DESIGN AND CONSTRUCTION OF A TESTING MACHINE TO STUDY THE IMPACT BEHAVIOUR OF MATERIALS

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This report describes designing of a drop weight impact testing machine for testing materials such as ceramics, plastics and clay-polymer composites. The maximum physical drop height is 1.00 m and this is corresponding to a velocity of 4.5 m s^{-1}. This approach is not only cost-effective, but also the system developed is capable of further modifications. Calibration of the constructed machine was done according to the Sri Lankan standards; SLS 147: 1993 and the results also were compared with previous reported Charpy test values available.

Tests were conducted for different materials such as ceramic tiles, polyaniline bars, specimens prepared from bentonite clay, clay-polymer nanocomposites and phosphate bonded clay bricks, using the impact tester. The impact tests were also conducted on polyvinyl chloride (PVC) samples prepared from PVC pipes, under high rate of loading. These tests were performed using notched test specimens of size; 64 x 12.7 x 3.2 mm^3. For clay polymer nanocomposites, experiments were performed using the test specimens of sample size, 40 x 5 x 5 mm^3. 50 x 25 x 15 mm^3 sample size was used to test clay bricks. For ceramic both standard Charpy V notched and unnotched geometries were used for testing. Five samples were tested for each material and average was calculated. These

results were comparable with the reported values. This confirmed the ability of the testing machine to test ductile materials as well as brittle materials. The investigations were then extended to study the effect of different environmental conditions on impact properties of PVC.

This includes the results of the test samples immersed in different solutions such as lime, salt, chlorine, sodium hydroxide. Tests were conducted on PVC samples after exposing to natural sunlight. For each test, complete curves of impact energy vs. number of days were generated. It was done in order to determine the total energy absorbed by the PVC specimens and to observe how it resists under given conditions. The test results showed that the impact resistance of the samples is slightly affected by exposing to lime solution and sunlight.