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Experimental Behavior of concrete under compression load with steel fiber and Ferro-cement partial add of cement

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Abstract: This research has shown that the Steel fiber and Ferro-cement have potential to produce high performance of concrete and it will also improve the characteristic properties. Concrete under compression with steel fiber and Ferro-cement partial add of cement, It has been Studied that the relative under Compression load partial adding of steel fiber and Ferro-cement appear that the ratio are designed for target strength and result in increased Stress-strain value.For the calculation purpose M25 grade of concrete has been designed on the basis of IS code 10262-2009. The mix design water cement ratio is 0.50. The thesis consisted of casting and testing of 35 cylinders (300mmX150mm) and 15 cubes (150mmX150mmX150mm) which were casted in 6 batches. The cylinders in each batch are divided into 5sets. In each set 5 identical specimens were casted and the average behavior is taken to represent the behavior for that set of specimens. Hence in each batch total no of cylinders come to 5. Out of 6 batches 1st batch was casted with 0 mesh and 0 fiber, 2nd with 0 mesh and 0.5% fiber, 3rd with 1 mesh and 0% fiber , 4th with 1 mesh and 0.5% fiber, 5th with 2 mesh of 0 fiber and lastly 6th with 2 mesh and 0.5% fiber 2 extra specimens were prepared one with 0 mesh , fiber and second with 0 mesh, 0.5% fiber. This thesis has shown that the steel fiber and Ferro-cement has following observation that the maximum ultimate strain is for the B_0(Casting and Curing of M25 Grade of Concrete with 0.5% Steel Fiber and 0 Ferro-cement layers) type of columns which it is observed that for the cube specimen with 0.5% fiber concrete the compressive strength improved by 16% when compared with cube specimen with plane concrete only is necessary criteria for absorbing the energy.This research has shown that the Steel fiber and Ferro-cement have potential to produce high performance of concrete and it will also improve the characteristic properties.

Keywords: - Strain Curve, steel fiber, Ferro-cement, Grade M25, Compressive strength. etc.

INTRODUCTION:

Concrete is a man-made construction materials which is most commonly used in construction work in the world. It is obtained by mixing of water, cement, fine aggregate, coarse aggregate and some minerals admixtures in necessary proportion are known as concrete. The hardened concrete can be worked as an artificial stone in which the voids of coarse are filled by the fine aggregates and cement. The hardening of concrete is caused by chemical reaction between cement, water, and reaction for a long time and hardening of concrete strong with the age. The properties of concrete depend on the quantity and proportion of the ingredients used in the mix and the control exercised in formwork and curing.

Concrete is the boon to construction, as it has various direct and indirect advantages concrete has many inherent advantages such as:

1. High resistance and weathering action
2. Availability of ingredients at reasonable cost
3. High compressive strength
4. Mould ability to any shape leading to architectural finishes
5. Aesthetic appearance.

Therefore it widely used in construction

It has some disadvantages they are:

1. Low tensile strength
2. Poor ductility
3. More brittleness
4. High W/C ratio

A Concrete with reinforcement fails suddenly when subject to earthquake and nuclear blast etc. This problem can be avoided if the critical sections are able to undergo large plastic deformation and be in a position to absorb large of strain energy.

Section composed with high strength steel and higher steel ratios fail suddenly without yielding of tension steel, provision of compression reinforcement helps to some extent. But the design becomes most uneconomical

The improvement in ductility of concrete allows economical use of high strength steel, higher cement ratio and avoids sudden failure and also the moment curvature

characteristics of reinforced concrete section can be brought nearer to that of a steel section and the analysis of intermediate concrete structures get simplified. The concrete with improved ductility is more efficient building material.

The structural which are designed for seismic resistant demands high ductility. Therefore the ductility of concrete is being improved by confining it in steel binders, as ties in compression member and as stirrups in beams at present. In the structures which are statically indeterminate the critical section, at which first hinge forms are incidentally also the section having maximum shear force. The stirrup reinforcement, which is provided. Moreover, use of sophisticated arrangement of closely spaced stirrups in confinement columns not only creates plane of weakness between core and the concrete and interrupts the continuity but also adds the problem of steel congestion.

Therefore it may not be possible to sufficiently the structure by providing the laterals ties alone but it would be useful if a supplementary or indirect confinement, in addition to laterals, can be devised. Several investigations have reviled that incorporation of discontinuous, discrete and uniformly spread fibers in concrete increases tensile strength ductility, impact, toughness, flexural and fatigue resistance.

The conclusion highlighted that fibers can give some confinement, such type of concrete is termed as Confined fiber Reinforced Concrete (CFRC). When we use fibers in large volumes it has tendency to ball. Therefore limitation to the quantity of indirect confinement offered by steel also. This Limitation confinement necessity the requirement of additional confinement can be provided in the form of Ferro cement shell. Such concrete can be termed as Confined Ferro Reinforced Concrete (CFRC). The present present investigation is an attempt to study the strain characteristics of CFRC.

LITERATURE REVIEW:

P Sangeetha [1] and R. Sumathi [2]2010 [2]

Fiber – Wrapping using Fiber – Reinforced Plastic (FRP) shells is one of effective methods, significantly enhances the strength and ductility of concrete columns. The paper reports the behavior of the GFRP wrapped concrete columns under uniaxial compression. The cross section of the concrete columns considered in the work is circular with diameter of 150mm and height 300mm. The Parameters that are varied in the investigation are wrapping shell materials, (which includes GFRP Materials Surface Mat(SM), Chopped Strand Mat (CSM) and Woven Roving Mat (WRM)), Number of Plies (1Ply and 3plies) and Period of Curing (7 & 28 Days). Results from a series of the experimental study were reported and discussed. The study on small – scale specimens showed that confinement increased the strength of the concrete columns loaded axially.

Shabans Salik K [1], Athira M. M. [2], Lalna S.S [3] ,Prasum C. [4] ,Rafeekha K.[5] Rajimol K. R [6], Safna A. M [7] 2015 [3]

This paper evaluates the performance of short concrete compression members strengthened with coir rope wrapping, under axial compression. From the study on small-scale specimens, it has been seen that the coir rope wrapped specimen exhibit significant increase in strength, as compared to control specimen, due to the confinement by rope wrapping. The tests were carried out with ropes of different diameters 0.6cm, 1cm and 1.4cm at spacing of 0.0h, 0.1h, 0.2h and 0.3h, where h is the height of the specimen. Maximum improvement was obtained for wrapping with coir rope of diameter 1.4 cm at 0.0h spacing. The strength was found to be increased with increase in diameter of rope and decreased with increase in spacing. The costs for unit improvement with various wrapping were worked out and the method was found to be very cost-effective. As the weight of coir rope is negligibly small, it has practically no impact on footing design.

A.R. Rahai [1] ,P.Sadeghian [2] and M.R. Ehsani [3]2008 [4]

This paper presents the results of experimental studies about concrete cylinders confined with high-strength carbon fiber reinforced polymer (CFRP) composites. Forty small scale specimens (150×300 mm) were subjected to uniaxial compression up to failure and stress-strain behaviors were recorded. The various parameters such as wrap thickness and fiber orientation were considered. Different wrap thicknesses (1, 2, 3, and 4 layers), fiber orientation of 0o, 90o, ±45o and combinations of them were investigated. The results demonstrated significant enhancement in the compressive strength, stiffness, and ductility of the CFRP-wrapped concrete cylinders as compared to unconfined concrete cylinders.

Katsuki Takiguchi [1] and Abdullah [2]2000 [5]

Investigation by many researchers have indicated that by providing external confinement at plastic region or over the entire reinforced columns, the strength and ductility can be enhanced. In this paper, a strengthening method using circular ferrocement jacket to improve the confinement of a substandard column was investigated

and compared with control specimens and different strengthening methods. Five 1:6 scale model square columns were constructed and have been tested under constant axial load while simultaneously being subjected to cyclic lateral load. The loading system used in this experiment displaced the tested columns in a double bending. Two columns were tested as control specimens; one column was strengthened with circular Ferro cement jacket and were compared with those of other two identical square RC columns strengthened circularly with steel plate and carbon fiber. The control specimens suffered shear failure and significant degradation of strength during testing whereas the strengthened columns showed ductile flexural response and higher strength. The test results indicate that circular Ferro cement jacket can be an effective alternative material to strengthen reinforced concrete column with in adequate shear resistance.

Hanaa I EI Sayad [1] and Aiman A. Shaheen [2]2011 [6]

The aim of this investigation is firstly to evaluate the different methods used for confining the reinforced concrete (R.C) columns either internally or externally. Secondly, the effect of overheating on the performance of confining methods is studied using the computer program "ANSYS 5.4". Beside the traditional transverse steel ties, the internal confinement was satisfied by steel fibers or a cage of expanded metal mesh inside the ties, while external confinement was achieved by wrapping the studied columns with Ferro cement layers or GFRP sheets. Six R. C columns were prepared, namely, the control column reinforced traditionally with transverse ties only, two columns containing 1% and 2% steel fibers, one column reinforced additionally with a cage of expanded metal mesh, two columns wrapped with either Ferro-cement laminates or glass fiber reinforced plastics (GFRP). The columns were tested under axial loads to evaluate the effect of the different confining methods on the ultimate capacity and ductility. It was found that adding 2% steel fibers or reinforcing the column with a cage of expanded metal mesh inside the ties gave almost similar results (26% increase in the ultimate capacity compared with that of the control column). Despite that the ultimate capacity of the column wrapped with GFRP was the highest among the studied columns (37% increase in the ultimate capacity), its ductility was the lowest. The parametric study using ANSYS 5.4 showed that the R.C columns containing steel fibers were less affected by fire than the other columns. It was also found that the ultimate capacity of R.C columns wrapped with GFRP was reduced by fire to a high degree (approximately 53% reduction in the ultimate capacity).

PSangeetha 2006 [7]

Fiber wrapping or encasement of columns with fiber-reinforcedplastic (FRP) sheets significantly enhances strength and ductility of concrete. To investigate the behavior of concrete columns confined by fiber reinforced polymer (FRP) sheets under uniaxial compression, analytical models were solved using Finite Element Method (FEM) against published experimental data. Cross sections of concrete columns in analysis are categorized into circular, square and rectangular sections. Finite Element Analysis (FEA) can effectively simulate the behavior of concrete columns confined by FRP sheets when the proper numerical model is adopted. Results from a series of the analysis on small-scale specimens showed that confinement increase strength (20-25) and ductility of concrete columns loaded axially. ANSYS (version 6.0) offers a series of very robust nonlinear capabilities for designs and analyses.

Emdad K. Z. Balanji [1], M. Neaz Sheikh [2] Muhammad N.s. Hadi [3] 2016 [8]

The strength and ductility of high strength concrete columns improve with the addition of steel fiber. This paper reports the behavior of circular High Strength Concrete (HSC) columns reinforced with Hybrid Steel Fibers (HSF) under different loading conditions. In this study, HSF consisted of a combination of macro steel fibers and micro steel fibers. A total of eight circular specimens of 205 mm diameter and 800 mm height were cast and tested. All specimens were reinforced with same amount of steel reinforcements. The specimens were divided into two groups of four specimens. Group RC (reference group) contained no steel fibers. Group HSF (hybrid steel fibers) contained 2.5% by volume of HSF. From each group one specimen was tested under concentric loading, one under 25 mm eccentric loading, one under 50 mm eccentric loading, and one under four-point loading. The results showed that the specimens reinforced with HSF achieved higher strength and ductility compared to RC specimens under different loading conditions. It was also observed that the presence of HSF delayed the spalling of the concrete cover

Azadeh Parvin [1] and David Brighton [2] 2014 [9]

In recent years, the repair of unstrengthened and damaged reinforced concrete member by external bonding such as ferrrocement laminate is increasing which

demands need of investigations on behavior of ferrocement confinements. Significant amount of work has been carried out on confinement of column with ferrocement laminates considering change in parameter such as types of meshes with different sizes, concrete grade, height of column, etc. In this study, use of ferrocement as an external confinement to concrete specimen is investigated with reference to layers of confinement and orientation of meshes. The effectiveness of confinement is achieved by comparing the behavior of confined specimen with that of unconfined specimen.

Shankarkumar V[1] ,Arun K [2], Dhivya P [3], Mahesh Kumar M[4], Suresh Babu R[5] 2010 [10] Invention of new methods in strengthening concrete is under work for decades. On the track of such invention Fiber Reinforced Composite materials plays a significant role. The main function of fiber reinforcement is to carry the load along its length and also to provide stiffness and strength in one direction. FRP thus alters the compressive strength, tensile strength and flexural strength of concrete to a good extent and hence it imprints as a good solution for strengthening concrete. FRP materials can be externally bonded or wrapped to the existing structure; hence they can also be used for rehabilitation works. There are three major types of fiber reinforced polymers used in construction works. They are Glass fiber reinforced polymer (GFRP), Carbon fiber reinforced polymer (CFRP) and Aramid fiber reinforced polymer (AFRP). In the present investigation the effect of GFRP on M25 and M50 concrete mix is studied at two cases. First, Effect of GFRP on the compressive and flexural strength of M25 and M50 concrete mix with respect to number of layers, and secondly Effect of GFRP on compressive strength M25 and M50 concrete mix with respect to number of layers at 2000C temperature which is termed as durability studies.

Md. Mozaffar Masud[1] and Arum Kumar[2] 2013 [11]

The present study investigates the effect of confinement using ferrocement as wrapping material on the circular RC columns under concentric loading condition. Methods: Experimental studies were carried out on the confining effect using external confinement technique with one layer and two layers of GI wire mesh under concentrically loaded condition. All columns were tested by uniform concentric compressive load from top with a hydraulic compression testing machine of capacity 1000KN. Findings: Most of the researches have done on confining effect of either long column or short column (slenderness ratio more than 3). This paper demonstrates the confining effect on short column having slenderness ratio is less than 3, such a column is called pedestal. Pedestal is a form of short column which is used as a base support for steel structure, statue or vase. To protect the column of steel structure from corrosion that is in direct contact of soil, pedestal is provided. During earthquake such a structure can collapse or even cracks can develop. Hence, Ferro cement structures are highly ductile and energy dissipating material that can undergoes large deformations without collapsing during earthquakes. Even the deformed structures can be strengthened at very low cost after deformation. Steel jacketing has proved to be an effective measure for strengthening or retrofitting and has been widely used in practice, but the engineering community is currently looking for alternatives. Applications/Improvements: Material like Ferro cement is oldest, cost effective method emerges an alternative solution for strengthening of reinforced concrete column. External confinement or encasing of column with Ferrocement enhances the strength and ductility of concrete column.

Vikram Singh Thakur[1],Vikas Khatuja[2], Sumanth Reddy[3], K.V. Ratn Sai[4], and Dr. P.Rathish Kumar[5] 2016 [12]

In this paper, stress-strain diagrams for self-compacting concrete confined with ferrocement shell in addition to lateral tie confinement is presented, based on the experimental results of 102 cylinders of diameter 150mm and height 300 mm tested under axial compression. Increase in the strength and strain of concrete confined with ferrocement shell and lateral tie confinement is found to be linear. A constitutive relation is proposed for the first time for confined SCC to enable the engineers to apply the same for the designing such elements.

Prof.Y.B.I. Shaheen[1], Dr. M. Hassanen[2] 2012 [13]

This paper presents a proposed method of producing new circular reinforced concrete columns reinforced with various types of reinforcing materials. The experimental program includes casting and testing up to failure sixteen circular columns having the same dimensions of 72 mm in diameter and 1m long were tested under concentric compression loadings. The experimental program comprises five designations series. The main variables are the type of reinforcing materials metallic or non metallic, the number of layers; volume fraction of reinforcement, specific surface area of reinforcing materials, incorporating of bamboo in the core of the test specimens. The main objectives are to evaluate the effectiveness of employing three types of FRP with

different technical methods of strengthening concrete columns. To make comparative study between strengthening concrete columns and concrete columns reinforced with welded steel meshes, fiber glass meshes, polypropylene meshes, and bamboo with meshes. The results of an experimental investigation to examine the effectiveness of these produced columns are reported and discussed including strength, deformation, cracking, ductility and energy absorption properties of the test specimens. Specimens strengthened with FRP, Aramid emphasized more effective and efficient more than hydride materials. High ductility and energy absorption properties could be obtained of Ferrocement columns. New reinforced concrete Columns were developed with high strength, crack resistance, high ductility and energy confinement to concrete specimen is investigated with reference to layers of confinement and orientation of meshes. The effectiveness of confinement is achieved by comparing the behavior of confined specimen with that of unconfined specimen. The experimental program consists of testing 30 specimens under uniaxial compression. Cylindrical specimen of 120mm dia. and 600 mm height were used. Results show that the confinement of cylindrical specimen can improve the ultimate strength with single and double layer of mesh compared to unconfined specimen. Ultimate compressive strength increases with the change in orientation of square mesh from 90º to 45 º.

PARAMETERS:

1. **Characteristic strength [f_{ck}] -** Characteristic strength of concrete is the compressive strength of concrete cube after 28 days curing below which not more than 5% of test result of samples are expected to fall. This is also called the grade of concrete for mix design. For example, M-25 grade concrete, the minimum compressive strength of concrete should be 25 N/mm^2. The grade of concrete based on IS code 456:2000 and characteristic strength.

2. **Durability –** Durability of material to resist the combined action of atmospheric and other factor is known as durability.

3. **Workability –** Workability is the ease with concrete can be compacted fully without segregation and bleeding. Workability is the amount of internal work required to fully compact the concrete to optimum density. The workability depends on the shape, quantity of water, grading, and the percentage of aggregate present in the concrete.

absorption properties. High ductility and energy absorption properties could be obtained of Ferro cement columns.

V M Shinde[1] , J P Bhusari 2016 [14]

In recent years, the repair of unstrengthened and damaged reinforced concrete member by external bonding such as fibrocement laminate is increasing which demands need of investigations on behavior of Ferro cement confinements. Significant amount of work has been carried out on confinement of column with Ferro cement laminates considering change in parameter such as types of meshes with different sizes, concrete grade, height of column, etc. In this study, use of Ferro cement as an external

4. **Slump test –** Slump test are used to determine the workability of concrete. Slump value as per IS code 456:2000

Degree of workability	Slump (mm)
Low	25-50
Medium	50-100
High	100-150

Table

3.1 Workability of concrete Slump value

5. **Bleeding –** Bleeding is the property of fresh concrete, according to this property the water tends to rise to the surface while placing and compacting in mix, this is called bleeding.

6. **Segregation –**The Property of the ingredients to separate from each other while placing the concrete is called segregation.

7. **Fineness modulus –** The aggregate are separated by various sieves into different size of particles and mixed to the required proportion. Certain Value of Fineness Modulus for mixed aggregate have been accepted as giving the best result. The fineness modulus of fine aggregate is in the range of 2.0 to 3.5.

8. **Variance [s^2] –** The variance of a distribution is the sum of the square of the deviation from the mean value of sample.

9. **Standard Deviation [s] –** The standard deviation is derived by taking the square root of the variance.

10. **Coefficient of Variation [v] –** When it is necessary to compare the variation in the result of two products under similar condition but of different levels of average value, it will be incorrect to compare their standard deviation.
11. **Water cement ratio n [w/c] –**The ratio of amount of water to the amount of cement of cement by weight. This ratio is called the water-cement- ratio.
12. **Bulking of sand –** The presence of moisture in sand increase the volume of sand. This phenomenon content is about 4%.

MATERIALS USED:

Cement

Cement is a binding material of concrete. Cement is used in various type of construction work like building work and other heavy structure. Cement properties and characteristics depend upon its chemical composition. By changing the fineness of grinding or the oxide composition, composition, cement can be made different properties and characteristics. Different types of Portland cement are used in construction work. Cement used was Ordinary Portland Cement of 53 grade confirming to IS 12269-1987.

Fine Aggregate

Aggregate passes through 4.75 mm IS sieve, passed aggregate is known as fine aggregate. It should be free from organic matter, durable, hard, chemically inert, clean and free from adherent coating coatings, etc. It should not be containing any appreciable amount of clay balls or pellets and harmful impurities for example alkalis, salts, coal, mica, shale or similar laminated materials etc. Fine aggregate consist of natural sand, crushed stone sand, crushed gravel sand stone dust or marble dust, fly ash. The sum of the percentages of all deleterious such as decayed vegetation hump, coal dust etc. River sand available was used for concrete and fine aggregate (passing through 800u and retained on 600u sieve was used for Ferrocement.

Coarse Aggregate

Aggregate retained on 4.75 mm IS sieve and material as is permitted in IS 383 for various size and grading is known as coarse aggregate. Coarse aggregate is a large type of coarse materials used in construction, including sand, gravel, crushed stone, slag, recycled concrete. Aggregate are the most mining materials in the world. Aggregate are an element of composite materials such as concrete and asphalt concrete. Coarse Aggregate have high hydraulic conductivity value as compared to most soils, aggregate are broadly used in drainage work like foundation, septic tank drain, road side edge drains, and retaining wall drains. Aggregate are used as a stable foundation or road/rail base with expected. Machine cut aggregate chips passing IS sieve of 20mm (60%) and IS sieve 12mm (40%) are used as course aggregate throughout the work.

Steel Fiber

Fiber cut from the mild steel by lathe machine of size 2cm to 2.5cm in length and thickness of 0.4mm is used. **Steel** is an alloy of iron and carbon and other elements. Because of its high tensile strength and low cost, it is a major component used in buildings, infrastructure, tools, ships, automobiles, mach ines, appliances, and weapons.

Iron is the base metal of steel. Iron is able to take on two crystalline forms (allotropic forms), body centered cubic (BCC) and face centered cubic (FCC), depending on its temperature. In the body-centred cubic arrangement, there is an iron atom in the centre of each cube, and in the face-centred cubic, there is one at the center of each of the six faces of the cube. It is the interaction of theallotropes of iron with the alloying elements, primarily carbon, that gives steel and cast iron their range of unique properties.

In pure iron, the crystal structure has relatively little resistance to the iron atoms slipping past one another, and so pure iron is quiteductile, or soft and easily formed. In steel, small amounts of carbon, other elements, and inclusions within the iron act as hardening agents that prevent the movement of dislocations that are common in the crystal lattices of iron atoms.

The carbon in typical steel alloys may contribute up to 2.14% of its weight. Varying the amount of carbon and many other alloying elements, as well as controlling their chemical and physical makeup in the final steel (either as solute elements, or as precipitated phases), slows the movement of those dislocations that make pure iron ductile, and thus controls and enhances its qualities. These qualities include such things as the hardness, quenching behavior, need for annealing, tempering behavior, yield strength, andtensile strength of the resulting steel. The increase in steel's strength compared to pure iron is only possible by reducing iron's ductility.

Steel was produced in bloomery furnaces for thousands of years, but its large-scale, industrial use only began after more efficient production methods were devised in the 17th century, with the production of blister steel and

then crucible steel. With the invention of the Bessemer process in the mid-19th century, a new era of mass-produced steel began. This was followed by the Siemens-Martin process and then the Gilchrist-Thomas process that refined the quality of steel. With their introductions, mild steel replaced wrought iron.

Further refinements in the process, such as basic oxygen steelmaking (BOS), largely replaced earlier methods by further lowering the cost of production and increasing the quality of the final product. Today, steel is one of the most common man-made materials in the world, with more than 1.6 billion tons produced annually. Modern steel is generally identified by various grades defined by assorted standards organizations.

1. Ferro –Cement

Galvanized woven mesh of a square grid fabric was used. The diameter of meshed wire is 0.43mm.Ferro cement is a construction material consisting of wire meshes and cement mortar. Applications of Ferro cement in construction are vast due to the low self-weight, lack of skilled workers, no need of framework etc. Ferrocement or Ferro-cement (also called thin-shell concrete or Ferro-concrete) is a system of reinforced mortar or plaster (lime ferrocement, sand and water) applied over layer of metal mesh, woven expanded-metal or metal-fibers and closely spaced thin steel rods such as rebar. The metal commonly used is iron or some type of steel. It is used to construct relatively thin, hard, strong surfaces and structures in many shapes such as hulls for boats, shell roofs, and water tanks. Ferro cement originated in the 1840s in France and is the origin of reinforced concrete. It has a wide range of other uses including sculpture and prefabricated building components. The term "Ferro cement" has been applied by extension to other composite materials, including some containing no cement and no ferrous material

Fly Ash

Fly ash is like slag an industrial waste that is widely used as mineral admixture in the cement and concrete industry. The chemical composition of fly ash depends on the composition of the original coal ash. Fly ash with high glass content is used for blending with Ordinary Portland Cement. The glass content in the fly ash depends on burning temperature, the source of the coal, and on the cooling rate. Compared to blast – furnace slag, ordinary and high calcium fly ash is low in CaO and MgO, and is rice in SiO_2. The main chemical components of fly ash are varying amounts of SiO_2, Al_2O_3, CaO, FeO_3 and MgO. Fly ash is the main component in the waste mixture of fly ash and slag, which is produced by power station that use coal as fuel. The amount of unburned carbon in the fly ash primarily depends on the combustion method. In a fly ash-slag mixture, the pozzolanic activity of the fly ash is lower than that of the slag.

Details of Cylinders and Cubes Tested:

S.No.	Designation	No of Specimens	Mesh layer	Steel Fibers in %	Specification
1.	Ao	10	0	0	0,0
2.	A1	5	1	0	1,0
3.	A2	5	2	0	2,0
4.	Bo	5	0	0.5	0,1
5.	B1	5	1	0.5	1,1
6.	B2	5	2	0.5	2,1
7.	C1	10	0	0	0,0,0
8.	C2	5	0	0.5	0,1,0

Testing of concrete cylinder and cube:

The compressive strength of the test cylinder are determined by the compression testing machine. Total numbers of Specimen is 32 in all are crushed. The length of curing dates considered is 7 and 28 days respectively.

We take the type aggregate as 10mm, 20mm. After this, we take the suitable weight of sand using of steel fiber by Mix design. Cylinder and cube made by fine aggregate (sand), course aggregate (10mm, 20mm), cement (OPC) 53 grade, steel fiber, Ferro-cement and water. Vibration processes of Cylinder and cube for purpose of the removing of air voids and dipped for 7 Days and 28 Days. After this, testing process is start of cube with the help of

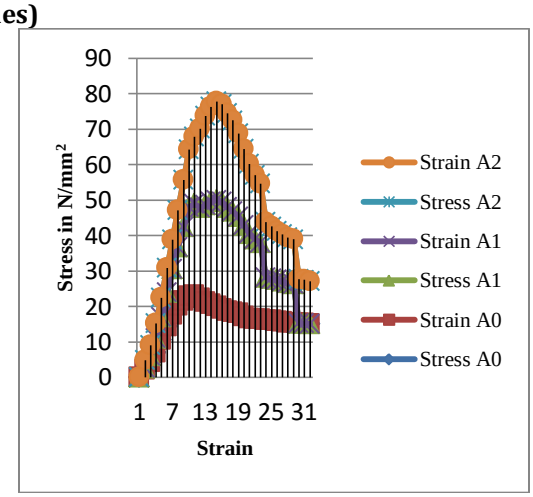
Compressive Strength testing machine, after testing the cube are deformed.

For the purpose of longitudinal strain measurement a standard compress meter is used. It consists of two frames. One called top frame and the other called bottom frame. The inner dimension of the frame is 30mm more than the outside dimensions of specimens.

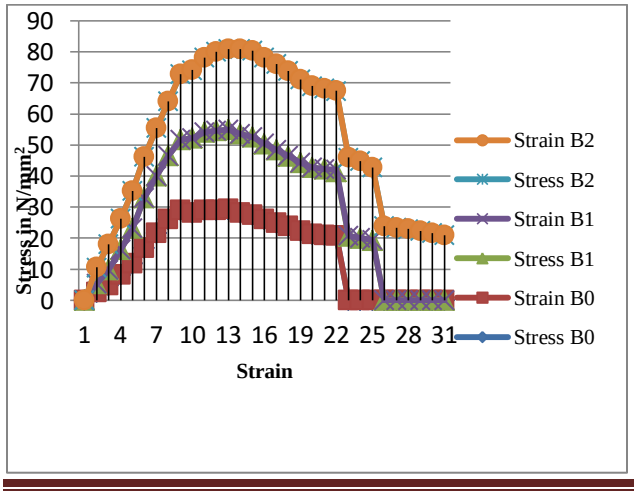
Each frame was attached to the concrete specimen by two diametrically opposite pairs of screws at four points. The screws were positioned at the midpoint of the sides of the square frame. The frames were attached to the specimens symmetrically at the required gauge length i.e. 150mm apart.

RESULT:

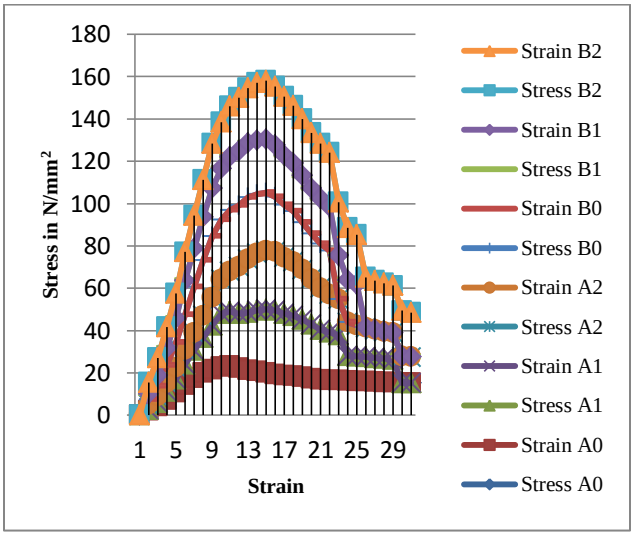
Comparison between Stress-Strain Curve of concrete having $A_0(0,0)$, $A_1(1,0)$ and $A_2(2,0)$deferent specimen (A Series)



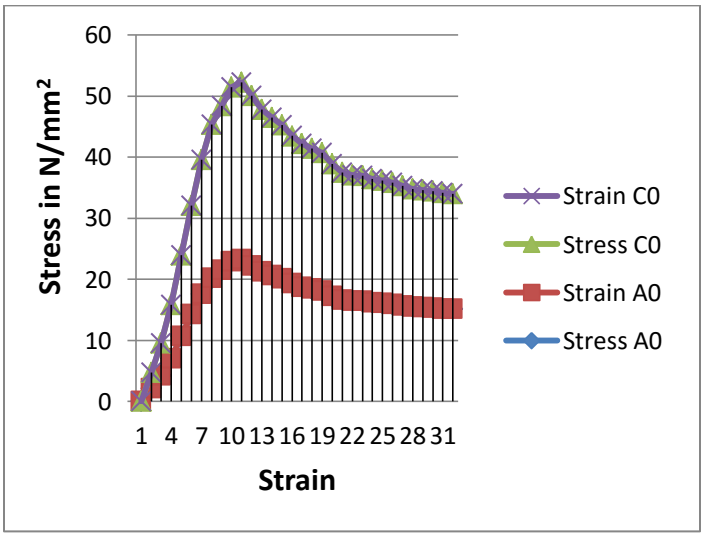
Comparison between Stress-Strain Curve of concrete having $B_0(0,1)$, $B_1(1,1)$ and $B_2(2,1)$ deferent specimen (B Series)



Comparison between Stress-Strain Curve of concrete having$A_0(0,0)$, $A_1(1,0)$, $A_2(2,0)$ $B_0(0,1)$, $B_1(1,1)$ and $B_2(2,1)$ deferent specimen (A & B Series)



Comparison between Stress-Strain Curve of concrete having$A_0(0,0)$ And $C_0(0,0)$ deferent specimen (A & C Series)



CONCLUSION:

1. The confinement of the reinforcement in column with fibers has improved stress-strain behavior compared to plane concrete.
2. The confinement of Ferro cement shell with fibers has improved the stress strain behavior of the concrete.
3. With the increase in the confinement of ferro-fibre reinforcement, concrete has improved the peak the stress and at peak strength.
4. With the increase in the specific surface factor, the improvement in strain is more pronounced.
5. With the use of CFFRC the strain energy absorption capacity has improved by imparting ductility to the structure.

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