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EXPERIMENTAL STUDY OF INTUMESCENT FIRE PROTECTION COATINGS

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Abstract:

The use of passive protection materials is one of the measures normally adopted to prescribe structural fire resistance, which intumescent coatings represents about one third of steel fire protection costs and is growing mainly due to their use in off-site applications.
The fire resistance of an insulated steel member is determined by assessing the loadbearing capacity of the component during fire exposure. Heat transfer analysis of the insulated steel member is of great importance for determining, accurately, the critical temperature of the protected structural element, which depends essentially on the protection material properties and on the bulk fire temperature. The specification of the minimum protection thickness is, normally, recommended by manufactures. These values are based on experimental fire tests, using typical structural elements (beams and columns), being the reports kept confidential.
The intumescent coating behaviour is characterized by expansion and mass loss, producing a foam char with a volume that varies from 5 to 200 times its original volume. The knowledge of the coating behaviour during a fire is fundamental when this thermal protection is applied.
This presentation will address a set of full-scale experimental fire resistance tests to determine the behaviour of steel beams protected with intumescent coatings, considering different dry film thicknesses.
Also a set of specimens experiments are presented and compared with a numerical study based on steel plates coated with intumescent paint and subjected to a radiant heat flux inside a cone calorimeter in well-controlled conditions. The intumescence thickness and steel temperatures are measured experimentally and used in the non linear inverse numerical analysis to assess the intumescence surface temperature and the effective thermal conductivity.