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Experiment Study of Concrete with Steel Waste Scrap as Fibre

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ABSTRACT: The research consists of an experimental finding on the mechanical properties of concrete with waste steel (scrap from Lathe machine). The recycling of scrap metal as a concrete base reinforcement eliminates the issue of disposal. Concrete is the most generally used construction material and has desirable properties like high compressive strength, Tensile and Flexural strength and these parameters are often enhanced in concrete by adding fibers. Lathe waste fiber of cut length 5 cm having ratio 60-100, is employed in these projects. The compression behavior was obtained using uniaxial compression tests while the tensile behavior was obtained using splitting tensile tests. It's observed that the bending behavior of the concrete is increased by the addition of lathe waste up to 1.5% and it has been noted to be the optimum percentage for bending strength. From the test, it was observed that the addition of iron scrap improved the flexural strength of concrete and it is suggested as cost-effective and structurally efficient material in many Civil Engineering applications. 7 day, 28 days test were conducted to find out strength of steel scrap concrete. It is observed that the split tensile strength of steel scrap concrete has increased slightly. Split tensile strength of Steel scrap concrete is found to be maximum with volume fraction of 2.0% steel scrap.

KEYWORDS: Steel fiber, concrete, properties, crack, ductility, technology.

I. INTRODUCTION

Steel scrap is a waste product of the steel plate manufacturing industry. Also a large quantity of steel scrap is produced by drilling on lathe machines every year. The disposal of those steel scraps is a major issue all over the world. The landfill is one of the methods for disposing of the scraps but it produces soil pollution and it is harmful to the environment. In order to keep a check over such industrial waste, an attempt was made to use it in concrete. Utilizing waste in concrete prevents disposal problems and environmental impact. One way to alleviate the situation, the present study suggests that steel scrap is added with concrete, and the mechanical and physical properties were studied. It also contributes to enhancing some of the properties of concrete. It has been marked from previous researches that wastes like fly-ash, steel scrap, blast furnace slag, foundry sand etc., are effectively used to improve the properties of concrete. One such attempt is made in this paper by adding lathe steel scrap from lathe industries in concrete.

II. LITERATURE REVIEW

1) The basic objective of this chapter is to get inside into the previous findings so that it will help to know the gap in earlier studies and to justify the research problem selected by me for the study purpose. The literature is reviewed on Steel waste fiber reinforced concrete, the various tests carried out by researchers on the durability, flexural and shrinkage behavior of steel fiber reinforced concrete specimens. The prominent areas covered in the present literature of reviewed are studies related to concept, model, system, functions, experimental tests and IS code recommendations, specifications, guidelines for detailed analysis and design of cold formed steel structures and connections. Indian and international studies are studied. The Research Carried Out by Various Researchers. The extensive literature review was carried out by referring standard journals, reference books, I.S. Code and conference proceeding. The major work carried out by different researchers is summarized below:

2) Innovative Use of Waste Steel Scrap in Rigid Pavements[8] - Pooja Shrivastava et al, have studied that, to know about fresh and hardened concrete properties of SFRC and their mechanical properties such as

compressive strength, flexural strength and split tensile strength are found to be increased due to the addition of steel scrap fiber in the concrete. When compared with conventional concrete to SFRC, steel fibre increases flexural strength by 40% and considerable increase in compressive and tensile strength. These fibers may also contribute to improve properties such as shrinkage reduction, modulus of elasticity, toughness, resistance to cracking and preventing crack propagation. The workability of fresh concrete containing lathe scraps are carried out by using slump test. This paper focuses on structural strength enhancement and improvement in fatigue life of rigid pavement by locally available scrap steel. These rigid pavements using steel scrap promises an appreciably higher design life, offer better serviceability and minimize crack growth and corrosion. The innovative idea of this paper is the use of waste lathe scrap as recycled steel fibres, which provides more economical and environmental sustainable SFRC Pavement

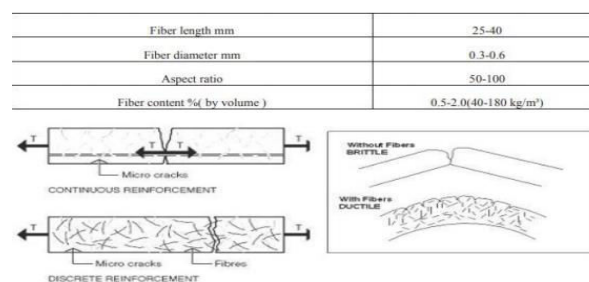


Fig.no.1 Steel Fibers mechanism in Concrete presented by the authors in this paper Experimental work

Experiments were conducted by adding lathe scrap steel fibers in M- 20 concrete varying in percentage from 0 to 2% by volume with 10 to 20 mm aggregates. The workability and strength of SFRC for pavements construction are studied by the workability, compressive strength test, split tensile test and flexural strength test and the results are presented as below-

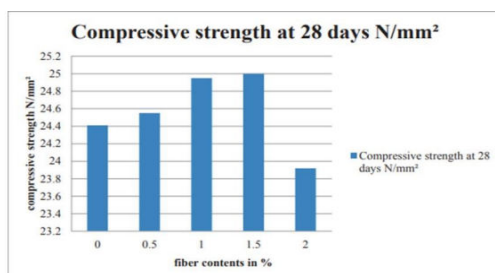


FIG.NO.2-Compressive strength of SFRC after 28 days

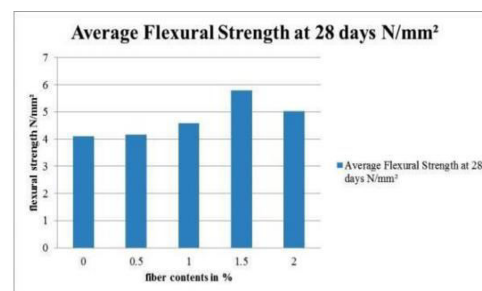


FIG.NO.3 -Compressive strength of SFRC after 28 days

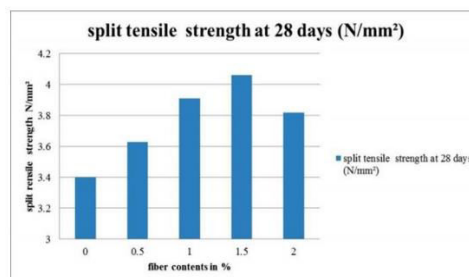


FIG.NO.4-Compressive strength of SFRC after 28 days

Performance Analysis of Steel Scrap in Structural Concrete- Abdul Rahman et al, have studied that, The metal scrap waste material which is obtainable from the lathe can be used as steel fiber for the innovative construction industry and in pavement construction. It is generated by each lathe industries Dumping of these wastes contaminates the soil and groundwater, which creates a harmful environment. In addition, to get sustainable development and environmental benefits, lathe scrap with concrete is likely to be used. In this project steel scrap concrete using lathe waste is prepared and its properties are studied. “Manufactured sand” is such alternative for good quality Natural River sand due to depletion of resources and restriction due to environmental consideration has made concrete manufacturers look for suitable alternative fine aggregate. Though it has been in use in concrete manufacturing in India, the percentage of its contribution is still very negligible in many parts of the country. The tests conducted were slump test, compressive strength test, split tensile strength test and. For this concrete beams and cylinders were cast and cured and tests were done at 3th day, 7th day and 28th day



FIG.NO.5. Metal scrap Conclusion of the experiments carried out by the authors

The waste steel scrap material which is available from the lathe can be used as steel fiber for innovative construction industry. An optimum of 1% of lathe scrap as an addition can be used to improve the strength of fiber reinforced concrete. Compressive strength increases up to 60.171 % at 28 days when compared to control specimen. The 36.904 % increase in Tensile strength at 28 days when compared to control specimen.

III. CONCLUSION

Based upon the experimental test results of the ferrocement panels the following conclusions can be stated:

1. Based on the experimental research conducted, it can be concluded that at 1.5% LMW shows maximum strength of compression. The substitution of cement with LMW increased the strength of compression till 1.5% and began to decrease slightly after 1.5% LMW.
2. The workability of concrete with LMW decreases the slump value up to 20% as against the control mix of the concrete.
3. Based on Split tensile Strength and Flexural strength test results, it can be concluded that 1.0% LMW is Optimum percentage to achieve maximum Strength, further increase in LMW Percentage (beyond 1.0%) causes decrease in split tensile and flexural strength.
4. The wet and dry density (28 Days) goes on decreasing as the percentage fiber volume fraction increases.
5. In general, the satisfactory improvement in various strengths is observed with the inclusion of Steel waste fibers in the plain concrete. However, maximum gain in strength of concrete is found to depend upon the amount of fiber content. The optimum fiber content to impart maximum gain in various strengths varies with type of the strengths.



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