

Model 631

# **AURORA<sup>®</sup>** 630 SERIES SINGLE STAGE SEWAGE PUMPS

# AURORA® 630 SERIES

## Single Stage Sewage Pumps

Capacities to 1000 GPM  
Heads to 80 Feet  
Temperatures to 140° F  
Discharge Sizes 4" and 6"

### Introduction

Water pollution and its effect on our environment is on everyone's mind. This is particularly true today and for the future generations. The population explosion along with broader understanding of the water pollution problem has brought about the need for more and better sewage treatment facilities. The installations of today and tomorrow demand more reliable sewage pumping equipment. Longer life has become essential to overall pump performance. Aurora Pump recognizes this need, and with this bulletin offers the 630 Series of heavy-duty vertical wet pit solids handling pumps as our solution to your sewage pumping problems. Contact your Aurora Pump representative for added details.

### Quick Reference 630 Series Feature Selector

#### Standard Features

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

#### Optional Features

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



# Pump Features

## A. Motor Mounting

bracket that assures alignment of motor and pump shaft with tongue-and-groove machining. Motors are of standard hp manufacture.

## B. External Impeller Adjustment

is accomplished with hexagon-shaped adjusting nut. A lock nut secures the bearing collar to the shaft.

## C. Thrust Bearing

is regreaseable and is protected from contamination by grease seals on both sides and a water slinger. The bearing is elevated 6" above the floor level for easy servicing and added protection from wash down, flooding, etc.

## D. Stuffing Box

is standard with packing, lantern ring, and a split gland for gastight construction. The lantern ring can also be used for packing lubrication from an external source.

## E. Steel Oval Baseplate

is standard and eliminates removing the complete cover plate.

## F. Elevated Float Switch Assembly

is standard. Several enclosures are available. Refer to page 7 for additional details.

## G. Bearing Assemblies

available in several arrangements and materials to suit difficult applications. Line bearings are provided on 6'2" settings and deeper. One bearing is provided for each additional 5' of setting. All the standard bearings are grease lubricated.

## H. Positive Alignment Throughout

uses tongue-and-groove registered design.

## I. Pump Shaft 1-7/16"

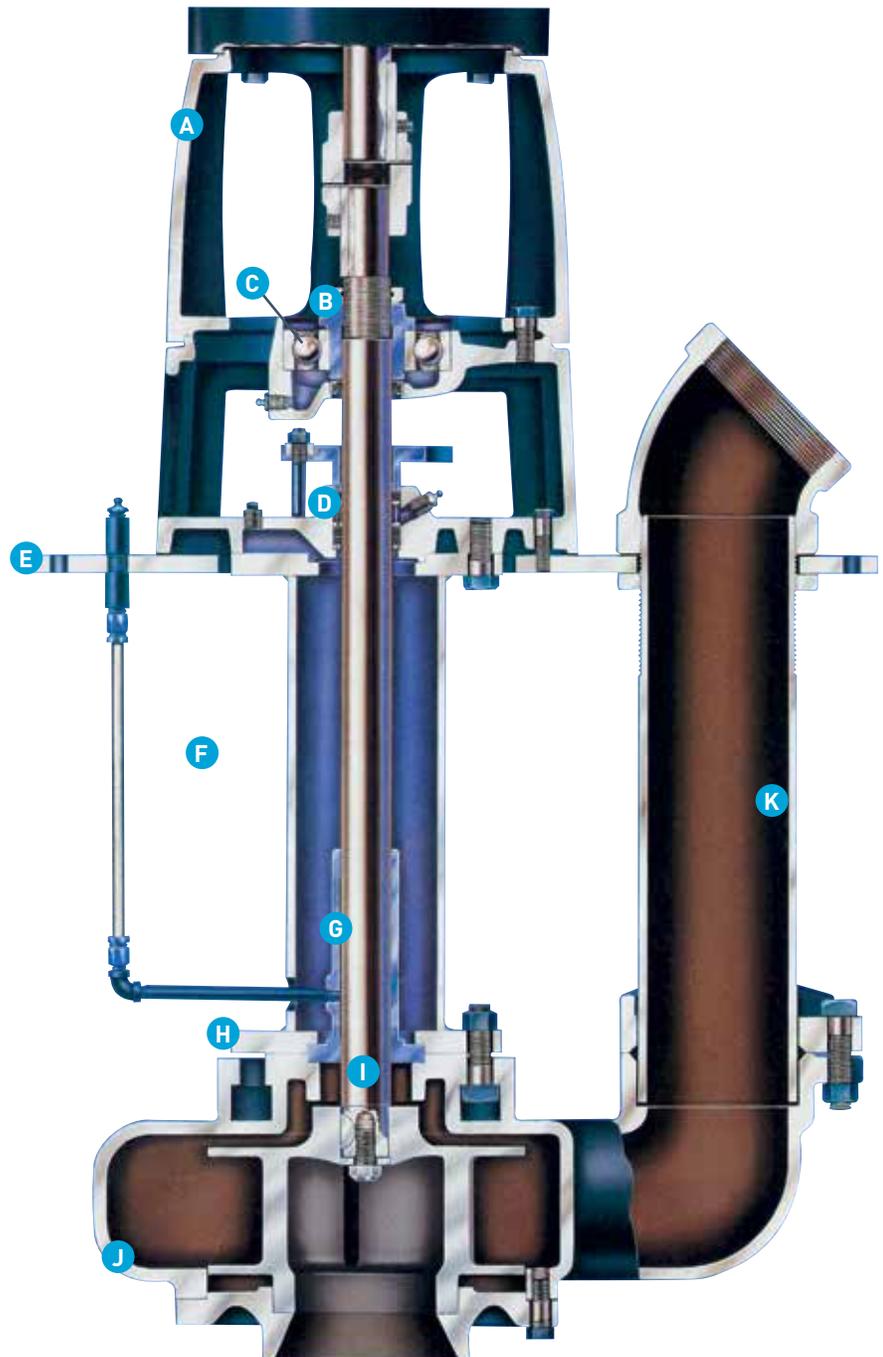
in diameter is provided to minimize deflection and bearing wear.

## J. Liquid End

includes a solids handling impeller as standard and will pass a 3" sphere.

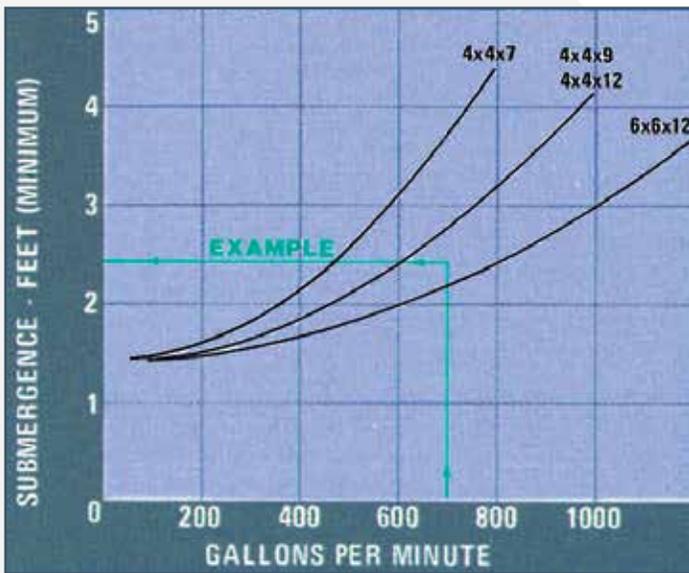
## K. Discharge Pipe

is securely locked to the baseplate. A 45° elbow is threaded for easy system piping. A below-surface discharge is optionally available.



# Performance Data and Engineering Details

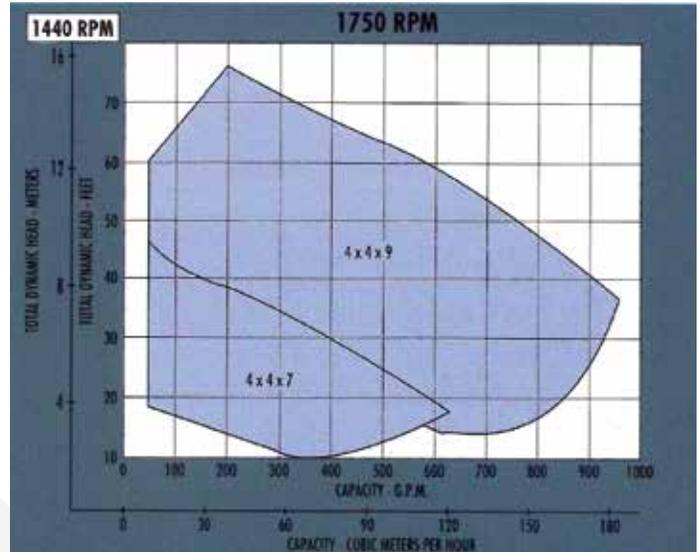
Air may be entrained in the pumped liquid if the pump suction is located too close to the free liquid surface in the suction source. Pumping liquid with entrained air can cause a reduction of capacity, vibration, loss of efficiency and wasted power. Excessive wear of close running parts, bearing stresses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



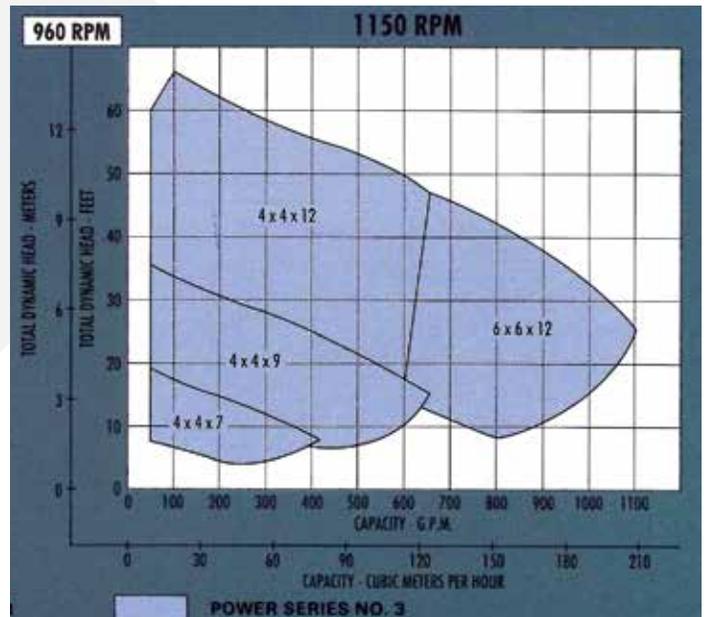
Example: The recommended minimum submergence for a 4" x 4" x 9" Model 630 pump operating at 700 gallons per minute (GPM), from water level to suction flange is 2.4 feet.

Material of Construction	
Description	Material
Baseplate	Steel WRT
Pump bearing	Bronze ASTM B52
Bearing collar	Bronze ASTM B52
Casing	Cast Iron ASTM A48
Discharge pipe	Steel WRT sch'd 40
Head - lower	Cast iron ASTM A48
Head - upper	Cast iron ASTM A48
Impeller	Cast iron ASTM A48
Packing	Graphited fiber
Shaft	Steel AISI C1040
Suction cover	Cast iron ASTM A48
Support pipe	Steel WRT sch'd 40

Intermediate Line Shaft Bearings		
Pit Depths	Pump Setting	No. of Line Shaft Bearing
6'6"	6'2"	1
11'6"	11'2"	2
16'6"	16'2"	4



Individual performance curves should be checked for final selection. For selections not shown on this chart, please refer to the factory.



Pit Depth or Pump Setting (approx.)					
Length in Feet		Length in Feet		Length in Feet	
Pit Depth	Pump Setting	Pit Depth	Pump Setting	Pit Depth	Pump Setting
2'	1'8"	7'	6'8"	12'	11'8"
2'6"	2'2"	7'6"	7'2"	12'6"	12'2"
3'	2'8"	8'	7'8"	13'	12'8"
3'6"	3'2"	8'6"	8'2"	13'6"	13'2"
4'	3'8"	9'	8'8"	14'	13'8"
4'6"	4'2"	9'6"	9'2"	14'6"	14'2"
5'	4'8"	10'	9'8"	15'	14'8"
5'6"	5'2"	10'6"	10'2"	15'6"	15'2"
6'	5'8"	11'	10'8"	16'	15'8"
6'6"	6'2"	11'6"	11'2"	Refer to factory	

# Engineering Details and Pump Selection

Limitations		
Maximum limitations based on standard materials and pumping clear water		
Speed – RPM		1750
Minimum horsepower	1750 RPM 1150 RPM	1 3/4
Temperature – °F		140
Basin pressure – psi		2
Basin cover size	w/o oval or manhole w/ or w/o oval or manhole	28 78

Design Details		
Area	Description	Power Series 3
Pump Shaft	Diameter at impeller	1-1/4
	Diameter between coupling and impeller	1-7/16
	Diameter at coupling end	1-1/4
Bearings	Bearing (ball) – head	311
	Bearing (sleeve) – pump	6" lg.
Support pipe size		4"
Power series		3

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

Important note: According to the National Plumbing Code, a duplex sewage ejector is required whenever the pit or basin services more than six toilets. Each pump in a duplex system must be large enough to handle the entire flow by itself. This is a safety precaution in the event of failure of one of the pumps. Pumps that handle 3" solids are recommended.

## Determining Pump Capacity

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

Max. No. of Toilets	1-2	3-4	5-6	7-10	11-14	15-20	21-25	26-30
GPM	75	100	125	150	200	250	300	350

## Additional Water Drainage

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

Example A:	
Capacity of 5 toilets	125 GPM
Number of fixtures to be handled in addition to toilets	25
Deduct number of fixtures that can be handled by pump (4 times number of toilets) (4 x 5 toilets)	20
Excess fixtures	5
Fixtures @ 3 GPM each =	15 GPM
Total capacity required	140 GPM

## Water Seepage

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

Example B:	
Total sewage and clear water drainage from fixtures	140 GPM
Water seepage	80 GPM
Allowance for handling seepage up to 50% of sewage total	70 GPM
Additional capacity required	10 GPM
Total pump capacity required	150 GPM

## Unusual Additional Service Flow

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

# Pump Selection

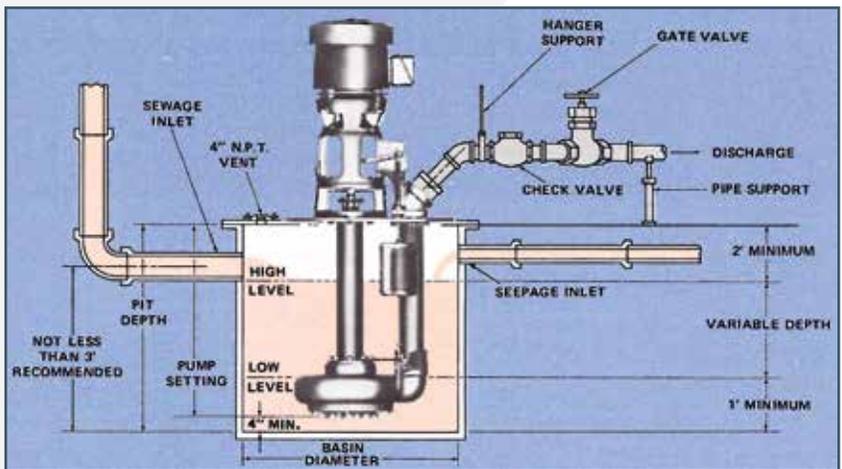
## Determining Pump Discharge Head

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

Example C:	
Distance from lowest level of water to street level	26 feet
Friction of discharge pipe (150 GPM, 4" pipe, 150' long)	2 feet
Friction of pipe fittings (elbows, check valves, gate valves, Y-branch, etc.)	2 feet
Total discharge head	30 feet

## Determining Tank or Basin Size

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



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

## Calculating Round Tank or Basin Capacities per Foot of Depth

Pump	Simplex				Duplex			
	24	30	36	42	48	54	60	72
Basin dia. (inches)	24	30	36	42	48	54	60	72
Capacity per foot (in gallons)	24	38	53	77	95	119	150	212

Note: Tanks are available in depths of 6" increments.

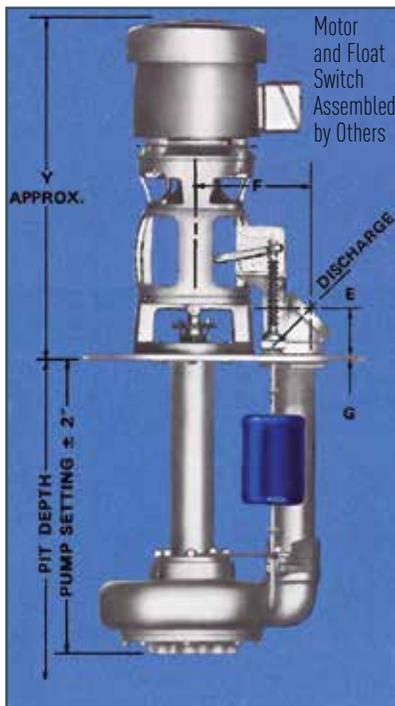
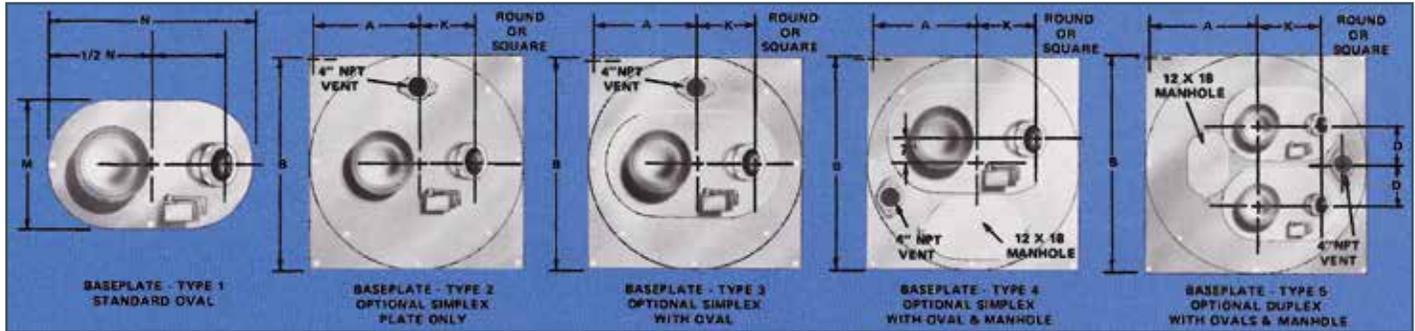
## Calculating Square Pit Capacities

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

### Typical Installation:

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

# Dimensional Data



**Notes:**

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

Baseplate - Oval - Steel					
Number	Type	G	M	N	Wgt.
1	20 x 24	3/8	20	24	36
2	22 x 28	1/2	22	28	63

Baseplate - Round or Square - Steel													
A	B	Type 2				Type 4				Type 5			
		Oval No.	G	Rd. Wgt.	Sq. Wgt.	Oval No.	G	Rd. Wgt.	Sq. Wgt.	Oval No.	G	Rd. Wgt.	Sq. Wgt.
11	24	N/A	3/8	41	54								
13	28	N/A	3/8	58	76								
Type 3													
16	34	1	3/8	89	115								
19	40	2	3/8	126	163	1	3/8	136	173				
22	46	2	1/2	225	289	2	1/2	235	299	1	1/2	245	309
25-1/2	53	2	1/2	302	387	2	1/2	312	397	2	5/8	397	504
29	60	2	5/8	487	623	2	5/8	497	633	2	5/8	507	643
32	66	2	5/8	592	755	2	5/8	602	765	2	3/4	730	927
38	78	2	5/8	832	1060	2	5/8	842	1070	2	3/4	1016	1290

Motor					
Frame	Horsepower		Motor Wgt. (lbs)	Upper Head Wgt. (lbs)	Y Approx.
	1750	1150			
143 HP	1	3/4	40	21	25
145 HP	1-1/2 - 2	1	45	21	26
182 HP	3	1-1/2	72	21	27
184 HP	5	2	80	21	28
213 HP	7-1/2	3	130	21	30
215 HP	10	5	145	21	32
254 HP	15	7-1/2	220	21	34
256 HP	20	10	240	21	36
284 HPH	25	15	330	42	39

Pump Size					Minimum Baseplate Size													
Disch.	Suction	Case Bore	Pump wgt. in lbs.	For Ea. Add. 1' Setting	D	E	F	Type 1		Type 2		*Type 3		**Type 4		Type 5		
								Size	K	Size	K	Size	K	Size	K	Size	K	
4	4	7	542	30	10-1/2	4-1/2	11-7/8	20 x 24	9-3/8	24	9-3/8	34	9-3/8	40	9-3/8	46	12-3/8	
4	4	9	562	30	10-1/2	4-1/2	11-7/8	20 x 24	9-3/8	24	9-3/8	34	9-3/8	40	9-3/8	46	12-3/8	
4	4	12	610	30	11-1/2	4-1/2	11-7/8	22 x 28	8-7/8	34	9-3/8	36	8-7/8	42	8-7/8	53	11-3/8	
6	6	12	655	30	11-1/2	6	13-1/2	22 x 28	10-1/2	34	11	36	10-1/2	42	10-1/2	53	13	

\*All bases 36" and larger - use 22 x 28 oval only.

\*\* All bases 42" and larger - use 22 x 28 oval only

# Engineering Specifications

The contractor shall furnish (and install as shown on the plans) Aurora Model (631 simplex) (632 duplex) centrifugal sewage pumps size \_\_\_\_\_ x \_\_\_\_\_ x \_\_\_\_\_ of (bronze fitted) (all iron) construction. Each pump shall have a capacity of \_\_\_\_\_ GPM at \_\_\_\_\_ ft. total head, with a temperature of \_\_\_\_\_ °F, \_\_\_\_\_ specific gravity. The units shall be designed for a sump depth of \_\_\_\_\_ ft. and shall be furnished with an (above floor discharge terminating at the baseplate with a 45° threaded elbow) (below the floor discharge terminating with a threaded connection). A steel baseplate; (oval) (round) (square) — (simplex) (simplex with oval) (simplex with oval and manhole) (duplex with ovals and manhole) will be provided. A 4" vent will be provided on all round or square baseplates. The pump casing and suction cover shall be cast iron. The casing is to be provided with a cast integral discharge elbow. The cast iron impeller is of the enclosed solids handling type and shall be capable of passing a 3" diameter sphere. The impeller running clearances will be of the face type to provide simple adjustments axially to compensate for wear. The impeller is to be dynamically balanced and keyed to the pump shaft. The column pipe must be 4" diameter having machined tongue-and-grooved joints to ensure shaft alignment. A pump bearing will be located directly above the impeller and shall be (bronze sleeve) (iron sleeve) or relief type with (iron) (bronze) (cutless rubber) bushing. Spool bearing with steel housing with (iron) (bronze) (cutless rubber) bushing. Line bearings must be provided with a setting of 6'2" and one bearing for each additional 5' of setting thereafter. All standard

sleeve or relief pump and line bearings must be (grease) (oil) (water) lubricated through separate nylon tube lubrication lines terminating at the (baseplate) (discharge pipe). Standard bearings will be grease lubricated (unless otherwise specified). The motor pedestal is to be of cast iron, two-piece construction, fitted with a sealed thrust ball bearing located 6" above the baseplate. The ball bearing collar will be arranged to allow external axial adjustment of the shaft and impeller. Grease seals shall be provided to retain grease and to prevent contamination of the vertically mounted ball bearing. A grease fitting will be provided to allow regreasing of the bearing. A packed stuffing box complete with a split gland shall be provided for gastight construction. The upper head shall be of sufficient height to elevate the motor shaft extension should the motor be removed for servicing. The pump shall be controlled by an enclosed (heavy duty) (watertight and explosion-resisting) (hazardous location) type float operated switch 6" above the baseplate with plastic float and float rod. A flexible bellows will provide gastight construction. An automatic alternator shall be furnished on duplex pumps to allow the pumps to alternate on each successive cycle or operation. The pumps are to be driven by and flexible coupled to a standard hp \_\_\_\_\_ hp, \_\_\_\_\_ volt, \_\_\_\_\_ phase, \_\_\_\_\_ hertz, \_\_\_\_\_ RPM, \_\_\_\_\_ vertical solid shaft (open drip-proof) (totally enclosed) (hazardous location) electric motor. A conduit box will be provided as well as a drip cover.



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Because we are continuously improving our products and services, Pentair reserves the right to change specifications without prior notice.

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