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Review Paper on High Strength Concrete by Partial Replacement of Fine Aggregate by Demolished Waste

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Abstract:
A lot of construction waste have been expanded in most recent couple of years and subsequently the ecological effects on recycling the destruction waste have been increased. Recently this fine aggregate of ideal amount is utilized for preparing fresh concrete by using demolished waste. The experiment was conducted to assess the concrete strength, in which natural fine aggregate is moderately replaced by recycled fine aggregate. A small percentage of glass fiber and silica fume were added with respect to the weight of the cement. And also the test were conducted for 0%,5%,10% and 20% replacement of fine aggregate by recycled concrete aggregate with various percentage of glass fiber and silica fumes. And various test were conducted for workability, compressive strength, split tensile strength, flexural strength to determine the strength of the concrete.

Keywords: *Fine aggregate, Silica fume, Glass fiber, Demolished waste.*

INTRODUCTION

In current situation the world is heading towards huge climatic change and environmental change.Each and every field is responsible for this current situation and our civil field is also one such field.The natural resources like cement, fine aggregate and coarse aggregate which create impact to the natural environment is due to the production of concrete.Due to the construction of new buildings and modernization of old buildings which have higher and larger equipment has lead to the increase in the amount of construction waste.This construction and demolition waste (C&DW) has been increased in volume and has to be stored on land fills and therefore we have to find a new solution in reusing the construction and demolition waste such as concrete, mortar,hollow block.In a concrete the aggregate constitute around 70% of its volume and it is widely used material.The waste generated from the C&DW is used for replacing natural aggregate and leads towards saving the natural resources.The solution for the problem is using eco-friendly products and also the usage of (3R Reduce,reuse,recycle) using alternative material for concrete seems to prove effective than conventional concrete in many ways such as improved strength, durability, workability preventing corrosion, enivornmental degradation etc. And the strength is also increased by using silica fume, glass fibers.Glass fibers have more mechanical properties than other fibers such as polymer and carbon fibre.It has high elasticity in concrete which means the concrete elements can absorb load and return to its original form without damage it can also control cracking and reduce bleeding of water.Silica fume increases the compressive strength of the concrete and the

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addition have to 50% by weight of cement does not result in the loss of workability.

MATERIALS USED:

CEMENT:

which outperforms the prerequisites of IS12269-1987 Grade. It is delivered by bury granulating of high evaluation clinker and right quality gypsum in foreordained extents.

It is used in fields like high rise buildings,all types of RCC works,and prestressed concrete work like bridges.

FINE AGGREGATE:

The most significant capacity of the fine aggregate is to help with creating workability and consistency in mixture.and it assists with holding the coarse aggregate particles in suspension.This activity advances plasticity in the blend and forestalls isolation of glue and coarse aggregate,and fundamentally during transport from blending plant to the point of position.

n this manner the expense of development can be constrained by the utilization of fabricated sand as an option material.This M-Sand is without dust and the sizes can be effectively controlled so it meets the necessary reviewing for construction.

COARSE AGGREGATE:

It is the most strongest and least permeable material of cement. It is progressively steady chemical material.Aggregate going through 20mm strainer and held on 10mm sifter are utilized as coarse aggregate.the coarse total utilized in experimentation were tried according to IS 383-1970 and 2386-1963

DEMOLISHED WASTE:

This wrecked waste was gathered from the site.The gathered was sent into appropriate smasher to squash into required sizes.then different materials like metals and wooden specifics were removed.the better materials were expelled from squashed material by sieving and screening process.

And demolished waste is collected from outside waste source.Then this demolished waste was crushed manualy to 4.75 nominal size which is then used as fine aggregate in concrete.

WATER:

Water is a significant element of concrete as it effectively takes an interest in the concoction response to frame (C-S-H) GEL.The higher water concrete proportion will diminish the water tightness,durability and strength and furthermore different properties of cement.in addition of water it leads to formation of voids.the PH should lie between 6 and 8 and it should be free from acids and impurities.Locally available portable water confirming to standard specified in IS:456-2000 is used.

SILICA FUME:

It is a fine non crystalline silica delivered in electric furnances as by result of creation of basic silicon.silica fume is known as miniaturized scale silica,condensed silica fume,silica dust.silica molecule is round material under 1 micro meter in measurement and normal size of about 0.15 micro meter.

SUPER PLASTICIZER:

In this super plasticizer - CONPLAST-SP 430 in the form of sulphonated napthalene polymers complies with IS:9130-1999 is used to improve the workability.

LITERATURE REVIEW:

COMPRESSIVE STRENGTH:

Iveta Novakava, Karel Mikulica (2016).In this experiment the recycled concrete aggrgates is replaced in the place of fine aggregates produced by precast construction by 20% has no influence on the physicochemical properties of concrete.And it also causes a sudden raise is about 5.8% consistent and it causes by hydration of cement by RCA

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P.Easwarn, M.Kalaivani, et al(2019**)**.In this research bottom ash in foundry sandwas tested for compressive strength at 5%,10%,20% and shown better result in conventional concrete.The replacement at 10% prove to have optimum compressive strength and the strength is 30.04mpa and is nearly 10.52% more than the compressive strength of the conventional concrete.

Saeid Ghorbani,Sohrab Shariti,et al(2019) Right now utilizing different greatest sizes of squashed solid waste the mechanial and durability charactertics of concrete have been tested.The test was directed for different extents and the strength of cement blends was improved or all sizes of Crushed solid waste by joining 25% of CCW.In this the compression test was conducted for 0%,25%,50% ,75% and 100%. The optimum compression strength was attained at 25% in which the effect in CCW is higher when compare to CA.

S.K.Kirthika,M.Surya,S.K.singh(2019)The existence of clay as fine aggregate at the interstices of Alternate fine aggregate increase the performance of concrete and also increase the MBV and decreases the workability of the concrete. The test was conducted for 30% 50% 75% and 100%.The compressive strength of all concrete mix has no significant change.Because the clay content has been less than 5% for all fine aggregates.

Alaa M.Rashad (2013).This experiment is conducted to know the feasibility of metakaolin as a replacement of fine aggregate in a concrete. Sand content was replaced by Metakaolin at various levels of 10% to 50% at the replacement of MK up to 40% .The compressive strength for replacement was higher when compare to conventional.

Kirthi Vardhan,Rafat Siddique,Shweta Goyal (2019).In this study the marble waste is partially replaced by river sand and the replacement occured at various level from 10% to 60 % and the investigation is carried out in the terms of workability , compressive strength, micro structural properties of concrete.By adding marble waste the compressive strength of the concrete increases and the maximum strength and is archived at 40% replacement.The 28 days compressive strength has gradually increase to 20.2%.

Chaocan Zhena,Cong Lou,et al(2018). In this experiment the compressive strength of the concrete is checked by replacement using recycled clay brick aggregate.In this five different replacement will carried out at 0%, 25%, 50%, 75%, 100% of this the compressive strength increases up to 50%.

Hanmed Salahuddin, Liaqat Ali et al (2020).The purpose of this project is to produce the reactive powder concrete by replacing the aggregate by using various curing techniques.And also various properties like compressive strength, flexural and tensile were also studied.In this mechanical properties of RPC in RA were increased up to 50% in mean while the durability decreases with increase in RA.The maximum compressive strength attained at 7 days was 81.4%.

CC Fan, R Huang, H Huang, SJ Chao(2016).In this production it involves two method one involves both fine and coarse aggregate and other involves only fine aggregate.And the experiment was conducted for the replacement from 0% to 100% of fine aggregate replaced by fine recycled aggregate .At the replacement of 25% and 100% compressive strength concrete reduced by 15% and 30%.

Chan-Hui Liu, Ji- Yang-Lui pi, et al(2017) This blend concrete is made of coarsely crushed demolished block and fresh concrete and has greater strength when compared to conventional concrete. And also the compressive ,flexural and tensile strength test were conducted for various strength and various replacement ratio of demolished concrete blocks.And as the result the compressive strength of recycled blend concrete will decrease with increase in replacement ratio of demolished blend concrete.

Mignel C.S. Nepomuceno, Rui A.S Isidmo, et al (2018).Right now aggregate were supplanted by reused coarse aggregate and supplanting in the proportion of 0%, 10%, 30%, 50%, and 75%. Also, it is tried for compressive, flexural, tensile. What's more, the mechanical presentation diminishes with increment in the substitution.

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Akash Rao, Kumar N.Jha, Sundhri Misra,(2007). In this research they have suggested that using of recycled waste aggregate in concrete is especially used in lower application.And also the use of this recycled aggregate in concrete provides solution to solve the problems in the destruction waste.And also it is clearly noted that Recycled aggregate concrete can be used in the lower end application .And in this recycled aggregate is used for making concrete in addition with fly ash and silica fume and also the properties of hardened RAC is also taken.

SPLIT TENSILE TEST:

P.Easwarn, M.Kalaivani, et al(2019)**:**This split tensile test the optimum strength at obtained at 10% replacement at this 10% replacement the strength obtained is 11% higher than conventional concrete

Alaa M.Rashad (2013):In this split tensile test the strength is increased at 40% replacement but the strength is less when compared to compressive strength at 50% replacement and also the split tensile strength decreases.

Hanmed Salahuddin, Liaqat Ali et al (2020).In this split tensile strength has been increased with the replacement up to 50%. In this two types of curing are used .In normal curing the percentage attained for split tensile strength is between 1.28% to 19.6% and for hot curing it is between 2.77% to 18.24%.

Chan-Hui Liu, Ji- Yang-Lui pi, et al(2017).In this the split tensile strength the strength decrease with the increase in the replacement and the modulus of elasticity will decrease with increase in the replacement ratio.

T.Sathish, B.Palanikumar S.Karthick(2019):In this the optimum split tensile test for M30 mix is 2.77N/mm^2 and were for control mix it is 2.42 N/mm^2.The split tensile strength is increases for 20% replacement of RCA and the carbon fibre with the addition of 0.8%.

Wang, Yuyin, et al. (2019):In this split tensile strength with 100% replacement of CRA the strength decreases form 12.6% to 2%

Verian, Kho Pin, Warda Ashraf, and Yizheng Cao.(2018):The tensile strength of the concrete when replaced with recycled coarse aggregate results in 6% lower when compare to natural aggregate.

FLEXURAL STRENGTH:

Hanmed Salahuddin, Liaqat Ali et al (2020):In this flexural strength the reactive powder concrete containing recycled fine aggregate as raised up to 50% and in the normal curing the increase is between 15.79% to 47.37% and for hot curing it is between 30.77% to 53.85%.

Chan-Hui Liu, Ji- Yang-Lui pi, et al(2017).The flexural strength increases with increase in replacement and also the modulus of elasticity increases with increase in replacement.

U.Sathish,B.Palanikumar,S.Karthick(2019):The optimum strength is achived at 20% replacement of RCA and the addition of 0.8% of carbon fibre. The ultimate load is archived for 28 days is 46

Verian, Kho Pin, Warda Ashraf, and Yizheng Cao.(2018): In this flexural strength when replaced with RCA shows result which is lesser than natural aggregate and the RCA shows less flexural strength when the saturated RCA mixture was used in concrete.

Belltran (2014):Inexperiment the flexural strength of the concrete does not have any significant effect on the concrete.The strength increases when the water and cement ratio increases by 0.5 to 0.6.

Bhutta, Muhammad Aamer Rafique, et al.(2013):In this flexural strength of concrete decreases with the increase in the recycled aggregate but when the polymer is introduced the strength of the concrete increases the percentage decreases from 28.12% to 23%.

CONCLUSION:

The replacement of fine aggregate by demolished waste is more appropriate for both strength and workability. This reused aggregate in cement can be utilized to limit the destroyed waste in development. And it is used as a alternate for conventional concrete. The workability increases the percentage of demolished waste. And the optimum level of replacement is obtained from the

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test. By replacing this demolished waste we can reduce the environmental impacts and land fill.s

REFERENCES

1. Nováková, Iveta, and Karel Mikulica. "Properties of concrete with partial replacement of natural aggregate by recycled concrete aggregates from precast production." Procedia Engineering 151 (2016): 360-367.
2. Easwaran, P., et al. "Study on Strength Properties of Concrete by Using Bottom Ash and Foundry Sand as a Partial Replacement of Fine Aggregate." International Research Journal of Multidisciplinary Technovation 1.6 (2019): 346-352.
3. Ghorbani, Saeid, et al. "Effect of crushed concrete waste's maximum size as partial replacement of natural coarse aggregate on the mechanical and durability properties of concrete." Resources, Conservation and Recycling 149 (2019): 664-673.
4. Kirthika, S. K., M. Surya, and S. K. Singh. "Effect of clay in alternative fine aggregates on performance of concrete." Construction and Building Materials 228 (2019): 116811.
5. Rashad, Alaa M. "A preliminary study on the effect of fine aggregate replacement with metakaolin on strength and abrasion resistance of concrete." Construction and Building Materials 44 (2013): 487-495.
6. Vardhan, Kirti, Rafat Siddique, and Shweta Goyal. "Influence of marble waste as partial replacement of fine aggregates on strength and drying shrinkage of concrete." Construction and Building Materials 228 (2019): 116730.
7. Zheng, Chaocan, et al. "Mechanical properties of recycled concrete with demolished waste concrete aggregate and clay brick aggregate." Results in Physics 9 (2018): 1317-1322.
8. Salahuddin, Hammad, et al. "Effect of recycled fine aggregates on performance of Reactive Powder Concrete." Construction and Building Materials 243 (2020): 118223.
9. Fan, Cheng-Chih, et al. "Properties of concrete incorporating fine recycled aggregates from crushed concrete wastes." Construction and Building Materials 112 (2016): 708-715.
10. Liu, Chun-Hui, et al. "Influence of demolished concrete blocks on mechanical properties of recycled blend concrete." Construction and Building Materials 136 (2017): 329-347.
11. Nepomuceno, Miguel CS, Rui AS Isidoro, and José PG Catarino. "Mechanical performance evaluation of concrete made with recycled ceramic coarse aggregates from industrial brick waste." Construction and Building Materials 165 (2018): 284-294.
12. Rao, Akash, Kumar N. Jha, and Sudhir Misra. "Use of aggregates from recycled construction and demolition waste in concrete." Resources, conservation and Recycling 50.1 (2007): 71-81.
13. Sathish, T., B. Palanikumar, and S. Karthick. "Comparative study on addition of carbon fiber in concrete with partial replacement of demolished concrete waste in structural concrete." Materials Today: Proceedings (2020)
14. Berredjem, Layachi, Nourredine Arabi, and Laurent Molez. "Mechanical and durability properties of concrete based on recycled coarse sand fine aggregates produced from demolished concrete." Construction and Building Materials 246 (2020): 118421.
15. Wang, Yuyin, et al. "Prediction of the elastic modulus and the splitting tensile strength of concrete incorporating both fine and coarse recycled aggregate." Construction and Building Materials 215 (2019): 332-346.
16. Verian, Kho Pin, Warda Ashraf, and Yizheng Cao. "Properties of recycled concrete aggregate and their influence in new concrete production." Resources, Conservation and Recycling 133 (2018): 30-49.
17. c"Properties of porous concrete from waste crushed concrete (recycled aggregate)." Construction and building materials 47 (2013): 1243-1248.