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Performance based design of reinforced concrete beams under impact

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Abstract. The purpose of this research is to collect fundamental data to establish a performance-based design method for reinforced concrete beams under perpendicular impact load.

Series of low speed impact experiments using reinforced concrete were performed varying span length, cross section and main reinforcement.

The experimental results are evaluated focusing on the impact load characteristics and the impact behaviours of reinforced concrete beams. Various characteristic values and their relationships are investigated as the collision energy, the impact force duration, the energy absorbed by the beams and the beam response values. Also the bending performance of the reinforced concrete beams against perpendicular impact is evaluated.

An equation is proposed to estimate the maximum displacement of beam based on the collision energy and the static ultimate bending strength. The validity of the proposed equation is confirmed by comparison with experimental results obtained by other researchers as well as numerical results obtained by FEM simulations. The proposed equation allows for a performance based design of the structure accounting actual deformation due to the expected impact action.

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