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EXPERIMENTAL STUDY ON M 20 GRADE WITH STEEL FIBER REINFORCED CONCRETE

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ABSTRACT: *Concrete is used as a construction material in the earth due to its ability to obtain cast in any type and character. It also replaces old construction materials such as brick and stone masonry. The only drawback in concrete is that it has low tensile strength. Fibers can be used to improve this quality. Fiber Reinforced Concrete (FRC) is a composite material made primarily from hydraulic cements, aggregates and discrete reinforcing fibers. Fiber incorporation in concrete, mortar and cement paste enhances many of the engineering properties of these materials such as fracture toughness, flexural strength, resistance to fatigue, impact, thermal shock and spalling. Here the concrete of M 20 grade have been studied by varying the percentage of fibers such as 0%, 0.1%, 2% and 3% by weight of cement with Aspect Ratio 50(25mm length and 0.5mm diameter). The Cubes and Cylinders were prepared for Compressive and Split Tensile Strength at 7th day, 14th day and 28th day of curing.*

Key Word: Concrete, Steel fiber, Compressive Strength, Split Tensile Strength and crack resistance.

UNIT I INTODUCTION

Fibre reinforced concrete (FRC) is Portland cement concrete reinforced with more or less randomly distributed fibres. The development of fiber reinforced cement concrete is undergoing in recent year. Fiber reinforced concrete is successfully used in constructions with its excellent properties of compression-tensile strength, crack resistance and impact resistance. It is an effective way from which we can increase the properties of concrete such as toughness, shock resistance and resistance to plastic shrinkage cracking of the mortar. They can be circular, triangular or flat in cross-section. The fire is often described by a convenient parameter called ―aspect ratio‖. The aspect ratio of the fibre is the ratio of its length to its diameter. The principle reason for incorporating fibres into a cement matrix is to increase the toughness and tensile strength and improve the cracking deformation characteristics of the resultant composite. For FRC to be a viable construction material, it must be able to compete economically with existing reinforcing system.

FRC composite properties, such as crack resistance, reinforcement and increase in toughness are dependent on the mechanical properties of the fibre, bonding properties of the fibre and matrix, as well as the quantity and distribution within the matrix of the fibres.

Effects of Steel Fibres in Concrete: Fibres are generally adopt in concrete to control cracking due to both plastic shrinkage and drying shrinkage. They reduces the permeability of concrete thus bleeding of water also gets reduced. There are various types of fiber in which few fibres produces bigger impact, abrasion and shatter resistance in concrete even there are few fibres which actually reduce the strength of concrete. The quantity of fibres added in the concrete mix is expressed as a % of total volume of the combination (concrete and fibres), termed volume fraction (V_f). V_f typically ranges from 0.1 to 3%. Aspect ratio is defines as fibre length (l) by its diameter (d). The aspect ratio of Fibres of a non circular shape can be determines by using an equivalent diameter for the calculation of aspect ratio. However, fibres which are too long tend to ballZ in the mix and create workability problems. Some recent research indicated that using fibres in concrete has limited effect on the impact resistance of the materials. The result of fiber reinforcement concrete indicates that the use of micro fibres offers better impact resistance compared with the longer fibres.

UNIT II LITERATURE REVIEW

N. Shireesha et.al: Experimental Studies on Steel Fiber Reinforced Concrete: The objective of the study is to analyze systematically the effects of steel fiber reinforcement in concrete. Concrete mixes were prepared using M40 grade concrete and hooked end glued steel fiber with aspect ratio of 80 were added at a dosage of 0.5%, 1.0%, 1.5% volume fraction of concrete.

P Soroushian, Z Bayasi: Fibre Type Effects on the Performance of Steel Fibre Reinforced Concrete: The results of an experimental study on the relative effectiveness of different types of steel fibres in concrete are reported. The fibres considered in this study were straight-round, crimped-round, crimped-rectangular, hooked-single and hooked-collated with aspect ratios of about 60, and straight-round and hooked-collated fibres with aspect ratios of about 75.

UNIT III MATERIAL AND METHODOLOGY

CEMENT: In this experiment we use Cement as a binding material. Ordinary Portland Cement of 43 grade is used for better result.

SAND: As per IS383 for filler material we use sand of Zone II. Sand is a naturally occurring granular material composed of finely divided rock and mineral particles.

AGGREGATE: 20mm graded aggregate of irregular angular shape is used.

STEEL FIBER: For Aspect Ratio 50- 25mm length and diameter of 0.5mm

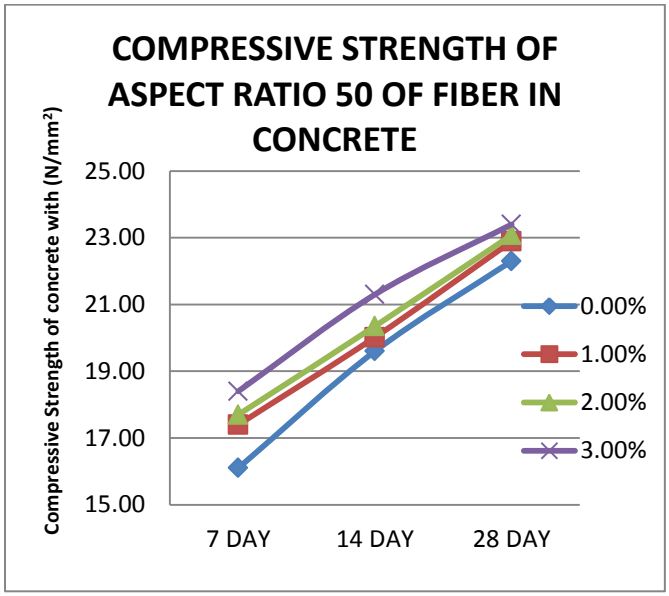
UNIT IV METHODOLOGY:

It is observed that one of the important properties of Steel Fiber Reinforced Concrete (SFRC) is its superior resistance to cracking and crack propagation. Thus the concrete is reinforced with the steel fiber in various proportions such as 0%, 1.0%, 2%, and 3% by weight of cement. All the volume proportions were tested with Aspect Ratio 50. The Compressive and Tensile Strength were analysed as per IS standards on 7th, 14th and 28th day of curing.

UNIT V RESULT AND ANALYSIS

COMPRESSIVE STRENGTH ASPECT RATIO 50 OF SFR IN CONCRETE

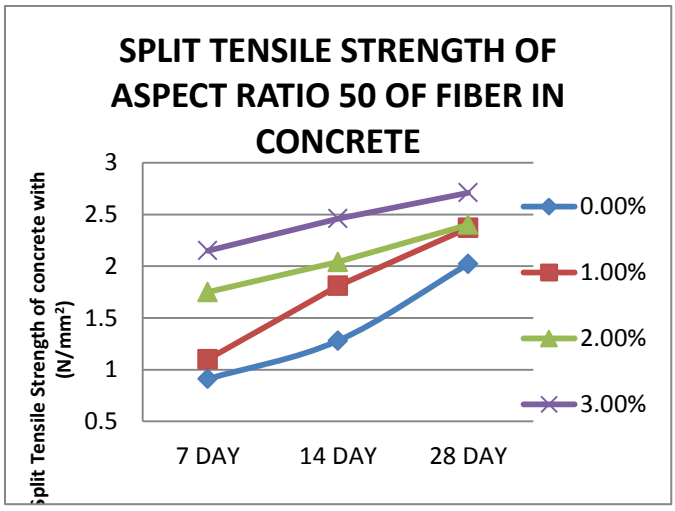
From the results it is observed that by adding steel fibre reinforcement in the concrete will increase in compressive strength. By adding 1%, 2% and 3% of steel fiber to the volume of concrete will give compressive strength of 22.89 MPa, 23.08MPa and 23.40 MPa at 28th day respectively. The compressive strength of M20 grade of concrete should be 20MPa at 28th day of curing. The maximum compressive strength is by adding 3% of fiber in concrete. The strength is increases by 4.47% from normal concrete.



Graph 1: Compressive Strength of Concrete

SPLIT TENSILE STRENGTH ASPECT RATIO 50 OF SFR IN CONCRETE

From the results it is observed that by adding steel fibre reinforcement in the concrete will increase in tensile strength. By adding 1%, 2% and 3% of steel fiber to the volume of concrete will give tensile strength of 2.37 MPa, 2.4MPa and 2.71 MPa at 28th day respectively. The tensile strength of M20 grade of concrete should be 20MPa at 28th day of curing. The maximum tensile strength is by adding 3% of fiber in concrete. The strength is increases by 25% from normal concrete.



Graph 8: Split Tensile Strength Of Concrete

UNIT V CONCLUSION

1. From the result it is observed that the workability of Steel Fibre reinforced concrete decreases as the percentage of steel fibres increases.

2. The Compressive Strength of SFRC (Aspect ratio 50) for proportions of 0%, 0.1%, 2% and 3% are 22.3 MPa, 22.89 MPa, 23.08 MPa and 23.4MPa respectively at 28th day of curing. The Split Tensile strength of SFRC for proportions of 0%, 0.1%, 2% and 3% are 2.02 MPa, 2.37 MPa, 2.4 MPa and 2.71MPa respectively at 28th day of curing.

3. The addition of Steel Fibre in concrete increases the Tensile properties of concrete and also improves resistance to cracking.

FUTURE SCOPES

1. The steel fibre can be used in various Aspect ratios.
2. From the above result we saw that, as steel fibre is increasing strength is increases thus more than 3% of fibre amount can be used to analysis the strength.
3. Other fibers can also be examined to increase tensile strength and crack resistance.

UNIT IV REFERENCE

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UNIT V BIOGRAPHIES

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