The Effects of Strength in Concrete Made With Silica and Admixture

A
Project Report submitted to the Department of Civil Engineering of Sonargaon University (SU) in partial fulfillment of the requirements for the degree

Of

Bachelor of Science in Civil Engineering

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LETTER OF TRANSMITTAL

January 31, 2020

To

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Subject: Submission of Project Report,

Sir,

This is our Great pleasure that we are submitting here with the project report of **"The Effects of Strength in Concrete Made With Silica and Admixture "** It is an important topic. The project report has been done according to the requirement and guidelines of the Sonargaon University (SU)

We hope that this report will certainly help you in evaluating our project report on - **The Effects of Strength in Concrete Made With Silica and Admixture"** We would be very glad provide any assistance in interpreting any part of the paper, whenever necessary,

Thanking You
Sincerely your
Group Leader

DECLARATION

This is to declare that the work and material presented in the report has been carried out by us and has not previously been submitted to any University / College/ Organization for any Academic Qualification.

We hereby ensure that the work that been presented does not breach existing copyright.

We undertake to indemnify the university against any loss or damage arising from breach of the foregoing obligation.

Thanking You

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CERTIFICATION

This is to certify that the project paper on **"The Effects of Strength in Concrete Made With Silica and Admixture"** is the confined record of project work done by Md. Bahauddin (Student ID: BCE 1602008062) as a group Leader and other for partial fulfillment of the requirement of the degree of B.Sc. in Civil Engineering from the Sonargaon University (SU)

This project work has been carried out under my guidance and is a record of the successful work.

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ABSTRACT

Bangladesh is a developing country and for this reason the construction of mega projects and other different projects are carried out in the different sector of the country. Experimental work was performed to determine the compressive strengths of concrete and to compare the strengths of Concrete Made with Admixture & Silica. Concrete strength is one of the most important considerations in the design of new structures and when assessing the condition of existing structures. Concrete construction is becoming increasingly complex and the importance of producing structures that are both cost effective and durable has been higher. The objectives of the study are comparison of compressive strength of concrete by using Portland Composite Cement (PCC) with Admixture and silica. To complete this test, we performed about 48 cylinders (4"x8") in size. There are four types of concrete are investigated in this study. To find out the strength variation Normal Concrete (CI), Concrete made with admixture (CII), Concrete made with both silica and admixture (CIII) and Concrete in which cement replaced by silica (CIV) were studied. Water cement ratio varies for different concrete with respect to cement, silica and admixture. Fresh properties of aggregate were carried out according to the ACI standard. The compressive strength of these concrete increased in different scale with respect to CI concrete. Tensile strength also shows more value than a CI concrete when replaced with silica and addition of admixture. Unit weight is also varied among these concrete.

NOTATION

f'_c = The 28 days compressive strength of cylinder specimen of concrete ACI

= American Concrete Institute.

F.M = Fineness modulus,

MPa = Mega Pascal.

Psi = Pound per square inch.

GGBS = Ground granulated blast-furnace slag.

S.S.D = Saturated Surface Dry.

W/C = Water Cement ratio.

CC = Crushed Concrete.

HSC = High Strength Concrete.

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CHAPTER 1

INTRODUCTION

1.1 GENERAL

Concrete has its benefits of strength, availability, durability, flexibility and economy. In case of designing a concrete structure, the compressive strength of concrete is an essential element. 28 days compressive strength of concrete is usually considered as the design strength. To ensure this strength it is necessary to wait a considerable time i.e.28 days. It becomes mandatory because it also represents the quality control process of concrete mixing, placing, compaction, curing etc. Concrete mix design is a process that uses code recommendation and blends with the experience of the concerned engineer. Due to same error in mix design or mix preparation at site the test result may fail to achieve the designed strength, then repetition of the entire. Processes become mandatory, which can be costly and time consuming. For every failure, it is necessary to wait at least 28 days, thus the need for an easy and reliable method for estimating the final strength at an early age of concrete is a long felt necessity. Hence, a rapid and suitable concrete strength prediction would be of great significance. Many studies are being carried out to explore the behavior of concrete and to make a better prediction of its characteristic strength and its age. A simplification of the model is also proposed.

Concrete is composed principally of aggregates, a cement, and water, and may contain other cementitious materials or chemical admixture it will contain some amount of entrapped air. Chemical admixtures are frequently used to accelerate, retard, improve workability, reduce W/C ratio, increase strength or other property of concrete (see ACI 212.3R).Depending upon the type and amount certain cementtious materials such as fly ash, natural pozzolans, GGBS slag (see ACI 226.1R) and silica fume may be used in co njunction with cement for specific properties such as reduce heat of hydration , improved late-age strength development, increased to alkali-aggregate. Where high strength is not required higher percentage of silica fume are frequently used. In our thesis we use water reducing cum retarding admixture. We want to use optimum dosages. Use silica fume 10% by the weight of cement partials. In site trials we get the perfect W/C. It is the most important part of strength characteristic. Although strength is an important characteristic of concrete .Strength at the age of 28 days is frequently used as a parameter for the structural design, concrete proportioning and evaluation of concrete. 28 days' strength of concrete made with Admixture & Silica. There are many method of HPC [1] Islam Lasker and talukder are some method the first important is given to selection of water binder ratio for a given targeted strength, even though the w/b ratio is not a very good predictor of compressive strength the use of admixture like silica fume and super plasticizer as workable agent is a usual way to made HPC.[2] Vinayagamp conducted experiments with silica and admixture of high performance concrete with replace of silica fume 15% and mix are tested experimentally for workability, compression , split flexure and concluded the performance of the mix ratio or mix design.[3] Hooton conducted

experiments on replacement of cement with silica fume and studied physical properties and durability properties like freezing, thawing, sulphate attack and alkali-silica reactivity he concluded that 28 days compressive strength was maximum at 15% silica fume replacement of w/b ratio 0.35 with variable dosage of admixture. [4] Bühler, E. "Two Decades of Ready-Mixed High Performance Silica Fume Concrete A US Project Review" NRMCA Concrete Technology Forum, proceedings, Dallas, May 2007, 22 pp.[5] Annadurai and Ravichandran contracted experiments for mix design of high strength concrete with admixture dosage range is 0.06 to 0.9% with an increment of 0.1% and concluded that addition of silica fume increases compressive strength and decrease the slump.[6] Shreekear and Kumbhar studied the effect of mineral admixture in mix proportioning of high strength concrete silica is replace by weight of cement along with admixture and conducted that better strengths are achieved for 15% replacement.

1.2 BACKGROUND OF THE STUDY

High performance concrete now-a-days used widely in construction industry worldwide HPC always has a higher strength than normal concrete. A number of research efforts have concentrated on using multivariable regression model to improve the accuracy of prediction. In a recent study multivariable power equation is chosen as an effective model for prediction of strength of different ages of concrete the general format of the equation is given below:

In the above equation compressive strength of a particular day variables age which is considered as the dependent variable on the has significant correlation with the strength like the water cement ratio (w/c), cement (c), water (W),sand (FA), aggregate (CA) content and density of concrete (I), Admixture, Silica then become it is expected that the strength gain pattern of admixture and silica mix concrete would be quite better than of normal aggregate concrete, the effectiveness of the proposed mathematical model for strength prediction is also tested with these admixture and silica mix concrete concrete test results. Determined predict the strength of concrete for a particular age directly. To know about the strength history of the corresponding day it is required individually. Some recent studies considered the early day's strength result as an important index for the predication of concrete strength and the aim of this study is also to predict the concrete compressive strength from early days' strength result. Previously many parameters have been considered for predication of concrete strength which influences its strength gaining characteristics. In this study, attempt is made to predict the concrete strength form early days' concrete strength test result. [7] ACI, 234R -96 guide for the use of silica fume in concrete reported by ACI committee, 234, pp1-51, 1996
[8] Aitcen P.C high performance concrete, E & FN spon, London, 1998. [9]. P Vinayagam, Experimental Investigation on high performance concrete using silica fume and admixture, International journey of Computer and Communication Engineering, vol-1, no.2 pp.168- 171,2012

1.3 OBJECTIVES OF THE STUDY

The objectives of this study are given below:

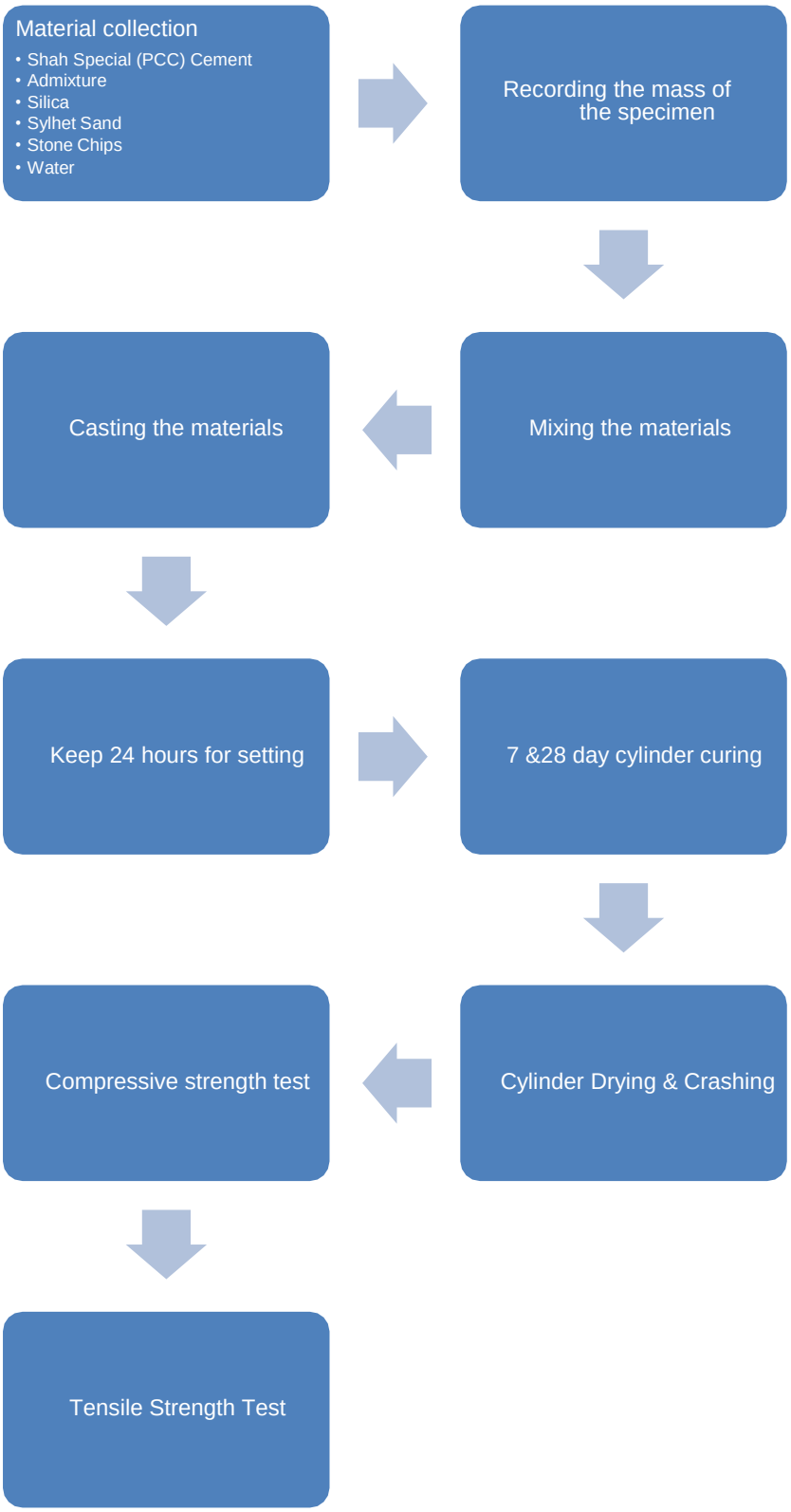
a) To find out the Compressive & Tensile Strength of Concrete mixing with Cement, Admixture & Silica.
b) To compare the Compressive & Tensile Strength of Concrete mixing with Cement, Admixture & Silica.
c) To compare the unit weight of these concrete.
d) To find out the effective strength in concrete among these mixer.

1.4 METHODOLOGY

The working methodology in this study is as follows:

a) Properly selection of materials.
b) Concrete is prepared using Portland cement, water, sand, ston chips and Admixture Silica at the ratio according to ACI mix design.
c) Properly Mixing Concrete
d) Curing of concrete.
e) Testing of specimens.
f) Result & Analysis.
g) Conclusion and recommendation

1.5 Flowchart of working methodology



CHAPTER II

LITERATURE REVIEW

The applications of admixture and silica in the construction area are very wide. Now in Bangladesh Concrete Admixture using every prestigious projects such as Metro rail, Padma multipurpose bridge, Hanif Flyover. karnaphuly tunnel, jamuna bridge and all high rise building projects. Silica fume used in ruppur nuclear power plant project, rampal power plant and every high strength concrete project all over the countries.

Standard practice for selecting proportions for normal, heavy weight and mass concrete (ACI 211.1-01) Donald E. Dixon, Jack R. Prestrera Reapproved ACI 211.

International journal Innovative research in science, engineering and technology vol-3, issue 3 Mix design of high performance concrete using silica fume and admixture march 2002.

A major role in modern concrete materials and technologies, national conference on : Trends and challenges of civil engineering in today transforming world under Dr. Jayeshkumar Pitroda on September 2015.

Bohler E. Two decades of ready-mixed high performance silica fume concrete a project review NRMCA concrete technology forum, proceedings, dallas May 2007.

P Vinayagam, Experimental Investigation on high performance concrete using silica fume and admixture, International journey of Computer and Communication Engineering, vol-1, no.2 pp.168-171, 2012

Yogendran and langan investigated on high strength silica fume concrete at a e/b ratio 0.34 and percentage of silica fume 25% with varying dosage of admixture are used.



Figure No: 2.1 HSC Flyovers

CHAPTER III

EXPERIMENTAL INVESTIGATION

3.1 INTRODUCTION

This chapter includes the experiments required to the effects of strength in concrete made with admixture and silica & all the ingredients of concrete, and tests the fresh & hardened concrete.

3.2 THE PROPETIES OF INGREDIENTS OF CONCRETE

Following are the commonly used ingredients in concrete

(a) Binding Materials
(b) Aggregate
    (i) Fine aggregate
    (ii) Course aggregate
(c) Admixture
(d) Silica
(e) Water

3.2.1 Cement

A cementing material is one which has the adhesive and cohesive properties necessary to bond inner aggregates into a solid mass of adequate strength, durability. For making structural concrete, so called hydraulic cements are used exclusively. Water is needed for the chemical process (hydration) in which the cement powder sets and hardens into solid mass. Various hydraulic cements have been developed, Portland cements, this was first patented in England in 1824, is by far the most common. In hydraulic cement that hardens by interacting with water and forms water resisting compound when it receives its final sets. It is highly durable and compressive strength in mortar and concrete. Its specific gravity ranges from 3.12 to 3.16 and weight 1208 kg/m^3 (94 lb/ft^3). Its measured fineness by particles size ranges from 10 microns to 50 microns. The specific gravity of cement used in this study was 3.15. The SHAH CEMENT is manufactured by ABUL KHAIR GROUP was used in this study.

3.2.2 Aggregate

Concrete is made up of cement, fine aggregate, coarse aggregate and water. It is important to know the properties of constituent materials as they impact strength and durability to the concrete. Aggregate is important that the aggregate have good strength, durability and weather resistance, that its surface be free from impurities such as loam, silt and organic matter which may weakened the bond with the cement paste, and that no unfavorable chemical reaction take place between it and the cement.

Aggregate can be classified on the basis of size as

- **Fine Aggregate**

  Fine aggregate (FA) with a rounded particle shape and smooth texture have been found to require less mixing water in concrete and for this reason are preferable in HSC. HSC typically contain such high contents of fine cement materials that the grading of the FA used is relatively unimportant. However, it is sometimes helpful to increase the fineness modulus (FM) as the lower FM of FA can give the concrete with a greater water demand. Therefore, sand with a FM of about 3.0 is usually preferred for HSC (ACI 363r, 1992).



Figure 3.1: Sylhet Sand

- **Coarse Aggregate**

In HSC the capacity of the aggregate can be the limiting factor. This may be either result of the aggregate being weaker than low water-cement matrix. Or alternatively it is not sufficiently strong and rigid to provide the strengthening effect. This is mainly related to the coarse aggregate (CA). For optimum compressive strength with high cement and low water-cement ratios the maximum size of CA should be kept to minimum. At ½ in. or 3/8 in. the strength increases were caused by the reduction in average bond stress due to the increased surface area of the individual aggregate. Smaller aggregate sizes are also considered to produce higher concrete strengths because of less server concentrations of stress around the particles, which are caused by differences between the elastic module of the paste and the aggregate. Many studies have shown that crushed stone produces higher strengths than rounded gravel. The most likely reason for this is the greater mechanical bond, which can develop with angular particles. However, accentuated angularity is to be avoided because of the attendant high water requirement and reduced workability.

The ideal CA should be clean, cubical, angular, 100% crushed aggregate with a minimum of flat and elongated particles (ACI 363R, 1992). Among the different crushed aggregates that have been studied trap rock, quartzite, limestone, greywacke, granite, and crushed gravel trap rock tends to produce the highest concrete strength. Limestone, however, produces concrete strength nearly as high as those achieved using trap rock. Gradation of CA within ASTM limits makes very little difference in strength of HSC. Optimum strength and workability of HSC are attained with fines content of HSC mixes, use of ordinary amounts of CA results in sticky mix (Peterman and carrasquillo, 1986).



Figure 3.2: Coarse Aggregate

3.2.3 Admixture (Conplast SP337)

Superplastic sing admixture: To produce high workability concrete without loss of strength. To promote the high early and ultimate strength by taking advantage of water reduction as well as maintaining workability.

To quality of concrete can be produced high by improving the durability and impermeability. At higher dosages, advantages can be taken of the retardation of initial setting time of concrete especially in large pours. Advantages

- Pumping ability: Increased workability provides easier and quicker placing and optimum compaction. Aids concrete placement by pump.
- Increased strength: Provides higher strength without increase in cement content or reduction in workability. Ideal for precast concrete production.
- Improved quality and cohesion: Reduce rate of workability loss normally associated with super plasticizer. Reduces shrinkage cracking because of lower water cement ratio. Makes the concrete water impermeable.
- Bleeding and segregation minimized: Improves durability and impermeability of concrete.
- Chloride free: Safe in pre-stressed concrete production.

Standards compliance: Conplast SP337 compile to IS:9103: 1999 as a water reducing admixture. It also complies with IS 2645: 1975 and BS 5075 Part 3 and ASTM C494 Type F.



Figure 3.3: Conplast SP337

3.2.4 Silica

Silica Fume: La AdCrete MS Conforms to ASTM C124095a and IS15388-2003. Typically, 4 to 10% by weight of cement depending upon the specific need. The optimum dosage of La AdCrete MS to meet specific requirements should always be determined by trials using the materials and conditions that will be experienced in use.

Advantage: Specific properties such as reduced early heat of hydration, improve late of strength development, incase resistant to alkali aggregate reaction. Significantly reduces permeability, reduction in chloride ion penetration by reducing continuous capillary pores Improved mechanical properties, and resistance to the intrusion of aggregate solution.



Figure 3.4: Silica

3.2.5 Water

Water is essential in the production of concrete in order to precipitate chemical with the cement, to wet the aggregate, and to lubricate the mixture for easy workability. Since the quality of water affect the strength it is necessary to go into the purely of water. The water was free from oils, acids, alkalis and has a water soluble chloride content of 160 mg/lit As per (IS 456:2000) In this study drinking water has been used in mixing of concrete.



Figure 3.5: Water

3.3 WATER AND WATER-CEMENT RATIO

The single most important variable in achieving HSC is the water- cement ratio (Peterman and car tranquillo, (1986). HSC produce by conventional mixing technologies are usually prepared with water-cement ratio is the range of 0.22 to 0.50, and their compressive strength is about 20 to 130 MPa when normal concrete are used (FLP/CEB, 1990). The requirements for water quality for HSC are no strongest than those for conventional concrete. Usually, water for concrete is specified to be potable quality (ACI 363R, 1992).

When we used only

PCC then our WC was 0.45 and when used admixture WC was 0.38 on the other hand when we used silica and without silica WC was 0.45.

3.4 CONCRETE MIX DESIGN

In this study mix ratio of these concrete used by volume 1:1:2 in accordance to BNBC or BS, ACI -318-99 and 318R-99

In this study ACI mix design method has been used. This method if based on the fact that for a given maximum size of fine aggregate, the water content determines the workability of mix. Using the steps of ACI method of mix proportioning, the mix proportion.

Most of the available mix design methods are based on empirical relationships, charts and graphs developed from extensive experimental investigations.

3.5 PROCESS OF CASTING

Production of quality of concrete requires meticulous care exercised at every stage of manufacture of concrete. The various stages of casting of test specimens are:

(a) Batching
(b) Mixing
(c) Compacting
(d) Curing
(e) Testing

3.5.1 Batching

Volume batching is the correct method of measuring the materials. For important concrete, invariably, weigh batching system is should be adopted.

In this study weigh batching has been used for measuring the materials.

CI Concrete: Mixing ratio 1:1:2 for 25 MPa (Cement: Sand: Stone Chips) we use W/C ratio 0.45 and initial Slump getting 120 mm.

CII Concrete: Mixing ratio 1:1:2 for 25 MPa (Cement: Sand: Stone Chips) we use Admixture 0.9% by the weight of cement W/C ratio 0.38 and initial Slump getting 120 mm.

CIII Concrete: Mixing ratio 1:1:2 for 25 MPa (Cement :Sand: Stone Chips) we use Admixture 0.9% and Silica 10% by the weight of cement with W/C ratio 0.4 and initial Slump getting 80 mm.

CIV Concrete: Mixing ratio 1:1:2 for 25 MPa (Cement :Sand: Stone Chips) we use Silica 10% by the weight of cement with W/C ratio 0.42 and initial Slump getting 80 mm.

3.5.2 Mixing

In this study concrete mixing had been done by the hand mix . Mixing time was 5-6 minutes until homogenous mixing. Mixing time may need mixer machine increased to achieve thorough distribution when using large quantities of concrete with silica fume and admixture when we use admixture required good mixing.



Figure 3.6: Concrete Mixing

3.5.3 Slump test of Concrete

The vertical settlement recorded in terms of mm is known as slump. It is performed to check the workability of freshly made concrete, and therefore the ease with which concrete flows. It can also be used as an indicator of an improperly mixed batch. The test is done according ASTM C143-90a. The slump test is used to ensure uniformity for different loads of concrete under field conditions. There are three types of slump such as true, shear and collapse slump.



Figure 3.7: Slump test

3.5.4 Compaction of Concrete

Compaction of concrete is the process adopted for expelling the entrapped air from the concrete. In the process of placing and mixing of concrete, air is likely to get entrapped in the concrete. If this air in not remove fully, the concrete losses strength considerably.

3.5.5 Curing of Concrete

Curing of concrete is one of the essential requirements of the process of concreting. Curing is the maintaining of an adequate moisture content and temperature in concrete at early ages so that it can develop properties the mixture was designed to achieve. Curing begins immediately after placement and finishing so that the concrete may develop the designed strength and durability.

3.5.6 Methods of Curing

The best method of water curing is immersion of specimens in water because it satisfies all the requirements of curing namely promotion of hydration, elimination of shrinkage and absorption of the heat of hydration. In the study, the specimen was submerged in water for 7 & 28 days.

3.5.7 COMPRESSIVE STRENGTH TEST

The compressive strength of concrete is one the factors, which controls the loads, which may be applied to a concrete structure. Therefore, fore every significant it is important to check the compressive strength from a representative number of concrete cylinders cast from the same batches of concrete used to structure. For some structures, such as concrete pavements, the modulus of rupture is also important. In the design of concrete structures, the design engineer specifies given strengths that the final concrete products must be capable of attaining. When trial batches are prepaed during mix design or as a quality control measure to ensure that concrete mixed or delivered in the field satisfies those specified strengths, the following tests are performed compression tests are conducted to determine the compressive strength of concrete (or its ability to resist a crushing force). In this test, a standard test load is applied parallel to the longitudinal axis of a pre-molded and properly cured concrete cylinder of a standard size. When the test properly con-ducted, a maximum load is obtained at the point at which the cylinder ruptures. With this maximum load, the compressive strength, measured in pounds per square inch (psi), can be easily calculated. The equipment to will use to perform the compression test is a compression-testing machine, having a capacity.



Figure 3.5: Crushing of cylinder in (SU) lab

3.5.8 Splitting tensile and flexural strength:

The splitting tensile strength of concrete cylinder using admixture and silica and aggregate in the composition is presented in the **Figure.** It is observed that addition of admixture and silica in the composition adversely effects on the tensile strength.

The tensile stress can be computed as

$$f_{sp} = \frac{2P}{\Pi LD}$$

Where, f_{sp} = Split cylinder tensile strength

P= Compressive load on the cylinder

L= Length of the cylinder

D= Diameter of the cylinder.

The test method conforms to the ASTM standard requirements of specification C496 for cylinder. Figure 3.5 shows the set-up of Split cylinder



Figure: Tensile Fracture of Cylinder

3.6 COMPRESSSIVE STRENGTH IMPROTANCE

(1) Effect of cement

- The effect of Portland cement on concrete strength depends on the chemical composition and fineness of the cement. Cement content also affects the strength of concrete.
- Cement having higher C3S contents gain strength more rapidly, but may end up with slightly lower strengths at later ages.
- Since the fineness of cement affects the rate of hydration it also governs the strength of concrete.
- The effect of cement content on strength of concrete a constant slump.

(2) Effect of Aggregate/Cement Ratio

- It has been that, for constant water/ cement ratio mix (having more aggregate and less cement) leads to higher strength.
- This is due to a fact that if the paste represents a smaller proportion of the volume of concrete (as is the case in a leaner mix), then the total porosity of the concrete is lower, and hence its strength is higher.

(3) Effect of aggregate Properties-

- The influence of the aggregate properties on strength is of secondary importance.
- The aggregate parameters that are most important are the shape and we maximum size of the aggregate.

(4) Effect of admixtures-

- Any admixture which can reduce the w/c ratio or the porosity of the concrete increases the strength of concrete.

(5) Effect of the specimen size

- Both the strength and variability in strength decrease as the specimen size increase.

(6) Effect of the rate of loading

- The higher the rate of loading, the higher the measured strength of concrete.

(7) Effect of the moisture content

- Moist concrete gives leaser-measured strength than the dried concrete.

(8) Effect of the temperature at testing

- At higher testing temperature the measured strength of concrete is low.

(9) Effect of Cylinder weight

- When we found high weight of cylinder then we got HSC.

3.7 CYLINER TEST

- Cylinder test development by the ASTM is very popularly used in USA for determining compressive strength of concrete in the lab.

- The test cylinder has a diameter of 100 mm 4(4in.) and length as 200mm (8in.) to match with 1/d ratio of 2.1

- The specimens are prepared and tested as per the ASTM specification, as follows: Molds (ASTM C4700 Molding the specimens (ASTM C31) Curing (ASTMC192) Capping the cylinder (ASTM C617) Determinations of compressive strength (ASTM C39)

CHAPTEER IV

TEST RESULTS AND ANALYSIS

4.1 INTRODUCTION

Testing of harden concrete plays an important role in controlling and confirming the quality of cement concrete work. To perform this study in total 48 standard cylinder specimens were tested. Among these, 24 cylinders were tested to determine the compressive were tested All specimens are tested 7 and 28 days normal water curing.

After the experiment we get the below result

4.2 TABLE: RESULT OF 7 DAYS COMPRESSIVE STRENGTH TEST

No	Name of concrete	Mix Ratio	Water cement (ratio)	Initial Slump (mm)	Test Sample	Compressive Strength (KN)	Avenge Strength (KN)	Strength (Psi)
1	CI	1:1:2	0.45	120	Sample: 1	125	124.66	2231.30
					Sample: 2	122		
					Sample: 3	127		
2	CII	1:1:2	0.38	120	Sample: 1	127	126.66	2266.97
					Sample: 2	125		
					Sample: 3	128		
3	CIII	1:1:2	0.45	80	Sample: 1	171	167.66	3000.9
					Sample: 2	168		
					Sample: 3	164		
4	CIV	1:1:2	0.45	80	Sample: 1	169	165.66	2965.11
					Sample: 2	166		
					Sample: 3	162		

Table No: 4.1-7 Days Compressive Strength

- In Table no-4.1-7Mixing ratio 1:1:2 We used water cement ratio 0.45 and got initial slump 120mm and then sampling we got average compressive strength in Psi is 2231.30. Mixing ratio 1:1:2 We used water cement ratio 0.38 and got initial slump 120 mm and then sampling we got average compressive strength in Psi is 2266.97. Mixing ratio 1:1:2 We used water cement ratio 0.45 and got initial slump 80 mm and then sampling we got average compressive strength in Psi is 3000.9. Mixing ratio 1:1:2 We used water cement ratio 0.45 and got initial slump 80 mm and then sampling we got average compressive strength in Psi is 2965.11

4.3 TABLE: RESULT OF 7 DAYS TENSILE STRENGTH TEST

No	Name of concrete	Mix Ratio	Water cement (ratio)	Initial Slump (mm)	Test Sample	Compressive Strength (KN)	Avenge Strength (KN)	Strength (Psi)
1	CI	1:1:2	0.45	120	Sample: 1	21	20.66	369.89
					Sample: 2	17		
					Sample: 3	24		
2	CII	1:1:2	0.38	120	Sample: 1	24	22.66	405.69
					Sample: 2	22		
					Sample: 3	22		
3	CIII	1:1:2	0.45	80	Sample: 1	35	31	554.84
					Sample: 2	30		
					Sample: 3	28		
4	CIV	1:1:2	0.45	80	Sample: 1	34	30.66	548.87
					Sample: 2	29		
					Sample: 3	29		

Table No: 4.2-7 Days Tensile Strength

- In Table no-4.2-7 Mixing ratio 1:1:2 We used water cement ratio 0.45 and got initial slump 120mm and then sampling we got average tensile strength in Psi is 369.89. Mixing ratio 1:1:2 We used water cement ratio 0.38 and got initial slump 120 mm and then sampling we got average tensile strength in Psi is 405.69. Mixing ratio 1:1:2 We used water cement ratio 0.45 and got initial slump 80 mm and then sampling we got average tensile strength in Psi is 554.84. Mixing ratio 1:1:2 We used water cement ratio 0.45 and got initial slump 80 mm and then sampling we got average tensile strength in Psi is 548.87.

4.4 TABLE: RESULT OF 28 DAYS COMPRESSIVE STRENGTH TEST

No	Name of concrete	Mix Ratio	Water cement (ratio)	Initial Slump (mm)	Test Sample	Compressive Strength (KN)	Avenge Strength (KN)	Strength (Psi)
1	CI	1:1:2	0.45	120	Sample: 1	203	206.66	3698.81
					Sample: 2	210		
					Sample: 3	207		
2	CII	1:1:2	0.38	120	Sample: 1	214	212.66	3806.20
					Sample: 2	208		
					Sample: 3	216		
3	CIII	1:1:2	0.45	80	Sample: 1	258	258.66	4629.63
					Sample: 2	260		
					Sample: 3	258		
4	CIV	1:1:2	0.45	80	Sample: 1	254	252.33	4516.28
					Sample: 2	253		
					Sample: 3	250		

Table No: 4.3-28 Days Compressive Strength

- In Table no- 4.3 Mixing ratio 1:1:2 We used water cement ratio 0.45 and got initial slump 120mm and then sampling we got average compressive strength in Psi is 3698.81. Mixing ratio 1:1:2 We used water cement ratio 0.38 and got initial slump 120 mm and then sampling we got average compressive strength in Psi is 3806.2. Mixing ratio 1:1:2 We used water cement ratio 0.45 and got initial slump 80 mm and then sampling we got average compressive strength in Psi is 4629.63. Mixing ratio 1:1:2 We used water cement ratio 0.45 and got initial slump 80 mm and then sampling we got average compressive strength in Psi is 4516.28.

4.5 TABLE: RESULT OF 28 DAYS TENSILE STRENGTH TEST

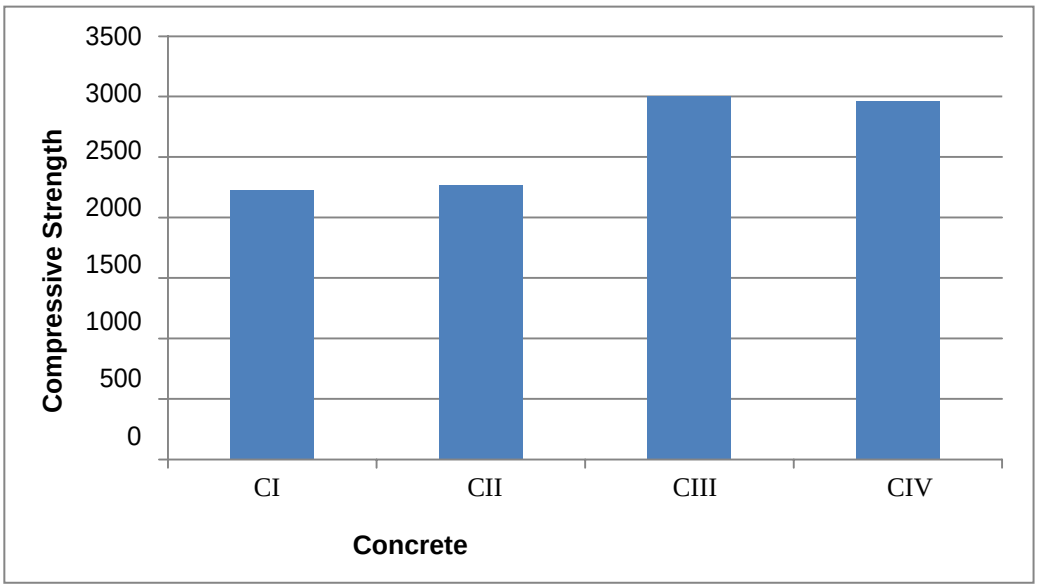
No	Name of concrete	Mix Ratio	Water cement (ratio)	Initial Slump (mm)	Test Sample	Compressive Strength (KN)	Avenge Strength (KN)	Strength (Psi)
1	CI	1:1:2	0.45	120	Sample: 1	35	31	554.84
					Sample: 2	28		
					Sample: 3	30		
2	CII	1:1:2	0.38	120	Sample: 1	38	33	590.63
					Sample: 2	30		
					Sample: 3	31		
3	CIII	1:1:2	0.45	80	Sample: 1	52	50.33	900
					Sample: 2	50		
					Sample: 3	49		
4	CIV	1:1:2	0.45	80	Sample: 1	50	49.66	888.93
					Sample: 2	48		
					Sample: 3	51		

Table No: 4.4-28 Days Tensile Strength

- In Table no- 4.4 Mixing ratio 1:1:2 We used water cement ratio 0.45 and got initial slump 120mm and then sampling we got average tensile strength in Psi is 554.85. Mixing ratio 1:1:2 We used water cement ratio 0.38 and got initial slump 120 mm and then sampling we got average tensile strength in Psi is 590.63. Mixing ratio 1:1:2 We used water cement ratio 0.45 and got initial slump 80 mm and then sampling we got average tensile strength in Psi is 900. Mixing ratio 1:1:2 We used water cement ratio 0.45 and got initial slump 80 mm and then sampling we got average tensile strength in Psi is 888.93.

4.6 Compressive Strength graph (Psi) for 7 days

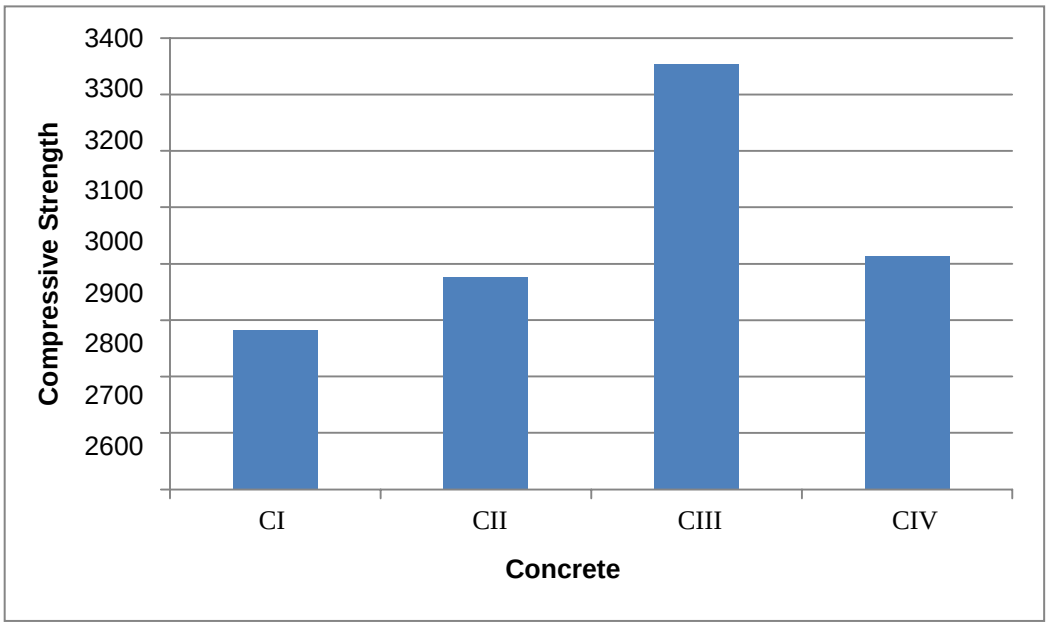
- In graph no- 4.1 we found 7 days compressive strength 2231.30 Psi by using normal concrete and 3000.9 Psi we found by using Admixture with silica



Graph No-4.1: Compressive Strength graph (Psi) for 7 days

4.7 Compressive Strength graph (Psi) for 28 days

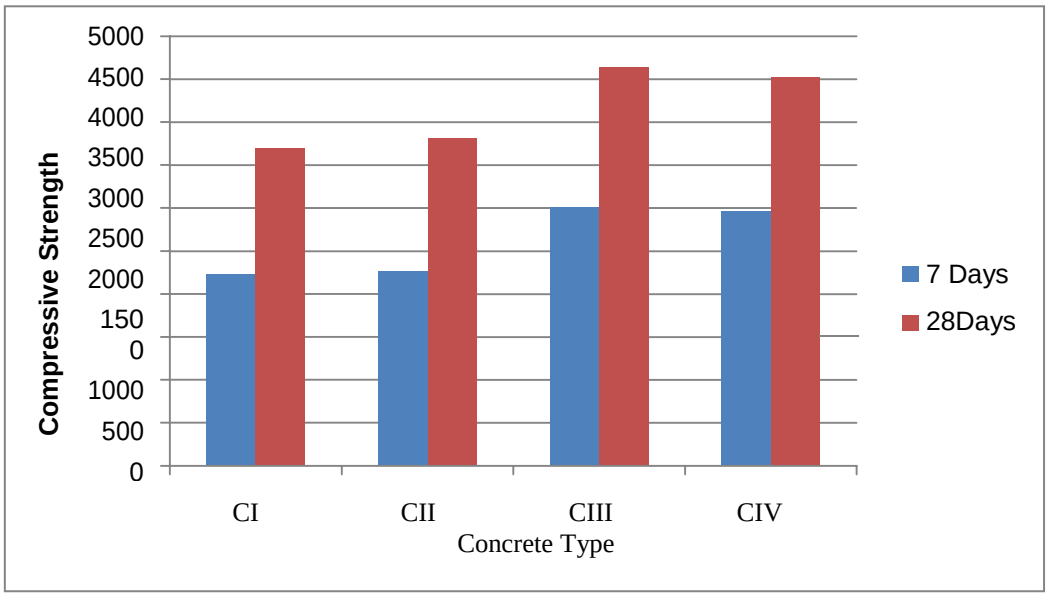
- In graph no- 4.2 we found 28 days' compressive strength 3698.81Psi by using normal concrete and 4629.63 Psi we found by using Admixture with silica



Graph No-4.2: Compressive Strength graph (Psi) for 28 days

4.8 Compare Compressive Strength Graph 7 days & 28 days

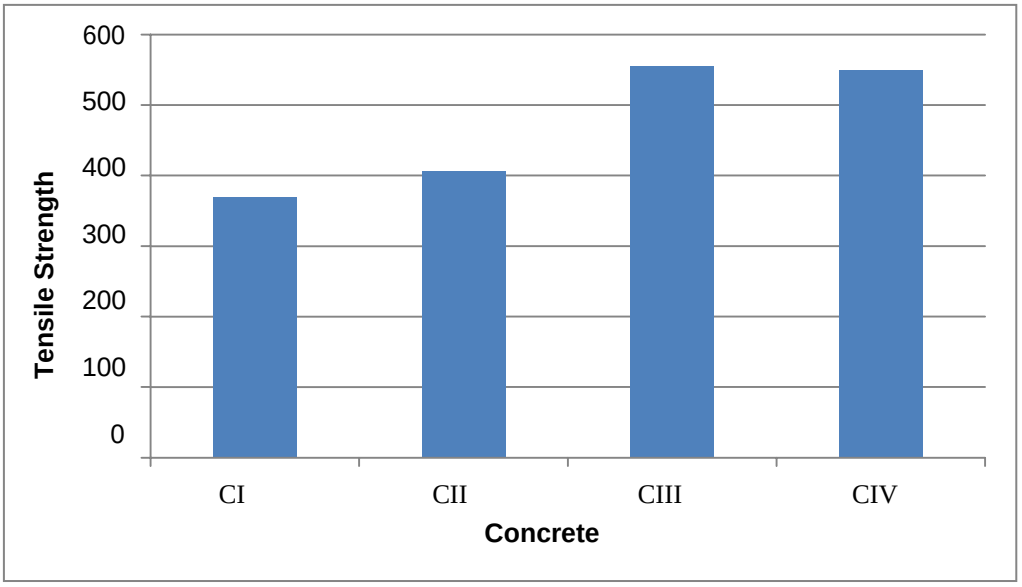
- In graph no- 4.3 Compressive strength of normal concrete of 7 days is 34.5% lower than Admixture & Silica mixing concrete. Compressive strength of normal concrete of 28 days is 25.16% lower than Admixture & Silica mixing concrete.



Graph No-4.3 Compressive Strength Compare graph (Psi) for 7& 28 days

4.9 Tensile Strength graph (Psi) for 7 days

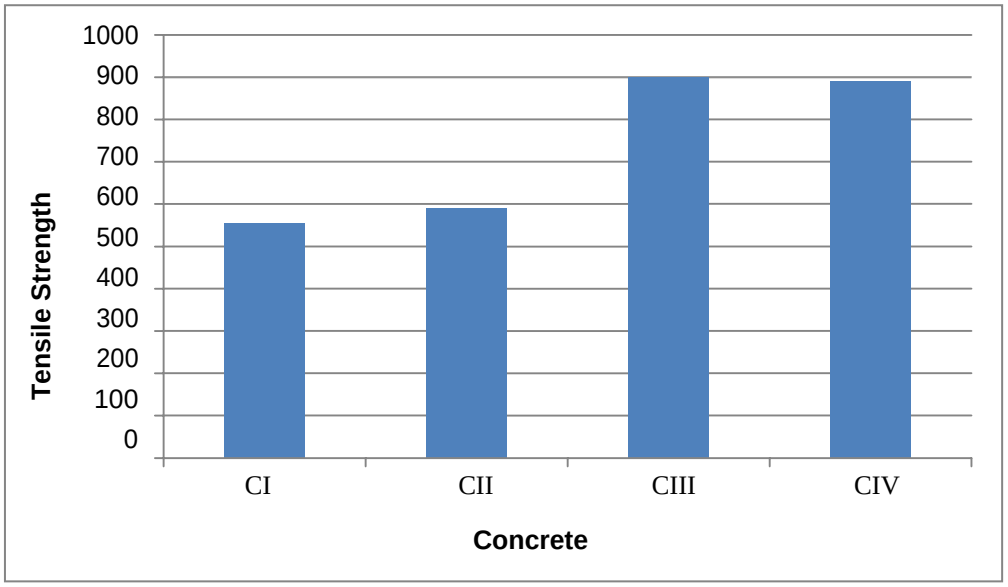
- In graph no- 4.4 we found 7 days' tensile strength 369.89 Psi by using normal concrete and 554.84 Psi we found by using Admixture with silica



Graph No-4.4 Tensile Strength graph (Psi) for 7 days

4.10: Tensile Strength graph (Psi) for 28 days

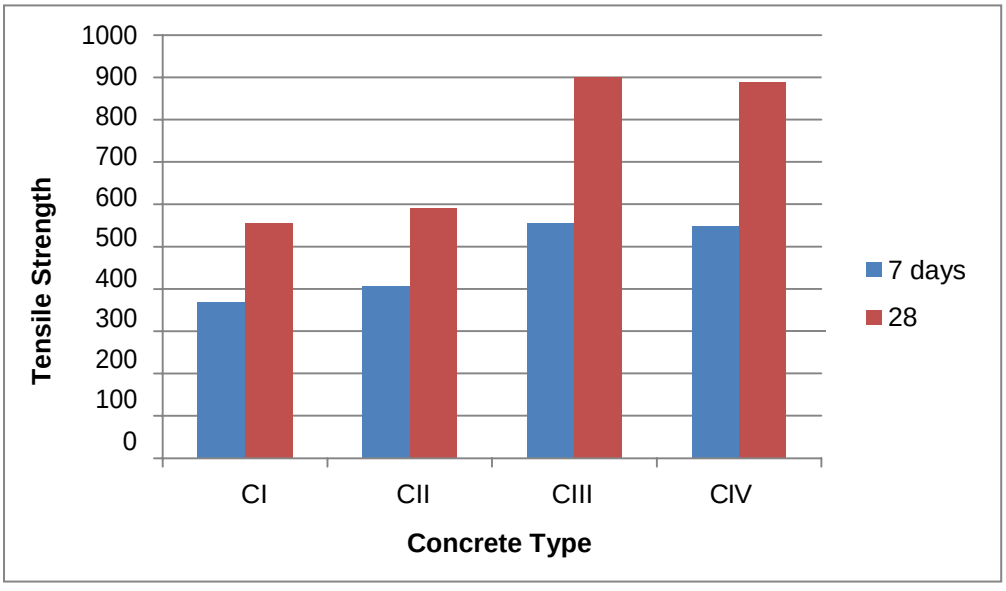
- In graph no- 4.5 we found 28 days' tensile strength 554.84Psi by using normal concrete and 900 Psi we found by using Admixture with silica



Graph No-4.5 Tensile Strength graph (Psi) for 28 days

4.11 Compare Tensile Strength Graph 7 days & 28 days

- In graph no- 4.6 Tensile strength of normal concrete of 7 days is 50% lower than Admixture & Silica mixing concrete. Tensile strength of normal concrete of 28 days is 62% lower than Admixture & Silica mixing concrete.



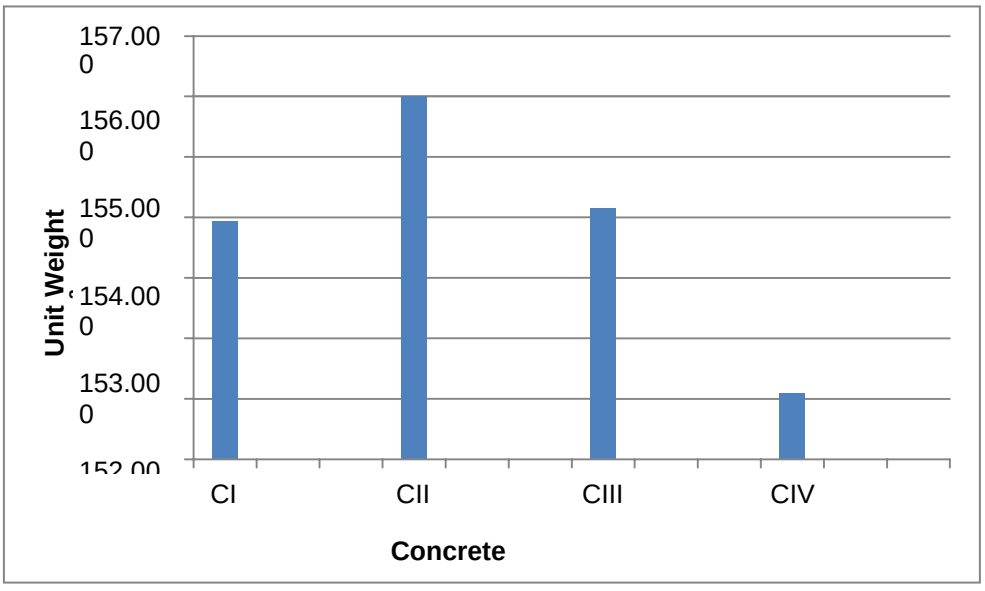
Graph No-4.6 Compare Tensile Strength Graph 7 days & 28 days

4.12 TABLE: DENSITY IN DIFFERENT AGE CONCRET

- Density is easily obtained by weighing the compacted fresh concrete in a standard container of known volume and mass. ASTM C 138-92 describe the procedures.

Sample	Weight (Kg)	Avg Weight	Weight (Ib)	Volume Ft^3	28 days
C-I	4.086	4.06	9.0	0.06	153.935
	4.025				
	4.079				
C-II	4.152	4.12	9.1	0.06	156.006
	4.114				
	4.088				
C-III	4.052	4.07	9.0	0.06	154.150
	4.065				
	4.09				
C-IV	4.027	3.99	8.8	0.06	151.106
	3.876				
	4.063				

Table No: 4.5- Density



Graph No:-4.7 Unit weight

CHAPTER -5

CONCLUSIONS AND RECOMMENDATIONS

5.1 GENERAL

This chapter was set out to represent the conclusion of this project. Lastly, some testing, investigations and studies were also recommended after the conclusion, to further the strength characteristics of CI, CII, CIII, CIV concrete for the application in high strength concrete.

5.2 After the experiment we get the Following Result-

Concrete Compressive Strength-

Sample	7 Days Psi	28 Days Psi
CI	2231.30	3698.81
CII	2266.97	3806.2
CIII	3000.9	4629.63
CIV	2965.11	4516.28

Concrete Tensile Strength-

Sample	7 Days Psi	28 Days Psi
CI	369.89	554.84
CII	405.69	590.63
CIII	554.84	900
CIV	548.87	888.93

In 7 days Compressive strength of normal concrete is **1.20%** lower than Admixture mix concrete

In 7 days Compressive strength of normal concrete is **16.35%** lower than Admixture & Silica mix concrete.

In 7 days Compressive strength of normal concrete is **4.55%** lower than Silica mix concrete.

In 28 days Compressive strength of normal concrete is **2.90%** lower than Admixture mix concrete.

In 28 days Compressive strength of normal concrete is **25.17%** lower than Admixture & Silica mix concrete.

In 28 days Compressive strength of normal concrete is **22.10%** lower than Silica mix concrete.

In case of unit weight, the weight is increase from the normal concrete in all type of concrete. The fact is the specific gravity of silica is more than cement.

We got highest compressive & tensile strength for used silica & Admixture and get lowest compressive strength of concrete for used normal cement. When we use admixture we got high work ability concrete. And when we used only Silica we got HSC. Overall we found good result in using Silica and Admixture.

5.3 RECOMMENDATIONS:

On the basis of present study following recommendations are suggested for further study

- With stone chips we used admixture and silica fume as percentage in later it can be used or tried with brick chips and other aggregate.
- We used water cement ratio as 0.45 & 0.38 for individual sampling. This would be used or can be used through test as 0.40 to 0.60.
- We used mixed design as 1:1:2. This would be changed by testing.
- We used admixture and silica fume. This would be in later can be used or tested to any kinds of admixtures and another chemical which used in construction.

References

[1] Islam Lasker and talukder are some method the first important is given to selection of water binder ratio for a given targeted strength, even though the w/b ratio is not a very good predictor of compressive strength the use of admixture like silica fume and super plasticizer as workable agent is a usual way to made HPC

[2] Vinayagamp conducted experiments with silica and admixture of high performance concrete with replace of silica fume 15% and mix are tested experimentally for workability, compression, split flexure and concluded the performance of the mix ratio or mix design

[3] Hooton conducted experiments on replacement of cement with silica fume and studied physical properties and durability properties like freezing, thawing, sulphate attack and alkali-silica reactivity he concluded that 28 days compressive strength was maximum at 15% silica fume replacement of w/b ratio 0.35 with variable dosage of admixture.

[4] Bühler, E. "Two Decades of Ready-Mixed High Performance Silica Fume Concrete A US Project Review" NRMCA Concrete Technology Forum, proceedings, Dallas, May 2007, 22 pp.

[5] Annadurai and Ravichandran contracted experiments for mix design of high strength concrete with admixture dosage range is 0.06 to 0.9% with an increment of 0.1% and concluded that addition of silica fume increases compressive strength and decrease the slump.

[6] Shreekear and Kumbhar studied the effect of mineral admixture in mix proportioning of high strength concrete silica is replace by weight of cement along with admixture and conducted that better strengths are achieved for 15% replacement.

[7] ACI, 234R -96 guide for the use of silica fume in concrete reported by ACI committee, 234, pp1-51, 1996

[8] Aitcen P.C high performance concrete, E & FN spon, London, 1998.

[9]. P Vinayagam, Experimental Investigation on high performance concrete using silica fume and admixture, International journey of Computer and Communication Engineering, vol-1, no.2 pp.168-171,2012

[10] Concrete Technology by A.M Neville & J.J Brooks.