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FIRE ANALYSIS OF PRESTRESSED HOLLOW-CORE SLAB

In this discussion we present a fire analysis of prestressed hollow-core slab. Analysis is divided in two mathematically independent phases. In the first phase we determine time dependent temperature distribution over the cross-section of the slab. Closed air cells are considered too. We also assume that the panel is exposed to standard fire temperature-time curve ISO 834. Heat conduction is described with known Fourier's partial differential equation, heat flux throughout the outer surfaces due to convection and radiation is assumed as boundary conditions.

The second phase consists of mechanical analysis. It includes the proof of slab fire safety using simplified method of isotherm 500°C and advanced calculation model. Using isotherm 500°C, the capacity of cross-section is checked. In advanced calculation model we analyze stress-strain state of slab during fire, all the way to the calculated failure. The model is based on Reissner beam. We also assume additive decomposition of geometric deformation into elastic, plastic, temperature and creep deformation of concrete and prestressed steel and transient deformation of concrete. The simple calculation model of isotherm 500°C shows larger fire resistance than in the case of using advanced calculation model, which is contrary to the expectations. Using isotherm 500°C, section failure occurs due to cable yield at high temperatures, while using advanced model, due to viscousious creep of prestressing steel.