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EXPERIMENTAL STUDY ON M 20 GRADE OF CONCRETE WITH ADDITION OF STEEL SCRAP FIBER

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ABSTRACT: *When we speak of compressive strength of concrete, it is quite high but tensile strength becomes low. When we use steel reinforcement the tensile strength of concrete increases considerably. This research is followed by means of technological development have enlightened us with ways to add fiber to strengthen concrete. To develop specialized concrete lots of efforts are being in this field. The concept of using steel scrap concrete is to improve the characteristic strength of construction material. Use of steel scrap in concrete increases the strength and ductility, but requires careful placement and labor skill. Internal micro cracks, leads to the brittle failure of concrete.*

It is observed that one of the important properties of Steel Scrap Concrete is its superior resistance to cracking and crack propagation. Thus the concrete is reinforced with the steel scrap in various proportions such as 0%, 0.5%, 1.0%, 1.5%, 2%, 2.5% and 3% by weight of cement of size 20mm. The Compressive and Tensile Strength were analysed as per IS standards on 7th, 14th and 28th day of curing for M 20 Grade of concrete..

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

UNIT I INTODUCTION

When we speak of compressive strength of concrete, it is quite high but tensile strength becomes low. When we use steel reinforcement the tensile strength of concrete increases considerably. Research followed by technological developments have enlightened us with ways to add fiber to strengthen concrete. To develop specialized concrete lots of efforts are being in this field. Attempts are being made by worldwide researchers to effectively enhance the performance of concrete by using admixtures and fibers in certain proportions. Recently we have begun using lathe waste material that is locally available which has become an important part in construction. Fiber reinforced concrete usage has been amplified by the day particularly due to the introduction of steel fiber to cement concrete which has led to an incredible improvement in usability properties of concrete. One ton of carbon dioxide is released into the atmosphere by the production of a single ton of cement. Similar damage to the environment is done by the steel industry. To avoid such staggering quantities of generated wastes we need to reuse it by pondering over sustainable development. At present, we are faced with expensive options in the market when it comes to purchase of different categories of steel fiber. Lots of local workshops and lathes offer low cost lathe scraps in plentitude. Lathe industries generate daily approximately 20 kg lathe waste and heavily contaminate the ground water and soil by dumping in the barren lands. Effective management of waste steel scrap material derived from lathe to be used as steel fiber is among the finest solutions for civil construction like pavements and other structures this recycles the lathe scrap with concrete. The objective of this paper is to do a comparative study of plain concrete and lathe fiber reinforced concrete. Research followed by experiments and investigations are inevitably necessary to learn details of both plain and steel fiber reinforced concrete when they are fresh and hardened respectively. Various improvements in properties are noted by the addition of fiber such as crack resistance and prevention of crack propagation, modulus of elasticity, shrinkage reduction and toughness.

UNIT II LITERATURE REVIEW

In today's technologically advanced world we can find concrete very easily at lower costs compared to before. It is one of the most adaptable and flexible building materials available which can be molded to fit into any column or rectangular beam as well as a cylindrical tank of water storage.

Abhishek Mandloi says using lathe scrap as fibre reinforced concrete in the innovative construction industry. Every day about 8 to 10 kg of lathe waste are generated by each lathe industries in the Pondicherry region and dumped in the barren soil there by contaminating the soil and ground water, which creates an environmental issue. Hence by adopting proper management by recycling the lathe scrap with concrete is considered to be one of the best solutions.

UNIT III MATERIAL AND METHODOLOGY

LATHE SCRAPE

From the past many researchers during their research work have come across many benefits and barriers. The replaced concrete aggregate proved to be a good substitute for aggregate in the concrete production. The lathe scrap is act as a good fiber in the concrete. To estimate the strength, durability, workability and other characteristics of concrete. The raw materials obtained from Iron and Steel industries. It also produced from lathe industries also. The aggregate which comprises of 70 % to 80% volume of concrete has three main functions are to provide a cheap filler, to provide a mass of particles for resisting the action of applied loads and to reduce the volume changes resulting from the settling and hardening process. The density of lathe scrap is 7850 kg/m3.

Fig 1. Lathe scrape

CEMENT

Cement is a binding material, a substance that sets and hardens independently, and can bind other materials together. OPC is used.

SAND

Sand is a naturally occurring granular material composed of finely divided rock and mineral particles. In terms of particle size as used by geologists, sand particles range in diameter of 2 mm.

AGGREGATE

20mm graded aggregate of irregular angular shape is used.

METHODOLOGY:

Concrete is strong in compression and weak in tension and also it has brittle character. The concept of using steel scrap concrete is to improve the characteristic strength of construction material. Use of steel scrap in concrete increases the strength and ductility, but requires careful placement and labor skill. Internal micro cracks, leads to the brittle failure of concrete.

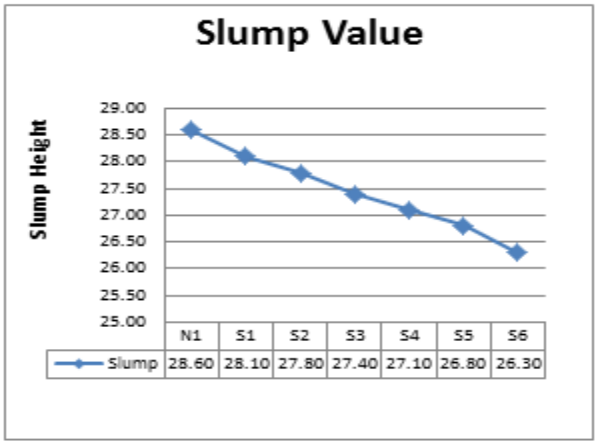
It is observed that one of the important properties of Steel Scrap Concrete is its superior resistance to cracking and crack propagation. Thus the concrete is reinforced with the steel scrap in various proportions such as 0%, 0.5%, 1.0%, 1.5%, 2%, 2.5% and 3% by weight of cement of size 20mm. The Compressive and Tensile Strength were analysed as per IS standards on 7th, 14th and 28th day of curing

UNIT IV RESULT AND ANALYSIS

TEST RESULT OF CEMENT

CEMENT TEST	RESULT
Fineness	2.45%
Initial Setting Time	30min 35 Sec
Final Setting Time	10 Hours
Specific gravity of Cement	3.15

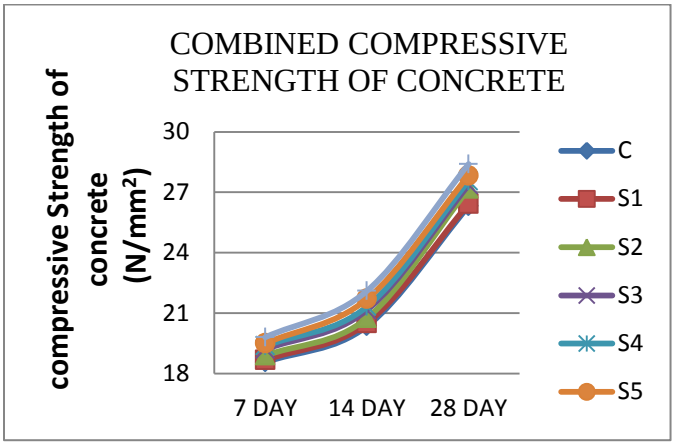
SLUMP VALUE (WORKABILITY TEST):



Graph 1. Slump Value of Concrete

As shown in Graph1, the Slump Value of lathe scrap steel fiber reinforced concrete for 20mm is 28.6cm, 28.1cm, 27.8cm, 27.4cm, 27.1cm, 26.8cm and 26.3cm for ratio 0%, 0.5%, 1%, 1.5%, 2%, 2.5% and 3% respectively. The slump value is decreasing as the percentage of concrete increases, thus it indicates that as amount of steel scrap fiber increase the workability decreases.

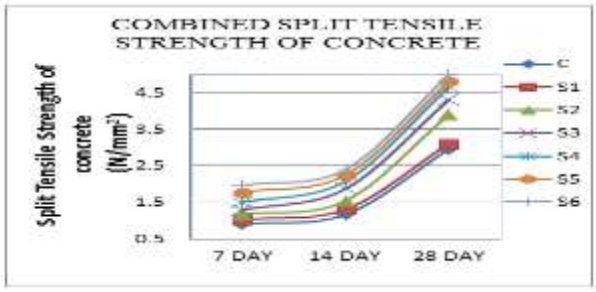
COMPRESSIVE STRENGTH TEST



Graph 2: Compressive Strength Of Concrete

From Graph 2, it is observed that Compressive Strength increases as volume of Steel fiber increases. As per the previous research it is observed that the using Steel fiber upto 3% in concrete is good. The Compressive Strength of concrete with steel Fiber reinforced in proportions of 0%, 0.5%, 1.0%, 1.5%, 2.0%, 2.5% and 3.0% is 26.31MPa, 26.43MPa, 27.17MPa, 27.36MPa, 27.56MPa, 27.83MPa and 28.4MPa at 28th day of curing respectively. The Compressive strength is in increasing order and the maximum strength is gained at 3.0% of steel fiber use concrete that is 28.4 MPa.

TENSILE STRENGTH OF SFRC



Graph 3: Split Tensile Strength of Concrete

From Graph 3, it is observed that Split Tensile Strength increases as volume of Steel fiber increases. As per the previous research it is observed that the using Steel fiber upto 3% in concrete is good. The Split Tensile Strength of concrete with steel Fiber reinforced in proportions of 0%, 0.5%, 1.0%, 1.5%, 2.0%, 2.5% and 3.0% is 2.96MPa, 3.1MPa, 3.9MPa, 4.3MPa, 4.65MPa, 4.8MPa and 4.98MPa at 28th day of curing respectively. The Split Tensile strength is in increasing order and the maximum strength is gained at 3.0% of steel fiber use concrete that is 4.98MPa.

UNIT V CONCLUSION

1. Compressive and tensile strength of Concrete increases with increase in fiber content.
2. It is observed that compressive and split tensile strength of concrete reinforced with Aspect ratio 66 (20 mm long) Steel Scrap fiber is higher than the normal reinforced concrete.
3. The Compressive Strength of SFRC (Aspect ratio 66(20mm long and 0.3mm diameter) for proportions of 0%, 0.5%, 0.10%, 1.5%, 2%, 2.5% and 3% are 22.31MPa, 22.43 MPa, 23.17 MPa, 23.36MPa, 23.56MPa, 23.83MPa and 24.4MPa respectively at 28th day of curing.
4. The Split Tensile strength of SFRC for proportions of 0%, 0.5%, 0.10%, 1.5%, 2%, 2.5% and 3% are 2.96MPa, 3.1 MPa, 3.9MPa, 4.3MPa, 4.65MPa, 4.8MPa and 4.98MPa respectively at 28th day of curing.
5. With the use of 3% of steel fibre gives the maximum result in compression as 15.8MPa, 20.10MPa and 24.4MPa at 7th day, 14th day and 28th day of curing respectively.
6. With the use of 3% of steel fibre gives the maximum result in Split Tensile Strength as 1.97MPa, 2.4MPa and 4.98MPa at 7th day, 14th day and 28th day of curing respectively.
7. From the result it is observed that the workability of Steel Fibre reinforced concrete decreases as the percentage of steel fibres increases.
8. The addition of Steel Fibre in concrete increases the Tensile properties of concrete and also improves resistance to cracking.

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UNIT V BIOGRAPHIES

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