

Bond Strength of Concrete made with Recycled Aggregates from Construction Demolition Waste

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Abstract

The bond between reinforcement and the surrounding concrete is an important factor responsible for the effective performance of reinforced concrete structures. The bond is mainly achieved by the adhesion, shrinkage of concrete and the ribs on the surface of bar. The bond is mainly affected by the strength of concrete and bar properties such as diameter, type of bar (plain or deformed) and the embedment length of bar. The use of recycled aggregates from construction and demolition waste is an alternate to natural aggregates in concrete. The concrete produced with recycled aggregates have inferior properties compared to that produced with natural aggregates. The reason is attributed to the presence of old mortar attached to the surface of coarse aggregates. In the present investigation, the concrete is made with 100% recycled coarse and fine aggregates and the same is compared with that of natural aggregates. The bond strength between reinforcement and the surrounding concrete is evaluated using the pull-out test as specified by IS 2770 (Part-I). Two different concrete strengths 20 and 40MPa were considered. Three different bar diameters 10, 12 and 16 mm embedded to full depth of the specimen were considered. For 10 and 12 mm diameter bar, cube specimens of size 100 mm were used and for 16 mm diameter specimens, 150 mm size cube was used for conducting pull-out test as per IS 2770 (Part-I). The bond strength and slip curves were plotted for concrete with natural aggregates and concrete with recycled aggregates. With the increase in concrete strength the bond strength increased and with the increase in bar diameter the bond strength decreased. From the typical comparison of natural and recycled aggregates, it is concluded that the bond strength of recycled aggregate concrete reduced compared to natural aggregate concrete. The bond strength values were normalised with respect to the corresponding compressive strength and is termed as the normalised bond strength. The normalised bond strength of recycled aggregate concrete specimens were higher

compared to that of natural aggregate concrete specimens. This is attributed to the increased internal friction in case of recycled coarse aggregates due to the rough surface texture of old adhered mortar.

Keywords: Pull-out test, bond stress, slip, recycled aggregates.