A08

Cyclic tests on wood panel restrained steel shear walls with slits

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1. Introduction

A new damping device known as “slit walls” is presented (Fig. 1). Composed of a thin steel plate restrained to in-plane behavior by wood panels attached to the plate by steel bolts. The steel plate between the slits behave as a series of flexural links, which undergo large flexural deformations relative to their shear deformation.

In the framework of this research, 9 specimens featuring thin steel plates (1.2 and 2.3 mm) and different degrees of out-of-plane restraining provided by wood panels, were tested under cyclic loading. Non-linear FEM analysis performed on equivalent models provide an analytical verification to the fundamental experimental background for the development of this devices.

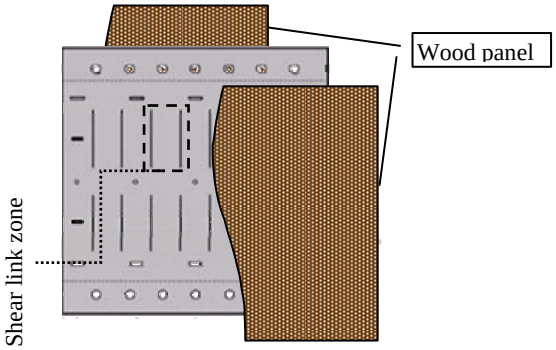

Fig 1. Steel shear plate diagram

2. Experimental Procedure

The design goal considering inclusion of the damper is to sustain a 10% of the design shear force with the dampers. Specimens were fabricated in a 1:2 scale with the original shear wall required for such design.

Loading procedure consisted of three cycle at every 0.25% of drift angle (3mm for the test specimen) up to a 2%. Out of plane deformation and bolt strains were monitored throughout the experiment.

3. Experimental Result

Hysteretic loops present a characteristic slip behavior attributed to local out-of-plane buckling of the steel plate in the vicinity of the slit ends. Plastic behavior initiates at a drift angle of 0.1%. Significant strength deterioration did not take place until R=1.5%.

Global out of plane deformation was effectively restrained by the wood panels and bolt forces due to restraining remained within acceptable limits.

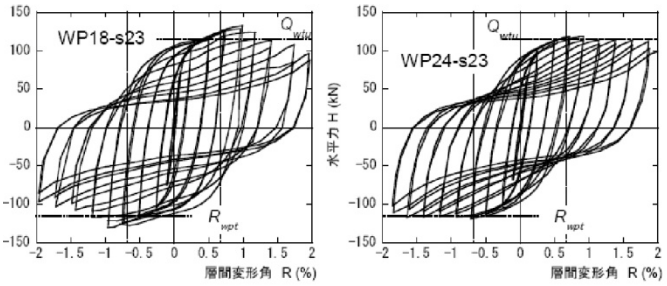

Fig 2. Sample horizontal force - story drift relation

4. Conclusions

(1) Slitted steel plates are appropriate to use as hysteretic dampers: plastic behavior initiates in early stages and strength does not deteriorate within the design limits.

(2) Out of plane restraining by wood panels provides sufficient control over buckling for the proposed application.

(3) Hysteretic behavior of the restraining bolts is independent of the thickness of the steel plate or wood panel.