

Title Seismic Performance of Mid-Rise Buildings Designed using Various Codes in High Seismic Zones

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Abstract

To achieve the objectives, a 21 story mid-rise building is selected as a case study. The building is design under three different building codes, (1) ACI, (2) BS, and (3) Euro. As there is no seismic code for BS, ASCE7-10 and Euro Code-8 are used for seismic design. There are three different combination of codes, (1) a combination of ACI318 and ASCE7-10, (2) a combination of BS8110 and Eurocode 8, and (3) a combination of Eurocode-2 and Eurocode-8. The case study building is assumed to be located in Philippines which is one of the high seismic zones. Three different design procedures are considered in the seismic design. The first one is the Response Spectrum Analysis (RSA) procedure, the second one is the Linear Time History Analysis (LTHA) procedure, and the third one is the Nonlinear Time History Analysis (NLTHA) Procedure. The code based design is accomplished by response spectrum analysis in Etabs and the performance evaluation is accomplished by nonlinear time history analysis in Perform-3D. The performance of the buildings are determined based on the story drift, story shear, story displacement, etc. Based on the results obtained from nonlinear time history analysis, all three designed buildings have enough flexural capacity to resist ground motion excitations. The transient story drifts and residual drifts are within acceptable limit. To compare the results obtained from three codes, it is found that the combination of Eurocode2 and Eurocode8 leads to economical design. ACI design is not as economical as Euro but the performance from ACI building can compare with Euro. The combination of BS8110 and Eurocode8 make an uneconomical design. The shear wall and coupling beam design from this combination make the size of them larger and more reinforcement required. All three building design codes are the most widely use building code document worldwide. Based on this study, the suitability of the design code to be use will depend of the choice of the designer and the circumstance of the situations.

Keywords Mid-rise buildings, Code-based design, Non-Linear dynamic analysis, Seismic evaluation.