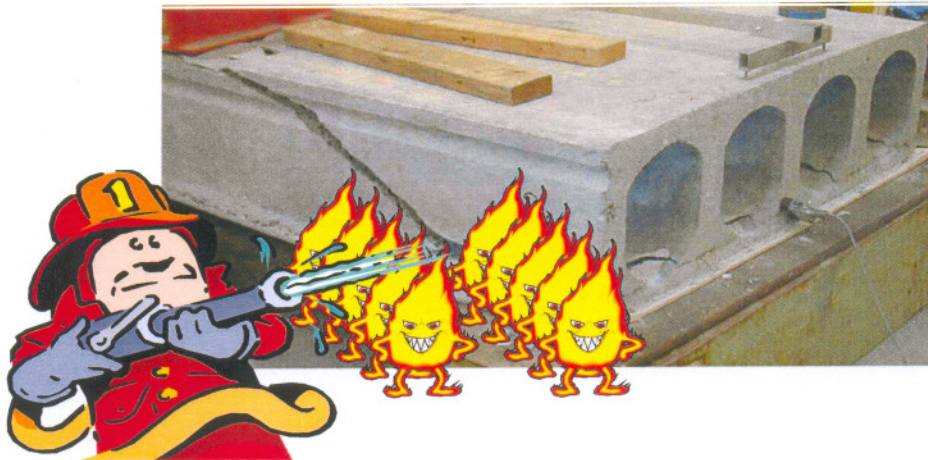




Concrete exposed to Fire

Modelling of high temperature behaviour



Background

When concrete structures are exposed to fire they are subject to an extremely damaging situation. It is of paramount importance that the structure is capable to resist the fire load for sufficient time for the building to be evacuated. According to Eurocode 2 the structural concrete elements should be designed against the fire load similarly with other loads such as wind and snow.

Calculations on fire exposed concrete

Analysis of thermal actions on a structure needs knowledge of firstly, how heat is conducted within the concrete and secondly, how the concrete material reacts to elevated temperatures. Since full-size fire testing is very expensive and time consuming it is advantageous to predict the response to a fire by means of calculations.

The Concrete Centre has developed a computer programme called FIRE-

2D that solves the heat conduction equation within a concrete cross-section. Based on the temperatures the normal stress distribution over the cross-section is calculated, taking into account the thermal expansion of concrete and reinforcement and the temperature degrading effects on the strength and stiffness.

Hence, the Concrete Centre has worked within this topic for several years, providing consulting services and condition surveys on buildings after fire accidents. For instance the Concrete Centre has assisted the Øresund Tunnel Consortium with both theoretical and experimental work.

Experimental work

The Concrete Centre has developed a test setup in cooperation with Aalborg University. The setup enables measurements of thermal dilation of concrete cylinders exposed to a controlled elevated temperature history. Furthermore, the cylinders may be

subject to a compressive stress simultaneously with the heating, making it possible to register so-called transient creep.

Information

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