

FAST WELDING COLD-FORMED STEEL BEAMS OF CORRUGATED SHEET WEB (WELLFORMED)

Goal of the project

The main aim of the project is to test and validate a NEW technological solution for built-up cold-formed steel beams (CWB), with corrugated sheet webs and built-up cold-formed steel flanges, using Spot welding (SW) or Cold Metal Transfer (CMT) connecting technologies.

Short description of the project

The advances in cold-formed steel structures require not only material savings but also high efficiency of production and manpower reduction. The WELLFORMED research project proposes to study a new technological solution for built-up beams made of corrugated steel sheets for the web and thin-walled cold-formed steel profiles for the flanges, connected by SW or CMT welding. Within the research project, the experimental work includes tensile-shear tests on the lap joint spot-welded specimens, were different combinations of steel sheets with various thicknesses were tested and, tests on full scale beams in bending. The study intends to demonstrate the feasibility of the proposed solutions, to assess their performance and to enlarge the knowledge by using numerical simulations for the optimization of the current solution and to define the limits of applicability of the solution.

Project implemented by

CEMSIG - The Research Center for Mechanics of Materials and Structural Safety - Research and Technical Development unit of Politehnica University Timișoara, at the Faculty of Civil Engineering, Department of Steel Structures and Structural Mechanics.

Implementation period

03.01.2017-02.07.2018

Main activities

- design and fabrication of experimental program;
- experimental program on welded connections (SW and CMT) and optimisation of fastening technology;
- experimental program on full scale CWB beams, using SW or CMT connecting technologies;
- numerical investigation of beams and parametric investigations:
 - calibration of numerical models by experimental tests;
 - optimization of technical solutions;
 - design and numerical analysis of specimens with larger spans;
- design guidelines and recommendations for fabrication.

Results

- experimental results on tensile-shear tests on the lap joint spot-welded and CMT specimens (280 small specimens), were different combinations of steel sheets with various thicknesses were tested;
- experimental program on 5 full scale CWB beams, 2 using SW and 3 CMT connecting technologies.

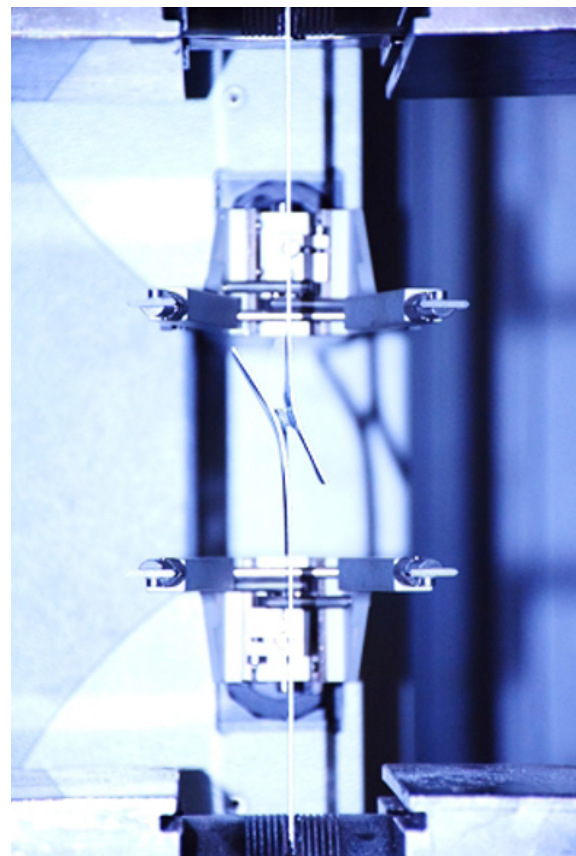


Fig. 1: Full button pull-out failure mode



Fig. 2: SW1 CWB Beam during the test

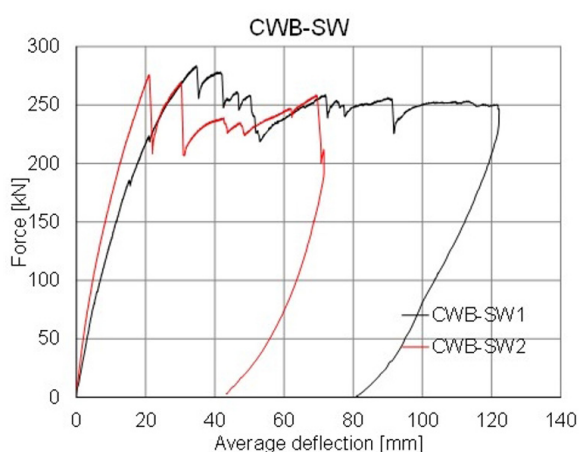


Fig. 3: Force-deflection curve for the full scale built-up beams

Applicability and transferability of the results

The new technical solution is composed of 100% of cold-formed steel components, having high protection to corrosion, due to the fact that all components are galvanised. The solution allows for easy prefabrication, reduced erection time, mass production and high-precision quality control. All of these characteristics are expected to be interesting both for manufacturers and contractors, making steel competitive. Design guidelines and recommendations for fabrication will be provided.

Financed through/by

The project is supported by a grant of the Executive Unit for Financing Higher Education, Research, Development and Innovation (UEFISCDI), grant agreement 57PED/2017.

Research centre

Research Center for Mechanics of Materials and Structural Safety (CEMSIG)

Research team

Prof. Viorel UNGUREANU, PhD
 Acad. Dan DUBINA, PhD
 Assist. prof. Mircea GEORGESCU, PhD
 Assist. prof. Bogdan RADU, PhD
 Assoc. prof. Mircea BURCA, PhD
 Assoc. prof. Daniel TUNEA, PhD
 Assoc. prof. Ioan Both, PhD
 Assist. Calin NEAGU, PhD
 Marius GROSAN, PhD stud.

Contact information

Prof. Viorel UNGUREANU, PhD
 Faculty of Civil Engineering
 Department of Steel Structures and Structural Mechanics
 Address: Str. Ioan Curea, No. 1, 300224, Timișoara
 Phone: (+40) 256 403912, Mobile: (+40) 740 137640
 E-mail: viorel.ungureanu@upt.ro
http://www.ct.upt.ro/centre/cemsig/wellformed_en.htm