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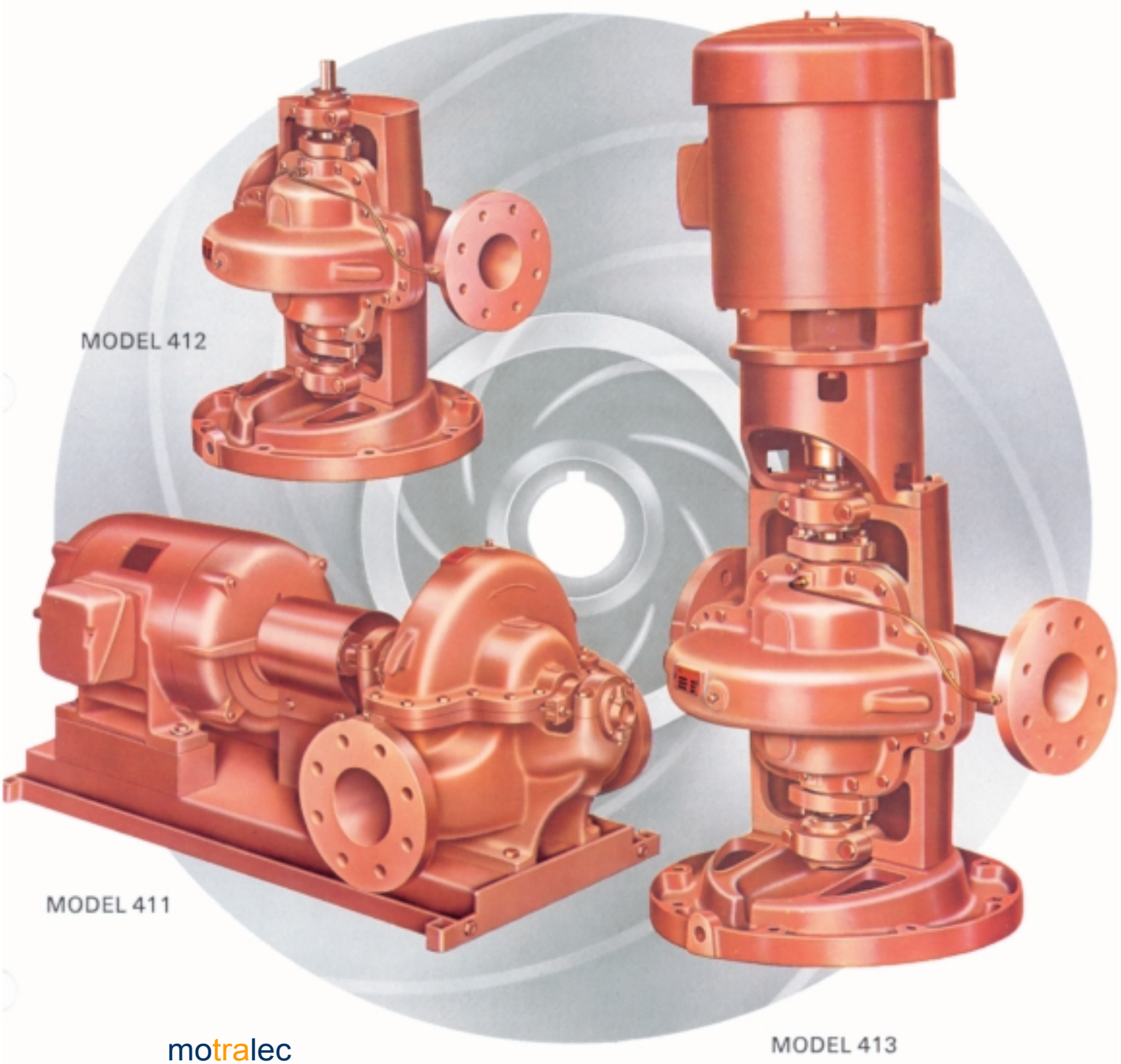
AURORA PUMP A member of PENTAIR PUMP GROUP

AURORA PUMP

BULLETIN 410/REV. P

410 SERIES SINGLE STAGE SPLIT CASE PUMPS

CAPACITIES TO 15000 G.P.M.
HEADS TO 500 FEET
TEMPERATURES TO 275° F



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INTRODUCTION
410 SERIES PUMPS

The horizontal split case pump has long and properly been used for the handling of liquids where the utmost in reliability and accessibility are paramount. Billions of gallons of liquid have been pumped by split case double suction pumps and billions more will be pumped considering the rapid industrial, agricultural and commercial expansion. The Aurora 410 Series pumps make a significant contribution to the customer requirements for pumps on this type of service. The 410 Series is a modern design based on Aurora Pump's 50 years experience with the design, sales and manufacture of horizontal split case pumps. Look through this bulletin and see what real accomplishments can be made when an imaginative approach is taken to the customer's problem of moving liquids within a piping system. See Aurora now!

STANDARD
RIGHT HAND ROTATION

OPTIONAL DUAL DRIVE
RIGHT HAND ROTATION

OPTIONAL
LEFT HAND ROTATION

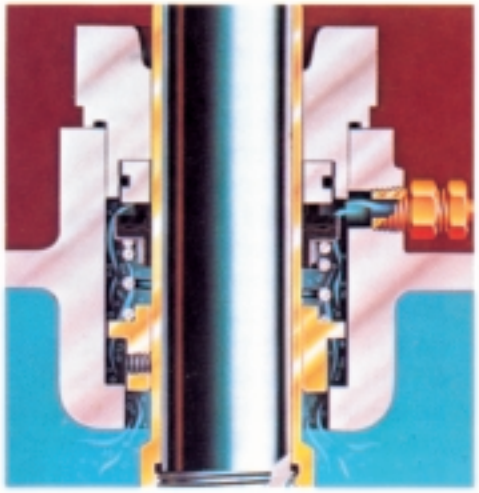
QUICK REFERENCE 410 SERIES FEATURE SELECTOR

STANDARD

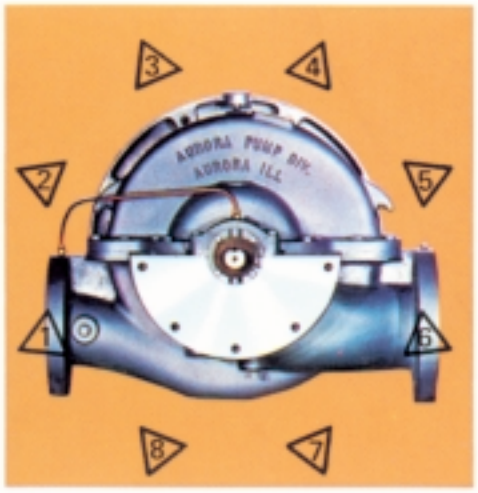
- Bronze fitted pump construction
- Bronze shaft sleeves
- Dynamically balanced impellers
- Bronze case wearing rings
- Twin volute on 10" and larger pumps
- Stainless steel impeller key
- Regreasable ball bearings
- Single row ball bearing (inboard)
- Double row ball bearing (outboard)
- Mechanical seals . . . single unbalanced (Model 412 and 413)
- Graphite and TFE lubricated acrylic packing
- Internal bypass between casing and stuffing box
- 125# ASA flanges
- 250 psi case working pressure
- Carbon steel shaft
- Stuffing box bushings
- Lifting lugs
- Hydrostatic test
- Cast integral bearing arms
- Water slingers and grease seals
- External bypass between casing and stuffing box (Model 412 and 413)
- Coupling guard (Model 411)

OPTIONAL

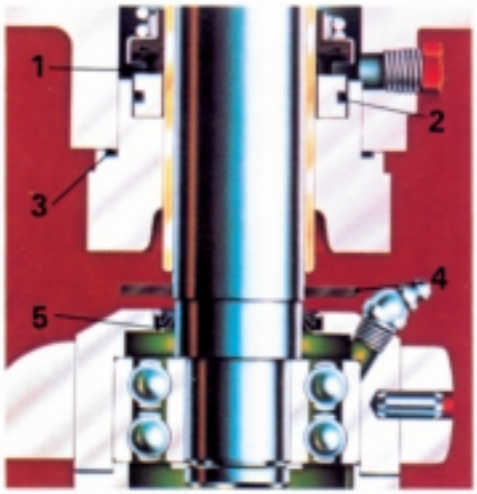
- All iron, all bronze or special alloy pump construction
- Hardened 440C stainless steel shaft sleeves (packing only)
- 316 stainless steel shaft sleeves (mechanical seal)
- Impeller wearing rings
- Oil lubricated ball bearings (Model 411 horizontal pump)
- Mechanical seals . . . single unbalanced (Model 411)
  . . . single balanced (All Models)
- Stainless steel or monel shaft
- External bypass between casing and stuffing box (Model 411)
- Steel drip rim, formed steel or fabricated steel bases
- Double extended shaft (Model 411)
- Right or left hand rotation
- Certified performance test
- Packing with lantern ring (Model 411)
- 250# ASA suction and discharge flanges
- Bottom suction or chair mounted pumps
- Water cooled cartridge caps



EXTERNAL UPPER SEAL FLUSH



INLINE PIPING IN ANY DIRECTION



FIVE WAY BEARING PROTECTION

GO VERTICAL AND PUT 2 PUMPS WHERE ONLY ONE HORIZONTAL WOULD FIT.

Aurora's space saving vertical split case pumps have long been recognized for their reliability. This reputation in the field of vertical installations has been re-emphasized since the introduction of the Model 413 as pumps of unmatched quality.

VERTICAL PUMPS PROVIDE DISTINCT ADVANTAGES OVER HORIZONTAL PUMP CONSTRUCTION.

A. Less floor space required.

B. Inline piping arrangement allows piping in any direction.

C. Elevated motor protects against potential flooding if the pump station is in a low area.

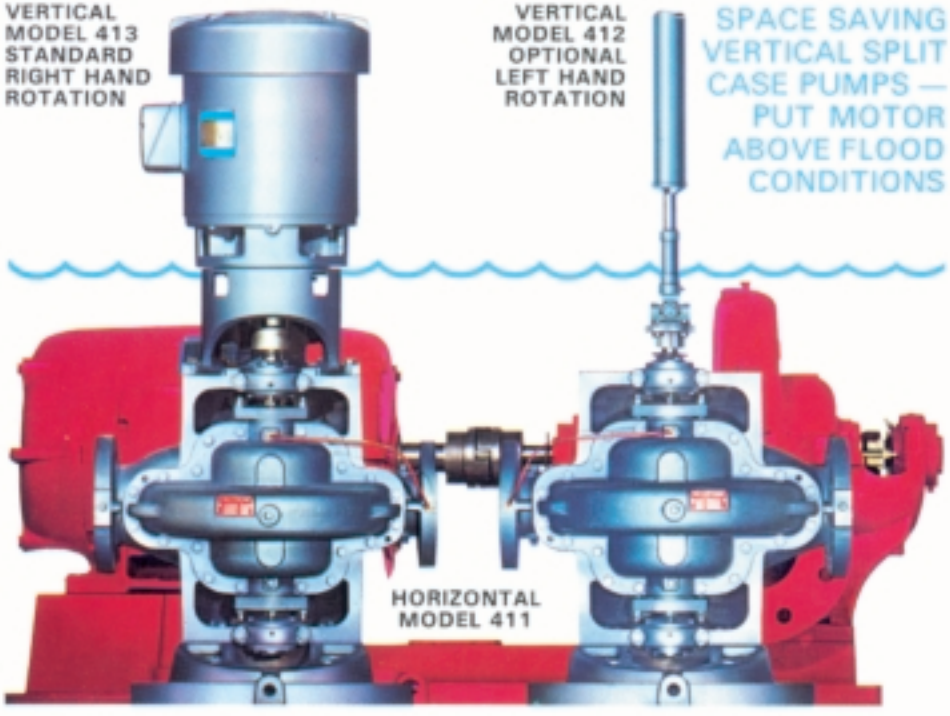
Additional features described for the horizontal pumps are also found in the vertical pumps. In addition, there are several features unique only to Model 413.

1 COUPLING ALIGNMENT True alignment is vital to long life and proper performance. To maintain proper coupling alignment the mounting bracket is rabbet fitted to the motor.

2 MECHANICAL SEALS Standard construction includes carbon against Ni-Resist face for optimum hot water performance. Long life is also assured with 303 stainless steel metal parts and "Buna-N" elastomers.

3 BEARING PROTECTION Grease seals and water slingers are provided to protect the bearings from contamination. This important feature is also standard on horizontal pumps.

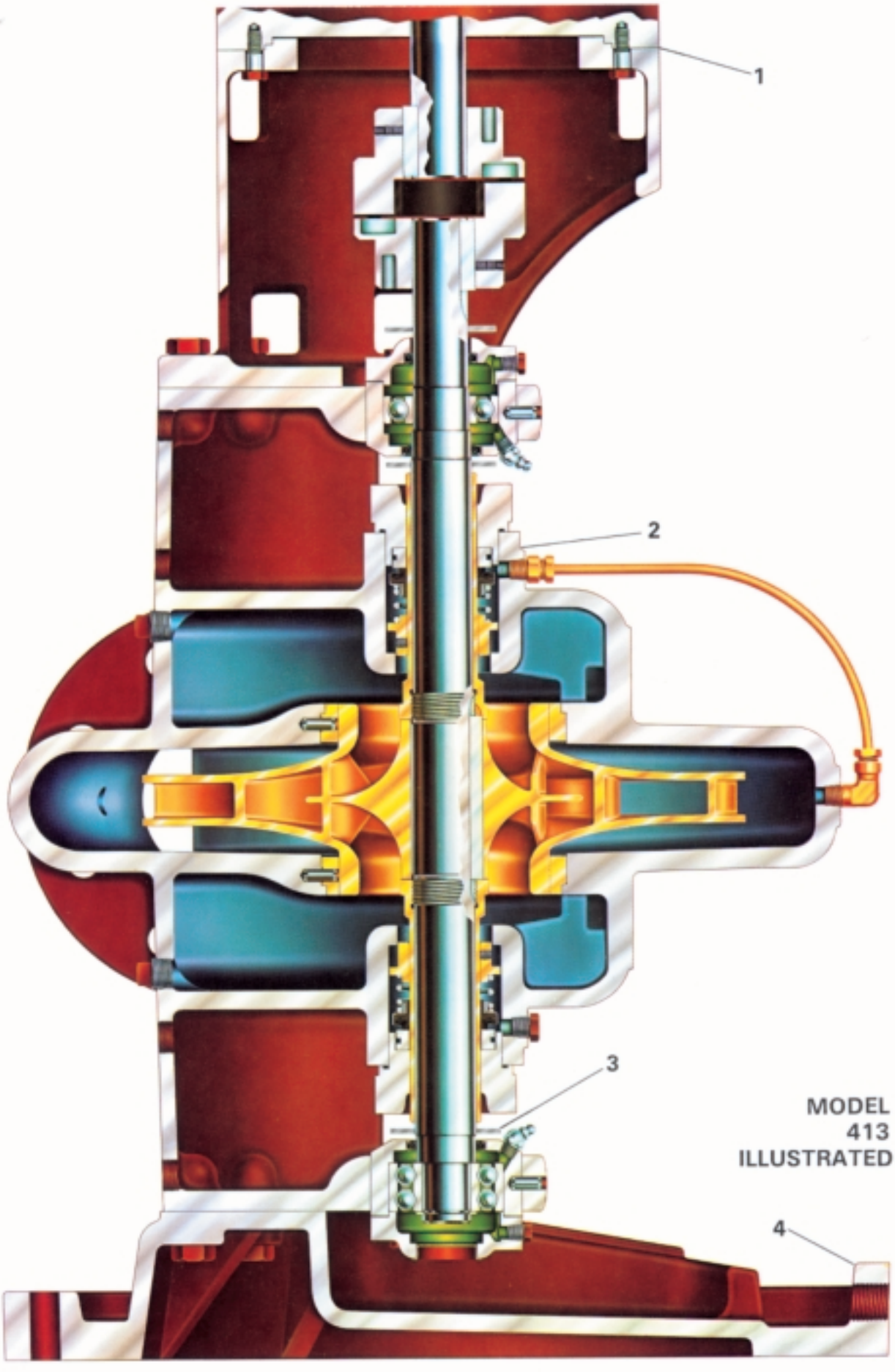
4 CAST IRON DRIP RIM BASE Accurate positioning of the pump is assured by the mounting base. A drip rim is incorporated in the base design to control condensation and leakage.



MODELS 411 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.

MODELS 412 are vertically mounted and utilize flexible shafting between the driver and the pump. This model is frequently used on difficult applications where flooding of the installation is a possibility.

MODELS 413 are vertically mounted with an elevated driver coupled directly to the pump thru a flexible coupling. Model 413 is very popular for installations where available floor space is limited and where possible flooding is marginal.

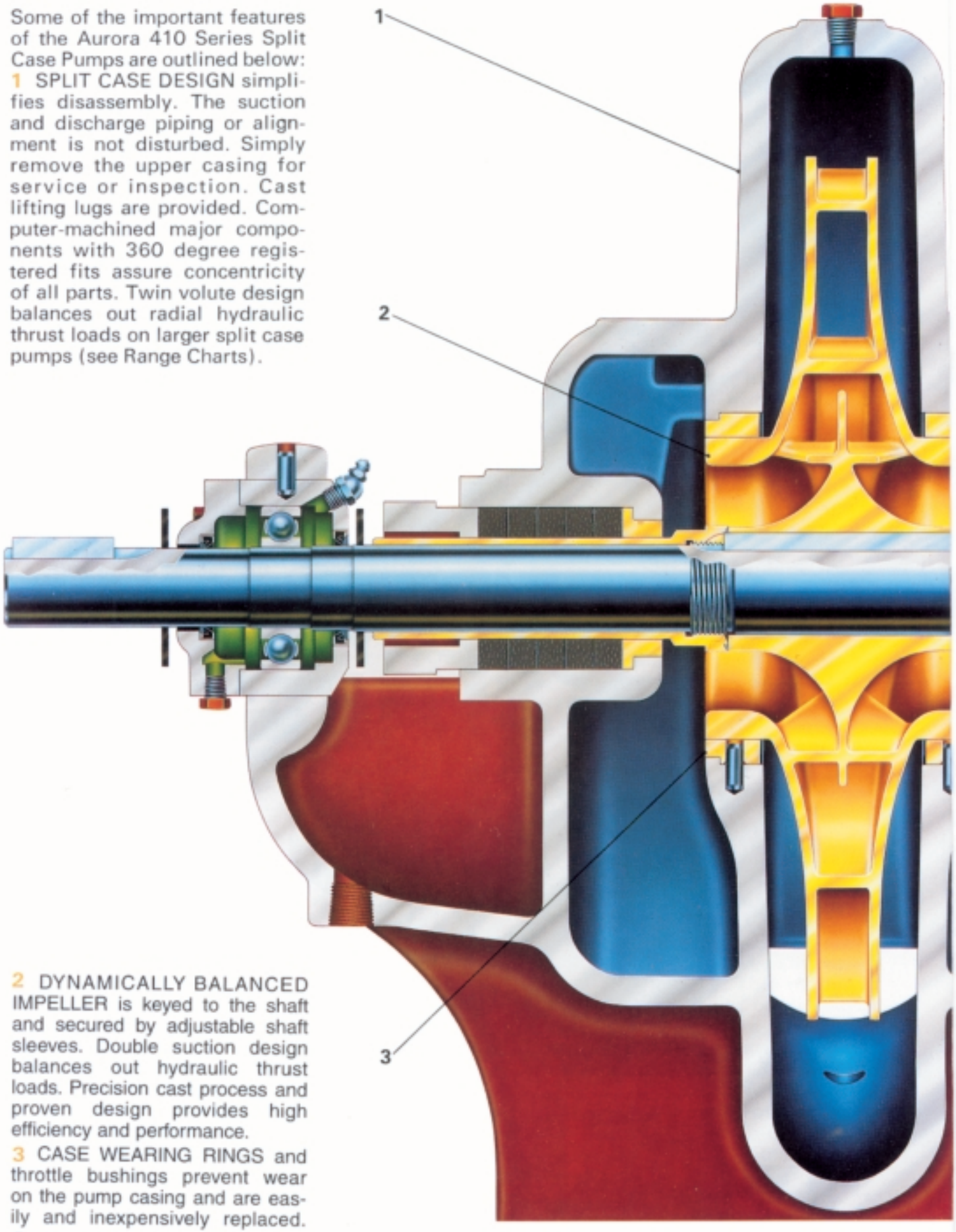


MODEL
413
ILLUSTRATED

HORIZONTAL PUMPS

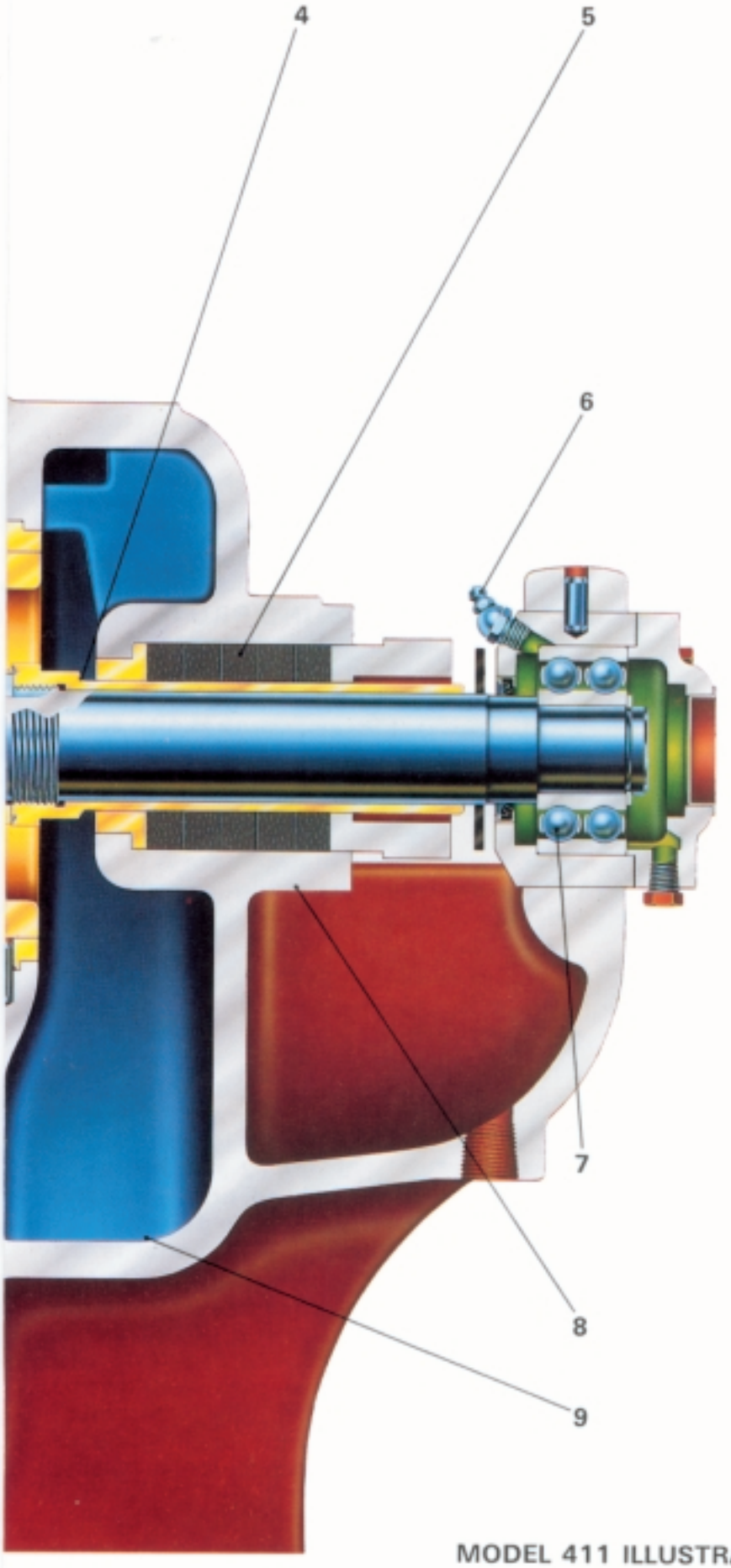
Some of the important features of the Aurora 410 Series Split Case Pumps are outlined below:

1 SPLIT CASE DESIGN simplifies disassembly. The suction and discharge piping or alignment is not disturbed. Simply remove the upper casing for service or inspection. Cast lifting lugs are provided. Computer-machined major components with 360 degree registered fits assure concentricity of all parts. Twin volute design balances out radial hydraulic thrust loads on larger split case pumps (see Range Charts).



2 DYNAMICALLY BALANCED IMPELLER is keyed to the shaft and secured by adjustable shaft sleeves. Double suction design balances out hydraulic thrust loads. Precision cast process and proven design provides high efficiency and performance.

3 CASE WEARING RINGS and throttle bushings prevent wear on the pump casing and are easily and inexpensively replaced.



MODEL 411 ILLUSTRATED

4 BRONZE SHAFT SLEEVE prevents shaft wear, is slip fit over the shaft, keylocked, and extends the entire length of each stuffing box. Shaft sleeves and impeller are "O" ring sealed to eliminate corrosion of the shaft by the pumped liquid. This eliminates the need for high cost, special stainless steel or monel shafts.

5 INTERCHANGEABLE STUFFING BOX for mechanical seals or packing. Packing is standard on horizontal pumps. Optional lantern rings have internal water seal passages between the casing and stuffing box and cannot be damaged. Mechanical seals have carbon against Ni-Resist face. Long life is assured with 303 stainless steel metal parts and "Buna-N" elastomers. Several optional mechanical seals are available.

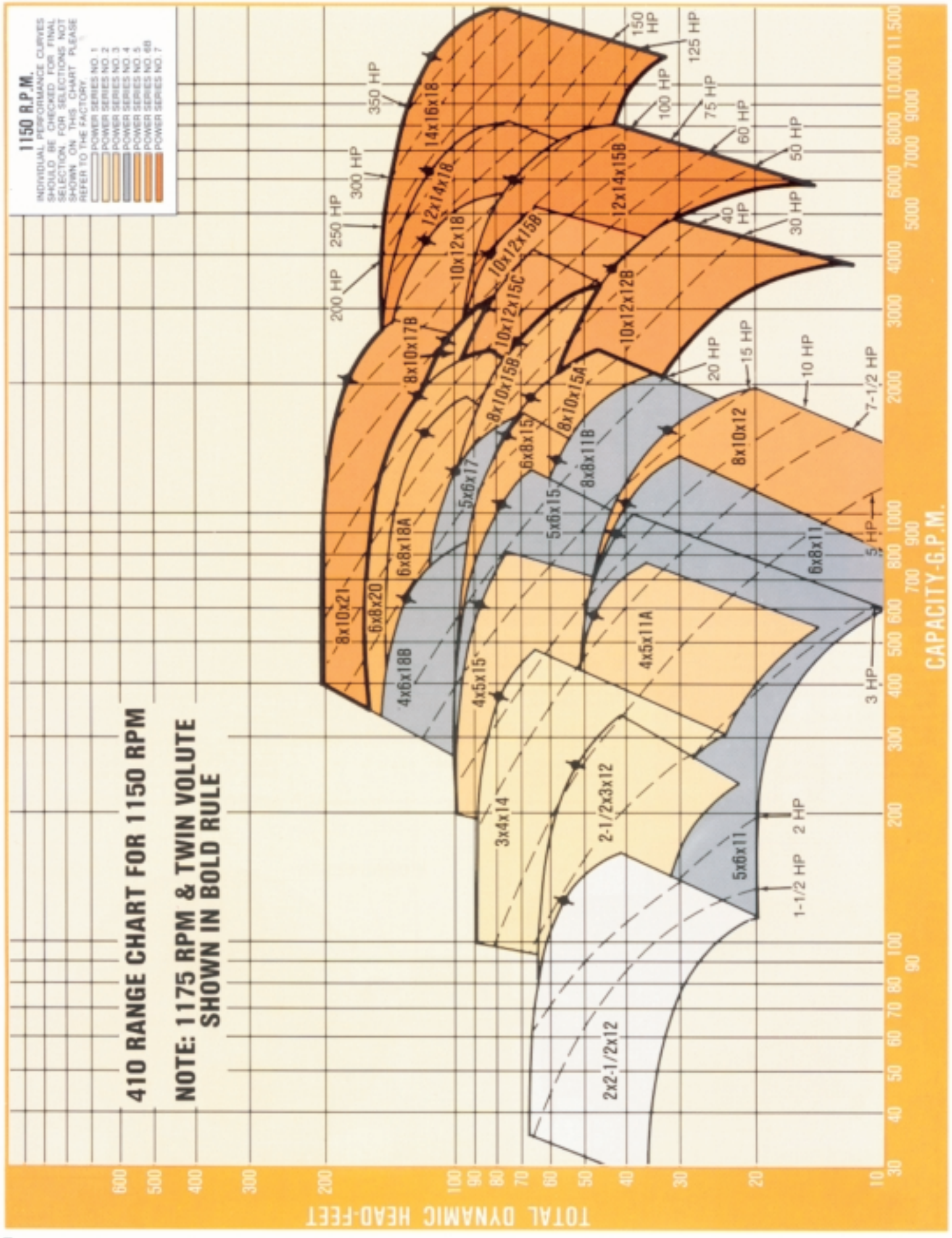
6 GREASE LUBRICATION purges old grease from bearings. Oil lubrication is optional on horizontal pumps. Lube fittings are conveniently located for quick accessibility and provide positive bearing lubrication. Oil seals and non-sparking Neoprene rotating slingers protect both bearings during pump operation and washdowns.

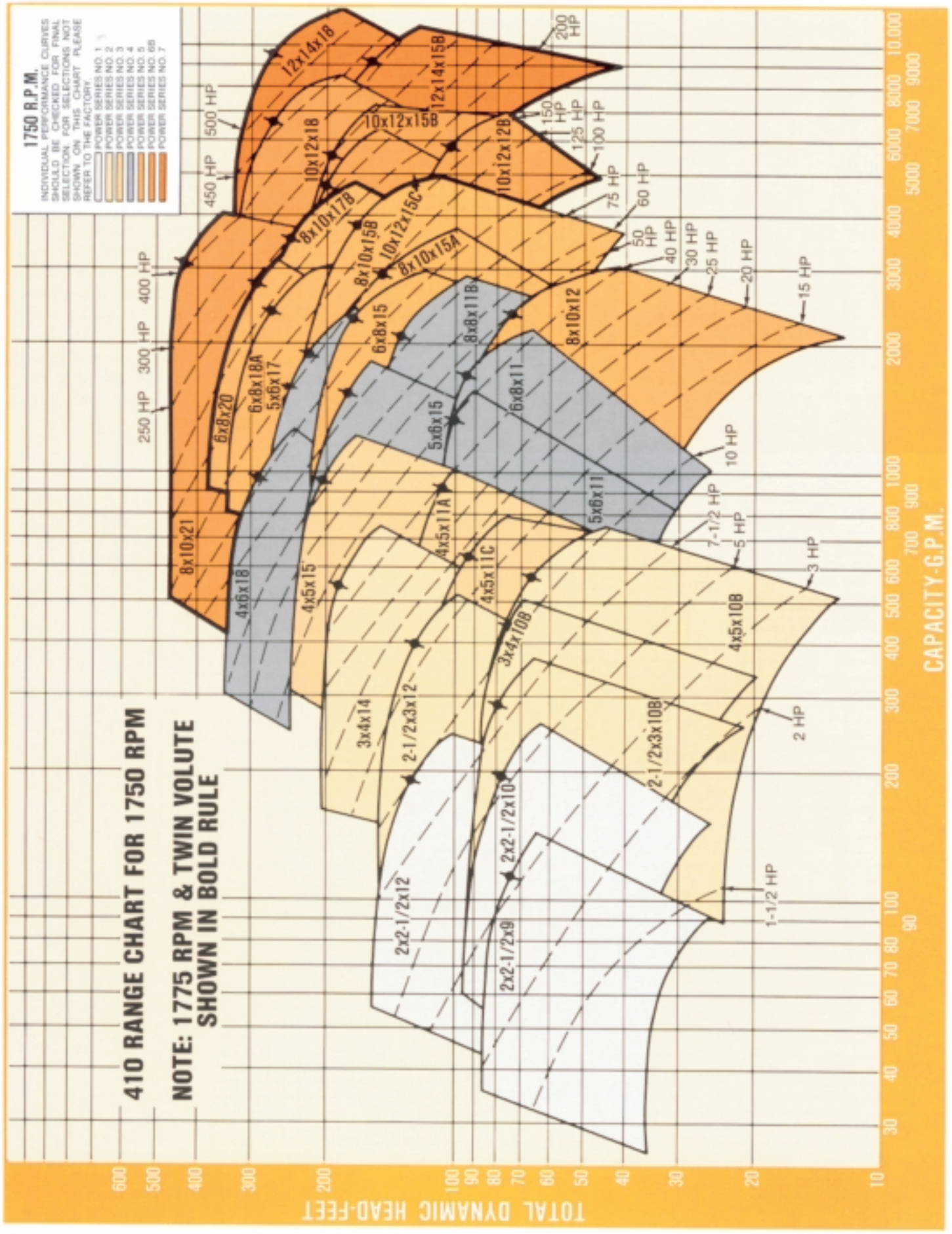
7 BEARINGS selected for 50,000 hour minimum life at maximum load. Average bearing life 5 x minimum. Double row thrust ball bearing is standard on all models. Short bearing span holds shaft deflection to .002" at face of stuffing box at maximum load. Integral bearing arms eliminate bearing misalignment and simplify service.

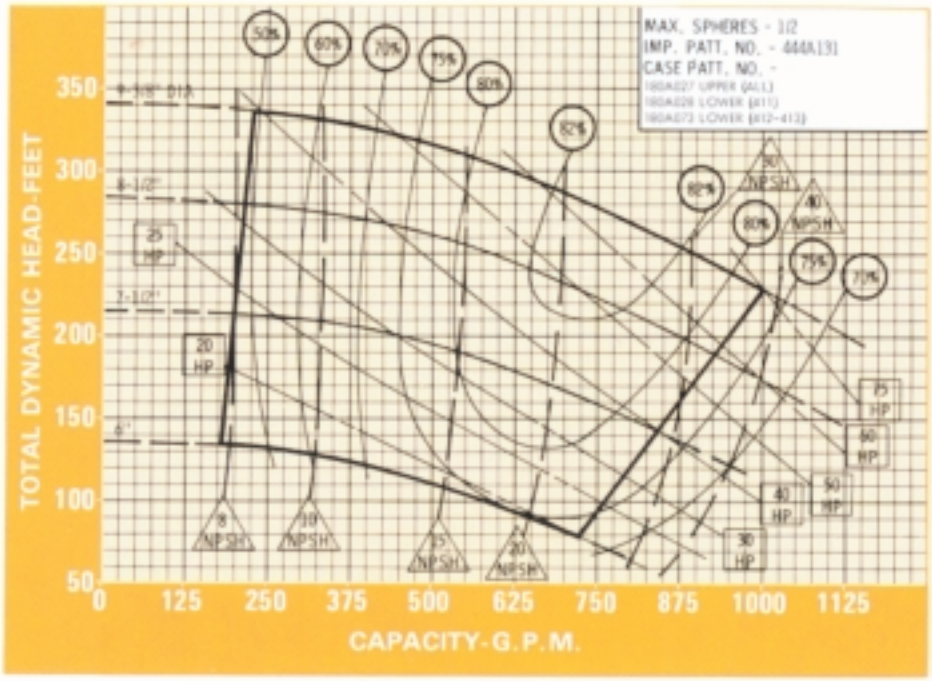
8 LEFT HAND ROTATION can be readily provided with standard parts. Tandem drive pumps require only a different shaft.

9 CERTIFIED PERFORMANCE with POSITIVE SUCTION PRESSURE or with a SUCTION LIFT are available on each pump for customer approval. Pumps are all hydrostatically tested.

RANGE CHARTS
1150 R.P.M.

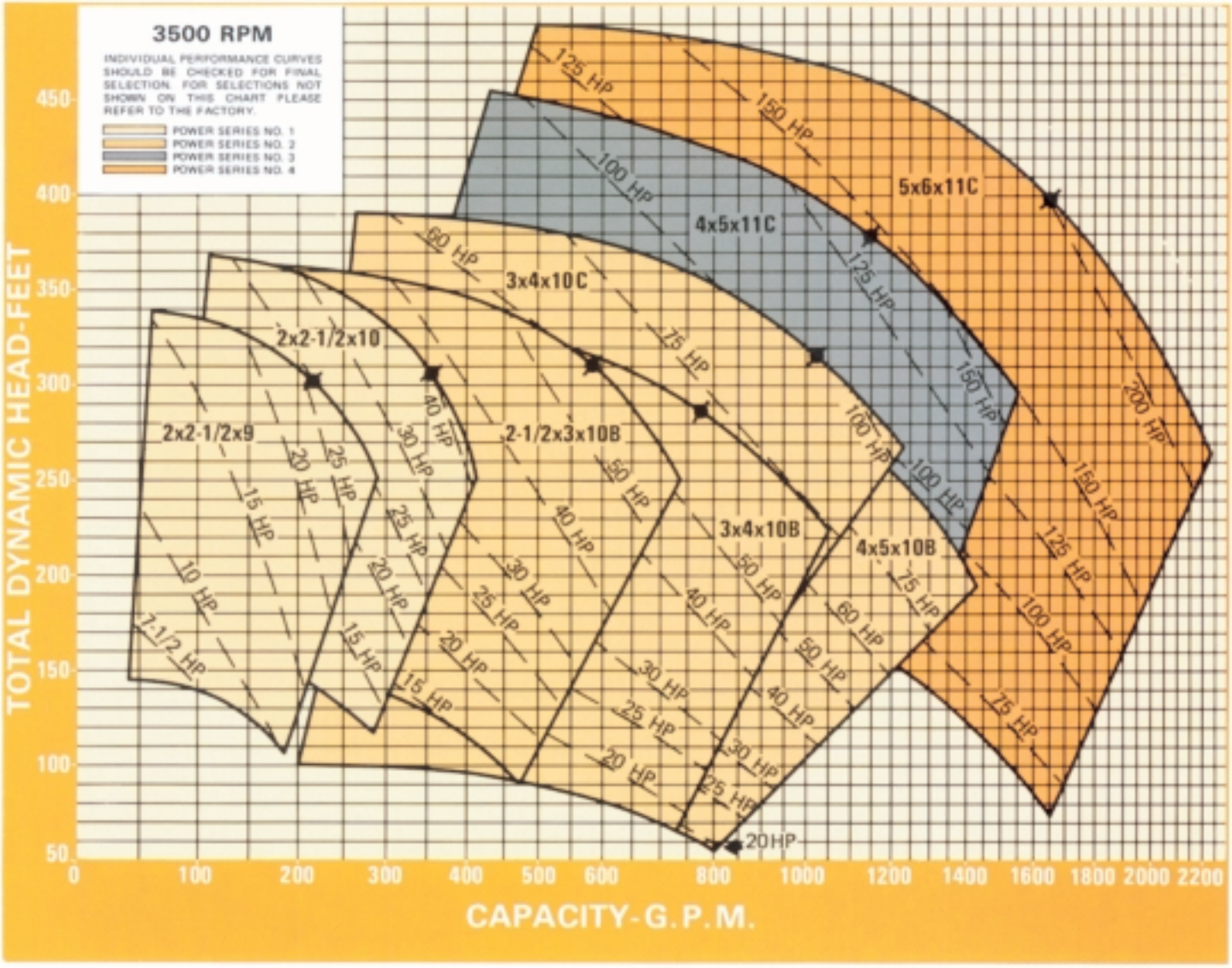



1750 R.P.M.
INDIVIDUAL PERFORMANCE CURVES SHOULD BE CHECKED FOR FINAL SELECTION. FOR SELECTIONS NOT SHOWN ON THIS CHART PLEASE REFER TO THE FACTORY.
POWER SERIES NO. 1
POWER SERIES NO. 2
POWER SERIES NO. 3
POWER SERIES NO. 4
POWER SERIES NO. 5
POWER SERIES NO. 6B
POWER SERIES NO. 7
410 RANGE CHART FOR 1750 RPM
NOTE: 1775 RPM & TWIN VOLUTE SHOWN IN BOLD RULE
TOTAL DYNAMIC HEAD-FEET
CAPACITY-G.P.M.
12x14x18
12x14x15B
10x12x18
10x12x15B
10x12x12B
8x10x17B
8x10x15B
10x12x15C
8x10x15A
6x8x20
6x8x18A
5x6x17
6x8x15
8x8x11B
8x10x12
5x6x15
6x8x11
8x10x21
4x6x18
4x5x15
5x6x11
4x5x11A
4x5x11C
3x4x10B
4x5x10B
3x4x14
2-1/2x3x12
2-1/2x3x10B
2x2-1/2x12
2x2-1/2x10
2x2-1/2x9
200 HP
150 HP
125 HP
100 HP
75 HP
60 HP
50 HP
40 HP
30 HP
25 HP
20 HP
15 HP
10 HP
7-1/2 HP
5 HP
3 HP
2 HP
1-1/2 HP
500 HP
450 HP
400 HP
300 HP
250 HP



PERFORMANCE CURVES

The individual curve for the size pump selected is found in catalog section 410. These performance curves give complete operating characteristics, efficiency, horsepower, and N.P.S.H. required. Horsepower lines on these curves are based on specific gravity of 1.0. To obtain the horsepower for a liquid of a different specific gravity, multiply the horsepower obtained from the curve by the specific gravity of that liquid. The performance curve illustrated to the left is typical of the individual curves readily available for each pump size.



HORIZONTAL PUMP DIMENSIONS

MOTOR FRAME	MODEL 413	143 HP	145 HP	182 HP	184 HP	213 HP	215 HP	254 HP	256 HP	284 HPH		286 HPH		324 HP		326 HP		364 HP		365 HP		404 HP		405 HP		444 HP		445 HP	
	MODEL 411	143 T	145 T	182 T	184 T	213 T	215 T	254 T	256 T	284 TS	284 T	286 TS	286 T	324 TS	324 T	326 TS	326 T	364 TS	364 T	365 TS	365 T	404 TS	404 T	405 TS	405 T	444 TS	444 T	445 TS	445 T
HORSE POWER	3500 RPM	1½	2-3	5	7½	10	15	20	25	30	—	40	—	50	—	60	—	75	—	100	—	125	—	150	—	200†	—	—	—
	1750 RPM	1	1½ -2	3	5	7½	10	15	20	—	25	—	30	—	40	—	50	60	—	75	—	100	—	125	—	150	—	200†	—
	1150 RPM	—	1	1½	2	3	5	7½	10	—	15	—	20	—	25	—	30	—	40	—	50	—	60	—	75	—	100	—	125
MOTOR WEIGHT	MODEL 411	40	45	72	80	130	145	220	240	330	330	370	370	475	475	525	525	630	630	690	690	830	830	915	915	1095	1095	1270	1270
	MODEL 413	43	48	84	102	132	156	300	300	420	420	420	420	570	570	570	570	950	950	950	950	1230	1230	1230	1230	1680	1680	1680	1680
C		12	13	13	14	16	18	21	23	22	24	24	25	25	26	26	28	27	29	28	30	30	33	31	34	34	38	36	40
D (SEE NOTE **)		3½	3½	4½	4½	5¼	5¼	6¼	6¼	7	7	7	7	8	8	8	8	9	9	9	9	10	10	10	10	11	11	11	11
P APPROX.		8	8	10	10	11	11	13	13	16	16	16	16	18	18	18	18	20	20	20	20	22	22	22	22	26	26	26	26
AG APPROX.		11	12	14	15	16	17	20	21	22	22	23	23	25	25	26	26	25	25	25	25	28	28	28	28	32	32	32	32

MODEL 411 BASE NUMBER

POWER SERIES MODEL 411																													
	1	3	3	3	3	3	3	8	8	8•	—	8•	—	11•															
	2	3	3•	3•	3•	5	5	8	8	9	9	9	9	11•	12	11•	12	12	—	12									
	3				5•	8	8	8	9	11	11	11	11	12	12	12	12	12	—	12	—	15•	—	15•					
	4					6•	6•	9	9•	—	11	—	11	11	11	12	12	12•	12•	12•	12•	16•	—	16•	—	16•	—	16•	
	5							11	11	—	12	—	12	—	12•	—	12	12	12	13	13	16	16•	16•	16•	16•	16•	16•	—
	6B												13	—	13•	—	13•	—	13•	13•	13•	17	17•	17	17	17	17	17	18
	7																						17•	—	17•	17•	18	18	18•

BASE	3	5	6	8	9	11	12	13	15	16	17	18
BASE WEIGHT	49	59	68	96	109	164	192	235	291	344	399	441
HA	15	17¼	17¼	20½	20½	26¼	26¼	26¼	30¼	30¼	30¼	30¼
HB	33½	36½	42½	42½	48½	46½	54½	64½	54½	64½	74½	82½
HN	3	3	3	3	3	4	4	4	4½	4½	4½	4½

FLANGES — ASA STD.	FURNISHED AS:
250# WITH 125# DRILLING	STANDARD
250# WITH 250# DRILLING	OPTIONAL

NOTES Apply to all Models.

*Add 1" for true discharge centerline.

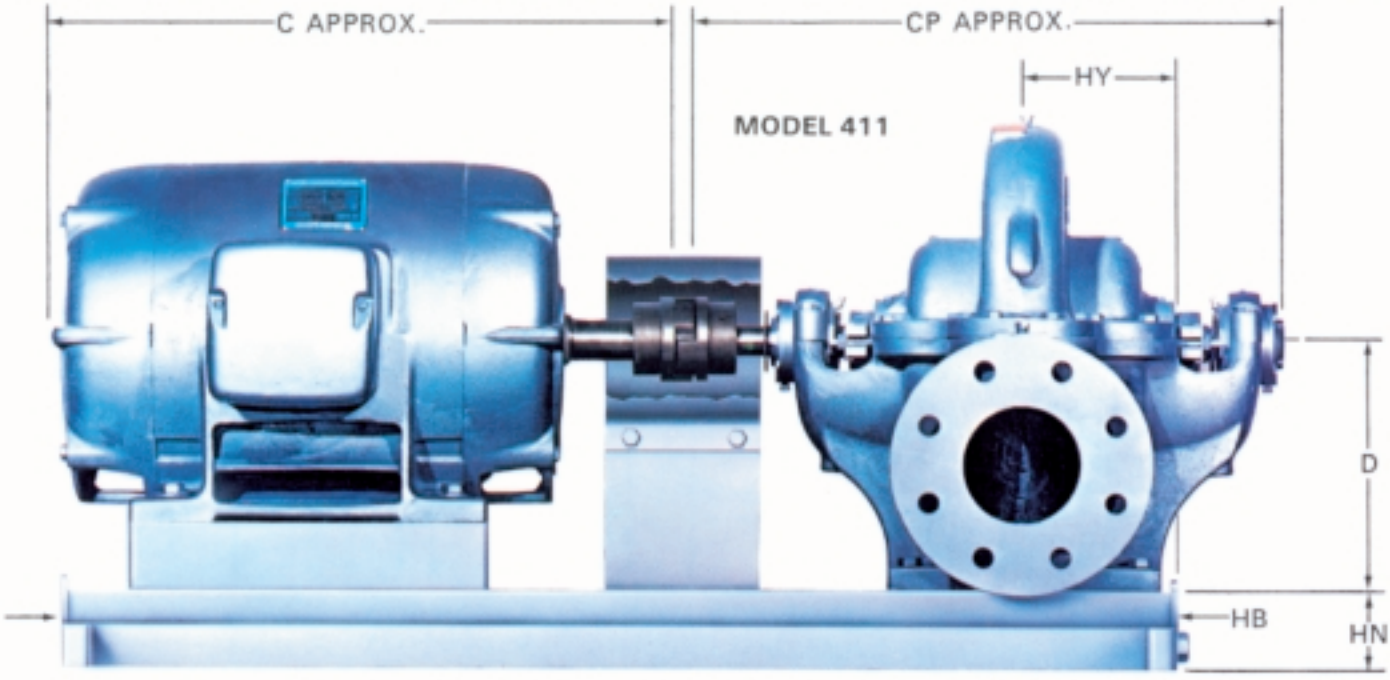
**Always use largest of 2 "D" dimensions.

•May not be used for all pump sizes in this power series. Consult individual dimension pages for final selection.

†For motor and baseplate dimensions over 200 HP refer to the factory.

††These pump sizes are available in a vertical chair mount configuration in Models 412C and 413C. See individual dimension pages for complete dimensions and weights.

1. Dimensions and weights are approximate.
2. Complete dimensions are available.
3. Not for construction purposes unless certified for approval.
4. Frame sizes shown are for open drip proof motors only.
5. Add pump, base and motor weight for unit total weight.
6. Conduit box is shown in approximate position. Dimensions are not specified as they vary with each motor manufacturer.
7. Aurora Pump reserves the right to make revisions to its products and their specifications, and to this bulletin and related information without notice.
8. 10 x 12 x 18 and 12 x 14 x 15 pump sizes are also available as bottom suction horizontal Model 411B pumps. See individual dimension pages for complete dimensions.

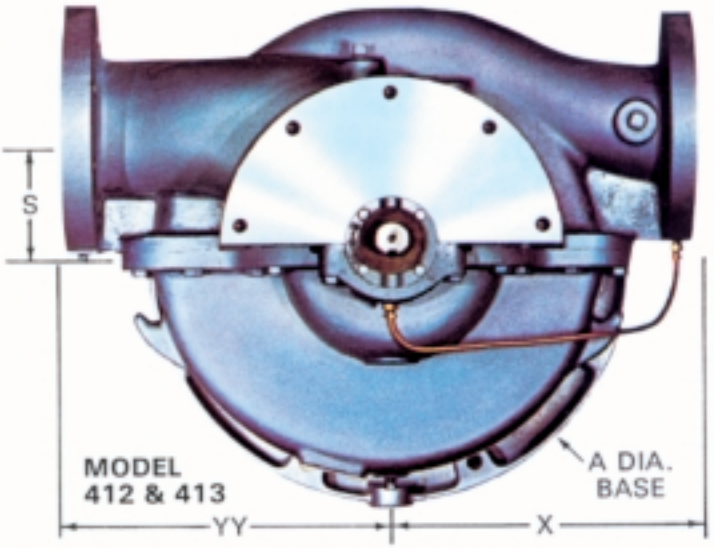


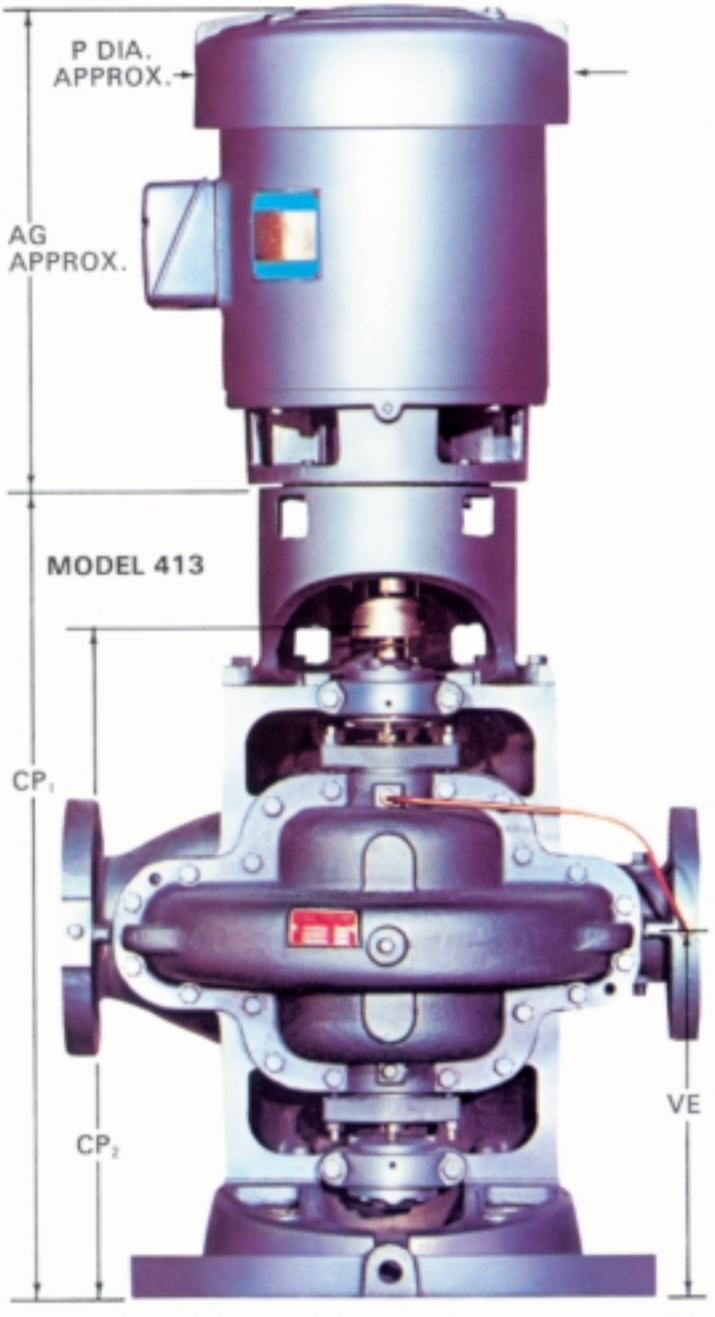
VERTICAL PUMP DIMENSIONS

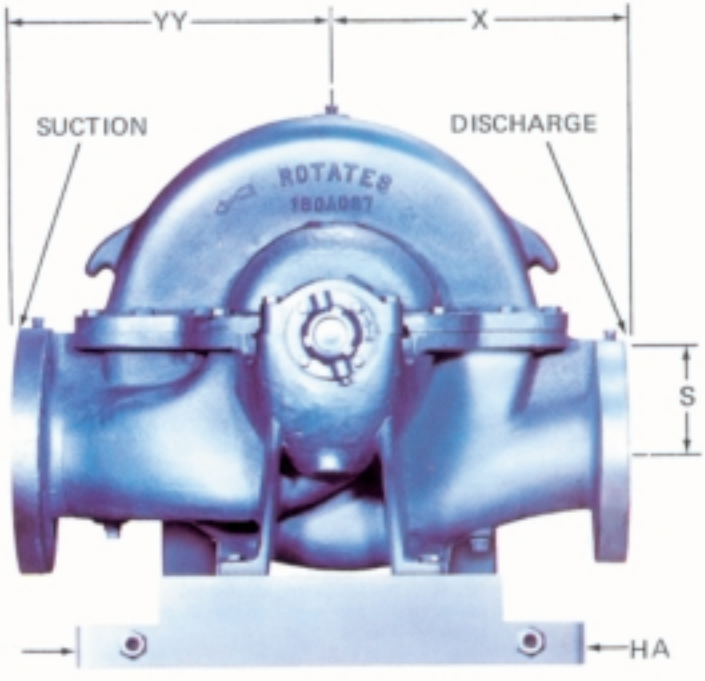
PUMP SIZE			P. SERIES	PUMP WGT. (LBS.)		A	D**	S	X	CP	HY	VE	YY
DISCH	SUCT	BORE		411	413								
2	2½	9	1	145	215	18	7	3½	8½	21	4½	11⅞	9
2	2½	10		145	215	18	7	3½	8½	21	4½	11⅞	9
2	2½	12		175	260	18	8	4	10	21	4½	11⅞	10¾
2½	3	10	2	215	300	18	8	4	9¾	24	5½	13	10
2½	3	12		255	360	18	9	4½	11	24	5½	13	11½
3	4	10		260	365	18	9	4½	10	24	5½	13	11
3	4	14		310	435	18	10	5	12	24	5½	13	13
4	5	10		330	465	18	9	4⅝	10	24	5½	13	11¼
4	5	11	3	390	435	22	10	5	11¼	26	6½	14	12¾
4	5	15		415	490	22	11	5½	13	26	6½	14	14
4	6	18		560	780	22	12½	6¼	14	29	6½	15	16
5	6	11	4	455	580	22	11	5½	11¼	29	6½	15	13¼
5	6	15		530	735	22	12½	6¼	13¼	29	6½	15	15
5	6	17		635	855	22	12½	6¼	14	29	6½	15	15
6	8	11		520	650	22	12½	6¼	11¾	29	6½	15	14½
8	8	11		605	835	22	12½	6¼	12	29	6½	15	14½
6	8	15	5	585	735	30	13½	6⅝	14¼	32	7½	17	16¾
6	8	18		880	1020	30	14¾	8	16	32	7½	17	18
6	8	20		875	1095	30	14¾	8	15⅝	32	7½	17	18
8	10	12		740	925	30	14¾	8"	17	32	7½	17	17¾
8	10	15		835	1040	30	14⅝	8"	17	32	7½	17	17¾
8	10	17		865	1085	30	14⅝	8	17	32	7½	17	17¾
8	10	21	6	955	††		18⅛	9⅛	18	38	11½	—	21
10	12	12	6B	1325	1575	40	23	12	16	38	11½	—	19
10	12	15		1390	††		25	13½	17	38	11½	—	20
10	12	18		1725	††		25	13½	18	38	11½	—	22
12	14	15	7	2000	††		24	15	17	44	11½	—	22
12	14	18		2100	††		24	15	18	44	—	—	23
14	16	18		2850	††		29¼	16	22	44	—	—	27

MODEL 412 AND 413

POWER SERIES		1	2	3	4	5
CP1	UP TO 256 HP	26	30	33	35	—
	284 HP & UP	28	32	35	37	41
CP2		23	27	29	31	35







ENGINEERING SPECIFICATIONS

MODEL 411-412 AND 413 SPLIT CASE BASE MOUNTED – Furnish and install as shown on the plans . . . . . Right hand (Left hand) Aurora Model (Horizontal-411) (Vertical-412 Open Shaft) (Vertical-413 Flexible Coupled) type Split-Case, Double Suction, Single Stage centrifugal pump, Size . . . . . x . . . . . x . . . . . of bronze fitted (all bronze) (all iron) (stainless steel) construction. The pump shall be capable of delivering at design conditions a capacity of . . . . . G.P.M. when operating against a Total Dynamic Head of . . . . . feet, with a temperature of . . . . . °F, specific gravity . . . . . Pump shall have minimum guaranteed efficiency at design capacity of . . . . . %. Pump must also be capable of delivering a maximum of . . . . G.P.M. when operating against a head of . . . . . feet, and at this condition shall have a minimum efficiency of . . . . . %. Minimum shut off head acceptable will be . . . . . feet. Pump shall operate at a maximum synchronous speed of . . . . . R.P.M. 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 halves shall be of the inline piping design and will be constructed of "CLASS 30 CAST IRON," C.I. having a minimum tensile strength of 30,000 psi, and shall be of sufficient thickness to withstand stresses and strains at full operating pressures. Casings shall be subject to a hydrostatic pressure test at 150% of the specified duty point. Bearing housing supports, suction and discharge flanges shall be integrally cast with the lower half of the casing. Removal of the upper half of the casing must allow the rotating element to be removed without disconnecting the suction and discharge flanges. The upper casing is to be dowel aligned to the lower casing. Pump sizes 10" and larger are to be of the twin volute design. Drain openings must be provided in the bearing arms for removal of lubricating liquid. Impeller shall be of the enclosed double suction type and shall be of precision cast bronze (or optional material). Impeller shall be dynamically balanced and securely fastened to the shaft by key and screw locked shaft sleeves. The vanes shall be designed to reduce noise. The pump shaft shall be made of high grade SAE 1045 Steel or equal, accurately machined to give a true running rotating element. The minimum dia. acceptable will be . . . . . ". The shaft shall be protected from wear by bronze (. . . . .) sleeves which are key locked and threaded so that the sleeves tighten with the rotation of the shaft. Buna o-rings must be provided between the impeller hub and the shaft sleeves to prevent pumped liquid from corroding the shaft. Pump shall be equipped with easily renewable bronze (. . . . .) casing rings (impeller wearing rings) so designed that hydraulic pressure will seat them against a shoulder in the pump case around the full periphery of the wearing ring. The wear rings will be locked in place by doweling to prevent rotation. The rotating element shall be mounted in heavy duty grease lubricated ball bearings and shall be equipped with water stingers on side next to pump glands. Bearing housings shall be so designed to flush lubricant through and provide continuous cleaning of bearing surfaces and maximum protection against overheating. The pump shall be supplied with a single row inboard bearing primarily for radial loads and a double row outboard bearing primarily for thrust loads. Both bearings shall be regreaseable lubrication ball type, designed for 250,000 hours average life. Each bearing shall be mounted in a machined housing that is moisture and dust proof. The housing shall have registered fits to assure alignment, pinned to prevent rotation, and bolted to the bearing arms. Each housing shall be supplied with a grease fitting and a plugged relief port. **MODEL 411** – Stuffing boxes shall be placed on both sides of the pump centerline to seal the pump shaft. All packed pumps having a suction lift shall be provided with lantern rings connected to the pressure side of the pump by cored passages in the parting flange of the pump. The stuffing boxes shall be equipped with heavy, cast, split glands with extra length, for easy removal for packing inspection and maintenance. Pump and motor shall be mounted on a common heavy base plate of (steel with drip rim) (formed steel) (structural steel). Pump and motor must be checked for alignment after the pump base has been installed and grouted in place, in accordance with the standards of the Hydraulic Institute. There shall be no strain transmitted to the pumps. **MODEL 412 and 413** – Mechanical seal boxes shall be placed on both sides of the pump centerline to seal the pump shaft. Each pump is to be furnished with mech. seals with all metal parts to be 303 stainless steel with "Buna-N" elastomers, Ni-Resist seat, and carbon washer. A bypass line must be provided for the upper seal between the seal faces and the discharge flange to assure adequate venting of the seal chamber and to provide lubrication. All pumps shall be provided with cored passages in the parting flange of the pump to provide additional circulation to both seals. The mech. seal boxes shall be equipped with heavy, cast, one piece "O" ring sealed glands. The pump shall be supported by a cast iron drip rim base. **MODEL 412** – 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 H.P. 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 413** – Vertical flexible coupled pumps shall be furnished with a cast iron motor bracket which is to be bolted to the vertical casing. The motor bracket must be machined with a register fit to ensure proper alignment of motor and pump shaft. **MODEL 411 AND 413** – The pumps shall be flexible coupled to a standard (horizontal) (vertical) NEMA . . . . . HP . . . . . phase . . . . . Hertz . . . . . volts . . . . . RPM (drip-proof) (tot. encl.) (explosion-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.

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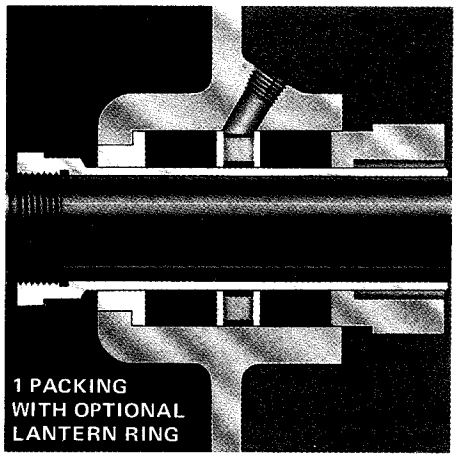
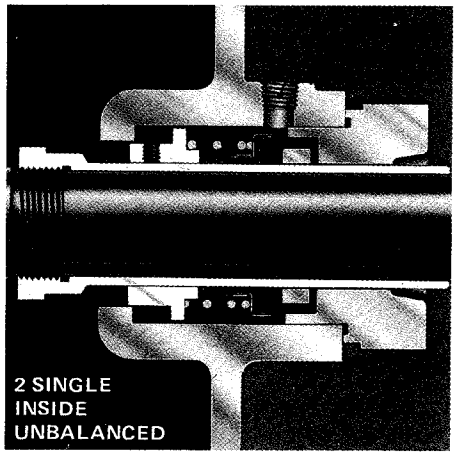
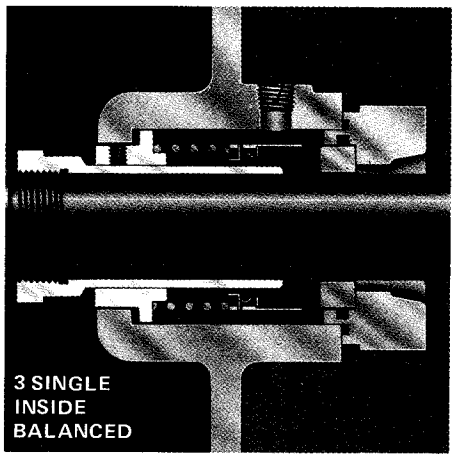
ENGINEERING DATA
MECHANICAL SEALS AND PACKING







Standard packing on horizontal pumps and the standard mechanical seals on vertical pumps are suitable for most applications. Special sealing arrangements may however, be required due to higher pressure or temperature requirements and the nature of the liquid to be pumped. Factory option seals are of high quality and supplied by leading mechanical seal manufacturers. Various seal arrangements and types that better suit your specific needs are available. Seal faces are carbon vs. Ni-Resist on standard seals and carbon vs. Tungsten carbide on high temperature seals. Corrosion resistant alloy metal parts and Buna-N secondary sealing elements are provided. Various other metals are also available. Gland plates are cast iron and can be supplied in alternate materials. Recommendations and limitations are general. Specific selections can be offered only after rotating speeds, pressures, temperatures, type of equipment and liquid nature are known. The following illustrations describe the basic seal and packing options available. For options not shown refer to the factory. For quick reference for the type of seal best suited to your application, refer to the condensed information that heads each option. The following comments govern these recommendations:

1 PACKING Standard on Model 411. Not avail. on 412 & 413.
PRESSURES (suction): Below atmospheric up to 250* P.S.I.G. (Maximum pump limitation) Lantern rings are required on suction lift applications.
TEMPERATURES: From minus 100°F. up to 275°F.* with high temperature packing, or 225°F. with standard packing.
LIQUIDS: All liquids that are compatible with braided fiber packing. Other packings available for special applications.

2 SINGLE — UNBALANCED Standard on Model 412 and 413. Optional Model 411.
PRESSURES (suction): Below atmospheric up to 100 P.S.I.G.
TEMPERATURES: From minus 100°F. up to 275°F. with high temperature seals, or 225°F. with standard seals.
LIQUIDS: All liquids that are compatible with the seal materials of construction and with a specific gravity higher than .6.

3 SINGLE — BALANCED Optional on all Models.
PRESSURES (suction): Up to 250 P.S.I.G. (Max. pump limit)
TEMPERATURES: Minus 100°F. up to 275°F. with high temperature seals, or 225°F. with standard seals.
LIQUIDS: All liquids that are compatible with the seal materials of construction. Required on liquids with a specific gravity of .6 or lower.

PRESSURES

PRESSURES — The pressures referred to are those found at the pump suction. Most seal manufacturers recommend a flushing arrangement from the discharge to the stuffing box where "below atmospheric pressure" is encountered. The 410 Series stuffing boxes incorporate internal bypass arrangements which permit flushing to the mechanical seals. External bypasses are available to both seal faces. An external bypass is standard on vertical pumps to the upper seal face.

TEMPERATURES

TEMPERATURES — The temperature limitation of a mechanical seal is frequently determined by the shaft sealing material. The various elastomer "O" ring materials have varying temperature limits, depending upon the chemical and/or physical properties of the process fluid. Filled TEFLON†, shaft seal rings are available.

LIQUIDS

LIQUIDS — Due to varying degrees of resistance of various sealing compounds in different pumped liquids, the following mechanical seal sealing rings are available: BUNA-N, NEOPRENE, VITON, TEFLON† and other synthetic elastomers.

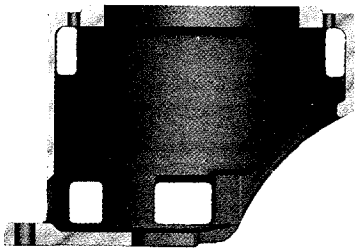
†DUPONT registered trademark.

***NOTE:** Hardened stainless steel (450 minimum brinnel) shaft sleeves are available with this option and are required when the suction pressure is over 100 P.S.I.G. or when the temperature exceeds 225°F.

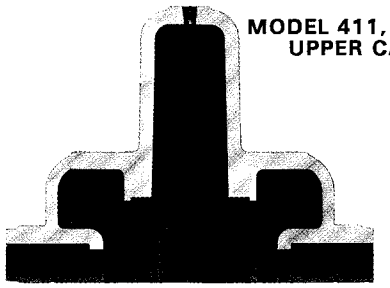
410 SERIES ENGINEERING DATA INTERCHANGEABILITY AND POWER SERIES

Aurora Models 411, 412 and 413 were designed for maximum interchangeability. Each model is available in 34 different sizes, offering a model and size precisely fitted to the installation requirements. The 34 sizes are divided into 7 "power series." Within each power series, all parts are completely interchangeable except for the impeller, casing, and case wearing rings for either right hand or left hand rotation. See the illustration below for all details.

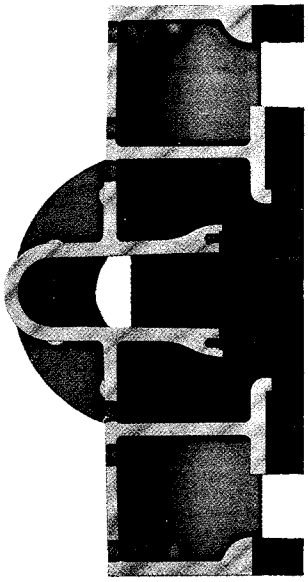
MODEL 413
MOTOR BRACKETS



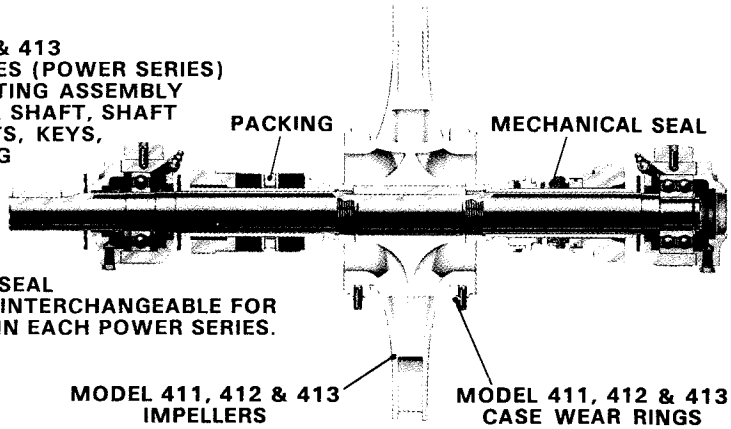
MODEL 411, 412 & 413
UPPER CASINGS



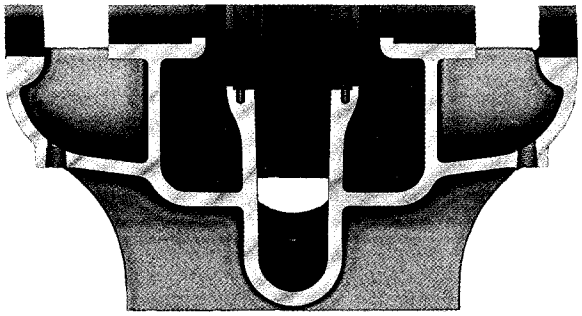
MODEL 412 & 413
LOWER CASINGS



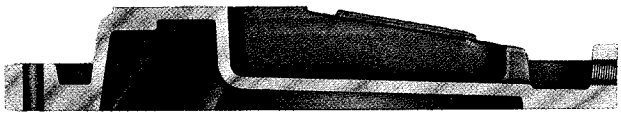
MODEL 411, 412 & 413
SHAFT ASSEMBLIES (POWER SERIES)
COMPLETE ROTATING ASSEMBLY
CONSISTING OF A SHAFT, SHAFT
SLEEVES, GASKETS, KEYS,
INBOARD BEARING
ASSEMBLY,
OUTBOARD
BEARING
ASSEMBLY
AND PACKING
OR MECHANICAL SEAL
ASSEMBLIES ARE INTERCHANGEABLE FOR
ALL PUMPS WITHIN EACH POWER SERIES.



MODEL 411
LOWER CASINGS

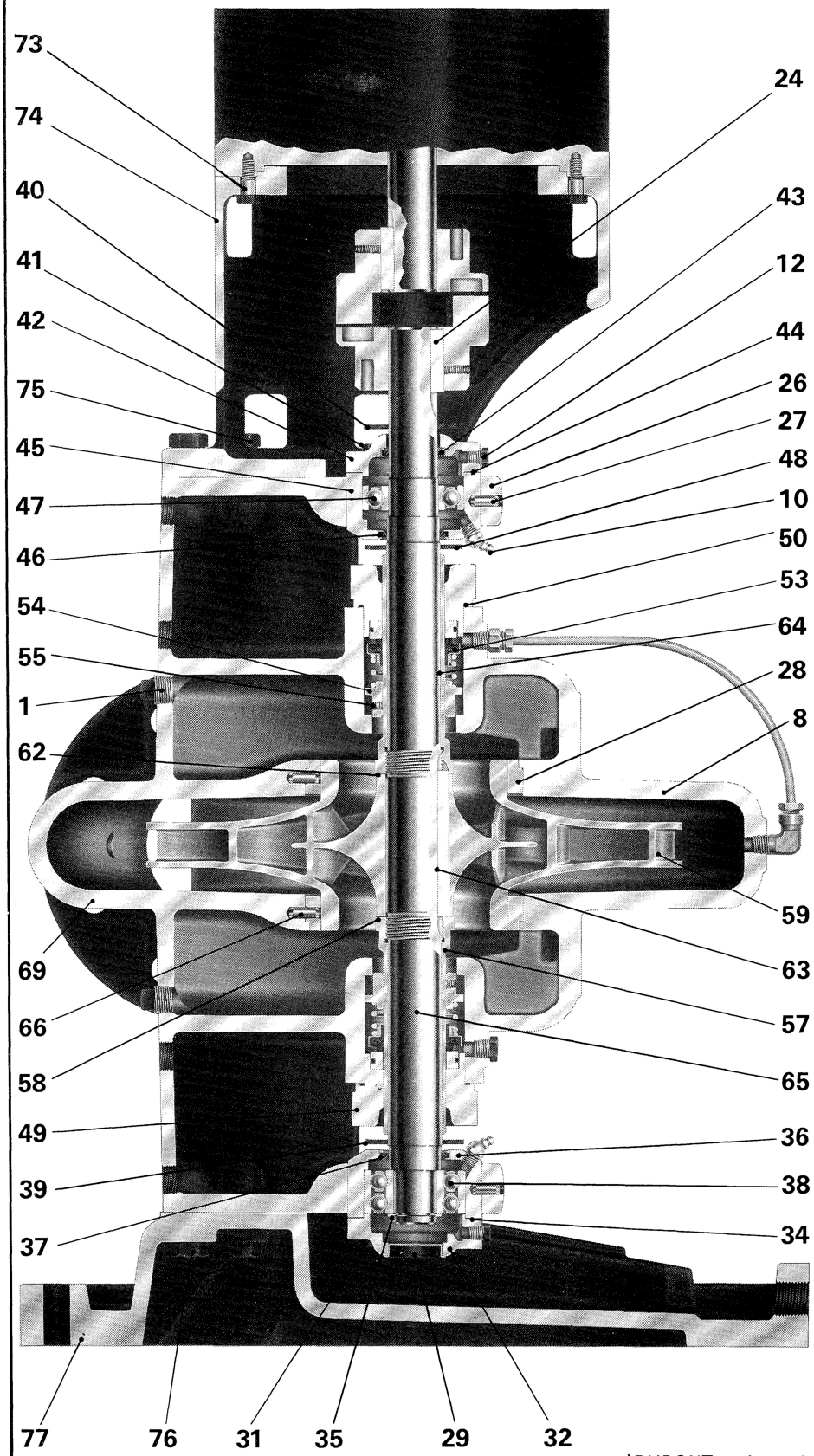


MODEL 412 & 413
DRIP RIM BASES



POWER SERIES — Pump Size Example: 3 x 4 x 14 (3-Discharge Dia.) (4-Suction Dia.) (14-Approx. Max. Impeller Dia.).

1	2	3	4		5		6B	7*
2 x 2½ x 9	2½ x 3 x 10B	4 x 5 x 11A	—	5 x 6 x 17	6 x 8 x 15	8 x 10 x 12	10 x 12 x 12B	12 x 14 x 15B
2 x 2½ x 10	2½ x 3 x 12	4 x 5 x 11C	4 x 6 x 18B	6 x 8 x 11	6 x 8 x 18A	—	10 x 12 x 15B*	12 x 14 x 18
2 x 2½ x 12	3 x 4 x 10B	4 x 5 x 15	5 x 6 x 11	8 x 8 x 11B	6 x 8 x 18B	8 x 10 x 15A	10 x 12 x 15C*	14 x 16 x 18
	3 x 4 x 14		5 x 6 x 11C		6 x 8 x 18C	8 x 10 x 15B	10 x 12 x 18*	
	4 x 5 x 10B		5 x 6 x 15		6 x 8 x 20	8 x 10 x 17B	*Model 411 Pumps Only	

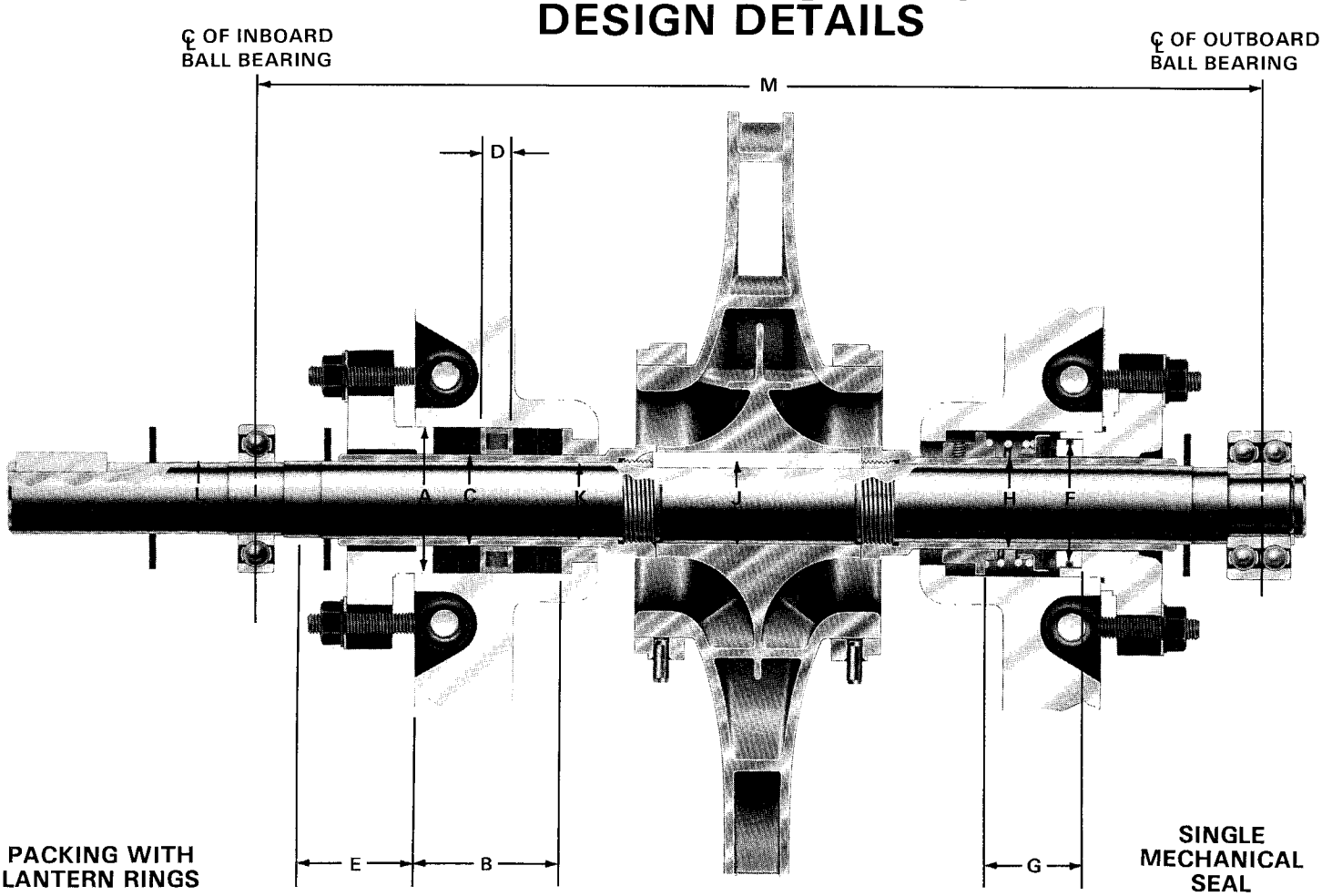


Pc No	Descrip. (*Not Shown)	PUMP CONSTRUCTION			
		Bronze Fitted	All Bronze	All Iron	Stain. Steel
1	Plug	Mall. Iron	Bronze	Mall. Iron	Stain. Stl.
2	*Plug	A197	Wrought	A197	AISI 316
6	*Capscrew	Steel	Steel	Steel	Stain. Stl.
7	*Capscrew	SAE 2	SAE 2	SAE 2	AISI 316
8	Casing Half	Cast Iron A48	Bronze B62	Cast Iron A48	Stain. Stl. ACI CF8M
9	*Gasket	Buna-N Treated Cellulose			
10	Gr. Ftg.	Steel Zerk			
12	Plug	Malleable Iron ASTM A197			
18	*Nut	Bronze Wrought		Steel SAE 2	Stain. Stl. AISI 316
19	*Washer	Cad. Plated Steel	Bronze Wrought	Cad. Plated Steel	Stain. Stl. AISI 316
20	*Gland Clamp				
21	*Gland	Cast Iron A48	Bronze B62	Cast Iron A48	Stain. Stl. ACI CF8M
22	*Swing Bolt	Cad. Plated Steel	Silicon Bronze Wrought	Cad. Plated Steel	Stain. Stl. AISI 316
23	*Packing	Graphited Acrylic			
24	Key	Steel Wrought			
25	*Capscrew	Steel SAE 2	Bronze Wrought	Steel SAE 2	Stain. Stl. AISI 316
26	Bearing Cap	Cast Iron A48	Bronze B62	Cast Iron A48	Stain. Stl. ACI CF8M
27	Pin	Cad. Plated Steel	Stain. Steel AISI 416	Cad. Plated Steel	Stain. Stl. AISI 316
28	Case Ring	Bronze ASTM B62		Cast Iron A48	Stain. Stl ACI CF8M
29	Protector	Steel Wrought			
31	Capscrew	Steel SAE 2			
32	Cart. Cap	Cast Iron ASTM A48			
34	Gasket	Buna-N Treated Cellulose			
35	Ret. Ring	Spring Steel			
36	Cartridge	Cast Iron ASTM A48			
37	Gr. Seal	Buna-N and Steel			
38	Bearing	Steel Commercial			
39	Slinger	Neoprene			
40	Slinger	Neoprene			
41	Capscrew	Steel SAE 2			
42	Cart. Cap	Cast Iron ASTM A48			
43	Gr. Seal	Buna-N and Steel			
44	Gasket	Buna-N Treated Cellulose			
45	Cartridge	Cast Iron ASTM A48			
46	Gr. Seal	Buna-N and Steel			
47	Bearing	Steel Commercial			
48	Slinger	Neoprene			
49	Gland	Cast Iron A48	Bronze B62	Cast Iron A48	Stain. Stl. ACI CF8M
50	O-Ring	Buna-N			
52	*Lantern Ring	Bronze ASTM B62		Cast Iron A48	Stain. Stl ACI CF8M
53	Seal	Stain. Stl (1)	Stain. Stl. (2)	Stain. Stl. (1)	Stain. Stl (2)
54	Collar	Bronze ASTM B62		Cast Iron A48	Stain. Stl. AISI 316
55	Setscrew	Stainless Steel AISI 316			
56	*Bushing	Bronze ASTM B62		Cast Iron A48	Stain. Stl. AISI 316
57	Sleeve	Bronze High Lead Tin		Stain. Stl. AISI 316	
58	Gasket	DuPont TFE Coated Steel			
59	Impeller	Bronze ASTM B584		Cast Iron A48	Stain. Stl. ACI CF8M
61	*Imp. Ring	Bronze ASTM B62			
62	Gasket	DuPont TFE Coated Steel			
63	Key	Stain. Stl AISI 416	Stain. Stl. AISI 316	Stain. Stl. AISI 416	Stain. Stl. AISI 316
64	Sleeve	Bronze High Lead Tin		Stain. Stl. AISI 316	
65	$S_{h_{a_{f_t}}}$ P.S. 1-5	Stl. AISI C1045	Stain. Stl. AISI 316	Stl. AISI C1045	Stain. Stl. AISI 316
	$S_{h_{a_{f_t}}}$ 6B-7	Alloy Stl.	(3)	Alloy Stl.	(3)
66	Pin	Cad. Plated Steel	Stain. Steel AISI 416	Cad. Plated Steel	Stain. Steel AISI 316
67	*Pin				
68	*Pin				
69	Casing Half	Cast Iron A48	Bronze B62	Cast Iron A48	Stain. Stl. ACI CF8M
70	*Drive Screw	Steel Bronze Plated			
71	*Name-plate	Stainless Steel AISI 303			
73	Capscrew	Steel SAE 2			
74	Bracket	Cast Iron ASTM A48			
75	Capscrew	Steel SAE 2			
76	Capscrew	Steel SAE 2			
77	Base	Cast Iron ASTM A48			

All material specifications are in accordance with ASTM unless otherwise noted. (1) $B_{30}P_{66}$ 171 (JC) (2) XP_{66} 1C1 (JC) (3) AISI 416 chrome steel heat treated power series 6B-7.

†DUPONT registered trademark.

410 SERIES ENGINEERING DATA DESIGN DETAILS



PACKING WITH LANTERN RINGS

SINGLE MECHANICAL SEAL

PUMP PART			DIMENSION	POWER SERIES 1	POWER SERIES 2	POWER SERIES 3	POWER SERIES 4	POWER SERIES 5	POWER SERIES 6B	POWER SERIES 7
STUFFING BOX	PACKING	A	Stuffing Box Bore Diameter	2-1/16	2-7/16	2-13/16	3-1/16	3-7/16	3-11/16	3-15/16
		B	Stuffing Box Depth	2-3/8	3-1/8	3	3-1/2	3-3/4	3-3/4	3-7/8
		C	Outside Dia., Sleeve for Packing	1-1/8	1-1/2	1-3/4	2	2-3/8	2-1/2	2-7/8
		—	No. of Packing Rings without Lantern Ring	10	12	10	12	12	12	14
		—	Total number of Packing Rings with Lantern Ring	8	10	8	10	10	10	12
		—	No. of rings in front of Lantern Ring	1	2	2	2	2	2	3
		—	Packing Size	7/16 Sq.	7/16 Sq.	1/2 Sq.	1/2 Sq.	1/2 Sq.	9/16x1/2	1/2 Sq.
		D	Width of Lantern Ring	1/2	5/8	5/8	5/8	3/4	3/4	3/4
		E	Distance from Box to Nearest Obstruction	1-1/4	1-5/8	1-11/16	1-11/16	2	2-3/8	2-1/2
	M. SEAL	F	Dia. of Mechanical Seal Seat	1-3/4	2-1/8	2-1/2	2-3/4	3-1/4	3-3/8	3-3/4
		G	Length of Mechanical Seal	1-1/2	1-9/16	1-7/8	2	2-3/8	2-3/8	2-7/8
		H	Outside Dia., sleeve for Mech. Seal	1-1/8	1-1/2	1-3/4	2	2-3/8	2-1/2	2-7/8
SHAFT		J	Dia. at Impeller (Max. Shaft Dia.)	1-1/8	1-3/8	1-5/8	1-7/8	2-1/8	2-3/8	2-3/4
		K	Diameter at Shaft Sleeve	7/8	1-1/4	1-1/2	1-3/4	2	2-1/4	2-5/8
		L	Diameter at Coupling End	3/4	1-1/8	1-3/8	1-1/2	1-3/4	2-1/8	2-1/2
		—	Max. deflection at Sealing Face	.002	.002	.002	.002	.002	.002	.002
BALL BEARINGS		—	Ball Bearing No. (Inboard Radial)	204	206	207	208 †	309	211	213
		—	Ball Bearing No. (Outboard Thrust)	5303	5305	5306	5307	5309	5211	5213
		M	Bearing Centers	14-3/4	18-3/8	19-3/8	21-1/4	24	28-3/8	33-1/8
		—	Minimum Life of Bearing under worst conditions of load (*)	6 YEARS	6 YEARS	6 YEARS	6 YEARS	6 YEARS	6 YEARS	6 YEARS

*Average life of bearing is 5 times minimum life.

†5208 is provided as standard on 5 x 6 x 11B when operating at 3500 R.P.M. only.

MAXIMUM CASE WORKING PRESSURE is the sum of the differential pressure and the suction pressure. Table 2 indicates the maximum case working pressure for the 410 Series Split Case Pumps in various materials and at various operating temperatures. These maximum allowable pressures are based on wall thickness for the particular series of pumps, ratings for American Standard Flange Specifications, see Table 1, and take into account the material at various allowable temperatures. Table 1 offers the available casing materials and flange ratings for the 410 Series Split Case Pumps.

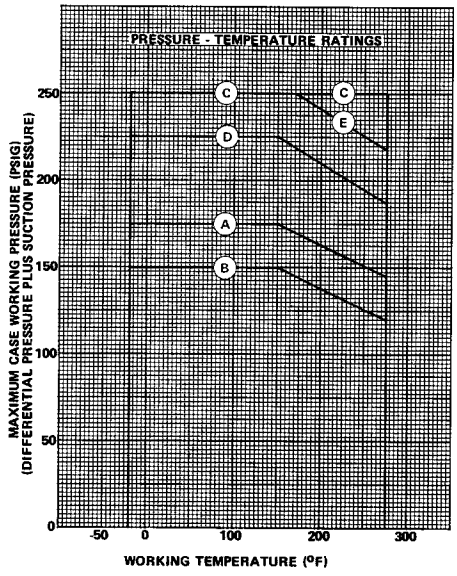
TABLE 1

PUMP CASING MATERIAL	MINIMUM REQUIREMENT FOR STANDARD SUCTION AND DISCHARGE FLANGES		PIPE SIZE	CODE
	A.S.A. SPEC.	CLASSIFICATION		
Cast Iron ASTM A48	B16.1	125 PSI Flat Face	1-12	A
			14-24	B
		250 PSI Flat Face	1-12 14-24	C
Bronze ASTM B62	B16.24	150 PSI Flat Face	All	D
		300 PSI Flat Face		C
Stainless Steel ASTM 296 Grade CF8M	B16.5	150 PSI Flat Face	All	E
		300 PSI Flat Face		C

Maximum Hydrostatic Pressure 1½ times maximum case working pressure at 100°F.

EXAMPLE: A model 410 Pump with a bronze casing has been selected for operating at a case working pressure of 240 P.S.I.G. at 150°F. Enter Table 2 at 150°F. and read upward to 240 P.S.I.G. It is determined that the selection is within the recommended maximum case working pressure area for 300 PSI flanges and is therefore acceptable. Note that the example exceeds the maximum case working pressure unit if the material selected would have been 125 PSI flanged cast iron or 150 PSI flanged bronze.

TABLE 2



EXTERNAL INERTIA OR FLYWHEEL EFFECT is the Kinetic energy stored in the rotating assembly that must be overcome when the pump impeller is caused to rotate within the casing. This energy frequently must be calculated to determine the torque required to start, accelerate or decelerate the pump. If the acceleration is rapid, the torque may be several times greater than the torque required to run the pump at normal or constant speed. WR^2 values in $LBS\text{-}FT^2$ are provided for these calculations. See tables 3 thru 8.

WR^2 values given in tables are for bronze impeller... $LB\text{-}FT^2$

EXAMPLE 1: Find WR^2 value for a 15" diameter 8x10x15B bronze fitted pump handling cold water.

From chart the "WET" value for a 15" diameter impeller ..... **10.38 $LB\text{-}FT^2$**

Add power series 5 rotating element less impeller ..... **0.15 $LB\text{-}FT^2$**

Total **10.53 $LB\text{-}FT^2$**

EXAMPLE 2: Find WR^2 value for a 15" diameter 8 x 10 x 15B all iron pump handling 0.67 specific gravity gasoline.

From chart select "DRY" value and correct for difference in materials.

$$\frac{\text{Sp. Gr. cast iron}}{\text{Sp. Gr. bronze}} \times 9.29\ LB\text{-}FT^2 \ldots . \textbf{7.54 } LB\text{-}FT^2$$

Take difference ("WET"-"DRY") values and correct for difference in specific gravities.

1.09 x 0.67 ..... **0.73 $LB\text{-}FT^2$**

Add power series 5 rotating element less impeller ..... **0.15 $LB\text{-}FT^2$**

Total **8.42 $LB\text{-}FT^2$**

TABLE 3

SPECIFIC GRAVITY OF COMMON METALS

METALS	S.G.
Bronze	8.86
Cast Iron	7.20
Carbon Steel	7.84
Stainless Steel	7.90

TABLE 4

WR^2 VALUE OF ROTATING ELEMENT LESS IMPELLER

POWER SERIES	WR^2
1	0.006
2	0.020
3	0.038
4	0.075
5	0.154
6B	0.294
7	0.536

TABLE 5

DIA.	2x2½x9 DRY	2x2½x9 WET	2x2½x10 DRY	2x2½x10 WET	2½x3x10B DRY	2½x3x10B WET	3x4x10B DRY	3x4x10B WET	4x5x10B DRY	4x5x10B WET				
10"	—	—	—	—	—	—	1.17	1.30	—	—				
9.5"	—	—	0.72	0.88	0.84	0.95	0.98	1.10	0.90	1.03				
9.0"	0.56	0.63	0.60	0.70	0.70	0.85	0.80	0.90	0.80	0.90				
8.5"	0.37	0.43	0.46	0.54	0.62	0.73	0.70	0.75	0.68	0.75				
8.0"	0.28	0.32	0.40	0.47	0.56	0.65	0.56	0.60	0.56	0.63				
7.5"	0.23	0.26	0.36	0.41	0.47	0.56	0.46	0.50	0.48	0.54				
7.0"	0.19	0.22	0.29	0.33	0.42	0.49	0.36	0.40	0.43	0.46				
6.5"	0.18	0.19	0.27	0.31	0.39	0.44	0.32	0.36	0.38	0.41				
6.0"	0.16	0.18	—	—	0.35	0.41	0.28	0.31	0.33	0.36				
IMP. WGT.	10#		12#		14#		18#		15#					

TABLE 6

DIA.	2x2½x12 DRY	2x2½x12 WET	2½x3x12 DRY	2½x3x12 WET	4x5x11A DRY	4x5x11A WET	4x5x11C DRY	4x5x11C WET	5x6x11 6x8x11 DRY	5x6x11 6x8x11 WET	5x6x11C DRY	5x6x11C WET	8x8x11B DRY	8x8x11B WET	8x10x12 DRY	8x10x12 WET	10x12x12B DRY	10x12x12B WET		
12"	1.55	1.82	1.70	1.95	—	—	—	—	—	—	—	—	2.91	3.43	4.10	4.60	5.80	6.75		
11.5"	1.25	1.45	1.40	1.55	—	—	—	—	—	—	—	—	2.55	3.00	3.80	4.00	5.32	6.10		
11.0"	1.05	1.20	1.10	1.25	1.90	2.10	1.65	1.80	2.04	2.47	3.00	3.60	2.15	2.45	3.40	3.80	5.00	5.60		
10.5"	0.93	1.04	0.98	1.10	1.60	1.75	1.45	1.55	1.80	2.10	2.90	3.20	1.95	2.20	3.10	3.30	4.90	5.50		
10.0"	0.81	0.90	0.83	0.90	1.35	1.52	1.22	1.35	1.60	1.85	2.65	3.10	1.73	1.95	2.85	3.10	4.80	5.40		
9.5"	0.75	0.83	0.68	0.75	1.20	1.33	1.08	1.19	1.45	1.65	2.50	2.90	1.50	1.66	2.70	2.90	—	—		
9.0"	0.70	0.78	0.60	0.67	1.05	1.22	1.00	1.10	1.30	1.45	2.40	2.80	1.40	1.50	2.60	2.70	—	—		
8.5"	—	—	—	—	0.95	1.05	0.88	0.99	1.20	1.35	2.35	2.60	1.30	1.40	2.50	2.60	—	—		
8.0"	—	—	—	—	0.83	0.95	0.75	0.84	1.06	1.15	2.00	2.40	1.15	1.20	—	—	—	—		
7.5"	—	—	—	—	—	—	0.73	0.80	0.93	1.05	1.90	2.20	1.09	1.12	—	—	—	—		
7.0"	—	—	—	—	—	—	0.65	0.74	—	—	—	—	—	—	—	—	—	—		
IMP. WGT.	15#		17#		26#		22#		27#		32#		29#		43#		59#			

TABLE 7

DIA.	3x4x14 DRY	3x4x14 WET	4x5x15 DRY	4x5x15 WET	5x6x15 DRY	5x6x15 WET	8x10x15 6x8x15 DRY	8x10x15 6x8x15 WET	8x10x15B DRY	8x10x15B WET	10x12x15B DRY	10x12x15B WET	10x12x15C DRY	10x12x15C WET	12x14x15B DRY	12x14x15B WET
15	—	—	4.51	5.18	6.18	6.76	7.39	8.51	9.29	10.4	9.23	10.0	14.5	17.5	14.3	17.7
14.5	—	—	3.80	4.50	5.40	6.00	6.75	7.50	7.75	8.80	8.50	9.25	13.5	16.2	14.0	16.5
14.0	3.62	4.36	3.50	3.90	4.60	5.20	6.00	6.75	6.75	7.75	8.00	9.00	12.2	14.4	13.0	15.0
13.5	3.10	3.60	3.00	3.40	4.20	4.50	5.40	6.00	6.10	7.00	7.50	8.50	11.3	12.2	12.5	14.5
13.0	2.70	3.10	2.55	2.95	3.60	3.90	5.00	5.50	5.70	6.25	6.75	7.60	10.5	11.4	11.8	13.9
12.5	2.25	2.65	2.20	2.60	3.20	3.50	4.50	5.00	5.10	5.80	6.50	7.25	10.0	11.0	11.0	13.0
12.0	1.98	2.30	1.95	2.25	3.05	3.20	4.10	4.40	4.80	5.30	6.25	7.00	—	—	10.5	12.5
11.5	1.60	1.90	1.70	2.00	2.70	2.98	3.70	4.00	4.50	5.00	—	—	—	—	—	—
11.0	1.40	1.65	1.50	1.75	2.50	2.70	3.30	3.55	4.10	4.40	—	—	—	—	—	—
10.5	1.25	1.50	—	—	2.30	2.45	3.00	3.20	3.70	4.10	—	—	—	—	—	—
10.0	1.10	1.35	—	—	2.05	2.25	2.85	3.10	3.50	3.80	—	—	—	—	—	—
IMP. WGT.	28#		30#		45#		56#		59#		70#		85#		87#	

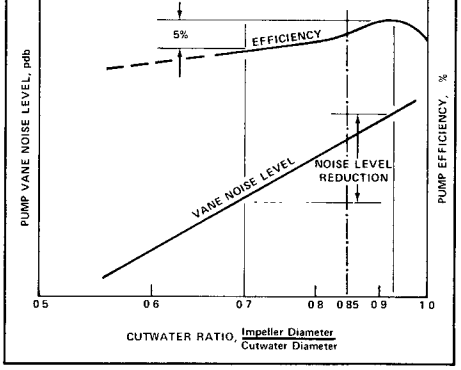
TABLE 8

DIA.	4x6x18B DRY	4x6x18B WET	5x6x17 DRY	5x6x17 WET	6x8x18A 6x8x18B 6x8x18C DRY	6x8x18A 6x8x18B 6x8x18C WET	6x8x20 DRY	6x8x20 WET	8x10x17B DRY	8x10x17B WET	10x12x18 DRY	10x12x18 WET	12x14x18 DRY	12x14x18 WET	14x16x18 DRY	14x16x18 WET
19.5	—	—	—	—	—	—	18.0	20.3	—	—	—	—	—	—	—	—
19.0	—	—	—	—	—	—	16.5	19.0	—	—	—	—	—	—	—	—
18.5	—	—	—	—	—	—	15.0	17.2	—	—	—	—	—	—	—	—
18.0	11.6	13.5	—	—	15.0	18.0	14.0	15.4	—	—	19.5	22.6	30.0	32.0	46.0	48.0
17.5	10.8	12.0	—	—	13.0	16.0	12.6	14.3	16.5	18.5	18.5	21.0	25.0	29.0	40.0	42.0
17.0	10.1	11.1	—	—	11.5	13.5	11.4	13.4	15.2	16.5	17.0	19.5	22.0	26.5	36.0	39.0
16.5	9.50	10.3	8.64	9.69	10.0	11.6	10.5	12.0	12.6	14.5	15.5	18.5	20.0	24.0	31.0	34.0
16.0	9.00	9.50	8.00	9.00	8.80	9.70	9.93	11.2	11.5	13.0	14.0	17.1	17.5	21.5	28.0	31.5
15.5	8.81	8.90	7.30	8.30	7.50	8.80	9.00	10.0	10.0	11.5	13.1	16.0	15.5	19.5	25.0	29.0
15.0	—	—	6.80	7.80	6.70	7.00	8.10	9.25	9.10	9.90	12.0	14.5	14.0	18.0	22.5	27.5
14.5	—	—	6.00	7.00	6.00	6.50	7.36	8.28	7.50	8.60	—	—	—	—	—	—
14.0	—	—	5.30	6.20	—	—	—	—	—	—	—	—	—	—	—	—
13.5	—	—	4.90	5.80	—	—	—	—	—	—	—	—	—	—	—	—
13.0	—	—	4.40	5.20	—	—	—	—	—	—	—	—	—	—	—	—
IMP. WGT.	60#		49#		65#		77#		68#		98#		115#		135#	

ENGINEERING DATA
QUIET PUMP SELECTION

TABLE 9 PUMP SIZE	MAX. IMP. DIA.	CUT-WATER DIA.	QUIET IMP. DIA.	SPHERE SIZE DIA.
2x2½x9	9.0	10.4	8 13/16	1/8
2x2½x10	9.5	10.3	8 11/16	1/4
2x2½x12	12.0	13.3	11 1/4	1/4
2½x3x10B	9.5	10.3	8 11/16	3/8
2½x3x12	12.0	13.3	11 3/8	3/8
3x4x10B	10.0	10.5	8 13/16	1/2
3x4x14	14.0	15.4	13 1/16	5/8
4x5x10B	9.5	10.6	9 1/16	5/8
4x5x11A	11.3	12.8	10 7/8	5/8
4x5x11C	11.3	12.8	10 7/8	1/2
4x5x15	15.0	16.4	13 15/16	5/8
4x6x18B	18.3	22.6	18 1/4	9/16
5x6x11	11.0	12.6	10 3/4	1
5x6x11C	11.0	12.6	10 3/4	5/8
5x6x15	15.0	16.4	13 7/8	13/16
5x6x17	16.5	17.4	14 3/4	11/16
6x8x11	11.0	12.8	10 7/8	1
8x8x11B	12.0	13.3	11 1/4	1 1/4
6x8x15	15.0	16.6	14 1/8	15/16
6x8x18A	18.0	20.5	17 7/8	1
6x8x18B	18.0	20.5	17 7/8	1
6x8x18C	18.0	20.5	17 7/8	1
6x8x20	19.5	20.6	17 9/16	13/16
8x10x12	12.0	14.4	12 1/4	15/16
8x10x15A	15.0	16.8	14 1/4	15/16
8x10x15B	15.0	16.8	14 1/4	1 5/16
8x10x17B	17.5	18.5	15 3/4	1 5/16
PUMP SIZE	**MAX. IMP. DIA.**	**CUT-WATER DIA.**	**QUIET IMP. DIA.**	**SPHERE SIZE DIA.**
10x12x12B	12.0	14.0	11 15/16	15/16
10x12x15B	15.0	17.1	14 9/16	1 7/16
10x12x15C	15.0	17.1	14 9/16	1 1/8
10x12x18	18.0	20.5	17 7/16	1 9/16
12x14x15B	15.0	17.8	15	1 1/16
12x14x18	18.0	21.1	18	1 5/16
14x16x18	18.0	22.0	18	1 1/2

TABLE 10 TYPICAL PERFORMANCE



QUIET PUMP operation is always desirable and sometimes essential. One of the most important factors for noise control in a pumping installation is the correct selection of a pumping unit for the system. To insure that the pump will run quietly, it should be selected so that it will operate as close as possible to the best efficiency point. At this point the hydraulic shock within the pump is at a minimum since the flow angle of the fluid from the tip of the impeller is correct for the casing design. Every pump is designed for the best efficiency point and operation at any other point on the characteristic curves is a compromise. The amount of turbulence on either side of the best efficiency point increases as the point of operation is moved along the curve from the maximum efficiency. Therefore, the greater the turbulence, the greater the noise generated.

Hydraulic shock is also a factor if the periphery of the impeller passes too close to the cutwater. If the ratio of the impeller diameter to the cutwater diameter in centrifugal pumps is greater than 0.92, the pump is likely to be hydraulically noisy.

In such instances the hydraulic pulses are actually differential pressures that occur when the impeller vanes pass the cutwater. Cutwater ratios of 0.9 to 0.95 are typical; however, significantly lower noise levels are achieved in pumps designed with a ratio of 0.7 to 0.75. Although there is an optimum gap for pump efficiency, increases of only 3%-5% may be realized by using the optimum. A cutwater ratio of 0.85 is commonly specified by practicing engineers, thereby realizing a minimum reduction in pump efficiency with a mean reduction in noise level. Table 9 offers recommended quiet impeller diameter at 85% cutwater ratio.

BEARING LIFE is based on the radial and thrust loads imposed on the bearings at the specific operating head and suction pressure. The Split case pump is designed for a six year minimum B_{10} life at the maximum recommended loads. Bearing life at any other point of greater capacity on the curves will greatly exceed the minimum life shown. Average bearing life is equal to five (5) times the minimum bearing life. Tables 11, 12, 13 and 14 will enable you to determine the minimum radial and thrust bearing life for any type 410 Series pump size.

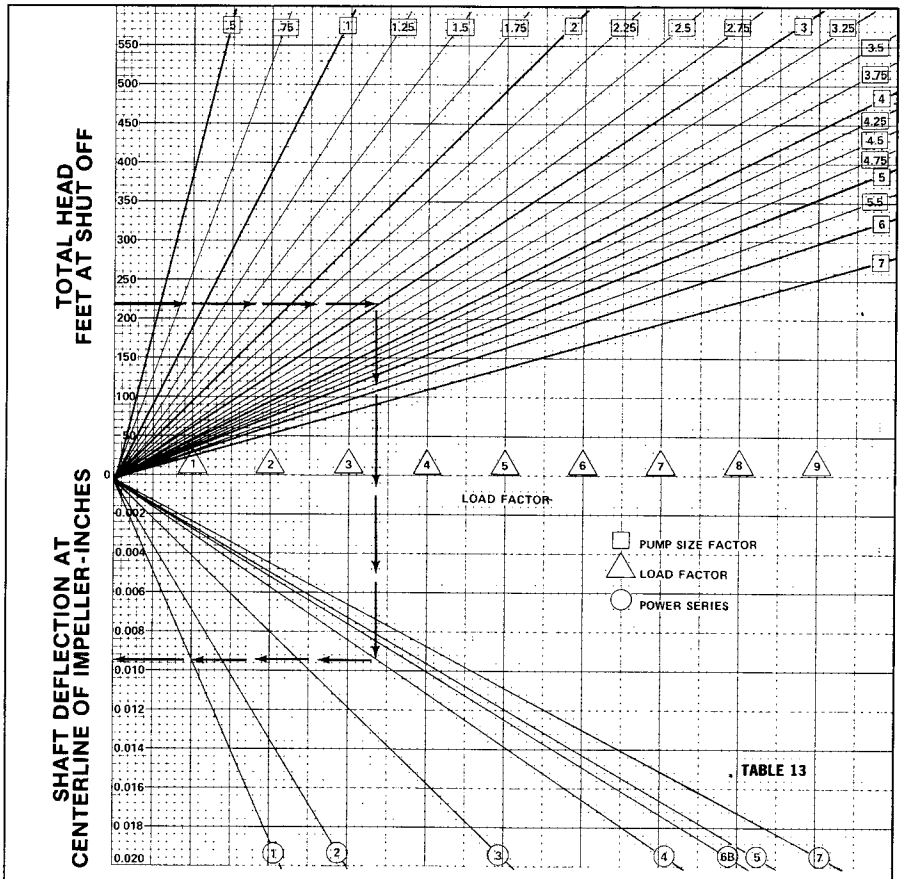
SHAFT DEFLECTION is the consequence of the unbalanced hydraulic force acting inside the pump on the impeller and shaft in a radial direction. This unbalance occurs when the pump is operating away from its best efficiency point. At shut-off condition (zero flow) the unbalance is greatest and therefore the resultant radial load is maximum. *Radial load and shaft deflection approach zero at the best efficiency point of the pump.* 410 Series pumps are designed for a maximum deflection of .002" at the mechanical seal faces when operating at the maximum recommended differential pressure. Deflection in a twin volute pump is minimized by a splitter blade that is cast within the casing thereby nearly balancing the resultant forces acting on the shaft. See Table 13 on page 77.

PROCEDURE FOR DETERMINING MAXIMUM SHAFT DEFLECTION AND MINIMUM BEARING LIFE.

1. Determine the proper Pump Size, approximate Shut-Off Head in feet, Power Series number, and Speed from the range charts illustrated in the 410 Bulletin.
2. From table 11 on page 77 determine the Pump Size Factor based on Pump Size and R.P.M.
3. On table 13 on page 77 locate the correct Shut-Off Head in feet and read across to the proper Pump Size Factor and down to the applicable Power Series. Note the Load Factor in the process. Read to the scale on the left for the maximum Shaft Deflection value.
4. From table 14 on page 77 using the Load Factor from step 3 above read across to the correct Power Series number and down for the minimum Bearing Life in hours.

NOTE: 1. One (1) year life is based on 8740 HOURS (continuous operation). 2. Additional bearing information can be found on page 74. 3. Specific information on Bearing Life and Shaft Deflection can be obtained from the factory.

SHAFT DEFLECTION AND BEARING LIFE



The charts reflect the *worst possible* conditions at pump shut-off. The effect from the impeller, shaft sleeves, wearing rings and packing will *reduce* the amount of *deflection.*

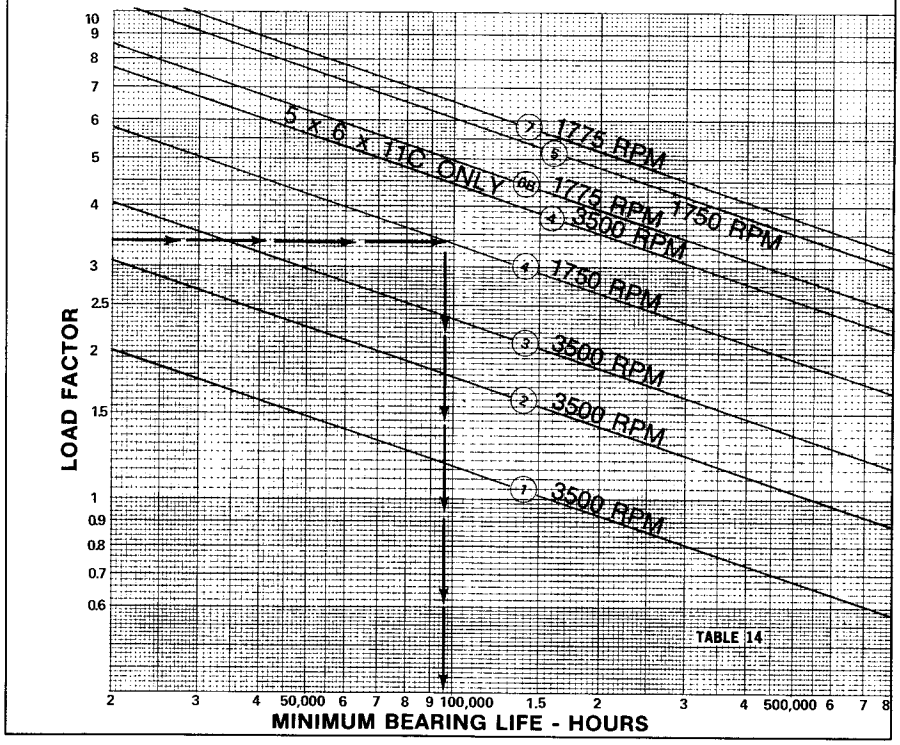


TABLE 11 PUMP SIZE	POWER SERIES	PUMP SIZE FACTOR 3500 RPM	1750 RPM	1150 RPM
2x2½x9	1	0.40	0.50	
2x2½x10	1	0.55	0.65	
2x2½x12	1		0.65	0.80
2½x3x10B	2	1.00	1.00	
2½x3x12	2		1.00	1.20
3x4x10B	2	1.25	1.50	
3x4x14	2		1.40	1.60
4x5x10B	2	1.30	1.40	
4x5x11A	3		2.00	2.25
4x5x11C	3	1.50	1.70	
4x5x15	3		2.00	2.25
4x6x18B	4		1.70	1.80
5x6x11	4		4.00	4.50
5x6x11C	4	2.00	2.13	
5x6x15	4		3.00	3.25
5x6x17	4		3.00	3.25
6x8x11	4		4.00	4.50
8x8x11B	4		5.25	5.50
6x8x15	5		3.75	4.00
6x8x18A	5		3.00	3.25
6x8x18B	5		2.75	3.50
6x8x18C	5		3.75	4.75
6x8x20	5		3.20	3.40
8x10x12	5		3.50	4.00
8x10x15A	5		4.00	4.50
8x10x15B	5		4.50	5.00
8x10x17B	5		4.00	5.00

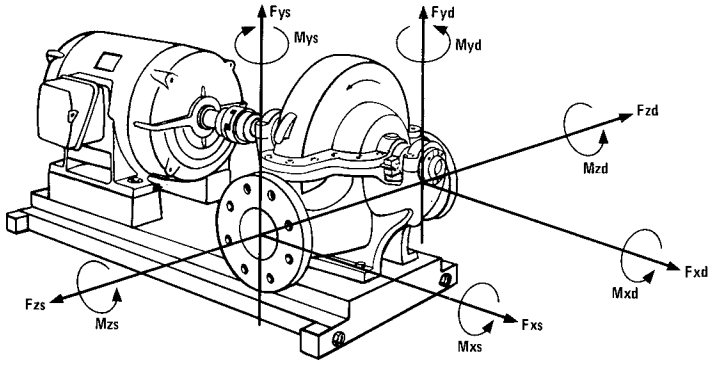
PUMP SIZE	POWER SERIES	PUMP SIZE FACTOR 1775 RPM	1175 RPM	885 RPM
10x12x12B	6B	4.50	5.00	
10x12x15B	6B	3.25	3.75	
10x12x15C	6B	3.50	4.75	
10x12x18	6B	3.25	3.75	
12x14x15B	7	4.75	5.50	
12x14x18	7	4.00	4.50	
14x16x18	7		7.00	7.50

EXAMPLE: A 5x6x15 pump operating at 1750 R.P.M. on a No. 4 power series with a shut-off head of 225 ft. T.D.H. has a Size Factor of 3.00, a Load Factor of 3.35, a maximum Shaft Deflection at the centerline of the impeller of .0092, and a minimum Bearing Life of 97,000 hours @ 1750 R.P.M.

TABLE 12	CHART SPEED R.P.M.	DESIRED SPEED R.P.M.	MULTIPLY CHART LIFE BY
SPEED (R.P.M.) FACTORS	3500	1750	2
	3500	1150	3
	1750	1150	1.5
	1775	1175	1.5
	1775	875	2
	1175	875	1.3

AURORA 410 SERIES ENGINEERING DATA

PUMP NOZZLE LOADING
PUMPS WITH GROUTED BASEPLATES

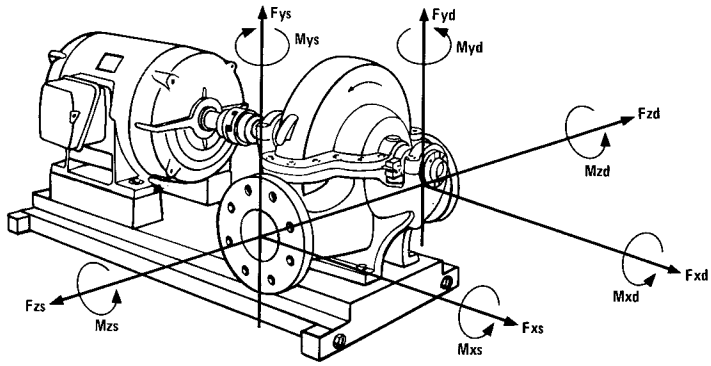


PUMP SIZE		FORCES - LBS.			MOMENTS - FT. LBS.		
		Fx	Fy	Fz	Mx	My	Mz
2 x 2-1/2 x 9	DISCHARGE	200	250	750	250	350	300
	SUCTION	200	250	750	250	350	300
2 x 2-1/2 x 10	DISCHARGE	200	250	750	250	350	300
	SUCTION	200	250	750	250	350	300
2 x 2-1/2 x 12	DISCHARGE	200	250	750	250	350	300
	SUCTION	200	200	750	250	350	300
2-1/2 x 3 x 10	DISCHARGE	500	550	1350	600	800	700
	SUCTION	450	550	1350	600	800	700
2-1/2 x 3 x 12	DISCHARGE	400	500	1350	600	800	700
	SUCTION	400	500	1350	600	800	700
3 x 4 x 10	DISCHARGE	450	550	1350	600	800	700
	SUCTION	400	500	1350	600	800	700
3 x 4 x 14	DISCHARGE	400	450	1400	600	800	700
	SUCTION	350	400	1400	600	800	700
4 x 5 x 10	DISCHARGE	450	550	1400	650	800	700
	SUCTION	400	500	1400	650	800	700
4 x 5 x 11	DISCHARGE	250	850	750	1200	550	1400
	SUCTION	250	850	750	1200	550	1400
4 x 5 x 15	DISCHARGE	700	850	2200	1200	1600	1450
	SUCTION	650	750	2200	1200	1600	1450
4 x 6 x 18	DISCHARGE	650	800	2200	1250	1600	1450
	SUCTION	550	700	2200	1250	1600	1450
5 x 6 x 11	DISCHARGE	800	400	2200	500	1600	600
	SUCTION	700	350	2200	500	1600	600
5 x 6 x 15	DISCHARGE	700	850	2200	1250	1600	1450
	SUCTION	600	750	2200	1250	1600	1450
5 x 6 x 17	DISCHARGE	650	800	2250	1250	1600	1500
	SUCTION	600	750	2250	1250	1600	1500
6 x 8 x 11	DISCHARGE	800	950	2200	1250	1600	1450
	SUCTION	650	750	2200	1250	1600	1450

Values tabled are for forces and moments acting alone at the suction or discharge flange.
Combined forces and moments must be reduced so:

$$\frac{Fxd}{Fxdmax} + \frac{Fyd}{Fydmax} + \frac{Fzd}{Fzdmax} + \frac{Mxd}{Mxdmax} + \frac{Myd}{Mydmax} + \frac{Mzd}{Mzdmax} + \frac{Fxs}{Fxsmax} + \frac{Fys}{Fysmax} + \frac{Fzs}{Fzsmax} + \frac{Mxs}{Mxsmax} + \frac{Mys}{Mysmax} + \frac{Mzs}{Mzsmax} \leq 1.0$$

PUMP NOZZLE LOADING
PUMPS WITH GROUTED BASEPLATES



PUMP SIZE		FORCES - LBS.			MOMENTS - FT. LBS.		
		Fx	Fy	Fz	Mx	My	Mz
8 x 8 x 11	DISCHARGE	750	750	2250	1000	1600	1200
	SUCTION	650	600	2250	1000	1600	1200
6 x 8 x 15	DISCHARGE	1150	1300	3250	2100	2800	2550
	SUCTION	950	1100	3250	2100	2800	2550
6 x 8 x 18	DISCHARGE	1000	1200	3300	2150	2850	2600
	SUCTION	900	1050	3300	2150	2850	2600
6 x 8 x 20	DISCHARGE	1050	1250	3300	2200	2850	2650
	SUCTION	900	1100	3300	2200	2850	2650
8 x 10 x 12	DISCHARGE	950	1150	3300	2150	2850	2600
	SUCTION	900	1100	3300	2150	2850	2600
8 x 10 x 15	DISCHARGE	950	1150	3300	2200	2850	2600
	SUCTION	900	1100	3300	2200	2850	2600
8 x 10 x 17	DISCHARGE	950	1150	3300	2200	2850	2650
	SUCTION	900	1100	3300	2200	2850	2650
8 x 10 x 21	DISCHARGE	1650	2000	3300	4000	4350	3350
	SUCTION	1400	1700	3300	4000	4350	3350
10 x 12 x 12B	DISCHARGE	1350	1700	3350	3000	4450	4650
	SUCTION	1150	1400	3350	3000	4450	4650
10 x 12 x 15B	DISCHARGE	1300	1600	3400	3050	4500	4700
	SUCTION	1100	1350	3400	3050	4500	4700
10 x 12 x 15C	DISCHARGE	1300	1600	3400	3050	4500	4700
	SUCTION	1100	1350	3400	3050	4500	4700
10 x 12 x 18	DISCHARGE	1200	1500	3400	3050	4500	4700
	SUCTION	1000	1250	3400	3050	4500	4700
12 x 14 x 15B	DISCHARGE	1300	1700	3450	3250	4600	5050
	SUCTION	1000	1300	3450	3250	4600	5050
12 x 14 x 18	DISCHARGE	1250	1650	3500	3300	4650	5100
	SUCTION	950	1250	3500	3300	4650	5100
14 x 16 x 18	DISCHARGE	1050	1450	3600	3550	4800	5500
	SUCTION	850	1150	3600	3550	4800	5500

Values tabled are for forces and moments acting alone at the suction or discharge flange.
Combined forces and moments must be reduced so:

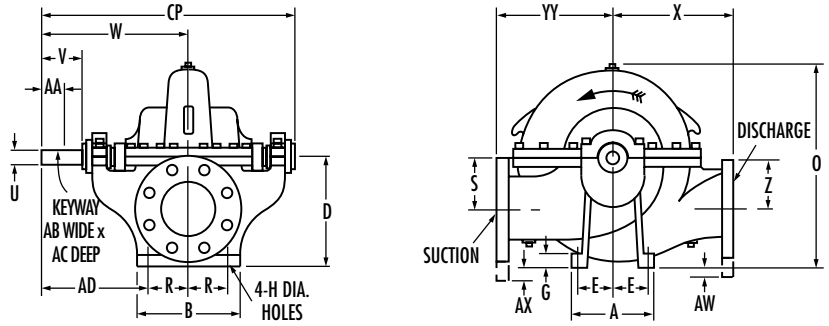
$$\frac{Fxd}{Fxdmax} + \frac{Fyd}{Fydmax} + \frac{Fzd}{Fzdmax} + \frac{Mxd}{Mxdmax} + \frac{Myd}{Mydmax} + \frac{Mzd}{Mzdmax} + \frac{Fxs}{Fxsmax} + \frac{Fys}{Fysmax} + \frac{Fzs}{Fzsmax} + \frac{Mxs}{Mxsmax} + \frac{Mys}{Mysmax} + \frac{Mzs}{Mzsmax} \leq 1.0$$

AURORA MODEL 411 PUMPS

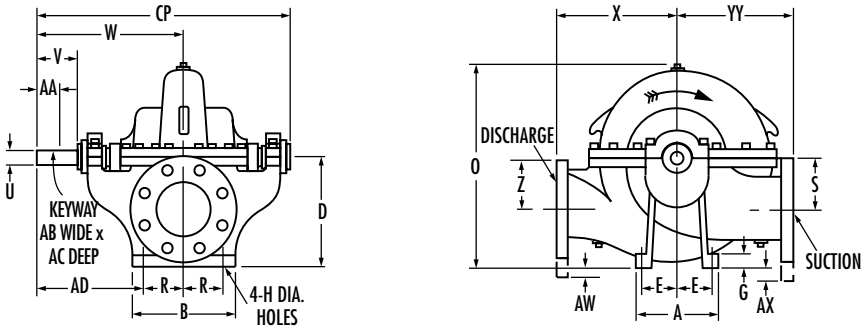
2″ THRU 8″ PUMPS

POWER SERIES NO. 1-2-3-4

Supersedes Section 410 Page 201
Dated February 2001



RIGHT HAND ROTATION



LEFT HAND ROTATION

PUMP SIZE			POWER																						
DISCH	SUCT	CASE BORE	SERIES	A	B	D	E	G	H	O	R	S	U	V	W	X	Z	AA	AB	AC	AD	AW	AX	CP	YY
2	2-1/2	9	1	6-1/2 (165)	8 (203)	7 (178)	2-3/4 (70)	5/8 (16)	1/2 (13)	13-3/8 (340)	3-1/4 (83)	3-1/2 (89)	3/4 (19)	3-1/2 (89)	11-5/8 (295)	8-1/2 (216)	3-1/2 (89)	2 (51)	3/16 (5)	3/32 (2)	8-3/8 (213)	–	1/4 (6)	20-1/2 (521)	9 (229)
2	2-1/2	10	1	6-1/2 (165)	8 (203)	7 (178)	2-3/4 (70)	5/8 (16)	1/2 (13)	13-1/2 (343)	3-1/4 (83)	3-1/2 (89)	3/4 (19)	3-1/2 (89)	11-5/8 (295)	8-1/2 (216)	3-1/2 (89)	2 (51)	3/16 (5)	3/32 (2)	8-3/8 (213)	–	1/4 (6)	20-1/2 (521)	9 (229)
2	2-1/2	12	1	6-1/2 (165)	8 (203)	8 (203)	2-3/4 (70)	5/8 (16)	1/2 (13)	15-7/8 (403)	3-1/4 (83)	4 (102)	3/4 (19)	3-1/2 (89)	11-5/8 (295)	10 (254)	4 (102)	2 (51)	3/16 (5)	3/32 (2)	8-3/8 (213)	–	–	20-1/2 (521)	10-3/4 (273)
2-1/2	3	10	2	8 (203)	10 (254)	8 (203)	3-1/2 (89)	3/4 (19)	5/8 (16)	16 (406)	4 (102)	4 (102)	1-1/8 (29)	2-7/8 (73)	13-1/2 (343)	9-3/4 (248)	4 (102)	2-1/8 (54)	1/4 (6)	1/8 (3)	9-1/2 (241)	–	–	24 (610)	10 (254)
2-1/2	3	12	2	8 (203)	10 (254)	9 (229)	3-1/2 (89)	3/4 (19)	5/8 (16)	17-1/4 (438)	4 (102)	4-1/2 (114)	1-1/8 (29)	2-7/8 (73)	13-1/2 (343)	11 (343)	4-1/2 (114)	2-1/8 (54)	1/4 (6)	1/8 (3)	9-1/2 (241)	–	–	24 (610)	11-1/2 292)
3	4	10	2	8 (203)	10 (254)	9 (229)	3-1/2 (89)	3/4 (19)	5/8 (16)	16-1/4 (413)	4 (102)	4-1/2 (114)	1-1/8 (29)	2-7/8 (73)	13-1/2 (343)	10 (254)	4-1/2 (114)	2-1/8 (54)	1/4 (6)	1/8 (3)	9-1/2 (241)	–	1/2 (13)	24 (610)	11 (343)
3	4	14	2	8 (203)	10 (254)	10 (254)	3-1/2 (89)	3/4 (19)	5/8 (16)	19-3/8 (492)	4 (102)	5 (127)	1-1/8 (29)	2-7/8 (73)	13-1/2 (343)	12 (305)	5 (127)	2-1/8 (54)	1/4 (6)	1/8 (3)	9-1/2 (241)	–	–	24 (610)	13 (330)
4	5	10	2	8 (203)	10 (254)	9 (229)	3-1/2 (89)	3/4 (19)	5/8 (16)	16-1/4 (413)	4 (102)	4-5/8 (117)	1-1/8 (29)	2-7/8 (73)	13-1/2 (343)	10 (254)	4-1/2 (114)	2-1/8 (54)	1/4 (6)	1/8 (3)	9-1/2 (241)	1/2 (13)	1-1/8 (29)	24 (610)	11-1/4 (286)
4	5	11	3	10 (254)	12 (305)	10 (254)	4-1/4 (108)	7/8 (22)	3/4 (19)	18-3/8 (467)	5 (127)	5 (127)	1-3/8 (35)	3 (76)	14-1/2 (368)	11-1/4 (286)	5 (127)	2-3/8 (60)	3/8 (10)	3/16 (5)	9-1/2 (241)	–	1/2 (13)	26 (660)	12-3/4 (324)
4	5	15	3	10 (254)	12 (305)	11 (279)	4-1/4 (108)	7/8 (22)	3/4 (19)	21-1/8 (537)	5 (127)	5-1/2 (140)	1-3/8 (35)	3 (76)	14-1/2 (368)	13 (330)	5-1/2 (140)	2-3/8 (60)	3/8 (10)	3/16 (5)	9-1/2 (241)	–	–	26 (660)	14 (356)
4	6	18	4	10 (254)	12 (305)	12-1/2 (318)	4-1/4 (108)	3/4 (19)	3/4 (19)	24-1/4 (616)	5 (127)	6-1/4 (159)	1-1/2 (38)	3-1/2 (89)	16 (406)	14 (356)	6-1/4 (159)	2-7/8 (73)	3/8 (10)	3/16 (5)	11 (279)	–	–	28-1/2 (724)	16 (406)
5	6	11	4	10 (254)	12 (305)	11 (279)	4-1/4 (108)	7/8 (22)	3/4 (19)	19-3/4 (502)	5 (127)	5-1/2 (140)	1-1/2 (38)	3-1/2 (89)	16 (406)	11-1/4 (286)	5-1/2 (140)	2-7/8 (73)	3/8 (10)	3/16 (5)	11 (279)	–	3/4 (19)	28-1/2 (724)	13-1/4 (337)
5	6	15	4	10 (254)	12 (305)	12-1/2 (318)	4-1/4 (108)	7/8 (22)	3/4 (19)	22-1/2 (572)	5 (127)	6-1/4 (159)	1-1/2 (38)	3-1/2 (89)	16 (406)	13-1/4 (337)	6-1/4 (159)	2-7/8 (73)	3/8 (10)	3/16 (5)	11 (279)	–	–	28-1/2 (724)	15 (343)
5	6	17	4	10 (254)	12 (305)	12-1/2 (318)	4-1/4 (108)	7/8 (22)	3/4 (19)	22-1/2 (572)	5 (127)	6-1/4 (159)	1-1/2 (38)	3-1/2 (89)	16 (406)	14 (356)	6-1/4 (159)	2-7/8 (73)	3/8 (10)	3/16 (5)	11 (279)	–	–	28-1/2 (724)	15 (343)
6	8	11	4	10 (254)`	12 (305)	12-1/2 (318)	4-1/4 (108)	7/8 (22)	3/4 (19)	21-7/8 (556)	5 (127)	6-1/4 (159)	1-1/2 (38)	3-1/2 (89)	16 (406)	11-3/4 (298)	6-1/4 (159)	2-7/8 (73)	3/8 (10)	3/16 (5)	11 (279)	–	1-1/4 (32)	28-1/2 (724)	14-1/2 (368)
8	8	11	4	10 (254)	12 (305)	12-1/2 (318)	4-1/4 (108)	7/8 (22)	3/4 (19)	21-3/4 (552)	5 (127)	6-1/4 (159)	1-1/2 (38)	3-1/2 (89)	16 (406)	12 (305)	6-1/4 (159)	2-7/8 (73)	3/8 (10)	3/16 (5)	11 (279)	1-1/4 (32)	1-1/4 (32)	28-1/2 (724)	14-1/2 (368)

NOTES:
1. All dimensions in inches (mm).
2. Dimensions may vary ± 3/8" (10).
3. Not for construction purposes unless certified.
4. Discharge and suction flanges - ANSI Standard flat face.

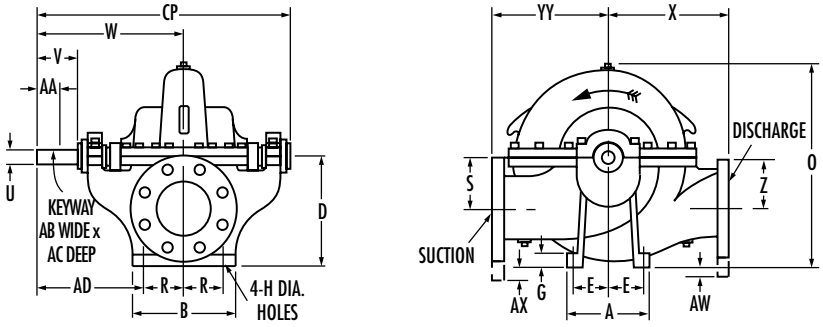
STD. 125# FLANGES	OPT. 250# FLANGES

Supersedes Section 410 Page 202
Dated October 1984

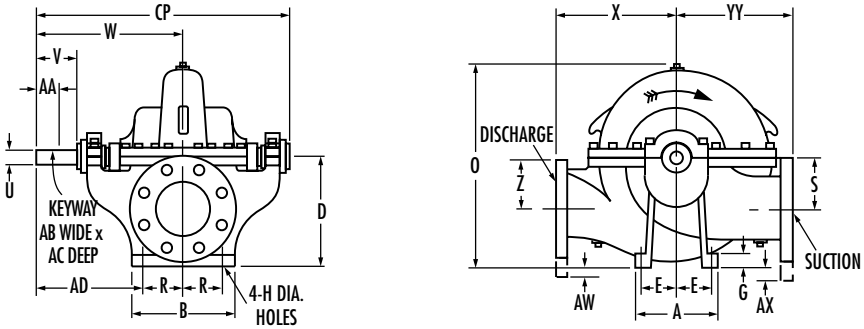
AURORA MODEL 411 PUMPS

6" THRU 14" PUMPS

POWER SERIES NO. 5-6B-7



RIGHT HAND ROTATION



LEFT HAND ROTATION

PUMP SIZE			POWER																						
DISCH	SUCT	CASE BORE	SERIES	A	B	D	E	G	H	O	R	S	U	V	W	X	Z	AA	AB	AC	AD	AW	AX	CP	YY
6	8	15	5	12 (305)	14 (356)	13-1/2 (343)	5 (127)	1 (25)	7/8 (22)	24-7/8 632)	6 (152)	6-3/4 (171)	1-3/4 (44)	4 (102)	18 (457)	14-1/4 (362)	6-3/4 (171)	2-7/8 (73)	3/8 (10)	3/16 (5)	12 (305)	–	3/4 (19)	32 (813)	16-3/4 (425)
6	8	18	5	12 (305)	14 (356)	14-3/4 (375)	5 (127)	3/4 (19)	7/8 (22)	27-1/4 (692)	6 (152)	8 (203)	1-3/4 (44)	4 (102)	18 (457)	16 (406)	8 (203)	2-7/8 (73)	3/8 (10)	3/16 (5)	12 (305)	–	3/4 (19)	32 (813)	18 (457)
6	8	20	5	12 (305)	14 (356)	14-3/4 (375)	5 (127)	1 (25)	7/8 (22)	27-3/4 (705)	6 (152)	8 (203)	1-3/4 (44)	4 (102)	18 (457)	15-3/4 (400)	8 (203)	2-7/8 (73)	3/8 (10)	3/16 (5)	12 (305)	–	3/4 (19)	32 (813)	18 (457)
8	10	12	5	12 (305)	14 (356)	14-3/4 (375)	5 (127)	1-1/4 (32)	7/8 (22)	26-3/8 (670)	6 (152)	8 (203)	1-3/4 (44)	4 (102)	18 (457)	17 (432)	9 (229)	2-7/8 (73)	3/8 (10)	3/16 (5)	12 (305)	1-3/4 (44)	2 (51)	32 (813)	17-3/4 (451)
8	10	15	5	12 (305)	14 (356)	14-3/4 (375)	5 (127)	1-1/4 (32)	7/8 (22)	26-5/8 (676)	6 (152)	8 (203)	1-3/4 (44)	4 (102)	18 (457)	17 (432)	9 (229)	2-7/8 (73)	3/8 (10)	3/16 (5)	12 (305)	1-3/4 (44)	2 (51)	32 (813)	17-3/4 (451)
8	10	17	5	12 (305)	14 (356)	14-3/4 (375)	5 (127)	1-1/4 (32)	7/8 (22)	27-1/8 (689)	6 (152)	8 (203)	1-3/4 (44)	4 (102)	18 (457)	17 (432)	8 (203)	2-7/8 (73)	3/8 (10)	3/16 (5)	12 (305)	3/4 (19)	2 (51)	32 (813)	17-3/4 (451)
8	10	21	6B	20 (508)	17 (432)	18-1/2 (470)	9 (229)	1 (25)	7/8 (22)	32-1/2 (826)	7-1/2 (191)	9-1/2 (241)	2-1/8 (54)	5-7/16 (138)	21-7/8 (556)	18 (457)	9-1/2 (241)	4-3/4 (121)	1/2 (13)	1/4 (6)	14-3/8 (365)	–	–	38 (965)	21 (533)
10	12	12B	6B	15 (381)	22 (559)	23 (584)	6-1/2 (165)	1 (25)	7/8 (22)	35-1/2 (902)	10 (254)	12 (305)	2-1/8 (54)	5-7/16 (138)	21-7/8 (556)	16 (406)	12 (305)	4-3/4 (121)	1/2 (13)	1/4 (6)	11-7/8 (302)	–	–	38 (965)	19 (483)
10	12	15B&C	6B	15 (381)	22 (559)	25 (635)	6-1/2 (165)	1 (25)	7/8 (22)	38-1/2 (978)	10 (254)	13-1/2 (343)	2-1/8 (54)	5-7/16 (138)	21-7/8 (556)	17 (432)	13-1/2 (343)	4-3/4 (121)	1/2 (13)	1/4 (6)	11-7/8 (302)	–	–	38 (965)	20 (508)
10	12	18	6B	15 (381)	22 (559)	25 (635)	6-1/2 (165)	1 (25)	7/8 (22)	39-1/2 (1003)	10 (254)	13-1/2 (343)	2-1/8 (54)	5-7/16 (138)	21-7/8 (556)	18 (457)	13-1/2 (343)	4-3/4 (121)	1/2 (13)	1/4 (6)	11-7/8 (302)	–	–	38 (965)	22 (559)
12	14	15B	7	15 (381)	22 (559)	24 (610)	6-1/2 (165)	1 (25)	7/8 (22)	39 (991)	10 (254)	15 (343)	2-1/2 (64)	6-5/8 (168)	25-1/4 (641)	17 (432)	15 (343)	5 (127)	5/8 (16)	5/16 (8)	15-1/4 (387)	1-1/4 (32)	2-1/2 (64)	43-7/8 (1114)	22 (559)
12	14	18	7	15 (381)	22 (559)	24 (610)	6-1/2 (165)	1 (25)	7/8 (22)	40-1/8 (1019)	10 (254)	15 (381)	2-1/2 (64)	6-5/8 (168)	25-1/4 (641)	18 (457)	15 (343)	5 (127)	5/8 (16)	5/16 (8)	15-1/4 (387)	1-1/4 (32)	2-1/2 (64)	43-7/8 (1114)	23 (584)
14	16	18	7	15 (381)	22 (559)	29-1/4 (743)	6-1/2 (165)	1 (25)	7/8 (22)	47-1/2 (1207)	10 (254)	16 (406)	2-1/2 (64)	6-5/8 (168)	25-1/4 (641)	22 (559)	16 (406)	5 (127)	5/8 (16)	5/16 (8)	15-1/4 (387)	–	–	43-7/8 (1114)	27 (686)

NOTES:
1. All dimensions in inches (mm).
2. Dimensions may vary ± 3/8" (10).
3. Not for construction purposes unless certified.
4. Discharge and suction flanges - ANSI Standard flat face.

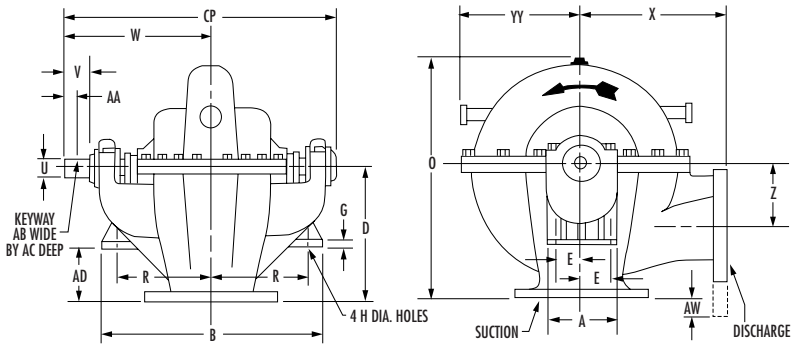
STD. 125# FLANGES	OPT. 250# FLANGES

AURORA®
Pentair Pump Group

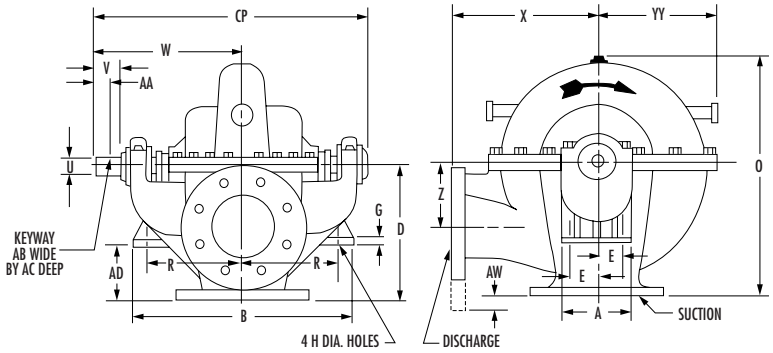
AURORA MODEL 411 PUMPS

10" AND 12"BOTTOM SUCTION PUMPS
POWER SERIES NO. 6B & 7

Supersedes Section 410 Page 203
Dated October 1984



RIGHT HAND ROTATION



LEFT HAND ROTATION

PUMP SIZE			POWER SERIES																			
DISCH	SUCT	CASE BORE		A	B	D	E	G	H	O	R	U	V	W	X	Z	AA	AB	AC	AD	AW	CP	YY
10	12	18	6B	16-3/4 (425)	26 (660)	25 (635)	7-1/2 (191)	1-1/4 (32)	7/8 (22)	39-1/2 (1003)	11-3/4 (298)	2-1/8 (54)	5-7/16 (138)	21-7/8 (556)	18 (457)	13-1/2 (343)	4-3/4 (121)	1/2 (13)	1/4 (6)	12-1/2 (318)	–	38 (965)	18 (457)
12	14	15B	7	21 (533)	32 (813)	25 (635)	9 (229)	1-1/4 (32)	7/8 (22)	40 (1016)	14-1/2 (368)	2-1/2 (64)	6-5/8 (168)	25-1/4 (641)	17 (432)	15 (381)	5 (127)	5/8 (16)	5/16 (8)	13-11/16 (348)	1/4 (6)	43-7/8 (1114)	19 (483)

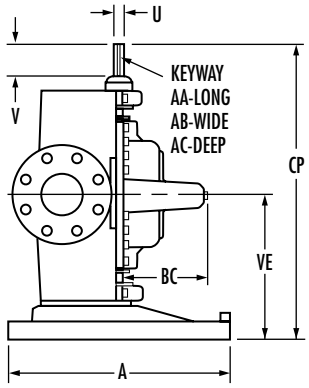
NOTES:
1. All dimensions in inches (mm).
2. Dimensions may vary ± 3/8" (10).
3. Not for construction purposes unless certified.
4. Discharge and suction flanges - ANSI Standard flat face.

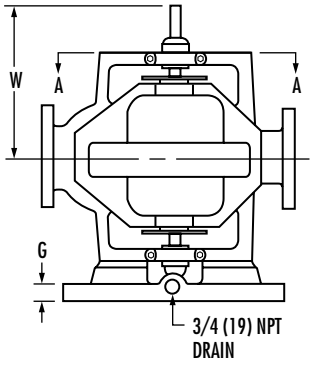
☐ STD. 125# FLANGES	☐ OPT. 250# FLANGES

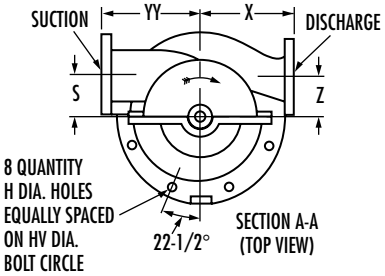
AURORA MODEL 412 PUMPS

2" THRU 10" PUMPS

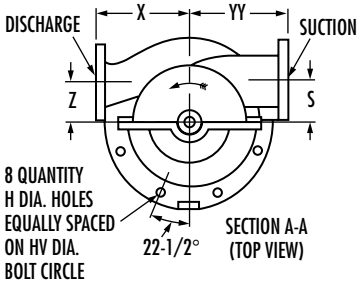
POWER SERIES NO. 1-2-3-4-5-6B







RIGHT HAND ROTATION



LEFT HAND ROTATION

STD. 125# FLANGES | OPT. 250# FLANGES

PUMP SIZE			POWER SERIES	BASE	S	U	V	W	X	Z	AA	AB	AC	BC	CP	VE	YY
DISCH	SUCT	CASE BORE															
2	2-1/2	9	1	1	3-1/2 (89)	3/4 (19)	3-1/2 (89)	11-5/8 (295)	8-1/2 (216)	3-1/2 (89)	2 (51)	3/16 (5)	3/32 (2)	6-3/8 (162)	22-3/4 (578)	11-1/8 (283)	9 (227)
2	2-1/2	10	1	1	3-1/2 (89)	3/4 (19)	3-1/2 (89)	11-5/8 (295)	8-1/2 (216)	3-1/2 (89)	2 (51)	3/16 (5)	3/32 (2)	6-3/8 (162)	22-3/4 (578)	11-1/8 (283)	9 (227)
2	2-1/2	12	1	1	4 (102)	3/4 (19)	3-1/2 (89)	11-5/8 (295)	10 (254)	4 (102)	2 (51)	3/16 (5)	3/32 (2)	7-7/8 (200)	22-3/4 (578)	11-1/8 (283)	10-3/4 (273)
2-1/2	3	10	2	1	4 (102)	1-1/8 (29)	2-7/8 (73)	13-1/2 (343)	9-3/4 (248)	4 (102)	2-1/8 (54)	1/4 (6)	1/8 (3)	8 (203)	26-1/2 (673)	13 (330)	10 (254)
2-1/2	3	12	2	1	4-1/2 (114)	1-1/8 (29)	2-7/8 (73)	13-1/2 (343)	11 (279)	4-1/2 (114)	2-1/8 (54)	1/4 (6)	1/8 (3)	8-1/4 (209)	26-1/2 (673)	13 (330)	11-1/2 (292)
3	4	10	2	1	4-1/2 (114)	1-1/8 (29)	2-7/8 (73)	13-1/2 (343)	10 (254)	4-1/2 (114)	2-1/8 (54)	1/4 (6)	1/8 (3)	7-3/16 (183)	26-1/2 (673)	13 (330)	11 (279)
3	4	14	2	1	5 (127)	1-1/8 (29)	2-7/8 (73)	13-1/2 (343)	12 (305)	5 (127)	2-1/8 (54)	1/4 (6)	1/8 (3)	9-3/8 (238)	26-1/2 (673)	13 (330)	13 (330)
4	5	10	2	1	4-5/8 (117)	1-1/8 (29)	2-7/8 (73)	13-1/2 (343)	10 (254)	4-1/2 (114)	2-1/8 (54)	1/4 (6)	1/8 (3)	7-3/16 (183)	26-1/2 (673)	13 (330)	11-1/4 (286)
4	5	11	3	2	5 (127)	1-3/8 (35)	3 (76)	14-1/2 (356)	11-1/4 (286)	5 (127)	2-3/8 (60)	3/8 (10)	3/16 (5)	8-5/16 (211)	28-1/2 (724)	14 (356)	12-3/4 (324)
4	5	15	3	2	5-1/2 (140)	1-3/8 (35)	3 (76)	14-1/2 (356)	13 (330)	5-1/2 (140)	2-3/8 (60)	3/8 (10)	3/16 (5)	9 (227)	28-1/2 (724)	14 (356)	14 (356)
4	6	18	4	2	6-1/4 (159)	1-1/2 (38)	3-1/2 (89)	16 (406)	14 (356)	6-1/4 (159)	2-7/8 (73)	3/8 (10)	3/16 (5)	11-3/4 (298)	31 (787)	15 (381)	16 (406)
5	6	11	4	2	5-1/2 (140)	1-1/2 (38)	3-1/2 (89)	16 (406)	11-1/4 (286)	5-1/2 (140)	2-7/8 (73)	3/8 (10)	3/16 (5)	8-3/4 (222)	31 (787)	15 (381)	13-1/4 (337)
5	6	15	4	2	6-1/4 (159)	1-1/2 (38)	3-1/2 (89)	16 (406)	13-1/4 (337)	6-1/4 (159)	2-7/8 (73)	3/8 (10)	3/16 (5)	10-1/16 (256)	31 (787)	15 (381)	15 (381)
5	6	17	4	2	6-1/4 (159)	1-1/2 (38)	3-1/2 (89)	16 (406)	14 (356)	6-1/4 (159)	2-7/8 (73)	3/8 (10)	3/16 (5)	10-1/16 (256)	31 (787)	15 (381)	15 (381)
6	8	11	4	2	6-1/4 (159)	1-1/2 (38)	3-1/2 (89)	16 (406)	11-3/4 (298)	6-1/4 (159)	2-7/8 (73)	3/8 (10)	3/16 (5)	9-1/4 (235)	31 (787)	15 (381)	14-1/2 (356)
8	8	11	4	2	6-1/4 (159)	1-1/2 (38)	3-1/2 (89)	16 (406)	12 (305)	6-1/4 (159)	2-7/8 (73)	3/8 (10)	3/16 (5)	9-3/4 (248)	31 (787)	15 (381)	14-1/2 (356)
6	8	15	5	3	6-3/4 (171)	1-3/4 (44)	4 (102)	18 (457)	14-1/4 (362)	6-3/4 (171)	2-7/8 (73)	3/8 (10)	3/16 (5)	11-5/16 (287)	35 (889)	17 (432)	16-3/4 (425)
6	8	18	5	3	8 (203)	1-3/4 (44)	4 (102)	18 (457)	16 (406)	8 (203)	2-7/8 (73)	3/8 (10)	3/16 (5)	12-1/2 (318)	35 (889)	17 (432)	18 (457)
8	8	20	5	3	8 (203)	1-3/4 (44)	4 (102)	18 (457)	15-3/4 (400)	8 (203)	2-7/8 (73)	3/8 (10)	3/16 (5)	12-15/16 (329)	35 (889)	17 (432)	18 (457)
8	10	12	5	3	8 (203)	1-3/4 (44)	4 (102)	18 (457)	17 (432)	9 (227)	2-7/8 (73)	3/8 (10)	3/16 (5)	11-9/16 (294)	35 (889)	17 (432)	17-3/4 (438)
8	10	15	5	3	8 (203)	1-3/4 (44)	4 (102)	18 (457)	17 (432)	9 (227)	2-7/8 (73)	3/8 (10)	3/16 (5)	11-13/16 (300)	35 (889)	17 (432)	17-3/4 (438)
8	10	17	5	3	8 (203)	1-3/4 (44)	4 (102)	18 (457)	17 (432)	8 (203)	2-7/8 (73)	3/8 (10)	3/16 (5)	12-3/8 (314)	35 (889)	17 (432)	17-3/4 (438)
10	12	12B	6B	4	12 (305)	2-1/8 (54)	5-1/2 (140)	21-7/8 (556)	16 (406)	12 (305)	4-3/4 (121)	1/2 (13)	1/4 (6)	12-1/2 (318)	40-7/8 (1038)	19 (483)	19 (483)

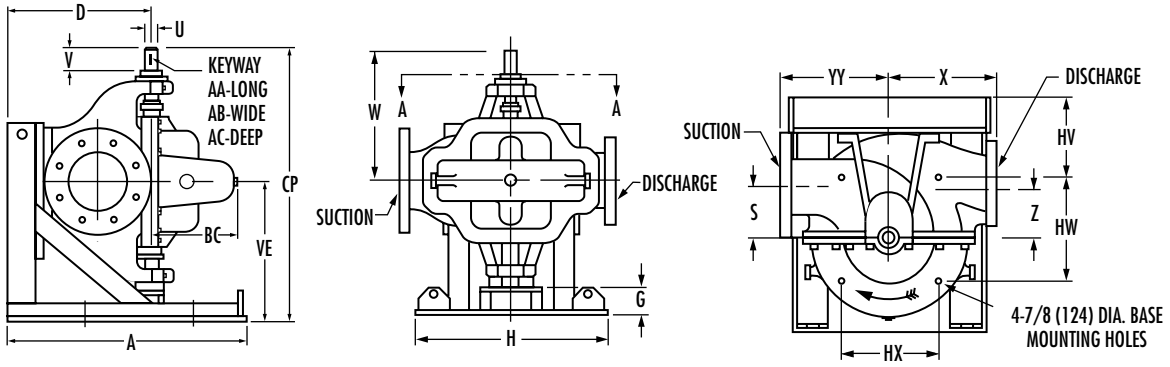
BASE	1	2	3	4
A	18 (457)	22 (559)	30 (762)	40 (1016)
G	1-3/4 (44)	1-3/4 (44)	2 (51)	2-1/4 (57)
H	3/4 (19)	3/4 (19)	7/8 (22)	7/8 (22)
HV	16-1/4 (413)	20 (508)	28 (711)	38 (965)

NOTES:
1. All dimensions in inches (mm).
2. Dimensions may vary ± 3/8" (10).
3. Not for construction purposes unless certified.
4. Discharge and suction flanges - ANSI Standard flat face.

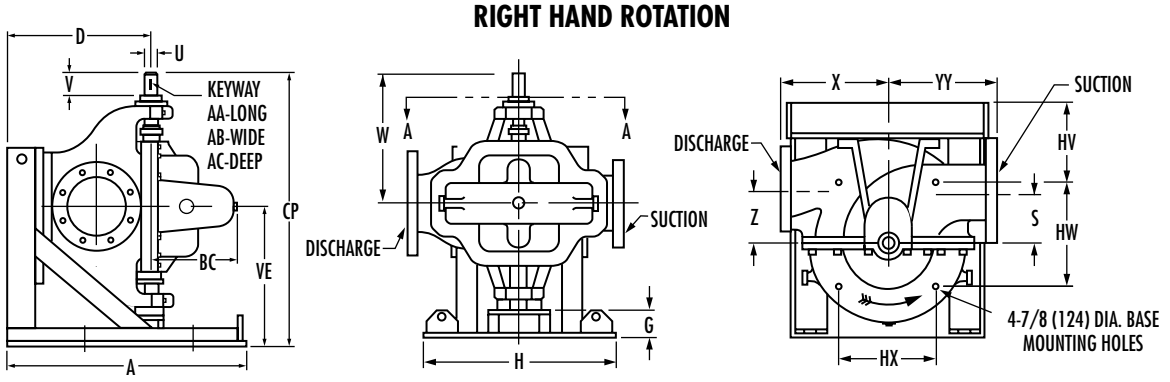
AURORA®
Pentair Pump Group

AURORA MODEL 412-C PUMPS

10"-12"-14" PUMPS
POWER SERIES NO. 6B-7
VERTICAL CHAIR MOUNTED



RIGHT HAND ROTATION



LEFT HAND ROTATION

PUMP SIZE			POWER SERIES	BASE	D	S	U	V	W	X	Z	AA	AB	AC	BC	CP	VE	YY
DISCH	SUCT	CASE BORE																
8	10	21	6B	4	25-1/4 (641)	9-1/2 (241)	2-1/8 (54)	5-7/16 (138)	21-7/8 (556)	18 (457)	9-1/2 (241)	4-3/4 (121)	1/2 (13)	1/4 (6)	14 (356)	47 (1194)	25-1/8 (638)	21 (533)
10	12	15	6B	1	31-3/4 (806)	13-1/2 (343)	2-1/8 (54)	5-7/16 (138)	21-7/8 (556)	17 (432)	13-1/2 (343)	4-3/4 (121)	1/2 (13)	1/4 (6)	13-1/2 (343)	47 (1194)	25-1/8 (638)	20 (508)
10	12	18	6B	1	31-3/4 (806)	13-1/2 (343)	2-1/8 (54)	5-7/16 (138)	21-7/8 (556)	18 (457)	13-1/2 (343)	4-3/4 (121)	1/2 (13)	1/4 (6)	14-1/2 (368)	47 (1194)	25-1/8 (638)	22 (559)
12	14	15	7	2	33-3/4 (857)	15 (381)	2-1/2 (64)	6-5/8 (168)	25-1/4 (641)	17 (432)	15 (381)	5 (127)	5/8 (16)	5/16 (8)	15 (381)	51-1/4 (1302)	26 (660)	22 (559)
12	14	18	7	2	33-3/4 (857)	15 (381)	2-1/2 (64)	6-5/8 (168)	25-1/4 (641)	18 (457)	15 (381)	5 (127)	5/8 (16)	5/16 (8)	16-1/8 (410)	51-1/4 (1302)	26 (660)	23 (584)
14	16	18	7	3	36 (914)	16 (406)	2-1/2 (64)	6-5/8 (168)	25-1/4 (641)	22 (559)	16 (406)	5 (127)	5/8 (16)	5/16 (8)	18-1/4 (464)	51-1/4 (1302)	26 (660)	27 (686)

BASE	1	2	3	4
A	38 (965)	46 (1168)	48 (1219)	40 (1016)
G	9-5/8 (244)	8 (203)	8 (203)	9-5/8 (244)
H	36-1/2 (927)	35 (889)	35 (889)	36-1/2 (927)
HV	8 (203)	8 (203)	8 (203)	8 (203)
HW	26 (660)	34 (864)	36 (914)	28 (711)
HX	22 (559)	19 (483)	19 (483)	22 (559)

STD. 125# FLANGES	OPT. 250# FLANGES

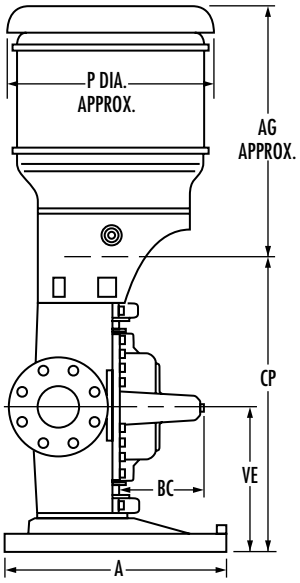
NOTES:
1. All dimensions in inches (mm).
2. Dimensions may vary ± 3/8" (10).
3. Not for construction purposes unless certified.
4. Discharge and suction flanges - ANSI Standard flat face.

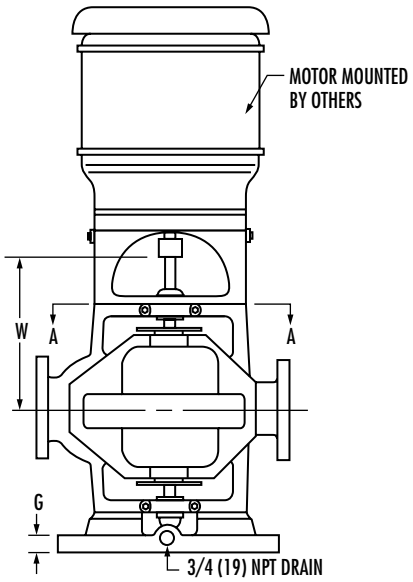
Supersedes Section 410 PAGE 206
DATED June 1994

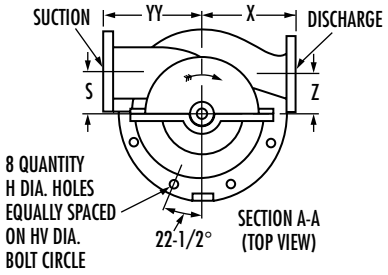
AURORA MODEL 413 PUMPS

2" THRU 4" PUMPS

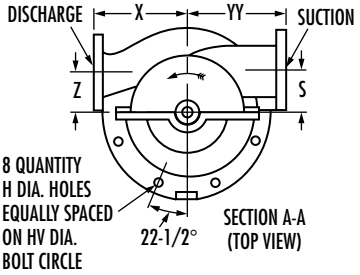
POWER SERIES NO. 1-2-3







RIGHT HAND ROTATION



LEFT HAND ROTATION

PUMP SIZE			POWER SERIES	BASE	S	W	X	Z	BC	VE	YY
DISCH	SUCT	CASE BORE									
2	2-1/2	9	1	1	3-1/2 (89)	11-5/8 (295)	8-1/2 (216)	3-1/2 (89)	6-3/8 (162)	11-1/8 (283)	9 (228)
2	2-1/2	10	1	1	3-1/2 (89)	11-5/8 (295)	8-1/2 (216)	3-1/2 (89)	6-3/8 (162)	11-1/8 (283)	9 (228)
2	2-1/2	12	1	1	4 (102)	11-5/8 (295)	10 (254)	4 (102)	7-7/8 (200)	11-1/8 (283)	10-3/4 (273)
2-1/2	3	10	2	1	4 (102)	13-1/2 (343)	9-3/4 (247)	4 (102)	8 (203)	13 (330)	10 (254)
2-1/2	3	12	2	1	4-1/2 (114)	13-1/2 (343)	11 (279)	4-1/2 (114)	8-1/4 (210)	13 (330)	11-1/2 (292)
3	4	10	2	1	4-1/2 (114)	13-1/2 (343)	10 (254)	4-1/2 (114)	7-3/16 (183)	13 (330)	11 (279)
3	4	14	2	1	5 (127)	13-1/2 (343)	12 (305)	5 (127)	9-3/8 (238)	13 (330)	13 (330)
4	5	10	2	1	4-5/8 (117)	13-1/2 (343)	10 (254)	4-1/2 (114)	7-3/16 (183)	13 (330)	11-1/4 (286)
4	5	11	3	2	5 (127)	14-1/2 (368)	11-1/4 (286)	5 (127)	8-5/16 (211)	14 (356)	12-3/4 (324)
4	5	15	3	2	5-1/2 (140)	14-1/2 (368)	13 (330)	5-1/2 (140)	9 (228)	14 (356)	14 (356)

BASE	1	2	3	4
A	18 (457)	22 (558)	30 (762)	40 (1016)
G	1-3/4 (44)	1-3/4 (44)	2 (51)	2-1/4 (57)
H	3/4 (19)	3/4 (19)	7/8 (22)	7/8 (22)
HV	16-1/4 (413)	20 (508)	28 (711)	38 (965)

☐ STD. 125# FLANGES ☐ OPT. 250# FLANGES

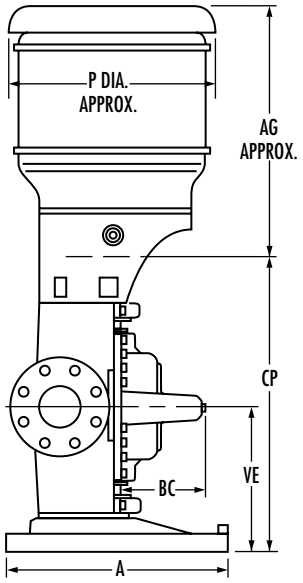
	FRAME	143	145	182	184	213	215	254	256	284	286	324	326	364	365	404	405	444	445
	P	8 (203)	8 (203)	10 (254)	10 (254)	11 (279)	11 (279)	13 (330)	13 (330)	16 (406)	16 (406)	18 (457)	18 (457)	21 (534)	21 (534)	22 (559)	22 (559)	24 (610)	24 (610)
	AG	11 (279)	12 (305)	14 (356)	15 (381)	16 (406)	17 (432)	20 (508)	21 (534)	22 (559)	23 (584)	25 (635)	26 (660)	25 (635)	25 (635)	28 (711)	28 (711)	32 (813)	32 (813)
PUMP SIZE		CP																	
2 x 2-1/2 x 9 2 x 2-1/2 x 10 2 x 2-1/2 x 12		26 (660)								28 (711)		NOT AVAILABLE							
2-1/2 x 3 x 10 2-1/2 x 3 x 12 3 x 4 x 10 3 x 4 x 14 4 x 5 x 10		30 (762)								32 (813)					NOT AVAILABLE				
4 x 5 x 11 4 x 5 x 15		33 (838)								35 (889)								NA	

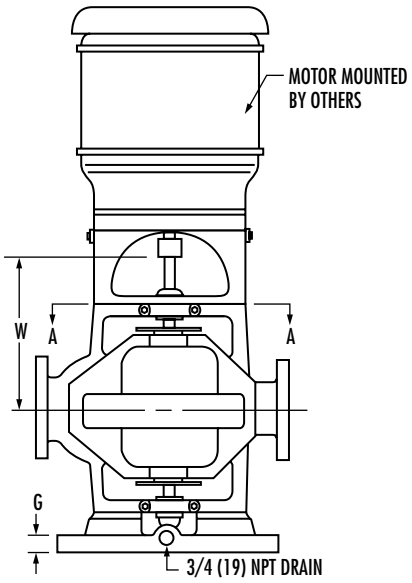
NOTES:
1. All dimensions in inches (mm).
2. Dimensions may vary ± 3/8" (10).
3. Not for construction purposes unless certified.
4. Coupling gap may vary 1/8" (3) to 1" (25)
5. Height (AG) and diameter (P) dimensions of motor will vary based on make and style of motor. DIMENSIONS SHOWN REFLECT AURORA STANDARD MOTORS. See individual motor supplier dimensional data sheets for your application.
6. Conduit box is shown in approximate location. Dimensions are not specified as they vary for each motor manufacturer.
7. Discharge and suction flanges - ANSI Standard flat face.

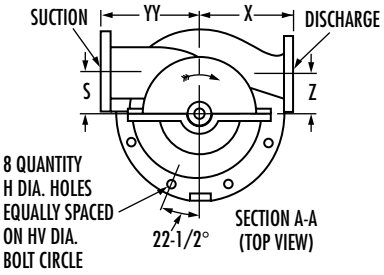
AURORA MODEL 413 PUMPS

4" THRU 10" PUMPS

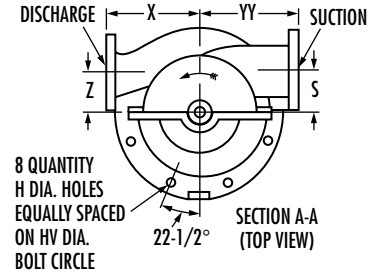
POWER SERIES NO. 4-5-6B







RIGHT HAND ROTATION



LEFT HAND ROTATION

PUMP SIZE			POWER SERIES	BASE	S	W	X	Z	BC	VE	YY
DISCH	SUCT	CASE BORE									
4	6	18	4	2	6-1/4 (159)	16 (406)	14 (356)	6-1/4 ()	11-3/4 (298)	15 (381)	16 (406)
5	6	11	4	2	5-1/2 (140)	16 (406)	11-1/4 (286)	5-1/2 (140)	8-3/4 (222)	15 (381)	13-1/4 (337)
5	6	15	4	2	6-1/4 (159)	16 (406)	13-1/4 (337)	6-1/4 (159)	10-1/16 (256)	15 (381)	15 (381)
5	6	17	4	2	6-1/4 (159)	16 (406)	14 (356)	6-1/4 (159)	10-1/16 (256)	15 (381)	15 (381)
6	8	11	4	2	6-1/4 (159)	16 (406)	11-3/4 (298)	6-1/4 (159)	9-1/4 (235)	15 (381)	14-1/2 (368)
8	8	11	4	2	6-1/4 (159)	16 (406)	12 (305)	6-1/4 (159)	9-3/4 (248)	15 (381)	14-1/2 (368)
6	8	15	5	3	6-3/4 (171)	18 (457)	14-1/4 (362)	6-3/4 (171)	11-5/16 (287)	17 (432)	16-3/4 (425)
6	8	18	5	3	8 (203)	18 (457)	16 (406)	8 (203)	12-1/2 (318)	17 (432)	18 (457)
6	8	20	5	3	8 (203)	18 (457)	15-3/4 (400)	8 (203)	2-15/16 (75)	17 (432)	18 (457)
8	10	12	5	3	8 (203)	18 (457)	17 (432)	9 (228)	11-9/16 (294)	17 (432)	17-3/4 (451)
8	10	15	5	3	8 (203)	18 (457)	17 (432)	9 (228)	11-13/16 (300)	17 (432)	17-3/4 (451)
8	10	17	5	3	8 (203)	18 (457)	17 (432)	8 (203)	12-3/8 (314)	17 (432)	17-3/4 (451)
10	12	12B	6B	4	12 (305)	21-7/8 (457)	16 (406)	12 (305)	12-1/2 (318)	19 (483)	19 (483)

BASE	1	2	3	4
A	18 (457)	22 (558)	30 (762)	40 (1016)
G	1-3/4 (44)	1-3/4 (44)	2 (51)	2-1/4 (57)
H	3/4 (19)	3/4 (19)	7/8 (22)	7/8 (22)
HV	16-1/4 (413)	20 (508)	28 (711)	38 (965)

STD. 125# FLANGES | OPT. 250# FLANGES

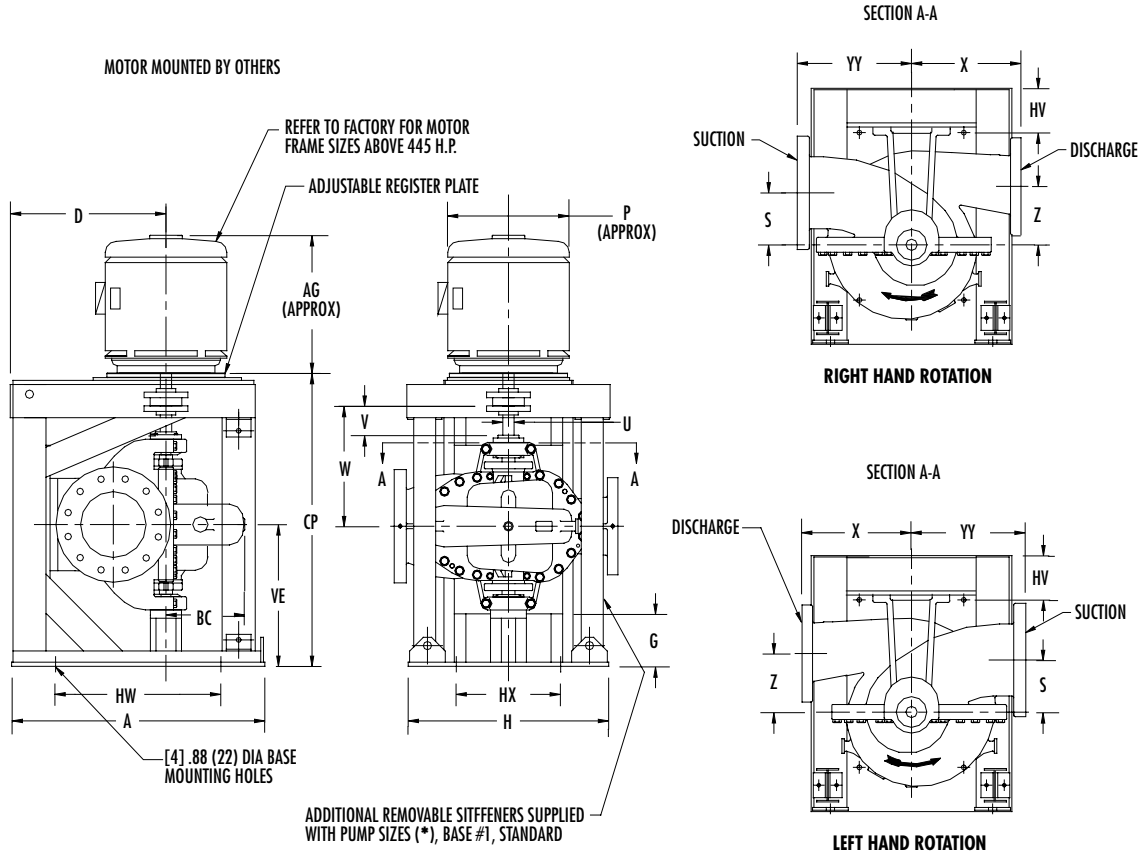
	FRAME	143	145	182	184	213	215	254	256	284	286	324	326	364	365	404	405	444	445
	P	8 (203)	8 (203)	10 (254)	10 (254)	11 (279)	11 (279)	13 (330)	13 (330)	16 (406)	16 (406)	18 (457)	18 (457)	21 (534)	21 (534)	22 (559)	22 (559)	24 (610)	24 (610)
	AG	11 (279)	12 (305)	14 (356)	15 (381)	16 (406)	17 (432)	20 (508)	21 (534)	22 (559)	23 (584)	25 (635)	26 (660)	25 (635)	25 (635)	28 (711)	28 (711)	32 (813)	32 (813)
PUMP SIZE		CP																	
4 x 6 x 18 5 x 6 x 11 5 x 6 x 15 5 x 6 x 17 6 x 8 x 11 8 x 8 x 11		35 (889)								37 (940)								NOT AVAILABLE	
6 x 8 x 15 6 x 8 x 18 6 x 8 x 20 8 x 10 x 12 8 x 10 x 15 8 x 10 x 17		NOT AVAILABLE								41 (1041)									
10 x 12 x 12B		NOT AVAILABLE								46-1/2 (1181)									

NOTES:
1. All dimensions in inches (mm).
2. Dimensions may vary ± 3/8" (10).
3. Not for construction purposes unless certified.
4. Coupling gap may vary 1/8" (3) to 1" (25)
5. 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.
6. Conduit box is shown in approximate location. Dimensions are not specified as they vary for each motor manufacturer.
7. Discharge and suction flanges - ANSI Standard flat face.

Supersedes Section 410 Page 208
Dated January 2003

AURORA MODEL 413-C PUMPS

10"-12"-14" PUMPS
POWER SERIES NO. 5-6B-7
VERTICAL CHAIR MOUNTED



	PUMP SIZE			POWER SERIES	BASE	D	S	U	V	W	X	Z	BC	CP	VE	YY
	DISCH	SUCT	CASE BORE													
	8	10	17B	5	5	25 (635)	8 (203)	1.75 (45)	4 (102)	18 (457)	17 (432)	8 (203)	12.38 (314)	47 (1194)	22.88 (581)	17.75 (451)
	8	10	21	6B	4	25.25 (641)	9.5 (241)	2.13 (54)	5.44 (138)	21.88 (556)	18 (457)	9.5 (241)	14 (356)	51.75 (1314)	25.13 (638)	21.0 (533)
*	10	12	15	6B	1	31.75 (806)	13.5 (343)	2.13 (54)	5.44 (138)	21.88 (556)	17 (432)	13.5 (343)	13.5 (343)	51.75 (1314)	25.13 (638)	20 (508)
*	10	12	18	6B	1	31.75 (806)	13.5 (343)	2.13 (54)	5.44 (138)	21.88 (556)	18 (457)	13.5 (343)	14.5 (368)	51.75 (1314)	25.13 (638)	22.0 (559)
	12	14	15	7	2	33.75 (857)	15 (381)	2.5 (64)	6.63 (168)	25.25 (641)	17 (432)	15 (381)	15 (381)	56 (1422)	26 (660)	22.0 (559)
	12	14	18	7	2	33.75 (857)	15 (381)	2.5 (64)	6.63 (168)	25.25 (641)	18 (457)	15 (381)	16.13 (410)	56 (1422)	26 (660)	23 (584)
	14	16	18	7	3	36 (914)	16 (406)	2.5 (64)	6.63 (168)	25.25 (641)	22.0 (559)	16 (406)	18.25 (464)	56 (1422)	26 (660)	27 (686)

BASE	1	2	3	4	5
A	50 (1270)	46 (1168)	48 (1219)	40 (1016)	40 (1016)
G	9.63 (245)	8 (203)	8 (203)	9.63 (245)	9.63 (245)
H	36.5 (927)	35 (889)	35 (889)	36.5 (927)	36.5 (927)
HV	8 (203)	8 (203)	8 (203)	8 (203)	8 (203)
HW	34 (864)	34 (864)	36 (914)	28 (711)	28 (711)
HX	19 (483)	19 (483)	19 (483)	22.0 (559)	22.0 (559)

	FRAME	364	365	404	405	444	445
	P	21.0 (533)	21.0 (533)	22.0 (559)	22.0 (559)	24.0 (610)	24.0 (610)
	AG	25.0 (635)	25.0 (635)	28.0 (711)	28.0 (711)	32.0 (813)	32.0 (813)
PUMP SIZE		MOTOR SIZING (7)					
8 x 10 x 17B							
8 x 10 x 21		X	X	X	X	X	X
10 x 12 x 15		X	X	X	X	X	X
10 x 12 x 18					X	X	X
12 x 14 x 15				X	X	X	X
12 x 14 x 18							X
14 x 16 x 18							X

NOTES:
1. All dimensions in inches (mm).
2. Dimensions may vary ± 3/8" (10).
3. Not for construction purposes unless certified.
4. Discharge and suction flanges - ANSI Standard flat face.
5. 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.
6. Conduit box is shown in approximate location. Dimensions are not specified as they vary for each motor manufacturer.
7. (X) denotes standard frame sizes based on horsepower.

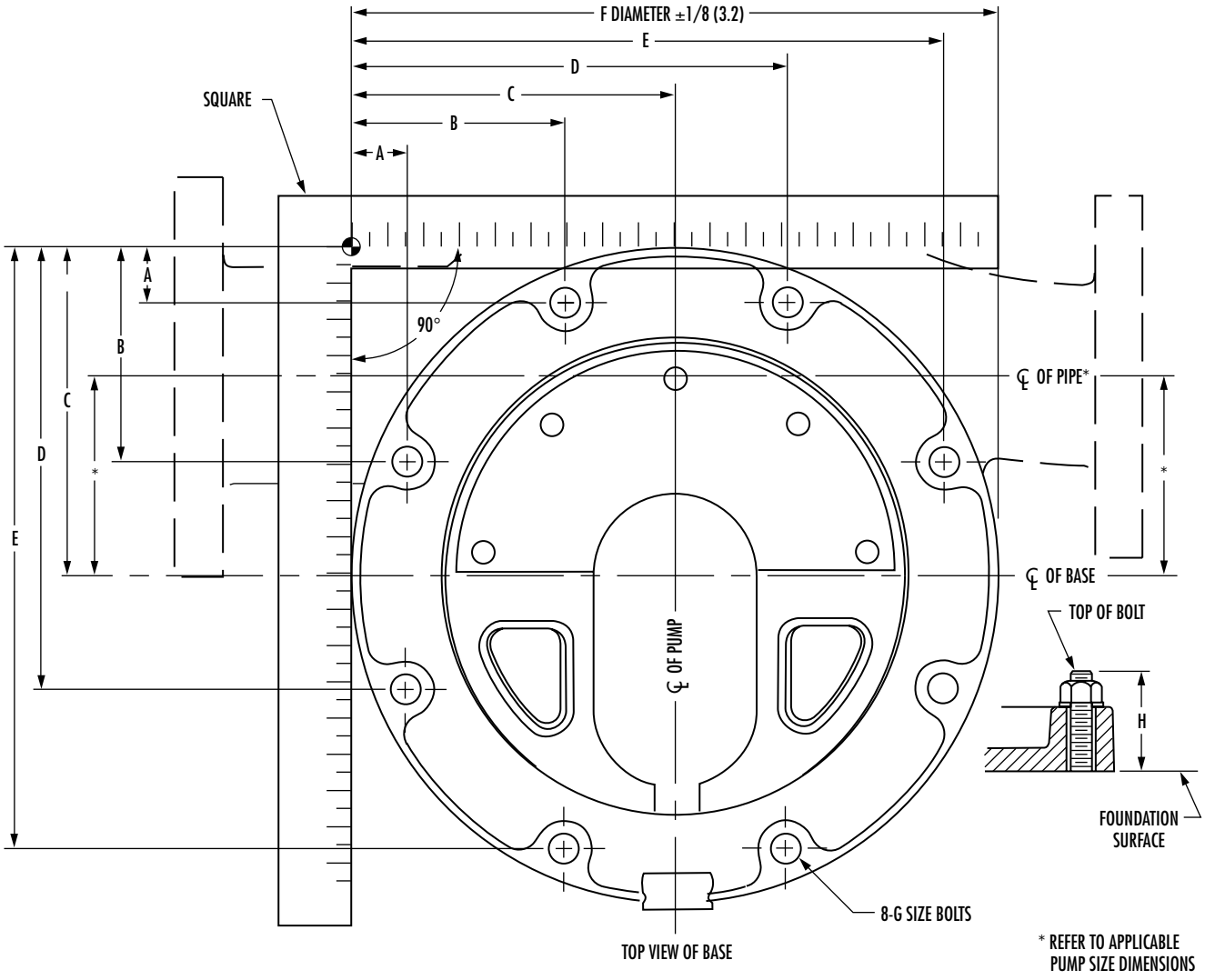
STD. 125# FLANGES	OPT. 250# FLANGES

AURORA®
Pentair Pump Group

AURORA MODEL 412 & 413

BASEPLATE DIMENSIONS

Supersedes Section 410 Page 209
Dated March 1981

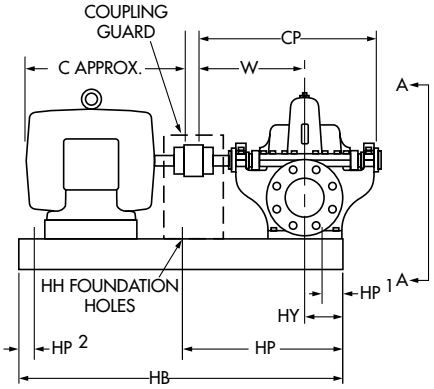


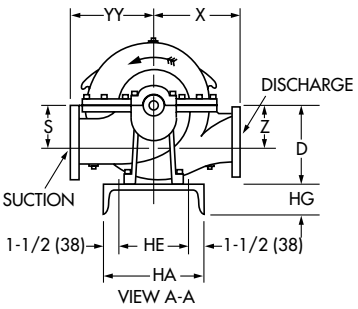
BASE	A	B	C	D	E	F	G	H	FULL SCALE TEMPLATE
1	1-1/2 (38)	5-29/32 (150)	9 (229)	12-1/8 (308)	16-1/2 (419)	18 (457)	5/8 (16)	2-3/4 (70)	294-0579-000
2	1-25/32 (45)	7-3/16 (183)	11 (279)	14-27/32 (377)	20-1/4 (514)	22 (559)	5/8 (16)	2-3/4 (70)	294-0580-000
3	2-1/16 (52)	9-21/32 (245)	15 (381)	20-3/8 (518)	27-15/16 (710)	30 (762)	3/4 (19)	3-1/4 (83)	294-0581-000
4	2-7/16 (62)	12-23/32 (323)	20 (508)	27-9/32 (693)	37-9/16 (954)	40 (1016)	3/4 (19)	3-1/2 (89)	294-0613-000

NOTES:
1. All dimensions in inches (mm).
2. Dimensions may vary ± 3/8" (10).
3. Not for construction purposes unless certified.
4. Discharge and suction flanges - ANSI Standard flat face.

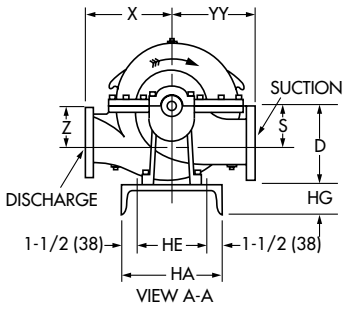
AURORA MODEL 411 PUMPS

ON STEEL BASE
2" THRU 4" PUMPS
POWER SERIES NO. 1-2-3





RIGHT HAND ROTATION



LEFT HAND ROTATION

BASE	SIZE	HA	HB	HE	HG	HH QTY	HH SIZE	HP	HP1	HP2
2	10 x 28	10 (254)	28 (711)	7 (178)	2-5/8 (67)	2	5/8 (16)	14 (356)	-	-
3	12 x 30	12 (305)	30 (762)	9 (229)	3 (76)	2	5/8 (16)	15 (381)	-	-
4	12 x 34	12 (305)	34 (864)	9 (229)	3 (76)	4	5/8 (16)	20 (508)	-	1 (25)
5	12 x 38	12 (305)	38 (965)	9 (229)	3 (76)	4	5/8 (16)	20 (508)	-	1 (25)
6	13 x 38	13 (330)	38 (965)	10 (254)	4 (102)	4	3/4 (19)	-	1 (25)	1 (25)
7	13 x 42	13 (330)	42 (1067)	10 (254)	4 (102)	4	3/4 (19)	24 (610)	-	1 (25)
8	15 x 40	15 (381)	40 (1016)	12 (305)	3-3/8 (86)	4	3/4 (19)	-	1 (25)	1 (25)
9	15 x 44	15 (381)	44 (1118)	12 (305)	3-3/8 (86)	4	3/4 (19)	24 (610)	-	1 (25)
10	18 x 44	18 (457)	44 (1118)	15 (381)	4 (102)	4	3/4 (19)	-	1 (25)	1 (25)
11	18 x 48	18 (457)	48 (1219)	15 (381)	4 (102)	4	3/4 (19)	-	1 (25)	1 (25)
12	18 x 54	18 (457)	54 (1372)	15 (381)	4 (102)	4	3/4 (19)	-	1 (25)	1 (25)
15	22 x 60	22 (559)	60 (1524)	19 (483)	4 (102)	4	3/4 (19)	-	1 (25)	1 (25)

NOTE: WHEN 2 "D" DIMENSIONS ARE INDICATED ALWAYS USE THE LARGER FIGURE.

PUMP SIZE DISCH	PUMP SIZE SUCT	PUMP SIZE CASE BORE	POWER SERIES	D	S	W	X	Z	CP	HY	YY
2	2-1/2	9	1	7 (178)	3-1/2 (89)	11-5/8 (295)	8-1/2 (216)	3-1/2 (89)	20-1/2 (521)	4 (102)	9 (229)
2	2-1/2	10	1	7 (178)	3-1/2 (89)	11-5/8 (295)	8-1/2 (216)	3-1/2 (89)	20-1/2 (521)	4 (102)	9 (229)
2	2-1/2	12	1	8 (203)	4 (102)	11-5/8 (295)	10 (254)	4 (102)	20-1/2 (521)	4 (102)	10-3/4 (273)
2-1/2	3	10B	2	8 (203)	4 (102)	13-1/2 (343)	9-3/4 (248)	4 (102)	24 (610)	5 (127)	10 (254)
2-1/2	3	12	2	9** (229**)	4-1/2 (114)	13-1/2 (343)	11 (279)	4-1/2 (114)	24 (610)	5 (127)	11-1/2 (292)
3	4	10B & C	2	9** (229**)	4-1/2 (114)	13-1/2 (343)	10 (254)	4-1/2 (114)	24 (610)	5 (127)	11 (279)
3	4	14	2	10 (254)	5 (127)	13-1/2 (343)	12 (305)	5 (127)	24 (610)	5 (127)	13 (330)
4	5	10B	2	9** (229**)	4-5/8 (118)	13-1/2 (343)	10 (254)	4-1/2 (114)	24 (610)	5 (127)	11-1/4 (286)
4	5	11A & C	3	10‡ (254‡)	5 (127)	14-1/2 (368)	11-1/4 (286)	5 (127)	26 (660)	6 (152)	12-3/4 (324)
4	5	15	3	11 (279)	5-1/2 (140)	14-1/2 (368)	13 (330)	5-1/2 (140)	26 (660)	6 (152)	14 (356)

PUMP SIZE	FRAME	143T	145T	182T	184T	213T	215T	254T	256T	284TS	284T	286TS	286T	324TS	324T	326TS	326T	364TS	364T	365TS	365T	404TS	405TS	444TS
	C	13 (330)	13 (330)	13 (330)	14 (356)	16 (406)	18 (457)	21 (533)	23 (584)	22 (559)	24 (610)	24 (610)	25 (635)	25 (635)	26 (660)	26 (660)	28 (711)	27 (686)	29 (711)	28 (711)	30 (762)	30 (762)	31 (787)	34 (864)
	D	-	-	-	-	-	-		-	-	-	-	-	8 (203)	8 (203)	8 (203)	9 (229)	9 (229)	9 (229)	9 (229)	9 (229)	10 (254)	10 (254)	11 (279)
2 x 2-1/2 x 9	BASE																							
2 x 2-1/2 x 10	BASE	2		3		4		6		8			9	10		-								
2 x 2-1/2 x 12	BASE																							
2-1/2 x 3 x 10B	BASE																							
2-1/2 x 3 x 12	BASE																							
3 x 4 x 10B & C	BASE	3		4		5		7		9				10	11	10	11			12		-		
3 x 4 x 14	BASE																							
4 x 5 x 10B	BASE																							
4 x 5 x 11A & C	BASE	-			5	7			9	11									12			15		
4 x 5 x 15	BASE																							

NOTES:
1. All dimensions in inches (mm).
2. Dimensions may vary ± 3/8" (10).
3. Not for construction purposes unless certified.
4. Coupling gap may vary 1/8" (3) to 2-1/16" (52).
5. Conduit box is shown in approximate location. Dimensions are not specified as they vary with each motor manufacturer.
6. Discharge and suction flanges - ANSI Standard flat face.

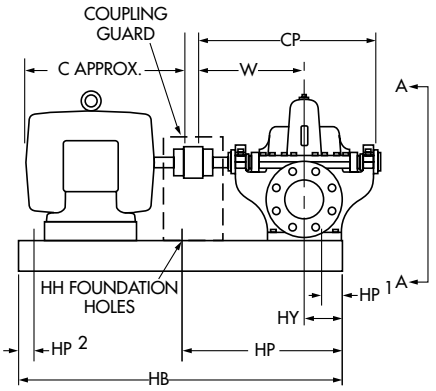
** Dimension "D" is 10-1/2" (267) when using frames 324TS thru 365T.
‡ Dimension "D" is 10-1/2" (267) when using frames 404TS thru 405TS.
‡ Dimension "D" is 11" (279) when using frames 444TS.

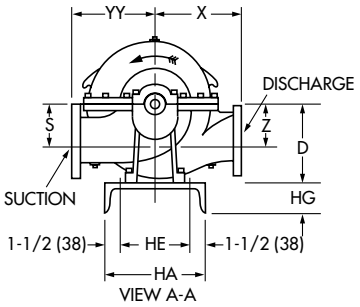
STD. 125# FLANGES	OPT. 250# FLANGES

Supersedes Section 410 Page 252
Dated FEBRUARY 1999

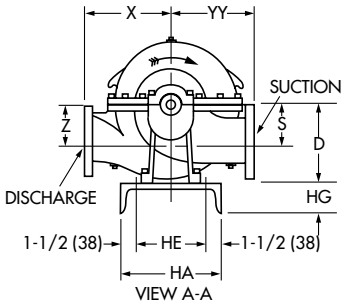
AURORA MODEL 411 PUMPS

ON STEEL BASE
4" THRU 8" PUMPS
POWER SERIES NO. 4 AND 5





RIGHT HAND ROTATION



LEFT HAND ROTATION

BASE	SIZE	HA	HB	HE	HG	HH QTY	HH SIZE	HP	HP1	HP2
5	12 x 38	12 (305)	38 (965)	9 (229)	3 (76)		5/8 (16)	20 (508)	-	
7	13 x 42	13 (330)	42 (1067)	10 (254)	4 (102)			24 (610)	-	
9	15 x 44	15 (381)	44 (1118)	12 (305)	3-3/8 (86)			24 (610)	-	
10	18 X 44	18 (457)	44 (1219)	15 (381)	4 (102)			-		
11	18 x 48	18 (457)	48 (1219)	15 (381)	4 (102)			-	1 (25)	
12	18 x 54	18 (457)	54 (1372)	15 (381)	4 (102)	4	3/4 (19)	-		1 (25)
13	18 x 60	18 (457)	60 (1524)	15 (381)	4 (102)			24 (610)	-	
14	18 x 65	18 (457)	65 (1651)	15 (381)	4 (102)			24 (610)	-	
15	22 x 60	22 (559)	60 (1524)	19 (483)	4 (102)			-		
16	22 x 72	22 (559)	72 (1829)	19 (483)	4 (102)			-	1 (25)	
17	22 x 84	22 (559)	84 (2134)	19 (483)	4 (102)			-		

PUMP SIZE DISCH	SUCT	CASE BORE	POWER SERIES	D	S	W	X	Z	CP	HY	YY
4	6	18B	4	12-1/2 (318)	6-1/4 (159)	16 (406)	14 (356)	6-1/4 (159)	28-1/2 (724)	6 (152)	16 (406)
5	6	11A & C		11** (279**)	5-1/2 (140)		11-1/4 (286)	5-1/2 (140)			13-1/4 (337)
5	6	15		12-1/2 (318)	6-1/4 (159)		13-1/4 (337)	6-1/4 (159)			15 (381)
5	6	17		12-1/2 (318)	6-1/4 (159)		14 (356)	6-1/4 (159)			15 (381)
6	8	11		12-1/2 (318)	6-1/4 (159)		11-3/4 (286)	6-1/4 (159)			14-1/2 (368)
8	8	11B		12-1/2‡ (318‡)	6-1/4 (159)		12 (305)	6-1/4 (159)			14-1/2 (368)
6	8	15	5	13-1/2 (343)	6-3/4 (171)	18 (457)	14-1/4 (362)	6-3/4 (171)	32 (813)	7 (178)	16-3/4 (425)
6	8	18A,B & C		14-3/4 (375)	8 (203)		16 (406)	8 (203)			18 (457)
6	8	20		14-3/4 (375)	8 (203)		15-3/4 (400)	8 (203)			18 (457)
8	10	12 & 12A		14-3/4 (375)	8 (203)		17 (432)	9 (229)			17-3/4 (451)
8	10	15A & B		14-3/4 (375)	8 (203)		17 (432)	9 (229)			17-3/4 (451)
8	10	17B		14-3/4 (375)	8 (203)		17 (432)	8 (203)			17-3/4 (451)

FRAME		213T	215T	254T	256T	284TS	284T	286TS	286T	324TS	324T	326TS	326T	364TS	364T	365TS	365T	404TS	404T	405TS	405T	444TS	444T	445TS	445T	447TS	447T	449TS	449T
PUMP SIZE	C	16 (406)	18 (457)	21 (533)	23 (584)	22 (559)	24 (610)	24 (610)	25 (635)	25 (635)	26 (660)	26 (660)	28 (711)	27 (686)	29 (737)	28 (711)	30 (762)	30 (762)	33 (838)	31 (787)	35 (889)	34 (864)	38 (965)	36 (1016)	40 (914)	40 (914)	44 (1118)	45 (1143)	49 (1245)
4 x 6 x 18B	BASE	5	7	9	10	11				12								15								16			
5 x 6 x 11A & C	BASE																												
5 x 6 x 15	BASE																												
5 x 6 x 17	BASE																												
6 x 8 x 11	BASE																												
8 x 8 x 11B	BASE																												
6 x 8 x 15	BASE	-	-	10	11	12										13		15				16							17
6 x 8 x 18A, B, & C	BASE	-	-																										
6 x 8 x 20	BASE	-	-																										
8 x 10 x 12 & 12A	BASE	-	-																										
8 x 10 x 15A & B	BASE	-	-																										
8 x 10 x 17B	BASE	-	-																										

NOTES:
1. All dimensions in inches (mm).
2. Dimensions may vary ± 3/8" (10).
3. Not for construction purposes unless certified.
4. Coupling gap may vary 1/8" (3) to 2-1/16" (52).
5. Conduit box is shown in approximate location. Dimensions are not specified as they vary with each motor manufacturer.
6. Discharge and suction flanges - ANSI Standard flat face.

** Dimension "D" is 12" (305) when using frames 404TS thru 449T.

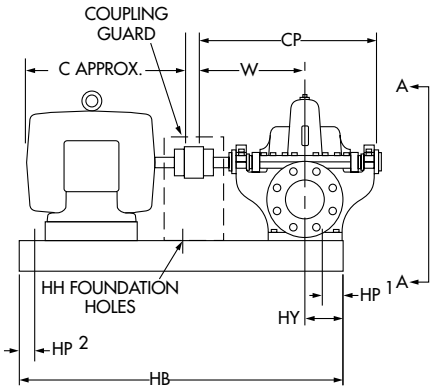
‡ Dimension "D" is 14-1/2" (368) when using frames 404TS thru 449T.

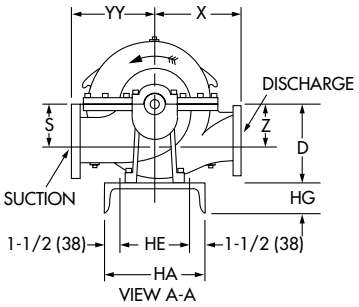
STD. 125# FLANGES	OPT. 250# FLANGES

AURORA®
Pentair Pump Group

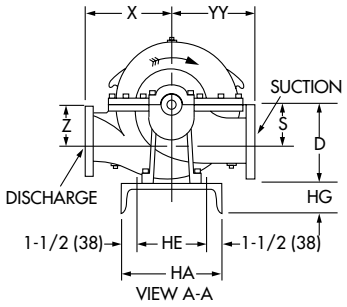
AURORA MODEL 411 PUMPS

ON STEEL BASE
8" THRU 12" PUMPS
POWER SERIES NO. 6B & 7





RIGHT HAND ROTATION



LEFT HAND ROTATION

BASE	SIZE	HA	HB	HE	HG	HH QTY	HH SIZE	HP1	HP2
13	18 x 60	18 (457)	60 (1524)	15 (381)	4 (102)	4	3/4 (19)	24 (610)	1 (25)
14	18 x 65	18 (457)	65 (1651)	15 (381)	4 (102)	4	3/4 (19)	24 (610)	1 (25)
15	22 x 60	22 (559)	60 (1524)	19 (483)	4 (102)	4	3/4 (19)	1 (25)	1 (25)
16	22 x 72	22 (559)	72 (1829)	19 (483)	4 (102)	4	3/4 (19)	1 (25)	1 (25)
17	22 x 84	22 (559)	84 (2134)	19 (483)	4 (102)	4	3/4 (19)	1 (25)	1 (25)

PUMP SIZE DISCH	PUMP SIZE SUCT	PUMP SIZE CASE BORE	POWER SERIES	D	S	W	X	Z	CP	HY	YY
8	10	21 & 21A	6B	18-1/2 (470)	9-1/2 (241)	21-7/8 (556)	18 (457)	9-1/2 (241)	38 (965)	11 (279)	21 (533)
10	12	12B		23 (584)	12 (305)	21-7/8 (556)	16 (406)	12 (305)	38 (965)	11 (279)	19 (483)
10	12	15B & C		25 (635)	13-1/2 (343)	27-7/8 (708)	17 (432)	13-1/2 (343)	38 (965)	11 (279)	20 (508)
10	12	18		25 (635)	13-1/2 (343)	27-7/8 (708)	18 (457)	13-1/2 (343)	38 (965)	11 (279)	22 (559)
12	14	15B	7	24 (610)	15 (381)	25-1/4 (641)	17 (432)	15 (381)	43-7/8 (1114)	11 (279)	22 (559)
12	14	18A		24 (610)	15 (381)	25-1/4 (641)	18 (457)	15 (381)	43-7/8 (1114)	11 (279)	23 (584)
14	16	18		29-1/4 (743)	16 (406)	25-1/4 (641)	22 (559)	16 (406)	43-7/8 (1114)	11 (279)	27 (686)

PUMP SIZE	FRAME	286TS	286T	324TS	324T	326TS	326T	364TS	364T	365TS	365T	404TS	404T	405TS	405T	444TS	444T	445TS	445T	447TS	447T	449TS	449T
	C	24 (610)	25 (635)	25 (635)	26 (660)	26 (660)	28 (711)	27 (686)	29 (737)	28 (711)	30 (762)	30 (762)	33 (838)	31 (787)	35 (889)	34 (864)	38 (965)	36 (1016)	40 (914)	40 (914)	44 (1118)	45 (1143)	49 (1245)
8 x 10 x 21 & 21A	BASE	13				14						16						17					
10 x 12 x 12B	BASE																						
10 x 12 x 15B & C	BASE																						
10 x 12 x 18	BASE																						
12 x 14 x 15B	BASE	-											16				17						
12 x 14 x 18A	BASE																						
14 x 16 x 18	BASE																						

NOTES:
1. All dimensions in inches (mm).
2. Dimensions may vary ± 3/8" (10).
3. Not for construction purposes unless certified.
4. Coupling gap may vary 1/8" (3) to 2-1/16" (52).
5. Conduit box is shown in approximate location. Dimensions are not specified as they vary with each motor manufacturer.
6. Discharge and suction flanges - ANSI Standard flat face.

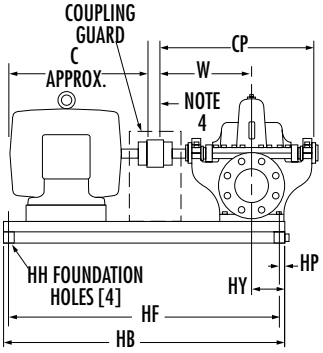
STD. 125# FLANGES	OPT. 250# FLANGES

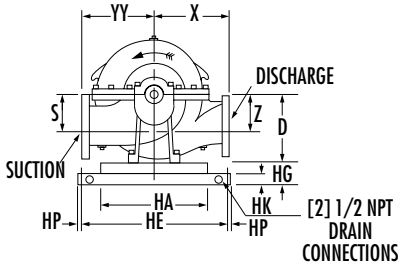
AURORA MODEL 411 PUMPS

ON STEEL DRIP RIM BASE

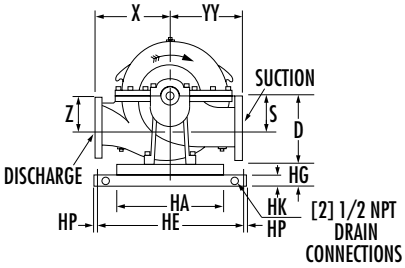
2″-2-1/2″-3″-4″ PUMPS

POWER SERIES NO. 1-2-3





RIGHT HAND ROTATION



LEFT HAND ROTATION

BASE	SIZE	HA	HB	HE	HF	HG	HH	HK	HP
3	9 x 33	9 (229)	33-1/2 (851)	13-3/4 (349)	32-1/4 (819)	3 (76)	3/4 (19)	1-1/2 (38)	5/8 (16)
5	11 x 36	11 (279)	36-1/2 (927)	15-7/8 (403)	35-1/8 (892)	3 (76)	7/8 (22)	1-1/2 (38)	11/16 (18)
6	11 x 42	11 (279)	42-1/2 (1080)	15-7/8 (403)	41-1/8 (1045)	3 (76)	7/8 (22)	1-1/2 (38)	11/16 (18)
8	14 x 42	14 (356)	42-1/2 (1080)	19 (483)	41 (1041)	3 (76)	1 (25)	1-1/2 (38)	3/4 (19)
9	14 x 48	14 (356)	48-1/2 (1232)	19 (483)	47 (1194)	3 (76)	1 (25)	1-1/2 (38)	3/4 (19)
11	18 x 46	18 (457)	46-1/2 (1181)	25-1/8 (638)	44-7/8 (1140)	4 (102)	1-1/8 (29)	2 (51)	13/16 (21)
12	18 x 54	18 (457)	54-1/2 (1384)	25-1/8 (638)	52-7/8 (1343)	4 (102)	1-1/8 (29)	2 (51)	13/16 (21)
15	22 x 54	22 (559)	54-1/2 (1384)	29-1/8 (740)	52-7/8 (1343)	4-1/2 (114)	1-1/8 (29)	2 (51)	13/16 (21)

NOTE: WHEN 2 "D" DIMENSIONS ARE INDICATED ALWAYS USE THE LARGER FIGURE.

PUMP SIZE			POWER SERIES	D	S	W	X	Z	CP	HY	YY
DISCH	SUCT	CASE BORE									
2	2-1/2	9	1	7 (178)	3-1/2 (89)	11-5/8 (295)	8-1/2 (216)	3-1/2 (89)	20-1/2 (521)	4-1/2 (114)	9 (229)
2	2-1/2	10		7 (178)	3-1/2 (89)		8-1/2 (216)	3-1/2 (89)			9 (229)
2	2-1/2	12		8 (203)	4 (102)		10 (254)	4 (102)			10-3/4 (273)
2-1/2	3	10B	2	8 (203)	4 (102)	13-1/2 (343)	9-3/4 (248)	4 (102)	24 (610)	5-1/2 (140)	10 (254)
2-1/2	3	12		9** (229**)	4-1/2 (114)		11 (279)	4-1/2 (114)			11-1/2 (292)
3	4	10B & C		9** (229**)	4-1/2 (114)		10 (254)	4-1/2 (114)			11 (279)
3	4	14		10 (254)	5 (127)		12 (305)	5 (127)			13 (330)
4	5	10B		9** (229**)	4-5/8 (118)		10 (254)	4-1/2 (114)			11-1/4 (286)
4	5	11A & C	3	10‡ (254‡)	5 (127)	14-1/2 (368)	11-1/4 (286)	5 (127)	26 (660)	6-1/2 (165)	12-3/4 (324)
4	5	15		11 (279)	5-1/2 (140)		13 (330)	5-1/2 (140)			14 (356)

PUMP SIZE			POWER SERIES	FRAME	143T	145T	182T	184T	213T	215T	254T	256T	284TS	284T	286TS	286T	324TS	324T	326TS	326T	364TS	364T	365TS	365T	404TS	405TS	444TS
				C	13 (330)	13 (330)	13 (330)	14 (356)	16 (406)	18 (457)	21 (533)	23 (584)	22 (559)	24 (610)	24 (610)	25 (635)	25 (635)	26 (660)	26 (660)	28 (711)	27 (686)	29 (737)	28 (711)	30 (762)	30 (762)	31 (787)	34 (864)
DISCH	SUCT	CASE BORE		D	-	-	-	-	-	-	-	-	-	-	-	-	8 (203)	8 (203)	8 (203)	8 (203)	9 (229)	9 (229)	9 (229)	9 (229)	10 (254)	10 (254)	11 (279)
2	2-1/2	9	1	BASE	3				5		8						11		-								
2	2-1/2	10		BASE																							
2	2-1/2	12		BASE																							
2-1/2	3	10B	2	BASE	3				5		8		9				11	12	11	12			-				
2-1/2	3	12		BASE																							
3	4	10B & C		BASE																							
3	4	14		BASE																							
4	5	10B		BASE																							
4	5	11A & C	3	BASE	-			5	6		8	9			11		12						15		-		
4	5	15		BASE																							

NOTES:
1. All dimensions in inches (mm).
2. Dimensions may vary ± 3/8" (10).
3. Not for construction purposes unless certified.
4. Coupling gap may vary 1/8" (3) to 2-1/16" (52).
5. Conduit box is shown in approximate location. Dimensions are not specified as they very with each motor manufacturer.
6. Discharge and suction flanges - ANSI Standard flat face.

** Dimension "D" is 10-1/2" (267) when using frames 324TS thru 365T.

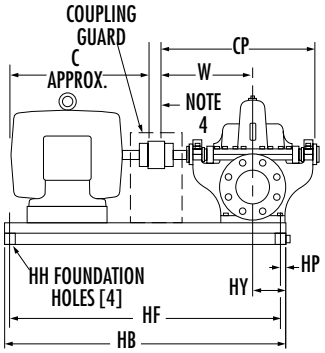
‡ Dimension "D" is 10-1/2" (267) when using frames 404TS thru 405TS.

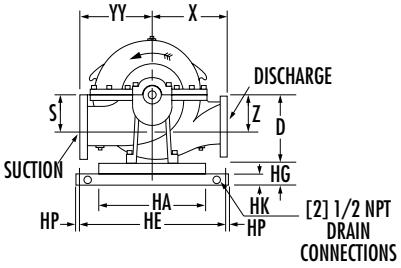
STD. 125# FLANGES	OPT. 250# FLANGES

AURORA®
Pentair Pump Group

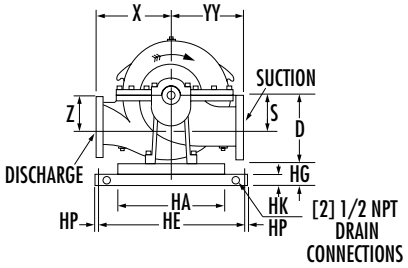
AURORA MODEL 411 PUMPS

ON STEEL DRIP RIM BASE
4"-5"-6"-8" PUMPS
POWER SERIES NO. 4-5





RIGHT HAND ROTATION



LEFT HAND ROTATION

BASE	SIZE	HA	HB	HE	HF	HG	HH	HK	HP
6	11 x 42	11 (279)	42-1/2 (1080)	15-7/8 (403)	41-1/8 (1045)	3 (76)	7/8 (22)	1-1/2 (38)	11/16 (18)
9	14 x 48	14 (356)	48-1/2 (1232)	19 (483)	47 (1194)	3 (76)	1 (25)	1-1/2 (38)	3/4 (19)
11	18 x 46	18 (457)	46-1/2 (1181)	25-1/8 (638)	44-7/8 (1140)	4 (102)	1-1/8 (29)	2 (51)	13/16 (21)
12	18 x 54	18 (457)	54-1/2 (1384)	25-1/8 (638)	52-7/8 (1343)	4 (102)	1-1/8 (29)	2 (51)	13/16 (21)
13	18 x 64	18 (457)	64-1/2 (1638)	25-1/8 (638)	62-7/8 (1597)	4 (102)	1-1/8 (29)	2 (51)	13/16 (21)
15	22 x 54	22 (559)	54-1/2 (1384)	29-1/8 (740)	52-7/8 (1343)	4-1/2 (114)	1-1/8 (29)	2 (51)	13/16 (21)
16	22 x 64	22 (559)	64-1/2 (1638)	29-1/8 (740)	62-7/8 (1597)	4-1/2 (114)	1-1/8 (29)	2 (51)	13/16 (21)
17	22 x 74	22 (559)	74-1/2 (1892)	29-1/8 (740)	72-7/8 (1851)	4-1/2 (114)	1-1/8 (29)	2 (51)	13/16 (21)
18	22 x 82	22 (559)	82-1/2 (2096)	29-1/8 (740)	80-7/8 (2054)	4-1/2 (114)	1-1/8 (29)	2 (51)	13/16 (21)

PUMP SIZE			POWER SERIES	D	S	W	X	Z	CP	HY	YY
DISCH	SUCT	CASE BORE									
4	6	18B	4	12-1/2 (318)	6-1/4 (159)	16 (408)	14 (356)	6-1/4 (159)	28-1/2 (734)	6-1/2 (165)	16 (406)
5	6	11A & C		11** (279**)	5-1/2 (140)		11-1/4 (286)	5-1/2 (140)			13-1/4 (337)
5	6	15		12-1/2 (318)	6-1/4 (159)		13-1/4 (337)	6-1/4 (159)			15 (381)
5	6	17		12-1/2 (318)	6-1/4 (159)		14 (356)	6-1/4 (159)			15 (381)
6	8	11		12-1/2 (318)	6-1/4 (159)		11-3/4 (298)	6-1/4 (159)			14-1/2 (368)
8	8	11B		12-1/2‡ (318‡)	6-1/4 (159)		12 (305)	6-1/4 (159)			14-1/2 (368)
6	8	15	5	13-1/2 (343)	6-3/4 (171)	18 (457)	14-1/4 (362)	6-3/4 (171)	32 (813)	7-1/2 (191)	16-3/4 (425)
6	8	18A,B & C		14-3/4 (375)	8 (203)		16 (406)	8 (203)			18 (457)
6	8	20		14-3/4 (375)	8 (203)		15-3/4 (400)	8 (203)			18 (457)
8	10	12 & 12A		14-3/4 (375)	8 (203)		17 (432)	9 (229)			17-3/4 (451)
8	10	15A &B		14-3/4 (375)	8 (203)		17 (432)	9 (229)			17-3/4 (451)
8	10	17B		14-3/4 (375)	8 (203)		17 (432)	8 (203)			17-3/4 (451)

PUMP SIZE			FRAME	213T	215T	254T	256T	284TS	284T	286TS	286T	324TS	324T	326TS	326T	364TS	364T	365TS	365T	404TS	404T	405TS	405T	444TS	444T	445TS	445T	447TS	447T	449TS	449T
DISCH	SUCT	CASE BORE	C	16 (406)	18 (457)	21 (533)	23 (584)	22 (559)	24 (610)	24 (610)	25 (635)	25 (635)	26 (660)	26 (660)	28 (711)	27 (686)	29 (737)	28 (711)	30 (762)	30 (762)	33 (838)	31 (787)	35 (889)	34 (864)	38 (965)	36 (914)	40 (1016)	40 (1016)	44 (1118)	45 (1143)	49 (1245)
4	6	18B	BASE	6		9		11				12								15			16					17			
5	6	11A & C	BASE																												
5	6	15	BASE																												
5	6	17	BASE																												
6	8	11	BASE																												
8	8	11B	BASE																												
6	8	15	BASE	-		9		12										13		16						17				18	
6	8	18A,B & C	BASE																												
6	8	20	BASE																												
8	10	12 & 12A	BASE																												
8	10	15A &B	BASE																												
8	10	17B	BASE																												

NOTES:
1. All dimensions in inches (mm).
2. Dimensions may vary ± 3/8" (10).
3. Not for construction purposes unless certified.
4. Coupling gap may vary 1/8" (3) to 2-1/16" (52).
5. Conduit box is shown in approximate location. Dimensions are not specified as they very with each motor manufacturer.
6. Discharge and suction flanges - ANSI Standard flat face.

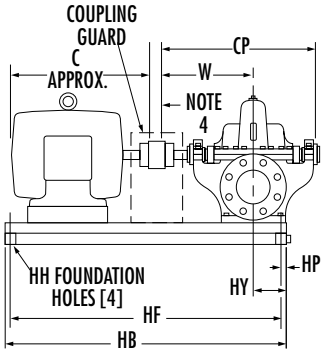
** Dimension "D" is 12" (305) when using frames 405TS-449T.

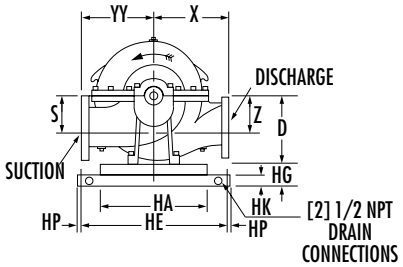
‡ Dimension "D" is 14-1/2" (368) when using frames 404TS thru 449T.

STD. 125# FLANGES	OPT. 250# FLANGES

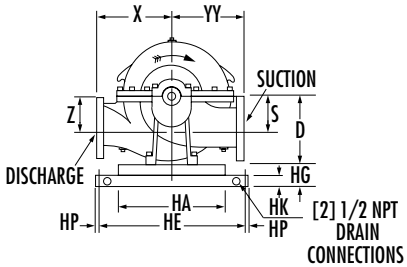
AURORA MODEL 411 PUMPS

ON STEEL DRIP RIM BASE
8"-10"-12"-14" PUMPS
POWER SERIES NO. 6B-7





RIGHT HAND ROTATION



LEFT HAND ROTATION

BASE	SIZE	HA	HB	HE	HF	HG	HH	HK	HP
13	18 x 64	18 (457)	64-1/2 (1638)	25-1/8 (638)	62-7/8 (1597)	4 (102)	1-1/8 (29)	2 (51)	13/16 (21)
17	22 x 74	22 (559)	74-1/2 (1892)	29-1/8 (740)	72-7/8 (1851)	4-1/2 (114)	1-1/8 (29)	2 (51)	13/16 (21)
18	22 x 82	22 (559)	82-1/2 (2096)	29-1/8 (740)	80-7/8 (2054)	4-1/2 (114)	1-1/8 (29)	2 (51)	13/16 (21)

PUMP SIZE			POWER SERIES	D	S	W	X	Z	CP	HY	YY
DISCH	SUCT	CASE BORE									
8	10	21 & 21A	6B	18-1/2 (467)	9-1/2 (241)	21-7/8 (556)	18 (457)	9-1/2 (241)	38 (965)	11-1/2 (292)	21 (533)
10	12	12B		23 (584)	12 (305)		16 (406)	12 (305)			19 (483)
10	12	15B & C		25 (635)	13-1/2 (343)		17 (432)	13-1/2 (343)			20 (508)
10	12	18		25 (635)	13-1/2 (343)		18 (457)	13-1/2 (343)			22 (559)
12	14	15B	7	24 (610)	15 (381)	25-1/4 (641)	17 (432)	15 (381)	43-7/8 (1114)	11-1/2 (292)	22 (559)
12	14	18A		24 (610)	15 (381)		18 (457)	15 (381)			23 (584)
14	16	18		29-1/4 (743)	16 (406)		22 (559)	16 (406)			27 (686)

PUMP SIZE			FRAME	286TS	286T	324TS	324T	326TS	326T	364TS	364T	365TS	365T	404TS	404T	405TS	405T	444TS	444T	445TS	445T	447TS	447T	449TS	449T
DISCH	SUCT	CASE BORE	C	24 (610)	25 (635)	25 (635)	26 (660)	26 (660)	28 (711)	27 (686)	29 (737)	28 (711)	30 (762)	30 (762)	33 (838)	31 (787)	35 (889)	34 (864)	38 (965)	36 (914)	40 (1016)	40 (1016)	44 (1118)	45 (1143)	49 (1245)
8	10	21 & 21A	BASE	13										17							18				
10	12	12B	BASE																						
10	12	15B & C	BASE																						
10	12	18	BASE																						
12	14	15B	BASE	-											17				18						
12	14	18A	BASE																						
14	16	18	BASE																						

NOTES:
1. All dimensions in inches (mm).
2. Dimensions may vary ± 3/8" (10).
3. Not for construction purposes unless certified.
4. Coupling gap may vary 1/8" (3) to 2-1/16" (52).
5. Conduit box is shown in approximate location. Dimensions are not specified as they very with each motor manufacturer.
6. Discharge and suction flanges - ANSI Standard flat face.

STD. 125# FLANGES	OPT. 250# FLANGES

AURORA PUMP
A member of PENTAIR PUMP GROUP

INSTRUCTION MANUAL 2
INSTALLATION
FRAME MOUNTED

GENERAL. The life of your Aurora pump can be extended considerably by carefully following the installation instructions contained herein. Each step of the pump installation instructions plays a vital part in assuring long life, efficient operation, and reduced maintenance, from the initial location of the pump through prestarting directions.

UNPACKING YOUR PUMP. The crate containing your pump should be opened immediately upon receipt from the factory, and the pump generally inspected for damage and shortage of parts. Particular attention should be given to the discharge and suction nozzle threads or flanges. Any damage or shortage of parts should be reported to the carrier immediately.

CLEANING. If your pump is to be installed immediately, it will be necessary to remove the protective covers from all openings, and to clean the exposed metal parts thoroughly with white gasoline or other suitable solvent to remove the preservative coating.

STORAGE. If your pump is not to be put in service immediately it should be covered and stored in a clean dry area. The protective covers and preservative should be left intact until the pump is put into service. For extended storage, the pump should be dried internally with hot air or some other suitable means, and once free of moisture, filled with a protective fluid such as light oil or kerosene. Accordingly, at time of installation, the pump will have to be completely dismantled and thoroughly cleaned.

PLANNING THE PUMP LOCATION. You probably have spent considerable time planning where your pump will be located. However you may have overlooked some factor which may affect your pump operation or efficiency.

The pump should be located as close to the liquid source as possible so that the suction line can be

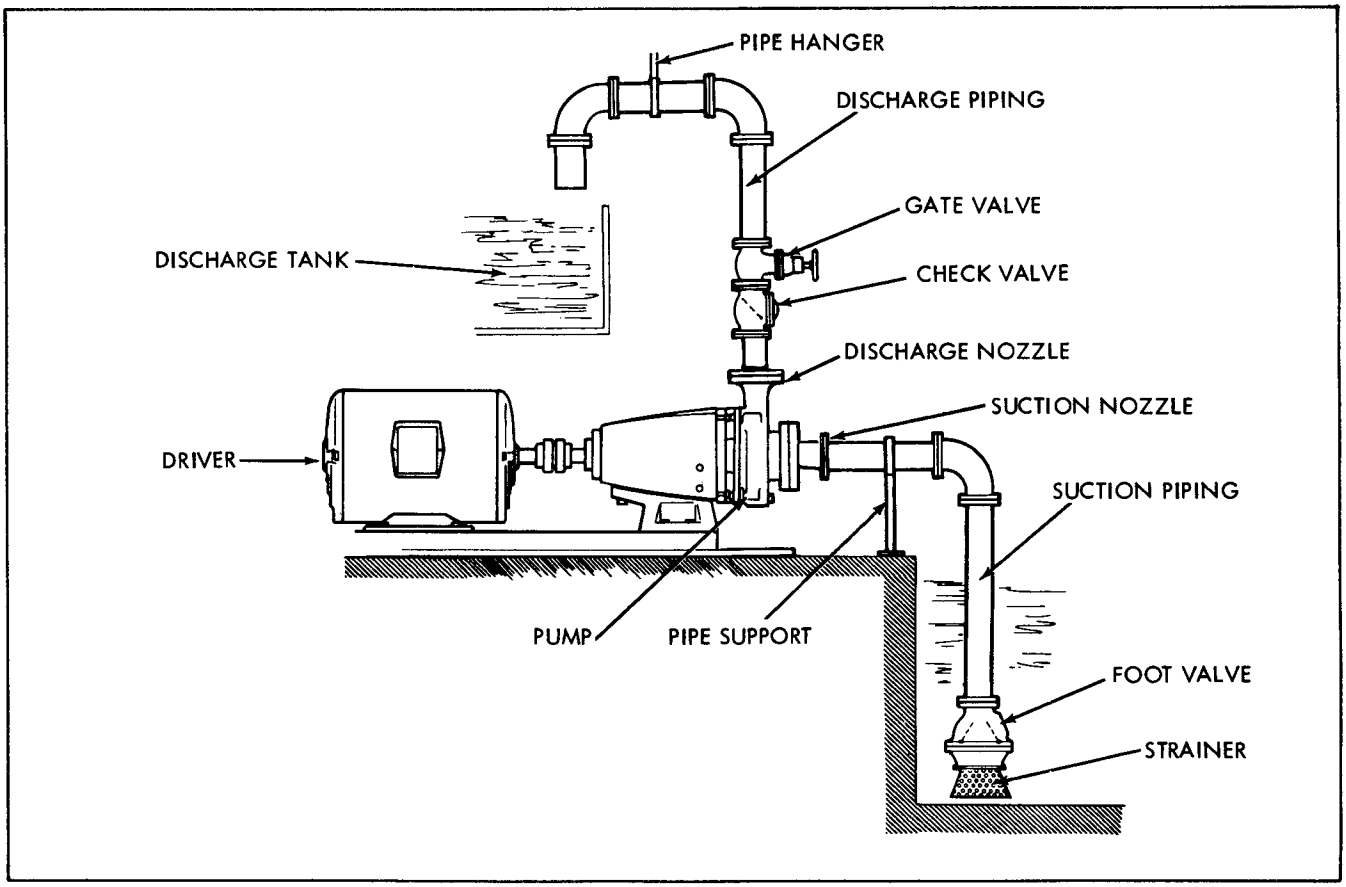


FIGURE 1. RECOMMENDED LOCATION - SHORT DIRECT SUCTION

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AURORA, ILLINOIS

short and direct. It should be located in a clean, open area, where it is easily accessible for inspection, lubrication, and repair. Pumps installed in dark, dirty areas or in cramped locations are often neglected which can result in premature failure of both the pump and the driver.

Your pump should be located so that a hoist or crane can be used to move it without interference from piping. This factor is often overlooked in the advance planning stage.

Protect your pump against the possibility of flooding. Although water will not seriously damage the pump, the drive motor can be damaged.

The pump should be located in an area where moisture, either from leakage through the packing or from condensation, can be adequately drained off. Moisture dripping on exposed metal or wood can cause rapid deterioration of the area. Also, wet floors produce safety hazards.

Adequate provisions should be made for electrical wiring to the pump motor. A switch and overload protection should be installed near the pump unless it is impractical. The electrical conduit should be positioned in such a way as to preclude the possibility of moisture entering the conduit or the motor and causing short circuits.

Outdoor installation will normally provide all of the above mentioned conditions. However it is advisable to provide a weather shelter for your pump.

FOUNDATION. The foundation for your pump must be sufficiently rigid to absorb any vibration and stress encountered during pump operation. A raised foundation of concrete is preferable for most floor mounted pumps. The raised foundation assures a satisfactory base, protects against flooding, simplifies moisture drainage, and facilitates keeping the area clean.

Your pump should be firmly bolted to the foundation, whether it is a raised concrete base, steelwork wall, or structural member. The mounting bolts or studs should be accurately located per the applicable Aurora dimension sheet. Foundation bolts should be enclosed by a sleeve 2 to 4 diameters larger than the bolt to allow movement for proper alignment with the pump mounting holes. Refer to figure 3.

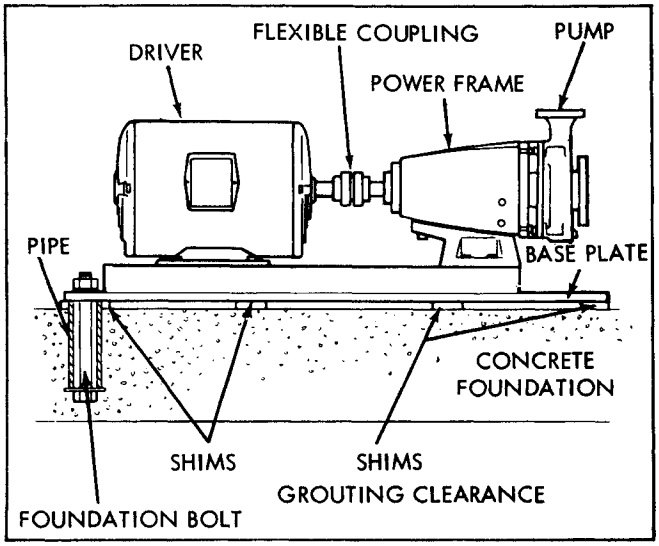


FIGURE 3. FOUNDATION FOR FRAME MOUNTED PUMPS

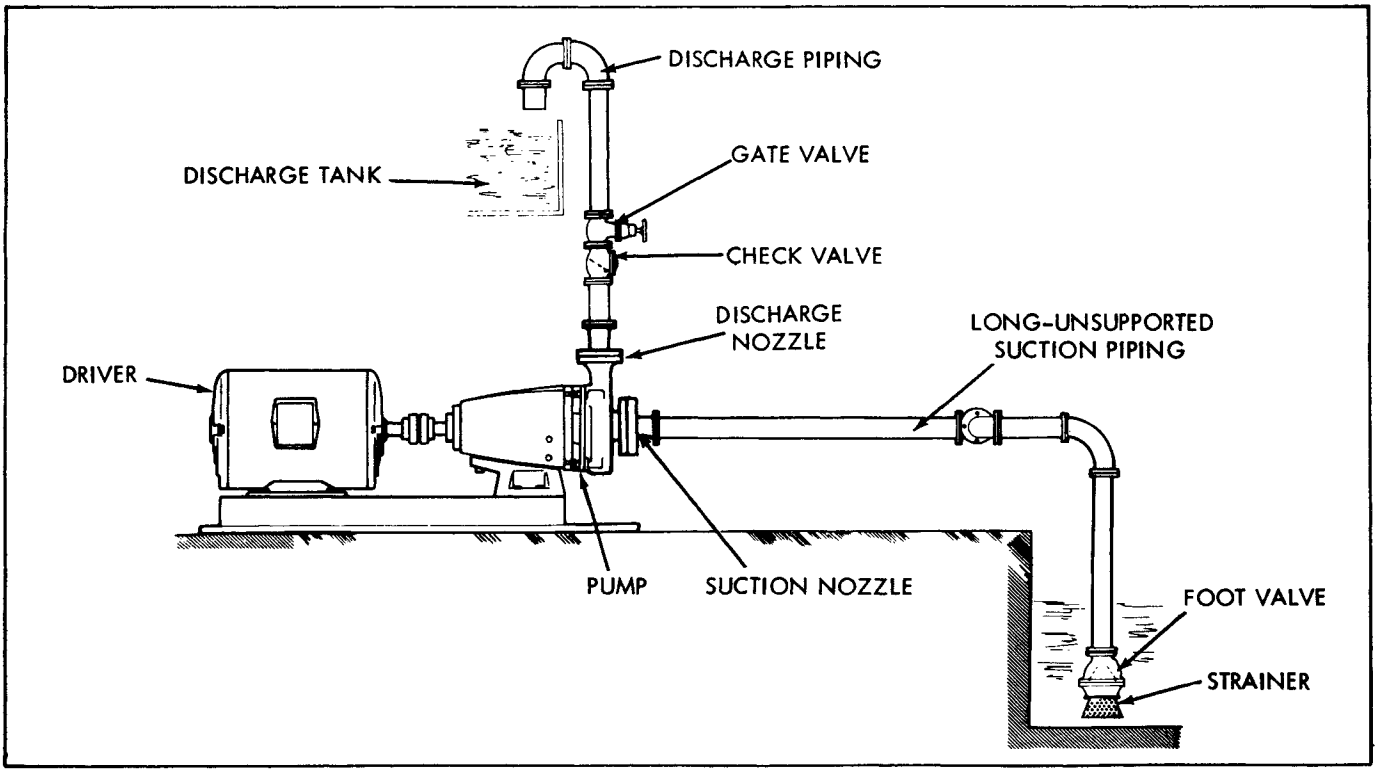


FIGURE 2. UNSATISFACTORY LOCATION - LONG INDIRECT SUCTION WITH NO SUPPORT

FRAME MOUNTED INSTALLATION

If the pump is to be mounted on steelwork or other structure, adequate support should be provided to prevent distortion of the base plate or the structure, which could produce excessive strain on the pump casing and piping, and seriously affect alignment of the pump and driver.

PREPARING TO INSTALL YOUR PUMP. Your pump and driver unit will normally be mounted on a common base plate. The unit has been accurately aligned and securely mounted to the base plate at the factory. However, the alignment cannot be maintained during shipping and the complete unit must be leveled and realigned at the time of installation.

LEVELING THE PUMP. Leveling the pump will require enough shims to support the base plate near the foundation bolts, and at any points of the base plate carrying a substantial weight load. The shims should be large enough to allow a gap of 3/4" to 1-1/2" between the base plate and foundation for grouting.

The pump unit should be set on the foundation, being careful not to damage the threads on the foundation bolts. The flexible coupling halves should then be disconnected. The shims should be inserted and the pump leveled. A spirit level should be used on the faces of the flexible coupling halves, and on the suction and discharge flanges. If your pump has threaded nozzles, a short piece of pipe inserted in the nozzles will serve as a smooth surface for a leveling reference point. The shims should be adjusted until the pump is leveled horizontally and vertically. Tighten the foundation bolts finger tight.

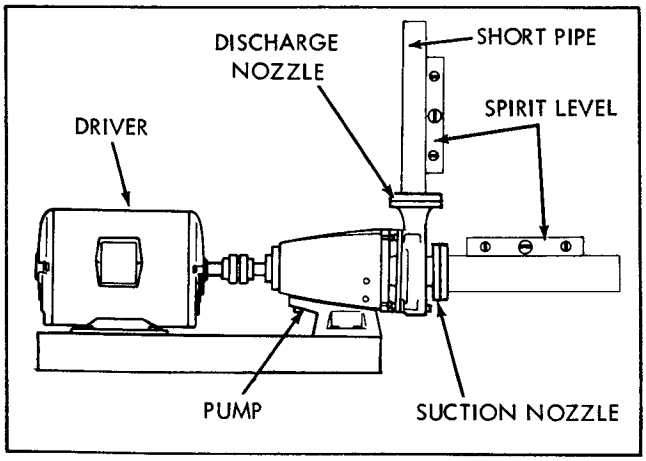


FIGURE 4. LEVELING PUMP UNIT WITH SPIRIT LEVEL AND SHORT LENGTHS OF PIPE

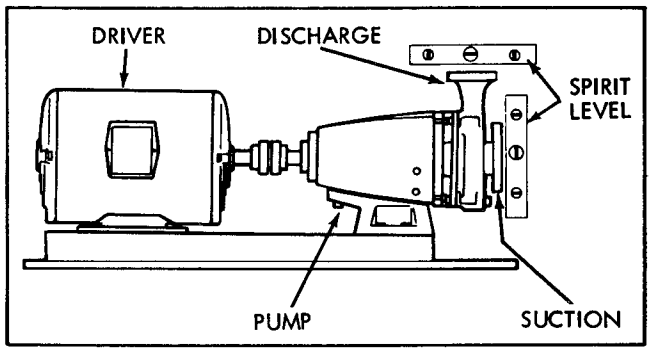


FIGURE 5. LEVELING PUMP UNIT WITH SPIRIT LEVEL ON PUMP FLANGES

INITIAL ALIGNMENT OF THE FLEXIBLE COUPLING. The pump and driver were accurately aligned at the factory. However, it is impossible to maintain this alignment during shipping and handling. Therefore it will be necessary for you to realign the pump and driver. Flexible couplings are not universal joints. They should not be used to compensate for misalignment of the pump and motor shafts. Their function is to transmit power from the driver to the pump while compensating for thermal expansion and shaft end movement. The coupling faces should be far enough apart so that they do not make contact when the motor shaft is forced to the limit of the bearing clearance toward the pump shaft.

In order to properly align the coupling, you will need a taper gauge or set of feeler gauges, and a straight edge, or if available, a dial indicator.

There are two types of misalignment encountered with flexible couplings: angular misalignment, in which the shafts are not parallel, and parallel misalignment where the shafts are parallel but not on the same axis.

To check angular alignment, insert a feeler gauge or taper gage at any four places 90° apart around the

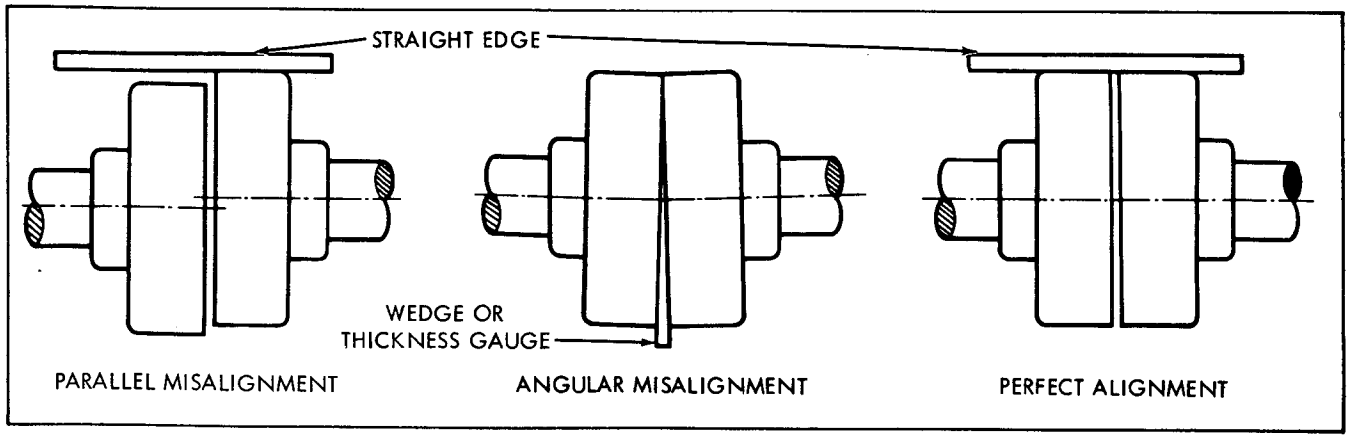


FIGURE 6. FLEXIBLE COUPLING ALIGNMENT

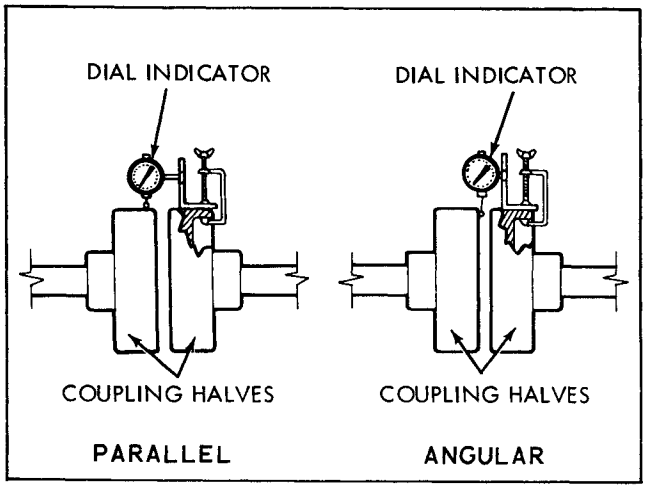


FIGURE 7. CHECKING ALIGNMENT WITH DIAL INDICATOR

coupling halves. Insert shims under the driver feet until the same reading is obtained at all four check points. The pump and driver will then be in angular alignment.

To check angular alignment with a dial indicator, clamp the dial indicator to the pump coupling half so that ball on the indicator just rests on the face of the motor coupling half. A chalk mark should be made at the point where the ball contacts the coupling half. Both the pump shaft and the motor shaft should be rotated an equal amount so that the reading is taken at all check points with the ball on the chalk mark. Insert shims as required.

To check parallel alignment, a straight edge should be held against the edges of the coupling halves at any four places 90° apart around the coupling. The straight edge should be parallel to the pump and driver shafts at all times. Insert shims until the straight edge lies flat against both coupling halves at all four check points. The pump and driver will then be in proper parallel alignment.

To check parallel alignment with the dial indicator, the ball should rest on periphery of the motor coupling half. A chalk mark should be made at the point of contact, and the shafts rotated equally so that the reading is taken with the ball on the chalk mark at all check points. Insert shims as required.

NOTE

Any adjustment to correct one direction of alignment may affect the other direction. Therefore, it is necessary to recheck both angular and parallel alignment after each adjustment.

When the unit is properly aligned, the foundation bolts should be tightened, but not too firmly. Waste material should be stuffed into the sleeves around the foundation bolts, to prevent grout from filling the sleeves during grouting.

GROUTING THE INSTALLATION. Grouting the base plate prevents lateral movement of the base plate, and improves the vibration absorbing characteristics of the foundation by increasing its mass. A wooden dam should be constructed around the base plate to contain the grout while it is being poured. The dam can be built tight against the base plate, or slightly removed from it as desired.

The entire base plate should be completely filled with grout. A non-shrinkable type grout, such as manufactured by EMBCO is recommended. The grout should be puddled frequently to remove any air bubbles from the grout.

The leveling shims can be grouted in place, or they can be removed after the grout has set usually from 48 to 72 hours after pouring.

After the grout has set, alignment of the unit should be checked and the foundation bolts firmly tightened down.

PIPING. Your pump unit is now ready to be piped. The piping practices you follow will directly affect the efficiency and power consumption of your pump.

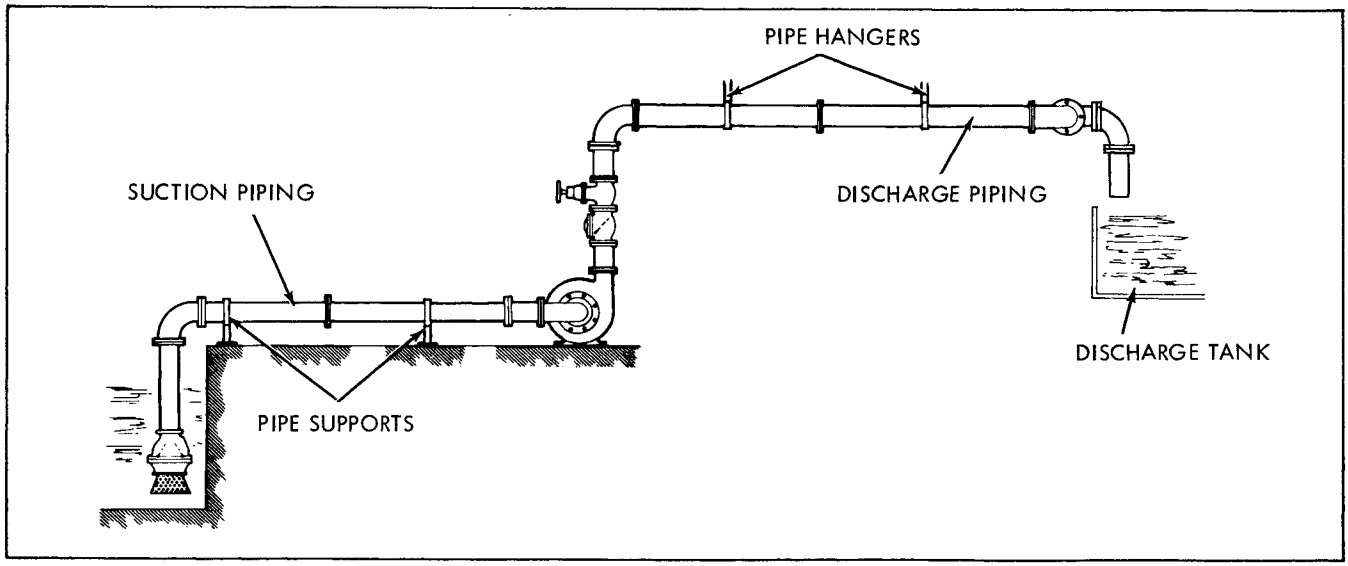


FIGURE 8. SUPPORTING PIPING

Pay particular attention to the seemingly insignificant details involved in piping your pump for they make the difference between a good and bad installation.

SUPPORTING THE PIPE. Both the suction and the discharge piping should be independently supported near the pump. Liberal use of pipe hangers and support blocks will prevent excessive strain on the pump casing and on the pipe joints.

SUCTION PIPING. The suction piping should be short, but no less than ten pipe diameters in length, and direct with as few elbows and fittings as possible, to keep head loss from friction at a minimum. However, the suction pipe should provide a minimum uninterrupted length, equal to ten pipe diameters, to the pump suction flange. A horizontal suction line should have a gradual rise to the pump, and pass under any interfering piping.

PIPE. The suction pipe diameter should be at least the same diameter as the suction nozzle on the pump, and preferably larger. Use of a smaller diameter pipe will result in loss of head due to friction. All joints must be tight to maintain prime on the pump.

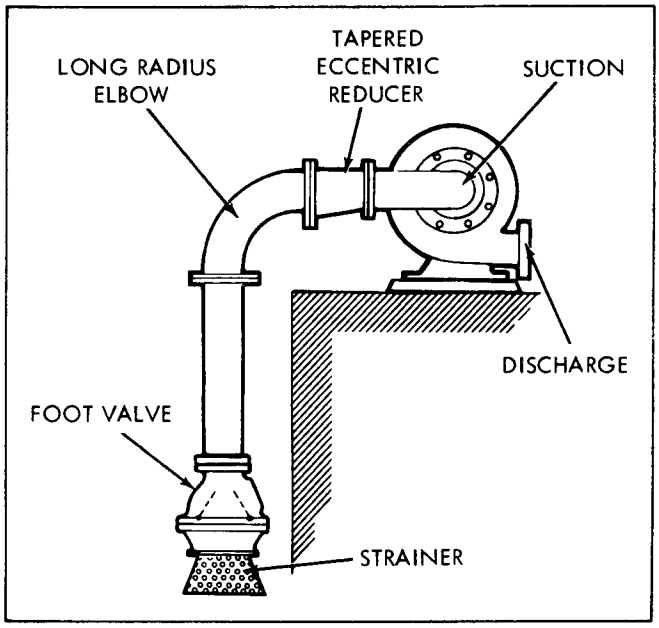


FIGURE 9. RECOMMENDED SUCTION LIFT PIPING - SHORT AND DIRECT

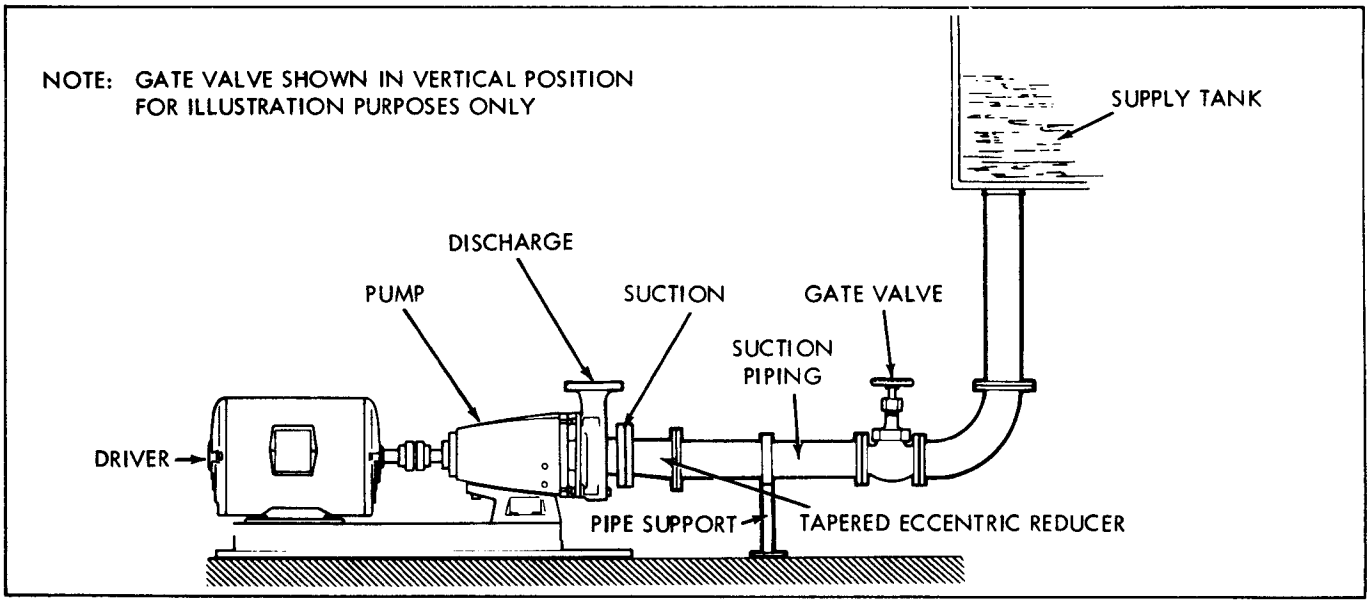


FIGURE 10. RECOMMENDED FLOODED SUCTION PIPING - SHORT AND DIRECT

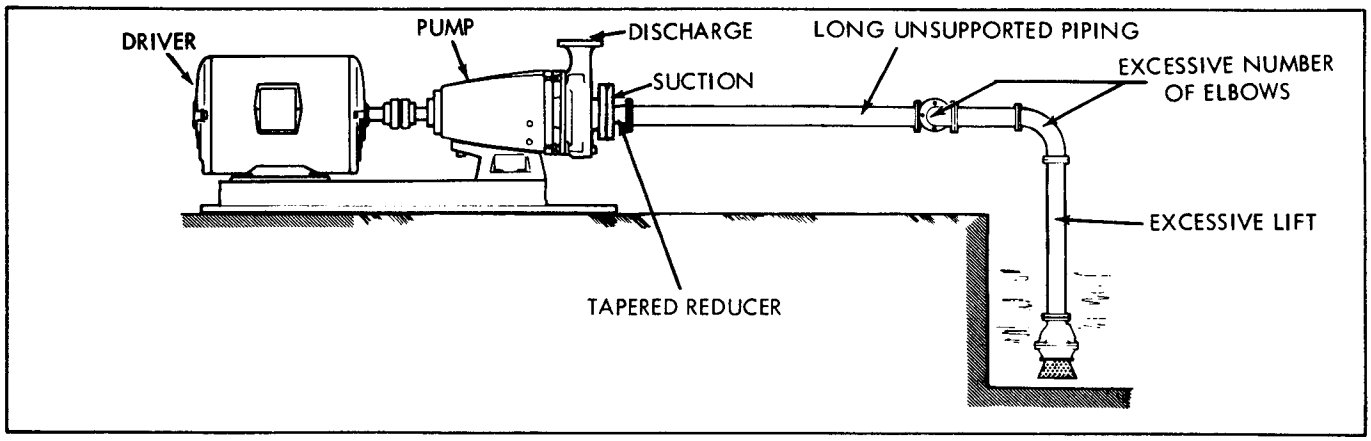


FIGURE 11. UNSATISFACTORY SUCTION LIFT PIPING - LONG AND INDIRECT WITH NO SUPPORT

FRAME MOUNTED INSTALLATION

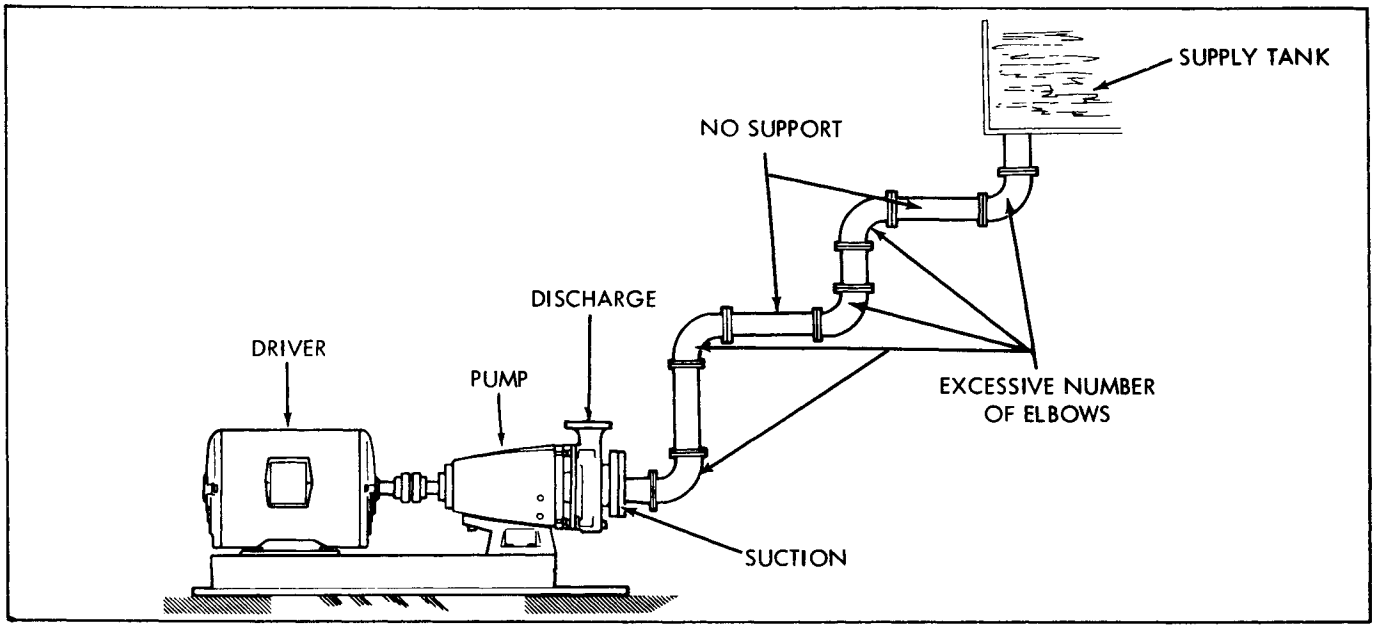


FIGURE 12. UNSATISFACTORY FLOODED SUCTION PIPING - LONG AND INDIRECT WITH NO SUPPORT

ELBOWS. Long radius elbows should be used in place of standard elbows wherever possible, because of their superior flow characteristics. For instance, head loss in a standard four inch elbow is equivalent to the head loss in a piece of pipe 11 feet long, while the head loss in a long radius elbow is approximately half as much. Elbows should not be used at the suction nozzle, but if it is unavoidable, they should be installed in a vertical position. Elbows installed in any position at the suction nozzle have a tendency to distribute the liquid unevenly in the impeller chamber, causing a reduction in capacity, and creating an undesirable thrust condition.

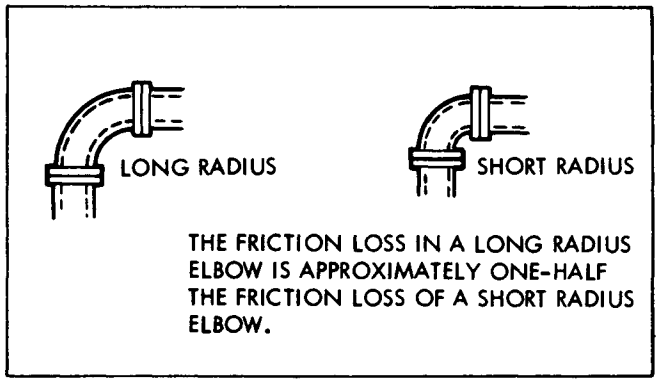


FIGURE 13. LONG VERSUS SHORT RADIUS ELBOWS

REDUCERS. Eccentric reducers should be installed directly at the suction nozzle, with the taper at the bottom to prevent air pockets from forming. Straight taper reducers should never be used in a horizontal suction line because of the air pocket that is formed at the leg of the reducer and the pipe.

DISCHARGE PIPING. Discharge piping should also be short and direct as possible, with few elbows and fittings, to reduce head loss from friction.

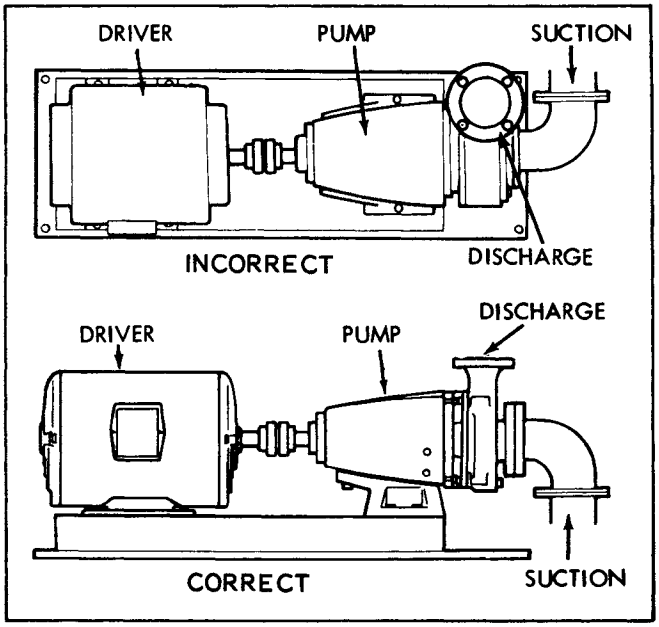


FIGURE 14. ELBOW INSTALLATION IN SUCTION NOZZLE

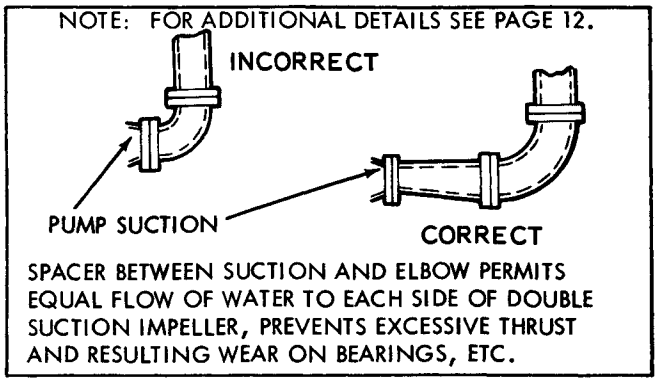


FIGURE 15. REDUCER BETWEEN ELBOW AND PUMP SUCTION NOZZLE

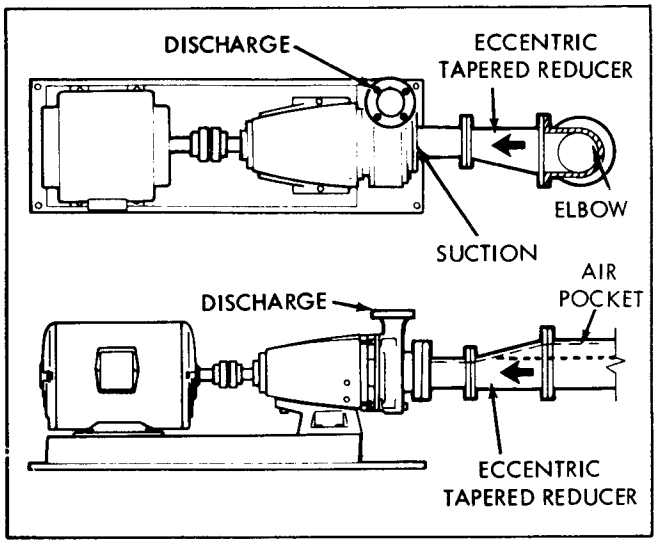


FIGURE 16. UNSATISFACTORY INSTALLATION OF TAPERED REDUCER

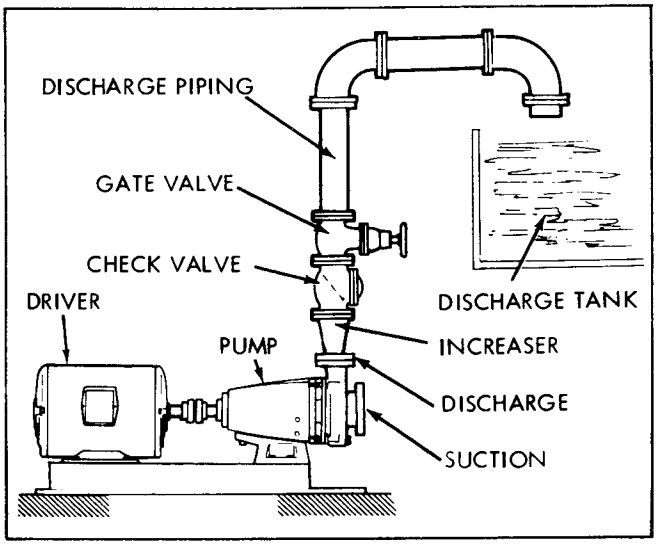


FIGURE 17. RECOMMENDED DISCHARGE PIPING - SHORT AND DIRECT

PIPE. The discharge pipe diameter should be the same as, or larger than, the discharge nozzle diameter. The size of discharge pipe to be used is dependent upon its application.

The recommended pipe diameter can be obtained from your nearest Aurora Pump Sales Office.

ELBOWS. Long radius elbows should be used in the discharge piping as well as in the suction piping to prevent excessive head loss due to friction. Whenever possible, elbows should not be installed directly at the discharge nozzle as the turbulence created by the elbow will affect pressure gauge readings.

REDUCERS AND INCREASERS. An increaser should be installed at the discharge nozzle if larger diameter

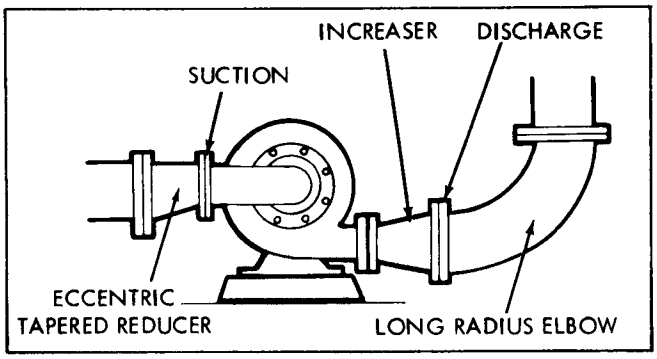


FIGURE 19. REDUCER AND INCREASER INSTALLATION

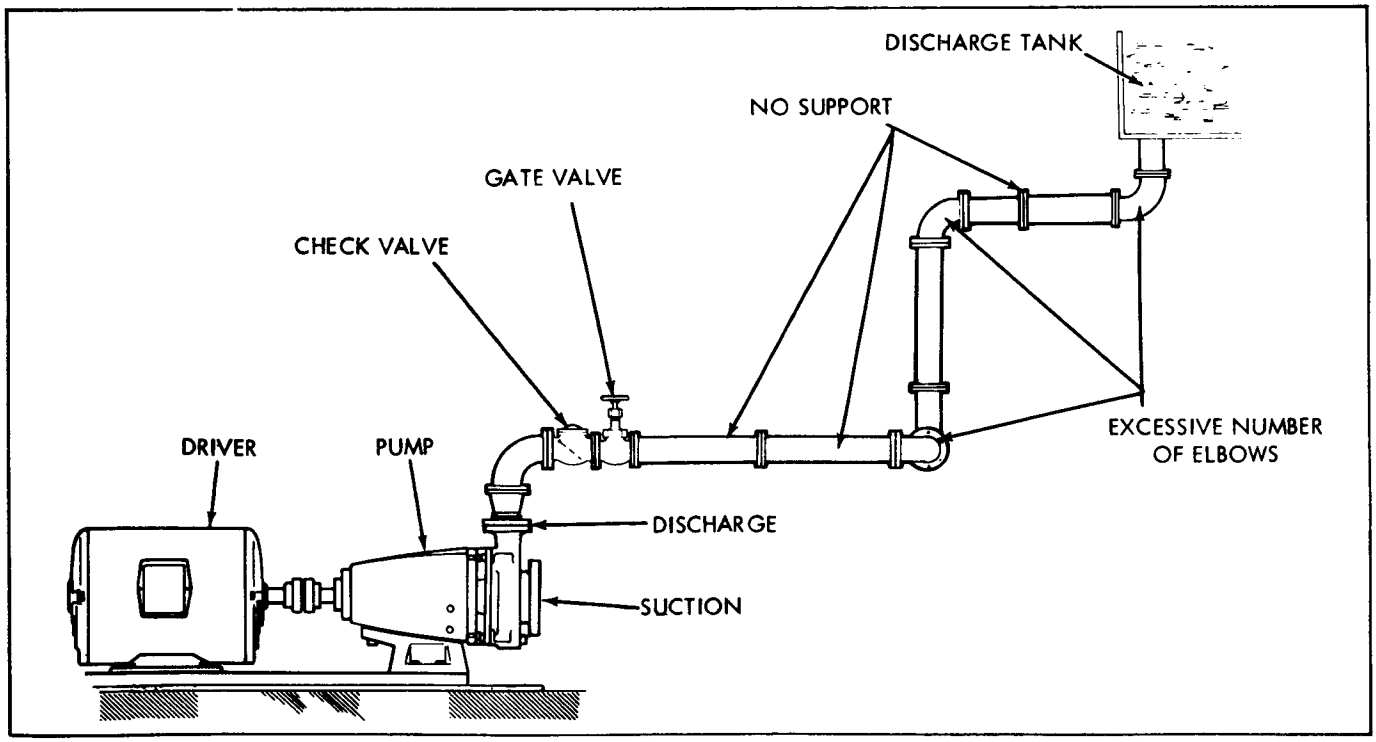


FIGURE 18. UNSATISFACTORY DISCHARGE PIPING - LONG WITH EXCESSIVE ELBOWS AND JOINTS AND NO SUPPORT

discharge piping is used. Straight taper increasers and/or reducers are satisfactory in discharge applications.

EXPANSION JOINTS. Expansion joints are used primarily to prevent the transmission of piping strain, caused by thermal expansion and contraction, piping misalignment, pressure changes, or other causes, to the pump casing. They are also used to suppress any noise that may be transmitted through the piping.

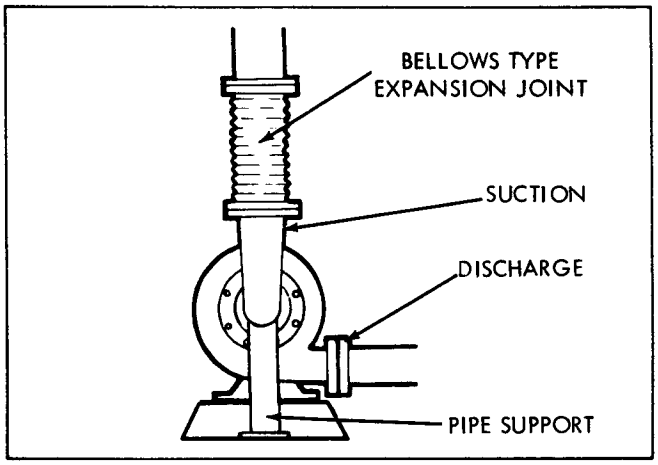


FIGURE 20. EXPANSION JOINT IN SUCTION LINE

It is recommended that the flexible metal type of expansion joint be used, because rubber expansion joints, while costing less, have a tendency to deteriorate, making frequent replacement necessary.

If an expansion joint must be used, an anchor or restraining device should be installed between the joint and the pump to prevent objectional forces from being transmitted to the pump. If an anchor is not installed at this point, a force equal to the area of the joint times the pressure in the pipe is developed and transmitted to the pump. This force may exceed the allowable flange loading, and could result in damage to the pump or piping.

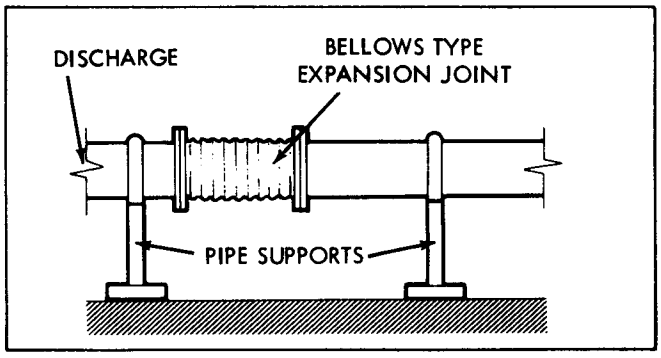


FIGURE 21. EXPANSION JOINT IN DISCHARGE PIPING

PIPE ALIGNMENT. Proper piping alignment is essential before connection is made. Piping alignment should never be achieved by force, this could produce strain on the piping and the pump casing. Proper supports should be installed for the piping to keep its weight off the pump casing.

When flange bolts are used, line up the piping first, then loosely install flange bolts. Check the piping alignment, and tighten the flange bolts until all bolts are tightened securely.

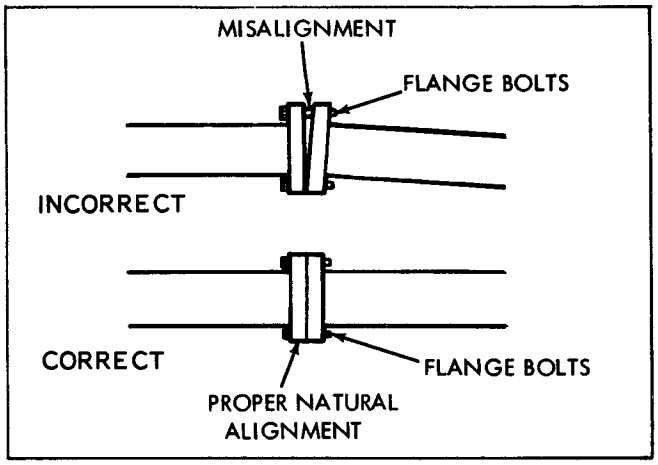


FIGURE 22. PIPE ALIGNMENT

AIR IN PIPING. One of the most common conditions affecting pump efficiency is the formation of air pockets in the suction line. The air pockets are a result of high points and improper installation of elbows, reducers, and valves in the suction piping.

For suction lift applications, lantern rings are required to prevent air from leaking into the pump through the stuffing box, or at the joints.

The pump packings or seal depend on the liquid being pumped for lubrication. Excessive air can prevent proper lubrication with resultant damage to them.

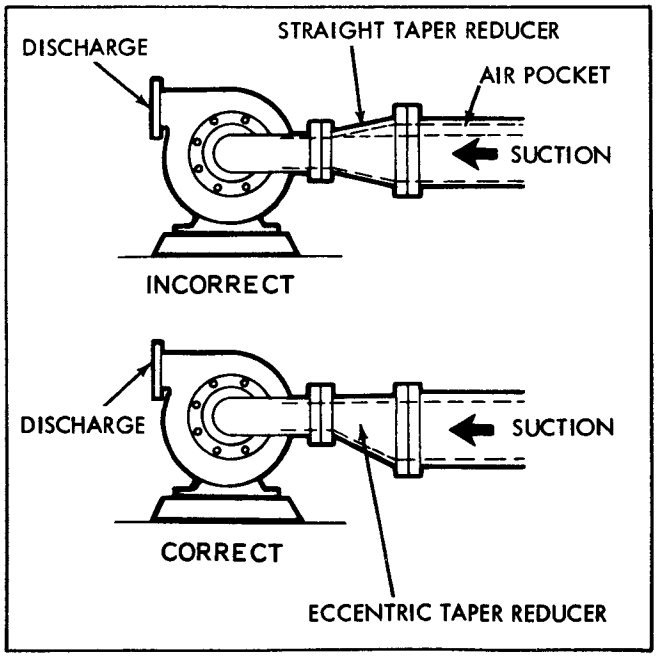


FIGURE 23. AIR POCKETS IN REDUCER

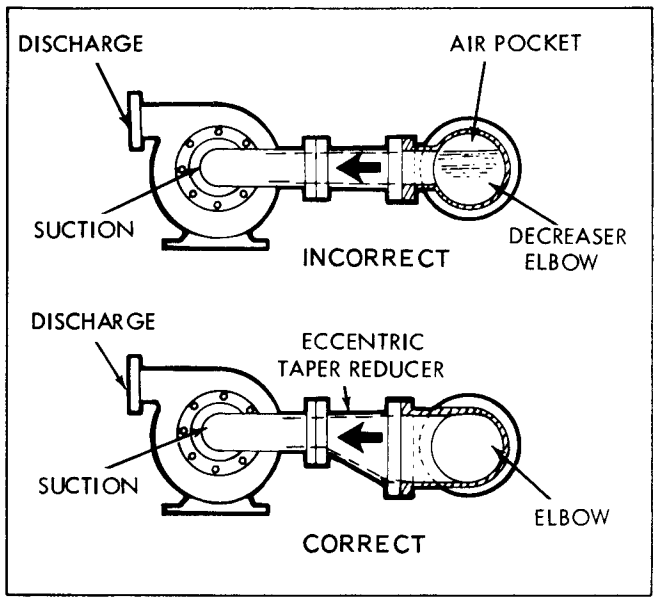


FIGURE 24. AIR POCKET IN ELBOW

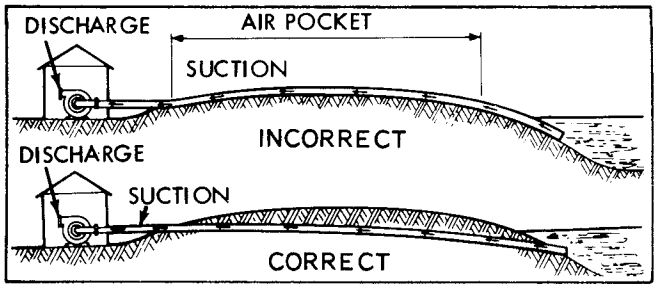


FIGURE 25. AIR POCKET IN HORIZONTAL SUCTION PIPING

In suction lift applications the suction pipe in the liquid well must be sufficiently submerged to prevent exposure of the end of the pipe when the well is at its minimum level and to prevent vortexing action (whirlpool effect) of the liquid at the suction pipe, which will draw air into the pipe. Also, care should be taken to keep the suction pipe located away from the well inlet since the incoming liquid may be carrying air bubbles. Another cause of air in the liquid is dropping of the liquid from too high a point into the well.

VALVES. Valves are an important part of your installation, for they facilitate priming of the pump, and control the volume of the pumped liquid.

SUCTION LIFT. In suction lift applications where the suction lift is low a foot valve can be installed, to maintain the prime on the pump. A foot valve is essentially a check valve, allowing flow in one direction only toward the pump. When the pump is shut down, the pressure of the liquid returning to the well, causes the valve to close, retaining the liquid in the suction line.

A slow closing check valve should be installed when the static discharge head is high. A foot valve should not be used under these conditions, as failure of the driver would allow the water to rush back rapidly thus causing a heavy water hammer.

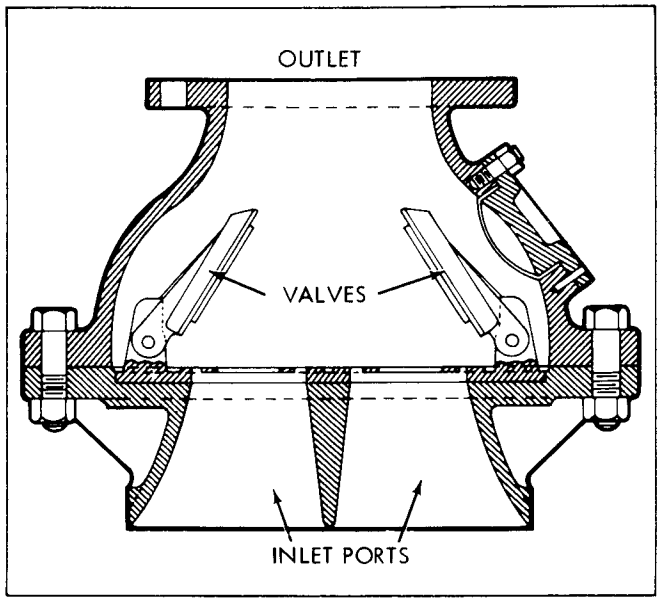


FIGURE 26. FOOT VALVE

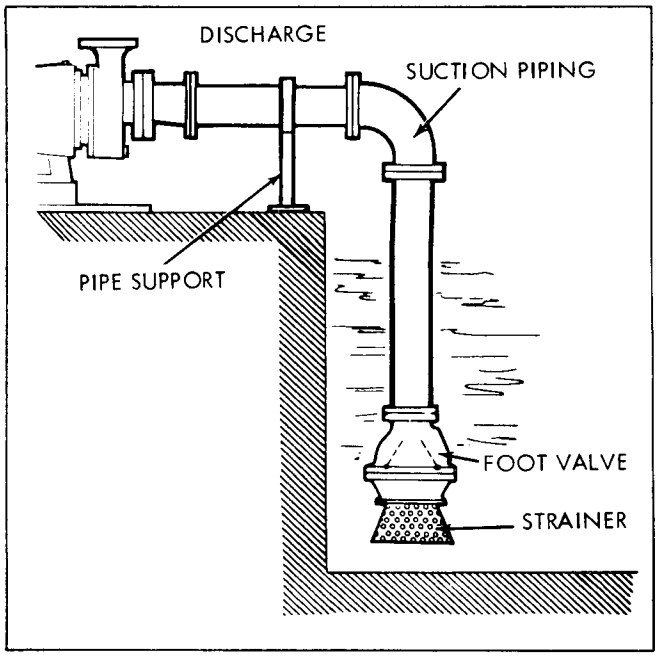


FIGURE 27. FOOT VALVE INSTALLED WITH SCREEN

Foot valves, when used, should be of the flat type rather than multiple spring type. The valve should have a large inlet area, because the friction loss in a foot valve is high. Install check and foot valves as indicated by arrow to ensure proper installation.

FLOODED SUCTION. When the liquid source is above the pump centerline, a flooded suction condition exists, and a gate valve is required to shut off the liquid supply for pump inspection and maintenance. The gate valve should be installed with the stem in a horizontal or downward position to prevent formation of an air pocket in the valve.

DISCHARGE VALVES. Tne discharge piping should include a check valve and a gate valve. The check

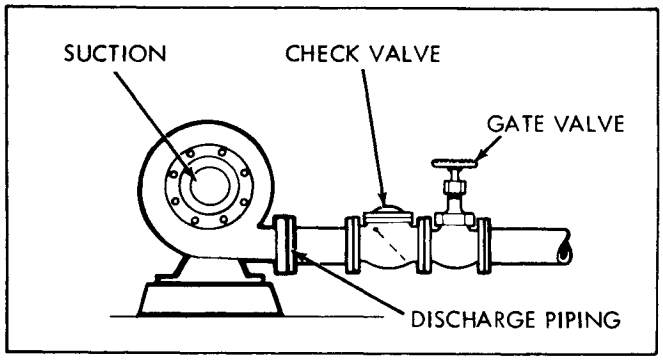


FIGURE 28. GATE VALVE AND CHECK VALVE

valve should be located between the gate valve and the pump. If an increaser is used in the discharge piping, the increaser should be installed between the pump nozzle and the check valve. The check valve protects against a reverse flow of the liquid if the driver fails.

The gate valve is used in the priming operation, as a throttling valve to control pump volume, and to shut down the pump for inspection and maintenance.

AIR VENT VALVE. Vent valves are installed at the high points in the pump casing to allow air or vapor to escape. These valves are used to release trapped air from the pump casing during priming and when pump becomes air bound.

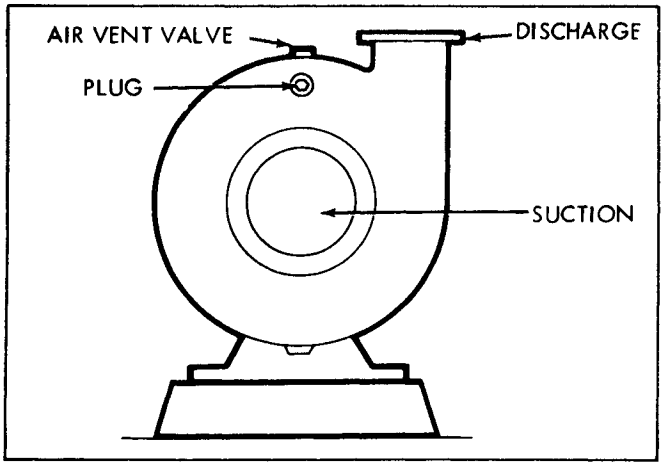


FIGURE 29. AIR VENT VALVE OR PLUG

STRAINERS AND SCREENS. It is important to screen the suction piping to remove foreign matter that can clog the pump and impair its capacity, or stop it completely. Small particles such as sand, dirt, scale from inside pipe and other extraneous materials can get into the close clearance parts of the pump and cause considerable damage to the parts.

Strainers should be selected so as to have a total area of holes equal to at least four times the suction pipe area.

In applications where sticks, twigs, leaves and other large debris are present, a larger outside screen should be placed around the suction inlet to prevent choking of the strainer. This screen should have sufficient openings so that flow velocity does not exceed two feet per second.

PRIMING THE PUMP. Your pump will not operate satisfactorily until it is primed. All air must be expelled from the suction piping and pump casing, and replaced by the liquid to be pumped. There are several methods of priming pumps. The one you select will depend on your specific requirements.

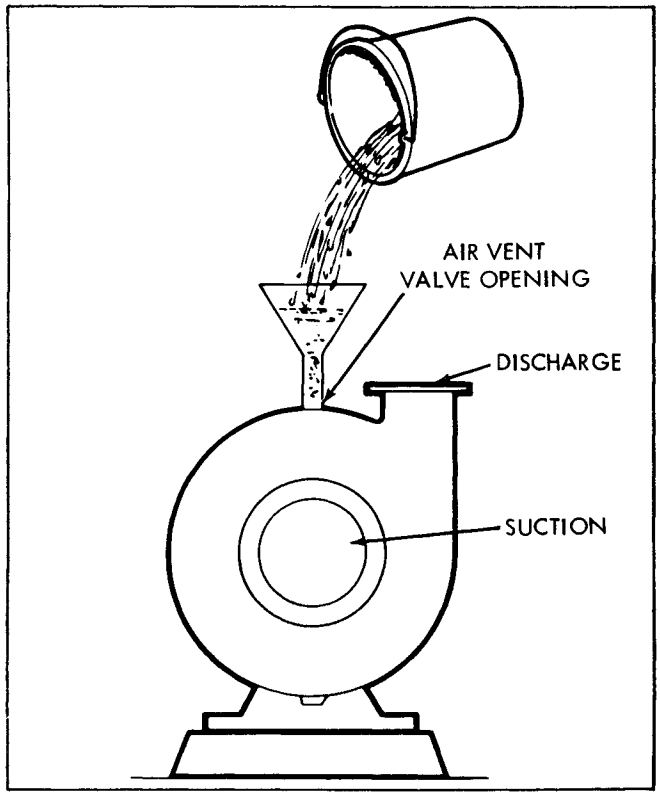


FIGURE 30. PRIMING BY HAND

FLOODED SUCTION PRIMING. This method of priming a pump is relatively simple. The liquid source is located above the pump, and all that is necessary to prime the pump is to open the air vent valve or plug in the pump casing, and to crack the gate valve in the suction line. The suction line and pump should be filled slowly until a steady stream of liquid is observed flowing from the air vent. After your pump is operating, it is recommended that the air vent valve or plug be opened again to insure that all air has been expelled from the pump casing.

FOOT VALVE PRIMING. A foot valve can be used for priming on suction lift applications. The foot valve located at the bottom end or foot of the suction piping, functions as a check valve which allows flow in one direction only, toward the pump.

Initial priming is accomplished by completely filling the suction piping and pump casing with the liquid to be pumped. This can be done by removing the air vent valve or plug at the top of the pump casing and inserting a pipe nipple in the orifice, with an appropriate increaser to accommodate a hose connection.

A priming line can also be inserted in the discharge piping between the check valve and the pump or the priming can be done with a bucket and funnel. The important thing is to completely fill the suction pipe and pump casing with liquid.

When the pump is started, the vacuum created by pumping the priming fluid, combined with atmospheric pressure in the liquid well, forces liquid into the suction piping, thus opening the foot valve and keeping it open until the pump is shut down. When the pump is shut down, the liquid being pumped reverses its flow, causing the foot valve to close, trapping the liquid in the suction piping and pump casing, thus maintaining a prime on the pump.

VACUUM PRIMING. Vacuum priming consists of removing air from the pump casing and suction piping and drawing liquid into them by means of a vacuum creating device. The types of vacuum equipment range from a simple hand pump to complex central priming systems. Your specific priming requirements will govern what type of vacuum primer to use.

AIR EJECTOR. One type of vacuum primer is the air ejector. If liquid under pressure or steam is available, an ejector can be used. The ejector is connected to the air vent orifice. A stream of the ejecting medium is passed through the ejector creating a vacuum in the ejector, and drawing air from the pump casing and suction piping. When liquid flows steadily from the ejector discharge pipe, the pump is primed.

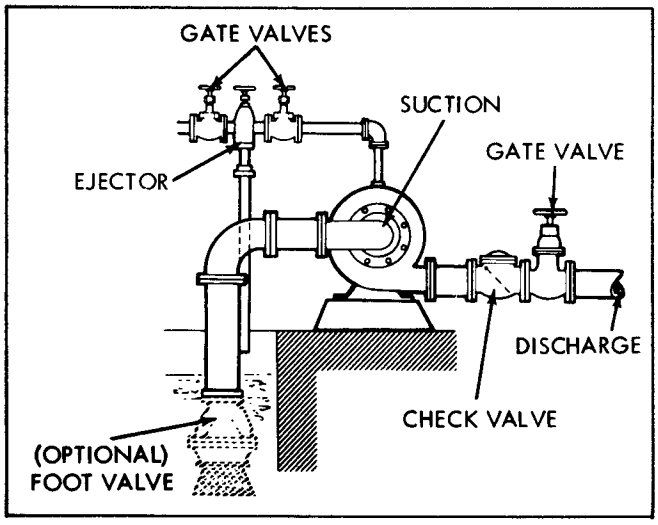


FIGURE 31. PRIMING BY EJECTOR

VACUUM PUMPS. Rotary or reciprocating pumps are frequently used as vacuum pumps. They fall into two categories, wet-vacuum and dry-vacuum. The principle of operation is essentially the same, however, the dry-vacuum pump cannot accommodate a liquid and air mixture while the wet-vacuum pump can accommodate liquid, air or a combination of both.

Vacuum pumps can be installed as part of a central priming system servicing many pumps, as an automatic priming system, or as a manually controlled independently driven pump.

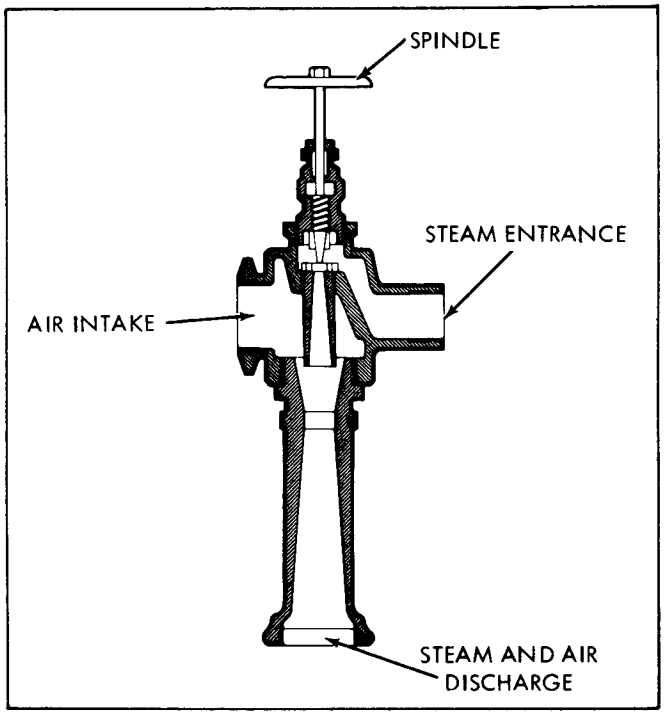


FIGURE 32. EJECTOR CUTAWAY

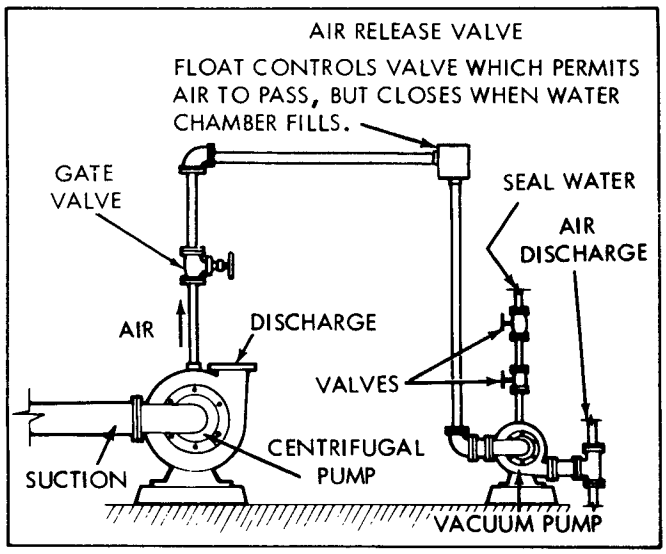


FIGURE 33. PRIMING BY VACUUM PUMP

The suction piping of the vacuum pump is connected to the air vent orifice on the pump to be primed. The vacuum produced by the vacuum pump removes air from the centrifugal pump suction piping and casing, and draws liquid from the liquid well into the centrifugal pump. Dry-vacuum pumps must be installed so that no liquid is taken into the air pump. Installation of a water trap, or use of a vacuum tank are recommended for dry vacuum pumps.

INDUCTOR PRIMING. On suction lift applications it may be desirable to prime your pump with a priming inductor. This type of primer is comprised of a liquid nozzle and an inductor at the foot end of the

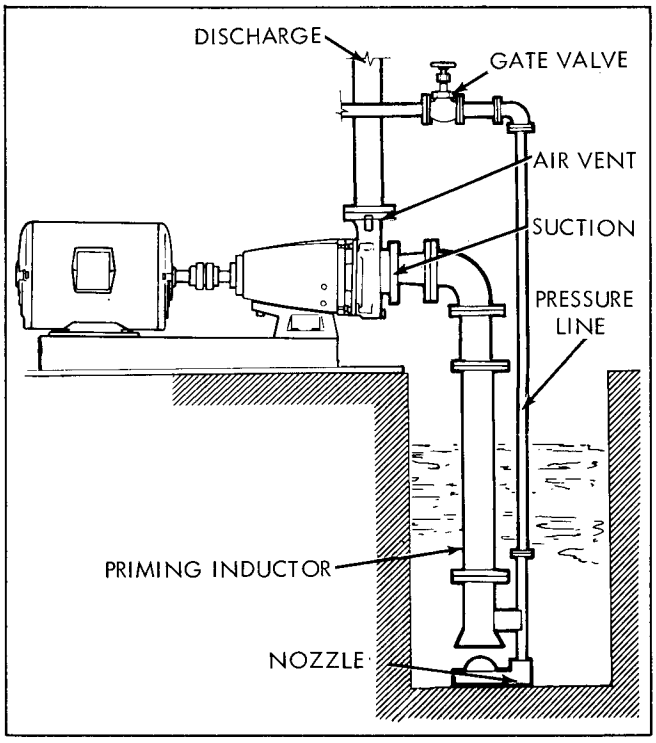


FIGURE 34. PRIMING BY INDUCTOR

suction piping. The nozzle and inductor are connected to a high pressure liquid supply such as a city water service.

The pump is primed by opening the valve in the pressure line, which allows the liquid to flow through the nozzle into the inductor. The velocity of the high pressure liquid drives the liquid into the suction piping and up to the pump, priming it.

ELECTRICAL WIRING. Normally, your pump will be supplied with an attached drive motor. The motor should be wired in accordance with the wiring diagram found on the motor name plate. Be sure the voltage, frequency, and phase of your power supply corresponds with the name plate data. It is advisable to provide a separate switch and overload protection for your pump motor to protect against power failure in some other area. Conversely, if the pump motor develops electrical problems, it will be isolated from other equipment.

PRESTARTING INSTRUCTION. The coupling halves should be connected. Prior to connection however, the drive motor should be started to make sure the direction of roatation is the same as the direction indicated by the arrow on the pump casing.

WARNING: On all 350 series pumps and the 364A with a 15" impeller on a #21 power frame, reverse rotation will destroy the pump.

After you are sure the motor is rotating clockwise you can couple the motor to the pump. Again, after coupling but BEFORE starting it is important to check coupling and shaft alignment. Use a standard dial indicator to align the motor shaft and pump shaft to within .003"-.005".

The suction and discharge piping should now be connected to the pump, and the pump primed.

CAUTION

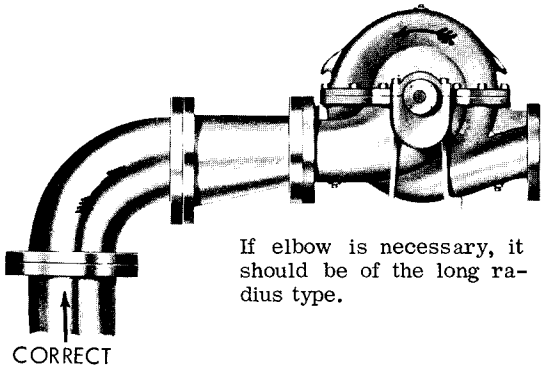
Do not operate the pump without liquid. Pump seals or packing depend on the liquid being pumped for lubrication.

Open or close the various valves as required by your specific application. Start the pump and bring it up to operating temperature. After the temperature has stabilized, the pump should be shut down and the alignment rechecked. It will be necessary to check the alignment with the coupling halves both connected and disconnected.

Remember, any alignment adjustment made in one direction may affect the other direction so extreme care should be taken when final adjustment is made.

Make sure all pump, motor and base plate mounting bolts are firmly tightened down.

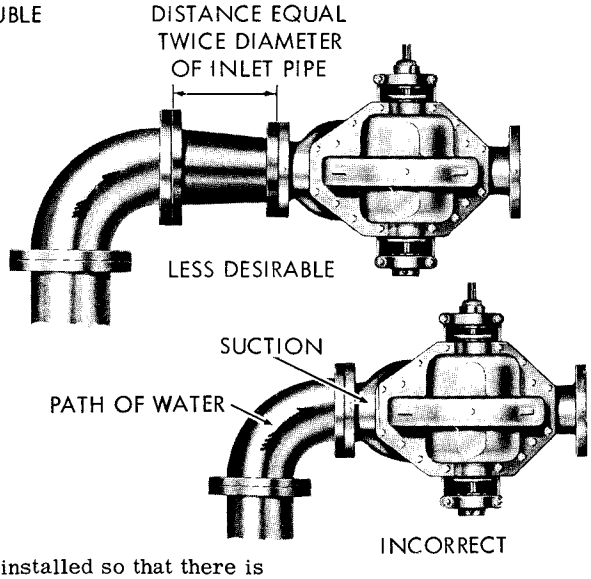
SPECIAL SUCTION PIPING SPECIFICATIONS FOR HORIZONTAL DOUBLE SUCTION PUMPS FOR ADDITIONAL DETAILS SEE PAGE 6



If elbow is necessary, it should be of the long radius type.

CORRECT

Discharge piping and suction piping should be supported close to the pump flange to prevent vibration and strain on pump casing.



The suction pipe on horizontal double suction pumps, should not be installed so that there is an elbow close to the suction nozzle unless the elbow is mounted vertically. There is always an uneven flow of liquid through an elbow and when the elbow is installed at any angle other than vertical more water will enter one side of the impeller than enters the other side. This causes a reduction in capacity and efficiency and creates an axial thrust load which may over heat and possibly cause rapid wear of the thrust bearing.

AP-Sect. 2-Item 2

SECTION 6 ITEM 410
DATED JUNE 1985
SUPERSEDES ITEM 411 & 481,
412, 413 & 483
DATED JULY 1980

AURORA PUMP
A member of the PENTAIR PUMP GROUP

INSTRUCTION MANUAL
REPAIR
MODELS 411 & 481, 412, 413 & 483

6

NOTE

This repair manual is applicable to pump Models 411 & 481, 412, 413 & 483. All photos illustrate Model 412.

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 will require periodic lubrication and can be accomplished by using the zerk or lubrication fittings in the bearing cartridge. 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 bearings. 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 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 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.

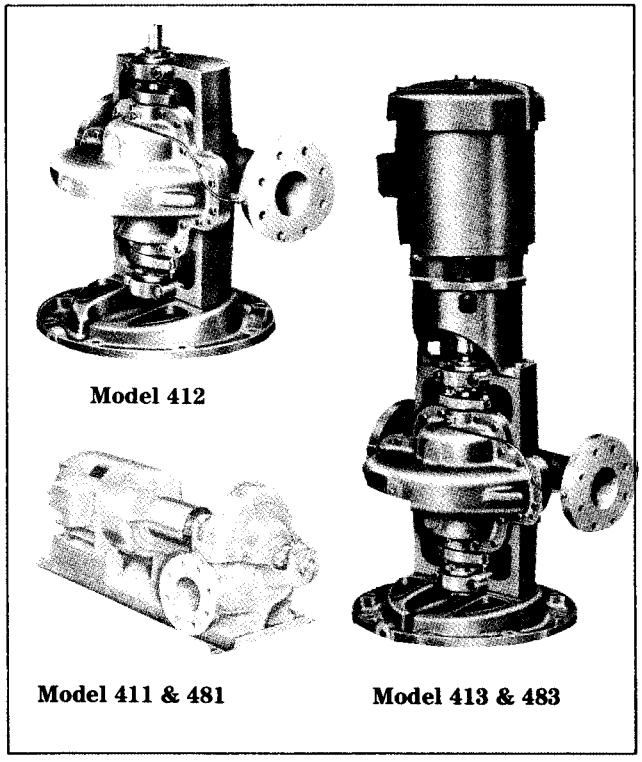
Model 411 pumps are available with two options for lubricating the shaft bearings. They are:

1. Regreasable (standard)
2. Oil Lubrication

Oil lubricated bearings are optional on Model 411 pumps. A fixed oil level is maintained within the bearing cartridge by an oiler which allows visual indications of reserve oil.

At initial installation and before starting a unit that has been shut down for repairs or for any extended length of time, run enough 10W-30 weight motor oil through the oiler to maintain a constant oil level to insure that the bearing will never be without an oil supply. Oil will have to be added at intervals to maintain a constant level in the oiler. This interval can only be determined by experience.

Under working conditions, oil will breakdown and need to be replaced at regular intervals. The length of these intervals will depend on many factors. Under normal operation, in clean and dry locations, the oil should be changed about



A. Complete pump assemblies.

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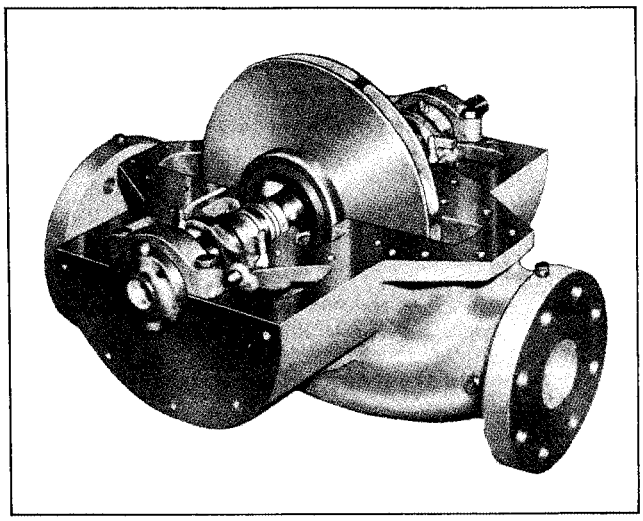
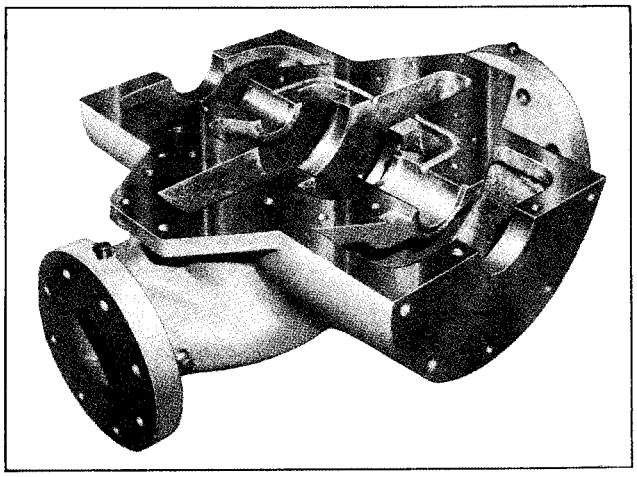
NO. AURORA, ILLINOIS



B. Casing half removed.

once a year. However, when the pump is exposed to dirt contamination, high temperatures (200°F. or above) or a wet location, the oil may have to be changed every 2 or 3 months.

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



C. Rotating element removed from casing half.

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.

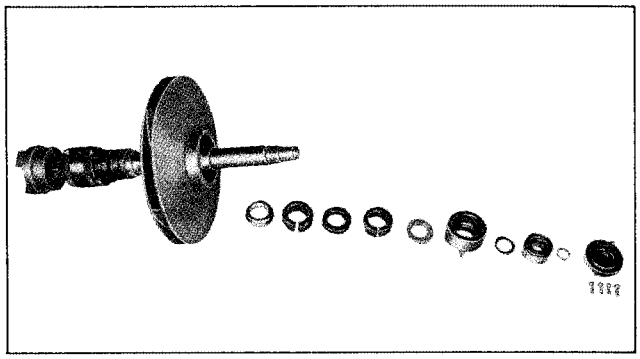
The illustrations accompanying the disassembly instructions show the pump at various stages of disassembly. The illustrations are intended to aid in the correct identification of the parts mentioned in the text.

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 to the manufacturer for repair only the motor and motor controller.

DISASSEMBLY OF THE PUMP. Disassemble only what is needed to make repairs or accomplish inspection. Proceed to disassemble the pump as follows: (See Figure 4 for Model 411 & 481, Figure 5 for Model 412 and Figure 6 for Model 413 & 483.)

1. Break electrical connections to motor or take other steps needed to prevent drive unit from being unintentionally energized during disassembly.

2. Close such valves or flow-control devises necessary to make certain flow of liquid will not take place during disassembly.



D. Outboard rotating element components removed illustrating disassembly order.

NOTE

Discharge and suction piping need not be disturbed unless complete pump assembly is to be removed.

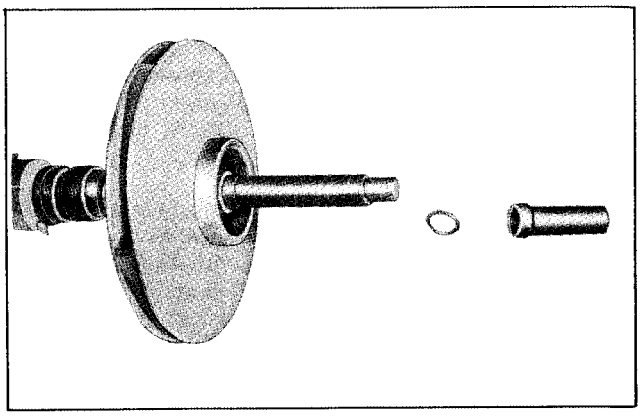
3. Drain liquid from pump by removing plugs (1 and 2). Disconnect any flushing, cooling, by-pass lines that are connected to parts that will be removed.

4. Loosen and remove capscrews (6) securing casing halve (8) to remainder of pump assembly.

NOTE

If pump being disassembled is size 4 x 5 x 11 or larger, remove capscrews (7) also before attempting to separate casing halves.

5. Make certain all securing capscrews are removed, then carefully remove casing halve (8) using hoist or crane with a sling attached around cast hooks on the casing and under the casing.



E. Sleeve and thrust washer removed.

CAUTION

Use extreme care when casing comes loose that it does not drop out of sling as this would cause extensive damage to other components of pump.

6. Remove gasket (9) and scrape mating surfaces of casing halves to remove pieces of gasket which have adhered in separation. Take care not to scratch or mar mating surfaces.

7. On Model 411, 481 and 413, 483 loosen flexible coupling and slide the halves apart. On Model 412 pumps remove flexible shafting.

8. Remove four capscrews (25) securing two bearing caps (26). Lift off bearing caps (26) and pins (27). Mark caps to insure correct replacement and orientation on the respective bearing arms.

9. Loosen and remove four nuts (18), washers (19), and gland clamps (20) securing split halves of two packing glands (21). Remove four swing bolts (22).

10. Assuming that further work is required on shaft and impeller assembly use properly secured rope slings and hoist or crane as required to lift it from casing halve (69) and place it on a suitable bench or work surface.

CAUTION

Take care not to dent or damage impeller and/or other parts. Use of a supporting cradle or work stand is recommended.

NOTE

Disassembly procedure from this point covers pumps having standard packing. If pump has mechanical seals, refer to specific instructions.

11. Remove and discard rings of packing (23). Replacement with new packing is recommended whenever pump is disassembled.

12. Slip off flexible coupling halve or spicer coupling and remove key (24). If preferred, the key may be removed by carefully tapping it from outer end with a brass drift or similar non-marring tool, using a small hammer.

13. Remove two casing wearing rings (28).

14. Remove zerks (10) and pipe plugs (12) from cartridge caps (32 and 42).

15. Loosen and remove four capscrews (31) from cartridge cap (32). The outboard shaft end protector (29) may be removed from its recess in the outboard cartridge cap if necessary. Remove retainer ring (35) with a pair of truarc pliers. Also remove gasket (34).

NOTE

If the unit has a tandem shaft, protector (29) is not used.

16. Outboard bearing (38) is press fitted onto shaft (65). To remove it, place a puller on bearing cartridge (36) and pull cartridge, grease seal (37) and bearing from shaft. The grease seal can be pressed from the bearing cartridge if it needs replacing, then slide slinger (39), lantern ring (52) and bushing (56) off shaft (65).

On 6B and 7 Power Frames remove snap ring (35A) on inboard side of bearing. Then slide slinger (39), lantern ring (52), bushing (56) off shaft.

17. Removal of inboard bearing is basically the same as for outboard bearing. Remove capscrews (41) and slide slinger (40), cartridge cap (42), grease seal (43) and gasket (44) off shaft.

18. Pull or press off bearing cartridge (45), grease seal (46) and bearing (47). Remove slinger (48), lantern ring (52) and bushing (56) from shaft.

19. If pump has right hand rotation, unscrew and remove outboard sleeve (57) first. Remove o-ring (58). If pump has left hand rotation unscrew and remove inboard sleeve (64) first. Remove o-ring (62).

20. Key (63) holds impeller (59) and either sleeve (64) if pump is right hand or sleeve (57) for a left hand pump. These parts can be removed by pulling impeller from shaft (65) and removing key (63) from its position in keyway and sleeve. Unscrew and remove remaining sleeve and gasket.

21. Disassemble wearing ring (61) (optional) from impeller (59) only if necessary. On power frames 5, 6B and 7, remove setscews (78). Apply a puller and gradually withdraw wearing rings (61) from impeller (59). Wearing rings may have to be cut or trimmed off the impeller. If a lathe is used to trim rings off, use care not to clamp impeller too tight and cause distortion. Also use care not to remove any metal from impeller.

22. Remove locking and locating pins (66, 67 and 68) from casing halve (69) only if replacement is necessary.

23. Nameplate (71) and its securing screws (70) should only be removed if replacement is necessary.

24. For Model 413 & 483 pumps unscrew capscrews (75) to remove motor and motor bracket (74) from casing halve (69). The motor can be separated from motor bracket by removing capscrews (73).

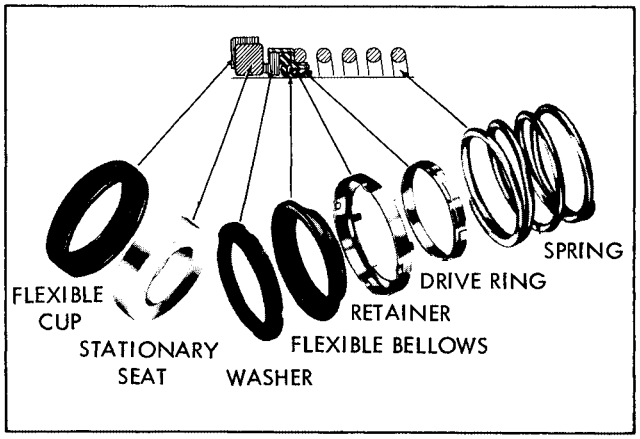
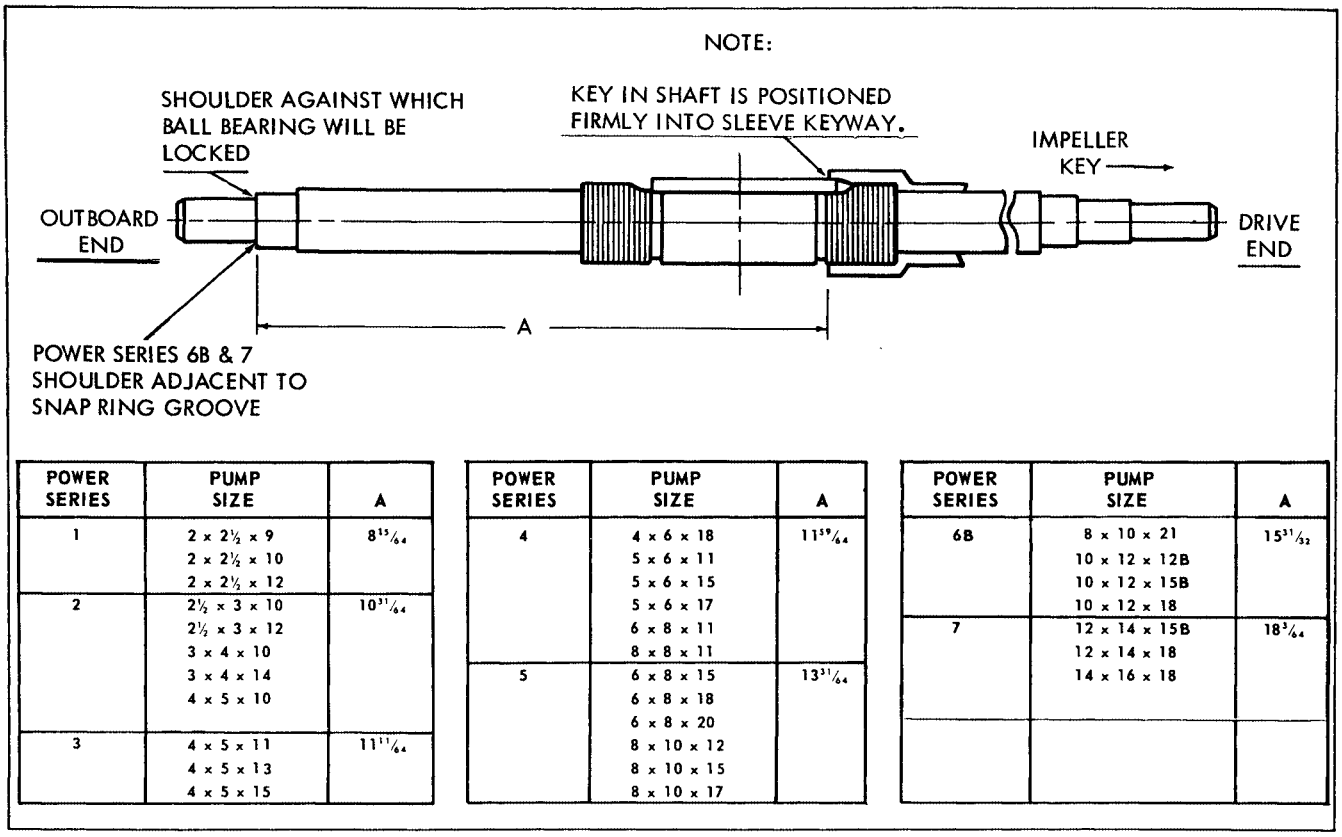


Figure 1. Mechanical Seal

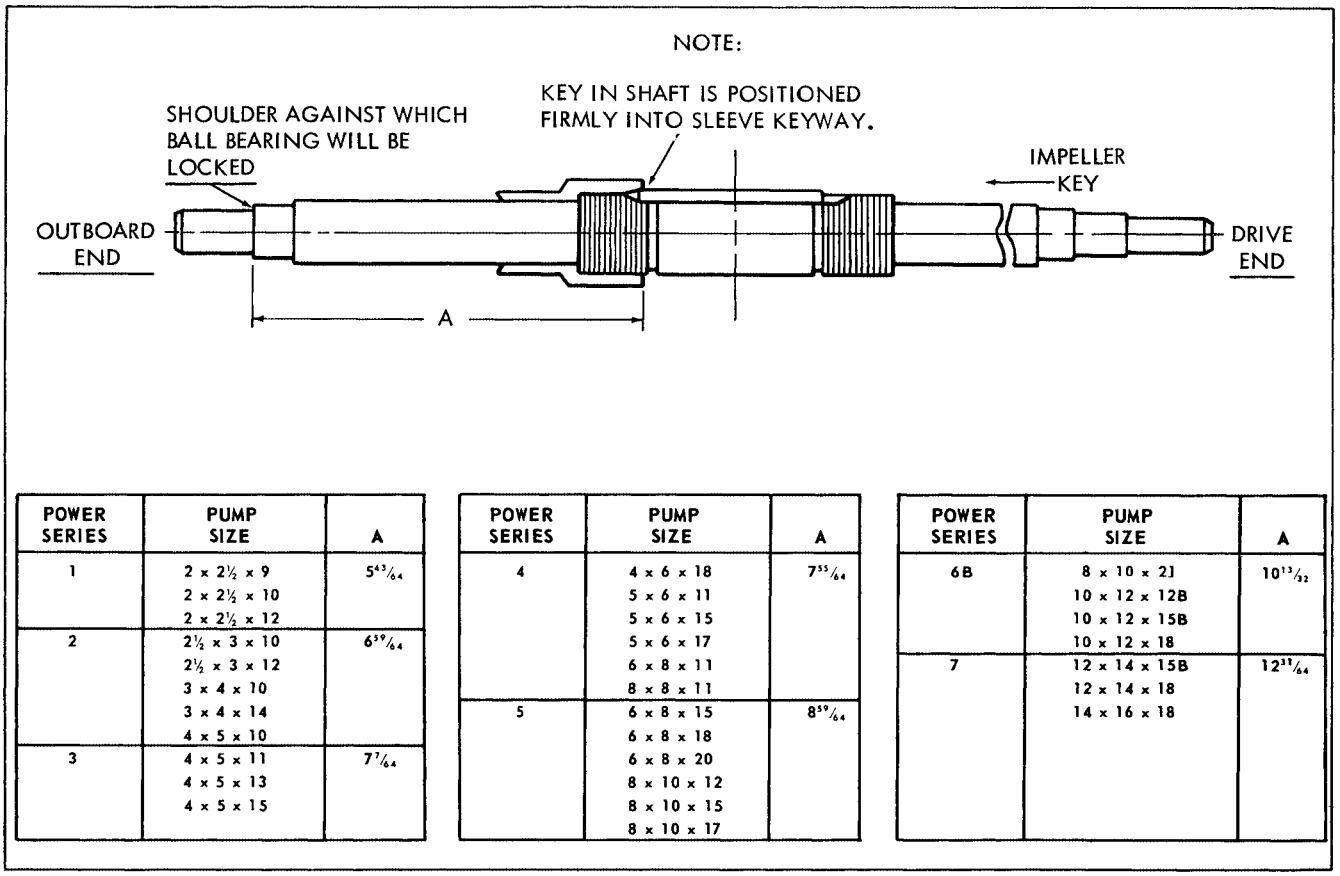


POWER SERIES	PUMP SIZE	A
1	2 x 2½ x 9 2 x 2½ x 10 2 x 2½ x 12	$8^{15}/_{64}$
2	2½ x 3 x 10 2½ x 3 x 12 3 x 4 x 10 3 x 4 x 14 4 x 5 x 10	$10^{31}/_{64}$
3	4 x 5 x 11 4 x 5 x 13 4 x 5 x 15	$11^{11}/_{64}$

POWER SERIES	PUMP SIZE	A
4	4 x 6 x 18 5 x 6 x 11 5 x 6 x 15 5 x 6 x 17 6 x 8 x 11 8 x 8 x 11	$11^{59}/_{64}$
5	6 x 8 x 15 6 x 8 x 18 6 x 8 x 20 8 x 10 x 12 8 x 10 x 15 8 x 10 x 17	$13^{31}/_{64}$

POWER SERIES	PUMP SIZE	A
6B	8 x 10 x 21 10 x 12 x 12B 10 x 12 x 15B 10 x 12 x 18	$15^{31}/_{32}$
7	12 x 14 x 15B 12 x 14 x 18 14 x 16 x 18	$18^{3}/_{64}$

Figure 2. Locating Shaft Sleeve on Shaft, Right Hand Rotation



POWER SERIES	PUMP SIZE	A
1	2 x 2½ x 9 2 x 2½ x 10 2 x 2½ x 12	$5^{43}/_{64}$
2	2½ x 3 x 10 2½ x 3 x 12 3 x 4 x 10 3 x 4 x 14 4 x 5 x 10	$6^{59}/_{64}$
3	4 x 5 x 11 4 x 5 x 13 4 x 5 x 15	$7^{7}/_{64}$

POWER SERIES	PUMP SIZE	A
4	4 x 6 x 18 5 x 6 x 11 5 x 6 x 15 5 x 6 x 17 6 x 8 x 11 8 x 8 x 11	$7^{55}/_{64}$
5	6 x 8 x 15 6 x 8 x 18 6 x 8 x 20 8 x 10 x 12 8 x 10 x 15 8 x 10 x 17	$8^{59}/_{64}$

POWER SERIES	PUMP SIZE	A
6B	8 x 10 x 21 10 x 12 x 12B 10 x 12 x 15B 10 x 12 x 18	$10^{13}/_{32}$
7	12 x 14 x 15B 12 x 14 x 18 14 x 16 x 18	$12^{31}/_{64}$

Figure 3. Locating Shaft Sleeve on Shaft, Left Hand Rotation

25. If complete removal of pump is required, disconnect the suction and discharging piping from casing halve (69). Remove nuts from foundation bolts and lift pump casing halve (69) and base (77) out. When the casing halve and base are moved away from the piping, lay them on their side, so that, by removing capscrews (76) the base can be separated from casing halve (69).

DISASSEMBLY OF A PUMP WITH MECHANICAL SEALS

1. Perform disassembly procedure as previously given through step 8.

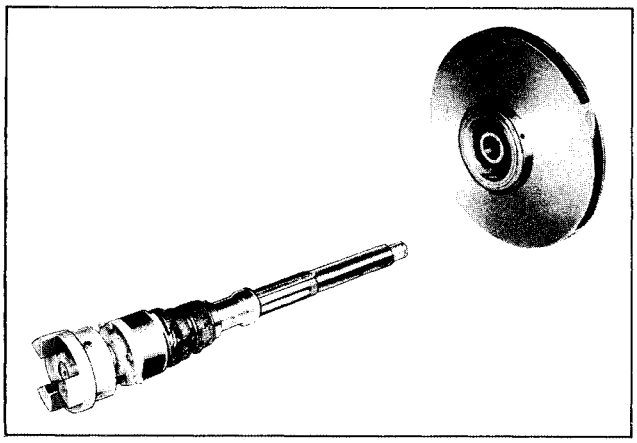
2. Loosen and remove four nuts (18), and washers (19) thus freeing swing bolts (22) to allow shaft and impeller assembly to be lifted from casing halve (69) with sling and hoist or crane as described in paragraph 10 above.

CAUTION

Use extreme care in moving this assembly, because ceramic seats can be cracked by sliding loose on the shaft. To prevent this, wrap seal securely in a cloth to stop it from sliding on shaft.

3. With shaft and impeller assembly on a suitable bench, cradle, or work stand, loosen and remove pipe plug (12) from inboard cartridge cap (42). Remove grease zerk (10) and capscrews (41) and slide cartridge cap with grease seal (43) off end of this shaft (65). Remove gasket (44).

4. Either pull or press bearing cartridge (45), grease seal (46) and bearing (47) off shaft. Remove slinger (48).



F. Impeller removed from outboard rotating element.

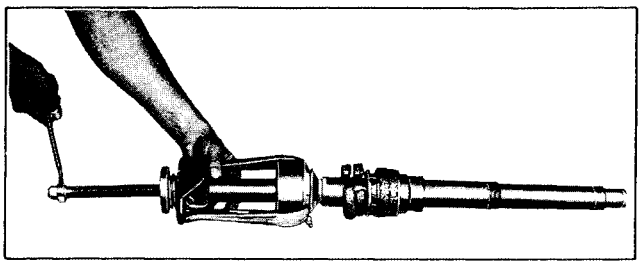
5. The one piece gland (49) used with mechanical seal assembly can now be removed from the shaft.

6. "O" ring (50) can be removed from seal gland if desired.

CAUTION

7. Exercise great care in removing seal assembly (53) to keep from marring or otherwise damaging precision ground mating surfaces.

8. Scribe a mark on shaft sleeves for relocating seal collar on reassembly. Loosen setscrews (55), securing seal collars (54) to shaft sleeves and slide them off.



G. Removing bearing from shaft using conventional puller.

9. Proceed with further disassembly of outboard seal assembly using the same procedure.

10. After removal of mechanical seals, proceed with balance of disassembly in same manner as described for packing design.

REASSEMBLY

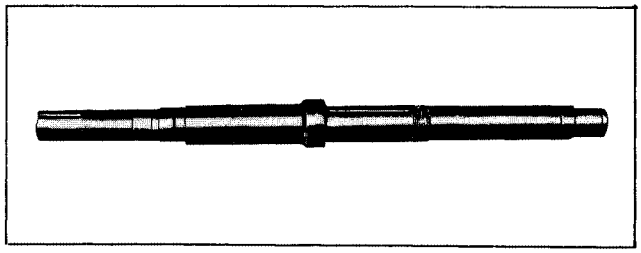
Reassembly will generally be in reverse order of disassembly. If disasseмby was not complete use only those steps related to your particular repair program.

1. For Model 412, 413 & 483 pumps, reassemble base (77) to casing halve (69) with capscrews (76). Set these parts back on their foundation and connect them to the suction and discharge piping, then secure the base to its foundation by tightening nuts on foundation bolts.

2. Position locating pins (67) in lower casing (69), adding swing bolt pins (68), if used on your pump. Install wearing ring pins (66). Tap pins gently to seat them in place. If nameplate (71) was removed, install it with screws (70). Install o-ring (62) in shaft sleeve (64).

3. On a right hand unit thread inboard sleeve (64) onto shaft (65) distance A (refer to Figure 2). On a left hand unit thread outboard sleeve (57) onto the shaft a distance A (refer to Figure 3). When the sleeve is in position its keyway should align with keyway on shaft. Coat key and keyway with Loctite Sealant Grade 242. Insert key (63) into keyways of shaft and sleeve. Tap it firmly in place.

4. Coat inside diameter of impeller wearing rings (61) (optional) with Loctite sealant Grade 271 and press them over hubs of impeller (59). Do not attempt to hammer impeller wear rings into position, since they are a press fit. Use of an arbor press is preferred. However, placing a block of wood over the impeller wearing ring and pressing it in will work satisfactorily. For power frames 5, 6B and 7 only, two setscrews (78) will be installed by drilling into wearing rings and impeller. The opposite surface of the impeller should be protected from damage throughout the procedures by resting it against soft wood on the surface of work bench.



H. Shaft with sleeve and key in position.

CAUTION

Impeller wearing rings must be given special care because they are press fit. Be sure rings are positioned squarely over the hubs of impeller. A softheaded hammer may be used to gently tap impeller wearing rings into correct alignment before they are pressed into place.

5. Coat impeller (59) keyway with loctite sealant grade 242 and slide onto shaft until it is firmly against the shaft sleeve. Place o-ring (58) in shaft sleeve (57) and thread shaft sleeve firmly against the impeller.

NOTE

When assembling rotating element of a 410 Series Pump, it is important that the curve of the impeller blades is in agreement with pump rotation. (See insert in Figures 4, 5 and 6).

CAUTION

Carefully check that proper shaft sleeve has been keyed into place for rotation of pump. If correct shaft sleeve is not keyed onto shaft, it can spin loose during operation of pump and cause excessive damage.

6. Install packing or mechanical seals and secure according to the following specific instructions.

STANDARD PACKING

a. Slide a bushing (56) onto each end of shaft. The raised shoulder on these bushings must face away from impeller.

b. Pump sizes 2 x 2-1/2 x 9, 2 x 2-1/2 x 10 and 2 x 2-1/2 x 12 have one packing ring (23) in front of lantern ring (52). All other pump sizes have two packing rings in front of lantern ring. Stagger the joints in packing rings so pump will not leak excessively.

MECHANICAL SEALS

a. Single Seal and Balanced Single Seals

I. Slide one seal lock collar (54) with setscrews (55) facing the impeller onto each end of the shaft. Position on scribe mark made during disassembly and lock in place.

II. Put a light coat of liquid dishwashing detergent on the shaft sleeve. Check rotating parts of seal to make sure they are clean. Spread a light coat of liquid detergent on inside diameters of flexible bellows and washers.

III. Place the seal's spring, drive ring, retainer, flexible bellows, and washer on the shaft sleeve in respective order. (Refer to Figure 1.)

IV. Thoroughly inspect cavity of seal gland (49) for burrs or nicks which would damage seat of the seal. Apply a film of liquid detergent to seal seat and install it in seal gland cavity, taking care to seat it evenly and squarely.

NOTE

If it is not possible to insert the seat with fingers, place a cardboard protecting ring, furnished with seal, over lapped face of seat and press into place with a piece of tubing having end cut square. Tubing should be slightly larger than the diameter of the shaft. Remove cardboard after the seat is firmly in place.

CAUTION

Never place a mechanical seal into service after it has been used without replacing or relapping stationary seat and washer faces.

V. Place "O" rings (50) around the seal glands and slide seal glands onto the ends of the shaft.

b. Double Seal

I. Place one seal seat in collar (54), the other one fits into seal gland (49). These parts are set into their cavities in the same manner as they are with a single seal.

II. Place "O" rings (51) around collars (54) and put the collars with stationary seats facing away from impeller on ends of the shaft, then slide flexible bellows, washers, and springs on the shaft in order shown in figure 1, for each half of double seal assembly (53).

III. Place "O" rings (50) around the seal glands (49) and slide seal glands onto ends of the shaft with stationary seats facing impeller.

7. Place slinger (39) onto outboard end of the shaft.

8. Press grease seal (37) into bearing cartridge (36). On 6B and 7 Power Frames replace snap ring (35A) on inboard side of bearing. Place outboard double row ball bearing (38) in bearing cartridge and press these parts onto outboard end of the shaft. Snap retainer ring (35) in place to secure outboard bearing. Place gasket (34) and cartridge cap (32) in position and secure with capscrews (31).

NOTE

Model 412, 413 & 483

Both the grease zerk holes in bearing cartridges and the pipe plug holes in cartridge caps must be facing the front of pump when it is assembled.

9. Protector (29) can be placed in the cartridge cap or if unit has a tandem shaft, press grease seal into cartridge cap and slide a slinger onto shaft.

10. Place slinger (48) on inboard end of the shaft.

11. Press grease seal (46) into bearing cartridge (45). Place the inboard ball bearing (47) in the bearing cartridge and press this assembly onto inboard end of the shaft.

12. Press grease seal (43) into cartridge cap (42). Position gasket (44) and cartridge cap against bearing cartridge and secure it in place with capscrews (41). Be sure to align grease zerk hole and pipe plug hole to the front.

13. Place slinger (40) onto shaft. Place grease zerks (10) in bearing cartridges and pipe plugs (12) in bearing caps. If pump is oil lubricated, breather tubes are placed in bearing cartridges and oilers with nipples and elbows are placed in cartridge caps.

14. Slide casing wearing rings (28) over impeller wearing rings (61) and set rotating element into casing halve (69). Make certain the holes that are drilled in bottom surface of casing wearing rings locate over pins (66) previously set in casing halve (69). Grease zerks or breather tube should face outward.

15. Install key (24) in motor end of shaft (65). Check positioning and alignment of packing rings or seal components and install swing bolts (22) and split gland halves (21) if the pump has packing. Place in position clamps (20), washers (19), and nuts (18) securing loosely in place. Swing bolts (22) are set over pins (68) on 4 x 5 x 10 or smaller pumps. On larger pumps swing bolts are held in place by capscrews (7) after casing halve (8) is in position.

16. Place pins (27) into bearing cartridges. Place bearing caps (26) in position and secure with capscrews (25).

17. Position new casing gaskets (9) on casing halve (69). Set casing halve (8) in place and secure it to casing halve (69) with capscrews (6). Pins (67) are used as a means of locating position of the two casing halves.

18. On pumps larger than 4 x 5 x 10, thread in capscrews (7) making sure they are placed through the eyes of swing bolts (22).

19. Place drain plugs (1) and (2) back in the casing halves.

20. On Model 413 & 483 pumps, set the motor on motor bracket (74) and fasten them together with capscrews (73). Slide the flexible coupling halves onto the pump and motor shafts. Attach motor bracket to casing halve (69) with capscrews (75). Connect flexible coupling halves. On Model 412 pumps, attach flexible shafting. Ideal joint operating angle is 1° to 5°. On Model 411 pumps, if lower casing was removed from the base, see section on Installation for proper methods of realigning pump to motor and piping.

21. Replace any flushing, cooling, by-pass or drain lines that were removed from the pump. Connect electricity back to the motor.

STARTING PUMP AFTER REASSEMBLY. Do not start pump until all air and vapor have been bled and making sure that there is liquid in pump to provide necessary lubrication.

NOTE

Do not over tighten standard packing assembly before returning unit to operation. Jog the pump to check for proper rotation. Then allow pump to run for a short time, gradually tighten nuts (18) until dripping has been reduced to its normal level.

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.

MODEL 411 & 481 LIST OF PARTS (See Figure 4)

1. Plug
2. Plug
6. Capscrew
7. Capscrew
8. Casing
9. Gasket
10. Grease Fitting
12. Plug
18. Nut
19. Washer
20. Clamp
21. Gland Half
22. Swing Bolt
23. Packing
24. Key
25. Capscrew
26. Bearing Cap
27. Pin
28. Wearing Ring
29. Protector
31. Capscrew
32. Cartridge Cap
34. Gasket
35. Retaining Ring
35A. Retaining Ring
36. Cartridge
37. Grease Seal
38. Bearing
39. Slinger
40. Slinger
41. Capscrew
42. Cartridge Cap
43. Grease Seal
44. Gasket
45. Cartridge
46. Grease Seal
47. Bearing
48. Slinger
49. Gland
50. "O" Ring
51. "O" Ring
52. Lantern Ring
53. Seal
54. Collar
55. Setscrew
56. Bushing
57. Sleeve
58. O-Ring
59. Impeller
61. Wearing Ring
62. O-Ring
63. Key
64. Sleeve
65. Shaft
66. Pin
67. Pin
68. Pin
69. Casing
70. Drivescrew
71. Nameplate
78. Setscrew

MODEL 412 LIST OF PARTS (See Figure 5)

1. Plug
2. Plug
6. Capscrew
7. Capscrew
8. Casing
9. Gasket
10. Grease Fitting
12. Plug
18. Nut
19. Washer
20. Clamp
21. Gland Half
22. Swing Bolt
23. Packing
24. Key
25. Capscrew
26. Bearing Cap
27. Pin
28. Wearing Ring
29. Protector
31. Capscrew
32. Cartridge Cap
34. Gasket
35. Retaining Ring
35A. Retaining Ring
36. Cartridge
37. Grease Seal
38. Bearing
39. Slinger
40. Slinger
41. Capscrew
42. Cartridge Cap
43. Grease Seal
44. Gasket
45. Cartridge
46. Grease Seal
47. Bearing
48. Slinger
49. Gland
50. "O" Ring
51. "O" Ring
52. Lantern Ring
53. Seal
54. Collar
55. Setscrew
56. Bushing
57. Sleeve
58. Gasket
59. Impeller
61. Wearing Ring
62. Gasket
63. Key
64. Sleeve
65. Shaft
66. Pin
67. Pin
68. Pin
69. Casing
70. Drivescrew
71. Nameplate
76. Capscrew
77. Base
78. Setscrew

MODEL 413 & 483 LIST OF PARTS (See Figure 6)

1. Plug
2. Plug
6. Capscrew
7. Capscrew
8. Casing
9. Gasket
10. Grease Fitting
12. Plug
18. Nut
19. Washer
20. Clamp
21. Gland Half
22. Swing Bolt
23. Packing
24. Key
25. Capscrew
26. Bearing Cap
27. Pin
28. Wearing Ring
29. Protector
31. Capscrew
32. Cartridge Cap
34. Gasket
35. Retaining Ring
35A. Retaining Ring
36. Cartridge
37. Grease Seal
38. Bearing
39. Slinger
40. Slinger
41. Capscrew
42. Cartridge Cap
43. Grease Seal
44. Gasket
45. Cartridge
46. Grease Seal
47. Bearing
48. Slinger
49. Gland
50. "O" Ring
51. "O" Ring
52. Lantern Ring
53. Seal
54. Collar
55. Setscrew
56. Bushing
57. Sleeve
58. Gasket
59. Impeller
61. Wearing Ring
62. Gasket
63. Key
64. Sleeve
65. Shaft
66. Pin
67. Pin
68. Pin
69. Casing
70. Drivescrew
71. Nameplate
73. Capscrew
74. Bracket
75. Capscrew
76. Capscrew
77. Base
78. Setscrew

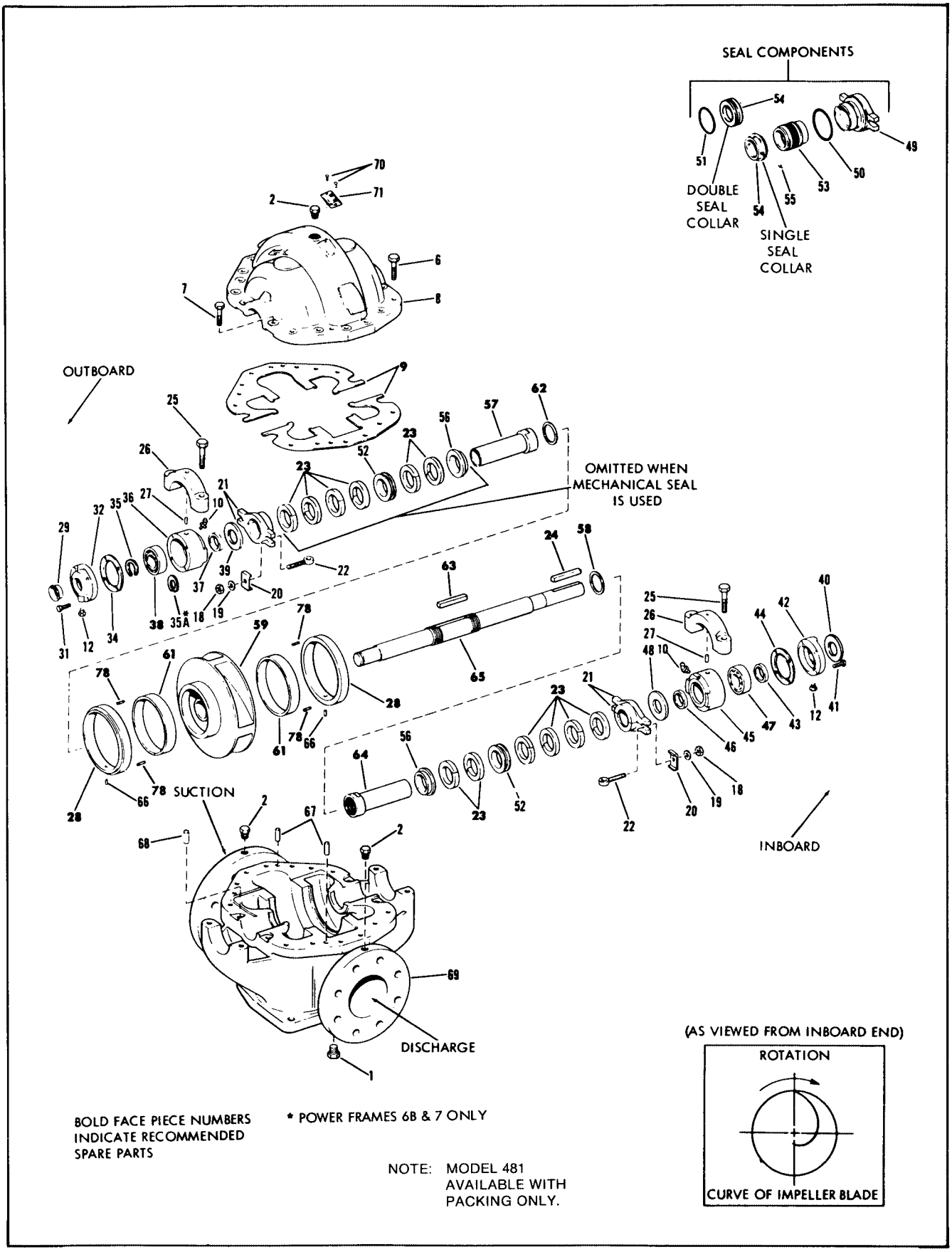


Figure 4. Model 411 & 481 Exploded View

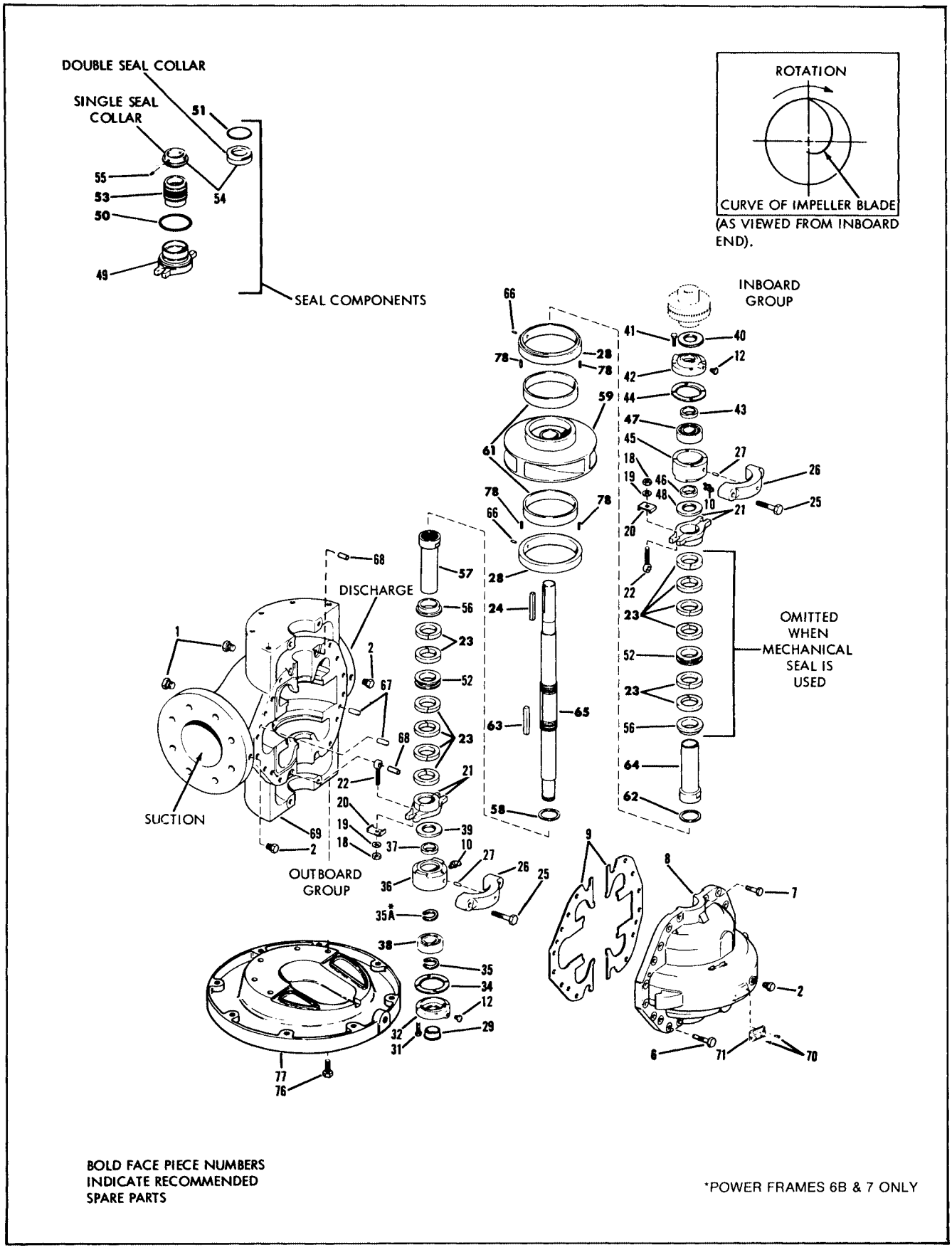


Figure 5. Model 412 Exploded View

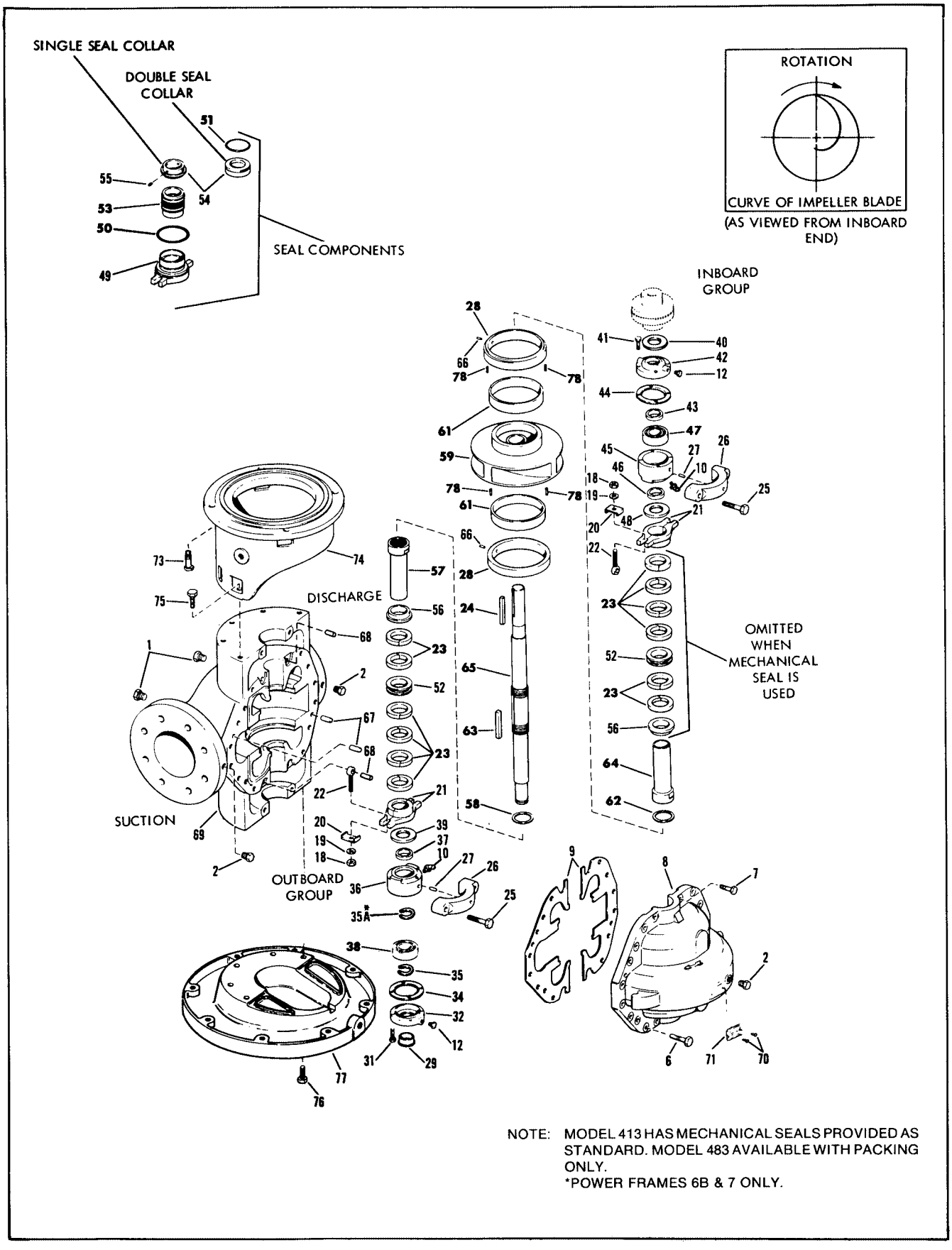
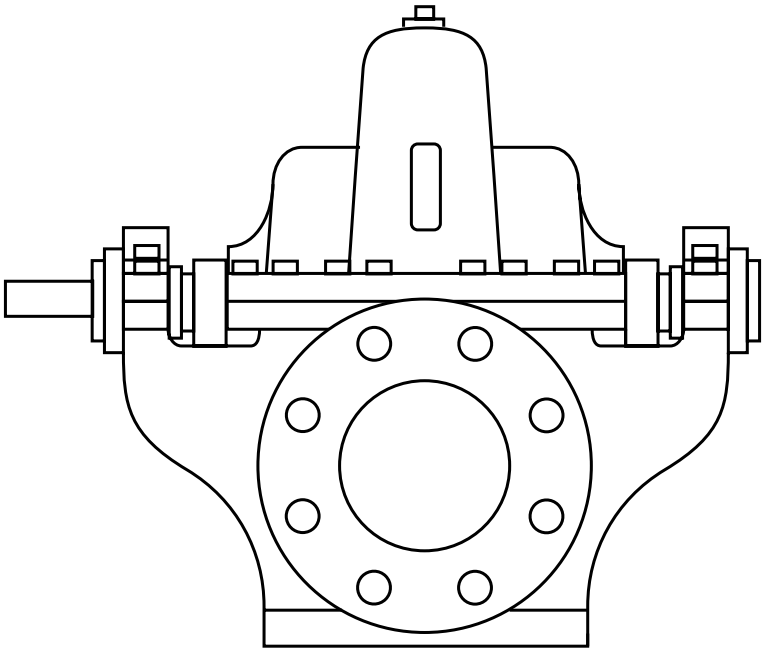


Figure 6. Model 413 & 483 Exploded View

410A SERIES
REPAIR PARTS INDEX



READ AND UNDERSTAND THE PUMP AND MOTOR INSTRUCTIONS BEFORE ATTEMPTING TO INSTALL, DISASSEMBLE OR REPAIR THE PUMP

AURORA®
Pentair Pump Group

410 SERIES
MODELS 411 - 411B - 412 - 412C - 413 - 413C

TABLE OF CONTENTS

PUMP MODEL	POWER SERIES	DESCRIPTION	PAGE
411, 412 & 413	1	2 x 2-1/2 x 9, 2 x 2-1/2 x 10, 2 x 2-1/2 x 12	6-7
411, 412 & 413	2	2-1/2 x 3 x 10B, 2-1/2 x 3 x 12, 3 x 4 x 10B & C, 3 x 4 x 14, 4 x 5 x 10B	8-9
411, 412 & 413	3	4 x 5 x 11A & C, 4 x 5 x 15	10-11
411, 412 & 413	4	4 x 6 x 18B, 5 x 6 x 11A & C, 5 x 6 x 15, 5 x 6 x 17, 6 x 8 x 11, 8 x 8 x 11B	12-13
411, 412 & 413	5	6 x 8 x 15, 6 x 8 x 18A, B & C, 6 x 8 x 20, 8 x 10 x 12 & 12A, 8 x 10 x 15A & B, 8 x 10 x 17B	14-15
411, 412C, 413C	6B	8 x 10 x 21, 8 x 10 x 21A	16-17
411, 412, 413	6B	10 x 12 x 12B,	
411, 412C, & 413C	6B	10 x 12 x 15B & C	
411, 411B, 412, 412C, 413 & 413C	6B	10 x 12 x 18	
411, 411B, 412C & 413C	7	12 x 14 x 15B	18-19
411, 411B, 412C & 413C	7	12 x 14 x 18A, 14 x 16 x 18	

SPLIT CASE MODEL DESIGNATIONS

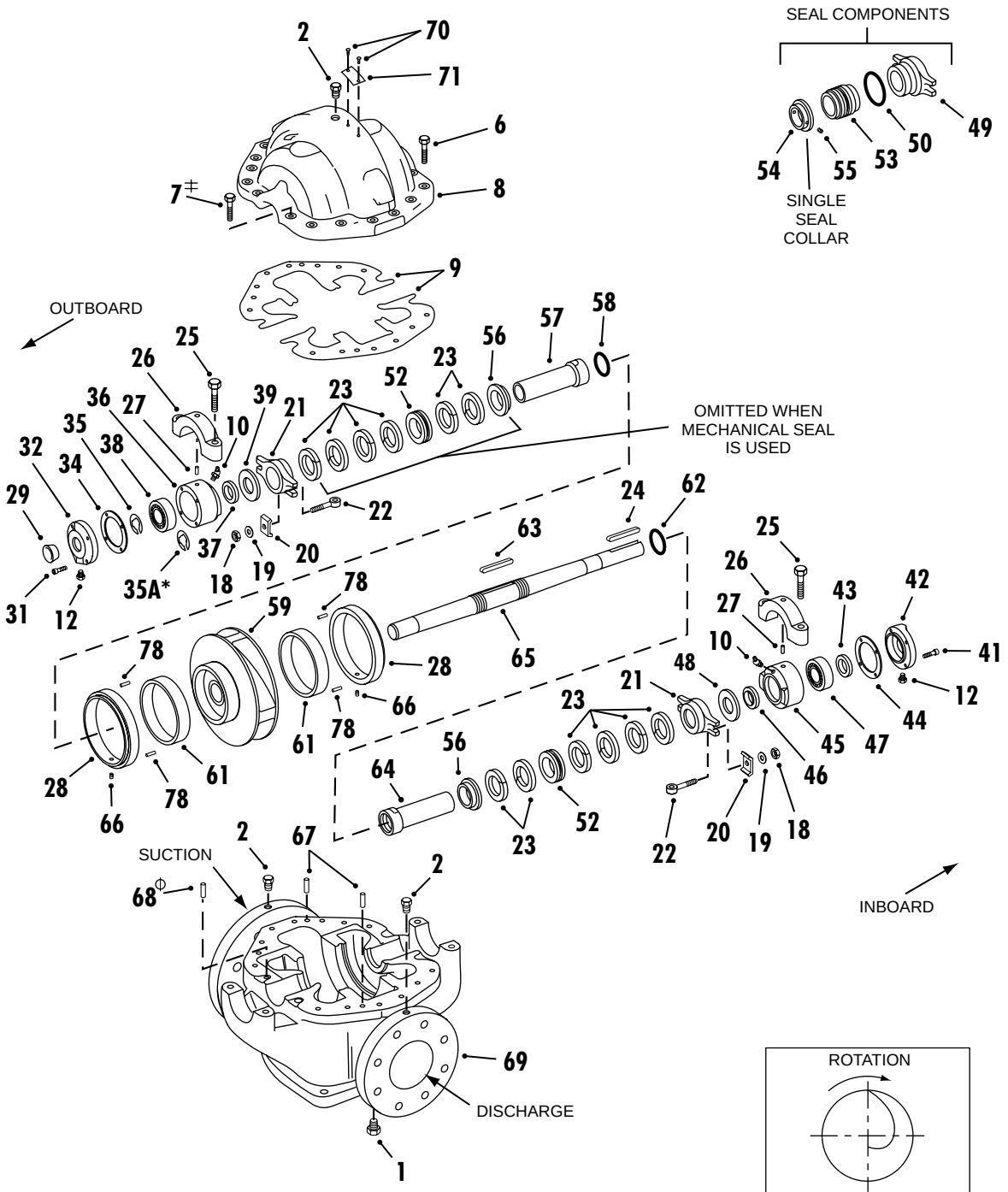
MODEL 411 = HORIZONTAL FLEX COUPLED
MODEL 411B = HORIZONTAL FLEX COUPLED BOTTOM SUCTION
MODEL 412 = VERTICAL FLEXIBLE SHAFT
MODEL 412C = VERTICAL FLEXIBLE SHAFT CHAIR MOUNT
MODEL 413 = VERTICAL FLEX COUPLED
MODEL 413C = VERTICAL FLEX COUPLED CHAIR MOUNT

NOTE: PUMPS ARE GENERALLY BUILT IN ONE OF (5) FIVE MATERIALS OF CONSTRUCTION:

B.F. = BRONZE FITTED
S.F. = STANDARD FITTED
A.B. = ALL BRONZE
A.I. = ALL IRON
S.S. = STAINLESS STEEL

THE ONLY DIFFERENCE BETWEEN B.F. AND S.F. IS THE IMPELLER MATERIAL. B.F. PUMPS HAVE BRONZE IMPELLERS AND S.F. PUMPS HAVE CAST IRON IMPELLERS.

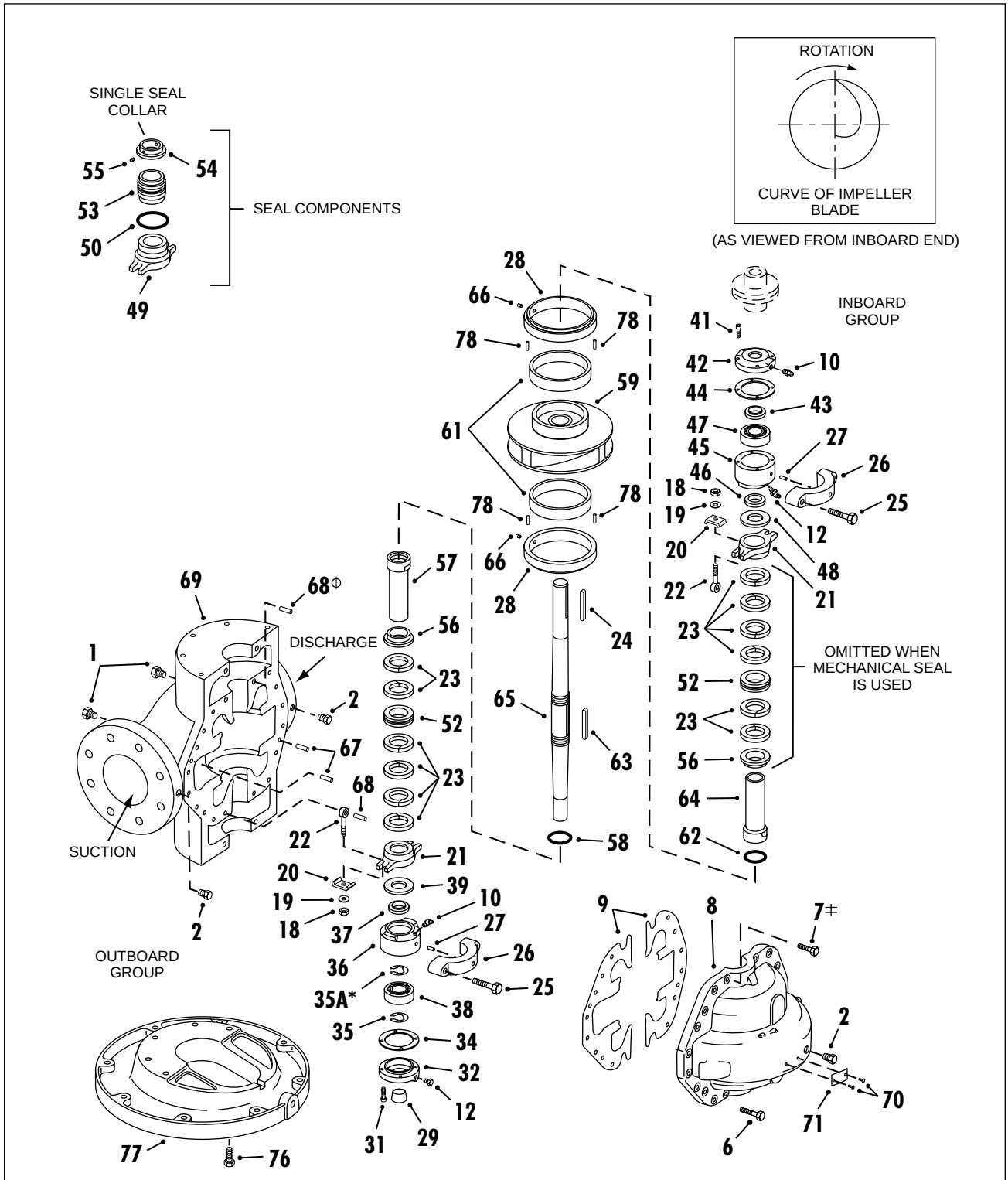
MODEL 411
PIECE NUMBERS



* POWER FRAMES 6B & 7 ONLY.
‡ PC. NO. 7 NOT REQUIRED FOR PS #1 & #2. REFER PC. NO. 68.
Φ PC. NO. 68 FOR PS #1 & #2 ONLY. FOR OTHER PS REFER PC. NO. 7.

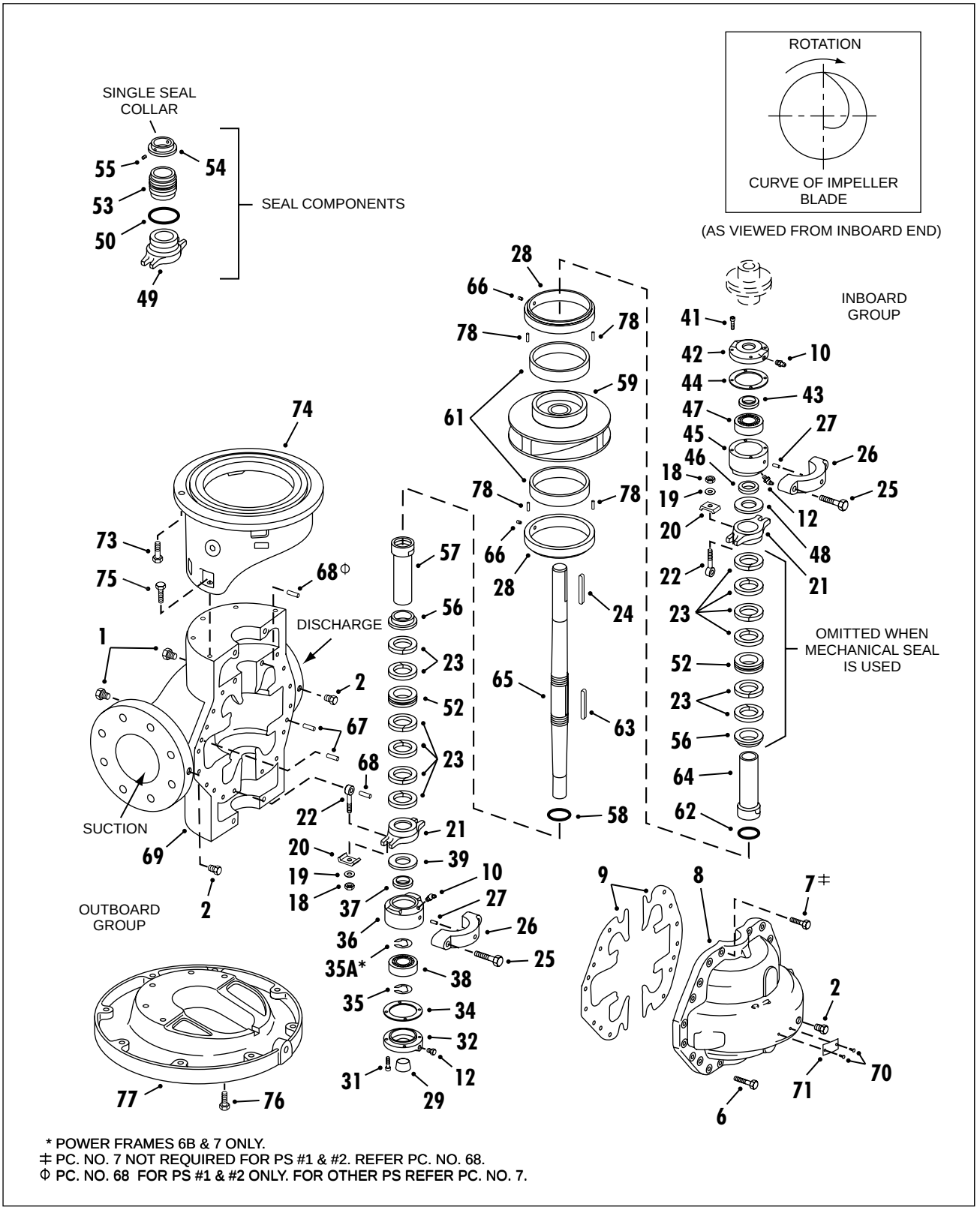
410 SERIES

MODEL 412
PIECE NUMBERS



* POWER FRAMES 6B & 7 ONLY.
‡ PC. NO. 7 NOT REQUIRED FOR PS #1 & #2. REFER PC. NO. 68.
Φ PC. NO. 68 FOR PS #1 & #2 ONLY. FOR OTHER PS REFER PC. NO. 7.

MODEL 413
PIECE NUMBERS



* POWER FRAMES 6B & 7 ONLY.
‡ PC. NO. 7 NOT REQUIRED FOR PS #1 & #2. REFER PC. NO. 68.
Φ PC. NO. 68 FOR PS #1 & #2 ONLY. FOR OTHER PS REFER PC. NO. 7.

410 SERIES P.S. #1
MODELS 411-412-413
2 x 2-1/2 x 9 - 2 x 2-1/2 x 10 - 2 x 2-1/2 x 12
PARTS LIST

PC. NO.	DESCRIPTION	QTY	PART NO.	MATERIAL B.F.	A.B.	A.I.	S.S.
1	PLUG	2	600-0003	087	190	087	104
2	PLUG	5	600-0002	087	190	087	104
6	CAPSCREW 2x9&10	12	168-0490	082	082	082	104
	2x2-1/2x12	16	168-0490	082	082	082	104
7	PIN		REFER PC. NO. 68				
8	CASING HALF	1	INCLUDED WITH NO. 69				
9	GASKET 2x2-1/2x9&10	1	364-1262	598	598	598	598
	2x2-1/2x12	1	364-1256	598	598	598	598
10	GREASE FITTING	2	508-0001	651	651	651	651
12	PLUG	2	600-0001	087	087	087	087
18	NUT	4	544-0107		190	080	104
19	WASHER	4	908-0109		190	080	104
20	GLAND CLAMP	4	204-0120		190	360	104
21	GLAND (PACKING)	2	372-0238	010	208	010	104
22	SWING BOLT	4	100-0216		190	082	104
22A	SWING BOLT ASSY.						
	(18, 19, 20, 22)	4	099-0002	644			
23	PACKING	10	564-0152	802	802	802	802
24	KEY	1	472-0208	087	087	087	087
25	CAPSCREW	4	168-0490	082	190	082	104
26	BEARING CAP	2	163-0541	010		010	
27	PIN	2	592-0361	360	107	360	107
28	CASE RING	2	676-1744	208	208	010	107
29	PROTECTOR	1	624-0105	087	087	087	087
31	CAPSCREW	4	168-0015	082	082	082	082
32	CARTRIDGE CAP	1	164-0549	010	010	010	010
34	GASKET	1	364-1308	614	614	614	614
35	RETAINER RING	1	676-0440	088	088	088	088
36	CARTRIDGE	1	176-0064	010	010	010	010
37	GREASE SEAL	1	712-6322	653	653	653	653
	OIL SEAL	1	712-0097	653	653	653	653
38	BEARING	1	068-0452	647	647	647	647
39	SLINGER	1	764-1012	478	478	478	478
41	CAPSCREW	4	168-0015	080	080	080	080
42	CARTRIDGE CAP	1	164-0549	010	010	010	010
43	GREASE SEAL	1	712-6321	653	653	653	653
	OIL SEAL	1	712-0052	653	653	653	653
44	GASKET	1	364-1308	614	614	614	614
45	CARTRIDGE	1	176-0064	010	010	010	010

PC. NO.	DESCRIPTION	QTY	PART NO.	MATERIAL B.F.	A.B.	A.I.	S.S.
46	GREASE SEAL	1	712-6322	653	653	653	653
	OIL SEAL	1	712-0097	653	653	653	653
47	BEARING	1	068-1905	647	647	647	647
48	SLINGER	1	764-1012	478	478	478	478
49	GLAND (SEAL)	2	372-0285	010	208	010	104
50	O-RING	2	364-0417	457	457	457	457
52	LANTERN RING	2	676-1767	512	512	512	512
53	SEAL	2	712-0907	749	764	749	764
54	COLLAR	2	224-0180	208	208	010	104
55	SETSCREW	4	724-0081	104	104	104	104
56	BUSHING	2	136-1423	208	208	010	104
57	SLEEVE WITH "O" RING PC. NO. 58 (NOTE 1)						
	SLEEVE (PACKING)	1	756-0641	644	644	646	623
	(SEALS)	1	756-0641	644	644	623	623
58	O-RING	1	364-0328	457	457	457	457
59	IMPELLER 2x2-1/2x9	1	443-2104	225	225	010	104
	2x2-1/2x10	1	443-2105	225	225	010	104
	2x2-1/2x12	1	443-2106	225	225	010	104
	IMPELLER		FOR S.F. CONSTRUCTION				
	(FITTED WITH		USE MATERIAL 655				
	OPT. RING NO. 61)						
	2x2-1/2x9	1	443-2479	643	643	642	646
	2x2-1/2x10	1	443-2476	643	643	642	646
	2x2-1/2x12	1	443-2471	643	643	642	646
61	IMP. RING (OPT.)		BEFORE 10/1/85				
		2	676-1047	208	108	010	104
			AFTER 10/1/85				
		2	676-2043	208	208	010	104
62	O-RING	1	364-0328	457	457	457	457
63	KEY	1	472-0410	107	104	107	104
	SLEEVE WITH "O" RING PC. NO. 62 (NOTE 1)						
64	SLEEVE (PACKING)	1	756-0641	644	644	646	623
	(SEALS)	1	756-0641	644	644	623	623
65	SHAFT	1	728-0945	063	104	063	104
66	PIN	2	592-0361	360		360	
		2	592-0051		235		235
67	PIN	2	592-0375	360	107	360	107
68	PIN	4	592-0213	104	104	104	104

NOTE 1) MATERIAL CODE 644 - SLEEVE 208, "O" RING 457
646 - SLEEVE 108, "O" RING 457
623 - SLEEVE 104, "O" RING 457

410 SERIES P.S. #1
MODELS 411-412-413
2 x 2-1/2 x 9 - 2 x 2-1/2 x 10 - 2 x 2-1/2 x 12
PARTS LIST

PC. NO.	DESCRIPTION	QTY	PART NO.	MATERIAL			
				B.F.	A.B.	A.I.	S.S.
69	MODEL 411 PUMPS						
	CASING ASSY.						
	(1, 2, 8, 26, 27, 66)						
	2x2-1/2x9	1	179-1563	010	208	010	104
	2x2-1/2x10	1	179-1564	010	208	010	104
	2x2-1/2x12	1	179-1565	010	208	010	104
	MODEL 412 & 413						
	PUMPS						
	CASING ASSEMBLY						
	(1, 2, 8, 26, 27, 66)						
	2x2-1/2x9	1	179-1575	010	208	010	104
	2x2-1/2x10	1	179-1576	010	208	010	104
	2x2-1/2x12	1	179-1577	010	208	010	104
70	DRIVE SCREW	2	708-0013	365	365	365	365
71	NAMEPLATE	2	532-0045	114	114	114	114
73	CAPSCREW						
	FR. 143HP-256HP	4	168-0388	082	082	082	082
	FR. 284HPH-445HP	4	168-0566	082	082	082	082
74	BRACKET						
	FR. 143HP-256HP	1	116-0373	010	010	010	010
	FR. 284HPH-445HP	1	116-0374	010	010	010	010
75	CAPSCREW	5	168-0490	082	082	082	082
76	CAPSCREW	5	168-0490	082	082	082	082
77	BASE	1	060-0484	010	010	010	010
78	SETSCREW		NOT REQUIRED				

PC. NO.	DESCRIPTION	QTY	PART NO.	MATERIAL			
				B.F.	A.B.	A.I.	S.S.

410 SERIES P.S. #2
MODELS 411-412-413
2-1/2 x 3 x 10B - 2-1/2 x 3 x 12 - 3 x 4 x 10B&C - 3 x 4 x 14 - 4 x 5 x 10B
PARTS LIST

PC. NO.	DESCRIPTION	QTY	PART NO.	MATERIAL B.F.	A.B.	A.I.	S.S.
1	PLUG	2	600-0003	087	190	087	104
2	PLUG	3	600-0002	087	190	087	104
6	CAPSCREW	16	168-0492	082	082	082	082
	3x4x14	20	168-0492	082	082	082	082
7	PIN		REFER PC NO. 68				
8	CASING HALF	1	INCLUDED WITH NO. 69				
9	GASKET 2-1/2x3x10B	1	364-1263	598	598	598	598
	2-1/2x3x12	1	364-1264	598	598	598	598
	3x4x10B&C	1	364-1265	598	598	598	598
	3x4x14	1	364-1266	598	598	598	598
	4x5x10B	1	364-1265	598	598	598	598
10	GREASE FITTING	2	508-0015	651	651	651	651
12	PLUG	2	600-0001	087	087	087	087
12A	PLUG*	6	600-0003	087	087	087	087
18	NUT	4	544-0107		190		104
19	WASHER	4	908-0109		190		104
20	GLAND CLAMP	4	204-0120		190		104
21	GLAND (PACKING)	2	372-0225	010	208	010	104
22	SWING BOLT	4	100-0216		190		104
22A	SWING BOLT ASSY.	4	099-0005	644		644	
	(18, 19, 20, 22)						
23	PACKING	12	564-0151	802	802	802	802
24	KEY	1	472-0247	087	087	087	087
25	CAPSCREW	4	168-0494	080	190	080	104
26	BEARING CAP	2	163-0306	010		010	
27	PIN	2	592-0361	360	107	360	107
28	CASE RING						
	2-1/2x3x10B & 12	2	676-1745	208	208	010	107
	3x4x10B, C & 14	2	676-1746	208	208	010	107
	4x5x10B	2	676-1719	208	208	010	107
29	PROTECTOR	1	624-0080	087	087	087	087
31	CAPSCREW	4	168-0015	082	082	082	082
32	CARTRIDGE CAP	1	164-0531	010	010	010	010
34	GASKET	1	364-1309	614	614	614	614
35	RETAINING RING	1	676-0267	088	088	088	088
36	CARTRIDGE	1	176-0065	010	010	010	010
37	GREASE SEAL	1	712-6324	653	653	653	653
	OIL SEAL	2	712-0053	653	653	653	653

PC. NO.	DESCRIPTION	QTY	PART NO.	MATERIAL B.F.	A.B.	A.I.	S.S.
38	BEARING	1	068-0454	647	647	647	647
39	SLINGER	1	764-1017	478	478	478	478
41	CAPSCREW	4	168-0015	080	080	080	080
42	CARTRIDGE CAP	1	164-0531	010	010	010	010
43	GREASE SEAL	1	712-0231	653	653	653	653
	OIL SEAL	1	712-0016	653	653	653	653
44	GASKET	1	364-1309	614	614	614	614
45	CARTRIDGE	1	176-0065	010	010	010	010
46	GREASE SEAL	1	712-6324	653	653	653	653
	OIL SEAL	2	712-0053	653	653	653	653
47	BEARING	1	068-1907	647	647	647	647
48	SLINGER	1	764-1017	478	478	478	478
49	GLAND (SEAL)	2	372-0287	010	208	010	104
50	O-RING	2	364-0420	457	457	457	457
52	LANTERN RING	2	676-1698	512	512	512	512
53	SEAL	2	712-0910	749		479	
		2	712-0910		764		764
54	COLLAR	2	224-0174	208	208	010	104
55	SETSCREW	4	724-0081	104	104	104	104
56	BUSHING	2	136-1411	208	208	010	104
	SLEEVE WITH "O" RING PC. NO. 58 (NOTE 1)						
57	SLEEVE (PACKING)	1	756-0642	644	644	646	623
	(SEALS)	1	756-0642	644	644	623	623
58	O-RING	1	364-0368	457	457	457	457
59	IMPELLER						
	2-1/2x3x10B	1	443-2295	225	225	010	104
	2-1/2x3x12	1	443-2108	225	225	010	104
	3x4x10B	1	443-2266	225	225	010	104
	3x4x10C & 14	1	443-2110	225	225	010	104
	4x5x10B	1	443-2251	225	225	010	104
	IMPELLER		FOR S.F. CONSTRUCTION				
	(FITTED WITH		USE MATERIAL 655				
	OPT. RING NO. 61)						
	2-1/2x3x10B	1	443-2470	643	643	642	646
	2-1/2x3x12	1	443-2475	643	643	642	646
	3x4x10B	1	443-2265	643	643	642	646
	3x4x10C & 14	1	443-1881	643	643	642	646
	4x5x10B	1	443-2468	643	643	642	646

*USED WITH WATER COOLED CARTRIDGE CAPS ONLY

NOTE 1) MATERIAL CODE 644 - SLEEVE 208, "O" RING 457
646 - SLEEVE 108, "O" RING 457
623 - SLEEVE 104, "O" RING 457

410 SERIES P.S. #2
MODELS 411-412-413
2-1/2 x 3 x 10B - 2-1/2 x 3 x 12 - 3 x 4 x 10B&C - 3 x 4 x 14 - 4 x 5 x 10B
PARTS LIST

PC. NO.	DESCRIPTION	QTY	PART NO.	MATERIAL B.F.	A.B.	A.I.	S.S.
61	IMP. RING (OPT.)		BEFORE 10/1/85				
	2-1/2x3x10B & 12	2	676-1056	208	208	010	104
	3x4x10B, C & 14	2	676-1058	208	208	010	104
	4x5x10B	2	676-1892	208	208	010	104
	IMP. RING (OPT.)		AFTER 10/1/85				
	2-1/2x3x10B & 12	2	676-2042	208	208	010	104
	3x4x10B, C & 14	2	676-1058	208	208	010	104
	4x5x10B	2	676-2040	208	208	010	104
62	O-RING	1	364-0368	457	457	457	457
63	KEY	1	472-0411	107	104	107	104
	SLEEVE WITH "O" RING PC. NO. 62 (NOTE 1)						
64	SLEEVE (PACKING)	1	756-0642	644	644	646	623
	(SEALS)	1	756-0642	644	644	623	623
65	SHAFT	1	728-0946	063	104	063	104
66	PIN	2	592-0361	360		360	
		2	592-0051		235		235
67	PIN	2	592-0375	360	107	360	107
68	PIN	4	592-0213	104	104	104	104
69	MODEL 411 PUMPS						
	CASING ASSY.						
	(1, 2, 6, 8, 26, 27, 66)						
	2-1/2x3x10B	1	179-1357	010	208	010	104
	2-1/2x3x12	1	179-1358	010	208	010	104
	3x4x10B&C	1	179-1359	010	208	010	104
	3x4x14	1	179-1360	010	208	010	104
	4x5x10B	1	179-1361	010	208	010	104
	MODEL 412 & 413						
	PUMPS						
	2-1/2x3x10B	1	179-1445	010	208	020	104
	2-1/2x3x12	1	179-1446	010	208	010	104
	3x4x10B&C	1	179-1447	010	208	010	104
	3x4x14	1	179-1448	010	208	010	104
	4x5x10B	1	179-1449	010	208	010	104
70	DRIVE SCREW	2	708-0013	365	365	365	365
71	NAMEPLATE	1	532-0045	114	114	114	114
73	CAPSCREW						
	FR. 143HP-256HP	4	168-0388	082	082	082	082
	FR. 284HPH-445HP	4	168-0566	082	082	082	082
74	BRACKET						
	FR. 143HP-256HP	1	116-0373	010	010	010	010
	FR. 284HPH-445HP	1	116-0374	010	010	010	010

PC. NO.	DESCRIPTION	QTY	PART NO.	MATERIAL B.F.	A.B.	A.I.	S.S.
75	CAPSCREW	5	168-0490	082	082	082	082
76	CAPSCREW	5	168-0490	082	082	082	082
77	BASE	1	060-0484	010	010	010	010
78	SETSCREW		NOT REQUIRED				

410 SERIES P.S. #3
MODELS 411-412-413
4 x 5 x 11A&C - 4 x 5 x 15
PARTS LIST

PC. NO.	DESCRIPTION	QTY	PART NO.	MATERIAL B.F.	A.B.	A.I.	S.S.
1	PLUG	3	600-0004	028	190	028	104
2	PLUG	2	600-0002	087	190	087	104
6	CAPSCREW	14	168-0492	082	082	082	104
	4x5x15	16	168-0492	082	082	082	104
7	CAPSCREW	4	168-0492	082	082	082	104
8	CASING HALF	1	INCLUDED WITH NO. 69				
9	GASKET		BEFORE MARCH 1979				
	4x5x11A	1	364-1267	614	614	614	614
	4x5x11C	1	364-1267	614	614	614	614
	GASKET		AFTER MARCH 1979				
	4x5x11A	1	364-0099	598	598	598	598
	4x5x11C	1	364-0099	598	598	598	598
	4x5x15 (ALL)	1	364-1268	598	598	598	598
10	GREASE FITTING	2	508-0015	651	651	651	651
12	PLUG	2	600-0001	087	087	087	087
12A	PLUG*	6	600-0003	087	087	087	087
18	NUT	4	544-0109		190	080	104
19	WASHER	4	908-0112		190	080	104
20	GLAND CLAMP	4	204-0120		190	360	104
21	GLAND (PACKING)	2	372-0226	010	208	010	104
22	SWING BOLT	4	100-2011		190	360	104
22A	SWING BOLT ASSY.						
	(18, 19, 20, 22)	4	099-0014	644			
23	PACKING	10	564-0175	816	816	816	816
24	KEY	1	472-0318	087	087	087	087
25	CAPSCREW	4	168-0494	080	190	080	104
26	BEARING CAP	2	163-0307	010		010	
27	PIN	2	592-0361	360	107	360	107
28	CASING RING						
	4x5x11A	2	676-1720	208	208	010	107
	4x5x11C	2	676-1747	208	208	010	107
	4x5x15	2	676-1747	208	208	010	107
29	PROTECTOR	1	624-0081	087	087	087	087
31	CAPSCREW	4	168-0260	082	082	082	082
32	CARTRIDGE CAP	1	164-0550	010	010	010	010
34	GASKET	1	364-1310	614	614	614	614
35	RETAINING RING	1	676-0929	088	088	088	088
36	CARTRIDGE	1	176-0066	010	010	010	010

PC. NO.	DESCRIPTION	QTY	PART NO.	MATERIAL B.F.	A.B.	A.I.	S.S.
37	GREASE SEAL	1	712-6326	653	653	653	653
	OIL SEAL	1	721-0017	653	653	653	653
38	BEARING	1	068-0455	647	647	647	647
39	SLINGER	1	764-1020	478	478	478	478
41	CAPSCREW	4	168-0260	082	082	082	082
42	CARTRIDGE CAP	1	164-0550	010	010	010	010
43	GREASE SEAL	1	712-6325	653	653	653	653
	OIL SEAL	1	712-0019	653	653	653	653
44	GASKET	1	364-1310	614	614	614	614
45	CARTRIDGE	1	176-0066	010	010	010	010
46	GREASE SEAL	1	712-6326	653	653	653	653
	OIL SEAL	1	712-0017	653	653	653	653
47	BEARING	1	068-1908	647	647	647	647
48	SLINGER	1	764-1020	478	478	478	478
49	GLAND (SEAL)	2	372-0289	010	208	010	104
50	O-RING	2	364-0423	457	457	457	457
52	LANTERN RING	2	676-1699	512	512	512	512
53	SEAL	2	712-1012	749	764	749	764
54	COLLAR	2	224-0175	208	208	010	104
55	SETSCREW	4	724-0081	104	104	104	104
56	BUSHING	2	136-1412	208	208	010	104
	SLEEVE WITH "O" RING PC. NO. 58 (NOTE 1)						
57	SLEEVE (PACKING)	1	756-0643	644	644	646	623
	(SEALS)	1	756-0643	644	644	623	623
58	O-RING	1	364-0372	457	457	457	457
59	IMPELLER						
	4x5x11A	1	443-2112	225	225	010	104
	4x5x11C	1	443-0147	225	225	010	104
	4x5x15	1	443-2115	225	225	010	104
	IMPELLER		FOR S.F. CONSTRUCTION				
	(FITTED WITH		USE MATERIAL 655				
	OPT. RING NO. 61)						
	4x5x11A	1	443-2478	643	643	642	646
	4x5x11C	1	443-2466	643	643	642	646
	4x5x15	1	443-1885	643	643	642	646
61	IMP. RING (OPT.)		BEFORE 10/1/85				
	4x5x11A	2	676-1893	208	208	010	104
	4x5x11C	2	676-1059	208	208	010	104
	4x5x15	2	676-1059	208	208	010	104

*USED WITH WATER COOLED CAPS ONLY

NOTE 1) MATERIAL CODE 644 - SLEEVE 208, "O" RING 457
646 - SLEEVE 108, "O" RING 457
623 - SLEEVE 104, "O" RING 457

410 SERIES P.S. #3
MODELS 411-412-413
4 x 5 x 11A&C - 4 x 5 x 15
PARTS LIST

PC. NO.	DESCRIPTION	QTY	PART NO.	MATERIAL			
				B.F.	A.B.	A.I.	S.S.
61	IMP. RING (OPT.)		AFTER 10/1/85				
	4x5x11A	2	676-2045	208	208	010	104
	4x5x11C	2	676-2038	208	208	010	104
	4x5x15	2	676-1059	208	208	010	104
62	O-RING	1	364-0372	457	457	457	457
63	KEY	1	472-0412	107	104	107	104
	SLEEVE WITH "O" RING PC. NO. 62 (NOTE 1)						
64	SLEEVE (PACKING)	1	756-0643	644	644	646	623
	(SEALS)	1	756-0643	644	644	623	623
65	SHAFT	1	728-0947	063	104	063	104
66	PIN	2	592-0361	360		360	
		2	592-0051		235		235
67	PIN	2	592-0375	360	107	360	107
68	PIN		NOT REQUIRED				
69	MODEL 411 PUMPS						
	CASING ASSY.						
	(1, 2, 8, 26, 27, 66)						
	4x5x11A	1	179-1363	010	208	010	104
	4x5x11C	1	179-1363	010	208	010	104
	4x5x15	1	179-1364	010	208	010	104
	MODEL 412 & 413						
	PUMPS						
	CASING ASSY.						
	(1, 2, 8, 26, 27, 66)						
	4x5x11A	1	179-1451	010	208	010	104
	4x5x11C	1	179-1451	010	208	010	104
	4x5x15	1	179-1452	010	208	010	104
70	DRIVE SCREW	2	708-0013	365	365	365	365
71	NAMEPLATE	1	532-0045	114	114	114	114
73	CAPSCREW						
	FR. 143HP-256HP	4	168-0388	082	082	082	082
	FR. 284HPH-445HP	4	168-0570	082	082	082	082
74	BRACKET						
	FR. 143HP-256HP	1	116-0376	010	010	010	010
	FR. 284HPH-445HP	1	116-0364	010	010	010	010
75	CAPSCREW	5	168-0562	082	082	082	082
76	CAPSCREW	5	168-0562	082	082	082	082
77	BASE	1	060-0485	010	010	010	101
78	SETSCREW		NOT REQUIRED				

PC. NO.	DESCRIPTION	QTY	PART NO.	MATERIAL			
				B.F.	A.B.	A.I.	S.S.

410 SERIES P.S. #4
MODELS 411-412-413
4 x 6 x 18B - 5 x 6 x 11A&C - 5 x 6 x 15 - 5 x 6 x 17 - 6 x 8 x 11 - 8 x 8 x 11B
PARTS LIST

PC. NO.	DESCRIPTION	QTY	PART NO.	MATERIAL B.F.	A.B.	A.I.	S.S.
1	PLUG	3	600-0004	028	190	028	104
2	PLUG MODEL 411	2	600-0002	087	190	087	104
	MODEL 412 & 413	4	600-0002	087	190	087	104
6	CAPSCREW						
	5x6x11A, 6x8x11,						
	8x8x11B	14	168-0564	082	082	082	104
	5x6x11C, 5x6x15						
	5x6x17	16	168-0564	082	082	082	104
	4x6x18B	20	158-0564	082	082	082	104
7	CAPSCREW	4	168-0494	082	082	082	104
8	CASING HALF	1	INCLUDED WITH NO. 69				
9	GASKET 4x6x18B	1	364-0801	598	598	598	598
	5x6x11A	1	364-1269	598	598	598	598
	5x6x11C	1	364-0809	598	598	598	598
	5x6x15	1	364-1270	598	598	598	598
	5x6x17	1	364-1270	598	598	598	598
	6x8x11	1	364-1271	598	598	598	598
	8x8x11B	1	364-1271	598	598	598	598
10	GREASE FITTING	2	508-0015	651	651	651	651
12	PLUG	2	600-0001	087	087	087	087
12A	PLUG*	6	600-0003	087	087	087	087
18	NUT	4	544-0109		190	080	104
19	WASHER	4	908-0112		190	080	104
20	GLAND CLAMP	4	204-0120		190	360	104
21	GLAND (PACKING)	2	372-0227	010	208	010	104
22	SWING BOLT	4	100-2011		190	360	104
22A	SWING BOLT ASSY.						
	(18, 19, 20, 22)	4	099-0014	644			
23	PACKING	12	564-0176	816	816	816	816
24	KEY	1	472-0318	087	087	087	087
25	CAPSCREW	4	168-0566	082	190	082	104
26	BEARING CAP	2	163-0308	010		010	
27	PIN	2	592-0361	360	107	360	107
28	CASE RING						
	4x6x18B	2	676-1748	208	208	010	107
	5x6x11A & C	2	676-1748	208	208	010	107
	5x6x15	2	676-1748	208	208	010	107
	5x6x17, 6x8x11	2	676-1748	208	208	010	107
	8x8x11B	2	676-1721	208	208	010	107

*USED WITH WATER COOLED CARTRIDGE CAPS ONLY

PC. NO.	DESCRIPTION	QTY	PART NO.	MATERIAL B.F.	A.B.	A.I.	S.S.
29	PROTECTOR	1	624-0081	087	087	087	087
31	CAPSCREW	4	168-0260	082	082	082	082
32	CARTRIDGE CAP	1	164-0532	010	010	010	010
34	GASKET	1	364-1311	614	614	614	614
35	RETAINING RING	1	676-0935	088	088	088	088
36	CARTRIDGE	1	176-0067	010	010	010	010
37	GREASE SEAL	1	712-6327	653	653	653	653
	OIL SEAL	1	712-6327	653	653	653	653
38	BEARING	1	068-0456	647	647	647	647
39	SLINGER	1	764-1022	478	478	478	478
41	CAPSCREW	4	168-0260	082	082	082	082
42	CARTRIDGE CAP	1	164-0532	010	010	010	010
43	GREASE SEAL	1	712-6326	653	653	653	653
	OIL SEAL	1	712-0017	653	653	653	653
44	GASKET	1	364-1311	614	614	614	614
45	CARTRIDGE	1	176-0067	010	010	010	010
46	GREASE SEAL	1	712-6327	653	653	653	653
	OIL SEAL	1	712-6327	653	653	653	653
47	BEARING	1	068-1909	647	647	647	647
	5x6x11C (3500)	1	068-0359	647	647	647	647
48	SLINGER	1	764-1022	478	478	478	478
49	GLAND (SEAL)	2	372-0291	010	208	010	104
50	O-RING	2	364-0425	457	457	457	457
52	LANTERN RING	2	676-1700	512	512	512	512
53	SEAL	2	712-1014		764		764
		2	712-1014	749		749	
54	COLLAR	2	224-0176	208	208	010	104
55	SETSCREW	4	724-0081	104	104	104	104
56	BUSHING	2	136-1413	208	208	010	104
	SLEEVE WITH "O" RING PC. NO. 58 (NOTE 1)						
57	SLEEVE (PACKING)	1	756-0644	644	644	646	623
	(SEALS)	1	756-0644	644	644	623	623
58	O-RING	1	364-0375	457	457	457	457

NOTE 1) MATERIAL CODE 644 - SLEEVE 208, "O" RING 457
646 - SLEEVE 108, "O" RING 457
623 - SLEEVE 104, "O" RING 457

410 SERIES P.S. #4
MODELS 411-412-413
4 x 6 x 18B - 5 x 6 x 11A&C - 5 x 6 x 15 - 5 x 6 x 17 - 6 x 8 x 11 - 8 x 8 x 11B
PARTS LIST

PC. NO.	DESCRIPTION	QTY	PART NO.	MATERIAL B.F.	A.B.	A.I.	S.S.
59	IMPELLER 4x6x18B	1	443-0648	225	225	010	104
	5x6x11A	1	443-2116	225	225	010	104
	5x6x11C	1	443-2300	225	225	010	104
	5x6x15	1	443-2117	225	225	010	104
	5x6x17	1	443-2118	225	225	010	104
	6x8x11	1	443-2116	225	225	010	104
59	IMPELLER						
	8x8x11B	1	443-2122	225	225	010	104
	IMPELLER		FOR S.F. CONSTRUCTION				
	(FITTED WITH OPT.		USE MATERIAL 655				
	NO. 61 IMP. RING)						
	4x6x18B	1	443-1021	643	643	642	646
	5x6x11A	1	443-0126	643	643	642	646
	5x6x11C	1	443-2480	643	643	642	646
	5x6x15	1	443-2467	643	643	642	646
	5x6x17	1	443-1887	643	643	642	646
	6x8x11	1	443-0126	643	643	646	646
	8x8x11B	1	443-0119	643	643	642	646
61	IMP. RING (OPT.)		BEFORE 10/1/85				
	4x6x18B, 5x6x11A & C						
	5x6x15, 5x6x17 &						
	6x8x11	2	676-1071	208	208	010	104
	8x8x11B	2	676-1894	208	208	010	104
			AFTER 10/1/85				
	4x6x18B, 5x6x11A &						
	5x6x17, 6x8x11	2	676-1071	208	208	010	104
	5x6x11C	2	676-2046	208	208	010	104
	5x6x15	2	676-2039	208	208	010	104
	8x8x11B	2	676-1894	208	208	010	104
62	O-RING	1	364-0375	457	457	457	457
63	KEY	1	472-0412	107	104	107	104
	SLEEVE WITH "O" RING PC. NO. 62 (NOTE 1)						
64	SLEEVE (PACKING)	1	756-0644	644	644	646	623
	(SEALS)	1	756-0644	644	644	623	623
65	SHAFT	1	728-0948	063	104	063	104
66	PIN	2	592-0361	360		360	
		2	592-0051		235		235
67	PIN	2	592-0375	360	107	360	107
68	PIN		NOT REQUIRED				

PC. NO.	DESCRIPTION	QTY	PART NO.	MATERIAL B.F.	A.B.	A.I.	S.S.
69	MODEL 411 PUMPS						
	CASING ASSEMBLY						
	(1, 2, 8, 26, 27, 66)						
	4x6x18B	1	179-2047	010	208	010	104
	5x6x11A	1	179-1365	010	208	010	104
	5x6x11C	1	179-2129	010	208	010	104
	5x6x15	1	179-1366	010	208	010	104
	5x6x17	1	179-1367	010	208	010	104
	6x8x11	1	179-1368	010	208	010	014
	8x8x11B	1	179-1371	010	208	010	014
	MODEL 412 & 413						
	PUMPS						
	CASING ASSY.						
	(1, 2, 8, 26, 27, 66)						
	4x6x18B	1	179-2101	010	208	010	104
	5x6x11A	1	179-1453	010	208	010	104
	5x6x11C	1	179-2135	010	208	010	104
	5x6x15	1	179-1454	010	208	010	104
	5x6x17	1	179-1455	010	208	010	104
	6x8x11	1	179-1456	010	208	010	104
	8x8x11B	1	179-1459	010	208	010	104
70	DRIVE SCREW	2	708-0013	365	365	365	365
71	NAMEPLATE	1	532-0045	114	114	114	114
73	CAPSCREW						
	FR. 143HP-256HP	4	168-0388	082	082	082	082
	FR. 284HPH-445HP	4	168-0570	082	082	082	082
74	BRACKET						
	FR. 143HP-256HP	1	116-0376	010	010	010	010
	FR. 284HPH-445HP	1	116-0364	010	010	010	010
75	CAPSCREW	5	168-0562	082	082	082	082
76	CAPSCREW	5	168-0562	082	082	082	082
77	BASE	1	060-0485	010	010	010	010
78	SETSCREW	6	724-0027	104	104	104	104

410 SERIES P.S. #5
MODELS 411-412-413
6 x 8 x 15 - 6 x 8 x 18A,B&C - 6 x 8 x 20
8 x 10 x 12 & 12A - 8 x 10 x 15A&B - 8 x 10 x 17B
PARTS LIST

PC. NO.	DESCRIPTION	QTY	PART NO.	MATERIAL			
				B.F.	A.B.	A.I.	S.S.
1	PLUG	3	600-0004	028	190	028	104
2	PLUG MODEL 411	2	600-0002	087	190	087	104
	MODEL 412 & 413	4	600-0002	087	190	087	104
6	CAPSCREW 6x8x15	17	168-0636	082	190	082	104
	6x8x18A,B&C	20	168-0638	082	190	082	104
	6x8x20	19	168-0638	082	190	082	104
	ALL OTHER SIZES	18	168-0638	082	190	082	104
7	CAPSCREW	4	168-0498	082	190	082	104
8	CASING HALF	1	INCLUDED WITH NO. 69				
9	GASKET 6x8x15	1	364-1272	598	598	598	598
	6x8x18A,B&C	1	364-0802	598	598	598	598
	6x8x20	1	364-1273	598	598	598	598
	8x10x12, 12A	1	364-1274	598	598	598	598
	8x10x15A&B	1	364-1275	598	598	598	598
	8x10x17B	1	364-1276	598	598	598	598
10	GREASE FITTING	2	508-0015	651	651	651	651
12	PLUG	2	600-0001	087	087	087	087
12A	PLUG*	6	600-0003	087	087	087	087
18	NUT	4	544-0113		190	080	104
19	WASHER	4	908-0114		190	080	104
20	GLAND CLAMP	4	204-0121		190	360	104
21	GLAND (PACKING)	2	372-0228	010	208	010	104
22	SWING BOLT	4	100-2012		190	360	104
22A	SWING BOLT ASSY.						
	(18, 19, 20, 22)	4	099-0015	644			
23	PACKING	12	564-0177	802	802	802	802
24	KEY	1	472-0321	087	087	087	087
25	CAPSCREW	4	168-0638	082	208	082	104
26	BEARING CAP	2	163-0309	010		010	
27	PIN	2	592-0361	360	107	360	107
28	CASE RING						
	6x8x15, 6x8x18A&C	2	676-1750	208	208	010	107
	6x8x20, 8x10x12 6x8x18B	2	676-1989	208	208	010	107
	8x10x15A	2	676-1988	208	208	010	107
	8x10x12A, 15B & 17B	2	676-0018	208	208	010	107
29	PROTECTOR	1	624-0110	087	087	087	087
31	CAPSCREW	4	168-0260	082	082	082	082
32	CARTRIDGE CAP	1	164-0533	010	010	010	010

PC. NO.	DESCRIPTION	QTY	PART NO.	MATERIAL			
				B.F.	A.B.	A.I.	S.S.
34	GASKET	1	364-1312	614	614	614	614
35	RETAINING RING	1	676-0943	088	088	088	088
36	CARTRIDGE	1	176-0068	010	010	010	010
37	GREASE SEAL	1	712-6329	653	653	653	653
	OIL SEAL	1	712-0037	653	653	653	653
38	BEARING	1	068-0458	647	647	647	647
39	SLINGER	1	764-1028	478	478	478	478
41	CAPSCREW	4	168-0260	082	082	082	082
42	CARTRIDGE CAP	1	164-0533	010	010	010	010
43	GREASE SEAL	1	712-6328	653	653	653	653
	OIL SEAL	1	712-0055	653	653	653	653
44	GASKET	1	364-1312	614	614	614	614
45	CARTRIDGE	1	176-0068	010	010	010	010
46	GREASE SEAL	1	712-6329	653	653	653	653
	OIL SEAL	1	712-0037	653	653	653	653
47	BEARING	1	068-0160	647	647	647	647
48	SLINGER	1	764-1028	478	478	478	478
49	GLAND (SEAL)	2	372-0293	010	208	010	104
50	O-RING	2	364-0429	457	457	457	457
52	LANTERN RING	2	676-1701	512	512	512	512
53	SEAL	2	712-1017	749	764	749	764
54	COLLAR	2	224-0177	208	208	010	104
55	SETSCREW	4	724-0081	104	104	104	104
56	BUSHING	2	136-1414	208	208	010	104
	SLEEVE WITH "O" RING PC. NO. 58 (NOTE 1)						
57	SLEEVE (PACKING)	1	756-0645	644	644	646	623
	(SEALS)	1	756-0645	644	644	623	623
58	O-RING	1	364-0380	457	457	457	457
59	IMPELLER						
	6x8x15	1	443-2119	225	225	010	104
	6x8x18A	1	443-0649	208	208	010	104
	6x8x18B	1	443-0658	225	225	010	104
	6x8x18C	1	443-2298	208	208	010	104
	6x8x20	1	443-2120	225	225	010	104
	8x10x12	1	443-2447	225	225	010	104
	8x10x15A	1	443-2119	225	225	010	104
	8x10x12A & 15B	1	443-2445	225	225	010	104
	8x10x17B	1	443-0476	225	225	010	104

*USED WITH WATER COOLED CARTRIDGE CAPS ONLY

NOTE 1) MATERIAL CODE 644 - SLEEVE 208, "O" RING 457
646 - SLEEVE 108, "O" RING 457
623 - SLEEVE 104, "O" RING 457

410 SERIES P.S. #5
MODELS 411-412-413
6 x 8 x 15 - 6 x 8 x 18A,B&C - 6 x 8 x 20
8 x 10 x 12 & 12A - 8 x 10 x 15A&B - 8 x 10 x 17B
PARTS LIST

PC. NO.	DESCRIPTION	QTY	PART NO.	MATERIAL B.F.	A.B.	A.I.	S.S.
	IMPELLER (FITTED)		FOR S.F. CONSTRUCTION				
	WITH OPT. NO. 61		USE MATERIAL 655				
	RING						
	6x8x15	1	443-1888	643	643	642	646
	6x8x18A	1	443-1022	643	643	642	646
	6x8x18B	1	443-0659	643	643	642	646
	6x8x18C	1	443-2299	643	643	642	646
	6x8x20	1	443-1889	643	643	642	646
59	IMPELLER (FITTED)		FOR S.F. CONSTRUCTION				
	WITH OPT. NO. 61		USE MATERIAL 655				
	RING						
	8x10x12	1	443-2446	643	643	642	646
	8x10x15A	1	443-1888	643	643	642	646
	8x10x12A & 15B	1	443-2473	643	643	642	646
	8x10x17B	1	443-2472	643	643	642	646
61	IMP. RING (OPT.)		BEFORE 10/1/85				
	6x8x15	2	676-1054	208	208	010	104
	6x8x18B	2	676-1990	208	208	010	104
	8x10x12A, 15B & 17B	2	676-0019	208	208	010	104
	IMP. RING (OPT.)		AFTER 10/1/85				
	6x8x15, 18A & 18C	2	676-1054	208	208	010	104
	6x8x20	2	676-1054	208	208	010	104
	8x10x12	2	676-1054	208	208	010	104
	8x10x15A	2	676-1054	208	208	010	104
	6x8x18B	2	676-1990	208	208	010	104
	8x10x12A, 15B & 17B	2	676-2044	208	208	010	104
62	O-RING	1	364-0380	457	457	457	457
63	KEY	1	472-0413	107	104	107	104
	SLEEVE WITH "O" RING PC. NO. 62 (NOTE 1)						
64	SLEEVE (PACKING)	1	756-0645	644	644	646	623
	(SEALS)	1	746-0645	644	644	623	623
65	SHAFT	1	728-0949	063	104	063	104
66	PIN	2	592-0361	360		360	
		2	592-0051		235		235
67	PIN	2	592-0375	360	107	360	107
68	PIN		NOT REQUIRED				

PC. NO.	DESCRIPTION	QTY	PART NO.	MATERIAL B.F.	A.B.	A.I.	S.S.
69	MODEL 411						
	CASING ASSEMBLY						
	(1, 2, 8, 26, 27, 66)						
	6x8x15	1	179-1369	010	228	010	104
	6x8x18A,B&C	1	179-2049	010	208	010	104
	6x8x20	1	179-1370	010	208	010	104
	8x10x12	1	179-1373	010	208	010	104
	8x10x12A	1	179-2344	010	208	101	104
	8x10x15A&B	1	179-2204	010	208	010	104
	8x10x17B	1	179-2074	010	208	010	104
69	MODEL 412 & 413						
	CASING ASSEMBLY						
	(1, 2, 8, 26, 27, 66)						
	6x8x15	1	179-1457	010	208	010	104
	6x8x18A,B&C	1	179-2103	010	208	010	104
	6x8x20	1	179-1458	010	208	020	104
	8x10x12	1	179-1461	010	208	010	104
	8x10x12A	1	179-2346	010	208	010	104
	8x10x15A&B	1	179-2207	010	208	010	104
	8x10x17B	1	179-2077	010	208	010	104
70	DRIVE SCREW	2	708-0013	365	365	365	365
71	NAMEPLATE	1	532-0045	114	114	114	114
73	CAPSCREW	4	168-0498	082	082	082	104
74	BRACKET		REFER TO FACTORY				
75	CAPSCREW	5	168-0634	082	082	082	082
76	CAPSCREW	5	168-0634	082	082	082	082
77	BASE	1	060-0470	010	010	010	010
78	SETSCREW						
	6x8x18A						
	6x8x18C						
	6x8x20						
	8x10x12, 12A						
	8x10x15A	6	724-0027	104	104	104	104
	6x8x18B						
	8x10x15B						
	8x10x17B	8	724-0027	104	104	104	104

410 SERIES P.S. #6B
MODELS 411-411B-412-412C-413-413C
8 x 10 x 21 - 8 x 10 x 21A - 10 x 12 x 12B - 10 x 12 x 15B&C - 10 x 12 x 18
PARTS LIST

PC. NO.	DESCRIPTION	QTY	PART NO.	MATERIAL B.F.	A.B.	A.I.	S.S.
1	PLUG	3	600-0004	028	190	028	104
2	PLUG	2	600-0002	087	190	087	104
	10x12x12B 412 &413	4	600-0002	087	190	087	104
6	CAPSCREW						
	8x10x21 & 21A	21	168-0638	082	082	082	082
	10x12x12B	24	168-0638	082	082	082	104
	10x12x15B	26	168-0638	082	082	082	104
	10x12x18	26	168-0638	082	082	082	104
7	CAPSCREW	4	168-0498	082	082	082	104
8	UPPER CASING		INCLUDED WITH NO. 69				
9	GASKET 8x10x21&21A	1	364-2110	598	598	598	598
	10x12x12B	1	364-0803	598	598	598	598
	10x12x15B&C	1	364-0804	598	598	598	598
	10x12x18	1	364-0805	598	598	598	598
10	GREASE FITTING	2	508-0015	651	651	651	651
12	PLUG	2	600-0001	087	087	087	087
18	NUT	4	544-0113		190	080	104
19	WASHER	4	908-0114	080	190	080	104
20	CLAMP	4	204-0121	360	190	360	104
21	GLAND (PACKING)	2	372-0065	010	208	010	104
22	SWING BOLT						
	PACKING	4	100-2012	360	190	360	104
	SEALS	4	100-2013	360	190	360	104
23	PACKING	10	564-0179	802	802	802	802
24	KEY	1	472-0366	087	087	087	087
25	CAPSCREW	4	168-0638	082	082	082	104
26	BEARING CAP	2	163-0309	010		010	
27	PIN	2	592-0361	360	107	360	107
28	CASE RING						
	8x10x21	2	676-2031	208	208	010	107
	8x10x21A	2	676-2014	208	208	010	107
	10x12x12B	2	676-1982	208	208	010	107
	10x12x15B&C	2	676-1983	208	208	010	107
	10x12x18	2	676-1984	208	208	010	107
29	PROTECTOR	1	624-0111	087	087	087	087
31	CAPSCREW	4	168-0260	082	082	082	082
32	CARTRIDGE CAP	1	164-0352	010	010	010	010
34	GASKET	1	364-1312	614	614	614	614
35	RETAINING RING	1	676-0382	088	088	088	088
35A	RETAINING RING	1	676-0925	088	088	088	088
36	CARTRIDGE	1	176-0001	010	010	010	010

PC. NO.	DESCRIPTION	QTY	PART NO.	MATERIAL B.F.	A.B.	A.I.	S.S.
37	GREASE SEAL	1	712-6331	653	653	653	653
	OIL SEAL	1	712-6331	653	653	653	653
38	BEARING	1	068-0362	647	647	647	647
39	SLINGER	1	764-0178	478	478	478	478
41	CAPSCREW	4	168-0260	082	082	082	082
42	CARTRIDGE CAP	1	164-0352	010	010	010	010
43	GREASE SEAL	1	712-6330	653	653	653	653
	OIL SEAL	1	712-6330	653	653	653	653
44	GASKET	1	364-1312	614	614	614	614
45	CARTRIDGE	1	176-0001	010	010	010	010
46	GREASE SEAL	1	712-6331	653	653	653	653
	OIL SEAL	1	712-6331	653	653	653	653
47	BEARING	1	068-1912	647	647	647	647
48	SLINGER	1	764-0178	478	478	478	478
49	GLAND (SEAL)	2	372-0150	010	208	010	104
50	O-RING	2	364-0433	457	457	457	457
52	LANTERN RING	2	676-1462	512	512	512	512
53	SEAL	2	712-0468	755	764	756	764
54	COLLAR	2	224-0004	208	208	010	104
55	SETSCREW	4	724-0081	104	104	104	104
56	BUSHING	2	136-1002	208	208	010	104
	SLEEVE WITH "O" RING PC. NO. 58 (NOTE 1)						
57	SLEEVE (PACKING)	1	756-0646	644	644	646	623
	(SEALS)	1	756-0646	644	644	623	623
58	O-RING	1	364-0388	457	457	457	457
59	IMPELLER						
	8x10x21	1	443-2432	208	208	010	104
	8x10x21A	1	443-2662	208	208	010	104
	10x12x12B	1	443-0650	208	208	010	104
	10x12x15B	1	443-0651	208	208	010	104
	10x12x15C	1	443-0841	208	208	010	104
	10x12x18	1	443-0652	225	225	010	104
	IMPELLER (FITTED		FOR S.F. CONSTRUCTION				
	WITH OPT. IMP.		USE MATERIAL 655				
	RING NO. 61)						
	8x10x21	1	443-2457	643	643	642	646
	8x10x21A	1	443-2663	643	643	642	646
	10x12x12B	1	443-1023	643	643	642	646
	10x12x15B	1	443-1024	643	643	642	646
	10x12x15C	1	443-2474	643	643	642	646
	10x12x18	1	443-2469	643	643	642	646

NOTE 1) MATERIAL CODE 644 - SLEEVE 208, "O" RING 457
646 - SLEEVE 108, "O" RING 457
623 - SLEEVE 104, "O" RING 457

410 SERIES P.S. #6B
MODELS 411-411B-412-412C-413-413C
8 x 10 x 21 - 8 x 10 x 21A - 10 x 12 x 12B - 10 x 12 x 15B&C - 10 x 12 x 18
PARTS LIST

PC. NO.	DESCRIPTION	QTY	PART NO.	MATERIAL B.F.	A.B.	A.I.	S.S.
61	IMP. RING (OPT.)		ALSO ORDER #78 SETSCREW				
			BEFORE 10/1/85				
	8x10x21	2	676-1757	208	208	010	104
	10x12x12B	2	676-1970	208	208	010	104
	10x12x15B&C	2	676-1971	208	208	010	104
	10x12x18	2	676-1972	208	208	010	104
			AFTER 10/1/85				
	8x10x21	2	676-1757	208	208	010	104
	8x10x21A	2	676-2013	208	208	010	104
	10x12x12B	2	676-1970	208	208	010	104
	10x12x15B	2	676-1971	208	208	010	104
	10x12x15C	2	676-2047	208	208	010	104
	10x12x18	2	676-2041	208	208	010	104
62	O-RING	1	364-0388	457	457	457	457
63	KEY	1	472-0414	107	107	107	107
	BEFORE JULY 1990						
64	SLEEVE (PACKING)	1	756-0384	208	208	108	104
	(SEALS)	1	756-0384	208	208	104	104
	SLEEVE WITH "O" RING PC. NO. 62 (NOTE 1)						
64	SLEEVE (PACKING)	1	756-0646	644	644	646	623
	(SEALS)	1	756-0646	644	644	623	623
65	SHAFT	1	728-0502	076	109	076	109
66	PIN	2	592-0361	360		360	
		2	592-0051		235		235
67	PIN	2	592-0375	360	107	360	107
68	PIN		NOT REQUIRED				
69	CASING ASSEMBLY						
	(1, 2, 8, 26, 27, 66)						
	8x10x21 411	1	179-2328	010	208	010	104
	8x10x21A	1	179-2464	010	208	010	104
	8x10x21 412C & 413C	1	179-2330	010	208	010	104
	8x10x21A	1	179-2466	010	208	010	104
	10x12x12B 411	1	179-2051	010	208	010	104
	10x12x12B						
	412 & 413	1	179-2315	010	208	010	104
	10x12x15B&C 411	1	179-2053	010	208	010	104
	10x12x15B&C						
	412C, 413C	1	179-0310	010	208	010	104
	10x12x18 411	1	179-2055	010	208	010	104
	10x12x18 411B	1	179-2317	010	208	010	104
	10x12x18						
	412C & 413C	1	179-0312	010	208	010	104

PC. NO.	DESCRIPTION	QTY	PART NO.	MATERIAL B.F.	A.B.	A.I.	S.S.
70	DRIVE SCREW	2	708-0013	365	365	365	365
71	NAMEPLATE	1	532-0045	114	114	114	114
73	CAPSCREW	4	168-0566	082	082	082	082
74	BRACKET		REFER TO FACTORY				
75	CAPSCREW						
	8x10x21 & 21A	4	168-0636	082	082	082	082
	10x12x12B	5	168-0634	082	082	082	082
	10x12x15B&C	4	168-0636	082	082	082	082
	10x12x18	4	168-0636	082	082	082	082
76	CAPSCREW						
	8x10x21 & 21A	4	168-0636	082	082	082	082
	10x12x12B	5	168-0634	082	082	082	082
	10x12x15B&C	4	168-0636	082	082	082	082
	10x12x18	4	168-0636	082	082	082	082
77	BASE (MODELS						
	412 & 413)						
	10x12x12B	1	060-1292	010	010	010	010
*	BASE		(NOT ILLUSTRATED)				
	MODEL 411B		REFER TO FACTORY				
	MODEL 412C						
	8x10x21 & 21A	1	060-1335	087	087	087	087
	10x12x12B						
	10x12x15B&C						
	10x12x18	1	060-1298	087	087	087	087
	MODEL 413C						
	8x10x21 & 21A	1	060-1336	087	087	087	087
	10x12x12B						
	10x12x15B&C						
	10x12x18	1	060-1328	087	087	087	087
78	SETSCREW						
	8x10x21 & 21A	6	724-0027	104	104	104	104
	10x12x12B						
	10x12x15B&C						
	10x12x18	8	724-0027	104	104	104	104
80	REGISTER PLATE		(NOT ILLUSTRATED)				
	MODEL 413C	1	008-0591	087	087	087	087

*411B – BOTTOM SUCTION PUMP. 412C – CHAIR MOUNTED PUMPS.

410 SERIES P.S. #7
MODELS 411-411B-412C-413C
12 x 14 x 15B - 12 x 14 x 18A - 14 x 16 x 18
PARTS LIST

PC. NO.	DESCRIPTION	QTY	PART NO.	MATERIAL B.F.	A.B.	A.I.	S.S.
1	PLUG	3	600-0004	087	190	087	104
2	PLUG	2	600-0002	087	190	087	104
6	CAPSCREW	32	168-0638	082	190	082	104
	12x14x18A &						
	14x16x18	36	168-0790	082	190	082	104
7	CAPSCREW	4	168-0163	082	082	082	104
8	CASING HALF		INCLUDED WITH NO. 69				
9	GASKET						
	12x14x15B	1	364-0806	598	598	598	598
	12x14x18A	1	364-0807	598	598	598	598
	14x16x18	1	364-0808	598	598	598	598
10	GREASE FITTING	2	508-0010	651	651	651	651
11	GREASE FITTING		INCLUDED WITH NO. 10				
12	PLUG	2	600-0001	087	087	087	087
18	NUT	4	544-0113	080	190	080	104
19	WASHER	4	908-0114	080	190	080	104
20	GLAND CLAMP	4	204-0121	360	190	360	104
21	GLAND (PACKING)	2	372-0280	010	208	010	104
22	SWING BOLT	4	100-2013	360	190	360	104
23	PACKING	14	564-0180	802	802	802	802
24	KEY	1	472-0394	087	087	087	087
25	CAPSCREW	4	168-0642	082	190	082	104
26	BEARING CAP	2	163-0334	010		010	
27	PIN	2	592-0366	360	107	360	107
28	CASE RING						
	12x14x15B	2	676-1985	208	208	010	107
	12x14x18A	2	676-2056	208	208	010	107
	14x16x18	2	676-1969	208	208	010	107
29	PROTECTOR	1	624-0111	087	087	087	087
31	CAPSCREW	4	168-0388	082	082	082	082
32	CARTRIDGE CAP	1	164-0499	010	010	010	010
34	GASKET	1	364-1330	614	614	614	614
35	RETAINING RING	1	676-0295	088	088	088	088
35A	RETAINING RING	1	676-0926	088	088	088	088
36	CARTRIDGE	1	176-0002	010	010	010	010
37	GREASE SEAL	1	712-6332	653	653	653	653
	OIL SEAL	1	712-0059	653	653	653	653
38	BEARING	1	068-0364	647	647	647	647
39	SLINGER	1	764-0177	478	478	478	478
41	CAPSCREW	4	168-0388	082	082	082	082

NOTE 1) MATERIAL CODE 644 - SLEEVE 208, "O" RING 457
646 - SLEEVE 108, "O" RING 457
623 - SLEEVE 104, "O" RING 457

PC. NO.	DESCRIPTION	QTY	PART NO.	MATERIAL B.F.	A.B.	A.I.	S.S.
42	CARTRIDGE CAP	1	164-0499	010	010	010	010
43	GREASE SEAL	1	712-6333	653	653	653	653
	OIL SEAL	1	712-0058	653	653	653	653
44	GASKET	1	364-1330	614	614	614	614
45	CARTRIDGE	1	176-0002	010	010	010	010
46	GREASE SEAL	1	712-6332	653	653	653	653
	OIL SEAL	1	712-0059	653	653	653	653
47	BEARING	1	068-1914	647	647	647	647
48	SLINGER	1	764-0177	478	478	478	478
49	GLAND (SEAL)	2	372-0068	010	208	010	104
50	O-RING	2	364-0436	457	457	457	457
52	LANTERN RING	2	676-1943	010	208	010	104
53	MECH. SEAL	2	712-0471	755	764	756	764
54	COLLAR	2	224-0006	208	208	010	104
55	SETSCREW	4	724-0081	104	104	104	104
56	BUSHING	2	136-1602	208	208	010	104
	SLEEVE WITH "O" RING PC. NO. 58 (NOTE 1)						
57	SLEEVE (PACKING)	1	756-0647	644	644	646	623
	(SEALS)	1	756-0647	644	644	623	623
58	O-RING	1	364-0390	457	457	457	457
59	IMPELLER						
	12x14x15B	1	443-0653	208	208	010	104
	12x14x15C	1	443-3080	208	208	010	104
	12x14x18A	1	443-2482	208	208	010	104
	14x16x18	1	443-0655	208	208	010	104
	IMPELLER						
	(FITTED WITH OPT.		FOR S.F. CONSTRUCTION				
	IMP. RING NO. 61)		USE MATERIAL 655				
	12x14x15B	1	443-1026	643	643	642	646
	12x14x15C	1	443-3084	643	643	642	646
	12x14x18A	1	443-2481	643	643	642	646
	14x16x18	1	443-1028	643	643	642	646
61	IMP. RING (OPT.)		ALSO ORDER #78, SETSCREW				
	12x14x15B	2	676-1973	208	208	010	104
	12x14x15C	2	676-2124	208	208	010	104
	12x14x18A	2	676-2055	208	208	010	104
	14x16x18	2	676-1975	208	208	010	104
62	O-RING	1	364-0390	457	457	457	457
63	KEY	1	472-0414	107	104	107	104
64	SLEEVE WITH "O" RING PC. NO. 62 (NOTE 1)						
	SLEEVE (PACKING)	1	756-0647	644	644	646	623
	(SEALS)	1	756-0647	644	644	623	623
65	SHAFT	1	728-0503	076	109	076	109

410 SERIES P.S. #7
MODELS 411-411B-412C-413C
12 x 14 x 15B - 12 x 14 x 18A - 14 x 16 x 18
PARTS LIST

PC. NO.	DESCRIPTION	QTY	PART NO.	MATERIAL B.F.	A.B.	A.I.	S.S.
66	PIN	2	592-0361	360		360	
		2	592-0051		235		235
67	PIN	2	592-0375	360	107	360	107
68	PIN		NOT REQUIRED				
69	CASING ASSEMBLY						
	12x14x15B 411	1	179-2057	010	208	010	104
	12x14x15B 411B	1	179-2319	010	208	010	104
	12x14x15B						
	412C, 413C	1	179-2321	010	208	010	104
	12x14x18A 411	1	179-2337	010	208	010	104
	12x14x18A						
	412C, 413C	1	179-2338	010	208	010	104
	14x16x18 411	1	179-2061	010	208	010	104
	14x16x18						
	412C, 413C	1	179-2323	010	208	010	104
70	DRIVE SCREW	2	708-0013	365	365	365	365
71	NAMEPLATE	1	532-0045	114	114	114	114
73	CAPSCREW 413C	4	168-0636	082	082	082	082
74	BRACKET		REFER TO FACTORY				
75	CAPSCREW 412C	4	168-0636	082	082	082	082
	413C	4	168-0636	082	082	082	082
76	CAPSCREW 412C	4	168-0636	082	082	082	082
	413C	4	168-0636	082	082	082	082
*	BASE		(NOT ILLUSTRATED)				
	MODEL 411B		REFER TO FACTORY				
	MODEL 412C						
	12x14x15B	1	060-1297	087	087	087	087
	12x14x18A	1	060-1297	087	087	087	087
	14x16x18	1	060-1296	087	087	087	087
	MODEL 413C						
	12x14x15B	1	060-1327	087	087	087	087
	12x14x18A	1	060-1327	087	087	087	087
	14x16x18	1	060-1326	087	087	087	087
78	SETSCREW	8	724-0027	104	104	104	104
80	REGISTER PLATE		(NOT ILLUSTRATED)				
	MODEL 413C	1	008-0591	087	087	087	087

PC. NO.	DESCRIPTION	QTY	PART NO.	MATERIAL B.F.	A.B.	A.I.	S.S.

*411B – BOTTOM SUCTION PUMP. 412C, 413C – CHAIR MOUNTED PUMPS.

AP-410P-REPAIR 12.99

AURORA®
Pentair Pump Group

Aurora Pumps
800 Airport Road
North Aurora, IL 60542
phone: 630-859-7000
fax: 630-859-7060

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

Performance Curves for the 410 Series (50 Hz)

MODEL/SIZE	R.P.M.	PDF PAGE
2x2-1/2x9	2880	3
2x2-1/2x9	1440	4
2x2-1/2x10	2880	5
2x2-1/2x10	1440	6
2x2-1/2x12	1440	7
2x2-1/2x12	960	8
2-1/2x3x10B	2880	9
2-1/2x3x10B	1440	10
2-1/2x3x12	1440	11
2-1/2x3x12	960	12
3x4x10B	2880	13
3x4x10B	1440	14
3x4x10C	2950	15
3x4x10C	1440	16
3x4x14	1440	17
3x4x14	960	18
4x5x10B	2880	19
4x5x10B	1440	20
4x5x11A	1440	21
4x5x11A	960	22
4x5x11C	2950	23
4x5x11C	1440	24
4x5x15	1440	25
4x5x15	960	26
4x6x18B	1475	27
4x6x18B	960	28
5x6x11A	1440	29
5x6x11A	960	30
5x6x11C	2950	31
5x6x11C	1440	32
5x6x15	1440	33
5x6x15	960	34
5x6x17	1475	35
5x6x17	960	36
6x8x11	1440	37
6x8x11	960	38
6x8x15	1475	39
6x8x15	960	40
6x8x18A	1475	41
6x8x18A	980	42
6x8x18B	1475	43
6x8x18B	960	44
6x8x18C	1475	45

Continued next page

Performance Curves for the 410 Series (50 Hz) (cont.)

MODEL/SIZE	R.P.M.	PDF PAGE
6x8x18C	960	46
6x8x20	1475	47
8x8x11B	1440	48
8x8x11B	960	49
8x10x12	1440	50
8x10x12	960	51
8x10x12A	1475	52
8x10x12A	980	53
8x10x15A	1475	54
8x10x15A	960	55
8x10x21	1475	56
8x10x21	980	57
8x10x21A	1475	58
8x10x21A	980	59
10x12x12B	1440	60
10x12x12B	980	61
10x12x15B	1475	62
10x12x15B	980	63
10x12x15C	1475	64
10x12x15C	980	65
10x12x18	1475	66
10x12x18	980	67
12x14x15B	1475	68
12x14x15B	980	69
12x14x18A	1475	70
12x14x18A	980	71
14x16x18	980	72
14x16x18	735	73

AURORA®
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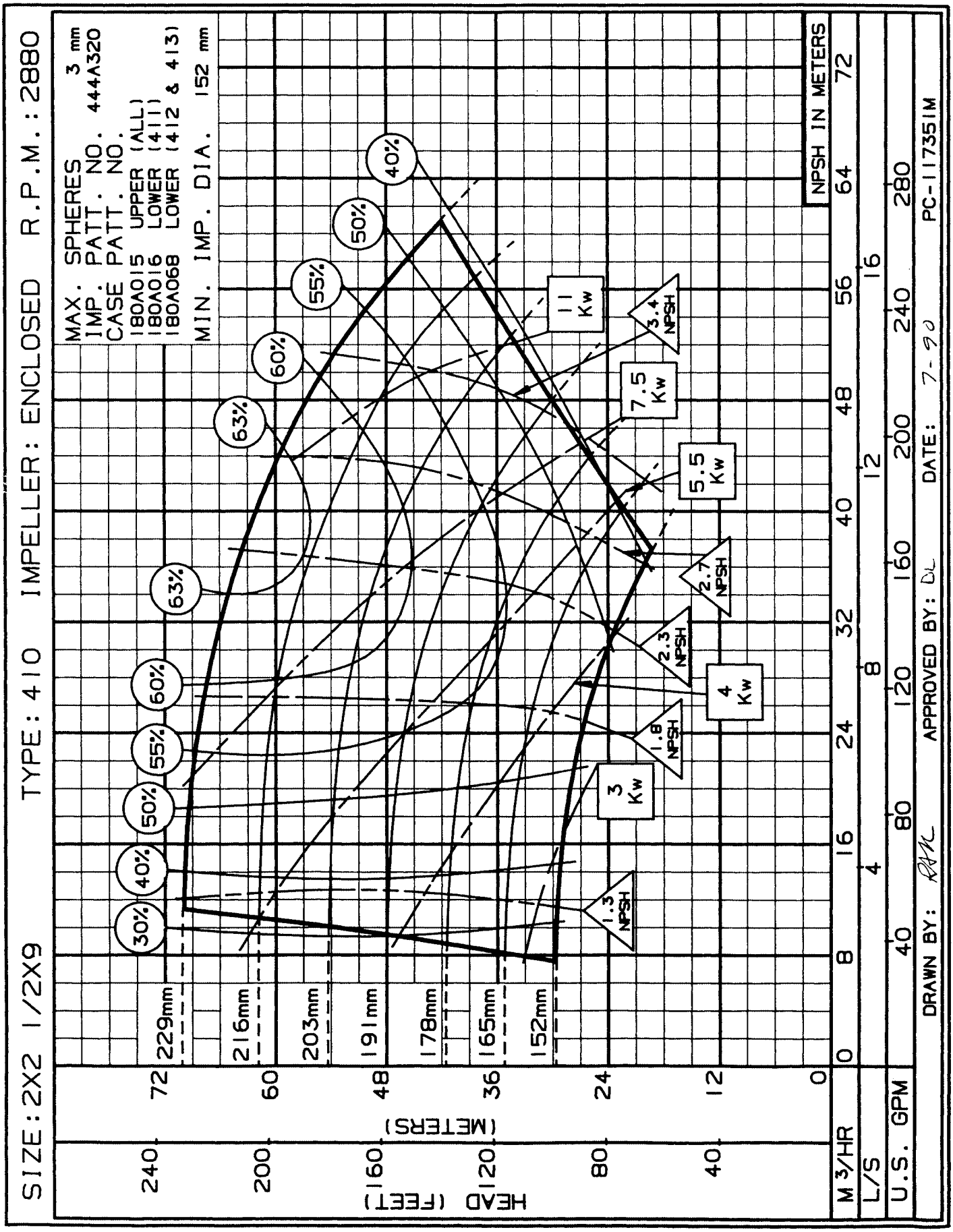
2x2-1/2x9 - 2880 RPM
ENCLOSED IMPELLER

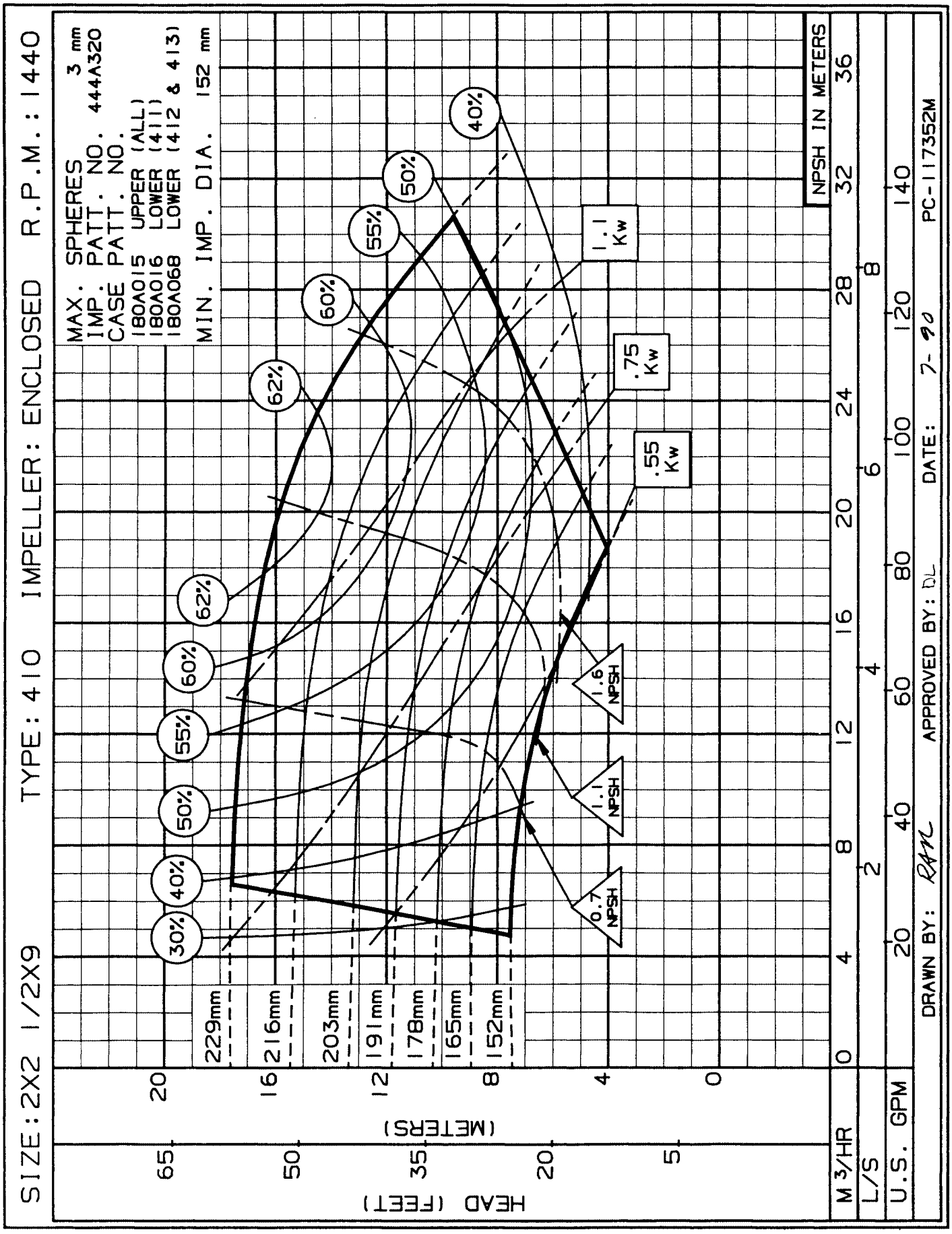
SECTION 410 (Metric 50Hz)
DATE JULY 1994
SUPERCEDES MARCH 1986



SECTION **410 (Metric 50Hz)**
DATE **JULY 1994**
SUPERCEDES MARCH 1986

2x2-1/2x9 - 1440 RPM
ENCLOSED IMPELLER

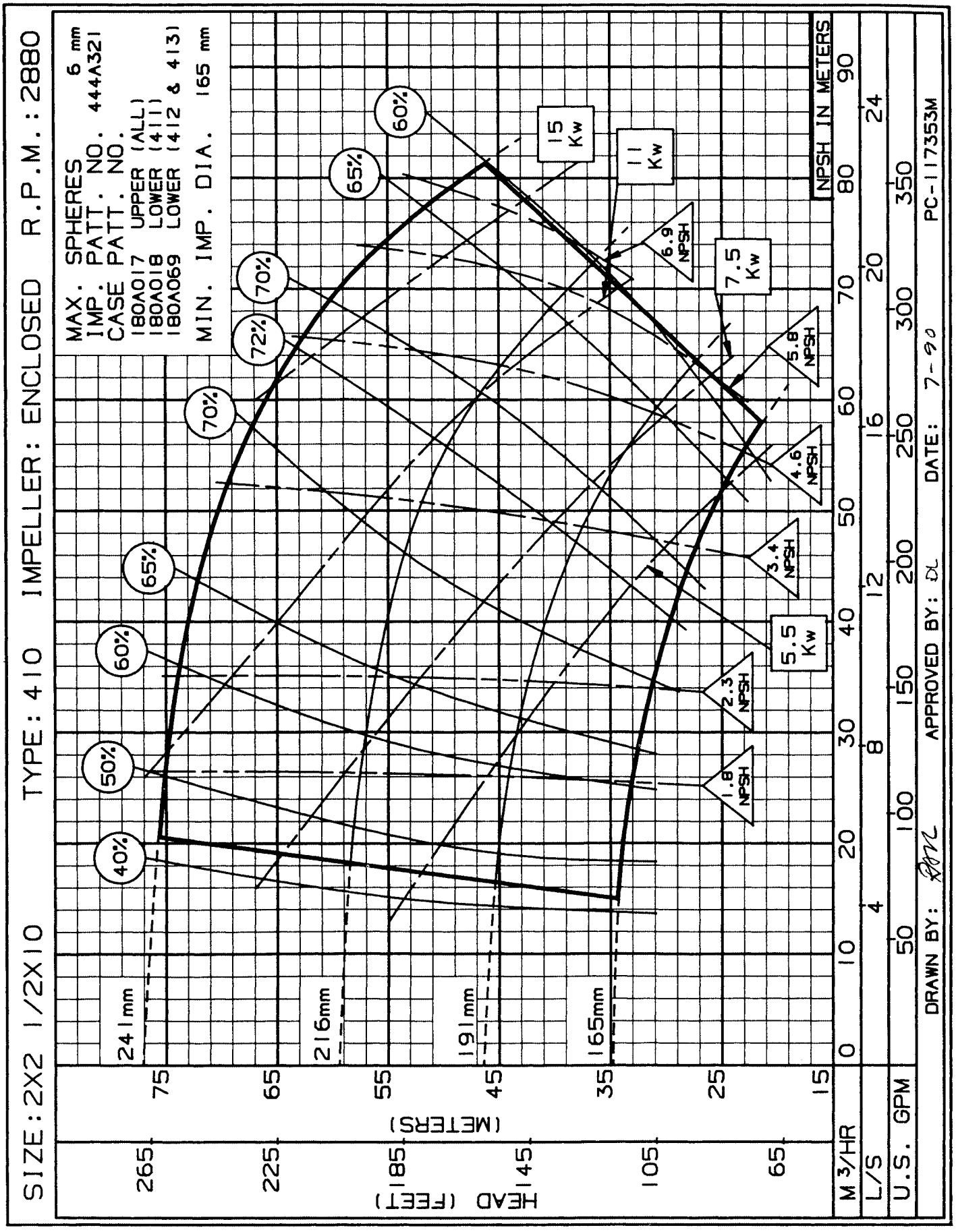
AURORA®
Pentair Pump Group



AURORA®
Pentair Pump Group

2x2-1/2x10 - 2880 RPM
ENCLOSED IMPELLER

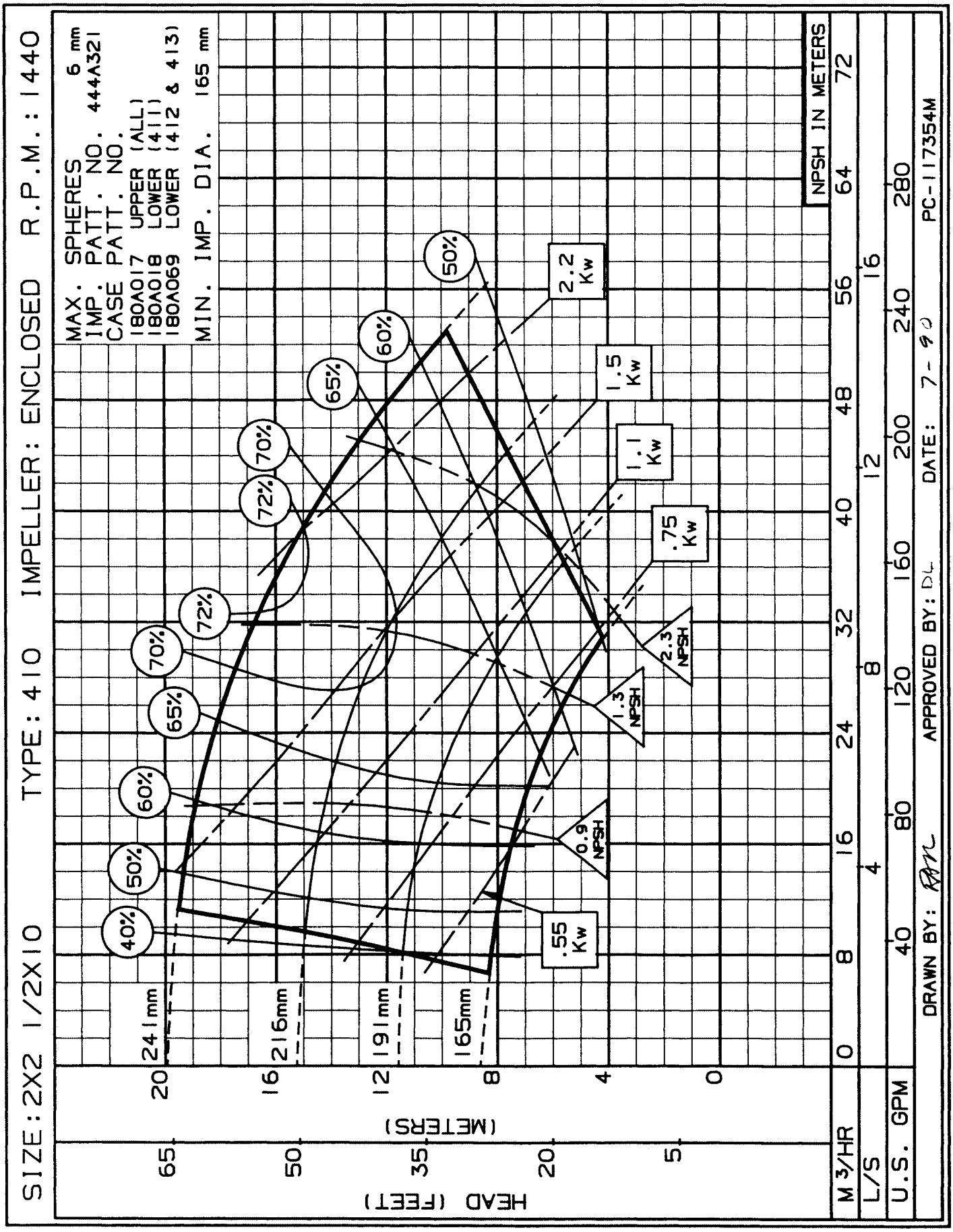
SECTION 410 (Metric 50Hz)
DATE JULY 1994
SUPERCEDES MARCH 1986



SECTION **410 (Metric 50Hz)**
DATE **JULY 1994**
SUPERCEDES MARCH 1986

2x2-1/2x10 - 1440 RPM
ENCLOSED IMPELLER

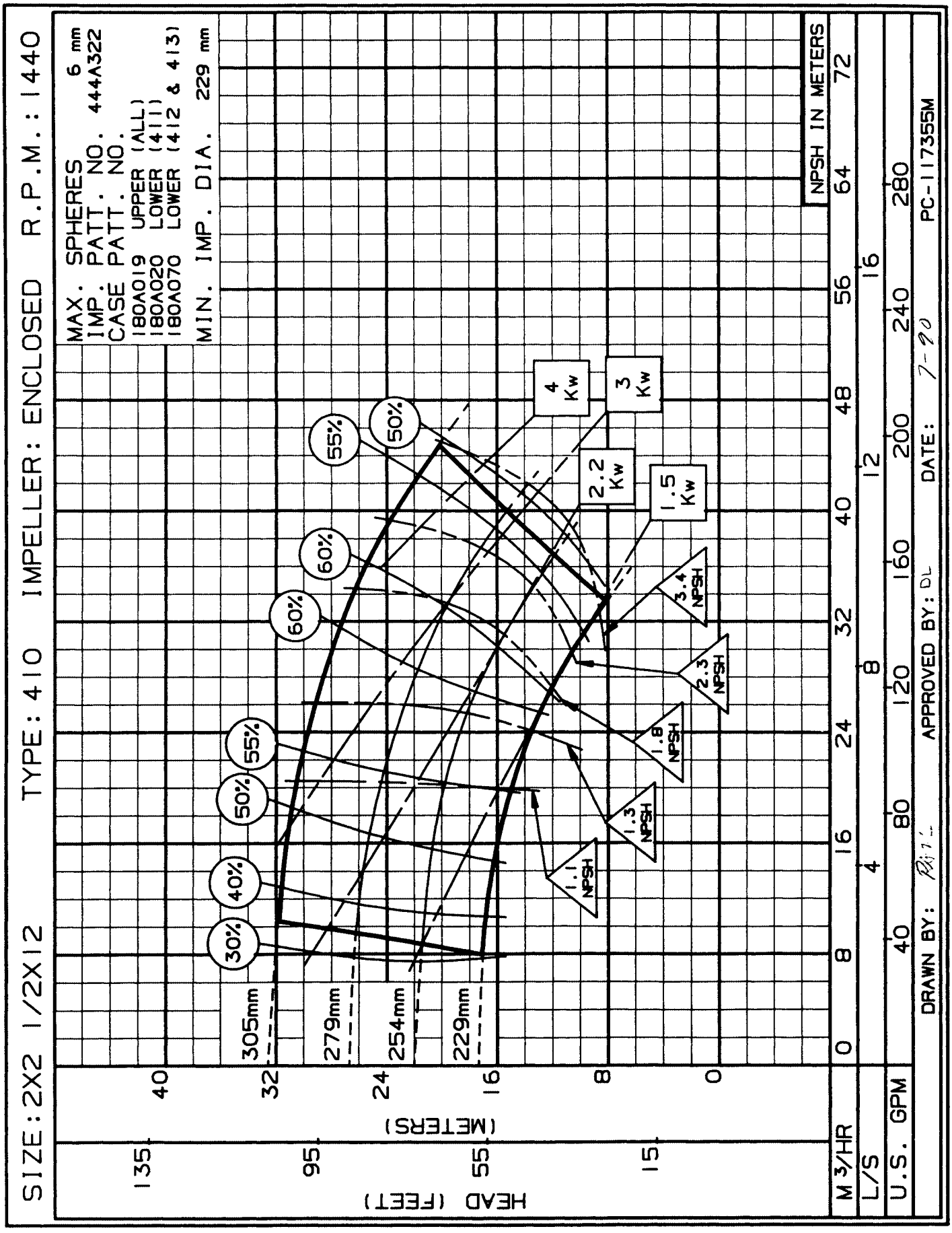
AURORA®
Pentair Pump Group



AURORA®
Pentair Pump Group

2x2-1/2x12 - 1440 RPM
ENCLOSED IMPELLER

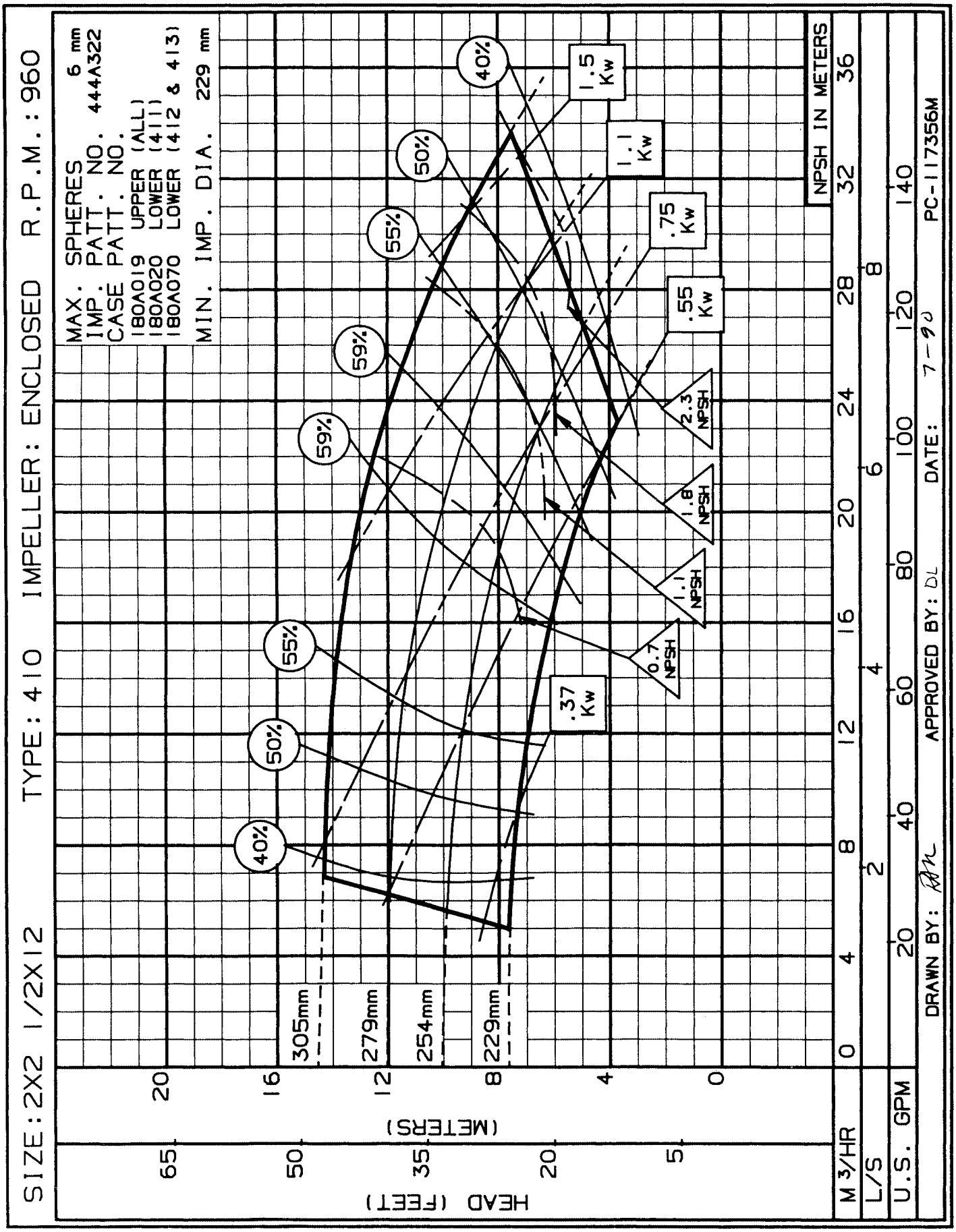
SECTION 410 (Metric 50Hz)
DATE JULY 1994
SUPERCEDES MARCH 1986



SECTION **410 (Metric 50Hz)**
DATE **JULY 1994**
SUPERCEDES MARCH 1986

2x2-1/2x12 - 960 RPM
ENCLOSED IMPELLER

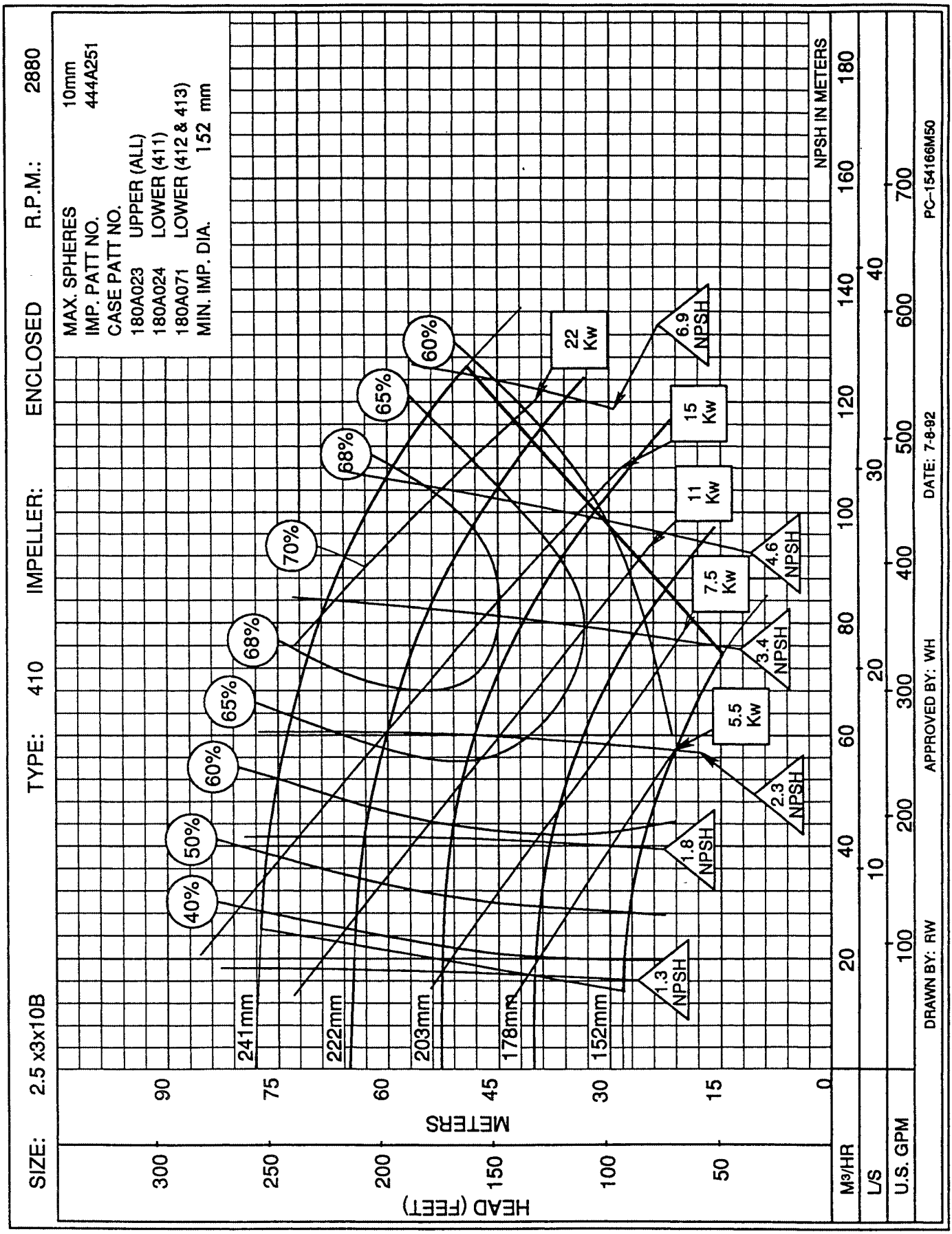
AURORA®
Pentair Pump Group



AURORA®
Pentair Pump Group

2-1/2x3x10B- 2880 RPM
ENCLOSED IMPELLER

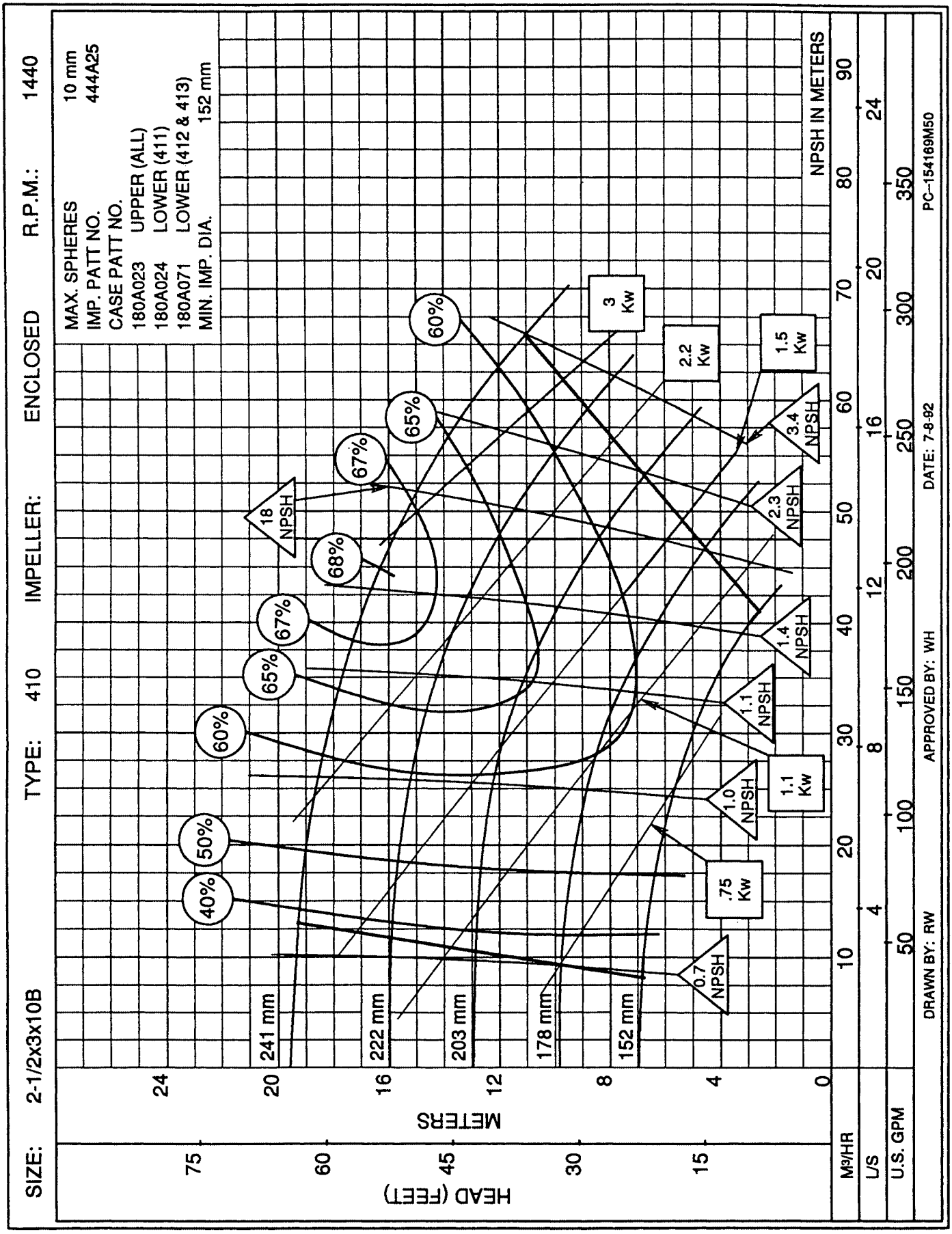
SECTION 410 (Metric 50Hz)
DATE JULY 1994
SUPERCEDES MARCH 1986



SECTION **410 (Metric 50Hz)**
DATE **JULY 1994**
SUPERCEDES MARCH 1986

2-1/2x3x10B - 1440 RPM
ENCLOSED IMPELLER

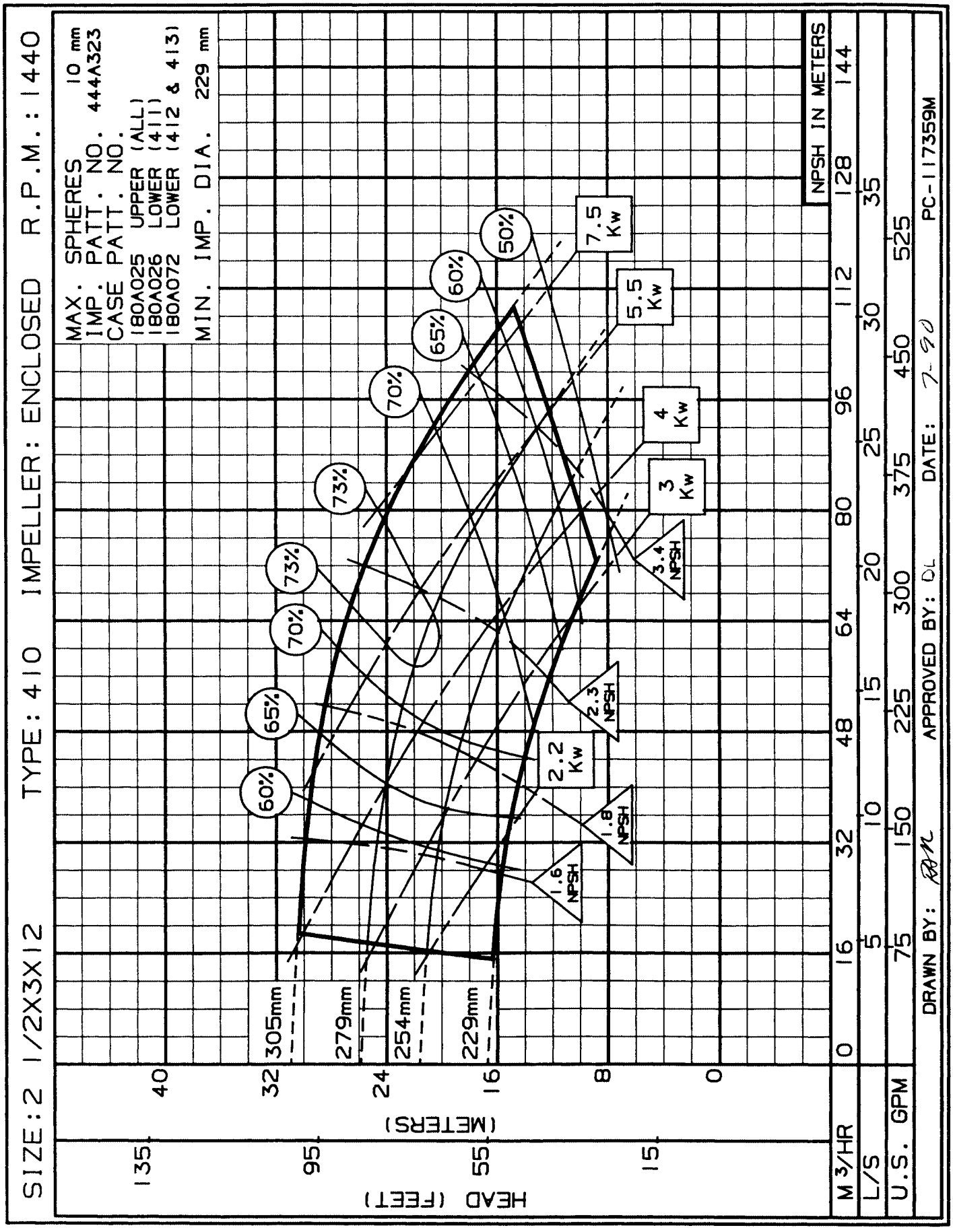
AURORA®
Pentair Pump Group



AURORA®
Pentair Pump Group

2-1/2x3x12 - 1440 RPM
ENCLOSED IMPELLER

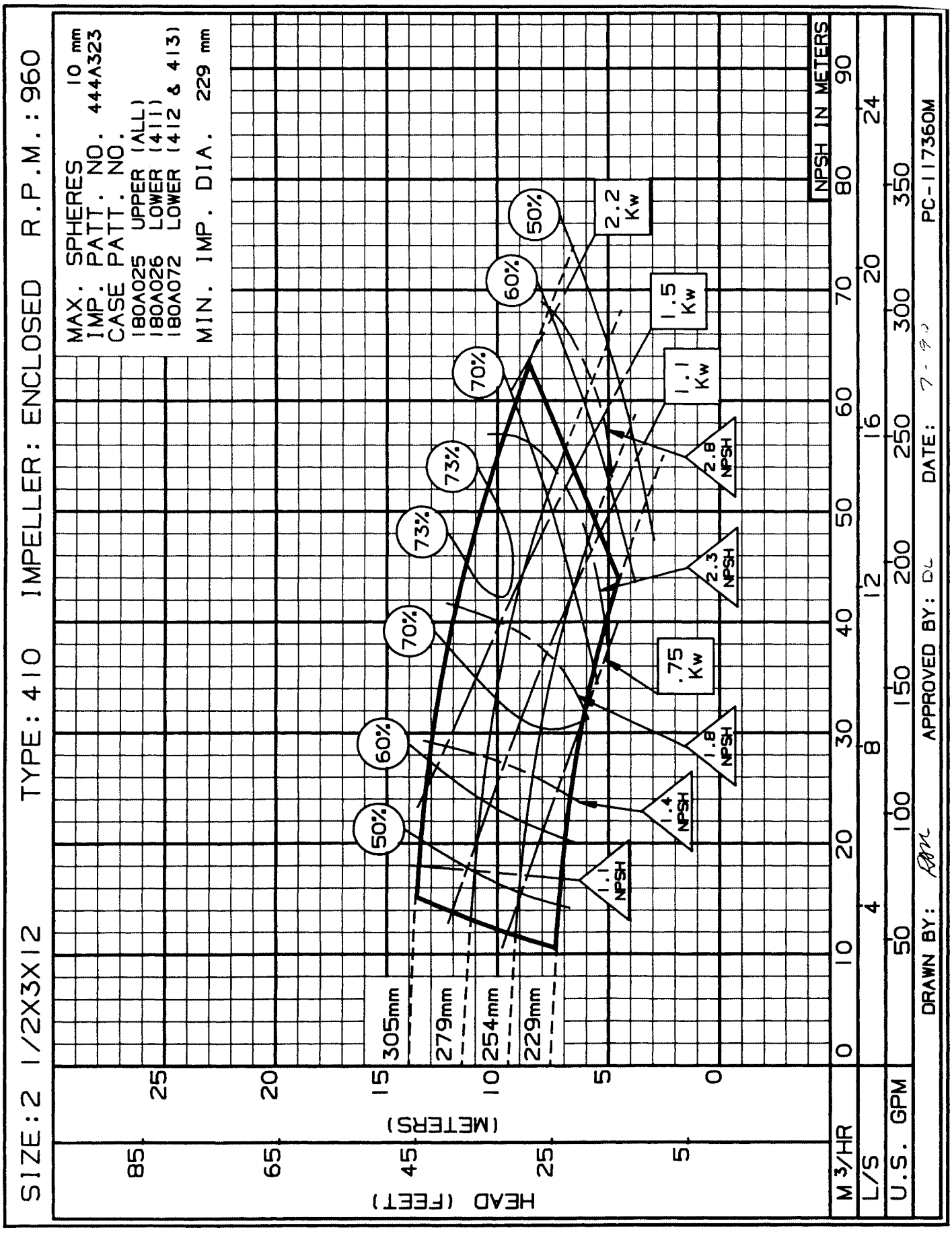
SECTION 410 (Metric 50Hz)
DATE JULY 1994
SUPERCEDES MARCH 1986



SECTION 410 (Metric 50Hz)
DATE JULY 1994
SUPERCEDES MARCH 1986

2-1/2X3x12 - 960 RPM
ENCLOSED IMPELLER

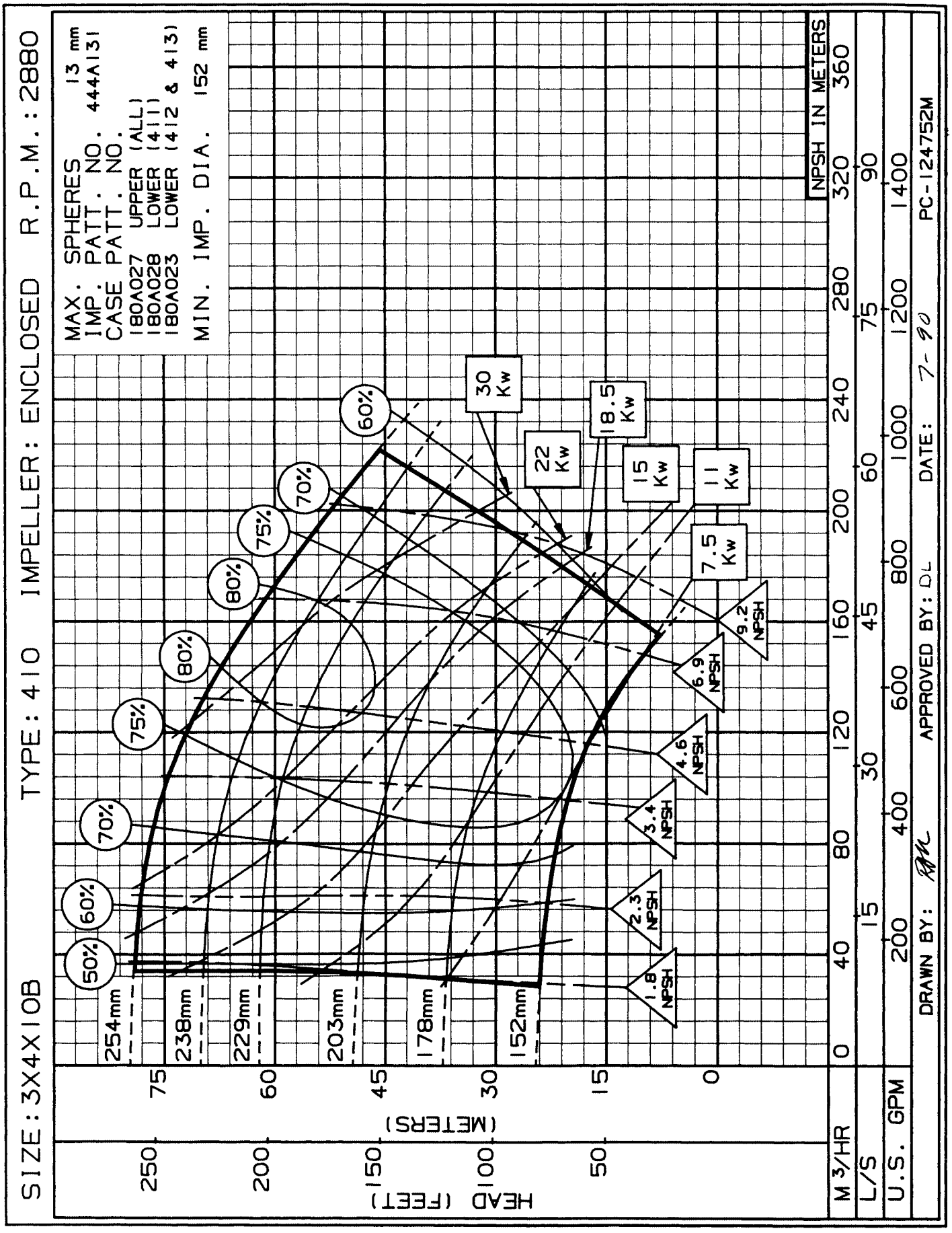
AURORA®
Pentair Pump Group



AURORA®
Pentair Pump Group

3x4x10B - 2880 RPM
ENCLOSED IMPELLER

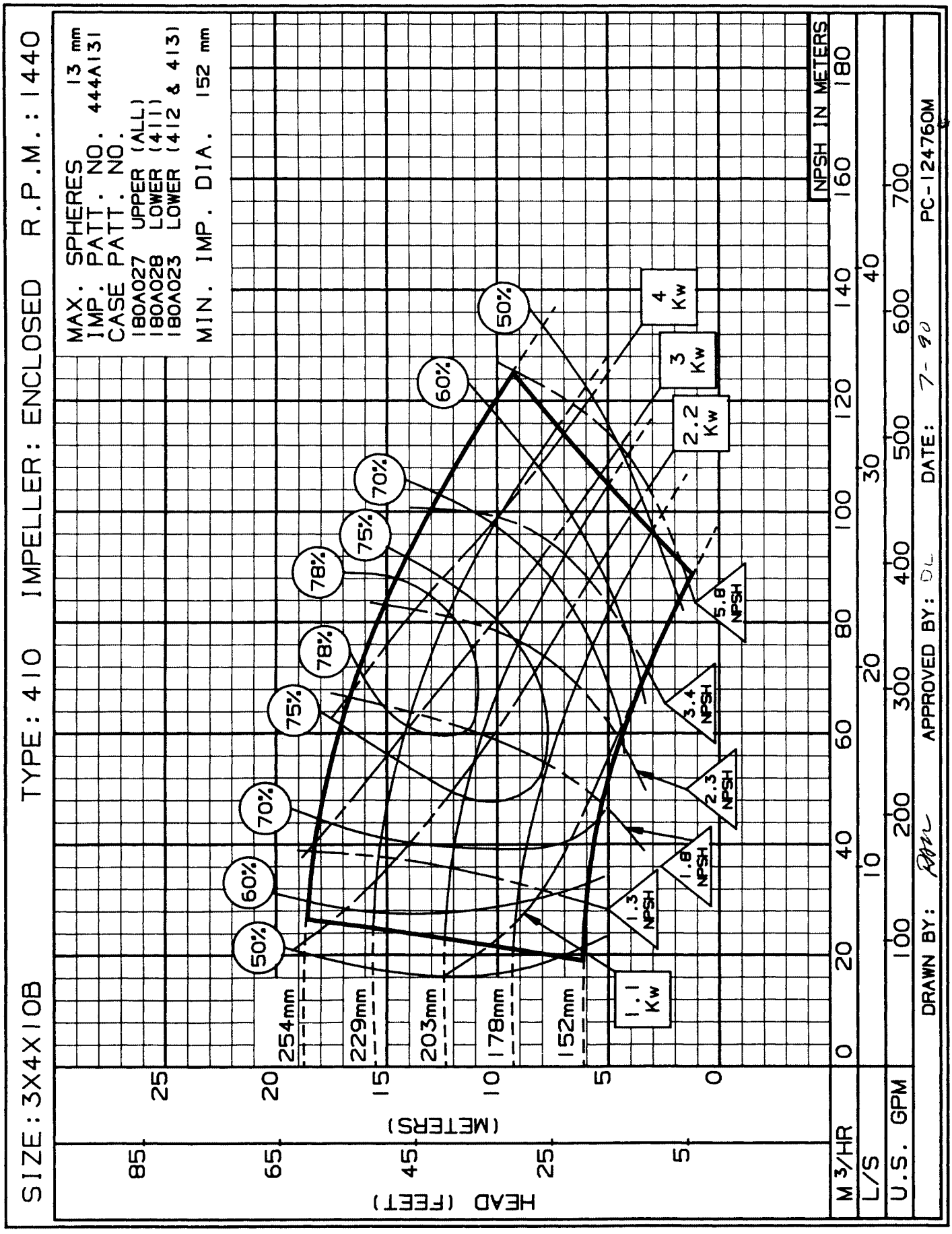
SECTION 410 (Metric 50Hz)
DATE JULY 1994
SUPERCEDES MARCH 1986



SECTION **410 (Metric 50Hz)**
DATE **JULY 1994**
SUPERCEDES MARCH 1986

3x4x10B - 1440 RPM
ENCLOSED IMPELLER

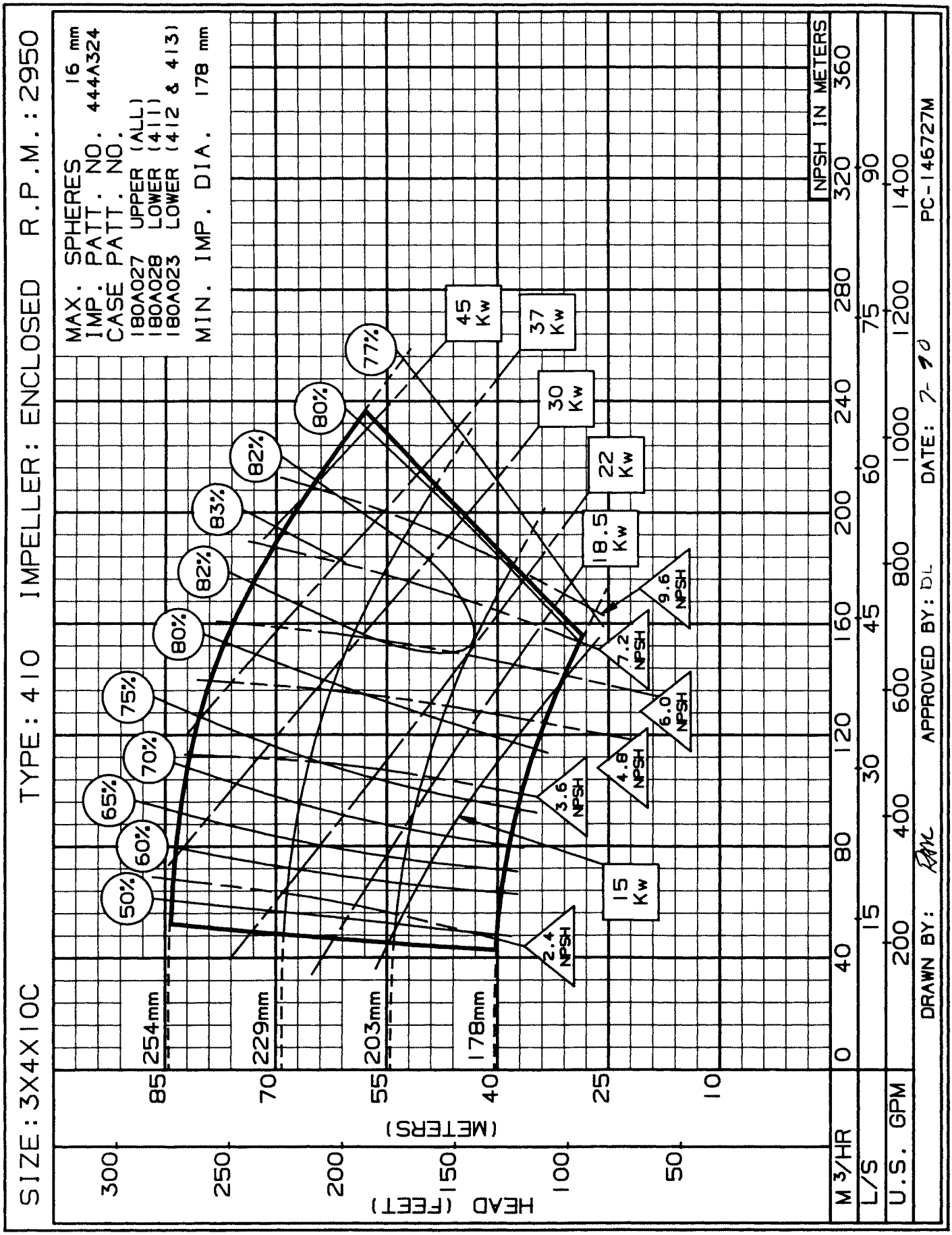
AURORA®
Pentair Pump Group



AURORA®
Pentair Pump Group

3x4x10C - 2950 RPM
ENCLOSED IMPELLER

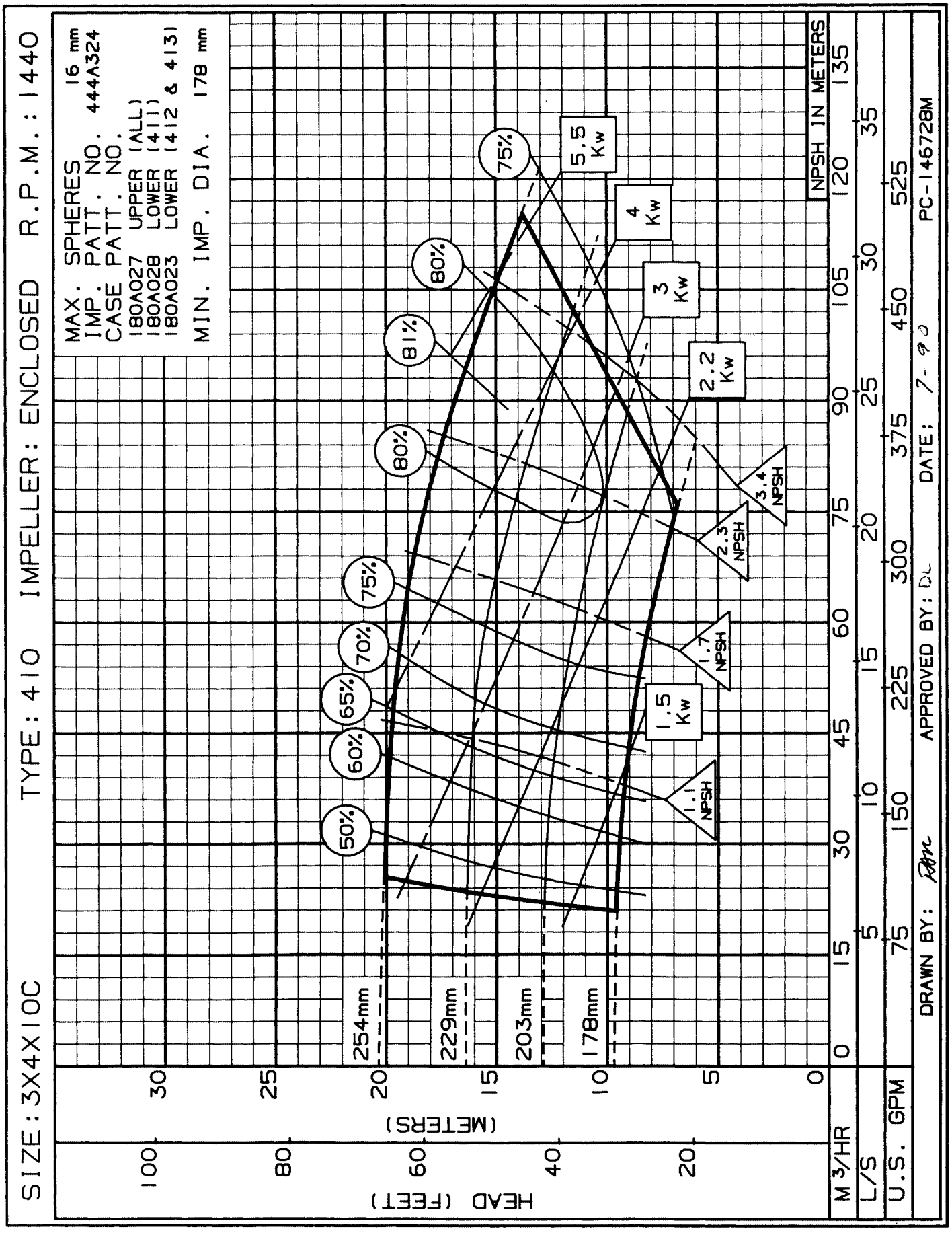
SECTION 410 (Metric 50Hz)
DATE JULY 1994
SUPERCEDES MARCH 1986



SECTION **410 (Metric 50Hz)**
DATE **JULY 1994**
SUPERCEDES MARCH 1986

3x4x10C - 1440 RPM
ENCLOSED IMPELLER

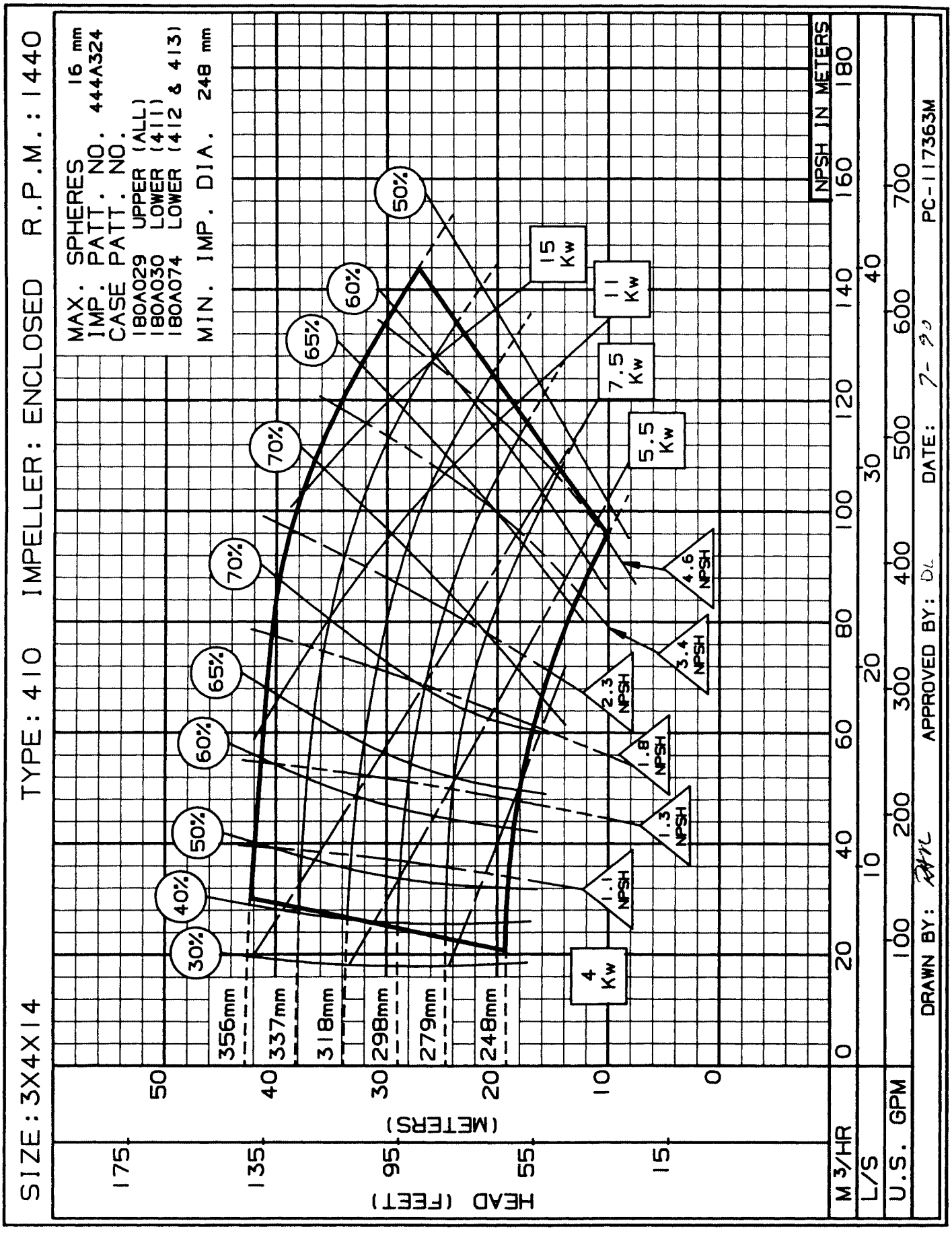
AURORA®
Pentair Pump Group



AURORA®
Pentair Pump Group

3x4x14 - 1440 RPM
ENCLOSED IMPELLER

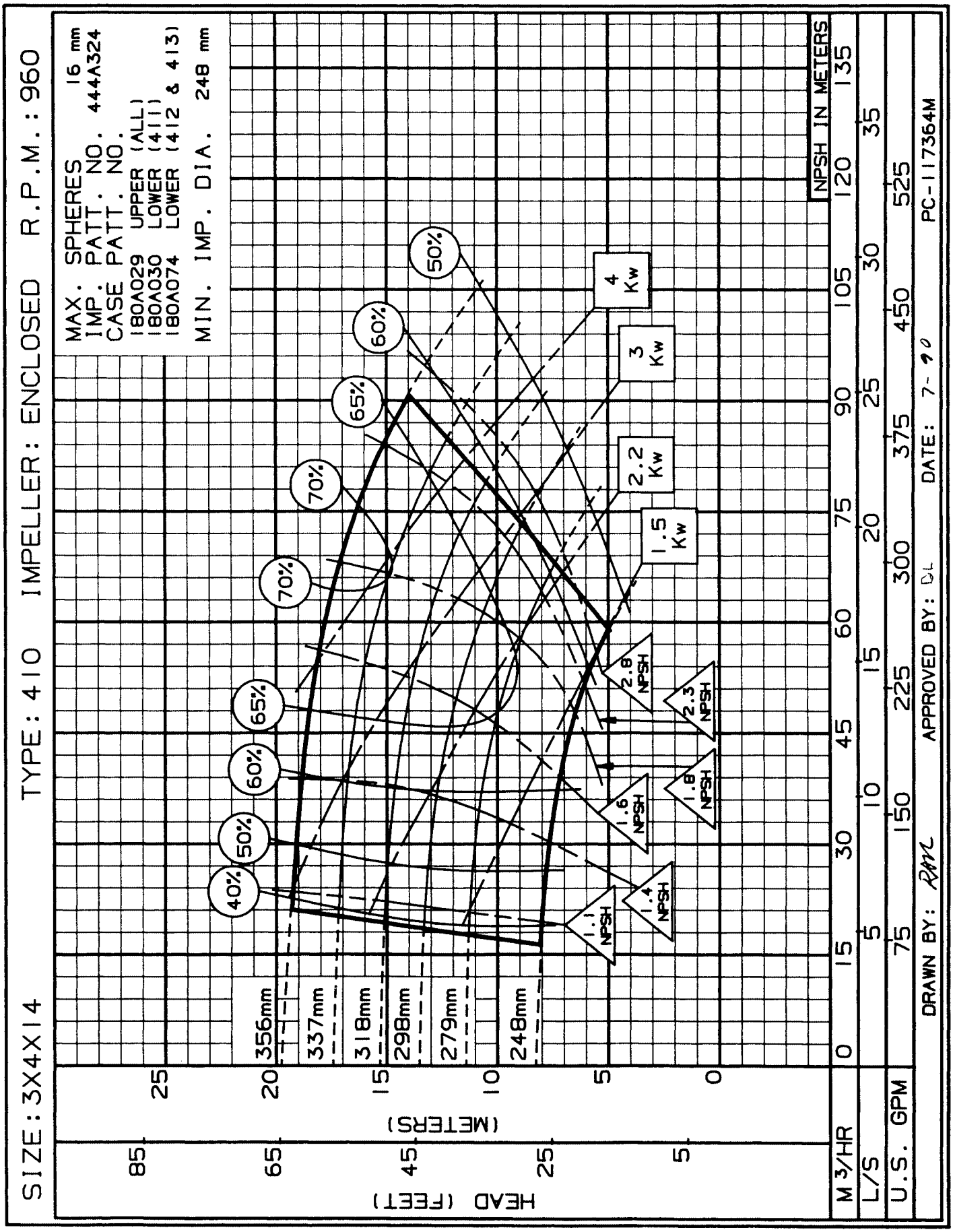
SECTION 410 (Metric 50Hz)
DATE JULY 1994
SUPERCEDES MARCH 1986



SECTION 410 (Metric 50Hz)
DATE JULY 1994
SUPERCEDES MARCH 1986

3x4x14 - 960 RPM
ENCLOSED IMPELLER

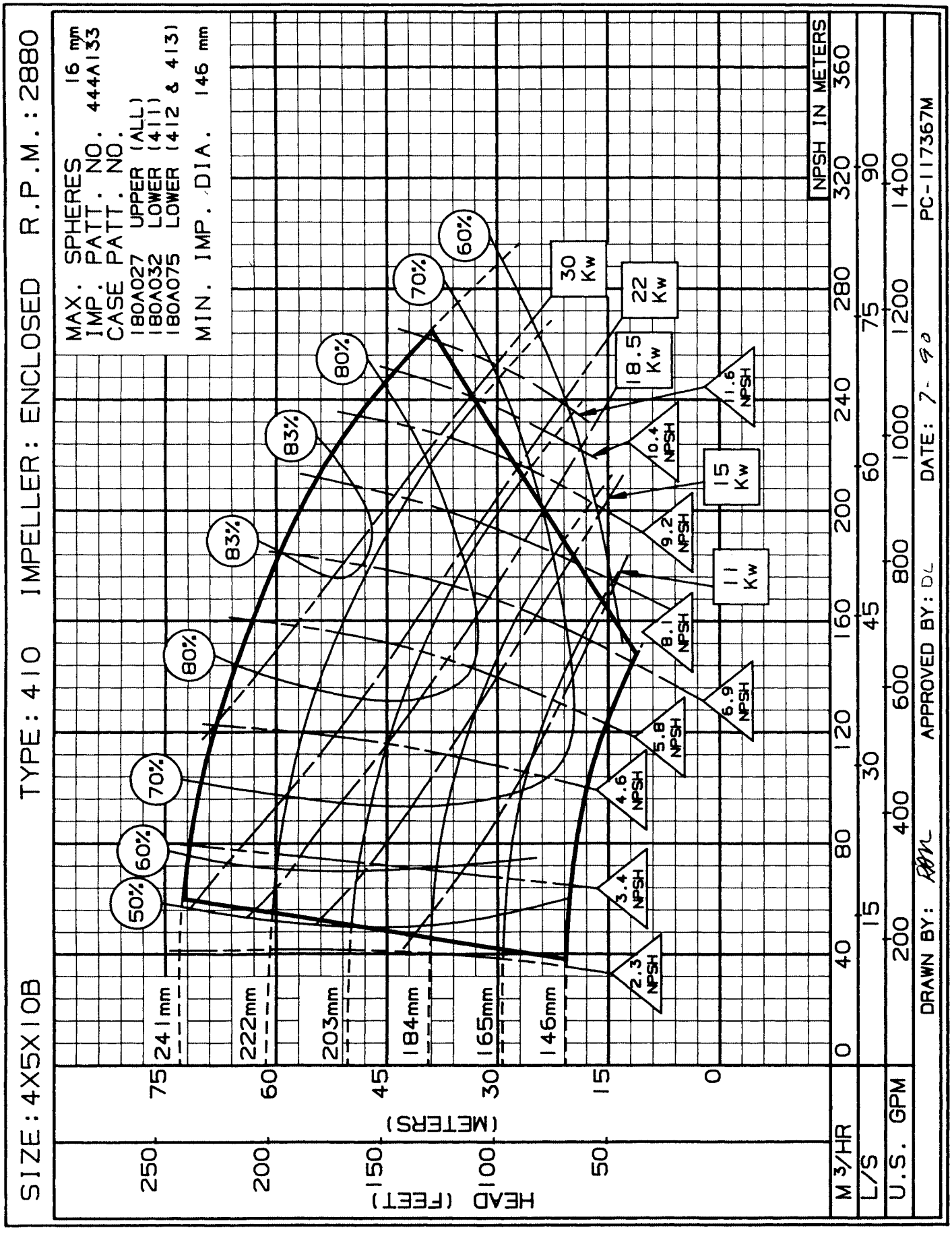
AURORA®
Pentair Pump Group



AURORA®
Pentair Pump Group

4x5x10B - 2880 RPM
ENCLOSED IMPELLER

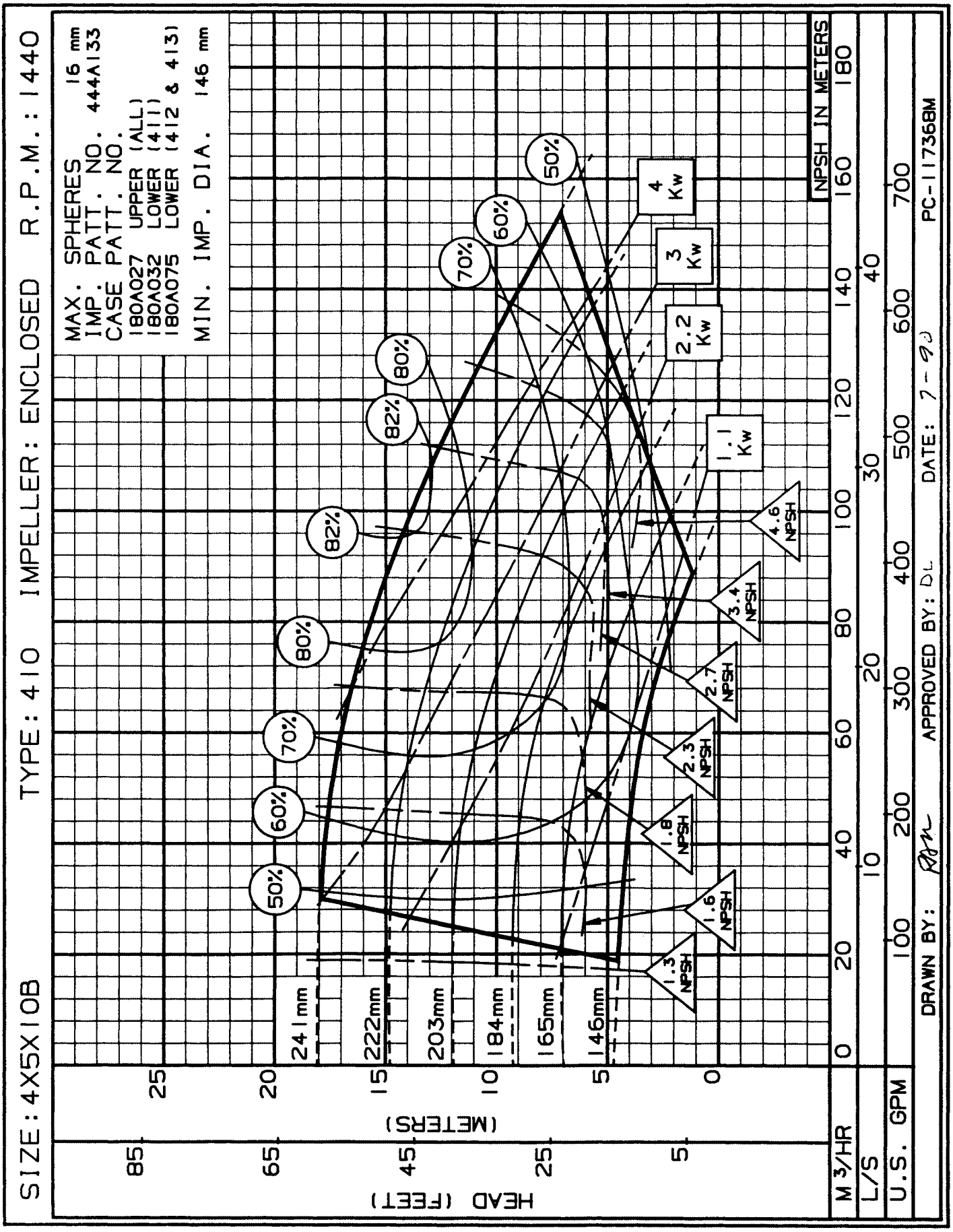
SECTION 410 (Metric 50Hz)
DATE JULY 1994
SUPERCEDES MARCH 1986



SECTION 410 (Metric 50Hz)
DATE JULY 1994
SUPERCEDES MARCH 1986

4x5x10B - 1440 RPM
ENCLOSED IMPELLER

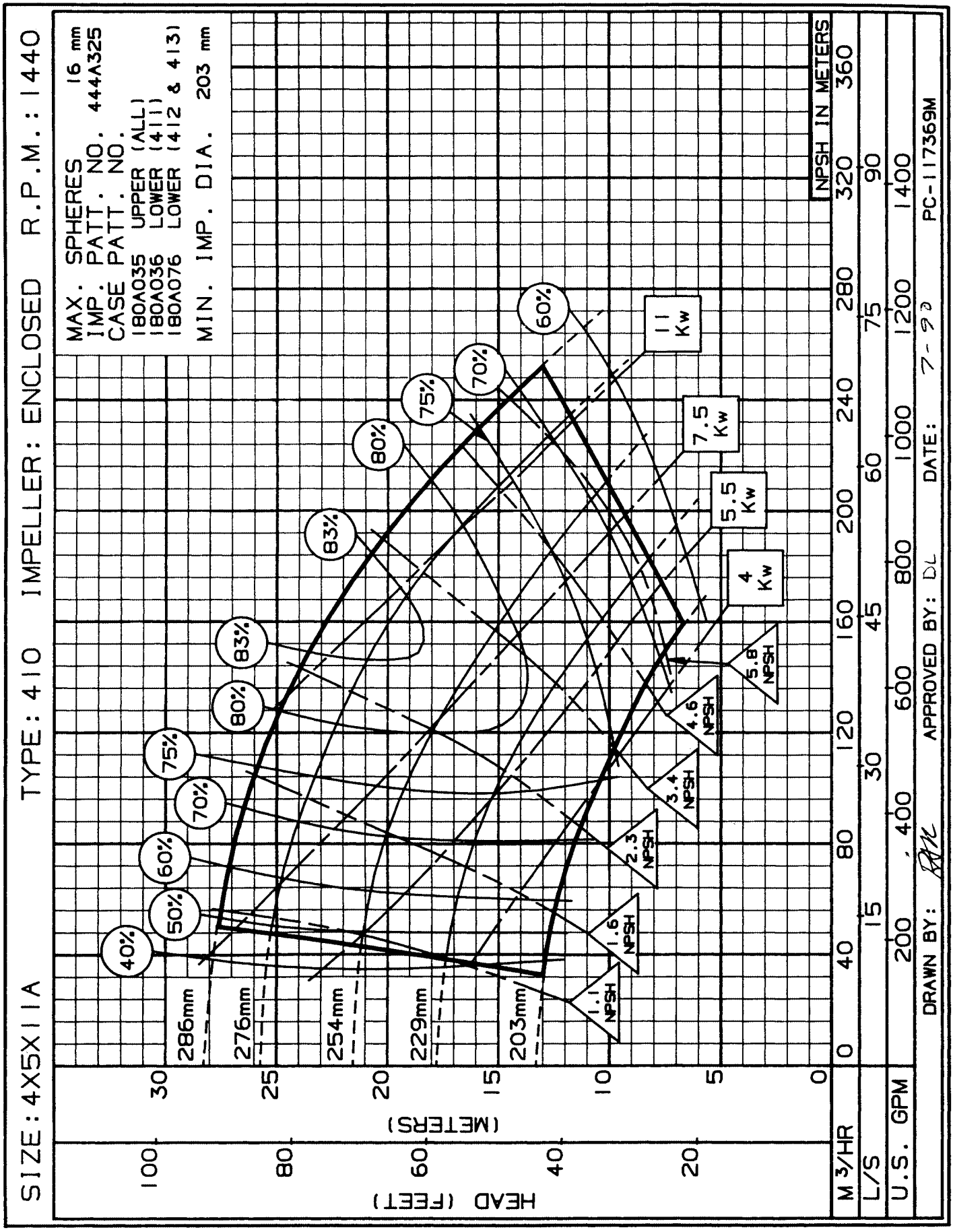
AURORA®
Pentair Pump Group



AURORA®
Pentair Pump Group

4x5x11A - 1440 RPM
ENCLOSED IMPELLER

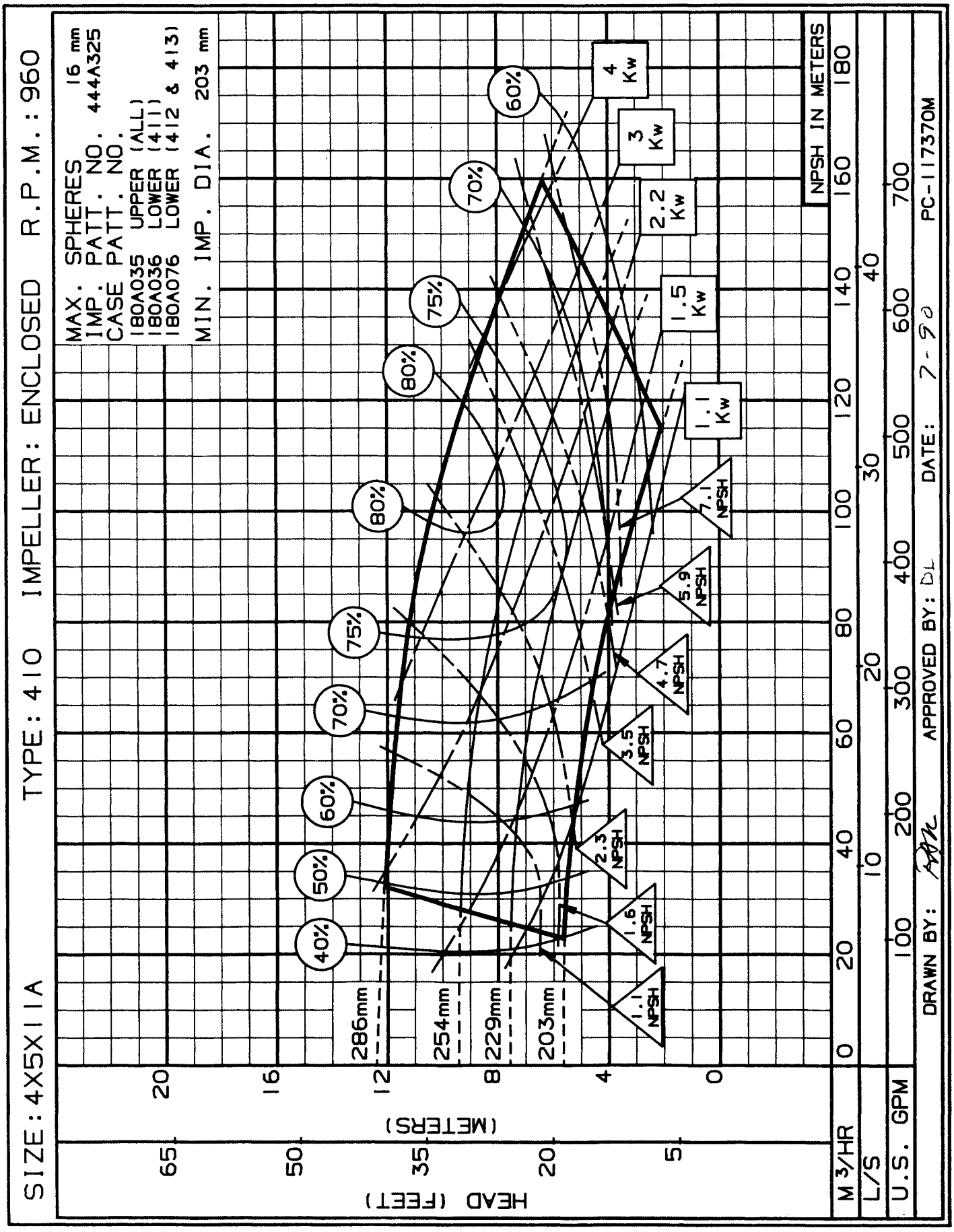
SECTION 410 (Metric 50Hz)
DATE JULY 1994
SUPERCEDES MARCH 1986



SECTION 410 (Metric 50Hz)
DATE JULY 1994
SUPERCEDES MARCH 1986

4x5x11A - 960 RPM
ENCLOSED IMPELLER

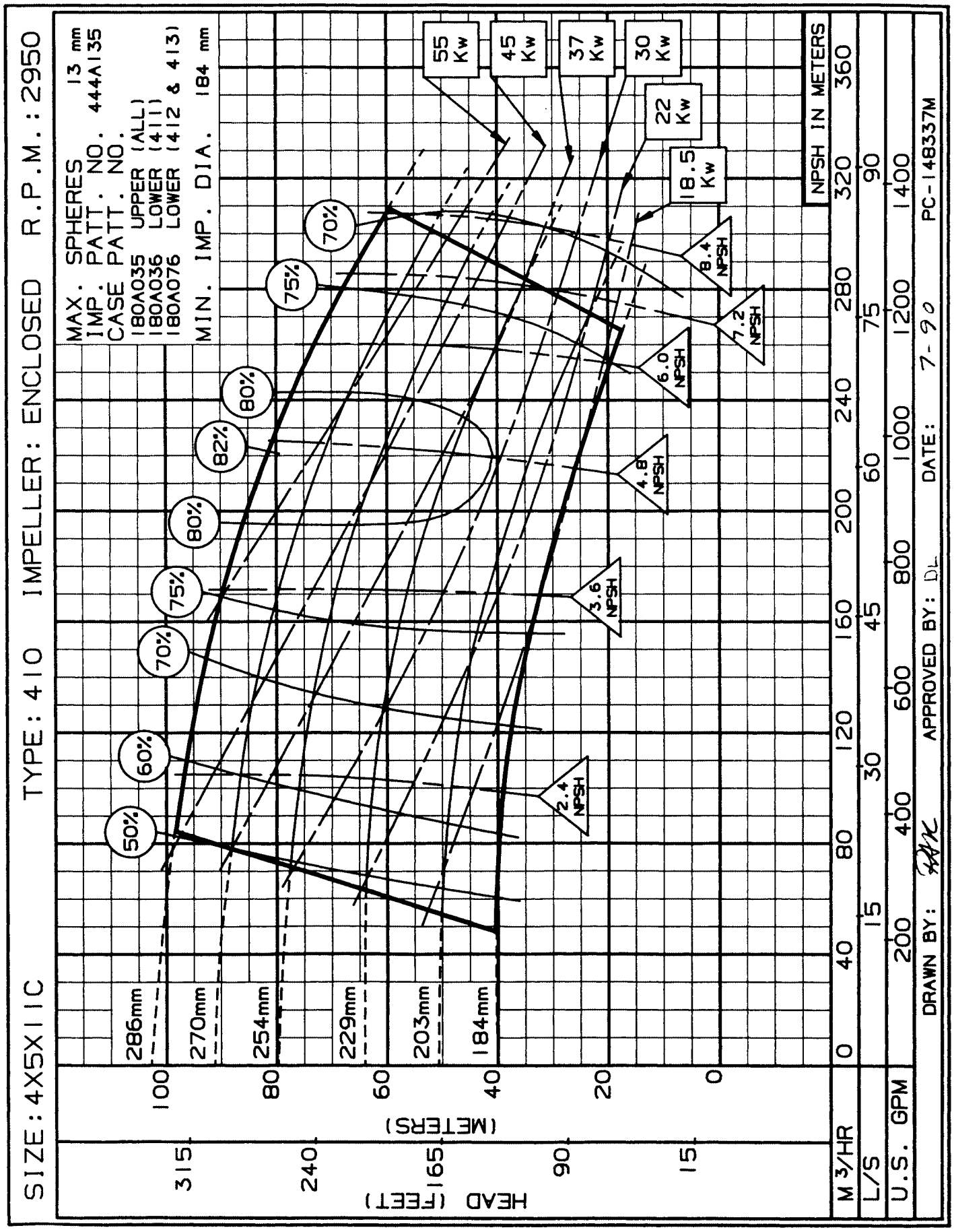
AURORA®
Pentair Pump Group



AURORA®
Pentair Pump Group

4x5x11C - 2950 RPM
ENCLOSED IMPELLER

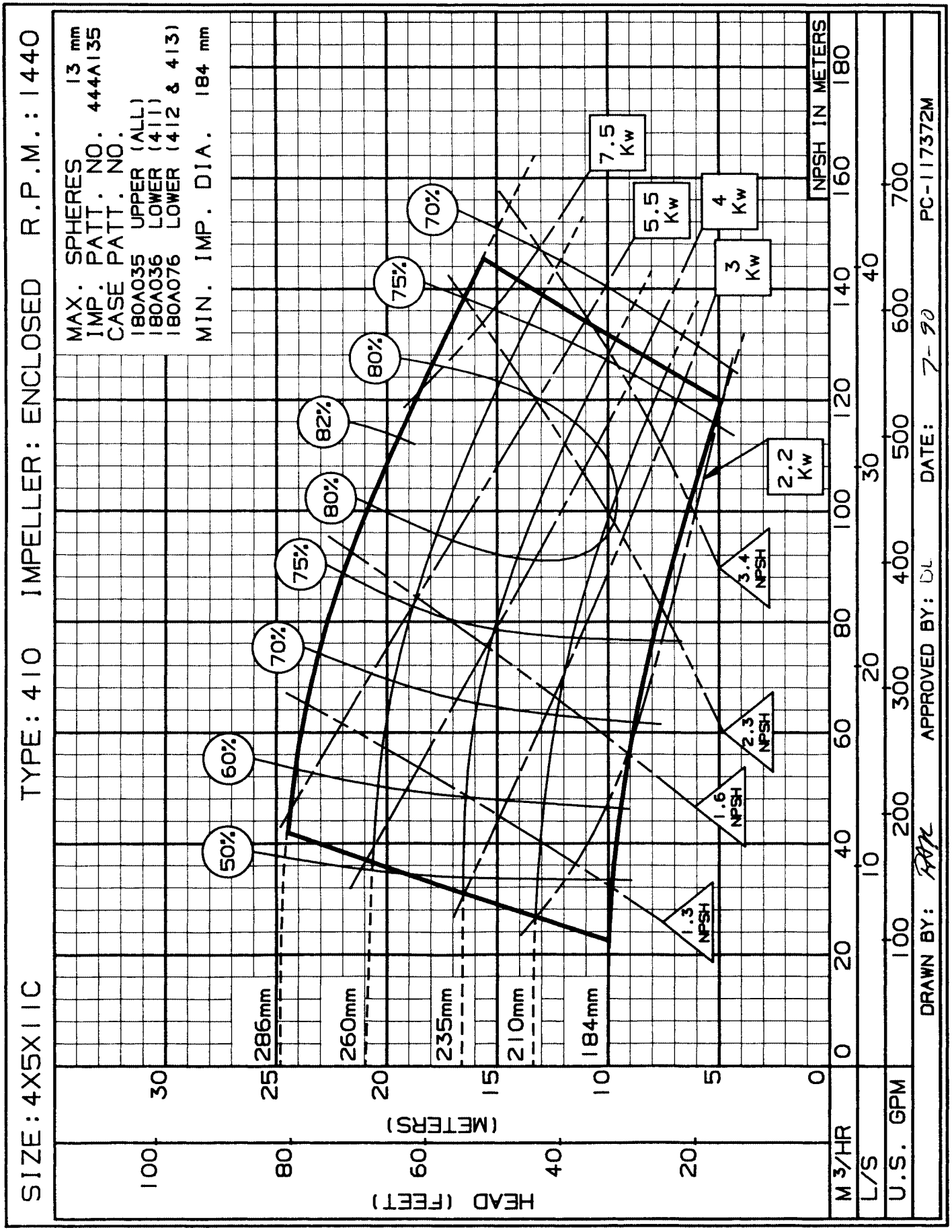
SECTION 410 (Metric 50Hz)
DATE JULY 1994
SUPERCEDES MARCH 1986



SECTION **410 (Metric 50Hz)**
DATE **JULY 1994**
SUPERCEDES MARCH 1986

4x5x11C - 1440 RPM
ENCLOSED IMPELLER

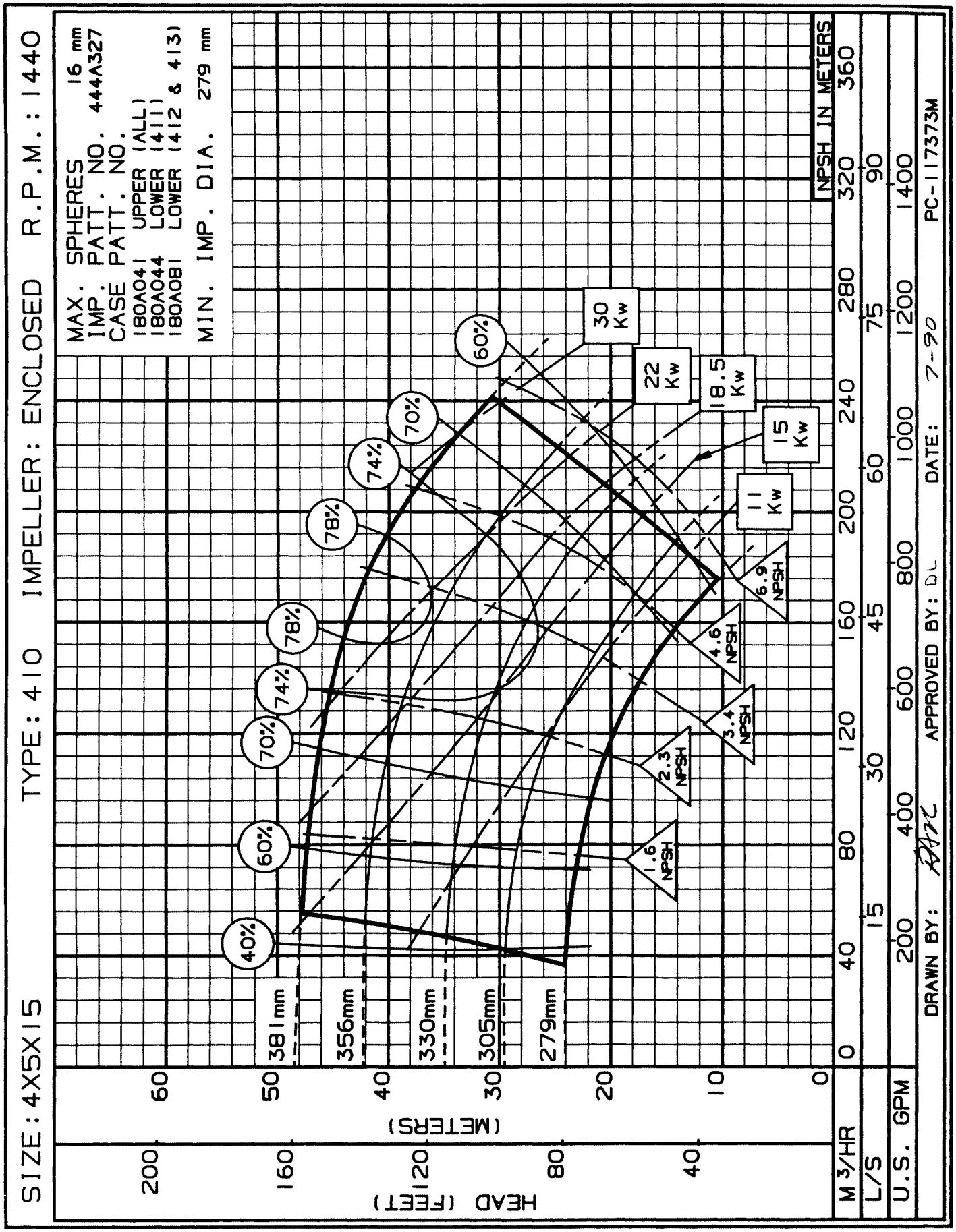
AURORA®
Pentair Pump Group



AURORA®
Pentair Pump Group

4x5x15 - 1440 RPM
ENCLOSED IMPELLER

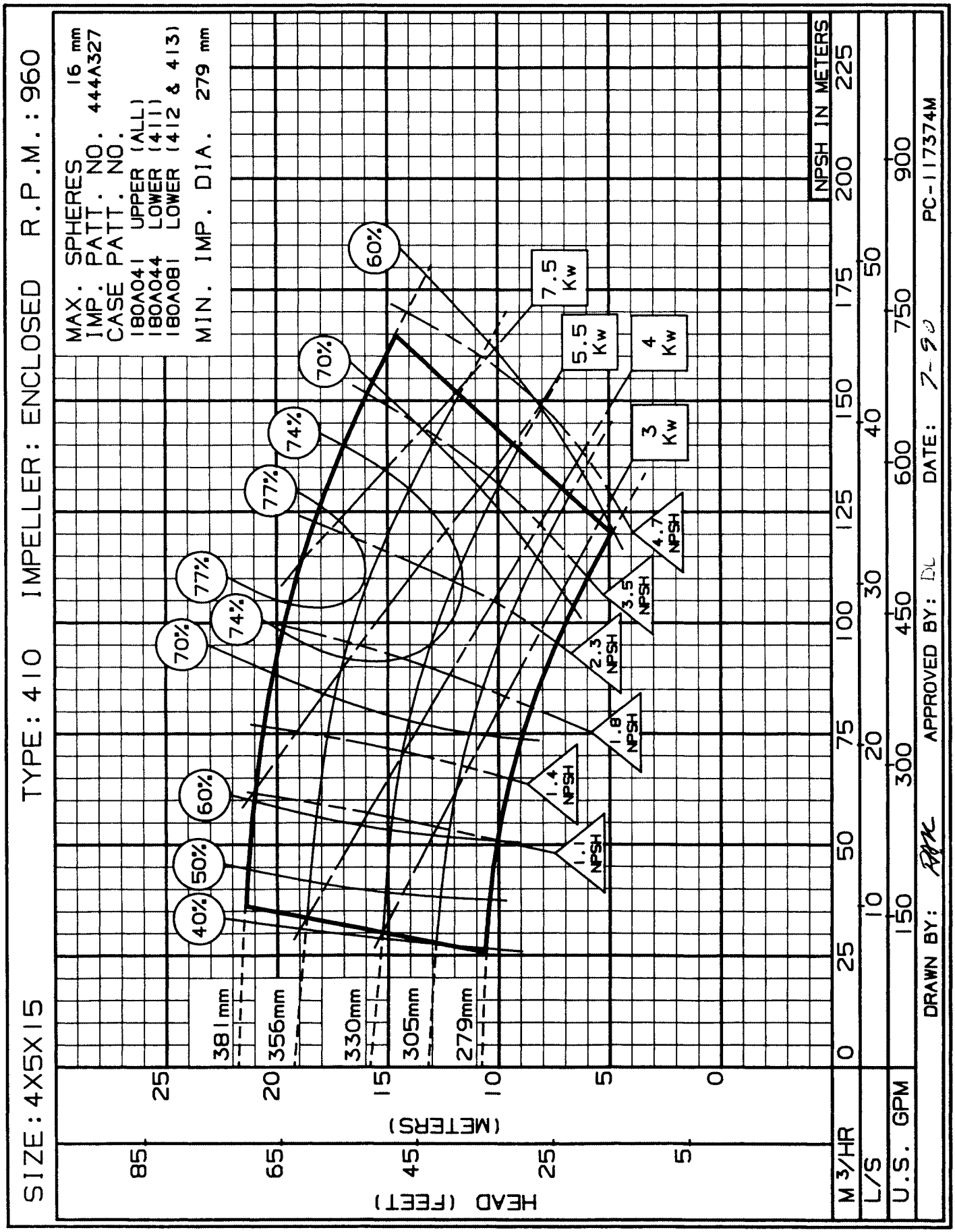
SECTION 410 (Metric 50Hz)
DATE JULY 1994
SUPERCEDES MARCH 1986



SECTION 410 (Metric 50Hz)
DATE JULY 1994
SUPERCEDES MARCH 1986

4x5x15 - 960 RPM
ENCLOSED IMPELLER

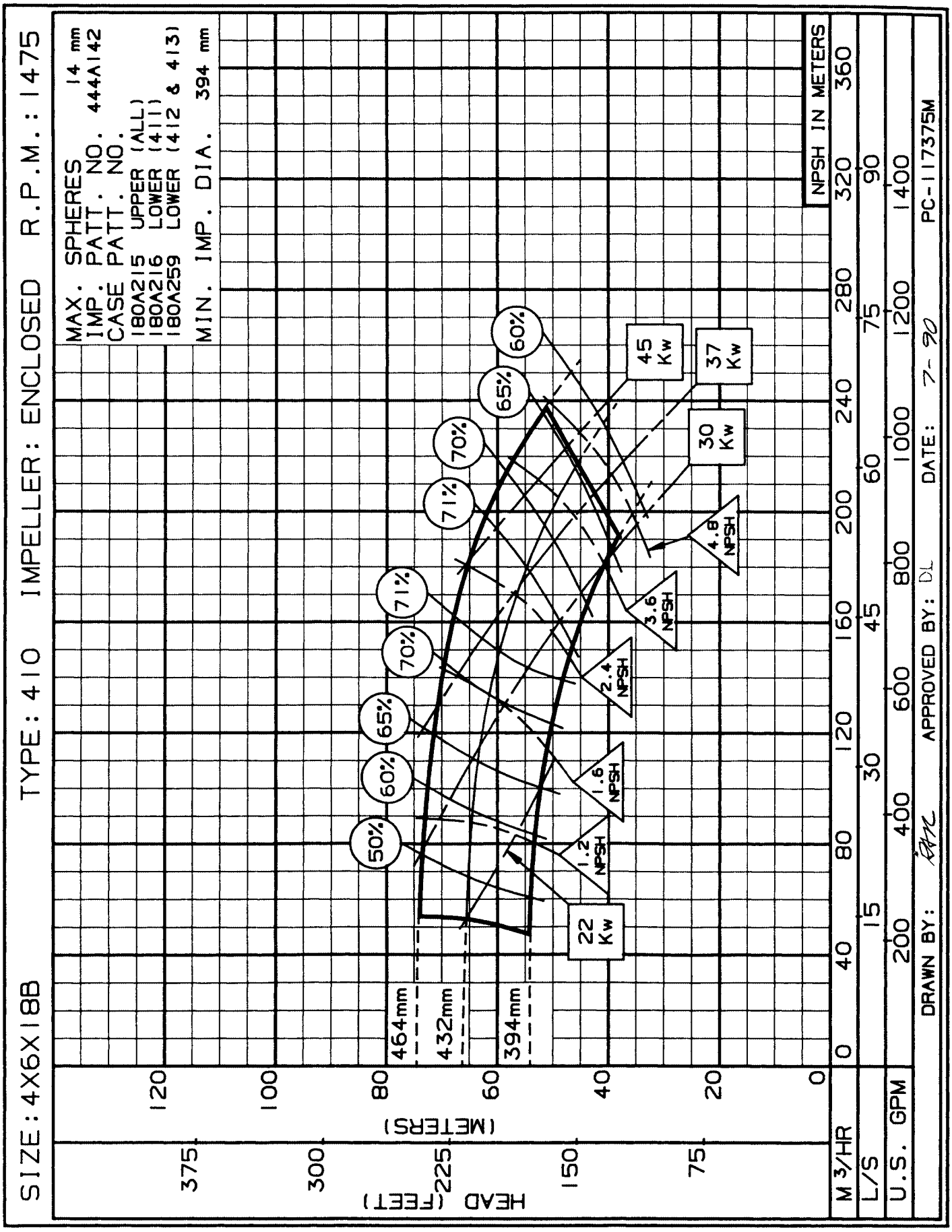
AURORA®
Pentair Pump Group



AURORA®
Pentair Pump Group

4x6x18B - 1475 RPM
ENCLOSED IMPELLER

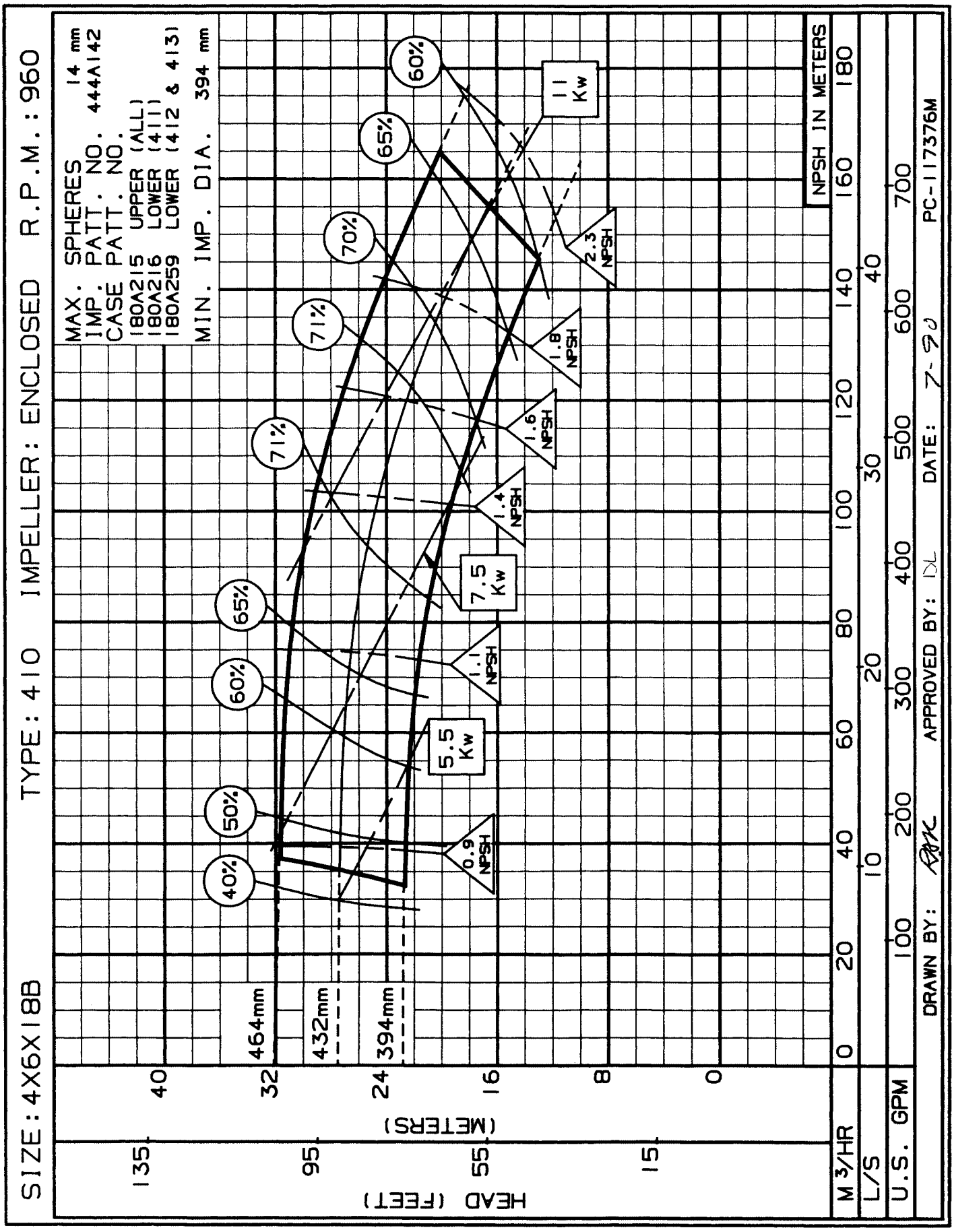
SECTION 410 (Metric 50Hz)
DATE JULY 1994
SUPERCEDES MARCH 1986



SECTION 410 (Metric 50Hz)
DATE JULY 1994
SUPERCEDES MARCH 1986

4x6x18B - 960 RPM
ENCLOSED IMPELLER

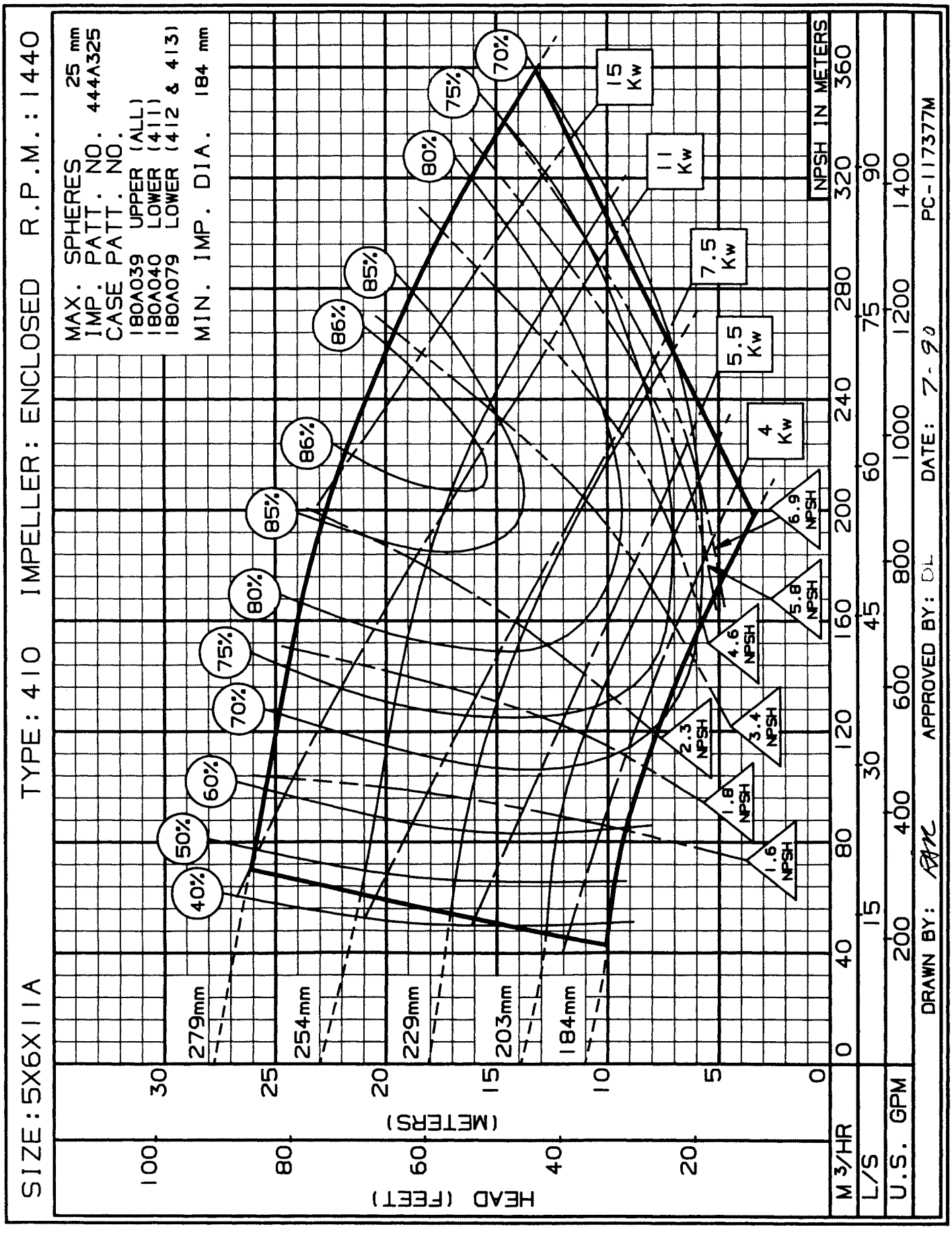
AURORA®
Pentair Pump Group



AURORA®
Pentair Pump Group

5x6x11A - 1440 RPM
ENCLOSED IMPELLER

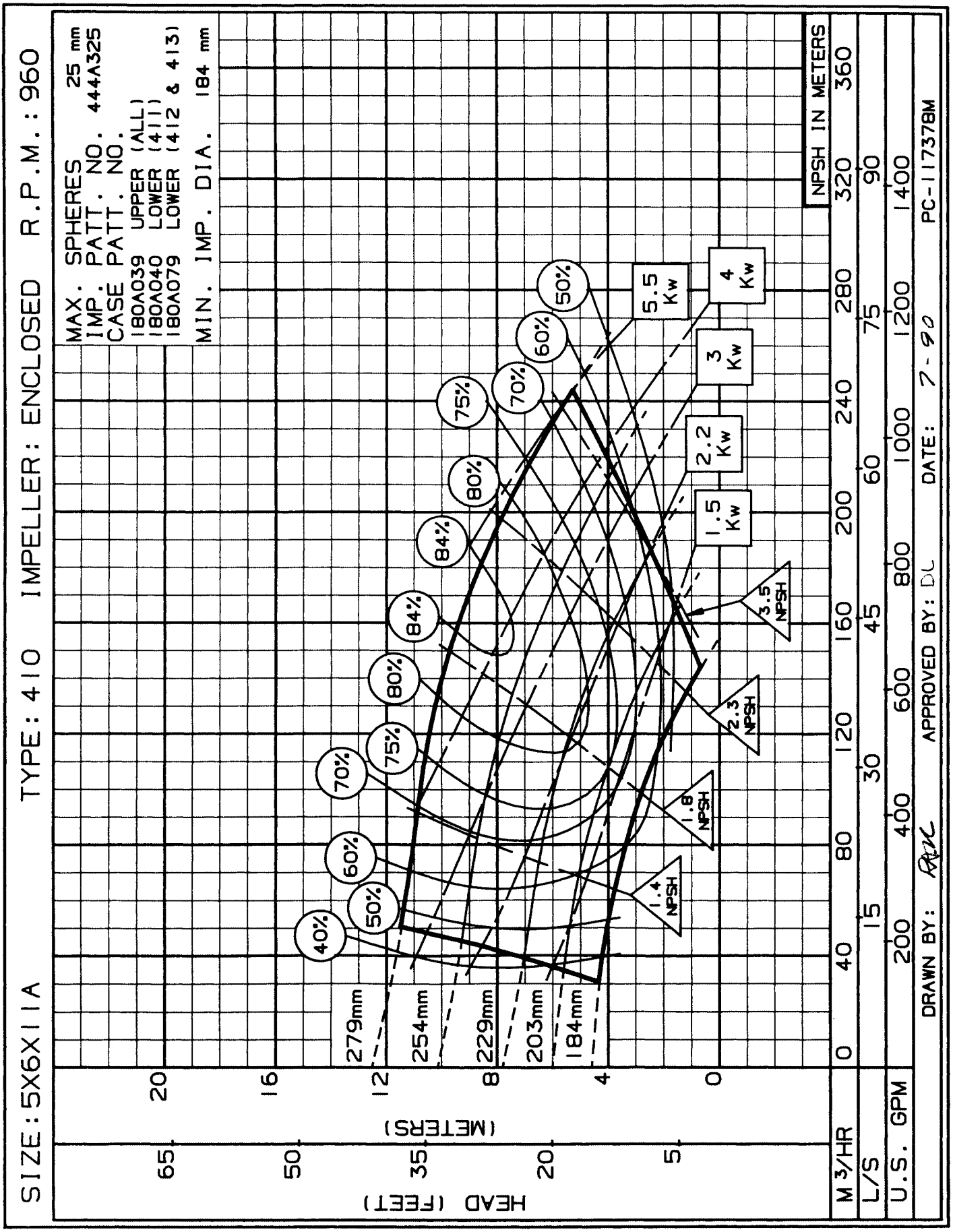
SECTION 410 (Metric 50Hz)
DATE JULY 1994
SUPERCEDES MARCH 1986



SECTION 410 (Metric 50Hz)
DATE JULY 1994
SUPERCEDES MARCH 1986

5x6x11A - 960 RPM
ENCLOSED IMPELLER

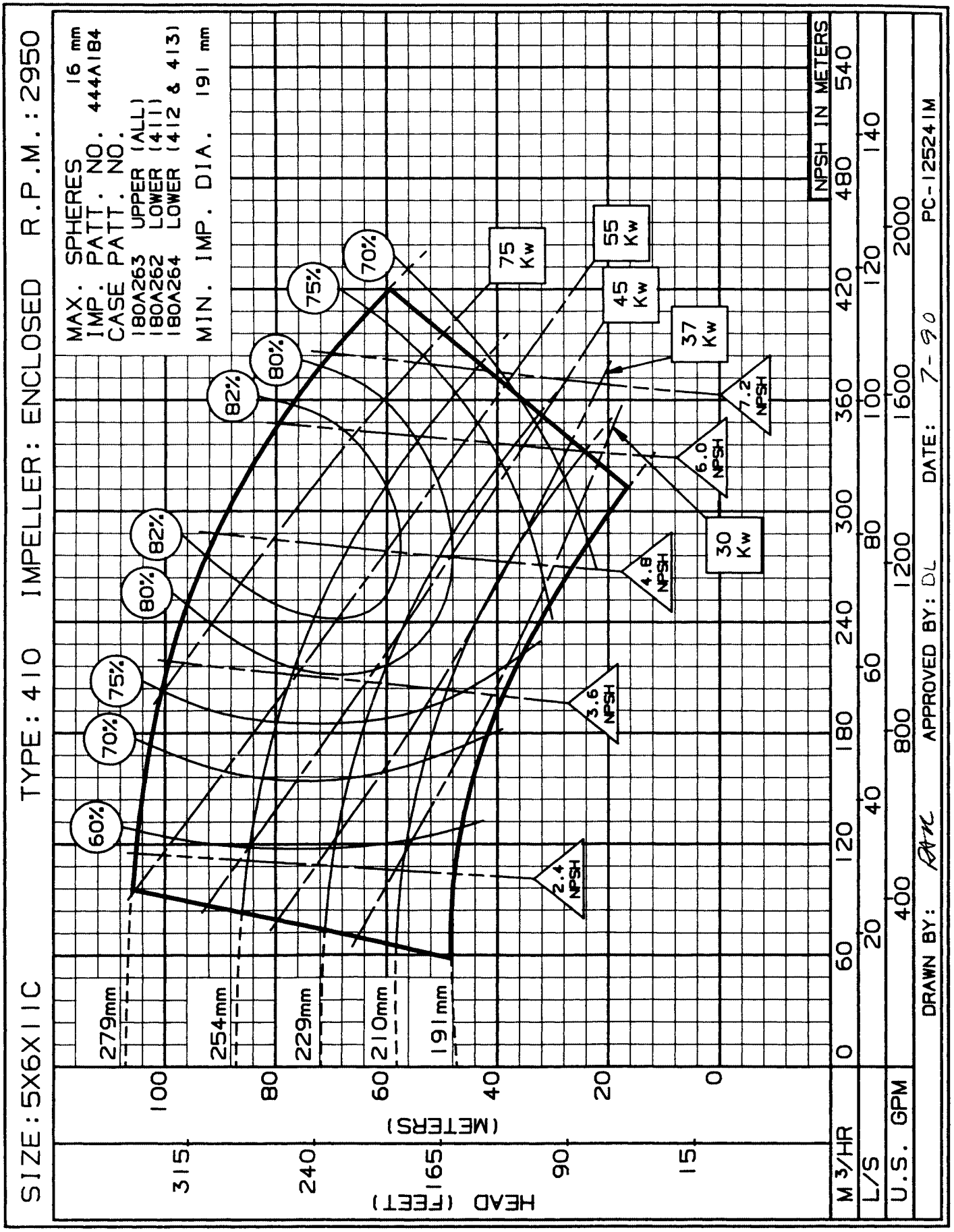
AURORA®
Pentair Pump Group



AURORA®
Pentair Pump Group

5x6x11C - 2950 RPM
ENCLOSED IMPELLER

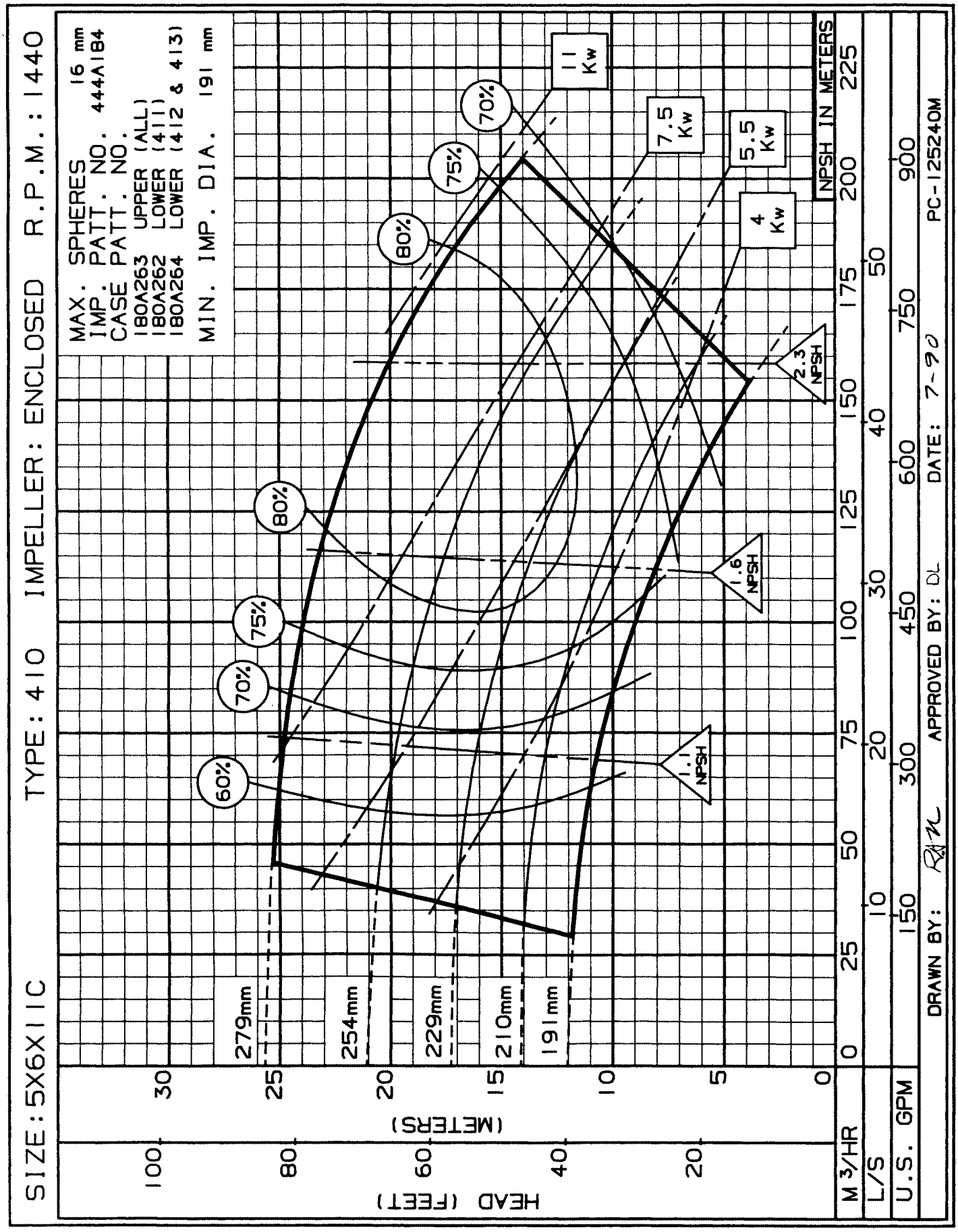
SECTION 410 (Metric 50Hz)
DATE JULY 1994
SUPERCEDES MARCH 1986



SECTION 410 (Metric 50Hz)
DATE JULY 1994
SUPERCEDES MARCH 1986

5x6x11C - 1440 RPM
ENCLOSED IMPELLER

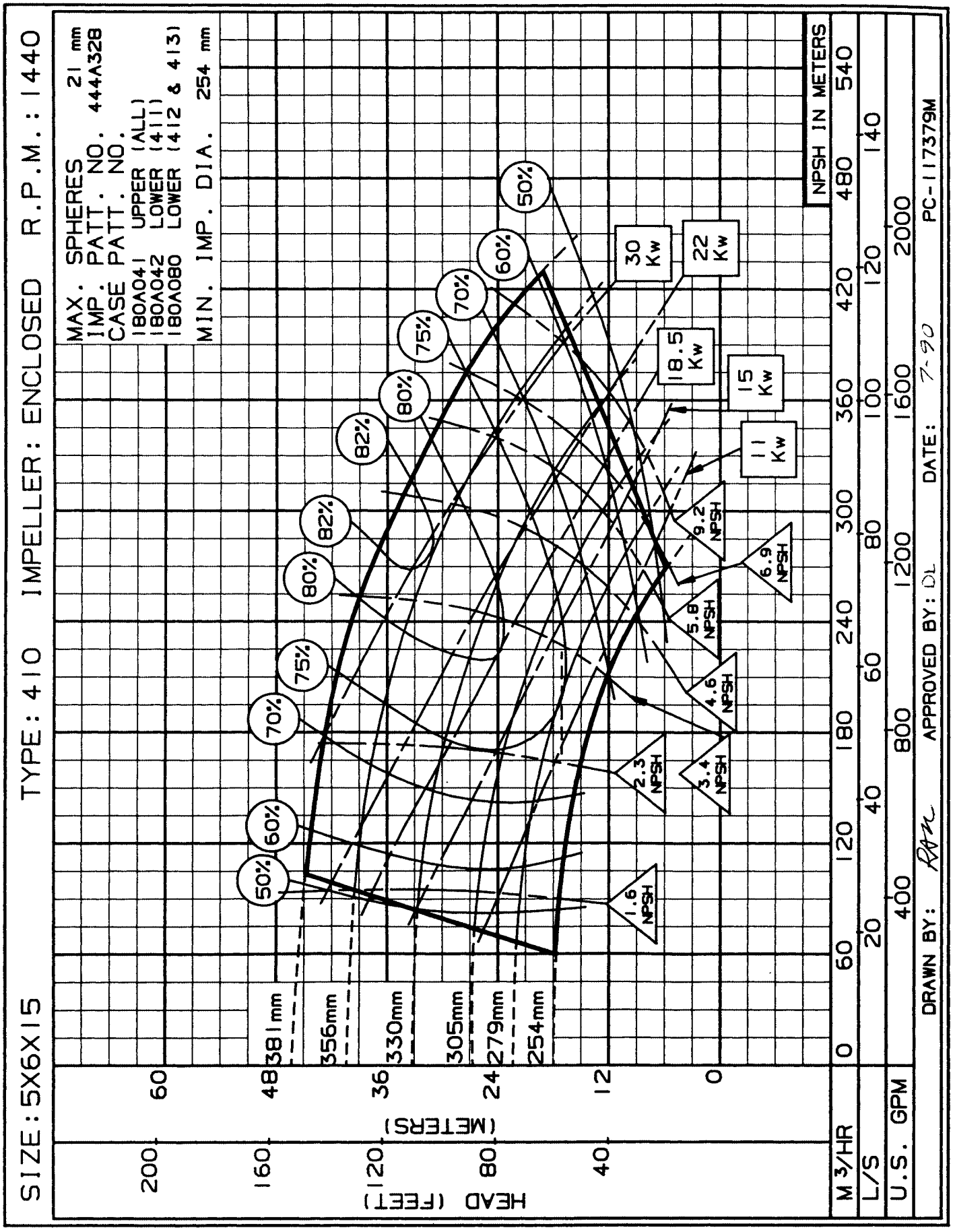
AURORA®
Pentair Pump Group



AURORA®
Pentair Pump Group

5x6x15 - 1440 RPM
ENCLOSED IMPELLER

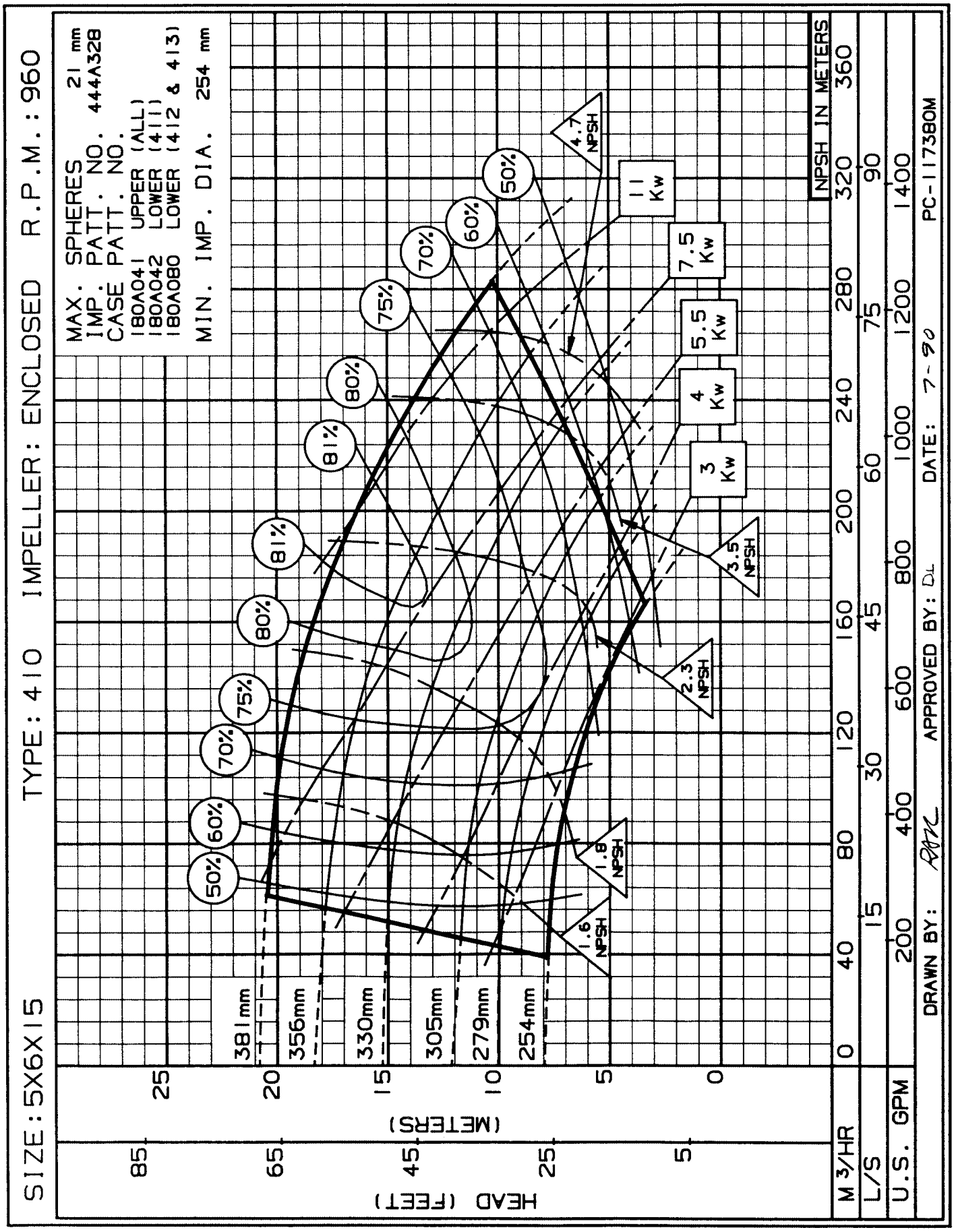
SECTION 410 (Metric 50Hz)
DATE JULY 1994
SUPERCEDES MARCH 1986



SECTION 410 (Metric 50Hz)
DATE JULY 1994
SUPERCEDES MARCH 1986

5x6x15 - 960 RPM
ENCLOSED IMPELLER

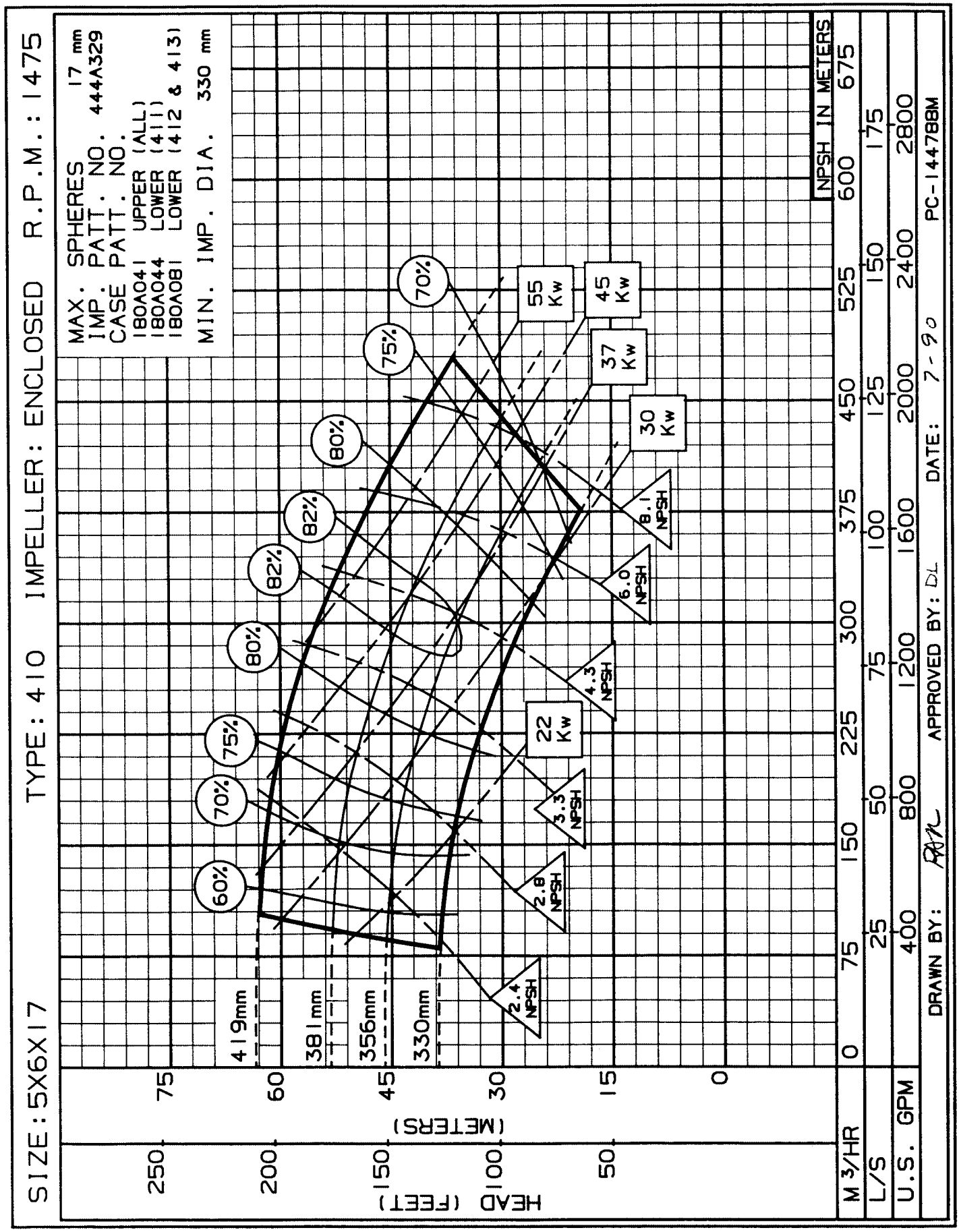
AURORA®
Pentair Pump Group



AURORA®
Pentair Pump Group

5x6x17 - 1475 RPM
ENCLOSED IMPELLER

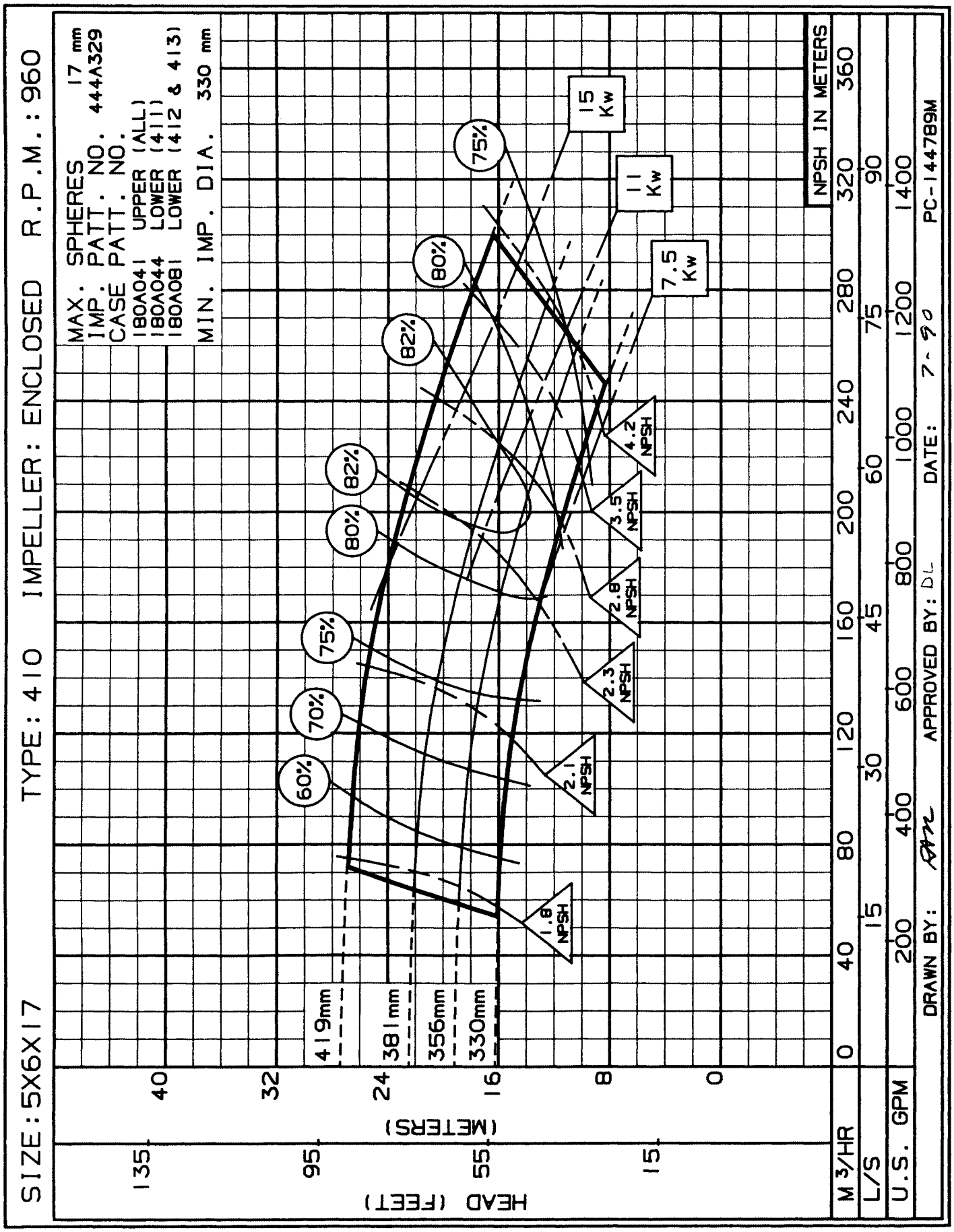
SECTION 410 (Metric 50Hz)
DATE JULY 1994
SUPERCEDES MARCH 1986



SECTION 410 (Metric 50Hz)
DATE JULY 1994
SUPERCEDES MARCH 1986

5x6x17 - 960 RPM
ENCLOSED IMPELLER

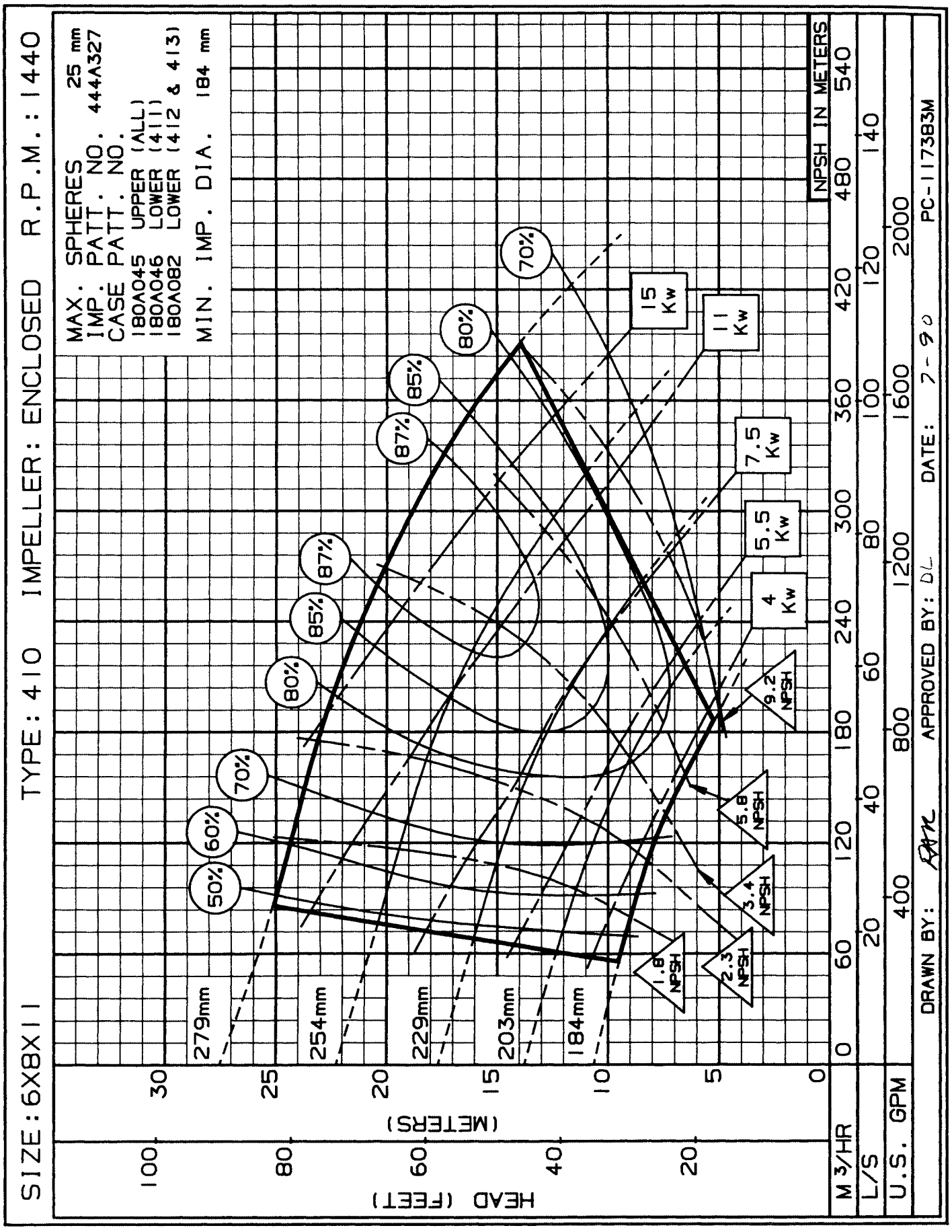
AURORA®
Pentair Pump Group



AURORA®
Pentair Pump Group

6x8x11 - 1440 RPM
ENCLOSED IMPELLER

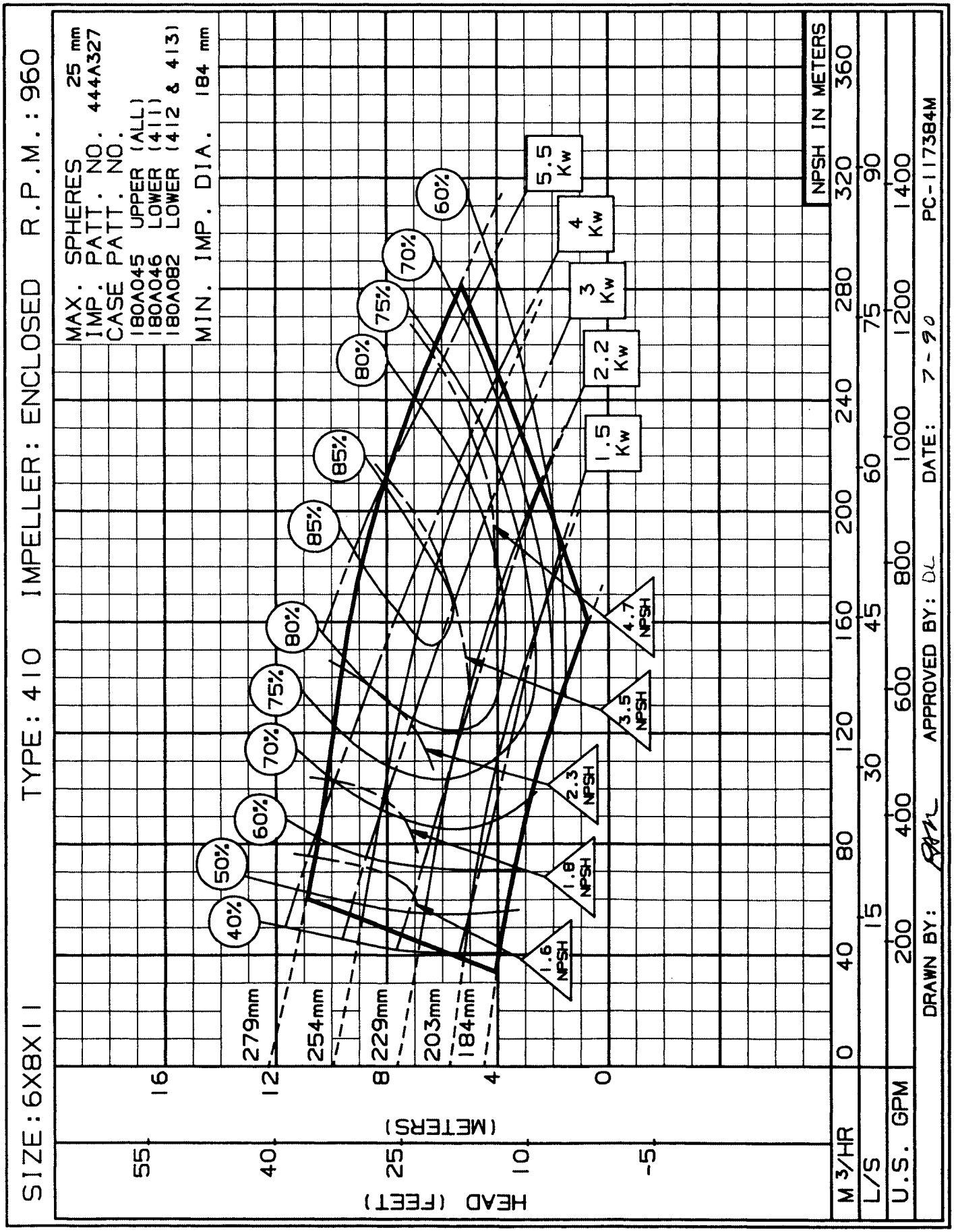
SECTION 410 (Metric 50Hz)
DATE JULY 1994
SUPERCEDES MARCH 1986



SECTION **410 (Metric 50Hz)**
DATE **JULY 1994**
SUPERCEDES MARCH 1986

6x8x11- 960 RPM
ENCLOSED IMPELLER

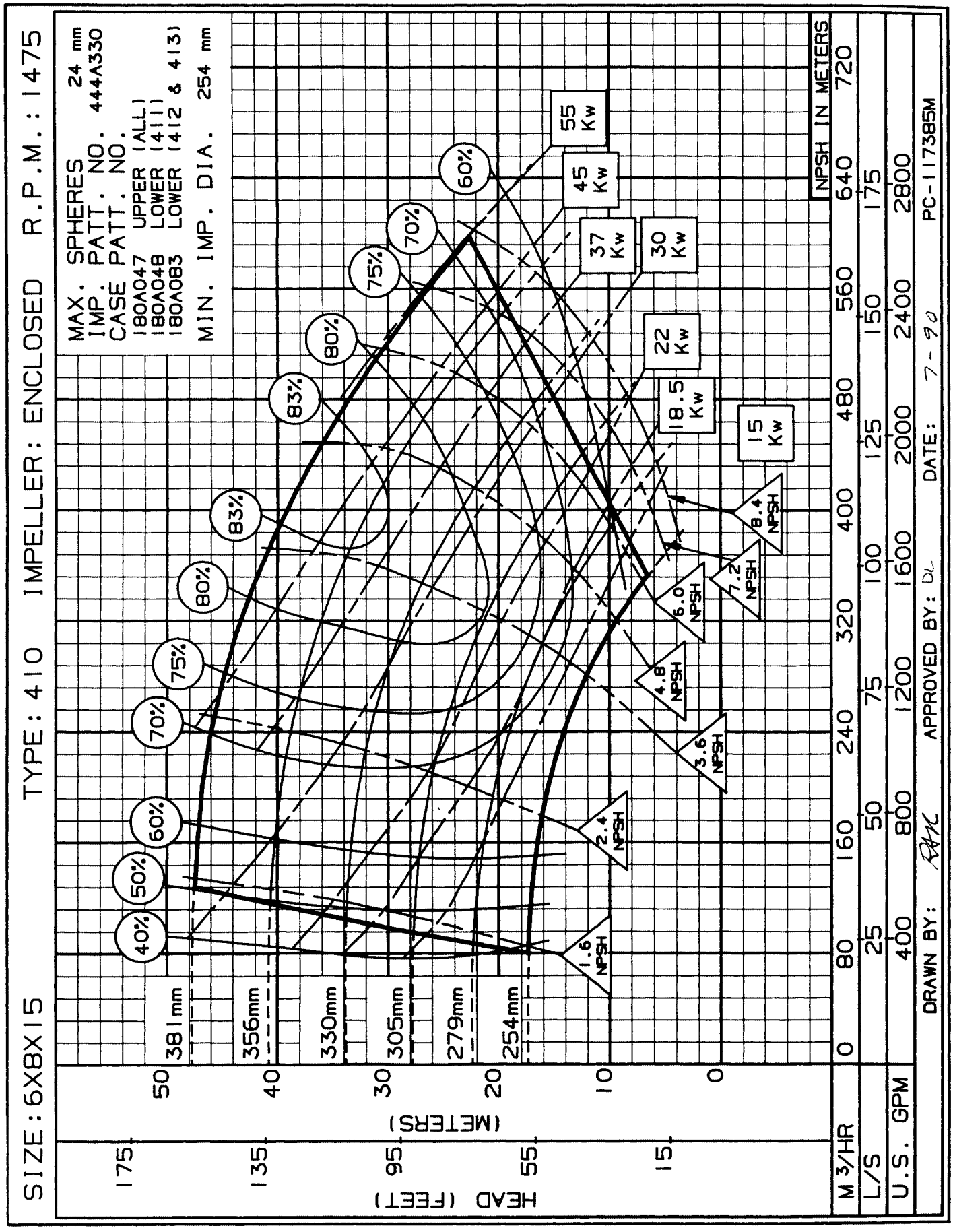
AURORA®
Pentair Pump Group



AURORA®
Pentair Pump Group

6x8x15 - 1475 RPM
ENCLOSED IMPELLER

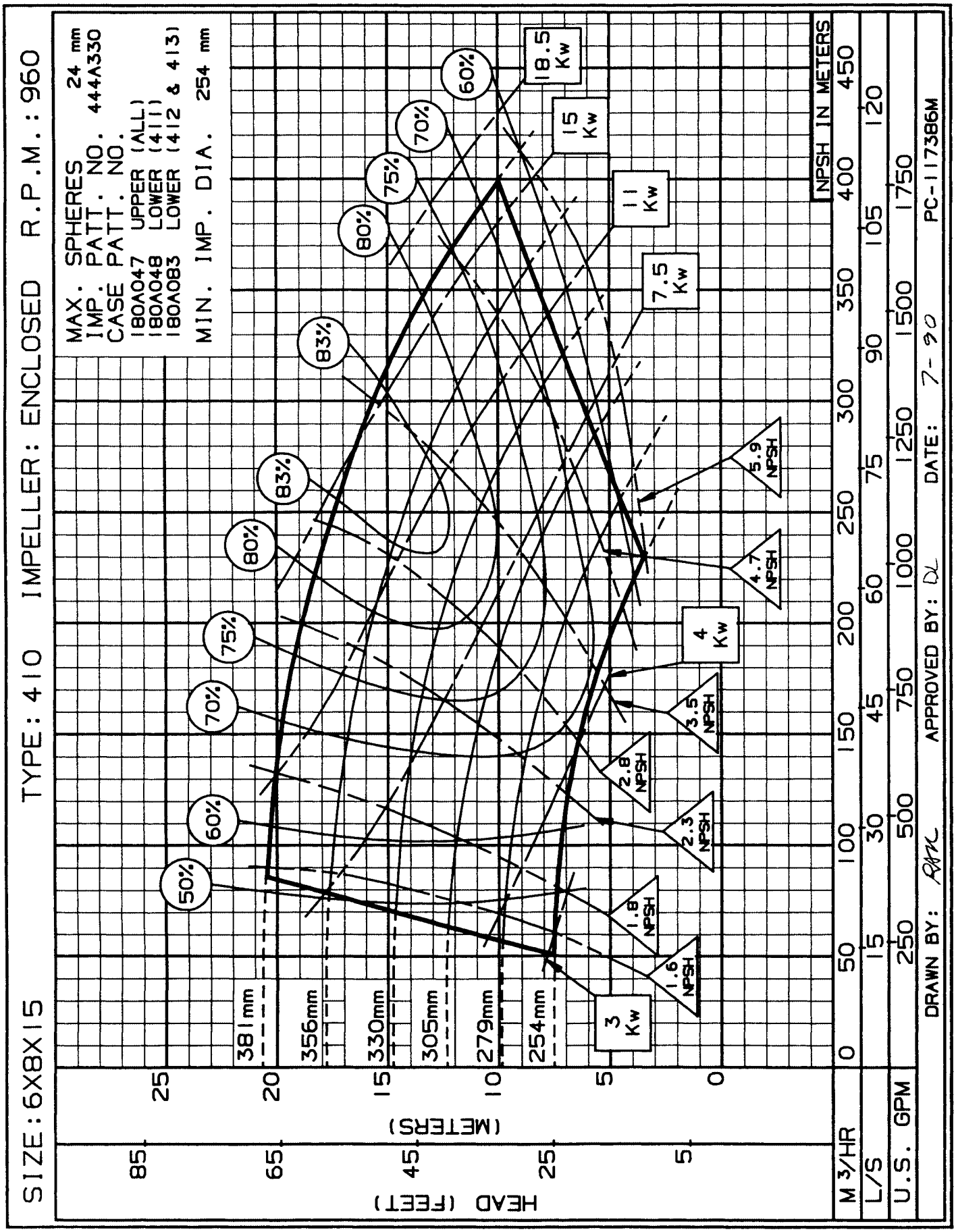
SECTION 410 (Metric 50Hz)
DATE JULY 1994
SUPERCEDES MARCH 1986



SECTION **410 (Metric 50Hz)**
DATE **JULY 1994**
SUPERCEDES MARCH 1986

6x8x15 - 960 RPM
ENCLOSED IMPELLER

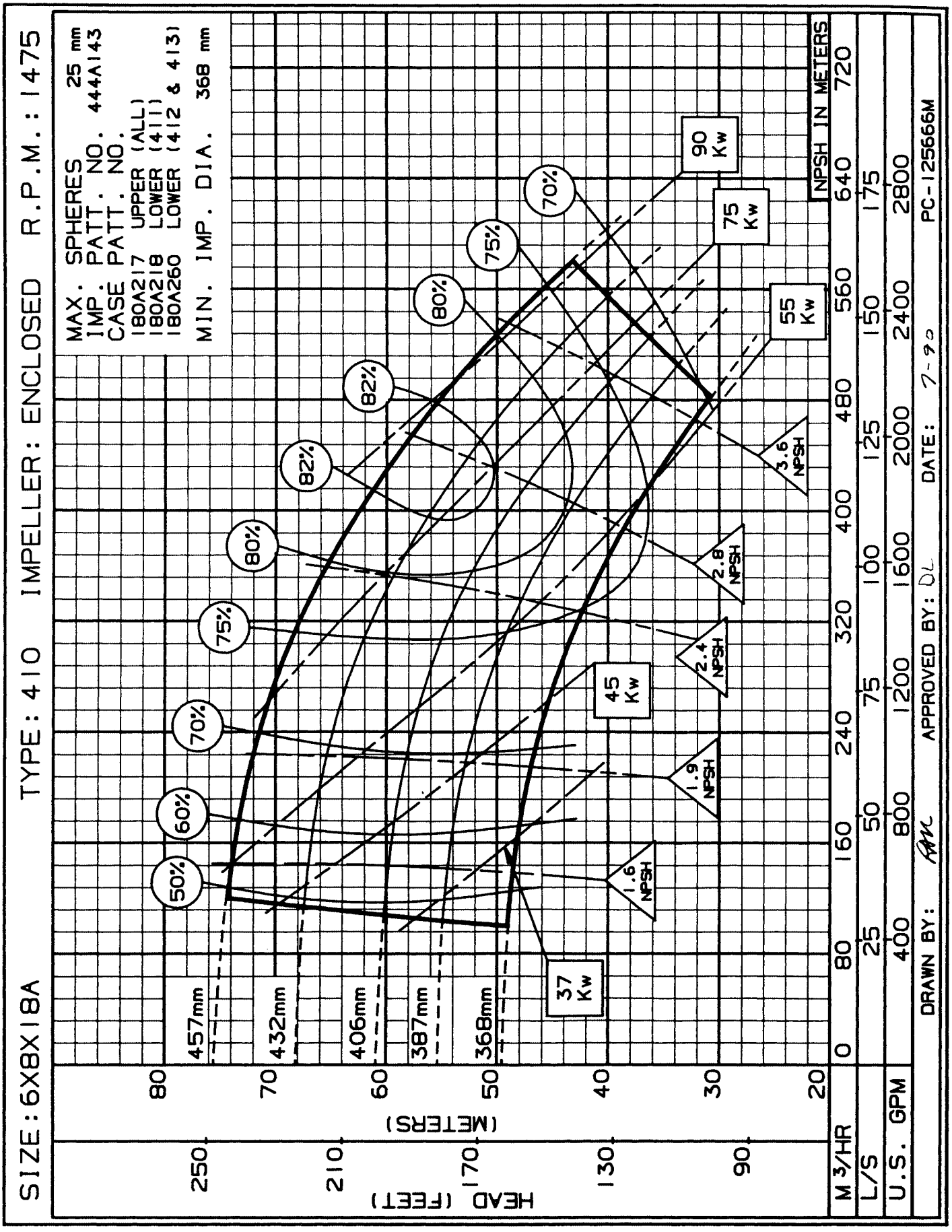
AURORA®
Pentair Pump Group



AURORA®
Pentair Pump Group

6x8x18A - 1475 RPM
ENCLOSED IMPELLER

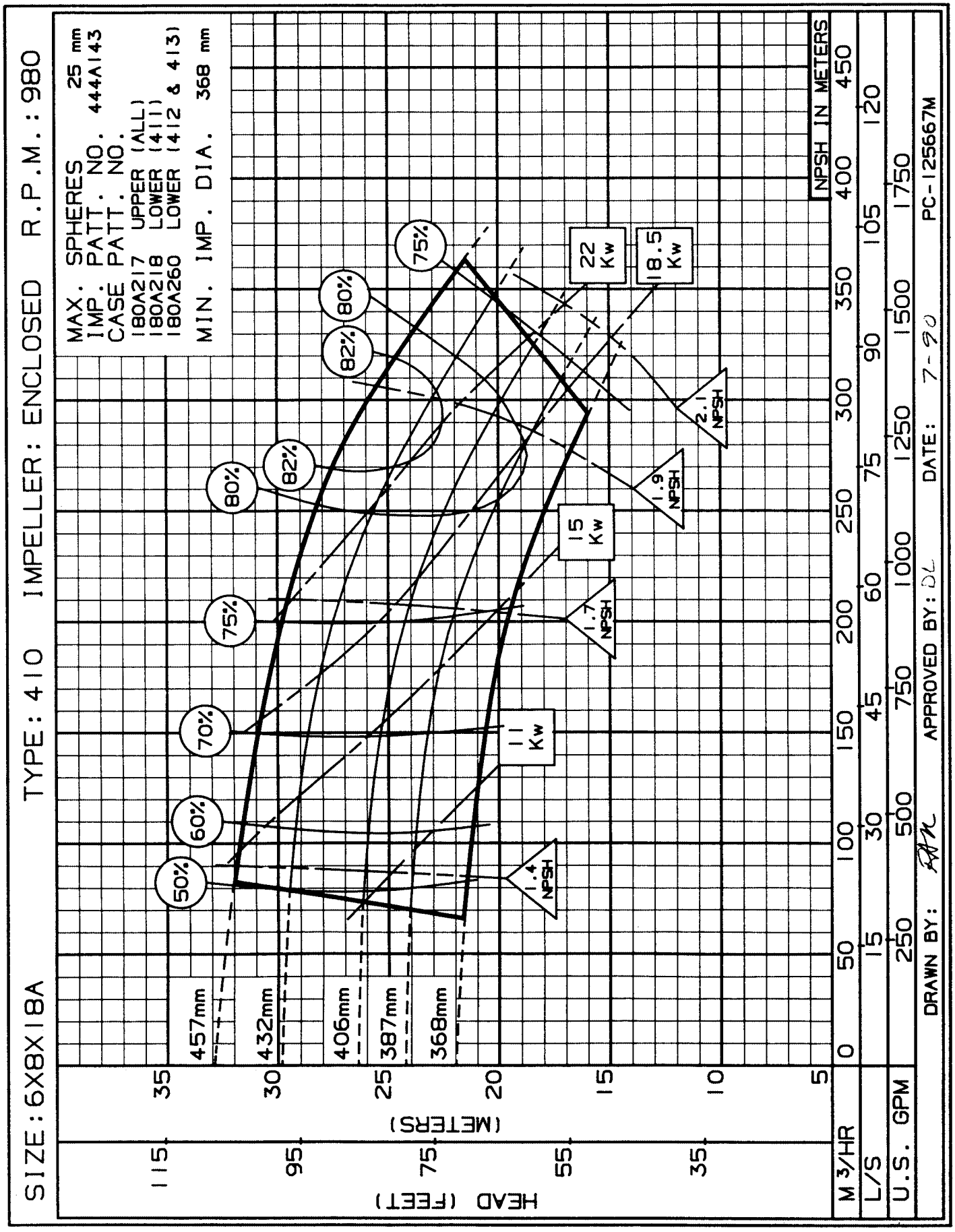
SECTION 410 (Metric 50Hz)
DATE JULY 1994
SUPERCEDES MARCH 1986



SECTION 410 (Metric 50Hz)
DATE JULY 1994
SUPERCEDES MARCH 1986

6x8x18A - 980 RPM
ENCLOSED IMPELLER

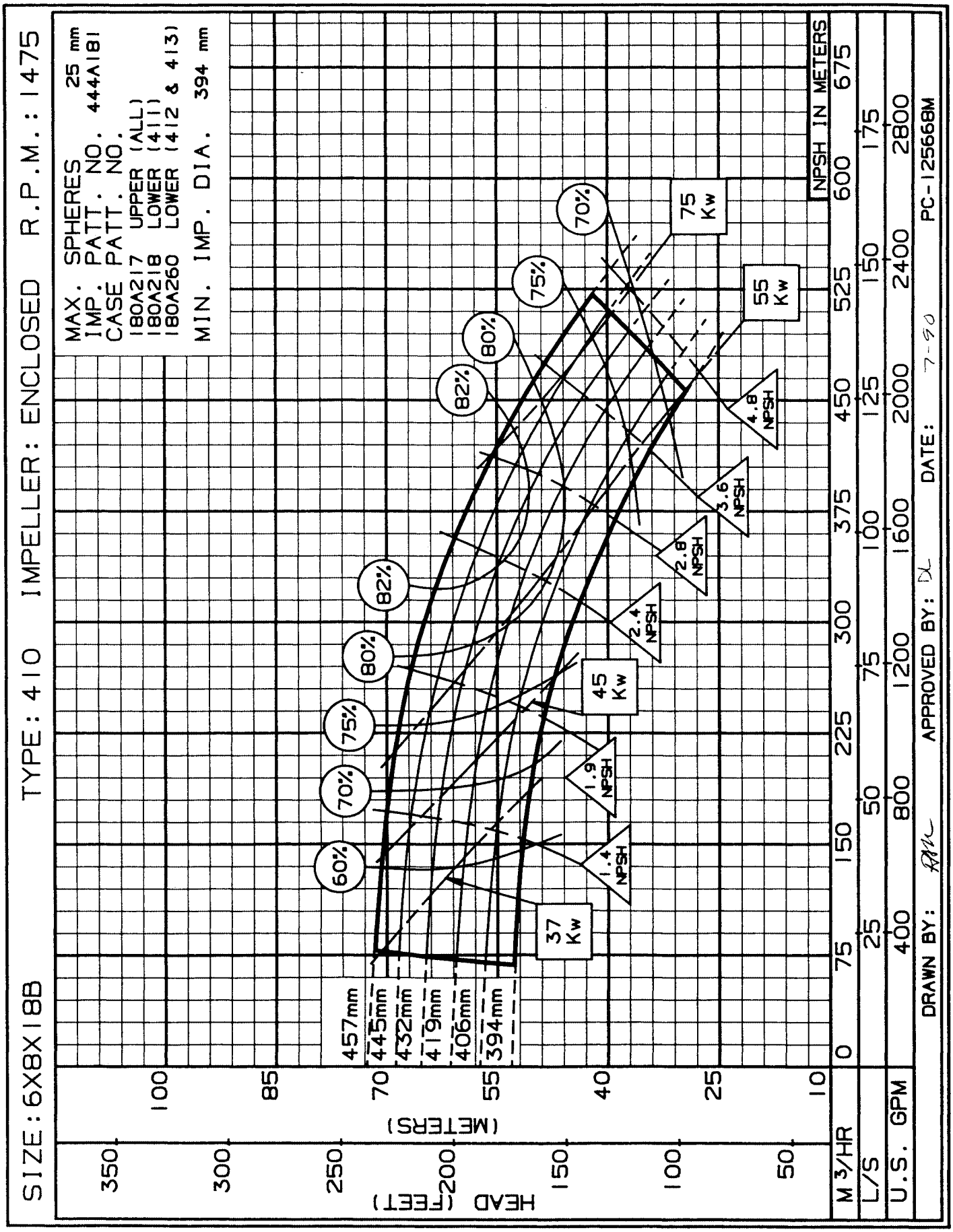
AURORA®
Pentair Pump Group



AURORA®
Pentair Pump Group

6x8x18B - 1475 RPM
ENCLOSED IMPELLER

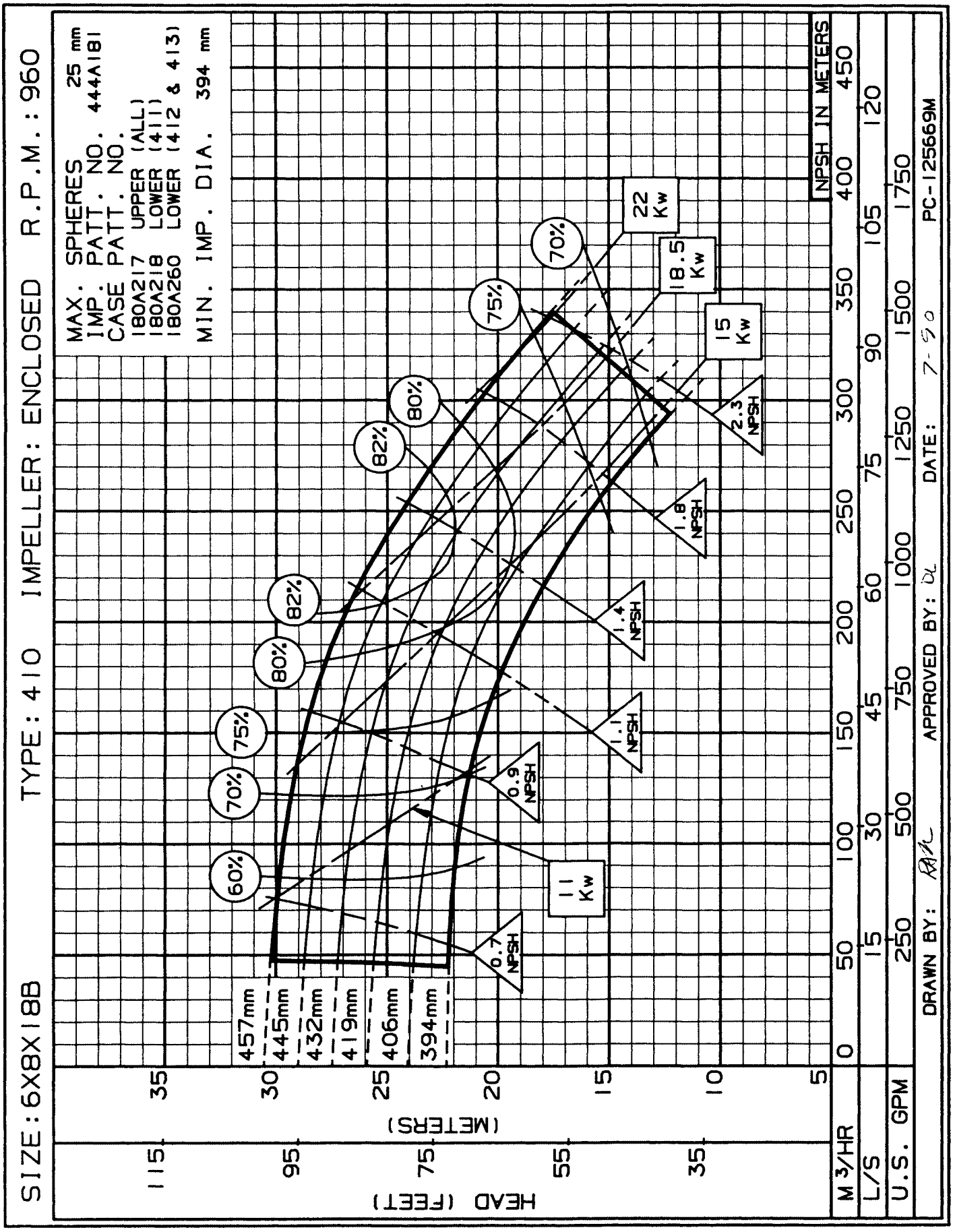
SECTION 410 (Metric 50Hz)
DATE JULY 1994
SUPERCEDES MARCH 1986



SECTION 410 (Metric 50Hz)
DATE JULY 1994
SUPERCEDES MARCH 1986

6x8x18B - 960 RPM
ENCLOSED IMPELLER

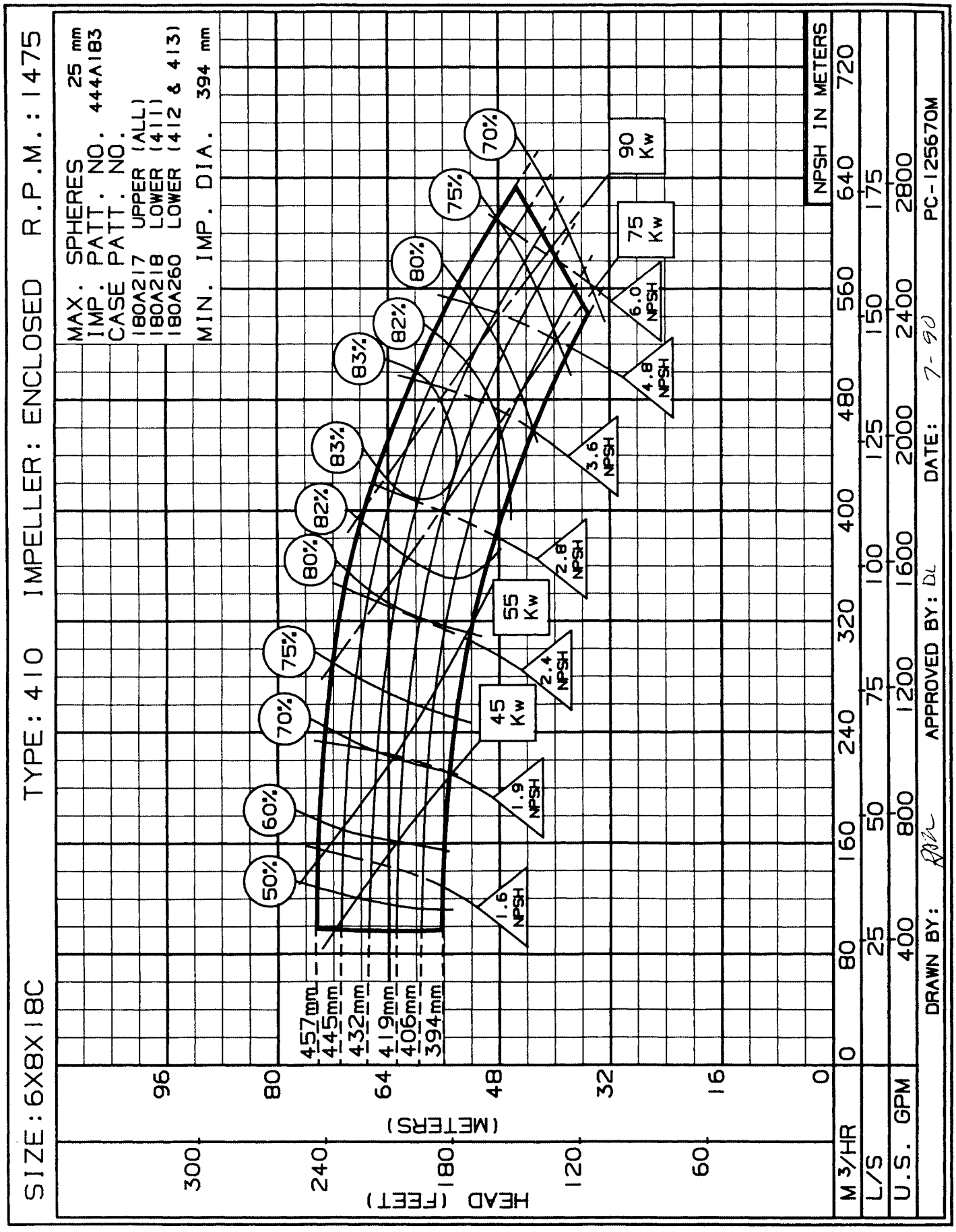
AURORA®
Pentair Pump Group



AURORA®
Pentair Pump Group

6x8x18C - 1475 RPM
ENCLOSED IMPELLER

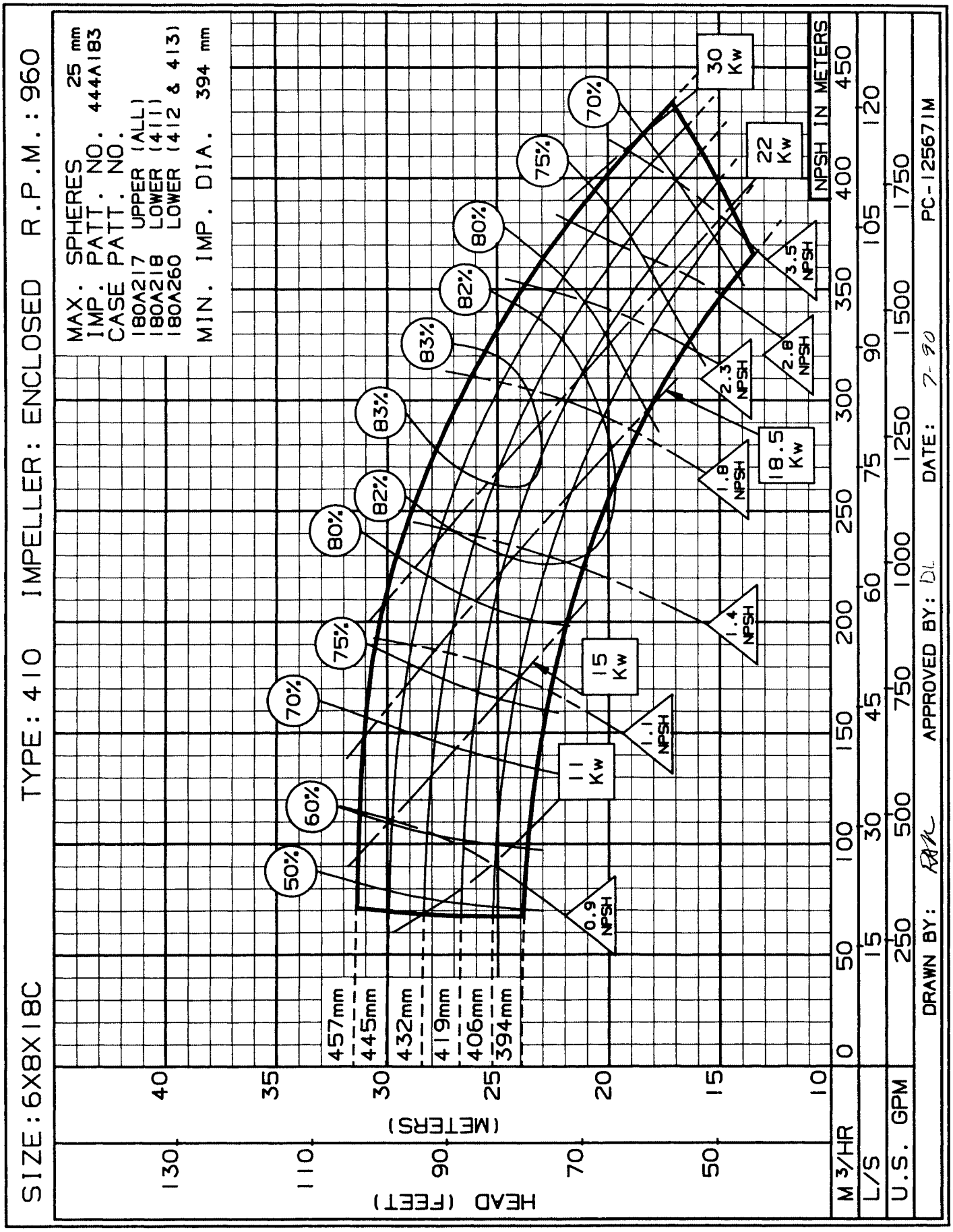
SECTION 410 (Metric 50Hz)
DATE JULY 1994
SUPERCEDES MARCH 1986



SECTION **410 (Metric 50Hz)**
DATE **JULY 1994**
SUPERCEDES MARCH 1986

6x8x18C - 960 RPM
ENCLOSED IMPELLER

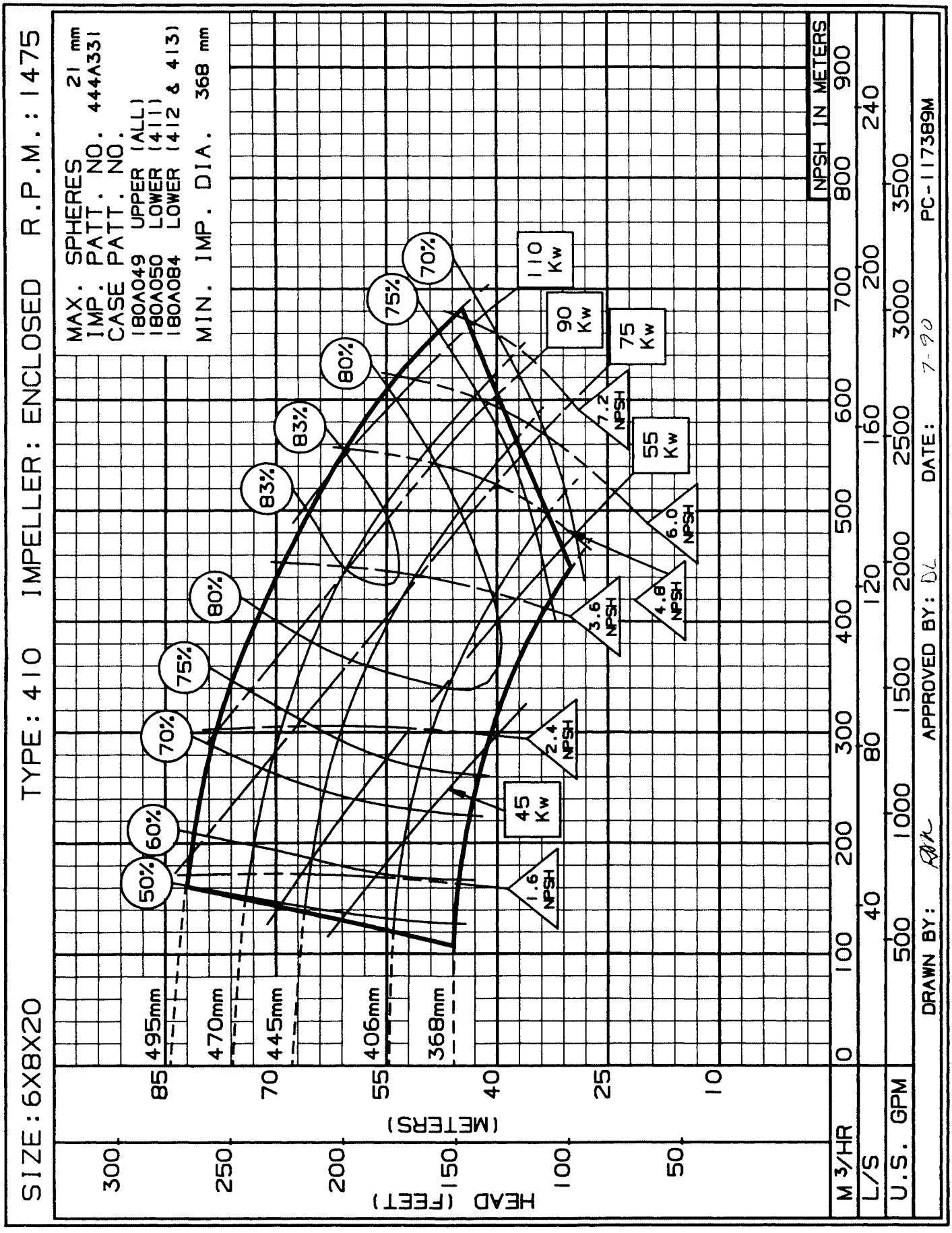
AURORA®
Pentair Pump Group



AURORA®
Pentair Pump Group

6x8x20 - 1475 RPM
ENCLOSED IMPELLER

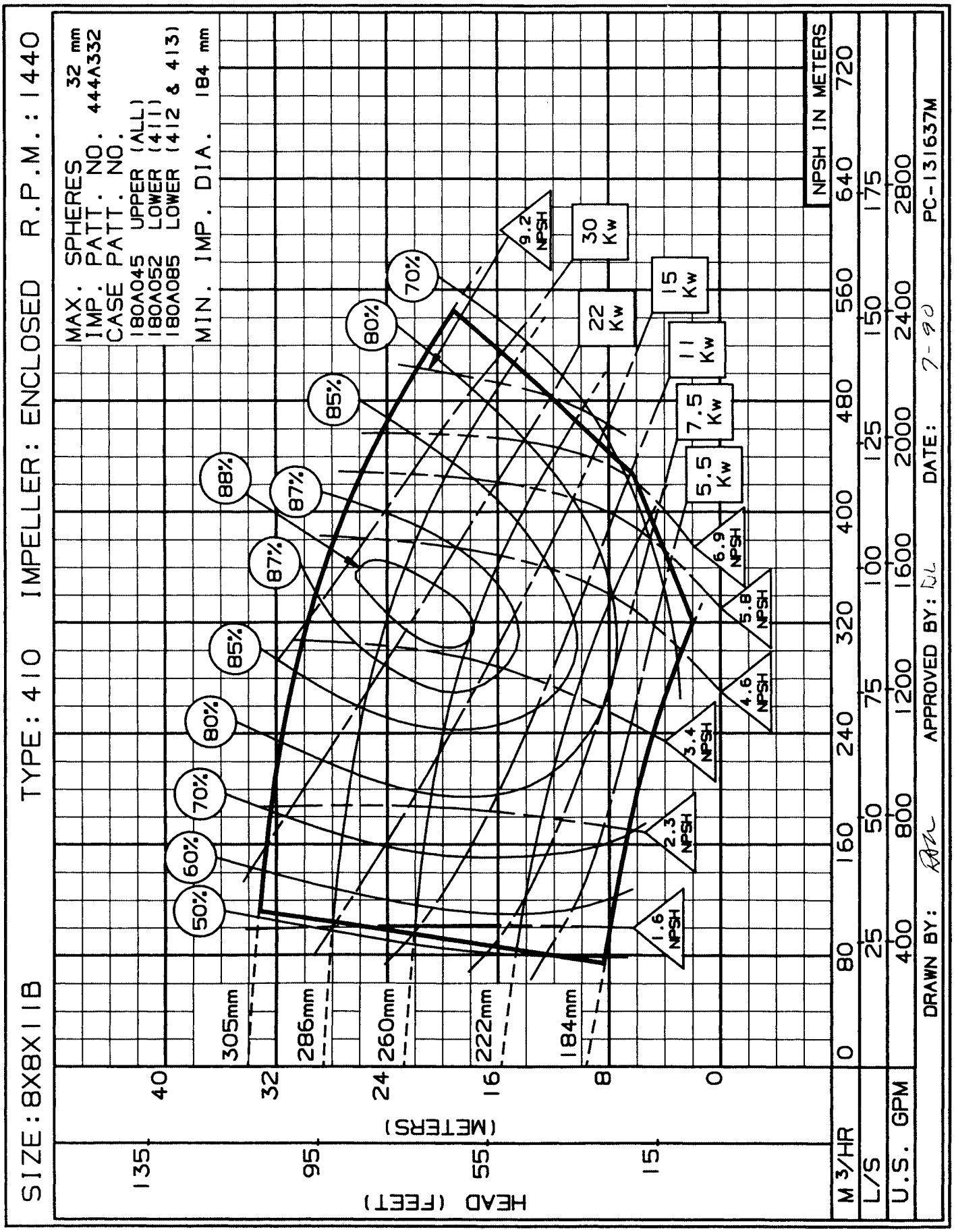
SECTION 410 (Metric 50Hz)
DATE JULY 1994
SUPERCEDES MARCH 1986



SECTION **410 (Metric 50Hz)**
DATE **JULY 1994**
SUPERCEDES MARCH 1986

8x8x11B - 1440 RPM
ENCLOSED IMPELLER

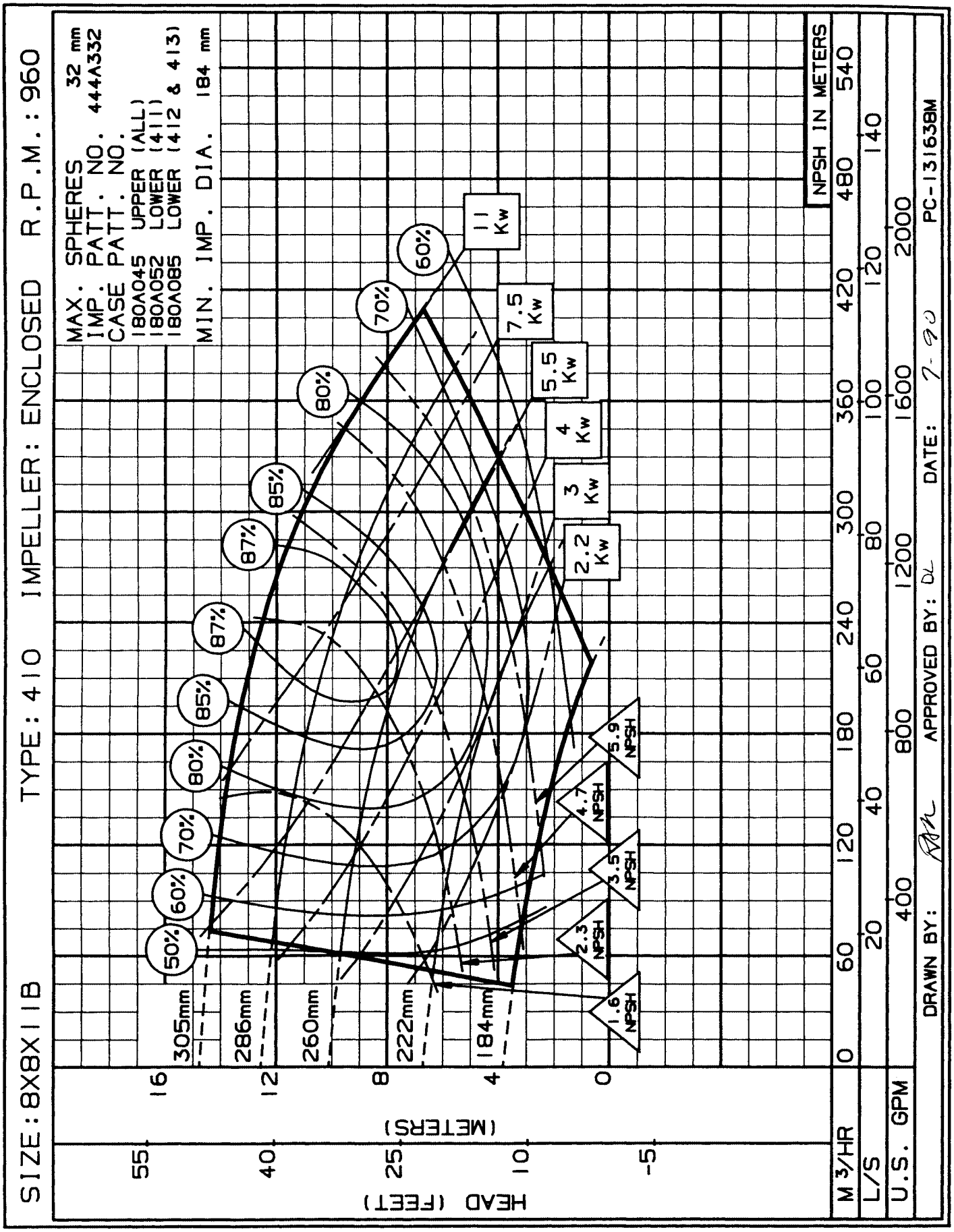
AURORA®
Pentair Pump Group



AURORA®
Pentair Pump Group

8x8x11B - 960 RPM
ENCLOSED IMPELLER

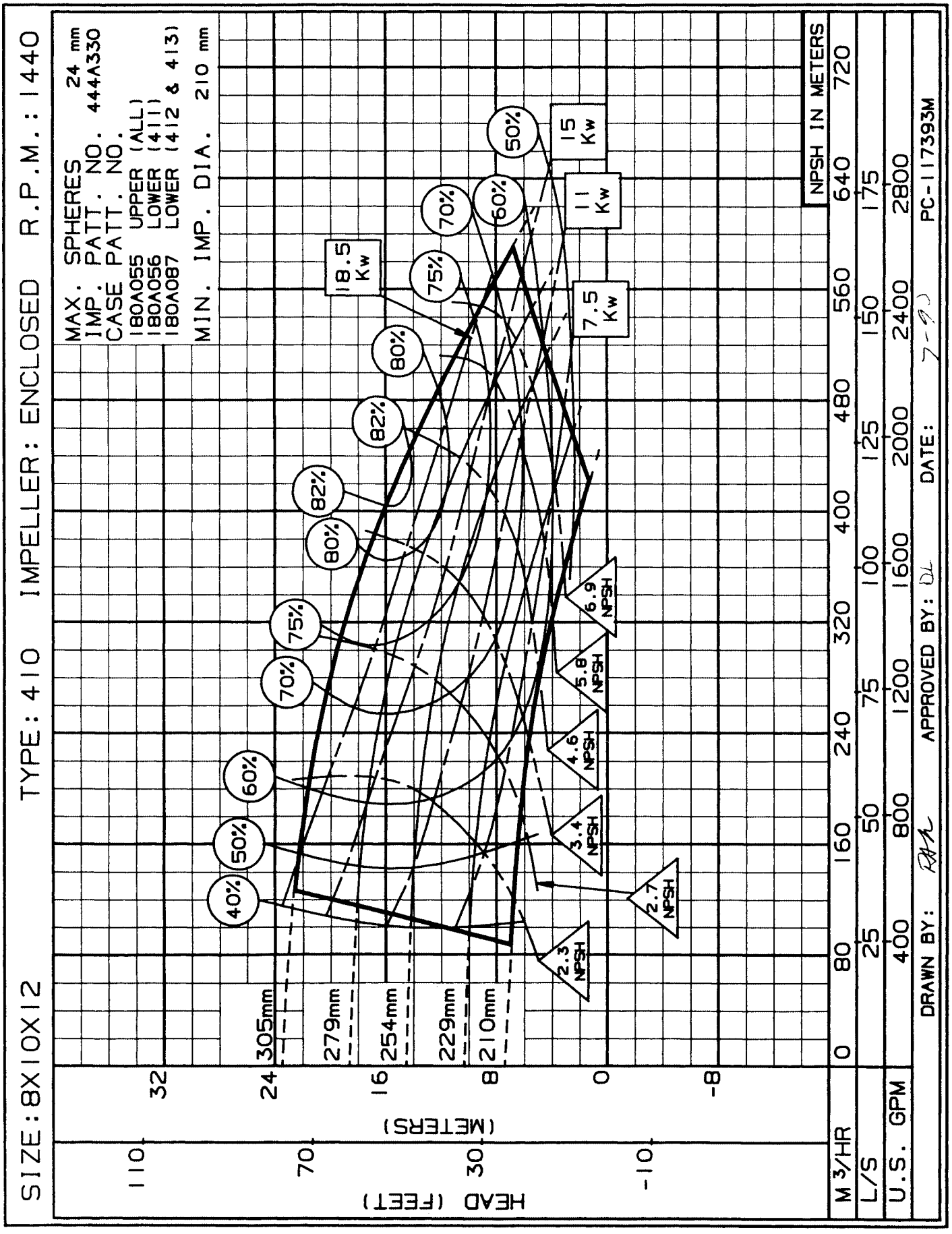
SECTION 410 (Metric 50Hz)
DATE JULY 1994
SUPERCEDES MARCH 1986



SECTION 410 (Metric 50Hz)
DATE JULY 1994
SUPERCEDES MARCH 1986

8x10x12 - 1440 RPM
ENCLOSED IMPELLER

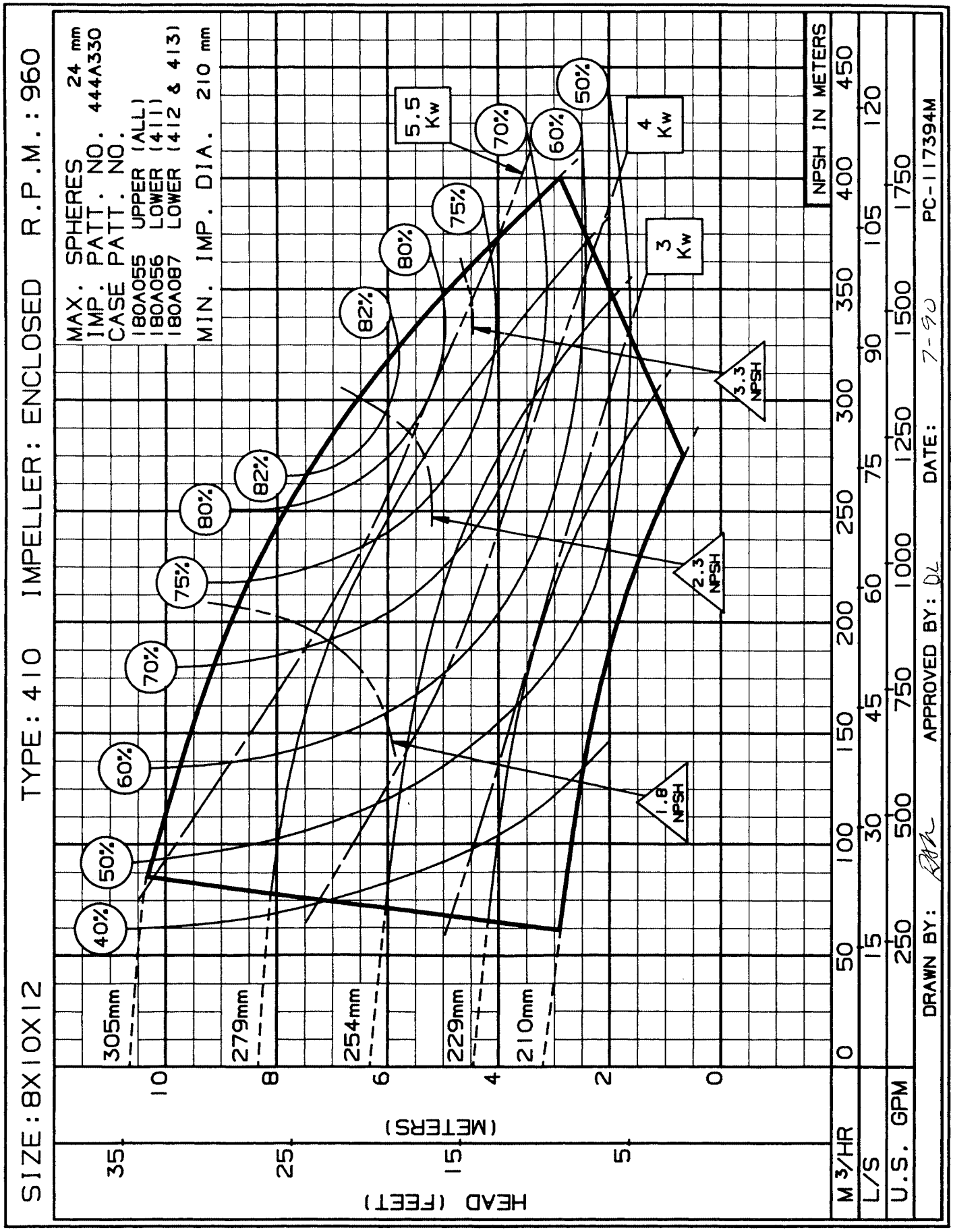
AURORA®
Pentair Pump Group



AURORA®
Pentair Pump Group

8x10x12 - 960 RPM
ENCLOSED IMPELLER

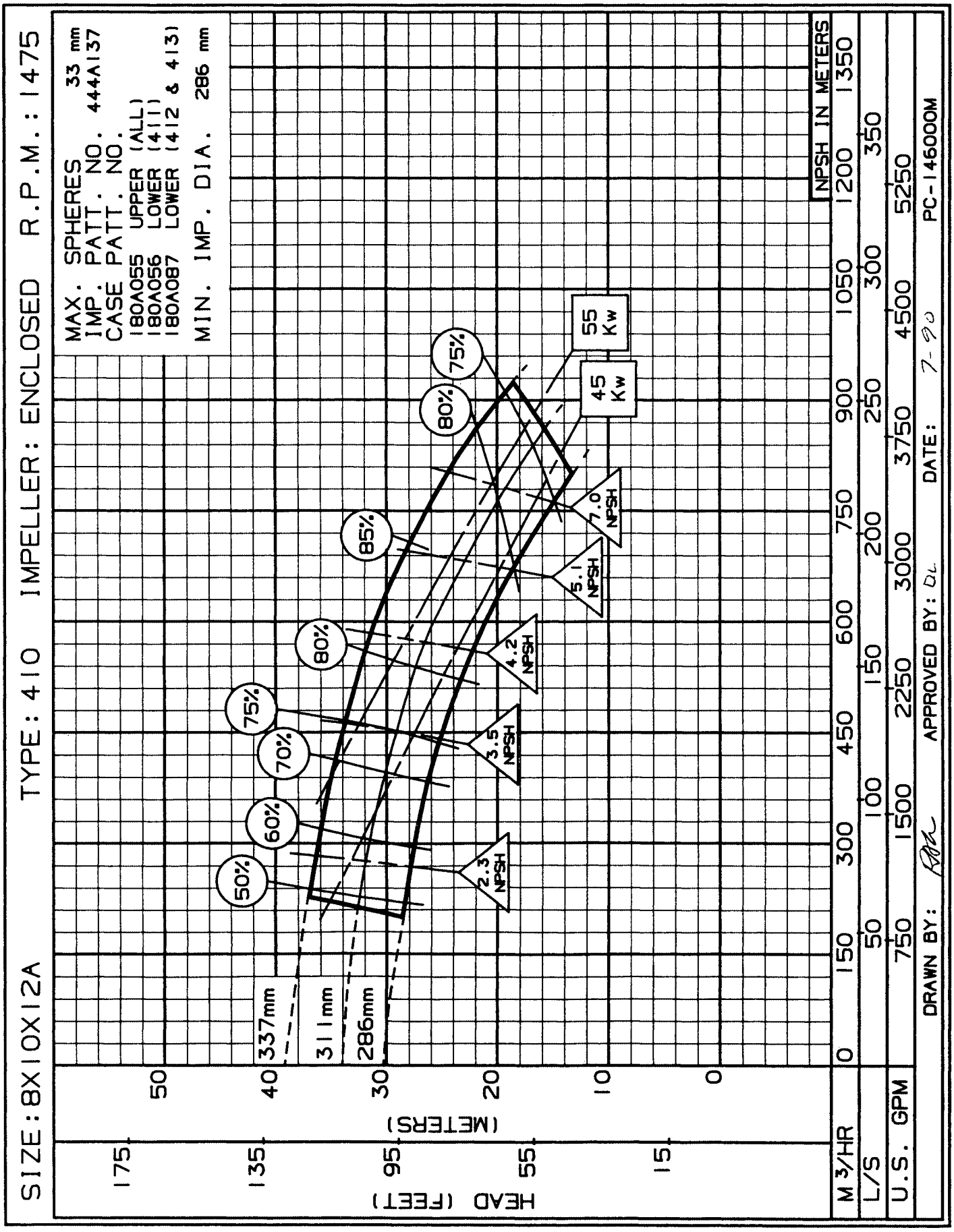
SECTION 410 (Metric 50Hz)
DATE JULY 1994
SUPERCEDES MARCH 1986



SECTION 410 (Metric 50Hz)
DATE JULY 1994
SUPERCEDES MARCH 1986

8x10x12A - 1475 RPM
ENCLOSED IMPELLER

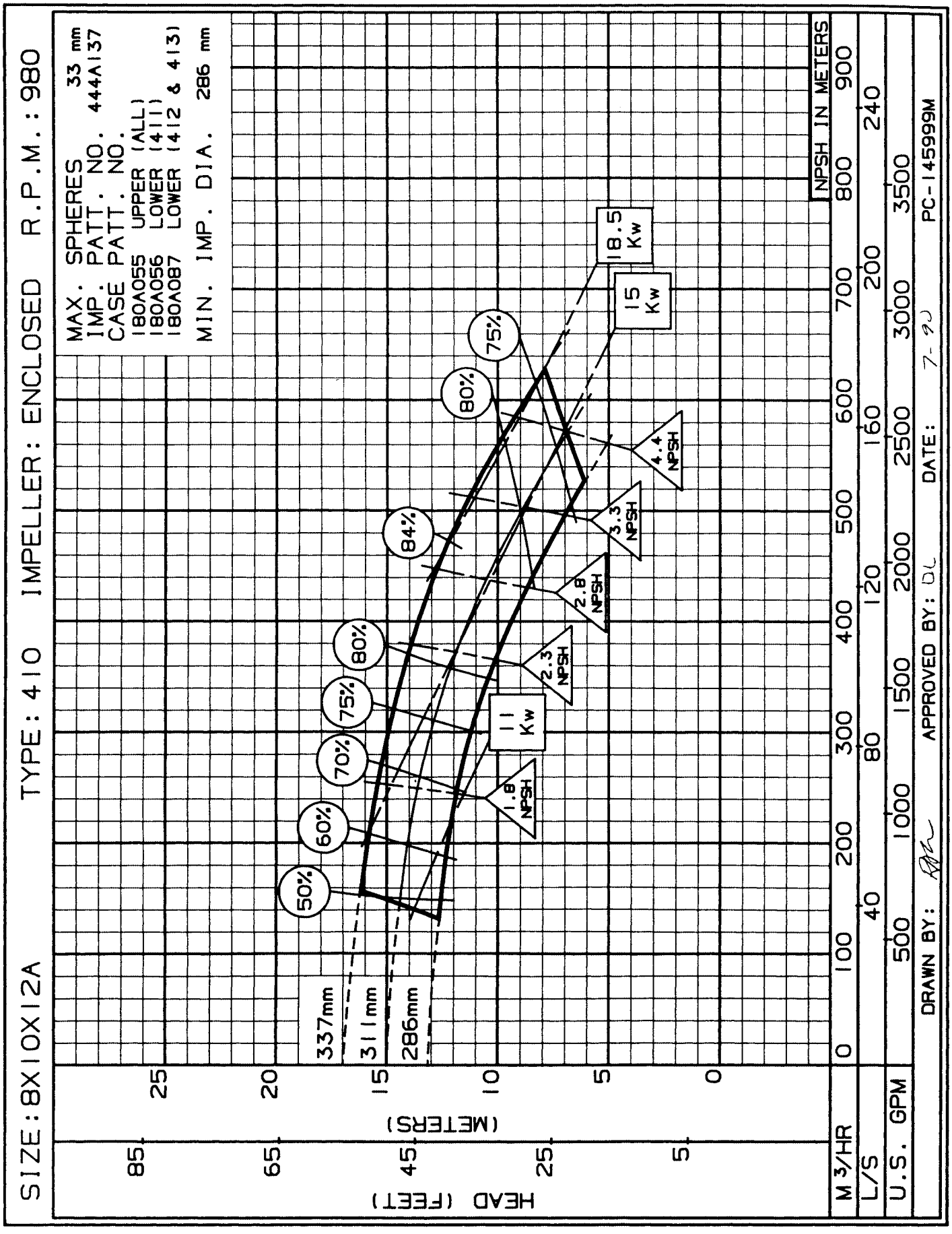
AURORA®
Pentair Pump Group



AURORA®
Pentair Pump Group

8x10x12A - 980 RPM
ENCLOSED IMPELLER

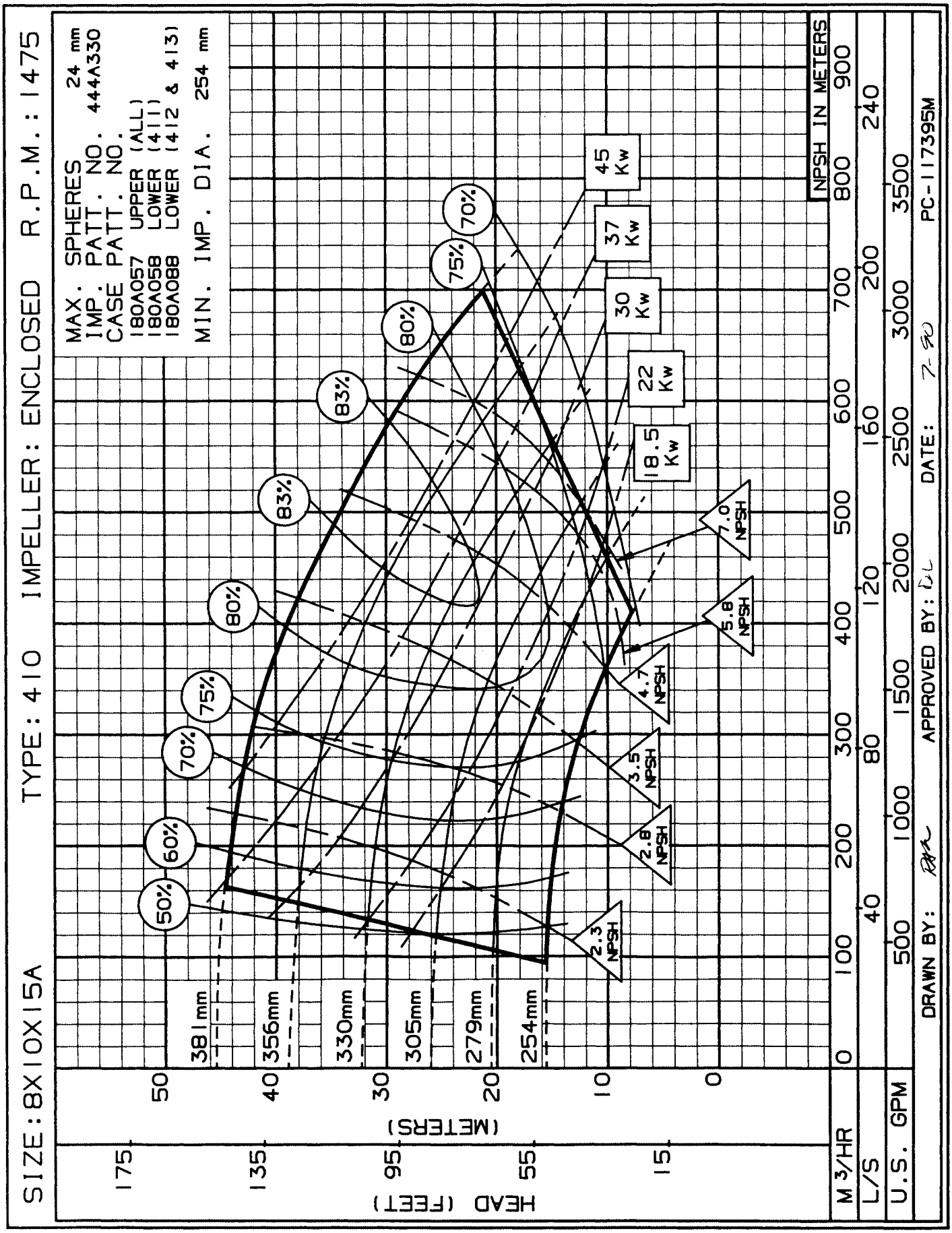
SECTION 410 (Metric 50Hz)
DATE JULY 1994
SUPERCEDES MARCH 1986



SECTION **410 (Metric 50Hz)**
DATE **JULY 1994**
SUPERCEDES MARCH 1986

8x10x15A - 1475 RPM
ENCLOSED IMPELLER

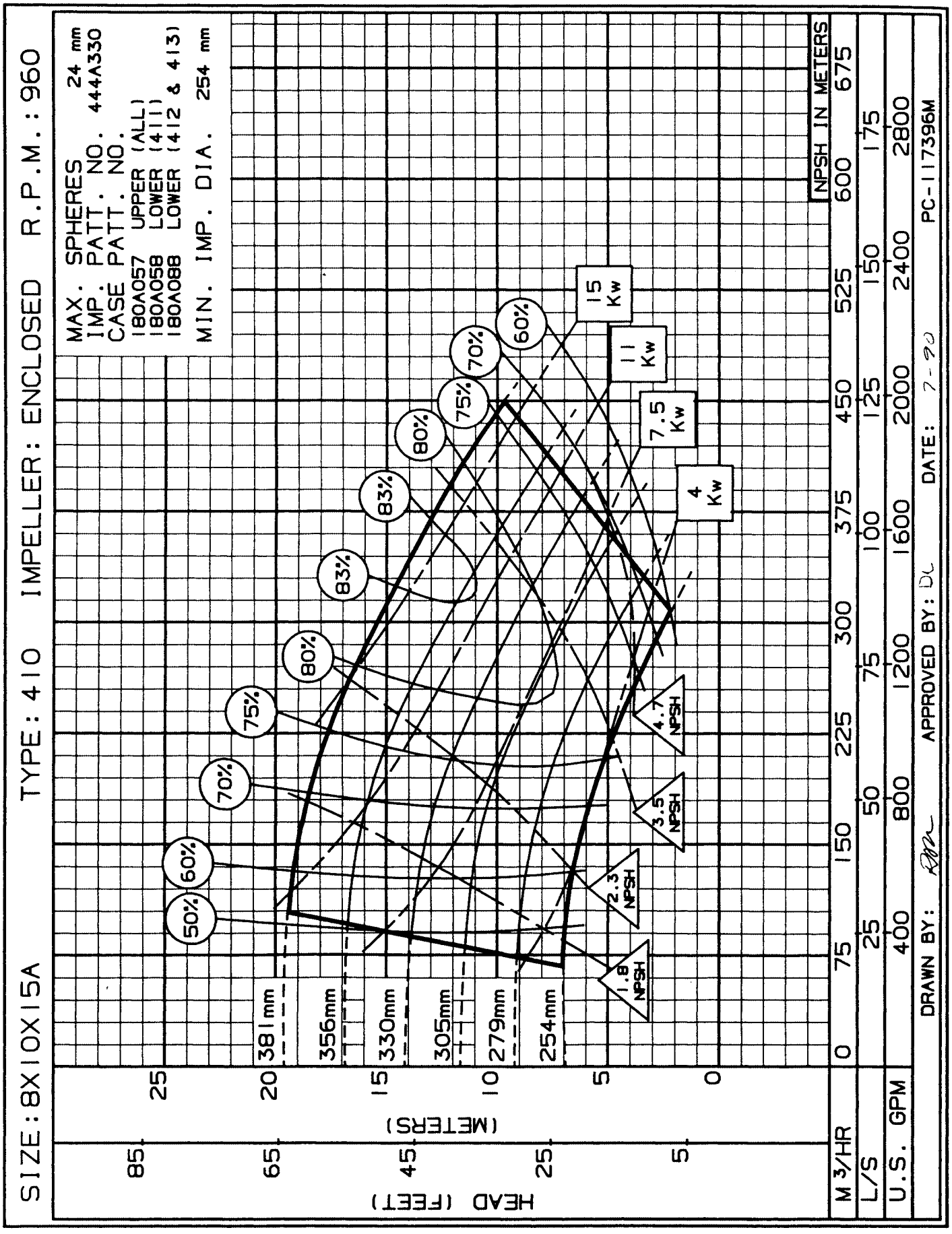
AURORA®
Pentair Pump Group



AURORA®
Pentair Pump Group

8x10x15A - 960 RPM
ENCLOSED IMPELLER

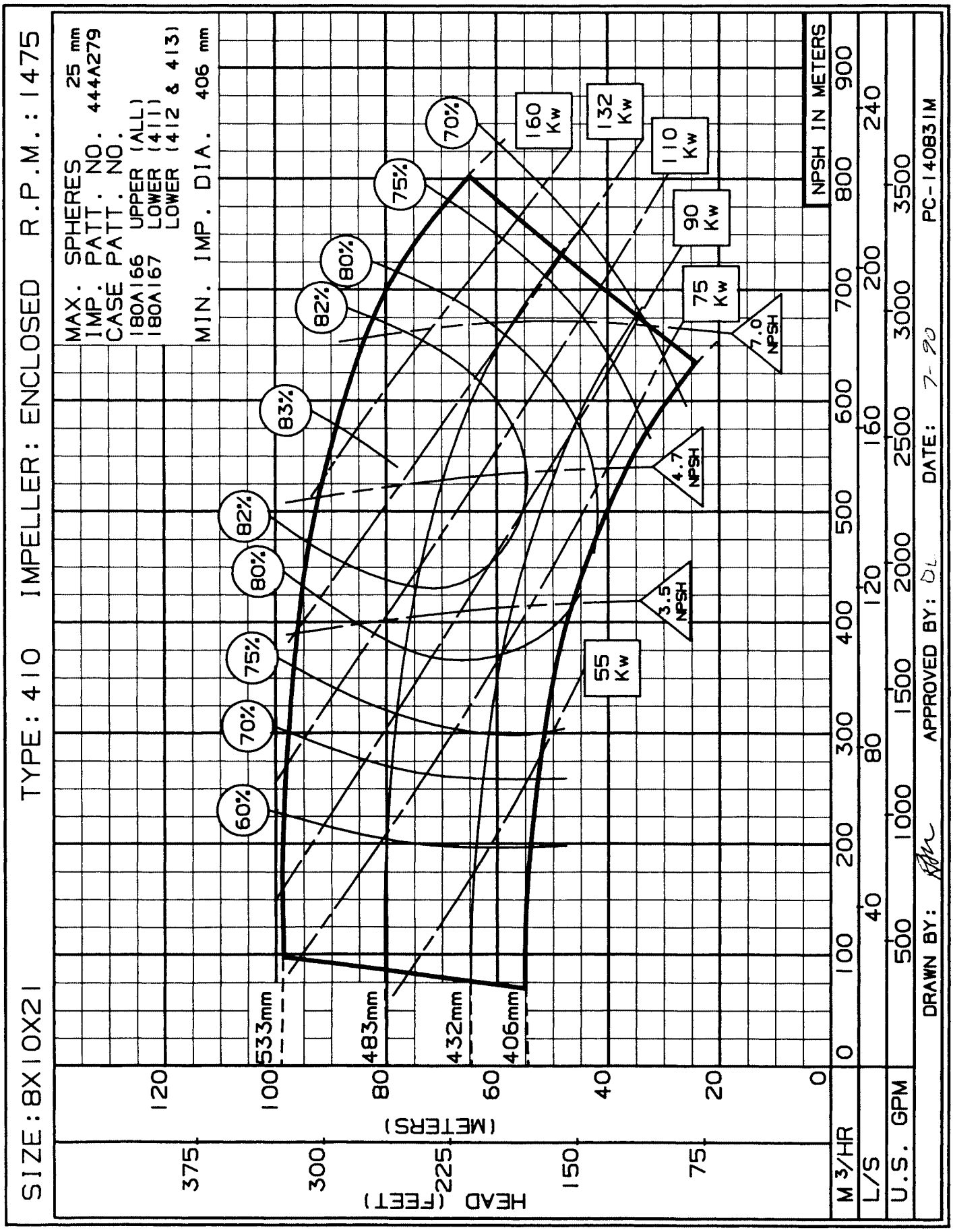
SECTION 410 (Metric 50Hz)
DATE JULY 1994
SUPERCEDES MARCH 1986



SECTION **410 (Metric 50Hz)**
DATE **JULY 1994**
SUPERCEDES MARCH 1986

8x10x21 - 1475 RPM
ENCLOSED IMPELLER

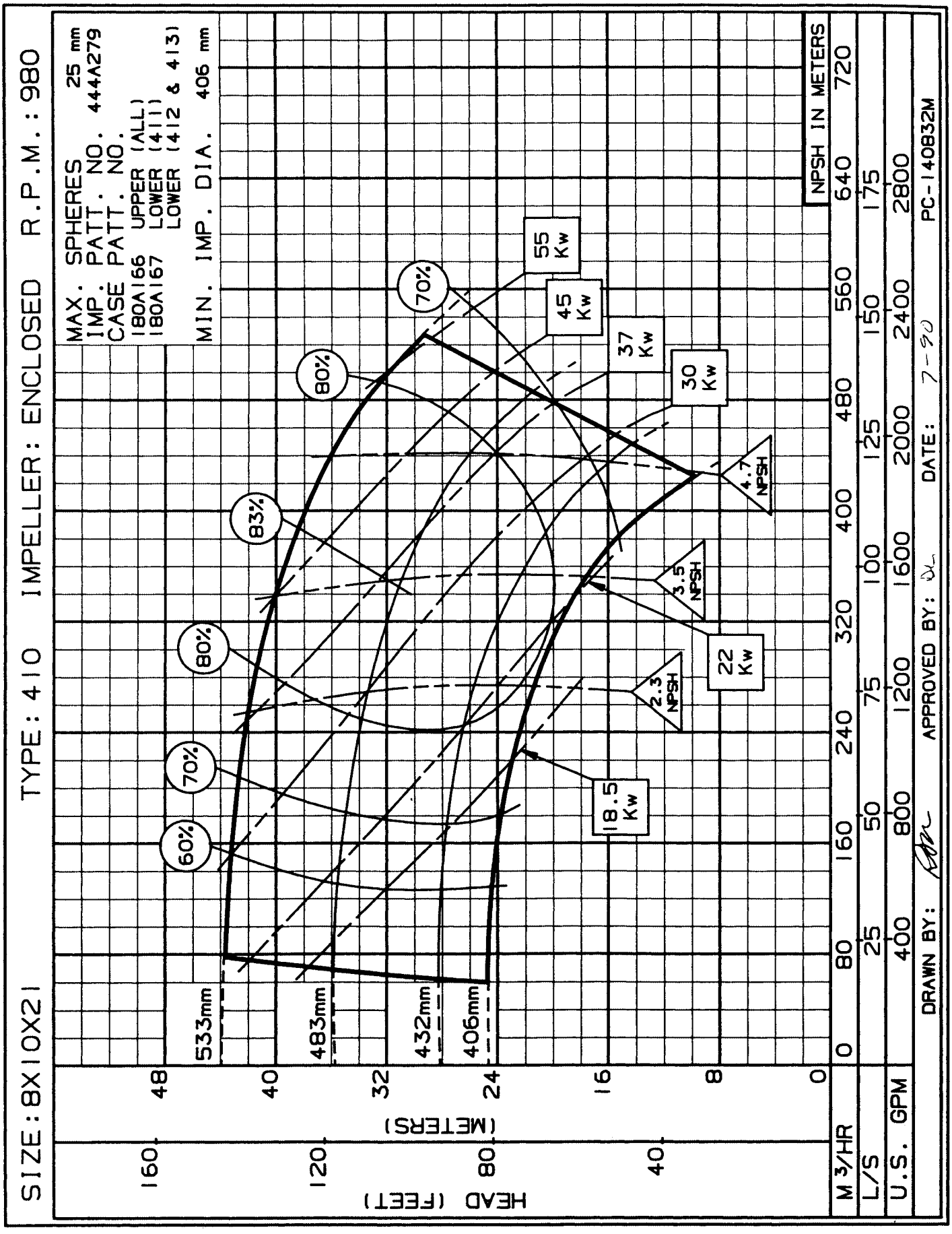
AURORA®
Pentair Pump Group



AURORA®
Pentair Pump Group

8x10x21 - 980 RPM
ENCLOSED IMPELLER

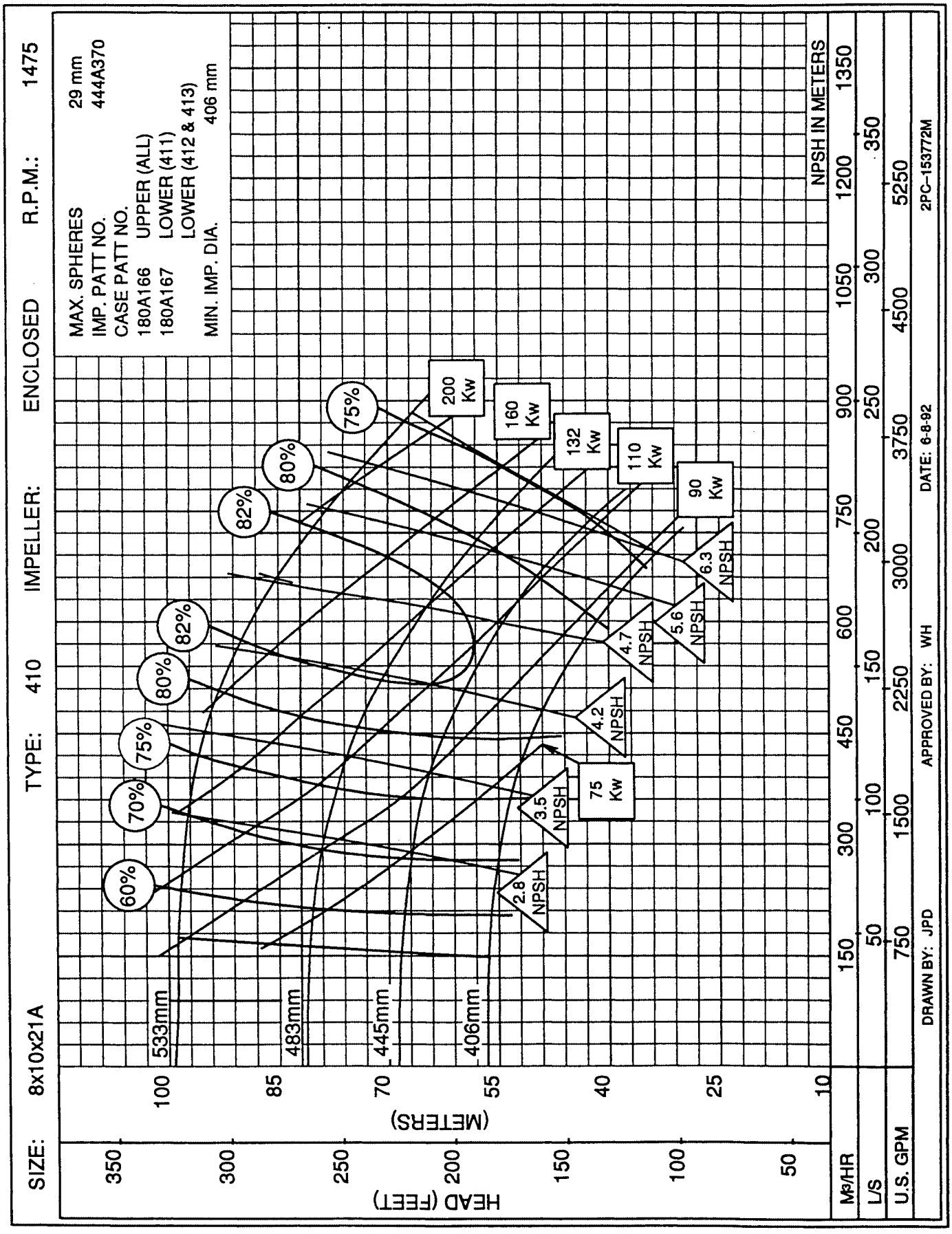
SECTION 410 (Metric 50Hz)
DATE JULY 1994
SUPERCEDES MARCH 1986



SECTION 410 (Metric 50Hz)
DATE JULY 1994
SUPERCEDES MARCH 1986

8x10x21A - 1475 RPM
ENCLOSED IMPELLER

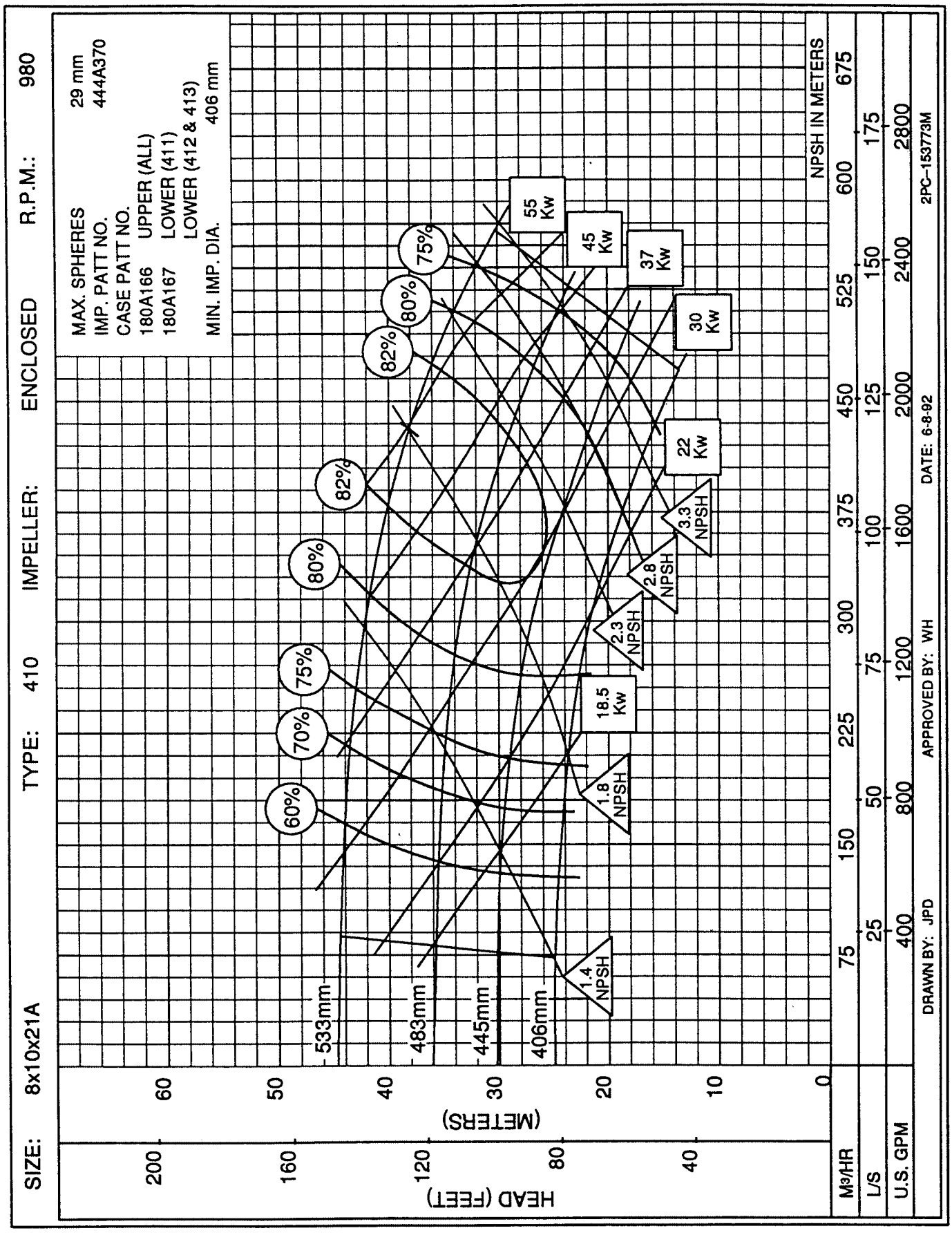
AURORA®
Pentair Pump Group



AURORA®
Pentair Pump Group

8x10x21A - 980 RPM
ENCLOSED IMPELLER

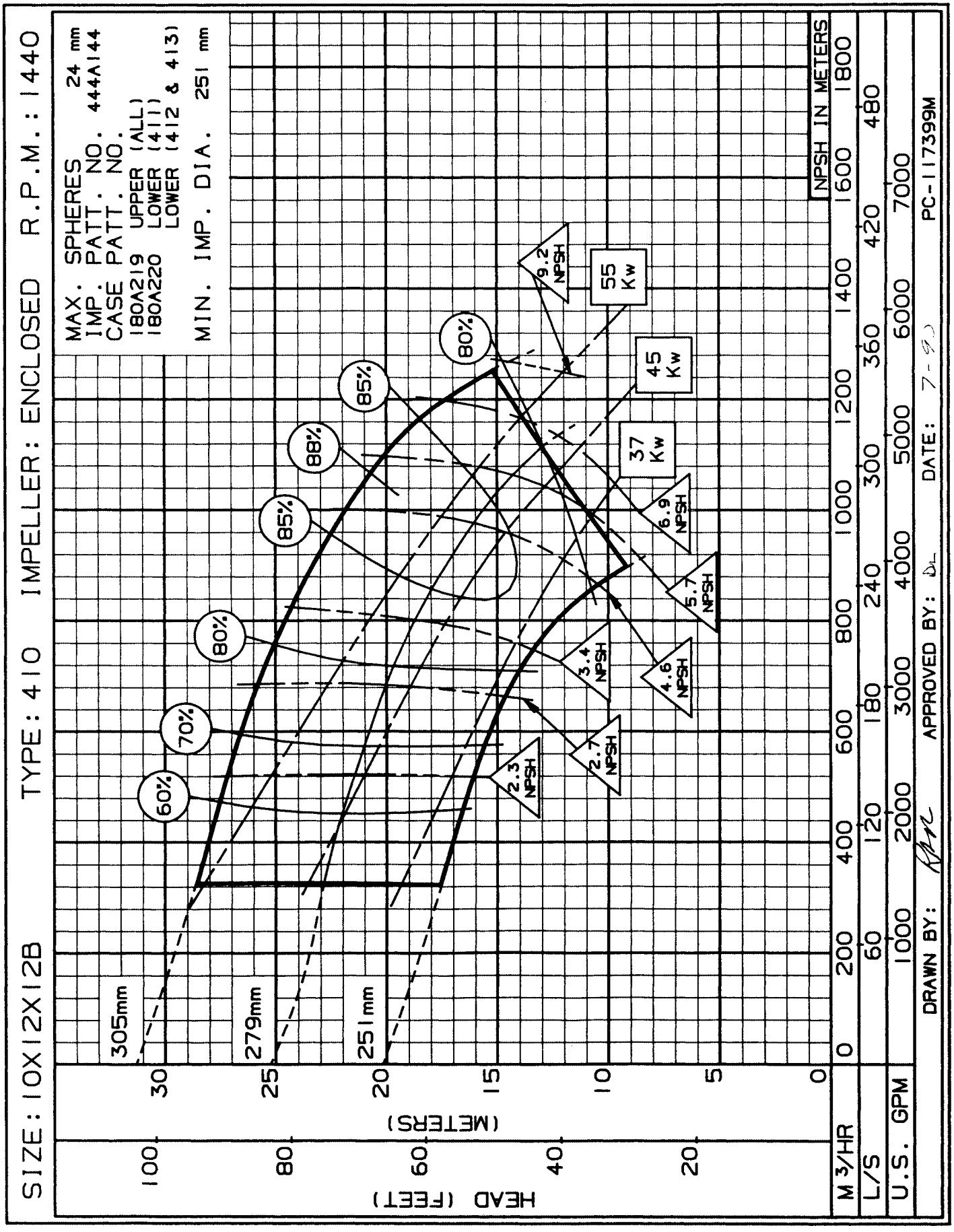
SECTION 410 (Metric 50Hz)
DATE JULY 1994
SUPERCEDES MARCH 1986



SECTION 410 (Metric 50Hz)
DATE JULY 1994
SUPERCEDES MARCH 1986

10x12x12B - 1440 RPM
ENCLOSED IMPELLER

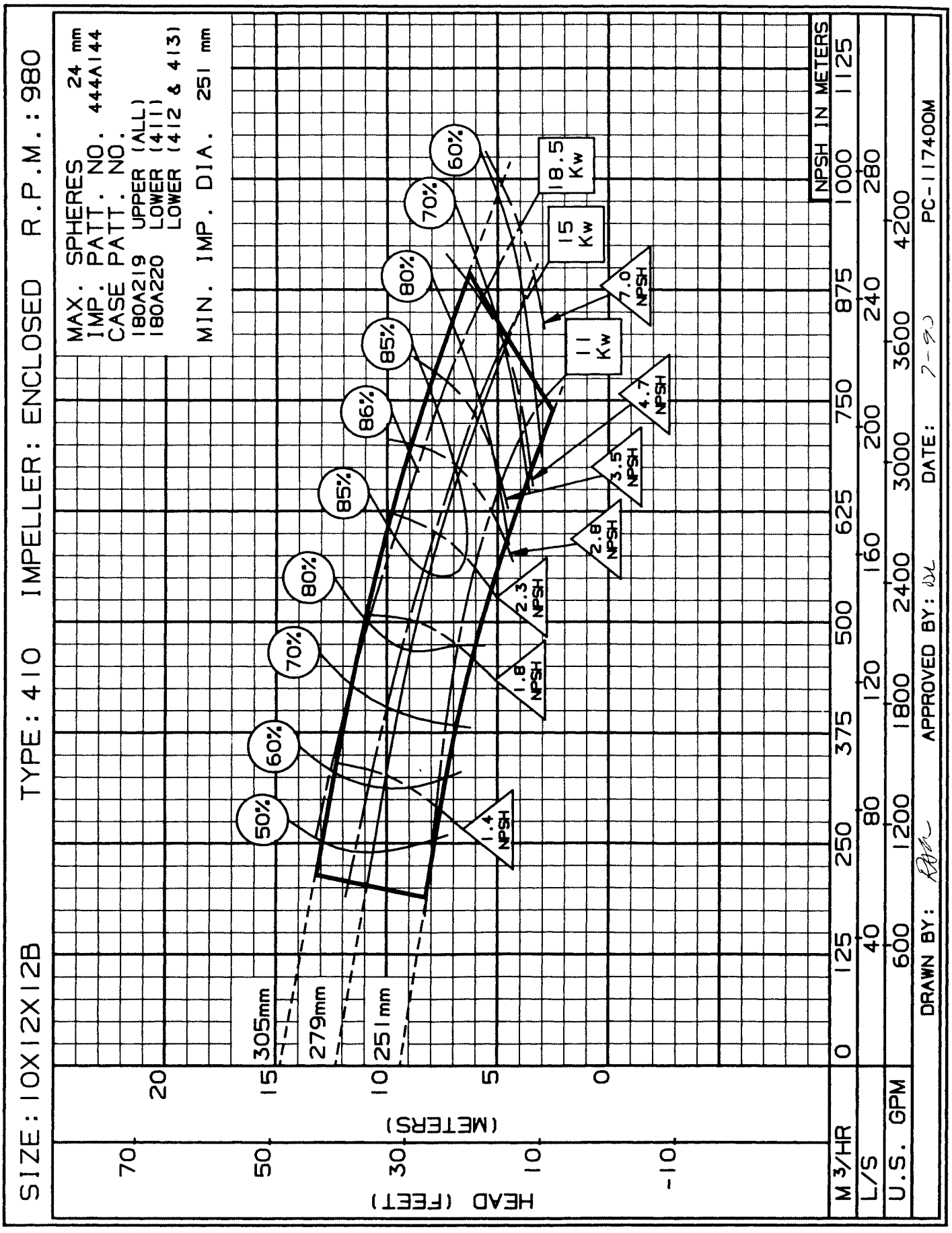
AURORA®
Pentair Pump Group



AURORA®
Pentair Pump Group

10x12x12B - 980 RPM
ENCLOSED IMPELLER

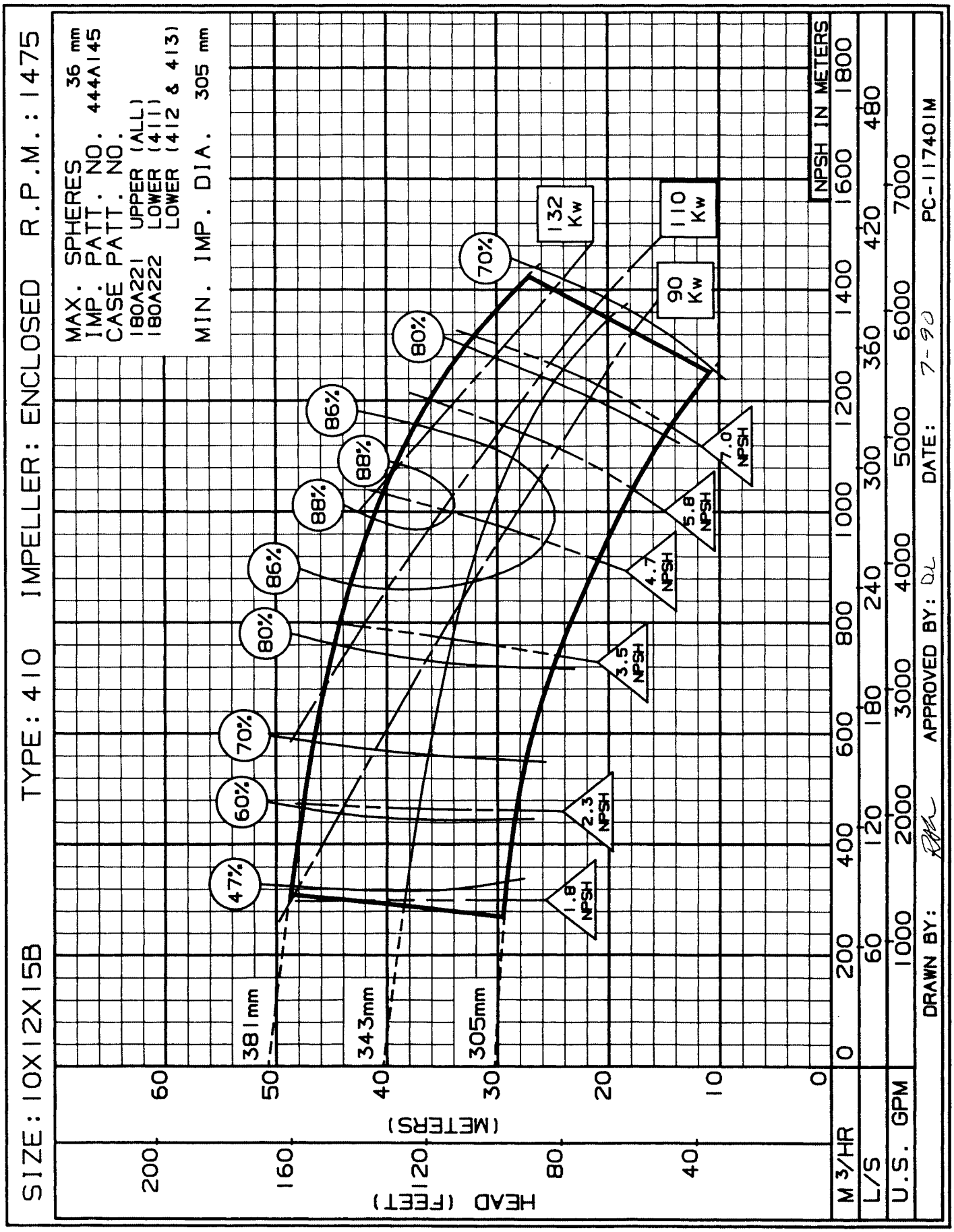
SECTION 410 (Metric 50Hz)
DATE JULY 1994
SUPERCEDES MARCH 1986



SECTION 410 (Metric 50Hz)
DATE JULY 1994
SUPERCEDES MARCH 1986

10x12x15B - 1475 RPM
ENCLOSED IMPELLER

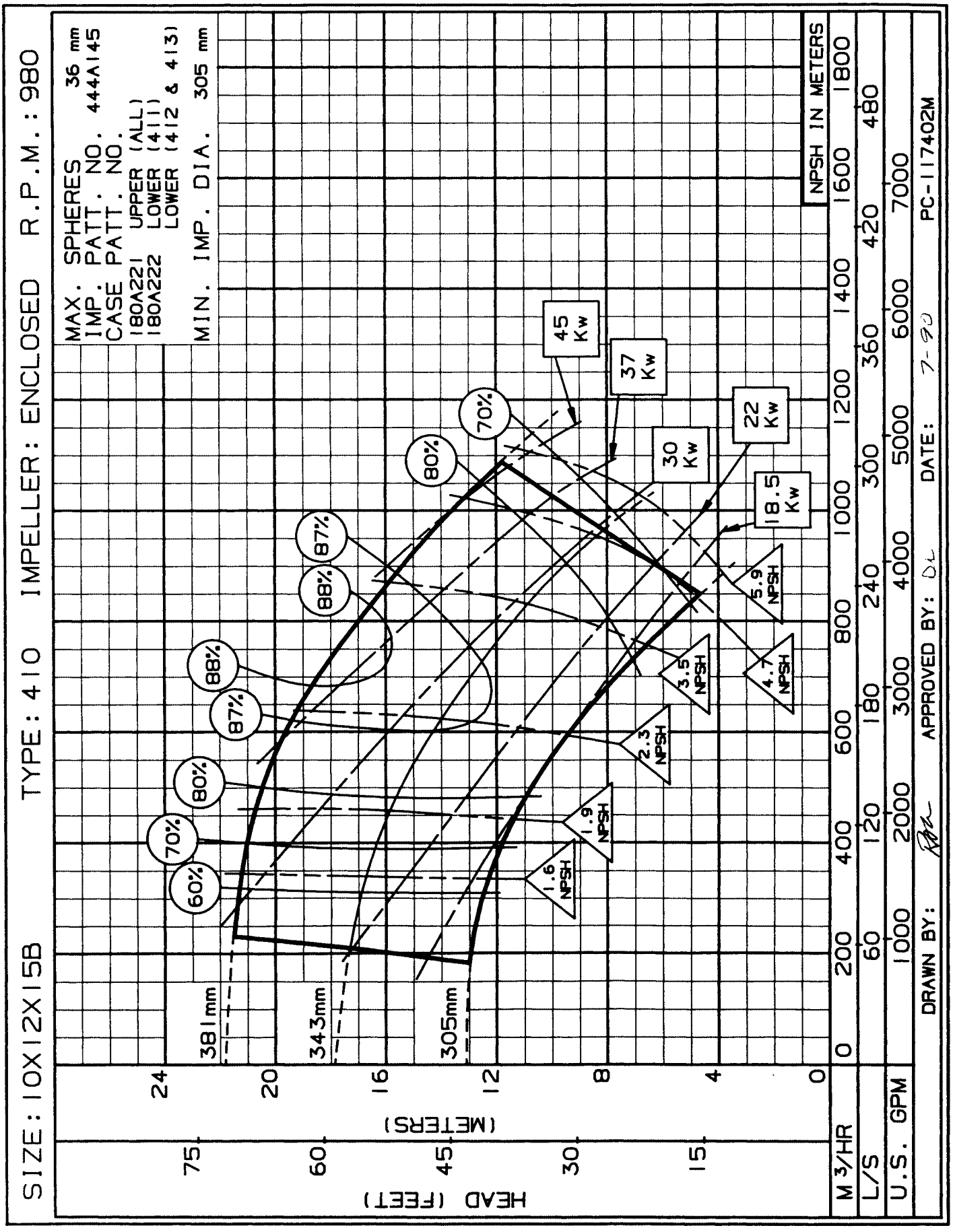
AURORA®
Pentair Pump Group



AURORA®
Pentair Pump Group

10x12x15B - 980 RPM
ENCLOSED IMPELLER

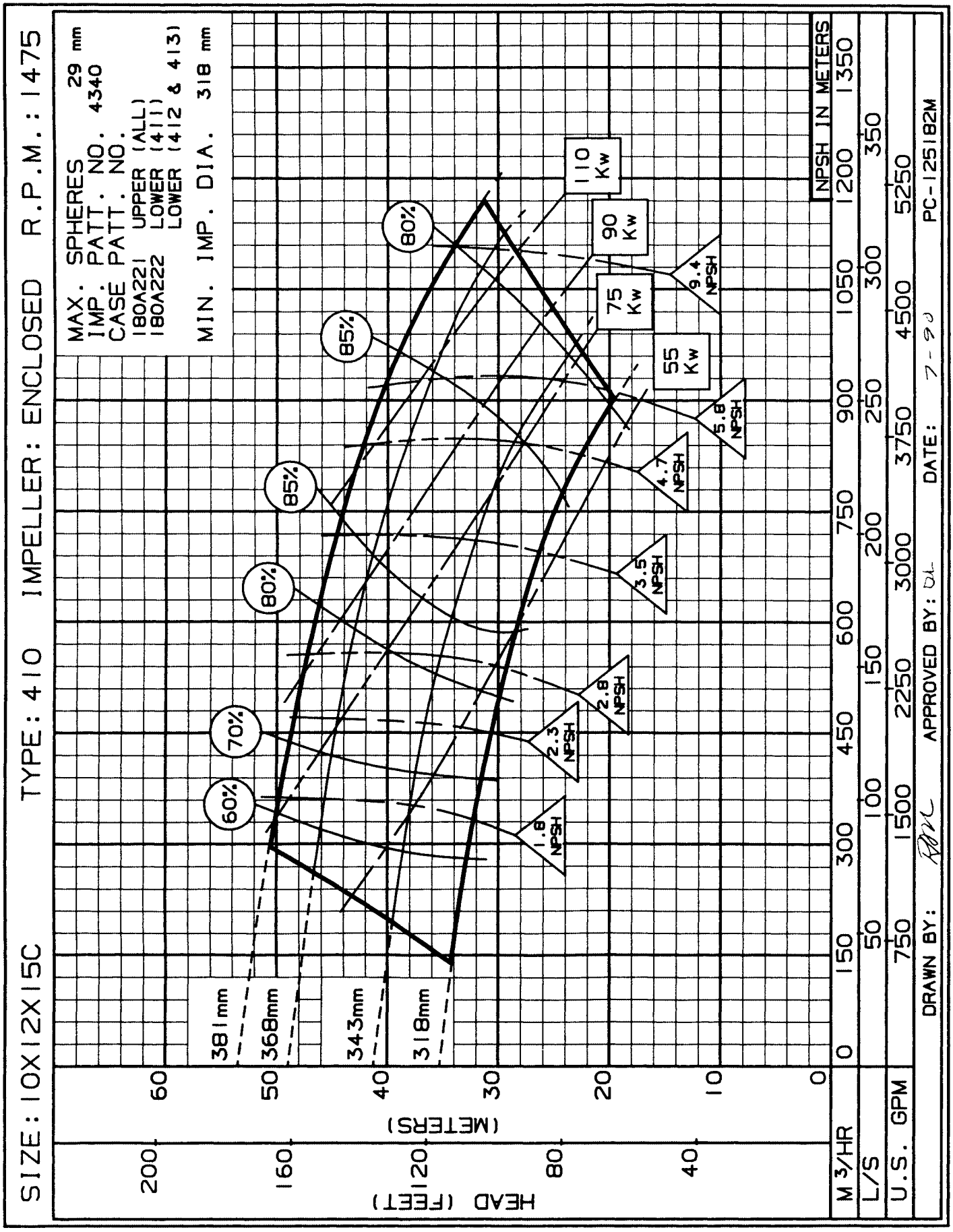
SECTION 410 (Metric 50Hz)
DATE JULY 1994
SUPERCEDES MARCH 1986



SECTION **410 (Metric 50Hz)**
DATE **JULY 1994**
SUPERCEDES MARCH 1986

10x12x15C - 1475 RPM
ENCLOSED IMPELLER

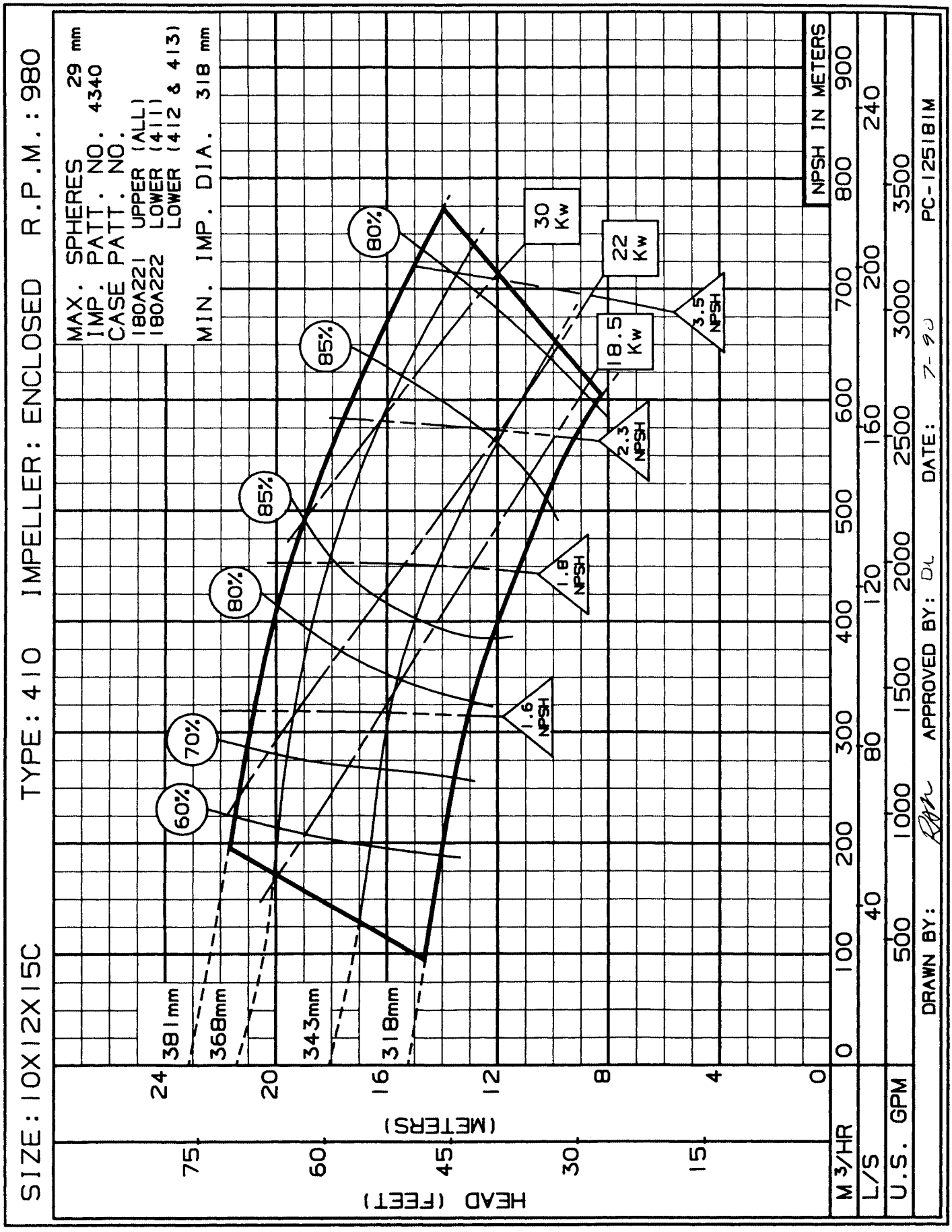
AURORA®
Pentair Pump Group



AURORA®
Pentair Pump Group

10x12x15C - 980 RPM
ENCLOSED IMPELLER

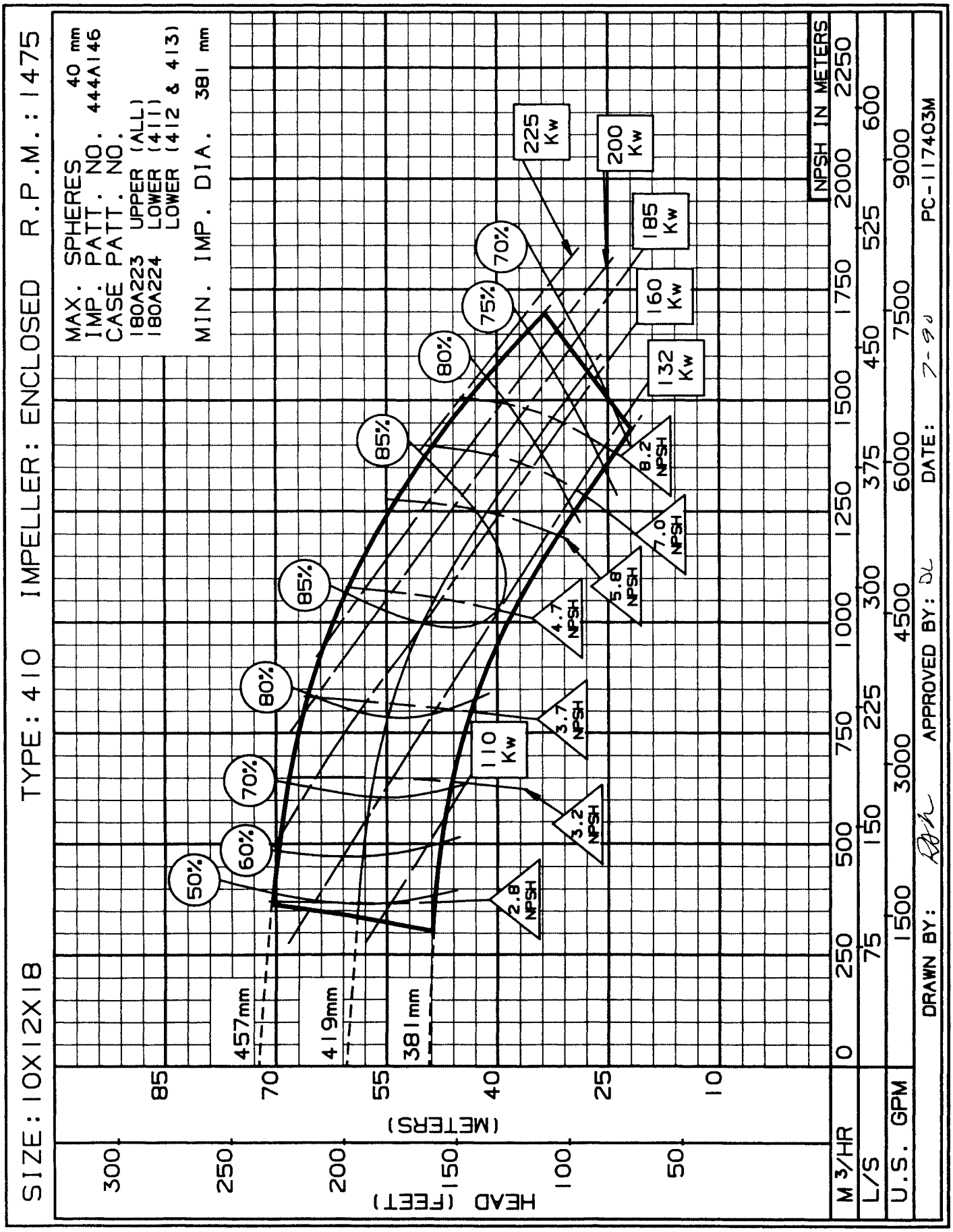
SECTION 410 (Metric 50Hz)
DATE JULY 1994
SUPERCEDES MARCH 1986



SECTION 410 (Metric 50Hz)
DATE JULY 1994
SUPERCEDES MARCH 1986

10x12x18 - 1475 RPM
ENCLOSED IMPELLER

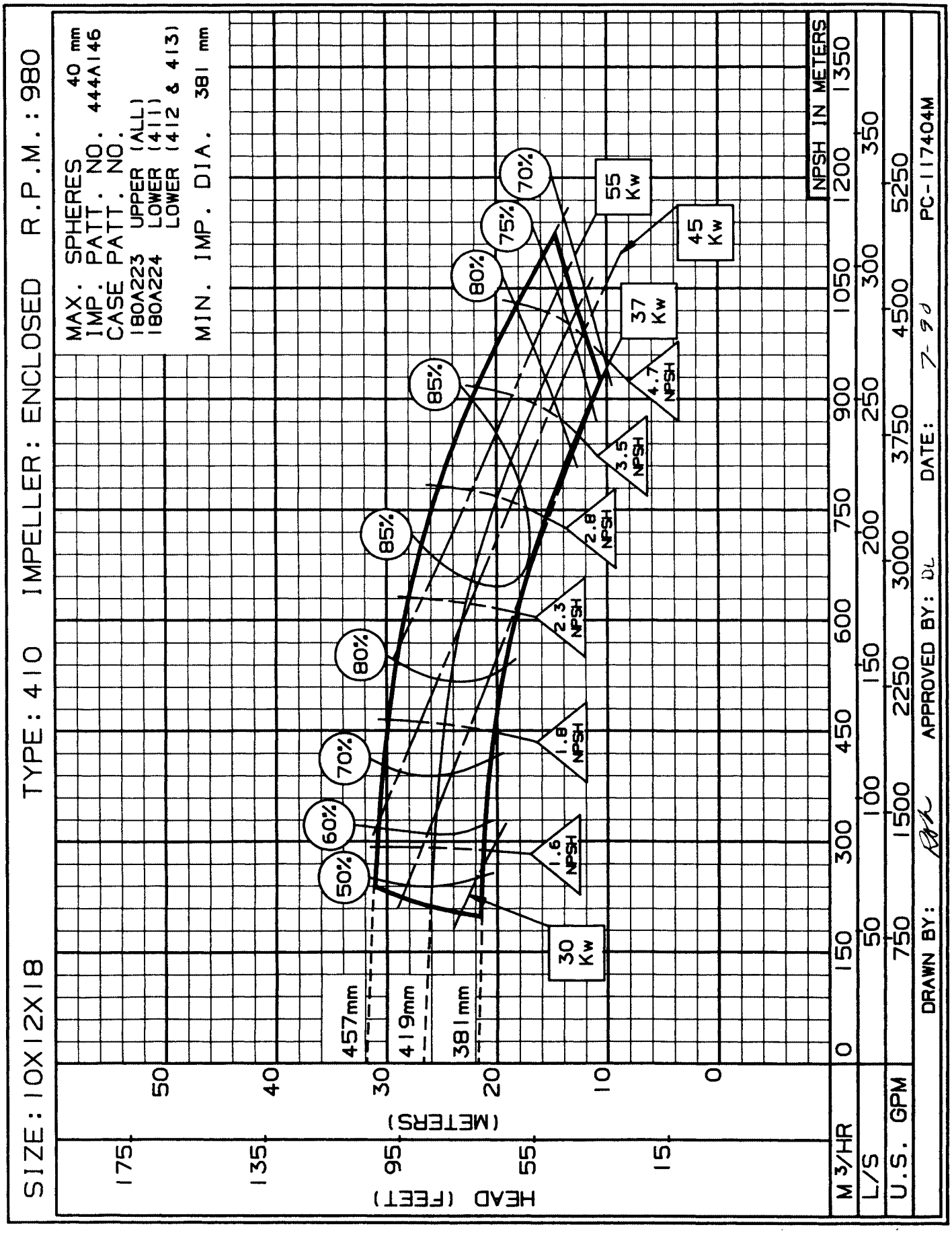
AURORA®
Pentair Pump Group



AURORA®
Pentair Pump Group

10x12x18 - 980 RPM
ENCLOSED IMPELLER

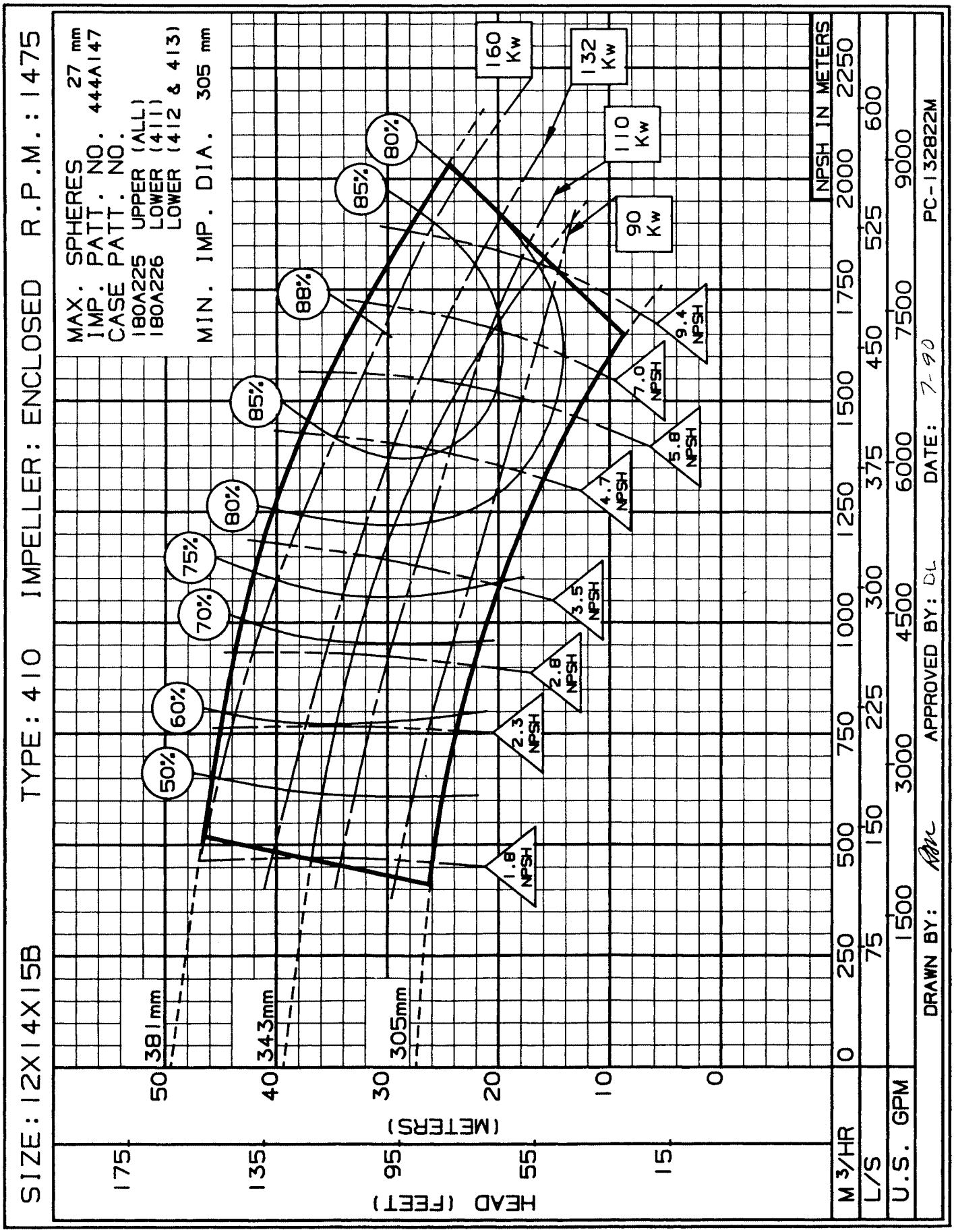
SECTION 410 (Metric 50Hz)
DATE JULY 1994
SUPERCEDES MARCH 1986



SECTION 410 (Metric 50Hz)
DATE JULY 1994
SUPERCEDES MARCH 1986

12x14x15B - 1475 RPM
ENCLOSED IMPELLER

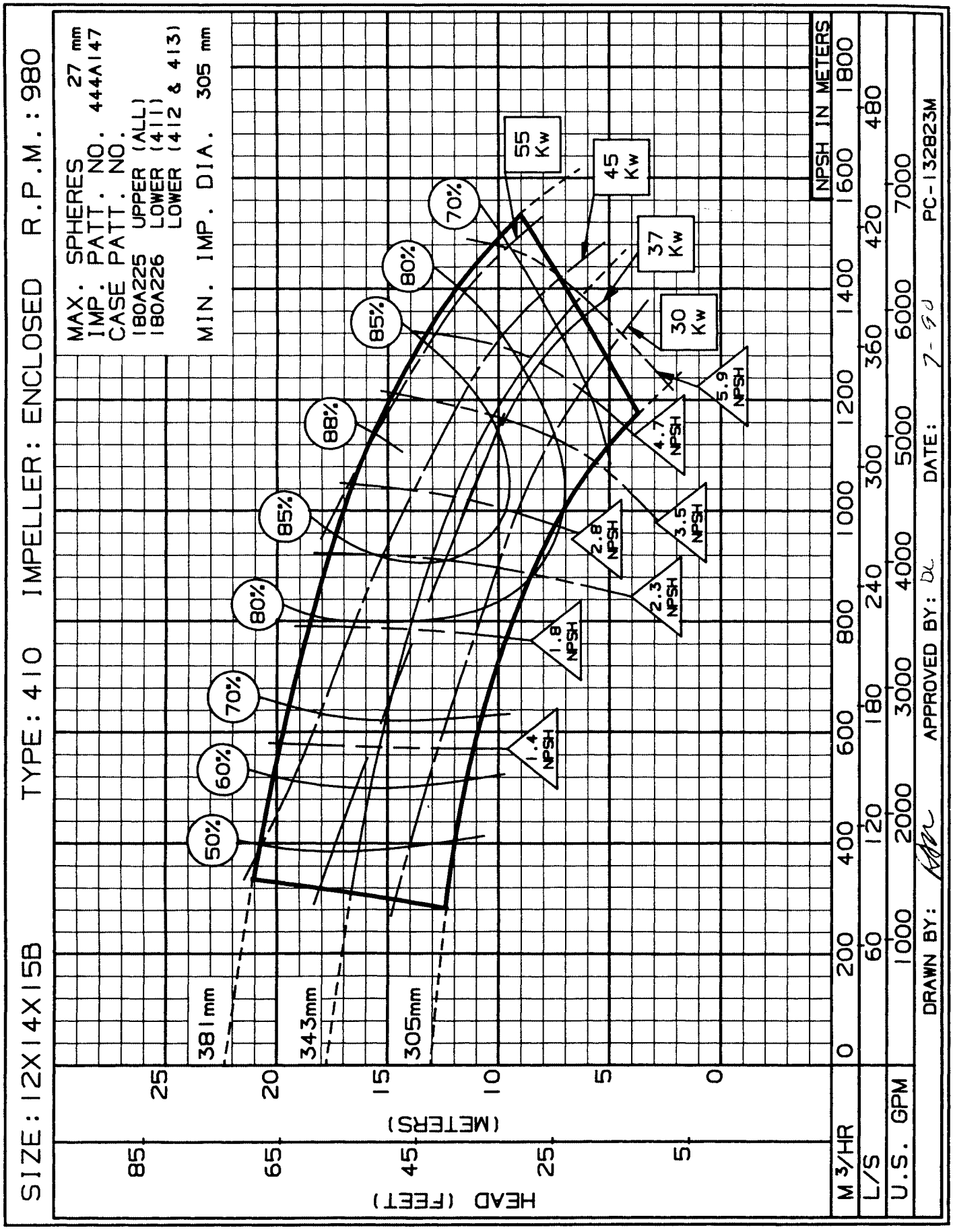
AURORA®
Pentair Pump Group



AURORA®
Pentair Pump Group

12x14x15B - 980 RPM
ENCLOSED IMPELLER

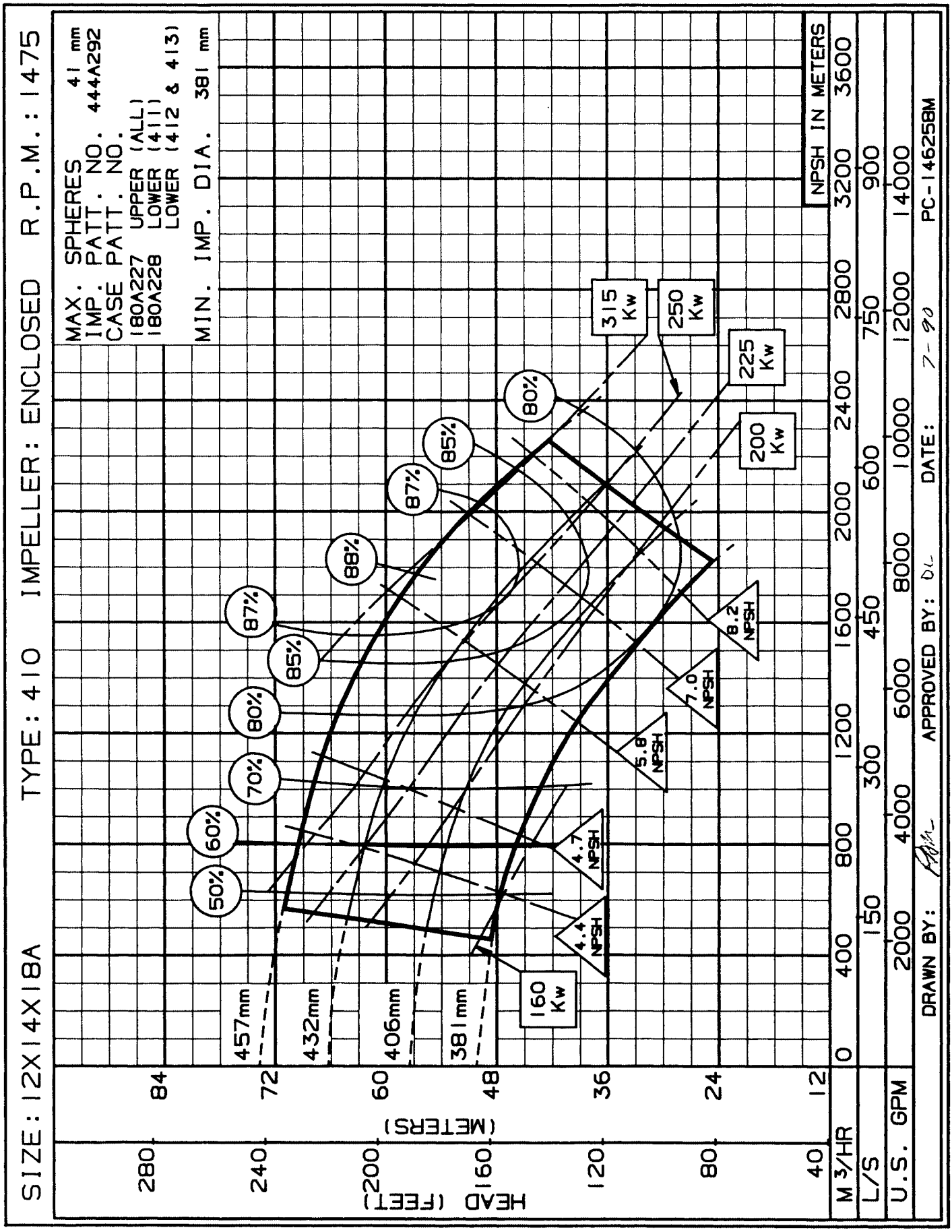
SECTION 410 (Metric 50Hz)
DATE JULY 1994
SUPERCEDES MARCH 1986



SECTION 410 (Metric 50Hz)
DATE JULY 1994
SUPERCEDES MARCH 1986

12x14x18A - 1475 RPM
ENCLOSED IMPELLER

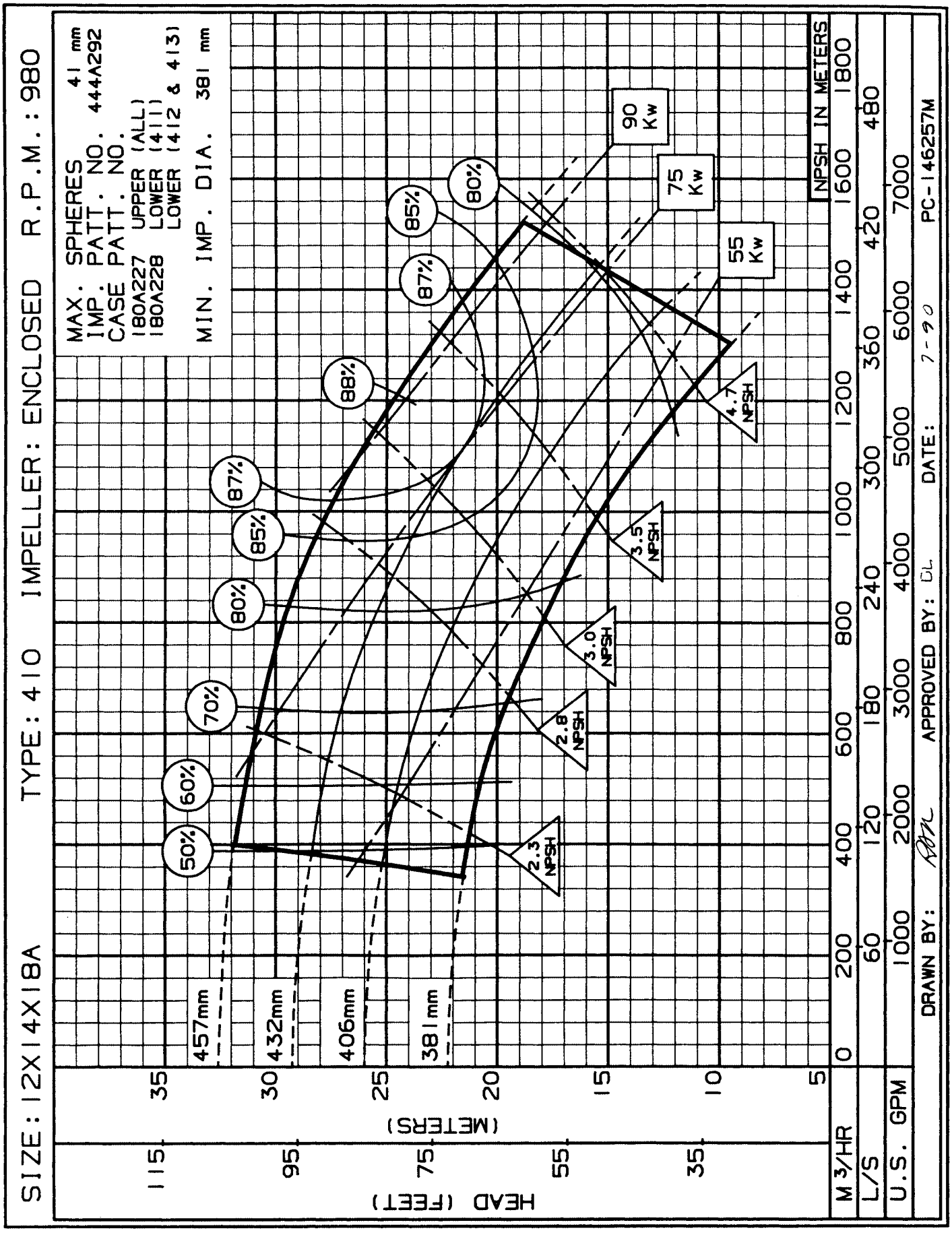
AURORA®
Pentair Pump Group



AURORA®
Pentair Pump Group

12x14x18A - 980 RPM
ENCLOSED IMPELLER

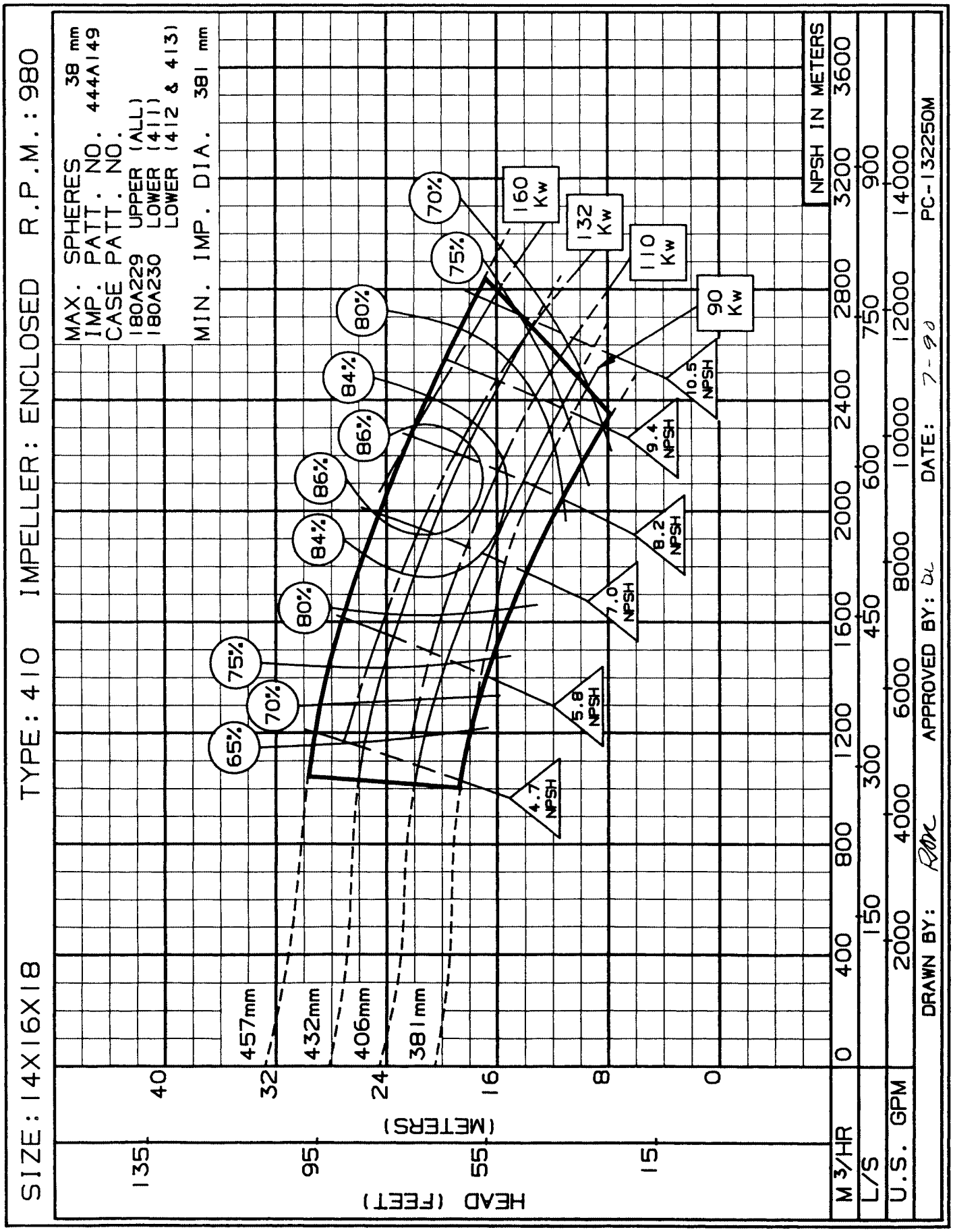
SECTION 410 (Metric 50Hz)
DATE JULY 1994
SUPERCEDES MARCH 1986



SECTION **410 (Metric 50Hz)**
DATE **JULY 1994**
SUPERCEDES MARCH 1986

14x16x18 - 980 RPM
ENCLOSED IMPELLER

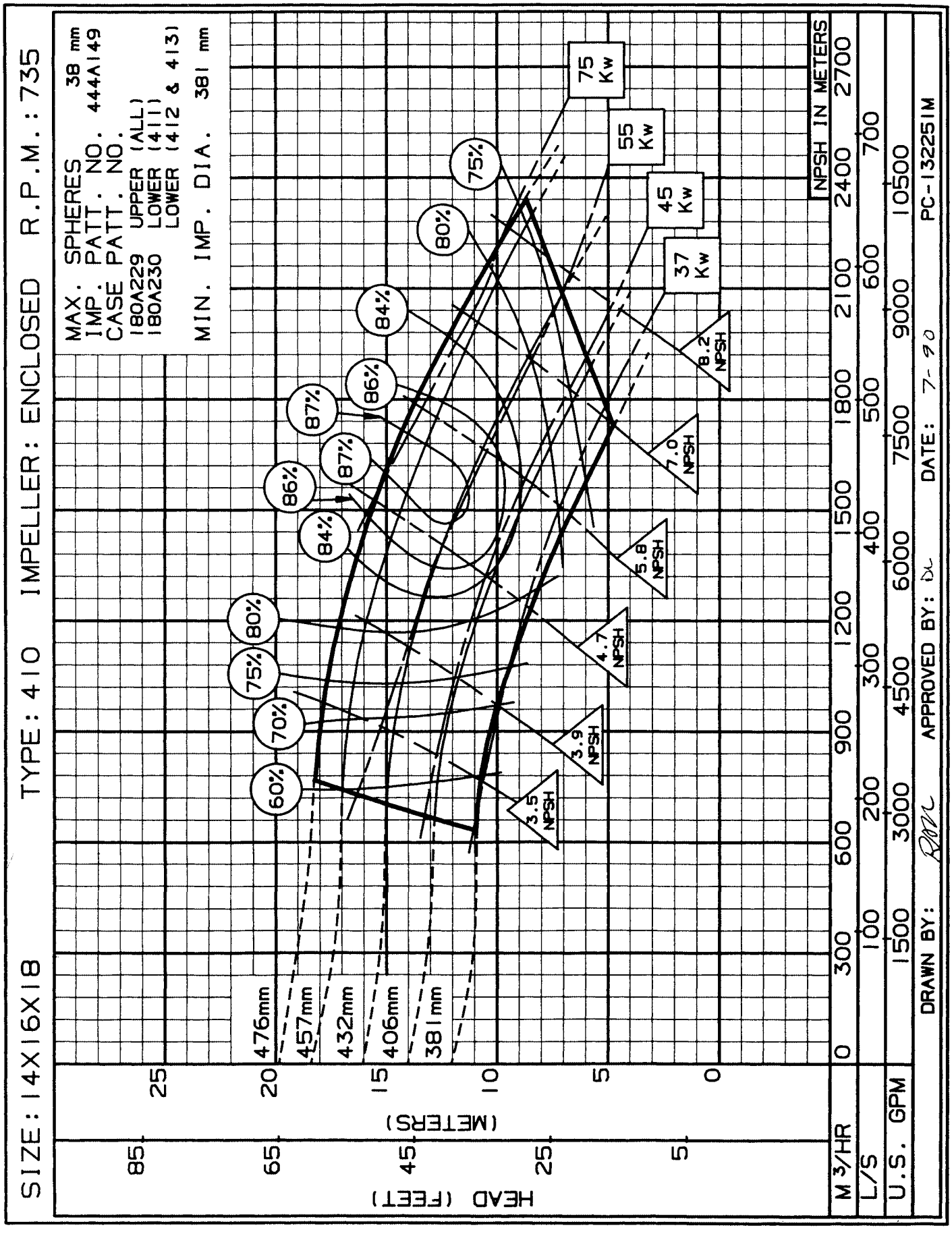
AURORA®
Pentair Pump Group



AURORA®
Pentair Pump Group

14x16x18 - 735 RPM
ENCLOSED IMPELLER

SECTION 410 (Metric 50Hz)
DATE JULY 1994
SUPERCEDES MARCH 1986



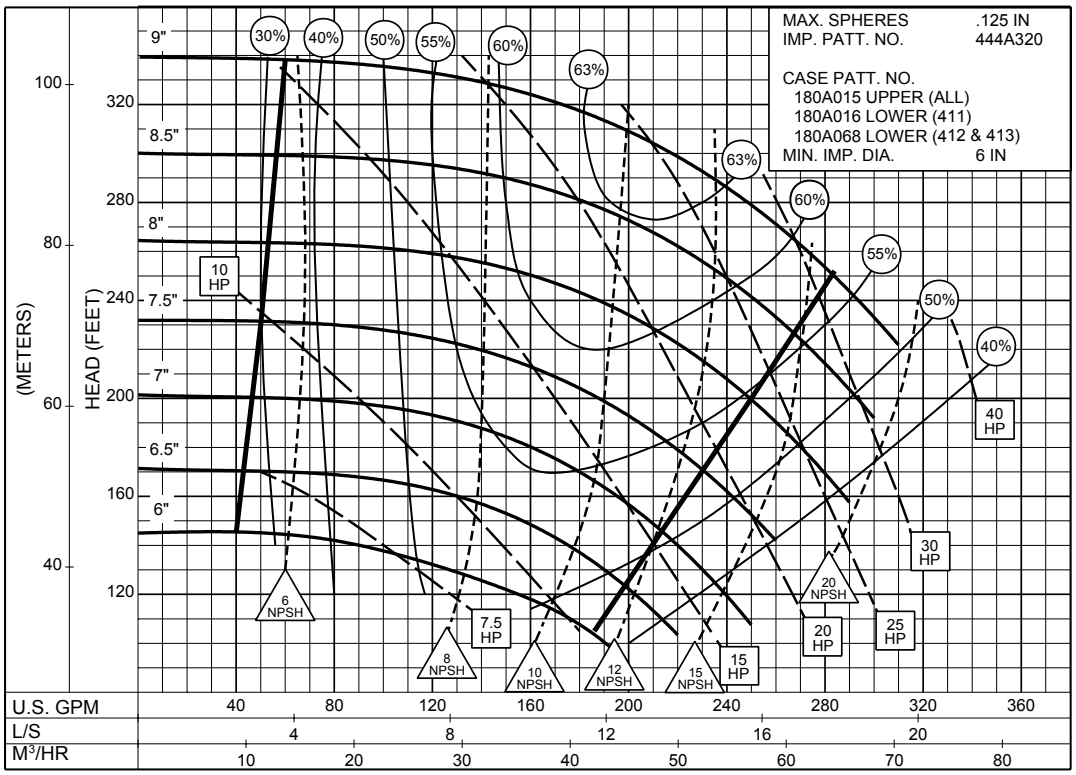
Performance Curves for the 410 Series

MODEL/SIZE	R.P.M.	CATALOG PAGE	PDF PAGE
2 x 2-1/2 x 9	3500/1750	401	2
2 x 2-1/2 x 10	3500/1750	402	3
2 x 2-1/2 x 12	1750/1150	403	4
2-1/2 x 3 x 10B	3500/1750	404	5
2-1/2 x 3 x 12	1750/1150	405	6
3 x 4 x 10B	3500/1750	406	7
3 x 4 x 10C	3500/1750	407	8
3 x 4 x 14	1750/1150	408	9
4 x 5 x 10B	3500/1750	409	10
4 x 5 x 11A	1750/1150	410	11
4 x 5 x 11C	3500/1750	411	12
4 x 5 x 15	1750/1150	412	13
4 x 6 x 18B	1750/1150	413	14
5 x 6 x 11A	1750/1150	414	15
5 x 6 x 11C	3500/1750	415	16
5 x 6 x 15	1750/1150	416	17
5 x 6 x 17	1750/1150	417	18
6 x 8 x 11	1750/1150	418	19
6 x 8 x 15	1750/1150	419	20
6 x 8 x 18A	1750/1150	420	21
6 x 8 x 18B	1750/1150	421	22
6 x 8 x 18C	1750/1150	422	23
6 x 8 x 20	1750/1150	423	24
8 x 8 x 11B	1750/1150	424	25
8 x 10 x 12	1750/1150	425	26
8 x 10 x 12A	1775/1175	426	27
8 x 10 x 15A	1750/1150	427	28
8 x 10 x 15B	1750/1150	428	29
8 x 10 x 17B	1775/1150	429	30
8 x 10 x 21	1775/1175	430	31
8 x 10 x 21A	1775/1175	430A	32
10 x 12 x 12B	1760/1175	431	34
10 x 12 x 15B	1775/1170	432	35
10 x 12 x 15C	1775/1175	433	36
10 x 12 x 18	1775/1175	434	37
12 x 14 x 15B	1775/1175	435	38
12 x 14 x 18A	1775/1175	436	39
14 x 16 x 18	1180/885	437	40

2 x 2-1/2 x 9
SERIES 410

ENCLOSED IMPELLER

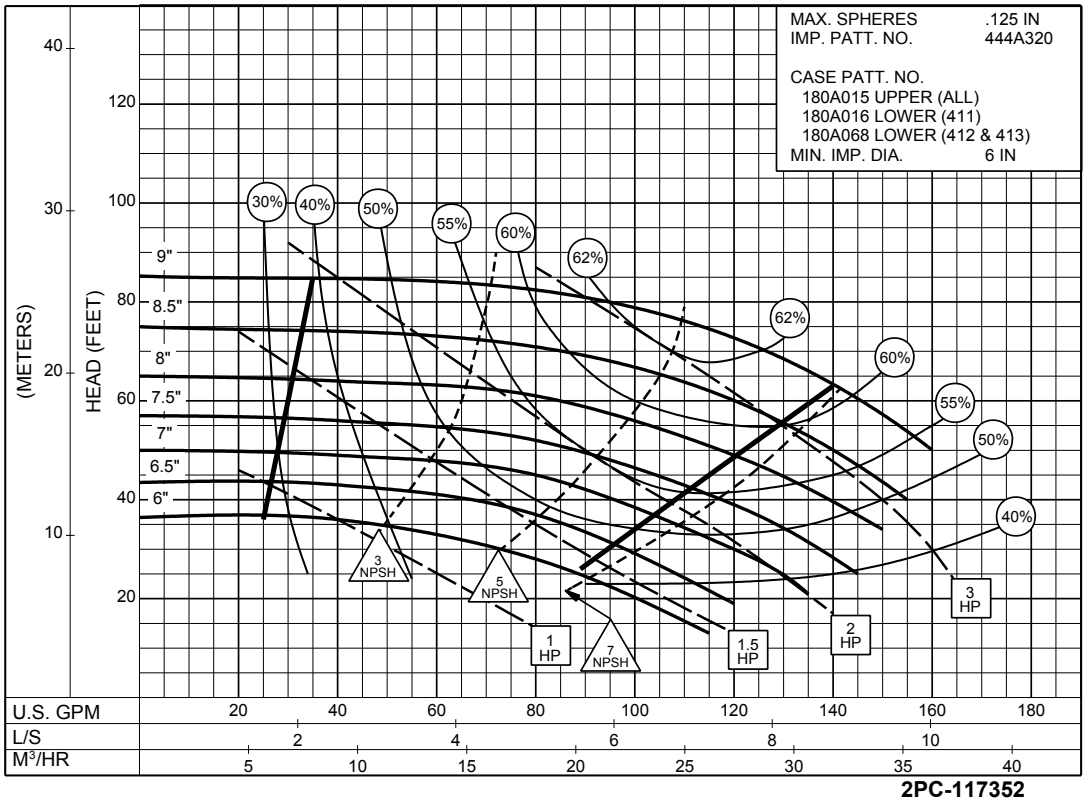
SIZE : 2x2-1/2x9 **TYPE : 410** **IMPELLER : Enclosed** **R. P. M. : 3500**



2PC-117351

3500 RPM

SIZE : 2x2-1/2x9 **TYPE : 410** **IMPELLER : Enclosed** **R. P. M. : 1750**



2PC-117352

1750 RPM

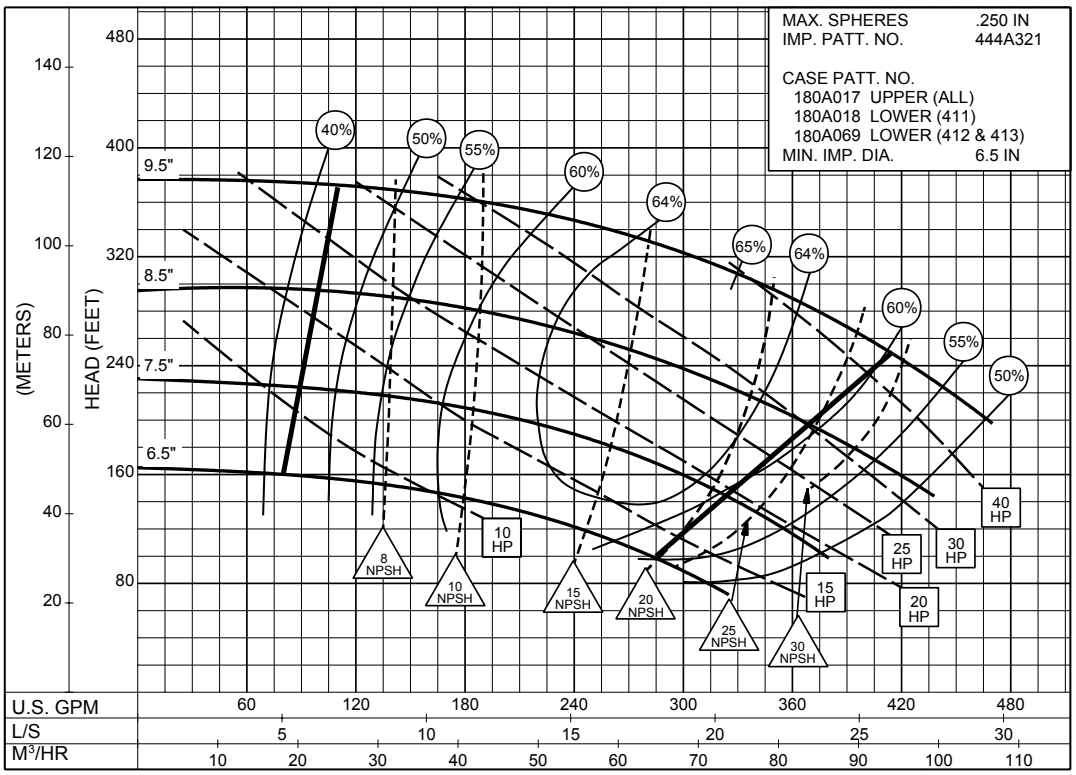
AURORA®
Pentair Pump Group

2 x 2-1/2 x 10
SERIES 410

ENCLOSED IMPELLER

3500 RPM

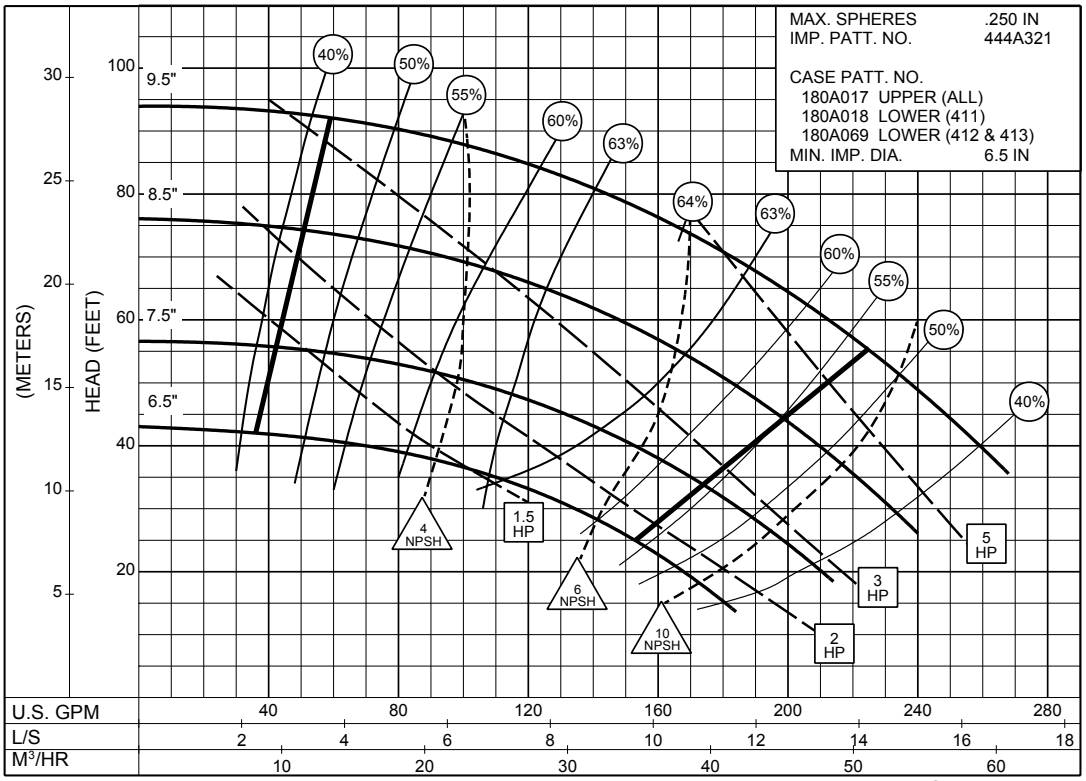
SIZE : 2X2-1/2X10 **TYPE : 410** **IMPELLER : Enclosed** **R. P. M. : 3500**



2PC-117353A

1750 RPM

SIZE : 2X2-1/2X10 **TYPE : 410** **IMPELLER : Enclosed** **R. P. M. : 1750**



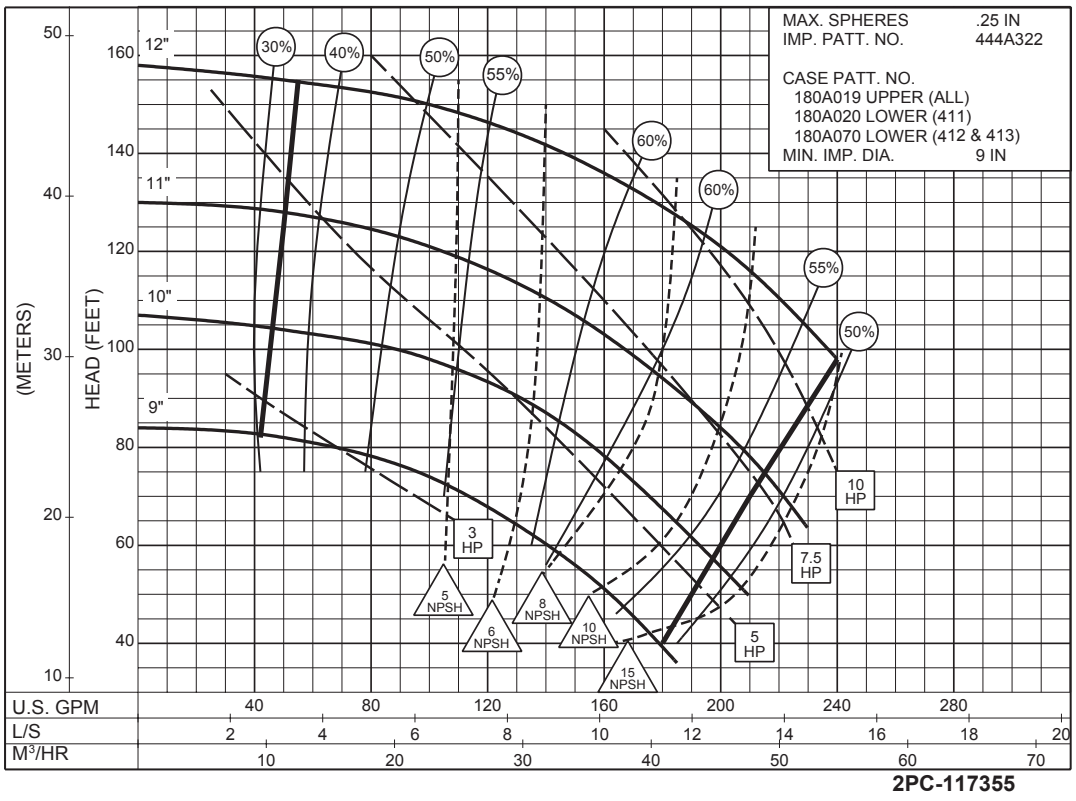
2PC-117354A

2 x 2-1/2 x 12
SERIES 410

ENCLOSED IMPELLER

Supersedes Section 410 Page 403
Dated June 1989

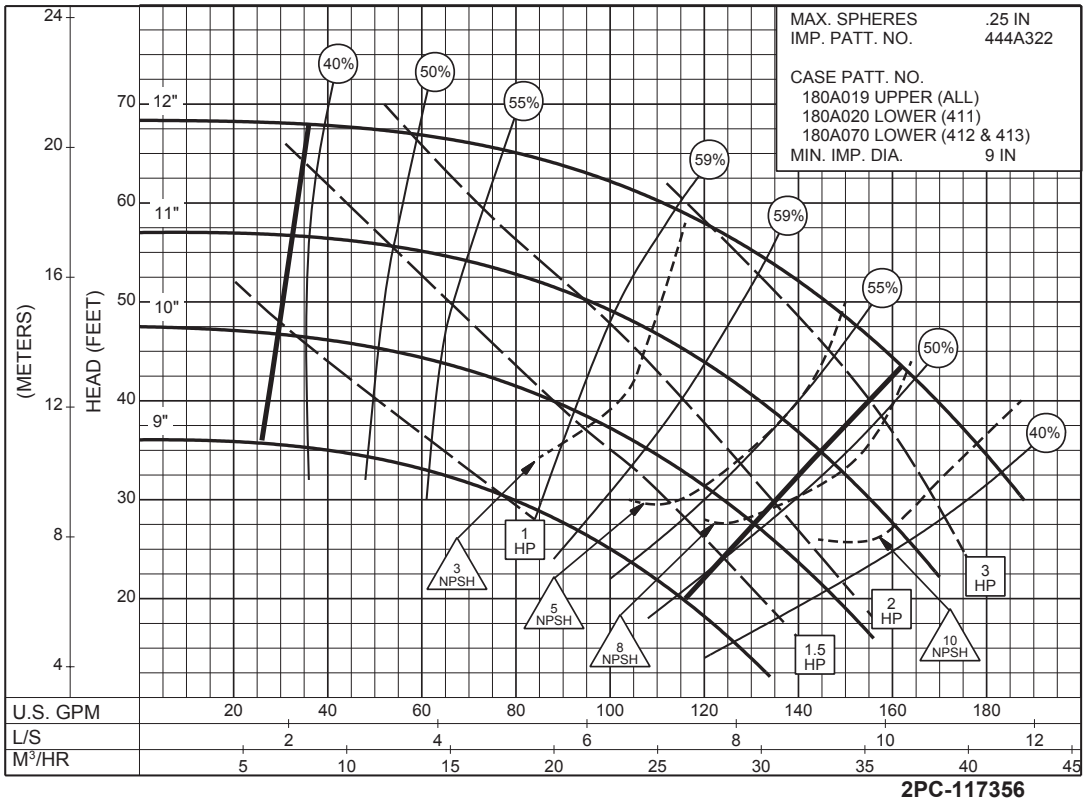
SIZE : 2x2-1/2x12 **TYPE : 410** **IMPELLER : Enclosed** **R. P. M. : 1750**



2PC-117355

1750 RPM

SIZE : 2x2-1/2x12 **TYPE : 410** **IMPELLER : Enclosed** **R. P. M. : 1150**



2PC-117356

1150 RPM

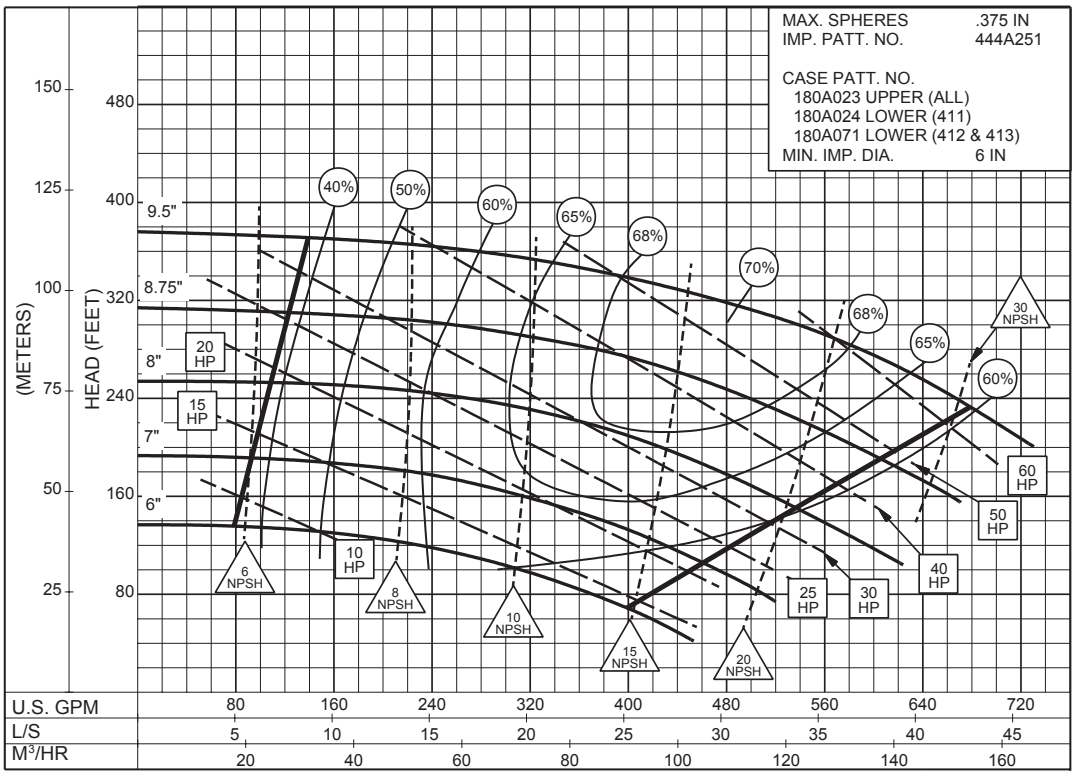
AURORA®
Pentair Pump Group

2-1/2 x 3 x 10B
SERIES 410

ENCLOSED IMPELLER

3500 RPM

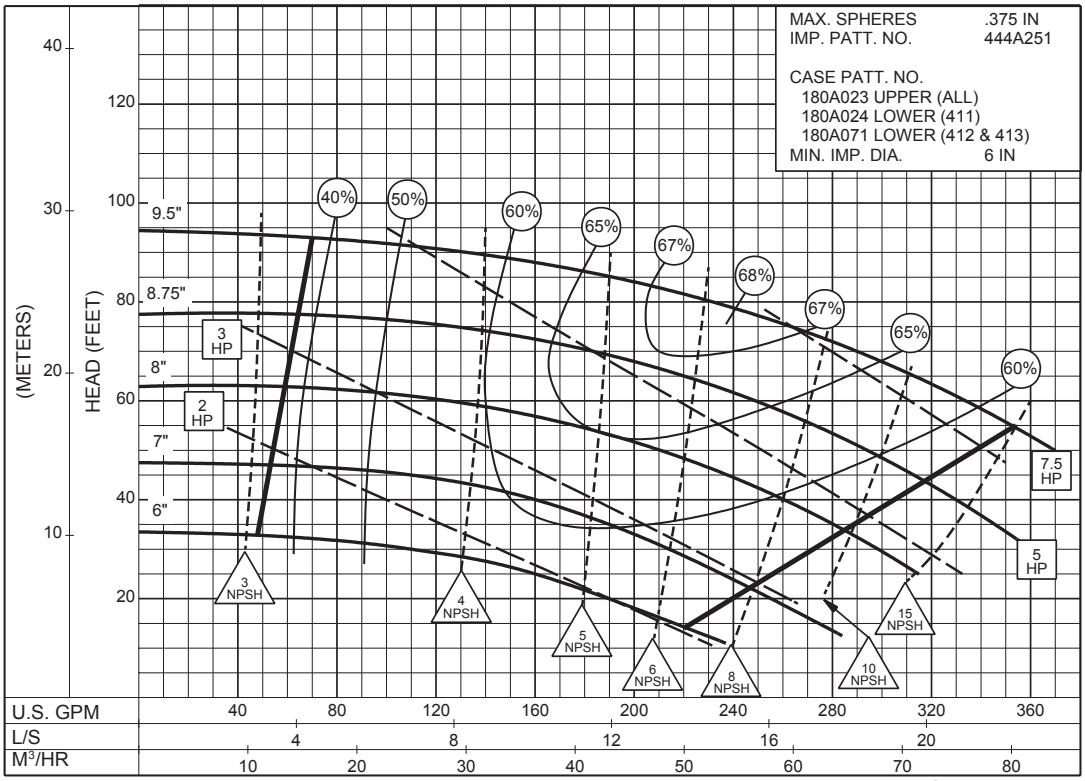
SIZE : 2-1/2x3x10B **TYPE : 410** **IMPELLER : Enclosed** **R. P. M. : 3500**



2PC-117357A

1750 RPM

SIZE : 2-1/2x3x10B **TYPE : 410** **IMPELLER : Enclosed** **R. P. M. : 1750**



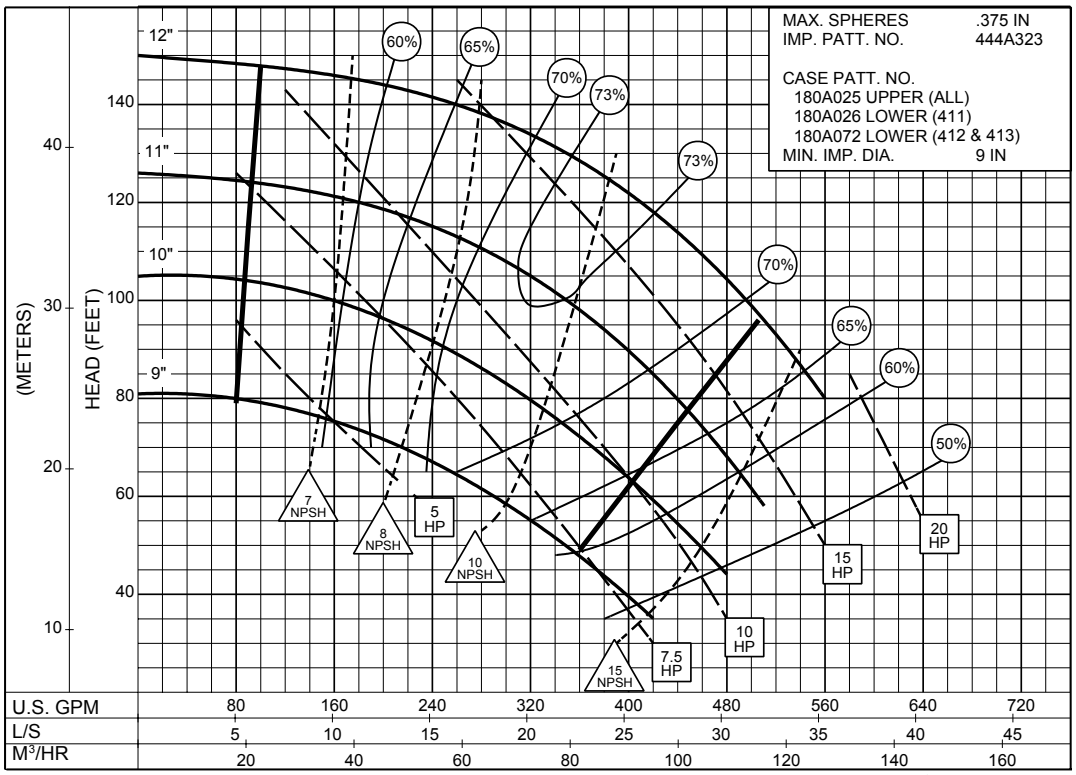
2PC-117358A

2-1/2 x 3 x 12
SERIES 410

ENCLOSED IMPELLER

Supersedes Section 410 Page 405
Dated June 1989

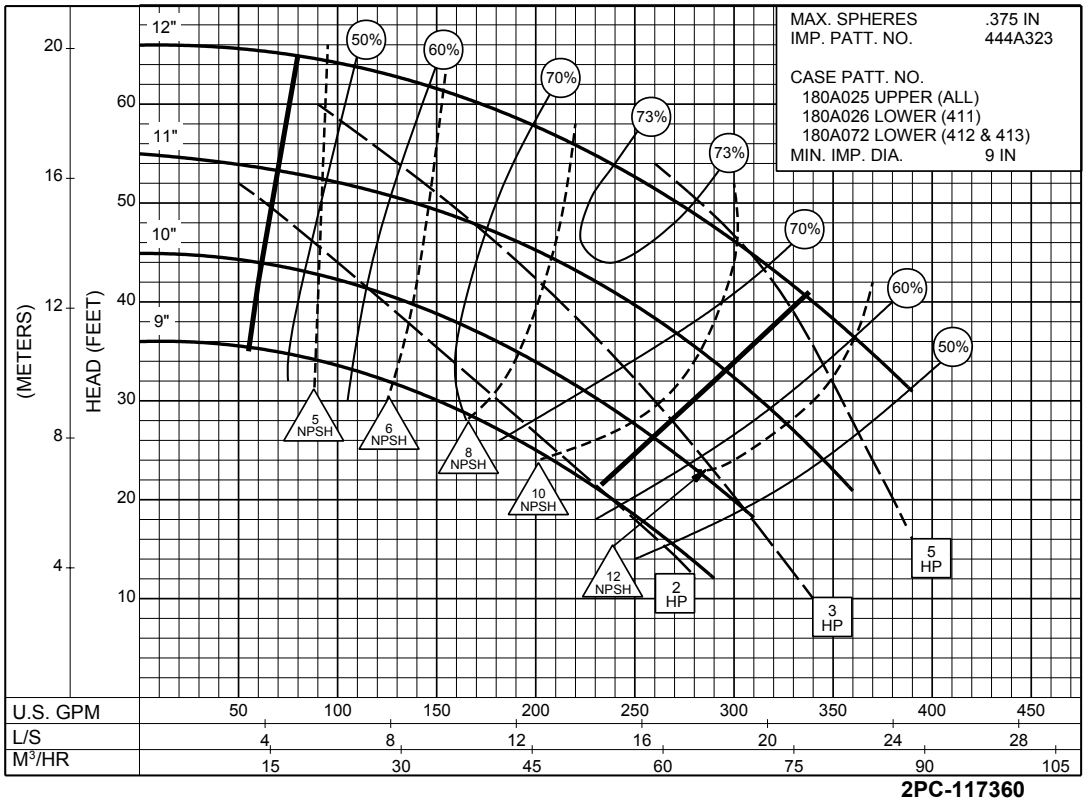
SIZE : 2-1/2x3x12 **TYPE : 410** **IMPELLER : Enclosed** **R. P. M. : 1750**



2PC-117359

1750 RPM

SIZE : 2-1/2x3x12 **TYPE : 410** **IMPELLER : Enclosed** **R. P. M. : 1150**



2PC-117360

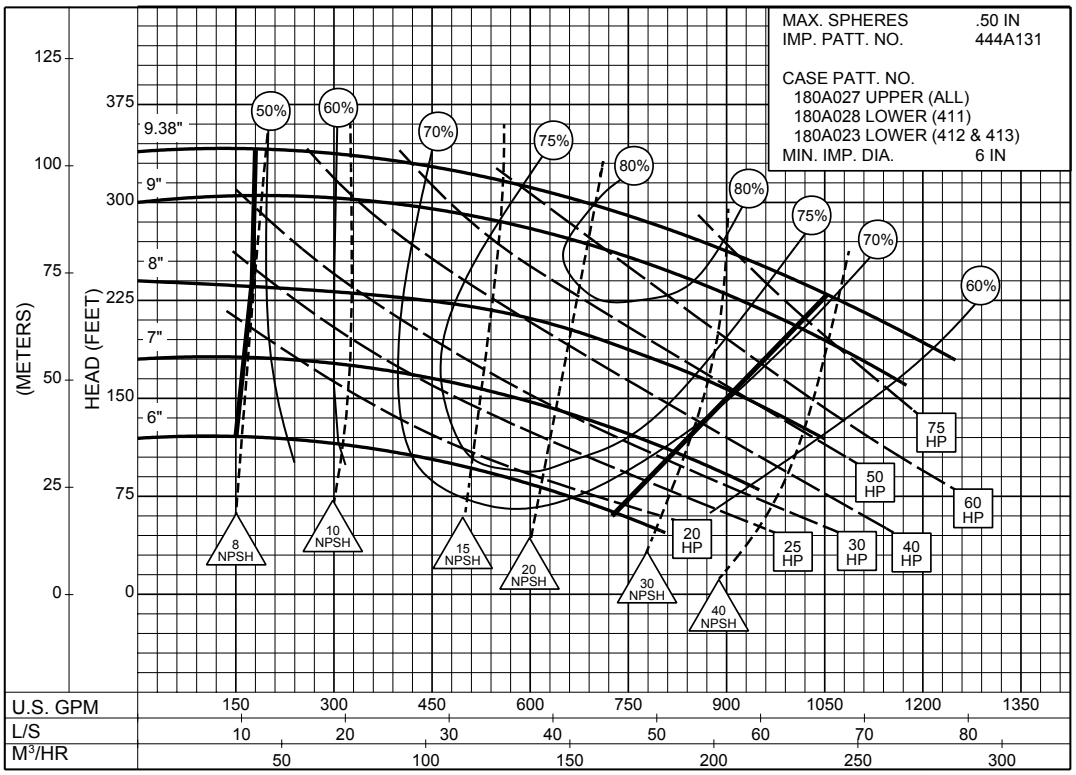
1150 RPM

3 x 4 x 10B
SERIES 410

ENCLOSED IMPELLER

3500 RPM

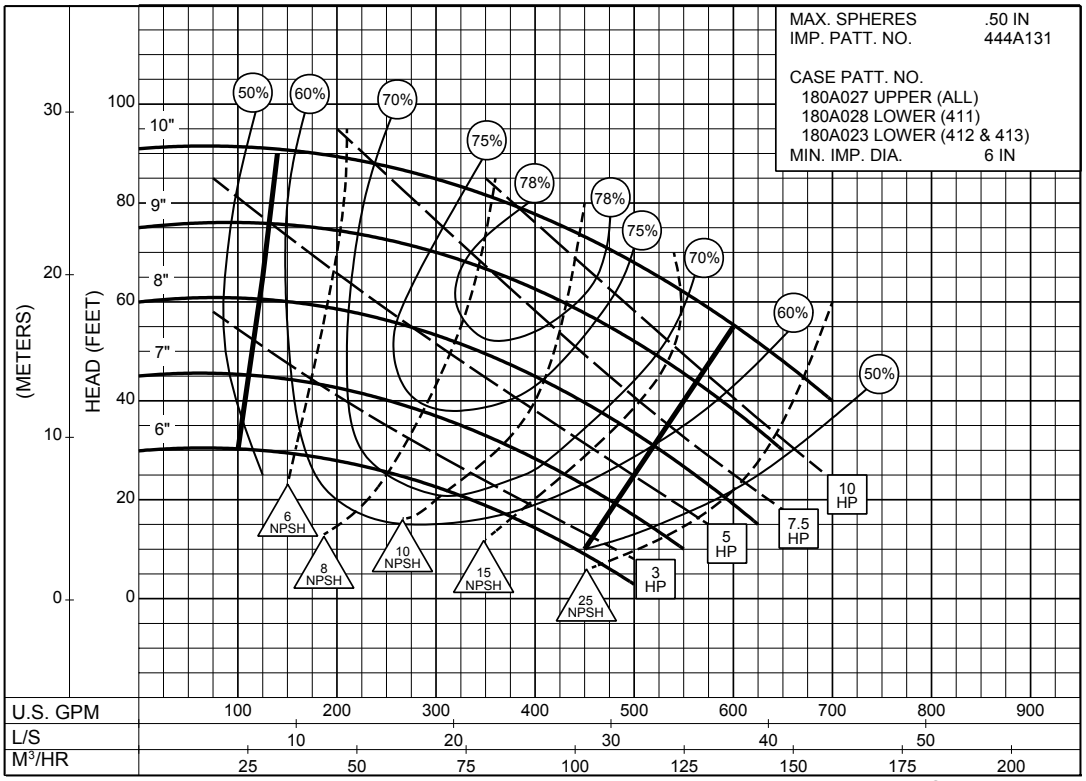
SIZE : 3x4x10B **TYPE : 410** **IMPELLER : Enclosed** **R. P. M. : 3500**



2PC-124752

1750 RPM

SIZE : 3x4x10B **TYPE : 410** **IMPELLER : Enclosed** **R. P. M. : 1750**



2PC-124760

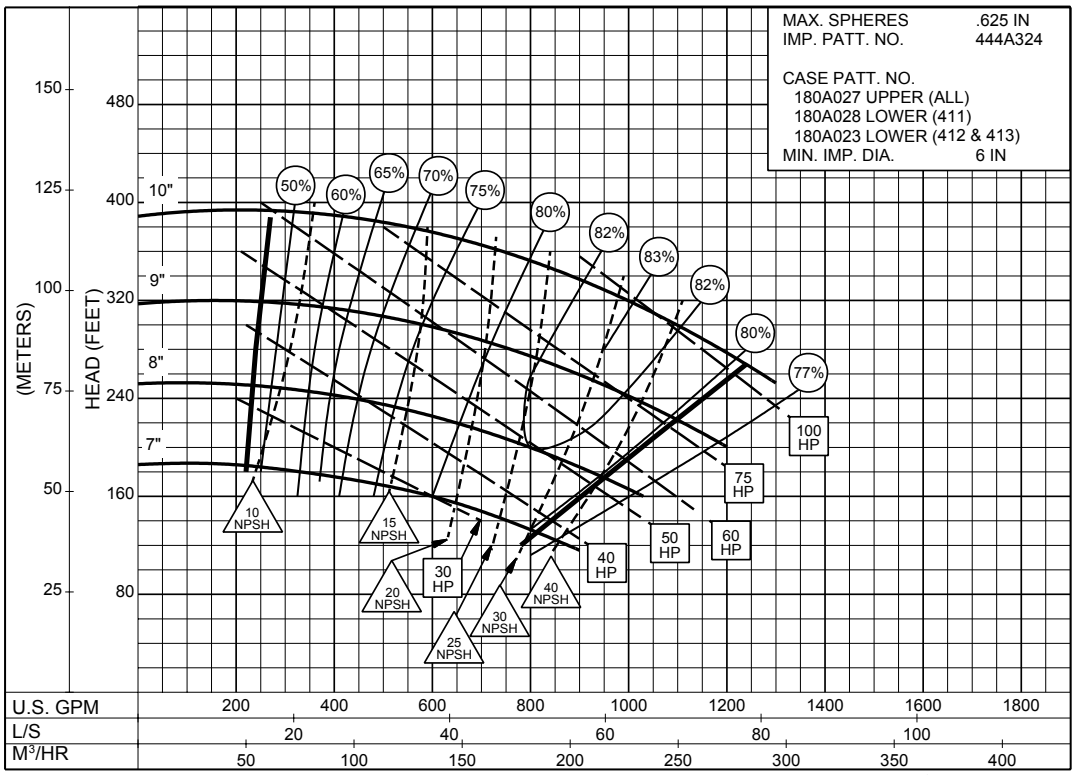
AURORA®
Pentair Pump Group

3 x 4 x 10C
SERIES 410

ENCLOSED IMPELLER

Supersedes Section 410 Page 407
Dated June 1989

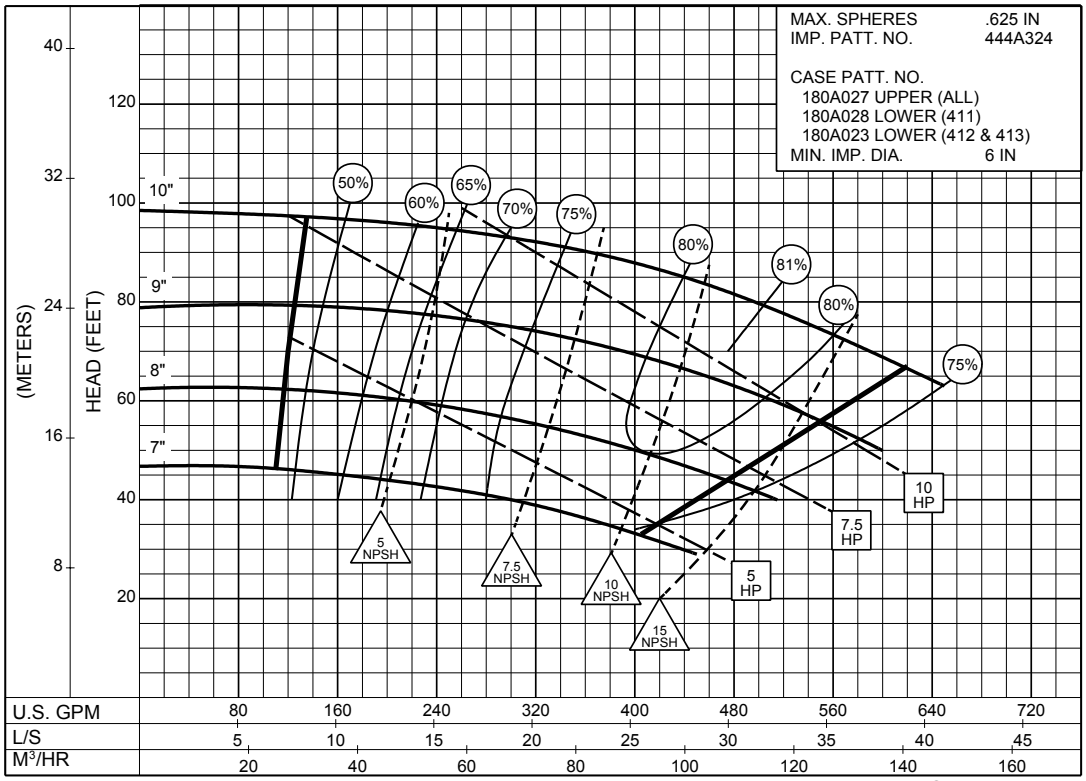
SIZE : 3x4x10C **TYPE : 410** **IMPELLER : Enclosed** **R. P. M. : 3500**



2PC-146727

3500 RPM

SIZE : 3x4x10C **TYPE : 410** **IMPELLER : Enclosed** **R. P. M. : 1750**



2PC-146728

1750 RPM

AURORA®
Pentair Pump Group

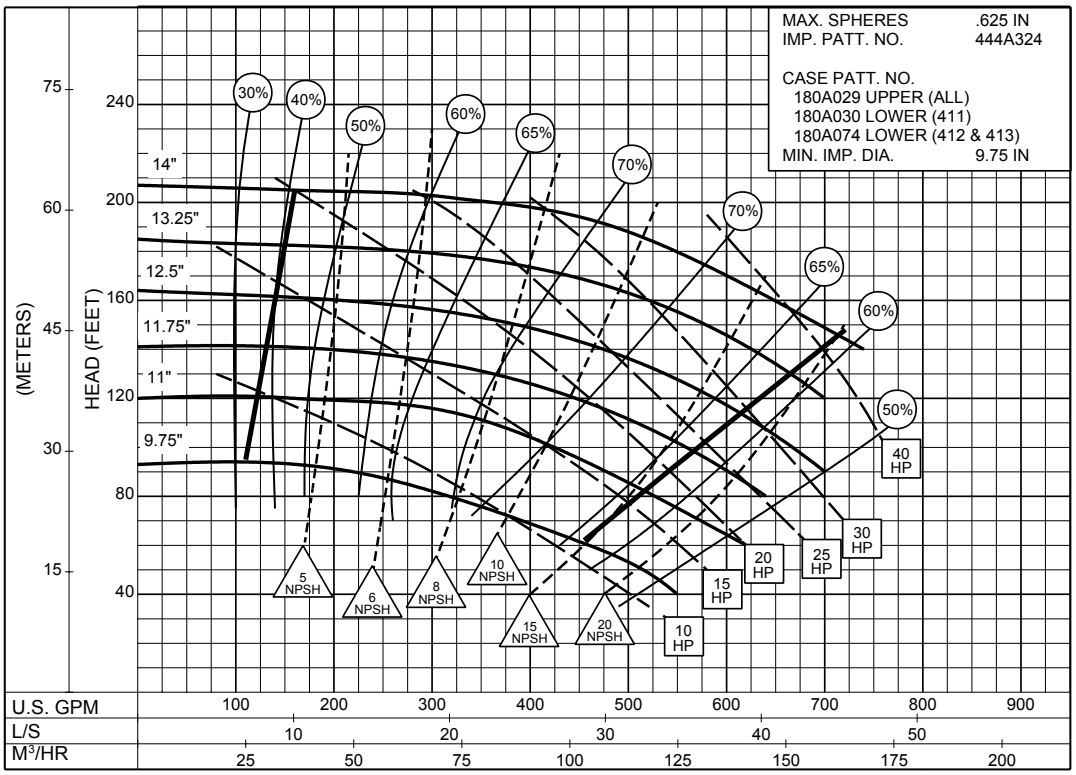
Supersedes Section 410 Page 408
Dated June 1989

3 x 4 x 14
SERIES 410

ENCLOSED IMPELLER

1750 RPM

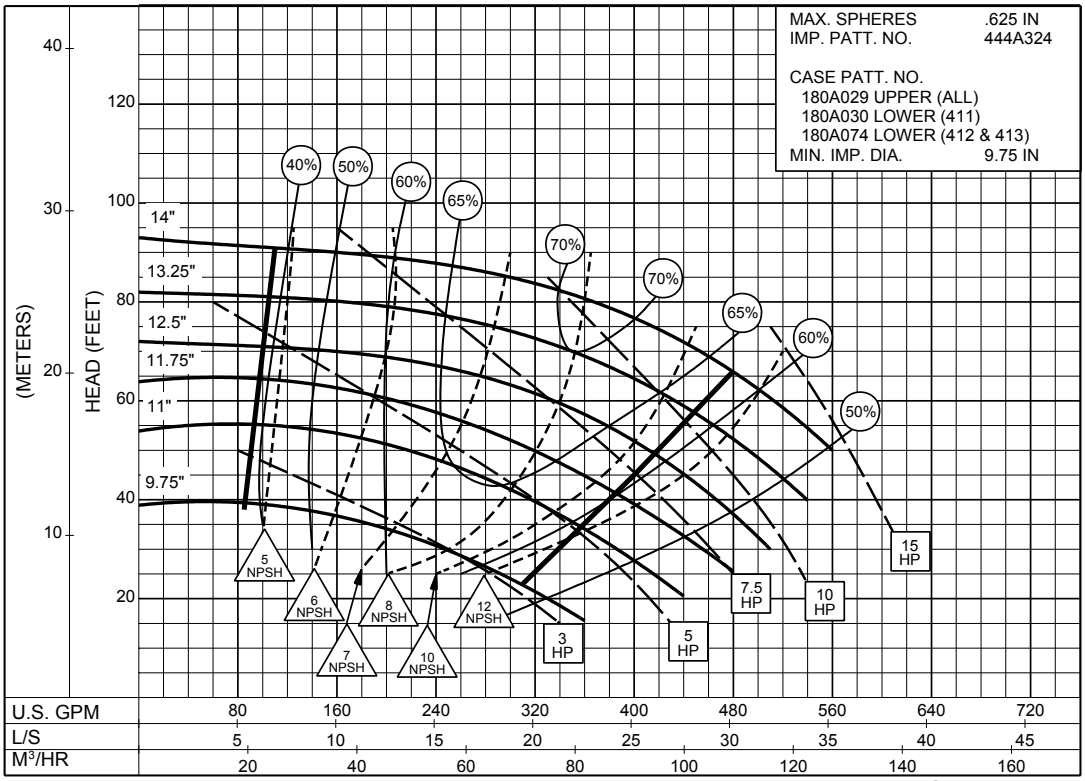
SIZE : 3x4x14 **TYPE : 410** **IMPELLER : Enclosed** **R. P. M. : 1750**



2PC-117363

1150 RPM

SIZE : 3x4x14 **TYPE : 410** **IMPELLER : Enclosed** **R. P. M. : 1150**



2PC-117364

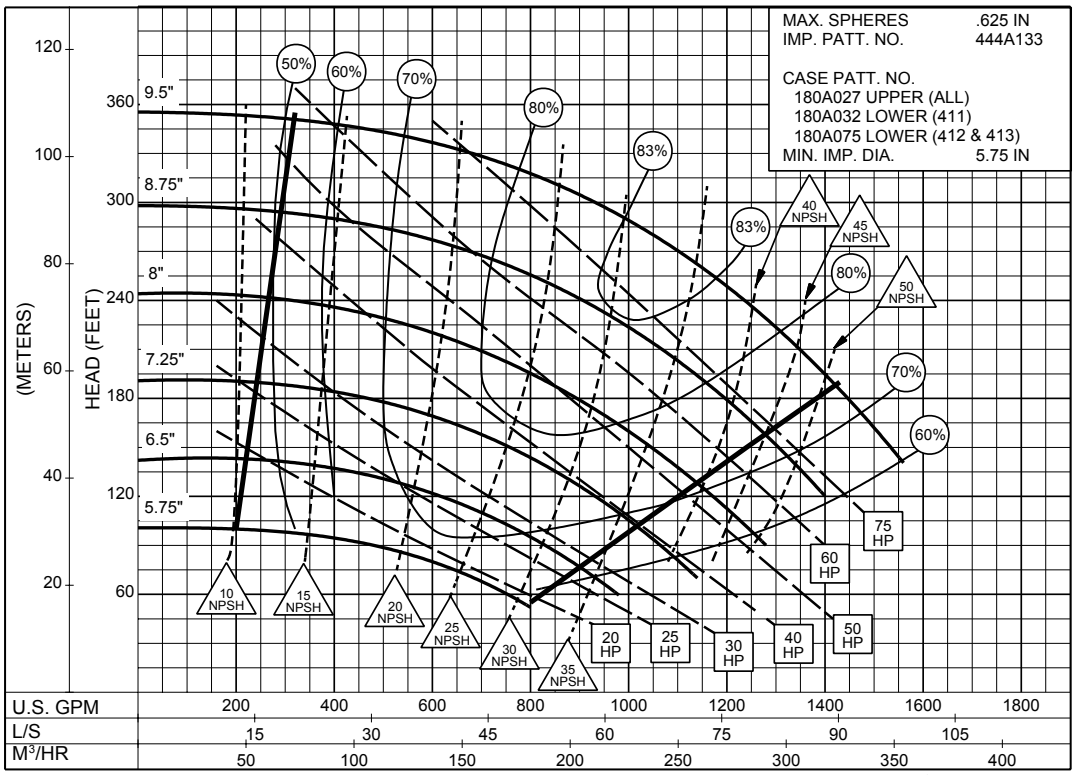
AURORA®
Pentair Pump Group

4 x 5 x 10B
SERIES 410

ENCLOSED IMPELLER

Supersedes Section 410 Page 409
Dated June 1989

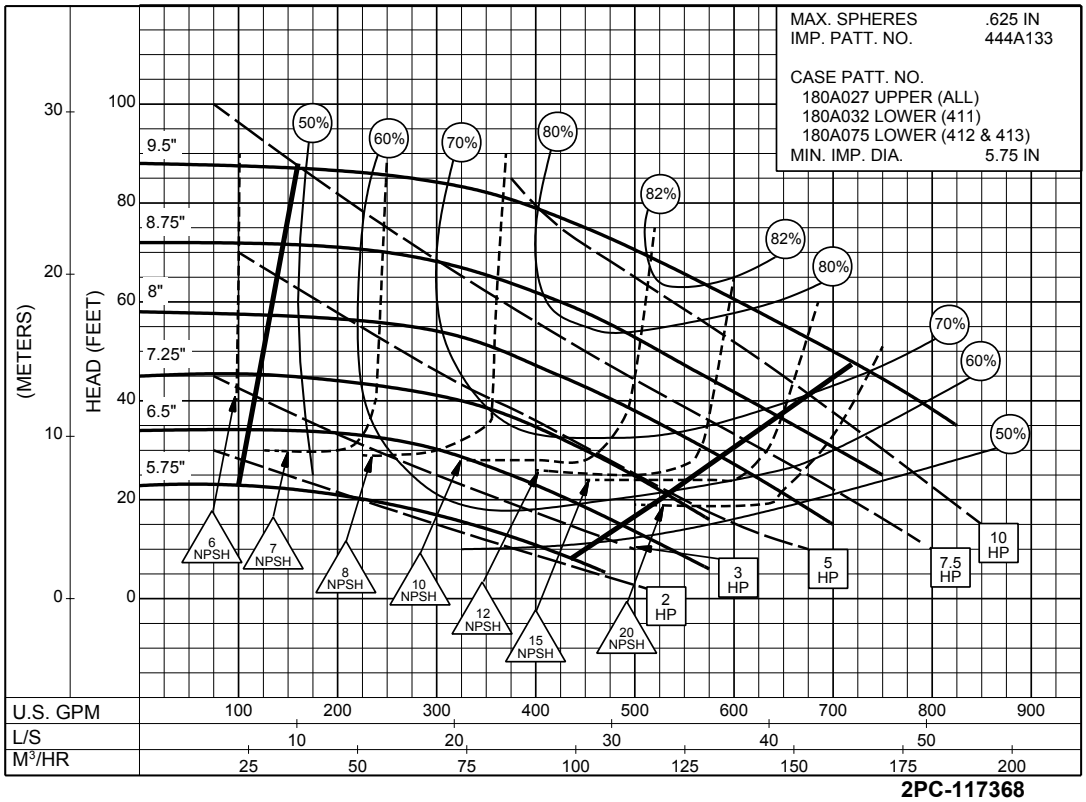
SIZE : 4x5x10B **TYPE : 410** **IMPELLER : Enclosed** **R. P. M. : 3500**



2PC-117367

3500 RPM

SIZE : 4x5x10B **TYPE : 410** **IMPELLER : Enclosed** **R. P. M. : 1750**



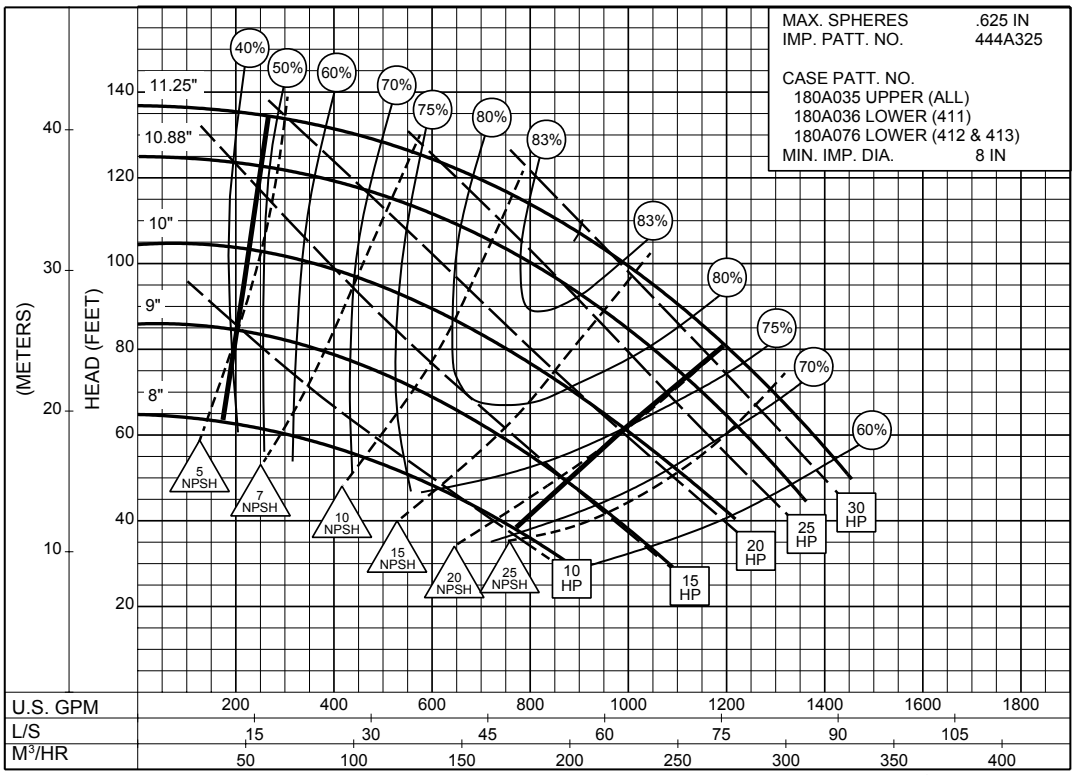
2PC-117368

1750 RPM

4 x 5 x 11A
SERIES 410
ENCLOSED IMPELLER

1750 RPM

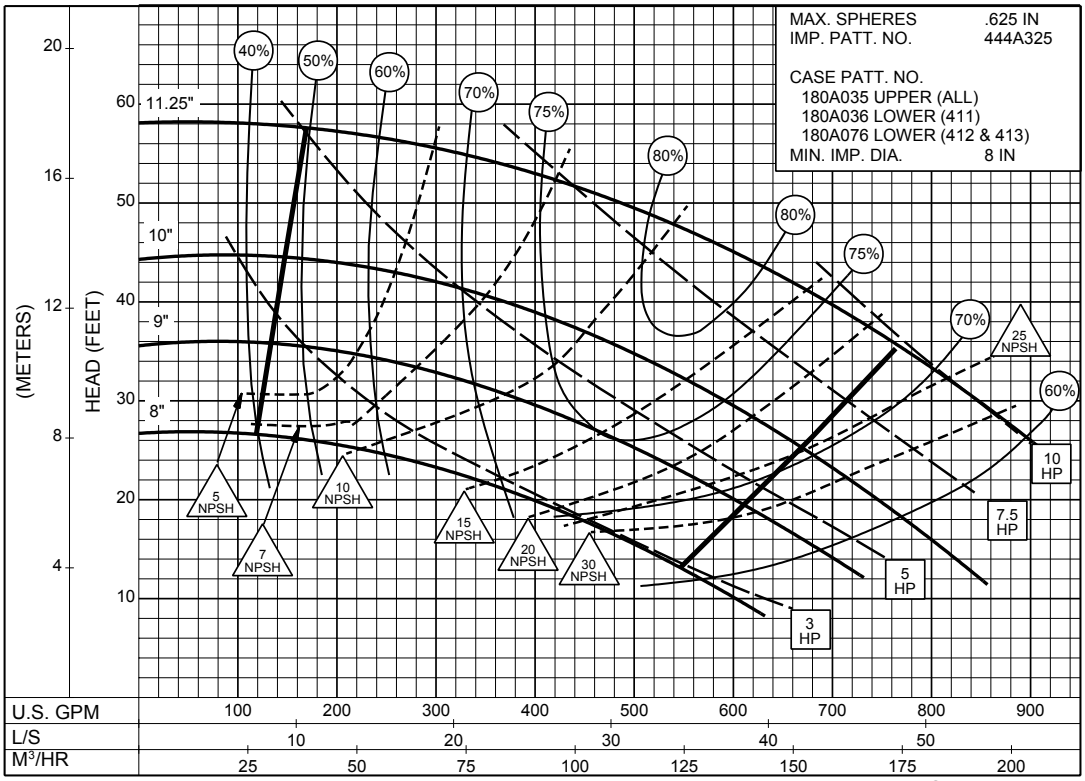
SIZE : 4x5x11A **TYPE : 410** **IMPELLER : Enclosed** **R. P. M. : 1750**



2PC-117369

1150 RPM

SIZE : 4x5x11A **TYPE : 410** **IMPELLER : Enclosed** **R. P. M. : 1150**



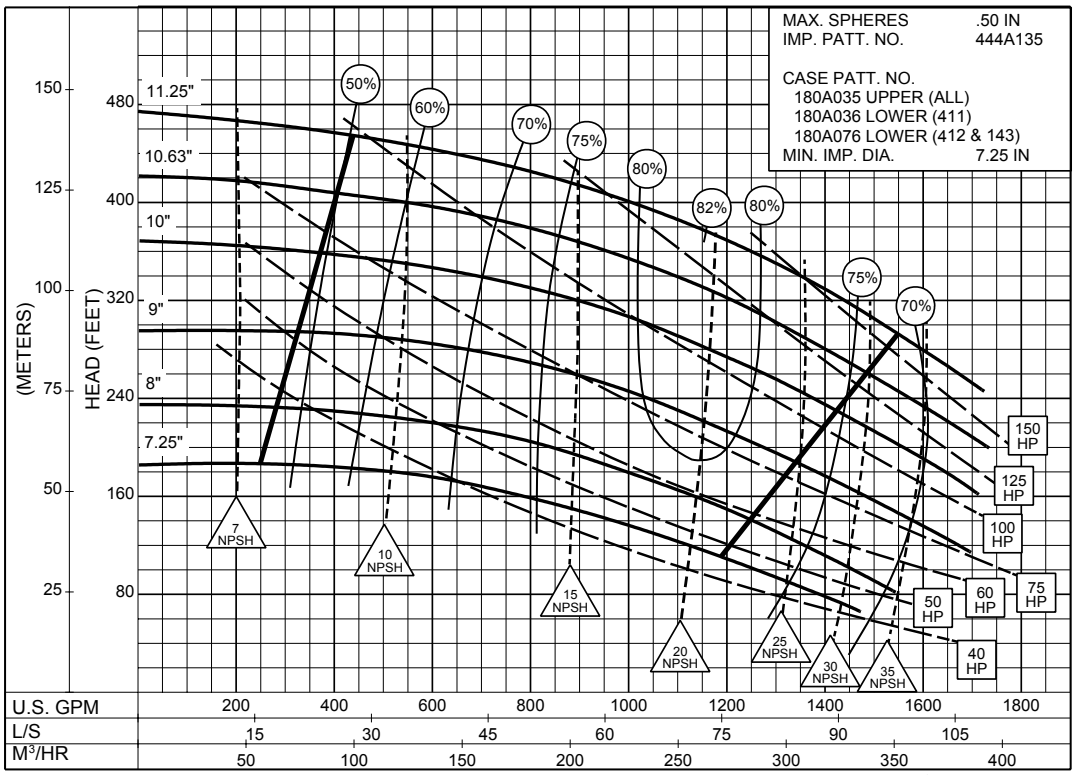
2PC-117370

4 x 5 x 11C
SERIES 410

ENCLOSED IMPELLER

Supersedes Section 410 Page 411
Dated June 1989

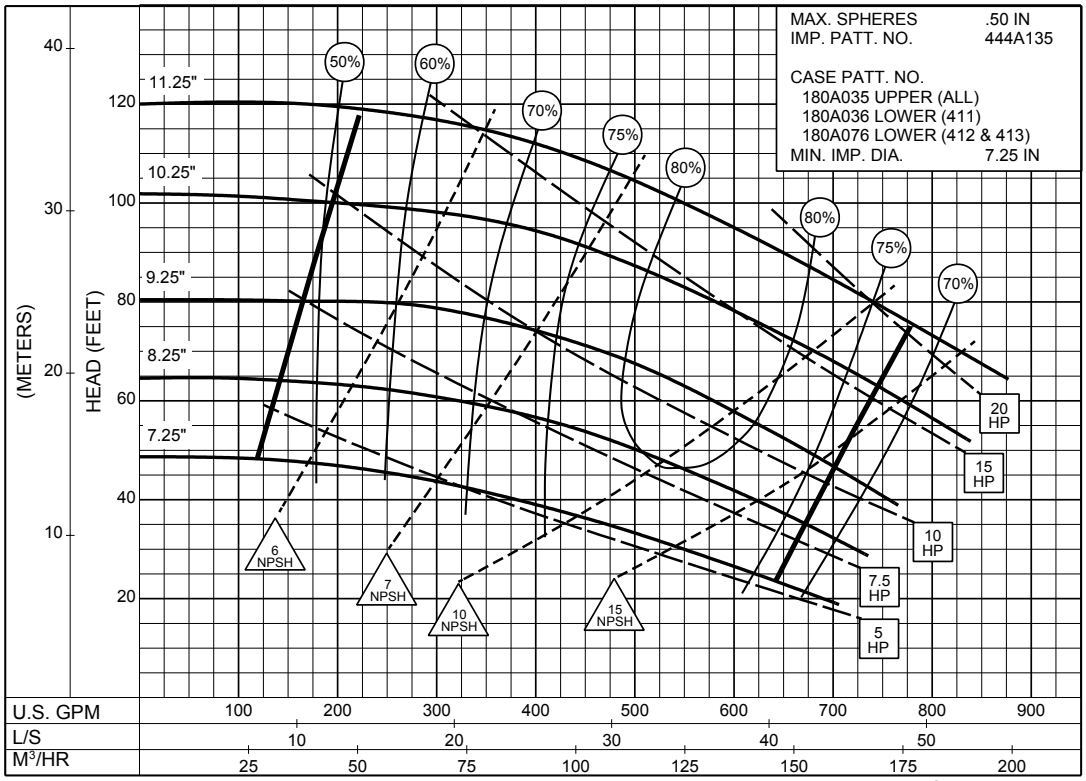
SIZE : 4x5x11C **TYPE : 410** **IMPELLER : Enclosed** **R. P. M. : 3500**



2PC-148337

3500 RPM

SIZE : 4x5x11C **TYPE : 410** **IMPELLER : Enclosed** **R. P. M. : 1750**



2PC-117372

1750 RPM

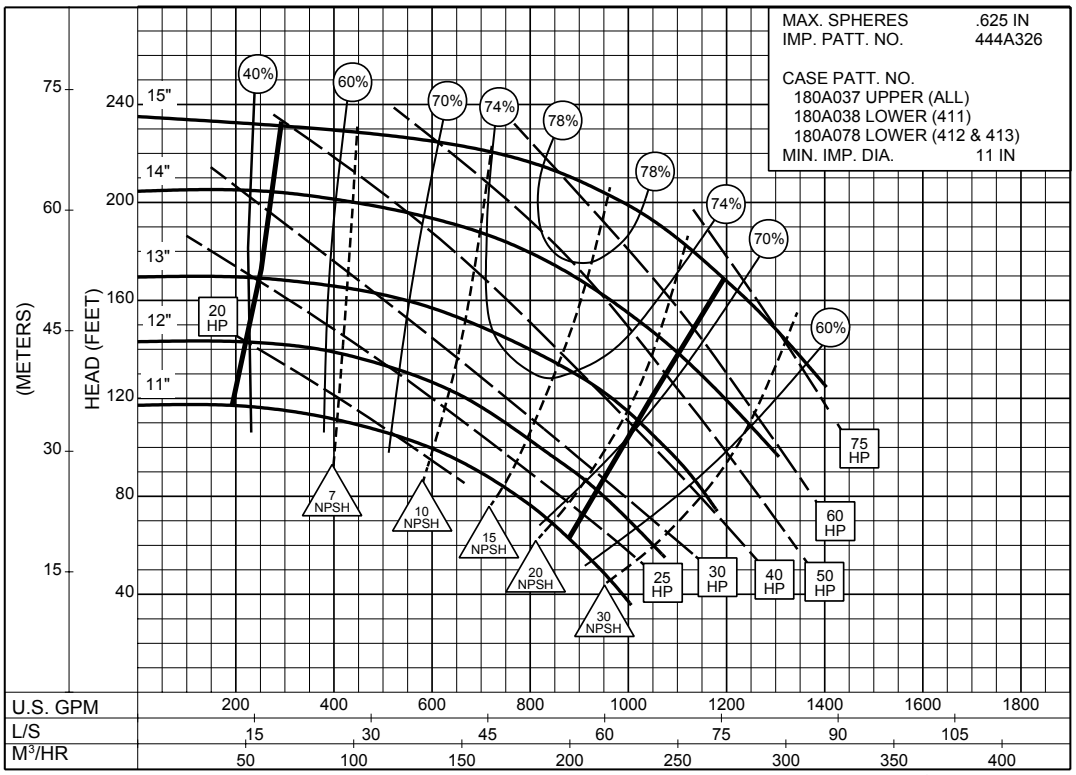
AURORA®
Pentair Pump Group

4 x 5 x 15
SERIES 410

ENCLOSED IMPELLER

1750 RPM

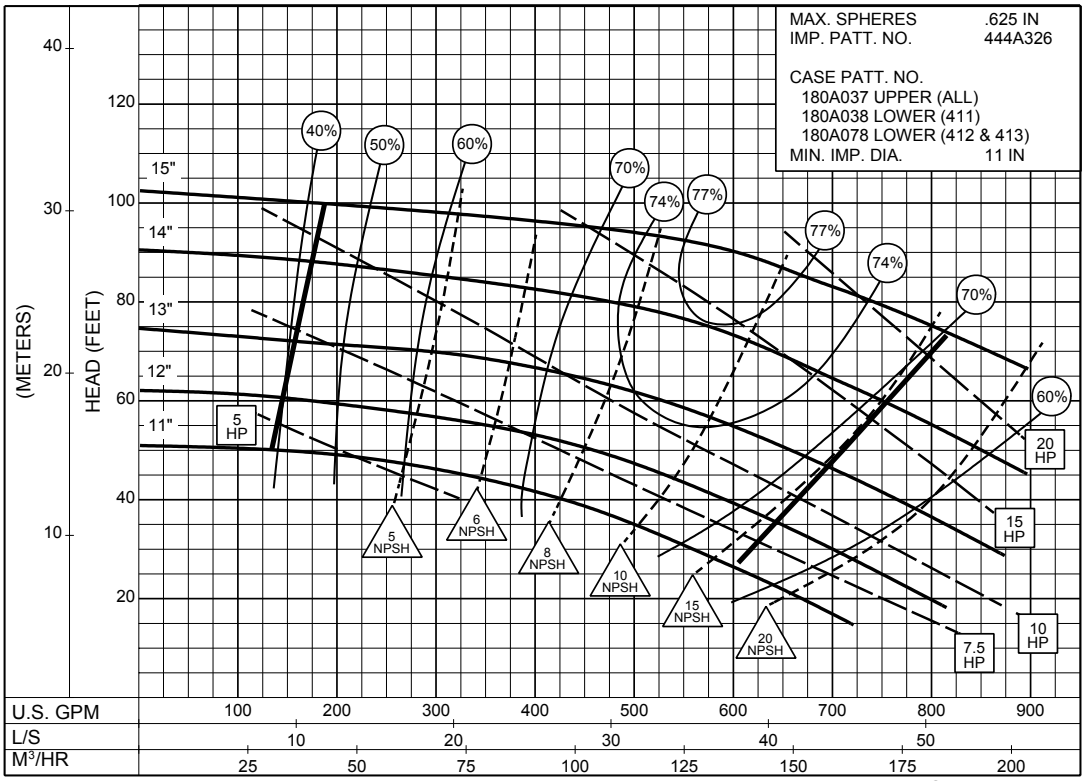
SIZE : 4x5x15 **TYPE : 410** **IMPELLER : Enclosed** **R. P. M. : 1750**



2PC-117373

1150 RPM

SIZE : 4x5x15 **TYPE : 410** **IMPELLER : Enclosed** **R. P. M. : 1150**



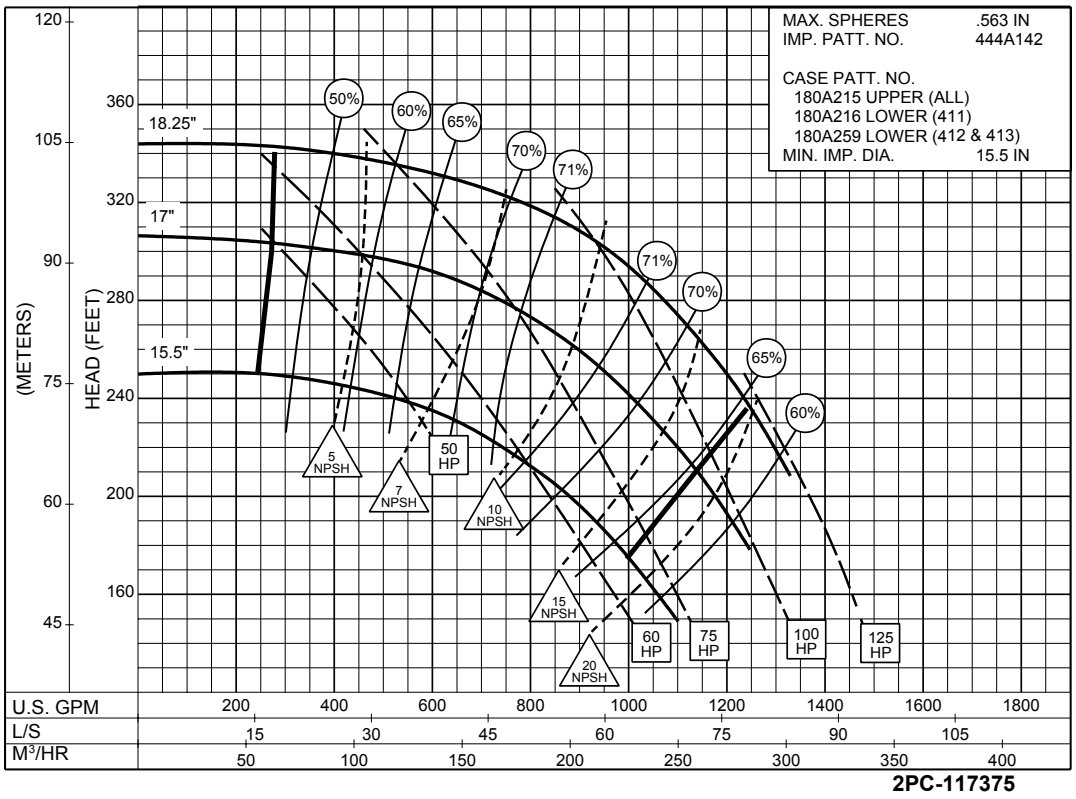
2PC-117374

AURORA®
Pentair Pump Group

4 x 6 x 18B
SERIES 410

ENCLOSED IMPELLER

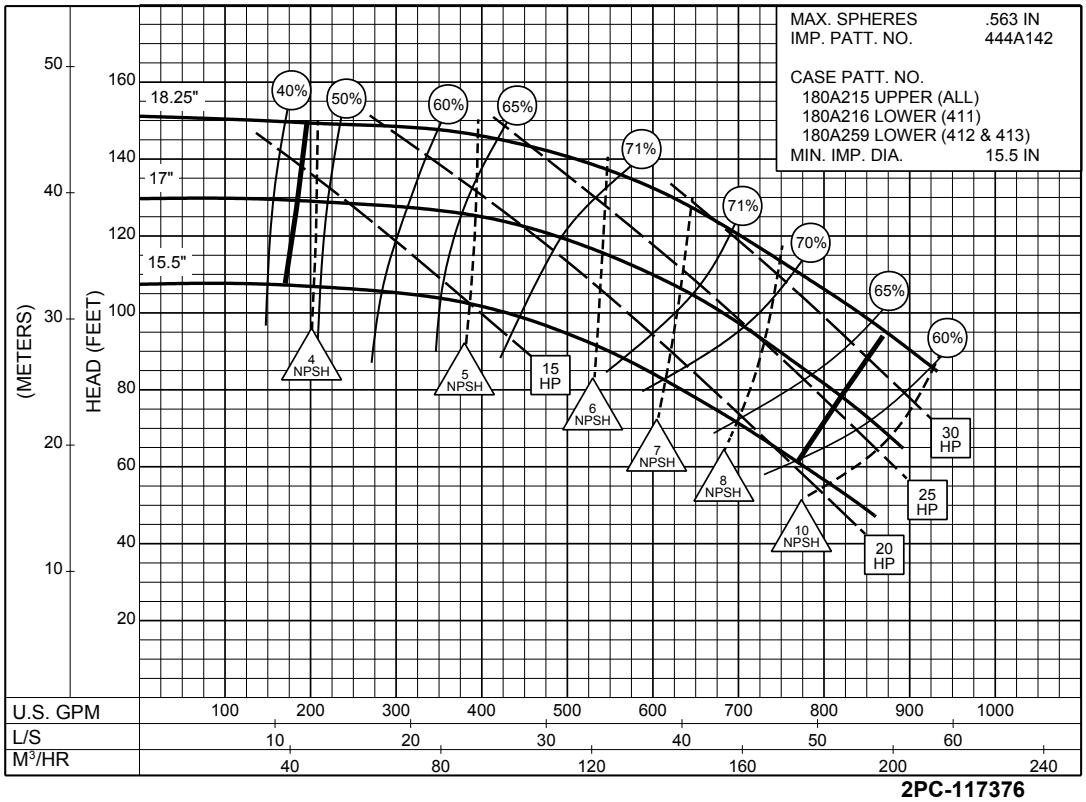
SIZE : 4x6x18B **TYPE : 410** **IMPELLER : Enclosed** **R. P. M. : 1750**



2PC-117375

1750 RPM

SIZE : 4x6x18B **TYPE : 410** **IMPELLER : Enclosed** **R. P. M. : 1150**



2PC-117376

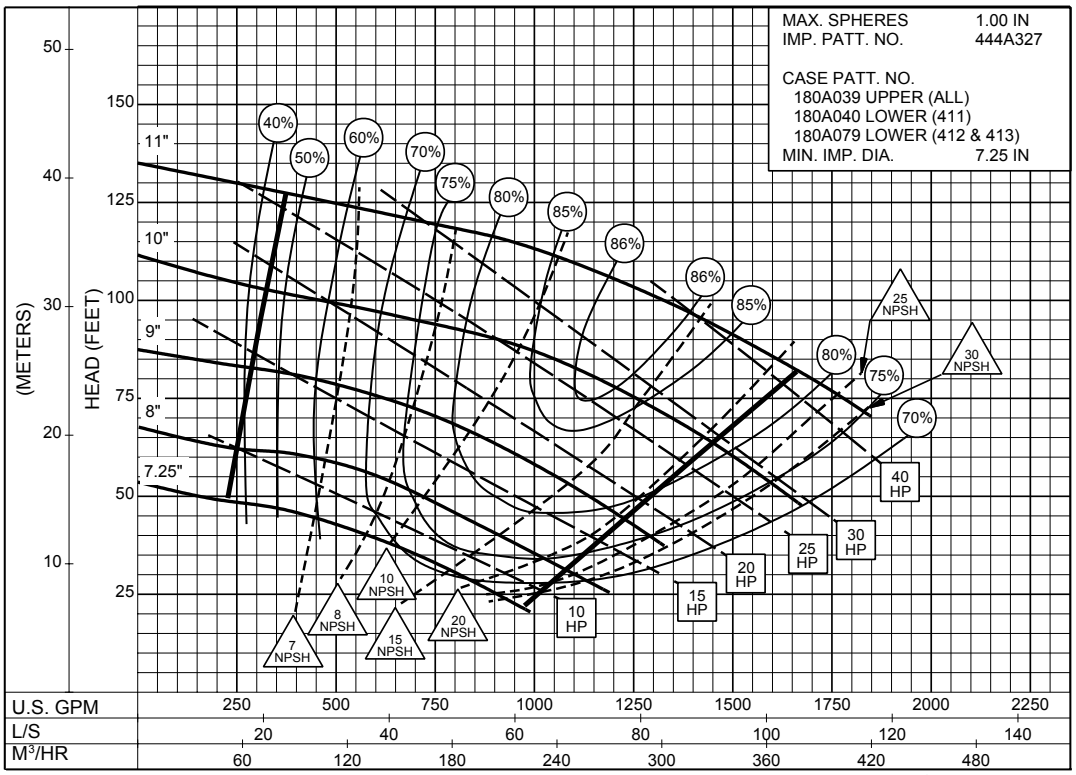
1150 RPM

5 x 6 x 11A
SERIES 410

ENCLOSED IMPELLER

1750 RPM

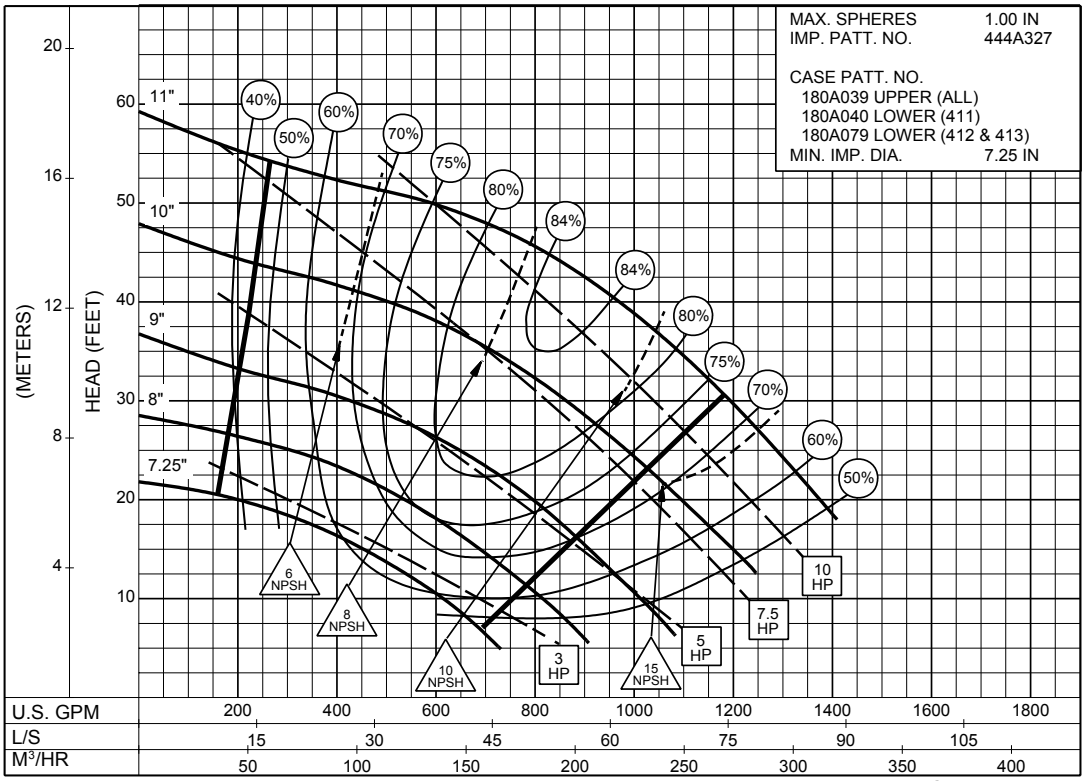
SIZE : 5x6x11A **TYPE : 410** **IMPELLER : Enclosed** **R. P. M. : 1750**



2PC-117377

1150 RPM

SIZE : 5x6x11A **TYPE : 410** **IMPELLER : Enclosed** **R. P. M. : 1150**



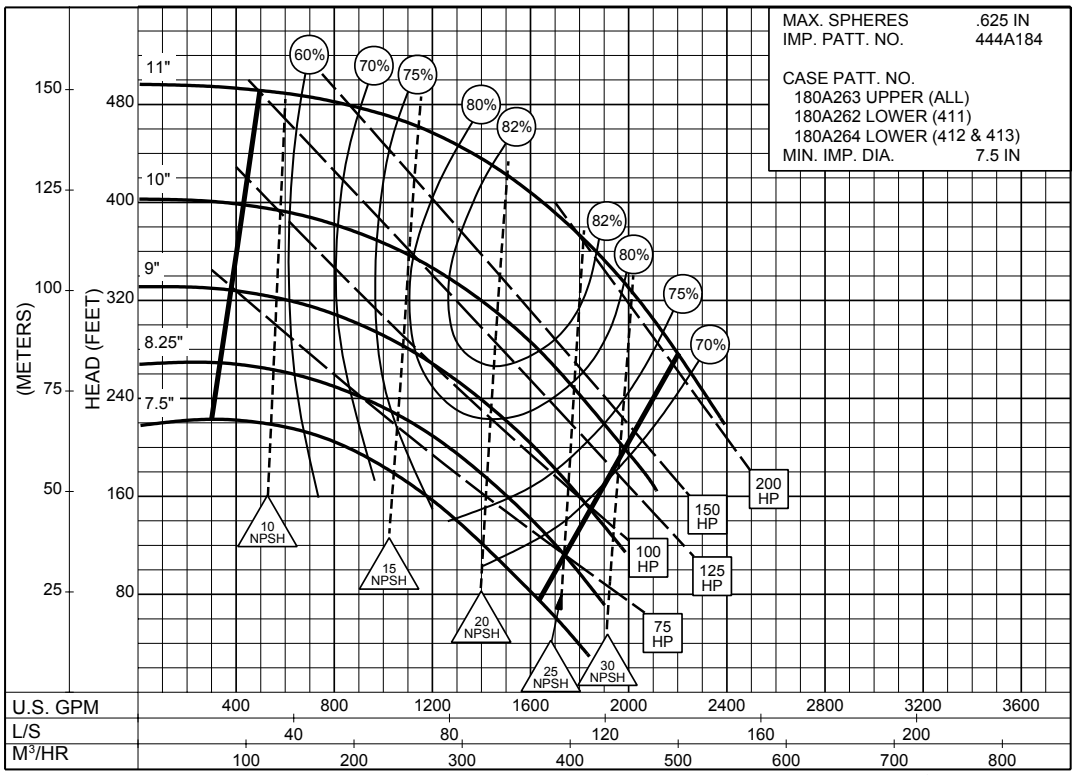
2PC-117378

5 x 6 x 11C
SERIES 410

ENCLOSED IMPELLER

Supersedes Section 410 Page 415
Dated June 1989

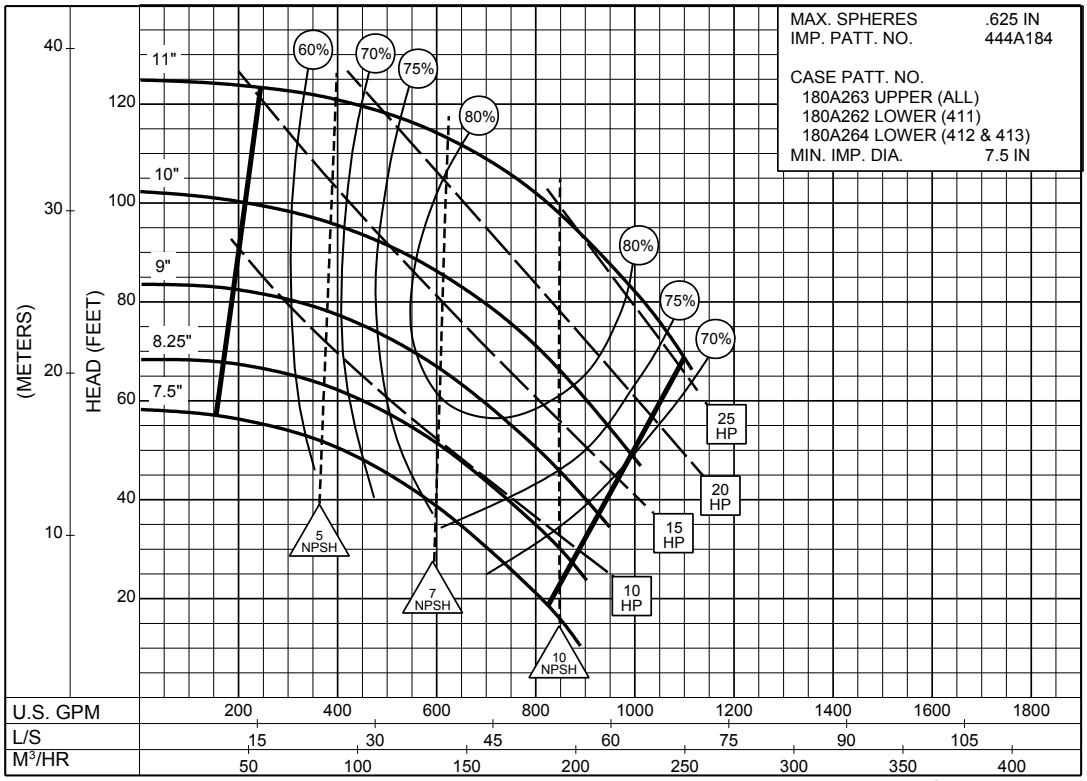
SIZE : 5x6x11C **TYPE : 410** **IMPELLER : Enclosed** **R. P. M. : 3500**



2PC-125241

3500 RPM

SIZE : 5x6x11C **TYPE : 410** **IMPELLER : Enclosed** **R. P. M. : 1750**



2PC-125240

1750 RPM

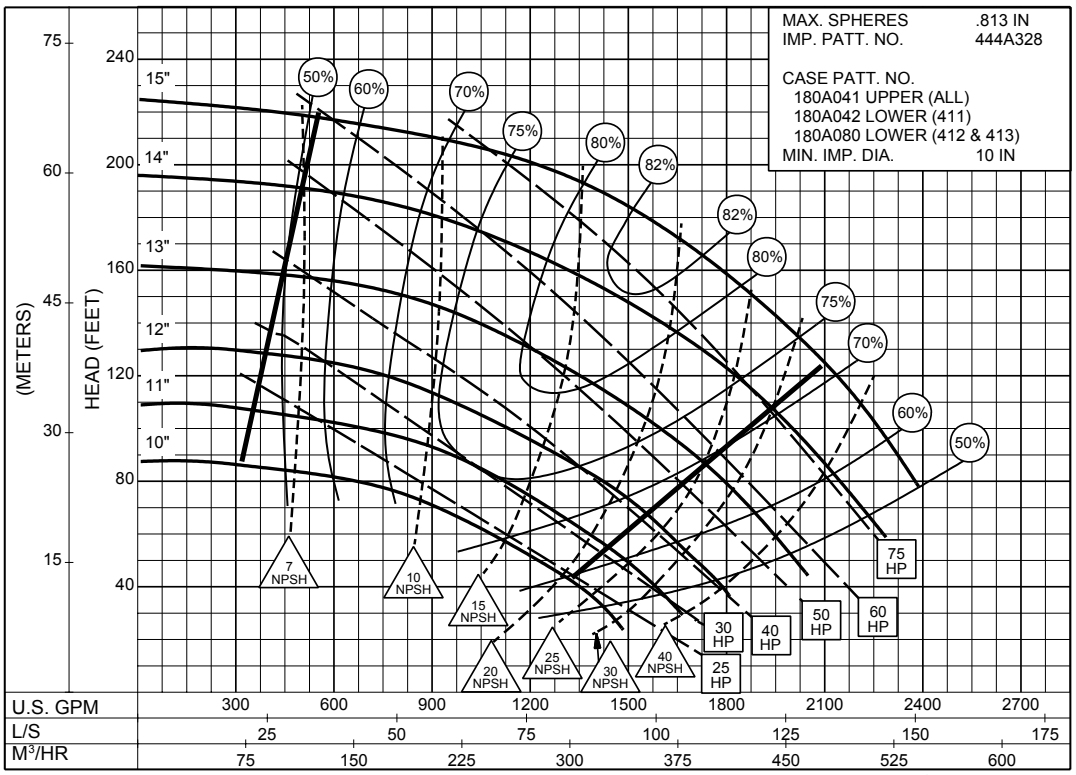
AURORA®
Pentair Pump Group

5 x 6 x 15
SERIES 410

ENCLOSED IMPELLER

1750 RPM

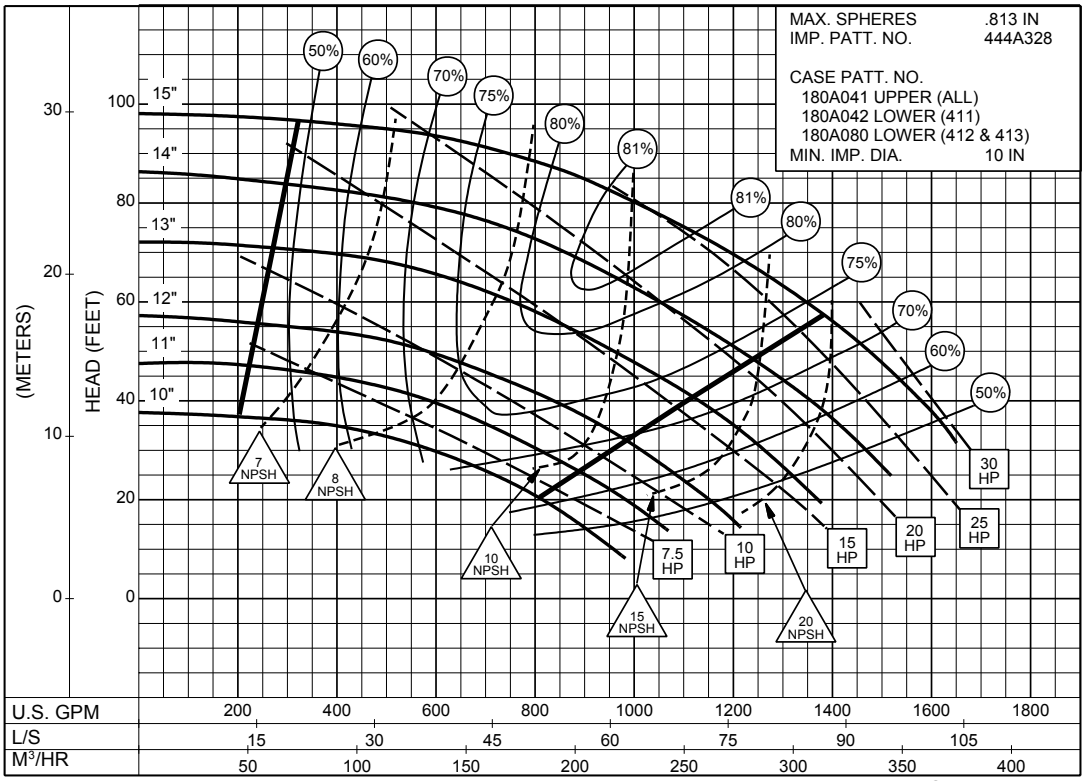
SIZE : 5x6x15 **TYPE : 410** **IMPELLER : Enclosed** **R. P. M. : 1750**



2PC-117379

1150 RPM

SIZE : 5x6x15 **TYPE : 410** **IMPELLER : Enclosed** **R. P. M. : 1150**



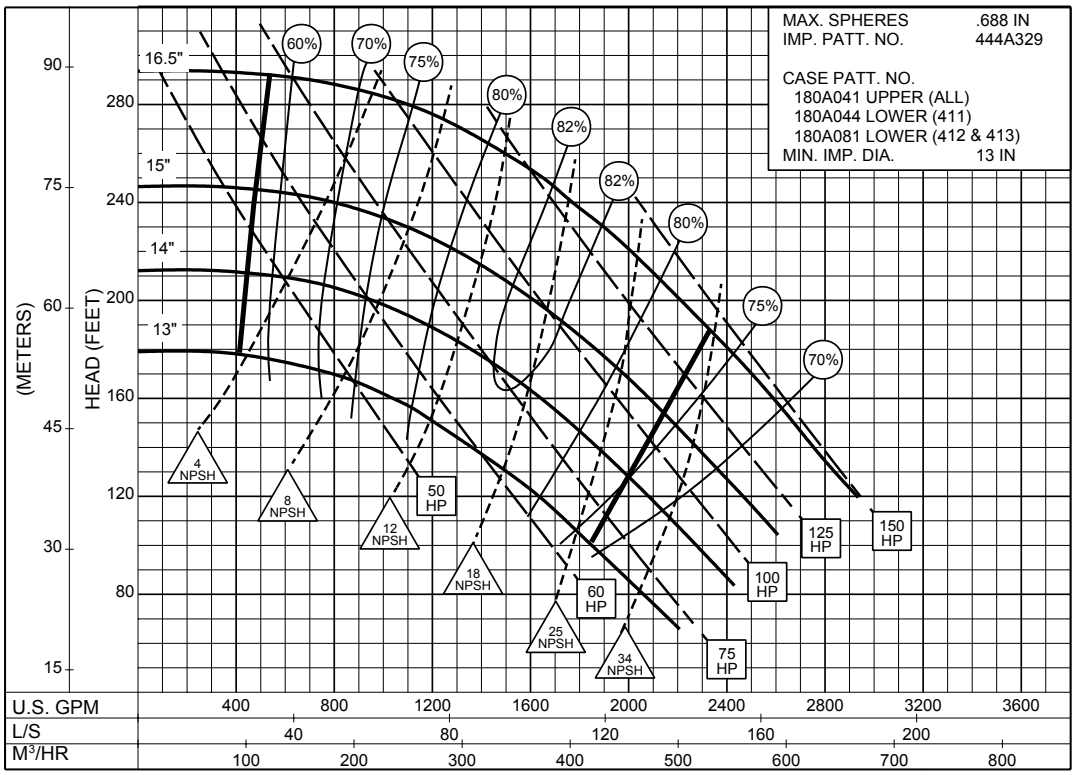
2PC-117380

5 x 6 x 17
SERIES 410

ENCLOSED IMPELLER

Supersedes Section 410 Page 417
Dated June 1989

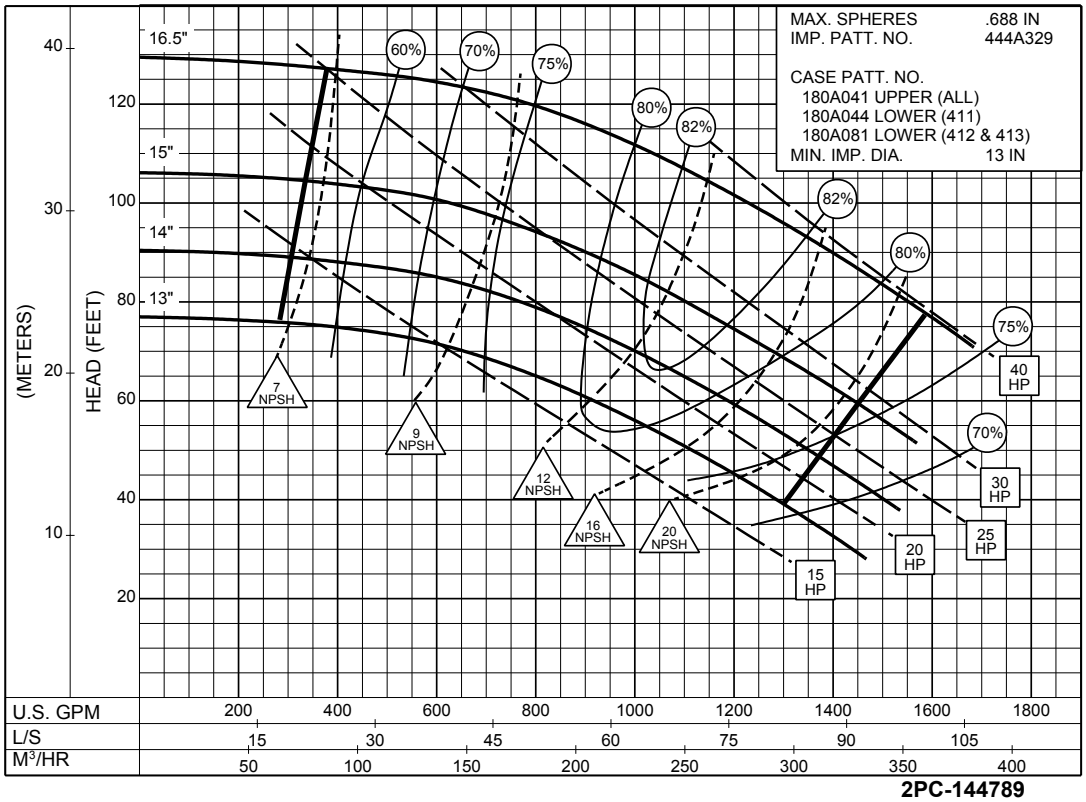
SIZE : 5x6x17 **TYPE : 410** **IMPELLER : Enclosed** **R. P. M. : 1750**



2PC-144788

1750 RPM

SIZE : 5x6x17 **TYPE : 410** **IMPELLER : Enclosed** **R. P. M. : 1150**



2PC-144789

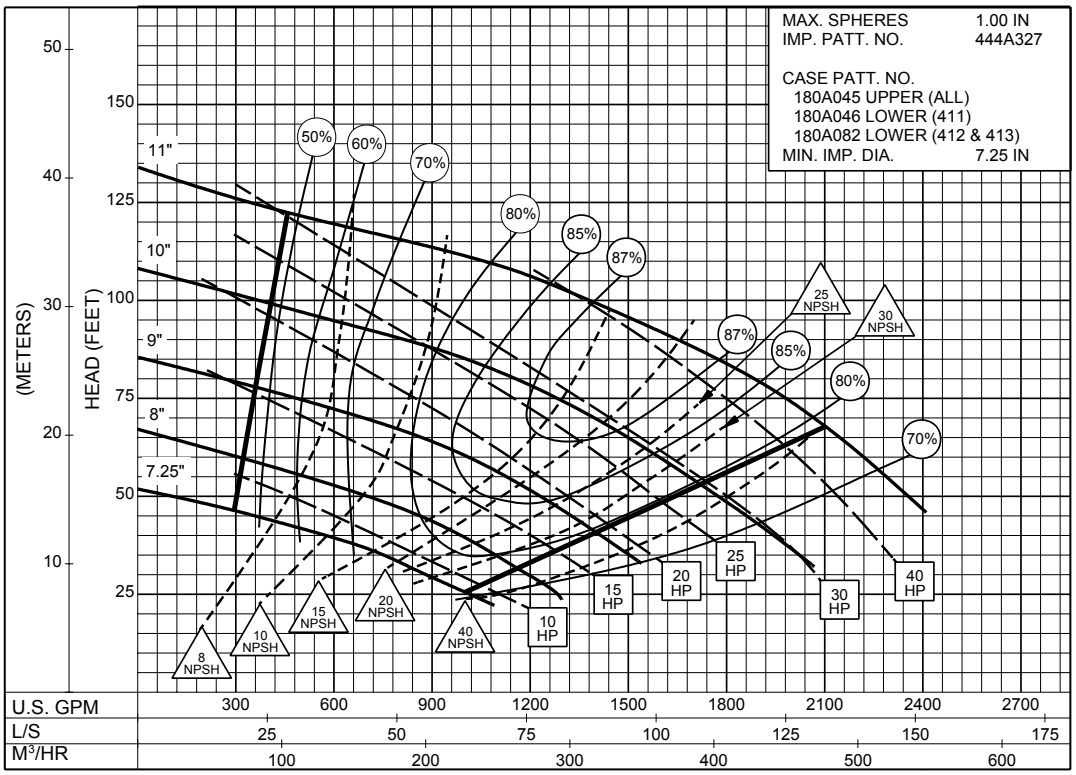
1150 RPM

6 x 8 x 11
SERIES 410

ENCLOSED IMPELLER

1750 RPM

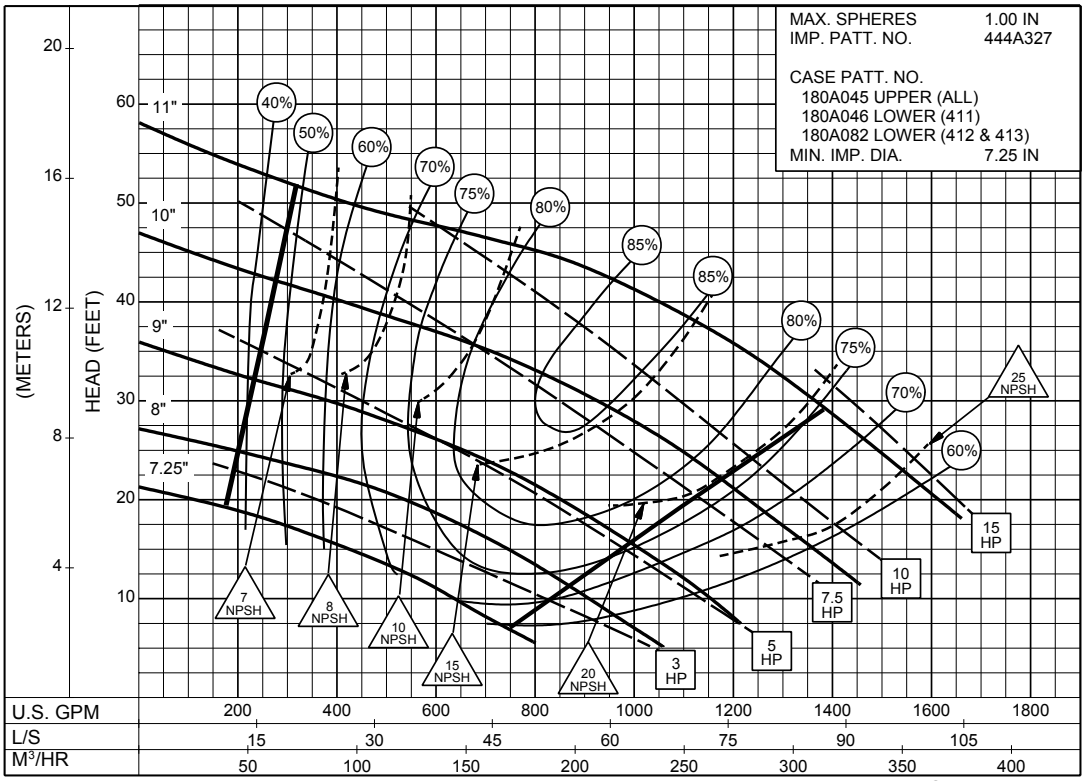
SIZE : 6x8x11 **TYPE : 410** **IMPELLER : Enclosed** **R. P. M. : 1750**



2PC-117383

1150 RPM

SIZE : 6x8x11 **TYPE : 410** **IMPELLER : Enclosed** **R. P. M. : 1150**



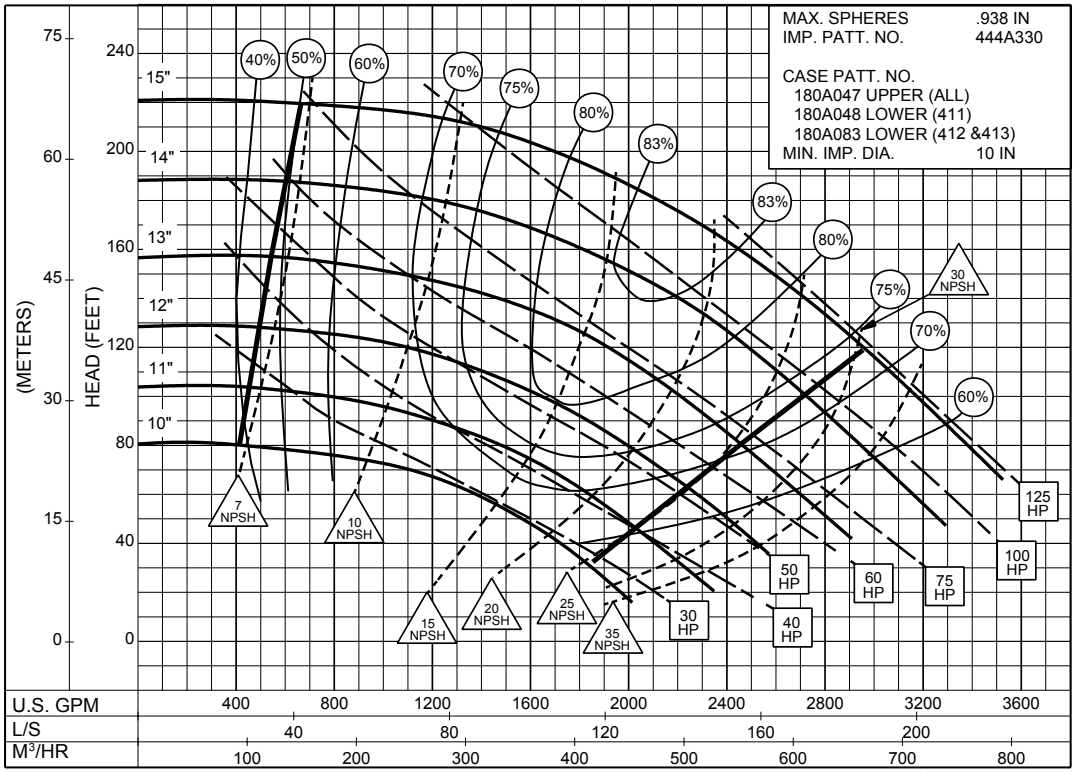
2PC-117384

6 x 8 x 15
SERIES 410

ENCLOSED IMPELLER

Supersedes Section 410 Page 419
Dated June 1989

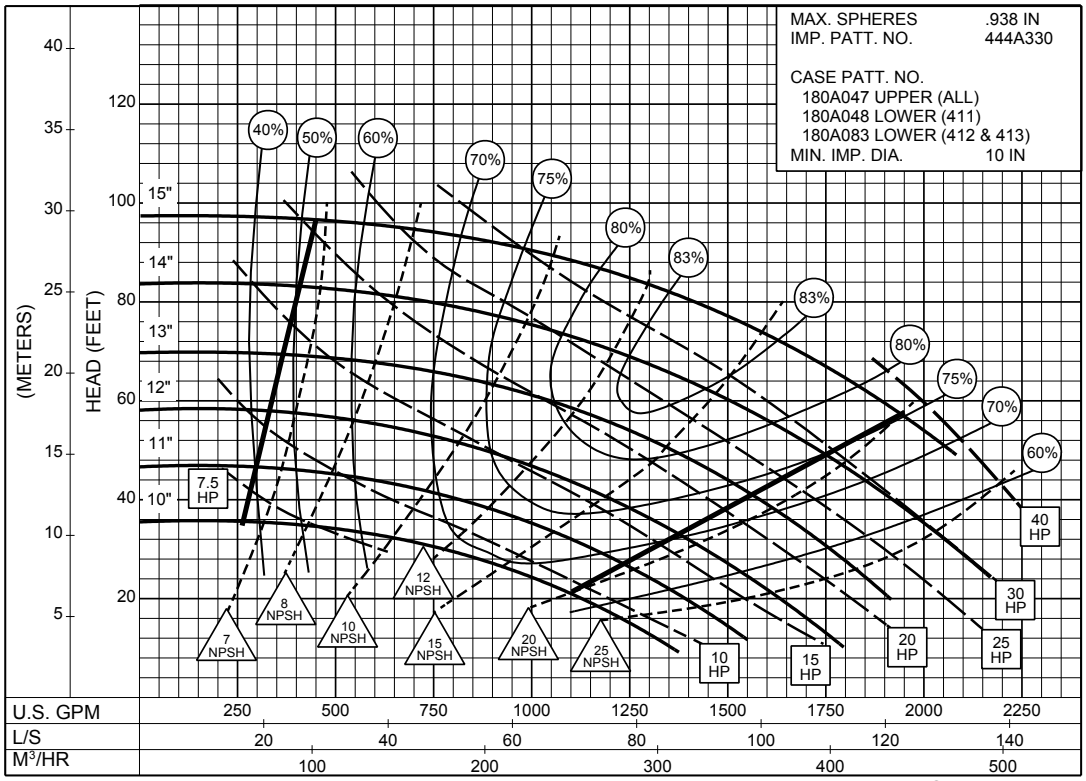
SIZE : 6x8x15 **TYPE : 410** **IMPELLER : Enclosed** **R. P. M. : 1750**



2PC-117385

1750 RPM

SIZE : 6x8x15 **TYPE : 410** **IMPELLER : Enclosed** **R. P. M. : 1150**



2PC-117386

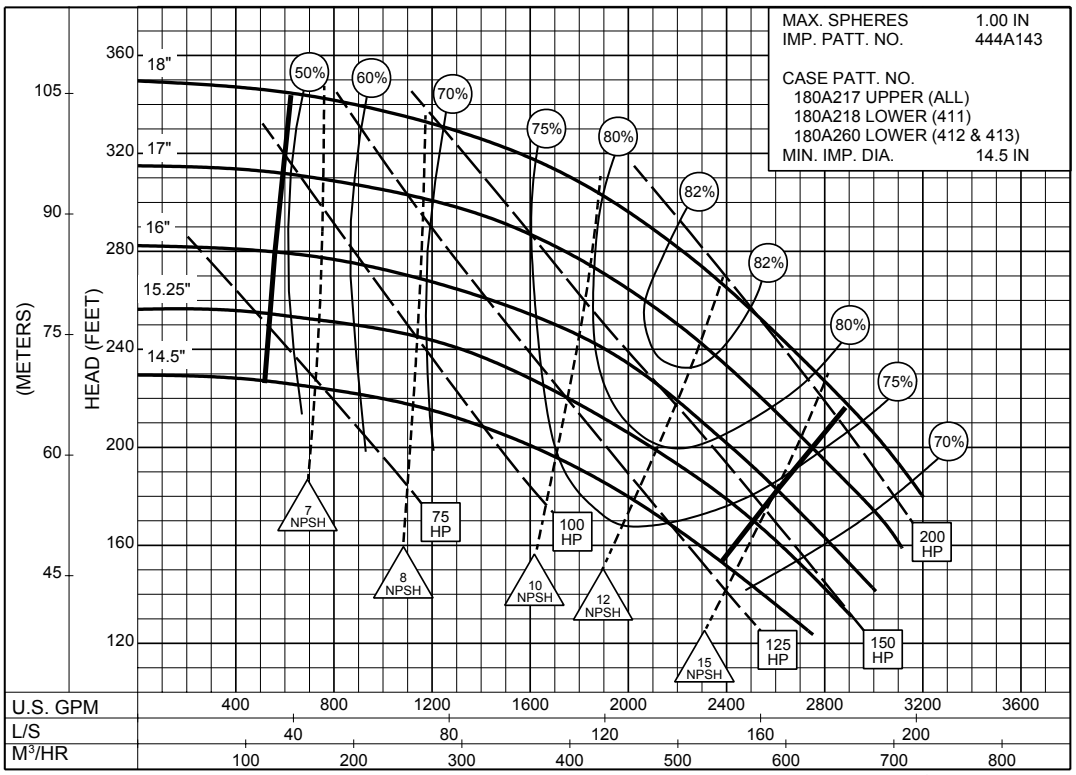
1150 RPM

6 x 8 x 18A
SERIES 410

ENCLOSED IMPELLER

1750 RPM

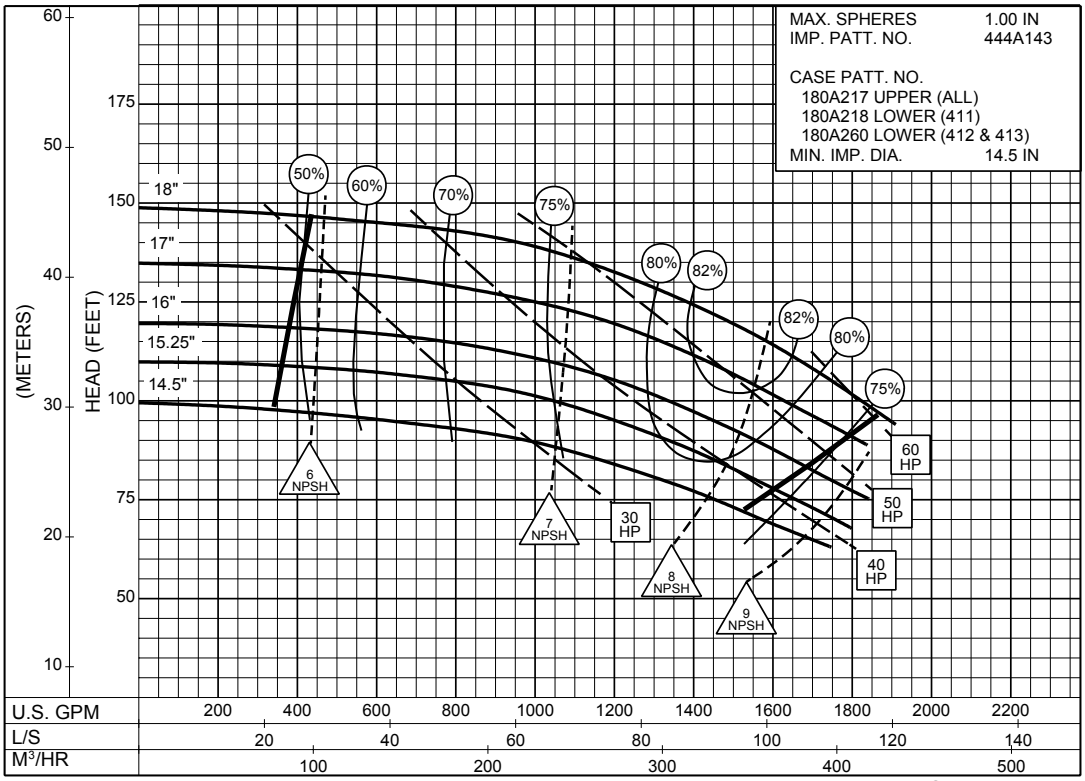
SIZE : 6x8x18A **TYPE : 410** **IMPELLER : Enclosed** **R. P. M. : 1750**



2PC-125666

1150 RPM

SIZE : 6x8x18A **TYPE : 410** **IMPELLER : Enclosed** **R. P. M. : 1150**



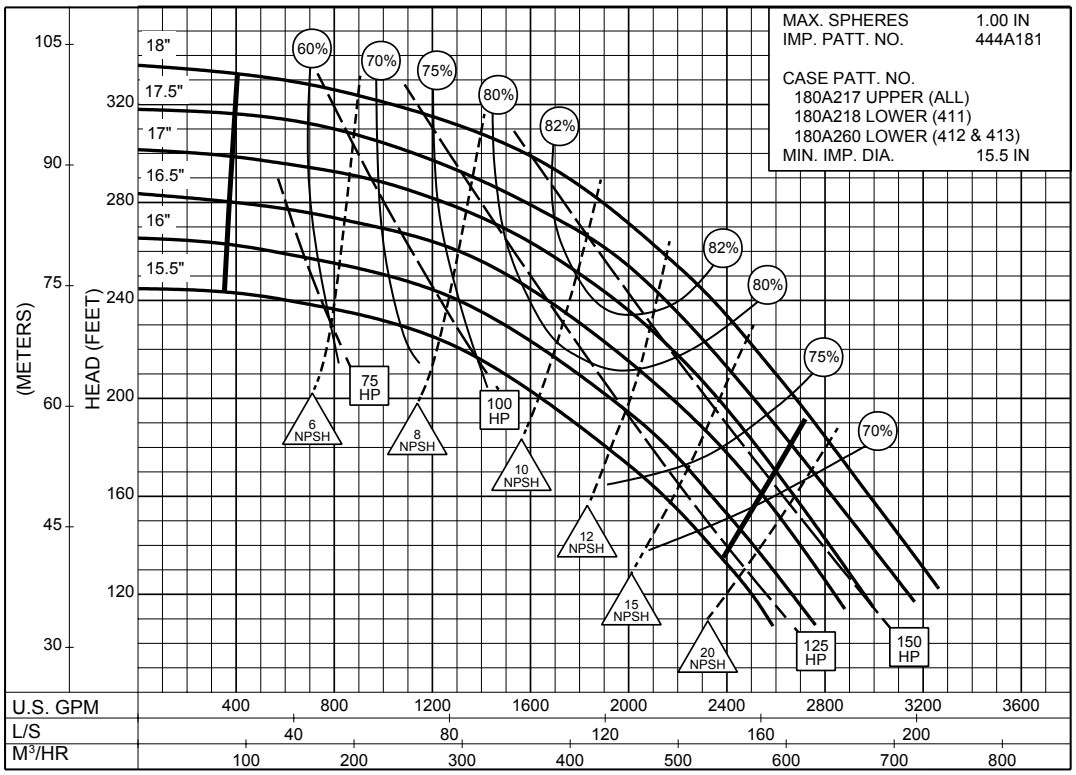
2PC-125667

6 x 8 x 18B
SERIES 410

ENCLOSED IMPELLER

Supersedes Section 410 Page 421
Dated June 1989

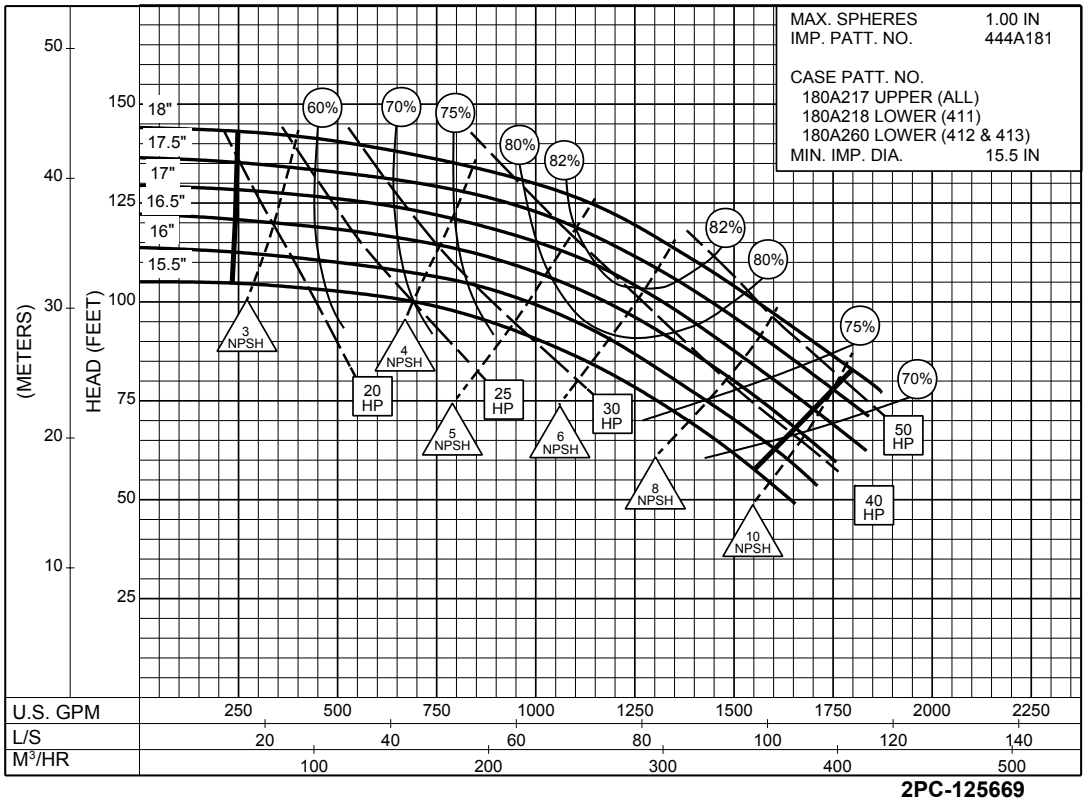
SIZE : 6x8x18B **TYPE : 410** **IMPELLER : Enclosed** **R. P. M. : 1750**



2PC-125668

1750 RPM

SIZE : 6x8x18B **TYPE : 410** **IMPELLER : Enclosed** **R. P. M. : 1150**



2PC-125669

1150 RPM

AURORA®
Pentair Pump Group

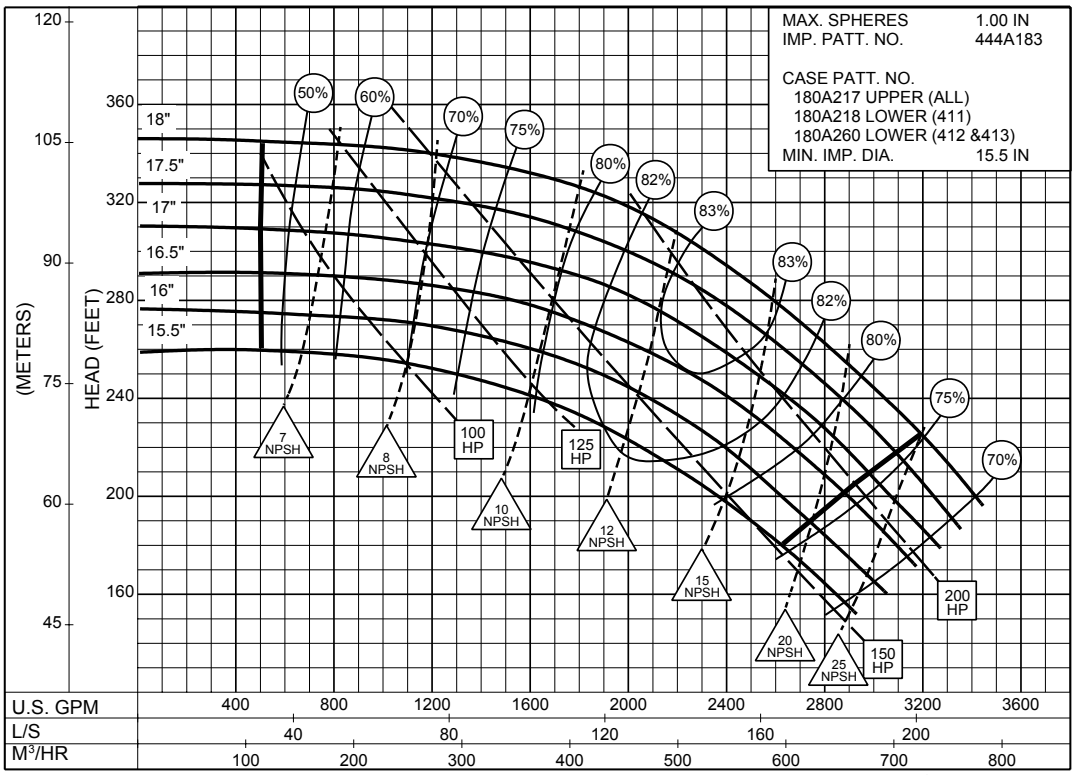
Supersedes Section 410 Page 422
Dated June 1989

6 x 8 x18C
SERIES 410

ENCLOSED IMPELLER

1750 RPM

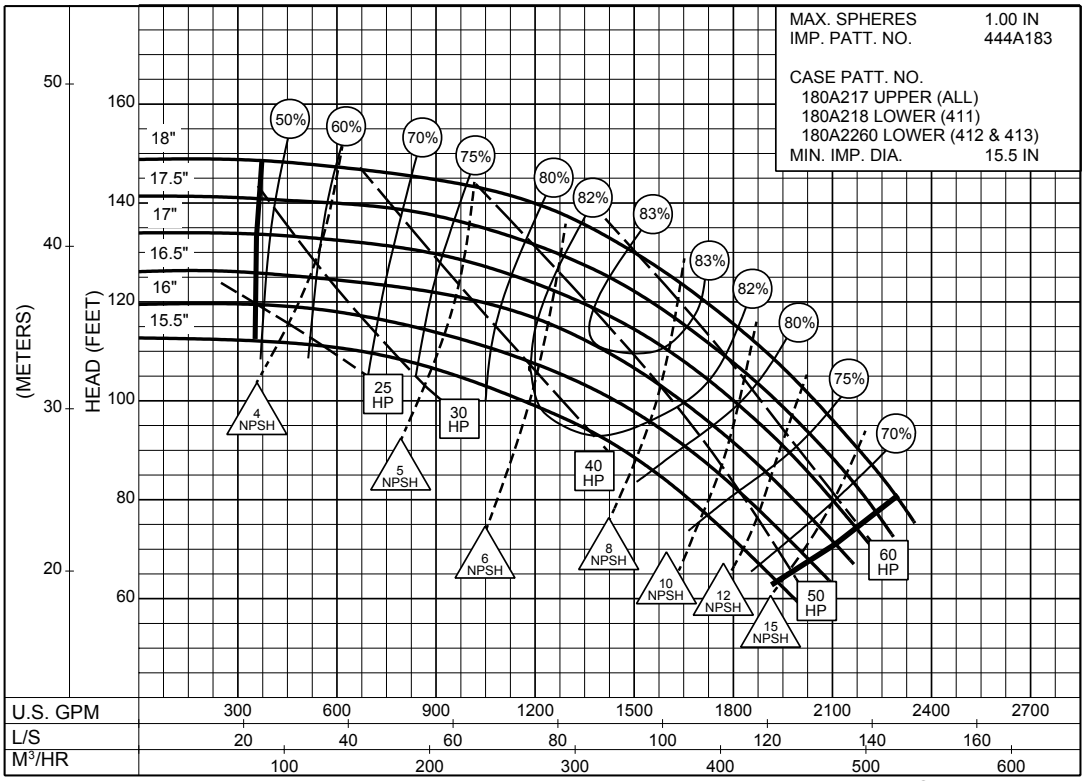
SIZE : 6x8x18C **TYPE : 410** **IMPELLER : Enclosed** **R. P. M. : 1750**



2PC-125670

1150 RPM

SIZE : 6x8x18C **TYPE : 410** **IMPELLER : Enclosed** **R. P. M. : 1150**



PC-125671

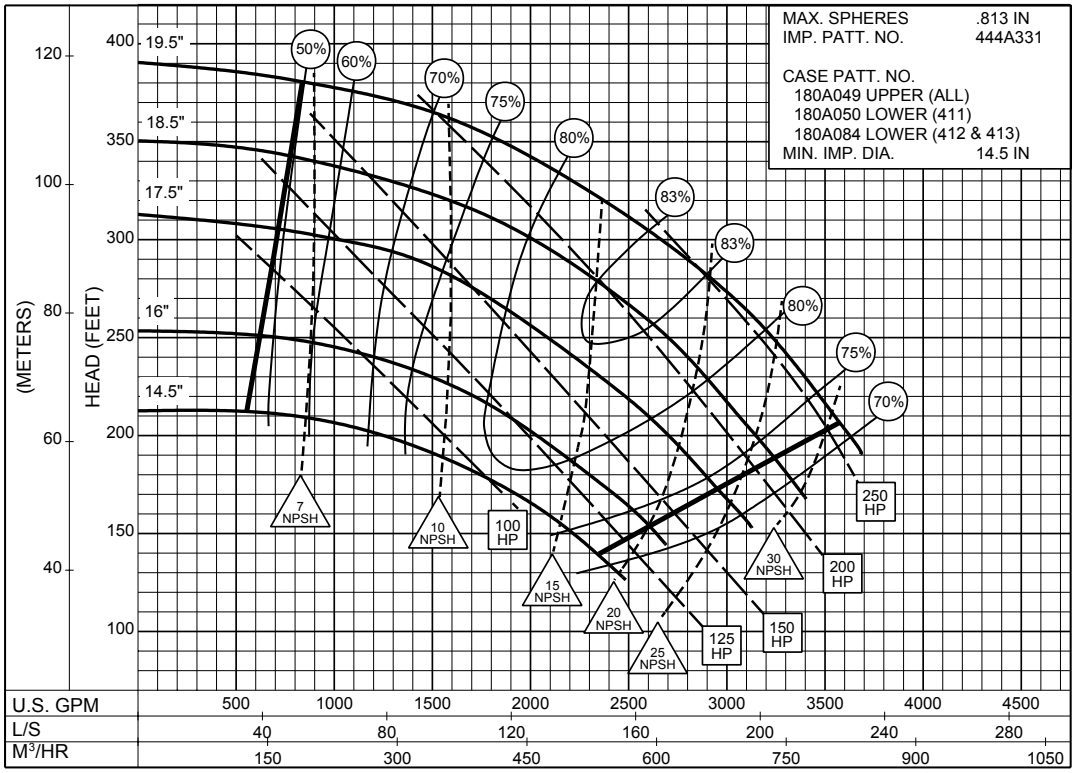
AURORA®
Pentair Pump Group

6 x 8 x 20
SERIES 410

ENCLOSED IMPELLER

Supersedes Section 410 Page 423
Dated June 1989

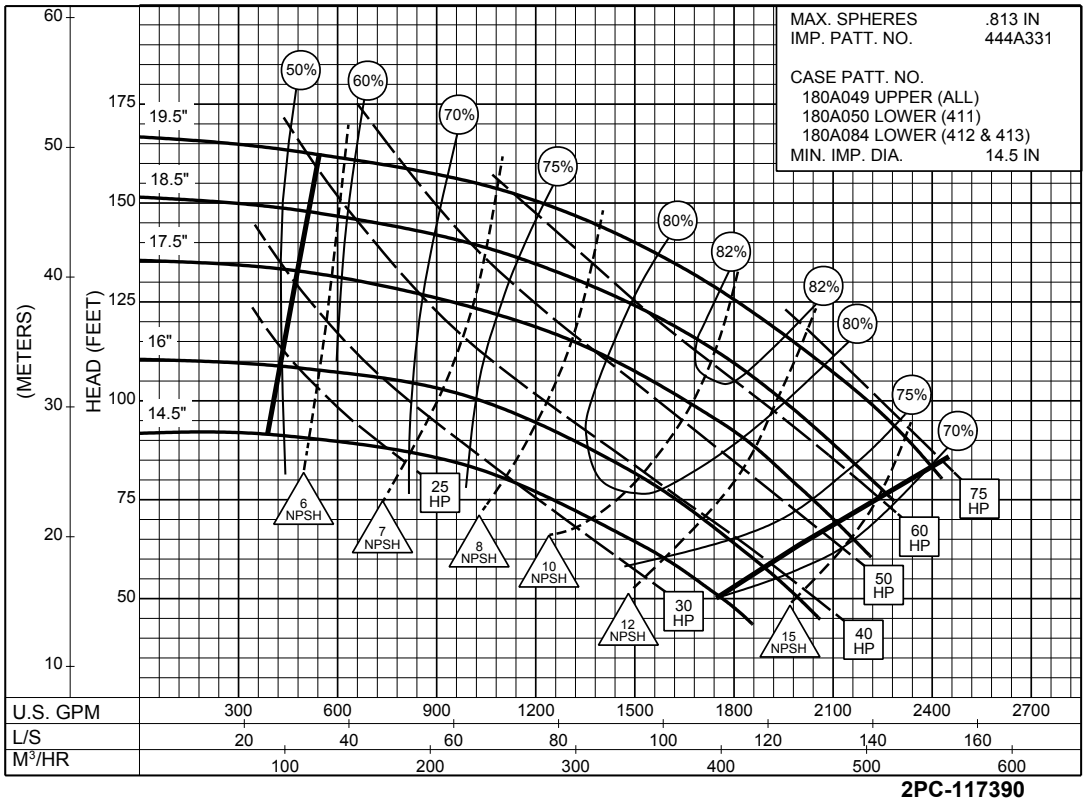
SIZE : 6x8x20 **TYPE : 410** **IMPELLER : Enclosed** **R. P. M. : 1750**



2PC-117389

1750 RPM

SIZE : 6x8x20 **TYPE : 410** **IMPELLER : Enclosed** **R. P. M. : 1150**



2PC-117390

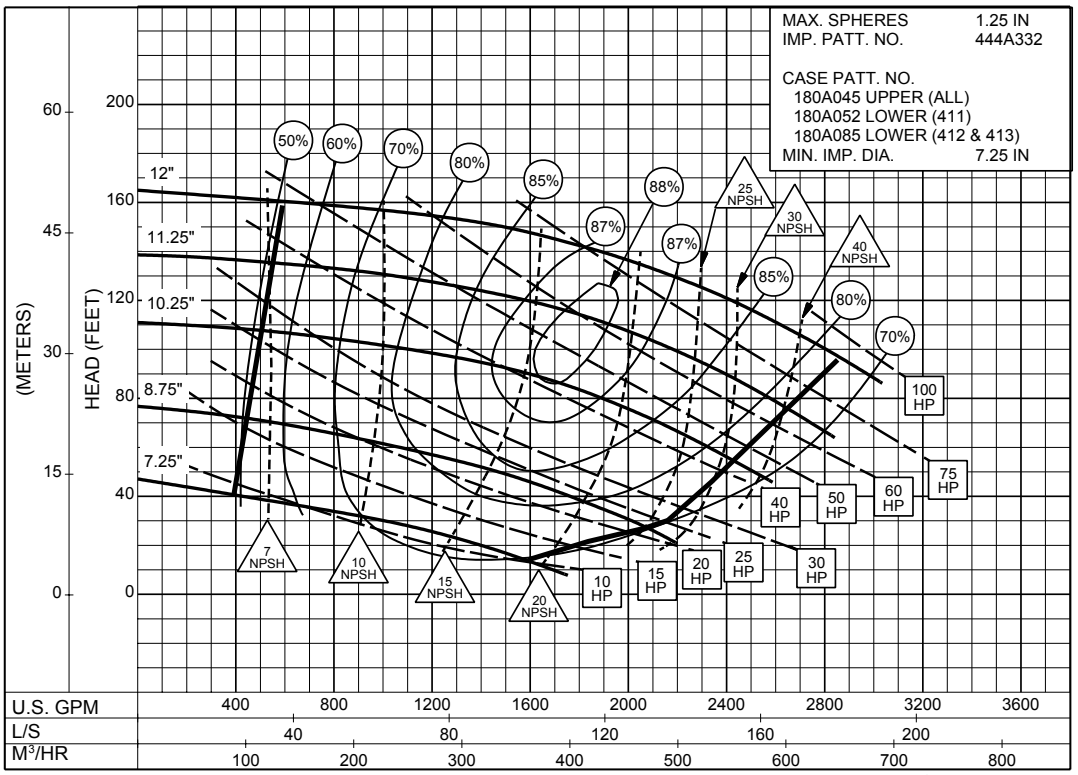
1150 RPM

8 x 8 x 11B
SERIES 410

ENCLOSED IMPELLER

1750 RPM

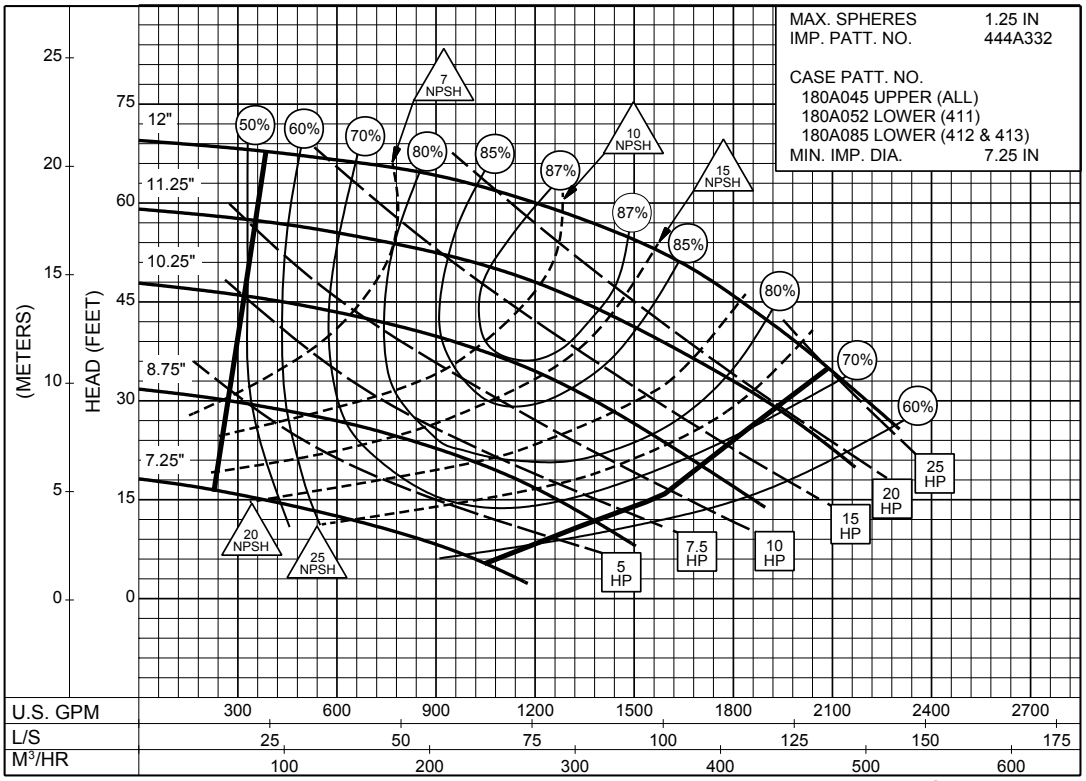
SIZE : 8x8x11B **TYPE : 410** **IMPELLER : Enclosed** **R. P. M. : 1750**



2PC-131637

1150 RPM

SIZE : 8x8x11B **TYPE : 410** **IMPELLER : Enclosed** **R. P. M. : 1150**

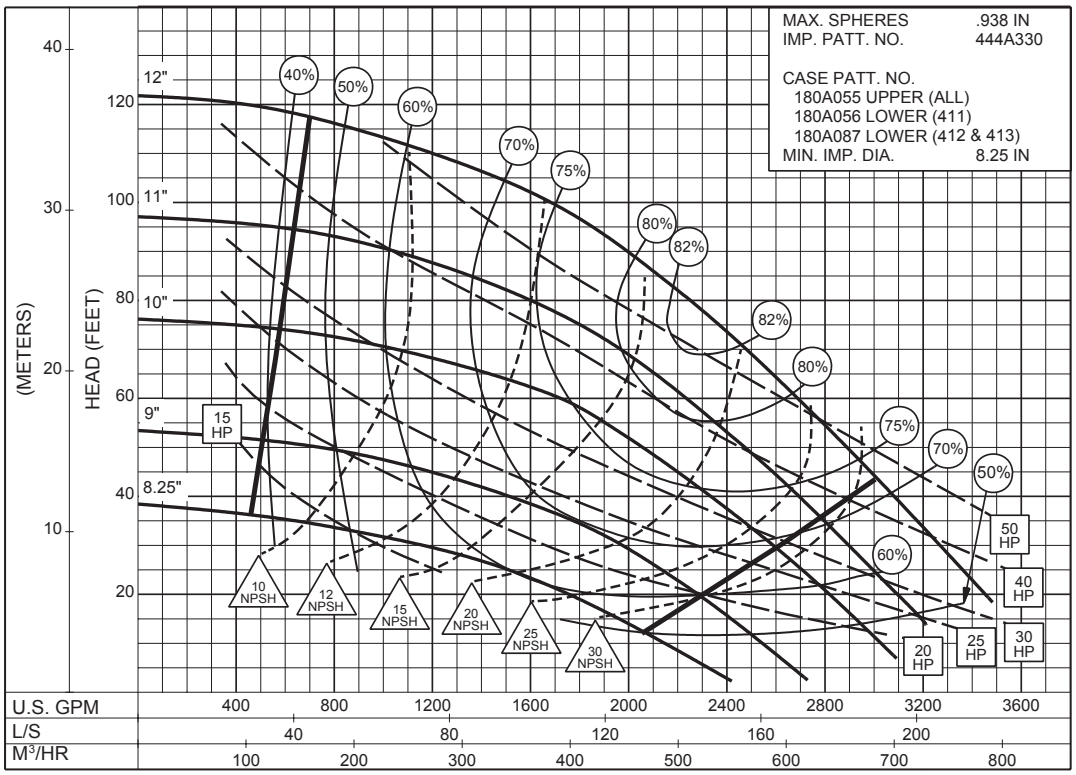


2PC-131638

8 x 10 x 12
SERIES 410

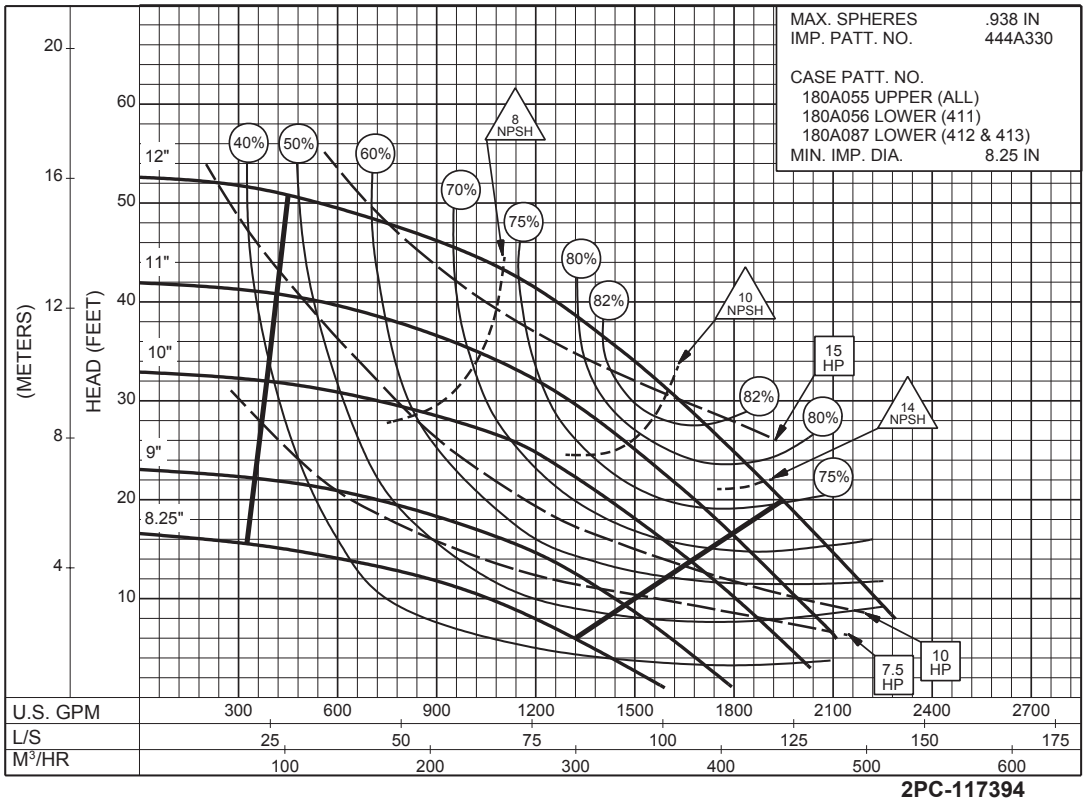
ENCLOSED IMPELLER

SIZE : 8x10x12 **TYPE : 410** **IMPELLER : Enclosed** **R. P. M. : 1750**



1750 RPM

SIZE : 8x10x12 **TYPE : 410** **IMPELLER : Enclosed** **R. P. M. : 1150**



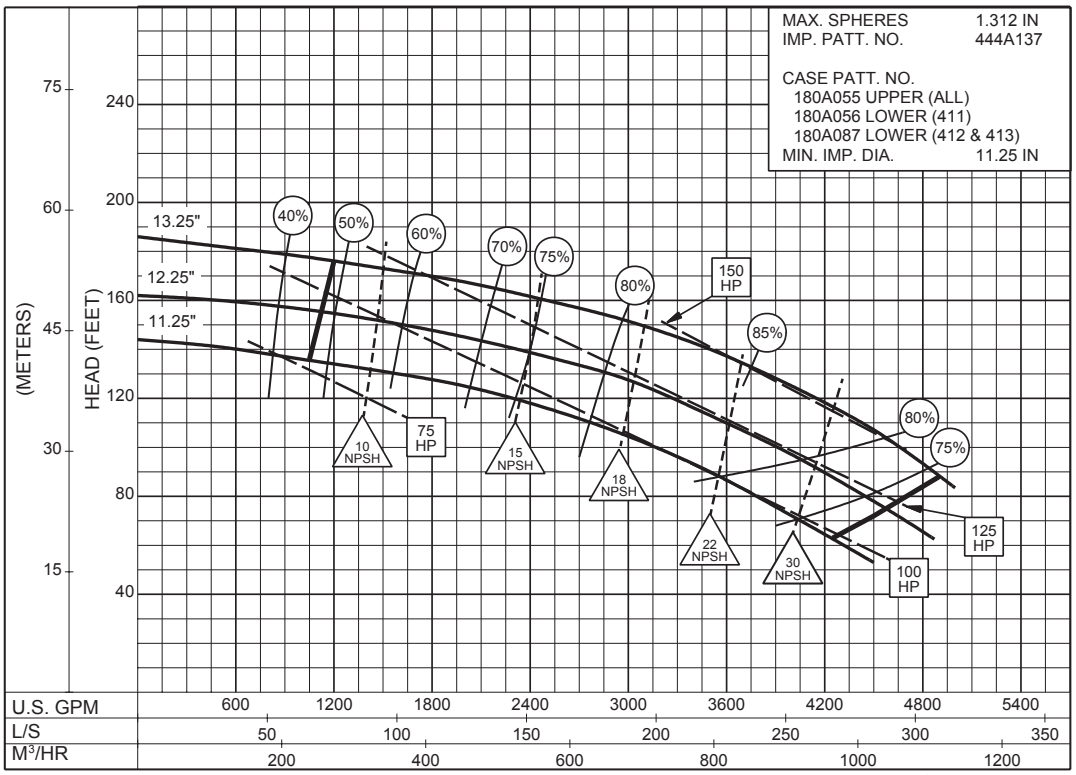
1150 RPM

8 x 10 x 12A
SERIES 410

ENCLOSED IMPELLER

1775 RPM

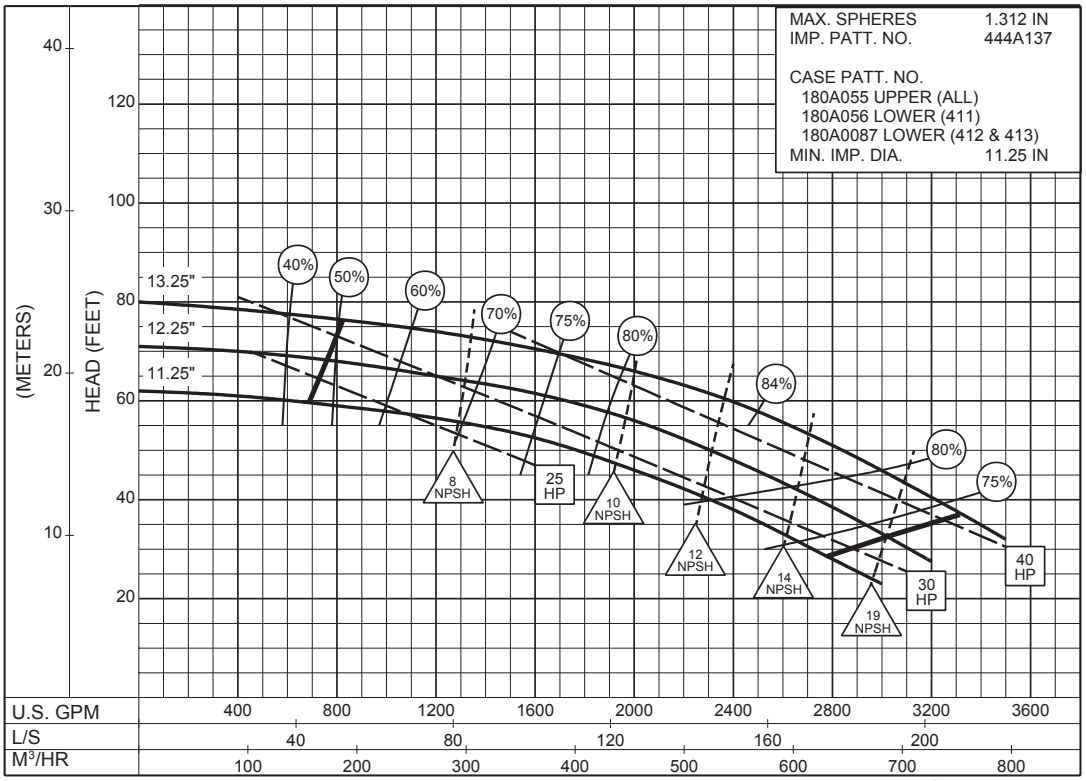
SIZE : 8x10x12A **TYPE : 410** **IMPELLER : Enclosed** **R. P. M. : 1775**



2PC-146000

1175 RPM

SIZE : 8x10x12A **TYPE : 410** **IMPELLER : Enclosed** **R. P. M. : 1175**



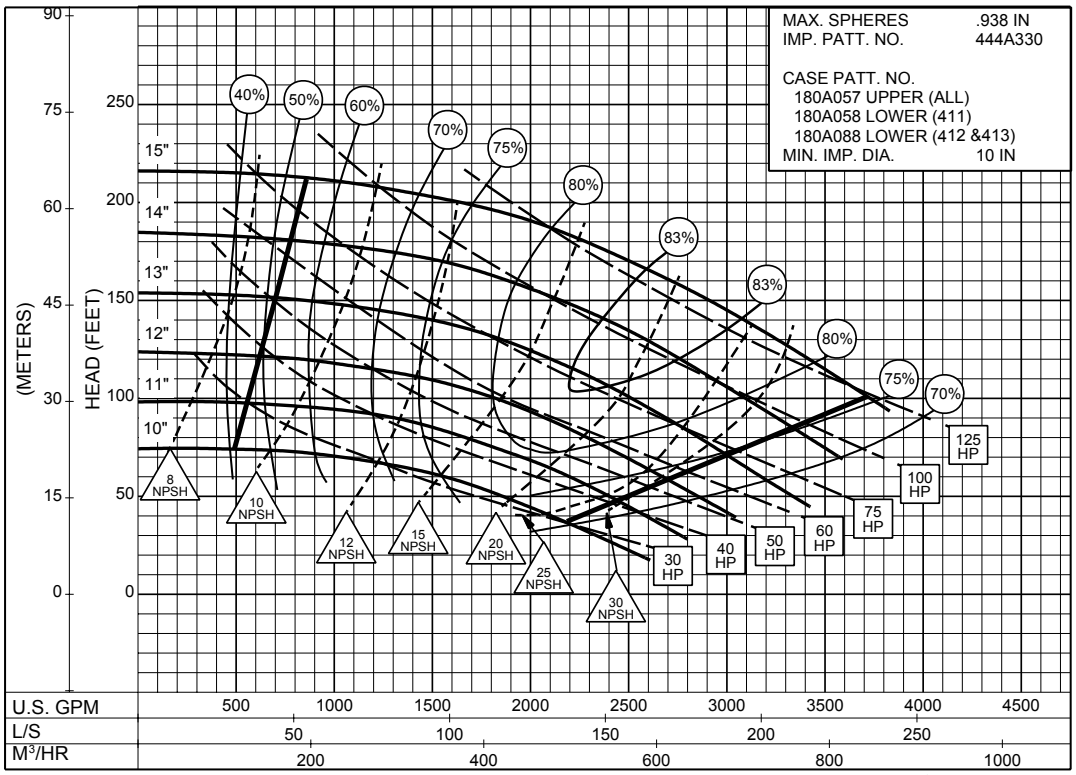
2PC-145999

8 x 10 x 15A
SERIES 410

ENCLOSED IMPELLER

Supersedes Section 410 Page 427
Dated June 1989

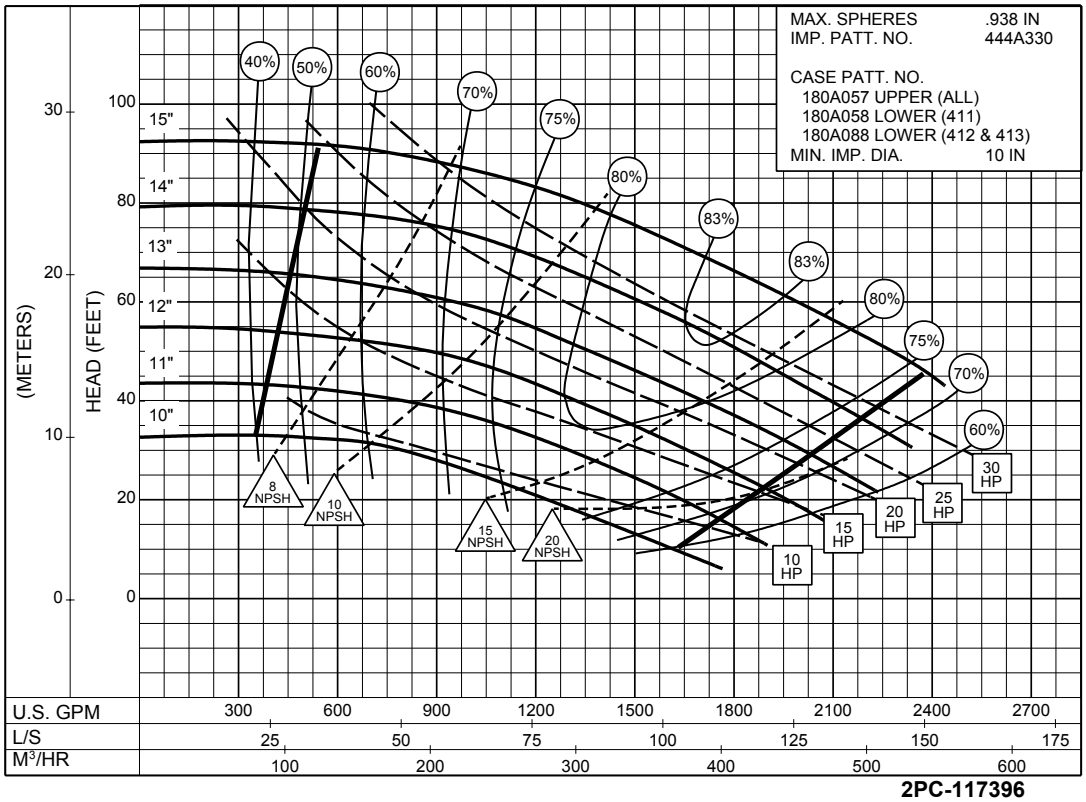
SIZE : 8x10x15A **TYPE : 410** **IMPELLER : Enclosed** **R. P. M. : 1750**



2PC-117395

1750 RPM

SIZE : 8x10x15A **TYPE : 410** **IMPELLER : Enclosed** **R. P. M. : 1150**



2PC-117396

1150 RPM

AURORA®
Pentair Pump Group

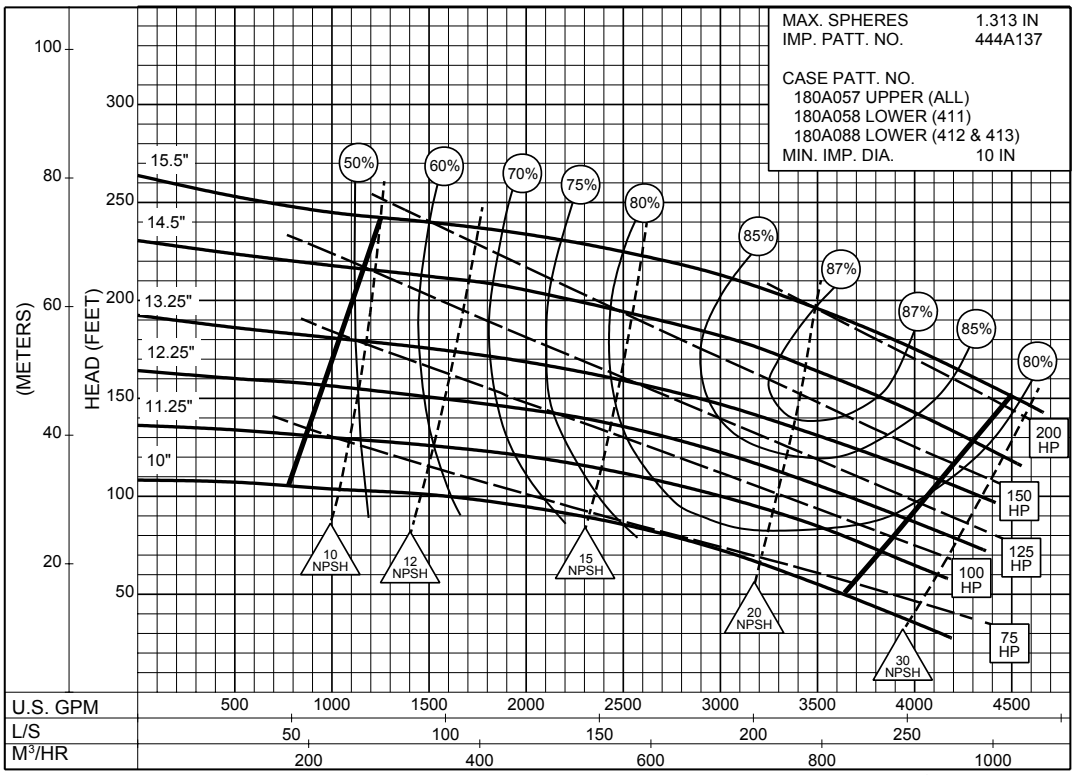
Supersedes Section 410 Page 428
Dated October 1990

8 x 10 x 15B
SERIES 410

ENCLOSED IMPELLER

1750 RPM

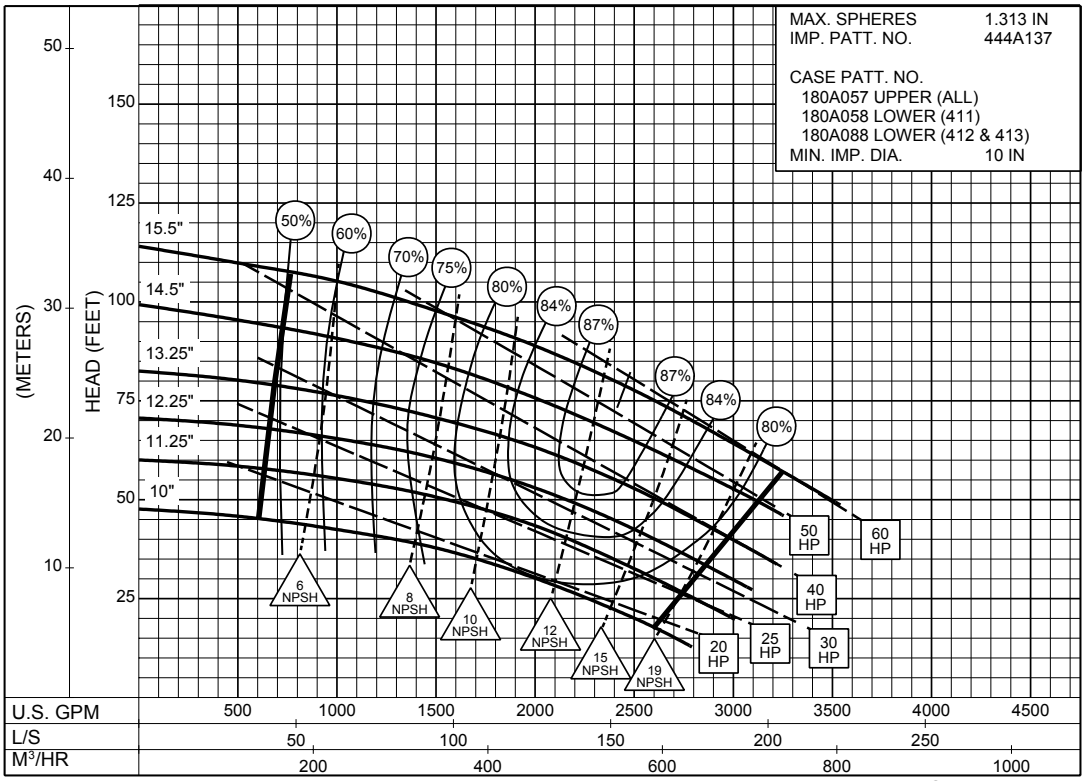
SIZE : 8x10x15B **TYPE : 410** **IMPELLER : Enclosed** **R. P. M. : 1750**



2PC-120356B

1150 RPM

SIZE : 8x10x15B **TYPE : 410** **IMPELLER : Enclosed** **R. P. M. : 1150**



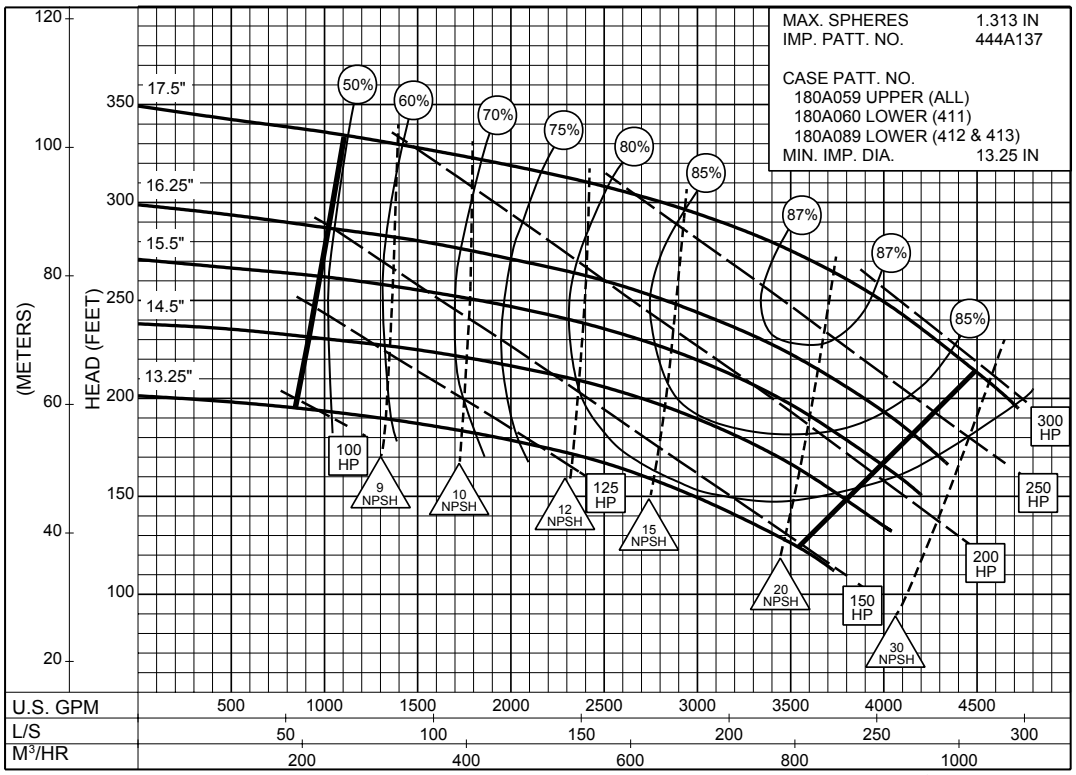
2PC-120357A

AURORA®
Pentair Pump Group

8 x 10 x 17B
SERIES 410

ENCLOSED IMPELLER

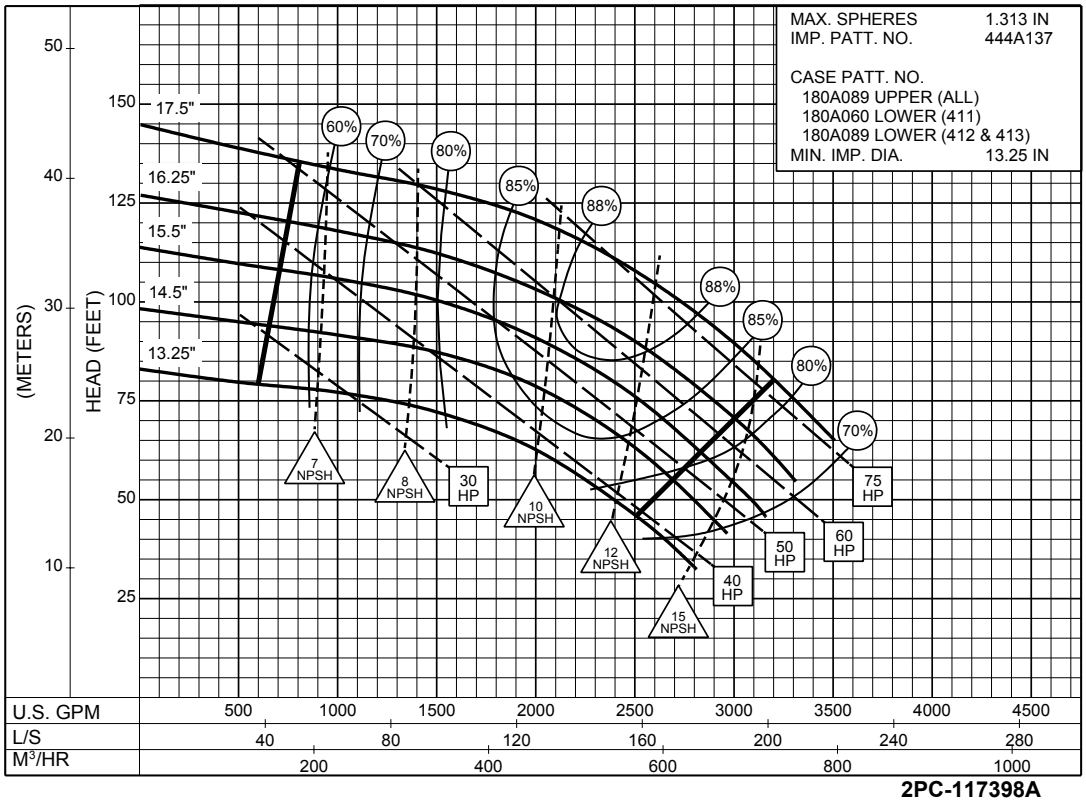
SIZE : 8x10x17B **TYPE : 410** **IMPELLER : Enclosed** **R. P. M. : 1775**



2PC-117397B

1775 RPM

SIZE : 8x10x17B **TYPE : 410** **IMPELLER : Enclosed** **R. P. M. : 1150**



2PC-117398A

1150 RPM

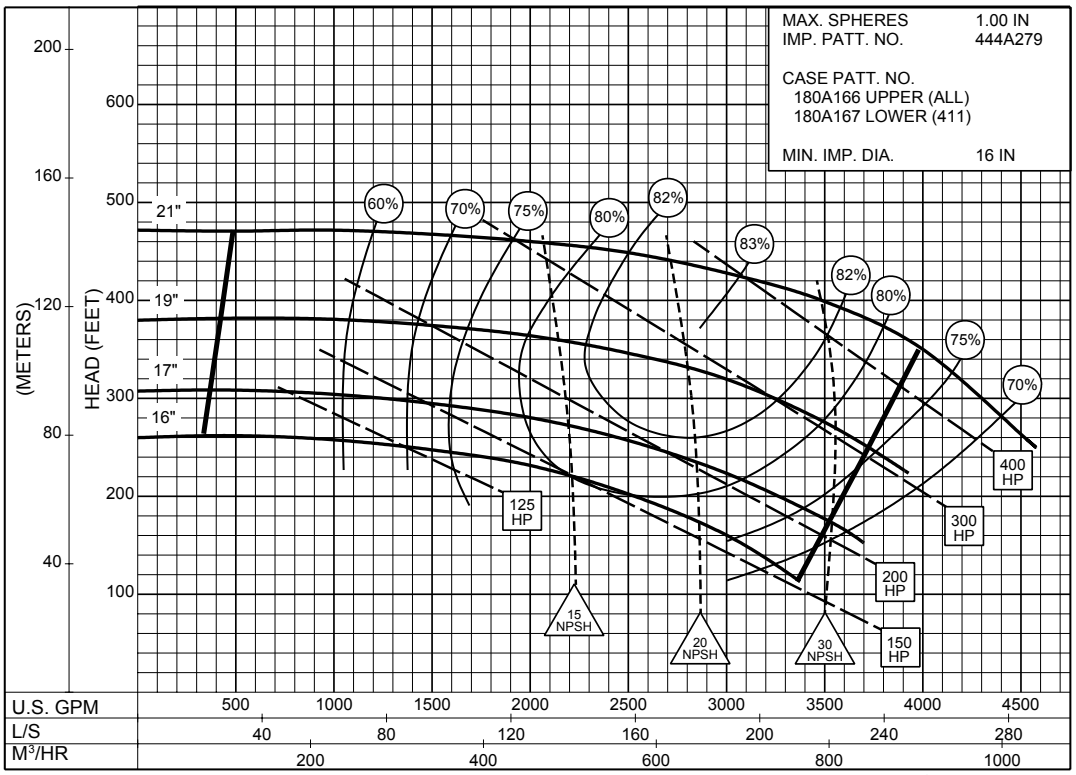
AURORA®
Pentair Pump Group

8 x 10 x 21
SERIES 410

ENCLOSED IMPELLER

1775 RPM

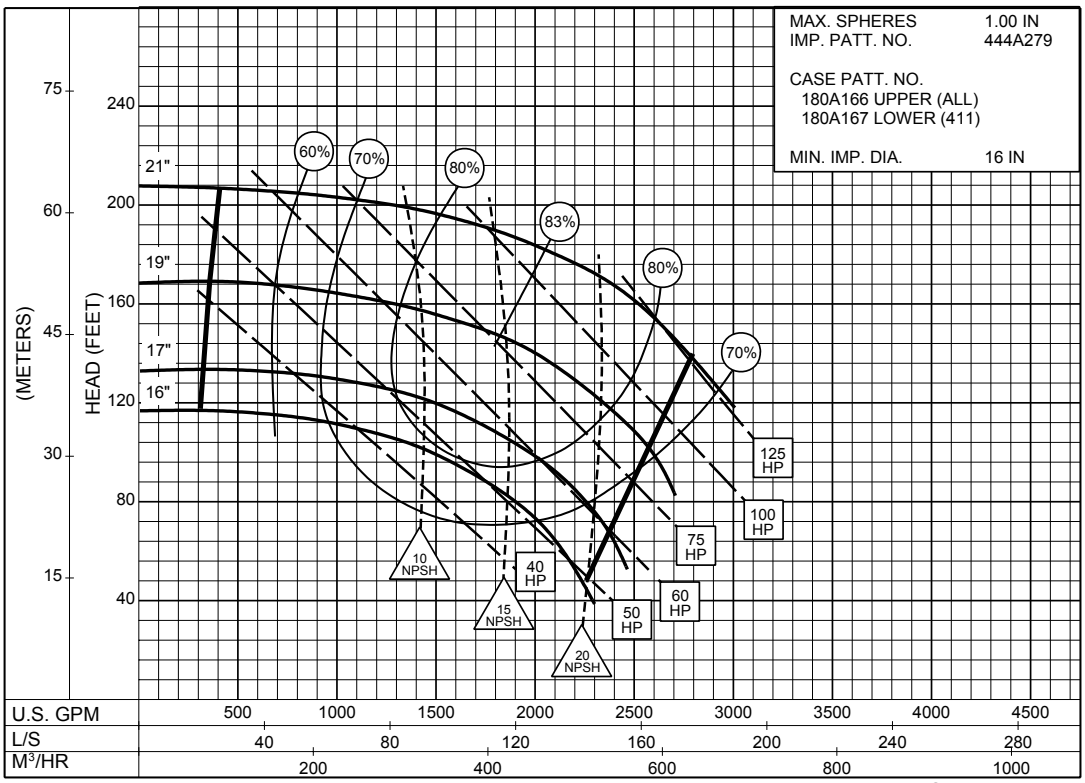
SIZE : 8x10x21 **TYPE : 410** **IMPELLER : Enclosed** **R. P. M. : 1775**



2PC-140831

1175 RPM

SIZE : 8x10x21 **TYPE : 410** **IMPELLER : Enclosed** **R. P. M. : 1175**



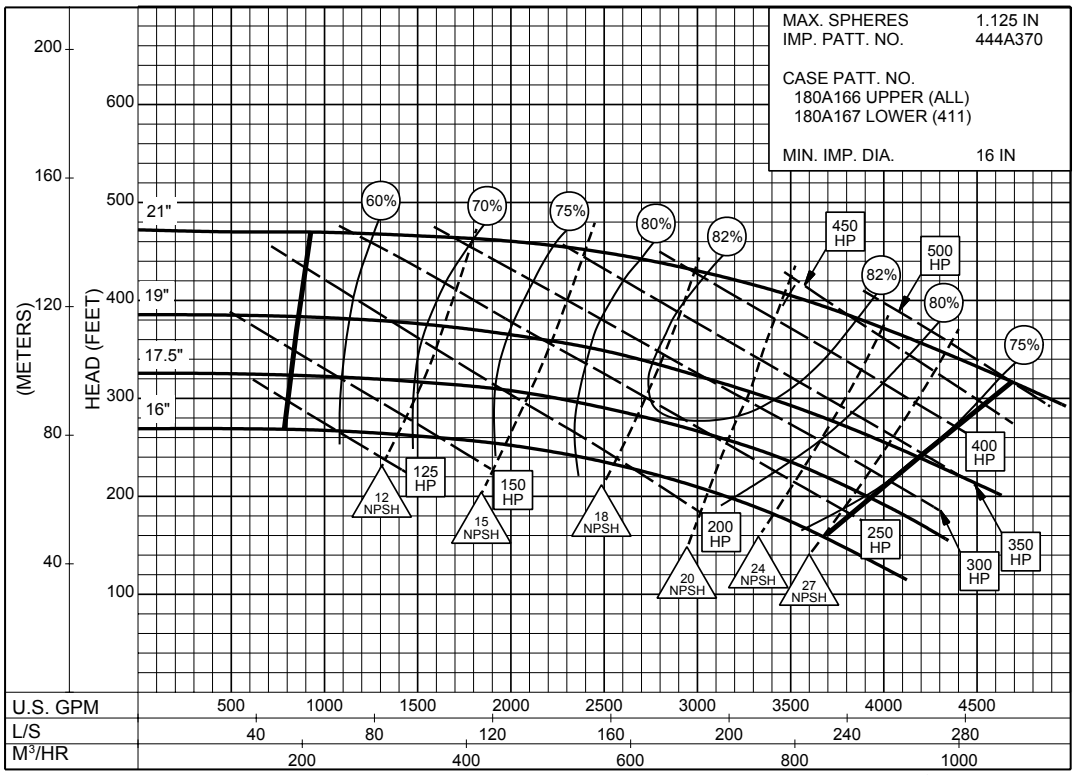
2PC-140832

8 x 10 x 21A
SERIES 410

ENCLOSED IMPELLER

Supersedes Section 410 Page 430A
Dated June 1989

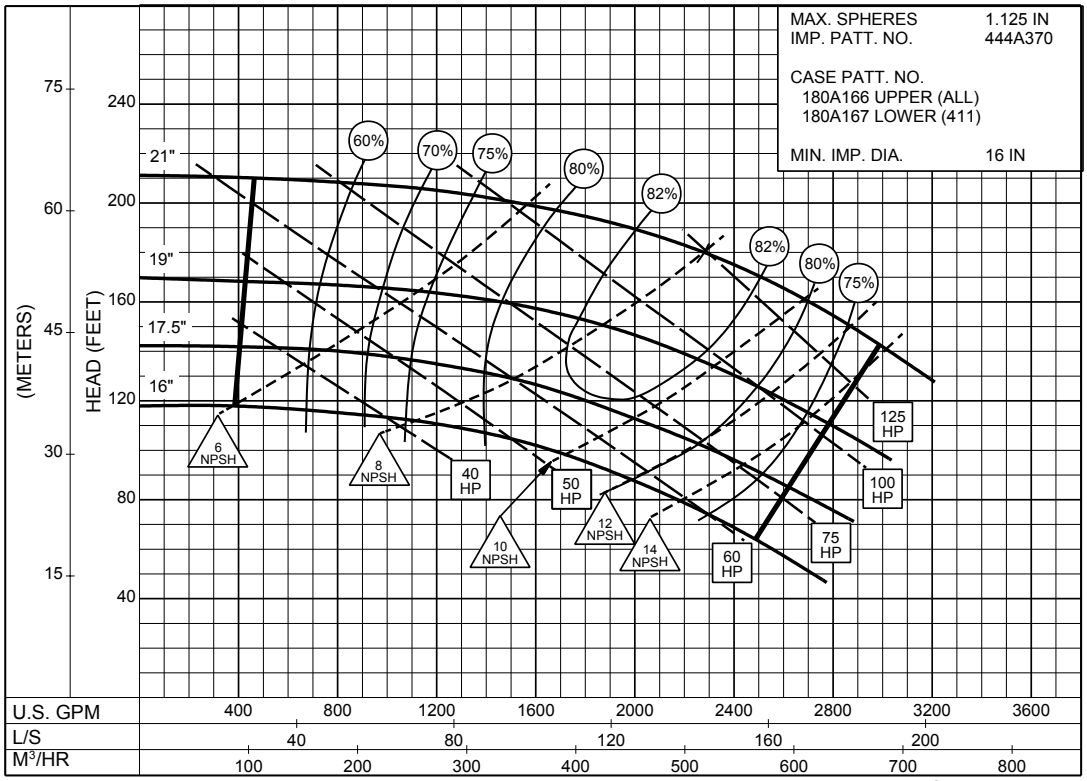
SIZE : 8x10x21A **TYPE : 410** **IMPELLER : Enclosed** **R. P. M. : 1775**



2PC-153772

1775 RPM

SIZE : 8x10x21A **TYPE : 410** **IMPELLER : Enclosed** **R. P. M. : 1175**

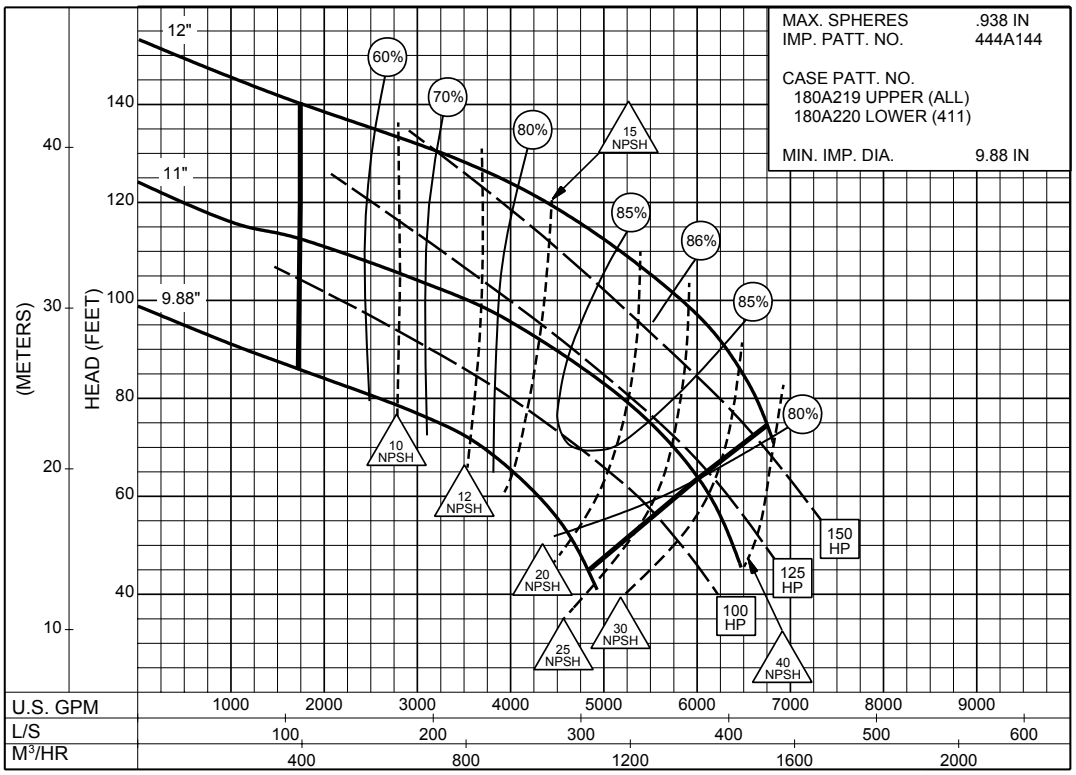


2PC-153773

1175 RPM

AURORA®
Pentair Pump Group

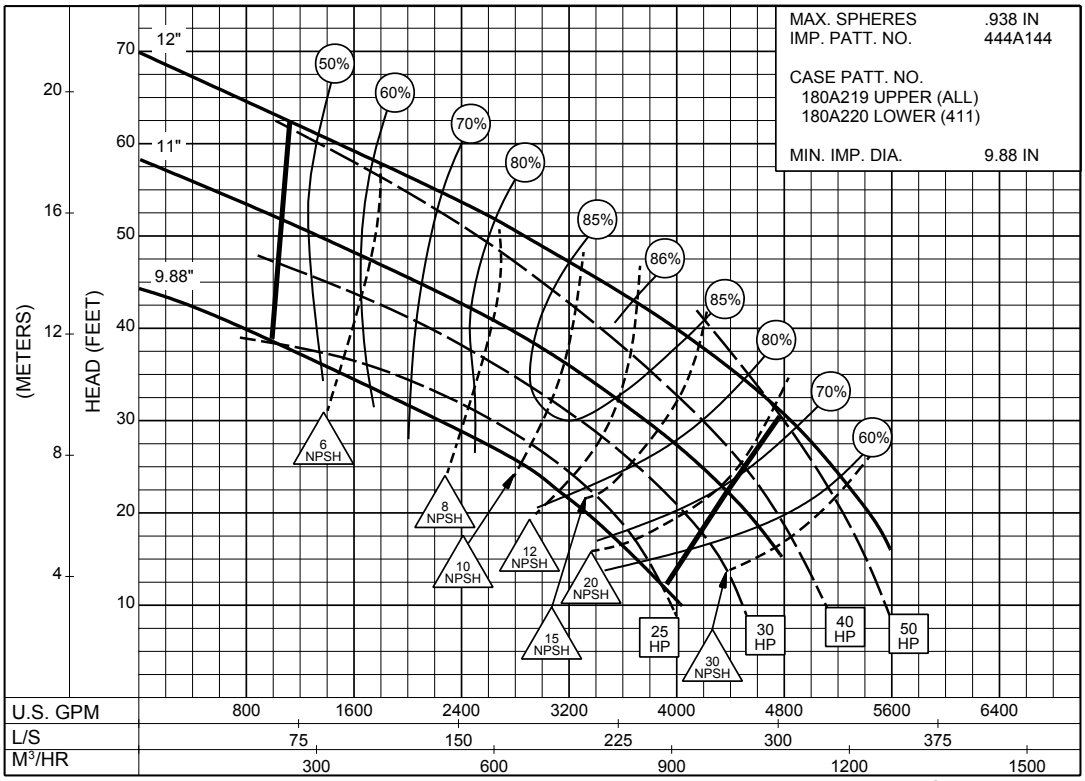
SIZE : 10x12x12B **TYPE : 410** **IMPELLER : Enclosed** **R. P. M. : 1760**



2PC-117399

1760 RPM

SIZE : 10x12x12B **TYPE : 410** **IMPELLER : Enclosed** **R. P. M. : 1175**



2PC-117400

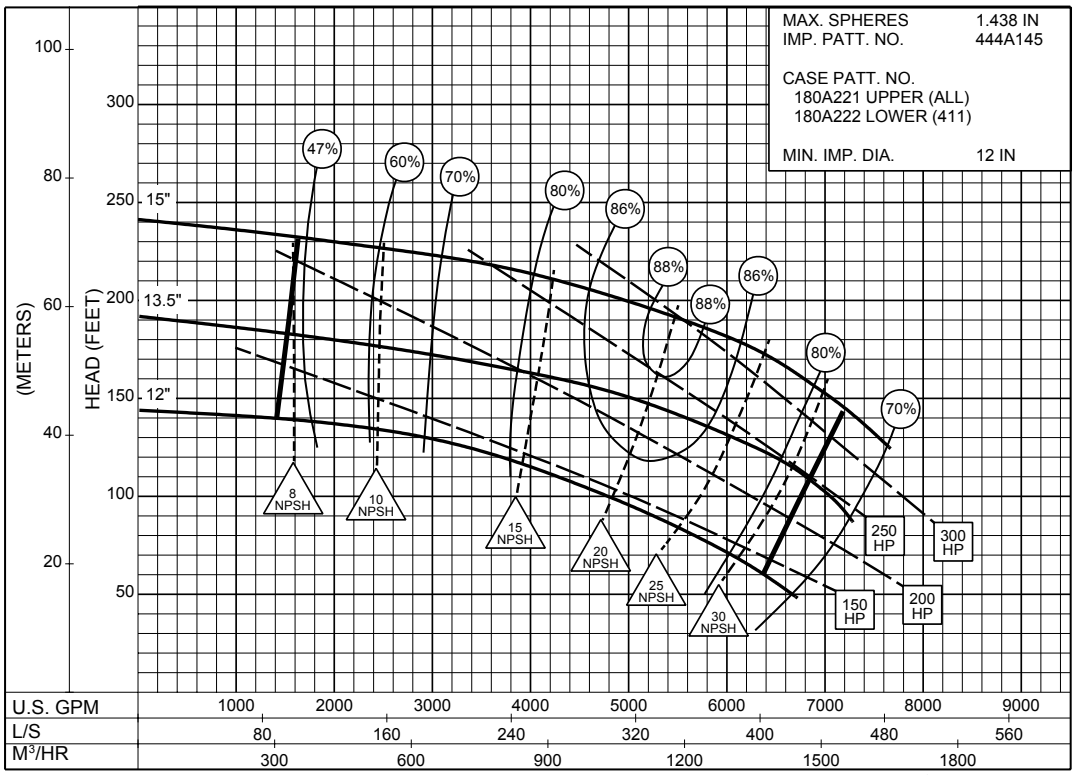
1175 RPM

10 x 12 x 15B
SERIES 410

ENCLOSED IMPELLER

1775 RPM

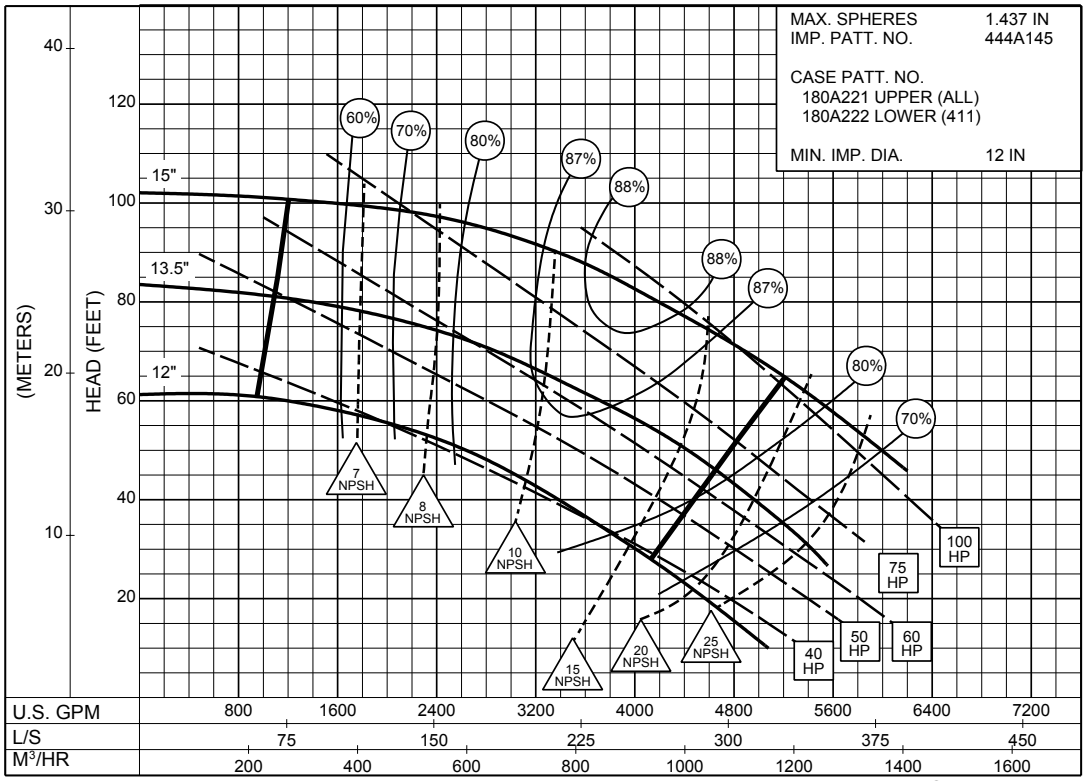
SIZE : 10x12x15B **TYPE : 410** **IMPELLER : Enclosed** **R. P. M. : 1775**



2PC-117401

1170 RPM

SIZE : 10x12x15B **TYPE : 410** **IMPELLER : Enclosed** **R. P. M. : 1170**



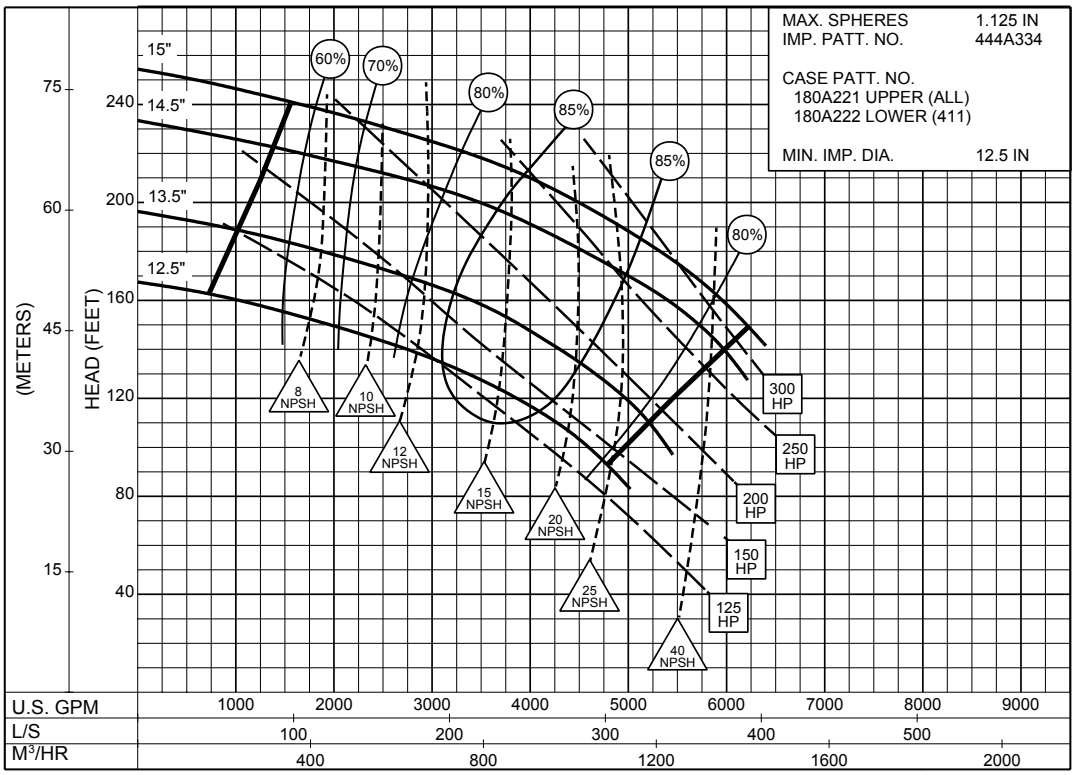
2PC-117402

AURORA®
Pentair Pump Group

10 x 12 x 15C
SERIES 410

ENCLOSED IMPELLER

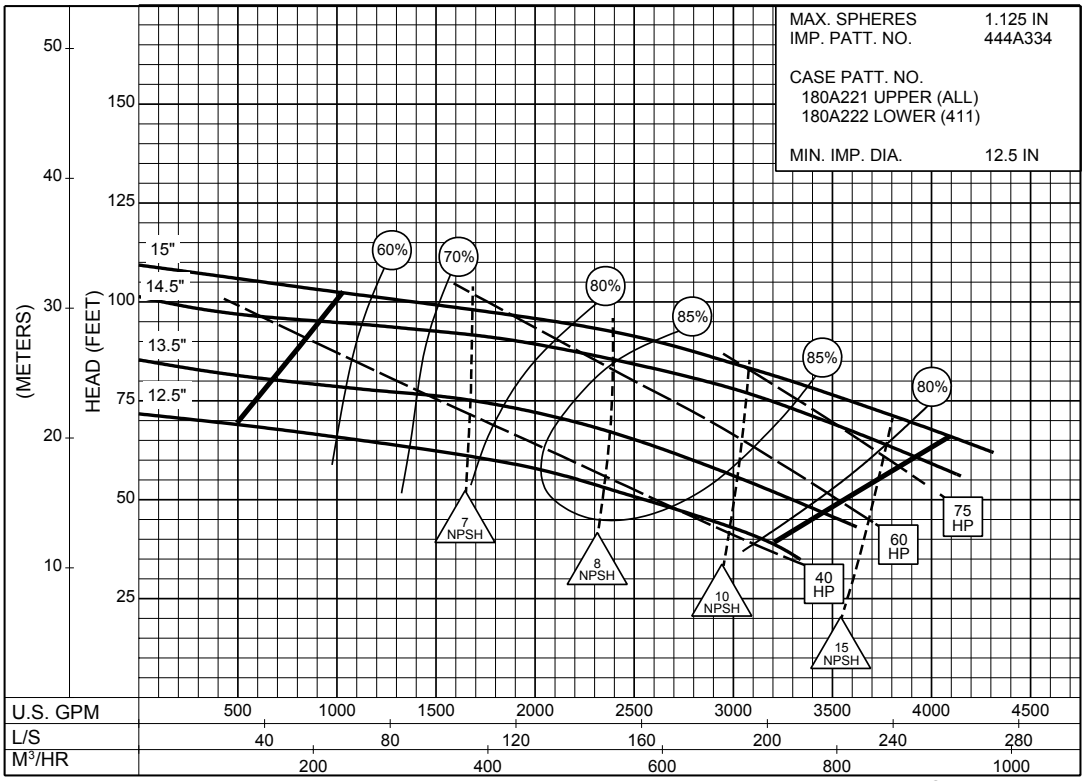
SIZE : 10x12x15C **TYPE : 410** **IMPELLER : Enclosed** **R. P. M. : 1775**



1775 RPM

2PC-125182

SIZE : 10x12x15C **TYPE : 410** **IMPELLER : Enclosed** **R. P. M. : 1175**



1175 RPM

2PC-125181

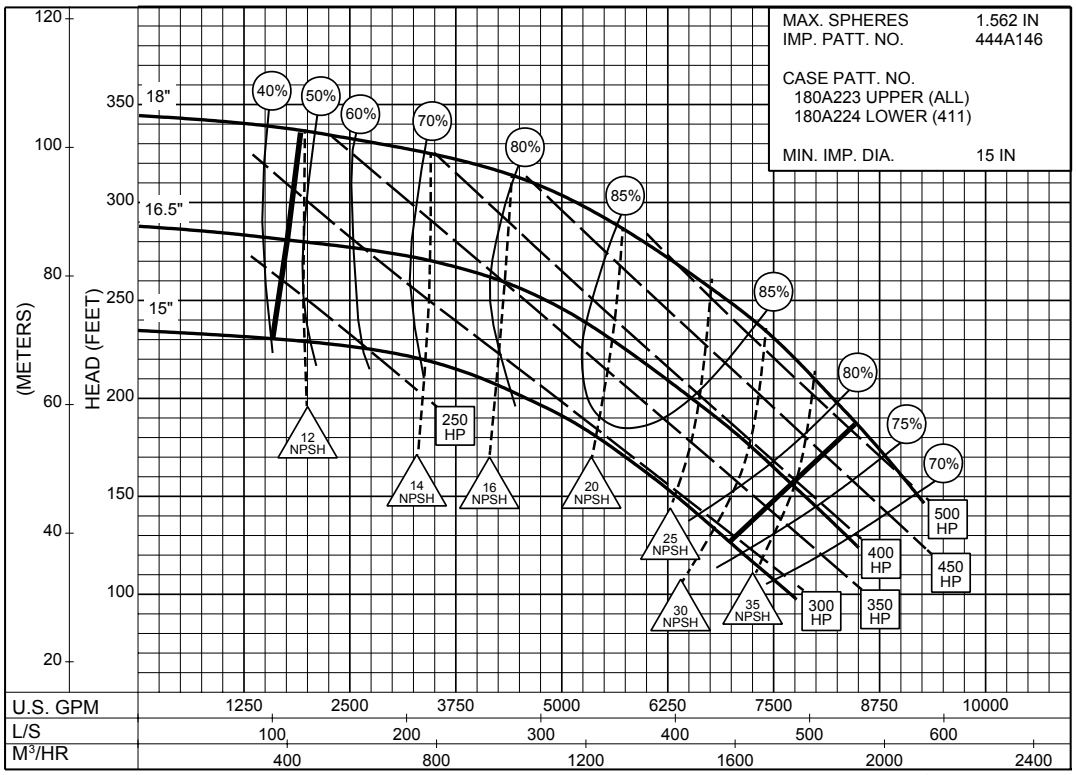
AURORA®
Pentair Pump Group

10 x 12 x 18
SERIES 410

ENCLOSED IMPELLER

1775 RPM

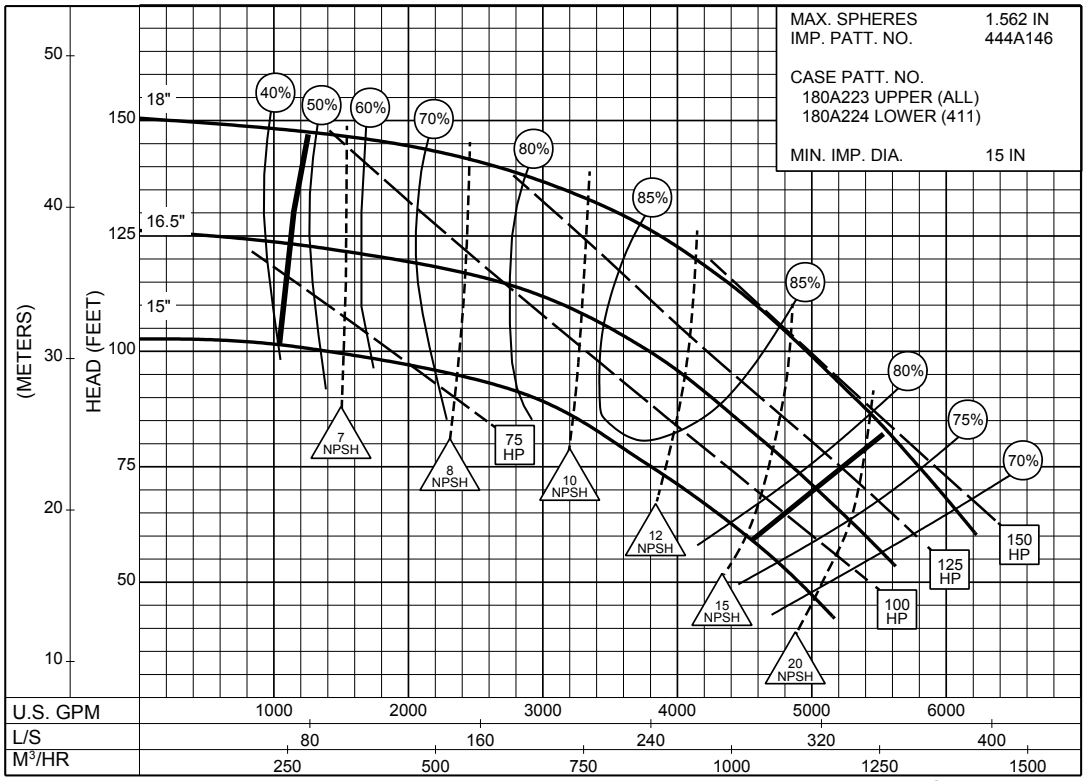
SIZE : 10x12x18 TYPE : 410 IMPELLER : Enclosed R. P. M. : 1775



2PC-117403

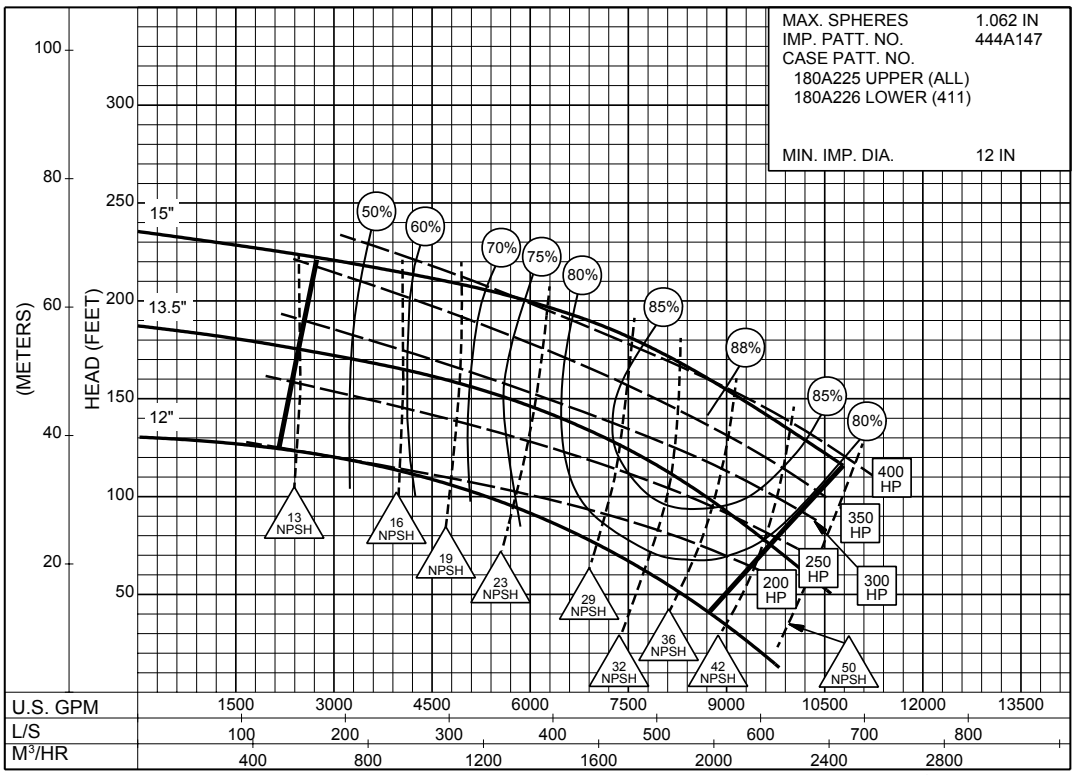
1175 RPM

SIZE : 10x12x18 TYPE : 410 IMPELLER : Enclosed R. P. M. : 1175



2PC-117404

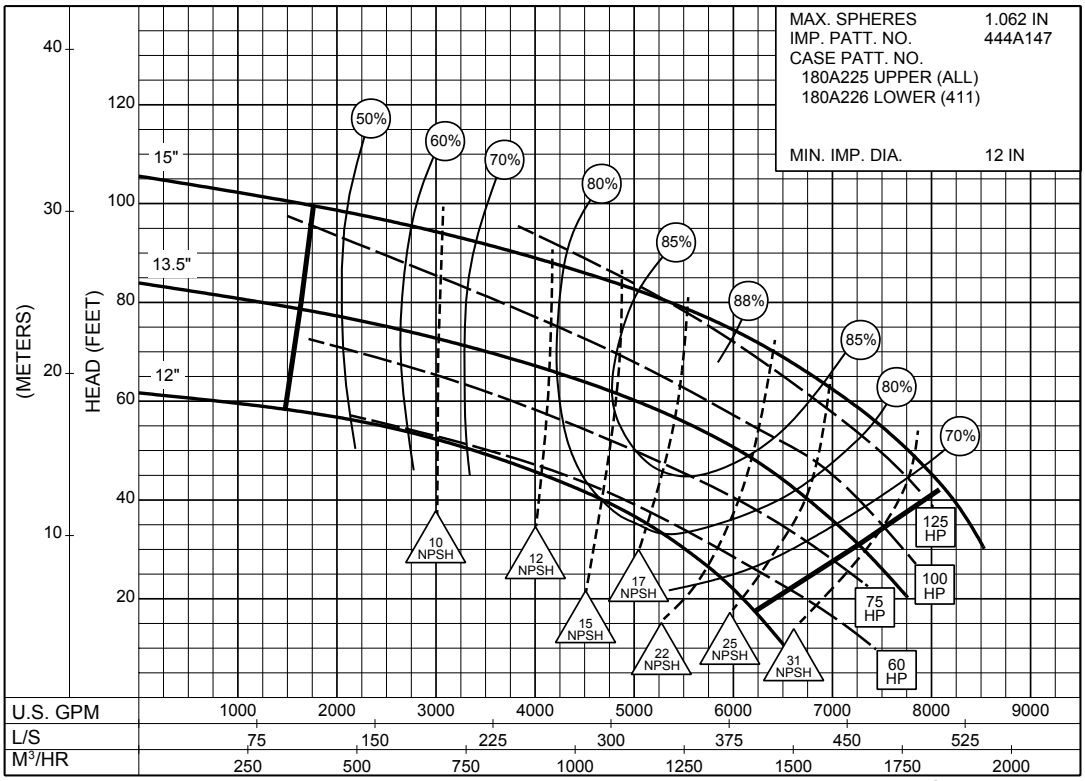
SIZE : 12x14x15B **TYPE : 410** **IMPELLER : Enclosed** **R. P. M. : 1775**



2PC-132822A

1775 RPM

SIZE : 12x14x15B **TYPE : 410** **IMPELLER : Enclosed** **R. P. M. : 1175**



2PC-132823A

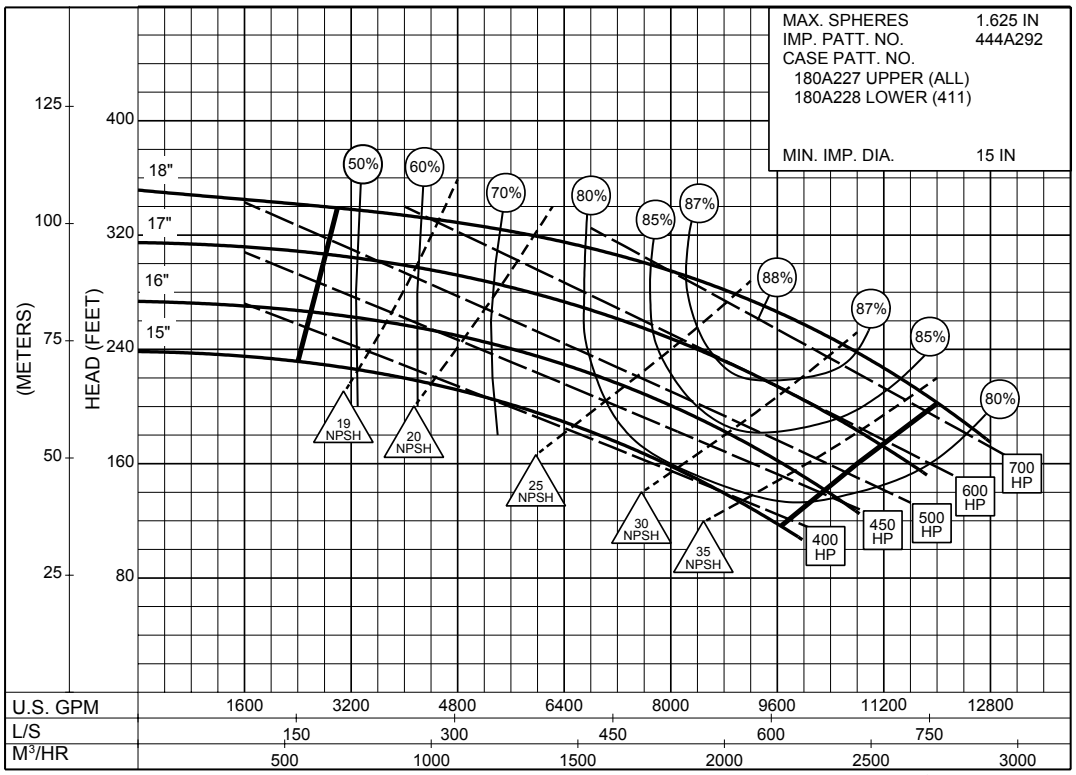
1175 RPM

12 x 14 x 18A
SERIES 410

ENCLOSED IMPELLER

1775 RPM

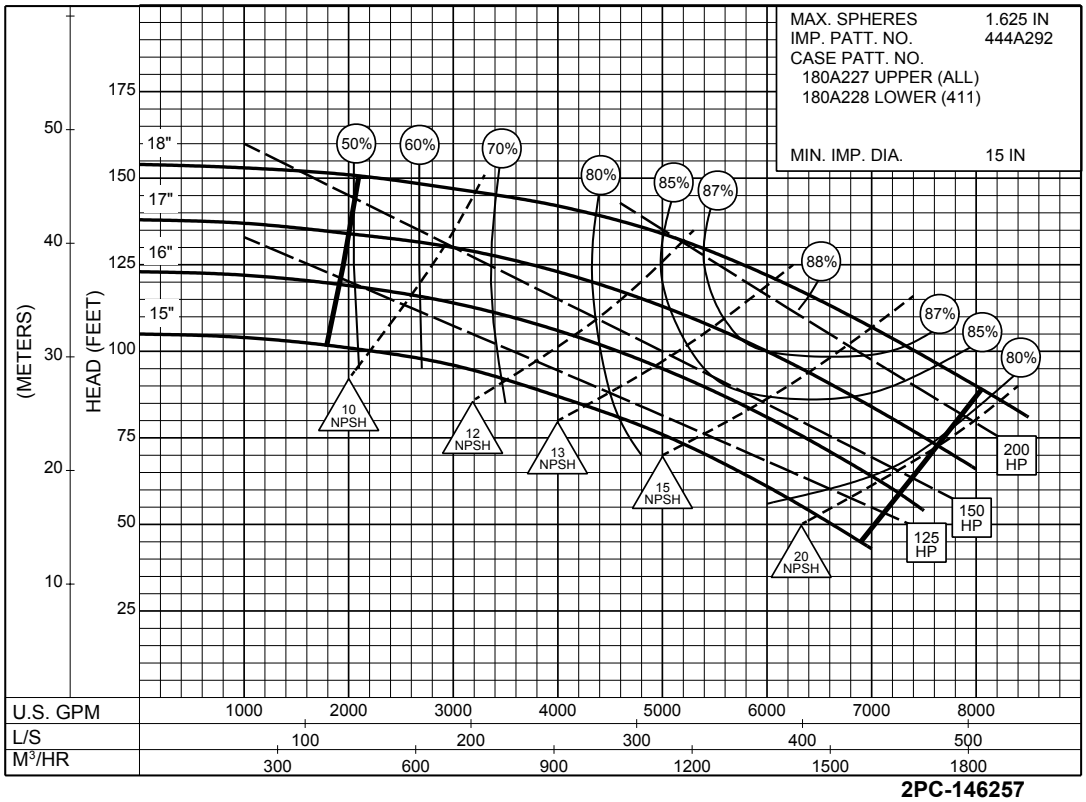
SIZE : 12x14x18A **TYPE : 410** **IMPELLER : Enclosed** **R. P. M. : 1775**



2PC-146258

1175 RPM

SIZE : 12x14x18A **TYPE : 410** **IMPELLER : Enclosed** **R. P. M. : 1175**



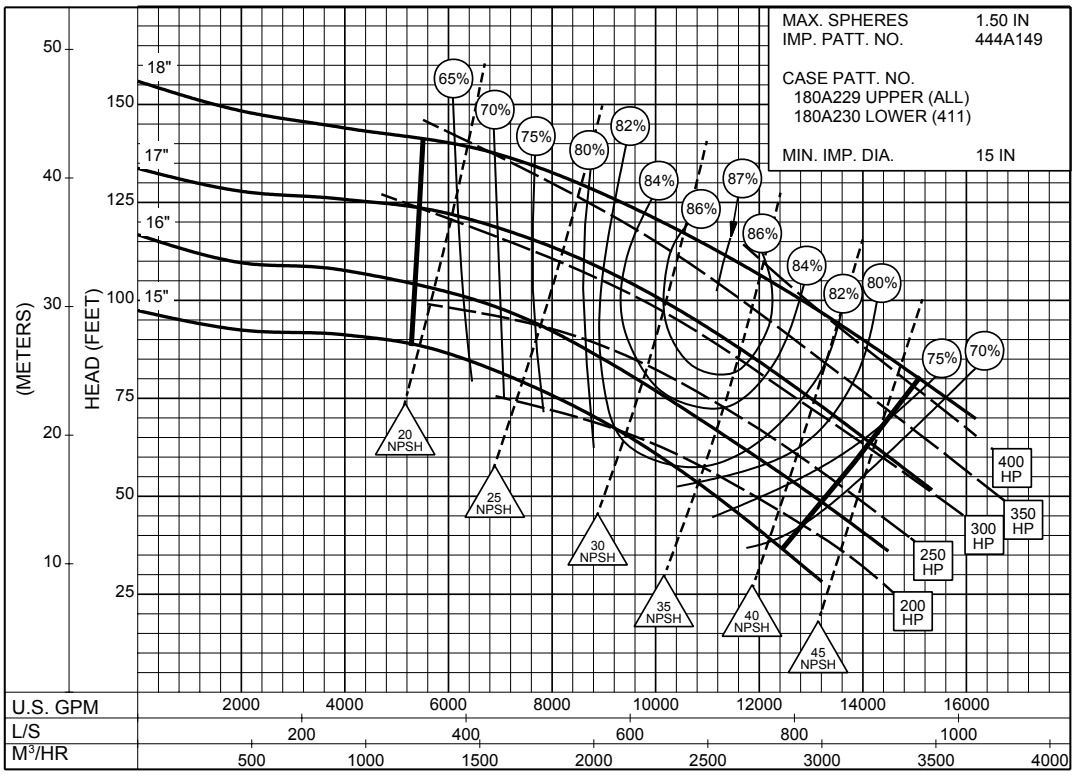
2PC-146257

14 x 16 x 18
SERIES 410

ENCLOSED IMPELLER

Supersedes Section 410 Page 437
Dated June 1989

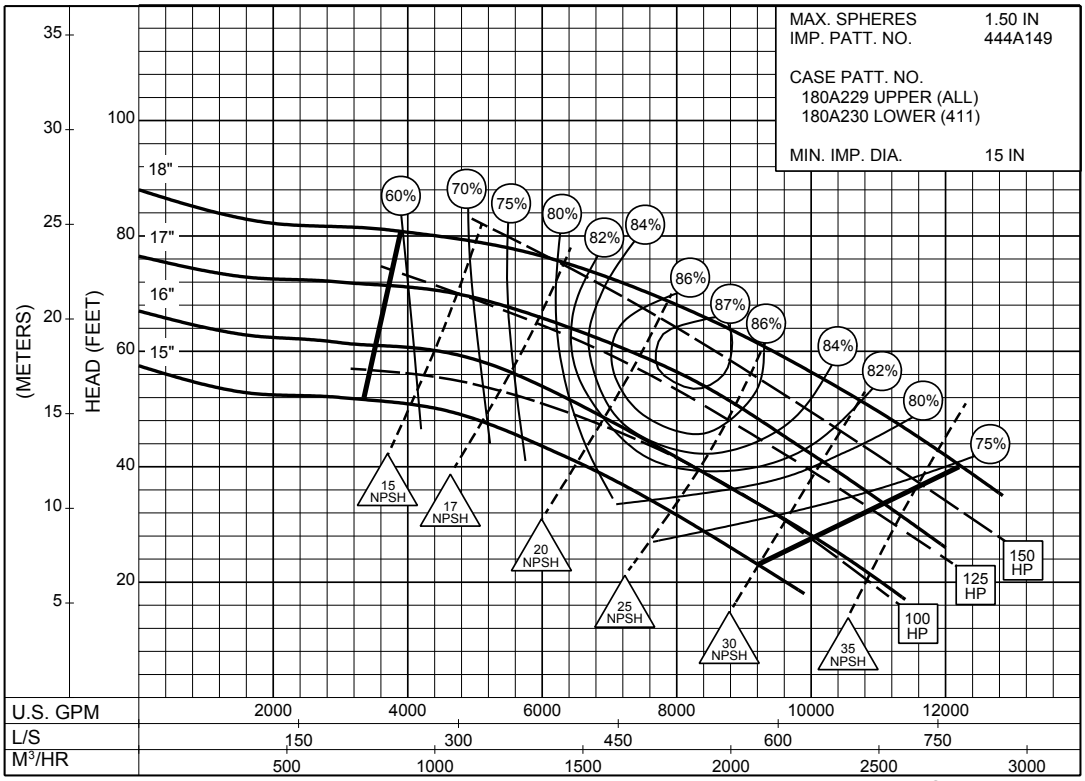
SIZE : 14x16x18 **TYPE : 410** **IMPELLER : Enclosed** **R. P. M. : 1180**



2PC-132250

1180 RPM

SIZE : 14x16x18 **TYPE : 410** **IMPELLER : Enclosed** **R. P. M. : 885**



2PC-132251

885 RPM

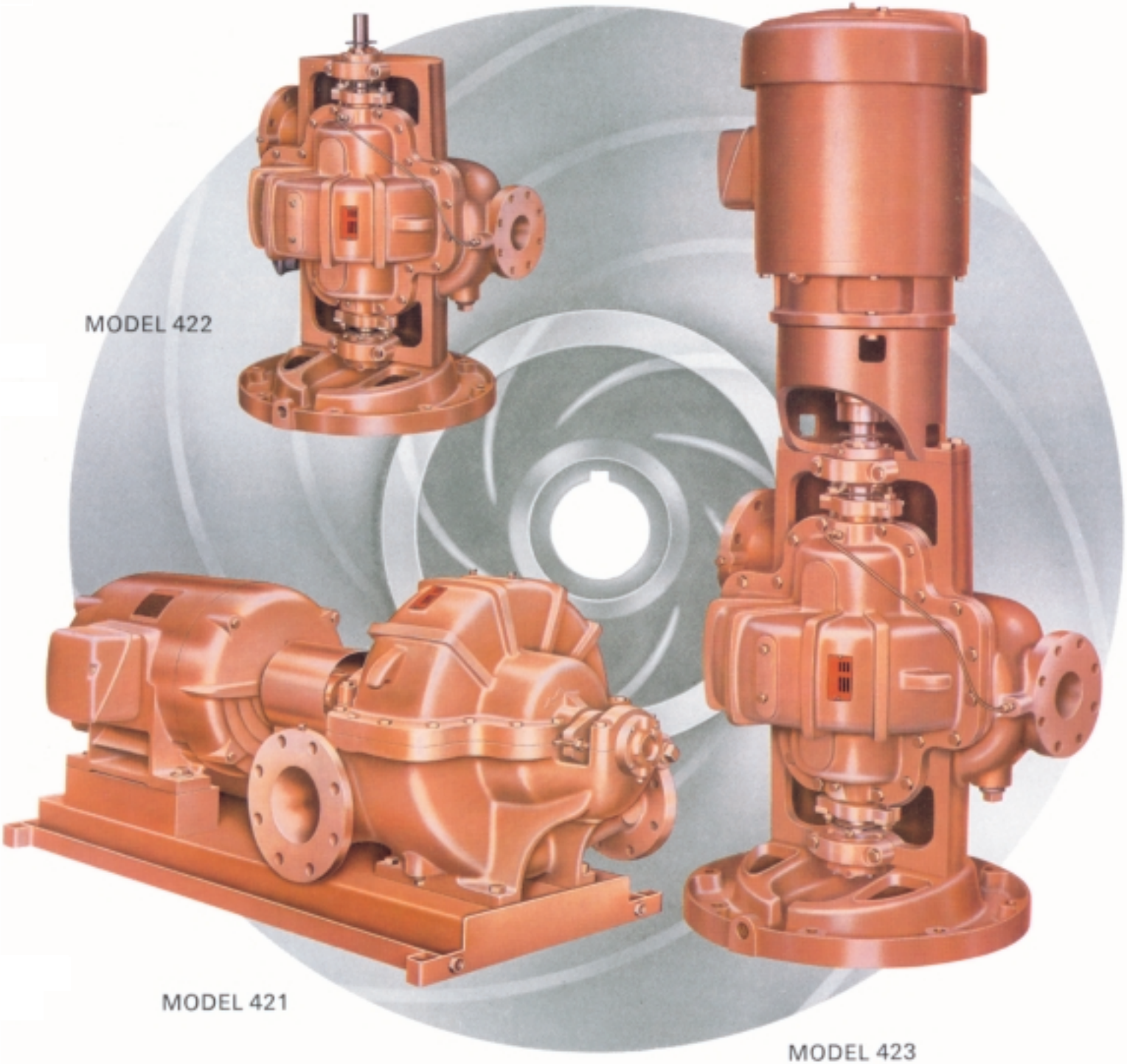
AURORA PUMP A member of PENTAIR PUMP GROUP

AURORA PUMP

BULLETIN 420/REV. H

420 SERIES MULTI-STAGE SPLIT CASE PUMPS

CAPACITIES TO 1800 G.P.M.
HEADS TO 600 FEET
TEMPERATURES TO 275°F



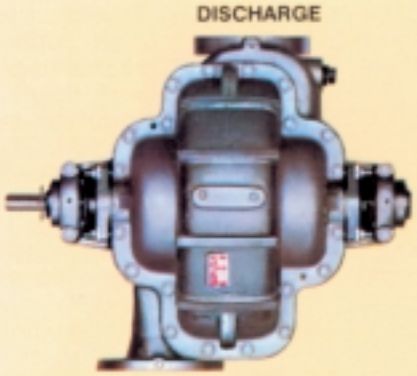
MODEL 422

MODEL 421

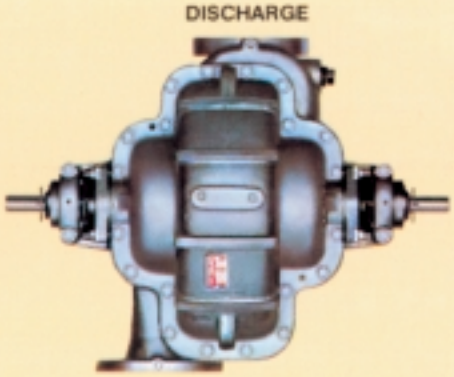
MODEL 423

INTRODUCTION
420 SERIES PUMPS

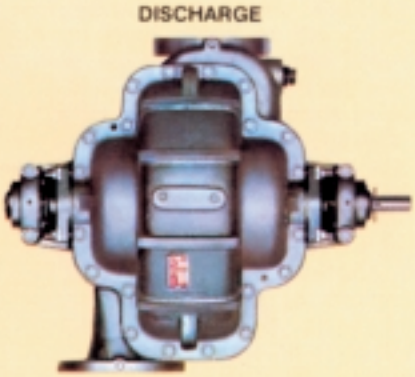
The horizontal split case pump has long and properly been used for the handling of liquids where the utmost in reliability and accessibility are paramount. Billions of gallons of liquid have been pumped by split case opposed suction pumps and billions more will be pumped considering the rapid industrial, agricultural and commercial expansion. The Aurora 420 Series pumps make a significant contribution to the customer requirements for pumps on this type of service. The 420 Series is a modern design based on Aurora Pump's 70 years experience with the design, sales and manufacture of horizontal split case pumps. Look through this bulletin and see what real accomplishments can be made when an imaginative approach is taken to the customer's problem of moving liquids within a piping system. See Aurora now!



STANDARD
RIGHT HAND ROTATION



OPTIONAL DUAL DRIVE
RIGHT HAND ROTATION



OPTIONAL
LEFT HAND ROTATION

QUICK REFERENCE 420 SERIES FEATURE SELECTOR

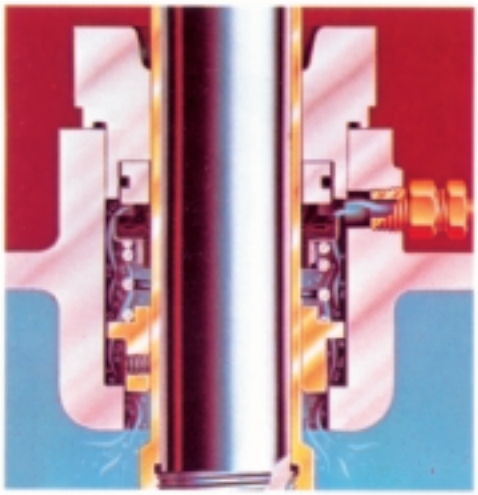
STANDARD

- Bronze fitted pump construction
- Bronze shaft sleeves
- Dynamically balanced impellers
- Bronze case wearing rings
- Multi-volute on 2" and larger pumps
- Stainless steel impeller key
- Regreaseable ball bearings
- Single row ball bearing (inboard)
- Double row ball bearing (outboard)
- Mechanical seals . . . single unbalanced (Model 422 and 423)
- Interwoven, graphite/Teflon lubricated acrylic yarn packing rings (Model 421)
- Internal bypass between casing and stuffing box (First Stage)
- 125# suct., 250# disch. ASA flanges
- 250 psi case working pressure
- Carbon steel shaft
- Stuffing box bushings
- Lifting lugs
- Hydrostatic test
- Cast integral bearing arms
- Water slingers and grease seals
- Coupling guard (Model 421)

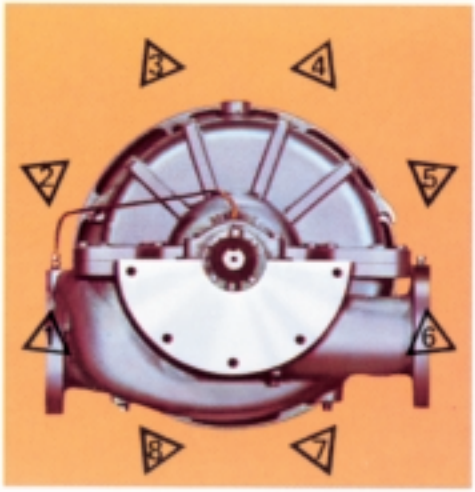
OPTIONAL

- All iron, all bronze or special alloy pump construction
- Hardened 440C stainless steel shaft sleeves (packing only)
- 316 stainless steel shaft sleeves (mechanical seal)
- Impeller wearing rings
- Oil lubricated ball bearings (model 421 horizontal pump)
- Mechanical seals . . . single unbalanced (Model 421)
- Stainless steel or monel shaft
- External bypass between casing and stuffing box
- Steel drip rim, formed steel or fabricated steel bases
- Double extended shaft (Model 421)
- Right or left hand rotation
- Certified performance test
- Packing with lantern ring (Model 421)
- 250# ASA suction & discharge flanges
- Water cooled bearings

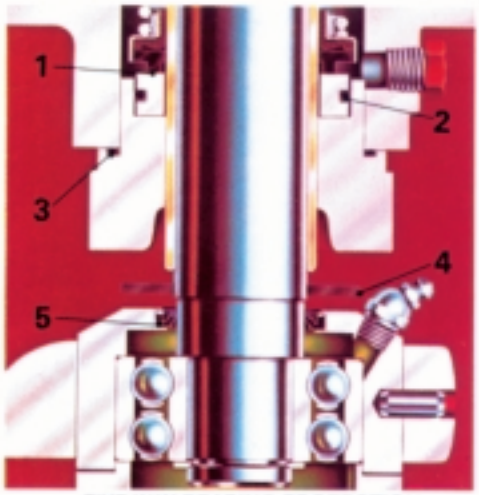
VERTICAL PUMP FEATURES



EXTERNAL UPPER SEAL FLUSH



INLINE PIPING IN ANY DIRECTION



FIVE WAY BEARING PROTECTION

GO VERTICAL AND PUT 2 PUMPS WHERE ONLY ONE HORIZONTAL WOULD FIT.

Aurora's space saving vertical split case pumps have long been recognized for their reliability. This reputation in the field of vertical installations has been re-emphasized since the introduction of the Model 423 as pumps of unmatched quality.

VERTICAL PUMPS PROVIDE DISTINCT ADVANTAGES OVER HORIZONTAL PUMP CONSTRUCTION.

1. Less floor space required.
2. Inline piping arrangement allows piping in any direction.
3. Elevated motor protects against potential flooding if the pump station is in a low area.

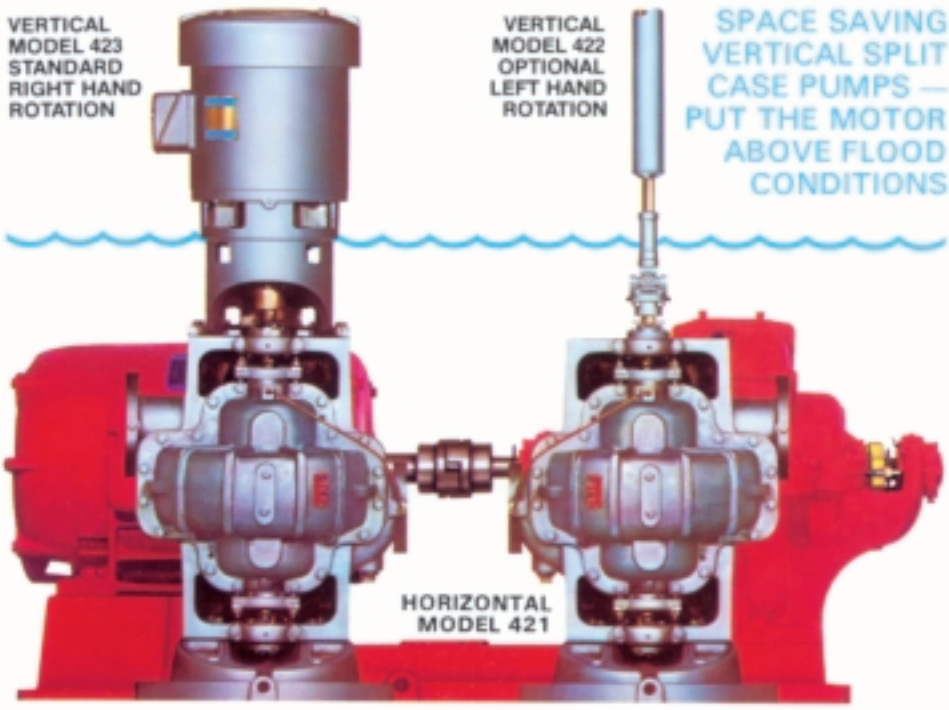
Additional features described for the horizontal pumps are also found in the vertical pumps. In addition, there are several features unique only to verticals.

1 COUPLING ALIGNMENT True alignment is vital to long life and proper performance. To maintain proper coupling alignment the mounting bracket is rabbet fitted to the motor.

2 MECHANICAL SEALS Standard construction includes carbon against Ni-Resist face for optimum hot water performance. Long life is also assured with 303 stainless steel metal parts and "Buna-N" elastomers.

3 BEARING PROTECTION Grease seals and water slingers are provided to protect the bearings from contamination. This important feature is also standard on horizontal pumps.

4 CAST IRON DRIP RIM BASE Accurate positioning of the pump is assured by the mounting base. A drip rim is incorporated in the base design to control condensation and leakage.



MODELS 421 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.

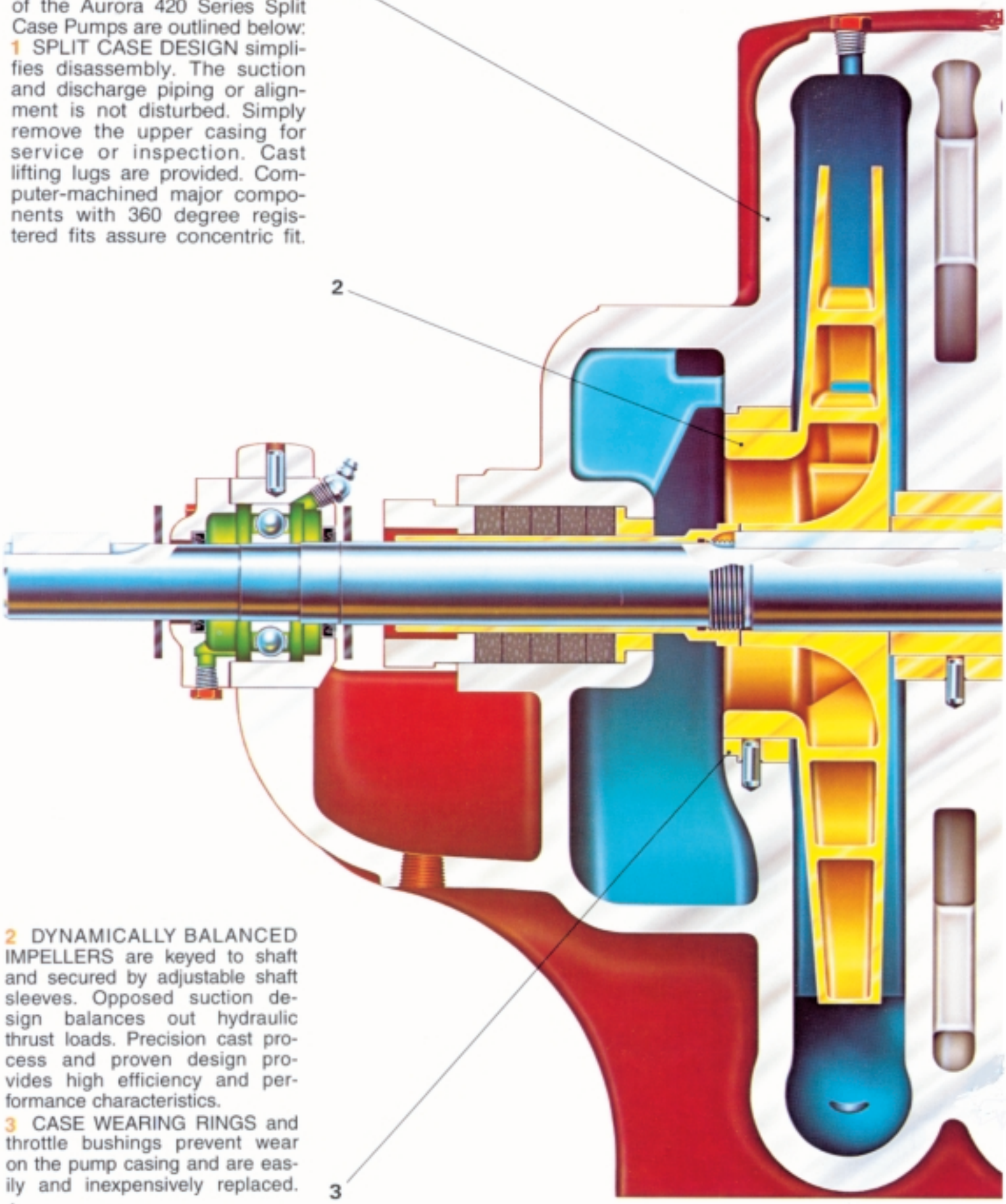
MODELS 422 are vertically mounted and utilize flexible shafting between the driver and the pump. This model is frequently used on difficult applications where flooding of the installation is a possibility.

MODELS 423 are vertically mounted with an elevated driver coupled directly to the pump thru a flexible coupling. Model 423 is very popular for installations where available floor space is limited and where possible flooding is marginal.

HORIZONTAL PUMPS

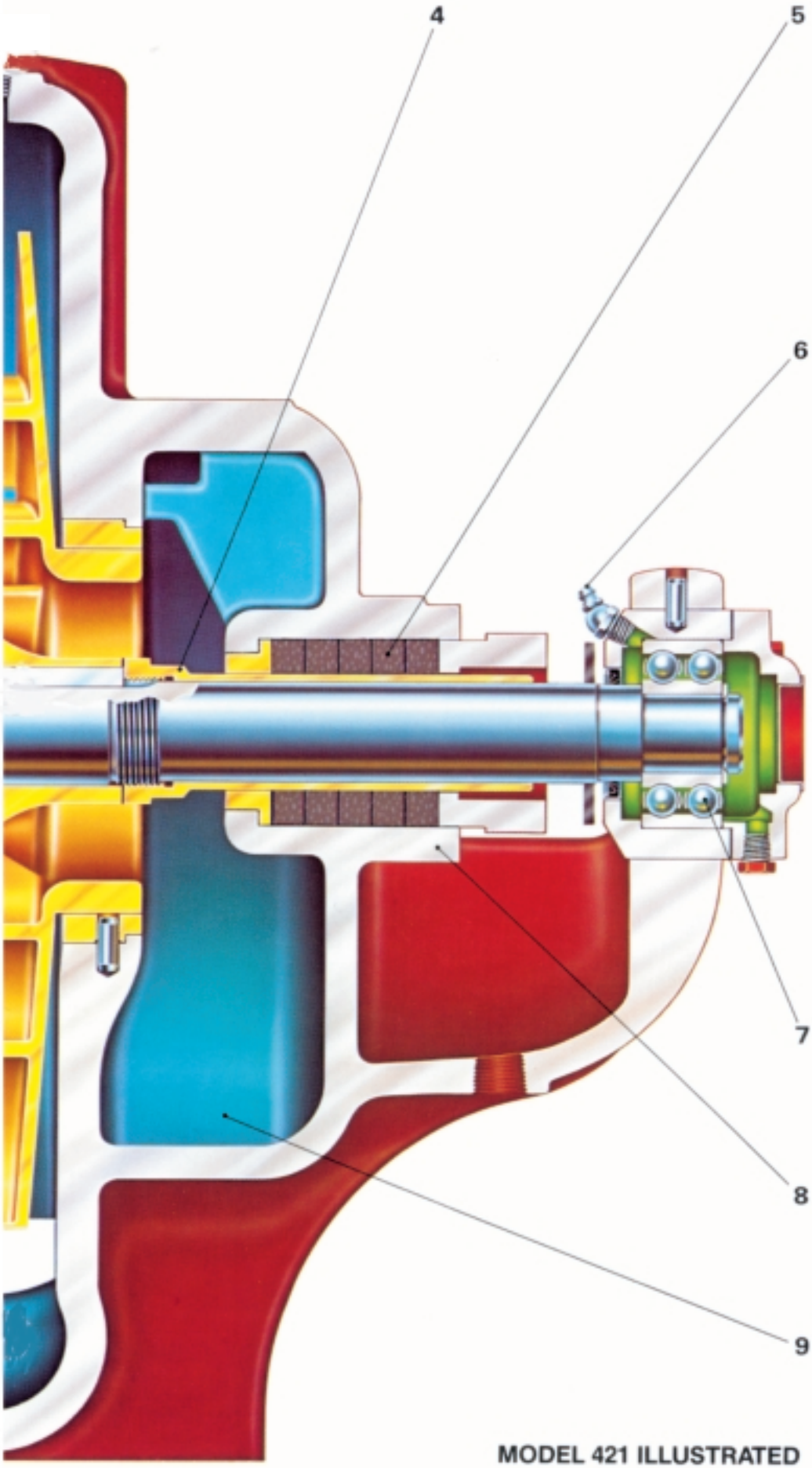
Some of the important features of the Aurora 420 Series Split Case Pumps are outlined below:

1 SPLIT CASE DESIGN simplifies disassembly. The suction and discharge piping or alignment is not disturbed. Simply remove the upper casing for service or inspection. Cast lifting lugs are provided. Computer-machined major components with 360 degree registered fits assure concentric fit.



2 DYNAMICALLY BALANCED IMPELLERS are keyed to shaft and secured by adjustable shaft sleeves. Opposed suction design balances out hydraulic thrust loads. Precision cast process and proven design provides high efficiency and performance characteristics.

3 CASE WEARING RINGS and throttle bushings prevent wear on the pump casing and are easily and inexpensively replaced.



MODEL 421 ILLUSTRATED

*E.I. DuPont Registered Trademark

4 BRONZE SHAFT SLEEVE prevents shaft wear, is slip fit over the shaft, keylocked, and extends the entire length of each stuffing box. Shaft sleeves and impeller are "O" ring sealed to eliminate corrosion of the shaft by the pumped liquid. This eliminates the need for high cost, special stainless steel or monel shafts.

5 INTERCHANGEABLE STUFFING BOX for mechanical seals or packing. Packing is standard on horizontal pumps. Optional lantern ring has an internal water seal passage between the casing and stuffing box and cannot be damaged. Mechanical seals have carbon against Ni-Resist face. Long life is assured with 303 stainless steel metal parts and "Buna-N" elastomers. Several optional mechanical seals are available.

6 GREASE LUBRICATION purges old grease from bearings. Oil lubrication is optional on horizontal pumps. Lube fittings are conveniently located for quick accessibility and provide positive bearing lubrication. Oil seals and non-sparking Neoprene rotating slingers protect both bearings during pump operation and washdowns.

7 BEARINGS selected for 50,000 hour minimum life at maximum load. Average bearing life 5 x minimum. Double row thrust ball bearing is standard on all models. Short bearing span holds shaft deflection to .002" at face of stuffing box at maximum load. Integral bearing arms eliminate bearing misalignment and simplify service.

8 LEFT HAND ROTATION can be readily provided with standard parts. Tandem drive pumps require only a different shaft.

9 CERTIFIED PERFORMANCE with POSITIVE SUCTION PRESSURE or with a SUCTION LIFT are available on each pump for customer approval. Pumps are all hydrostatically tested.

420 SERIES RANGE CHARTS

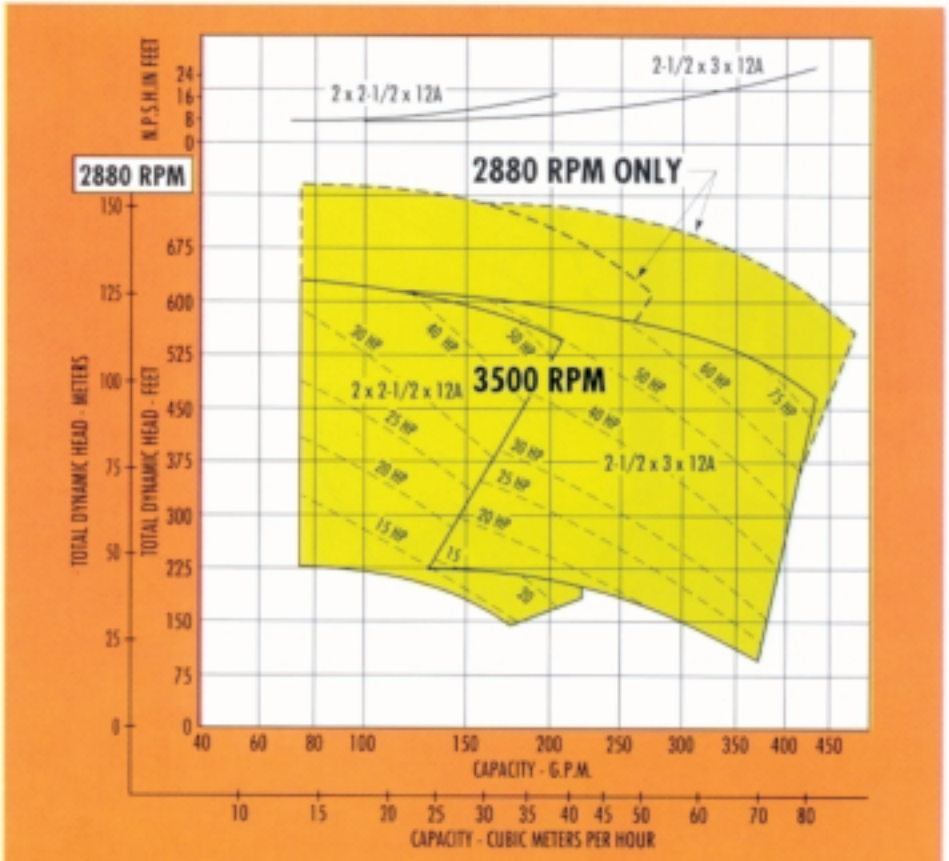
FIRE PUMPS APPROVED BY FM AND LISTED BY UL FOR FIRE SERVICE

HORIZONTAL split case pumps are the most common type of Fire Pump. These pumps are specially tested for fire-service applications where reliability of performance is of vital importance. They are characterized by easy access to all working parts, rugged construction, liberal water passages, and efficient operation. They are specified when the source of water is located above the surface of the ground and will provide a positive suction pressure to the pump at any performance point.

AURORA MEETS ALL OF THE REQUIREMENTS FOR FIRE PUMP SERVICE WITH ITS STANDARD PRODUCTION PUMPS. Therefore, to the Fire Pump user this feature means:

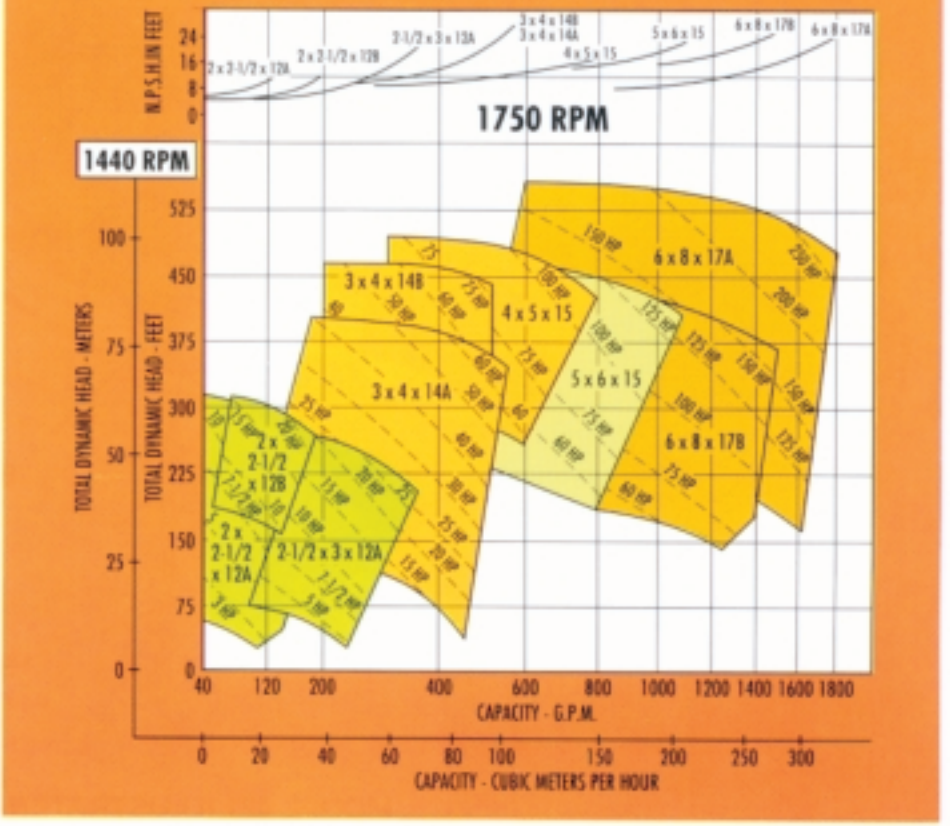
1. Lower initial cost.
2. Quicker delivery from stock.
3. Parts interchangeability with Aurora pumps specified elsewhere in your building reduces spare parts inventory and simplifies maintenance. The fact that Aurora pumps meet the rigid requirements of Underwriters' Laboratories and Factory Mutual Engineering is testimonial to the high quality of Aurora Pump products. Aurora Pump offers the only complete line of VERTICAL SPLIT CASE Double Suction type pumps approved and listed for fire-service. Vertical Fire Pumps provide distinct advantages over horizontal pump constructions.
1. Less floor space required.
2. Inline piping arrangement allows piping in any direction.
3. Elevated motor protects against potential flooding if the pump station is in a low area.
4. Components are register fitted to prevent misalignment.

If additional information is required, refer to Aurora Fire Pump Bulletin 900 for details.



Individual performance curves must be used for final selections. For selections not shown refer to the factory or catalog sec. 420.

POWER SERIES NO. 2
POWER SERIES NO. 3
POWER SERIES NO. 4
POWER SERIES NO. 5

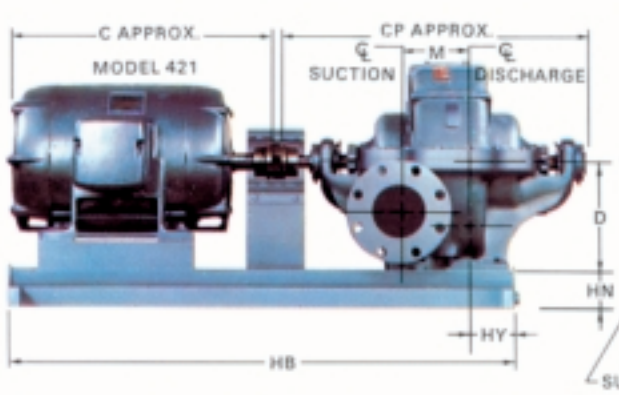


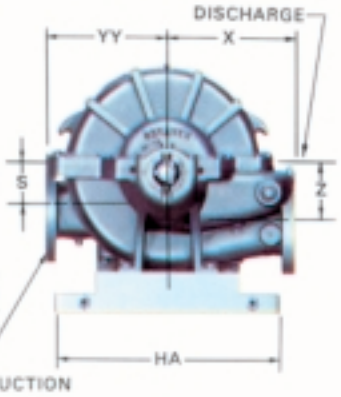
PUMP DIMENSIONS

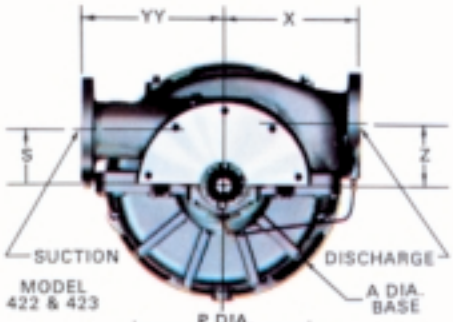
PUMP SIZE DISCH.	PUMP SIZE SUCT.	PUMP SIZE BORE	P. SERIES	PUMP WGT. (LBS.) 421	PUMP WGT. (LBS.) 423	A	D **	M	S	X	Z	CP	HY	VE1	VE2	YY
2	2½	12	2	270	360	18	9	4¾	4	10	5½	26	5¼	17¾	12¼	10¼
2½	3	12	2	290	400	18	9	5¼	4	11	5½	26	5¼	18¼	12¼	11
3	4	14	3	480	610	22	10	6¼	4½	12	6	31	5¾	21½	14¾	12¾
4	5	15	3	570	NOT AVAIL.		11	7¼	5	13	6½	31	5¾	—	—	13½
5	6	15	4	790	NOT AVAIL.		12½	9¼	5½	15	7½	35	6½	—	—	15½
6	8	17	5	1030	NOT AVAIL.		14¾	11	7	16	9	38	5¾	—	—	16½

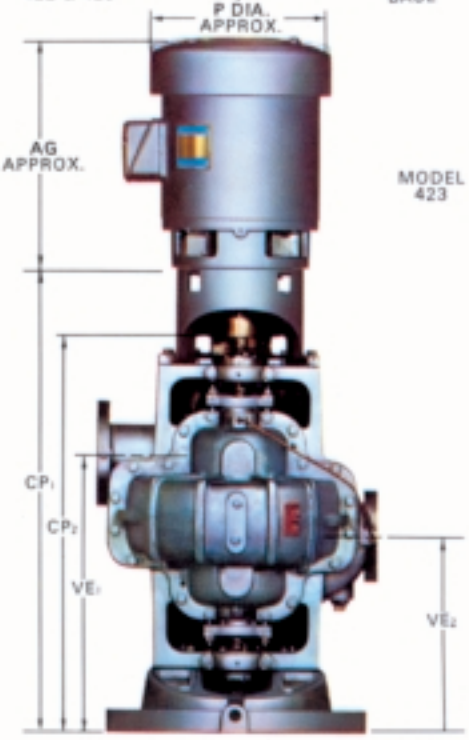
MODEL 422 AND 423

POWER SERIES		2	3	4	5
CP1	UP TO 256 HP	32	37	—	—
	284 HPH & UP	34	40	—	—
CP2		29	34	—	—









NOTES: Apply to all Models.

**Always use largest of 2 "D" dimensions.

†For motor and baseplate dimensions over 200 HP refer to the factory.

1. Dimensions and weights are approximate. **2.** Complete dimensions are available. **3.** Not for construction purposes unless certified for approval. **4.** Frame sizes shown are for open drip proof motors only. **5.** Add pump, base and motor weight for unit weight total. **6.** Conduit box is shown in approximate position. Dimensions are not specified as they vary with each motor manufacturer. **7.** Aurora Pump reserves the right to make revisions to its products and their specifications, and to this bulletin and related information without notice.

MOTOR FRAME	MODEL 423	143 HP	145 HP	182 HP	184 HP	213 HP	215 HP	254 HP	256 HP	284 HPH		286 HPH		324 HP		326 HP		364 HP		365 HP		404 HP		405 HP		444 HP		445 HP	
	MODEL 421	143 T	145 T	182 T	184 T	213 T	215 T	254 T	256 T	284 TS	284 T	286 TS	286 T	324 TS	324 T	326 TS	326 T	364 TS	364 T	365 TS	365 T	404 TS	404 T	405 TS	405 T	444 TS	444 T	445 TS	445 T
HORSE POWER RPM	3500	1½	2-3	5	7½	10	15	20	25	30	—	40	—	50	—	60	—	75	—	100	—	125	—	150	—	200†	—	—	—
	1750	1	1½	3	5	7½	10	15	20	—	25	—	30	—	40	—	50	60	—	75	—	100	—	125	—	150	—	200†	—
	1150	—	1	1½	2	3	5	7½	10	—	15	—	20	—	25	—	30	—	40	—	50	—	60	—	75	—	100	—	125
MOTOR WEIGHT MODEL	421	40	45	72	80	130	145	220	240	330	330	370	370	475	475	525	525	630	630	690	690	830	830	915	915	1095	1095	1270	1270
	423	43	48	84	102	132	156	300	300	420	420	420	420	570	570	570	570	950	950	950	950	1230	1230	1230	1230	1680	1680	1680	1680
C		12	13	13	14	16	18	21	23	22	24	24	25	25	26	26	28	27	29	28	30	30	33	31	34	34	38	36	40
D.**		3½	3½	4½	4½	5¼	5¼	6¼	6¼	7	7	7	7	8	8	8	8	9	9	9	9	10	10	10	10	11	11	11	11
P APPROX.		8	8	10	10	11	11	13	13	16	16	16	16	18	18	18	18	20	20	20	20	22	22	22	22	26	26	26	26
AG APPROX.		11	12	14	15	18	17	20	21	22	22	23	23	25	25	26	28	25	25	25	25	28	28	28	28	32	32	32	32

MODEL 421 BASE NUMBER

PUMP SIZE	Power Ser. Mod. 421																												
2 x 2½ x 12	2			3	3	5	6	8	8	8	9	9	9	11	11	11	11	11	12	12	12								
2½ x 3 x 12				3	3	5	6	8	8	8	9	9	9	11	11	11	11	11	12	12	12								
3 x 4 x 14	3						6	9	9	9	9	9	9	12	12	12	12	12	12	12	12	15	16	15					
4 x 5 x 15										9	9	9	9	12	12	12	12	12	12	15	16	15	16	16	16				
5 x 6 x 15	4															12	12	12	12	16	16	16	16	16	16	16			
6 x 8 x 17	5									10	10	10	10	12	12	13	13	13	13	16	16	16	16	16	16	16	17		

BASE	3	5	6	8	9	10	11	12	13	15	16	17	FLANGES — ASA STD.	FURNISHED AS:
BASE WEIGHT	49	59	68	96	109	128	164	192	235	291	344	339	250# WITH 125# DRILLING (SUCT.) 250# DRILLING (DISCH.)	STANDARD
HA	15	17¼	17¼	20½	20½	20½	26¼	26¼	26¼	30¼	30¼	30¼		
HB	33½	36½	42½	42½	48½	56½	46½	54½	64½	54½	64½	74½	250# WITH 250# DRILLING	OPTIONAL
HN	3	3	3	3	3	3	4	4	4	4½	4½	4½		

ENGINEERING SPECIFICATIONS

MODEL 421, 422 and 423 HORIZONTAL SPLIT CASE – Furnish and install as shown on the plans ..... Right hand (Left hand) Aurora Model (Horizontal-421) (Vertical-422 Open Shaft) (Vertical-423 Flexible Coupled) type Split-Case, Opposed Suction, Multi-Stage centrifugal pump, Size ..... x ..... x ..... of bronze fitted (all bronze) (all iron) (stainless steel) construction. The pump shall be capable of delivering at design conditions a capacity of ..... G.P.M. when operating against a Total Dynamic Head of .... feet, with a temperature of ..... °F, specific gravity ..... Pump shall have minimum guaranteed efficiency at design capacity of ..... %. Pump must also be capable of delivering a maximum of .... G.P.M. when operating against a head of ..... feet, and at this condition shall have a minimum efficiency of ..... %. Minimum shut off head acceptable will be .... feet. Pump shall operate at a maximum synchronous speed of .... R.P.M. 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 halves will be constructed of "CLASS 30 CAST IRON," C.I. having a minimum tensile strength of 30,000 psi. and shall be of sufficient thickness to withstand stresses and strains at full operating pressures. Casings shall be subject to a hydrostatic pressure test at 150% of the specified duty point. Bearing housing supports, suction and discharge flanges shall be integrally cast with the lower half of the casing. Removal of the upper half of the casing must allow the rotating element to be removed without disconnecting the suction and discharge piping. The upper casing is to be dowel aligned to the lower casing. Pump sizes 2" and larger are to be of the multi-volute design. Drain openings must be provided in the bearing arms for removal of lubricating liquid. Impellers shall be of the enclosed, opposed, suction type and shall be of precision cast bronze (.....). Impellers shall be dynamically balanced and securely fastened to the shaft by key and screw locked shaft sleeves. The vanes shall be designed to reduce noise. The pump shaft shall be made of high grade SAE 1045 Steel or equal, accurately machined to give a true running rotating element. The minimum dia. acceptable will be .....". The shaft shall be protected from wear by bronze (.....) sleeves which are key locked and threaded so that the sleeves tighten with the rotation of the shaft. Nitrile "O" rings must be provided between the impeller hub and the shaft sleeves to prevent pumped liquid from corroding the shaft. Pump shall be equipped with easily renewable bronze (.....) casing rings (impeller wearing rings) so designed that hydraulic pressure will seat them against a shoulder in the pump case around the full periphery of the wearing ring. The wear rings will be locked in place by doweling to prevent rotation. The rotating element shall be mounted in heavy duty grease lubricated ball bearings and shall be equipped with water slingers on side next to pump glands. Bearing housings shall be so designed to flush lubricant through and provide continuous cleaning of bearing surfaces and maximum protection against overheating. The pump shall be supplied with a single row inboard bearing primarily for radial loads and a double row outboard bearing primarily for thrust loads. Both bearings shall be regreaseable lubrication ball type, designed for 250,000 hours average life. Each bearing shall be mounted in a machined housing that is moisture and dust proof. The housing shall have registered fits to assure alignment, pinned to prevent rotation, and bolted to the bearing arms. Each housing shall be supplied with a grease fitting and a plugged relief port. **MODEL 421** – Stuffing boxes shall be placed on both sides of the pump centerline to seal the pump shaft. All packed pumps having a suction lift shall have a 1st stage lantern ring connected to the pressure side of the pump by a cored passage in the parting flange of the pump. The stuffing boxes shall be equipped with heavy, cast, split glands with extra length, for easy removal for packing inspection and maintenance. Pump and motor shall be mounted on a common heavy base plate of (steel drip rim) (formed steel) (structural steel). Pump and motor must be checked for alignment after the pump base has been installed and grouted in place, in accordance with the standards of the Hydraulic Institute. There shall be no strain transmitted to the pumps. **MODEL 422 AND 423** – Mechanical seal boxes shall be placed on both sides of the pump centerline to seal the pump shaft. Each pump is to be furnished with mech. seals with all metal parts to be 303 stainless steel with "Buna-N" elastomers, Ni-Resist seat, and carbon washer. A bypass line must be provided for the upper seal between the seal faces and the discharge flange to assure adequate venting of the seal chamber and to provide lubrication. All pumps shall be provided with a cored passage in the parting flange of the pump to provide additional circ. to 1st stage seal. The mech. seal boxes shall be equipped with heavy, cast, one piece, "O" ring sealed glands. The pump shall be supported by a cast iron drip rim base. **MODEL 422** – 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 H.P. 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 423** – Vertical flexible coupled pumps shall be furnished with a cast iron motor bracket which is to be bolted to the vertical casing. The motor bracket must be machined with a register fit to insure proper alignment of motor and pump shaft. **MODEL 421 AND 423** – The pumps shall be flexible coupled to a standard (horizontal) (vertical) NEMA ..... HP ..... phase ..... Hertz ..... volts ..... RPM (drip-proof) (tot. encl.) (explosion-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.

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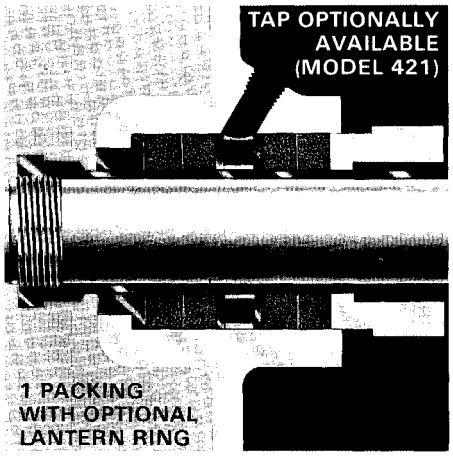
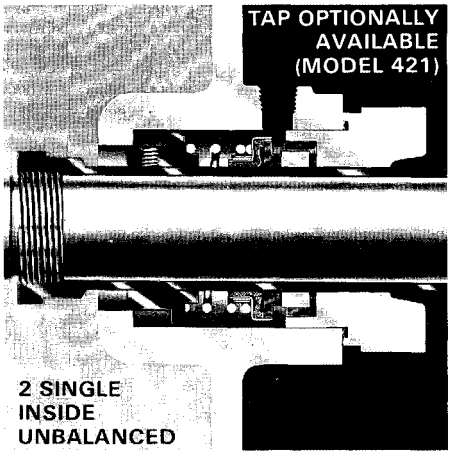
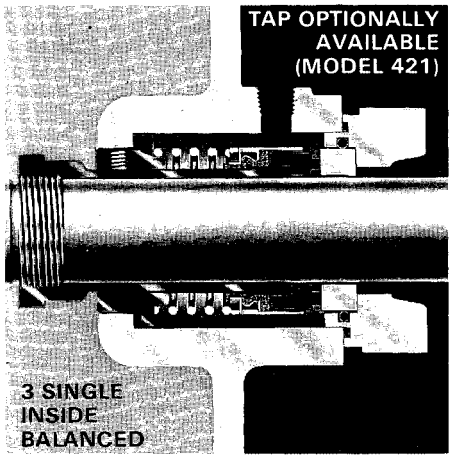
ENGINEERING DATA
MECHANICAL SEALS AND PACKING







PRESSURES

TEMPERATURES

LIQUIDS

Standard packing on horizontal pumps and the standard mechanical seals on vertical pumps are suitable for most applications. Special sealing arrangements may however, be required due to higher pressure or temperature requirements and the nature of the liquid to be pumped. Factory option seals are of high quality and supplied by leading mechanical seal manufacturers. Various seal arrangements and types that better suit your specific needs are available. Seal faces are carbon vs. Ni-Resist on standard seals and carbon vs. Tungsten carbide on high temperature seals. Corrosion resistant alloy metal parts and Buna-N secondary sealing elements are provided. Various other metals are also available. Gland plates are cast iron and can be supplied in alternate materials. Recommendations and limitations are general. Specific selections can be offered only after rotating speeds, pressures, temperatures, type of equipment and liquid nature are known. The following illustrations describe the basic seal and packing options available. For options not shown refer to the factory. For quick reference for the type of seal best suited to your application, refer to the condensed information that heads each option. The following comments govern these recommendations:

1 PACKING Standard on Model 421. Not available on 422 and 423.
PRESSURES (suction): Below atmospheric up to 250* P.S.I.G. (Maximum pump limitation) A lantern ring is required on the first stage for suction lift applications.
TEMPERATURES: From minus 100°F. up to 275°F.* with high temperature packing, or 225°F. with standard packing.
LIQUIDS: All liquids that are compatible with graphited fiber packing. Other packings are available for special applications.

2 SINGLE — UNBALANCED Standard on Model 422 and 423. Optional on Model 421.
PRESSSURES (suction): Below atmospheric up to 100 P.S.I.G.
TEMPERATURES: From minus 100°F. up to 275°F. with high temperature seals, or 225°F. with standarad seals.
LIQUIDS: All liquids that are compatible with the seal materials of construction and with a specific gravity higher than .6.

3 SINGLE — BALANCED Optional on all Models.
PRESSURES (suction): Up to 250 P.S.I.G. (Max. pump limit)
TEMPERATURES: Minus 100°F. up to 275°F. with high temperature seals, or 225°F. with standard seals.
LIQUIDS: All that are compatible with the seal materials of construction and with a specific gravity of .6 or lower.

PRESSURES — The pressures referred to are those found at the pump suction. Most seal manufacturers recommend a flushing arrangement from the discharge to the stuffing box where "below atmospheric pressure" is encountered. The 420 Series first stage stuffing box incorporates an internal bypass arrangement which permits flushing to the mechanical seal. External bypasses are available to both seal faces. An external bypass is standard on vertical pumps to the upper seal face.

TEMPERATURES — The temperature limitation of a mechanical seal is frequently determined by the shaft sealing material. The various elastomer "O" ring materials have varying temperature limits, depending upon the chemical and/or physical properties of the process fluid. Filled TEFLON†, shaft seal rings are available.

LIQUIDS — Due to varying degrees of resistance of various sealing compounds in different pumped liquids, the following mechanical seal sealing rings are available: BUNA-N, NEOPRENE, VITON, TEFLON† and other synthetic elastomers.

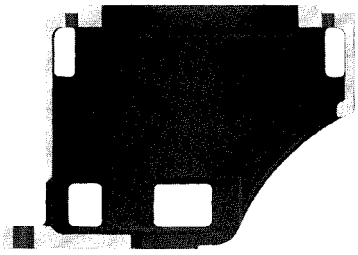
†DUPONT registered trademarks.

***NOTE:** Hardened stainless steel (450 minimum brinnel) shaft sleeves are available with this option and are required when the suction pressure is over 100 P.S.I.G. or when the temperature exceeds 225°F.

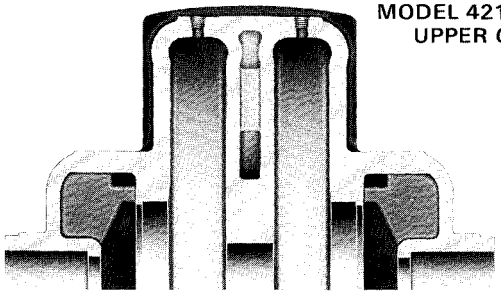
ENGINEERING DATA INTERCHANGEABILITY AND POWER SERIES

Aurora Models 421, 422 and 423 were designed for maximum interchangeability. Each model is available in 9 different sizes, offering a model and size precisely fitted to the installation requirements. The 9 sizes are divided into 4 "power series." Within each power series, all parts are completely interchangeable except for the impeller, casing, and case wearing rings for either right hand or left hand rotation. See the illustration below for all details.

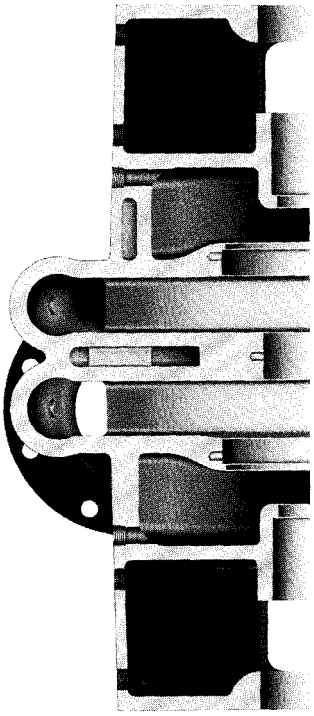
MODEL 423
MOTOR BRACKETS



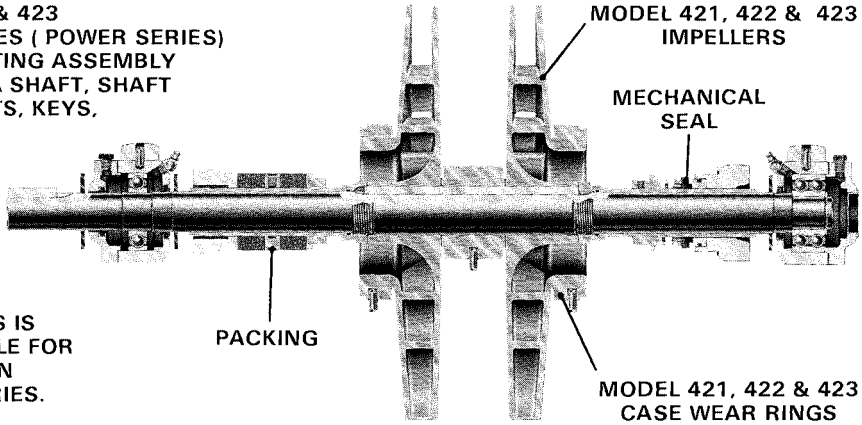
MODEL 421, 422 & 423
UPPER CASINGS



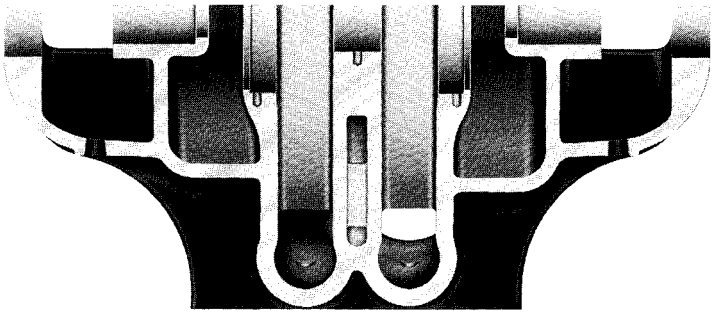
MODEL 422 & 423
LOWER CASINGS



MODEL 421, 422 & 423
SHAFT ASSEMBLIES (POWER SERIES)
COMPLETE ROTATING ASSEMBLY
CONSISTING OF A SHAFT, SHAFT
SLEEVES, GASKETS, KEYS,
INBOARD
BEARING
ASSEMBLY,
OUTBOARD
BEARING
ASSEMBLY
AND PACKING
OR MECHANICAL
SEAL ASSEMBLIES IS
INTERCHANGEABLE FOR
ALL PUMPS WITHIN
EACH POWER SERIES.



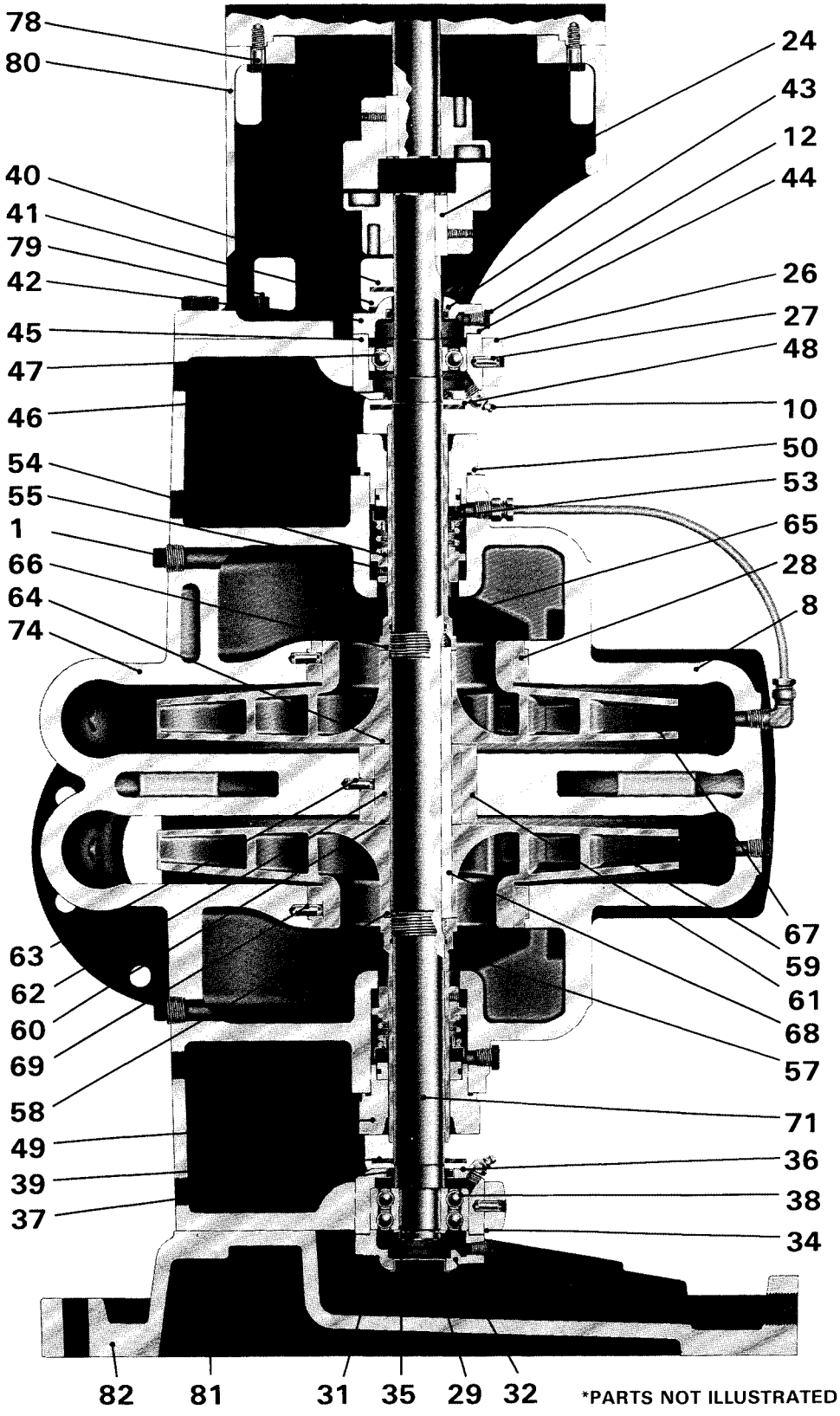
MODEL 421
LOWER CASINGS



MODEL 422 & 423
DRIP RIM BASES

POWER SERIES	PUMP SIZE EXAMPLE: 3 x 4 x 14 (3-Discharge Dia.) (4-Suction Dia.) (14-Approx. Max. Impeller Dia.)				
2	3	4A	4	5A	5
2 x 2-1/2 x 12A	3 x 4 x 14A	5 x 5 x 12*	5 x 6 x 15*	6 x 6 x 12*	6 x 8 17A*
2 x 2-1/2 x 12B	3 x 4 x 14B				6 x 8 x 17B*
2-1/2 x 3 x 12A	4 x 5 x 15*	*Model 421 Pumps Only			

ENGINEERING DATA
MATERIALS OF CONSTRUCTION



*PARTS NOT ILLUSTRATED.

Pc No	Descrip. (*Not Shown)	PUMP CONSTRUCTION			
		Bronze Fitted	All Bronze	All Iron	Stain. Steel
1	Plug	Mall. Iron A197	Bronze Wrought	Mall. Iron A197	Stain. Stl. AISI 316
2	*Plug				
6	*Capscrew	Steel SAE 2	Steel SAE 2	Steel SAE 2	Stain. Stl. AISI 316
7	*Capscrew				
8	Casing Half	Cast Iron A48	Bronze B62-4A	Cast Iron A48	Stain. Stl. ACI CF8M
9	*Gasket	Buna-N Treated Cellulose			
10	Gr. Ftg.	Steel Zerk			
12	Plug	Malleable Iron ASTM A197			
18	*Nut	Bronze Wrought		Steel SAE 2	Stain. Stl. AISI 316
19	*Washer	Cad. Plt. Steel	Bronze Wrought	Cad. Plt. Steel	Stain. Stl. AISI 316
20	*Gland Clp.				
21	*Gland	Cast Iron A48	Bronze B62-4A	Cast Iron A48	Stain. Stl. ACI CF8M
22	*Swing Bolt	Cad. Plt. Steel	Sil. Brz. Wrought	Cad. Plt. Steel	Stain. Stl. AISI 316
23	*Packing	Graphited Fiber			
24	Key	Steel Wrought			
25	*Capscrew	Steel SAE 2	Bronze Wrought	Steel SAE 2	Stain. Stl. AISI 316
26	Bearing Cap	Cast Iron A48	Bronze B62-4A	Cast Iron A48	Stain. Stl. ACI CF8M
27	Pin	Cad. Plt. Steel	Stain. Stl. AISI 416	Cad. Plt. Steel	Stain. Stl. AISI 316
28	Case Ring	Bronze ASTM B62-4A		Cast Iron A48	Stain. Stl. ACI CF8M
29	Protector	Steel Wrought			
31	Capscrew	Steel SAE 2			
32	Cart. Cap	Cast Iron ASTM A48			
34	Gasket	Buna-N Treated Cellulose			
35	Ret. Ring	Spring Steel			
36	Cartridge	Cast Iron ASTM A48			
37	Gr. Seal	Buna-N and Steel			
38	Bearing	Steel Commercial			
39-40	Slinger	Neoprene			
41	Capscrew	Steel SAE 2			
42	Cart. Cap	Cast Iron ASTM A48			
43	Gr. Seal	Buna-N and Steel			
44	Gasket	Buna-N Treated Cellulose			
45	Cartridge	Cast Iron ASTM A48			
46	Gr. Seal	Buna-N and Steel			
47	Bearing	Steel Commercial			
48	Slinger	Neoprene			
49	Gland	Cast Iron A48	Bronze B62-4A	Cast Iron A48	Stain. Stl. ACI CF8M
50	O-Ring	Buna-N			
52	*Lantern Ring	Bronze ASTM B62-4A		Cast Iron A48	Stain. Stl. ACI CF8M
53	M. Seal	St. Stl. (1)	St. Stl. (2)	St. Stl. (1)	St. Stl. (2)
54	Collar	Bronze ASTM B62-4A		Cast Iron A48	Stain. Stl. AISI 316
55	Setscrew	Stainless Steel AISI 316			
56	*Bushing	Bronze ASTM B62-4A		Cast Iron A48	Stain. Stl. AISI 316
57	Sleeve	Bronze High Lead Tin		Stain. Stl. AISI 316	
58	Gasket	Teflon DuPont			
59	Impeller	Bronze B119	Bronze B119	Cast Iron A48	Stain. Stl. ACI CF8M
60	Gasket	Teflon DuPont			
61	Bushing	Bronze ASTM B62-4A		Cast Iron A48	Stain. Stl. ACI CF8M
62	Sleeve				
63	Pin	Cad. Plt. Steel	Stain. Stl. AISI 416	Cad. Plt. Steel	Stain. Stl. AISI 316
64	Gasket	Teflon DuPont			
65	Sleeve	Bronze High Lead Tin		Stain. Stl. AISI 316	
66	Gasket	Teflon DuPont			
67	Impeller	Bronze B584	Bronze B584	Cast Iron A48	Stain. Stl. ACI CF8M
68	Key	Stain. Stl. AISI 416	Stain. Stl. AISI 316	Stain. Stl. AISI 416	Stain. Stl. AISI 316
69	Pin	Cad. Plt. Steel	Stain. Stl. AISI 416	Cad. Plt. Steel	Stain. Stl. AISI 316
70	*Imp. Ring	Bronze B584		Cast Iron A48	Stain. Stl. AISI 316
71	Shaft	Stl. AISI C1045	Stain. Stl. AISI 316	Stl. AISI C1045	Stain. Stl. AISI 316
72	*Pin	Cad. Plt. Steel	Stain. Stl. AISI 416	Cad. Plt. Steel	Stain. Stl. AISI 316
73	*Pin				
74	Casing Half	Cast Iron A48	Bronze B62-4A	Cast Iron A48	Stain. Stl. ACI CF8M
75	*Drive Scr.	Steel Bronze Plated			
76	*Name Plt.	Stainless Steel AISI 303			
78-79	Capscrew	Steel SAE 2			
80	Bracket	Cast Iron ASTM A48			
81	Capscrew	Steel SAE 2			
82	Base	Cast Iron ASTM A48			

All material specifications are in accordance with ASTM unless otherwise noted. (1) $B_{30}P_{66}171$(JC) (2) $XP_{66}1C1$(JC).

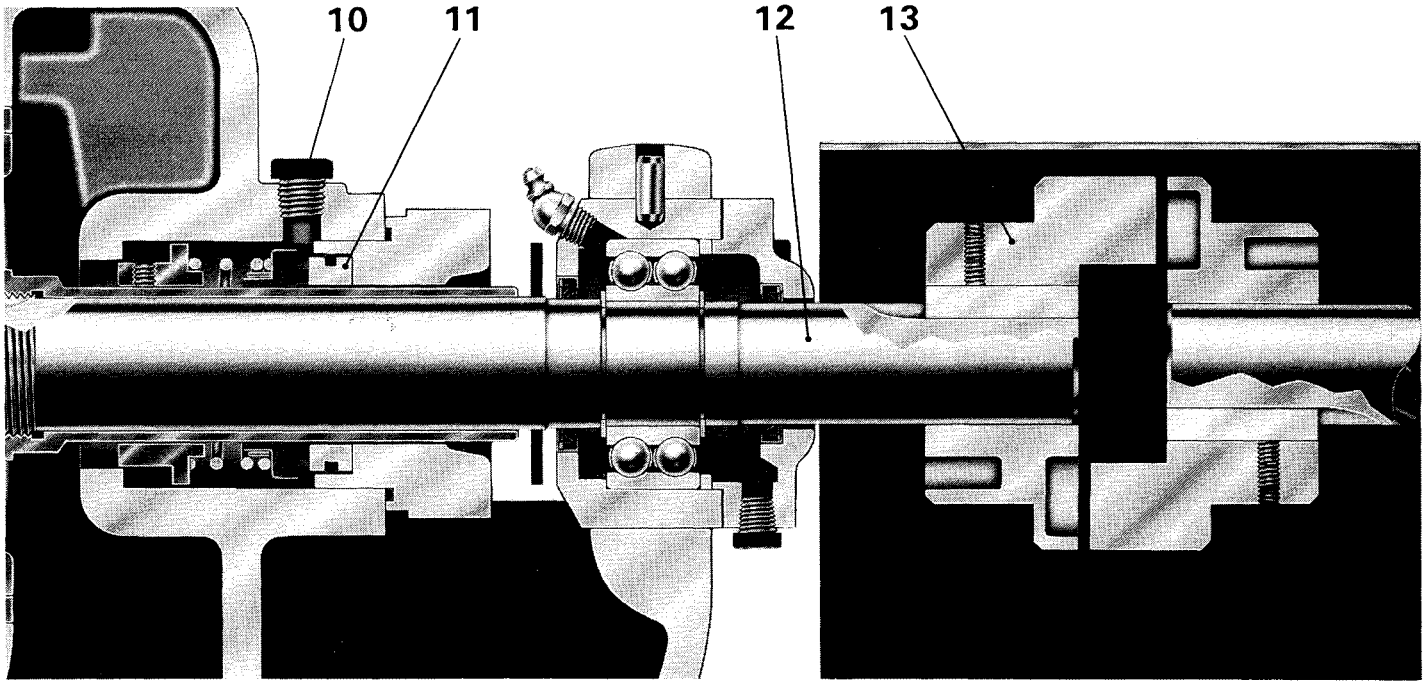
ENGINEERING DATA

10 EXTERNAL PIPING can be provided when it is necessary to filter and regulate the flow of liquid to the stuffing box. With this option, piping is provided from the pump discharge to both stuffing boxes. If the pumped liquid is not suitable for sealing purposes, the standard internal passages can be plugged and external piping from a water seal unit can be provided directly to the stuffing box or seal chamber. Lantern rings are required with this option on packed pumps.

11 MECHANICAL SEALS are available for special applications or hazardous service in single, balanced, and unbalanced designs. Packing with a lantern ring is available.

12 DOUBLE EXTENDED SHAFT option provides for dual drive applications such as an electric motor prime driver and stand-by diesel or internal combustion engine.

13 FLEXIBLE COUPLING is required between the pump and driver. It compensates for minor misalignment and reduces the transmission of vibration from the driver to the pump system. Clutch type couplings are available for the dual drive systems.



★STANDARD PUMP: Available in Bronze Fitted. Optional in All Bronze, All Iron, or Stainless Steel. Special materials are also available. **1.** MECHANICAL SEALS. **2.** LANTERN RINGS: Available for packed pumps only, provides lubrication under pressure to each stuffing box to extend packing life. An internal water seal passage provides the necessary lubricant from the pumped liquid. **3.** FLUSHING LINES. **4.** IMPELLER WEARING RINGS: Prevent rotational wear from occurring on the impeller and are easily replaced. The rings are press locked on the impeller. **5.** CASE WEARING RINGS: Available in 316 Stainless Steel for longer life. **6.** SHAFT SLEEVES: Minimum 450 Brinnel Hardened 440C Stainless Steel is recommended for abrasive applications on packed pumps only. Pumps with mechanical seals are available with 316 Stainless Steel sleeves. **7.** SHAFT MATERIAL: Standard pumps do not require alloy shafts as Teflon sealed shaft sleeves protect the shaft from corrosion. On severe applications 316 Stainless Steel shafting is available. Alloy shaft is recommended when inside balanced seals are specified. **8.** DOUBLE EXTENDED SHAFT. **9.** VERTICAL PUMPS. OIL LUBRICATION: Recommended for special applications such as remote installations, etc. Available only in Model 421. **11.** 250 PSI FLANGS: Suction and Discharge flanges machined to ASA flat face specifications. Special surface finishes such as raised face are available. **12.** PETCOCK: Vents air manually from the upper casing during initial start up. **13.** VENT TAPS: Oversize taps are available in either/or the upper casing or suction chambers. **14.** BASES: Available in cast iron with drip rim, formed steel or structural steel. **15.** ABRASIVE SEPARATORS: Available with option 3 to prevent entrained abrasives from entering the stuffing boxes via the recirculation or water seal liquid. **16.** ORIFICE BY-PASS: Regulates a predetermined flow of liquid to the stuffing boxes where this is desired. **17.** GLAND EYEBOLTS AND NUTS: For corrosive applications. Made of 316 Stainless Steel. **18.** BRONZE PACKING GLANDS: For corrosive duty. **19.** ENGINEERING TESTS: Several tests can be provided. (A) Certified Performance Test; (B) Certified Witness Performance Test; (C) Hydrostatic Test Submittal; (D) Vibration Test Submittal; (E) NPSH Test; (F) Witness NPSH Test. **20.** COUPLING GUARD. **23.** DOUBLE ROW INBOARD BEARING: Recommended for severe service such as direct drive with internal combustion engines. ADDITIONAL MODIFICATIONS are also available.

ENGINEERING DATA

MAXIMUM CASE WORKING PRESSURE is the sum of the differential pressure and the suction pressure. Table 2 indicates the maximum case working pressure for the 420 Series Split Case Pumps in various materials and at various operating temperatures. These maximum allowable pressures are based on wall thickness for the particular series of pumps, ratings for American Standard Flange Specifications, see Table 1, and take into account the material at various allowable application temperatures. EXTERNAL INERTIA OR FLYWHEEL EFFECT is the Kinetic energy stored in the rotating assembly that must be overcome when the pump impeller is caused to rotate within the casing. This energy frequently must be calculated to determine the torque required to start, accelerate or decelerate the pump. If the acceleration is rapid, the torque may be several times greater than the torque required to run the pump at normal or constant speed. WR^2 values in LBS-FT^2 are provided for these calculations. See tables 3 thru 6.

BEARING LIFE is based on the radial and thrust loads imposed on the bearings at the specific operating head and suction pressure. The Split case pump is designed for two year minimum B_{10} life at the maximum recommended loads. Bearing life at any other point of greater capacity on the curves will greatly exceed the minimum life shown. Average bearing life is equal to five (5) times the minimum bearing life (note*). SHAFT DEFLECTION is the consequence of the unbalanced hydraulic force acting inside the pump on the impeller and shaft in a radial direction. This unbalance occurs when the pump is operating away from its best efficiency point. At shut-off condition (zero flow) the unbalance is greatest and therefore the resultant radial load is maximum. *Radial load and shaft deflection approach zero at the best efficiency point of the pump.* 420 Series pumps are designed for a maximum deflection of .002" at the mechanical seal faces when operating at the maximum recommended differential pressure.

WR^2 values given in tables are for bronze impeller ..... **LB-FT^2**

EXAMPLE 1: Find WR^2 value for a 15" diameter 5 x 6 x 15 bronze fitted pump handling cold water.

From chart the "WET" value for a 15" diameter impeller ..... **16.60 LB-FT^2**

Add power series 4 rotating element less impeller ..... **.09 LB-FT^2**

Total **16.69 LB-FT^2**

EXAMPLE 2: Find WR^2 value for a 15" diameter 5 x 6 x 15 all iron pump handling 0.67 specific gravity gasoline.

From chart select "DRY" value and correct for difference in materials.

$\frac{\text{Sp. Gr. cast iron}}{\text{Sp. Gr. bronze}}$ x 14.9 LB-FT^2 .... **12.09 LB-FT^2**

Take difference ("WET"-"DRY") values and correct for difference in specific gravities.

1.70 x 0.67 ..... **1.14 LB-FT^2**

Add power series 4 rotating element less impeller ..... **.09 LB-FT^2**

Total **13.32 LB-FT^2**

PROCEDURE FOR DETERMINING MAXIMUM SHAFT DEFLECTION AND MINIMUM BEARING LIFE.

1 Determine the proper Pump Size, approximate Shut-Off Head in feet Power Series number, and Speed from the range charts illustrated on page 3 of 420 Bulletin

2 From table 11 determine the Pump Size Factor based on Pump Size and R P M

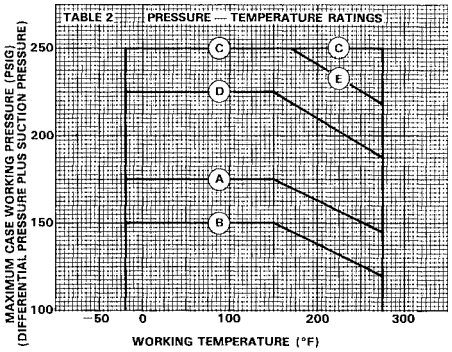
3 On table 13, page 76, locate the correct Shut-Off Head in feet and read across to the proper Pump Size Factor and down to the applicable Power Series Note the Load Factor in the process Read to the scale on the left for the maximum Shaft Deflection value

4 From table 14, page 76, using the Load Factor from step 3 above read across to the correct Power Series number and down for the min Bearing Life in hours

NOTE: 1. One (1) year life is based on 8740 HOURS (continuous operation) 2. Additional bearing information can be found on page 76 3. Specific information on Bearing Life and shaft Deflection can be obtained from the factory

TABLE 1 PUMP CASING MATERIAL	MINIMUM REQUIREMENT FOR STANDARD SUCTION AND DISCHARGE FLANGES		PIPE SIZE	CODE
	ANSI SPEC.	CLASSIFICATION		
Cast Iron ASTM A48	B16.1	125 PSI Flat Face	1-12	A
			14-24	B
		250 PSI Flat Face	1-12 14-24	C
Bronze ASTM B62	B16.24	150 PSI Flat Face	All	D
		300 PSI Flat Face		C
Stainless Steel ASTM A743 Grade CF8M	B16.5	150 PSI Flat Face	All	E
		300 PSI Flat Face		C

Maximum Hydrostatic Pressure 1½ times maximum case working pressure at 100°F.



EXAMPLE: A model 420 Pump with a bronze casing has been selected for operating at a case working pressure of 240 P.S.I.G. at 150°F. Enter Table 2 at 150°F. and read upward to 240 P.S.I.G. It is determined that the selection is within the recommended maximum case working pressure area for 300 PSI flanges and is therefore acceptable. Note that the example exceeds the maximum case working pressure unit if the material selected would have been 125 PSI flanged cast iron or 150 PSI flanged bronze.

TABLE 3
SPECIFIC GRAVITY OF COMMON METALS

TYPE METAL	CAST BRONZE	CAST IRON	CARBON STEEL	STAIN. STEEL
SP. GR.	8.86	7.20	7.84	7.90

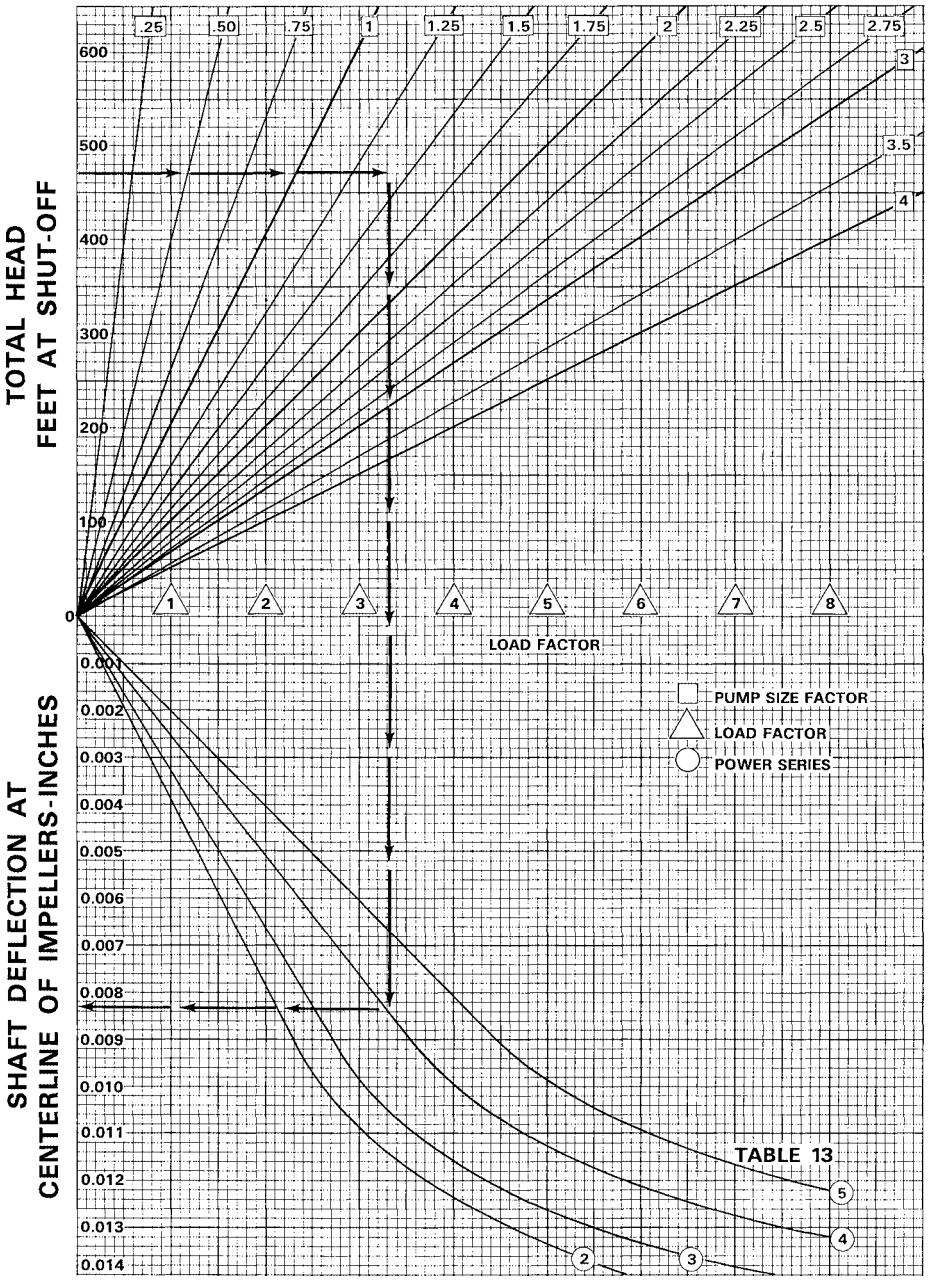
TABLE 4 († LESS IMPELLER)			TABLE 9 QUIET PUMP DATA				TABLE 11 - PUMP SIZE FACTOR		
PUMP SIZE	POWER SERIES	WR² ROT ELEMENT†	MAX. IMP. DIA.	CUT WATER DIA.	QUIET IMP. DIA.	SPHERE DIA.	3500 RPM	1750 RPM	1150 RPM
2 x 2-1/2 x 12A	2	.025	12.00	13.25	11.25	.25	.50	.65	–
2 x 2-1/2 x 12B			12.00	13.25	11.25	.31	–	.70	–
2-1/2 x 3 x 12B			12.00	13.25	11.25	.25	.60	.65	.70
3 x 4 x 14A	3	.060	14.00	15.50	13.25	.50	–	1.15	1.25
3 x 4 x 14B			14.50	15.50	13.25	.43	–	1.10	–
4 x 5 x 15			15.00	16.53	14.00	.68	–	1.40	1.50
5 x 5 x 12	4A	RTF	12.00	13.13	12.00	.70	RTF	–	–
5 x 6 x 16	4	.099	15.00	16.56	14.00	.68	–	1.40	–
6 x 6 x 12	5A	RTF	12.00	13.13	12.00	.70	RTF	–	–
6 x 6 x 17A	5	.210	17.00	18.75	16.00	.68	–	1.80	–
6 x 8 x 17B			17.00	18.75	16.00	.81	–	1.65	1.75
1-1/2 x 3 x 9	2	.025	8.75	9.50	8.00	.25	.40	.45	–
2 x 4 x 9			8.62	8.53	8.00	.31	.45	.50	–

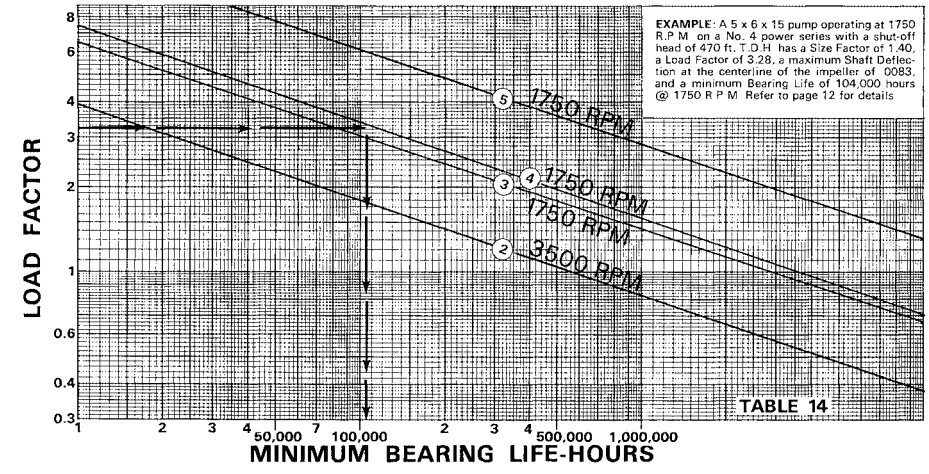
TABLE 12	CHART R.P.M.	DESIRED R.P.M.	MULTIPLY LIFE BY
SPEED (R.P.M.) FACTORS	3500	1750	2
	3500	1150	3
	1750	1150	1.5

TABLE 5	MODEL 430				MODEL 420						TABLE 6	MODEL 420													
	1-1/2 x 3 x 9		2 x 4 x 9		2 x 2-1/2 x 12A		2 x 2/1/2 x 12B		2-/1/2 x 3 x 12A			3 x 4 x 14A		3 x 4 x 14B		4 x 5 x 15		5 x 5 x 12		5 x 6 x 15		6 x 6 x 12		6 x 8 x 17A		6 x 8 x 17B	
DIA	DRY	WET	DRY	WET	DRY	WET	DRY	WET	DRY	WET	DIA	DRY	WET	DRY	WET	DRY	WET	DRY	WET	DRY	WET	DRY	WET	DRY	WET	DRY	WET
12.0	–	–	–	–	4.96	5.19	4.69	4.99	4.53	4.88	17.0	–	–	–	–	–	–	RTF	RTF	–	–	RTF	RTF	26.6	30.3	25.0	28.5
11.5	–	–	–	–	4.29	4.45	3.95	4.18	3.65	3.92	16.5	–	–	–	–	–	–	RTF	RTF	–	–	RTF	RTF	22.6	25.5	21.6	24.5
11.0	–	–	–	–	3.67	3.75	3.43	3.65	2.98	3.20	16.0	–	–	–	–	–	–	RTF	RTF	–	–	RTF	RTF	20.0	22.6	19.9	22.6
10.5	–	–	–	–	2.97	3.04	2.91	3.10	2.42	2.61	15.5	–	–	–	–	–	–	RTF	RTF	–	–	RTF	RTF	17.8	20.1	18.4	20.9
10.0	–	–	–	–	2.52	2.61	2.44	2.58	2.02	2.19	15.0	–	–	–	–	14.7	16.4	RTF	RTF	14.9	16.6	RTF	RTF	15.8	17.9	17.0	19.3
9.5	–	–	–	–	2.08	2.16	1.94	2.06	1.66	1.78	14.5	–	–	11.3	12.3	12.5	13.8	RTF	RTF	13.5	15.1	–	–	14.5	16.2	15.7	17.8
9.0	–	–	–	–	1.75	1.80	–	–	1.41	1.52	14.0	10.2	11.1	10.2	11.2	10.8	11.9	RTF	RTF	12.2	13.6	–	–	13.1	14.7	14.5	16.4
8.0	0.86	0.89	1.02	1.08	1.18	1.22	–	–	0.99	1.06	12.0	5.65	6.10	5.80	6.30	5.80	6.25	–	–	7.24	8.05	–	–	–	–	9.85	11.0
7.0	0.58	0.60	0.59	0.64	0.79	0.81	–	–	0.71	0.76	11.0	4.00	4.34	4.05	4.40	–	–	–	–	5.55	6.15	–	–	–	–	7.30	8.20
6.0	0.41	0.43	0.28	0.31	0.52	0.54	–	–	0.48	0.51	10.0	2.72	2.94	–	–	–	–	–	–	–	–	–	–	–	–	–	–
6.0	0.31	0.32	0.11	0.13	–	–	–	–	–	–	9.0	1.67	1.85	–	–	–	–	–	–	–	–	–	–	–	–	–	–
WGT.	20#		18#		35#		34#		33#		WGT	56#		56#		67#		40#		72#		42#		100#		98#	

TABLE 15 DIMENSION & DESCRIPTION	POWER SERIES			
	2	3	4	5
A — STUFFING BOX I.D.	2.43	2.81	3.06	3.43
B — STUFFING BOX DEPTH	3-1/8	3	3-1/2	3-3/4
C — O.D. OF SLEEVE	1-1/2	1-3/4	2	2-3/8
PKG. RINGS W/O LANT. RING	12	10	12	12
PKG. RINGS W/LANT. RING	10	8	10	10
RING IN FRONT OF LANT.	2	2	2	2
PACKING SIZE (SQ.)	7/16	1/2	1/2	1/2
D — WIDTH OF LANT. RING	5/8	5/8	3/4	3/4
E — NEAREST OBSTRUCTION	1-5/8	1-3/4	1-3/4	2
F — DIA. OF MECH. SEAL SEAT	2-1/8	2-1/2	2-3/4	3-1/4
G — LENGTH OF MECH. SEAL	1-9/16	1-7/8	2	2-3/8
J — SHAFT DIA. AT IMPELLER	1-3/8	1-5/8	1-7/8	2-1/8
K — SHAFT DIA. AT SLEEVE	1-1/4	1-1/2	1-3/4	2
L — SHAFT DIA. AT CLPG. END	1-1/8	1-3/8	1-1/2	1-3/4
MAX. DEFL. @ SEAL FACE	.002	.002	.002	.002
INBOARD BEARING NO.	206	207	208	309
OUTBOARD BEARING NO.	5305	5306	5307	5309
M — BEARING CENTERS	20 3/4	24-1/2	27-3/8	30
MIN. BEARING LIFE*	6 YR.	6 YR.	6 YR.	6 YR.

ENGINEERING DATA
SHAFT DEFLECTION AND BEARING LIFE

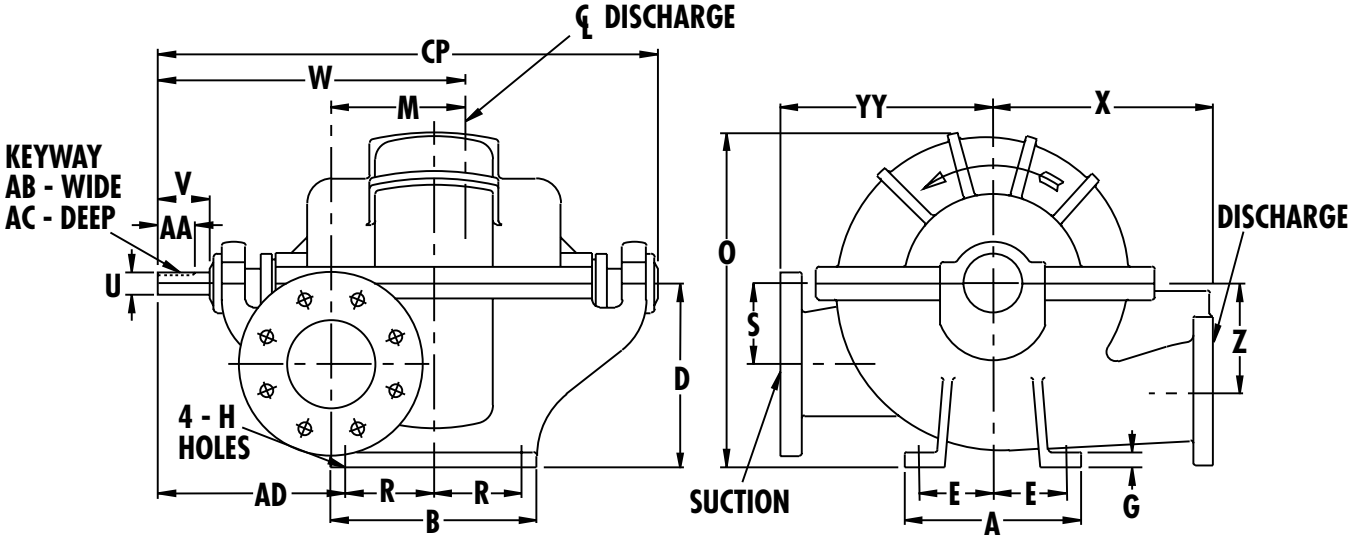




QUIET PUMP operation is always desirable and sometimes essential. One of the most important factors for noise control in a pumping installation is the correct selection of a pumping unit for the system. To insure that the pump will run quietly, it should be selected so that it will operate as close as possible to the best efficiency point. At this point the hydraulic shock within the pump is at a minimum since the flow angle of the fluid from the tip of the impeller is correct for the casing design. Every pump is designed for the best efficiency point and operation at any other point on the characteristic curves is a compromise. The amount of turbulence on either side of the best efficiency point increases as the point of operation is moved along the curve from the maximum efficiency. Therefore, the greater the turbulence, the greater the noise generated. Hydraulic shock is also a factor if the periphery of the impeller passes too close to the cutwater. If the ratio of the impeller diameter to the cutwater diameter in centrifugal pumps is greater than 0.92, the pump is likely to be hydraulically noisy. In such instances the hydraulic pulses are actually differential pressures that occur when the impeller vanes pass the cutwater. Cutwater ratios of 0.9 to 9.5 are typical; however, significantly lower noise levels are achieved in pumps designed with a ratio of 0.7 to 0.75. Although there is an optimum gap for pump efficiency, increases of only 3%-5% may be realized by using the optimum. A cutwater ratio of 0.85 is commonly specified by practicing engineers, thereby realizing a minimum reduction in pump efficiency with a mean reduction in noise level. Table 9 offers recommended quiet impeller diameter at 85% cutwater ratio. See Aurora Pump for details.

The charts reflect the *worst possible* conditions at pump shut-off. The effect from the impeller, shaft sleeves, wearing rings and packing will *reduce* the amount of *deflection.*

AURORA®
Pentair Pump Group



NOTES
1. All dimensions are in inches (mm).
2. Dimensions may vary ± 3/8" (10).
3. Not for construction purposes unless certified.
4. Suction & discharge flanges - American Standard flat face.
5. *5x5x12 and 6x6x12 Standard 150# Suction Flanges & 300# Discharge Flanges.
6. †5x5x12 and 6x6x12 Opt. 300# Flanges.

STD. 125# SUCTION FLANGES & 250# DISCHARGE FLANGES*	OPT. 250# FLANGES†

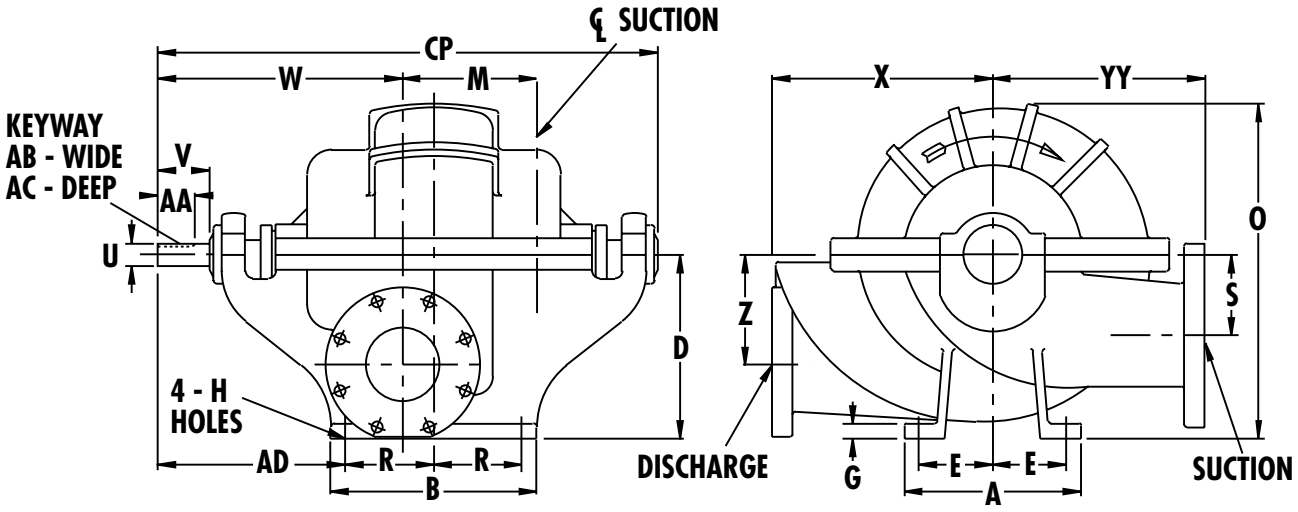
RIGHT HAND PUMP DIMENSIONS

PUMP SIZE			POWER SERIES																					
DISCH	SUCTION	CASE BORE		A	B	D	E	G	H	M	O	R	S	U	V	W	X	Z	AA	AB	AC	AD	CP	YY
2	2-1/2	12	2	8 (203)	10 (254)	9 (229)	3-1/2 (89)	3/4 (19)	5/8 (16)	4-3/4 (121)	19 (483)	4 (102)	4 (102)	1-1/8 (29)	2-3/4 (70)	15-3/4 (400)	10 (254)	5-1/2 (140)	2 (51)	1/4 (6)	1/8 (3)	10-1/2 (268)	26-1/4 (667)	10-1/4 (260)
2-1/2	3	12	2	8 (203)	10 (254)	9 (229)	3-1/2 (89)	3/4 (19)	5/8 (16)	5-3/8 (137)	19 (483)	4 (102)	4 (102)	1-1/8 (29)	2-3/4 (70)	15-7/8 (403)	11 (279)	5-1/2 (140)	2 (51)	1/4 (6)	1/8 (3)	10-1/2 (268)	26-1/4 (667)	11 (279)
3	4	14	3	10 (254)	12 (305)	10 (254)	4-1/4 (108)	7/8 (22)	3/4 (19)	6-3/4 (171)	21 (533)	5 (127)	4-1/2 (114)	1-3/8 (35)	3 (76)	18-3/4 (476)	12 (305)	6 (152)	2 (51)	3/8 (10)	3/16 (5)	12 (305)	31 (787)	12-3/8 (314)
4	5	15	3	10 (254)	12 (305)	11 (279)	4-1/4 (108)	7/8 (22)	3/4 (19)	7-1/8 (181)	23 (584)	5 (127)	5 (127)	1-3/8 (35)	3 (76)	18-7/8 (479)	13 (330)	6-1/2 (165)	2 (51)	3/8 (10)	3/16 (5)	12 (305)	31 (787)	13-1/2 (343)
5	5	12	4A	15 (381)	16 (305)	14 (356)	6-1/2 (165)	1 (25)	7/8 (22)	6-5/8 (168)	24-1/4 (616)	7 (178)	7 (178)	1-1/2 (38)	3-5/8 (92)	20-7/8 (530)	13 (330)	7 (178)	2-1/2 (64)	3/8 (10)	3/16 (5)	12-1/2 (318)	35-3/8 (899)	13 (330)
5	6	15	4	12 (305)	14 (356)	12-1/2 (318)	5 (127)	1 (25)	7/8 (22)	9-1/8 (232)	24-1/2 (622)	6 (152)	5-1/2 (140)	1-1/2 (38)	3-1/2 (89)	21-1/8 (537)	15 (381)	7-1/2 (191)	2 (51)	3/8 (10)	3/16 (5)	13 (330)	34-1/2 (876)	15-7/16 (392)
6	6	12	5A	16 (406)	19 (483)	15 (381)	7 (178)	1 (25)	7/8 (22)	7-1/2 (191)	26-1/4 (667)	8-1/2 (216)	8 (203)	1-3/4 (44)	4 (102)	22-7/8 (581)	14 (356)	8 (203)	2-3/4 (70)	3/8 (10)	3/16 (5)	12-3/4 (324)	38-1/2 (978)	14 (356)
6	8	17	5	12 (305)	14 (356)	14-3/4 (375)	5 (127)	1 (25)	7/8 (22)	11 (279)	28-1/4 (718)	6 (152)	7 (178)	1-3/4 (44)	4 (102)	24-1/2 (622)	16 (406)	9 (229)	2-7/8 (73)	3/8 (10)	3/16 (5)	15 (381)	38 (965)	16-1/2 (419)

AURORA MODEL 421 PUMP (LH)

Date **November 2001**

Supersedes Section 420 Page 202
Dated April 1973

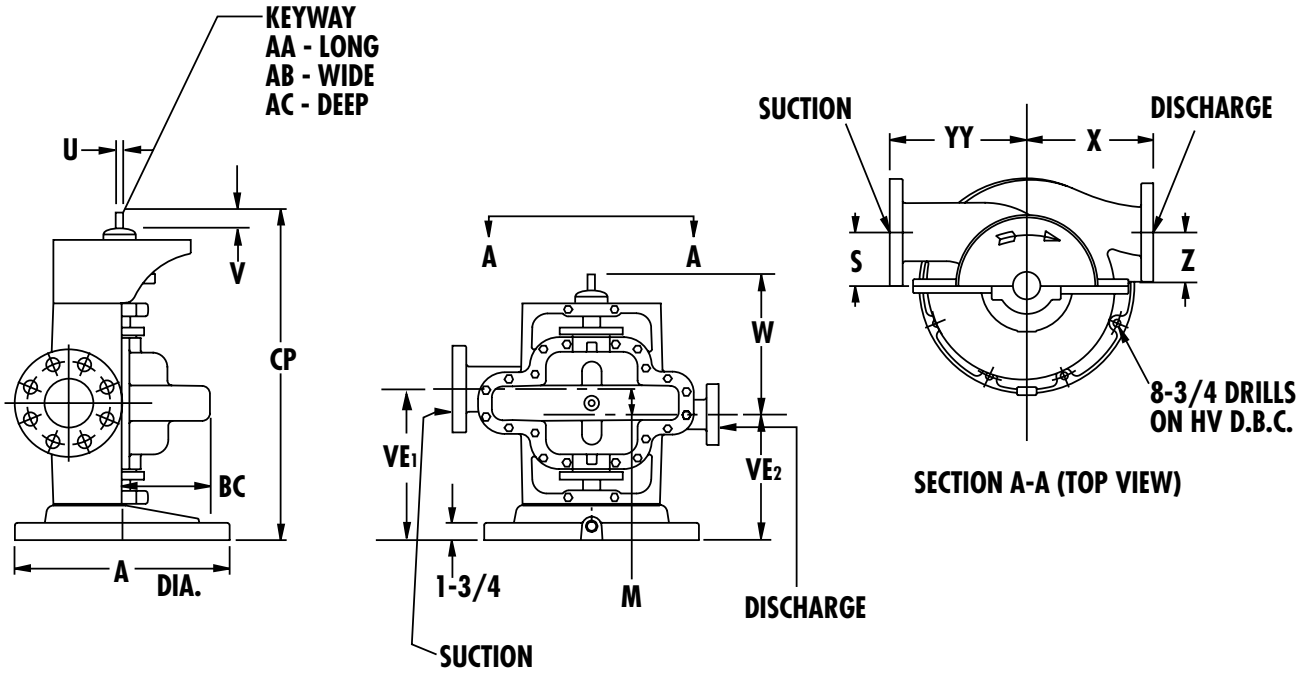


NOTES
1. All dimensions are in inches (mm).
2. Dimensions may vary ± 3/8" (10).
3. Not for construction purposes unless certified.
4. Discharge and suction flanges - American standard flat face.
5. *5x5x12 and 6x6x12 Standard 150# Suction Flanges & 300# Discharge Flanges.
6. †5x5x12 and 6x6x12 Opt. 300# Flanges.

STD. 125# SUCTION FLANGES &250# DISCHARGE FLANGES*	OPT. 250# FLANGES†

LEFT HAND PUMP DIMENSIONS

PUMP SIZE			POWER SERIES																					
DISCH	SUCTION	CASE BORE		A	B	D	E	G	H	M	O	R	S	U	V	W	X	Z	AA	AB	AC	AD	CP	YY
2	2-1/2	12	2	8 (203)	10 (254)	9 (229)	3-1/2 (89)	3/4 (19)	5/8 (16)	4-3/4 (121)	19 (483)	4 (102)	4 (102)	1-1/8 (29)	2-3/4 (70)	13-1/4 (337)	10 (254)	5-1/2 (140)	2 (51)	1/4 (6)	1/8 (3)	10-1/2 (268)	26-1/4 (667)	10-1/4 (260)
2-1/2	3	12	2	8 (203)	10 (254)	9 (229)	3-1/2 (89)	3/4 (19)	5/8 (16)	5-3/8 (137)	19 (483)	4 (102)	4 (102)	1-1/8 (29)	2-3/4 (70)	13-1/8 (333)	11 (279)	5-1/2 (140)	2 (51)	1/4 (6)	1/8 (3)	10-1/2 (268)	26-1/4 (667)	11 (279)
3	4	14	3	10 (254)	12 (305)	10 (254)	4-1/4 (108)	7/8 (22)	3/4 (19)	6-3/4 (171)	21 (533)	5 (127)	4-1/2 (114)	1-3/8 (35)	3 (76)	15-1/4 (387)	12 (305)	6 (152)	2 (51)	3/8 (10)	3/16 (5)	12 (305)	31 (787)	12-3/8 (314)
4	5	15	3	10 (254)	12 (305)	11 (279)	4-1/4 (108)	7/8 (22)	3/4 (19)	7-1/8 (181)	23 (584)	5 (127)	5 (127)	1-3/8 (35)	3 (76)	15-1/8 (384)	13 (330)	6-1/2 (165)	2 (51)	3/8 (10)	3/16 (5)	12 (305)	31 (787)	13-1/2 (343)
5	5	12	4A	15 (381)	16 (305)	14 (356)	6-1/2 (165)	1 (25)	7/8 (22)	6-5/8 (168)	24-1/4 (616)	7 (178)	7 (178)	1-1/2 (38)	3-5/8 (92)	18-1/8 (460)	13 (330)	7 (178)	2-1/2 (64)	3/8 (10)	3/16 (5)	12-1/2 (318)	35-3/8 (899)	13 (330)
5	6	15	4	12 (305)	14 (356)	12-1/2 (318)	5 (127)	1 (25)	7/8 (22)	9-1/8 (232)	24-1/2 (622)	6 (152)	5-1/2 (140)	1-1/2 (38)	3-1/2 (89)	16-7/8 (429)	15 (381)	7-1/2 (191)	2 (51)	3/8 (10)	3/16 (5)	13 (330)	34-1/2 (876)	15-7/16 (392)
6	6	12	5A	16 (406)	19 (483)	15 (381)	7 (178)	1 (25)	7/8 (22)	7-1/2 (191)	26-1/4 (667)	8-1/2 (216)	8 (203)	1-3/4 (44)	4 (102)	19-5/8 (498)	14 (356)	8 (203)	2-3/4 (70)	3/8 (10)	3/16 (5)	12-3/4 (324)	38-1/2 (978)	14 (356)
6	8	17	5	12 (305)	14 (356)	14-3/4 (375)	5 (127)	1 (25)	7/8 (22)	11 (279)	28-1/4 (718)	6 (152)	7 (178)	1-3/4 (44)	4 (102)	17-1/2 (445)	16 (406)	9 (229)	2-7/8 (73)	3/8 (10)	3/16 (5)	15 (381)	38 (965)	16-1/2 (419)



NOTES
1. All dimensions are in inches (mm).
2. Dimensions may vary ± 3/8" (10).
3. Not for construction purposes unless certified.
4. Discharge and suction flanges - American Standard flat face.

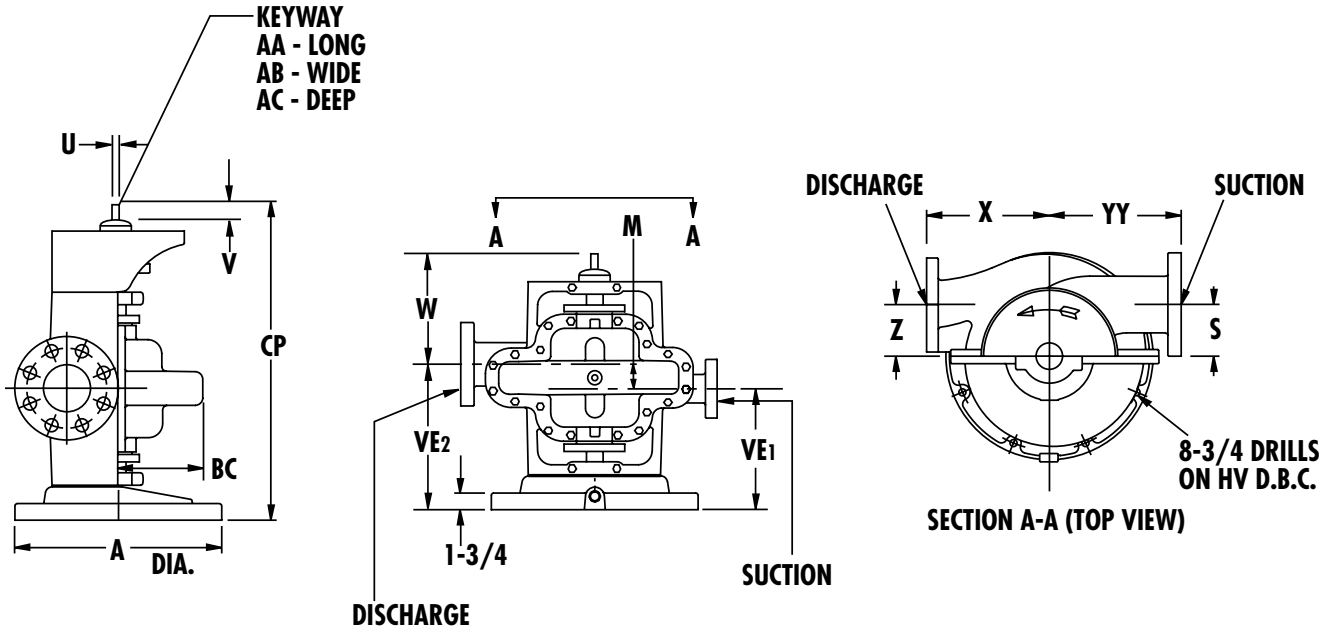
STD. *125# SUCTION FLANGES & *250# DISCHARGE FLANGES	OPT. *250# FLANGES

RIGHT HAND PUMP DIMENSIONS

PUMP SIZE			POWER SERIES	A	M	S	U	V	W	Z	AA	AB	AC	BC	CP	HV	VE_1	VE_2	X	YY
DISCH	SUCTION	CASE BORE																		
2	2-1/2	12	2	18 (457)	4-3/4 (121)	4 (102)	1-1/8 (29)	2-3/4 (70)	15-3/4 (400)	5-1/2 (140)	2 (51)	1/4 (6)	1/8 (3)	10 (254)	28-5/8 (651)	16-1/4 (413)	17-5/8 (448)	12-7/8 (327)	10 (254)	10-1/4 (260)
2-1/2	3	12	2	18 (457)	5-3/8 (137)	4 (102)	1-1/8 (29)	2-3/4 (70)	15-7/8 (403)	5-1/2 (140)	2 (51)	1/4 (6)	1/8 (3)	10 (254)	28-5/8 (651)	16-1/4 (413)	18-1/8 (460)	12-3/4 (324)	11 (279)	11 (279)
3	4	14	3	22 (559)	6-3/4 (171)	4-1/2 (114)	1-3/8 (35)	3 (76)	18-3/4 (476)	6 (152)	2 (51)	3/8 (10)	3/16 (5)	11 (279)	33-1/2 (851)	20 (508)	21-1/2 (546)	14-3/4 (375)	12 (305)	12-3/8 (314)

AURORA MODEL 422 PUMP (LH)

Supersedes Section 420 Page 204
Dated November 2001



NOTES
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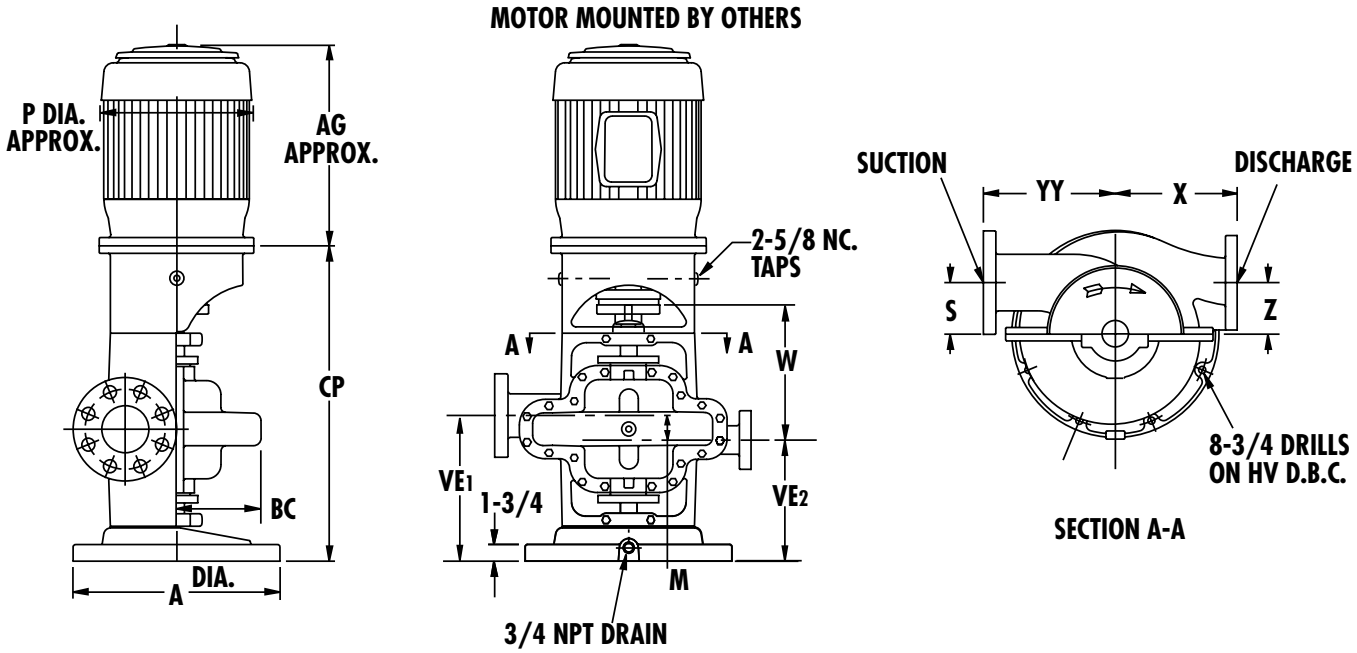
2. Dimensions may vary ± 3/8" (10).
3. Not for construction purposes unless certified.
4. Discharge and suction flanges - American Standard flat face.

STD. 125# SUCTION FLANGES & 250# DISCHARGE FLANGES	OPT. *250# FLANGES

LEFT HAND PUMP DIMENSIONS

PUMP SIZE			POWER SERIES																	
DISCH	SUCTION	CASE BORE		A	M	S	U	V	W	Z	AA	AB	AC	BC	CP	HV	VE_1	VE_2	X	YY
2	2-1/2	12	2	18 (457)	4-3/4 (121)	4 (102)	1-1/8 (29)	2-3/4 (70)	13-1/4 (330)	5-1/2 (140)	2 (51)	1/4 (6)	1/8 (3)	10 (254)	28-5/8 (651)	16-1/4 (413)	10-5/8 (270)	15-3/8 (391)	10 (254)	10-1/4 (260)
2-1/2	3	12	2	18 (457)	5-3/8 (137)	4 (102)	1-1/8 (29)	2-3/4 (70)	13-1/8 (333)	5-1/2 (140)	2 (51)	1/4 (6)	1/8 (3)	10 (254)	28-5/8 (651)	16-1/4 (413)	10-1/8 (257)	15-1/2 (394)	11 (279)	11 (279)
3	4	14	3	22 (559)	6-3/4 (171)	4-1/2 (114)	1-3/8 (35)	3 (76)	15-1/4 (387)	6 (152)	2 (51)	3/8 (10)	3/16 (5)	11 (279)	33-1/2 (851)	20 (508)	11-1/2 (292)	18-1/4 (464)	12 (305)	12-3/8 (314)



NOTES
1. All dimensions are in inches (mm).
2. Dimensions may vary ± 3/8" (10).
3. Not for construction purposes unless certified.
4. Coupling gap may vary 1/8" to 1".
5. Conduit box is shown in approximate location. Dimensions are not specified as they vary with each motor manufacturer.
6. Discharge and suction flanges - American Standard flat face.

☐ STD. 125# SUCTION FLANGES & 250# DISCHARGE FLANGES	☐ OPT. 250# FLANGES

RIGHT HAND PUMP DIMENSIONS

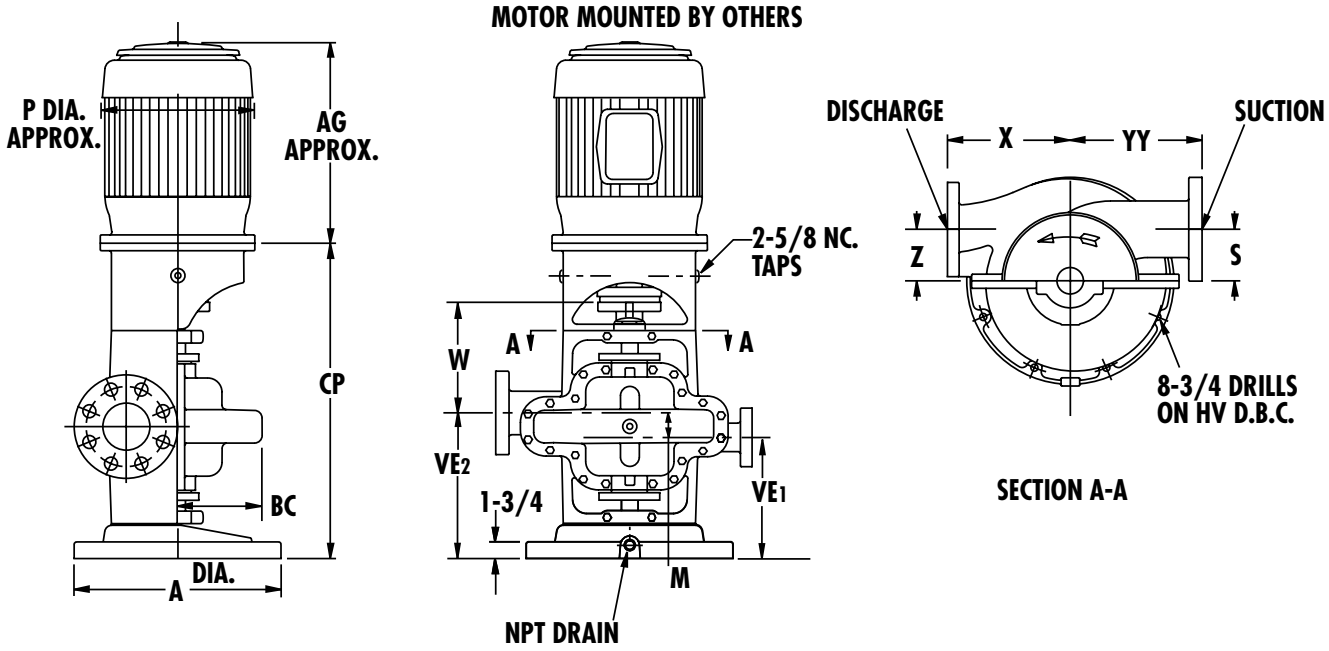
PUMP SIZE			POWER SERIES							CP						
DISCH	SUCTION	CASE BORE		A	M	S	W	Z	BC	143HP-256HP	284HPH 404HP	HV	VE_1	VE_2	X	YY
2	2-1/2	12	2	18 (457)	4-3/4 (121)	4 (102)	15-3/4 (400)	5-1/2 (140)	10 (254)	32-1/8 (816)	34 (864)	16-1/4 (413)	17-5/8 (448)	12-7/8 (327)	10 (254)	10-1/4 (260)
2-1/2	3	12	2	18 (457)	5-3/8 (137)	4 (102)	15-7/8 (403)	5-1/2 (140)	10 (254)	32-1/8 (816)	34 (864)	16-1/4 (413)	18-1/8 (460)	12-3/4 (324)	11 (279)	11 (279)
3	4	14	3	22 (559)	6-3/4 (171)	4-1/2 (114)	18-3/4 (476)	6 (152)	11 (279)	37-3/8 (949)	39-3/4 (1010)	20 (508)	21-1/2 (546)	14-3/4 (375)	12 (305)	12-3/8 (314)

Frame	143 HP	145 HP	182 HP	184 HP	213 HP	215 HP	254 HP	256 HP	284 HP	286 HP	324 HP	326 HP	364 HP	365 HP	404 HP
P	8	8	10	10	11	11	13	13	16	16	18	18	20	20	22
AG	11	12	13	14	16	18	20	22	23	24	25	27	32	32	35

AURORA MODEL 423 PUMP (LH)

Date **March 2004**

Supersedes Section 420 Page 206
Dated November 2001



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5. Conduit box is shown in approximate location. Dimensions are not specified as they vary with each motor manufacturer.
6. Discharge and suction flanges - American Standard flat face.

STD. 125# SUCTION FLANGES & 250# DISCHARGE FLANGES	OPT. 250# FLANGES

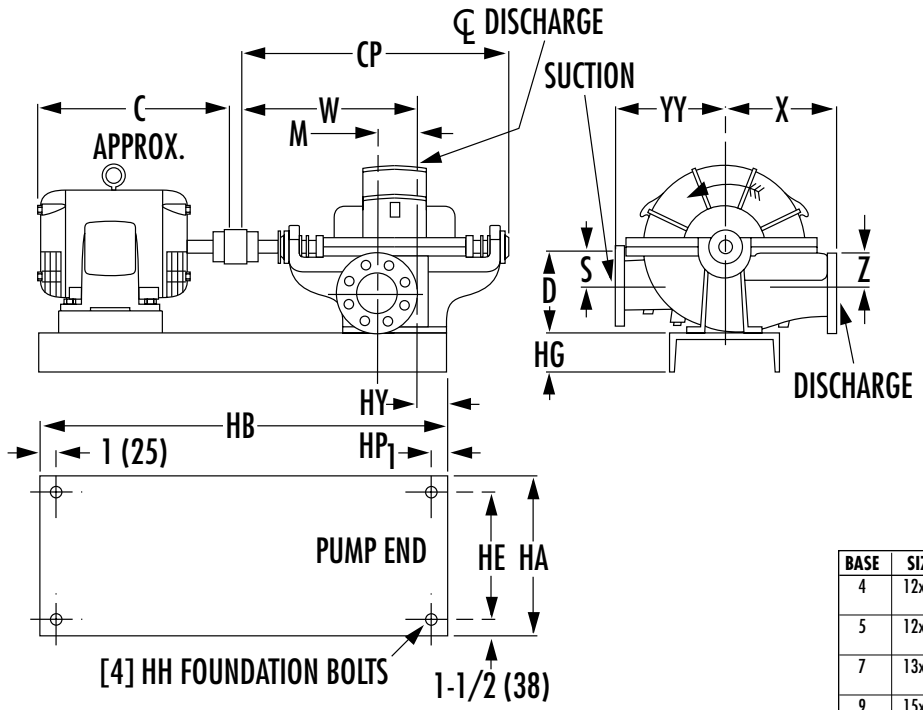
LEFT HAND PUMP DIMENSIONS

PUMP SIZE			POWER SERIES							CP						
DISCH	SUCTION	CASE BORE		A	M	S	W	Z	BC	143HP-256HP	284HPH 404HP	HV	VE_1	VE_2	X	YY
2	2-1/2	12	2	18 (457)	4-3/4 (121)	4 (102)	13-1/4 (349)	5-1/2 (140)	10 (254)	32-1/8 (816)	34 (864)	16-1/4 (413)	10-5/8 (270)	15-3/8 (391)	10 (254)	10-1/4 (260)
2-1/2	3	12	2	18 (457)	5-3/8 (137)	4 (102)	13-1/8 (340)	5-1/2 (140)	10 (254)	32-1/8 (816)	34 (864)	16-1/4 (413)	10-1/8 (257)	15-1/2 (394)	11 (279)	11 (279)
3	4	14	3	22 (559)	6-3/4 (171)	4-1/2 (114)	15-1/4 (387)	6 (152)	11 (279)	37-3/8 (949)	39-3/4 (1010)	20 (508)	11-1/2 (292)	18-1/4 (464)	12 (305)	12-3/8 (314)

Frame	143 HP	145 HP	182 HP	184 HP	213 HP	215 HP	254 HP	256 HP	284 HPH	286 HPH	324 HP	326 HP	364 HP	365 HP	404 HP
P	8	8	10	10	11	11	13	13	16	16	18	18	20	20	22
AG	11	12	13	14	16	18	20	22	23	24	25	27	32	32	35

AURORA MODEL 421 PUMPS

ON STEEL BASE
RIGHT HAND PUMP



RIGHT HAND PUMP

BASE	SIZE	HA	HB	HE	HG	HH	HP
4	12x34	12 (305)	34 (863)	9 (228)	3 (76)	1/2 (13)	20 (508)
5	12x38	12 (305)	38 (964)	9 (228)	3 (76)	1/2 (13)	20 (508)
7	13x42	13 (330)	42 (1066)	10 (254)	4 (102)	5/8 (16)	24 (609)
9	15x44	15 (381)	44 (1117)	12 (305)	3-3/8 (86)	5/8 (16)	24 (609)
11	18x48	18 (457)	48 (1218)	15 (381)	4 (102)	5/8 (16)	1 (25)
12	18x54	18 (457)	54 (1371)	15 (381)	4 (102)	5/8 (16)	1 (25)
13	18x60	18 (457)	60 (1523)	15 (381)	4 (102)	5/8 (16)	24 (609)
15	22x60	22 (558)	60 (1523)	19 (482)	4 (102)	5/8 (16)	1 (25)
16	22x72	22 (558)	72 (1827)	19 (482)	4 (102)	5/8 (16)	1 (25)
17	22x84	22 (558)	84 (2134)	19 (482)	4 (102)	5/8 (16)	1 (25)

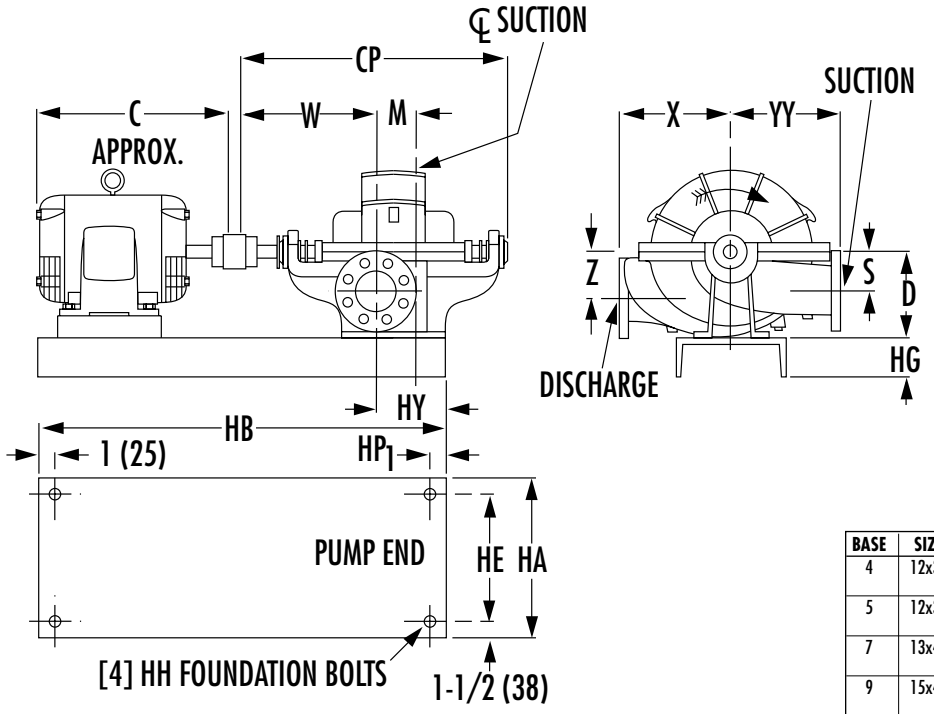
NOTES
1. All dimensions are in inches.
2. Dimensions may vary ± 3/8".
3. Not for construction purposes unless certified.
4. Coupling gap may vary 1/8" thru 1".
5. Conduit box is shown in approximate location. Dimensions are not specifed as they vary with each motor manufacturer.
6. Suction and discharge flanges are ANSI standard flat face.

❑ STANDARD 125# SUCTION FLANGE, 250# DISCHARGE FLANGE
❑ OPTIONAL 250# SUCTION AND DISCHARGE FLANGES
❑ STANDARD 5x5x12 & 6x6x12 150# SUCTION FLANGE, 300# DISCHARGE FLANGE
❑ OPTIONAL 5x5x12 & 6x6x12 300# SUCTION AND DISCHARGE FLANGES

PUMP SIZE			POWER SERIES	D	M	S	W	Z	CP	HY	X	YY	C FRAME	145T	182T	184T	213T	215T	254T	256T	284TS	284T	286TS	286T	324TS	324T	326TS	326T	364TS	364T	365TS	365T	404TS	404T	405TS	405T	444TS	445TS	447TS	449TS
DISCH	SUCTION	CASE BORE												12 (305)	13 (330)	14 (355)	16 (406)	18 (457)	21 (533)	23 (584)	22 (558)	24 (609)	24 (609)	25 (635)	25 (635)	26 (660)	26 (660)	28 (711)	27 (685)	29 (736)	28 (711)	30 (761)	30 (761)	33 (838)	31 (787)	34 (863)	34 (863)	36 (914)	39 (991)	45 (1143)
2	2-1/2	12	2	9 (228)	4-3/4 (121)	4 (102)	15-3/4 (400)	5-1/2 (140)	26-1/4 (666)	3-3/4 (95)	10 (254)	10-1/4 (260)	BASE	4	4	4	5	5	9	9	9	9	9	11	11	11	11	11	11	11	11	11								
2-1/2	3	12	2	9-3/4 (248)	5-3/8 (136)	4 (102)	15-7/8 (403)	5-1/2 (140)	26-1/4 (666)	3-5/8 (92)	11 (279)	11 (279)	BASE	4	4	4	5	5	9	9	9	9	9	11	11	11	11	11	11	11	11	11								
3	4	14	3	11 (279)	6-3/4 (171)	4-1/2 (114)	18-3/4 (476)	6 (152)	31 (787)	4-1/4 (108)	12 (305)	12-3/8 (314)	BASE		5	5	7	7	9	11	11	11	11	11	11	12	12	12	12	12	12	12	15		15		15			
4	5	15	3	11 (279)	7-1/8 (181)	5 (130)	18-7/8 (479)	6-1/2 (165)	31 (787)	4-1/8 (105)	13 (330)	13-1/2 (343)	BASE						9	11	11	11	11	11	11	12	12	12	12	12	12	12	15		15		15			
5	5	12	4A	14 (356)	6-5/8 (168)	7 (178)	20-7/8 (530)	7 (178)	35-3/8 (899)	11-1/8 (283)	13 (330)	13 (330)	BASE																				16		16		16	16	17	17
5	6	15	4	12-1/2 (317)	9-1/8 (232)	5-1/2 (140)	21-1/8 (536)	7-1/2 (190)	34-1/2 (876)	4-7/8 (124)	15 (381)	15-7/16 (392)	BASE						11	12	12	12	12	12	12	12	12	12	12	12	12	12	15		15		15	16		
6	6	12	5A	15 (381)	7-1/2 (191)	8 (203)	22-7/8 (581)	8 (203)	38-1/2 (978)	10-7/8 (276)	14 (356)	14 (356)	BASE																						16		16	16	17	17
6	8	17	5	14-3/4 (374)	11 (279)	7 (178)	24-1/2 (622)	9 (228)	38 (964)	3-1/2 (89)	16 (406)	16-1/2 (419)	BASE						12	12	12	12	12	12	12	12	12	13	13	13	13	13	15	15	15	16	16	16		

AURORA MODEL 421 PUMPS

ON STEEL BASE
LEFT HAND PUMP



LEFT HAND PUMP

BASE	SIZE	HA	HB	HE	HG	HH	HP
4	12x34	12 (305)	34 (863)	9 (228)	3 (76)	1/2 (13)	20 (508)
5	12x38	12 (305)	38 (964)	9 (228)	3 (76)	1/2 (13)	20 (508)
7	13x42	13 (330)	42 (1066)	10 (254)	4 (102)	5/8 (16)	24 (609)
9	15x44	15 (381)	44 (1117)	12 (305)	3-3/8 (86)	5/8 (16)	24 (609)
11	18x48	18 (457)	48 (1218)	15 (381)	4 (102)	5/8 (16)	1 (25)
12	18x54	18 (457)	54 (1371)	15 (381)	4 (102)	5/8 (16)	1 (25)
13	18x60	18 (457)	60 (1523)	15 (381)	4 (102)	5/8 (16)	24 (609)
15	22x60	22 (558)	60 (1523)	19 (482)	4 (102)	5/8 (16)	1 (25)
16	22x72	22 (558)	72 (1827)	19 (482)	4 (102)	5/8 (16)	1 (25)
17	22x84	22 (558)	84 (2134)	19 (482)	4 (102)	5/8 (16)	1 (25)

NOTES
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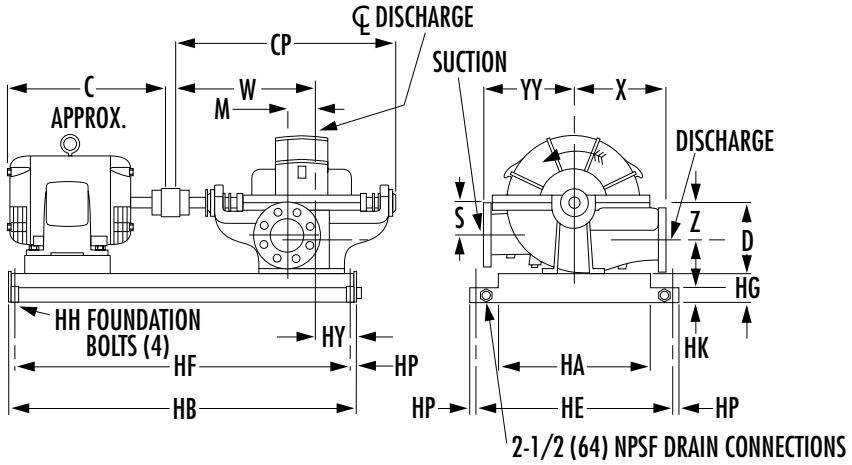
❑ OPTIONAL 5x5x12 & 6x6x12 300# SUCTION AND DISCHARGE FLANGES

PUMP SIZE														145T	182T	184T	213T	215T	254T	256T	284TS	284T	286TS	286T	324TS	324T	326TS	326T	364TS	364T	365TS	365T	404TS	404T	405TS	405T	444TS	445TS	447TS	449TS
														12	13	14	16	18	21	23	22	24	24	25	25	26	26	28	27	29	28	30	30	33	31	34	34	36	39	45
DISCH	SUCTION	CASE BORE	POWER SERIES	D	M	S	W	Z	CP	HY	X	YY	C FRAME	(305)	(330)	(355)	(406)	(457)	(533)	(584)	(558)	(609)	(609)	(635)	(635)	(660)	(660)	(711)	(685)	(736)	(711)	(761)	(761)	(838)	(787)	(863)	(863)	(914)	(991)	(1143)
2	2-1/2	12	2	9 (228)	4-3/4 (121)	4 (102)	13-1/4 (337)	5-1/2 (140)	26-1/4 (666)	6-1/4 (159)	10 (254)	10-1/4 (260)	BASE	4	4	4	5	5	9	9	9	9	9	11	11	11	11	11	11	11	11	11	11							
2-1/2	3	12	2	9-3/4 (248)	5-3/8 (136)	4 (102)	13-1/8 (333)	5-1/2 (140)	26-1/4 (666)	6-3/8 (162)	11 (279)	11 (279)	BASE	4	4	4	5	5	9	9	9	9	9	11	11	11	11	11	11	11	11	11	11							
3	4	14	3	11 (279)	6-3/4 (171)	4-1/2 (114)	15-1/4 (387)	6 (152)	31 (787)	7-3/4 (197)	12 (305)	12-3/8 (314)	BASE		5	5	7	7	9	11	11	11	11	11	11	12	12	12	12	12	12	12	15		15		15			
4	5	15	3	11 (279)	7-1/8 (181)	5 (130)	15-1/8 (384)	6-1/2 (165)	31 (787)	7-7/8 (257)	13 (330)	13-1/2 (343)	BASE						9	11	11	11	11	11	11	12	12	12	12	12	12	12	15		15		15			
5	5	12	4A	14 (356)	6-5/8 (168)	7 (178)	18-1/8 (460)	7 (178)	35-3/8 (899)	13-7/8 (352)	13 (330)	13 (330)	BASE																				16		16		16	16	17	17
5	6	15	4	12-1/2 (317)	9-1/8 (232)	5-1/2 (140)	16-7/8 (536)	7-1/2 (190)	34-1/2 (876)	9-1/8 (232)	15 (381)	15-7/16 (392)	BASE						11	12	12	12	12	12	12	12	12	12	12	12	12	13	15		15		15	16		
6	6	12	5A	15 (381)	7-1/2 (191)	8 (203)	19-5/8 (498)	8 (203)	38-1/2 (978)	14-1/8 (359)	14 (356)	14 (356)	BASE																						16		16	16	17	17
6	8	17	5	14-3/4 (374)	11 (279)	7 (178)	17-1/2 (445)	9 (228)	38 (964)	10-1/2 (267)	16 (406)	16-1/2 (419)	BASE						12	12	12	12	12	12	12	12	12	13	13	13	13	13	15	15	15	16	16	16		

AURORA MODEL 421 PUMPS

ON STEEL DRIP RIM BASE
RIGHT HAND PUMP



RIGHT HAND PUMP

BASE	SIZE	HA	HB	HE	HF	HG	HH	HK	HP
3	9x33	9 (229)	33-1/2 (851)	13-3/4 (349)	32-1/4 (826)	3 (76)	3/8 (10)	1-1/2 (38)	5/8 (16)
5	11x36	11 (279)	36-1/2 (927)	15-7/8 (403)	35-1/8 (892)	3 (76)	1/2 (13)	1-1/2 (38)	11/16 (17)
6	11x42	11 (279)	42-1/2 (1080)	15-7/8 (403)	41-1/8 (1045)	3 (76)	1/2 (13)	1-1/2 (38)	11/16 (17)
8	14x42	14 (356)	42-1/2 (1080)	19 (483)	41 (1041)	3 (76)	5/8 (16)	1-1/2 (38)	3/4 (19)
9	14x48	14 (356)	48-1/2 (1232)	19 (483)	47 (1194)	3 (76)	5/8 (16)	1-1/2 (38)	3/4 (19)
10	14x56	14 (356)	56-1/2 (1435)	19 (483)	55 (1397)	3 (76)	5/8 (16)	1-1/2 (38)	3/4 (19)
11	18x46	18 (457)	46-1/2 (1181)	25-1/8 (638)	44-7/8 (1140)	4 (102)	3/4 (19)	2 (51)	13/16 (21)
12	18x54	18 (457)	54-1/2 (1384)	25-1/8 (638)	52-7/8 (1343)	4 (102)	3/4 (19)	2 (51)	13/16 (21)
13	18x64	18 (457)	64-1/2 (1638)	25-1/8 (638)	62-7/8 (1597)	4 (102)	3/4 (19)	2 (51)	13/16 (21)
15	22x54	22 (559)	54-1/2 (1384)	29-1/8 (740)	52-7/8 (1343)	4-1/2 (114)	3/4 (19)	2 (51)	13/16 (21)
16	22x64	22 (559)	64-1/2 (1638)	29-1/8 (740)	62-7/8 (1597)	4-1/2 (114)	3/4 (19)	2 (51)	13/16 (21)
17	22x74	22 (559)	74-1/2 (1892)	29-1/8 (740)	72-7/8 (1851)	4-1/2 (114)	3/4 (19)	2 (51)	13/16 (21)
18	22x82	22 (559)	82-1/2 (2273)	29-1/8 (740)	80-7/8 (2054)	4-1/2 (114)	3/4 (19)	2 (51)	13/16 (21)

NOTES
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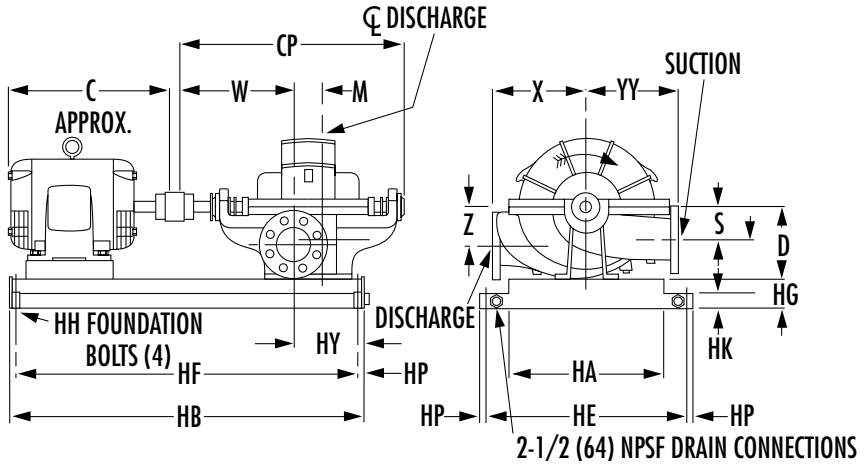
PUMP SIZE			POWER SERIES	D	M	S	W	Z	CP	HY	X	YY	C FRAME	145T	182T	184T	213T	215T	254T	256T	284TS	284T	286TS	286T	324TS	324T	326TS	326T	364TS	364T	365TS	365T	404TS	404T	405TS	405T	444TS	444T	445TS	445T	447TS	449TS
														13	13	14	16	18	21	23	22	24	24	25	25	26	28	27	29	28	30	30	33	31	34	34	38	36	40	39	45
DISCH	SUCTION	CASE BORE												(330)	(330)	(355)	(406)	(457)	(533)	(584)	(558)	(609)	(609)	(635)	(635)	(660)	(711)	(685)	(736)	(711)	(761)	(761)	(838)	(787)	(863)	(863)	(965)	(914)	(1016)	(991)	(1143)
2	2-1/2	12	2	9 (228)	4-3/4 (121)	4 (102)	15-3/4 (400)	5-1/2 (140)	26-1/4 (666)	4-1/4 (108)	10 (254)	10-1/4 (260)	BASE		3	3	5	6	8	8	8	9	9	9	11	11	11	11	11	12	12	12										
2-1/2	3	12	2	9-3/4 (248)	5-3/8 (136)	4 (102)	15-7/8 (403)	5-1/2 (140)	26-1/4 (666)	4-1/8 (105)	11 (279)	11 (279)	BASE		3	3	5	6	8	8	8	9	9	9	11	11	11	11	11	12	12	12										
3	4	14	3	10-3/4 (273)	6-3/4 (171)	4-1/2 (114)	18-3/4 (476)	6 (152)	31 (787)	4-3/4 (121)	12 (305)	12-3/8 (314)	BASE					6	9	9	9	9	9	9	12	12	12	12	12	12	12	12	15	16	15							
4	5	15	3	11 (279)	7-1/8 (181)	5 (130)	18-7/8 (479)	6-1/2 (165)	31 (787)	4-5/8 (117)	13 (330)	13-1/2 (343)	BASE								9	9	9	9	12	12	12	12	12	12	12	12	15	16	15	16	16	16				
5	5	12	4A	14 (356)	6-5/8 (168)	7 (178)	20-7/8 (530)	7 (178)	35-3/8 (899)	11-1/8 (283)	13 (330)	13 (330)	BASE																			17		17		17		17		18	18
5	6	15	4	12-1/2 (317)	9-1/8 (232)	5-1/2 (140)	21-1/8 (536)	7-1/2 (190)	34-1/2 (876)	5-3/8 (137)	15 (381)	15-7/16 (392)	BASE														12	12	12	12	12	13	16	16	16	16	16	16	16			
6	6	12	5A	15 (381)	7-1/2 (191)	8 (203)	22-7/8 (581)	8 (203)	38-1/2 (978)	10-7/8 (276)	14 (356)	14 (356)	BASE																					17		17		17		18	18
6	8	17	5	14-3/4 (374)	11 (279)	7 (178)	24-1/2 (622)	9 (228)	38 (964)	4 (102)	16 (406)	16-1/2 (419)	BASE								10	10	10	10	12	12	13	13	13	13	13	13	16	16	16	16	16	16	16	17		

AURORA®
Pentair Pump Group

Supersedes Section 421 Page 302
Dated May 1991

AURORA MODEL 421 PUMPS

ON STEEL DRIP RIM BASE
LEFT HAND PUMP



LEFT HAND PUMP

BASE	SIZE	HA	HB	HE	HF	HG	HH	HK	HP
3	9x33	9 (229)	33-1/2 (851)	13-3/4 (349)	32-1/4 (826)	3 (76)	3/8 (10)	1-1/2 (38)	5/8 (16)
5	11x36	11 (279)	36-1/2 (927)	15-7/8 (403)	35-1/8 (892)	3 (76)	1/2 (13)	1-1/2 (38)	11/16 (17)
6	11x42	11 (279)	42-1/2 (1080)	15-7/8 (403)	41-1/8 (1045)	3 (76)	1/2 (13)	1-1/2 (38)	11/16 (17)
8	14x42	14 (356)	42-1/2 (1080)	19 (483)	41 (1041)	3 (76)	5/8 (16)	1-1/2 (38)	3/4 (19)
9	14x48	14 (356)	48-1/2 (1232)	19 (483)	47 (1194)	3 (76)	5/8 (16)	1-1/2 (38)	3/4 (19)
10	14x56	14 (356)	56-1/2 (1435)	19 (483)	55 (1397)	3 (76)	5/8 (16)	1-1/2 (38)	3/4 (19)
11	18x46	18 (457)	46-1/2 (1181)	25-1/8 (638)	44-7/8 (1140)	4 (102)	3/4 (19)	2 (51)	13/16 (21)
12	18x54	18 (457)	54-1/2 (1384)	25-1/8 (638)	52-7/8 (1343)	4 (102)	3/4 (19)	2 (51)	13/16 (21)
13	18x64	18 (457)	64-1/2 (1638)	25-1/8 (638)	62-7/8 (1597)	4 (102)	3/4 (19)	2 (51)	13/16 (21)
15	22x54	22 (559)	54-1/2 (1384)	29-1/8 (740)	52-7/8 (1343)	4-1/2 (114)	3/4 (19)	2 (51)	13/16 (21)
16	22x64	22 (559)	64-1/2 (1638)	29-1/8 (740)	62-7/8 (1597)	4-1/2 (114)	3/4 (19)	2 (51)	13/16 (21)
17	22x74	22 (559)	74-1/2 (1892)	29-1/8 (740)	72-7/8 (1851)	4-1/2 (114)	3/4 (19)	2 (51)	13/16 (21)
18	22x82	22 (559)	82-1/2 (2273)	29-1/8 (740)	80-7/8 (2054)	4-1/2 (114)	3/4 (19)	2 (51)	13/16 (21)

NOTES
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❑ OPTIONAL 250# SUCTION AND DISCHARGE FLANGES
❑ STANDARD 5x5x12 & 6x6x12 150# SUCTION FLANGE, 300# DISCHARGE FLANGE
❑ OPTIONAL 5x5x12 & 6x6x12 300# SUCTION AND DISCHARGE FLANGES

PUMP SIZE														145T	182T	184T	213T	215T	254T	256T	284TS	284T	286TS	286T	324TS	324T	326TS	326T	364TS	364T	365TS	365T	404TS	404T	405TS	405T	444TS	444T	445TS	445T	447TS	449TS
DISCH	SUCTION	CASE BORE	POWER SERIES	D	M	S	W	Z	CP	HY	X	YY	C FRAME	13 (330)	13 (330)	14 (355)	16 (406)	18 (457)	21 (533)	23 (584)	22 (558)	24 (609)	24 (609)	25 (635)	25 (635)	26 (660)	26 (660)	28 (711)	27 (685)	29 (736)	28 (711)	30 (761)	30 (761)	33 (838)	31 (787)	34 (863)	34 (863)	38 (965)	36 (914)	40 (1016)	39 (991)	45 (1143)
2	2-1/2	12	2	9 (228)	4-3/4 (121)	4 (102)	13-1/4 (337)	5-1/2 (140)	26-1/4 (666)	6-3/4 (171)	10 (254)	10-1/4 (260)	BASE		3	3	5	6	8	8	8	9	9	9	11	11	11	11	11	12	12	12									
2-1/2	3	12	2	9-3/4 (248)	5-3/8 (136)	4 (102)	13-1/8 (333)	5-1/2 (140)	26-1/4 (666)	6-7/8 (175)	11 (279)	11 (279)	BASE		3	3	5	6	8	8	8	9	9	9	11	11	11	11	11	12	12	12									
3	4	14	3	10-3/4 (273)	6-3/4 (171)	4-1/2 (114)	15-1/4 (387)	6 (152)	31 (787)	8-1/4 (210)	12 (305)	12-3/8 (314)	BASE					6	9	9	9	9	9	9	12	12	12	12	12	12	12	12	15	16	15						
4	5	15	3	11 (279)	7-1/8 (181)	5 (130)	15-1/8 (460)	6-1/2 (165)	31 (787)	8-3/8 (213)	13 (330)	13-1/2 (343)	BASE								9	9	9	9	12	12	12	12	12	12	12	12	15	16	15	16	16	16			
5	5	12	4A	14 (356)	6-5/8 (168)	7 (178)	18-1/8 (460)	7 (178)	35-3/8 (899)	13-7/8 (352)	13 (330)	13 (330)	BASE																				17		17		17		17	18	18
5	6	15	4	12-1/2 (317)	9-1/8 (232)	5-1/2 (140)	16-7/8 (429)	7-1/2 (190)	34-1/2 (876)	9-5/8 (244)	15 (381)	15-7/16 (392)	BASE														12	12	12	12	12	13	16	16	16	16	16	16	16			
6	6	12	5A	15 (381)	7-1/2 (191)	8 (203)	19-5/8 (498)	8 (203)	38-1/2 (978)	14-1/8 (359)	14 (356)	14 (356)	BASE																					17		17		17		18	18
6	8	17	5	14-3/4 (374)	11 (279)	7 (178)	17-1/2 (445)	9 (228)	38 (964)	11 (279)	16 (406)	16-1/2 (419)	BASE								10	10	10	10	12	12	13	13	13	13	13	16	16	16	16	16	16	16	17		

AURORA®
Pentair Pump Group

AURORA PUMP
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INSTRUCTION MANUAL 2
INSTALLATION
FRAME MOUNTED

GENERAL. The life of your Aurora pump can be extended considerably by carefully following the installation instructions contained herein. Each step of the pump installation instructions plays a vital part in assuring long life, efficient operation, and reduced maintenance, from the initial location of the pump through prestarting directions.

UNPACKING YOUR PUMP. The crate containing your pump should be opened immediately upon receipt from the factory, and the pump generally inspected for damage and shortage of parts. Particular attention should be given to the discharge and suction nozzle threads or flanges. Any damage or shortage of parts should be reported to the carrier immediately.

CLEANING. If your pump is to be installed immediately, it will be necessary to remove the protective covers from all openings, and to clean the exposed metal parts thoroughly with white gasoline or other suitable solvent to remove the preservative coating.

STORAGE. If your pump is not to be put in service immediately it should be covered and stored in a clean dry area. The protective covers and preservative should be left intact until the pump is put into service. For extended storage, the pump should be dried internally with hot air or some other suitable means, and once free of moisture, filled with a protective fluid such as light oil or kerosene. Accordingly, at time of installation, the pump will have to be completely dismantled and thoroughly cleaned.

PLANNING THE PUMP LOCATION. You probably have spent considerable time planning where your pump will be located. However you may have overlooked some factor which may affect your pump operation or efficiency.

The pump should be located as close to the liquid source as possible so that the suction line can be

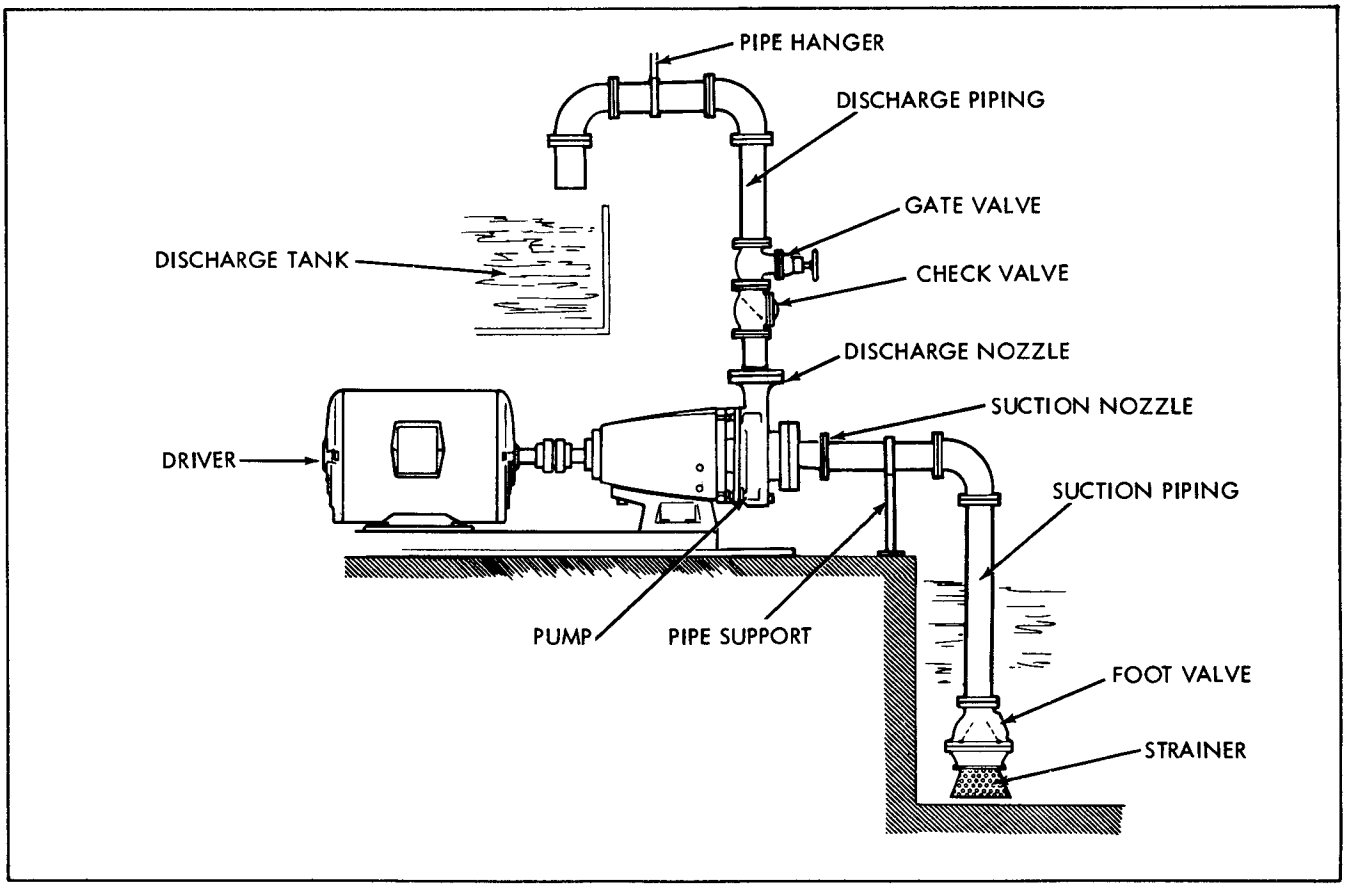

FIGURE 1. RECOMMENDED LOCATION - SHORT DIRECT SUCTION

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short and direct. It should be located in a clean, open area, where it is easily accessible for inspection, lubrication, and repair. Pumps installed in dark, dirty areas or in cramped locations are often neglected which can result in premature failure of both the pump and the driver.

Your pump should be located so that a hoist or crane can be used to move it without interference from piping. This factor is often overlooked in the advance planning stage.

Protect your pump against the possibility of flooding. Although water will not seriously damage the pump, the drive motor can be damaged.

The pump should be located in an area where moisture, either from leakage through the packing or from condensation, can be adequately drained off. Moisture dripping on exposed metal or wood can cause rapid deterioration of the area. Also, wet floors produce safety hazards.

Adequate provisions should be made for electrical wiring to the pump motor. A switch and overload protection should be installed near the pump unless it is impractical. The electrical conduit should be positioned in such a way as to preclude the possibility of moisture entering the conduit or the motor and causing short circuits.

Outdoor installation will normally provide all of the above mentioned conditions. However it is advisable to provide a weather shelter for your pump.

FOUNDATION. The foundation for your pump must be sufficiently rigid to absorb any vibration and stress encountered during pump operation. A raised foundation of concrete is preferable for most floor mounted pumps. The raised foundation assures a satisfactory base, protects against flooding, simplifies moisture drainage, and facilitates keeping the area clean.

Your pump should be firmly bolted to the foundation, whether it is a raised concrete base, steelwork wall, or structural member. The mounting bolts or studs should be accurately located per the applicable Aurora dimension sheet. Foundation bolts should be enclosed by a sleeve 2 to 4 diameters larger than the bolt to allow movement for proper alignment with the pump mounting holes. Refer to figure 3.

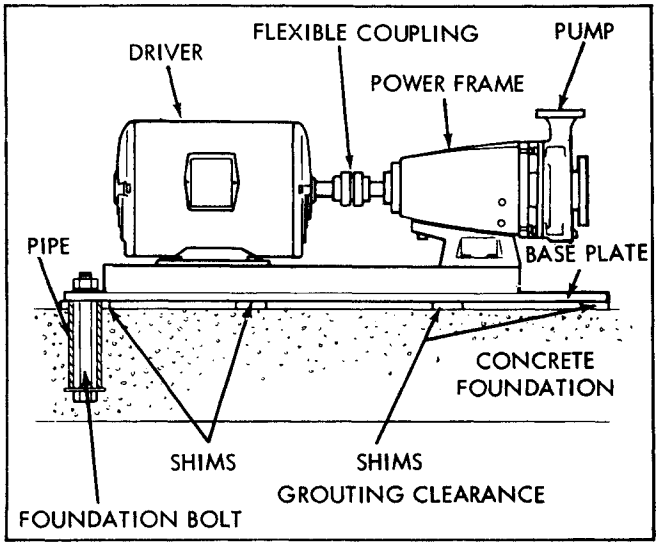


FIGURE 3. FOUNDATION FOR FRAME MOUNTED PUMPS

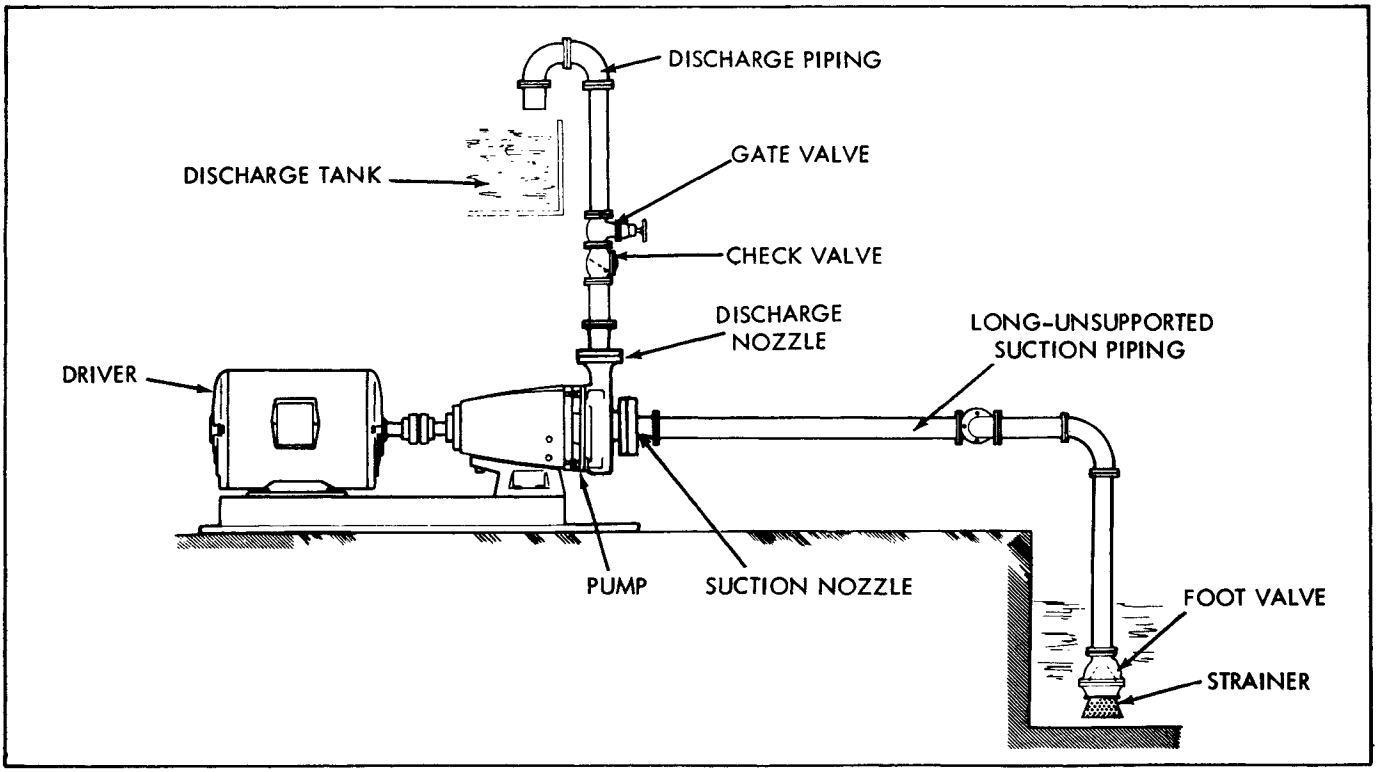


FIGURE 2. UNSATISFACTORY LOCATION - LONG INDIRECT SUCTION WITH NO SUPPORT

FRAME MOUNTED INSTALLATION

If the pump is to be mounted on steelwork or other structure, adequate support should be provided to prevent distortion of the base plate or the structure, which could produce excessive strain on the pump casing and piping, and seriously affect alignment of the pump and driver.

PREPARING TO INSTALL YOUR PUMP. Your pump and driver unit will normally be mounted on a common base plate. The unit has been accurately aligned and securely mounted to the base plate at the factory. However, the alignment cannot be maintained during shipping and the complete unit must be leveled and realigned at the time of installation.

LEVELING THE PUMP. Leveling the pump will require enough shims to support the base plate near the foundation bolts, and at any points of the base plate carrying a substantial weight load. The shims should be large enough to allow a gap of 3/4" to 1-1/2" between the base plate and foundation for grouting.

The pump unit should be set on the foundation, being careful not to damage the threads on the foundation bolts. The flexible coupling halves should then be disconnected. The shims should be inserted and the pump leveled. A spirit level should be used on the faces of the flexible coupling halves, and on the suction and discharge flanges. If your pump has threaded nozzles, a short piece of pipe inserted in the nozzles will serve as a smooth surface for a leveling reference point. The shims should be adjusted until the pump is leveled horizontally and vertically. Tighten the foundation bolts finger tight.

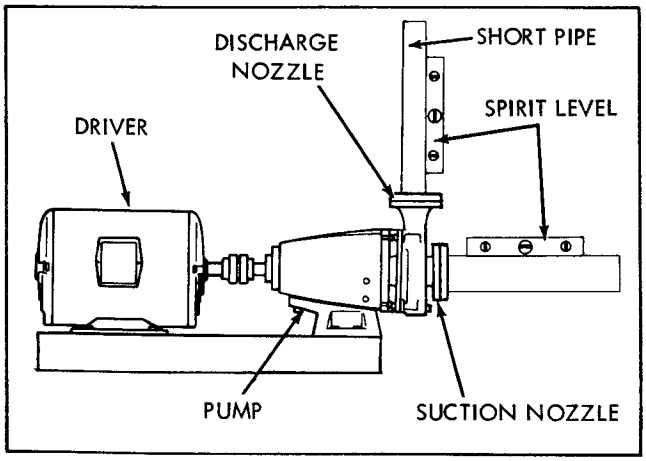


FIGURE 4. LEVELING PUMP UNIT WITH SPIRIT LEVEL AND SHORT LENGTHS OF PIPE

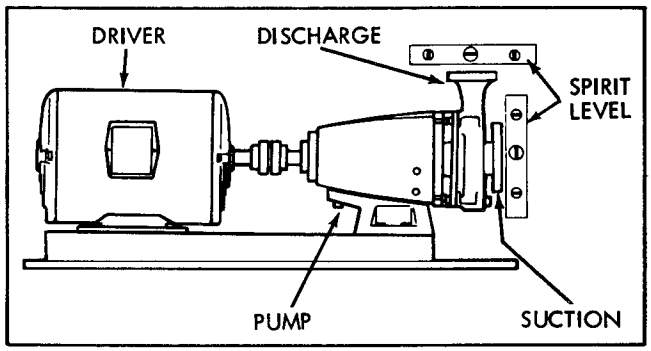


FIGURE 5. LEVELING PUMP UNIT WITH SPIRIT LEVEL ON PUMP FLANGES

INITIAL ALIGNMENT OF THE FLEXIBLE COUPLING. The pump and driver were accurately aligned at the factory. However, it is impossible to maintain this alignment during shipping and handling. Therefore it will be necessary for you to realign the pump and driver. Flexible couplings are not universal joints. They should not be used to compensate for misalignment of the pump and motor shafts. Their function is to transmit power from the driver to the pump while compensating for thermal expansion and shaft end movement. The coupling faces should be far enough apart so that they do not make contact when the motor shaft is forced to the limit of the bearing clearance toward the pump shaft.

In order to properly align the coupling, you will need a taper gauge or set of feeler gauges, and a straight edge, or if available, a dial indicator.

There are two types of misalignment encountered with flexible couplings: angular misalignment, in which the shafts are not parallel, and parallel misalignment where the shafts are parallel but not on the same axis.

To check angular alignment, insert a feeler gauge or taper gage at any four places 90° apart around the

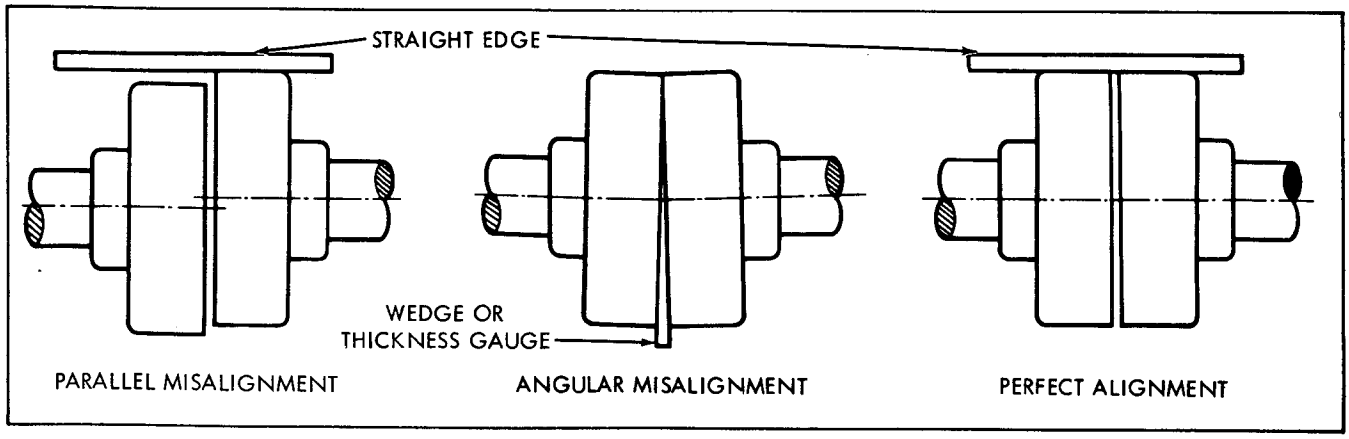


FIGURE 6. FLEXIBLE COUPLING ALIGNMENT

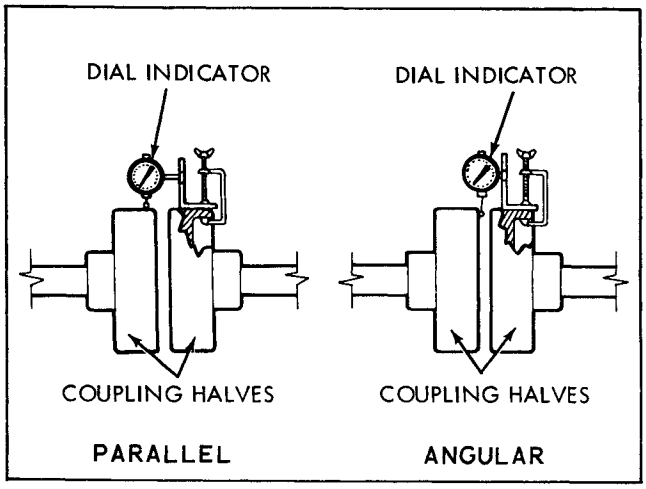


FIGURE 7. CHECKING ALIGNMENT WITH DIAL INDICATOR

coupling halves. Insert shims under the driver feet until the same reading is obtained at all four check points. The pump and driver will then be in angular alignment.

To check angular alignment with a dial indicator, clamp the dial indicator to the pump coupling half so that ball on the indicator just rests on the face of the motor coupling half. A chalk mark should be made at the point where the ball contacts the coupling half. Both the pump shaft and the motor shaft should be rotated an equal amount so that the reading is taken at all check points with the ball on the chalk mark. Insert shims as required.

To check parallel alignment, a straight edge should be held against the edges of the coupling halves at any four places 90° apart around the coupling. The straight edge should be parallel to the pump and driver shafts at all times. Insert shims until the straight edge lies flat against both coupling halves at all four check points. The pump and driver will then be in proper parallel alignment.

To check parallel alignment with the dial indicator, the ball should rest on periphery of the motor coupling half. A chalk mark should be made at the point of contact, and the shafts rotated equally so that the reading is taken with the ball on the chalk mark at all check points. Insert shims as required.

NOTE

Any adjustment to correct one direction of alignment may affect the other direction. Therefore, it is necessary to recheck both angular and parallel alignment after each adjustment.

When the unit is properly aligned, the foundation bolts should be tightened, but not too firmly. Waste material should be stuffed into the sleeves around the foundation bolts, to prevent grout from filling the sleeves during grouting.

GROUTING THE INSTALLATION. Grouting the base plate prevents lateral movement of the base plate, and improves the vibration absorbing characteristics of the foundation by increasing its mass. A wooden dam should be constructed around the base plate to contain the grout while it is being poured. The dam can be built tight against the base plate, or slightly removed from it as desired.

The entire base plate should be completely filled with grout. A non-shrinkable type grout, such as manufactured by EMBCO is recommended. The grout should be puddled frequently to remove any air bubbles from the grout.

The leveling shims can be grouted in place, or they can be removed after the grout has set usually from 48 to 72 hours after pouring.

After the grout has set, alignment of the unit should be checked and the foundation bolts firmly tightened down.

PIPING. Your pump unit is now ready to be piped. The piping practices you follow will directly affect the efficiency and power consumption of your pump.

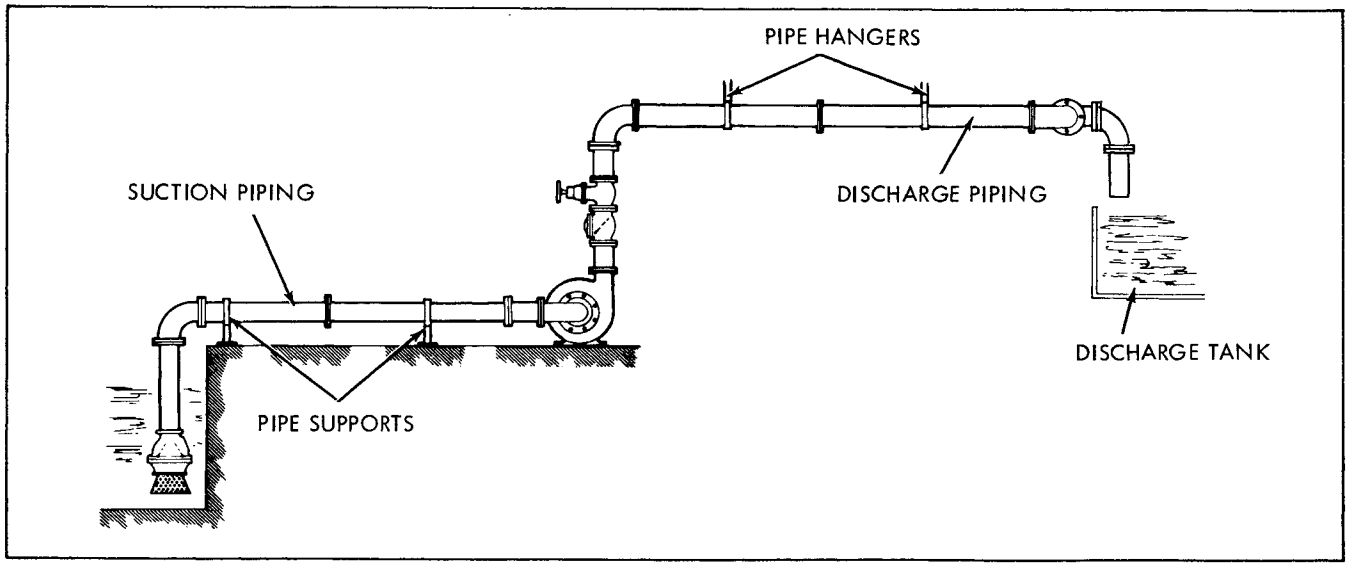


FIGURE 8. SUPPORTING PIPING

Pay particular attention to the seemingly insignificant details involved in piping your pump for they make the difference between a good and bad installation.

SUPPORTING THE PIPE. Both the suction and the discharge piping should be independently supported near the pump. Liberal use of pipe hangers and support blocks will prevent excessive strain on the pump casing and on the pipe joints.

SUCTION PIPING. The suction piping should be short, but no less than ten pipe diameters in length, and direct with as few elbows and fittings as possible, to keep head loss from friction at a minimum. However, the suction pipe should provide a minimum uninterrupted length, equal to ten pipe diameters, to the pump suction flange. A horizontal suction line should have a gradual rise to the pump, and pass under any interfering piping.

PIPE. The suction pipe diameter should be at least the same diameter as the suction nozzle on the pump, and preferably larger. Use of a smaller diameter pipe will result in loss of head due to friction. All joints must be tight to maintain prime on the pump.

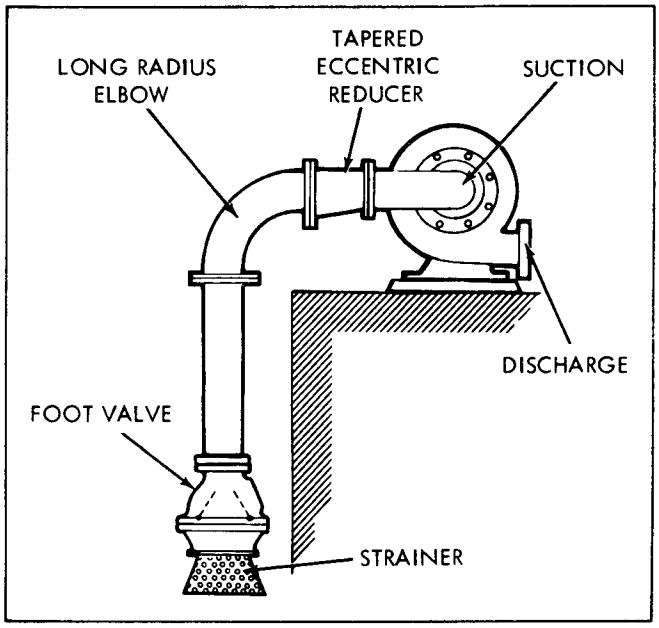


FIGURE 9. RECOMMENDED SUCTION LIFT PIPING - SHORT AND DIRECT

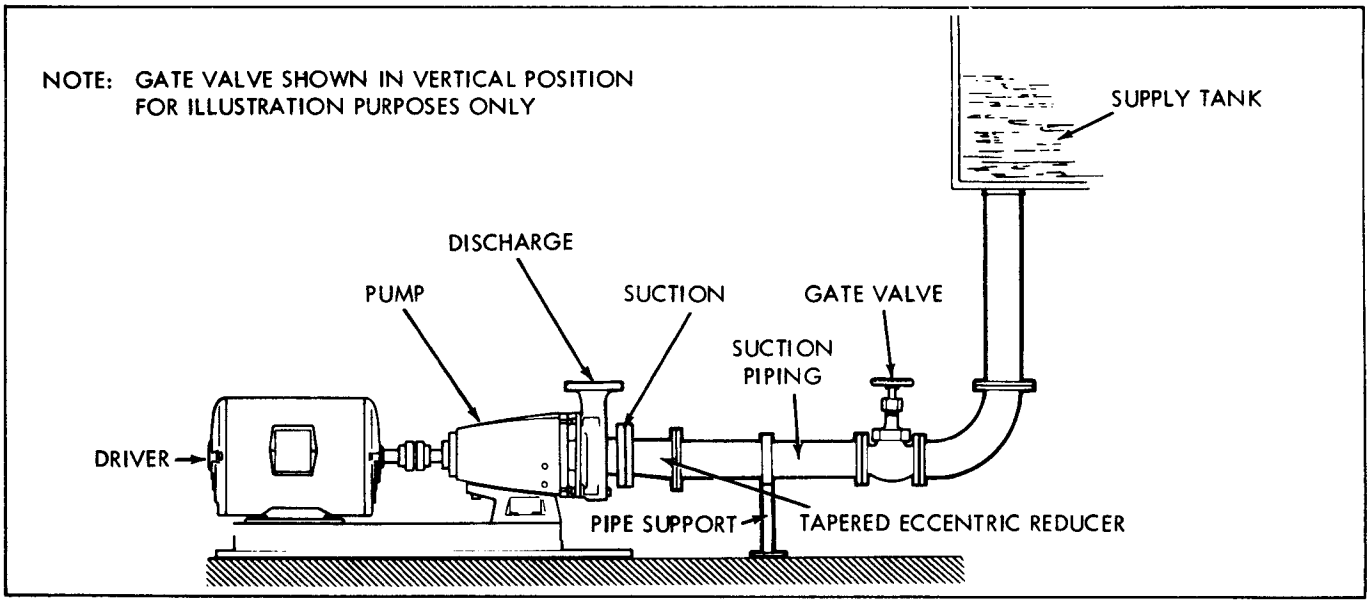


FIGURE 10. RECOMMENDED FLOODED SUCTION PIPING - SHORT AND DIRECT

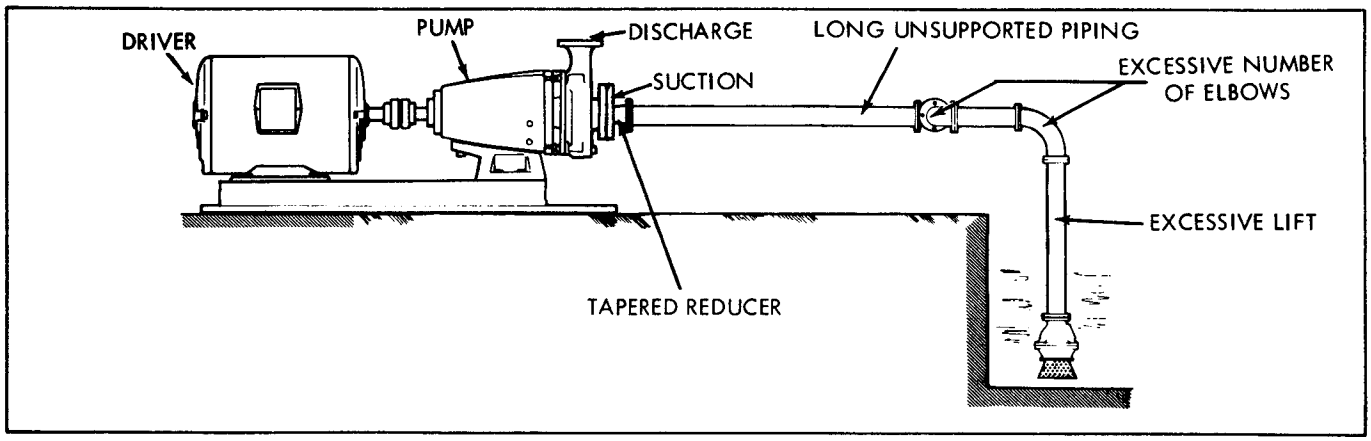


FIGURE 11. UNSATISFACTORY SUCTION LIFT PIPING - LONG AND INDIRECT WITH NO SUPPORT

FRAME MOUNTED INSTALLATION

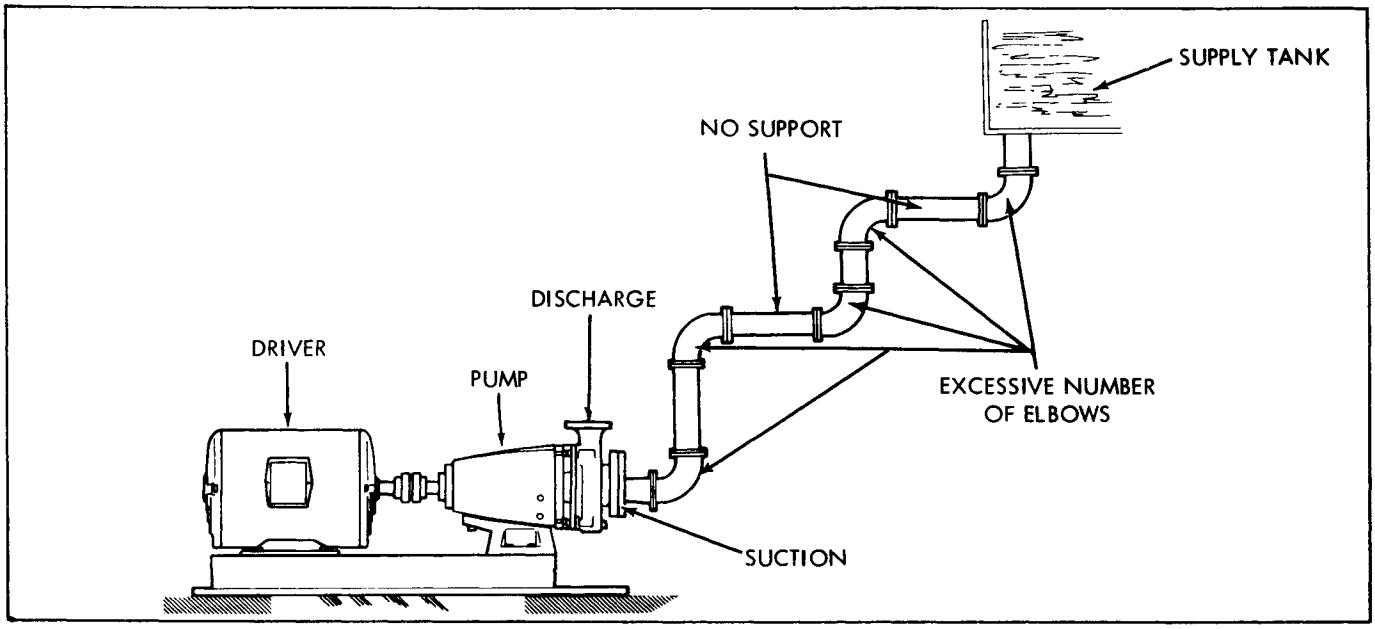


FIGURE 12. UNSATISFACTORY FLOODED SUCTION PIPING - LONG AND INDIRECT WITH NO SUPPORT

ELBOWS. Long radius elbows should be used in place of standard elbows wherever possible, because of their superior flow characteristics. For instance, head loss in a standard four inch elbow is equivalent to the head loss in a piece of pipe 11 feet long, while the head loss in a long radius elbow is approximately half as much. Elbows should not be used at the suction nozzle, but if it is unavoidable, they should be installed in a vertical position. Elbows installed in any position at the suction nozzle have a tendency to distribute the liquid unevenly in the impeller chamber, causing a reduction in capacity, and creating an undesirable thrust condition.

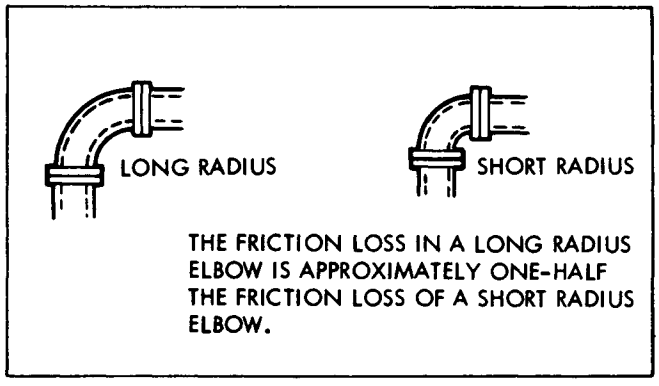


FIGURE 13. LONG VERSUS SHORT RADIUS ELBOWS

REDUCERS. Eccentric reducers should be installed directly at the suction nozzle, with the taper at the bottom to prevent air pockets from forming. Straight taper reducers should never be used in a horizontal suction line because of the air pocket that is formed at the leg of the reducer and the pipe.

DISCHARGE PIPING. Discharge piping should also be short and direct as possible, with few elbows and fittings, to reduce head loss from friction.

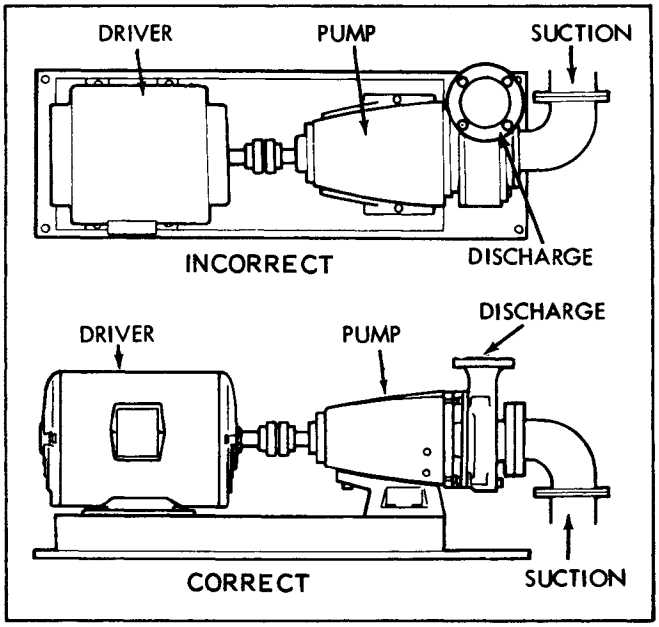


FIGURE 14. ELBOW INSTALLATION IN SUCTION NOZZLE

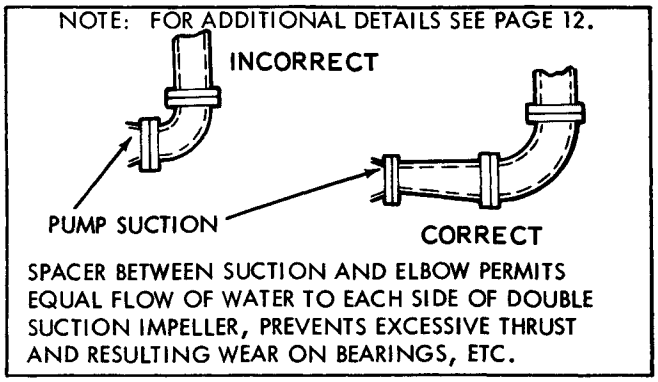


FIGURE 15. REDUCER BETWEEN ELBOW AND PUMP SUCTION NOZZLE

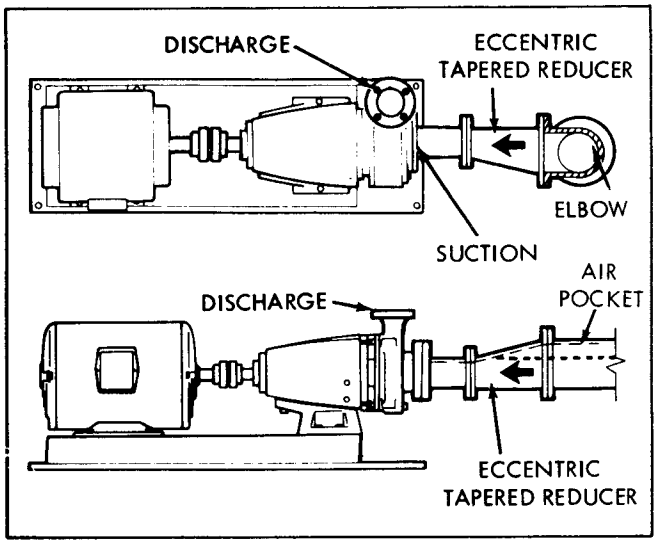


FIGURE 16. UNSATISFACTORY INSTALLATION OF TAPERED REDUCER

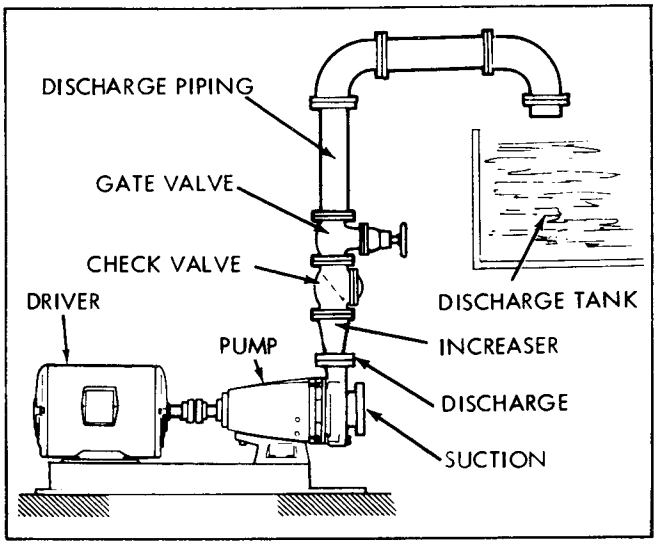


FIGURE 17. RECOMMENDED DISCHARGE PIPING - SHORT AND DIRECT

PIPE. The discharge pipe diameter should be the same as, or larger than, the discharge nozzle diameter. The size of discharge pipe to be used is dependent upon its application.

The recommended pipe diameter can be obtained from your nearest Aurora Pump Sales Office.

ELBOWS. Long radius elbows should be used in the discharge piping as well as in the suction piping to prevent excessive head loss due to friction. Whenever possible, elbows should not be installed directly at the discharge nozzle as the turbulence created by the elbow will affect pressure gauge readings.

REDUCERS AND INCREASERS. An increaser should be installed at the discharge nozzle if larger diameter

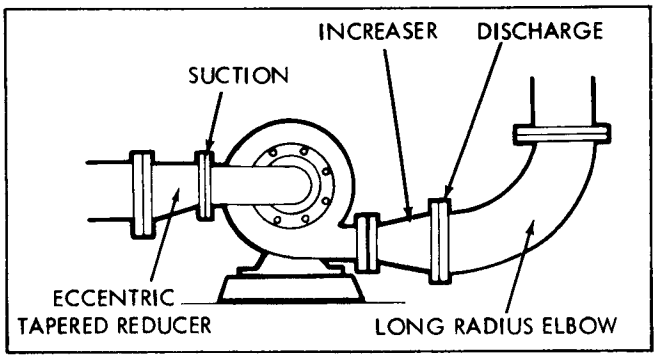


FIGURE 19. REDUCER AND INCREASER INSTALLATION

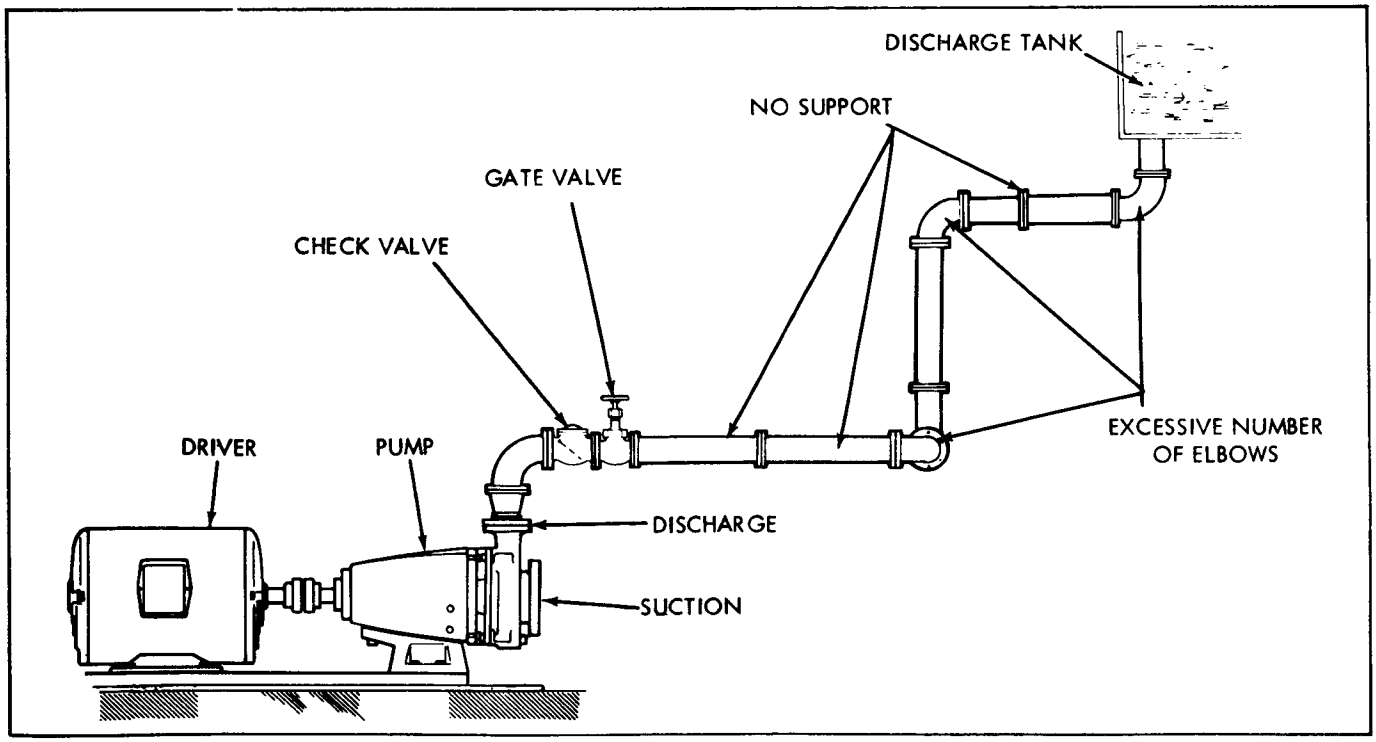


FIGURE 18. UNSATISFACTORY DISCHARGE PIPING - LONG WITH EXCESSIVE ELBOWS AND JOINTS AND NO SUPPORT

discharge piping is used. Straight taper increasers and/or reducers are satisfactory in discharge applications.

EXPANSION JOINTS. Expansion joints are used primarily to prevent the transmission of piping strain, caused by thermal expansion and contraction, piping misalignment, pressure changes, or other causes, to the pump casing. They are also used to suppress any noise that may be transmitted through the piping.

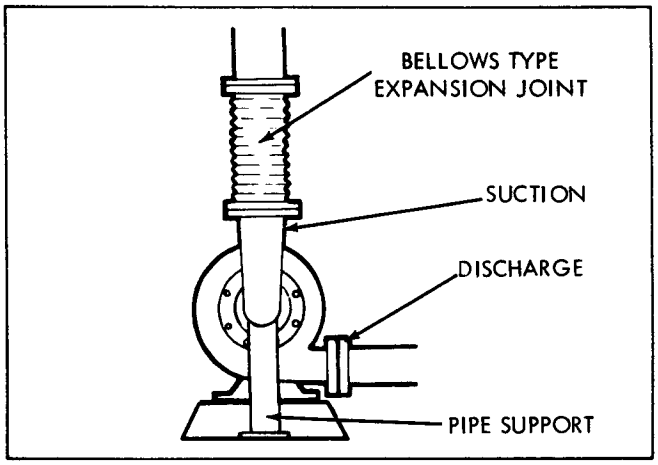


FIGURE 20. EXPANSION JOINT IN SUCTION LINE

It is recommended that the flexible metal type of expansion joint be used, because rubber expansion joints, while costing less, have a tendency to deteriorate, making frequent replacement necessary.

If an expansion joint must be used, an anchor or restraining device should be installed between the joint and the pump to prevent objectional forces from being transmitted to the pump. If an anchor is not installed at this point, a force equal to the area of the joint times the pressure in the pipe is developed and transmitted to the pump. This force may exceed the allowable flange loading, and could result in damage to the pump or piping.

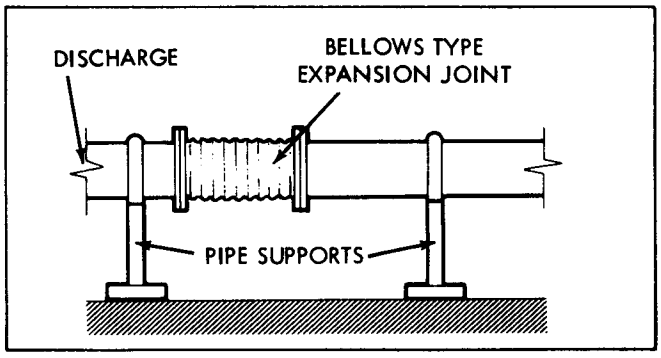


FIGURE 21. EXPANSION JOINT IN DISCHARGE PIPING

PIPE ALIGNMENT. Proper piping alignment is essential before connection is made. Piping alignment should never be achieved by force, this could produce strain on the piping and the pump casing. Proper supports should be installed for the piping to keep its weight off the pump casing.

When flange bolts are used, line up the piping first, then loosely install flange bolts. Check the piping alignment, and tighten the flange bolts until all bolts are tightened securely.

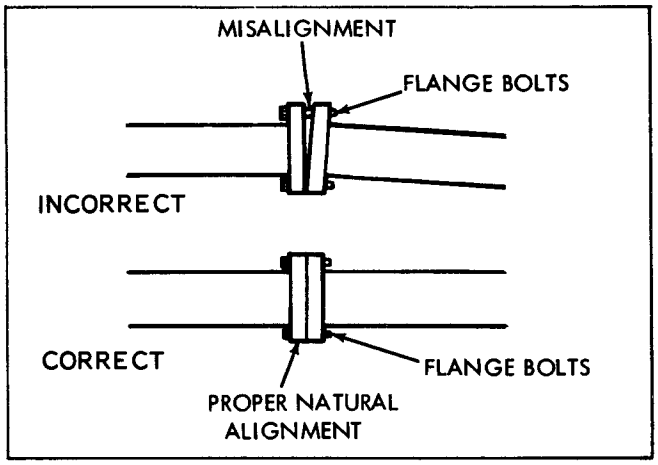


FIGURE 22. PIPE ALIGNMENT

AIR IN PIPING. One of the most common conditions affecting pump efficiency is the formation of air pockets in the suction line. The air pockets are a result of high points and improper installation of elbows, reducers, and valves in the suction piping.

For suction lift applications, lantern rings are required to prevent air from leaking into the pump through the stuffing box, or at the joints.

The pump packings or seal depend on the liquid being pumped for lubrication. Excessive air can prevent proper lubrication with resultant damage to them.

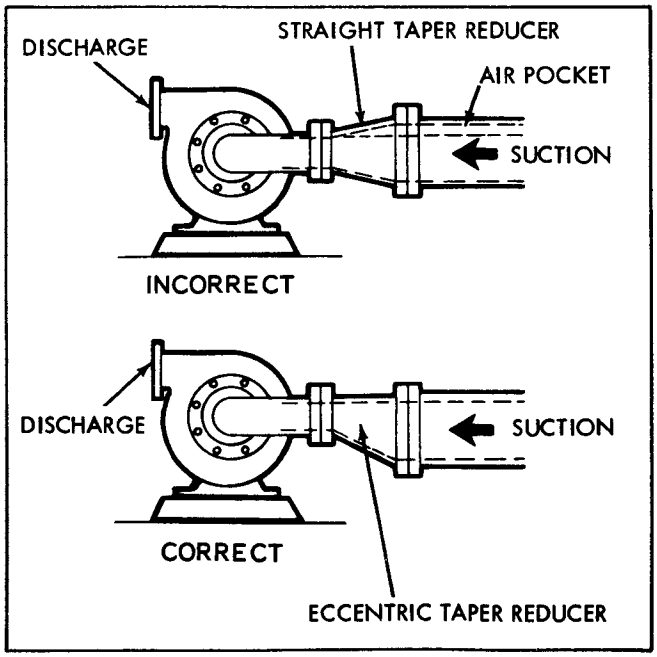


FIGURE 23. AIR POCKETS IN REDUCER

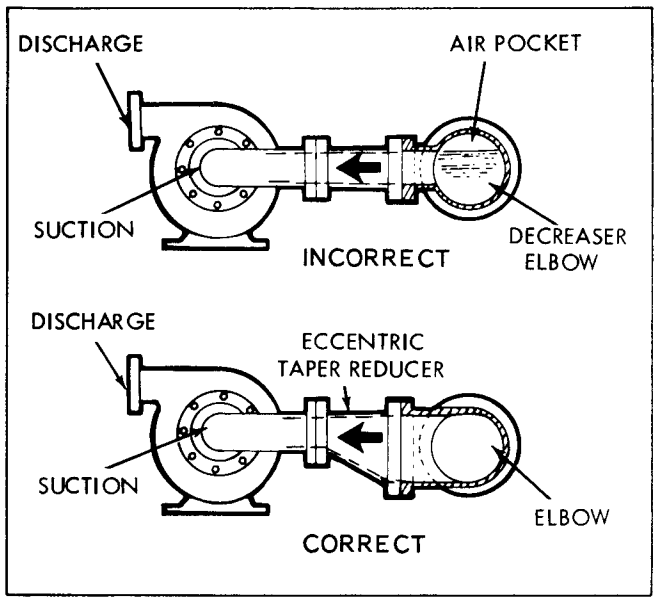


FIGURE 24. AIR POCKET IN ELBOW

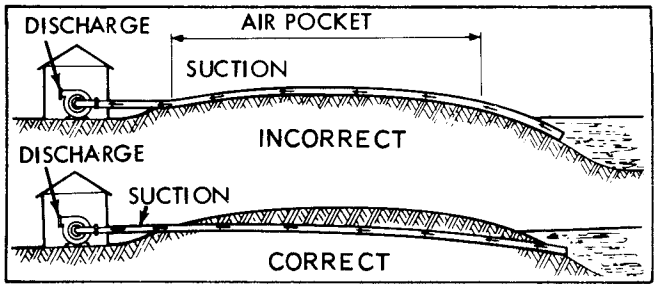


FIGURE 25. AIR POCKET IN HORIZONTAL SUCTION PIPING

In suction lift applications the suction pipe in the liquid well must be sufficiently submerged to prevent exposure of the end of the pipe when the well is at its minimum level and to prevent vortexing action (whirlpool effect) of the liquid at the suction pipe, which will draw air into the pipe. Also, care should be taken to keep the suction pipe located away from the well inlet since the incoming liquid may be carrying air bubbles. Another cause of air in the liquid is dropping of the liquid from too high a point into the well.

VALVES. Valves are an important part of your installation, for they facilitate priming of the pump, and control the volume of the pumped liquid.

SUCTION LIFT. In suction lift applications where the suction lift is low a foot valve can be installed, to maintain the prime on the pump. A foot valve is essentially a check valve, allowing flow in one direction only toward the pump. When the pump is shut down, the pressure of the liquid returning to the well, causes the valve to close, retaining the liquid in the suction line.

A slow closing check valve should be installed when the static discharge head is high. A foot valve should not be used under these conditions, as failure of the driver would allow the water to rush back rapidly thus causing a heavy water hammer.

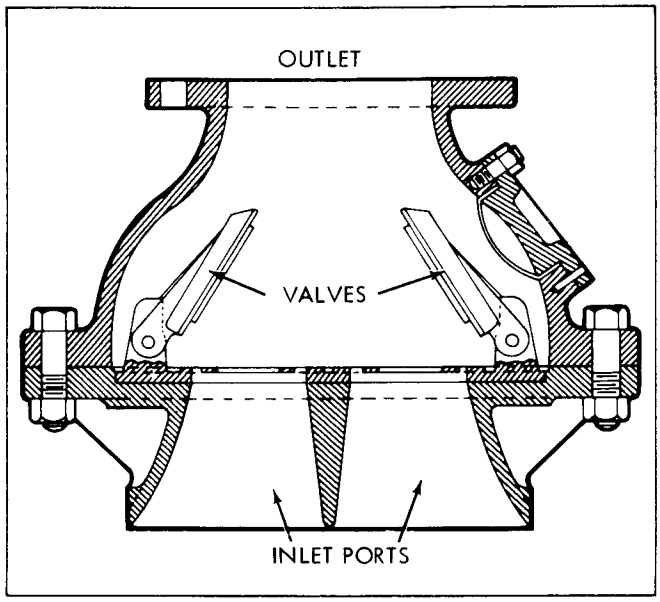


FIGURE 26. FOOT VALVE

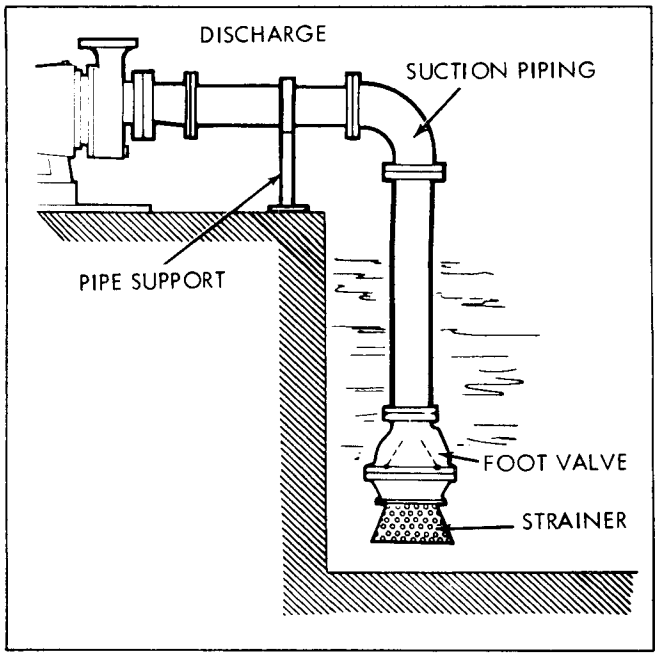


FIGURE 27. FOOT VALVE INSTALLED WITH SCREEN

Foot valves, when used, should be of the flat type rather than multiple spring type. The valve should have a large inlet area, because the friction loss in a foot valve is high. Install check and foot valves as indicated by arrow to ensure proper installation.

FLOODED SUCTION. When the liquid source is above the pump centerline, a flooded suction condition exists, and a gate valve is required to shut off the liquid supply for pump inspection and maintenance. The gate valve should be installed with the stem in a horizontal or downward position to prevent formation of an air pocket in the valve.

DISCHARGE VALVES. Tne discharge piping should include a check valve and a gate valve. The check

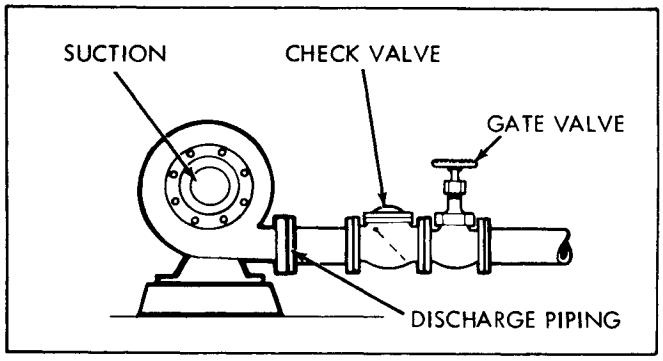


FIGURE 28. GATE VALVE AND CHECK VALVE

valve should be located between the gate valve and the pump. If an increaser is used in the discharge piping, the increaser should be installed between the pump nozzle and the check valve. The check valve protects against a reverse flow of the liquid if the driver fails.

The gate valve is used in the priming operation, as a throttling valve to control pump volume, and to shut down the pump for inspection and maintenance.

AIR VENT VALVE. Vent valves are installed at the high points in the pump casing to allow air or vapor to escape. These valves are used to release trapped air from the pump casing during priming and when pump becomes air bound.

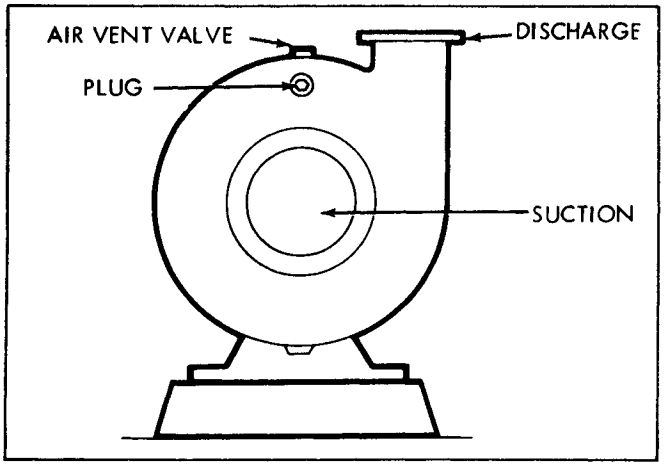


FIGURE 29. AIR VENT VALVE OR PLUG

STRAINERS AND SCREENS. It is important to screen the suction piping to remove foreign matter that can clog the pump and impair its capacity, or stop it completely. Small particles such as sand, dirt, scale from inside pipe and other extraneous materials can get into the close clearance parts of the pump and cause considerable damage to the parts.

Strainers should be selected so as to have a total area of holes equal to at least four times the suction pipe area.

In applications where sticks, twigs, leaves and other large debris are present, a larger outside screen should be placed around the suction inlet to prevent choking of the strainer. This screen should have sufficient openings so that flow velocity does not exceed two feet per second.

PRIMING THE PUMP. Your pump will not operate satisfactorily until it is primed. All air must be expelled from the suction piping and pump casing, and replaced by the liquid to be pumped. There are several methods of priming pumps. The one you select will depend on your specific requirements.

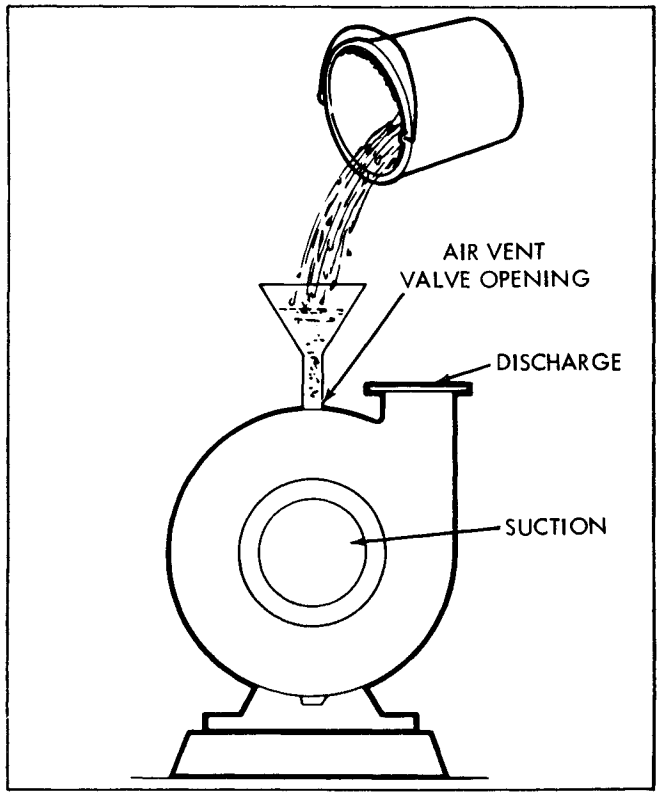


FIGURE 30. PRIMING BY HAND

FLOODED SUCTION PRIMING. This method of priming a pump is relatively simple. The liquid source is located above the pump, and all that is necessary to prime the pump is to open the air vent valve or plug in the pump casing, and to crack the gate valve in the suction line. The suction line and pump should be filled slowly until a steady stream of liquid is observed flowing from the air vent. After your pump is operating, it is recommended that the air vent valve or plug be opened again to insure that all air has been expelled from the pump casing.

FOOT VALVE PRIMING. A foot valve can be used for priming on suction lift applications. The foot valve located at the bottom end or foot of the suction piping, functions as a check valve which allows flow in one direction only, toward the pump.

Initial priming is accomplished by completely filling the suction piping and pump casing with the liquid to be pumped. This can be done by removing the air vent valve or plug at the top of the pump casing and inserting a pipe nipple in the orifice, with an appropriate increaser to accommodate a hose connection.

A priming line can also be inserted in the discharge piping between the check valve and the pump or the priming can be done with a bucket and funnel. The important thing is to completely fill the suction pipe and pump casing with liquid.

When the pump is started, the vacuum created by pumping the priming fluid, combined with atmospheric pressure in the liquid well, forces liquid into the suction piping, thus opening the foot valve and keeping it open until the pump is shut down. When the pump is shut down, the liquid being pumped reverses its flow, causing the foot valve to close, trapping the liquid in the suction piping and pump casing, thus maintaining a prime on the pump.

VACUUM PRIMING. Vacuum priming consists of removing air from the pump casing and suction piping and drawing liquid into them by means of a vacuum creating device. The types of vacuum equipment range from a simple hand pump to complex central priming systems. Your specific priming requirements will govern what type of vacuum primer to use.

AIR EJECTOR. One type of vacuum primer is the air ejector. If liquid under pressure or steam is available, an ejector can be used. The ejector is connected to the air vent orifice. A stream of the ejecting medium is passed through the ejector creating a vacuum in the ejector, and drawing air from the pump casing and suction piping. When liquid flows steadily from the ejector discharge pipe, the pump is primed.

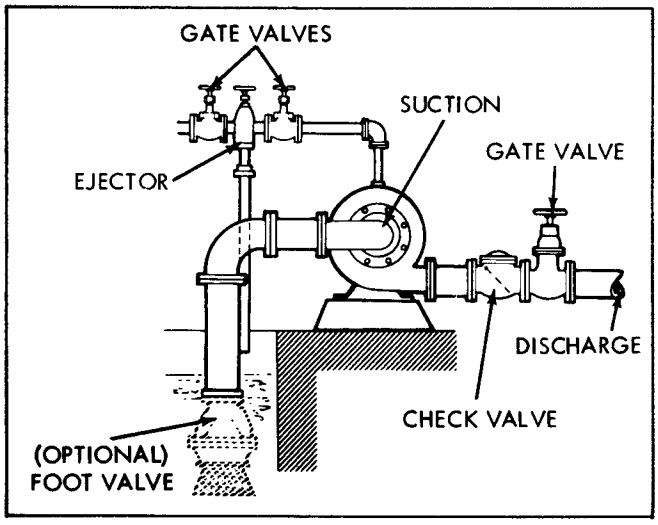


FIGURE 31. PRIMING BY EJECTOR

VACUUM PUMPS. Rotary or reciprocating pumps are frequently used as vacuum pumps. They fall into two categories, wet-vacuum and dry-vacuum. The principle of operation is essentially the same, however, the dry-vacuum pump cannot accommodate a liquid and air mixture while the wet-vacuum pump can accommodate liquid, air or a combination of both.

Vacuum pumps can be installed as part of a central priming system servicing many pumps, as an automatic priming system, or as a manually controlled independently driven pump.

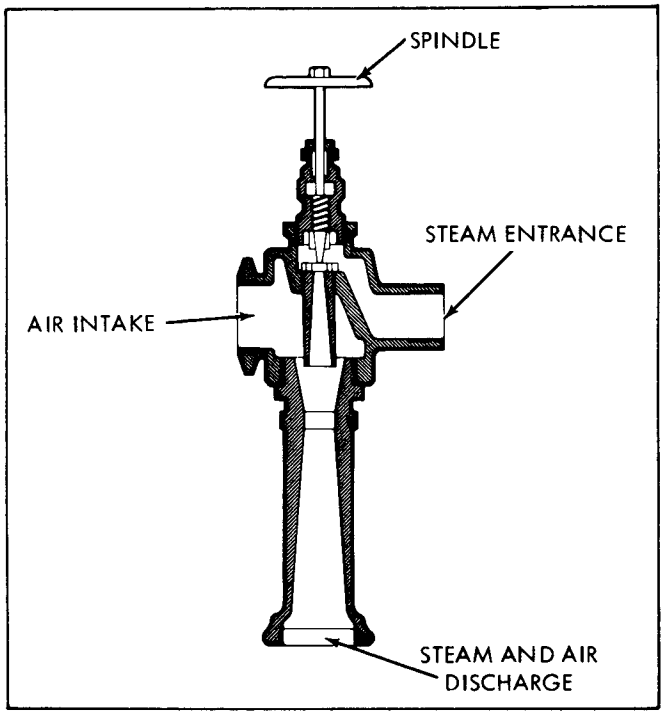


FIGURE 32. EJECTOR CUTAWAY

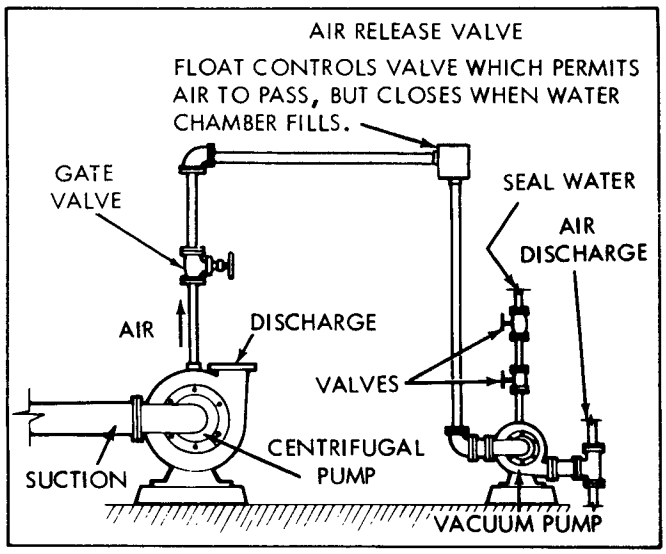


FIGURE 33. PRIMING BY VACUUM PUMP

The suction piping of the vacuum pump is connected to the air vent orifice on the pump to be primed. The vacuum produced by the vacuum pump removes air from the centrifugal pump suction piping and casing, and draws liquid from the liquid well into the centrifugal pump. Dry-vacuum pumps must be installed so that no liquid is taken into the air pump. Installation of a water trap, or use of a vacuum tank are recommended for dry vacuum pumps.

INDUCTOR PRIMING. On suction lift applications it may be desirable to prime your pump with a priming inductor. This type of primer is comprised of a liquid nozzle and an inductor at the foot end of the

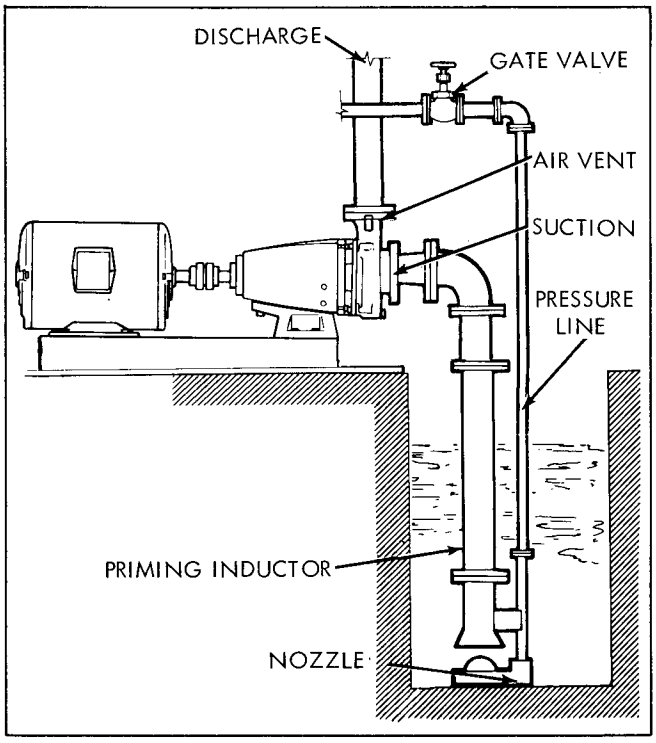


FIGURE 34. PRIMING BY INDUCTOR

suction piping. The nozzle and inductor are connected to a high pressure liquid supply such as a city water service.

The pump is primed by opening the valve in the pressure line, which allows the liquid to flow through the nozzle into the inductor. The velocity of the high pressure liquid drives the liquid into the suction piping and up to the pump, priming it.

ELECTRICAL WIRING. Normally, your pump will be supplied with an attached drive motor. The motor should be wired in accordance with the wiring diagram found on the motor name plate. Be sure the voltage, frequency, and phase of your power supply corresponds with the name plate data. It is advisable to provide a separate switch and overload protection for your pump motor to protect against power failure in some other area. Conversely, if the pump motor develops electrical problems, it will be isolated from other equipment.

PRESTARTING INSTRUCTION. The coupling halves should be connected. Prior to connection however, the drive motor should be started to make sure the direction of roatation is the same as the direction indicated by the arrow on the pump casing.

WARNING: On all 350 series pumps and the 364A with a 15" impeller on a #21 power frame, reverse rotation will destroy the pump.

After you are sure the motor is rotating clockwise you can couple the motor to the pump. Again, after coupling but BEFORE starting it is important to check coupling and shaft alignment. Use a standard dial indicator to align the motor shaft and pump shaft to within .003"-.005".

The suction and discharge piping should now be connected to the pump, and the pump primed.

CAUTION

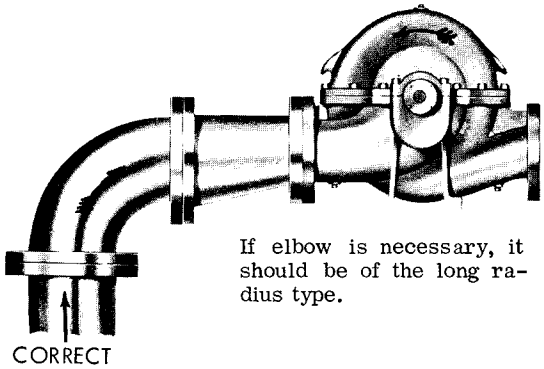
Do not operate the pump without liquid. Pump seals or packing depend on the liquid being pumped for lubrication.

Open or close the various valves as required by your specific application. Start the pump and bring it up to operating temperature. After the temperature has stabilized, the pump should be shut down and the alignment rechecked. It will be necessary to check the alignment with the coupling halves both connected and disconnected.

Remember, any alignment adjustment made in one direction may affect the other direction so extreme care should be taken when final adjustment is made.

Make sure all pump, motor and base plate mounting bolts are firmly tightened down.

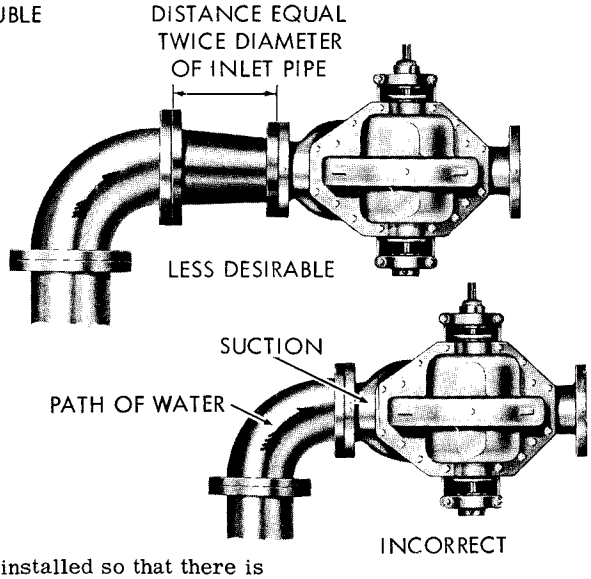
SPECIAL SUCTION PIPING SPECIFICATIONS FOR HORIZONTAL DOUBLE SUCTION PUMPS FOR ADDITIONAL DETAILS SEE PAGE 6



If elbow is necessary, it should be of the long radius type.

CORRECT

Discharge piping and suction piping should be supported close to the pump flange to prevent vibration and strain on pump casing.



The suction pipe on horizontal double suction pumps, should not be installed so that there is an elbow close to the suction nozzle unless the elbow is mounted vertically. There is always an uneven flow of liquid through an elbow and when the elbow is installed at any angle other than vertical more water will enter one side of the impeller than enters the other side. This causes a reduction in capacity and efficiency and creates an axial thrust load which may over heat and possibly cause rapid wear of the thrust bearing.

AP-Sect. 2-Item 2

SECTION 6 ITEM 420
DATED JUNE 1985
SUPERSEDES ITEMS 421 & 485
422, 423
DATED JULY 1980

AURORA®
Pentair Pump Group

INSTRUCTION MANUAL
REPAIR
MODELS 421 & 485, 422, 423

6

NOTE

This repair manual is applicable to pump Models 421 & 485, 422, 423. All photos illustrate Model 422 except where noted.

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 will require periodic lubrication and can be accomplished by using the zerk or lubrication fittings in the bearing cartridge. 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 bearings. 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 lubriction 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 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 to speed drying, but care should be taken not to let bearings rotate while being dried.

CAUTION

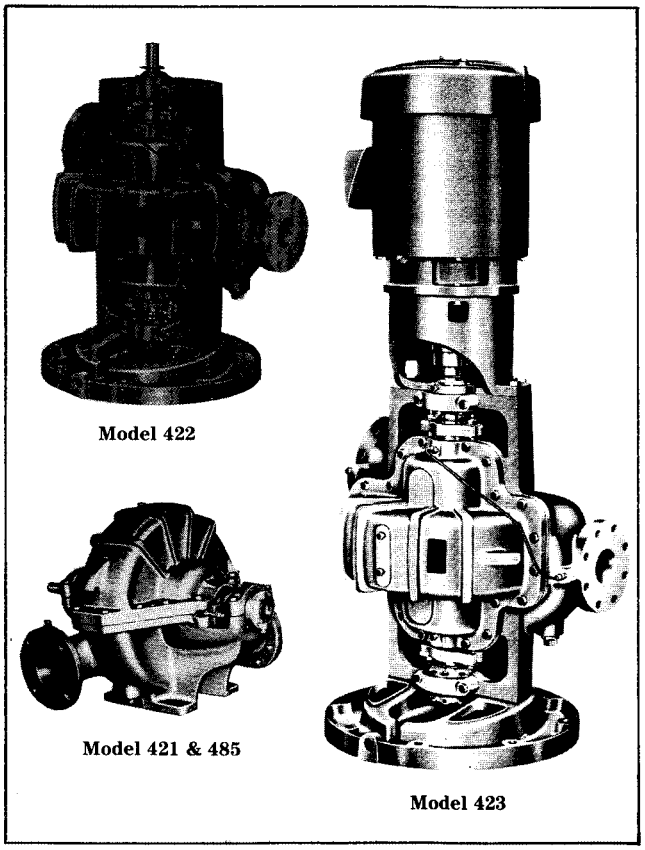
Use normal fire caution procedures when using any petroleum cleaner.

Model 421 pumps are available with two options for lubricating the shaft bearings. They are:

1. Regreasable (standard)
2. Oil Lubrication

Oil lubricated bearings are optional on Model 421 pumps. A fixed oil level is maintained within the bearing cartridge by an oiler which allows visual indications of reserve oil.

At initial installation and before starting a unit that has been shut down for repairs or for any extended length of time, run enough 10W-30 weight motor oil through the oiler to maintain a constant oil level to insure that the bearing will never be without an oil supply. Oil will have to be added at intervals to maintain a constant level in the oiler. This interval can only be determined by experience.



A. Complete pump assemblies.

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Under working conditions, oil will breakdown and need to be replaced at regular intervals. The length of these intervals will depend on many factors. Under normal operation, in clean and dry locations, the oil should be changed about once a year. However, when the pump is exposed to dirt contamination, high temperatures (200°F. or above) or a wet location, the oil may have to be changed every 2 or 3 months.

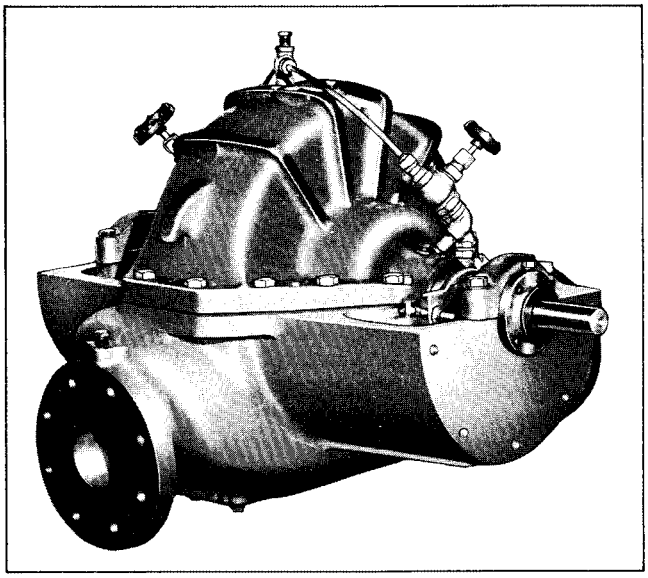
The motor which drives your Aurora pump may or may not require lubrication. Consult the manufacturer's recommendations for proper maintenance instructions.

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 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 to the manufacturer for repair only the motor and motor controller.



B. Pump positioned horizontally for disassembly. Pump base removed. Model 422 or 423 Illustrated.

DISASSEMBLY OF THE PUMP.

Disassemble only what is needed to make repairs or accomplish inspection. Proceed to disassemble the pump as follows: (See Figure 4 for Model 421 & 485, Figure 5 for Model 422 and Figure 6 for Model 423.)

1. Break electrical connection to motor or take similar steps to make certain that drive unit will not be unintentionally energized during disassembly.

2. Close such valves or flow-control devises necessary to make certain that flow of liquid will not take place during disassembly.

NOTE

Discharge and suction piping need not be disturbed unless complete pump assembly is to be removed.

3. Drain liquid from pump by removing plugs (1 and 2). Disconnect by-pass lines if applicable.

4. Loosen and remove capscrews (6) securing casing half (8) to remainer of pump assembly.

NOTE

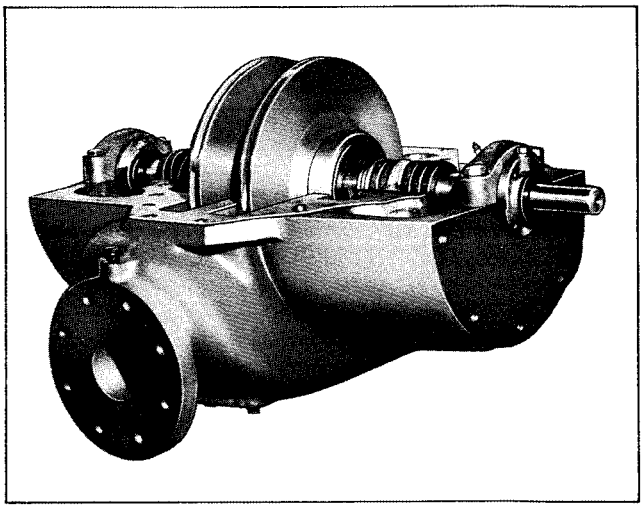
If pump being disassembled is 3 x 4 x 14A or larger, remove capscrews (7) before attempting to separate the casing halves.

5. Make certain that all securing capscrews are removed, then carefully remove casing half (8) using hoist or crane with sling attached to cast hooks.

CAUTION

Use extreme care when casing comes loose that it does not drop out of sling as this would cause extensive damage to other components of pump.

6. Remove gasket (9) and scrape mating surfaces of casing halves to remove pieces of gasket which may have adhered in separation. Take care not to scratch or mar mating surfaces.



C. Upper casing, bearing caps and packing removed. Model 421 or 485 Illustrated.

7. For Model 421 & 485 and 423 pumps, loosen setscrews in flexible coupling and slide halves apart. For Model 422 remove flexible shafting from pump.

8. Remove capscrews (25) securing bearing caps (26). Lift off bearing caps (26) and pins (27). Mark caps to insure correct replacement and orientation on the respective bearing arms.

9. Loosen and remove nuts (18), washers (19), and

clamps (20), securing split halves of packing glands (21). Remove swing bolts (22).

10. Assuming that further work is required on shaft and impeller assembly, use properly secured rope slings and hoist or crane as required to lift it from casing half (74) and place it on suitable bench or work surface.

CAUTION

Take care not to dent or damage impeller and/or other parts. Use of a supporting cradle or work stand is recommended.

NOTE

Disassembly procedure from this point covers pumps having standard packing. If pump has mechanical seals, refer to Specific Instructions.

11. Remove and discard rings of packing (23), since replacement with new packing is recommended whenever pump is disassembled.

12. Slide pump half of flexible coupling off shaft (71) and remove key (24). Pry up on end of key so as not to damage shaft. If preferred, key may be removed by carefully tapping from outer end with a brass drift or similar non-marring tool, using a small hammer.

13. Remove casing wearing rings (28).

14. If pump is grease lubricated remove zerks (10) and pipe plugs (12) from cartridge caps (32 and 42). If pump has oil lubrication option, Model 421 only, remove breather cap from top of cartridge caps and remove close nipples from bottom of cartridge caps. The remaining oil cup, street elbows, and nipples are loose at this point and can be removed as an assembly.

15. For Model 422 and 423 pumps, loosen and remove capscrews (31) from cartridge cap (32). Outboard shaft end protector (29) may be removed from its recess in the outboard cartridge cap at this time if necessary. Remove retainer (35) with truarc pliers. Remove gasket (34).

NOTE

For Model 421 pumps, if unit has tandem shaft, protector (29) is not used. Remove slinger and capscrews (31). Slide cartridge cap (32) and grease seal off shaft. Press grease seal out of cartridge cap if it is necessary to replace this seal. Remove retainer ring (35) with truarc pliers. Remove gasket (34).

16. Outboard bearing (38) is press fitted onto shaft (71). To remove it, place a puller on bearing cartridge (36) and pull cartridge, grease seal (37), and bearing from shaft.

The grease seal can be pressed from the bearing cartridge if it needs replacing. Slide slinger (39), lantern ring (52), and bushing (56) off shaft (71).

17. Removal of the inboard bearing is basically the same as the outboard bearing. Remove capscrews (41) and slide slingers (40), cartridge cap (42), grease seal (43), and gasket (44) off shaft.

18. Pull or press off bearing cartridge (45), grease seal (46), and bearing (47). Remove slinger (48), lantern ring (52), and bushing (56) from shaft.

19. **If unit has right hand rotation, unscrew and remove outboard sleeve (57) first. Remove O-ring (58). If unit has left hand rotation, unscrew and remove inboard sleeve (65). Remove O-ring (66).**

20. On right hand unit, balance of the parts will be removed as follows: Pull or tap impeller (59) off shaft (71) using care not to damage impeller. Remove gasket (60). Slide casing bushing (61) off separator sleeve (62). Pull separator sleeve, gasket (64), and impeller (67) off shaft. Remove gasket (66) and key (68). Unscrew and remove shaft sleeve (65).

Left hand unit disassembly will begin with impeller (67) and end with sleeve (58).

21. Disassemble wearing ring(s) (70) (optional) from impeller(s) (59) and (67) only if necessary. For pumps on power frame 5, remove setscrews (83). Apply a puller and gradually withdraw wearing rings (70) from impellers (59 and 67). Wearing rings may have to be cut or trimmed off the impeller. If a lathe is used to trim rings off, use care not to clamp impeller too tight and cause distortion. Also use care not to remove any metal from impeller.

22. Remove locking and locating pins (63, 69, 72, and 73) from lower casing half (74) only if replacement is necessary.

23. Nameplate (76) and its securing screws (75) should only be removed if replacement is necessary.

24. On Model 423 pumps unscrew capscrews (79) to remove motor and motor bracket (80) from casing half (74). It is best to leave motor bracket on motor as it helps protect motor shaft from possible damage. Remove nuts (77) from capscrews (78) which allows motor to be separated from motor bracket.

Disassembly of Pumps with Mechanical Seals.

1. Perform disassembly procedures as previously given through step 8.

2. Loosen and remove nuts (18), and washers (19), thus freeing swing bolts (22) to allow shaft and impeller assembly to be lifted from casing half (74) with sling and hoist or crane as described in paragraph 10 above.

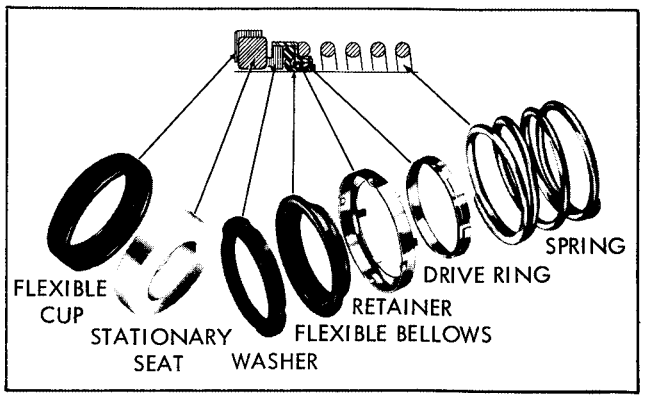


Figure 1. Mechanical Seal

CAUTION

Use extreme care in moving assembly. Ceramic seats can be cracked by just sliding loose on shaft. To prevent this, wrap seal securely in a shop cloth or other protective covering.

3. With shaft and impeller assembly on a suitable bench, cradle, or work stand, loosen and remove pipe plug (12) from inboard cartridge cap (42). Remove grease zerk (10) and capscrews (41) and slide the cartridge cap with grease seal (43) off end of shaft (71). Remove gasket (44).

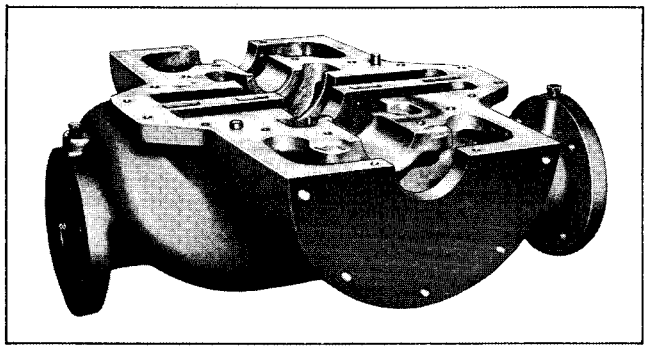
4. Pull or press bearing cartridge (45), grease seal (46), and bearing (47) off shaft. Remove slinger (48).

5. One piece gland (49) used with mechanical seal assembly can now be removed from shaft."O" ring (50) can be removed from seal gland if desired.

CAUTION

Exercise great care in removing seal assembly (53) to keep from marring or otherwise damaging precision ground mating surfaces.

6. Scribe a mark on shaft sleeves for relocating seal collar on reassembly. Loosen setscrews (55), securing seal collars (54) to shaft sleeves and slide them off.



D. Rotating element removed from lower casing.

7. Proceed with further disassembly of outboard ball bearing and seal assembly using same basic procedure.

8. After removal of mechanical seals proceed with balance of disassembly in same manner of described for packing design.

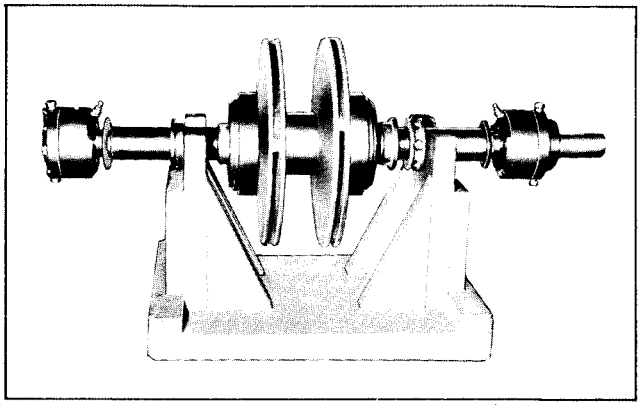
REASSEMBLY

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. Position locating pins (72) in casing half (74), adding swing bolt pins (73) if used on your pump. Install wearing ring pins (69) and casing bushing pins (63). Tap pins gently to seat them in place. Place O-ring (66) in shaft sleeve (65).

If nameplate (76) was removed, install it with screws (75).

2. On right hand unit, thread inboard sleeve (65) onto shaft (71) distance "A" (refer to Figure 2). On left hand unit, thread outboard sleeve (57) onto shaft distance "A" (refer to Figure 3). When sleeve is in position, its keyway should align



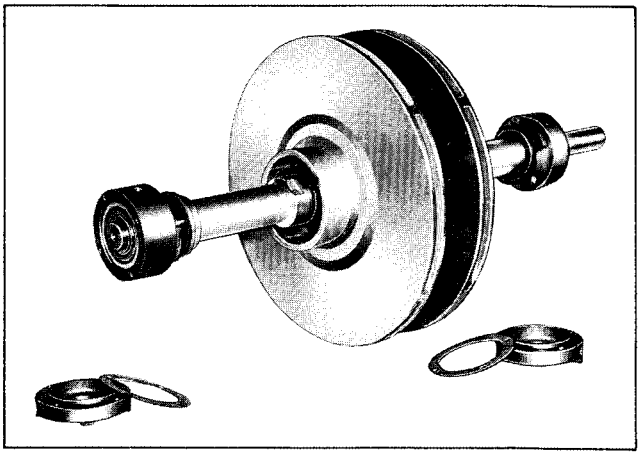
E. Rotating element placed in a protective cradle for further disassembly.

with keyway on shaft. Coat key and keyway with loctite sealant grade 242. Insert key (68) into keyways of shaft and sleeve. Tap key firmly in place.

3. Coat inside diameter of impeller wearing rings (70) (optional) with Loctite sealant Grade 271 and press them over hubs of impeller(s) (59) and (67). Do not attempt to hammer impeller wear rings into position, since they are a press fit. Use of an arbor press is preferred. However, placing a block of wood over the impeller wearing ring and pressing it in will work satisfactorily. For pumps on power frame 5 only, four setscrews (83) will be installed by drilling into wearing rings and impeller. The opposite surface of the impeller should be protected from damage throughout the procedures by resting it against soft wood on the surface of work bench.

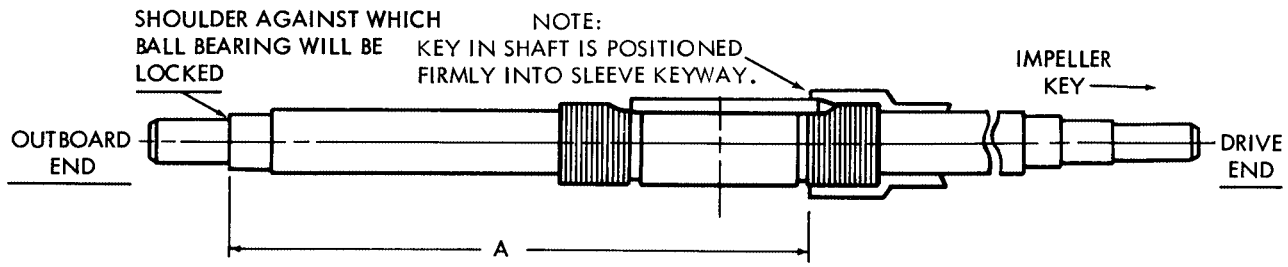
CAUTION

Impeller wearing rings must be given special care because they are press fit. Be sure rings are positioned squarely over hubs of impeller. A soft headed hammer may be used to gently tap impeller wearing rings into correct alignment before they are pressed into place.



F. Bearing cartridge cap and gasket removed from shaft.

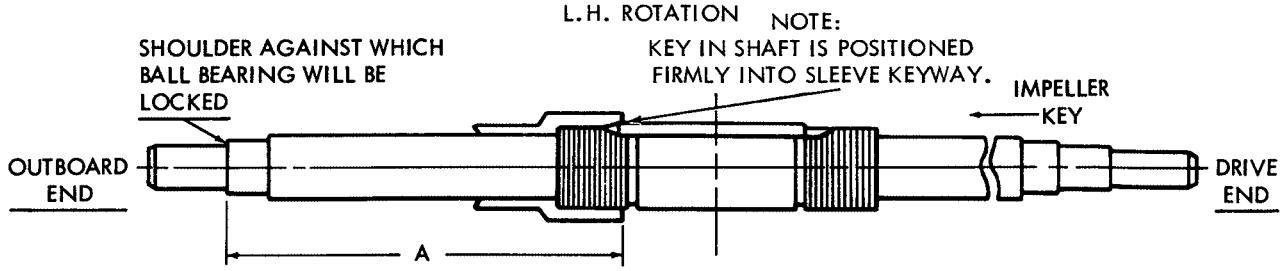
TWO STAGE PUMP SHAFTS
LOCATION SHAFT SLEEVE ON SHAFT
R.H. ROTATION



POWER SERIES	PUMP SIZE	A
1		
2	2 x 2½ x 12 2½ x 3 x 12	12 49/64
3	3 x 4 x 14 4 x 5 x 15	15 29/64
4	5 x 6 x 15	17 9/64
5	6 x 8 x 17	18 41/64

Figure 2

TWO STAGE PUMP SHAFTS
LOCATION OF SHAFT SLEEVE ON SHAFT
L.H. ROTATION



POWER SERIES	PUMP SIZE	A
1		
2	2 x 2½ x 12 2½ x 3 x 12	6 57/64
3	3 x 4 x 14 4 x 5 x 15	7 53/64
4	5 x 6 x 15	8 49/64
5	6 x 8 x 17	9 49/64

Figure 3

4. On right hand unit proceed to assemble the rotating element as follows:

Coat impeller (59) keyway with loctite sealant grade 242, slide impeller (67) onto shaft (71).

Place gasket (64) on shaft and slide separate sleeve (62) against it. Place casing bushings (61) over separator sleeve. Place gasket (60) on shaft, coat impeller (59) keyway with loctite sealant grade 242 and slide impeller (59) in place. Key (68) should not protrude beyond impeller (59) hub after impeller has been positioned. Place O-ring (58) in shaft sleeve (57), then thread shaft sleeve tight onto shaft (71).

On left hand unit use same procedure only starting with impeller (59).

NOTE

When assembling rotating element of a 420 Series Pump it is important that the curve of impeller blades is in agreement with pump rotation. (See insert in Figures 4, 5, or 6).

CAUTION

Carefully check to see that the proper shaft sleeve has been keyed into place for rotation of pump. If the correct shaft sleeve is not keyed onto shaft, it can spin loose during operation of pump and cause extensive damage.

5. Install packing or mechanical seals and secure according to the following specific instructions:

STANDARD PACKING

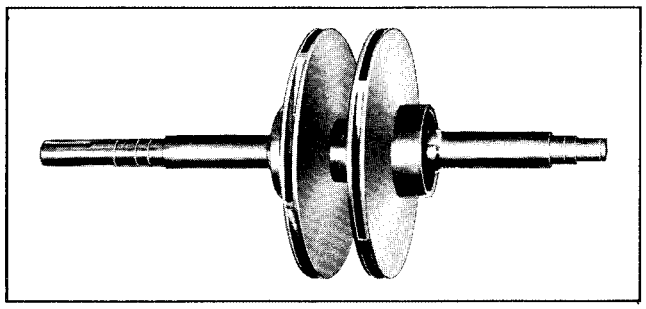
a. Slide bushings (56) onto each end of shaft. The raised shoulder on bushings must face away from impeller.

b. Seven pieces of packing (23) are placed on outboard end of shaft (71) over shaft sleeve. Two pieces of packing, a lantern ring (52), and three more pieces of packing are placed on inboard shaft sleeve.

Stagger breaks in packing rings so that pump will not leak excessively.

MECHANICAL SEAL

a. Single seal and balanced single seals.



G. Inboard and outboard bearings and bearing cartridges removed.

I. Slide one seal lock collar (54) with setscrews (55) facing the impeller onto each end of the shaft. Position on scribe mark made during disassembly and lock in place.

II. Put a light coat of liquid dishwashing detergent on shaft sleeve. Check rotating parts of seal to make sure they are clean. Spread a light coat of liquid detergent on inside diameters of flexible bellows and washer.

III. Place the seal's spring, drive ring, retainer, flexible bellows, and washer on shaft sleeve in respective order. (Refer to Figure 1.)

IV. Thoroughly inspect cavity of seal gland (49) for burrs or nicks which could damage the seat of seal. Apply a film of liquid detergent to seal seat and install it in the seal gland cavity, taking care to seat it evenly and squarely.

NOTE

If it is not possible to insert seat with fingers, place a cardboard protecting ring furnished with seal over the lapped face of seat and press into place with a piece of tubing having end cut square. Tubing should be slightly larger than the diameter of shaft. Remove cardboard after seat is firmly in place.

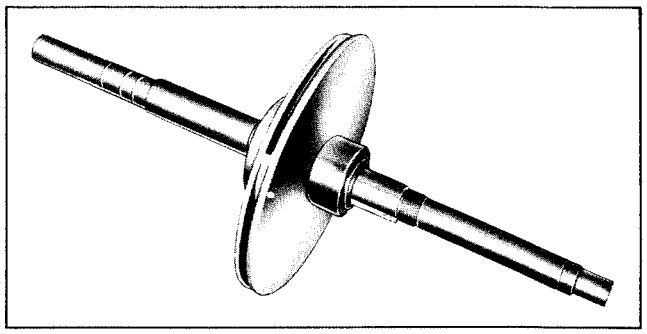
CAUTION

Never place a mechanical seal into service after it has been used without replacing or relapping stationary seat and washer faces.

V. Place "O" rings (50) around seal glands and slide seal glands onto ends of shaft.

b. Double Seal

I. Place one seal seat in collar (54). The other fits into seal gland (49). These parts are set into their cavities in the same manner as they are with a single seal.



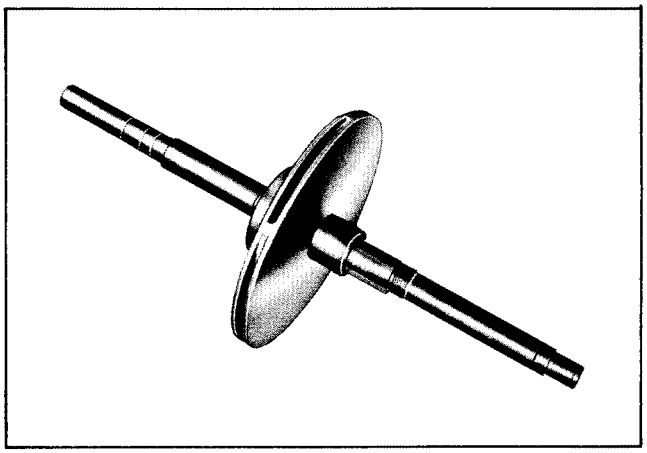
H. Shaft sleeve and outboard impeller removed from shaft.

II. Place "O" rings (51) around collars (54) and put the collars with stationary seats facing away from impeller on ends of shaft. Slide flexible bellows, washers, and springs on shaft in the order shown in Figure 1, for each half of double seal assembly (53).

III. Place "O" rings (50) around the seal glands (49) and slide seal glands onto ends of the shaft with stationary seats facing impeller.

6. Place slinger (39) onto outboard end of shaft (71).

7. Press grease seal (37) into bearing cartridge (36). Place outboard double row ball bearing (38) in bearing cartridge and press parts onto outboard end shaft. Snap retainer ring (35) in place to secure outboard bearing. Place gasket (34) and cartridge cap (32) in position and secure it with capscrews (31).



I. Casing bushing removed from impeller separator sleeve.

NOTE

Both grease zerk holes in bearing cartridges and pipe plug holes in cartridge caps must be facing in opposite directions when assembled.

8. Protector (29) can be placed in cartridge cap or if unit has tandem shaft press a grease seal into cartridge cap and slide a slinger onto shaft.

9. Place slinger (48) in inboard end of shaft.

10. Press grease seal (46) into bearing cartridge (45). Place inboard ball bearing (47) in bearing cartridge and press this assembly onto inboard end of shaft.

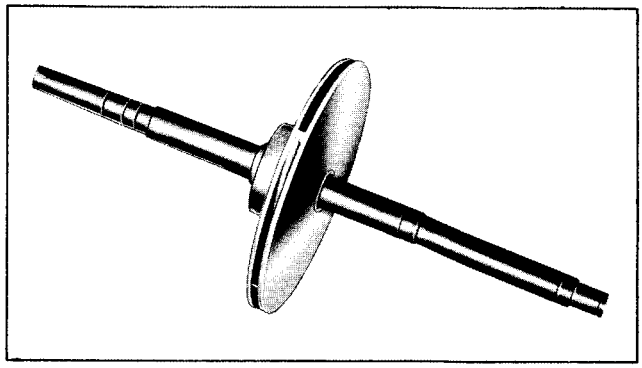
11. Press grease seal (43) into cartridge cap (42). Position gasket (44) and cartridge cap against bearing cartridge and secure it in place with capscrews (41). Be sure to align grease zerk holes and pipe plug hole on opposite sides.

12. Place slinger (40) onto shaft. Place grease zerks (10) in bearing cartridges and pipe plugs (12) in bearing caps. If pump is oil lubricated, Model 421 only, breather tubes are placed in each bearing cartridge. Oilers with nipples and elbows are placed in cartridge caps.

13. Slide casing wearing rings (28) over impeller hub or optional wearing rings (70) and set rotating element into casing half (74). Make certain that drill holes in bottom surface of casing wearing rings are located over pins (69). The drill hole in casing bushing (61) is over pin (63) previously set in casing half (74).

NOTE

Grease zerks or breather tubes should face up.



J. Impeller separator sleeve removed from shaft.

14. Install key (24) in motor end of shaft (71). Check positioning and alignment of packing rings or seal components, install swing bolts (22) and split gland halves (21) if pump has packing. Position clamps (20), washers (19), and nuts (18), securing loosely in place. Swing bolts (22) are set over pins (73) on 3 x 4 x 14A or smaller units. On larger units, swing bolts are held in place by capscrews (7) after casing half (8) is in position.

15. Place pins (27) into bearing cartridges. Place bearing caps (26) in position and secure with capscrews (25).

16. Position new casing gaskets (9) on casing half (74). Set casing half (8) in place. Secure it to casing half (74) with capscrews (6). Pins (72) are used as a means of locating the position of casing halves.

17. On pumps larger than 3 x 4 x 14A thread in capscrews (7) making sure they are placed through eye of swing bolts (22).

18. Place drain plugs (1) and (2) back in casing halves.

19. On Model 423 pumps, set the motor on motor bracket (80) and fasten them together with capscrews (78) and nuts (77). Slide flexible coupling halve onto pump and motor shafts. Attach motor bracket to casing half (74) with capscrews (79). Connect flexible coupling halves.

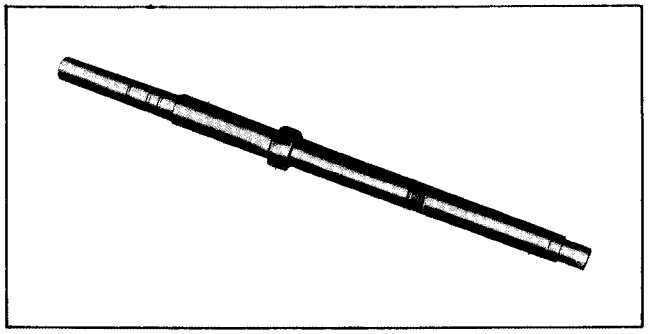
20. If the casing half (74) was removed from base, see section on installation for proper methods of realigning pump to motor and piping. On Model 422 pumps see this section for realigning pump to flexible shafting. Attach flexible shafting to pump. Ideal joint operating angle is 1° to 5°.

21. Replace any flushing or cooling lines that were removed. Connect electricity back to motor.

Starting Pump After Reassembly. Do not start pump until all air and vapor have been bled. Make sure that there is liquid in the pump to provide necessary lubrication.

NOTE

Do not over tighten standard packing assembly before returning unit to operation.



K. Inboard impeller removed. Shaft sleeve in place.

CAUTION

Read operating instructions carefully before starting pump. Jog pump to check for proper rotation. Allow it to run a short time. Gradually tighten nuts (18) until dripping has been reduced to its normal level.

Over tightening the packing will cause stuffing box to over heat. The shaft sleeve will also receive excessive wear.

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 NO. AURORA, ILLINOIS.

MODEL 421 & 485 LIST OF PARTS (SEE FIGURE 4)

1. Plug
2. Plug
6. Capscrew
7. Capscrew
8. Casing
9. Gasket
10. Grease Fitting
12. Plug
18. Nut
19. Washer
20. Clamp
21. Gland Half
22. Swing Bolt
23. Packing
24. Key
25. Capscrew
26. Bearing Cap
27. Pin
28. Case Ring
29. Protector
31. Capscrew
32. Cartridge Cap
34. Gasket
35. Retaining Ring
36. Cartridge
37. Grease Seal
38. Bearing
39. Slinger
40. Slinger
41. Capscrew
42. Cartridge Cap
43. Grease Seal
44. Gasket
45. Cartridge
46. Grease Seal
47. Bearing
48. Slinger
49. Gland
50. "O" Ring
51. "O" Ring
52. Lantern Ring
53. Seal
54. Collar
55. Setscrew
56. Bushing
57. Sleeve
58. O-Ring
59. Impeller
60. Gasket
61. Bushing
62. Sleeve
63. Pin
64. Gasket
65. Sleeve
66. O-Ring
67. Impeller
68. Key
69. Pin
70. Wearing Ring
71. Shaft
72. Pin
73. Pin
74. Casing
75. Drive Screw
76. Nameplate
83. Setscrew

MODEL 422 LIST OF PARTS (SEE FIGURE 5)

1. Plug
2. Plug
6. Capscrew
7. Capscrew
8. Casing
9. Gasket
10. Grease Fitting
12. Plug
18. Nut
19. Washer
20. Clamp
21. Gland Half
22. Swing Bolt
23. Packing
24. Key
25. Capscrew
26. Bearing Cap
27. Pin
28. Case Ring
29. Protector
31. Capscrew
32. Cartridge Cap
34. Gasket
35. Retaining Ring
36. Cartridge
37. Grease Seal
38. Bearing
39. Slinger
40. Slinger
41. Capscrew
42. Cartridge Cap
43. Grease Seal
44. Gasket
45. Cartridge
46. Grease Seal
47. Bearing
48. Slinger
49. Gland
50. "O" Ring
51. "O" Ring
52. Lantern Ring
53. Seal
54. Collar
55. Setscrew
56. Bushing
57. Sleeve
58. Gasket
59. Impeller
60. Gasket
61. Bushing
62. Sleeve
63. Pin
64. Gasket
65. Sleeve
66. Gasket
67. Impeller
68. Key
69. Pin
70. Wearing Ring
71. Shaft
72. Pin
73. Pin
74. Casing
75. Drive Screw
76. Nameplate
81. Capscrew
82. Base

MODEL 423 LIST OF PARTS (SEE FIGURE 6)

1. Plug
2. Plug
6. Capscrew
7. Capscrew
8. Casing
9. Gasket
10. Grease Fitting
12. Plug
18. Nut
19. Washer
20. Clamp
21. Gland Half
22. Swing Bolt
23. Packing
24. Key
25. Capscrew
26. Bearing Cap
27. Pin
28. Case Ring
29. Protector
31. Capscrew
32. Cartridge Cap
34. Gasket
35. Retaining Ring
36. Cartridge
37. Grease Seal
38. Bearing
39. Slinger
40. Slinger
41. Capscrew
42. Cartridge Cap
43. Grease Seal
44. Gasket
45. Cartridge
46. Grease Seal
47. Bearing
48. Slinger
49. Gland
50. "O" Ring
51. "O" Ring
52. Lantern Ring
53. Seal
54. Collar
55. Setscrew
56. Bushing
57. Sleeve
58. Gasket
59. Impeller
60. Gasket
61. Bushing
62. Sleeve
63. Pin
64. Gasket
65. Sleeve
66. Gasket
67. Impeller
68. Key
69. Pin
70. Wearing Ring
71. Shaft
72. Pin
73. Pin
74. Casing
75. Drive Screw
76. Nameplate
77. Nut
78. Capscrew
79. Capscrew
80. Bracket
81. Capscrew
82. Base

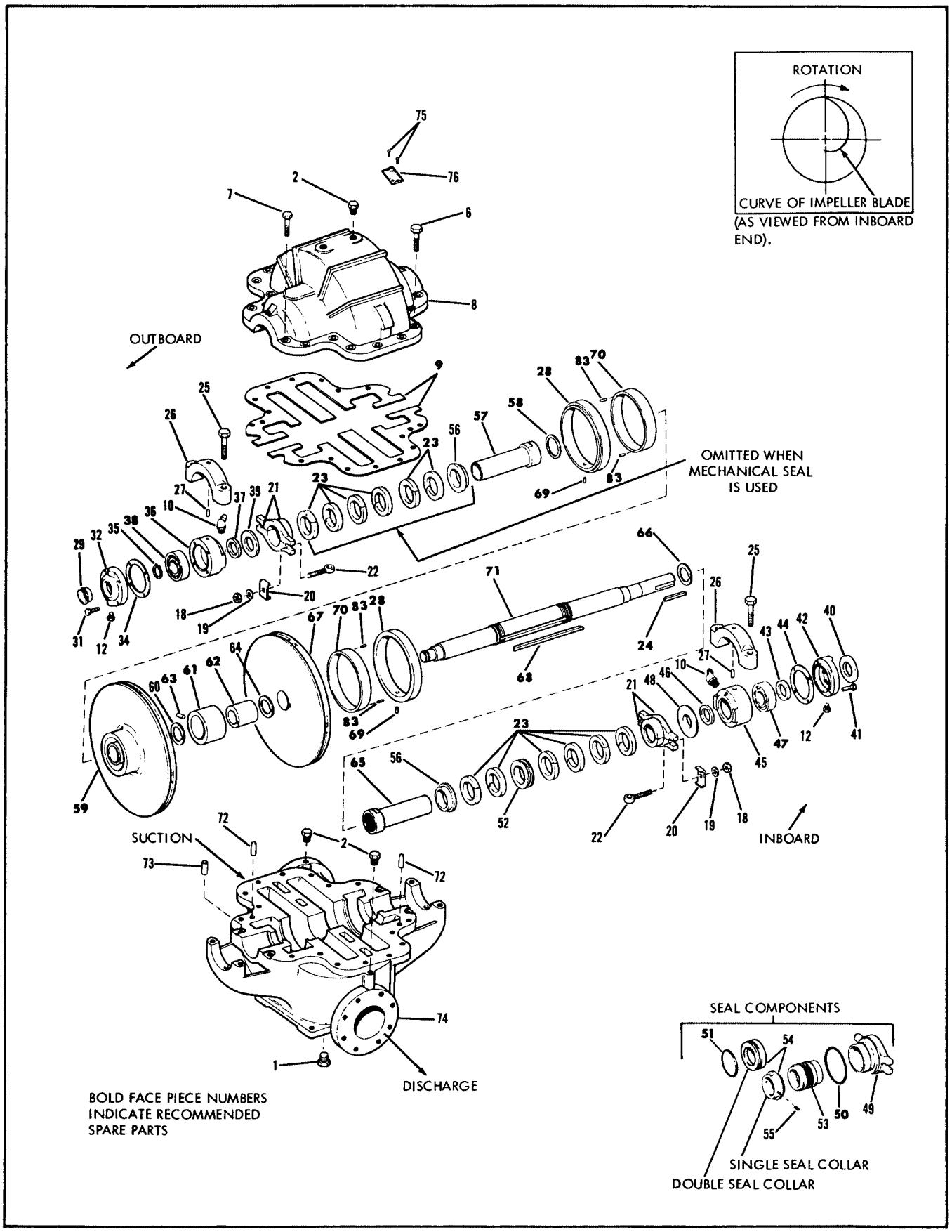


Figure 4. 421 & 485 Pump Exploded View

NOTE: MODEL 485 AVAILABLE WITH PACKING ONLY.

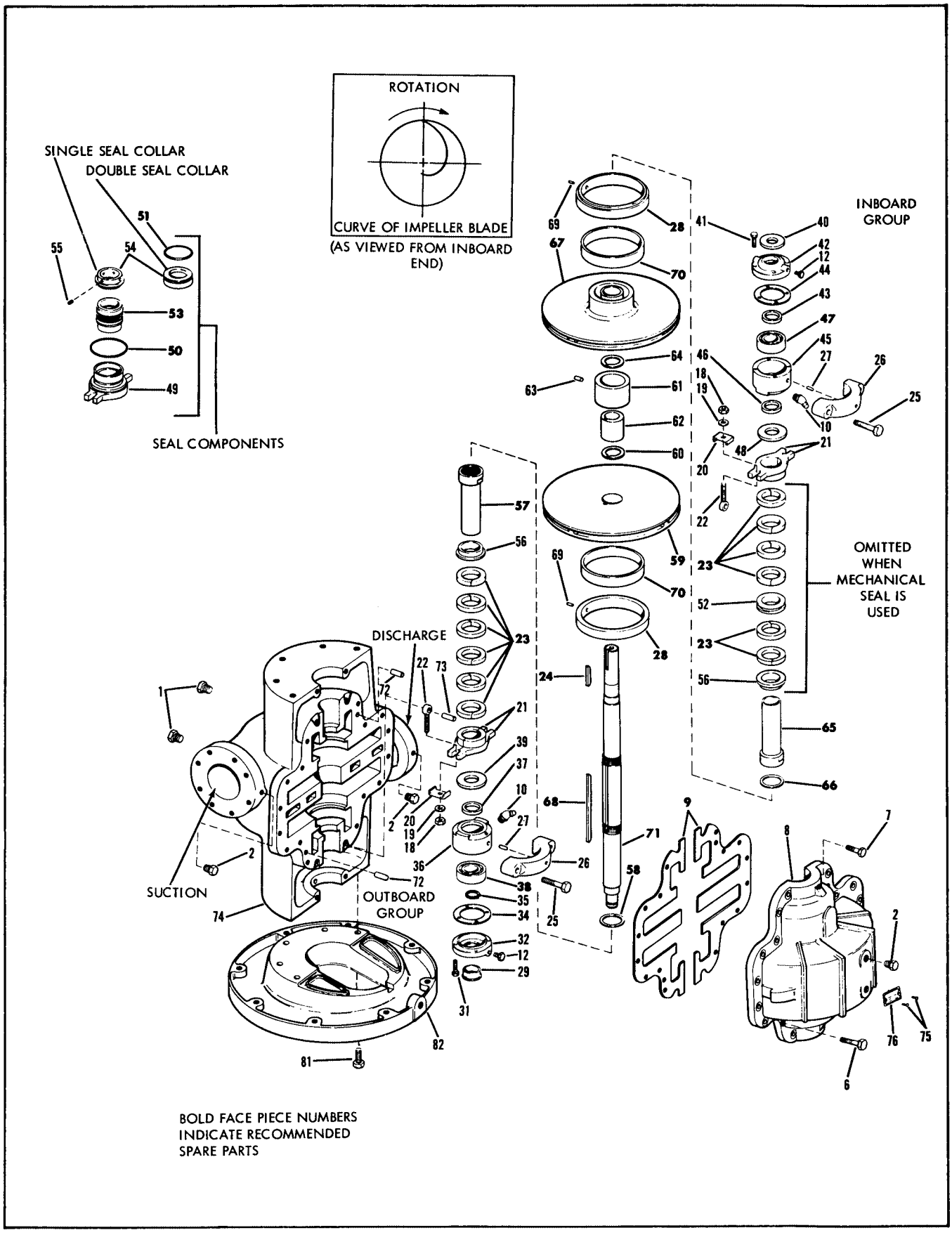


Figure 5. 422 Pump Exploded View

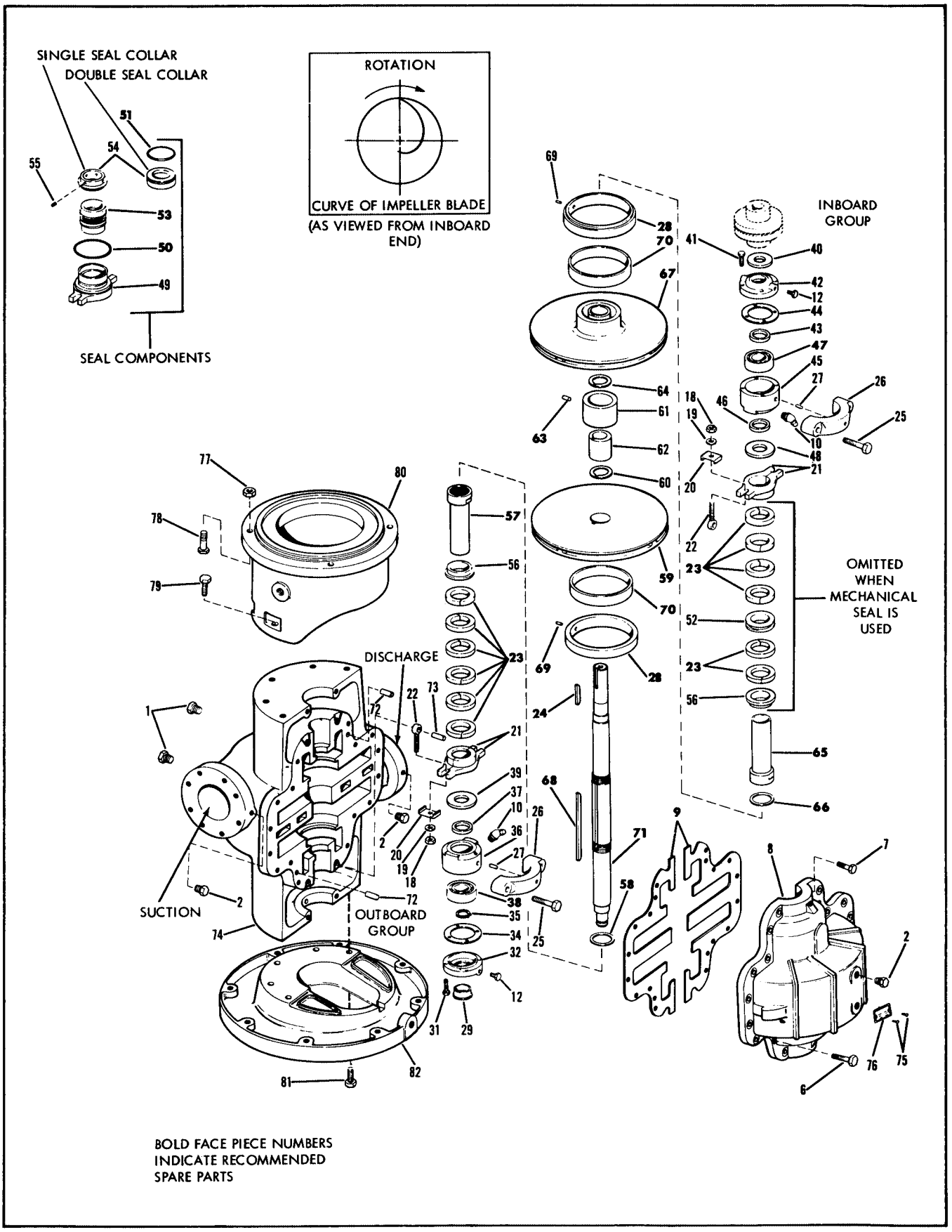
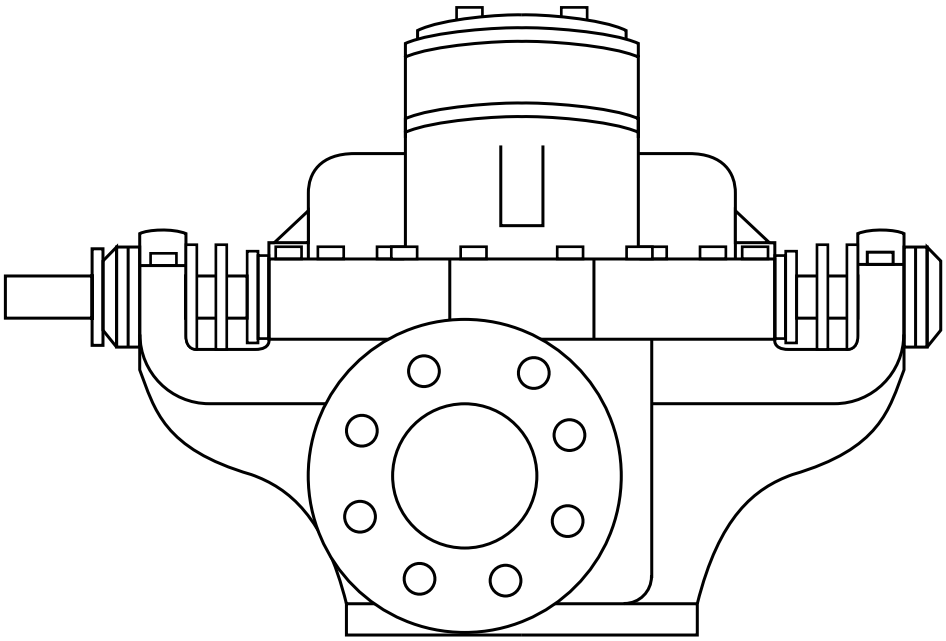


Figure 6. 423 Pump Exploded View

SUPERSEDES 420P PAGE 1
DATED APRIL 1996

420 SERIES
REPAIR PARTS INDEX



READ AND UNDERSTAND THE PUMP AND MOTOR INSTRUCTIONS BEFORE ATTEMPTING TO INSTALL, DISASSEMBLE OR REPAIR THE PUMP

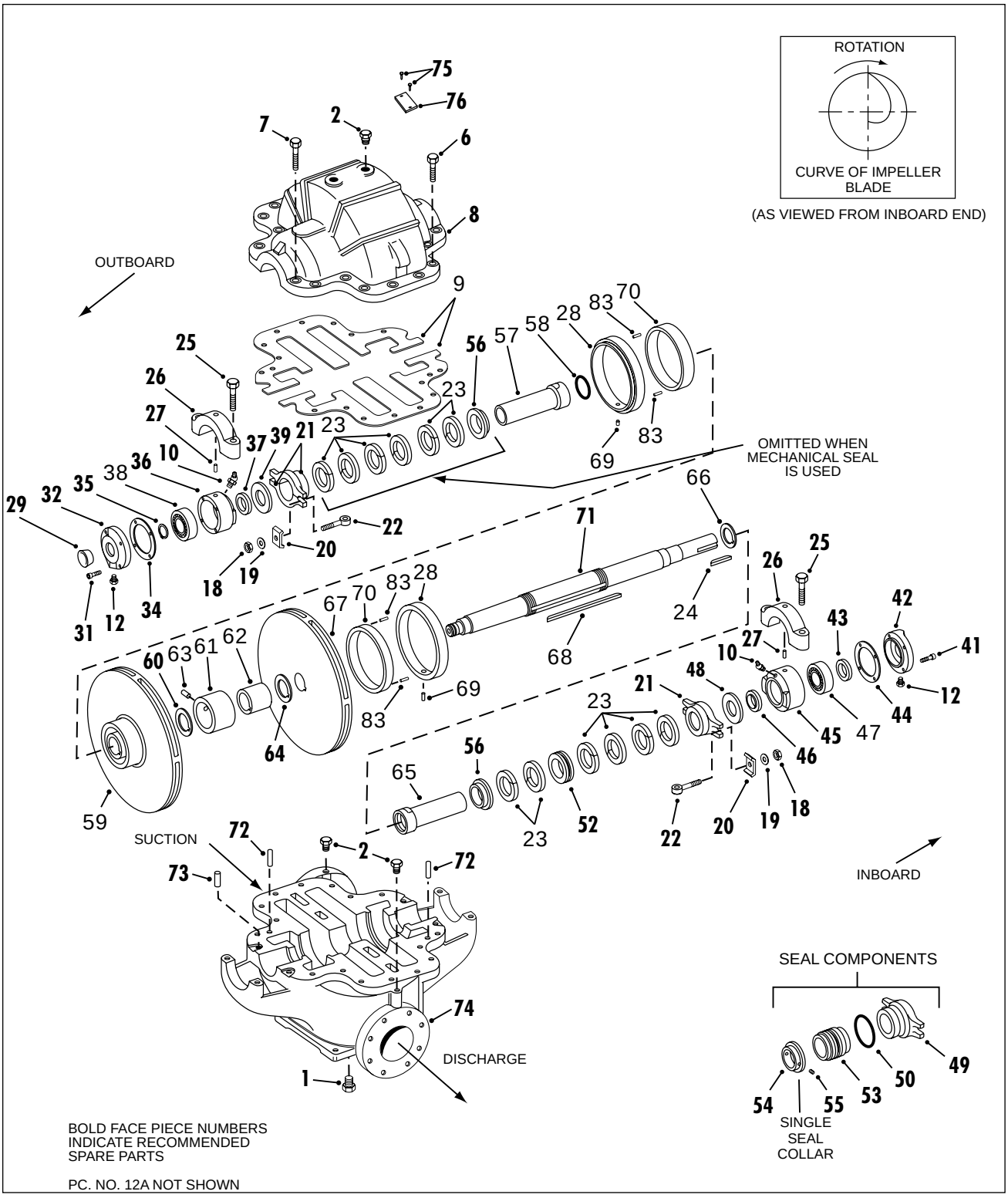
AURORA®
Pentair Pump Group

420 SERIES
MODELS 421 - 422 - 423

TABLE OF CONTENTS

PUMP MODEL	POWER SERIES	DESCRIPTION	PAGE
421, 422 & 423	2	2 x 2-1/2 x 12A	7, 8
		2 x 2-1/2 x 12B	7, 8
		2-1/2 x 3 x 12A	7, 8
421, 422 & 423	3	3 x 4 x 14A	9, 10
		3 x 4 x 14B	9, 10
421	3	4 x 5 x 15	9, 10
421	4	5 x 6 x 15	11, 12
421	5	6 x 8 x 17A	13, 14
421		6 x 8 x 17B	13, 14

MODEL 421
PIECE NUMBERS

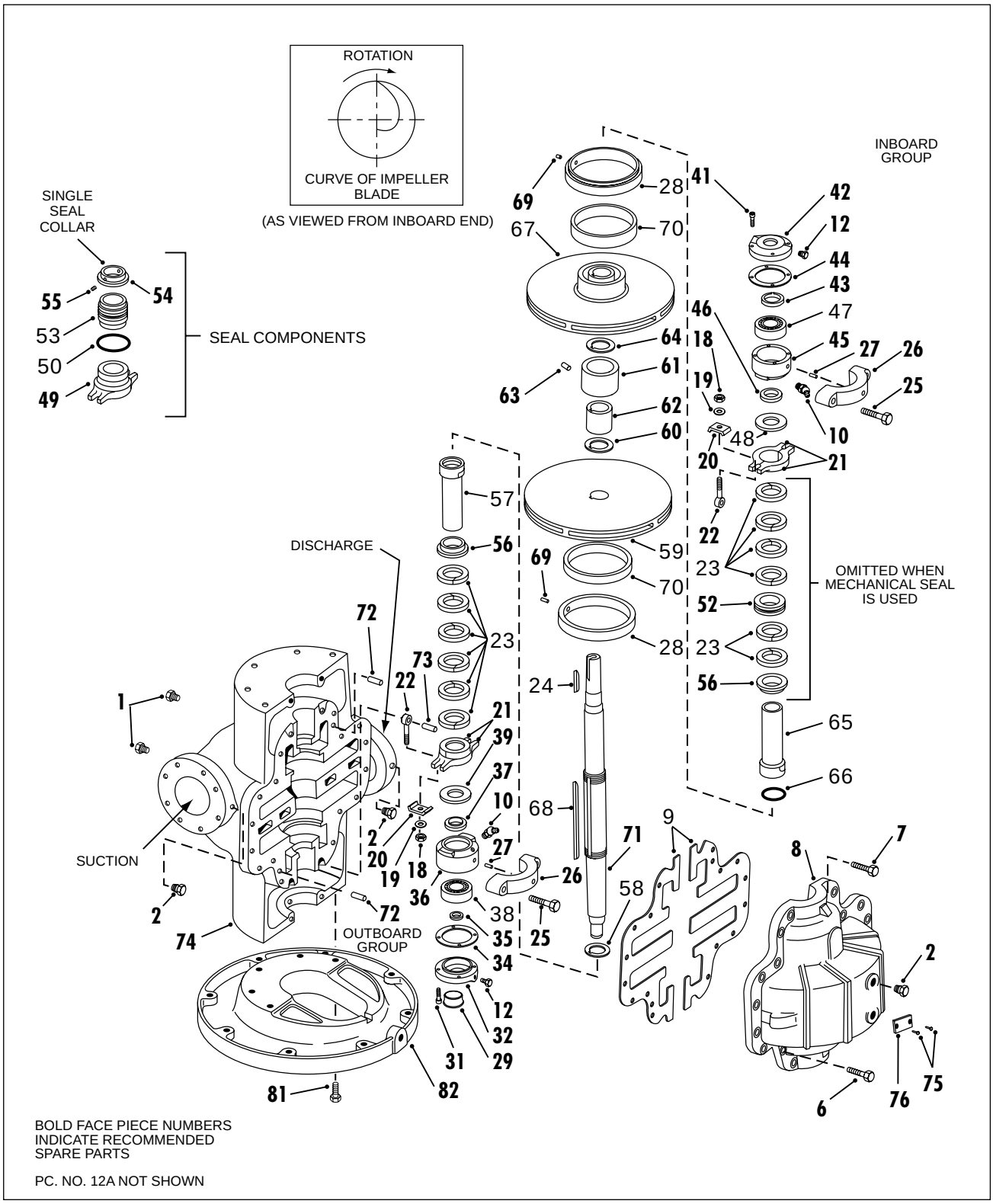


BOLD FACE PIECE NUMBERS INDICATE RECOMMENDED SPARE PARTS

PC. NO. 12A NOT SHOWN

420 SERIES

MODEL 422
PIECE NUMBERS

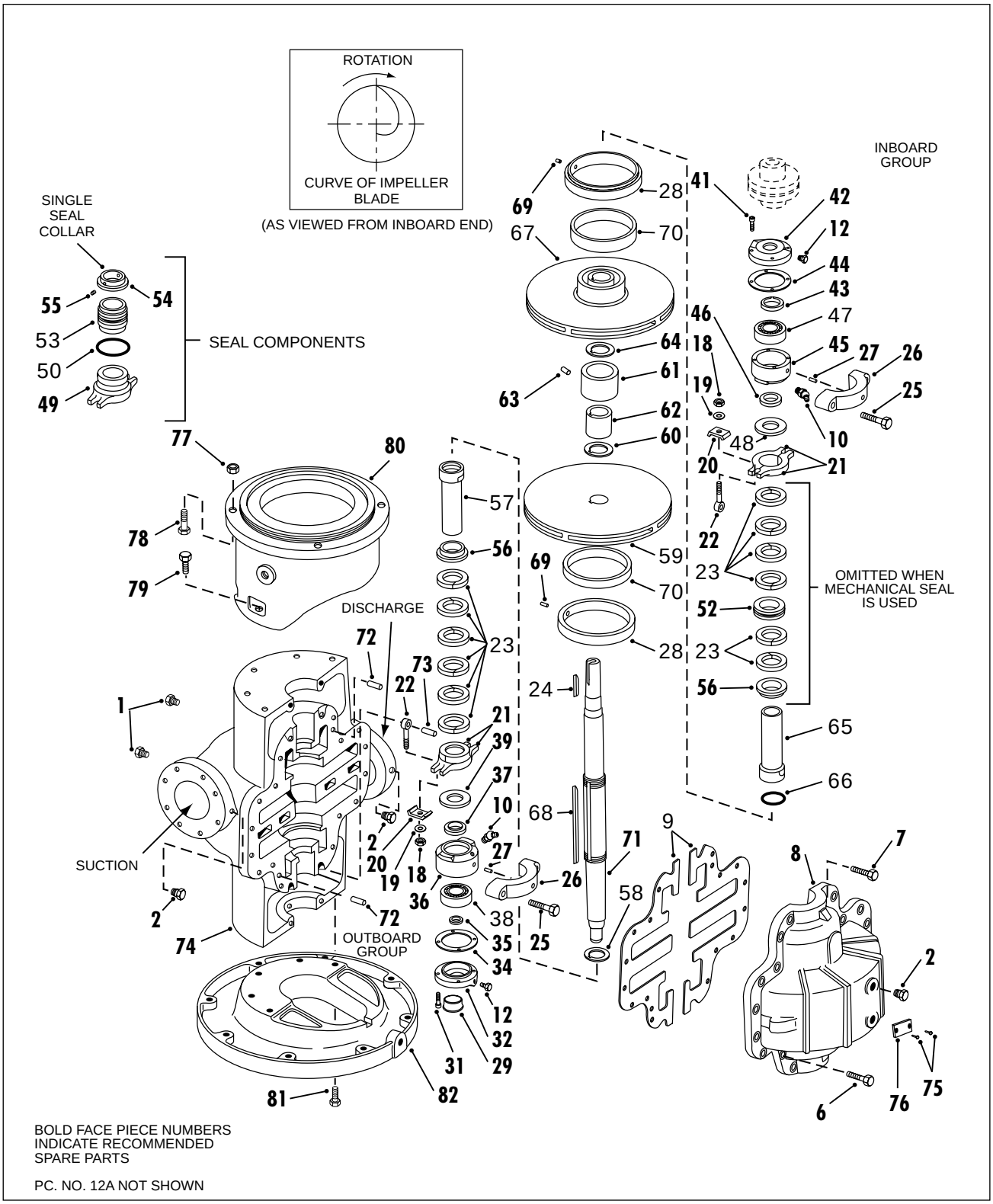


BOLD FACE PIECE NUMBERS INDICATE RECOMMENDED SPARE PARTS

PC. NO. 12A NOT SHOWN

420 SERIES

MODEL 423
PIECE NUMBERS



420 SERIES P.S. #2
MODELS 421-422-423
2 x 2-1/2 x 12A&B - 2-1/2 x 3 x 12A
PARTS LIST

PC. NO.	DESCRIPTION	QTY	PART NO.	MATERIAL B.F.	A.B.	A.I.	S.S.
1	PLUG MODEL 421	7	600-0003	087	190	087	104
	MODEL 422 & 423		REFER TO FACTORY				
2	PLUG	4	600-0002	087	190	087	104
6	CAPSCREW	16	168-0494	082	082	082	082
7	CAPSCREW		REFER TO PC NO. 73				
8	CASING		INCLUDED WITH PC NO. 74				
9	GASKET						
	2x2-1/2x12A&B	1	364-1220	598	598	598	598
	2-1/2x3x12A	1	364-1221	598	598	598	598
10	GREASE FITTING	2	508-0015	651	651	651	651
12	PLUG	2	600-0001	087	087	087	087
18	NUT	4	544-0107	–	190	080	104
19	WASHER	4	908-0109	–	190	080	104
20	CLAMP	4	204-0120	–	190	360	104
21	GLAND (PACKING)	2	372-0225	010	208	010	104
22	SWING BOLT	4	100-0216		190	360	104
22A	SWING BOLT ASSY						
	(18,19,20,22)	4	099-0002	644	–	–	–
23	PACKING	12	564-0151	802	802	802	802
24	KEY	1	472-0247	087	087	087	087
25	CAPSCREW	4	168-0494	082	082	082	082
26	BEARING CAP	2	163-0306	010		010	
27	PIN	2	592-0361	360	107	360	107
28	CASE RING						
	2x2-1/2x12A	2	676-1007	208	208	010	107
	2x2-1/2x12B	2	676-1015	208	208	010	107
	2-1/2x3x12A	2	676-1015	208	208	010	107
29	PROTECTOR	1	624-0080	087	087	087	087
31	CAPSCREW	4	168-0015	082	082	082	082
	WATER COOL (OPT)	4	168-0025	082	082	082	082
32	CARTRIDGE CAP						
	(STANDARD)	1	164-0531	010	010	010	010
	(WATER COOLED)	1	476-0745	644	644	644	644
34	GASKET	1	364-1309	614	614	614	614
35	RETAINING RING	1	676-0267	088	088	088	088
36	CARTRIDGE	1	176-0065	010	010	010	010
37	GREASE SEAL	1	712-6324	653	653	653	653
	OIL SEAL	1	712-0053	653	653	653	653
38	BEARING	1	068-0454	647	647	647	647
39	SLINGER	1	764-1017	478	478	478	478

PC. NO.	DESCRIPTION	QTY	PART NO.	MATERIAL B.F.	A.B.	A.I.	S.S.
41	CAPSCREW	4	168-0015	082	082	082	082
	WATER COOL (OPT)	4	168-0025	082	082	082	082
42	CARTRIDGE CAP						
	STANDARD	1	164-0531	010	010	010	010
	WATER COOLED	1	476-0745	644	644	644	644
43	GREASE SEAL	1	712-0231	653	653	653	653
	OIL SEAL	1	712-0016	653	653	653	653
44	GASKET	1	364-1309	614	614	614	614
45	CARTRIDGE	1	176-0065	010	010	010	010
46	GREASE SEAL	1	712-6324	653	653	653	653
	OIL SEAL	1	712-0053	653	653	653	653
47	BEARING	1	068-1907	647	647	647	647
48	SLINGER	1	764-1017	478	478	478	478
49	GLAND (SEAL)	2	372-0287	010	208	010	104
50	O RING	2	364-0420	457	457	457	457
52	LANTERN RING	1	676-1698	512	512	512	512
53	SEAL	2	712-0910	749	764	749	764
54	COLLAR	2	224-0174	208	208	010	104
55	SETSCREW	4	724-0081	104	104	104	104
56	BUSHING	2	136-1411	208	208	010	104
	SLEEVE WITH "O" RING PC. NO. 58 (NOTE 1)						
57	SLEEVE (PACKING)	1	756-0642	644	644	646	623
	SLEEVE (SEALS)	1	756-0642	644	644	623	623
58	O RING	1	364-0368	457	457	457	457
59	IMPELLER						
	2x2-1/2x12A	1	443-2092	225	225	N/A	104
	2x2-1/2x12B	1	443-2127	225	225	N/A	104
	2-1/2x3x12A	1	443-2094	225	225	010	104
	IMPELLER 9" & SMALLER & ALL 3500 RPM						
	2x2-1/2x12A	1	443-1127	225	225	N/A	104
	2-1/2x3x12A	1	443-1131	225	225	010	104
59	IMPELLER (MACHINED FOR OPT IMP RING NO. 70)						
	2x2-1/2x12A	1	443-1897	225	225	N/A	104
	2x2-1/2x12B	1	443-2129	225	225	N/A	104
	2-1/2x3x12A	1	443-1899	225	225	010	104
	IMPELLER 9" & SMALLER & ALL 3500 RPM						
	2x2-1/2x12A	1	443-1128	225	225	N/A	104
	2-1/2x3x12A	1	443-1132	225	225	010	104
60	O RING	1	364-0368	457	457	457	457
61	BUSHING	1	136-1320	226	226	010	–

NOTE 1) MATERIAL CODE 644 - SLEEVE 208, "O" RING 457
646 - SLEEVE 108, "O" RING 457
623 - SLEEVE 104, "O" RING 457

420 SERIES P.S. #2
MODELS 421-422-423
2 x 2-1/2 x 12A&B - 2-1/2 x 3 x 12A
PARTS LIST

PC. NO.	DESCRIPTION	QTY	PART NO.	MATERIAL B.F.	A.B.	A.I.	S.S.
62	SEPARATOR SLEEVE WITH "O" RINGS PC NO 60 & 64						
	(NOTE 2)	1	756-0632	644	644	642	–
63	PIN	1	592-0361	360	–	360	–
		1	592-0051	–	235	–	235
64	O RING	1	364-0368	457	457	457	457
65	SLEEVE WITH "O" RING PC NO. 66 (NOTE 1)						
	SLEEVE (PACKING)	1	756-0642	644	644	646	623
	(SEALS)	1	756-0642	644	644	623	623
66	O RING	1	364-0368	457	457	457	457
67	IMPELLER						
	2x2-1/2x12A	1	443-2093	225	225	N/A	104
	2x2-1/2x12B	1	443-2128	225	225	N/A	104
	2-1/2x3x12A	1	443-2095	225	225	010	104
	9" DIA & SMALLER						
	ALL 3500 RPM						
	2x2-1/2x12A	1	443-1125	225	225	N/A	104
	2-1/2x3x12A	1	443-1129	225	225	010	104
	IMPELLER MACHINED FOR OPT. IMP RING PC 70						
	2x2-1/2x12A	1	443-1898	225	225	N/A	104
	2x2-1/2x12B	1	443-2130	225	225	N/A	104
	2-1/2x3x12A	1	443-1900	225	225	010	104
	9" DIA & SMALLER						
	ALL 3500 RPM						
	2x2-1/2x12A	1	443-1126	225	225	N/A	104
	2-1/2x3x12A	1	443-1130	225	225	010	104
68	KEY	1	472-0415	107	104	107	104
69	PIN	2	592-0361	360	–	360	–
		2	592-0051	–	235	–	235
70	IMP RING (OPT)						
	2x2-1/2x12A	2	676-1056	208	208	–	104
	2x2-1/2x12B	2	676-1014	208	208	–	104
	2-1/2x3x12A	2	676-1014	208	208	010	104
71	SHAFT	1	728-1040	063	104	063	104
72	PIN	4	592-0213	104	104	104	104
73	PIN	4	592-0213	104	104	104	104

NOTE 1) MATERIAL CODE 644 - SLEEVE 208, "O" RING 457
646 - SLEEVE 108, "O" RING 457
623 - SLEEVE 104, "O" RING 457

PC. NO.	DESCRIPTION	QTY	PART NO.	MATERIAL B.F.	A.B.	A.I.	S.S.
74	CASING ASSY MODEL 421						
	2x2-1/2x12A	1	179-1910	010	RTF	010	RTF
	2x2-1/2x12B	1	179-1910	010	RTF	010	RTF
	2-1/2x3x12A	1	179-1918	010	RTF	010	RTF
	CASING ASSY MODEL 422 & 423						
	2x2-1/2x12A	1	179-1914	010	RTF	010	RTF
	2x2-1/2x12B	1	179-1914	010	RTF	010	RTF
	2-1/2x3x12A	1	179-1922	010	RTF	010	RTF
75	DRIVE SCREW	2	708-0013	365	365	365	365
76	NAMEPLATE	1	532-0045	114	114	114	114
77	NUT						
	FR. 143HP-256HP	4	544-0109	080	190	080	104
	FR. 284HP-445HP	4	544-0115	080	190	080	104
78	CAPSCREW						
	FR. 143HP-256HP	4	168-0388	082	082	082	082
	FR. 284HP-445HP	4	168-0566	082	082	082	082
79	CAPSCREW	5	168-0490	082	082	082	104
80	BRACKET		REFER TO FACTORY				
81	CAPSCREW	5	168-0490	082	082	082	104
82	BASE		REFER TO FACTORY				

NOTE 2) MATERIAL CODE 644 - SEP SLEEVE 215, "O" RING 457
642 - SEP SLEEVE 010, "O" RING 457

420 SERIES P.S. #3
MODELS 421-422-423
3 x 4 x 14A&B - 4 x 5 x 15
PARTS LIST

PC. NO.	DESCRIPTION	QTY	PART NO.	MATERIAL B.F.	A.B.	A.I.	S.S.
1	PLUG MODEL 421	7	600-0003	087	190	087	104
	MODEL 422 & 423		REFER TO FACTORY				
2	PLUG	4	600-0002	087	190	087	104
6	CAPSCREW	16	168-0492	082	082	082	104
7	CAPSCREW	4	168-0492	082	082	082	104
8	CASING		INCLUDED WITH PC NO. 74				
9	GASKET						
	3x4x14A&B	1	364-1226	598	598	598	598
	BEFORE 3/78	1	364-1222	598	598	598	598
	4x5x15 (421 ONLY)	1	364-1302	598	598	598	598
	BEFORE 3/78	1	364-1223	614	614	614	614
10	GREASE FITTING	2	508-0015	651	651	651	651
12	PLUG	2	600-0001	087	087	087	087
12A	PLUG*	6	600-0003	087	087	087	087
18	NUT	4	544-0109	–	190	080	104
19	WASHER	4	908-0112	–	190	080	104
20	CLAMP	4	204-0120	–	190	360	104
21	GLAND (PACKING)	2	372-0226	010	208	010	104
22	SWING BOLT	4	100-2011	–	190	360	104
22A	SWING BOLT ASSY						
	(18,19,20,22)	4	099-0014	644	–	–	–
23	PACKING	12	564-0175	802	802	802	802
24	KEY	1	472-0318	087	087	087	087
25	CAPSCREW	4	168-0494	082	082	082	082
26	BEARING CAP	2	163-0307	010	–	010	–
27	PIN	2	592-0361	360	107	360	107
28	CASE RING						
	3x4x14A&B	2	676-1009	208	208	010	107
	4x5x15 (421 ONLY)	2	676-1013	360	208	010	107
29	PROTECTOR	1	624-0081	087	087	087	087
31	CAPSCREW (STD)	4	168-0260	082	082	082	082
	WATER COOL (OPT)	4	168-0051	082	082	082	082
32	CARTRIDGE CAP(STD)	1	164-0550	010	010	010	010
	WATER COOLED	1	164-0088	326	326	326	326
34	GASKET	1	364-1310	614	614	614	614
35	RETAINING RING	1	676-0930	088	088	088	088
36	CARTRIDGE	1	176-0066	010	010	010	010
37	GREASE SEAL	1	712-6326	653	653	653	653
	OIL SEAL	1	712-0017	653	653	653	653

PC. NO.	DESCRIPTION	QTY	PART NO.	MATERIAL B.F.	A.B.	A.I.	S.S.
38	BEARING	1	068-0455	647	647	647	647
39	SLINGER	1	764-1020	478	478	478	478
41	CAPSCREW (STD)	4	168-0260	082	082	082	082
	WATER COOLED (OPT)	4	168-0051	082	082	082	082
42	CARTRIDGE CAP (STD)	1	164-0550	010	010	010	010
	WATER COOLED	1	164-0088	326	326	326	326
43	GREASE SEAL	1	712-6325	653	653	653	653
	OIL SEAL	1	712-0019	653	653	653	653
44	GASKET	1	364-1310	614	614	614	614
45	CARTRIDGE	1	176-0066	010	010	010	010
46	GREASE SEAL	1	712-6326	653	653	653	653
	OIL SEAL	1	712-0017	653	653	653	653
47	BEARING	1	068-1908	647	647	647	647
48	SLINGER	1	764-1020	478	478	478	478
49	GLAND (SEAL)	2	372-0289	010	208	010	104
50	O RING	2	364-0423	457	457	457	457
52	LANTERN RING	1	676-1699	512	512	512	512
53	SEAL	2	712-1012	749	764	749	764
54	COLLAR	2	224-0175	208	208	010	104
55	SETSCREW	4	724-0081	104	104	104	104
56	BUSHING	2	136-1412	208	208	010	104
57	SLEEVE WITH "O" RING PC 58 (NOTE 1)						
	SLEEVE (PACKING)	1	756-0643	644	644	646	623
	SLEEVE (SEAL)	1	756-0643	644	644	623	623
58	O RING	1	364-0372	457	457	457	457
59	IMPELLER						
	3x4x14A	1	443-2137	225	225	010	104
	3x4x14B	1	443-2096	225	225	010	104
	4x5x15 (421 ONLY)	1	443-2098	208	208	010	104
	IMPELLER FITTED WITH OPT. IMPELLER RING PC 70						
	3x4x14A	1	443-2125	643	643	642	646
	3x4x14B	1	443-1901	643	643	642	646
	4x5x15 (421 ONLY)	1	443-2535	643	643	642	646
60	O RING	1	364-0372	457	457	457	457
61	BUSHING	1	136-1321	226	226	010	104
62	SEPARATOR SLEEVE WITH "O" RINGS PC NO. 60 & 64						
	(NOTE 2)	1	756-0633	644	644	642	-
63	PIN	1	592-0361	360		360	
		1	592-0051		235		235

*USED WITH WATER COOLED CARTRIDGE CAPS ONLY

NOTE 1) MATERIAL CODE 644 - SLEEVE 208, "O" RING 457
646 - SLEEVE 108, "O" RING 457
623 - SLEEVE 104, "O" RING 457

NOTE 2) MATERIAL CODE 644 - SEP SLEEVE 215, "O" RING 457
642 - SEP SLEEVE 010, "O" RING 457

420 SERIES P.S. #3
MODELS 421 - 422 - 423
3 x 4 x 14A&B - 4 x 5 x 15
PARTS LIST

PC. NO.	DESCRIPTION	QTY	PART NO.	MATERIAL B.F.	A.B.	A.I.	S.S.
64	O RING	1	364-0372	457	457	457	457
65	SLEEVE WITH "O" RING PC 66 (NOTE 1)						
	SLEEVE (PACKING)	1	756-0643	644	644	646	623
	SLEEVE (SEAL)	1	756-0643	644	644	623	623
66	O RING	1	364-0372	457	457	457	457
67	IMPELLER						
	3x4x14A	1	443-2138	225	225	010	104
	3x4x14B	1	443-2097	225	225	010	104
	4x5x15 (421 ONLY)	1	443-2099	208	208	010	104
	IMPELLER (FITTED WITH OPT. IMP. RING PC 70)						
	3x4x14A	1	443-2126	643	643	642	646
	3x4x14B	1	443-1902	643	643	642	646
	4x5x15 (421 ONLY)	1	443-2536	643	643	642	646
68	KEY	1	472-0416	107	104	107	104
69	PIN	2	592-0361	360	–	360	–
		2	592-0051	–	235	–	235
70	IMP RING (OPT)						
	3x4x14A&B	2	676-1010	208	208	010	104
	4x5x15 (421 ONLY)	2	676-2069	208	208	010	104
71	SHAFT	1	728-1041	063	104	063	104
72	PIN	2	592-0375	360	107	360	107
73	PIN		REFER TO PIECE NO. 7				
74	CASING ASSEMBLY MODEL 421						
	3x4x14A	1	179-2276	010	RTF	010	RTF
	3x4x14B	1	179-2276	010	RTF	010	RTF
	4x5x15 (421 ONLY)	1	179-2267	010	RTF	010	RTF
	CASING ASSEMBLY MODEL 422 & 423						
	3x4x14A	1	179-2278	010	RTF	010	RTF
	3x4x14B	1	179-2278	010	RTF	010	RTF
75	DRIVE SCREW	2	708-0013	365	365	365	365
76	NAMEPLATE	1	532-0045	114	114	114	114
77	NUT						
	FR. 143HP-256HP	4	544-0109	080	190	080	104
	FR. 284HPH-445HP	4	544-0115	080	190	080	104
78	CAPSCREW						
	FR. 143HP-256HP	4	168-0388	082	082	082	082
	FR. 284HP-445HP	4	168-0570	082	082	082	082
79	CAPSCREW	5	168-0562	082	082	082	082
80	BRACKET		REFER TO FACTORY				
81	CAPSCREW	5	168-0562	082	082	082	082
82	BASE		REFER TO FACTORY				

PC. NO.	DESCRIPTION	QTY	PART NO.	MATERIAL B.F.	A.B.	A.I.	S.S.

NOTE 1) MATERIAL CODE 644 - SLEEVE 208, "O" RING 457
646 - SLEEVE 108, "O" RING 457
623 - SLEEVE 104, "O" RING 457

420 SERIES P.S. #4
MODELS 421
5 x 6 x 15
PARTS LIST

PC. NO.	DESCRIPTION	QTY	PART NO.	MATERIAL B.F.	A.B.	A.I.	S.S.
1	PLUG	7	600-0004	028	190	028	104
2	PLUG	4	600-0002	087	190	087	104
6	CAPSCREW	11	168-0566	082	082	082	104
	CAPSCREW (OVER BY-PASS)	5	168-0564	082	082	082	104
7	CAPSCREW	4	168-0494	082	082	082	104
8	CASING	INCLUDED WITH NO. 74					
9	GASKET	1	364-1224	598	598	598	598
10	GREASE FITTING	2	508-0015	651	651	651	651
12	PLUG	2	600-0001	087	087	087	087
12A	PLUG*	6	600-0003	087	087	087	087
18	NUT	4	544-0109	–	190	080	104
19	WASHER	4	908-0112	–	190	080	104
20	CLAMP	4	204-0120	–	190	360	104
21	GLAND (PACKING)	2	372-0227	010	208	010	104
22	SWING BOLT	4	100-2011	–	190	360	104
22A	SWING BOLT ASSY. (18, 19, 20, 22)	4	099-0014	644	–	–	–
23	PACKING	12	564-0176	802	802	802	802
24	KEY	1	472-0318	087	087	087	087
25	CAPSCREW	4	168-0568	082	082	082	082
26	BEARING CAP	2	163-0308	010	–	010	–
27	PIN	2	592-0361	360	107	360	107
28	CASE RING	2	676-1012	208	208	010	107
29	PROTECTOR	1	624-0081	087	087	087	087
31	CAPSCREW (STD)	4	168-0260	082	082	082	082
	WATER COOL (OPT)	4	168-0049	082	082	082	082
32	CARTRIDGE CAP						
	STANDARD	1	164-0532	010	010	010	010
	WATER COOLED	1	164-0087	326	326	326	326
34	GASKET	1	364-1311	614	614	614	614
35	RETAINING RING	1	676-0935	088	088	088	088
36	CARTRIDGE	1	176-0067	010	010	010	010
37	GREASE SEAL	1	712-6327	653	653	653	653
	OIL SEAL	1	712-0018	653	653	653	653
38	BEARING	1	068-0456	647	647	647	647
39	SLINGER	1	764-1022	478	478	478	478
41	CAPSCREW (STD)	4	168-0260	082	082	082	082
	WATER COOL (OPT)	4	168-0049	082	082	082	082

*USED WITH WATER COOLED CARTRIDGE CAPS ONLY

PC. NO.	DESCRIPTION	QTY	PART NO.	MATERIAL B.F.	A.B.	A.I.	S.S.
42	CARTRIDGE CAP						
	STANDARD	1	164-0532	010	010	010	010
	WATER COOLED	1	164-0087	326	326	326	326
43	GREASE SEAL	1	712-6326	653	653	653	653
	OIL SEAL	1	712-0017	653	653	653	653
44	GASKET	1	364-1311	614	614	614	614
45	CARTRIDGE	1	176-0067	010	010	010	010
46	GREASE SEAL	1	712-6327	653	653	653	653
	OIL SEAL	1	712-0018	653	653	653	653
47	BEARING	1	068-1909	647	647	647	647
48	SLINGER	1	764-1022	478	478	478	478
49	GLAND (SEAL)	2	372-0291	010	208	010	104
50	O RING	2	364-0425	457	457	457	457
52	LANTERN RING	1	676-1700	512	512	512	512
53	SEAL	2	712-1014	749	764	749	764
54	COLLAR	2	224-0176	208	208	010	104
55	SETSCREW	4	724-0081	104	104	104	104
56	BUSHING	2	136-1413	208	208	010	104
57	SLEEVE WITH "O" RING PC. 58 (NOTE 1)						
	SLEEVE (PACKING)	1	756-0644	644	644	646	623
	SLEEVE (SEAL)	1	756-0644	644	644	623	623
58	O-RING	1	364-0375	457	457	457	457
59	IMPELLER	1	443-2100	208	208	010	104
	IMPELLER (FITTED W/ OPT. IMP. RING NO. 70						
		1	443-1905	643	643	642	646
60	O RING	1	364-0375	457	457	457	457
61	BUSHING	1	136-1322	226	226	010	104
62	SEPARATOR SLEEVE WITH "O" RINGS PC 60 & 64						
	(NOTE 2)	1	756-0634	644	644	642	–
63	PIN	1	592-0361	360	–	360	–
		1	592-0051	–	235	–	235
64	O RING	1	364-0375	457	457	457	457
65	SLEEVE WITH "O" RING PC. 66 (NOTE 1)						
	SLEEVE (PACKING)	1	756-0644	644	644	646	623
	SLEEVE (SEAL)	1	756-0644	644	644	623	623
66	O RING	1	364-0375	457	457	457	457

NOTE 1) MATERIAL CODE 644 - SLEEVE 208, "O" RING 457
646 - SLEEVE 108, "O" RING 457
623 - SLEEVE 104, "O" RING 457

NOTE 2) MATERIAL CODE 644 - SEP SLEEVE 215, "O" RING 457
642 - SEP SLEEVE 010, "O" RING 457

420 SERIES P.S. #4
MODELS 421
5 x 6 x 15
PARTS LIST

PC. NO.	DESCRIPTION	QTY	PART NO.	MATERIAL			
				B.F.	A.B.	A.I.	S.S.
67	IMPELLER	1	443-2101	208	208	010	104
	IMPELLER (FITTED W/ OPT. IMP RING PC 70)						
		1	443-1906	643	643	642	646
68	KEY	1	472-0417	107	104	107	104
69	PIN	2	592-0361	360	–	360	–
		2	592-0051	–	235	–	235
70	IMP RING (OPT)	2	676-1011	208	208	010	104
71	SHAFT	1	728-1042	063	104	063	104
72	PIN	2	592-0375	360	107	360	107
73	PIN		REFER TO PIECE NO. 7				
74	CASING ASSEMBLY	1	179-1938	010	RTF	010	RTF
75	DRIVE SCREW	2	708-0013	365	365	365	365
76	NAMEPLATE	1	532-0045	114	114	114	114

PC. NO.	DESCRIPTION	QTY	PART NO.	MATERIAL			
				B.F.	A.B.	A.I.	S.S.

420 SERIES P.S. #5
MODELS 421
6 x 8 x 17A&B
PARTS LIST

PC. NO.	DESCRIPTION	QTY	PART NO.	MATERIAL B.F.	A.B.	A.I.	S.S.
1	PLUG	7	600-0004	028	190	028	104
2	PLUG	4	600-0002	087	190	087	104
6	CAPSCREW	11	168-0636	082	082	082	104
7	CAPSCREW	4	168-0498	082	082	082	104
8	CASING		INCLUDED WITH NO. 74				
9	GASKET	1	364-1332	598	598	598	598
	BEFORE 3/78	1	364-1225	614	614	614	614
10	GREASE FITTING	2	508-0015	651	651	651	651
12	PLUG	2	600-0001	087	087	087	087
12A	PLUG*	6	600-0003	087	087	087	087
18	NUT	4	544-0113	–	190	080	104
19	WASHER	4	908-0114	–	190	080	104
20	CLAMP	4	204-0121	–	190	360	104
21	GLAND (PACKING)	2	372-0228	010	208	010	104
22	SWING BOLT	4	100-2012	–	190	360	104
22A	SWING BOLT ASSY.						
	(18, 19, 20, 22)	4	099-0015	644	–	–	–
23	PACKING	12	564-0177	802	802	802	802
24	KEY	1	472-0321	087	087	087	087
25	CAPSCREW	4	168-0638	082	082	082	082
26	BEARING CAP	2	163-0309	010	–	010	–
27	PIN	2	592-0361	360	107	360	107
28	CASE RING	2	676-1750	208	208	010	107
29	PROTECTOR	1	624-0110	087	087	087	087
31	CAPSCREW (STD)	4	168-0260	082	082	082	082
	WATER COOL (OPT)	4	168-0047	082	082	082	082
32	CARTRIDGE CAP						
	STANDARD	1	164-0533	010	010	010	010
	WATER COOLED	1	164-0086	326	326	326	326
34	GASKET	1	364-1312	614	614	614	614
35	RETAINING RING	1	676-0943	088	088	088	088
36	CARTRIDGE	1	176-0068	010	010	010	010
37	GREASE SEAL	1	712-6329	653	653	653	653
	OIL SEAL	1	712-0037	653	653	653	653
38	BEARING	1	068-0458	647	647	647	647
39	SLINGER	1	764-1028	478	478	478	478
41	CAPSCREW (STD)	4	168-0260	082	082	082	082
	WATER COOL (OPT)	4	168-0047	082	082	082	082

*USED WITH WATER COOLED CARTRIDGE CAPS ONLY

PC. NO.	DESCRIPTION	QTY	PART NO.	MATERIAL B.F.	A.B.	A.I.	S.S.
42	CARTRIDGE CAP						
	STANDARD	1	164-0533	010	010	010	010
	WATER COOLED	1	164-0086	326	326	326	326
43	GREASE SEAL	1	712-6328	653	653	653	653
	OIL SEAL	1	712-0055	653	653	653	653
44	GASKET	1	364-1312	614	614	614	614
45	CARTRIDGE	1	176-0068	010	010	010	010
46	GREASE SEAL	1	712-6329	653	653	653	653
	OIL SEAL	1	712-0037	653	653	653	653
47	BEARING	1	068-0160	647	647	647	647
48	SLINGER	1	764-1028	478	478	478	478
49	GLAND (SEAL)	2	372-0293	010	208	010	104
50	O RING	2	364-0429	457	457	457	457
52	LANTERN RING	1	676-1701	512	512	512	512
53	SEAL	2	712-1017	749	764	749	764
54	COLLAR	2	224-0177	208	208	010	104
55	SETSCREW	4	724-0081	104	104	104	104
56	BUSHING	2	136-1414	208	208	010	104
57	SLEEVE WITH "O" RING PC 58 (NOTE 1)						
	SLEEVE (PACKING)	1	756-0645	644	644	646	623
	SLEEVE (SEAL)	1	756-0645	644	644	623	623
58	O-RING	1	364-0380	457	457	457	457
59	IMPELLER						
	6x8x17A	1	443-2133	208	208	010	104
	6x8x17B	1	443-2102	208	208	010	104
	IMPELLER (FITTED WITH/OPT IMP RING 70)						
	6x8x17A	1	443-2131	643	643	642	646
	6x8x17B	1	443-2135	643	643	642	646
60	O RING	1	364-0380	457	457	457	457
61	BUSHING	1	136-1323	226	226	010	104
62	SEPARATOR SLEEVE WITH "O" RING PC 60 & 64						
	(NOTE 2)	1	756-0635	644	644	642	–
63	PIN	1	592-0361	360	–	360	–
		1	592-0051	–	235	–	235
64	O RING	1	364-0380	457	457	457	457
65	SLEEVE WITH "O" RING PC 66 (NOTE 1)						
	(PACKING)	1	756-0645	644	644	646	623
	(SEAL)	1	756-0645	644	644	623	623

NOTE 1) MATERIAL CODE 644 - SLEEVE 208, "O" RING 457
646 - SLEEVE 108, "O" RING 457
623 - SLEEVE 104, "O" RING 457

NOTE 2) MATERIAL CODE 644 - SEP SLEEVE 215, "O" RING 457
642 - SEP SLEEVE 010, "O" RING 457

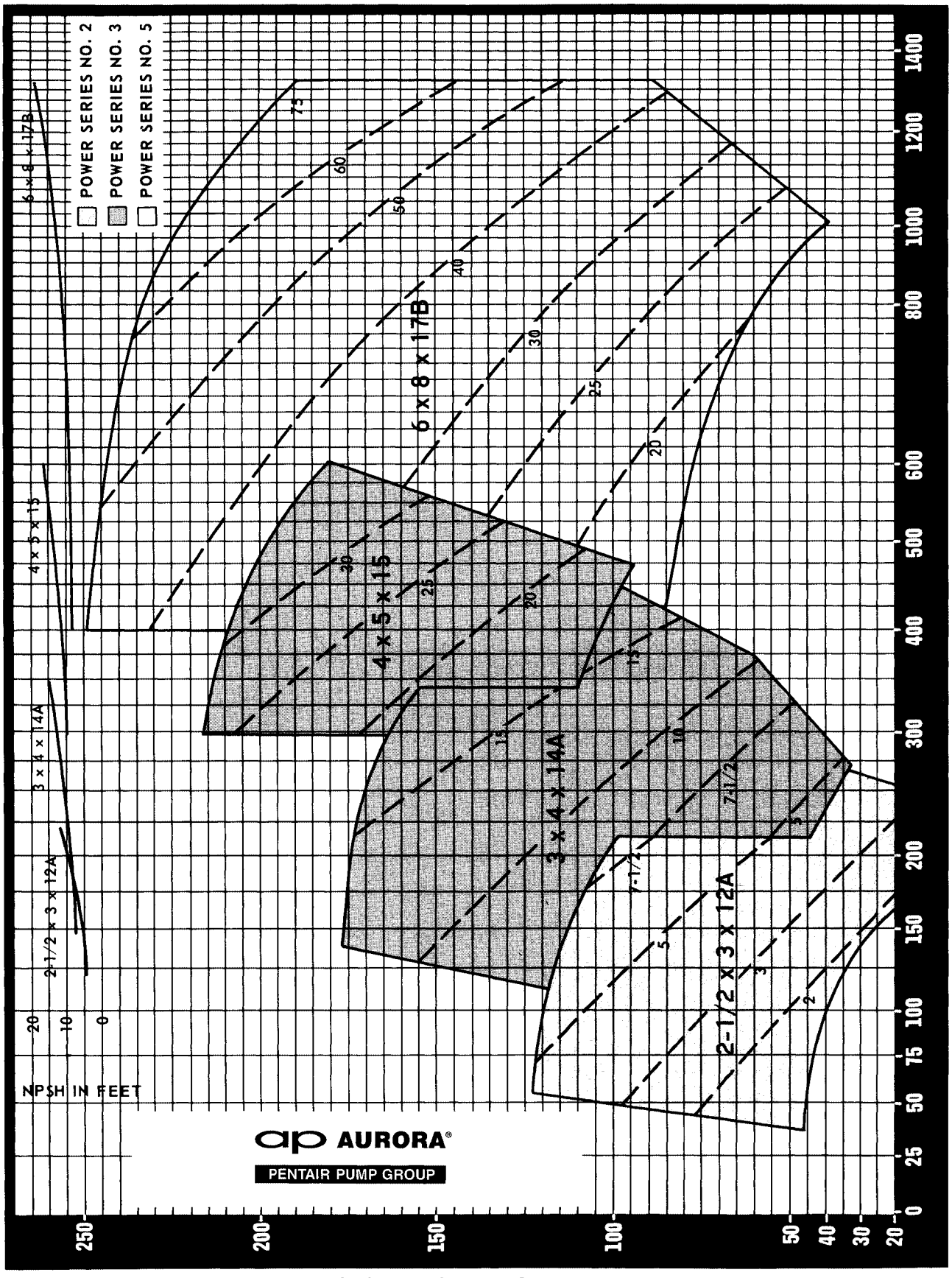
420 SERIES P.S. #5
MODELS 421
6 x 8 x 17A&B
PARTS LIST

PC. NO.	DESCRIPTION	QTY	PART NO.	MATERIAL B.F.	A.B.	A.I.	S.S.
66	O RING	1	364-0380	457	457	457	457
67	IMPELLER						
	6x8x17A	1	443-2134	208	208	010	104
	6x8x17B	1	443-2103	208	208	010	104
	IMPELLER (FITTED W/OPT. IMP RING NO. 70)						
	6x8x17A	1	443-2132	643	643	642	646
	6x8x17B	1	443-2136	643	643	642	646
68	KEY	1	472-0418	107	104	107	104
69	PIN	2	592-0361	360	–	360	–
		2	592-0051	–	235	–	235
70	IMP RING (OPT)	2	676-1054	208	208	010	104
71	SHAFT	1	728-1043	063	104	063	104
72	PIN	2	592-0375	360	107	360	107
73	PIN		REFER TO PIECE NO. 7				
74	CASE ASSY	1	179-2266	010	RTF	010	RTF
75	DRIVE SCREW	2	708-0013	365	365	365	365
76	NAMEPLATE	1	532-0045	114	114	114	114
83	SETSCREW	6	724-0027	104	104	104	104

PC. NO.	DESCRIPTION	QTY	PART NO.	MATERIAL B.F.	A.B.	A.I.	S.S.

AURORA®
Pentair Pump Group

SELECTION CHART
1150 R.P.M.
ENCLOSED IMPELLER



Performance Curves for the 420 Series

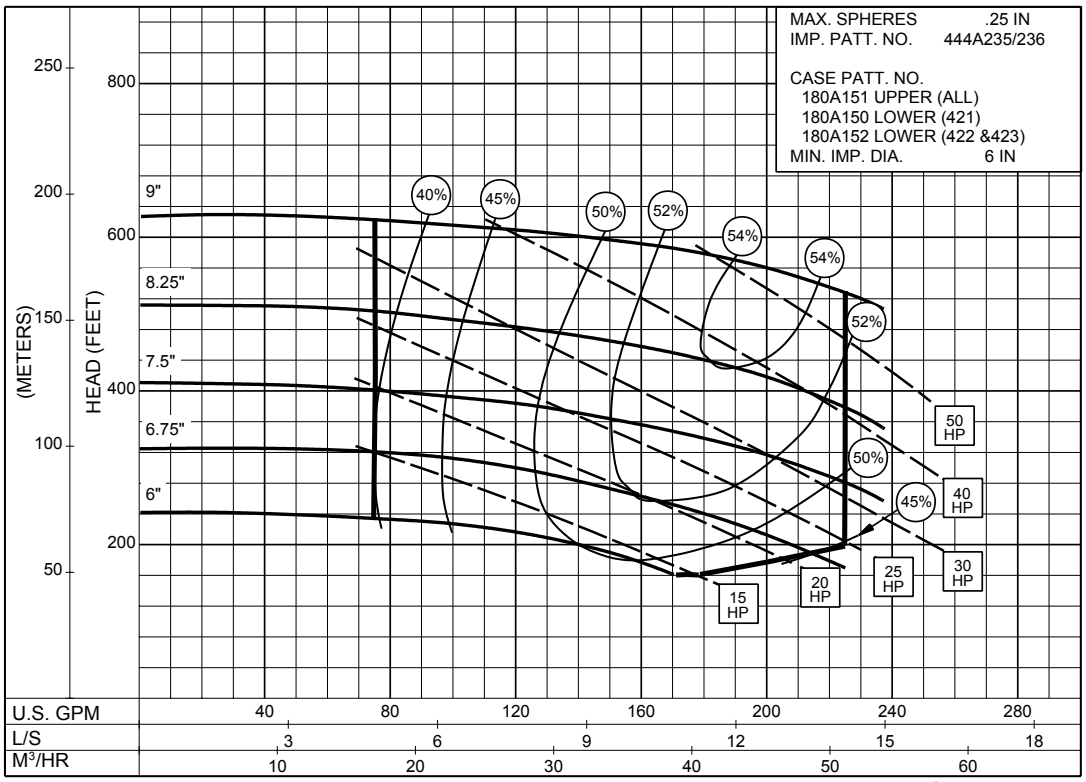
MODEL/SIZE	R.P.M.	CATALOG PAGE	PDF PAGE
2 x 2-1/2 x 12A	3500/1750	401	2
2 x 2-1/2 x 12B	1750	402	3
2-1/2 x 3 x 12A	3500/1750	403	4
2-1/2 x 3 x 12A	1150	404	5
3 x 4 x 14A	1750/1150	405	6
3 x 4 x 14B	1750	406	7
4 x 5 x 15	1750/1150	407	8
5 x 5 x 12	3550	408	9
5 x 6 x 15	1750	408.1	10
6 x 6 x 12	3550	408.2	11
6 x 8 x 17A	1750	409	12
6 x 8 x 17B	1750/1150	410	13

2 x 2-1/2 x 12A SERIES 420

ENCLOSED IMPELLER

Supersedes Section 420 Page 401
Dated January 1968

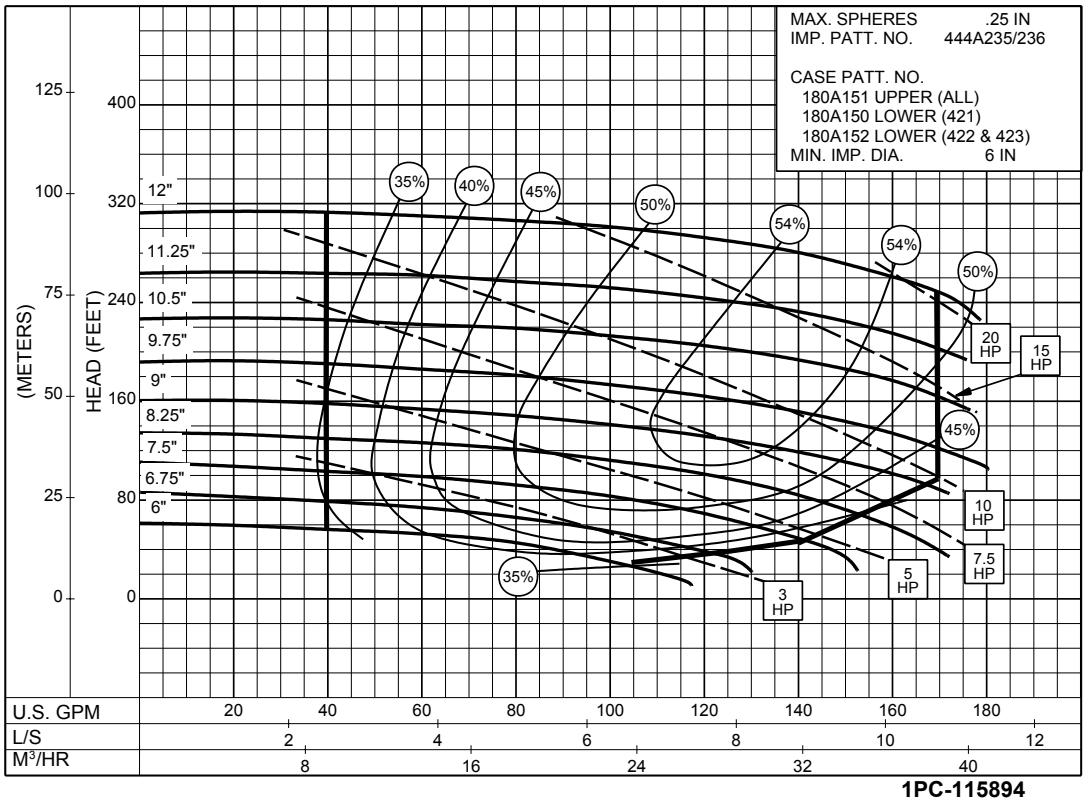
SIZE : 2x2-1/2x12A **TYPE : 420** **IMPELLER : Enclosed** **R. P. M. : 3500**



1PC-115893

3500 R.P.M

SIZE : 2x2-1/2x12A **TYPE : 420** **IMPELLER : Enclosed** **R. P. M. : 1750**



1PC-115894

1750 R.P.M

AURORA®
Pentair Pump Group

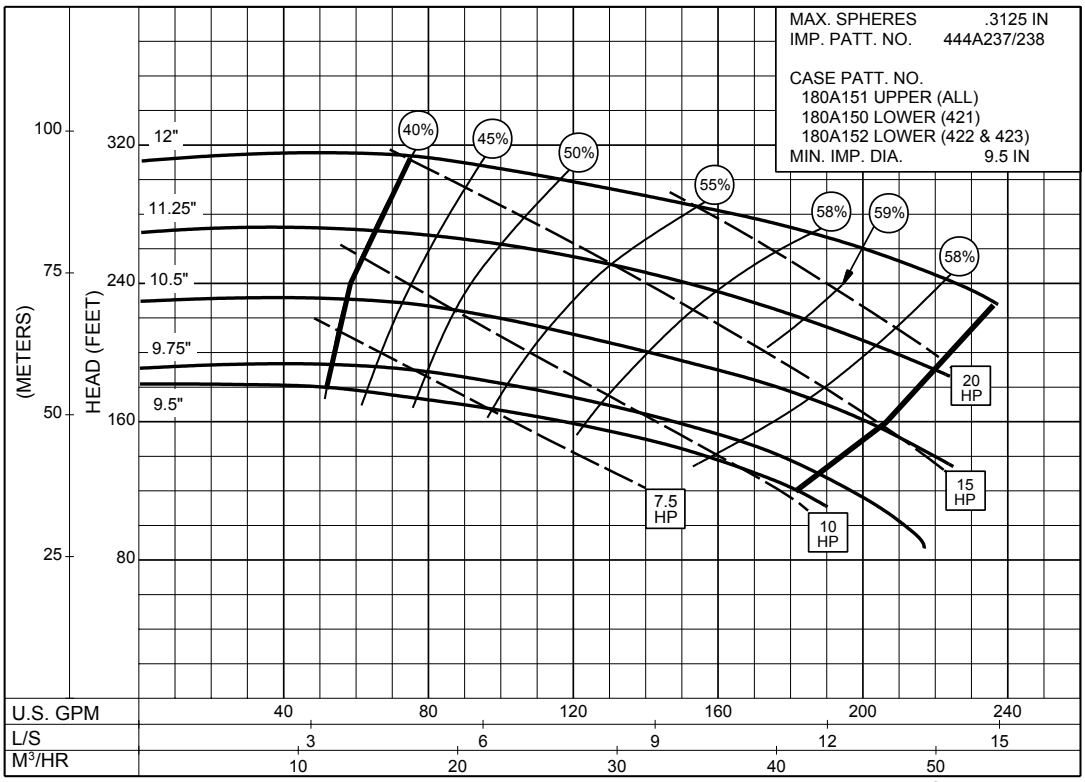
Supersedes Section 420 Page 402
Dated January 1968

2 x 2-1/2 x 12B SERIES 420

ENCLOSED IMPELLER

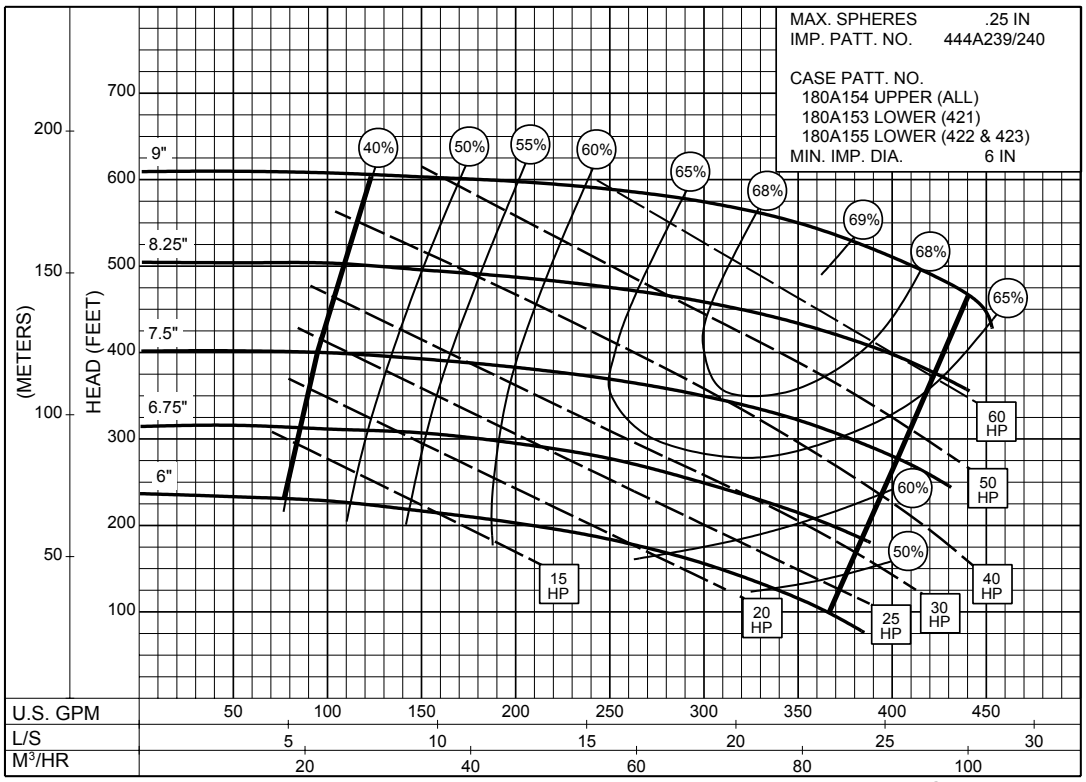
1750
R.P.M

SIZE : 2x2-1/2x12B **TYPE : 420** **IMPELLER : Enclosed** **R. P. M. : 1750**



1PC-115895

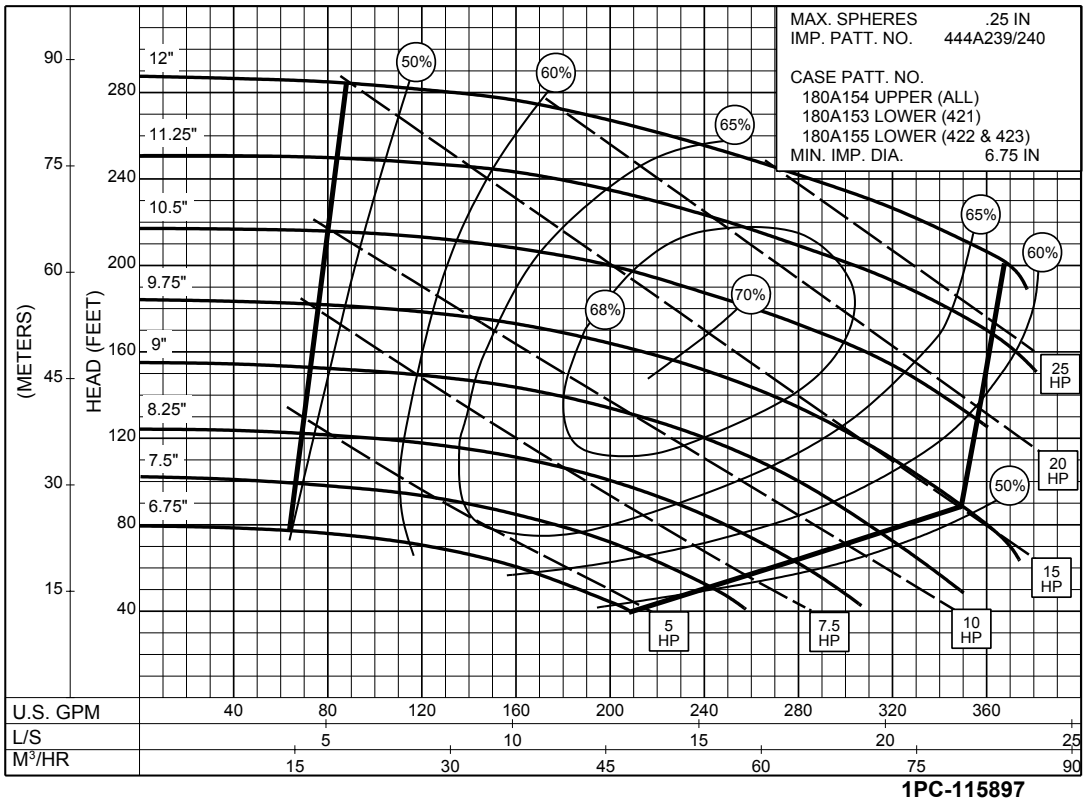
SIZE : 2-1/2x3x12A **TYPE : 420** **IMPELLER : Enclosed** **R. P. M. : 3500**



1PC-115896

3500 R.P.M

SIZE : 2-1/2x3x12A **TYPE : 420** **IMPELLER : Enclosed** **R. P. M. : 1750**



1PC-115897

1750 R.P.M

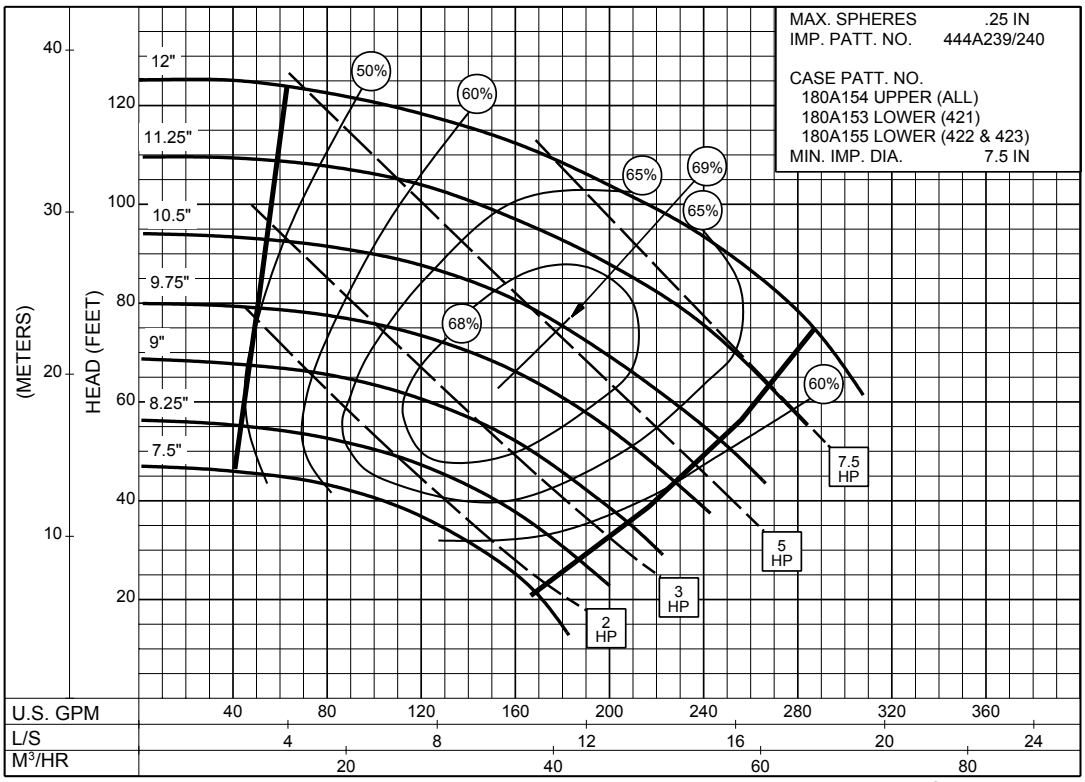
2-1/2 x 3 x 12A SERIES 420

ENCLOSED IMPELLER

Supersedes Section 420 Page 404
Dated January 1968

1150
R.P.M

SIZE : 2-1/2x3x12A **TYPE : 420** **IMPELLER : Enclosed** **R. P. M. : 1150**



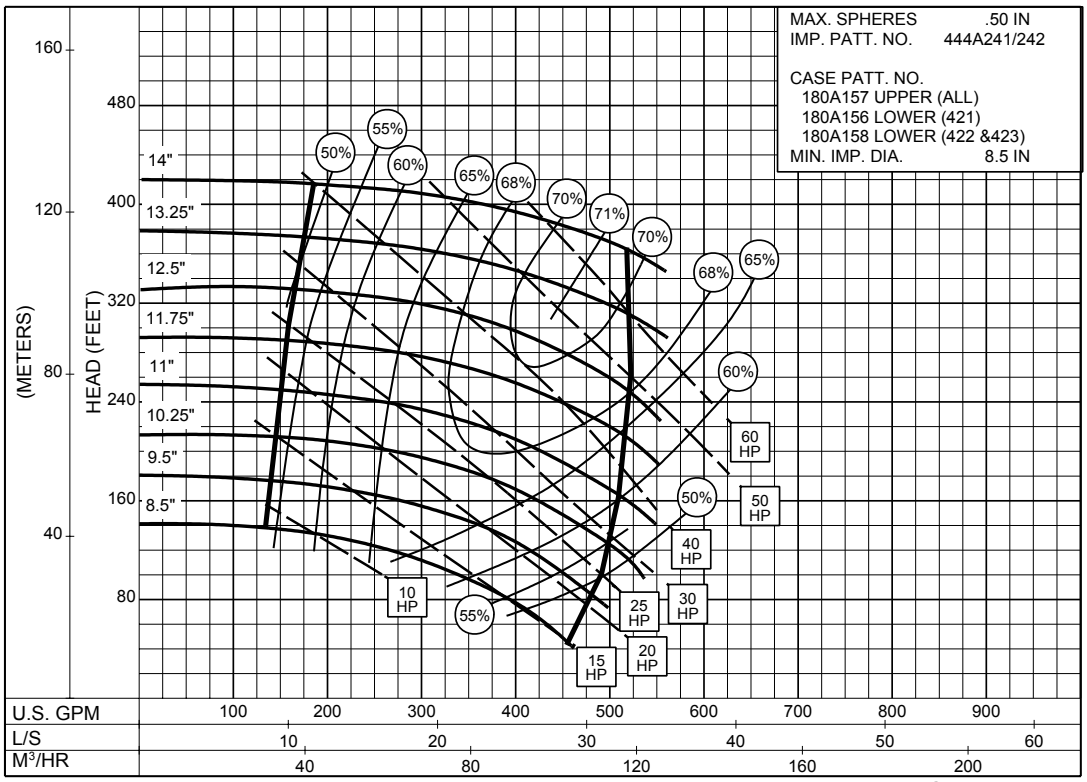
1PC-115898

3 x 4 x 14A SERIES 420

ENCLOSED IMPELLER

Supersedes Section 420 Page 405
Dated January 1968

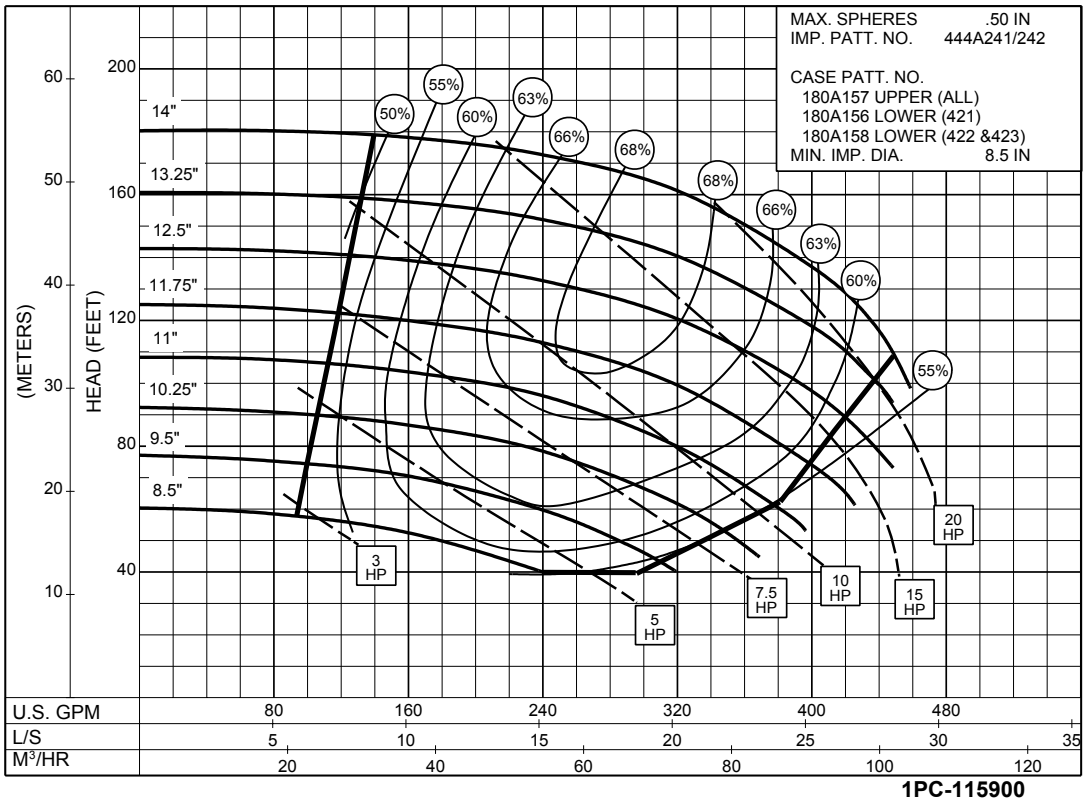
SIZE : 3x4x14A **TYPE : 420** **IMPELLER : Enclosed** **R. P. M. : 1750**



1PC-115899

1750 R.P.M

SIZE : 3x4x14A **TYPE : 420** **IMPELLER : Enclosed** **R. P. M. : 1150**



1PC-115900

1150 R.P.M

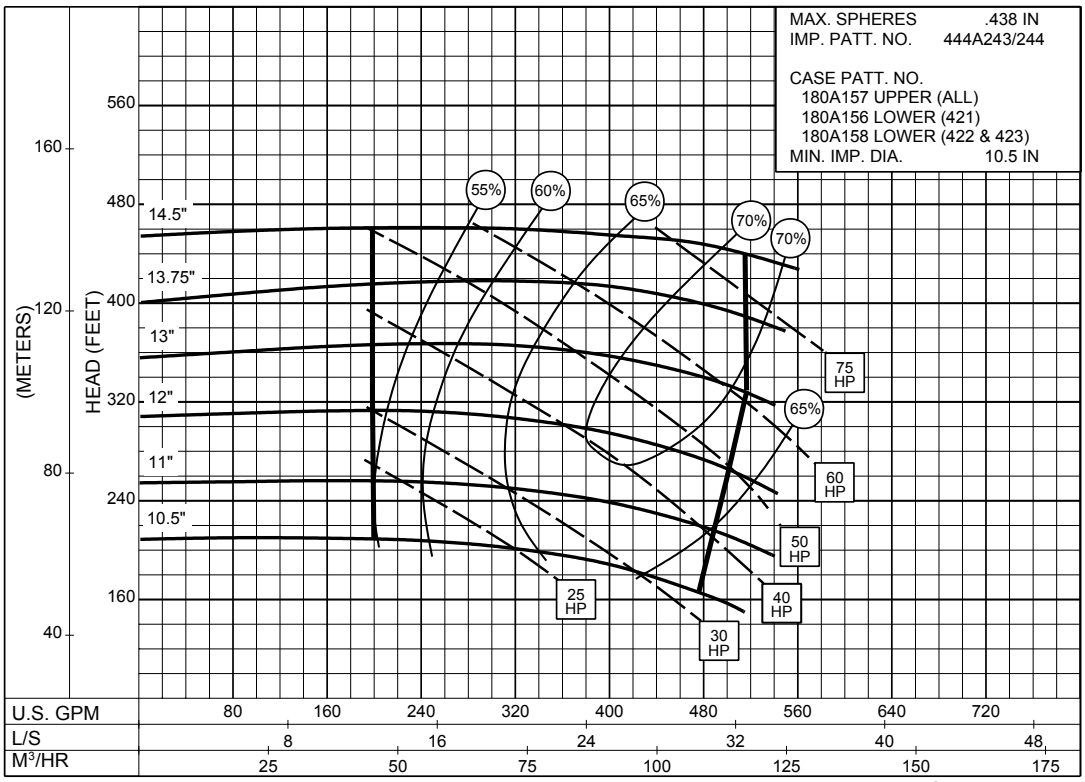
Supersedes Section 420 Page 406
Dated July 1971

3 x 4 x 14B SERIES 420

ENCLOSED IMPELLER

1750
R.P.M

SIZE : 3x4x14B **TYPE : 420** **IMPELLER : Enclosed** **R. P. M. : 1750**



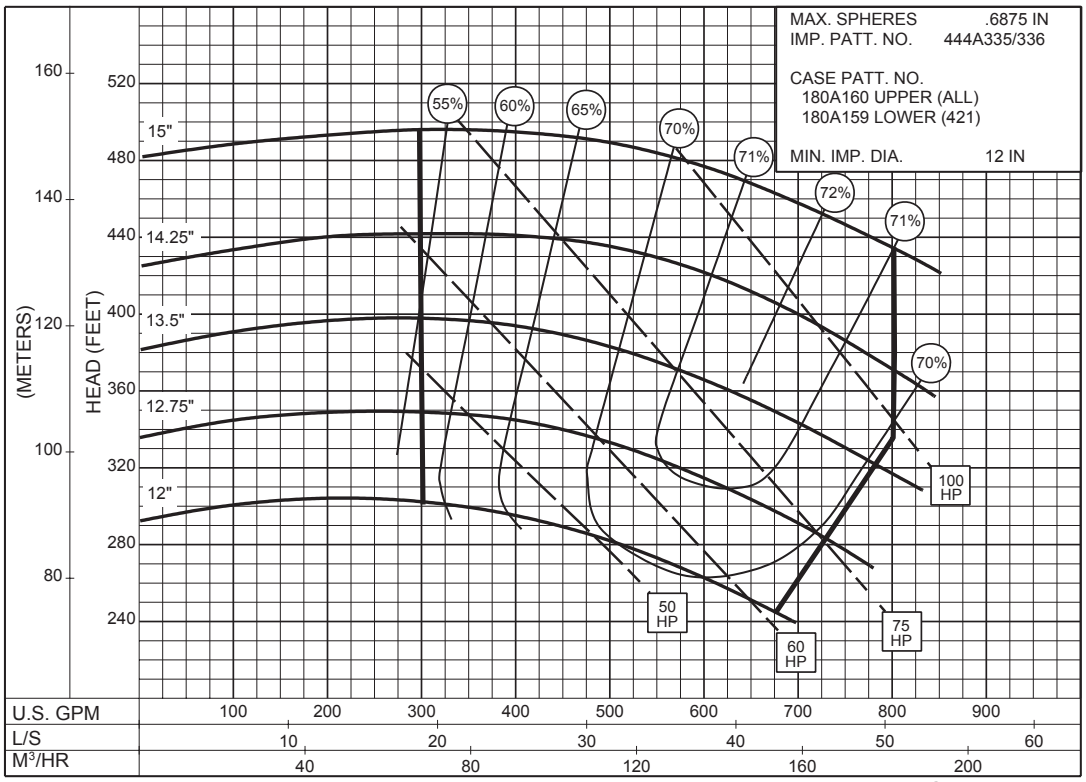
1PC-118277

4 x 5 x 15 SERIES 420

ENCLOSED IMPELLER

Supersedes Section 420 Page 407
Dated January 1968

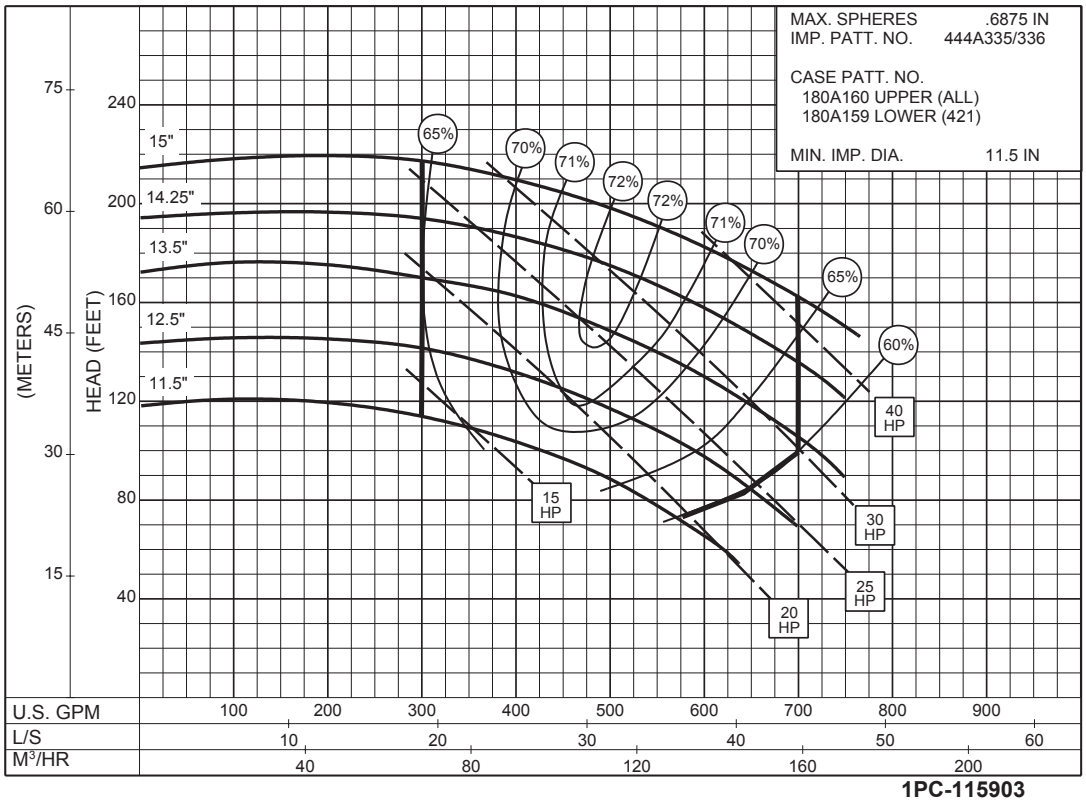
SIZE : 4x5x15 **TYPE : 420** **IMPELLER : Enclosed** **R. P. M. : 1750**



1PC-115902

1750 R.P.M

SIZE : 4x5x15 **TYPE : 420** **IMPELLER : Enclosed** **R. P. M. : 1150**



1PC-115903

1150 R.P.M

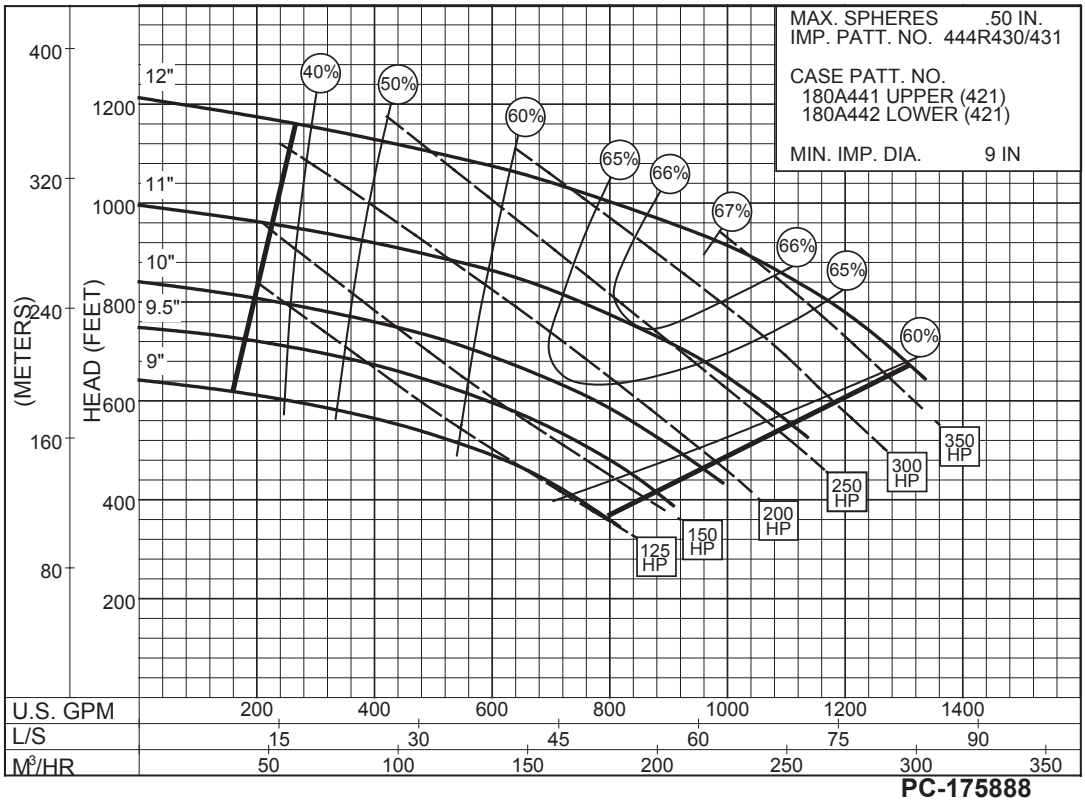
AURORA®
Pentair Pump Group

5 x 5 x 12 SERIES 420

ENCLOSED IMPELLER

3550
R.P.M

SIZE : 5x5x12 **TYPE : 420** **IMPELLER : Enclosed** **R. P. M. : 3550**

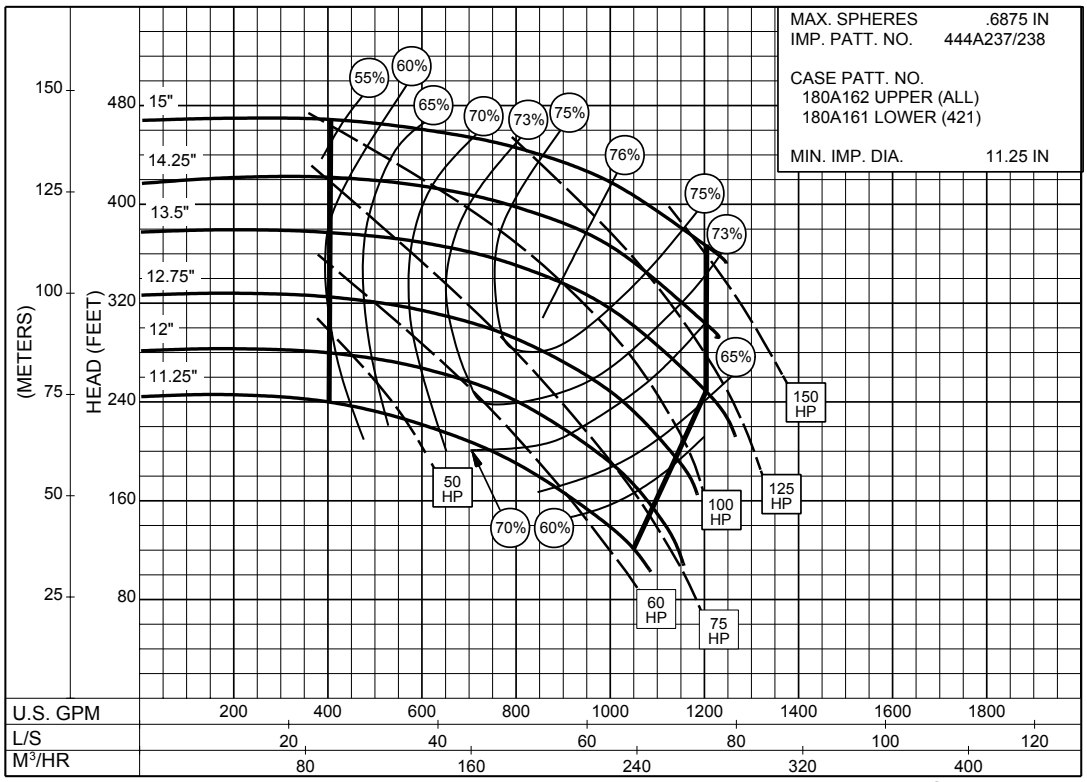


PC-175888

5 x 6 x 15 SERIES 420

ENCLOSED IMPELLER

SIZE : 5x6x15 **TYPE : 420** **IMPELLER : Enclosed** **R. P. M. : 1750**



1PC-115904

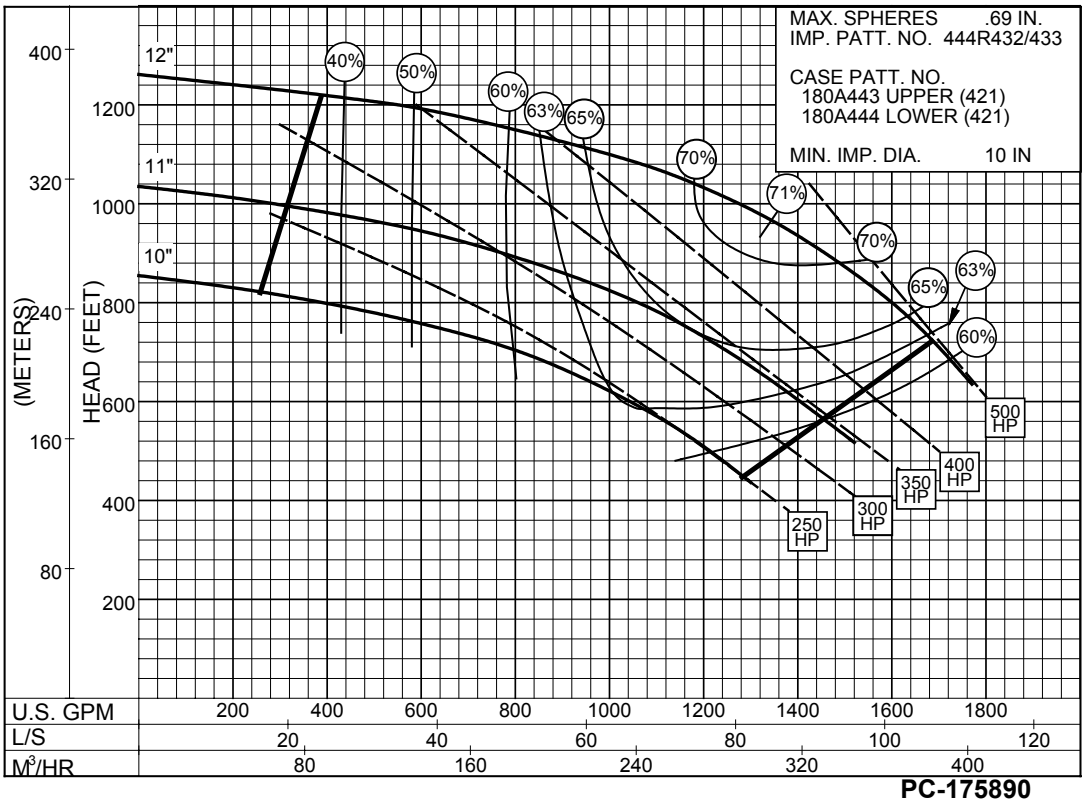
1750
R.P.M

6 x 6 x 12 SERIES 420

ENCLOSED IMPELLER

3550
R.P.M

SIZE : 6x6x12 **TYPE : 420** **IMPELLER : Enclosed** **R. P. M. : 3550**



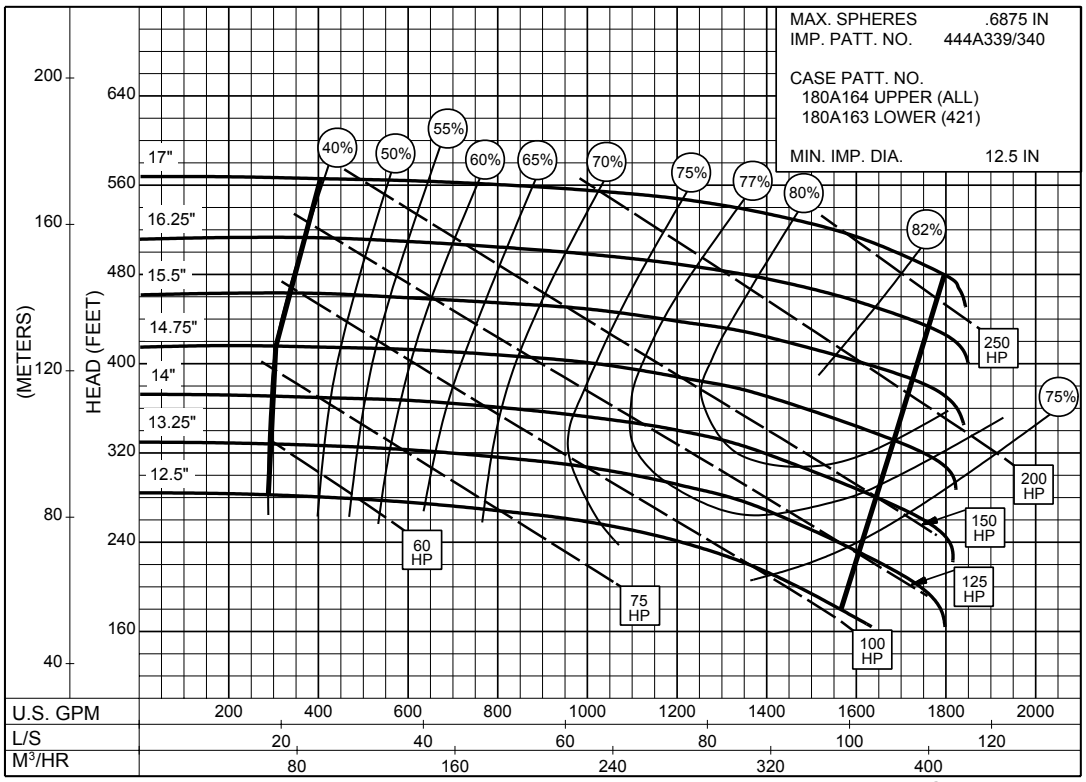
PC-175890

6 x 8 x 17A SERIES 420

ENCLOSED IMPELLER

Supersedes Section 420 Page 409
Dated January 1968

SIZE : 6x8x17A **TYPE : 420** **IMPELLER : Enclosed** **R. P. M. : 1750**



1PC-115905

1750
R.P.M

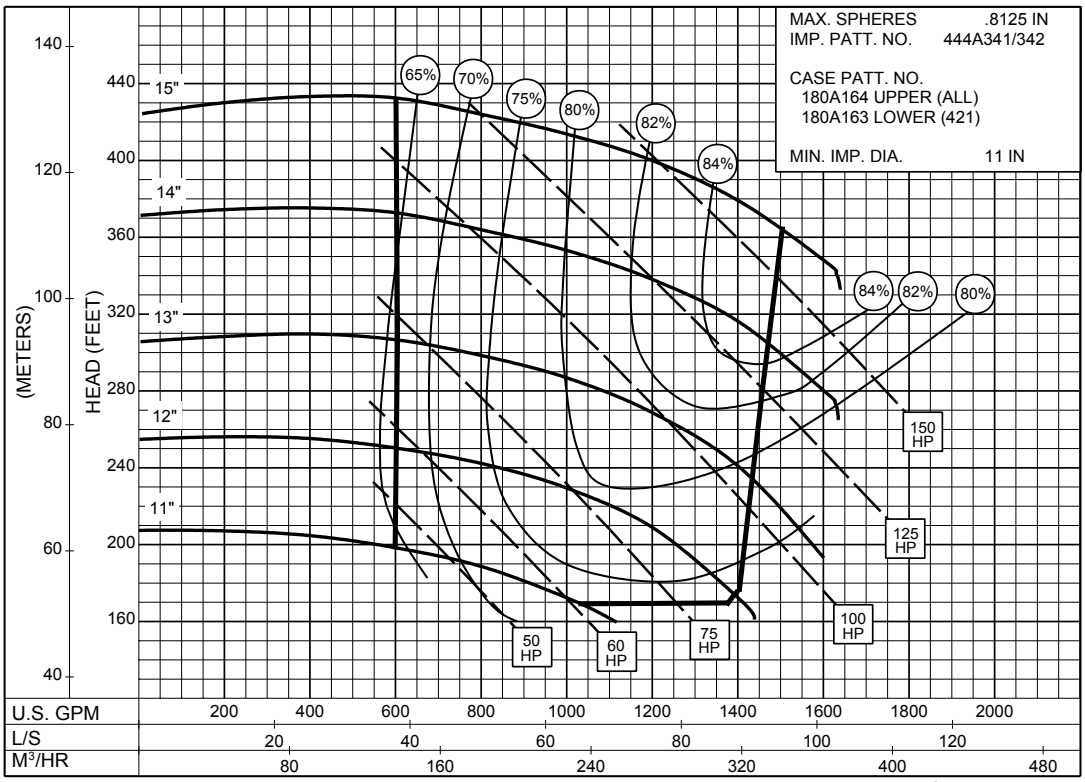
Supersedes Section 420 Page 410
Dated January 1968

6 x 8 x 17B SERIES 420

ENCLOSED IMPELLER

1750 R.P.M

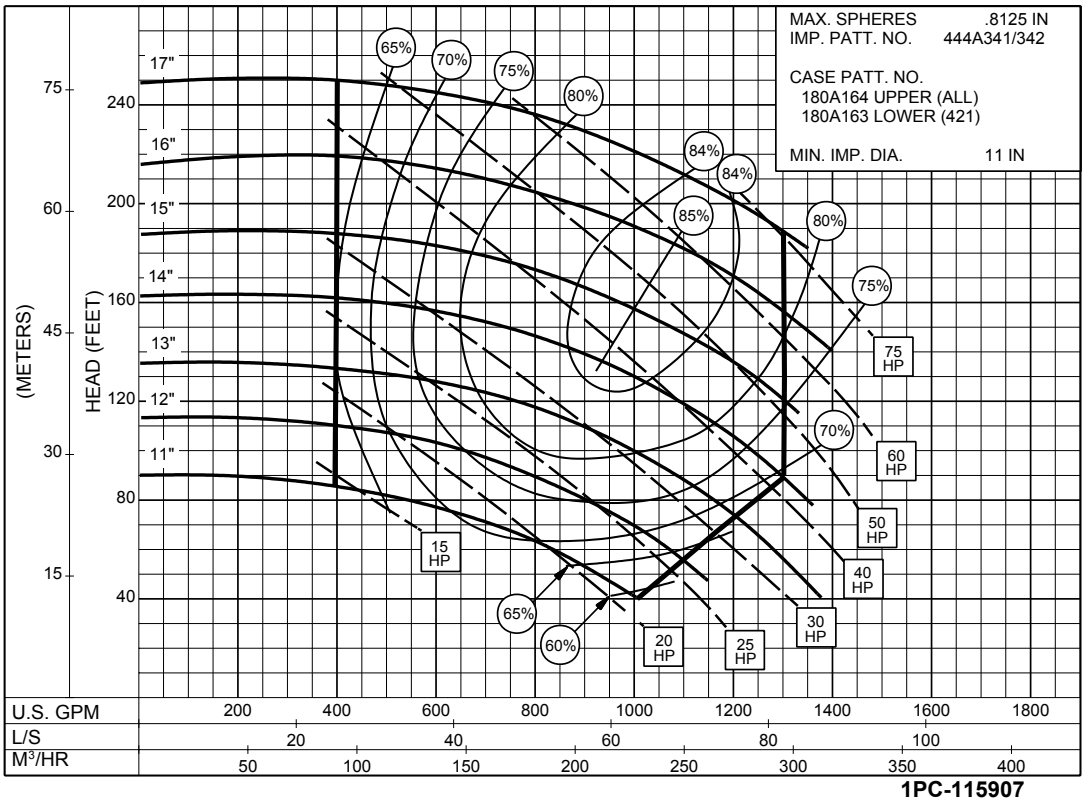
SIZE : 6x8x17B **TYPE : 420** **IMPELLER : Enclosed** **R. P. M. : 1750**



1PC-115906

1150 R.P.M

SIZE : 6x8x17B **TYPE : 420** **IMPELLER : Enclosed** **R. P. M. : 1150**



1PC-115907

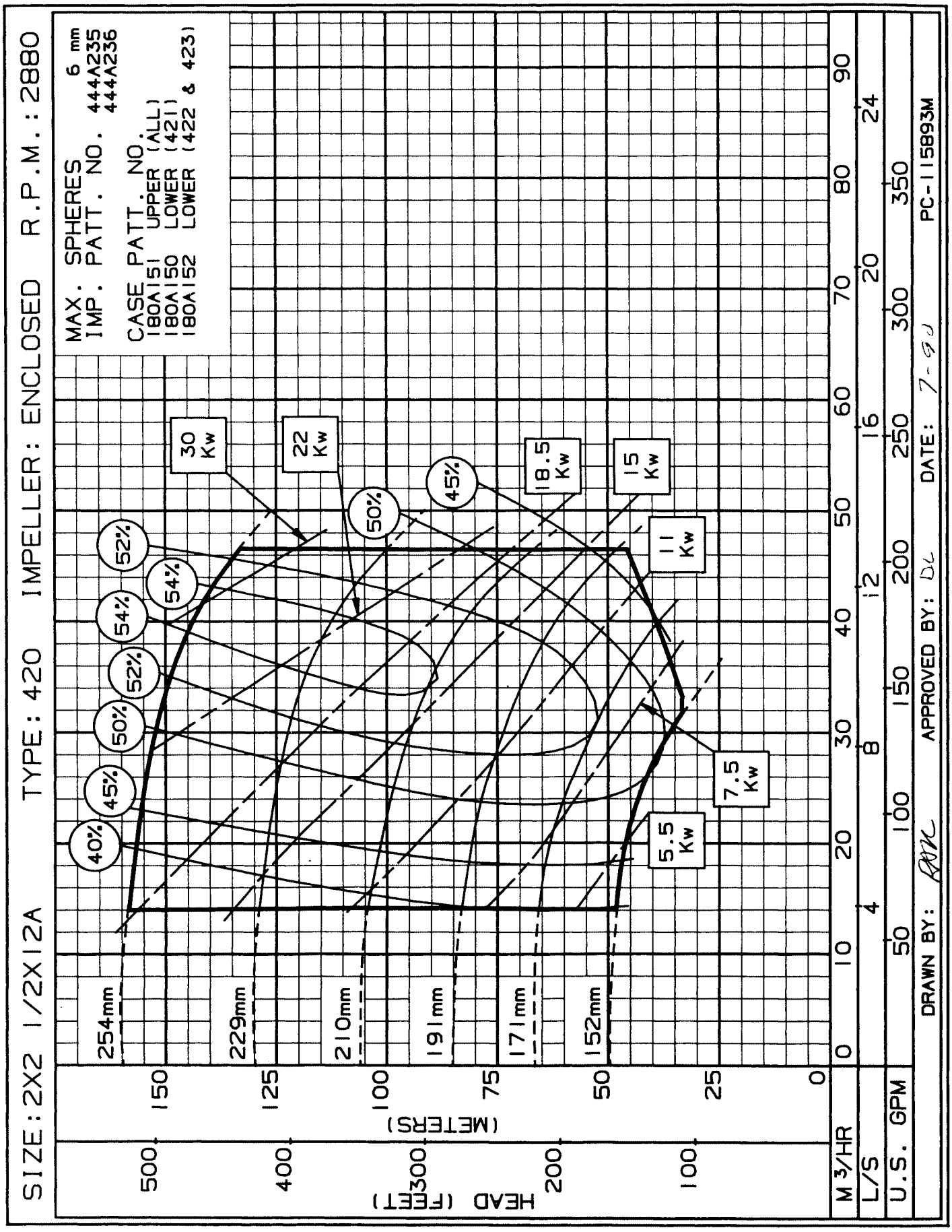
Performance Curves for the 420 Series (50 Hz)

MODEL/SIZE	R.P.M.	PDF PAGE
2x2-1/2x12A	2880	2
2x2-1/2x12A	1440	3
2x2-1/2x12B	1440	4
2-1/2x3x12A	2880	5
2-1/2x3x12A	1440	6
2-1/2x3x12A	960	7
3x4x14A	1440	8
3x4x14A	960	9
3x4x14B	1440	10
4x5x15	1475	11
4x5x15	960	12
5x6x15	1440	13
6x8x17A	1475	14
6x8x17B	1475	15
6x8x17B	960	16

AURORA®
Pentair Pump Group

2x2-1/2x12A - 2880 RPM
ENCLOSED IMPELLER

SECTION 420 (Metric 50Hz)
DATE JULY 1994
SUPERCEDES OCTOBER 1986



SECTION 420 (Metric 50Hz)
DATE JULY 1994
SUPERCEDES OCTOBER 1986

2x2-1/2x12A - 1440 RPM
ENCLOSED IMPELLER

AURORA®
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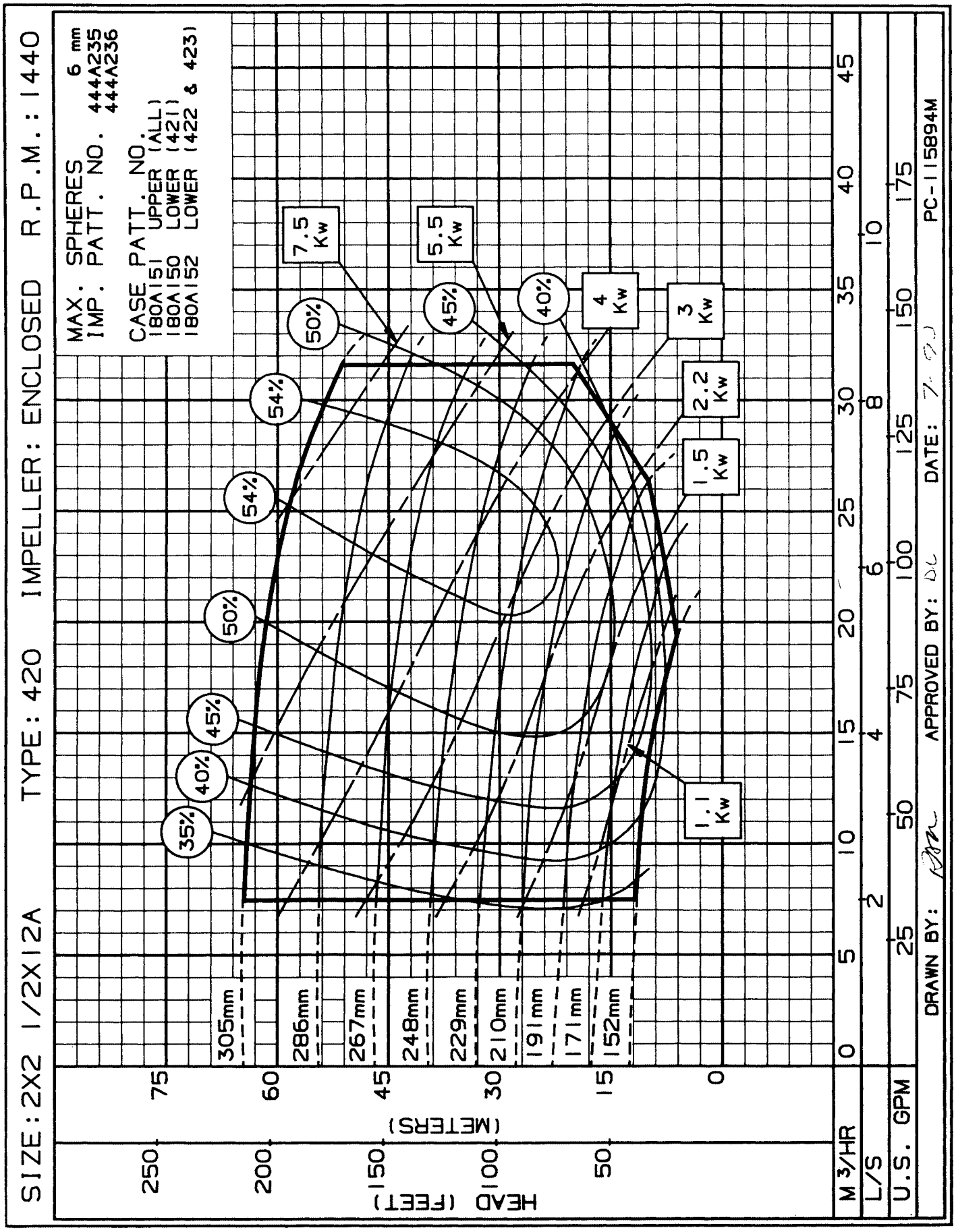
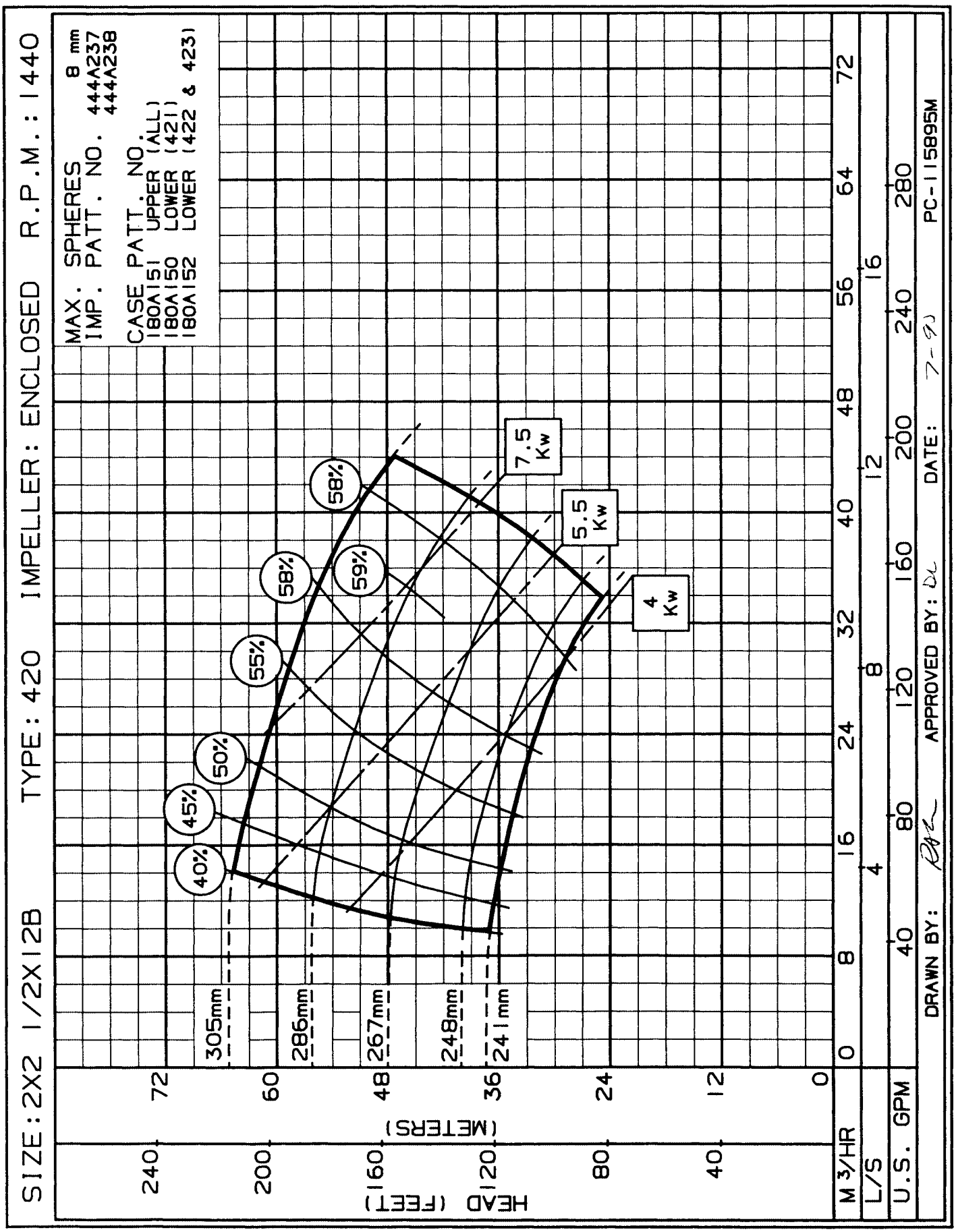


AURORA®
Pentair Pump Group

2x2-1/2x12B - 1440 RPM
ENCLOSED IMPELLER

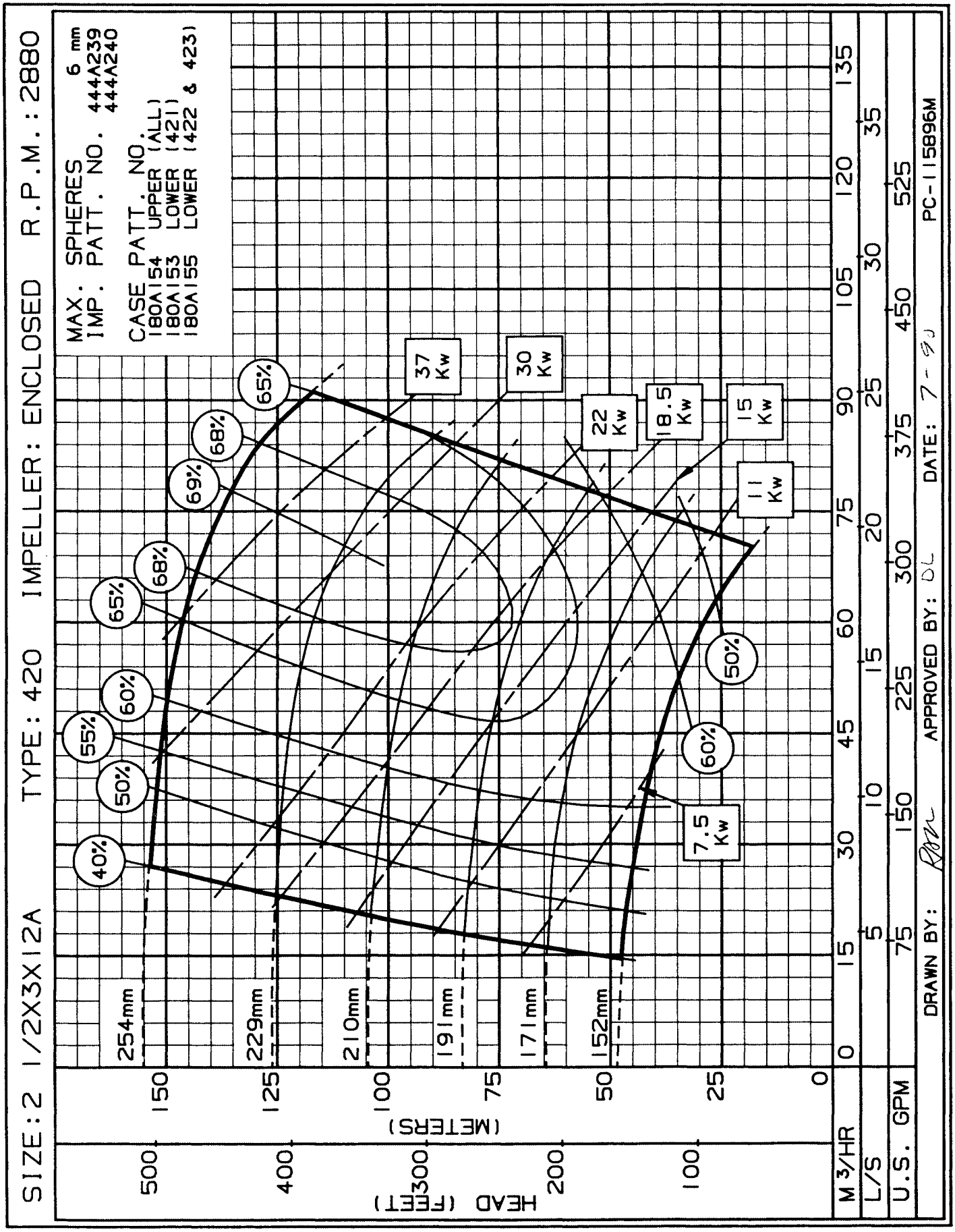
SECTION 420 (Metric 50Hz)
DATE JULY 1994
SUPERCEDES OCTOBER 1986



SECTION **420 (Metric 50Hz)**
DATE **JULY 1994**
SUPERCEDES OCTOBER 1986

2-1/2x3x12A - 2880 RPM
ENCLOSED IMPELLER

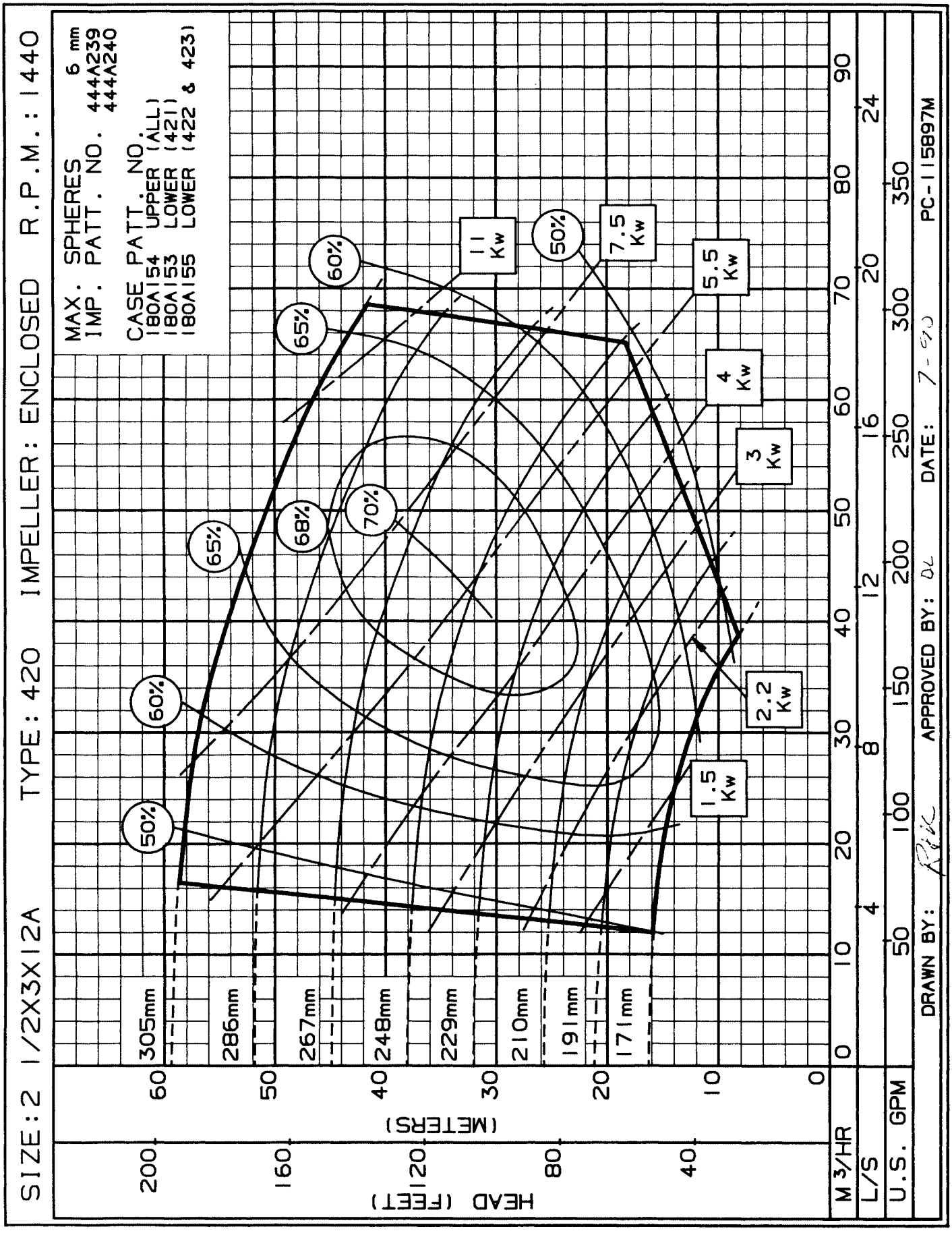
AURORA®
Pentair Pump Group



AURORA®
Pentair Pump Group

2-1/2x3x12A - 1440 RPM
ENCLOSED IMPELLER

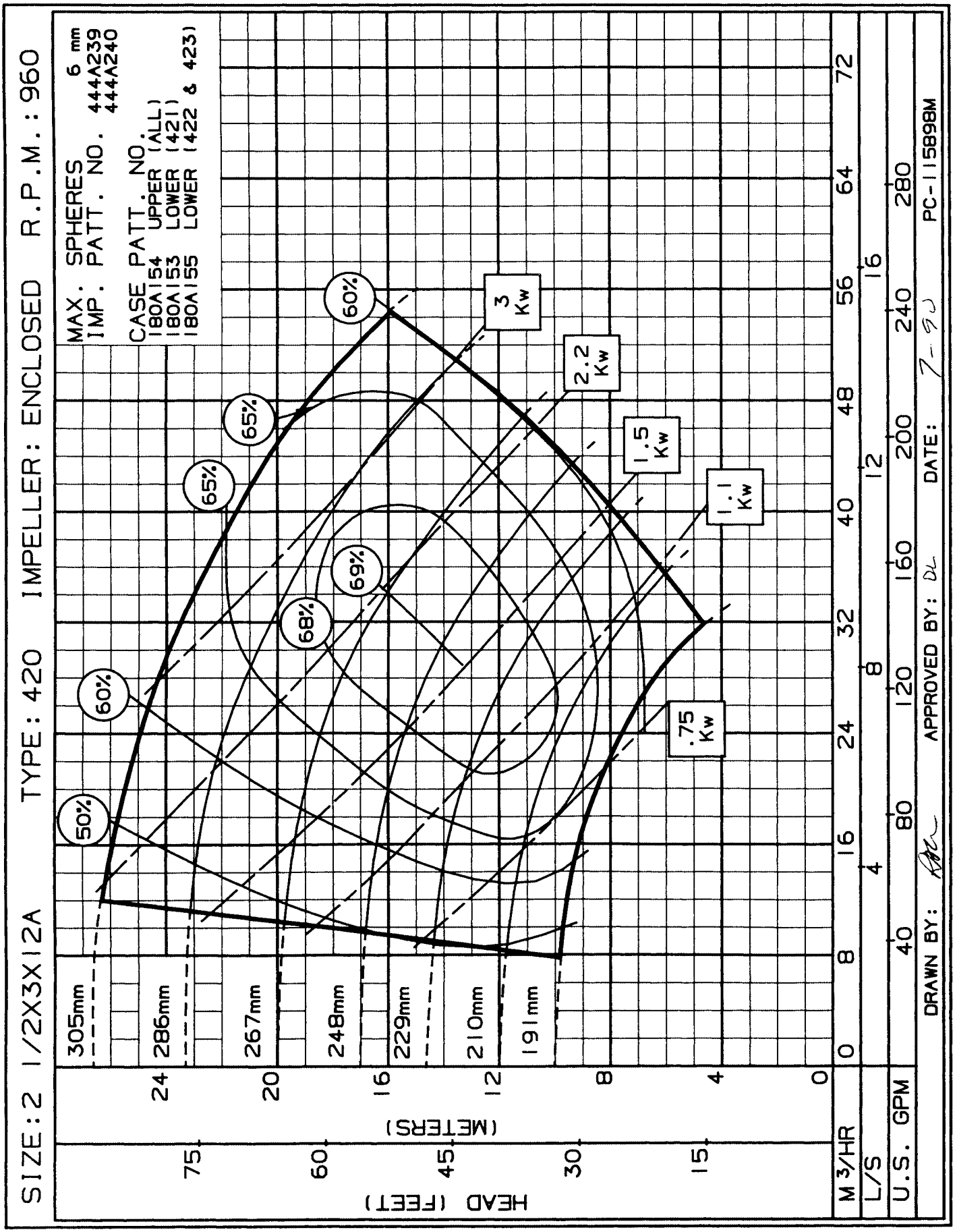
SECTION 420 (Metric 50Hz)
DATE JULY 1994
SUPERCEDES OCTOBER 1986



SECTION **420 (Metric 50Hz)**
DATE **JULY 1994**
SUPERCEDES OCTOBER 1986

2-1/2x3x12A - 960 RPM
ENCLOSED IMPELLER

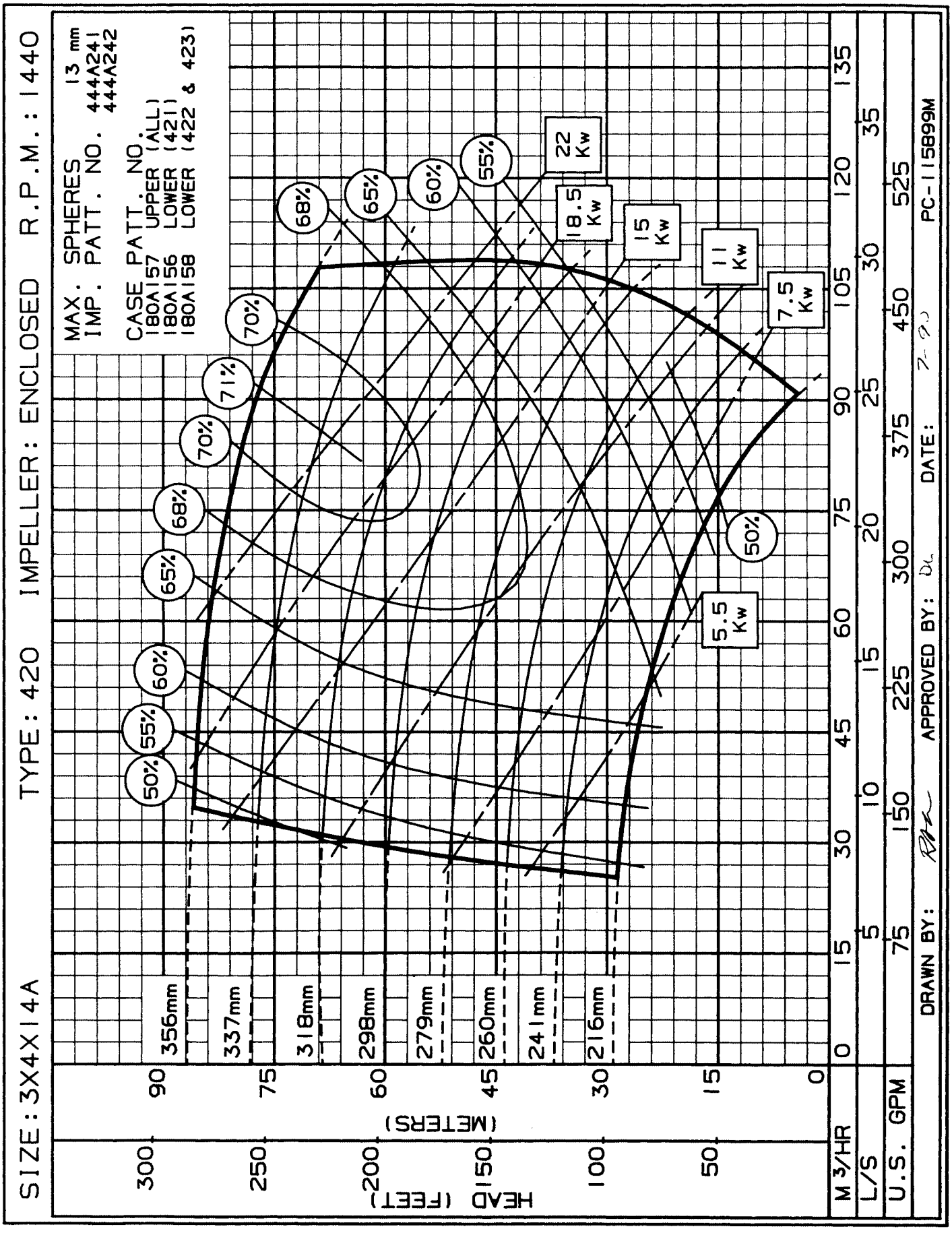
AURORA®
Pentair Pump Group



AURORA®
Pentair Pump Group

3x4x14A - 1440 RPM
ENCLOSED IMPELLER

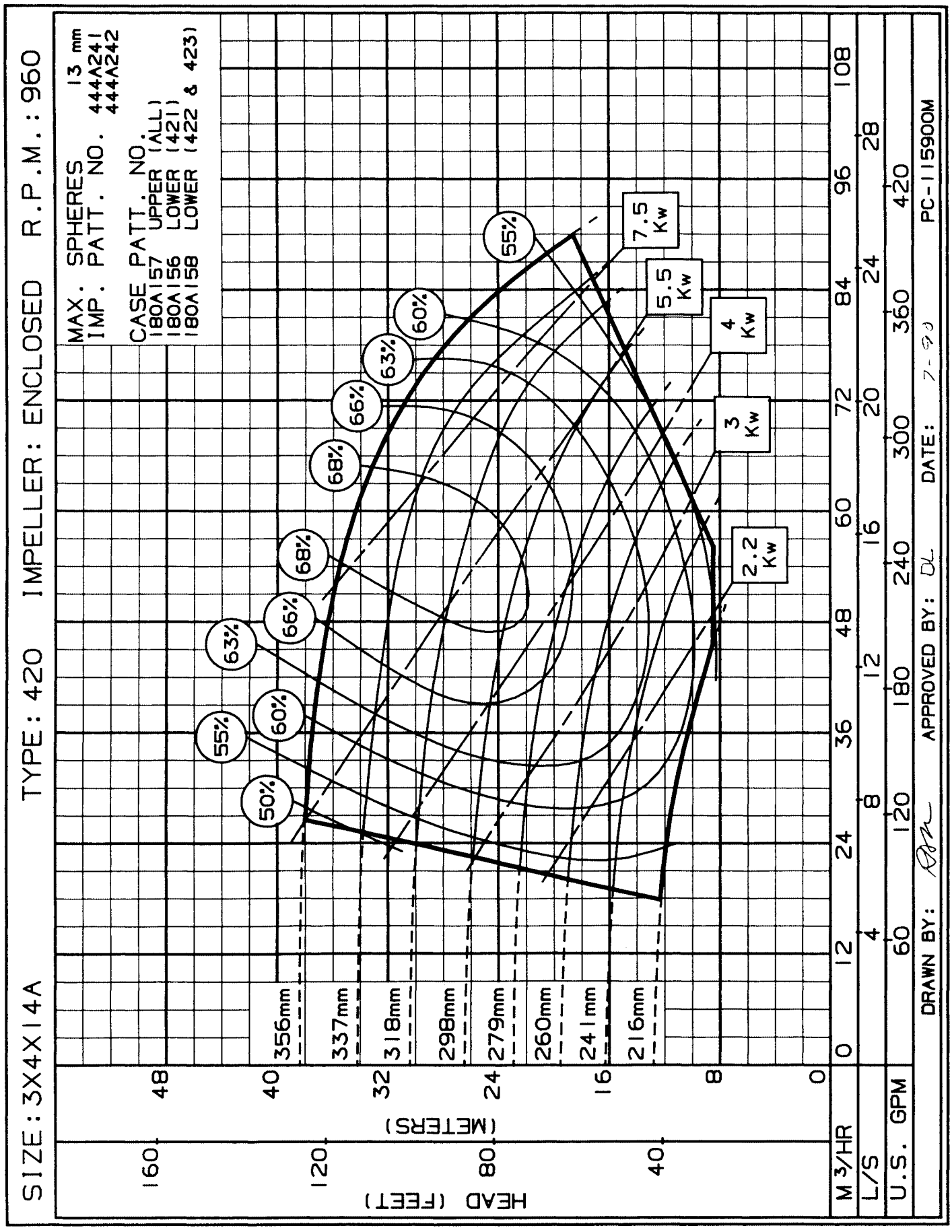
SECTION 420 (Metric 50Hz)
DATE JULY 1994
SUPERCEDES OCTOBER 1986



SECTION **420 (Metric 50Hz)**
DATE **JULY 1994**
SUPERCEDES OCTOBER 1986

3x4x14A - 960 RPM
ENCLOSED IMPELLER

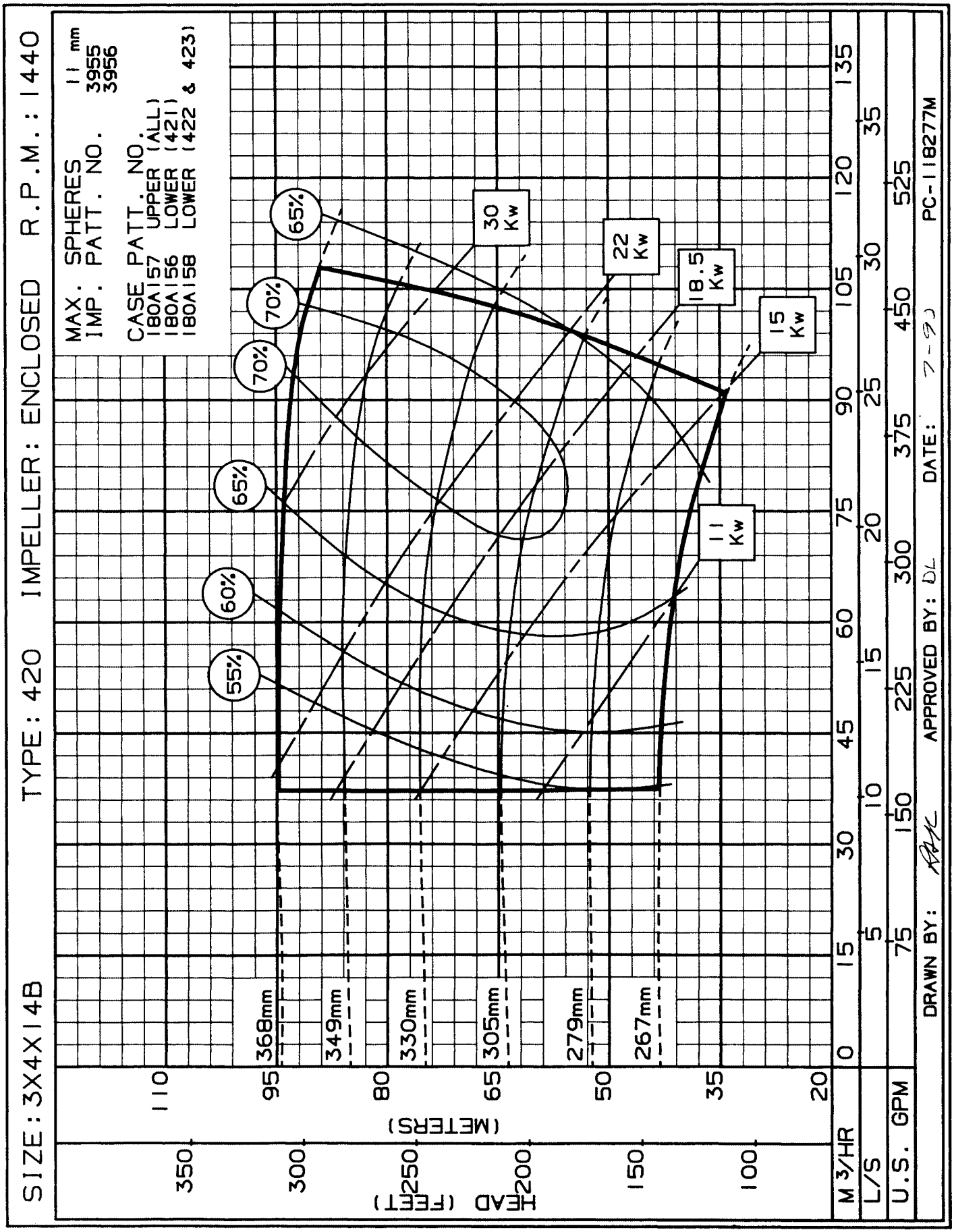
AURORA®
Pentair Pump Group



AURORA®
Pentair Pump Group

3x4x14B - 1440 RPM
ENCLOSED IMPELLER

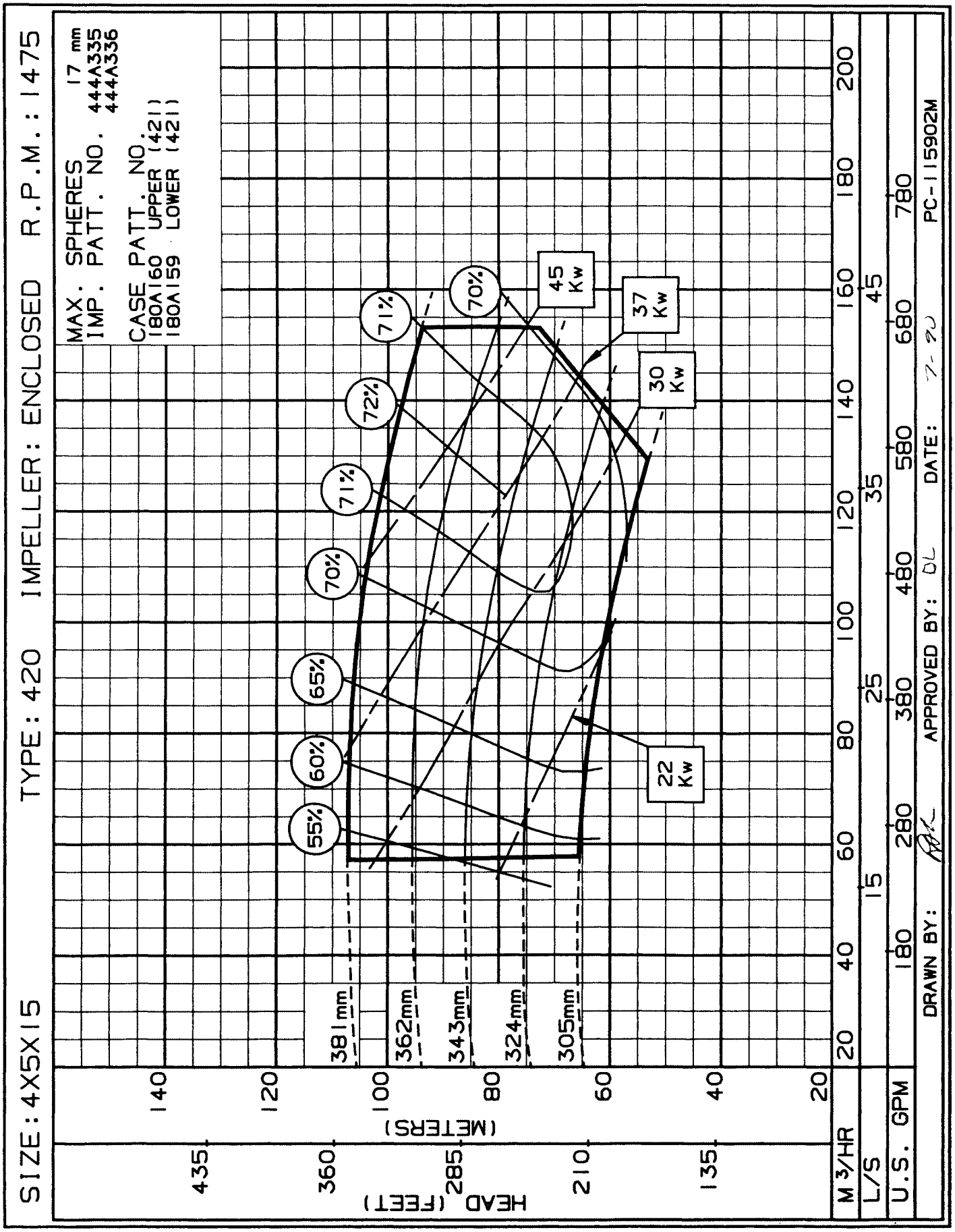
SECTION 420 (Metric 50Hz)
DATE JULY 1994
SUPERCEDES OCTOBER 1986



SECTION **420 (Metric 50Hz)**
DATE **JULY 1994**
SUPERCEDES OCTOBER 1986

4x5x15 - 1475 RPM
ENCLOSED IMPELLER

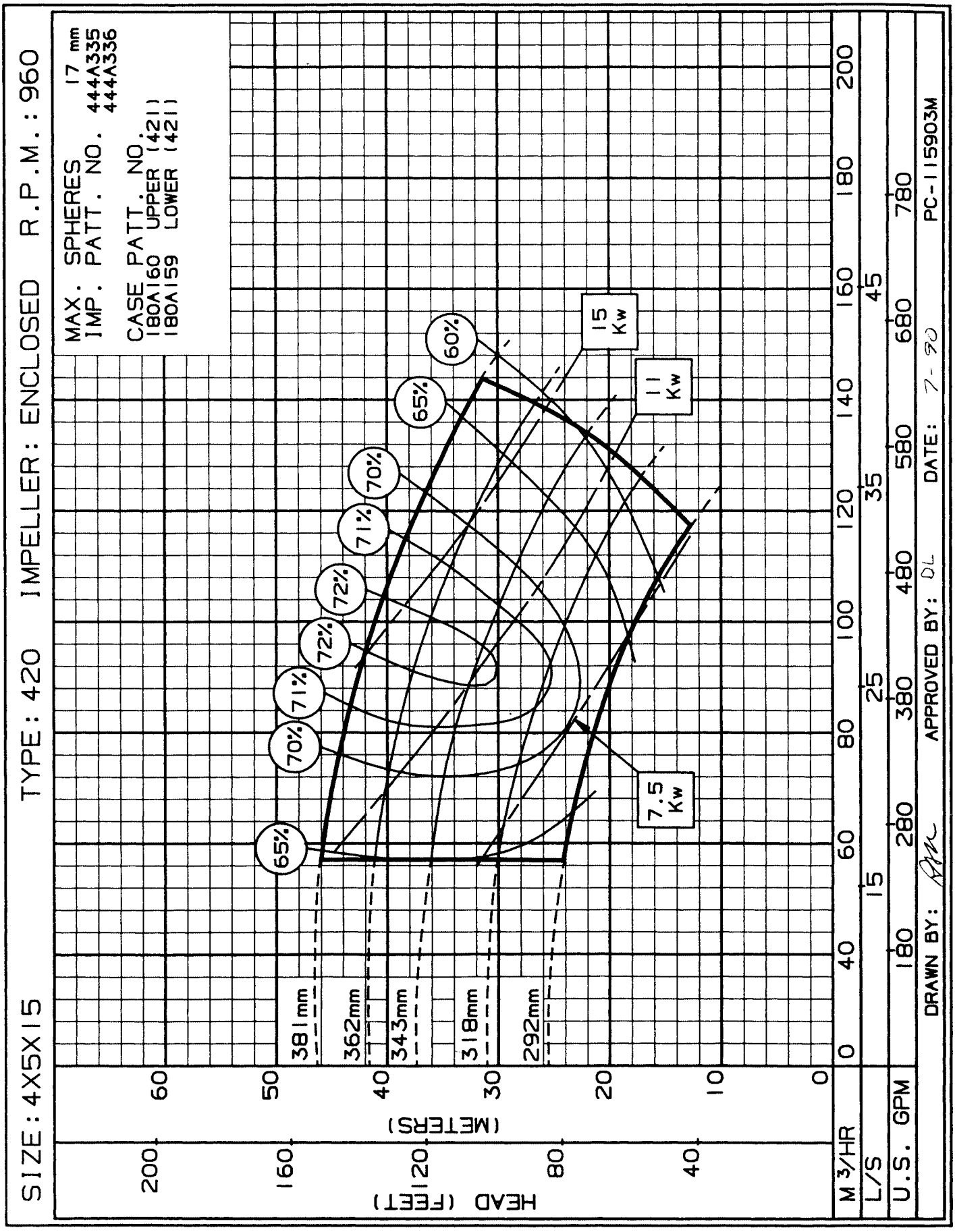
AURORA®
Pentair Pump Group



AURORA®
Pentair Pump Group

4x5x15 - 960 RPM
ENCLOSED IMPELLER

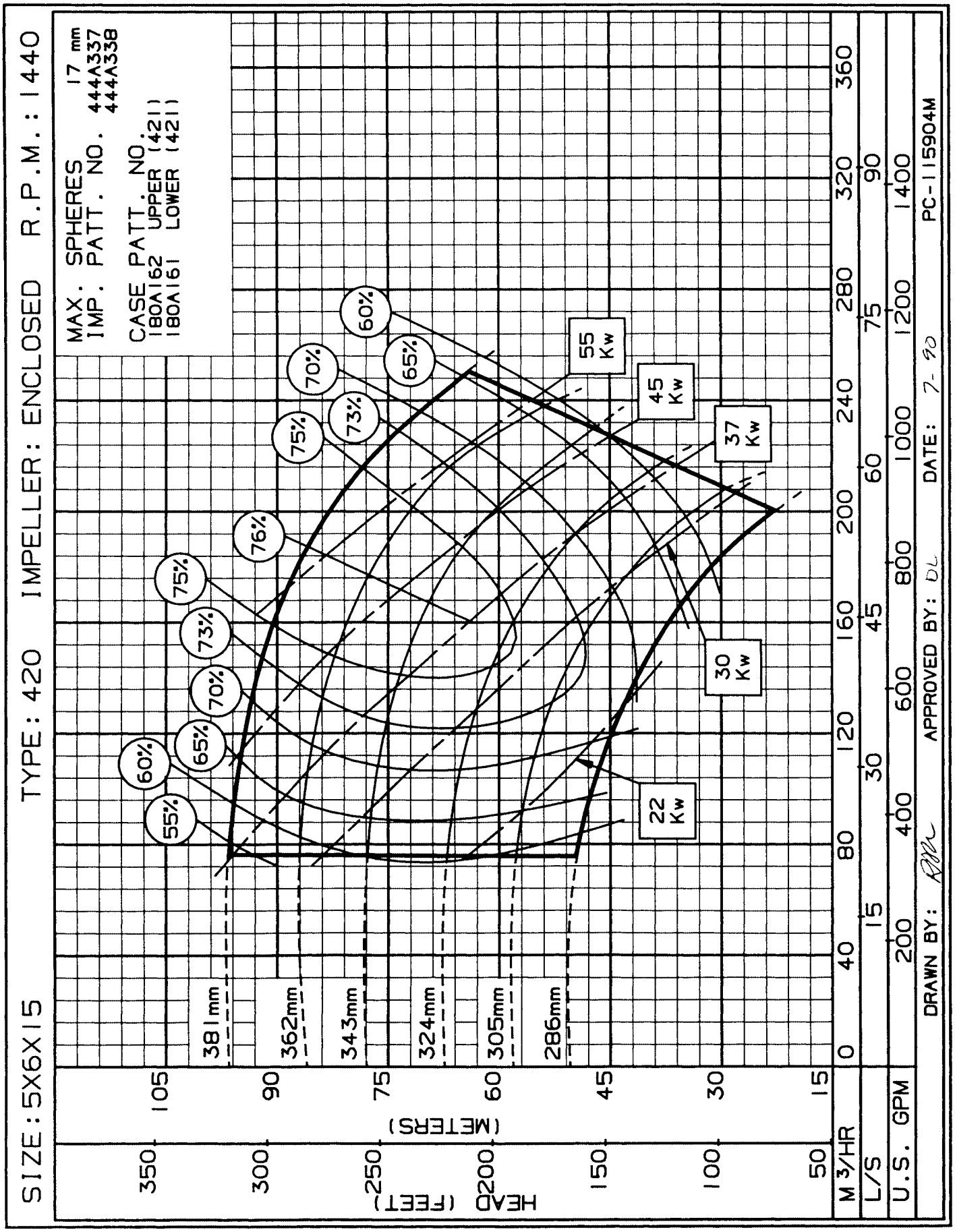
SECTION 420 (Metric 50Hz)
DATE JULY 1994
SUPERCEDES OCTOBER 1986



SECTION **420 (Metric 50Hz)**
DATE **JULY 1994**
SUPERCEDES OCTOBER 1986

5x6x15 - 1440 RPM
ENCLOSED IMPELLER

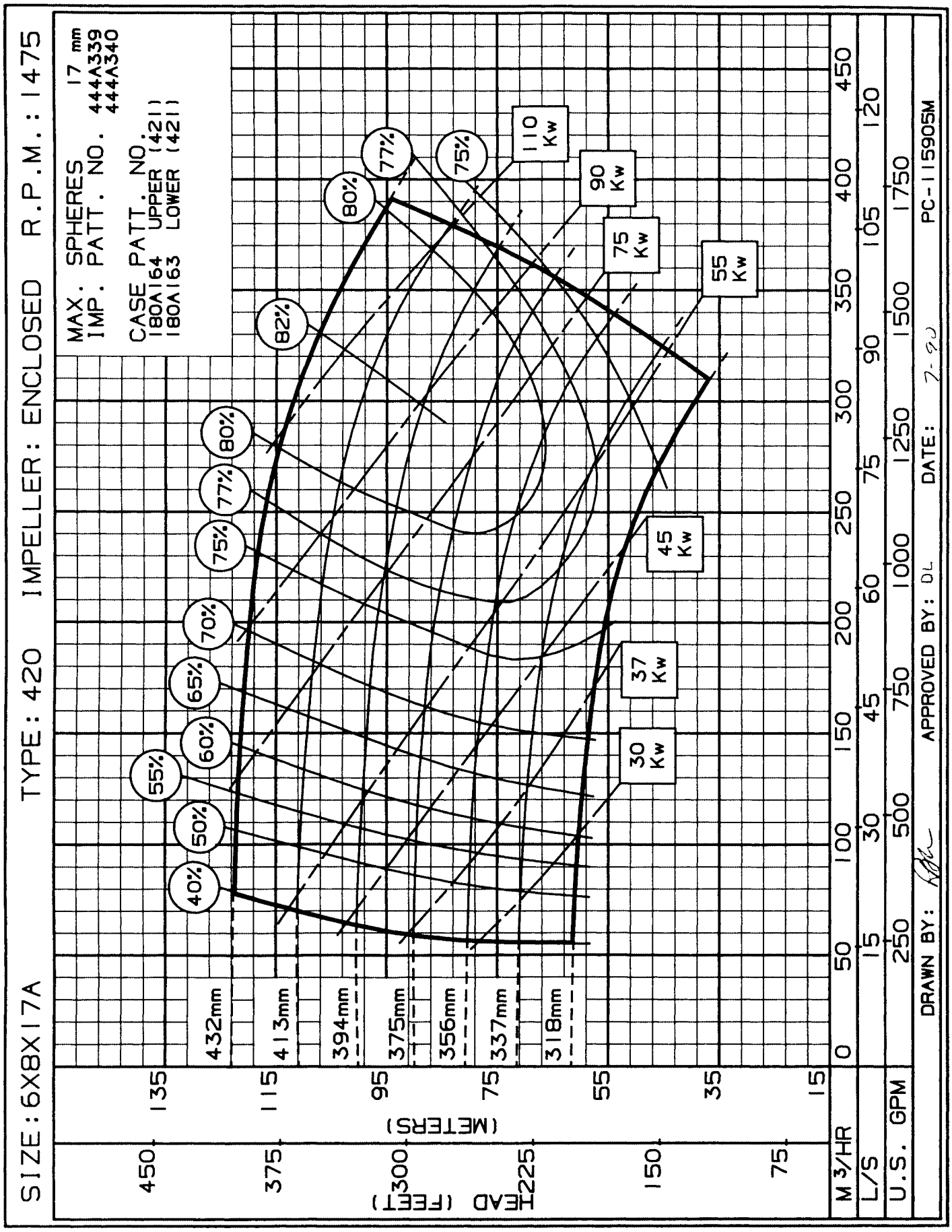
AURORA®
Pentair Pump Group



AURORA®
Pentair Pump Group

6x8x17A - 1475 RPM
ENCLOSED IMPELLER

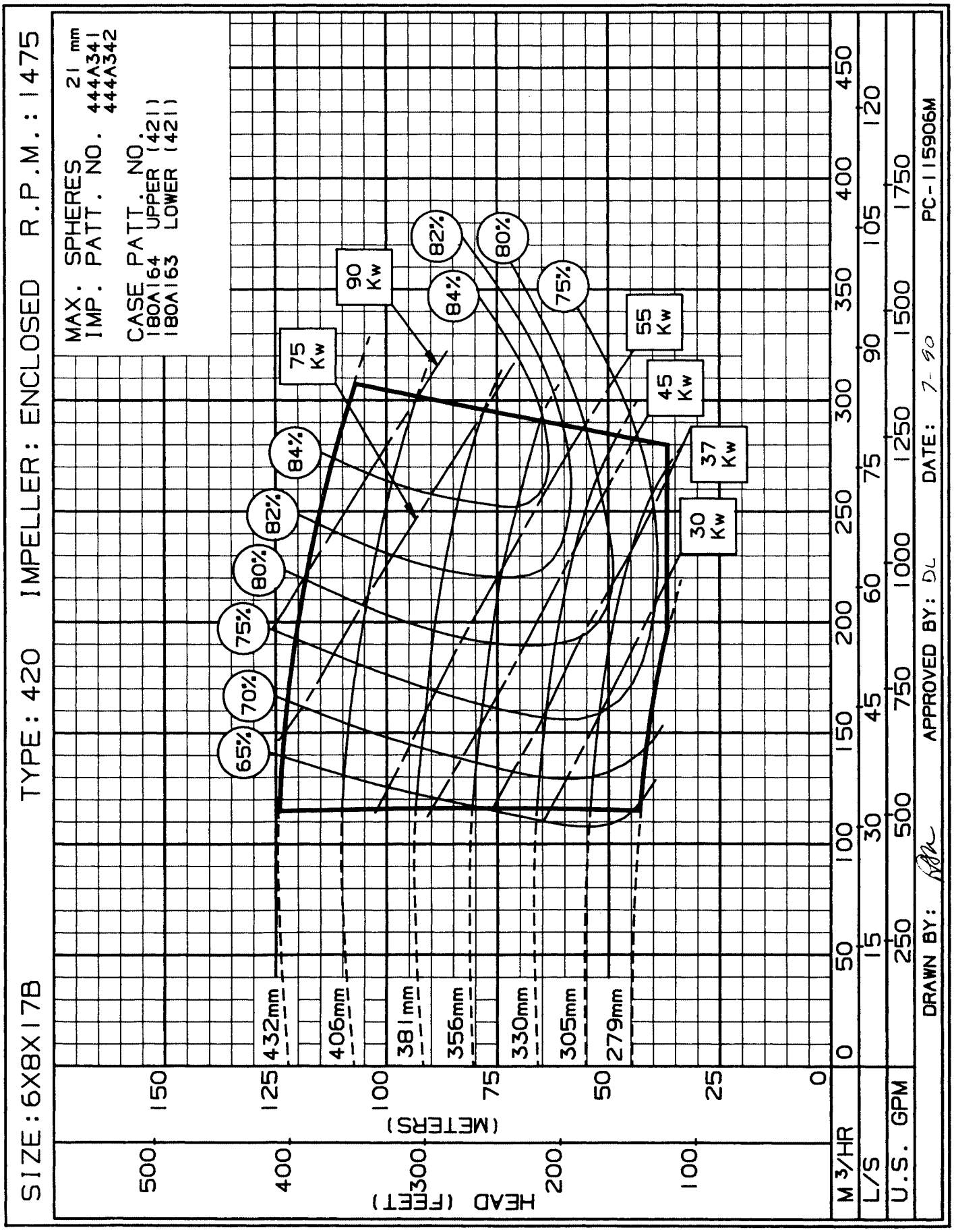
SECTION 420 (Metric 50Hz)
DATE JULY 1994
SUPERCEDES OCTOBER 1986



SECTION **420 (Metric 50Hz)**
DATE **JULY 1994**
SUPERCEDES OCTOBER 1986

6x8x17B - 1475 RPM
ENCLOSED IMPELLER

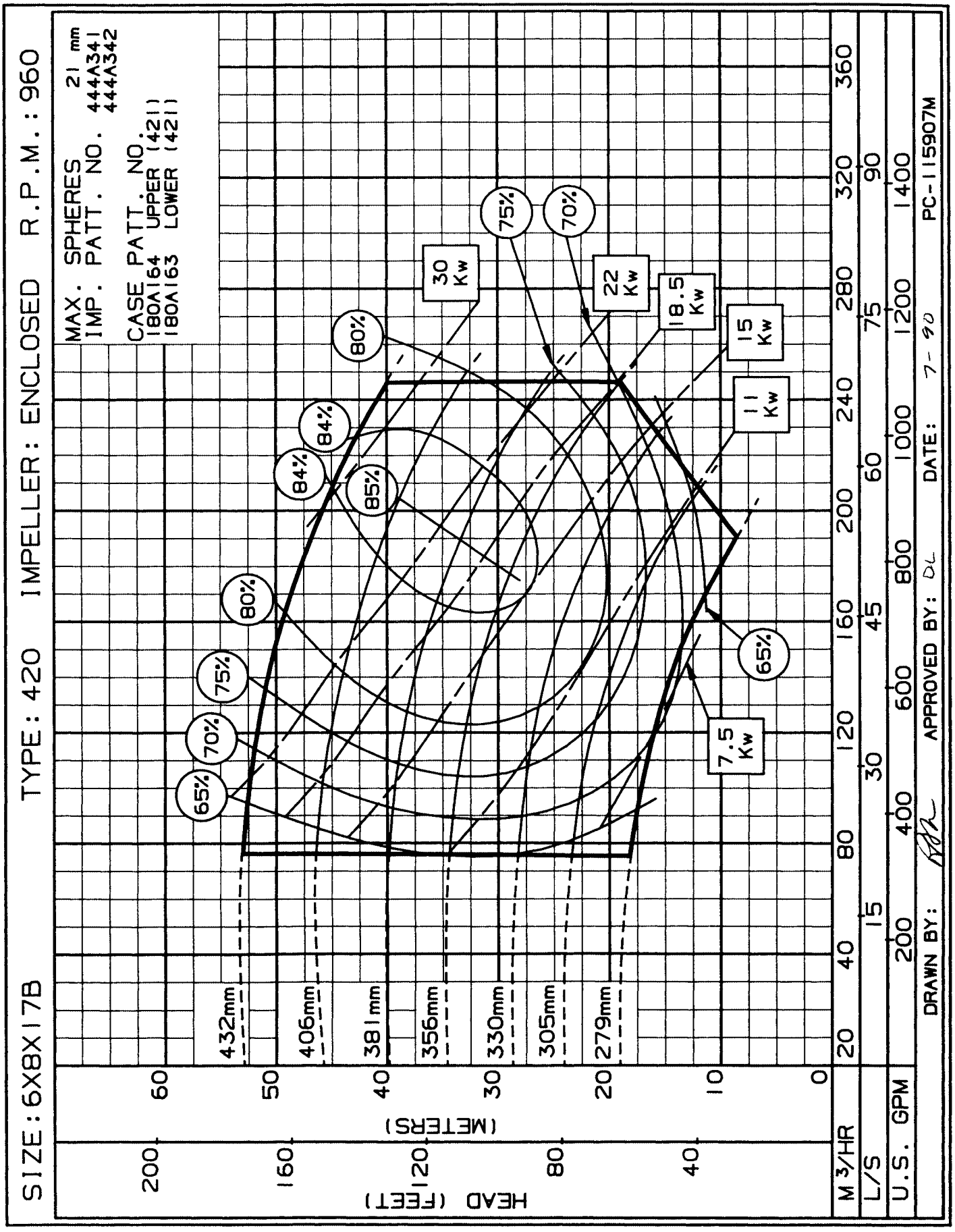
AURORA®
Pentair Pump Group



AURORA®
Pentair Pump Group

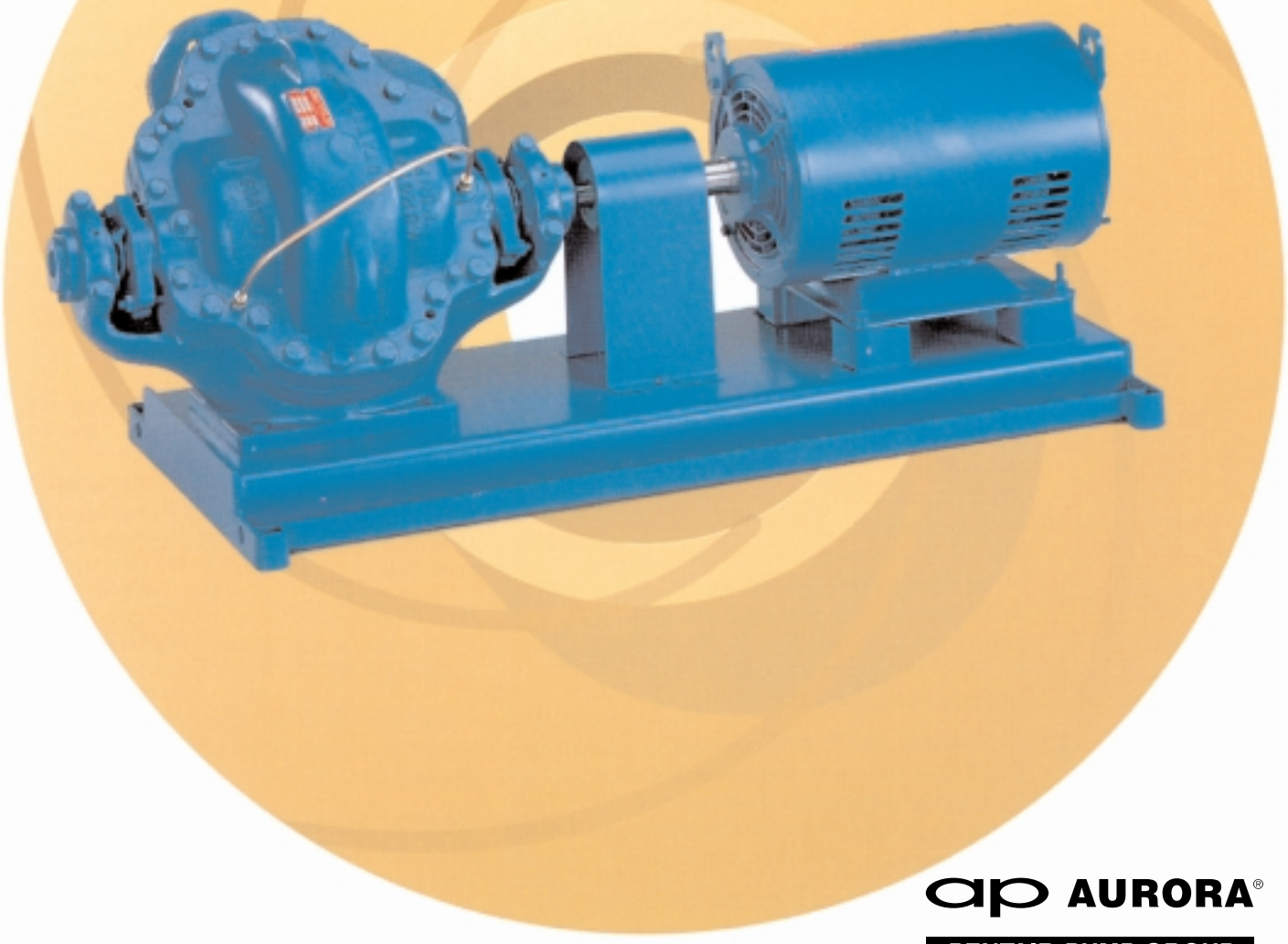
6x8x17B - 960 RPM
ENCLOSED IMPELLER

SECTION 420 (Metric 50Hz)
DATE JULY 1994
SUPERCEDES OCTOBER 1986



430B Series
Two-Stage Split Case Pumps

- Capacities To 400 GPM
- Heads To 1,000 Feet
- Temperatures To 300° F
- Power Series No. 2 and 3A

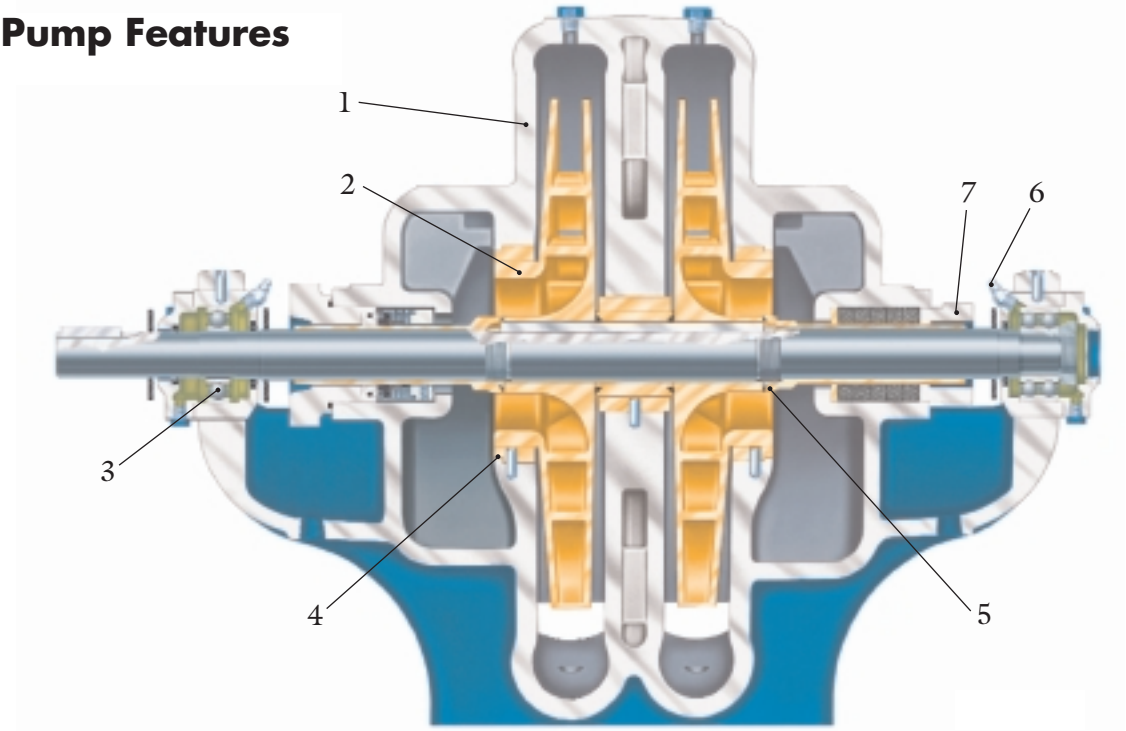


AURORA®

PENTAIR PUMP GROUP

430B Series Pumps

Pump Features



1 DIAGONAL SPLIT CASING is suited for many applications. Important among these uses is BOILER FEED SERVICE, as well as hot or volatile liquid applications requiring low NPSH characteristics. The 45° diagonally split case feature allows both suction and discharge to be in the bottom half of the casing but above the centerline of the pump. This feature makes the casing self-venting. Because they are self-venting they WILL NOT VAPOR LOCK. Large suction areas give ideal NPSH characteristics. All of the advantages of the horizontally split case pumps are retained in that the entire rotating element can be removed without disturbing the piping.

2 DYNAMICALLY BALANCED IMPELLERS are keyed to shaft and secured by adjustable shaft sleeves. Design provides highest efficiency and performance.

3 BEARINGS selected for 50,000 hour minimum life at maximum load. Average bearing life is 5 x minimum. Double row thrust ball bearing is standard on Power Series 2 models. Duplex back to back ball bearings on Power Series 3A models. Short bearing span holds shaft deflection to .002" at face of stuffing box at maximum load. Outboard thrust bearing locked to shaft with lock nut. Integral bearing arms eliminate bearing misalignment and simplify servicing.

4 CASE WEARING RINGS and throttle bushings prevent wear on the pump casing and are easily and inexpensively replaced.

5 BRONZE SHAFT SLEEVE prevents shaft wear, is slip fit over the shaft, and keylocked.

6 GREASE LUBRICATION purges old grease from bearings. Oil lubrication is optional.

7 INTERCHANGEABLE STUFFING BOX for mechanical seals or packing. Packing is optional. Standard mechanical seals have carbon against Ni-Resist face. Long life is assured with 303 stainless steel metal parts and "Buna-N" Elastomer.

Specifications and Dimensions

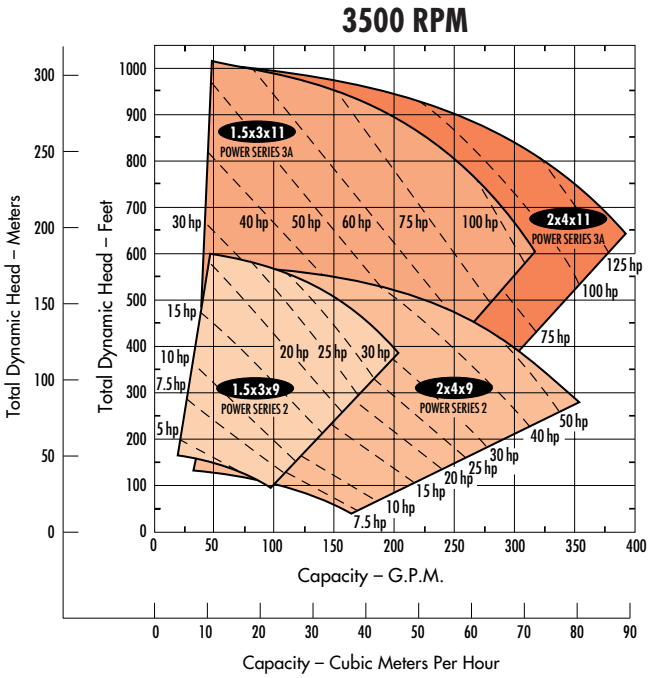
High discharge pressures often require the use of multi-stage pumping units, which impose additional demands on the pump design. Various pressures and forces generated within a multi-stage unit must balance, making shaft and bearing design more critical than in single stage units. Aurora Pump has been designing and building multi-stage pumping units for over 50 years. The 430B series reflects the latest in modern design for this important product.

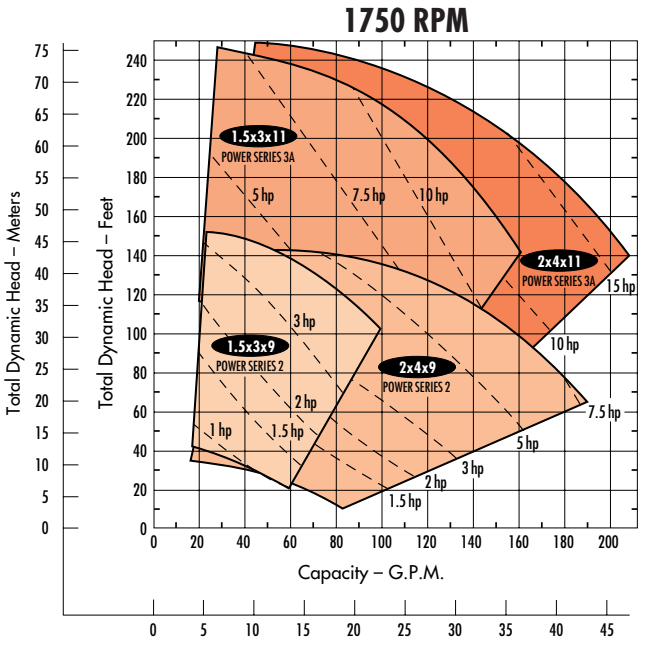
Standard

Bronze fitted pump construction
Bronze shaft sleeves, "O" ring sealed
Dynamically balanced impellers
Bronze case wearing rings
Stainless steel impeller key
Regreasable ball bearings
Single row ball bearing (inboard)
Double row ball bearing (Power Series 2 - outboard)
Duplex back to back ball bearings (Power Series 3A - outboard)
Single mechanical seals
Flanges per ANSI B16.1: class 125 suction, class 250 discharge
Max. case working pressure
Power Series 2-250 psi
Power Series 3A-450 psi
Carbon steel shaft
Lifting lugs
Hydrostatic test
Cast integral bearing arms
Water slingers (neoprene)
Grease seals
Mechanical seal flush line
Right hand rotation

Optional

All iron, or iron impeller pump construction
Hardened 440C stainless steel shaft sleeves (packing only)
316 s. stl. shaft sleeves (mech. seal)
Oil lubricated bearings
Mechanical seals: single unbalanced, high-temp.
Cartridge type mechanical seals
Stainless steel or monel shaft
External bypass to stuffing boxes
Steel drip rim or fabricated bases



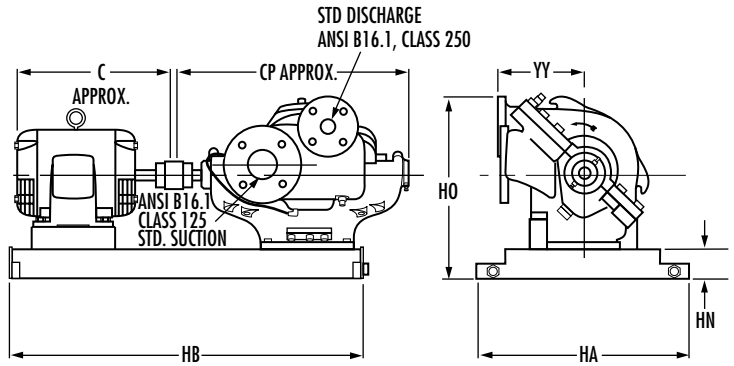


Left hand rotation
Certified performance test
Packing with lantern ring
250# ANSI B16.1 suction & discharge flanges
Water cooled bearing cartridge caps
Metallic/Plastic hi-temp packing
Stuffing box bushings

Note: For BHP and NPSH requirements see individual performance curves.

Engineering Specifications

MODEL 431B BASE MOUNTED – Furnish and install as shown on the plans……Right hand (Left hand) Aurora Model 431B type 45° Diagonal Split-Case, Opposed Suction, Two-Stage centrifugal pump, Size……..x…….. x……..of bronze fitted (all iron) construction. The pump shall be capable of delivering at design conditions a capacity of ……..G.P.M. when operating against a Total Dynamic Head of……..feet, with a temperature of……..°F, specific gravity……..Pump shall have minimum guaranteed efficiency at design capacity of……..%. Pump must also be capable of delivering a maximum of……..G.P.M. when operating against a head of…….. feet, and at this condition shall have a minimum efficiency of……..%. Minimum shut off head acceptable will be……..feet. Pump shall operate at a maximum speed of……..R.P.M. 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 with rear piping design and will be constructed of C.I. having a minimum tensile strength of 30,000 psi and shall be of sufficient thickness to withstand stresses and strains at full operating pressures. Casings shall be subject to a hydrostatic pressure test at 150% of the specified duty point. Bearing housing supports, suction and discharge flanges shall be integrally cast with the lower half of the casing. Removal of the upper half of the casing must allow the rotating element to be removed without disconnecting the suction and discharge flanges. The upper casing is to be dowel aligned to the lower casing. Both halves of the casing must be self-venting to prevent vapor lock. Drain openings must be provided in the bearing arms for removal of lubricating liquid. Impellers shall be of the enclosed, opposed suction type and shall be of vacuum cast bronze (……). Impellers shall be dynamically balanced and securely fastened to the shaft by key and screw locked shaft sleeves. The vanes shall be designed to reduce noise. The pump shaft shall be made of high grade SAE 1045 Steel or equal, accurately machined to give a true running rotating element. The minimum dia. acceptable will be……". The shaft shall be protected from wear by bronze (……) sleeves which are key locked and threaded so that the sleeves tighten with rotation of the shaft. EPR-o-rings must be provided between the impeller hub and the shaft sleeves to prevent pumped liquid from corroding the shaft. Pump shall be equipped with easily renewable bronze (……) casing rings so designed that hydraulic pressure will seat them against a shoulder in the pump case around the full periphery of the wearing ring. The wear rings will be locked in place by doweling to prevent rotation. The rotating element shall be mounted in heavy-duty grease lubricated ball bearings and equipped with bronze water slingers for packed pumps on side next to pump glands. (Neoprene slingers on mechanical seal pumps). Bearing housings shall be so designed to flush lubricant through and provide continuous cleaning of bearing surfaces and maximum protection against overheating. The bearing housings are to be of C.I. and shall be furnished with a set of regreaseable (Optional oil lubricated on Model 431B) bearings for both radial and thrust loads. The bearings shall have an average life of 250,000 hours and shall be mounted in machined, moisture and dust proof housings. The housings are to have register fits and then be bolted to the pump casing to insure permanent alignment. Stuffing boxes (packing) (m. seal) shall be placed on both sides of the pump centerline to seal the pump shaft. All standard mechanical seal pumps will have flushline from 2nd to 1st stage stuffing boxes. All packed pumps having a suction lift shall have a 1st stage lantern ring connected to the pressure side of the pump by a bypass line to the parting flange of the pump. The stuffing boxes shall be equipped with heavy, cast, glands. Pump and motor shall be mounted on a common heavy base plate of (steel drip rim) (formed steel) (structural steel). Pump and motor must be checked for alignment after the pump base has been installed and grouted in place, in accordance with the standards of the Hydraulic Institute. There shall be no strain transmitted to the pumps. The diagonal split case pumps shall be flexible coupled to a standard horizontal NEMA……HP……phase…… Hertz……volts……RPM (drip-proof) (totally enclosed) (explosion-proof) motor.



BASE	3	5	6	8	9	11	MOTOR FRAME	143 T	145 T	182 T	184 T	213 T	215 T	254 T	256 T	284 TS	284 T	286 TS	286 T	324 TS	324 T	326 TS	364 TS	365 TS	404 TS	405 TS
WGT	49	59	68	96	109	164	HP 3500	1½	2-3	5	7½	10	15	20	25	30	–	40	–	50	–	60	75	100	125	150
HA	15	17½	17¼	20½	20½	26¾	HP 1750	1	1½-2	3	5	7½	10	15	20	25										
HB	33½	36½	42½	42½	48½	46½	MTR WGT.	40	45	72	80	130	145	220	240	330	370	370	370	475	475	525	710	775	975	1030
HN	3	3	3	3	3	4	C	12	13	13	14	16	18	21	23	22	24	24	25	25	26	26	27	28	30	31

PUMP SIZE			PUMP				BASE																			
DIS	SUCT	BORE	WGT	YY	CP	HO																				
1½	3	9	300	9	26¼	19¾	3	3	3	3	5	6	8	8	8	9	9	9	11	11	11	11	11	11	11	
2	4	9	310	9	26¼	19¾	3	3	3	3	5	6	8	8	8	9	9	9	11	11	11	11	11	11	11	
1½	3	11		11	34	25	–	–	6	6	6	6	9	9	9	9	9	–	12	12	12	12	12	15	16	
2	4	11		11	34	25	–	–	6	6	6	6	9	9	9	9	9	–	12	12	12	12	12	15	16	

Limitations

3500 R.P.M., 150 H.P. Max. Temp.

1. Standard mechanical seals 230°F
2. High temp. mechanical seals with flushing at seal faces and water cooled bearings 300°F
3. Packing with hardened stainless steel shaft sleeves 225°F

Max. case working pressure (all or any part can be suction pressure)*
Power Series 2-250 psi
Power Series 3A-450 psi
675 PSI Hydrostatic test pressure (Max)

*Packing…Suction lift requires lantern ring. Above 100 PSI suction pressure requires hardened stainless steel shaft sleeves.
*Seals…Above 100 PSI suction pressure requires balanced seal.

Description	Material of Construction
Casing halves	Cast iron ASTM A48
Packing rings	Alternating rings of babbit foil and arimid fiber
Case wearing rings	Bronze ASTM B62
Sleeves	Bronze High Lead Tin
Impellers	Bronze ASTM B584
Key	Stainless steel AISI 416
Shaft	Steel AISI C1045

1. Dimensions and weights are approximate. **2.** Complete dimensions are available. **3.** Not for construction purposes unless certified for approval. **4.** Frame sizes shown are for open drip proof motors only. **5.** Add pump, base and motor weight for unit weight total. **6.** Conduit box is shown in approximate position. Dimensions are not specified as they vary with each motor manufacturer. **7.** Aurora Pump reserves the right to make revisions to its products and their specifications, and to this bulletin and related information without notice. **8.** Individual performance curve must be used for final selection. For selection not shown on range charts, refer to factory.

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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WEB: www.aurorapump.com
EMAIL: aurora_info@pentairpump.com

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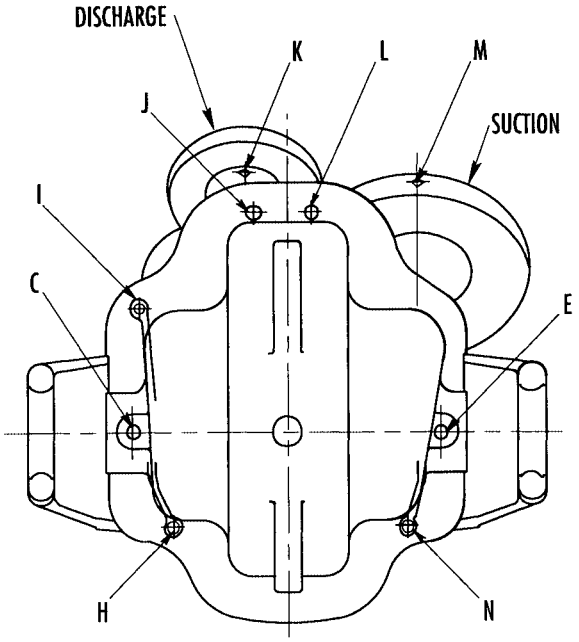
Refer to "Pumps" in yellow pages of your phone directory for your local Distributor.

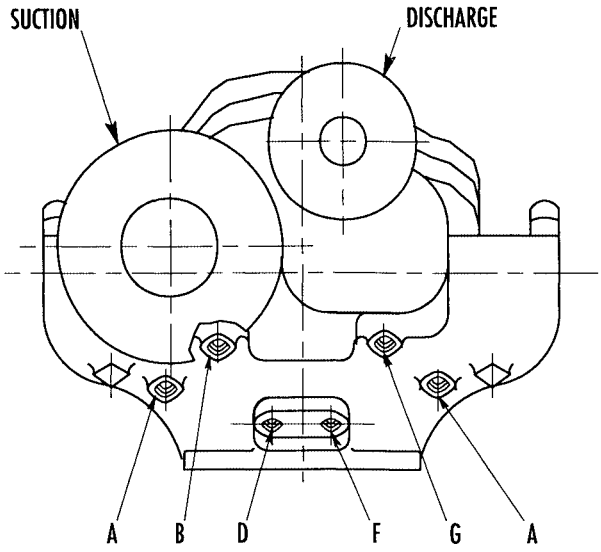
AURORA® Pentair Pump Group

AP-430B/Rev. D 6.95

430 SERIES

ENGINEERING DATA
PIPE TAP CONNECTIONS AND FUNCTION
POWER SERIES 2





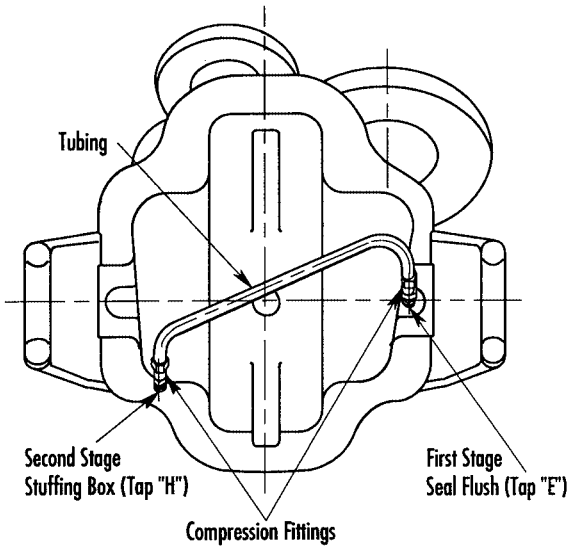
LETTER	PIPE TAP SIZE	DESCRIPTION
A	1/2	PACKING BOX DRAIN
B	1/2	FIRST STAGE SUCTION CHAMBER DRAIN
C	1/4	SECOND STAGE SEAL FLUSH
D	1/2	FIRST STAGE VOLUTE DRAIN
E	1/4	FIRST STAGE SEAL FLUSH
F	1/2	SECOND STAGE VOLUTE DRAIN
G	1/2	SECOND STAGE SUCTION CHAMBER DRAIN
H	1/4	INLET TO SECOND STAGE PACKING BOX
I	1/4	OUTLET FROM SECOND STAGE PACKING BOX
J	1/4	SECOND STAGE VOLUTE VENT (SEE NOTE 1)
K	1/4	DISCHARGE GAUGE CONNECTION
L	1/4	FIRST STAGE VOLUTE VENT (SEE NOTE 1)
M	1/4	SUCTION GAUGE CONNECTION
N	1/4	INLET TO FIRST STAGE PACKING BOX

NOTES:
1. CAUTION - LOOSEN VENT PLUGS "J" AND "L" AND ROTATE SHAFT SLOWLY TO VENT AIR.

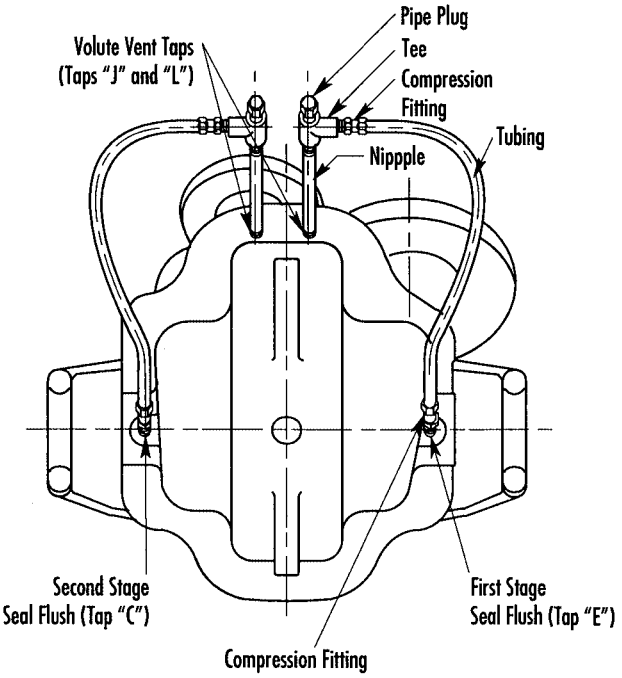
AURORA MODEL 430 PUMPS

ENGINEERING DATA
EXTERNAL FLUSH LINE
SCHEMATICS / POWER SERIES 2

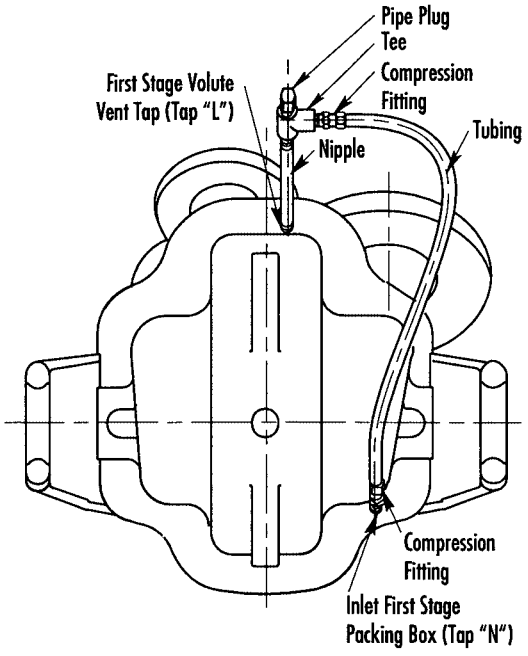
MECHANICAL SEALS EXTERNAL FLUSH STANDARD WITH INSIDE SEALS / OPTION 1



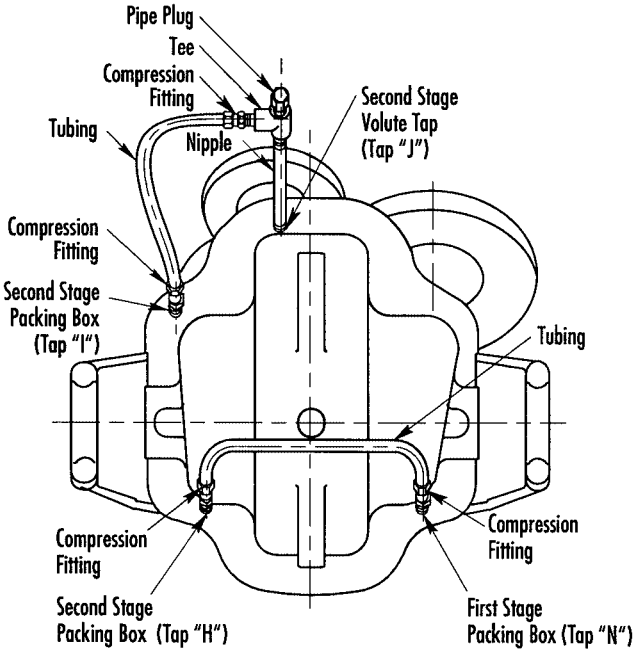
MECHANICAL SEALS EXTERNAL FLUSH / OPTION 16



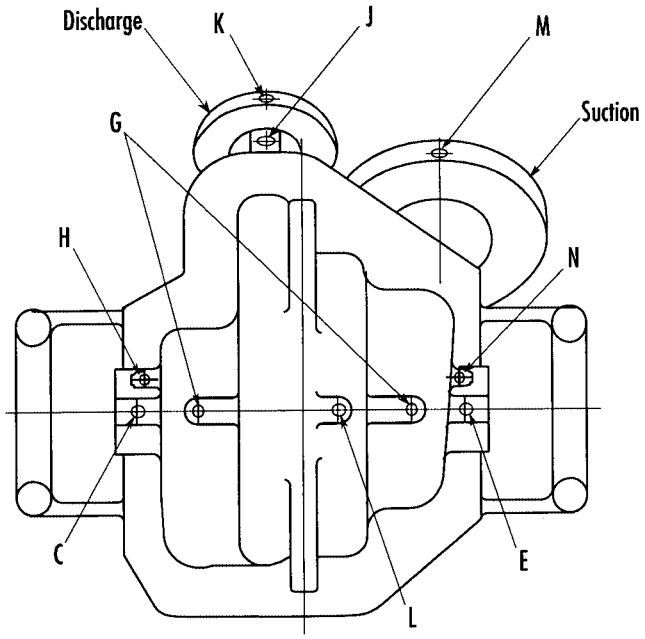
PACKING WITH LANTERN RING - 1ST STAGE EXTERNAL WATER SEAL / OPTION 37B

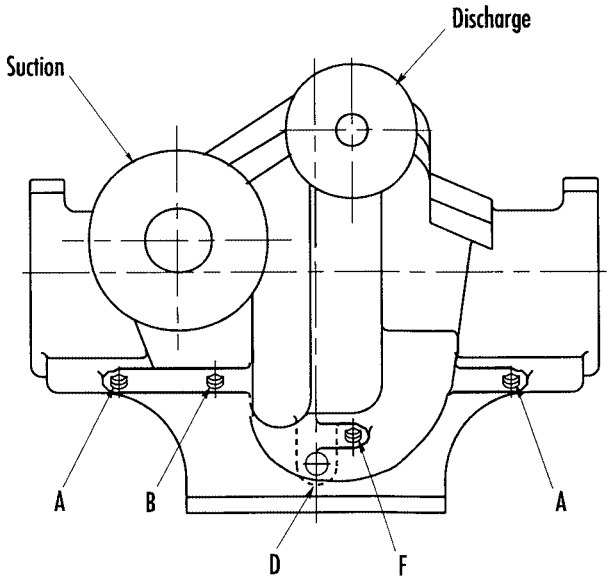


PACKING WITH LANTERN RINGS - BOTH STAGES EXTERNAL WATER SEAL / OPTION 37J



ENGINEERING DATA
PIPE TAP CONNECTIONS AND FUNCTION
POWER SERIES 3A





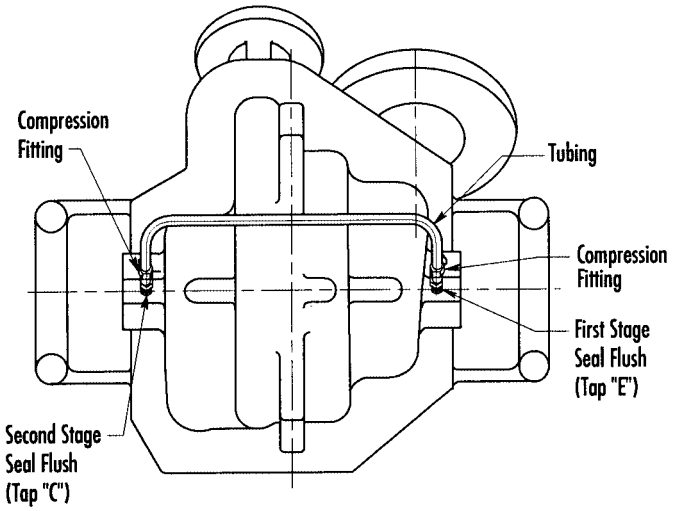
LETTER	PIPE TAP SIZE	DESCRIPTION
A	1/2	PACKING BOX DRAIN
B	1/2	FIRST STAGE SUCTION CHAMBER DRAIN
C	1/4	SECOND STAGE SEAL FLUSH
D	1	FIRST STAGE VOLUTE DRAIN & SECOND STAGE SUCTION DRAIN (1-1/2x3x11)
	1-1/4	FIRST STAGE VOLUTE DRAIN & SECOND STAGE SUCTION DRAIN (2x4x11)
E	1/4	FIRST STAGE SEAL FLUSH
F	1/2	SECOND STAGE VOLUTE DRAIN
G	1/4	SUCTION VENT
H	1/4	INLET TO SECOND STAGE PACKING BOX
J	1/4	SECOND STAGE VOLUTE VENT (SEE NOTE 1)
K	1/4	DISCHARGE GAUGE CONNECTION
L	1/4	FIRST STAGE VOLUTE VENT (SEE NOTE 1)
M	1/4	SUCTION GAUGE CONNECTION
N	1/4	INLET TO FIRST STAGE PACKING BOX

NOTES:
1. CAUTION - LOOSEN VENT PLUGS "J" AND "L" AND ROTATE SHAFT SLOWLY TO VENT AIR.

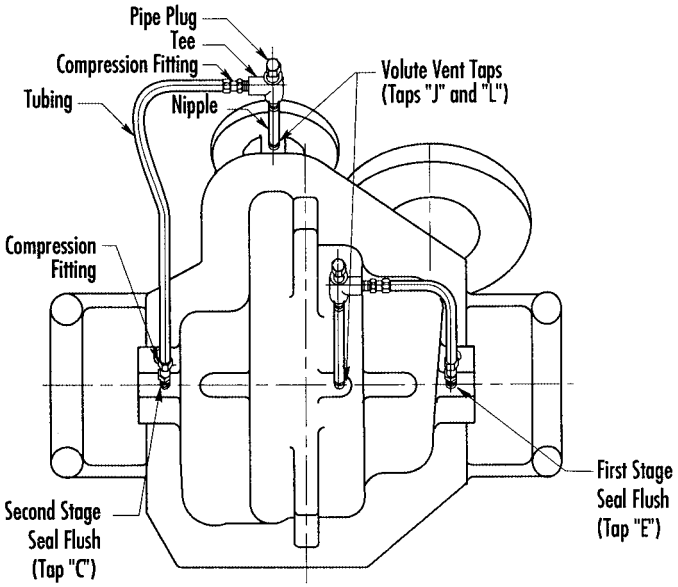
AURORA MODEL 430 PUMPS

ENGINEERING DATA
EXTERNAL FLUSH LINE
SCHEMATICS / POWER SERIES 3A

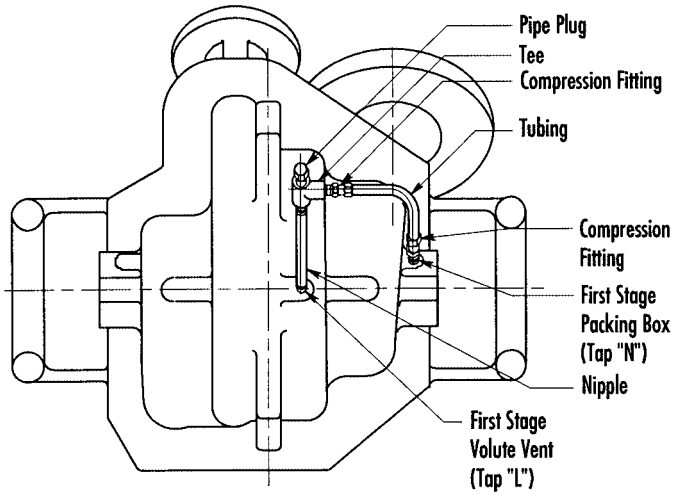
MECHANICAL SEALS EXTERNAL FLUSH STANDARD WITH INSIDE SEALS / OPTION 1



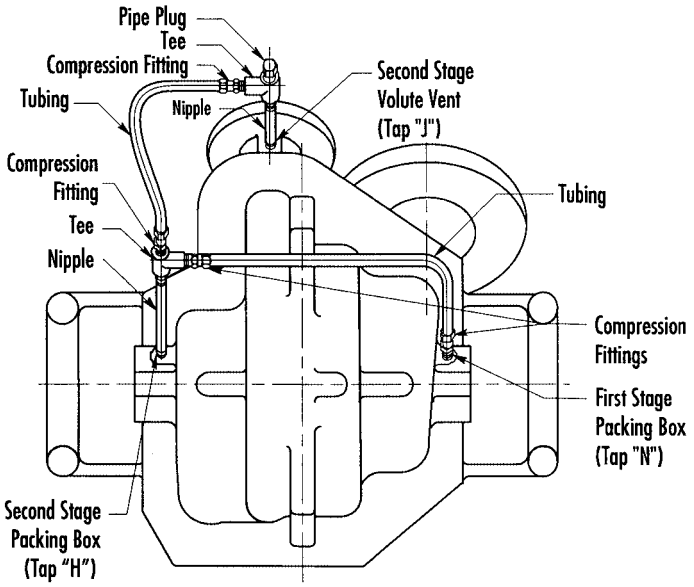
MECHANICAL SEALS EXTERNAL FLUSH OPTION 16

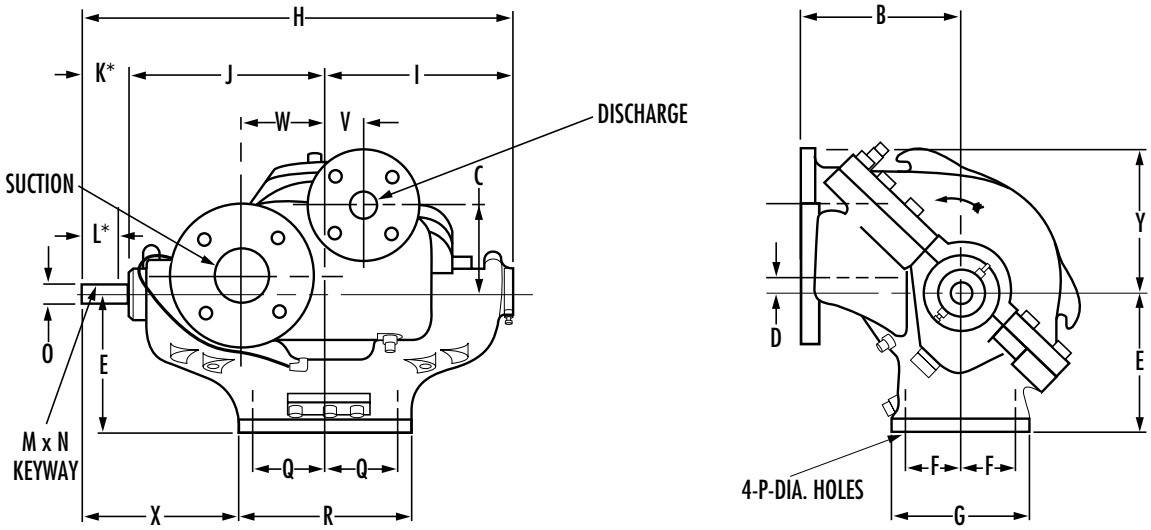


PACKING WITH LANTERN RING – 1ST STAGE EXTERNAL WATER SEAL / OPTION 37B



PACKING WITH LANTERN RING – BOTH STAGES EXTERNAL WATER SEAL / OPTION 37J





RIGHT HAND PUMPS

DISCH.	SUCT.	CASE BORE	B	C	D	E	F	G	H	I	J	K
1-1/2	**3**	**9**	9	5-1/4	1-1/2	8	3-1/2	8	26-1/4	11-3/4	11-3/4	2-3/4
2	**4**	**9**	9	5-1/4	1	8	3-1/2	8	26-1/4	11-3/4	11-3/4	2-3/4
1-1/2	**3**	**11**	11	6-1/2	1-1/2	11	4-3/8	10-1/2	34	14-7/8	14-7/8	4-1/4
2	**4**	**11**	11	6-9/16	1-1/2	11	4-3/8	10-1/2	34	14-7/8	14-7/8	4-1/4

DISCH.	SUCT.	CASE BORE	L	M	N	O	P	Q	R	V	W	X	Y
1-1/2	**3**	**9**	2-1/2	1/4	1/8	1-1/8	5/8	4	10	1-1/4	5-1/2	9-1/2	8-3/4
2	**4**	**9**	2-1/2	1/4	1/8	1-1/8	5/8	4	10	1-3/4	5-1/2	9-1/2	8-3/4
1-1/2	**3**	**11**	3	3/8	3/16	1-3/8	5/8	5	12	1-5/8	6-3/8	13-1/8	10
2	**4**	**11**	3	3/8	3/16	1-3/8	5/8	5	12	1-5/8	6-3/8	13-1/8	10

NOTES:

1. All dimensions in inches.
2. Dimensions may vary ± 3/8".
3. Not for construction purposes unless certified.
4. Discharge and suction flanges–American Standard flat face.

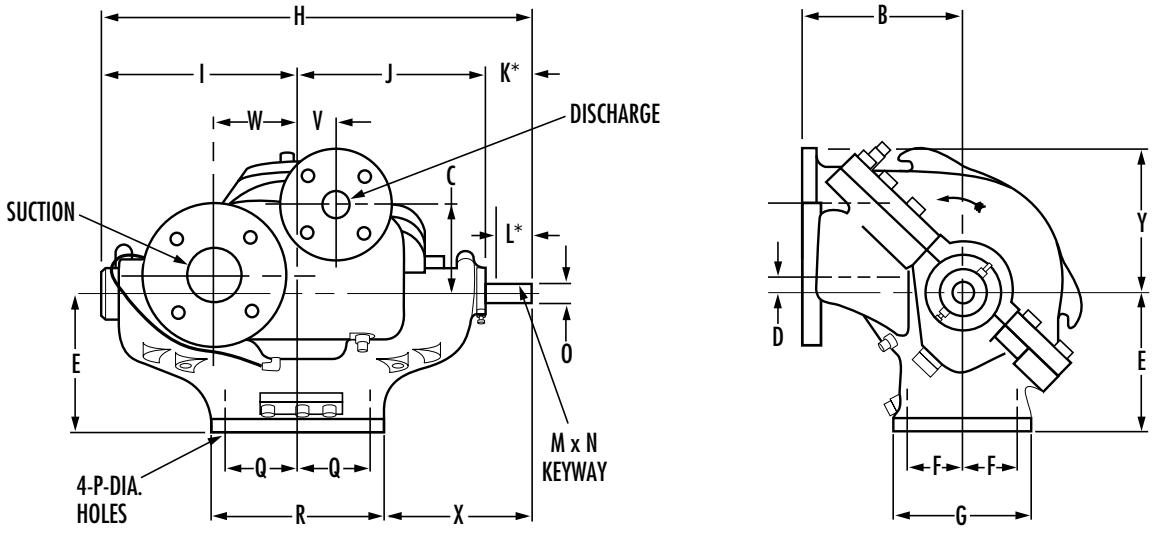
*L=Length of keyway
K=Length of shaft exposed

	STD. 125# SUCTION FLANGES & 250# DISCHARGE FLANGES
	OPT. 250# FLANGES

Supersedes Section 430 Page 202
Dated FEBRUARY 1996

AURORA MODEL 431 PUMPS (LH)

POWER SERIES NO. 2 AND 3A



LEFT HAND PUMPS

DISCH.	SUCT.	CASE BORE	B	C	D	E	F	G	H	I	J	K
1-1/2	**3**	**9**	9	5-1/4	1-1/2	8	3-1/2	8	26-1/4	11-3/4	11-3/4	2-3/4
2	**4**	**9**	9	5-1/4	1	8	3-1/2	8	26-1/4	11-3/4	11-3/4	2-3/4
1-1/2	**3**	**11**	11	6-1/2	1-1/2	11	4-3/8	10-1/2	34	14-7/8	14-7/8	4-1/4
2	**4**	**11**	11	6-9/16	1-1/2	11	4-3/8	10-1/2	34	14-7/8	14-7/8	4-1/4

DISCH.	SUCT.	CASE BORE	L	M	N	O	P	Q	R	V	W	X	Y
1-1/2	**3**	**9**	2-1/2	1/4	1/8	1-1/8	5/8	4	10	1-1/4	5-1/2	9-1/2	8-3/4
2	**4**	**9**	2-1/2	1/4	1/8	1-1/8	5/8	4	10	1-3/4	5-1/2	9-1/2	8-3/4
1-1/2	**3**	**11**	3	3/8	3/16	1-3/8	5/8	5	12	1-5/8	6-3/8	13-1/8	10
2	**4**	**11**	3	3/8	3/16	1-3/8	5/8	5	12	1-5/8	6-3/8	13-1/8	10

NOTES:

1. All dimensions in inches.
2. Dimensions may vary ± 3/8".
3. Not for construction purposes unless certified.
4. Discharge and suction flanges–American Standard flat face.

*L=Length of keyway
K=Length of shaft exposed

	STD. 125# SUCTION FLANGES & 250# DISCHARGE FLANGES
	OPT. 250# FLANGES

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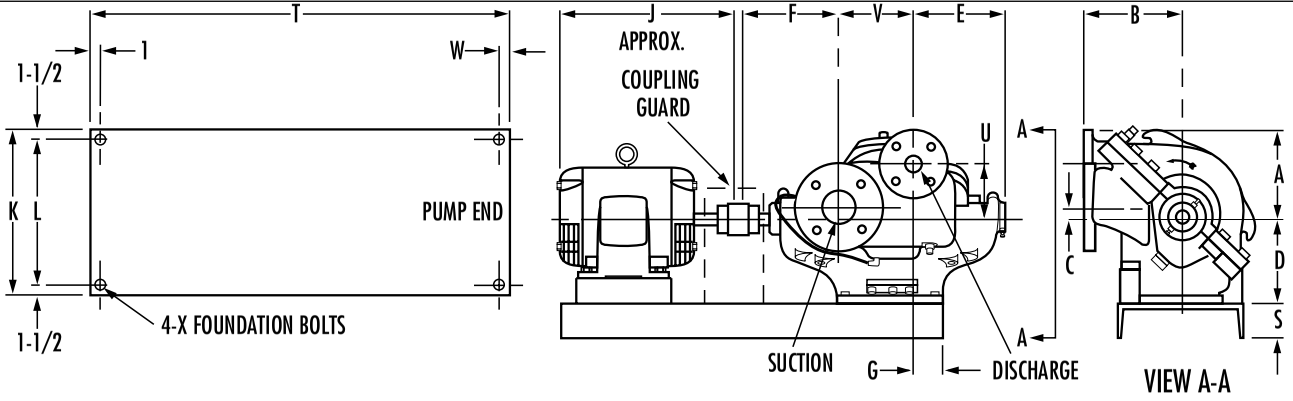
RIGHT HAND PUMPS



BASE	12x34	13x38	15x40	15x44	15x48	15x54	18x48	18x50	18x54	22x60
K	12	13	15	15	15	15	18	18	18	22
L	9	10	12	12	12	12	15	15	15	19
S	3	4	4	3-3/8	3-3/8	3-3/8	4	4	4	4
T	34	38	40	44	48	54	48	50	54	60
W	20	1	1	1	1	1	1	1	1	1
X	1/2	5/8	5/8	5/8	5/8	5/8	5/8	5/8	5/8	5/8

NOTES:

1. All dimensions in inches.
2. Dimensions may vary ± 3/8".
3. Not for construction purposes unless certified.
4. Coupling gap may vary 1/8" to 1".
5. Discharge and suction flanges–American Standard flat face.
6. Conduit box is shown in approximate location.
   Dimensions are not specified as they vary with each motor manufacturer.

STD. 125# SUCTION FLANGES & 250# DISCHARGE FLANGES
OPT. 250# FLANGES

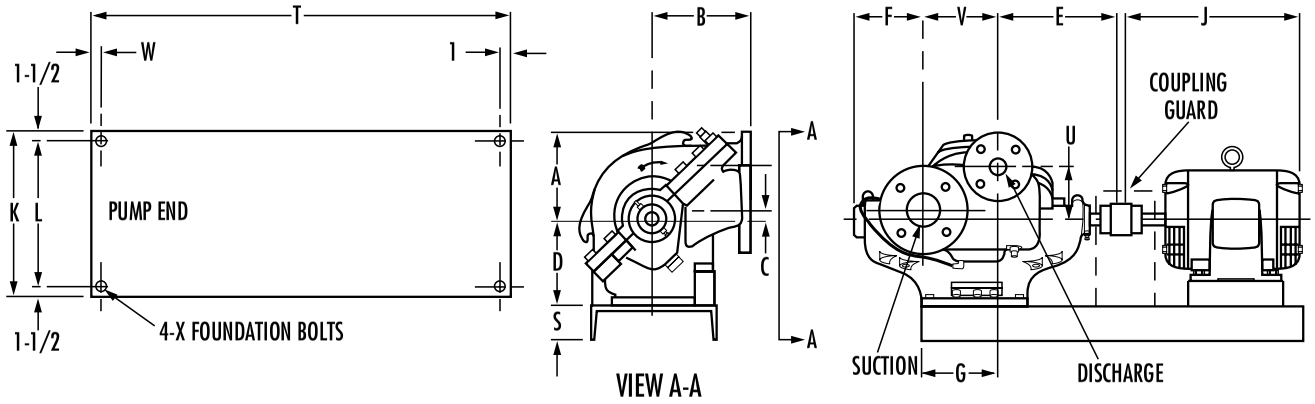
DISCH.	SUCT.	CASE BORE	A	B	C	E	F	G	U	V	MOTOR FRAME	143T	145T	182T	184T	213T	215T	254T	256T
											J	12	13	13	14	16	18	21	23
1-1/2	3	9	8-3/4	9	1-1/2	10-1/2	9	3-3/4	5-1/4	6-3/4	BASE	12x34	12x34	12x34	12x34	13x38	13x38	15x44	15x44
											D	8	8	8	8	8	8	8	8
2	4	9	8-3/4	9	1	10	9	3-1/4	5-1/4	7-1/4	BASE	12x34	12x34	12x34	12x34	13x38	13x38	15x44	15x44
											D	8	8	8	8	8	8	8	8
1-1/2	3	11	10	11	1-1/2	13-1/2	12-3/4	4-3/8	6-1/2	8	BASE	–	–	15x40	15x40	15x44	15x44	15x48	15x48
											D	–	–	11	11	11	11	11	11
2	4	11	10	11	1-1/2	13-1/2	12-3/4	4-3/8	6-9/16	8	BASE	–	–	15x40	15x40	15x44	15x44	15x48	15x48
											D	–	–	11	11	11	11	11	11

DISCH.	SUCT.	CASE BORE	A	B	C	E	F	G	U	V	MOTOR FRAME	284TS	284T	286TS	324TS	326TS	364TS	365TS	404TS	405TS
											J	22	24	24	25	26	27	28	30	31
1-1/2	3	9	8-3/4	9	1-1/2	10-1/2	9	3-3/4	5-1/4	6-3/4	BASE	15x44	15x44	18x48	18x48	18x48	18x48	–	–	–
											D	8	8	8	8	8	9	–	–	–
2	4	9	8-3/4	9	1	10	9	3-1/4	5-1/4	7-1/4	BASE	15x44	15x44	18x48	18x48	18x48	18x48	–	–	–
											D	8	8	8	8	8	9	–	–	–
1-1/2	3	11	10	11	1-1/2	13-1/2	12-3/4	4-3/8	6-1/2	8	BASE	15x48	15x54	15x54	18x50	18x54	18x54	18x54	22x60	22x60
											D	11	11	11	11	11	11	11	11	11
2	4	11	10	11	1-1/2	13-1/2	12-3/4	4-3/8	6-9/16	8	BASE	15x48	15x54	15x54	18x50	18x54	18x54	18x54	22x60	22x60
											D	11	11	11	11	11	11	11	11	11

AURORA MODEL 431 PUMPS (LH)

ON STEEL BASE

POWER SERIES NO. 2 AND 3A



LEFT HAND PUMPS

BASE	12x34	13x38	15x40	15x44	15x48	15x54	18x48	18x50	18x54	22x60
K	12	13	15	15	15	15	18	18	18	22
L	9	10	12	12	12	12	15	15	15	19
S	3	4	4	3-3/8	3-3/8	3-3/8	4	4	4	4
T	34	38	40	44	48	54	48	50	54	60
W	20	1	1	1	1	1	1	1	1	1
X	1/2	5/8	5/8	5/8	5/8	5/8	5/8	5/8	5/8	5/8

NOTES:

1. All dimensions in inches.
2. Dimensions may vary ± 3/8".
3. Not for construction purposes unless certified.
4. Coupling gap may vary 1/8" to 1".
5. Discharge and suction flanges–American Standard flat face.
6. Conduit box is located on the opposite side of the motor shown. Dimensions are not specified as they vary with each motor manufacturer.

STD. 125# SUCTION FLANGES & 250# DISCHARGE FLANGES

OPT. 250# FLANGES

DISCH.	SUCT.	CASE BORE	A	B	C	E	F	G	U	V	MOTOR FRAME	143T	145T	182T	184T	213T	215T	254T	256T
											J	12	13	13	14	16	18	21	23
1-1/2	3	9	8-3/4	9	1-1/2	13-1/4	6-1/4	6-1/4	5-1/4	6-3/4	BASE	12x34	12x34	12x34	12x34	13x38	13x38	15x44	15x44
											D	8	8	8	8	8	8	8	8
2	4	9	8-3/4	9	1	12-3/4	6-1/4	6-3/4	5-1/4	7-1/4	BASE	12x34	12x34	12x34	12x34	13x38	13x38	15x44	15x44
											D	8	8	8	8	8	8	8	8
1-1/2	3	11	10	11	1-1/2	17-1/2	8-1/2	7-5/8	6-1/2	8	BASE	–	–	15x40	15x40	15x44	15x44	15x48	15x48
											D	–	–	11	11	11	11	11	11
2	4	11	10	11	1-1/2	17-1/2	8-1/2	7-5/8	6-9/16	8	BASE	–	–	15x40	15x40	15x44	15x44	15x48	15x48
											D	–	–	11	11	11	11	11	11

DISCH.	SUCT.	CASE BORE	A	B	C	E	F	G	U	V	MOTOR FRAME	284TS	284T	286TS	324TS	326TS	364TS	365TS	404TS	405TS
											J	22	24	24	25	26	27	28	30	31
1-1/2	3	9	8-3/4	9	1-1/2	13-1/4	6-1/4	6-1/4	5-1/4	6-3/4	BASE	15x44	15x44	18x48	18x48	18x48	18x48	–	–	–
											D	8	8	8	8	8	9	–	–	–
2	4	9	8-3/4	9	1	12-3/4	6-1/4	6-3/4	5-1/4	7-1/4	BASE	15x44	15x44	18x48	18x48	18x48	18x48	–	–	–
											D	8	8	8	8	8	9	–	–	–
1-1/2	3	11	10	11	1-1/2	17-1/2	8-1/2	7-5/8	6-1/2	8	BASE	15x48	15x54	15x54	18x50	18x54	18x54	18x54	22x60	22x60
											D	11	11	11	11	11	11	11	11	11
2	4	11	10	11	1-1/2	17-1/2	8-1/2	7-5/8	6-9/16	8	BASE	15x48	15x54	15x54	18x50	18x54	18x54	18x54	22x60	22x60
											D	11	11	11	11	11	11	11	11	11

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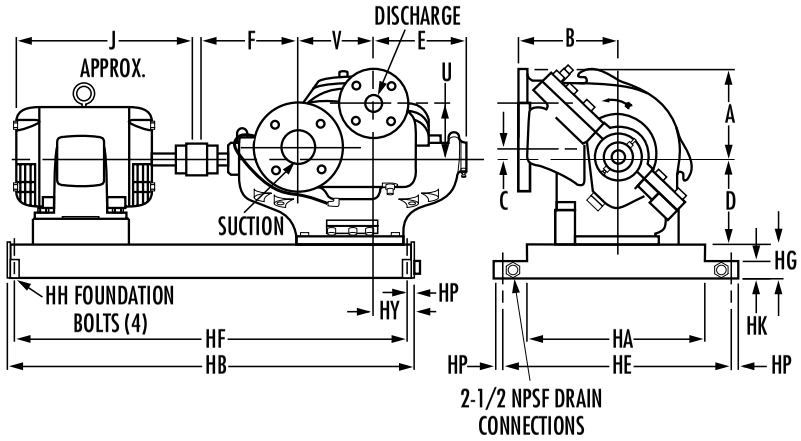
NOTES:

1. All dimensions in inches.
2. Dimensions may vary ± 3/8".
3. Not for construction purposes unless certified.
4. Coupling gap may vary 1/8" to 1".
5. Discharge and suction flanges–American Standard flat face.
6. Conduit box is located on the opposite side of the motor shown. Dimensions are not specified as they vary with each motor manufacturer.
7. 3 grout holes are provided in top of base.

BASE	SIZE	HA	HB	HE	HF	HG	HH	HK	HP
3	9x33	9	33-1/2	13-3/4	32-1/4	3	3/8	1-1/2	5/8
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
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
15	22x54	22	54-1/2	29-1/8	52-7/8	4-1/2	3/4	2	13/16
16	22x64	22	64-1/2	29-1/8	62-7/8	4-1/2	3/4	2	13/16



RIGHT HAND PUMPS

	STD. 125# SUCTION FLANGES & 250# DISCHARGE FLANGES
	OPT. 250# FLANGES

DISCH.	SUCT.	CASE BORE	A	B	C	E	F	HY	U	V	MOTOR FRAME	143T	145T	182T	184T	213T	215T	254T	256T
											J	12	13	13	14	16	18	21	23
1-1/2	3	9	8-3/4	9	1-1/2	10-1/2	9	4-1/4	5-1/4	6-3/4	BASE	3	3	3	3	5	6	8	8
											D	8	8	8	8	8	8	8	8
2	4	9	8-3/4	9	1	10	9	3-3/4	5-1/4	7-1/4	BASE	3	3	3	3	5	6	8	8
											D	8	8	8	8	8	8	8	8
1-1/2	3	11	10	11	1-1/2	13-1/2	12-3/4	4-7/8	6-1/2	8	BASE	–	–	6	6	6	6	9	9
											D	–	–	11	11	11	11	11	11
2	4	11	10	11	1-1/2	13-1/2	12-3/4	4-7//8	6-9/16	8	BASE	–	–	6	6	6	6	9	9
											D	–	–	11	11	11	11	11	11

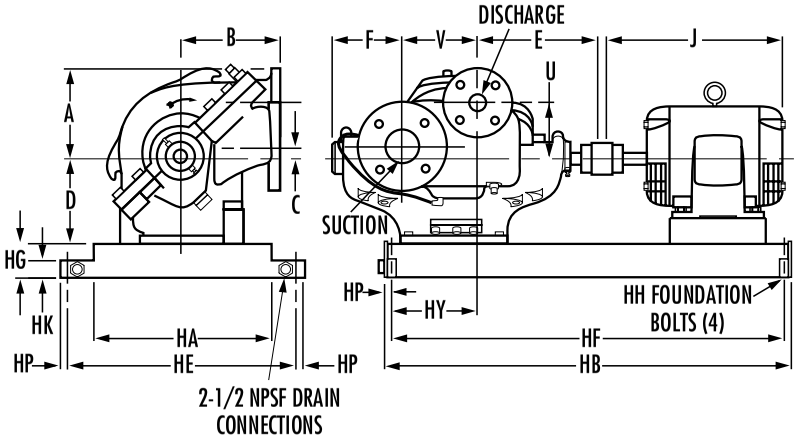
DISCH.	SUCT.	CASE BORE	A	B	C	E	F	HY	U	V	MOTOR FRAME	284TS	284T	286TS	324TS	326TS	364TS	365TS	404TS	405TS
											J	22	24	24	25	26	27	28	30	31
1-1/2	3	9	8-3/4	9	1-1/2	10-1/2	9	4-1/4	5-1/4	6-3/4	BASE	8	9	9	11	11	11	–	–	–
											D	8	8	8	8	8	9	–	–	–
2	4	9	8-3/4	9	1	10	9	3-3/4	5-1/4	7-1/4	BASE	8	9	9	11	11	11	–	–	–
											D	8	8	8	8	8	9	–	–	–
1-1/2	3	11	10	11	1-1/2	13-1/2	12-3/4	4-7/8	6-1/2	8	BASE	9	9	9	12	12	12	12	15	16
											D	11	11	11	11	11	11	11	11	11
2	4	11	10	11	1-1/2	13-1/2	12-3/4	4-7/8	6-9/16	8	BASE	9	9	9	12	12	12	12	15	16
											D	11	11	11	11	11	11	11	11	11

ON STEEL DRIP RIM BASE
POWER SERIES NO. 2 AND 3A

NOTES:

1. All dimensions in inches.
2. Dimensions may vary ± 3/8".
3. Not for construction purposes unless certified.
4. Coupling gap may vary 1/8" to 1".
5. Discharge and suction flanges–American Standard flat face.
6. Conduit box is located on the opposite side of the motor shown. Dimensions are not specified as they vary with each motor manufacturer.
7. 3 grout holes are provided in top of base.

BASE	SIZE	HA	HB	HE	HF	HG	HH	HK	HP
3	9x33	9	33-1/2	13-3/4	32-1/4	3	3/8	1-1/2	5/8
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
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
15	22x54	22	54-1/2	29-1/8	52-7/8	4-1/2	3/4	2	13/16
16	22x64	22	64-1/2	29-1/8	62-7/8	4-1/2	3/4	2	13/16



LEFT HAND PUMPS

	STD. 125# SUCTION FLANGES & 250# DISCHARGE FLANGES
	OPT. 250# FLANGES

DISCH.	SUCT.	CASE BORE	A	B	C	E	F	HY	U	V	MOTOR FRAME	143T	145T	182T	184T	213T	215T	254T	256T
											J	12	13	13	14	16	18	21	23
1-1/2	3	9	8-3/4	9	1-1/2	13-1/4	6-1/4	5-3/4	5-1/4	6-3/4	BASE	3	3	3	3	5	6	8	8
											D	8	8	8	8	8	8	8	8
2	4	9	8-3/4	9	1	12-3/4	6-1/4	6-1/4	5-1/4	7-1/4	BASE	3	3	3	3	5	6	8	8
											D	8	8	8	8	8	8	8	8
1-1/2	3	11	10	11	1-1/2	17-1/2	8-1/2	7-1/8	6-1/2	8	BASE	–	–	6	6	6	6	9	9
											D	–	–	11	11	11	11	11	11
2	4	11	10	11	1-1/2	17-1/2	8-1/2	7-1/8	6-9/16	8	BASE	–	–	6	6	6	6	9	9
											D	–	–	11	11	11	11	11	11

DISCH.	SUCT.	CASE BORE	A	B	C	E	F	HY	U	V	MOTOR FRAME	284TS	284T	286TS	324TS	326TS	364TS	365TS	404TS	405TS
											J	22	24	24	25	26	27	28	30	31
1-1/2	3	9	8-3/4	9	1-1/2	13-1/4	6-1/4	5-3/4	5-1/4	6-3/4	BASE	8	9	9	11	11	11	–	–	–
											D	8	8	8	8	8	9	–	–	–
2	4	9	8-3/4	9	1	12-3/4	6-1/4	6-1/4	5-1/4	7-1/4	BASE	8	9	9	11	11	11	–	–	–
											D	8	8	8	8	8	9	–	–	–
1-1/2	3	11	10	11	1-1/2	17-1/2	8-1/2	7-1/8	6-1/2	8	BASE	9	9	9	12	12	12	12	15	16
											D	11	11	11	11	11	11	11	11	11
2	4	11	10	11	1-1/2	17-1/2	8-1/2	7-1/8	6-9/16	8	BASE	9	9	9	12	12	12	12	15	16
											D	11	11	11	11	11	11	11	11	11

AURORA®
Pentair Pump Group

AURORA PUMP
A member of PENTAIR PUMP GROUP

INSTRUCTION MANUAL 2
INSTALLATION
FRAME MOUNTED

GENERAL. The life of your Aurora pump can be extended considerably by carefully following the installation instructions contained herein. Each step of the pump installation instructions plays a vital part in assuring long life, efficient operation, and reduced maintenance, from the initial location of the pump through prestarting directions.

UNPACKING YOUR PUMP. The crate containing your pump should be opened immediately upon receipt from the factory, and the pump generally inspected for damage and shortage of parts. Particular attention should be given to the discharge and suction nozzle threads or flanges. Any damage or shortage of parts should be reported to the carrier immediately.

CLEANING. If your pump is to be installed immediately, it will be necessary to remove the protective covers from all openings, and to clean the exposed metal parts thoroughly with white gasoline or other suitable solvent to remove the preservative coating.

STORAGE. If your pump is not to be put in service immediately it should be covered and stored in a clean dry area. The protective covers and preservative should be left intact until the pump is put into service. For extended storage, the pump should be dried internally with hot air or some other suitable means, and once free of moisture, filled with a protective fluid such as light oil or kerosene. Accordingly, at time of installation, the pump will have to be completely dismantled and thoroughly cleaned.

PLANNING THE PUMP LOCATION. You probably have spent considerable time planning where your pump will be located. However you may have overlooked some factor which may affect your pump operation or efficiency.

The pump should be located as close to the liquid source as possible so that the suction line can be

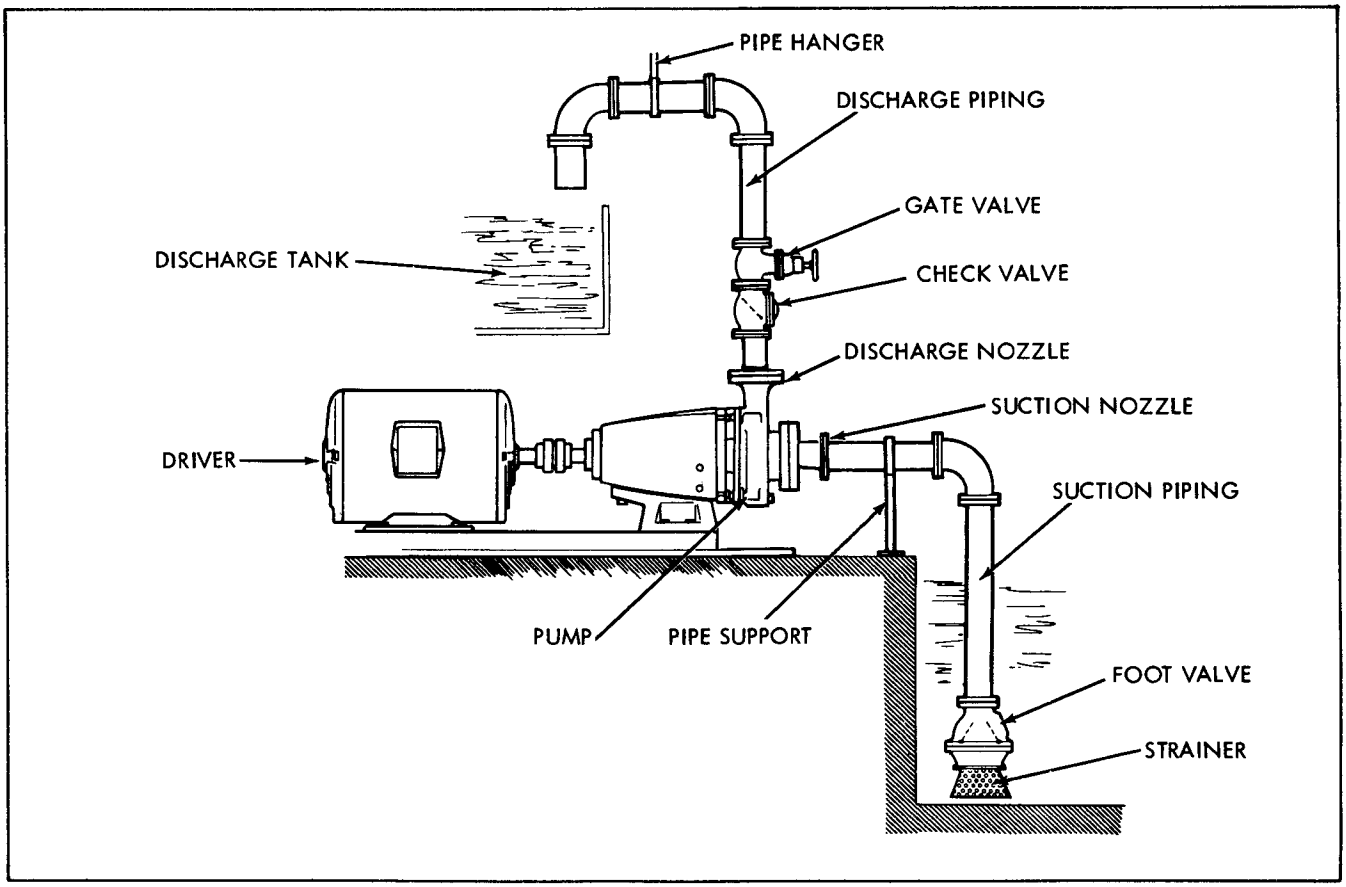


FIGURE 1. RECOMMENDED LOCATION - SHORT DIRECT SUCTION

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AURORA, ILLINOIS

short and direct. It should be located in a clean, open area, where it is easily accessible for inspection, lubrication, and repair. Pumps installed in dark, dirty areas or in cramped locations are often neglected which can result in premature failure of both the pump and the driver.

Your pump should be located so that a hoist or crane can be used to move it without interference from piping. This factor is often overlooked in the advance planning stage.

Protect your pump against the possibility of flooding. Although water will not seriously damage the pump, the drive motor can be damaged.

The pump should be located in an area where moisture, either from leakage through the packing or from condensation, can be adequately drained off. Moisture dripping on exposed metal or wood can cause rapid deterioration of the area. Also, wet floors produce safety hazards.

Adequate provisions should be made for electrical wiring to the pump motor. A switch and overload protection should be installed near the pump unless it is impractical. The electrical conduit should be positioned in such a way as to preclude the possibility of moisture entering the conduit or the motor and causing short circuits.

Outdoor installation will normally provide all of the above mentioned conditions. However it is advisable to provide a weather shelter for your pump.

FOUNDATION. The foundation for your pump must be sufficiently rigid to absorb any vibration and stress encountered during pump operation. A raised foundation of concrete is preferable for most floor mounted pumps. The raised foundation assures a satisfactory base, protects against flooding, simplifies moisture drainage, and facilitates keeping the area clean.

Your pump should be firmly bolted to the foundation, whether it is a raised concrete base, steelwork wall, or structural member. The mounting bolts or studs should be accurately located per the applicable Aurora dimension sheet. Foundation bolts should be enclosed by a sleeve 2 to 4 diameters larger than the bolt to allow movement for proper alignment with the pump mounting holes. Refer to figure 3.

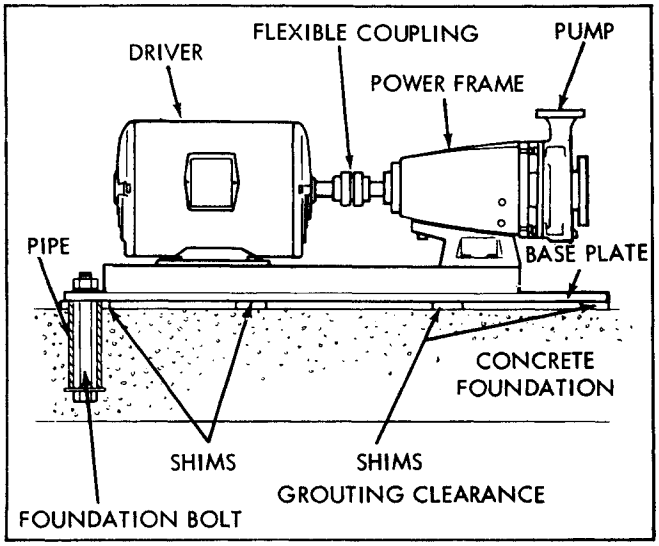


FIGURE 3. FOUNDATION FOR FRAME MOUNTED PUMPS

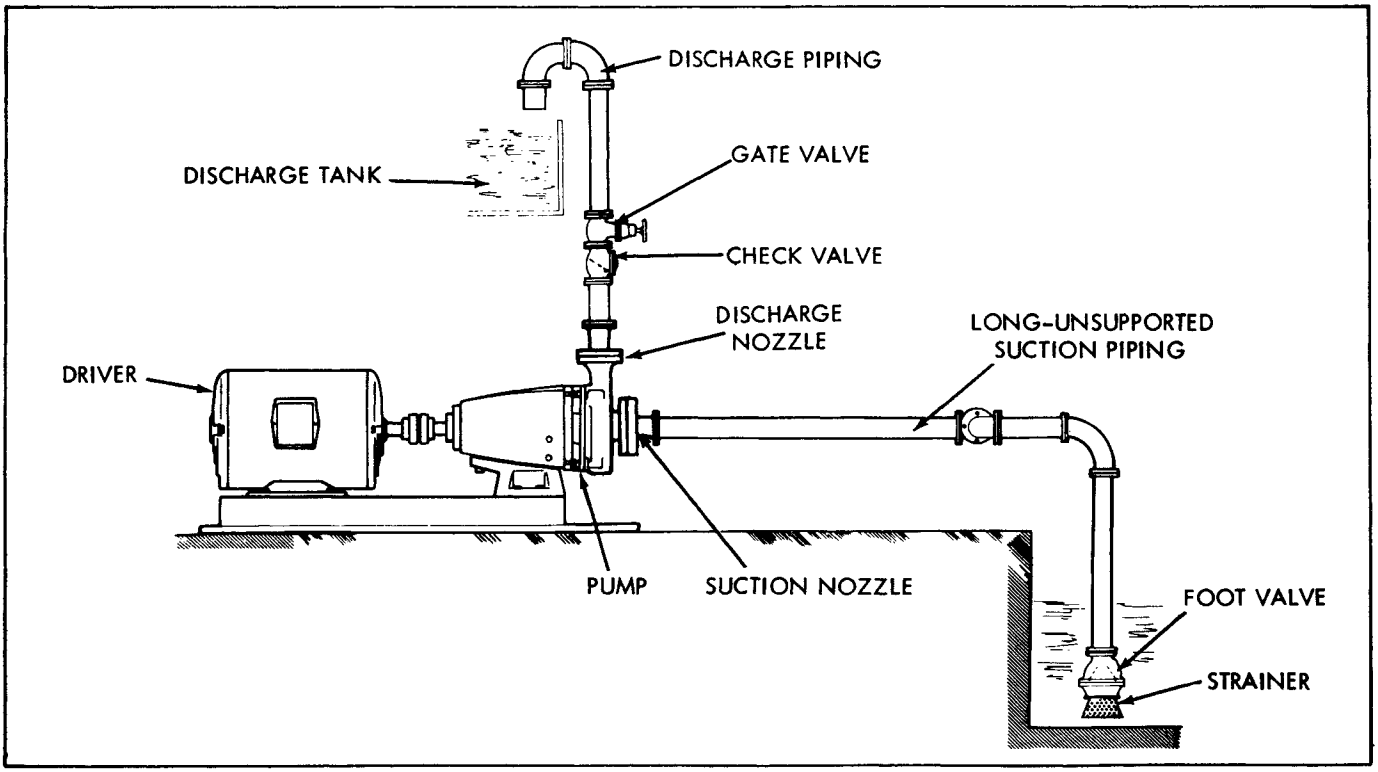


FIGURE 2. UNSATISFACTORY LOCATION - LONG INDIRECT SUCTION WITH NO SUPPORT

FRAME MOUNTED INSTALLATION

If the pump is to be mounted on steelwork or other structure, adequate support should be provided to prevent distortion of the base plate or the structure, which could produce excessive strain on the pump casing and piping, and seriously affect alignment of the pump and driver.

PREPARING TO INSTALL YOUR PUMP. Your pump and driver unit will normally be mounted on a common base plate. The unit has been accurately aligned and securely mounted to the base plate at the factory. However, the alignment cannot be maintained during shipping and the complete unit must be leveled and realigned at the time of installation.

LEVELING THE PUMP. Leveling the pump will require enough shims to support the base plate near the foundation bolts, and at any points of the base plate carrying a substantial weight load. The shims should be large enough to allow a gap of 3/4" to 1-1/2" between the base plate and foundation for grouting.

The pump unit should be set on the foundation, being careful not to damage the threads on the foundation bolts. The flexible coupling halves should then be disconnected. The shims should be inserted and the pump leveled. A spirit level should be used on the faces of the flexible coupling halves, and on the suction and discharge flanges. If your pump has threaded nozzles, a short piece of pipe inserted in the nozzles will serve as a smooth surface for a leveling reference point. The shims should be adjusted until the pump is leveled horizontally and vertically. Tighten the foundation bolts finger tight.

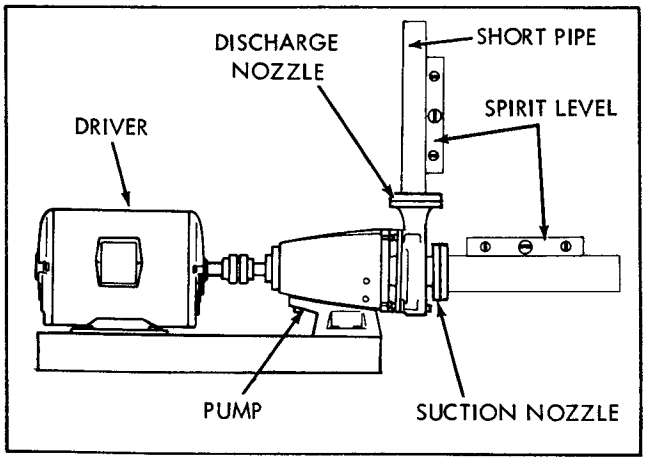


FIGURE 4. LEVELING PUMP UNIT WITH SPIRIT LEVEL AND SHORT LENGTHS OF PIPE

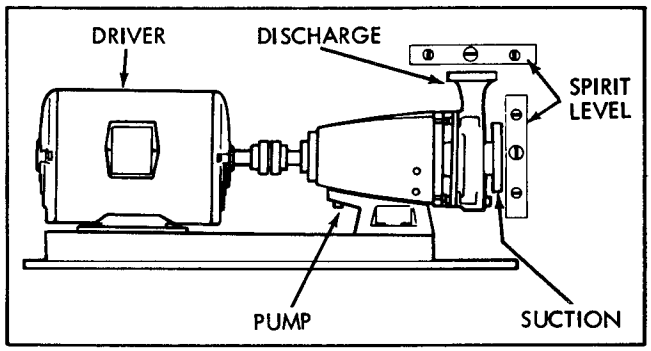


FIGURE 5. LEVELING PUMP UNIT WITH SPIRIT LEVEL ON PUMP FLANGES

INITIAL ALIGNMENT OF THE FLEXIBLE COUPLING. The pump and driver were accurately aligned at the factory. However, it is impossible to maintain this alignment during shipping and handling. Therefore it will be necessary for you to realign the pump and driver. Flexible couplings are not universal joints. They should not be used to compensate for misalignment of the pump and motor shafts. Their function is to transmit power from the driver to the pump while compensating for thermal expansion and shaft end movement. The coupling faces should be far enough apart so that they do not make contact when the motor shaft is forced to the limit of the bearing clearance toward the pump shaft.

In order to properly align the coupling, you will need a taper gauge or set of feeler gauges, and a straight edge, or if available, a dial indicator.

There are two types of misalignment encountered with flexible couplings: angular misalignment, in which the shafts are not parallel, and parallel misalignment where the shafts are parallel but not on the same axis.

To check angular alignment, insert a feeler gauge or taper gage at any four places 90° apart around the

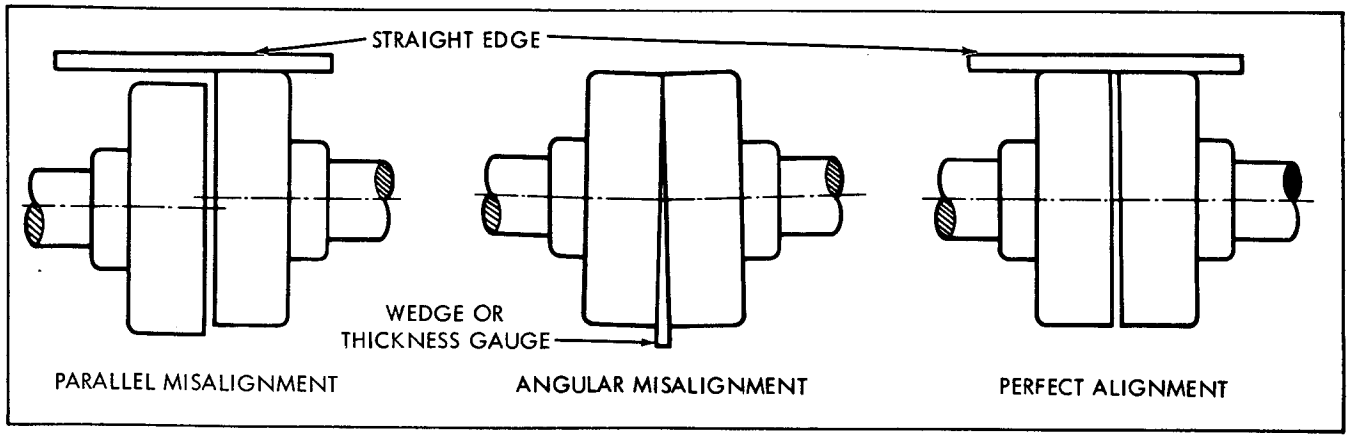


FIGURE 6. FLEXIBLE COUPLING ALIGNMENT

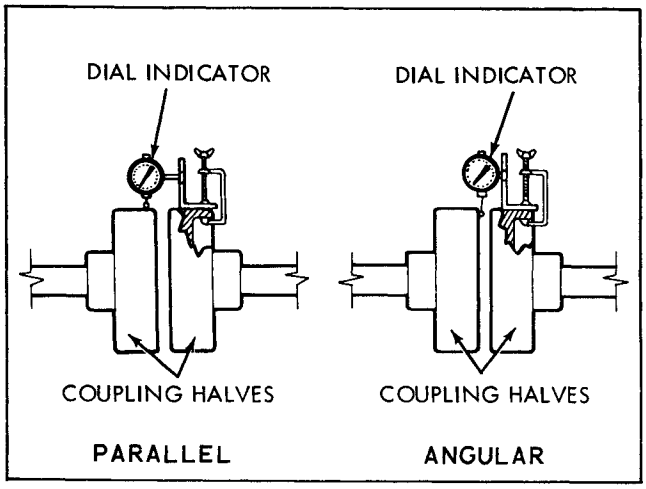


FIGURE 7. CHECKING ALIGNMENT WITH DIAL INDICATOR

coupling halves. Insert shims under the driver feet until the same reading is obtained at all four check points. The pump and driver will then be in angular alignment.

To check angular alignment with a dial indicator, clamp the dial indicator to the pump coupling half so that ball on the indicator just rests on the face of the motor coupling half. A chalk mark should be made at the point where the ball contacts the coupling half. Both the pump shaft and the motor shaft should be rotated an equal amount so that the reading is taken at all check points with the ball on the chalk mark. Insert shims as required.

To check parallel alignment, a straight edge should be held against the edges of the coupling halves at any four places 90° apart around the coupling. The straight edge should be parallel to the pump and driver shafts at all times. Insert shims until the straight edge lies flat against both coupling halves at all four check points. The pump and driver will then be in proper parallel alignment.

To check parallel alignment with the dial indicator, the ball should rest on periphery of the motor coupling half. A chalk mark should be made at the point of contact, and the shafts rotated equally so that the reading is taken with the ball on the chalk mark at all check points. Insert shims as required.

NOTE

Any adjustment to correct one direction of alignment may affect the other direction. Therefore, it is necessary to recheck both angular and parallel alignment after each adjustment.

When the unit is properly aligned, the foundation bolts should be tightened, but not too firmly. Waste material should be stuffed into the sleeves around the foundation bolts, to prevent grout from filling the sleeves during grouting.

GROUTING THE INSTALLATION. Grouting the base plate prevents lateral movement of the base plate, and improves the vibration absorbing characteristics of the foundation by increasing its mass. A wooden dam should be constructed around the base plate to contain the grout while it is being poured. The dam can be built tight against the base plate, or slightly removed from it as desired.

The entire base plate should be completely filled with grout. A non-shrinkable type grout, such as manufactured by EMBCO is recommended. The grout should be puddled frequently to remove any air bubbles from the grout.

The leveling shims can be grouted in place, or they can be removed after the grout has set usually from 48 to 72 hours after pouring.

After the grout has set, alignment of the unit should be checked and the foundation bolts firmly tightened down.

PIPING. Your pump unit is now ready to be piped. The piping practices you follow will directly affect the efficiency and power consumption of your pump.

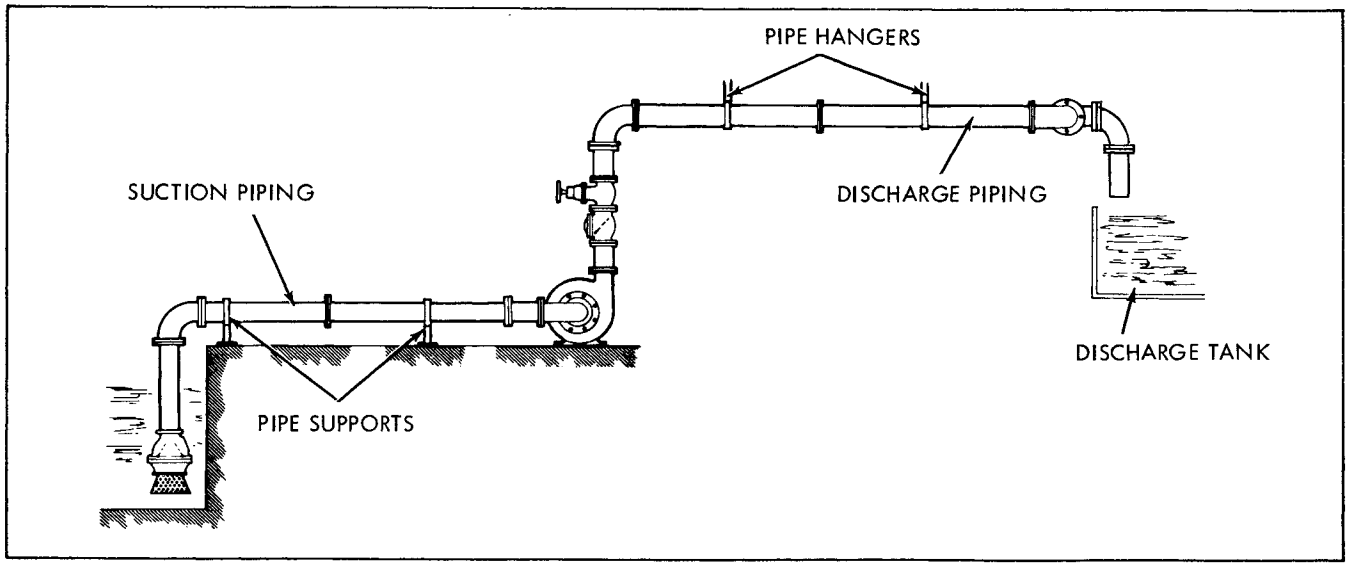


FIGURE 8. SUPPORTING PIPING

Pay particular attention to the seemingly insignificant details involved in piping your pump for they make the difference between a good and bad installation.

SUPPORTING THE PIPE. Both the suction and the discharge piping should be independently supported near the pump. Liberal use of pipe hangers and support blocks will prevent excessive strain on the pump casing and on the pipe joints.

SUCTION PIPING. The suction piping should be short, but no less than ten pipe diameters in length, and direct with as few elbows and fittings as possible, to keep head loss from friction at a minimum. However, the suction pipe should provide a minimum uninterrupted length, equal to ten pipe diameters, to the pump suction flange. A horizontal suction line should have a gradual rise to the pump, and pass under any interfering piping.

PIPE. The suction pipe diameter should be at least the same diameter as the suction nozzle on the pump, and preferably larger. Use of a smaller diameter pipe will result in loss of head due to friction. All joints must be tight to maintain prime on the pump.

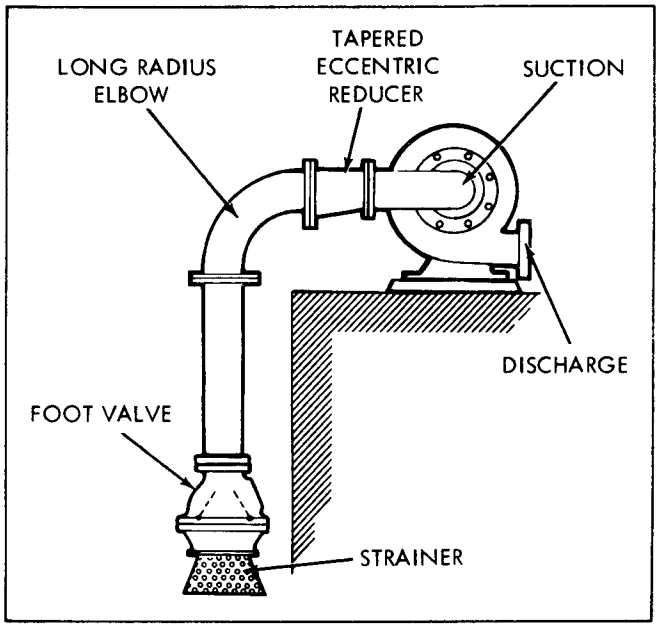


FIGURE 9. RECOMMENDED SUCTION LIFT PIPING - SHORT AND DIRECT

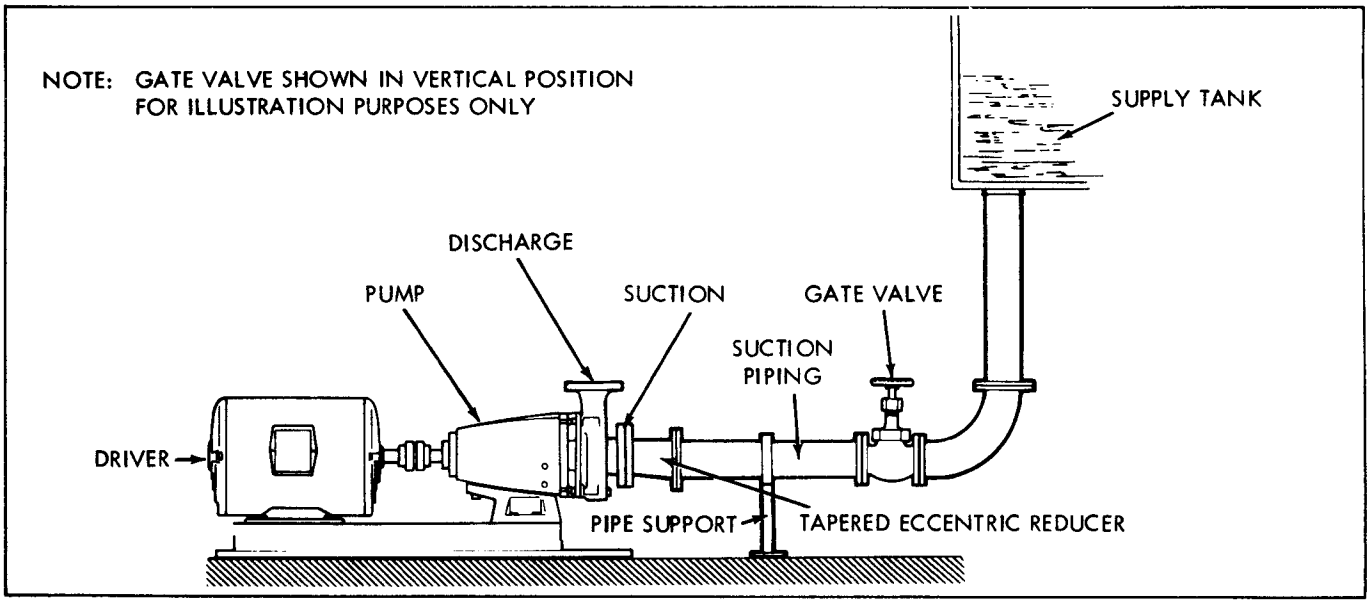


FIGURE 10. RECOMMENDED FLOODED SUCTION PIPING - SHORT AND DIRECT

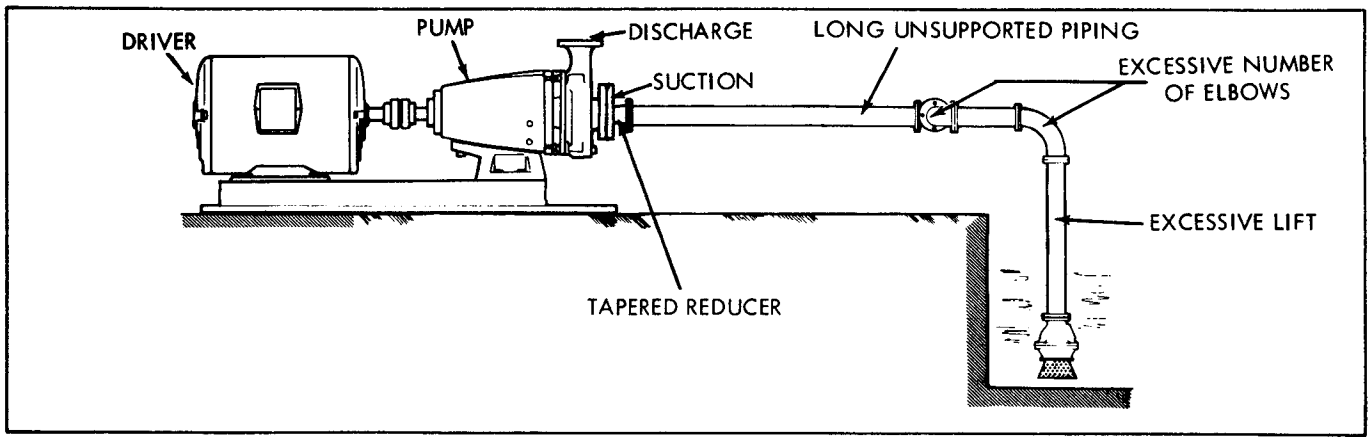


FIGURE 11. UNSATISFACTORY SUCTION LIFT PIPING - LONG AND INDIRECT WITH NO SUPPORT

FRAME MOUNTED INSTALLATION

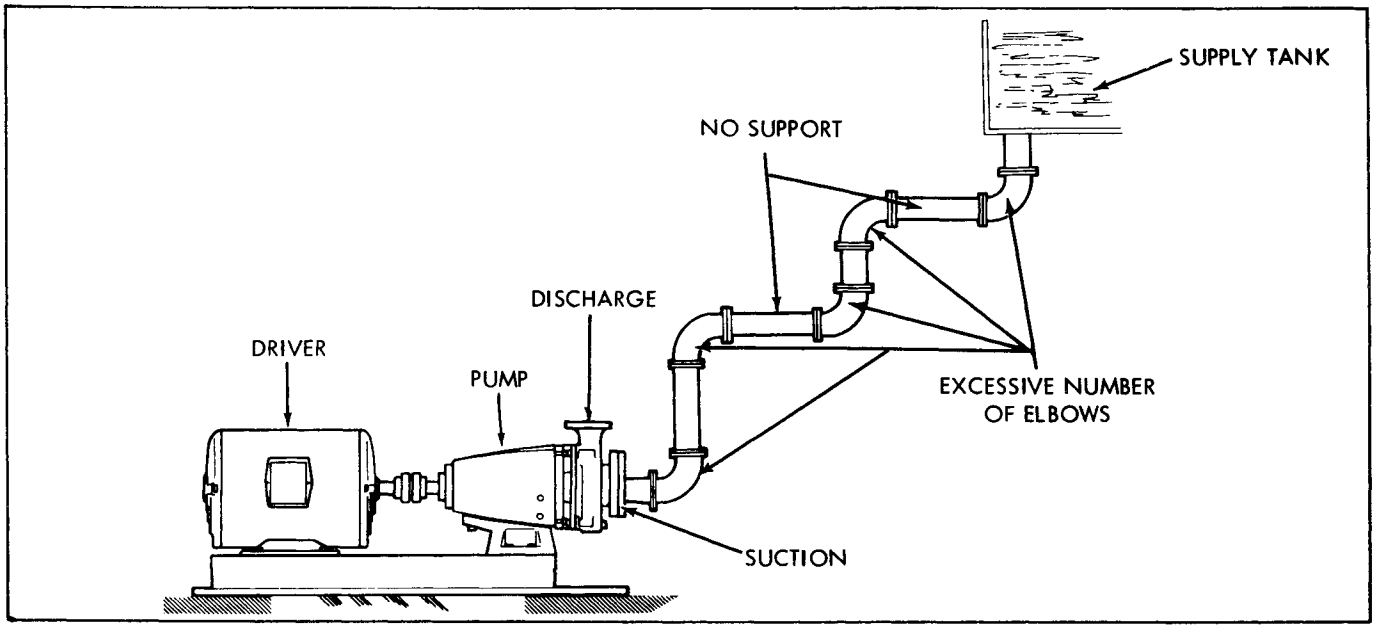


FIGURE 12. UNSATISFACTORY FLOODED SUCTION PIPING - LONG AND INDIRECT WITH NO SUPPORT

ELBOWS. Long radius elbows should be used in place of standard elbows wherever possible, because of their superior flow characteristics. For instance, head loss in a standard four inch elbow is equivalent to the head loss in a piece of pipe 11 feet long, while the head loss in a long radius elbow is approximately half as much. Elbows should not be used at the suction nozzle, but if it is unavoidable, they should be installed in a vertical position. Elbows installed in any position at the suction nozzle have a tendency to distribute the liquid unevenly in the impeller chamber, causing a reduction in capacity, and creating an undesirable thrust condition.

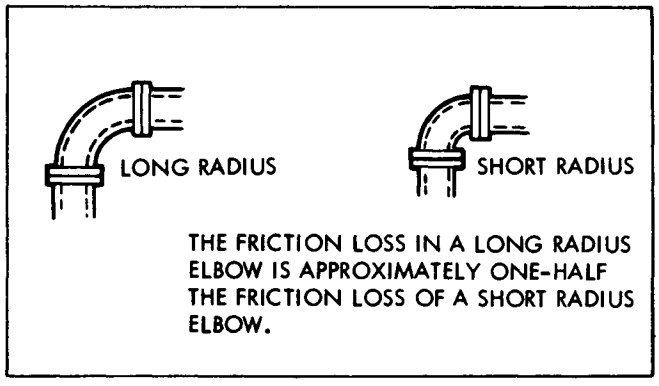


FIGURE 13. LONG VERSUS SHORT RADIUS ELBOWS

REDUCERS. Eccentric reducers should be installed directly at the suction nozzle, with the taper at the bottom to prevent air pockets from forming. Straight taper reducers should never be used in a horizontal suction line because of the air pocket that is formed at the leg of the reducer and the pipe.

DISCHARGE PIPING. Discharge piping should also be short and direct as possible, with few elbows and fittings, to reduce head loss from friction.

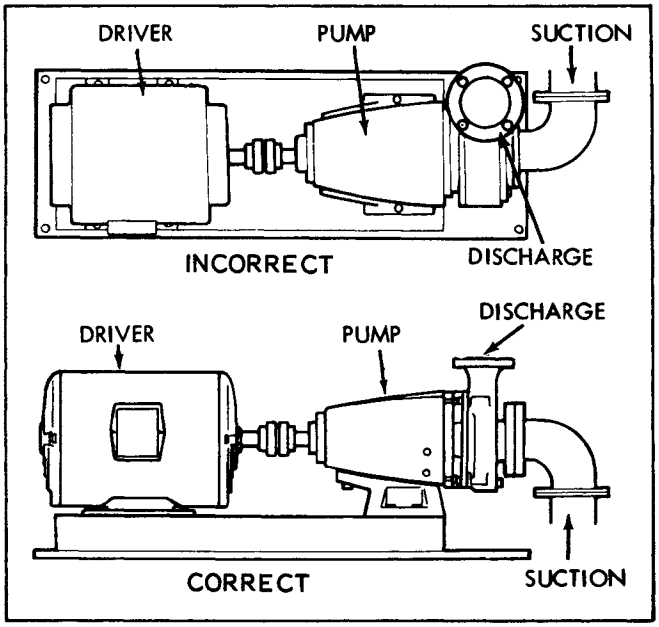


FIGURE 14. ELBOW INSTALLATION IN SUCTION NOZZLE

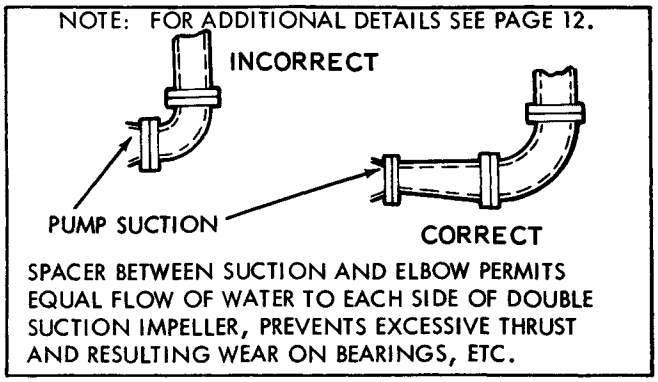


FIGURE 15. REDUCER BETWEEN ELBOW AND PUMP SUCTION NOZZLE

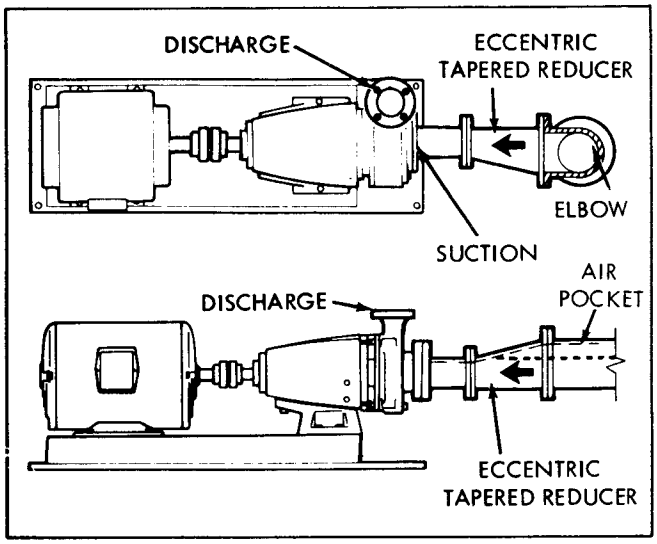


FIGURE 16. UNSATISFACTORY INSTALLATION OF TAPERED REDUCER

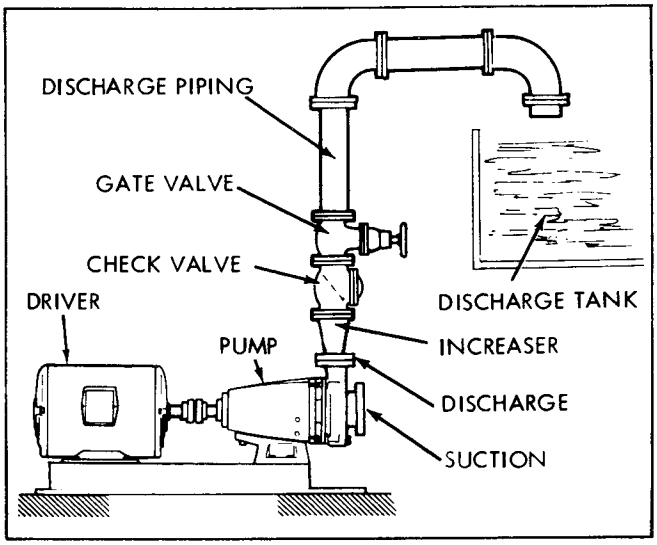


FIGURE 17. RECOMMENDED DISCHARGE PIPING - SHORT AND DIRECT

PIPE. The discharge pipe diameter should be the same as, or larger than, the discharge nozzle diameter. The size of discharge pipe to be used is dependent upon its application.

The recommended pipe diameter can be obtained from your nearest Aurora Pump Sales Office.

ELBOWS. Long radius elbows should be used in the discharge piping as well as in the suction piping to prevent excessive head loss due to friction. Whenever possible, elbows should not be installed directly at the discharge nozzle as the turbulence created by the elbow will affect pressure gauge readings.

REDUCERS AND INCREASERS. An increaser should be installed at the discharge nozzle if larger diameter

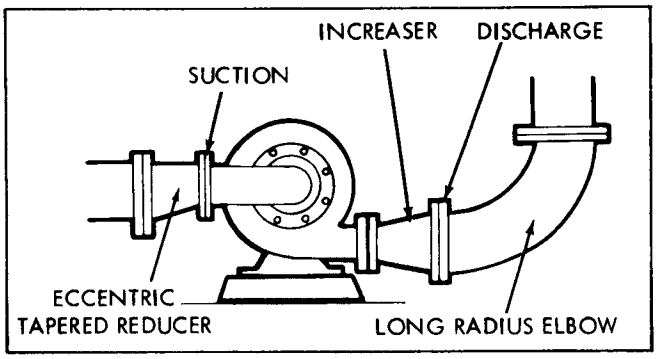


FIGURE 19. REDUCER AND INCREASER INSTALLATION

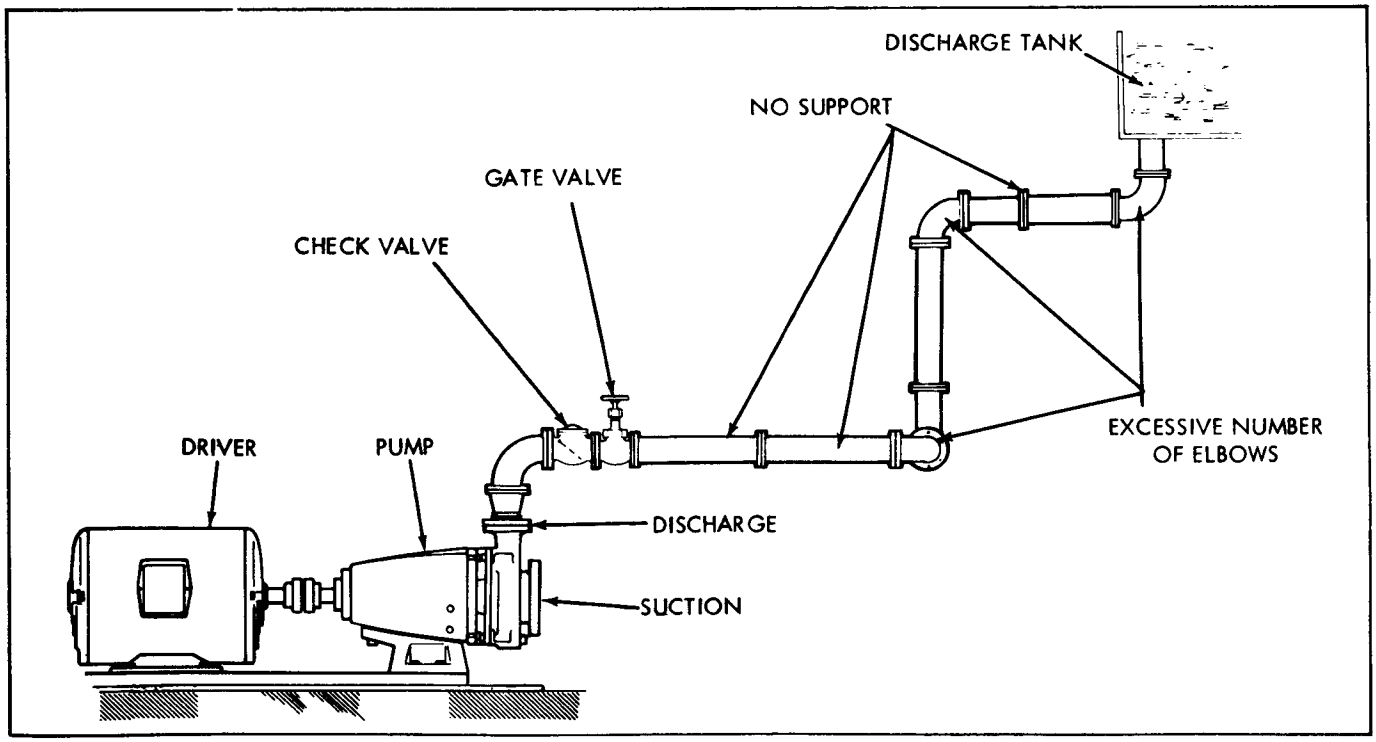


FIGURE 18. UNSATISFACTORY DISCHARGE PIPING - LONG WITH EXCESSIVE ELBOWS AND JOINTS AND NO SUPPORT

discharge piping is used. Straight taper increasers and/or reducers are satisfactory in discharge applications.

EXPANSION JOINTS. Expansion joints are used primarily to prevent the transmission of piping strain, caused by thermal expansion and contraction, piping misalignment, pressure changes, or other causes, to the pump casing. They are also used to suppress any noise that may be transmitted through the piping.

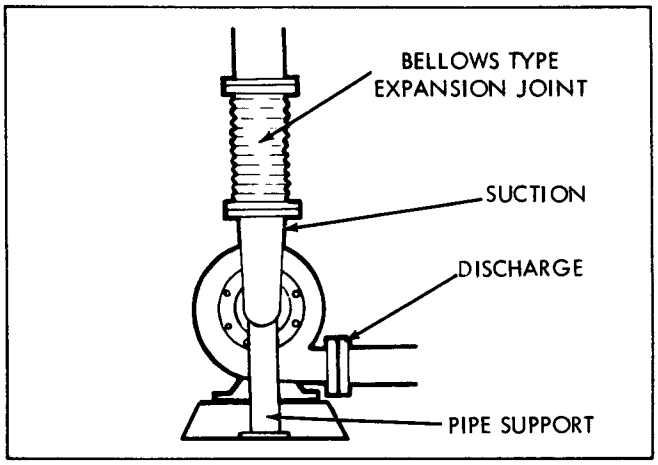


FIGURE 20. EXPANSION JOINT IN SUCTION LINE

It is recommended that the flexible metal type of expansion joint be used, because rubber expansion joints, while costing less, have a tendency to deteriorate, making frequent replacement necessary.

If an expansion joint must be used, an anchor or restraining device should be installed between the joint and the pump to prevent objectional forces from being transmitted to the pump. If an anchor is not installed at this point, a force equal to the area of the joint times the pressure in the pipe is developed and transmitted to the pump. This force may exceed the allowable flange loading, and could result in damage to the pump or piping.

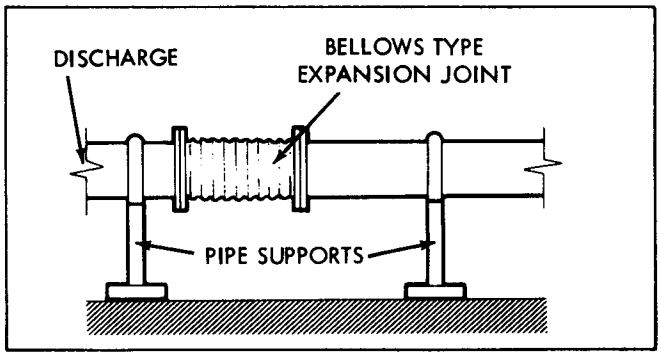


FIGURE 21. EXPANSION JOINT IN DISCHARGE PIPING

PIPE ALIGNMENT. Proper piping alignment is essential before connection is made. Piping alignment should never be achieved by force, this could produce strain on the piping and the pump casing. Proper supports should be installed for the piping to keep its weight off the pump casing.

When flange bolts are used, line up the piping first, then loosely install flange bolts. Check the piping alignment, and tighten the flange bolts until all bolts are tightened securely.

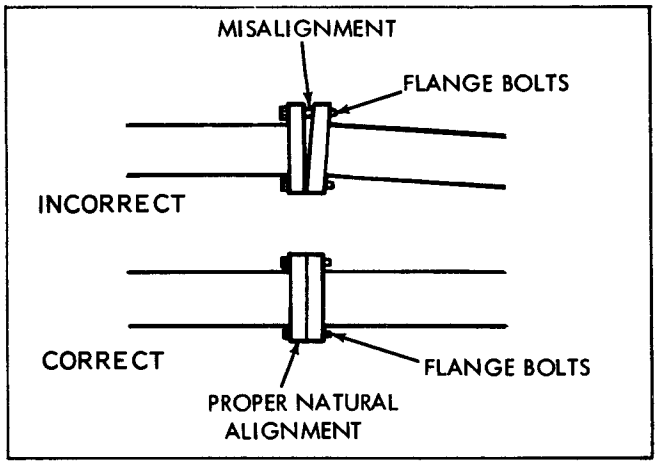


FIGURE 22. PIPE ALIGNMENT

AIR IN PIPING. One of the most common conditions affecting pump efficiency is the formation of air pockets in the suction line. The air pockets are a result of high points and improper installation of elbows, reducers, and valves in the suction piping.

For suction lift applications, lantern rings are required to prevent air from leaking into the pump through the stuffing box, or at the joints.

The pump packings or seal depend on the liquid being pumped for lubrication. Excessive air can prevent proper lubrication with resultant damage to them.

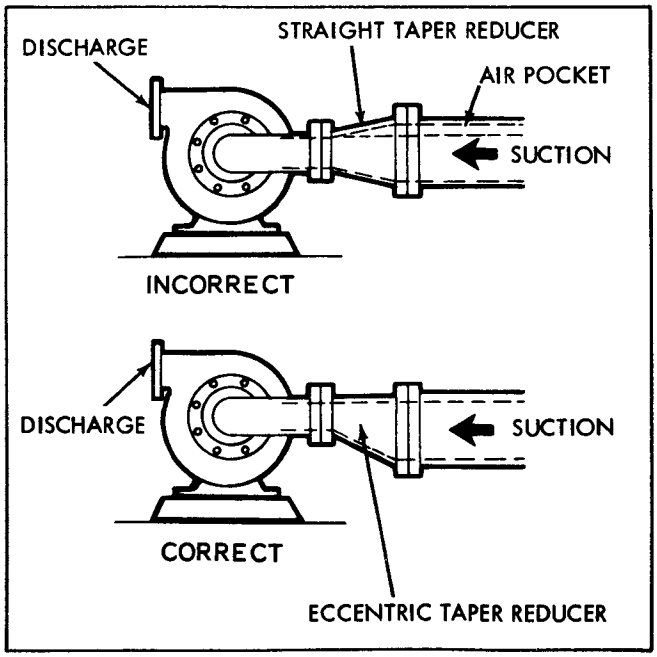


FIGURE 23. AIR POCKETS IN REDUCER

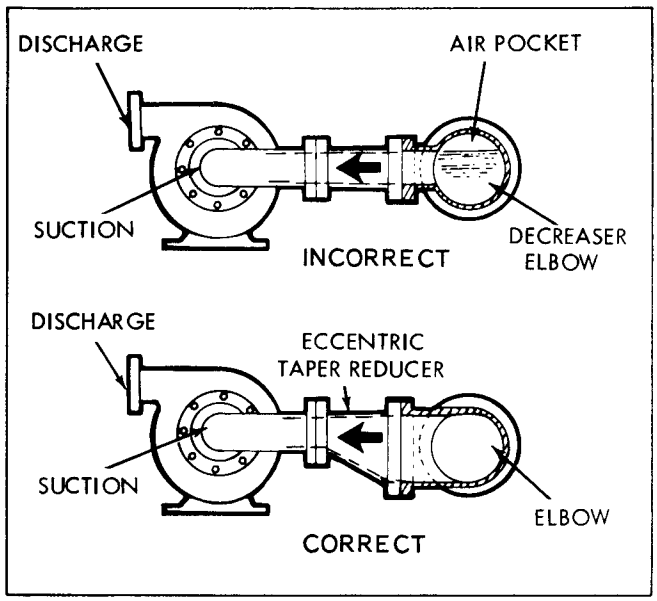


FIGURE 24. AIR POCKET IN ELBOW

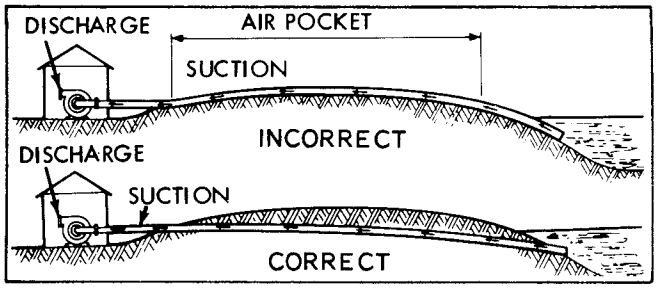


FIGURE 25. AIR POCKET IN HORIZONTAL SUCTION PIPING

In suction lift applications the suction pipe in the liquid well must be sufficiently submerged to prevent exposure of the end of the pipe when the well is at its minimum level and to prevent vortexing action (whirlpool effect) of the liquid at the suction pipe, which will draw air into the pipe. Also, care should be taken to keep the suction pipe located away from the well inlet since the incoming liquid may be carrying air bubbles. Another cause of air in the liquid is dropping of the liquid from too high a point into the well.

VALVES. Valves are an important part of your installation, for they facilitate priming of the pump, and control the volume of the pumped liquid.

SUCTION LIFT. In suction lift applications where the suction lift is low a foot valve can be installed, to maintain the prime on the pump. A foot valve is essentially a check valve, allowing flow in one direction only toward the pump. When the pump is shut down, the pressure of the liquid returning to the well, causes the valve to close, retaining the liquid in the suction line.

A slow closing check valve should be installed when the static discharge head is high. A foot valve should not be used under these conditions, as failure of the driver would allow the water to rush back rapidly thus causing a heavy water hammer.

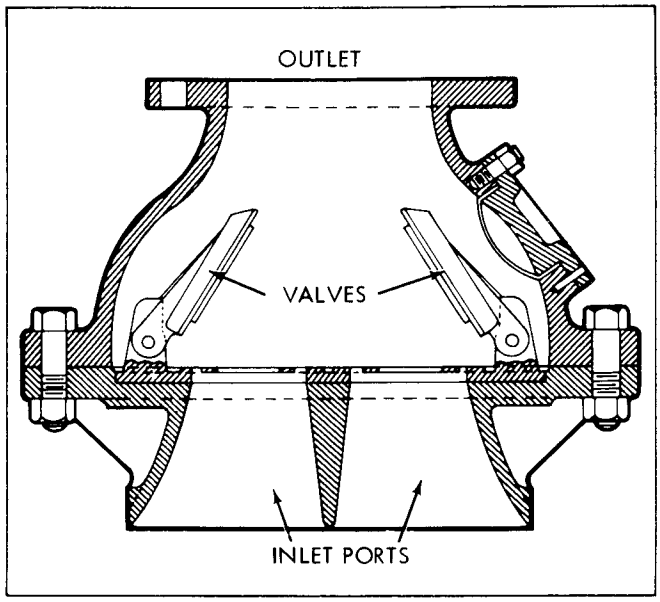


FIGURE 26. FOOT VALVE

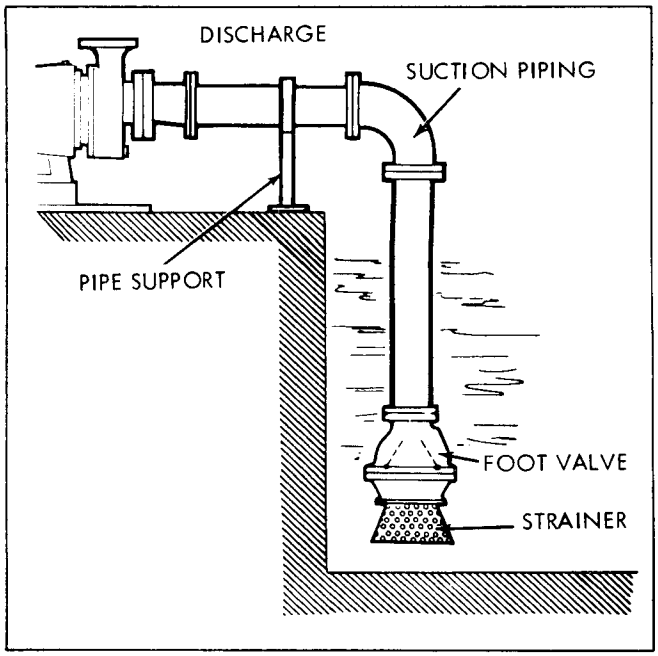


FIGURE 27. FOOT VALVE INSTALLED WITH SCREEN

Foot valves, when used, should be of the flat type rather than multiple spring type. The valve should have a large inlet area, because the friction loss in a foot valve is high. Install check and foot valves as indicated by arrow to ensure proper installation.

FLOODED SUCTION. When the liquid source is above the pump centerline, a flooded suction condition exists, and a gate valve is required to shut off the liquid supply for pump inspection and maintenance. The gate valve should be installed with the stem in a horizontal or downward position to prevent formation of an air pocket in the valve.

DISCHARGE VALVES. Tne discharge piping should include a check valve and a gate valve. The check

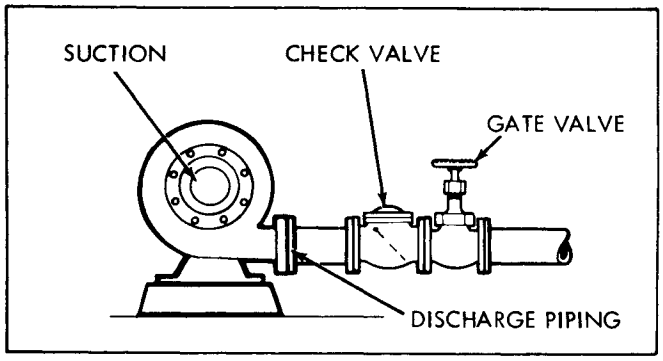


FIGURE 28. GATE VALVE AND CHECK VALVE

valve should be located between the gate valve and the pump. If an increaser is used in the discharge piping, the increaser should be installed between the pump nozzle and the check valve. The check valve protects against a reverse flow of the liquid if the driver fails.

The gate valve is used in the priming operation, as a throttling valve to control pump volume, and to shut down the pump for inspection and maintenance.

AIR VENT VALVE. Vent valves are installed at the high points in the pump casing to allow air or vapor to escape. These valves are used to release trapped air from the pump casing during priming and when pump becomes air bound.

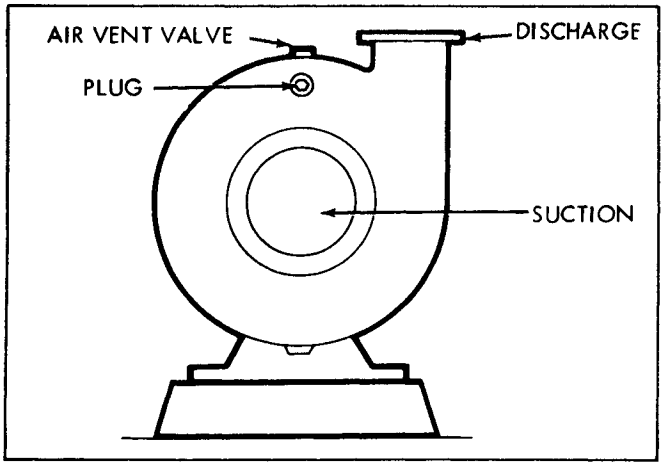


FIGURE 29. AIR VENT VALVE OR PLUG

STRAINERS AND SCREENS. It is important to screen the suction piping to remove foreign matter that can clog the pump and impair its capacity, or stop it completely. Small particles such as sand, dirt, scale from inside pipe and other extraneous materials can get into the close clearance parts of the pump and cause considerable damage to the parts.

Strainers should be selected so as to have a total area of holes equal to at least four times the suction pipe area.

In applications where sticks, twigs, leaves and other large debris are present, a larger outside screen should be placed around the suction inlet to prevent choking of the strainer. This screen should have sufficient openings so that flow velocity does not exceed two feet per second.

PRIMING THE PUMP. Your pump will not operate satisfactorily until it is primed. All air must be expelled from the suction piping and pump casing, and replaced by the liquid to be pumped. There are several methods of priming pumps. The one you select will depend on your specific requirements.

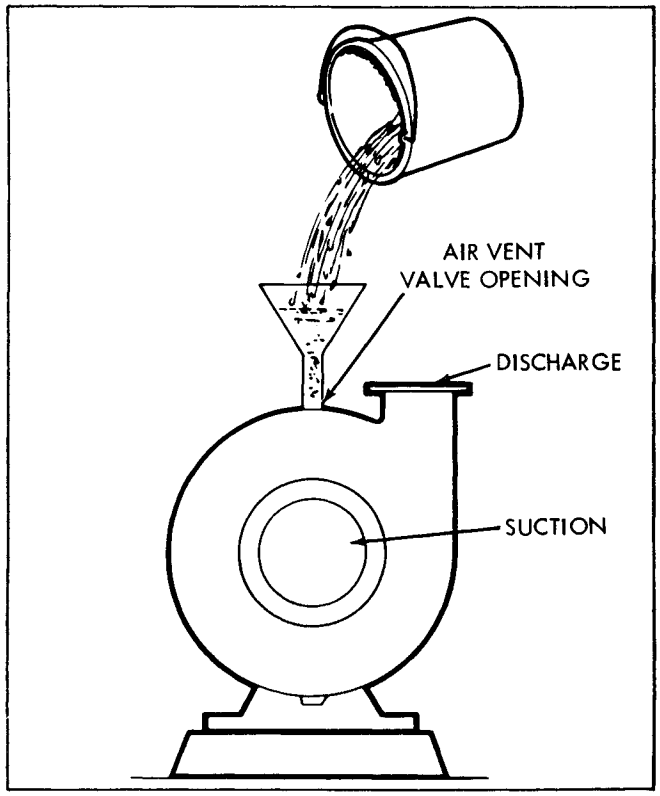


FIGURE 30. PRIMING BY HAND

FLOODED SUCTION PRIMING. This method of priming a pump is relatively simple. The liquid source is located above the pump, and all that is necessary to prime the pump is to open the air vent valve or plug in the pump casing, and to crack the gate valve in the suction line. The suction line and pump should be filled slowly until a steady stream of liquid is observed flowing from the air vent. After your pump is operating, it is recommended that the air vent valve or plug be opened again to insure that all air has been expelled from the pump casing.

FOOT VALVE PRIMING. A foot valve can be used for priming on suction lift applications. The foot valve located at the bottom end or foot of the suction piping, functions as a check valve which allows flow in one direction only, toward the pump.

Initial priming is accomplished by completely filling the suction piping and pump casing with the liquid to be pumped. This can be done by removing the air vent valve or plug at the top of the pump casing and inserting a pipe nipple in the orifice, with an appropriate increaser to accommodate a hose connection.

A priming line can also be inserted in the discharge piping between the check valve and the pump or the priming can be done with a bucket and funnel. The important thing is to completely fill the suction pipe and pump casing with liquid.

When the pump is started, the vacuum created by pumping the priming fluid, combined with atmospheric pressure in the liquid well, forces liquid into the suction piping, thus opening the foot valve and keeping it open until the pump is shut down. When the pump is shut down, the liquid being pumped reverses its flow, causing the foot valve to close, trapping the liquid in the suction piping and pump casing, thus maintaining a prime on the pump.

VACUUM PRIMING. Vacuum priming consists of removing air from the pump casing and suction piping and drawing liquid into them by means of a vacuum creating device. The types of vacuum equipment range from a simple hand pump to complex central priming systems. Your specific priming requirements will govern what type of vacuum primer to use.

AIR EJECTOR. One type of vacuum primer is the air ejector. If liquid under pressure or steam is available, an ejector can be used. The ejector is connected to the air vent orifice. A stream of the ejecting medium is passed through the ejector creating a vacuum in the ejector, and drawing air from the pump casing and suction piping. When liquid flows steadily from the ejector discharge pipe, the pump is primed.

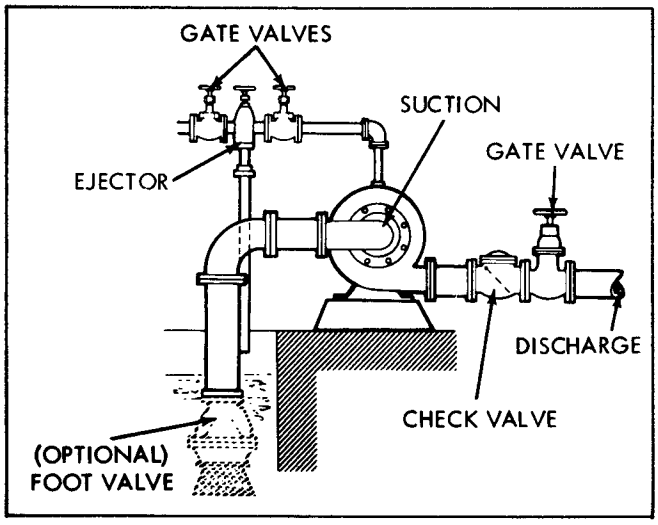


FIGURE 31. PRIMING BY EJECTOR

VACUUM PUMPS. Rotary or reciprocating pumps are frequently used as vacuum pumps. They fall into two categories, wet-vacuum and dry-vacuum. The principle of operation is essentially the same, however, the dry-vacuum pump cannot accommodate a liquid and air mixture while the wet-vacuum pump can accommodate liquid, air or a combination of both.

Vacuum pumps can be installed as part of a central priming system servicing many pumps, as an automatic priming system, or as a manually controlled independently driven pump.

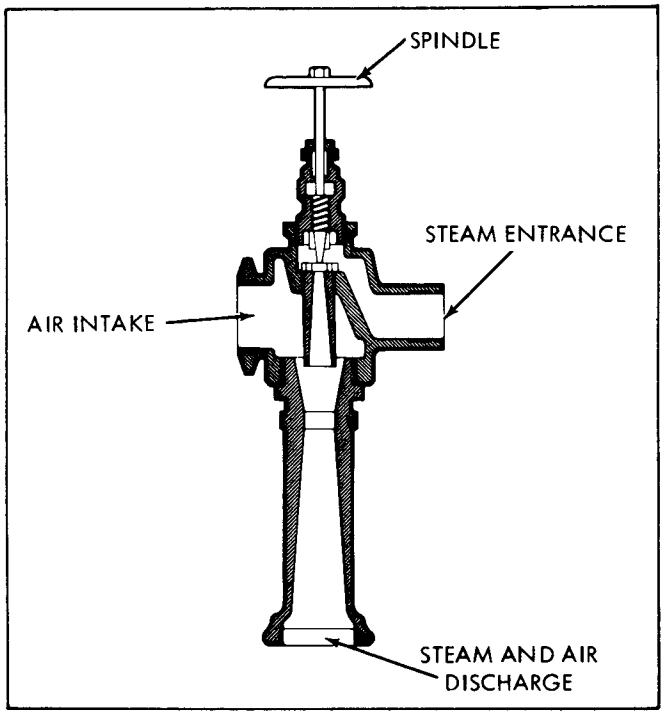


FIGURE 32. EJECTOR CUTAWAY

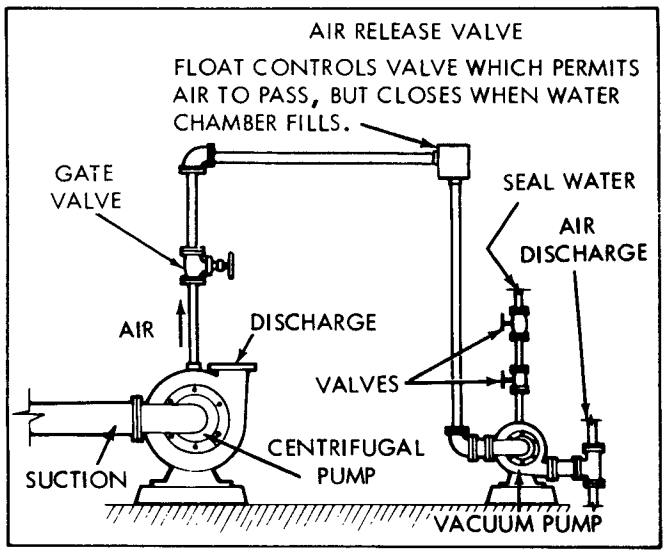


FIGURE 33. PRIMING BY VACUUM PUMP

The suction piping of the vacuum pump is connected to the air vent orifice on the pump to be primed. The vacuum produced by the vacuum pump removes air from the centrifugal pump suction piping and casing, and draws liquid from the liquid well into the centrifugal pump. Dry-vacuum pumps must be installed so that no liquid is taken into the air pump. Installation of a water trap, or use of a vacuum tank are recommended for dry vacuum pumps.

INDUCTOR PRIMING. On suction lift applications it may be desirable to prime your pump with a priming inductor. This type of primer is comprised of a liquid nozzle and an inductor at the foot end of the

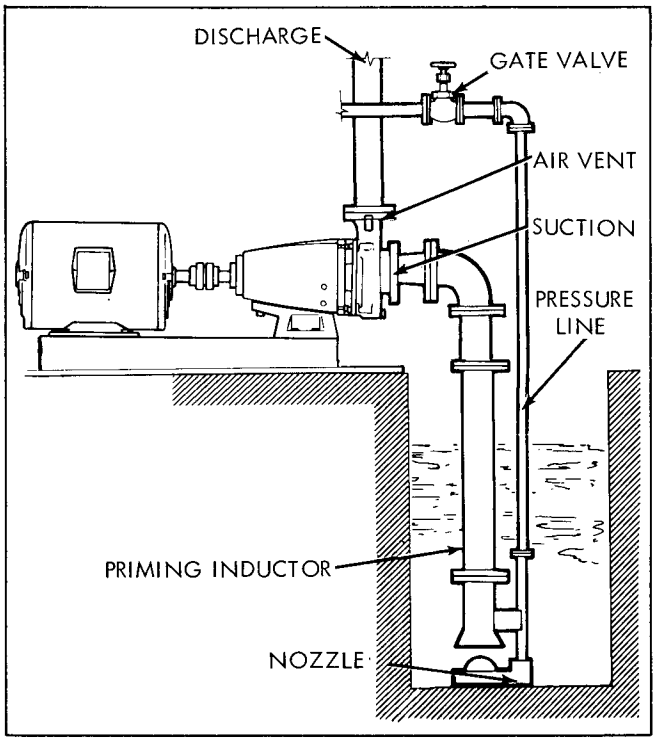


FIGURE 34. PRIMING BY INDUCTOR

suction piping. The nozzle and inductor are connected to a high pressure liquid supply such as a city water service.

The pump is primed by opening the valve in the pressure line, which allows the liquid to flow through the nozzle into the inductor. The velocity of the high pressure liquid drives the liquid into the suction piping and up to the pump, priming it.

ELECTRICAL WIRING. Normally, your pump will be supplied with an attached drive motor. The motor should be wired in accordance with the wiring diagram found on the motor name plate. Be sure the voltage, frequency, and phase of your power supply corresponds with the name plate data. It is advisable to provide a separate switch and overload protection for your pump motor to protect against power failure in some other area. Conversely, if the pump motor develops electrical problems, it will be isolated from other equipment.

PRESTARTING INSTRUCTION. The coupling halves should be connected. Prior to connection however, the drive motor should be started to make sure the direction of roatation is the same as the direction indicated by the arrow on the pump casing.

WARNING: On all 350 series pumps and the 364A with a 15" impeller on a #21 power frame, reverse rotation will destroy the pump.

After you are sure the motor is rotating clockwise you can couple the motor to the pump. Again, after coupling but BEFORE starting it is important to check coupling and shaft alignment. Use a standard dial indicator to align the motor shaft and pump shaft to within .003"-.005".

The suction and discharge piping should now be connected to the pump, and the pump primed.

CAUTION

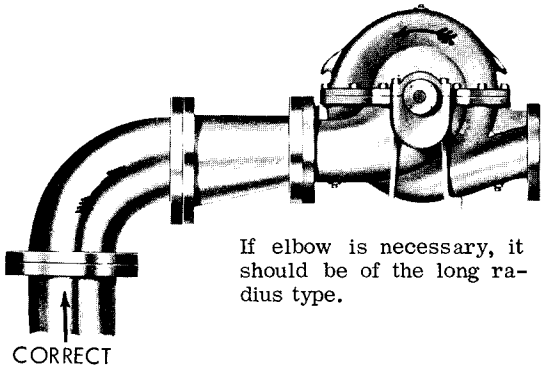
Do not operate the pump without liquid. Pump seals or packing depend on the liquid being pumped for lubrication.

Open or close the various valves as required by your specific application. Start the pump and bring it up to operating temperature. After the temperature has stabilized, the pump should be shut down and the alignment rechecked. It will be necessary to check the alignment with the coupling halves both connected and disconnected.

Remember, any alignment adjustment made in one direction may affect the other direction so extreme care should be taken when final adjustment is made.

Make sure all pump, motor and base plate mounting bolts are firmly tightened down.

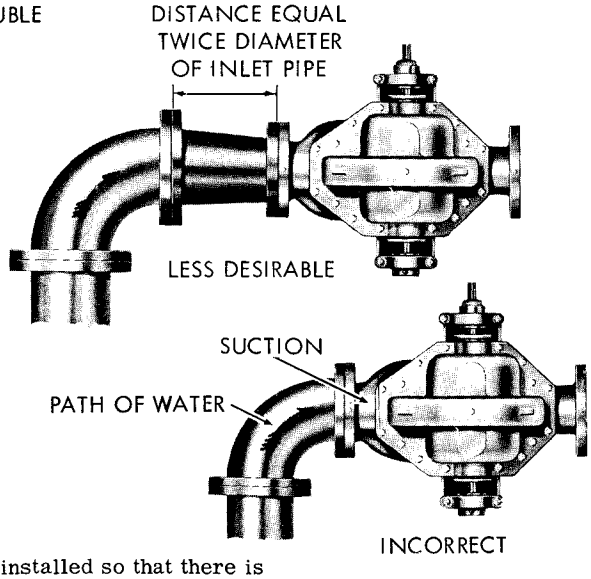
SPECIAL SUCTION PIPING SPECIFICATIONS FOR HORIZONTAL DOUBLE SUCTION PUMPS FOR ADDITIONAL DETAILS SEE PAGE 6



If elbow is necessary, it should be of the long radius type.

CORRECT

Discharge piping and suction piping should be supported close to the pump flange to prevent vibration and strain on pump casing.



The suction pipe on horizontal double suction pumps, should not be installed so that there is an elbow close to the suction nozzle unless the elbow is mounted vertically. There is always an uneven flow of liquid through an elbow and when the elbow is installed at any angle other than vertical more water will enter one side of the impeller than enters the other side. This causes a reduction in capacity and efficiency and creates an axial thrust load which may over heat and possibly cause rapid wear of the thrust bearing.

AP-Sect. 2-Item 2

AURORA®
Pentair Pump Group

INSTRUCTION MANUAL
REPAIR
MODEL 431B

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

Model 431B pump is available with four options for lubricating and shaft bearings. They are:

1. Regreasable (standard)
2. Oil Lubrication
3. Regreasable, Water-Cooled
4. Oil Lubrication, Water-Cooled

Regreasable bearings will require periodic lubrication and can be accomplished by using the zerk or lubrication fittings in the cartridge cap. Lubricate the bearings at regular intervals using a grease of high quality. Aurora recommends Amoco Rykon No. 2 grease, however, most major brands of Grade No. 2 ball bearing grease are satisfactory 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. 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 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.

Oil lubricated bearings are optional on all Model 431B pumps. A fixed oil level is maintained within the bearing cartridge by an oiler which allows visual indications of reserve oil.

At initial installation and before starting a unit that has been shut down for repairs or for any extended length of time, run enough 10/20 weight motor oil through the oiler to maintain a constant oil level to insure that the bearing will never be without an oil supply. Oil will have to be added at intervals to maintain a constant level in the oiler. This interval can only be determined by experience.

Under working conditions, oil will breakdown and need to be replaced at regular intervals. The length of these intervals will depend on many factors. Under normal operation, in clean and dry locations, the oil should be changed about once a year. However, when the pump is exposed to dirt contamination, high temperatures (200° F. or above) or a wet location, the oil may have to be changed every 2 or 3 months.

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 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

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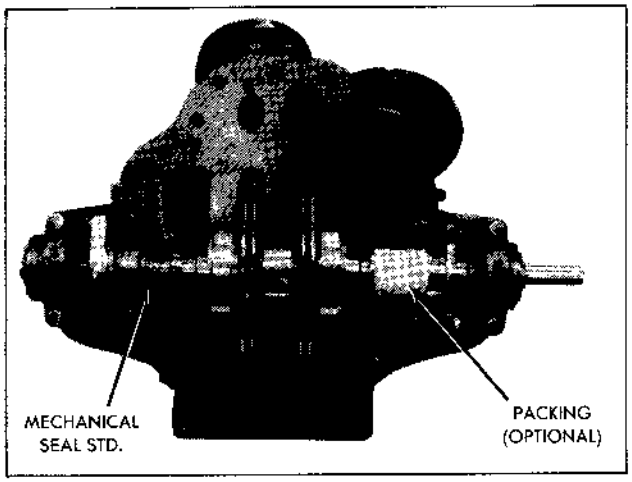
AURORA, ILLINOIS

reused. All optional 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 to the manufacturer for repair only the motor and motor controller.



A. Upper casing, gland halves, and bearing cap removed.

Disassembly of Model 431B (Refer to Figure 4.)

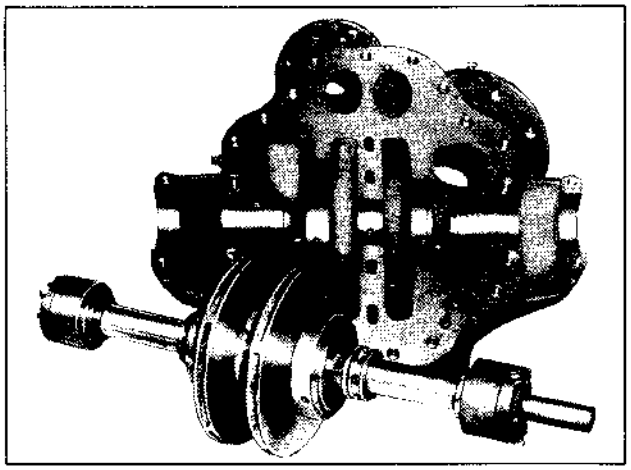
1. Break the electrical connection to motor or take similar steps to make certain that drive unit will not be unintentionally energized during disassembly.

2. Close such valves or flow-control devices necessary to make certain that flow of liquid will not take place during disassembly.

Note

Discharge and suction piping need not be disturbed unless complete pump assembly is to be removed.

3. Drain liquid from pump by removing plugs (1 and 2). Disconnect by-pass lines if applicable.



B. Rotating element removed from lower casing.

4. Loosen and remove capscrews (6) securing upper casing (8) to remainder of pump assembly.

NOTE

Disassembly procedure from this point covers pumps having standard mechanical seals. If pump has optional packing, refer to specific instructions located at the end of the disassembly instructions.

5. Loosen and remove nuts (18), washers (19), and clamps (20) holding gland to casing.

CAUTION

Use extreme care in loosening nuts and freeing gland. Gland is under spring pressure from the mechanical seal. Nuts (18) should be loosened evenly to allow gland to separate from casing evenly. To prevent damage to stationary mechanical seal seat, mounted in gland, the gland should be wrapped in a clean shop cloth or other protective coating to prevent the seat from hitting the shaft during movement of the rotating assembly.

6. Loosen and remove capscrews (7) at stuffing box and remove swing bolts (22).

7. Making certain that all securing capscrews are removed, carefully remove upper casing (8) using hoist or crane with sling attached to cast hooks.

8. Remove gasket (9) and scrape mating surfaces of casing halves to remove pieces of gasket which may have adhered in separation. Take care not to scratch or mar surface of casing halves.

9. Separate couplings connecting pump shaft and motor.

10. Remove the four capscrews (25) securing the two bearing caps (26). Mark both caps to insure correct replacement and orientation on the respective bearing arms. NOTE: Bearing caps must be replaced as installed by the factory or premature bearing failure could result. Lift off bearing caps (26) and pins (27).

11. Assuming that further work is required on shaft and impeller assembly, use properly secured rope slings and hoist or crane as required to lift it from lower pump casing (74) and place it on suitable bench or work surface.

CAUTION

Take care not to dent or damage impeller and/or other parts. Use of a supporting cradle or work stand is recommended.

12. Slide pump half of flexible coupling off shaft (71) and remove key (24). Pry up on end of key so as not to damage shaft. If preferred, key may be removed by carefully tapping from outer end with a brass drift or similar non-marring tool, using a small hammer.

13. Remove casing wearing rings (28).

14. With shaft and impeller assembly on a suitable bench, cradle, or work stand, loosen and remove pipe plug (12) and grease zerks (10) from cartridge caps (32 and 42). If pump has oil lubrication option, remove breather cap from top of cartridge caps and remove oiler and connecting nipple. If pump has water-cooled option, remove water inlet and outlet piping.

15. Loosen and remove capscrews (31) from cartridge cap (32). Outboard shaft end protector (29) may be removed from its recess in outboard cartridge cap at this time if necessary.

For pumps equipped with water-cooled bearing caps, loosen and remove capscrews (31 and 89) and cover plate (84) from cartridge. Remove the four capscrew sealing "O" rings (81 - PS #2 only), along with the ID "O" ring (82) and OD "O" ring (83) from the cartridge caps (32).

16. Loosen and remove locknut (77) and slide lock washer (35) off of outboard end of shaft. Outboard bearing (38) is press fitted onto shaft (70). To remove it, place a bearing puller on bearing cartridge (36) and pull cartridge, lip seal (37), and bearing from shaft. Bearing can then be removed from cartridge and lip seal pressed out of cartridge.

17. Remove inboard bearing (47) using a bearing puller in the identical fashion as the outboard bearing.

18. One piece gland (49) used with mechanical seal assembly can now be removed from shaft. "O" ring (50) can be removed from seal gland along with the mechanical seal stationary seat.

CAUTION

Exercise great care in removing seal assembly (53) to keep from marring or otherwise damaging precision ground mating surfaces where it meets seal collar (54).

19. Scribe a mark on shaft sleeves for relocating seal collar on reassembly. Loosen setscrews (55), securing seal collars (54) to shaft sleeves and slide them off.

20. If unit has right hand rotation, unscrew and remove outboard sleeve (57) first. Remove "O" ring (58). If unit has left hand rotation, unscrew and remove inboard sleeve (65). Remove "O" ring (66).

21. On right hand unit, balance of the parts will be removed as follows: Pull or tap impeller (59) off shaft (71) using care not to damage impeller. Remove "O" ring (60). Slide casing bushing (61) off separator sleeve (62). Pull separator sleeve, "O" ring (64), and impeller (67) off shaft. Remove "O" ring (66) and key (68). Unscrew and remove shaft sleeve (65).

Left hand unit disassembly will begin with impeller (67) and end with sleeve (58).

22. Remove locking and locating pins (63, 69 and 72) from lower casing half (74).

23. Nameplate (76) and its securing screws (75) should only be removed if replacement is necessary.

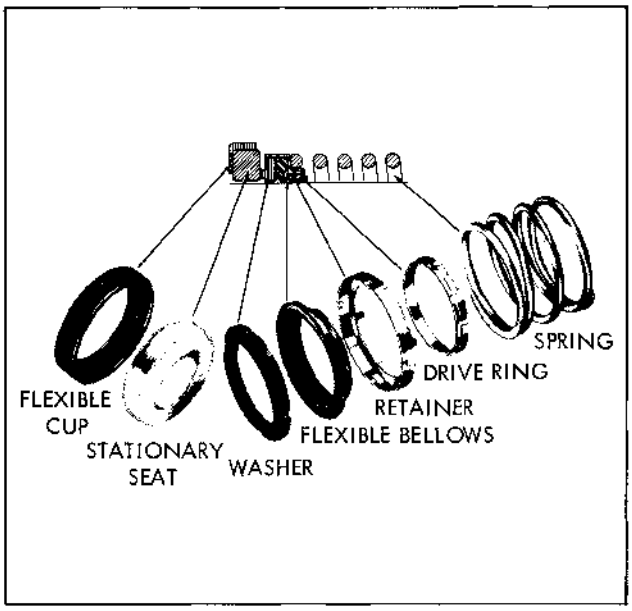


Figure 1. Mechanical Seal

Disassembly of Pumps with Optional Packing

1. Disassembly of pumps equipped with packing will be similar to disassembly of pumps equipped with mechanical seals except as follows.

2. The gland (21) is of split design that can be removed after the nuts (18) are sufficiently loosened to allow the gland clamp (20) to slide off gland ears.

3. After the cartridges and slingers are removed, slide the six ring packing set (23) off the shaft. Slide the throttle bushing (56) off the shaft. Used packing sets should be replaced during any pump repair operation. These packing sets consist of two different types of high temperature packing rings. The sets consist of 6 rings arranged with metallic and plastic packing rings in the order of metallic-plastic-plastic-metallic-plastic-metallic. This is the order of the rings from the impeller side of the stuffing box to the gland end of the stuffing box.

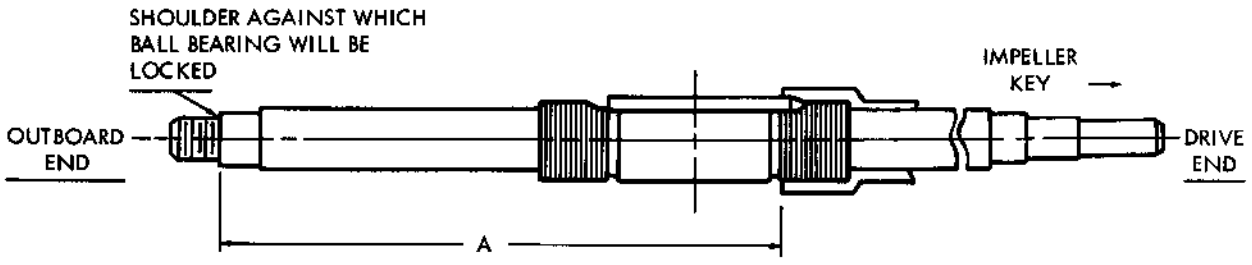
Reassembly of Model 431B (Refer to Figure 4.)

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 locating pins (72) in lower casing (74). Install wearing ring pins (69) and casing bushing pins (63). Tap pins gently to seat them in place.

If nameplate (76) was removed, install it with screws (75).

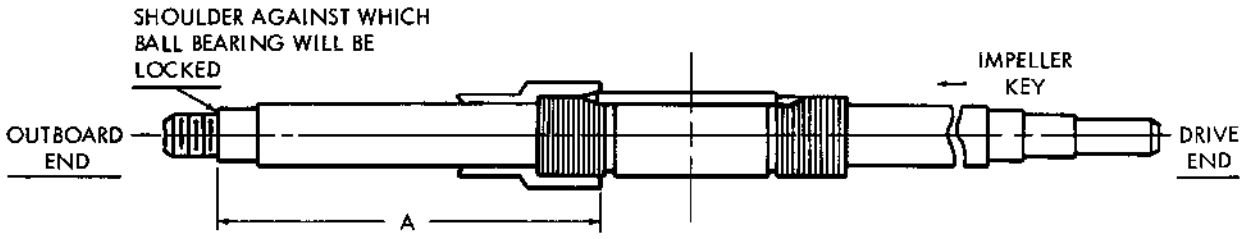
TWO STAGE PUMP SHAFTS
LOCATION OF SHAFT SLEEVE ON SHAFT
R.H. ROTATION



POWER SERIES	PUMP SIZE	A
2	1-1/2 x 3 x 9 2 x 4 x 9	12-49/64
3A	1-1/2 x 3 x 11 2 x 4 x 11	14-59/64

Figure 2

TWO STAGE PUMP SHAFTS
LOCATION OF SHAFT SLEEVE ON SHAFT
L.H. ROTATION



POWER SERIES	PUMP SIZE	A
2	1-1/2 x 3 x 9 2 x 4 x 9	6-57/64
3A	1-1/2 x 3 x 11 2 x 4 x 11	7-59/64

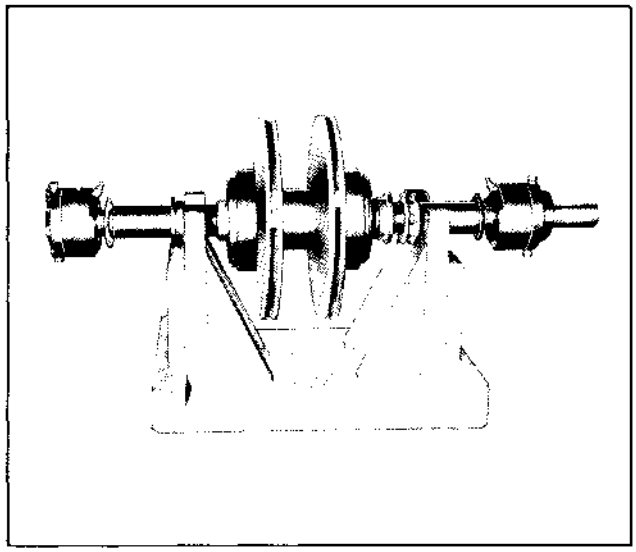
Figure 3

2. On a right hand unit, thread inboard sleeve (65) onto shaft (71) distance "A" (refer to Figure 2). On a left hand unit, thread outboard sleeve (57) onto shaft distance "A" (refer to Figure 3). When the sleeve is in position, its keyway should align with keyway on shaft. Coat key and keyway with Loctite Sealant Grade 242. Insert key (68) into keyways of shaft and sleeve. Tap key firmly in place.

3. On right hand unit proceed to assemble the rotating element as follows:

Place "O" ring (66) into groove on face of shaft sleeve (65) and slide impeller (67) onto shaft (71). A small amount of silicon or grease is useful in holding "O" ring into groove until impeller is tightened against it.

Place "O" ring (64) into groove on separator sleeve (62) and slide onto shaft and against impeller. Place casing bushing (61) over separator sleeve. Place "O" ring (60) into groove on separator sleeve and slide impeller (59) in place. Place "O" ring (58) into groove of shaft sleeve (57) and thread shaft sleeve (57) tightly onto shaft (71).



C. Rotating element placed in a protective cradle for further disassembly.

NOTE

When assembling rotating element of a 431A Series Pump it is important that the curve of impeller blades is in agreement with pump rotation.

CAUTION

Carefully check to see that the proper shaft sleeve has been keyed into place for rotation of pump. If the correct shaft sleeve is not keyed onto the shaft, it can spin loose during operation of pump and cause extensive damage.

4. Install mechanical seals and optional packing according to the following specific instructions:

Mechanical Seal, single.

I. Slide one seal lock collar (54) with setscrews (55), with spring shoulder facing away from impeller, onto each end of the shaft. Position on scribe made during disassembly and lock in place.

II. Put a coating of mechanical seal lubricant, or if not available, a blend of non-abrasive dishwashing soap and water on shaft sleeve. Check rotating parts of seal to make sure they are clean. Spread a light coating of the mechanical seal lubricant on inside diameters of flexible bellows.

III. Place the seal's spring first onto the shaft sleeve, followed by the rotating element of the seal, being sure the carbon rotating face is pointed away from the seal lock collar (54).

IV. Thoroughly inspect cavity of seal gland (49) for burrs or nicks which could damage the seat of seal. Liberally apply mechanical seal lubricant to the gland bore as well as to the stationary seat seal. Press the seal seat evenly and squarely into the cavity of the seal gland.

NOTE

If it is not possible to insert seat with fingers, place a cardboard protecting ring furnished with seal over the lapped face of seat and press into place with a piece of tubing having end cut square. Tubing should be slightly larger than the diameter of shaft. Remove cardboard after seat is firmly in place.

CAUTION

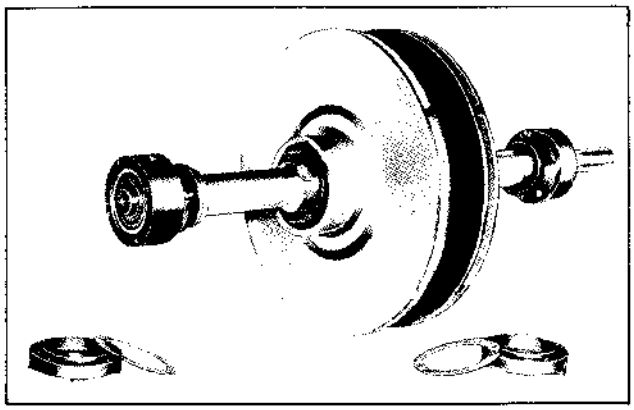
Never place a mechanical seal into service after it has been used without replacing or relapping stationary seat and washer faces.

V. Place "O" rings (50) around seal glands (49) and slide seal glands onto ends of shaft.

Optional Packing

a. Slide throttle bushings (56) onto each end of shaft.

b. One packing set (23) consisting of 6 rings of high temperature packing is required for each stuffing box. Slide packing set onto shaft in the ring order as noted in the previous section of pump disassembly with optional packing. Confirm that the butt cuts in the packing are staggered so that the pump will not leak excessively.

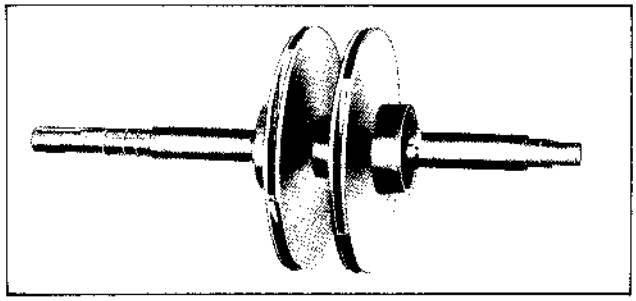


D. Bearing cartridge cap and gasket removed from shaft.

6. Place slinger (39) onto outboard end of shaft (71).

7. Press grease seal (37) into bearing cartridge (36). Place outboard double row ball bearing (38) in bearing cartridge and press parts onto outboard end of shaft until bearing is against shoulder of shaft. Slide bearing lock washer (35) onto the shaft with the concave side facing out. Thread locknut (77) onto shaft and tighten nut until the groove of the nut aligns with one of the tangs of the lock washer (35). Bend the aligned tang into the groove of the lock nut (77). Place gasket (34) and cartridge cap (32) in position and secure it with capscrews (31).

For water-cooled option, position ID "O" ring (82) and OD "O" ring (83) into the grooves located in the cartridge cap (32). Place the four capscrews (31) into the holes of the cover plate (84) and slide the four small bolt "O" rings (81 - PS #2 only) onto the shoulders of the capscrews (31). Place the cover plate (84) onto the cartridge cap (32) insuring the four capscrews (31) pass through the holes in the cartridge cap (32) and lock the cover plate (84) in place using the four small capscrews (89). Place gasket (34) into position on bearing cartridge (36) and secure the cartridge cap/cover plate subassembly to the bearing cartridge using the four capscrews (31) that were previously mounted through the cap.

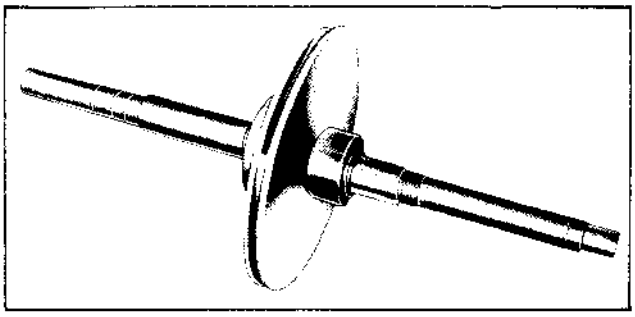


E. Inboard and outboard bearings and bearing cartridges removed.

NOTE

Both grease zerk holes in bearing cartridges and pipe plug holes in cartridge caps must be facing in opposite directions when assembled.

8. Protector (29) can be placed in cartridge cap.



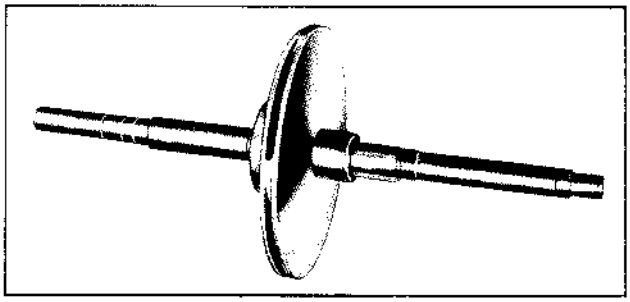
F. Shaft sleeve and outboard impeller removed from shaft.

9. Place slinger (48) on inboard end of shaft.

10. Press grease seal (46) into bearing cartridge (45). Place inboard ball bearing (47) in bearing cartridge and press this assembly onto inboard end of shaft.

11. Press grease seal (43) into cartridge cap (42). Position gasket (44) and cartridge cap against bearing cartridge and secure it in place with capscrews (41). Be sure to align grease zerk holes and pipe plug hole on opposite sides. For water-cooled cap proceed as in step 7.

12. Place grease zerks (10) in bearing cartridges and pipe plugs (12) in bearing caps. If pump is oil lubricated, breather tubes are placed in each bearing cartridge. Oilers with nipple are placed in cartridge caps.



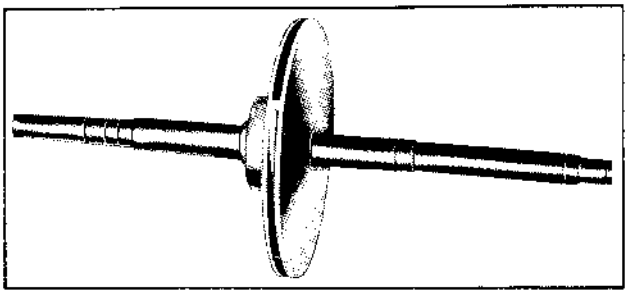
G. Casing bushing removed from impeller separator sleeve.

13. Slide casing wearing rings (28) over impeller suction hubs and set rotating element into lower casing (74). Make certain that drill holes in bottom surface of casing wearing rings are located over pins (69). The drill hole in casing bushing (61) is over pin (63) previously set in lower casing (74).

NOTE

Grease zerks should face up.

14. Install key (24) in motor end of shaft (71). Check positioning and alignment of packing rings or seal components.



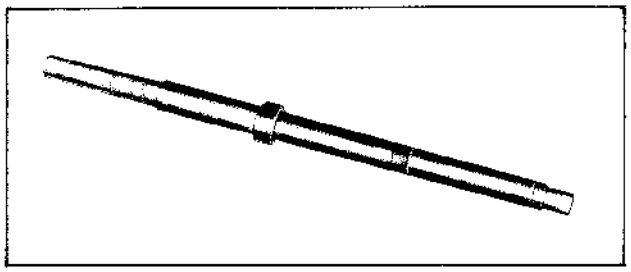
H. Impeller separator sleeve removed from shaft.

15. Place pins (27) into bearing cartridges. Place bearing caps (26) (as marked during disassembly) in position and secure with capscrews (25). Bearing caps must be replaced in the same orientation as before disassembly or premature bearing failure could result.

16. Position new casing gaskets (9) on lower casing (74). Set upper casing (8) in place. Secure it to casing half (74) with capscrews (6). Pins (72) are used as a means of locating the position of casing halves.

17. Install swing bolts (22) and position clamps (20), washers (19), and nuts (18), securing in place with capscrews (7). On mechanical seal equipped pumps, position clamps (20) over ears of gland (49). Tighten nuts (18) evenly until gland is snug against casing. Note that the cover gasket may have to be trimmed at the end of the stuffing box to insure proper sealing of the gland. On optional packed pumps the split gland (21) is to be positioned into the stuffing box and the clamps (20) tightened loosely by use of the nuts (18).

18. Place drain plugs (1) in (2) back in casing halves.



I. Inboard impeller removed. Shaft sleeve in place.

19. If lower casing was removed from base, see instruction manual on Frame Mounted Installation for proper methods of realigning pump to motor and piping.

20. Replace any flushing or cooling lines that were removed. Connect electricity back to motor.

Starting Pump After Reassembly. Do not start pump until all air and vapor have been bled. Bleed air by removing both pipe plugs (2) from the upper casings. Make sure that there is liquid in the pump to provide necessary lubrication.

NOTE

Do not overtighten optional packing assembly before returning unit to operation.

CAUTION

Read operating instructions carefully before starting pump. Jog pump to check for proper rotation. Allow it to run a short time. Gradually tighten nuts (18) on optional packed pumps until dripping has been reduced to its normal level.

Overtightening the packing will make stuffing box overheat causing excessive wear. The shaft sleeve will also receive excessive wear.

MODEL 431B LIST OF PARTS (SEE FIGURE 4)

1. Plug	37. Grease Seal	63. Pin
2. Plug	38. Bearing	64. "O" Ring
6. Capscrew	39. Slinger	65. Sleeve
7. Capscrew	40. Slinger	66. "O" Ring
8. Casing	41. Capscrew	67. Impeller
9. Gasket	42. Cartridge Cap	68. Key
10. Grease Fitting	43. Grease Seal	69. Pin
12. Plug	44. Gasket	71. Shaft
18. Nut	45. Cartridge	72. Pin
19. Washer	46. Grease Seal	74. Casing
20. Clamp	47. Bearing	75. Drive Screw
21. Gland Half	48. Slinger	76. Nameplate
22. Swing Bolt	49. Gland	77. Locknut
23. Packing	50. "O" Ring	79. Comp. Fitting
24. Key	52. Lantern Ring	80. Tubing
25. Capscrew	53. Seal	81. "O" Ring - Bolt (PS #2 only)
26. Bearing Cap	54. Collar	
27. Pin	55. Setscrew	82. "O" Ring - I.D.
28. Case Ring	56. Bushing	83. "O" Ring - O.D.
29. Protector	57. Sleeve	84. Cover Plate
31. Capscrew	58. "O" Ring	85. Oiler
32. Cartridge Cap	59. Impeller	86. Nipple
34. Gasket	60. "O" Ring	87. Plug
35. Lockwasher	61. Bushing	88. Reducing Bush
36. Cartridge	62. Sleeve	89. Capscrew

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 or the factory at Aurora, Illinois.

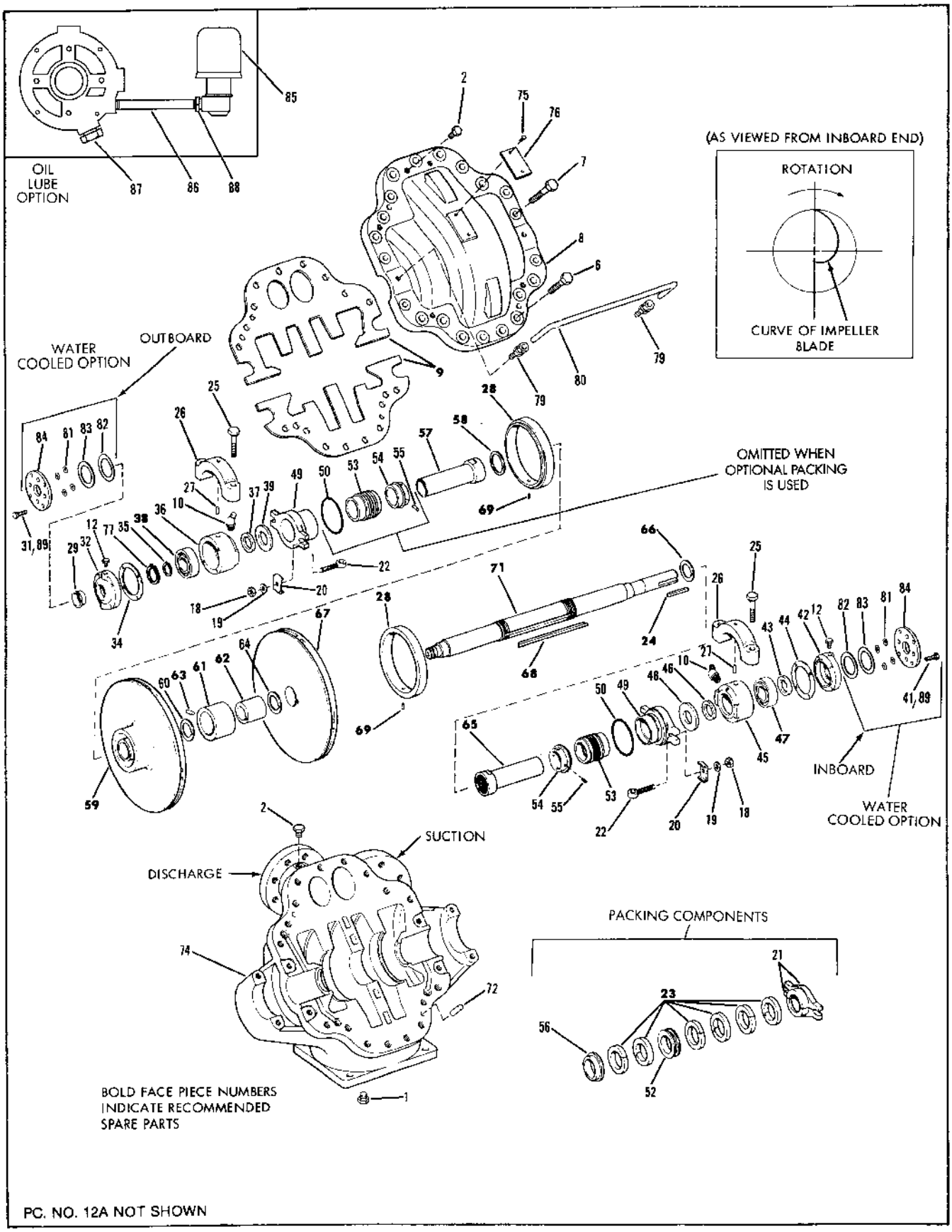
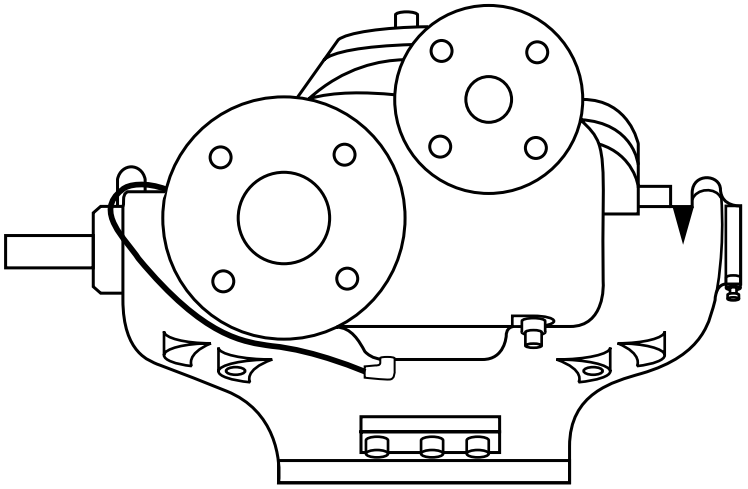


Figure 4. 431B Pump Exploded View

SUPERSEDES 430P PAGE 1
DATED APRIL 1996

430B SERIES
REPAIR PARTS INDEX



READ AND UNDERSTAND THE PUMP AND MOTOR INSTRUCTIONS BEFORE ATTEMPTING TO INSTALL, DISASSEMBLE OR REPAIR THE PUMP

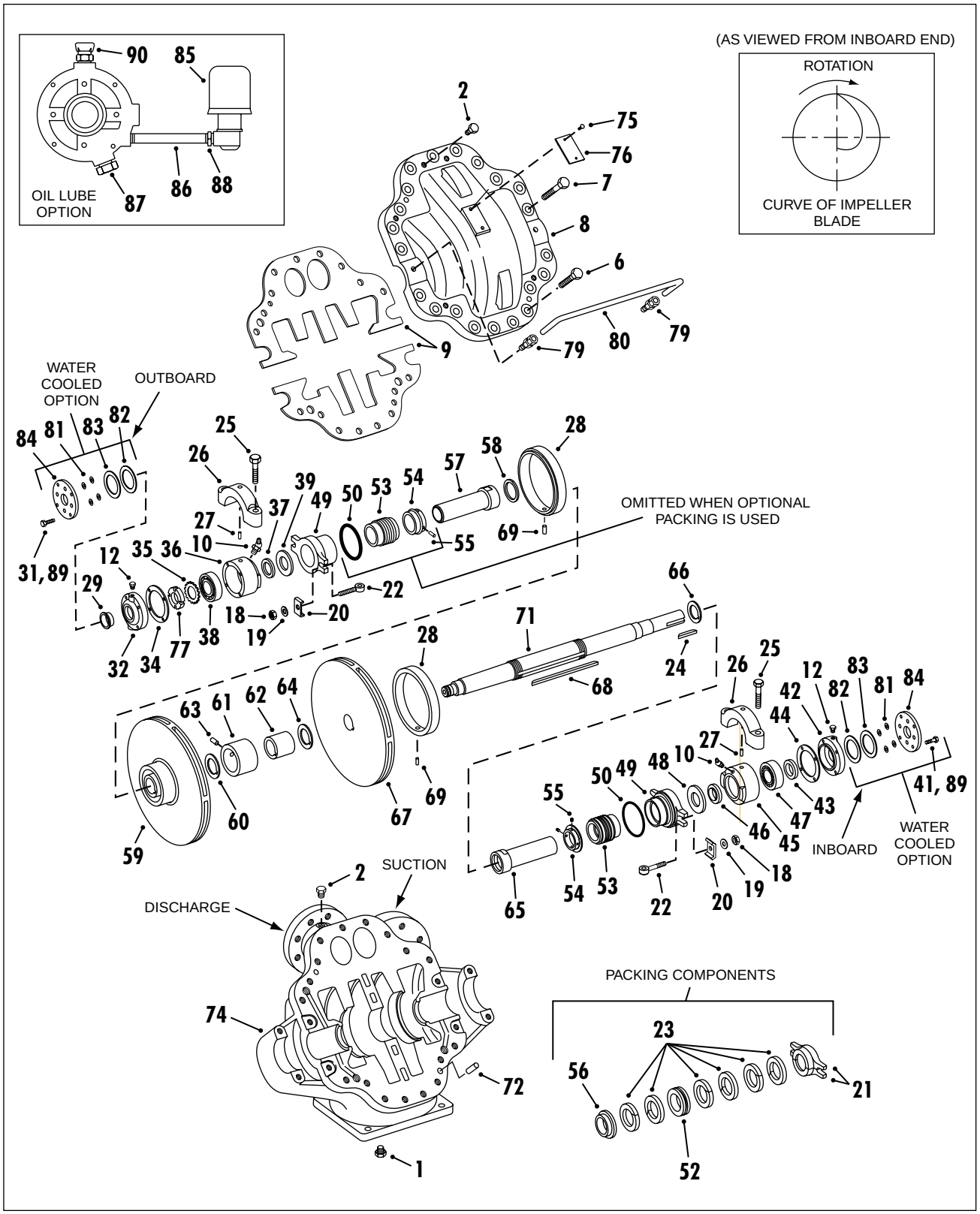
AURORA®
Pentair Pump Group

430 SERIES
MODEL 431B

TABLE OF CONTENTS

PUMP MODEL	POWER SERIES	DESCRIPTION	PAGE
431	2	1-1/2 x 3 x 9	4, 5
431	2	2 x 4 x 9	4, 5
431	3A	1-1/2 x 3 x 11	6, 7
431	3A	2 x 4 x 1	6, 7

MODEL 431B
PIECE NUMBERS



430B SERIES P.S. #2
MODEL 431B
1-1/2 x 3 x 9 - 2 x 4 x 9
PARTS LIST

PC. NO.	DESCRIPTION	QTY	PART NO.	MATERIAL B.F.	A.B.	A.I.	
1	PLUG	5	600-0004	028	028	028	
2	PLUG	5	600-0002	087	087	087	
6	CAPSCREW	17	168-0566	082	082	082	
7	CAPSCREW	4	168-0494	082	082	082	
8	UPPER CASING		INCLUDED WITH NO. 74				
9	GASKET	1	364-1339	598	598	598	
10	GREASE FITTING	2	508-0015	651	651	651	
12	PLUG	2	600-0001	087	087	087	
12A	PLUG+	6	600-0003	087	087	087	
18	NUT	4	544-0109			080	
19	WASHER	4	908-0112			080	
20	CLAMP	4	204-0120			360	
21	GLAND	2	372-0225	010	010	010	
22	SWING BOLT	4	100-2011			360	
22A	SWING BOLT ASSY.						
	(18, 19, 20, 22)	4	099-0014	644	644		
23	PACKING SET (6 RINGS)	2	564-3031	806	806	806	
24	KEY	1	472-0247	087	087	087	
25	CAPSCREW	4	168-0496	082	082	082	
26	BEARING CAP		INCLUDED WITH NO. 74				
27	PIN	2	592-0361	360	360	360	
28	CASE RING						
	1-1/2x3x9	2	676-1007	208	208	010	
	2x4x9	2	676-1015	208	208	010	
29	PROTECTOR	1	624-0080	087	087	087	
31	CAPSCREW (STD)	4	168-0015	082	082	082	
	WATER COOL (OPT)+	4	168-0025	082	082	082	
32	CARTRIDGE CAP						
	STANDARD	1	164-0531	010	010	010	
	OIL LUBE**	1	164-0579	010	010	010	
	WATER COOLED+	1	164-0580	010	010	010	
34	GASKET	1	364-1309	614	614	614	
35	LOCK WASHER	1	908-0406	080	080	080	
36	CARTRIDGE	1	176-0065	010	010	010	
37	GREASE SEAL	1	712-6324	653	653	653	
	OIL SEAL**	1	712-0053	653	653	653	
38	BEARING	1	068-0454	647	647	647	
39	SLINGER SEAL	1	764-1017	478	478	478	
	SLINGER, PACKED (OPT)	1	764-0002	208	208	208	
41	CAPSCREW (STD)	4	168-0015	082	082	082	
	WATER COOL (OPT)+	4	168-0025	082	082	082	

PC. NO.	DESCRIPTION	QTY	PART NO.	MATERIAL B.F.	A.B.	A.I.	
42	CARTRIDGE CAP						
	STANDARD	1	164-0531	010	010	010	
	OIL LUBE**	1	164-0579	010	010	010	
	WATER COOLED+	1	164-0580	010	010	010	
43	GREASE SEAL	1	712-0231	653	653	653	
	OIL SEAL**	1	712-0016	653	653	653	
44	GASKET	1	364-1309	614	614	614	
45	CARTRIDGE	1	176-0065	010	010	010	
46	GREASE SEAL	1	712-6324	653	653	653	
	OIL SEAL**	1	712-0053	653	653	653	
47	BEARING	1	068-1907	647	647	647	
48	SLINGER, SEAL	1	764-1017	478	478	478	
	SLINGER, PACKED (OPT)	1	764-0002	208	208	208	
49	GLAND	2	372-0287	010	208	010	
50	O-RING	2	364-0420	474	474	474	
52	LANTERN RING	2	676-1698	512	512	512	
53	SEAL, STD	2	712-0910	749	749	749	
54	COLLAR	2	224-0174	208	208	010	
55	SETSCREW	4	724-0081	104	104	104	
56	BUSHING	2	136-1411	208	208	010	
	SLEEVE WITH "O" RING PC. NO. 58 (NOTE 1)						
57	SLEEVE (SEALS)	1	756-0642	644	644	623	
	SLEEVE (PACKING)	1	756-0642	644	644	646	
58	O-RING	1	364-0368	474	474	474	
59	IMPELLER						
	1-1/2x3x9	1	443-2088	225	010	010	
	2x4x9	1	443-2090	225	010	010	
60	O-RING	1	364-0368	474	474	474	
61	BUSHING	1	136-1320	226	226	010	
	SLEEVE WITH "O" RINGS PC. NO. 60 AND 64 (NOTE 2)						
62	SLEEVE	1	756-0632	644	644	642	
63	PIN	1	592-0361	107	107	107	
64	O-RING	1	364-0368	474	474	474	
	SLEEVE WITH "O" RING PC. NO. 66 (NOTE 1)						
65	SLEEVE (SEALS)	1	756-0642	644	644	623	
	SLEEVE (PACKING)	1	756-0642	644	644	646	
66	O-RING	1	364-0368	474	474	474	

** USE WITH OIL LUBRICATED BEARING OPTION ONLY

+ USE WITH WATER COOLED BEARING CAP OPTION ONLY
(REFER PC. NO. 91)

430B SERIES P.S. #2
MODEL 431B
1-1/2 x 3 x 9 - 2 x 4 x 9
PARTS LIST

PC. NO.	DESCRIPTION	QTY	PART NO.	MATERIAL B.F.	A.B.	A.I.	
67	IMPELLER						
	1-1/2x3x9	1	443-2089	225	010	010	
	2x4x9	1	443-2091	225	010	010	
68	KEY	1	472-0415	107	107	107	
69	PIN	2	592-0361	107	107	107	
71	SHAFT	1	728-7287	063	063	063	
72	PIN	2	592-0375	360	360	360	
74	CASING ASSEMBLY						
	1-1/2x3x9	1	179-0296	010	010	010	
	2x4x9	1	179-0302	010	010	010	
75	DRIVE SCREW	2	708-0013	365	365	365	
76	NAMEPLATE	1	532-0045	114	114	114	
77	LOCKNUT	1	544-0706	080	080	080	
79	COMP. FITTING	2	868-3359	190	190	087	
80	TUBING (INCHES)	20	872-0124	175	175	087	
81	O-RING-BOLT +	8	364-0309	457	457	457	
82	O-RING-ID +	2	364-0329	457	457	457	
83	O-RING-OD +	2	364-0344	457	457	457	
84	COVER PLATE+	2	260-0742	087	087	087	
85	OILER**	2	552-0027	652	652	652	
86	NIPPLE**	2	600-1162	387	387	387	
87	PLUG**	2	600-0001	387	387	387	
88	RED BUSHING**	2	600-0901	387	387	387	
89	CAPSCREW+	8	168-0011	082	082	082	
	WATER COOLED (OPT)						
90	BREATHER	2	864-0051	656	656	656	
91	WATER COOLED	2	476-0745	644	644	644	
	CARTRIDGE CAP						
	KIT, INCLUDES						
	PC. NO. 12A, 29,						
	31, 32, 34, 81,						
	82, 83, 84 & 89						

PC. NO.	DESCRIPTION	QTY	PART NO.	MATERIAL B.F.	A.B.	A.I.	

** USE WITH OIL LUBRICATED BEARING OPTION ONLY

+ USE WITH WATER COOLED BEARING CAP OPTION ONLY

NOTE 1) MATERIAL CODE 644 - SLEEVE 208, "O" RING 457
646 - SLEEVE 108, "O" RING 457
623 - SLEEVE 104, "O" RING 457

NOTE 2) MATERIAL CODE 644 - SEP SLEEVE 215, "O" RING 457
642 - SEP SLEEVE 010, "O" RING 457

430B SERIES P.S. #3A
MODEL 431B
1-1/2 x 3 x 11 - 2 x 4 x 11
PARTS LIST

PC. NO.	DESCRIPTION	QTY	PART NO.	MATERIAL B.F.	A.B.	A.I.	
1	PLUG						
	1-1/2x3x11	4	600-0004	028	028	028	
		1	600-0006	028	028	028	
	2x4x11	4	600-0004	028	028	028	
		1	600-0007	028	028	028	
2	PLUG	10	600-0002	087	087	087	
6	CAPSCREW	22	168-0568	082	082	082	
7	CAPSCREW	6	168-0566	082	082	082	
8	UPPER CASING		INCLUDED WITH NO. 74				
9	GASKET	1	364-2122	598	598	598	
10	GREASE FITTING	2	508-0001	651	651	651	
12	PLUG	2	600-0001	087	087	087	
12A	PLUG+	6	600-0003	087	087	087	
18	NUT	4	544-0109			080	
19	WASHER	4	908-0112			080	
20	CLAMP	4	204-0120			360	
21	GLAND	2	372-0226	010	010	010	
22	SWING BOLT	4	100-2017			360	
22A	SWING BOLT ASSY.						
	(18, 19, 20, 22)	4	099-0017	644	644		
23	PACKING SET (6 RINGS)	2	564-3032	806	806	806	
24	KEY	1	472-0323	087	087	087	
25	CAPSCREW	4	168-0496	082	082	082	
26	BEARING CAP		INCLUDED WITH NO. 74				
27	PIN	2	592-0361	360	360	360	
28	CASE RING	2	676-2109	208	208	010	
29	PROTECTOR	1	624-0081	087	087	087	
31	CAPSCREW (STD)	4	168-0260	082	082	082	
	WATER COOL (OPT)+	4	168-0280	082	082	082	
32	CARTRIDGE CAP						
	STANDARD	1	164-0581	010	010	010	
	OIL LUBE**	1	164-0581	010	010	010	
	WATER COOLED+	1	164-0582	010	010	010	
34	GASKET	1	364-2123	614	614	614	
35	LOCK WASHER	1	908-0406	080	080	080	
36	CARTRIDGE	1	176-0077	010	010	010	

PC. NO.	DESCRIPTION	QTY	PART NO.	MATERIAL B.F.	A.B.	A.I.	
37	GREASE SEAL	1	712-6326	653	653	653	
	OIL SEAL**	1	712-0017	653	653	653	
38	BEARING (BACK TO BACK)	2	068-0021	647	647	647	
39	SLINGER SEAL	1	764-1020	478	478	478	
	SLINGER, PACKED (OPT)	1	764-1042	208	208	208	
41	CAPSCREW (STD)	4	168-0260	082	082	082	
	WATER COOL (OPT)+	4	168-0280	082	082	082	
42	CARTRIDGE CAP						
	STANDARD & OIL LUBE	1	164-0581	010	010	010	
	WATER COOLED+	1	164-0582	010	010	010	
43	GREASE SEAL	1	712-6334	653	653	653	
	OIL SEAL**	1	712-6471	653	653	653	
44	GASKET	1	364-2123	614	614	614	
45	CARTRIDGE	1	176-0077	010	010	010	
46	GREASE SEAL	1	712-6326	653	653	653	
	OIL SEAL**	1	712-0017	653	653	653	
47	BEARING	1	068-0158	647	647	647	
48	SLINGER, SEAL	1	764-1020	478	478	478	
	SLINGER, PACKED (OPT)	1	764-1042	208	208	208	
49	GLAND	2	372-0362	010	208	010	
50	O-RING	2	364-0423	474	474	474	
52	LANTERN RING	2	676-1699	512	512	512	
53	SEAL, STD	2	712-0412	749	749	749	
54	COLLAR	2	224-0017	208	208	010	
55	SETSCREW	4	724-0081	104	104	104	
56	BUSHING	2	136-1412	208	208	010	
	SLEEVE WITH "O" RING PC. NO. 58 (NOTE 1)						
57	SLEEVE (SEALS)	1	756-0643	644	644	623	
	SLEEVE (PACKING)	1	756-0643	644	644	646	
58	O-RING	1	364-0372	474	474	474	
59	IMPELLER						
	1-1/2X3X11	1	443-2881	225	010	010	
	2X4X11	1	443-2883	225	010	010	
60	O-RING	1	364-0372	474	474	474	
61	BUSHING	1	136-1321	226	226	010	
	SLEEVE WITH "O" RINGS PC. NO. 60 AND 64 (NOTE 2)						
62	SLEEVE	1	756-0633	644	644	642	
63	PIN	1	592-0361	107	107	107	

** USE WITH OIL LUBRICATED BEARING OPTION ONLY

+ USE WITH WATER COOLED BEARING CAP OPTION ONLY
(REFER PC. NO. 91)

430B SERIES P.S. #3A
MODEL 431B
1-1/2 x 3 x 11 - 2 x 4 x 11
PARTS LIST

PC. NO.	DESCRIPTION	QTY	PART NO.	MATERIAL B.F.	A.B.	A.I.	
64	O-RING	1	364-0372	474	474	474	
	SLEEVE WITH "O" RING PC. NO. 66 (NOTE 1)						
65	SLEEVE (SEALS)	1	756-0643	644	644	623	
	SLEEVE (PACKING)	1	756-0643	644	644	646	
66	O-RING	1	364-0372	474	474	474	
67	IMPELLER						
	1-1/2x3x11	1	443-2882	225	010	010	
	2x4x11	1	443-2884	225	010	010	
68	KEY	1	472-0302	107	107	107	
69	PIN	2	592-0361	107	107	107	
71	SHAFT	1	728-7291	063	063	063	
72	PIN	2	592-0375	360	360	360	
74	CASING ASSEMBLY						
	1-1/2x3x11	1	179-2471	010	010	010	
	2x4x11	1	179-2468	010	010	010	
75	DRIVE SCREW	2	708-0013	365	365	365	
76	NAMEPLATE	1	532-0045	114	114	114	
77	LOCKNUT	1	544-0706	080	080	080	
79	COMP. FITTING	2	868-3359	190	190	087	
80	TUBING (INCHES)	20	872-0124	175	175	087	
81	NOT REQUIRED						
82	O-RING-ID +	2	364-0337	457	457	457	
83	O-RING-OD +	2	364-0553	457	457	457	
84	COVER PLATE+	2	260-0743	087	087	087	
85	OILER**	2	552-0029	652	652	652	
86	NIPPLE**	2	600-1212	387	387	387	
89	CAPSCREW+	4	168-0011	082	082	082	
	WATER COOLED (OPT)						
90	BREATHER	2	864-0051	656	656	656	
91	WATER COOLED	2	476-0749	644	644	644	
	CARTRIDGE CAP						
	KIT, INCLUDES						
	PC. NO. 12A, 29,						
	31, 32, 34,						
	82, 83, 84 & 89						

PC. NO.	DESCRIPTION	QTY	PART NO.	MATERIAL B.F.	A.B.	A.I.	

** USE WITH OIL LUBRICATED BEARING OPTION ONLY

+ USE WITH WATER COOLED BEARING CAP OPTION ONLY

NOTE 1) MATERIAL CODE 644 - SLEEVE 208, "O" RING 457
646 - SLEEVE 108, "O" RING 457
623 - SLEEVE 104, "O" RING 457

NOTE 2) MATERIAL CODE 644 - SEP SLEEVE 215, "O" RING 457
642 - SEP SLEEVE 010, "O" RING 457

AP-430P-REPAIR 12.99

AURORA®
Pentair Pump Group

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

Aurora Pumps
800 Airport Road
North Aurora, IL 60542
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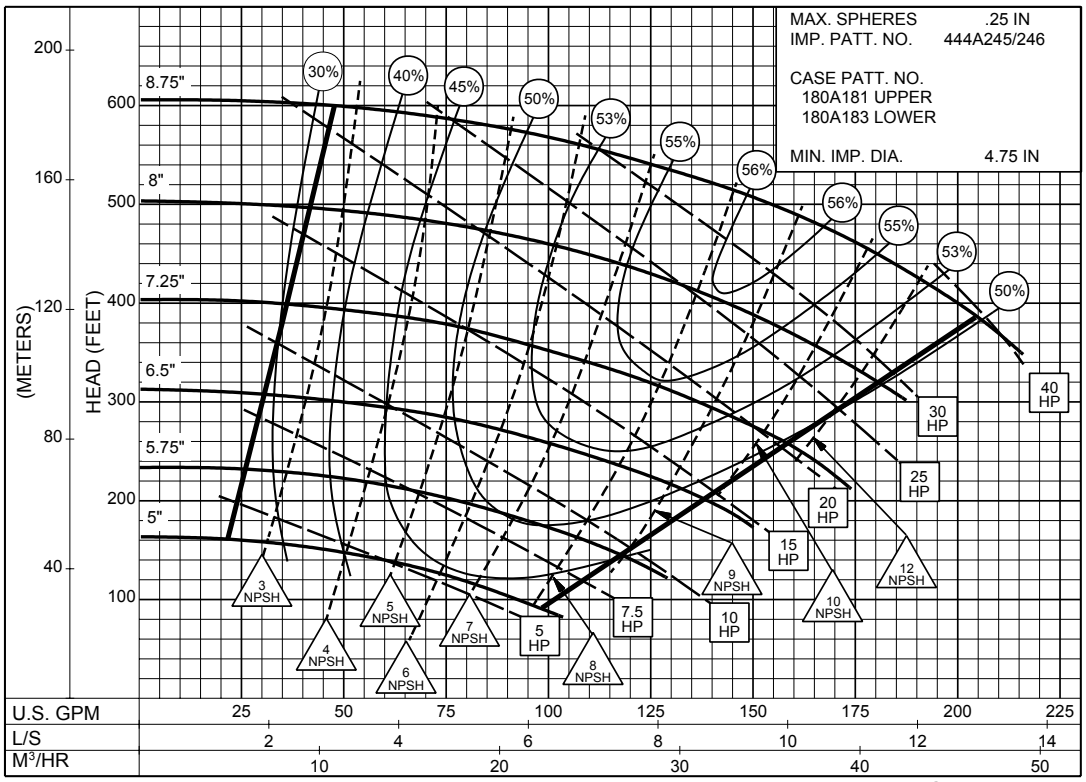
fax: 630-859-7060

Performance Curves for the 430 Series

MODEL/SIZE	R.P.M.	CATALOG PAGE	PDF PAGE
1-1/2 x 3 x 9	3500/1750	401	2
1-1/2 x 3 x 11	3550/1750	402	3
2 x 4 x 9	3500/1750	403	4
2 x 4 x 11	3550/1750	404	5

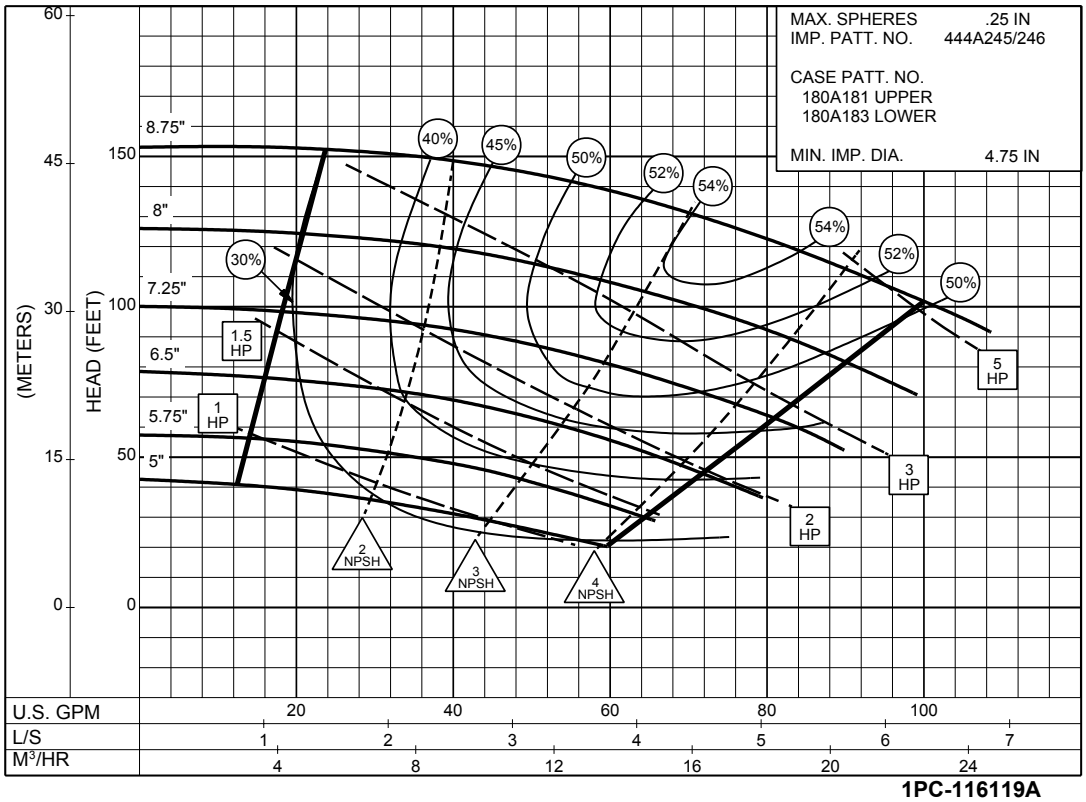
SIZE : 1-1/2x3x9 **TYPE : 430** **IMPELLER : Enclosed** **R. P. M. : 3500**



1PC-116118A

3500 R.P.M

SIZE : 1-1/2x3x9 **TYPE : 430** **IMPELLER : Enclosed** **R. P. M. : 1750**



1PC-116119A

1750 R.P.M

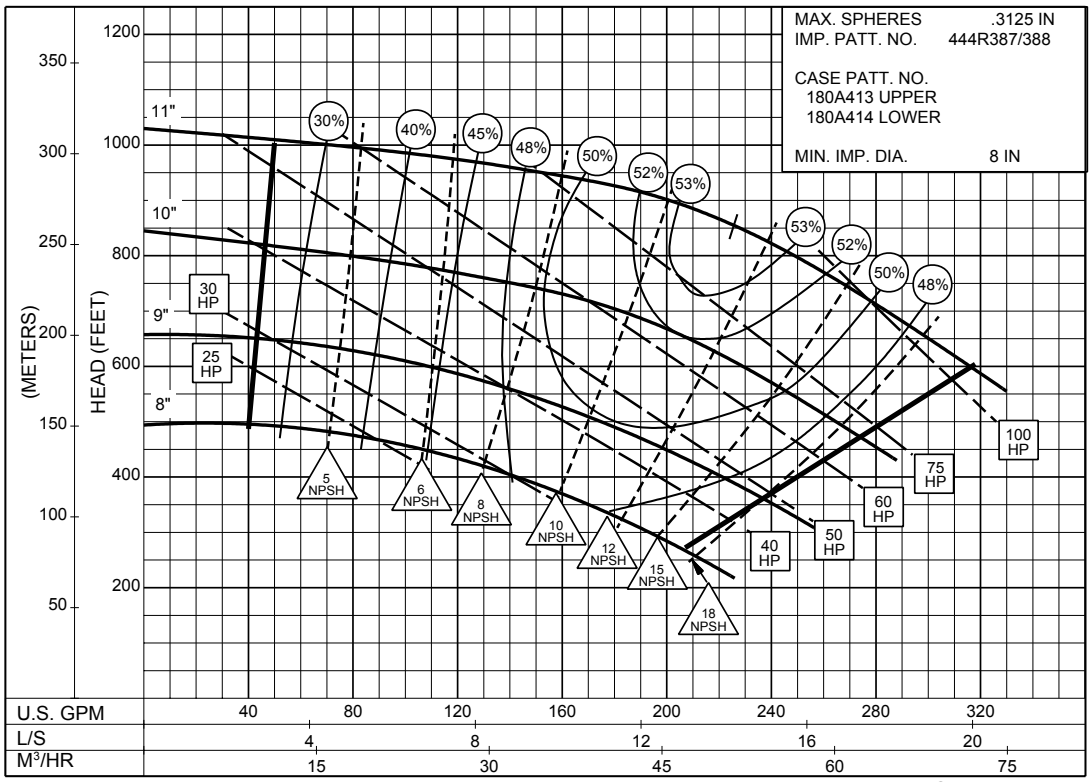
1-1/2 x 3 x 11 SERIES 430

ENCLOSED IMPELLER

Supersedes Section 430 Page 402
Dated May 1995

3550 R.P.M

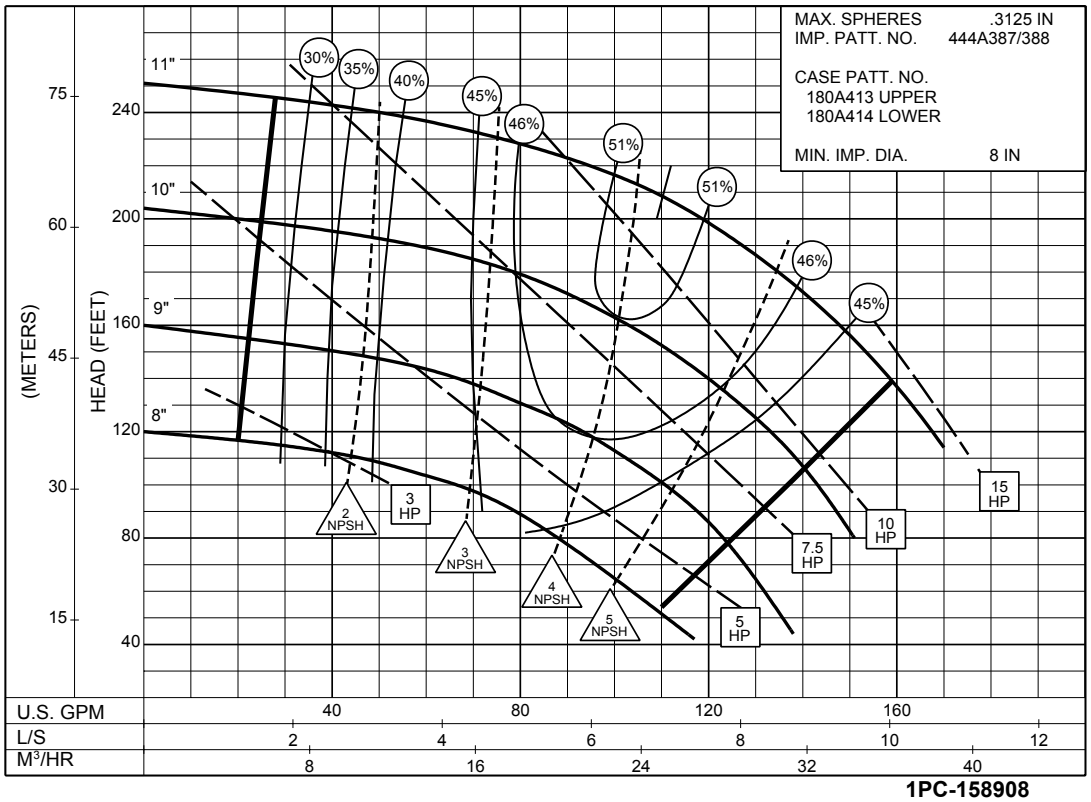
SIZE : 1-1/2x3x11 **TYPE : 431** **IMPELLER : Enclosed** **R. P. M. : 3550**



1PC-158883

1750 R.P.M

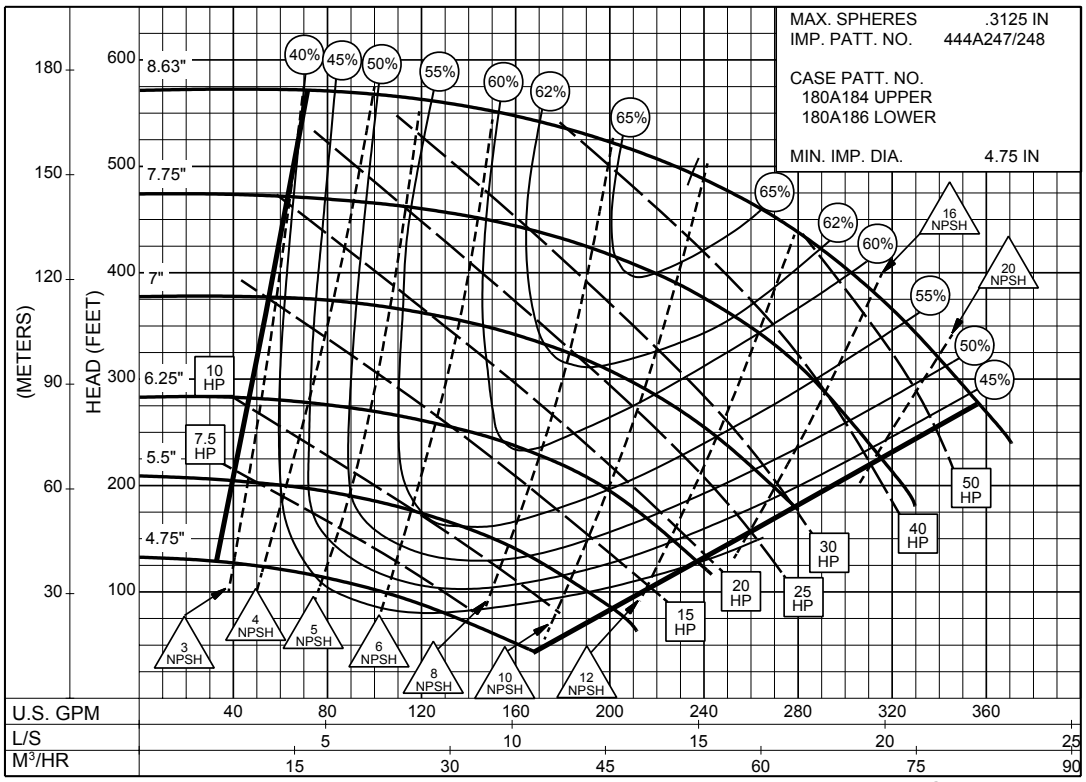
SIZE : 1-1/2x3x11 **TYPE : 431** **IMPELLER : Enclosed** **R. P. M. : 1750**



1PC-158908

Supersedes Section 430 Page 403
Dated May 1995

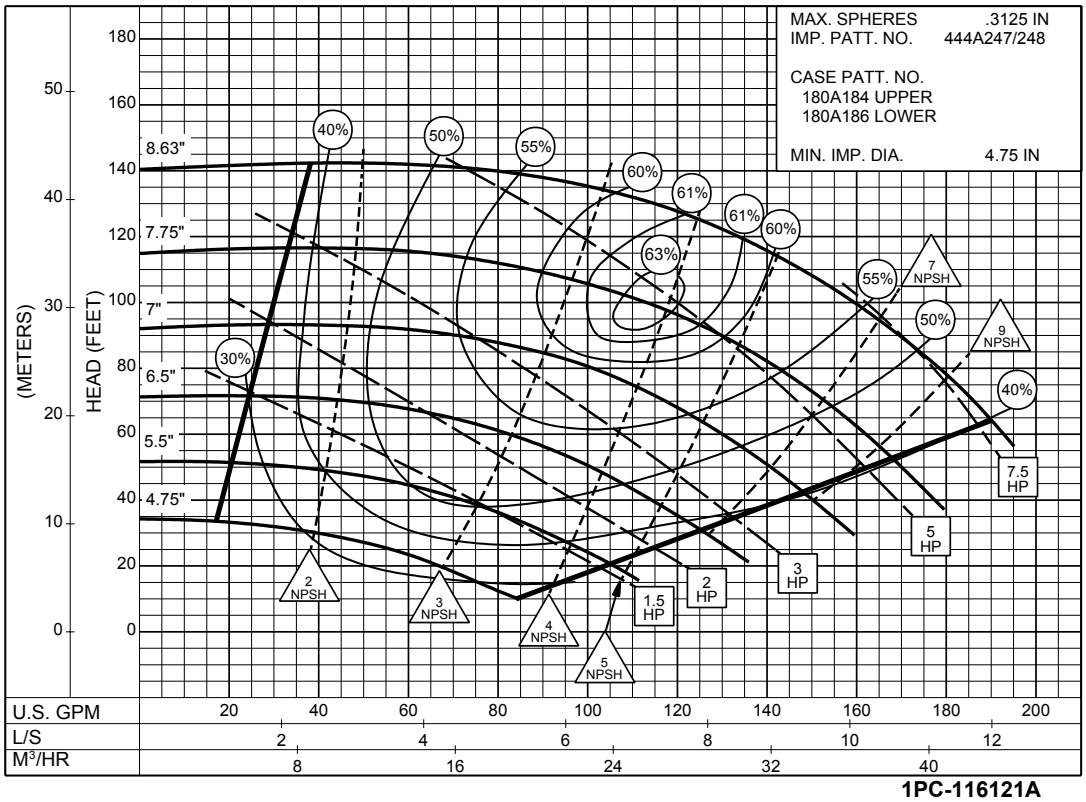
SIZE : 2x4x9 **TYPE : 430** **IMPELLER : Enclosed** **R. P. M. : 3500**



1PC-116120A

3500 R.P.M

SIZE : 2x4x9 **TYPE : 430** **IMPELLER : Enclosed** **R. P. M. : 1750**



1PC-116121A

1750 R.P.M

AURORA®
Pentair Pump Group

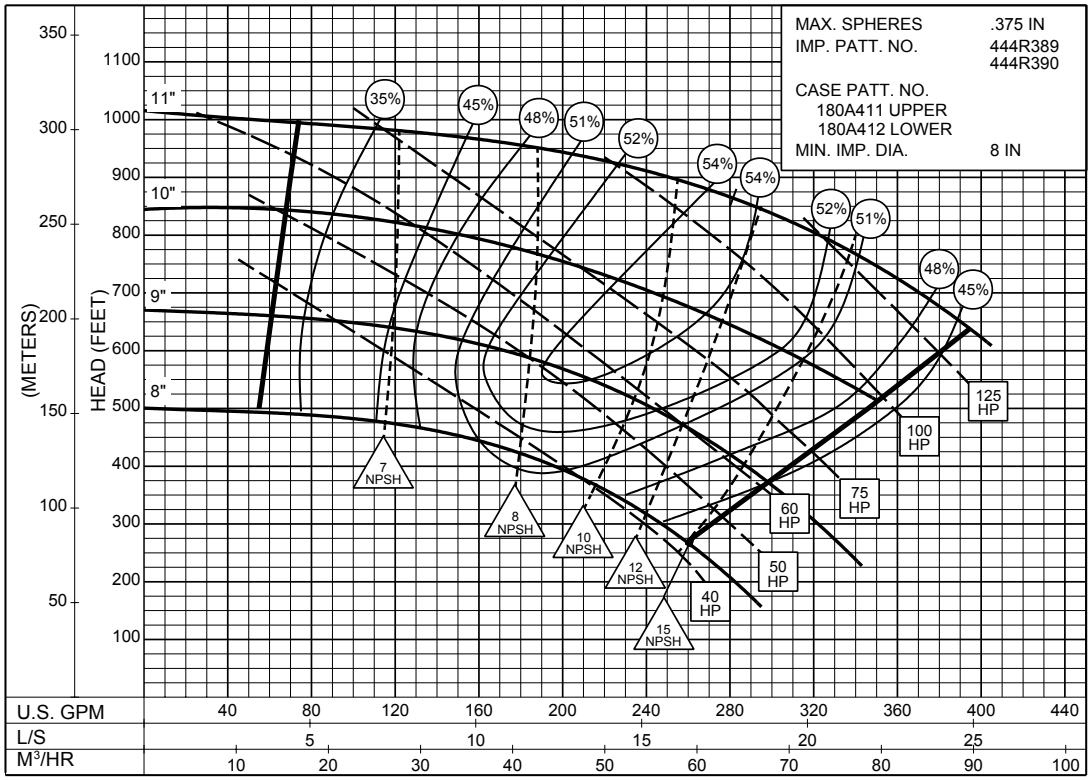
Supersedes Section 430 Page 404
Dated May 1995

2 x 4 x 11 SERIES 430

ENCLOSED IMPELLER

3550 R.P.M

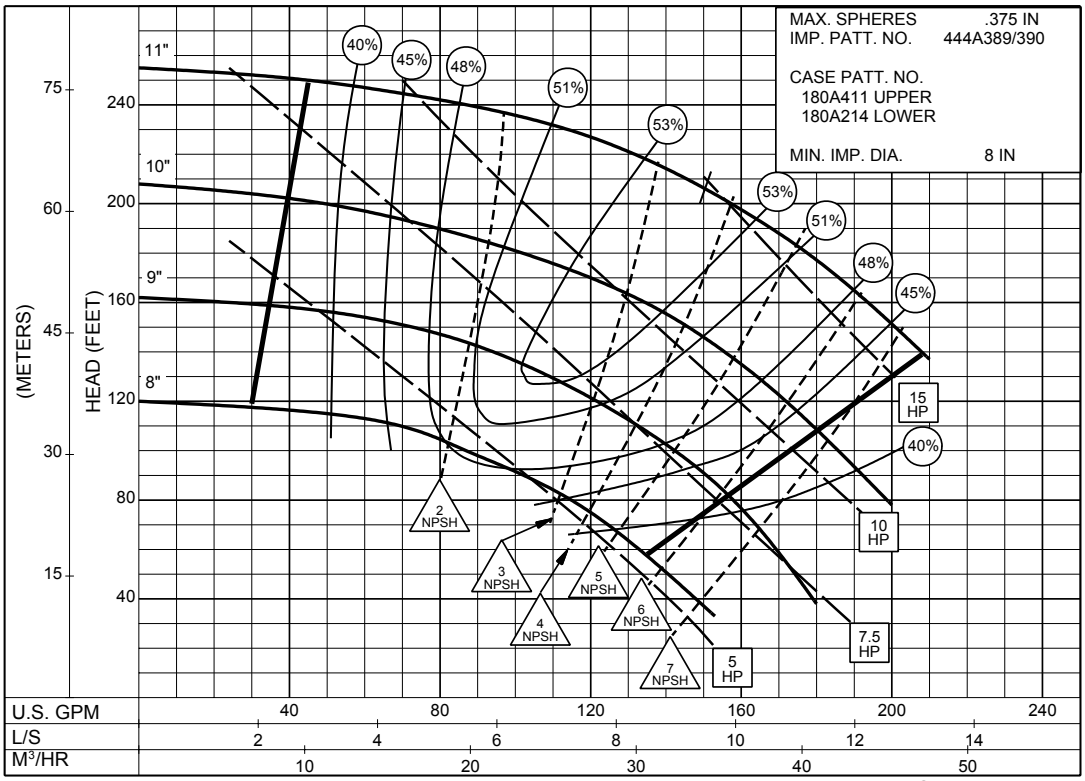
SIZE : 2x4x11 TYPE : 431 IMPELLER : ENCLOSED R. P. M. : 3550



PC-158291

1750 R.P.M

SIZE : 2x4x11 TYPE : 430 IMPELLER : Enclosed R. P. M. : 1750



PC-158292

AURORA®
Pentair Pump Group

Performance Curves for the 430 Series (50 Hz)

MODEL/SIZE	R.P.M.	PDF PAGE
1-1/2x3x9	2880	2
1-1/2x3x9	1440	3
2x4x9	2880	4
2x4x9	1440	5

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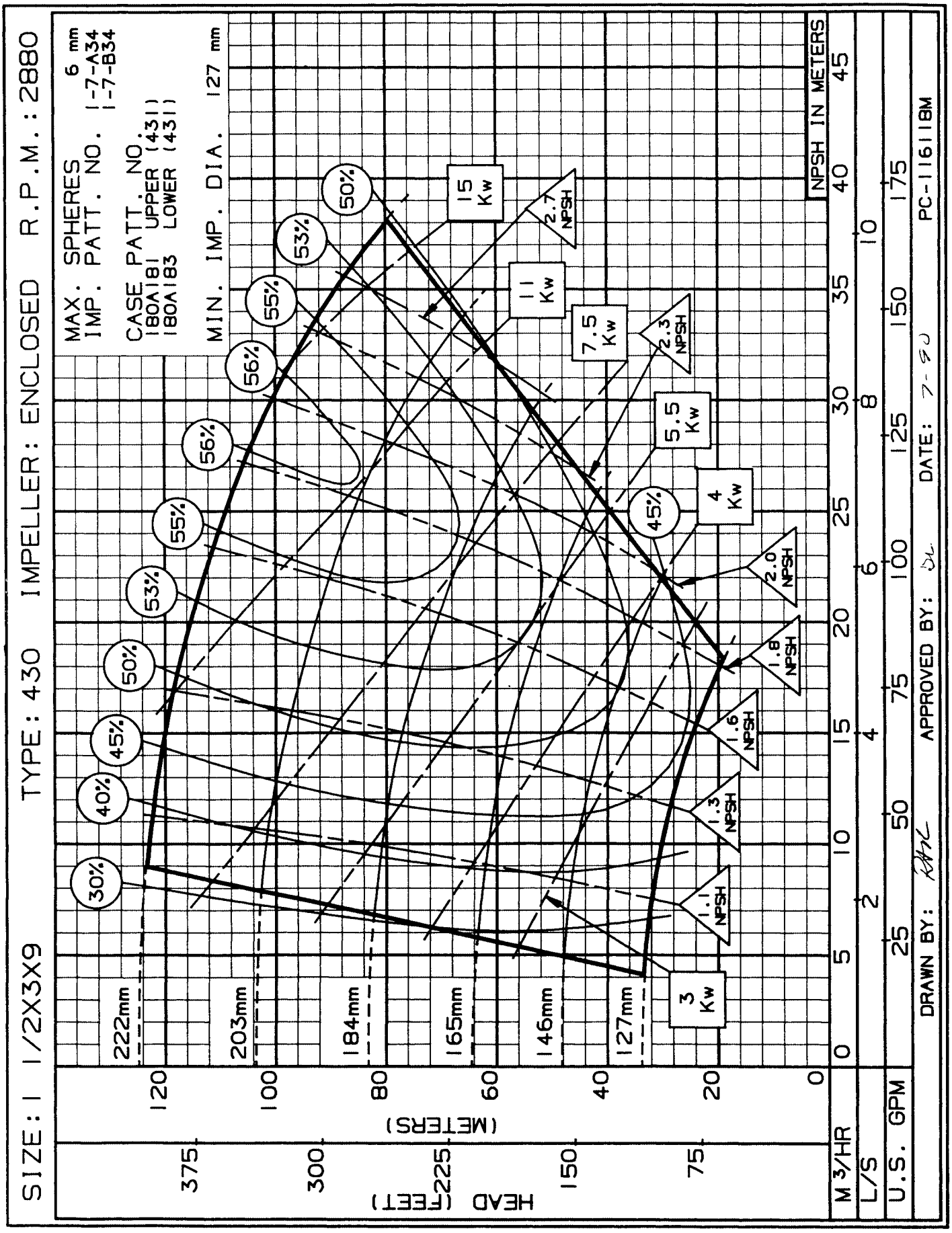
Pentair Pump Group

1-1/2x3x9 - 2880 RPM
ENCLOSED IMPELLER

SECTION 430 (Metric 50Hz)
DATE JULY 1994
SUPERCEDES MARCH 1986



SECTION 430 (Metric 50Hz)
DATE JULY 1994
SUPERCEDES MARCH 1986

1-1/2x3x9 - 1440 RPM
ENCLOSED IMPELLER

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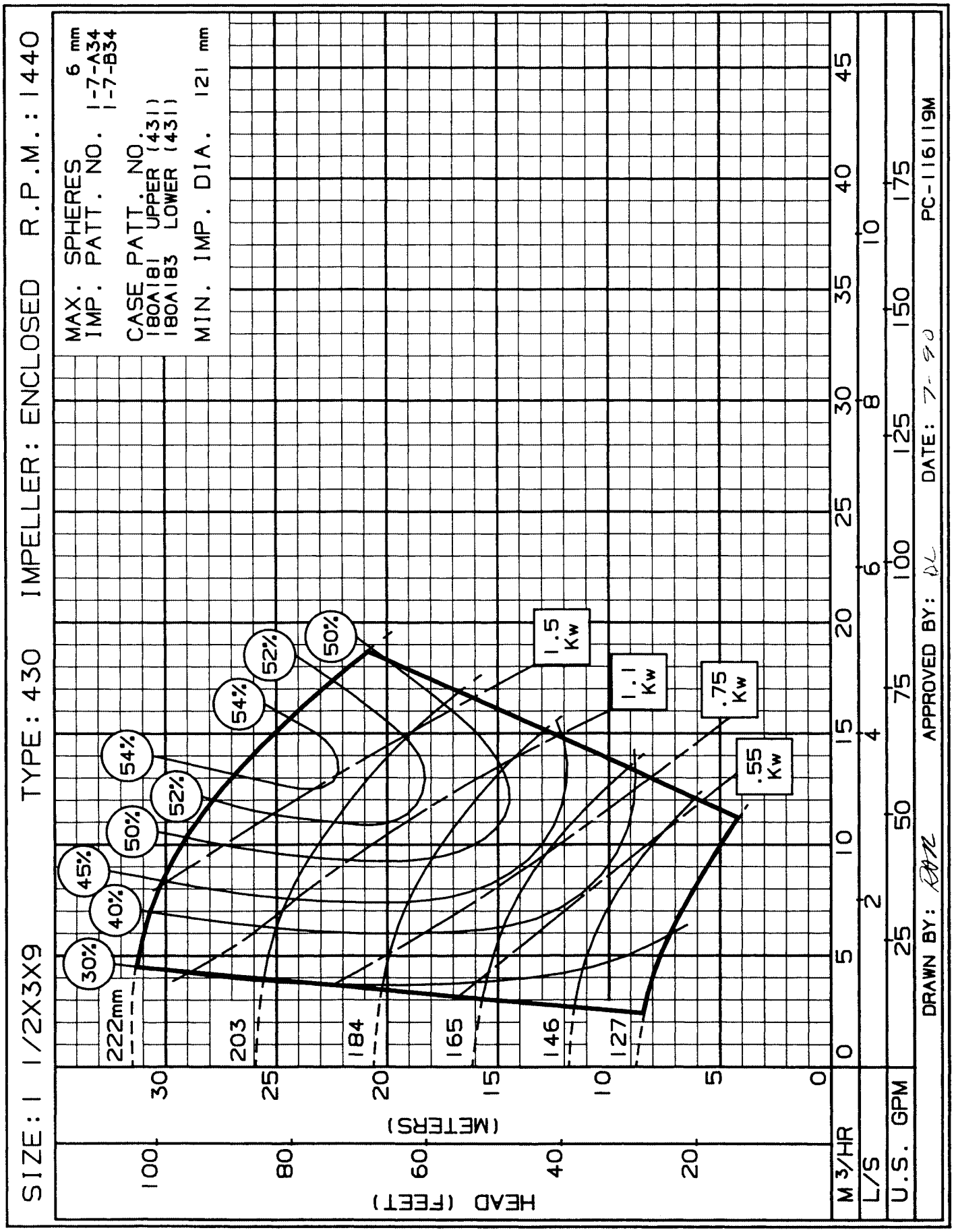
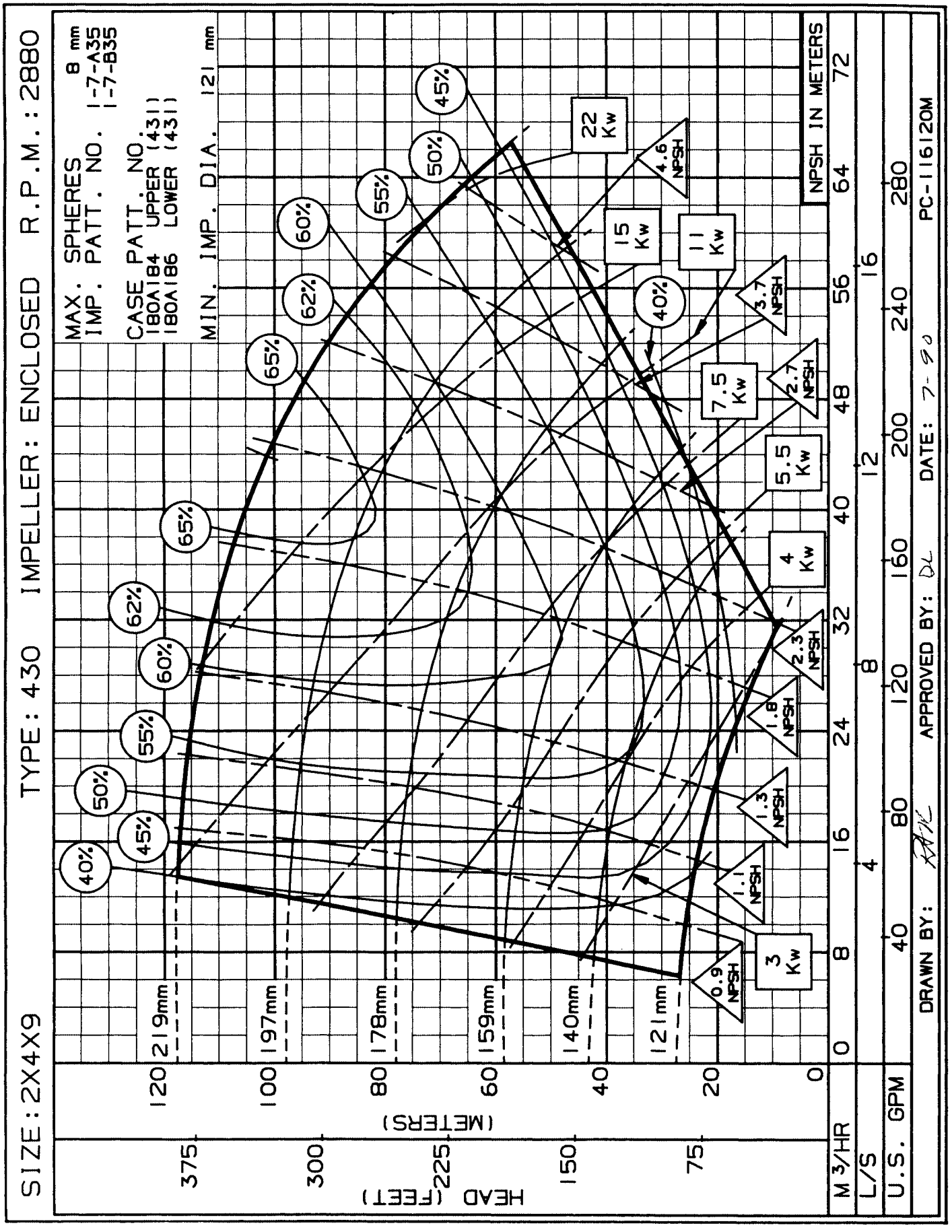


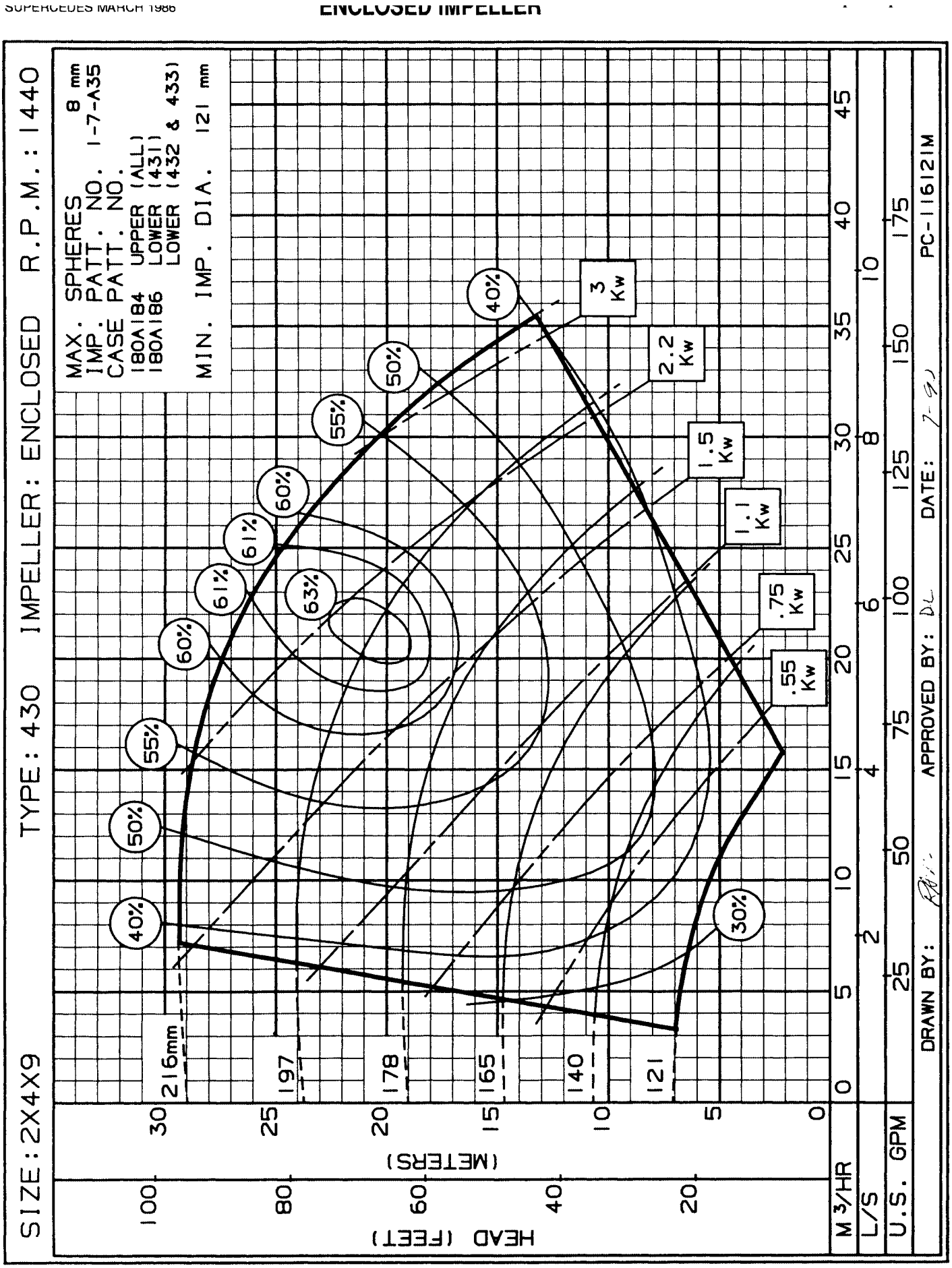
AURORA®
Pentair Pump Group

2x4x9 - 2880 RPM
ENCLOSED IMPELLER

SECTION 430 (Metric 50Hz)
DATE JULY 1994
SUPERCEDES MARCH 1986



SUPERCEDES MARCH 1986



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