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Laboratory Investigation of the Impact Resistance of High-Strength Reinforced Concrete Against Impact Loading

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Abstract : Reinforced concrete structures, in addition to bearing service loads and seismic effects, may also be subjected to impact loads resulting from unforeseen incidents. Understanding the behavior of these structures is crucial, as they serve to protect against such sudden loads and can significantly reduce damage and destruction. In examining the behavior of structures under such loading conditions, a total of eight specimens of single-layer reinforced concrete slabs were subjected to impact loading through the free fall of weights from specified heights. The weights and dimensions of the specimens were uniform, and the amount of reinforcement was consistent. By altering the slabs' overall shape and the reinforcement details, efforts were made to optimize the behavior of the slabs against impact loads. The results indicated that utilizing ductile features in the slabs increased their resistance to impact loading. However, the compressive strength of the reinforcement did not significantly enhance the flexural resistance. Assuming a constant amount of longitudinal steel, changes in the placement of tensile reinforcement led to a decrease in resistance. With a fixed amount of transverse steel, merely adjusting the angle of the transverse reinforcement could help control cracking and mitigate premature failures. An increase in compressive resistance beyond a certain limit resulted in local buckling of the compressive zone, subsequently decreasing the impact resistance.

Keywords : reinforced concrete slab, high-strength concrete, impact loading, impact resistance
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