PARTIAL SAFETY FACTOR BASED DESIGN OF IC SHELLS OF INDIAN NPPS

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ABSTRACT

Partial safety factors (PSFs) used in reliability-based design are intended to account for uncertainties in load, material and mathematical modeling while ensuring that the target reliability is satisfied for the relevant class of structural components in the given load combination and limit state. This report describes the methodology in detail for developing a set of optimal reliability-based PSFs for the design of rectangular partially prestressed concrete sections subjected to biaxial flexure. The mechanical formulation of the flexural limit state is based on the principle behind prestressed concrete design recommended by IS 1343 and SP16 and failure is defined as tensile cracking of concrete extending beyond the depth of cover. The applied moments are combined according to Wood's criteria. The optimization of the PSFs is based on reliability indices obtained from Monte Carlo simulations performed at two levels: (1) To determine the capacity statistics and dependence between capacity and applied loads (effected through the axial loads influencing moment capacity corresponding to cracking) and (2) To obtain the probability of failures of the structural components. Numerical examples involving flexural design of partially prestressed concrete shell elements in nuclear power plant containments under accidental pressure load combination are provided.