NEPAL EARTHQUAKE RECOVERY HOUSING OPTIONS
Project ID: CEEn_2018CPST_005

by

ABBA Consulting
Braiden Green
Abbey Wilson
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A Capstone Statement of Work

Submitted to

Bishnu Adhikari

Department of Civil and Environmental Engineering
Brigham Young University

October 8, 2018

Introduction

PROJECT TITLE: NEPAL EARTHQUAKE RECOVERY – HOUSING OPTIONS
PROJECT ID: CEEn_2018CPST_005
PROJECT SPONSOR: Bishnu Adhikari
TEAM NAME: ABBA Consulting

Adequate housing conditions in much of the world are sparse and inaccessible. Foregoing "luxuries" such as running water, sanitation, and cooking facilities, many countries lack even structurally sound dwellings. Following the 2015 Gorkha earthquake in Nepal, nine-thousand people were killed with an additional twenty-thousand injured due to substandard building practices and lack of access to materials.

Building upon last year's capstone project which updated the building code for Nepal, our project will provide structural analysis for five separate building materials available to the people of Nepal. These materials will need to be economically feasible, as well as readily available to the people of the area. In addition, they will need to either stand up to certain seismic loads, or at the least, be lightweight so as to prevent further death from building collapse.

Application of the research performed in conjunction with this project will likely save many lives and allow for continued growth in the country across the board.

Proposed Work Plan

Liaison

The primary responsibility of the Liaison will be to coordinate all communication with anyone outside of the consulting group, including the client, faculty mentor, and any other outside consultants or resources. On top of this, it will be his responsibility to organize assignments for each group member and streamline group communication through basecamp.com to promote efficiency. Finally, he will lead out in compiling and organizing all major group reports including monthly progress reports.

Basecamp

At all stages of the project, members of the team will utilize basecamp.com to provide updates on their assignments and communicate difficulties, breakthroughs, and any other necessary information. It will be the duty of the Liaison to keep up with progress in the individual assignments, and to ensure that no team member has more work than they can complete. It will be his job to maintain the calendar and update the group with any communication from our client and others.

Reporting

Leading up to major deadlines, it will be the role of the liaison to organize team members work into a cohesive report and submit the report as a representative for the team. He will work closely with the project coordinator to ensure assignments are leading towards eventual completion of major assignments.

Project Coordinator

The primary responsibilities of the project coordinator will be to organize the efforts of the liaison, cultural researcher, and the analyst to ensure the effectiveness and viability of the project. The project coordinator will also assist the analyst with the analysis of the building materials and the construction of the analysis report. Deliverables from the project coordinator will include the analysis report, a record of weekly team member assignments, and a schedule to direct the future progress of the project.

Analysis Report

(See Analyst's deliverables)

Record of Team Member Assignments

Each week the project coordinator will assign team members tasks and will follow-up on them the following week. The project coordinator will work with the liaison to ensure assignments are recorded on Basecamp and with the analyst to ensure our findings are

recorded. This report will be a brief summary of the assignment, what was learned and what we will do moving forward.

Schedule

The schedule will be a compilation of deadlines that will direct the progress of the project. The schedule will contain goals that will be broken down into weekly tasks. The schedule will be adjusted as needed.

Cultural Researcher

The cultural researcher will become an expert on living conditions in Nepal and provide information on available resources as well as their price points. In addition to this, the cultural researcher will find opportunities for the group to experience Nepali culture. The main deliverable here will be research into viability of materials based upon current practices as well as accessibility and economy.

Cultural Research

As Nepal is largely impoverished and not easily accessible, the materials we are to deliver should be available within the country or transportable at low cost. Taking these factors into mind, it will be the job of the cultural researcher to determine sourcing of materials and estimate the economic impact this might create for the Nepalese people.

Cultural Experiences

As this project can be deeply personal, it will also be the job of the cultural researcher to establish opportunities with the group to explore different aspects of Nepalese culture. These may take the form of movies, cuisine, interviews with Nepalese citizens, or otherwise.

Analyst

The primary responsibilities of the analyst will be to record information from research, team meetings, sponsor meetings, and other experiences and then to synthesize and analyze that information. Deliverables from the analyst will include a literature review of research performed by team members related to the scope of work, a summary report of meetings, a report detailing the analysis of the materials selected and their viability.

Literature Review

Throughout the project, research will be performed by all team members to inform work in material sciences, cultural sensitivity, economic viability, construction methods, and product availability. As research is gathered, the analyst will compile monthly memos for internal team review as well as for client and faculty advisor review. The information in these memos will be aggregated at the completion of the project into a comprehensive literature review as part of the deliverables to the client.

Summary of Meetings

Given the number of gatherings that will take place over the course of two semesters, the analyst will take minutes in team, faculty advisor, and sponsor meetings. Goals, discussions, assignments, and other pertinent items will be organized and sent to the Liaison for reporting to Capstone faculty. Additionally, the minutes will be condensed into a report for the client deliverables.

Analysis Report

The analyst will lead the evaluation of material candidates. This will entail developing performance criteria based on ongoing research, determining testing methods, and assigning team members to perform analysis tasks. Further details will be established as the client provides further information regarding the material aspect of deliverables requested.

Schedule

Phase 1: Research

Week 1
October 8, 2018 — Team Meeting: Follow-up on previous week's assignments and make new assignments
Contact Sponsor

Week 2
October 15, 2018 — Team Meeting: Follow-up on previous week's assignments and make new assignments
Regular Status Report #2

Week 3
October 22, 2018 — Team Meeting: Follow-up on previous week's assignments and make new assignments
Contact Sponsor
Regular Status Report #3

Week 4
October 29, 2018 — Team Meeting: Follow-up on previous week's assignments and make new assignments
Regular Status Report #4
Monthly Nepalese Culture Education Experience #1
November 1, 2018 — Select 5-6 materials selected for further analysis

Phase 2: Analysis

Week 5
November 5, 2018 — Team Meeting: Follow-up on previous week's assignments and make new assignments
Contact Sponsor
Regular Status Report #5

Week 6
November 12, 2018 — Team Meeting: Follow-up on previous week's assignments and make new assignments
Regular Status Report #6

Week 7
November 19, 2018 — Team Meeting: Follow-up on previous week's assignments and make new assignments
Contact Sponsor
Regular Status Report #7
Compile all known material properties into a spreadsheet.

Week 8
November 26, 2018 — Team Meeting: Follow-up on previous week's assignments and make new assignments
Regular Status Report #8

	Monthly Nepalese Culture Education Experience #2
Week 9	
December 3, 2018	Team Meeting: Follow-up on previous week's assignments and make new assignments Contact Sponsor
Week 10	
December 10, 2018	Team Meeting: Follow-up on previous week's assignments and make new assignments 30% Completion Report Complete first draft of structural analysis spreadsheet.
Week 11	
December 17, 2018	Team Meeting: Follow-up on previous week's assignments and make new assignments Contact Sponsor Monthly Nepalese Culture Education Experience #3
Week 12	
	Christmas Break
Week 13	
	Christmas Break
Week 14	
January 7, 2019	Team Meeting: Follow-up on previous week's assignments and make new assignments Contact Sponsor
Week 15	
January 14, 2019	Team Meeting: Follow-up on previous week's assignments and make new assignments Contact Sponsor Complete second draft of structural analysis spreadsheet
Week 16	
January 21, 2019	Team Meeting: Follow-up on previous week's assignments and make new assignments Contact Sponsor
Week 17	
January 28, 2019	Team Meeting: Follow-up on previous week's assignments and make new assignments Contact Sponsor Monthly Nepalese Culture Education Experience #4 Complete final draft of structural report.
Week 18	
February 4, 2019	Team Meeting: Follow-up on previous week's assignments and make new assignments Contact Sponsor Select 3 of the most cost-effective and seismic-resistant materials for in depth research.

Phase 3: Testing

Week 19
February 11, 2019 — Team Meeting: Follow-up on previous week's assignments and make new assignments
Contact Sponsor
Begin lab testing as needed.

Week 20
February 18, 2019 — Team Meeting: Follow-up on previous week's assignments and make new assignments
Contact Sponsor
Begin optimization- Combining materials or changing how they are installed

Week 21
February 25, 2019 — Team Meeting: Follow-up on previous week's assignments and make new assignments
Contact Sponsor
Monthly Nepalese Culture Education Experience #5

Week 22
March 4, 2019 — Team Meeting: Follow-up on previous week's assignments and make new assignments
Contact Sponsor
Report of Constructability of Materials

Week 23
March 11, 2019 — Team Meeting: Follow-up on previous week's assignments and make new assignments
Contact Sponsor

Week 24
March 18, 2019 — Team Meeting: Follow-up on previous week's assignments and make new assignments
Contact Sponsor

Phase 4: Conclusion

Week 25
March 25, 2019 — Team Meeting: Follow-up on previous week's assignments and make new assignments
Contact Sponsor
Monthly Nepalese Culture Education Experience #6

Week 26
April 1, 2019 — Team Meeting: Follow-up on previous week's assignments and make new assignments
Contact Sponsor
Finish proposal of most effective materials.

Week 27 April 8, 2019	Team Meeting: Follow-up on previous week's assignments and make new assignments Contact Sponsor Finish PowerPoint, poster, and presentation Finish Final Report

Facilities, Tools, Data and Equipment

Facilities

The facilities required will vary greatly based on upcoming feedback from the client. Initially, analysis will be purely theoretical. Thus, the primary facility will be department computer labs. If analysis progresses to the point that physical testing is required, access to department structural labs will be requested through Capstone faculty.

Tools & Equipment

The task of determining tools needed faces a similar detail bottleneck to the facilities section above. Initial analysis will utilize structural and material modeling programs. If physical testing is implemented, tools will include items such as shake tables and hydraulic presses.

Data

Until physical testing is performed, data will come from research performed by team members. Data used will be cataloged as analysis is performed and reported by the Analyst as detailed in the Proposed Work Plan.

Project Budget

Phase 1: Research

- Time: 1 month
- Hours: 1-2 hours/week outside class and team meetings
- Tasks:
    - Select 5-6 materials selected for further analysis

Phase 2: Analysis

- Time: 3 months
- Hours: 1-2 hours/week outside class and team meetings (1st semester)
  2-3 hours/week outside class and team meetings (2nd semester)
- Tasks:
    - Compile all known material properties into a spreadsheet.
    - Complete first draft of structural analysis spreadsheet.
    - Complete second draft of structural analysis spreadsheet.
    - Complete final draft of structural analysis spreadsheet.
    - Select 3 of the most cost-effective and seismic-resistant materials for in depth research.

Phase 3: Testing

- Time: 6 weeks
- Hours: 2-3 hours/week outside class and team meetings
- Tasks:
    - Begin lab testing as needed.
    - Begin optimization- Combining materials or changing how they are installed
    - Report of Constructability of Materials

Phase 4: Conclusion

- 1 month:
- Hours: 2-3 hours/week outside class and team meetings
- Tasks:
    - Finish proposal of most effective materials.
    - Finish PowerPoint, poster, and presentation
    - Finish Final Report

Deliverables

Monthly Status Reports

Answers to 4 questions

- What challenges have your team encountered in your Capstone project?
- What actions did your team decided to do to overcome these challenges?
- Any progress in overcoming these challenges?
- Is project on schedule?

Final Report

A final report with design alternatives for the project that include economic and environmental considerations

Poster

A poster reflecting a summary of your project to be presented to student, faculty and other interested individuals in the final undergraduate seminar

Presentation

A presentation summarizing your project to be presented to your 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.

The team will strive to provide deliverables that reflect the client's requests as closely as possible given the above statement. Further standards will be established once regular client contact becomes feasible.

Statement of Qualification

Fernando Fonseca PhD, SE – Faculty Mentor

BS Magna Cum Laude in Civil Engineering – Brigham Young University, 1987
MS Civil Engineering – Brigham Young University, 1988
PhD Civil Engineering – University of Illinois, Urbana, 1997
4 years field experience with Karren & Associates
Licensed as Structural Engineer in the State of Utah
Voting Member of Shear and Flexural & Axial Committees in the Masonry Society – 2011
ASCE/SEI Wood Education Committee
Structures/Structural Mechanics Committee Chair, Brigham Young University
Internationally published in multiple renowned publications.

Braiden Green – Team Lead/Liaison

BS in Civil Engineering, Brigham Young University, exp. April 2019
Architectural Draftsman for Upwall Design Architects
Research Assistant in structural composite analysis at Brigham Young University

Abbey Wilson – Project Coordinator

BS in Civil Engineering, Brigham Young University, exp. December 2019
Associate Degree in Science, Utah State University, May 2013
Student Engineer at Acute Engineering, Provo, UT
Engineering Intern with Provo City Public Works
Design Coordinator for a project empowering working women in Peru through GEO

Adam Foulk – Cultural Research

BS in Civil Engineering, Brigham Young University, exp Dec 2019
Associate Degree with Honors in General Studies, Eastern Arizona College
Teaching Assistant for Mechanics of Materials
Research Assistant in mortar design at Brigham Young University
Engineering Intern with Earthtech Engineering and Project Engineering Consultants
EERI Structural Design Captain

Bryce Miller – Analyst

BS in Civil Engineering, Brigham Young University, exp April 2019
Planning Intern for City of Orem, UT
Research Assistant in finite element analysis of material properties at Brigham Young University
Planning Intern for City of Madison, AL

Appendix A

Braiden Green

Civil Engineering Student
Architecture Emphasis

818.825.7868
443 N 100 E
Provo, UT, 84606
braidenbfgreen@gmail.com

Technical Skills

AutoCAD	●●●●○	Photoshop	●●●●●
Revit	●●●●●	Illustrator	●●●●○
Dynamo	●●●○○	MS Office	●●●●●
Matlab	●●●●○	VBA	●●●○○

Experience

Upwall Design Architects

Architectural Draftsman| Jun. 2017 - Current| SLC, UT

Prepared construction documents for client/city approval
Modeled custom homes and furniture in Revit
Trained new employees in Revit and production standards

BYU Center for Advanced Structural Composites

Research Assistant | Aug. 2016 - Apr. 2017 | Provo, UT

As a research team, developed new methods of carbon fiber rebar manufacture.
Designed lab equipment increasing production capabilities by 500%.

Blue Line Deli & Market

Asst.Kiosk Supervisor | Aug. 2015 - Apr. 2016 | Provo, UT

Trained a team of 30 employees in customer service.
Led a bi-weekly council of supervisors to improve production and efficiency.
Responsible for strategy, marketing, production, inventory management, and customer service.

BYU Men's Chorus Presidency

Activities & Projects Manager | Apr. 2016 - Apr. 2017 | Provo, UT

Coordinated the organization of retreats, tours, and other activities for 200 - 400 people.
Organized publicization of the choir through print, web, and school of music public affairs.

Education

Brigham Young University

B.S. Civil & Environmental Engineering
Expected Graduation: Apr. 2019

ABBEY WILSON

abbeywilson08@gmail.com • (801)633-4449 • 592 W 940 N Provo, UT 84606

EDUCATION:

Bachelor's Degree, BS — Provo, UT
Civil and Environmental Engineering — Dec. 2019
Brigham Young University – 3.66 GPA

Associates Degree of Science — Logan, UT
Utah State University – 4.0 GPA — May 2013

WORK EXPERIENCE:

Student Engineer
Orem, UT
Acute Engineering — Jan. 2018-present

- Design residential houses to withstand all lateral and vertical loads applied to them
- Create custom details to provide load transfer in unique circumstances
- Communicate structural design using Auto Cad and PDF drawings

Student Engineering Intern
Provo, UT
Provo City Public Works — *Jan. 2017-Dec. 2017*

- Assist city engineers in the design and execution of road design projects
- Manage the addressing of Provo City by updating their GIS map and suppling the needed legal documents for address change
- Quantify materials needed to create accurate bid documents
- Inspect public roadways for the development of future projects and the releasing of bonds

Research Assistant
Provo, UT
Harold B. Lee Library — May 2016-May 2017

- Execute projects regarding the women's movement using library databases and resources
- Prepare research for editing and publication by compiling annotated bibliographies, writing essays, and creating PowerPoint presentations
- Coordinate often with professor to unify vision yet work independently to fulfil expectations

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VOLUNTEER EXPERIENCE:

Design Coordinator
Provo, UT
Global Engineer Outreach — Aug. 2017-May 2018

- Work on an interdisciplinary engineering team to design a soapmaking process for entrepreneurial women in Peru
- Executed changes to formula based of the availability of resources and client feedback
- Instructed women on soapmaking process and safety measures

ADAM FOULK

185 E 300 N Provo, UT 84606 #39 • (928) 965-8209 • adamjfoulk@gmail.com

Education

Bachelor of Science - Civil Engineering April 2020
Brigham Young University Provo, UT

- GPA 3.26
- Europe Infrastructure and Global Leadership Study Abroad – selected by a board of professors from many applicants for the first summer BYU offers this program.
- Achieved position in the Beyond Measure Vocal Group on campus

Associate Degree - General Studies May 2016
Eastern Arizona College
Thatcher, AZ

- GPA 3.69
- Graduated with honors
- Graduated on Dean's list
- Awarded Presidential Full Ride Scholarship for Academics
- Awarded Half Tuition Scholarship for Music
- Awarded "Mr. Physics" for 100% on test
- Awarded Scholarship for Vocal Lessons

Professional Experience

Brigham Young University
Provo, UT
Teaching Assistant – Mechanics of Materials, Metals, Woods & Composites January 2018 - Present

- Mentored 160 students on process to find stress and strain, moments of inertia, and torsion forces on structures
- Collaborate with professor and team of TAs to optimize and expand student understanding

Brigham Young University
Provo, UT
Research Assistant - Mortar Design September 2017- December 2017

- Performed tests on mortar compressive strength for breaking points and vulnerability with different additives.
- Delivered results to a Las Vegas construction company to improve sustainability.

Earthtech Engineering
Lindon, UT
Engineering Intern - Geotechnical February 2017- August 2017

- American Concrete Institute (ACI) Certified as concrete technician and handle radiation equipment
- Ensured quality performance of compressive strength tests on concrete cylinders, soil compaction tests, and lab sieve tests
- Traveled across Utah to various locations speaking Spanish to continue work production

Project Engineering Consultants
Phoenix, AZ
Engineering Intern – Water Resource Management May 2016-August 2016

- Analyzed video data for defects in over 200 miles of sewer pipe and manholes for the City of Phoenix
- Reviewed billing records for errors in company's organization and acquired documents from local city records departments.

Professional Skills

- Fluent in Spanish (speaking, writing, reading, and interpreting)
- Programs: ArcGIS, SAP 2000, AutoCAD, Revit, Pipe LOGIX, Microsoft Office
- Coding language: Visual Basic (major), Script Editor (Google sheets-minor)

Leadership Experience

- Earthquake Engineering Research Institute (EERI)– Structural Design Captain for EERI competition in Los Angeles
- American Society for Civil Engineers (ASCE) – regular attendance and participation in humanitarian aids to local groups
- Global Engineering Outreach (GEO) – Installment of water system and adobe house on Navajo Reservation.
- Structural Engineering Association of Utah (SEAU) – webinar instruction of structural code improvements.
- GuyZ Vocal Group – Beat Boxer for select small ensemble group of skilled singers from among a few hundred
- Boy Scouts of America (BSA) – Completed Eagle Scout Rank, highest rank one can receive.
- Tenor II Section Leader A Capella Choir – Instructed group to read solfedge, improved sight reading and vocalizing
- Eastern Arizona Engineering Club – Secretary – managed meetings and organized "Engineering Day" activities for hundreds of high school students in the Gila Valley region of Arizona to spark an interesting in engineering.

Bryce C. Miller

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(256) 813-4405 · brycecurtismiller@gmail.com
linkedin.com/in/brycecurtismiller

SKILLS

- Surveying & Land Measurement
- Statistical Analysis
- Building & Site Review
- Demographic Analysis & Projection
- Ordinance Writing
- Public Meeting Organization
- Transportation Engineering & Planning

SOFTWARE PROFICIENCIES

- AutoCAD
- Revit
- ABAQUS
- ArcGIS
- ArcMap 10
- Synchro
- Microsoft Office Suite
- Adobe Creative Suite
- VBA
- Python

EDUCATION

Brigham Young University — Expected Graduation: April 2019
B.S., Civil Engineering — *Provo, UT*
Minor in Urban Planning

- GPA 3.57
- Scholarship: U.S. Department of Veteran Affairs DEA Scholarship

PROFESSIONAL EXPERIENCE

City of Orem — June 2018-Present
Planning Intern — *Orem, UT*

- Update zoning ordinance language for the City
- Enforce zoning code through meetings with citizens and written notices
- Attend public meetings and committees as a member of staff to advise public officials
- Manage GIS data entry for Development Services department

Civil Engineering Department, BYU — September 2017-September 2018
Research Assistant — *Provo, UT*

- Researched the effects of material properties through finite element analysis in ABAQUS CAE
- Analyzed and summarized research findings for report

City of Madison — May 2017-August 2017
Planning Intern — *Madison, AL*

- Assisted with the development of the Industrial Master Plan
- Analyzed local demographic trends for public officials
- Reviewed site and building plans for approval by the City
- Performed research for long range planners

VOLUNTEER EXPERIENCE

Church of Jesus Christ of Latter-day Saints — May 2013-May 2015
Full Time Representative — *Greater Philadelphia Region*

Boy Scouts of America — October 2006-Present
Member & Counselor — *Atlanta, GA; Huntsville, AL*

PROFESSIONAL ASSOCIATIONS

American Society of Civil Engineers, — September 2015-Present
National and BYU Student Chapter
American Planning Association — June 2018-Present
BYU Student Urban Planning Association — September 2017-Present