ABSTRAK

Denielito Soul Winner Sidauruk. NIM 5191250013: Analisis Kinerja Interlocking Wall (Wall-Y) dan Perbandingannya dengan Dinding Konvensional

Penyediaan hunian terjangkau di Indonesia masih menghadapi tantangan berupa biaya konstruksi yang tinggi, waktu produksi yang lambat, serta kerentanan terhadap gempa bumi. Kerusakan masif pada dinding konvensional saat bencana gempa menuntut adanya alternatif sistem dinding yang lebih efektif dan tahan gempa, seperti sistem *Interlocking masonry* tanpa mortar. Penelitian ini bertujuan untuk menganalisis kinerja ketahanan seismik dinding *Interlocking Wall* tipe *Wall-Y* dan membandingkannya dengan dinding bata konvensional pada panel berukuran 3x3 meter yang representatif untuk hunian sederhana. Selain itu, penelitian ini mengkaji pengaruh tingkat beban aksial awal (*pre-compression*) terhadap respons seismik kedua tipe dinding tersebut. Metode yang digunakan adalah simulasi numerik berbasis Metode Elemen Hingga (*FEM*) dengan perangkat lunak Abaqus. Pemodelan menggunakan pendekatan mikro-sederhana dengan model material *Concrete Damage Plasticity (CDP)* untuk menangkap perilaku non-linear struktur. Protokol pembebanan mengikuti standar FEMA 461, yang melibatkan pemberian *pre-compression* aksial konstan diikuti oleh beban lateral siklik *Displacement-Controlled* berbasis *drift*. Indikator kinerja yang dievaluasi meliputi kapasitas lateral maksimum, kekakuan, energi disipasi, dan pola kerusakan.Hasil penelitian menunjukkan bahwa pengaplikasian sistem dinding *Interlocking Wall-Y* memberikan kapasitas gempa yang jauh lebih unggul dibandingkan dengan dinding bata konvensional. Dinding *Interlocking Wall-Y* mampu mencapai kapasitas dorong puncak sebesar 989,076 kN, sedangkan dinding konvensional hanya mampu mencapai 698,52 kN. Di sisi lain, peningkatan gaya *pre-compression* aksial memberikan dampak yang signifikan terhadap peningkatan kapasitas lateral kedua struktur. Peningkatan *pre-compression* dari 0,5 N/mm² menjadi 1 N/mm² pada dinding konvensional meningkatkan kapasitas *Pushover* dari 593,443 kN menjadi 653,294 kN. Sementara itu, pada dinding *Interlocking Wall-Y*, kenaikan level *pre-compression* tersebut berhasil mendongkrak kapasitas gaya dorong puncak menjadi 716,519 kN dari nilai awal sebesar 683,351 kN.

Kata Kunci: *Interlocking Wall*, Dinding Konvensional, Analisis Elemen Hingga, Abaqus, Kinerja Seismik, Beban Siklik.

ABSTRACT

Denielito Soul Winner Sidauruk. NIM 5191250013: ***Performance Analysis of Interlocking Wall (Wall-Y) and Comparison With Conventional Walls***

The provision of affordable housing in Indonesia faces challenges such as high construction costs, slow production time, and vulnerability to earthquakes. Massive Damage To conventional Walls during seismic events necessitates alternative Wall systems that are more effective and earthquake-resistant, such as mortarless Interlocking masonry systems. This study aims to analyze the seismic performance of the Wall-Y Interlocking Wall system and compare it with conventional brick Walls on 3×3 meter panels, which are representative of simple housing. Furthermore, this research examines the effect of initial axial load levels (pre-compression) on the seismic response of both Wall types. The method used is numerical simulation based on the Finite Element Method (FEM) using Abaqus software. The modeling employs a simplified micro-approach with the Concrete Damage Plasticity (CDP) material model to capture the non-linear Behavior of the structures. The loading protocol follows the FEMA *461 standard, involving the application of constant axial pre-compression followed by drift-based Displacement-Controlled Cyclic lateral loads. Performance indicators evaluated include maximum lateral capacity, stiffness, energy dissipation, and failure patterns The results of the study indicate that the application of the Wall-Y Interlocking Wall system provides a much superior earthquake capacity compared to conventional brick Walls. The Wall-Y Interlocking Wall is able to achieve a peak thrust capacity of 989.076 kN, while the conventional Wall is only able to achieve 698.52 kN. On the other hand, increasing the axial pre-compression force has a significant impact on increasing the lateral capacity of both structures. Increasing pre-compression from 0.5 N/mm² to 1 N/mm² in the conventional Wall increases the Pushover capacity from 593.443 kN to 653.294 kN. Meanwhile, in the Wall-Y Interlocking Wall, the increase in the pre-compression level successfully boosted the peak thrust capacity to 716.519 kN from the initial value of 683.351 kN.*

Keywords*: Interlocking Wall, Conventional Wall, Finite Element Analysis, Abaqus, Seismic Performance, Cyclic Loading.*