

WP 10: TA Project FUTURE

Full-scale experimental validation of steel moment frame with EU qualified joints and energy efficient claddings under near fault seismic scenarios

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Keywords

Steel moment resisting frames, Detachable Joints, ductile claddings, Near Fault earthquake, Seismic design

Figures

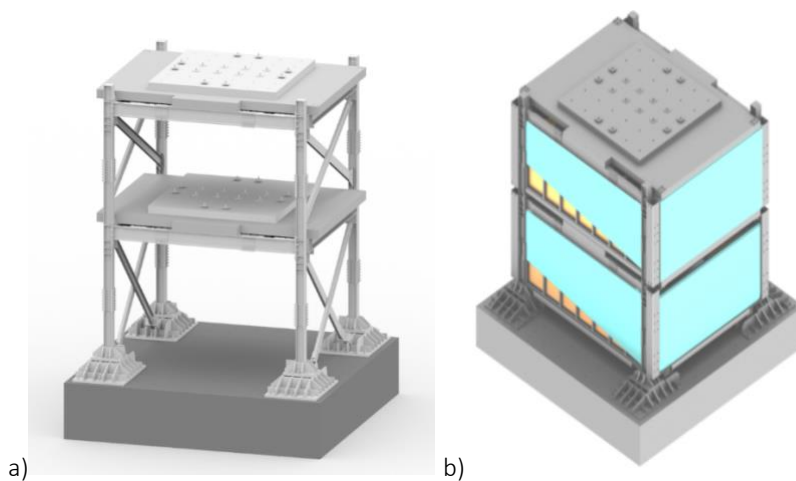


Figure 1. FUTURE mock-up; overall layout without (a) and with cladding (b)

Main expected Results

The FUTURE testing campaign aims to qualify the behavior of steel moment frames equipped with different types of replaceable beam-to-column joints, as well as to investigate the influence of energy-efficient ductile non-structural claddings under near-fault (NF) seismic scenarios. Therefore, a 50-ton scale 2:3 model was designed and manufactured.

The experimental mock-up is a two-story one-bay steel frame (5 m x 5 m) that has been sub-structured from a reference steel building that is a typical example of archetype for multi-story office building of the standard EU practice. It has been designed to detach and to replace easily all components that will experience plastic deformation. In particular, three types of beam-to-column joints are examined, namely reduced beam section (RBS), haunched (H) and extended stiffened (ES) sections.

The mock-up is ready and some preliminary tests have already been conducted for signal testing (empty shake table). However, the experimental campaign has not started yet, as due to the unpredictable on-

going COVID-19 crisis which is currently affecting all Europe, especially Italy and France, the mock-up could not be delivered to CEA site (still blocked in Italy).

List of Publications

D’Aniello, M., Di Sarno, L., Fiorino, L., Tartaglia, R., Costanzo, S., Landolfo, R., Le Maout, A., Rastiello G. (2019). Behaviour of steel moment resisting frames under near fault earthquakes: the “FUTURE” project. COMPDYN 2019, 7th ECCOMAS Thematic Conference on Computational Methods in Structural Dynamics and Earthquake Engineering. Papadrakakis, M., Fragiadakis, M., (eds.). Crete, Greece, 24–26 June 2019.

Access to Data and Services

All experimental data are freely available at http://ged.laboweb.sylos.com/GED_LaboWEB and on the European database at <http://www.dap.series.upatras.gr/>

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WP 10: TA Project SEREME

Seismic Resilience of Museum contEnts

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Keywords

Earthquake Engineering, museum contents, statues rocking, shake table tests

Figure



Figure 1. General set up of the statues and busts on the shake table

Main Results

In the framework of SEREME project, an extensive experimental campaign on the seismic response of museum artefacts, with emphasis on statues and busts, was performed using AZALEE shake table of CEA in Saclay, France. The objective of this experimental campaign was to give insight on the seismic behaviour of statues and busts as well as to evaluate the effectiveness of two different mitigation



methods used to improve the seismic behaviour of these artefacts. A total of five couples of real scale marble artefacts were tested, three busts installed on marble pedestals and two statues. Seven different testing arrangements were considered during this experimental campaign and a total of 281 seismic tests were performed. Regarding the employed mitigation techniques, two different isolators types were used. First, a local isolation method, based on SMA wires, was used in order to enhance the seismic behaviour of a single artefacts. Then, three pendulum isolators were employed in order to isolate a floor on which a group of artefacts (2 or 3 artefacts) was installed. In order to give a direct evaluation of the isolators effectiveness, for each test configuration, a couple of two similar artefacts were tested together in an isolated and a non-isolated arrangement. Furthermore, to evaluate the influence of the frequency content of the excitation as well as the directionality of the seismic excitation, 12 different waveforms were applied to the shake table (seven uni-directional motions, three bi-directional motions and two tri-directional motions). Regarding the instrumentation, the artefacts motions were recorded using both accelerometers, gyroscopic and displacement sensors.

The achievement of this experimental campaign are:

- For high excitation intensity tests, the non-isolated artefacts are prone to show a complex rocking and sliding behaviour. The impact induced by the rocking motion can be a source of damage to the base of the busts.
- In most of the cases, the considered mitigation methods have been effective in the prevention of the rocking/sliding behaviour of the artefacts. As a result, these mitigation methods improved significantly the seismic behaviour of the artefacts.

List of Publications

Fragiadakis, M., et al. Seismic response assessment and protection of statues and busts. Arco Conference, May 28-30, 2020, Firenze, Italy.

Access to Data and Services

All experimental data are freely available at http://ged.laboweb.sylos.com/GED_LaboWEB and on the European database at <http://www.dap.series.upatras.gr/>

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