

**LDS Church Camp Concrete Storage Tank
Replacement/Restoration Study
Project ID: CEEEn_2017CPST_012**

by

**Genesis Engineering
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A Capstone project submitted to

**Roy McDaniel
The Church of Jesus Christ of Latter Day Saints**

**Department of Civil and Environmental Engineering
Brigham Young University**

10/30/2017

Introduction

PROJECT TITLE: LDS Church Camp Concrete Storage Tank Study
PROJECT ID: CEEEn-2017 CPST-012
PROJECT SPONSOR: The Church of Jesus Christ of Latter-Day Saints
TEAM NAME: Genesis Engineering

There are currently two concrete water tanks in use on a campground operated by The Church of Jesus Christ of Latter-Day Saints. One tank is a raw water tank, where water from two spring sources and one domestic source is stored. The other tanks stores the water treated from the raw water tank to be used throughout the campground. Currently the raw water tank can only accomodate having one source open at a time to fill the tank. The client wishes to determine what changes need to be made in order to have multiple sources open at a time.

The project can be summarized as having three main components: 1) Determine whether the water tanks are structurally sound and are still viable for the client's needs, 2) Perform an hydraulic analysis to determine what changes are to be made to the system, 3) Deliver a cost analysis and presentation summarizing the results of the findings

A list of the project's requirements, objectives, tasks, and deliverables can be found below. A general overview of the project schedule can be also found, with a more detailed schedule found on page 4 of this proposal.

Project Requirements

- Fulfill the project objects, tasks, and deliverables in a timely and professional manner

Project Objectives

- Inspection to determine the structural stability of the concrete tanks
- Resolve the issue of how to get both springs to flow into the water tank at the same time

Project Tasks

- Learn how to perform a non-destructive materials test
- Perform a non-destructive materials test
- Learn how to perform a hydraulic analysis
- Perform a hydraulic analysis

Project Deliverables

- Report discussing the results of the hydraulic analysis and hydraulic model
- Concept drawings of recommended design changes
- Cost of the recommended solution
- Monthly Status Report

General Project Schedule

- 9/25/2017 - 10/30/2017: Site Visit
- 10/25/2017 - 12/15/2017: Project Proposal/Finalize contract
- 1/52018 - 4/25/2018: Perform hydraulic/material/cost analysis and present findings

Proposed Work Plan

In order to determine whether the concrete tanks are suitable for the project it was determined that a non-destructive material test is to be performed. Outside advisors will be consulted to determine how exactly this test is to be done to achieve accurate and relevant results. The test itself, after learning the correct procedure, will be carried out by the team working on the project. The test will be carried out at the location site. The results will be recorded and brought back to BYU campus, where they will be interpreted and summarized in a report. The test and calculations will be performed collaboratively by the team, whereas the report will be assigned to one person.

A hydraulic analysis is also needed, to determine if the current system layout is appropriate for the client's needs. As with the material test, an outside consultant will have to be contacted in order to gain the relevant knowledge necessary to perform a hydraulic analysis. Upon gaining an understanding of the procedure the necessary measurements will be found, likely on site with the entire team present. These results will be brought back and interpreted and again summarized in a report, following the general outline as described in the paragraph above.

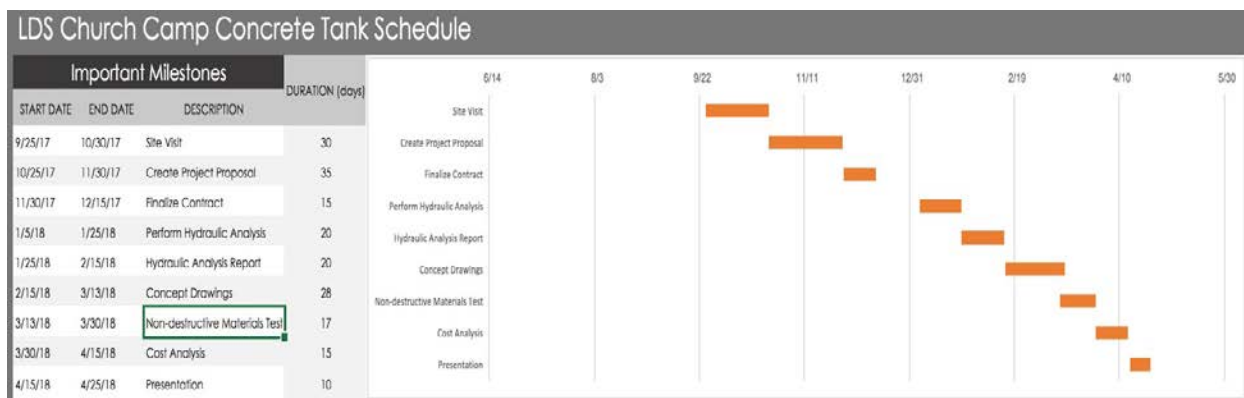
Using the reports and their findings it will be determined what changes are to be done to meet the client's needs. A cost analysis will accompany these results.

The aforementioned reports will be part of the deliverables, along with a presentation summarizing the findings and potential cost to change the system to the standards set forth by the client.

Schedule

The following tables show the important project milestones. More time-consuming milestones will be concentrated in the 1st quarter of 2018 when the student members of the team will have additional time each week to dedicate to each milestone. Timeline and milestone are subject to change as needed. The final milestone (Presentation) will include a full report of the findings of the study.

A timeline for meetings has yet to be established.



Facilities, Tools, Data and Equipment

Resources expected to be used in completion of the project include, but are not limited to the following:

- Construction plans of the two water tanks
- A horizontal layout of the water system, including contours
- Flow records for the area
- Water modelling software
- Non-destructive materials testing equipment
- Access to the campgrounds
- Guides and resources on water tank construction
- Cameras to take pictures during site visits

Other materials, resources, data of equipment may not listed above may also be necessary to complete all requirements for the project.

Project Budget

For the duration of the 4th quarter of 2017 each student will be expected to contribute 1-3 hours each week toward the completion of the project objectives.

For the duration for the 1st quarter of 2018 each student will be expected to contribute 8-10 hours each week toward the completion of the project objectives.

Deliverables

The minimum deliverables upon project completion will include a report in PDF format discussing the results of any hydraulic analyses and hydraulic models. This report will also include concept drawings detailing any recommended design changes. The estimated costs of the recommended solution, and any alternatives will be detailed in the report.

Additional deliverables will include a monthly status report delivered to sponsors and other involved parties. The monthly status report will include details such as challenges encountered through completion of project duties, and actions taken to overcome those challenges. Progress on completion and any necessary changes to procedures will also be detailed in the monthly progress report.

Upon completion of the project, a poster will be made, and a presentation given to the sponsor detailing the overall scope of the project, actions taken, resources used, challenges encountered, and final products and recommendations. The report will include a profile of the two springs, and two tanks, with the hydraulic grade line of the spring flow. Recommendations will be given both on how to enable both springs to flow into the water tanks simultaneously, and which course of action to take to reduce overall long term costs and ensure water quality within the two water tanks at Camps Ben Lomond and Shawnee.

Any other deliverables deemed necessary by both Sponsor and Project group may also be added to the list of deliverables.

Performance Standards

Team will provide work for this Capstone project “as is” using best practices and with best effort. Project results cannot be construed as work performed by licensed professionals and cannot be used as “stamped deliverables” without first being reviewed, approved and stamped by a qualified and relevant license professional engineer.

Statement of Qualification

Dr. Fernando S. Fonseca- Structural Engineering

Education:

- University of Illinois at Urbana-Champaign, PhD, 1997
- Brigham Young University, MS, 1988
- Brigham Young University, BS, Magna Cum Laude, Civil Engineering, 1987

Work Experience:

- Professor, BYU, (2017-present)
- Associate Professor, Civil Engineering, BYU, (2003-2017)
- Assistant Professor, Civil Engineering, BYU, (1996-2003)
- Engineer, Karren and Associates (1988-1991)

Sample of Principal Publications:

- Shuangzhen Wang, Emilio Llamazos, Larry Baxter and Fernando Fonseca, (2008). Durability of biomass fly ash concrete: Freezing and thawing and rapid chloride permeability tests, Fuel, Volume 87, Issue 3, March 2008, Pages 359-364.
- Shuangzhen Wang, Amber Miller, Emilio Llamazos, Fernando Fonseca and Larry Baxter, (2008). Biomass fly ash in concrete: Mixture proportioning and mechanical properties, Fuel, Volume 87, Issue 3, March 2008, Pages 365-371.
- Shuangzhen Wang, Larry Baxter and Fernando Fonseca, (2008). Biomass fly ash in concrete: SEM, EDX and ESEM analysis, Fuel, Volume 87, Issue 3, March 2008, Pages 372-379.
- Fonseca, F. S., Judd, J. P., and Burns, J. (2006). "Strength of Plywood Joints with Overdriven Nails." Forest Products Journal, Forest Products Society (FPS), Vol. 56, No. 7/8.
- Judd, J. P., and Fonseca, F. S. (2006). "Equivalent single degree of freedom model for wood shearwalls and diaphragms." Proceedings, 9th World Conference on Timber Engineering, August 6-10, Portland, Oregon.
- Judd, J. P., Fonseca, F. S. (2005). "Analytical model for sheathing-to-framing connections in wood shear walls and diaphragms." Journal of Structural Engineering, American Society of Civil Engineers, Vol. 131, No. 2, 345-352.

Dr. Rollin Hotchkiss - Hydraulics and Water Resources

Education:

- University of Minnesota, PhD, Civil Engineering, 1989
- Utah State University, MS, Civil Engineering, 1979
- Brigham Young University, BS, Civil Engineering, 1976

Work Experience:

- Ira A. Fulton Professorship in Leadership, College of Engineering and Technology, Brigham Young University (2010 – Present)
- Professor, Civil and Environmental Engineering, BYU, (2005-present)
- Associate Professor, Civil and Environmental Engineering, Washington State University, (1998-2005)
- Associate Professor, Civil and Environmental Engineering, University of Nebraska-Lincoln, (1995 – 1998)
- Assistant Professor, Civil and Environmental Engineering, University of Nebraska-Lincoln, (1989 – 1995)
- Civil Engineer, Flood Protection Branch, Tennessee Valley Authority, (1979-1985)

Sample of Principal Publications

- George, Matthew W., Rollin H. Hotchkiss, and Ray Huffaker. Reservoir Sustainability and Sediment Management. *Journal of Water Resources Planning and Management*. Just Released Oct 24.
- Hinton, Darren and Rollin H. Hotchkiss. Comprehensive and Quality-Controlled Bedload Transport Database. *Journal of Hydraulic Engineering*, Just Released Sep 28. Thiele, Elizabeth A., Rollin H. Hotchkiss, and Philip L. Thompson. 2009. Discussion of “Hydraulic performance curves for highway culverts.” *Journal of Hydraulic Engineering*, 135(3): 242-244, March
- Kern, Ed, Rollin H. Hotchkiss and Daniel P. Ames. 2015. Introducing a Low-Head Dam Fatality Database and Internet Information Portal *Journal of the American Water Resources Association* 51(5): 1453-1459, October.
- Pineda-Martínez, Luis F., Oscar Dzul García, and Rollin H. Hotchkiss. 2014. Implications of Maximum Daily Precipitation on streamflow of a watershed: a case Study in Zacatecas, Mexico. *International Journal of River Basin Management* 12(4): 411-418.

Description of Team

The team that uniquely qualified for this project is a group of three engineering students currently enrolled at BYU. They have each worked in a variety of internships, giving them valuable experience working in the field. They have all been in the civil engineering program for a few years which has allowed them to take classes covering various branches of the profession.

The division of labor is yet to be exactly determined, though most likely the tasks will be split equally amongst the team, to ensure that effort and time is used most effectively. These tasks would consist of the hydraulic analysis of the system, the non-destructive materials test, and the reports accompanying these analyses. Other tasks will be worked on collaboratively, such as the concept drawings and final presentation.

Appendix A

Timothy Seth Richardson

2108 N 120 W APT 289 Provo, UT

801-719-9727

t.seth.richardson@gmail.com

Objective

Seeking an internship or entry level employment with the church

Experience

Construction Management Intern

Staker-Parson

May 2016–Aug 2016

- Assisted project managers in interpreting and processing engineering plans in order to make bids
- Wrote and distributed detailed notes of coordination meetings to help managers remember main points of the meeting and know what assigned tasks they should perform by the next meeting
- Programmed custom Excel spreadsheets for Operations Manager to make his work more efficient
- Helped Grading Systems Engineer in obtaining measurements and setting up equipment on job sites
- Learned to use Business Center and Plan Swift software

Computer Lab Attendant

Brigham Young University

Jan 2015–Present

- Proctored 3-5 language oral interviews a week for students seeking to obtain language certification
- Maintained lab audio and visual equipment for student and employee use
- Managed 2-4 digitization projects for department faculty each week
- Trained new employees in work policies and procedures
- Helped resolve student and employee questions and concerns.

Full-time Volunteer Representative

The Church of Jesus Christ of Latter-day Saints

Oct 2012–Nov 2014

- Increased self-discipline through 10-14 hours of daily service and personal study
- Taught English as a Second Language (ESL) classes for up to 12 students
- Led a group of 20-30 volunteers, conducted weekly training meetings, and submitted weekly progress reports

Food Service Worker

Polynesian Cultural Center

Jun 2008–Oct 2012

- Fulfilled various assignments based on customer need
- Earned employee of the month 3 times for excellent customer service

Education

BS in Civil Engineering

Brigham Young University—Provo, UT

Jan 2015–Present

- Member of Tau Beta Pi, Phi Kappa Phi, and Phi Eta Sigma Honor Societies
- BYU Full Academic Scholarship
- GPA 3.92/4.0

Mathematics

Brigham Young University—Laie, HI

Jun 2011–Aug 2012

- Obtained recognition on the college dean's list.
- GPA 4.0/4.0

KYLER ASHBY

kr4shby4@gmail.com
567 N. University Ave, Provo, UT 84601
(480) 662-7007

EDUCATION

Brigham Young University

December 2018 (anticipated graduation) BS Civil Engineering

- Gained invaluable organizational skills
- Learned how to work as a member of team
- Obtained time management skills through long term projects and various other assignments

EXPERIENCE

Brigham Young University | 155 E 1230 N, Provo, UT 84602

Custodian August 2015 – April 2017

Jobs hours were from 5am to 8am. Performed various jobs involving general cleaning and upkeep of the facilities in the Clyde Engineering building.
Helped fill in for other students when they were unable to complete their assigned duties.

SKILLS

- Great attention to detail
- Well-versed in Microsoft programs (Word, Excel, Powerpoint, etc.)
 - Knowledgeable of VBA functions in Excel
- Average 88 WPM typing speed
- Fluent in Spanish

OTHER NOTES

- Eagle Scout
- LDS Missionary
 - Served as Financial Secretary for the Veracruz-Mexico mission

MICHAEL REYNOLDS

2112 N 40 W #347
Provo UT, 84604

michael.reynolds457@gmail.com
801-427-3223

EDUCATION

Brigham Young University – Bachelors in Civil and Environmental Engineering

- Expected Graduation: April 2018
- Current GPA: 3.27

EXPERIENCE

Research Assistant - BYU Civil Engineering Dept. 09/2017 - Present

- Research studying the characteristics of Self-Consolidating Grout (SCG)

Technical Support Intern – Aquaveo LLC: 02/2017 - 09/2017

- Engineering Internship troubleshooting software bugs and licensing issues

Rental Assistant – BYU Vehicle Rentals: 05/2016 – 02/2017

- Performed routine cleaning of vehicles, and assisted customers

Receiver – BYU Catering: 09/2014 – 05/2016

- Led other receivers through high pressure work of receiving and delivering supplies

Shipping Clerk – Blue Bell Creameries: 05/2011 – 08/2014

- Quickly unloaded Semi-trailers and loaded shipping trucks daily

SKILLS

Experience with Microsoft Excel, Word, and PowerPoint, AutoCAD, Revit, ArcGIS,
WMS, SMS, and GMS.

MEMBERSHIP

Both a Local and National Member of ASCE. Weekly attendance at Local Meetings.

VOLUNTEER EXPERIENCE

Missionary for The Church of Jesus Christ of Latter-Day Saints

- Trained and taught new missionaries, and performed 6-10 hour of community service weekly

Habitat for Humanity

- Building homes for families in need, and volunteering at Donation Center