

A New Instrumented Drop-Weight Test Machine for Studying the Impact Behaviour of Reinforced Concrete Beams

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Abstract : Structures can be subjected to impact loading from various sources like earthquake, tsunami, missiles and explosions. The impact loading can cause different degrees of damage to concrete structures. The demand for strengthening and rehabilitation of damaged structures is increasing. In recent years, Carbon Fibre Reinforced Polymer (CFRP) matrix composites has gain more attention for strengthening and repairing these structures. To study the impact behaviour of the reinforced concrete (RC) beams strengthened or repaired using CFRP, a heavy impact test machine was designed and manufactured. The machine included a newly designed support system for beams together with various instrumentation. This paper describes the support design configuration of the impact test machine, instrumentation and dynamic analysis of the concrete beams. To evaluate the efficiency of the new impact test machine, experimental impact tests were conducted on simple supported reinforced concrete beam. Different methods were used to determine the impact force and impact response of the RC beams in terms of inertia force, maximum deflection, reaction force and fracture energy. The manufactured impact test machine was successfully used in testing RC beams under impact loading and used successfully to test the reinforced concrete beams strengthened or repaired using CFRP under impact loading.

Keywords : beam, concrete, impact, machine

Conference Title : ICCSEE 2015 : International Conference on Civil, Structural and Earthquake Engineering

Conference Location : Barcelona, Spain

Conference Dates : October 26-27, 2015