

**Recent research and design developments in steel and composite structures at UPC**

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**ABSTRACT**

Recent research and design developments of the Steel and Composite Division group of the Department of Civil and Environmental Engineering (*UPC, Barcelona Tech*) encompasses several areas of expertise. Particular research focus includes i) Structural behavior of stainless steel, ii) Stability and design developments of plated structures and iii) Steel-concrete composite members. The research in steel and composite structures covers experimental, numerical and theoretical studies on the behavior and analysis for safe and sustainable design.

Stainless steel design has been studied for two decades by the group within the frame of several European and National research projects. The projects include the Theoretical and experimental study on instability of stainless steel structures (DGES PB95-0772), Structural applications of plated stainless steel girders (MAT 2000-1000) and Structural analysis of ferritic stainless steel members such as tubes, slabs and hat-sections (BIA 2012-036373 and SAFSS 2010 RFS-PR-09032). On the other hand, the Steel and Composite Division group has been involved in several valorization projects funded by RFCS-European Commission: Development of the use of stainless steel in construction (ECSC Contract 1999-7215-PP/056), Structural design of cold-worked austenitic stainless steel (RFS2-CT-2005-00036), and Promotion of new Eurocode rules for structural stainless steels (RFCS-2015, RFCS RFS-AM-709600). Research has resulted in a considerable amount of scientific production (journal papers, conference proceedings, design manuals and participation in European committees for standardization and design such as EN1993-1-4 Working Group).

Plated structures have been actively studied for more than two decades as part of different research activities. National projects related to instability problems in plates (DGICYT PB90-0604), to hybrid steel plate girders (BIA 2004-04673) and to steel tapered plate girders (BIA 2008-01897), among others, have provided a robust platform to the group for the development of theoretical, experimental and numerical expertise in the field. Research has also resulted in a considerable amount of scientific production (journal papers, conference proceedings, design manuals and participation in European committees for standardization and design such as TC8 and TWG 8.3 of ECCS, and EN 1993-1-1 Working Group WG 1 and EN 1993-1-5 Working Group WG 1-5).

Composite structures have also been studied as part of research projects related to concrete-filled steel tubes (Safety and serviceability of integral railway bridges in front of accidental actions: Research for design criteria and construction, 2007-2011, Project 51/07), to stainless steel-concrete composite slabs (SAFSS project) and to a vast array of experimental applications including push-out and pull-out tests, composite action with shear connectors and thermally-induced deformations within composite elements. Research has resulted in journal papers, conference proceedings and experimental expertise.

Generally speaking, the research expertise includes: instability-related problems (buckling), new metallic materials (stainless steel), numerical simulations of construction processes, time-dependent effects in composite structures, plate girders and the systematic usage of FEM in steel structures design. Researchers work in close collaboration with international institutions, universities and research centers and they participate actively in the development of the Spanish Steel Code (EAE-12) as in the ongoing development of European Standards.

**Keywords:** Stainless steel, Plated structures, Composite columns, FEM in steel structures