

Sewer Department Review

The Residences at Stone Ridge – Phase II

The Gutierrez Company | Milford, MA

February 23, 2021 (revised May 11, 2021)



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Sewer Department Review

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Stone Ridge
SMMA #19162

Date: 12/04/2020, Rev. 01/25/2021, Rev. 02/10/2021, Rev. 05/11/2021

Pump Station Design - Currently Proposed -w/Modified & New Pump Station Configuration

I. PUMP STATION DESIGN INFORMATION

Use	Quantity	Unit	Rate		GPD	Hours Op.	Adj. Max. Flow (GPM)	Peak Factor	Peak Flow (GPD)	Adj. Peak Flow (GPM)
Restaurant Depot	63,085	sq. ft.	50	per 1000 sq. ft.	3,154	12	4.38	3.0	9,463	13
Residences - Phase I	383	bedrooms	110	per bedroom	42,130	18	39.01	4.0	168,520	156
Residences - Phase II	460	bedrooms	110	per bedroom	50,600	18	46.85	4.0	202,400	187
Swimming Pool	104	persons	10	gpd/person	1,040	18	0.96	4.0	4,160	4
I/I	1,450	li. ft.	200	gpd/idm	439	24	0.30	4.0	1,756	1
Future Development	Conceptual Design Flow				21,120	12	29.33	3.0	63,360	88
Total					118,483		121		449,659	450

B. High Point in Force Main (ft) = 304.00
Pump Off Elevation (ft) = 286.00
Elevation Head (ft) = 18.00

C. Force Main Velocity Check: Dia.(in) = 6
Length (ft) = 2347
Assumed Q_{pump} (gpm) = 475
Material = PVC
* Velocity (ft/s) = 5.39
Hazen-Williams "C" value = 140

* (3.00 ft/s < velocity < 7.00 ft/s)

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D. Minor Losses in Fittings "K" Value (Included in Total Equivalent Length)

Apparatus	Quantity	"K" Value	Quantity * K
Check Valve	1	1.80	1.80
Enlargement	0	0.10	0.00
90° Bend	4	0.54	2.16
6" Gate Valve	1	0.14	0.14
Tee Branch	0	1.08	0
Tee Through	0	0.36	0.00
45° Bend	8	0.29	2.32
22.5° Bend	0	0.24	0.00
Pipe Exit	1	1.00	1.00
Total "K" =			7.42

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II. SYSTEM HEAD COMUTATIONS

Given: Forcemain Diameter (in) = 6
 Length of Forcemain (ft) = 2347
 Hazen-Williams "C" Value = 140
 Minor Loss "K" Value = 7.42
 High Point Elevation (ft) = 304.00
 Pump Off Elevation (ft) = 286.00

Minor Headloss (Hm) = $K \cdot (V^2) / (2 \cdot G)$

Friction Headloss (Hf) = $2.083 \cdot (L/1000)^{1.85} \cdot (\text{gpm}^{1.85} / \text{dia}^{4.8655})$

Static Headloss (Hstat) = Discharge Elevation - Pump Off Elevation

Total Dynamic Head (TDH) = Hm + Hf + Hstat

Q (gmp)	V (fps)	Hm (ft)	Hf (ft)	Hstat (ft)	TDH	
0	0.00	0.00	0.00	18.00	18.00	
25	0.28	0.01	0.17	18.00	18.17	
50	0.57	0.04	0.60	18.00	18.63	
75	0.85	0.08	1.26	18.00	19.35	
100	1.14	0.15	2.15	18.00	20.30	
125	1.42	0.23	3.25	18.00	21.48	
150	1.70	0.33	4.56	18.00	22.89	
175	1.99	0.45	6.06	18.00	24.51	
200	2.27	0.59	7.76	18.00	26.35	
225	2.55	0.75	9.65	18.00	28.40	
250	2.84	0.93	11.72	18.00	30.65	
275	3.12	1.12	13.98	18.00	33.10	
300	3.41	1.34	16.42	18.00	35.76	
325	3.69	1.57	19.04	18.00	38.61	
350	3.97	1.82	21.84	18.00	41.66	
375	4.26	2.09	24.82	18.00	44.90	
400	4.54	2.38	27.96	18.00	48.34	
425	4.83	2.68	31.28	18.00	51.96	
450	5.11	3.01	34.77	18.00	55.78	
475	5.39	3.35	38.43	18.00	59.78	Qpump
500	5.68	3.71	42.25	18.00	63.97	
525	5.96	4.09	46.25	18.00	68.34	
550	6.24	4.49	50.40	18.00	72.89	
575	6.53	4.91	54.72	18.00	77.63	
600	6.81	5.35	59.20	18.00	82.55	

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III. WETWELL DESIGN

A. Volume of Wetwell

$$V = t * q / 4$$

t = minimum cycle time (min)
q = peak flow (gpm)
V = volume (gal)

t = 15
q = 29

V = 109

Wetwell & Pump Elevations:

299.00	Top of Slab
290.00	Invert In
288.00	Lag Pump On & High Water Alarm
287.50	Lead Pump On
286.00	Pumps Off and Alternate
285.80	Low Water Alarm
284.80	Bottom Inside of Chamber

C. Effective Capacity of Wetwell Chamber:

	Wetwell A	Wetwell B
Inside Dia. (ft) =	8.00	10.00
X - Area (sf) =	50.3	78.5
Effective Capacity (gal) =	564	881

Total Capacity Wetwell A + Wetwell B = 1,445

D. Emergency Storage Capacity:

Wetwells A & B Above "Pump On" Elevation to Underside of Slab =	8,507	Gal.
Emergency Storage Tank (ID = 20'-6" L x 10'-0" W x 8'-0" H) Above		
Elevation 289.5 to Underside of Tank Slab (297.5) =	24,534	Gal.
Total =	33,042	Gal.

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Stage	Elev	Emer. Tank Stor. Vol.	Wet Wells Stor. Vol.	Total Volume	Cum. Volume
1	289.5-290.5	3,066	963	4,029	4,029
2	290.5-291.5	3066	963	4029	8,058
3	291.5-292.5	3066	963	4029	12087
4	292.5-293.5	3066	963	4029	16116
5	293.5-294.5	3066	963	4029	20145
6	294.5-295.5	3066	963	4029	24174
7	295.5-296.5	3066	963	4029	28203
8	296.5-297.5	3,066	963	4029	32232
9	297.5-298.33	0	799	799	33,031

Total Volume Required for 6 Hours of Storage = 29620

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IV. WETWELL DETENTION TIMES

A. Time to Empty Wetwell (pump run start to stop)

$$T1 = \text{Effective Capacity} / (Q_{\text{pump}} - Q_{\text{in}})$$

Effective Capacity (gal) =	1445
Pumping Rate (gpm) =	475
Max. Daily Flow (gpd) =	118,483
Peak Flow (gpm) =	450
Max. Daily Flow (gpm) =	121

1. No Inflow:	T1(min) =	3.04
2. Maximum Daily Inflow:	T1(min) =	4.08
3. Peak Inflow:	T1(min) =	57.03
4. 1/2 Of Pump Rate:	T1(min) =	6.09

B. Time to Fill Wetwell (pump off)

$$T2 = \text{Effective Capacity} - Q_{\text{in}}$$

1. No Inflow:	T2(min) =	N/A
2. Maximum Daily Inflow:	T2(min) =	11.96
3. Peak Inflow:	T2(min) =	3.21
4. 1/2 Of Pump Rate:	T2(min) =	6.09

C. Cycle Time (pump start to start)

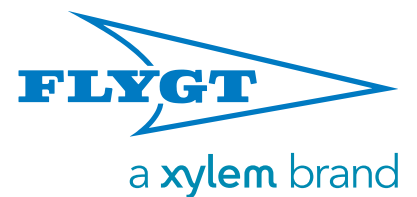
$$Tt = T1 + T2$$

1. No Inflow:	Tt(min) =	N/A
2. Maximum Daily Inflow:	Tt(min) =	16.04
3. Peak Inflow:	Tt(min) =	60.24
4. 1/2 Of Pump Rate:	Tt(min) =	12.17



Flygt N-pump Series

SELF-CLEANING PUMPS WITH SUSTAINED HIGH EFFICIENCY



Sustained high efficiency is priceless

Flygt N-pumps take on the toughest applications and get the job done. Every component is designed and manufactured to deliver sustained high efficiency. Thanks to the patented N-technology with its innovative self-cleaning impeller, Flygt N-pumps deliver the highest total efficiency – lowering your energy bill and reducing unplanned maintenance costs. That adds up to total peace of mind – and big savings over the long term.

Our vast fluid handling knowledge and dedication to research and development lead to technological advances and continuous improvement.

That's why our Flygt N-pumps are at work in more than a hundred thousand installations worldwide. They have proven to be the best and most reliable choice for both dry and submersible installations far and away over our competition.

Robust and reliable

Every Flygt N-pump is tested in the factory to ensure high performance and premium



quality. Flygt products deliver outstanding, cost-effective performance that has been proven in applications such as:

- Wastewater
- Stormwater
- Sludge
- Industrial effluent
- Raw water
- Cooling water



THE N-PUMP ADVANTAGE

- Patented technology
- Innovative design
- Sustained high efficiency
- Self-cleaning ability
- Modular design
- Reliable
- Fewer unplanned service calls



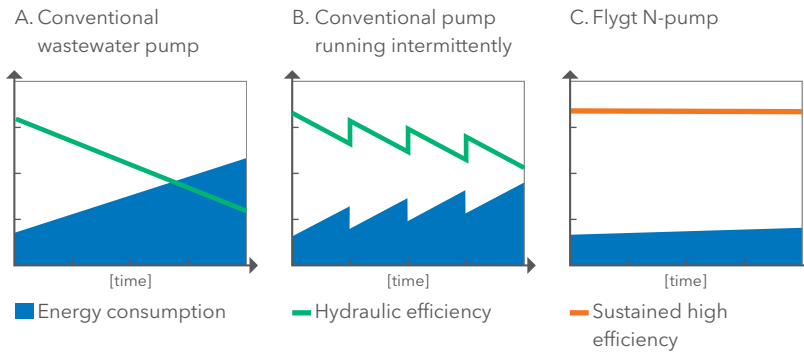
BROAD RANGE CAPACITY

- Ratings from 2.2 hp to 870 hp
- Discharges up to 20" (500 mm)
- Flows up to 16,000 US GPM (1,000 l/s)
- Heads up to 400 ft (120 m)
- Submersible and dry installations
- Every Flygt pump is performance tested in the factory
- Can handle dry solids up to 8%

Self-cleaning N-pump saves money

Sustained high efficiency

When solid objects such as stringy fibrous material and modern trash enter the inlet of a conventional pump, they tend to get caught on the leading edges of the impeller vanes. This buildup reduces the impeller's efficiency, resulting in increased power consumption (Fig. A) and generating increased energy charges.



As solids continue to build up inside the impeller, motor thermal protection can trip causing the pump to stop and leading to costly unplanned service calls. If a conventional wastewater pump runs intermittently, the solids buildup will be removed by backflushing when the pump is shut off at the end of the operating cycle. When the next cycle begins, efficiency returns to its initial value since the impeller is free from solid objects (Fig B).

The high efficiency of the Flygt N-pump is sustained over time due to its self-cleaning ability, keeping energy costs to a minimum (Fig. C).

All Flygt N-pumps have the same self-cleaning performance regardless of duty point.

THE SELF-CLEANING CONCEPT

Stage 1. Most solid objects entering the pump will pass through the impeller between the impeller vanes. If an object gets caught on the leading edge of one of the vanes, it will slide along the backswept shape towards the perimeter of the inlet.



Stage 2. The solid object will slide along the tip of the impeller vane inside the relief groove. The guide pin in the insert ring will push all types of solids away from the center of the impeller, along the leading edge and out through the relief groove.



Broad capacity range to suit your application

Flexible and modular design

Flygt N-technology enables you to tailor the hydraulics to meet the requirements of virtually any application. Choose the hardened cast iron version for typical wastewater applications and the chopper ring version for cutting long fibers or solids. The Hard-Iron™ version should be used in abrasive applications and waters that could cause erosion corrosion due to high oxygen content.

Whatever you choose, you never sacrifice pump efficiency – and you can easily switch the module if the operating conditions change.

Cast iron



Cast iron impeller with hardened edges and insert ring for typical pumping applications.

Hard-Iron™ (60 HRC)



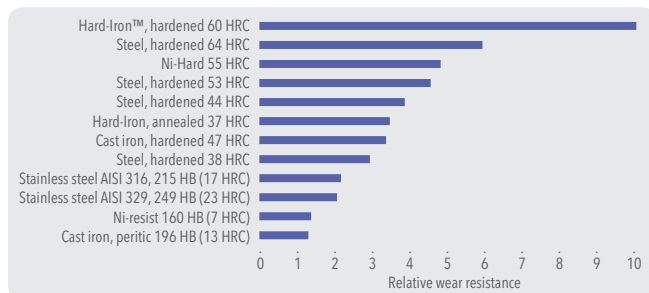
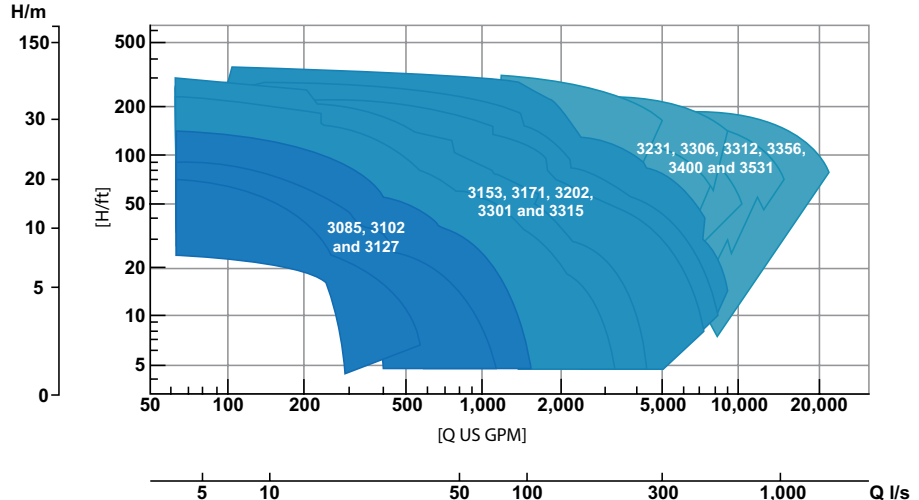
Extra durable option for abrasive and erosion corrosion applications.

Chopper ring for cutting long fibers or solids.

Top performance with a broad capacity range

- Large capacity pumps
- Medium capacity pumps
- Low capacity pumps

Composite curves for comparison purposes only. Consult engineering data for exact flow and head capabilities.



HARD-IRON™ (60 HRC) FOR THE TOUGHEST WASTEWATER CHALLENGES

Accelerated wear tests prove that Hard-Iron™ hydraulic components keep on working efficiently with minimal wear after pumping water with a very high concentration of coarse sand (2,400 tons).

Flygt N-pumps with Hard-Iron™ components continue to deliver sustained high efficiency without clogging or erosion corrosion, prolonging lifetime by 200 percent compared to standard hardened cast iron hydraulics.

Designed and engineered for longer life

Xylem specially designs and manufactures Flygt N-pump components, such as the motor, seals and shaft, to optimize operation and prolong pump service life.

Motor

The Class H squirrel-cage induction motor delivers outstanding performance and superior heat transfer in submersible and dry installations. Heat losses are concentrated around the shrink-fitted stator, which is cooled by means of the surrounding water. The motor has a NEMA Class B maximum operating temperature rise of 80°C (176°F) to ensure long service life. All motors are capable of fully utilizing the available power while operating on a variable frequency drive.

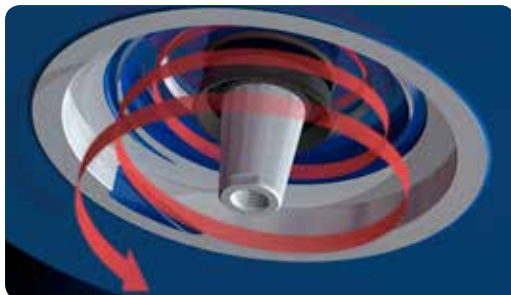
For an even higher overall efficiency, premium efficiency motors IE3 are available.

Long-life seals

Durable tungsten carbide seals offer exceptional mechanical strength as well as superior sliding properties even when running dry. These low-friction seals withstand thousands of hours of high-pressure operation under extreme conditions without cracking, seizing up or showing signs of unacceptable wear.

Low shaft deflection

To minimize vibration, promote quiet operation, and prolong seal and bearing life, all Flygt N-pumps feature a short shaft overhang to reduce shaft deflection.



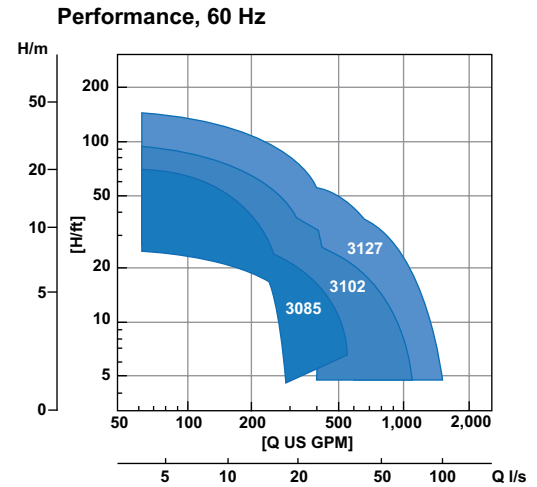
SPIN-OUT™ SEAL PROTECTION FOR PUMPS WITH CAVITIES IN THE SEAL CHAMBER

The patented Spin-out™ design expels abrasive particles from the seal chamber, providing protection against wear of the outer seal. As an integral part of the seal chamber, Spin-out™ is as simple as it is effective.

Low capacity pumps



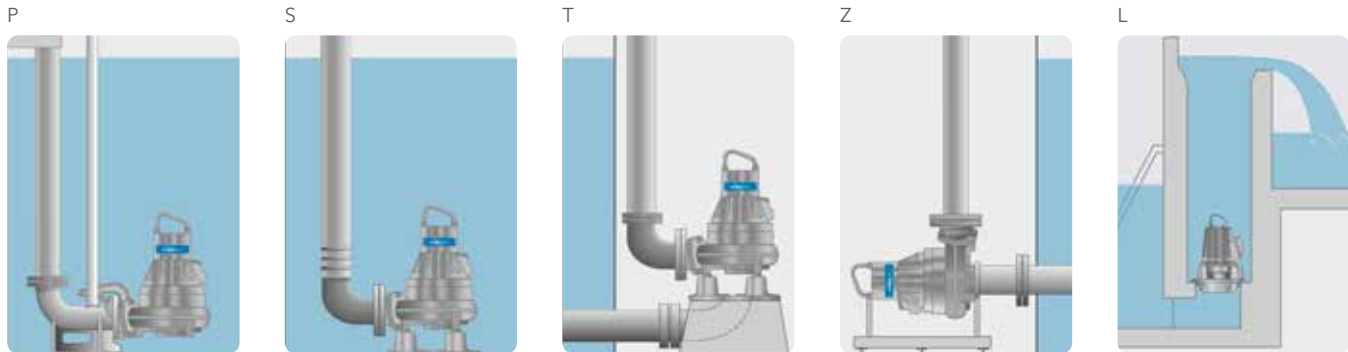
This series of Flygt N-pumps includes three models that handle capacities up to 1,600 US GPM (100 l/s). Like all Flygt N-pumps, these contribute to reducing the total life cycle costs of your installation.



Power ratings and size

Model	3085	3102	3127
Rating, hp	2.2-4	5-6	7.5-11
Discharge, in	3" (80 mm)	3" (80 mm) 4" (100 mm) 6" (150 mm)	3" (80 mm) 4" (100 mm) 6" (150 mm)

Methods of installation



P For semi-permanent wet well installations. The pump is installed with twin guide bars on a discharge connection.

S A semi-permanent freestanding installation. Transportable version with pipe or hose connection.

T A vertically-mounted, permanent dry well or in-line installation with flange connections for suction and discharge pipework.

Z A horizontally-mounted, permanent dry well or in-line installation with flange connections for suction and discharge pipework.

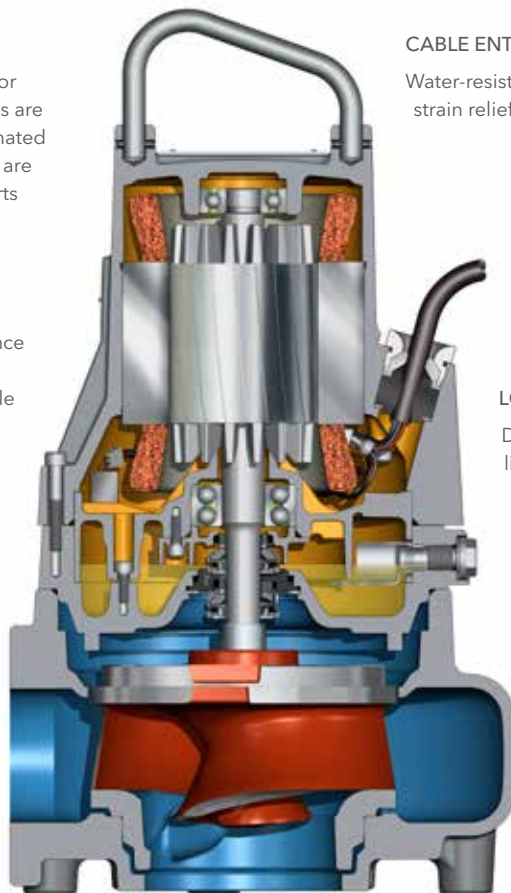
L A semi-permanent installation of a pump within a vertical steel or concrete column.

BETTER HEAT TRANSFER

Our specially designed and manufactured motor provides enhanced cooling because heat losses are concentrated around the stator. Trickle impregnated in resin (Class H insulation), the stator windings are rated at 180°C (355°F) and enable up to 30 starts per hour.

COMPLIANCE

Each pump is tested and approved in accordance with national and international standards, including 60034-1 and CSA. Pumps are available in explosion-proof versions for use in hazardous environments, and are approved by the Factory Mutual, European Standard and IEC.

**CABLE ENTRY**

Water-resistant cable entry provides both sealing and strain relief functions to ensure a safe installation.

SENSORS

Thermal sensors embedded in the stator windings prevent overheating. Optional leakage sensors in the stator and oil housings are also available.

LONG-LIFE BEARINGS

Durable bearings provide a minimum service life of 50,000 hours.

ENDURING SEALS

The Griploc™ system consists of two sets of mechanical shaft seals that operate independently to provide double security against leakage.

**Griploc™ seal**

With a robust design, Griploc™ seals offer consistent performance and trouble-free operation in challenging environments. Solid seal rings minimize leakage and the patented griplock spring, which is tightened around the shaft, provides axial fixation and torque transmission. In addition, the Griploc™ design facilitates quick and correct assembly and disassembly.

Adaptive N-impeller

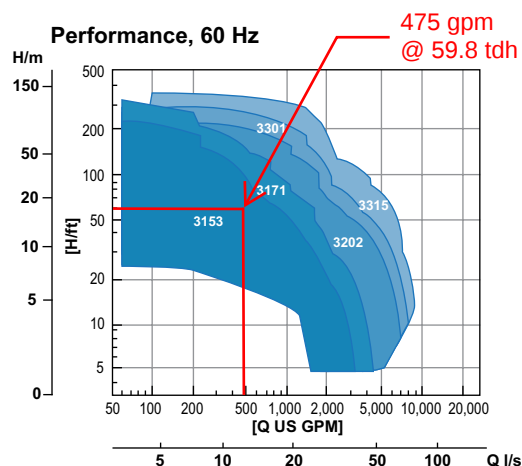
The Flygt N3085 - N3127 feature an adaptive self-cleaning N-impeller that can move axially to enable easy passage of large solids through the pump.



Medium capacity pumps



For demanding pumping duties, five models handle fluid transport for capacities up to 8,000 US GPM (500 l/s). Highly efficient, these heavy-duty models provide clog-free performance in order to achieve the best overall life cycle cost.



Power ratings and size

Model	3153	3171	3202	3301	3315
Rating, hp	12-23	25-35	35-75	60-105	85-160
Discharge, in	3" (80 mm)	4" (100 mm)	4" (100 mm)	6" (150 mm)	6" (150 mm)
	4" (100 mm)	6" (150 mm)	6" (150 mm)	10" (250 mm)	10" (250 mm)
	6" (150 mm)	10" (250 mm)	8" (200 mm)	12" (300 mm)	12" (300 mm)
	8" (200 mm)			14" (350 mm)	14" (350 mm)
	10" (250 mm)				

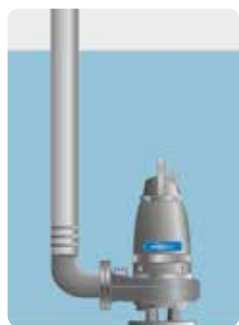
Methods of installation

P



For semi-permanent wet well installations. The pump is installed with twin guide bars on a discharge connection.

S



A semi-permanent freestanding installation. Transportable version with pipe or hose connection.

T



A vertically-mounted, permanent dry well or in-line installation with flange connections for suction and discharge pipework.

Z



A horizontally-mounted, permanent dry well or in-line installation with flange connections for suction and discharge pipework.

BETTER HEAT TRANSFER

Our specially designed and manufactured motor provides enhanced cooling because heat losses are concentrated around the stator. Trickle impregnated in resin (Class H insulation), the stator windings are rated at 180°C (355°F) and enable up to 30 starts per hour.

EFFICIENT COOLING

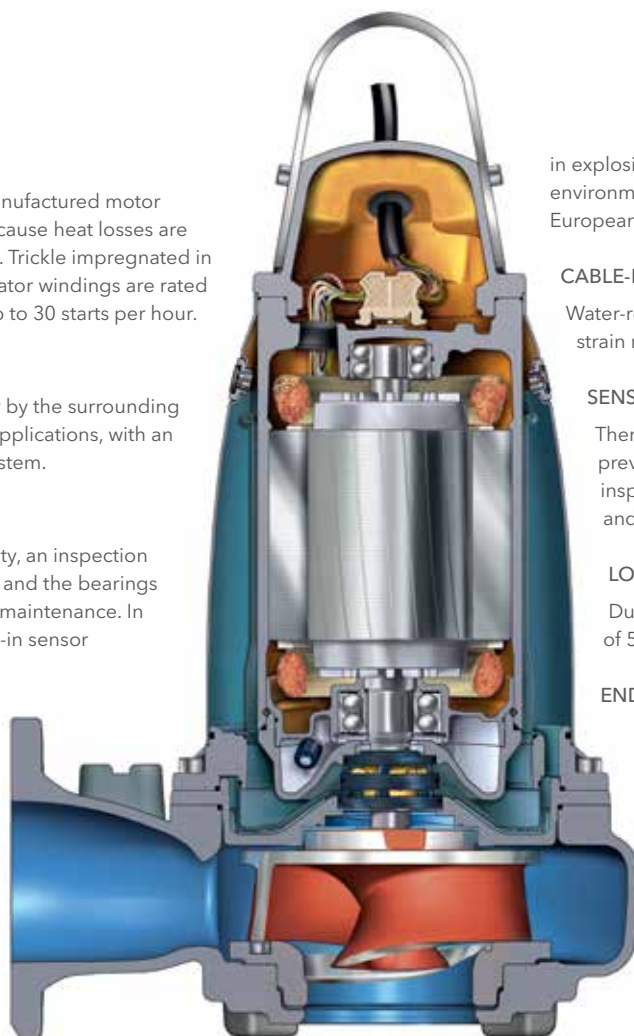
These pumps are cooled either by the surrounding liquid or, in more demanding applications, with an internal closed-loop cooling system.

INSPECTION CHAMBER

To increase operational reliability, an inspection chamber between the seal unit and the bearings enables rapid spot checks and maintenance. In the case of a seal failure, a built-in sensor provides an early warning of any fluid buildup, thus reducing the risk of expensive repair work.

COMPLIANCE

Each pump is tested and approved in accordance with national and international standards, including IEC60034-1 and CSA. Pumps are available



in explosion-proof versions for use in hazardous environments, and are approved by the Factory Mutual, European Standard and IEC.

CABLE-ENTRY

Water-resistant cable entry provides both sealing and strain relief functions to ensure a safe installation.

SENSORS

Thermal sensors embedded in the stator windings prevent overheating, and a leakage sensor in the inspection chamber minimizes the risk for bearing and stator failure.

LONG-LIFE BEARINGS

Durable bearings provide a minimum service life of 50,000 hours.

ENDURING SEALS

The Flygt Plug-in™ seal with the Active Seal™ system offers increased sealing reliability and zero leakage into the motor, thereby reducing the risk of bearing and stator failure.

Flygt Plug-in™ seal with Active Seal™ system

The Flygt Plug-in™ seal is a seal unit that eliminates the risks associated with incorrect installation and careless handling. It comprises the Active Seal™ system in one easy-to-handle unit.

The Active Seal™ system is a patented zero-leakage double-seal system that actively prevents liquid from entering the motor cavity, thereby reducing the risk for bearing and stator failure. It comprises a unique



Inner seal with laser-cut spiral grooves.



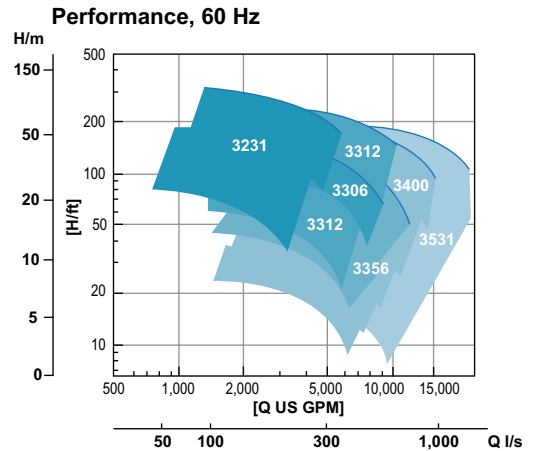
inner seal that acts as a micro-pump and an outer seal that prevents leakage of pumped media into the buffer chamber.

Laser-cut grooves on the inner seal create a hydrodynamic pumping effect that prevents any leakage from entering the motor. This translates into enhanced sealing reliability, reduced downtime and fewer unscheduled maintenance checks. In addition, regular service inspections can be prolonged in many applications.

Large capacity pumps



When higher capacity is required, the Flygt N-pump series has five pumps to do the job. These models deliver unprecedented pumping power – reliably and efficiently.



Power ratings and size

Model	3231	3306	3312	3356	3400	3531
Rating, hp	90-335	70-280	90-470	70-280	60-470	60-870
Discharge, in	8" (200 mm)	12" (300 mm)	12" (300 mm)	14" (350 mm)	16" (400 mm)	20" (500 mm)

Methods of installation

P



For semi-permanent wet well installations. The pump is installed with twin guide bars on a discharge connection.

S



A semi-permanent freestanding installation. Transportable version with pipe or hose connection.

T



A vertically-mounted, permanent dry well or in-line installation with flange connections for suction and discharge pipework.

Z



A horizontally-mounted, permanent dry well or in-line installation with flange connections for suction and discharge pipework.

BETTER HEAT TRANSFER

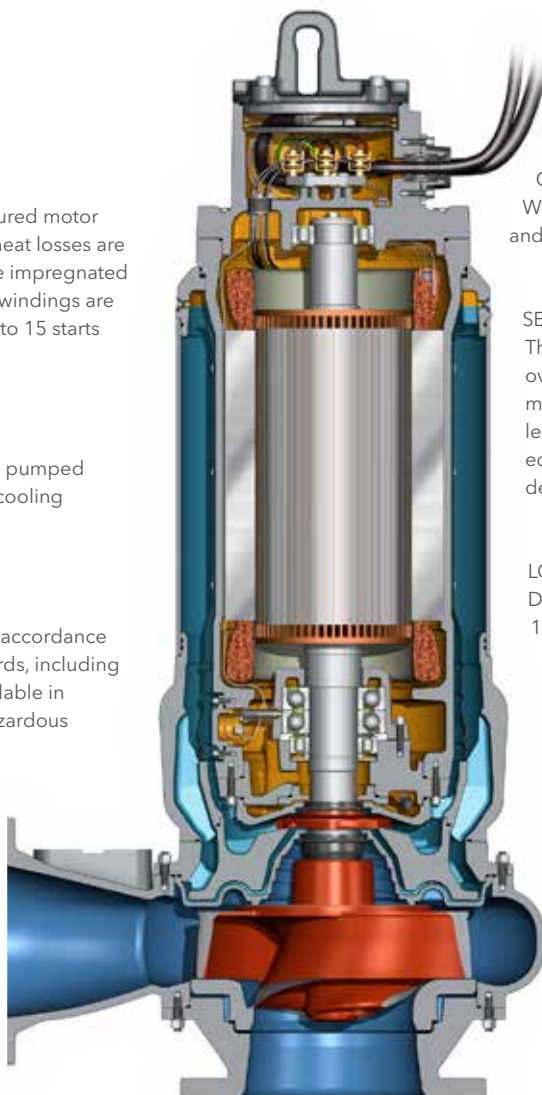
Our specially designed and manufactured motor provides enhanced cooling because heat losses are concentrated around the stator. Trickle impregnated in resin (Class H insulation), the stator windings are rated at 180°C (355°F) and enable up to 15 starts per hour.

EFFICIENT COOLING

These pumps are cooled either by the pumped liquid or with an internal closed-loop cooling system.

COMPLIANCE

Each pump is tested and approved in accordance with national and international standards, including IEC 60034-1 and CSA. Pumps are available in explosion-proof versions for use in hazardous environments, and are approved by the Factory Mutual, European Standard and IEC.

**CABLE ENTRY**

Water-resistant cable entry provides both sealing and strain relief functions for a safe installation.

SENSORS

Thermal sensors in the stator windings prevent overheating, and an analog temperature sensor monitors the lower bearing. The stator housing/leakage chamber and the junction box are equipped with leakage sensors. The sensors decrease the risk of bearing and stator failure.

LONG-LIFE BEARINGS

Durable bearings provide a minimum service life of 100,000 hours.

ENDURING SEALS

Two sets of mechanical shaft seals work independently for double security. The Active Seal™ system offers increased sealing reliability and zero leakage into the motor, thereby reducing the risk of bearing and stator failure.

Zero leakage into the motor cavity

The Active Seal™ system is a patented zero-leakage double-seal system that actively prevents liquid from entering the motor cavity, thereby reducing the risk for bearing and stator failure. It comprises a unique inner seal that acts as a micro-pump and an outer seal that prevents leakage of pumped media into the buffer chamber.



Laser-cut grooves on the inner seal create a hydrodynamic pumping effect that prevents any leakage to enter the motor.

This translates into enhanced sealing reliability, reduced downtime and fewer unscheduled maintenance checks. In addition, regular service inspections can be prolonged in many applications.

Complete solutions for your needs



Ready-to-install pre-engineered, prefabricated pumping solutions

Flygt offers several packaged solutions combining our premium N-pumps with dedicated monitoring and control options and pre-fabricated pump stations designed for your needs. The prefabricated pump stations are available in a range of designs and sizes, all supplied complete with the necessary materials and equipment to allow ease and speed of installation and commissioning.

Our packaged solutions have a self-cleaning design and are tested as a system to work perfectly together to give you the ultimate performance within wastewater pumping.



Flygt SmartRun™



Flygt Multismart™

MONITORING AND CONTROL

Our state-of-the-art solutions are designed to ensure pumps work at optimum efficiency, to provide key data, to increase reliability and to prevent pump breakdown.

Our monitoring and control systems are designed for use in a variety of pumping applications. It is the specific conditions at each pump station that help you decide the best monitoring and control solution for your needs. Whether it's wastewater, stormwater, effluent, RAS, WAS, lightly contaminated water or clean water, it all demands a different solution. Naturally each system is designed to work well on its own. However, our pumps and monitoring & control systems are optimized to work even better together.



Engineered pumping solutions

Flygt's standard pump station designs are based on our long history in wastewater pumping. Our engineers work closely with you, from design and system analysis to selection of pumps, installation and monitoring & control solutions. Whether we recommend a proven Flygt standard design or develop a custom solution for you, we can offer you reliable and cost-effective pumping solutions that meet your specific requirements.

All Flygt monitoring and control equipment integrate easily into SCADA control systems for remote monitoring and control. Flygt PumpView puts you in Total Control, Your Way.



FLYGT N-PUMPS: SUBMERSIBLE AND DRY INSTALLATIONS

Flygt N-pumps are an excellent choice for handling solids in dry-pit installations. Originally designed for submersible conditions, our pumps eliminate the risk of damage to the motor due to station flooding. Submersible or dry-installed Flygt N-pumps deliver superior clog-free operation with minimal maintenance and substantial energy savings.

The power to adapt

Options table

Customize your Flygt N-pump with optional equipment.

Flygt N-pump model	3085	3102	3127	3153	3171	3202	3301	3315	3231	3306	3312	3356	3400	3531
Option/Product														
Motor														
Premium efficiency (IE3)	◐	◐	◐	◐	◐	◐	◐		◐	◐	◐	◐	◐	◐
Hydraulic														
Guidepin	●	●	●	◐	◐	◐								
Hard-Iron™	◐	◐	◐	◐	◐	◐	◐	○	○		○	○		○
Chopper			○	◐	◐	◐								
Adaptive N	●	●	●											
Seal system														
Griploc™ seal	●	●	●											
Plug-in™ seal				●	●	●	●	●						
Active Seal™				●	●	●	●	●	●	●	●	●	●	●
Spin-out™	●	●	●	●	●	●	●	●	◐	◐	◐	◐	◐	◐
Seal flush									○	○	○	○	○	○
Cooling system														
1. w/o cooling jacket	●	●	●	○	○	○	○	○	○	○	○	○	○	○
2. Closed Loop Cooling				●	●	●	●	●	◐	◐	◐	◐	◐	◐
3. Pump media									●	●	●	●	●	●
4. External				○	○	○	○	○	○	○	○	○	○	○
Installation														
P	●	●	●	●	●	●	●	●	●	●	●	●	●	●
S	●	●	●	●	●	●	◐	◐	●	●	●	◐	◐	◐
T	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Z	●	●	●	●	●	●	●	●	●	●	●	●	●	●
L		●	●											
Accessories														
Flush valve	○	○	○	◐	◐	◐	◐	◐						
Pump monitor														
Prepared for														
- Mini CAS	●	●	●	●	●	●	●	●						
- MAS					○	○	○	○	●	●	●	●	●	●
Pump control														
- SmartRun™	○	○	○	○	○	○	○							
- MultiSmart™				○	○	○	○	○	○	○	○	○	○	○
- FGC	○	○												

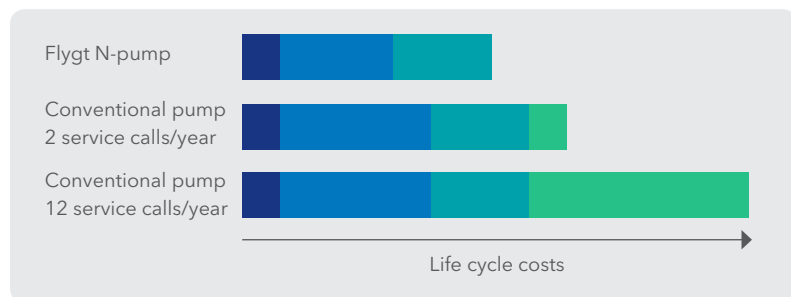
● = Standard

○ = Optional

◐ = Standard but also optional depending on model

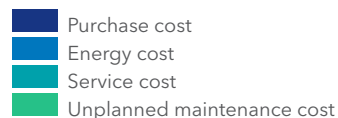
◐ = Standard or not available depending on model

◐ = Optional or not available depending on model



SELF CLEANING SAVES MONEY

Schematic overview of calculations made on a 30kW Flygt N-pump



Supporting your business, every step of the way

Extensive engineering know-how

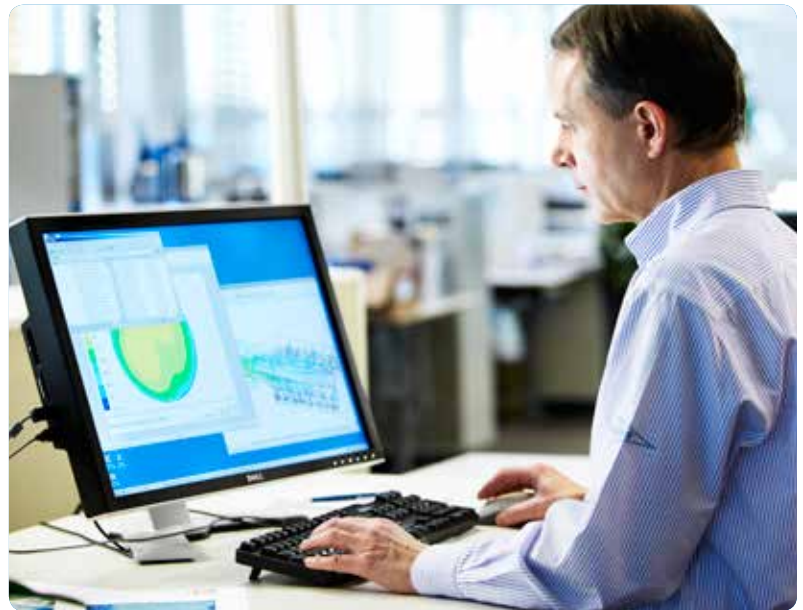
Xylem has extensive knowledge of fluid dynamics and vast practical experience in designing, operating and maintaining efficient wastewater transport systems. We provide a broad range of engineering services, including:

- System analysis and calculations
- Sump design
- Water hammer calculations
- Pump start analysis
- Transient analysis
- Computational Fluid Dynamics (CFD)
- Scale model testing

In short, we can assist you with everything you need for optimal performance and economical, energy-efficient operation.

Empower your system

With Flygt monitoring and control products, you can control and optimize the performance of every component of your system. This helps reduce stress on pumps, valves and mains, enable reliable, efficient operation, and prolong service lifetime.



Support for your Flygt pumps

Our global network of local service centers and service partners provide integrated services to support safe, efficient and reliable operation. To ensure trouble-free operation and minimal downtime, count on us for quick, professional response and quality maintenance services, using genuine Flygt spare parts.



EXTENSIVE MONITORING AND CONTROL

We supply hardware and software for complete process systems - from individual pump drives, starters, sensors and controllers to system software and scalable SCADA systems.



GENUINE FLYGT SPARE PARTS AND WARRANTY

When downtime isn't an option, rely on our global service network to deliver genuine Flygt spare parts to you - quickly and efficiently. All Flygt spare parts are backed by a solid 15-year availability guarantee. Large capacity pumps offer a 20-year availability guarantee.

Xylem ['zīləm]

- 1) The tissue in plants that brings water upward from the roots
- 2) A leading global water technology company

We're 12,000 people unified in a common purpose: creating innovative solutions to meet our world's water needs. Developing new technologies that will improve the way water is used, conserved, and re-used in the future is central to our work. We move, treat, analyze, and return water to the environment, and we help people use water efficiently, in their homes, buildings, factories and farms. In more than 150 countries, we have strong, long-standing relationships with customers who know us for our powerful combination of leading product brands and applications expertise, backed by a legacy of innovation.

For more information on how Xylem can help you, go to xyleminc.com.



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14125 South Bridge Circle
Charlotte, NC 28273
Tel 704.409.9700
Fax 704.295.9080
855-XYL-H2O1 (855-995-4261)
www.xyleminc.com

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Flygt N-Technology Pumps N 3153



Specifications

Overview

PRODUCT FEATURES

- State-of-the-art wastewater pump with N-technology
- Sustained high efficiency with energy savings up to 25%
- Flexible and modular design
- Robust and reliable

WASTEWATER N-TECHNOLOGY PUMP

Flygt N-pumps take on the toughest applications and get the job done. Every component is designed and manufactured to deliver sustained high efficiency. Thanks to patented N-technology with its innovative self-cleaning impeller, Flygt N-pumps deliver the highest total efficiency. They lower your energy bill and reduce unplanned maintenance costs. That adds up to total peace of mind – and big savings over the long term.

Most solid objects entering the pump will pass through the impeller between the impeller vanes. If an object gets caught on the leading edge of one of the vanes, it will slide along the backswept shape towards the perimeter of the inlet.

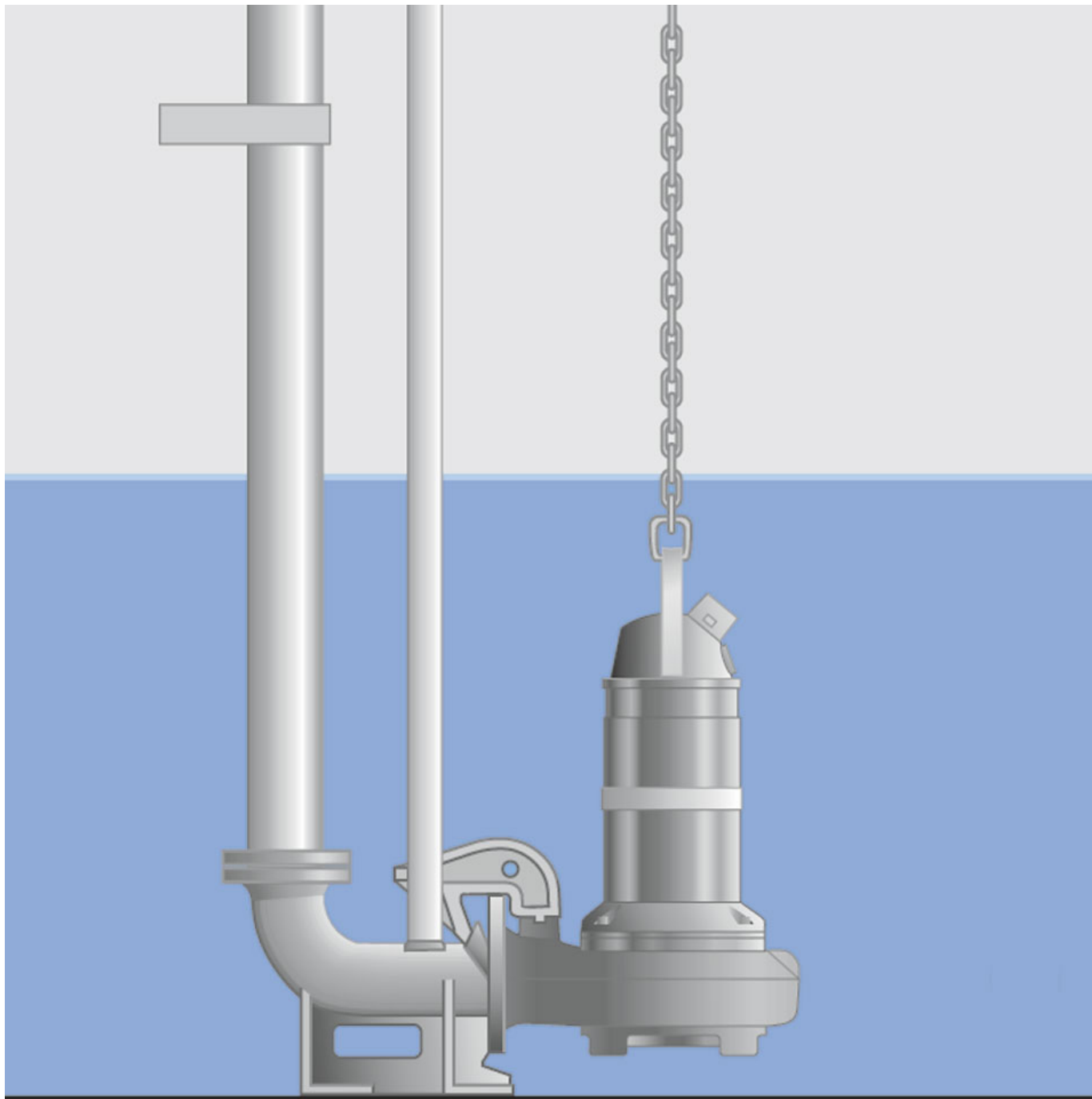
Due to the mechanical self-cleaning design, a sludge concentration up to 8% can easily be pumped.

FLEXIBLE AND MODULAR DESIGN

This self-cleaning pump features innovative functions that make it the best choice for a broad range of applications. The modular hydraulic design enables you to tailor the hydraulics to meet the requirements of virtually any application.

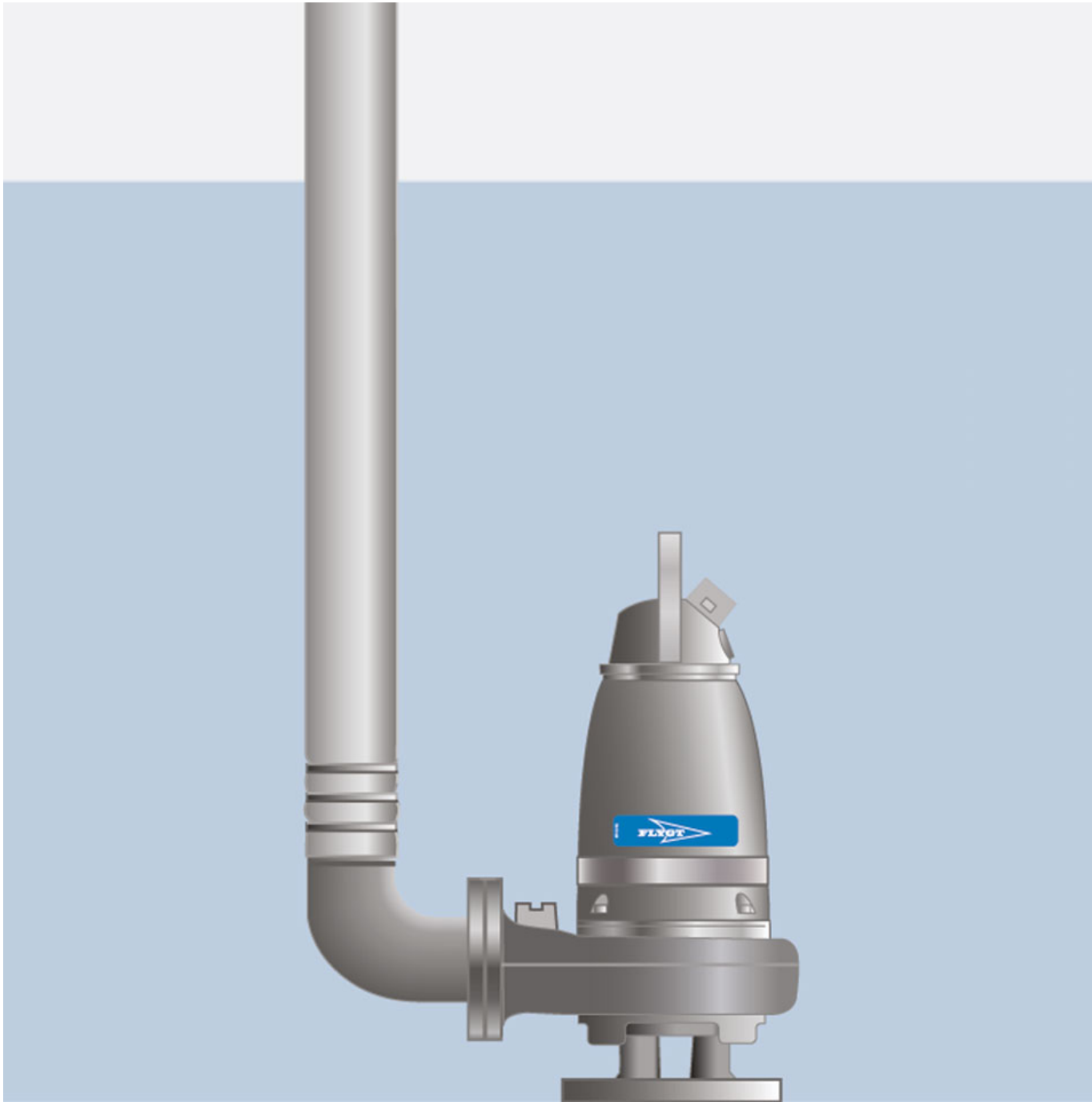
- Replaceable wear ring in two materials, gray iron or Hard Iron™, for different operation conditions
- Hardened gray iron impeller for typical wastewater applications
- Hard Iron™ impeller for abrasive and corrosive applications
- Chopper ring intended for tough wastewater applications where cutting is required due to long fibers and solids
- Stainless steel impeller for special applications that require duplex stainless steel
- Short shaft overhang reduces shaft deflection and increases seal and bearing life
- Motor designed for submersible use. Heat is concentrated to the stator core for improved cooling properties.
- The Plug-in™ seal with Active Seal™ system eliminates the risk associated with incorrect installation and careless handling. All in one unit. Available in Tungsten carbide (WCCR) or Silicone carbide (SiC) depending on pumped media.
- Motor cable SUBCAB® specially developed for submersible use
- Offers flexible cooling systems, e.g. closed-loop cooling system, media cooled or external cooling.

Wet Pit (P)



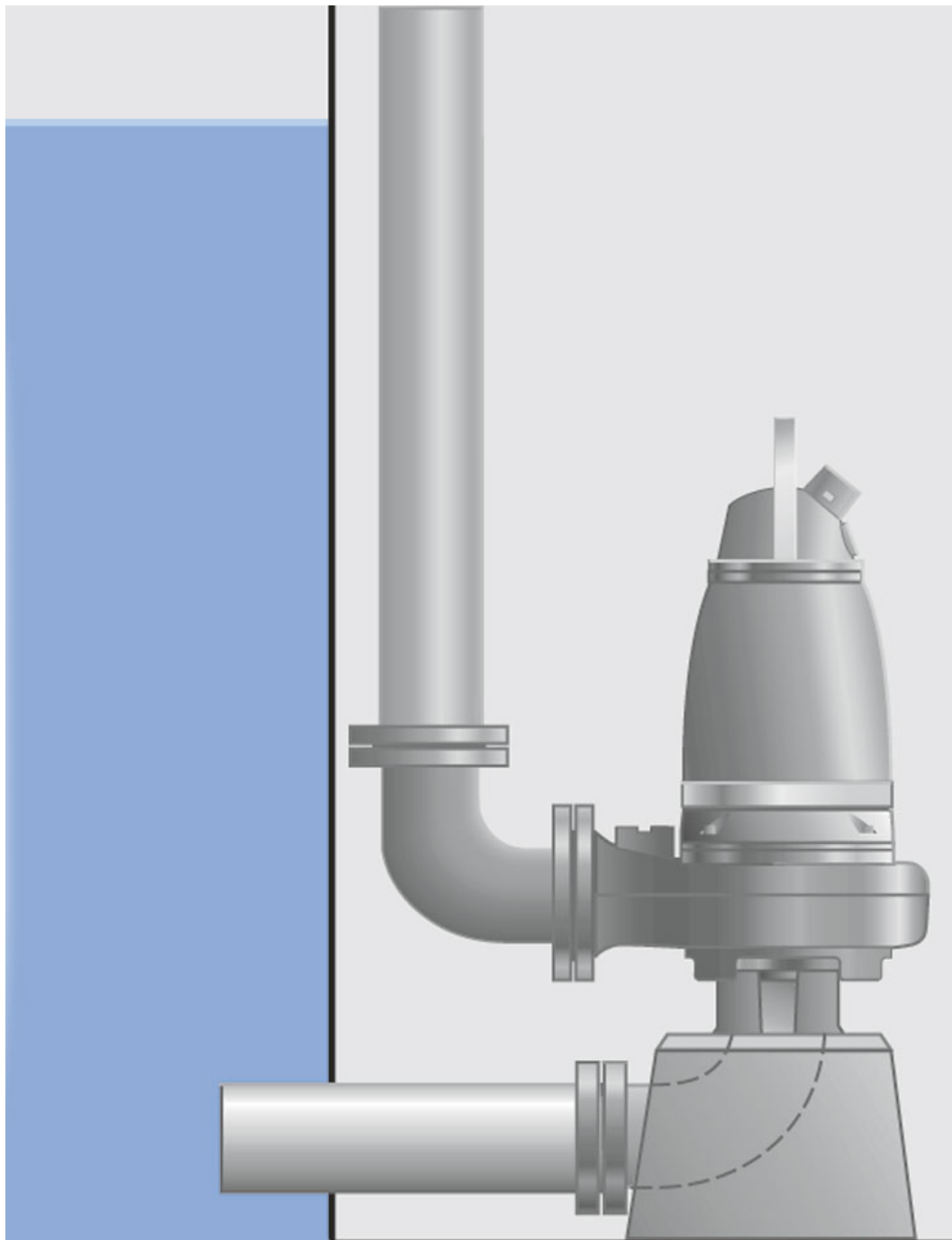
Semi permanent, submersible pump installation. Wet pit arrangement with the pump installed on twin guide bars with automatic connection to the discharge pipe.

Portable (S)



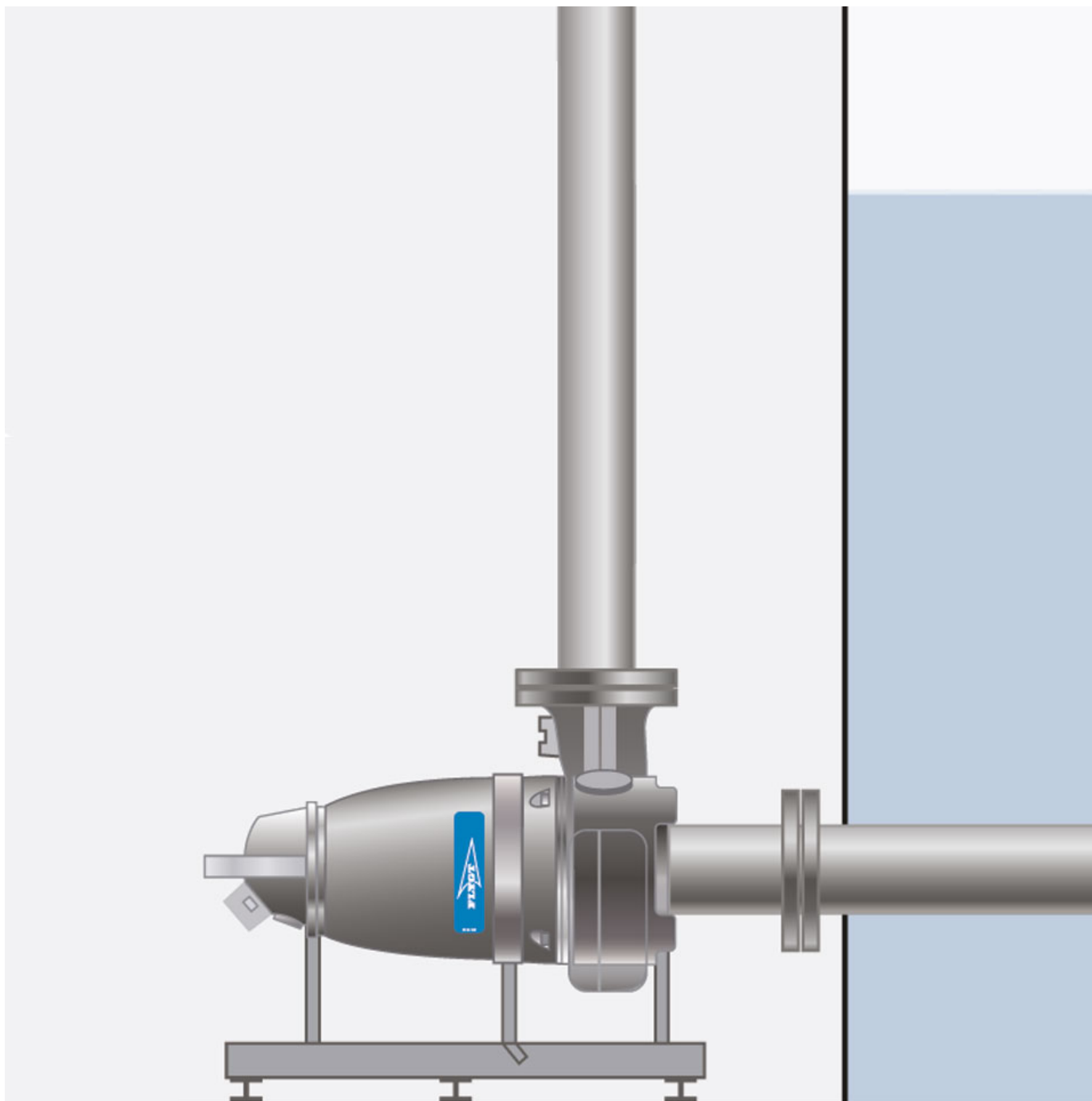
Portable, submersible pump installation. Portable pump with hose coupling or flange for connection to the discharge pipe.

Dry Installation vertical (T)



Vertical, permanent, dry pump installation. The submersible pump is installed in a dry pit, with flange connection to suction and discharge piping.

Dry Installation (Z)



Horizontal, permanent, dry pump installation. The submersible pump is installed in a dry pit, with flange connection to suction and discharge piping.

Featured
Download



Flygt N-Technology Pump Series Brochure - 60Hz

PDF |
1.14
MB

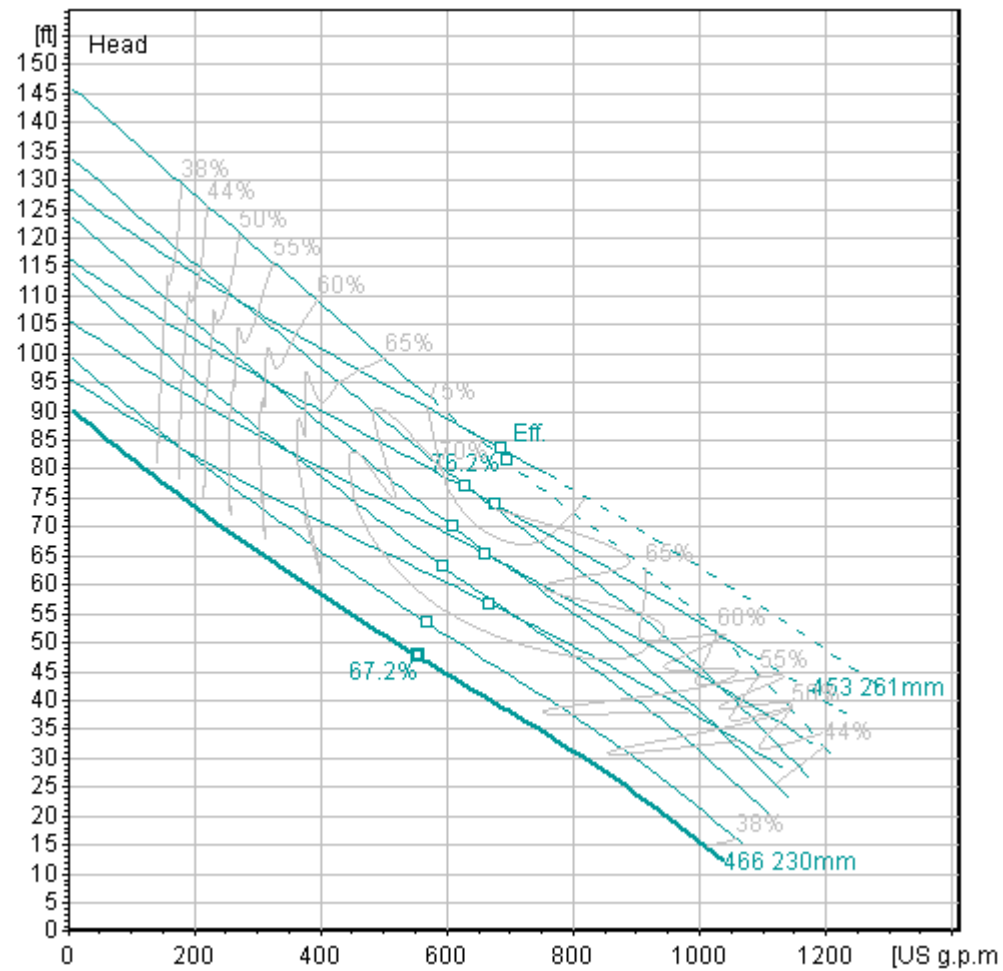
Learn More

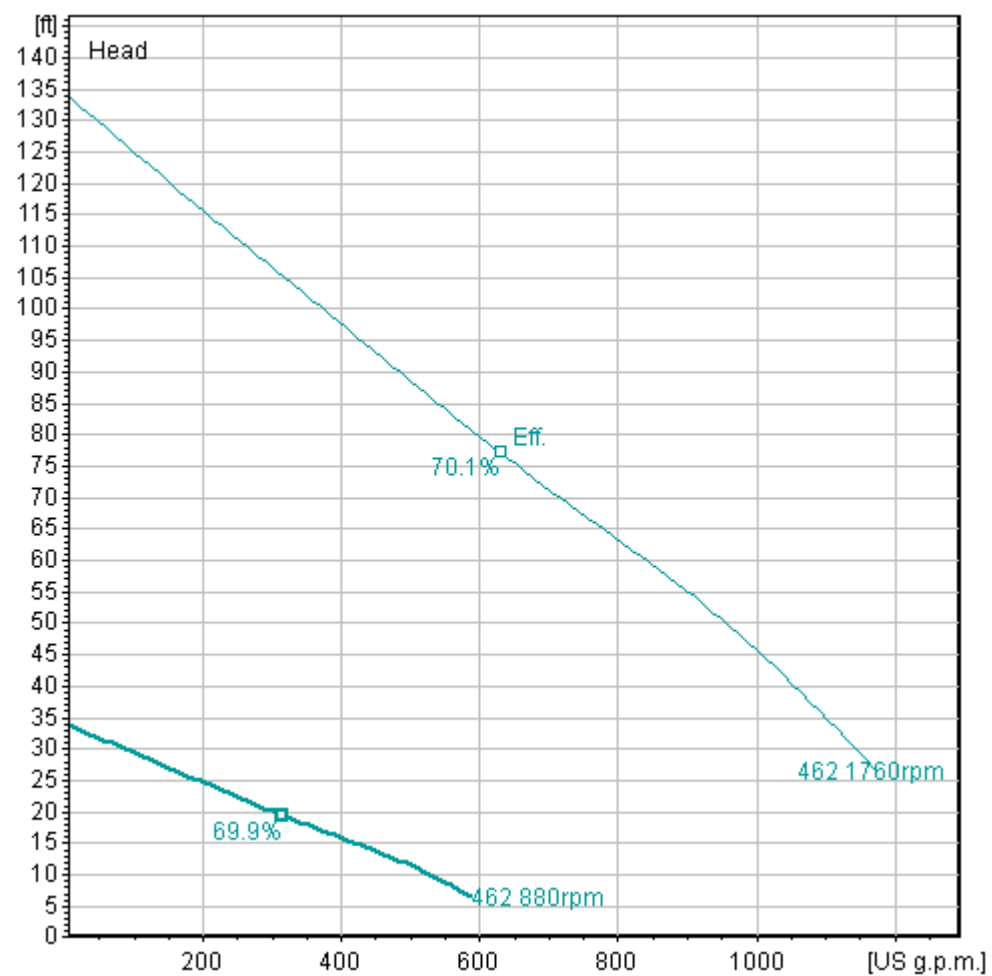


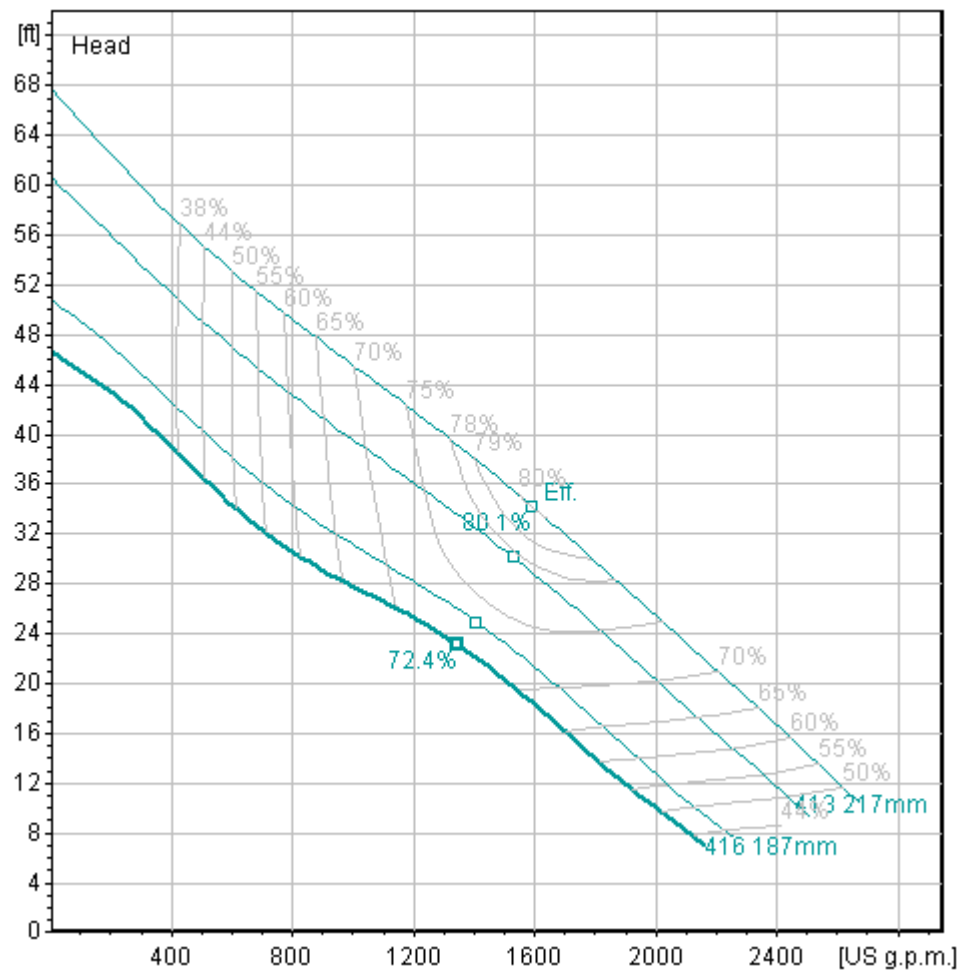
PUMP	N 3153 HT 3 PHASE 4 POLES 60HZ US	N 3153 HT 3 PHASE 4 POLES SMARTRUN 60HZ US	N 3153 LT 3 PHASE 4 POLES 60HZ US	N 3153 LT 3 PHASE 6P 60HZ US	N 3153 LT 3 PHASE 4 POLES SMARTRUN 60HZ US	N 3153 LT 3 PHASE 6P 60HZ US
F) FREQUENCY	60 hz	60 hz	60 hz	60 hz	60 hz	60 hz
G) NUMBER OF POLES	4	4	4	6	4	6
H) PHASE	3~	3~	3~	3~	3~	3~
D) DISCHARGE OUTLET DIAMETER	3 15/16 inch	3 15/16 inch	7 7/8 inch	9 13/16 inch	7 7/8 inch	9 13/16 inch
I) RATED POWER	12 hp - 20 hp	12 hp	12 hp - 20 hp	15 hp	12 hp	15 hp
J) RATED CURRENTS @400V	36 A - 52 A	19 A	36 A - 52 A	46 A	19 A	46 A
A) IMPELLER MATERIAL	Grey cast iron	Grey cast iron	Grey cast iron	Grey cast iron	Grey cast iron	Grey cast iron
B) IMPELLER MATERIAL OPTION 1	Stainless steel	Stainless steel	Stainless steel			

**E) MOTOR
EFFICIENCY CLASS**

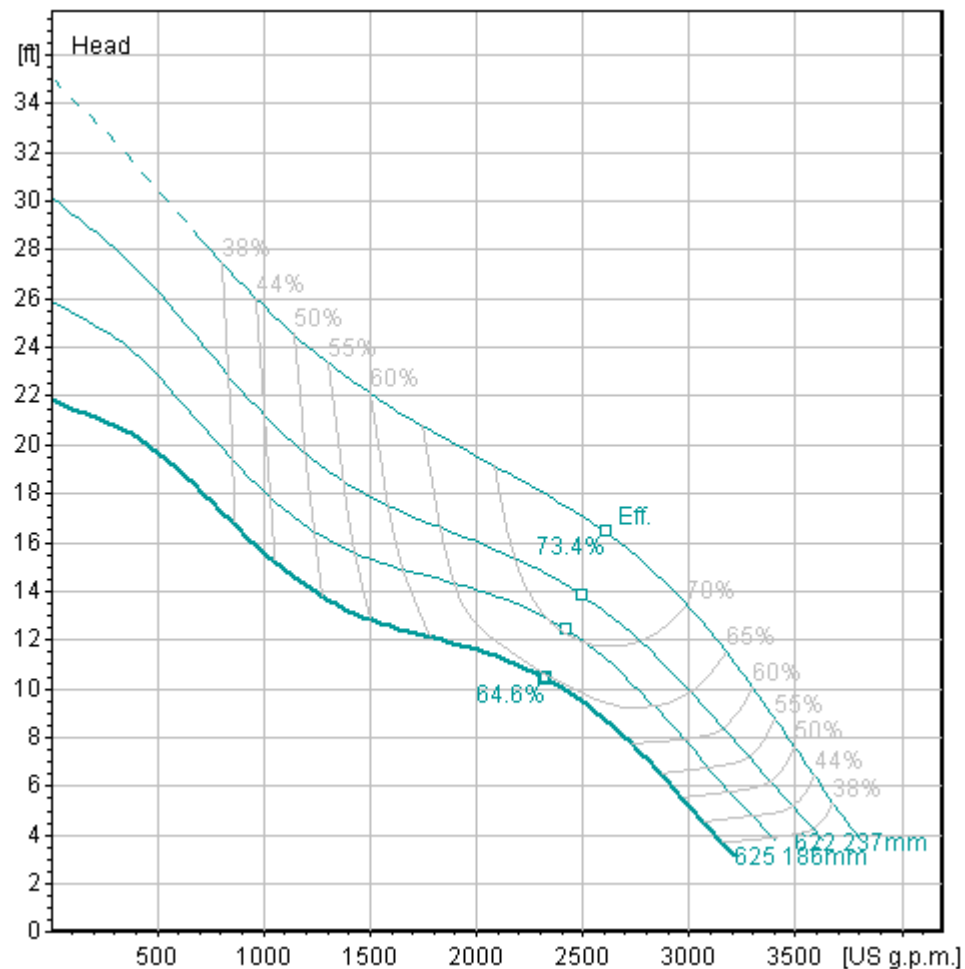
Performance Curves

N 3153 HT 3 phase 4 poles 60hz US

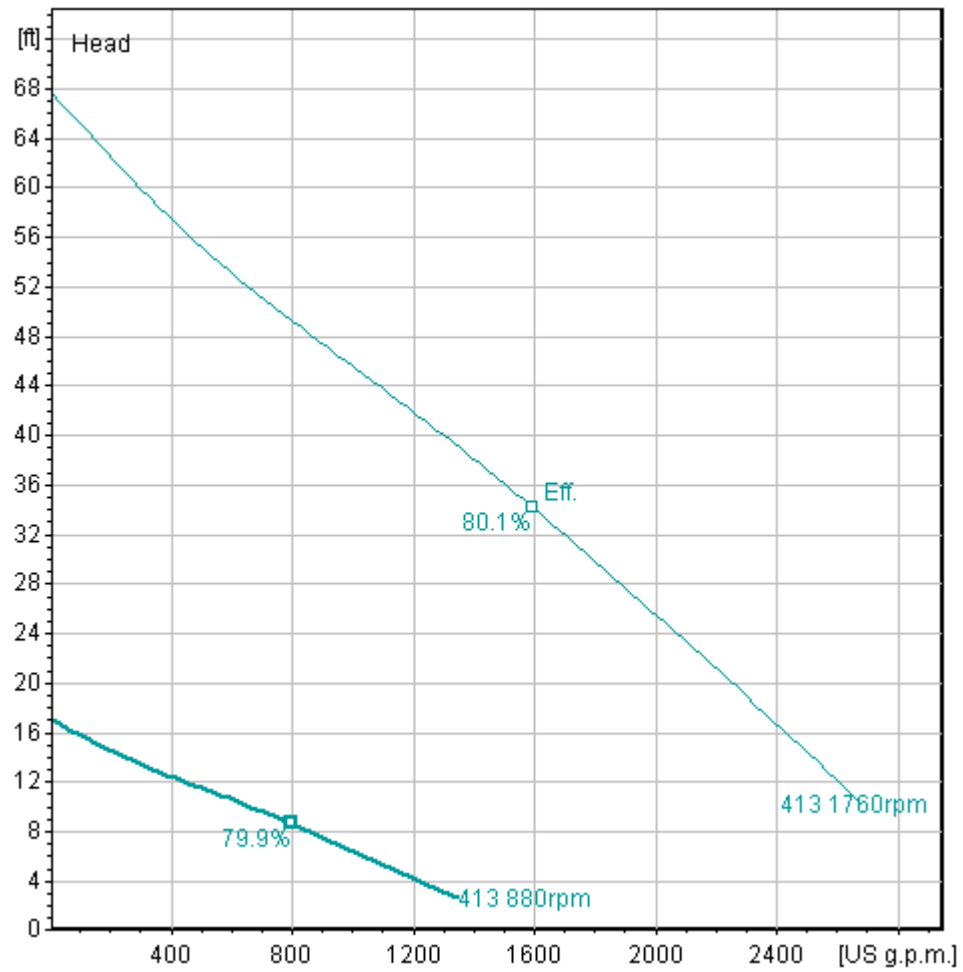
N 3153 HT 3 phase 4 poles SmartRun 60hz US**N 3153 LT 3 phase 4 poles 60hz US**



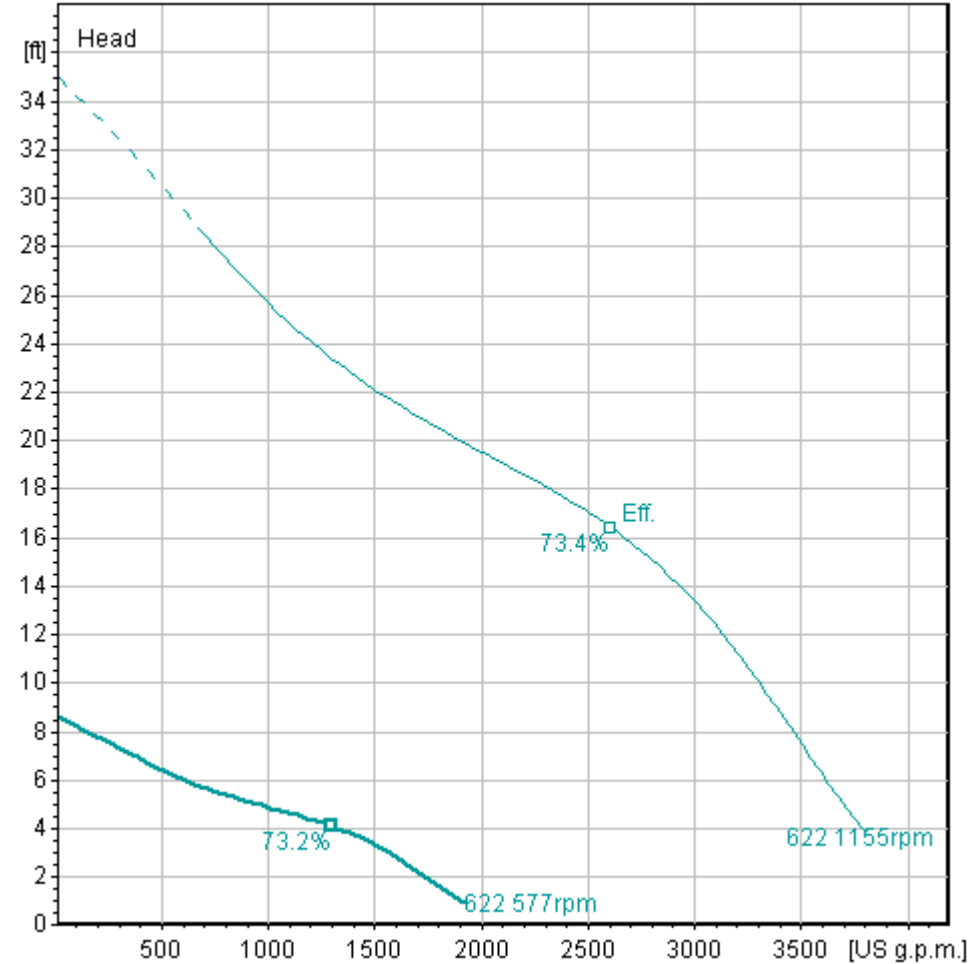
N 3153 LT 3 phase 6p 60hz US



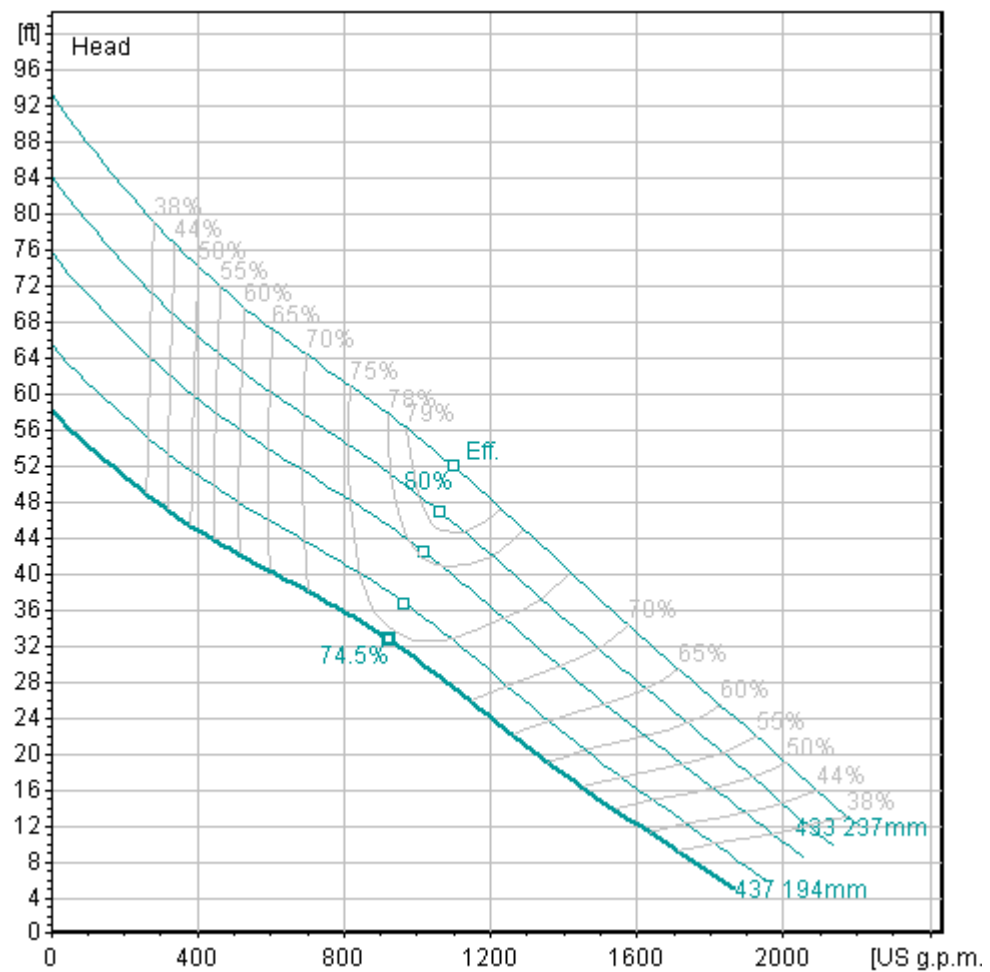
N 3153 LT 3 phase 4 poles SmartRun 60hz US



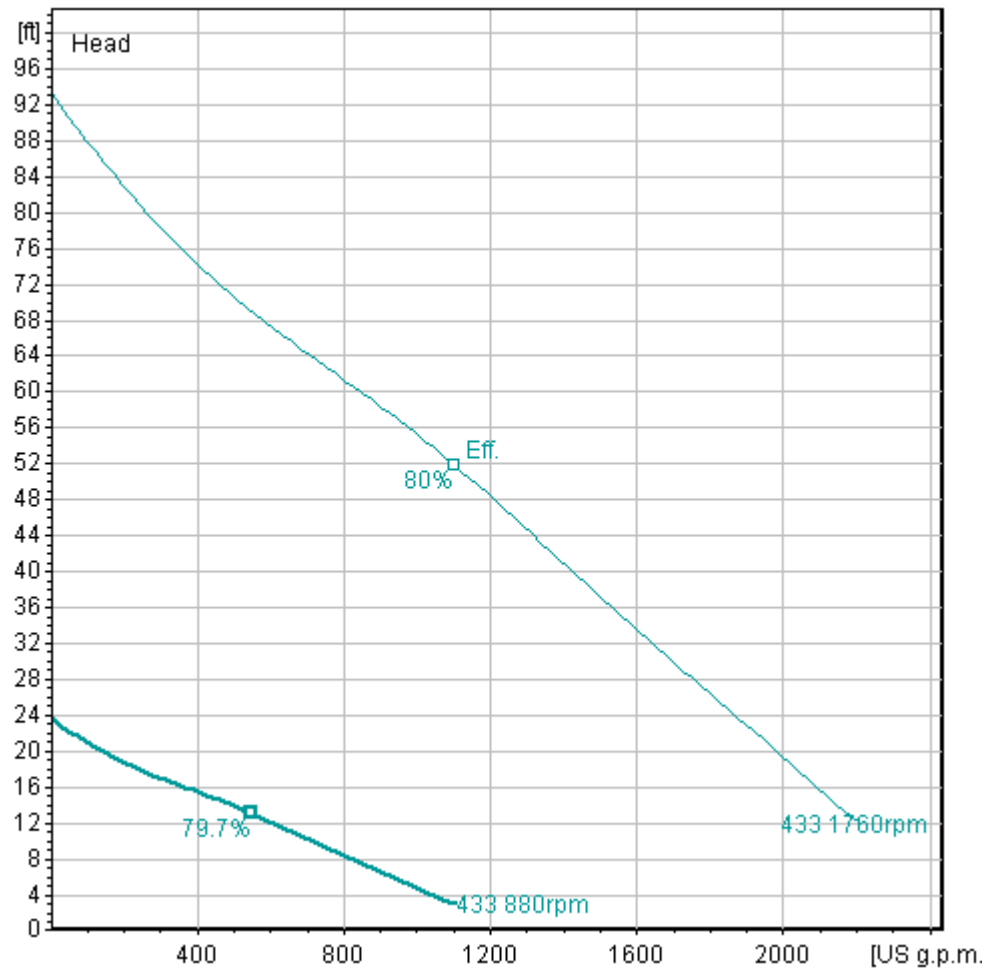
N 3153 LT 3 phase 6p SmartRun 60hz US



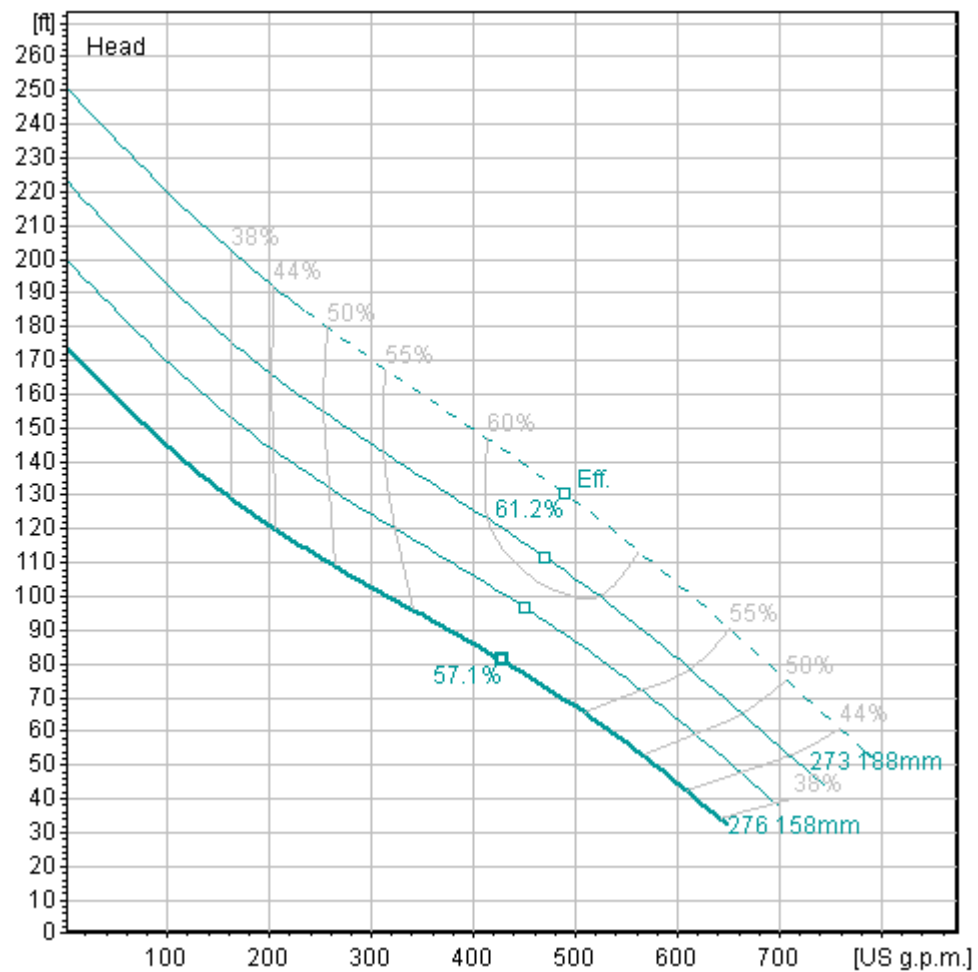
N 3153 MT 3 phase 4 poles 60hz US



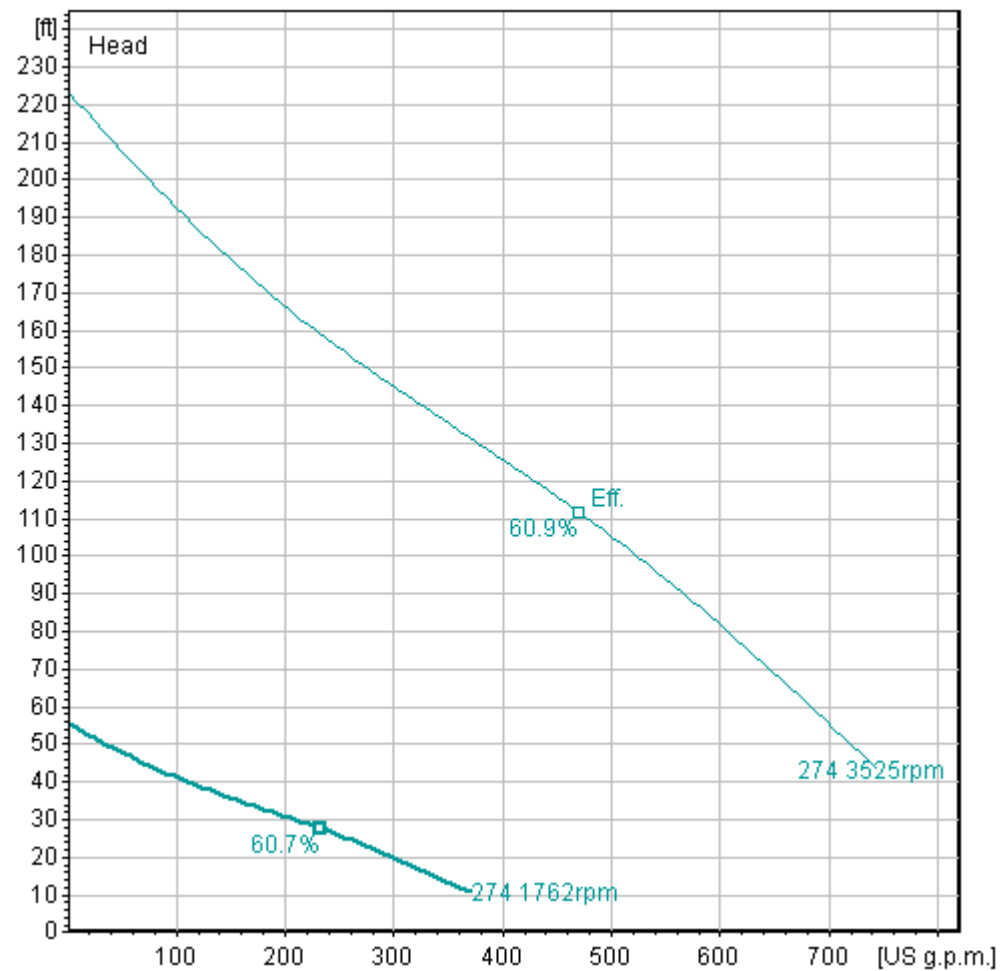
N 3153 MT 3 phase 4 poles SmartRun 60hz US



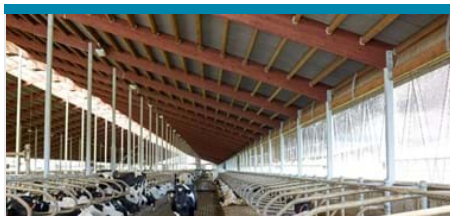
N 3153 SH 3 phase 2 poles 60hz US



N 3153 SH 3 phase 2 poles SmartRun 60hz US



Recommended Solutions





Livestock & Poultry
Agricultural Waste
Management



Aquaculture
Land-based Recirculating
Systems (RAS)



Energy & Power
Coal



Energy & Power
Nuclear



General Industry
Bypass and Backup
Pumping



General Industry
Raw Water Intake and
Process Water Supply



Ports, Harbors & Shipping
Dry Dock Drainage



Commercial Ship Building
Dry Dock Drainage



Mining
Wastewater Treatment &
Reuse - Mining



Mining
Mining Source Water -
Pumps & Treatment



Reuse
Wastewater Overflow
Solutions



Wastewater
Sewage Bypass Pumps for
Municipal Wastewater



Wastewater
Lift Station Pumps



Wastewater
Wastewater Pump
Systems



Wastewater > Sludge
Handling
Sludge Pumping



Potable / Drinking Water
Potable / Drinking Water
Pumping



Potable / Drinking Water
Raw Water Intake



Stormwater & Flooding
Combined Sewage &
Stormwater Handling



Stormwater & Flooding
Storm Water
Management Systems



Stormwater & Flooding
Flood Preparedness &
Mitigation Plan



Oil & Gas > Offshore
Offshore Oil Platform



Agriculture & Irrigation
Crop Irrigation & Watering



Agriculture Products &
Irrigation Systems



Energy & Power

Water Management

Systems



Industrial Wastewater and
Process Water Treatment



**Commercial Shipping & Ship
Building**
Commercial Ship Building



Commercial Shipping &
Ship Building



**Commercial Shipping & Ship
Building**
Ports, Harbors & Shipping



Mining
Mining Solutions - Mining
Water Management
Solutions



**Municipal Water &
Wastewater**
Desalination & Water
Treatment



Municipal Sewage
Handling & Waste
Treatment



**Municipal Water &
Wastewater**
Stormwater Pump Stations
& Flooding Relief





**Municipal Water &
Wastewater**
Potable Water Pumps &
Drinking Water Treatment
Systems



**Municipal Water &
Wastewater**
Municipal Wastewater
Pumping and Treatment



Wastewater
Sludge Pumping &
Treatment



**Municipal Water &
Wastewater**
Wastewater Recycling &
Reuse



Oil & Gas
Offshore Oil & Gas Water
Management



Oil & Gas Water
Treatment



Aquaculture



Building Systems
Wastewater Systems



Commercial Buildings
Building Systems



Commercial Buildings



Water Rides & Attractions
Pressure Boosting



**Commercial Pools & Water
Parks**
Water Rides & Attractions



Commercial Pools &
Water Parks



Wastewater
Primary Treatment

Interactive Tools



Technical Product Information

Get additional technical
information about your Xylem
products here. Can only be
viewed in Internet Explorer.

Brochure

Flygt N-Technology Pump Series Brochure - 60Hz	 PDF 1.14 MB
Flygt 3000/1300 Series Late Stage Configuration Program	 PDF 196.2 KB

Documents

N-Pumps solve clogging problems at Vancouver Island’s Victoria Hospital, BC	 PDF 154.63 KB
Xylem assists William Head Treatment Plant setup temporary aeration system	 PDF 105.81 KB
Horse Racetrack bets on Flygt for pump station design	 PDF 94.78 KB
Flygt N-Technology Pump Series Brochure - 60Hz	 PDF 1.14 MB
Flygt Liquid Manure Technology brochure	 PDF 13.65 MB

Featured Download



Flygt N-Technology Pump Series Brochure - 60Hz

PDF | 1.14 MB

 Learn More

NP 3153 HT 3~ 465

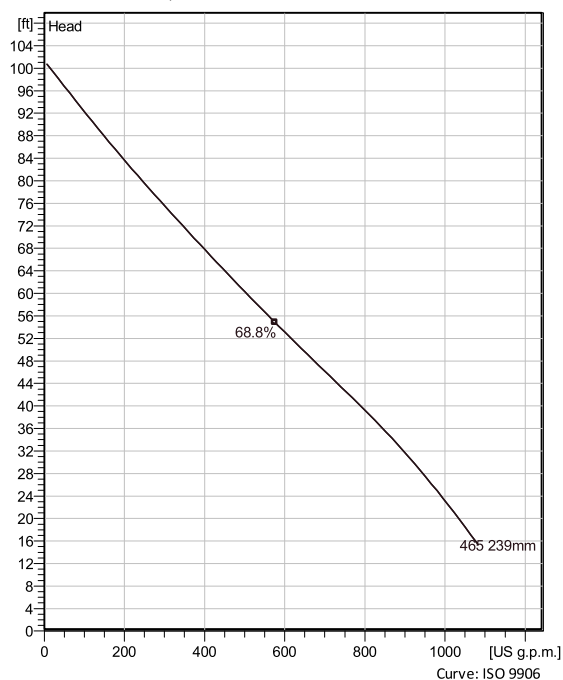
Patented self cleaning semi-open channel impeller, ideal for pumping in waste water applications. Possible to be upgraded with Guide-pin® for even better clogging resistance. Modular based design with high adaptation grade.



Technical specification



Curves according to: Water, pure ,39.2 °F,62.42 lb/ft³,1.6891E-5 ft²/s



Configuration

Motor number N3153.830 21-15-4AS-W IE3 14hp	Installation type P - Semi permanent, Wet
Impeller diameter 239 mm	Discharge diameter 4 inch

Pump information

Impeller diameter 239 mm
Discharge diameter 4 inch
Inlet diameter 150 mm
Maximum operating speed 1800 rpm
Number of blades 2
Max. fluid temperature 40 °C

Materials

Impeller Hard-Iron™

Project	Created by	Ian Belczyk	Last update	12/8/2020
Block	Created on	12/8/2020		

NP 3153 HT 3~ 465

Technical specification



Motor - General

Motor number N3153.830 21-15-4AS-W IE3 14hp	Phases 3~	Rated speed 1800 rpm	Rated power 14 hp
ATEX approved FM	Number of poles 4	Rated current 14 A	Stator variant 15
Frequency 60 Hz	Rated voltage 460 V	Insulation class H	Type of Duty S1
Version code 830			

Motor - Technical

Power factor - 1/1 Load 0.98	Motor efficiency - 1/1 Load 92.8 %	Total moment of inertia 1.96 lb ft ²	Starts per hour max. 30
Power factor - 3/4 Load 0.97	Motor efficiency - 3/4 Load 92.7 %	Starting current, direct starting 129 A	
Power factor - 1/2 Load 0.96	Motor efficiency - 1/2 Load 91.2 %	Starting current, star-delta 43 A	

Project
Block

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Created on 12/8/2020

Last update 12/8/2020

NP 3153 HT 3~ 465

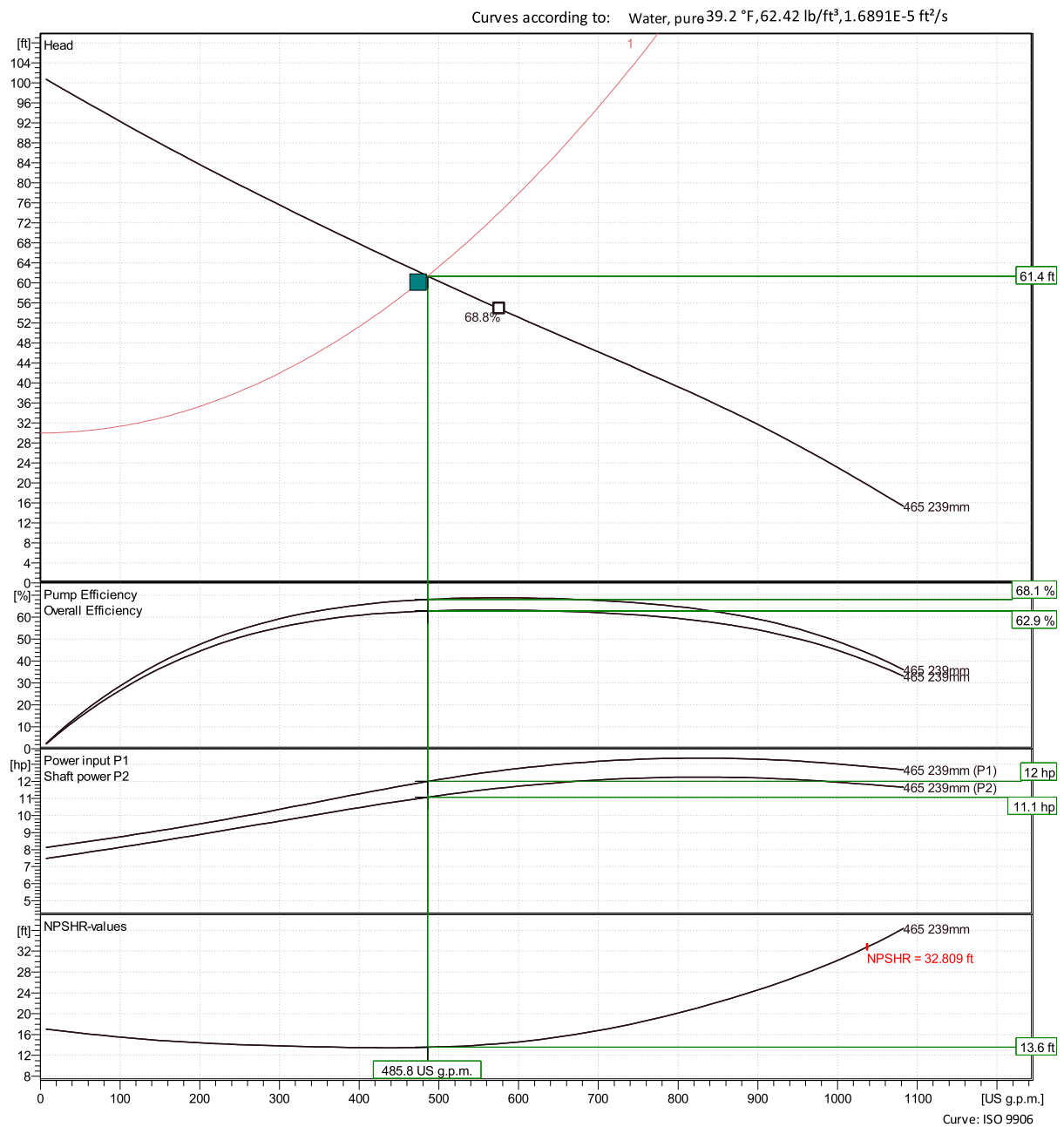
Performance curve



Duty point

Flow
486 US g.p.m.

Head
61.4 ft



Project
Block

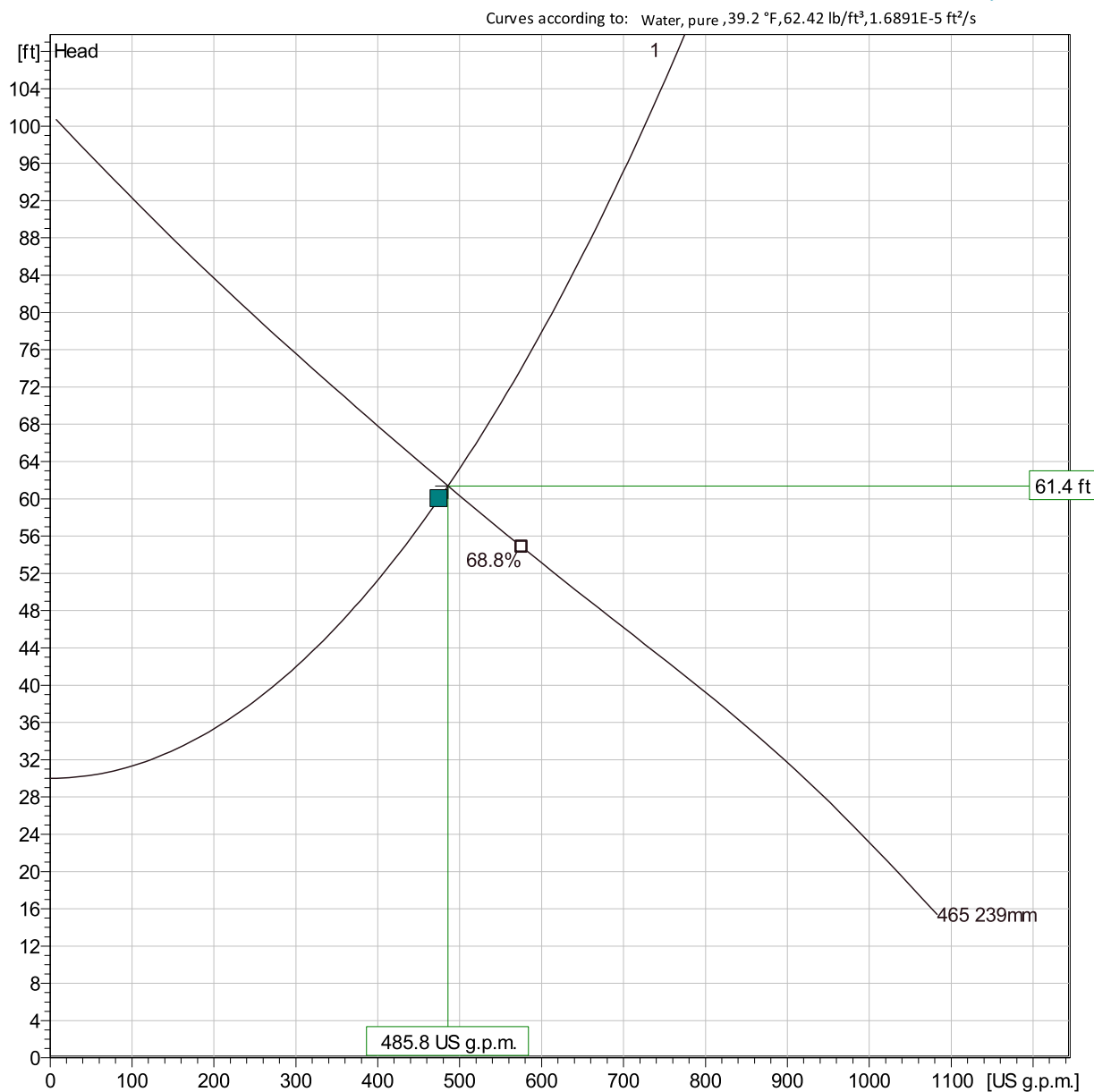
Created by Ian Belczyk
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Last update 12/8/2020

Curve: ISO 9906

NP 3153 HT 3~ 465

Duty Analysis



Operating characteristics

Pumps / Systems	Flow	Head	Shaft power	Flow	Head	Shaft power	Hydr.eff.	Specific Energy	NPSHre
1	486 US g.p.m.	61.4 ft	11.1 hp	486 US g.p.m.	61.4 ft	11.1 hp	68.1 %	307 kWh/US M	13.6 ft

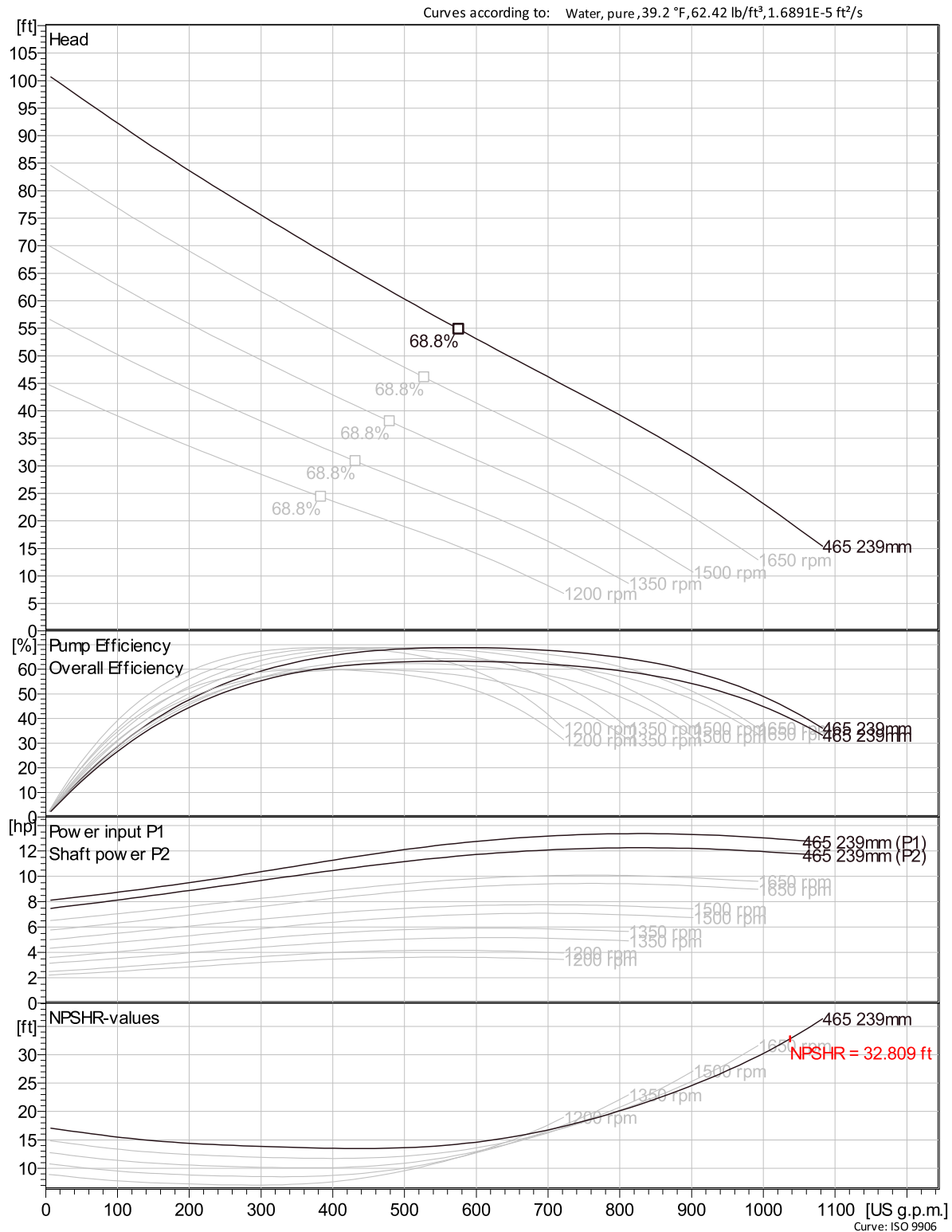
Project
Block

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Created on 12/8/2020

Last update 12/8/2020

NP 3153 HT 3~ 465

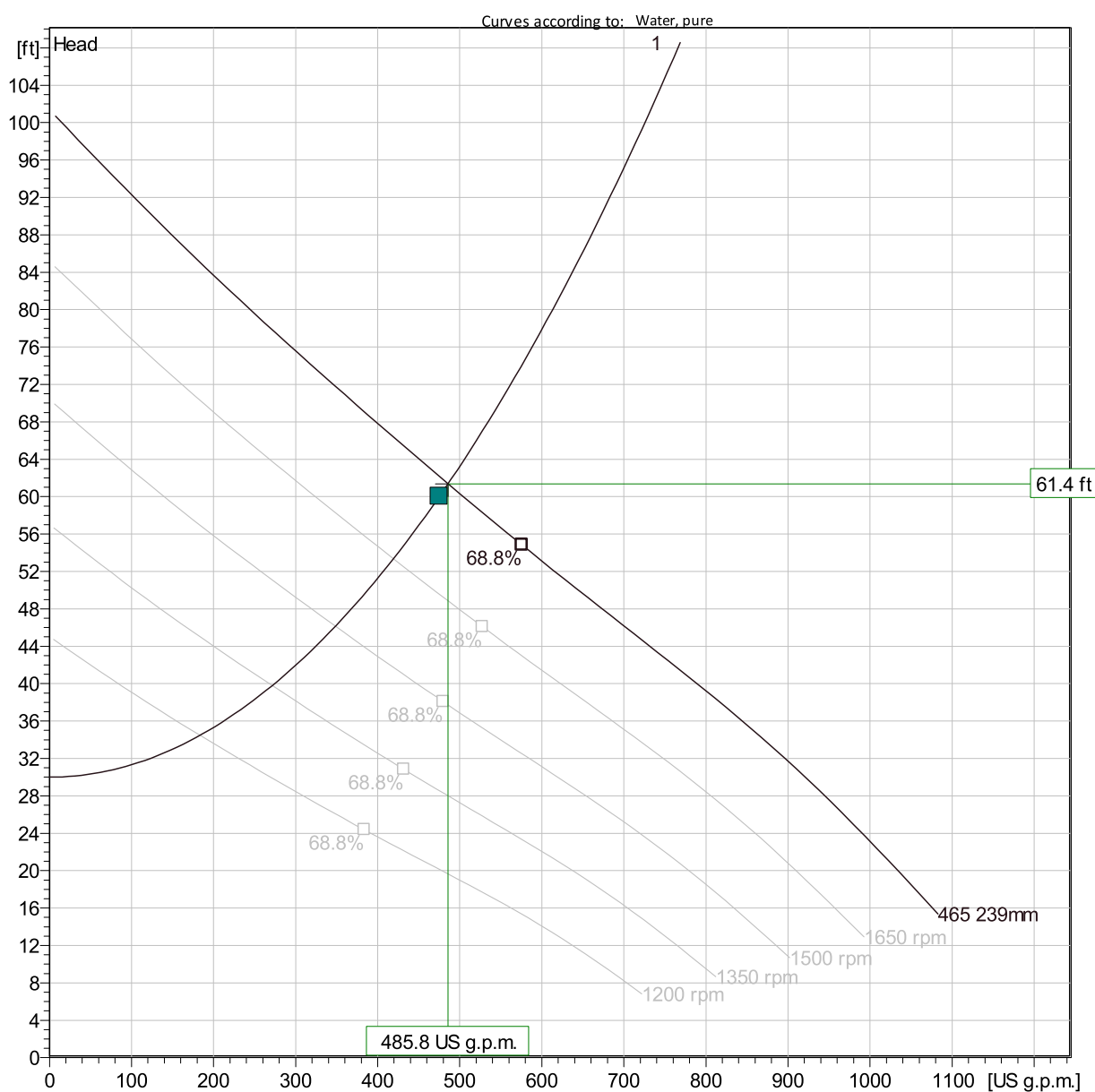
VFD Curve



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Block	Created on	12/8/2020		

NP 3153 HT 3~ 465

VFD Analysis



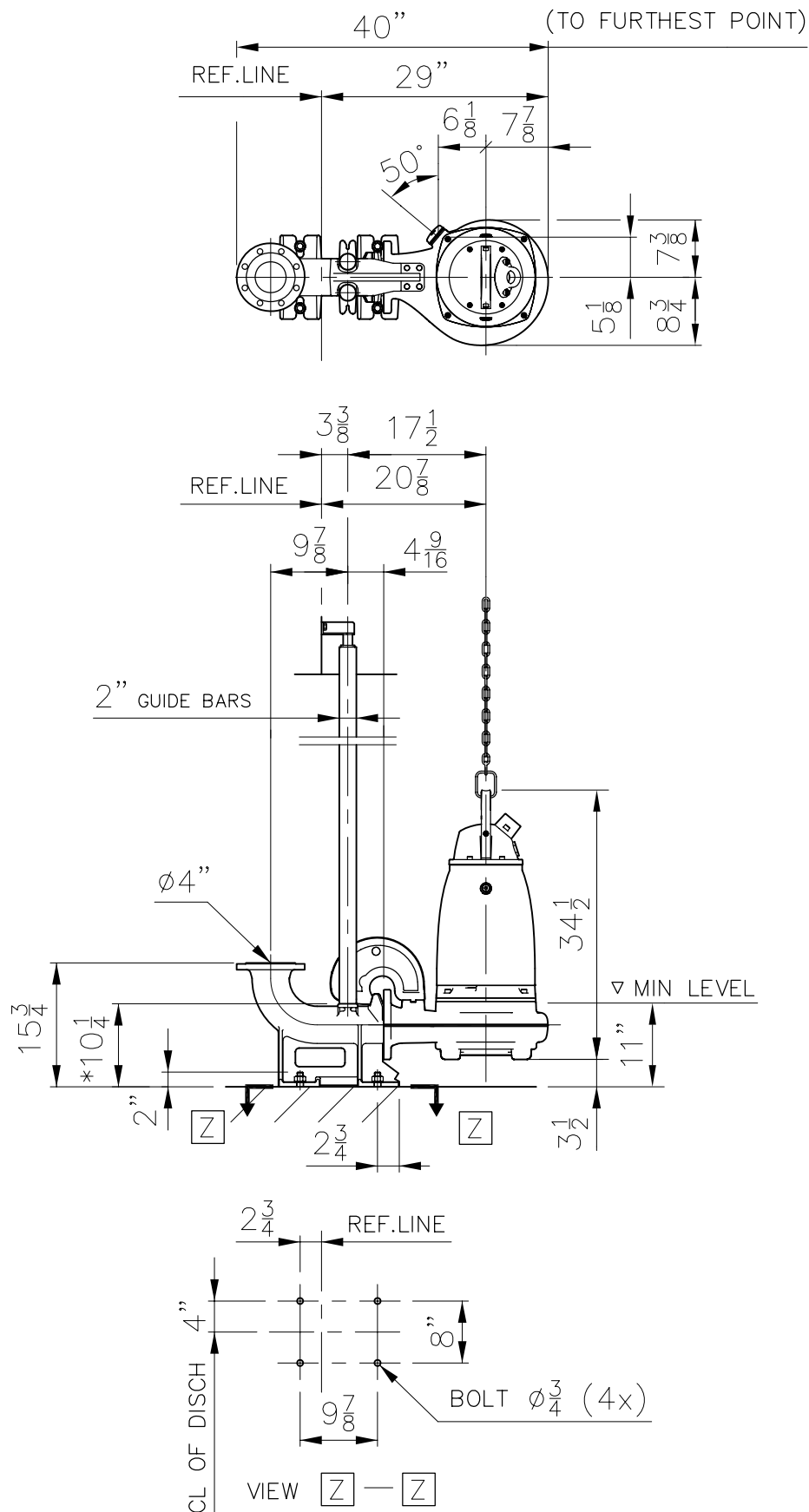
Operating characteristics

Pumps / Systems	Frequency	Flow	Head	Shaft power	Flow	Head	Shaft power	Hydr.eff.	Specific Energy	NPSHre
1	60 Hz	486 US g.p.m.	61.4 ft	11.1 hp	486 US g.p.m.	61.4 ft	11.1 hp	68.1 %	307 kWh/US M	13.6 ft
1	55 Hz	419 US g.p.m.	53.4 ft	8.38 hp	419 US g.p.m.	53.4 ft	8.38 hp	67.5 %	267 kWh/US M	11.7 ft
1	50 Hz	348 US g.p.m.	46.1 ft	6.13 hp	348 US g.p.m.	46.1 ft	6.13 hp	66.3 %	245 kWh/US M	10.1 ft
1	45 Hz	271 US g.p.m.	39.8 ft	4.29 hp	271 US g.p.m.	39.8 ft	4.29 hp	63.7 %	227 kWh/US M	8.59 ft
1	40 Hz	183 US g.p.m.	34.5 ft	2.81 hp	183 US g.p.m.	34.5 ft	2.81 hp	57 %	216 kWh/US M	7.29 ft

Project
Block

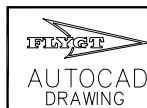
Created by Ian Belczyk
Created on 12/8/2020

Last update 12/8/2020



* DIMENSION TO ENDS OF GUIDE BARS

Weight (lbs)	
Pump	Disch
465	95



Denomination
Dimensional drwg
NP,FP 3153 HT
 $\phi 4"$

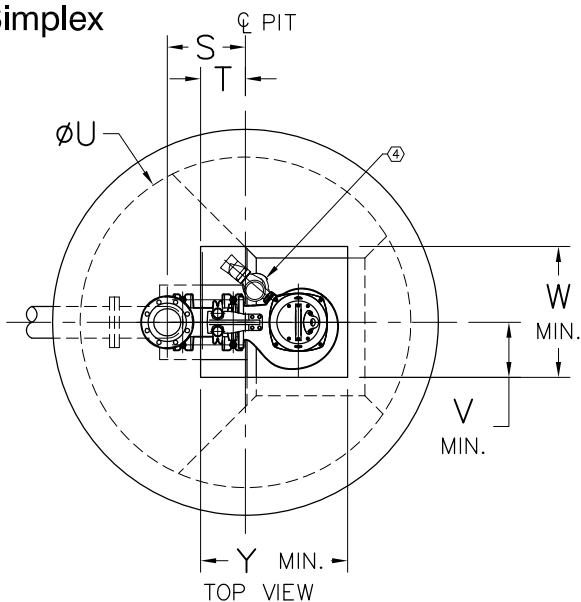
Drawn by NK	Checked by SB	Date 081013
Scale		Reg no 5399
6504500		11

FP/NP-3153

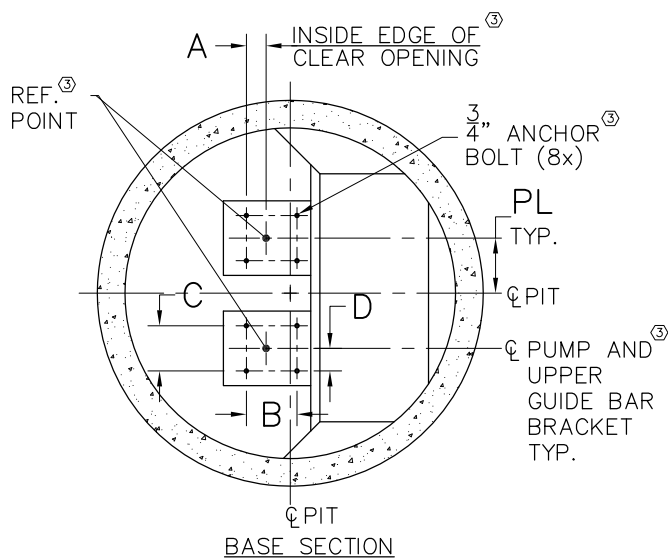
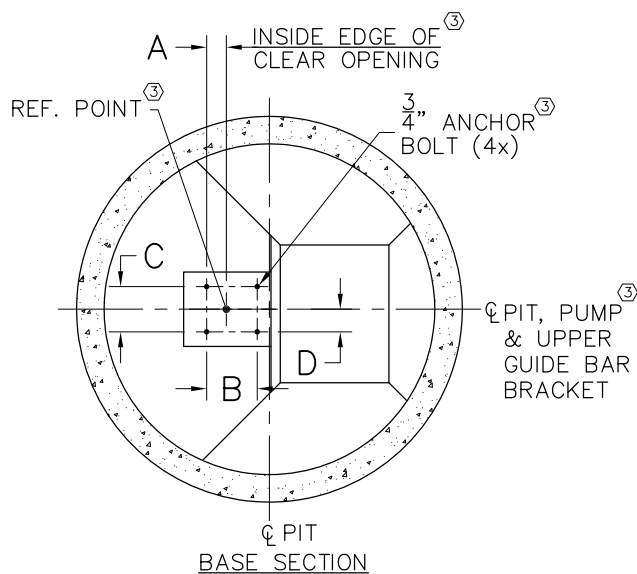
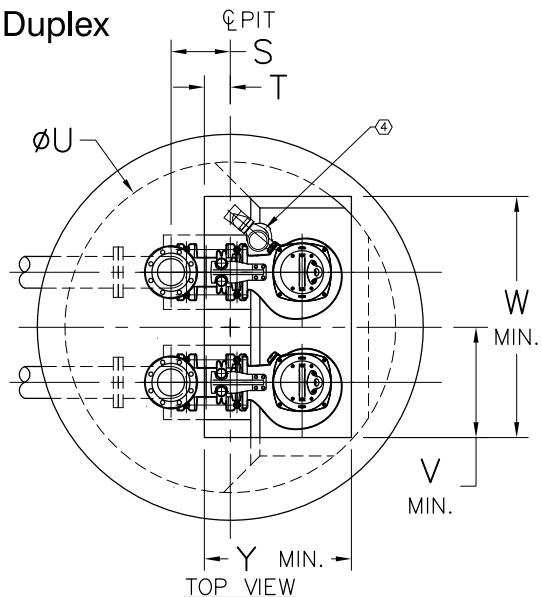
NOTES:

1. CONFIGURATION AND DIMS. SHOWN ARE SUGGESTED REQUIREMENTS ONLY. ALL DETAILS, INCLUDING SIZING OF PIT, TYPE, LOCATION AND ARRANGEMENT OF VALVES AND PIPING, ETC. ARE TO BE SPECIFIED BY THE CONSULTING ENGINEER AND ARE SUBJECT TO THEIR APPROVAL.
2. REFERENCE GENERIC DUPLEX LIFT STATION LAYOUT FOR ELEVATION VIEW.
3. LOCATE ANCHOR BOLTS USING INSIDE EDGE OF CLEAR OPENING AND PUMP CENTERLINE AS REFERENCE POINT. BOLT LOCATIONS MUST BE HELD TO MAINTAIN EXACT POSITION OF PUMP TO CLEAR OPENING.
4. ITT FLYGT MIX-FLUSH VALVE.

Simplex



Duplex



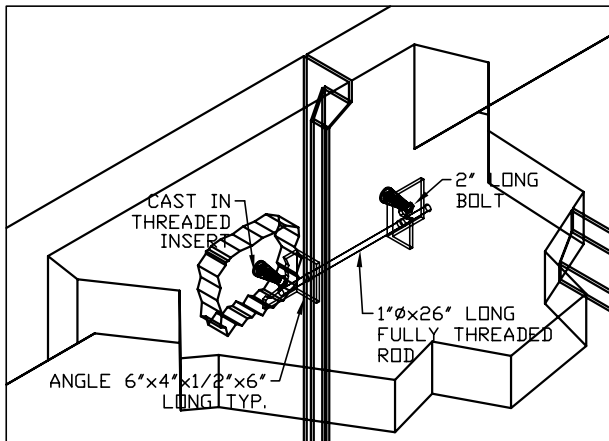
ALL DIMENSIONS ARE IN INCHES

MODEL	NOM. SIZE	VERSION	SIMPLEX										DUPLEX						
			A	B	C	D	S	T	U	V	W	Y	S	T	U	PL	V	W	Y
FP/NP	3"	SH	2 1/2	9 7/8	8	4	21 1/4	15 1/4	72	9	27	29 1/2	18 3/8	12 3/8	72	11	20	49	29 1/2
FP/NP	4"	SH	2 3/4	9 7/8	8	4	19 3/4	13 1/4	72	9	27	29 1/2	16 1/2	10	72	11	20	49	29 1/2
FP/NP	4"	HT	2 3/4	9 7/8	8	4	19 3/4	13 1/4	72	11	27 1/2	30 1/2	16 1/2	10	72	11	22	49 1/2	30 1/2
FP/NP	6"	MT	4 5/8	11	10	5	17 5/8	9 3/4	72	12	28 1/2	32	12 5/8	5 1/4	72	12	24	52 1/2	32
NP	8"	LT	5 1/2	11	10	5	14 1/4	5 3/8	72	14	30 1/2	35	16 1/2	7 3/8	84	13	27	56 1/2	35
NP	10"	LT	14 3/8	19 3/4	10	5	23 3/4	13	96	16 1/2	35 1/2	40	16 3/4	6	96	18	34 1/2	71 1/2	40



Concrete Systems Inc.
9 Commercial St., Hudson, NH, 03051
Phone 603-889-4163
Fax 603-889-0039

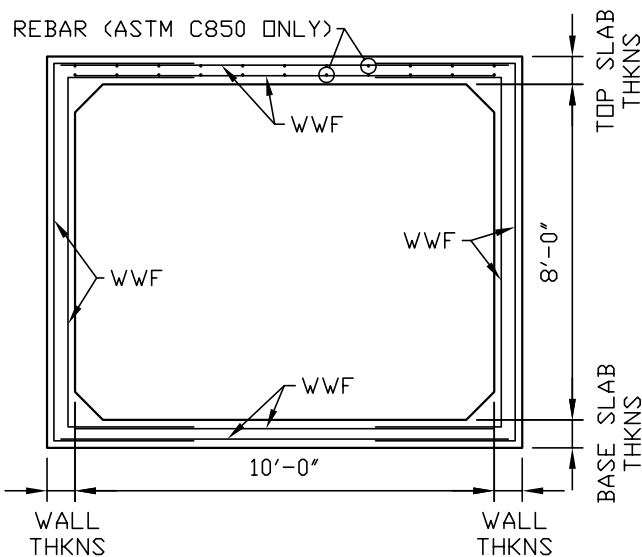
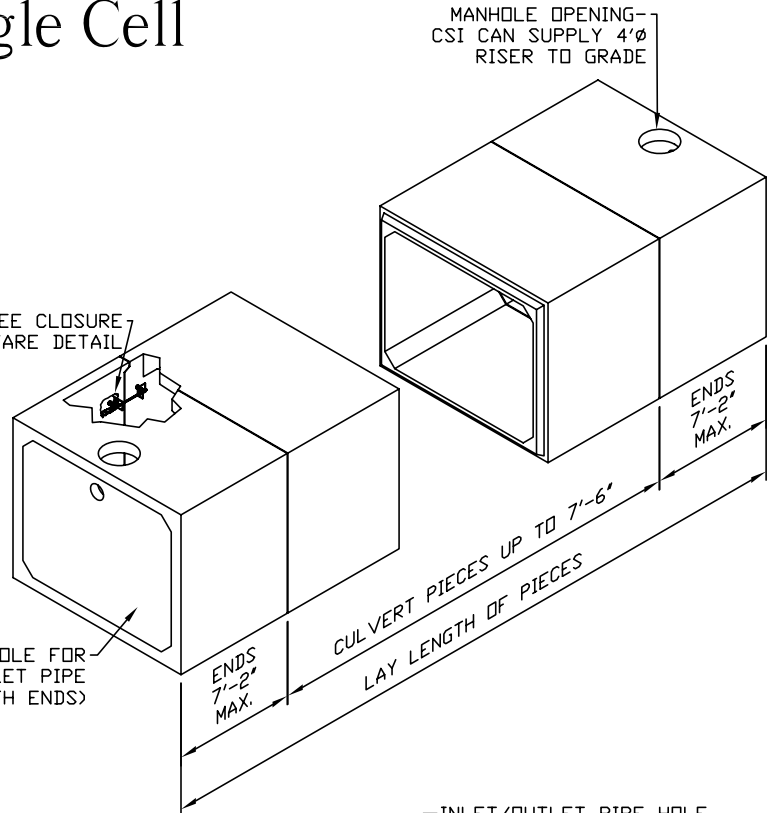
10' X 8' Storage Tank Single Cell



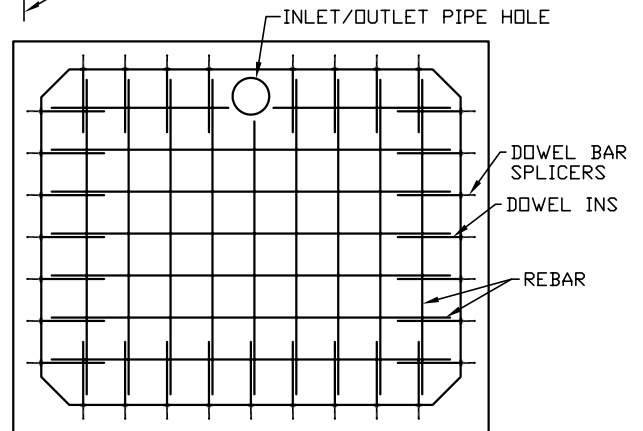
CLOSURE HARDWARE
DETAIL

ENDWALL WITH HOLE FOR
INLET/OUTLET PIPE
(BOTH ENDS)

SEE CLOSURE
HARDWARE DETAIL



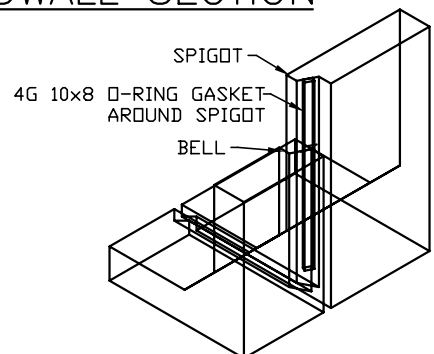
TYPICAL SECTION



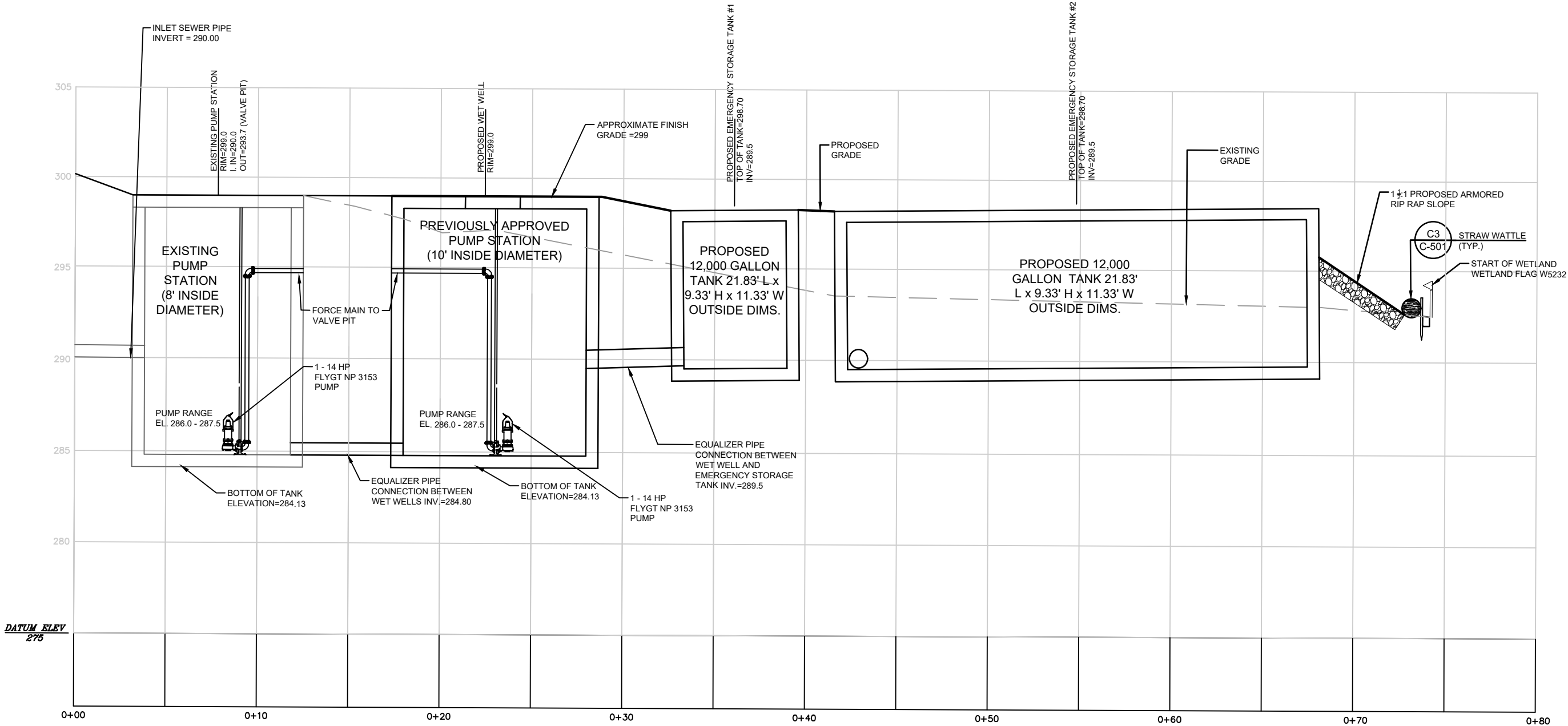
ENDWALL SECTION

GENERAL NOTES:

- Structure designed and built in accordance with ACI 318-99 "Building Code Requirements for Structural Concrete" and ASTM C789 or C850. Other design codes: AASHTO, AREA, FAA Airport Loading & BOCA as required.
- Design Parameters:
Live load: As specified
Earth Cover: Per job condition
Concrete: Design strength $f'_c = 5000$ psi
Unit weight = 150 pcf
Reinforcing: ASTM A615 (Rebar) Grade 60
ASTM A185 (Welded Wire Fabric) Grade 70
- Exterior dampproofing can be supplied by CSI.



JOINT DETAIL



NOTES:

- EXISTING PUMP STATION TO REMAIN. TWO EXISTING 5HP PUMPS TO BE REMOVED AND REPLACED WITH ONE 14.0 HP PUMP. RAILS, FLOATS, CONTROLS, ETC. TO REMAIN.
- NEW 10 FOOT INSIDE DIAMETER WET WELL TO BE INSTALLED WITH ONE 14.0 HP PUMP. PUMP TO BE CONNECTED TO EXISTING CONTROL PANEL. NEW RAIL SYSTEM TO BE INSTALLED. PUMP DISCHARGE TO BE CONNECTED TO EXISTING VALVE PIT. EXISTING VALVES TO REMAIN.
- PUMPS ARE TO FUNCTION AS A DUPLEX SYSTEM ALTERNATING LAG/LEAD.
- ADDITIONAL LOW AND HIGH WATER ALARM FLOATS TO BE INSTALLED IN NEW WET WELL.
- NEW TWO 12,000 GALLON EMERGENCY STORAGE TANK.S

EMERGENCY STORAGE VOLUME PROVIDED
EXISTING PUMP STATION VOLUME ABOVE ELEVATION 289.5 = 3,322 GAL.
PROPOSED WET WELL VOLUME ABOVE ELEVATION 289.5 = 5,185 GAL.
EMERGENCY STORAGE TANK VOLUME = 24,534 GAL.

TOTAL EMERGENCY STORAGE REQUIRED
6 HOURS OF REQUIRED STORAGE = 29,620 GAL
MAXIMUM DAILY FLOW = 118,483 GAL./DAY
STORAGE TIME PROVIDED = 33,041 GAL./118,483 GAL./DAY = 0.279 DAYS OR 6.69 HOURS
MAXIMUM ELEVATION AT 6 HOURS OF STORAGE = 297.0
0.50 FEET OF FREEBOARD AVAILABLE (IN EMERGENCY TANKS)

DATE:	05/11/2021
ISSUE:	
SCALE:	1"=6'
REF:	
DR BY:	PSG
CK BY:	CHK

SECTION 33 31 10
SANITARY SEWERAGE PUMPING STATION

PART 1 - GENERAL

1.01 SUMMARY

- A. Work Includes: Sanitary sewer pumping station, including equipment and controls.
- B. Related Work Specified in other Sections:
 - 1. Geotechnical Data: Section 00 31 32.
 - 2. Earth Moving: Section 31 20 00.
 - 2. Sanitary Utility Sewerage System: Section 33 31 00.

1.02 DEFINITIONS

- A. Pump controller: Microprocessor driven water level indicator and pump controller.
- B. Rail system: Rail and support system installed in concrete wet well for removal of pumps.
- C. Submersible Self Cleaning Pump: Pump that operates with motor submerged in liquid that passes through most solids.
- D. Wet well: Precast concrete basin equipped with pumps, rail system and other appurtenances.

1.03 SUBMITTALS

- A. Product data including certified performance curves, weights (shipping, installed, and operating), furnished specialties, and accessories. Include the following:
 - 1. Startup instructions.
 - 2. Parts list.
 - 3. Literature and drawings describing the equipment and showing all important details of construction and dimensions.
- B. Shop drawings showing layout and connections for pumps. Include setting drawings with templates, directions for installation of foundation and anchor bolts, and other anchorages.
- C. Wiring diagrams detailing wiring for power, signal, and control systems differentiating between manufacturer-installed wiring and field-installed wiring.
- D. Product certificates signed by pump manufacturers certifying accuracy under specified operating conditions and compliance with specified requirements.
- E. Closeout Submittals: Operation and Maintenance data for each type and size pump specified to include in the "Operating and Maintenance Manual".
- F. Shop test results and written notification from the engineer if his acceptance is necessary before equipment can be shipped to the site.

1.04 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with provisions of the following:
 - 1. ASME B31.9 "Building Services Piping" for piping materials and installation.
 - 2. H.I. "Hydraulic Institute Standards for Centrifugal, Rotary and Reciprocating Pumps" for pump design, manufacture, and installation.
 - 3. UL 778 "Standard for Motor Operated Water Pumps" for construction requirements. Include UL listing and labeling.
 - 4. NEMA MG 1 "Standard for Motors and Generators" for electric motors. Include NEMA listing and labeling.
 - 5. NFPA 70 "National Electrical Code" for electrical components and installation.
- B. Design Criteria: Drawings indicate sizes, profiles, connections, and dimensional requirements of pumps and are based on specific manufacturer types and models indicated. Pumps having equal performance characteristics by other manufacturers may be considered provided that deviations in dimensions and profiles do not change the design concept or intended performance as judged by the Engineer. The burden of proof for equality of pumps is on the proposer.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Store pumps in a clean, dry location.
- B. Retain shipping flange protective covers and protective coatings during storage.
- C. Protect bearings and couplings against damage from sand, grit, or other foreign matter.
- D. Comply with pump manufacturer's rigging instructions for handling.

1.06 PROJECT/SITE CONDITIONS

- A. Test the pump at startup. Record voltage, current and other significant parameters as determined by the manufacturer or engineer. The manufacturer to provide a formal test procedure and forms for recording data.

1.07 WARRANTY

- A. Warranty the pumps against defects in workmanship and materials for a period of five years under normal use, operation and service.
- B. Warranty periods begin on the first day of normal sewage pumping station operation.
- C. The warranty is to be in published form.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by following:

1. Self Cleaning Submersible Pumps: Flygt Pump or approved equal
2. Sliderail Assembly: Flygt Pump or approved equal
3. Junction Box: Flygt Pump or approved equal
4. Indicator Pump Controller: Flygt Pump or approved equal

2.02 MANUFACTURED UNITS

- A. Sewage pumping station: Package unit supplied by one manufacturer including:
1. Pumps.
 2. Motors.
 3. Level Controls.
 4. Miscellaneous metals.
 5. Lights.
 6. Pump removal system.

2.03 PUMPS AND MOTORS, GENERAL

- A. Pumps and motors shall be suitably designed and of proper material for continuous quiet operation at maximum performance without undue strain or overheating and with only normal maintenance. Critical shaft speeds for centrifugal pumps shall not occur below 150 percent of normal speed.
- B. Provide materials of quality suited to withstand any corrosion and abrasion encountered in the service intended.
- C. Corresponding parts of the equipment interchangeable and all parts subject to wear shall be of standard pattern and easily replaced without the necessity of special cutting and fitting.
- D. Two complete shaft seals shall be furnished as spare parts.

2.04 GRINDER SEWAGE PUMPS

- A. Each pump shall be rated 14 HP, 460 volts three phase, 60 hertz, 1800 RPM. Pumps shall have the capacity of 485 GPM at a total head of 61.4 feet. Install unit in such a way that solids are fed in an upflow direction to the pump impeller with no feet, rails or other obstructions below inlet. Pump shall not be intended to handle abrasive materials or sewage containing large excessive amounts of sand, grit or other stone like compositions. Pumps shall be installed on lift-out rail systems in order to allow for easy removal without requiring entry into the wetwell. Three phase motors shall be NEMA B type.
- B. Each pump shall be of the totally enclosed submersible self cleaning high efficiency, Model NP-Series 3153 HT 3 as manufactured by Flygt – a xylem brand or approved equal. The pump volute, motor and seal housing shall be high tensile strength cast iron ASTM A48, Class 30. Castings shall be treated with phosphate and chromic rinse prior to painting. Castings shall be painted with a high quality lead free, alkyl enamel finish.
- C. Motor: Heat losses are concentrated around the shrink-fitted stator, which is cooled by means of the surrounding water. The motor has a NEMA Class B maximum operating temperature rise

of 80°C (176°F) to ensure long service life. The stator windings are rated at 180°C (355°F) and enable up to 30 starts per hour.

- D. The pump and motor shall be specifically designed so that they may be operated partially or completely submerged in the liquid being pumped. The pump shall not require cooling water jackets. Dependence upon, or use of, water jackets for supplemental cooling shall not be acceptable.
- E. A heat sensor thermostat shall be embedded in top of windings and be connected in series with the motor starter coil in control box to stop motor if temperature rises in motor to over 221°F for any reason. Thermostat to reset automatically when temperature drops to a safe limit. Three phase motors to have two heat sensor thermostats attached to adjacent windings.

2.05 SEALS

- A. The motor shall be protected by two mechanical shaft seals, mounted in tandem, with an oil filled chamber between the seals for lubricating seal faces and providing buffer zone to protect motor in event of first seal leakage. Seal shall be of tungsten carbide lapped to a flatness tolerance of one light band. Metal parts and springs for seals shall be of 18-8 stainless steel.
- B. The pump shall be equipped with a seal leak detection probe and warning system. This shall be designed to alert maintenance personnel of lower seal failure without having to take the unit out of service for inspection or requiring access for checking seal chamber oil level and consistency.
- C. There shall be an electric probe or seal failure sensor installed in the seal chamber between the two tandem mechanical seals. If the lower seal fails, contaminants which enter the seal chamber shall be detected by the sensor and send a signal to operate the specified warning device.

2.06 IMPELLER

- A. The pump impeller shall be sized to provide the required system flow and head characteristics. Impeller shall be self cleaning that can move axially to enable easy passage of large solids through the pump. Dynamically balanced, ISO G6.3 of cast iron and shall thread onto shaft.

2.07 ELECTRICAL POWER CORD

- A. Motor power cord shall be 10/4 or 8/4 SOW/SOWA 4 conductor of proper length to suit installation. Motor control cords to be 18/5 SOW/SOW 5 conductor of proper length to suit installation. Each cable shall be provided with a green ground wire to be grounded in accordance with local and national electric codes. All cords shall be CSA and UL approved.
- B. Cable entry system shall consist of three separate seals. A rubber grommet that seals both cable jackets shall be clamped onto cord by end holding cap. An "O" ring shall seal end holding cap to bottom half of cord cap. Both cables shall have individual conductors stripped and potted into motor end cap with epoxy potting compound. Potting compound shall prevent wicking of water into motor if the cable jacket becomes damaged. Cords shall withstand a pull

of 300 pounds without loosening or losing integrity. The end holding cap shall have female threaded tapping for 2 inch conduit.

2.08 SUPPORT

- A. Though the pump may not require feet to support the unit while installed, the pump volute must have feet to support the unit when removed for service. Units which do not have feet upon which the unit can be supported when removed for service shall not be acceptable.

2.09 FIELD TESTS

- A. Commercial testing shall be required and include the following: The pump shall be visually inspected to confirm that it is built in accordance with the specifications as to HP, voltage, phase and hertz.
 - 1. The motor seal and housing chambers shall be meggered for infinity to test for moisture content or insulation defects. Pump shall be allowed to run dry to check for proper rotation.
 - 2. Discharge piping shall be attached, the pumps submerged in water and amp readings shall be taken in each leg to check for an imbalance stator winding. If there is a significant difference in readings, the stator windings shall be checked with a bridge to determine if an unbalanced resistance exists. If so, the stator shall be replaced.
 - 3. The pump shall be removed from the water, meggered again, dried and the motor housing filled with dielectric oil.

2.10 CONTROL PANEL AND CONTROLS

- A. Existing duplex motor control and panel by Williamson Electric, Inc.
- B. Retrofit the following components of existing control panel as necessary to accommodate 2-7.5 HP pumps:
 - 1. Circuit breakers.
 - 2. Across-the-line magnetic motor starters.
 - 3. Motor thermal overload relays.
 - 4. Overtemp and seal fail relays.
 - 5. Cumulative run-time meters for each pump.
 - 6. Event counters for each pump.

2.12 CHECK VALVE AND PIPING

- A. Ductile iron pipe (Class 52), fittings and gate valves shall conform in all respects to the provisions contained in the Section 33 31 00 Sanitary Sewerage System with the exception of the following:
 - 1. All appurtenance connections shall be flanged. All flanges shall be drilled Class 125 lb. ANSI Standard.
 - 2. Gate valves shall be wheel operated.

- B. Piping: Piping shall include one (1) pump check valve per pump and three (3) gate valves. Piping shall include all necessary elbows and tees. All piping shall be coated with coal tar epoxy or approved equal for corrosion resistance. Where piping passes through a wall, use jointing methods for sewer manholes as indicated on Drawings to make a water-tight joint. Refer to construction documents for specific piping arrangements and details.

2.13 OPERATION OF SYSTEM

- A. On sump level rise, lower switch shall first be energized, then upper level switch shall next energize and start lead pump. With lead pump operating, sump level shall lower to low switch turn-off setting and pump shall stop. Alternating relay shall index on stopping of pump so that lag pump will start first on next operation and become lead pump. If sump level continues to rise when lead pump is operating, override switch shall energize and start lag pump. Both lead and lag pump shall operate on the override control and if level rises above override control, alarm shall signal. All level indicators to be adjustable from control panel on the surface.

2.14 VENTS

- A. Vents shall be installed as detailed on the drawings and where and as directed by the engineer or construction manager. Riser sections shall be set plumb, embedded in a concrete base, while horizontal section shall pitch towards the ejector station. The vent cap shall be galvanized cast iron, vandal-proof and frost-proof. The vent cap shall be equal to Josam Series 26700 or Wasde W-8780-CV. Two field coats of black enamel as manufactured by Koppers (Glamortex 501), Tnemec, or equal shall be required on the vent cap.

2.15 ELECTRIC SUPPLY

- A. Provide adequate, approved, temporary electric service for pumping station operation until approved, permanent electric supply is available.
- B. Provide approved conduit for permanent electric service in the locations as shown.

2.16 CONCRETE WET WELL

- A. Precast concrete structures: Concrete minimum strength of 5000 psi (minimum) @ 28 days. Steel reinforcement- ASTM A-615 GR 60, A-185, or A-497, 1" min. cover, design loading AASHTO HS20-44

2.17 PUMP GUIDERAIL CONFIGURATION AND ACCESSORIES

- A. General: Provide a complete single rail on-site concrete sewage pumping system complete and in place.
- B. Lift-Out Rail System: Rail system(s) shall be Flygt Pump model and shall have a seal fitting that mounts vertically into a stationary discharge casting. A simple downward motion shall connect pump and seal fitting to the stationary discharge casting. Seal fitting shall seal with two "O" rings and a tapered rubber seal ring into funnel of discharge case. Discharge pipe tapping shall be 4" NPT female for standard pipe.
- C. Discharge casting shall be painted with a high quality, lead free, alkyd enamel finish.
- D. An upper guide plate shall be attached to pump to support lift-out fitting and guide pump on rails. A lifting eye shall be attached.

2.18 ACCESS HATCH

- A. Aluminum construction H20 loading by Halliday Products or approved equal.

2.19 LIGHTING

- A. Install lighting in wetwell as shown on the drawings and modify existing control panel as required.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine areas, equipment foundations, and conditions with Installer present for compliance with requirements for installation and other conditions affecting performance of pumps. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. General: Comply with pump manufacturer's written installation instructions.
- B. Install pumps in locations indicated and arrange to provide access for periodic maintenance, including removal of motors, impellers, couplings, and accessories.
- C. Support piping so that weight of piping is not supported by pumps.
- D. Submersible Sewage Pumps: Install submersible sewage pumps set on basin floor. Make direct connections to sanitary drainage piping.
 - 1. Install guide rail systems anchored to bottom of basins and to basin sidewalls or covers. Install pumps so that pump and discharge pipe disconnecting flanges make positive seals when pumps are dropped into place.

3.03 CONNECTIONS

- A. General: Connect piping to pumps as indicated. Install valves that are same size as piping connecting to pumps.
- B. Install discharge pipe sizes equal to or greater than diameter of pump nozzles.
- C. Install check valve and gate or ball valve on each sewage and sump pump discharge.
- D. Install electrical connections for power, controls, and devices.
- E. Electrical power and control wiring and connections are specified in Division 16 Sections.

3.04 CONTROL ADJUSTMENT

- A. Pump Controls: Set pump controls for automatic start, stop, and alarm operation as required for system application.

END OF SECTION 02732