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Relative Study of Orthodox Concrete with Dualistic Concrete of Recycled Fine Aggregate

Shailesh Kumar Yadav[1], Itendra Singh[2], Akash Agrawal[3], Shakti Suryavanshi[4]
[1,2]M. Tech Student, [3,4]Assistant Professor
Department of Civil Engineering, Shepherd Institute of Engineering & Technology
Sam Higginbottom University of Agriculture, Technology and Sciences, Allahabad, India
shaileshdv5@gmail.com,9411888623

Abstract-India is a country with the second largest population in the world, and with the induction of schemes like “Prime Ministers housing scheme” and “Housing for all” need of alternate building materials is increasing rapidly, to make the cost of construction cheaper and to provide low cost housing for people below poverty level. Making a construction material out of construction waste is quite efficient and cheap as well, such as demolition wastes, ceramic wastes, recycled coarse and fine aggregates etc. Use of recycled waste in concrete makes it economical and also solves the discarding issuesand is alsoadvantageous for ecological protection. Recycled fine aggregate is the resourceof the future. Usage of recycled fine aggregate isin progress inHughamount of construction projects in severalcountries. Several countries are giving relaxation in infrastructural laws for raising the use of recycled aggregates and other construction materials. This research works deals with the usage of recycled fine aggregate as a replacement to natural fine aggregate i.e. sand and its effect on cost, workability, density, compressive strength and flexural strength of concrete with respect to conventional concrete. During the course of this research it is found that the cost of concrete decreases by about 6%, while compressive strength is similar at a replacement level of 20%, workability and flexural strength decreases slightly and the density remains same.

Keywords: Low cost Housing, Alternate building materials, recycled aggregate, waste disposal.

1. INTRODUCTION

Aggregate and cement are the mainingredientsneededtomake concrete. The higher usage of these natural materials is having an objectionableeffect on the environment and climatic condition. Preservation of these conventional materials such as aggregates; is a need to the civilization and its benefit and can be preserved by using suitablesubstitutematerial that are neglected and are believe as pitch away.This paper informs the outcome of an investigationalstudy into the use of recycled fine aggregates asa substitute material in concrete. Testswere conducted out with dissimilar mix proportions tostudy the properties of recycled fine aggregate concrete inthe new and hardened states and there outcome are comparedwith those for concrete of related mix compositionsready with ordinary aggregates. The special effects onconcrete properties of using recycled fine aggregatewith ordinary aggregate have been reported.Concrete aggregates were created in the laboratoryand can therefore be consider as free ofunstable materials and infectivity.

Significance and objectives of on-going research

- To evaluatethe compressive strength and flexural strength of recycled fine aggregate concrete.
- To compare the workability of recycled fine aggregate concrete with traditional concrete.
- To compare the strength of recycled fine aggregate concrete withtraditionalconcrete.
- To find out an optimum percentage of replacement level.

2. MATERIALS

2.1 *Cement*
Pozzolana Portland Cement (P.P.C),the two necessary ingredients of Portland cement are namely argillaceous and calcareous material. Cement of uniform colour (i.e. grey with a light greenish shade) and free from lumps was used in this work.

2.2 *Course aggregates*
The course aggregate was used as crushed granite, passing throughout 20mm sieve and retained on 10mm sieve

2.3 *Fine aggregates*

The fine aggregate was nearby available river sand which is accepted through 4.75 mm sieve

2.4 ***Recycled fine aggregate***

Recycled aggregate was available in the laboratory from various experiments performed by undergraduate students. This sample had different sizes so it was broken into smaller pieces and thus is made to pass through 4.75mm sieve.

3. METHODS THAT WERE FOLLOWED FOR THE SPECIMEN PREPARATION

3.1 ***Volume Mix***

Concrete was prepared volumetrically in the ratio 1:1.5:3(where 1 is proportion of cement, 1.5 is for fine aggregate of size less than 4.75mm and3 is for coarse aggregate of size between 20mm and 10mm size aggregate), the water cement ratio was kept as 0.50. To recognize this comparative study cubes and beams were cast replacing fine aggregate by 5%, 10%, 15%, 20% and 25% to evaluatecost of concrete, density, workability, compressive strength and flexural strength.

3.2 ***Mixing procedure***

The mixing is the most important technique of concreting. Invariable a small difference can have a large influence on the workability of the moist concrete and so the property and external of final composite 66 cubes and 66 beams control specimens were cast to find the compressive strength and flexural strength at 7 and 28 days respectively. The specimens were mix up using a volume mix 1:1.5:3

4. TESTS

Slump cone test was performed for the workability of the concrete at all mixtures was carried out on after mixing. Slump was measured at 1hour to 2 hour after mixing for each concrete mixture. The compressive strength of the concrete mixtures was measured at 7 and 28 days using 150x150x150 cubes. The flexural strength of the concrete mixtures was measured at 7 and 28 days using 500×100×100mm beams. All the specimens de-moulding at about 24 hours after casting and immersed in the water for 7 days and 28 days at room temperature. The compressive strength and flexural strength measured of the specimens after 7 days and 28 days specimens were out from the water before 2 hours of the test of the specimens placing at room temperature

5. RESULTS AND DISCUSSIONS

5.1 ***Compressive strength:***

Three set of cubes were casted for V1, V2, V3, V4, V5, V6 with the replacement of aggregates by recycle fine aggregate percentage 0, 5,10, 15, 20 and 25 for the time periods of 7 and 28 days with a water cement ratio of 0.50 and the results of the same are as follows:

Table 1 Compressive strength of recycle fine aggregate concrete (W/C=0.50)

S.No.	Cube	Water	% age of	Average	Average	% Change in
1	V1	0.50	0%	8.26	23.7	Referral
2	V2	0.50	5%	7.60	27.03	14.05%
3	V3	0.50	10%	8.46	25.92	9.36%
4	V4	0.50	15%	8.184	30.96	30.63%
5	V5	0.50	20%	8.108	26.73	12.78%
6	V6	0.50	25%	8.035	22.22	-6.24%

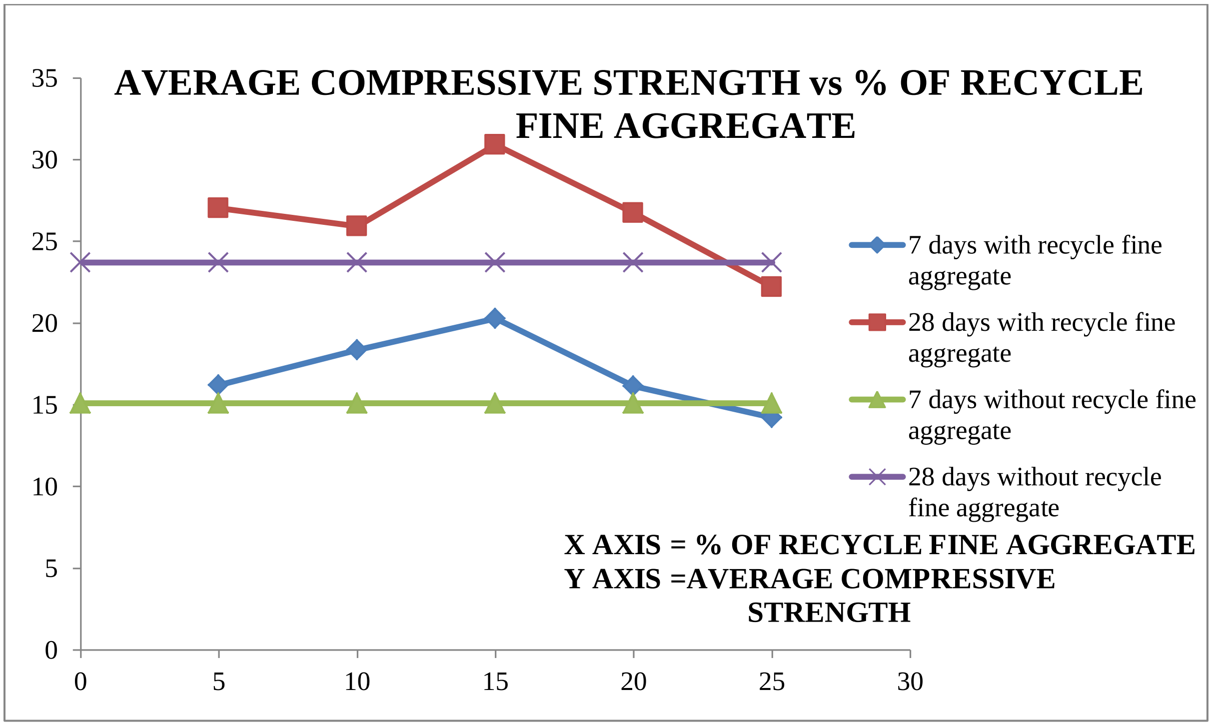

Figure 1: Average compressive strength Vs % of recycle fine aggregate

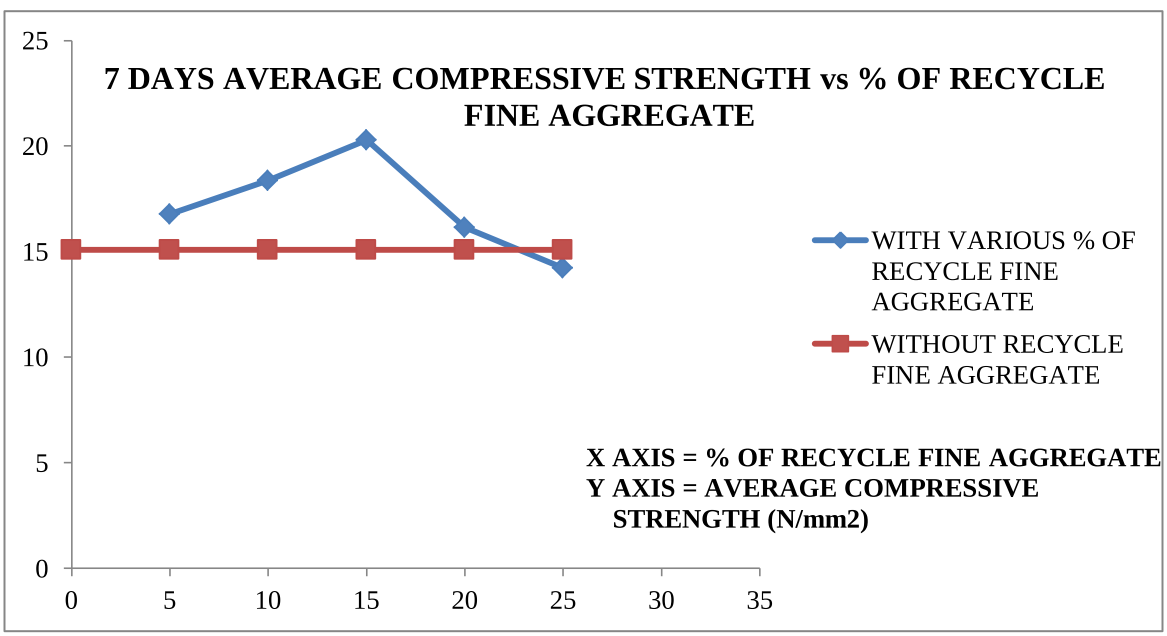

Figure2: 7days average compressive strength Vs % of recycle fine aggregate

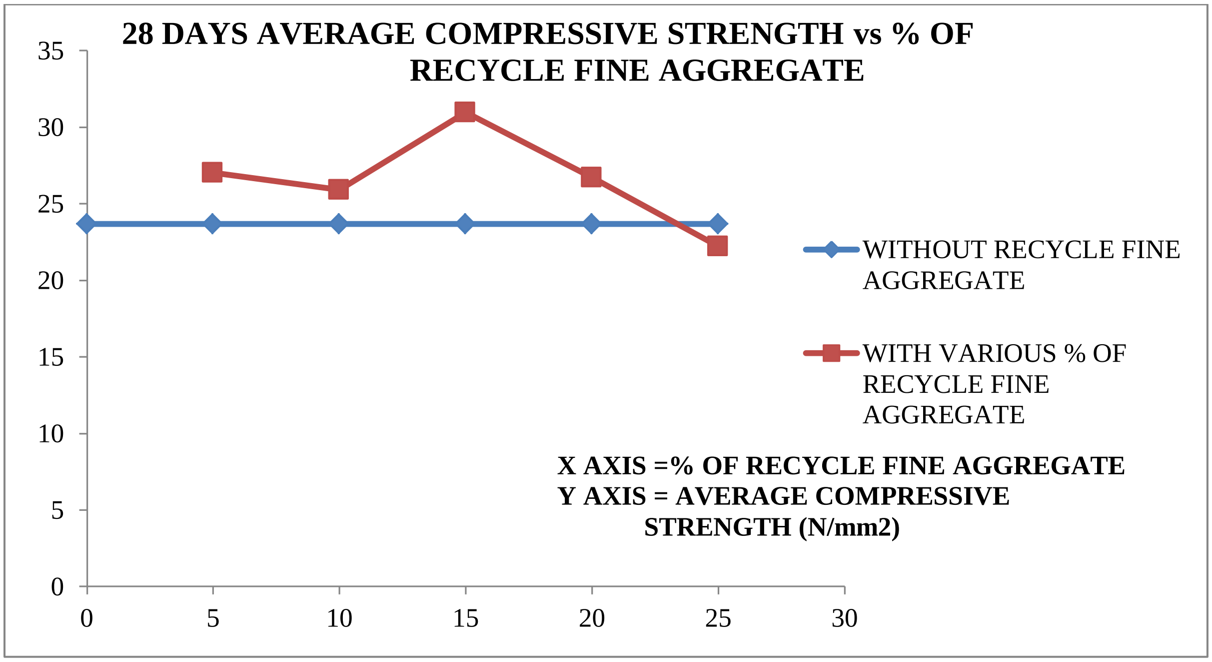

Figure 3: 28day's avg. Compressive strength Vs % of recycle fine aggregate

5.2 *Flexural strength:*

Three set of beams were casted for V1, V2, V3, V4, V5, V6 with the replacement of aggregates by recycle fine aggregate percentage 0, 5,10, 15, 20 and 25 for the time periods of 7 and 28 days with a water cement ratio of 0.50 and the results of the same are as follows:

Table 2 Flexural strength of recycle fine aggregate concrete (W/C=0.50)

S.No.	Beam Designation	Water Cement Ratio	% age of recycle fine aggregate	Average Flexural Strength At 28 days	% Change in Strength
1	V1	0.50	0%	15.16	Referral
2	V2	0.50	5%	11.66	- 23.09%
3	V3	0.50	10%	12.16	- 19.79%
4	V4	0.50	15%	11.5	- 24.14%
5	V5	0.50	20%	13	- 14.24%
6	V6	0.50	25%	11.16	- 26.38%

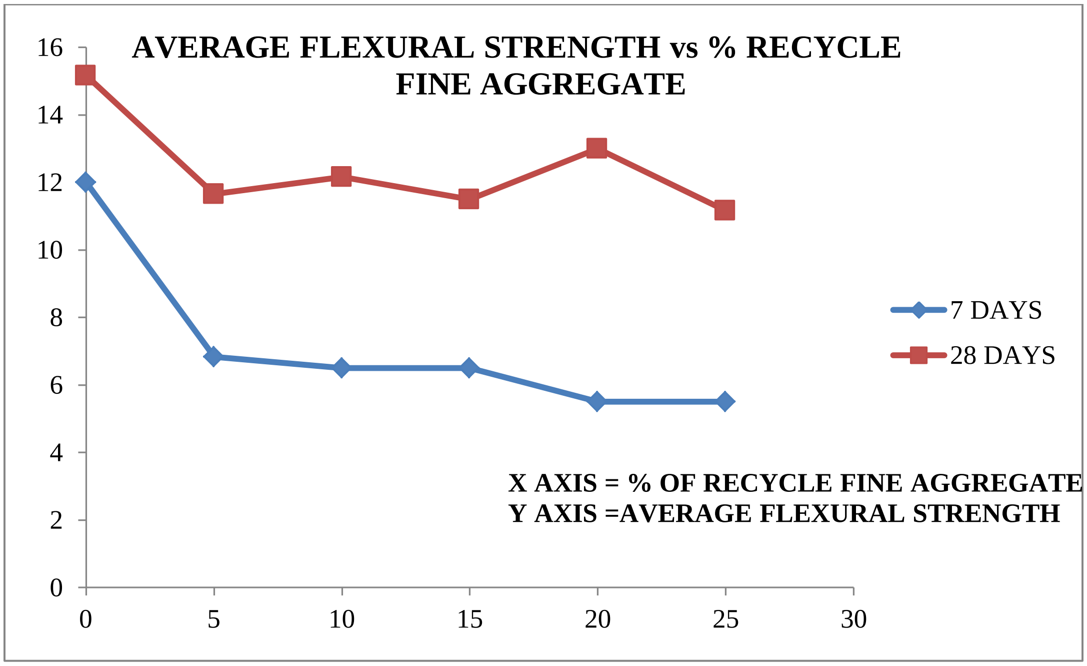

Figure 4: Average compressive strength Vs % of recycle fine aggregate

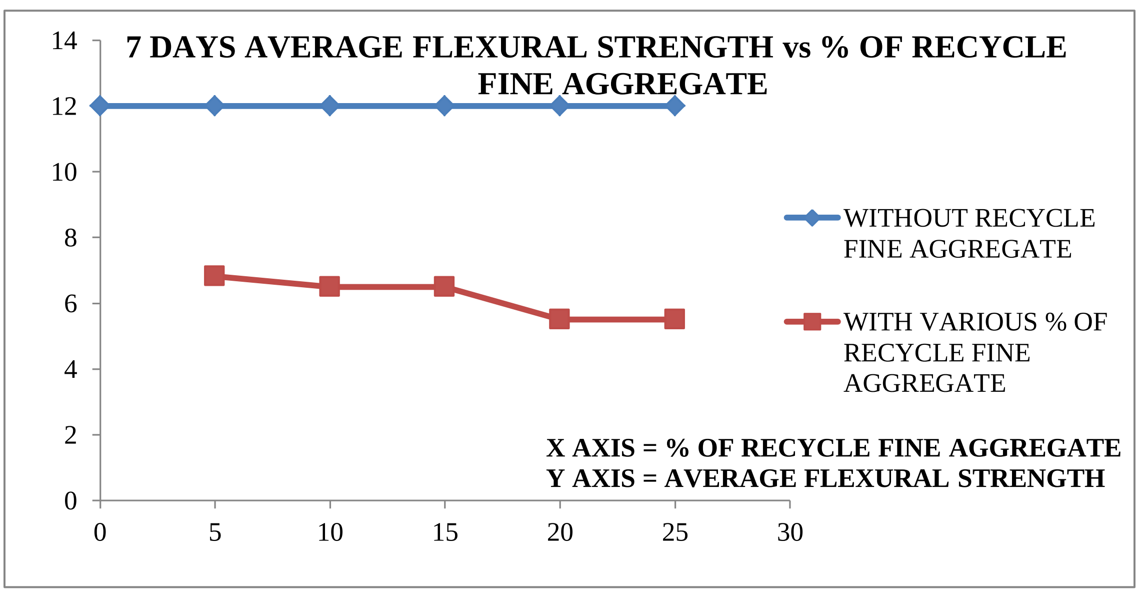

Figure5: 7days average flexural strength Vs % of recycle fine aggregate

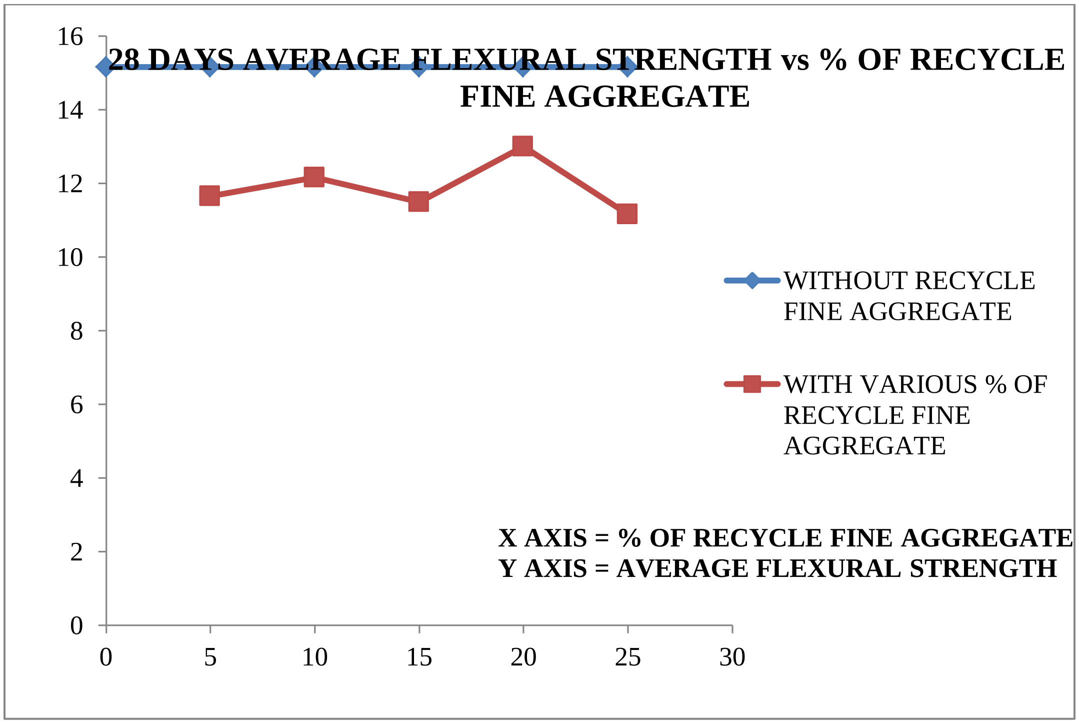

Figure 6: 28day's avg. Compressive strength Vs % of recycle fine aggregate

5.3 *Workability:*

The workability of the replaced concrete is same as that of the referral concrete. Replacement of fine aggregates by the recycle fine aggregate does not affect the workability.

The values observed are as follows:

Table 3: workability of the recycle fine aggregate concrete

Percentage ofrecycle fine aggregate	**Workability**
0%	25mm
5%	25mm
10%	20mm
15%	17mm
20%	15mm
25%	12mm

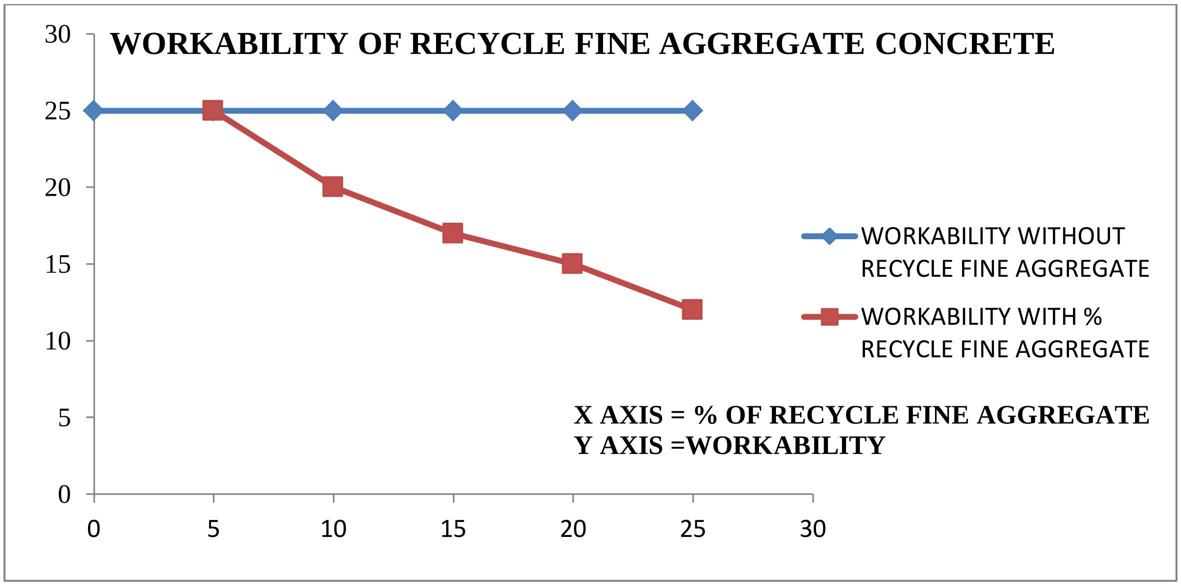

Figure 7: Workability of recycle fine aggregate concrete

6. CONCLUSION

The following conclusions are derived on the use of recycle fine aggregate concrete making.

- With increase in the percentage replacement of recycle fine aggregate, the compressive strength increases as compared to that of nominal concrete up-to a replacement level of 25%.
- At 5% replacement, the compressive strength increases by 15%,
- At 10% replacement, the compressive strength increases by 10%
- At 15% replacement, the compressive strength increases by 31%,
- At 20% replacement, the compressive strength increases by 13%,
- At 25% replacement, the compressive strength decreases by 7%,
- With increase in the percentage replacement of recycle fine aggregate, the flexural strength decreases as compared to that of nominal concrete.
- At 5% replacement, the flexural strength decreases by 23%
- At 10% replacement, the flexural strength decreases by 20%
- At 15% replacement, the flexural strengthdecreases by 24%,
- At 20% replacement, the flexural strength decreases by 14%,
- At 25% replacement, the flexural strength decreases by 27%
- Cost of Concrete decreases by 6% for a replacement level of 25%

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3. **KhaldounRahal**_Department of Civil Engineering, Kuwait University, P.O. Box 5969, Safat 13060, Kuwait Received 4 April 2005; received in revised form 17 June 2005; accepted 29 July 2005
4. **R. Sri Ravindrarajah**BSc(Eng), PhD**, Y. H. Loo** BEng**,** PhD and **c. T. Tam** BE, ME, PhD, MICE, FIES, FACI, FIEM, MIE Aust NATIONAL UNIVERSITY OF SINGAPORE: DEPARTMENT OF CIVIL ENGINEERING*
5. **Akash Raoa, Kumar N. Jhab, SudhirMisraa,***aDepartment of CE, IIT Kanpur, Kanpur 208016, IndiaDepartment of CE, IIT Delhi, New Delhi 110016, India Received 2 August 2005;

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6. **Amnon Katz*** National Building Research Institute, Department of Civil Engineering, Technion, Israel Institute of Technology, Haifa 32000, Israel Received 18 September 2001; accepted 23 October 2002
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8. **L. Evangelista a, J. de Brito b,* a Instituto Superior de Engenharia de Lisboa, R. ConselheiroEmı´dio**Navarro, 1, 1950-062 Lisboa, Portugal b Instituto Superior Te´cnico, Av. RoviscoPais, 1049-001 Lisboa, Portugal Received 28 December 2005; received in revised form 14 December 2006; accepted 15 December 2006 Available online 10 January 2007
9. **Nik. D. Oikonomou *** Laboratory of Building Materials, Department of Civil Engineering, Aristotle University of Thessaloniki, 54124 Thessaloniki, Greece