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CYCLIC TESTS OF THE PRECAST PANELS EQUIPPED WITH STEEL CUSHIONS

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The observations on the heavily damaged precast industrial buildings in L'Aquila Earthquake (2009) demonstrated that the connection details of claddings are extremely effective on the earthquake performance of the buildings. The research on the performance of existing and new connection details of RC cladding systems used in the precast industrial buildings have been initiated by an FP7 research project called SAFECLADDING.

A new low-cost steel cushion has been developed in the Structural and Earthquake Engineering Laboratory of ITU to consume a predefined part of the earthquake energy imparted to the precast structure through the connections of cladding systems. The typical section and force deformation relation of a steel cushion are showed in Fig. 1. It is observed that the cushion has a large deformation capacity with robust hysteretic loops.

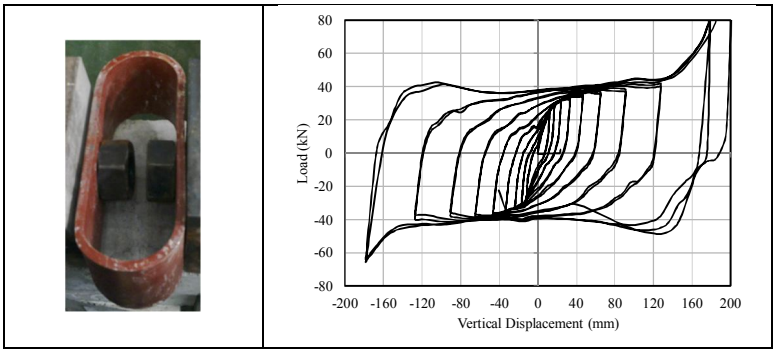

Fig. 1 The steel cushion and its load-displacement curve

The energy based design concept will be utilized for the analysis of industrial buildings with precast panels equipped with steel cushions. The energy based design requires the individual contribution of each cushion to the overall dissipated energy of the system.

The steel cushions might be positioned at different locations on the precast panels. Depending on the results of a preliminary work (Aksakal, 2013), it is decided to examine two alternative cases defined in Fig. 2.

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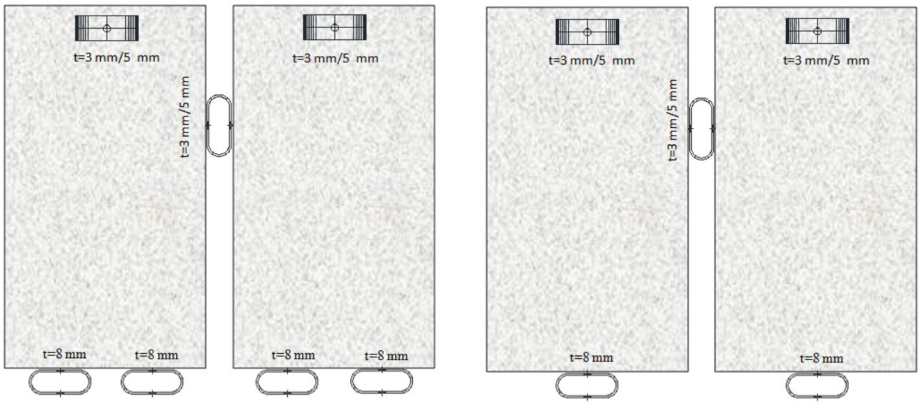

Fig. 2 The placement of steel cushions on the precast claddings

A four pinned swaying planar steel frame which transfers the lateral loading to the precast panels placed at both side of it, has been designed and produced in the laboratory as a step of SAFECLADDING Project, Fig. 2. Four RC precast panels having dimensions of 1.0×2.5 m are set to the testing frame simultaneously. The pairs of panels which are connected to each other with the steel cushion are fixed to the foundation and to the loading frame by means of the similar cushions.

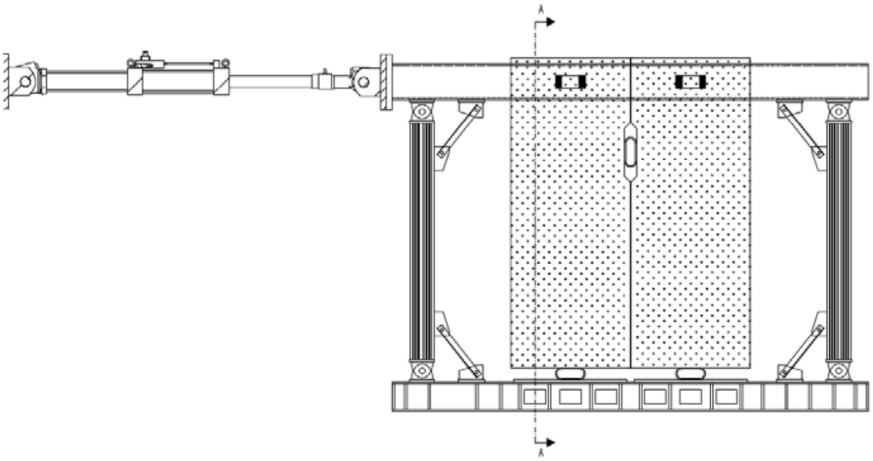

Fig. 2 The four pinned swaying planar steel frame and test specimen

A complete set of nonlinear static and dynamic time history analyses have been performed for the blind prediction of the first test in which each panel will be supported by only one steel cushion at the foundation level.

The results of the experimental and analytical works are going to be compared in terms of load displacement curves, strain distributions at various locations and cumulative energy dissipation capacities.

REFERENCES

Aksakal, T., (2013) "A New Proposal For The Supporting of Vertical Reinforced Concrete Cladding Panels Used in Prefabricated Industrial Buildings", M.Sc. Thesis Submitted to Graduate School of ITU.