Valencia Pipe Tanks
VALENCIA PIPE COMPANY

Septic Tank Buoyancy Mitigation Guidance

Buoyancy Control

Buoyancy control is a fundamental engineering challenge to prevent floating of polyethylene septic tanks in regions prone to high groundwater levels. Implementing proper septic tank buoyancy mitigation can prevent flotation that can lead to system failure and environmental concerns. Our tanks are designed to be used with buoyancy controls to counteract upward groundwater forces to ensure septic tanks remain securely anchored and functional.

Local and state regulations may require specific buoyancy control methods or other regulations that dictate the safety and environmental standards for septic system installation. When necessary, verify with the department that has jurisdiction to ensure a specified method is not required and that the proposed method will comply with government standards and regulatory requirements.

This document is Valencia Pipe Company's technical guide on recommended buoyancy control methods for our polyethylene septic tanks with insights into proven practices for mitigating buoyancy risks to ensure installations are secure and compliant.

Assessing Buoyancy Control Needs

Assessing when buoyancy control is needed is a critical step in septic tank installation. This section outlines the criteria and methods to determine buoyancy risks.

Criteria for Evaluating Buoyancy Risks

Evaluating buoyancy risk will involve an analysis of several factors, including the septic tank size, the installation location, and the underground groundwater height and saturation conditions. Considerations include:

- **Tank Size**: Septic tank size affects buoyancy concerns where larger tanks can present a higher floatation risk due to a greater displacement area.
- **Location and Topography**: Proximity to water bodies and the slope of the install site can influence groundwater behavior and affect buoyancy risks.
- **Groundwater Conditions**: Groundwater table levels, saturation, and seasonal variations play the largest role in buoyancy concerns and when mitigation is necessary.

Subsurface Water Level Measurements

Accurate subsurface water level measurements are necessary to assess buoyancy risks. Groundwater level assessment is often determined during site evaluation activities within the state septic tank permitting and approval process. These measurements will determine the potential for groundwater to exert upward pressure on the tank and therefore present buoyancy concerns.

Common Techniques for Assessing Site Conditions

Several techniques are often employed to assess site conditions and typically must be performed by a licensed or certified professional:

- **Geotechnical Surveys**: Designed to provide detailed information on soil composition, density, and permeability, which are essential for predicting buoyancy behavior.
- **Hydrological Studies**: Evaluates the movement and distribution of groundwater for insights into seasonal variations and potential risks.
- **Site Evaluation**: Standardized procedures in the permitting process ensure all relevant factors are considered, from initial site surveys to final installation assessments.

Indicators of Potential Buoyancy Issues

Recognizing indicators of potential buoyancy issues will allow proper septic tank installation and can prevent costly remedial actions. Key indicators include:

- **Soil Saturation**: Persistent soil saturation near the installation site is a leading contributor to buoyancy risk.
- **High Water Tables**: A high water table level can increase buoyant forces acting on the tank, especially during peak groundwater periods such as rainy seasons.
- **Unusual Settling or Shifting**: Any unexpected movement or settling of the tank post-installation should be investigated for buoyancy related causes.

Soil Cover Depth Requirements

The depth of soil cover over a septic tank is a significant factor in buoyancy control. Adequate soil cover provides a contrasting downward force that can successfully resist buoyant forces.

- **Allowable Burial Depth:** Valencia Pipe Company septic tanks have a minimum soil cover depth of 6 inches and a maximum burial depth of 30 inches.
- **Buoyancy Risk Depths:** Septic tanks installed 6 to 15 inches deep typically will require buoyancy controls if groundwater rises above set heights on the tank.

Groundwater Levels for Buoyancy Control

Buoyancy control methods are required when groundwater levels will exceed specified heights on installed septic tanks with less than 15 inches of soil cover. Deeper septic tanks installed with more than 15 inches of soil cover will not need buoyancy mitigation. If local soil conditions allow, septic tanks are recommended to be installed at depths exceeding 15 inches.

NO BUOYANCY CONTROL WILL BE NECESSARY FOR SEPTIC TANKS INSTALLED WITH GREATER THAN 15 INCHES (> 15″) OF SOIL COVER ON TOP OF THE TANK.

When installation with less than 15 inches of top of tank soil cover is required, refer to the following charts for recommended additional weights to serve as buoyancy control of septic tanks based on tank size, soil cover, and inches of groundwater above the base of the tank.

Buoyancy Mitigation Charts

Table 1: Recommended Additional Weight for 1000 Gallon Septic Tanks

Inches of Soil Cover On Top of Tank	Valencia Pipe Company 1000 Gallon Septic Tank Additional Weight Necessary (Pounds)				
	Inches of Groundwater Above Base of Tank				
	6	12	18	24	30
6		360	1890	3330	4860
9			540	2070	3510
12				720	2250
15					900
18					
21					
24					
27					
30					

Table 2: Recommended Additional Weight for 1500 Gallon Septic Tanks

Inches of Soil Cover On Top of Tank	Valencia Pipe Company 1500 Gallon Septic Tank Additional Weight Necessary (Pounds)				
	Inches of Groundwater Above Base of Tank				
	6	12	18	24	30
6		540	2700	4770	6840
9			810	2880	5040
12				1080	3150
15					1260
18					
21					
24					
27					
30					

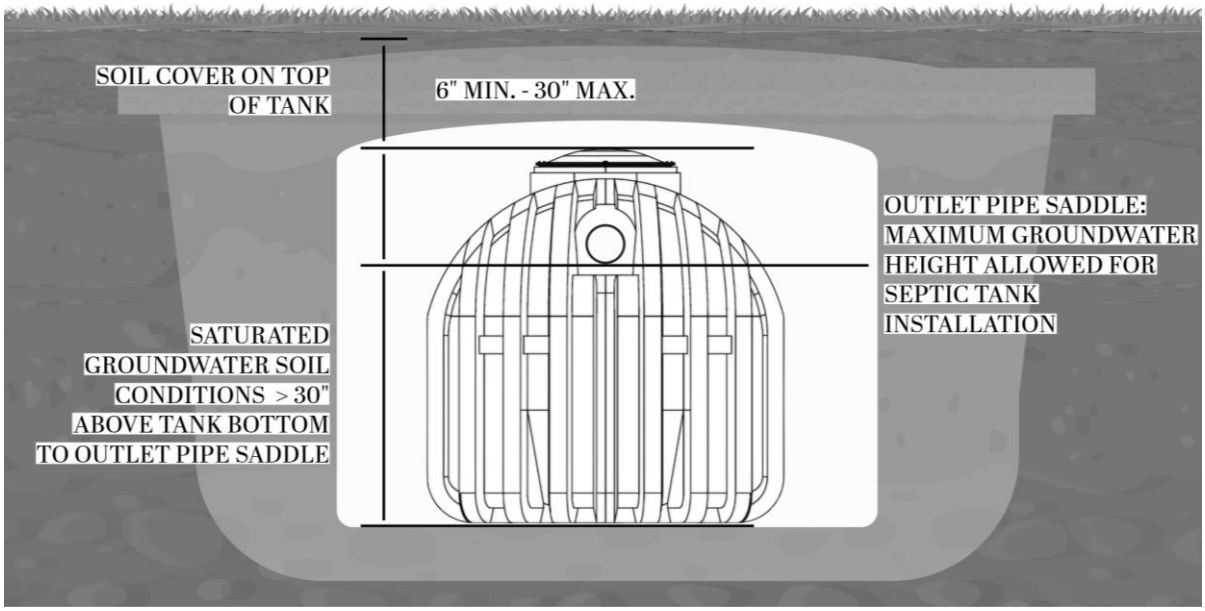
No additional weight or restraints necessary

Amount of extra weight / restraint necessary (In pounds)

Unacceptable Groundwater Height

If the site's groundwater height, either potential, seasonal, or actual, will be at a level equal to or above the septic tank's inlet / outlet pipe saddle, (> 40 inches) installation modifications are required. Buoyancy mitigation control cannot be used to compensate for install sites with these elevated groundwater heights. The septic tank location should be reevaluated or changed, or the burial depth of the tank increased with groundwater control methods used to keep the excavation dry during installation.

SEPTIC TANK INSTALLATION CONDITIONS



Selection of Buoyancy Control Methods

Selecting the appropriate buoyancy control method will ensure the stability and functionality of a polyethylene septic tank. This section provides an overview of available control methods and factors influencing their selection.

Overview of Available Control Methods

Several buoyancy control methods are available to counteract the upward forces exerted by groundwater through adding additional downward weight and/or restraint on the septic tank. Each method has distinct options and advantages:

- **Weighted Anchoring Systems**: Also known as deadman anchors, this method involves adding weight to the tank through wood beams or concrete beams, blocks, or plates positioned at each side of the tank with straps connecting the weights stretched over and across the top of the tank. The weighted anchor method is straightforward, relying on the gravitational force of added weight. This option is often cost effective and easy to implement but may require specific sourcing or creation of the anchors.
- **Ground Anchoring Products**: Ground anchors include helical or screw anchors and are designed to secure the tank to the underlying soil by being driven into the ground. Ground anchors are to be installed on each side of the septic tank. Straps are then used to connect the anchors and secure the tank in place. This method is particularly beneficial in areas with variable soil conditions. Ground anchors provide a highly secure method of fixing tanks in place. Installation can be more work intensive and may be more costly than the weighted anchoring method.

- **Concrete Collar Solution**: The concrete collar method involves pouring concrete around the full perimeter of the septic tank halfway through the backfill process of installation. This option adds significant weight to the tank itself and requires a fair amount of professional grade concrete. The concrete collar solution has fewer parts and installation steps compared to the other options but requires careful execution and will extend installation due to concrete curing times.

Factors that Influence Method Selection

The selection of a buoyancy control method depends on several factors:

- **Site Specific Conditions**: The topography, groundwater level, and soil composition at the installation site can influence method selection. Areas with high water tables will require heavier or stronger anchoring solutions.
- **Soil Type and Environmental Factors**: Sandy or loose soils may necessitate more extensive anchoring systems compared to clay or compact soils. Environmental considerations, such as flood risks, can also play a role in determining suitable methods.
- **Tank Size and Weight Considerations**: The size and weight of the septic tank itself dictate the extent of buoyancy control required. Larger septic tanks will need more anchoring compared to smaller units (compare Table 1 and Table 2).

Notes on Buoyancy Control Methods

Valencia Pipe Company does not advocate for any one particular buoyancy control method, brand, or product type over the other as septic tank installations are often unique and can vary significantly based on local site conditions and regulatory specifics. The weighted anchoring method is the most customizable and can be more easily tailored to site requirements. The ground anchoring method is the most definitive as it involves the use of products specifically made for applications such as septic tank buoyancy mitigation. The concrete collar method is a heavy weight option but requires a large amount of properly prepared and properly added concrete.

Instructions for Buoyancy Control Methods

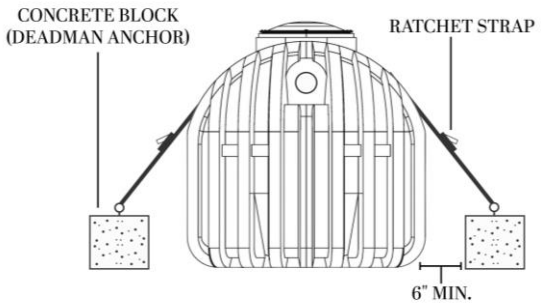
Implementing buoyancy control methods for polyethylene septic tanks will require careful planning and execution to ensure they work as intended.

1. Weighted Anchoring Systems:

- **When to Install**: Septic tank weighted anchors are to be installed following excavation and when the septic tank has been placed in the dig site, as properly prepared according to Valencia Pipe Company's installation instructions, and prior to any backfill.
- **Anchor Design Calculation**: Determine the required weight based on tank size and the recommendations listed in Table 1 for 1000 gallon septic tanks or Table 2 for 1500 gallon septic tanks.
- **Material Preparation**: Gather necessary materials, including concrete blocks, half-pipe beams, or plates and ensure they can provide the specified weight requirements when coupled with the downward force provided by the ratchet straps.
    - **Poured Concrete Blocks**: Minimum 2 per side.
    - **Concrete-Filled PVC Half-Pipe Beams**: Placed on both sides with length recommended to match necessary buoyancy weight requirement.
    - **Precast Concrete Plates**: Minimum 2 per side.
- **Anchor Placement**: Position the anchors on the left and right side of the septic tank ensuring they are evenly distributed to provide uniform stability.
    - **Placement Distance**: Place at minimum 6 inches from the septic tank, leaving sufficient room for backfill material. Never place beneath any part of the tank.
- **Integration with Tank**: Secure the anchors to the adjacent anchor on the other side of the tank, going over the tank using ratchet straps made from corrosion resistant materials (see Use of Ratchet Straps, below).

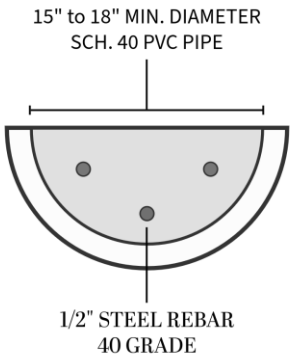
1a. Poured Concrete Blocks:

- **About**: Concrete cast molds can be used to create poured concrete blocks of sufficient width, depth, and weight to serve as a weighted ballast and anchor point. Use professional grade concrete cured to a minimum 6% air entrainment and rated to provide 3000 PSI compression strength after 4 weeks. Steel bar reinforcement is optional but recommended.
- **Anchor Straps**: Corrosion resistant connectors rated to 2500 lbs must be added to the concrete blocks when curing for ratchet strap hook attachment.
- **Min. Amount**: A minimum of 2 concrete blocks shall be used per side, evenly spaced, for a total minimum of 4 blocks.



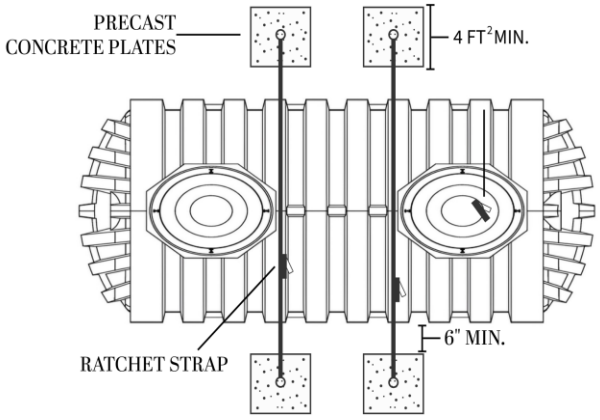
1b. Concrete-Filled PVC Half-Pipe Beams:

- **About**: Use Schedule 40 PVC pipe 15 to 18 inches in diameter, cut in half lengthwise, fill with concrete, and reinforce with steel rebar. Concrete shall have a minimum weight of 145 lbs/ft^3. Reinforcement shall be three (3) 40 grade, 1/2 inch diameter steel bars equally spaced lengthwise. Recommended pipe length is approximately 3/4 the full septic tank length.
- **Anchor Straps**: Corrosion resistant connectors rated to 2500 lbs shall be added to the concrete half-pipes when curing for ratchet strap hook attachment, or a loop and hook dual strap connection method can be used that wraps around the half-pipe.
- **Min. Amount**: An even two (2) concrete half-pipes shall be used, one per tank side.



1c. Precast Concrete Plates:

- **About**: Precast concrete plates can be used as anchors. They can be purchased or made onsite. Square concrete plates shall be used with a minimum surface area of 4ft^2 (2ft x 2ft) and at least 3 inches thick. Use professional grade concrete cured to a minimum 6% air entrainment and rated to provide 3500 PSI compression strength after 4 weeks. Steel bar reinforcement is optional but recommended.
- **Anchor Straps**: Corrosion resistant connectors rated to 2500 lbs must be added to the concrete blocks when curing for ratchet strap hook attachment.
- **Min. Amount**: A minimum of 2 concrete plates shall be used per side, evenly spaced, for a total minimum of 4 blocks.



2. Ground Anchoring Products

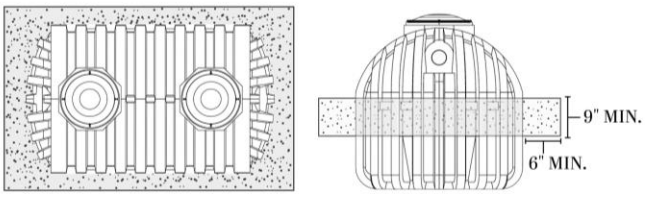
HELICAL SCREW AUGUR ANCHORS

- **When to Use**: Septic tank ground anchoring products (helical anchors or screw anchors) are to be installed following excavation and when the septic tank has been placed in the dig site, as properly prepared according to Valencia Pipe Company's installation instructions, and prior to any backfill.
- **Anchor Design Selection**: Choose a ground anchoring product of sufficient size and strength to provide the required downward force and buoyancy resistance needed based on tank size and the recommendations listed in Table 1 for 1000 gallon septic tanks or Table 2 for 1500 gallon septic tanks.
- **Points on Installation**: Follow manufacturer's guidelines on proper use and installation.
- **Anchor Placement**: Ground anchors shall be placed so the anchor eyelet is level with the septic tank base at a minimum distance of 6 inches from the tank wall.
- **Minimum Amount**: A minimum of 2 ground anchors shall be installed per side of the septic tank for a total of 4 anchors, minimum.
- **Integration with Tank**: Secure the anchors to the adjacent anchor on the other side of the tank, going over the tank using ratchet straps made from corrosion resistant materials (see Use of Ratchet Straps, below).

3. Concrete Collar

CONCRETE COLLAR (TOP VIEW)

CONCRETE COLLAR (FRONT VIEW)



- **When to Use**: Adding the concrete collar ring shall be performed when backfilling has reached the middle of the septic tank height and shall complete the entire perimeter of the tank.
- **Dimensions**: Concrete collar shall be a minimum 9 inches thick and a minimum 6 inches wide.
- **Points on Installation**: Use professional grade concrete cured to a minimum 6% air entrainment and rated to provide 3000 PSI compression strength after 4 weeks. When pouring, ensure concrete evenly fills between septic tank ribs. Steel bar reinforcement is optional.
- **Anchor Placement**: No additional anchors, straps, or reinforcement necessary when properly installed.
- **Integration with Tank**: Concrete is poured around the septic tank and cures to the tank walls. No additional tank integration measures are needed.

Use of Ratchet Straps:

- **Recommended Types:** Only use durable ratchet straps made from materials resistant to the corrosive effects of underground burial.
    - For the straps, use polyester or nylon. Recommended strap width is 2 inches.
    - For the ratchet and hooks, use stainless steel, galvanized steel, or corrosion resistant epoxy coated steel.

- **Recommended Strength:** Straps and ratchet shall have a load limit minimum of 3300 lbs and break strength minimum of 10000 lbs.
- **Strap to Tank Placement**: Straps shall be placed flat across the top of the tank or within the tank ribs. Do not place over manway lid(s).
- **Strap Installation**: Use ratchet strap hooks to connect opposing anchor eyelets. Use strap ratchet mechanism to remove all slack from straps, tightening to slightly load the tank. Do not over tighten as it could cause damage to the tank.

Coordinating with Tank Installation

- **Synchronization**: Coordinate the installation of buoyancy control methods with the overall tank installation timeline to prevent delays. This can include sourcing of products or materials or creating anchors.
- **Site Evaluation Integration**: Include buoyancy control assessments alongside initial site evaluation and reviews to identify potential issues early.

Support

The buoyancy mitigation control methods provided in this guidance document are recommendations only and provided without warranty or implied guarantee on results or suitability due to variables and variations in site conditions and geological factors. Always adhere to Valencia Pipe Company's septic tank installation instructions and follow manufacturer's instructions on specific products when used.

For complex scenarios or when uncertainties arise during installation, consult a state licensed professional engineer for support and custom solutions.

For questions regarding Valencia Pipe Company's septic tanks, our team is available for assistance. Please contact our technical support team at:

- **Phone**: 1-661-257-3923
- **Email**: info@valenciapipe.com
- **Website**: www.valenciapipe.com/contact

Appendix

Glossary of Terms and Definitions

- **Anchoring System**: A method used to secure a septic tank in place, preventing it from floating or shifting due to buoyant forces.
- **Backfill**: The process of refilling an excavation site around a septic tank with soil or other materials to provide stability and support.
- **Buoyancy**: The upward force exerted by a fluid that opposes the weight of an object submerged in it.
- **Compaction**: The process of increasing the density of soil by mechanical means to improve stability and support for septic tanks.
- **Concrete Reinforcement**: The use of steel bars or mesh within concrete to increase its tensile strength and load-bearing capacity.
- **Excavation**: The process of removing earth to create space for septic tank installation, requiring careful planning to avoid buoyancy issues.
- **Groundwater Table**: The upper level of an underground surface at which the ground is saturated with water, crucial in determining buoyancy risks.
- **Hydrological Study**: An analysis conducted to understand water movements and distribution in a specific area, important in assessing buoyancy risks.
- **Load Limit**: The maximum weight a structure or material can support without failing, important for determining the strength of anchoring systems.
- **Permeability**: The ability of soil or rock to allow water to flow through it, impacting groundwater behavior and buoyancy considerations.
- **Polyethylene**: A durable plastic material used in the construction of septic tanks due to its resistance to underground corrosion and water infiltration.
- **Saturation**: The extent to which soil or rock in a given area is filled with water, which affects the buoyancy of structures.
- **Strap Fittings**: Hardware used to secure straps around a tank, ensuring stability against buoyant forces.
- **Subsurface Water Level**: The level of water present below the ground surface, influencing the buoyancy of underground structures.