Basalt Chopped Strands Fiber

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Abstract- *This paper is to study the properties of basalt chopped strands fiber. To study the flexural behaviour of basalt chopped strands fiber reinforced concrete beam. To study its load-deformation characteristics and load carrying capacity, failure mode across cross section of the basalt strands chopped concrete beam. To study the parameters, which affect the behavior and increase in ultimate strength of the flexural strength of basalt fiber strands chopped fiber and effective technique in using the same, The various length of basalt chopped fiber in different volume of ratio to find. Major application of the basalt chopped fiber concrete for strengthening the beam. The beam are of 150mm x 175mm cross section through the longitudinal length of 1200mm long simply supported beam designed for flexure failure. This aims to reduce the weight and cost of the reinforced concrete structures by adding in the concrete.*

Keywords- Basalt Rocks Replacement, Basalt Fibers, Replacement to coarse aggregate in concrete, Flexural behaviour of basalt fiber concrete.

I. INTRODUCTION

Basalt rock is a volcanic rock and can be divided into small particles then formed into continues or chopped fibers. Basalt fiber has a higher working temperature and has a good resistance to chemical attack, impact load, and fire with less poisonous fumes. Some of the potential applications of these basalt composites are: plastic polymer reinforcement, soil strengthening, bridges and highways, industrial floors, heat and sound insulation for residential and industrial buildings, bullet proof vests and retrofitting and rehabilitation of structures.

Basalt is fine-grained, extrusive, igneous rock composed of plagioclase, feldspar, pyroxene and magnetite, with or without olivine and containing not more than 53 Weight percentages of SiO_2 and less than 5 weight percentages of total alkalis. Many types of basalt contain phenocrysts of olivine, clinopyroxene (augite) and plagioclase feldspar. Basalt is divided into two main types, alkali basalt and tholeiites. They have a similar concentration of SiO2, but alkali basalts have higher content of NA_2O and K_2O than tholeiites. The production of basalt fibers is similar to the production of glass fibers. Basalt is quarried, crushed and washed and then melted at 1500° C.Moreover, it is cheaper, available and chemically more stable than the other fibers. Also, it can be work in a wide range of temperatures (-269^0 C to 650^oC).Basalt fibers can be support the tensile properties of concrete as internal strengthening materials by two systems. Firstly wideness requires a high amount of fibers well distributed inside the mixture to avoid or prevent any existing number of micro-crack. Second one is a crack bridge, high length fibers and adequate bond of concrete.

Basalt fiber is a typical ceramic fiber, it's easy to disperse when mixed with cement concrete and mortar. Therefore, basalt fiber reinforced concrete serves the functions of reinforcement, crack resistance, and can extend the life of construction in the fields of housing, bridges, Highways, railways, urban elevated roads, runways, ports, subway tunnels, the coastal Protection works, plant facilities. Performance of conventional Concrete is enhanced by the addition of fibers in concrete. The brittleness in concrete is reduced and the adequate ductility of concrete is ensured by the addition of fibers in concrete. In this paper the behavior of RC beam structures strengthened by using hybrid fiber reinforced concrete (HFRC) is analyzed. Experienced BFR is a new material in civil engineering compared to carbon, glass and aramid and has shown to be a promising material for infrastructure strengthening. They are made from basalt rocks through melting process and contain no other additives in the producing process which makes advantages in cost. Basalt fibers show comparable mechanical properties to glass fibers at lower cost and exhibit good resistance to chemical and high temperature exposure.

II. REVIEW OF LITERATURE

Huobao Rong Zhang, Xiangdong Song,Yang (2008) The experimental program consist of casting and testing of RC beam of size 200mmx350mmx2100mm with concrete mix design for M-25 grade concrete. This paper works on thirds point static loading tests until failure, study and performance of different steel reinforcement ratio of basalt chopped strands fiber reinforced concrete beam simply supported beam. Basalt

chopped strands fiber reinforced concrete beam load-deflection curve is approximately a straight line, but still performed better with ductility and crack width can be controlled at 2.5 mm or less.

Tan Zhifang (2009) The experimental program consist of casting and testing of RC beam of size 100mm x 150mm x700mm with concrete mix design for M-20 grade concrete. By Increasing Basalt chopped strands fiber length of 12mm, 14mm and 16mm ratios of reinforcement beams crack control effect is more obvious. The 16mm basalt chopped strands fiber with volume rate of 0.3% gives high resistance to crack and give high tensile strength. This results in a crack resistance, and enhanced toughening effect and other mechanical properties of concrete on strength basis.

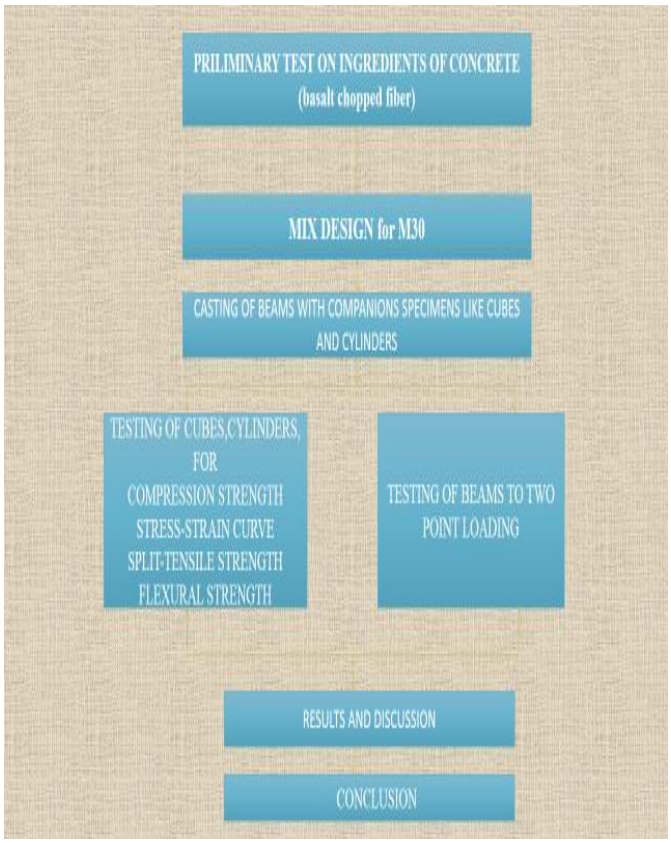
Ding Bin Yujiang, Tao Ouyang, Lijun Jiang Jie(2010) The experimental program consist of casting and testing of RC beam of size 150mmx250mmx2000mm with concrete mix design for M-30 grade concrete . In continuous beams, the basalt chopped strands fiber is added to 0.5%. The length of 12mm basalt chopped strands fiber is used here which significantly improves the strength of the beam. By using this fiber, the corrosion-resistant properties as well as in strengthening cost has obvious advantages. The results show that the basalt chopped strands fiber reinforcement beams yield load, ultimate load were significantly improved and showed good ductility and stability.

Fan Feilin, Bai Erlei,Liu Junzhong(2010) The experimental program consist of casting and testing of RC beam of size 150mmx200mmx2100mm with concrete mix design for M-20 grade concrete.In this paper, the dynamic mechanical property of basalt strands chopped fiber reinforced concrete beam (BFRC)is discussed ,a dynamic test on basalt strands chopped fiber with four kinds of volume content (0.1%,0.2%and 0.3%) of fiber was carried out using 15mm-length of basalt chopped fiber .Dynamic stress-strain curves and testing data have been analyzed..The strain rate sensitivity of impact-compression strength is stronger and the dynamic compression strength and toughness are higher relatively when the fiber volume content is 0.1% and there is approximate linear function relation between the dynamic strength increasing factor in the concrete.

R.Singaravadivelan, Dr.K.LMuthuramu, N Sakthieswaren (2010) The experimental program consist of casting and testing of RC beam of size 150mmx200mmx2100mm with concrete mix design for M-20 grade concrete. In this paper they have taken the basalt fiber sheet which wraps the concrete cube and cylinder specimen and it gives 25%increase in the ultimate strength compared to controlled specimens.By having 2 layers of basalt strands fiber cloth which is found to have less brittle failure than normal reinforced concrete. About 28% increase in flexural strength of concrete is obtained by using basalt strands chopped fiber than normal concrete. The crack obtained in normal concrete is much minimized as compared to basalt fiber cloth.

QuaziSobiya ,Sonukumar Sharma , Dattatray Nimbalkar (2016) The experimental program consist of casting and testing of RC beam of size 100mmx150mmx700mm with concrete mix design for M-25 grade concrete. Effective increase in compressive strength during 7 days to 28 days when 10% addition of rice husk admixture in concrete along with 2% of basalt chopped strands fiber increases compressive strength by 16%, 20% addition of rice husk admixture and basalt chopped strands fiber again increases strength by 8% While strength reduces on addition of 30% of rice husk admixture. Maximum flexural strength obtained at 2% addition of basalt fiber and 20% of rice husk admixture when more than 2% addition of basalt fiber reduces the flexural strength.

III. METHODOLOGY



IV. CONCLUSIONS

From the study of literature review, I conclude the following ,

- From the analysis the flexural behavior of beam with different length of 0.2% percentages of basalt fiber is studied compared with normal mix concrete.
- About 20% increase in compressive strength than the design strength, when 0.2% of basalt chopped fibers are introduced in the concrete.
- The basalt fiber with 6mm and 12mm length strands when added partially, it gives better results in performance of concrete than normal mix concrete beam.

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