

# Standard Arsenic Removal Adsorption System **SORB 33® ARS Series**

De Nora offers the SORB 33® ARS, a standard pre-engineered product line of adsorber systems for the removal of arsenic from potable ground water sources. The ARS product line features our proven and effective arsenic removal media.

ARS standard adsorption systems are designed in five different adsorber vessel sizes ranging from 3.5 to 7 foot (1.1 to 2.1 m) diameter. Model numbers include ARS-42, -48, -60, -72 and -84.

ARS systems are also available in one, two or three vessel configurations to meet various treatment requirements. Multiple vessel systems are arranged in parallel flow configuration and have a design pressure of 100 psig (7 bar).

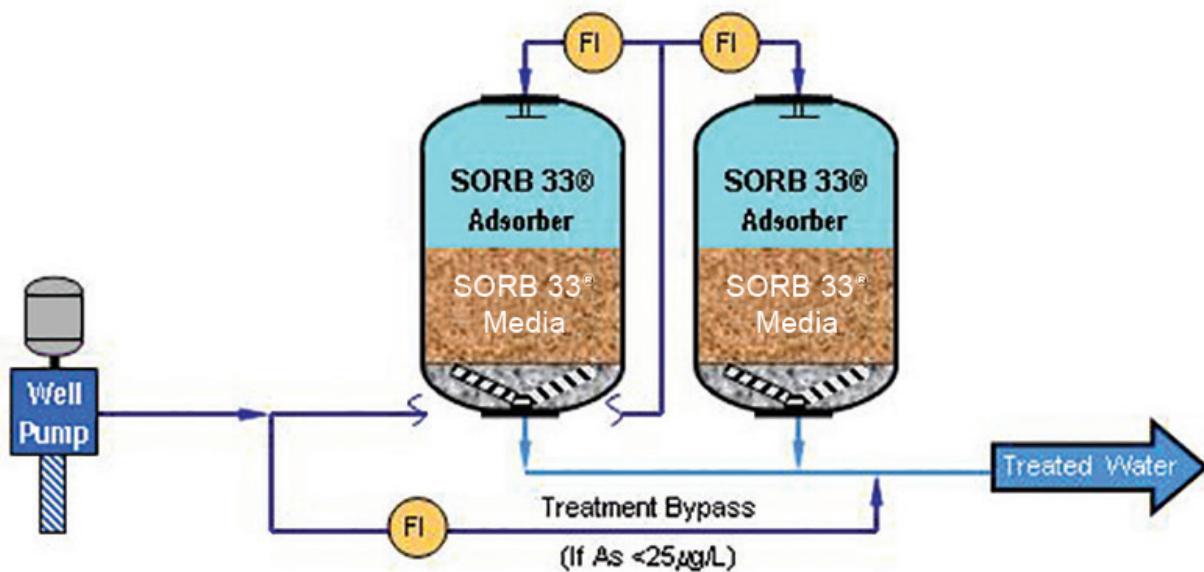


WATER MADE EASY

## Features & Benefits

- Pre-engineered system design with faster delivery times
- Simple installation and operation
- Standard parallel flow configuration
- Standard manual operation
- Cost-effective treatment solution for arsenic removal
- Removes arsenic to non-detect levels

A typical ARS system, illustrated below, consists of two adsorbers configured for parallel flow and include treatment bypass if the water's arsenic level is not very high. This arrangement provides enough well water flow to effectively backwash each adsorber when needed and without the need for a supplemental water supply. Other configurations using one or three adsorbers are available to meet specific site requirements and constraints.



## Process Description

SORB 33 is a passive arsenic adsorption process using De Nora's proven granular iron oxide media to remove arsenic from water. The adsorbers receive water directly from the well under pressure; re-pumping is not required. The media has a high capacity for arsenic and as a result has a long run time before it must be replaced. Monthly arsenic analysis on the adsorber effluent streams is used to monitor the performance of the system. Arsenic breakthrough is gradual so media replacement can be suitably scheduled. Unless the well water is turbid or contains sand particles, the SORB 33 system can be operated for months before media backwashing is required to reclassify the media bed. Well water is used for backwashing.

SORB 33 ARS systems are delivered as piped vessels to promote easy installation and commissioning. ARS systems require field interconnecting piping and installation of flowmeters. Then hydrostatic testing is completed and gravel underbedding and media are installed before the system can be fully commissioned.

SORB 33 ARS systems are manually operated. Flow meters measure and totalize the flow to each adsorber, and pressure gauges monitor any pressure build up. Each adsorber has 5 butterfly process valves, sampling points and manway access for media fill and removal. Media is typically loaded by gravity from supersacks, and spent media is removed by vacuum. De Nora offers a media replacement and can be contacted directly for more information on this service.

## Options

The SORB 33 ARS systems are made available with options that help to further optimize operating conditions and integration into the overall water treatment system.

### Options include:

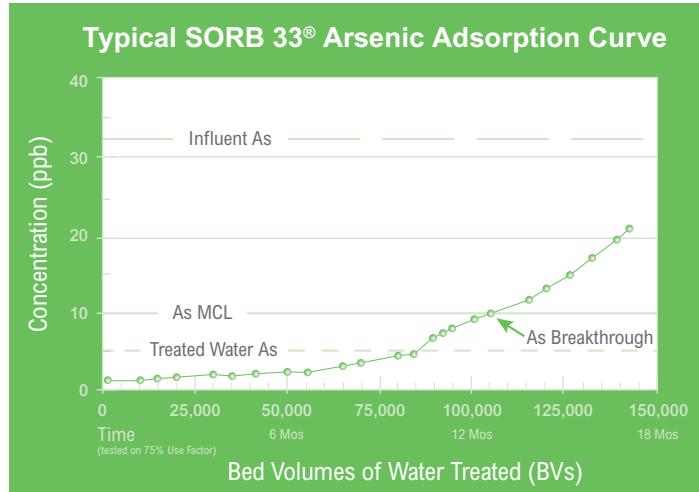
- **Treatment Bypass:** When the water's arsenic level is not much higher than 10 µg/L, some water can bypass adsorption and be blended with treated water to produce a quality slightly below the 10 µg/L regulatory limit. This extends the media life and reduces operating costs.
- **pH Adjustment:** A pH reduction system using either carbon dioxide or hydrochloric acid can supplement treatment of high pH waters in order to optimize media life; without the need for treated water pH increase downstream.
- **Zero Wastewater Discharge:** A backwash decant/reclaim tank and pump can be utilized for those systems without any sewer or other disposal options.
- **Series Flow Configuration:** Increased media arsenic capacity and extended life for very high arsenic waters is accomplished through series flow adsorber configuration where the "lead" adsorber treats water to arsenic breakthrough levels well above 10 µg/L while the "lag" adsorber polishes the water to produce treated water with a low arsenic level.
- **Sequencing Flow Configuration:** A hybrid of parallel and series flow arrangements that offers flexibility for extended media life with fewer vessels.
- **Automation:** The system can be designed with automatic electric actuators and a control panel for remote monitoring and control and for SCADA interfacing.
- **Distribution Water for Backwash:** Treated water from the effluent header can be used for backwashing if preferred over well water use for this service.
- **Firm Capacity Requirements:** An extra adsorber can be included in the system to meet firm capacity ("N+1 Redundancy) requirements.

## Technical Support

De Nora Water Technologies maintains a library of documentation to offer further technical support and process details on the SORB 33 arsenic removal systems and our arsenic removal media.

### Technical documentation includes:

- Spent Media Characterization and Disposal
- Adsorption Flow Configuration Options
- Media Backwashing Requirements
- pH Reduction for Optimum Arsenic Adsorption
- Monitoring Media Performance
- Disinfection Practices
- Treatment Bypass and Blending
- Arsenic Speciation and Oxidation
- Oil, Grease and Sand Contamination
- Systems design and evaluation methods



In this illustration, water containing 32 ppb arsenic can be treated to about 105,000 bed volumes before the treated water's arsenic level exceeds the 10 ppb MCL. SORB 33® has a gradual breakthrough curve that allows operators to efficiently manage the system without the need for emergency media exchange due to sharp break through seen from other media.

## ARS-42 Standard Adsorption System

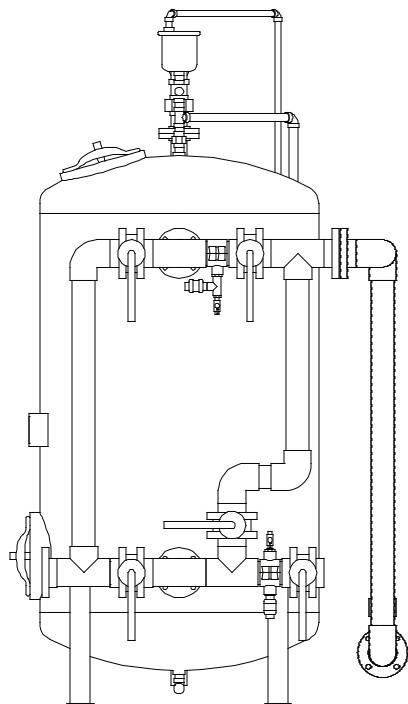
### 75 - 225 gpm (17 - 51 m<sup>3</sup>/hr) Treatment Capacity

De Nora offers the SORB 33® ARS-42, standard absorption systems available in one, two or three adsorber vessel configurations to meet flow rate requirements of 75, 150 and 225 gpm (17, 34 and 51 m<sup>3</sup>/hr).

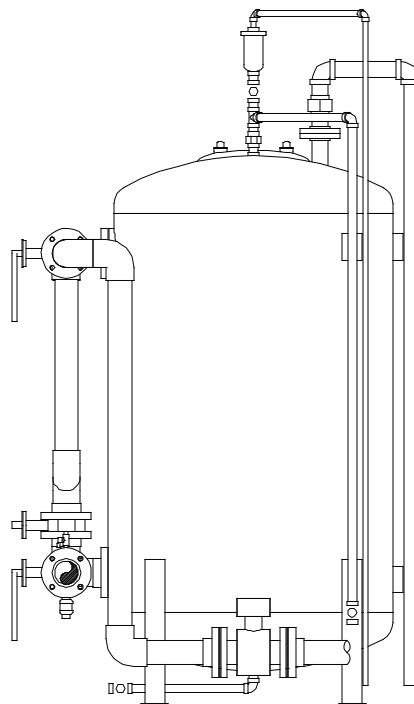
Systems feature 3.5 foot (1.1 m) diameter vertical pressure vessels with a capacity of up to 75 gpm (17 m<sup>3</sup>/hr) each. Multiple vessel systems are arranged in parallel flow configuration.

## SORB 33® ARS-42 Model Offering

Model Number	ARS-42S	ARS-42D	ARS-42T
Number of Vessels	1	2	3
Flow Capacity	75 gpm 17 m <sup>3</sup> /hr	150 gpm 34 m <sup>3</sup> /hr	225 gpm 51 m <sup>3</sup> /hr
Media Volume	28 ft <sup>3</sup> 0.8 m <sup>3</sup>	56 ft <sup>3</sup> 1.6 m <sup>3</sup>	84 ft <sup>3</sup> 2.4 m <sup>3</sup>
Backwash Rate (Max)	125 gpm 28 m <sup>3</sup> /hr	125 gpm 28 m <sup>3</sup> /hr	125 gpm 28 m <sup>3</sup> /hr
Vessel Diameter	3.5 ft 1.1 m	3.5 ft 1.1 m	3.5 ft 1.1 m
System Footprint (Length x Width)	5 ft x 5 ft 1.5 m x 1.5 m	10 ft x 5 ft 3.0 m x 1.5 m	15 ft x 5 ft 4.5 m x 1.5 m



Front View



Side View

## ARS-48 Standard Adsorption System

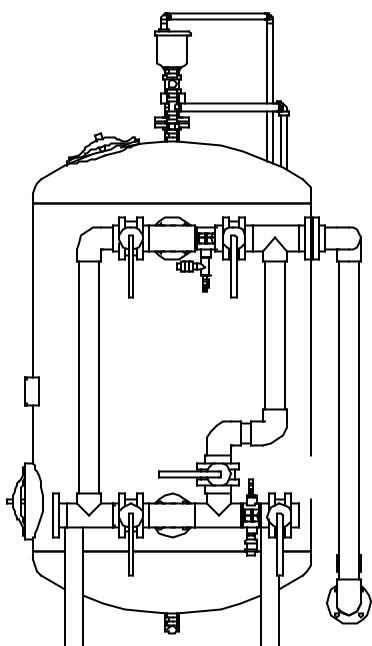
### 100 - 300 gpm (23 - 68 m<sup>3</sup>/hr) Treatment Capacity

De Nora offers the SORB 33® ARS-48, standard absorption systems available in one, two or three adsorber vessel configurations to meet flow rate requirements of 100, 200 and 300 gpm (23, 46 and 68 m<sup>3</sup>/hr).

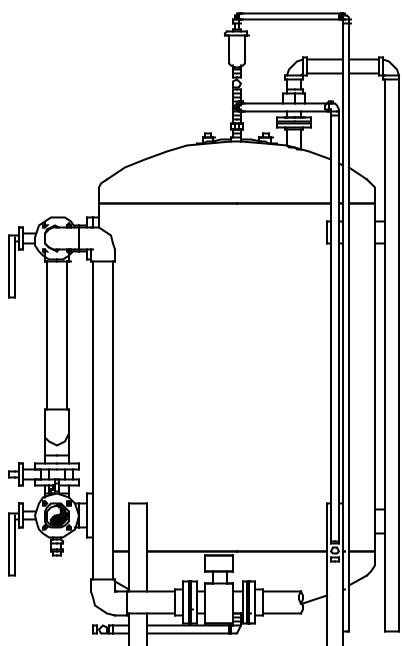
Systems feature 4 foot (1.2 m) diameter vertical pressure vessels with a capacity of up to 100 gpm (23 m<sup>3</sup>/hr) each. Multiple vessel systems are arranged in parallel flow configuration.

## SORB 33® ARS-48 Model Offering

Model Number	ARS-48S	ARS-48D	ARS-48T
Number of Vessels	1	2	3
Flow Capacity	100 gpm	200 gpm	300 gpm
	23 m <sup>3</sup> /hr	46 m <sup>3</sup> /hr	68 m <sup>3</sup> /hr
Media Volume	38 ft <sup>3</sup>	76 ft <sup>3</sup>	114 ft <sup>3</sup>
	1.1 m <sup>3</sup>	2.2 m <sup>3</sup>	3.3 m <sup>3</sup>
Backwash Rate (Max)	165 gpm	165 gpm	165 gpm
	37 m <sup>3</sup> /hr	37 m <sup>3</sup> /hr	37 m <sup>3</sup> /hr
Vessel Diameter	4.0 ft	4.0 ft	4.0 ft
	1.2 m	1.2 m	1.2 m
System Footprint (Length x Width)	6 ft x 6 ft	12 ft x 6 ft	18 ft x 6 ft
	1.8 m x 1.8 m	3.6 m x 1.8 m	5.5 m x 1.8 m



Front View



Side View

## ARS-60 Standard Adsorption System

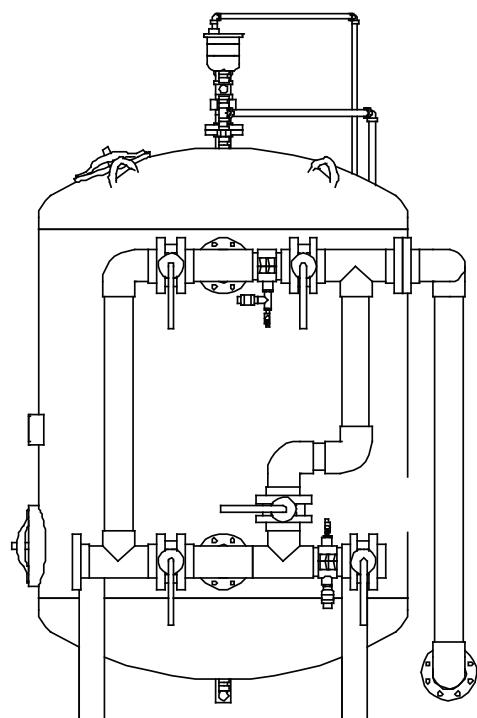
### 150 - 450 gpm (34 - 102 m<sup>3</sup>/hr) Treatment Capacity

De Nora offers the SORB 33 ARS-60, standard absorption systems available in one, two or three adsorber vessel configurations to meet flow rate requirements of 150, 300 and 450 gpm (34, 68 and 102 m<sup>3</sup>/hr).

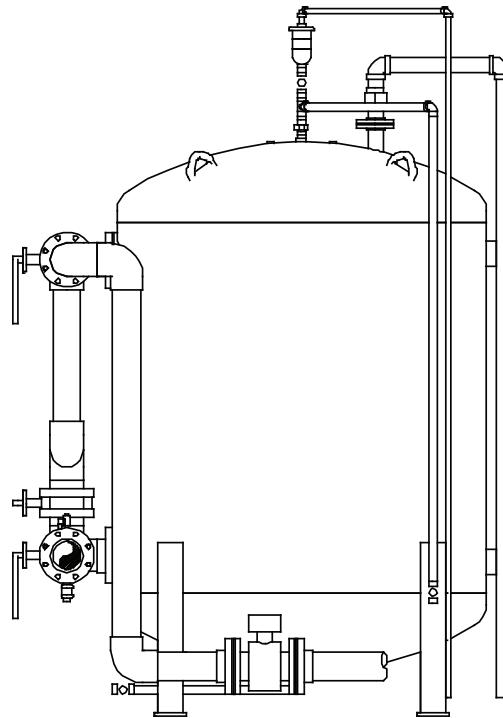
Systems feature 5 foot (1.5 m) diameter vertical pressure vessels with a capacity of up to 150 gpm (34 m<sup>3</sup>/hr) each. Multiple vessel systems are arranged in parallel flow configuration.

### SORB 33® ARS-60 Model Offering

Model Number	ARS-60S	ARS-60D	ARS-60T
Number of Vessels	1	2	3
Flow Capacity	150 gpm 34 m <sup>3</sup> /hr	300 gpm 68 m <sup>3</sup> /hr	450 gpm 102 m <sup>3</sup> /hr
Media Volume	56 ft <sup>3</sup> 1.6 m <sup>3</sup>	112 ft <sup>3</sup> 3.2 m <sup>3</sup>	168 ft <sup>3</sup> 4.7 m <sup>3</sup>
Backwash Rate (Max)	255 gpm 58 m <sup>3</sup> /hr	255 gpm 58 m <sup>3</sup> /hr	255 gpm 58 m <sup>3</sup> /hr
Vessel Diameter	5.0 ft 1.5 m	5.0 ft 1.5 m	5.0 ft 1.5 m
System Footprint (Length x Width)	7 ft x 7 ft 2.1 m x 2.1 m	14 ft x 7 ft 4.3 m x 2.1 m	21 ft x 7 ft 6.4 m x 2.1 m



Front View



Side View

## ARS-72 Standard Adsorption System

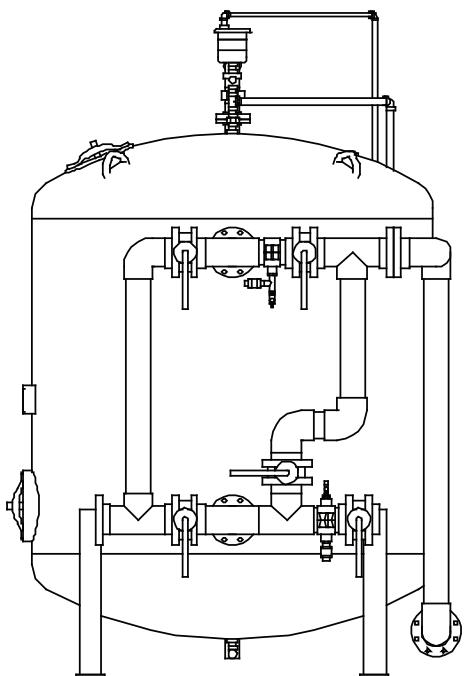
### 220 - 660 gpm (50 - 150 m<sup>3</sup>/hr) Treatment Capacity

De Nora offers the SORB 33 ARS-72, standard absorption systems available in one, two or three adsorber vessel configurations to meet flow rate requirements of 220, 440 and 660 gpm (50, 100 and 150 m<sup>3</sup>/hr).

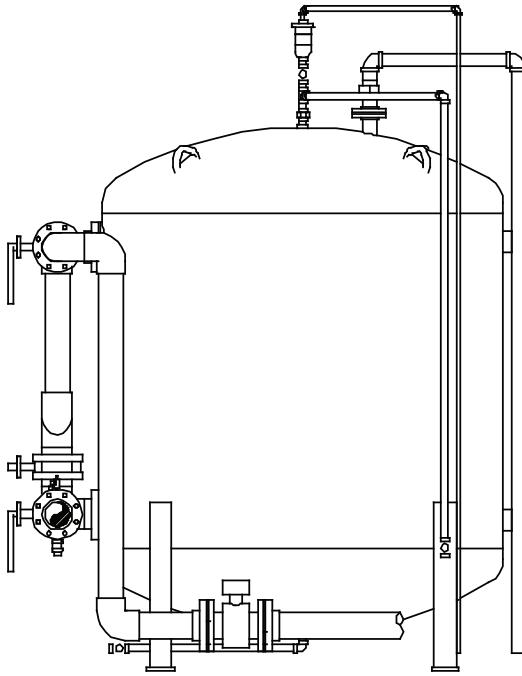
Systems feature 6 foot (1.8 m) diameter vertical pressure vessels with a capacity of up to 220 gpm (50 m<sup>3</sup>/hr) each. Multiple vessel systems are arranged in parallel flow configuration.

## SORB 33® ARS-72 Model Offering

Model Number	ARS-72S	ARS-72D	ARS-72T
Number of Vessels	1	2	3
Flow Capacity	220 gpm 50 m <sup>3</sup> /hr	440 gpm 100 m <sup>3</sup> /hr	660 gpm 150 m <sup>3</sup> /hr
Media Volume	84 ft <sup>3</sup> 2.4 m <sup>3</sup>	128 ft <sup>3</sup> 4.8 m <sup>3</sup>	212 ft <sup>3</sup> 7.2 m <sup>3</sup>
Backwash Rate (Max)	365 gpm 83 m <sup>3</sup> /hr	365 gpm 83 m <sup>3</sup> /hr	365 gpm 83 m <sup>3</sup> /hr
Vessel Diameter	6.0 ft 1.8 m	6.0 ft 1.8 m	6.0 ft 1.8 m
System Footprint (Length x Width)	8 ft x 8 ft 2.4 m x 2.4 m	16 ft x 8 ft 4.8 m x 2.4 m	24 ft x 8 ft 7.2 m x 2.4 m



Front View



Side View

# SORB 33® ARS Series

## Standard Arsenic Removal Adsorption System

### ARS-84 Standard Adsorption System

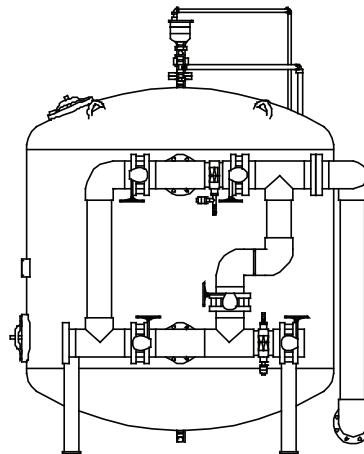
#### 300 - 900 gpm (68 - 204 m<sup>3</sup>/hr) Treatment Capacity

De Nora offers the SORB 33 ARS-84, standard absorption systems available in one, two or three adsorber vessel configurations to meet flow rate requirements of 300, 600 and 900 gpm (68, 138 and 204 m<sup>3</sup>/hr).

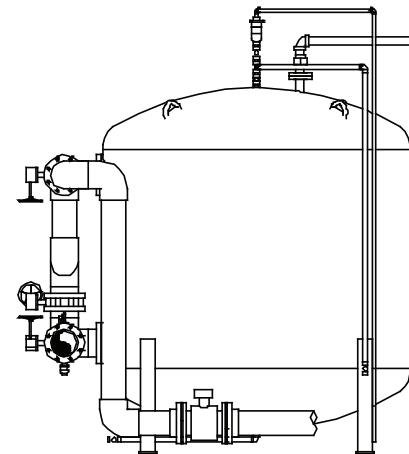
Systems feature 7 foot (2.1 m) diameter vertical pressure vessels with a capacity of up to 300 gpm (68 m<sup>3</sup>/hr) each. Multiple vessel systems are arranged in parallel flow configuration.

### SORB 33® ARS-84 Model Offering

Model Number	ARS-84S	ARS-84D	ARS-84T
Number of Vessels	1	2	3
Flow Capacity	300 gpm 68 m <sup>3</sup> /hr	600 gpm 138 m <sup>3</sup> /hr	900 gpm 204 m <sup>3</sup> /hr
Media Volume	56 ft <sup>3</sup> 1.6 m <sup>3</sup>	112 ft <sup>3</sup> 3.2 m <sup>3</sup>	168 ft <sup>3</sup> 4.7 m <sup>3</sup>
Backwash Rate (Max)	500 gpm 113 m <sup>3</sup> /hr	500 gpm 113 m <sup>3</sup> /hr	500 gpm 113 m <sup>3</sup> /hr
Vessel Diameter	7.0 ft 2.1 m	7.0 ft 2.1 m	7.0 ft 2.1 m
System Footprint (Length x Width)	9 ft x 9 ft 2.7 m x 2.7 m	18 ft x 9 ft 5.5 m x 2.7 m	27 ft x 9 ft 8.2 m x 2.7 m



Front View



Side View

WATER MADE EASY

MARINE

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INDUSTRIAL



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