



Cost Estimation: Underground Fuel Tank

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Assumptions



- Construction requirements in the past are the same requirements necessary today.
- Technology and production has improved so cost may be less with equivalent material.
- Tanks are constructed to the same degree of or better quality than in 1991.
- Use the average between the lowest and highest cost values to determine cost estimate.
- We will only use tanks holding 10,000 gallons or less. (Supports dispersion)





Cost Estimation Sources



Sources:

CommTank (2023)

- Commercial underground fuel tank installation company

Explosive Weapons Effects (2017)

- Weapons effects for similar Russian precision guided munitions

Terre Armee (2023)

- Reinforced earthen wall retailer

US Army Corps of Engineers Special Report (1991)

- Concerns the installation or deconstruction of underground fuel tanks and associated wells on Fort Dix.





Cost Estimation – Underground Fuel Tank



Cost estimation for one 10,000 gallon, single-walled, underground fuel tank:

Tank Cost:

- Single walled tank with asphalt and epoxy coating with sacrificial anodes
- Single walled tank with fiberglass coating
- Single walled tank with reinforced-fiberglass plastic coating

Then-Yr \$/Inflation Index = Base-Yr \$

$$\$4,500/0.5551 = \$8,106.65$$

$$\$6,000/0.5551 = \$10,808.86$$

$$\$5,500/0.5551 = \$9,908.12$$

Installation:

- Crane lowering, excavation, leak and structure tests, delivery pipes, monitor installation, backfilling.

$$\$6,500/0.5551 = \$11,709.60$$

Monitoring Equipment:

- Sensor system to connect all tanks
- Electronic inventory control system
- Tank leak test
- Drilling for well monitor
- Well vapor sensor
- Well petroleum sensor

$$\$950/0.5551 = \$1,711.40$$

$$\$5,500/0.5551 = \$9,908.12$$

$$\$750/0.5551 = \$1,351.11$$

$$\$475/0.5551 = \$855.70$$

$$\$900/0.5551 = \$1,621.33$$

$$\$500/0.5551 = \$900.74$$



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Inspiration → Imagination → Innovation → Invention → Implementation → Impact





Total Cost: One Single Walled 10K Gallon Tank



Lowest Cost Option

\$28,058.00 + \$8,106.65

\$36,164.65 FY23\$

Value Option

\$28,058.00 + \$9,908.12

\$37,966.12 FY23\$

Premium Option

\$28,058.00 + \$10,808.86

\$38,866.86 FY23\$

Considering effectiveness:

- Current Russian/Ukrainian Munitions use 96kg of HE – produces overpressure above 117kPa.
- From 16 meters of impact – steel fragments penetrate up to 32mm of steel armor and 200mm of concrete.
- Produces a crater depth between 0.76 meters and 4.27 meters.

Conclusion:

- Underground tanks avoid fragmentation effects and are very effective if deep enough.
- Tanks may be installed as deep as 40ft below ground. Deep enough to avoid crater effects.
- Effects may be mitigated using earth-reinforced walls on top of the underground tanks.

