DECLARATION

I, Ashish kumar (11208150), hereby declare that this thesis report entitled **"Variation of strength using different material such as steel fibre and rice husk ash "** submitted in the partial fulfilment of the requirements for the award of degree of Master of Civil Engineering, in the School of Civil Engineering, Lovely Professional University, Phagwara, is my own work. This matter embodied in this report has not been submitted in part or full to any other university or institute for the award of any degree.

Date: **Ashish kuamr**

Place:

CERTIFICATE

This is to certify that the thesis entitled **"COMPARISON BETWEEN STRENGTH USING DIFFERENT MATERIAL"** is submitted by **(ASHISH KUMAR 11208150)** to the School of Civil Engineering , LPU- Punjab, for the award of the degree in M.Tech is a bonafide record of work carried out by him under my supervision. The contents of this thesis, in full or in parts have not been submitted to any other Institute or University for the award of any degree or diploma.

Signature of Supervisor

Mr.S.Ganesh

Assistant Professor

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Signature of Student

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ABSTRACT

The Study investigates about the Effect of various fibres in concrete that helps to determine the optimized strength of concrete with respect various proportion of fibres. The influence of Steel fibre and rice husk explains about the mechanism of bonding strength. In this present study the concrete cube size of size of 100 x 100 x 100 mm for cylinder of size 100 x 300 mm were casted in order to determine the compressive strength and split tensile strength parameters. The fibres were cleaned and the dust particles were removed by suitable method and later on added to the concrete Mix. Aspect ratio of the fibre is adopted in each stage of concrete mix preparation so that the uniformity of fibre size is maintained. The Concrete specimens were prepared with each calculated ratio of fibres, these fibres strength along with concrete shows the Individual strength results as well as combined form. Steel fibre was using 0%, 1%, 3% and 5% by volume fraction and rice husk ash is replacing by the ordinary portland cement by the weight at 7%, 12% and 15%. Optimum value of steel fibre is 3% for the compressive strength and for the split tensile strength optimum value is 5 %. And RHA optimum value for replacement is 12 % for both the compressive strength and split tensile strength.Total number of cube casted for compressive strength is 27 and total number casted of cylinder is 27.

Keywords: Steel fibres, Rice husk ash

TABLE OF CONTENT

LIST OF TABLE

LIST OF FIGURE

LIST OF GRAPH

CHAPTER-1

INTRODUCTION

Concrete is the one of most important material which is using now days in construction of buildings or in case of other constructions. We have so many types of concrete but mostly used concrete is Ordinary Portland Cement (OPC) concrete and that concrete include the coarse aggregate, fine aggregate, cement and water. Others types of concrete:-

Normal concrete

- High strength concrete
- High performance concrete
- Air entrained concrete
- Light weight concrete
- Self-weight concrete

Concrete have already enough strength but now days we are adding or replacing so many material in concrete only for increasing the strength. Such materials are steel fibre, silica fume and etc. There are so many materials such as silica fume and rice husk ash by using these material we can increase the surface area so they will absorb more water and by this way we can increase strength or other properties. If we are using the steel fibre for adding in concrete so we need to know the size of fibre and also the

diameter of the steel fibre. And also when we are this material in concrete so we have to be very carefull there shoud not be any ball in concrete when we are adding these materials. And Rice husk is waste material by burning this material we can get a material that is the rice husk ash which is used now days in concrete fot incresing the strength of concrete.

1.1 Rice Husk Ash

1.1.1 History behind Development of RHA

RHA is stand for the rice husk ash. Rice husk ash is a agro based waste material. Rice husk ash is made by the burning of the rice husk and rice husk is a waste material which mostly find out in the region of the rice growing. But after burning the rice husk we find out a supplementary material which has cementations properties and used as addition material in cement. And the rate of this extremely widing used day by day. And by use of this we can increase the strength of the concrete. After burning the 100kg of rice husk we will get the 20kg rice husk ash.

1.1.2 Motive behind Development of RHA

The main motive behind the use of RHA is we can use the waste of rice. Which is nothing but after burning its pozzolanic material in cement. And one more thing is it's economically.

1.1.3 Physical properties of RHA:

Table 0.1: Physical properties of RHA

Particular	Description
Colour	Grey
Particle size	<45 micron
Shape	Irregular
Odour	Odourless
Appearance	Very fine

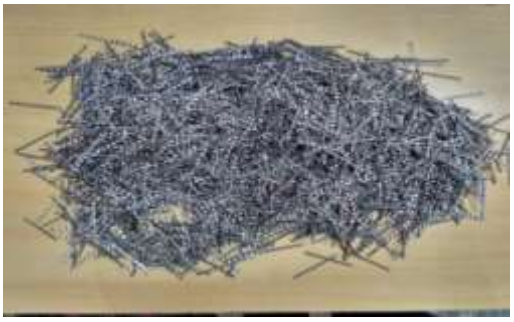
1.1.4 Benefits and Advantages

- Control pollution
- Use of waste
- Increase the strength

1.2 Steel fibre:

Steel fibre is also material which is also used in the concrete that type of concrete is known as the steel fibre reinforcement concrete (SFRC). Steel fibre will also use for increase the strength of concrete and also the other properties of the concrete. But the properties will also affected by the size and aspect ratio, and also the diameter will be also the predefined. So we have to very careful with the sizes and other things of the steel fibre. And also at the time of adding the steel fibre into the concrete we have to be very careful because there is the so many chances of making the balling by the gathering of the steel fibre, so we have to add steel fibre very careful. The length of the steel fibre is 5cm which is using by me. The fibre were then added in small amounts to avoid fibre balling and to produce the concrete with uniform material consistency and good workability.

Figure 1: Sample of Steel Fibre



1.2.1 Physical properties of Steel fibre

Table 0.2 Physical properties of Steel Fibre

Properties of fibre	Parameter
Length	5cm
Colour	Silver
Shape	Crimpte fibre

Advantage of using steel fibre is it will increase the strength.

CHAPTER -2

LITERATURE REVIEW

J. DHANALAKSHMI et al(2016) has invetigate the due to the manufacturing of cement, emission of co_2 is increasing in the atmosphere and rice husk ash is also a problem for dipose it. So they find the workability, compressive strength and the split tensile strength.according to them the fine RHA is the best for the replacing the cement because due to fineness surface area will be more and the find the optimum value for replacing the cement is 20%.

ANANYA SETH, ANIRUDH GOEL et al(2014) has investigate the mechanical properties of the concrete by using the Expanded poly stryene(EPS) and the rice husk ash.In this research they replaced the aggregates with the Expanded poly stryene(EPS) and ordinary portland cement with the rice husk ash by the weight. They are using the EPS for the decrease the unit weight and rice husk ash is using for the increase the workability. Mixture proportioning was done for the strength 65Mpa. In other research they got the 10Mpa and aim of him is for 25 Mpa.With addition of rice husk ash they verified that the water absorption will increase. And the compressive strength will also increase but only when if we will the less quantity of rice husk ash with the Expanded poly styrene(EPS) And they also preferd the small size of particle.

PATNAIKUNI CHANDAN KUMAR, PALLI MALLESWARA RAO et al(2013) has investigate that, they have replaced they ordinary portland cement with the rice husk ash at different percentage 0%, 5%, 7.5%, 10%, 12.5%, 15%, 20%.and the size of all the specimen is 100mm* 100mm* 100mm. They got the optimum percentage for replacement is 7.5%. and i have studied that also normal concrete exhibited zero strength at a temepreture 1000 C. That shows us concrete cannot withstand a temperatyre of 1000 C or above. Compessive strength with replacement of rice husk ash of cement will increase upto the the 500 C and above this it will decrease. And for the mixing first the mixed all the gredients in dry condition and then add the 80% of water and rest water will be add later. And because silica is more present in the rice husk ash means workability will be less so they use the super plasticizer dosage for maintain the workability 75mm.the rate was applied gradually at a rate of 5kn/mintue until the specimen showed the first crack.

MAURICE E. EPHRAIM, GODWIN A. AKEKE et al(2012) has investigate the rice husk ash is replacing with the ordinary portland cemnet at the different different pecentage 10%, 20%, 25%.specific gravity find by them was 1.55 and the mix ratio was the 1:1.5:3.they done the curing for the 7 days, 14 days, 21 days, 28 days. According to them because of silica the workability will be less so they add some dosage of super platicizer for maintaining the workabilty. The optimum value for the replacement of rice husk ash with the ordinary portland cement is the 10%. At 7, 14, 21, 28 days the compressive strength will be more for 10% but when they increase the quantity of rice husk ash 20% and 25% the strength was decreasing respectively.

S. D. NAGRALE, PANKAJ RR. MODAK et al(2012) has investigate about the rice husk utilization.According to this paper rice husk is the one of material which is producing more in india.by this rice husk india produce the 20 million tone rice husk ash.major problem with rice husk is dumping, so they were trying it with replacement of ordinary portland cement with this rice husk ash for looking of the strength variation. Percentage of replacemnt is the 15-25%.and according to them the burning tempereture should be 600 C, because if it shoud be above the the 700 C so that will produce the crystalline silica which is fae less reactive. And inthe conclusion they have seen the compressive strength is increasing, but the optimum percentage is 17%.

RAVANDE KISHORE, V. BHIKSHMA et al(2011) has investigate that rice husk ash for the compressive strength the 10% will be the optimum percentage for the rice husk ash for replacing the ordinary portland cement. They tried the three different percentages for 5%, 10%, 15%.according to him due to relative high water demand, the lime rice husk ash cement devloped lower compressive strength. And also the water demand will also increase with increasing the quantity of the rice husk ash. In case of split tensile strength the strength will decrease with due to increasing the quantity of rice husk ash. For compressive strength the make the cube and for the split tensile strength they make thecylinder.

NOOR SHUHADA MOHAMMAD et al(2011) has investigate about the rice husk ash in the case of fine grained mortar.they were using the ordinary portland cement for replacement of rice husk ash and for investigate they were using the XRF to know the content of silica is present in this material.they were testing for the different 0%, 10%, 20%,30%. In this paper they were finding the compressive strength and flexural strength.the optimum percentage for replacement was the 20%.Prism was using for the flexural strength and the size of prism was 40mm*40mm*160mm. And they find the optimumu percentage is 20% because for 7 days the strength was the 4.37 N/mm^2 and for the 28 days the strength was the 6.66 N/mm^2. For maintain the workability the were using the super plasticizer 1% by the weight.

GHASSAN ABOOD HABEEB et al(2009) has investigate about using the average particle size of rice husk ash effect on the mechanical properties and drying shrinkage properties.Locally produced rice husk ash size is 31.3, 18.3 and 11.5 micometere. They replacing the ordinary portland cement with the rice husk ash by the weight and the percentage was the 20%.

The fresh properties of concrete was the, there was no bleeding, no segregation and slump range was the 210-230mm. They shows that there will development of strength at various stages,Means the compressive strength will increase day by day. Flexural strength will also increase and the higher strength was for the finer rice husk ash due to the increased pozzolanic reaction and the packing ability of rice husk ash fine

particles.split tensile strength has been enhanced by adding the the rice husk ash in the concrete.

JING JU LU et al(2017) has investigate about the flexural toughness evaluation method of steel fibre reinforcement in lightweight aggregate concrete. But at the first stage they find out the density, workability and the compressive strength and also in additionally they find out the microstructure of SFLWC byusing scanning electron microscope.The optimal percentage is 2% of steel fibre was proposed based on the degree to which the fibre improved the toughness of plain light weight concrete(LWC). The effectiveness of the steel fibre on pre-peak behaviour was superor to that on the post-peal behaviour. The interfacial zone at aggregate paste was not the weakest link in SFLWC. Length was 38mm, diameter was 0.7mm and the aspect ratio was the 54. For the maximum load the capacity of machine was the 2000KN. According to the conclusion the steel fibre will decrease the workability and enhance the compressive strength and also improve the post cracking ductility of light weight concrete(LWC).

G.M. CHEN, H. YANG et al(2016) has investigate about the fracture behaviour of steel fibre reinforced recycled aggregate concrete after exposure to elevated temperature. One of the main concern for using such concrete in building is spalling and post-fire residual mechanical properties.the steel fibre was the 0%, 0.5%,1%,1.5% and the exposure temperature was room temperature,200 C,400C and 600 C has investigated. In the result the steel fibre postpones the initiation of cracks and also enhance the fracture energy.the depth, height and length of speciman was the 100mm, 100mm, 515mm respectively. That is all based on three-point notched beam test. After exposure to 400 C and 600 C micro cracks were seen by naked eyes.higher fibre contents generally lead to more tortuous crack pattern of the notched beams, implying longer crack paths and thus larger fracture energy to be absorb. The fracture energy has been enhance after exposure to high temperature up to 600 C. And the optimum value of steel fibre is 1% by volume for fracture energy.

DEEPA A SINHA et al(2014) has investigate about the characteristic properties of steel fibre reinforce concrete with varying a percentage of steel fibre. They were using the steel fibre by the volume fraction in concrete and the different percentages was the 0.5%, 0.75%, 1%, 1.25%, 1.50%, 1.75%, 2.0%. The optimum percentage was the 1%

for adding in the concrete by the volume fraction. The grade was the M30, proportioning for this grade is 1:1.86:2.41. According to this paper if we will increase the percentage of steel fibre in concrete so, compressive strength will also decrease. For 7 days it will increase 11% and for 28 days it will increase 6%. Similar trends are observed for the tensile strength.They fouund that after adding the 1% steel fibre result in 42% and 32% increase in 7 days and 28 days tensile strength respectively.

N. SHIREESHA et al(2014) has investigate the mechanical properties of steel fibre reinforced concrete.the quantity of steel fibre was the 0.5%,1% and 1.5% by the volume fraction.they were using the hooked end steel fibre.the compressive strength was the higher was for the 1.5%. by adding the steel fibre in concrete compressive strength increase 8% to 21% for 7 days and 6% to 12% for 28 days and the split tensile was also the higher at the 1.5%.the split tensile strength was increase from 14% to 36% for 7 days and 15% to 39% for 28 days.

A.M. SHENDE, A.M. PANDE et al(2012) has investigate about the steel fibre adding in the concrete with the different quantity of steel fibre. They were adding the steel fibre in concrete by the different volume fraction. The percentage was the 0%, 1%, 2% and 3%.i have studied the effect of steel fibre on the strength(compressive strength, split tensile strength, flexural strength) of concrete.The grade was the M40, proportioning for this grade is 1:1.43:3.04. strength properties are observed to be on higher side for aspect ratio 50 compare to 60 and 67. I have also learn the the compressive strength will increase upto the 11 to 24% after adding the steel fibre, flexural strength will increase upto the 12 to 49% after adding the stee fibre and split tensile strength will increase upto the 3 to 41% after adding the steel fibre in concrete.

M.L. BERNDT et at(2010) has investigate the strength and the permeability of steel fibre reinforced grouts.they were using the 13mm round steel fibre and the diameter is 0.16 mm. Grouts were added 0.5% and 1% by the volume fraction. They found that the steel fibre is beneficial for short and long term tensile strength. Resistance to microcracing and increase the permeability after wet dry cycle.

K. HOLSCHEMACHER et al(2010) has investigate the the effect of the steel fibre on mechanical properties of high strength concrete.one of the most advantage of using the steel fibre is hindrance of microcracks development or delay in microcracks. This paper deals with a role of steel fibres having different configuration in combination with steel bar reinforcement.they were using the three type of fibres.two were the straight with end hooks with differenet fibres and one corrugated were used.they were also using the 2 bars of 6 dia and 2 was the 12 dia.

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P.S. SONG et al(2004) has investigate about the high strength concrete with the steel fibre. The steel fibre were added in concrete at the volume fraction of 0.5%,1%,1.5% and 2%.The compressive strength reached at maximum after adding the 1.5% steel fibre in concrete and the improvement was in strength 15.3% over the HSC and for split tensile strength the maximum value was the 2% of steel fibre and also for the modulus of rupture.

CHAPTER 3

SCOPE OF THE STUDY

3.1 GENERAL

Constructionnhas been an important element in the rapidly changing modern survey.innovation in construction is highly linkes with the development of advanced construction materials.cementitious materialsare the major class of construction materials that have been used for several millennia. The ancient cementitious materials were lime alone or lime in combination with natural pozzolan, as well as gypsum, while the modern ones are largely portland cement. Many countries arein severe shortage of cement,in spite of higher demand. There would be an increase in the useof combination of portland cement with large content of mineral additives. Therefore, the search for alternative binder or cement replacemnt materials has baecome a technological interest and there is an urgent need to develop newer concrete as a reliable and durable construction material.

The amount of portland cement replaced with the pozzolanic materials depends not only the on the physical and chemical properties of the pozzolanic materials, bur also on the characterstics of the portland cement and pozzolan. These include control of the alkali – aggregate reaction,improvement in durability properties,enhancement of resistance against the corrosion of steel in concrete and reduction in the heat of hydration. While 40 to 50% replacement is permitted by many standards, optimum replacement from a strength point of view appears to less than 30%. With this amount of replacement for what can be referred to as good reactive pozzolan, the days compressive strength with at least be comparable than the strength of the unsubstituted portland cement. For poor pozzolanic materials, the amount of replacement could reduce to 10% to achieve strength equivalence at 28 days.

3.2 SCOPE OF THE STUDY:

Many studies were carried out on the utilization of RHA, obtained from the controlled burning of RICE HUSK and most of the studies are focused on the improvement of physical and mechanical properties of Rice Husk Ash in concrete.here we are replacing the ordinary portland cement with Rice Husk Ash. The percentages will 7%, 12% and 15%. In this study we are focusing on the compressive strength and split tensile strength. In this research work, We will find the percentage of replacemnt of RHA with the ordinary portland cement for the compressive strength and also for the split tensile strength. For finding the compressive strength, we will cast the cube and for finding the split tensile strength, we wil cast the cylinder.

The uniformly dispersed fibres strengthen the cement matrix and bridge over cracks, reduce the cracking sensitivity of the matrix and decrease the crack width. Although addition of fibres is expected to improve the engiineering properties, it is not well understood for various types of fibres and should be tested for each kind of fibre . because use of steek fibre has disadvantages like corrosive nature. Therfore there is a need for researchers to investigtae on new type of fibre made of synthetic which no-corrosive and chemically inert for use in fibre reinforced concrete to improve its quality.

CHAPTER 4

OBJECTIVE OF THE STUDY

The objective of the present investigation are:

- To convert the rice husk into the rice husk ash by the burning the rice husk at 650^0c tempereture for one hour
- To characterizethe physical and chemical properties of Rice Husk Ash.
- To find the compressive strength by uisng the RHA at different percentages 7%, 12% and 15%.
- To find the split tensile strength by using the RHA at different percentages 7%, 12% and 15%.
- To find the compressive strength and split tensile strength by using the steel fibre at different percentages 1%, 3%, 5% and 7%.
- The main objective of thesis to obtain the concrete with fibres to be effectively controlled cracking.

- And use the concrete with free crack.
- To increase the properties like compressive strength,ductility,flexural,quality of the concrete.
- To compare the strength at different percentages after using the RHA and steel fibre in concrete.
- The properties of materials such as cement, fine aggregate, coarse aggregate and fibre that are going to be used in the specimen preparation were determined and the values have been tabulated.
- To study the different strength properties of rice husk ash concrete with age in comparison to control concrete.

CHAPTER 5

MATERIALS AND PROPERTIES

5.1 MATERIAL USED

5.1.1 RICE HUSK ASH:- Rice Husk Ash was burnt for approximately 72hours in air in an uncontrolled burning process. The tempereture was in the range of 400-600^{0}C and the colour is grey.RHA particle size is less then the 75micronmeter.

Ttable no. 5.1 Physical properties of RHA

S.No	Particular	Description
1	Colour	Grey
2	Particle size	<45 micron
3	Shape	Irregular
4	Odour	Odourless
5	Appearance	Very fine

Table no. 5.2 Chemical properties of RHA

S.no	Particular	Description
1	Silicon dioxide	86.94%
2	Aluminium oxide	0.2%
3	Iron oxide	0.3-2.2%
4	Calcium oxide	0.2-0.6%
5	Magnesium oxide	0.1-0.8%

5.1.2 CEMENT:- Ordinary portland cement (OPC) of 43 gradewas used in which compositionand properties is in compliance with the Indian standard organization.

Cement can be defined as the bonding material having cohesive and adhesive properties which makes it capable to unite the different construction material and from compacted assembly.

The cheif chemical components of OPC:-

- Calcium
- Silica
- Alumina
- Iron

BASIC COMPOSITION:-

Table no. 5.3

S.No	Contents	Percentages
1	Cao	60-67
2	Sio_2	17-25
3	Al_2o_3	3.3-8
4	Fe_2o	6.0
5	Mgo	0.5-0.40
6	Alkalis	0.3-3.5

CHARACTERSTICS OF OPC 43 GRADE:-

1. Durable
2. Corrosion resistance
3. Low heat of hydration
4. Volume stability
5. Gigantic compressive strength

SETTING AND HARDENING:-

Cement sets when mixed with water by way of a complex series of chemical reactions still only partly understood. The different constituents slowly crystallize and the interlocking of their crystals gives cement its strength.caebon dioxide is slowly absorbed to convert the portlandite into insoluble calcium carbonate. After the initial setting, immersion in warm water will speed up settin. Gypsum is added as an inhibitor to prevent flash setting.

CONCRETE:

Concrete is a composite material composed mainly of water, aggregate, and cement. Often, additives and reinforcements are included in the mixture to achieve desired physical properties of finished material. When these ingredients are mixed together, they form a fluid mass that is easily molded into shape. Over time, the cement forms a hard matrix which binds the rest of the ingredients together into a durable stone-like material with many uses.

CHARACTERSTICS OF GOOD CONCRETE:-

1. Workability
2. Freedom from segregation
3. Freedom from bleeding
4. Strength
5. Durability
6. Appearance

5.1.3 AGGREGATES:-

The inert mineral materials such as sand, gravel, etc used for manufacture of concrete are known as aggregates. Requirements of good aggregates

1. It should be sufficiently strong.
2. It should be hard.
3. It should have rough surface.
4. It should be in spherical or cubical in shape.

CLASSIFICATION OF AGGREGATES:-

1. Coarse aggregates

2. Fine aggregates

COARSE AGGREGATE**:-** The aggregate which pass through 75mm is sieve and retain on 4.75mm is sieve are known as coarse aggregate.

FINE AGGREGATES**:-** The aggregates which pass through 4.75mm IS sieve and retain 75 micron IS sieve are known as fine aggregates.

5.1.4 WATER:-

Water plays an important role in concrete production in that starts the reaction between the cement, pozzolan and the aggregates. It helps in the hydration of the mix. In this research, the water usedwas distilled water.

5.1.5 STEEL FIBRE:-

Steel fibre is also material which is also used in the concrete that type of concrete is known as the steel fibre reinforcement concrete (SFRC). Steel fibre will also use for increase the strength of concrete and also the other properties of the concrete. But the properties will also affected by the size and aspect ratio, and also the diameter will be also the predefined. So we have to very careful with the sizes and other things of the steel fibre. And also at the time of adding the steel fibre into the concrete we have to be very careful because there is the so many chances of making the balling by the gathering of the steel fibre, so we have to add steel fibre very careful.

Table no. 5.4 Physical properties of Steel Fibre

Sr.N	Properties of fibre	Parameter
1	Length	5cm
2	Colour	Silver
3	Shape	Crimpte fibre

CHAPTER-6

METHODLOGY AND EXPERIMENTAL WORK

My all the thesis work is experimental work. Here m using the material cement, coarse aggregate, fine aggregate. And the size of aggregate will be the 10mm and 20mm.The percentage 60% of 10mm of coarse aggregate and 40% of 20mm of coarse aggregate for per cube. And then experimental work will done. And then cast the cube by using this material for compressive strength and also the cylinder for the tensile strength. Casting will done the grade M20.three supplementary material Rice husk ash, coconut fibre and steel fibre are using. Number of the cubes is 27 for testing of the compressive strength and as well as cylinder number is fore casting the 27 cylinder for testing of tensile strength. Average of 3 cube and 3 cylinder. In whole the casting the total quantity of cement will be 52.704kg, Fine aggregate Quantity is 79.056kg and the total quantity of coarse aggregate 158.184kg. First of all we have to be done all experimental work on materials.

- Fineness test
- Consistency test

- Initial setting time
- Final Setting time
- Soundness test
- Specific gravity test

Experiment of the Aggregates:-

- Sieve analysis test
- Specific gravity test of aggregates
- Water absorption test of aggregates

Experiments of the Sand:-

- Sieve analysis test
- Specific gravity test

6.1 Material used

Cement

Cement is the binding material which is used in the field of construction cement has two type of components

- Calcium components
- Clay

Composition of Cement is the Lime, silica, alumina, calcium sulphate and the other also.

Table 6.1 Material presence in cement

Materials	Percentage (%)
Lime	62-67%
Silica	17-25%
Alumina	3-8%
Calcium sulphate	3-4%
Iron oxide	3-4%
Sulphur	1-2%

In cement the Lime or calcium oxide will imparts strength and also the soundness to the cement Silica will also increase the strength and it's also increase the setting time Alumina also imparts the quick setting property of the cement and in excess there will

be some weakness in cement and here calcium sulphate will help to the increasing the initial setting time and iron oxide will provide the colour.

Physical properties of cement:-

Table 6.2 Physical properties of cement

Properties	Description
Colour	Grey
Specific gravity	3.15
Size	2-50 micrometer
Shape	Angular shape

6.2 Experiments of cement:-We have different-different experiment

6.2.1 Fineness test

Procedure:-

- First we have to be take sample weight of cement of 100gm.
- Then we will use the sieve of 90 micron.
- Sieve will be used by us for 20 minute.
- Then we will weigh the retained sample.
- In final the weight of retaining cement should be less than the 10% of weight.

Table 6.3 Quantity of sample

Material	Quantity
Total weight of sample	100gm
Weight retained	5gm
Percentage wt retained	<10%

6.2.2 Consistency test:-

To find the initial setting time, final setting time, soundness and strength of the cement a parameter known as consistency has to be used. For finding the consistency we will use the "VICAT'S PLUNGER". The Diameter of the needle is 10mm and the height will be the 50mm.This apparatus is used to "find the water content require to produce the cement paste" of standard consistency.

Procedure:-

- First we will take the cement sample 250kg.
- Then we add in this 28% water for first trial.
- Remove all the air voids from present in the sample.
- Then release the plunger and then measure the depth of perimeter from the bottom.

Figure 2: Figure of Cement Paste

When the sample is 250g

Material Quantity

Material	Water	Quantity
28% of 250gm	70ml	24mm
30% of 250gm	75ml	19mm
32% of 250gm	80ml	12mm
34% of 250gm	85ml	8mm

Hence the consistency is 34%.

6.2.3 Initial setting time:-

Initial setting time is the time measure from the instant water is added to the cement upto the instant its starts losing its plasticity.

Procedure:-

- Take the sample of cement 500gm.
- Then find the consisency and then see the penetrate it;'s upto the

33mm to 35mm from the top.

- Then time for penetrate is known as the initial setting time.

Figure 3 : Vicat Apparatus

Table 6.4 : Initial setting time

Time(10 min gap)	Penetration(From bottom)
0-10	3mm
10-20	4.5mm
20-30	6mm

Hence the initial setting time is 30 minute.

6.2.3 Specific gravity test:-

Procedure:-

- First weight of empty flask.
- Then weight flask and cement.
- Then weight of flask, cement and diesel.
- Then weight flask and diesel

In tabular form:-

Quantity of material

Perimeter	Name	Weight
W_1	Wt. of flask	111gm
W_2	Wt. of flask cement	161gm
W_3	Flask+cement+diesel	400gm
W_4	Flask+diesel	358.5gm

Calculation:

Calculation is given in below image for specific gravity:-

Specific gravity= $(w_2-w_1)/ ((w_2-w_3)-(w_2-w_4)*.87)$

$=(161-111)/((161-111)-(400-358.5)*.87)$

$=3.139/cc$

6.3 FINE AGGREGATE:-

Fine aggregate is the one of the important part of the concrete. That is also used in field of construction. That is also known as sand and we can got it from the marine and also from the land.

Physical properties of sand:-

Table 6.5 Physical properties

Name	Properties
Size	0.0625mm to 0.004mm
Shape	Granular
Specific gravity	2.60 to 2.80

We have so many test of sand.

6.3.1 Specific gravity test:-

Procedure:-

- First take the weight of pycnometer.
- Then take the weight of sand pycnometer and water.
- Then take the weight of pycnometer and water.
- Then take the weight of sand from oven after 24 hours.

Table 6.6 Reading of specific gravity

Perimeter	Name	Weight
W’	Wt. of pycnometer	645gm
W	pycnometer+sand+water	1845.8gm
W_1	Pycnimeter+water	1500gm
W_2	After 24hr	545gm

Calculation

Specific gravity= $(W_2)/ (W_2-(W-W_1))$

= (545)/ (545-(1845.8-1500))

=2.73gm/cc

6.3.2 Sieve test:-

Procedure:-

- First we will take the sample of sand.
- Then we will arrange the sieve according to the series.
- Then we will calculate the weight of retained sand.
- Then Percentage of cumulative sand retained.

Tabular form:

Table 6.7 Material Quantity for sieve test

Sieve size	Wt retained in gm	% retained	Cumulative wt. retained	Cumulative %of sand retained
4.75	1	0.06	-	-
2.36	1	0.06	1	0.06
1.18	15	0.80	2	0.12
600 micron meter	1	0.06	17	0.92
300 micron meter	1	0.06	18	0.98
180micr	640	32	19	1.04
90 micron meter	850	42.5	659	33.04
75 micron meter	490	24.5	1509	75.54
			1999	100.04
				211.74

Calculations

Fineness modulus=211.74/100

=2.11

So in result the sand is very fine.

6.4 COARSE AGGREGATE:-

Coarse aggregate are basically used in the field of construction these are mainly use in concrete to provide the better binding with the cement. Here the coarse aggregate of two size 10mm and 20mm.

Physical properties of coarse aggregate:

Table 6.8 Physical properties of Coarse aggregate

Name	Properties
Size	<40mm
Shape	Irregular

Experiments of coarse aggregate:-

6.4.1 Specific gravity test and water absorption test:-

Procedure:-

- First we will calculate the weight of basket in air/water.
- Then Weight of basket and aggregate in water.
- Then wt. of aggregate after 24hr

Table 6.9 Material for water absorption test

Perimeter	Weight	Quantity
W_1	Basket aggregate in water	3250gm
W_2	Basket in air/water	850gm
W_3	Wt. before oven dry	3984gm
W_4	After 24hrs	3981.5gm

Calculation

Specific gravity $=W_3/(W_4-(W_1-W_2))$

$=3984/ (3981.5-(3250-850))$

$=2.52$gm/cc

Water absorption$=100(W_3-W_4)/W_3$

$=100(3984-3981.5)/3981.5$

=.1%

CHAPTER 7
RESULT AND DISCUSSION

7.1 MIX DESIGN FOR M20 GRADE

Materials for proportioning:

a) Grade of concrete: M20

b) Types of cement: OPC 43 Grade

c) Maximum size of coarse aggregate: 20mm

d) Maximum cement content: 450kg/mt^3

e) Types of aggregate: crushed

Test data for material: all data is based on the results which were donr in laboratory.

a) Specific gravity of cement= 3.125

b) Specific gravity of coarse aggregate =2.66

c) Specific gravity of fine aggregate=2.638

d) Water absorption of CA=0.61%

e) Water absorption of FA=0.81%

f) Fineness modulus of CA=2.662

g) Fineness modulus of FA=2.46

h) Consistency of cement=28%

i) Soundness of cement=0.3

j) Initial setting time=49.33 min

k) Final setting time=610 min

1. **Target strength for mix design**

$$\mathbf{F_{ck} = f_{ck} + (t * s)}$$

Where F_{ck} is target average compressive strength at 28 days and f_{ck} is the characteristic at 28 days. s is standard deviation and t is a statistic variable depending upon the accepted proportion of low results and the no. of tests.

$$F_{ck} = 20 + (1.65*4.6) = 27.59 N/mm^2$$

2. **Selection of water cement ratio**

W/C ratio for corresponding F_{ck} value =0.48

3. **Air content:**

For maximum size of 20 mm aggregates the entrapped air 2% of the vo;ume of concrete.

4. **Water content and fine to total aggregate ratio**

For nominal maximum size of 20 mm aggregates and concrete grade of M20the water and sand content are obtained 186 kg/m^3 and 35% of total aggregate vo;ume respectively.

5. **Adjustments of values in water content and sand percentages**

No corrections are required since aggregates used are not rounded and there is no increase or decrease in w/c ratio compaction factor.

6. **Determination of cement content**

W/C ratio= 0.48

Water content = 186 kg/m^3

Cement content =387.5 kg/m^3

7. Check for minimum and maximum cement content

The calculated cement content of 387.5 is adequate as per IS: 456:1978

8. Determination of coarse and fine aggregate content

Fine aggregate:

0.98= (186+387.5/3.125 +(1/0.35)*(f_a/2.638))*(1/1000)= 618.611 kg

Coarse aggregate:

0.98=(186+(387.5/3.125)+(1/(1-0.35))*(C_a/2.66)*(1/1000)= 1158.43kg

9. Total quantities of ingredients and mix proportions

Table no.7.1 Quantities of ingredients and mix proportions

cement	Fine aggregate	Coarse aggregate	water
387.5 (kg)	618.611 (kg)	1158.43 (kg)	186 (kg)
1	1.597	2.99	0.48

7.2 Workability and density of concrete

A concrete is said to be workable if it is easily transported, placed and compacted without any segregation.we have three method to determine the workability of concrete.

- Slump test
- Compaction factor test
- Vee-bee consistometer test

The slump test was used to determine the workability. Mould which is used for the slump test,the upper diameter is 10cm, below diameter is 20cm and the height is 30cm.

Slump values at different percentages of Rice Husk Ash(RHA):

Table no 7.2 slump value for RHA

Serial no	W/c ratio	% RHA	Slump value
1	0.48	0 %(control)	103
2	0.48	7 %	108
3	0.48	12 %	110
4	0.48	15 %	93

Slump values at different percentages of Steel Fibre(SF):

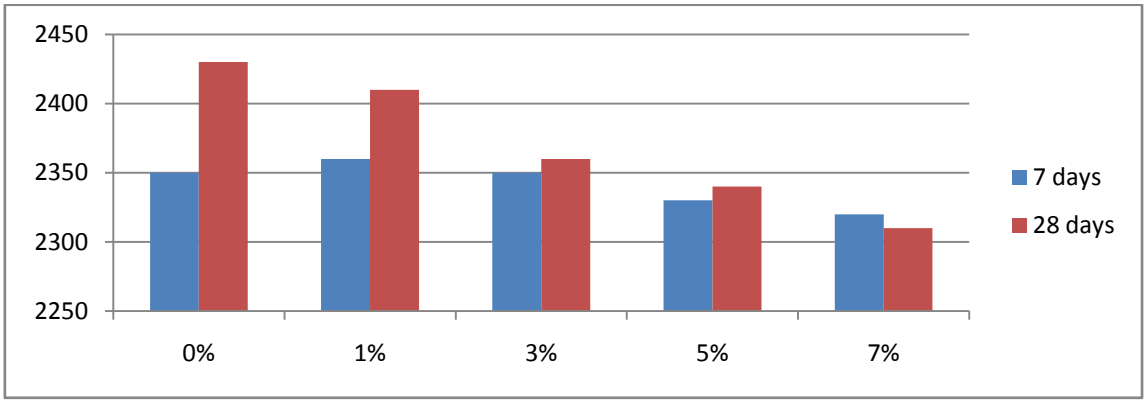
Table no 7.3 Slump value for Steel fibre

Serial no	W/c ratio	% Steel Fibre	Slump value
1	0.48	0 %(control)	103
2	0.48	1 %	98
3	0.48	3 %	95
4	0.48	5 %	91
5	0.48	7 %	88

Density of concrete:- Using cube size is 100mm*100mm*100mm. For finding the density first we have to be take weight of cube:

Table no 7.4 for density of cubes

Serial no	% of steel fibre	Density(7 days kg/mt^3)	Density(28 days kg/mt^3)
1	0 %	2350	2430
2	1 %	2360	2410
3	3 %	2350	2360
4	5 %	2340	2340
5	7 %	2320	2310



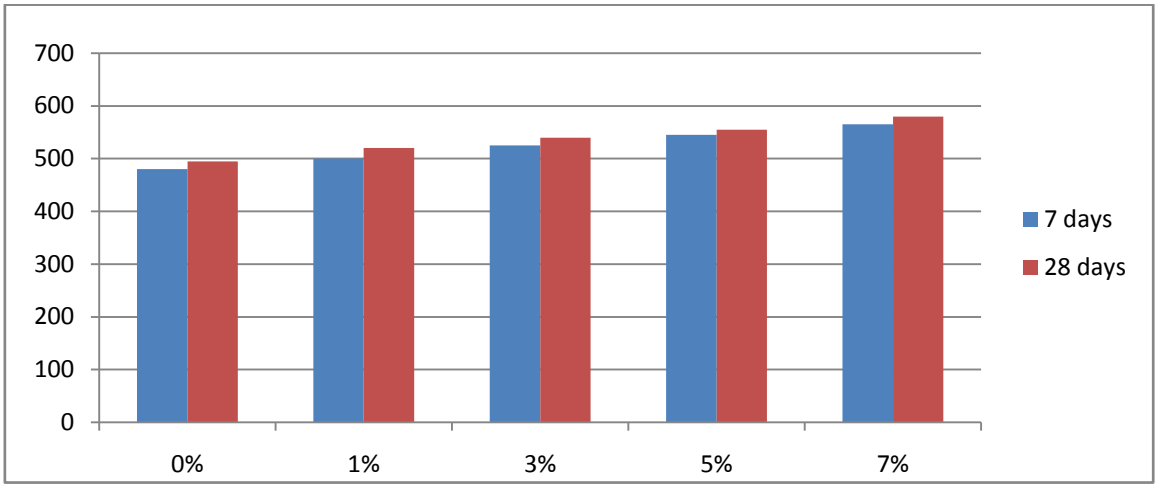
Graph 7.1 of density for cube

Cylinder size is 300mm*100mm.

Table 7.5 for density of cylinder

Serial no.	% of steel	Density after 7 days(kg/mt^3)	Density after 28 days(kg/mt^3)
1	0 %	480	495
2	1 %	500	520

3	3 %	525	540
4	5 %	545	555
5	7 %	565	580

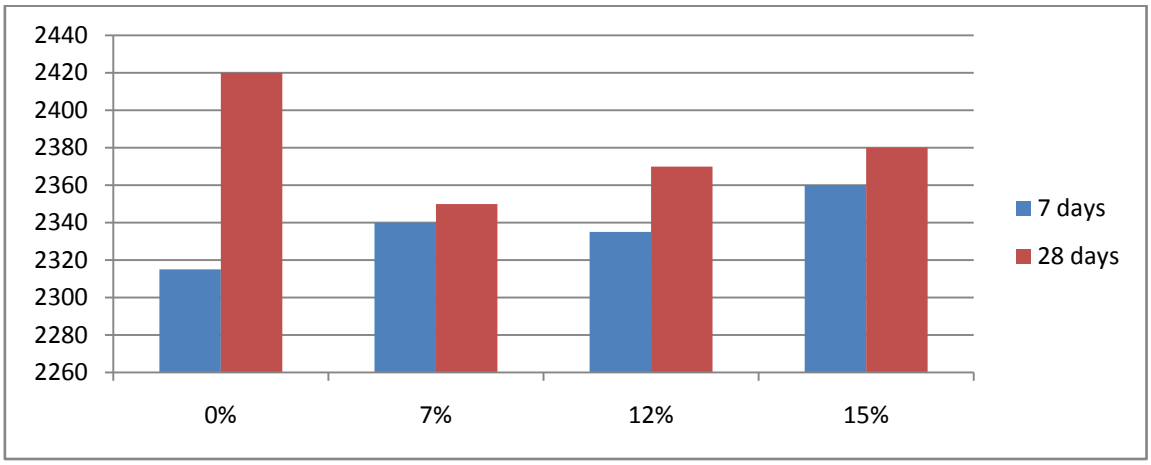


Graph 7.2 of density of cylinder

Density of cubes after using the Rice Husk Ash:-Cube size 100mm*100mm*100mm.

Table no 7.6 for density of cubes by using RHA

Serial no.	% of RHA	Density after 7 days(kg/mt^3)	Density after 28 days(kg/mt^3)
1	0 %	2315	2420
2	7 %	2340	2350
3	12 %	2355	2370
4	15 %	2360	2380

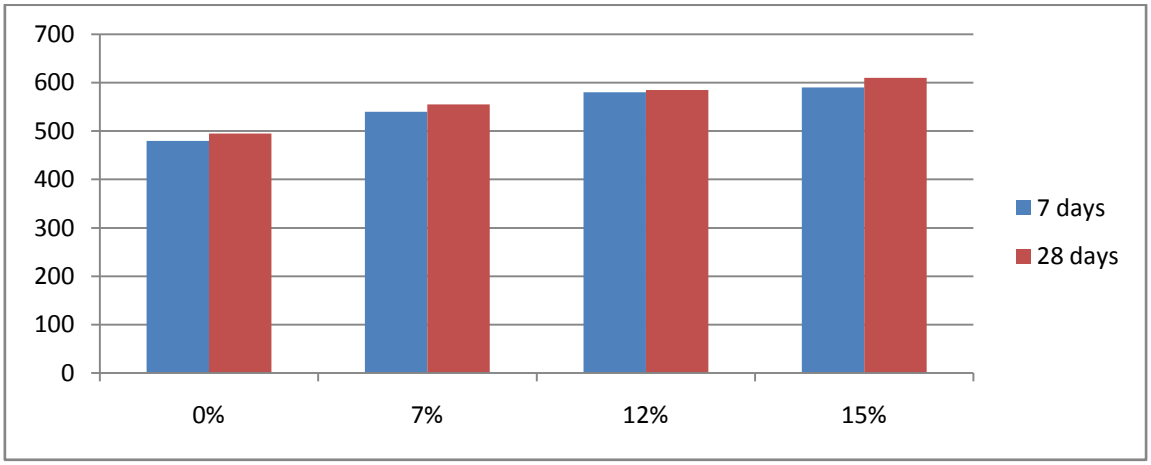


Graph 7.3 of density of cube

Cylinder size is 300mm*100mm.

Table no 7.7 of density for cylinder by using SF

Serial no.	% of RHA	Density after 7 days(kg/mt^3)	Density after 28 days(kg/mt^3)
1	0 %	480	495
2	7 %	540	555
3	12 %	580	585
4	15 %	590	610



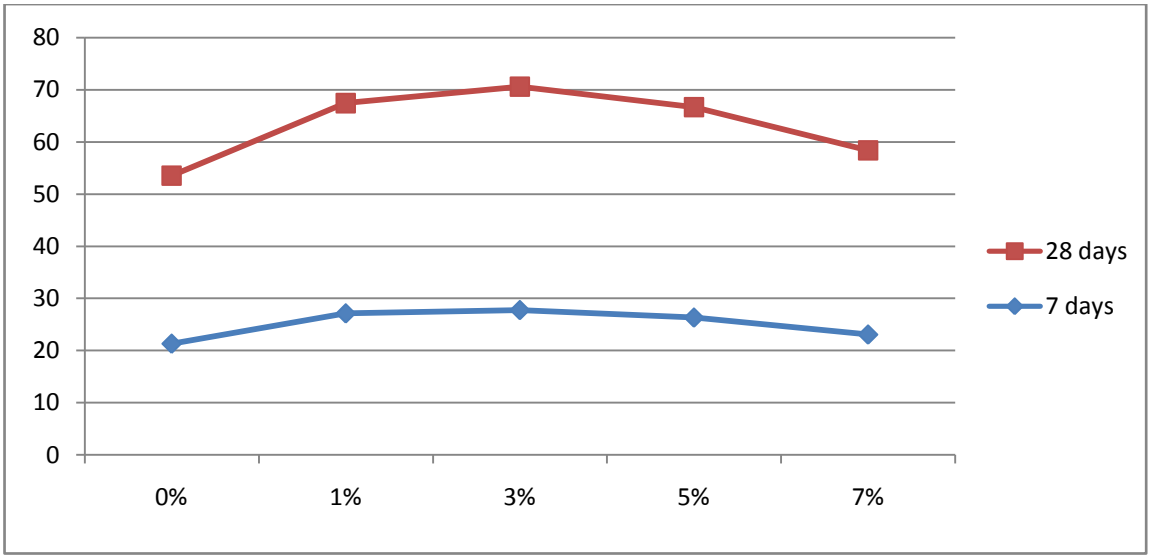
Graph 7.4 of density cylinder

7.3 Compressive strength:- The compressive strength of any material is defined as the resistance to failure under the compressive force.compressive strength is find out for the different percentages 0 %, 1%, 3 %,5 % and 7 %.I found the optimum value of steel fibre is 3 % for adding into the concrete by the weight. And the size of cube is 100mm*100mm*100mm which is used for finding the compressive strength.compressive strength will find out by the using of UTM.where the load was applying at the size of cube 100mm*100mm*100mm 2.33 /sec. Total number of cube casted is 27, Here is 15 cube is for steel fibre and 12 is for Rice Husk Ash.

Figure 4.0 sample during compressive testing

Table no 7.8 of compressive strength of cube by using SF

Sr no.	% of steel	Compressive strength			
		7 days(Mpa)	Avg(Mpa)	28 Days(Mpa)	Avg(Mpa)
1	0 %	21.66 20.95 21.32	21.31	31.22 32.80 32.72	32.27
2	1 %	26.80 28.15 26.52	27.15	40.20 40.50 40.30	40.33
3	3 %	27.41 28.20 27.76	27.79	42.20 43.52 42.80	42.84
4	5 %	26.51 25.20 27.32	26.34	40.80 40.20 40.13	40.38
5	7 %	25.32 20.67 23.22	23.07	35.12 35.30 35.60	35.34



Graph 7.5 between compressive strength and steel fibre

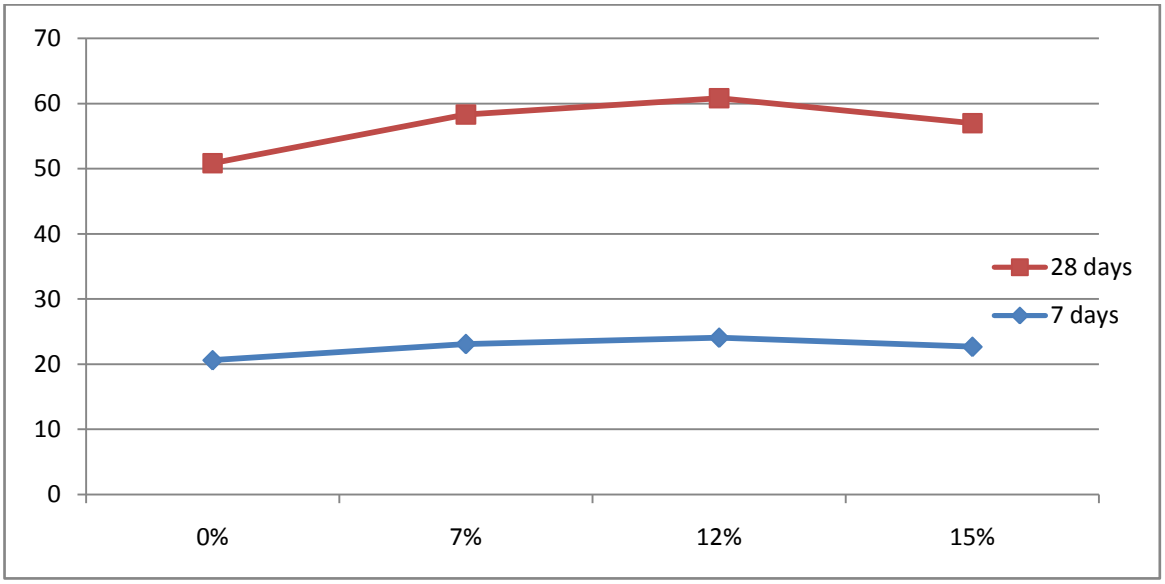
Table for the compressive strength of Rice Husk Ash:-

Fig 5.0 during testing the compressive strength with RHA

Table no 7.9 compressive strength of cube by using RHA

Sr no.	% of RHA	Compressive strength			
		7 days(Mpa)	Avg(Mpa)	28Days(Mpa)	Avg(Mpa)

1	0 %	20.30 20.65 20.89	20.62	30.32 30.80 29.80	30.21
2	7 %	23.20 22.80 23.30	23.10	35.80 34.80 35.00	35.20
3	12 %	23.60 24.80 23.80	24.06	36.32 36.48 37.40	36.74
4	15 %	23.20 22.10 22.70	22.67	34.52 34.37 34.00	34.29



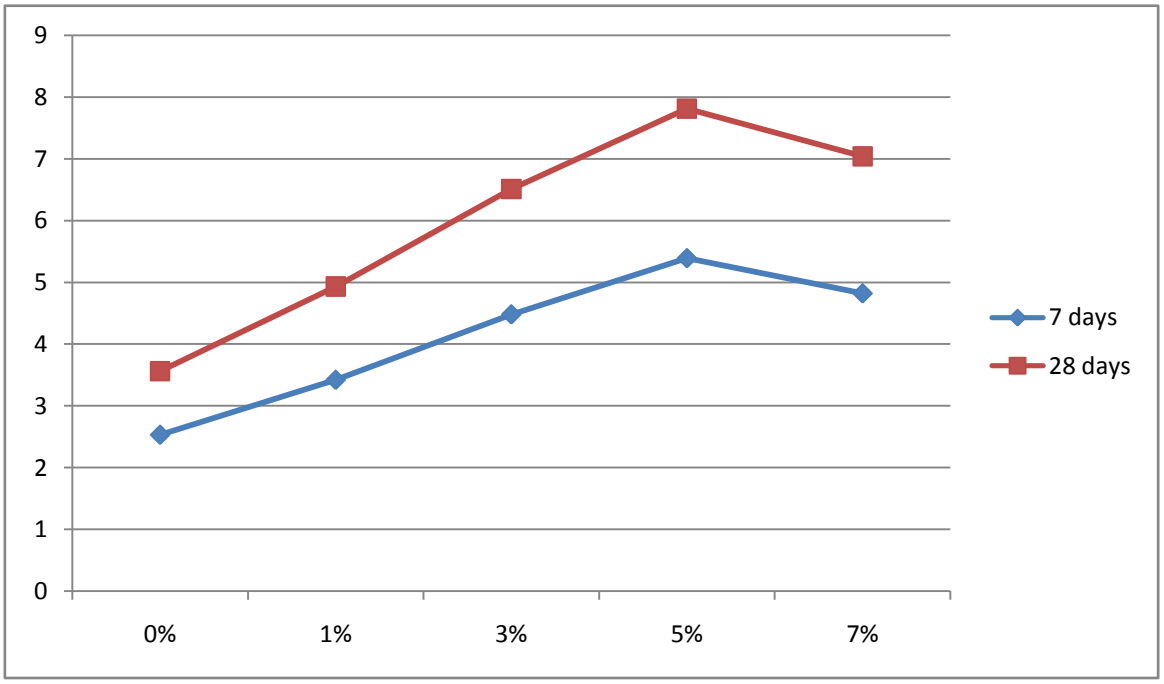
Graph 7.6 between the compressive strength and RHA

7.4 Split tensile strength:- The determination of the split tensile strength of cylindrical concrete sample will be find out by the apply the the load along the length of the sample at a continuous rate until failure occurs.this loading induces the tensile stresseson the plane containing the applied load,causing tensile failure of the sample.the spliting tensile strength will be find out by dividing the applied load by the area. The load applied by the rate of 1.2/sec.size of the cylindre is 30cm*10cm. Total number of casted cylinder is 27, here is a5 cylinder is for 15 and 12 is for Rice Husk Ash.

Table no 7.10 Split tensile strength of cylinder by using SF

Sr no.	% of Steel fibre	Split tensile strength			
		7days(Mpa)	Avg(Mpa)	28days(Mpa)	Avg(M

					pa)
1	0 %	2.60 2.48 2.53	2.53	3.60 3.58 3.52	3.56
2	1 %	3.35 3.39 3.52	3.42	4.90 4.93 4.96	4.93
3	3 %	4.50 4.49 4.46	4.48	6.34 6.38 6.80	6.51
4	5 %	5.60 5.22 5.36	5.39	7.82 7.80 7.79	7.81
5	7 %	4.90 4.86 4.71	4.82	7.10 6.98 7.03	7.04



Graph 7.7 between Split tensile strength and steel fibre

Fig 6.0 during the testing of split tensile strength

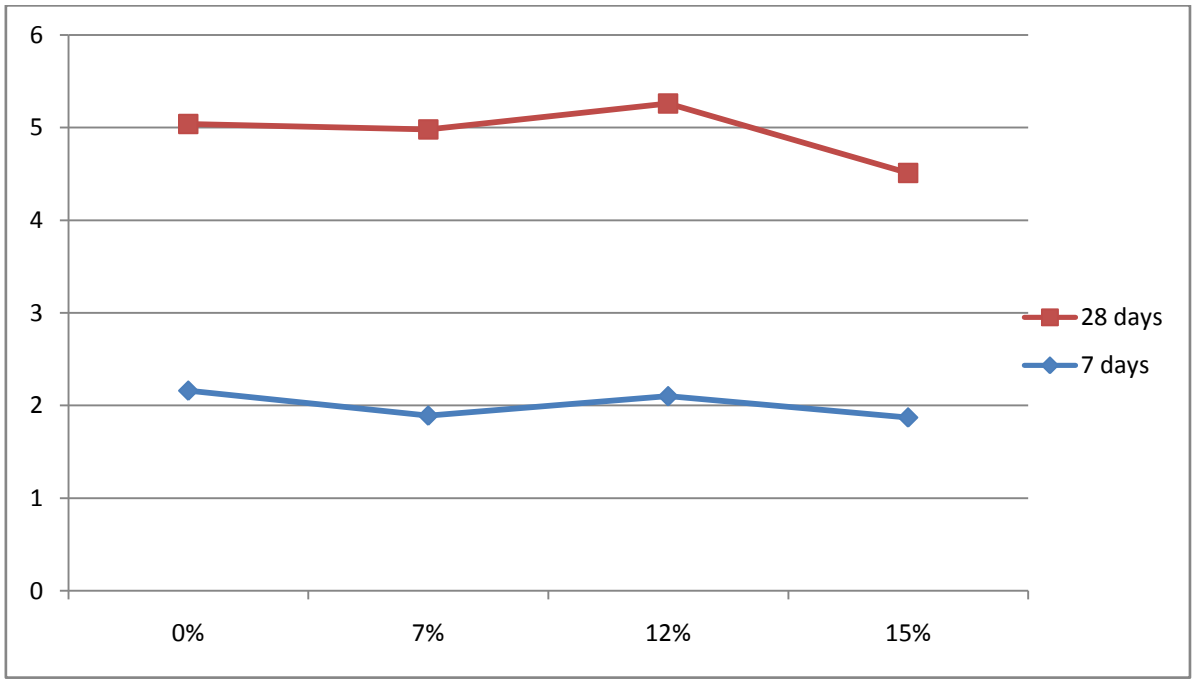
Table for Split tensile strength:-

Figure 7.0 shows the cracks

Table no 7.11 Split tensile strength of Cylinder by using RHA

Sr	% of	Split tensile strength

no.	RHA	7 days(Mpa)	Avg(Mpa)	28Days(Mpa)	Avg(Mpa)
1	0 %	2.20 2.10 2.18	2.16	2.88 2.86 2.90	2.88
2	7 %	1.80 1.98 1.88	1.89	3.10 3.02 3.15	3.09
3	12 %	2.10 2.12 2.08	2.10	3.15 3.23 3.10	3.16
4	15 %	1.88 1.89 1.86	1.87	2.68 2.66 2.58	2.64



Graph 7.8 between Split tensile strength and RHA

CHAPTER 8
CONCLUSION

Following conclusion may be drawn based on the observation.

- Addition of 3 % of steel fibre result in higher compressive strength and use more than 3 % steel fibre will bring down the compressive strength.
- Addition of 5 % of steel fibre result in higher split tensilt strength and use more than 5 % steel fibre will bring down the split tensile strength.
- Addition of 12 % of RHA compressive strength and use more than 12 % RHA will bring down the compressive strength.
- Addition of 12 % RHA in higher split tensile strength and use more than 12 % RHA will bring down the split tensile strength.
- In both the steel fibre and Rice Huak Ash(RHA) steel fibre is better for split tensile strength.
- In both the material RHA is cheap compare to steel fibre.

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