Evaluation of Increasing Coefficient of Fundamental Period of Buildings

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Summary

Linear Static Analysis is a current approximate method in buildings analysis under earthquake force. One of the effective parameters in determining earthquake forces is building fundamental period. For computation this parameter, different experimental equations are provided on the basis of different structure resisting systems. Also the code has been allowed to increase the fundamental period in special conditions. Since the period changing used in lateral static forces calculation is leaded to change the building calculated earthquake force, so it is clear that taking into account more accurate fundamental period is leaded to better estimating of real earthquake forces. In this research the numbers of steel buildings are chosen from existing buildings and calculated earthquake force from using codes' period and calculated ones from dynamic analysis has been computed and compared so that can achieve the fundamental period allowed increasing coefficient.

Keywords: Include a list of not more than ten keywords, for example: post-tensioning; anchors; slabs; walls; high-rise buildings.

1. Introduction

Linear Static analysis methods are used to calculate earthquake force using the fundamental period of buildings in most codes. Therefore, considering a period close to fundamental period of a building is importance to calculate accurate earthquake force imposed on a building. Based on lateral resisting system of buildings, codes have presented different approximate equations in terms of a building height. However, upon performing dynamic analysis, it is seen that the period obtained from approximate equations is different from quantity obtained from a different analysis. Codes have also provided provisions for increasing period obtained from approximate relations. However, codes have presented same increasing coefficient in all cases. This raises the question that whether different increasing factors are used in buildings with different laterals resisting system and heights. This research aims at studying increase in period possible by different coefficients from the code through comparison of period obtained from approximate relations with the quantity obtained from dynamic analysis and reanalysis based on different increase coefficients. To this end, 120 steel structures with difference lateral resisting system and structure heights of 1 to 12 stories have been studied. After calculation of the fundamental period, buildings were analyzed with linear static methods taking fundamental period obtained from the code into account to calculate earthquake force through dynamic analysis and its comparison with the period obtained from approximate relations of the code. Then increased approximate period is used and reanalyzed to calculate earthquake force according to the code provisions. Ultimately, a reanalysis is made by taking period obtained from dynamic analysis in calculations into account. Examining the results, it was observed that two code and analytic period are too close in short buildings though they are different in tall ones. As a result, earthquake force in tall buildings has been calculated cautiously based on increased code period and extra increase in period is suitable for such buildings. At the end, different increasing factors are recommended in various buildings.

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