ABSTRAK

Chevan Yehezkiel Sinaga, NIM: 5203250022: Pengaruh Implementasi Base Isolation Jenis High Damping Rubber Bearing (HDRB) Terhadap Respon Strukur Pada Gedung. Skripsi. Fakultas Teknik, Universitas Negeri Medan. 2025

Indonesia merupakan negara yang rawan gempa karena berada di wilayah Cincin Api Pasifik, tempat bertemunya tiga lempeng tektonik utama. Tingginya risiko seismik memerlukan inovasi dalam desain struktur bangunan tahan gempa. Salah satu teknologi yang efektif adalah *base isolation*, khususnya tipe *High Damping Rubber Bearing* (HDRB), yang berfungsi meredam energi gempa agar tidak diteruskan langsung ke struktur bangunan. Berbagai studi telah membuktikan efektivitas HDRB dalam menurunkan gaya geser dan deformasi bangunan secara signifikan. Oleh karena itu, penelitian ini difokuskan pada analisis pengaruh implementasi HDRB terhadap performa struktur bangunan bertingkat di daerah rawan gempa di Indonesia.

Penelitian dilakukan dengan studi kasus struktur gedung kantor berjumlah 3, 4, dan 5 lantai yang dimodelkan menggunakan perangkat lunak ETABS versi 2022. Sistem struktur yang digunakan adalah Sistem Rangka Pemikul Momen Khusus (SRPMK) dan dianalisis berdasarkan SNI 1728:2019 menggunakan metode *Response Spectrum Analysis*. Penelitian ini membandingkan respons struktur antara kondisi *fixed base* dan *base isolated* dalam hal periode getar alami, gaya geser, dan simpangan antar lantai, untuk mengetahui sejauh mana sistem HDRB dapat meningkatkan kinerja seismik bangunan.

Hasil penelitian menunjukkan bahwa penerapan HDRB memberikan pengaruh signifikan terhadap respons struktur. Lantai 3, 4, dan 5 masing-masing menggunakan isolator dengan jenis HH090X6R, HH100X6R, dan HH110X6R. Terjadi peningkatan periode hingga 43,89%, serta reduksi gaya geser hingga 48% dan simpangan antar lantai hingga 36%, tergantung jumlah lantai dan arah pembebanan. Nilai periode untuk gedung 3, 4, dan 5 lantai masing-masing adalah 2,151 s; 2,592 s; dan 3,018 s, dengan simpangan maksimum 39,124 mm; 47,934 mm; dan 56,563 mm, serta gaya geser dasar 180,034 kN; 196,620 kN; dan 209,219 kN. Hal ini membuktikan bahwa implementasi sistem isolasi HDRB efektif dalam meningkatkan ketahanan struktur terhadap gempa bumi.

Kata Kunci: **Base Isolator, Gempa, Gaya Geser, HDRB, Periode, Simpangan**

ABSTRACT

Chevan Yehezkiel Sinaga, Student ID: 5203250022: The Effect of Implementing High Damping Rubber Bearing (HDRB) Base Isolation on the Structural Response of Buildings. Thesis. Faculty of Engineering, State University of Medan. 2025.

Indonesia is an earthquake-prone country as it lies along the Pacific Ring of Fire, where three major tectonic plates converge. The high seismic risk necessitates innovations in earthquake-resistant structural design. One effective technology is base isolation, particularly the High Damping Rubber Bearing (HDRB), which functions to absorb seismic energy before it is transferred to the superstructure. Various studies have proven the effectiveness of HDRB in significantly reducing structural shear forces and deformations. Therefore, this study focuses on analyzing the impact of HDRB implementation on the performance of multi-story buildings in earthquake-prone regions of Indonesia.

The study was conducted using a case study of office buildings with 3, 4, and 5 floors, modeled using ETABS 2022 software. The structural system used is the Special Moment Resisting Frame (SMRF), and the analysis was performed based on SNI 1728:2019 using the Response Spectrum Analysis method. The structural responses of fixed-base and base-isolated conditions were compared in terms of natural period, base shear, and inter-story drift to assess the effectiveness of HDRB systems in improving seismic performance.

The results of the study indicate that the implementation of HDRB has a significant effect on the structural response. The 3, 4, and 5 story buildings respectively utilized HH090X6R, HH100X6R, and HH110X6R isolator types. The analysis showed an increase in the fundamental period of up to 43.89%, a reduction in base shear of up to 48%, and a decrease in inter-story drift of up to 36%, depending on the number of stories and the direction of seismic loading. The fundamental periods for the 3, 4, and 5 story buildings were 2.151 s, 2.592 s, and 3.018 s, with maximum displacements of 39.124 mm, 47.934 mm, and 56.563 mm, and base shear values of 180.034 kN, 196.620 kN, and 209.219 kN, respectively. These findings confirm that the implementation of HDRB base isolation systems is effective in enhancing the seismic resilience of structures.

Keywords: **Base Isolation, Base Shear, Earthquake, HDRB, Inter-story Drift, Period**