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STUDY ON PARTIAL REPLACEMENT OF CEMENT BY BENTONITE IN FIBER REINFORCED CONCRETE

Mr. Sunil S[1], Mr. Arun Kumar H R[2], Mrs. Shilpa BS[3] , Dr. Nagaraj Gupta M S [4]

[1]Student, Master of Technology, Department of civil engineering, East West Institute of Technology, Bangalore.
[2]Associate professor, Department of civil engineering, East West Institute of Technology, Bangalore.
[3]Assistant professor, Department of civil engineering, East West Institute of Technology, Bangalore.
[4]Professor, Department of civil engineering, East West Institute of Technology, Bangalore.

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Abstract - The main aim of the study is to search an alternative for cement to reduce carbon footprints. The world's yearly creation of concrete of 1.6 billion tons discharges 7% of the worldwide stacking of carbon dioxide into the air and it is likewise the most vitality escalated material of development which is in charge of the emanation of extensive measure of greenhouse gasses into the environment. Bentonite is exceedingly plastic mud containing around 85% earth minerals and montmorillonite. In this project work am attempt has been made to study the mechanical behaviour of concrete with the partial replacement of cement with bentonite. compressive strength split tensile strength and flexural strength were perform and result's have been tabulated, it was seen from the results that bentonite resulted in poor early stage and good later stage,the results of compressive strength, split tensile strength and flexural strength were compared with the conventional concrete. Fibrofor fibers are introduced in order to arrest the micro cracks and increase the tensile strength of the concrete. Mix design has been done as per Indian code. In Present work bentonite was varied for 25%, 30% and 35% and fibrofor fiber 1kg/$m^2$is kept constant.

***Key Words*:** Bentonite, Fibrofor fiber, compressive strength, split tensile strength and flexural strength

1.INTRODUCTION

Concrete is the construction material that requires the most energy to produce, is responsible for a considerable amount of greenhouse gas emissions, and is accountable for 7 percent of the annual carbon dioxide emissions that are produced throughout the globe. As a consequence of this, we need the look of an addition for cement. Bentonite is a very plastic muck that is made up of about 85 percent earth minerals and montmorillonite. There are two separate varieties of bentonite, the first of which is sodium bentonite, which swells, and the second of which is calcium bentonite, which does not swell. The present endeavour makes use of calcium bentonite, which is often commonly referred to as more fuller's earth. Bentonite may be found in large quantities in nature, and it has the pazzolanica properties that have contributed to its widespread use. The yearly consumption of crude materials by industry is around 12.6 billion tonnes, making it the largest consumer of natural resources in the world and having a considerable detrimental impact on the environment of the globe. Because of this, increasing the lifetime of structures made of concrete is of the utmost importance. In order to test the endurance of the attributes, chemical assaults were used.

When it comes to protecting our planet's natural resources, recycling industrial byproducts stands out as the most effective strategy for a greener building industry. Large quantities of waste from industries and mines, including fly ash, slag, limestone powders, aggregate dust, etc., are thrown in landfills. For many years, builders have taken advantage of fly ash's many benefits across a variety of qualities, including durability.

In the last several years, the construction industry has made significant strides in assessing the effectiveness of different cementitious components, also known as pozzolans, in the formulation of cement-based products. As a result, not only has the material's compressive strength increased, but so has its capacity to set and become more solid when immersed in water. Many other materials may be used as a replacement for coal, including fly-ash, slag from blast furnaces, ash from rice husks, silica fume, and orametakaolin. Researchers are looking exploring alternatives to traditional cement production, such as using gypsum, gypsum fines, Portland cement, cement kiln dust, lime dust, stone dust, and calcined clay.Cement formulations with less calcinated material reduce carbon dioxide emissions per manufactured product. The goal of lowering emissions of carbon dioxide and other greenhouse gases might be aided by this. You can also achieve the required levels of compressive strength and/or flexural strength by using less cement or gypsum than is customarily used with traditional cement or gypsum. This option is eco-friendly since it lasts for a long time and may be put to many different purposes. Using inexpensive aggregates also allows for the manufacturing of cement and gypsum products at a reduced cost.

Fibrfor high glycemic The Swiss firm BruggContec, which has a successful history in engineering dating back 30 years, has released a brand-new product called Fibrfor Fiber. They have also made significant strides in fibre technology, with Fibrfor fibres and Concrix fibres standing out in particular. Industrial fibre production occurs in highly developed, cutting-edge facilities that meet or exceed all relevant European Building Materials Standards.

With its bundled, fibrillated architecture and 3D fibre net, Fibrfor fibre ensures the uniform and debauched spreading and connecting of concrete and fibre throughout the concrete mass. Macro Polypropylene Fiber is its primary component. In the area of concrete engineering, fibres are well-known and commonly employed to counteract the weaknesses of regular concrete. These weaknesses include a lack of tensile strength and deformation capacity as well as inadequate ductility after breaking. To enhance the static, seismic, and fatigue behaviour of concrete structures, it is generally accepted that fibre should be included into the matrix of concrete, which reduces the workability of concrete but increases its flexural, tensile, impact, toughness, and post-cracking ductility.

2. METHODOLOGY

This section explores the evolution of concrete with the addition of bentonite and fibrofor fibre. Compressive and split tensile strengths, as well as typical concrete strengths, have been studied for this project's concrete properties investigation.

Materials used:

1. Cement
2. Fine aggregates (M Sand)
3. Coarse aggregates
4. Bentonite
5. Fibrofor fiber
6. Water

Bentonite

Table 1: Physicalproperties of Bentonite

Colour	Light Yellow
Size	Pass from 70 microns
Free swell	60% by volume
Nature	Pozzolanic

Table 2: Chemicalproperties of Bentonite

S.No.	Chemicals	Test Results
1	Al_2O_3	21.118
2	SiO_2	49.634
3	Fe_2O_3	3.235
4	TiO_2	0.498
5	Na_2O	0.449
6	CaO	0.65
7	MgO	3.591
8	K_2O	2.091

Fibro for Fiber

TABLE 3 Physical properties of Fibrofor fiber

Form	Fibrillated
Bulk density	0.91
Lengths	19mm
Colour	Beige
Resistance toacids/alkalis	Inert
Tensile strength	400N/mm2
Modulus of elasticity	4900 N/mm2
Softening point	1500C
Foiltthickness	80 micro meter

Mix proportions

Cement= 394.479 kg/m3

Water= 189.35 kg/m3

Fine aggregate = 688.689 kg/m3

Coarse aggregate = 1113.3696 kg/m3

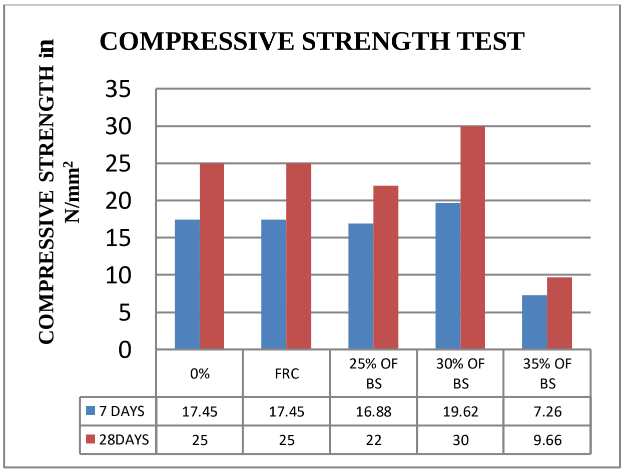
Water-Cementaratio = 0.48

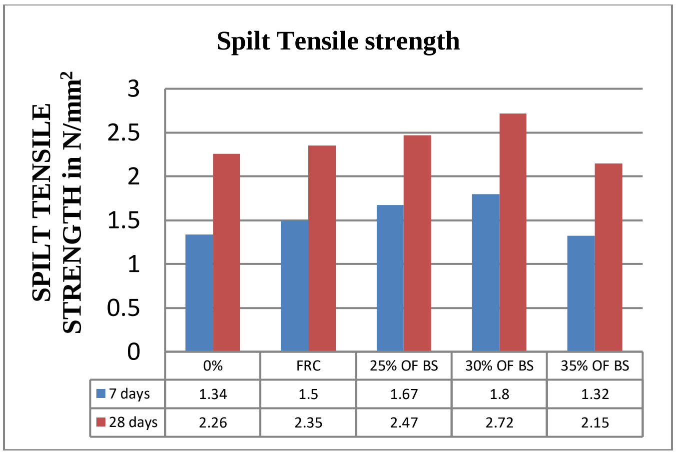
CEMENT: F.A:C.A

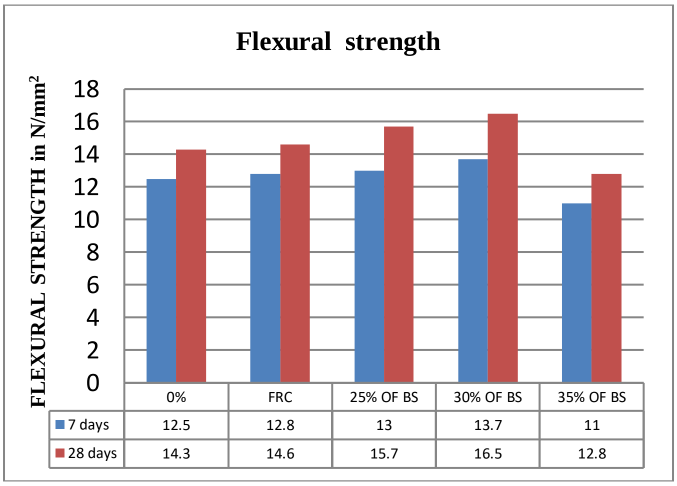
394.479: 688.689: 1113.3696

Proportion = 1:1.74:2.82

3. RESULTS







4. CONCLUSIONS

- The parameter of fibro forfiber reinforced bentonite concrete mix with 25%, 30% and 35% bentonitereplaced in place of cement are measured and analysed for cured states.
- Bentonite have optimum values for 30%.
- Fiber reinforced bentonite concrete has a 20% greater compression strength than regular concrete.
- Fiber reinforced bentonite concrete has a 21% higher split tensile strength than regular concrete.
- In comparison to regular concrete, the flexural strength of fiber-reinforced bentonite concrete is 20% higher.
- Characteristics are enhanced when either bentonite (a cement replacement) or fibro for fibre (a reinforcing material) is added to the mix.

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