ISSN: 2350-0328
International Journal of Advanced Research in Science, Engineering and Technology
Vol. 4, Issue 9 , September 2017

Comparison Between Strengths of Concrete Cubes and Cylinders Using Silica Fume, Steel Fibers-Bacteria and Fly ash

GorijalaEkalya, A. Krishna Kiran

P.G. Student, Department of Civil Engineering, Vasireddyvenkatadri institute of engineering and technology, Guntur, Andhra pradesh, India
Assistant Professor, Department of Civil Engineering, Vasireddyvenkatadri institute of engineering and technology, Guntur, Andhra pradesh, India

ABSTRACT:The Main Objective of the present Investigation is to study the performance of concrete mix of M40 grade, on parameters like compressive strength , Flexural strength and Split tensile strength etc., By comparing strengths of standard concrete and standard concrete mix with Bacteria, Fly ash, Silica fume and Steel fibers.

I. INTRODUCTION

Concrete is the most widely used construction material. Despite its versatility in construction it is known to have several limitations. It is weak in tension has limited ductility and little resistance to cracking. Based on the continuous research carried out around the globe, various modifications have been made from time to time to overcome the deficiencies of cement concrete.
The ongoing research in the field of concrete technology has lead to the development of special concrete considering the speed of construction, the environmental friendliness with industrial material like fly ash, silica fume, bacteria and steel fibres.

II. MATERIALS USED

Cement: 53 Grade Ordinary Portland cement
Fine Aggregate: Locally Available river sand
Coarse aggregate
Silica fume:

Silicon, ferrosilicon and other silicon alloys are produced by reducing quartz, with coal and iron or other ores, at very high temperatures (2000°C) in electric arc furnaces

The physical properties are
Specific gravity- 2.40
Bulk density -550 to 700kg/m3
Color and particle size-Bluish grey and less than 1um.

A. Steel fibers:

The role of fibers is to arrest the advancing of crack by applying pinching forces at the crack tips, to delay the propagation of cracks across the matrix and create a slow cracking propagation stage. This increases the ultimate cracking strain of the matrix by many times as compared to that of unreinforced matrix. The Specifications of the fibers used are given in Table.

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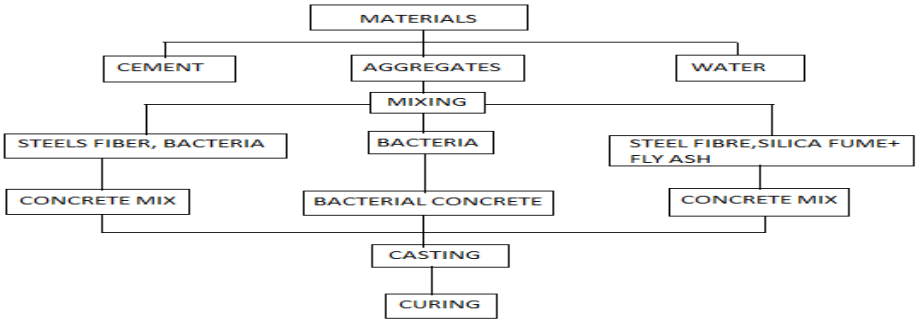
Diameter	0.60mm
Length	30mm
Aspect ratio	50

B. Fly ash:

Fly ash is a group of materials that can vary significantly in composition. It is residue left from burning coal, which is collected on an electrostatic precipitator or in a bag house. It mixes with flue gases that result when powdered coal is used to produce electric power .
Specific Gravity of Fly ash -2.25
Bacteria:
Bacteria used in experimental study were Bacillus Thuringnesis
Addition of Bacteria named bacillus thuringnesis increases the compressive strength of concrete. Bacteria can be added in two forms both liquid and powder form.

III. METHODOLOGY



Data Using
1. Grade of concrete – M40.
2. Type of cement – OPC 53 grade.
3. Max nominal size of Coarse aggregate – 20mm.
4. Minimum cement content – 320kg/m3.
5. Maximum water cement ratio – 0.40
6. Workability – 100 (slump).
7. Exposure condition – moderate
8. Degree of Supervision – good.
9. Type of aggregate -- Crushed angular aggregate
10. Maximum cement content - 450kg/m3.

A. Mix Proportion:
Cement: 365kg/m3
Water: 146lit
Fine aggregate: 709.904kg/m3
Coarse aggregate: 1398.111kg/m3
Mix Ratio Cement: Fine Agg: Coarse Agg-1: 1.94: 3.83

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(Quantities of Materials per 1 Cubic Meter of Concrete)

Grade of concrete	Cement(kg)	Fine aggregate (kg)	Coarse aggregate (kg)	Water (lit)	w/c ratio
M40	365	709.904	1398.111	146	0.45

B. Tests to be conducted on concrete:

Compressive Strength – In the evaluation of compressive strength, all the cube specimens were subjected to a compressive load in a digital compression testing machine with a loading capacity of 2000kN. The most load carried out to the specimen become recorded and then using formula we calculate strength of the cube.

Compressive strength of specimen=P/A

Split Tensile strength – In order to evaluate the split tensile strength of concrete composites, all the cylinder specimens were subjected to split tensile test in a 2000kN digital compression testing machine. The most load carried out to the specimen become recorded and then using formula we calculate strength of the cylinder.

split tensile stress=2P/∏DL

C. Flexural strength: Flexural strength of concrete composites was determined using prism specimens by subjecting them to two point loading in Universal testing machine having capacity of 1000kN.The maximum load of the specimen was recorded.

Flexural strength =pl/bd2

IV .RESULTS AND DISCUSSIONS

A. Compressive Strength test results:

a) The compressive strength values of the standard concrete & concrete with different percentages of bacteria were presented below in tabular form & graph

Curing period	Compressive strength of concrete with different percentages of bacteria			
	Normal Concrete	5%	8%	10%
7 days	15.55	24.23	55.11	48.88
14 days	20	31.89	57.21	52.2
28 days	48.5	61	60	57.77

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b) The compressive strength values of the standard concrete & concrete with 5% of bacteria &different percentages of steel fibers (0.5%-2%) were presented below in tabular form & graph

Curing period	Compressive strength of concrete with 5%of bacteria and steel fibres (0.5%-2%)				
	Normal Concrete	0.5%	1%	1.5%	2%
7 days	15.55	31.96	35.61	34.73	33.17
14 days	20	44.2	48.3	45.9	44.5
28 days	48.5	59.89	64.01	61.02	59.04

c) The compressive strength values of the standard concrete & concrete with silica fume & fly ash mix and 1% fiber were presented below in tabular form & graph

Curing period	Compressive strength of concrete with and without fly ash& silica fume mix including 1% of fibre content				
	Normal Concrete	10% of SF & FA mix	20% of SF & FA mix	30% SF & FA mix	40% of SF & FA mix
7 days	15.5	30.41	30.23	48.8	44.8
28days	48.5	44.6	45.4	46.1	43.9
56 days	49.7	45.1	46.4	29.72	27.8

B. Split Tensile Strength test results:

a) The Split tensile strength values of the standard concrete & concrete with different percentages of bacteria were presented below in tabular form & graph

Curing period	Split Tensile strength of concrete with different percentages of bacteria			
	Normal Concrete	5%	8%	10%
7 days	1.55	2.42	5.51	4.88
14 days	2.0	3.18	5.72	5.22
28 days	4.85	6.10	6.00	5.77

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b) The Split tensile strength values of the standard concrete & concrete with 5% of bacteria &different percentages of steel fibers (0.5%-2%) were presented below in tabular form & graph

Curing period	Split tensile strength of concrete with 5%of bacteria and steel fibres (0.5%-2%)				
	Normal Concrete	0.5%	1%	1.5%	2%
7 days	1.55	3.19*	3.56	3.47	3.31
14 days	2.00	4.42	4.83	4.59	4.45
28 days	4.85	5.98	6.40	6.10	5.90

c) The Split tensile strength values of the standard concrete & concrete with silica fume & fly ash mix and 1% fiber were presented below in tabular form & graph

Curing period	Split tensile strength of concrete with and without fly ash& silica fume mix including 1% of fibre content				
	Normal Concrete	10% of SF & FA mix	20% of SF & FA mix	30% SF & FA mix	40% of SF & FA mix
7 days	1.55	3.41	3.02	4.88	4.48
28 days	4.85	4.46	4.54	4.61	4.39
56 days	4.97	4.51	4.64	2.97	2.78

C. Flexural Strength test results:

a) The Flexural strength values of the standard concrete & concrete with different percentages of bacteria were presented below in tabular form & graph

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Curing period	Flexural strength of concrete with different percentages of bacteria			
	Normal Concrete	5%	8%	10%
7 days	2.69	3.38	5.2	4.69
14 days	3.18	3.98	5.29	5.05
28 days	4.87	5.47	5.42	5.32

b) The Flexural strength values of the standard concrete & concrete with 5% of bacteria &different percentages of steel fibers (0.5%-2%) were presented below in tabular form & graph

Curing period	Flexural strength of concrete with 5%of bacteria and steel fibres (0.5%-2%)				
	Normal Concrete	0.5%	1%	1.5%	2%
7 days	2.69	3.95	4.17	4.12	4.03
14 days	3.18	4.65	4.86	4.74	4.66
28 days	4.87	5.42	5.6	5.46	5.34

c) The Flexural strength values of the standard concrete & concrete with silica fume & fly ash mix and 1% fiber were presented below in tabular form & graph

Curing period	Flexural strength of concrete with and without fly ash& silica fume mix including 1% of fibre content				
	Normal Concrete	10% of SF & FA mix	20% of SF & FA mix	30% SF & FA mix	40% of SF & FA mix
7 days	2.69	3.86	3.84	4.88	4.68
28 days	4.87	4.67	4.71	4.75	4.63
56 days	4.95	4.7	4.76	3.81	3.69

ISSN: 2350-0328

International Journal of Advanced Research in Science, Engineering and Technology

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V. CONCLUSIONS

The strength of bacterial concrete will be high at 8% and decreases when the percentage of bacteria increases.
On addition of 1% steel fibers and bacteria there was increase in compressive strength, flexural strength and split tensile strength compared to normal concrete at 28 days.

Test results at 56 days on replacement of cement with silica fume and fly ash mix along with 1% fiber content indicates an increase in compressive strength, flexural strength and split tensile strength compared to normal concrete with 1% fiber content.

REFERENCES

1. A.M. Neville, Properties of concrete technology M.S.Shetty, Concrete technology theory and practice.
2. Billington, David P., The Tower and the Bridge, 1985, Princeton University Press.
3. R.E. Schaeffer, Reinforced concrete, Preliminary design for Architects and Builders; 1992 McGraw-Hill.
4. Steiger, Richard W., "The History of Concrete," Concret Journal, July 1995, Publication# J950584.