



Experimental Study On Compressive Strength Of Concrete By Using Polypropylene Fiber, Carbon Fiber And Lithium Carbonate

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Abstract: This Abstract is to find the experimental studies that conducted to assess mechanical characteristics of the concrete mix in which lithium carbonate, carbon fiber and polypropylene fiber is added in various volume proportions in few of the different mixtures. Tests are tested to know Performance of new concrete. Breaking Tensile strength, or tensile strength of splitting bending strength, and the modulus of elasticity is found at end of the process. The test findings show that the addition significantly improves the strength qualities of plain concrete. of carbon fibers and polypropylene fibers. as additives and lithium carbonate shows that it will decreases the setting time of concrete, and can be efficiently utilized in structural concrete.

Unless the fibre extent fraction is so high that the amount of void material content becomes excessively high, the effect of carbon fibre and polypropylene fibre addition at concrete dwellings will increase with fibre quantity fraction. Furthermore, the flexibility of the combination reduces as the fibre content material increases. Furthermore, the value will rise as the fibre content increases. As a result, a low fibre fraction is preferred as an alternative. The optimal concentration is 0.2 vol.% lithium carbonate. Fibre content as little as 0.25 vol.% works for carbon fibres, and 0.5 vol.% is efficient for polypropylene fibre, while fibre contents above 1 vol.% are not uncommon.

In the work of experimental part, High Strength concrete (HSC) was prepared using intensive mixer. Carbon Fiber in volume fraction of 0.2 vol.% in every mix 0.25%, 0.50%, and 0.75 volume fractions of polypropylene fibre, % & 0.1% and lithium carbonate in volume fraction of 0.1%, 0.2%, 0.3% & 0.4. Results of compressive and bending test proved an increase of strength value in the case of second mix of 0.2%LC, 0.2%CF & 0.5%PPF. The principal parameters considered in the study were the volume fractions of fibre and properties of the concrete.

Key Words: Lithium Carbonate, Carbon fiber, Polypropylene fiber, Compressive Strength , Tensile Strength & Flexural Strength

I. INTRODUCTION

Due of its accessibility, affordability, long-lastingness, and capacity to withstand harsh weather conditions, cement is one of the earliest and most used building materials in the world. Concrete is an extremely brittle material with a high breaking vigour but little tensile force. In order for concrete to handle tensile pressures, it must be reinforced. Steel is frequently used to produce such reinforcement.

However, concrete was a composite material composed of cement, water, various types of coarse and fine aggregates, and a binding agent. Despite the fact that cement is only one component of concrete, many people still think of it as concrete. The use of concrete structures around the world is subject to a wide range of situations, and they are familiar with environmental factors like erosion, climate change, and pollution.

reinforced fibre concrete is an advance product of a concrete made from addition of chopped fibers with water, cement, fine & coarse aggregate. Various types Various fibres, including steel fibre, glass fibre, natural fibre, and synthetic fibre, are used to enhance the physical qualities of concrete. Early in the 20th century, studies on fibre reinforced concrete (FRC) 1970s and most of the research has used steel fibers

II.MIX DESIGN FOR M20 GRADE

Cement= 320 kg/m³, Water= 176kg/m³, FA= 794 kg/m³ and CA= 1138kg/m³

Concrete mixes

Table 2.1 Quantity of materials per m3 of concrete

Designation	Cement (Kg/m ³)	Fine aggregate (kg/m ³)	Coarse aggregate (kg/m ³)	Lithium carbonate (Kg/m ³)	Carbon fiber (kg/m ³)	Polypropylene fiber kg/m ³
CC M20	320	794	1138	-	-	-
M1	320	794	1138	2.328	5.82	5.82
M2	320	794	1138	4.656	5.82	11.64
M3	320	794	1138	6.984	5.82	17.46
M4	320	794	1138	9.312	5.82	23.28

Fives concrete mix are designed with varied LC, CF and PPF contents:

CC M20 - Concrete of fck 20 N/mm²

M1 0.1LC (F) - Concrete with 0.1%LC, 0.2%CF, 0.25%PPF

M2 0.2LC (F) - Concrete with 0.2%LC, 0.2%CF, 0.5%PPF

M3 0.3LC (F) - Concrete with 0.3%LC, 0.2%CF, 0.75%PPF

M4 0.4LC (F) - Concrete with 0.4%LC, 0.2%CF, 1%PPF

Number of specimens**Table 3.8 Number of specimens**

Mixes	Compressive strength	Tensile strength	Flexural strength	Water absorption
CC M20	Cubes of dimension 0.15m*0.15m three for seven days three for fourteen days three for twenty eight days	Cylinder of dimension 0.15m*0.3m two for fourteen days two for twenty eight days	Prism of size 0.1m x0.5m two for twenty-eight days	Cubes of dimension 0.15m*0.15m three for seven days three for fourteen days three for twenty-eight days
M1	Cubes of dimension 0.15m*0.15m three for seven days three for fourteen days three for twenty eight days	Cylinder of dimension 0.15m*0.3m two for fourteen days two for twenty eight days	Prism of size 0.1m x0.5m two for twenty-eight days	Cubes of dimension 0.15m*0.15m three for seven days three for fourteen days three for twenty-eight days
M2	Cubes of dimension 0.15m*0.15m three for seven days three for fourteen days three for twenty eight days	Cylinder of dimension 0.15m*0.3m two for fourteen days two for twenty eight days	Prism of size 0.1m x0.5m two for twenty-eight days	Cubes of dimension 0.15m*0.15m three for seven days three for fourteen days three for twenty-eight days
M3	Cubes of dimension 0.15m*0.15m three for seven days three for fourteen days three for twenty eight days	Cylinder of dimension 0.15m*0.3m two for fourteen days two for twenty eight days	Prism of size 0.1m x0.5m two for twenty-eight days	Cubes of dimension 0.15m*0.15m three for seven days three for fourteen days three for twenty-eight days
M4	Cubes of dimension 0.15m*0.15m three for seven days three for fourteen days three for twenty-eight days	Cylinder of dimension 0.15m*0.3m two for fourteen days two for twenty eight days	Prism of size 0.1m x0.5m two for twenty-eight days	Cubes of dimension 0.15m*0.15m three for seven days three for fourteen days three for twenty-eight days

All the constituents are measured and mixed in a mixer. The aggregates are mixed for more than 2 minute and The cement is then added. After another minute of mixing, water was added. in the mixer

For CF mixtures, Within the dry mixFibres are added. and thoroughly combined. The dry mix is gradually supplemented with fibres. and the mixes are churned for another three minutes in order to ensure that the fibres are evenly distributed. It is manually assured that all fibres are blended.

After mixing thoroughly, it is moulded in cubes, cylinder and prism moulds. Cubes are 150x150x150 mm in dimension, 150 x 300mm cylinders and beams are 100 x100 x 500mm. Moulds are after 24 hours, removed and specimen cube & beam are kept in water for curing for 28 days

III. RESULTS AND DISCUSSION

3.1 INTRODUCTION

Mechanical properties like compressive, tensile, or splitting strength, as well as flexural strength, water absorption and density of concrete are presented in this chapter.

3.1.1 Compressive strength

The following Fig 4.1 shows the 7, 14 and 28days compressive strength of various mixes It has been discovered that the strength of compression for M2 mix is high compared to the other mixes.

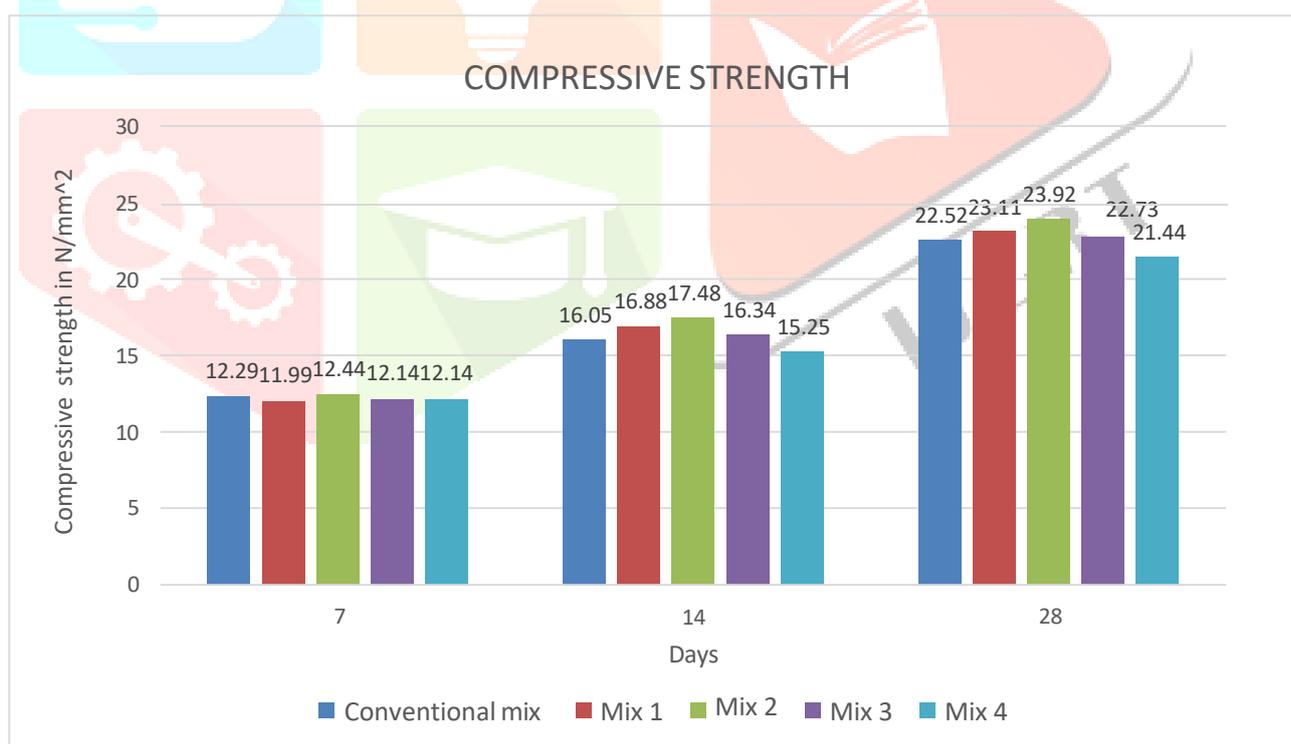


Fig 3.1: Comparison of compressive strength

Lithium carbonate can potentially increase the concrete's ability to break, it should be used with caution and in accordance with recommended guidelines to ensure optimal performance and durability. The addition of fibers provides a reinforcement in concrete, but When the fibre concentration increases, the homogeneity gets disrupted. This disruption in concrete by fiber causes a decrease in the breaking strength of concrete.

Concrete loses some of its with an increase in fibre content, compressive strength for this study, the Mix 2 (0.2%LC, 0.5% PPF and 0.25%CF) content is found to be with maximum breaking strength which is of 10 – 20% increases in to conventional concrete.

3.1.2 Tensile strength

The following Fig 4.2 shows the 14 and 28days Tensile stiffness of different mixtures It has been discovered that the strength of tensile is for M2 mix is high compared to the other mixes.

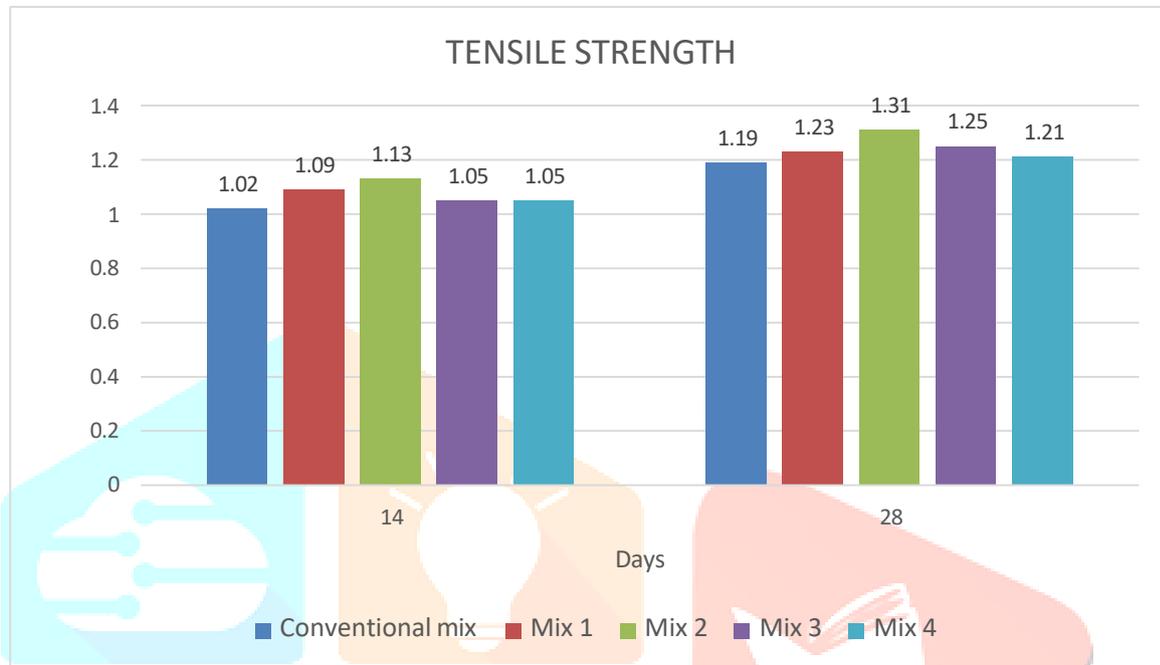


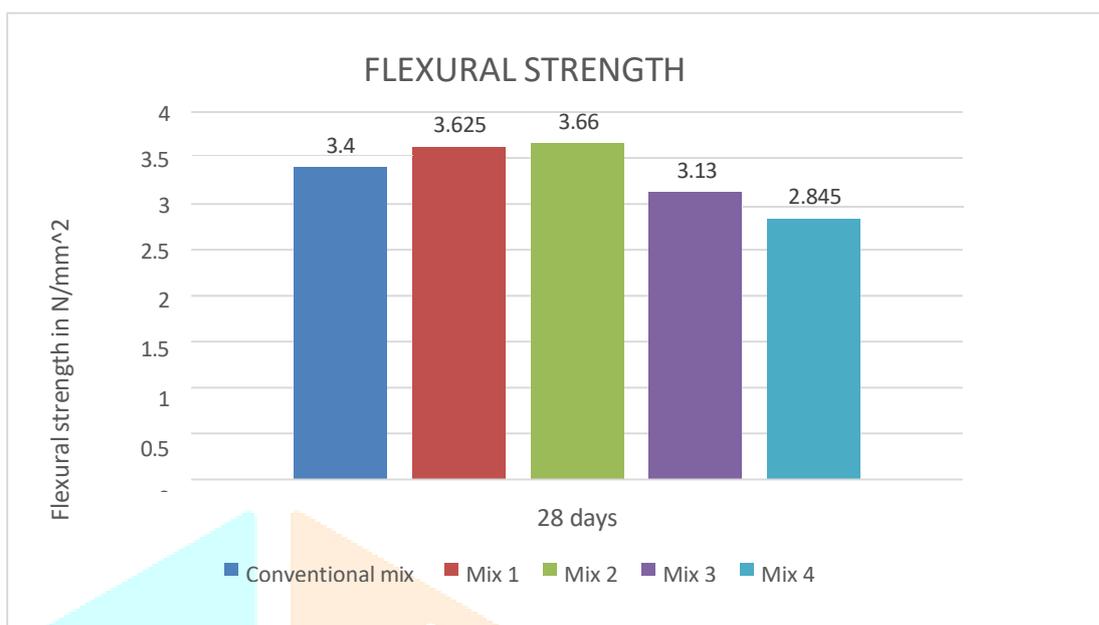
Fig 3.2 Comparison of tensile strength

Lithium carbonate can increase the tensile stiffness of building material by reducing the porosity and increasing the connection between the particles and cement matrix. Concrete's tensile strength can be considerably increased by the inclusion of fibres. This is because fibers, such as carbon and polypropylene, provide additional reinforcement to the concrete.

This study shows that increase in the fiber content will gradually increases the tensile stiffness compared to the conventional mix because the fiber is worked as the reinforcement in the concrete. The Mix 2 (0.2%LC, 0.5% PPF and 0.25%CF) content is found to be with maximum tensile strength which is of 5 – 10 % increases in to conventional concrete.

3.1.3 Flexural strength

The following Fig 4.2 shows the 28days bending strength of various mixes it is observed that the bending strength for M2 mix is high compared to the other mixes.



3.3 Comparison of flexural strength

Here it is informed that the breaking strength of concrete improves as the temperature rises in fiber content in the concrete mixture. In mix 1 and mix 2 the bending strength increased by 6.6 and 7.7 percent respectively compared to conventional mix. the growth in the bending stiffness is noticeable in Mix2(0.2%LC, 0.25%CF and 0.5%PPF).

IV.CONCLUSION

4.1 CONCLUSION

- The strength of concrete decreases with an increase of fiber content for this study, because increase in fiber content tends more air content and voids in concrete and here in every mix, we have added both carbon and polypropylene fiber so the air content and voids in concrete will be more.
- Lithium carbonate will hydrate the cement quickly it has the fly ash properties any how it should be used in an required amount only.
- Optimum level of inclusion of fibres and lithium carbonate content is the Mix2 (0.2%LC, 0.5% PPF and 0.25%CF) it is found to be with giving maximum strength and beyond increasing the materials proportions the strength is found to be reduced.
- M2 produced a good result overall compared to the Conventional mix, M1, M3 and M4.

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