C-26: Compressive strength of concrete at elevated temperatures

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Today in Sri Lanka it is very important to know whether a particular concrete structure could be rehabilitated after a fire damage due to a bomb blast or any other reason. In order to investigate whether a concrete structure can fulfil its functions after a fire accident and to design for high temperature, behaviour of fire damaged concrete is important.

Four inch concrete specimens of grade 20, 30 and 40 were prepared and exposed to 100°C, 300°C, 450°C and 600°C for 1h and 3h. These specimens were tested for compressive strength at hot state and air cooled state.

Grade of concrete did not have any influence on the strength variation at the elevated temperature. In specimens heated to 100°C, the hot state strength had fallen by 20% of its original strength for both exposure periods. During cooling, 1 h exposure showed 10% gain and 3 h exposure showed 10% loss in strength.

Specimens exposed to 300°C for 3 h showed 10% gain in strength at hot state. Above 300°C hot state strength declines sharply for 3 h exposure period while specimens exposed for 1 h show about 10% strength reduction. Further strength loss occurred during air cooling from hot state for both exposure periods. Specimens heated to 600°C for 1 h and 3 h and air-cooled to room temperature showed 25% and 50% strength loss respectively.

Residual strengths after heating to different elevated temperatures under different conditions are useful in rehabilitating a structure subjected to fire.