Target Safety Criteria for School Gymnasium Structure

Jun KANDA
Professor
Nihon University
Tokyo, Japan
kandaj@k.u-tokyo.ac.jp

Jun Kanda, born 1947, graduated from the University of Tokyo, Japan, then received his PhD from the University of Edinburgh, U.K. He worked for Takenaka Corporation, Tokyo as a structural engineer before becoming Professor at the University of Tokyo, Japan. He moved to Nihon University from April 2012. His main area of research is related to the structural safety in general.

Summary

The safety criteria for building structures are provided in regulations as minimum requirements. Then people usually do not pay attentions to the level of safety. However the local conditions for the seismic activity, soil conditions and social behaviour are rather different. The appropriate safety level has to be based on the demands of stakeholders including clients and users. The target safety criteria for school gymnasium are discussed as an example. The minimum total expected cost principle is applied as a tool for the discussion.

Keywords: safety criteria; building regulations; reliability index; minimum total expected cost; failure cost; school gymnasium; societal consensus.

1. Introduction

The target structural safety of building may be determined by considering the minimization of total expected cost which is the summation of the initial construction cost and expected failure costs. In particular, it is desirable to achieve an agreement among communities on the seismic safety performance for public buildings. On the other hand building regulations provide minimum requirements for the structural safety and people tend to think buildings approved based on the regulations are regarded as safe.

A school gymnasium is taken as an example for such discussions. The building standard law of Japan does not provide the importance factor, however some special safety requirements are specified for governmental buildings in terms of the ministry order. School facilities are often used as shelter structures at the occasion of natural disaster. Performance requirements for shelter structures are rather special, but a design of school usually has not considered any increase of structural safety. The ministry order recommends the owner of buildings to increase the design earthquake load for buildings by multiplying a factor 1.25 when the building is potentially used as a shelter.

It is the purpose of this paper to discuss the feasibility of stakeholder conference for determining the target safety criteria as an alternative building approval system, where the safety criteria are given in terms of regulations in the current system. Attempts of workshops were made in a local community to examine the mutual understanding of sharing the responsibilities on the structural safety.

2. Current Safety Requirements

2.1 Seismic Safety in Japanese Regulation

The typical design intensity of earthquake ground motion is regarded as 400 Gal(cm/s^2) for the capacity design as specified in enforcement orders of Building Standard Law. Corresponding return period in Tokyo to this intensity for example is estimated as 500 years. This will provide a certain level of safety in the probabilistic means. However the regional factor specified in the

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