

Review of Comparison of Split Tensile Strength, Flexural Strength and Compression strength of Glass Fiber Self-Compacting Concrete

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Abstract: This research aims to evaluate of using the glass fiber on the properties of fresh and hardened self compacting concrete (SCC). The self compacting concrete (SCC) is one of the most widely used to recognized development material and essential need for additives to improve performance of self compacting concrete (SCC). hence an attempt has been made in the present investigation to study the behavior of glass fiber in self compacting concrete. The main aim of the study to effect of glass fiber on self compacting concrete (SCC). The work involves four mixes, the mix proportion of this mixes is (1:1.62:2.96) Grade M40 and water cement ratio is (0.4), super plasticizer 5% of cement content and glass fiber (0,1,2 &3)% respectively. Usage of SCC the difficult the casting conditions and reduce the manpower. SCC added with relatively short and discontinuous glass fibers to produce Glass Fiber Self Compacting Concrete (GFSCC). The purpose of this study is to investigate the workability and mechanical properties of plain SCC and GFSCC. The laboratory testing included splitting tensile strength test, flexural strength test and compressive strength test. The addition of the glass fiber into self compacting concrete can dramatically increase the split tensile strength, flexural strength and compressive strength of concrete.

Keywords: Self-Compacting Concrete, Glass-Fiber, Splitting Tensile Strength, Flexural, Compressive Strength

I. INTRODUCTION

The term fiber reinforced concrete can be defined as a concrete structure having randomly oriented and dispersed fiber. fiber can be defined as small wire like reinforcements which are made of either steel or polymers having high ductility. the fibers are produce having wide range of sizes and shapes, stiff or flexible etc.

Addition of fiber into self compacting concrete improve the ductility, greater tensile strength, flexural strength, toughness drying shrinkage, failure pattern of the concrete and resistance to fatigue, impact, blast loading and abrasion. The raw material required for the production of GFSCC are cement, coarse aggregate, fine aggregate, water, super plasticizer and fibers. The investigations on the influences of fibers on properties of many researchers. The study conducted to investigate the properties of fiber reinforced self compacting concrete (FRSCC) with glass fiber self compacting concrete (GFSCC).

One of the problem of a cement based matrix is inherently brittle type of failure which occurs under tensile stress system of impact loading and in the construction industry a major reason for the growing interest in the performance of fibers in cement based materials in the desire to increase the toughness or tensile properties of the basic matrix. the alkali resistant glass fiber which developed recently has overcome this defect and can be effectively used in concrete. The production of fiber reinforced concrete should always be considered in two well define phases (Fresh phase and Hardened phase) each phase must be considered carefully at mix design stage and each presents its own particular characteristics and related constructional and structural problems.

1.1 Objectives

- Study the mix design aspects of the GFSCC.
- Understand the various applications involving GFSCC.

- Perform laboratory tests that are related to compressive, tensile and flexure by use of glass fiber in the self compacting concrete.

1.2 Advantages

- Improve quality of concrete and reduction of onsite repairs.
- Faster construction times.
- Facilitation of introduction of automation into concrete construction.
- Improvement of health and is also achieved through elimination of handling of vibrators.

II. GLASS FIBER

Glass Fiber is the chemical inorganic fiber. it contents strong plastic, textiles or the other materials containing embedded materials. A Glass Fiber is a material consisting of numerous extremely fine fiber of glass. A Glass Fiber has roughly comparable mechanical properties to other fiber such as polymer and carbon fiber. Glass Fiber is form with an a thin strands of silica-based or other formulation glasses are extruded in to many fibers with small diameter sui for textile processing.

2.1 Self-Compacting Concrete

Self-compacting concrete (SCC) is a flowing concrete mixture. it is the highly fluid nature to makes the suitable for placing in difficult site conditions and the sections with congested reinforcement. It is the good segregation resistance, faster in construction, reduction in site manpower, better surface finishes, thinner concrete sections, safer working environment, the relatively high cost of material used in such concrete structures. SCC can be used for the casting heavily reinforced sections.

2.2 Split Tensile Strength

The tensile strength of concrete is one of the basic and important property, This is the split tensile strength test to determine the tensile strength of concrete on concrete cylinder. The concrete is weak in tension due to brittle in nature. The equipment used for the test is Compression testing machine.

The standard test cylinder of a concrete specimen (300mm x 150mm) is placed horizontally between the loading surfaces of compression testing machine. The compression load is applied diametrically and uniformly along the length of cylinder until the failure of the cylinder along the vertical diameter.

$$\text{Split tensile strength (Mpa)} = \frac{2P}{\pi D l}$$

P=Failure load

D=Diameter of Cylinder L=Length of cylinder



Figure:-constructor.org

2.3 Flexural Strength

The flexural strength is the stress at failure in bending. The modulus of rupture, transverse of rupture and bend strength is a material properties. The flexural strength represent the highest stress experienced the material at it is moment of failure. The resulting stress for the rectangular sample under a load in a three-point bending setup (fig)

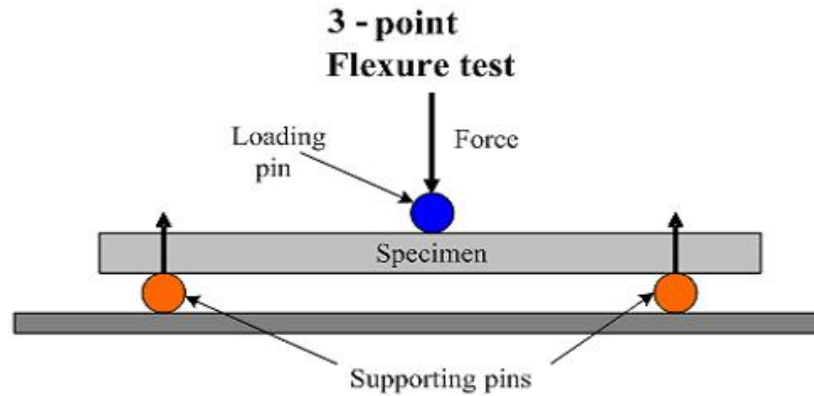


Figure:-substech.com

The flexural tests are extremely sensitive to specimen preparation, handling and curing procedure. The flexural strength calculated to following formula will be used.

$$\text{Flexural Strength (Mpa)} = \frac{p l}{b d^2}$$

P=Failure Load

L=c/c distance

b=width of the specimen

d=Depth of the specimen

2.4 Compression Strength

Compressive strength is one of the most important engineering property of concrete of concrete. Compression strength or compressive strength is the capacity of a material or the structures withstand loads testing to reduce the size and oppose to tensile strength, compressive strength resists compression. Compressive strength is key value for the structures. For design purpose compressive strength value is restricted by dividing the factor of safety, the value depends on the design philosophy use.

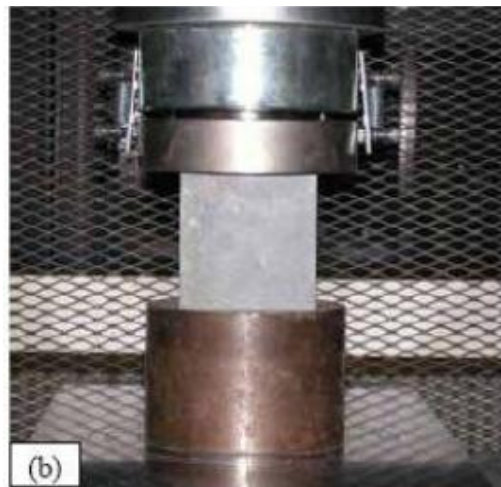


Figure: fhwa.dot

To determine the compressive strength of concrete specimen by use given formula.

Compressive Strength (Mpa) = P/A

P= failure load

A= Cross-sectional area

III. CONCLUSION AND DISCUSSION

They observed that the hardened concrete inspection results show increasing of compressive strength and splitting strength and modulus of rupture (MOR). When using of glass fiber and this increment is proportionate directly with volume of fibers are used. The variations of 7 days and 28 days self compacting concrete of glass fiber percentage of not significant.

The variations of 7 days and 28 days splitting tensile strength of self compacting concrete with glass fiber percentage are moderate. The variation of 28 days flexural strength of self compacting concrete with glass fiber percentage is small. The addition of glass fibers increases the 7 days compressive strength compared to the reference mix but the increase is not significant. SCC gives good finishing as compared to ordinary concrete without any external mean of compaction. The 28 days of compressive strength, split tensile strength and flexural strength of concrete generally increase with 20% Metakolin content up to its optimum content and there after declines. The development of multiple and micro cracks is prevented the use of the glass fiber.

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