

## **CEEn-2017CPST-012**

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# **LDS Church Camp Concrete Storage Tank**

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## Introduction

- Location: Shawnee & Ben Lomond Campgrounds near Liberty, UT
- 2 – 25,000 gallon concrete water tanks
- ~50 year old
- Worn and cracked in places
- Refurbish or replace?

**South Tank – Raw Water**  
→



**North Tank –  
Treated Water**





## Site Observations

### Site Visit Observations

- Exposed Rebar
- Exposed Aggregate
- Cracking
- Efflorescence



Exposed Rebar



Exposed Aggregate



Cracking

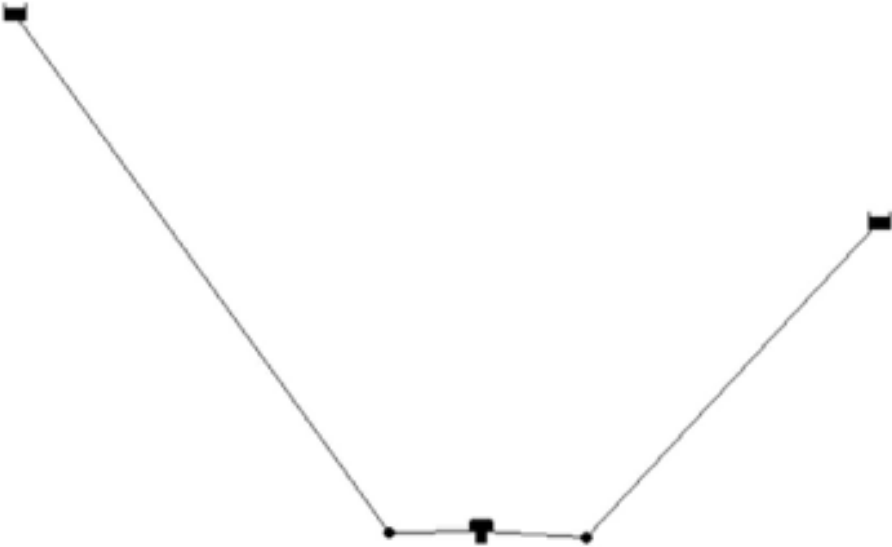


Efflorescence

# Hydraulic Analysis

Link ID	Flow (GPM)	Velocity (fps)	Headloss ft/Kft	Friction Factor
Pipe 1	109.56	4.97	27.03	0.018
Pipe 2	109.56	4.97	27.05	0.018
Pipe 3	92.17	4.18	19.80	0.018
Pipe 4	92.17	4.18	19.82	0.018

Node ID	Demand GPM	Head (ft)	Pressure (psi)
Junc 4	0.00	5580.27	4.45
Junc 5	0.00	5580.20	4.42
Resvr 1	-109.56	5610.00	0.00
Resvr 2	-92.17	5600.00	0.00
Tank 3	201.73	5580.00	4.72





## Test Results

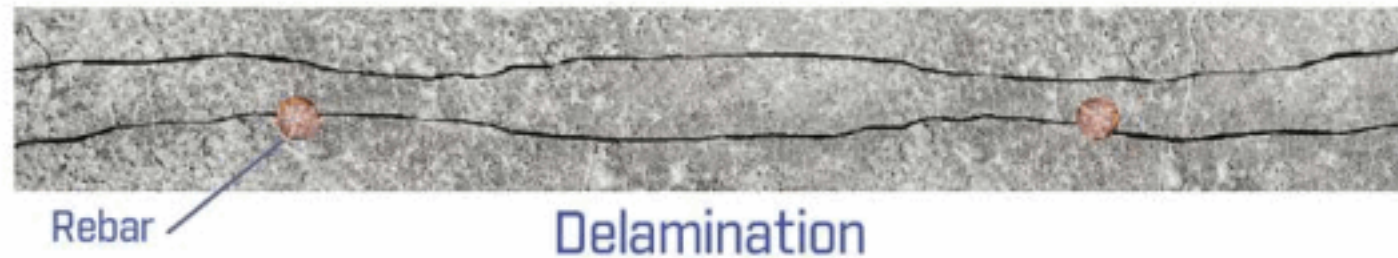
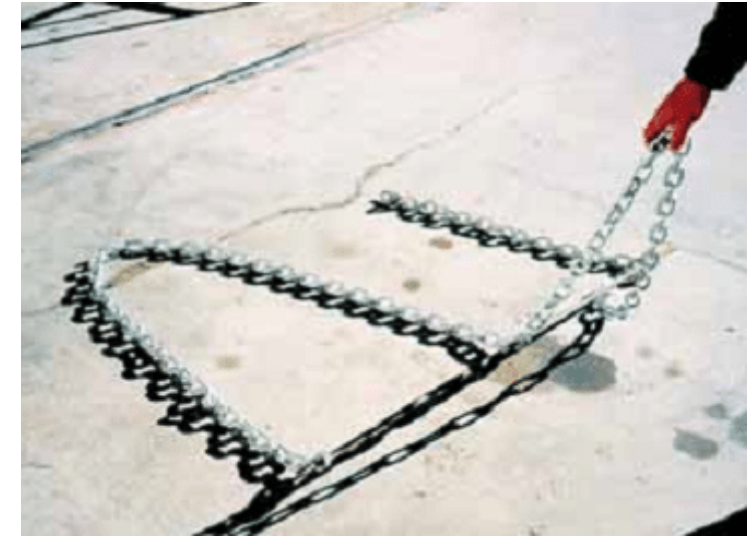
### Non-Destructive Concrete Testing



Hammer Test



Chain Test



## What are possible solutions?

### Refurbishment

- Coat Inside and top of tanks with Xypex
- Durable, proven, and easy to apply
- Low Cost
- Low Risk
- NSF Certified



## What are possible solutions?

### Replacement

- Replace Concrete tanks with Fiberglass Tanks
  - Light-weight, reasonably priced, and long lasting.
  - Knowing the structural integrity and plans of the tank
  - Best option to ensure long-term reliability of tanks





## What are possible solutions?

### ○ Other Options

- Do nothing
- Use the bottoms of the tanks as foundations for fiberglass tanks





## Our Recommendation

- Coat inside and top of tanks with Xypex



	Above Ground	Below Ground
1 tank	\$ 22,196.99	\$ 57,999.99
2 tanks	\$ 44,393.98	\$ 115,999.98

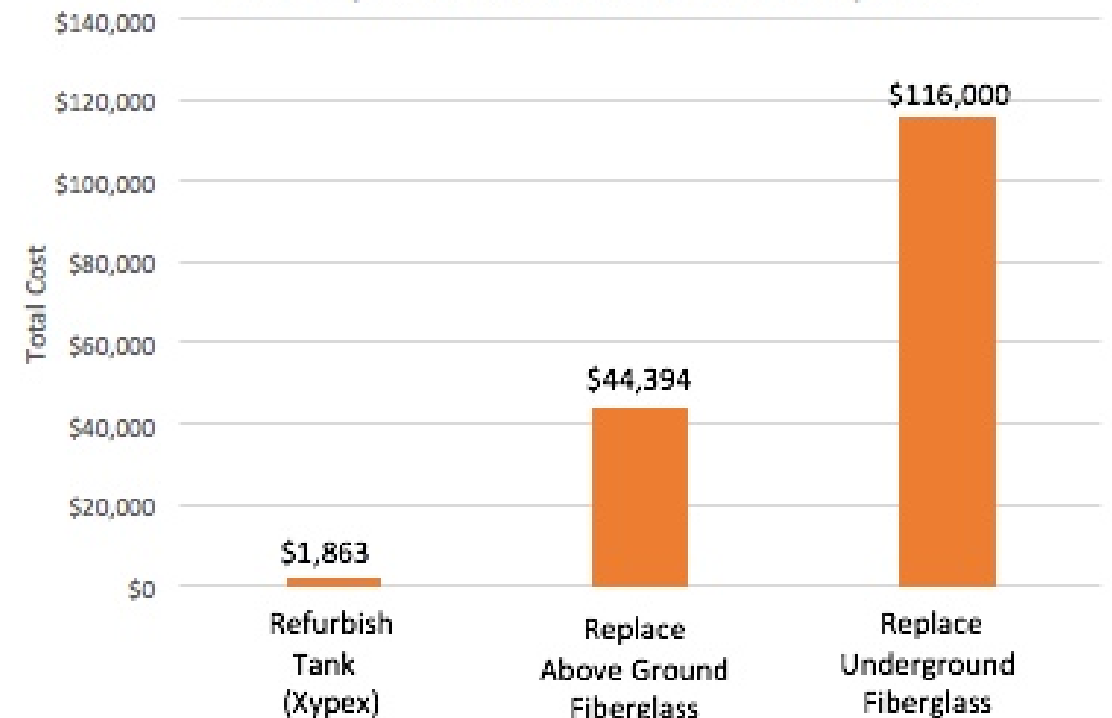
  

Approximate Tank Dimensions		
Outer Diameter	19	ft
Inner Diameter	18	ft
Inner Radius	9	ft
Inner Volume	25000	gal
Inner Volume	3342.0	ft <sup>3</sup>
Inner height	13.13	ft
Inner Surface Area	1251.6	ft <sup>2</sup>
Top Surface Area	283.5	ft <sup>2</sup>

Xypex Info	
1.5	lb/yd <sup>2</sup>
60	lbs/bucket
169.4	\$/bucket

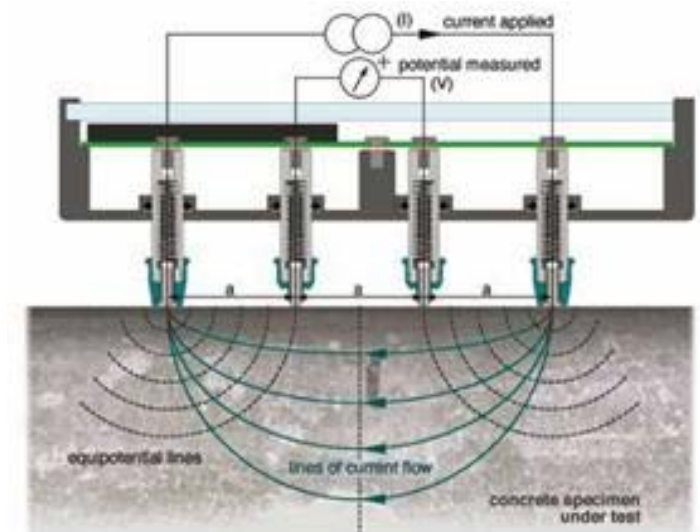
Amount needed	Lbs	Buckets	Cost
One Tank	319.8	6	<b>\$1,016.40</b>
Both Tanks	639.6	11	<b>\$1,863.40</b>

Tank Improvement Material Cost Comparison



## Recommendations for Further Analysis

- Perform within the next 10 years
  - Cover-meter test - finds where the rebar is located
  - Resistivity test – determines if rebar is corroding
- Other possible tests
  - Half-Cell electrical potential test – Similar to resistivity test
  - Ultrasonic test - uses acoustic waves to measure properties



## Sources

- **Xypex Prices**

- [https://www.amazon.com/Xypex-CON-Concentrate/dp/B00JH0DN1C/ref=sr\\_1\\_1?ie=UTF8&qid=1522820481&sr=8-1&keywords=xypex+concentrate](https://www.amazon.com/Xypex-CON-Concentrate/dp/B00JH0DN1C/ref=sr_1_1?ie=UTF8&qid=1522820481&sr=8-1&keywords=xypex+concentrate)

- **Fiberglass Tank Prices**

- <http://www.plastic-mart.com/product/14638/nationwide-tank-33500-gallon-fiberglass-tank-ntp15x24frp>
- <http://www.plastic-mart.com/product/17020/25000-gallon-underground-potable-drinking-water-tank-10-45pot>