CMN 2015

Congresso de Métodos Numéricos em Engenharia

Congreso de Métodos Numéricos en Ingeniería

LIVRO DE RESUMOS

29 de junho a 2 de julho de 2015

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LISBOA • PORTUGAL

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RESUMO N° 172

THREE DIMENSIONAL SIMULATION OF PARTIALLY ENCASED BEAMS AT ELEVATED TEMPERATURES

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Keywords: Elevated Temperatures, Partially Encased Beams, Composite Steel and Concrete, Numerical Simulation, Bending Resistance

Partially Encased Beams (PEBs) are composite steel and concrete elements in which the web of the steel section is encased by reinforced concrete. The experimental investigation was already verified under fire and under elevated temperatures [1-2].

The bending resistance for three bending point configuration, at four temperature levels (20, 200, 400 and 600 ºC) is determined, based on the three dimensional finite element model, with precise detail of each component (steel profile, reinforcement, stirrups and concrete). The solution method is incremental and iterative (arc length), based on geometric and material non-linear analysis (ANSYS), using reduced integration method. The model considers perfect contact between steel and concrete. The material model assumes plasticity. The imperfection mode was based on the elastic stability solution, also performed with finite element method (ANSYS).

Two types of stirrups were considered: welded to the web (PEBA) and welded to the flanges (PEBB), three different lengths (2.5, 4.0 and 5.5 m) and three types of cross section dimensions were simulated, based on the dimensions of IPE100, IPE200 and IPE300 steel profiles.

A total of 72 models were simulated, showing conservative results with respect to the simple calculation method of EN1994-1-2. The bending resistance of the numerical results was determined for different force events, giving the opportunity to compare the ultimate bending moment.

Results are in accordance to the new formula presented by Vila Real et al. [3] and adapted to composite beams.