Nepal Earthquake Recovery Building Code Review & Update
Project ID: CEEn_2017CPST_011

by

Team Bhukampa Aid
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A Capstone project submitted to

Bishnu H. Adhikari

Department of Civil and Environmental Engineering
Brigham Young University

30 October 2017

Introduction

PROJECT TITLE: Nepal Earthquake Recovery Building Code Review and Update
PROJECT ID: CEEn-2017CPST-011
PROJECT SPONSOR: Bishnu H. Adhikari
TEAM NAME: Team Bhukampa Aid

Nepal was hit by a 7.8R scale earthquake on 25 April 2015, and suffered subsequent aftershocks of similar magnitude that devastated structures throughout 31 districts out of 75 districts . The Nepal National Building Code (NBC) does include designs for seismic loading, but would benefit from a review by a third party. It has been asked that we submit a proposal to compare the NBC seismic provisions with that of the International Building Code or that of the United States. Our project proposal includes our plan, schedule, budget, and all other necessary details for us to complete this project. This proposal will include the following:

- Proposed Work Plan
- Schedule
- Facilities, Tools, and Equipment
- Project Budget
- Deliverables
- Statement of Qualifications

As we follow the aforementioned plan, we believe that we will be able to deliver something valuable to the people of Nepal. We hope to improve the engineering, quality of construction, and safety of Nepalese buildings to prevent future earthquake catastrophes. Our project will consist of research and comparison, evaluation of solutions, and adapting to the needs of Nepal. We will investigate the most common causes of building failure and collapse to find the most urgent needs, and give proposals of how the current building code can be improved.

As we review the current building code through research and comparison with other codes, we will be able to understand where it is inadequate. We will also study the geography and geology of Nepal and past earthquakes with the hope that we can learn from the past to prepare for the future. We know that one of the biggest problems in Nepal's building construction is widespread failure to follow any sort of code in order to save money on engineering and construction. Keeping in mind the economic state of the country of Nepal and its citizens, we will find the best solutions to overcome the common failures to implement code.

Overall, we expect this process to take several months; our proposed date of project delivery is . Please, keep in mind that we are flexible and willing to adapt to the needs of Mr. Adhikari and the nation of Nepal.

Please contact us at ceen2017cpst011@gmail.com for questions or suggestions.

Proposed Work Plan

In working with Mr. Adhikari, we plan to follow his direction as to what exactly he would like delivered. Because he is living in Nepal, we will perform much of our communication with him via email and video chat. He plans to visit Provo at some time in March, so we will be able to meet with him in person and show him the progress on the project.

Outside of our communication with Mr. Adhikari, we will work on our own performing research on the current Nepal National Building Code. By comparing the NBC with 2015 International Building Code and others, we will report on where the NBC can be amended and improved to meet a higher standard. We will also investigate engineered solutions that may be more economical to the people living in Nepal, especially in rural areas where means and materials are limited.

Upon completion of the project, we will deliver a final PDF report to the client of our findings and recommendations. With the hope that Mr. Adhikari will be satisfied with our work, he will desire to deliver our recommendations to the people of Nepal. Our ultimate goal is to improve the engineering and construction of Nepal's buildings to ensure future safety.

Schedule

The following is our schedule and proposed timeline, with each task to be completed by the last day of each month. Progress reports will be given each month until the project is finished. It is expected that researching, gathering information, and report writing will be done throughout the project. Project milestones are shown in **bold**.

This project will be completed in three stages. The first stage is the research, learning about the Nepalese Building Code, and the International and US Building code. The second stage will be the analysis, comparing the codes to each other and determining where the Nepalese Building Code can be improved and how economical such improvements will be. The third stage will be the writing of the technical report, summarizing all the data and presenting it in a useful manner.

November 2017
- Read through information provided by the client
- Gather research papers, literature reviews, and articles written by others
- Start doing research
- Find out the current state of NBC in Nepal

December 2017
- Summarize research done in November
- Meet as a team

January 2018
- Begin comparison of the Nepalese Building Code with international or US building code
- Write monthly report

Feb 2018
- Look at differences in building codes and determine economical feasibility for Nepal
- Begin drafting the technical report
- Write monthly report

March 2018
- Begin final draft of the technical report
- **Meet with Mr. Adhikari** to discuss any last changes or needs

April 9, 2018
- Finish the project, presentation, and poster
- **Deliver final project** to Mr. Adhikari
- **Give presentation** to BYU CEEn faculty and students

Facilities, Tools, Data and Equipment

The use of Brigham Young University labs, research, and database access will be needed to gather information. A copy of the Nepal National Building Code as well as other building codes will be purchased and used throughout the project. All report compilation will be done and stored digitally. Mr. Adhikari has already provided a fair amount of materials related to the Nepalese building code that will be used for the project.

Project Budget

In order to fully complete the project in time, our team plans to spend approximately 8 hours each week from November to April. This will amount to about 650 total man hours. The following schedule shows the times team members will be spending on the project.

Week	January				February				March				April	
	7-13	14-20	21-27	28-3	4-10	11-17	18-24	25-3	4-10	11-17	18-24	25-31	1-7	8-14
Research	6	6	4	4	3	3	1	-	-	-	-	-	-	-
Analysis	1	1	2	1	4	4	3	2	2	-	-	-	-	-
Group Meetings	1	1	1	2	1	1	1	2	1	1	1	2	-	-
Monthly Report	-	-	1	1	-	-	1	1	-	-	1	1	-	-
Technical Report	-	-	-	-	-	-	2	3	5	5	4	2	2	2
Presentation	-	-	-	-	-	-	-	-	-	2	2	3	6	6
Total	8	8	8	8	8	8	8	8	8	8	8	8	8	8

Deliverables

We will give monthly progress reports to the client to notify him of the current status of the project and our findings. Status and findings will include challenges we encounter, how we overcame the challenges, progress made in overcoming these challenges, and if the project is still on schedule. These progress reports will be vital in keeping the project on the right track and keeping our final report within the expectations of the client.

Our monthly progress reports will be delivered in email form, with any important documentation given as attachments. Our final report will be available as a PDF document, and a report summary will be given in the form of a PowerPoint presentation. A project poster will also be created to summarize the project, findings, and final result.

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 be guided by Jenny Blonquist, a grad student currently working with Dr. Franke on earthquake engineering research. Dr. Paul Richards, a BYU professor of structural engineering, will be the faculty member guiding the project.

The project team will comprise three undergraduate civil engineering students attending Brigham Young University. The team will dedicate about 8 hours each week to finishing the project and will use the help of their advisors as needed during the project.

Statement of Qualification

1. Taylor Dayton- Team Leader
    a. Senior in the BYU Civil and Environmental Engineering Program
2. Kevin Gibelyou- Team Member
    a. Senior in the BYU Civil and Environmental Engineering Program
3. Eric Holmstead- Team Member
    a. Senior in the BYU Civil and Environmental Engineering Program
4. Jenny Blonquist- Graduate Student Advisor
    a. Candidate for Masters Degree in Civil and Environmental Engineering with a Geotechnical Emphasis
5. Dr. Paul Richards - Faculty Advisor
    a. Assistant Professor, Civil and Environmental Engineering, BYU, (2006-present), PhD Structural Engineering, University of California San Diego, 2004

Appendix A

Taylor D. Dayton

SUMMARY OF QUALIFICATION

- 3 years of undergraduate study in Civil and Environmental Engineering
- 2 engineering internships in residential structural engineering
- Will be taking a course on Geotechnical Analysis of Earthquakes next semester
- Fluent French speaker

EDUCATION

Brigham Young University (BYU) **Provo, UT**
Bachelor of Science in Civil Engineering
December 2018

- **GPA:** 3.73 / 4.0
- President of the BYU Student Chapter for the American Society of Civil Engineers

WORK EXPERIENCE

Acute Engineering **Orem, UT**
Structural Engineering Intern January 2017 – Current

- Perform structural engineering of residential and commercial projects for various clients
- Collaborate as a team with other engineers to find the most effective solutions to engineering problems
- Communicate directly with dozens different clients via email to find engineered solutions
- Improved speed and quality of our product, resulting in faster turnaround times for the customer

American Society of Civil Engineers **Provo, UT**
President of BYU Student Chapter April 2017 – Current

- Leads a student chapter that is the best in the country, receiving national awards and recognition
- Conduct regular meetings with officers, instructing and training how to best help members
- Organize weekly seminar events for students to learn from professionals in the field
- Increase interest and membership of the club through engaging social and service activities

Park Engineering **Heber, UT**
Engineering Intern and Draftsman April 2016– January 2017

- Served the principal engineer as an assistant to check calculations and ensure quality of the product

Eric Holmstead

SUMMARY OF QUALIFICATIONS

- 3 years of undergraduate study in Civil and Environmental Engineering
- 2 engineering internships in land development and water resources
- Technical design using Civil 3D and AutoCAD
- Collecting and presenting information using GIS
- Fluent Spanish speaker

EDUCATION

Brigham Young University, Provo Utah
August 2011-May 2012, August 2014-present
BS Civil and Environmental Engineering
3.80 GPA

WORK EXPERIENCE

Bowen Collins & Associates
Water Resources Engineering Intern, Summer 2017
Assisted PE in pipeline and water tank design
Coordinated with contractors on large-scale projects throughout northern Utah
Performed hydraulic modeling using Microsoft Excel

VIKA Engineering
Engineering Intern, Summer 2016
Supported project managers in land development projects
Interfaced with 5 different organizations in the permitting process
Built a GIS database of past and current engineering and surveying projects

Brigham Young University Office of IT
Network Technician, 2015-2016
Organized and implemented campus-wide repair of internet systems
Responsible for team of technicians during $3 million building upgrade

Kevin Gibelyou

EDUCATION
Brigham Young University, Provo, UT
Civil Engineering
GPA 3.57

EXPERIENCE
Applied Geotechnical Engineering Consultants, field technician
May 2017-August 2017

- Inspected field compaction for soils and advised contractors on how to fix failing tests
- Wrote technical reports on compaction tests to inform owners and document progress

Brigham Young University, grounds crew laborer
August 2014-April 2015

- Improved the landscape and quality of the BYU campus
- Learned to operate small construction tools and machinery to increase efficiency

Grand Canyon Resort, IT Technician
February 2012-August 2014

- Solved technical issues experienced by employees during point of sales operations
- Assisted in creating an improved computer network to better unify business operations