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To Study the Strengthening of RCC Structures by adding Basalt Fibre (BF)

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ABSTRACT: The purpose of this research paper is to study and focus on the structures that lack the necessary strength as per the requirements due to storey extensions, overloading, due to change in functionality of the structure, Use of poor quality construction materials while execution of work, poor supervision while construction, wrong / defective design, etc. This all causes the whole / partial failure of existing structure/structural member as well as In India the most of the structures are load bearing structures or constructed without provision of earthquake resisting function, so due to which the small scale earthquakes may also cause the cracks and defects in structure or member and this defects may gradually convert into permanent failure of structure / structural member, so it is necessary to avoid it or to come up with solution with respect to this and for this there are some methods to improve the strength of structural members such as foundation, beams and columns using so many materials and techniques available such as materials like CFRP, basalt, etc. And techniques / methods such as Jacketing, Retrofitting, etc. So here we are going to use / add the basalt fiber in 3 concrete cubes to strengthen the concrete and we will record the compressive strength after 3 days of each cube.

KEYWORDS: Strength, Basalt fibres, Structure, Earthquake, Storey Extension, Bearing Capacity.

Aim: -

- 1) To improve Compressive strength of concrete
- 2) To improve the Tensile strength of concrete
- 3) To strengthen the concrete.

Objective:-

- 1) To add the basalt-fiber into concrete.
- 2) To test basalt-fiber reinforced concrete.
- 3) To observe the workability by using BF in concrete.
- 4) To obtain improvement in split tensile strength.
- 5) To obtain improvement in flexural strength of BF mixed concrete.
- 6) To find optimum dosage of BF in concrete to improve compressive strength

I. INTRODUCTION

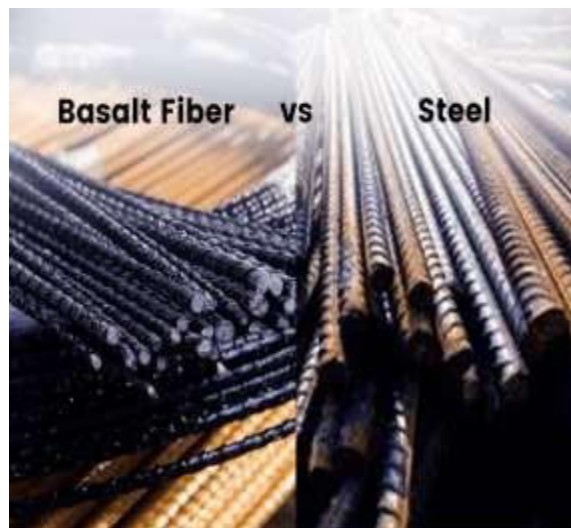
Strengthening of structures is nothing but the procedure of improving structure's strength under existing loads or to increase the strength of structural members to carry additional loads. The need

of strengthening / rehabilitate a structure may arise at any time from the beginning of the construction phase until the end of the service life. During the construction phase, it may occur because of Design error, Deficient concrete production, Bad execution process. And during servicelife it may arise on account of an earthquake, an accident such as collisions, fire, explosions; Situations involving changes in the structure's functionality. As well as storey extensions are an increasingly popular way to crowded cities. Lack experience and knowledge are major challenges for Engineers. So there are so many varieties of materials available, which are used for strengthening of RCC and Concrete structures, here we are going to use basalt fibre as a strengthening material for concrete cube of size 150 X 150 X 150 mm. The basalt fibers can be produced from the melt of basalt stones. Basalt fibres are environmentally - neutral as they are made from 100% natural rock and any basalt residue in the environment will not disturb any eco system.

II. IMPORTANCE

"Composite materials are nowadays successfully replacing steel in construction industry. But among reinforcing fibres, basalt fibers is the product of choice for this application. It is known that the basalt fibers have better tensile strength than the steel, E-glass fibres, greater failure strain than the carbon fibers as well as good resistance to chemical attack, impact load and fire with less poisonous fumes. According to tests and experience, basalt fibers are very flexible, ductile and have a high mechanical strength. Their greatest advantage lies in their stability over time, which makes them suitable for use in different applications ". Basalt fibers have a wide range of application areas due to their superior characteristics; excellent thermal, electric, and acoustic insulation. Addition of basalt fiber in concrete significantly improves tensile strength, flexural strength, and toughness of concrete mix. It also improves fracture energy and abrasion resistance. Fibres are used in concrete to improve its structural integrity.

Fig.1 Basalt Fiber Rebars and Steel bar



III. PROBLEM IDENTIFICATION

In general, Basalt fibre is significantly stronger than steel fiber. Its durability is superior, and its tensile strength is 2.5 times that of steel. Basalt fibre contributes to reduction in concrete coverage by 25 to 30% and its weights 4.5 times less than steel fiber. This means we will need less manpower to lift and place the material during construction.



Fig. 2 Basalt fibre has less weight

Basalt Fiber is useful for the concrete because it adds strength, durability, and reduces shrinkage. Basalt Fiber is also a non-rusting alternative to steel rebar and don't corrode over time. These benefits enhance the life of the concrete and increase the effectiveness of the overall construction in any project.

IV. LITERATURE SURVEY

Jongsung Sim (2005): Examined the applicability of the basalt fibre as a strengthening material for structural concrete members through various experimental works for durability, mechanical properties, and flexural strengthening. The basalt fibre used in this study was manufactured in Russia and exhibited the tensile strength of 1000 Mpa, which was about 30% of the carbon and 60% of the strength of glass (S-glass) fibre. From the results presented herein, two layers of the basalt fibre sheets were thought to be better strengthening scheme. In addition, strengthening does not need to extend over the entire length of the flexural member. When moderate structural alternative methodology among other fiber reinforced polymer (FRP) strengthening systems.

Nayan Rathod (2013): Examined that Basalt fiber is a high performance nonmetallic fiber made from basalt rock melted at high temperature. Basalt fiber reinforced concrete offers more Characteristics such as light weight, good fire resistance and strength. In future it is very beneficial for construction industry. Many applications of basalt fiber are residential, industrial, highway and bridges etc. In this study trial test for concrete with basalt fiber and without basalt fiber are conducted to show the difference in compressive strength and flexural strength by using cubes and concrete beams. Various application of BFRC shown in the study, the experimental test result, Techno-financial comparison with other type presented, indicate the tremendous potential of BFRC as an alternative construction material.

Prashant V. Kapure (2017): Examined that, with the addition of basalt fibers, up to (0 - 2.5%) by volume, different quantities of fibers compared to existing fibers. Different W/C ratios can be added without causing any segregation. The performance of basalt fiber reinforced concrete is superior that different fiber reinforced concrete currently being used in the market.

V. CONCLUSION

This study aimed to use basalt fibre in concrete and effectively replace the steel and other fibres in concrete for best performance than steel and other strengthening materials. Using numerous basalt filaments contributes to minimizing the micro autogenous shrinkage -voids inside the concrete structure, notably making their positions occasional. Therefore, using basalt fibers minimize and improves the compressive strength more than using steel fibers.



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