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EVALUASI KINERJA STRUKTURAL BANGUNAN PASAR PAGI DI JAKARTA BERDASARKAN STANDAR ASCE 41-17 DAN ALTERNATIF RETROFITTING
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INTISARI

Evaluasi ini dilatarbelakangi oleh tingginya kerawanan gempa di Indonesia akibat posisi geografisnya di pertemuan empat lempeng tektonik aktif, yaitu Eurasia, Indo-Australia, Pasifik, dan Mikro Filipina, yang mengancam bangunan peninggalan regulasi lama terhadap risiko kegagalan getas (*brittle failure*). Rumusan masalah evaluasi berpusat pada apakah komponen struktural Gedung Pasar Pagi memenuhi kriteria penerimaan standar ASCE 41-17 dan SNI 9273:2025 pada tingkat bahaya seismik BSE-1E dan BSE-2E melalui prosedur *Screening* (*Tier* 1) dan *Deficiency-Based Evaluation* (*Tier* 2), serta apa metode *retrofitting* yang efektif. Tujuan evaluasi adalah mengevaluasi kapasitas aktual struktur eksisting dan merencanakan opsi perkuatan untuk memastikan pemenuhan target kinerja *Life safety* (LS) dan *Collapse Prevention* (CP).

Metode evaluasi dimulai dengan memperoleh data hasil survei lapangan *non-destructive test* (NDT) seperti *ultrasonic pulse velocity* (UPV), *brinell test* dan *hammer test* dan *destructive test* (DT) seperti *core drill*. Setelah data material diperoleh, dilakukan pemodelan 3D menggunakan perangkat lunak ETABS v22. Dalam tahap ini, pemodelan tidak hanya berfokus pada geometri, tetapi juga pada sifat mekanis elemen struktur yang disesuaikan dengan kondisi retak (*cracked section properties*) sesuai pedoman ASCE 41. Analisis beban gempa menggunakan prosedur dinamik linier (LDP) metode respons spektrum. Teknik analisis data meliputi evaluasi *checklist* konfigurasi dasar, penapisan awal *Tier* 1, dilanjutkan analisis mendalam *Tier* 2 pada komponen yang mengalami defisiensi, hingga evaluasi pasca-*retrofitting*.

Hasil evaluasi menunjukkan kondisi eksisting berstatus tidak memenuhi (*Non-Compliant*) pada *Tier* 1 akibat masalah tegangan geser kolom, *captive columns*, dan kegagalan geser balok. Analisis *Tier* 2 mengonfirmasi defisit kapasitas geser pada komponen kolom serta balok representatif. Kesimpulan evaluasi menunjukkan bahwa penerapan tiga skema *retrofitting* yaitu pemasangan *bracing* baja tipe X arah-Y, *concrete jacketing* kolom dan *concrete jacketing* balok berhasil memulihkan kapasitas struktur. Verifikasi pasca-perkuatan membuktikan seluruh komponen kini memenuhi seluruh kriteria keselamatan yang disyaratkan oleh ASCE 41-17 pada level BSE-1E dan BSE-2E.

Kata kunci: Evaluasi Seismik, ASCE 41-17, Bangunan Eksisting, *Retrofitting*, *Concrete Jacketing*, *Bracing* Baja.

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ABSTRACT

This evaluation is motivated by Indonesia's high seismic vulnerability resulting from its geographical position at the convergence of four active tectonic plates: Eurasia, Indo-Australia, Pacific, and the Philippine Microplate. This condition poses a significant threat of brittle failure to legacy structures built under outdated regulations. The core problem evaluates whether the structural components of the Pasar Pagi Building satisfy the acceptance criteria of ASCE 41-17 and SNI 9273:2025 standards at the BSE-1E and BSE-2E seismic hazard levels using Tier 1 Screening and Tier 2 Deficiency-Based Evaluation procedures, while determining effective retrofitting methods. The objective is to evaluate the actual capacity of the existing structure and design retrofitting options to ensure compliance with Life Safety (LS) and Collapse Prevention (CP) performance targets.

The methodology begins with gathering field data from non-destructive testing (NDT) such as ultrasonic pulse velocity (UPV), brinell hardness testing, and hammer testing as well as destructive testing (DT) via core drilling. Following material data acquisition, 3D structural modeling was performed using ETABS v22 software. In this stage, the modeling focuses not only on geometry but also on the mechanical properties of structural elements, adjusted for cracked section properties according to ASCE 41 guidelines. Seismic load analysis was conducted using the linear dynamic procedure (LDP) via the response spectrum method. Data analysis techniques encompass the evaluation of basic configuration checklists, Tier 1 initial screening, followed by an in-depth Tier 2 analysis of deficient components, and concluding with a post-retrofit evaluation.

Evaluation results indicate that the existing condition is categorized as "Non-Compliant" at the Tier 1 level due to issues regarding column shear stress, captive columns, and beam shear failure. The Tier 2 analysis confirms a deficit in shear capacity within representative column and beam components. The study concludes that the application of three retrofitting schemes specifically the installation of X-type steel bracing in the Y-direction, concrete jacketing of columns, and concrete jacketing of beams successfully restores the structure's capacity. Post-retrofitting verification demonstrates that all components now meet the safety criteria mandated by ASCE 41-17 at both the BSE-1E and BSE-2E levels.

Keywords: Seismic Evaluation, ASCE 41-17, Existing Buildings, Retrofitting, Concrete Jacketing, Steel Bracing