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Investigating of the effect of thickness and numbers of T-ADAS plates for improving the performance of steel frames under syclic loading

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Abstract:

The progress in the field of dampers has proved their good performance in structure of modern structures and strengthening the existing structures. Their behavior against the seismic forces is nonlinear and the time history analysis is important for them. By adding the yielding dampers, most of the input energy is absorbed by dampers during the earthquake and plastic behavior in structural members is restrained, so the behavior of frame will be improved. By investigating some important parameters, the behavior of structure will be studied. In the present article, ABAQUS finite element software is used and six ADAS dampers with different numbers and thicknesses are studied. To do the analysis, three dampers are modeled based on the design. Two of the dampers are weaker and the other one is stronger compared with the design. The number and thickness of these dampers affect the energy absorption. After applying cyclic loading, the hysteresis loop and the absorbed energy by plasticizing are compared and the better model is determined.

Keywords: yielding damper, ADAS, cyclic loading, ABAQUS, thickness

Introduction:

metallic dampers belong to the category of passive dampers. They act based on energy dissipation caused by inelastic displacement in a steel member. The yielding metallic dampers by self-focusing damage, keep other structural members in elastic zone and reduce the structural dynamic response [١]. A metallic damper must have the well-recognized force-displacement behavior to be used for designing purpose. And many dampers with different shapes and features have been introduced [٢].

Since the ١٩٨٠s, many mechanisms have been introduced, fabricated and tested as yielding dampers and some of them are commercial [٣].

Dampers with triangular plates are a type of yielding dampers that installing them between brace and beam dissipates energy caused by earthquake. Their feature is that the bending yield happens along these triangular plates and this process of yielding causes the energy dissipation in maximum capacity. Also, the function of x-shaped plates is similar to these triangular plates in the way that yielding will occur in whole section. The shape of these dampers (x-shaped or triangular) is based on the yielding on whole section [٤].

ADAS dampers were first used in a nuclear installation in the USA [٥]. Baktal Paul and Counter Quick corporations in a research in ١٩٩١, studied a ٣-story frame in direction of loading, and bracing in other direction and a ٣-story frame reconstructed with ADAS elements and checked mechanical