

# **ANCHORAGE OF ROOFTOP EQUIPMENT**

**Project ID: CEEEn\_2018CPST\_002**

**by**

**B-RAY Incorporated  
Ammon Hymas  
Roman Calderon Pacheco  
Yejezkel Jimenez  
Brandon Roberts**

**A Capstone Statement of Work**

**Submitted to**

**Bahaar Taylor  
Erickson Structural**

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

**April 17, 2019**

## **Introduction**

**PROJECT TITLE:** ANCHORAGE OF ROOFTOP EQUIPMENT  
**PROJECT ID:** CEEEn\_2018CPST\_002  
**PROJECT SPONSOR:** Erickson Structural  
**TEAM NAME:** B-RAY Incorporated

This project is to help our clients at Erickson Structural to create a streamlined process to perform calculations of forces while taking various constraints into account, including wind loads, lateral loads, weight of roof installations, different roof types, pitches, and grade. After consulting with our clients, it was made known that there are no hard deadlines for its completion. It is solely to help them serve their clients more effectively and efficiently. Three deliverables will be required to complete the objective of this project, an automated spreadsheet that performs the necessary calculations, an AutoCAD model for creating that can be modified for individual projects, and a proposal template which will be a formal contract between Erickson Structural and its clients stating what the work is that is going to be done, in addition to other project-specific information.

Weekly meetings will be held at B-RAY Incorporated to follow up on assignments and to provide a time for team members to collaborate and ask for help and assess the progress made that week. Additionally, a weekly email will be sent to Bahaar Taylor at Erickson Structural to inform her of advancements of the project and to provide a scheduled opportunity to request assistance or ask other related questions.

For the Excel spreadsheet, the objectives include determining the necessary means to fasten mechanical and structural units onto roofs, streamline input of information such as weight of mechanical units, grade of roof top, expected wind speeds, etc. The spreadsheet will also be used to check whether the existing roof will be safe with the desired added loads. Load capacity will be compared to added loads of structures, and materials used to construct the building such as wood or steel will be considered. For the AutoCAD model, a sort of template will be created from which individual projects will be based. The AutoCAD model will be linked to the spreadsheet so that as the spreadsheet is updated, the current parameters will be reflected in the model.

The proposal template will contain general information that will be provided by Erickson Structural, but another, more project-specific section will be created so that proposals can be created more quickly and easily.

From start to finish, accuracy of calculations from the code produced will be of utmost importance. This automated spreadsheet will be used for actual projects on real buildings and, as with any engineering project, care must be exercised so that load capacities are not exceeded nor inaccurate wind loading calculations made in order to avoid catastrophic failure.

This project is set to be completed by the start of April 2019.

## **Proposed Work Plan**

This project will be an Anchorage of Roof-Top Equipment and it will consist of three different parts:

**Calculations:** We will create an Excel spreadsheet that can take inputs to calculate anchorages, mechanical units and rooftop equipment and determinate wind loads and lateral loads. It should be automated as much as possible to accommodate several different scenarios such as pitched roofs, varying sizes of equipment, different wind and seismic loading requirements, snow drift loading, etc.

**AutoCAD:** We will create details of the rooftop equipment and other building structures that can be modified and customizable as far as possible for individual projects

**Proposal Template:** We will create a formal contract that will tell clients the details of what will be done, this document will include details on procedure codes and structural load requirements from

**Deliverables:**

Excel Spreadsheet

AutoCAD Details

Proposal Template

## Schedule

All team members will continue to meet every Tuesday at 1:00pm o'clock for two hours to work on the project until the end of the semester (December 13<sup>th</sup>). If necessary, the team will also meet for a couple of hours on Mondays. The team will have weekly communication with their sponsors to send weekly reports of the progress of the project as well as to discuss concerns about it. This weekly report will be implemented starting on Monday, October 8<sup>th</sup>. On the other hand, before a team meeting, each team member must be prepared to discuss new ideas or concerns that help to improve the performance of the team. This will be implemented starting on Monday, October 8<sup>th</sup>. Also, the final report showing the 30% completion of the project will be submitted on December 10<sup>th</sup>. The Excel spreadsheet(s) will be completed on March 12<sup>th</sup>, so the team have a couple of weeks before the due date which is April 17<sup>th</sup> to identify and remove errors. The model of the project in AutoCAD will be completed on February 4<sup>th</sup>, so the team has time to check with their sponsors if the model meets their speciation. The template proposal will be completed on March 8<sup>th</sup> so the team has time to revise it and check with sponsors if it meets their requirements.

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

The necessary tools that will be used to complete tasks of the project will be Microsoft Excel, Microsoft Word and AutoCAD.

- Excel will be necessary to create Excel spreadsheet (s) that help to calculate gravity and lateral anchorage of the rooftop equipment (including sonar panels, mechanical units, etc.)
- AutoCAD will be necessary to depict typical connections of rooftop equipment to the building structure
- Word will be necessary to create a template proposal for use for such projects

## **Project Budget**

The Budget of this project is \$150, which will be used to buy the procedure codes from the ASCE in case they are not found at the or companies sources.

## **Deliverables**

- Our end products that we will deliver will be an automated Excel worksheet, AutoCAD details that can be modified for specific projects, and a proposal template.
- Short regular status reports documenting challenges, solutions & progress.
- A poster or slide show reflecting a summary of your project to be presented to student, faculty, and other interested individuals in the final undergraduate seminar.
- A presentation summarizing your project to be presented to our sponsor.

## **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.

Our client is looking for products that are functional, user-friendly, and accurate.



## **Statement of Qualification**

- Faculty advisor – Dr. Borden.
  - Dr. Borden has a BS and MS in Civil and Environmental Engineering from BYU and a PhD in Computational Science, Engineering, and Mathematics from the University of Texas at Austin. He has five years of experience teaching structural and finite element analysis courses.
- Team member – Brandon Roberts
  - Brandon is a senior at Brigham Young University, working on his BS in Civil Engineering, with an emphasis in geotechnical and water resources engineering. He has worked with an engineering firm in Mesa, AZ called EPS Group, Inc. where he gained experience performing quality control on civil improvement plans as well as creating cross-sectional models of floodways and roadway striping plans.
  - Will oversee programming and debugging in Excel.
- Team member – Ammon Hymas (Team Focal)
  - Undergrad at Brigham Young University studying Civil Engineering. He has some experience using AutoCAD as an intern for an engineering company.
  - Will oversee communication with client and AutoCAD work.
- Team member – Roman Calderon Pacheco
  - Undergrad at Brigham Young University studying Civil Engineering. He has an Associate's degree in Business with an accounting certificate and a minor in Business management. He has been trained in NX10 and AutoCAD CIVIL 3D at Brigham Young University.
  - Will oversee AutoCAD design.
- Team member – Yejezkel Jimenez Dominguez
  - Civil Engineering undergrad at Brigham Young University. He's also working on a Minor in Business Management and has an Associate's degree in Business and Accounting from LDS Business College. He has been trained in Excel VBA coding, also in Revit, Catia and AutoCAD modeling design
  - Will oversee programming in Excel.

## **Appendix A**

# Brandon Roberts

brandon.b.roberts@gmail.com • 480.432.4234 • linkedin.com/in/brandon-b-roberts

## Education

### Bachelor of Science in Civil Engineering

*Brigham Young University*

Dec 2019

*Provo, UT*

- Cumulative GPA: 3.42
- Relevant Coursework: Engineering Mechanics (Statics, Dynamics, Materials), Hydraulics and Fluid Flow Theory, Soil Mechanics, Geomatics (GIS)
- Extracurricular Experience: Tau Beta Pi Honor Society, American Society of Civil Engineering

## Professional Experience

### Land Development Intern

*EPS Group Inc.*

May 2018 - July 2018

*Mesa, AZ*

- Prepared cross-sectional flow modeling for presentation to 5+ stakeholders
- Designed base maps and roadway striping plans in AutoCAD/Civil 3D 2018
- Ensured correct referencing and quality of plans and reports
- Executed post-design construction activities including contractor requests for information and deliverables
- Supported 1 Senior Project Manager and 2 Project Managers in 2+ project simultaneously
- Collaborated with 6 team members and 10+ external consultant groups on project development

### Inventory Supervisor

*Pinto Creek Co. LLC (Grower, Packer, Shipper of Fresh Vegetables)*

May 2017 - July 2017

*Eloy, AZ*

- Coordinated packing of vegetables for retail and wholesale orders using real-time industry specific software system
- Coordinated shipping process with sales department and freight carriers
- Oversaw shipping of 15 Semi Loads of product per day to retail and wholesale customers in United States and Canada
- (Customers included: Walmart, Costco, Safeway, Supervalu, Meijer, Bashas, Target)
- Worked with team in fast paced, dynamic, and stressful environment where accuracy and timeliness were paramount

### Student Piano Technician

*BYU Piano Shop*

October 2015 - Present

*Provo, UT*

- Tune pianos within 5 cents of accuracy
- Perform maintenance work on 15+ pianos
- Trusted to handle \$250,000 pianos and take care of assigned pianos
- Diagnose and remedy regulation problems among 1200+ parts

## Volunteer Work

### Volunteer Representative

*The Church of Jesus Christ of Latter-day Saints*

Aug 2013 - Aug 2015

*Villahermosa, Mexico*

- Increased effectiveness by training 3 other representatives over 3-month period each
- Prepared and taught training meetings to 8+ representatives weekly
- Presented 20+ lessons of self-improvement and behavioral changes in community
- Analyzed and reported performance indicators weekly

## Awards and Skills

Advanced Spanish fluency (reading, writing, speaking)

Engineering related software: AutoCAD/ Civil 3D 2018, ArcGIS, FLO-2D, Extensive knowledge of Microsoft Office

Eagle Scout

## Yejezkel Jiménez

602 E 600 N #419, Provo, UT 84604 || C: (801)-793-3485 [yejezkeljd@hotmail.com](mailto:yejezkeljd@hotmail.com)

### Education

#### Civil Engineering

Minor: Business Management  
Brigham Young University  
Expected - April 2019

#### Associate Degree in Business

LDS Business College  
Winter 2013

### Work experience

#### Translator – BYU Political Science Department

January/2018 - Present

- Translate documents for a nonprofit organization Impact Evidence, who has developed a website to help public policy makers (<http://ie.byu.edu/>)

#### Social Media and Marketing Specialist - BYUtv International

June/2015 – January/ 2018

- Increased viewership by 350% analyzing and capturing social media data, insights and best practices.
- Lead a team on creation and designing of marketing and communication platforms.
- Designed logos and edited pictures and videos for social media content.

#### Intern - Academy for Creating Enterprise

Jan/2015 – April/2015

- worked with the CEO and the presidents of ACE (non-profit organization) in Mexico to gather information to create, design and write a manual in Spanish for an incentive program, that the company has recently opted to run in Peru.

#### Call Center & Customer Service – Nuskin

Aug/2013 - Jan/2015

- Navigate multiple computer systems, applications, and utilize search tools to find information
- Selling products and services, taking phone calls and placing orders.

#### Teller - Wells Fargo

Nov/2012 – Aug/2013

- Worked in a fast-paced environment while providing excellent customer service and helping resolve their concerns in a timely fashion.
- Handle big amounts of cash, processing account transactions effectively and following proper procedures to minimize errors and reduce fraud.

### Skills

- **Bilingual** Spanish / English
- **CAD:** Revit, Catia and Autocad
- Excel VBA coding.

# Ammon Hymas

7809 E 122<sup>nd</sup> Pl, Thornton CO, 80602 | (303) 875-3166 | akhymas@gmail.com

## Profile

Senior in college with an emphasis and interest in transportation engineering. Hard working, driven, and committed to delivering high quality results.

## Education

### HORIZON HIGH SCHOOL | 2009-2013

- Cumulative GPA: 3.98

### CIVIL ENGINEERING | 2013-PRESENT | BRIGHAM YOUNG UNIVERSITY

- Cumulative GPA: 3.09

## Skills, Abilities, & Service

### SKILLS

- I have experience using Microsoft Excel, Microsoft Word, AutoCAD Civil 3D, Visual Basic, and MicroStation. I can fluently speak and write Indonesian.

### LEADERSHIP

- I organized and lead my Eagle Scout project. I was a team leader in the varsity wrestling and football teams in high school. I served as a district leader on a religious mission in Indonesia; leading up to 9 other missionaries.

### SERVICE

- I served as a full-time, volunteer missionary in Indonesia for two years. I worked with at risk youth, performed ecclesiastical functions, and managed service projects.

## Experience

### INTERN | ROCKSOL CONSULTING GROUP | SUMMER 2018

- Assisted in quality assurance for a project replacing a bridge and fixing drainage issues on a road in Nebraska.
- Made alignments, corridors, and section views for a project proposal for Pena Blvd in Colorado.

### INTERN | HDR ENGINEERING INC | SUMMER 2012, SUMMER 2013

- Learned from and worked with experienced transportation and traffic engineers.
- Assisted engineers on project revision/completion, delivered documents, and provided relevant insights.

### CASHIER/FLOORING ASSOCIATE | HOME DEPOT | OCTOBER 2016 - PRESENT

- Gained skills interacting with customers and helping them meet their needs. Learned to maintain my composure under pressure.
- I was cashier of the month in December 2016 and July 2017.

## **Roman Calderon**

rcp\_calderon@hotmail.com (352)-722-1148

### **EDUCATION**

B.S. Civil Engineering

Dec 2019

*Brigham Young University*

*Provo, UT*

- Minors in Math, and Business Management
- 3.52/4.0 GPA
- Relevant Course Work: Computational methods; Metals, Woods, & Composites; Concrete, Masonry, & Asphalt; Mechanics of Materials; Elementary Soil Mechanics; Intro to Transportation Engr; Hydraulics & Fluid Flow Theory; Structural analysis; Geometric Design of Highways

Associate's Degree in Business with an accounting certificate

Apr 2015

*LDS Business Collage Salt Lake, UT*

- 3.93/4.0 GPA

### **WORK EXPERIENCE**

Custodian

May 2015 - Current

*Brigham Young University*

*Provo, UT*

- Supervise a group of 5 students to clean and maintain some BYU buildings in excellent conditions
- Assist with training of new staff in work methods and procedures
- Developed a new system of teamwork resulting in a remarkable improvement in performance and effectiveness of each team member

Custodian  
2015

Aug 2014 - Apr

*The Church of Jesus Christ of Latter-Day Saints Salt Lake, UT*

- Worked with a multidisciplinary team for the possible implementation of new equipment
- Developed an outstanding ability to coordinate maintenance activities with management and other custodial staff
- Improved and documented all SOP (Standard Operating Procedures) concerning custodial duties

### **LEADERSHIP AND SERVICE**

Boxing Club President

May 2015 – Dec 2016

*Brigham Young University*

*Provo, UT*

- Increased the total number of active members by 200%
- Planned and organized several activities such as: info sessions, community service projects and mentorship sessions.

Student Committee Coordinator

Jul 2010 – Apr 2011

*Polytechnic University of Pachuca*

*Pachuca, Mexico*

- Motivated over 250 students to overcome their fear of sharing their ideas to school administrators
- Responsible for performance measures and well-being of more than 100 students.

### **SKILLS**

- Modeling/Rendering: AutoCAD CIVIL 3D, NX10
- Computer: MS Office
- Programming: Visual Basic for Applications
- QuickBooks
- 

### **Foreign Language**

- Spanish: Native and English: Proficient
- Portuguese