

**ACUTE/UNTF NAVAJO HOUSE PLANS**  
**Project ID: CEEEn\_2018CPST\_003**

by

**B<sup>4</sup> Engineering**  
**David Bell**  
**Benjamin Arrington**  
**Zachary Barnett**  
**David Blake**

**A Capstone Statement of Work**

**Submitted to**

**Paul Thorley**  
**Acute Engineering/Utah Navajo Trust Fund**

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

**October 8, 2018**

## Introduction

**PROJECT TITLE:** ACUTE/UNTF NAVAJO HOUSE PLANS  
**PROJECT ID:** CEEEn\_2018CPST\_003  
**PROJECT SPONSOR:** Paul Thorley  
**TEAM NAME:** B<sup>4</sup> Engineering

The capstone group B<sup>4</sup> Engineering has been assigned to the Acute UNTF Navajo house plans project. This project will include: completing a set of engineering plans based on architectural drawings, compiling a list of required materials for house construction, and developing construction steps to build these plans. Students will perform research to understand the Utah Navajo Trust Fund and fulfill the project according to the desires of the client. An understanding of the availability of construction materials and tools will be necessary to complete this project. The objective of this project is to engineer house plans that are structurally sound and have been optimized for rapid construction and to minimize costs. This project will be completed during the Fall 2018 and Winter 2019 semesters. The deliverables for the final product are: structural house plans and structural details, structural calculations, a list of materials with their costs, local sources for materials, and a set of instructions for construction.

## Proposed Work Plan

Paul Thorley will serve as a liaison for communication with the Utah Navajo Trust Fund. Students will work with Paul to develop the scope of the project. Students will meet twice a week to plan and execute the project in the following stages:

### Stage 1

- Students will work with Paul to research the Utah Navajo Trust Fund and understand their expectations for the project. Different UNTF construction locations will be identified with different engineering design criteria.

### Stage 2

- Students will use architectural provided house plans and compile a materials list (including cost and source of materials).

### Stage 3

- Students will prepare instructions for the construction of the houses. Instructions will be followed by unskilled laborers and will be created with a two-week construction period in mind.

### Stage 4

- Students will compile a report consisting of the engineered house plans, all relevant calculations, a materials list (including cost and source), and instructions for construction.

## Schedule

### Weekly Group Work Schedule:

- Group meetings are to be conducted every Monday and Thursday for one hour to follow up on assigned tasks, complete assignments, and coordinate as a team with the sponsor about upcoming milestones. This schedule is subject to change based on student schedules.
- Each team member will dedicate 1 hour of personal time weekly to focus on tasks that they have been specifically assigned.
- Communication with the client for this project must be completed through the sponsor. Weekly communication will be established with Paul Thorley.

### Project Milestones:

- Stage 1: Students will work with Paul to research the Utah Navajo Trust Fund and understand their expectations for the project.
  - This stage is to be completed by November 15th.
- Stage 2: Students will use provided house plans and compile a materials list (including cost and source of materials).
  - A first draft of plans and materials will be completed by December 20th.
  - A final draft of plans and materials will be completed by February 15th.
- Stage 3: Students will prepare instructions for the construction of the houses. Instructions will be followed by unskilled laborers and will be created with a two week construction period in mind.
  - The stage is to be completed by April 1st.
- Stage 4: Students will compile a report consisting of the house plans, all relevant calculations, a materials list (including cost and source), and instructions for construction.
  - The submittable product will be completed by April 15th.
- Group members will present the final results of the project in the last seminar of the Winter 2019 semester.

## **Facilities, Tools, Data and Equipment**

- Personal computers: used for general communication, design work for plans, and general research
- Wide format plotter provided by Acute Engineering
- Structural engineering software provided by Acute Engineering
- AutoCAD and Revit: used for drafting work and deliverables
- Cell phones: used for communicating with Paul Thorley
- Existing plans: used for reference in designing for the project

## **Project Budget**

There are realistically less than 20 Monday evenings that we will meet together between now and the end of the project in April of 2019. We will not spend more than \$7.50 a week on food for the meetings to remain within the \$200 budget provided by the department. A potential site visit could use the remainder of our funds as it is distant from our location of design. Printing costs will be donated by Acute Engineering.

## **Deliverables**

The final report will consist of a summary of the plans, relevant calculations, a materials list (including cost and source) and construction instructions. Monthly status reports reflecting the work schedule (both planned and actual) will be provided. A poster and powerpoint presentation will be created to summarize the project for sponsors and other interested people. Large map with UNTF construction locations and tool and material locations.

## **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**

Benjamin Arrington has worked as an AutoCAD technician for 3 years and has worked as a teaching assistant for the Drafting class at Brigham Young University (BYU). He is currently a co-president of the Earthquake Engineering Research Institute chapter at BYU and working for Jones and DeMille Engineering. He is passionate about engineering, loves to tackle difficult problems, and his enthusiasm for engineering is contagious.

Zachary Barnett has worked as a teaching assistant for the Statics class for 2 years. He currently works as a student structural engineer at Acute Engineering. His experience brings high-level technical abilities and practical problem-solving skills to the group. He has served as the co-president of the Earthquake Engineering Research Institute chapter at BYU. Zachary has passed the Fundamentals of Engineering exam and is an Engineer in Training.

David Bell has worked as a teaching assistant for Statics, Geomatics, Physics, and Drafting classes during his time at BYU. He currently works as a student structural engineer at Acute Engineering. He is also involved with the Earthquake Engineering Research Institute at BYU and serves as a co-president. His wide range of knowledge gained from being a teaching assistant is extremely helpful when solving problems. David has passed the Fundamentals of Engineering exam and is an Engineer in Training.

David Blake has worked as a teaching assistant for the Geomatics and Advanced Applications of GIS classes. He currently works as a student structural engineer at Acute Engineering. He has served as the Rocky Mountain Conference Chair for the BYU chapter of the American Society of Civil Engineers and as the membership coordinator for the Earthquake Engineering Research Institute chapter at BYU. David has passed the Fundamentals of Engineering exam and is an Engineer in Training.

Paul Thorley studied Mechanical Engineering at BYU and graduated with his Master's degree in 1990. He founded Acute Engineering in 2002. He went on to obtain his professional engineering license and his structural engineering license. He currently serves as the committee chair for the Structural Engineers Engineering Response and is actively involved with the Structural Engineers Association of Utah.

**Appendix A**

## **Benjamin D. Arrington**

98 Wymount Terrace Provo, UT 84604 | Phone: 407.508.8083 | Email: benarrington70@gmail.com

### **Skills**

I am proficient in Microsoft Office, Autodesk AutoCAD & Revit, and troubleshooting computers. I am used to managing my time efficiently with little to no supervision, learn very quickly, problem solve, and work hard. I can collaborate clearly and kindly with coworkers, superiors, and clients.

### **Experience**

#### **~ Construction Manager and Co-President for EERI BYU Student Chapter**

*Provo, UT*

*January 2018 –*

*Present*

- Counseled with group about seismic competition building design
- Helped implement construction design in time for competition in Los Angeles
- Modeled building design architecturally in Revit

#### **~ Building Modeler for BYU Physical Facilities - Planning Department**

*Provo, UT*

*May 2017 –*

*Present*

- Constructed models and plans of renovations to existing structures
- Entirely modeled buildings maintained and owned by BYU in coordination with their architects
- Managed working on multiple projects simultaneously
- Provided tech support to other modelers.

#### **~ CAD Technician for C M Arrington & Associates, INC.**

*Kissimmee, FL*

*June 2015 – May 2017*

- Designed and put together construction plans for site development projects for the Professional Engineer and Surveyor using Autodesk AutoCAD software
- Worked under deadline constraints for multiple tedious projects simultaneously
- Worked with engineers and other technicians to complete assignments
- Managed my own schedule working remotely in Provo

#### **~ Drafting and CAD Teaching Assistant at Brigham Young University**

*Provo, UT*

*September 2016 – May 2017*

- Taught students how to use AutoCAD and Revit software to complete assignments
- Shared insights into using the basic tools of the programs effectively and efficiently

#### **~ Construction Worker and Ticket operator for CKA LLC. Site Development**

*Kissimmee, FL*

*October – November 2015*

- Assisted in laying sewer pipe and lift station
- Supervised the site for safety
- Assisted an excavator operator

*Minot, ND & Kissimmee, FL*

*August – September 2012*

- Managed ticket distribution for truck drivers collecting material for construction sites
- Organized the information for billing in Excel

### **Major Accomplishments**

- ~ Served 2 years in the Nevada Reno Mission of the Church of Jesus Christ of Latter-day Saints
- ~ Happily married since May of 2016
- ~ Eagle Scout

### **Education**

Undergraduate Civil Engineering student with a structural emphasis at BYU since 2012; expected to graduate in April of 2020. Taken courses in structural analysis; elementary soil mechanics; elementary fluid mechanics; basic metals, woods, and composites; and basic concrete, masonry, and asphalt.

# Zachary Barnett

[zacbarnett12@gmail.com](mailto:zacbarnett12@gmail.com)

566 Wymount Terrace Provo, Utah 84604

435-650-9479

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## **Education:**

### **Bachelor of Science in Civil Engineering**

*Brigham Young University*

- 3.87 Cumulative GPA

April 2019

*Provo, Utah*

### **Associate of Science in General Studies**

*Brigham Young University-Idaho*

July 2015

*Rexburg, Idaho*

## **Experience:**

### **Student Engineer**

*Acute Engineering*

- Perform accurate structural engineering on various light frame structures in accordance with the building codes adopted by the local jurisdiction
- Familiar with ASCE 7, NDS, and AISC structural design methods and specifications
- Perform structural engineering on plans that are in need of revisions during the construction phase

April 2018-Present

*Orem, Utah*

### **BYU Student Chapter Co-President**

*Earthquake Engineering Research Institute*

- Direct 15 students in creating a skyscraper building design that can withstand simulated earthquake loads
- Coordinate with professors and local engineering firms to ensure reasonable design practices
- Prepare the BYU student chapter to qualify for and participate in 2018 national EERI competition

Jan. 2018-Aug. 2018

*Provo, Utah*

### **Teaching Assistant**

*Brigham Young University Civil Engineering Department*

- Tutor students on physics and engineering concepts
- Proper grading of homework in a timely manner
- Teach class lectures and test review sessions as necessary

Sep. 2016- April 2018

*Provo, Utah*

### **Laboratory Technician**

*Horizon Laboratories*

- Demonstrate accuracy and precision in laboratory testing procedures and the recording of test data

Aug. 2015-Dec. 2015

*Price, Utah*

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## **Skills:**

### **Technical Computer Programs**

- Proficient in Microsoft Excel and Word
- Proficient in Bluebeam, Forte, and MathCAD
- Experience with AutoCAD, SAP2000, RAM Steel, Revit, and RetainPro

# DAVID BELL

davidbell74@byu.edu

(615) 274-8290

## Education

**B.S. Civil Engineering**, *Brigham Young University*

Graduation: April 2019

- 3.90 GPA
- Coursework: Steel Design, Reinforced Concrete Design, Timber Design, Hydraulics Design, GIS

## Skills/Certifications

**Passed FE Exam**

### Computer Programs

- Proficient in ArcGIS Pro, ArcMap, AutoCAD, Forte, Revit, SAP2000, and WaterCAD
- Experienced coding in VBA and Python

### Professional Organizations

- Earthquake Engineering Research Institute – Student Chapter Co-President
- Structural Engineers Association of Utah – Student Member
- American Society of Civil Engineers – Student Member

## Work Experience

**Student Engineer**, *Acute Engineering*

April 2017-Present

- Utilized software to engineer up to 10 projects a week
- Relied on engineering judgment to provide solutions for onsite problems
- Prepared structural reports and project addendums submitted for city review
- Reviewed submittals for trusses, hardware, and materials from third-party suppliers

Orem, UT

**Statics Teaching Assistant**, *BYU Civil Engineering Department*

January 2017-April 2017

- Assisted students in mastering the principles of statics
- Graded 35 homework assignments on a weekly basis

Provo, UT

**Engineering Intern**, *JWO Engineering*

April 2017-August 2017

- Modeled basic structures and sites in AutoCAD
- Compared site plans to update utility maps using GIS and WaterCAD
- Prepared technical write-ups for projects, including sections of city ordinances

Orem, UT

**Research Assistant**, *BYU Civil Engineering Department*

April 2017-December 2017

- Developed web applications in Python and HTML code for modeling groundwater flow in worldwide locations

Provo, UT

**GIS Teaching Assistant**, *BYU Civil Engineering Department*

January 2017-April 2017

- Assisted 45 students in data collection using GPS and surveying methods
- Helped students master the basics of digitalization and analysis of data using GIS software

Provo, UT

**Drafting Teaching Assistant**, *BYU Civil Engineering Department*

August 2016-January 2017

- Helped students to master the basics of AutoCAD and Revit
- Troubleshooted problems with the programs and grade 40 assignments a week on both programs

Provo, UT

## Leadership

**Volunteers Coordinator**, *2016 ASCE National Student Steel Bridge Competition*

**Squad Leader**, *BYU Marching Band*

# DAVID H. BLAKE

69 Wymount Terrace  
Provo, UT 84604

dhblake@byu.edu  
774-285-4261

EDUCATION	<b>Civil Engineering Student</b> , Brigham Young University • Structural engineering emphasis • Member of ASCE and SEAU	Graduate: April 2019 <i>Provo, UT</i> 3.6 GPA
WORK EXPERIENCE	<b>Student Structural Engineer</b> , Acute Engineering • Engineer structural members for single and multi-family structures • Completed RFIs from clients covering a whole range of topics • Designed many custom structural details for unusual architectural features <b>Teaching Assistant</b> , Engineering Applications of GIS • Taught students ModelBuilder and Python scripting in ArcMap • Instructed 38 students two times per week on various topics • Updated the class manual from ArcMap to ArcGIS Pro • Conducted and graded 12 labs and other related assignments <b>Water Resources Intern</b> , Central Utah Water Conservancy District • Conducted field visits to 20+ water facilities to catalog facility and asset information • Coordinated with managers and operators to develop standard operating procedures for District facilities • Summarized technical data for over 1000 company assets • Reviewed record drawings and submittals to compare asset details <b>Student Production Leader</b> , BYU Concessions • Lead 100+ volunteers to maintain, stock and run football concessions • Supervised events at the Marriot Center (seats 19,000 fans) including basketball • Managed over \$300,000 of product in the warehouse <b>Electrician's Apprentice</b> , VMA Electric	Present <i>Orem, UT</i> Fall/Winter 2017 <i>Provo, UT</i> Summer 2017 <i>Orem, UT</i> 2016 <i>Provo, UT</i> Fall/Winter 2015 <i>Marlborough, MA</i>
SKILLS	• People Skills: Global-mindset, amiable, patient, communicator • Leadership Skills: BYU ASCE Officer, EERI officer, Eagle Scout • Computer Skills: Advanced Excel, ArcMap/ArcGIS Pro modelling and scripting, VBA coding, proficient Python scripting	
VOLUNTARY SERVICE	<b>Full Time Volunteer</b> , The Church of Jesus Christ of Latter-day Saints • Prepared and presented 90 trainings to groups of 5-20 volunteers • Served community and individuals on a weekly basis <b>Community Service Projects</b> • Eagle Scout Project: Planned and organized 25 volunteers to build and replace 72-ft. of boardwalks on community trail • Participated in BYU's Y-Serve club, Global Engineering Outreach club, volunteered for ASCE Concrete Canoe club, planned and prepared the trip to the 2018 Rocky Mountain Student Conference	2013-2015 <i>New Zealand</i>