A COMPARISON OF THE STRENGTH OF GLASS FIBER REINFORCED CONCRETE AND CONVENTIONAL CONCRETE IN AN EXPERIMENTAL STUDY (M30 GRADE)

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Abstract **- It's a comparatively recent advancement in construction technology. It saves money in the construction process because to its light weight. The use of glass fibre to replace steel in reinforced concrete structures helps to reduce corrosion and structural damage. Many alternatives are being investigated to increase the strength, durability, shrinkage characteristics, and serviceability of concrete while taking global environmental factors into consideration. As a consequence, glass fibre has been employed as an addition, and trials with various percentages of 1% , 2 %, and 3% cement have been carried out. When thinking about this material, concepts like glass fibre, light weight, cost-effective, ecologically friendly, and compressive strength come to mind. GFRC is a cementitious matrix that contains short-length glass fibres and is made up of cement, sand, water, and admixtures. Facade panels, pipes, and channels are all examples of non-structural elements that have been used extensively. Lightweight, which lowers dead load, fire resistance, an attractive appearance, and tensile strength are just a few of the benefits of GRC. Trial tests for concrete with and without glass fibre are conducted using cubes, beams, and cylinders to measure the differences in compressive strength, flexural strength, and split tensile strength. Because glass fibre may be moulded and sculpted in a number of ways, demand for it is growing in India due to rising building activity and other causes. In comparison to other reinforcing materials, it is a more affordable and cost-effective solution. As a consequence, glass fibre has been employed as an addition, and trials with various percentages of 1%, 2 %, and 3% cement have been carried out. When thinking about this material, concepts like glass fibre, light weight, cost-effective, ecologically friendly, and compressive strength come to mind.****Keywords: Glass fibre, Light weight, Economic, Eco friendly, Compressive strength.**

1. INTRODUCTION

Glass fibres are round and straight, with diameters ranging from 0.005 mm to 0.015 mm. Glass fibres are available in a wide range of lengths, diameters, and aspect ratios, all of which are readily available. Alkali resistant glass fibres were used in all of the investigations in this research. By varying the quantity of fibres, the study contrasts some of the characteristics of two different concrete classes. The goal of this study was to discover if incorporating glass fibre into concrete enhanced its strength.

1.1 Objectives of the project

Theobjectivesoftheprojectareasbelow:

1. The cost effect data analysis.
2. AnalyseandDesignstep of glass fibre reinforcement.
3. Fullyorganisedstrength.

1.2 Role of Fiber Glass Reinforcement

The main tensile-load carrying component of GFRC is alkali resistant glass fibres. The concrete matrix connects the fibres together and transfers loads from one fibre to the next by causing shear stresses in the matrix.

Concrete fibre reinforcement is a subject that is commonly misunderstood and feared. Articles on fibre reinforcing in ordinary concrete have been published by CCI. The relevance of structural fibre dose and orientation, on the other hand, will be investigated further down.

Fiber reinforcing is a typical approach for improving a material's mechanical characteristics. Many engineers with an interest in material science have received education on the subject.

As previously said, fibreglass is the most prevalent and well-known type of fibre reinforcement.

1.3 Zirconia Content Important

SiO_2	50-60
Al_2O_3	1-11
ZrO_2	4-10
ZnO	0.5-7
Group I A Oxide	10-19
Group II A Oxide	3-15

Alkali resistance is conferred by zirconia in glass. The more zirconia there is the more alkali resistant it is. AR glassfibre is also resistant to acids.

Finally, the direction of the fibres is crucial. The randomness of the orientation increases as the number of fibres required to bear the load increases. This is because only a small number of randomly oriented fibres are oriented in the correct direction.

1.4 Mandatory Study

GFRC's strength comes from a high dosage of AR glass fibre. While GFRC has a high compressive strength, it also has extraordinarily high flexural and tensile strengths, making it a better choice than conventional concrete. High fibre doses effectively transmit tensile loads and make the material more flexible while preventing it from breaking. Facades are commonly composed of

cost of the materials used is lowered overall. We must explore its qualities in order to make the most of its superior structural features and reduced cost while keeping high strength.

2. Used Materials

Concrete is a freshly mixed material that can be formed into nearly any shape. Concrete, unlike other construction materials, is made on site and, with the exception of cement, can vary widely in quality, features and performance due to the use of natural ingredients. When it comes to making concrete workable and long-lasting, material properties are crucial.

The following are the materials that were used in the study:

Cement:	OPC
Fine aggregate:	local available sand
Coarse aggregate	Aggregates that have passed through a 20mm sieve
Glass fibre:	5 cm of long chopped fibres
Water:	Potable water as per is code 456:2000

2.1 Demands Of Fibre Ar-Glass

It may be used to replace asbestos. High-quality alkali-resistant glass fibre with a high proportion of zirconia (ZrO2) to increase alkali resistance in cement composites. Strand lengths and sizes are available in a variety of lengths and sizes to fulfill specific applications and processing demands.

Our UK warehouse has large inventories of roving and chopped strand ready to export to Europe and the rest of the world. AR Glass fibre is also available through a variety of local agencies in Saudi Arabia, France, the United States, Russia, Thailand, Singapore and the United Arab Emirates.

2.2 Composition Of Ar-Glass Fibre

S.no	Compound	Composition (Parts by Weight)
1.	SiO_2	50-60
2.	Al_2O_3	1-11
3.	ZrO_2	4-10
4.	ZnO	0.5-7
5.	Group I A Oxide	10-19
6.	Group II A Oxide	3-15

2.3 Compressive Strength of Concrete at Various Ages

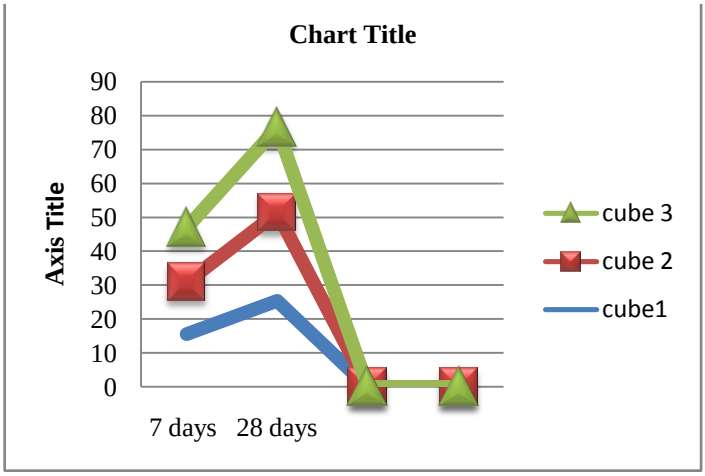
S.no	Age	Strength per cent
1.	1	16%
2.	3	40%
3.	7	65%
4.	14	90%
5.	28	99%

3.1 Test Results For Conventional Concrete Cube

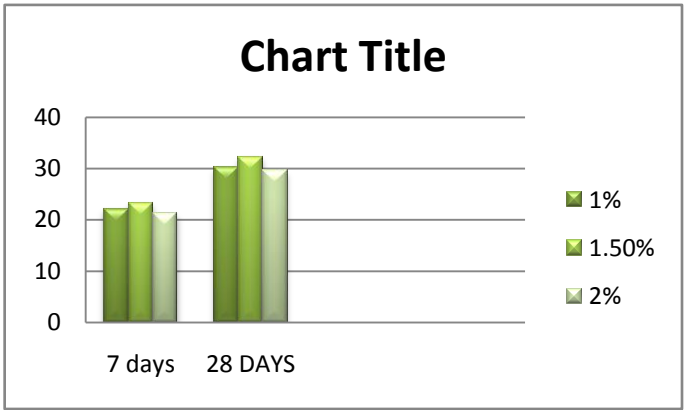
S.No	LOAD		Compressive Strength	
	7 Days	28 Days	7 Days	28 Days
1.	350	570	15.55	25.33
2.	345	585	15.33	26
3.	360	565	360	25.11
Average			15.62	25.48

3.2 Test Result Of Glass Fiber Reinforced Concrete Cube

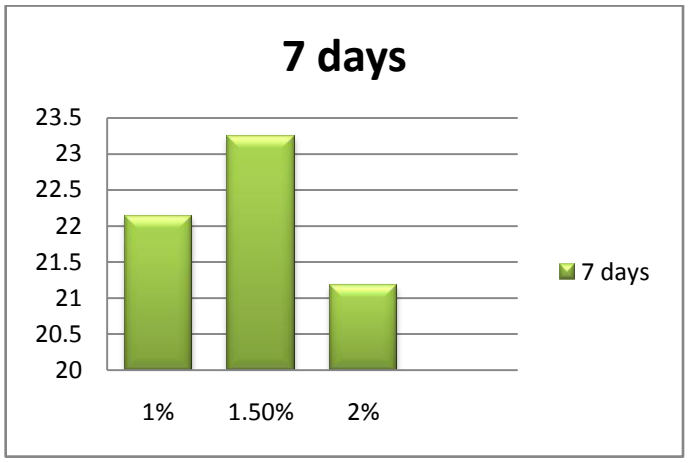
S.No.	% Of Glass Fibre	Load (Kn.)		Compressive Strength (N/mm2)		Average	
		7 Days	28 Days	7 Days	28 Days	7 Days	28 Days
1	1%	505	685	22.44	30.44	**22.14**	**30.14**
		490	670	21.77	29.77		
		500	680	22.22	30.22		
2	1.5%	535	725	23.77	32.22	**23.25**	**32.22**
		515	720	22.88	32		
		520	730	23.11	32.44		
3	2%	485	670	21.55	29.77	**21.18**	**29.55**
		470	660	20.88	29.33		
		475	665	21.11	29.55		



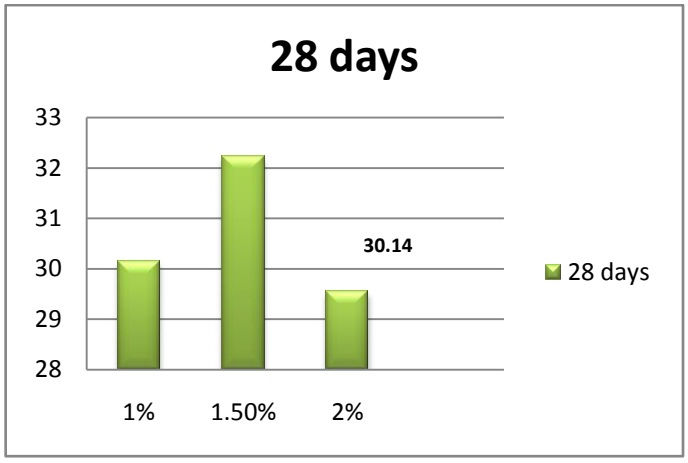
By Adding 1%, 1.5% And 2% Glass Fibre Reinforced Concrete Cubes



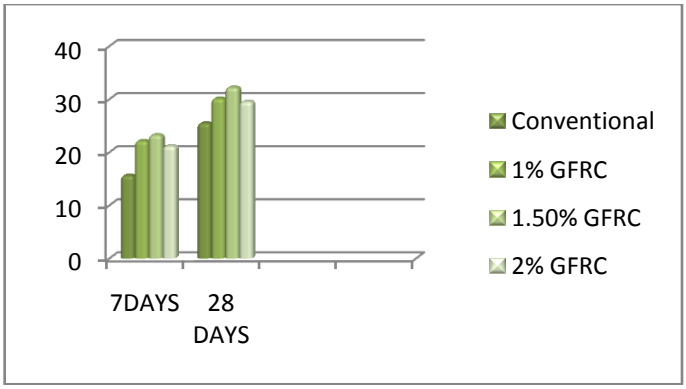
3.4 Compressive Strength Graph At 7 Days



3.5 Compressive Strength Graph At 28 Days



3.7 Comparison Between Conventional Cubes And Glass Fibre Reinforced Concrete Cubes



CONCLUSIONS

As a result of the experiments, the following conclusions were reached:

1. The highest compressive strength was attained by adding 1.6 percent glass fibre by weight to the entire concrete mix; successive additions resulted in a minor divergence from the maximum strength.

2. Adding 1.5 percent glass fibres to the total weight of the concrete increased compressive strength by 26%.

3. When it comes to achieving high strength, glass fibre is a cost-effective and suitable option. Concrete s panels are sturdy and can be manufactured with little material.

4. As a result, alkali-resistant glass fibre can be used as reinforcement in regular concrete, resulting in lighter, smaller, and stronger panels.

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