

PRECIOUS (PREfabricated Composite beam to concrete filled tube or partially reinforced-concrete-encased column connections for severe Seismic and fire loadings)

Project funded by RFCS – Contract No. RFS-CR-03034	
Period:	2003 - 2007
Coordinator:	University of Trento
Position of Ferriere Nord:	Partner
Other partners:	Profilarbed (Arcelor-Mittal – Luxemburg), University of Pisa (Italy), University of Liegi (Belgium), University of Navarra (Spain), BRE Ltd. (Building Research Establishment – UK)

The project mainly investigated some joints of composite steel-concrete structures that are increasingly used owing to improved strength and ductility both under seismic actions and, especially, fire loads as compared with steel structures. The objective of PRECIOUS was to define engineering procedures based on theoretical modelling, checked through laboratory tests and related to practical and economically advantageous building solutions for the two types of beam-to-column joints chosen for the project, under severe seismic actions and fire loads. For the first time, prefabricated lattice girder slabs were used for floors in the study of these joints. Then they were compared to steel sheeting with cast in situ generally used for floor in steel buildings.

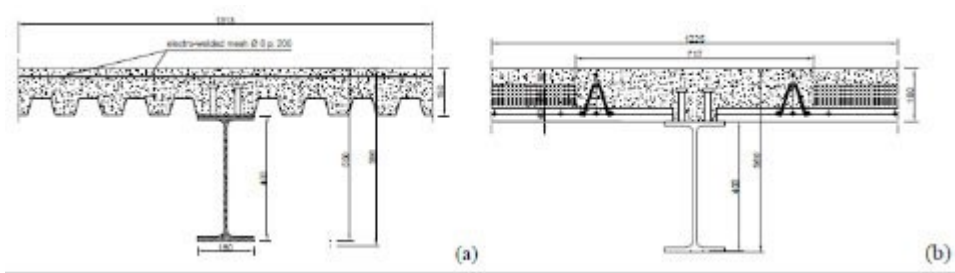
Ferriere Nord was involved in the project as both a B450C steel supplier and a partner in the design of decks made with lattice girder slabs. The main interest was the use of electrowelded meshes and lattice girders in the slabs for floors of composite steel-concrete constructions. First of all, Ferriere Nord focused on a feasibility study to check whether steel sheeting with cast in situ concrete, could be replaced by lattice girder slabs in floors.

Subsequently, it identified the best geometry to obtain, on the one side, the same weight as the steel sheeting slabs solution with an increased self-supporting capacity and, on the other side, a better seismic and fire performance of the joint in composite steel-concrete constructions. Thereafter, static checks (SLU and SLE) were made on the floor of the structure subjected to seismic actions and fire loads. The results were used to design composite floors for the joints studied and tested in laboratory.

The work continued with the analysis of the results obtained from experiments and their comparison with engineering activities and studies on design details. The results are promising because the behaviour of prefabricated elements based on meshes and lattice girders are better than steel sheeting with cast in situ slabs both during erection (wider spans) and under seismic actions and fire loads.

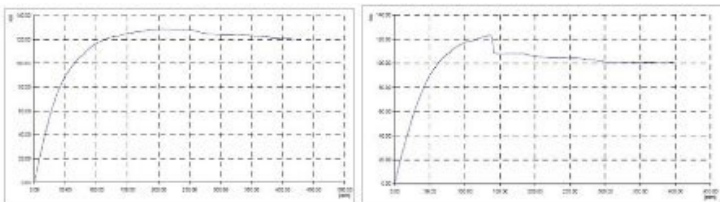


In 2008, the whole documentation was finalised: summary report of about 150 pages and a CD containing all numerical and experimental calculations performed during the project.

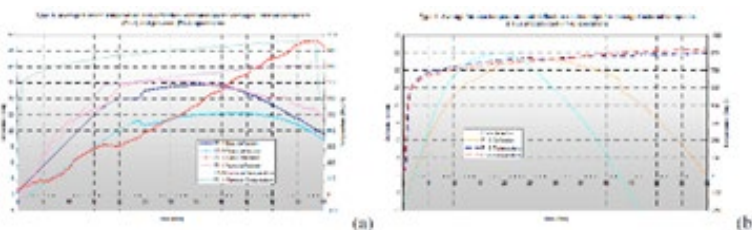


Main publications:

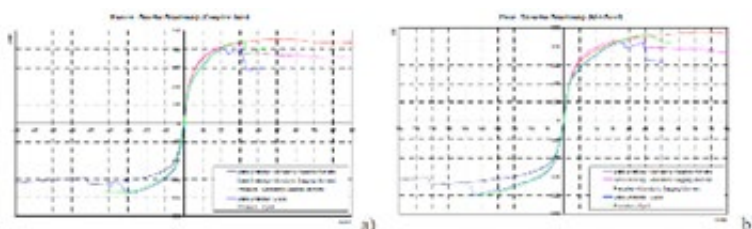
- "Fire performance of undamaged and pre-damaged welded steel-concrete composite beam-to-column joints with concrete filled tubes" Elisabetta Alderighi (University of Pisa), Oreste Bursi (University of Trento), Tom Lennon (BRE- UK), Roberta Mallardo (Ferriere Nord S.p.A.), Raffaele Pucinotti (University of Reggio Calabria), 14th World Conference on Earthquake Engineering – October 2008 (China).
- "Analisi numerico-sperimentali di lastre tralicciate per impalcati di strutture composte" Roberta Mallardo (Ferriere Nord S.p.A.), Marco Molinari (University of Trento), Roberto Pucinotti (University of Reggio Calabria) , R Zandonini (University of Trento). 7th Italian workshop on composite structures – October 2008.



Floor made of lattice girders slabs and cast in-situ concrete and floor made of steel sheeting and concrete cast in situ.



Comparison between the results obtained with monotonic and cyclic test in both types of floors.



Comparison between the results obtained by fire tests with both types of slabs on both the internal and the external joints.