

Tie-Down Fuel Tanks

Overview

Design Recommendations:

- **Mounting to a concrete slab or counterweights:**
 - Mount or strap tank to a concrete slab.
 - Strap fuel tank to concrete counterweights on both sides of the tank.

~ OR ~

- **Strapping a tank to earth augers:**
 - Attach straps to earth auger anchors.
 - Generally, increasing the number and/or the size of the augers increases total holding strength.

Tips:

- Expected buoyancy forces must be calculated to make sure that the tie-downs are strong enough to withstand all flooding forces.
- Straps must be made of non-corrosive material, especially in coastal areas.
- If possible, fill tank completely before flood event as it is less likely to float.
- This measure should not be used if the tanks could experience velocity flooding.



Photo credit: Only in Oregon licensed under CC

Key Takeaways

During flood events, ground level fuel tanks can dislodge. Unsecured tanks could leak, catch on fire, and/or explode.

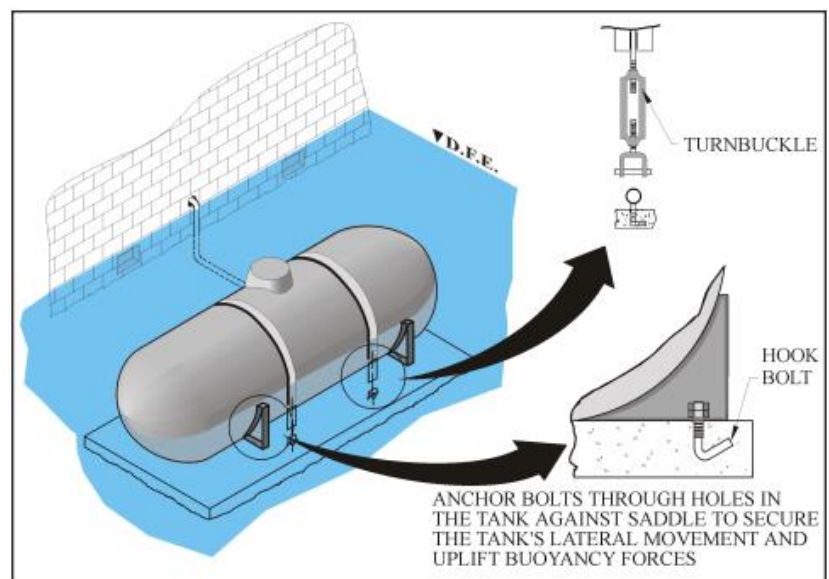
Additionally, the tank could become a floating projectile with the potential to cause extensive damage to other property.

To avoid hazardous conditions and reduce associated costs, fuel tanks should be secured to the ground using tie-downs or anchors.


Estimated Costs/Benefits

*U.S. dollars (2022), estimates are subject to change

Potential Costs		Potential Benefits	
Item (quantity)	Estimate	Post-Flood Recovery Actions	Estimate
Set of 2 tie-down straps	\$50	Installation of a new fuel tank	\$800-\$3,800
Set of 4 ground anchors	\$30	Anchoring of new fuel tank	\$65-\$80
OR			
Set of 4 turnbuckles	\$20	Gas line damage repair	\$270-\$760
80-pound bags concrete mix (3)	\$15 per bag		
ESTIMATED TOTAL COST	\$65-\$80	ESTIMATED TOTAL SAVINGS	\$1,135-\$4,640



A typical tie down strap configuration of a horizontal propane tank. Credit: FEMA



I-ADAPT

Exterior Adaptation Tie-Down Fuel Tanks

Expected Maintenance

Monthly maintenance

- Check for damaged tie-downs.
- Check for cracks or other damage in the concrete slabs/counterweights.

Periodic maintenance

- Replace straps, anchors, concrete slabs or augers in the event of damage or deterioration.
- Re-evaluate fuel tank system to determine if it will be effective during flooding. If not, consider elevating the fuel system onto a platform above the Base Flood Elevation line.

Additional Resources

- [FEMA Homeowner's Guide to Retrofitting \(Chapter 8\)](#)
- [Delaware Homeowners Handbook to Prepare for Natural Hazards](#)
- [FEMA Principles and Practices for the Design and Construction of Flood Resistant Building Utility Systems](#)

Resources can also be found at <https://de.gov/iadapt>

Additional Actions

- Other equipment may need to be moved.
- To protect tank from debris impact, protective wet floodproofed walls can be built around the tank.

Permitting Agencies

Contacts for permitting requirements include but are not limited to the following:

- Your city and/or county government for local flood ordinances or regulations
- Your city and/or county government for building permits
- [DNREC Coastal Construction Permit](#)

Who to Contact

- [811 Call Before You Dig](#)
- Gas company
- Geotechnical engineer or other professional to install concrete slabs

Technical definitions and more information are located on the I-ADAPT website: <https://de.gov/iadapt>.



This information is intended to be used for planning purposes. It is not intended to substitute or take precedence over the guidance of design engineers, contractors, utility companies or regulatory agencies.

For more information, contact DNREC's Division of Climate, Coastal and Energy at DNREC_IADAPT@Delaware.gov

