



## Reliability Analysis of High Rise Building Considering Wind Load Uncertainty

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### Abstract

In engineering structures, the safety problems are always depending on the respond of structures to different types of load. The safety assessment of a high rise building is highly depending on the analysis of environmental load. Many codes and practices have proposed many requirements for engineers in the design works. These include safety factors, limitations on damage, maximum deflections and so on. When violations in these requirements occur, the structure is believed to be dangerous. But once the problem becomes complicated such as multiple unknown loads in one building, it requires reliability analysis in the design. It must take care of all the assumptions and uncertainties in the structural design. In probabilistic assessment, any input variable is considered as an uncertainty. However, the traditional way to deal with these problems may have problems when uncertainties are large. Many probabilistic safety measures need to be reconsidered in engineering work. This paper, we will provide reliability analysis on a high rise building with consideration of wind load. All the most commonly applied reliability methods are been utilized in this analysis and compared base on the performance. The statistical influences including correlation and distribution type are also discussed in the same reliability problem.

*Keywords:* Structural Analysis; Reliability Analysis; Uncertainty Modeling; Wind Engineering.

### 1. Introduction

Wind loading problem is often met in engineering design works especially in the high rise building design. It is a very common natural phenomenon in our real life and is related to quite a lot of loadings to the building structures. In some particular areas such as coastline buildings, it may even suffer hazardous wind load such as hurricanes. This may even create more uncertainty problems in our engineering analysis process.

Many former works have been done on the development of wind related civil engineering research works. Zhang et al. [15] had utilized the concept of copula to model the joint distribution of wind speed and wave height. This concept is then utilized in the structural safety assessment of high rise building and offshore engineering [16-21]. Yan et al. [22] have adopted a stochastic term to characterize the randomness of erosion coefficient when modeling the wind load. This concept was then applied to analyze the stability of buildings when it suffers snow load. Followed the same idea, Cui et al. [27] conducted several experiment studies to investigate the uncertainties regarding the modeling of wind load. For more practical problems in wind related structural analysis, see [5-14]. However, not many works are done on the reliability analysis of high rise building with consideration of wind load [28]. The former works are either only focusing on the reliability methods or emphasizing the practical design code development [29, 30]. There is a need of full analysis on the existing techniques which are able to perform the structural reliability analysis for high rise building considering wind load. Thus, the significance of the present study is emphasized.

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