OSCAR-XO2 **Treatment System Design Manual**
October, 2023, AZ

Manufactured by:

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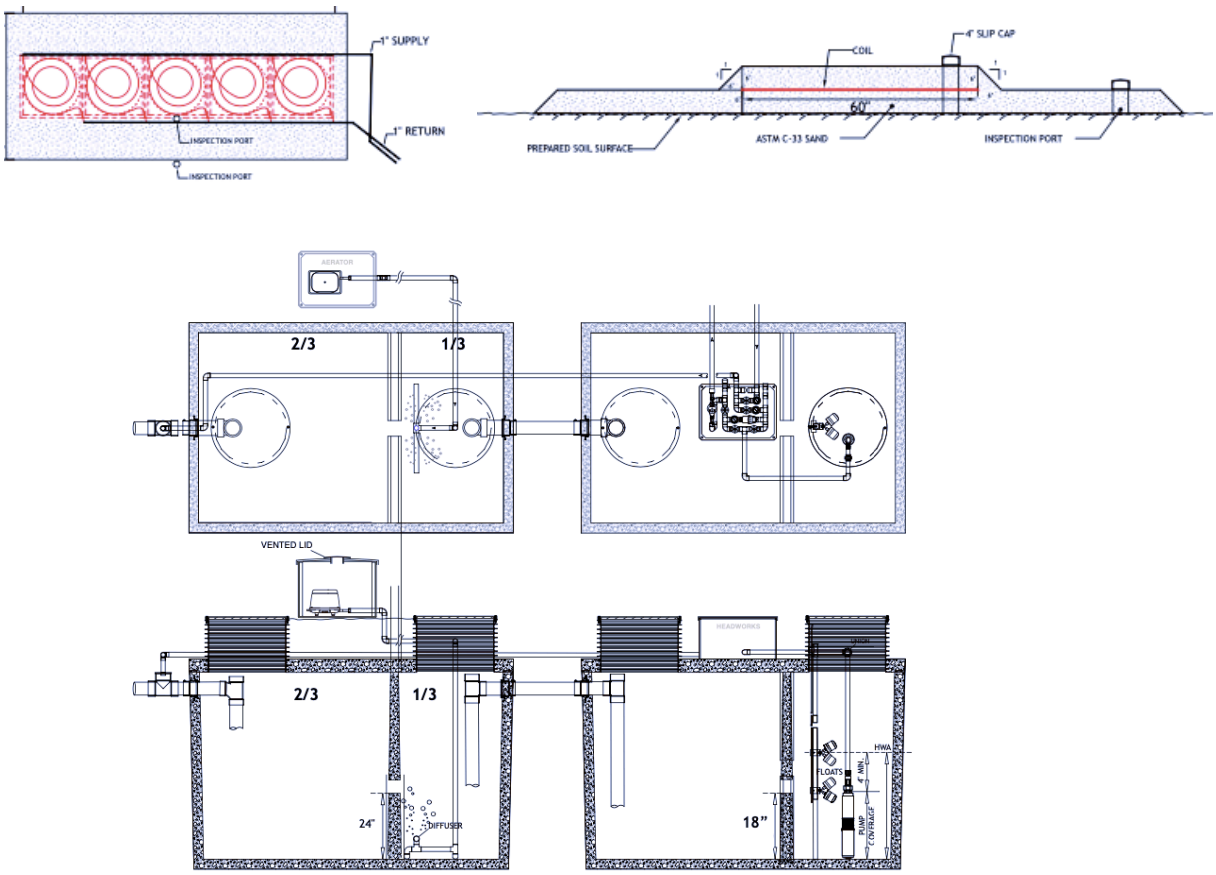


Introduction:

The *OSCAR-XO2* treatment system is comprised of two technologies. The *XO2 (*a treatment tank comprising a septic and aeration chamber and a discharge tank comprising a clarifier and pump chamber). And the *OSCAR:* coils made of Netafim drip tubing, C-33 sand, reverse flush headworks, and control equipment.

Wastewater is collected in the septic chamber where gross and suspended solids are settle out or floated. The septic tank effluent flows to the aeration chamber where it is aerated and then settled again in the clarifier. Clarified effluent flows to the pump chamber where the expected average waste strength will be 31 mg/l CBOD5 and 9 mg/l TSS. Effluent from the pump chamber is filtered through a 120 mesh disc filter before reaching the *OSCAR* coils, installed in ASTM C-33 sand. Clarified effluent discharged from the coils is treated by the ASTM

C-33 sand prior to infiltrating into the receiving soil. Final discharge is expected to reach 2 mg/l CBOD, 1 mg/l TSS, and 333 TC/100 ml of effluent. Standard design flows are: 150, 300, 450, 600, and 750 gpd.

Design:

The design of the *OSCAR-XO2* system is arranged so that the same components (such as the pump) will work for all design flows specified in this manual. Therefore, all criteria in this manual must be followed and no substitutions of parts from the kits are needed.

An *OSCAR-XO2* has two segments: the *OSCAR* (the disposal unit), and the *XO2* (the tankage). The *XO2* portion is designed in increments set out in Table 1: 150, 300, 450, 600, and 750 gpd. One to three bedroom systems use the *XO2* kits while the four and five bedroom systems will need the *XO2+1* kit. The *XO2+1* kit is the same as the *XO2* kit, except there is an additional aerator. See the appendix for *XO2* kit and *XO2+1* kit details.

To design a complete system, use the following tables and illustrations below to determine the size of tanks, basal area dimensions, kit number, coil layout, and total dynamic head of supply line.

XO2 tanks:

The tanks for the *XO2* must be approved by *ADEQ* for use as wastewater tanks. Other than the criteria outlined below, there is no specific designation of an *XO2* tank. Tanks can be made of concrete, polyethylene, or fiberglass.

Treatment Tank: The partition wall between the first and second compartment of the treatment tank must have a 4 inch by-pass hole or the bottom of the tee baffle located between 40% to 60% of the liquid depth.

Discharge Tank: The partition between the first and second compartment of the discharge tank must have a 4 inch by-pass hole located at least 18 inches above the floor of the tank.

Table I*

Table

Design Flow	Septic	Aeration	Clarifier	Pump	Aerators required	Standard Kit Code	**Suggested Tanks:
150 gpd	731	361	731	361	1	XO2	IM 1060, 1250 gal. concrete
300 gpd	731	361	731	361	1	XO2	IM 1060, 1250 gal. concrete
450 gpd	731	361	731	361	1	XO2	IM 1060, 1250 gal. concrete
600 gpd	874	434	874	434	2	XO2+1	IM 1560, 1500 gal concrete
750 gpd	1,096	541	1,096	541	2	XO2+1	1,750 gal concrete

*Minimum sized tanks.
**Tanks sizes must met at a minimum the sizes listed in the first four columns.

OSCAR Coils:

With the *OSCAR-XO2* process, each OS-50 *OSCAR* coil will treat and dispose of up to 62.5 gallons of treated effluent.The OS-50 coils form a nominal 5 foot wide row. Coils will be arranged in a line along the contour. Coils are arranged in laterals. Each lateral is a single coil or a group of coils linked in series between the supply and flush manifolds. The *OSCAR* coils are timed dosed and flushed automatically.

Table 2 depicts the number of OS-50 coils and laterals required for a given design flow using a *Lowridge Onsite Technologies* 30 gpm, 1/2 hp, 110 volt turbine pump, model LOT-30. The criteria in these tables ***must be*** followed. The tables also indicate how much excess head, under the pump curve, is available for supply line elevation lift and friction loss. All manifolds, supply and flush lines are assumed to be 1 inches sch 40 PVC. Use Table 5 to determine if the distance and elevation between the tanks and *OSCAR* are within the performance capability of the pump. First, determine the distance between tanks and *OSCAR*. Then, the elevation difference from the tanks to *OSCAR*. Check to see if the intersection between the two criteria falls within the color shaded area. If not, call *Lowridge* for assistance.

TABLE 2

Hydraulic Layout

Design Flow	Total Coils	# of Lats.	Coils per lat.	Dose GPM	Flush GPM	Excess TDH
150	3	3	1	1.05	3.45	50’
300	5	5	1	1.75	5.75	50'
450	8	4	2	2.8	6.0	50’

Design Flow	Total Coils	# of Lats.	Coils per lat.	Dose GPM	Flush GPM	Excess TDH
600	10	5	2	3.5	7.5	50'
750	12	4	3	4.2	7.4	50’

Basal Area:

The basal area is comprised of the total area where the C-33 sand media is in contact with the receiving soil. The minimum required basal area is depicted in table 3.

Vertical separation for the *OSCAR-XO2* is 2 feet for SAR 0.20 to 0.63 and 4 feet for SAR of 0.63+ to 0.93. It is allowable to excavate soil to either lower the *OSCAR* within the soil profile or modify the slope. In either case, the minimum vertical separation must be maintained.

Table 3, Basal area and dimensions

SAR g/ft2/d	1 Bedrm 150 gpd	2 Bedrm 300 gpd	3 Bedrm 450 gpd	4 Bedrm 600 gpd	5 Bedrm 750 gpd
0.93	23’ x 8’	34’ x 10’	51’ x 10’	62’ x 11’	73’ x 12’
0.73	23’ x 9’	34’ x 12’	51’ x 12’	62’ x 14’	73’ x 15’
0.67	23’ x 10’	34’ x 14’	51’ x 14’	62’ x 15’	73’ x 16’
0.60	23’ x 11’	34’ x 15’	51’ x 15’	62’ x 17’	73’ x 18’
0.53	23’ x 13’	34’ x 17’	51’ x 17’	62’ x 19’	73’ x 20’
0.50	23’ x 13’	34’ x 18’	51’ x 18’	62’ x 20’	73’ x 21’
0.42	23’ x 16’	34’ x 21’	51’ x 21’	62’ x 42’	73’ x 25
0.40	23’ x 17’	34’ x 22’	51’ x 22’	62’ x 25’	73’ x 26’
0.33	23’ x 20’	34’ x 27’	51’ x 27’	62’ x 30’	73’ x 32’
0.29	23’ x 23’	34’ x 31’	51’ x 31’	62’ x 34’	73’ x 36’
0.27	23’ x 24’	34’ x 33’	51’ x 33	62’ x 36’	73’ x 39’
0.24	23’ x 27’	34’ x 37	51’ x 37’	62’ x 41’	73’ x 43’
0.22	23’ x 30’	34’ x 41’	51’ x 41’	62’ x 44 ’	73’ x 47’
0.21	23’ x 31’	34’ x 42’	51’ x 42’	62’ x 47’	73’ x 49’
0.20	23’ x 33’	34’ x 45’	51’ x 45’	62’ x 49’	73’ x 52’
0.19	23’ x 35’	34’ x 47	51’ x 47	62’ x 51’	73’ x 55’

SAR g/ft2/d	1 Bedrm 150 gpd	2 Bedrm 300 gpd	3 Bedrm 450 gpd	4 Bedrm 600 gpd	5 Bedrm 750 gpd
0.18	23’ x 37’	34’ x 49’	51’ x 49’	62’ x 54’	73’ x 58
0.17	23’ x 39’	34’ x 52’	51’ x 52’	62’ x 57’	73’ x 61’
0.13	23’ x 51’	34’ x 68’	51’ x 68	62’ x 75’	73’ x 80’

Coil placement and layout:

Coils on flat sites should be placed in the center of the basal area. The coils should be arranged in a single line, although the line can be curved or angled to match site contours or other site constraints.

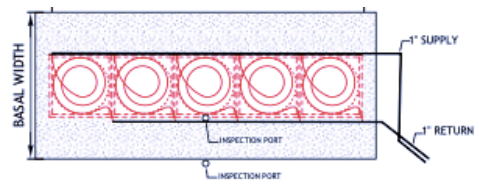
On sloping sites the coils must be placed parallel to the contour and one edge of the coils must be placed about 12 inches from the upslope basal boundary. See Illustration I.

On contour means that all the coils are on the same plain and each coil has the same depth of sand under each coil.

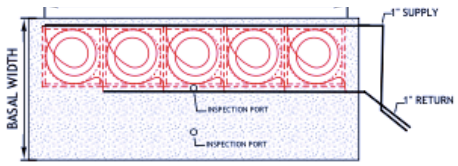
The dimensions given are for flat or sloping sites. The coils must be installed level regardless of the slope of the site.

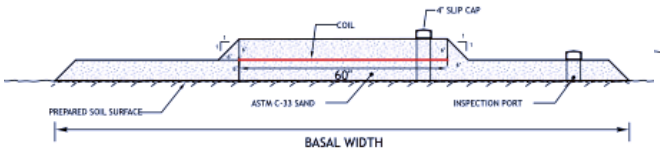
Two inspection ports must be installed: one in the coil area and the other in the basal area as shown. For inspection port construction, see Appendix.

Flat site
OSX-300-5



Sloping Site
OSX-300-5S





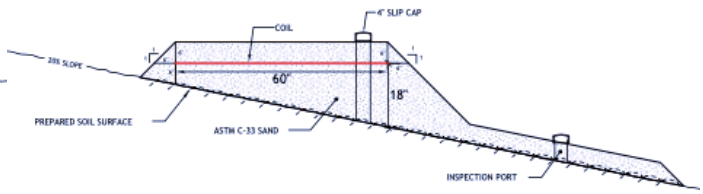


Illustration I

Total dynamic head of supply line:

When using the standard pump and coil arrangements, all but one of the head requirements are met. There is at least 50 feet of excess head under the pump curve remaining. The last factor in the design process is to calculate the total dynamic head (TDH) loss of the supply line.

To insure that the standard kit and coil arrangements will work, the maximum head loss of 50 feet shall not be exceeded. To insure proper function, Table 4 must be followed. Compare the vertical elevation and the horizontal distance between the tanks and the OSCAR. Compare the two factors to Table 4. If the intersection of the vertical head and the horizontal distance values falls within the blue shaded area, the system will work. If not, call *Lowridge* for assistance.

Table 4: Total dynamic head of supply line.

	100	200	300	400	500	600	700	800
Lift in ft.								
5	10’	15’	20’	25’	30’	35’	40’	45’
10	15’	20’	25’	30’	35’	40’	45’	50’
15	20’	25’	30’	35’	40’	45’	50’	55’
20	25’	30’	35’	40’	45’	50’	55’	60’
25	30’	35’	40’	45’	50’	55’	60’	65’
30	35’	40’	45’	50’	55’	60’	65’	70’
35	40’	45’	50’	55’	60’	65’	70’	75’
40	45’	50’	55’	60’	65’	70’	75’	80’
45	50’	55’	60’	65’	70’	75’	80’	85’
50	55’	60’	65’	70’	75’	80’	85’	90’

Values in the left vertical column are elevation lift between tanks and *OSCAR*.
Values across the top horizontal row are distances between tanks and *OSCAR*.

Controller:

The LF1P-RF-ARA control panel shall be used to operate the timed dosing sequencing of the *OSCAR-XO2*. Timer settings for the *OSCAR-XO2* are short and very frequent (3 minutes off and 30 seconds on). The supply line needs to drain between doses, so the "on time" may need to be increased to compensate for filling the supply line prior to each dose.

Set-backs:

Use local code.

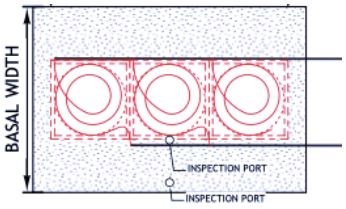
Appendix

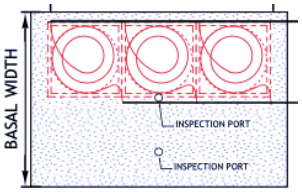
OS-50: The OS-50 OSCAR coil is made with 25 feet of custom Netafim Bioline with 0.42 gph emitters @ 6 inches spacing (50 emitters), an average of 2 emitters per sq. ft. Each coil has a minimum area of 25 sq. ft. (5 feet x 5 feet). There must be a minimum of 6 inches spacing between each coil and a minimum of 6 inches spacing between a coil and the shoulder edge. Table 4 contains the minimum shoulder length for a given design flow. The "shoulder length" is the total minimum distance from the outside shoulder edge of the first coil to the opposite end shoulder of the last coil. This dimension includes all the coils, coil spacing, and shoulder spacing on each end.

OS-50 Detail:

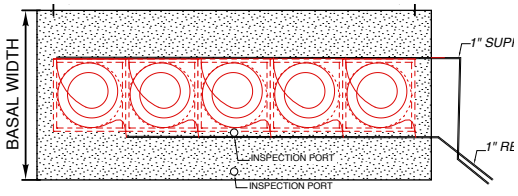
Sample Coil layouts

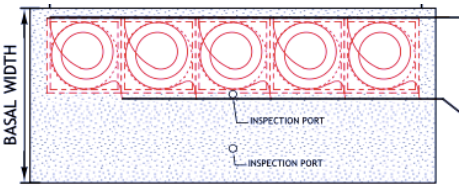
150 gpd



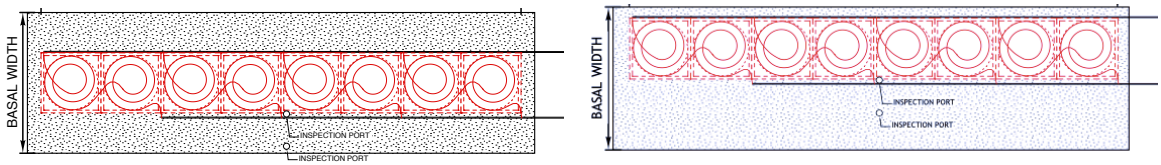


300 gpd

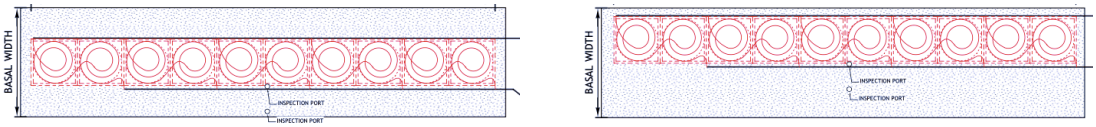




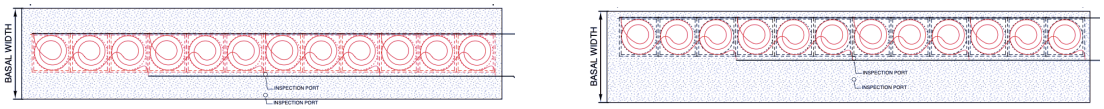
450 gpd



600 gpd

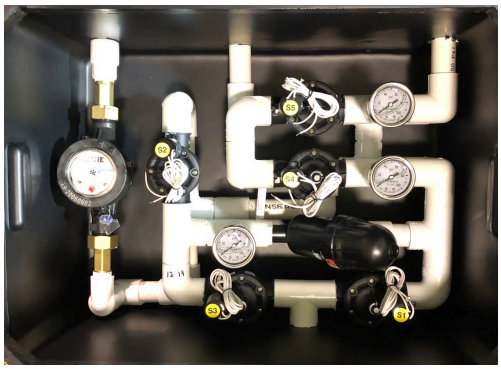


750 gpd



Headworks: HWN-.7-RF

- ¾ inches Arkal disc filter, 120 mesh, 130 micron
- ¾ inches Arad flow meter
- Three oil filled pressure gauges (0-100 psi)
- 5 Netafim normally closed solenoid valves (Model 80)



***OSCAR-XO2* Parts list (<=450 gpd).**

Each *OSCAR-XO2* unit will include an XO2 kit:

- LF1P-RF-ARA control panel
- LOT-30, 1/2 hp, 120 volt pump
- Hi-Blow Aerator, XB-80
- Hi-Blow diffusers (2)
- OS-50 Coils
- PVC fittings and drip tubing adapters
- HWN-.7-RF automatic headworks
- Solid ½ inches poly tubing for connections
- 2 float switches

***OSCAR-XO2* Parts list (>450 to 750 gpd).**

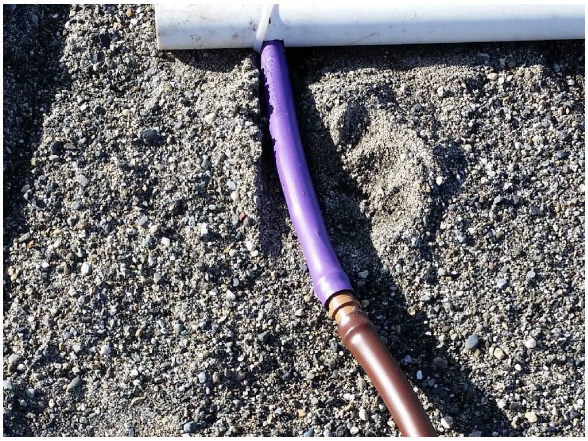
Each *OSCAR-XO2* unit will include an XO2+1 kit:

- LF1P-RF-ARA control panel
- LOT-30, 1/2 hp, 120 volt pump
- Hi-Blow Aerator, XB-80 (2)
- Hi-Blow diffusers (4)
- OS-50 Coils
- PVC fittings and drip tubing adapters
- HWN-.7-RF automatic headworks
- Solid ½ inches poly tubing for connections
- 2 float switches

***OSCAR-XO2* coil Connections**

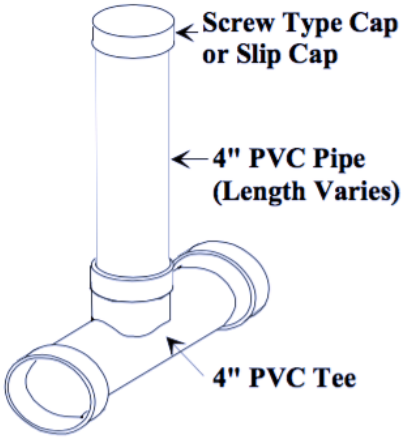
Manifolds and supply lines are 1 inches Sch 40 PVC

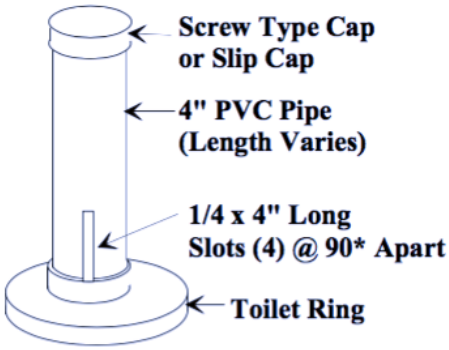
Manifold and blank tech line adapter and connection.



Blank tech liner and Bioline connection with internal coupling

Inspection ports.





OSCAR Cover Options.

There may be a desire to cover the *OSCAR* with something additional to the specified ASTM C-33 sand. The intent is not to have too much additional cover over the final C-33 sand layer. Placing too much cover will inhibit plant root growth. Because the C-33 sand is sub-surface irrigated, grass and other ground cover will grow rapidly, forming a firm protective cover over the *OSCAR*. At the end of the first growing season the C-33 sand layer should be as firm as native soil to walk on.

Options include:

- landscaping jute mat with grass seed or ground cover plantings
- a thin layer of mineral soil low in organic content (<10% organics)
- Thin layer of decomposed granite, crushed or washed rock for wind erosion protection.
- Thin layer of bark to wood chips.

Do Not Cover C-33 Sand with:

- organic mix (manufactured top soil from compost)
- filter fabric

Vegetative cover:

Almost anything can be planted on an *OSCAR* without interfering with the functionality of the system. Trees and large shrubs should not be planted directly in the coil area. As these plants grow they may physically impact the coils. Trees in the basal area away from the coils is acceptable. Ground covers and grasses anywhere on an *OSCAR* are acceptable.

LOT-30 pump curve:

SUBMITTAL DATA SHEET

Thermoplastic

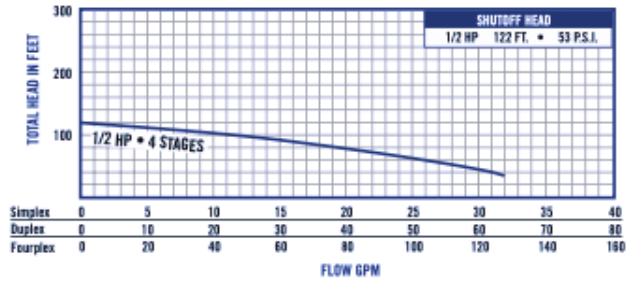
Reinforced Thermoplastic motor bracket and discharge with built-in guide bearing. This 1/2 HP pump has a stainless steel top bearing and motor coupling. These are assembled with our A.Y. McDonald stainless steel motors. Two wire single phase models include pump, motor, and 10' lead.

This four inch submersible is supplied with grounded leads meeting the National Electrical Code (N.E.C.) specifications.

The performance curve below will assist you in choosing the pump that meets your needs.

MODELS | E - 30 GPM

E - 30 GPM



Specifications

Model	HP	Material	Volts	Phase	A	B	Wt.
LOT-30	1/2	Plastic	115	1	10.94	9.53	23

SUBMITTAL INFORMATION

- Stainless steel pump shell and pump shaft
- Reinforced Thermoplastic diffusers and impellers
- Thermoplastic intake screen and cable guard
- Powered by A.Y. McDonald submersible motors 1/2 HP.
- 1 1/4" FNPT Discharge

NO-LEAD: The weighted average of the wetted surface of this no-lead product contacted by consumable water contains less than one quarter of one percent (0.25%) lead.

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Submitted by:

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