ABSTRACT

Finite element modelling (FEM) of the asymmetric friction connection (AFC)

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Earthquakes occur frequently in New Zealand as the country is situated in the collision zone between the Indo-Australian and Pacific tectonic plates, where many earthquakes and volcanic activities occur. The consequences of severe earthquakes are injury and loss of life of people, the costs of repair for the damage of the structures and contents, and the costs of disruption of business and other activities. In average, 10 000 people are killed in earthquakes every year. Moreover, the damage and disruption caused by earthquakes throughout the world can be considerable. To avoid these undesirable economic effects of earthquakes, the global tendency has been moving towards the development and implementation of low-damage seismic resisting systems. The low damage design philosophy aims to satisfy the well-accepted “life safety” mandate, and minimize the economic losses due to post-earthquake damage repair as well as the downtime. The Sliding Hinge Joint (SHJ) is a low-damage beam-column connection used in steel moment-resisting frames. It allows large beam-column rotation with minimal damage through sliding in asymmetric friction components (AFCs) that are located at the web bottom bolt and bottom flange levels. AFC is friction seismic energy dissipating component of the SHJ. Following a set of experiments and different analytical research carried out on the AFC, there are proposed modifications to improve the performance of the AFC, and in general the SHJ (Clifton et. al., 2007 & Ramhormozian, 2017). One of the key objectives of this project is to provide a complete literature review and background of the friction energy dissipators for seismic applications including the SHJ developments, and to create numerical models to be validated by the previous and ongoing experimental results of the AFC as well as the SHJ. This includes creating finite element model (FEM) of different sizes, capacities, and configurations of the AFC and those of the SHJ, using ABAQUS software.

References

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