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Determination of Basic Wind Velocity for Wind Load-Governed Limit State

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1 Abstract

This paper proposes a general procedure for evaluating a nominal value of wind velocity for a wind load-governed limit state to secure a target reliability index during the design life of a structure. The nominal value of wind velocity, referred to as a basic wind velocity, and wind load factor should be determined so that the factored wind load effect secures a target reliability index for a wind load-governed limit state. In this study, the analytical form of the return period of the basic wind velocity is expressed as a function of the target reliability index, wind load factor, and statistical parameters of wind pressure, which are derived as linear functions of the coefficient of wind velocity. The proposed approach is applied to the Korean Highway Bridge Design Code-Cable supported Bridge, which specifies the design life of a structure as 100- and 200-year.

Keywords: basic wind velocity; wind load-governed limit state; target reliability index; 200-year bridge, reliability-based design code

2 Introduction

The wind load factor and nominal wind load in a reliability-based design code should be determined to secure a target reliability index for a wind load-governed limit state (WGLS) in the code. Although various studies [1-4] have been reported to evaluate the wind load factor for reliability-based design codes, most of the previous studies did not clearly describe neither the backgrounds for determining the nominal value of wind load nor target reliability index of the WGLS.

This study proposes a general approach for determining the nominal value of wind load to secure a target reliability index of the WGLS. The statistical parameters of wind velocity are quoted from the work by Kim et al. [4]. The normalized wind pressure is defined to identify the statistical characteristics of wind pressure, and is utilized in Monte-Carlo simulations (MCS). The statistical parameters of wind pressure are presented as linear functions of the coefficient of variations (COV) of wind velocity by an approximation.

The ratio of the return period of wind velocity to the design life of a structure (RRD) is derived as a function of the target reliability index and COV of wind velocity by utilizing the analytical form of wind load factor and the statistical parameters of wind

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