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EXPERIMENTAL INVESTIGATION OF T-STUB LINK-TO-COLUMN CONNECTIONS IN ECCENTRICALLY BRACED FRAMES

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Based on previous researches on long link-to-column connections, brittle failure happened in welded connections before reaching to plastic rotation capacity and because AISC/ANSI 341-10 does not provide any proved connection for long link-to-column connections (AISC/ANSI 341-10), therefore this research is only for long link connections, which has been tested for evaluating performance of T-stub connections in long link-to-column connections.

In this study, two experimental tests have been carried out on full scale link-to-column connections under cyclic loading. The setup is similar to that used by Okazaki et al. (2006). The load is applied to the column by a 1000 kN hydraulic actuator. The test is conducted using the displacement control at the column end. The view of the test setup is shown in Figure 1.

Figure 1. View of the test setup.

To calculate the design plastic moment of connection, equation 1 is used.

$$0.95M_{p.con} = C.M_p \quad \text{(Eq. 1)}$$

where $M_{p.con}$ is design plastic moment of connection. The value obtained from the parenthesis in Equation 1 is called C

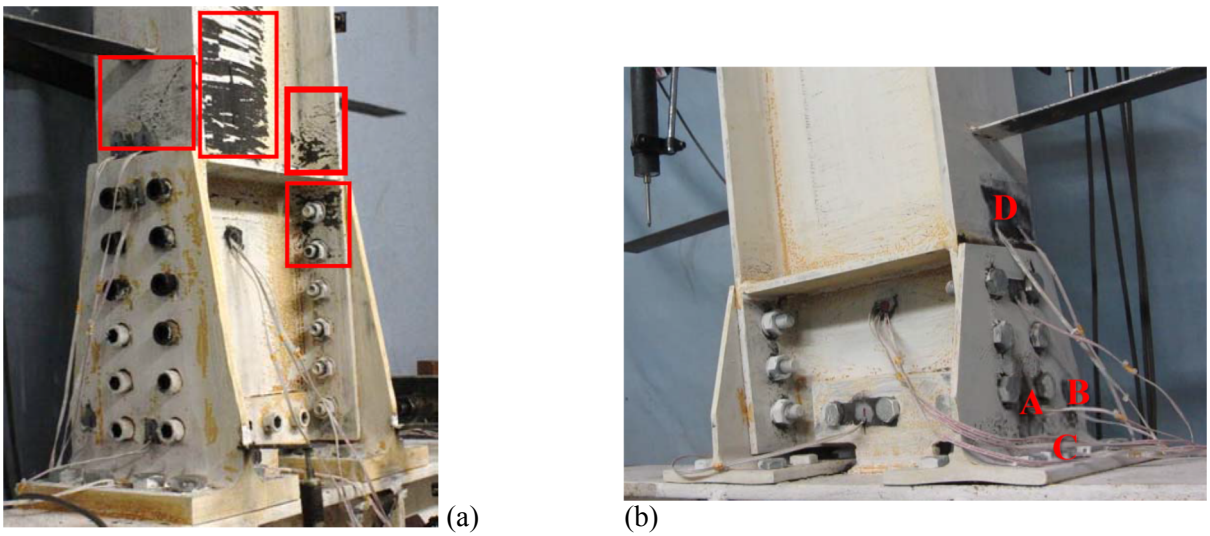
coefficient herein. Since one of the purposes of the study is to investigate the behavior of the link assembly where the ratio of connection strength to link strength is variable, the values of C is assumed to be 1.5 for the TS-FR-1 specimen and 1.0 for the TS-FR-2 specimen. In other words, the purpose of testing the second specimen is to investigate the behavior of connection as well as link beam when the connection strength is reduced. The first specimen meets the requirements of codes. The design process for specimen 1 and 2 are briefly presented in Table 1.

Table 1. Geometrical properties of the specimens.

	connection	Link			Top and Bottom connection			Web connection		
specimens		section	e/ (Mp/Vp)	Target ϒp	Section	Bolts connected to column	Bolts connected to beam	Section	Bolts connected to column	Bolts connected to beam
TS-FR-1	T-stub	IPE300	3.0	0.02	HEB450	8M20	12M16	2PL.220x100x12	Welded	3M16
TS-FR-2	T-stub	IPE300	3.0	0.02	IPE360	8M16	6M16	2PL.220x100x12	Welded	3M16

Mp= 185 KN.m

According to AISC/ANSI 341-10, the required inelastic rotation of long links is 0.02 rad. In specimen TS-FR-1, the inelastic rotation of the link is extended up to 0.024 rad and T-stub connection is able to provide these rotations without failure and resistance reduction. The inelastic link rotation of the specimen TS-FR-2 significantly exceeded the requirement link rotation and no failure and loss of strength was observed before the inelastic link rotation of 0.0426 rad. Figure 2 shows the deformation of specimen TS-FR-1 and TS-FR-2 at end of test.



(a) (b)

Figure 2. Deformation of specimens in at the end of test, a) TS-FR-1, b) TS-FR-2.

The results of tests show that the t-stub connections connected to column have very desirable performance. For the TS-FR-1 specimen, no significant plastic deformation is observed in the t-stub connection components. In the TS-FR-2 specimen, the components of t-stub connection experienced high deformations. By inducing plastic areas in different places, the connection has very desirable performance in cyclic loading.

REFERENCES

Okazaki, T., Engelhardt, M.D, Nakashima, M., and Suita, K. (2006). Experimental Performance of Link-to-Column Connections in Eccentrically Braced Frames. *Journal of Structural Engineering*, ASCE P.P:1201-1211.