Available at www.ijsred.com

RESEARCH ARTICLE OPEN ACCESS

An Analysis on Strength Properties of Recycled Aggregate Concrete Using PP Fiber

Chirag Shukla[1], Prof. Harsh Gupta [2]

[1,] Post Graduate Student, [2]Head Of Civil Engineering Department,

(JNCT REWA, NEAR R.T.O. RATAHARA BYPASS, M.P. INDIA)

Abstract:-In this thesis, we have examined the utilization of Recycled Aggregate (RA) in the substantial and the consequences for its Compressive Strength and Split Tensile Strength by logically supplanting the normal total (NA) with reused total. The reused total will be gathered from the destroyed structures and it is somewhat supplanted by normal totals with different extents of 0%, 15%, 25%, and 35%. The substantial is intended for M 20 grade, the proportion is 1:1.46:3.25 with water concrete proportion 0.5 from blend configuration (IS 10262). To work on the rigidity in reused total substantial polypropylene fiber is utilized. The size and extent of polypropylenes fiber are saved consistently for the whole proportion as 6 mm and 15 % by volume of concrete. The material trial of concrete, coarse total, and the reused total is proceeded according to IS code. To check the usefulness of the substantial droop cone test is performed for every one of the proportions. To break down the solidified cement, pressure strength test and rigidity test are performed on the seventh day, fourteenth day, and 28th day with restoring. The size of form utilized is 150 x 150 x 150 mm and 300 x 150mm for pressure and rigidity individually. It is observed that exhibition of cement with 0% and 15% substitution of the regular total by reused total is very like ordinary cement however with 25% and 35% substitution, the compressive strength and split rigidity of cement with PP fiber is expanded. The reused total cement can be extensively utilized in low ascent structure, asphalt plan, seepage design and street development and so forth.

1. INTRODUCTION

Concrete made with Portland cement has certain characteristics: Concrete relatively strong in compression where as weak in tension and tends to be brittle. Another reason behind weakness of the concrete is that cracks start to form when concrete is placed and before it gets fully hardened. The cracks are major factor of weakness in concrete in large onsite applications leading to subsequent failure, generally lack of durability and fracture. The weakness in tension of concrete can be overcome by the use of conventional steel bar reinforcement and to some inclusion of a sufficient volume of fibers. Polypropylene (PP) is made by synthetic hydrocarbon polymers which are extracted by the processes of hot drawing the material through a die. In this study we are comparing Tensile and Compressive Strength with conventional concrete.

Concrete is the most versatile heterogeneous construction material and the impetus of infrastructural development of any nation. It is an artificial material similar in appearance and properties to some of the natural lime stone rocks. Concrete is the man-made composite that composed of Natural aggregate like gravel, crushed rock, sand and cement fine particles which then mixed with water. The concrete becomes hardened as time goes on through a process of hydration of the cement paste, producing a required strength to withstand the load just like rock-hard by a chemical process called hydration. Then the water reacts with the cement and creates bonding between fine and Coarse Aggregate.

1.3 OBJECTIVE

1. To find the optimum mix design with regards to the amount of water, Coarse Aggregate, fine aggregate, fiber, and cement.
2. To find the strength of concrete are increases.
3. To have a comparative study of Recycled Aggregate used in structural concrete, compared with natural aggregate, as well as to find the most economical solution and quality of the recycled concrete aggregate.
4. To find an economical fiber for concrete with regard to its cost.
5. To find the weight of building is light weight construction.
6. To find the Recycled Aggregate are obtained the good quality concrete.
7. We used waste material to improve the strength.

2.POLYPROPYLENE FIBER

Polypropylene fiber was first introduced as an admixture to concrete in 1965. Since then, the fiber has subsequently improved further and it is used either as short size and discontinuous fiber material for production of fiber reinforced concrete. As, the use of these fibers has increased much in construction of structures, the addition of fibers in concrete improves the property of concrete such as its toughness, impact strength, flexural strength, Tensile Strength as well as failure mode of concrete. Polypropylene twine is hardly available, alike all man-made fibers of a consistent quality and is cheap also. Properties of Polypropylene Fibers The raw material of polypropylene comes from monomeric C3H6 which is a pure hydrocarbon. There are very useful properties of polypropylene fibers given by the mode of polymerization, its high molecular weight and the way it is processed into fibers are discussed as below:

- The atomic arrangement in the polymer molecule is regular and high crystalline. Due to its regular structure, it is called as isotactic polypropylene.
- Chemical presence in the fiber concrete makes the fibers more resistant towards the chemicals. As more aggressive chemicals came into contact, the concrete will get deteriorated first.
- A polypropylene fiber requires less amount of water.

3.RECYCLED AGGREGATE CONCRETE

The simple process of recycling of aggregate, crushing of natural aggregate. By using specified size and quality breaking, removing and crushing of existing concrete can be done. For obtaining good product it is desirable to separate out different materials before it gets crushed. A high level of cleanliness of the material is essential for getting a quality end product that can be reused. Recycled concrete aggregate (RCA) is generally manufactured by two-step screening and crushing of demolished concrete and removal of contaminants such as paper, wood, reinforcement, plastics and gypsum. Recycled Aggregate concrete (RAC) is made by recycled concrete aggregate. The main purpose of this work is to determine the basic properties of RAC depending on the coarse Recycled Aggregate content, and to compare them to the properties of concrete made with natural aggregate (NAC)—control concrete. Fine Recycled Aggregate cannot be considered for RAC production because of its application in structural concrete.

4. MIX PROPORTIONS:

In this research paper, $M_{20,}$ mix proportion is designed as per guidelines of Indian Standard recommended method IS 10262:2009. We used 43grade cement; also zone 2 is taken into consideration from IS 383(1970). The coarse aggregate is selected passing through 20mm and retained on 10mm Sieve.

5. RESULT AND DISCUSSION ON EXPERIMENTAL TEST:

5.1 Slump Cone Test:

Slump Cone test was performed for investigation of workability of fresh concrete. This test was carried out for M 20 grade of concrete, before casting the specimens, the results are tabulated and plotted below.

MIX	M20

SlumpValue(cm)	27.2
Slump(cm)	2.5

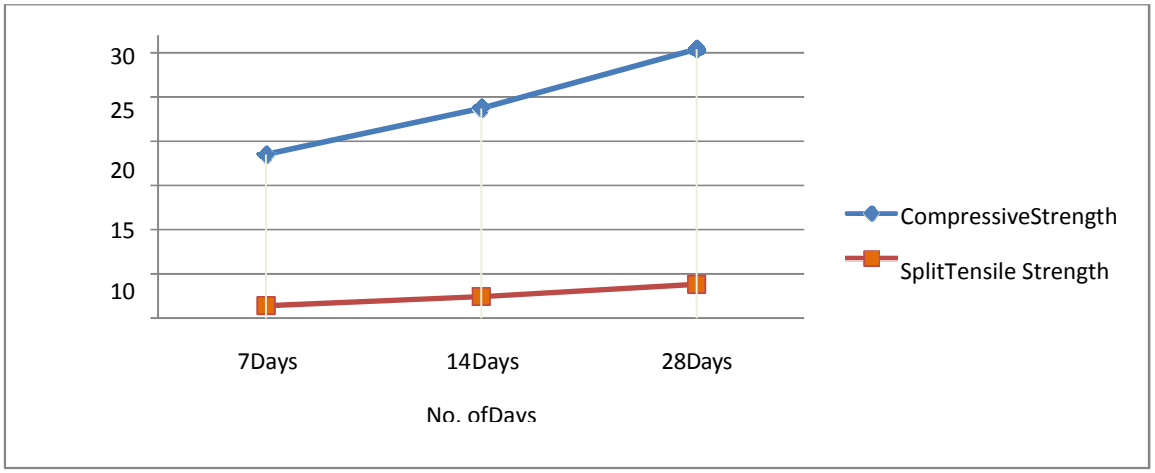
5.2 Effect of Age on Compressive and Tensile Strength

The 28 days strength obtained for M 20 grade of concrete is 30.45Mpa. The results reported in Table 16 are represented in the graphical variation, where in the Compressive Strength is plotted against curing period.

Strength of M20 Concrete

Number of Days	Compressive Strength N/mm^2	Split Tensile Strength N/mm^2
7Days	18.53	1.45
14Days	23.72	2.45
28Days	30.45	3.85

Table- 2



Graph 1. Compressive and Tensile Strength of M20 Concrete

The strength gain at different ages 7, 14 and 28 days for concrete are also presented in above table. From the Graph 1, it is clear that as the age increase. The rate of increase of strength is higher at curing upto 28 days. The Tensile Strength of 7 days is found to be 0.42 times that of 28 days strength, for 14 days, the strength is found to be 0.72 times that of 28 days strength.

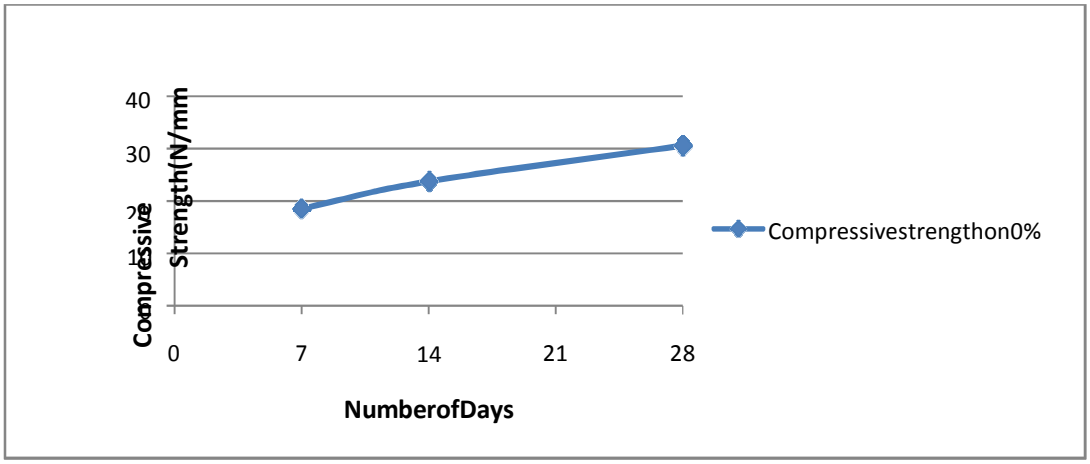
5.3 TestofCompressiveStrength withPPFiberwithAggregateReplaced

AsitisevidentfromTable tabulated showing the result of compressive strength test conducted,anenhancementin28daysCompressiveStrengthcompared to control sample occurs for the PP fiber concrete for size of 6mm fiber length.Also an increase in the fiber content has direct effect on Compressive Strength. HigherCompressiveStrengthofLWCspecimensas35.74KN/mm^2.TheresultoftheCompressive Strength of concrete cubes show that the Compressive Strength increases aspercentages offiberincreased.

Testof CompressiveStrengthon0%

Numberofdays	CompressiveStrengthon 0%
7	18.53
14	23.72
28	30.53

Table- 3



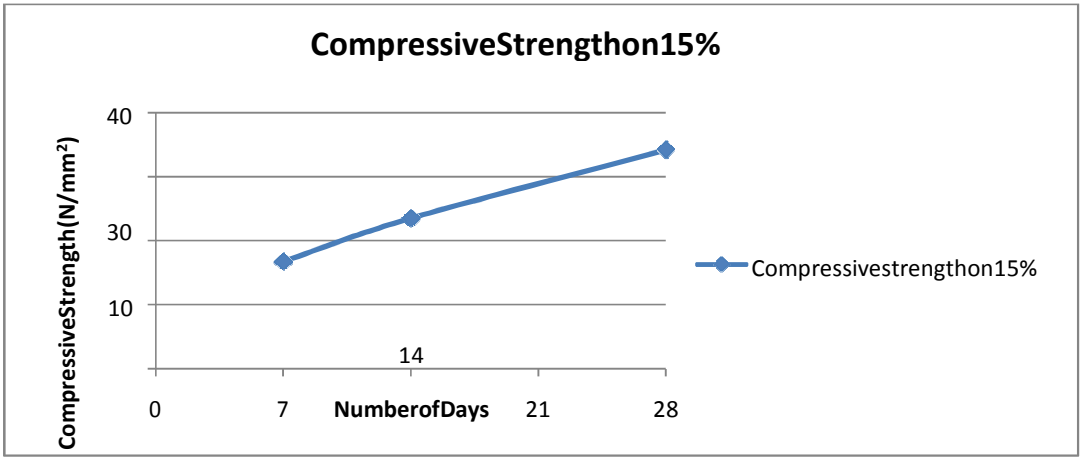
Graph2.CompressiveStrengthon 0%

As per the test performed, it is concluded from the above Graph 2, that theCompressiveStrength of the sample on 0% mix Recycled Aggregate Concrete, bonding with RecycledAggregate in concrete is less from 7 days to 14 days, while after 14 days it get increased.Therefore, it can be said that the Compressive Strength on 0% shows maximum bondingaftercuringon28daysi.e.30.53N/mm^2.

TestofCompressiveStrengthon 15%

Numberofdays	CompressiveStrengthon15%(N/mm^2)
7	16.74
14	23.48
28	34.16

Table- 4



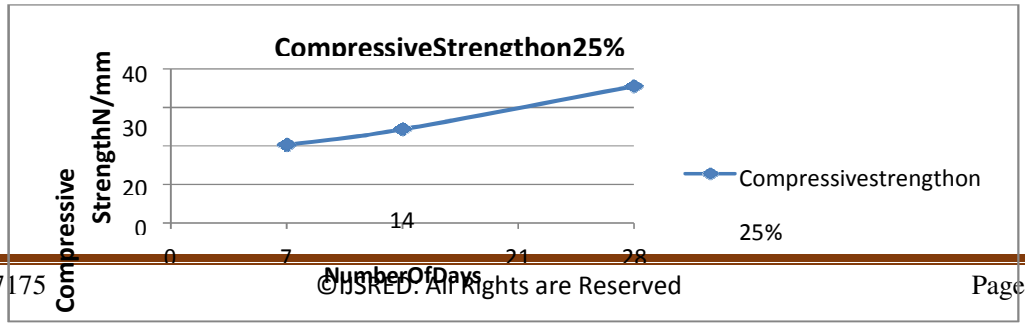
Graph3.CompressiveStrengthon15%

As per the test performed, it is concluded from the above Graph 3, that the CompressiveStrength of the sample on 15% mix Recycled Aggregate Concrete, bonding with RecycledAggregate in concrete is less from 7 days to 14 days, while after 14 days it get increased.Therefore, it can be said that the Compressive Strength on 15% shows maximum bondingaftercuringon28daysi.e.34.16N/mm^2.

CompressiveStrengthon25%

Numberofdays	CompressiveStrengthon 25%(N/mm^2)
7	20.31
14	24.34
28	35.48

Table-5



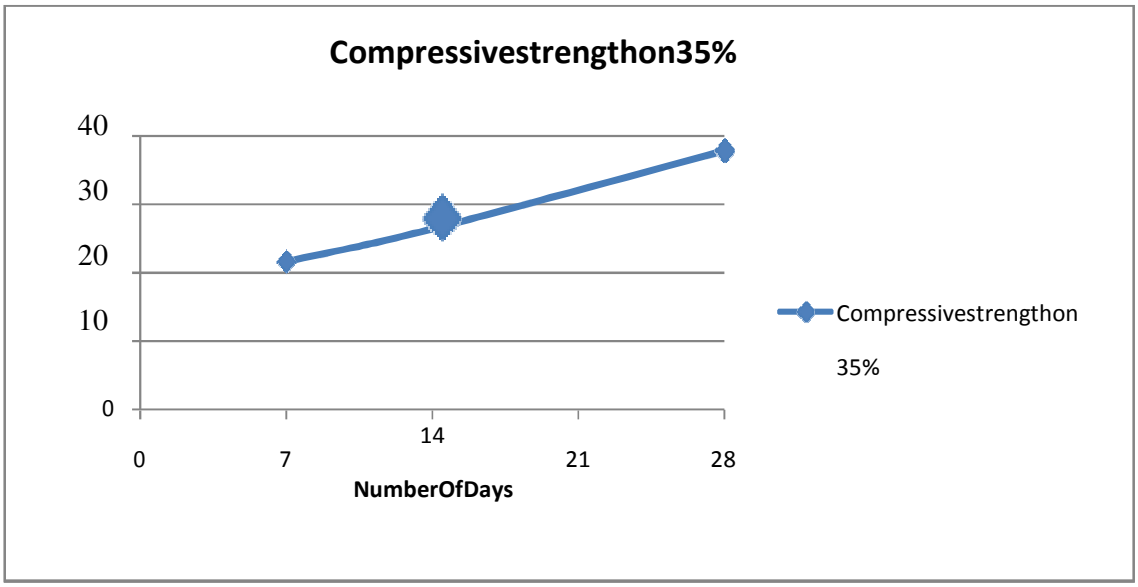
Graph4.CompressiveStrengthon25%

As per the test performed, it is concluded from the above Graph 4, that the CompressiveStrength of the sample on 25% mix Recycled Aggregate Concrete, bonding with RecycledAggregate in concrete is less from 7 days to 14 days, while after 14 days it get increased.Therefore, it can be said that the Compressive Strength on 25% shows maximum bondingaftercuringon28daysi.e.35.48N/mm^2.

CompressiveStrengthon35%

Numberofdays	CompressiveStrengthon 35%(N/mm^2)
7	20.25
14	24.83
28	35.74

Table-6



Graph5.CompressiveStrengthon35%

Name	ProportionofRecycledAggregate	Quantityofingredients (Kg/m^3)	Split Tensile Strength Of Concrete(N/mm^2)

TensileStrengthof concretewithPPfiber

Table-7

		Size	Cement	Sand	Aggregate	RCA	PPfiber	7Day		14Day		28Day	
T	0%-	-	384.35	580.4	1176.1	0	0	1.55 1.6 1.63	1.59	2.64 2.59 2.63	2.62	3.97 3.99 3.96	3.97
P1	15%	6 mm	384.35	580.4	999.68	176.42	57.65	1 0.99 0.97	0.99	1.77 1.86 1.79	1.81	4.13 4.09 4.15	4.12
P2	25%	6 mm	384.35	580.4	882.1	294.03	57.6	1.1 1.15 1.09	1.11	1.93 1.83 1.94	1.9	4.92 4.99 4.82	4.41
P3	35%	6 mm	384.35	580.4	764.46	411.64	57.6	1.15 1.3 1.18	1.21	2.05 2.09 2.08	2.07	5.45 5.59 5.37	5.47

Fromthe above Table-7,itshowsthatforcontrolled,theTensileStrengthof15% offiberreinforced concrete withsizeof6mmgivesbetterresult;itsstrengthisincreasesfrom1.72N/mm^{2}at7thdayto4.46N/mm^{2}at28days.TheCompressiveStrengthincreasedasthe no.ofdaysofcuringincreasedforeachpercentageandsize offiber.

CONCLUSION:

Basedonthetestspecimensmadewiththeavailablelocalmaterials,thefollowingconclusions canbederived:

1. Tensile Strength and Compressive Strength of Concrete increases with increase in fibercontentupto35%.
2. It is observed that Tensile Strength and Compressive Strength of concrete is easilyreinforcedwith6mmlongfiber.
3. Keeping Fiber length at 6 mm and using various percentage of PP Fiber, it is

observedthat Compressive and Split Tensile Strength at 28th day are higher at 35% of fiber

content,isincreasedby35.74N/mm^{2}and4.6N/mm^{2}from30.53N/mm^{2}and3.97N/mm^2(NominalConcrete)respectively.

4. It is concluded further that compressive & split Tensile Strength of concrete at 28 days,reinforcedwithPPFiber.

5. Since use of these fibers reduces the density of concrete hence may be termed as lightweightconcrete.

