**17th Symposium on Earthquake Engineering**
**November 14-17, 2022**
**IIT Roorkee, India**
**Paper No. 633**

# Numerical Analysis of Steel Beam Column Connection Assembled with Replaceable Fuse Under Cyclic Loading

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## Abstract

This work follows the latest development trend in resilient structures by arresting inelastic damage in a small replaceable link at a predetermined location. Towards this, here innovative beam fuse has been proposed with circular, triangle, square, and elliptic openings. These openings are also provided with a stiffening plate of 5 mm thickness to reduce the stress concentration effects inside the opening edge. Comparative analysis has been carried out for four beam column sub assemblages in ABAQUS FEM software. In this modeling, the bolted end plate has been omitted as the focus is only on the connection's pure fuse behavior. SAC loading protocol has been adopted to evaluate the cyclic behavior of the connections. Strength degradation, ductility, and energy dissipation have been studied. All the fuse connections show excellent ductility under the cyclic loading. For all the fuses based on rupture, index cracking may occur between the web plate and the stiffening plate of the fuse. Here fuse with a circular opening shows the highest amount of energy dissipation.

**Keywords:** Replaceable fuse, Energy dissipation capacity, Stiffening plate, Resilient structures, FEM, Cyclic