IMPLEMENTATION INTO ROMANIAN SEISMIC RESISTANT DESIGN PRACTICE OF BUCKLING RESTRAINED BRACES (IMSER)

Goal of the project:

The project aimed at developing a set of typical buckling restrained braces in view of their pre-qualification. Both "conventional" and "dry" devices were considered, with capacities corresponding to typical steel multistorey buildings in Romania. This should lead to a wider adoption of buckling restrained braced frames in design practice, which currently is precluded by the proprietary character of braces, need for their experimental qualification and lack of experience.

Short description of the project:

The project developed, investigated numerically, tested and prequalified a set of buckling-restrained braces.

Project implemented by

- Politehnica University of Timisoara (coordinator);
- SC Popp & Asociații SRL, Bucharest;
- SC HYDOMATIC SISTEM SRL, Timisoara.

Implementation period:

01.07.2014 – 30.09.2017

Main activities:

- Development of two different types of BRB prototypes: "conventional" and "dry", followed by a prequalification testing program on a set of BRBs of different capacity.
- Transfer of the "know-how" on design and production of two types of BRBs to the industrial partner, who will be able to set up quantity production of these devices.
- Development of design guidelines for buckling restrained braces (at the device level). It allows production of generic BRBs by local producers at more competitive prices than imported ones.
- Development of design guidelines and design examples for steel BRB frames (at system level).
- Dissemination of the project outcomes to practising engineers.

Results:

- Prototype structures (MRFs, BRBFs, D-BRBFs, and CBFs), located in Bucharest and Timisoara were designed. Two typical BRB capacities were selected (300 kN, respectively 700 kN).
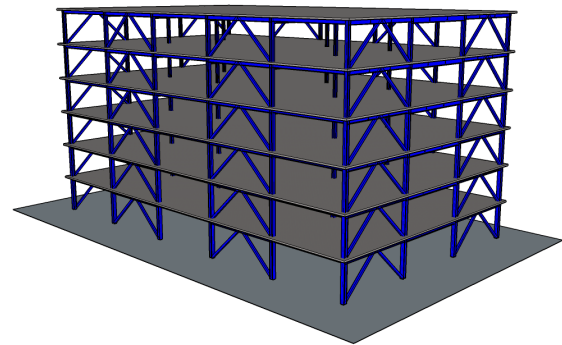
- Seismic performance evaluation of structures was performed using nonlinear static analyses for different seismic performance levels.

- Different BRB concepts were analysed and numerically tested.
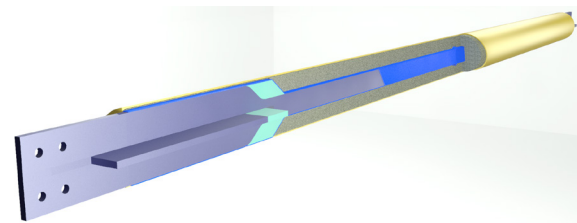
- 14 BRB specimens were manufactured and tested experimentally under cyclic loading. Their performance was assessed in terms of force adjustment factors and cumulative inelastic deformations.

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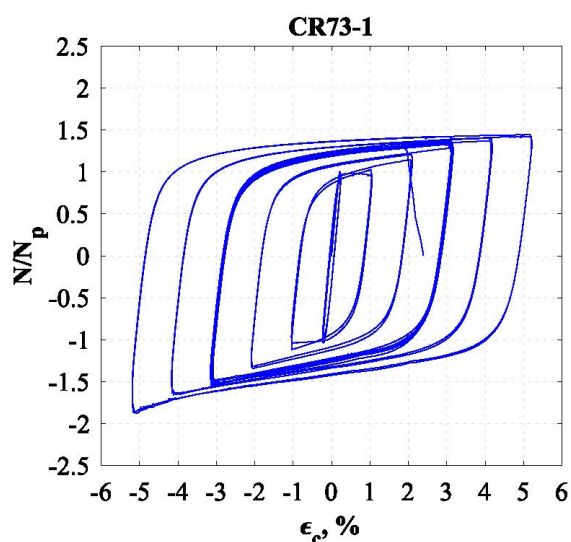
- Design guidelines were developed for prequalified BRBs and for steel buckling-restrained braced frames.
- Two workshops were organised (in Timisoara and Bucharest) in cooperation with the Association of Structural Engineers (AICPS), Politehnica University of Timisoara (UPT) and Technical University of Civil Engineering Bucharest (UTCB) for dissemination of project results.

- Research reports and design guidelines developed within the project are available at http://www.ct.upt.ro/centre/cemsig/imser.htm.

Applicability and transferability of the results:

Prototype BRBs were fabricated within the project by one of the partners (SC Hydomatic Sistem SRL). Design guidelines for buckling restrained braces (device level) and for steel structures using BRBs (system level) were developed. Moreover, BRBs were prequalified for capacities in the range of 150-840 kN. It allows structural designers to easily apply this modern structural system in practice. On the other hand, the developed procedure for design of BRBs allows local manufacturing of these devices.

Financed through/by

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Research Center

CEMSIG - The Research Center for Mechanics of Materials and Structural Safety

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