Typhoon Fragility Assessment of Industrial Buildings Using a Probabilistic Model

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Summary

Steel frame system incorporating sandwich panels is frequently used for industrial buildings in Korea. The industrial buildings are vulnerable structures to high wind hazards, and typhoons have caused billions of dollars (USD) losses in recent years in Korea.

However, a handful of studies exist in the public domain to predict wind damage of the industrial buildings. Most published studies use regression techniques with post-disaster investigations or claim data to develop fragility curves. This approach cannot be used to develop fragility curves for the industrial buildings in Korea because very limited post-disaster and claim data are existed.

In this paper, a probabilistic model was presented to predict the wind-induced building damage. The core of this model is a Monte Carlo simulation engine that generates damage information for typical industrial buildings, using a component approach. The simulation compares deterministic wind loads described in ASCE 7-05 and the probabilistic capacity of vulnerable building components based on pressure chamber tests, to determine the probability of damage, and finally probabilistic damage of a whole structure is identified over a range of assigned wind speed.

The fragility methodology described in this paper can be used to develop performance-based design guidelines for industrial buildings in high wind regions as well as to provide information on which to base structural safety or expected loss assessments.

keywords: Typhoon Fragility, Industrial Buildings, Probabilistic Model.

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