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RELATIONSHIP BETWEEN FLEXURAL STRENGTH OF PLANE RECYCLED AGGREGATE CONCRETE AND PLANE NATURAL AGGREGATE CONCRETE

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Abstract - In the era of latest science and technology, the fossil fuels are used gradually. So this paper deals with the relationship between the Flexural strength of plane natural aggregate concrete (PNAC) and plane recycled concrete aggregate (PRCA). By find out the Flexural strength of M25 & M30 grade with different percentage of recycled material for the usage of further concrete works. With the usage of plane recycled concrete aggregate the cost of the project will be decreased. The result shows that with the increase of recycled aggregates in concrete the flexural strength decreased.

Key Words: Plane natural aggregate concrete (PNAC), concrete, Plane recycled concrete aggregate (PRCA), Flexural strength.

1. INTRODUCTION

The applications of recycled aggregate in the construction areas are wide and they have been used since long time ago. In the past, recycled aggregates were used mainly in low utility applications such as general fill. Recently, these aggregates started to be used for intermediate utility applications such as foundations for building and roads. Nowadays, the aggregates are used, to a very limited extent, in high utility applications such as for the elements of buildings or structural layers of roads. None of the previous results indicated that recycled aggregate concrete is unsuitable for structural applications. Recent investigations on the performance of beams, columns, beam-column joints, and slabs made from recycled aggregate concrete all gave positive results, which further supports and encourages the possibilities of applying recycled aggregate concrete in civil engineering structures.

Numerous research and development projects on the reuse and recycling of demolished concrete and addition of by-products to concrete have been conducted. However, Successful cases are limited to some exceptional materials. The several reasons why it is difficult to extend the sustainable use of concrete materials are: lack of suitable laws, lack of codes, specifications standards and guidelines, cost, poor image, lack of experience, low quality, variations in quality, too many kinds and too large amounts of by-products, inefficient supply system, lack of proper information. In the present investigation, an attempt is made to establish a correlation for flexural strength between natural aggregate concrete and recycled aggregate concrete. Concrete of M25 and M30 grade are tested for flexural strength, based on the results, a data base is developed and some novel equations for describing the correlation for flexural strength between natural aggregate concrete and recycled aggregate concrete are derived by using a statistical regression analysis. This relation shall be established for concretes having strength values between M25 and M30 grade. The different percentage replacements of natural coarse aggregates by recycled aggregates considered are 0%, 20%, 40%, 70% and 100%.

TEST & RESULTS

In Baba Farid Group of Institutions there was a store room since last 8 years, which was need to be redesigned for a building hence, it was reconstructed and a new building has been constructed over the same place. The waste material collected from the demolition of store room is used for the testing of recycling aggregates. The waste material was manually broken down into small pieces and then crushed using hammer. With that material following tests has been conducted for the purpose of recycling of concrete.

In this section the flexural strength test is carried out on 500 mm x 100 mm x 100 mm beam specimen. To study the maximum effect on flexural strength of concrete with recycled aggregate. . On the beam specimens the tests are performed after 7 days and 28 days of casting to examine the strength of concrete and also the graphical representation results of different proportion of natural and recycled aggregates are detailed below -

On the beam specimens the flexural strength variation of Natural aggregate concrete after 28 days of casting for M25 is shown below.

Flexural Strength variations in 28 days of NAC for M25

Type of Mix	Flexural Strength, (MPa)	Percentage decrease in strength as
NAC	5.53	-----
RCA 20	4.94	10.66
RCA 40	4.48	18.98
RCA 70	3.92	29.11
RCA 100	3.40	38.51

The Flexural strength test of concrete at 28days for the M25 mix of NAC. RCA20, RCA40, RCA70 and RCA100 come 5.53 MPa, 4.94 MPa, 4.48 MPa, 3.92 MPa and 3.40 MPa respectively. From Fig – 1.1, it has been observed that the 28 days flexural strength of NAC is more than the flexural strength of RCA. The flexural strength decreased with the increase of recycled coarse aggregate in a concrete. The strength of RCA 100 decreased 2.13 MPa than the strength of NAC.

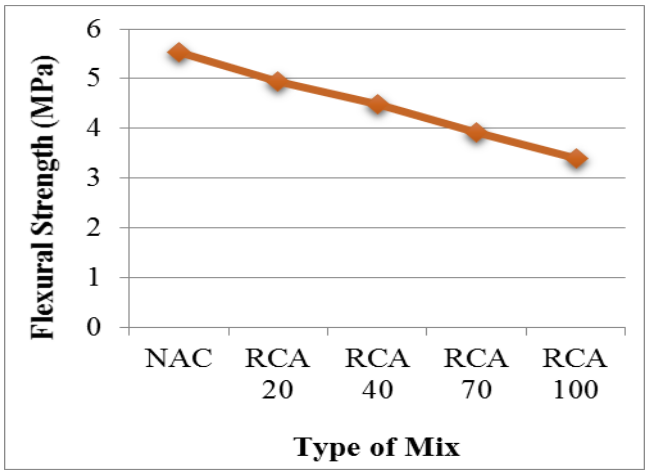

Fig1.1 - Flexural Strength (28days)

Fig-1.2 shows the analysis from the different change in percentage to get 28 days compressive strength of RCA 20, RCA 40, RCA 70 and RCA 100 as compared with the NAC. The figure shows that the strength of RCA 100 is very low than the NAC. The percentage decrease in twenty eight days flexural strength of 20 % replacement with RCA is 10.66%, for 40% replacement is 18.98%, for 70% replacement is 29.11% and for 100% replacement is 38.51%.

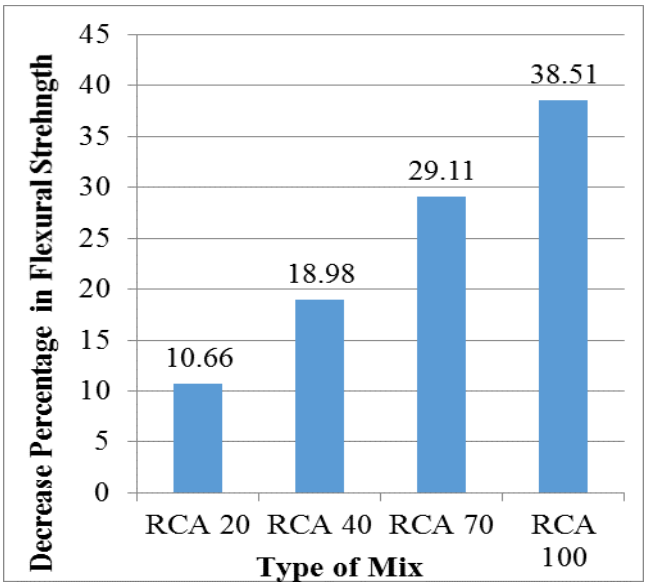

Fig1.2 - Variation in Flexural Strength (28days)

On the beam specimens the flexural strength variation of Natural aggregate concrete after 28 days of casting for M30 is shown below.

Flexural Strength variations in 28 days of NAC for M30

Type of Mix	Flexural Strength, (MPa)	Percentage decrease in strength as compared to NAC
NAC	5.92	-----
RCA 20	5.14	4.72
RCA 40	4.84	18.24
RCA 70	4.49	24.15
RCA 100	3.98	32.77

The Flexural strength test of concrete at 28days for the M30 mix of NAC. RCA20, RCA40, RCA70 and RCA100 come 5.92 MPa, 5.14 MPa, 4.84 MPa, 4.49 MPa and 3.98 MPa respectively. From Fig-1.3, it has been observed that the 28 days flexural strength of NAC is more than the flexural strength of RCA. The flexural strength decreased with the increase of recycled aggregate in a concrete. The strength of RCA 100 decreased 2.13 MPa than the strength of NAC.

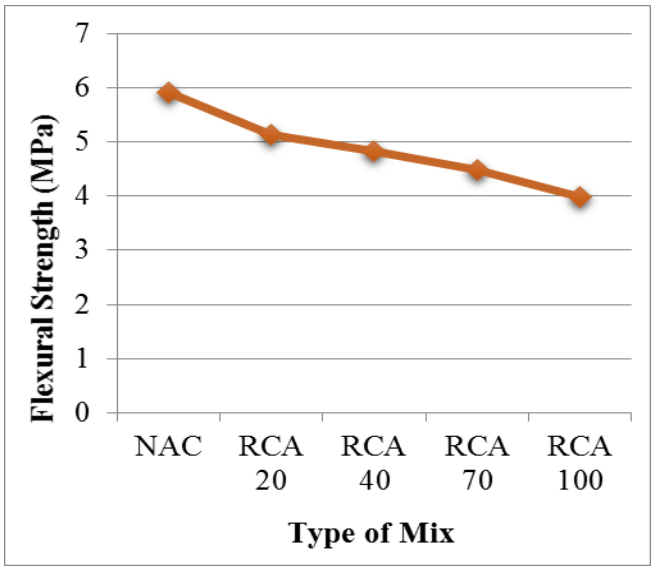

Fig1.3 - Flexural strength (28days)

The analysis from the different change in percentage to get 28 days compressive strength of RCA 20, RCA 40, RCA 70 and RCA 100 as compared with the NAC. The figure shows that the strength of RCA 100 is very low than the NAC. The percentage decrease in twenty eight days flexural strength of 20 % replacement with RCA is 4.72%, for 40% replacement is 18.24%, for 70% replacement is 24.15% and for 100% replacement is 32.77% which is shown in Fig-4.14 on the next page.

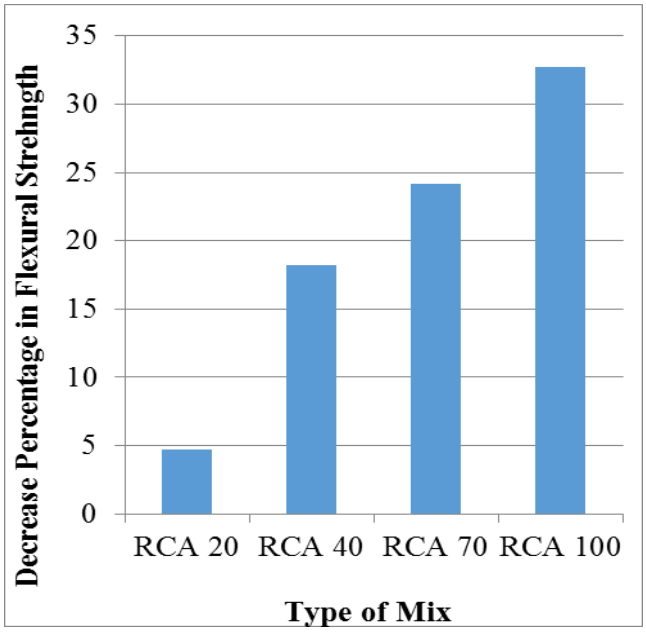

Fig 1.4 Variation in Flexural strength (28days)

Conclusion

In this paper the result shows that the flexural strength is reduced with the increased of recycled coarse aggregate in the place of natural coarse aggregate in a concrete. After 28 days of beam casting for M25 mix, decrease percentage in flexural strength for the 20% recycled coarse aggregate replaced in the place of natural coarse aggregate is 10.66%, for the 40% replacement the strength is decreased by 18.98%, for the 70% replacement the strength is decreased by 29.11% and for the 100% replacement the strength is decreased by 38.51%. The percentage decrease in twenty eight days flexural strength of 20 % replacement with Recycled coarse aggregate is 4.72%, for 40% replacement is 18.24%, for 70% replacement is 24.15% and for 100% replacement is 32.77%. Thus the beam casting for M25 and M30 with 100% recycled coarse aggregate the flexural strength for that becomes 3.40 MPa and 3.98 MPa respectively.

The results have shown the flexural strength of M25 & M30 mix with 100% recycled coarse aggregate in concrete is very low comparatively to the conventional concrete

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REFERENCES

[1] Mmasetlhomo Tommy Gumede, Shodolapo Oluyemi Franklin, "Studies On Strength And Related Properties Of Concrete Incorporating Aggregates From Demolished Wastes: Part 2—Compressive And Flexural Strengths", Open Journal of Civil Engineering, 2015, 5, pp.175-184Use of Recycled Aggregates in Granular Sub Base by Parveen Berwal, Dr. Praveen Aggarwal, Dr. Rajesh Goel.

[2] Kanawade Bhimaji Dashrath, Nawale Mahesh Anil, Wakchaure M.R., Kulkarni V.P., "Effect of Aggregate Types on Flexural Strength of Concrete",IJSET, Volume No.3 Issue No.7,July 2014, pp. 906-909.

[3] Manjunath M and Prakash K B, "Correlation Between Flexural Strength Of Natural Aggregate Concrete And Recycled Aggregate Concrete", IRJET, Volume: 02 Issue: 06 | Sep-2015, pp.947-951.

[4] Sellakkannu N. & Subramani V, "Study On Properties Of Recycled Aggregate – A. Review", IJIR, Vol-2, Issue-3 , 2016,pp.469-475.

[5] Y. V. Akbari, N. K. Arora, M. D. Vakil, "Effect On Recycled Aggregate On Concrete Properties", IJEE, Volume 04, October 2011, pp. 924-928.

[6] S R Yadav, S R Pathak, "Use Of Recycled Concrete Aggregate In Making concrete- An Overview", 34th Conference On Our World In Concrete & Structures: 16 – 18 August 2009, Singapore.