Studi Efektivitas dan Redundansi Sistem Struktur Penahan Lateral Ganda dengan Variabel Konfigurasi Struktur Berdasarkan Desain Seismik Berbasis Kinerja terhadap Analisis Dinamik Nonliner = Effectiveness and Redundancy of Dual Lateral Resisting System with Structure Configuration Variation Based on Nonlinear Dynamic Analysis Performance Based Seismic Design through Nonlinear Dynamic Analysis.

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Abstrak

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Performa bangunan beton bertulang dengan sistem dinding geser khusus dengan rangka penahan momen khusus (sistem ganda) yang didesain sesuai ASCE 7-16, dievaluasi dengan Performance-Based Seismic Design (PBSD) sesuai ASCE 41-17, berdasarkan variasi konfigurasi bentang struktur, jumlah lantai, konfigurasi dinding geser, dan geometri bangunan. Dalam tata cara perencanaan, perilaku inelastis struktur disederhanakan dalam bentuk modifikasi respons gempa R, yang bergantung hanya pada sistem struktur. Kontribusi konfigurasi struktur terhadap perilaku inelastis aktual tidak diketahui. Non-Linear Time History Analysis menggunakan 11 pasang ground motion yang terskalakan terhadap respons spektra ASCE 7-16, digunakan untuk menilai potensi performa tata cara perencanaan. Hasil evaluasi menunjukkan bahwa peningkatan jumlah bentang struktur dan penggunaan faktor redundansi, dapat meningkatkan performa dan redundansi struktur. Peningkatan jumlah lantai, konfigurasi dinding geser asimetris, torsi tak terduga dan pengarahan ground motion pada sumbu utama struktur dapat menurunkan performa dan redundansi struktur. Prediksi kebutuhan dapat dengan mudah melampaui kapasitas rotasi inelastis balok dan kolom pada bangunan dengan SRPMK, sedangkan prediksi kebutuhan dapat dengan mudah melebihi kapasitas kuat geser dinding geser pada bangunan dengan sistem ganda. Secara keseluruhan, bangunan yang sudah didesain menurut ASCE 7 tidak terjamin dapat mencapai tujuan target kinerja menurut ASCE 41.
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ABSTRACT
Performance of special reinforced concrete shear walls with special moment frame (dual systems) buildings designed in accordance with ASCE 7-16, are evaluated with Performance-Based Seismic Design (PBSD) in accordance with ASCE 41-17, based on variations in structure bays configuration, number of levels, shear walls configuration, and building geometry. In prescriptive code, structure inelastic behaviour is simplified in forms of seismic response modification R, which depends solely on structural system. Contribution of structure configuration, to actual structure inelastic behavior remains unknown. Non-Linear Time History Analysis using 11 pairs of ground motions matched to ASCE 7-16 response spectrum is used to assess the potential performance of prescriptive code. Evaluation results show that increasing amount of structure bays and usage of redundancy factor, may increase structure performance and redundancy. Increasing number of levels, asymmetric shear walls configuration, accidental torsion and ground motions directionality may reduce structure performance and redundancy. Predicted demands may easily exceed beams' and columns' inelastic rotation capacity in buildings with SMF, while predicted demands may easily exceed shear walls'

shear strength capacities in buildings with dual systems. Thus in overall, the buildings designed as per ASCE 7 are not guaranteed may achieve expected target performance objective by ASCE 41.