AN INVESTIGATION OF ECCENTRICALLY BRACED FRAMES WITH DIFFERENT GEOMETRICAL PATTERNS

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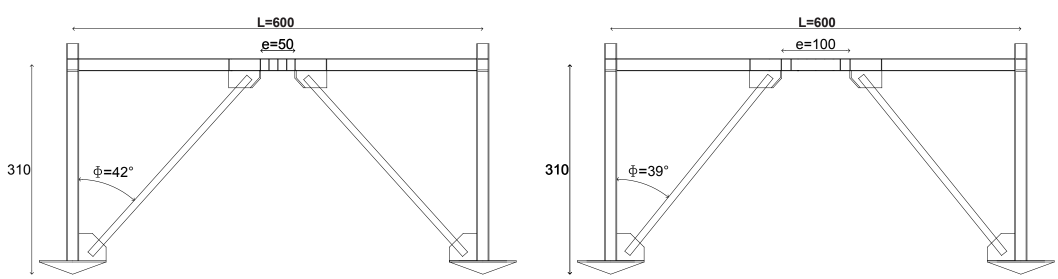
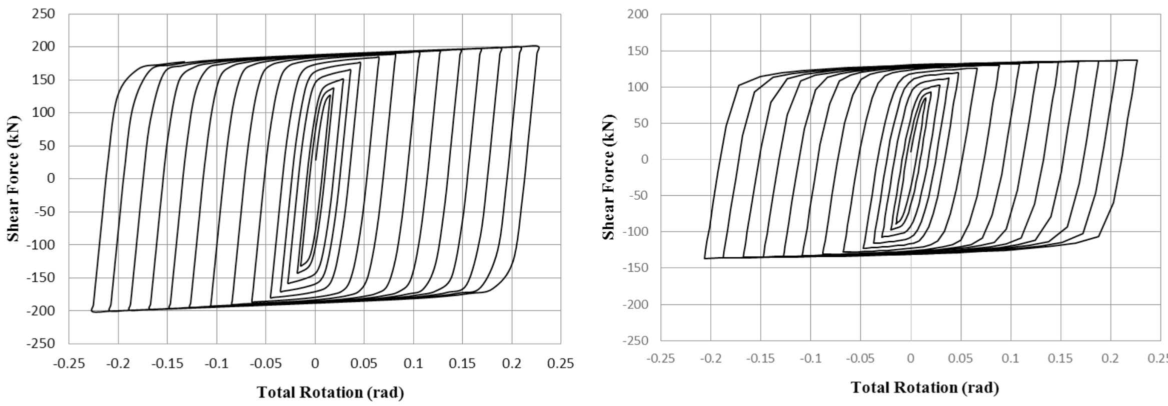
Based on previous full scale experimental works on complete eccentrically braced frames, under cyclic loading (Maalek et al., 2012), the energy absorption capacity of bracing panels incorporating short to long link beams have been investigated and compared. Considering a constant span length of the braced panel, the work includes a parametric study focusing on the effects of the change in the angle of inclination of the bracing member, (see Figure 1), resulting in the change in the length of the link beam, and consequently leading to different modes of behavior and energy dissipation capabilities. Detailed finite element models have been constructed and analysed after calibration with the test results. To achieve this, a combined isoparametric-kinematic material property has been employed. In the range of short, medium and long link beams, the manner in which the energy absorption capacity changes has been demonstrated and discussed. A change of the angle of inclination of the bracing member, that leads to a change in the length of the link beam, also results in a change in the axial force of the bracing members, if either lateral stiffness or lateral strength is to be preserved. This is also associated with a change in the length of the bracing member leading to a change in the slenderness ratio. A relationship has been suggested here to ensure the achievement of the full energy absorption capacity of the braced panel with sufficient margin of safety against buckling and other dominant modes of failure, observed in the experiments. Figures 1(a) and 1(b) show two single-span eccentrically braced frames with the same span length, but different link lengths. A comparision of their hysteretic behaviour, as represented by Figures 2(a) and 2(b), reveals a remarkable change in the energy dissipation capacity of the two systems as a result of the change in the angle of inclination of the bracing member (i.e. the change in the link length). Figures 1(a) and 2(a) pertain to a typical short (shear) link, and Figures 2(a) and 2(b) correspond to a sample long (flexural) link. The paper elaborates such geometric influences on the hysteretic behaviour of eccentrically braced frames for a rather large variety of geometric parameters.



a) F = 42°, e=50 (cm) b) F = 39°, e=100 (cm)

Figure 1. Eccentrically Braced Frames with the same span length, but different link lengths



a) F = 42°, e=50 (cm)

b) F = 39°, e=100 (cm)

Figure 2. Hysteresis Curves (shear force against link rotation)

REFERENCE

Maalek S, Adibrad MH and Moslehi Y (2012) An experimental investigation of the behaviour of EBFs, *Journal of Structures and Buildings,* 165(4): 179-198