Effect of Continuity-Plate Alignment on the Capacity of Welded Beam-to-Column Moment Connections

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Abstract

In fully restrained beam-to-column moment connections, beam moments are mostly transferred to the connected column sections through tension-compression force couples that develop in the beam flanges. Column sections that are incapable of transferring these flange forces are often retrofitted with continuity plates within the connection region to improve capacity. In cases of unequal beam depth framing into a column, an eccentricity between the framed-in beam flange and continuity plate may be required. Limited research exists to justify current guidance on acceptable levels of flange-to-continuity-plate eccentricity. This paper analytically investigates the performance of beam-to-column moment connections having unequal beam depths and eccentric continuity plate detailing. In this paper, twelve detailed finite element analyses considering two column sections (W14x132 and W21x147 sections) and six levels of connection eccentricity (ranging from 0 to 6 in.) were considered. Modeling techniques considered for the parametric investigation were validated against experiments performed by others. As expected, increasing the level of eccentricity between the beam flange and continuity plate results in decreased continuity plate participation; however, unlike current code recommendations, noticeable participation (up to 30% additional flange capacity) was observed at eccentricities greater than 2 inches. Current code recommendations appear appropriate for eccentricities up to 2in, but an expanded equation accounting for eccentricities up to 4.5 inches is proposed.

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