.C. 88 CART.	1	712-6418	767			
	* J.C. 1 SINGLE	1	712-6414	678			
	J.C. 882 OUT.	1	712-6417	678			
	DURA CRO DBL.	1	712-6426	773			
	DURA BRO DBL.	1	712-6427	741			
	DURA RA OUT.	1	712-6428	566			
	CHEST. 241 CART.	1	712-6434	571			
	CHEST. 880 SINGLE	1	712-6436	571			
47A	BUSHING						
	FOR SINGLE SEALS						
	PF 3 & 4	1	224-0223	208			
	PF 5	1	224-0224	208			
48	SHAFT						
	PF 3C	1	728-0513	063			
	PF 4C	1	728-0514	063			
	PF 5E & 5F	1	728-0515	063			
49	BEARING INBOARD						
	PF 3C	1	068-0427	647			
	PF 4C	1	068-0162	647			
	PF 5E	1	068-0168	647			
	PF 5F	1	068-0046	647			
49A	GREASE SHIELD						
	PF 4C	1	712-0280	087			
	PF 5E & 5F	1	712-0281	087			

PC. NO.	DESCRIPTION	QTY	PART NO.	MATERIAL B.F.	A.B.	A.I.	S.S.
50	BEARING OUTBOARD						
	PF 3C	1	068-2560	647			
	PF 4C	1	068-3004	647			
	PF 5E	2	068-2996	647			
	PF 5F	2	068-2996	647			
50A	GREASE SHIELD						
	PF 3C	1	712-0283	087			
	PF 4C	1	676-0560	087			
	PF 5E & 5F	1	676-0398	010			
50B	RETAINING RING						
	PF 3C	1	INCLUDED	WITH PC. 50			
	PF 4C	1	676-0446	088			
	PF 5E & 5F	1	676-0447	088			
50C	RETAINING RING						
	PF 3C	1	676-0944	088			
	PF 4C	1	676-0943	088			
	LOCK WASHER						
	PF 5E & 5F	1	908-0416	080			
50D	LOCKNUT PF 5	1	544-0716	080			
51	BEARING CARTRIDGE						
	PF 3C	1	164-0472	010			
	PF 4C	1	164-0447	010			
	PF 5E & 5F	1	164-0448	010			
51A	O-RING PF 3C	1	364-0570	457			
52	GREASE SEAL						
	PF 3C	1	712-0233	653			
	PF 4C	1	712-0248	653			
	PF 5E & 5F	1	712-0241	653			
53	GREASE SEAL						
	PF 3C	1	712-0234	653			
	PF 4C	1	712-0240	653			
	PF 5E & 5F	1	712-0265	653			
54	KEY, SLEEVE	1	472-0010	087			
55	KEY, SHAFT						
	PF 3C	1	472-0247	087			
	PF 4C	1	472-0250	087			
	PF 5E & 5F	1	472-0390	087			

* REFER TO FACTORY FOR J.C. 1 SINGLE SEALS, COLLARS AND SETSCREWS.

PARTS LIST

PC. NO.	DESCRIPTION	QTY	PART NO.	MATERIAL B.F.	A.B.	A.I.	S.S.
56	POWER FRAME HOUSING						
	PF 3C	1	356-0203	010			
	PF 4C	1	356-0044	010			
	PF 5E & 5F	1	356-0045	010			
57	PIPE PLUG						
	PF 3C		NOT REQUIRED				
	PF 4C	1	600-0001	087			
	PF 5E & 5F	1	600-0001	087			
58	GREASE FITTING						
	PF 3C	1	508-0005	651			
	PF 4C	1	508-0015	651			
	PF 5E & 5F	1	508-0010	651			
59	CAPSCREWS						
	PF 3C	4	168-0492	082			
	PF 4C	3	168-0492	082			
	PF 5E & 5F	4	168-0564	082			
60	SHIM PACK						
	PF 3C	1	740-0070	517			
	CAPSCREWS PF 4C	3	168-0201	080			
	PF 5E & 5F	4	168-0202	080			
61	JAM NUT						
	PF 3C		NOT REQUIRED				
	PF 4C	3	544-0312	080			
	PF 5E & 5F	4	544-0316	080			
62	PIPE PLUG						
	PF 3C		NOT REQUIRED				
	PF 4C	1	600-0001	087			
	PF 5E & 5F	1	600-0001	087			
63	GREASE FITTING						
	PF 3C	1	508-0001	651			
	PF 4C	1	508-0015	651			
	PF 5E & 5F	1	508-0010	651			
64	GASKET 652A,653A & 654A						
	3" SUCTION	1	364-0605	603			
	4" SUCTION	1	364-0607	603			
	6" SUCTION	1	364-0609	603			
65	ELBOWS 652A,653A & 654A						
	(STD) 3x3	1	600-4581	010			
	(CLEANOUT) 3x3	1	816-0739	010			
	3x4	1	816-0742	010			

PC. NO.	DESCRIPTION	QTY	PART NO.	MATERIAL B.F.	A.B.	A.I.	S.S.
65	ELBOWS (CONT'D)						
	(STD) 4x4	1	600-4533	010			
	(CLEANOUT) 4x4	1	816-1015	010			
	4x6	1	816-0740	010			
	STD.W/CLEANOUT						
	6x6	1	816-1018	010			
	6x8	1	816-1019	010			
66	CAPSCREW						
	3" SUCTION	4	168-0562	082			
	4" SUCTION	2	168-0564	082			
	4" SUCTION	6	168-0570	082			
	6" SUCTION	8	168-0636	082			
66A	WASHER						
	3" SUCTION	3	908-0112	080			
66B	CAPSCREW						
	3" SUCTION	3	168-0388	082			
67	GASKET 3x3	1	364-1041	453			
	3x4	1	364-1042	453			
	4x4	1	364-1043	453			
	4x6	1	364-1043	453			
	6x6	1	364-1048	478			
	6x8	1	364-1048	478			
68	HANDHOLE COVER						
	3x3	1	260-0093	010			
	3x4	1	260-0089	010			
	4x4	1	260-0088	010			
	4x6	1	260-0088	010			
	6x6	1	260-0649	010			
	6x8	1	260-0649	010			
69	CAPSCREW						
	3x3	2	168-0494	082			
	3x4	2	168-0494	082			
	4x4	2	168-0564	082			
	4x6	2	168-0564	082			
	6x6	4	168-0562	082			
	6x8	4	168-0562	082			
69A	NUT 3x3	2	544-0113	080			
	3x4	2	544-0113	080			
	4x4	2	544-0115	080			
	4x6	2	544-0115	080			

650A SERIES

PARTS LIST

PC. NO.	DESCRIPTION	QTY	PART NO.	MATERIAL			
				B.F.	A.B.	A.I.	S.S.
69A	NUT (CONT'D)						
	6x6		NOT REQUIRED				
	6x8		NOT REQUIRED				
69B	WASHER						
	3x3	4	908-0114	080			
	3x4	4	908-0114	080			
	4x4	4	908-0116	080			
	4x6	4	908-0116	080			
	6x6		NOT REQUIRED				
	6x8		NOT REQUIRED				
70	PIPE PLUG						
	3x3	1	600-0006	028			
	3x4	1	600-0008	028			
	4x4	1	600-0008	028			
	4x6	1	600-0008	028			
	6x6	1	600-0009	028			
	6x8	1	600-0009	028			
71	PIPE PLUG						
	3x3	1	600-0002	087			
	3x4	1	600-0002	087			
	4x4	1	600-0002	087			
	4x6	1	600-0002	087			
	6x6	1	600-0002	087			
	6x8	1	600-0002	087			
72	DRIVE PINS	2	708-0013	365			
73	NAMEPLATE	1	532-0045	114			
74	LEAKAGE						
	ACCUMULATOR KIT						
	652A & 653A						
	PF 3 & 4	1	476-0279	645			
	PF 5	1	476-0280	645			
75	SEALANT	1	716-0025	621			
	(REQUIRED WITH						
	PIECE 44						
	PACKED 652A						
	& 653A)						

PC. NO.	DESCRIPTION	QTY	PART NO.	MATERIAL			
				B.F.	A.B.	A.I.	S.S.

Performance Curves for the 650 Series

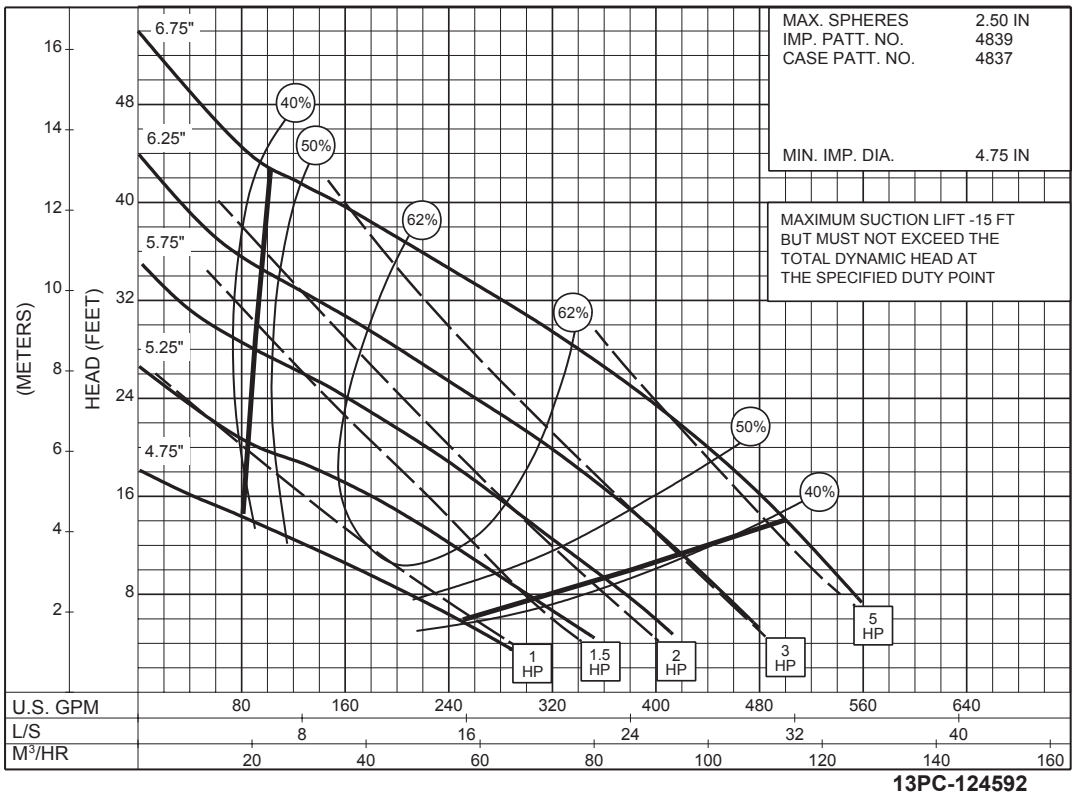
MODEL/SIZE	R.P.M.	CATALOG PAGE	PDF PAGE
3 x 3 x 7	1750/1150	401	2
3 x 3 x 9	1750/1150	402	3
4 x 4 x 7	1750/1150	403	4
4 x 4 x 9A	1750/1150	404	5
4 x 4 x 9B	1750/1150	405	6
4 x 4 x 9B	875	406	7
4 x 4 x 12	1750/1150	407	8
4 x 4 x 12	875	408	9
4 x 6 x 15	1750/1150	409	10
4 x 6 x 15	875/700	410	11

3 x 3 x 7
SERIES 650A

ENCLOSED IMPELLER

Supersedes Section 650 Page 401
Dated July 1988

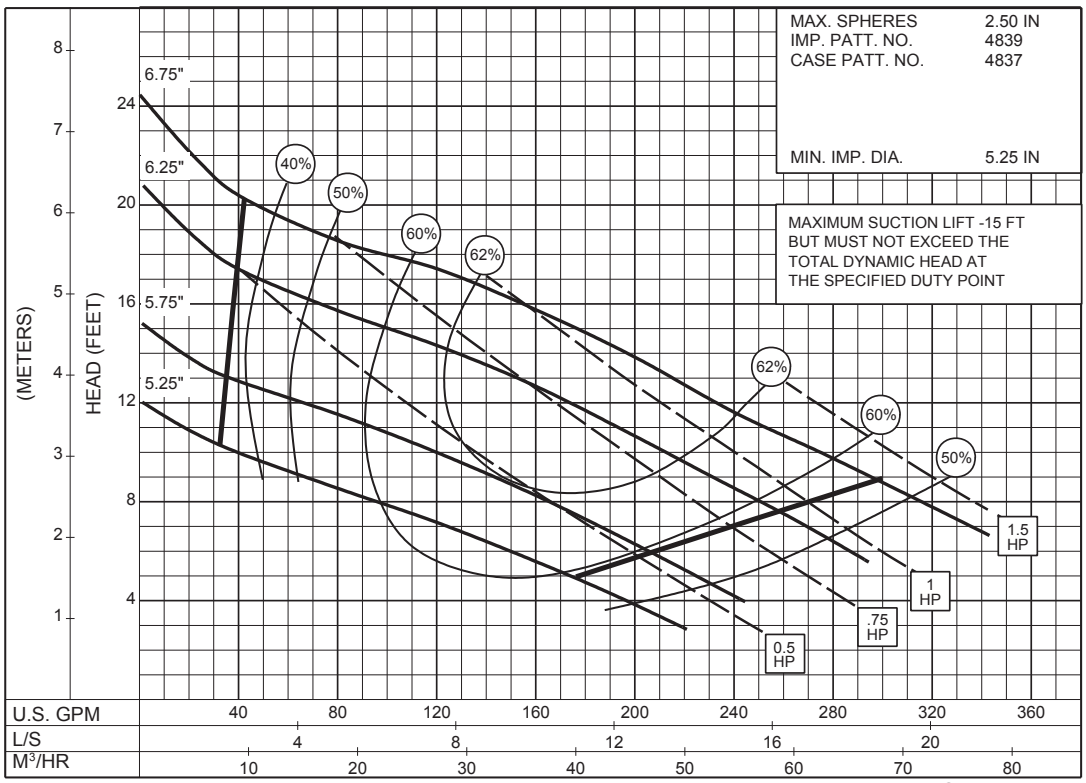
SIZE : 3x3x7 **TYPE : 650** **IMPELLER : Enclosed** **R. P. M. : 1750**



13PC-124592

1750 RPM

SIZE : 3x3x7 **TYPE : 650** **IMPELLER : Enclosed** **R. P. M. : 1150**



13PC-124591

1150 RPM

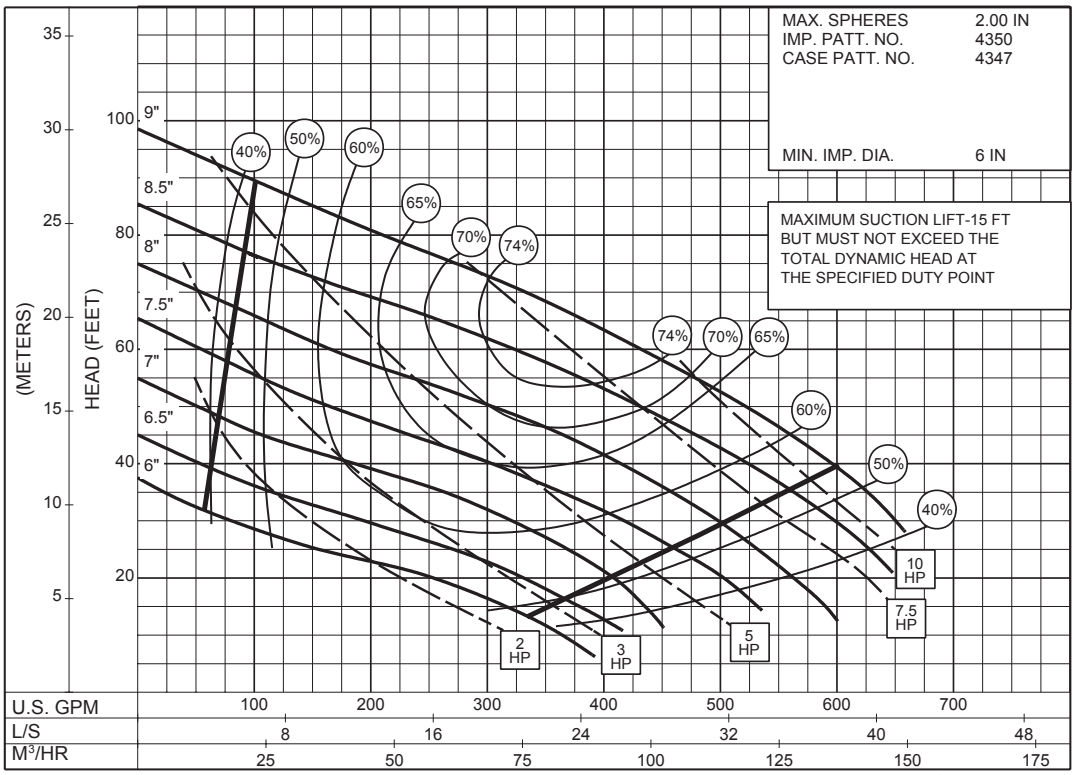
Supersedes Section 650 Page 402
Dated July 1988

3 x 3 x 9
SERIES 650A

ENCLOSED IMPELLER

1750 RPM

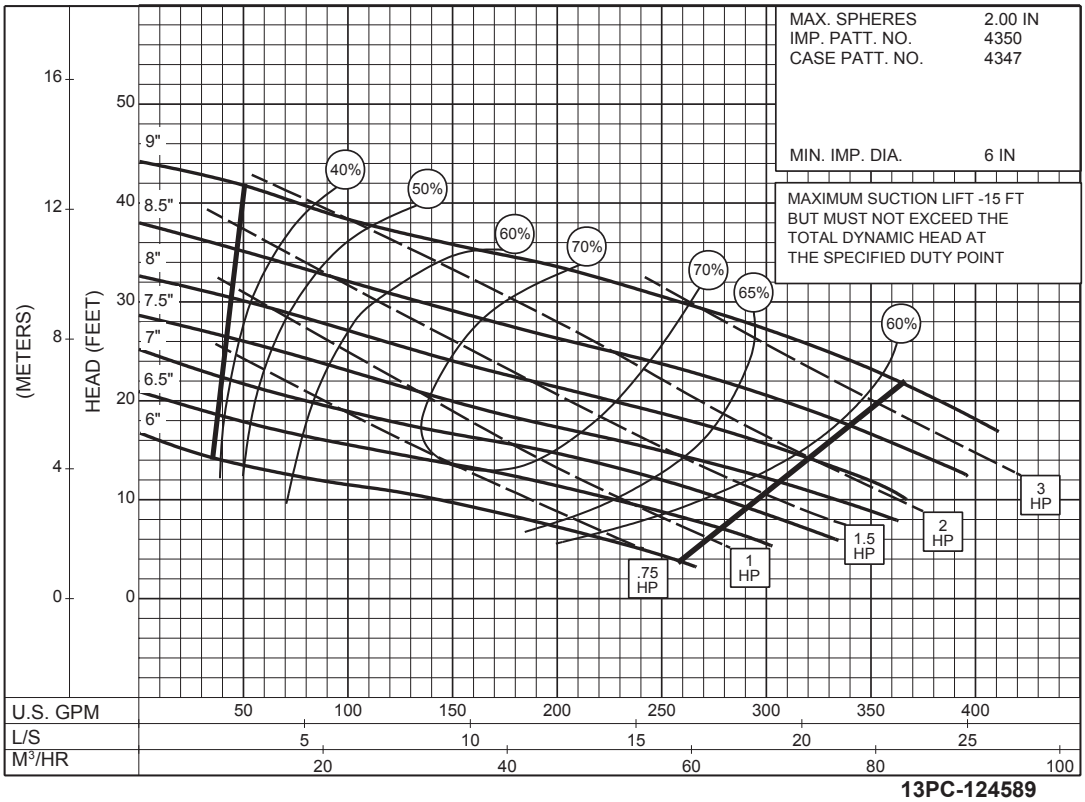
SIZE : 3x3x9 **TYPE : 650** **IMPELLER : Enclosed** **R. P. M. : 1750**



13PC-124590

1150 RPM

SIZE : 3x3x9 **TYPE : 650** **IMPELLER : Enclosed** **R. P. M. : 1150**



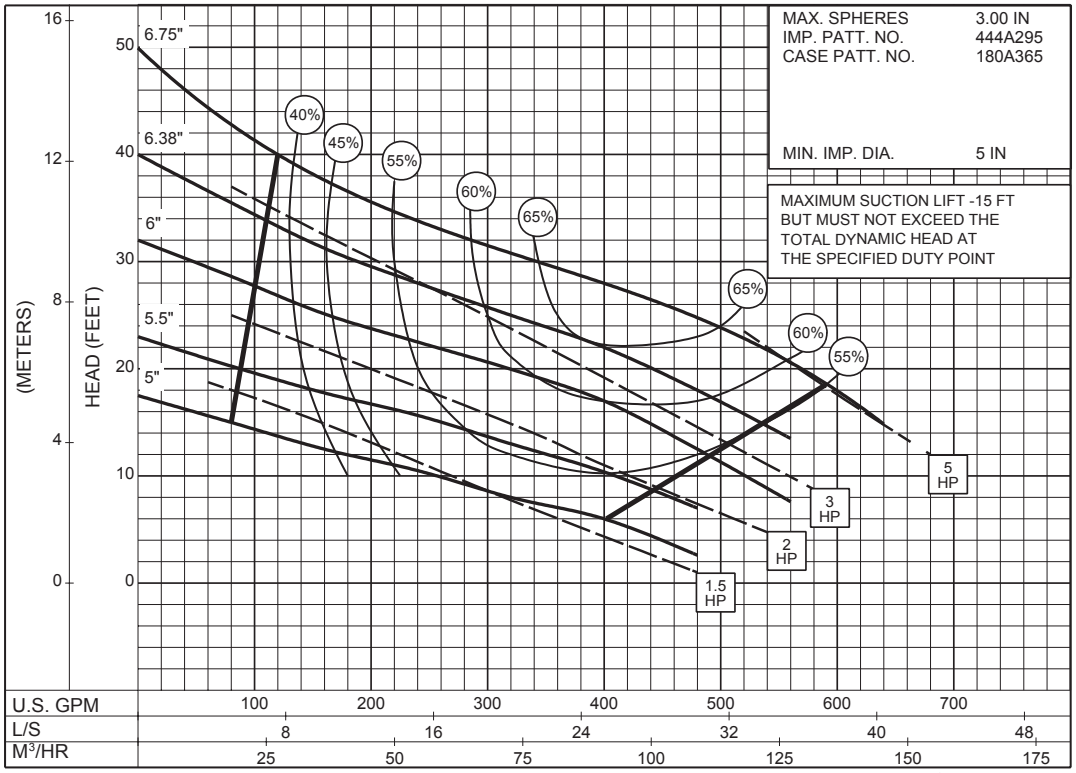
13PC-124589

4 x 4 x 7
SERIES 650A

ENCLOSED IMPELLER

Supersedes Section 650 Page 403
Dated July 1988

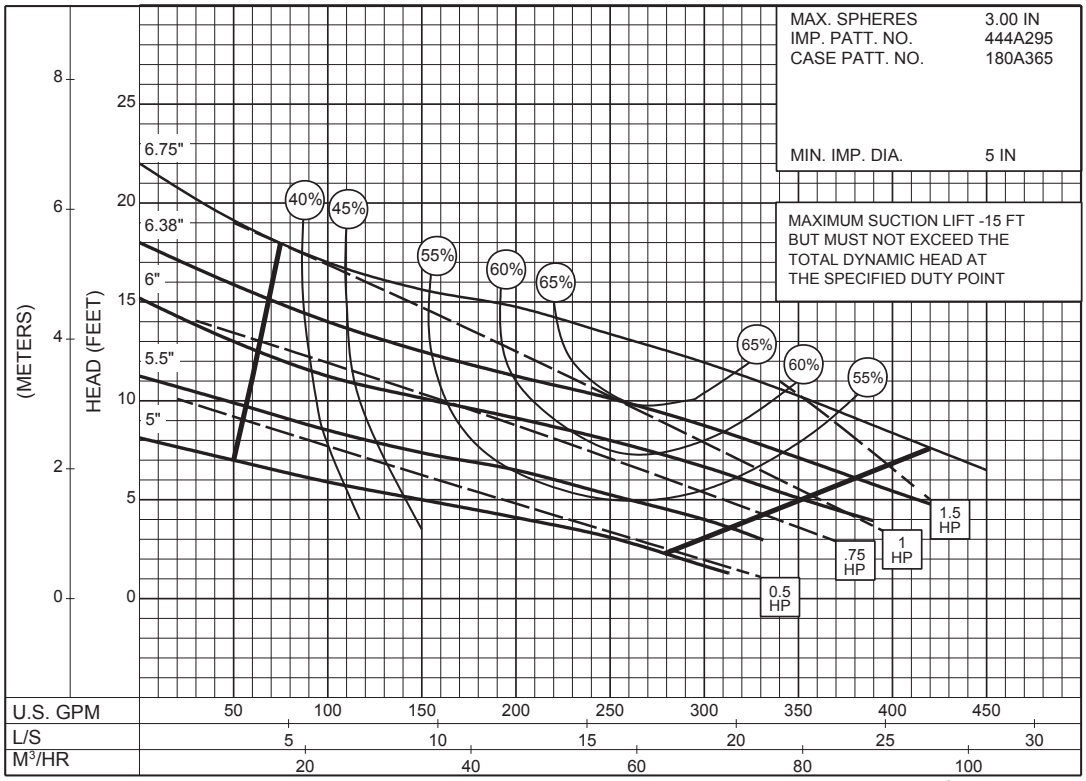
SIZE : 4x4x7 **TYPE : 650** **IMPELLER : Enclosed** **R. P. M. : 1750**



13PC-146843

1750 RPM

SIZE : 4x4x7 **TYPE : 650** **IMPELLER : Enclosed** **R. P. M. : 1150**



13PC-146844

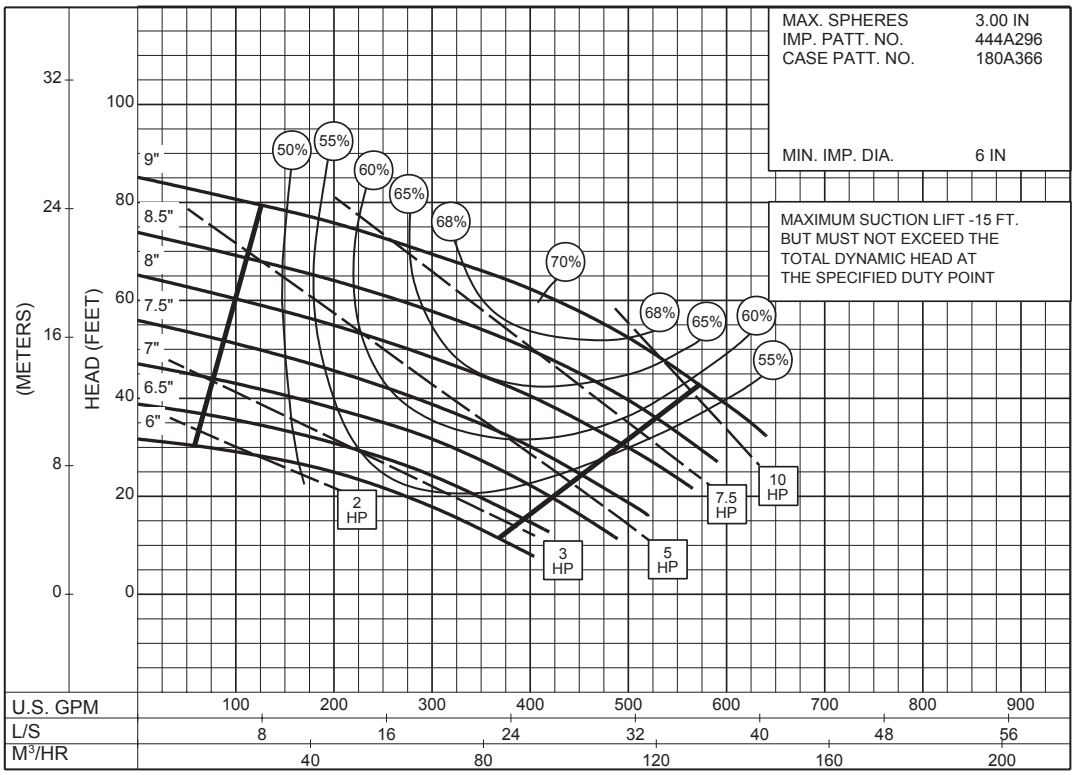
1150 RPM

4 x 4 x 9A
SERIES 650A

ENCLOSED IMPELLER

1750 RPM

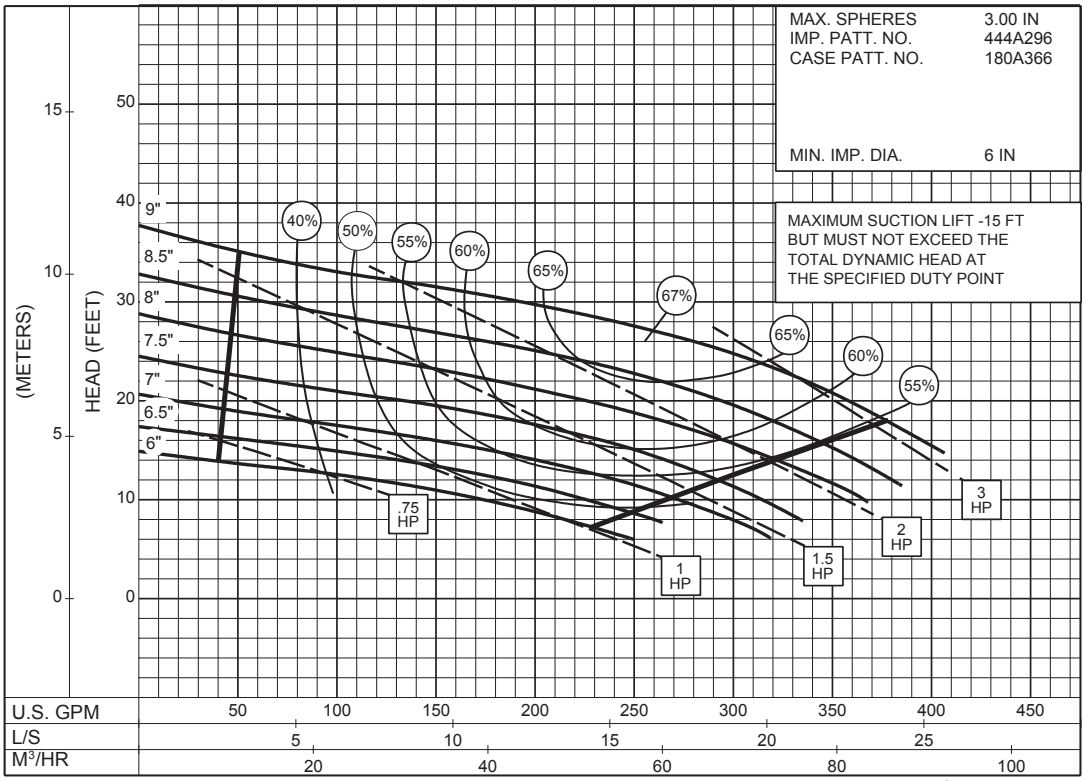
SIZE : 4x4x9A **TYPE : 650** **IMPELLER : Enclosed** **R. P. M. : 1750**



13PC-147001

1150 RPM

SIZE : 4x4x9A **TYPE : 650** **IMPELLER : Enclosed** **R. P. M. : 1150**



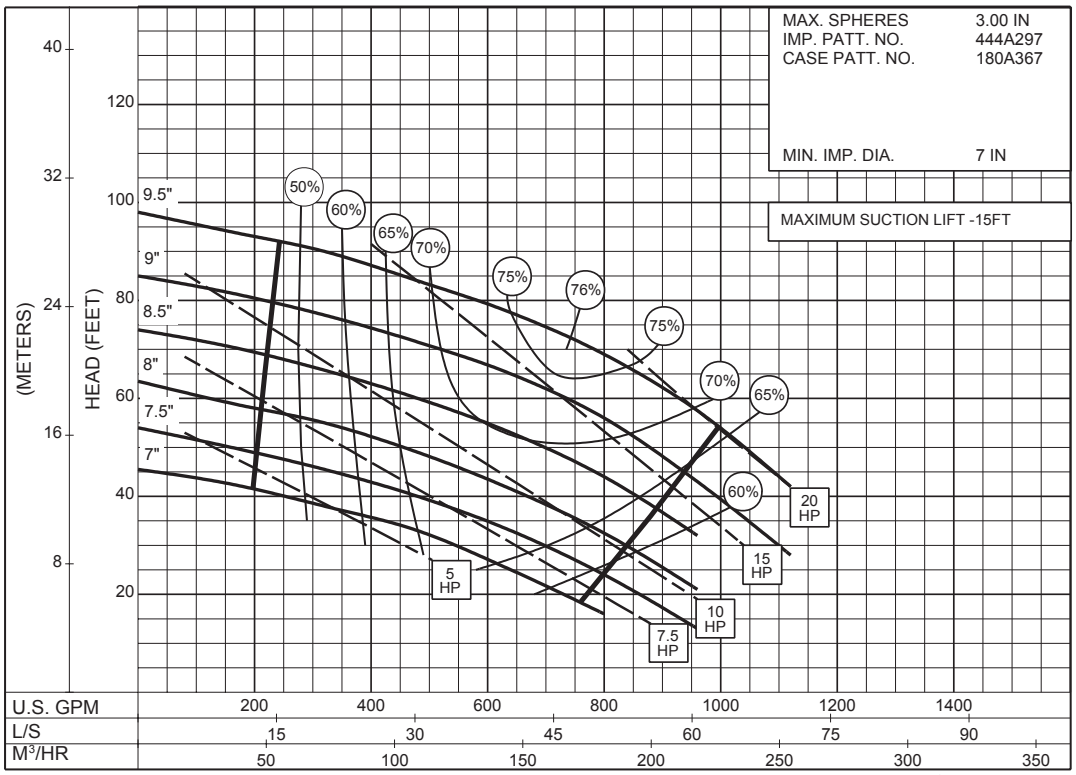
13PC-147002

4 x 4 x 9B
SERIES 650A

ENCLOSED IMPELLER

Supersedes Section 650 Page 405
Dated July 1988

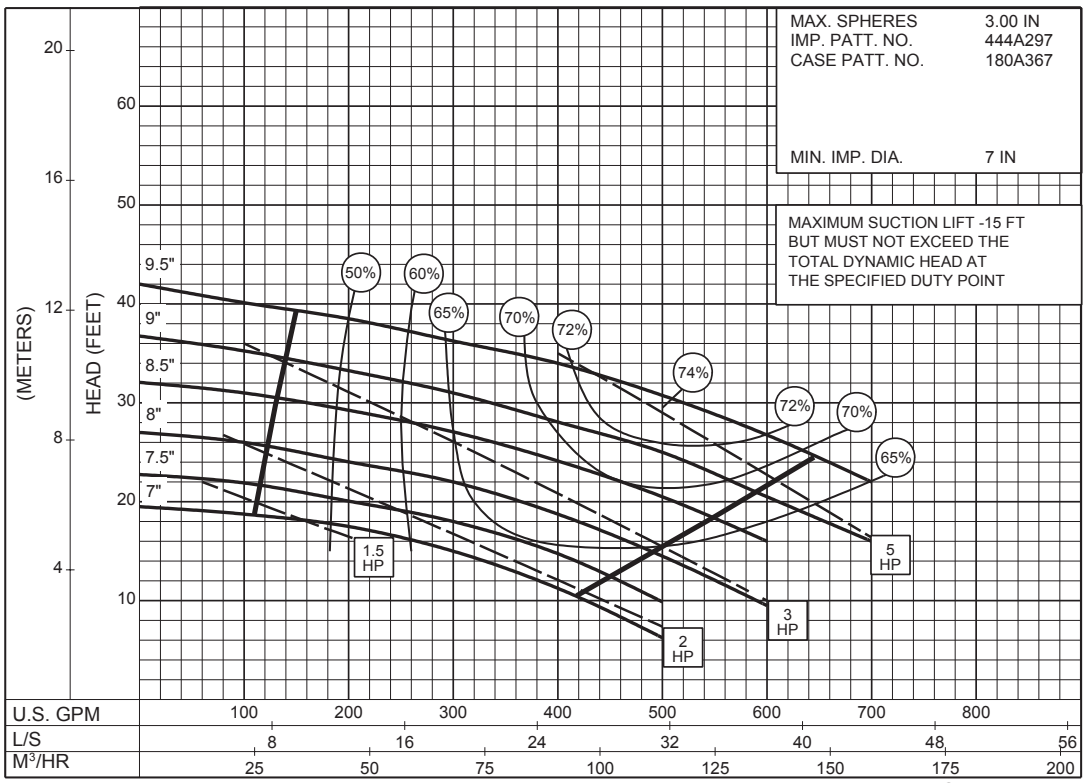
SIZE : 4x4x9B **TYPE : 650** **IMPELLER : Enclosed** **R. P. M. : 1750**



13PC-146601

1750 RPM

SIZE : 4x4x9B **TYPE : 650** **IMPELLER : Enclosed** **R. P. M. : 1150**



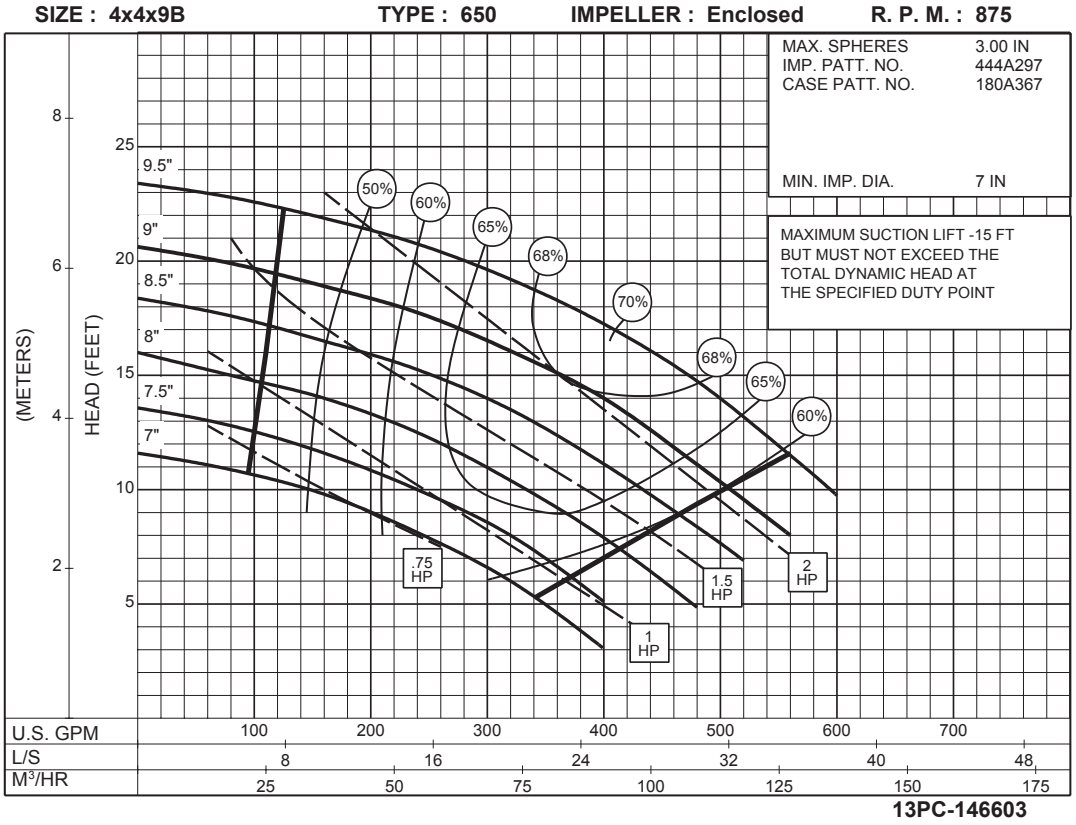
13PC-146602

1150 RPM

4 x 4 x 9B
SERIES 650A

ENCLOSED IMPELLER

875
RPM



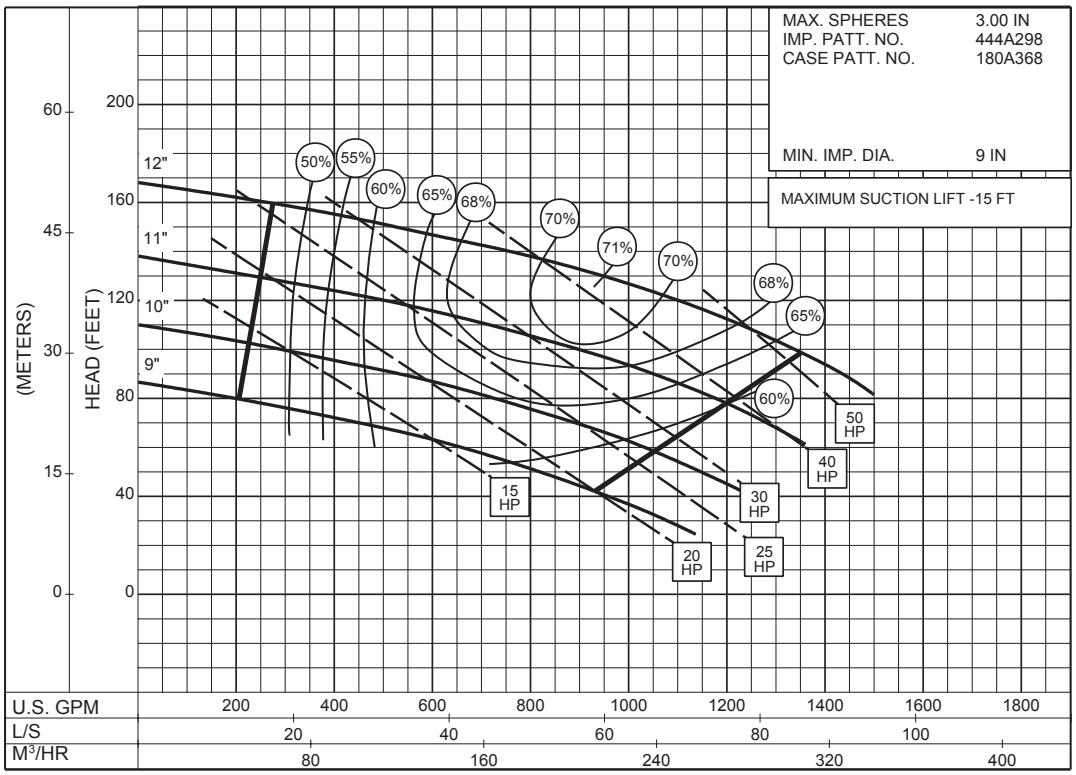
13PC-146603

4 x 4 x 12
SERIES 650A

ENCLOSED IMPELLER

Supersedes Section 650 Page 407
Dated March 1993

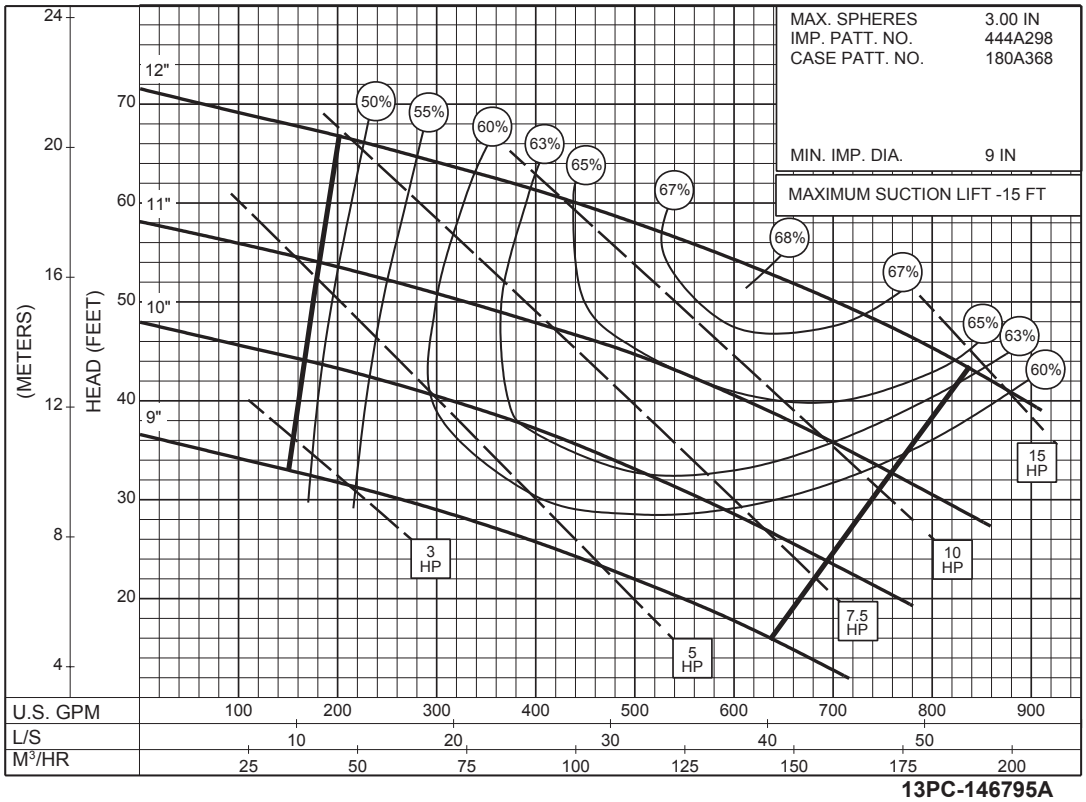
SIZE : 4x4x12 **TYPE : 650** **IMPELLER : Enclosed** **R. P. M. : 1750**



13PC-146794A

1750 RPM

SIZE : 4x4x12 **TYPE : 650** **IMPELLER : Enclosed** **R. P. M. : 1150**



13PC-146795A

1150 RPM

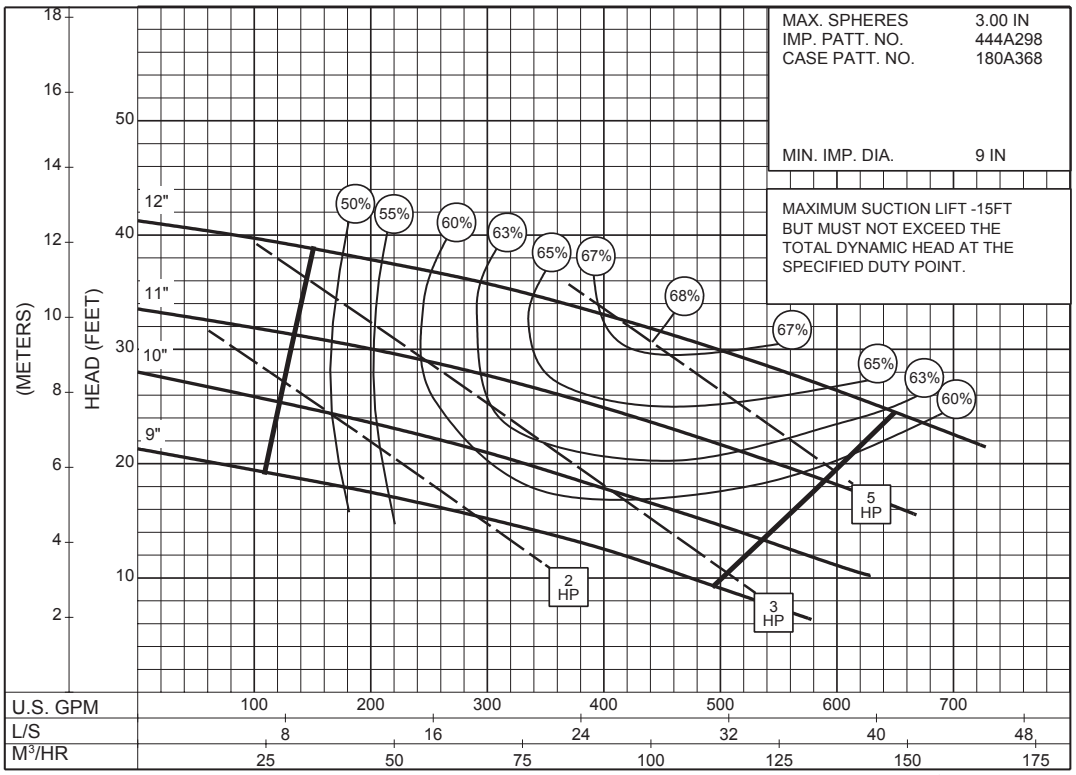
AURORA®
Pentair Pump Group

4 x 4 x 12
SERIES 650A

ENCLOSED IMPELLER

875
RPM

SIZE : 4x4x12 **TYPE : 650** **IMPELLER : Enclosed** **R. P. M. : 875**



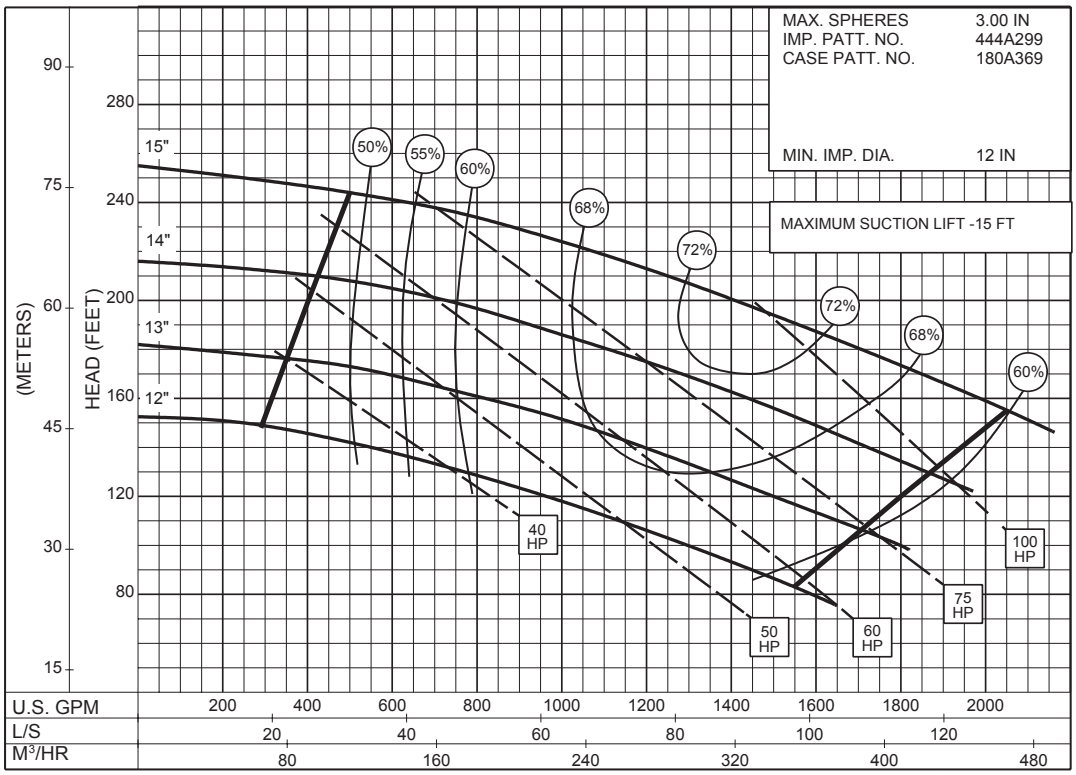
13PC-146796A

4 x 6 x 15
SERIES 650A

ENCLOSED IMPELLER

Supersedes Section 650 Page 409
Dated July 1988

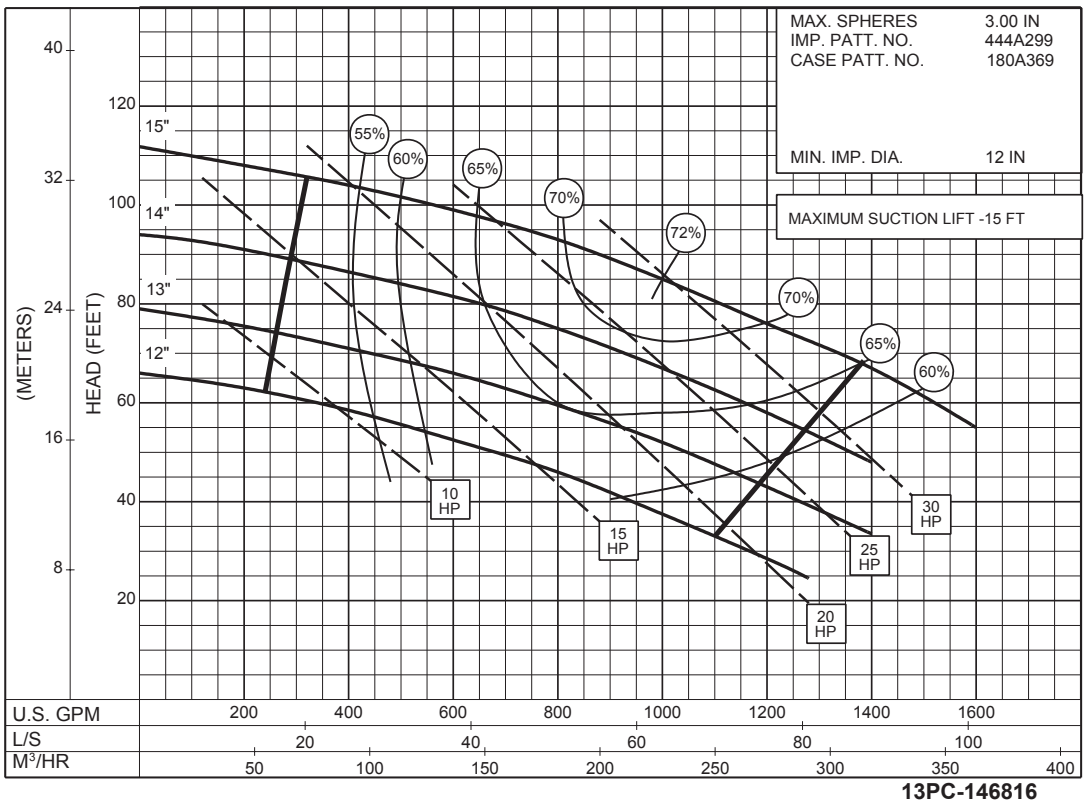
SIZE : 4x6x15 **TYPE : 650** **IMPELLER : Enclosed** **R. P. M. : 1750**



13PC-146815

1750 RPM

SIZE : 4x6x15 **TYPE : 650** **IMPELLER : Enclosed** **R. P. M. : 1150**



13PC-146816

1150 RPM

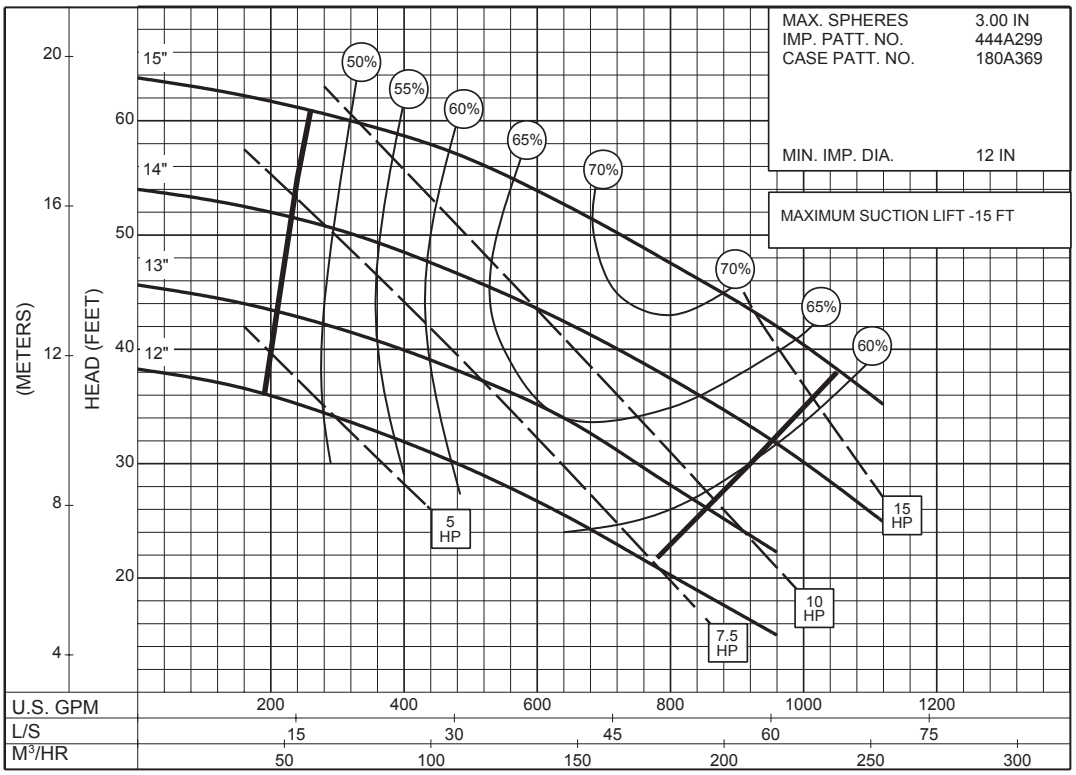
AURORA®
Pentair Pump Group

4 x 6 x 15
SERIES 650A

ENCLOSED IMPELLER

875 RPM

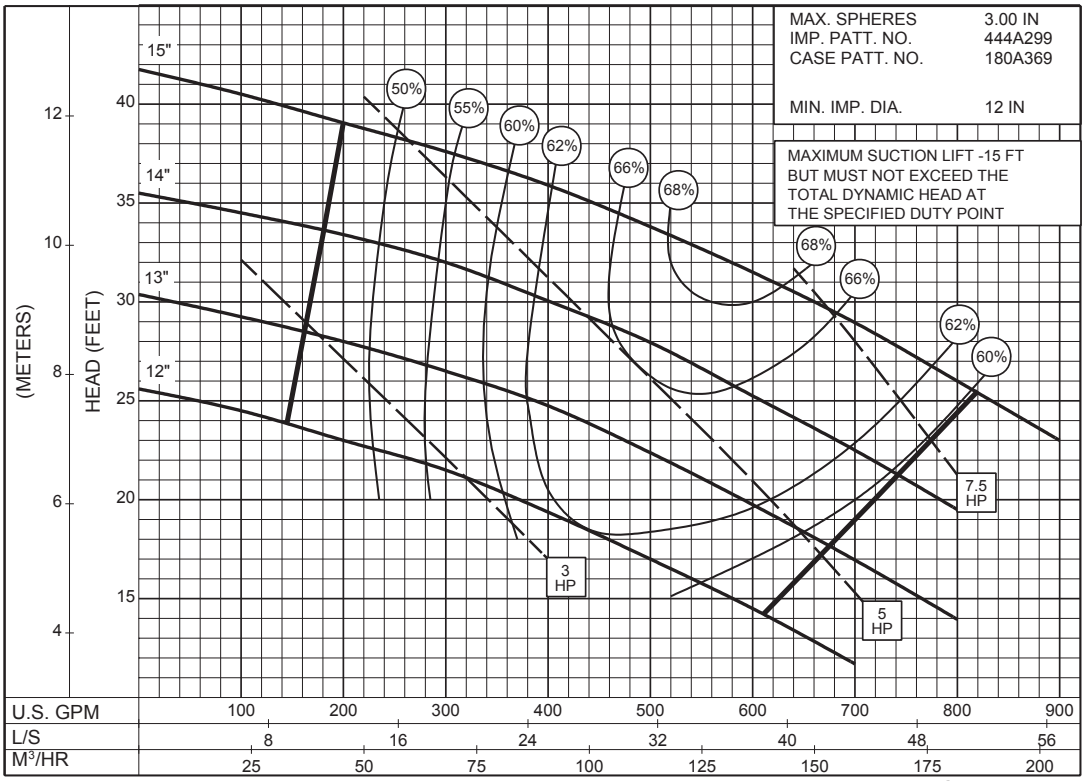
SIZE : 4x6x15 **TYPE : 650** **IMPELLER : Enclosed** **R. P. M. : 875**



13PC-146817

700 RPM

SIZE : 4x6x15 **TYPE : 650** **IMPELLER : Enclosed** **R. P. M. : 700**



13PC-146818

AURORA®
Pentair Pump Group

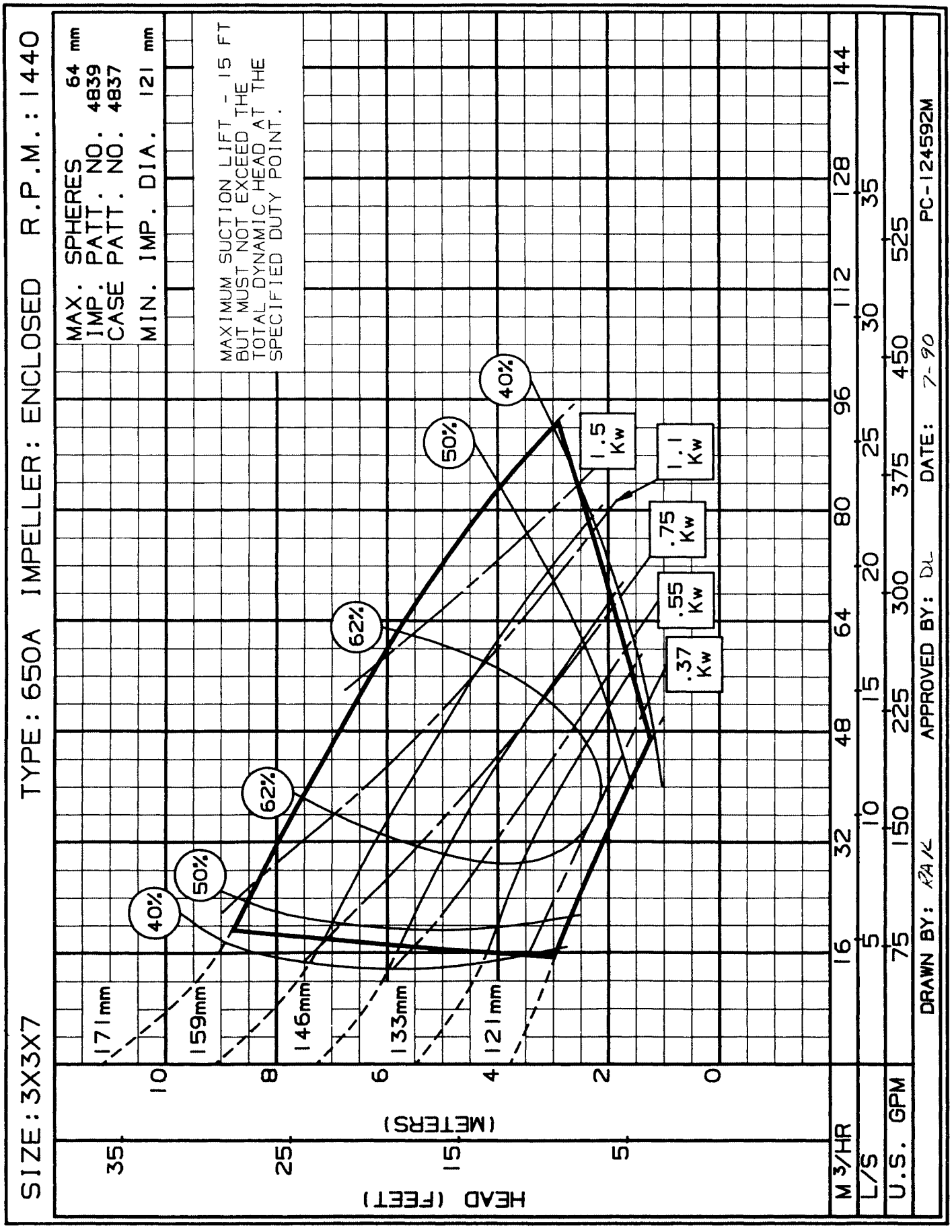
Performance Curves for the 650 Series (50 Hz)

MODEL/SIZE	R.P.M.	PDF PAGE
3x3x7	1440	2
3x3x7	960	3
3x3x9	1440	4
3x3x9	960	5
4x4x7	1440	6
4x4x7	960	7
4x4x9A	1440	8
4x4x9A	960	9
4x4x9B	1440	10
4x4x9B	960	11
4x4x9B	720	12
4x6x15	1475	13
4x6x15	960	14
4x6x15	720	15
4x6x15	575	16

AURORA®
Pentair Pump Group

3x3x7 - 1440 RPM
ENCLOSED IMPELLER

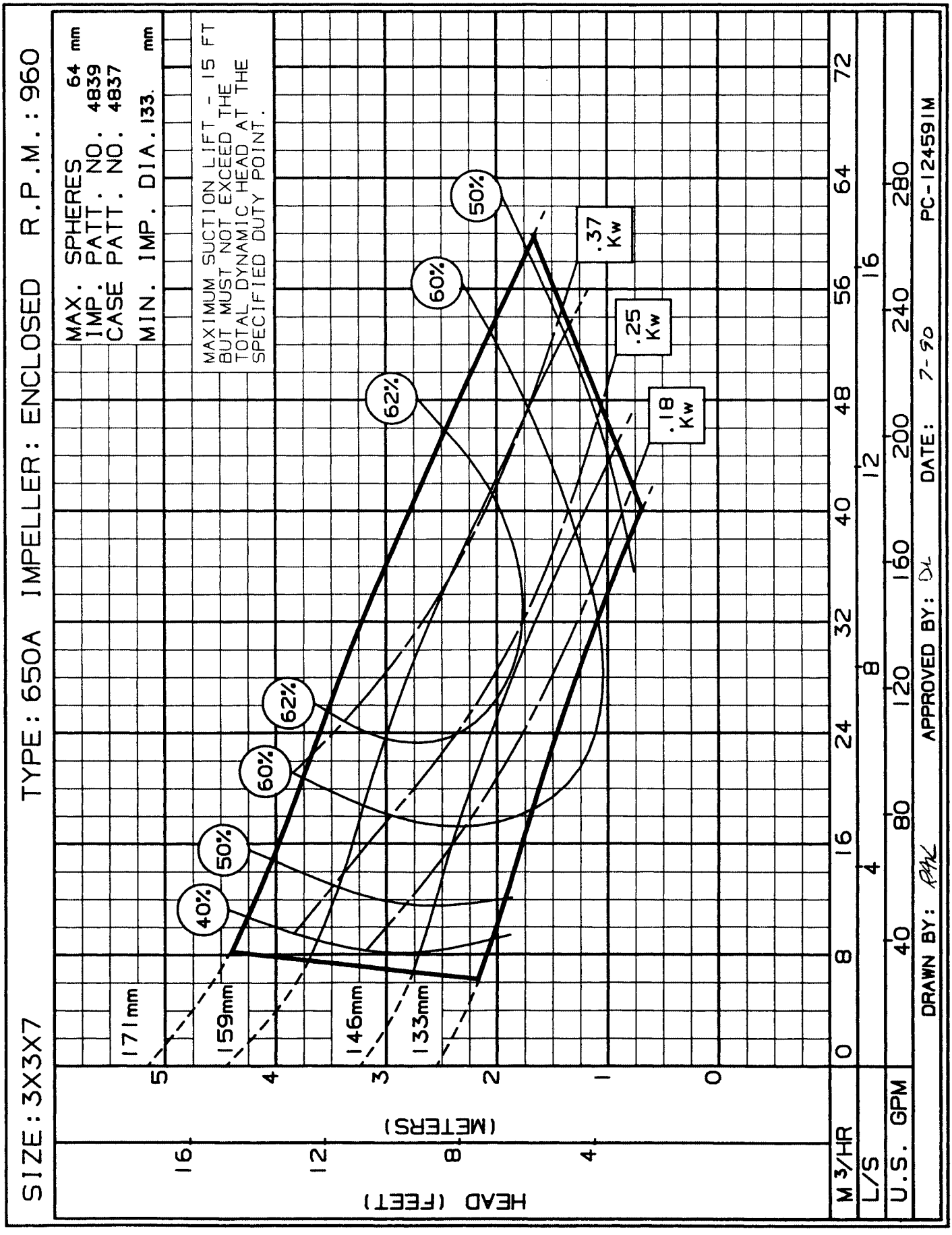
SECTION 650A (Metric 50Hz)
DATE JULY 1994
SUPERCEDES MARCH 1986



SECTION **650A (Metric 50Hz)**
DATE **JULY 1994**
SUPERCEDES MARCH 1986

3x3x7 - 960 RPM
ENCLOSED IMPELLER

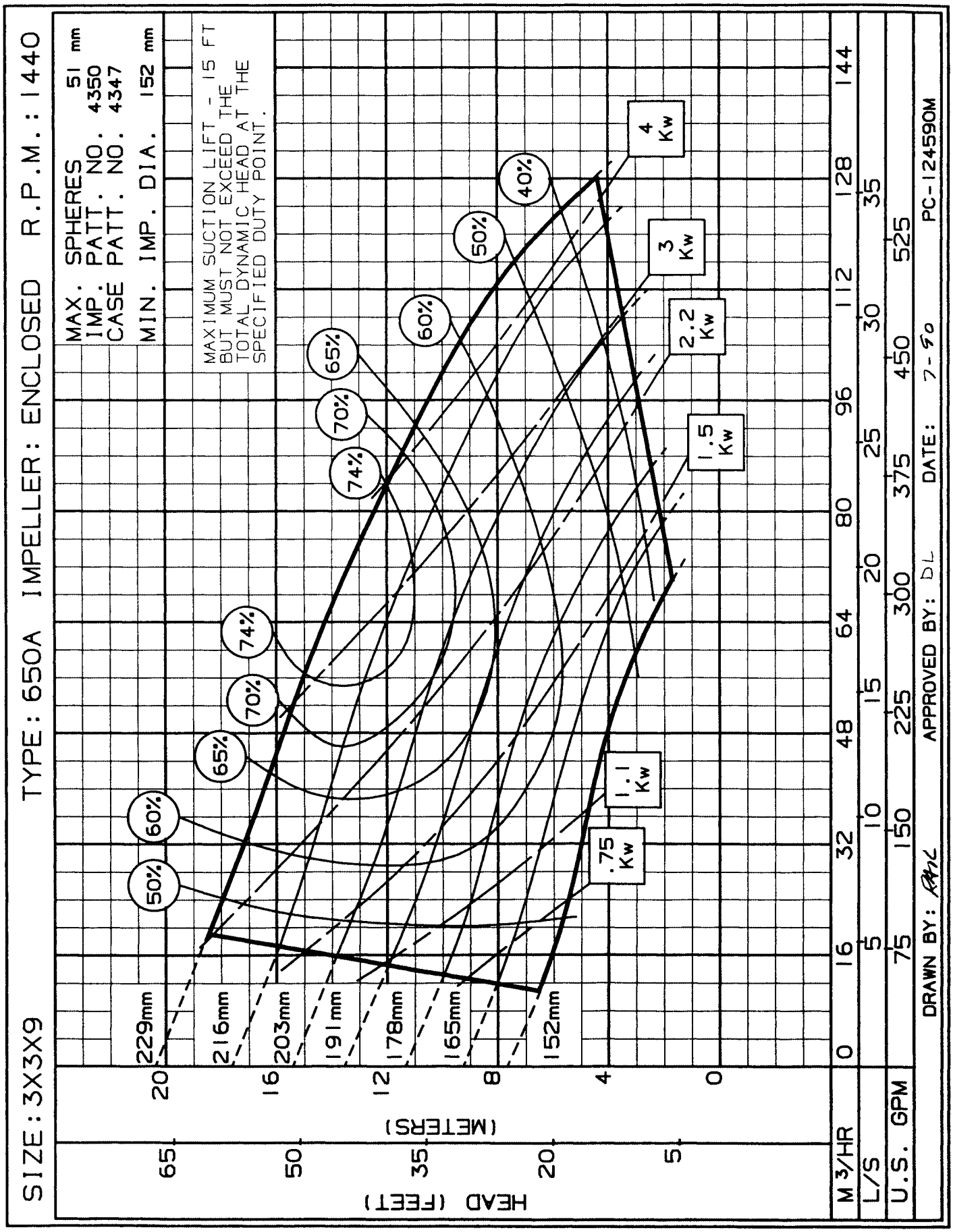
AURORA®
Pentair Pump Group



AURORA®
Pentair Pump Group

3x3x9 - 1440 RPM
ENCLOSED IMPELLER

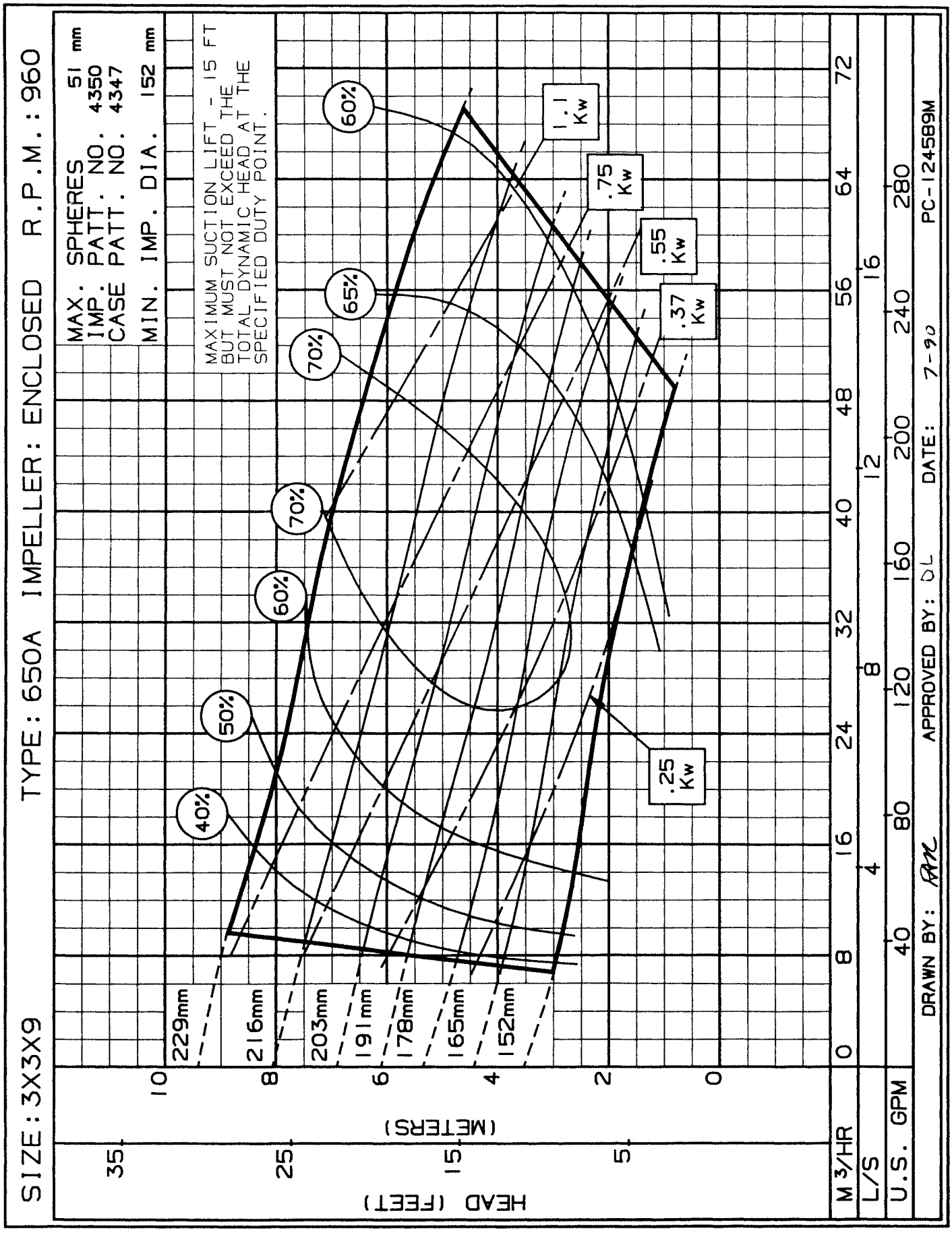
SECTION 650A (Metric 50Hz)
DATE JULY 1994
SUPERCEDES MARCH 1986



SECTION **650A (Metric 50Hz)**
DATE **JULY 1994**
SUPERCEDES MARCH 1986

3x3x9 - 960 RPM
ENCLOSED IMPELLER

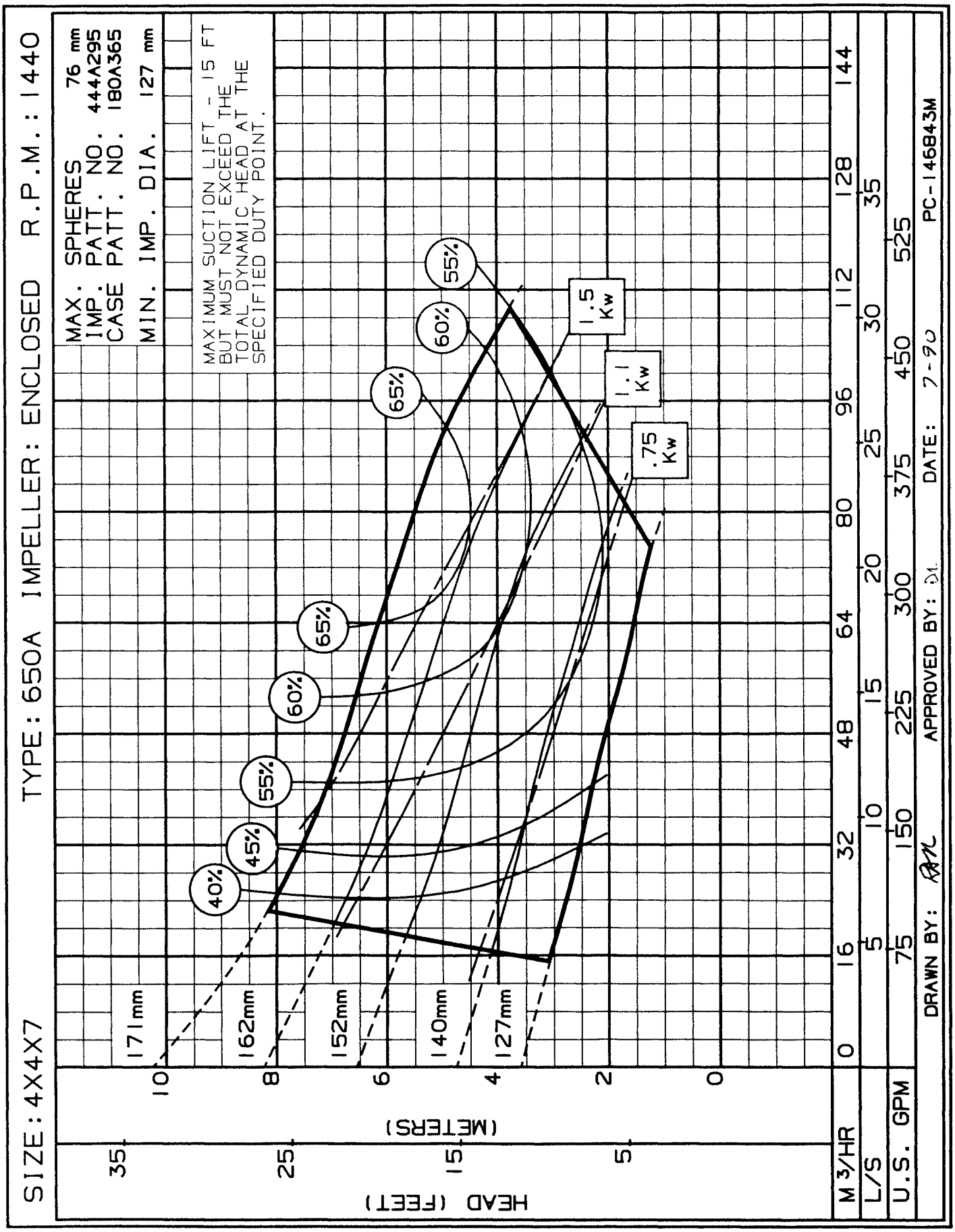
AURORA®
Pentair Pump Group



AURORA®
Pentair Pump Group

4x4x7 - 1440 RPM
ENCLOSED IMPELLER

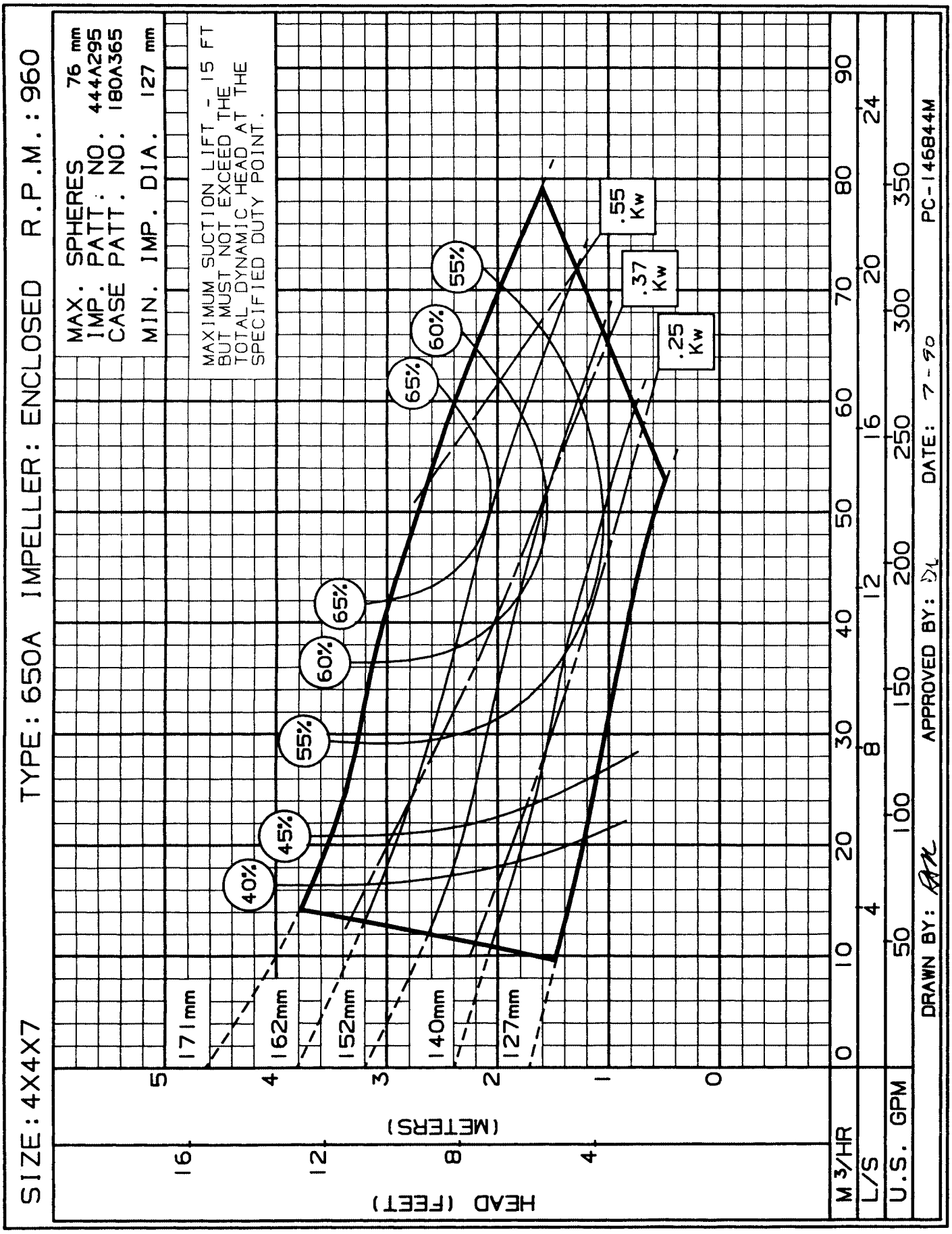
SECTION 650A (Metric 50Hz)
DATE JULY 1994
SUPERCEDES MARCH 1986



SECTION 650A (Metric 50Hz)
DATE JULY 1994
SUPERCEDES MARCH 1986

4x4x7 - 960 RPM
ENCLOSED IMPELLER

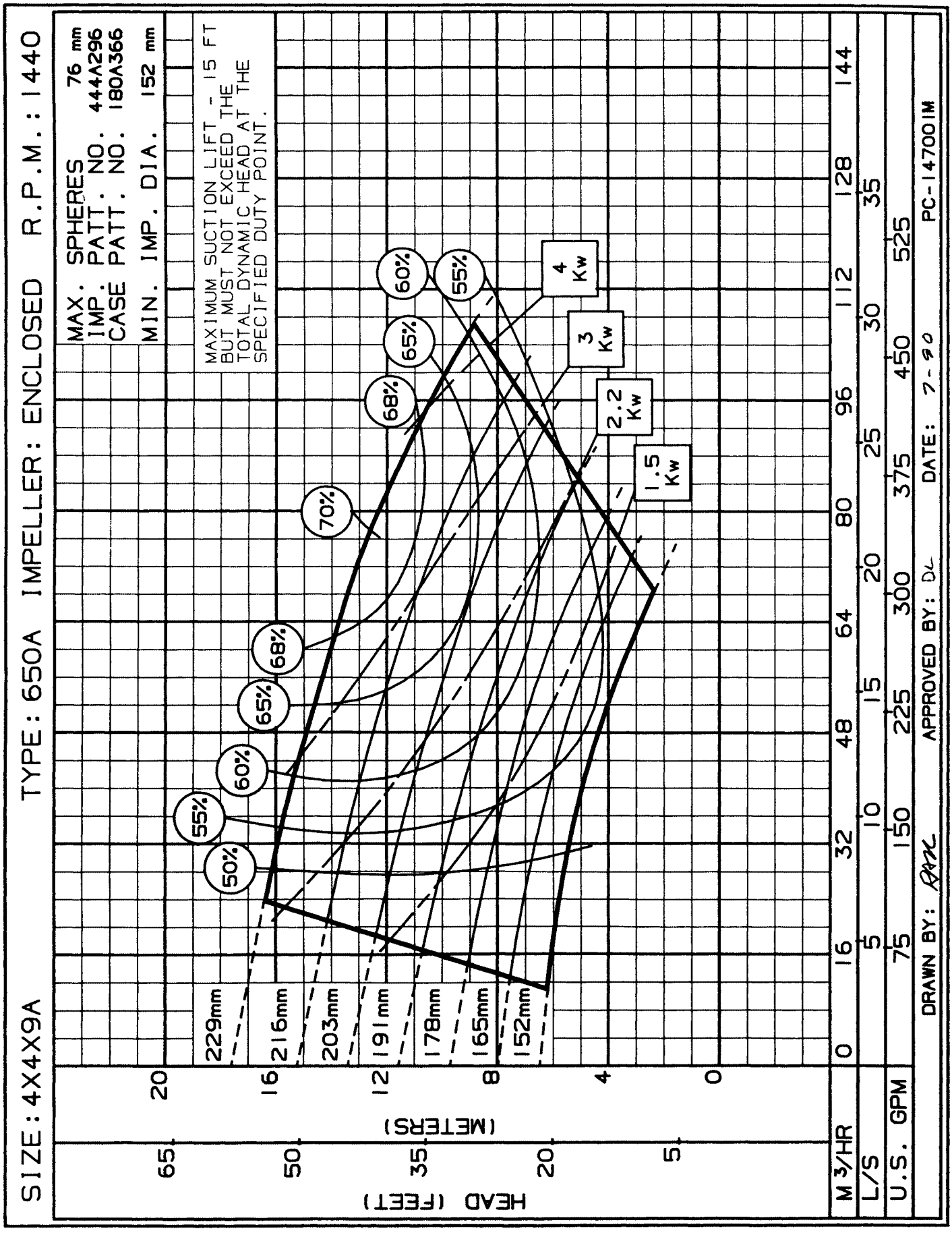
AURORA®
Pentair Pump Group



AURORA®
Pentair Pump Group

4x4x9A - 1440 RPM
ENCLOSED IMPELLER

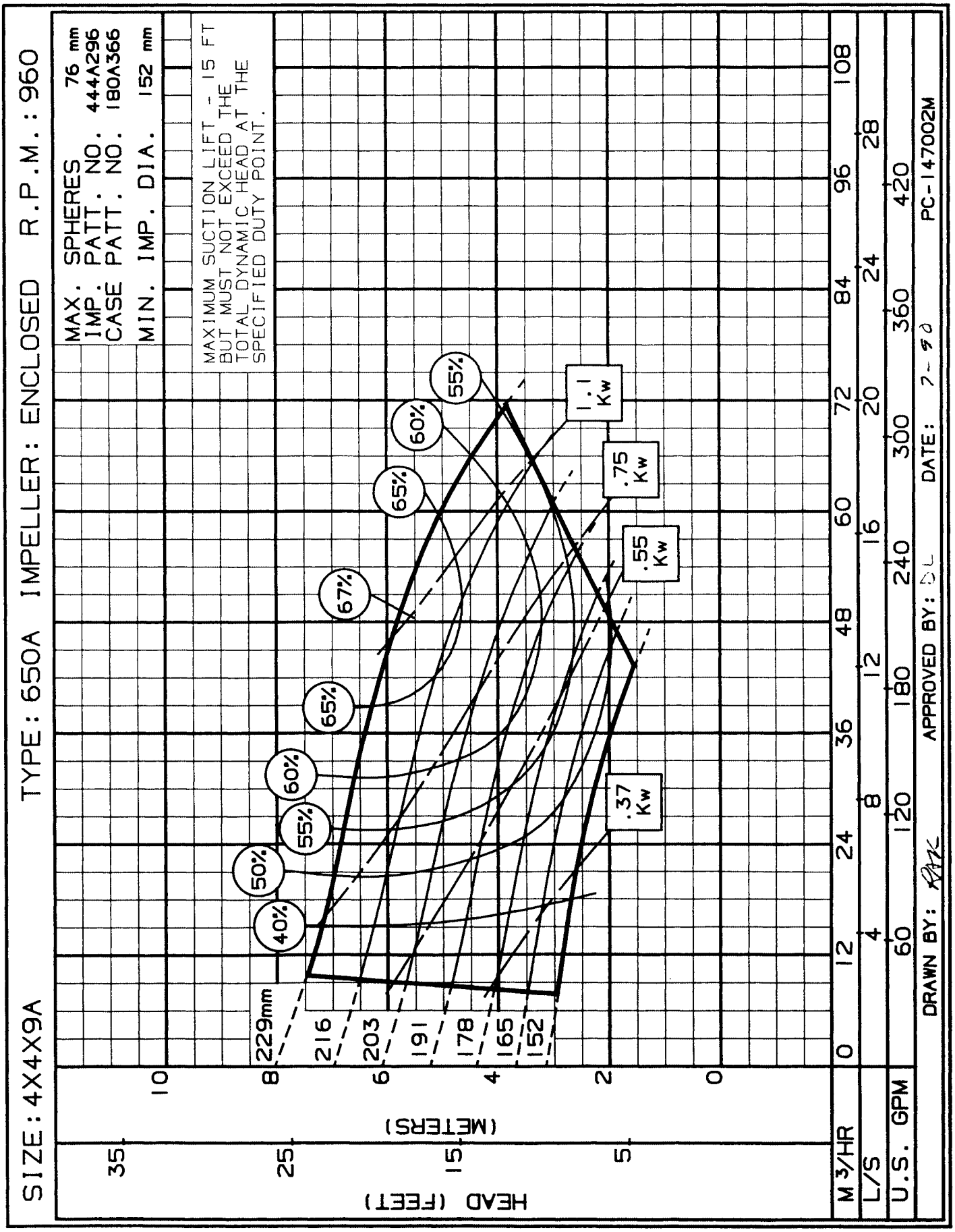
SECTION 650A (Metric 50Hz)
DATE JULY 1994
SUPERCEDES MARCH 1986



SECTION **650A (Metric 50Hz)**
DATE **JULY 1994**
SUPERCEDES MARCH 1986

4x4x9A - 960 RPM
ENCLOSED IMPELLER

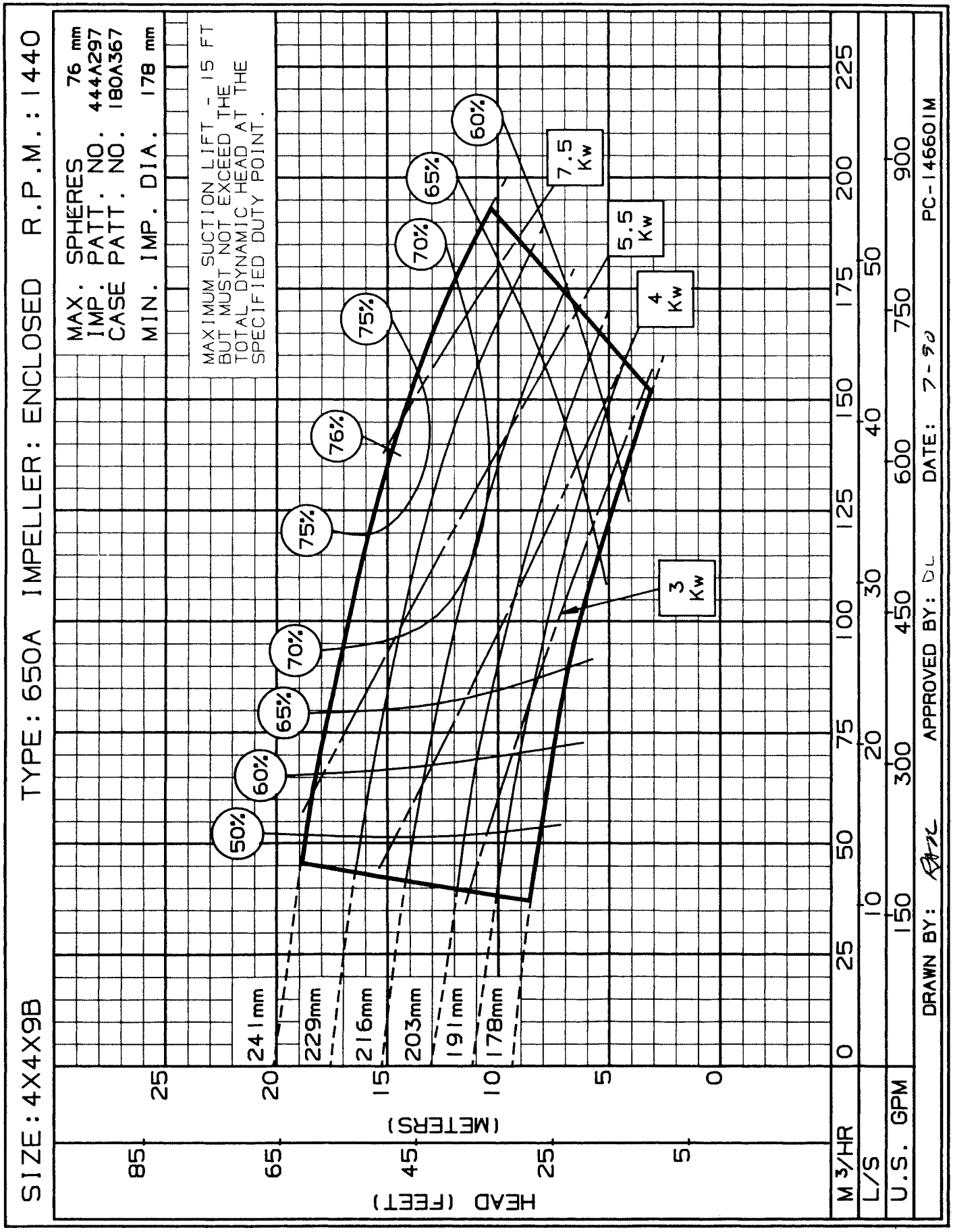
AURORA®
Pentair Pump Group



AURORA®
Pentair Pump Group

4x4x9B - 1440 RPM
ENCLOSED IMPELLER

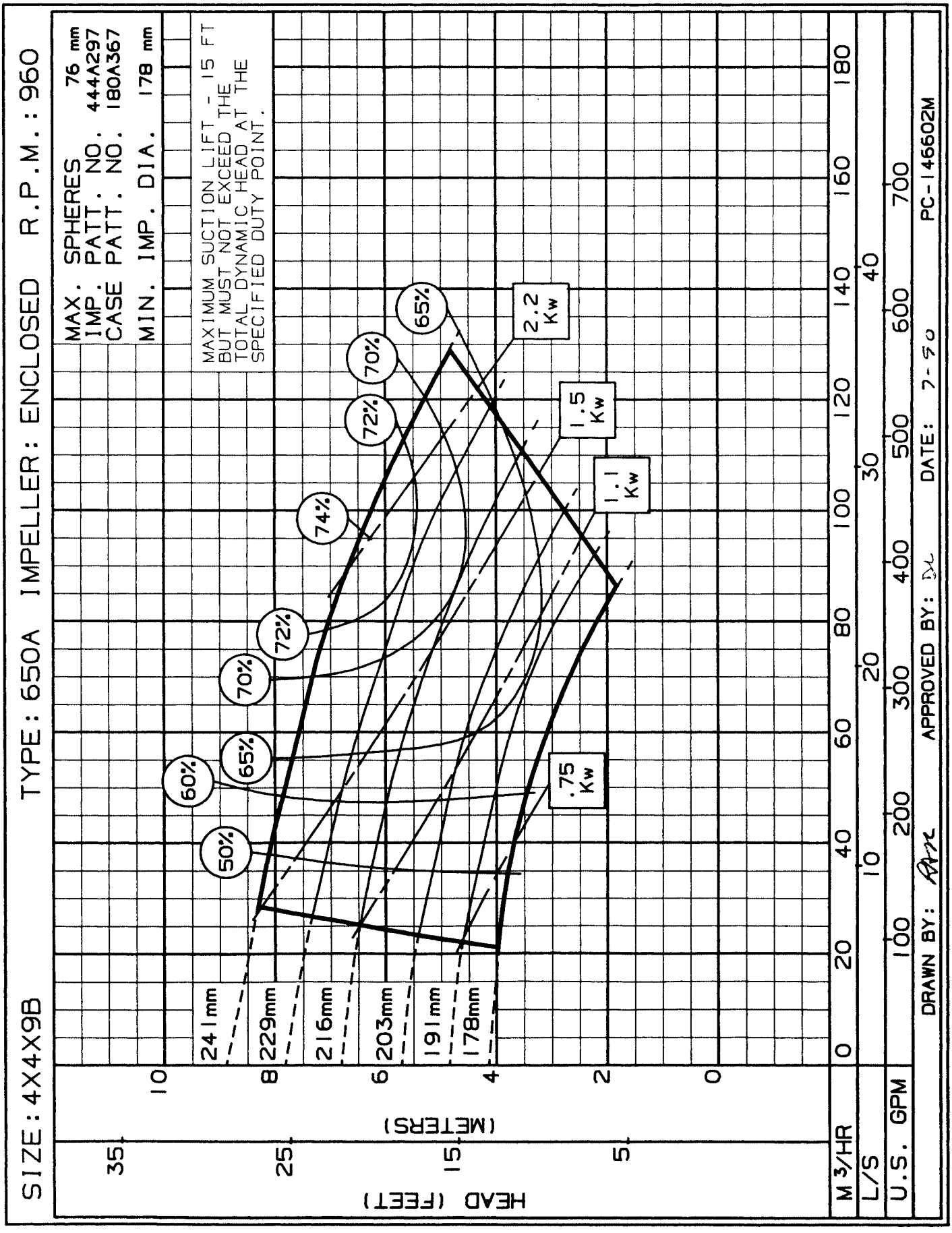
SECTION 650A (Metric 50Hz)
DATE JULY 1994
SUPERCEDES MARCH 1986



SECTION 650A (Metric 50Hz)
DATE JULY 1994
SUPERCEDES MARCH 1986

4x4x9B - 960 RPM
ENCLOSED IMPELLER

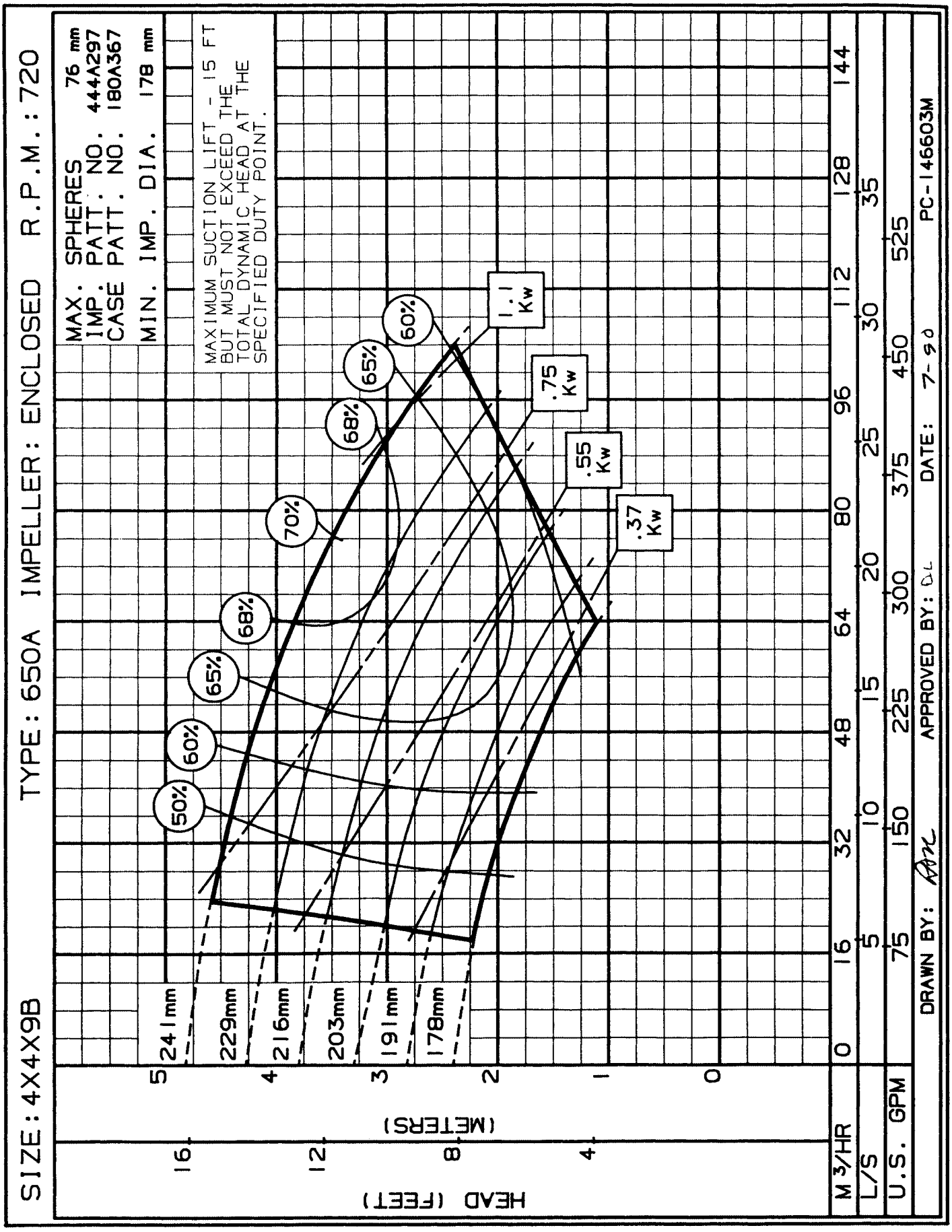
AURORA®
Pentair Pump Group



AURORA®
Pentair Pump Group

4x4x9B - 720 RPM
ENCLOSED IMPELLER

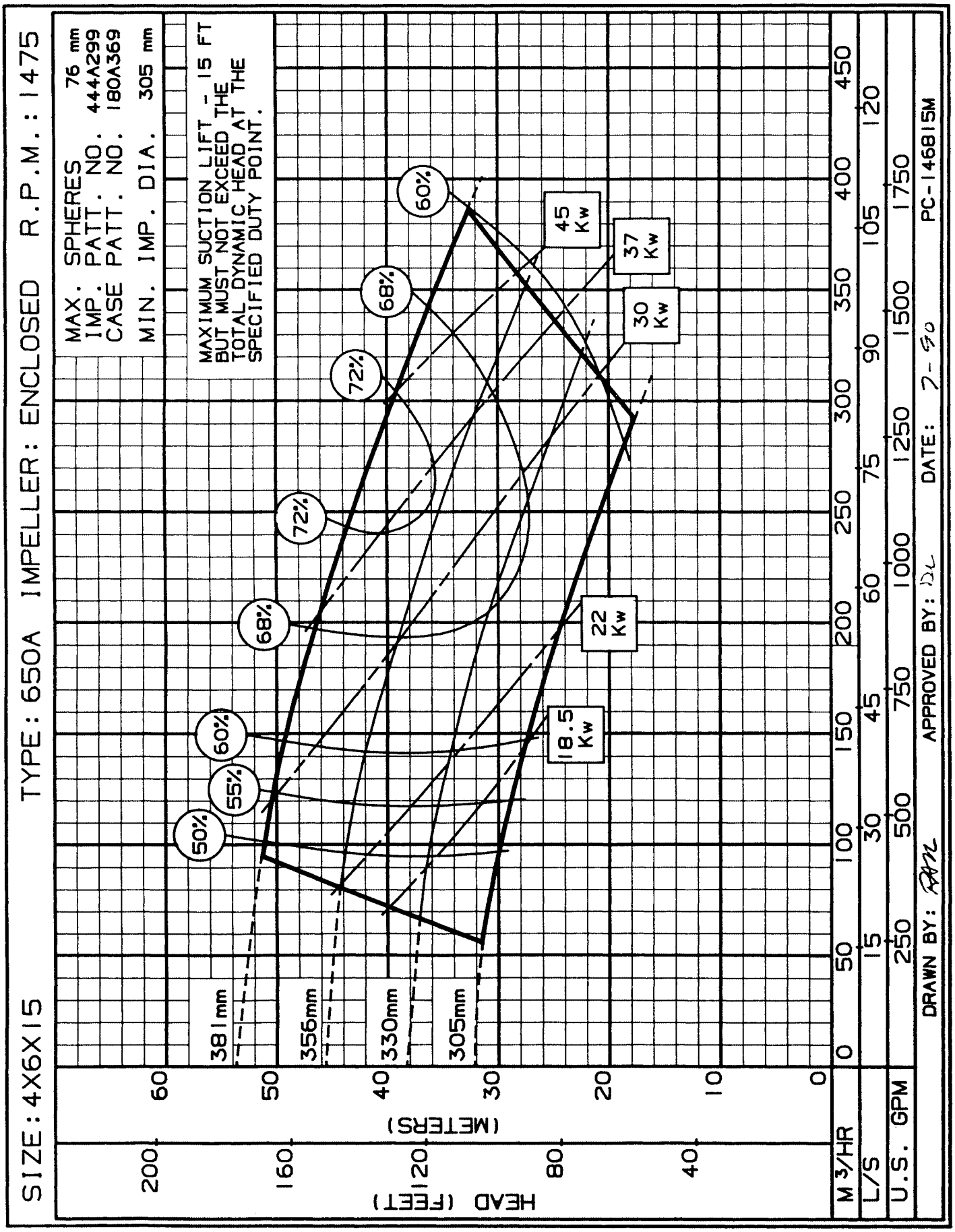
SECTION 650A (Metric 50Hz)
DATE JULY 1994
SUPERCEDES MARCH 1986



SECTION 650A (Metric 50Hz)
DATE JULY 1994
SUPERCEDES MARCH 1986

4x6x15 - 1475 RPM
ENCLOSED IMPELLER

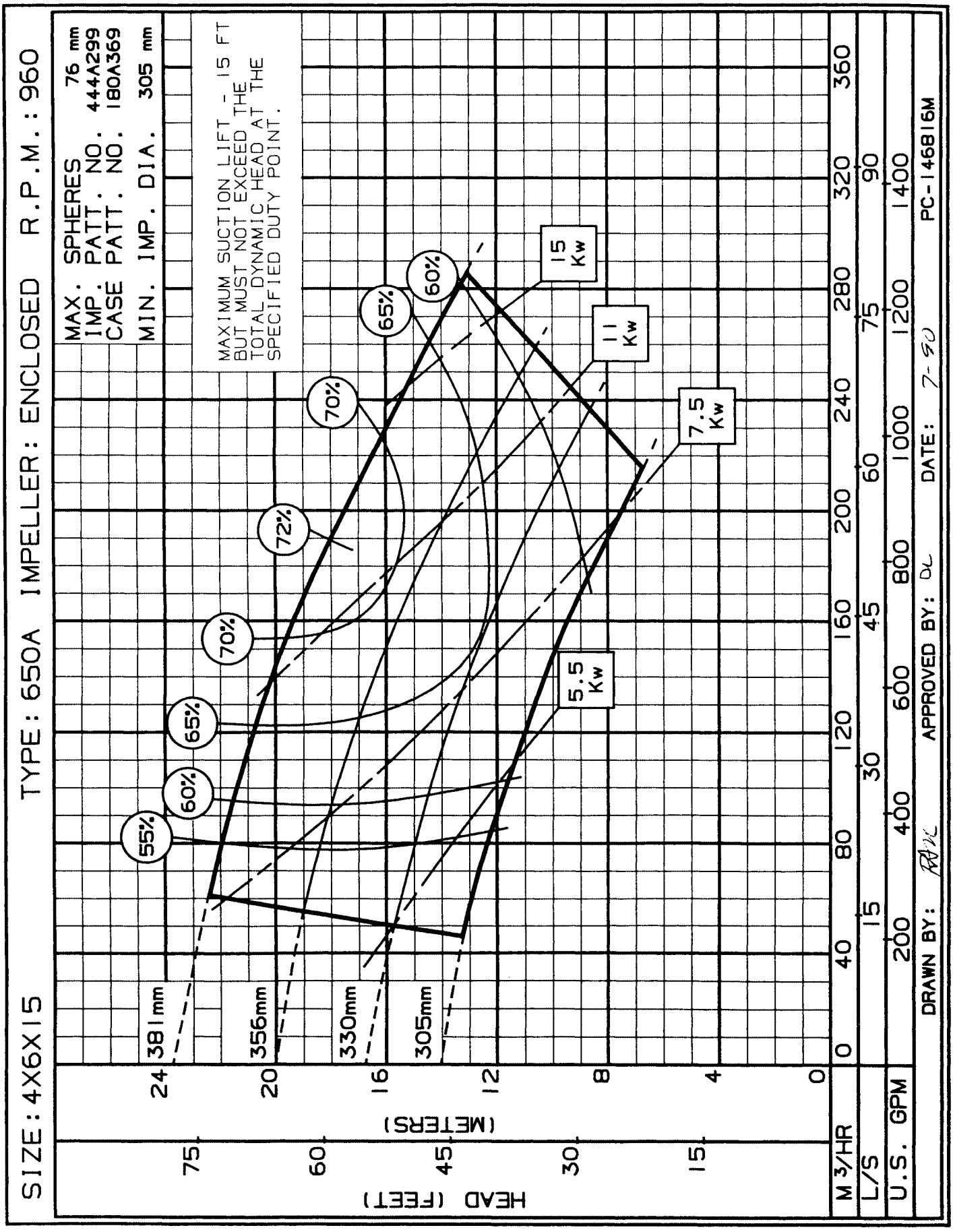
AURORA®
Pentair Pump Group



AURORA®
Pentair Pump Group

4x6x15 - 960 RPM
ENCLOSED IMPELLER

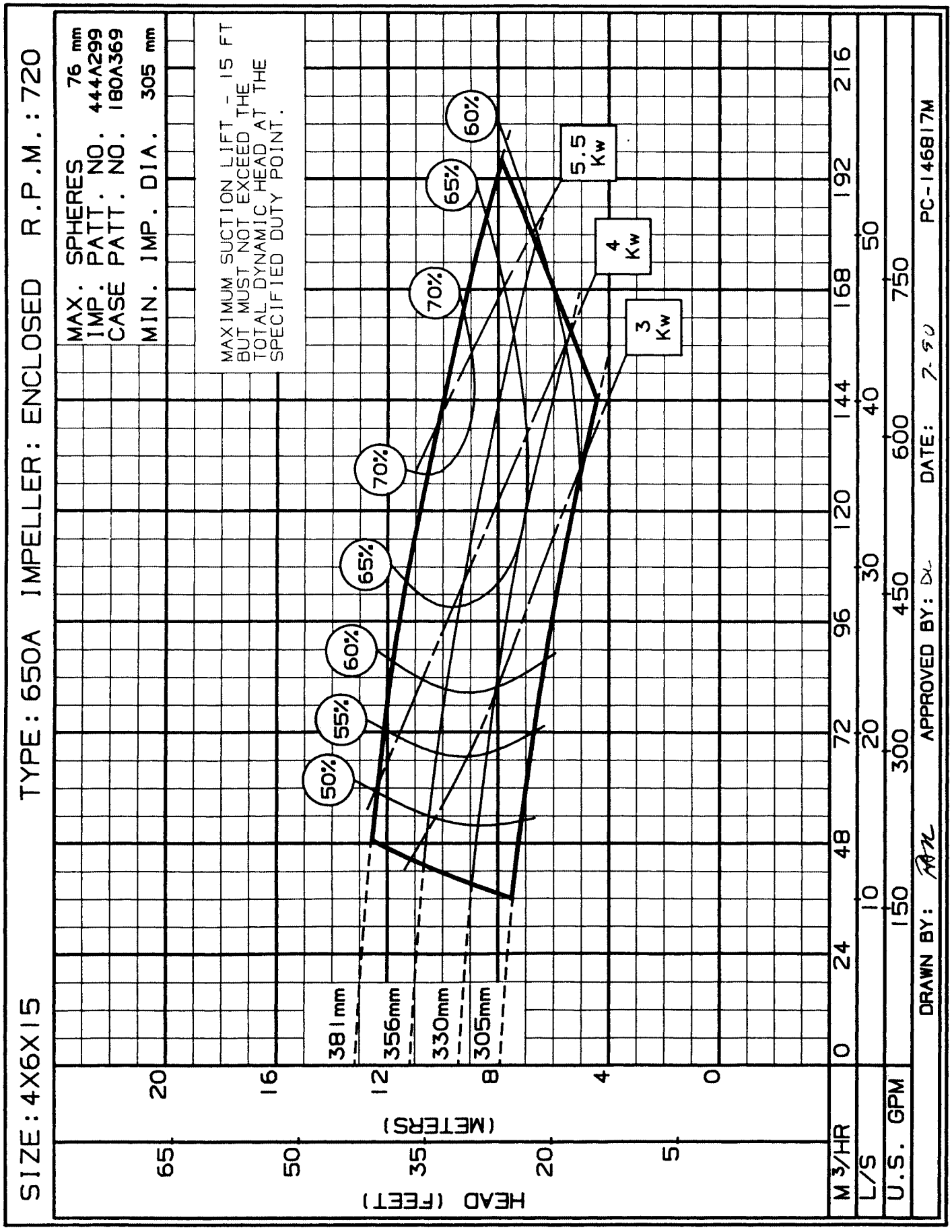
SECTION 650A (Metric 50Hz)
DATE JULY 1994
SUPERCEDES MARCH 1986



SECTION **650A (Metric 50Hz)**
DATE **JULY 1994**
SUPERCEDES MARCH 1986

4x6x15 - 720 RPM
ENCLOSED IMPELLER

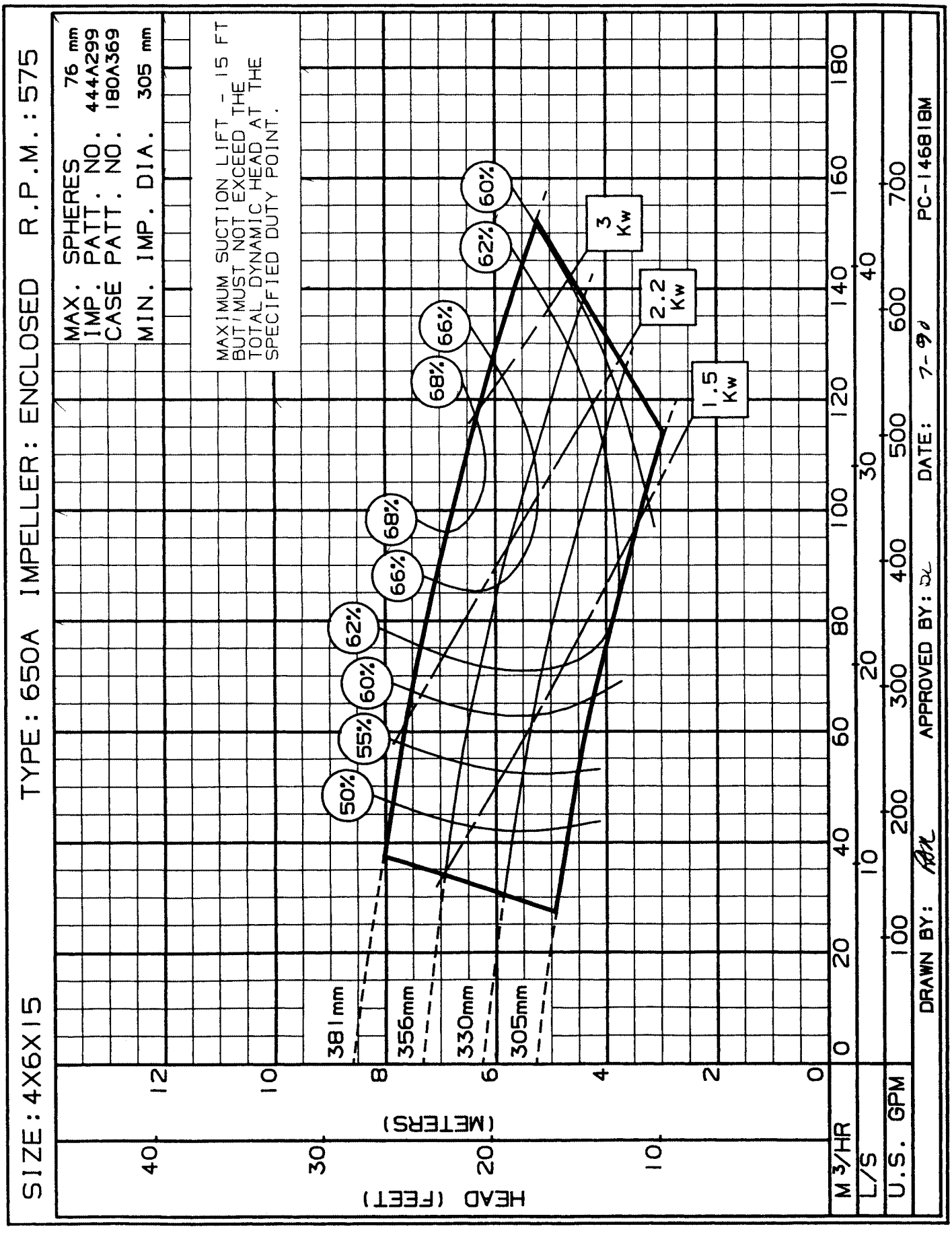
AURORA®
Pentair Pump Group



AURORA®
Pentair Pump Group

4x6x15 - 575 RPM
ENCLOSED IMPELLER

SECTION 650A (Metric 50Hz)
DATE JULY 1994
SUPERCEDES MARCH 1986



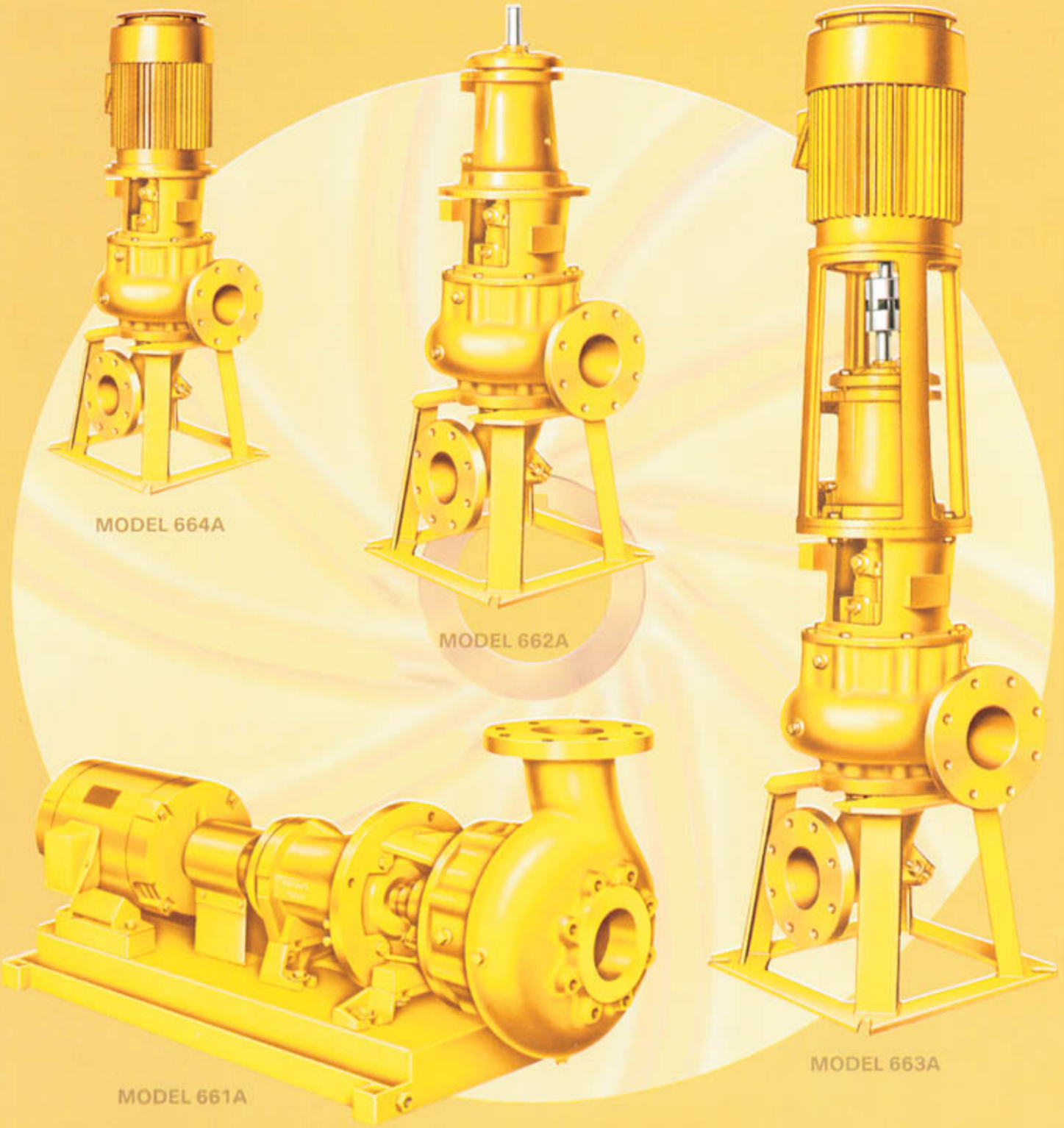
AURORA PUMP A member of PENTAIR PUMP GROUP

AURORA PUMP

BULLETIN 660A/REV. E

660 SERIES SINGLE STAGE NON-CLOG VORTEX PUMPS

CAPACITIES TO 2600 G.P.M.
HEADS TO 160 FEET
TEMPERATURES TO 250° F
DISCHARGE SIZES 3" THRU 6"



MODEL 664A

MODEL 662A

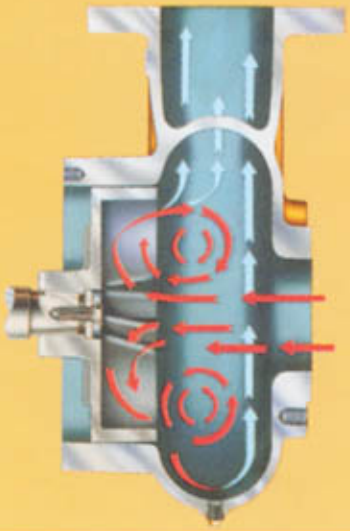
MODEL 661A

MODEL 663A

INTRODUCTION AND PRINCIPLE OF OPERATION VORTEX PUMPS

The application difficulties inherent in the pumping of heavy concentrations of solid materials are solved with the introduction of the Aurora Vortex Pump. The Vortex design is suited primarily to the pumping of sludge or slurry but may be readily applied to food processing and other diverse applications ranging from acetic acid to zinc sulphate. A 28% Hi-Chrome Iron is available for highly abrasive mixtures. This product coupled with a complete line of Aurora Non-Clog Pumps provides a single source availability unique in the centrifugal pumping industry.

PRINCIPLE OF OPERATION



The Model 660 pump operates on the vortex principle. The vortex action created by the impeller is similar to a hurricane in that the liquid upon entering the casing is constantly swirling. The majority of the liquid does not contact the impeller, but is caught up in the mainstream of the casing and by centrifugal force is discharged. The design easily handles stringy material. The unique impeller design and the fact that the material pumped does not flow thru the impeller in a conventional manner requires special consideration of the engineer. Refer to Bulletin 670 for wet pit pump details.

MODELS 661A are horizontally baseplate mounted with a driver flexibly coupled to the pump. This easy to service design is recommended where floor space is readily available or where flooding of the installation is not possible.

MODELS 662A are vertically mounted and utilize flexible shafting between the driver and the pump. This model is frequently used on lift station applications where flooding of the installation is possible. The driver is remote.

MODELS 663A and 664A are vertically mounted with an elevated driver coupled directly to the pump (Model 663A thru a flexible coupling). 663A-664A are popular for installations where floor space is limited and flooding is marginal.

QUICK REFERENCE 660 SERIES FEATURE SELECTOR

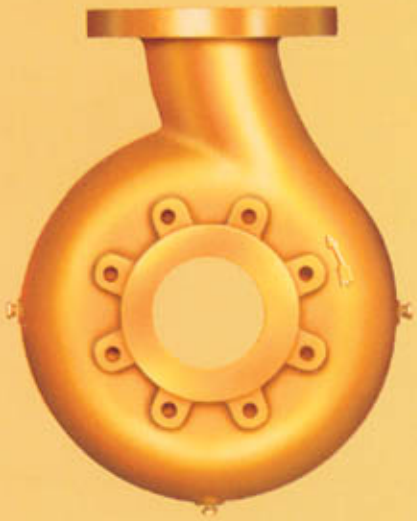
STANDARD

- 3" to 6" sphere and slurry handling capability
- All iron fitted pump construction
- Regreaseable bearings
- Double row outboard thrust bearing
- Single row inboard radial bearing
- Hardened stainless steel (450 min. Brinell) shaft sleeve (pumps with packing)
- Taper shaft fit at impeller
- Steel impeller key
- Carbon steel shaft
- Back impeller pull out
- Dynamically balanced impeller
- Centerline discharge casing
- Suction elbow w/handhole (Model 662A-663A-664A)
- Flush connection behind impeller
- Hydrostatic test all pumps
- Interwoven graphite/teflon lubricated acrylic yarn packing
- Lantern ring
- Gasket sealed pump shaft
- Leakage accumulator packing gland (Model 662A-663A)
- Discharge position No. 1
- Rodding hole in casing
- Coupling guard (Model 661A)

OPTIONAL

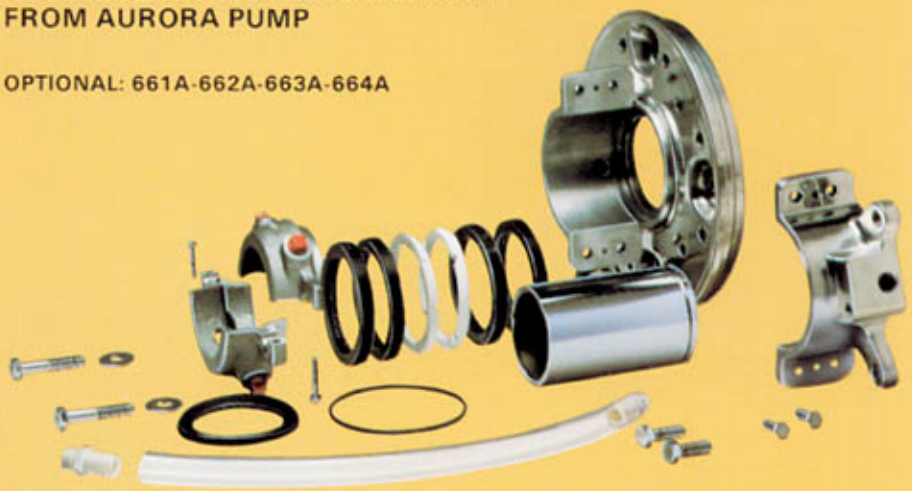
- Removable split packing box
- Single mechanical seal
- Stainless steel shaft
- External stuffing box piping with filter or valve
- Automatic stuffing box grease seal lubricator
- Spacer type coupling (Model 661A only)
- Flexible shaft drive with or without guard (Model 662A only)
- Water Seal Unit Assembly (See Bulletin 680)
- Constant liquid level system (Apco-Matic Variable Speed — See Bulletin 700)
- Certified test report — witnessed or unwitnessed (clear water)
- Special alloy pump construction (Stainless Steel) (HI-CHROME iron)
- Alternate discharge positions
- Alloy shaft sleeve (standard with mechanical seal)
- Double mechanical seal (standard Model 664A)
- Suction increasing elbow with clean out (Models 662A-663A-664A)

CENTERLINE DISCHARGE



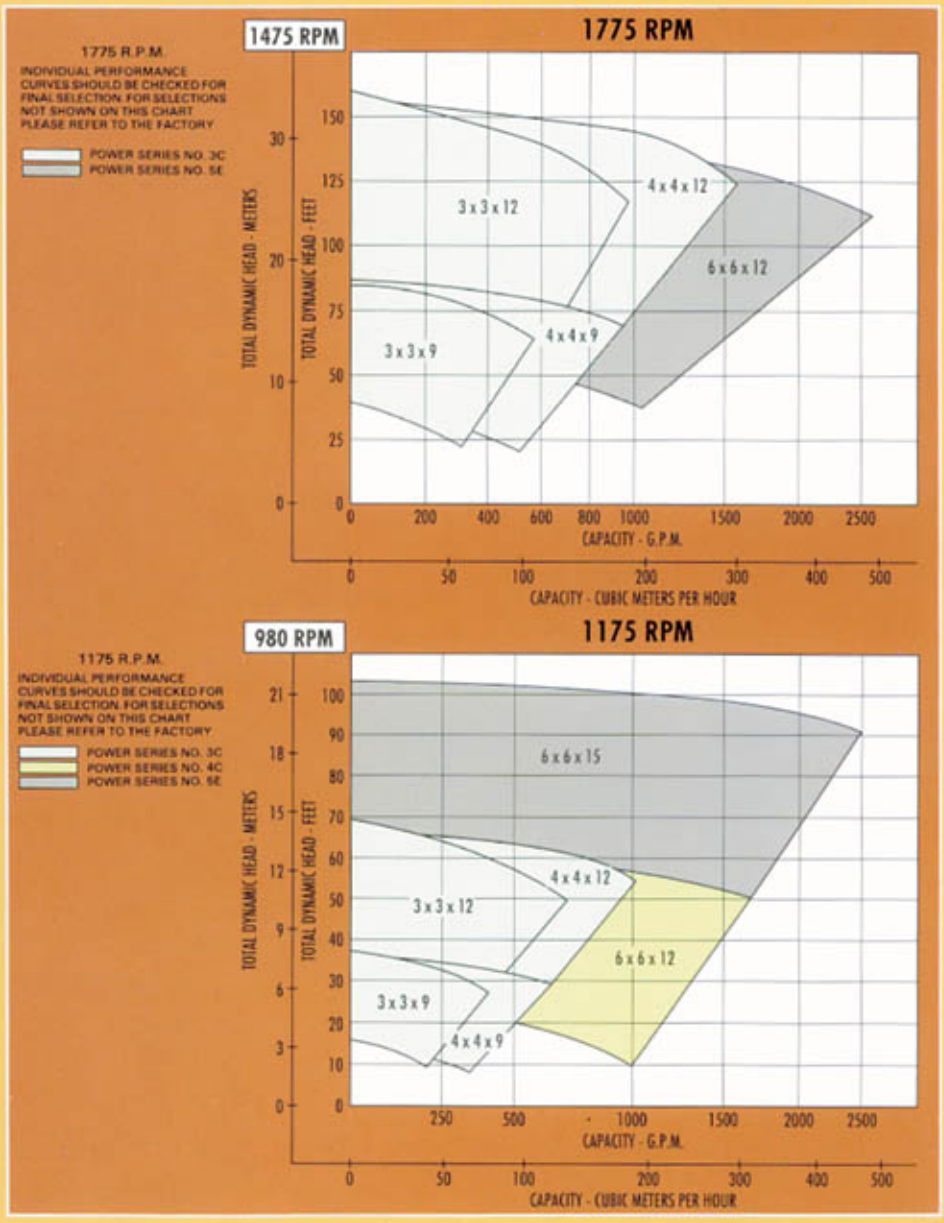
EXCLUSIVE SPLIT PACKING BOX OPTION WITH LEAKAGE ACCUMULATOR IS AVAILABLE *ONLY* FROM AURORA PUMP

OPTIONAL: 661A-662A-663A-664A



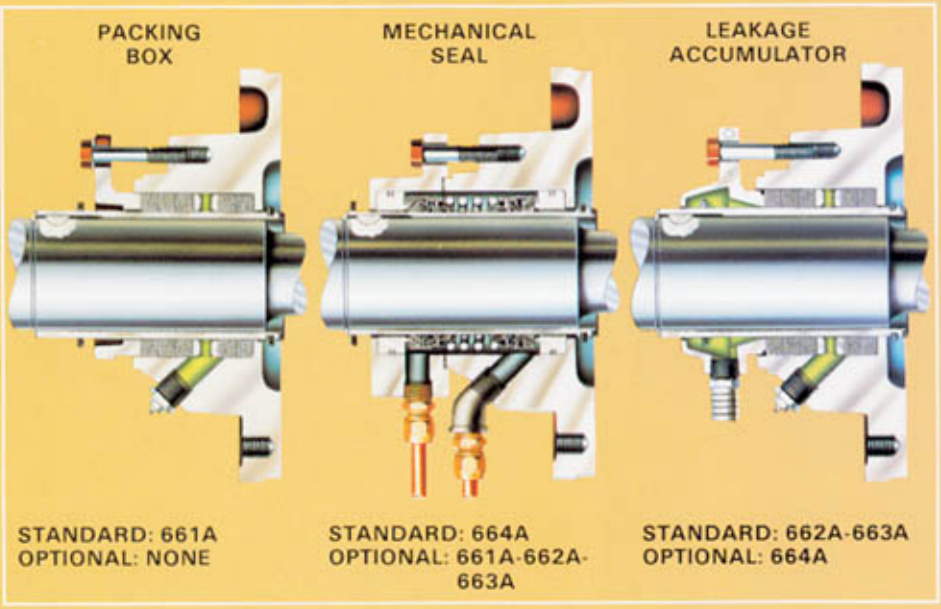
SPECIAL PUMP FEATURES

MODELS 661A are horizontally baseplate mounted with a driver flexibly coupled to the pump. SUPPORT of various pump components is important. Inadequate mounting designs impose unnecessary stress and strain on the entire pump and installation. The top centerline discharge casing is one solution. AURORA VORTEX pumps are designed to provide the best available component support. HORIZONTAL 661A UNITS are supported at both pump and coupling end. This, with centerline discharge support, provides protection against pipe strain and maintains casing support when the drive end of the pump is removed for servicing. The rear support foot greatly simplifies shaft coupling alignment. On VERTICAL 663A UNITS, the steel motor base has a VORTEX pump registered fit at the motor end and is fastened to a separate pump adapter. This exclusive arrangement assures alignment and concentrates loads on the separate pump adapter thereby eliminating strain and misalignment of the bearing housing. On 662A-663A-664A UNITS the steel base provides a rigid support for the complete pump unit. 664A is close coupled.



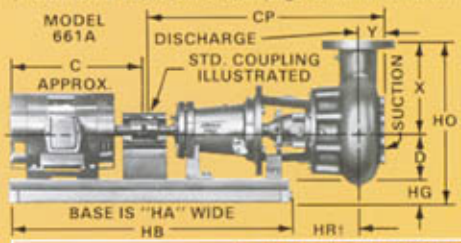
OPTIONAL EQUIPMENT AND DIMENSIONS

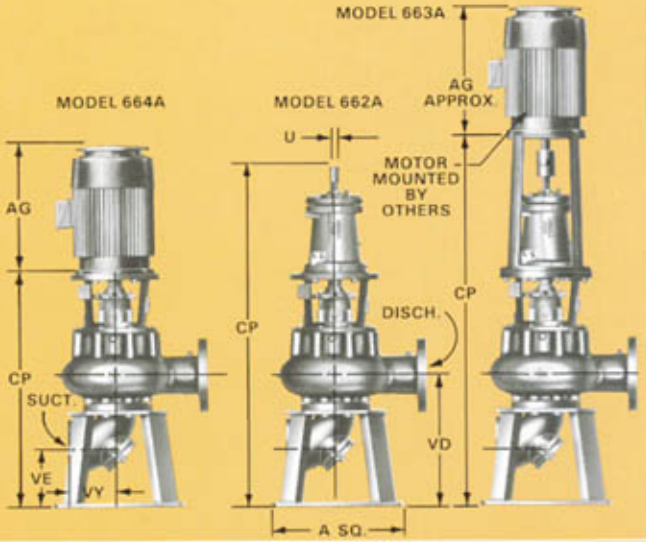
SPLIT PACKING BOXES separate vertically through the packing insert to simplify packing replacement and shaft sleeve inspection. The insert halves are doweled, register aligned and gasketed to prevent leakage. Only six bolts need be removed to disassemble the insert from the pump assembly. DOUBLE MECHANICAL SEALS must be recommended for gritty or abrasive applications. Seal faces are protected by clear water under pressure, injected directly into the seal cavity. The seal box design allows speedy seal maintenance. Single mechanical seals are available. LEAKAGE ACCUMULATOR for vertical pump models with packed stuffing boxes collects seepage for easy drain off. The gland halves are dowel aligned.



NOTES:
1. Dimensions and weights are approximate.
2. Refer to factory for base dimensions when spacer couplings are specified.
3. Not for construction purposes unless certified.
4. Frame sizes shown are for open drip-proof motors only.
5. Suction and discharge flanges are American Standard 125#.
6. Conduit box is shown in approximate position. Dimensions are not specified as they vary with each motor manufacturer.
7. Add pump, base and motor weight for unit weight.
8. Horizontal motors are "T" frame as shown — Vertical motors are "HP" frame.

†Refer to individual dimension page for HR dimension.





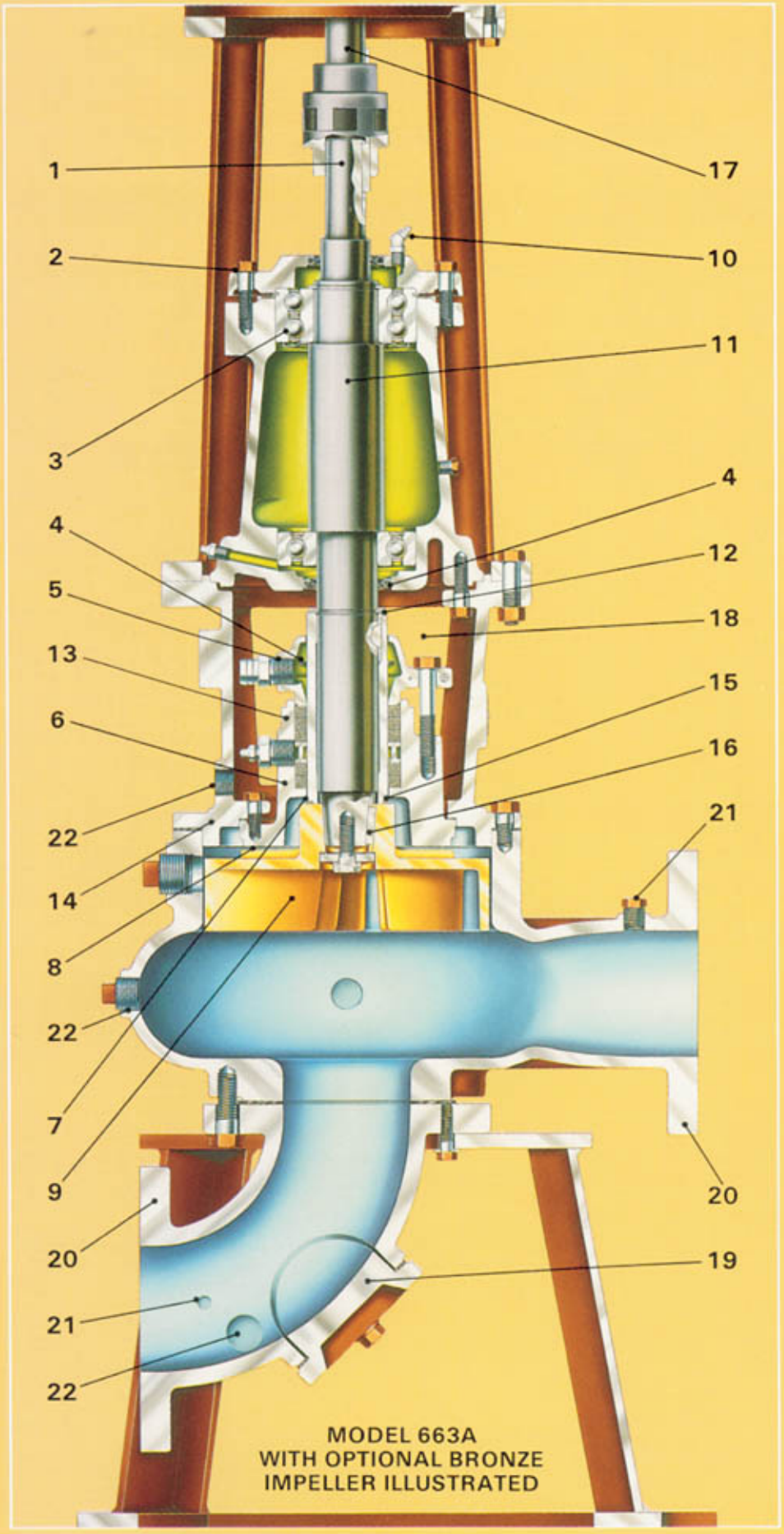
MOTOR FRAME (note 8)	HORSEPOWER RPM 1750	HORSEPOWER RPM 1150	WGT. IN LBS.	C	AG
143T	1	3/4	40	12	11
145T	1-1/2-2	1	45	13	12
182T	3	1-1/2	72	13	13
184T	5	—	85	14	14
213T	7-1/2	—	150	16	16
215T	10	5	190	18	17
254T	15	7-1/2	230	21	19
256T	20	10	250	23	21
284T	25	15	350	24	22
286T	30	20	380	25	23
324T	40	25	475	26	24
326T	50	30	525	28	26
364T	—	40	630	29	25
364TS	60	—	630	27	25
365T	—	50	690	30	25
365TS	75	—	690	28	25
404T	—	60	830	33	28
404TS	100	—	830	30	28
405T	—	75	915	34	28
405TS	125	—	915	31	28
444T	—	100	1000	38	32
444TS	150	—	1000	34	32
445T	—	125	1100	40	32
445TS				36	

661A-662A-663A-664A — DIMENSIONS — PUMP *Add 2" w/Frame 284 HPH or larger

PUMP SIZE DISCH	SUCT.	CASE	PWR. SER.	PUMP WEIGHT 661A	662A	663A	A	D	U	X	Y	CP 661A	662A	663A	664A	VD	VE	VY
3	3	9	3C	212	288	321	17	8	1-1/4	10	3-1/8	28-11/16	42	45-5/8	28-11/16	16-7/16	7-3/4	5-1/2
4	4	9	3C	232	318	351	17	8	1-1/4	11	3-3/8	29-15/16	43-7/16	47-1/16	30-1/8	16-7/8	8-15/16	6-1/2
3	3	12	3C	289	365	398	17	8	1-1/4	13	3-1/8	28-3/4	42-1/16	45-11/16	28-3/4	16-7/16	7-3/4	5-1/2
4	4	12	3C	317	402	435	17	8	1-1/4	13	3-3/8	30-1/4	43-3/4	47-3/8	30-7/16	16-7/8	8-15/16	6-1/2
6	6	13	4C	455	687	754	24	13-1/2	1-1/4	14	4-5/8	31-3/4	51-5/16	55-1/16	38-1/8	24-3/16	11-1/2	8
6	6	12	5E	797	1060	1292	24	13-1/2	2-3/8	14	4-5/8	42-3/4	62-5/16	*65-7/8	39-5/16	24-3/16	11-1/2	8
6	6	15	5E	914	1166	1398	24	13-1/2	2-3/8	16	4-5/8	42-3/4	62-5/16	*65-7/8	39-5/16	24-3/16	11-1/2	8

661A — DIMENSIONS — BASE

MOTOR FRAMES	BASE	HA	HB	HG	HO	BASE WT. LBS.
143T thru 184T	5	17-1/4	36-1/2	3	21	59
213T-215T	6	17-1/4	42-1/2	3	21	68
254T	8	20-1/2	42-1/2	3	21	96
256T-284T	9	20-1/2	48-1/2	3	21	109
182T-184T	5	17-1/4	36-1/2	3	22	59
213T-215T	6	17-1/4	42-1/2	3	22	68
254T	8	20-1/2	42-1/2	3	22	96
256T-284T-286T	9	20-1/2	48-1/2	3	22	109
324T	11	26-3/4	48-1/2	4	23	164
213T-215T	6	17-1/4	42-1/2	3	24	68
254T	8	20-1/2	42-1/2	3	24	96
256T-284T-286T	9	20-1/2	48-1/2	3	24	109
324T	11	26-3/4	48-1/2	4	25	164
326T thru 365T	12	26-3/4	54-1/2	4	25	192
215T	6	17-1/4	42-1/2	3	24	68
254T	8	20-1/2	42-1/2	3	24	96
256T-284T-286T	9	20-1/2	48-1/2	3	24	109
324T	11	26-3/4	48-1/2	4	25	164
326T thru 365T	12	26-3/4	54-1/2	4	25	192
404TS-404T	15	30-3/4	54-1/2	4-1/2	25-1/2	291
254T-256T-284T	10	20-1/2	56-1/2	3	30-1/2	128
286T-324T	13	26-3/4	64-1/2	4	31-1/2	235
326T thru 365T	13	26-3/4	64-1/2	4	31-1/2	235
254T-256T	14	26-3/4	72-1/2	4	31-1/2	268
254T-286T-324T	14	26-3/4	72-1/2	4	31-1/2	268
326T thru 445T	18	30-3/4	82-1/2	4-1/2	32	441
254T-256T	14	26-3/4	72-1/2	4	33-1/2	268
284T-286T-324T	14	26-3/4	72-1/2	4	33-1/2	268
326T thru 445T	18	30-3/4	82-1/2	4-1/2	34	441



MODEL 663A
WITH OPTIONAL BRONZE
IMPELLER ILLUSTRATED

1 LIFTING EYE tap in shaft end simplifies disassembly.
2 EXTERNAL SHAFT ADJUSTMENT simplifies correctly orientating the impeller within the casing during scheduled maintenance.
3 DOUBLE ROW THRUST BEARINGS are added protection for high loads. Average bearing life is 10 years.
4 WATER SLINGER, and grease seals protect both bearings from moisture.
5 LEAKAGE ACCUMULATOR GLAND option to siphon off packing leakage.
6 STUFFING BOXES are machined for mechanical seals or packing. Either may be used without modification.
7 GASKETS protect shaft from pumped liquid corrosion and contamination.
8 IMPELLER WIPER VANES minimize stuffing box pressure and clogging.
9 IMPELLER VANES brought well into the inlet eye to pick up liquid early and to minimize clogging.
10 GREASE LUBRICATION purges old grease from both bearings.
11 RUGGED SHAFT with taper for easy impeller removal and minimum deflection.
12 HARDENED STAINLESS STEEL SLEEVE on packed pumps is securely key locked to the shaft.
13 .002 MAXIMUM SHAFT DEFLECTION at stuffing box face extends packing and mechanical seal life.
14 BACK PULLOUT DESIGN for pump maintenance, does not disturb suction or discharge piping.
15 SNAP RING groove is provided for a snap ring to aid in sleeve removal during preventative maintenance period.
16 STEEL IMPELLER KEY, capscrew and washer secures impeller to shaft.
17 NEMA STANDARD "HP" mounting face and shaft extension motors.
18 LARGE ACCESS OPENINGS provide adequate visibility and working room.
19 OVAL CLEANOUT in elbow is HAND SIZE and located to provide visibility and accessibility to the suction. A rodding hole in the side of the casing is provided.
20 DISCHARGE flanges can be located in 45° increments for 8 different positions. (suction in 90° -vert. pumps)
21 STANDARD GAUGE TAPS are conveniently located at both the discharge and suction flange openings.
22 STANDARD DRAIN TAPS are located conveniently in the adapter bracket, suction elbow, and casing.

ENGINEERING SPECIFICATIONS

STUFFING BOX, SHAFT AND BEARING DIMENSIONS * Indicates Back to Back Bearings Qty. 2

AREA	DESCRIPTION		POWER SERIES 3C	4C	5E
STUFFING BOX	Stuffing Box Bore Diameter	PACKING	3-9/32	3-9/32	4-25/32
	Stuffing Box Depth		2-3/4	2-3/4	3-1/2
	Outside Dia., Sleeve for Packing		2-1/2	2-1/2	3-3/4
	Total Number of Packing Rings With Lantern Ring		5	5	5
	No. of Rings in Front of Lantern Ring		2	2	2
	Packing Size		3/8	3/8	1/2
	Width of Lantern Ring		5/8	5/8	3/4
	Distance From Box to Nearest Obstruction		2-15/16	2-15/16	2-3/4
	Dia. of Mech. Seal (Bore)	M. SEAL	3-9/32	3-9/32	4-25/32
	Length of Mechanical Seal		3-1/4	3-1/4	4-7/16
	Outside Dia., Sleeve for Mechanical Seal		2-1/4	2-1/4	3-5/8

AREA	DESCRIPTION	POWER SERIES 3C	4C	5E
SHAFT	Dia. at Impeller (Average of Taper)	1-7/16	1-7/16	2-1/4
	Diameter at Shaft Sleve	1-7/8	1-7/8	3-1/4
	Diameter Between Bearings (Max. Shaft Dia.)	2-3/8	3-5/16	4-1/8
	Diameter at Coupling End	1-1/4	1-1/4	2-3/8
	Max. Deflection at Stuffing Box Face	.002"	.002"	.002"
BEARINGS	Bearing No. (Inboard Radial)	6310	6311	6317
	Bearing No. (Outboard Thrust)	3310	3309	7315*
	Bearing Centers	7-9/32	7-3/4	12-11/16
	Minimum Life of Bearing Under Worst Conditions of Load	2 Years	2 Years	2 Years

LIMITATIONS (Maximum)

Hydrostatic test pressure	125 PSI
Case working pressure	100 PSI
Suction pressure	100 PSI
Temperature-Packing	250°F
Temperature-Mech. Seal	225°F
Operating speed	1775 RPM

DESCRIPTION	FITTED	MATERIAL OF CONSTRUCTION
Impeller	Iron	Cast Iron ASTM A48
Gland	Iron	Cast Iron ASTM A48
Packing	Iron	Graphite/Teflon Lubricated Acrylic Yarn
Insert	Iron	Cast Iron ASTM A48
Lant. Ring	Iron	Teflon
	Stainless	Stainless Steel AISI 316
Sleeve (Pack)	Iron	Hard. Stn. Steel AISI 440C
Sleeve (Seal)	Iron	Bronze ASTM B62
Sleeve (Seal)	Stainless	Stainless Steel AISI 316
Impeller Screw	Iron	Steel SAE Grade 5
Shaft	Iron	Steel SAE 1045
Frame	Iron	Cast Iron ASTM A48
Casing	Iron	Cast Iron ASTM A48
Cover	Iron	Cast Iron ASTM A48
Supports	Iron	Steel

Furnish and install as shown on the plans, Aurora Model . . . . . (Horizontal-661A) (Vertical-663A Flexible Coupled) (Vertical-662A Open Shaft), (Vertical-664A-Close Coupled) type Vortex pump. The pump shall be capable of delivering a capacity of . . . . . GPM when operating against a total dynamic head of . . . . . feet. The pump shall also deliver a maximum of . . . . . GPM when operating against a head of . . . . . feet. The minimum shut-off head acceptable will be . . . . . feet.

The pump shall operate at a maximum speed of . . . . . RPM. A unit operating at a lesser rotative speed will be considered but in no event will a pump operating at more than the maximum speed specified be acceptable.

The pump casing shall be of the top centerline design and will be constructed of cast iron and shall be of sufficient thickness to withstand stresses and strains at full operating pressures. Casings shall be subject to a hydrostatic pressure test of 150 lbs. A rodding hole is to be provided in casing to facilitate casing and impeller cleanout. The casing design shall allow rear pullout.

The bearing housing is to be of cast iron and shall be furnished with a set of regreaseable bearings for both radial and thrust loads. A double row thrust bearing is to be provided to ensure maximum bearing life under extreme thrust loads. The bearings shall have an average life of 100,000 hours and shall be mounted in a machined, moisture and dust proof housing. The housing is to have a register fit and then bolted to the pump casing to insure permanent alignment. An extra deep (split) packing box simplifying packing replacement and shaft sleeve inspection is to be provided and must be so arranged with a lantern ring for either grease lubrication or tapped connections for water sealing from an outside source. A 3/8" drain opening must be provided to facilitate removal of seepage.

The impeller to be of cast iron and shall be capable of passing a maximum sphere size of . . . . inches. The impeller shall be dynamically balanced before assembly into the pump and shall be securely fastened to the shaft by means of a steel key and impeller locknut.

The pump shaft shall be constructed of high grade carbon steel having a tapered impeller extension and accurately machined. The minimum diameter acceptable between bearings will be 2-3/8 inches. The pump shaft shall be protected from wear by a corrosion and wear resisting hardened stainless steel shaft sleeve having a 450 minimum Brinell hardness. An "O" ring type gasket must be provided between the impeller hub and the shaft sleeve to prevent pumped liquid from corroding the shaft.

MODEL 661A HORIZONTAL

The pump and motor shall be mounted on a common (steel) (steel drip rim) base. Alignment shall be checked in accordance with the Standards of the Hydraulic Institute after installation and there shall be no strain transmitted to the pumps.

MODEL 662A VERTICAL OPEN SHAFT, 663A VERTICAL FLEXIBLE COUPLED AND 664A CLOSE COUPLED VERTICAL PUMPS

The pump shall be supported by a fab. steel pedestal base. The pedestal shall have openings large enough to permit access to the suction line. An optional handhole of not less than 3" in diameter must be provided in the suction elbow on 3", 4" and 6" pumps. The pedestal must be of sufficient height so that the suction elbow will not touch the floor or foundation upon which it stands.

Vertical flexible coupled 663A pumps shall be furnished with a fab. steel motor bracket which is to be bolted to a separate pump adapter. The motor bracket must be machined with a register fit to insure proper alignment of motor shaft and pump shaft. 664A is coupled directly to the motor shaft extension.

Vertical open shaft pumps are to be driven through flexible shafting with . . . . . dia. tubing, and intermediate bearings. Shafting must be of sufficient size to transmit required horsepower and must be provided with a slip spline which will permit removal of the pump rotating assembly without removing any section of intermediate shafting, bearings, suction or discharge piping (. . . . sections req'd.).

The Engineering Specification has been condensed from a very comprehensive specification. Additional information is available from any Aurora Pump Sales Office. Aurora Pump reserves the right to make revisions to its products and their specifications, and to this bulletin and related information, without notice.

NOTE: Aurora Pump reserves the right to make revisions to its products and their specifications, and to this bulletin and related information without notice.

— Your Authorized Local Distributor —

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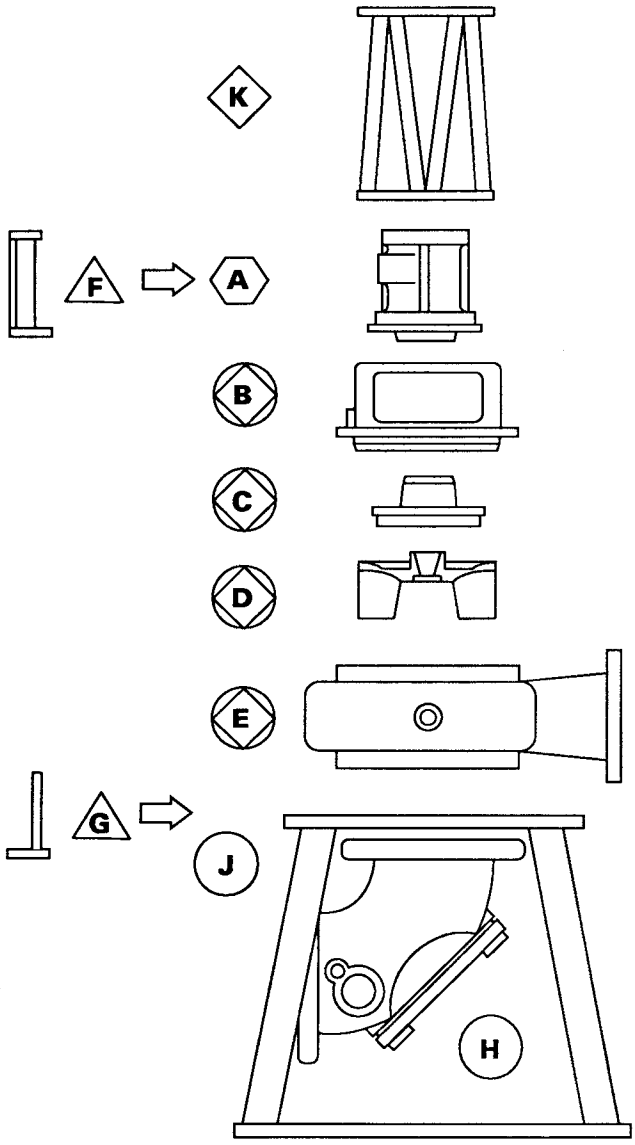
INTERCHANGEABILITY



Non-Clog pumps are designed for maximum interchangeability. All models are available in all 6 sizes, offering a model and size precisely fitted to the installation requirements over a wide range of capacities. The 6 sizes are divided into 3 "Power Frames". Within a given power frame, all parts are interchangeable except for the liquid end and supports. The chart illustrates the degree of interchageability achieved with the standard non-clog vortex pumps.

Model 661A Only ..... △
Model 663A Only ..... ◇
Models 662A, 663A, & 664A ..... ○
Models 661A, 662A, & 663A ..... ⬡
Models 661A, 662A, 663A, & 664A ..... ⊘

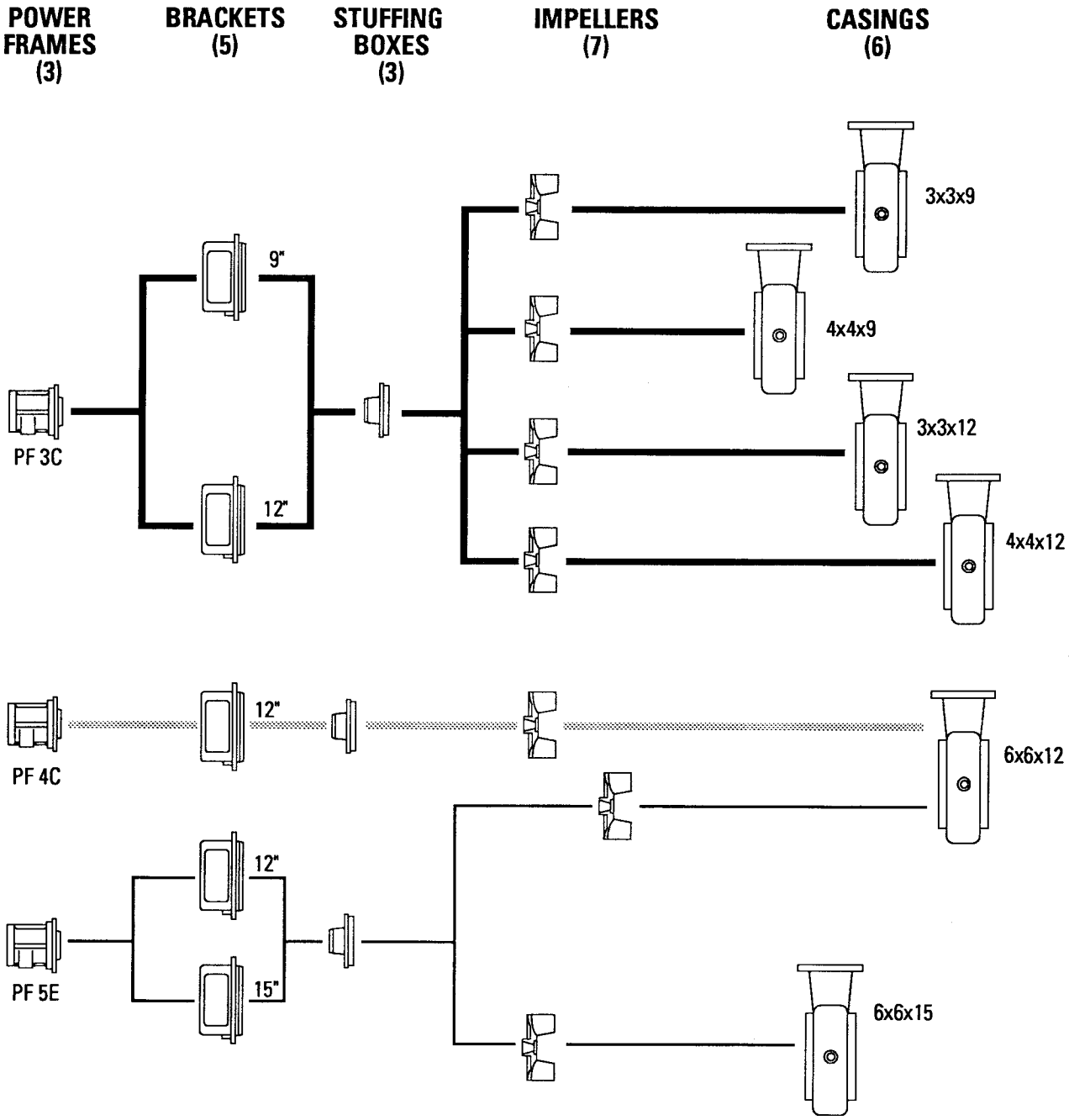
	Qty
A - Power Frames	3
B - Brackets	5
C - Stuffing Boxes	3
D - Impellers	7
E - Casings	6
F - Mounting Feet (Rear)	3
G - Mounting Feet (Front)	3
H - Elbows	3
J - Bases	2
K - Motor Supports	3

POWER FRAME SELECTION

	PUMP SIZE	POWER FRAME	RPM 1750	1150	875	700
⊘	3x3x9		3C	3C	3C	
⊘	4x4x9		3C	3C	3C	
⊘	3x3x12		3C	3C	3C	
⊘	4x4x12		3C	3C	3C	
⊘	6x6x12		5E	4C	4C	
⊘	6x6x15			5E	5E	5E

AURORA 660A SERIES
ENGINEERING DATA

INTERCHANGEABILITY



AURORA MODEL 660 PUMP
SPLIT PACKING BOX OPTION

POWER FRAMES 4 & 5 ONLY

Optional Split Packing Box
With Leakage Accumulator
Gland Illustrated

Split packing boxes separate vertically through the packing insert to simplify packing replacement and shaft sleeve inspection. The insert halves are dowled, register aligned and gasketed to prevent leakage. Only six bolts need be removed to expose all of the packing and lantern ring. Remove two more bolts and the remaining packing box insert half can be removed.

The completely exposed packing and sleeve area coupled with the extra large access openings in the pump adapter provides the ultimate in packing accessibility.

Five (5) die-molded, diagonally split, packing rings complete with lantern ring line the stuffing box. The general service packing consists of graphited fiber.

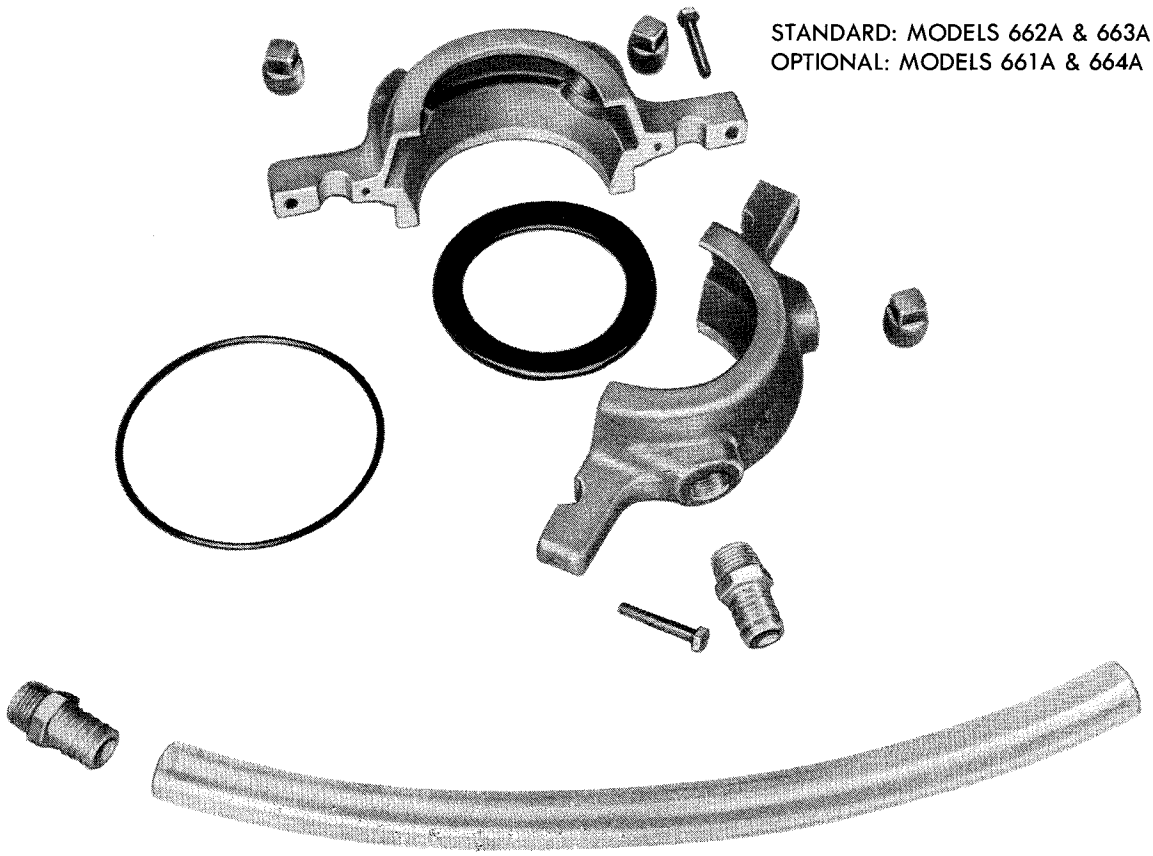
The stuffing box length, bore, sleeve diameters and lantern ring width conform with the recommended standard of the Mechanical Packing Association (MPA).

A tapped opening is provided for lubricating the stuffing box. Lubrication is accomplished by adding grease directly into the lantern ring cavity through a grease fitting or by connecting a by-pass line between the pump discharge and the stuffing box. Automatic grease seals as well as other flushing options are also available.

The standard 450 minimum brinnel hardened stainless steel shaft sleeve extends through the entire length of the box and gland and is provided with a snap ring. This snap ring design allows the sleeve and the completely assembled packing box to be removed intact. Reassembly can be accomplished in the same manner. Assemble the complete stuffing box at the convenience of the work bench, install and adjust the packing for proper lubrication leakage (5-10 drops per minute after run-in).

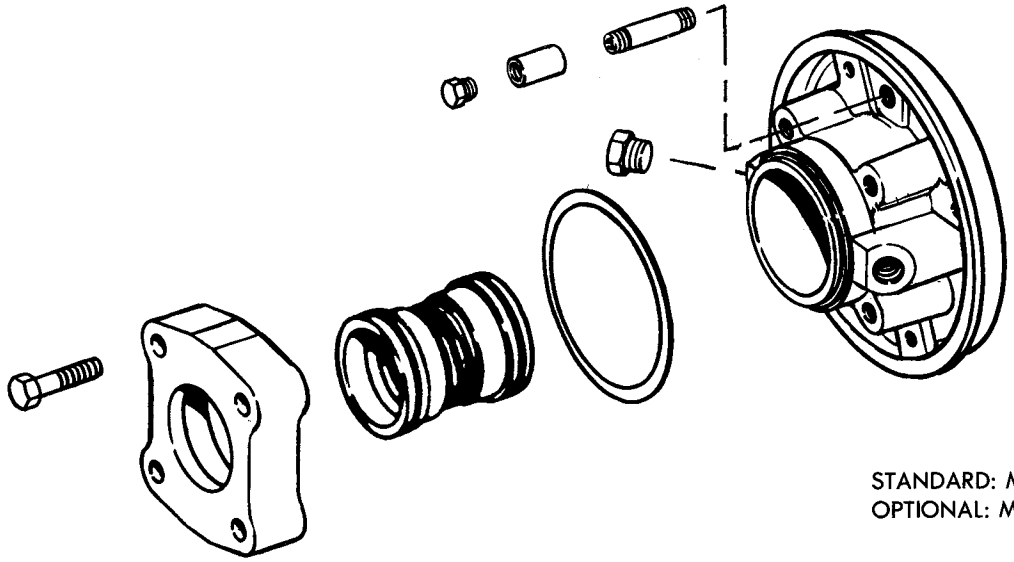
AURORA MODEL 660 PUMP
LEAKAGE ACCUMULATOR
POWER FRAMES 4 & 5 ONLY

STANDARD: MODELS 662A & 663A
OPTIONAL: MODELS 661A & 664A



The leakage accumulator gland (sprayless, dripless packing gland) is designed and constructed to prevent the collection of packing leakage in the pump bracket of a vertical or horizontally mounted pump. The leakage accumulator gland has a volute shape with two symetrical halves. This gland encloses the water slinger preventing any spray from escaping and contaminating the area. The leakage is efficiently directed to a drain connection.

The two gland halves are doweled, bolted together, and sealed at the parting line with a soft liquid sealant. An "O" ring seal between the gland and packing box prevents any leakage in this area. One of the pipe tap ports on the side of the gland is fitted with a hose connector and a clear plastic section of hose, to both drain off and allow visual inspection of the leakage. The remaining ports have pipe plugs, but may be used for maintenance purposes to flush & drain debris from the accumulator.



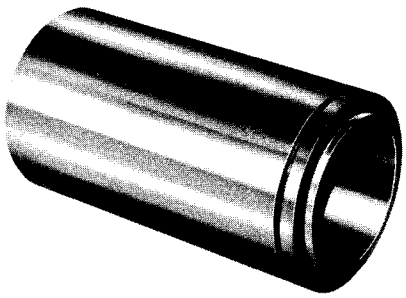
STANDARD: MODEL 664A
OPTIONAL: MODELS 661A, 662A & 663A

Double mechanical seals are recommended for gritty or abrasive applications. Seal faces are protected by clear water under pressure, injected directly into the seal cavity. Pressure in the seal box must be fifteen (15) lbs. higher than the operating pressure at the stuffing box of the pump. This forces the inner sealing faces closed and provides both faces with a film of clear sealant. If this is not done, abrasive particles may be forced under the sealing faces hastening wear. Even when the pump is not running, a pressure differential, or at least equal pressure in the seal box, is desirable. The sealant circulation for most pumping operations may be dead ended in the stuffing box. Pressures over 30 psi or RPM of 1200 max. require constant circulation to prevent overheating.

The seal box is designed for the compressed seal length and does not require any adjustments. The seal housing is extra large to provide excellent circulation of clear sealing liquid. The housing also has two tapped openings 180° apart for the flushing connections.

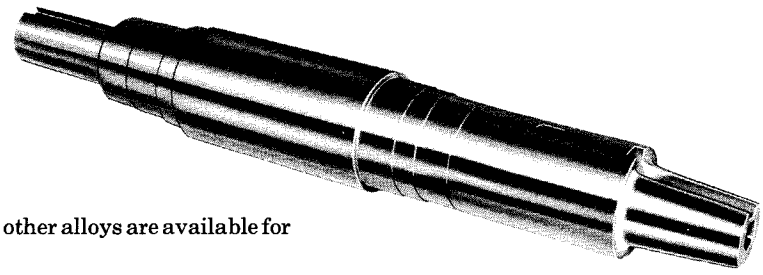
The standard shaft sleeve design is provided with a snap ring which allows the sleeve and the completely assembled seal box to be removed intact. Reassembly can be accomplished in the same manner. Assemble the complete seal box at the convenience of the work bench and install.

SLEEVES

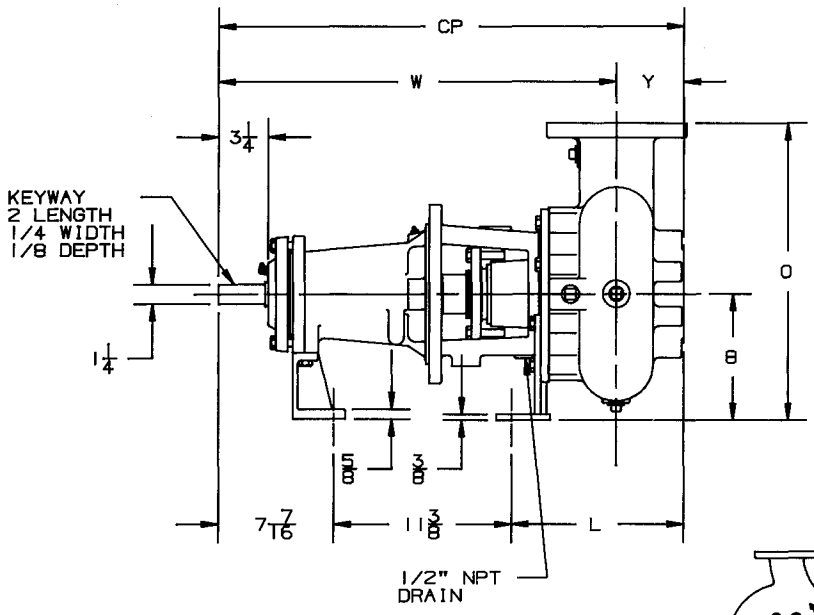


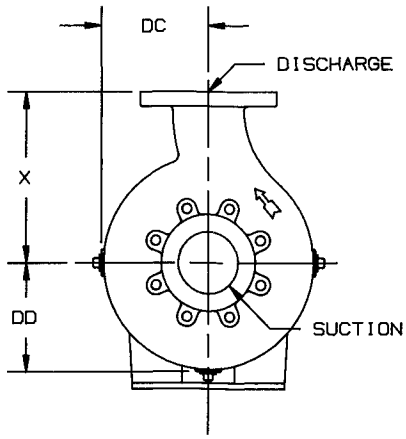
Shaft sleeves, machined to close tolerances are optionally available in either bronze, 316 stainless steel, or monel.

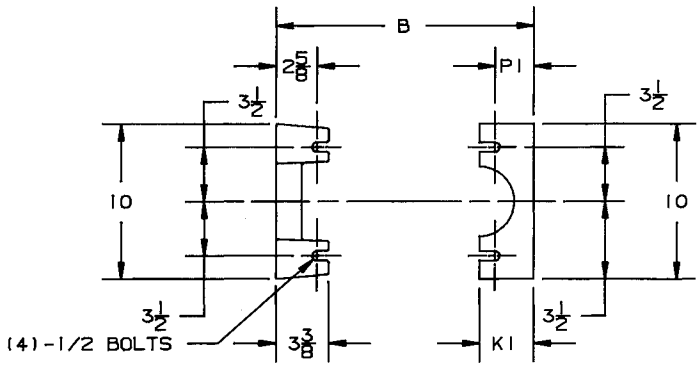
SHAFTS

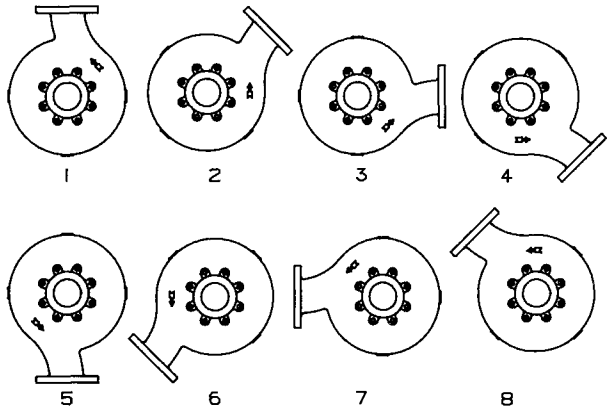


Precision machined shafts of stainless steel, monel and other alloys are available for difficult application.







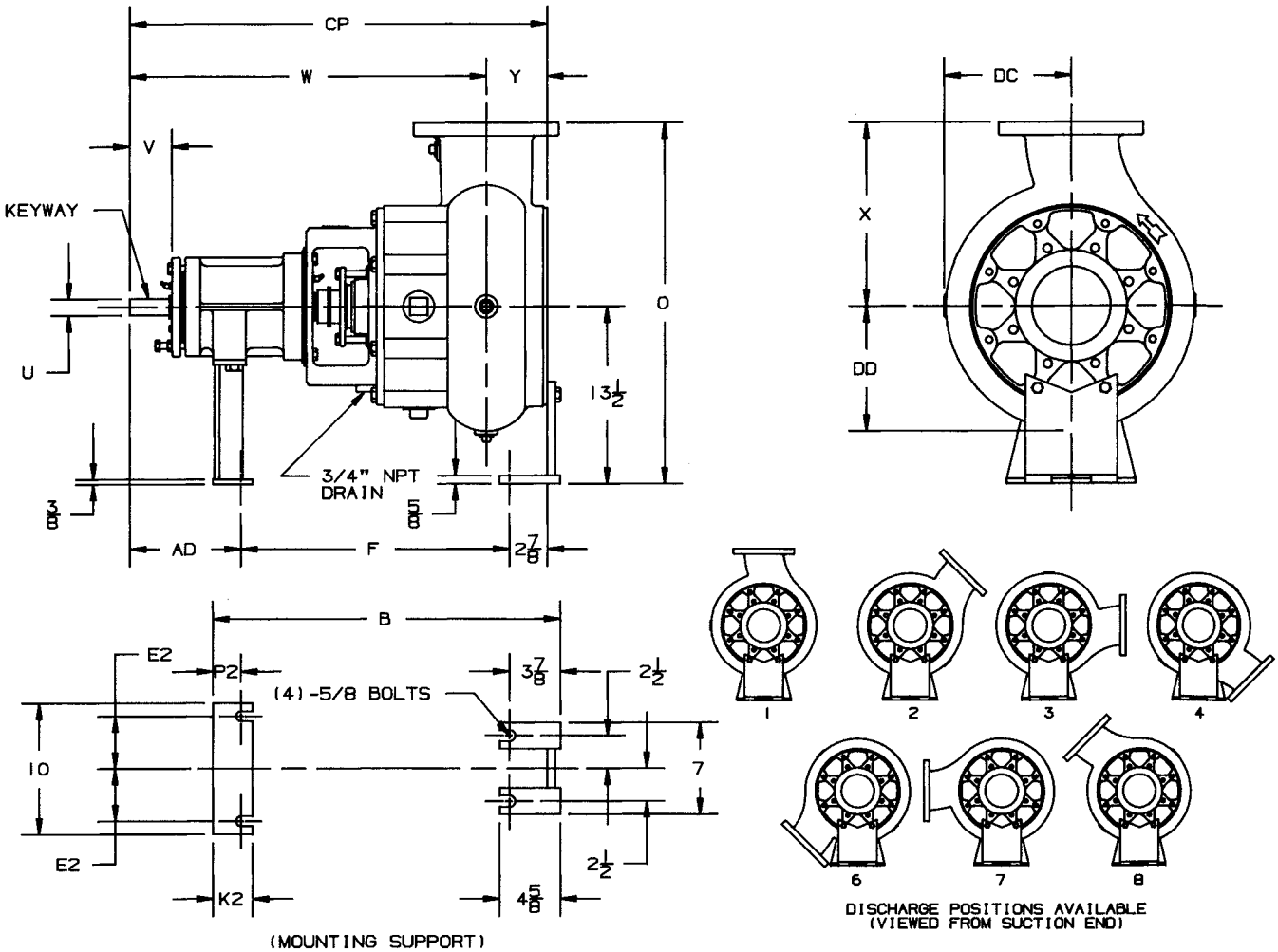


DISCHARGE POSITIONS AVAILABLE
(VIEWED FROM SUCTION END)

NOTES:
1. ALL DIMENSIONS IN INCHES.
2. DIMENSIONS MAY VARY ± 1/4".
3. NOT FOR CONSTRUCTION PURPOSES UNLESS CERTIFIED.
4. TWO (2) 1/2" NPT CONNECTIONS 180° APART, ON THE STUFFING BOX FOR LUBRICATION PURPOSES ARE FURNISHED AS STANDARD. ON PACKED PUMPS AN ALEMITE FITTING IS PROVIDED IN ONE TAP AND THE REMAINING TAP IS PLUGGED.
5. DISCHARGE POSITION 1 IS FURNISHED AS STANDARD UNLESS SPECIFIED.
6. SUCTION AND DISCHARGE FLANGES ARE AMERICAN STANDARD 125 LBS.
7. CHECK DISCHARGE POSITION, CASING DIMENSIONS WHICH EXCEED 8" MAY REQUIRE PADS FOR THE PUMP AND/OR MOTOR.

DISCH SUCT CASE BORE	POWER FRAME	B	L	O	P1	W	X	Y	CP	DC	DD
3x3x9	3C	16 1/2	9 13/16	18	2 1/2	25 1/2	10	3 1/8	28 5/8	6 3/4	6 3/4
3x3x12	3C	16 3/8	9 15/16	21	2 3/8	25 5/8	13	3 1/8	28 3/4	8 3/8	8 3/8
4x4x9	3C	16 1/2	11 1/16	19	2 1/2	26 1/2	11	3 3/8	29 7/8	7 1/4	7 1/4
4x4x12	3C	16 3/8	11 3/16	21	2 3/8	26 5/8	13	3 3/8	30	8 7/8	8 7/8

AURORA MODEL 661A PUMP
6" PUMPS



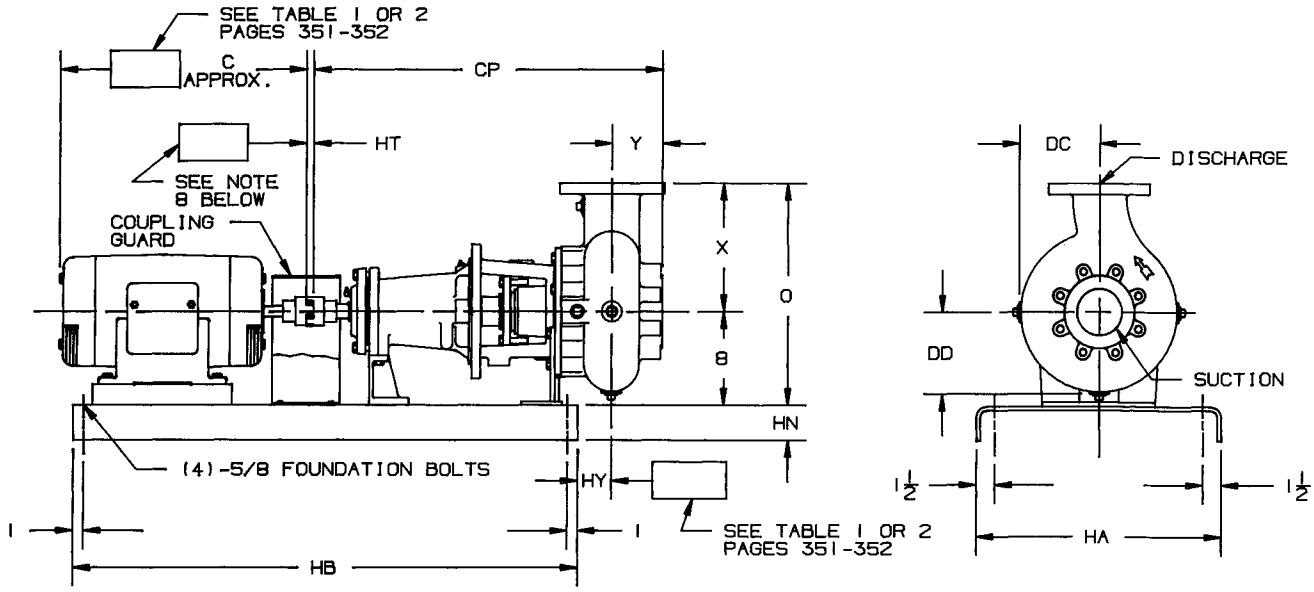
NOTES:
1. ALL DIMENSIONS IN INCHES.
2. DIMENSIONS MAY VARY ± 1/4".
3. NOT FOR CONSTRUCTION PURPOSES UNLESS CERTIFIED.
4. TWO (2) 1/2" NPT CONNECTIONS 180° APART, ON THE STUFFING BOX FOR LUBRICATION PURPOSES ARE FURNISHED AS STANDARD. ON PACKED PUMPS AN ALEMITE FITTING IS PROVIDED IN ONE TAP AND THE REMAINING TAP IS PLUGGED.
5. DISCHARGE POSITION 1 IS FURNISHED AS STANDARD UNLESS SPECIFIED.
6. SUCTION AND DISCHARGE FLANGES ARE AMERICAN STANDARD 125 LBS.

POWER FRAME	U	V	KEYWAY		
			LENGTH	WIDTH	DEPTH
4C	1 1/4	3 3/16	2	1/4	1/8
5E	2 3/8	6 3/8	4	5/8	5/16

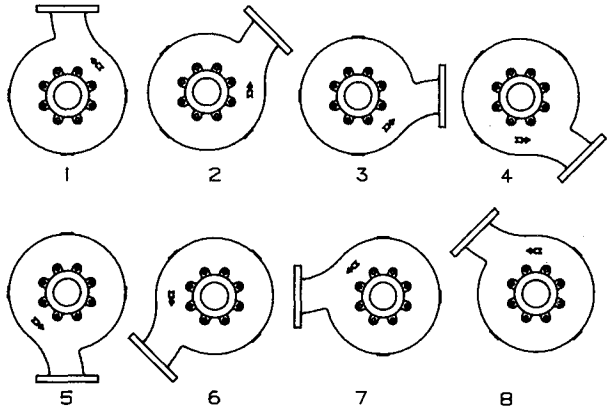
DISCH SUCT CASE BORE	POWER FRAME	B	E2	F	K2	O	P2	W	X	Y	AD	CP	DC	DD
6x6x12	4C	26 1/2	4	20 1/2	3	27 1/2	2 1/8	27 1/8	14	4 5/8	8 3/8	31 3/4	9 7/8	9 7/8
6x6x12	5E	32 3/4	3 3/4	26 1/8	4	27 1/2	2 3/4	38 1/8	14	4 5/8	13 3/4	42 3/4	9 7/8	9 7/8
6x6x15	5E	32 3/4	3 3/4	26 1/8	4	29 1/2	2 3/4	38 1/8	16	4 5/8	13 3/4	42 3/4	11 1/16	11 1/16

AURORA MODEL 661A PUMP

3" & 4" PUMPS
FORMED STEEL BASE



NOTES:
1. ALL DIMENSIONS IN INCHES.
2. DIMENSIONS MAY VARY ± 1/4".
3. NOT FOR CONSTRUCTION PURPOSES UNLESS CERTIFIED.
4. TWO (2) 1/2" NPT CONNECTIONS 180° APART, ON THE STUFFING BOX FOR LUBRICATION PURPOSES ARE FURNISHED AS STANDARD. ON PACKED PUMPS AN ALEMITE FITTING IS PROVIDED IN ONE TAP AND THE REMAINING TAP IS PLUGGED.
5. DISCHARGE POSITION 1 IS FURNISHED AS STANDARD UNLESS SPECIFIED.
6. SUCTION AND DISCHARGE FLANGES ARE AMERICAN STANDARD 125 LBS.
7. CONDUIT BOX IS SHOWN IS APPROXIMATE LOCATION. DIMENSIONS ARE NOT SPECIFIED AS THEY MAY VARY WITH EACH MOTOR MANUFACTURER.
8. STANDARD COUPLING ILLUSTRATED. "HT" DIMENSION MAY VARY 1/8" TO 1". FOR SPACER COUPLING SIZE AND "HT" DIMENSION REFER TO PAGE 353 (TABLE 3).

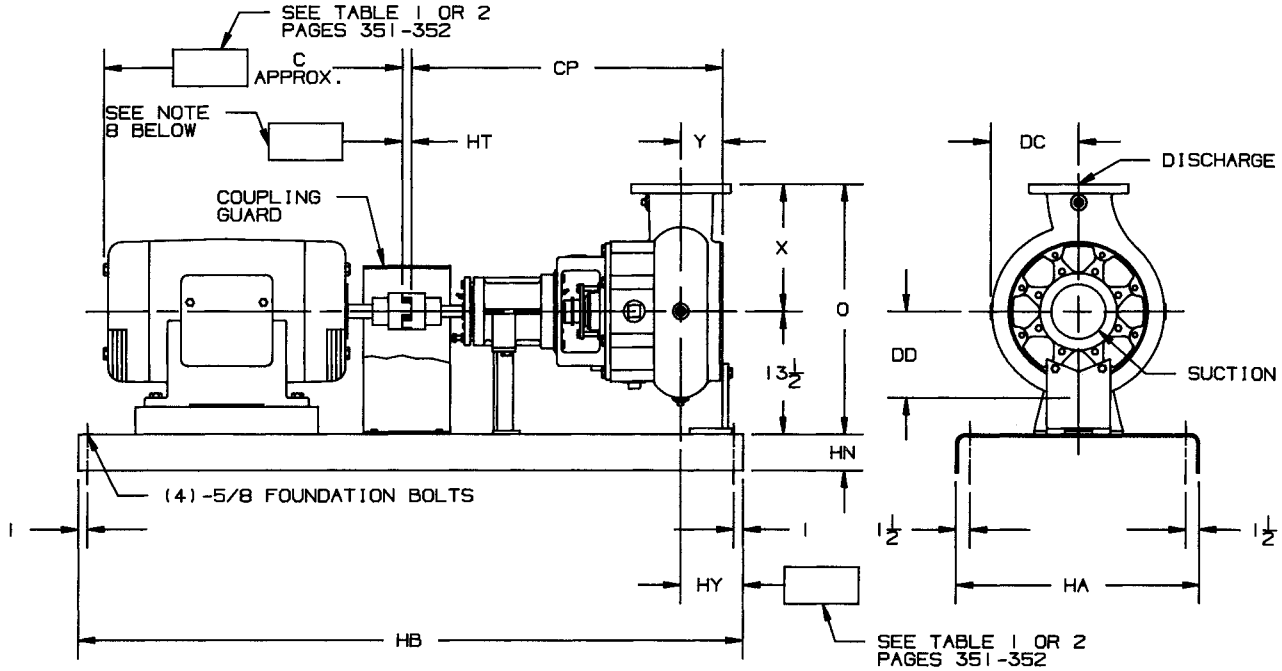


DISCHARGE POSITIONS AVAILABLE
(VIEWED FROM SUCTION END)

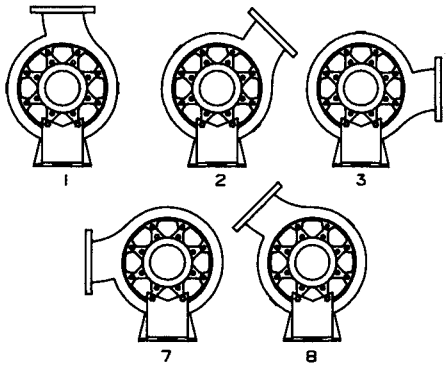
DISCH SUCT CASE BORE	POWER FRAME	O	X	Y	CP	DC	DD
3x3x9	3C	18	10	3 1/8	28 5/8	6 3/4	6 3/4
3x3x12	3C	21	13	3 1/8	28 3/4	8 3/8	8 3/8
4x4x9	3C	19	11	3 3/8	29 7/8	7 1/4	7 1/4
4x4x12	3C	21	13	3 3/8	30	8 7/8	8 7/8

BASE	HA	HB	HN
1	15	38	3 3/8
2	15	44	3 3/8
3	18	44	4
4	18	48	4
5	18	54	4
6	18	60	4

AURORA MODEL 661A PUMP
6" PUMPS
FORMED STEEL BASE



NOTES:
1. ALL DIMENSIONS IN INCHES.
2. DIMENSIONS MAY VARY ± 1/4".
3. NOT FOR CONSTRUCTION PURPOSES UNLESS CERTIFIED.
4. TWO (2) 1/2" NPT CONNECTIONS 180° APART, ON THE STUFFING BOX FOR LUBRICATION PURPOSES ARE FURNISHED AS STANDARD. ON PACKED PUMPS AN ALEMITE FITTING IS PROVIDED IN ONE TAP AND THE REMAINING TAP IS PLUGGED.
5. DISCHARGE POSITION 1 IS FURNISHED AS STANDARD UNLESS SPECIFIED.
6. SUCTION AND DISCHARGE FLANGES ARE AMERICAN STANDARD 125 LBS.
7. CONDUIT BOX IS SHOWN IS APPROXIMATE LOCATION. DIMENSIONS ARE NOT SPECIFIED AS THEY MAY VARY WITH EACH MOTOR MANUFACTURER.
8. STANDARD COUPLING ILLUSTRATED."HT" DIMENSION MAY VARY 1/8" TO 1". FOR SPACER COUPLING SIZE AND "HT" DIMENSION REFER TO PAGE 353 (TABLE 3).



DISCHARGE POSITIONS AVAILABLE
(VIEWED FROM SUCTION END)

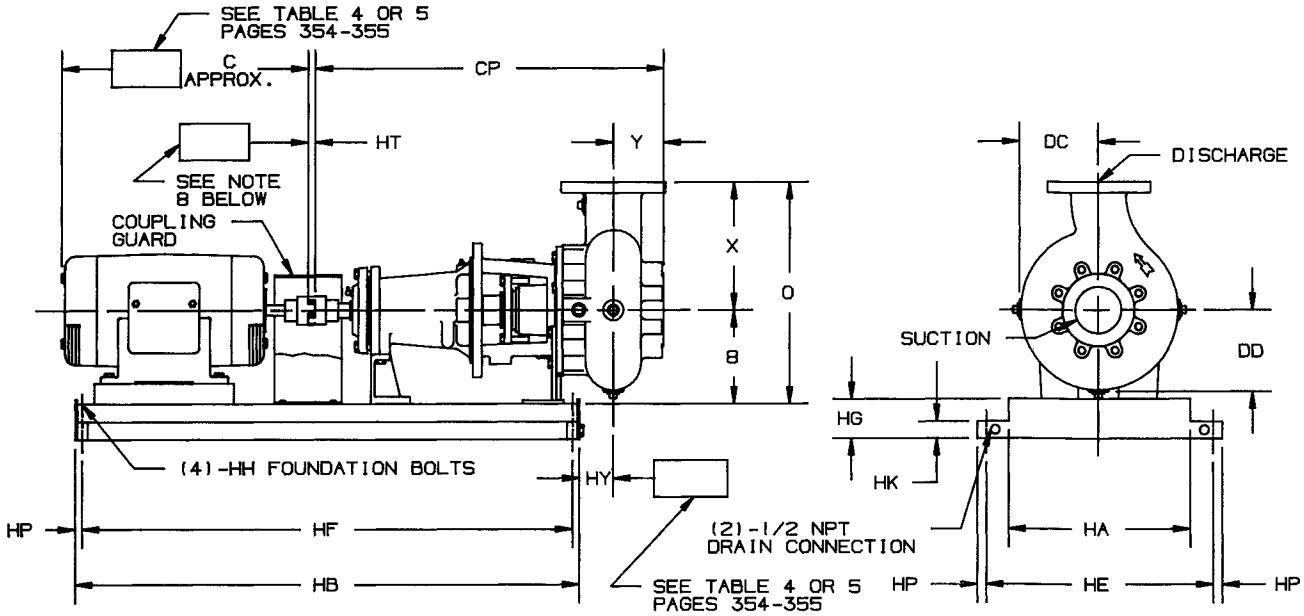
DISCH SUCT CASE BORE	POWER FRAME	O	X	Y	CP	DC	DD
6x6x12	4C	27 1/2	14	4 5/8	31 3/4	9 7/8	9 7/8
6x6x12	5E	27 1/2	14	4 5/8	42 3/4	9 7/8	9 7/8
6x6x15	5E	29 1/2	16	4 5/8	42 3/4	11 1/16	11 1/16

BASE	HA	HB	HN
5	18	54	4
6	18	60	4
7	18	68	4
8	18	72	4
9	18	80	4

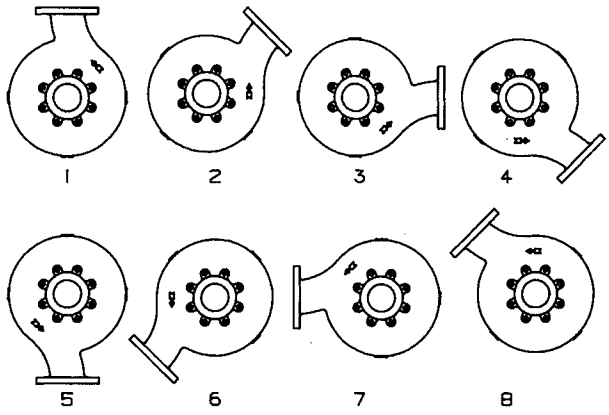
AURORA MODEL 661A PUMP

3" & 4" PUMPS

DRIP RIM STEEL BASE



NOTES:
1. ALL DIMENSIONS IN INCHES.
2. DIMENSIONS MAY VARY ± 1/4".
3. NOT FOR CONSTRUCTION PURPOSES UNLESS CERTIFIED.
4. TWO (2) 1/2" NPT CONNECTIONS 180° APART, ON THE STUFFING BOX FOR LUBRICATION PURPOSES ARE FURNISHED AS STANDARD. ON PACKED PUMPS AN ALEMITE FITTING IS PROVIDED IN ONE TAP AND THE REMAINING TAP IS PLUGGED.
5. DISCHARGE POSITION 1 IS FURNISHED AS STANDARD UNLESS SPECIFIED.
6. SUCTION AND DISCHARGE FLANGES ARE AMERICAN STANDARD 125 LBS.
7. CONDUIT BOX IS SHOWN IS APPROXIMATE LOCATION. DIMENSIONS ARE NOT SPECIFIED AS THEY MAY VARY WITH EACH MOTOR MANUFACTURER.
8. STANDARD COUPLING ILLUSTRATED."HT" DIMENSION MAY VARY 1/8" TO 1". FOR SPACER COUPLING SIZE AND "HT" DIMENSION REFER TO PAGE 353 (TABLE 3).
9. 3 GROUT HOLES ARE PROVIDED IN TOP OF BASE.

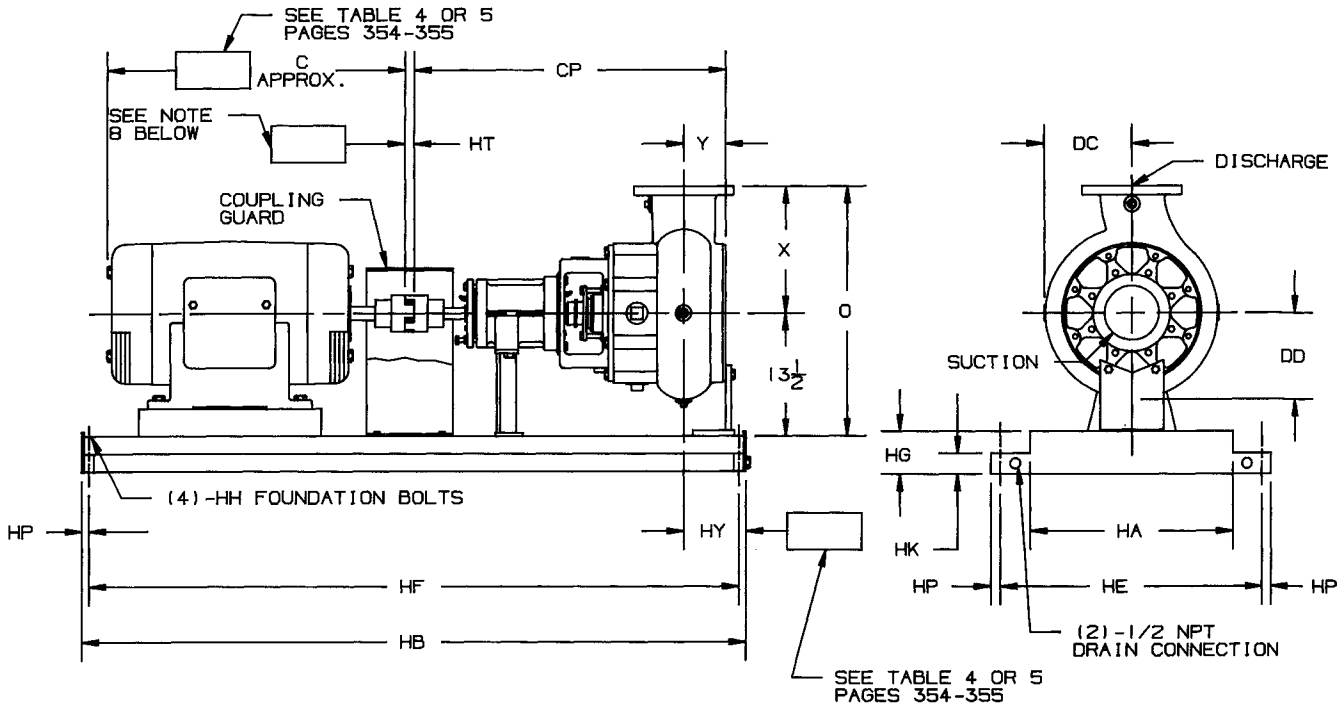


DISCHARGE POSITIONS AVAILABLE
(VIEWED FROM SUCTION END)

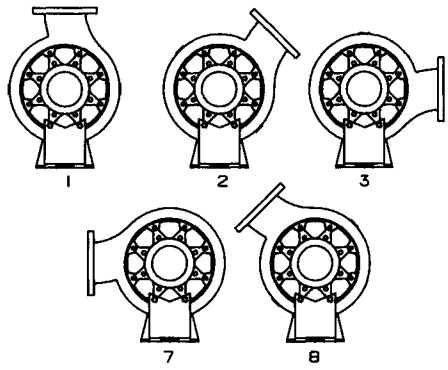
DISCH SUCT CASE BORE	POWER FRAME	O	X	Y	CP	DC	DD
3x3x9	3C	18	10	3 1/8	28 5/8	6 3/4	6 3/4
3x3x12	3C	21	13	3 1/8	28 3/4	8 3/8	8 3/8
4x4x9	3C	19	11	3 3/8	29 7/8	7 1/4	7 1/4
4x4x12	3C	21	13	3 3/8	30	8 7/8	8 7/8

BASE	SIZE	HA	HB	HE	HF	HG	HH	HK	HP
5	11x36	11	36 1/2	15 7/8	35 1/8	3	1/2	1 1/2	11/16
6	11x42	11	42 1/2	15 7/8	41 1/8	3	1/2	1 1/2	11/16
8	14x42	14	42 1/2	19	41	3	5/8	1 1/2	3/4
9	14x48	14	48 1/2	19	47	3	5/8	1 1/2	3/4
10	14x56	14	56 1/2	19	55	3	5/8	1 1/2	3/4
11	18x46	18	46 1/2	25 1/8	44 7/8	4	3/4	2	13/16
12	18x54	18	54 1/2	25 1/8	52 7/8	4	3/4	2	13/16
13	18x64	18	64 1/2	25 1/8	62 7/8	4	3/4	2	13/16
14	18x72	18	72 1/2	25 1/8	70 7/8	4	3/4	2	13/16
15	22x54	22	54 1/2	29 1/8	52 7/8	4 1/2	3/4	2	13/16

AURORA MODEL 661A PUMP
6" PUMPS
DRIP RIM STEEL BASE



NOTES:
1. ALL DIMENSIONS IN INCHES.
2. DIMENSIONS MAY VARY ± 1/4".
3. NOT FOR CONSTRUCTION PURPOSES UNLESS CERTIFIED.
4. TWO (2) 1/2" NPT CONNECTIONS 180° APART, ON THE STUFFING BOX FOR LUBRICATION PURPOSES ARE FURNISHED AS STANDARD. ON PACKED PUMPS AN ALEMITE FITTING IS PROVIDED IN ONE TAP AND THE REMAINING TAP IS PLUGGED.
5. DISCHARGE POSITION 1 IS FURNISHED AS STANDARD UNLESS SPECIFIED.
6. SUCTION AND DISCHARGE FLANGES ARE AMERICAN STANDARD 125 LBS.
7. CONDUIT BOX IS SHOWN IS APPROXIMATE LOCATION. DIMENSIONS ARE NOT SPECIFIED AS THEY MAY VARY WITH EACH MOTOR MANUFACTURER.
8. STANDARD COUPLING ILLUSTRATED."HT" DIMENSION MAY VARY 1/8" TO 1". FOR SPACER COUPLING SIZE AND "HT" DIMENSION REFER TO PAGE 353 (TABLE 3).
9. 3 GROUT HOLES ARE PROVIDED IN TOP OF BASE.



DISCHARGE POSITIONS AVAILABLE
(VIEWED FROM SUCTION END)

DISCH SUCT CASE BORE	POWER FRAME	O	X	Y	CP	DC	DD
6x6x12	4C	27 1/2	14	4 5/8	31 3/4	9 7/8	9 7/8
6x6x12	5E	27 1/2	14	4 5/8	42 3/4	9 7/8	9 7/8
6x6x15	5E	29 1/2	16	4 5/8	42 3/4	11 1/16	11 1/16

BASE	SIZE	HA	HB	HE	HF	HG	HH	HK	HP
10	14x56	14	56 1/2	19	55	3	5/8	1 1/2	3/4
11	18x46	18	46 1/2	25 1/8	44 7/8	4	3/4	2	13/16
12	18x54	18	54 1/2	25 1/8	52 7/8	4	3/4	2	13/16
13	18x64	18	64 1/2	25 1/8	62 7/8	4	3/4	2	13/16
14	18x72	18	72 1/2	25 1/8	70 7/8	4	3/4	2	13/16
15	22x54	22	54 1/2	29 1/8	52 7/8	4 1/2	3/4	2	13/16
18	22x85	22	82 1/2	29 1/8	80 7/8	4 1/2	3/4	2	13/16

TABLE I

DISCH SUCT CASE BORE	POWER SERIES	MOTOR FRAME	143T	145T	182T	184T	213T	215T	254T	256T	284TS	284T	286TS	286T	324TS	324T
		C	11	12	13	14	16	18	21	23	22	24	24	25	25	26
3x3x9	3	BASE	1	1	1	1	1	1	3	3	4	4				
		HY	4 7/8	4 7/8	4 7/8	4 7/8	4 7/8	4 7/8	4 7/8	4 7/8	4 7/8	4 7/8				
4x4x9	3	BASE			1	1	1	1	3	3	4	4	4	4	4	4
		HY			5 7/8	5 7/8	5 7/8	5 7/8	5 7/8	5 7/8	5 7/8	5 7/8	5 7/8	5 7/8	5 7/8	5 7/8
3x3x12	3	BASE					1	1	3	3	4	4	4	4	4	4
		HY					5	5	5	5	5	5	5	5	5	5
4x4x12	3	BASE						1	3	3	4	4	4	4	4	4
		HY						6	6	6	6	6	6	6	6	6
6x6x12	4	BASE							5	5	5	5	6	6	6	6
		HY							5 1/4	5 1/4	5 1/4	5 1/4	5 1/4	5 1/4	5 1/4	5 1/4
6x6x12	5	BASE							7	7	7	7	7	7	8	8
		HY							5 1/4	5 1/4	5 1/4	5 1/4	5 1/4	5 1/4	5 1/4	5 1/4
6x6x15	5	BASE							7	7	7	7	7	7	8	8
		HY							5 1/4	5 1/4	5 1/4	5 1/4	5 1/4	5 1/4	5 1/4	5 1/4

TABLE I (CONTINUED)

DISCH SUCT CASE BORE	POWER SERIES	MOTOR FRAME	326TS	326T	364TS	364T	365TS	365T	404TS	404T	405TS	405T	444TS	444T	445TS	445T
		C	26	28	27	29	28	30	30	33	32	35	34	38	36	40
3x3x12	3	BASE	5	5	4	5	4	5								
		HY	5	5	5	5	5	5								
4x4x12	3	BASE	5	5	4	5	4	5								
		HY	6	6	6	6	6	6								
6x6x12	4	BASE	6	6	6	6	6	7								
		HY	5 1/4	5 1/4	5 1/4	5 1/4	5 1/4	5 1/4								
6x6x12	5	BASE	8	8	8	8	8	8								
		HY	5 1/4	5 1/4	5 1/4	5 1/4	5 1/4	5 1/4								
6x6x15	5	BASE	8	8	8	8	8	8								
		HY	5 1/4	5 1/4	5 1/4	5 1/4	5 1/4	5 1/4								

NOTES:
1. ALL DIMENSIONS IN INCHES.
2. NOT FOR CONSTRUCTION PURPOSES UNLESS CERTIFIED.

AURORA MODEL 661A PUMP
FORMED STEEL BASE
SPACER COUPLING

TABLE 2

DISCH SUCT CASE BORE	POWER SERIES	MOTOR FRAME	143T	145T	182T	184T	213T	215T	254T	256T	284TS	284T	286TS	286T	324TS	324T
		C	11	12	13	14	16	18	21	23	22	24	24	25	25	26
3x3x9	3	BASE	2	2	2	2	2	2	4	4	5	5				
		HY	4 7/8	4 7/8	4 7/8	4 7/8	4 7/8	4 7/8	4 7/8	4 7/8	4 7/8	4 7/8				
4x4x9	3	BASE			2	2	2	2	4	4	5	5	5	5	5	5
		HY			5 7/8	5 7/8	5 7/8	5 7/8	5 7/8	5 7/8	5 7/8	5 7/8	5 7/8	5 7/8	5 7/8	5 7/8
3x3x12	3	BASE					2	2	4	4	5	5	5	5	5	5
		HY					5	5	5	5	5	5	5	5	5	5
4x4x12	3	BASE						2	4	4	5	5	5	5	5	5
		HY						6	6	6	6	6	6	6	6	6
6x6x12	4	BASE							6	6	6	6	7	7	7	7
		HY							5 1/4	5 1/4	5 1/4	5 1/4	5 1/4	5 1/4	5 1/4	5 1/4
6x6x12	5	BASE							8	8	9	9	9	9	9	9
		HY							5 1/4	5 1/4	5 1/4	5 1/4	5 1/4	5 1/4	5 1/4	5 1/4
6x6x15	5	BASE							8	8	9	9	9	9	9	9
		HY							5 1/4	5 1/4	5 1/4	5 1/4	5 1/4	5 1/4	5 1/4	5 1/4

TABLE 2 (CONTINUED)

DISCH SUCT CASE BORE	POWER SERIES	MOTOR FRAME	326TS	326T	364TS	364T	365TS	365T	404TS	404T	405TS	405T	444TS	444T	445TS	445T
		C	26	28	27	29	28	30	30	33	32	35	34	38	36	40
3x3x12	3	BASE	6	6	5	6	5	6								
		HY	5	5	5	5	5	5								
4x4x12	3	BASE	6	6	5	6	5	6								
		HY	6	6	6	6	6	6								
6x6x12	4	BASE	7	7	7	7	7	7								
		HY	5 1/4	5 1/4	5 1/4	5 1/4	5 1/4	5 1/4								
6x6x12	5	BASE	9	9	9	9	9	9								
		HY	5 1/4	5 1/4	5 1/4	5 1/4	5 1/4	5 1/4								
6x6x15	5	BASE	9	9	9	9	9	9								
		HY	5 1/4	5 1/4	5 1/4	5 1/4	5 1/4	5 1/4								

NOTES:
1. ALL DIMENSIONS IN INCHES.
2. NOT FOR CONSTRUCTION PURPOSES UNLESS CERTIFIED.

TABLE 3

DISCH SUCT CASE BORE	POWER SERIES	MOTOR FRAME	143T	145T	182T	184T	213T	215T	254T	256T	284TS	284T	286TS	286T	324TS	324T
3x3x9	3	SIZE	6	6	6	6	6	6	7	8	8	8				
		HT	5	5	5	5	5	5	5	5	5	5				
4x4x9	3	SIZE			6	6	6	6	7	8	8	8	9	9	9	9
		HT			5	5	5	5	5	5	5	5	5	5	5	5
3x3x12	3	SIZE					6	6	7	8	8	8	9	9	9	9
		HT					5	5	5	5	5	5	5	5	5	5
4x4x12	3	SIZE						6	7	8	8	8	9	9	9	9
		HT						5	5	5	5	5	5	5	5	5
6x6x12	4	SIZE							7	8	8	8	9	9	9	9
		HT							5	5	5	5	5	5	5	5
6x6x12	5	SIZE							8	8	9	9	9	9	9	9
		HT							7 3/4	7 3/4	7 3/4	7 3/4	7 3/4	7 3/4	7 3/4	7 3/4
6x6x15	5	SIZE							8	8	9	9	9	9	9	9
		HT							7 3/4	7 3/4	7 3/4	7 3/4	7 3/4	7 3/4	7 3/4	7 3/4

TABLE 3 (CONTINUED)

DISCH SUCT CASE BORE	POWER SERIES	MOTOR FRAME	326TS	326T	364TS	364T	365TS	365T	404TS	404T	405TS	405T	444TS	444T	445TS	445T
3x3x12	3	SIZE	10	10	11	10	11	11								
		HT	5	5	5	5	5	5								
4x4x12	3	SIZE	10	10	11	10	11	11								
		HT	5	5	5	5	5	5								
6x6x12	4	SIZE	10	10	11	10	11	11								
		HT	5	5	5	5	5	5								
6x6x12	5	SIZE	10	10	12	10	12	12								
		HT	7 3/4	7 3/4	7 3/4	7 3/4	7 3/4	7 3/4								
6x6x15	5	SIZE	10	10	12	10	12	12								
		HT	7 3/4	7 3/4	7 3/4	7 3/4	7 3/4	7 3/4								

NOTES:
1. ALL DIMENSIONS IN INCHES.
2. NOT FOR CONSTRUCTION PURPOSES UNLESS CERTIFIED.
3. SIZE: COUPLING SIZE FOR TYPE SC WOODS SURE-FLEX SPACER COUPLINGS.
4. HT: COUPLING GAP (DISTANCE BETWEEN SHAFTS)

AURORA MODEL 661A PUMP
DRIP RIM STEEL BASE
STANDARD COUPLING

TABLE 4

DISCH SUCT CASE BORE	POWER SERIES	MOTOR FRAME	143T	145T	182T	184T	213T	215T	254T	256T	284TS	284T	286TS	286T	324TS	324T
		C	11	12	13	14	16	18	21	23	22	24	24	25	25	26
3x3x9	3	BASE	5	5	5	5	6	6	8	9	9	9				
		HY	4 3/8	4 3/8	4 3/8	4 3/8	4 3/8	4 3/8	4 3/8	4 3/8	4 3/8	4 3/8				
4x4x9	3	BASE			5	5	6	6	8	9	9	9	9	9	11	11
		HY			5 3/8	5 3/8	5 3/8	5 3/8	5 3/8	5 3/8	5 3/8	5 3/8	5 3/8	5 3/8	5 3/8	5 3/8
3x3x12	3	BASE					6	6	8	9	9	9	9	9	11	11
		HY					4 1/2	4 1/2	4 1/2	4 1/2	4 1/2	4 1/2	4 1/2	4 1/2	4 1/2	4 1/2
4x4x12	3	BASE						6	8	9	9	9	9	9	11	11
		HY						5 1/2	5 1/2	5 1/2	5 1/2	5 1/2	5 1/2	5 1/2	5 1/2	5 1/2
6x6x12	4	BASE							10	10	10	10	13	13	13	13
		HY							5 1/4	5 1/4	5 1/4	5 1/4	5 1/4	5 1/4	5 1/4	5 1/4
6x6x12	5	BASE							14	14	14	14	14	14	14	14
		HY							5 1/4	5 1/4	5 1/4	5 1/4	5 1/4	5 1/4	5 1/4	5 1/4
6x6x15	5	BASE							14	14	14	14	14	14	14	14
		HY							5 1/4	5 1/4	5 1/4	5 1/4	5 1/4	5 1/4	5 1/4	5 1/4

TABLE 4 (CONTINUED)

DISCH SUCT CASE BORE	POWER SERIES	MOTOR FRAME	326TS	326T	364TS	364T	365TS	365T	404TS	404T	405TS	405T	444TS	444T	445TS	445T
		C	26	28	27	29	28	30	30	33	32	35	34	38	36	40
3x3x12	3	BASE	12	12	12	12	12	12								
		HY	4 1/2	4 1/2	4 1/2	4 1/2	4 1/2	4 1/2								
4x4x12	3	BASE	12	12	12	12	12	12	15	15						
		HY	5 1/2	5 1/2	5 1/2	5 1/2	5 1/2	5 1/2	5 1/2	5 1/2						
6x6x12	4	BASE	13	13	13	13	13	13								
		HY	5 1/4	5 1/4	5 1/4	5 1/4	5 1/4	5 1/4								
6x6x12	5	BASE	18	18	18	18	18	18	18	18	18	18	18	18	18	18
		HY	5 1/4	5 1/4	5 1/4	5 1/4	5 1/4	5 1/4	5 1/4	5 1/4	5 1/4	5 1/4	5 1/4	5 1/4	5 1/4	5 1/4
6x6x15	5	BASE	18	18	18	18	18	18	18	18	18	18	18	18	18	18
		HY	5 1/4	5 1/4	5 1/4	5 1/4	5 1/4	5 1/4	5 1/4	5 1/4	5 1/4	5 1/4	5 1/4	5 1/4	5 1/4	5 1/4

NOTES:
1. ALL DIMENSIONS IN INCHES.
2. NOT FOR CONSTRUCTION PURPOSES UNLESS CERTIFIED.

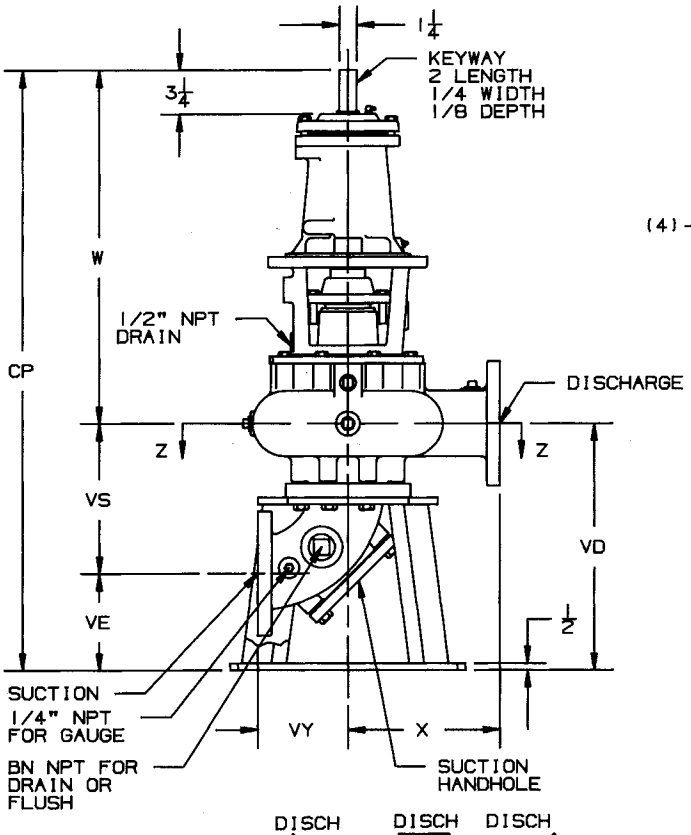
TABLE 5

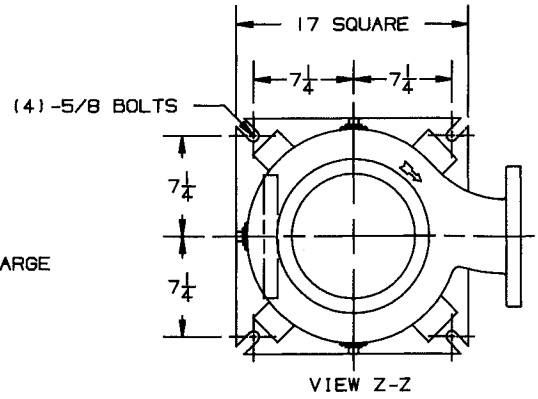
DISCH SUCT CASE BORE	POWER SERIES	MOTOR FRAME	143T	145T	182T	184T	213T	215T	254T	256T	284TS	284T	286TS	286T	324TS	324T
		C	11	12	13	14	16	18	21	23	22	24	24	25	25	26
3x3x9	3	BASE	6	6	6	6	6	6	9	9	9	9				
		HY	4 3/8	4 3/8	4 3/8	4 3/8	4 3/8	4 3/8	4 3/8	4 3/8	4 3/8	4 3/8				
4x4x9	3	BASE			6	6	6	6	9	9	9	9	12	12	12	12
		HY			5 3/8	5 3/8	5 3/8	5 3/8	5 3/8	5 3/8	5 3/8	5 3/8	5 3/8	5 3/8	5 3/8	5 3/8
3x3x12	3	BASE					6	6	9	9	9	9	12	12	12	12
		HY					4 1/2	4 1/2	4 1/2	4 1/2	4 1/2	4 1/2	4 1/2	4 1/2	4 1/2	4 1/2
4x4x12	3	BASE						6	9	9	9	9	12	12	12	12
		HY						5 1/2	5 1/2	5 1/2	5 1/2	5 1/2	5 1/2	5 1/2	5 1/2	5 1/2
6x6x12	4	BASE							13	13	13	13	13	13	13	13
		HY							5 1/4	5 1/4	5 1/4	5 1/4	5 1/4	5 1/4	5 1/4	5 1/4
6x6x12	5	BASE							14	14	18	18	18	18	18	18
		HY							5 1/4	5 1/4	5 1/4	5 1/4	5 1/4	5 1/4	5 1/4	5 1/4
6x6x15	5	BASE							14	14	18	18	18	18	18	18
		HY							5 1/4	5 1/4	5 1/4	5 1/4	5 1/4	5 1/4	5 1/4	5 1/4

TABLE 5 (CONTINUED)

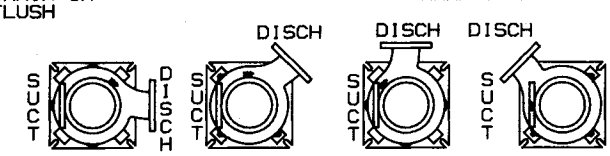
DISCH SUCT CASE BORE	POWER SERIES	MOTOR FRAME	326TS	326T	364TS	364T	365TS	365T	404TS	404T	405TS	405T	444TS	444T	445TS	445T
		C	26	28	27	29	28	30	30	33	32	35	34	38	36	40
3x3x12	3	BASE	12	12	12	12	12	12								
		HY	4 1/2	4 1/2	4 1/2	4 1/2	4 1/2	4 1/2								
4x4x12	3	BASE	12	12	12	12	12	12	15	15						
		HY	5 1/2	5 1/2	5 1/2	5 1/2	5 1/2	5 1/2	5 1/2	5 1/2						
6x6x12	4	BASE	13	13	13	13	13	13								
		HY	5 1/4	5 1/4	5 1/4	5 1/4	5 1/4	5 1/4								
6x6x12	5	BASE	18	18	18	18	18	18								
		HY	5 1/4	5 1/4	5 1/4	5 1/4	5 1/4	5 1/4								
6x6x15	5	BASE	18	18	18	18	18	18								
		HY	5 1/4	5 1/4	5 1/4	5 1/4	5 1/4	5 1/4								

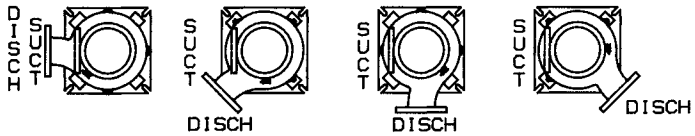
NOTES:
1. ALL DIMENSIONS IN INCHES.
2. NOT FOR CONSTRUCTION PURPOSES UNLESS CERTIFIED.





NOTES:
1. ALL DIMENSIONS IN INCHES.
2. DIMENSIONS MAY VARY ± 1/4".
3. NOT FOR CONSTRUCTION PURPOSES UNLESS CERTIFIED.
4. TWO (2) 1/2" NPT CONNECTIONS 180° APART, ON THE STUFFING BOX FOR LUBRICATION PURPOSES ARE FURNISHED AS STANDARD. ON PACKED PUMPS AN ALEMITE FITTING IS PROVIDED IN ONE TAP AND THE REMAINING TAP IS PLUGGED.
5. DISCHARGE POSITION 1 IS FURNISHED AS STANDARD UNLESS SPECIFIED.
6. SUCTION AND DISCHARGE FLANGES ARE AMERICAN STANDARD 125 LBS.



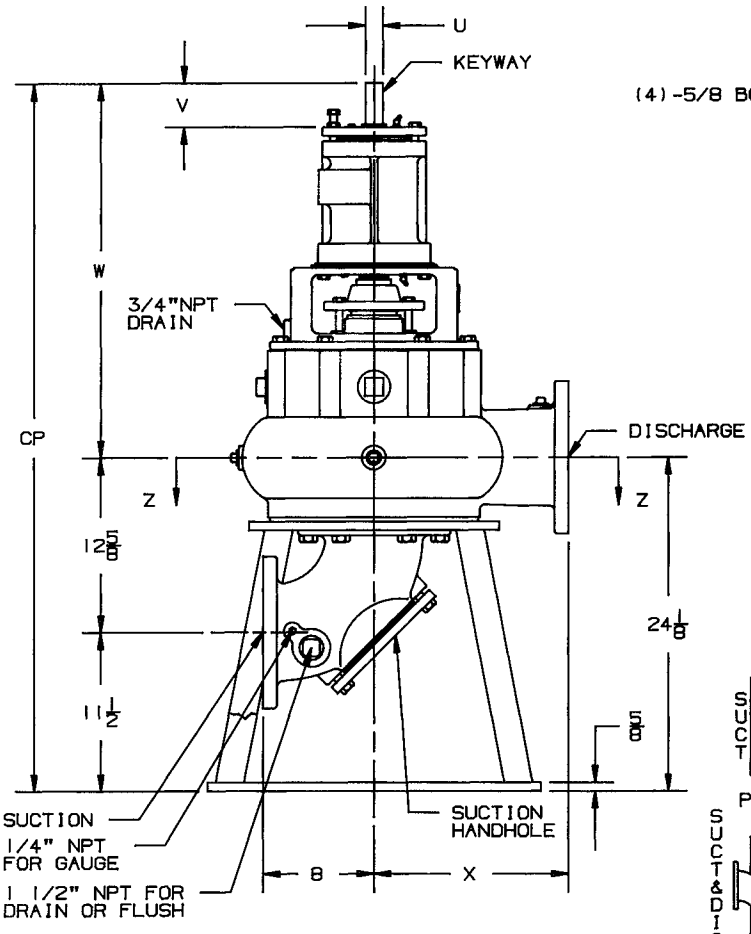


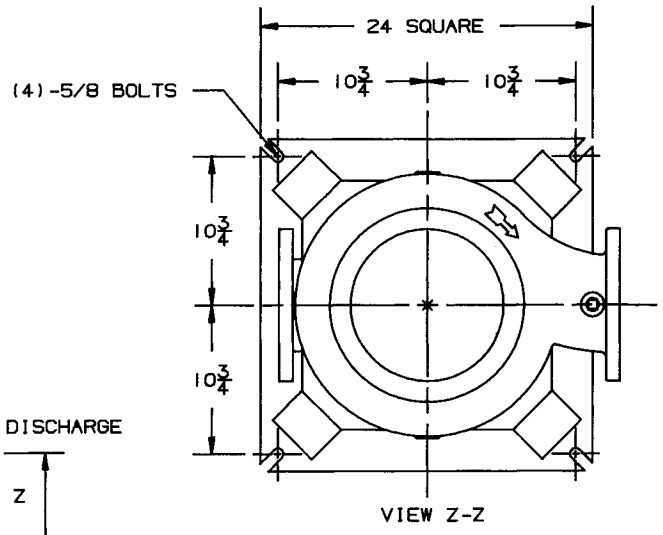
DISCHARGE POSITIONS AVAILABLE
(VIEW Z-Z)

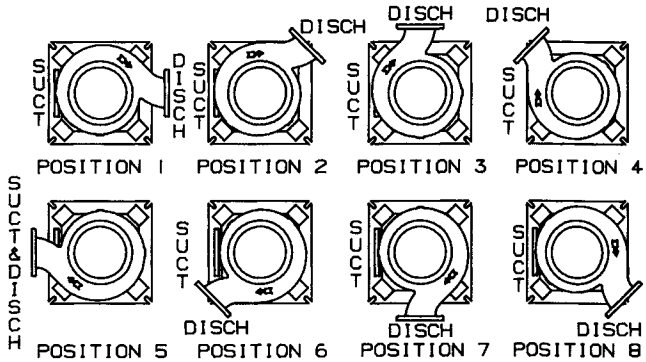
NOTE:
PUMP SIZES 3x3x9 AND 3x3x12 DISCHARGE POSITIONS AVAILABLE ONLY IN 1, 3, 5, AND 7.

DISCH SUCT CASE BORE	POWER FRAME	BN	VY	W	X	CP	VD	VE	VS
3x3x9	3C	1	6 1/2	25 1/2	10	41 7/8	16 3/8	6 3/4	9 5/8
3x3x12	3C	1	6 1/2	25 5/8	13	42	16 3/8	6 3/4	9 5/8
4x4x9	3C	1 1/2	6 1/2	26 1/2	11	43 3/8	16 7/8	6 15/16	9 15/16
4x4x12	3C	1 1/2	6 1/2	26 5/8	13	43 1/2	16 7/8	6 15/16	9 15/16

AURORA MODEL 662A PUMP
6" PUMPS







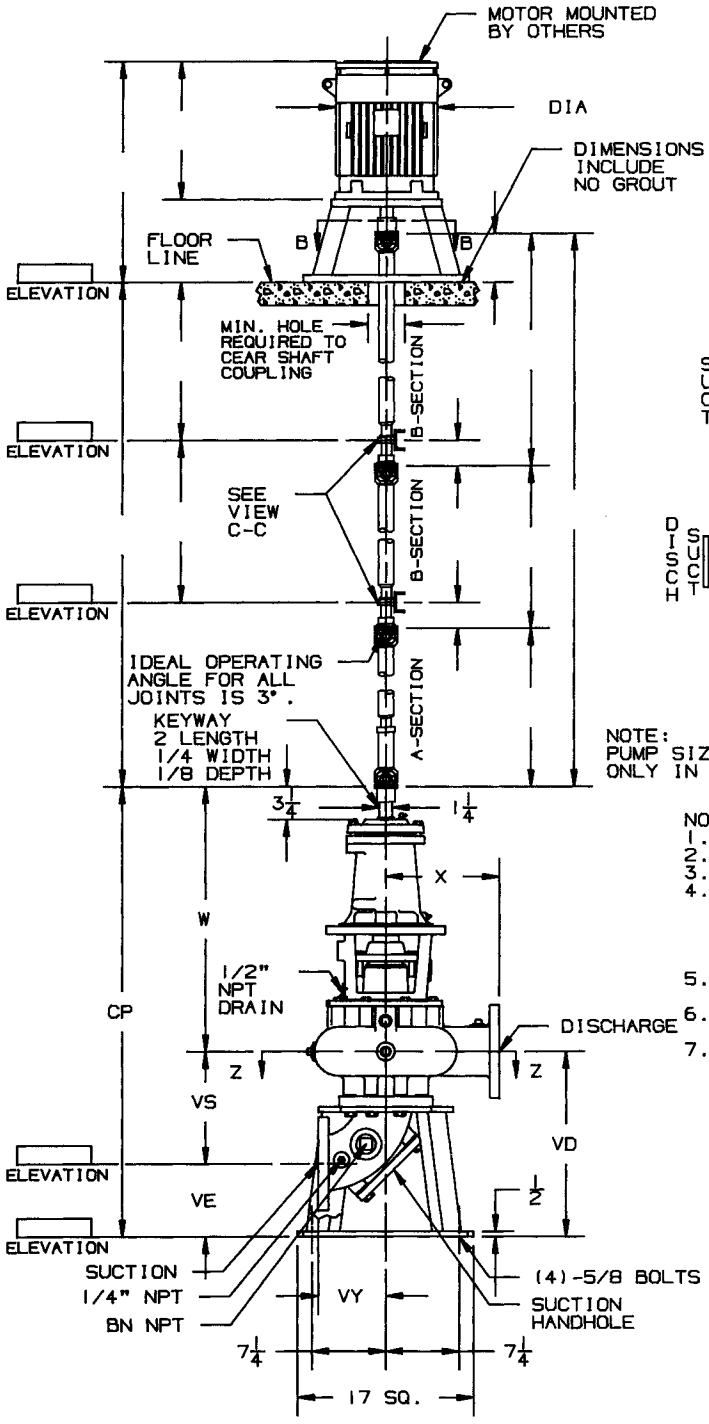
DISCHARGE POSITIONS AVAILABLE
(VIEW Z-Z)

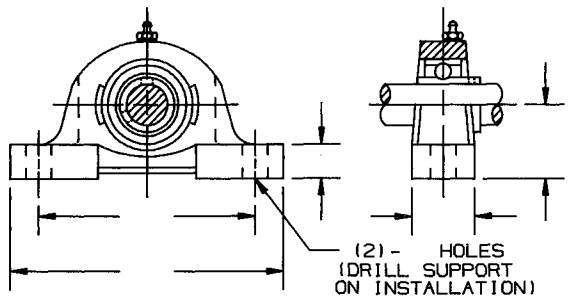
NOTES:
1. ALL DIMENSIONS IN INCHES.
2. DIMENSIONS MAY VARY ± 1/4".
3. NOT FOR CONSTRUCTION PURPOSES UNLESS CERTIFIED.
4. TWO (2) 1/2" NPT CONNECTIONS 180° APART, ON THE STUFFING BOX FOR LUBRICATION PURPOSES ARE FURNISHED AS STANDARD. ON PACKED PUMPS AN ALEMITE FITTING IS PROVIDED IN ONE TAP AND THE REMAINING TAP IS PLUGGED.
5. DISCHARGE POSITION 1 IS FURNISHED AS STANDARD UNLESS SPECIFIED.
6. SUCTION AND DISCHARGE FLANGES ARE AMERICAN STANDARD 125 LBS.

POWER FRAME	U	V	KEYWAY		
			LENGTH	WIDTH	DEPTH
4C	1 1/4	3 3/16	2	1/4	1/8
5E	2 3/8	6 3/8	4	5/8	5/16

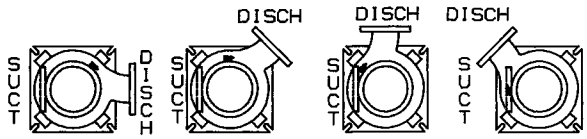
DISCH SUCT CASE BORE	POWER FRAME	W	X	CP
6x6x12	4C	27 1/8	14	51 1/4
6x6x12	5E	38 1/8	14	62 1/4
6x6x15	5E	38 1/8	16	62 1/4

3" & 4" PUMPS
FLEXIBLE SHAFT

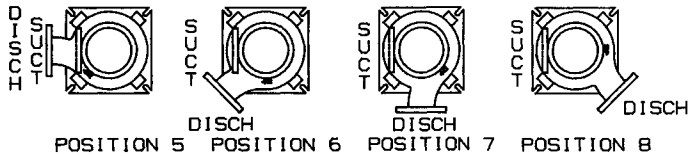




VIEW C-C
STEADY BEARINGS



POSITION 1 POSITION 2 POSITION 3 POSITION 4

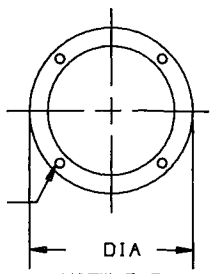


POSITION 5 POSITION 6 POSITION 7 POSITION 8

DISCHARGE POSITIONS AVAILABLE
(VIEW Z-Z)

NOTE:
PUMP SIZES 3x3x9 AND 3x3x12 DISCHARGE POSITIONS AVAILABLE ONLY IN 1, 3, 5, AND 7.

NOTES:
1. ALL DIMENSIONS IN INCHES.
2. DIMENSIONS MAY VARY ± 1/2".
3. NOT FOR CONSTRUCTION PURPOSES UNLESS CERTIFIED.
4. TWO (2) 1/2" NPT CONNECTIONS 180° APART, ON THE STUFFING BOX FOR LUBRICATION PURPOSES ARE FURNISHED AS STANDARD. ON PACKED PUMPS AN ALEMITE FITTING IS PROVIDED IN ONE TAP AND THE REMAINING TAP IS PLUGGED.
5. DISCHARGE POSITION 1 IS FURNISHED AS STANDARD UNLESS SPECIFIED.
6. SUCTION AND DISCHARGE FLANGES ARE AMERICAN STANDARD 125 LBS.
7. CONDUIT BOX IS SHOWN IS APPROXIMATE LOCATION. DIMENSIONS ARE NOT SPECIFIED AS THEY MAY VARY WITH EACH MOTOR MANUFACTURER.

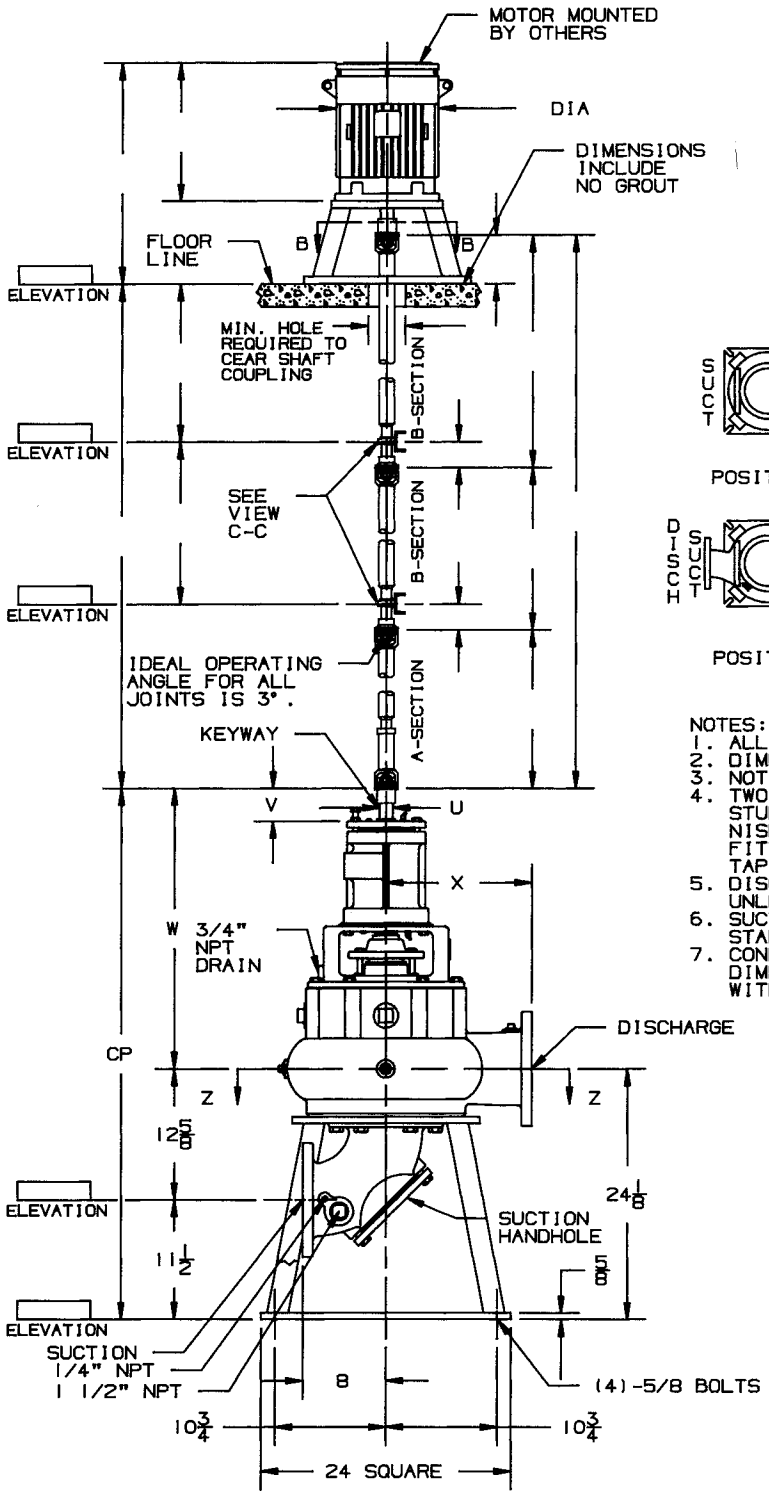


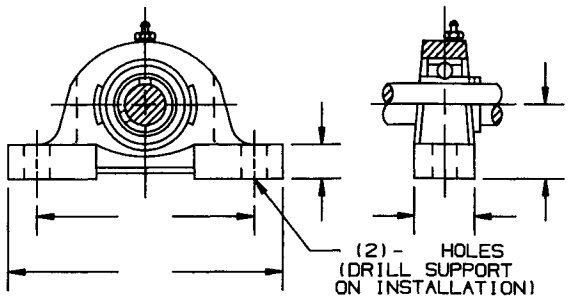
(4) DRILLS ON DIA. FOR FOUNDATION BOLTS.

VIEW B-B

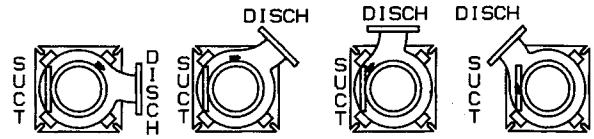
DISCH SUCT CASE BORE	POWER FRAME	BN	VY	W	X	CP	VD	VE	VS
3x3x9	3C	1	6 1/2	25 1/2	10	41 7/8	16 3/8	6 3/4	9 5/8
3x3x12	3C	1	6 1/2	25 5/8	13	42	16 3/8	6 3/4	9 5/8
4x4x9	3C	1 1/2	6 1/2	26 1/2	11	43 3/8	16 7/8	6 15/16	9 15/16
4x4x12	3C	1 1/2	6 1/2	26 5/8	13	43 1/2	16 7/8	6 15/16	9 15/16

AURORA MODEL 662A PUMP
6" PUMPS
FLEXIBLE SHAFT

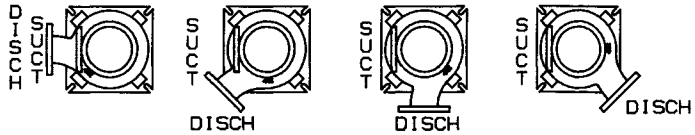




VIEW C-C
STEADY BEARINGS



POSITION 1 POSITION 2 POSITION 3 POSITION 4



POSITION 5 POSITION 6 POSITION 7 POSITION 8

DISCHARGE POSITIONS AVAILABLE
(VIEW Z-Z)

NOTES:
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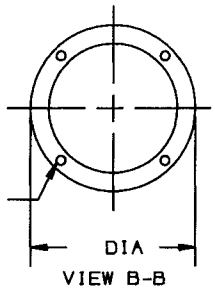
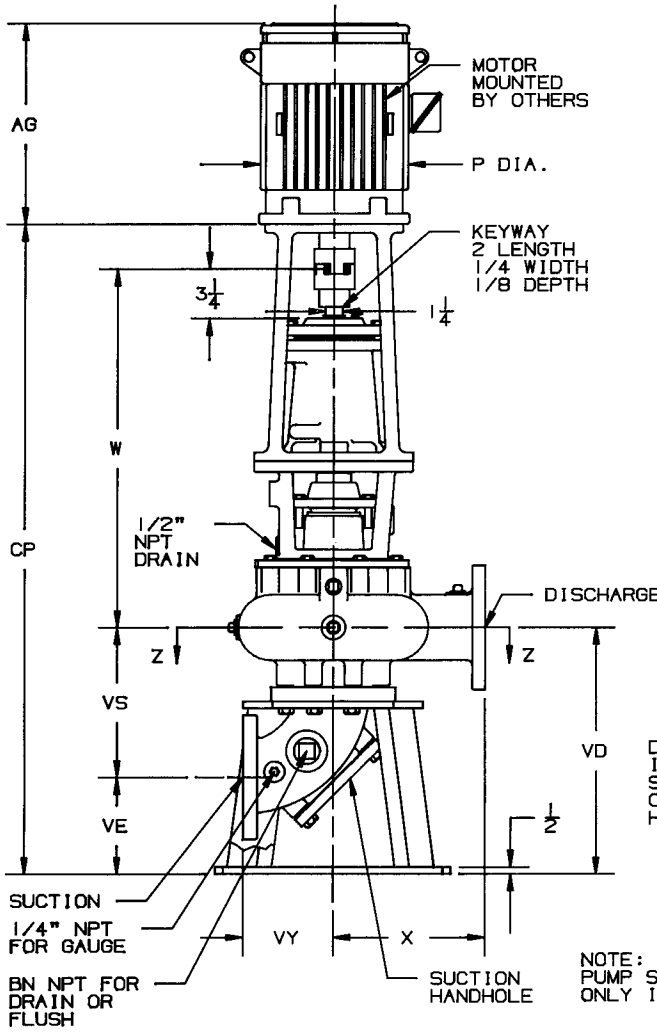
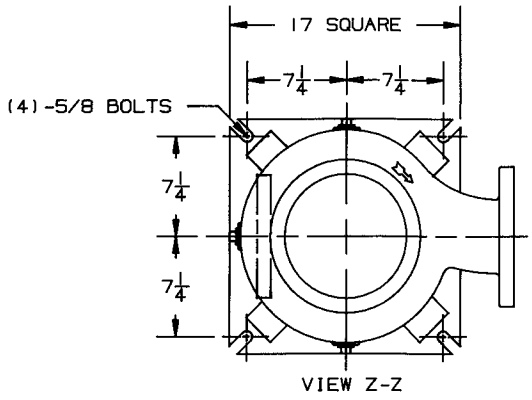


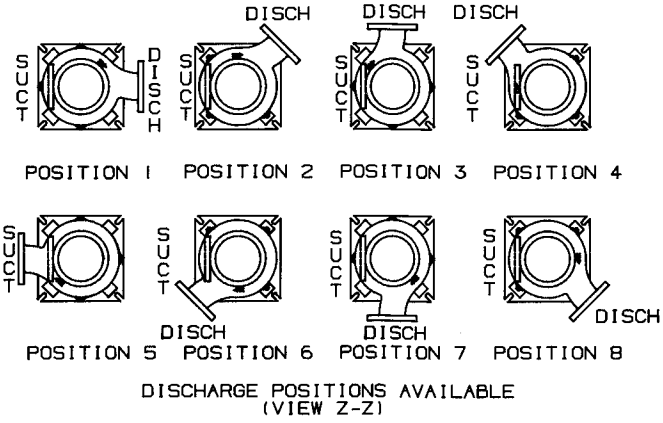
VIEW B-B

POWER FRAME	U	V	KEYWAY		
			LENGTH	WIDTH	DEPTH
4C	1 1/4	3 3/16	2	1/4	1/8
5E	2 3/8	6 3/8	4	5/8	5/16

DISCH SUCT CASE BORE	POWER FRAME	W	X	CP
6x6x12	4C	27 1/8	14	51 1/4
6x6x12	5E	38 1/8	14	62 1/4
6x6x15	5E	38 1/8	16	62 1/4







NOTE:
PUMP SIZES 3x3x9 AND 3x3x12 DISCHARGE POSITIONS AVAILABLE ONLY IN 1, 3, 5, AND 7.

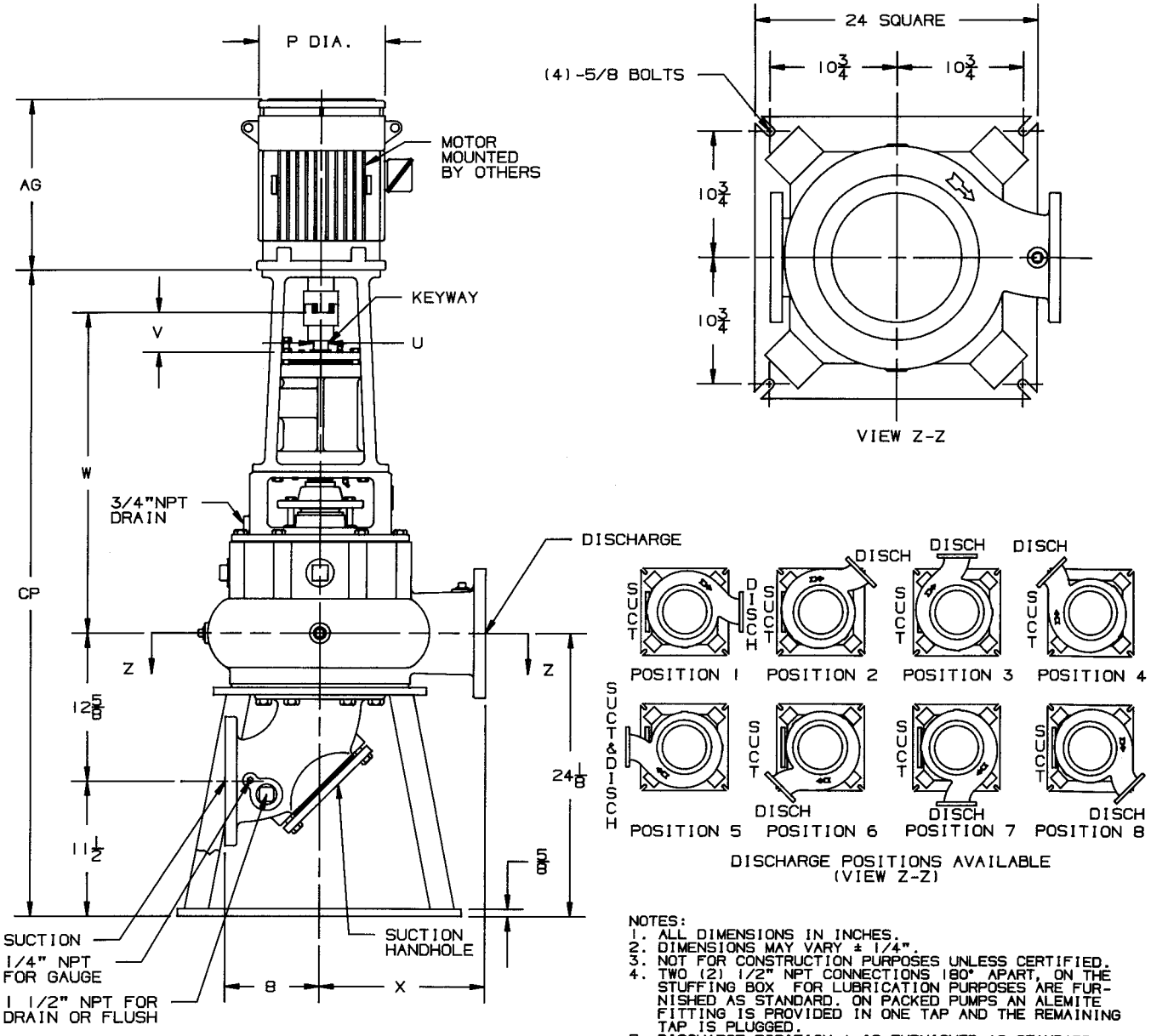
NOTES:
1. ALL DIMENSIONS IN INCHES.
2. DIMENSIONS MAY VARY ± 1/4".
3. NOT FOR CONSTRUCTION PURPOSES UNLESS CERTIFIED.
4. TWO (2) 1/2" NPT CONNECTIONS 180° APART, ON THE STUFFING BOX FOR LUBRICATION PURPOSES ARE FURNISHED AS STANDARD. ON PACKED PUMPS AN ALEMITE FITTING IS PROVIDED IN ONE TAP AND THE REMAINING TAP IS PLUGGED.
5. DISCHARGE POSITION 1 IS FURNISHED AS STANDARD UNLESS SPECIFIED.
6. SUCTION AND DISCHARGE FLANGES ARE AMERICAN STANDARD 125 LBS.
7. HEIGHT (AG) AND DIAMETER (P) DIMENSIONS OF MOTOR WILL VARY BASED ON MAKE AND STYLE OF MOTOR. DIMENSIONS SHOWN REFLECT AURORA STANDARD MOTORS. SEE INDIVIDUAL MOTOR SUPPLIER DIMENSIONAL DATA SHEETS FOR YOUR APPLICATION. CONDUIT BOX IS SHOWN IN APPROXIMATE LOCATION. DIMENSIONS ARE NOT SPECIFIED AS THEY VARY WITH EACH MOTOR MANUFACTURER.

MOTOR FRAME	143HP TO 145HP	182HP TO 184HP	213HP TO 215HP	254HP TO 256HP	284HPH TO 286HPH	324HP TO 326HP	364HP TO 365HP	404HP TO 405HP
P APPROX.	8	10	11	13	16	18	21	22
AG APPROX.	11 12	13 14	16 18	20 21	22 23	25 26	25	28

DISCH SUCT CASE BORE	POWER FRAME	BN	VY	W	X	CP	VD	VE	VS
3x3x9	3C	1	6 1/2	25 1/2	10	45 1/2	16 3/8	6 3/4	9 5/8
3x3x12	3C	1	6 1/2	25 5/8	13	45 5/8	16 3/8	6 3/4	9 5/8
4x4x9	3C	1 1/2	6 1/2	26 1/2	11	47	16 7/8	6 15/16	9 15/16
4x4x12	3C	1 1/2	6 1/2	26 5/8	13	47 1/8	16 7/8	6 15/16	9 15/16

ADD 3/4" TO CP FOR PUMPS WITH MOTOR FRAMES 284HPH OR LARGER.

AURORA MODEL 663A PUMP
6" PUMPS



NOTES:
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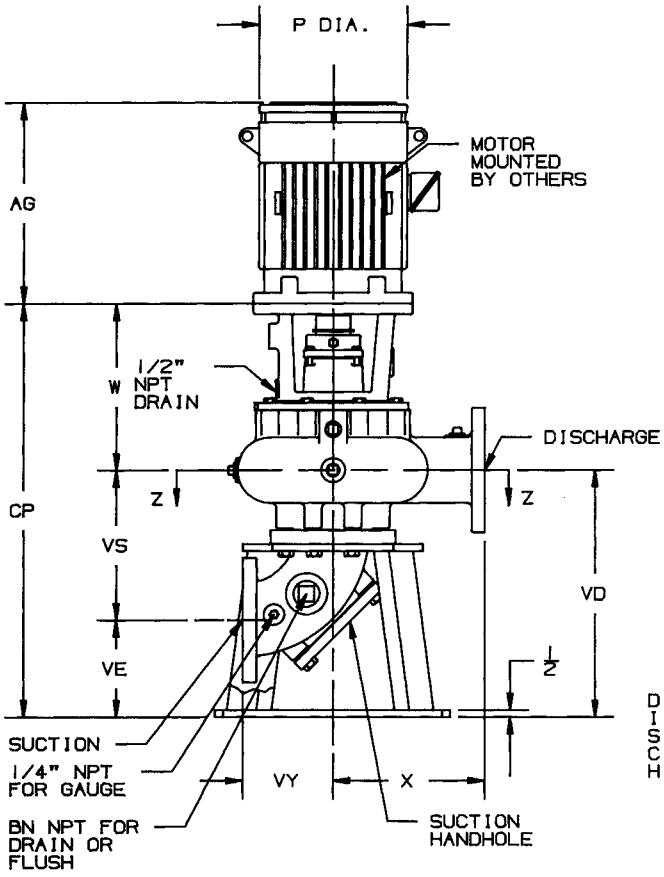
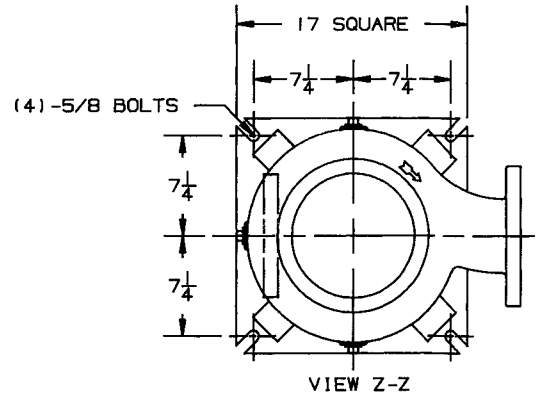
POWER FRAME	U	V	KEYWAY		
			LENGTH	WIDTH	DEPTH
4C	1 1/4	3 3/16	2	1/4	1/8
5E	2 3/8	6 3/8	4	5/8	5/16

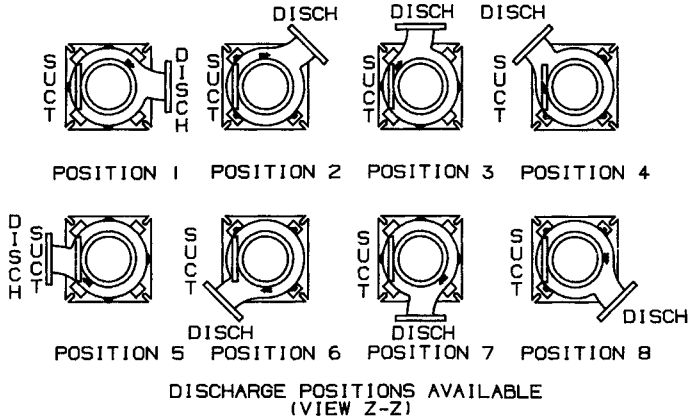
DISCH SUCT CASE BORE	POWER FRAME	W	X	CP
6x6x12	4C	27 1/8	14	54 7/8
6x6x12	5E	38 1/8	14	67 13/16
6x6x15	5E	38 1/8	16	67 13/16

MOTOR FRAME	143HP TO 145HP	182HP TO 184HP	213HP TO 215HP	254HP TO 256HP	284HPH TO 286HPH	324HP TO 326HP	364HP TO 365HP	404HP TO 405HP
P APPROX.	8	10	11	13	16	18	21	22
AG APPROX.	11 12	13 14	16 18	20 21	22 23	25 26	25	28

ADD 3/4" TO CP FOR PUMPS ON P.F. 4C WITH MOTOR FRAMES 284HPH AND LARGER.
SUBTRACT 2" FROM CP FOR PUMPS ON P.F. 5E WITH MOTOR FRAMES SMALLER THAN 284HPH







DISCHARGE POSITIONS AVAILABLE
(VIEW Z-Z)

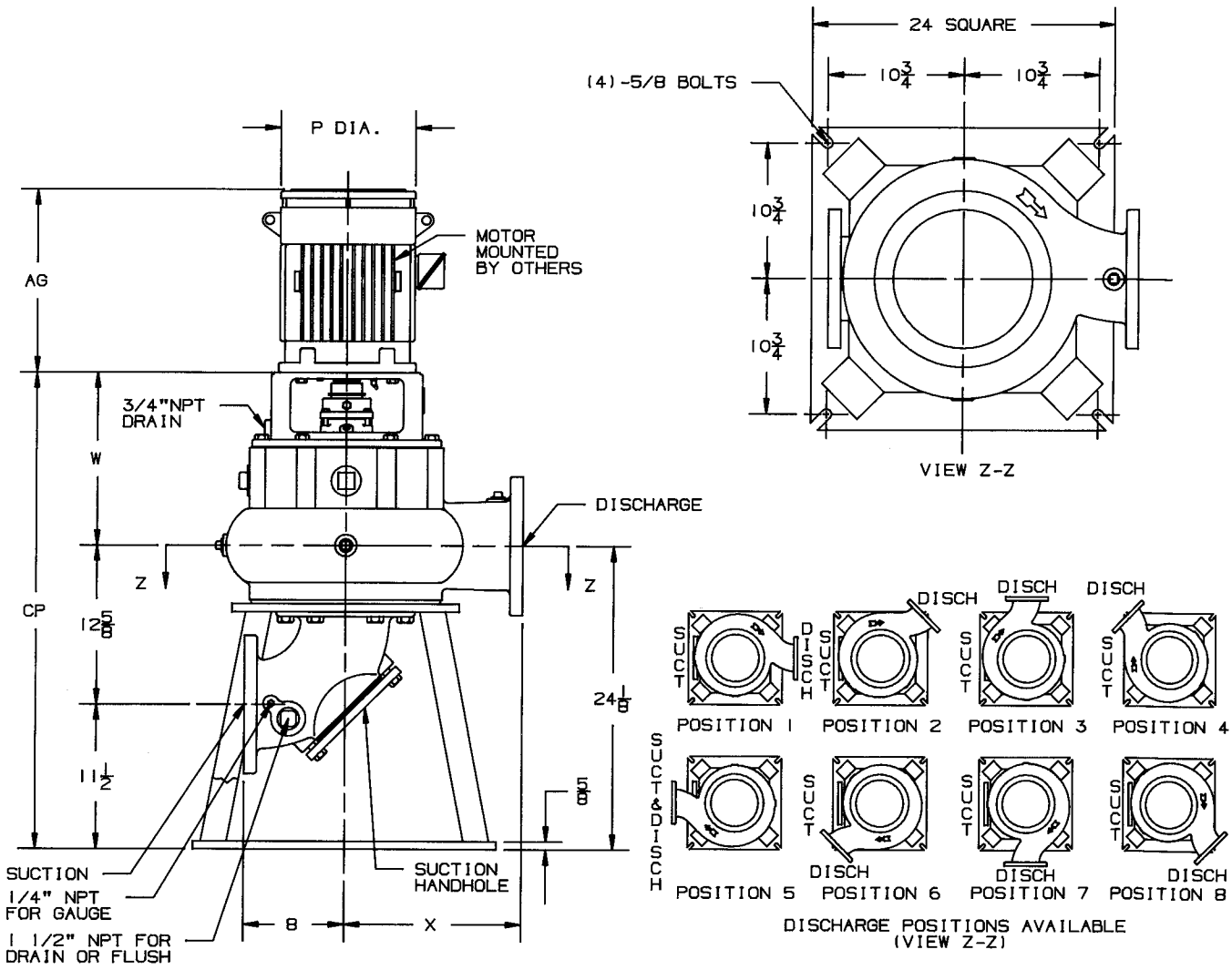
NOTES:
1. ALL DIMENSIONS IN INCHES.
2. DIMENSIONS MAY VARY ± 1/4".
3. NOT FOR CONSTRUCTION PURPOSES UNLESS CERTIFIED.
4. TWO (2) 1/2" NPT CONNECTIONS 180° APART, ON THE STUFFING BOX FOR LUBRICATION PURPOSES ARE FURNISHED AS STANDARD.
5. DISCHARGE POSITION 1 IS FURNISHED AS STANDARD UNLESS SPECIFIED.
6. SUCTION AND DISCHARGE FLANGES ARE AMERICAN STANDARD 125 LBS.
7. HEIGHT (AG) AND DIAMETER (P) DIMENSIONS OF MOTOR WILL VARY BASED ON MAKE AND STYLE OF MOTOR. DIMENSIONS SHOWN REFLECT AURORA STANDARD MOTORS. SEE INDIVIDUAL MOTOR SUPPLIER DIMENSIONAL DATA SHEETS FOR YOUR APPLICATION. CONDUIT BOX IS SHOWN IN APPROXIMATE LOCATION. DIMENSIONS ARE NOT SPECIFIED AS THEY VARY WITH EACH MOTOR MANUFACTURER.

NOTE:
PUMP SIZES 3x3x9 AND 3x3x12 DISCHARGE POSITIONS AVAILABLE ONLY IN 1, 3, 5, AND 7.

MOTOR FRAME	143TCV TO 145TCV	182TCV TO 184TCV	213TCV TO 215TCV	254TCV TO 256TCV	284TCV TO 286TCV	324TCV TO 326TCV	364TCV TO 365TCV	404TCV TO 405TCV
P APPROX.	8	10	11	13	16	18	21	22
AG APPROX.	11 12	13 14	16 18	20 21	22 23	25 26	25	28

DISCH SUCT CASE BORE	BN	VY	W	X	CP	VD	VE	VS
3x3x9	1	6 1/2	15 13/16	10	32 3/16	16 3/8	6 3/4	9 5/8
3x3x12	1	6 1/2	15 15/16	13	32 5/16	16 3/8	6 3/4	9 5/8
4x4x9	1 1/2	6 1/2	16 13/16	11	33 11/16	16 7/8	6 15/16	9 15/16
4x4x12	1 1/2	6 1/2	16 15/16	13	33 13/16	16 7/8	6 15/16	9 15/16

AURORA MODEL 664A PUMP
6" PUMPS



DISCHARGE POSITIONS AVAILABLE
(VIEW Z-Z)

NOTES:
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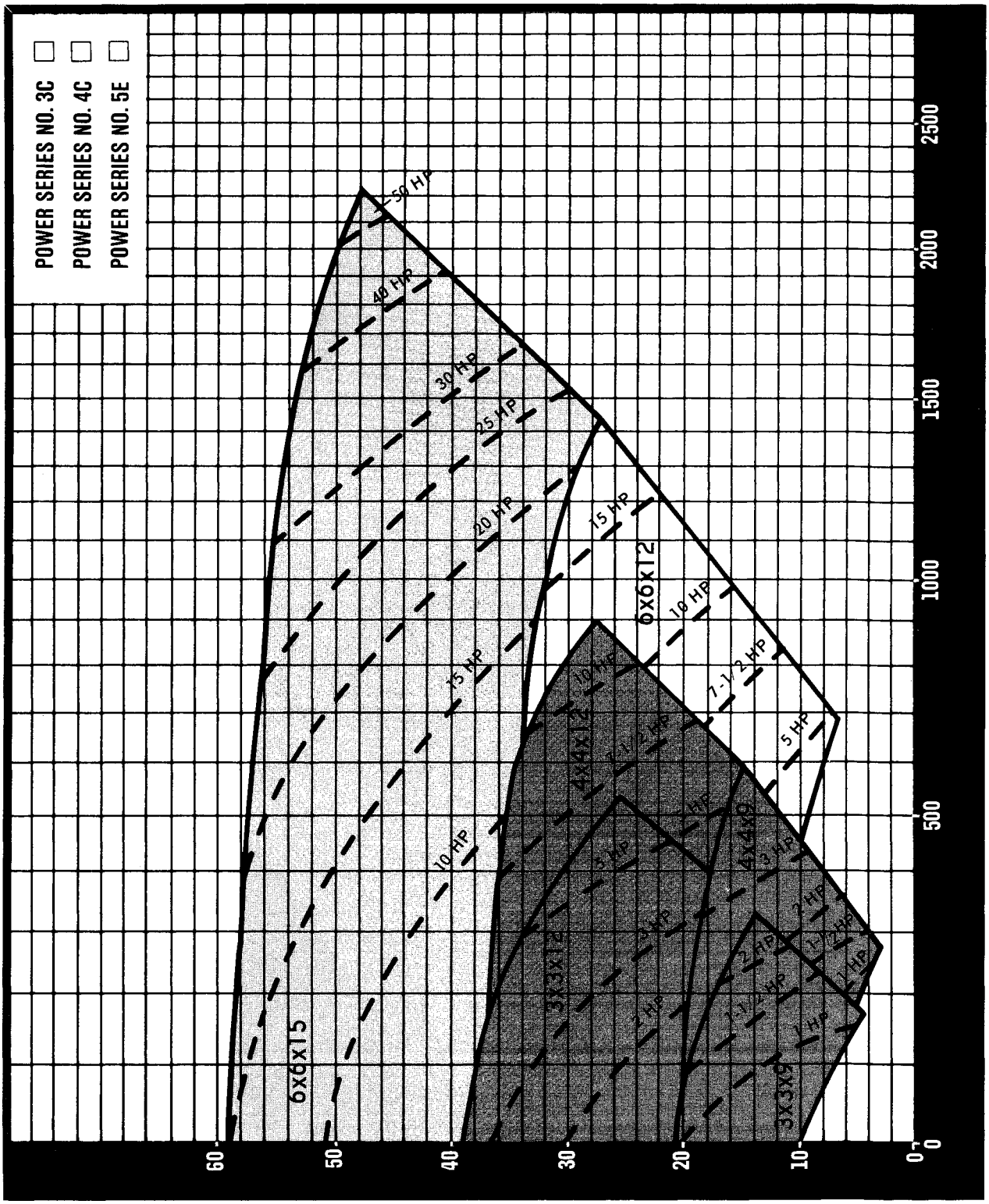
DISCH SUCT CASE BORE	MOTOR SHAFT EXT. TYPE	W	X	CP
6x6x12	4C, 4D	17 9/16	14	41 11/16
6x6x12	5E, 5F	20 11/16	14	44 13/16
6x6x15	5E, 5F	20 11/16	16	44 13/16

MOTOR FRAME	143TCV TO 145TCV	182TCV TO 184TCV	213TCV TO 215TCV	254TCV TO 256TCV	284TCV TO 286TCV	324TCV TO 326TCV	364TCV TO 365TCV	404TCV TO 405TCV
P APPROX.	8	10	11	13	16	18	21	22
AG APPROX.	11 12	13 14	16 18	20 21	22 23	25 26	25	28

AURORA SERIES 660
SELECTION CHART
885 R.P.M.
VORTEX IMPELLER



AURORA®
Pentair Pump Group

INSTRUCTION MANUAL
REPAIR
MODEL 661A

6

SERVICE

Your Aurora pump requires no maintenance other than periodic inspection, occasional cleaning and lubrication of bearings. The intent of inspection is to prevent breakdown, thus obtaining optimum service life. The liquid end of the pump is lubricated by the fluid being pumped and therefore does not require periodic lubrication. The motor, however, may require lubrication, in which case, the motor manufacturer's recommendations should be followed.

LUBRICATION OF SHAFT BEARINGS

The Series 661A pump is supplied with regreasable shaft bearings as standard. The following lubricating instructions are for pumps on a 3C power frame. See page 4 for lubricating instructions for pumps on 4C and 5E power frames. Regreasable bearings will require periodic lubrication, which can be accomplished by using the lubrication fittings in the cartridge cap and power frame. Lubricate the bearings at regular intervals using a grease of high quality. Lithium base grease is recommended as a lubricant for pumps operating in both wet and dry locations. Mixing of different brands of grease should be avoided due to possible chemical reactions between the brands which could damage the bearings. Avoid vegetable- or animal-base greases which can develop acids, as well as grease containing rosin, graphite, talc and other impurities. Under no circumstances should used grease be reused.

Over lubrication should be avoided as it may result in overheating and possible bearing failure. Under normal application, adequate lubrication is assured if the amount of grease is maintained at 1/3 to 1/2 the capacity of the bearing and adjacent space surrounding it.

In dry locations, each bearing will need lubrication at least every 600 hours of running time or every 6 to 12 months, whichever is more frequent. In wet locations the bearings should be lubricated at least every 300 hours of running time or every 4 to 6 months, whichever is more frequent. A unit is considered to be installed in a wet location if the pump and motor are exposed to dripping water, the weather, or heavy condensation such as is found in unheated and poorly ventilated underground locations.

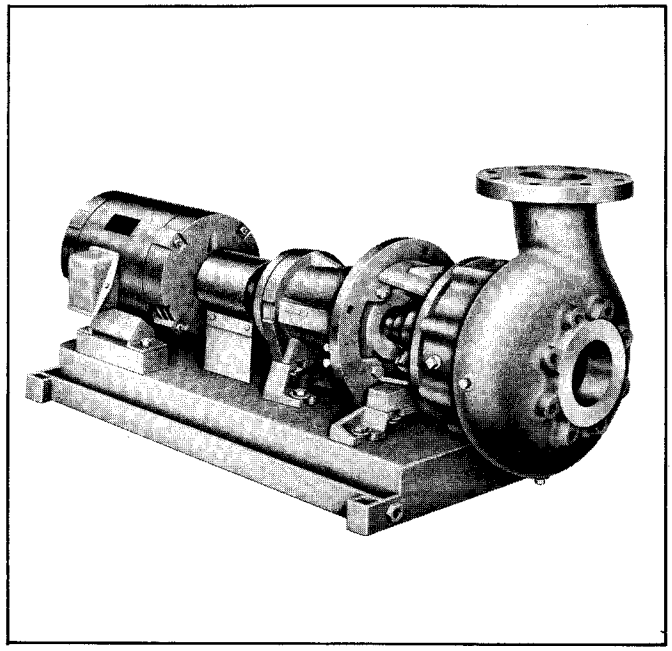
At times it may be necessary to clean the bearings due to accumulated dirt or deteriorated lubricants. This can be accomplished by flushing the bearing with a light oil heated to 180 to 200°F. While rotating it on a spindle, wipe the bearing housing with a clean rag soaked in a cleaning solvent and flush all surfaces.

Dry bearing thoroughly before relubricating. Compressed air can be used for speed drying, but care should be taken not to let bearings rotate while being dried.

CAUTION

Use normal fire caution procedures when using any petroleum cleaner.

The motor that drives your Aurora pump may or may not require lubrication. Consult the manufacturer's recommendations for proper maintenance instructions.



REPAIRS

The pump may be disassembled using the illustrations and text provided. Although complete disassembly is covered, it will seldom be necessary to completely disassemble your Aurora pump.

The illustration accompanying the disassembly instructions show an exploded view of the pump. The illustration is intended to aid in the correct identification of the parts mentioned in the text.

Inspect removed parts at disassembly to determine their reusability. Cracked castings should never be reused. Gaskets should be replaced at reassembly simply as a matter of economy; they are much less expensive to replace routinely than to replace as the need occurs. In general it is economical to return the motor and motor controller to the manufacturer for repair.

VORTEX PUMP 661A ON A 3C POWER FRAME DISASSEMBLY

This pump has been designed with back pull-out features which allow the power frame and rotating element to be removed without disturbing the suction and discharge piping.

Disassemble only that which is needed to make repairs or accomplish inspection..

1. Disconnect electrical connections to prevent drive unit from being energized during disassembly.

2. Close all valves or flow devices that control movement of liquids to or from pump. Remove drain plugs (25) from casing (1).

3. Remove all relief, cooling, flushing or drain lines from pump. Break suction and discharge connections unless it is intended to remove the power frame assembly and leave the casing (1) in the line.

4. Loosen capscrews which secure motor to base and slide motor out to obtain access to pump. Unscrew the capscrews that hold supports (21 and 22) to the base and slide the pump out to be worked on.

NOTE

If spacer coupling or V-belt drive is supplied, it is not necessary to move the motor. Loosen capscrews from each hub of spacer type coupling and remove coupling flanges and rubber insert. This leaves adequate space between end of drive shaft and pump shaft to facilitate back pull-out of pump. For V-belt drive units, remove sheave from pump shaft for back pull-out.

5. Remove capscrews (15A & 34) that hold casing (1) to bracket (8) with aid of a rope sling and a crane or hoist, carefully slide power frame and rotating element away from casing. Remove gasket (17) from its position between bracket (8) and casing (1). Inspect the sealing surface to insure that it is clean and free of any gasket material which has stuck to parting surfaces. Replace this gasket with a new one when pump is reassembled.

6. Unscrew impeller screw (10) and o-ring (11), remove washer (12) taking care not to damage gasket (13).

NOTE

The vortex pumps have a tapered end impeller fit-up to facilitate impeller removal. Use caution in the removal of impeller as it has to be moved only a few thousandths of an inch to become entirely free.

7. Slide impeller (2) and impeller key (14) from the shaft, again taking care not to damage gasket (38) located behind impeller. Remove gasket (38).

8. The various types of stuffing boxes may be disassembled as follows:

PACKING WITH LANTERN RING (STANDARD)

A. Remove capscrews (45) and gland halves (44).

Remove and discard old packing (40). Clean all parts to remove any packing that may have adhered.

C. Unscrew capscrews (33) and remove stuffing box (27) from bracket (8). The throat of adapter plate or stuffing box should be checked for excessive wear. Remove gasket (32).

D. Shaft sleeve (36) is a slip fit on the shaft and should be easily removed unless the pump has been in service for a long time. In this case it may be necessary to use a puller. A snap ring may be installed in the sleeve groove to ease disassembly. Take care to prevent damaging the surface of the sleeve. Replace the sleeve if it is grooved from wear. Remove key (54) and retaining ring (37) from shaft.

DOUBLE MECHANICAL SEAL (OPTIONAL)

CAUTION

The mechanical seal is a precision product and must be treated as such. During removal great care must be taken to avoid dropping any part of the seal. Take particular care not to scratch the lapped faces on the washer or the sealing seat. Do not put a seal back into service until the sealing faces of the washer and seat have been lapped or replaced.

A. Remove seal gland bolts (45) and remove gland (44) carefully exposing seal (47).

B. Unscrew capscrews (33) and remove stuffing box assembly (27). Remove gasket (32).

C. Slide sleeve (36) with rotating parts of mechanical seal (47) from the shaft. Remove ceramic seal rings and stainless steel parts from sleeve with great care as ceramic parts are easily damaged.

The sleeve should be carefully cleaned to remove any residue that may be remaining in the seal area. The rubber in the seal may have become partially adhered to the sleeve. The sleeve must also be checked for abrasion or corrosion that can occur when fluid residue penetrates between the seal (47) and sleeve (36). The sleeve under the seal may be polished lightly to a 32 RMS finish before reassembly. Do not reuse a pitted sleeve. Remove retaining ring (37) and key (54).

D. Remove stationary seat and o-rings from gland (44) and stuff box (27), using care not to damage these parts.

9. Remove capscrews (23) and washers (24) to take off support foot (22).

10. Unscrew capscrews (35) to remove bracket (8) from power frame (56).

11. Remove key (55) from the shaft (48).

12. Unscrew capscrews (59) and remove bearing cap (51). Remove gasket (51A) and retaining ring (50C).

13. Slide out shaft (48) and bearings (50 and 49). Remove shim (60). (See Figure 4). Since bearings (50 and 49) are press fitted on the shaft, they will have to pulled or pressed off the shaft.

Remove grease seals (52 and 53) from power frame (56) and bearing cap (51).

14. Remove screws (72) and nameplate (73) only if replacement is necessary.

VORTEX PUMPS 661A ON A 3C POWER FRAME REASSEMBLY

Reassembly will generally be in reverse order of disassembly. If disassembly was not complete, use only those steps related to your particular repair program.

1. Press grease seals (52 and 53) into power frame (56) and bearing cap (51).

2. Press bearings (50 and 49) onto shaft (48). Snap retaining ring (50C) into place.

3. Slide shaft (48) and bearings (50 and 49) into frame (56). Do not install gasket (51A), shim (60), or bearing cap (51) at this point.

4. Position key (54) in shaft (48).

5. Position bracket (8) on the frame (56) and secure with capscrews (35). Tighten capscrews evenly to assure proper alignment.

6. If nameplate (73) was removed, install and attach with screws (72).

7. Reassemble the various types of stuffing boxes as follows.

PACKING WITH LANTERN RING (STANDARD)

A. Place gasket (32) on stuffing box (27), slide over shaft and secure to bracket (8) with capscrews (33).

B. Install retaining ring (37), place key (54) in shaft and slide sleeve (36) over shaft. Packing (40) and lantern ring (41) may be replaced at this time. From impeller end of shaft place two new rings of packing (40) around shaft sleeve, slide lantern ring (41) back in position and place remaining three rings of packing on shaft sleeve. Be sure to stagger joints of packing rings to avoid excessive leakage through the packing.

C Thread capscrews (45) into stuffing box (27) approximately ¼ in. place each half of gland (44) in stuffing box. Insert gland clamps (44E) and tighten packing adjusting capscrews (45) to obtain proper sealing. Ensure capscrews (45) are tightened enough to hold parts in place. Final adjustment of packing box will have to be made after pump is returned to operation. When pump is running, gland capscrews (45) should be evenly turned down a flat at a time, allowing packing to work in until a leakage rate of approximately 60 to 120 drops per minute is obtained.

NOTE

Do not over tighten packing as this will cause packing box to over-heat and the shaft sleeve to receive excessive wear.

DOUBLE MECHANICAL SEAL (OPTIONAL)

NOTE

The mechanical seal (47) cannot be installed as an assembly. It is necessary to have the seal seats properly in place before the balance of parts can be added.

A. Install retaining ring and key (54) in shaft.

B. Wipe the sealing faces of the seat and seal washer clean. Lubricate the shaft sleeve (36) with a silicone-base lubricant. Slide the entire rotating assembly onto the sleeve.

C. Thoroughly inspect the seal box cavity checking for burrs or nicks which could damage the seat of the seal. Apply a film of liquid dishwashing detergent or rubber lubricant (do not use oil or grease) to the seal seats. Replace stationary seat and o-rings in gland (44) and stuffing box (27).

NOTE

If it is not possible to insert seat with fingers, place cardboard protecting ring furnished with seal over lapped face of seat and press into place with a piece of tubing having an end cut square. The tubing should be slightly larger than the diameter of the shaft. Remove cardboard after seat is firmly in place. Carefully slip the stuffing box assembly (27) over the shaft with the stationary seat facing away from the motor. Install gasket (46) into gland (44). Apply a film of liquid dishwashing detergent or rubber lubricant to the washer and bellows of the seal, and slide the remaining seal parts onto the sleeve, making sure the washer is seated against the seal seat.

D. The shaft sleeve (36) with the seal rotating assembly on it may now be replaced on the shaft. The shaft sleeve (36) should slide over shaft with keyway for key (54) toward power frame (56).

E. Replace gasket (32) on bracket (8) and carefully slip stuffing box (27), with stationary seal seat toward power frame (56), over the shaft, and secure with capscrews (33).

F. Position gland (44) onto stuffing box (27), taking care to seat it evently and squarely. Secure by tightening capscrews (45) evenly, being careful not damage gasket (46) between them.

8. Carefully place o-ring gasket (38) on shaft sleeve (36). Assemble key (14) and impeller (2) to shaft. Secure impeller with gasket (13), washer (12), impeller screw o-ring (11) and impeller screw (10).

9. Fasten supports (21 and 22) to bracket (8) and frame (56) with washers (15B & 24) and capscrews (15A & 23).

LAMINATED SHIM IMPELLER ADJUSTMENT

10. Push the shaft and impeller assembly completely forward until the snap ring and outboard bearings contacts the power frame. With a feeler gauge measure the clearance between the impeller wiper vanes and the stuffing box. This measurement minus the recommended clearance of .020 in. will give the total required shim thickness. Example: With the shaft and impeller assembly completely forward there is .040 in. of clearance between wiper vanes and stuffing box. Subract the recommended clearance of .020 in. and .020 in. remains. This is the required shim thickness needed. Remove snap ring on outer race of outboard bearing (50) and install proper shim (60). Replace snap ring (50C).

11. Install the pipe plugs (25) in the pump casing (1). Position gasket (17) and casing (1) against the bracket (8) and secure with capscrews (34). Position support foot (21) against bracket (8) and secure with capscrews (15A).

12. Install gasket (51A) and fasten bearing cap (51) in position with capscrews (59). Position key (55) on shaft.

13. Replace all relief, cooling, flushings or drain lines from the pump.

14. Secure suction and discharge piping to the pump. Make sure to install gaskets on flanged connections.

15. Connect electricity to the motor.

16. Open all valves or flow devices that control flow of liquids to and from pump.

STARTING PUMP AFTER REASSEMBLY

Do not start pump until all air and vapor has been bled making sure that there is liquid in the pump to provide the necessary lubrication. Without the fluid around it, a seal may be ruined in a few seconds of operation. It is possible that the mechanical seal may drip during the first few minutes to one hour of operation.

Packing should be adjusted as previously discussed in this manual.

VORTEX PUMPS 661A ON A 4C OR 5E POWER FRAME DISASSEMBLY

LUBRICATION OF BEARINGS

At the time of initial startup it is important to note that the pump bearings have been factory lubricated. Do not add additional lubrication until completion of initial break-in period, which is first 10 hours of continuous operation, or equivalent intermittent operation. After break-in period, while unit is operating, add fresh grease (American Oil Company's Rykon #2 or equivalent) through zerk fitting near bearings.

In dry locations, each bearing will need lubrication at least every 2,000 hours of running time or every 6 to 12 months, whichever is more frequent. In wet locations the bearings should be lubricated at least every 1,000 hours of running time or every 4 to 6 months, whichever is more frequent. A unit is considered to be installed in a wet location if the pump and motor are exposed to dripping water, to the weather, or to heavy condensation such as is found in unheated and poorly ventilated underground locations.

The 5E bearing frame has back-to-back angular contact bearings as the outboard thrust bearing (50). This style bearing requires more frequent lubrication intervals. It is suggested that this bearing be lubricated every 1000 hours of running time in dry locations, and every 500 hours in wet locations.

At times it may be necessary to clean the bearings due to accumulated dirt or deteriorated lubricants. This can be accomplished by flushing the bearing with a light oil heated to 180 to 200°F. While rotating it on a spindle, wipe the bearing housing with a clean rag soaked in a cleaning solvent, and flush all surfaces.

Dry bearing thoroughly before relubricating. Compressed air can be used for speed drying, but care should be taken not to let bearings rotate while being dried.

Use normal fire caution procedures when using any petroleum cleaner.

1. Break electrical connections to prevent drive unit from being energized during disassembly.

2. Close all valves or flow devices that control movement of liquids to or from pump. Remove drain plugs (25 & 26) from casing (1).

3. Remove all relief, cooling, flushings or drain lines from the pump.

4. Loosen capscrews from each hub of spacer type coupling and remove coupling flanges and rubber insert. This leaves adequate space between end of drive shaft and pump shaft to facilitate back pullout of pump. For V-belt drive units remove sheave from pump shaft or back pullout.

NOTE

If pump is not equipped with a spacer-type coupling or V-belt driven it will be necessary to break suction and discharge piping or move driver to remove the pump.

5. Unscrew the capscrews that hold support (22) to base. Remove capscrews (34), that hold casing (1) to bracket (8).

6. With the aid of a rope sling and crane or hoise, carefully slide power frame and rotating element or close coupled motor away from casing.

7. Unscrew capscrews (23) with washers (24) and remove support (22).

8. Remove gasket (17) from its position between bracket (8) and casing (1). Once power frame and rotating element has been withdrawn, inspect sealing surface to insure that they are clean and free of any gasket material which has struck to parting surfaces. Replace gasket with a new one when pump is reassembled.

9. Remove impeller capscrews (10), o-ring gasket (11), washer (12) and gasket (13) which allows impeller (2), key (14) and gasket (38) to be removed.

NOTE

The vortex pumps have a tapered hub impeller to facilitate impeller removal. Use caution in the removal of impeller as it has to be removed only a few thousandths of an inch to become entirely free.

The easiest method for removing the impeller is to suspend entire power frame and rotating element by an eyebolt about 1/32 of an inch above floor work area. Eyebolt size below. Apply pressure to the impeller by means of jackscrews (60 and 61) (located on the bearing cap (51)). When impeller is firmly against bracket (8) it should drop free after turning jackscrews evenly, a flat at a time, three or four flats.

a. Power frame 4C requires a 5/8-11 NC eyebolt.

b. Power frame 5E requires a 3/4-10 NC eyebolt.

10. When the power frame assembly is clear of impeller, place it on its side. At this point, either of the sealing box arrangements can be removed as a complete assembly by unscrewing capscrews (33). Slide complete assembly including shaft sleeve (36) off shaft (48) with the aid of a pinch bar or other lever. Remove gasket (32).

NOTE

The shaft sleeve incorporates a snap ring designed to interfere with the base of the seal box assembly. Therefore, when removing seal box the shaft sleeve is also removed.

For further disassembly of sealing box, proceed as follows:

A. Packing Box (Standard)

I. Remove capscrews (45), gland clamps (44E) and split gland halves (44).

II. Remove and discard old packing (40). Clean all parts to remove any packing that may have adhered during removal.

B. Double Mechanical Seal (Optional)

I. Remove seal gland bolts (45) and remove gland (44), exposing mechanical seal (47).

II. Use great care in removing ceramic seal rings and stainless steel metal parts from sealing box as ceramic parts are easily chipped or cracked.

III. Remove the carbon stationary seats and o-rings only if necessary, using care not to damage these parts.

11. Now set power frame on two benches, so that its shaft rests between them or on a bench with a hole cut in it large enough for shaft.

Remove grease zerk (63) and pipe plug (62) from inboard end of power frame. Remove retainer ring (37) by twisting it in a spiral movement toward end of shaft. Remove grease seal (53).

12. Unscrew capscrews (35) to remove bracket (8) from power frame (56). Lift the stuffing box away from power frame and shaft.

13. Unscrew capscrews (59) and lift out shaft assembly with bearings from the power frame.

14. Remove coupling half and key (55) from the shaft. Remove plug (57) and zerk fitting (58).

15. Retainer ring (50B) is removed with a pair of truarc internal pliers so that grease retainer (50A) can be removed allowing bearing cap (51) to be removed from shaft assembly. Grease seal (52) may be removed if necessary.

16. With a pair of truarc external pliers, remove snap ring (50C) (PF#4 only), or remove locknut (50D) and lockwasher (50C). on power frame #5.

17. Both inboard bearing (49) and outboard bearing (50) are pressed onto shaft. To remove bearings, use a wheel puller or press them off the shaft.

NOTE

When removing the inboard bearing (49), avoid damaging the separate grease shield (49A). This shield can be removed when bearing is removed from shaft.

18. If total disassembly is required, break connections to suction and discharge pipe and remove capscrews that hold support (21) to the pump base.

19. Secure casing and support assembly in a sling and move it away from the piping. Invert this assembly and set casing (1) on wood blocks so as not to mar the surface that mates with bracket (8). Remove support (21) by removing capscrews (15A) to complete disassembly.

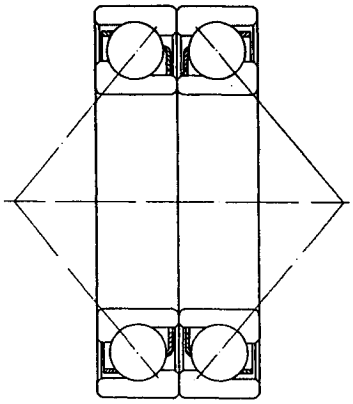
VORTEX PUMP 661A ON A 4C OR 5E POWER FRAME REASSEMBLY

1. Place support (21) in place and fasten to casing (1) with capscrews (15A).

2. Turn above sub-assembly over so it lies with suction facing down. Replace drain plugs (25) and rodding hole plug (26) in casing (1).

3. Hand pack the outboard bearing (50) with grease and pack the grease retainer (50A) cavity one half full. Slide the grease retainer onto the shaft. Press the outboard bearing onto the shaft until it hits the shoulder of the shaft. Make sure the outboard bearing set is properly matched back to back

configuration before pressing on shaft. Assemble snap ring (50C) onto the shaft with the beveled side outward to match the bevel in the shaft groove (power frame 4C only). For power frame 5E, assemble lockwasher (50C) and locknut (50D) onto the shaft threads and torque to 100 ft-lbs. Slide the bearing cap (51) over the bearing. Lock in the assembly with snap ring (50B) matching the snap ring bevel to the groove bevel.



Back-to-Back
Bearing Configuration

4. Hand pack the inboard bearing (49) and the recessed area of its grease shield (49A). Slide the grease shield onto the shaft with the raised lip toward the bearing. Press on the bearing.

5. Press or gently tap grease seal (52) into bearing cap (51). Place grease seal (53) into place on inboard end of power frame (56).

6. Lower sub-assembly from steps 3 through 5 into outboard end of power frame (56) which has been set on a bench with a hole in it to accomodate the shaft.

7. Position the jacking screws so that they extend past bearing cap as given below. This will position impeller hub end of the shaft in an axial position which will allow mounting impeller and closing down liquid end without any adjustment during intermediate assembly step. Final adjustment will have to be made by evenly tightening capscrews (60) (page 7, step 21).

	Gap Clearance	Bolt Extension
Power Frame #4C	1/8 in.	1/4 in.
Power Frame #5E	1/4 in.	9/16 in.

10. Place plug (57) and zerk (58) back in the bearing cap.

11. Place plug (62) and zerk (63) back on inboard end of power frame (56).

12. Retainer ring (37) can be set in its groove by turning it in a spiral motion up the shaft. When in position, outside diameter of ring should slope toward impeller end of shaft.

13. Position bracket (8) to power frame (56) and secure in place by evenly tightening capscrews (35).

14. The following procedure is used in assembling the sealing box:

A. Packing Box

I. Place two pieces of packing (40) into stuffing box cavity (27) being careful to get each piece firmly in place. Install lantern ring (41), then add remaining three pieces of packing. When packing is tightened, lantern ring should align with holes for plugs (29), flushing lines, or cooling lines.

NOTE

Be sure to stagger joints of packing rings to avoid excessive leakage.

II. Snap retainer ring (39) onto shaft sleeve (36) with a pair of truarc external snap ring pliers. Slide shaft sleeve carefully into inboard end of packing box.

III. Thread capscrews (45) into stuffing box (27) approximately ¼ in. Insert both halves of gland (44) into stuffing box (27). Insert gland clamps (44E) and tighten capscrews (45) to obtain proper sealing.

IV. Ensure capscrews (45) are tightened enough to hold assembled gland in place. Final adjustment of packing box will have to be made after pump is returned to operation.

When pump is running, gland capscrews (45) should be evenly turned down a flat at a time, allowing packing to work in until a leakage rate of approximately 60 to 120 drops per minute is obtained.

NOTE

Do not over tighten packing as this will cause packing box to over-heat and the shaft sleeve (36) to receive excessive wear.

V. Place gasket (38) in radial corner groove that is machined around inboard end of shaft sleeve to complete assembly.

B. Double Mechanical Seal

I. Press one stationary seat with o-ring gently into stuffing box body (27) and the other into gland plate (44).

II. Place gasket (46) in position in the gland register.

III. Snap retainer ring (39) onto sleeve (36) with a pair of truarc external pliers.

IV. Slide sleeve through the bottom of stuffing box and place one seal (47) over sleeve and slide it down to stationary seat. Place metal parts over the shaft sleeve and then second seal ring.

V. Position gland (44) over shaft sleve and fasten to seal box with capscrews (45).

NOTE

Do not put mechanical seal back into service until seal ring and stationary seat faces have been relapped or replaced.

15. Place gasket (32) in groove of bracket (8).

16. Place key (54) in its keyway on shaft. Slide stuffing box assembly onto shaft, so that, key and keyway in shaft sleeve mate. Continue to slide assembly forward until shaft sleeve is contact with retainer ring (37).

17. Align stuffing box (27) with gasket (32) and bracket (8). Fasten with capscrews (33).

18. Place impeller key (14) in keyway on tapered shank portion of shaft (48) and set impeller (2) in position. Put gasket (13) inside impeller suction eye with washer (12) next and o-ring gasket (11) last. Secure impeller in place with capscrew (10) according to chart below.

IMPELLER BOLT TORQUE

Power Frame	Impeller Bolt Size	Torque Value
4C	⅝ in.	75 FT-LBS.
5E	¾ in.	100 FT-LBS.

19. Attach support (22) to power frame (56) with capscrews (23) and washers (24). Remove eyebolt that has been used to handle power frame and rotating asembly and place a rope sling on assembly. Carefully lower assembly to a horizontal position.

20. Place a gasket (17) on bracket (8). Slide power frame and element into casing (1) and join them with capscrews (34).

21. Using jackscrews (60) and (61) located on bearing cap (51), adjust impeller axially up or down to gain proper impeller clearance. Turning hexagon head jackscrews one flat will axially move impeller approximately 0.008 inch. When this adjustment is completed, secure shaft in position by evenly tightening capscrews (59).

22. Make one last check to see that all parts of the rotating element turn freely.

23. Connect any flushing lines or cooling lines that were removed. Install spacer coupling in place between pump and motor.

24. Open all valves or flow devices that control flow of liquids to and from the pump.

25. Read carefully the section of this manual titled, Installation, especially those paragraphs referring to pump and coupling alignment.

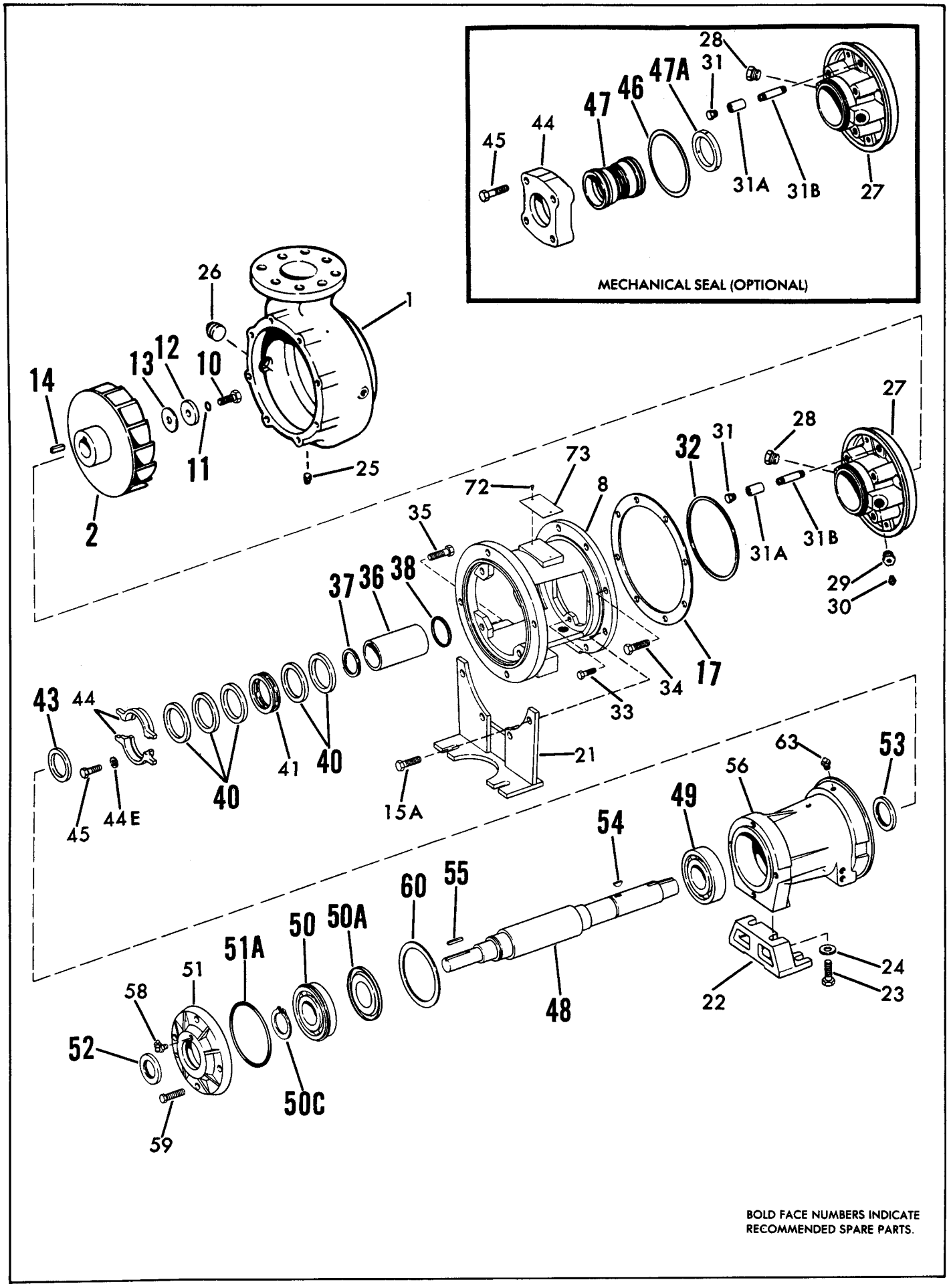
26. Connect power.

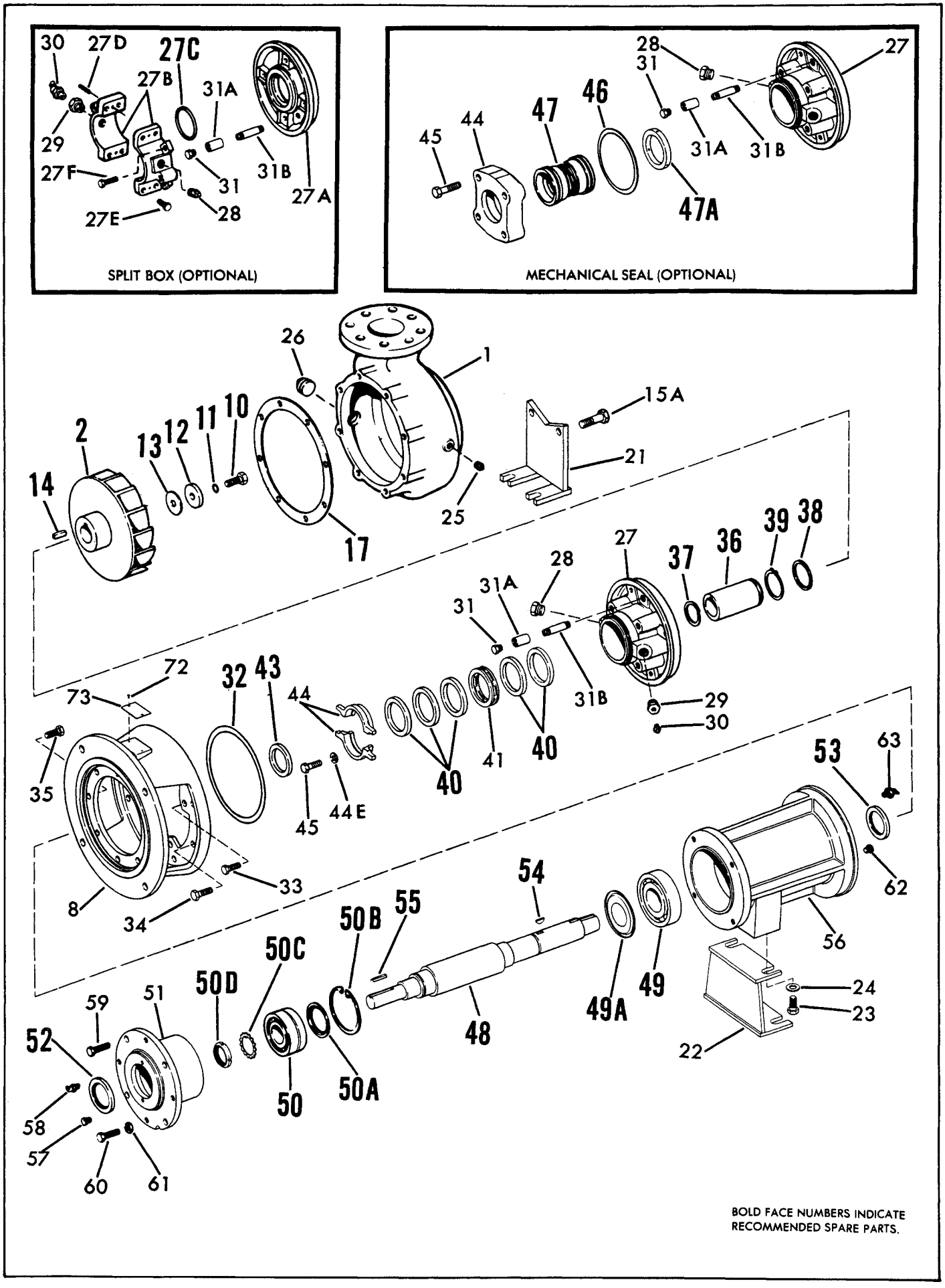
NOTE

Do not start up a pump until all air and vapor have been bled, making sure that there is liquid in the pump to provide necessary lubrication. It is possible that the mechanical seal may drip during first few minutes of operation.

Turn on power momentarily to check for proper rotation. Rotation should be clockwise as viewed from driver (see arrow on casing).

1. Casing
2. Impeller
8. Bracket
10. Imp. Bolt
11. Imp. Bolt Seal
12. Imp. Washer
13. Imp. Washer Gasket
14. Impeller Key
15A. Capscrew
17. Gasket
21. Pump Support
22. Pump Support
23. Capscrew
24. Washer
25. Pipe Plug
26. Pipe Plug
27. Stuffing Box
27A. Adapter Plate
27B. Split Packing Box
27C. Gasket
27D. Pin
27E. Capscrews
27F. Capscrews
28. Pipe Plug
29. Bushing
30. Fitting
31. Pipe Plug
31A. Pipe Coupling
31B. Nipple
32. Gasket
33. Capscrew
34. Capscrew
35. Capscrew
36. Sleeve
37. Retaining Ring
38. Gasket
39. Retaining Ring
40. Packing
41. Lantern Ring
43. Slinger
44. Gland
44E. Gland Clamp
45. Capscrew
46. Gasket
47. Mechanical Seal
48. Shaft
49. Inboard Bearing
49A. Grease Shield
50. Outboard Bearing
50A. Grease Shield
50B Retaining Ring
50C. Lockwasher or Retaining Ring
50D. Locknut
51. Bearing Cartridge
51A. O-Ring
52. Grease Seal
53. Grease Seal
54. Sleeve Key
55. Shaft Key
56. Power Frame
57. Pipe Plug
58. Grease Fitting
59. Capscrew
60. Capscrew or Shim Pack (P.F. 3C)
61. Jam Nut
62. Pipe Plug
63. Grease Fitting
72. Drive Pins
73. Name Plate


MECHANICAL SEAL (OPTIONAL)
BOLD FACE NUMBERS INDICATE
RECOMMENDED SPARE PARTS.



BOLD FACE NUMBERS INDICATE RECOMMENDED SPARE PARTS.

AURORA®
Pentair Pump Group

INSTRUCTION MANUAL
REPAIR
MODEL 662A

6

SERVICE

Your Aurora pump requires no maintenance other than periodic inspection, occasional cleaning and lubrication of bearings. The intent of inspection is to prevent breakdown, thus obtaining optimum service life. The liquid end of the pump is lubricated by the fluid being pumped and therefore does not require periodic lubrication. The motor, however may require lubrication, in which case, the motor manufacturer's recommendations should be followed.

LUBRICATION OF SHAFT BEARINGS

The 662A pump is supplied with regreasable shaft bearings as standard. The following lubricating instructions are for pumps on a 3C power frame. See page 4 for lubricating instructions for pumps on 4C and 5E power frames. Regreasable bearings will require periodic lubrication, which can be accomplished by using the lubrication fittings in the cartridge cap and power frame. Lubricate the bearings at regular intervals using a grease of high quality. Lithium base grease is recommended as a lubricant for pumps operating in both wet and dry locations. Mixing of different brands of grease should be avoided due to possible chemical reactions between the brands which could damage the bearings. Avoid vegetable- or animal-base greases, which can develop acids, as well as grease containing rosin, graphite, talc and other impurities. Under no circumstances should used grease be reused.

Over lubrication should be avoided as it may result in overheating and possible bearing failure. Under normal application, adequate lubrication is assured if the amount of grease is maintained at 1/3 to 1/2 the capacity of the bearing and adjacent space surrounding it.

In dry locations, each bearing will need lubrication at least every 600 hours of running time or every 6 to 12 months, whichever is more frequent. In wet locations the bearings should be lubricated at least every 300 hours of running time or every 4 to 6 months, whichever is more frequent. A unit is considered to be installed in a wet location if the pump and motor are exposed to dripping water, to the weather, or to heavy condensation such as is found in unheated and poorly ventilated underground locations.

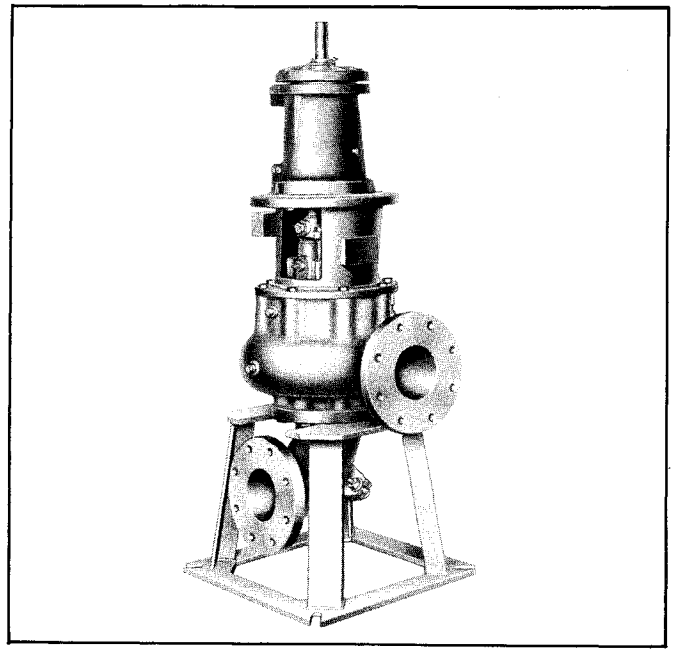
At times it may be necessary to clean the bearings due to accumulated dirt or deteriorated lubricants. This can be accomplished by flushing the bearing with a light oil heated to 180 to 200°F. While rotating it on a spindle, wipe the bearing housing with a clean rag soaked in a cleaning solvent and flush all surfaces.

Dry bearing thoroughly before relubricating. Compressed air can be used for speed drying, but care should be taken not to let bearings rotate while being dried.

CAUTION

Use normal fire caution procedures when using any petroleum cleaner.

The motor that drives your Aurora pump may or may not require lubrication. Consult the manufacturer's recommendations for proper maintenance instructions.



REPAIRS

The pump may be disassembled using the illustrations and text provided. Although complete disassembly is covered, it will seldom be necessary to completely disassemble your Aurora pump.

The illustration accompanying the disassembly instructions show an exploded view of the pump. The illustration is intended to aid in the correct identification of the parts mentioned in the text.

Inspect removed parts at disassembly to determine their reusability. Cracked castings should never be reused. Gaskets should be replaced at reassembly simply as a matter of

economy; they are much less expensive to replace routinely than to replace as the need occurs. In general it is economical to return the motor and motor controller to the manufacturer for repair.

VORTEX PUMP 662A ON A 3C POWER FRAME DISASSEMBLY

This pump has been designed with back pull-out features which allow the power frame and rotating element or close coupled motor to be removed without disturbing the suction and discharge piping.

Disassemble only that which is needed to make repairs or accomplish inspection.

1. Disconnect electrical connections to prevent drive unit from being energized during disassembly.

2. Close all valves or flow devices that control movement of liquids to or from pump. Remove drain plug or suction gauge (70) from base elbow (65).

3. Remove all relief, cooling, flushing or drain lines from pump. Break suction and discharge connections unless the intent is to remove the power frame assembly and leave the casing (1) in the line.

4. For Model 662A pumps, disconnect flexible shafting from pump. This may be accomplished by removing capscrews from flanged point adjacent to universal joint. It is recommended that flexible shafting be swung out of the way to allow removal of power frame and rotating element.

5. Remove capscrews (34) that secure bracket (8) to casing (1). Screw an eyebolt into outboard end of shaft (48) to aid in lifing power frame and rotating element from casing. Remove gasket (17) from its position between bracket (8) and casing (1). Once power frame and rotating element have been withdrawn, inspect the sealing surface to insure that it is clean and free of any gasket material which has stuck to parting surfaces. Replace this gasket with a new one when pump is reassembled.

6. Unscrew impeller screw (10) and o-ring (11) remove washer (12) taking care not to damage gasket (13).

NOTE

The vortex pumps have a tapered end impeller fit-up to facilitate impeller removal. Use caution in the removal of impeller as it has to be moved only a few thousandths of an inch to become entirely free.

7. Slide impeller (2) and impeller key (14) from the shaft, again taking care not to damage gasket (38) located behind impeller. Remove gasket (38).

8. The various types of stuffing boxes may be disassembled as follows:

PACKING WITH LANTERN RING (STANDARD)

A. Remove capscrews (44A and 45) and split accumulator gland halves (44). Remove o-ring gasket (42) and slinger (43) from stuffing box. The accumulator gland may be further disassembled by removing hose connector (44B), tubing (44C) and pipe plugs (44D).

Remove and discard old packing (40). Clean all parts to remove any packing that may have adhered.

C. Unscrew capscrews (33) and remove stuffing box (27) from bracket (8). The throat of adapter plate or stuffing box should be checked for excessive wear. Remove gasket (32).

D. Shaft sleeve (36) is a slip fit on the shaft and should be easily removed unless the pump has been in service for a long time. In this case it may be necessary to use a puller. A snap ring may be installed in the sleeve (36) groove to ease disassembly. Take care to prevent damaging the surface of the sleeve. Replace the sleeve if it is grooved from wear. Remove key (54) and retaining ring (37) from shaft.

DOUBLE MECHANICAL SEAL (OPTIONAL)

CAUTION

The mechanical seal is a precision product and must be treated as such. During removal great care must be taken to avoid dropping any part of the seal. Take particular care not to scratch the lapped faces on the washer or the sealing seat. Do not put a seal back into service until the sealing faces of the washer and seat have been lapped or replaced.

A. Remove seal gland bolts (45) and remove gland (44) carefully exposing seal (47).

B. Unscrew capscrews (33) and remove stuffing box assembly (27). Remove gasket (32).

C. Slide sleeve (36) with rotating parts of mechanical seal (47) from the shaft. Remove ceramic seal rings and stainless steel parts from sleeve with great care as ceramic parts are easily damaged.

The sleeve should be carefully cleaned to remove any residue that may be remaining in the seal area. The rubber in the seal may have become partially adhered to the sleeve. The sleeve must also be checked for abrasion or corrosion that can occur when fluid residue penetrates between the seal (47) and sleeve (36). The sleeve under the seal may be polished lightly to a 32 RMS finish before reassembly. Do not reuse a pitted sleeve. Remove retaining ring (37) and key (54).

D. Remove stationary seat and o-rings from gland (44) and stuffing box (27), using care not to damage these parts.

9. Remove capscrews (66) only if casing needs to be removed from vertical support.

10. Unscrew capscrews (35) to remove bracket (8) from power frame (56).

11. Remove key (55) from the shaft (48).

12. Unscrew capscrews (59) and remove bearing cap (51). Remove gasket (51A) and retaining ring (50C).

13. Slide out shaft (48) and bearings (49 and 50). Remove shim (60). Since bearings (49 and 50) are press fitted on the shaft, they will have to pulled or pressed off the shaft.

Remove grease seals (52 and 53) from power frame (56) and bearing cap (51).

14. Remove screws (72) and nameplate (73) only if replacement is necessary.

15. Elbow (65) and casing (1) may be removed from base (21) by removing capscrews (66B) with washers (66A), and capscrews (66). Handhole cover (68) is removed by unscrewing capscrews (69), nuts (66A) and washers (69B). Gaskets (64) and (67) should be replaced if these parts are removed.

POWER FRAME 3C
REASSEMBLY

Reassembly will generally be in reverse order of disassembly. If disassembly was not complete, use only those steps related to your particular repair program.

1. Press grease seals (52 and 53) into power frame (56) and bearing cap (51).

2. Press bearings (50 and 49) onto shaft (48). Snap retaining ring (50C) into place.

3. Slide shaft (48) and bearings (50 and 49) into frame (56). Do not install gasket (51A), shim (60), or bearing cap (51) at this point.

4. Position key (54) in shaft (48).

5. Position bracket (8) on the frame (56) and secure with capscrews (35). Tighten capscrews evenly to assure proper alignment.

6. If nameplate (73) was removed, install and attach with screws (72).

7. Reassemble the various types of stuffing boxes as follows.

PACKING WITH LANTERN RING (STANDARD)

A. Place gasket (32) on stuffing box (27), slide over shaft and secure to bracket (8) with capscrews (33).

B. Install retaining ring (37), place key (54) in shaft and slide sleeve (36) over shaft. Packing (40) and lantern ring (41) may be replaced at this time. From impeller end of shaft, place two new rings of packing (40) around shaft sleeve, slide lantern ring (41) back in position and place remaining three rings of packing on shaft sleeve. Be sure to stagger joints of packing rings to avoid excessive leakage through the packing.

C. Place o-ring gasket (42) in stuffing box on top ring of packing (40). Be sure o-ring remains concentric against inside diameter of stuffing box. Replace pipe plugs (44D), hose connector (44B), and tubing (44C) in leakage accumulator glands (44). Place one half of leakage accumulator gland in stuffing box with connection for hose to drain positioned properly. Apply General Electric* Silicon Rubber Sealant on both ends of this gland half. Thread capscrews (45) into stuffing box (27) approximately ¼ in. Slide slinger (43) over shaft and position inside leakage accumulator gland (44) place each half of gland (44) in stuffing box being careful not to disturb o-ring gasket (42). Insert capscrews (44A) into each side of gland (44) to hold the two halves together. Tighten capscrews (44A) before tightening packing adjusting capscrews (45) to obtain proper sealing. Ensure capscrews (45) are tightened enough to hold parts in place. Final adjustment of packing box will have to be made after pump is returned to operation. When pump is running, gland capscrews (45) should be evenly turned down a flat at a time, allowing packing to work in until a leakage rate of approximately 60 to 120 drops per minute is obtained.

NOTE

Do not over tighten packing as this will cause packing box to over-heat and the shaft sleeve to receive excessive wear.

DOUBLE MECHANICAL SEAL (OPTIONAL)

NOTE

The mechanical seal (47) cannot be installed as an assembly. It is necessary to have the seal seats properly in place before the balance of parts can be added.

A. Install retaining ring (37) and key (54) in shaft.

B. Wipe the sealing faces of the seat and seal washer clean. Lubricate the shaft sleeve (36) with a silicone-base lubricant. Slide the entire rotating assembly onto the sleeve.

C. Thoroughly inspect the seal box cavity checking for burrs or nicks which could damage the seat of the seal. Apply a film of liquid dishwashing detergent or rubber lubricant (do not use oil or grease) to the seal seats. Replace stationary seat and o-rings in gland (44) and stuffing box (27).

NOTE

If it is not possible to insert seat with fingers, place cardboard protecting ring furnished with seal over lapped face of seat and press into place with a piece of tubing having an end cut square. The tubing should be slightly larger than the diameter of the shaft. Remove cardboard after seat is firmly in place. Carefully slip the stuffing box assembly (27) over the shaft with the stationary seat facing away from the motor. Install gasket (46) into gland (44). Apply a film of liquid dishwashing detergent or rubber lubricant to the washer and bellows of the seal, and slide the remaining seal parts onto the sleeve, making sure the washer is seated against the seal seat.

D. The shaft sleeve (36) with the seal rotating assembly on it may now be replaced on the shaft. The shaft sleeve (36) should slide over shaft with keyway for key (54) toward power frame (56).

E. Replace gasket (32) on bracket (8) and carefully slip stuffing box (27), with stationary seal seat toward power frame (56), over the shaft, and secure with capscrews (33).

F. Position gland (44) onto stuffing box (27), taking care to seat it evently and squarely. Secure by tightening capscrews (45) evenly, being careful not damage gasket (46) between them.

8. Carefully place o-ring gasket (38) on shaft sleeve (36). Assemble key (14) and impeller (2) to shaft.

9. Secure impeller with gasket (13), washer (12), impeller screw o-ring (11) and ;impeller screw (10).

LAMINATED SHIM IMPELLER ADJUSTMENT

10. Push the shaft and impeller assembly completely forward until the snap ring and outboard bearings contacts the power frame. With a feeler gauge measure the clearance between the impeller wiper vanes and the stuffing box. This measurement minus the recommended clearance of .020 in. will give the total required shim thickness. Example: With the shaft and impeller assembly completely forward there is .040 in. of clearance between wiper vanes and stuffing box. Subract the recommended clearance of .020 in. and .020 in. remains. This is the required shim thickness needed. Remove snap ring on outer race of outboard bearing (50) and install proper shim (60). Replace snap ring (50C).

11. Install the pipe plugs (25 and 26) in the pump casing (1). Position gasket (17) and casing (1) against the bracket (8) and secure with capscrews (34).

12. Install gasket (51A) and fasten bearing cap (51) in position with capscrews (59). Position key (55) on shaft.

13. Replace handhole cover (68) on elbow (65) using gasket (67), capscrews (69), nuts (69A) and washers (69B). Elbow (65) and gasket (67) are secured to casing (1) with capscrews (66B). Completed pump assembly is secured to base (21) using capscrews (66). Replace pipe plug or suction gauge (70) in elbow (65).

14. Replace all relief, cooling, flushings or drain lines from the pump.

15. Secure suction and discharge piping to the pump. Make sure to install gaskets on flanged connections. Also connect flexible shafting. Ideal joint operating angle is 1° to 5°.

16. Connect electricity to the motor.

17. Open all valves or flow devices that control flow of liquids to and from pump.

STARTING PUMP AFTER REASSEMBLY

Do not start pump until all air and vapor has been bled making sure that there is liquid in the pump to provide the necessary lubrication. Without the fluid around it, a seal may be ruined in a few seconds of operation. It is possible that the mechanical seal may drip during the first few minutes to one hour of operation.

Packing should be adjusted as previously discussed in this manual.

POWER FRAME 4C OR 5E
DISASSEMBLY

LUBRICATION OF BEARINGS

At the time of initial startup it is important to note that the pump bearings have been factory lubricated. Do not add additional lubrication until completion of initial break-in period which is first 10 hours of continuous operation, or equivalent intermittent operation. After break-in period while unit is operating, add fresh grease (American Oil Company's Rykon #2 or equivalent) through zerk fitting near bearings.

In dry locations, each bearing will need lubrication at least every 2,000 hours of running time or every 6 to 12 months, whichever is more frequent. In wet locations the bearings should be lubricated at least every 1,000 hours of running time or every 4 to 6 months, whichever is more frequent. A unit is considered to be installed in a wet location if the pump and motor are exposed to dripping water, to the weather, or to heavy condensation such as is found in unheated and poorly ventilated underground locations.

The 5E bearing frame has back to back angular contact bearings as the outboard thrust bearing (50). This style bearing requires more frequent lubrication intervals. It is suggested that this bearing be lubricated every 1000 hours of running time in dry locations, and every 500 hours in wet locations.

At times it may be necessary to clean the bearings due to accumulated dirt or deteriorated lubricants. This can be accomplished by flushing the bearing with a light oil heated to 180 to 200°F. While rotating it on a spindle, wipe the bearing housing with a clean rag soaked in a cleaning solvent, and flush all surfaces.

Dry bearing thoroughly before relubricating. Compressed air can be used for speed drying, but care should be taken not to let bearings rotate while being dried.

CAUTION

Use normal fire caution procedures when using any petroleum cleaner.

1. Break electrical connections to prevent drive unit from being energized during disassembly.

2. Close all valves or flow devices that control movement of liquids to or from pump.

Remove pipe plug (70) from base elbow (65).

3. Remove all relief, cooling, flushings or drain lines from the pump.

4. Disconnect flexible shafting from pump. This may be accomplished by removing capscrews from flanged point adjacent to universal joint. It is recommended that flexible shafting be swung out of the way to allow removal of power frame and rotating element.

5. Remove capscrew (34) that secures bracket (8) to casing (1). Screw an eyebolt into outboard end of shaft (48) to aid in lifting power frame and rotating element from casing. The size of eyebolt is as follows:

a. Power frame 4C requires a 5/8-11 NC eyebolt.

b. Power frame 5E requires a 3/4-10 NC eyebolt.

6. Remove gasket (17) from its position between bracket (8) and casing (1). Once power frame and rotating element has been withdrawn, inspect sealing surface to insure that they are

clean and free of any gasket material which has struck to parting surfaces. Replace gasket with a new one when pump is reassembled.

7. Remove impeller capscrew (10), gasket (11), washer (12) and gasket (13) which allows impeller (2), key (14) and gasket (38) to be removed.

NOTE

The vortex pumps have a tapered hub impeller to facilitate impeller removal. Use caution in the removal of impeller as it has to be removed only a few thousandths of an inch to become entirely free.

The easiest method for removing the impeller is to suspend entire power frame and rotating element by an eyebolt (see step 5 above) about 1/32 of an inch above floor work area. Apply pressure to the impeller by means of jackscrews (60 and 61) (located on the bearing cap (51). When impeller is firmly against adapter (27) it should drop free after turning jackscrews evenly, a flat at a time, three or four flats.

8. When the power frame assembly is clear of impeller, place it on its side. At this point, either of the sealing box arrangements can be removed as a complete assembly by unscrewing capscrews (33). Slide complete assembly including shaft sleeve (36) off shaft (48) with the aid of a pinch bar or other lever. Remove gasket (32).

NOTE

The shaft sleeve incorporates a snap ring designed to interfere with the base of the seal box assembly. Therefore, when removing seal box the shaft sleeve is also removed.

For further disassembly of sealing box, proceed as follows:

A. Packing Box (Standard)

I. Remove capscrews (45), and split accumulator gland halves (44). Slinger (43) is now exposed and can be removed from shaft sleeve. Remove o-ring gasket (42) from stuffing box. The accumulator gland may be further disassembled by removing capscrews (44A), hose connector (44B), tubing (44C) and pipe plugs (44D).

Remove and discard old packing (40). Clean all parts to remove any packing that may have adhered during removal.

B. Double Mechanical Seal (Optional)

I. Remove seal gland bolts (45) and remove gland (44), exposing mechanical seal (47).

II. Use great care in removing ceramic seal rings and stainless steel metal parts from sealing box as ceramic parts are easily chipped or cracked.

III. Remove the carbon stationary seats and o-rings only if necessary, using care not to damage these parts.

9. Now set power frame on two benches, so that its shaft rests between them or on a bench with a hole cut in it large enough for shaft.

10. Remove grease zerk (63) and pipe plug (62) from inboard end of power frame. Remove retainer ring (37) by twisting it in a spiral movement toward end of shaft. Remove grease seal (53).

11. Unscrew capscrews (35) to remove bracket (8) from power frame (56). Lift the stuffing box away from power frame and shaft.

12. Unscrew capscrews (59) and lift out shaft (48) with bearings from the power frame.

13. Remove coupling half and key (55) from the shaft. Remove plug (57) and zerk fitting (58).

14. Retainer ring (50B) is removed with a pair of truarc internal pliers so that grease retainer (50A) can be removed allowing bearing cap (51) to be removed from shaft assembly. Grease seal (52) may be removed if necessary.

15. With a pair of truarc external pliers, remove snap ring (50C) (PF#4 only), or remove locknut (50D) and lockwasher (50C) on power frame #5.

16. Both inboard bearing (49) and outboard bearing (50) are pressed onto shaft. To remove bearings, use a wheel puller or press them off the shaft.

17. If total disassembly is required, break connections to suction and discharge pipe and remove nuts from foundation bolts that hold support (21) to its foundation.

18. Secure casing and support assembly in a sling and move it away from the piping. Invert this assembly and set casing (1) on wood blocks so as not to mar the surface that mates with bracket (8).

19. Elbow (65) and casing (1) may be removed from base (21) by removing capscrews (66) and capscrews (15). Hand hole cover (68) is removed by unscrewing capscrews (69). Gaskets (67) and (64) should be replaced if these parts are removed.

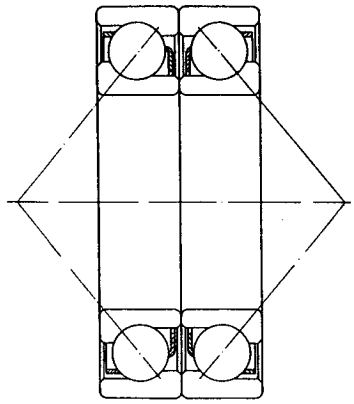
POWER FRAME 4C OR 5E
REASSEMBLY

1. Place support (21) in place and fasten to casing (1) with capscrews (15). Tighten capscrews evenly to insure perfect register of mating parts.

2. Turn above sub-assembly over so it lies with suction facing down. Replace drain plugs (25) and rodding hole plug (26) in casing (1). Replace elbow (65) with gasket (67) on casing (1) using capscrews (66). Replace drain plug (70) in elbow. If handhole cover (68) was removed during disassembly, replace using new gasket (67) with capscrews (69).

3. Hand pack the outboard bearing (50) with grease and pack the grease retainer (50A) cavity one half full. Slide the grease retainer onto the shaft. Press the outboard bearing onto the shaft until it hits the shoulder of the shaft. Make sure the outboard bearing set is properly matched back to back

configuration. Assemble snap ring (50C) onto the shaft with the beveled side outward to match the bevel in the shaft groove (Power Frame 4C only). For power frame 5E, assemble lockwasher (50C) and locknut (50D) onto the shaft threads and torque to 100 ft-lbs. Slide the bearing cap (51) over the bearing. Lock in the assembly with snap ring (50B) matching the snap ring bevel to the groove bevel.



Back-to-Back
Bearing Configuration

4. Hand pack the inboard bearing (49) and the recessed area of its grease shield (49A). Slide the grease shield onto the shaft with the raised lip toward the bearing. Press on the bearing.

5. Press or gently tap grease seal (52) into bearing cap (51). Place grease seal (53) into place on inboard end of power frame (56).

6. Lower sub-assembly from steps 3 through 5 into outboard end of power frame (56) which has been set on a bench with a hole in it to accomodate the shaft.

7. Position the jacking screws so that they extend past bearing cap as given below. This will position impeller hub end of the shaft in an axial position which will allow mounting impeller and closing down liquid end without any adjustment during intermediate assembly step. Final adjustment will have to be made by evenly tightening capscrews (60) (page 7, step 18).

	Gap Clearance	Bolt Extension
Power Frame #4C	1/8 in.	1/4 in.
Power Frame #5E	1/4 in.	9/16 in.

8. Place plug (57) and zerk (58) back in the bearing cap.

9. Place plug (62) and zerk (63) back on inboard end of power frame (56).

10. Retainer ring (37) can be set in its groove by turning it in a spiral motion up the shaft. When in position, outside diameter of ring should slope toward impeller end of shaft.

11. Position bracket (8) to power frame (56) and secure in place by evenly tightening capscrews (35).

12. The following procedure is used in assembling the sealing box:

A. Packing Box (Standard)

I. Place two pieces of packing (40) into stuffing box cavity (27) being careful to get each piece firmly in place. Install lantern ring (41), then add remaining three pieces of packing. When packing is tightened lantern ring should align with holes for plugs (29), flushing lines, or cooling lines.

NOTE

Be sure to stagger joints of packing rings to avoid excessive leakage.

II. Snap retainer ring (39) onto shaft sleeve (36) with a pair of truarc external snap ring pliers. Slide shaft sleeve carefully into inboard end of packing box.

III. Place o-ring gasket (42) in stuffing box (27) on top ring of packing (40). Be sure o-ring remains concentric against inside diameter of the stuffing box. Slide slinger (43) over shaft extension and adjust to ¼ in. below top of leakage accumulator after stuffing box assembly has been reattached to bracket. Replace pipe plugs (44D), hose connector (44B) and tubing (44C) in leakage accumulator glands (44). Place one half of leakage accumulator gland in stuffing box with connection for hose to drain positioned properly. Apply General Electric* Silicon Rubber Sealant (75) on both ends of this gland half. Thread capscrews (45) into stuffing box (27) approximately ¼ in. Insert other half of gland (44) in stuffing box being careful not to disturb o-ring gasket (42). Insert capscrews (44A) into each side of gland (44) to hold the two halves together. Tighten packing adjusting capscrews (45) to obtain proper sealing.

IV. Ensure capscrews (45) are tightened enough to hold assembled gland in place. Final adjustment of packing box will have to be made after pump is returned to operation.

When pump is running, gland capscrews (45) should be evenly turned down a flat at a time, allowing packing to work in until a leakage rate of approximately 60 to 120 drops per minute is obtained.

NOTE

Do not over tighten packing as this will cause packing box to over-heat and the shaft sleeve (36) to receive excessive wear.

V. Place gasket (38) in radial corner groove that is machined around inboard end of shaft sleeve to complete assembly.

B. Double Mechanical Seal (Optional)

I. Press one stationary seat with o-ring gently into box body (27) and the other into gland plate (44).

II. Place gasket (46) in position in the gland register.

III. Snap retainer ring (39) onto sleeve (36) with a pair of truarc external pliers.

IV. Slide sleeve through the bottom of stuffing box and place one seal (47) over sleeve and slide it down to stationary seat. Place metal parts over the shaft sleeve and then second seal ring.

V. Position gland over shaft sleeve and fasten to seal box with capscrews (45).

NOTE

Do not put mechanical seal back into service until seal ring and stationary seat faces have been relapped or replaced.

13. Place gasket (32) in groove of bracket (8).

14. Place key (54) in its keyway on shaft. Slide stuffing box onto shaft, so that, key and keyway in shaft sleeve mate. Continue to slide assembly forward until shaft sleeve is in with retainer ring (37).

15. Align stuffing box (27) with gasket (32) and bracket (8). Fasten with capscrews (33).

16. Place impeller key (14) in keyway on tapered shank portion of shaft (48) and set impeller (2) in position. Put gasket (13) inside impeller suction eye with washer (12) next and gasket (11) last. Secure in place with capscrew (10) according to chart below.

IMPELLER BOLT TORQUE

Power Frame	Impeller Bolt Size	Torque Value
4C	⅝ in.	75 FT-LBS.
5E	¾ in.	100 FT-LBS.

17. Place a gasket (17) on bracket (8). Slide power frame and element into casing (1) and join them with capscrews (34).

18. Using jackscrews (60) and (61) located on bearing cap (51), adjust impeller axially up or down to gain proper impeller clearance. Turning hexagon head jackscrews one flat will axially move impeller approximately 0.008 inch. When this adjustment is completed secure shaft in position by evenly tightening capscrews (59).

19. Make one last check to see that all parts of the rotating element turn freely.

20. Remove the lifting eye, replace key (55) and secure the flexible shafting in place. Ideal joint operating angle is 1° to 5°.

21. Connect any flushing lines or cooling lines that were removed. Install spacer coupling in place between pump and motor.

22. Open all valves or flow devices that control flow of liquids to and from the pump.

23. Connect power.

NOTE

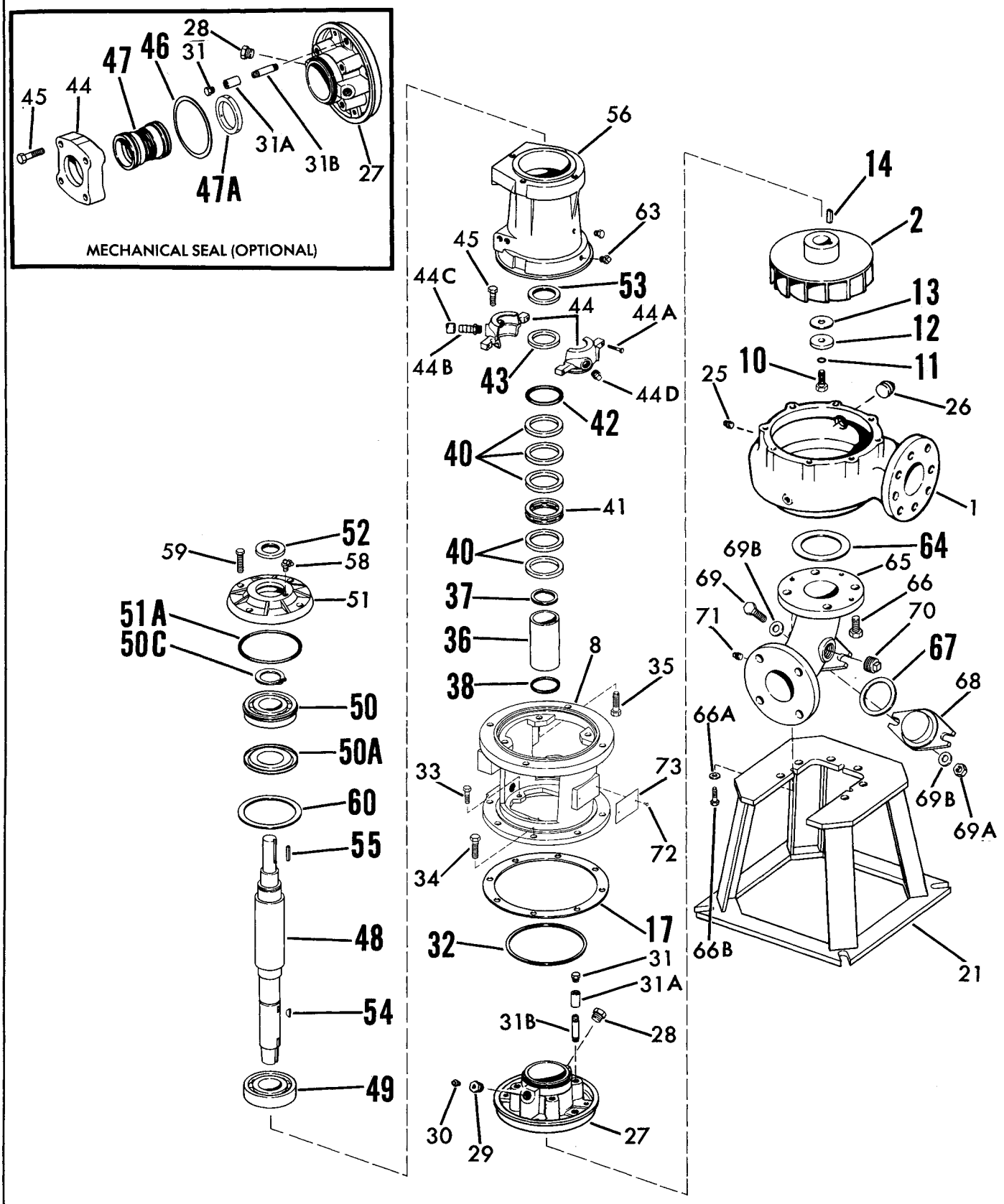
Do not start up a pump until all air and vapor have been bled, making sure that there is liquid in the pump to provide necessary lubrication. It is possible that the mechanical seal may drip during first few minutes of operation.

Turn on power momentarily to check for proper rotation. Rotation should be clockwise as viewed from driver (see arrow on casing).

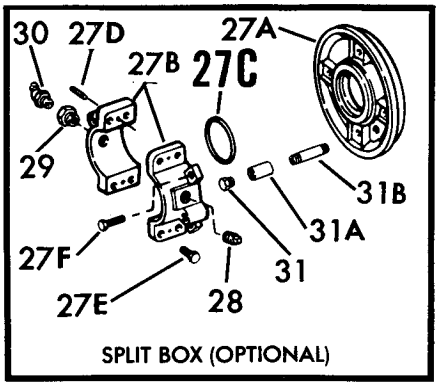
*General Electric is a registered trademark of General Electric Corporation.

MODEL 662A LIST OF PARTS

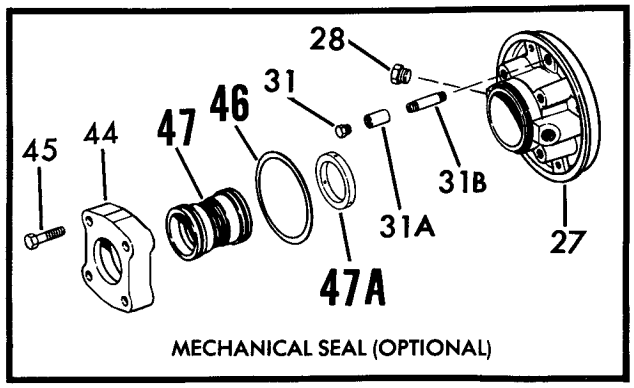
1. Casing
2. Impeller
8. Bracket
10. Imp. Bolt
11. Imp. Bolt Seal
12. Imp. Washer
13. Imp. Washer Gasket
14. Impeller Key
15. Capscrew
17. Gasket
21. Pump Support
25. Pipe Plug
26. Pipe Plug
27. Stuffing Box
27A. Adapter Plate
27B. Split Packing Box
27C. Gasket
27D. Pin
27E. Capscrews
27F. Capscrews
28. Pipe Plug
29. Bushing
30. Fitting
31. Pipe Plug
31A. Pipe Coupling
31B. Nipple
32. Gasket
33. Capscrew
34. Capscrew
35. Capscrew
36. Sleeve
37. Retaining Ring
38. Gasket
39. Retaining Ring
40. Packing
41. Lantern Ring
42. O-Ring
43. Slinger
44. Gland
44A. Capscrew
44B. Hose Connector
44C. Hose
44D. Pipe Plug
45. Capscrew
46. Gasket
47. Mechanical Seal
48. Shaft
49. Inboard Bearing
49A. Grease Shield
50. Outboard Bearing
50A. Grease Shield
50B Retaining Ring
50C. Lockwasher or Retaining Ring
50D. Locknut
51. Bearing Cartridge
51A. O-Ring
52. Grease Seal
53. Grease Seal
54. Sleeve Key
55. Shaft Key
56. Power Frame
57. Pipe Plug
58. Grease Fitting
59. Capscrew
60. Capscrew or Shim Pack (P.F. 3)
61. Jam Nut
62. Pipe Plug
63. Grease Fitting
64. Gasket
65. Suction Elboe
66. Capscrew
67. Gasket
68. Handhole Cover
69. Capscrew
69A. Nut
69B. Washer
70. Pipe Plug
71. Pipe plug or suction gauge
72. Drive Pins
73. Name Plate



BOLD FACE NUMBERS INDICATE RECOMMENDED SPARE PARTS.

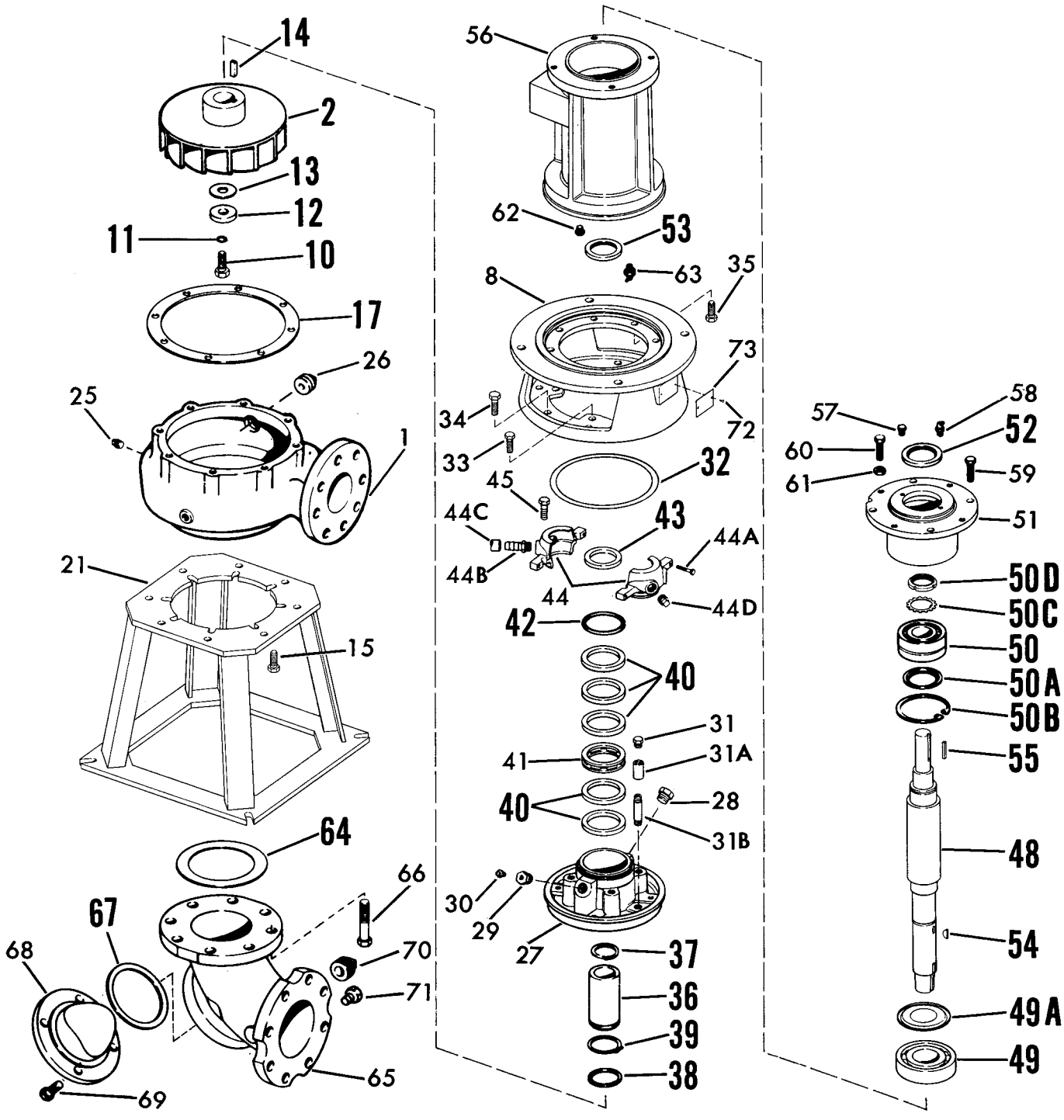


SPLIT BOX (OPTIONAL)



MECHANICAL SEAL (OPTIONAL)

BOLD FACE NUMBERS INDICATE
RECOMMENDED SPARE PARTS.



AURORA®
Pentair Pump Group

INSTRUCTION MANUAL
REPAIR
MODEL 663A

6

SERVICE

Your Aurora pump requires no maintenance other than periodic inspection, occasional cleaning and lubrication of bearings. The intent of inspection is to prevent breakdown, thus obtaining optimum service life. The liquid end of the pump is lubricated by the fluid being pumped and therefore does not require periodic lubrication. The motor, however, may require lubrication, in which case, the motor manufacturer's recommendation should be followed.

LUBRICATION OF SHAFT BEARINGS

The 663A pump is available with regreasable shaft bearings as standard. The following lubricating instructions are for pumps on a 3C power frame. See page 4 for lubricating instructions for pumps on 4C and 5E power frames. Regreasable bearings will require periodic lubrication and can be accomplished by using the zerk or lubrication fittings in the cartridge cap and power frame. Lubricate the bearings at regular intervals using a grease of high quality. Lithium-base grease is recommended as a lubricant for pumps operating in both wet and dry locations. Mixing of different brands of grease should be avoided due to possible chemical reactions between the brands, which could damage the bearings. Avoid using grease with a vegetable- or animal-base, which can develop acids, as well as grease containing rosin, graphite, talc and other impurities. Under no circumstances should used grease be reused.

Over lubrication should be avoided as it may result in overheating and possible bearing failure. Under normal application, adequate lubrication is assured if the amount of grease is maintained at 1/3 to 1/2 the capacity of the bearing and adjacent space surrounding it.

In dry locations, each bearing will need lubrication at least every 600 hours of running time or every 6 to 12 months, whichever is more frequent. In wet locations the bearings should be lubricated at least every 300 hours of running time or every 4 to 6 months, whichever is more frequent. A unit is considered to be installed in a wet location if the pump and motor are exposed to dripping water, to the weather, or to heavy condensation such as is found in unheated and poorly ventilated underground locations.

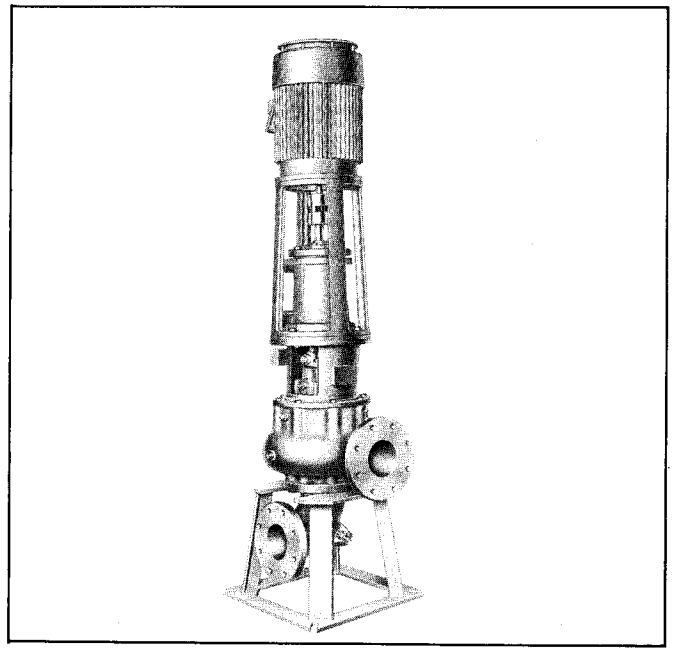
At times it may be necessary to clean the bearings due to accumulated dirt or deteriorated lubricants. This can be accomplished by flushing the bearing with a light oil heated to 180 to 200°. While rotating it on a spindle, wipe the bearing housing with a clean rag soaked in a cleaning solvent and flush all surfaces.

Dry bearing thoroughly before relubricating. Compressed air can be used for speed drying, but care should be taken not to let bearings rotate while being dried.

CAUTION

Use normal fire caution procedures when using any petroleum cleaner.

The motor which drives your Aurora pump may or may not require lubrication. Consult the manufacturer's recommendations for proper maintenance instructions.



REPAIRS

The pump may be disassembled using the illustrations and text provided. Although complete disassembly is covered, it will seldom be necessary to completely disassemble your Aurora pump.

The illustration accompanying the disassembly instructions show an exploded view of the pump. The illustration is intended to aid in the correct identification of the parts mentioned in the text.

Inspect removed parts at disassembly to determine their reusability. Cracked castings should never be reused. Gaskets should be replaced at reassembly simply as a matter of

economy; they are much less expensive to replace routinely than to replace as the need occurs. In general it is economical to return the motor and motor controller to the manufacturer for repair.

VORTEX PUMP 663A ON A 3C POWER FRAME DISASSEMBLY

This pump has been designed with back pull-out features, which allow the power frame and rotating element or close coupled motor to be removed without disturbing the suction and discharge piping.

Disassemble only that which is needed to make repairs or accomplish inspection.

1. Disconnect electrical connections to prevent drive unit from being energized during disassembly.

2. Close all valves or flow devices that control movement of liquids to or from pump. Remove drain plug or suction gauge (70) from suction elbow (65).

3. Remove all relief, cooling, flushing or drain lines from pump. Break suction and discharge connections unless the intent is to remove the power frame assembly and leave the casing (1) in the line.

4. Remove capscrews (23) and nuts (24) from bracket (8), which allow motor, motor support (22), and flexible coupling to be lifted off at this point, to allow removal of power frame and rotating element. On some sizes, adapter (22A) is required and can be removed from motor with capscrews. The motor can be removed from motor support (22) by unscrewing capscrews (22B).

5. Remove capscrews (34) that secure bracket (8) to casing (1). Screw an eyebolt into outboard end of shaft (48). To aid in lifting power frame and rotating element from casing. Remove gasket (17) from its position between bracket (8) and casing (1) once power frame and rotating element have been withdrawn, inspect the sealing surface to insure that it is clean and free of any gasket material which has stuck to parting surfaces. Replace this gasket with a new one when pump is reassembled.

6. Unscrew impeller screw (10) and o-ring (11) remove washer (12) taking care not to damage gasket (13).

NOTE

The vortex pumps have a tapered end impeller fit-up to facilitate impeller removal. Use caution in the removal of impeller as it has to be moved only a few thousandths of an inch to become entirely free.

7. Slide impeller (2) and impeller key (14) from the shaft, again taking care not to damage gasket (38) located behind impeller. Remove gasket (38).

8. The various types of stuffing boxes may be disassembled as follows:

PACKING WITH LANTERN RING (STANDARD)

A. Remove capscrews (44A and 45) and split accumulator gland halves (44). Remove o-ring gasket (42) and slinger (43) from stuffing box. The accumulator gland may be further disassembled by removing hose connector (44B), tubing (44C) and pipe plugs (44D).

Remove and discard old packing (40). Clean all parts to remove any packing that may have adhered.

C. Unscrew capscrews (33) and remove stuffing box (27) from bracket (8). The throat of adapter plate or stuffing box should be checked for excessive wear. Remove gasket (32).

D. Shaft sleeve (36) is a slip fit on the shaft and should be easily removed unless the pump has been in service for a long time. In this case it may be necessary to use a puller. A snap ring may be installed in the sleeve (36) groove to ease disassembly. Take care to prevent damaging the surface of the sleeve. Replace the sleeve if it is grooved from wear. Remove key (54) and retaining ring (37) from shaft.

DOUBLE MECHANICAL SEAL (OPTIONAL)

CAUTION

The mechanical seal is a precision product and must be treated as such. During removal great care must be taken to avoid dropping any part of the seal. Take particular care not to scratch the lapped faces on the washer or the sealing seat. Do not put a seal back into service until the sealing faces of the washer and seat have been lapped or replaced.

A. Remove seal gland bolts (45) and remove gland (44) carefully exposing seal (47).

B. Unscrew capscrews (33) and remove stuffing box assembly (27). Remove gasket (32).

C. Slide sleeve (36) with rotating parts of mechanical seal (47) from the shaft. Remove ceramic seal rings and stainless steel parts from sleeve with great care as ceramic parts are easily damaged.

The sleeve should be carefully cleaned to remove any residue that may be remaining in the seal area. The rubber in the seal may have become partially adhered to the sleeve. The sleeve must also be checked for abrasion or corrosion that can occur when fluid residue penetrates between the seal (47) and sleeve (36). The sleeve under the seal may be polished lightly to a 32 RMS finish before reassembly. Do not reuse a pitted sleeve. Remove retaining ring (37) and key (54).

D. Remove stationary seat and o-rings from gland (44) and stuff box (27), using care not to damage these parts.

9. Remove capscrews (66) only if casing needs to be removed from vertical support.

10. Unscrew capscrews (35) to remove bracket (8) from power frame (56).

11. Remove key (55) from the shaft (48).

12. Unscrew capscrews (59) and remove bearing cap (51). Remove gasket (51A) and retaining ring (50C).

13. Slide out shaft (48) and bearings (49 and 50). Remove shim (60). Since bearings (49 and 50) are press fitted on the shaft, they will have to pulled or pressed off the shaft. Remove grease seals (52 and 53) from power frame (56) and bearing cap (51).

14. Remove screws (72) and nameplate (73) only if replacement is necessary.

15. Elbow (65) and casing (1) may be removed from base (21) by removing capscrews (66B) with washers (66A), and capscrews (66). Handhole cover (68) is removed by unscrewing capscrews (69), nuts (66A) and washers (69B). Gaskets (64) and (67) should be replaced if these parts are removed.

POWER FRAME 3C
REASSEMBLY

Reassembly will generally be in reverse order of disassembly. If disassembly was not complete, use only those steps related to your particular repair program.

1. Press grease seals (52 and 53) into power frame (56) and bearing cap (51).

2. Press bearings (50 and 49) onto shaft (48). Snap retaining ring (50C) into place.

3. Slide shaft (48) and bearings (50 and 49) into frame (56). Do not install gasket (51A), shim (60), or bearing cap (51) at this point.

4. Position key (54) in shaft (48).

5. Position bracket (8) on the frame (56) and secure with capscrews (35). Tighten capscrews evenly to assure proper alignment.

6. If nameplate (73) was removed, install and attach with screws (72).

7. Reassemble the various types of stuffing boxes as follows.

PACKING WITH LANTERN RING (STANDARD)

A. Place gasket (32) on stuffing box (27), slide over shaft and secure to bracket (8) with capscrews (33).

B. Install retaining ring (37), place key (54) in shaft and slide sleeve (36) over shaft. Packing (40) and lantern ring (41) may be replaced at this time. From impeller end of shaft place two new rings of packing (40) around shaft sleeve, slide lantern ring (41) back in position and place remaining three rings of packing on shaft sleeve. Be sure to stagger joints of packing rings to avoid excessive leakage through the packing.

C. Place o-ring gasket (42) in stuffing box on top ring of packing (40). Be sure o-ring remains concentric against inside diameter of stuffing box. Replace pipe plugs (44D), hose connector (44B), and tubing (44C) in leakage accumulator glands (44). Place one half of leakage accumulator gland in stuffing box with connection for hose to drain positioned properly. Apply General Electric* Silicon Rubber Sealant on both ends of this gland half. Thread capscrews (45) into stuffing box (27) approximately ¼ in. Slide slinger (43) over shaft and position inside leakage accumulator gland (44). Place each half of gland (44) in stuffing box being careful not to disturb o-ring gasket (42). Insert capscrews (44A) into each side of gland (44) to hold the two halves together. Tighten capscrews (44A) before tightening packing adjusting capscrews (45) to obtain proper sealing. Ensure capscrews (45) are tightened enough to hold parts in place. Final adjustment of packing box will have to be made after pump is returned to operation. When pump is running, gland capscrews (45) should be evenly turned down a flat at a time, allowing packing to work in until a leakage rate of approximately 60 to 120 drops per minute is obtained.

NOTE

Do not over tighten packing as this will cause packing box to over-heat and the shaft sleeve to receive excessive wear.

DOUBLE MECHANICAL SEAL (OPTIONAL)

NOTE

The mechanical seal (47) cannot be installed as an assembly. It is necessary to have the seal seats properly in place before the balance of parts can be added.

A. Install retaining ring (37) and key (54) in shaft.

B. Wipe the sealing faces of the seat and seal washer clean. Lubricate the shaft sleeve (36) with a silicone base lubricant. Slide the entire rotating assembly onto the sleeve.

C. Thoroughly inspect the seal box cavity checking for burrs or nicks which could damage the seat of the seal. Apply a film of liquid dishwashing detergent or rubber lubricant (do not use oil or grease) to the seal seats. Replace stationary seat and o-rings in gland (44) and stuffing box (27).

NOTE

If it is not possible to insert seat with fingers, place cardboard protecting ring furnished with seal over lapped face of seat and press into place with a piece of tubing having an end cut square. The tubing should be slightly larger than the diameter of the shaft. Remove cardboard after seat is firmly in place. Carefully slip the stuffing box assembly (27) over the shaft with the stationary seat facing away from the motor. Install gasket (46) into gland (44). Apply a film of liquid dishwashing detergent or rubber lubricant to the washer and bellows of the seal, and slide the remaining seal parts onto the sleeve, making sure the washer is seated against the seal seat.

D. The shaft sleeve (36) with the seal rotating assembly on it may now be replaced on the shaft. The shaft sleeve (36) should slide over shaft with keyway for key (54) toward power frame (56).

E. Replace gasket (32) on bracket (8) and carefully slip stuffing box (27), with stationary seal seat toward power frame (56), over the shaft, and secure with capscrews (33).

F. Position gland (44) onto stuffing box (27), taking care to seat it evently and squarely. Secure by tightening capscrews (45) evenly, being careful not damage gasket (46) between them.

8. Carefully place o-ring gasket (38) on shaft sleeve (36). Assemble key (14) and impeller (2) to shaft.

9. Secure impeller with gasket (13), washer (12), impeller screw o-ring (11) and impeller screw (10).

LAMINATED SHIM IMPELLER ADJUSTMENT

10. Push the shaft and impeller assembly completely forward until the snap ring and outboard bearings contact the power frame. With a feeler gauge measure the clearance between the impeller wiper vanes and the stuffing box. This measurement minus the recommended clearance of .020 in. will give the total required shim thickness. Example: With the shaft and impeller assembly completely forward there is .040 in. of clearance between wiper vanes and stuffing box. Subract the recommended clearance of .020 in. and .020 in. remains. This is the required shim thickness needed. Remove snap ring on outer race of outboard bearing (50) and install proper shim (60). Replace snap ring (50C).

11. Install the pipe plugs (25 and 26) in the pump casing (1). Position gasket (17) and casing (1) against the bracket (8) and secure with capscrews (34).

12. Install gasket (51A) and fasten bearing cap (51) in position with capscrews (59). Position key (55) on shaft.

13. Replace handhole cover (68) on elbow (65) using gasket (67), capscrews (69), nuts (69A) and washers (69B). Elbow (65) and gasket (67) are secured to casing (1) with capscrews (66B). Completed pump assembly is secured to base (21) using capscrews (66). Replace pipe plug or suction gauge (70) in elbow (65).

Motor and motor support (22) are secured with capscrews (23). Motor is secured with capscrews and nuts supplied with motor.

14. Replace all relief, cooling, flushings or drain lines from the pump.

15. Secure suction and discharge piping to the pump. Make sure to install gaskets on flanged connections.

16. Connect electricity to the motor.

17. Open all valves or flow devices that control flow of liquids to and from pump.

STARTING PUMP AFTER REASSEMBLY

Do not start pump until all air and vapor has been bled making sure that there is liquid in the pump to provide the necessary lubrication. Without the fluid around it, a seal may be ruined in a few seconds of operation. It is possible that the mechanical seal may drip during the first few minutes to one hour of operation.

Packing should be adjusted as previously discussed in this manual.

POWER FRAME 4C OR 5E
DISASSEMBLY

LUBRICATION OF BEARINGS

At the time of initial start-up it is important to note that the pump bearings have been factory lubricated. Do not add additional lubrication until completion of initial break-in period, which is first 10 hours of continuous operation, or equivalent intermittent operation. After break-in period while unit is operating, add fresh grease (American Oil Company's Rykon #2 or equivalent) through zerk fitting near bearings.

In dry locations, each bearing will need lubrication at least every 2,000 hours of running time or every 6 to 12 months, whichever is more frequent. In wet locations the bearings should be lubricated at least every 1,000 hours of running time or every 4 to 6 months, whichever is more frequent. A unit is considered to be installed in a wet location if the pump and motor are exposed to dripping water, to the weather, or to heavy condensation such as is found in unheated and poorly ventilated underground locations.

The 5E bearing frame has back-to-back angular contact bearings as the outboard thrust bearing (50). This style bearing requires more frequent lubrication intervals. It is suggested that this bearing be lubricated every 1000 hours of running time in dry locations and every 500 hours in wet locations.

At times it may be necessary to clean the bearings due to accumulated dirt or deteriorated lubricants. This can be accomplished by flushing the bearing with a light oil heated to 180 to 200°F. While rotating it on a spindle, wipe the bearing housing with a clean rag soaked in a cleaning solvent, and flush all surfaces.

Dry bearing thoroughly before relubricating. Compressed air can be used for speed drying, but care should be taken not to let bearings rotate while being dried.

CAUTION

Use normal fire caution procedures when using any petroleum cleaner.

1. Break electrical connections to prevent drive unit from being energized during disassembly.

2. Close all valves or flow devices that control movement of liquids to or from pump. Remove pipe plug (70) from base elbow (65).

3. Remove all relief, cooling, flushings or drain lines from the pump.

4. Remove capscrews (23) and nuts (24) from bracket (8) which allow motor, motor support (22) and flexible coupling to be lifted off at this point, to allow removal of power frame and rotating element. On some sizes adapter (22A) is required and can be removed from motor with capscrews. The motor can be removed from motor support (22) by unscrewing capscrews (22B).

5. Remove capscrews (34) that secure bracket (8) to casing (1), screw an eyebolt into outboard end of shaft (48). To aid in handling the power frame and rotating element. The size of eyebolt is as follows:

a. Power frame 4C requires a 5/8-11 NC eyebolt.

b. Power frame 5E requires a 3/4-10 NC eyebolt.

6. Remove gasket (17) from its position between bracket (8) and casing (1). Once power frame and rotating element has been withdrawn, inspect sealing surface to insure that they are clean and free of any gasket material which has struck to parting surfaces. Replace gasket with a new one when pump is reassembled.

7. Remove impeller capscrew (10), gasket (11), washer (12) and gasket (13), which allows impeller (2), key (14) and gasket (38) to be removed.

NOTE

The Vortex Pumps have a tapered hub impeller to facilitate impeller removal. Use caution in the removal of impeller as it has to be removed only a few thousandths of an inch to become entirely free.

8. The easiest method for removing the impeller is to suspend entire power frame and rotating element by an eyebolt (see step 5 above) about 1/32 of an inch above floor work area. Apply pressure to the impeller by means of jackscrews (60 and 61) (located on the bearing cap (51). When impeller is firmly against adapter (27) it should drop free after turning jackscrews evenly, a flat at a time, three or four flats.

9. When the power frame assembly is clear of impeller, place it on its side. At this point, either of the sealing box arrangements can be removed as a complete assembly by unscrewing capscrews (33). Slide complete assembly including shaft sleeve (36) off shaft (48) with the aid of a pinch bar or other lever. Remove gasket (32).

NOTE

The shaft sleeve incorporates a snap ring designed to interfere with the base of the seal box assembly. Therefore, when removing seal box the shaft sleeve is also removed.

For further disassembly of sealing box, proceed as follows:

A. Packing Box (Standard)

I. Remove capscrews (45), and split accumulator gland halves (44). Slinger (43) is now exposed and can be removed from shaft sleeve. Remove o-ring gasket (42) from stuffing box. The accumulator gland may be further disassembled by removing capscrews (44A), hose connector (44B), tubing (44C) and pipe plugs (44D).

Remove and discard old packing (40). Clean all parts to remove any packing that may have adhered during removal.

B. Double Mechanical Seal (Optional)

I. Remove seal gland bolts (45) and remove gland (44), exposing mechanical seal (47).

II. Use great care in removing ceramic seal rings and stainless steel metal parts from sealing box as ceramic parts are easily chipped or cracked.

III. Remove the carbon stationary seats and o-rings only if necessary, using care not to damage these parts.

10. Now set power frame on two benches, so that its shaft rests between them or on a bench with a hole cut in it large enough for shaft.

11. Remove grease zerk (63) and pipe plug (62) from inboard end of power frame. Remove retainer ring (37) by twisting it in a spiral movement toward end of shaft. Remove grease seal (53).

12. Unscrew capscrews (35) to remove bracket (8) from power frame (56). Lift the stuffing box away from power frame and shaft.

13. Unscrew capscrews (59) and lift out shaft (48) with bearings from the power frame.

14. Remove coupling half and key (55) from the shaft. Remove plug (57) and zerk fitting (58).

15. Retainer ring (50B) is removed with a pair of truarc internal pliers so that grease retainer (50A) can be removed allowing bearing cap (51) to be removed from shaft assembly. Grease seal (52) may be removed if necessary.

16. With a pair of truarc external pliers, remove snap ring (50C) (PF #4 only), or remove locknut (50D) and lock washer (50C) on power frame #5..

17. Both inboard bearing (49) and outboard bearing (50) are pressed onto shaft. To remove bearings, use a wheel puller or press them off the shaft.

18. If total disassembly is required, break connections to suction and discharge pipe and remove nuts from foundation bolts that hold support (21) to its foundation.

19. Secure casing and support assembly in a sling and move it away from the piping. Invert this assembly and set casing (1) on wood blocks so as not to mar the surface that mates with bracket (8).

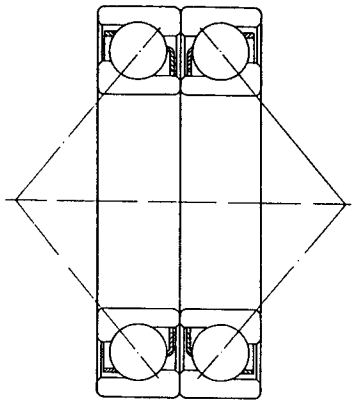
20. Elbow (65) and casing (1) may be removed from base (21) by removing capscrews (66) and capscrews (15). Hand hole cover (68) is removed by unscrewing capscrews (69). Gaskets (67) and (64) should be replaced if these parts are removed.

POWER FRAME 4C OR 5E REASSEMBLY

1. Place support (21) in place and fasten to casing (1) with capscrews (15). Tighten capscrews evenly to insure perfect register of mating parts.

2. Turn above sub-assembly over so it lies with suction facing down. Replace drain plugs (25) and rodding hole plug (26) in casing (1). Replace elbow (65) with gasket (67) on casing (1) using capscrews (66). Replace drain plug (70) in elbow. If handhole cover (68) was removed during disassembly, replace using new gasket (67) with capscrews (69).

3. Hand pack the outboard bearing (50) with grease and pack the grease retainer (50A) cavity one half full. Slide the grease retainer onto the shaft. Press the outboard bearing onto the shaft until it hits the shoulder of the shaft. Make sure outboard bearing set is properly matched back-to-back configuration. Assemble snap ring (50C) onto the shaft with the beveled side outward to match the bevel in the shaft groove (power frame 4C only). For power frame 5E, assemble lockwasher (50C) and locknut (50D) onto the shaft threads and torque to 100 ft-lbs. Slide the bearing cap (51) over the bearing. Lock in the assembly with snap ring (50B) matching the snap ring bevel to the groove bevel.



Back-to-Back
Bearing Configuration

4. Hand pack the inboard bearing (49) and the recessed area of its grease shield (49A). Slide the grease shield onto the shaft with the raised lip toward the bearing. Press on the bearing.

5. Press or gently tap grease seal (52) into bearing cap (51). Place grease seal (53) into place on inboard end of power frame (56).

6. Lower sub-assembly from steps 3 through 5 into outboard end of power frame (56), which has been set on a bench with a hole in it to accomodate the shaft.

7. Position the jacking screws so that they extend past bearing cap as given below. This will position impeller hub end of the shaft in an axial position which will allow mounting impeller and closing down liquid end without any adjustment during intermediate assembly step. Final adjustment will have to be made by evenly tightening capscrews (60) (page 7, step 20).

	Gap Clearance	Bolt Extension
Power Frame #4C	1/8 in.	1/4 in.
Power Frame #5E	1/4 in.	9/16 in.

10. Place plug (57) and zerk (58) back in the bearing cap.

11. Place plug (62) and zerk (63) back on inboard end of power frame (56).

12. Retainer ring (37) can be set in its groove by turning it in a spiral motion up the shaft. When in position, outside diameter of ring should slope toward impeller end of shaft.

13. Position bracket (8) to power frame (56) and secure in place by evenly tightening capscrews (35).

14. The following procedure is used in assembling the sealing box:

A. Packing Box (Standard)

I. Place two pieces of packing (40) into stuffing box cavity (27) being careful to get each piece firmly in place. Install lantern ring (41), then add remaining three pieces of packing. When packing is tightened lantern ring should align with holes for plugs (29), flushing lines, or cooling lines.

NOTE

Be sure to stagger joints of packing rings to avoid excessive leakage.

II. Snap retainer ring (39) onto shaft sleeve (36) with a pair of truarc external snap ring pliers. Slide shaft sleeve carefully into inboard end of packing box.

III. Place o-ring gasket (42) in stuffing box (27) on top ring of packing (40). Be sure o-ring remains concentric against inside diameter of the stuffing box. Slide slinger (43) over shaft extension and adjust to ¼ in. below top of leakage accumulator after stuffing box assembly has been reattached to bracket. Replace pipe plugs (44D), hose connector (44B) and tubing (44C) in leakage accumulator glands (44). Place one half of leakage accumulator gland in stuffing box with connection for hose to drain positioned properly. Apply General Electric* Silicon Rubber Sealant (75) on both ends of this gland half. Thread capscrews (45) into stuffing box (27) approximately ¼ in. Insert other half of gland (44) in stuffing box being careful not to disturb o-ring gasket (42). Insert capscrews (44A) into each side of gland (44) to hold the two halves together. Tighten packing adjusting capscrews (45) to obtain proper sealing.

IV. Ensure capscrews (45) are tightened enough to hold assembled gland in place. Final adjustment of box will have to be made after pump is returned to operation.

When pump is running, gland capscrews (45) be evenly turned down a flat at a time, allowing packing to work in until a leakage rate of approximately 60 to 120 drops per minute is obtained.

NOTE

Do not over tighten packing as this will cause packing box to over-heat and the shaft sleeve (36) to receive excessive wear.

V. Place gasket (38) in radial corner groove that is machined around inboard end of shaft sleeve to complete assembly.

B. Double Mechanical Seal (Optional).

I. Press one stationary seat with o-ring gently into stuffing box body (27) and the other into gland plate (44).

II. Place gasket (46) in position in the gland register.

III. Snap retainer ring (39) onto sleeve (36) with a pair of truarc external pliers.

IV. Slide sleeve through the bottom of stuffing box and place one seal (47) over sleeve and slide it down to stationary seat. Place metal parts over the shaft sleeve and then second seal ring.

V. Position gland over shaft sleeve and fasten to seal box with capscrews (45).

NOTE

Do not put mechanical seal back into service until seal ring and stationary seat faces have been relapped or replaced.

15. Place gasket (32) in groove of bracket (8).

16. Place key (54) in its keyway on shaft. Slide stuffing box onto shaft, so that, key and keyway in shaft sleeve mate. Continue to slide assembly forward until shaft sleeve is in with retainer ring (37).

17. Align stuffing box (27) with gasket (32) and bracket (8) fasten with capscrews (33).

18. Place impeller key (14) in keyway on tapered shank portion of shaft (48) and set impeller (2) in position. Put gasket (13) inside impeller suction eye with washer (12) next and gasket (11) last. Secure in place with capscrew (10) according to chart below.

IMPELLER BOLT TORQUE

Power Frame	Impeller Bolt Size	Torque Value
4C	⅝ in.	75 FT-LBS.
5E	¾ in.	100 FT-LBS.

19. Place a gasket (17) on bracket (8). Slide power frame and element into casing (1) and join them with capscrews (34).

20. Using jackscrews (60) and (61) located on bearing cap (51) adjust impeller axially up or down to gain proper impeller clearance. Turning hexagon head jackscrews one flat will axially move impeller approximately 0.008 inch. When this adjustment is completed, secure shaft in position by evenly tightening capscrews (59).

21. Make one last check to see that all parts of the rotating element turn freely.

22. Motor, motor adapter (22A) and motor support (22) may be replaced using capscrews (22B and 23) and nuts (24).

23. Connect any flushing lines or cooling lines that were removed. Install spacer coupling in place between pump and motor.

24. Open all valves or flow devices that control flow of liquids to and from the pump.

25. Connect power.

NOTE

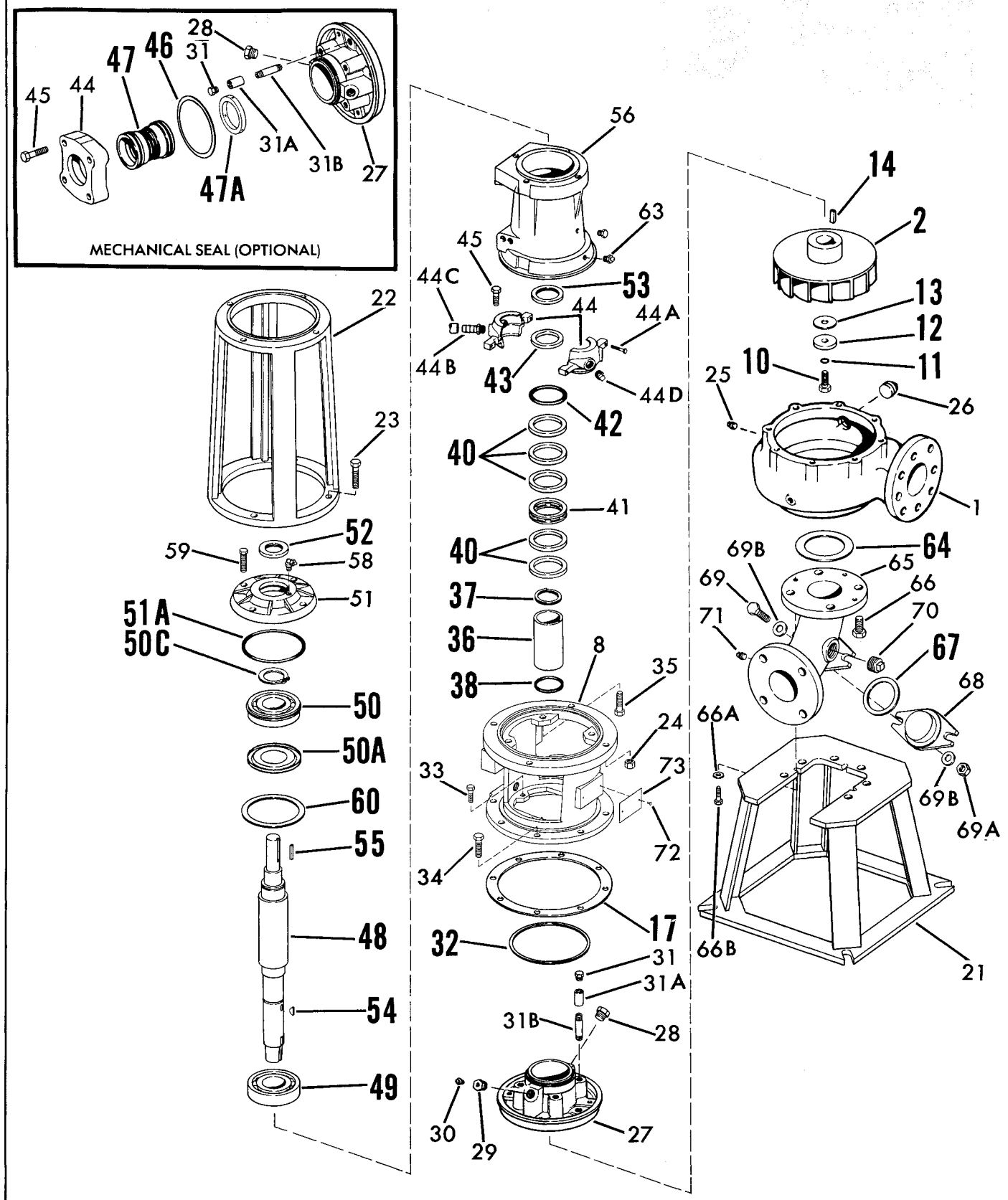
Do not start up a pump until all air and vapor have been bled, making sure that there is liquid in the pump to provide necessary lubrication. It is possible that the mechanical seal may drip during first few minutes of operation.

Turn on power momentarily to check for proper rotation. Rotation should be clockwise as viewed from driver (see arrow on casing).

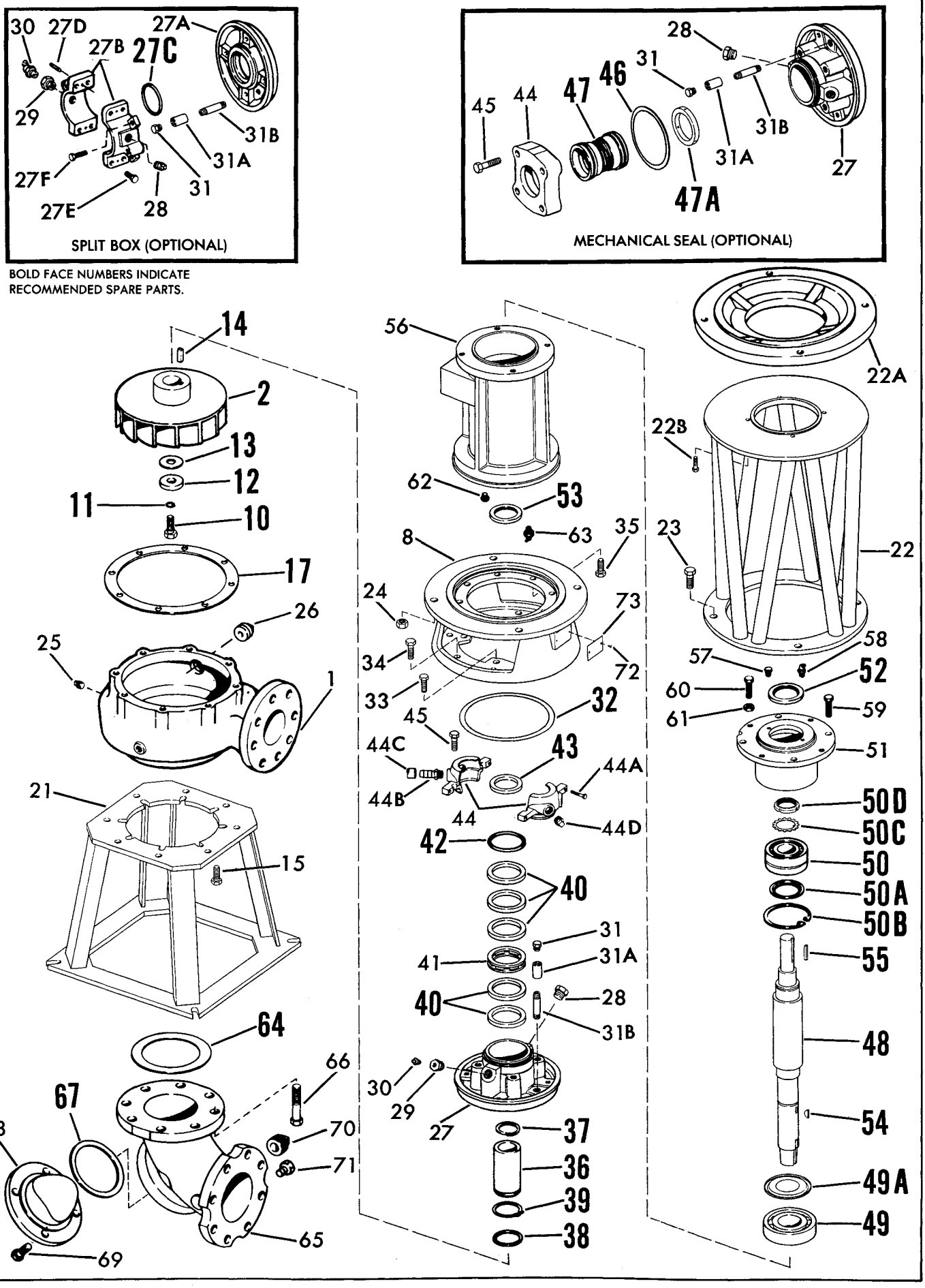
*General Electric is a registered trademark of General Electric Corporation.

3C, 4C & 5E POWER FRAMES MODEL 663A

1. Casing
2. Impeller
8. Bracket
10. Imp. Bolt
11. Imp. Bolt Seal
12. Imp. Washer
13. Imp. Washer Gasket
14. Impeller Key
15. Capscrew
17. Gasket
21. Pump Support
22. Pump Support
22A. Adapter
22B. Capscrew
23. Capscrew
24. Washer
25. Pipe Plug
26. Pipe Plug
27. Stuffing Box
27A. Adapter Plate
27B. Split Packing Box
27C. Gasket
27D. Pin
27E. Capscrews
27F. Capscrew
28. Pipe Plug
29. Bushing
30. Fitting
31. Pipe Plug
31A. Pipe Coupling
31B. Nipple
32. Gasket
33. Capscrew
34. Capscrew
35. Capscrew
36. Sleeve
37. Retaining Ring
38. Gasket
39. Retaining Ring
40. Packing
41. Lantern Ring
42. O-Ring
43. Slinger
44. Gland
44A. Capscrew
44B. Hose Connector
44C. Hose
44D. Pipe Plug
45. Capscrew
46. Gasket
47. Mechanical Seal
48. Shaft
49. Inboard Bearing
49A. Grease Shield
50. Outboard Bearing
50A. Grease Shield
50B Retaining Ring
50C. Lockwasher or Retaining Ring
50D. Locknut
51. Bearing Cartridge
51A. O-Ring
52. Grease Seal
53. Grease Seal
54. Sleeve Key
55. Shaft Key
56. Power Frame
57. Pipe Plug
58. Grease Fitting
59. Capscrew
60. Capscrew or Shim Pack (P.F. 3)
61. Jam Nut
62. Pipe Plug
63. Grease Fitting
64. Gasket
65. Suction Elbow
66. Capscrew
67. Gasket
68. Handhole Cover
69. Capscrew
69A. Nut
69B. Washer
70. Pipe Plug
71. Pipe Plug or Suction Gauge
72. Drive Pins
73. Name Plate



BOLD FACE NUMBERS INDICATE RECOMMENDED SPARE PARTS.


30
27D
27B
27C
27A
29
31B
31A
27F
31
27E
28
SPLIT BOX (OPTIONAL)
28
31
45
44
47
46
31B
31A
27
47A
MECHANICAL SEAL (OPTIONAL)
BOLD FACE NUMBERS INDICATE
RECOMMENDED SPARE PARTS.
14
2
13
12
11
10
17
26
25
1
21
15
64
66
67
68
70
71
65
69
56
62
53
63
35
8
24
73
34
72
33
45
32
44C
43
44A
44B
44
44D
42
40
31
41
31A
40
28
31B
30
29
27
37
36
39
38
22A
22B
23
22
58
57
52
60
59
61
51
50D
50C
50
50A
50B
55
48
54
49A
49

AURORA®
Pentair Pump Group

INSTRUCTION MANUAL
REPAIR
MODEL 664A

6

SERVICE

Your Aurora pump requires no maintenance other than periodic inspection and occasional cleaning. The intent of inspection is to prevent breakdown, thus obtaining optimum service life.

LUBRICATION

The motor that drives your Aurora pump may or may not require lubrication. Consult the manufacturer's recommendations for proper maintenance instructions.

REPAIRS

The pump may be disassembled using the illustrations and text provided. Although complete disassembly is covered, it will seldom be necessary to completely disassemble your Aurora pump.

The illustration accompanying the disassembly instructions show an exploded view of the pump. The illustration is intended to aid in the correct identification of the parts mentioned in the text.

Inspect removed parts at disassembly to determine their reusability. Cracked castings should never be reused. Gaskets should be replaced at reassembly simply as a matter of economy; they are much less expensive to replace routinely than to replace as the need occurs. In general it is economical to return the motor and motor controller to the manufacturer for repair.

VORTEX PUMP 664A
(MOTOR FRAME 250 OR SMALLER)
DISASSEMBLY

This pump has been designed with back pull-out features, which allow the motor and rotating element or close coupled motor to be removed without disturbing the suction and discharge piping.

Disassemble only that which is needed to make repairs or accomplish inspection.

1. Disconnect electrical connections to prevent drive unit from being energized during disassembly.

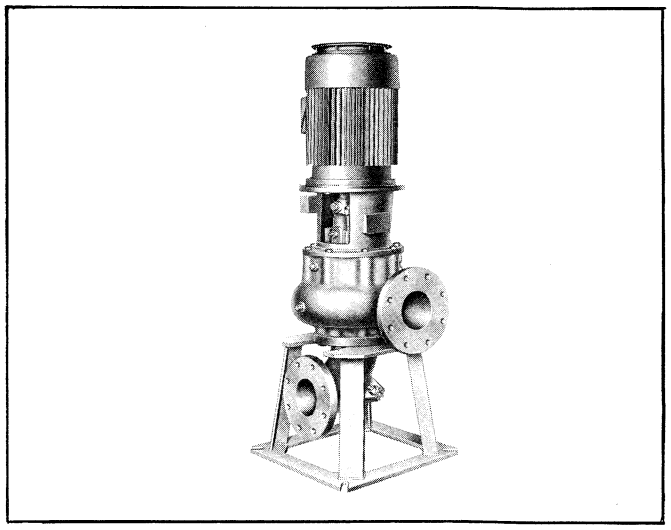
2. Close all valves or flow devices that control movement of liquids to or from pump. Remove drain plug (70) from suction elbow (65).

3. Remove all relief, cooling, flushing or drain lines from pump. Break suction and discharge connections unless the intention is to remove only the power frame assembly and leave the casing (1) in the line.

4. Remove capscrews (34). Screw eyebolt into the outboard end of the close coupled motor or use a sling under the motor lifting lugs to aid in lifting motor and rotating element from casing.

5. Remove gasket (17) from its position between bracket (8) and casing (1). Once the motor and rotating element have been withdrawn, inspect the sealing surface to ensure that it is clean and free of any gasket material that has stuck to parting surfaces. Replace this gasket with a new one when pump is reassembled.

6. Unscrew impeller screw (10) and remove o-ring gasket (11), and washer (12), taking care not to damage gasket (13).



NOTE

The Vortex Pumps have a tapered end impeller fit-up to facilitate impeller removal. Use caution in the removal of impeller as it has to be moved only a few thousandths of an inch to become entirely free.

7. Slide impeller (2) and impeller key (14) from the shaft, again taking care not to damage gasket (38) located behind impeller. Remove gasket (38).

8. The various types of stuffing boxes may be disassembled as follows:

DOUBLE MECHANICAL SEAL (STANDARD)

CAUTION

The mechanical seal is a precision product and must be treated as such. During removal great care must be taken to avoid dropping any part of the seal. Take particular care not to scratch the lapped faces on the washer or the sealing seat. Do not put a seal back into service until the sealing faces of the washer and seat have been lapped or replaced.

A. Remove seal gland bolts (45) and remove gland (44) carefully exposing seal (47).

B. Unscrew capscrews (33) and remove stuffing box assembly (27). Remove gasket (32).

C. Slide sleeve (36) with rotating parts of mechanical seal (47) from the shaft. Remove ceramic seal rings and stainless steel parts from sleeve with great care as ceramic parts are easily damaged.

The sleeve should be carefully cleaned to remove any residue that may be remaining in the seal area, as the rubber in the seal may have become partially adhered to the sleeve. The sleeve must also be checked for abrasion or corrosion that can occur when fluid residue penetrates between the seal (47) and sleeve (36). The sleeve under the seal may be polished lightly to a 32 RMS finish before reassembly. Do not reuse a pitted sleeve. Remove retaining ring (37).

D. Remove stationary seat and o-rings from gland (44) and stuff box (27), using care not to damage these parts.

PACKING WITH LANTERN RING (OPTIONAL)

A. Remove capscrews (45) and split accumulator gland halves (44) Remove o-ring gasket (42) and slinger (43) from stuffing box. The accumulator gland may be further disassembled by removing capscrews (44A), hose connector (44B), tubing (44C) and pipe plugs (44D).

Remove and discard old packing (40). Clean all parts to remove any packing that may have adhered.

C. Unscrew capscrews (33) and remove stuffing box (27) from bracket (8). The throat of adapter plate or stuffing box should be checked for excessive wear. Remove gasket (32).

D. Shaft sleeve (36) is a slip fit on the shaft and should be easily removed unless the pump has been in service for a long time. In this case it may be necessary to use a puller. A snap ring may be installed in the sleeve (36) groove to ease disassembly. Take care to prevent damaging the surface of the sleeve. Replace the sleeve if it is grooved from wear. Remove key (54) and retaining ring (37) from shaft.

9. Unscrew capscrews (35) to remove bracket (8) from close coupled motor.

10. Remove key (55) from the shaft.

11. Remove screws (72) and nameplate (73) only if replacement is necessary.

12. Elbow (65) and casing (1) may be removed from base (21) by removing capscrews (66B) with washers (66A), and capscrews (66). Handhole cover (68) is removed by unscrewing capscrews (69), nuts (66A) and washers (69B). Gaskets (64) and (67) should be replaced if these parts are removed.

VORTEX PUMP MODEL 664A
REASSEMBLY (MOTOR FRAME 250 OR SMALLER)

Reassembly will generally be in reverse order of disassembly. If disassembly was not complete, use only those steps related to your particular repair program.

1. Position bracket (8) on closed coupled motor and secure with capscrews (35). Tighten capscrews evenly to assure proper alignment.

2. If nameplate (73) was removed, install and attach with screws (72).

3. Reassemble the various types of stuffing boxes as follows.

DOUBLE MECHANICAL SEAL (STANDARD)

NOTE

The mechanical seal (47) cannot be installed as an assembly. It is necessary to have the seal seats properly in place before the balance of parts can be added.

A. Install retaining ring (37) and key (54) in shaft.

B. Wipe the sealing faces of the seat and seal washer clean. Lubricate the shaft sleeve (36) with a silicone base lubricant. Slide the entire rotating assembly onto the sleeve.

C. Thoroughly inspect the seal box cavity checking for burrs or nicks, which could damage the seat of the seal. Apply a film of liquid dishwashing detergent or rubber lubricant (do not use oil or grease) to the seal seats. Replace stationary seat and o-rings in gland (44) and stuffing box (27).

NOTE

If it is not possible to insert seat with fingers, place cardboard protecting ring furnished with seal over lapped face of seat and press into place with a piece of tubing having end cut square. The tubing should be slightly larger than the diameter of the shaft. Remove cardboard after seat is firmly in place. Carefully slip the stuffing box assembly (27) over the shaft with the stationary seat facing away from the motor. Install gasket (46) into gland (44). Apply a film of liquid dishwashing detergent or rubber lubricant to the washer and bellows of the seal, and slide the remaining seal parts onto the sleeve, making sure the washer is seated against the seal seat.

D. The shaft sleeve (36) with the seal rotating assembly on it may now be replaced on the shaft. The shaft sleeve (36) should slide over shaft with keyway for key (54) toward close-coupled motor.

E. Replace gasket (32) on bracket (8) and carefully slip stuffing box (27), with stationary seal seat toward motor, over the shaft and secure with capscrews (33).

F. Position gland (44) onto stuffing box (27), taking care to seat it evenly and squarely. Secure by tightening capscrews (45) evenly, being careful not to damage gasket (46) between them.

PACKING WITH LANTERN RING (OPTIONAL)

A. Place gasket (32) on stuffing box (27), slide over shaft and secure to bracket (8) with capscrews (33).

B. Install retaining ring (37), and place key (54) in shaft and slide sleeve (36) over shaft. Packing (40) and lantern ring (41) may be replaced at this time. From impeller end of shaft, place two new rings of packing (40) around shaft sleeve, slide lantern ring (41) back in position and place remaining three rings of packing on shaft sleeve. Be sure to stagger joints of packing rings to avoid excessive leakage through the packing.

C. Place o-ring gasket (42) in stuffing box on top ring of packing (40). Be sure o-ring remains concentric against inside diameter of stuffing box. Replace pipe plugs (44D), hose connector (44B), and tubing (44C) in leakage accumulator glands (44). Place one half of leakage accumulator gland in stuffing box with connection for hose positioned to drain properly. Apply General Electric* Silicon Rubber Sealant on both ends of this gland half. Thread capscrews (45) into stuffing box (27) approximately ¼ in. Slide slinger (43) over shaft and position inside leakage accumulator gland (44). Place each half of gland (44) in stuffing box, being careful not to disturb o-ring gasket (42). Insert capscrews (44A) into each side of gland (44) to hold the two halves together. Tighten capscrews (44A) before tightening packing adjusting capscrews (45) to obtain proper sealing. Ensure capscrews (45) are tightened enough to hold parts in place. Final adjustment of packing box will have to be made after pump is returned to operation. When pump is running, gland capscrews (45) should be evenly turned down a flat at a time, allowing packing to work in until a leakage rate of approximately 60 to 120 drops per minute is obtained.

NOTE

Do not over tighten packing, as this will cause packing box to over-heat and the shaft sleeve to receive excessive wear.

5. Carefully place o-ring gasket (38) on shaft sleeve (36). Assemble key (14) and impeller (2) to shaft. Secure impeller with gasket (13), washer (12), o-ring (11) and impeller screw (10). Torque impeller bolt to 75 ft. lbs.

5. Install the pipe plugs (25) in the pump casing (1). Position gasket (17) and casing (1) against the bracket (8) and secure with capscrews (34).

6. Replace handhole cover (68) on elbow (65) using gasket (67), capscrews (69), nuts (69A) and washers (69B). Elbow (65) and gasket (67) are secured to casing (1) with capscrews (66B). Completed pump assembly is secured to base (21) using capscrews (66). Replace pipe plug or suction gauge (70) in elbow (65).

7. Make one last check to see that rotating element turns freely. If binding occurs, remove shim gasket (17) between bracket (8) and casing (1).

8. Replace all relief, cooling, flushings or drain lines from pump.

9. Secure suction and discharge piping to the pump. Make sure to install gaskets on flanged connections.

10. Connect electricity to the motor.

11. Open all valves or flow devices that control flow of to and from pump.

STARTING PUMP AFTER REASSEMBLY

Do not start pump until all air and vapor have been bled, making sure that there is liquid in the pump to provide the necessary lubrication. Without the fluid around it, a seal may be ruined in a few seconds of operation. It is possible that the mechanical seal may drip during the first few minutes to one hour of operation.

Packing should be adjusted as previously discussed in this manual.

VORTEX PUMP MODEL 664A DISASSEMBLY (6x6x12 & 6x6x15)

1. Break electrical connections to prevent drive unit from being energized during disassembly.

2. Close all valves or flow devices that control movement of liquids to or from pump. Remove pipe plug (70) from base elbow (65).

3. Remove all relief, cooling, flushings or drain lines from the pump.

4. Remove capscrews (34) that secure bracket (8) to casing (1). Screw eyebolt into the outboard end of the close coupled motor or use a sling under the motor lifting lugs to aid in handling the power frame and rotating element.

5. Remove gasket (17) from its position between bracket (8) and casing (1). Once the motor and rotating element has been withdrawn, inspect sealing surface to ensure that they are clean and free of any gasket material, which may have stuck to parting surfaces. Replace gasket with a new one when pump is reassembled.

6. Remove impeller capscrew (10), gasket (11), washer (12) and gasket (13), which allow impeller (2), key (14) and gasket (38) to be removed.

NOTE

The Vortex Pumps have a tapered hub impeller to facilitate impeller removal. Use caution in the removal of impeller, as it has to be removed only a few thousandths of an inch to become entirely free.

7. When the close coupled motor assembly is clear of impeller, place it on its side. At this point, either of the sealing box arrangements can be removed as a complete assembly by unscrewing capscrews (33). Slide complete assembly, including shaft sleeve (36), off shaft (48) with the aid of a pinch bar or other lever. Remove gasket (32).

NOTE

The shaft sleeve incorporates a snap ring designed to interfere with the base of the seal box assembly. Therefore, when removing seal box the shaft sleeve is also removed.

For further disassembly of sealing box, proceed as follows:

A. Double Mechanical Seal (Standard)

I. Remove seal gland bolts (45) and remove gland (44), exposing mechanical seal (47).

II. Use great care in removing ceramic seal rings and stainless steel metal parts from sealing box, as ceramic parts are easily chipped or cracked.

III. Remove the carbon stationary seats and o-rings only if necessary, using care not to damage these parts.

B. Packing Box (Optional)

I. Remove capscrews (45), and split accumulator gland halves (44). Slinger (43) is now exposed and can be removed from shaft sleeve. Remove o-ring gasket (42) from stuffing box. The accumulator gland may be further disassembled by removing capscrews (44A), hose connector (44B), tubing (44C) and pipe plugs (44D).

Remove and discard old packing (40). Clean all parts to remove any packing that may have adhered during removal.

8. Now set close coupled motor assembly on two benches, so that its shaft rests between them or on a bench with a hole cut in it large enough for shaft. Remove retaining ring (37) by twisting it in a spiral movement toward end of shaft.

9. Unscrew capscrews (35) to remove bracket (8) from motor register (56). Lift the stuffing box away from the close coupled motor shaft.

10. If total disassembly is required, break connections to suction and discharge pipe and remove nuts from foundation bolts that hold support (21) to its foundation.

11. Secure casing and support assembly in a sling and move it away from the piping. Invert this assembly and set casing (1) on wood blocks so as not to mar the surface that mates with bracket (8).

12. Elbow (65) and casing (1) may be removed from base (21) by removing capscrews (66) and (15). Handhole cover (68) is removed by unscrewing capscrews (69). Gaskets (67) and (64) should be replaced if these parts are removed.

VORTEX PUMP MODEL 664A
REASSEMBLY (6x6x12 & 6x6x15)

1. Place support (21) in place and fasten to casing (1) with capscrews (15). Tighten capscrews evenly to ensure perfect register of mating parts.

2. Turn above sub-assembly over so it lies with suction facing down. Replace drain plugs (25) and rodding hole plus (26) in casing (1). Replace elbow (65) with gasket (67) on casing (1) using capscrews (66). Replace drain plug (70) in elbow. If handhole cover (68) was removed during disassembly, replace using new gasket (67) with capscrews(69).

3. Retainer ring (37) can be set in its groove by turning it in a spiral motion up the shaft. When in position, outside diameter of ring should slope toward impeller end of shaft.

4. Position bracket (8) to motor and secure in place by evenly tightening capscrews (35).

5. The following procedure is used in assembling the sealing box:

A. Double Mechanical Seal (Standard).

I. Press one stationary seat with o-ring gently into stuffing box body (27) and the other into gland plate (44).

II. Place gasket (46) in position in the gland register.

III. Snap retainer ring (39) onto sleeve (36) with a pair of truarc external pliers.

IV. Slide sleeve through the bottom of stuffing box and place one seal (47) over sleeve and slide it down to stationary seat. Place metal parts over the shaft sleeve and then second seal ring.

V. Position gland (44) over shaft sleeve and fasten to seal box with capscrews (45).

NOTE

Do not put mechanical seal back into service until seal ring and stationary seat faces have been relapped or replaced.

B. Packing Box (Optional)

I. Place two pieces of packing (40) into stuffing box cavity (27) being careful to get each piece firmly in place. Install lantern ring (41), then add remaining three pieces of packing. When packing is tightened lantern ring should align with holes for plugs (29), flushing lines, or cooling lines.

NOTE

Be sure to stagger joints of packing rings to avoid excessive leakage.

II. Snap retainer ring (39) onto shaft sleeve (36) with a pair of truarc external snap ring pliers. Slide shaft sleeve carefully into inboard end of packing box.

III. Place o-ring gasket (42) in stuffing box (27) on top ring of packing (40). Be sure o-ring remains concentric against inside diameter of the stuffing box. Slide slinger (43) over shaft extension and adjust to ¼" below top of leakage accumulator after stuffing box assembly has been reattached to bracket. Replace pipe plugs (44D), hose connector (44B) and tubing (44C) in leakage accumulator glands (44). Place one half of leakage accumulator gland in stuffing box with connection for hose to drain positioned properly. Apply General Electric* Silicon Rubber Sealant on both ends of the gland half. Thread capscrews (45) into stuffing box (27) approximately ¼ in. Insert other half of gland (44) in stuffing box being careful not to disturb o-ring gasket (42). Insert capscrews (44A) into each side of gland (44) to hold the two halves together. Tighten packing adjusting capscrews (45) to obtain proper sealing.

IV. Ensure capscrews (45) are tightened enough to hold assembled gland in place. Final adjustment of packing box will have to be made after pump is returned to operation.

When pump is running, gland capscrews (45) should be evenly turned down a flat at a time, allowing packing to work in until a leakage rate of approximately 60 to 120 drops per minute is obtained.

NOTE

Do not over tighten packing as this will cause packing box to over-heat and the shaft sleeve (36) to receive excessive wear.

V. Place gasket (38) in radial corner groove that is machined around inboard end of shaft sleeve to complete assembly.

6. Place gasket (32) in groove of bracket (8).

7. Place key (54) in its keyway on shaft. Slide stuffing box assembly onto shaft, so that, key and keyway in shaft sleeve mate. Continue to slide assembly forward until shaft sleeve is in contact with retainer ring (37).

8. Align stuffing box (27) with gasket (32) and bracket (8). Fasten assembly to bracket (8) with capscrews (33).

9. Place impeller key (14) in keyway on tapered portion of motor shaft and set impeller (2) in position. Put gasket (13) inside impeller suction eye with washer (12) next and gasket (11) last. Secure impeller in place with capscrew (10) according to chart below.

IMPELLER BOLT TORQUE

Close Coupled Motor Register	Impeller Bolt Size Torque Value	Torque Value
8½	⅝ in.	75 FT-LBS.
12½	¾ in.	100 FT-LBS.

10. Place a gasket (17) on bracket (8). Slide close coupled motor and rotating element into casing (1) and join them with capscrews (34).

11. Make one last check to see that all parts of the rotating element turn freely. If binding occurs, remove shim gasket (17) between bracket (8) and casing (1).

12. Connect any flushing lines or cooling lines that were removed.

13. Open all valves or flow devices that control flow of liquids to and from the pump.

14. Connect power.

NOTE

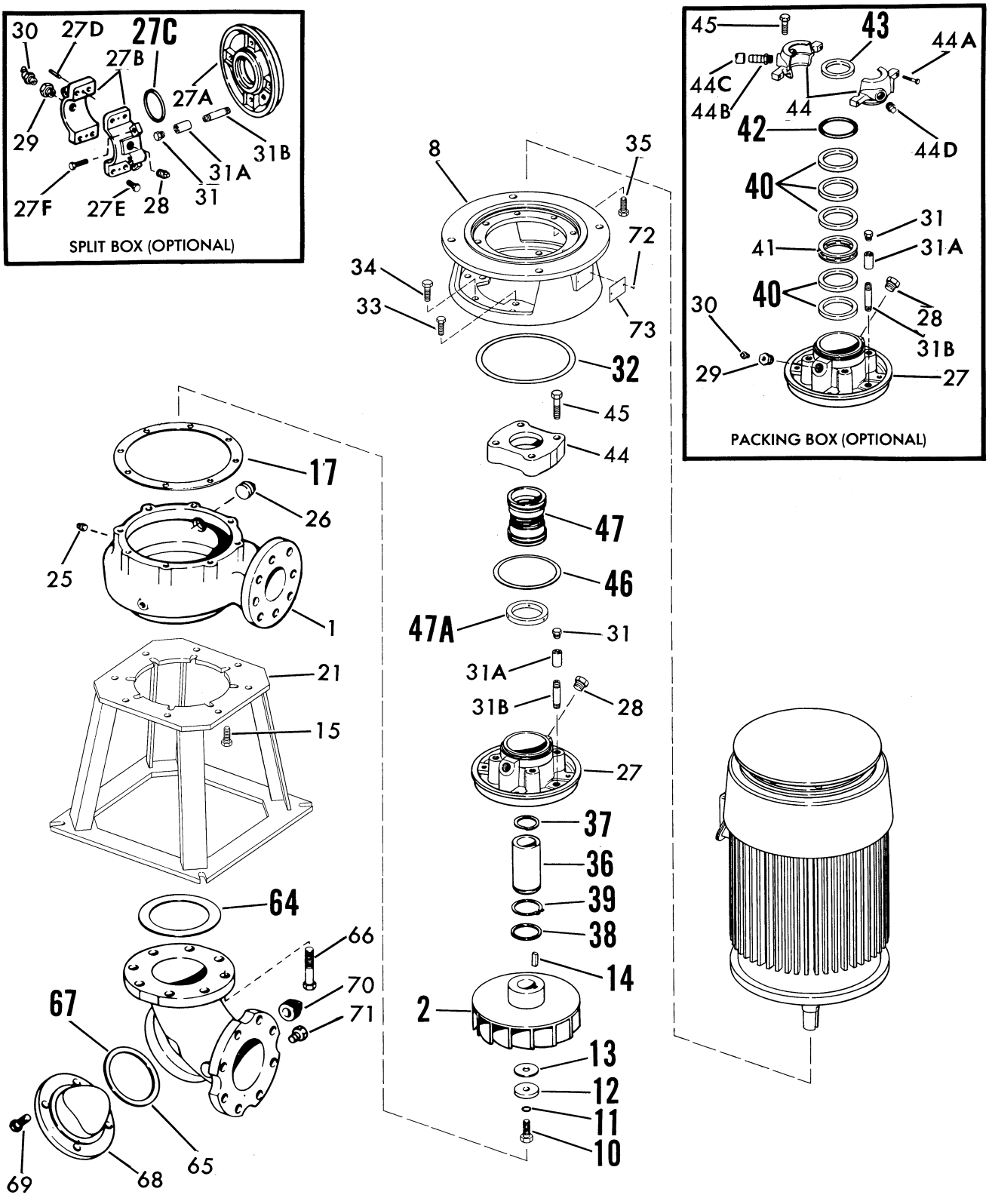
Do not start up a pump until all air and vapor have been bled, making sure that there is liquid in the pump to provide necessary lubrication. It is possible that the mechanical seal may drip during first few minutes of operation.

Turn on power momentarily to check for proper rotation. Rotation should be clockwise as viewed from driver (see arrow on casing).

*General Electric is a registered trademark of the General Electric Corporation.

MODEL 664A LIST OF PARTS

1. Casing
2. Impeller
8. Bracket
10. Imp. Bolt
11. Imp. Bolt Seal
12. Imp. Washer
13. Imp. Washer Gasket
14. Impeller Key
15. Capscrew
17. Gasket
21. Pump Support
25. Pipe Plug
26. Pipe Plug
27. Stuffing Box
27A. Adapter Plate
27B. Split Packing Box
27C. Gasket
27D. Pin
27E. Capscrews
27F. Capscrews
28. Pipe Plug
29. Bushing
30. Fitting
31. Pipe Plug
31A. Pipe Coupling
31B. Nipple
32. Gasket
33. Capscrew
34. Capscrew
35. Capscrew
36. Sleeve
37. Retaining Ring
38. Gasket
39. Retaining Ring
40. Packing
41. Lantern Ring
42. O-Ring
43. Slinger
44. Gland
44A. Capscrew
44B. Hose Connector
44C. Hose
44D. Pipe Plug
45. Capscrew
46. Gasket
47. Mechanical Seal
54. Sleeve Key
64. Gasket
65. Suction Elbow
66. Capscrew
67. Gasket
68. Handhole Cover
69. Capscrew
69A. Nut
69B. Washer
70. Pipe Plug
71. Suction Gauge or Pipe Plug
72. Drive Pins
73. Name Plate
74. Leakage Accumulator Kit
75. Sealant



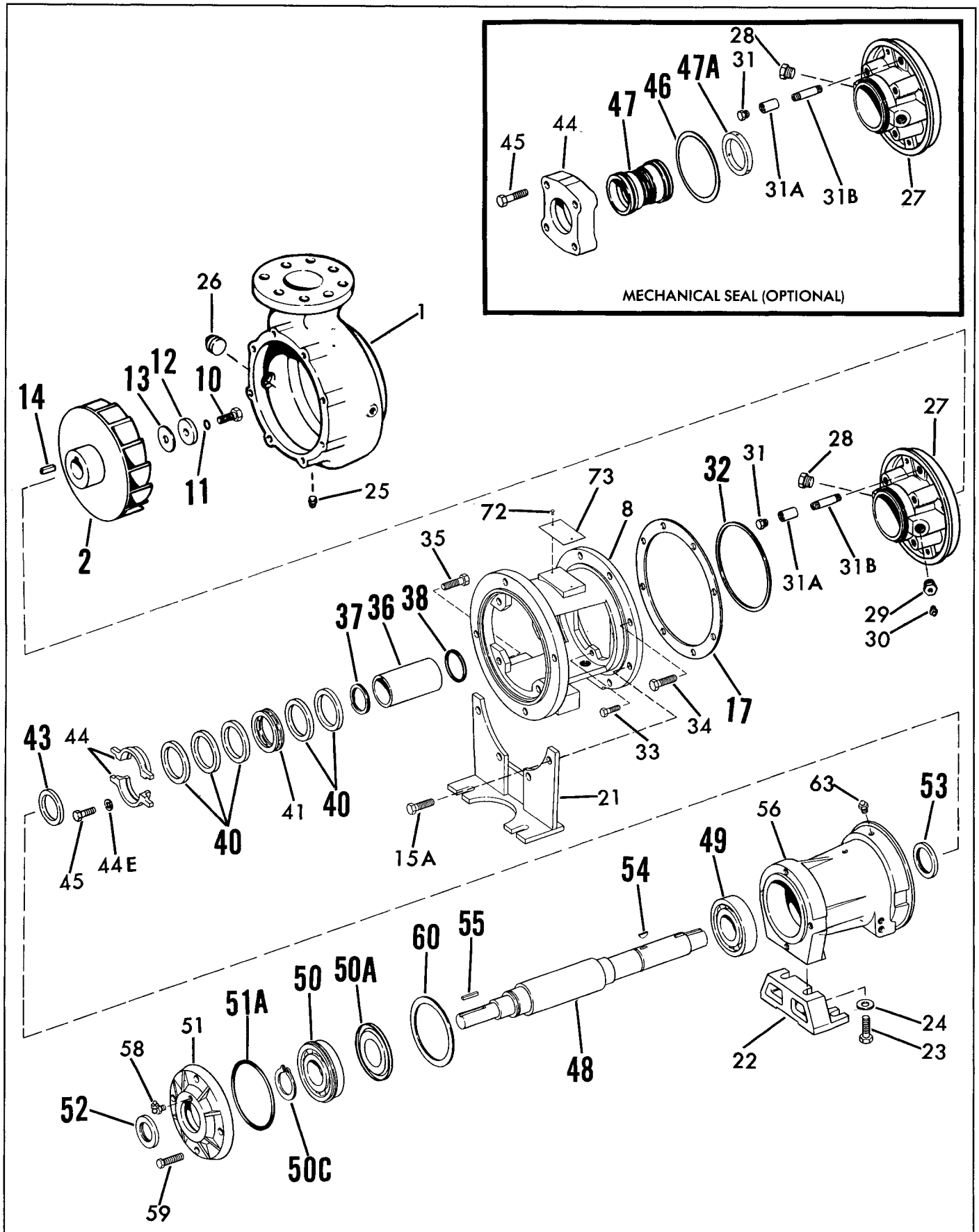
BOLD FACE NUMBERS INDICATE RECOMMENDED SPARE PARTS.

660 SERIES
REPAIR PARTS INDEX

PARTS ARE LISTED BY POWER FRAME AND LIQUID ENDS. SELECT POWER FRAME BY PUMP SIZE AND SPEED FROM CHART BELOW.

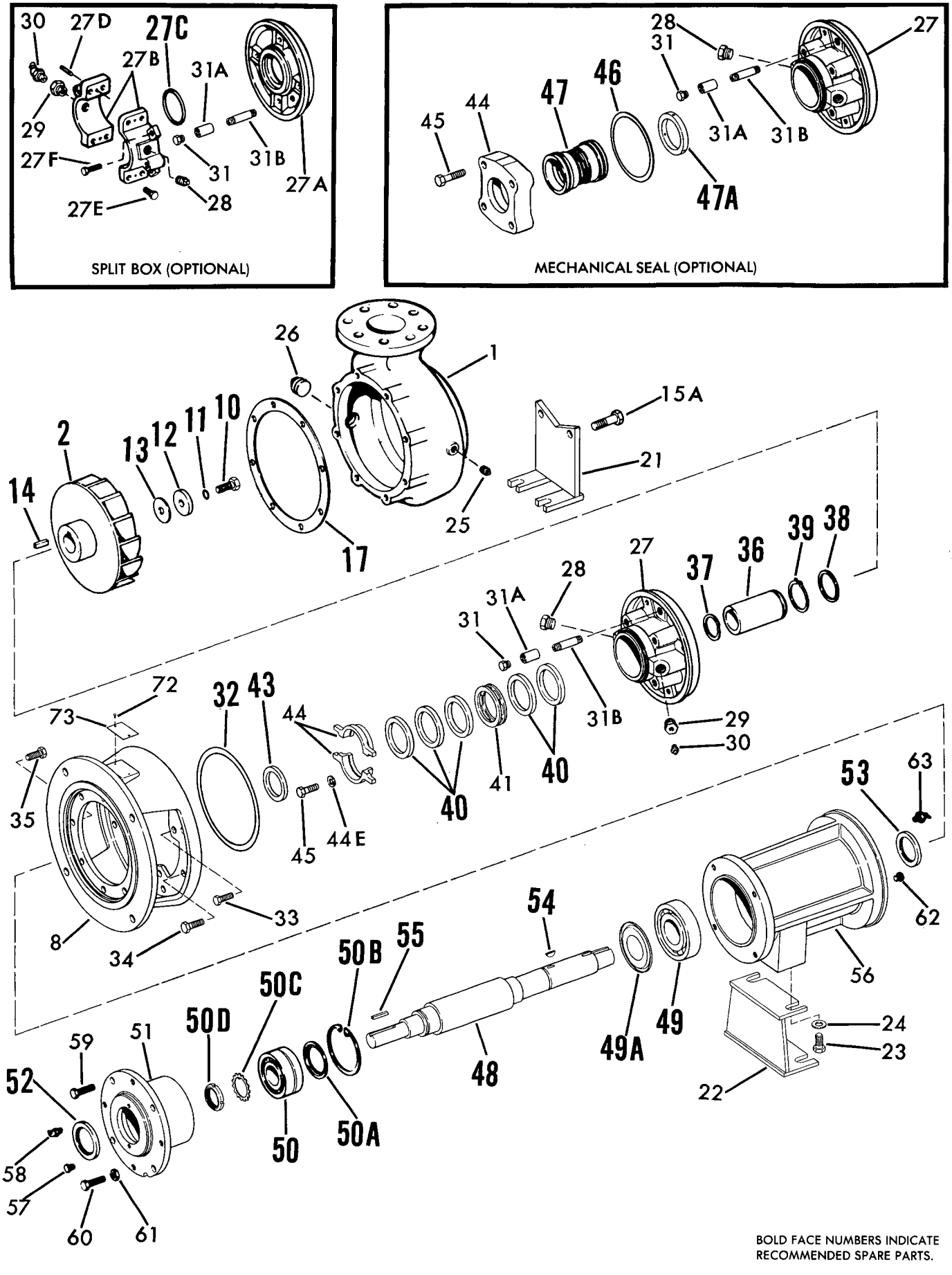
PUMP SIZE	RPM			
	1775	1175	885	710
3x3x9	3C	3C	3C	
4x4x9	3C	3C	3C	
3x3x12	3C	3C	3C	
4x4x12	3C	3C	3C	
6x6x12	5E	4C	4C	
6x6x15		5E	5E	5E

660A SERIES
MODEL 661A PF 3C
PIECE NUMBERS

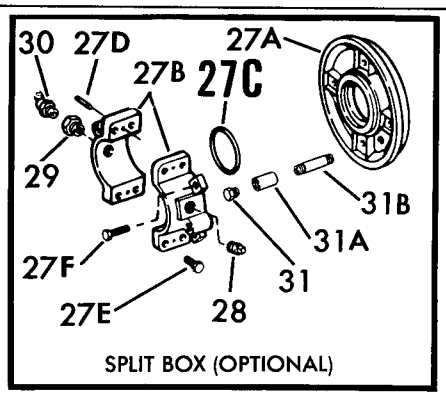


BOLD FACE NUMBERS INDICATE
RECOMMENDED SPARE PARTS.

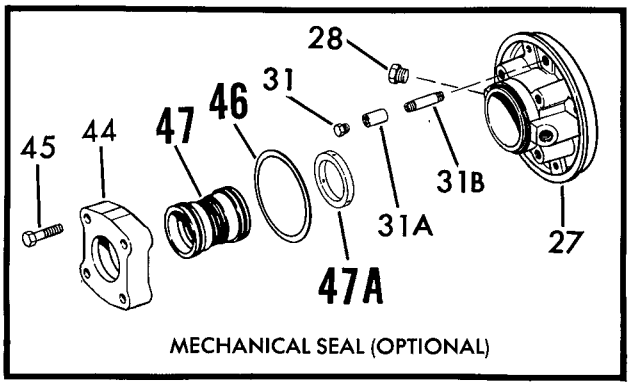
661A SERIES
MODEL 661A PF 4 & 5
PIECE NUMBERS



660A SERIES
MODEL 662A-663A PF 4 & 5
PIECE NUMBERS

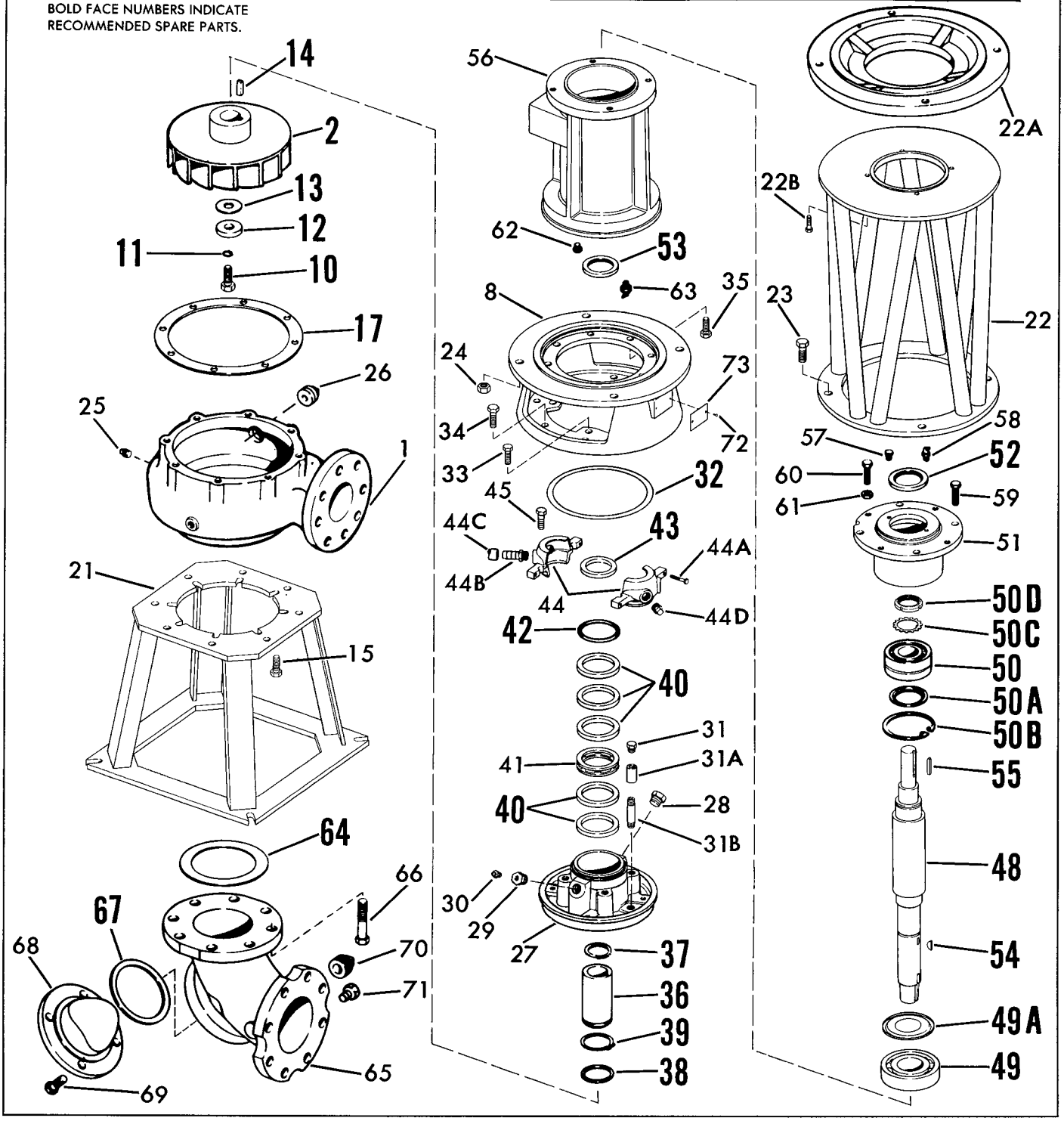


SPLIT BOX (OPTIONAL)

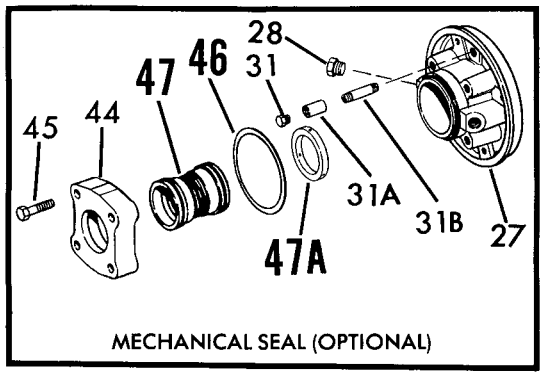


MECHANICAL SEAL (OPTIONAL)

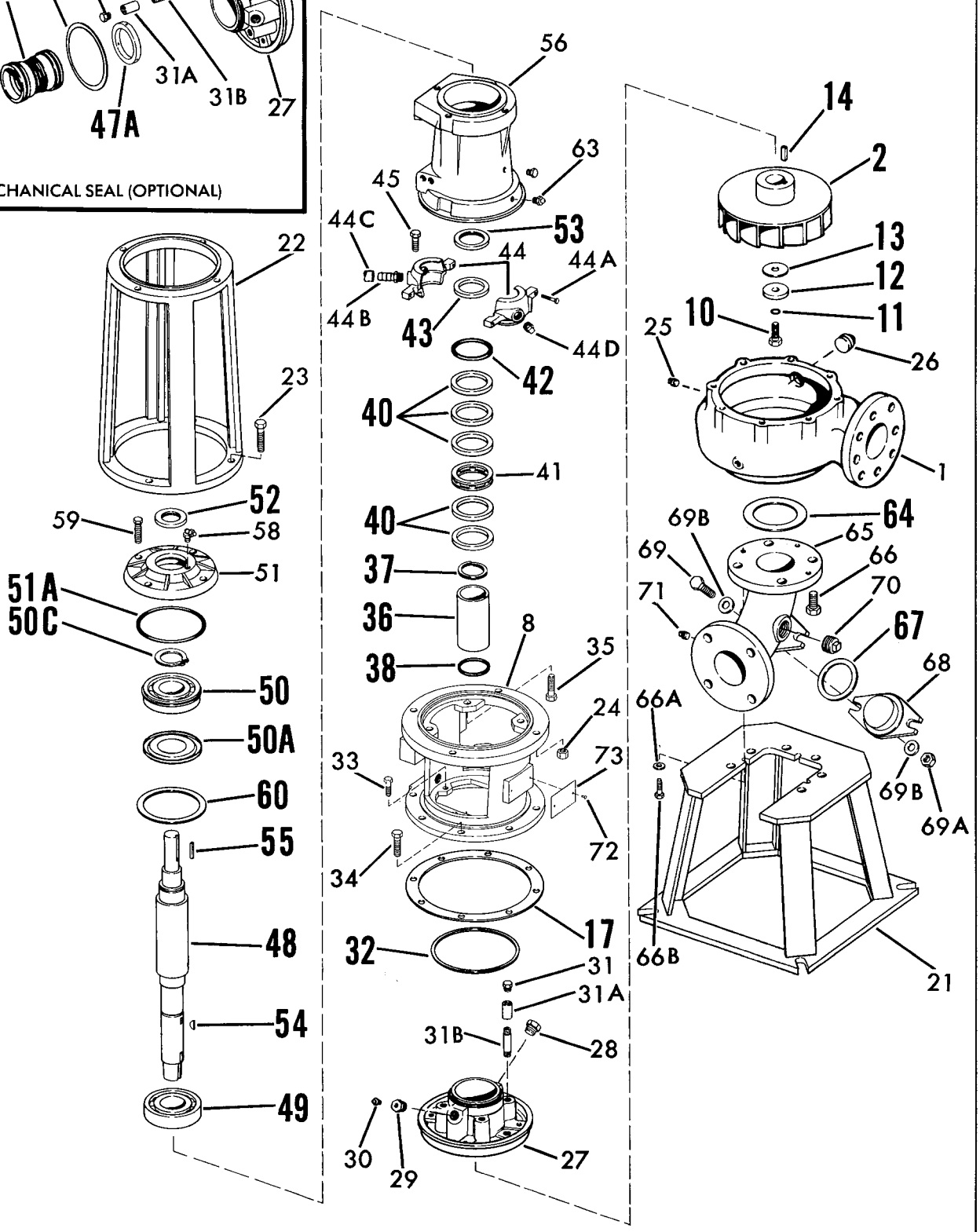
BOLD FACE NUMBERS INDICATE
RECOMMENDED SPARE PARTS.



660A SERIES
MODEL 662A-663A PF 3C
PIECE NUMBERS

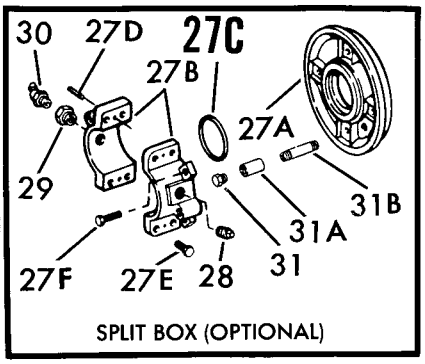


MECHANICAL SEAL (OPTIONAL)

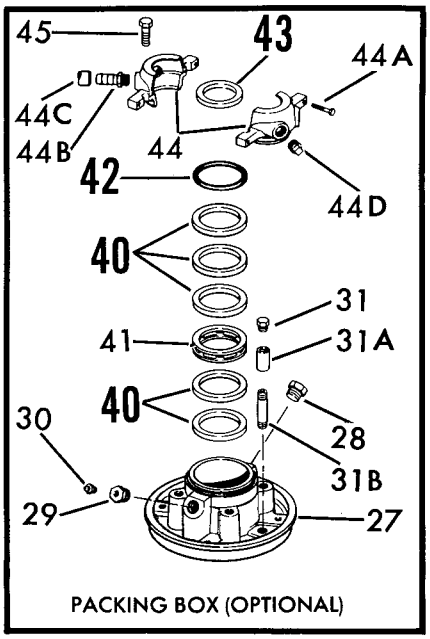


BOLD FACE NUMBERS INDICATE
RECOMMENDED SPARE PARTS.

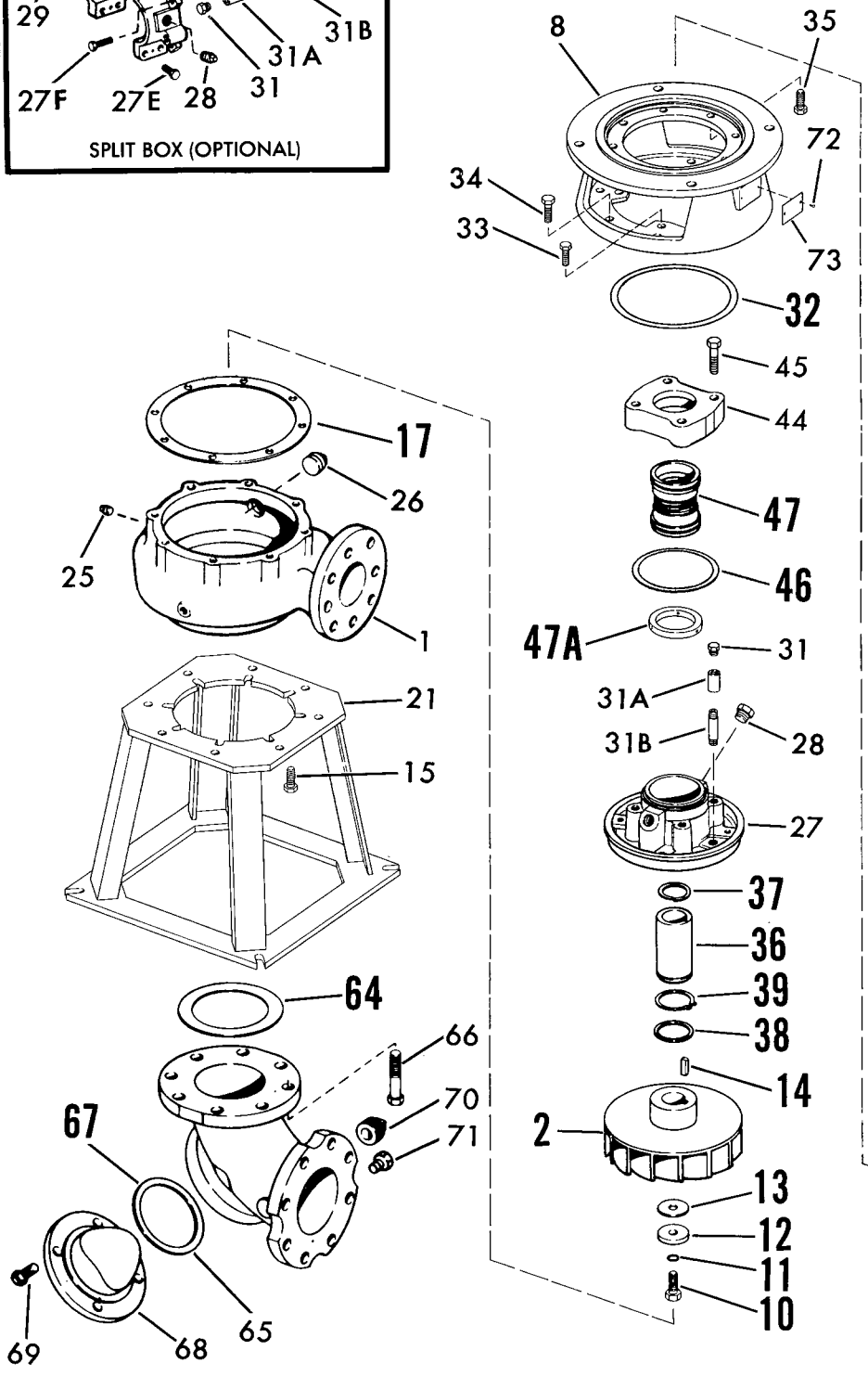
660A SERIES
MODEL 664A
PIECE NUMBERS

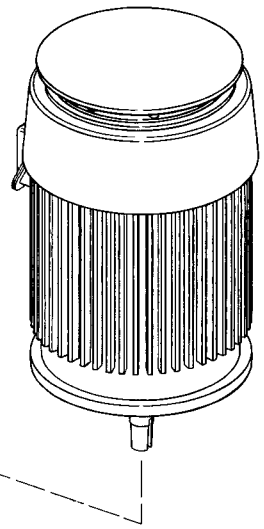


SPLIT BOX (OPTIONAL)



PACKING BOX (OPTIONAL)





BOLD FACE NUMBERS INDICATE
RECOMMENDED SPARE PARTS.

660A SERIES

PARTS LIST

PC. NO.	DESCRIPTION	QTY	PART NO.	MATERIAL S.F.	—	—	—
1	CASING						
	3x3x9	1	180-0655	010			
	4x4x9	1	180-0656	010			
	3x3x12	1	180-0657	010			
	4x4x12	1	180-0658	010			
	6x6x12	1	180-0659	010			
	6x6x15	1	180-0660	010			
2	IMPELLER						
	3x3x9	1	443-2518	010			
	4x4x9	1	443-2519	010			
	3x3x12	1	443-2520	010			
	4x4x12	1	443-2521	010			
	6x6x12 PF 4C (661A, 662A, 663A)	1	443-2522	010			
	6x6x12 PF 5E (661A, 662A, 663A)	1	443-2523	010			
	6x6x12 (614A) 885 RPM & 9" DIAMETER & LESS	1	443-2647	010			
	6x6x15	1	443-2524	010			
8	BRACKET						
	3x3x9, 4x4x9	1	116-0487	010			
	3x3x12, 4x4x12	1	116-0488	010			
	6x6x12, PF 4C	1	116-0490	010			
	6x6x12, PF 5E	1	116-0491	010			
	6x6x15	1	116-0492	010			
10	IMPELLER SCREW						
	PF 3C & 4C	1	168-1008	082			
	PF 5E	1	168-1009	082			
11	IMP. SCREW SEAL						
	PF 3C & 4C	1	908-1283	999			
	PF 5E	1	908-1284	999			
12	IMPELLER WASHER						
	PF 3C	1	908-0605	087			
	PF 4C	1	908-0457	062			
	PF 5E	1	908-0458	062			
13	IMPELLER WASHER GASKET						
	PF 3C	1	364-2038	803			
	PF 4C	1	364-2025	803			
	PF 5E	1	364-2029	803			
14	IMPELLER KEY						
	PF 3C	1	472-0250	087			
	PF 4C	1	472-0250	087			
	PF 5E	1	472-0391	087			

PC. NO.	DESCRIPTION	QTY	PART NO.	MATERIAL S.F.	—	*	—
15	CAPSCREW						
	662A, 663A & 664A						
	6x6x12	8	168-0566	082			
	6x6x15	8	168-0566	082			
15A	CAPSCREW 661A						
	3x3x9	4	168-0492	082			
	4x4x9	4	168-0492	082			
	3x3x12	4	168-0564	082			
	4x4x12	4	168-0564	082			
	6x6x12	2	168-0560	082			
	6x6x15	2	168-0560	082			
17	GASKET *						
	9" CASE BORE	1	364-1015	603			
	12" CASE BORE	1	364-1326	803			
	15" CASE BORE	1	364-1327	803			
21	PUMP SUPPORT						
	FRONT FOOT 661A						
	3x3x9, 4x4x9	1	820-1622	087			
	3x3x12, 4x4x12	1	820-1623	087			
	6x6x12	1	820-0507	087			
	6x6x15	1	820-0507	087			
	PUMP BASE						
	662A, 663A, 664A						
	3x3x9, 4x4x9	1	820-1387	087			
	3x3x12, 4x4x12	1	820-1387	087			
	6x6x12	1	820-1388	087			
	6x6x15	1	820-1388	087			
22	PUMP SUPPORT						
	REAR FOOT 661A						
	3x3x9, 4x4x9	1	820-0033	010			
	3x3x12, 4x4x12	1	820-0033	010			
	6x6x12, PF 4C	1	820-1628	087			
	6x6x12 PF 5E	1	820-1629	087			
	6x6x15	1	820-1629	087			
	MOTOR SUPPORT						
	663A						
	PF 3 & 4	1	820-1397	010			
	< 284 HPH PF 5	1	820-1617	087			
	≤ 284 HPH PF 5	1	820-1620	087			
22A	ADAPTOR 663A						
	284 HPH PF 3 & 4	1	008-0340	010			
22B	CAPSCREW 663A						
	284 HPH PF 3 & 4	1	168-0562	082			

*FOR MODEL 664A REFER TO FACTORY FOR SHIM GASKETS.

< LESS THAN ≥GREATER THAN OR EQUAL TO

660A SERIES

PARTS LIST

PC. NO.	DESCRIPTION	QTY	PART NO.	MATERIAL			
				S.F.	—	—	—
23	CAPSCREW						
	REAR FOOT 661A						
	PF 3C	2	168-0490	082			
	PF 4C	2	168-0560	082			
	PF 5E	2	168-0668	082			
	CAPSCREW 663A						
	PF 3C & 4C	4	168-0494	082			
	PF 5E	4	168-0640	082			
24	WASHER						
	REAR FOOT 661A						
	PF 3C	2	908-0114	080			
	PF 4C	2	908-0116	080			
	PF 5E	2	908-0118	080			
	NUT 663A						
	PF 3C & 4C	4	544-0113	080			
	PF 5E	4	544-0117	080			
25	PIPE PLUG	4	600-0005	028			
26	PIPE PLUG						
	3x3x9	1	600-0006	028			
	4x4x9	1	600-0006	028			
	3x3x12	1	600-0006	028			
	4x4x12	1	600-0006	028			
	6x6x12	1	600-0009	028			
	6x6x15	1	600-0009	028			
27	STUFFING BOX						
	STANDARD PF 3C	1	812-1083	010			
	STANDARD PF 4C	1	812-1084	010			
	STANDARD PF 5E	1	812-1085	010			
27A	STUFFING BOX						
	ADAPTOR						
	OPTIONAL PF 4C	1	008-0564	010			
	OPTIONAL PF 5E	1	008-0565	010			
27B	SPLIT STUFFING BOX						
	OPTIONAL PF 4C	1	812-0305	010			
	OPTIONAL PF 5E	1	812-0309	010			
27C	GASKET OPT PF 4	1	364-2006	803			
	OPTIONAL PF 5	1	364-2027	803			
27D	PIN OPT. PF 4	2	592-0836	104			
	OPTIONAL PF 5	2	592-0361	107			
27E	CAPSCRW OPT PF 4	4	168-0382	082			
	OPTIONAL PF 5	4	168-0382	082			
27F	CAPSCRW OPT PF 4	4	168-0382	082			
	OPTIONAL PF 5	4	168-0492	082			
28	PIPE PLUG	1	600-0004	028			

PC. NO.	DESCRIPTION	QTY	PART NO.	MATERIAL			
				S.F.	—	—	—
29	BUSHING (PACK)	1	600-0905	387			
30	FITTING(PACK)	1	508-0012	651			
31	PIPE PLUG						
	PF 3C	1	600-0002	087			
	PF 4C	1	600-0002	087			
	PF 5E	1	600-0003	087			
31A	PIPE COUPLING						
	PF 3C	1	600-0721	387			
	PF 4C	1	600-0721	387			
	PF 5E	1	600-0722	387			
31B	NIPPLE						
	PF 3C	1	600-1103	387			
	PF 4C	1	600-1103	387			
	PF 5E	1	600-1254	387			
32	GASKET						
	PF 3C	1	364-1343	803			
	PF 4C	1	364-1344	803			
	PF 5E	1	364-1345	803			
33	CAPSCREW						
	PF 3C	4	168-0382	082			
	PF 4C	4	168-0382	082			
	PF 5E	4	168-0560	082			
34	CAPSCREW						
	3x3x9	8	168-0487	082			
	4x4x9	8	168-0487	082			
	3x3x12	8	168-0560	082			
	4x4x12	8	168-0560	082			
6x6x12	PF 4C	8	168-0560	082			
6x6x12	PF 5E	8	168-0562	082			
	6x6x15	8	168-0632	082			
35	CAPSCREW						
	PF 3C	4	168-0490	082			
	PF 4C	4	168-0490	082			
	PF 5E	8	168-0560	082			
36	SLEEVE (PACK)						
	PF 3 & 4	1	756-0414	108			
	PF 5	1	756-0415	108			
	CERAMIC COATED						
	PF 3 & 4	1	756-0554	548			
	PF 5	1	756-0555	548			
	MECHANICAL SEALS						
	PF 3	1	756-0410	208			
	PF 4	1	756-0411	208			
	PF 5	1	756-0412	208			
	DURA BRO PF 5	1	756-0578	208			

660A SERIES

PARTS LIST

PC. NO.	DESCRIPTION	QTY	PART NO.	MATERIAL S.F.	—	—	—
37	RETAINING RING						
	PF 3 & 4	1	676-0470	088			
	PF 5	1	676-0471	088			
38	GASKET						
	PF 3 & 4	1	364-0581	457			
	PF 5	1	364-0584	457			
39	RETAINING RING						
	PF 3		NOT REQUIRED				
	PF 4	1	676-0294	088			
	PF 5	1	676-0460	088			
40	PACKING						
	PF 3 & 4	5	564-0114	802			
	PF 5	5	564-0183	802			
41	LANTERN RING						
	PF 3 & 4	1	676-1105	512			
	PF 5	1	676-1106	512			
42	O-RING (PACK)						
	PF 3 & 4	1	364-0425	457			
	PF 5	1	364-2101	457			
43	SLINGER (PACK)						
	PF 3 & 4	1	764-0021	478			
	PF 5	1	764-0023	478			
	MECHANICAL SEALS						
	SLINGER						
	PF 3 &4	1	764-0020	478			
	PF 5	1	764-0022	478			
44	GLAND						
	661A PACK						
	PF 3 & 4	1	372-0320	010			
	PF 5	1	372-0321	010			
	662A & 663A PACK						
	PF 3 & 4	1	372-0515	319			
	PF 5	1	372-0516	319			
	MECHANICAL SEAL						
	GLAND FOR						
	JOHN CRANE						
	TYPE 1, 21, 8TD						
	PF 3 & 4	1	372-0518	010			
	PF 5	1	372-0520	010			
	JOHN CRANE						
	TYPE 8B2						
	PF 3 & 4	1	372-0519	104			
	PF 5	1	372-0521	104			

PC. NO.	DESCRIPTION	QTY	PART NO.	MATERIAL S.F.	—	—	—
44	DURAMETALLIC						
	TYPE CRO, BRO						
	PF 3 & 4	1	372-0524	010			
	PF 5	1	372-0520	010			
	DURAMETALLIC						
	TYPE RA						
	PF 3 & 4	1	372-0530	104			
	PF 5	1	372-0527	104			
	CHESTERTON						
	TYPE 880						
	PF 3 & 4	1	372-0530	104			
	PF 5	1	372-0531	104			
44A	CAPSCREW (PACK)	2	168-0718	082			
44B	HOSE CONNECTOR						
	(PACK) PF 3, 4, & 5	1	600-2966	503			
44C	HOSE (PACK)	1	872-0005	505			
44D	PIPE PLUG (PACK)	3	600-0004	511			
44E	GLAND CLAMP						
	661A (PACK)						
	PF 3 & 4	2	204-0116	360			
	PF 5	2	204-0121	360			
45	CAPSCREW						
	661A PACKING	2	168-0500	082			
	662A & 663A						
	PACKING	2	168-0502	082			
	MECHANICAL SEALS						
	CAPSCREWS		REFER TO FACTORY				
46	GASKET (SEAL)						
	PF 3 & 4	1	364-0074	803			
	PF 5	1	364-0075	803			
47	MECHANICAL						
	SEALS PF 3 & 4						
	J.C. 21 DBL.	1	712-6410	749			
	J.C. 8TD DBL.	1	712-6411	749			
	J.C. 88 CART.	1	712-6413	767			
	* J.C. 1 SINGLE	1	712-6409	678			
	J.C. 8B2 OUT.	1	712-6412	678			
	DURA CRO DBL.	1	712-6424	772			
	DURA X-200 CART.	1	712-6431	519			
	DURA RA OUT.	1	712-6425	566			
	CHEST. 241 CART.	1	712-6433	571			
	CHEST. 880 SINGLE	1	712-6435	571			

*REFER TO FACTORY FOR J.C. 1 SINGLE SEALS, COLLARS & SETSCREWS.

660A SERIES

PARTS LIST

PC. NO.	DESCRIPTION	QTY	PART NO.	MATERIAL S.F.	—	—	—
47	POWER FRAME 5						
	J.C. 1 DBL.	1	712-6415	749			
	J.C. 8TD DBL.	1	712-6416	749			
	J.C. 88 CART.	1	712-6418	767			
	* J.C. 1 SINGLE	1	712-6414	678			
	J.C. 8B2 OUT.	1	712-6417	678			
	DURA CRO DBL.	1	712-6426	773			
	DURA BRO DBL.	1	712-6427	741			
	DURA RA OUT.	1	712-6428	566			
	CHEST. 241 CART.	1	712-6434	571			
	CHEST. 880 SINGLE	1	712-6436	571			
47A	BUSHING						
	FOR SINGLE SEALS						
	PF 3 & 4	1	224-0223	208			
	PF 5	1	224-0224	208			
48	SHAFT						
	PF 3C	1	728-0513	063			
	PF 4C	1	728-0514	063			
	PF 5E	1	728-0515	063			
49	BEARING INBOARD						
	PF 3C	1	068-0427	647			
	PF 4C	1	068-0162	647			
	PF 5E	1	068-0168	647			
49A	GREASE SHIELD						
	PF 4C	1	712-0280	087			
	PF 5E	1	712-0281	087			
50	BEARING OUTBOARD						
	PF 3C	1	068-2560	647			
	PF 4C	1	068-3004	647			
	PF 5E	2	068-2996	647			
50A	GREASE SHIELD						
	PF 3C	1	712-0283	087			
	PF 4C	1	676-0560	087			
	PF 5E	1	676-0398	010			
50B	RETAINING RING						
	PF 3C		Included with PC.50				
	PF 4C	1	676-0446	088			
	PF 5E	1	676-0447	088			
50C	RETAINING RING						
	PF 3C	1	676-0945	088			
	PF 4C	1	676-0943	088			
	LOCK WASHER						
	PF 5E	1	908-0416	080			
50D	LOCKNUT PF 5E	1	544-0716	080			

PC. NO.	DESCRIPTION	QTY	PART NO.	MATERIAL S.F.	—	—	—
51	BEARING CARTRIDGE						
	PF 3C	1	164-0472	010			
	PF 4C	1	164-0447	010			
	PF 5E	1	164-0448	010			
51A	O-Ring PF 3C	1	364-0570	457			
52	GREASE SEAL						
	PF 3C	1	712-0233	653			
	PF 4C	1	712-0248	653			
	PF 5E	1	712-0241	653			
53	GREASE SEAL						
	PF 3C	1	712-0234	653			
	PF 4C	1	712-0240	653			
	PF 5E	1	712-0265	653			
54	KEY, SLEEVE	1	472-0010	087			
55	KEY, SHAFT						
	PF 3C	1	472-0247	087			
	PF 4C	1	472-0250	087			
	PF 5E	1	472-0390	087			
56	POWER FRAME						
	HOUSING PF 3C	1	356-0203	010			
	PF 4C	1	356-0044	010			
	PF 5E	1	356-0045	010			
57	PIPE PLUG						
	PF 3C		NOT REQUIRED				
	PF 4C	1	600-0001	087			
	PF 5E	1	600-0001	087			
58	GREASE FITTING						
	PF 3C	1	508-0005	651			
	PF 4C	1	508-0015	651			
	PF 5E	1	508-0010	651			
59	CAPSCREWS						
	PF 3C	4	168-0492	082			
	PF 4C	3	168-0492	082			
	PF 5E	4	168-0564	082			
60	SHIM PACK						
	PF 3C	1	740-0070	517			
	CAPSCREW PF 4C	3	168-0201	080			
	PF 5E	4	168-0202	080			
61	JAM NUT PF 3C		NOT REQUIRED				
	PF 4C	3	544-0312	080			
	PF 5E	4	544-0316	080			
62	PIPE PLUG						
	PF 3C		NOT REQUIRED				
	PF 4C	1	600-0001	087			
	PF 5E	1	600-0001	087			

*REFER TO FACTORY FOR J.C. 1 SINGLE SEALS, COLLARS & SETSCREWS.

660A SERIES

PARTS LIST

PC. NO.	DESCRIPTION	QTY	PART NO.	MATERIAL			
				S.F.	—	—	—
63	GREASE FITTING						
	PF 3C	1	508-0001	651			
	PF 4C	1	508-0015	651			
	PF 5E	1	508-0010	651			
64	GASKET 662A,						
	663A & 664A						
	3" SUCTION	1	364-0605	603			
	4" SUCTION	1	364-0607	603			
	6" SUCTION	1	364-0609	603			
65	ELBOWS 662A,						
	663A & 664A						
	(STD.) 3x3	1	600-4581	010			
	(CLEANOUT) 3x3	1	816-0739	010			
	3x4	1	816-0742	010			
	(STD.) 4x4	1	600-4533	010			
	(CLEANOUT) 4x4	1	816-1015	010			
	4x6	1	816-0740	010			
	STD. W/CLNOUT 6x6	1	816-1018	010			
	6x8	1	816-1019	010			
66	CAPSCREW						
	3" SUCTION	4	168-0562	082			
	4" SUCTION	2	168-0564	082			
	4" SUCTION	6	168-0570	082			
	6" SUCTION	8	168-0636	082			
66A	WASHER						
	3" SUCTION	3	908-0112	080			
66B	CAPSCREW						
	3" SUCTION	3	168-0388	082			
67	GASKET						
	3x3	1	364-1041	453			
	3x4	1	364-1042	453			
	4x4	1	364-1043	453			
	4x6	1	364-1043	453			
	6x6	1	364-1048	478			
	6x8	1	364-1048	478			
68	HANDHOLE						
	COVER						
	3x3	1	260-0093	010			
	3x4	1	260-0089	010			
	4x4	1	260-0088	010			
	4x6	1	260-0088	010			
	6x6	1	260-0649	010			
	6x8	1	260-0649	010			

PC. NO.	DESCRIPTION	QTY	PART NO.	MATERIAL			
				S.F.	—	—	—
69	CAPSCREW						
	3x3	2	168-0494	082			
	3x4	2	168-0494	082			
	4x4	2	168-0564	082			
	4x6	2	168-0564	082			
	6x6	4	168-0562	082			
	6x8	4	168-0562	082			
69A	NUT						
	3x3	2	544-0113	080			
	3x4	2	544-0113	080			
	4x4	2	544-0115	080			
	4x6	2	544-0115	080			
	6x6		NOT REQUIRED				
	6x8		NOT REQUIRED				
69B	WASHER						
	3x3	4	908-0114	080			
	3x4	4	908-0114	080			
	4x4	4	908-0116	080			
	4x6	4	908-0116	080			
	6x6		NOT REQUIRED				
	6x8		NOT REQUIRED				
70	PIPE PLUG						
	3x3	1	600-0006	028			
	3x4	1	600-0008	028			
	4x4	1	600-0008	028			
	4x6	1	600-0008	028			
	6x6	1	600-0009	028			
	6x8	1	600-0009	028			
71	PIPE PLUG						
	3x3	1	600-0002	087			
	3x4	1	600-0002	087			
	4x4	1	600-0002	087			
	4x6	1	600-0002	087			
	6x6	1	600-0002	087			
72	DRIVE PINS	2	708-0013	365			
73	NAMEPLATE	1	532-0045	114			
74	LEAKAGE						
	ACCUMULATOR KIT						
	662A & 663A						
	PF 3 & 4	1	476-0279	645			
	PF 5	1	476-0280	645			
75	SEALANT	1	716-0025	621			
	(REQUIRED WITH						
	PIECE 44 PACKED						
	662A & 663A						

AURORA PUMP A member of PENTAIR PUMP GROUP

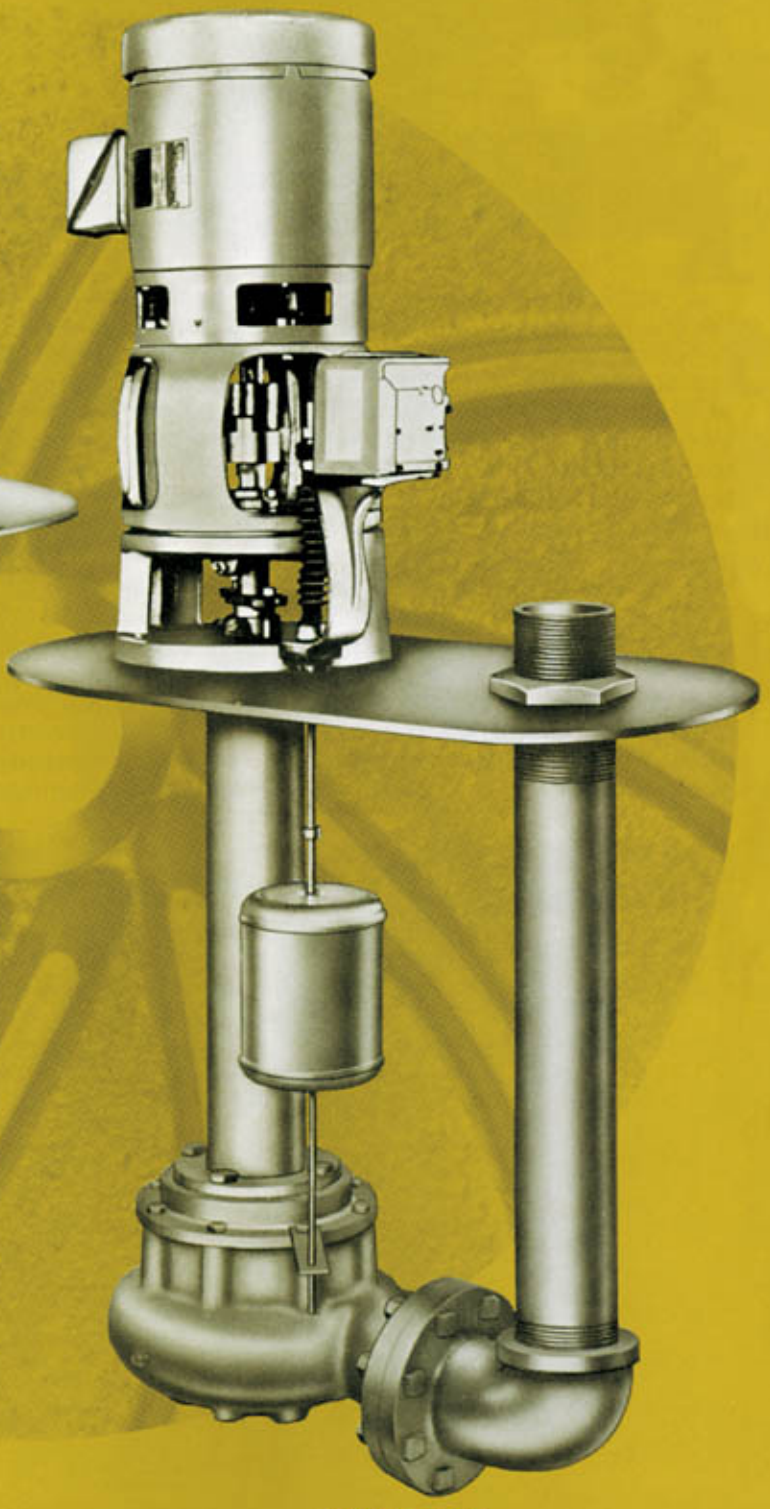
AURORA PUMP

BULLETIN 670/Rev. D

670 SERIES SINGLE STAGE VORTEX PUMPS

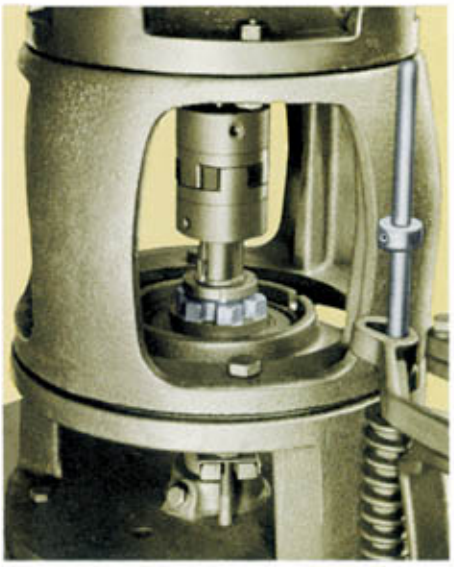
CAPACITIES TO 1025 G.P.M.
HEADS TO 160 FEET
TEMPERATURES TO 180°F.

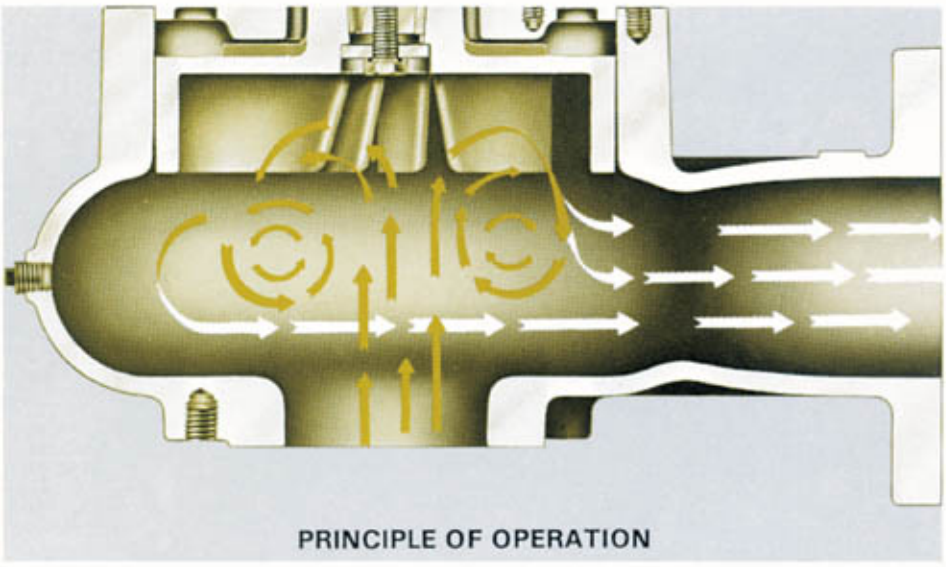
MODEL 672



MODEL 671

INTRODUCTION AND PRINCIPLE OF OPERATION VORTEX PUMPS





PRINCIPLE OF OPERATION

The application difficulties inherent in the pumping of heavy concentrations of solid materials are solved with the introduction of the Aurora Vortex Pump. The Vortex design is suited primarily to the pumping of sludge or slurry but may be readily applied to food processing and other diverse applications ranging from acetic acid to zinc sulphate. A 28% Hi-Chrome Iron is available for highly abrasive mixtures. This product coupled with a complete line of Aurora Non-Clog Pumps provides a single source availability unique in the centrifugal pump industry.

The Model 670 vertical wet pit pump operates on the vortex principle. The vortex action created by the impeller is similar to a hurricane in that the liquid upon entering the casing is constantly swirling. The majority of the liquid, as well as stringy material does not contact the impeller, but is caught up in the mainstream of the casing and by centrifugal force is discharged. The unique impeller design and the fact that the material pumped does not flow thru the impeller in a conventional manner requires special consideration of the specifying engineer.

1 MOTOR MOUNTING bracket that assures alignment of motor and pump shaft with tongue and groove machining. Motors are of standard "HP" manufacture.
2 THRUST BEARING is regreasable and is protected from contamination by grease seals on both sides and a water slinger. The bearing is elevated 6" above the floor level for easy servicing and added protection from washdown, flooding, etc.
3 EXTERNAL IMPELLER ADJUSTMENT is accomplished with hexagon shaped adjusting nut using standard tools. A locking nut secures the adjustment.

QUICK REFERENCE 670 SERIES FEATURE SELECTOR

STANDARD

Standard fitted construction
Bronze pump bearings
Bronze line bearings (6'-6" settings and deeper)
Dynamically balanced impeller
Sphere size equals suction size
Elevated regreaseable thrust bearing
Grease lubricated pump and line bearings
Standard "HP" base motors
Carbon steel shaft
Packing box with split gland and lantern ring
Oval baseplate

4" vent — 46" baseplate and larger
Plastic float and rod
Elevated float switch and support
External adjustment of impeller
Pump settings up to 21'-0"

OPTIONAL

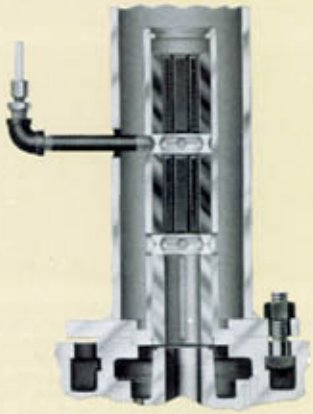
Special alloy construction
Various pump and line bearing types
Drip oiler for line bearings
Solenoid oiler for line bearings
Stainless steel shaft
Round, square or special baseplate
Steel curb rings
Various float switch enclosures
Electric alternator
Stainless steel or bronze float and rod
High water alarm
Alarm bells
Float guard
4" vent — 28" baseplate and smaller
Flushing lines to sleeve bearings
Electric controllers
Gastight construction

PUMP AND LINE BEARINGS

STANDARD

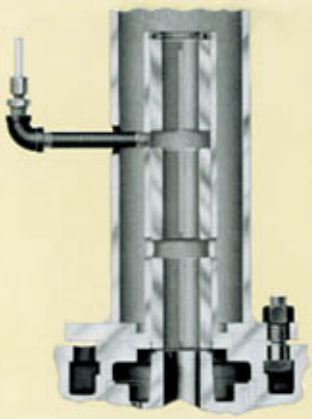
GRAPHITAR

CUTLESS RUBBER

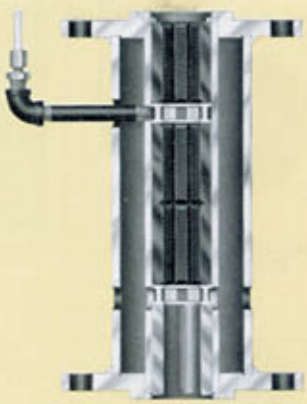


GLASS-FILLED TEFLON*

RELIEF



SPOOL



Two important parts in any sump pump construction are the pump and line bearings as they are immersed in the liquid. The line bearings frequently run wet or dry depending on the varying liquid level in the sump. A complete line of bearings for all types of service conditions is available. Line bearings are provided as standard on 6'-6" pump settings and for each additional 5' of setting.

STANDARD—All 670 Series pumps (except for 10 foot and deeper settings at 1750 R.P.M.) are furnished with bronze sleeve type bearing unless an optional style is specified and is also the standard lineshaft bearing for all settings. This bearing is also available in cast iron or ni-resist material. When pumping conditions are severe, abrasives are present in the liquid or the liquid temperature exceeds 140°F., one of the following optional bearings should be selected.

GRAPHITAR (OPTIONAL BEARING)—The wearing surface of the graphitar bearing is made of non-metallic material. It consists of a carbon steel relief-type bearing housing and three graphitar bushings. The graphitar bearing configuration is recommended for use on applications where the temperature of the liquid exceeds 140°F. Stainless steel shafting is recommended. DO NOT APPLY THIS OPTION WHEN LIQUID BEING PUMPED CONTAINS ABRASIVES; IN SUCH CASES, SELECT ONE OF THE OTHER BEARING OPTIONS.

CUTLESS RUBBER (OPTIONAL BEARING)—This bearing consists of a metal relief-type bearing housing and two cutless rubber bushings. A third bushing located at the bottom of the bearing housing is made of metal. Lubrication can be supplied by the liquid being pumped when used as a pump bearing. When used as an optional lineshaft bearing, water flush lubrication is provided. Grease lubrication is not recommended. This option is recommended for applications where abrasives are held in suspension in the liquid pumped. Stainless steel shafting is recommended. Do not apply this option when the liquid temperature exceeds 140°F.; in such cases, select one of the other bearing options.

GLASS-FILLED TEFLON* (OPTIONAL BEARING)—This bearing consists of a carbon steel relief-type bearing housing with three glass-filled Teflon* bushings as the bearing surface. The self-lubricating, low-friction and inert qualities of filled Teflon* make it ideal for handling hot liquids, chemicals and solvents which may attack standard bearing materials. Stainless steel shafting is recommended.

RELIEF—A RELIEF-TYPE BEARING WILL BE SUPPLIED AS STANDARD FOR 10'-6" AND DEEPER SETTINGS AT 1750 R.P.M., and is otherwise optionally available. The relief-type bearing housing has three metal bushings. Since this relief-type bearing housing is also used with the other bushing materials (Graphitar, Cutless Rubber and Teflon*), the same venting principle applies to these bushing materials.

SPOOL (OPTIONAL BEARING)—This bearing can be supplied as an optional bearing for any pump setting. It is intended for use as a rigid pump bearing for unusually rugged pump applications. The housing can be equipped with different bushing materials (Iron, Bronze, Graphitar, Cutless Rubber or Glass-Filled Teflon*) depending upon the application. The bearing housing is of rigid "double-wall" metal construction and is flanged at each end.

*Teflon is a registered trademark of E.I. duPont

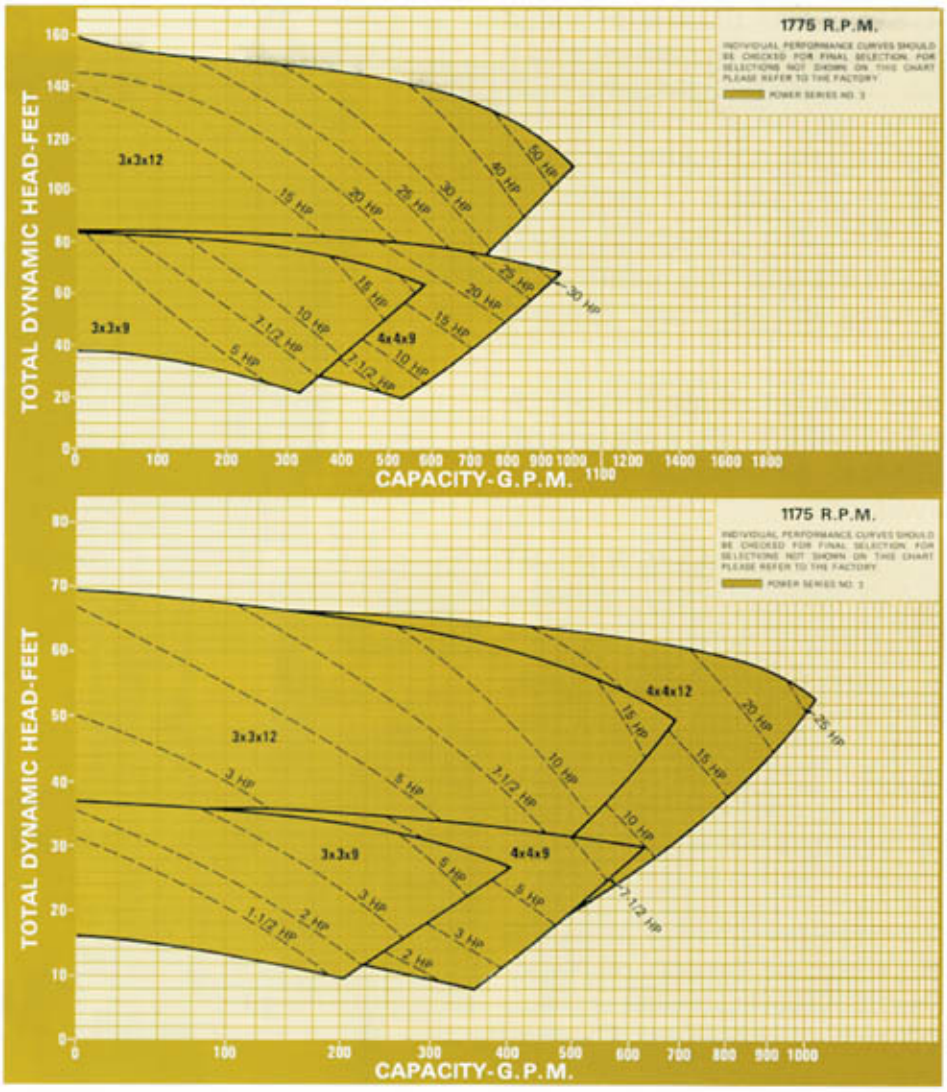
BEARING TYPE	PUMP CONSTRUCTION	BEARING HOUSING MATERIAL	BUSHING MATERIAL				
			IRON	BRONZE	CUTLESS RUBBER	GRAPHITAR	FILLED TEFLON
STANDARD BEARING FOR PIT DEPTHS UNDER 10'	BRONZE FITTED	BRONZE	NO BUSHINGS REQUIRED				
	ALL BRONZE	BRONZE					
	ALL IRON	IRON					
	STAINLESS STEEL	STAINLESS STEEL					X
RELIEF BEARING STANDARD FOR PIT DEPTHS 10' AND DEEPER	BRONZE FITTED	STEEL		X			
	ALL BRONZE	BRONZE		X			
	ALL IRON	STEEL	X				
	STAINLESS STEEL	STAINLESS STEEL					X
OPTIONAL RELIEF BEARING	BRONZE FITTED	STEEL		X	X	X	X
	ALL BRONZE	BRONZE		X	X	X	X
	ALL IRON	STEEL	X		X	X	X
	STAINLESS STEEL	STAINLESS STEEL			X	X	X
OPTIONAL SPOOL BEARING	BRONZE FITTED	STEEL		X	X	X	X
	ALL IRON	STEEL	X		X	X	X
	STAINLESS STEEL	STAINLESS STEEL			X	X	X
STANDARD LUBRICATION			GREASE		PUMPED LIQUID		
OPTIONAL LUBRICATION			WATER FLUSH OIL (1)		WATER FLUSH (2)	WATER FLUSH GREASE (2)	WATER FLUSH

(1) OIL—FOR LINE SHAFT BEARINGS ONLY
(2)—WATER FLUSH—RELIEF HOUSING ONLY

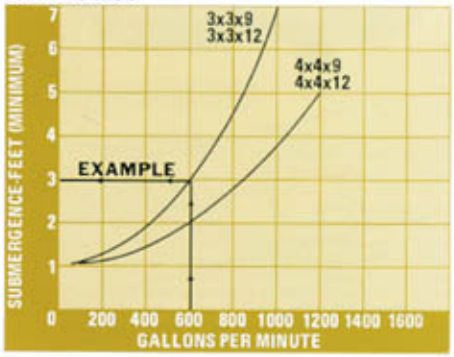
RANGE CHARTS AND ENGINEERING DETAILS

Air may be entrained in the pumped liquid if the pump suction is located too close to the free liquid surface in the suction source. Pumping liquid with entrained air can cause a reduction of capacity, vibration, loss of efficiency and wasted power. Excessive wear of close running parts, bearing stresses and shaft damage are also subsequent effects. If the capacity in gallons per minute and the suction inlet size or area is known, the minimum height of the liquid above the suction inlet (submergence) can be determined. A properly designed suction inlet and sump can be attained with the help of the submergence chart shown below.

EXAMPLE:
The recommended minimum submergence for a 3" x 3" x 9" Model 670 pump operating at 600 gallons per minute (G.P.M.), from water level to suction flange is 3 feet.



SUBMERGENCE



STANDARD MATERIAL OF CONSTRUCTION

DESCRIPTION	MATERIAL
BASEPLATE	STEEL-WRT
SLEEVE BEARINGS	BRONZE ASTM B62
BEARING COLLAR	BRONZE ASTM B62
CASING	CAST IRON ASTM A48
DISCHARGE PIPE	STEEL WRT. SCH'D. 40
HEAD-LOWER	CAST IRON ASTM A48
HEAD-UPPER	CAST IRON ASTM A48
IMPELLER	CAST IRON ASTM A48
PACKING	GRAPHITE IMPREGNATED T.F.E.
SHAFT	STEEL AISI C1040
BEARING COVER	CAST IRON ASTM A48
SUPPORT PIPE	STEEL WRT. SCH'D. 40

INTERMEDIATE LINE SHAFT BEARINGS

PIT DEPTHS	PUMP SETTING	NO. OF LINE SHAFT BRG.
7'-0"	6'-6"	1
12'-0"	11'-6"	2
17'-0"	16'-6"	3

PIT DEPTH OR PUMP SETTING (APPROX.)

LENGTH IN FT.		LENGTH IN FT.		LENGTH IN FT.	
PIT DEPTH	PUMP SETTING	PIT DEPTH	PUMP SETTING	PIT DEPTH	PUMP SETTING
2'-6"	2'-0"	7'-6"	7'-0"	12'-6"	12'-0"
3'-0"	2'-6"	8'-0"	7'-6"	13'-0"	12'-6"
3'-6"	3'-0"	8'-6"	8'-0"	13'-6"	13'-0"
4'-0"	3'-6"	9'-0"	8'-6"	14'-0"	13'-6"
4'-6"	4'-0"	9'-6"	9'-0"	14'-6"	14'-0"
5'-0"	4'-6"	10'-0"	9'-6"	15'-0"	14'-6"
5'-6"	5'-0"	10'-6"	10'-0"	15'-6"	15'-0"
6'-0"	5'-6"	11'-0"	10'-6"	16'-0"	15'-6"
6'-6"	6'-0"	11'-6"	11'-0"	16'-6"	16'-0"
7'-0"	6'-6"	12'-0"	11'-6"	17'-0"	16'-6"

DESIGN DETAILS

AREA	DESCRIPTION	POWER SERIES 3
PUMP SHAFT	DIAMETER AT IMPELLER	1¼
	DIAMETER BETWEEN COUPLING AND IMPELLER	1 3/16
	DIAMETER AT COUPLING END	1¼
BEARINGS	BEARING (BALL) — HEAD	311
	BEARING (SLEEVE) — PUMP	6" LG.
SUPPORT PIPE SIZE		4"
POWER SERIES		3

LIMITATIONS

MAXIMUM LIMITATIONS BASED ON STANDARD MATERIALS AND PUMPING CLEAR WATER		
SPEED — R.P.M.		1750
MINIMUM HORSEPOWER	1750 R.P.M.	3
	1150 R.P.M.	1
TEMPERATURE °F.		180
BASIN PRESSURE — P.S.I.		2
BASIN COVER SIZE	MINIMUM W/O OVAL OR MANHOLE	28
	MAXIMUM W OR W/O OVAL OR MANHOLE	78

PUMP FEATURES

4 STUFFING BOX is provided as standard with packing and a split gland for gastight construction. A lantern ring is also available for packing lubrication.

5 STEEL OVAL BASEPLATE is standard and eliminates removing the pit cover for service.

6 ELEVATED FLOAT SWITCH ASSEMBLY is standard. Several enclosures are also available.

7 POSITIVE ALIGNMENT THROUGHOUT utilizes tongue and groove register fit design.

8 SUPPORT PIPE is 4" sch. 40.

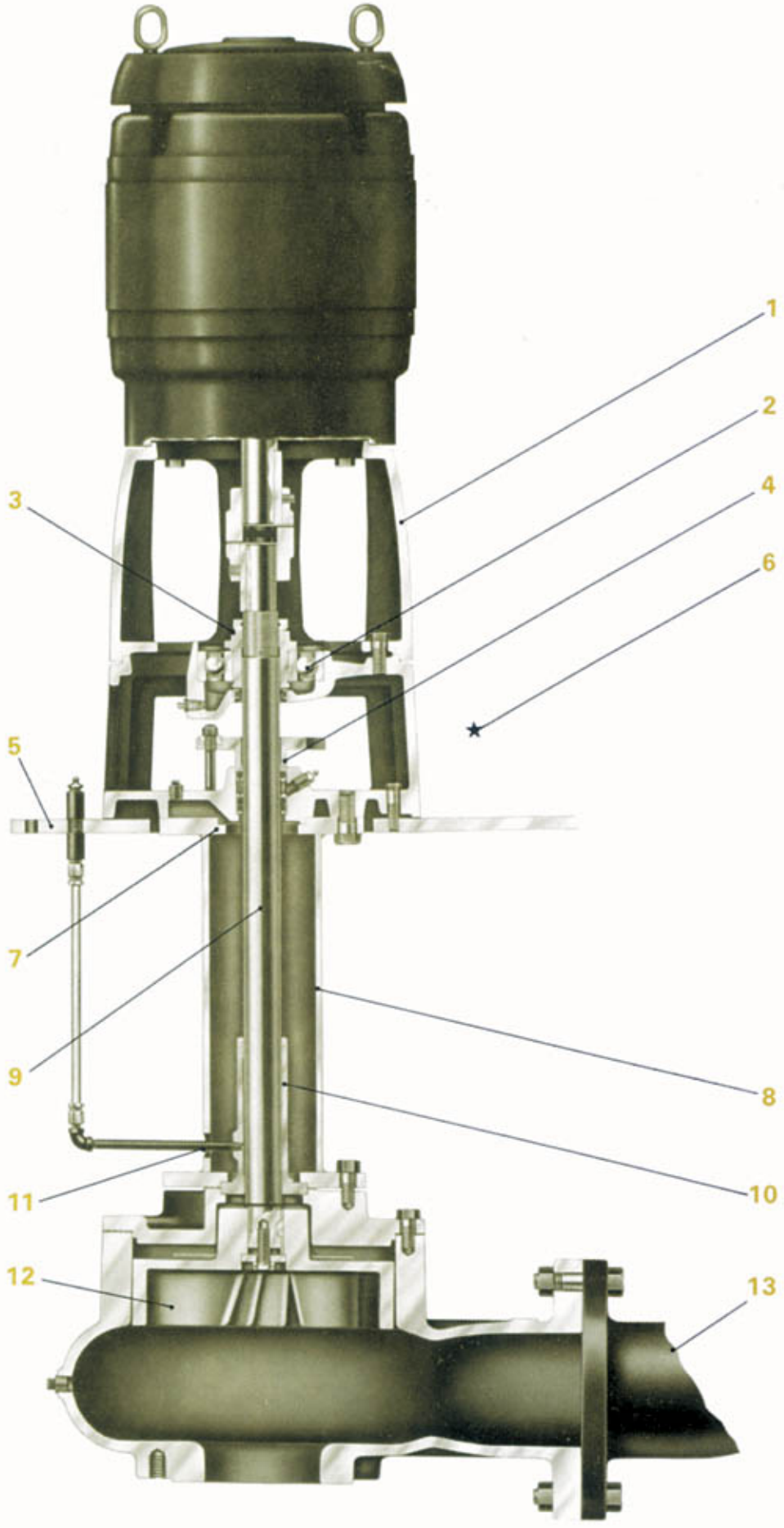
9 PUMP SHAFT that is 1-7/16" in diameter, is provided to minimize deflection. C1040 steel.

10 BEARING ASSEMBLIES available in several arrangements and materials to suit difficult applications. The line bearings are provided for pump settings of 6'-6" and longer. One bearing is provided for each additional 5' of setting. All standard line bearings are grease lubricated.

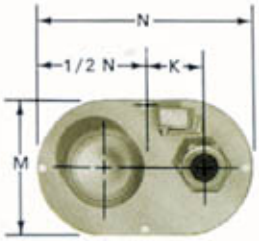
11 RELIEF HOLES prevent liquid under pressure from rising above the normal sump levels.

12 LIQUID END includes a totally recessed impeller as standard. The impeller is computer designed and dynamically balanced. Casing is concentric with all internal clearances larger or equal to the discharge opening.

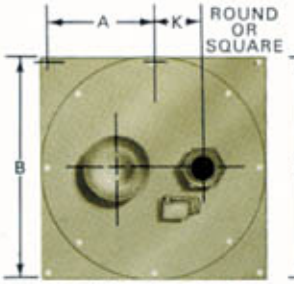
13 DISCHARGE PIPE is secured to the baseplate and is threaded for easy system piping. Below surface discharge is optional.



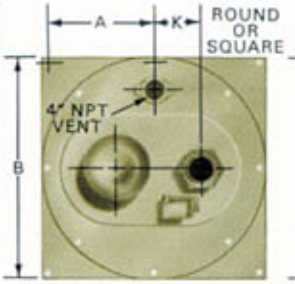
ENGINEERING SPECIFICATIONS AND DIMENSIONS



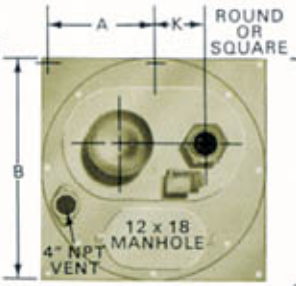
BASEPLATE — TYPE 1
STANDARD OVAL



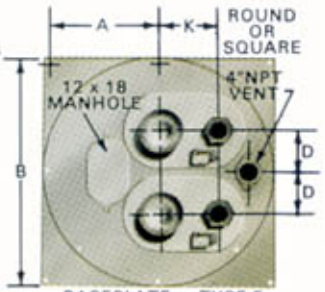
BASEPLATE — TYPE 2
OPTIONAL SIMPLEX
PLATE ONLY



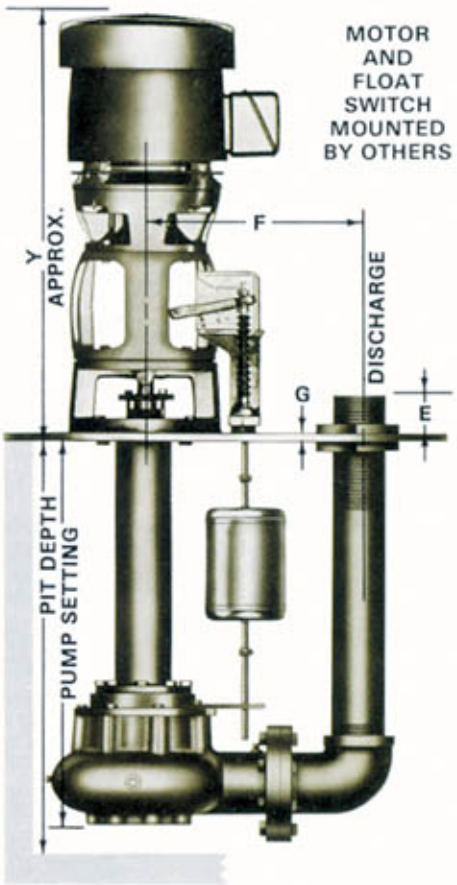
BASEPLATE — TYPE 3
OPTIONAL SIMPLEX
WITH OVAL



BASEPLATE — TYPE 4
OPTIONAL SIMPLEX
WITH OVAL & MANHOLE



BASEPLATE — TYPE 5
OPTIONAL DUPLEX
WITH OVALS & MANHOLE



NOTES:
1. Dimensions and weights are approximate.
2. All dimensions are in inches and may vary ± 1/2".
3. Frame sizes, "Y" dimension and motor weight are for open drip-proof motors only.
4. Conduit box is shown in approximate position. Dimensions are not specified as they vary with each motor manufacturer.
5. Add pump(s), base(s), upper head(s) and motor weight(s) for unit weight.
6. Not for construction purposes unless certified.
7. Motor H.P. will increase due to friction when multiple line shaft bearings are required.
8. Refer to factory for float suitability for liquids other than water.
9. Aurora Pump reserves the right to make revisions to its products and their specifications, and to this bulletin and related information, without notice.

BASEPLATE — OVAL — STEEL

NO.	TYPE	G	M	N	WGT.
2	22 x 28	½	22	28	63
3	26 x 36	½	26	36	95

BASEPLATES — ROUND OR SQUARE — STEEL

		TYPE 2				TYPE 4				TYPE 5			
A	B	OVAL NO.	G	WGT. RD.	WGT. SQ.	OVAL NO.	G	WGT. RD.	WGT. SQ.	OVAL NO.	G	WGT. RD.	WGT. SQ.
13	28	N.A.	½	41	54								
16	34	N.A.	½	58	76								
TYPE 3													
22	46	2	½	225	289	3	½	235	299				
25½	53	2	½	302	387	3	½	312	397				
29	60	2	¾	487	623	3	¾	497	633				
32	66	2	¾	592	755	3	¾	602	765	3	¾	730	927
38	78	2	¾	832	1060	3	¾	842	1070	3	¾	1016	1290

MOTOR

FRAME	HORSEPOWER 1750	HORSEPOWER 1150	MOTOR WGT (LBS)	UPPER HEAD WGT (LBS)	Y APPROX
143 HP	1	¾	40	21	25
145 HP	1½ 2	1	45	21	26
182 HP	3	1½ 2	72	21	27
184 HP	5	2	80	21	28
213 HP	7½	3	130	21	30
215 HP	10	5	145	21	32
254 HP	15	7½	220	21	34
256 HP	20	10	240	21	36
284 HPH	25	15	330	42	39
286 HPH	30	—	370	42	40
324 HP	40	—	475	42	41
326 HP	50	—	525	42	43
364 HP	60	—	630	42	48
365 HP	75	—	690	42	48

PUMP SIZE			PUMP WGT. IN LBS.		MINIMUM BASEPLATE SIZE											
DISCHARGE	SUCTION	CASE BORE	6'-0" SETTING	FOR EA. ADD. 1' SETTING	D	E	F	TYPE 1 SIZE	TYPE 1 K	TYPE 2 SIZE	TYPE 2 K	*TYPE 3 SIZE	*TYPE 3 K	*TYPE 4 SIZE	*TYPE 4 K	**TYPE 5 SIZE	**TYPE 5 K
3	3	9	452	30	10½	6½	14⅞	22x28	9⅜	28	9⅜	46	9⅜	46	9⅜	66	9⅜
4	4	9	527	30	10½	6	17	26x36	9	34	9	46	9	46	9	66	9
3	3	12	489	30	11½	6½	17⅞	26x36	9⅞	34	9⅞	46	9⅞	46	9⅞	66	9⅞
4	4	12	557	30	11½	6	19	26x36	11	34	11	46	11	46	11	66	11

*All Bases 46" and larger — use 26x36 oval only. **All bases 66" and larger — use 26x36 oval only.

The contractor shall furnish (and install as shown on the plans) Aurora Model (671 Simplex) (672 Duplex) centrifugal sewage pumps size . . . x . . . x . . . of (stand fitted) (all iron) construction. Each pump shall have a capacity of . . . G.P.M. at . . . ft. total head, with a temperature of . . . °F., . . . specific gravity. The unit shall be designed for a sump depth . . . feet and shall be furnished with an (above the floor discharge terminating at the baseplate) (below the floor discharge terminating with a threaded connection). A steel baseplate (oval) (round) (square) – (Simplex) (Simplex with oval) (Simplex with oval and manhole) (Duplex with ovals and manhole) will be provided. A 4" vent will be provided on all round or square baseplates*. The pump casing will be constructed of "CLASS 30 CAST IRON". The impeller is to be "CLASS 30 CAST IRON" and shall be capable of passing a maximum sphere size of . . . inches. The impeller shall be dynamically balanced before assembly into the pump and shall be securely fastened to the shaft by means of a steel key and impeller lock nut. The column pipe must be 4" diameter having machined tongue and grooved joints to insure shaft alignment. A pump bearing will be located directly above the impeller and shall be (bronze sleeve) (iron sleeve) (stainless steel sleeve) or relief type with (iron) (bronze) (cutless rubber) (graphitar) (filled teflon*) bushing. Spool bearing with (steel) (stainless steel) housing with (iron) (bronze) (cutless rubber) (graphitar) (filled teflon*) bushing. Line bearings must be provided with a setting of 6'-6" and one bearing for each additional 5' of setting thereafter. All standard sleeve or relief pump and line bearings must be (grease) (oil) (water) lubricated through separate Nylon tube lubrication lines terminating at the (baseplate) (discharge pipe). Standard bearings will be grease lubricated (unless otherwise specified). The motor pedestal is to be of cast iron, two piece construction, fitted with a sealed thrust ball bearing located 6" above the baseplate. The ball bearing collar will be arranged to allow external axial adjustment of the shaft and impeller. Grease seals shall be provided to retain grease and to prevent contamination of the vertically mounted ball bearing. A grease fitting will be provided to allow regreasing of the bearing. A packed stuffing box complete with a split gland shall be provided for gastight construction. The upper head shall be of sufficient height to elevate the motor shaft extension should the motor be removed for servicing. The pump shall be controlled by an enclosed (heavy duty) (watertight and explosion resisting) (explosion proof) type float operated switch 6" above the baseplate with plastic float and float rod. A flexible bellows will provide gastight construction. An automatic alternator shall be furnished on duplex pumps to allow the pumps to alternate on each successive cycle of operation. The pumps are driven by a flexible coupled std. . . . H.P., . . . volt, . . . Hertz, . . . R.P.M., vertical motor. *Teflon is a registered trademark of E.I. duPont

NOTE: Aurora Pump reserves the right to make revisions to its products and their specifications, and to this bulletin and related information without notice.

– Your Authorized Local Distributor –

AURORA PUMP
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AURORA MFG. PLANT: 800 AIRPORT ROAD • NORTH AURORA, ILLINOIS USA • 60542
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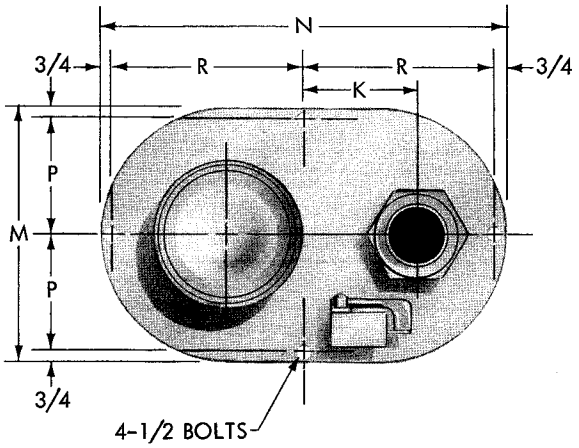
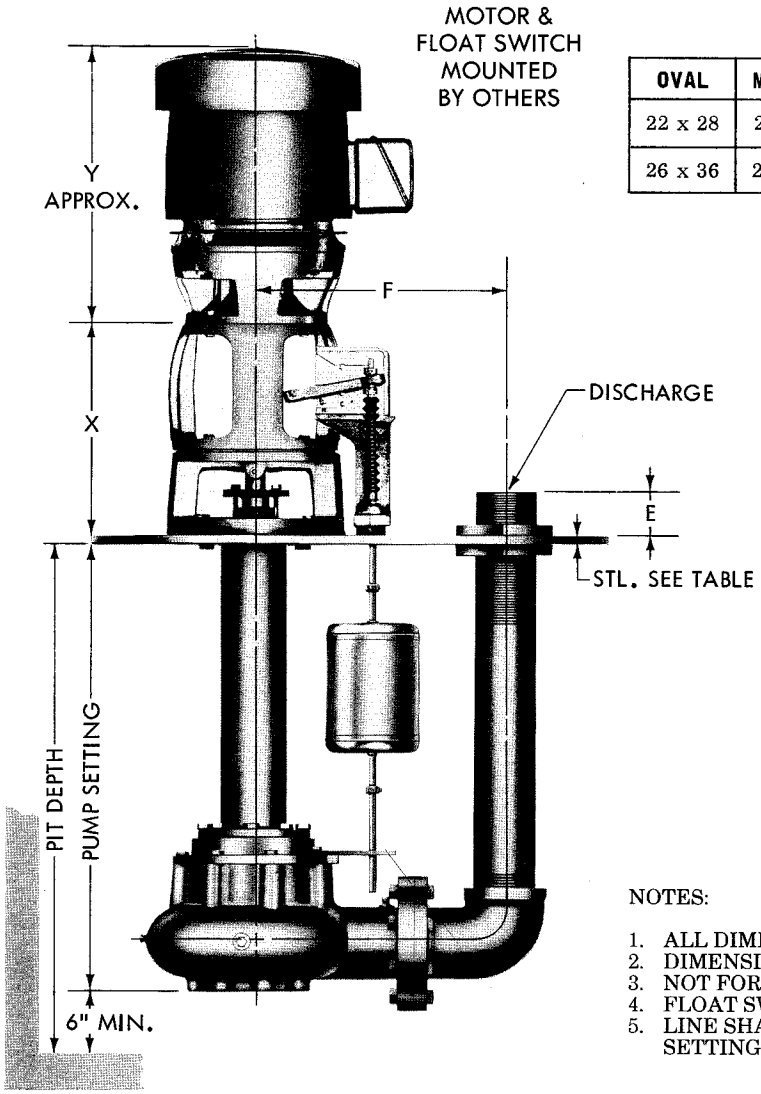
AURORA MODEL 671 PUMP
ON OVAL PLATE



PUMP SIZE			E	F	K	OVAL SIZE	STL THK
DISCH	SUCTION	CASE BORE					
3	3	9	6-1/2	14-13/16	9-5/16	22 x 28	1/2
4	4	9	6	16-15/16	8-15/16	26 x 36	1/2
3	3	12	6-1/2	17-13/16	9-13/16	26 x 36	1/2
4	4	12	6	18-15/16	10-15/16	26 x 36	1/2



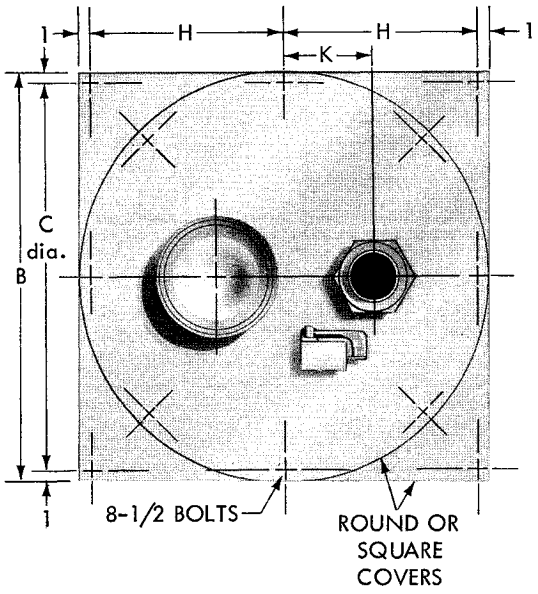
OVAL	M	N	P	R
22 x 28	22	28	10-1/4	13-1/4
26 x 36	26	36	12-1/4	17-1/4

FRAME	X	y
143HP	13-7/8	11
145HP	13-7/8	12
182HP	13-7/8	13
184HP	13-7/8	14
213HP	13-7/8	16
215HP	13-7/8	17
254HP	13-7/8	19
256HP	13-7/8	21
284HPH	15-5/8	21
286HPH	15-5/8	23
324HP	15-5/8	24
326HP	15-5/8	25
364HP	15-5/8	29
365HP	15-5/8	30

NOTES:

1. ALL DIMENSIONS IN INCHES.
2. DIMENSIONS MAY VARY ± 3/8".
3. NOT FOR CONSTRUCTION PURPOSES UNLESS CERTIFIED.
4. FLOAT SWITCH FURNISHED ONLY WHEN SPECIFIED.
5. LINE SHAFT BEARING FURNISHED ON 6'6" PUMP SETTINGS AND LONGER.

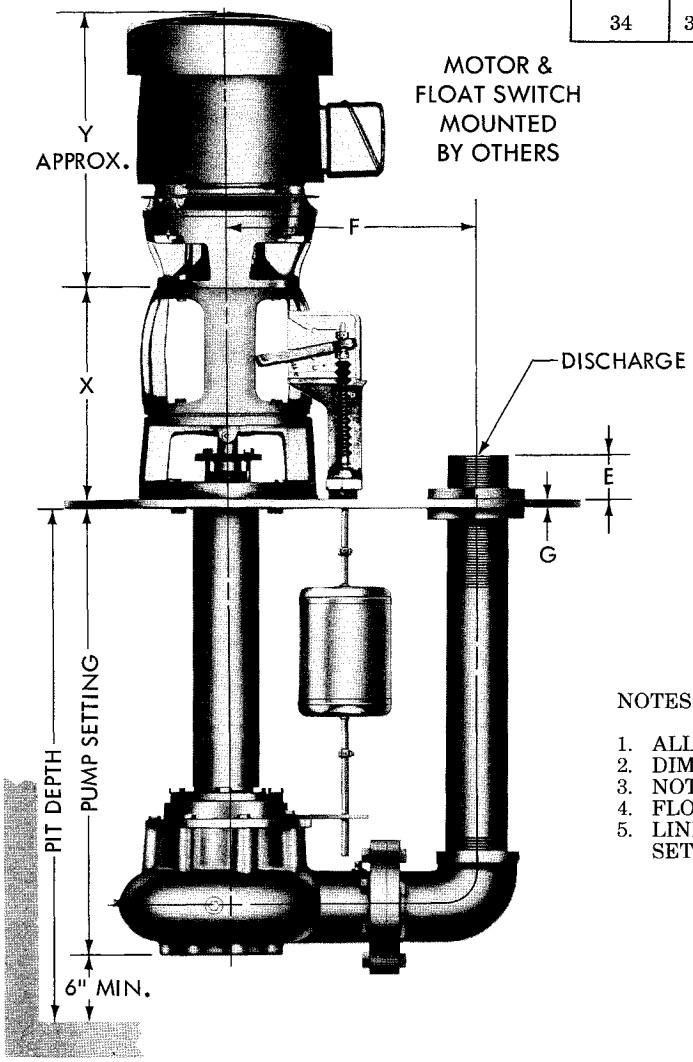
AURORA MODEL 671 PUMP
ON SIMPLEX PLATE



PUMP SIZE			E	F	K	MIN. COVER SIZE
DISCH	SUCTION	CASE BORE				
3	3	9	6-1/2	14-13/16	9-5/16	28
4	4	9	6	16-15/16	8-15/16	34
3	3	12	6-1/2	17-13/16	9-13/16	34
4	4	12	6	18-15/16	10-15/16	34

COVER SIZE B	C	H	G STEEL
28	26	13	1/2
34	32	16	1/2

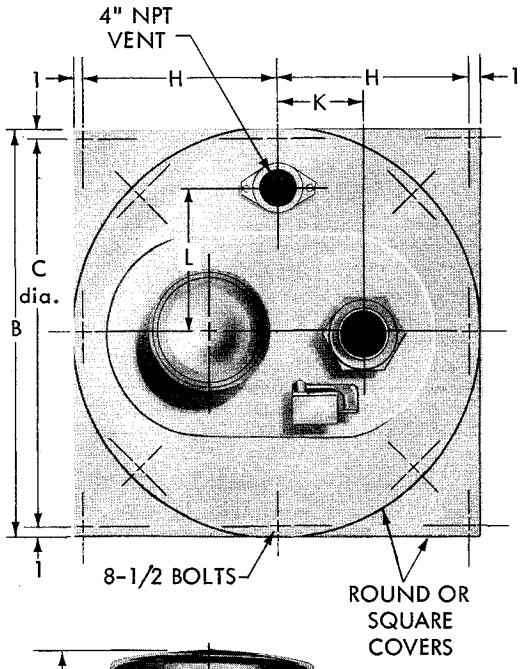
FRAME	X	Y
143HP	13-7/8	11
145HP	13-7/8	12
182HP	13-7/8	13
184HP	13-7/8	14
213HP	13-7/8	16
215HP	13-7/8	17
254HP	13-7/8	19
256HP	13-7/8	21
284HPH	15-5/8	21
286HPH	15-5/8	23
324HP	15-5/8	24
326HP	15-5/8	25
364HP	15-5/8	29
365HP	15-5/8	30



NOTES:

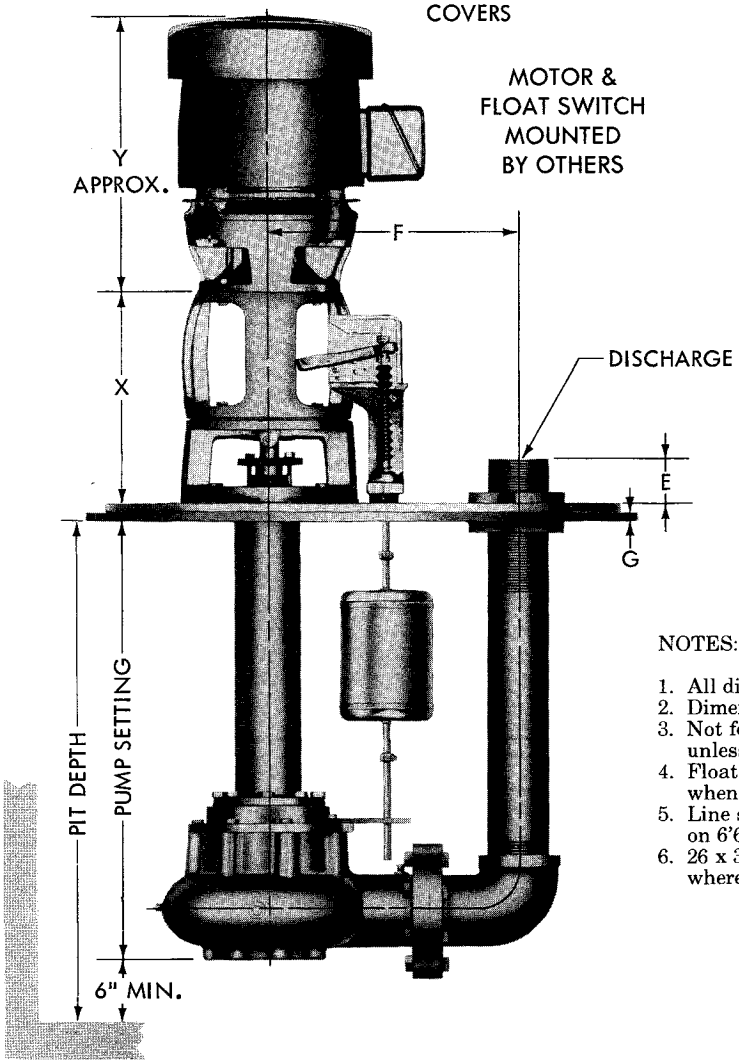
1. ALL DIMENSIONS IN INCHES.
2. DIMENSIONS MAY VARY ± 3/8".
3. NOT FOR CONSTRUCTION PURPOSES UNLESS CERTIFIED.
4. FLOAT SWITCH FURNISHED ONLY WHEN SPECIFIED.
5. LINE SHAFT BEARING FURNISHED ON 6'6" PUMP SETTINGS AND LONGER.

AURORA MODEL 671 PUMP
ON SIMPLEX PLATE WITH OVAL



PUMP SIZE			E	F	K	
DISCH	SUCTION	CASE BORE			22 X 28 OVAL	26 X 36 OVAL
3	3	9	6-1/2	14-13/16	9-5/16	9-5/16
4	4	9	6	16-15/16	N.A.	8-15/16
3	3	12	6-1/2	17-13/16	N.A.	9-13/16
4	4	12	6	18-15/16	N.A.	10-15/16

COVER SIZE B	C	H	G	L
			STEEL	
46	44	22	1/2	16
53	51	25-1/2	1/2	17-3/4
60	58	29	5/8	19-1/2
66	64	32	5/8	21
78	76	38	3/4	24

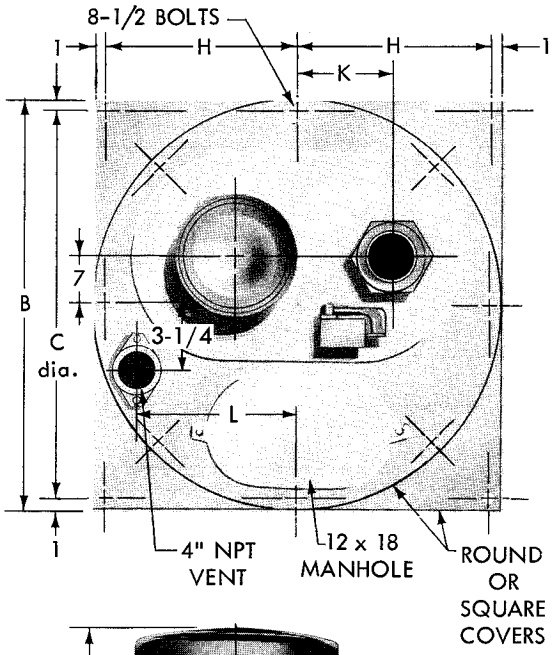


FRAME	X	Y
143HP	13-7/8	11
145HP	13-7/8	12
182HP	13-7/8	13
184HP	13-7/8	14
213HP	13-7/8	16
215HP	13-7/8	17
254HP	13-7/8	19
256HP	13-7/8	21
284HPH	15-5/8	21
286HPH	15-5/8	23
324HP	15-5/8	24
326HP	15-5/8	25
364HP	15-5/8	29
365HP	15-5/8	30

NOTES:

1. All dimensions in inches.
2. Dimensions may vary ± 3/8".
3. Not for construction purposes unless certified.
4. Float switch furnished only when specified.
5. Line shaft bearing furnished on 6'6" pump settings and longer.
6. 26 x 36 ovals are also available where 22 x 28 ovals are shown.

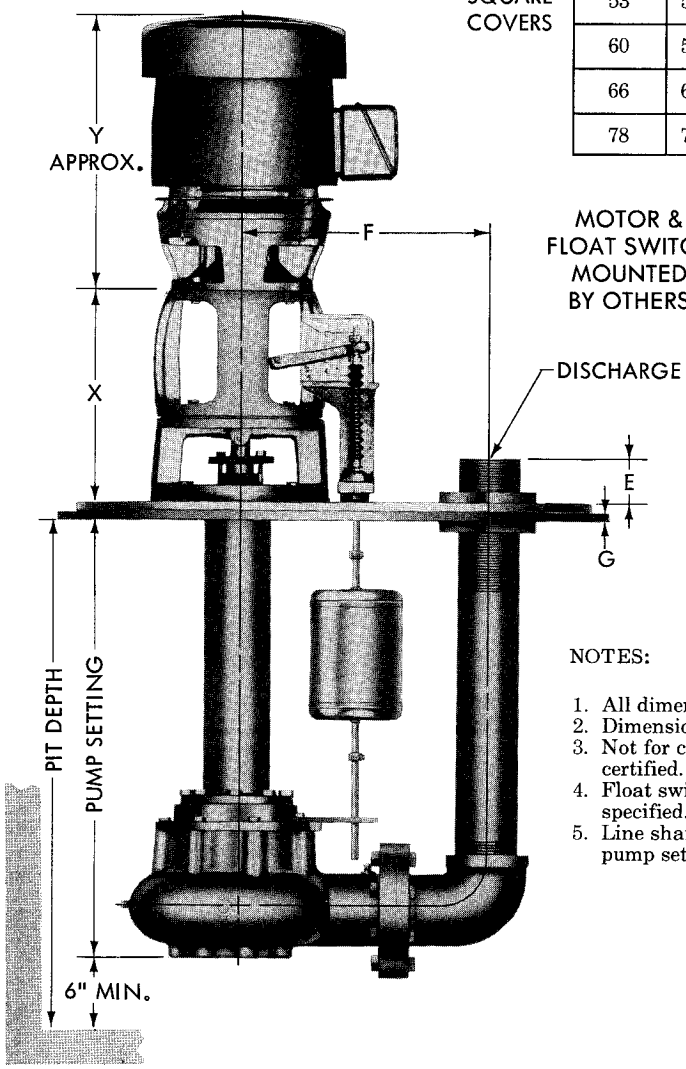
AURORA MODEL 671 PUMP
ON SIMPLEX PLATE WITH OVAL AND MANHOLE



PUMP SIZE			E	F	K	OVAL SIZE	MIN. COVER SIZE
DISCH	SUCTION	CASE BORE					
3	3	9	6-1/2	14-13/16	9-5/16	26 x 36	46
4	4	9	6	16-15/16	8-15/16	26 x 36	46
3	3	12	6-1/2	17-13/16	9-13/16	26 x 36	46
4	4	12	6	18-15/16	10-15/16	26 x 36	46

COVER SIZE B	C	H	G	L
			STEEL	
46	44	22	1/2	17
53	51	25-1/2	1/2	18-3/4
60	58	29	5/8	20-1/2
66	64	32	5/8	22
78	76	38	3/4	25

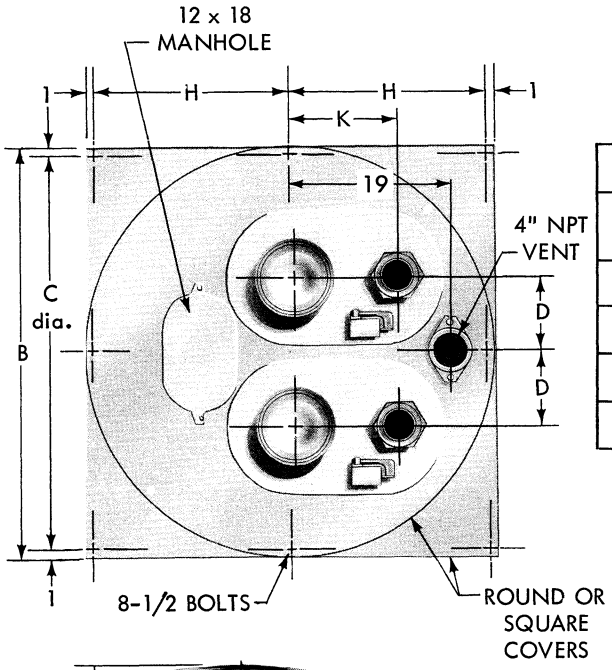
FRAME	X	Y
143HP	13-7/8	11
145HP	13-7/8	12
182HP	13-7/8	13
184HP	13-7/8	14
213HP	13-7/8	16
215HP	13-7/8	17
254HP	13-7/8	19
256HP	13-7/8	21
284HPH	15-5/8	21
286HPH	15-5/8	23
324HP	15-5/8	24
326HP	15-5/8	25
364HP	15-5/8	29
365HP	15-5/8	30



NOTES:

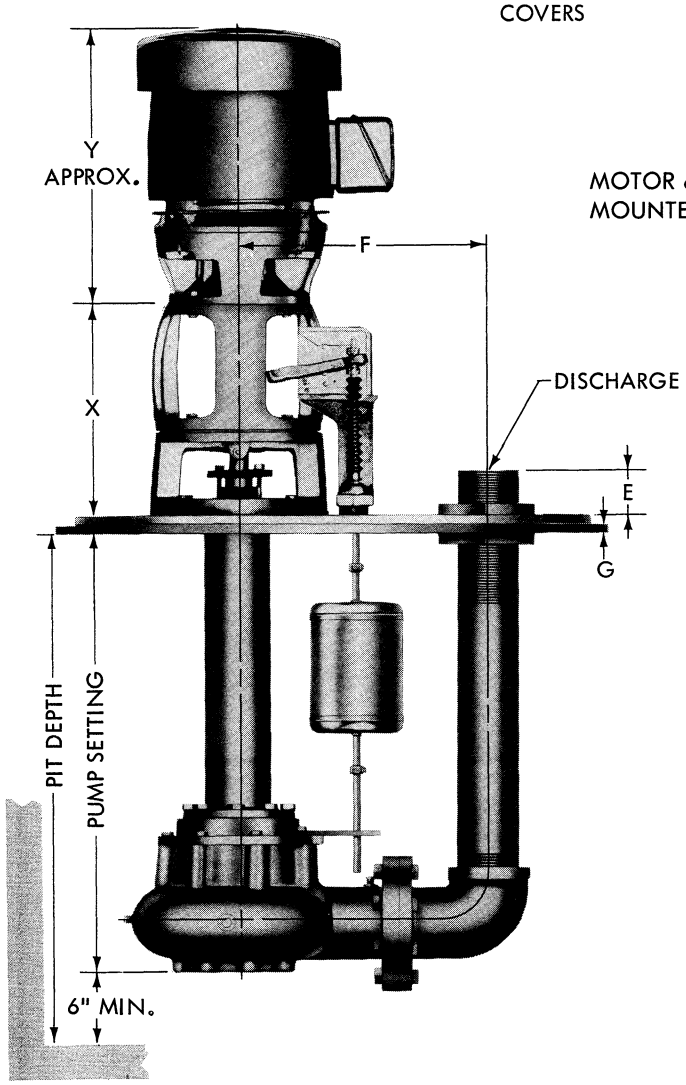
1. All dimensions in inches.
2. Dimensions may vary ± 3/8".
3. Not for construction purposes unless certified.
4. Float switch furnished only when specified.
5. Line shaft bearing furnished on 6'6" pump settings and longer.

AURORA MODEL 672 PUMP
ON DUPLEX PLATE WITH TWO OVALS AND MANHOLE



PUMP SIZE			E	F	K	
DISCH	SUCTION	CASE BORE			22 X 28 OVAL	26 X 36 OVAL
3	3	9	6-1/2	14-13/16	N.A.	9-5/16
4	4	9	6	16-15/16	N.A.	8-15/16
3	3	12	6-1/2	17-13/16	N.A.	9-13/16
4	4	12	6	18-15/16	N.A.	10-15/16

COVER SIZE B RD. OR SQ.	C ROUND	H SQUARE	G STL	OVAL USED	D
66	64	32	3/4	26 x 36	15
78	76	38	3/4	26 x 36	15



MOTOR & FLOAT SWITCH
MOUNTED BY OTHERS

FRAME	X	Y
143HP	13-7/8	11
145HP	13-7/8	12
182HP	13-7/8	13
184HP	13-7/8	14
213HP	13-7/8	16
215HP	13-7/8	17
254HP	13-7/8	19
256HP	13-7/8	21
284HPH	15-5/8	21
286HPH	15-5/8	23
324HP	15-5/8	24
326HP	15-5/8	25
364HP	15-5/8	29
365HP	15-5/8	30

NOTES:

1. ALL DIMENSIONS IN INCHES.
2. DIMENSIONS MAY VARY ± 3/8".
3. NOT FOR CONSTRUCTION PURPOSES UNLESS CERTIFIED.
4. FLOAT SWITCH FURNISHED ONLY WHEN SPECIFIED.
5. LINE SHAFT BEARING FURNISHED ON 6'6" PUMP SETTINGS AND LONGER.
6. SQUARE COVERS AVAILABLE ONLY IN STEEL.

670 SERIES
REPAIR PARTS INDEX

PARTS LISTED ARE FOR STANDARD PUMPS AND SOME OPTIONAL PUMP BEARINGS.

PUMP SIZE	PAGE
3 x 3 x 9 4 x 4 x 9 3 x 3 x 12 4 x 4 x 12	6-7

PIECE NO.

26 - STANDARD PUMP BEARING IS LISTED. REFER TO PART NUMBERS 27 THRU 37 FOR SPECIAL OPTION BEARINGS. FOR ALL PIT DEPTHS 10'-6" AND DEEPER, A RELIEF TYPE PUMP BEARING IS STANDARD.

39 - ONE SET OF FOUR (4) CAPSCREWS AND NUTS REQUIRED FOR EACH GUIDE BEARING JOINT.

38-40 - ONE SUPPORT PIPE IS REQUIRED FOR PIT DEPTHS UP TO 6'-0". TWO SUPPORT PIPES ARE REQUIRED FOR PIT DEPTHS 6'-6" TO 11'-0". THREE SUPPORT PIPES ARE REQUIRED FOR PIT DEPTHS 11'-6" TO 16'-0".

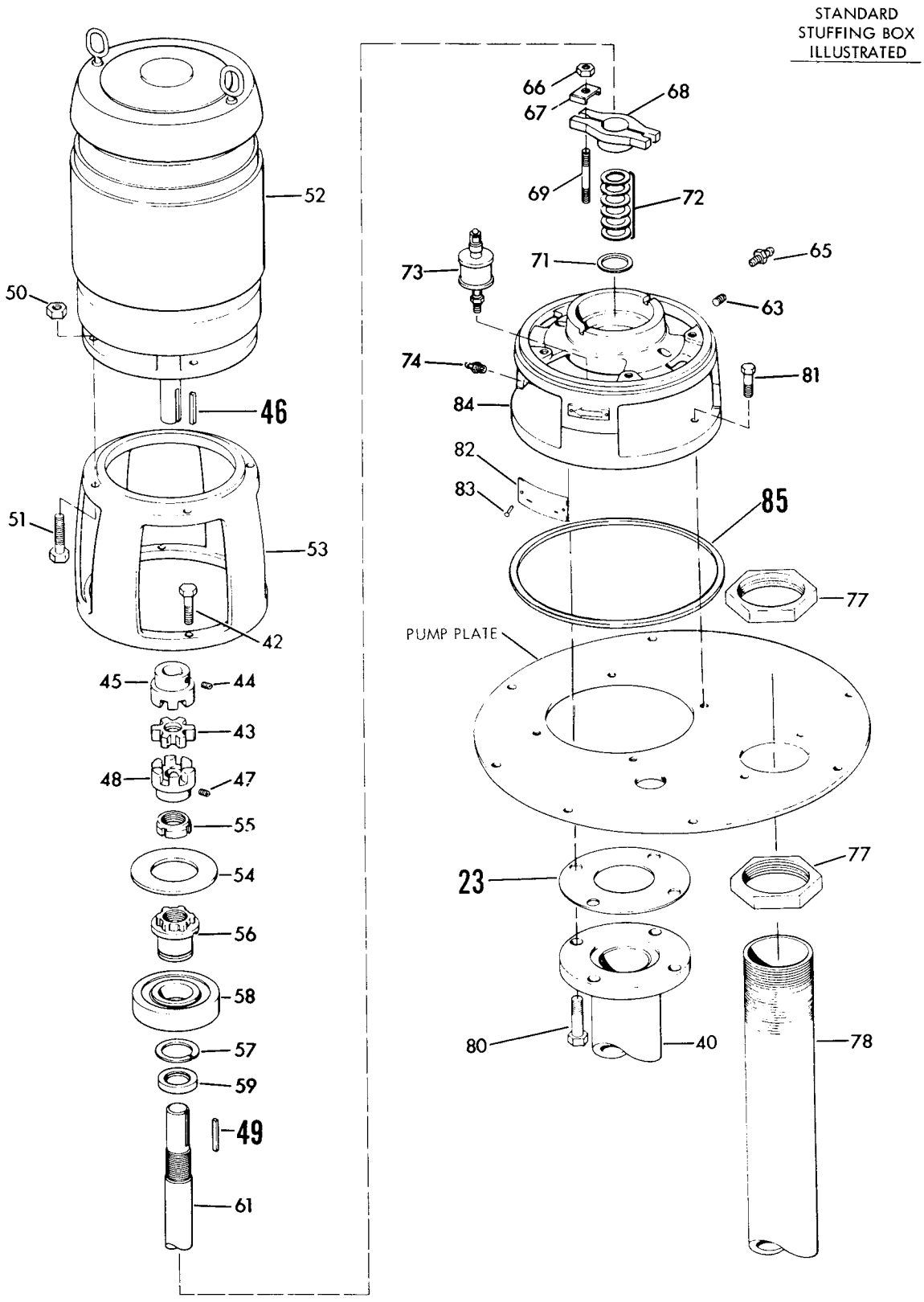
41 - ONE GUIDE BEARING IS REQUIRED FOR PIT DEPTHS 6'-6" TO 11'-0". TWO GUIDE BEARINGS ARE REQUIRED FOR PIT DEPTHS 11'-6" TO 16'-0".

60-61 - PIT DEPTHS TO 11'-6" REQUIRE ONE SHAFT (61). PIT DEPTHS 12'-0" TO 17'-6" REQUIRES ONE PUMP SHAFT (61C), ONE HEAD SHAFT (61A) AND ONE LINE COUPLING (60).

670 SERIES

MODEL 671-672

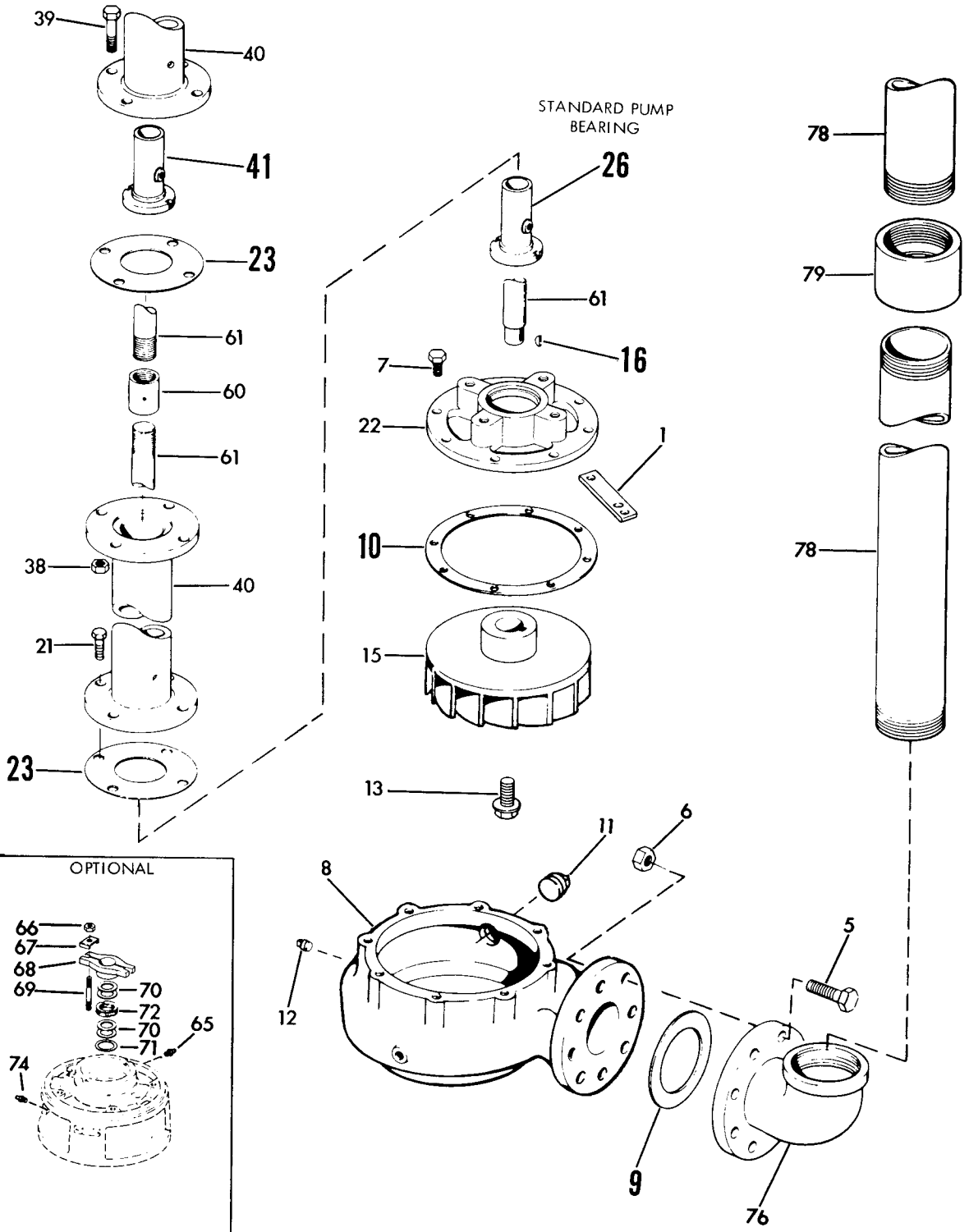
PIECE NUMBERS



670 SERIES

MODEL 671-672

PIECE NUMBERS



OPTIONAL

PACKING WITH LANTERN RING

NOTE: Recommended spare parts shown in bold face type.

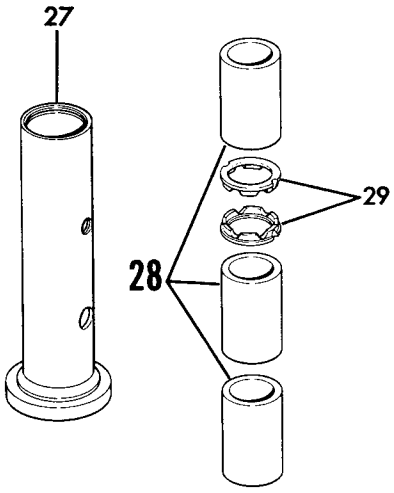
670 SERIES

MODEL 671-672

PIECE NUMBERS

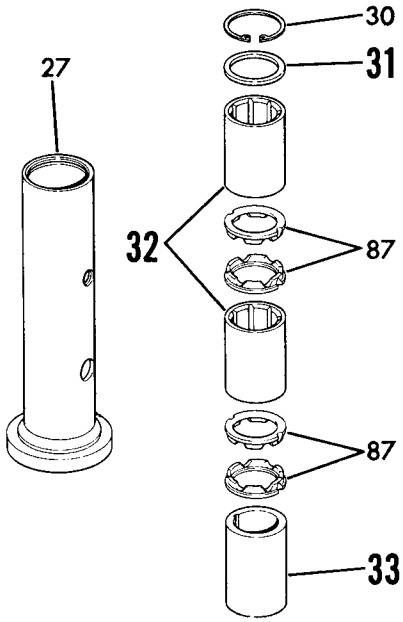
OPTIONAL RELIEF TYPE BEARINGS

GRAPHITAR



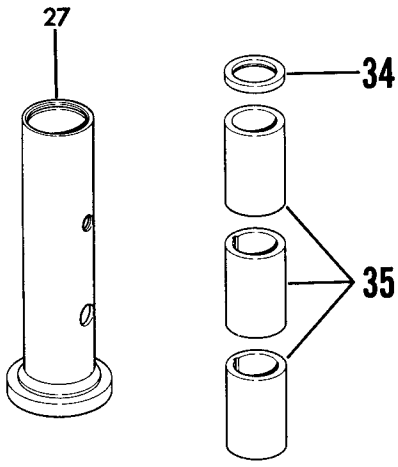
27A-COMPLETE ASSEMBLY

CUTLESS RUBBER



27B-COMPLETE ASSEMBLY

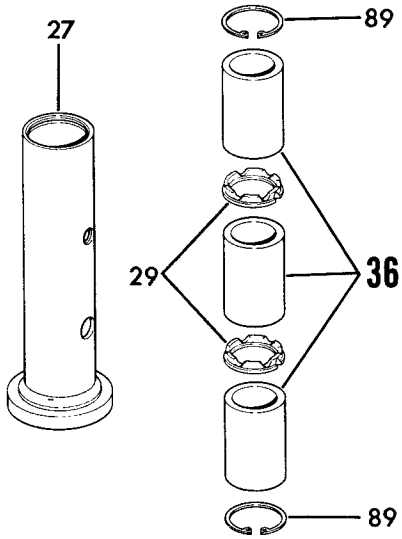
METAL BUSHING*



27C-COMPLETE ASSEMBLY

*Standard for pump settings over 10 feet.

TEFLON



27D-COMPLETE ASSEMBLY

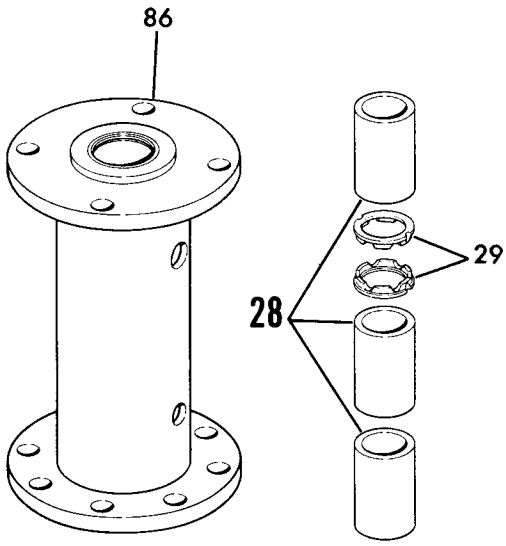
670 SERIES

MODEL 671-672

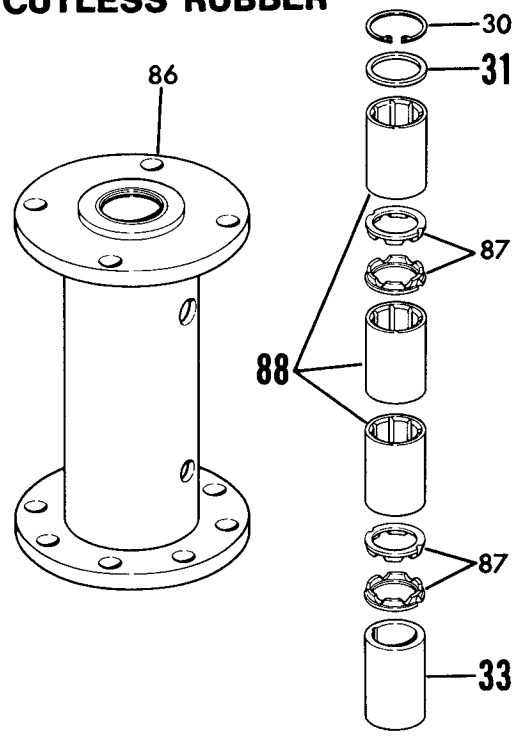
PIECE NUMBERS

OPTIONAL SPOOL TYPE BEARINGS

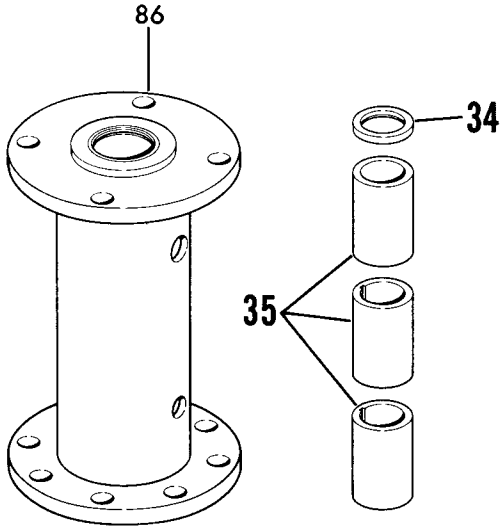
GRAPHITAR



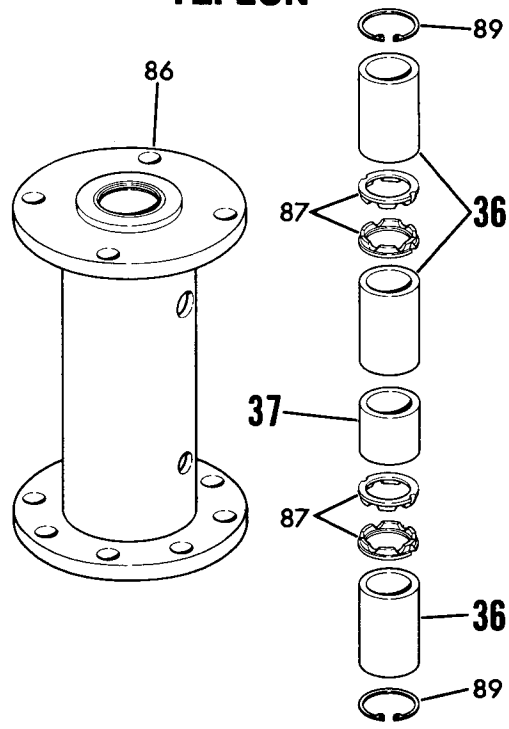
CUTLESS RUBBER



METAL BUSHING



TEFLON



670 SERIES

MODELS 671-672
3x3x9-3x3x12-4x4x9-4x4x12

PARTS LIST

PC. NO.	DESCRIPTION	QTY	PART NO.	MATERIAL			
				B.F.	A.B.	A.I.	S.S.
1	ROD GUIDE	1	396-0009	087		087	
5	CAPSCREW 3x9,3x12	4	168-0568	080		080	
	4x9,4x12	4	168-0570	080		080	
6	NUT	4	544-0115	080		080	
7	CAPSCREW 3x9,4x9	8	168-0490	080		080	
	3x12,4x12	8	168-0560	080		080	
8	CASING 3x9	1	180-0655	010		010	
	4x9	1	180-0656	010		010	
	3x12	1	180-0657	010		010	
	4x12	1	180-0658	010		010	
9	GASKET 3x9,3x12	1	364-0605	579		579	
	4x9,4x12	1	364-0607	579		579	
10	GASKET 3x9,4x9	1	364-1015	603		603	
	3x12,4x12	1	364-1326	803		803	
11	PLUG	1	600-0006	028		028	
12	PLUG	4	600-0005	028		028	
13	IMPELLER SCREW	1	544-2047	104		104	
15	IMPELLER 3x9	1	443-1098	010		010	
	4x9	1	443-1099	010		010	
	3x12	1	443-1100	010		010	
	4x12	1	443-1101	010		010	
16	KEY	1	472-0018	087		087	
21	CAPSCREW	4	168-0562	080		080	
22	COVER 3x9,4x9	1	260-0671	010		010	
	3x12,4x12	1	260-0672	010		010	
23	GASKET		364-1021	588		588	
26	PUMP BEARING	1	136-1402	208		010	
27	BRG. HOUSING	1	260-0701	087		087	
	OPTIONAL RELIEF TYPE BEARINGS-COMPLETE ASSY.						
	BEFORE MARCH 1986						
27A	GRAPHITAR	1	032-1246	NOT			
27B	CUTLESS RUBBER	1	032-1245	AVAILABLE			
27C	METAL BUSHING	1	032-1247	USE	NEW		
27D	TEFLON	1	032-1248	DESIGN			
28	BUSHING	3	136-1170	540	540	540	540
29	LANTERN RING	1	676-1681	512	512	512	512
30	SNAP RING	1	676-0220	088	104	088	104
31	RETAINING RING	1	676-1996	079	190	079	104
32	BUSHING	2	136-1379	457	457	457	457
33	BUSHING	1	136-1172	208	208	010	104

PC. NO.	DESCRIPTION	QTY	PART NO.	MATERIAL			
				B.F.	A.B.	A.I.	S.S.
34	SEAL	1	712-0047	653	653	653	
35	BUSHING	3	136-1172	208	208	010	
36	BUSHING	3	136-1585	522	522	522	522
37	BUSHING	1	136-1172	208	208	010	104
	AFTER MARCH 1986						
27A	GRAPHITAR	1	032-1246	644	643	642	646
27B	CUTLESS RUBBER	1	032-1245	644	643	642	646
27C	METAL BUSHING	1	032-1247	644	643	642	
27D	TEFLON	1	032-1248	644	643	642	646
28	BUSHING	1	136-1170	540	540	540	540
32	BUSHING	2	136-1617	486	486	486	486
33	BUSHING	1	136-1172	208	208	010	104
35	BUSHING	3	136-1172	208	208	010	
36	BUSHING	3	136-1615	485	485	485	485
37	BUSHING	1	136-1625	485	485	485	485
38	NUT		544-0115	080		080	
39	CAPSCREW		168-0562	087		087	
40	SUPPORT PIPE		REFER TO	FACTORY			
41	BEARING		136-1402	208		010	
42	CAPSCREEW	4	168-0490	080		080	
43	INSERT		REFER TO	SECTION		1000P	
44	SETSCREW		REFER TO	SECTION		1000P	
45	COUPLING HALF		REFER TO	SECTION		1000P	
46	KEY		REFER TO	FACTORY			
47	SETSCREW		REFER TO	SECTION		1000P	
48	COUPLING HALF		REFER TO	SECTION		1000P	
49	KEY	1	472-0250	087		087	
50	NUT		REFER TO	FACTORY			
51	CAPSCREW		REFER TO	FACTORY			
52	MOTOR		REFER TO	FACTORY			
53	UPPER HEAD						
	143HP-256HP	1	116-0346	010		010	
	284HPH-326HP	1	116-0347	010		010	
54	SLINGER	1	764-0401	478		478	
55	LOCKNUT	1	544-1108	080		080	
56	BEARING COLLAR	1	224-0163	208		208	
57	RETAINING RING	1	676-0289	088		088	
58	BEARING	1	068-2023	647		647	
59	SEAL	1	712-0146	653		653	
60	COUPLING	1	256-2014	062		062	

670 SERIES

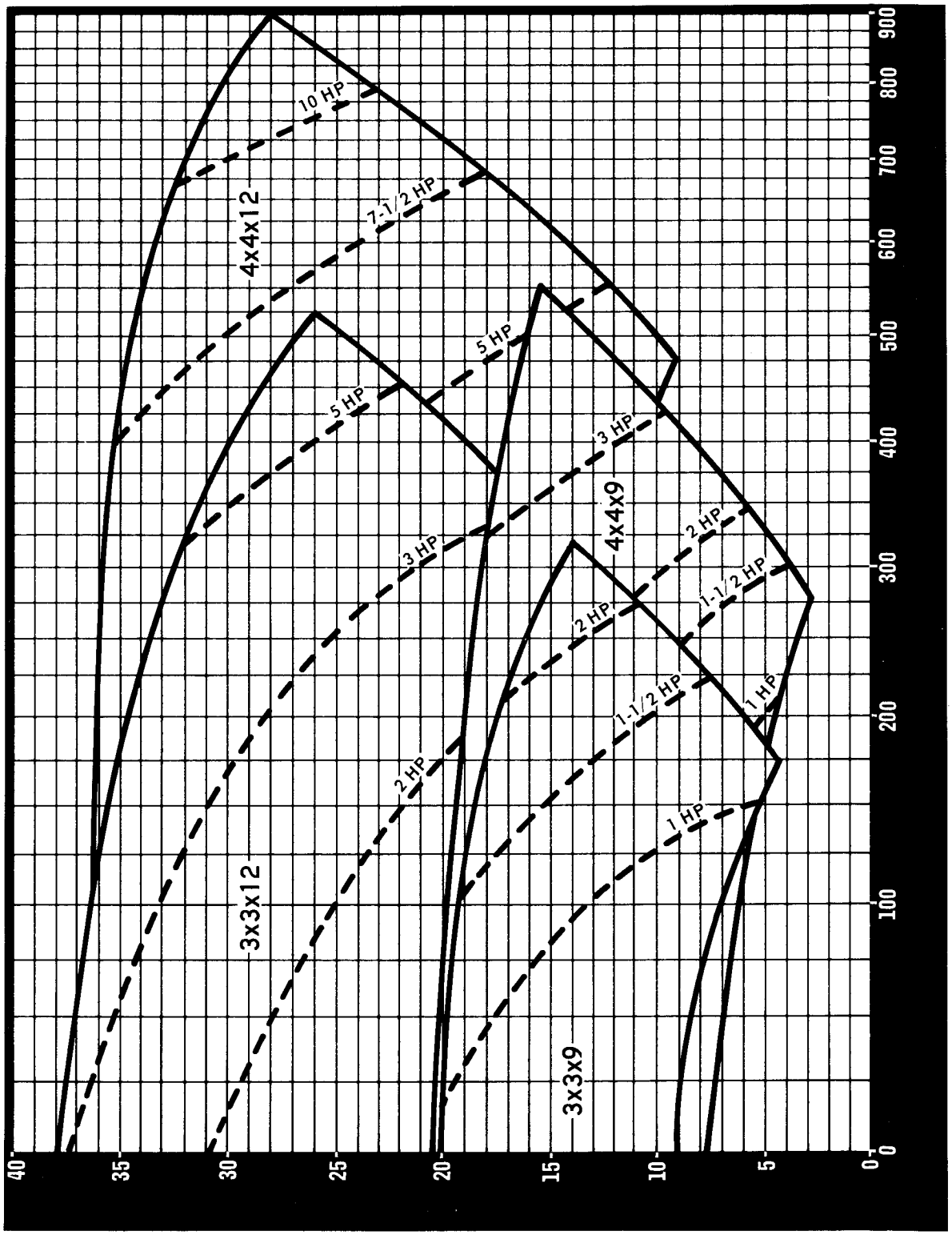
MODELS 671-672
3x3x9-3x3x12-4x4x9-4x4x12

PARTS LIST

PC. NO.	DESCRIPTION	QTY	PART NO.	MATERIAL			
				B.F.	A.B.	A.I.	S.S.
61	SHAFT		REFER TO	FACTORY			
63	PLUG	1	600-0002	087		087	
66	NUT	2	544-0109	190		190	
67	CLAMP	2	204-0120	360		360	
68	GLAND	1	372-0220	010		010	
69	STUD	2	808-0017	082		082	
71	PACKING RING	1	676-1232	190		087	
72	PACKING	6	564-0037	802		802	
73	OILER (OPT.)	1	552-0102	652		652	
74	GREASE FITTING	1	508-0002	651		651	
76	ELBOW 3x9,3x12	1	300-0011	010		010	
	4x9,4x12	1	300-0012	010		010	
77	LOCKNUT 3x9,3x12	2	544-0960	028		028	
	4x9,4x12	2	544-2037	028		028	
78	DISCHARGE PIPE		REFER TO	FACTORY			
79	COUPLING		REFER TO	FACTORY			
80	CAPSCREW	4	168-0562	080		080	
81	CAPSCREW	4	168-0388	080		080	
82	NAMEPLATE	1	532-0045	114		114	
83	DRIVE SCREW	2	708-0013	365		365	
84	LOWER HEAD	1	116-0439	010		010	
		1	116-0440	010		010	
		4	168-0378	080		080	
85	GASKET	1	364-1254	803		803	
	BEFORE MARCH 1986						
86	SPOOL HOUSING	1	260-0726	087	087	087	104
87	LANTERN RING	2	676-1681	512	512	512	512
88	BUSHING	3	136-1379	457	457	457	457
89	SNAP RING	2	676-0220	088	104	088	104
	AFTER MARCH 1986						
86	SPOOL HOUSING	1	260-0726	087	087	087	104
88	BUSHING	3	136-1617	486	486	486	486
PARTS NOT SHOWN ON EXPLODED VIEW							
	LANTERN RING	1	676-1681	512		512	
	FLOAT ROD		REFER TO				
	FLOAT STOP		SECTION 1020P FOR				
	FLOAT		FLOAT SWITCH ASSY.				

PC. NO.	DESCRIPTION	QTY	PART NO.	MATERIAL			
				B.F.	A.B.	A.I.	S.S.

SELECTION CHART
885 R.P.M.
VORTEX IMPELLER



CAPACITY–G.P.M.

TOTAL DYNAMIC HEAD

REFER TO SECTION **660**
PAGES **401** THRU **412**FOR INDIVIDUAL
PERFORMANCE CURVES BY
PUMP SIZE.

CAUTION

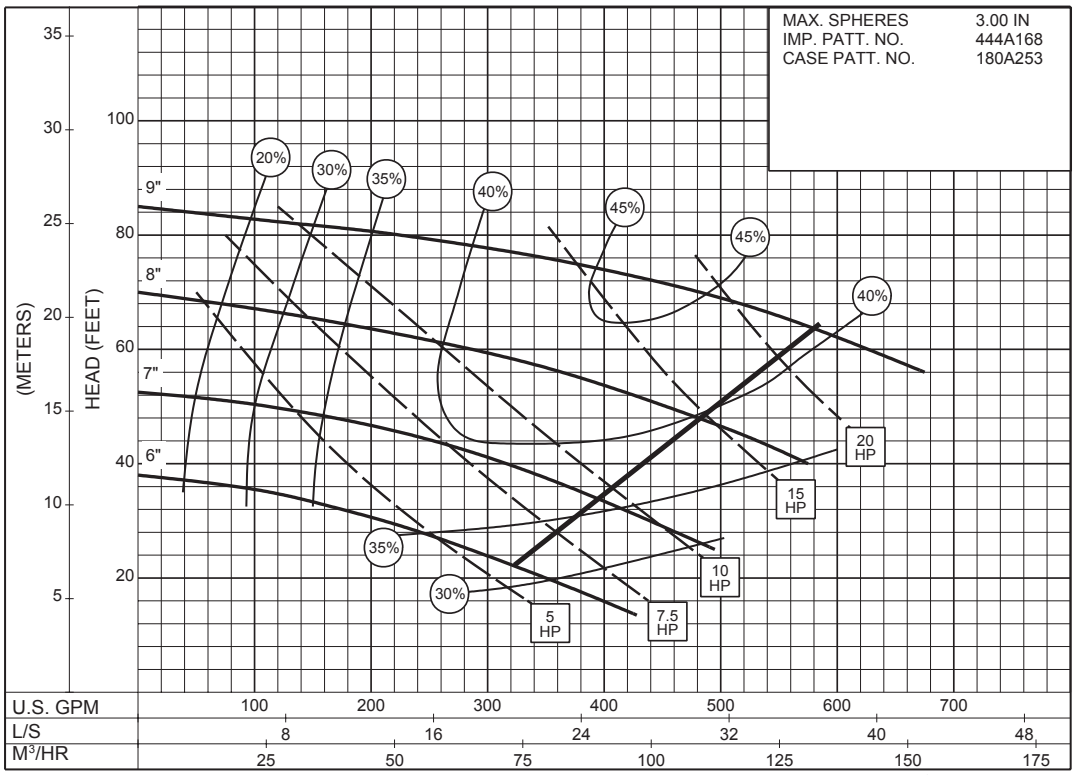
CHECK APPLICABLE PUMP SIZES ONLY.

3 x 3 x 9
SERIES 660

VORTEX IMPELLER

Supersedes Section 660 Page 401
Dated December 1972

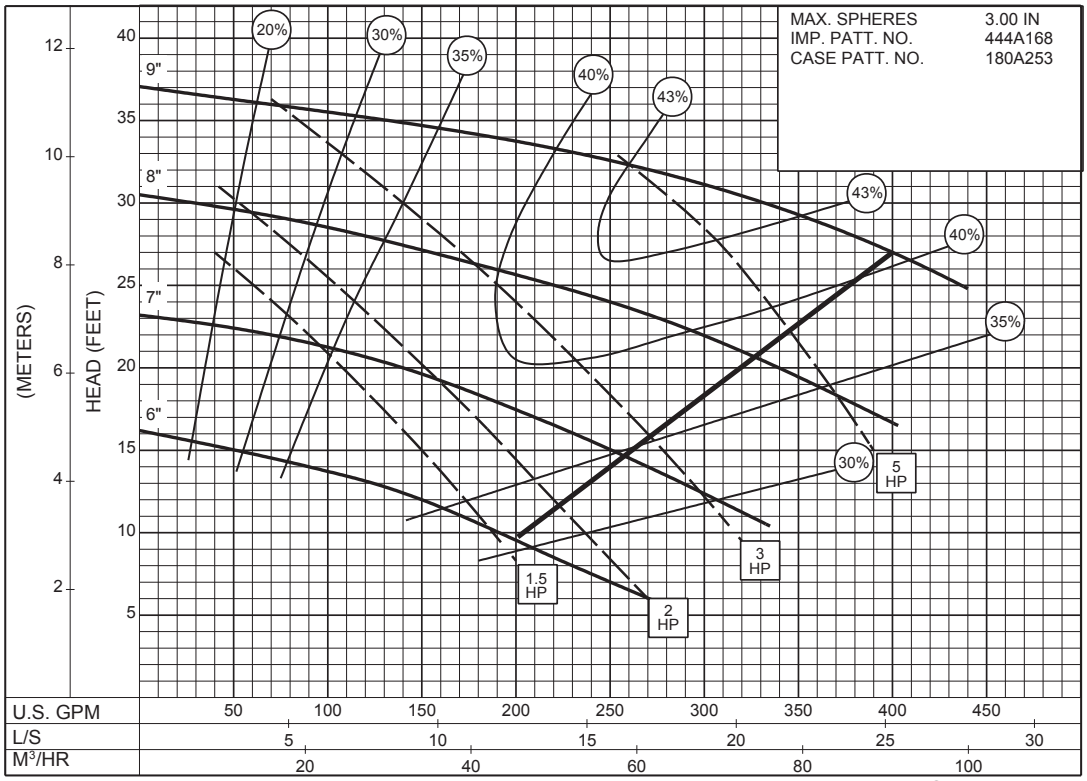
SIZE : 3x3x9 **TYPE : 660** **IMPELLER : Vortex** **R. P. M. : 1775**



8PC-119969

1775 RPM

SIZE : 3x3x9 **TYPE : 660** **IMPELLER : Vortex** **R. P. M. : 1175**



8PC-119970

1175 RPM

AURORA®
Pentair Pump Group

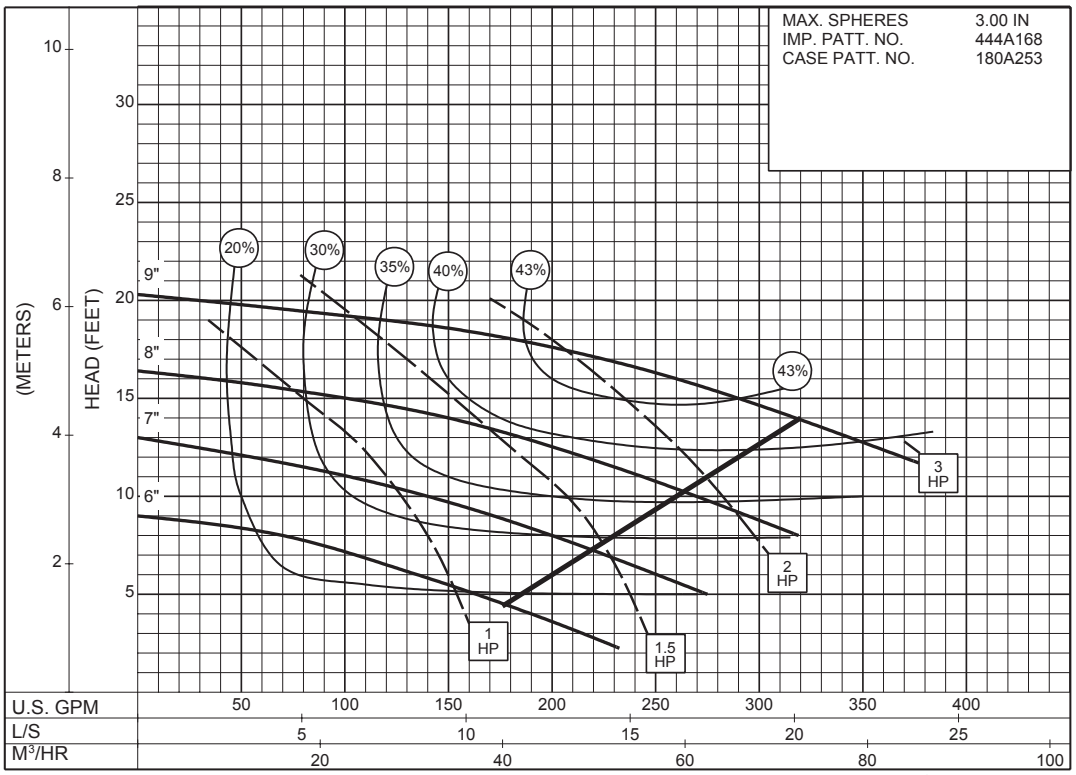
Supersedes Section 660 Page 402
Dated December 1972

3 x 3 x 9
SERIES 660

VORTEX IMPELLER

885
RPM

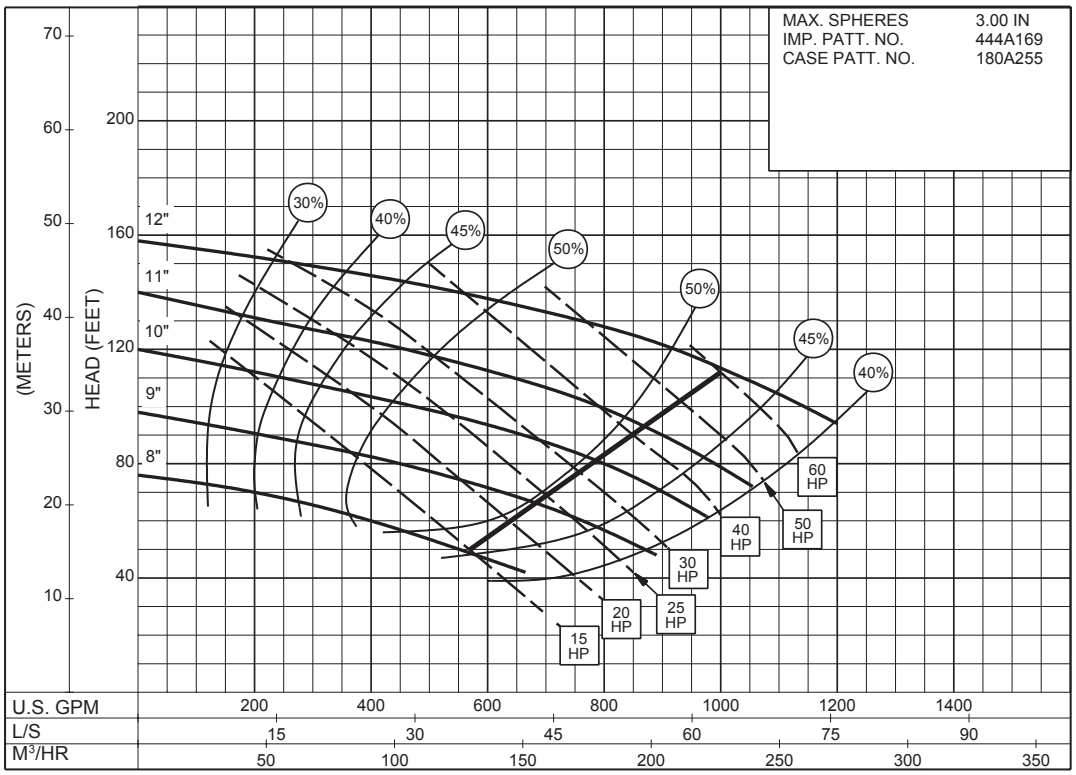
SIZE : 3x3x9 **TYPE : 660** **IMPELLER : Vortex** **R. P. M. : 885**



8PC-119971

3 x 3 x 12
SERIES 660
VORTEX IMPELLER

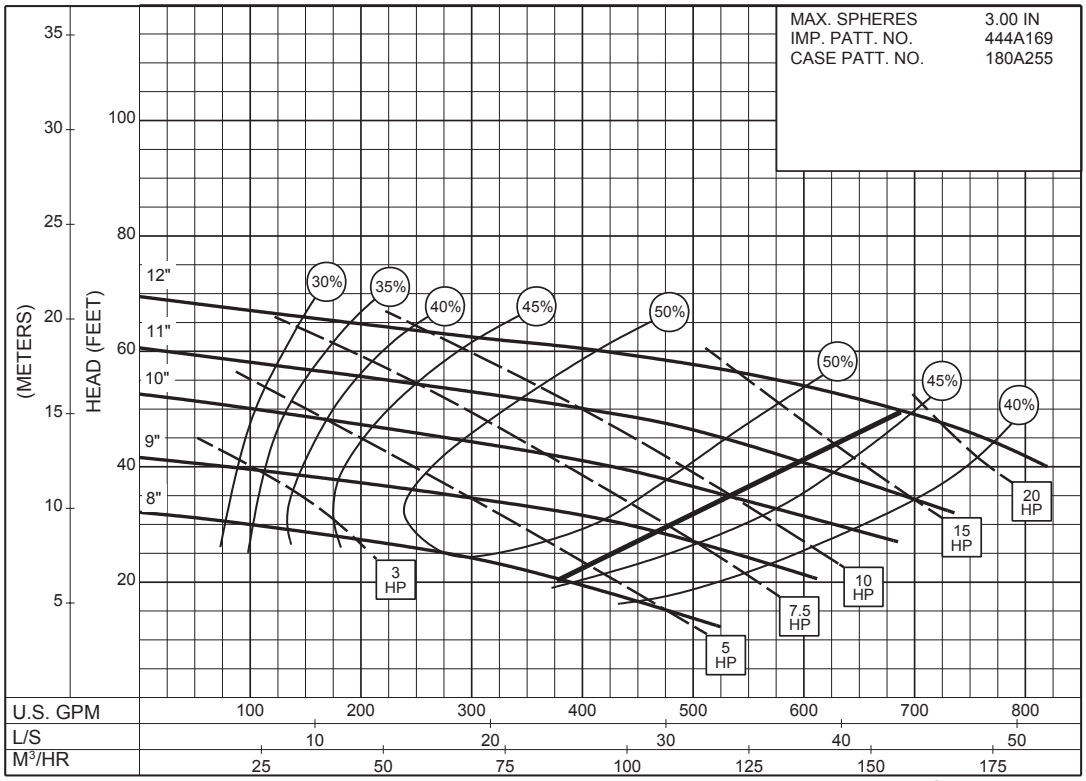
SIZE : 3x3x12 **TYPE : 660** **IMPELLER : Vortex** **R. P. M. : 1775**



8PC-119974

1775 RPM

SIZE : 3x3x12 **TYPE : 660** **IMPELLER : Vortex** **R. P. M. : 1175**



8PC-119975

1175 RPM

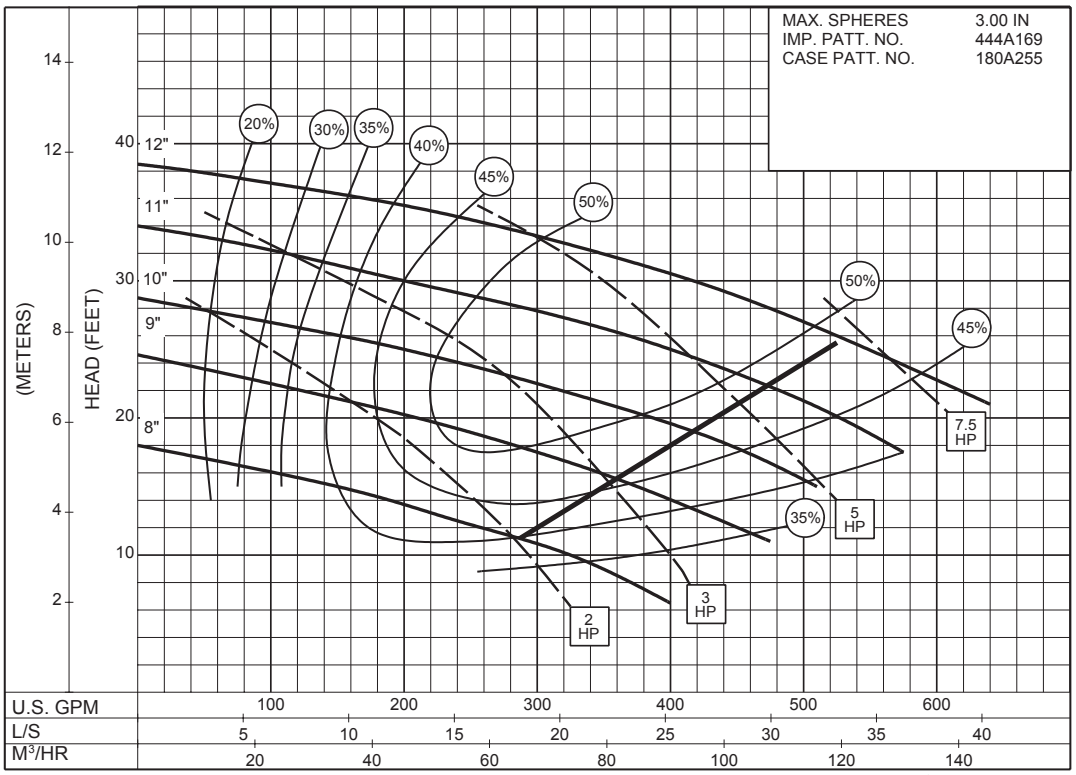
AURORA®
Pentair Pump Group

3 x 3 x 12
SERIES 660

VORTEX IMPELLER

885
RPM

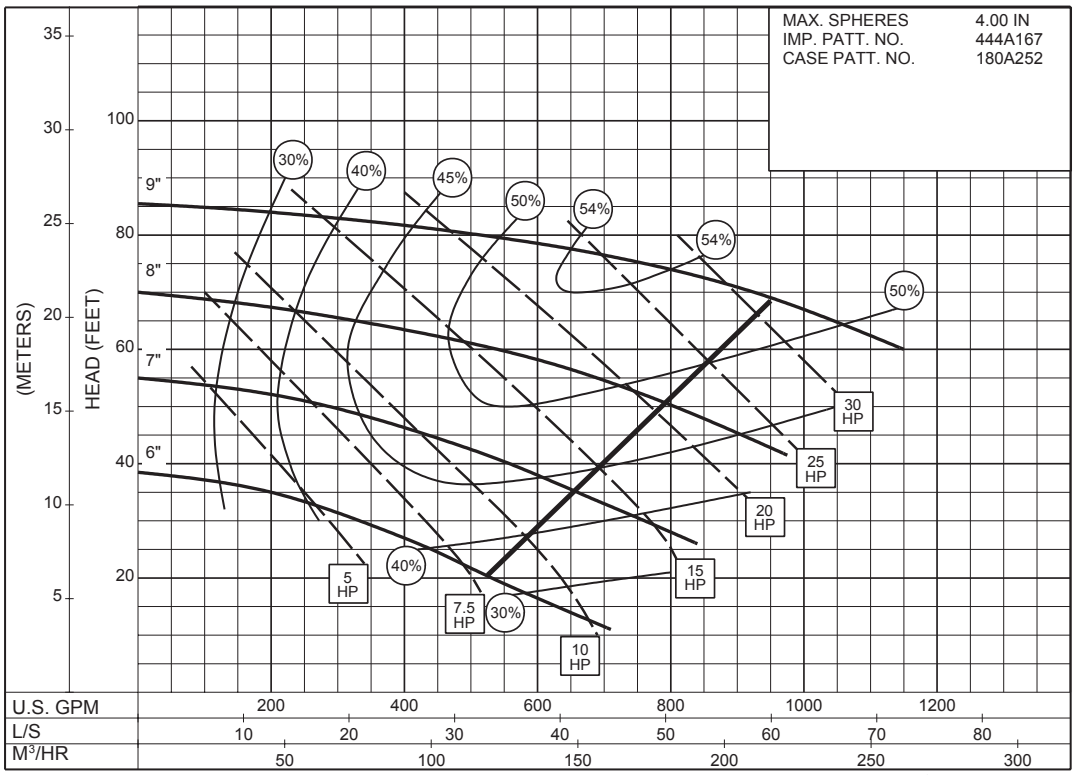
SIZE : 3x3x12 **TYPE : 660** **IMPELLER : Vortex** **R. P. M. : 885**



8PC-119976

4 x 4 x 9
SERIES 660
VORTEX IMPELLER

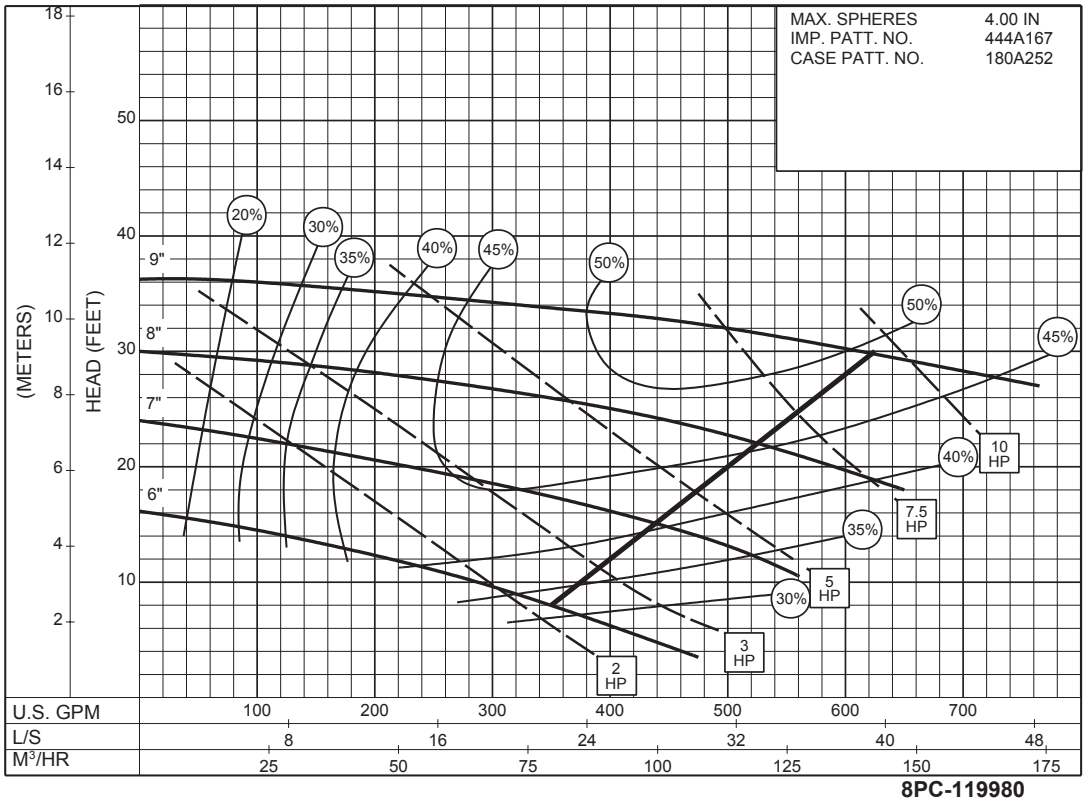
SIZE : 4x4x9 **TYPE : 660** **IMPELLER : Vortex** **R. P. M. : 1775**



8PC-119979

1775 RPM

SIZE : 4x4x9 **TYPE : 660** **IMPELLER : Vortex** **R. P. M. : 1175**



8PC-119980

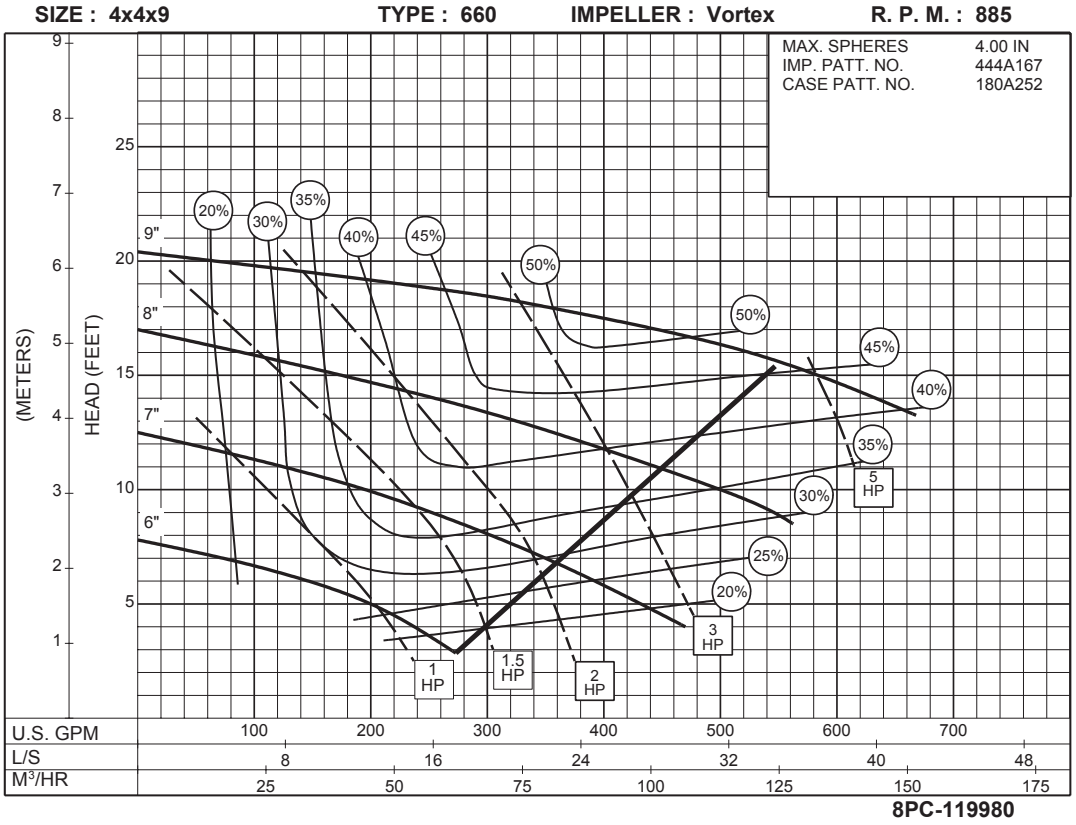
1175 RPM

AURORA®
Pentair Pump Group

4 x 4 x 9
SERIES 660

VORTEX IMPELLER

885
RPM

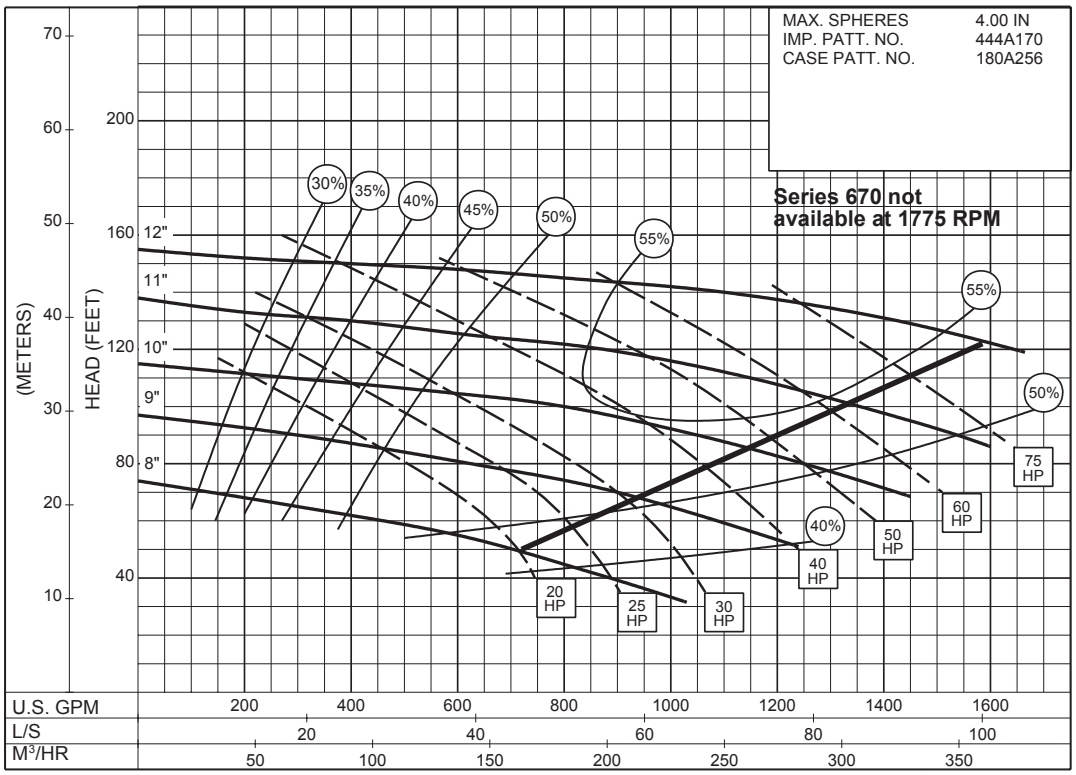


4 x 4 x 12
SERIES 660

VORTEX IMPELLER

Supersedes Section 660 Page 407
Dated December 1972

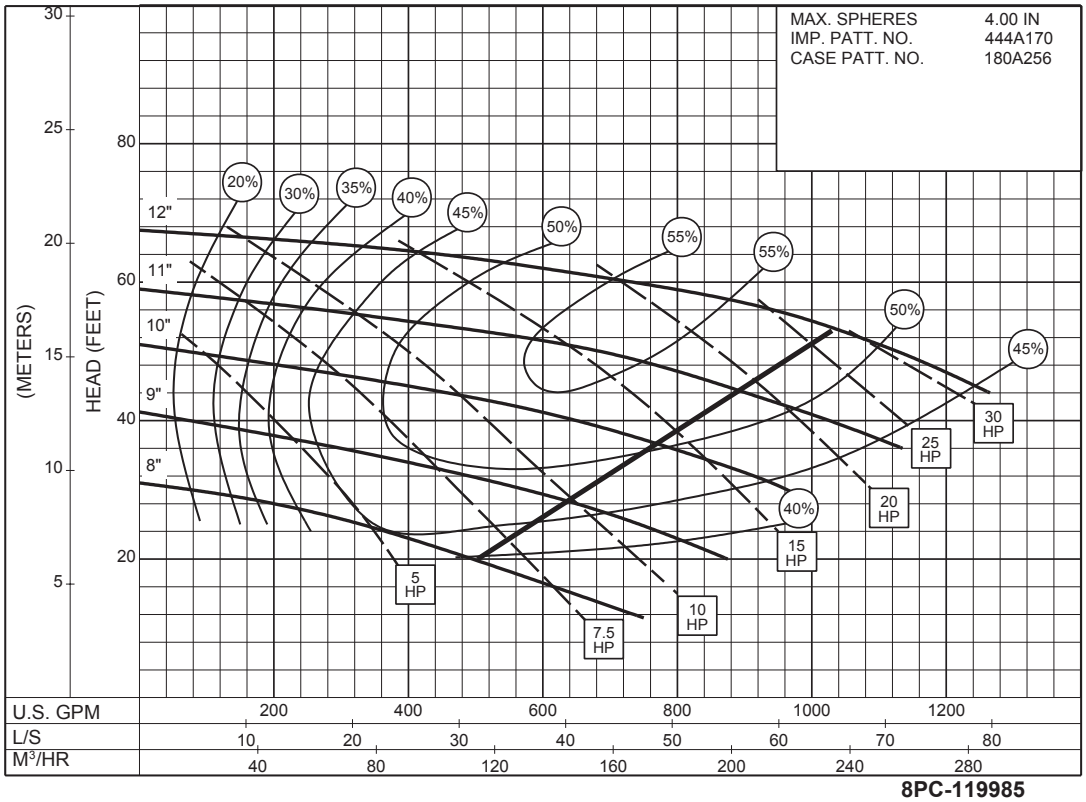
SIZE : 4x4x12 **TYPE : 660** **IMPELLER : Vortex** **R. P. M. : 1775**



8PC-119984

1775 RPM

SIZE : 4x4x12 **TYPE : 660** **IMPELLER : Vortex** **R. P. M. : 1175**



8PC-119985

1175 RPM

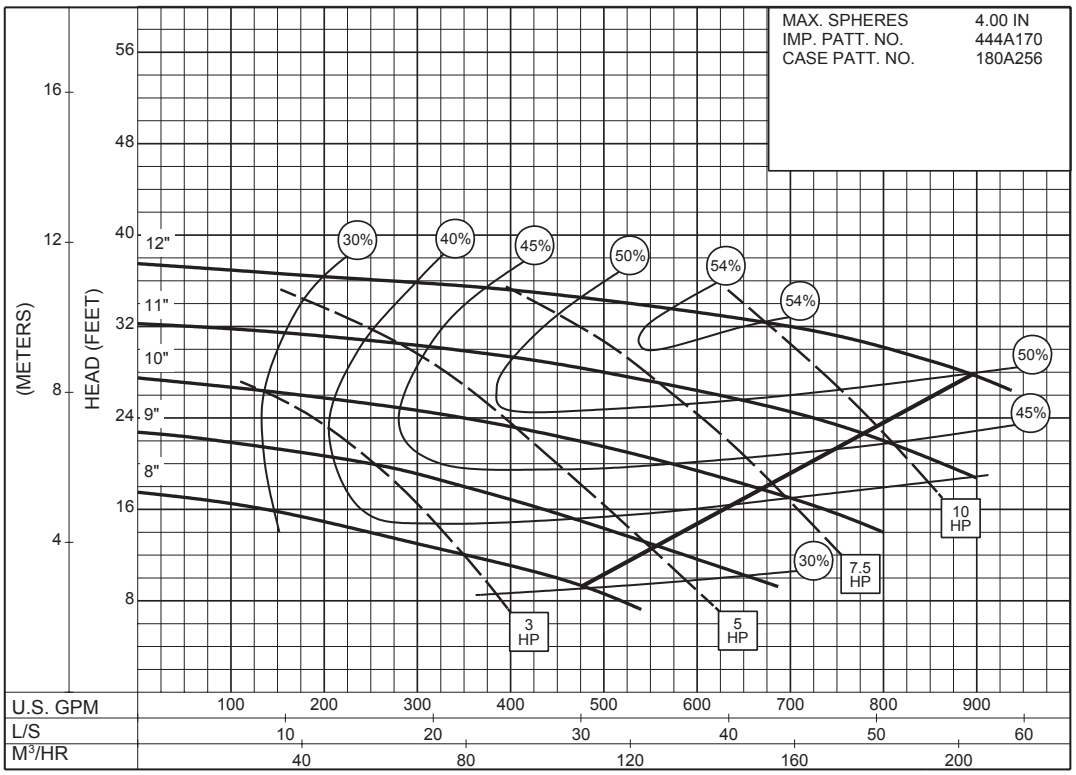
AURORA®
Pentair Pump Group

4 x 4 x 12
SERIES 660

VORTEX IMPELLER

885
RPM

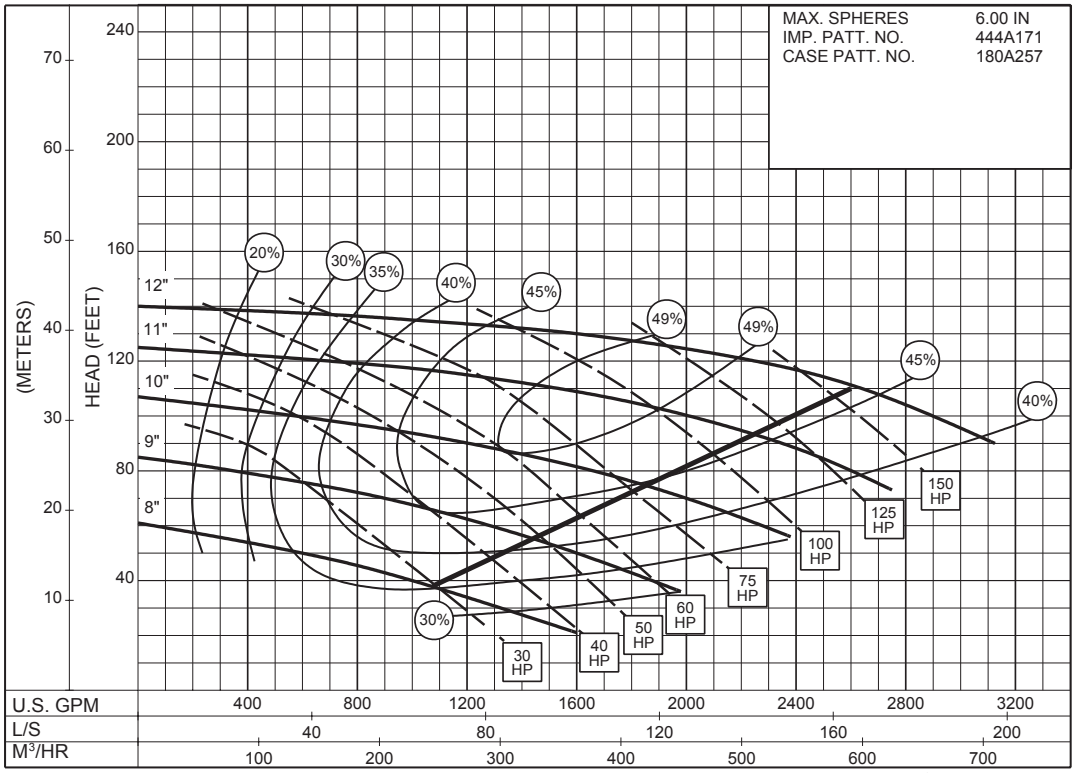
SIZE : 4x4x12 **TYPE : 660** **IMPELLER : Vortex** **R. P. M. : 885**



8PC-119986

6 x 6 x 12
SERIES 660
VORTEX IMPELLER

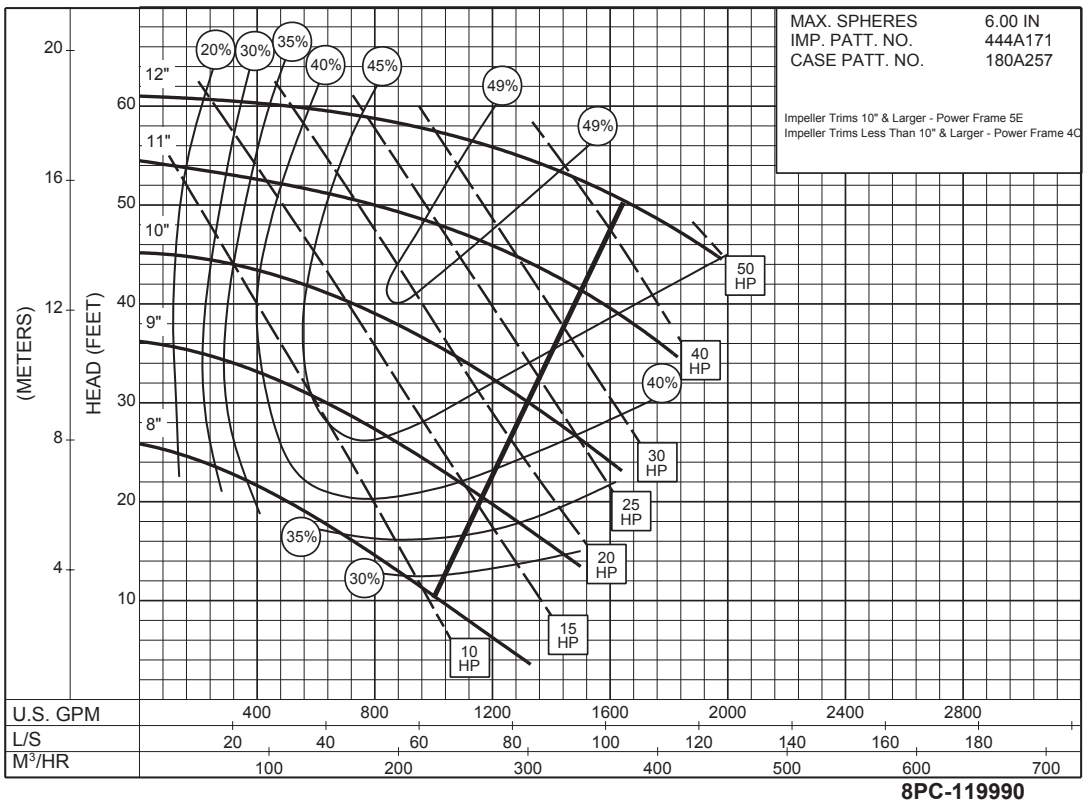
SIZE : 6x6x12 **TYPE : 660** **IMPELLER : Vortex** **R. P. M. : 1775**



8PC-119989

1775 RPM

SIZE : 6x6x12 **TYPE : 660** **IMPELLER : Vortex** **R. P. M. : 1175**



8PC-119990

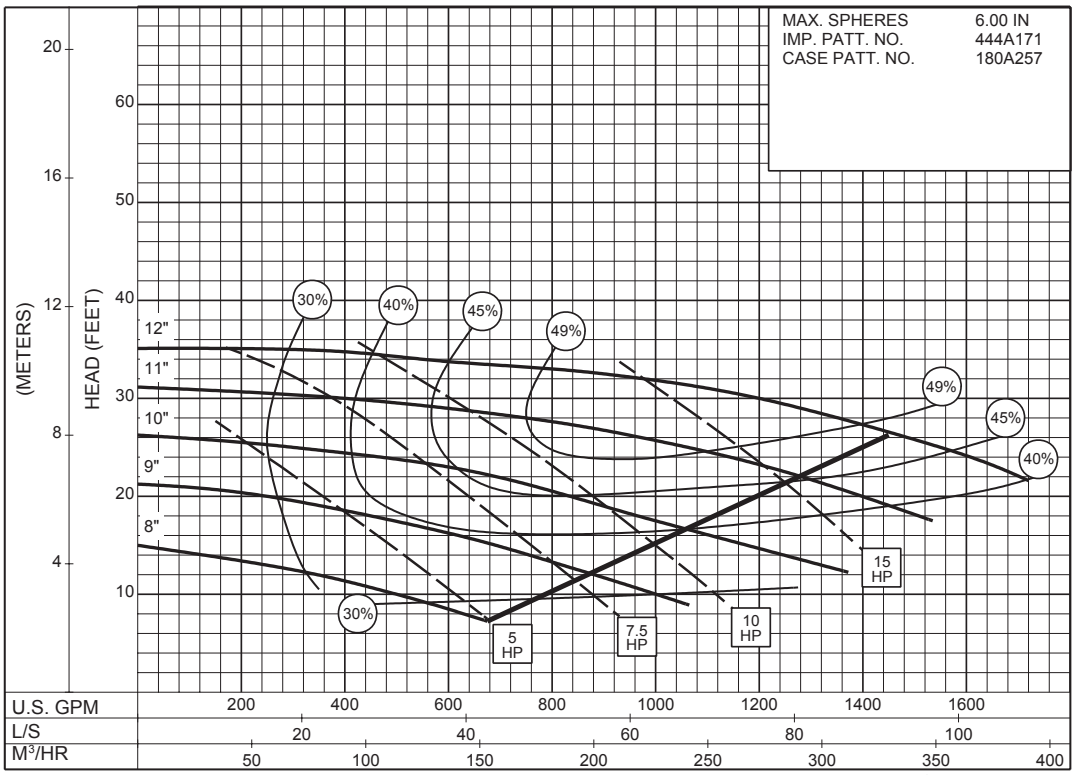
1175 RPM

6 x 6 x 12
SERIES 660

VORTEX IMPELLER

885
RPM

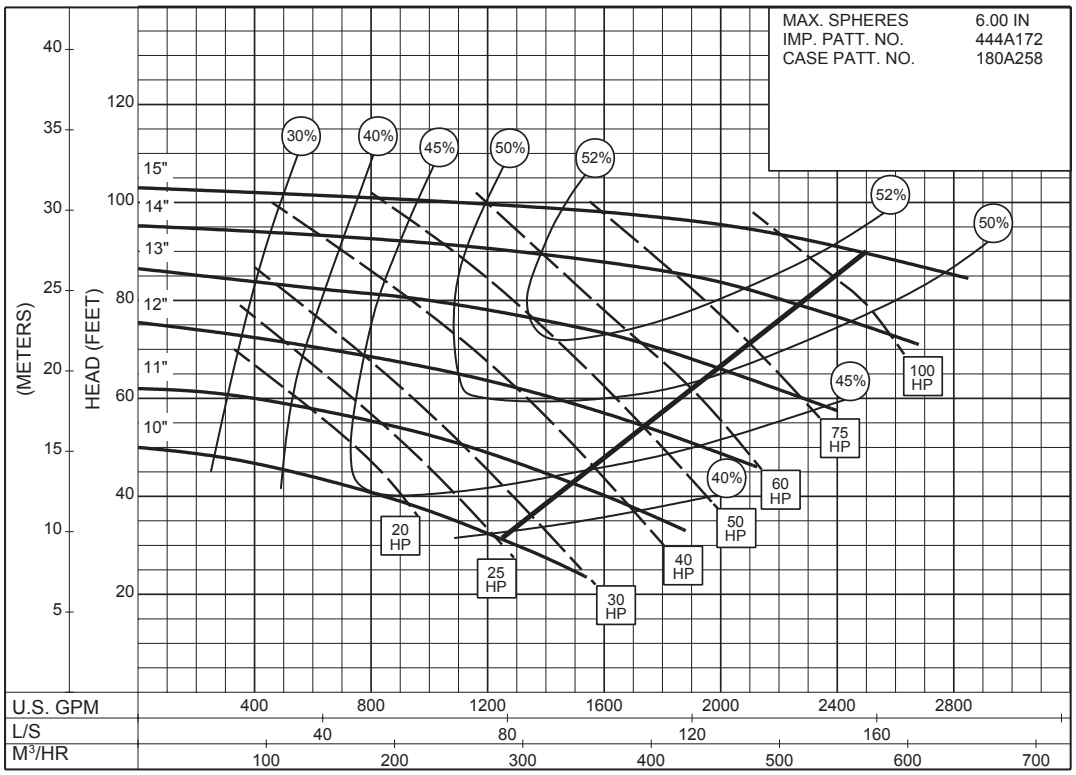
SIZE : 6x6x12 **TYPE : 660** **IMPELLER : Vortex** **R. P. M. : 885**



8PC-119991

6 x 6 x 15
SERIES 660
VORTEX IMPELLER

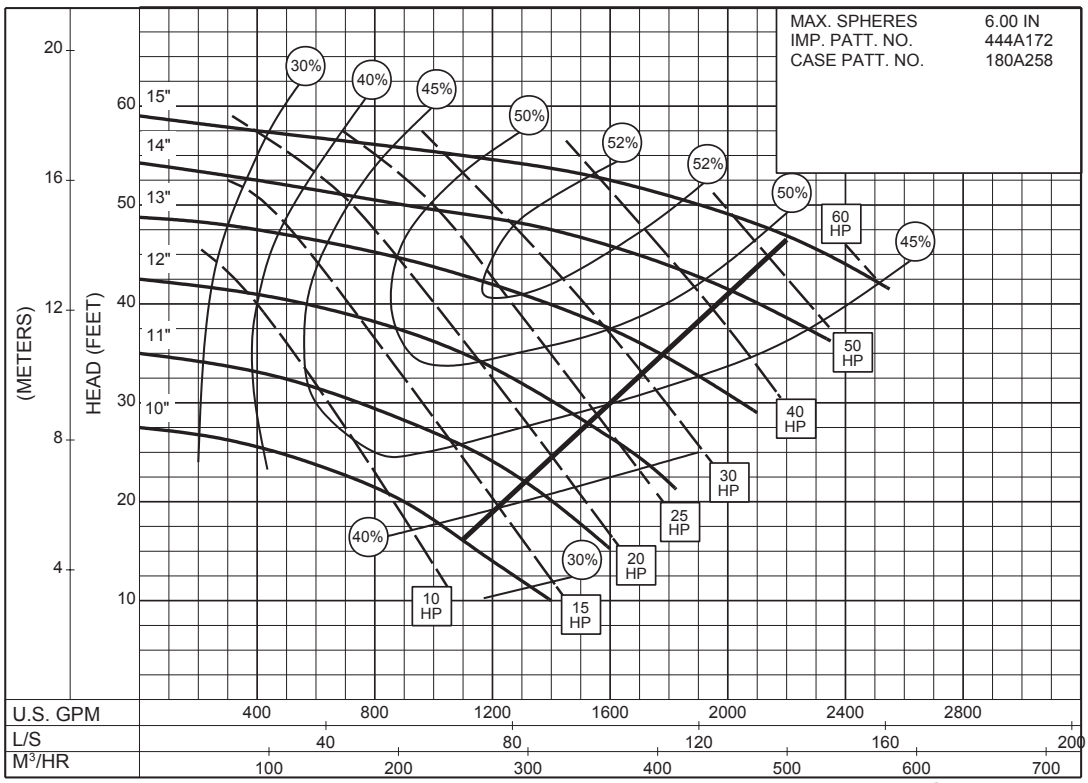
SIZE : 6x6x15 **TYPE : 660** **IMPELLER : Vortex** **R. P. M. : 1175**



8PC-119994

1175 RPM

SIZE : 6x6x15 **TYPE : 660** **IMPELLER : Vortex** **R. P. M. : 885**



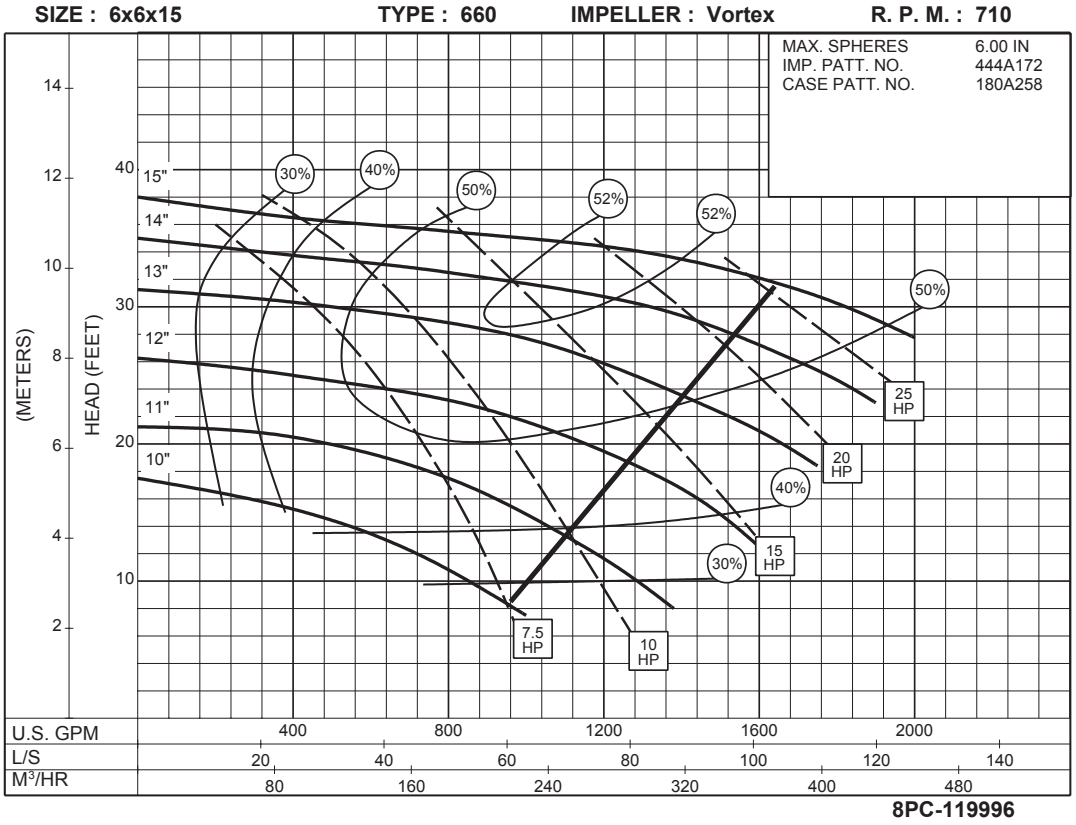
8PC-119995

885 RPM

6 x 6 x 15
SERIES 660

VORTEX IMPELLER

710
RPM



8PC-119996

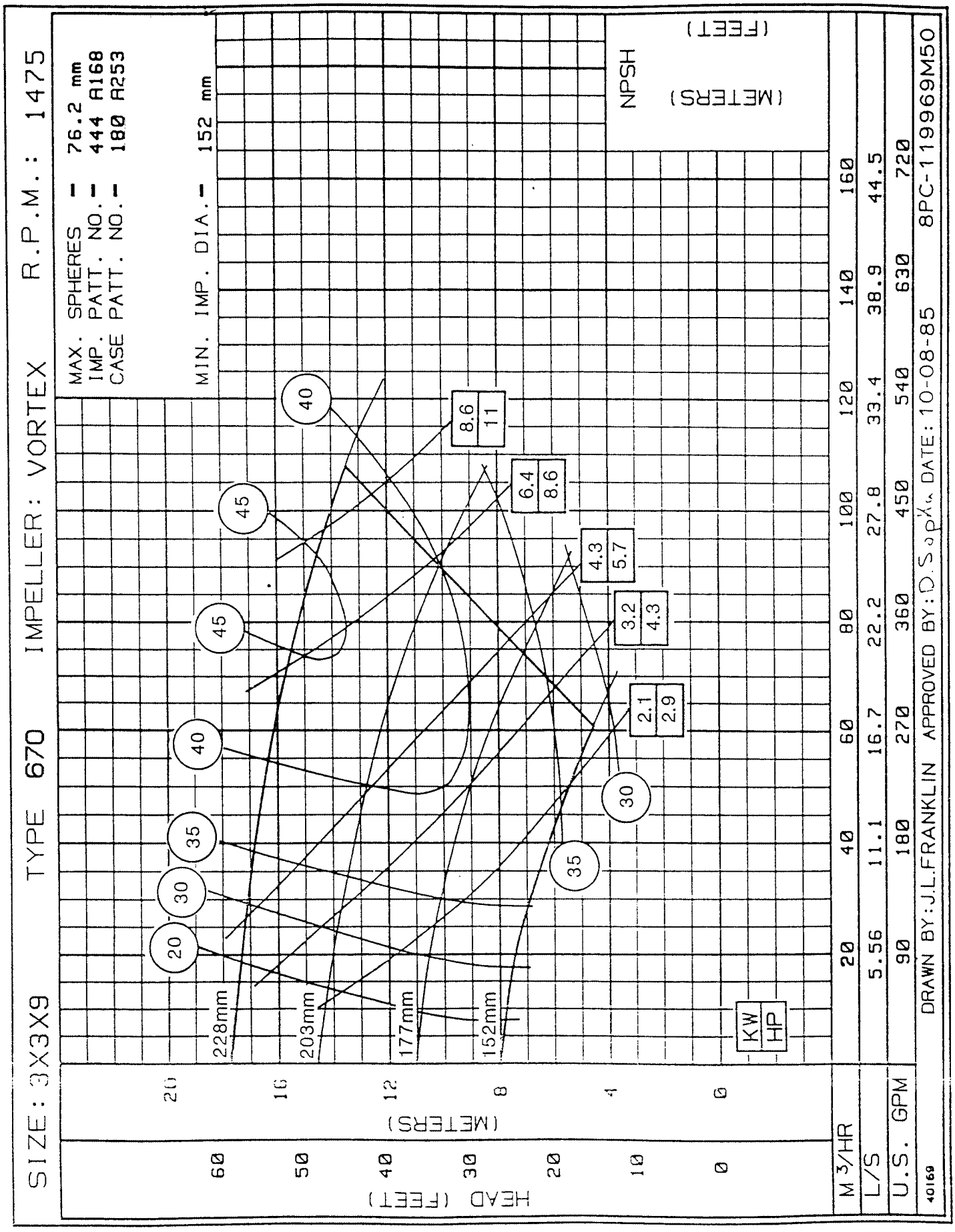
Performance Curves for the 670 Series (50 Hz)

MODEL/SIZE	R.P.M.	PDF PAGE
3x3x9	1475	2
3x3x9	980	3
3x3x9	735	4
3x3x12	1475	5
3x3x12	980	6
3x3x12	735	7
4x4x9	1475	8
4x4x9	980	9
4x4x9	735	10
4x4x12	980	11
4x4x12	735	12

AURORA®
Pentair Pump Group

3x3x9 - 1475 RPM
VORTEX IMPELLER

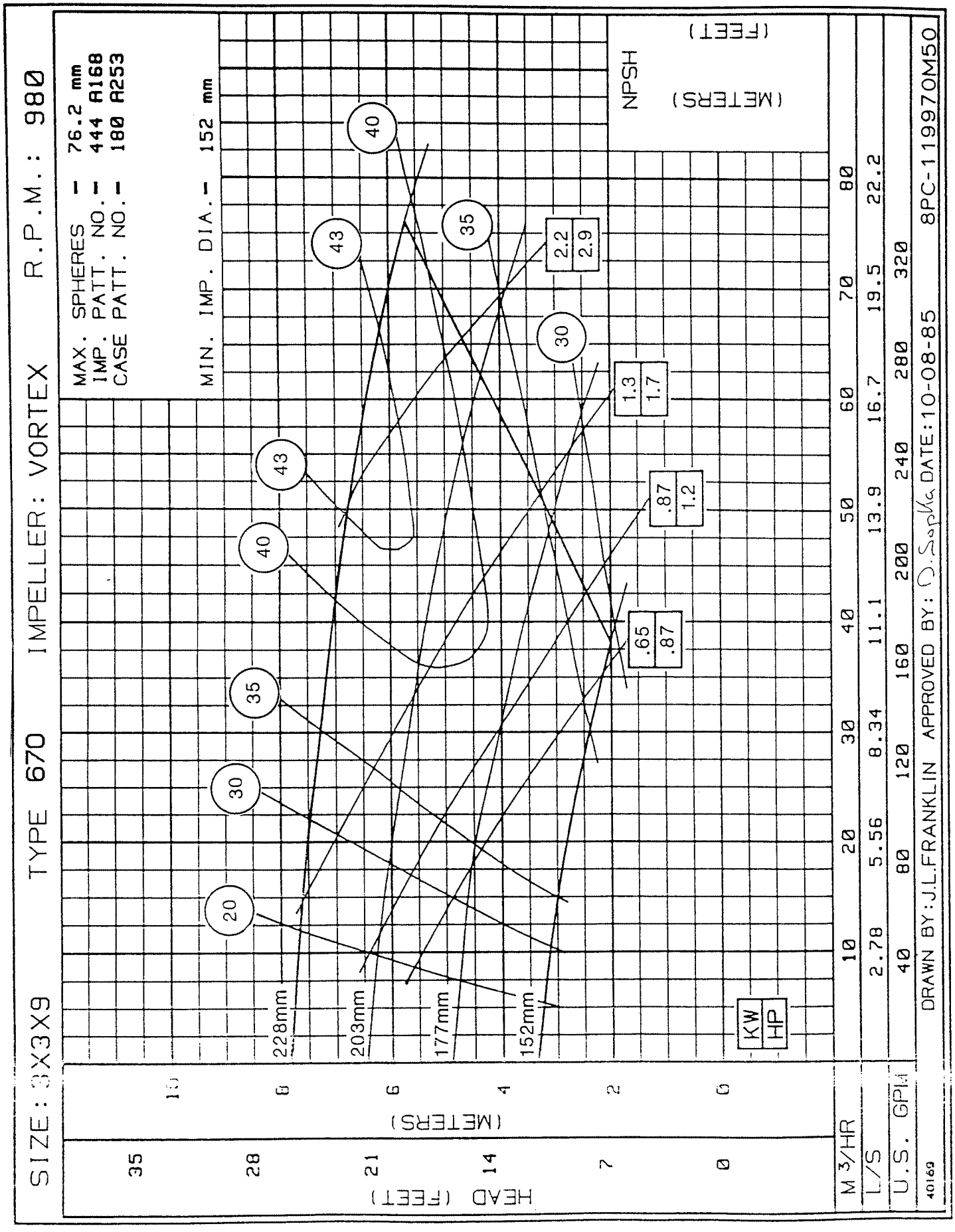
SECTION 670 (Metric 50Hz)
DATE JULY 1994
SUPERCEDES MARCH 1986



SECTION **670 (Metric 50Hz)**
DATE **JULY 1994**
SUPERCEDES MARCH 1986

3x3x9 - 980 RPM
VORTEX IMPELLER

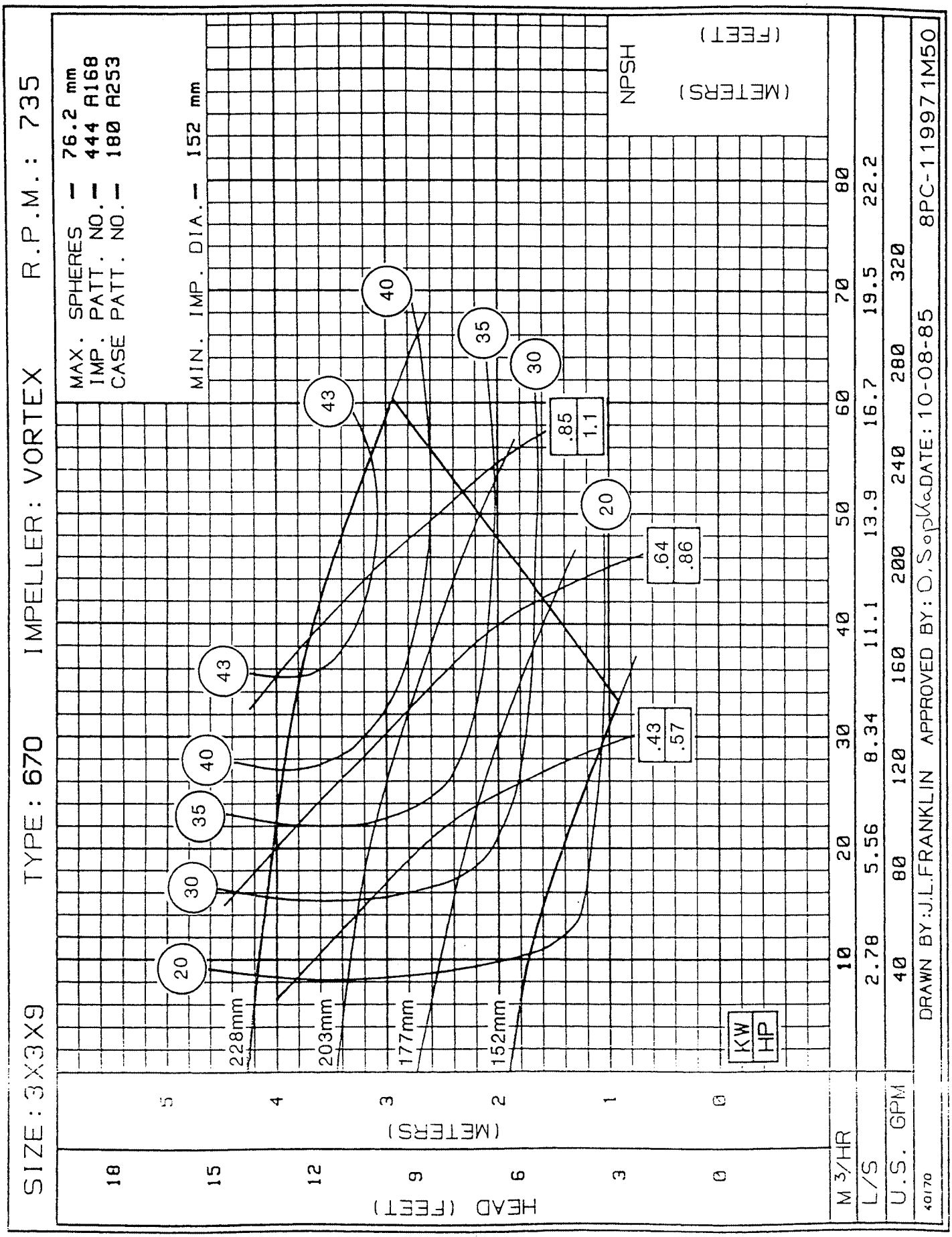
AURORA®
Pentair Pump Group



AURORA®
Pentair Pump Group

3x3x9 - 735 RPM
VORTEX IMPELLER

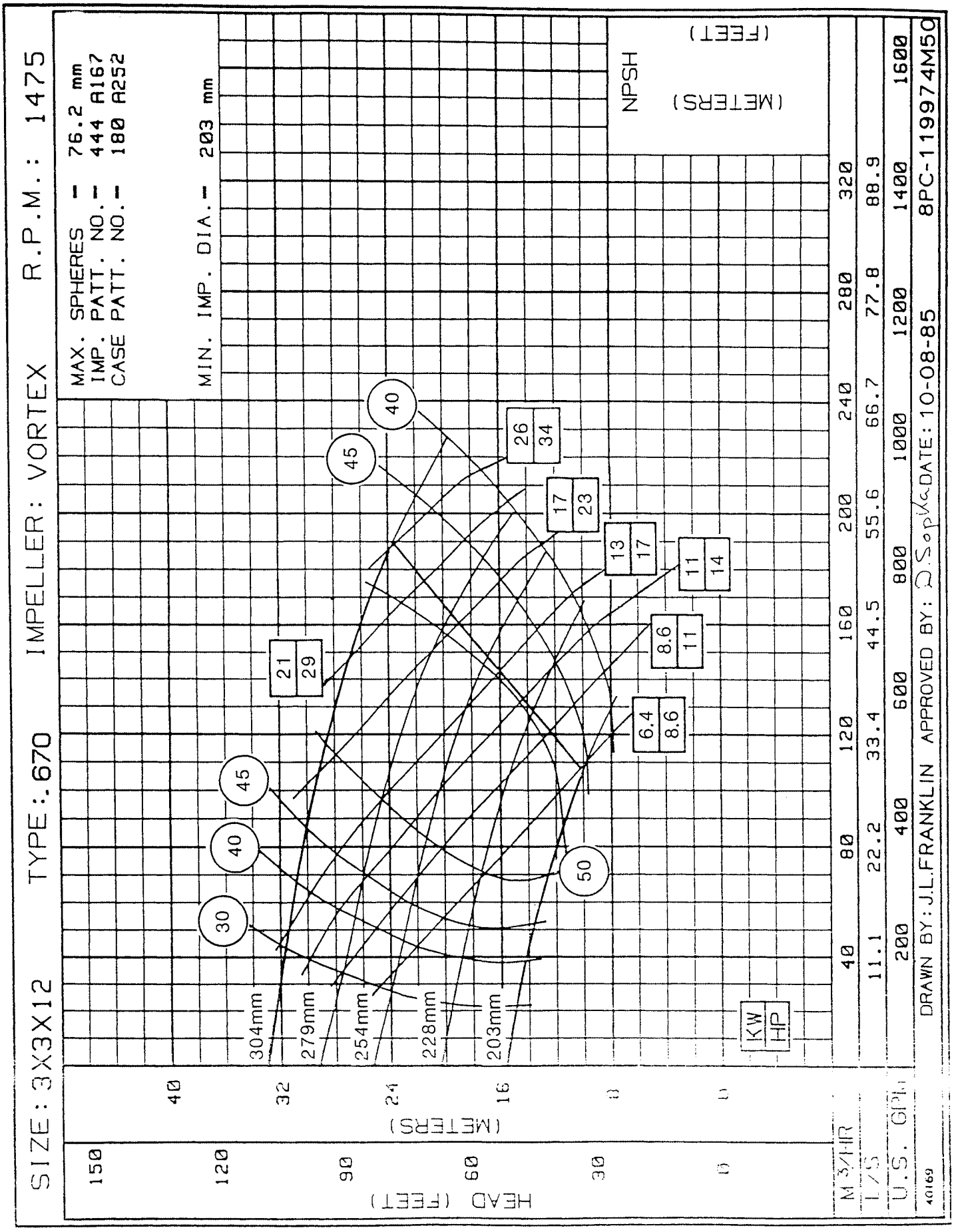
SECTION **670 (Metric 50Hz)**
DATE **JULY 1994**
SUPERCEDES MARCH 1986



SECTION **670 (Metric 50Hz)**
DATE **JULY 1994**
SUPERCEDES MARCH 1986

3x3x12 - 1475 RPM
VORTEX IMPELLER

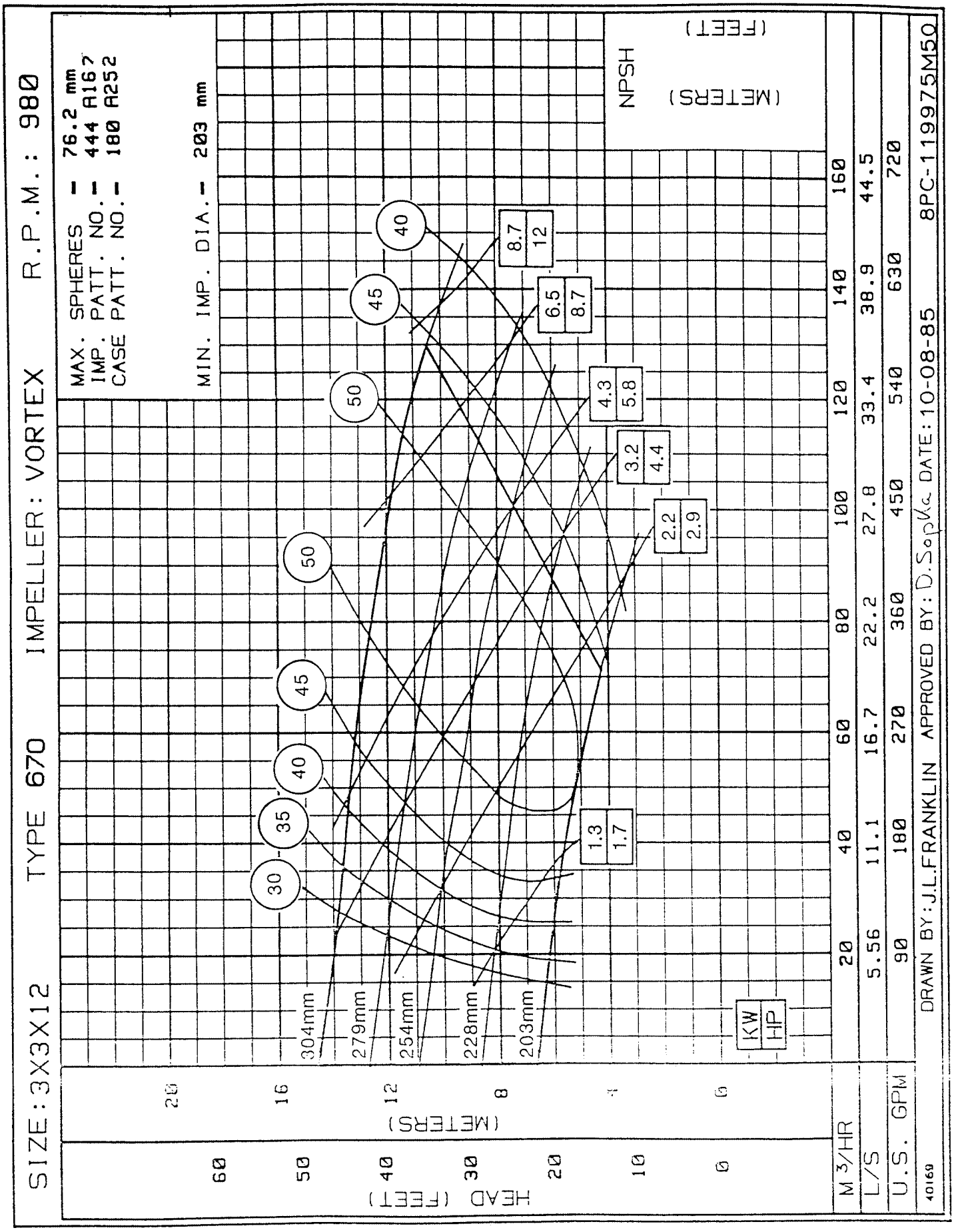
AURORA®
Pentair Pump Group



AURORA®
Pentair Pump Group

3x3x12 - 980 RPM
VORTEX IMPELLER

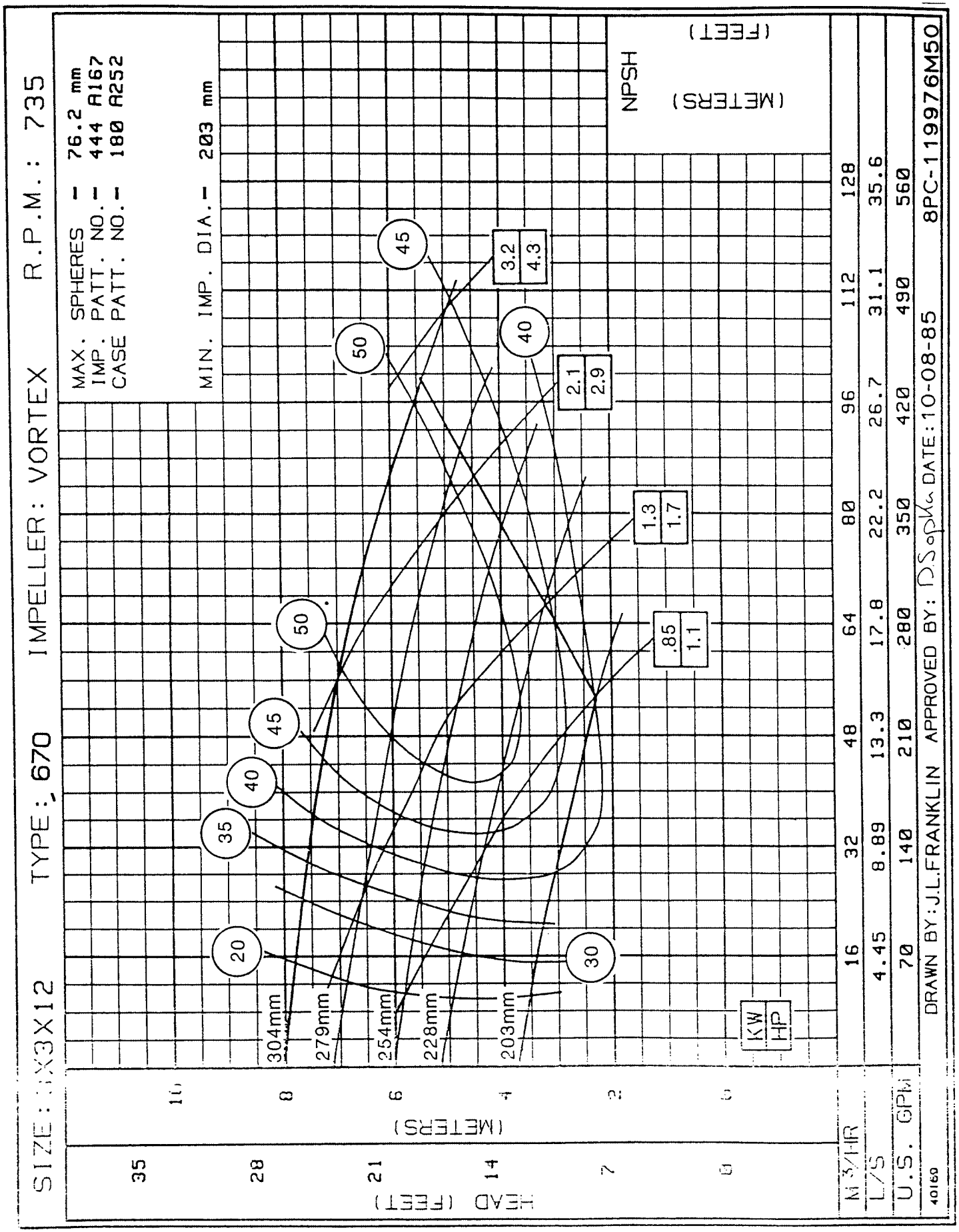
SECTION 670 (Metric 50Hz)
DATE JULY 1994
SUPERCEDES MARCH 1986



SECTION **670 (Metric 50Hz)**
DATE **JULY 1994**
SUPERCEDES MARCH 1986

3x3x12 - 735 RPM
VORTEX IMPELLER

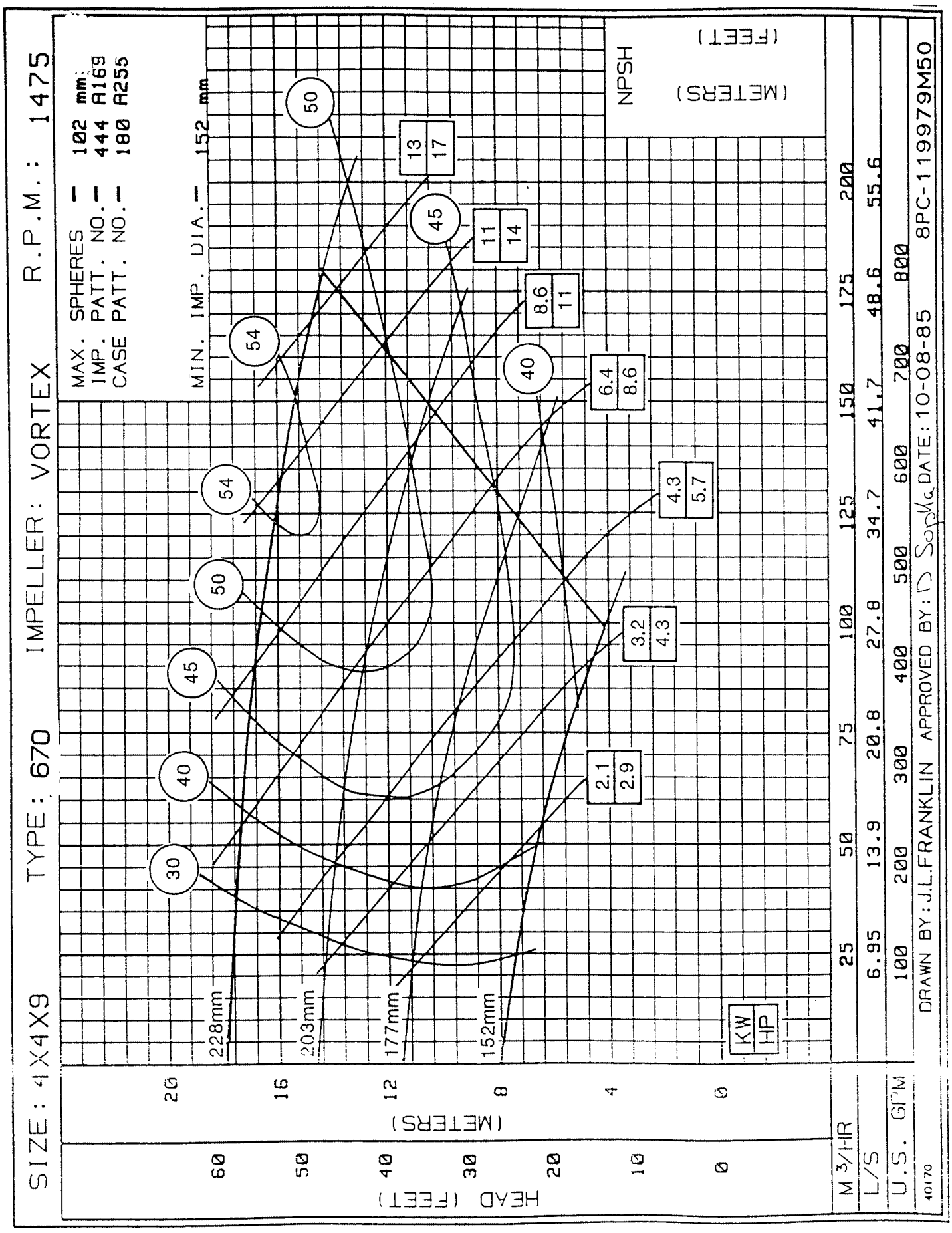
AURORA®
Pentair Pump Group



AURORA®
Pentair Pump Group

4x4x9 - 1475 RPM
VORTEX IMPELLER

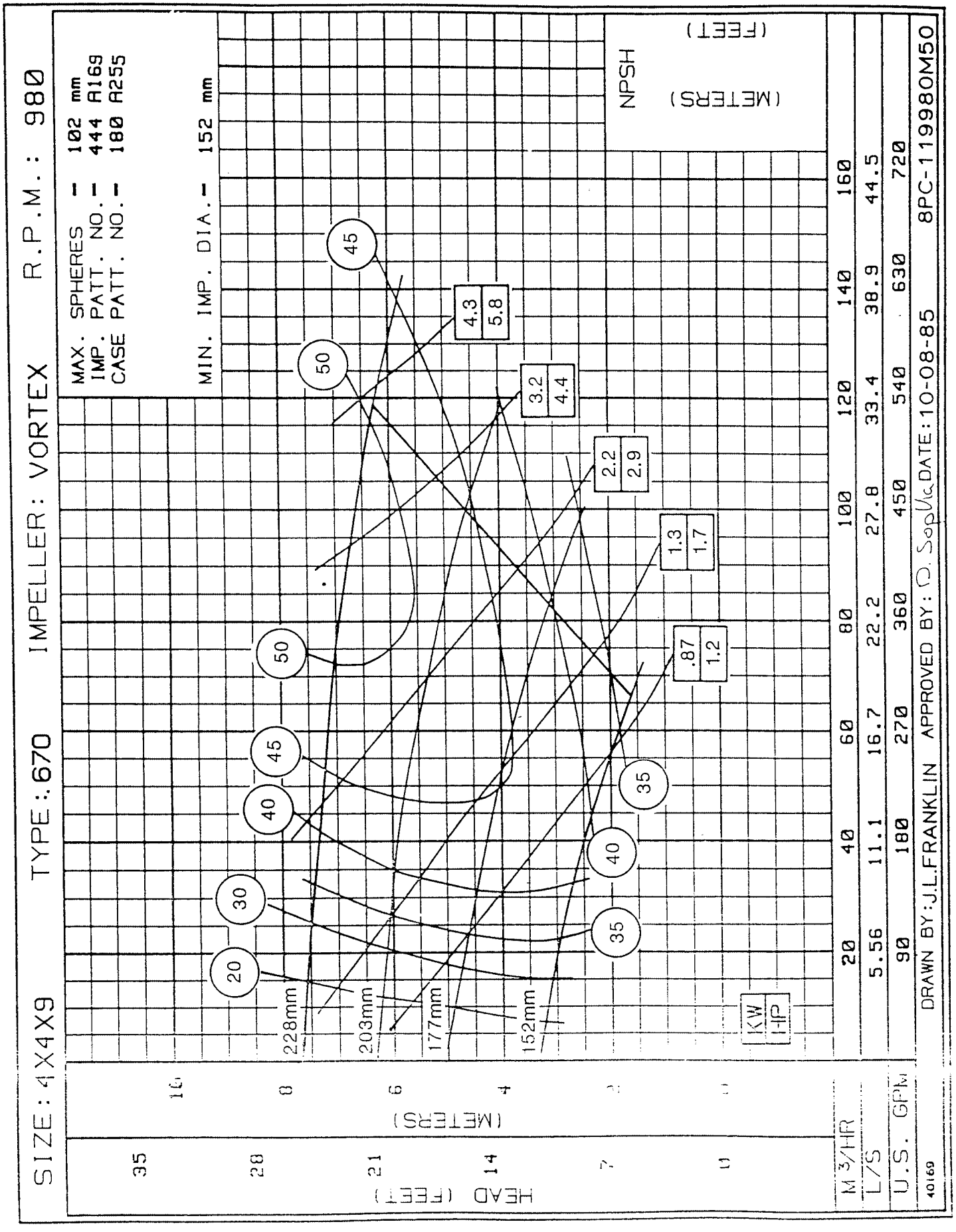
SECTION 670 (Metric 50Hz)
DATE JULY 1994
SUPERCEDES MARCH 1986



SECTION **670 (Metric 50Hz)**
DATE **JULY 1994**
SUPERCEDES MARCH 1986

4x4x9 - 980 RPM
VORTEX IMPELLER

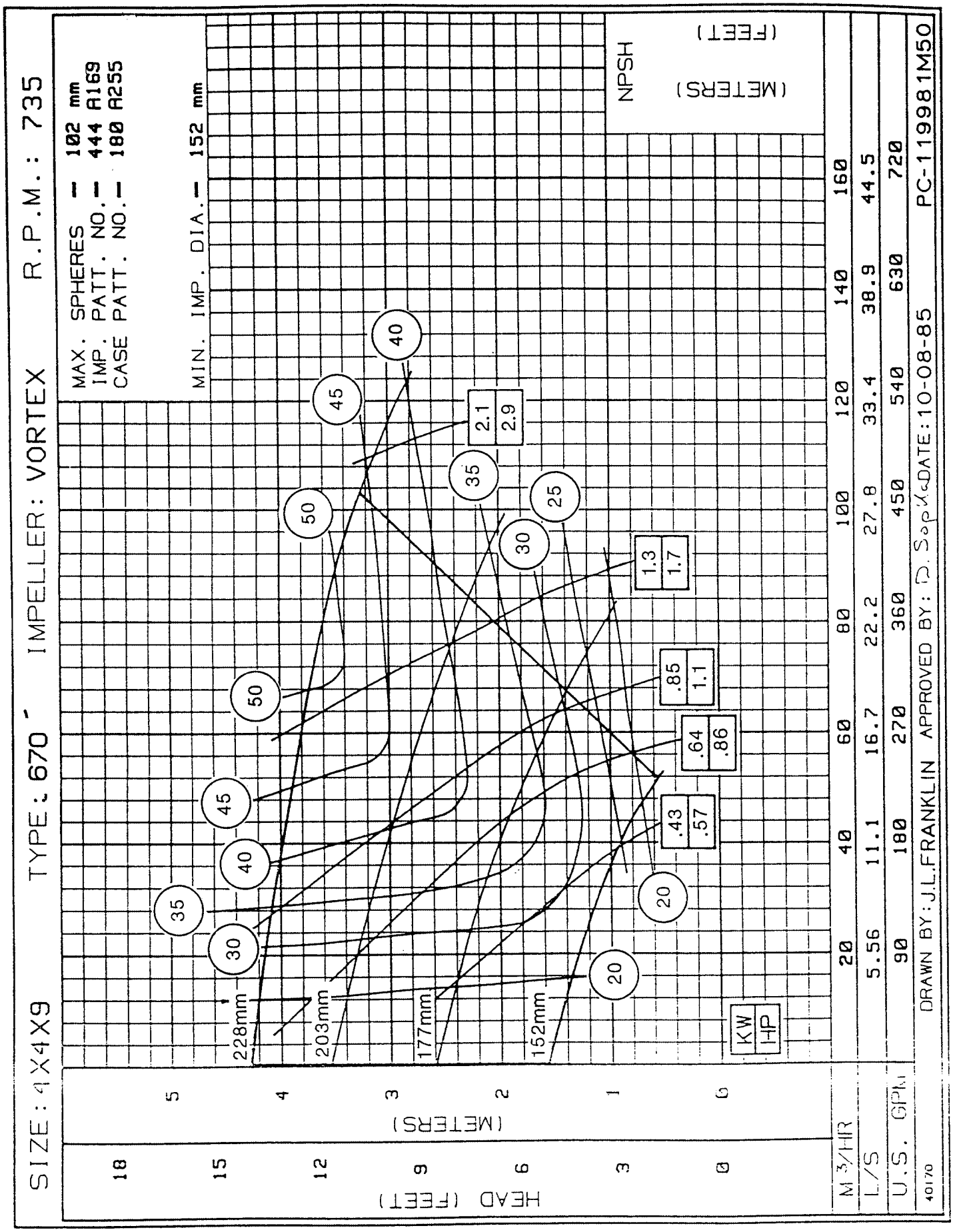
AURORA®
Pentair Pump Group



AURORA®
Pentair Pump Group

4x4x9 - 735 RPM
VORTEX IMPELLER

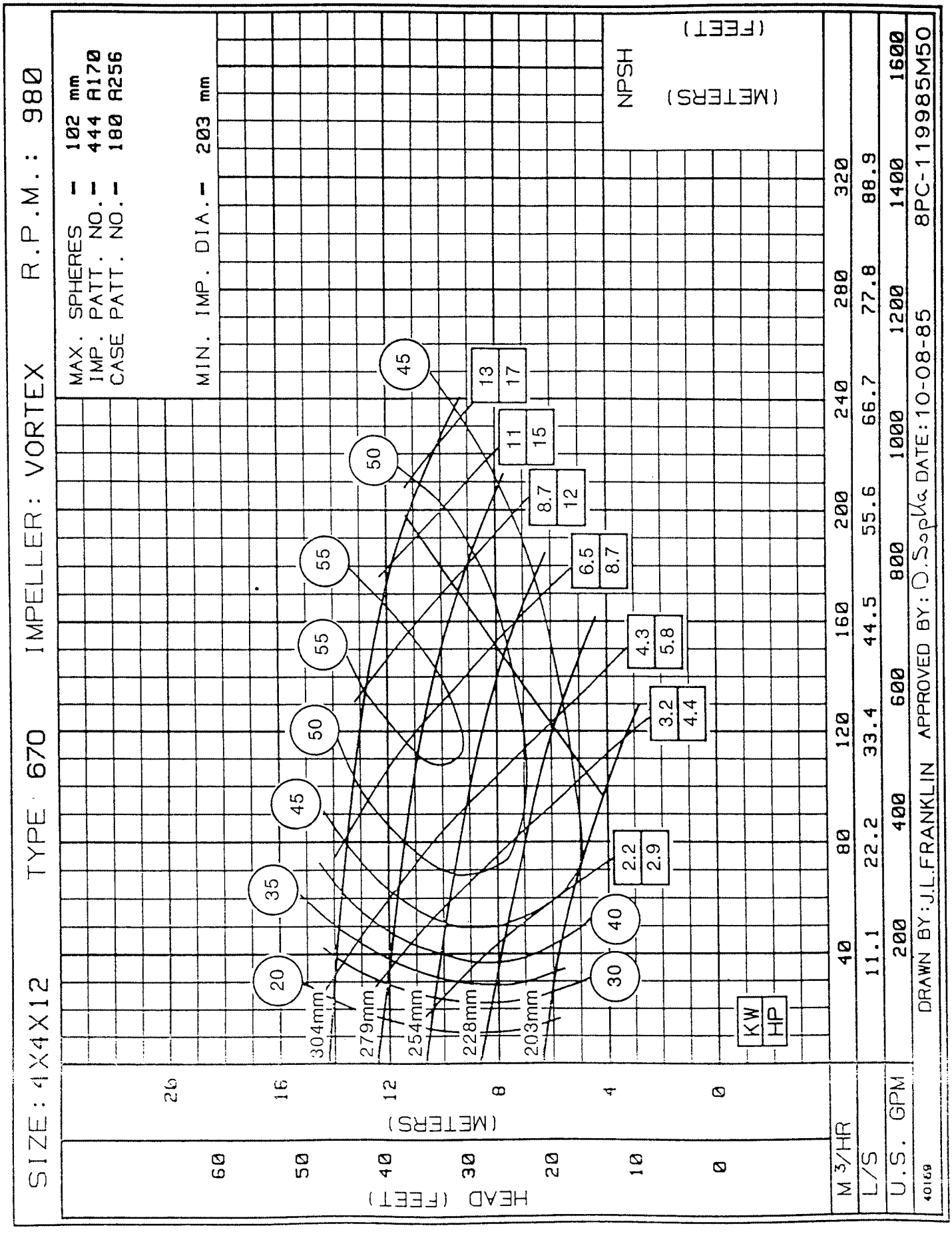
SECTION **670 (Metric 50Hz)**
DATE **JULY 1994**
SUPERCEDES MARCH 1986



SECTION **670 (Metric 50Hz)**
DATE **JULY 1994**
SUPERCEDES MARCH 1986

4x4x12 - 980 RPM
VORTEX IMPELLER

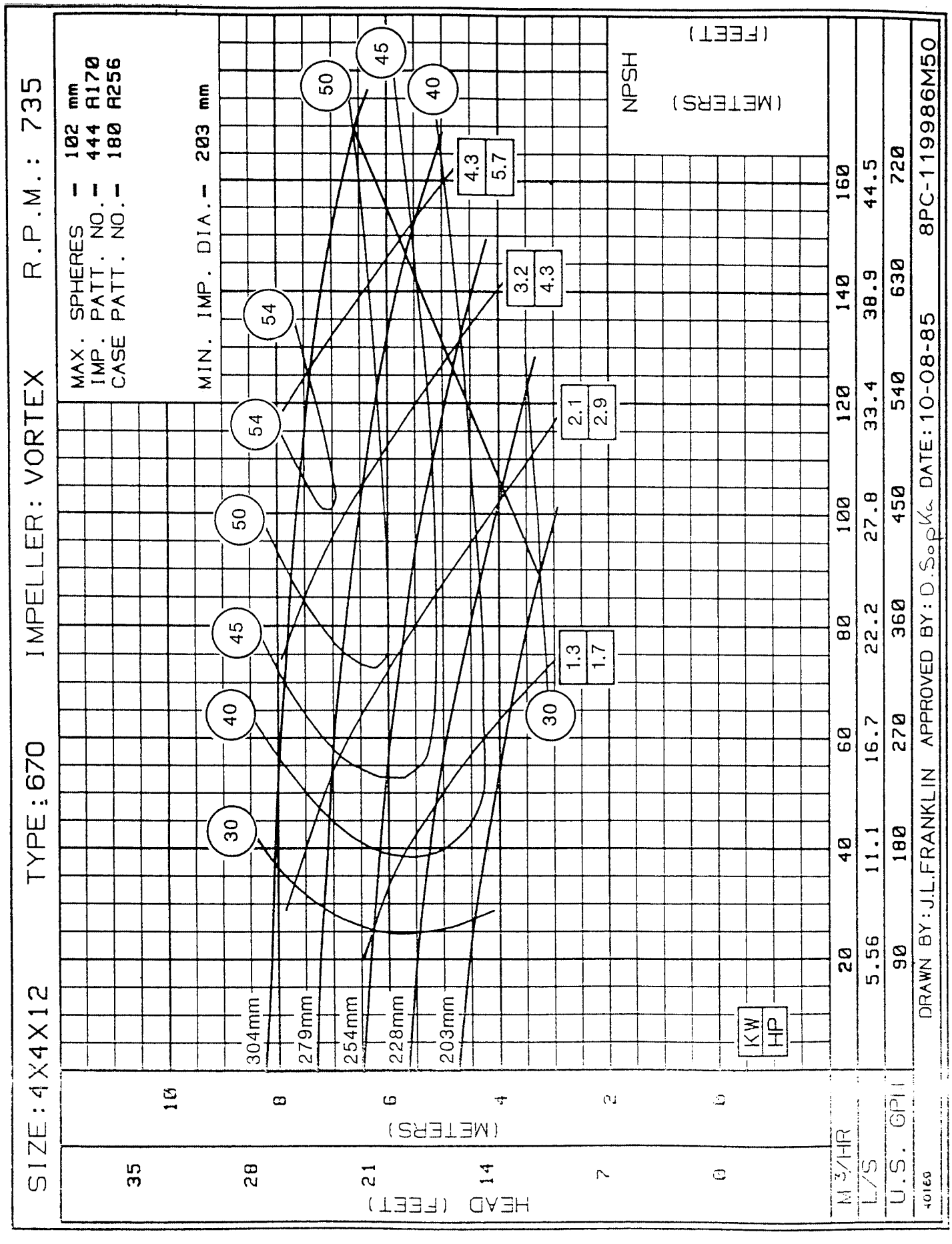
AURORA®
Pentair Pump Group



AURORA®
Pentair Pump Group

4x4x12 - 735 RPM
VORTEX IMPELLER

SECTION **670 (Metric 50Hz)**
DATE **JULY 1994**
SUPERCEDES MARCH 1986



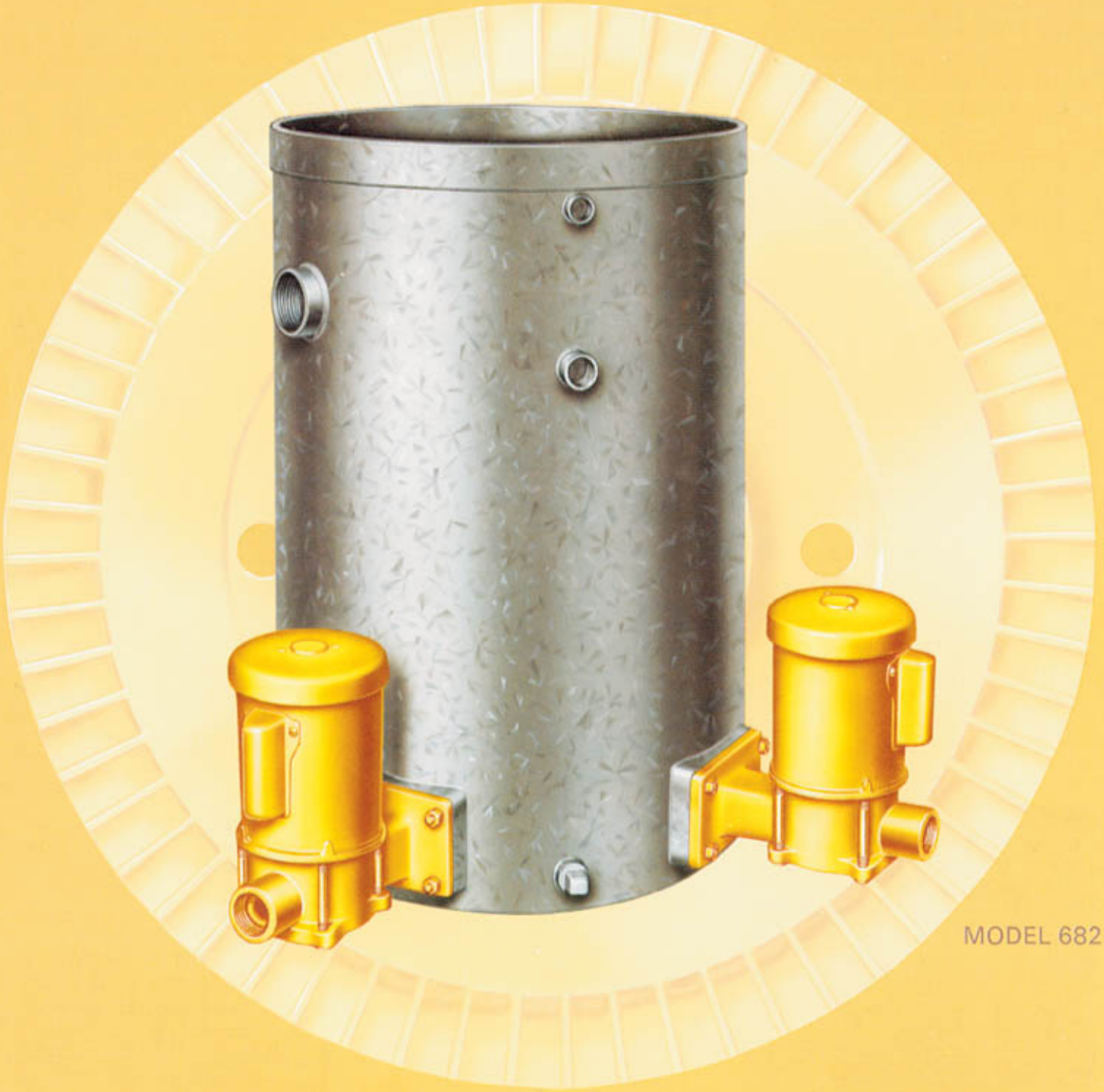
AURORA PUMP A member of PENTAIR PUMP GROUP

AURORA PUMP

BULLETIN 680/Rev. D

680 SERIES SINGLE STAGE WATER SEAL PUMPS—"APCO SEAL"

CAPACITIES TO 25 G.P.M.
HEADS TO 180 FEET
TEMPERATURES TO 190°F.
DISCHARGE SIZES 1" AND 1-1/2"



MODEL 682

INTRODUCTION
AURORA WATER SEAL UNITS

A Water Seal Unit is a complete pumping system used with, but independent of larger municipal or industrial pumps. Its purpose is to provide a lubrication and flushing action of clean water for mechanical seals and packing boxes in pumps handling abrasive or corrosive materials in suspension. Normally, pressure in a pump forces grit and corrosives, in the liquid being pumped, back into the stuffing box subjecting seals or packing to early wear or service. When a Water Seal Unit is installed, clean water, under pressure, is forced into the stuffing box thereby flushing away abrasive contaminants. Water Seal Units with sewage pumps are a must if packing and mechanical seal replacements are to be kept to a minimum.

When a central water supply is used for sealing purposes, an air gap between the incoming water supply and the tank overflow is required to prevent contamination of the central supply. This is accomplished by the Aurora Water Seal Unit.

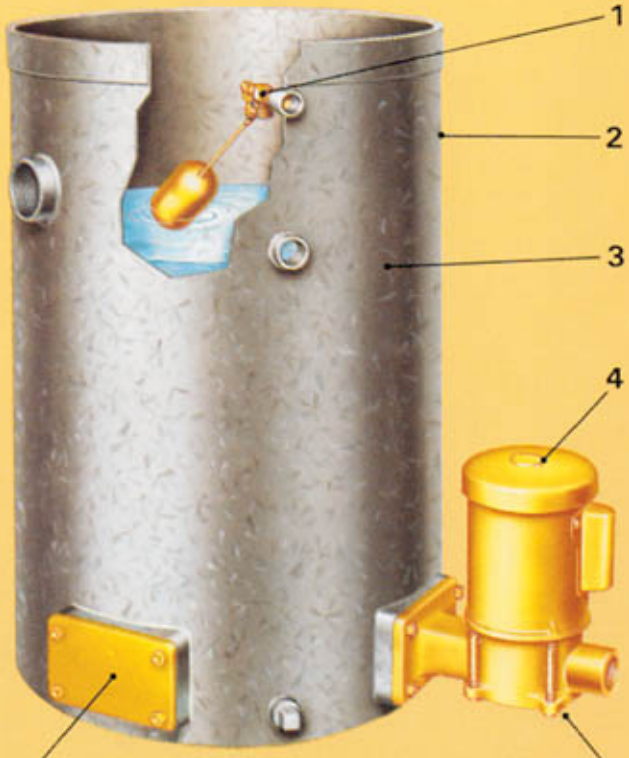
With your Aurora Water Seal Unit you are getting an Aurora Turbine Pump. These pumps are especially designed for small flows with little change in flow over wide pressure ranges, and operate at 1750 R.P.M. This is not a 3500 R.P.M. centrifugal pump running at "shut off", in its poorest operating range. All this means a system giving you reliability and long service life with top performance.

For reliability plus simplicity of design compare the features of the Aurora Water Seal Unit before you specify.

UNIT FEATURES

1 DIRECT FLOW, BRASS, POSITIVE SHUT-OFF, FLOAT VALVE provides trouble free service. Simple lever action replaces water lost due to processing, evaporation, etc.

2 50 GALLON GALVANIZED RECEIVER inside and out prevents corrosion, eliminates the need for special coatings and is 3/16" to insure long life. Receiver with open top includes threaded inlet, overflow and drain openings.



MODEL 681 ILLUSTRATED

3 COMPACT DESIGN FOR MINIMUM SPACE REQUIREMENTS, FITS INTO ROOM CORNER.

4 PUMPS MOUNT DIRECTLY ON THE RECEIVER. No suction piping is required.

5 TURBINE TYPE PUMP at 1750 R.P.M. provides reliable performance. For more information concerning the 130 Series Turbine Pump please refer to Bulletion 130.

6 COVERED SUCTION CONNECTION is provided for converting from Simplex to Duplex operation.

QUICK REFERENCE WATER SEAL UNIT FEATURE SELECTOR

STANDARD

04F or 05F Turbine Pumps With Mechanical Seals

Mechanical Make Up Float Valve

50 Gallon Capacity Galvanized Receiver with Inlet, Overflow and Drain Connections

OPTIONAL

Tank Cover

Electric Float Switch & External Solenoid Valve

Inlet "Y" Strainer

Electric Sequence Changer For Duplex Unit

Relief Valve

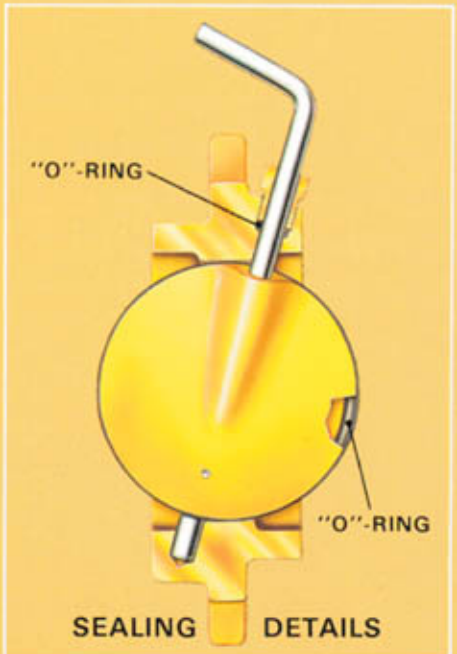
Isolation Valve

SELECTION CHART
MODEL 681 AND 682

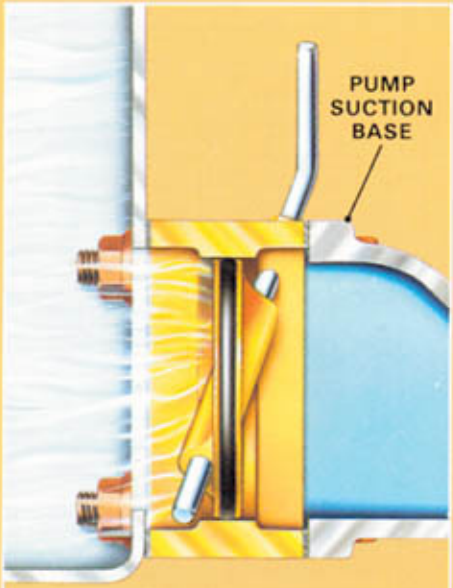
WATER SEAL UNIT 1750 R.P.M. MAXIMUM TEMPERATURE 190° F.

PRESSURE P.S.I.		9	13	17	22	26	30	35	39	43	52	61	69	78
TOTAL DYNAMIC HEAD IN FEET		20	30	40	50	60	70	80	90	100	120	140	160	180
G.P.M.														
2	SIZE	A04F	A04F	B04F	B04F	B04F	C04F	C04F	C04F	F05F	F05F	F05F	F05F	F05F
	H.P.	1/3	1/3	1/3	1/3	1/3	1/3	1/3	1/3	1/3	1/2	1/2	1/2	3/4
4	SIZE	C04F	C04F	D04F	D04F	D04F	F05F	F05F	F05F	F05F	F05F	H05F	H05F	H05F
	H.P.	1/3	1/3	1/3	1/3	1/3	1/3	1/3	1/3	1/3	1/2	3/4	1	1
6	SIZE	D04F	D04F	F05F	F05F	F05F	G05F	G05F	G05F	H05F	H05F	H05F	H05F	I05F
	H.P.	1/3	1/3	1/3	1/3	1/3	1/3	1/3	1/2	3/4	3/4	3/4	1	1 1/2
8	SIZE	G05F	G05F	G05F	G05F	G05F	H05F	H05F	H05F	H05F	H05F	I05F	I05F	K05F
	H.P.	1/3	1/3	1/3	1/3	1/3	1/3	3/4	3/4	3/4	3/4	1	1	2
10	SIZE	G05F	G05F	H05F	H05F	H05F	H05F	H05F	I05F	I05F	I05F	J05F	K05F	
	H.P.	1/3	1/3	1/3	1/2	1/2	1/2	1/2	3/4	3/4	1	1 1/2	1 1/2	
15	SIZE	I05F	I05F	I05F	I05F	I05F	J05F	J05F	J05F	J05F	K05F	K05F		
	H.P.	1/3	1/3	1/2	1/2	3/4	3/4	3/4	1	1	1 1/2	1 1/2		
20	SIZE	J05F	J05F	J05F	J05F	J05F	K05F	K05F	K05F	K05F				
	H.P.	1/2	1/2	1/2	3/4	3/4	3/4	1	1	1				
25	SIZE	K05F	K05F	K05F	K05F	K05F	NOTE: Refer to factory for selections not shown on chart.							
	H.P.	1/2	1/2	3/4	3/4	3/4								

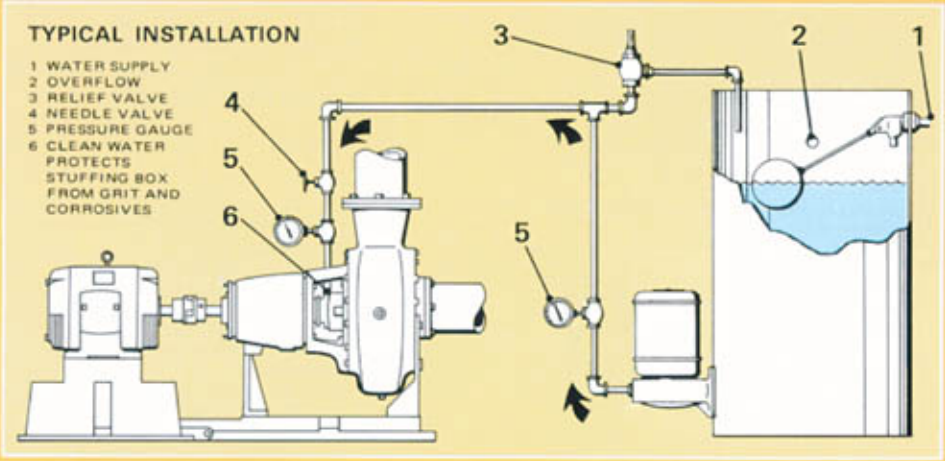
OPEN POSITION



SEALING DETAILS



CLOSED POSITION



SELECTING YOUR WATER SEAL UNIT

1 DETERMINE THE CAPACITY required for an installation by multipling the number of stuffing boxes being flushed by 2 G.P.M.

2 DETERMINE THE PRESSURE required for flushing a pump stuffing box by the following formula:

PRESSURE = Vertical Height + Friction Loss + (.8 x discharge head.)

VERTICAL HEIGHT = Vertical Distance between centerlines of suction of Water Seal Pump and stuffing box in pump being flushed.

FRICTION LOSS = Loss in head between Water Seal Pump and flushed pump stuffing box.

DISCHARGE HEAD = Discharge Head of pump being flushed.

3 MAKE THE SELECTION from the water seal selection chart above.

ENGINEERING SPECIFICATIONS

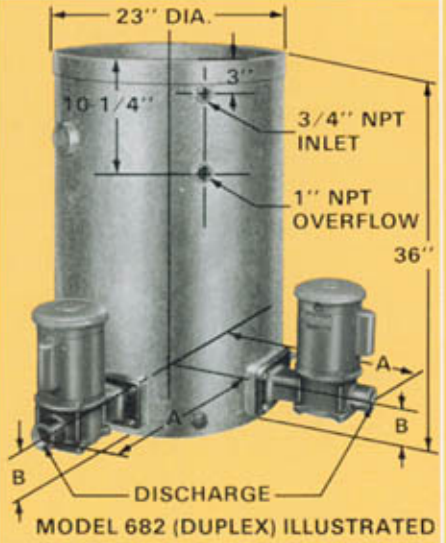
The contractor shall furnish (and install in location as shown on the plan) an Aurora Type APCO-SEAL Water Seal Unit Model 681 (Simplex) ☐ — Model 682 (Duplex) ☐. The unit shall have an Aurora vertical flange mounted (04F or 05F) turbine type pump with a capacity of . . . . . G.P.M. at . . . . . total head. The pump is to be bronze fitted with a mechanical seal with all metal parts of 316 stainless steel, "Buna-N" bellows, Ni-resist seat and carbon washer. The pump is to be close coupled to . . . . . Hertz, ... phase, ... cycle, ... voltage, 1750 R.P.M., (drip-proof) (totally enclosed) (explosion proof) motor with a stainless steel shaft. The motor shall be designed to Aurora Pump specifications. The pump-motor combination is to be flange mounted to a galvanized steel, open top receiver with a capacity of 50 gallons and shall be equipped with a float valve assembly. The receiver shall be provided with a drain plug and a 1" overflow below the inlet to allow an air gap to prevent back-siphonage. A 1" drain shall be furnished in the receiver.

WATER SEAL DIMENSIONS

Model	Disch.	Pump Wgt.	Receiver Wgt.	A***	B
04F	1	20	120	19 3/16	3 1/16
05F	1 1/2	34	120	22 5/16	3 3/4

Frame	Horsepower 1750 R.P.M.	Motor Wgt.
56	1/3	29
	1/2	46
	3/4	56
	1	56
	1 1/2**	65
145T	1 1/2*	42
	2 **	48
182T	2 *	65

*Single phase only **Three phase only ***Add 2" for Isolation Valve

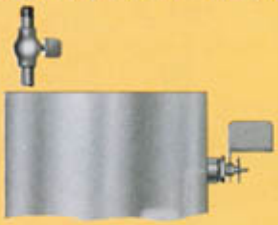


MODEL 682 (DUPLEX) ILLUSTRATED

MATERIALS OF CONSTRUCTION

PART	MATERIAL
CASING	CAST IRON ASTM A48
IMPELLER	BRONZE ASTM B62
IMPELLER SLEEVE	BRONZE ASTM B62
INNER RING	CAST IRON ASTM A48
OUTER RING	CAST IRON ASTM A48
MECHANICAL SEAL	316 stainless steel metal parts, "Buna'N" elastomer parts, Ni-resist seat and carbon washer.
BRACKET	CAST IRON ASTM A48
MOTOR SHAFT	STAINLESS STEEL AISI 416
FLOAT VALVE	BRASS ASTM B-36
RECEIVER	GALVANIZED STEEL 3/16" HOT DIPPED
SUCTION FLANGE (MODEL 681 ONLY)	CAST IRON ASTM A48

ADDITIONAL OPTIONAL EQUIPMENT


Solenoid valve and float switch for external air gap.


Sequence changer alternates duplex operation.


Cover keeps dirt out of the receiver.


Inlet "Y" strainer minimizes liquid impurities.

THE AURORA WATER SEAL UNIT is easy to install. Stand the unit in place, no special foundation is required, and connect the piping to the stuffing boxes of one or more pumps.

NOTES:
1. Dimensions and weights are approximate.
2. All dimensions are in inches and may vary ± 1/8".
3. Frame sizes and motor weight are for open drip-proof motors only.
4. Conduit box is shown in approximate position. Dimensions are not specified as they vary with each motor manufacturer.
5. Add pump, receiver and motor weight for unit weight.
6. Not for construction purposes unless certified.

NOTE: Aurora Pump reserves the right to make revisions to its products and their specifications, and to this bulletin and related information without notice.

— Your Authorized Local Distributor —

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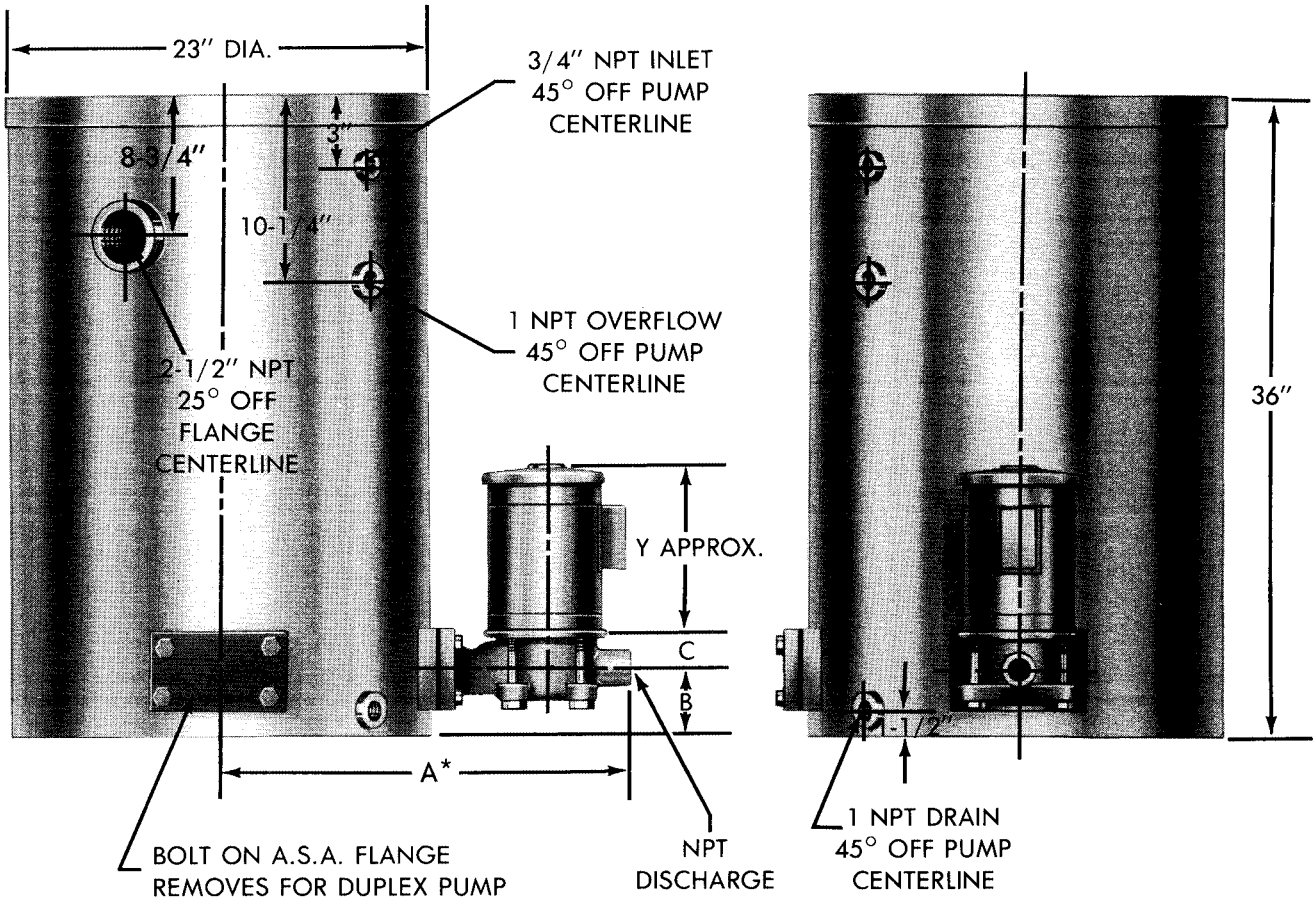
Refer to "Pumps" in yellow pages of your phone directory for your local Distributor.

AURORA MODEL 681
WATER SEAL UNITS
SIMPLEX



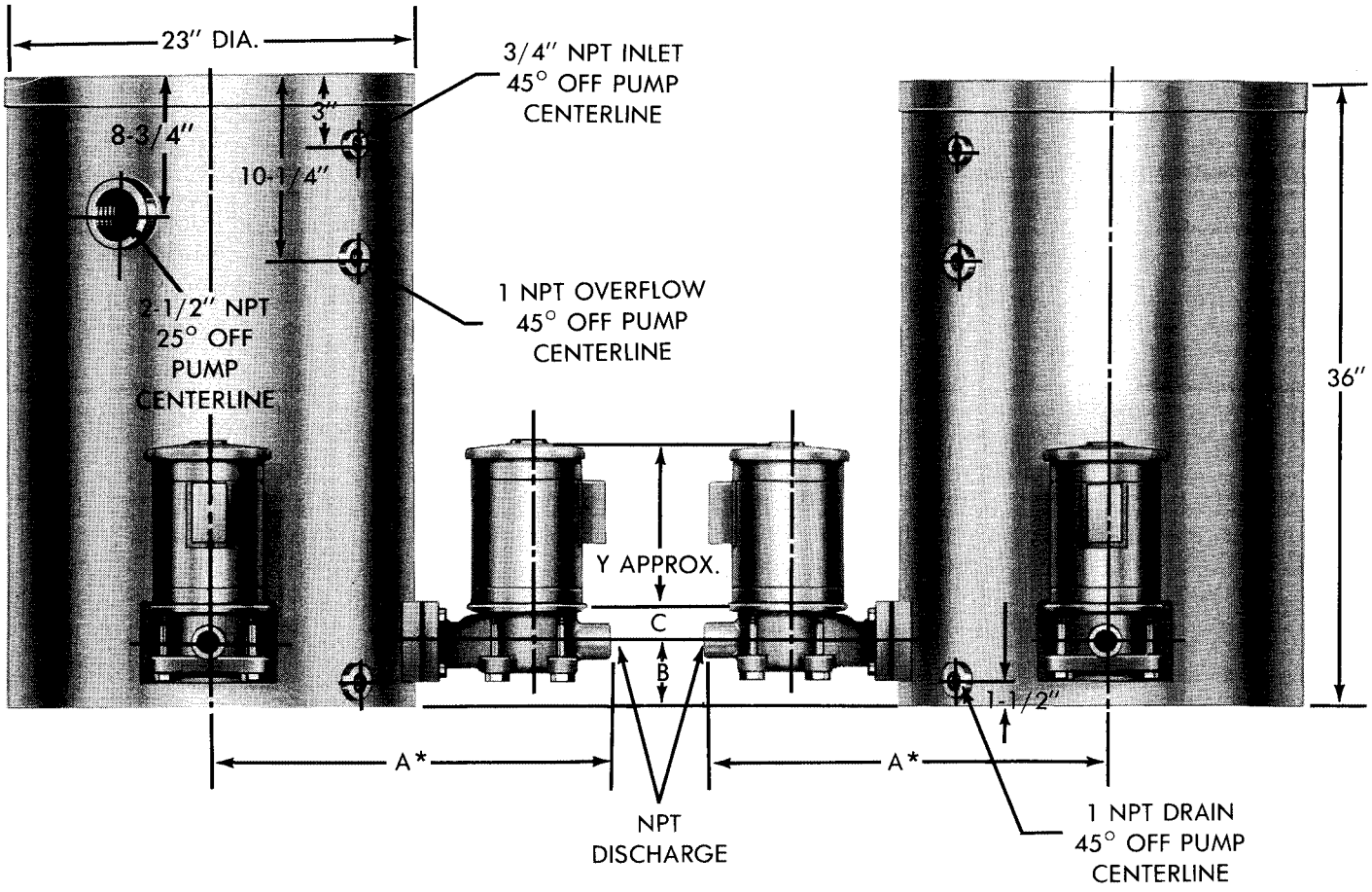
PUMP MODEL	DISCHARGE	A*	B	C
134 (F)	1"	19-9/16"	3-1/16"	2"
135 (F)	1-1/2"	22-5/16"	3-3/4"	2-1/4"

MOTOR FRAME	Y APPROX.
56	11"
56	11"

NOTES:
1. All dimensions in inches.
2. Not for construction purposes unless certified.
3. Dimensions may vary ±1/4".

* When isolation valve is furnished dimension increases by 2 inches.

AURORA MODEL 682
WATER SEAL UNITS
DUPLEX



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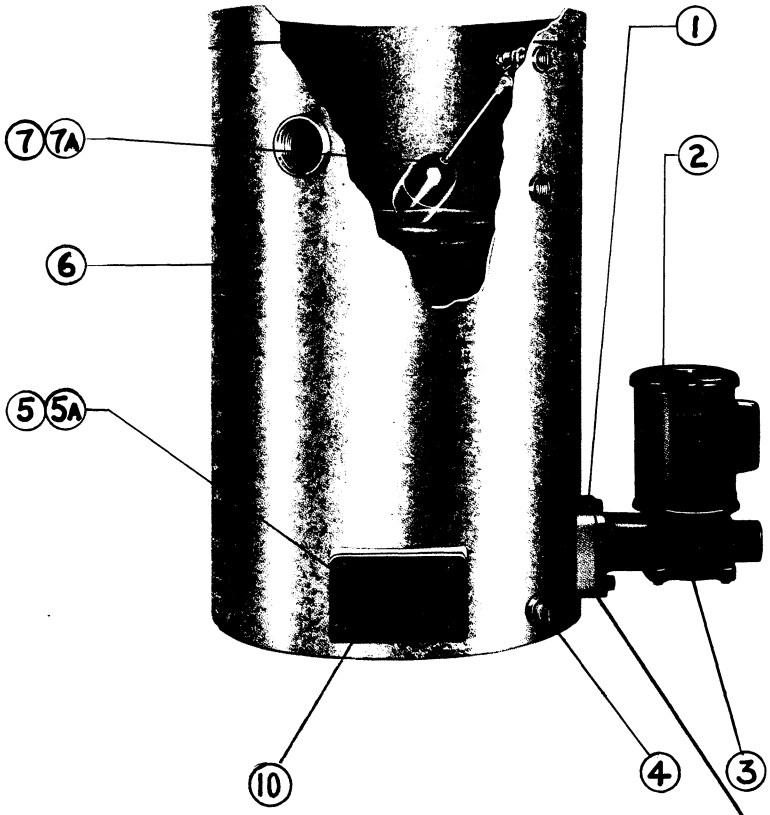
* When isolation valve is furnished dimension increases by 2 inches.

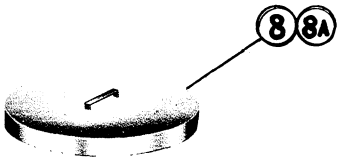
680 SERIES
REPAIR PARTS INDEX

680 SERIES

MODEL 681-682

PIECE NUMBERS





NOTE : FOR REMAINING PARTS NOT SHOWN, REFER TO REPAIR PARTS SEC. 130

680 SERIES

MODELS 681-682
A04-D04 - E05-L05

PARTS LIST

PC. NO.	DESCRIPTION	QTY	PART NO.	MATERIAL			
				B.F.	A.B.	A.I.	S.S.
1	GASKET	*	364-1154	617			
2	MOTOR		REFER TO FACTORY				
3	CASING						
	A04-D04	1	180-1226	010			
	E05-L05	1	180-1845	010			
4	PLUG	1	600-0006	028			
5	STUD						
	WITHOUT VALVE	8	808-0310	080			
	WITH VALVE	8	808-0345	080			
5A	NUT	8	544-0113	080			
6	TANK	1	836-0679	385			
7	MAKE-UP VALVE	1	896-4200	644			
7A	OPTIONAL						
	SOLENOID VALVE	1	896-4104	644			
8	OPTIONAL COVER	1	260-0500	385			
8A	OPT. COVER						
	USED WITH						
	SOLENOID VALVE	1	260-0501	385			
10	COVER (SIMPLEX)	1	260-0529	010			
11	ISOLATION VALVE		(OPTIONAL)				
	(SIMPLEX)	1	032-1631	643			
	(DUPLEX)	2	032-1631	643			

NOTE: FOR REMAINING PARTS OF PUMP NOT LISTED, REFER TO REPAIR PARTS SEC. 130P.

* GASKET
WITHOUT ISOLATION VALVE 2 REQUIRED
WITH ISOLATION VALVE:
SIMPLEX 3 REQUIRED
DUPLEX 4 REQUIRED

PC. NO.	DESCRIPTION	QTY	PART NO.	MATERIAL			
				B.F.	A.B.	A.I.	S.S.

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