Replaceable Eccentrically Braced Frame Links with Gusset Plates

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Keywords
Steel eccentrically braced frames, Hydraulic jacks, Quasi-static cyclic loading, Splice connections, Overstrength factor.

Abstract
This talk reports findings of an experimental study conducted on replaceable links for steel eccentrically braced frames (EBFs). The study was supported by the Scientific and Technological Research Council of Turkey and consisted of two phases. Replaceable link details which are based on splicing the braces and the beam outside the link are proposed. These details eliminate the need to use hydraulic jacks and flame cutting operations for replacement purposes. Performance of these proposed replaceable links was studied by conducting 17 nearly full scale EBF tests under quasi-static cyclic loading. Phase 1 concentrated on directly attached brace configuration whereas Phase 2 concentrated on braces attached by making use of gusset plates. The link length ratio, stiffening of the link, loading protocol, connection type, bolt pretension, gap size of splice connections, and demand-to-capacity ratios of members were considered as the prime variables. The specimens primarily showed two types of failure modes: link web fracture and fracture of the flange at the link-to-brace connection. No failures were observed at the splice connections indicating that the proposed replaceable link details provide an excellent response. The inelastic rotation capacity provided by the replaceable links satisfied the requirements of the AISC Seismic Provisions for Structural Steel Buildings (AISC341). The overstrength factor of the links exceeded 2.0 which is larger than the value considered for EBF links by design provisions. The high level of overstrength resulted in brace buckling in two of the specimens demonstrating the importance of overstrength factor used for EBF links.