

## **Steel vs. Concrete – A Life Cycle Cost Analysis**

Prospective water tank owners are faced with a myriad of options and details when planning the constructing a new storage tank. The very first, and probably the key decision to be made is whether the tank should be constructed of steel or concrete. To make the decision even more mystifying, fabricators of each type of tank readily espouse the superiority of their product in ads and sales literature.

One way to compare the two types of construction is to utilize a life cycle cost analysis. The following case study illustrates the experience of one water utility with both steel and concrete water storage tanks within their distribution system.

In 1953, the Philadelphia Suburban Water Company contracted with a concrete tank fabricator to build two 5-million gallon pre-stressed concrete water storage tanks. Each tank was 126 feet in diameter and 54-feet high. The total cost for this project was \$486,000.

During the service life of the tanks, several major maintenance procedures were performed. In 1963, the roof of Tank #1 was replaced due to the deterioration of the concrete and potential for structural damage to the tank. Both tank roofs underwent extensive repairs to stop leaks in the tanks, and in 1976 both tank roofs were abrasive blasted and a sealed with a water-proofing material to prevent water intrusion into the tanks. In 2001, the tanks, no longer viable structures within the system, were demolished, disposed of, and replaced by welded steel tanks. The project cost for demolition and replacement of the two tanks was \$2,223,000.

In 1961, an additional tank was added to the water system—a steel tank. A 5-million gallon steel reservoir was erected at a cost of \$190,000. A fourth tank, also steel, was added to the system in 1963 for \$205,000. Maintenance performed on these tanks includes interior repainting with a 3-coat epoxy system, and an exterior overcoating in 1993. These tanks are still in service today and in excellent condition. Steel was selected for these tanks for the same reasons that steel was chosen to replace the failed concrete tanks—the costly maintenance of the concrete tanks was ineffective in prolonging their useful life.

To summarize the life cycle costs of the four tanks:

**Concrete Tanks – 48-Year Service Life**

	<b>Total Life Cycle Cost</b>	<b>Average Cost per Year to Build, Maintain, and Replace the Tank</b>
Tank #1	\$1,776,250	\$37,005
Tank #2	\$1,639,250	\$34,151

**Steel Tanks – 44 and 46 Years Service to Date**

	<b>Total Life Cycle Cost</b>	<b>Average Cost per Year to Build and Maintain the Tank</b>
Tank #3	\$307,250*	\$6,679
Tank #2	\$326,250*	\$7,415

\* Costs as of 2001

At detailed schedule of costs follows.

**Conclusion**

Life cycle cost analyses have been effectively used for many years to assess the cost effectiveness of purchases. The life cycle cost analysis illustrated here is typical of analyses run on steel and concrete tanks nationwide and clearly indicates that steel is the most cost-effective material for the construction and maintenance of water storage tanks. Properly designed, constructed, and maintained steel water storage tanks have a virtual limitless life and year after year demonstrate their value.

**Construction and Maintenance Costs  
North Wayne Tank Farm  
Philadelphia Suburban Water Company**

	Tank #1	Tank #2	Tank #3	Tank #4
1953	Concrete Construction \$243,000	Concrete Construction \$243,000		
1961			Steel Construction \$190,000	
1963	Replace Dome Roof \$137,000			Steel Construction \$205,000
1973	Repairs to Stop Leaks \$273,000	Repairs to Stop Leaks \$273,000		
1976	Roof Blasted & Sealed \$ 5,250	Roof Blasted & Sealed \$ 5,250		
1978			Interior Repaint \$ 78,000	
1983				Interior Repaint \$ 82,000
1993			Exterior Overcoating \$ 39,250	Exterior Overcoating \$ 39,250
2001	Replaced with Steel \$1,118,000	Replaced with Steel \$1,118,000		
2007			Still in Service	Still in Service
<b>Total Cost</b>	<b>\$1,776,250</b>	<b>\$1,639,250</b>	<b>\$307,250</b>	<b>\$326,250</b>
<b>Average Cost/Yr</b>	<b>\$ 37,005</b>	<b>\$ 34,151</b>	<b>\$ 6,679</b>	<b>\$ 7,415</b>