EFFECT OF FIRE TEMPERATURE & DURATION ON ULTIMATE STRENGTH OF R.C. COLUMNS WITH DIFFERENT CROSS SECTIONAL SHAPES

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Abstract

Deterioration of reinforced concrete structures can be happened due to many reasons; fire is considered one of the most important deterioration reasons that can lead to a complete and a catastrophic failure. In order to evaluate the degradation level of a RC structures exposed to fire, a number of factors should be considered. These factors are: fire duration, fire peak temperature, dimensions of member, humidity and age of concrete, type of coarse aggreâgate, chemical composition of cement, water-cement ratio, and the loading conditions of the structural member. (3,4). The main goal of this research is to study the effect of two fires with two different temperatures and durations on the ultimate strength of 18 reinforced concrete columns. The first 6 columns were subjected to a fire of 300oC for 3 hours, 6 columns were subjected to a fire of 600oC for 6 hours and the last 6 columns were used as control (reference) columns without fire exposure and used for comparison. The tested 18 columns are of different cross sectional shapes (circular, square and rectangular) to account for the effect of surface area to volume ratio. Core tests were used to estimate the concrete compressive strength and the depth of the fire affected layer. A mathematical model was proposed to estimate the failure load of RC columns subjected to fire to decide if the structure needs repair and strengthening or not. Results of the mathematical model and the measured experimental results were compared together.

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