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Study of Strength Parameters for Self-Compacting Concrete Using Bagasse Ash and Glass Fiber

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Abstract

The present work study is carried out for the behavior of self compacted concrete investigation on glass fibre reinforced concrete was carried out by researchers. Glass fibre mesh is more effective in resisting bending and punching shear. Usually, usage of fibres enhances the properties of concrete structures. Fibre reinforced concrete is used for the construction of airport pavements to improve the properties of strength and toughness. So far, a very limited quantity of research work has been done on the application of glass fibres in structural concrete. Hence, the present research would lead to a stronger and durable Glass Fibre Reinforced Concrete, which can be recommended for applications like construction of special building and shelters, slab panels, wall planes, special repair job work, rigid pavements etc. It is observed that studies showed Glass Fibre Reinforced Concrete mixes provide improvement of high performance and high strength concretes.

Keywords: Self compacting concrete, concrete, Bagass ash, plasticizer,

Introduction:

Since the cement is the basic material which is used in construction industry, it is essential to find a suitable material for the replacement of cement. When compared to conventional concrete Self-compacting Concrete is a relatively new type of concrete with high flowability and cohesiveness. By the way, SCC improves health and safety at construction site as well as in surroundings. Self-compacting concrete is considered as a breakthrough in concrete technology due to its improved performance and working environment. SCC can be taken as greatest technical advancement and most revolutionary development in concrete technology over the years. SCC is a concrete of future, as it will be replacing normal concrete due to its distinct advantages. Self-compacting concrete also called as Self Consolidating Concrete or Rheodynamic concrete is an innovative concrete that does not require vibration for placing and compaction. The hardened concrete is dense, homogeneous and has at least engineering properties at par with and durability as traditional vibrated concrete.

The principle behind Self-compacting Concrete is that the settlement of aggregates is related to the viscosity of the fresh concrete. SCC can be produced using the same ingredients as that of normal concrete. SCC mix requires high powder content, lesser quantity of coarse aggregate, high range superplasticizer and VMA to give stability and fluidity to concrete mix. SCC may be used in pre-cast applications or for concrete placed on site. It can be manufactured in a site batching plant or in a ready mix concrete plant and delivered to site by truck. Self-Compacting Concrete offers a rapid rate of concrete placement, with faster construction times and ease of flow around congested reinforcement. The fluidity and segregation resistance of SCC ensures high level of homogeneity, minimal concrete voids and uniform concrete strength, providing the potential for a superior level of finish and durability to the structure. SCC requiring no compaction work at site or concrete plants, has been developed in Japan to improve the durability and uniformity of concrete in 1988. There is no standard method for SCC mix design and many academic institutions, concrete and construction chemical manufacturing companies and ready-mix concrete producers and contracting companies have developed their own proportioning methods by following EFNARC guidelines.

2. Materials

a. Cement:

Ordinary Portland cement available in local market of standard brand was used in the investigation. The specific gravity was 2.96 and fineness was 3200 cm^2/gm. The cement confirms to 53 Grade.

b. Aggregates :

Coarse aggregate: Machine Crushed angular granite metal of 20 mm and 10 mm size from a local source was used as coarse aggregate. It is free from impurities such as dust, clay particles and organic matter etc, The coarse aggregate is also tested for its various properties. The specific gravity are found to be 3.24 and 3.55 respectively.

Fine aggregate: The locally available river sand was used as fine aggregate in the present investigation. The sand should be devoid of impurities like clay matter, salt and organic matter and is tested for different properties as per IS 2386-1963, such as specific gravity, fineness modulus, bulk density etc. Sieve analysis is carried out. The fine aggregate is confirming to standard specification.

c. Glass Fibers

The glass fibers are of Fibro Fills AR Glass fibers with Modulus of Elasticity 7.2 GPA, Filament diameter 13 microns, Specific Gravity7.2, length 12mm. For kilogram, the number of fibers is 200million.

d. Water

Water is the least expensive but most important ingredient of the concrete. The water used for making concrete should be clean and free from deleterious impurities like oil, alkalinities, acids etc. In general, the water fit for drinking is ideal for concrete making.

e. Bagasse Ash

Sugarcane is the largest crop by production quantity in the world. A large amount of wet bagasse is yielded and the management of this residue is of great importance from an environmental point of view. The combustion of this bagasse is one of the most common practices, resulting in the production of an additional residue, the sugarcane bagasse ash (SCBA). Chemical and mineralogical composition of SCBA makes it a potential supplementary material in Portland cement blends and also in geopolymeric binders. Fineness, crystallinity, and the presence of unburned particles are crucial for the development of pozzolanic reactivity and for having good mechanical performance. Durability of SCBA-based mortar and concrete is appropriate, and in many cases 20% replacement of cement can be carried out without significant performance loss. Also, SCBA and sugarcane straw ash are good candidates for preparing geopolymeric binary systems. A reduction of CO_2 emissions has been proposed with the use of these residues.

TRIAL MIX:

Mix Proportion for M 50 grade.

Sr. no.	Materials	Weight Batching (per 1 cu m)	Trial Batch (per12 cubes) (5%)	Units
1	Cement	378	18.9	kg/cu m
2	Fly ash	110	5.5	kg/cu m
3	Bagasse Ash	42.00	2.1	kg/cu m
4	Water	195	9.8	Lit/cu m
5	CA I	598.41	29.9	kg/cu m
6	CA II	198.38	9.9	kg/cu m
7	FA	872.60	43.6	kg/cu m
8	Super plasticizer	6.89	0.3	kg/cu m
9	Viscosity Modifying agent	1.855	0.1	kg/cu m
Total		2403.14	120.2	

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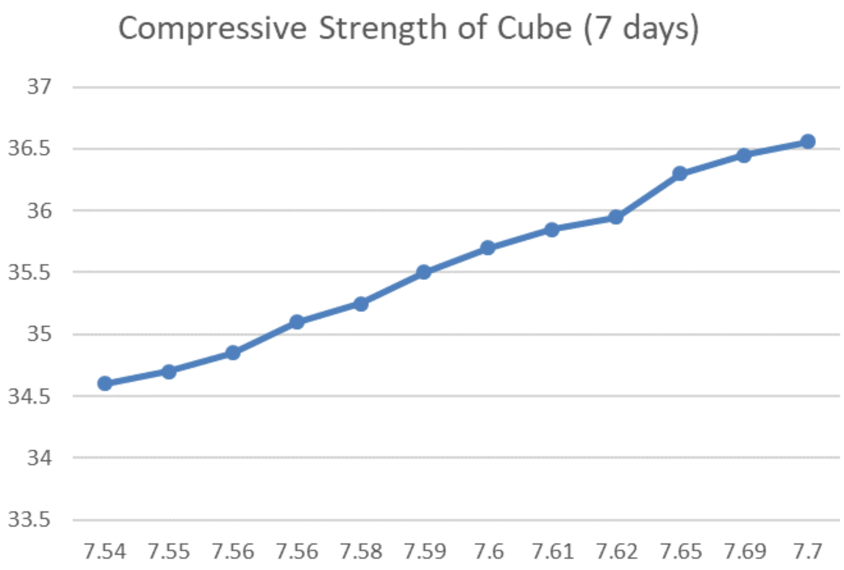
Results:

Slump Test



Sr. No	Glass Fibers (%)	Slump Flow (mm)
1	0	700
2	0.25	695
3	0.50	689
4	0.75	685
5	1	680
6	1.25	677
7	1.50	673

Compressive Strength of Cube for 7 days.

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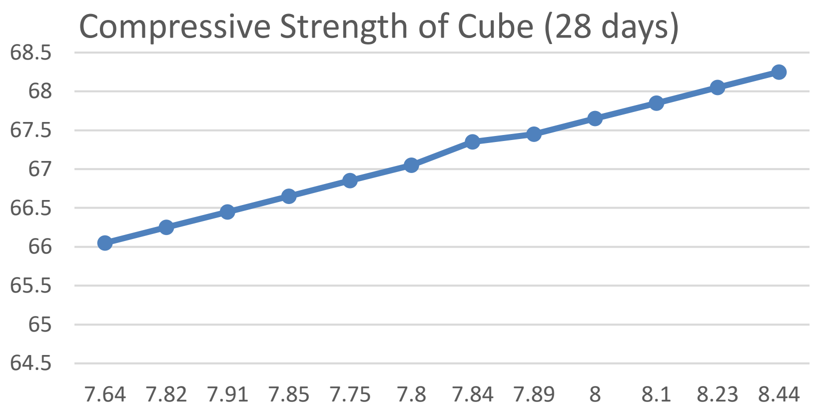
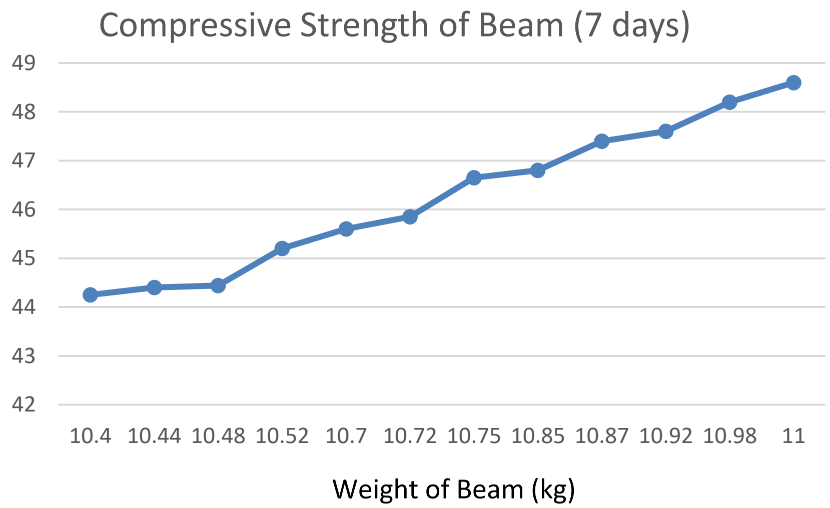
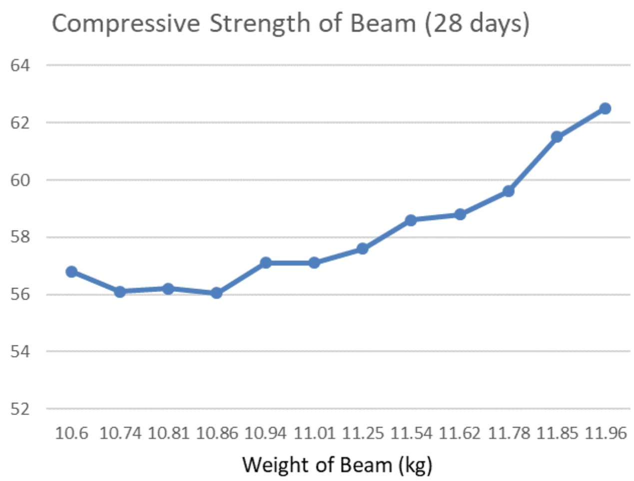


Compressive Strength of Cube for 28 days.



Compressive Strength of Beams for 7 days.



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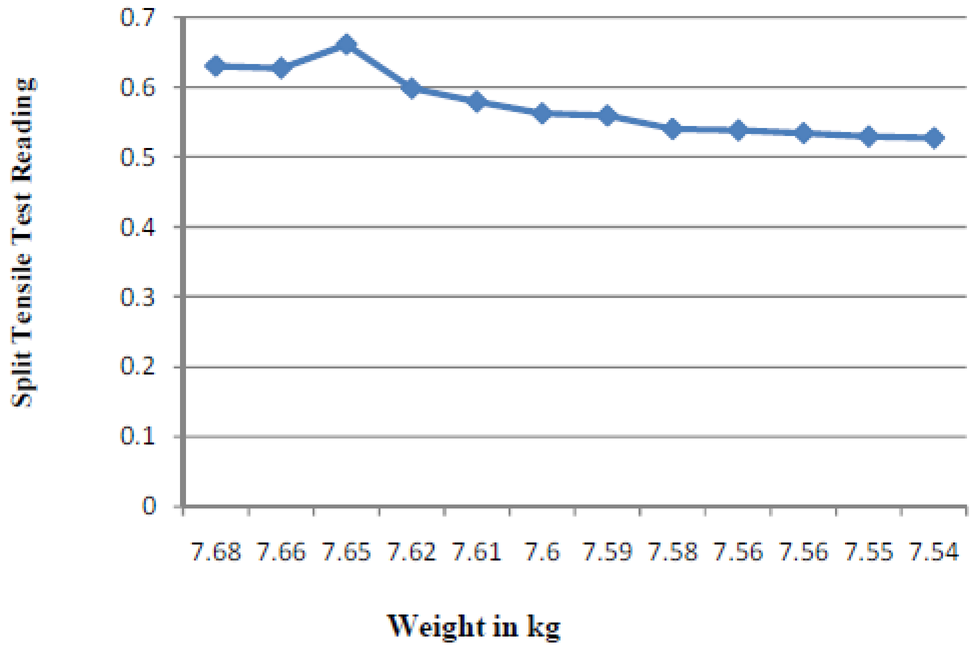
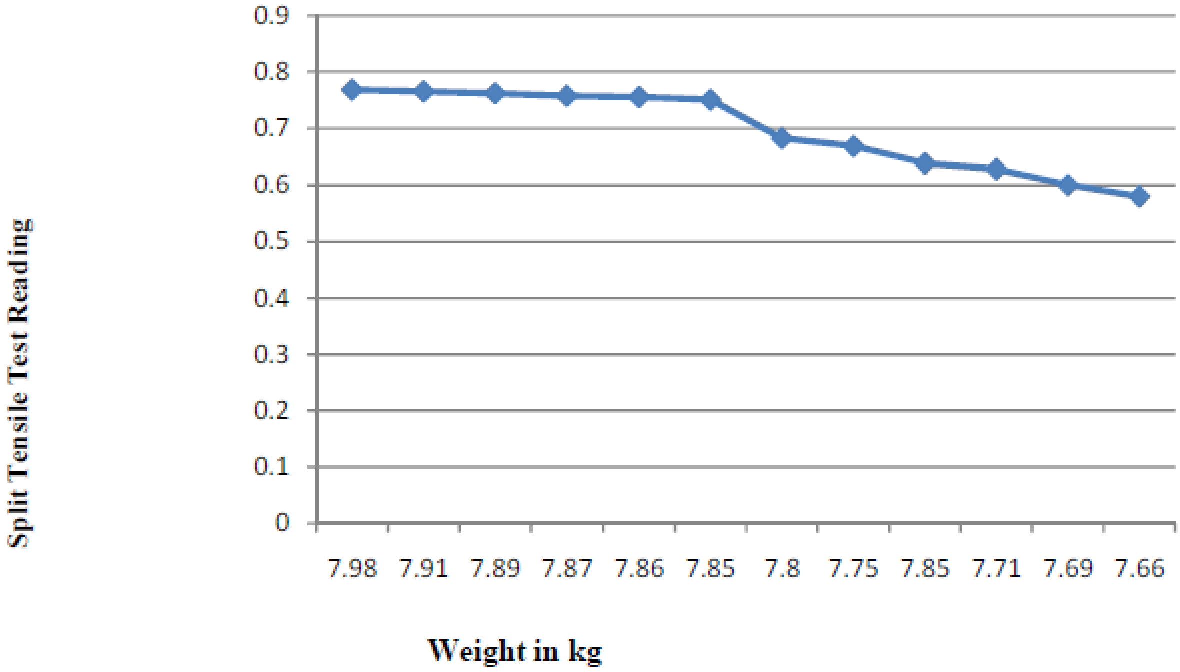
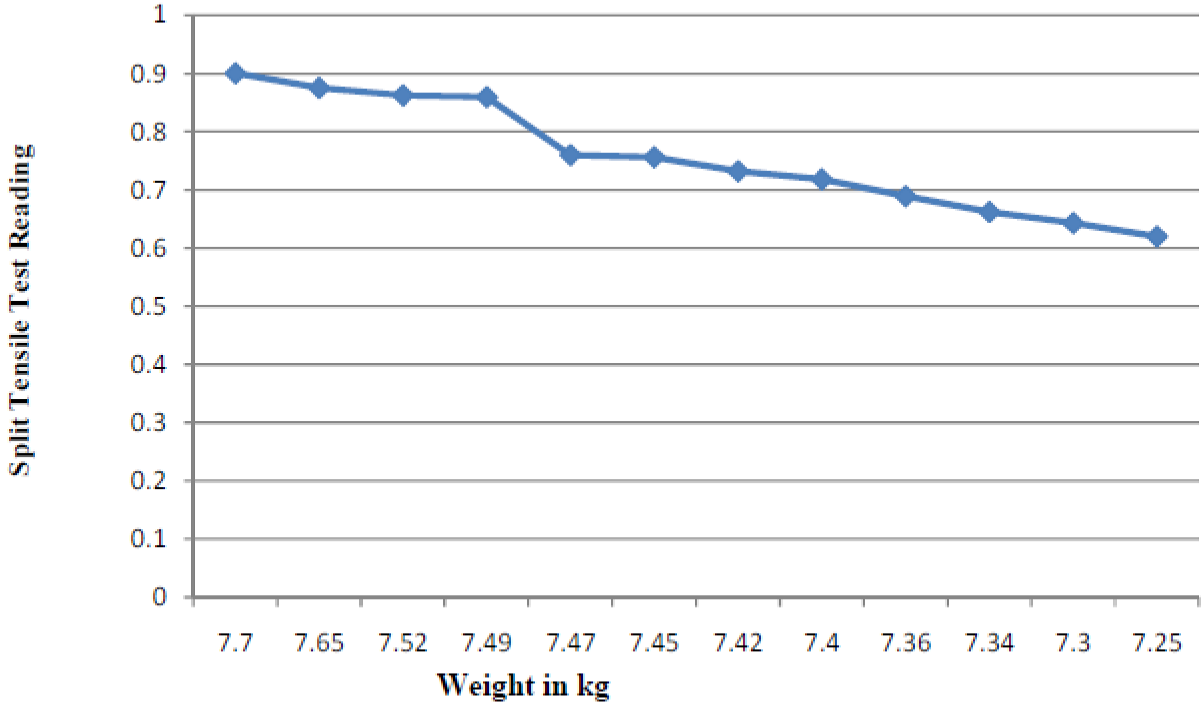
Compressive Strength of Beam for 28 days



Split Tensile Test Reading of Cube for 7 days



Split Tensile Test Reading of Cube for 28 days



Split Tensile Test Reading of Cube for 56 days

Conclusion:

- It has been observed with increase in percentage of glass fiber the value of slump decreases.
- In concrete cubes it has been seen that as the weight increases the compressive strength also increases.
- The curing period of concrete also affects the compressive strength positively.
- The period of curing also affected split tensile strength in supremacy.
- The characteristics observed for the glass fiber reinforced self-compacting beam is similar to RCC beams.
- The addition of glass fiber reduced average first crack load by 23.72 %.

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