別紙４－１（課程博士（英文））

Date of Submission (month day, year) : July 06th, 2020

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Abstract (Doctor)

Title of Thesis	A study of Seismic Evaluation of Existing Building in Indonesia

Approx. 800 words

Indonesia has often suffered major damaging earthquakes. It is difficult to precisely estimate the magnitude and location of earthquakes that will occur during the life of a building. There are still thousands of buildings in earthquake-prone regions that require seismic evaluation and rehabilitation. In recent years, the structure design code has experienced changes significantly because of the increased demand for structural capacity. The revision of the Indonesia hazard map is proposed by referring to the International Building Code where spectral acceleration values at peak ground acceleration, at 0.2 second and 1.0 second were applied for general buildings. Generally, the analysis shows the values of PGA relatively higher than in the previous Indonesian code. As a result, the existing buildings are no longer meets the standard requirement of applicable earthquake standard.

The introduction part in Chapter 1 clarifies the background problems and the motives for performing this study. The main objective is to develop a systematic evaluation of existing buildings in Indonesia. In order to achieve the objective, this research is conducted the study of the possibility of screening evaluation in the preliminary stage. There are fifteenth buildings evaluated in Chapter 2. These buildings are evaluated by Rapid Visual Screening (RVS), and then the static nonlinear analysis is used to confirm the result of the RVS. This RVS method can be used for the preliminary evaluation for the large numbers of buildings in a city against the earthquake risk.

The next stage of evaluations is a rapid evaluation method. The reliability of this method is described in Chapter 3 of this study. The rapid evaluation has been demonstrated by selecting cases of the 6th story steel moment-resisting frame system, and the 10th story braced frame system. Nonlinear static and dynamic analysis is performed to confirm the result of this method. The result of the evaluation, there are deficiencies founded in the basic configuration of the moment frame building because of non-compliant in the weak and soft story. The strong column weak beam criteria are not fulfilled in this building. It is confirmed by non-linear static and dynamic analysis, where the story failure likely to occur in the same stories with the screening result. The same evaluation method is also applied in the brace frame bu

ilding. There is no soft-story effect in this building, but the requirement of the strength capacity among the adjacent story is insufficient. This chapter shows that rapid evaluation can be implemented to evaluate the existing str ucture against the risk of an earthquake.

An index for evaluating the existing building performance is also proposed i n this study. Two existing buildings were evaluated in Chapter 4. The first building consisted of five stories, and the second has four stories. Both bui ldings were moment-resisting frame system. An index is represented as the seismic performance of the existing building by following the Japanese stan dard. The building A has a seismic index in transversal direction larger tha n in the longitudinal direction. Meanwhile, building B has the same seismic index in both directions. The application of a seismic index based on the J apanese standard needs some adjustments for other countries. In this study, a set procedure was proposed to determine a seismic index based on the r esult of the pushover analysis. The result of the seismic index is higher tha n it obtained by the Japanese standard, due to the calculation of structural capacity was carried out until post elastic conditions. While the calculation based on the Japanese standard was based on the average shear stress on the resisting elements of lateral force. Furthermore, the seismic demand in dex is also developed with the same method with following to target respon se spectrum.

The dynamic seismic index dIs and the dynamic ductility index dF of buildi ngs, where located in Indonesia are introduced in this study. Both of these indexes show good accuracy in evaluating the seismic performance of a stru cture. A collection of simulated ground motions was used in linear and no nlinear dynamic analysis, which had Indonesia's response spectrum code as the target. The ductility index could be estimated by the estimation method without conducting the dynamic analysis in this study. Two estimation met hods were also introduced that the first was the characteristic displacement response method which formulated from the relationship of the critical duc tility factor μcr and the ductility index, and the second was the equivalent linearization method.

Finally, this study concludes that several stages can be carried out to overcome the problem in evaluating the performance of existing buildings. Seismic index methods such as those conducted in Japan, with some adjustments, can be used as guidelines to be applied in Indonesia to assess the performance of the building. The dynamic seismic index and ductility index can be predicted without conducting the nonlinear dynamic analysis by using the proposed methods, as confirmed in this study.