

Unit Well 29

Deep Well Pump Replacement and Installation Bid

Due Date: **3:00 p.m. February 8, 2012**

Item	Description	Quantity	Unit Cost	Extended Price
	Line Shaft Vertical Turbine Pump – Base Bid	1		
	Guaranteed Power Consumption/Annual Cost for 800 million gallons pumped:			
	Lakos Sand Separator Complete	1		
	Complete Installation/Testing/Startup	1		
	Scheduled Installation Completion Date – Base Bid			
Miscellaneous Deep Well Pump Replacement Parts				
	SS Couplings 10 tpi	22		
	Rubber bearings to match wear sleeve dia. and spiders	32		
	12-inch diameter column that Threaded at pump, Flanged at top – 5 foot length	1		
	SS shaft 10 tpi 1-15/16-inch diameter – 5 foot length	1		
	12-inch flanged column – 10 foot length	1		
	SS wear sleeves	32		
	Stuffing Box Bearing	1		
Total Base Bid				
Optional Bid Items				
	Description	Add or Deduct from Base Bid		
	Ductile Iron Bowls and Impellers			

Unit Well 29

Deep Well Pump Replacement and Installation Bid

Due Date: **3:00 p.m. February 8, 2012**

	Guaranteed Power Consumption/Annual Cost for 800 million gallons pumped:	
	Revised Scheduled Installation Completion Date for Ductile Iron Bowls and Impellers	
	Revised Total Bid for Ductile Iron	
	Description	Add or Deduct from Base Bid
	Glass Coated Bowls and Impellers	
	Guaranteed Power Consumption/Annual Cost for 800 million gallons pumped:	
	Revised Scheduled Installation Completion Date for Glass Coated Bowls and Impellers	
	Revised Total Bid for Glass Coated Construction	
	Description	Add or Deduct from Base Bid
	Nickel Plated Bowls and Impellers	
	Guaranteed Power Consumption/Annual Cost for 800 million gallons pumped:	
	Revised Scheduled Installation Completion Date for Nickel Plated Bowls and Impellers	
	Revised Total Bid for Nickel Plated Construction	

Unit Well 29

Deep Well Pump Replacement and Installation Bid

Due Date: **3:00 p.m. February 8, 2012**

Respectively Submitted

Signature

Date

Printed Name

Company Name

Address

City, State Zip

Phone

Email

SECTION 11216

DEEP WELL LINE SHAFT TURBINE PUMP
Well 29

Part 1 GENERAL

1.01 SUMMARY

A. Work Included:

1. Provide one replacement deep well line shaft type turbine pump complete
2. Provide one "Lakos" pump protection sand control device
3. Provide required miscellaneous replacement parts for column and shaft assembly
4. Install pump, sand control device, column, shaft assembly, spiders and bearings, air line, transducer carrier pipe, discharge head, and motor
5. Testing and startup services to verify installation and set up of equipment

1.02 SUBMITTALS

A. Project Data/Bid Requirements:

1. Furnish performance data and curves for pump purposed
2. Furnish the following information in duplicate:
 - a. Name of pump manufacturer and type of model designation.
 - b. Field operating speed of unit at 480 volts 60 Hz. All performance data and tests shall be at this speed.
 - c. Number and size of bowls.
 - d. Complete performance curves drawn for the equipment being offered showing field capacity-head from shutoff to cutoff, NPSH required, wire to water efficiency and brake horsepower from shutoff to zero head. Do not provide a catalogue "generic" model pump curve.
 - e. Full descriptive literature on pump offered including a list of five similar installations where proposed unit has been in operation for a period of not less than 5 years
 - f. Provide multiple field head capacity curves for variable speed operation at 200 rpm increments between 1000 rpm and full speed
 - g. Pump minimum operating speed
 - h. Minimum flow requirements at operating speed
3. The above specifications and data, as approved by ENGINEER, shall become a part of the Contract and the equipment shall be constructed and installed in

1 accordance with them.

2 4. Guaranteed Power Consumption/Annual Cost:

- 3 a. Bidder shall enter in the proposal the guaranteed maximum power
4 consumption per year at the design performance point specified.
5 b. The award will be made on the considerations of performance curve
6 characteristics, equipment construction, and total annual cost of the
7 equipment.
8 c. Annual cost will be the sum of power cost using an average of \$0.11 per kwh
9 for pumping 800 million gallons per year. Assume that the motor efficiency is
10 93%.

11
12 5. Sand Control Device – Lakos Sand Separator

- 13 a. Submit design and construction data for the Lakos sand separator
14 b. Include operating conditions and performance specifications
15 c. Provide delivery information
16 d. Submit installation instructions and maintenance information
17 e. Provide warranty documentation
18

19 1.03 QUALITY ASSURANCE

20
21 A. Regulatory Requirements:

- 22 1. Except as otherwise specified, the units shall conform to AWWA E101 and the
23 requirements of the Wisconsin Department of Natural Resources.
24

25 B. Certifications:

- 26 1. Provide the ENGINEER written documentation of the exact distance from the top
27 of the well curb to the bottom of the telltale lines.
28 2. If telltale lines are damaged in any way so that accurate readings cannot be
29 obtained, replace the telltale lines at no cost to the OWNER.
30 3. Provide certification of the absence of floating material in the well prior to
31 starting work.
32

33 C. Warranty

- 34 1. All equipment shall be warranted free from defects in materials and
35 workmanship for one year following final acceptance of the installation.
36 2. Installation of the deep well pump shall be warranted against defects that result
37 from misalignment or poor workmanship by the installer for a period of one year
38 following final acceptance of the installation.
39 3. Remedy for any repair work includes all costs associated with pump removal and
40 reinstallation and any other costs associated with loss of pumping capacity due
41 to a warranty claim.
42
43
44

1 1.04 PROJECT CONDITIONS

2
3 A. Construction of the Well 29 below the curb is recorded as follows:

- 4 1. 42-inch Grouted hole surface to 40 feet.
5 2. 36-inch Grouted outer casing surface to 40 feet.
6 3. 30-inch Grouted inner casing surface to 342 feet.
7 4. 29-inch open hole 342 to 500 feet
8 5. 24-inch open hole 500 to 815 feet
9

10 B. Initial Specific Capacity

- 11 1. A 24-hour pumping test started on May 29, 2003 showed a static water level of
12 116 feet fellow the well curb.
13 2. When pumped for 24 hours at 2200 gpm the pumping level was measured to be
14 275 feet below the top of the proposed curb
15 3. The initial Specific Capacity is calculated at 13.79 gpm/ft of drawdown.
16

17 C. After well development the water had a sand content of between 5 and 10 ppm at
18 pumping rates in excess of 1500 gpm.
19
20

21 Part 2 PRODUCTS

22
23
24 2.01 MANUFACTURERS

25
26 A. The type of pump, efficiency and head-discharge curve slope shall be similar to:

- 27 1. Goulds,
28 2. Layne Christenson
29 3. American Turbine
30 4. Approved equal
31

32 B. Sand Separator

- 33 1. The separator shall be manufactured by LAKOS Filtration Systems, a division of
34 Claude Laval Corporation in Fresno, California USA. Specific model designation
35 is: PPS-1010-J
36

37 2.02 PUMPING EQUIPMENT

38
39 A. Pump Design Requirements:

- 40 1. Pump heads as specified herein are field heads external to the pumping unit
41 2. Increase in pump head capacity
42 a. The Utility is increasing the head of the pump at Well 29 to accommodate
43 the filter and the sand control equipment
44 b. The pump shall be designed to work with the existing motor and Variable

- 1 Frequency Drive equipment
- 2 c. The existing motor has a rating of 250 horse power
- 3 d. The proposed pump horsepower requirement for the proposed equipment
- 4 for Well 29 shall not exceed 245 horsepower at full design flow. For this
- 5 calculation, assume that the motor efficiency is 93%.
- 6 e. Provide flow capacity of the proposed pumping equipment to prevent pump
- 7 from exceeding power limitations if 2000 gpm is not attainable for proposed
- 8 pumping equipment.
- 9 3. Required pump heads do not include velocity head or internal friction head
- 10 4. Pump discharge head is that shown by a piezometer tap at the pump discharge
- 11 5. Use AWWA E101 to convert pump bowl assembly heads or shop heads and shop
- 12 test motor loads to field heads and field driver loads, hydraulic and mechanical
- 13 friction loads
- 14 6. A steep head discharge curve at performance point maintaining high efficiency
- 15 each side of the performance point is desired, and this characteristic will be
- 16 considered in awarding the Contract.

17
18 B. Pump Performance Requirements:

- 19 1. Revised pump field head when pumping to the system at 2000 gpm including
- 20 sand control equipment and filtration system is calculated as follows:

21	a. Approximate static lift in well	115.0 feet
22	b. Drawdown at initial specific capacity = 13.8 gpm/ft	145.0 feet
23	c. Well and pump deterioration allowance	20.0 feet
24	d. Discharge static head allowance	10 feet
25	e. System friction loss allowance	8 feet
26	f. Allowance for Lakos Sand Separator on pump suction	15 feet
27	g. Allowance for existing Lakos Sand Separator prior to filters	12 feet
28	h. Allowance for iron and manganese filtration system	<u>35 feet</u>
29	i. Total field head at 2000 gpm	360 feet

- 30
- 31
- 32 2. Design point under normal operating conditions at 1800 rpm
- 33

34 **2000 gpm @ 360 feet of head**

- 35
- 36 3. Existing motor and VFD power limitation = 245 horsepower
- 37

38 2.03 PUMP COMPONENTS

39
40 A. Bowls:

- 41 1. Pump bowls: cast iron
- 42 2. Bowl wear rings: Replaceable bronze
- 43 3. Bowls Diameter nominal 14-inch diameter.
- 44 4. Optional Bid materials and coatings

- 1 a. Ductile iron
- 2 b. Glass coated
- 3 c. Nickel plated
- 4
- 5 B. Impellers:
- 6 1. Material: bronze.
- 7 2. Fully enclosed.
- 8 3. Design to meet NPSH requirements with pumping level at the top of the bowl
- 9 assembly.
- 10 4. Optional Bid materials and/or coatings
- 11 a. Ductile Iron
- 12 b. Glass coated
- 13 c. Nickel plated
- 14
- 15 C. Impeller shaft
- 16 1. Type 416 stainless steel
- 17 2. Nickel plated
- 18 3. Collet and keys: 300 series stainless steel
- 19 4. Rubber fluted intermediate bearings in each bowl
- 20 5. 12-inch stick-up
- 21
- 22 D. Tail Piece (if used)
- 23 1. 12-inch diameter
- 24 2. If provided, minimum length 10 feet
- 25 3. Material: 0.375 inch thickness steel column pipe
- 26
- 27 E. Pump Discharge configuration:
- 28 1. Threaded connection
- 29 2. Constructed for oil lubrication with long bronze connector bearing
- 30 3. Nozzle configuration above the bowl assembly
- 31 4. Straightening vanes
- 32
- 33 F. Column:
- 34 1. 12-inch nominal diameter
- 35 2. Standard weight steel
- 36 3. Bolted flanged joints
- 37 4. Maximum ten foot lengths.
- 38 5. Column at discharge head connection maximum length = 5 feet
- 39 6. Column at pump connection maximum length = 5 feet
- 40 7. Column at pump shall be threaded
- 41 8. Spiders and bearing retainers shall be held tightly and firmly in place at column
- 42 ends
- 43 9. Flanges: ASTM-A36 steel welded inside and outside.
- 44 10. Include two 7/8-inch minimum air line holes 180 degrees apart on all flanges

- 1 11. Flange bolts: 304 or 316 series stainless steel.
- 2 12. Center pump column in the well casing
- 3 13. Furnish and install by welding to the casing any adapter needed to permit proper
- 4 setting of the pump and miscellaneous tubing.
- 5 14. Completely clean unpainted casing pipe of all coatings prior to installation.
- 6 15. Set the pump so that the top of the bowls is at approximately 320 feet below the
- 7 top of the well casing

8
9

G. Line Shaft:

- 10 1. Material: turned, ground polished and straightened stainless steel type 416
- 11 2. Minimum diameter: 1-15/16-inches
- 12 3. Provide threaded stainless steel couplings of the same material as the shaft sized
- 13 to develop the full strength of the shaft.
- 14 4. Threads: 10 per inch and meet ANSI Class 3A standards
- 15 5. Shaft length tolerance: -0.000-inches and +0.015-inches
- 16 6. Thread length: 3.26 inches
- 17 7. Top shaft and pump connection shaft shall match 5 foot pump column pieces

18

19 H. Line Shaft Bearings:

- 20 1. Material: Styrene butadiene rubber,
- 21 2. Designed for water lubrication
- 22 3. Fluted bearing surface
- 23 4. Firmly fixed in the bearing retainer
- 24 5. Bearings shall not rotate in the retainer
- 25 6. Bearings relying only on an adhesive substance to hold the bearings in place will
- 26 not be accepted
- 27 7. Rubber bearing shall be standard stock size requiring no sleeve, adapter, or
- 28 modification to fit in the retainer
- 29 8. Bearing alignment spiders: cast iron or stainless steel
- 30 9. Bearing shall have been in satisfactory operation on similar pumps for a
- 31 minimum of 5 years.

32 I. Existing Pump Motor:

- 33 1. Description:
 - 34 a. Vertical
 - 35 b. Hollow shaft
 - 36 c. Squirrel cage induction type
 - 37 d. Drip-proof
 - 38 e. Ball bearings
 - 39 f. Maximum speed 1800 rpm
 - 40 g. 105°C rise above 40°C ambient on continuous operation
 - 41 h. NEMA Design B
 - 42 i. Class F insulation with a Class B insulation rise
 - 43 j. Built for variable speed operation.

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2. Motor Construction:
 - a. Operation on 230/460 volt, three phase, 60 cycle current
 - b. Allowance for ± 1 0% voltage variation
 - c. Labeled accordingly
 - d. 1.15 service factor
 - e. Pump and motor shall operate together such that the motor is not loaded beyond nominal rating (not including service factor) at any head on the pump
 - f. Rated Horsepower: minimum 250 hp.
 - g. Copper windings
 - h. Ball or roller bearings in end brackets of steel or cast iron, or aluminum brackets with steel of bearing sleeves
 - i. Variable torque inverter duty rated meeting the requirements of NEMA MG1, Part 31
 - j. Capable of operating with a minimum speed turn down of 4:1
 3. Thrust bearing
 - a. Rated for use with the motor and pump supplied
 - b. Minimum rated bearing life: 5 years
 - c. Nameplate data shall identify the bearing, and the type and weight of lubricant required
 - d. Bearing shall be proper for use with motor and pump setting as described under line shaft
 4. Thermal sensors:
 - a. Apply motor sensors to the motor windings to shutdown the motor in the event of over temperature
 - b. Manual reset at the MCC shall be required to restart motor following a thermal sensor shutdown.
 5. Motor shall be premium efficient NEMA MG-1.
- J. Drawdown Measurement:
1. Air Lines
 - a. Furnish and install two telltale air lines with the pump
 - b. Material: 1/4-inch I.D. 1/2-inch O.D. rated to 250 psi; "Ortac-hose" by Industrial Rubber, Inc., Milwaukee
 - c. Hose to be new and continuous length with no joints
 - d. Locate lower ends at the top of pump bowl assembly
 - e. Fasten the two hoses to each length of column with 2-inch wide 3M No. 50 Scotch wrap
 - f. Route the hoses through the base of the discharge head in sanitary stuffing boxes and through taps provided in the column pipe flanges
 - g. Fit the upper end of each hose with a brass or copper fitting for connection to 1/4-inch copper airline
 2. Drawdown pressure transducer:
 - a. Provide and install 1-1/2-inch Schedule 80 PVC carrier pipe
 - b. PVC carrier pipe to run from discharge head to top of pump bowls

- 1 c. Secure PVC tubing to pump column with fabricated stainless steel guards
- 2 bolted to each flange connection
- 3 d. Fabricate and install stainless steel guards at each flange connection to
- 4 protect PVC pipe from being damaged by the pump column during
- 5 installation.
- 6
- 7 K. Sand Separator Suction Flow Device: PPS Series – LAKOS Pump Protection Separators
- 8 1. A centrifugal action separator shall be employed in the water well to remove
- 9 abrasive sand from the water before the sand enters the turbine or submersible
- 10 pump intake.
- 11 2. Head loss through the separator shall be approximately 9-14 feet (2.7 –4.3
- 12 meters).
- 13 3. Maximum particle size shall be 3/8-inch (9 mm). Maximum particle
- 14 concentration shall be 1,000 ppm.
- 15 4. Separator Design & Function
- 16 a. As the water well pump delivers water to the surface, head pressure caused
- 17 creates a flow of water into the separator. Passing through the tangential
- 18 inlet slots of the separator, accelerated centrifugal action is created,
- 19 influencing the particles in the water to the perimeter of the separation
- 20 barrel. Particles then steadily spiral downward in a manner that does not
- 21 promote wear to the separation barrel.
- 22 b. Water exits the separator via the center vortex created by the centrifugal
- 23 action in the separation barrel. Drawn inward by the lower pressure, the
- 24 water then spirals upward to the vortex pipe, which becomes the separator’s
- 25 outlet. Water is fed directly to the turbine pump
- 26 c. During pump operation, submergence and pump flow cause the separator’s
- 27 flapper valve to close, allowing separated particles to temporarily
- 28 accumulate in the separator’s lower chamber. Separated particle matter is
- 29 periodically discharged deep into the well when one of two conditions
- 30 occurs: 1) The pump shuts off, releasing pressure to the flapper and allowing
- 31 the separated sand to discharge; or 2) The accumulation of sand becomes
- 32 great enough to overcome the pressure on the flapper, allowing separated
- 33 sand to discharge.
- 34 5. Separator Construction
- 35 a. The separator shall be unishell carbon steel with A-36, A-53B or equivalent
- 36 quality steel, minimum thickness of .25 inches (6 mm).
- 37 b. Flapper valve shall be reinforced natural rubber with a stainless steel band
- 38 clamp.
- 39 c. Appropriate lugs shall be provided at the outlet to facilitate the installation
- 40 process.
- 41 d. Paint coating shall be non-toxic acrylic urethane, spray-on, gloss green,
- 42 suitable for potable water systems.
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3 Part 3 EXECUTION
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6 3.01 INSTALLATION
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- 8 A. During installation of the well pump keep the area around the well clean and free of
9 trash, construction materials, and other miscellaneous debris. Ensure that material
10 does not fall into the well during installation. Remove any material which falls into
11 the well during installation of the equipment.
12
- 13 B. Pump and suction flow control device installation:
14 1. Wash the pump and suction flow control device inside and out with water
15 containing 200 ppm of available chlorine per AWWA C654
16 2. Thoroughly wet all surfaces with the chlorine solution
17 3. Sample the pump discharge for bacteria twice, at least 24 hours apart
18 4. Report results to OWNER
19 5. If either sample is determined to be unsafe, disinfect the well per AWWA C654
20 and re-sample until two consecutive safe samples are obtain
21
- 22 C. Lakos Sand Separator Installation Details- Model PPS-1010-J
23 1. The selected separator model flow range of 1010 to 1800 gpm is matched to the
24 Well 29 deep well pump with a variable flow rate between 1000 and 1800 gpm.
25 2. The pump's suction connection to the separator shall be 10 inches NPT (male or
26 female).
27 3. The inside diameter of the well at the installation point is 24 inches.
28 4. The separator shall be set to maintain a drawdown submergence of 30 feet.
29

30 3.02 FIELD QUALITY CONTROL
31

- 32 A. Vibration Site Tests:
33 1. Vibration at any point on the equipment and shafting as operated in the field in
34 excess of 4.0 mils shall be the cause for rejection.
35 2. All surfaces intended for bearing shall be in full contact and insertion of washers
36 or spacers to minimize vibration are not permitted.
37 3. OWNER will make field and power tests to check compliance with the
38 specifications.
39
- 40 B. Penalties:
41 1. If the unit does not meet the power consumption guarantee submitted with the
42 Bid at the head specified, OWNER reserves the right to assess a 5-year power
43 consumption penalty, based on the bid data and power cost per KWH stated in
44 these specifications

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2. If the unit after installation does not operate smoothly, does not meet the vibration limitations, or does not operate in accordance with the factory characteristics curve, it shall be adjusted until it meets these standards or it shall be removed at no cost to the OWNER.
3. OWNER retains the right to assess a 5-year power consumption penalty if the pump does not operate according to the factory test power consumption curve once the pump is installed in the field.

END OF SECTION

Pump Protection Separators

Removes sand, increasing the life and efficiency of turbine and submersible pumps.

PPS

PPS

When sand threatens the performance of a pump, LAKOS Pump Protection Separators can help solve the problem. Utilizing controlled centrifugal action, LAKOS actually separates troublesome sand from the water before it enters the pump, and before it can grind away at a pump's internal components. Separated sand is then discharged deep into the well.

Made of durable carbon steel, LAKOS Pump Protection Separators (PPS) feature no moving parts to wear out, no screens or filter elements to clean or replace, and require no routine maintenance. Trouble-free and effective, the LAKOS PPS is easily installed onto the suction of a turbine or submersible pump. For pumps with flow less than 100 US gpm (23 m³/hr), refer to a LAKOS SUB-K separator.



PPS During Installation

Reduces pump wear, repair and replacement

Extends pump life by four times or more

Helps maintain optimum pump yield

Saves on pump energy costs with higher operating efficiency

Minimizes critical pump breakdowns

Reduces the burden on other filtration and treatment processes

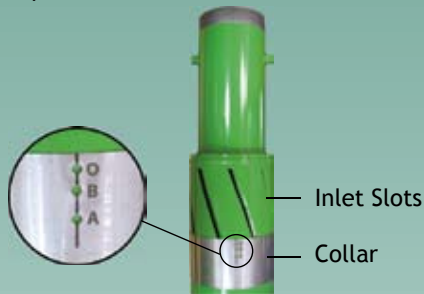


Flow range:
100-3,180 U.S. gpm
(23 - 723 m³/hr)

Sub-K models available for small submersible pumps

Flow Adjustment Collar

Standard on selected models, the flow adjustment collar allows for fine-tuning of LAKOS Pump Protection Separators. The collar is easily adjusted using the set screw to place the collar in the position for the system flow rate. The collar can be set at either of the three positions: O, allowing full flow through the separator inlet slots; and A or B, which allows partial restriction of the slots to allow the most efficient operation of the separator for the system flow. See the table below to determine the best collar position for the most efficient operation of the separator.

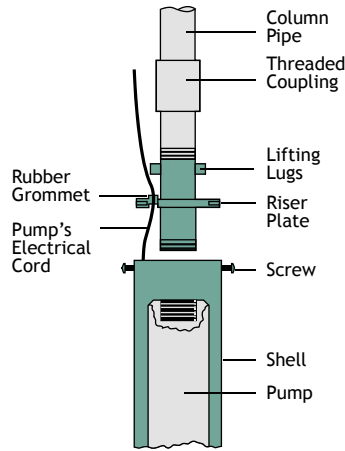


Model	Flow Range		Position Of Collar
	U.S. gpm	m ³ / hr.	
PPS-125-E	125-200	27-45	Collar On
	200-250	45-57	Collar Off
PPS-150-F	150-210	34-48	A
	210-275	48-62	B
PPS-325-G	275-325	62-74	Collar Off
	325-425	74-97	A
PPS-550-H	425-525	97-119	B
	525-650	119-148	Collar Off
PPS-825-I	676-825	154-187	A
	826-1110	188-252	B
PPS-1010-J	1050-1225	238-278	Collar Off
	1225-1450	278-329	A
PPS-1640-K	1010-1275	230-290	B
	1275-1450	290-329	Collar Off
PPS-1640-K	1450-1800	329-409	A
	1640-1890	373-429	B
PPS-1640-K	1890-2250	429-511	Collar Off
	2250-2560	511-582	

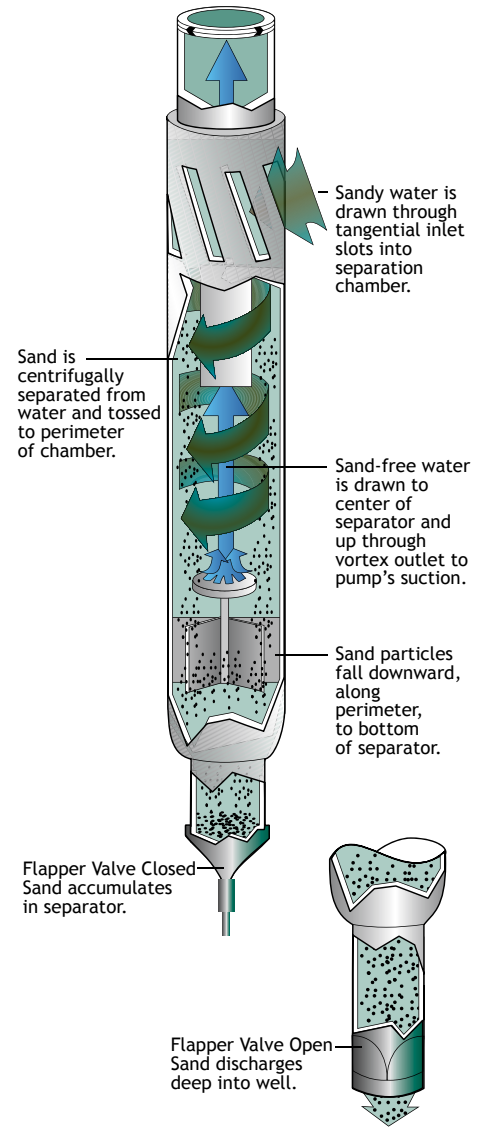
Enclosing the Pump in the Shell

For Submersible Pump Protection Models Only

The pump enclosure shell is designed to make certain that all water entering the pump is first drawn through the separator. This requires that the pump intake be properly shielded as described below.



- 1 Remove the riser assembly from the shell by removing the stainless steel set screws.
- 2 Attach the riser assembly to the pump's discharge.
- 3 Thread the pump's electrical cord through the opening in the rise plate. A rubber grommet is provided to establish a good seal.
- 4 Slide the pump into the shell and secure riser with the screws.
- 5 Gap between riser plate and shell should be sealed with a waterproof plastic sealant, putty or caulking compound to prevent water entry at this point.
- 6 Attach flapper valve before attaching riser to column pipe.
- 7 Pump and shell assembly is now ready for installation. A pair of lifting lugs is provided to make hoisting and adding column pipe easy. Shell assembly should be attached directly to the separator unit (see diagram, page 3).



Installation Instructions

LAKOS Pump Protection Separators come in a variety of sizes and may be shipped in a variety of ways. Most often, however, each unit is shipped complete, strapped onto a wooden skid. Before installation, remove all labels, decals and shipping instructions from each unit to avoid plugging the inlet slots. LAKOS Pump Protection Separators are designed to continuously flush separated particles back into the source water.

For Turbine models:

LAKOS Turbine Separators are manufactured with a standard riser size (note chart on page 3). Should this riser not match the connection to your pump's bowl assembly, you'll need to arrange for the proper

connection (i.e. reducer, etc.). Lifting lugs are provided on the riser of all models size "E" through "K" for ease of installation. Connect the separator to the bowl assembly, then install the flapper valve.

At this point, you may proceed with your customary routine for installing the pump.

For Submersible models:

To make LAKOS Pump Protection Separators operate properly, the pump's entire intake must be directed first through the actual separator. To achieve this with a submersible pump, we provide a pump enclosure shell. The submersible pump is contained within this shell and then attached directly to the separator itself. (See instructions above for

proper installation of the pump in the shell). With the pump properly secured in the shell, the riser is now attached directly to the column pipe.

Installation may now proceed as normal for submersible pumps.

Once installed, LAKOS Pump Protection Separators require no routine maintenance. Should you ever need to pull your pump, always take such an opportunity to inspect the separator and purge assembly. LAKOS Pump Protection Separators must be operated according to the flow range per model designated in the chart on page 3. Should your original flow rate vary significantly, note the instructions above for use of the adjustable flow collar on selected models.

Model	Minimum Well I.D.		Flow Range		Outside Diameter		Length With Riser & Flapper Valve		Riser Size	Weight		Required Minimum Submergence	
	in	mm	U.S. gpm	m ³ /hr	in	mm	in	mm		N.P.T.	lbs	kg	ft
PPS-100-D	6	152	100-175	23-40	5-5/8	143	88-3/8	2245	2-1/2"	93	42	30	9.2
PPS-125-E	7	178	125-250	29-57	5-9/16	141	106	2692	3"	142	64	30	9.2
PPS-150-F	8	203	150-325	34-74	6-5/8	168	120-1/4	3054	4"	220	100	30	9.2
PPS-325-GSA	9-3/4	248	325-520	74-118	8-5/8	219	124	3150	6"	191	87	60	18.4
PPS-520-GGA	9-3/4	248	520-710	118-161	8-5/8	219	130	3302	6"	213	97	60	18.4
PPS-325-G	10-3/4	273	325-650	74-148	8-5/8	219	132-1/2	3366	6"	267	121	30	9.2
PPS-600-HSA	12	305	600-910	136-207	10-5/8	270	141-1/2	3594	8"	281	128	60	18.4
PPS-880-HHA	12	305	880-1375	200-312	10-5/8	270	145-3/4	3702	8"	315	143	60	18.4
PPS-550-H	13-1/4	337	550-1110	125-252	10-3/4	273	147	3734	8"	390	177	30	9.2
PPS-1290-ISA	13-1/4	337	1290-1700	293-386	10-3/4	273	150-1/2	3823	8"	393	178	60	18.4
PPS-825-I	15-1/4	387	825-1450	187-329	12-3/4	324	154	3912	8"	454	206	30	9.2
PPS-1460-JSA	15-1/4	387	1460-2040	332-463	12-3/4	324	158	4013	10"	492	223	60	18.4
PPS-1010-J	17-1/4	438	1010-1800	230-409	14	356	163	4140	10"	526	239	30	9.2
PPS-1780-KSA	17-1/4	438	1780-2420	404-550	14	356	170	4318	10"	575	261	60	18.4
PPS-1640-K	19-1/4	489	1640-2560	373-582	16	406	185	4699	10"	703	319	30	9.2
PPS-2520-KKA	19-1/4	489	2520-3180	573-723	16	406	204	5182	12"	754	342	60	18.4

Head Loss: Typically, 9-14 feet (2.74-4.27m)
 Maximum Particle Size: 1/4 inch (6.3mm)
 Maximum Particle Concentration: 1,000 ppm

Each model in the Pump Protection Series is engineered for a specific flow range and with concern for certain restrictions. To assure maximum performance, carefully identify the proper model. Selecting a larger or smaller model than recommended may affect performance. Use this information to select a model according to your pump's actual flow rate. If two or more models are applicable, choose the unit with the lowest maximum flow rate. Note also the minimum well I.D. for the model chosen. If your well I.D. is too small, either select another model that accommodates your flow rate and well I.D., or consult the factory for special assistance.

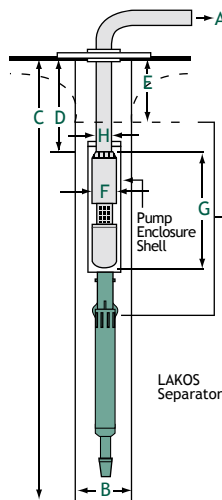
This data applies only to separators for turbine pumps. Separators for submersible pumps require a pump enclosure shell, predicated on the pump's actual dimensions. See worksheet (LS-423).

Installation Schematics

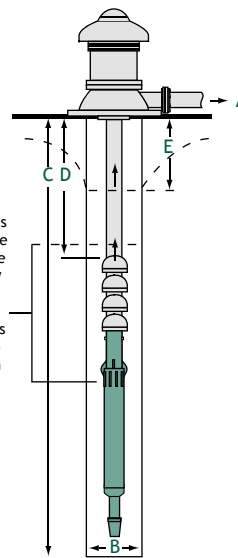
Required data for proper model selection:

- A. Maximum & minimum flow rate of pump
- B. Minimum inside diameter (I.D.) of well
- C. Depth of well
- D. Depth of pump setting
- E. Pumping water level
- F. Maximum diameter of pump/motor
- G. Overall length of pump and motor
- H. Pump's riser size

For Submersible Pumps



For Turbine Pumps



IMPORTANT
 Separator models with single-letter designations (i.e. D, E, F, etc.) require a minimum submergence of 30 feet (9.2m) below the drawdown water level. Models with three-letter designations require 60 feet (18.3m) submergence. Minimum clearance below separator's purge discharge: 30 ft (9.2M)

Lakos Separators are manufactured and sold under one or more of the following U.S. Patents:
 5,320,747; 5,338,341; 5,368,735; 5,425,876;
 5,571,416; 5,578,203; 5,622,545; 5,653,874;
 5,894,995; 6,090,276; 6,143,175; 6,167,960;
 6,202,543; 7,000,782; 7,032,760 and
 corresponding foreign patents, other U.S.
 and foreign patents pending.

Where Does The Sand Go?

Limited Warranty

All products manufactured and marketed by this corporation are warranted to be free of defects in material or workmanship for a period of at least one year from date of delivery. Extended warranty coverage applies as follows:

All LAKOS Separators: Five year warranty

All other components: 12 months from date of installation; if installed 6 months or more after ship date, warranty shall be a maximum of 18 months from ship date.

If a fault develops, notify us, giving a complete description of the alleged malfunction. Include the model number(s), date of delivery and operating conditions of subject product(s). We will subsequently review this information and, at our option, supply you with either servicing data or shipping instruction and returned materials authorization. Upon prepaid receipt of subject product(s) at the instructed destination, we will then either repair or replace such product(s), at our option, and if determined to be a warranted defect, we will perform such necessary product repairs or replace such product(s) at our expense.

This limited warranty does not cover any products, damages or injuries resulting from misuse, neglect, normal expected wear, chemically-caused corrosion, improper installation or operation contrary to factory recommendation. Nor does it cover equipment that has been modified, tampered with or altered without authorization.

No other extended liabilities are stated or implied and this warranty in no event covers incidental or consequential damages, injuries or costs resulting from any such defective product(s).

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Certainly the most common procedure for (and objection to) disposing of separated sand is to discharge that sand deep into the water well. It has always been, and always will be, a better alternative to grinding up a pump and destroying its efficiency. And, though the accumulation of sand in a well could eventually require evacuation (though it very seldom does), that cost is far less than the certainty of expensive pump repair or replacement and excessive energy costs through reduced efficiency.

But the sand most likely will never fill up the well. Extensive research conducted by Ohio University, under the direction of the National Water Well Association, unmasked the mystery of what a pump protection sand separator can really do to solve the problem of a sandy well (see Water Well Journal, October 1985). Essentially, the study revealed that a pump protection separator actually helps create a state of "equilibrium," virtually eliminating the entry of additional sand into a well.

Technically it is described as such:

1. Sand is carried into a well by the velocity and efficiency of the incoming water.
2. The sand separator removes and discharges that sand back into the well until the well fills to a certain level.

3. At that level, the flow pattern of the incoming water through the ground formations and into the well is sufficiently distorted to reduce its actual incoming velocity and efficiency.

4. At such a reduced efficiency, the water is then no longer capable of carrying sand into the well.

5. The sand separator maintains that equilibrium by preventing the pump from evacuating sand, which would otherwise encourage conditions in the well to draw in more sand.

Conclusion: The separated sand from a LAKOS Pump Protection Separator most often will NOT fill up the well, and may actually stop additional sand from even entering the well.

For other solutions, see the Complete Family of LAKOS Irrigation and Landscape Filtration Solutions



For more information go to www.LAKOS.com and refer to literature LS-848

LAKOS

Separators and Filtration Solutions

Specifying LAKOS PPS Series Pump Protection Separators

Each model in the LAKOS Pump Protection Series is engineered for a *specific flow range* and with concern for certain restrictions. It is therefore essential to use accurate application data.

This worksheet must be filled out completely, signed where indicated and returned to LAKOS *before any order can be shipped*. Contact your LAKOS representative if you require assistance.

Required Data

Maximum flow rate of pump: 2,000 gpm

Minimum flow rate of pump: 900 gpm

Minimum inside diameter (I.D.) of well: 24 inches

Depth of well: 800 feet

Depth of pump setting: 320 feet

Pump water level: 260 feet

Submergence: 60 feet

(To obtain: subtract pumping water level from depth of pump setting.)

If sizing a submersible pump, the following data is also required:

Maximum diameter of pump: 14 inches

Maximum diameter of motor: NA

Overall length of pump and motor: NA

Pump's riser size (N.P.T.): 12 inches

Identify Flow Range & Minimum Well I.D. Requirements

Use Chart A on reverse to select a model according to your pump's actual flow rate. If two or more models are applicable, select the model with the lowest maximum flow rate. Note also the minimum required well I.D. If your well is not large enough, either select another available model which accommodates your flow rate and well I.D. or consult factory for assistance. **Circle the appropriate model on this worksheet.**

Determine Pump Enclosure Shell Size (Submersible Pumps Only)

Your submersible pump must fit into this shell. Using Chart B, locate your pump's maximum flow rate (in U.S. gpm) along the horizontal scale and the maximum diameter of your pump or motor (whichever is larger) along the vertical scale. Find the intersecting point of these two values. The "range" it lies within dictates the required pump shell size (indicated in circle). NOTE: If the intersecting point is directly on the line between two "ranges," you must select the larger shell size. **Circle the appropriate shell size on this worksheet.**

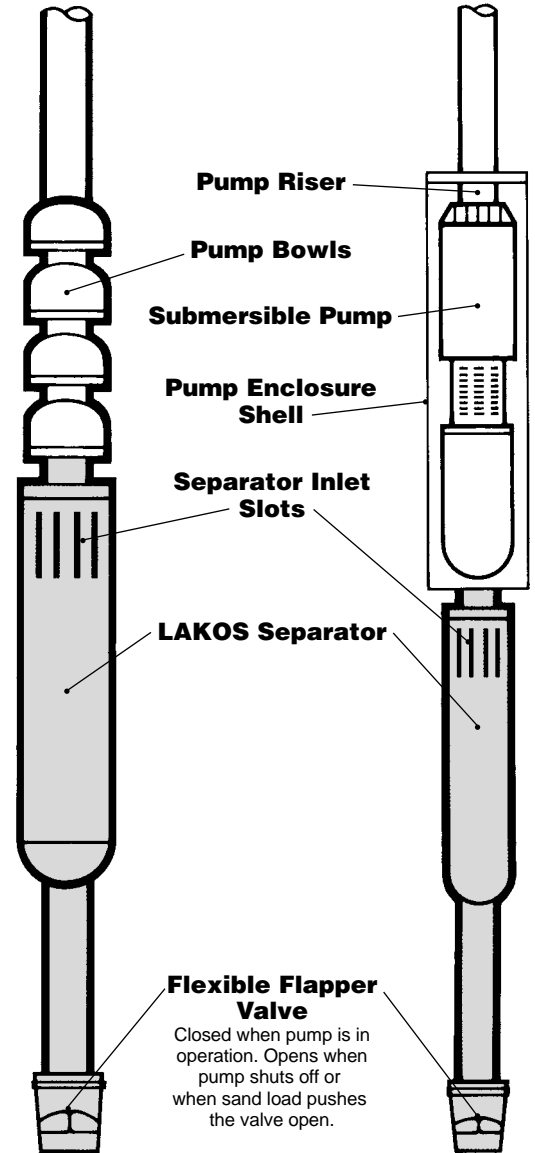
Use Chart C to determine if your well I.D. is large enough to accommodate the required pump enclosure shell. If not, consult your LAKOS representative for other options.

Important

- Note required minimum submergence of separator (below pumping water level) on Chart A.
- Maximum particle concentration: 1,000 ppm
- Maximum particle size: 1/4-inch (6.3 mm)
- Head loss: Typically 9-14 feet (2.7-4.3 m)
- Minimum depth of well below separator: 30 feet (9.2 m)

FOR TURBINE PUMPS

FOR SUBMERSIBLE PUMPS



PLEASE SIGN HERE

The "Required Data" provided on this worksheet is true and accurate for purposes of sizing a LAKOS Pump Protection Sand Separator in a water well application. I understand any errors or subsequent changes in this data may substantially affect performance and may void any warranty, either implied or expressed.

Signature _____

Company _____

Telephone No. _____

CHART A

The following data applies *only* to the basic separator. Since the pump enclosure shell for submersible separators is predicated on the actual pump's dimensions, standard specifications cannot be published.

Model	Minimum Well I.D. in./mm	Flow Range U.S. gpm m ³ /hr	Outside Diameter in./mm	Length with Riser & Flapper Valve in./mm	Riser Size N.P.T.	Weight lbs./kg	Required Minimum Submergence feet/meters
PPS-100-D	6 153	100-175 23-40	5½ 143	88½ 2245	2½-inch	93 42	30 9.2
PPS-125-E	7 178	125-250 28-57	5¾ 141	106 2692	3-inch	142 64	30 9.2
PPS-150-F	8 204	150-325 34-74	6¾ 168	120¾ 3054	4-inch	220 100	30 9.2
PPS-325-GSA	9¾ 248	325-520 74-118	8¾ 219	124 3150	6-inch	191 87	60 18.4
PPS-520-GGA	9¾ 248	520-710 118-161	8¾ 219	130 3302	6-inch	213 97	60 18.4
PPS-325-G	10¾ 273	325-650 74-148	8¾ 219	132½ 3366	6-inch	267 121	30 9.2
PPS-600-HSA	12 305	600-910 136-207	10¾ 270	141½ 3594	8-inch	281 128	60 18.4
PPS-880-HHA	12 305	880-1375 200-312	10¾ 270	145¾ 3702	8-inch	315 143	60 18.4
PPS-550-H	13¾ 337	550-1110 125-252	10¾ 273	147 3734	8-inch	390 177	30 9.2
PPS-1290-ISA	13¾ 337	1290-1700 293-386	10¾ 273	150½ 3823	8-inch	393 178	60 18.4
PPS-825-I	15¾ 388	825-1450 187-329	12¾ 324	154 3912	8-inch	454 206	30 9.2
PPS-1460-JSA	15¾ 388	1460-2040 332-463	12¾ 324	158 4013	10-inch	492 223	60 18.4
PPS-1010-J	17¾ 438	1010-1800 229-409	14 356	163 4140	10-inch	526 239	30 9.2
PPS-1780-KSA	17¾ 438	1780-2420 404-550	14 356	170 4318	10-inch	575 261	60 18.4
PPS-1640-K	19¾ 489	1640-2560 372-581	16 406	185 4699	10-inch	703 319	30 9.2
PPS-2520-KKA	19¾ 489	2520-3180 572-722	16 406	204 5182	12-inch	754 342	60 18.4

CHART B

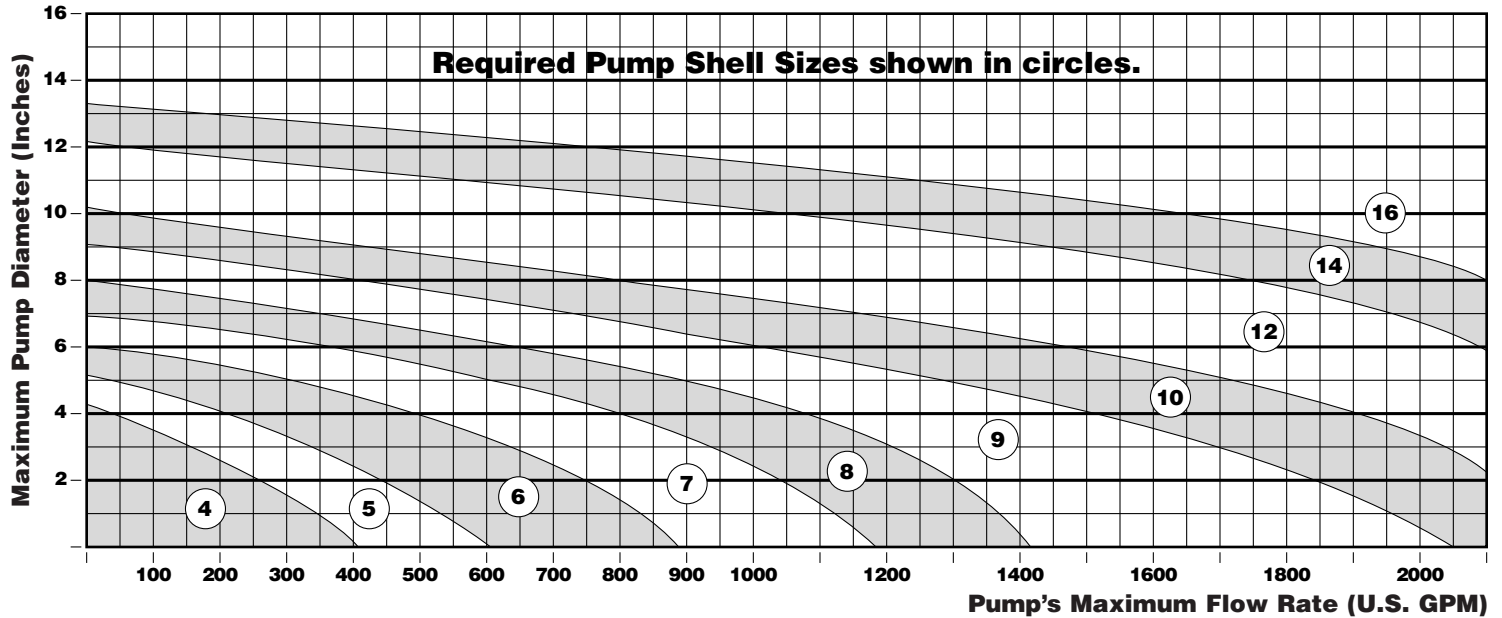


CHART C

Pump Enclosure Shell Size	4	5	6	7	8	9	10	12	14	16
Minimum Well I.D. (inches)	5½	6¾	7¾	8¾	10	11	12	14	16	18