

Choosing Tanks, Risers, and Lids

Our Presenter

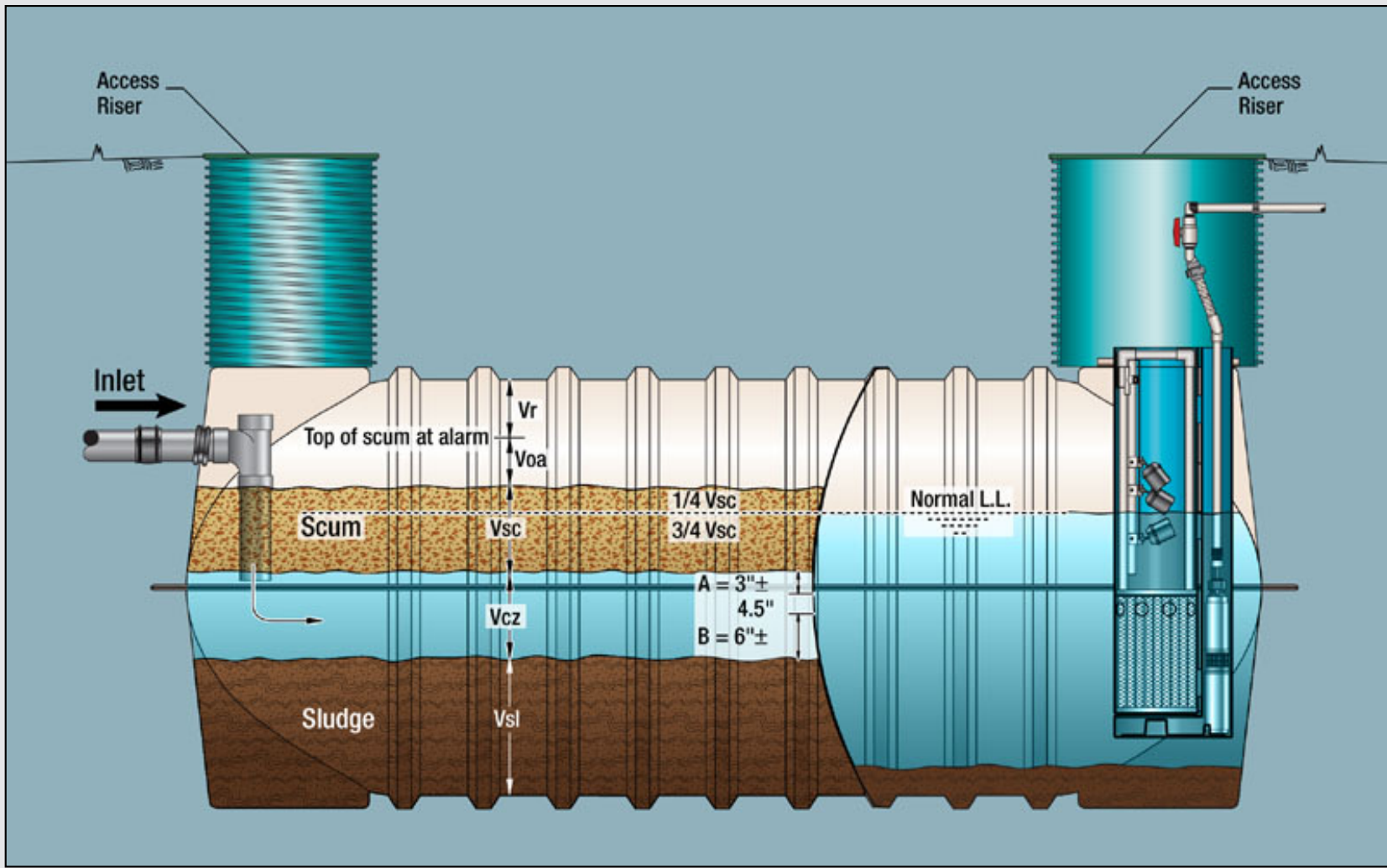
Dr. Eric Lanning

Eric Lanning is a Senior Technical Sales Representative with Orenco Systems, a company based in Sutherlin, Oregon, that engineers and manufactures innovative infrastructure solutions. In this role, he provides business and technical support for Orenco business partners in various locations in the U.S. and Canada. Having worked for Orenco for almost 20 years, he has been an integral part of developing the company's business within the land development and home-building industries, including in existing, unsewered communities.

Eric has a bachelor's degree in math and both a master's degree and a PhD in geophysics, all from the University of Washington. In his spare time, he enjoys volunteering at his church and at Grove Christian Camp near Cottage Grove, Oregon.

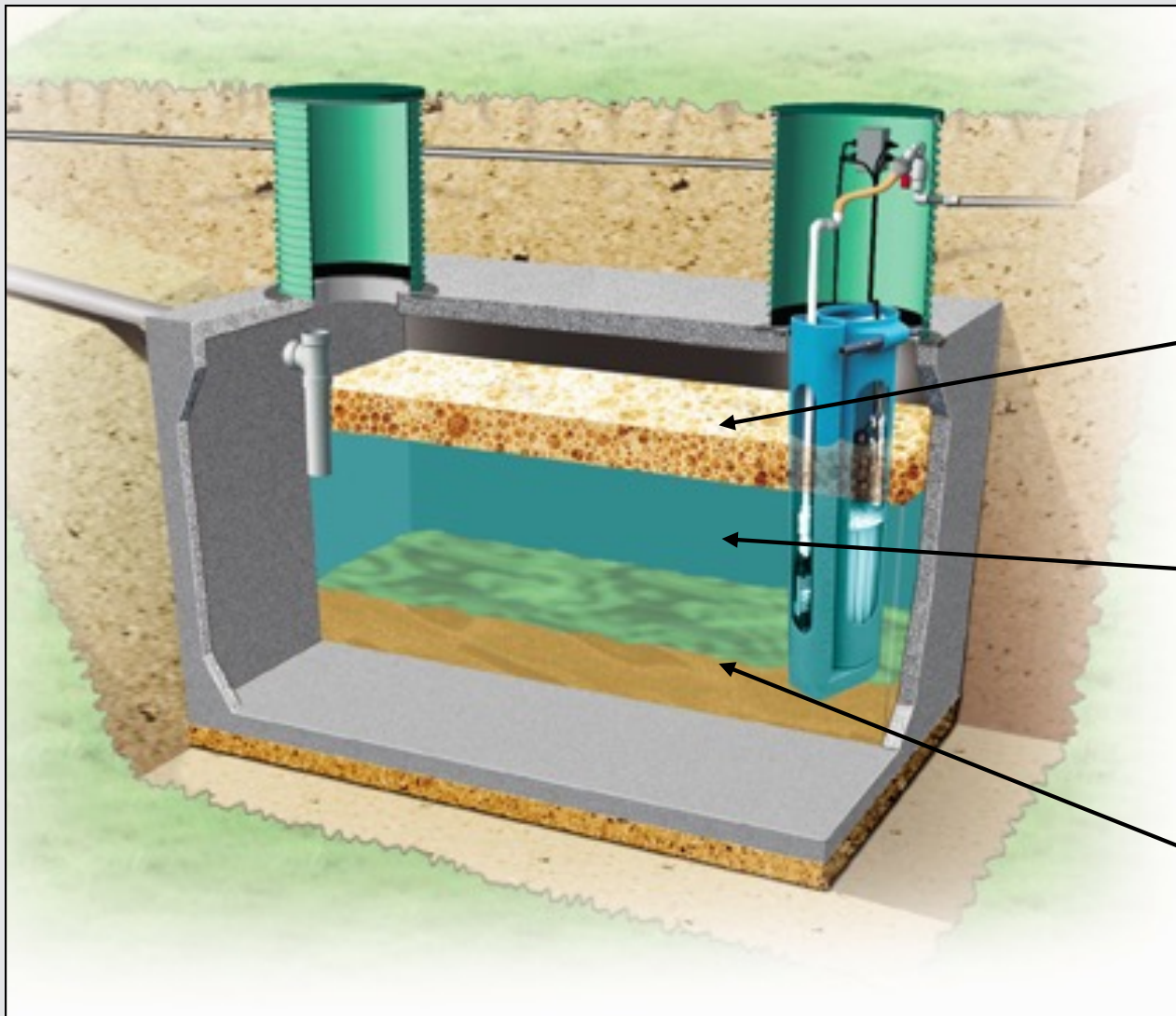
Tanks

Simple Yet Complex



Properly sized and configured tanks ensure optimum performance.

Tank Configuration: One Compartment

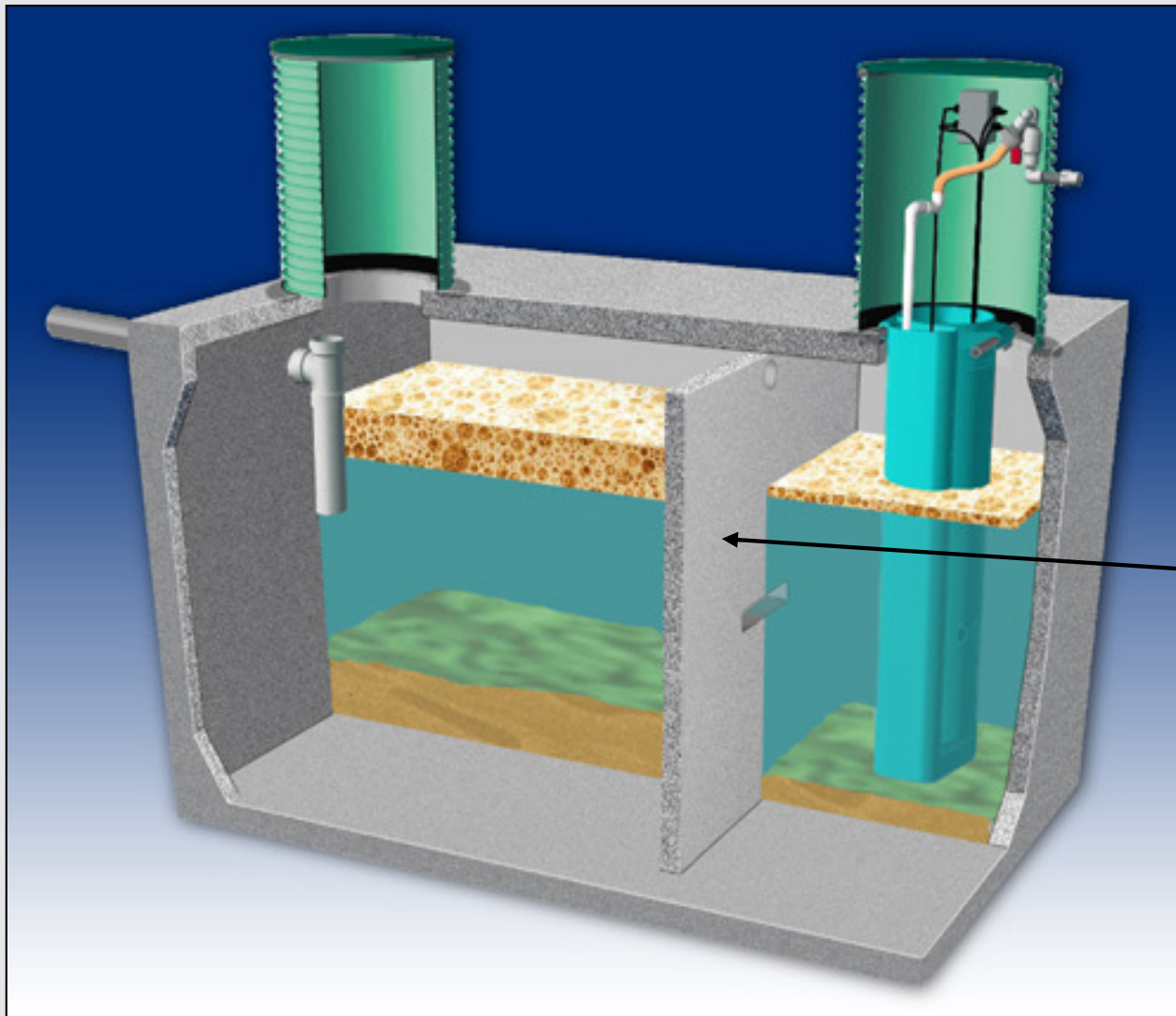


Scum layer

Clear zone

Sludge layer

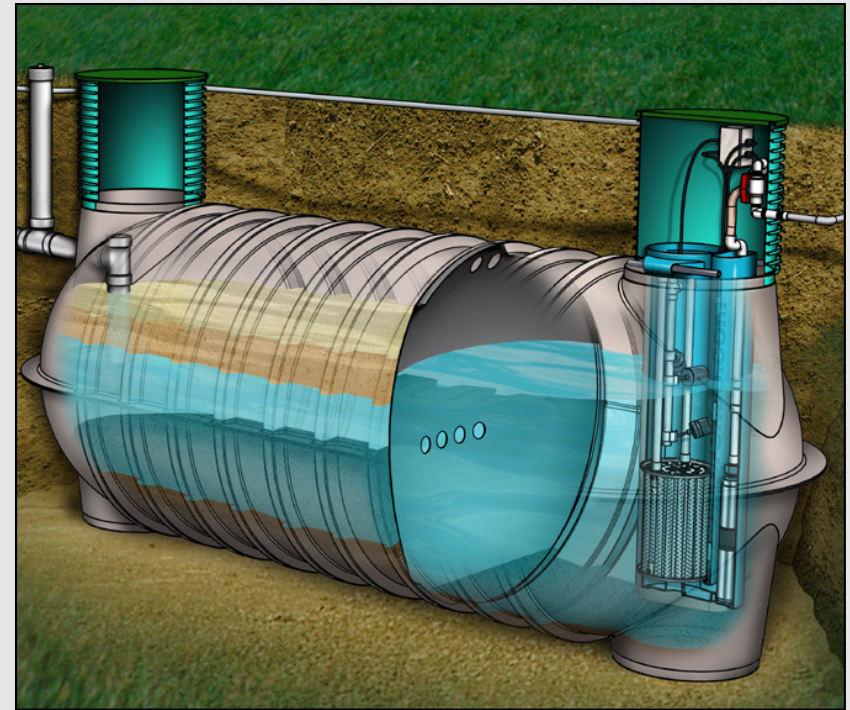
Tank Configuration: Two Compartments



Baffle

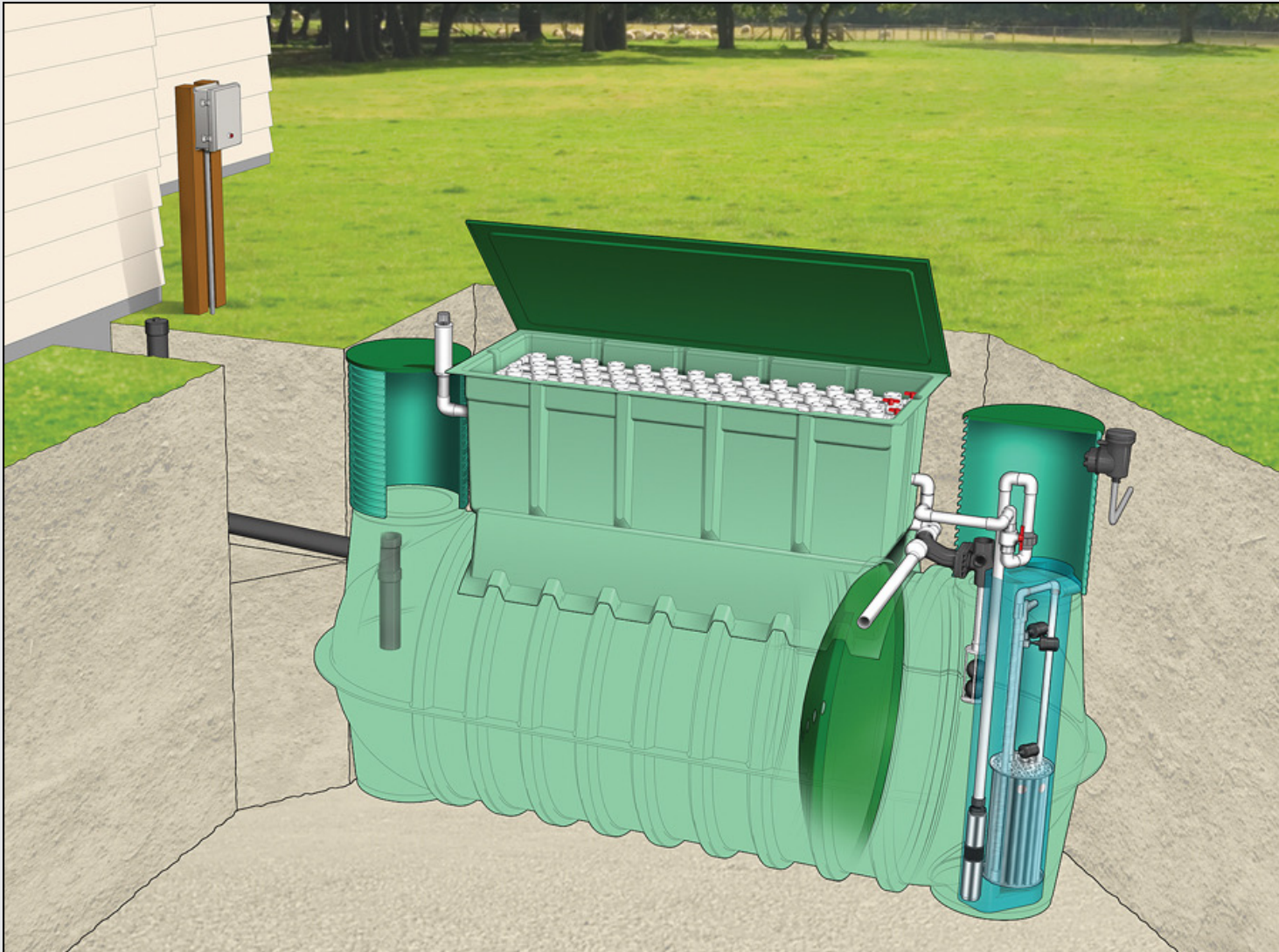
Onsite Systems Begin with a Watertight Tank

- Orenco insists that tanks are
 - ~ Watertight
 - ~ Structurally sound
- With well designed and constructed septic tanks:^{*}
 - ~ BOD₅ removal greater than 65%
 - ~ TSS removal of 70% or more
 - ~ FOG removal of at least 85%



^{*} *Small and Decentralized Wastewater Management Systems*, Crites & Tchobanoglous, 1998, p.183.

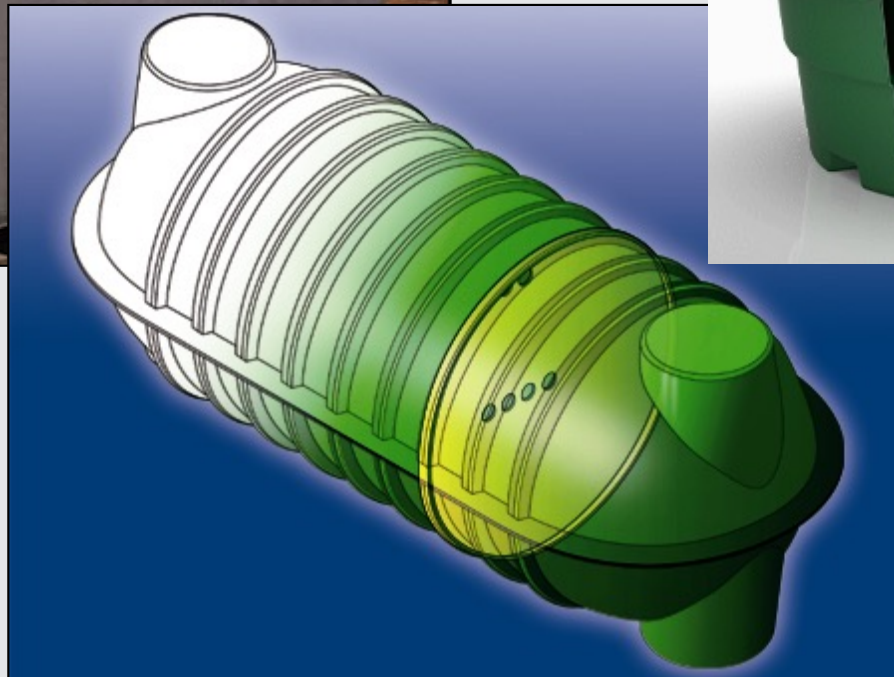
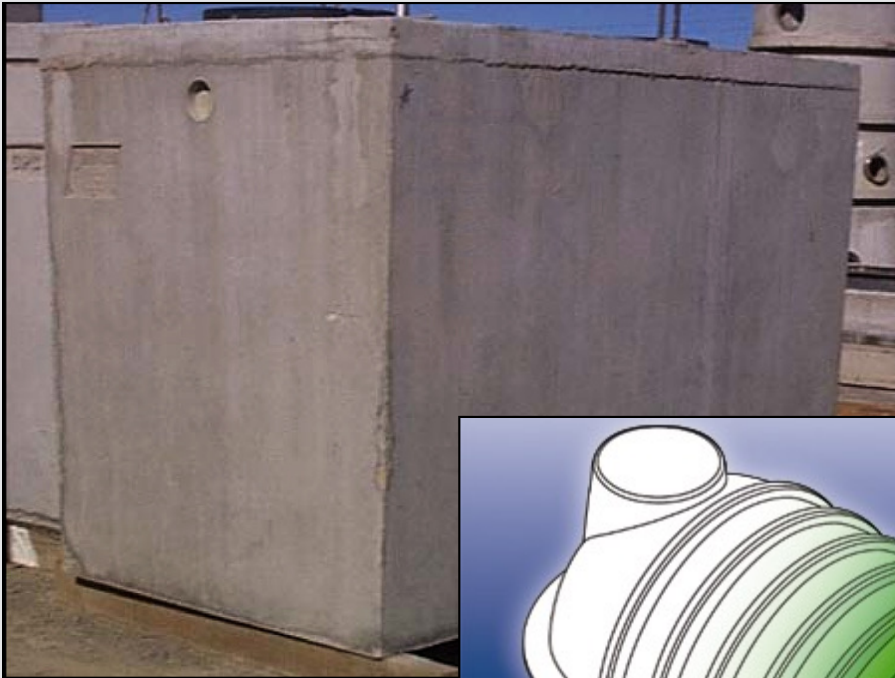
Septic Tank Applications



Watertight Tanks ...

- Reduce maintenance time/cost
- Protect public health, groundwater, and the environment

Materials of Tank Construction



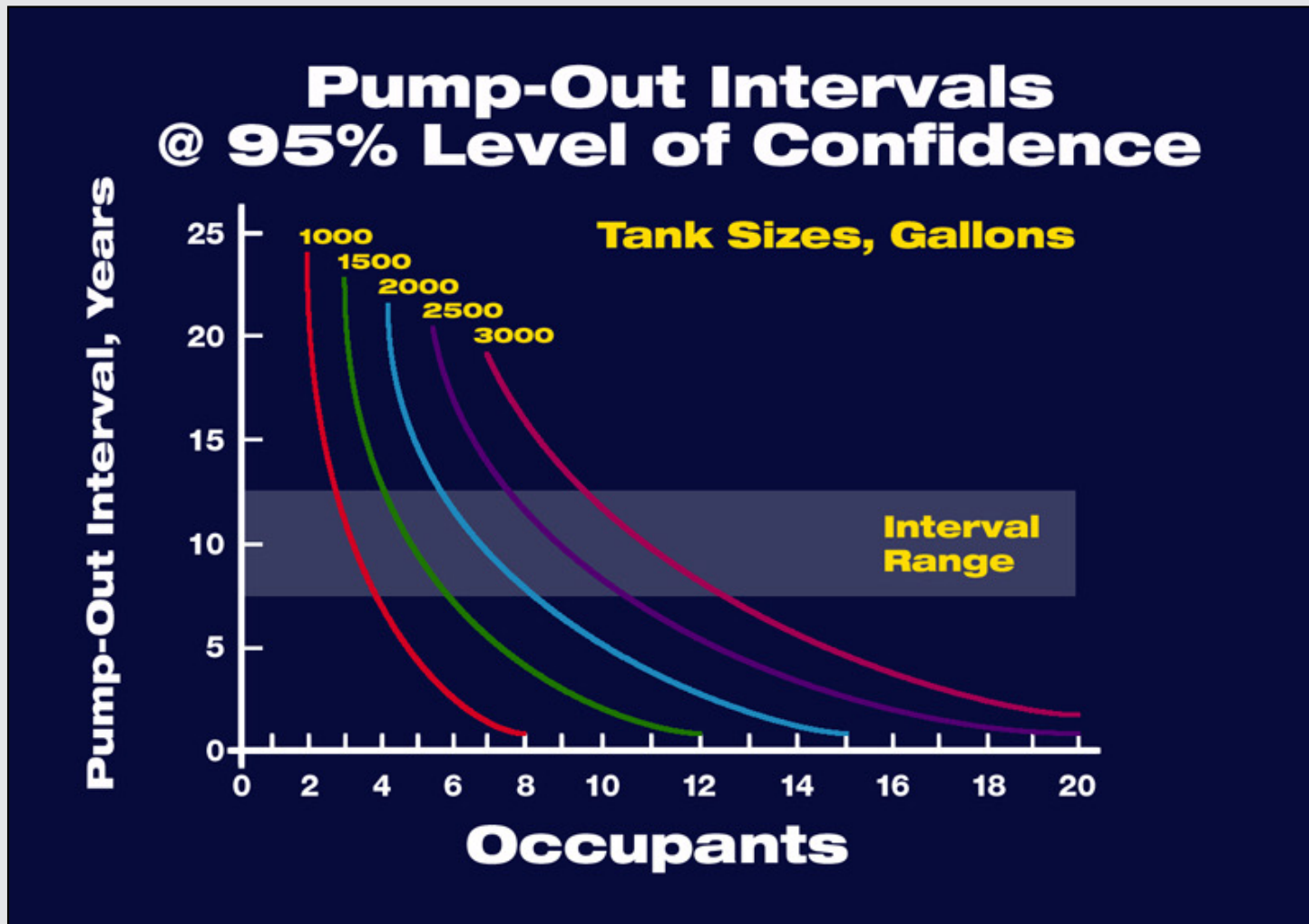
When Specifying Tanks, Consider ...



Typical Tank Sizing Criteria For Primary Tanks with Community Collection Systems

- 3-bedroom home or smaller
 - ~ 1000 gallons
- 4- to 5-bedroom home
 - ~ 1500 gallons
- 6-bedroom home or larger
 - ~ Consult Orenco

Tank Configuration and Pump-Out Intervals



*The pumping interval for properly sized and managed watertight tanks is about 12-20 years.**

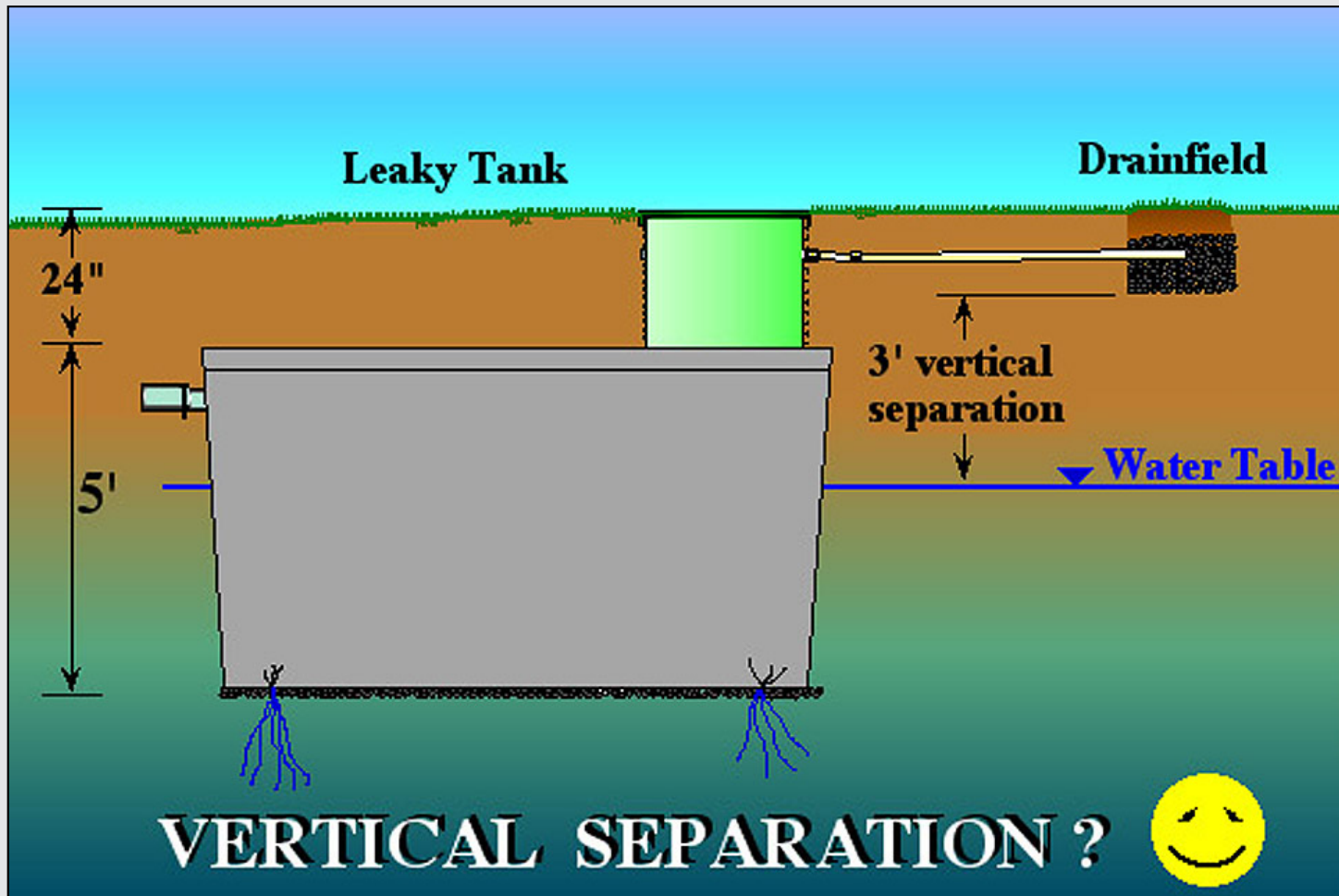
*Data gathered by Orenco during an audit of 450 tanks in Glide, Oregon, in 1986.

Structural Integrity and Watertightness



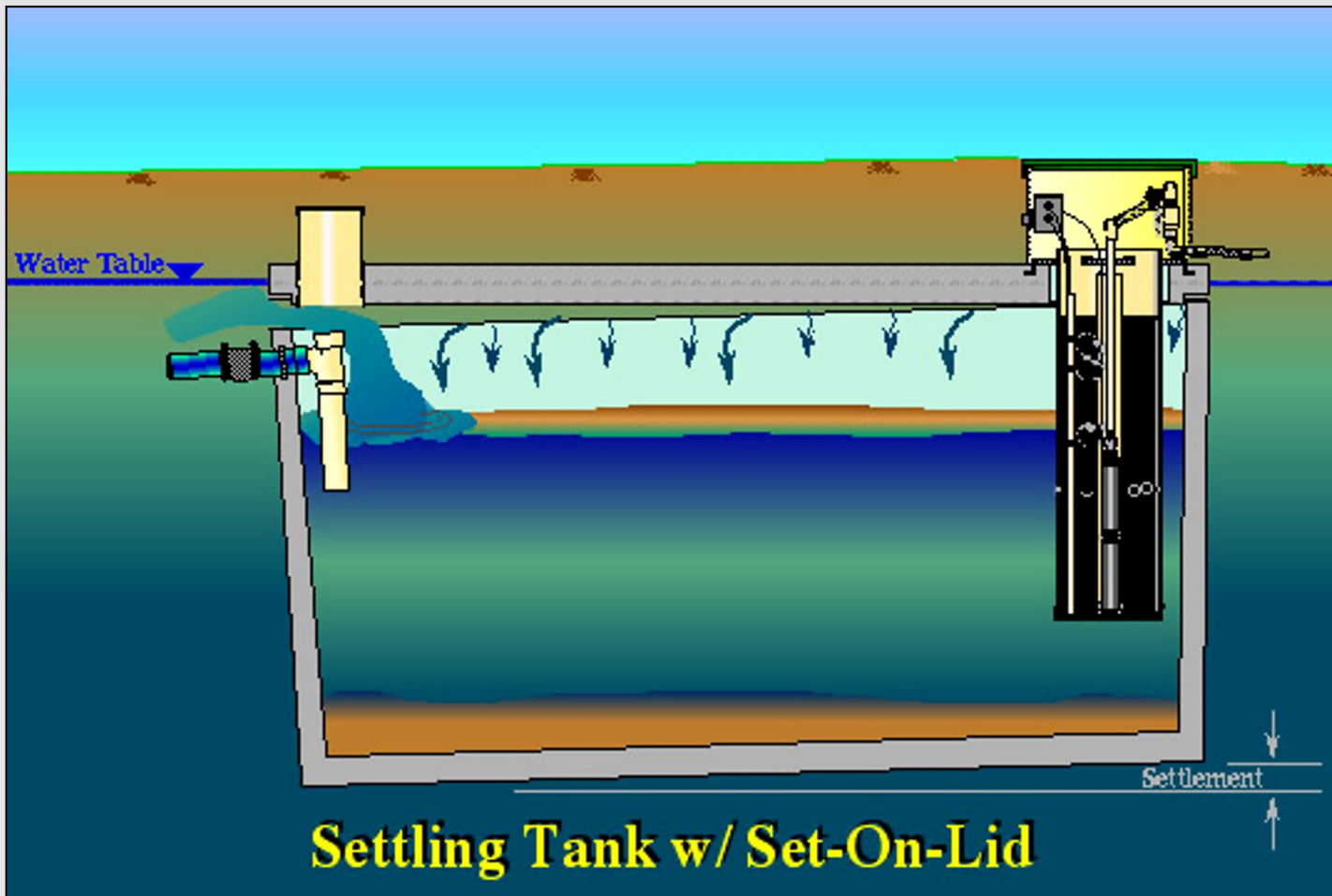
"the septic tank" by foot fingers is licensed under CC BY 2.0

Leaky Tanks Result in Exfiltration



Wastewater from leaky tanks bypasses the collection system/drainfield and goes into the groundwater.

Leaky Tanks Result in Infiltration



1/8" or 1/4" separation in top seam can result in 30 gpm infiltration, disrupting the tank's treatment process.

Unacceptable Quality Control



Poor Seam Quality



Top seams are often a problem.

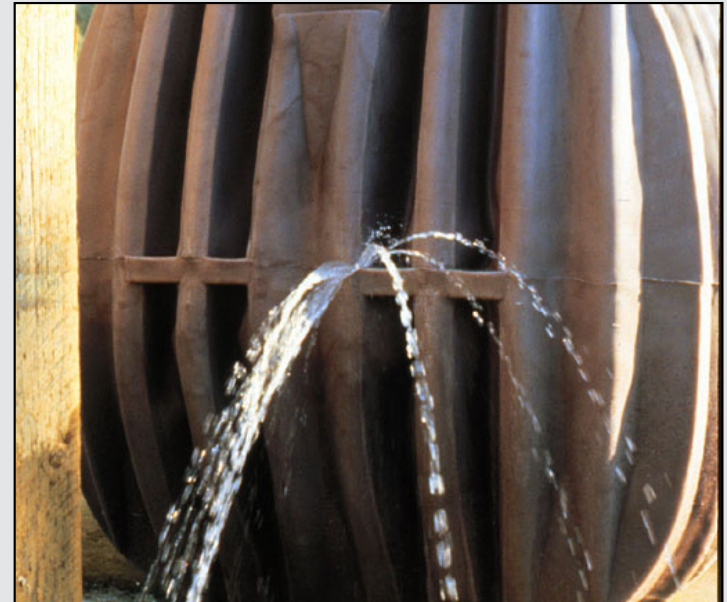
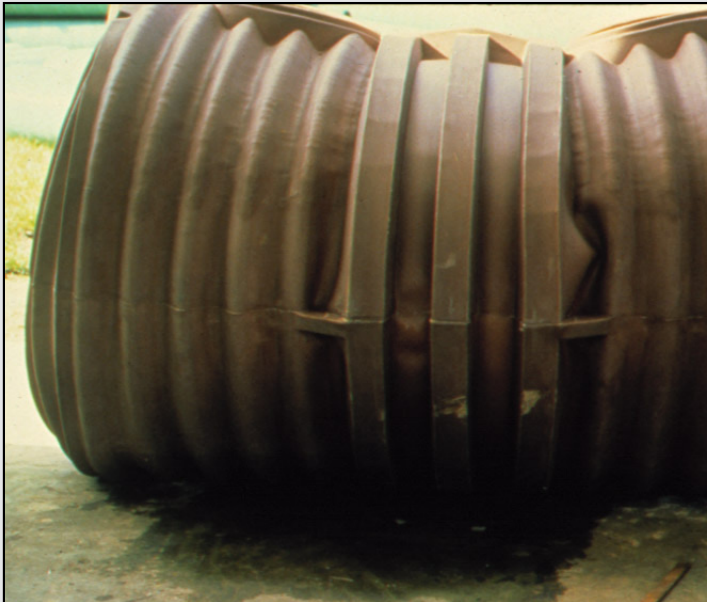
Knockouts Can Break and Leak



Knockouts Can Break and Leak, cont.



Some Polyethylene and Plastic Tanks Are Weak



	Concrete Tank	Poly Tank
Strength	4,000 psi (concrete)	1,600-6,000 psi
	60,000 psi (steel)	
Modulus of Elast.	3,600,000 psi (con)	40,000-260,000 psi
	29,000,000 psi (steel)	

Fiberglass Tanks Also Require Quality Control



Tank Structure and Watertightness

- For structural integrity and watertightness, consider ...
 - ~ Materials of construction
 - ~ Reinforcement
 - ~ A design for all loading conditions

Tank Concerns

- Watertight tanks not available in some regions
- Leaking, deforming tanks
- Some sites require lightweight tanks and equipment

Orenco Meander Tank

- 1000 and 1500 gallon
- Unique Meander tank design
- Comes as gravity or pump tank.
- Made of DCPD; Incredibly Strong
- Injection-molded
- Industry leading 5-year warranty
- Watertight processor provides primary wastewater treatment
- Lightweight; easy to install
- Directly accepts Orenco standard fiber wound risers



The Prelos Processor™

- A complete, high-quality package
- A single line item that's easy to specify
- Unique meander tank design
- Industry leading 5-year warranty
- Watertight processor provides primary wastewater treatment



Liquid-Only Sewer The Modern Sewer



PVC Pump Basin

- Lifts effluent from remote locations to the septic tank.
- Houses UV units



Effluent Filters

Tank Treatment With and Without Filter

	Crites/Tchobanoglous*		Orenco Systems [♦]	
	BOD ₅ (mg/L)	TSS (mg/L)	BOD ₅ (mg/L)	TSS (mg/L)
Tank <u>with</u> effluent filter	130-140	30	133	30
Tank <u>without</u> effluent filter	180-190	80-85	156	84
% reduction	>25%	>60%	15%	65%

* *Small and Decentralized Wastewater Management Systems*, Crites & Tchobanoglous, 1998, p.183.

♦ *Design and Performance of Septic Tanks*, NTP-TNK-TRB-3, Bounds, Terry, 1997 .

Solids Removal

- Prevent solids from leaving tank
- Improve quality of effluent
- Extend drainfield life

Tank Treatment With and Without Filter



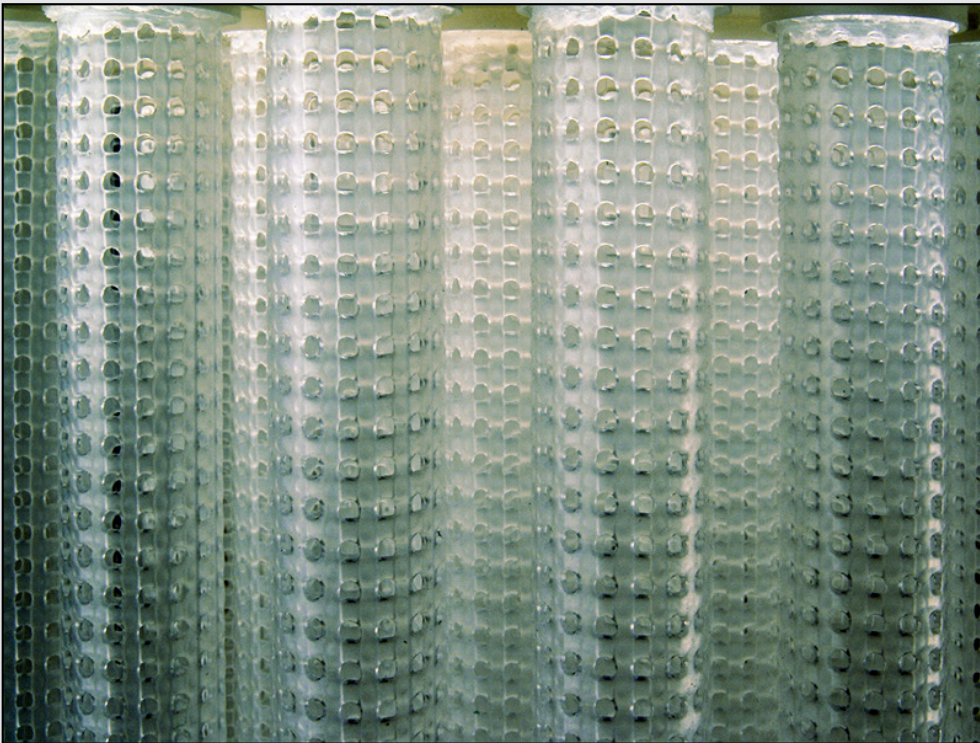
Septic tank effluent
w/o effluent filter



Septic tank effluent
with an Orenco effluent
filter

Filter Surface Area vs. Flow Area

- In evaluating effluent filters, it's important to compare both total filter surface area and total flow area
- Orenco flow area = 30% of total area



Filter Surface Area

Where solids are caught



Flow Area

- Prevents premature clogging
- 30% of Orenco filter tubes are open

Table 1:
Calculating Surface Area and Flow Area for Biotube[®] Effluent Filters

Filter Surface Area (A_s)

$$A_s = \pi d \times L$$

Flow Area (A_f)

$$A_f = (\pi d \times L) \times 0.3$$

where

d = diameter of filter tube material in feet or meters

L = total length of filter tube material in feet or meters

Example

Orenco's FT0444-36 filter has 17.3 linear feet (5.3 m) of 1.125-inch (28.6-mm) diameter filter material. This equates to about 5.1 ft² (0.47 m²) of filter surface area. Since the flow area of a Biotube effluent filter is 30% of the filter surface area, you can find the flow area of the filter by multiplying the filter surface area by 0.3.

Flow Area Calculation

Here's how we calculate total flow area ...

Orenco's FT0822-14B has 20.3 lineal feet of 1.125-inch-diameter screen tube, with 30% open area.

$$(20.3 \text{ lineal ft.}) (.09375 \text{ ft. diameter}) (3.1416) (0.3) = 1.8 \text{ ft}^2 \text{ total flow area}$$

Orenco's FT0444-36 has 17.3 lineal feet of 1.125-inch-diameter screen tube, with 30% open area.

$$(17.3 \text{ lineal ft.}) (.09375 \text{ ft. diameter}) (3.1416) (0.3) = 1.5 \text{ ft}^2 \text{ total flow area}$$

Another manufacturer's A100-12x20 has 173.17 lineal feet of 1/16-inch slots.

$$(173.17 \text{ lineal ft.}) (.0052083 \text{ ft. diameter}) = 0.9 \text{ ft}^2 \text{ total flow area}$$

Selection Criteria: Effluent Filter

- Large flow surface area to resist clogging
- Removable cartridge for easy maintenance
- Corrosion-proof to last a long time

Effluent Filter Sizing

Sizing Equations

$$A_F = C_f (Q) (\text{MTBC})$$

where:

A_F = Filter area required (ft²)

C_f = Filter coefficient ($\frac{\text{ft}^2}{\text{gpd} \cdot \text{yr}}$)

Q = Daily flow in gallons (gpd)

MTBC = Mean time between filter cleaning (years)

Actual Flow Equation:

$$A_F = 0.0044 (Q) (\text{MTBC})$$

(for calculations based on "actual flows")

Design Flow Equation:

$$A_F = 0.002 (Q) (\text{MTBC})$$

(for calculations based on "design flow"
as defined above)

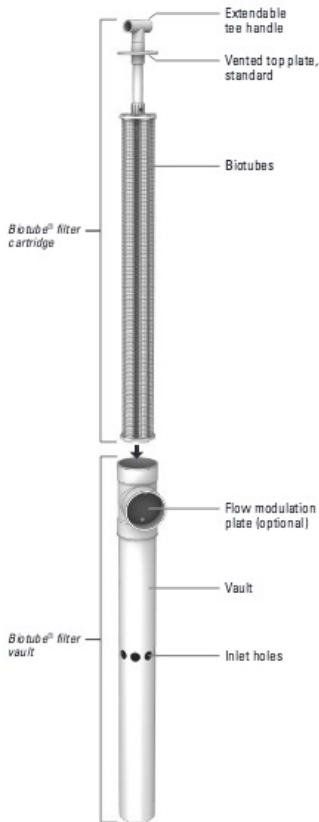
Orenco's Biotube[®] Effluent Filters



Residential Effluent Filters

Orenco® Technical Data Sheet

4-inch (100-mm) Biotube® Effluent Filters



Applications

Orenco® 4-inch Biotube® Effluent Filters are designed to remove solids from effluent leaving residential septic tanks. They can be used in new and existing tanks at flows of up to 1200 gpd.

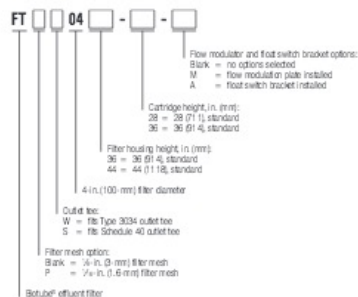
General

Orenco 4-inch Biotube Effluent Filters (U.S. Patents No. 4,439,323 and 5,492,835) are used to improve the quality of effluent exiting a septic tank in a residential septic system. Increased effluent quality improves system performance and extends drainfield life. The Biotube cartridge fits tightly in the vault and is removable for maintenance. The tee handle can be extended for easy removal of the cartridge.

Standard Models

FTS0444-36, FTS0444-36M, FTW0436-28, FTW0436-28M
FTW0444-36, FTW0444-36M

Product Code Diagram



Materials of Construction

Vault	PVC
Biotube® cartridge	Polypropylene and polyethylene
Handle components	PVC, polyethylene, stainless steel

Product Code Diagram



Flow modulator and float switch bracket options:
Blank = no options selected
M = flow modulation plate installed
A = float switch bracket installed

Cartridge height, in. (mm):
28 = 28 (711), standard
36 = 36 (914), standard

Filter housing height, in. (mm):
36 = 36 (914), standard
44 = 44 (1118), standard

4-in. (100-mm) filter diameter

Outlet tee:
W = fits Type 3034 outlet tee
S = fits Schedule 40 outlet tee

Filter mesh option:
Blank = 1/8-in. (3-mm) filter mesh
P = 1/16-in. (1.6-mm) filter mesh

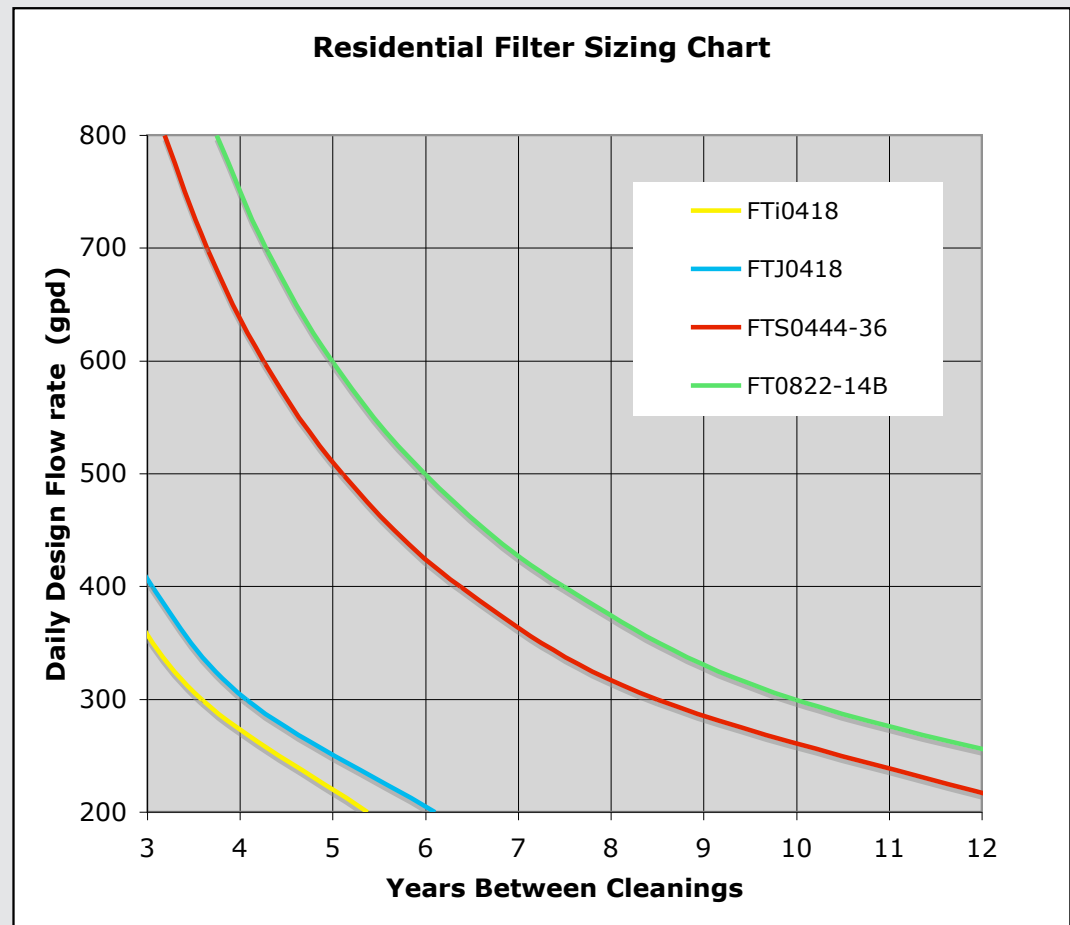
Biotube® effluent filter

Residential Applications



Selecting a Residential Effluent Filter

- Flow rates, waste-strength, and septic tankage all affect cleaning frequencies



Commercial Applications



Commercial Effluent Filters

Orencia® Technical Data Sheet

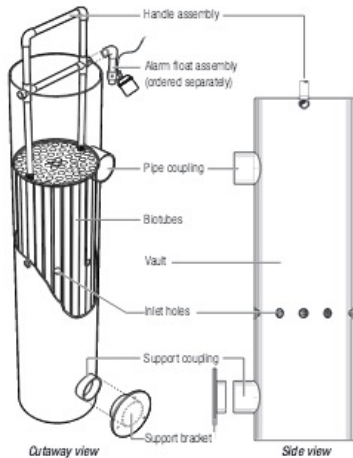
8-in. to 15-in. Dia. Biotube Effluent Filters

Applications

Orencia® 8-inch to 15-inch Biotube® Effluent Filters are designed to remove solids from effluent leaving commercial septic tanks. They can be used in new and existing tanks.

General

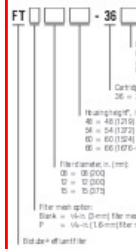
Orencia® 8-inch to 15-inch Biotube® Effluent Filters* are used to improve the quality of effluent exiting a commercial septic tank. The Biotube cartridge fits snugly in the vault and is removable for maintenance, the handle assembly snaps into the notches in the top of the vault, and the tee handle can be extended for easy removal of the cartridge. A "base inlet" model (see p. 2) is available for low-profile tanks. An optional slide rail system, available on larger models, simplifies installation and provides tank access for servicing.



Standard Models

FT 0854-36, FT 1254-36, FT 1554-36, FT 0822-14B, FT 1254-36AR

Product Code Diagrams



Minimum required (ML) information:
 08-in. (203-mm) housing for ML L0130-48 (046-1183-mm)
 12-in. (305-mm) housing for ML L0130-60 (064-1520-mm)
 15-in. (381-mm) housing for ML L0130-66 (082-2057-mm)
 For 12- and 15-in. (305- and 381-mm) only, additional option code may be required for that filter number.



Materials of Construction

Vault	PVC
Pipe coupling	PVC
Handle components	PVC
Support coupling and bracket	PVC
Biotube® cartridge	Polypropylene and polyethylene

* Orencia® Biotube® Effluent Filters are covered under multiple U.S. and international patents.

Note: Support coupling and support bracket are available on 12-inch and 15-inch sizes only.

Product Code Diagrams



Float switch bracket and slide rail options:
 Blank = no options selected
 A = float switch bracket installed
 R = slide rail installed†

Cartridge height, in. (mm):
 36 = 36 (914), standard

Housing height*, in. (mm):
 48 = 48 (1219)
 54 = 54 (1372)
 60 = 60 (1524)
 66 = 66 (1676-mm)

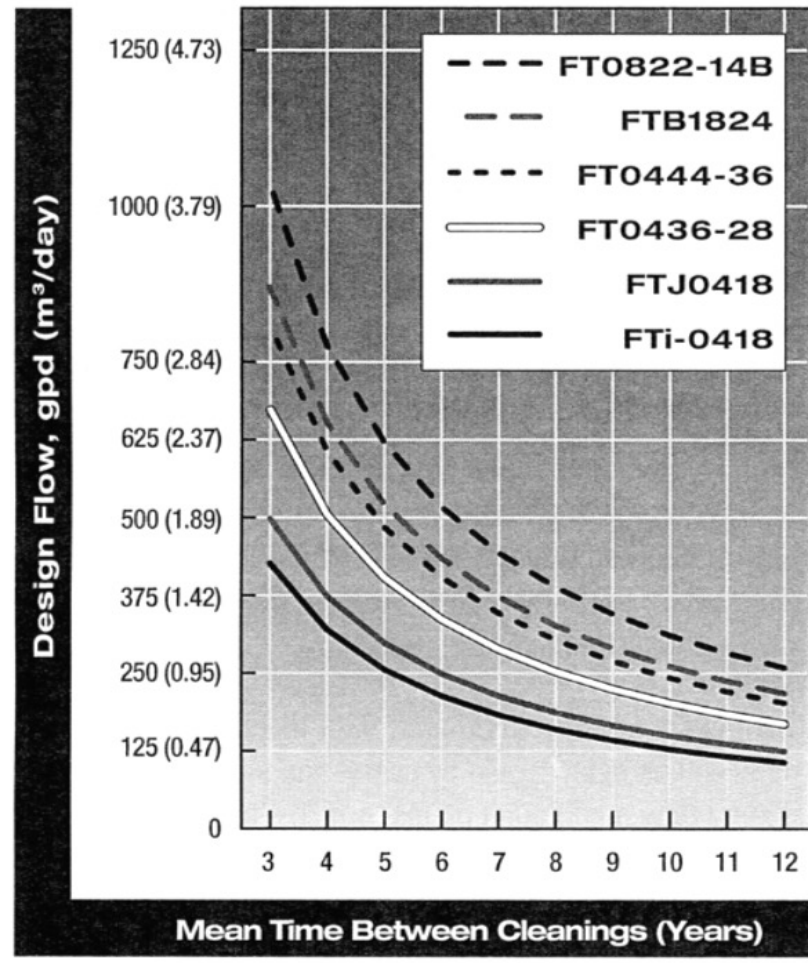
Filter diameter, in. (mm):
 08 = 08 (200)
 12 = 12 (300)
 15 = 15 (375)

Filter mesh option:
 Blank = 1/8-in. (3-mm) filter mesh
 P = 1/16-in. (1.6-mm) filter mesh

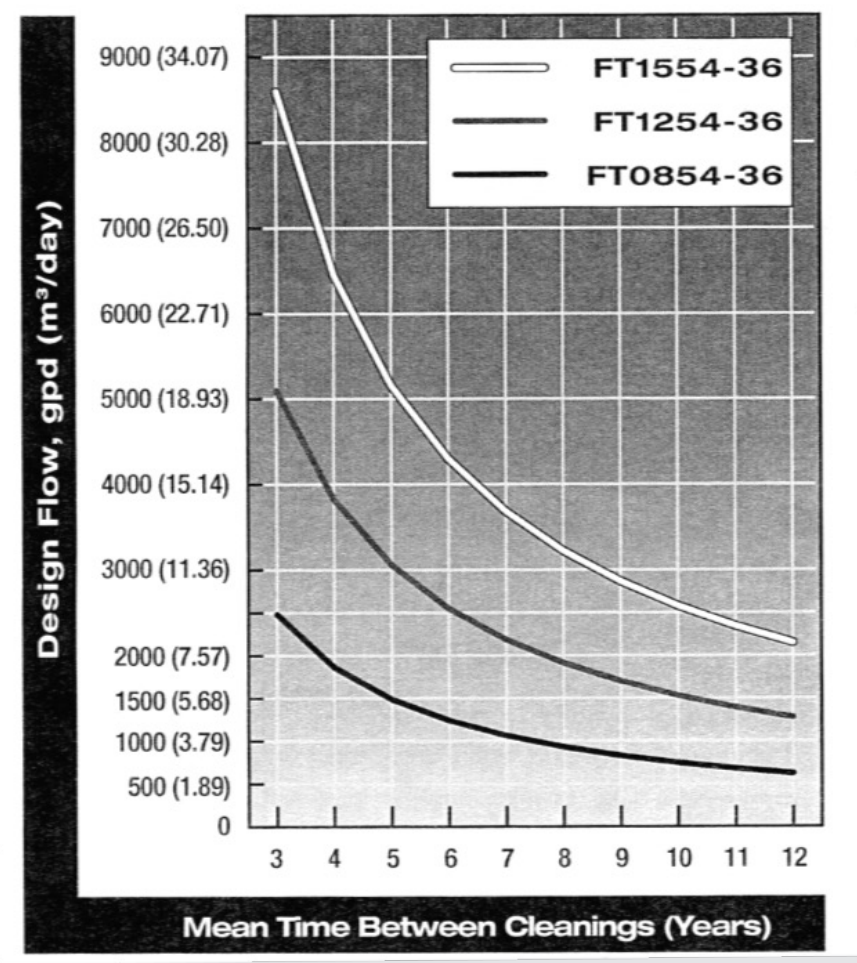
Biotube® effluent filter

Expected Cleaning Interval

Time Between Cleanings for Residential Biotube® Filters

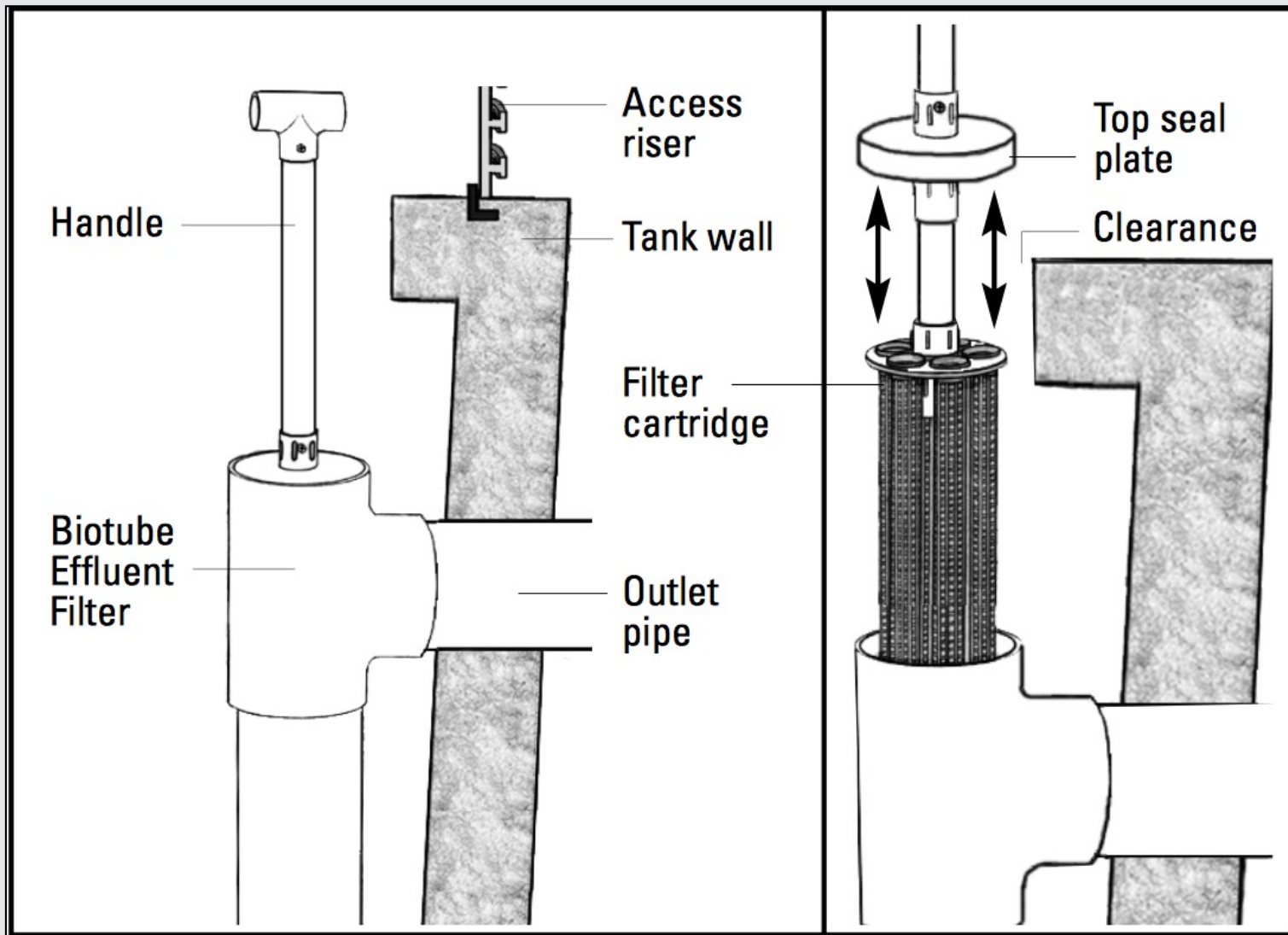


Time Between Cleanings for Commercial Biotube® Filters

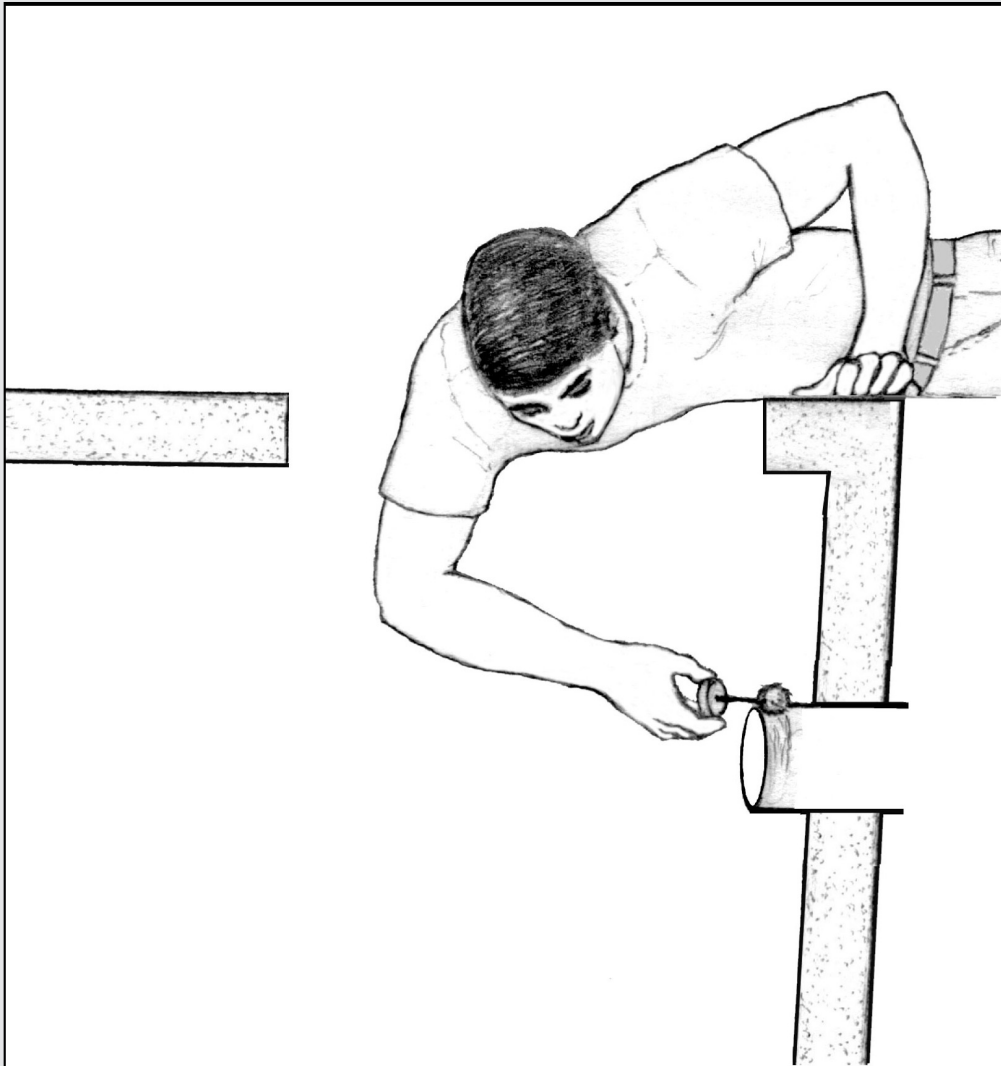


Effluent Filter Installation

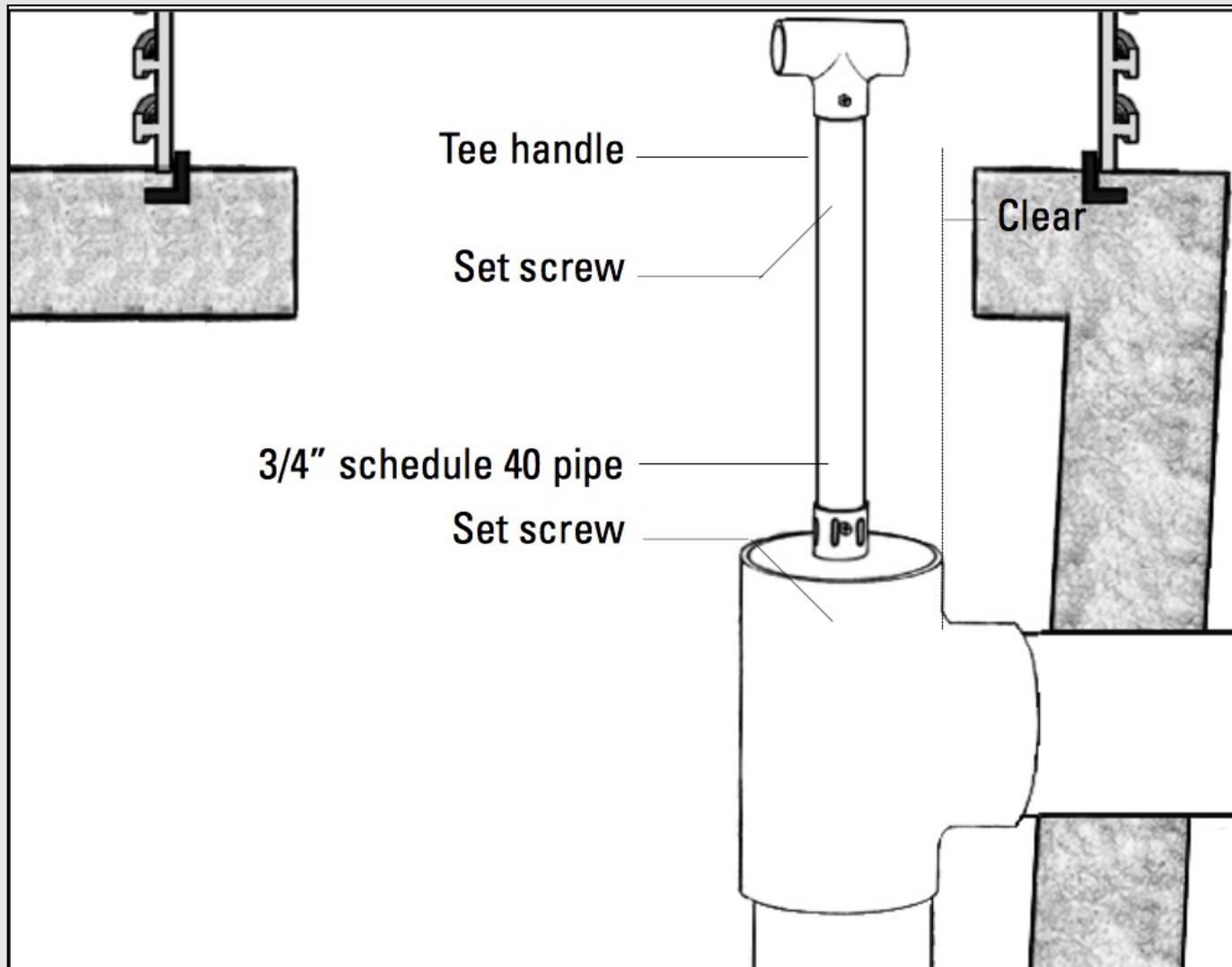
Step 1: Test-Fit Effluent Filter



Step 2: Attach Filter to Tank

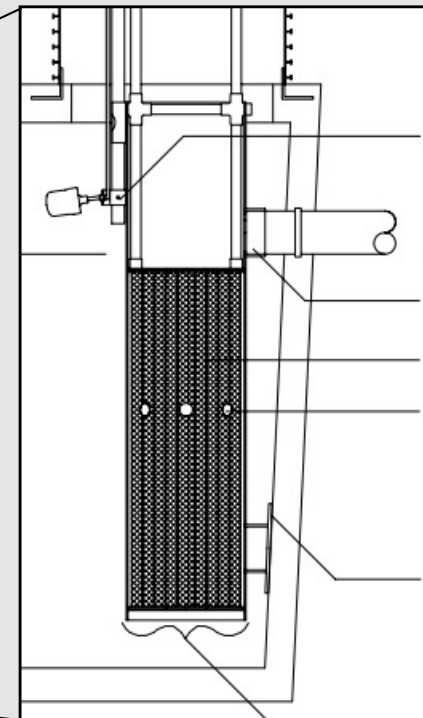
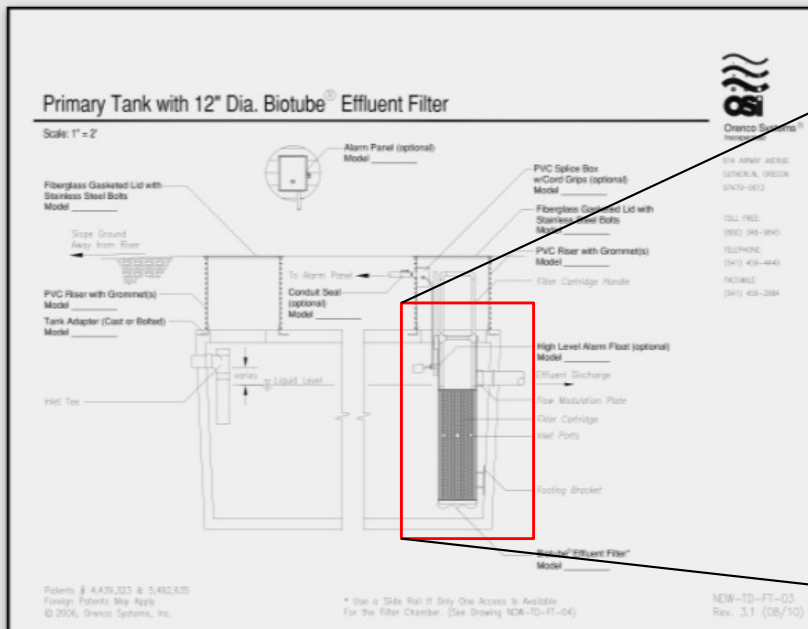


Step 3: Extend Cartridge Handle



Effluent Filter Installation

- Attach filter to the tank's outlet pipe
- For 12-in. & 15-in. diameter commercial filters, attach the foot brace to the floor of the tank (fiberglass or concrete tanks), or to the sidewall (concrete tanks only).
- Extend cartridge handle for easy access.

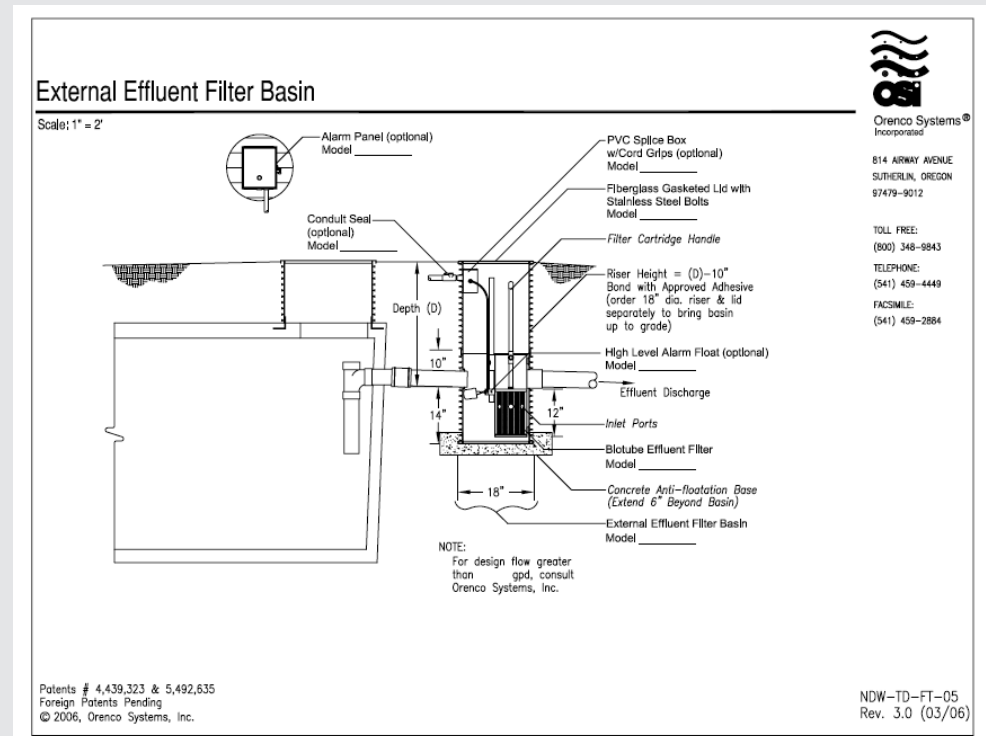


Effluent Filter Maintenance

- Remove and hold cartridge over inlet of tank
- Carefully spray buildup into tank
- Reinsert cartridge into effluent filter housing



External Effluent Filter Basin



External filter basins were designed for upgrades/repairs of residential systems.

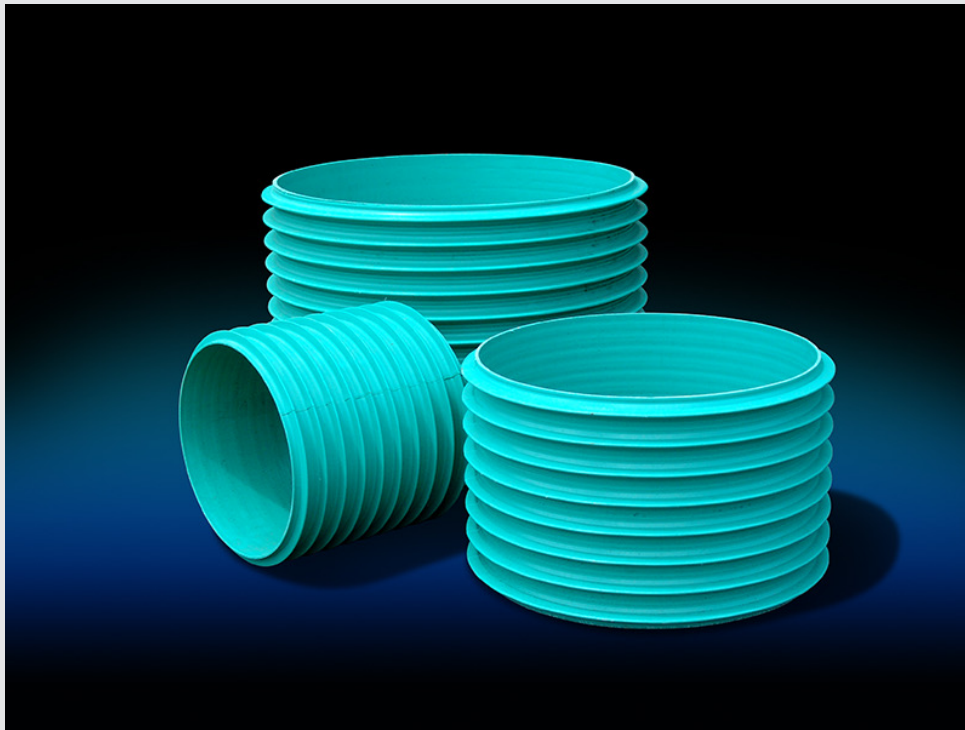
Orengo Durafiber™ Lid



Logo Lids



Access Risers



Orenco® Technical Data Sheet

Orenco® Fiberglass Access Risers

Applications

Orenco® Fiberglass Access Risers provide access to septic tank openings. They can be cast into the tops of concrete tanks or bonded to an Orenco riser tank adapter. They can also be used as valve enclosures.

General

Orenco Fiberglass Access Risers are constructed of filament-wound fiberglass, making them lightweight, corrosion resistant, and extremely strong.

Risers are available in diameters of 36 inches and 48 inches (914 mm and 1219 mm), with lengths available in 3-inch (75-mm) increments. They have an integral top flange with threaded bronze inserts for securing access riser lids.

Standard Models

RF36XX, RF48XX.

Nomenclature

RF +

Discharge grommet:
10 = 1"
12 = 1¼"
15 = 1½"
20 = 2"

Splice Box option:
S = 1" (25-mm) grommet installed
L = 1¼" (32-mm) grommet installed
S1 = SB1 attached
S2 = SB2 attached
S3 = SB3 attached
S4 = SB4 attached
L5 = SB5 attached
L6 = SB6 attached

SX = Predrilled hole for external splice box*
XS = Explosion-proof splice box for simplex pumps**
XD = Explosion-proof splice box for duplex pumps**
XT = Explosion-proof splice box for triplex pumps**

Riser height (inches)

Riser diameter: 36" (914 mm), 48" (1219 mm)

Orenco® fiberglass access riser

* Minimum riser height 18" (457 mm)

** Used in Class I Division 1 environments



Orenco® Fiberglass Access Risers are available in 36- and 48-inch (914- and 1219-mm) diameters.

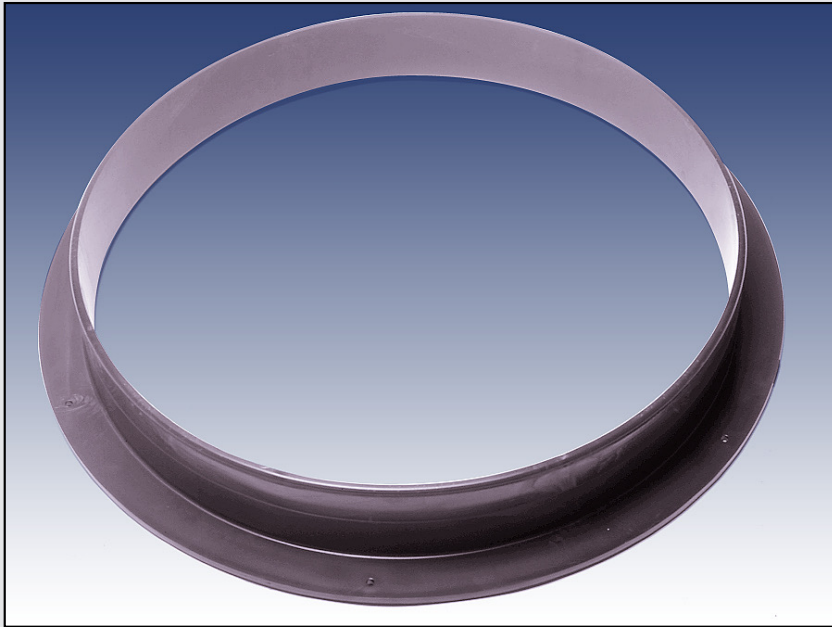
Materials of Construction

Access riser	Fiberglass reinforced polyester
Threaded inserts	Silicone, bronze

Specifications

Dimensions, nominal	RF36XX	RF48XX
Flange O.D., in. (mm)	42.0 (1067)	54.0 (1372)
O.D., in. (mm)	36.5 (927)	48.6 (1234)
I.D., in. (mm)	36.0 (914)	48.0 (1219)
Wall thickness, in. (mm)	0.25 (6.4)	0.30 (7.6)
Weight, lb/ft (kg/m)	24.0 (35.7)	36.0 (53.6)

Riser-to-Tank Adapters



Grade Rings

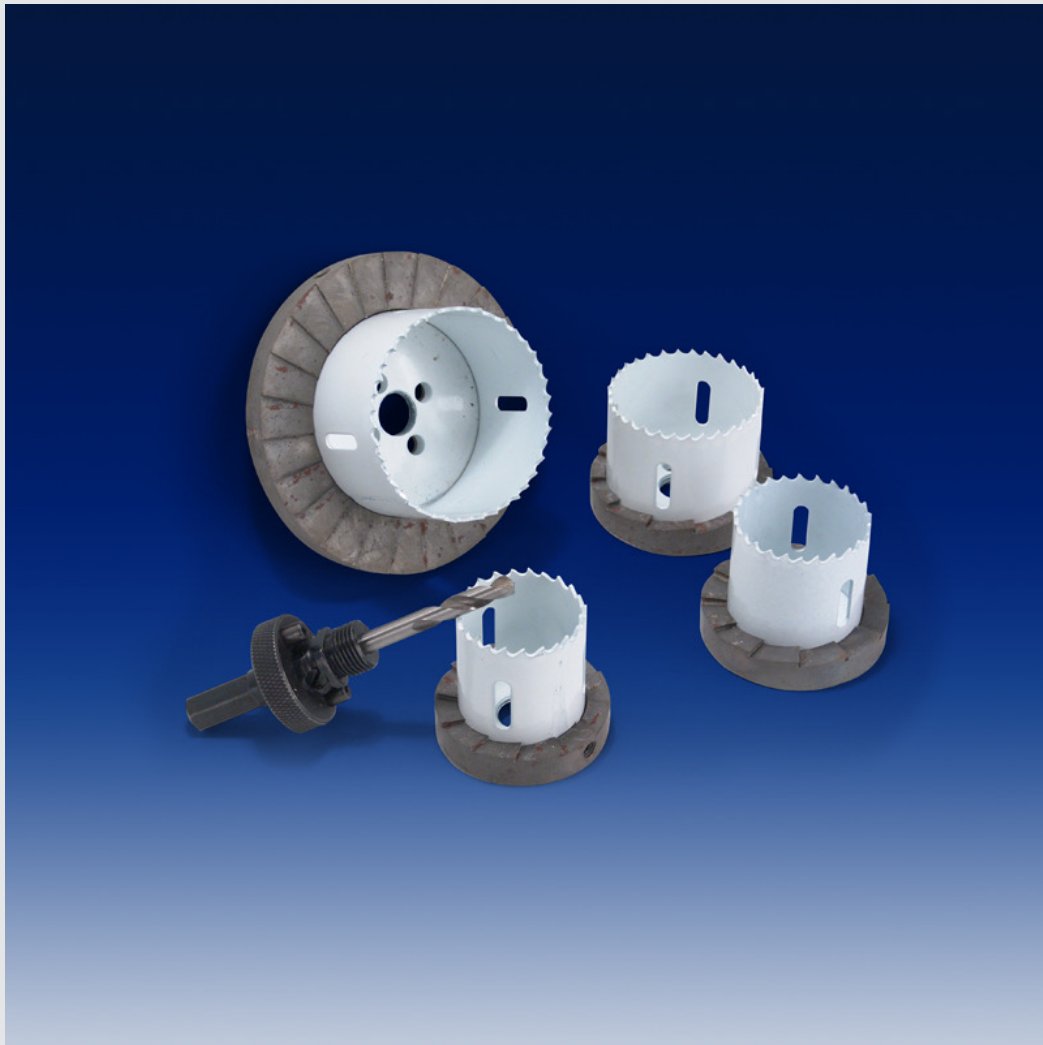


Types of Adhesive

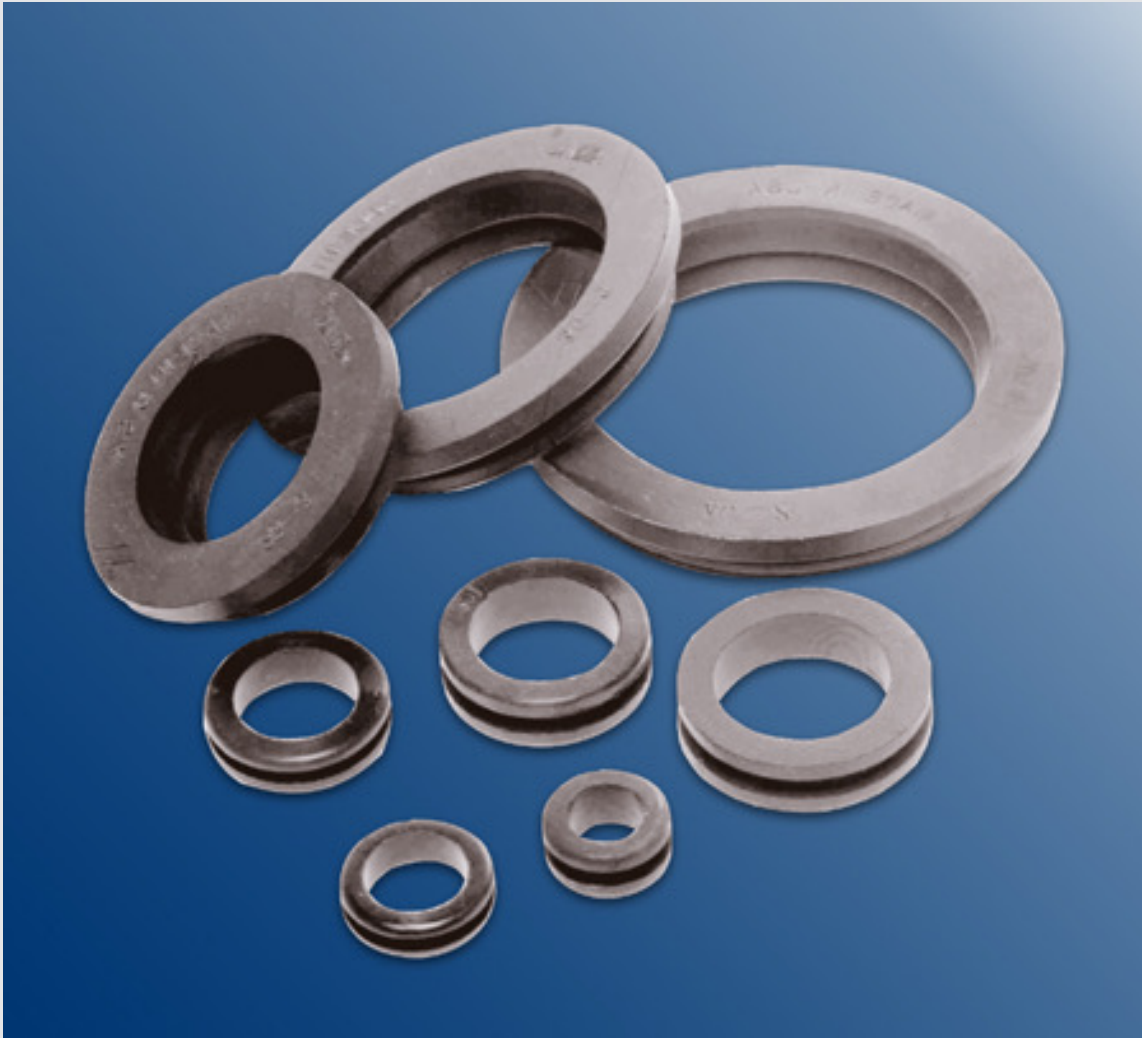
- MA320
- ADH200
- ADHP10



Riser Tools



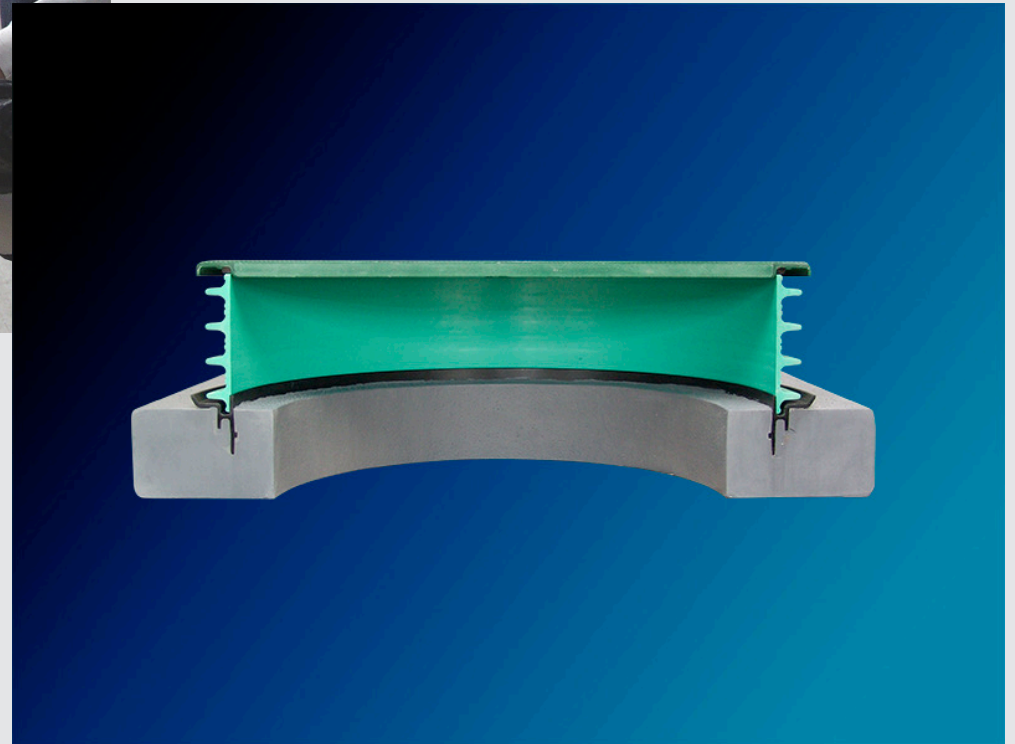
Grommets



Grommet Installation



Cast-In PRTA



Bolt-Down Kit



Bolt-Down Kit, cont.



Other Accessories

Carbon Filters

- Reduce or eliminate septic odors from the roof vent
- Carbon can be replaced
- Available in several sizes



Insulation Plugs and Riser Grates



Solutions for Decentralized Wastewater Treatment

Orenco Systems[®], Inc.

www.orencowater.com