

50% REPORT

Nepal Earthquake Recovery Building Code Review & Update

Project ID: CEEEn_2017CPST_011

by

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A Capstone Project Final Report

Submitted to

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Executive Summary

PROJECT TITLE: Nepal Earthquake Recovery Building Code Review and Update>
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PROJECT SPONSOR: Bishnu H. Adhikari
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Nepal experienced a 7.8 R. Scale earthquake in April of 2015. The Nepalese Building Code (NBC) has seismic loading provisions, but requires third party vetting of the code. Compare the seismic provision in the NBC with the International Building Code.

Introduction

In the course of analyzing and comparing the NBC to more established building codes, it was noticed that there have been many research articles, symposiums, and conferences in the past 3 decades to discuss the issue of earthquake safety in Nepal. From this vast pool of knowledge and expertise we have organized the various articles based on recommendations and most current research. Our focus of this study is

- How the code should be organized
- How the code is worded (mandatory rule of thumb, etc.)
- Code compliance and enforcement
- Method of design
- Seismic hazard levels
- Static and Dynamic Methods

By focusing on these topics, we can condense the many opinions and suggestions for the NBC to give an easier way for the Nepalese government to decide what actions should be prioritized in updating the Nepalese Building Code.

Schedule

January 8, 2018—Met with Dr. Richards, our Capstone faculty mentor. Discussed the IBC and ASCE 7. After meeting with Dr. Richards we proceeded to compare the NBC with the seismic sections of ASCE 7.

February 8, 2018—Met with Paul Thorley, a member of the Capstone Committee. Discussed the progress of our Capstone progress and where to focus our efforts. Concluded the best course of action was to compile the research done on Nepal earthquake safety over the past 30 years.

March 6, 2018—Finished the 50% report

March 15, 2018—Meet with Bishnu Adhikari

April 12, 2018—Present final project results to BYU ASCE and BYU Capstone Committee

Assumptions & Limitations

The limitations we have faced in our project is our own knowledge and expertise with code development and understanding structural engineering. Many professionals and researchers throughout the world have given critiques of the NBC, performed analyses and tests, and gathered information.

Design, Analysis & Results

Much work has already been done in terms of providing recommendations for the NBC, and our knowledge is not adequate enough to dispute any findings of PhD researchers and engineers. We have taken on the role of studying the research and writings of those professionals, and then organizing the information into a literature review. The purpose of the literature review is to compare the conclusions found in all research and establish the most common recommendations for improvement. Along with this, we are going to discuss the current state of the research and any potential gaps.

Lessons Learned

We have learned that much research has already been performed on the NBC and recommendations have been given already by many professional engineers and scientists. The NBC does need to be improved, but it also needs to be implemented better by the owner-builders and contractors in Nepal and more strictly enforced by some government entity.

Conclusions

Code Structure, Nepal Standards and Family of Codes- Which codes apply and to whom.

- Problem: There is confusion with Act, Bylaws, the Code (NNBC), Standards (NS), and Directives (PWD).
- Recommendations:
 - **Nepal Code Council** - A Code Council should be established and given the necessary authority to address the current deficiencies in the code, establish the enforcement of the code, and update the code as necessary.

Institutional Arrangements for Implementation of NBC- Single authority needs to be established over earthquake related matters. The Department of Urban Development & Building Construction and has so far been leading the country but other agencies are still responsible for some earthquake related matters.

MRT not to be a part of NNBC- The mandatory rules of thumb have been used to skirt building codes and should not be considered part of the NBC

Lessons Learned from Municipality Experience - Kathmandu and Lalitpur (the first and third largest cities in Nepal) reportedly have valuable experience in regulating the building permitting process and the construction process. However, no comprehensive report has been written and would be useful for making broad recommendations.

Reforms in Building Act and Building Bylaws- The most effective implementation of building codes has occurred where code compliance is included in municipal building bylaws, and by the VDC (Village Development Committee) and the DDC (District Development Committee)

Application of Bylaws in VDC - While compliance with NBC has increased within urban areas, some builders have moved their construction to areas only covered by VDC (Village Development Committee). Code compliance should therefore be mandated by the VDCs.

Effect of neighborhood safety and Architectural Design Requirement- Haphazard urban development has resulted in a dense mix of historical but dangerously constructed buildings and many different building uses all within the same area.

Change of occupancy- When buildings change uses, such as from a supermarket to a hotel, the new use may not be safe in the same building. The government has not monitored such changes so the safety of new building uses is unknown.

High Rise Buildings- High rise buildings need to meet much higher safety standards, but the current NBC does not address high rise buildings.

Abolishing MRT- Since the MRT is not complete, does not meet the requirements of the various codes under consideration, and is misused by designers of buildings, it should be abolished and replaced.

Need for Nepal Code Council- A Code Council should be established and given the necessary authority to address the current deficiencies in the code, establish the enforcement of the code, and update the code as necessary.

Family of Codes- NBC is a collection of individual codes but is not complete in and of itself. Urban Planning Code, Fire Code, Disability Accessibility Code, Environmental Code, Plumbing Code, Electrical Code, Construction Code, Construction Safety Code, should all be compiled into a unified code.

Examples of Model Designs- Model designs should be established to help professionals learn compliance with the building code.