

The present work explores the suitability of demolition waste as an alternative material for the natural coarse aggregate in the production of concrete in detail. The material which are used as coarse aggregate in the present investigation are obtained from three different old demolished structures: two different demolished RCC culverts one at Medinipur and the other at Kharagpur of West Bengal state and a RCC slab of an old residential building at Vizianagaram of Andhra Pradesh state. The whole investigation is carried out in four phases.

Phase I: In the first Phase, the physical and mechanical characteristics of recycled coarse aggregate (RCA) obtained from all the three different structures are investigated in detail. Then verified the requirements of IS: 383 (1970) which provides a guidance for suitability of aggregates for the production of normal concrete. It is found that the recycled coarse aggregate obtained from all the sources are satisfied the requirements of IS: 383 (1970) for the production of concrete.

Phase II: In depth investigation on designed concrete mixes in accordance with IS: 10262 (1980) is carried out to find out the optimum percentage utilization of recycled coarse aggregate in the second Phase. Four concrete mixes are prepared with 0%, 25%, 50% and 100% (fully recycled) from each source of recycled coarse aggregate (RCA) in combination with natural coarse aggregate. The study involves the fresh concrete property like workability and the engineering properties namely compressive strength at various curing periods, modulus of elasticity, indirect tensile strengths, the durability properties like chloride penetration, water absorption of hardened concrete. In addition, the non-destructive tests like rebound hammer and pulse velocity are investigated.

Phase III: In third Phase, a detailed investigation is conducted on the microstructural characteristics (porosity, anhydrous cement, hydration compounds, microhardness) of interfacial transition zone (ITZ) for better understanding the difference in mechanical and durability characteristics of recycled aggregate concrete (RAC) and normal concrete.

Phase IV: In Phase four, an attempt has been made to understand dynamic characteristics like acceleration, displacement, strains, and reactions of recycled aggregate concrete under drop weight impact load. The recycled coarse aggregate which are used in this final phase is from the source 2.

From the complete investigation, it is observed that the recycled coarse aggregates are conforming the requirements of IS: 383 (1970) and the replacement of natural aggregate with 25% recycled coarse aggregate does not influence the characteristics of concrete. Hence the recycled coarse aggregates may be used as a partial replacement of natural aggregate in the production of concrete.

Keywords: Demolished culverts, recycled coarse aggregate (RCA), recycled aggregate concrete (RAC), compressive strength, interfacial transition zone (ITZ), Vickers microhardness, drop weight impact load.