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FINITE ELEMENT MODELLING OF SELF COMPACTING CONCRETE BEAMS WITH DIFFERENT COVERS SUBJECTED TO THERMAL LOADS

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Abstract

Fire resistance of structures is an important safety aspect which is to be considered in the design of buildings. The resistance of materials to fire has been studied by few researchers in the past. The behavior of concrete subjected to higher temperature is not yet completely understood. The Indian standard for plain and reinforced cement concrete IS 456:2000 has a clause for fire resistance. As per this clause, fire resistance is a function of cover to the reinforcement. The fire resistance depends on many other parameters such as grade of concrete, grade of steel, density of concrete etc. Self compacting concrete has been recently accepted as a promising material that can be used in structural elements with congested reinforcement. An attempt has been made in this study to understand the thermal behaviour of self compacting concrete beams with different covers for various heating conditions. During the present study, the concrete beams were analysed under temperature loads for deflection, stresses and strain using the software ANSYS 11. Since, the behaviour of concrete is non-linear; the non-linear behaviour properties are incorporated in the model and the model is solved using a coupled thermal structural analysis method. Meshing has been done using an optimized modeling procedure where every element is created and placed in position so that consistent support conditions and loading points can be maintained. Reduction of strength and increase in deflection values were observed when temperature loads were introduced in the model geometry. Increasing the cover resulted in excessive deflection which can be interpreted as spalling in real cases.

Keywords : Furnace, Cover, SCC, Room temperature, Deflection, Peak load