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Experimental Investigation of Spilt Tensile Behavior of Basalt Grid Wrapping Concrete

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Abstract

This research describes an experimental investigation of spilt tensile behavior of basalt wrapping specimen. The purpose of this research is to investigate the mechanical properties with basalt fiber reinforced polymer grid. Basalt fibers were thought to have great potential as reinforcement in both polymer materials and in concrete. However, this research focused on the use of basalt fiber reinforced polymer composites. In the specimen the basalt fiber is wrapped with partially on top & bottom, middle and fully of the concrete binding with epoxy resin. In this paper to determine the test result on spilt tensile of Basalt Fiber Reinforced Polymer (BFRP) composite wrapped specimens evaluated by using epoxy .The main aim of this paper to increase tensile strength.

***Keywords**: - Split tensile strength, Basalt fibre grid, Epoxy resin*

INTRODUCTION

Generally, concrete is a durable material widely used in construction. Its durability is governed by concrete mix design, environmental conditions, age of building, chemical attack, atmospheric weather, carbonation, sub soil water table, sub soil condition, permeability, quality of materials & cover thickness, cement contents, water cement ratio etc., Durability can be extended by using suitable methods of maintenance, repairing, rehabilitations and strengthening.

(R. Anandakumar et al.), FRP applications for strengthening and retro fitting can be attributed to some of the advantages of

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FRP, such as its lightweight structure, noncorrosive material, and high tensile strength.

The externally bonded reinforcement technique is used to bond FRP composites to the tension side of RC members and is the primary technique for the flexural strengthening of RC beams. The flexural strengthening of RC structures using FRP sheets as well as their bond mechanism, has been extensively studied literature. In this paper to determine the spilt tensile strength of concrete specimen Materials Used are:

MATERIALS USED:

Cement

Cement is a mixture of calcareous, siliceous, argillaceous and other substance. Cement is used for binding material in concrete. In this grade of OPC 53 is used. The physical and chemical properties of cement given below ***See Table: 1***

Coarse Aggregate

Aggregate are the important constituent of concrete. Aggregates are granular material, derived from the most part from the natural rocks. The various physical properties of coarse aggregate are given below **See Table: 2**

Table: 1

S.NO	PHYSICAL PROPERTIES	TESTVALUE
1	Specific gravity	3.15
2	Standard consistency	30%
3	Setting time Initial Final	 30 min 5 hours

Table: 2

S.NO	PHYSICAL PROPERTIES	TEST VALUE
1	Specific gravity	2.7
2	Crushing value	33%
3	Water absorption	2%

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FINE AGGREGATE:

The fine aggregate used in this study was manufacture sand (M SAND) without any organic impurities. M-sand is a substitute of river sand for concrete construction. It is produced from hard granite stone by crushing. The various physical properties of fine aggregate

Table: 3

S. NO	SPECIFICATIONS	RESULT
1	Type	M sand
2	Specific gravity	2.56
3	Bulk density	1.75kg/mm^2
4	Fineness modulus	4.66

Water

Water is a one of the important ingredient on the concrete because, purpose of water for mixing and curing.

Basalt Fiber

Basalt fiber is a natural fiber made from extremely fine fibers of basalt, which is composed of the minerals plagioclase, pyroxene and olivine. The properties of the basalt fiber

Table: 4

S. NO	PROPERTY	VALUE
1	Tensile strength	2.8-3.1 Gpa
2	Elastic modulus	85-87 GPa
3	Elongation of break	3.15%
4	Density	2.67 g/cm^3

EPOXYN RESINS

Epoxy resins are used for the binding property of concrete with BFRP. Epoxy resins are relatively low molecular weight pre-polymers capable of being processed under a variety of conditions. Two important advantages of these resins are over unsaturated polyester resins are: first, they can be partially cured and stored in that state, and second they exhibit low shrinkage during cure. The properties of epoxy resins

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S.NO	PROPERTY	RANGE
1	Density	1.2-1.3
2	Tensile modulus	55-130
3	Thermal expansion	45-65
4	Water absorption	0.08-0.15

BASALT FIBER REINFORCED POLYMER GRIDES

Fiber reinforced polymers (FRP) have emerged as a well-accepted alternative to conventional materials for strengthening existing reinforced concrete (RC) structures. This growing interest in FRP applications for strengthening and retrofitting can be attributed to some of the advantages of FRP, such as its lightweight structure, noncorrosive material, and high tensile strength.

The extremely bonded reinforcement technique is used to bond FRP composites to the tension side of RC members and is the primary technique for the flexural strengthening of RC structures using FRP sheets, as well as their bond mechanism, has been extensively studied in the literature.

In practice however these externally bonded systems are often unable to attend the full tensile strength of the FRP sheet, thus leading to undesirable de bonding failures. The resulting design procedures for these systems often impose severe strain limits making them less economical than if the full tensile strength was available.

EXPERIMENTAL PROCEDURE

Spilt Tensile Strength of Cylinder Warping

When cylinder specimens are casting, total number of eight was tested. Six cylinders were spilt tensile strengthened with BFRP grids using epoxy resin as an adhesive material; the nominal thickness of the BFRP grids for beams respectively.

The Cylinder is basalt wrapped in the portion of

- Partially wrapped on top and bottom
- Fully wrapped
- Partially wrapped on middle

The last beam, B0, remained un strengthen as a control specimen. All cylinder had a total length of 300mm and dia of 150mm.. Mixed concrete was used with a specified compressive strength of 30MPa.

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RESULT AND DISCUSSION

The main aim of this research increasing the tensile of concrete due to externally wrapped with basalt fiber grid This paper describe the comparison of mechanical properties based on basalt fiber wrapping on the specimen.

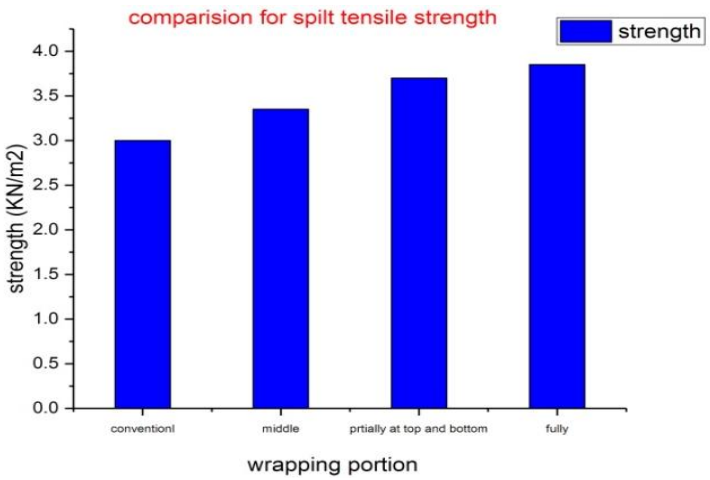
To determine the spilt tensile strength various portion on cylinder by wrapping at top & bottom, middle and fully. Split tensile tests were carried out on cylinders of size 300mm x150mm. Using a compression testing machine of 2000KN capacity per IS 516:1959. The test was conducted on 28 days .

Remove the specimen from water after specified curring time and wipe out excess water from the surface and externally wrapping on basalt fiber grid. Align the specimen centrally on the face plate of the machine rotate movable portion gently by hand shoe that it touch as the top surface of the specimen applied the load gradually till the specimen failure.

In this chart describe the fully wrapped specimen should resist the load upto 3.85. wrapping at top and bottom specimen with stand the load of before failure 3.7.middlde portion warping specimen should take the load up to 3.5.for conventional specimen failure point occurs at the load of 3.

When comparison of each specimen fully wrapping specimen better than the all other specimen. it can resist high tensile load. partially wrapped specimen should resist the load more the middle and conventional specimen.

Record the maximum load any unusual features in the type of failure



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CONCLUSION

Based on the above discussion and comparison we concluded that the usage of basalt fibre grid increases the load carring capacity of the wrapping concrete. Especially the fully basalt wrapped concrete gave better result over partiaaly wrapped basalt concrete.

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