EFFECT OF CEMENT SLURRY MIXED RECYCLED AGGREGATE CONCRETE ON STRENGTH PROPERTIES

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Abstract: In this research main concern on the reuse of construction and demolition waste in conventional concrete. In this study natural aggregates are replaced by recycled coarse aggregate and recycled fine aggregate. As per previous records there is considerably decrement in the strength property by using these kinds of recycled materials. This happened due to lower quality of recycled aggregates. In this study to improve the quality of Recycled Aggregate. Cement slurry treatment apply on the Recycle Aggregate (RA) and use this Processed Recycled Aggregates (PRA) with fine recycled aggregates (FRA). In this research natural aggregates are replace by 10, 20, and 30% Recycle aggregate. Then replace PRA 10, 20 and 30% with Natural Aggregates (NA). Also combine proportion of PRA and FRA and measure workability, compressive, tensile and flexural strength of concrete.

***Keywords* – Recycled Aggregate (RA), Cement Slurry Treatment, Slump Test, Compressive strength**

I. INTRODUCTION

As we know that concrete is the main construction material across the world and the mostly used in all types of civil Engineering works. As Aggregate represents about 70-80% of concrete components so it will be beneficial to recycle the aggregate for construction works and also to solve the environmental Problems. To minimize the problems of excess of waste material it is good step to utilize the recycled aggregates provide that the desired final product will meet the standards. The Cost of Recycled Concrete Aggregate may be less than 20 to 30 % less than natural aggregate in some regions. By using the recycled aggregate the consumption of natural aggregate can be reduced. Indian construction industry today is amongst the five largest in the world and at the current rate of growth, it is slated to be amongst the top two in the next century. With the shortage as likely seen today the future seems to be in dark for the construction sector. The requirements of natural aggregates are not only required to fulfill the demand for the upcoming projects, but also are the needs of the extensive repairs or replacements required for the existing infrastructure and dilapidated buildings built few decades back.

II. LITERATURE REVIEW

- Amnon Katz et al (ASCE 0899-1561/2008) [1] studied on the treatments of recycled aggregates they applied two different treatment silica fume treatment and ultrasonic cleaning treatment. By used silica fume treatment compressive strength improve by 30 % and 15% after 7 & 28 days. And by using ultrasonic treatment compressive strength improved by 7% after 28 days. Also reported that water absorption of R.A. increased due to old mortar on it because of high water absorption in R.A. There decreased in workability.
- Erhan guneyisi et al (ASCE/2014) [3] applied four different surface treatments on the Properties Of self compacting concrete with recycled Aggregates. Treatments are i) Two stage mixing approaches ii) Pre- soaking in HCl solution. iii) Water glass dispersion IV) Cement silica fumes slurry. And they conclude that water glass dispersion treatment gives best result among all.
- P. Pereira et al (ASCE/2013)[2] studied on effect of super plasticizer on the mechanical performance of concrete made with recycled sand and suggested that there is decrease in split tensile strength by 15.6 to 24.5% without use of SP and with SP using there is increase in strength by 26.6% to 52.8%.
- Valeria corinaldesi et al (ASCE 2010) [9] studied on the behavior of the beam and column joints made with recycled aggregate concrete and reported that there is decreased in the flexural strength by 10%.

III. OBJECTIVES OF STUDY

- To investigate the mechanical properties of Recycled aggregate generated from construction and demolition waste.
- To investigate the influence of cement slurry treatment on recycled aggregate.
- To investigate the Effect of recycled fine aggregate with treated recycled coarse aggregate on Strength Properties of concrete.

IV. TREATMENT GIVEN TO THE RECYCLED AGGREGATES

- After Collecting Recycled aggregates from C &D site, firstly determine all the mechanical properties to improve recycled aggregates quality by applying some treatments on to it. As per our literature survey we noticed that many authors applied treatments on to the RA and they are success to get better results .In this Research work Cement slurry treatment applied to recycle aggregate. In this treatment make cement + water paste and soak R.A in to cement slurry paste for 24 hours. After 24 hours take out from vessel and make them naturally dry. Cement and water used to make the slurry with 1:10 proportion.

V. COMPARISON PROPERTIES OF NATURAL AGGREGATES WITH RECYCLED AGGREGATES

(Table 1 Comparison Properties of NCA, RCA. and PRCA)

Properties	Natural Coarse Aggregate	Recycled Coarse Aggregate	Processed Recycled Coarse Aggregates
Abrasion value	23.54	33.35	29.51
Impact value	17.58	26.58	24.5
Crushing value	22.56	26.14	26.0
Specific Gravity	2.61	2.56	2.60
Fineness	7.42	7.02	7.12
Water absorption	0.48	4.2	1.09

VI. MIX PROPORTION

Mix design of concrete is done as per IS 10262:2009

a) Mix Proportion

(Table 2 Mix Proportion)

Grade	Cement (kg/m3)	Fine Aggregate (kg/m3)	Coarse Aggregate (kg/m3)	Water (lit./m3)
M20	388.18	593.91	1273.23	221.26

b) Types of Mixes

(Table 3 Types of Mixes)

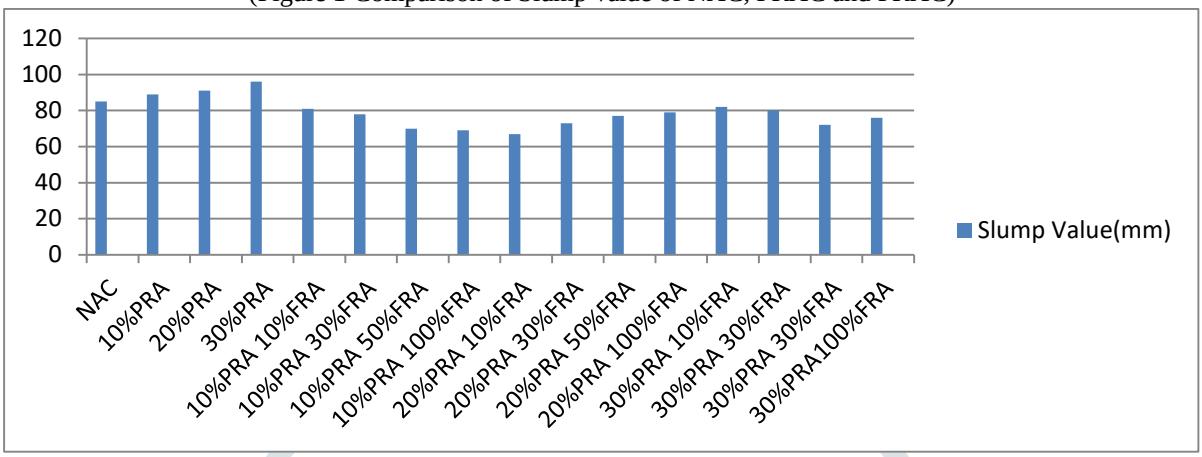
Sr. No.	Mix	Types of aggregates	Coarse RA (%replacement)	Fine RA (%replacement)	Name
1	M20	Normal Aggregates	100% NA	0%	NA
2	M20	Recycled aggregates	10%RA90%NA	0%	RA10
3	M20		20%RA80%NA	0%	RA20
4	M20		30%RA70%NA	0%	RA30
5	M20	Processed RA	10%RA90%NA	0%	PRA10
6	M20		20%RA80%NA	0%	PRA20
7	M20		30%RA70%NA	0%	PRA30
8	M20	Processed RA	10%RA90%NA	FRA10%	PRA10FRA10
9	M20			FRA30%	PRA10FRA30
10	M20			FRA50%	PRA10FRA50
11	M20			FRA100%	PRA10FRA100
12	M20		20%RA80%NA	FRA10%	PRA20FRA10
13	M20			FRA30%	PRA20FRA30
14	M20			FRA50%	PRA20FRA50
15	M20			FRA100%	PRA20FRA100
16	M20		30%RA70%NA	FRA10%	PRA30FRA10
17	M20			FRA30%	PRA30FRA30
18	M20			FRA50%	PRA30FRA5
19	M20			FRA100%	PRA30FRA100

VII. TEST RESULTS

The testing will be done as per I.S Specifications

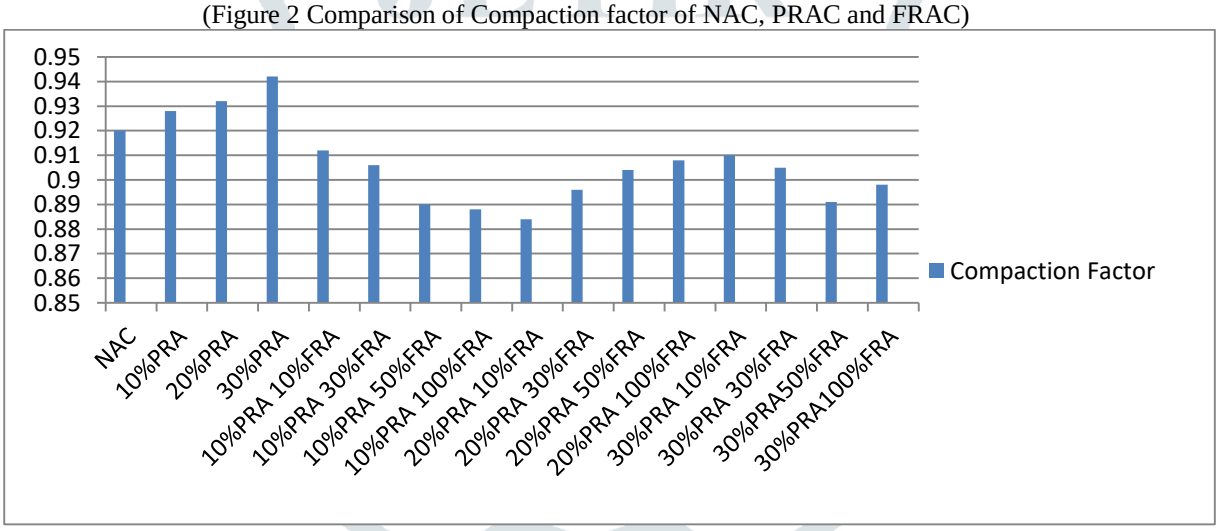
a) Slump Test Result

(Figure 1 Comparison of Slump value of NAC, PRAC and FRAC)



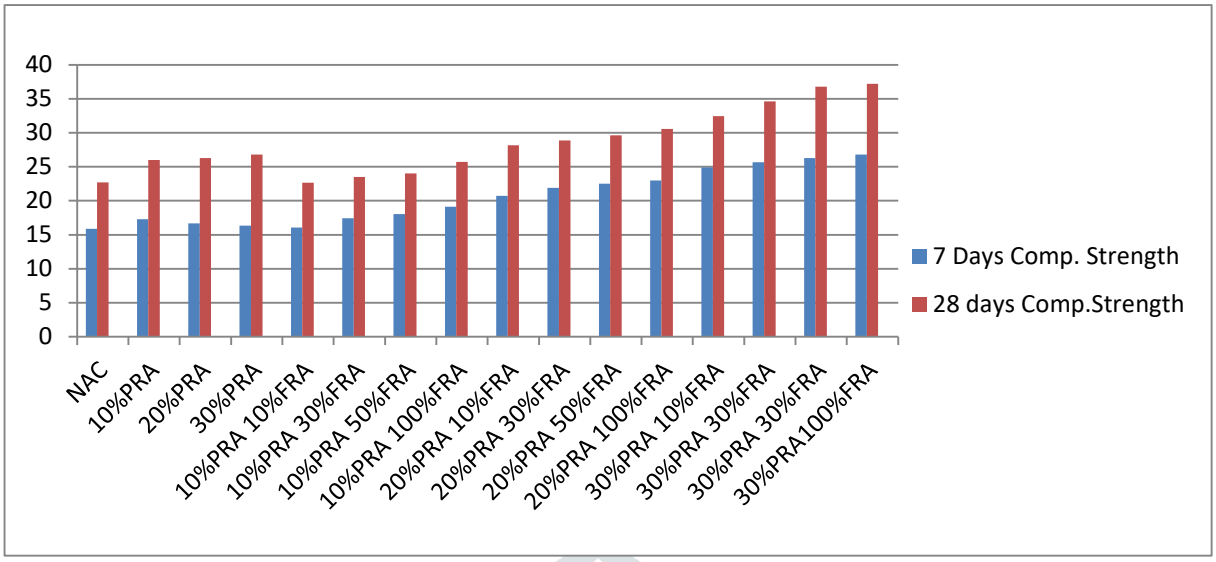
b) Compaction Factor Test Result

(Figure 2 Comparison of Compaction factor of NAC, PRAC and FRAC)



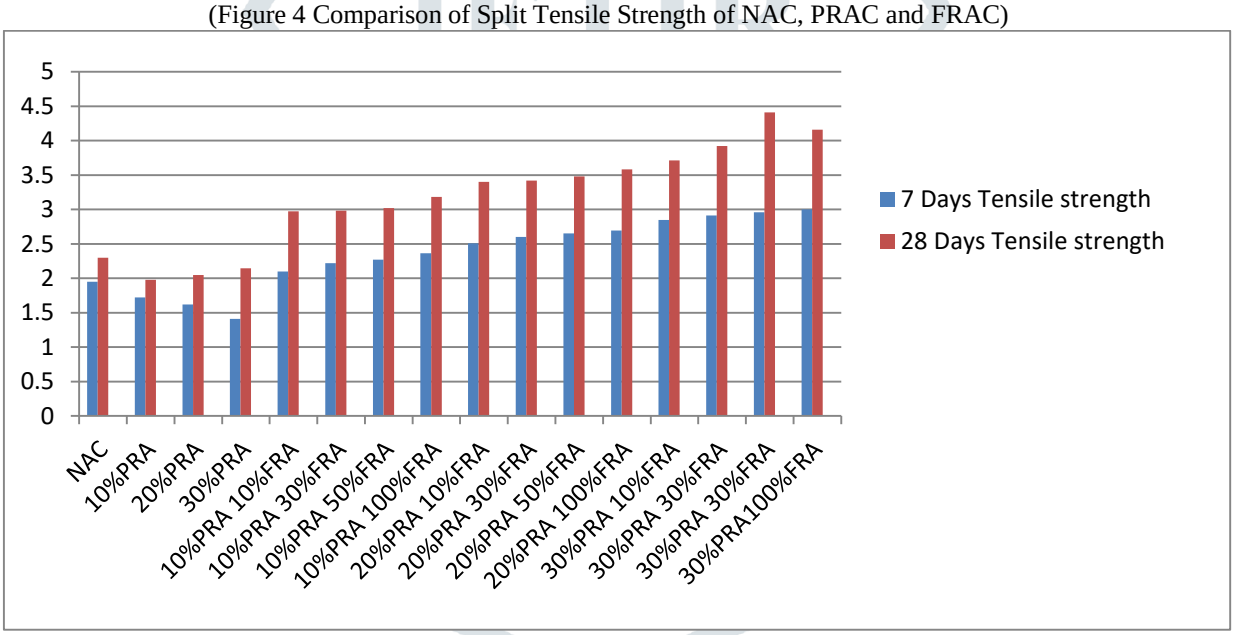
c) Compressive Strength Test Result

(Figure 3 Comparison of Compressive Strength of NAC, PRAC and FRAC)



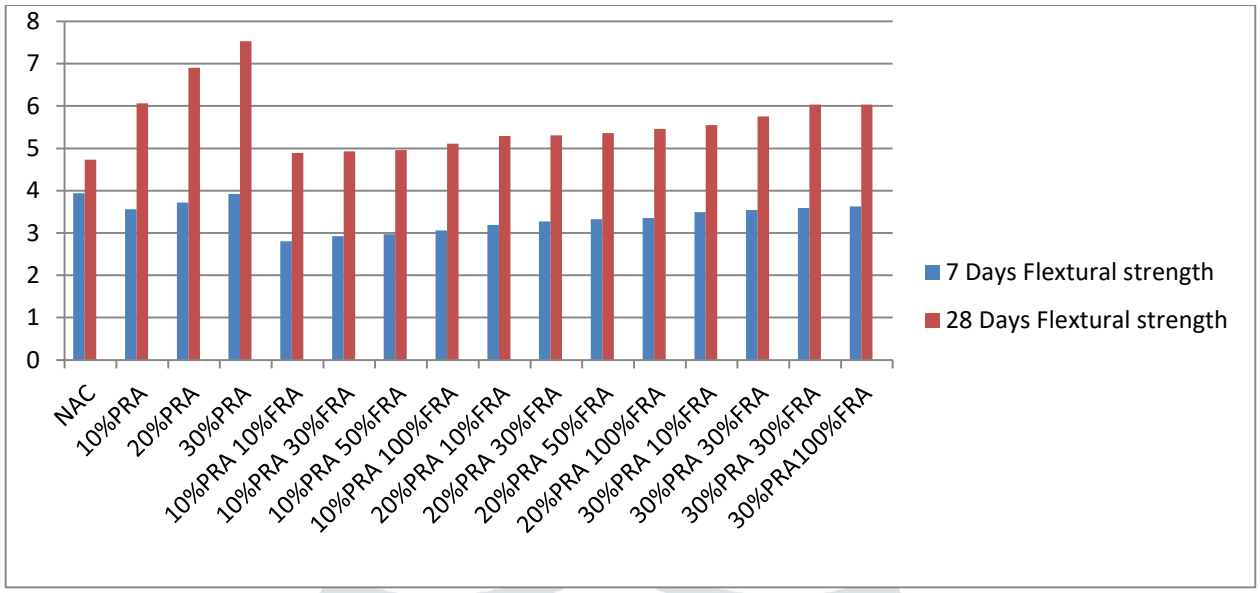
d) Split Tensile Strength Result

(Figure 4 Comparison of Split Tensile Strength of NAC, PRAC and FRAC)



e) Flexural Strength Result

(Figure 5 Comparison of Flexural Strength of NAC, PRAC and FRAC)



VIII. CONCLUSION

Based on experimental work, the following observations/conclusions are drawn:

- In Comparison of NAC, RAC and PRAC slump value decreased as increase in proportion of R.A. In PRAC if increase in proportion of P.R.A there is also increase in slump value.
- Compaction factor value is same while using F.R.A.in the starting decrease the value of Compaction Factor. But as the proportion of PRA. And F.A. increased it match the value of NAC.
- Higher strength properties of concrete prepared with processed recycled aggregates when compare with it normal recycled aggregates.
- As increase unprocessed R.A. there is decrease in compressive strength 10.44% to 12.39% and Tensile strength decrease 14.87% to 25.53%. When use processed R.A. there is increase14.63 to 18.02% in compressive strength and 13.91% to 6.74% in tensile strength.
- Increase in flexural strength properties while using processed R.A. 28 to 45%.If use F.R.A. with Processed R.A. as the proportion of FRA. And PRA. Increase there is increase 3% to 64% in compressive strength and 29.57% to 80.94% in tensile strength. In flexural strength as increase FRA proportion and processed R.A. there is increase in strength 3 to 28%.

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