

TENSILE MEMBRANE ACTION OF COMPOSITE SLABS IN FIRE – ARE THE CURRENT METHODS REALLY OK?

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Abstract

Tensile membrane action is a large-deflection effect which increases the load capacity of thin concrete or composite slabs at high deflections. It is relatively unimportant in normal service, but is very significant for composite slabs which are affected by high temperatures due to fires. A simplified model was developed about 15 years ago to simulate the effects of tensile membrane action as part of fire resistant design, and this is now very widely used in structural fire engineering. It is currently being extensively promoted for inclusion in the next upgrade of the Eurocodes. Recent work at Sheffield has shown that this method is severely flawed, even to the extent of being unsafe in some circumstances, and it has been re-developed from first principles, taking into account the effects of fracture of reinforcing mesh. This shows considerably different behaviour from that predicted by the existing methods.