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Experimental Investigation of Green Concrete in Construction Industry by Using Recycled Aggregate – A Review

Kishan Kumar Pandey[1], Mr. Vijay Kumar Tembhre[2], Mr. Jitendra Sihore[3], Mr. Harish Kumar Verma[4]
[1]*P. G. Scholar,* [2, 3, 4]*Assistant Professor, Department of Civil Engineering, School of Engineering and Technology, Sardar Patel University, Balaghat, Madhya Pradesh, India*

Abstract: ***In this study the natural aggregate replaced by recycled aggregate in different percentages (0%, 20%, 40%, 60%, 80%, 100%). The percentage of recycled aggregate mixed in the definite proportion it improves the property of fresh and hardened concrete like slump test, compressive strength test up to optimum percentage. From the laboratory test results indicates that the compressive strength of these mixtures goes on decreasing, however up to the 20% replacement level, it achieves target mean strength. Hence, for the structural concrete Natural Aggregate can be replaced by the Recycled Aggregate up to 20% range.***

I. INTRODUCTION

Due to the high amount of concrete produced and the high amount of waste generated by the demolition of old buildings, recycling of concrete has become necessary. New designs, production processes and wear and tear are causing the destruction of concrete structures. It is important to manage this waste in an environmentally friendly way to save space in landfills and storage areas. The recycling process begins with the careful management of recycled materials. Then comes the crushing stage, which can be done in many ways.

The most common method is jaw crushers, but cone crushers and large impact crushers are also used. Sometimes the stone may need to be crushed several times to achieve the desired consistency. After crushing, the products are inspected. A coarse screen separates dirt and foreign matter, while a fine screen separates small particles from large ones. Additional cleaning processes such as water flotation, manual separation, air separation and electromagnetic separation help recycle minerals. In addition to waste disposal, wet concrete from precast concrete also poses a disposal problem. Between 700 million and 10 billion cubic meters of concrete are produced worldwide each year, of which approximately 50 million cubic meters are not used on construction sites. To solve this problem, cement manufacturer Mapei created ReCon Zero (short for “zero coverage” for reconstruction). ReCon Zero has the ability to form new aggregates when mixed with wet recycled concrete. Transporting aggregates over long distances causes environmental stress.

Using RAC helps preserve these natural resources because many of these resources are located in urban areas, making them extremely valuable and useful. Additionally, many older buildings no longer meet current standards and need to be demolished, increasing the amount of waste rock. By integrating recycled concrete into buildings, we can reduce waste, conserve natural resources, and promote urban growth.

II. LITRATURE REVIEW

Rayachoti Narayana1 and Suchitra Kumari Panda2: Experimental Investigation On Concrete with Different Waste Stone Aggregate As A Replacement Of Coarse Aggregate: - Booming construction activities impose heavy demand on the construction material especially on the components of concrete. Advancements in technology get better not only human comforts but also harm the environment. Use of waste stone as an aggregate in construction industry has become popular and safe now. At present construction industry is in need of finding cost effective material to enhance the strength of concrete. The effect of natural stone aggregate (NSA), Shabath stone aggregate (SSA), granite stone aggregate (GSA) and ceramic tile stone aggregate (TSA) were investigated. Experimental investigation was done using M30 mix and tests were carried out as per recommended procedures by relevant codes. The compressive strength, split tensile strength, flexural strength and durability of concrete has been studied in this research.

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As a construction material, concrete is not considered to be environment friendly due to its unpleasant effects on the environment. However, it remains to be a most commonly used construction material. This creature the current situation, the concrete industry has to conform to sustainable development, predicting the future of concrete and developing essential strategies concerning this issue. For instance, better durability and more efficient use of concrete should be aimed at. Indeed, today, aggregates make up nearly 50 to 80% of concrete volume. Put differently, if the concrete industry fails to utilize substitute aggregates in the future, around 8 to 12 billion tons of natural aggregates will be addicted as of year 2010. The main aim of this experimental work is to study the experimental investigation on concrete with different waste stone aggregate as a partial replacement of coarse aggregate in comparison with the physical and mechanical characteristics of normal aggregates and different waste stone aggregates. The experimental investigation has been carried out to study the effects on compressive strength, split tensile strength and flexural strength on concrete. The obtained results is been compared with strength and durability of different waste stone concrete and it is been tabulated.

1) From The test result shows that the Compressive strength, Split Tensile strength, Flexure Strength and Durability of TSA were found to be lower than SSA, GSA and TSA.
2) The Strength of 50% & 75% GSA showed better performance than NSA and SSA Moreover the GSA gives similar strength that of the NSA.
3) Hence waste Granite stone can be used as a coarse aggregate in construction industry depend upon the waste granite stone availability.
4) Durability test also showed better performance of GSA compare with NSA.
5) Shabath Stone can be used as an aggregate in concrete for (unloaded structures) unimportant construction works. Also the recycling plants should be encouraged to avoid the landfills and save our environment.
6) "Economical and environmental pressures justify with the consideration of this alternative material source, in places where available source of new rocks are inaccessible" From this we can efficiently utilize the solid waste material

Krishan Pareek Effect of Recycled Aggregate on Mechanical and Durability Properties of Concrete : - Recycled aggregate is a term used to describe crushed concrete, mortar, bricks or asphalt from construction debris that is reused in other building projects. Recycled aggregate is produced by crushing demolished waste to reclaim the aggregate. For the past few decades the availability of Construction and demolition waste (C&DW) has increased so much that the concrete industry has begun utilizing it therefore reducing cost of aggregates. Utilizing C&D waste in structures decreases carbon emission and helps concrete industry to expand further without illtreating the environment. The objective is to study the mechanical properties (such as Compressive Strength, Splitting Tensile Strength and Flexural Strength) and durability properties (such as Resistance to Chloride, Carbonation and Freeze and Thaw) of concrete using reused aggregate. It is observed that the mechanical and durability behaviour of reused aggregate concrete (RAC) is secondary to that of standard concrete but with the using different admixture and different mixing approach, desired properties can be achieved. Moreover, it was seen that the improvement of the mineral admixtures to execution change of the reused aggregate are higher than that to the characteristic of natural aggregate.

an endeavor is made to cumulate the different certainty and properties of cement with reusing waste. As per the study, we observe that mechanical properties of concrete with recycled aggregate are slightly inferior to normal concrete. It was also understood that these properties like compressive strength, split tensile strength, flexural strength, can be improved by using additives such as micro silica, GGBS & fly ash left after burning coal and through proper surface treatment of RA and by using different mixing method such as dry mixing method. The structural element made by recycled aggregate have comparable property compared to that the conventional counterpart. Finally, from the study it can be said that RA obtained from C & D waste must be considered as a sustainable material which is not only economic but environmentally friendly also

Shamsher Singh1 Pankaj Rathore 2 Sanjeev Verma: Influence of recycled concrete aggregates on strength properties of concrete :- Recycling is the act of processing the used material for use in producing new product. The use of naturally available aggregate is getting more and more intense with the advanced development in infrastructure area. In order to reduce the usage of natural aggregate, Recycled aggregate concrete can be used as the replacement materials. Recycled aggregate concrete are consists of crushed concrete, inorganic particles processed from the materials that have been already used in the structural constructions and demolition waste. New technologies have evolved very fast to cater different difficulties in the construction industry, Production of concrete which will leave a substantial mark on the environment. The concrete is made with concrete wastes which are eco-friendly to environment is known as Recycled aggregate concrete.

This thesis covers the aspect on how to choose a material for Recycled aggregate concrete. By the use of Recycled aggregate concrete it is possible to reduce the CO2 emission in atmosphere. To avoid the pollution and reuse the material, the present study is carried out. In this study the laboratory test results indicates that as the percentage of Natural Aggregate in the mixture decreases by replacing the Recycled Aggregate, the corresponding strength of these mixtures goes on decreasing, however up to the 60% replacement level, it achieves target mean strength. Hence, for the structural concrete Natural Aggregate can be replaced by the Recycled Aggregate up to 60% range.

The laboratory test results indicates that as the percentage of Natural Aggregate in the mixture decreases by replacingthe Recycled Aggregate, the corresponding strength of these mixtures goes on decreasing, however up to the 60%replacement level, it achieves target mean strength. Hence, for the structural concrete Natural Aggregate can bereplaced by the Recycled Aggregate up to 60%range. This research project was targeted to determine the strength characteristics of Recycled Aggregate Concrete forpotential application in the structural concrete

Gourav Patel 1, Rahul Yadav2; Experimental Investigation of Green Concrete in Construction Industry by Using Recycled Aggregate: A Literature Review:- In order to reduce the usage of natural aggregate, Recycled aggregate concrete can be used as the replacement materials. Recycled aggregate concrete are consists of crushed concrete, inorganic particles processed from the materials that have been already used in the structural constructions and demolition waste. New technologies have evolved very fast to cater different difficulties in the construction industry, Production of concrete which will leave a substantial mark on the environment. The concrete is made with concrete wastes which are eco-friendly to environment is known as Recycled aggregate concrete. This thesis covers the aspect on how to choose a material for Recycled aggregate concrete. By the use of Recycled aggregate concrete it is possible to reduce the CO2 emission in atmosphere. To avoid the pollution and reuse the material, the present study is carried out.

From the above discussion following conclusions can be made.

1) Recycled concrete can be effectively used in low cost housing where slab load is not high, it can also be used in the construction of boundary wall columns and for other construction where compressive load is not too much.
2) By using recycled aggregates in concrete problem of dumping demolished waste can be minimized.
3) Using recycled aggregates in concrete also reduces environmental pollution, which would otherwise would have been produced during crushing of gravels as coarse aggregate for concrete

A. Naveen Arasu, M. Muhammed Rafsal O. R. Surya Kumar: Experimental Investigation of High Performance Concrete By Partial Replacement Of Fine Aggregate By Construction Demolition Waste :- In this developing world due to increasing demand of naturally available constructions materials due to rapid urbanization calls for necessity for alteration of construction material .Due to the reduction of natural fine aggregates, there is a replacement of fine aggregate by construction demolition waste. Demolition waste is generated from construction, renovation, repair, and demolition of houses, large building structures, roads, bridges, dams, etc., only 5% of C & D waste has been recycled & reused. Due to strict environmental laws and lack of land in urban cities, demolished waste disposal creates huge land pollution.

Various experiments have been done to replace the partial natural fine aggregate by recycled fine aggregate to gain
the compressive strength, flexural strength and tensile strength of the concrete. By various percentage of replacement of crushed C & D waste fine aggregate such as 10%, 20%, 30%, 40% and 50% for natural fine aggregates and the test is carried out. By the results obtained from compressive strength test, split tensile test and flexural test of recycled fine aggregate in concrete were compared with the conventional concrete. By various experimental studies, it was observed that compressive strength & tensile strength of concrete with recycling natural fine aggregates with 20% replacement of crushed C & D waste fine aggregates. The strength has been increased to about 5% in compressive strength, 6% in flexural strength and 8% in tensile strength by different test. Floor corner admixtures are used to increase the compressive, tensile and flexural strength of concrete with replacement crushed C & D waste of 30%, 40% and 50%. The strength has been increased to about 5.5% in compressive strength, 6.25% in flexural strength and 9% in tensile strength by different test.

The present work investigated the physical and chemical properties of construction demolition waste. Concrete properties (compressive strength, water absorption and porosity) were analysed for untreated C&D waste and reclaimed C&D waste as partial replacement of sand (10%, 20% and30%). On the basis of the results from the present study, following conclusions are drawn.

Based on the test carried out on the five mixtures the following conclusion has been made:

1) The fineness and high water absorption properties of the C&D waste and Reclamation of C &D waste affects the workability of the concrete, and the workability of the concrete gets reduced by the increase in the C&D waste substitution rate.
2) After some age the strength properties of the concrete mixtures containing C&D waste up to 20% was relatively close to the strength value of the CC.
3) The concrete mixtures of C&D waste and Reclamation of C&D waste 20% and 30% showed a decrease in compressive strength of only 2.03% and 5.7%, respectively, at the age of 28 days when compared to the CC.
4) Water absorption, voids, porosity decreases with addition of C&D waste compared to CC.
5) From the results obtained it is suggested that C&D waste with a replacement rate up to 30% can be used effectively as a fine aggregate in good concrete production without affecting the concrete standards.

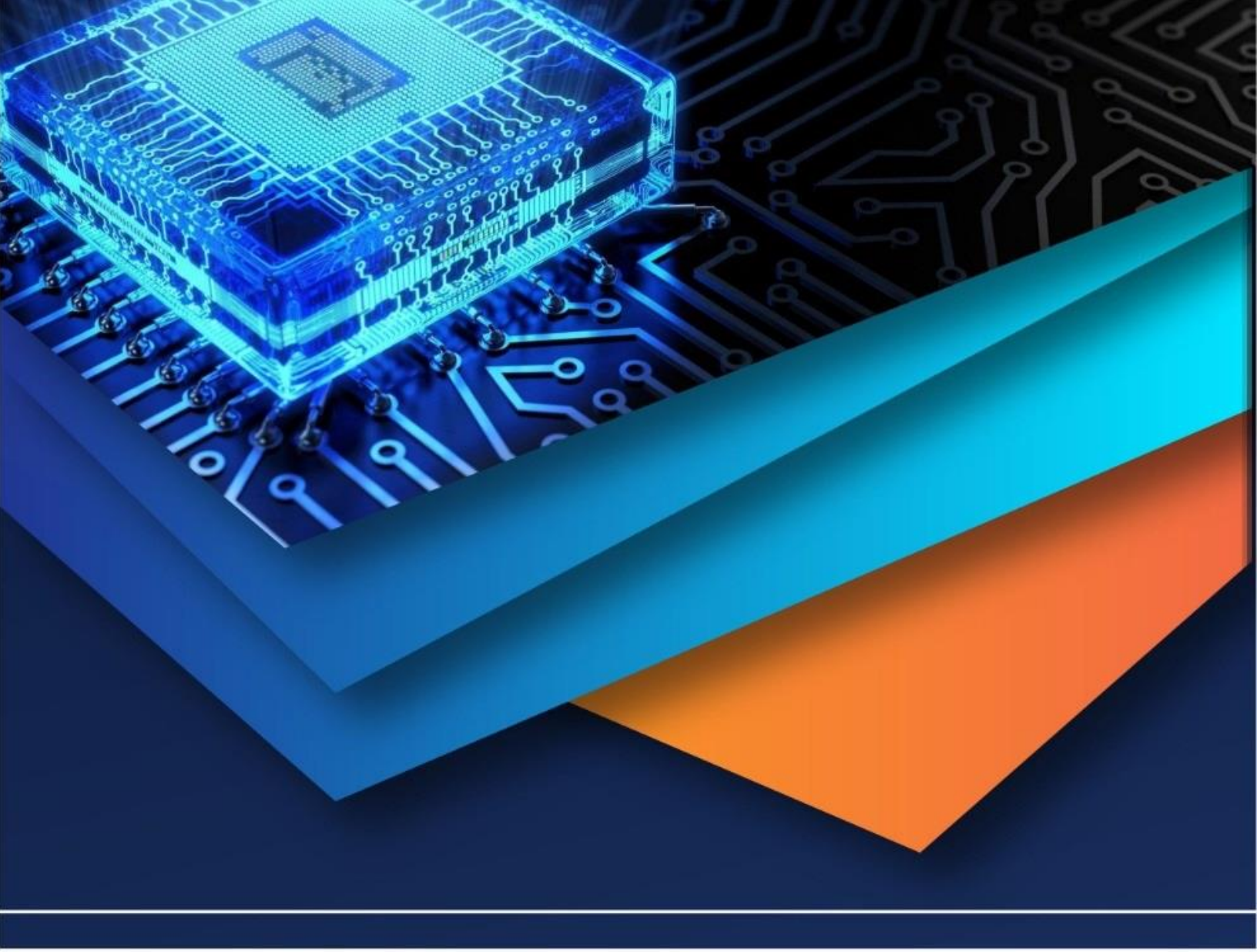
III. CONCLUSION

Based on experimental observations, following conclusions can be drawn

1) Optimum compressive strength observed when recycled aggregate replacement is about 20%.
2) Maximum split tensile strength was observed when recycled aggregate replacement is about 20%.
3) Maximum flexural strength was observed when recycled aggregate replacement is about 20%.
4) Before testing, it is observed that there is increase in weight of concrete specimen when it has been cured under water for 7 and 28 days

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