

REVIEW ON PARTIAL REPLACEMENT OF COARSE AGGREGATE

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Abstract : In last decade, construction has increased and replaced the greeneries by concrete mass. As the population is increasing abruptly, we are unable to stop basic housing need of human. Since we have to construct a large amount of concrete mass, we need large amount of coarse aggregate and fine aggregate. This will exhaust naturally available source sand and aggregates which will damage the environment. In futuristic way of construction people preferring cladding material for better architectural appearance. Which is extreme use of tiles, marbles, and granites? Because of these reasons the reuse of constructional waste like mosaic tiles, granite powder, marble chips came into the image to diminish the strong waste and to lessen the shortage of natural aggregate for making concrete. The mosaic tile waste isn't just coming from destruction of structure and also from manufacturing factory. This waste material must be reused so as to manage the restricted natural aggregate and to decrease construction wastes. This article is tied in with looking into the ideal level of various material as substitution of coarse aggregate as well as fine aggregate.

IndexTerms - Waste Crushed tiles, workability Compressive strength, Split Tensile strength.

I. INTRODUCTION

As the modernization in construction come in context, lots of old structure were dismantled to make new one to give more space or better strength. On that structure there is massive use of different tile mostly ceramic or mosaic tile. Ceramic products play a vital role to make structure look better instantly and also protect that surface. Some commonly used ceramics tiles are wall tiles, floor tiles, sanitary ware, household ceramics and technical ceramics and faucets. These are generally manufactured by natural material having lots of minerals. In India, around 100 million ton per year of ceramic tiles is manufactured and nearly 15%-30% of it becomes waste while production or while using in situ. And we all know that this type of waste is not perfectly recyclable in other means where as it possesses good resistance to biological chemical or physical degrading force. Therefore, we preferred it as replacement of coarse aggregate to make the waste product useful. These days we are using lots of innovative ways in construction field which increases the use of coarse aggregate and fine aggregates, at the same time, wastes from the dismantling of the structure is also very high. As the standard of living of people become more lavish, they are preferring well-furnished lifestyle.

The tile is first crushed by manual means or by crusher and replace the coarse aggregate in concrete mix proportion. The replacement is done in the percentage of 10%, 20%, 30%, 40% and 50% of coarse aggregate. Concrete grade of M25 is designed and tested. Various tests are performed like workability, Compressive strength test, split tensile strength test for different concrete mixes in interval of 7, 14- and 28-days curing. The results show that the workability is increases when the percentage of replacement is increases. The strength of concrete also increases with the replacement coarseaggregate. The big advantage of using tile waste, it reduces the construction cost as it is freely available.

II. LITERATURE REVIEW

As the lots of advancement have been made in aggregate replacement lots of researcher get various different results to get the more concrete strength in reliable means which are as follows:

Aruna D et al(2015)[1] :In his study he make a replacement of the coarse aggregates by tiles waste 20mm down size, tile wastes by 0% , 5%, 10%, 15%, 20% and 25% 30% and cement is also partially replaced by fly-ash. When the 25% replacement is done, they get the maximum compressive strength. Whereas the compressive strength is reduced by 15_20% on 25% of tile aggregate replacement.

Batrithi Monhun R. Marwein (2016)[2] : Batrithi had reuses the coarse aggregate by waste tiles at 0%, 15%, 20%, 25% and 30%. M20 grade concrete is adopted. This paper suggests that the replacement of waste tile aggregate should be in the range of 5-30% and also it is suitable to ordinary mixes like M10, M15 etc.

T. Subramani [2015][3] . This research is expected to locate the compelling approaches to reuse the hard-plastic waste particles as coarse aggregate . From this examination it has been reasoned that the plastic waste isn't appropriate to use as a fine aggregate , it is utilized to replace as a coarse aggregate. In any case, the quality perceptibly diminished when the plastic substance was over 20%.

Pramod S.Patil et al.7 . This study presents the use of plastic recycled aggregate as replacement of coarse aggregate for production of concrete. They used forty-eight specimen and six beams/cylinders casted from variable plastic percentages (0, 10, 20, 30, 40 and 50%) used as a replacement of coarse aggregate in concrete mixes. They have conducted various tests and observed a decrease in density of concrete with increase percentage of replacement of aggregate with recycling plastic concrete. They also reported a decrease in compressive strength for 7 and 28 days with the increase in the percentage of replacement of coarse aggregate with recycling plastic aggregate. They have recommended feasibility of replacing 20 % will satisfy the permissible limits of strength. Again, these researchers limited their research to only compressive strength property and no work was carried out to study the other important properties of concrete. Their research also lacks the use of various admixtures in concrete to cater for the loss of strength

Topçu and m. Canbaz (2010)[3]. The use of tile waste has a beneficial effect on environment and in the cost aspects too. This study shows that adding tile waste in place of aggregate can reduce the self weight of the concrete upto 4%. This papers suggested that more than 50% replacement had bad effect on both the compressive and split tensile strength of concrete. But this paper studied maximum replacements of tile waste which can be further divided into smaller percentages and can be utilized in concrete with desirable properties.

Julia García-González, Desirée Rodríguez-Robles, Andrés Juan-Valdés, Julia Ma Morán-del Pozo and M. Ignacio Guerra-Romero et al(2014)[4] : The study concentrates on the ceramic waste from industries in Spain. The concrete design is done as per the Spanish concrete code and the recycled ceramic aggregates met all the technical requirements imposed by current Spanish legislation. The ceramic aggregates are replaced up to 100% replacement of coarse aggregate. Flexural strength test for different concrete mixes decreases. The concrete was showing the property similar to normal stones.

M.Roobini et al. (2015) determined the development strength of concrete with ceramic tiles as coarse aggregate. 20MPa characteristic strength concrete is used with water cement ratio of 0.5. The compressive strength and split tensile strength improved by 4.84% and 13.30% respectively at 20% replacement. Whereas, flexure strength is best at 10% replacement which is 4.84% more than that of conventional concrete.

Md Daniyal and Shakeel Ahmad et al(2015)[5] : A large quantity of ceramic materials goes into wastage during processing, transporting and fixing due to its brittle nature. The crushed waste ceramic tiles were used in concrete as a replacement for natural coarse aggregates with 10%, 20%, 30%, 40% and 50% of substitution in concrete. The study states that the use of ceramic tile aggregate in concrete enhances its properties and it has been observed an increase in both compression and flexural strength.

III. CONCLUSION

The following conclusions are made based on the experimental investigations on compressive strength, split tensile strength and flexural strength considering the—environmental aspects also:

- The workability of concrete increases with the increase in tile aggregate replacement.
- The properties of concrete increased linearly with the increase in ceramic aggregate up to 30% replacement later it is decreased linearly.
- Mix of concrete produced a better concrete in terms of compressive strength, split tensile strength and flexural strength than the other mixes.

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