

## Statistical Characteristics of Code Formula for Design of Concrete Structures

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**Abstract :** In this research, a statistical analysis is carried out to examine the statistical properties of the formula given in the design code for concrete structures. The design formulas of the Korea highway bridge design code - the limit state design method (KHBDC) which is the current national bridge design code and the design code for concrete structures by Korea Concrete Institute (KCI) are applied for the analysis. The safety levels provided by the strength formulas of the design codes are defined based on the probabilistic and statistical theory. KHBDC is a reliability-based design code. The load and resistance factors of this code were calibrated to attain the target reliability index. It is essential to define the statistical properties for the design formulas in this calibration process. In general, the statistical characteristics of a member strength are due to the following three factors. The first is due to the difference between the material strength of the actual construction and that used in the design calculation. The second is the difference between the actual dimensions of the constructed sections and those used in design calculation. The third is the difference between the strength of the actual member and the formula simplified for the design calculation. In this paper, the statistical study is focused on the third difference. The formulas for calculating the shear strength of concrete members are presented in different ways in KHBDC and KCI. In this study, the statistical properties of design formulas were obtained through comparison with the database which comprises the experimental results from the reference publications. The test specimen was either reinforced with the shear stirrup or not. For an applied database, the bias factor was about 1.12 and the coefficient of variation was about 0.18. By applying the statistical properties of the design formula to the reliability analysis, it is shown that the resistance factors of the current design codes satisfy the target reliability indexes of both codes. Also, the minimum resistance factors of the KHBDC which is written in the material resistance factor format and KCI which is in the member resistance format are obtained and the results are presented. A further research is underway to calibrate the resistance factors of the high strength and high-performance concrete design guide.

**Keywords :** concrete design code, reliability analysis, resistance factor, shear strength, statistical property

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