

May 14, 2015

## KKE Engineer Wins Japan Association for Earthquake Engineering' "JAEE Incentive Award" for Study on Vulnerability of Nonresidential Buildings Based on Damage Survey Data from the 2011 East Japan Earthquake

Shunya Okuno, an engineer at the Disaster Reduction & Environmental Engineering Department of Kozo Keikaku Engineering Inc. (Head Office: Nakano-ku, Tokyo; President: Shota Hattori; hereinafter "KKE"), has won the Japan Association for Earthquake Engineering's "2014 JAEE Incentive Award". The award was presented to recognize his achievements in writing a joint paper together with Professor Shunichi Koshimura of Tohoku University's International Research Institute of Disaster Science, Makoto Yamaguchi and Haruki Yamamoto of the General Insurance Rating Organization of Japan, and Masao Tonagi of KKE. The award ceremony will take place on May 22.

The "JAEE Incentive Award" was established to encourage young researchers who have made significant contributions to the field of earthquake engineering through outstanding research. Award candidates must be 35 years old or younger. The winners are selected based on papers published in the JAEE Journal between December 31 of the fiscal year before the awarding year and two years prior to that date.

For more details on the JAEE Incentive Award, see: <http://www.jaee.gr.jp/english/contribution/con02/syourei.html>

### ■ The Paper and Authors

*"Tsunami vulnerability function for nonresidential buildings based on damage survey data from the 2011 East Japan earthquake"*

Shunya Okuno, KKE \*Award winner  
Masao Tonagi, KKE  
Makoto Yamaguchi, General Insurance Rating Organization of Japan  
Haruki Yamamoto, General Insurance Rating Organization of Japan  
Shunichi Koshimura, International Research Institute of Disaster Science, Tohoku University

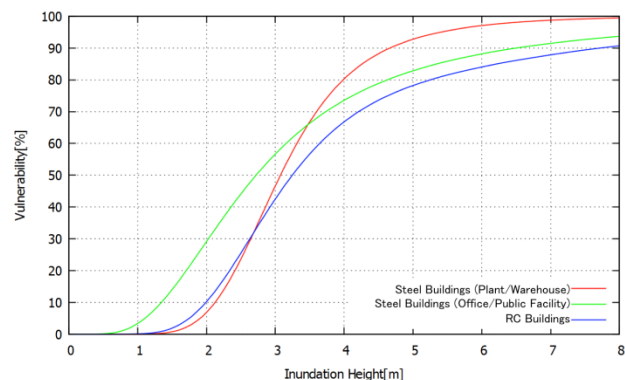


Fig. 1 Tsunami Vulnerability Curves by Building Structure and Purpose

### ■ Research Abstract

A tsunami vulnerability function has been introduced and is being used among researchers and scholars in order to estimate the degree of damage to buildings hit by tsunamis. This function represents the correlation between tsunami inundation depth and the probability of damage to structures. There are still only a few studies on a tsunami vulnerability function, and those that do exist focus mostly on houses and residential buildings.

The paper introduces an original concept, the "tsunami vulnerability function" from which the curves in Fig. 1 have been obtained, for the purpose of estimating the tsunami vulnerability of nonresidential buildings such as plants, warehouses, offices, hotels, and public facilities. This tsunami vulnerability function is numerically derived

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from the ratio of a building's repair cost to its rebuilding cost, both of which are based on data collected in an onsite survey after the 2011 East Japan Earthquake off the Pacific coast. The function represents the building's vulnerability to tsunamis with inundation depth as an explanatory variable.

KKE has been extensively engaged in the prediction of damage to buildings and other structures due to earthquakes and tsunamis. Japan has coastal areas that are home to many nonresidential buildings such as factories and warehouses. Predicting the damage to these kinds of nonresidential buildings is extremely useful in protecting the value of companies' assets, not to mention human lives.

### ■ About KKE (<http://www.kke.co.jp/en/>)

Founded as a structural design firm in 1956, KKE has expanded its objects of analysis from buildings to the surrounding natural environment (i.e. earthquakes, tsunamis, wind, etc.), society, business, and communities. As a professional design and engineering company that bridges the academic and industrial worlds, KKE strives to solve the various issues and challenges that society faces, utilizing its engineering expertise acquired through knowledge exchanges in diverse fields. KKE will thus contribute to creating a better society and systems for the next generation.

### ■ For More Information

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