Use of recycled concrete aggregate

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ABSTRACT

Urbanization has generated a high demand for construction aggregates and increased quantities of construction debris that may provide an additional source for aggregates. Recycling of concrete is a relatively simple process. It involves breaking, removing, and crushing existing concrete into a material with a specified size and quality. The quality of concrete with RCA is very dependent on the quality of the recycled material used. Reinforcing steel and other embedded items, if any, must be removed, and care must be taken to prevent contamination by other materials that can be troublesome, such as asphalt, soil and clay balls, chlorides, glass, gypsum board, sealants, paper, plaster, wood, and roofing materials. This investigation includes a descriptive analysis of the supply sources, technology, costs, incentives, deterrents, and market relationships associated with the production of aggregates

INTRODUCTION

The test performed on cubes & beams. Cement, fly ash, glass waste & recycled aggregate wastage material use in concrete.

After referring few mix designs from past trials, we will go for some trials to decide the proportions of the materials .As it is required to find out what is the maximum amount of the natural aggregates that we can replace by recycled aggregate without affecting the strength. Finally we will check the proportion of fresh concrete as well as hardened concrete to using recycled aggregate

In India, huge quantity of construction and demolition wastes is produced every year. These waste materials need a large place to dump and hence the disposal of wastes has become a severe social and environmental problem. On the other hand scarcity of natural resources like river sand is another major problem which results in increasing the depth of river bed resulting in drafts and also changes in climatic conditions.

The key to local materials recovery and the recycling industry sector is to achieve a balance between economic pressures and ecologically sound practice. This balance is critical not only to ensure a sustainable futures for the industry, but also to secure essential quality improvement and development of markets for value-added products, which are required to make recycled materials more attractive and economical.

Any construction activity requires several materials such as concrete, steel, brick, stone, glass, clay, mud, wood, and so on. However, the cement concrete remains the main construction material used in construction industries. For its suitability and adaptability with respect to the changing environment, the concrete must be such that it can conserve resources, protect the environment, economize and lead to proper utilization of energy. To achieve this, major emphasis must be laid on the use of wastes and byproducts in cement and concrete used for new constructions.

The utilization of recycled aggregate is particularly very promising as 75 per cent of concrete is made of aggregates. In that case, the aggregates considered are slag, power plant wastes, recycled concrete, mining and quarrying wastes, waste glass, incinerator residue, red mud, burnt clay, sawdust, combustor ash and foundry sand.

The enormous quantities of demolished concrete are available at various construction sites, which are now posing a serious problem of disposal in urban areas. This can easily be recycled as aggregate and used in concrete. Research & Development activities have been taken up all over the world for proving its feasibility, economic viability and cost effectiveness.

APPLICATIONS

In general, applications without any processing include:

- many types of general bulk fills
- bank protection
- base or fill for drainage structures
- road construction
- noise barriers and embankments

Most of the unprocessed crushed concrete aggregate is sold as 1½ inches or 2 inches fraction for pavement sub-bases. After removal of contaminants through selective demolition, screening, and /or air separation and size reduction in a crusher to aggregate sizes, crushed concrete can be used as: new concrete for pavements, shoulders, median barriers, sidewalks, curbs and gutters, and bridge foundations structural grade concrete soil-cement pavement bases lean-concrete or econo-crete bases and bituminous concrete.

RECYCLED AGGREGATE CHARACTERISTICS

The crushing characteristics of hardened concrete are similar to those of natural rock and are not significantly affected by the grade or quality of the original concrete. Recycled concrete aggregates produced from all but the poorest quality original concrete can be expected to pass the same tests required of conventional aggregates.
Recycled concrete aggregates contain not only the original aggregates, but also hydrated cement paste. This paste reduces the specific gravity and increases the porosity compared to similar virgin aggregates. Higher porosity of RCA leads to a higher absorption.

MIX DESIGN

It is generally accepted that when natural sand is used, up to 30 percent of natural crushed coarse aggregate can be replaced with coarse recycled aggregate without significantly affecting any of the mechanical properties of the concrete. As replacement amounts increase drying shrinkage and creep will increase and tensile strength and modulus of elasticity will decrease, however compressive strength and freeze-thaw resistance are not significantly affected. For more information.

SUSTAINABILITY

Recycling concrete provides sustainability several different ways. The simple act of recycling the concrete reduces the amount of material that must be land filled. The concrete itself becomes aggregate and any embedded metals can be removed and recycled as well. As space for landfills becomes premium, this not only helps reduce the need for landfills, but also reduces the economic impact of the project. Moreover, using recycled concrete aggregates reduces the need for virgin aggregates. This in turn reduces the environmental impact of the aggregate extraction process. By removing both the waste disposal and new material production needs, transportation requirements for the project are significantly reduced.
In addition to the resource management aspect, recycled concrete aggregates absorb a large amount of carbon dioxide from the surrounding environment. The natural process of carbonation occurs in all concrete from the surface inward. In the process of crushing concrete to create recycled concrete aggregates, areas of the concrete that have not carbonated are exposed to atmospheric carbon dioxide.
Credit can also be obtained for Construction Waste Management. It is awarded based on diverting at least 50 percent by mass of construction, demolition, and land clearing waste from landfill disposal. Concrete is a relatively heavy construction material and is frequently recycled into aggregate for road bases or construction fill.
It is recommended that RCA be batched in a prewetted and close to a saturated surface dry condition, like lightweight aggregates. To achieve the same workability, slump, and water-cement ratio as in conventional concrete, the paste content or amount of water reducer generally have to be increased.
Concrete with RCA can be transported, placed, and compacted in the same manner as conventional concrete. Special care is necessary when using fine RCA. Only up to 10 to 20 percent fine RCA is beneficial. The aggregate should be tested at several substitution rates to determine the optimal rate.

Often recycled aggregate is combined with virgin aggregate when used in new concrete. An example of a mix design using recycled aggregates in a pavement application is shown following table.

PROPORTION OF MATERIAL

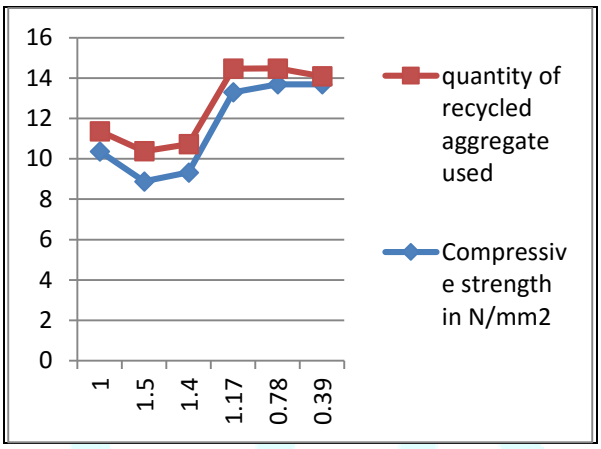
Mix Design	Cement (kg)	Sand (kg)	Recycle aggregate (kg)
1	1.2	1.8	-
2	1.3	1.95	1.5
3	1.3	1.95	1.4
4	1.3	1.95	1.17
5	1.3	1.95	0.78
6	1.3	1.95	0.39

PROCEDURE TO PERFORM TEST

FIG.1 REMOVE THE CEMENT DUST ON AGGREGATE WITH HAND OR HAMMER

Add admixture by weight in to the concrete. Then add cement ,sand, aggregate and admixture by weight. Add water in that mixture and mix it properly. After making the lump of concrete pour the concrete in to the cube of size 150mmX150mmX150mm size. Completely fill that mould with concrete 6 nos of cube to be taken.

Fig. 2 After making the cube put it in to the immersion method of curing for 7 days and then the cube is tested.



ENVIRONMENTAL BENIFTS OF RECYCLING AGGREGATE

Recycling and reuse of recycled aggregates brings substantial environmental gains. There are potential gains in the following areas:

• Reduced resource consumption – substitution of new products for recycled means conserving new quarried aggregates for future generations

• Diversion of waste materials from landfill – which can mean less biodiversity, amenity and transport emission costs

• Reduced quarrying – means less amenity costs and biodiversity loss

• Reduced greenhouse gas emissions – recycled aggregates can have lower embodied energy in addition to reduced transport emissions, especially where recycled materials are reused in close proximity to the site of reprocessing

ECONOMICS OF RECYCLING

Concrete recycling has proven to be profitable, but its use has limitations. Transportation costs need to be kept low, which forces the market to be urban-oriented. The market for recycled aggregates may be restricted by user specifications and prejudices. Finally, the availability of feedstock into recycling plants is fixed by the amount of demolition taking place, which generally places the activity within older, larger cities.

CONCRETE RECYCLING PRODUCT

Because the aggregates industry is a high-volume, low unit-value industry, a small variation in operation economics can have a significant impact on the profitability of an operation. Entry into this business often requires significant capital investment, particularly for small operators, and equipment suitable for processing natural aggregates may not be suitable for processing recycled aggregates. The relative distance and associated cost of transporting material between construction, mining, processing, and disposal (landfill) sites influence production site location. The technology required for raw material acquisition and processing of aggregates from both natural and recycled sources is summarized in table 1, which focuses on technical factors that provide both incentives and deterrents to aggregates recycling.

CONCLUSION

As per experiment performed strength of recycled aggregate is law compared to standard aggregate but still we can use it for construction of non structural member (non structural member :- member which not taking direct structural load) like floor slab ,lintel level ,gully road ,copping ,P.C.C compound wall ,temporary structure etc.

Strength point of view it is not up to the mark but it is helpful for our environment .It reduces wastage on the same way cost and utilization of waste material. At small scale it is not possible to produce this aggregate but when mass work going on field at that time we can produce it. Concrete recycling has proven to be profitable

LITERATURE REVIEW

Aggregates are defined in this study as materials, either natural or manufactured, that are either crushed and combined with a binding agent .When structures made of concrete are demolished or renovated, concrete recycling is an increasingly common method of utilizing the rubble. Concrete was once routinely trucked to landfills for disposal, but recycling has a number of benefits that have made it a more attractive option in this age of greater environmental awareness, more environmental laws and the desire to keep construction costs down.

Concrete aggregate collected from demolition sites is put through a crushing machine.

In keeping with our strong commitment to sustainable construction we are heavily involved in sourcing quality waste arising and secondary aggregates all over Great Britain in order to produce products for construction and building materials.

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