

## INTISARI

Berlokasi di daerah rawan gempa, rencana mitigasi menjadi hal yang perlu dipertimbangkan pada Gedung A Departemen Teknik Sipil dan Lingkungan. Kurva kerapuhan bangunan merupakan salah satu alat bantu statistik yang dapat merepresentasikan kemungkinan kegagalan struktur yang diakibatkan oleh gempa. Penelitian ini bertujuan untuk memperkirakan kegagalan tersebut.

Gedung A dimodelkan dalam 3D menggunakan program SAP2000 v15.0.0. Analisis beban dorong dilakukan untuk mendapatkan spektra kapasitas dan untuk memperkirakan perkembangan sendi plastis yang mungkin terjadi. Spektra kapasitas menghasilkan 3 titik kunci: a) titik leleh, b) titik median (*slight damage*), c) titik *nearly-collapse*. Ketiga titik kunci tersebut akan menjadi input utama dalam proses analisis probabilitas yang dilakukan dengan distribusi log-normal. Kondisi kerusakan yang diperkirakan (*slight, moderate, extensive, dan complete*) mengacu pada manual teknis HAZUS-MH MR 5.

Hasil estimasi analisis menunjukkan bahwa sendi plastis terbentuk hanya pada lantai 1 dan gedung akan mencapai *nearly-collapse point* pada simpangan lateral sebesar 8.37 cm dan gaya geser seismic dasar sebesar 14801.3 kN. Nilai-nilai median pada setiap kondisi kerusakan diperkirakan berada pada angka 2.74 cm (*slight damage*), 4.11 cm (*moderate damage*), 6 cm (*extensive damage*), 8.7 cm (*complete damage*).

**Kata kunci:** Kurva kerapuhan bangunan, analisis beban dorong, probabilitas kerusakan struktur, HAZUS, SAP2000

## ABSTRACT

The building of Department of Civil and Environmental Engineering UGM is a three-story reinforced concrete moment resisting frame. Located in a region prone to earthquake activity, mitigation plan has become an essential need. In this case, fragility curve stands as a supporting statistical tool which represents vulnerability/fragility of a structure as it shows the probability of structural damage or failure due to ground motion. This research aims to estimate the rate of structural damage might occur when certain level of ground motion strikes.

Existing building was modeled in 3D using SAP2000 v15.0.0. Static pushover analysis was performed to obtain capacity spectrum and to estimate plastic hinges development. Capacity spectrum gave three main points with certain value: a) yield point, b) median point (slight damage), c) nearly-collapse point. These values would become inputs to perform statistical analysis using normal log distribution to forecast the damage rate probability against certain level of spectral acceleration. Damage levels (slight, moderate, extensive, and complete) were determined based on HAZUS-MH MR 5 technical manual.

It is estimated that plastic hinges would develop only at the 1<sup>st</sup> story while nearly-collapse point would be reached at 8.37 cm of lateral displacement and 14801.3 kN of base force. Median values for each damage state are estimated such as follows: 2.74 cm (slight damage), 4.11 cm (moderate damage), 6 cm (extensive damage), 8.7 cm (complete damage).

**Keywords:** Fragility curves, pushover analysis, structural damage rate probability, HAZUS, SAP2000