EXPERIMENTAL STUDY ON GLASS FIBER REINFORCED CONCRETE BEAMS AT DIFFERENT PERCENTAGES

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Abstract-In present study, the experimental work is done by finding the optimum percentage of the glass fibers furthermore, by testing the specimens for compressive strength, split tensile strength and flexural strength by considering the varying percentages of fiber content throughout the beam viz.0%, 2%, 4%, 6%and 8%.the mechanical properties with the conventional concrete, here the conventional concrete is intended for M30 grade. when finding the optimum content of fiber the load-deflection studies were carried on the concrete beams of standard concrete glass fiber additional concrete and examined the variation of most deflection worth, load initially crack, final load.

Keywords—compression strength, split tensile strengths, deflection, glass fibre

I. INTRODUCTION

The homogenous mixture of Cement, fine aggregate, Coarse aggregate, and water is called concrete.Concrete is a composite material made of coarse aggregate bonded together with a cement paste that hardens progressively with time. Since the fundamental properties of the concrete are bond and it generally depends on the lime composition and with which are types of cement made by lime. When aggregate, Portland cement, and water combined (mixed) a slurry form and it is effortlessly (easily) transformable and can be formed into wanted (desired) shapes. What's more, there are a few admixtures and pozzolanic materials and super plasticizers can impart some new physical properties or can enhance (improve) the physical properties of concrete. Steel bars have been utilized as a powerful and cost-efficient reinforcing material for concrete.

Glass fiber reinforced concrete (GFRC) is a type of concrete the glass fibers of concrete dispersed in a matrix consists of a cementituous mixture composed of cement, sand, coarse aggregate, water, and admixtures. Glass fiber reinforced concrete (GFRC) is civil engineering recent introduction. So, it's been extensively utilized in several countries since its introduction 20 years agone. Glass-fiber-reinforced concrete contains concrete mixture with high-strength, alkali-resistant glass fiber. In this peculiar form, both fibers and matrix keep their physical and chemical properties as it is, it is offering synergic properties it is not achieved either of these components either acting alone for in the concrete. In general, fibers area unit the main load-carrying members, whereas the encompassing matrix tries to stay them within the desired locations and orientation, acting as a load transfer medium between the fibers and protects them from environmental damages. The fibers provide reinforcement for the matrix and other useful functions like limiting crack formation and improved ductility in fiber-reinforced composite materials. Glass fibers can be incorporated into a mixture either in continuous or discontinuous lengths. Durability was poor with the first sort of glass fiber because of the fact that the alkalinity of bond reacts with its silica.

II. LITERATURE REVIEW

Gopalaratnam and shah(1986) mentioned the impact of strain rate on the flexure behavior of unreinforced matrix and 3 totally different fiber ferroconcrete mixes. it absolutely was over that FRC is a lot of sense than the plain matrix and showing improvement in flexural strengths of seventy nine, ninety nine and 111 % over various static flexural strengths for the zero.5, 1.0 and 1.5 % (fiber volume content) composites (aspect quantitative relation of sixty two.5) at identical loading rates. Also, they need to developed a changed Charpy instrument to conduct impact tests and results obtained by them were found to vary with standard impact tests.Determine the lastingness of fiber ferroconcrete ordinarily obtained with the static flexural check by exploitation “SPLITTING-TENSION check “.it is over by Antonio Nanni(1988). Also, it over that the computation of the primary crack and supreme crack and supreme crack is convenient a lot of that of flexural or direction tension check.

The initial and final setting times of fiber and plain strengthened concretes were an equivalent is set by Balaguru and Ramakrishnan(1988). Fibre concrete had lower slump & air- content {and the|and therefore the|and conjointly the} rate of loss of those parameters with time was also higher. It ascertained that shrinkage of fiber concrete was slightly less however it underwent slightly a lot of creep deformations. the precise surface of air bubbles and space void characteristics was lower for Fibre ferroconcrete.

Bentur (1989) according to those tumbler fibers having the utilization of alkali resistants with silicon dioxide fume was effective in sturdiness performance improvement of alkali-resistant optical fiber strengthened cement composites (GFRC). The discussions were ascertaining supported silicon dioxide fume replacement within the matrix and sturdiness performance. it absolutely was advised that eliminates the fiber usage by aging evoked by microstructural effects, whereas the matrix modification reduces the influence of chemical attack.

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III. MATERIALS

A .Cement:

In nowadays, round the world cement is employed a basic and most vital ingredient of the concrete, mortar, stucco, and most non-specialty grout. It developed from alternative kinds of hydraulic lime in England within the mid-19th century it originates from sedimentary rock. it's made by the heating the materials during a oven to create a standard cement what's clinker, grinding the clinker and adding little amounts of alternative materials. Many varieties of cements square measure out there and principally we have a tendency to square measure victimization grey color Portland cement.

A. Sand.

Sand is a naturally occurring granular material composed of finely divided rock and mineral particles. The most common constituent of sand is silica (silicon dioxide, or SiO_2), usually in the form of quartz which, because of its chemical inertness and considerable hardness, it is the most common mineral resistant to weathering. It is used as fine aggregate in concrete.

B. Coarse aggregate.

Two single sized crushed stone aggregates ranging from 12.5mm to 16mm were used in respective proportions in concrete mixes. The aggregates were tested in accordance to IS-383: (1970).The results obtained are tabulated.

C. Water

Water plays a major role in the strength of concrete. it needs 3/10th of its weight of water for the complete association. Scientists found that standard concrete needs the minimum water cement magnitude relation regarding 0.35. Water places a significant role in reacting with a chemical with a fine and course combination of the cement.

D. *Glass fiber:*

The glass fibers with the designation “Cem-Cem-Fil Anti-Crack, HD-12mm, Alkali Resistant glass fibers” were used throughout within the experimental work.

IV. METHODOLOGY

The present study is aimed at dealing the strength of the beam. The objectives of the present study are elaborated below.

A. Mix design of concrete:

Effective mixing is important for the production of uniform, high quality concrete. For this reasons methods and equipment should be capable of effectively mixing concrete materials which contains different size of both coarse aggregate and fine aggregate to produce uniform mixtures of minimum slump which is suitabalemost of the practical works.

B. Workability:

Workability is that the ability of a contemporary (plastic) concrete combine to fill the form/mold properly with the specified work (vibration) and while not reducing the concrete's quality.

C. Curing:

Properly curing concrete leads to increased strength and lower permeability and avoids cracking. Care must also be taken to avoid freezing, or overheating due to the exothermic setting of cement. Improper curing can cause scaling, reduced strength, poor abrasion resistance and cracking.

D. Load and deflection comparative strength studies of a beam:

Preliminary tests for combine style of concrete need to conduct on cement, sand, and aggregates and also the concrete combine style needs to be in deep trouble the M30 grade concrete. Casting the cubes of size 150mmx150mmx150mmand testing for compressive strength for various percentages of optical fiber content viz. 0%, 2%,4%,6% and eight once twenty eight days of natural process. Casting the cylinders of the height of 30cm and 15cm in diameter. And testing for the split lastingness for various percentages of the optical fiber content viz. 0%,2%,4%,6%, and eight once twenty eight days natural process. Casting the beams of size 100mmx100mmx1000mm with totally different percentages of the optical fiber viz. 0%,2%,4%,6% and 8%.the casting of one beam with zero you look after the optical fiber. Casting of four beams with various factors of optical fiber below the neutral axis. Casting of four beams with various factors of optical fiber up to full depth of the beam. Perceptive the impact of an optical fiber in numerous aspects on the concrete properties.

TABLE 1

Mix proportion

Water	Cement	Fine aggregate	Coarse aggregate
186 lit	443.72kg	563.85kg	1024.69 kg
0.43	1	1.31	2.39

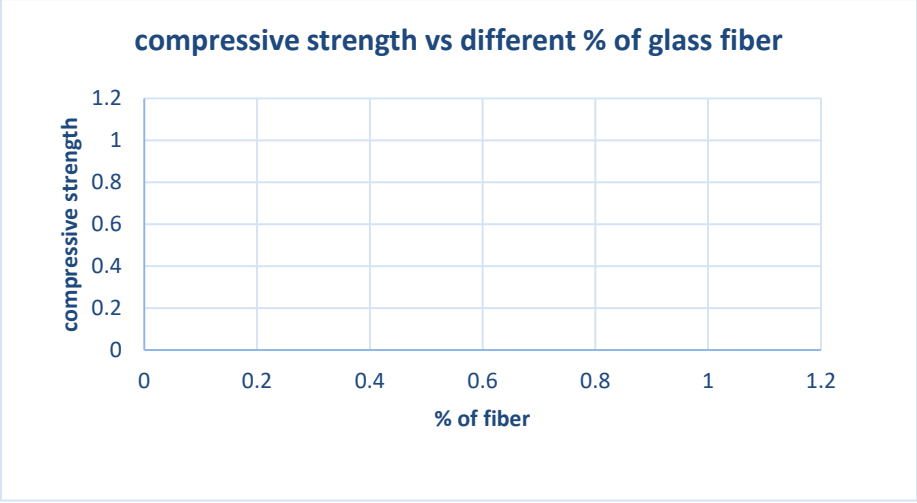

fig:1 variation of compressive strength expectantly of glass fibres used

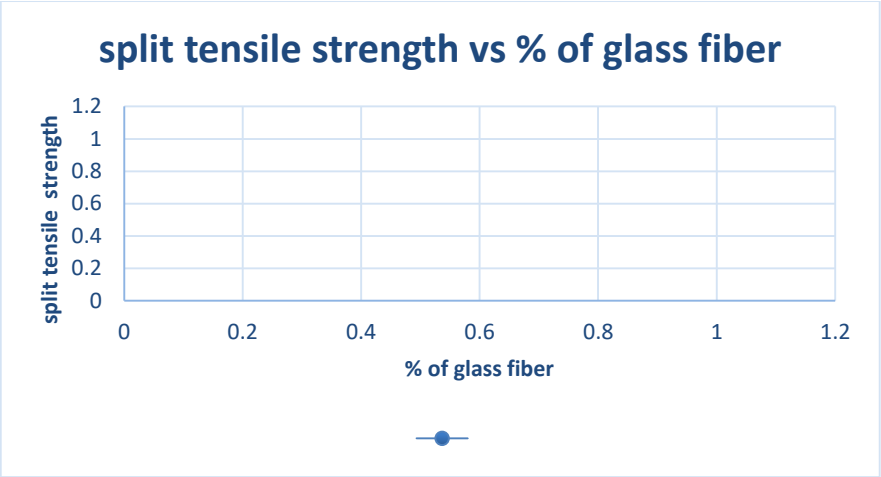

Fig 2: variation of compressive strength expectantly of glass fibres used

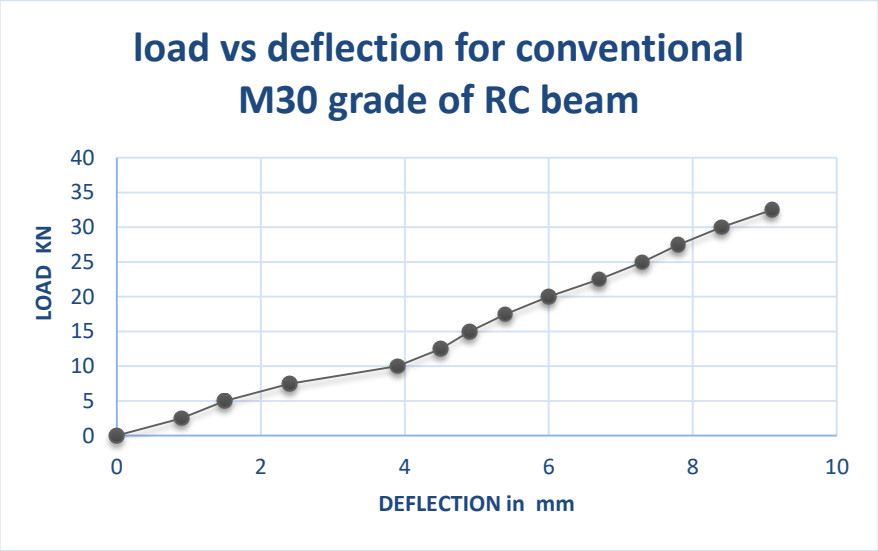

Fig 3: showing the variation of deflection under load for conventional concrete.

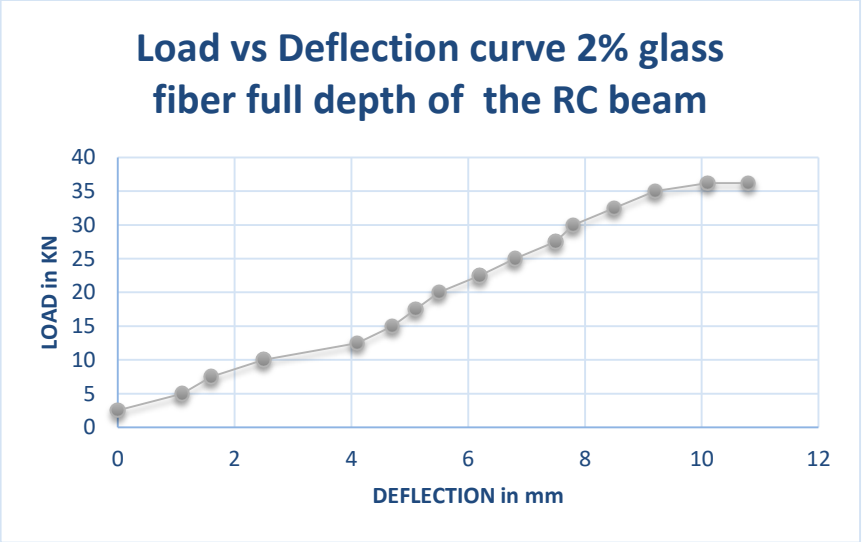

Fig 4: variation of deflection under load for 2% glass fibre added concrete.

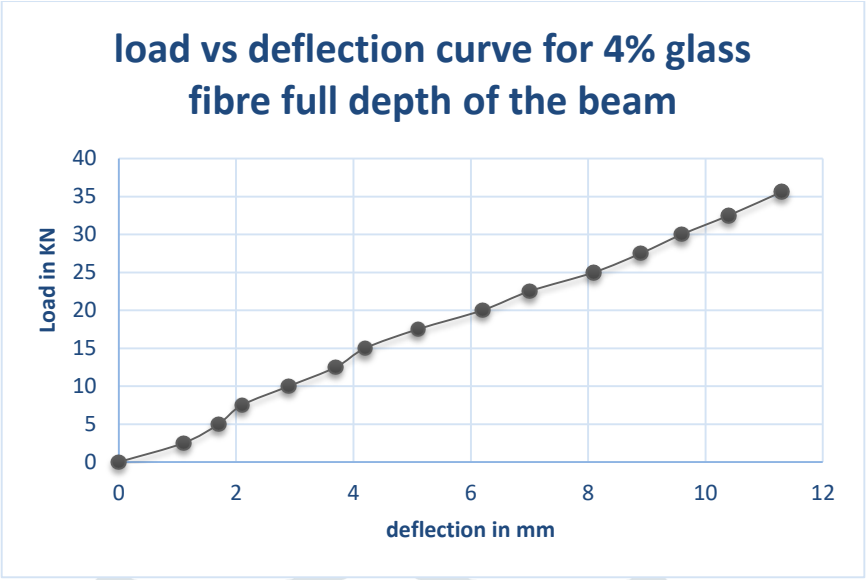

Fig 5: variation of deflection under load for 4% glass fibre added concrete.

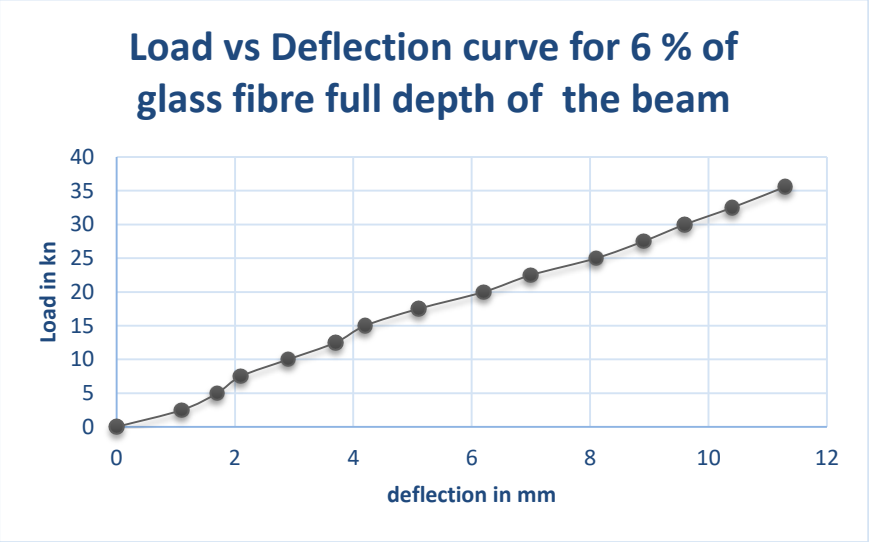

Fig 6: variation of deflection under load for 6% glass fibre added concrete.

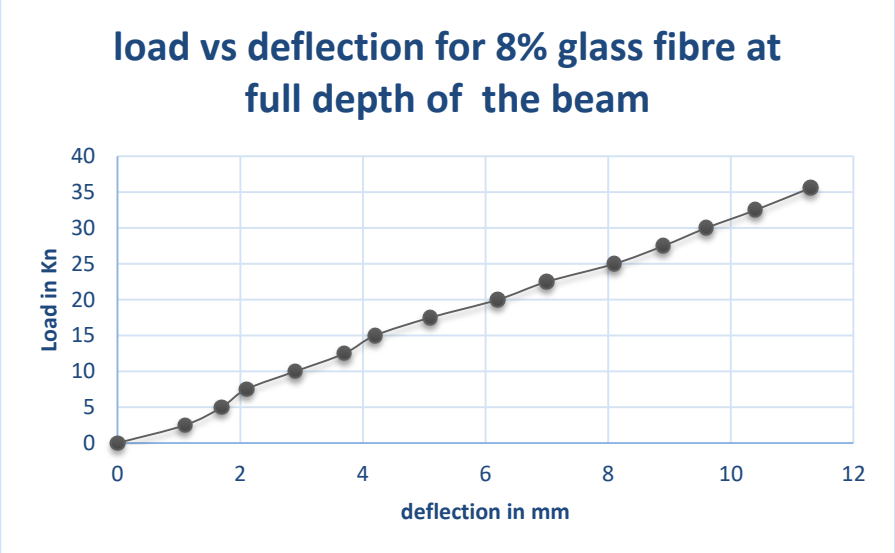

Fig 7: variation of deflection under load for 8% glass fibre added concrete.

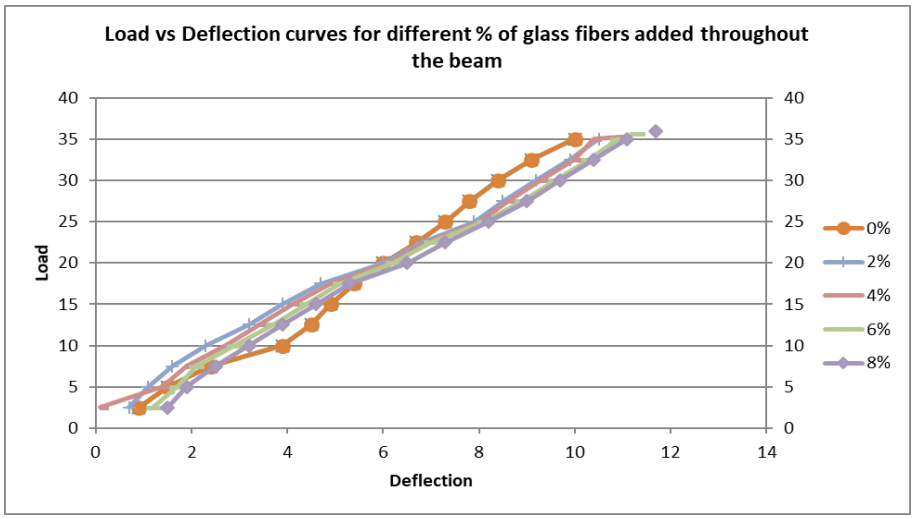

Fig 12: Load- deflection curves for different % of glass fibres

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Fig 12: showing the variations of load vs deflection values for various % of glass fibers.

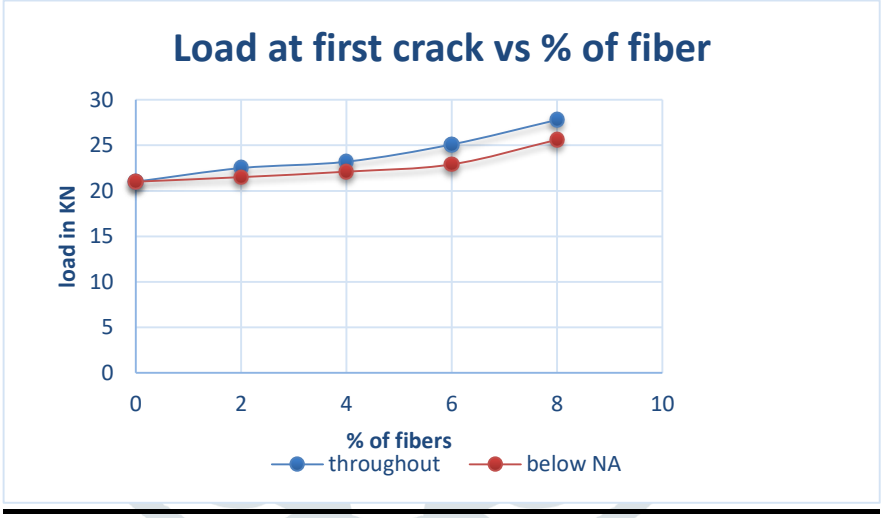

Fig 13:showing the comparison of load at first crack with glass fibres

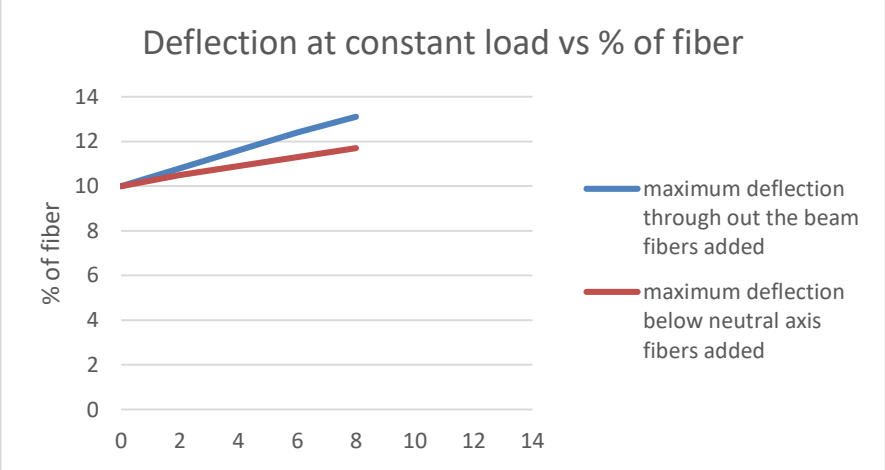

Fig 14: showing the comparison of maximum deflection values at constant load

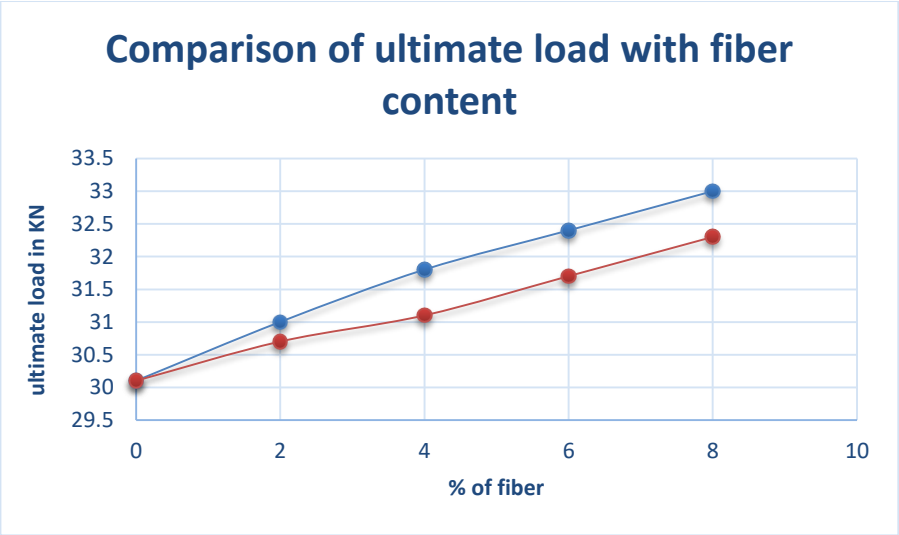

Fig 15: showing the comparison of ultimate load with % of fibre and fibre type

V. DISCUSSION

(1) The compressive strength of concrete is accumulated by 0.68% for 2% addition of glass fiber, 1.3% for 4% addition of glass fiber, 1.8% for 6% of glass fiber, 2.6% for 8 %addition of glass fiber than standard concrete.

(2) The split strength of concrete is accumulated by 0.08% for 2% addition of glass fiber, 0.17% for 4% addition of glass fiber, 0.24% for 6% addition of glass fiber, 0.36% for 8 % addition of glass fiber than conventional concrete.

(3) Glass fiber supplementary at various % throughout the beam

(i) The load initially crack of concrete is accumulated 1.7% for 2% additionof glass fiber, 2.3% for 4% addition of glass fiber, 4.2% for 6% addition of glass fiber, 6.9% for 8 % addition of glass fiber than standard concrete

(ii) the ultimate load of concrete is accumulated by 0.8% for 2% addition of glass fiber, 1.8% for 4% addition of glass fiber, 2.4% for 6% addition of glass fiber, 2.8% for 8%addition of glass fiber than standard concrete

VI. CONCLUSIONS

From the on top of discussions the following conclusions have created

1. For the addition of glass fibers, the compressive strength of concrete is accumulated compared to conventional concrete for most of 2.6%
2. For the addition of glass fibers, the split strength of concrete is accumulated for most of 0.38% compared with conventional concrete.
3. At 8% fiber content, the deflection parameters like load initially crack, associate final load were obtained most. These parameters square measure obtained most for glass fibers compared with standard concrete.
4. The utmost deflection was conjointly diminished at 8% of fiber content for glass fibers throughout the beam.
5. From final load comparisons, each glass fibers supplementary throughout the beam and conventional beam.this can be obtained most for the glass fibers supplementary throughout the beam.
6. The usage of fibre within the concrete offers higher performance altogether aspects because of the high tensile properties of the fibre.

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