INTISARI

Rekonstruksi pascagempa di Indonesia menghadapi dua tantangan utama yaitu kecepatan pembangunan dan pengendalian mutu pelaksanaan. Sistem RISBA (Rumah Instan Struktur Baja) dikembangkan sebagai solusi atas kedua permasalahan tersebut. Penelitian ini melakukan pengujian getaran, tarik lateral serta mengevaluasi pelaksanaan dan level kinerja seismik *Operational*, *Immediate Occupancy*, *Life Safety*, dan *Collapse Prevention* berdasarkan ASCE 41-17.

Prototipe rumah skala penuh menggunakan profil baja CNP 95×33×10×1.8 dengan lima variasi: RISBA 1 (3×6 m²) sambungan las tanpa dinding; RISBA 2 (3×6 m²) sambungan las dengan dinding bata 60 cm dan *sheathing*; RISBA 3 (6×6 m²) sambungan Kunci Penjepit Mekanis (KPM) tanpa dinding; RISBA 4 (6×6 m²) sambungan KPM dengan dinding bata 60 cm; dan RISBA 5 (6×6 m²) sambungan KPM dengan dinding bata 60 cm dan *sheathing*. *Sheathing* setinggi 2,40 m menggunakan sistem rangka baja ringan C75. Penelitian dilakukan dengan eksperimen uji getaran dan beban lateral di laboratorium, dilengkapi pemodelan numerik untuk analisis *modal* dan *nonlinear pushover.*

Hasil analisis pemodelan numerik untuk beban gempa Lombok dan Palu menunjukkan *performance point* berada pada kondisi linear dengan gaya lateral maksimum berturut-turut 20,75 kN, 66,95 kN, 31,30 kN, 88,72 kN, dan 116,62 kN atau 5,29 g; 2,51 g; 4,85 g; 2,39 g dan 2,90 g untuk RISBA 1–5. Frekuensi hasil uji getaran menunjukkan kesesuaian dengan hasil pemodelan. Uji *collapse* menunjukkan RISBA 1 mampu menahan beban 18 kN (empat kali berat strukturnya) dengan drift 6%, mengalami leleh pada titik angkur pondasi. RISBA 2 menahan beban 45 kN (1,5 kali berat struktur) dengan drift 4%, mengalami kerusakan *pull-through* dan tekuk kolom. RISBA 5 menahan beban 50 kN (dua kali berat struktur) dengan drift 1,5% tanpa kerusakan dinding. Analisis *target displacement* menunjukkan semua RISBA berada pada level kinerja *Immediate Occupancy* tanpa kerusakan. Penggunaan sambungan KPM memungkinkan konstruksi struktur sangat cepat dengan kontrol kualitas lebih baik daripada sambungan las, menjadikan RISBA KPM alternatif rekonstruksi pasca bencana yang menekankan pada kecepatan pembangunan kembali dengan standar ketahanan yang lebih baik.

Kata kunci: rumah instan struktur baja, level kinerja, *pushover*, frekuensi

ABSTRACT

Post-earthquake reconstruction in Indonesia faces two primary challenges: construction speed and quality control during implementation. The RISBA (Instant Steel Structure House) system was developed to address both issues. This study conducted vibration testing, lateral pull testing, and evaluated the construction process as well as seismic performance levels—Operational, Immediate Occupancy, Life Safety, and Collapse Prevention—in accordance with ASCE 41-17.

Full-scale house prototypes were constructed using CNP 95×33×10×1.8 steel profiles with five variations: RISBA 1 (3×6 m²) with welded connections and no walls; RISBA 2 (3×6 m²) with welded connections, 60 cm brick walls, and sheathing; RISBA 3 (6×6 m²) with KPM connections and no walls; RISBA 4 (6×6 m²) with KPM connections and 60 cm brick walls; and RISBA 5 (6×6 m²) with KPM connections, 60 cm brick walls, and sheathing. The sheathing, with a height of 2.40 m, utilized a C75 light steel frame system. The study employed experimental vibration and lateral load testing in the laboratory, supplemented by numerical modeling for modal and nonlinear pushover analysis.

Numerical modeling analysis for the Lombok and Palu earthquake loads indicated that performance points remained within the linear range, with maximum lateral forces of 20.75 kN, 66.95 kN, 31.30 kN, 88.72 kN, and 116.62 kN, corresponding to 5.29 g, 2.51 g, 4.85 g, 2.39 g, and 2.90 g for RISBA 1–5, respectively. Vibration test frequencies demonstrated good agreement with the modeling results. Collapse testing revealed that RISBA 1 sustained a load of 18 kN (four times its structural weight) at 6% drift, with yielding occurring at the foundation anchor points. RISBA 2 sustained a load of 45 kN (1.5 times its structural weight) at 4% drift, exhibiting pull-through failure and column buckling. RISBA 5 sustained a load of 50 kN (twice its structural weight) at 1.5% drift without wall damage. Target displacement analysis indicated that all RISBA variants achieved the Immediate Occupancy performance level without damage. The use of KPM connections enables very rapid structural construction with better quality control compared to welded connections, positioning RISBA as a viable post-disaster reconstruction alternative that emphasizes accelerated rebuilding while maintaining higher standards of structural resilience.

Keywords: *instant steel structure house, performance level, pushover, frequency*