AN EXPERIMENTAL STUDY ON FLOATING CONCRETE

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Abstract : Floating concrete is a special concrete which floats on the surface of the water. The main technique involved in this is to decrease the density of concrete than that of the density of water in order to make it float on the water. As we know that the density of conventional concrete is about 1800-2400kg/m3 but the density of water is 1000 kg/m3. So we need to make the concrete less dense than water. It can be done by using light weight materials having less bulk density. In this project we are going to develop a light weight floating concrete by replacing aggregates by using pumice stones which are having lesser bulk density of 250 kg/m3.Pumice in powder form called as pumicite can also be used as replacement of sand. Loss of heat in concrete is less due to the low thermal conductivity of pumice. it is widely used to make light weight concrete. As pumice has moisture retention capability it is also used in horticulture. Another light weight material used in this project was thermocole which has good thermal insulating properties, low moisture vapour permeability, high resistance to water absorption, relatively high mechanical strength and low density. A little percent of Foaming agent is also used to make floating concrete. We have prepared cubes by using different M 20 proportions and mixing the materials as per the standard mix proportions and curing the moulds by using pounding process which refers to covering of moulds with gunny bags and sprinkling of water. After curing the cubes are tested for compressive strength he cubes are tested for compressive strength for 3 days , 7 days, 14 days and 28 days.

KEY WORDS: Density, Floating concrete, compressive strength, Pumice, Thermocol.

I. INTRODUCTION

1.1 GENERAL

The time period during which concrete was first invented depends on how one interprets the term “concrete.” Ancient materials were crude cements made by crushing and burning gypsum or limestone. Lime also refers to crushed, burned limestone. When sand and water were added to these cements, they became mortar, which was a plaster-like material used to adhere stones to each other. The present day world is witnessing construction of very challenging and difficulty in civil engineering structures. As the earth is covered with two third of water there is a need for construction of floating structures. For this purpose a special concrete is required nothing but floating concrete . Researchers all over the world are attempting to develop low density or lightweight concrete by using different admixtures in concrete up to certain proportions. This study deals with the development of Floating concrete by using lightweight aggregates like Pumice stone, thermocole, and foaming agent as an air entraining agent. In order to make the concrete less dense we have to use light weight materials, so that its density should be less than that of water to make it float on the water surface.

Use of light weight concrete has been a feature in the construction industry for centuries. It has an expanding agent which increases the volume of the mixture and simultaneously reduces the dead weight of the mixture. The main features of the lightweight concrete are its low density and low thermal conductivity. It is lighter than the conventional concrete with a dry density of 300kg/m3 up to 1800 kg/m3. the reduced weight has many advantages, one of them is reduction in its self weight.

Generally the density of water is 1000 kg/m3 where as the density of conventional concrete is around 1800-2400 kg/m3, it shows that the density of concrete is more than that of water hence it will not float on water. To reduce the density of concrete we are using Pumice stone. It is a lightweight aggregate having less specific gravity of around 1.13. It is a highly porous material with a high water absorption percentage. In this we do not use the conventional aggregate and replacing it by the pumice stone. Pumice is the specimen of highly porous rocks having density approximately 250 Kg/m3. It is produced when super-heated, highly pressurized rock is violently ejected from volcano. The unusual foamy configuration of pumice happens because of simultaneous rapid cooling & rapid depressurization. Pumice has an average porosity of 60-80% and initially floats on water. Another material used to reduce the density of concrete is thermocole it is light in weight and floats on water. It has low moisture vapour permeability, high resistance to water absorption, high mechanical strength and low density. Its density is around 1.64 kg/m3. A little percent of foaming agent (protein based foaming agent) was used in order to make the concrete porous and light weight.

1.2. Objective:

1. To reduce the self weight of the concrete.
2. To characterize the materials required for developing floating concrete.
3. To develop a floating concrete based on trials.
4. To compare compressive strength of developed mixes.

1.3. Pumice structure:

Floating concrete is one of the type of light weight concrete. It was first introduced by the Romans in the second century where 'The Pantheon' has been constructed using pumice, the most common type of aggregate used in that particular year . From there on, the use of lightweight concrete has been widely spread across other countries such as USA, United Kingdom and Sweden. The main specialties of lightweight concrete are its low density and thermal conductivity. Its advantages are that there is a reduction of dead load, faster building rates in construction and lower haulage and handling costs. The building of 'The Pantheon' of lightweight concrete material is still standing eminently in Rome until now for about 18 centuries as shown in Figure 1.2. It shows that the lighter materials can be used in concrete construction and has an economical advantage.

1.4Advantages:

- Light in weight
- Floats on water due to less density
- Reduces the dead load of the structure
- Used as an acoustic medium
- Used for walk ways in docks and harbors
- High fire resistance capacity
- Easy to handle due to its less weight
- Can be used in earthquake regions for high rise buildings.
- Transportation is easy
- Takes less time for construction.

1.5.Disadvantages:

- Compressive strength of this concrete is lesser than that of conventional concrete, but when compared to autoclaved aerocon concrete its strength is high.
- Due to the presence of pores on its surface there is possibility seepage of water into it, Hence we use water proofing agents or water repellent agents in order to reduce water absorption tendency.

1.6.Applications:

The following are the different applications of floating concrete:

- Walkways for docks and harbours
- Tilt up walls
- Partition walls
- Parking areas
- Floating airports
- Floating bridges

2.LITERATURE REVIEW

2.1.Hemant k. Sarje and Amol S. Autade:

He has examined about the process of developing Lightweight concrete . this paper focuses on the compressive test, water absorption and flexural tests. The main fortes of lightweight concrete is its low density and low thermal conductivity which simultaneously reduces the dead load and increases the building rate, by mixing fly ash and aerating agents like kemelite- P;.R. Protein based foaming agent.

2.2.Dr.Sunilaa, et al (2015):

In this study attempt with M25 mix. As the result compression strength obtained maximum for the 60% of replacement of pumice with coarse aggregate concrete with 60% replacement of pumice the compressive strength in comparison to the normal concrete.

2.3.Saryas Qadir Sabir:

He worked on the development and performance in strength, fire endurance and thermal properties of lightweight concrete.

2.4.N.SivalingaRao et al.(2013):

They suggested with M20 concrete and achieved more target strength by replacing 20% of natural coarse aggregate by pumice aggregate with 1.5% of silica. The compressive strength is decreased when the increase in pumice aggregate.

3.MATERIALS

The materials used are:-

1.Cement
2.Fine Aggregate
3.Pumice aggregate
4.Water
5.Foaming agent
6.Thermocole

3.1. Cement:

The cement used was Ordinary Portland Cement. It was sourced from Ire, Osun State, Nigeria and it conformed to the requirements of BS EN 197-1: 2000.It is a fine mineral powder manufactured with very precise processes. Mixed with water, this powder transforms into paste that binds and hardens when submerged in water. Because the composition and fineness of the powder may vary, cement has different properties depending upon its makeup. Cement is the main component of concrete. It is economical, high quality construction material used in construction projects. Cement is made by grinding together a mixture of lime stone and clay which is then heated at a temperature of 1450 C. The granular substance called "CLINKER", a combination of calcium, silicate, alumina and iron oxide.

Basically, cement is produced in two steps**: -**

- First clinker is produced from raw materials.
- In the second step the cement is produced from cement clinker.

The first step can be a dry, wet, semi dry or semi wet process according to the state of the raw material.

3.2. Fine Aggregate:

Fine aggregates are the aggregates whose size is less than 4.75mm.

sand is used as fine aggregate in the preparation of concrete and Cement mortar. Sand is a naturally occurring granular material composed of finely divided rock and mineral particles. It is defined by size, being finer than gravel and coarser than slit. Sand can also refer to a textural class of soil or soil type; i.e. soil containing more than 85% sand-sized particles (by mass).The composition of sand varies, depending on the local rock sources and conditions, but the most common constituent of sand in silica (silicon-dioxide), usually in the form of quartz. The second most common type of sand is calcium carbonate.

3.3. Coarse aggregate (Pumice aggregate):

Pumice, called pumicite in its powdered or dust form, is a volcanic rock that consists of highly vesicular rough textured volcanic glass, which may or may not contain crystals. It is typically light colored. Scoria is another vesicular volcanic rock that differs from pumice in having larger vesicles, thicker vesicle walls and being dark colored and denser. Pumice is created when super-heated, highly pressurized rock is violently ejected from a volcano. The unusual foamy configuration of pumice happens because of simultaneous rapid cooling and rapid depressurization.

Fig.3.1 pumice aggregate

The depressurization creates bubbles by lowering the solubility of gases (including water and CO_2) that are dissolved in the lava, causing the gases to rapidly exsolve (like the bubbles of CO_2 that appear when a carbonated drink is opened). The simultaneous cooling and depressurization freezes the bubbles in a matrix. Eruptions under water are rapidly cooled and the large volume of pumice created can be a shipping hazard for cargo ships. Pumice is used in this concrete as it is a light weight aggregate and also less denser than metal aggregate.

3.4 Water:

The water used for the study was obtained from a free flowing stream. The water was clean and free from any visible impurities. It conformed to BS EN 1008:2002.The water content that is added in the concrete affects the workability of concrete. It also affects the properties of concrete such as durability, compressive strength, drying shrinkage, service life.

3.5 Foaming Agent:

Foaming agent is such chemical which are highly used in the field of construction for making bricks are simply made up with proper amount of cement, flyash and foaming agent finely mix with water in particular compressed air. what makes these bricks which are made with foaming agents different from other bricks due to some specific qualities such as it is very eco-friendly have very light weight so due to this it is easy for transporting it also have sound proof quality which make it different from other bricks. This agent produces almost no fumes of toxic or any emission over lifetime.

Types of foaming agent

1. Liquid foaming agent
2. Protein based foam agent
3. Synethic based foam agent

3.5.1. Liquid foaming agent

A liquid foaming agent is a substance which is capable of producing a light weight structure via a foaming process in a variety of materials that undergo hardening or phase transition. They are typically applied when the blown material is in a liquid stage. The light weight structure in a matrix reduces density, increasing thermal and acoustic insulation, while increasing relative stiffness of the original polymer.

Mixed physical/chemical blowing agents are used to produce flexible PU foams with very low densities. Here both the chemical and physical blowing are used in tandem to balance each other out with respect to thermal energy released and absorbed, minimizing temperature rise. Otherwise excessive exothermic heat because of high loading of a physical blowing agent can cause thermal degradation of a developing thermoset or polyurethane material. For instance, to avoid this in polyurethane systems isocyanate and water (which react to form carbon dioxide).

3.5.2. Protein based foam

It made to form light weight concrete and other bricks materials. Protein based foaming agent requires compartively more energy to make foam. It is prepared with raw material in presence of Ca(OH)2 and a small portion of NaHSO3. for improving the stability of foaming agent it is modified with the addition of several kinds of gel and surfactants.

Few siginificant improve the workability of foaming agent such as addition of alkyl benzene sulfonate etc. ,

3.5.3 Synethic based foam

Synthetic foaming agents are such chemicals which reduce the surface tension of liquid and commonly used globally to make blocks,bricks,clc brick etc.,where the high density is needed and it requires less energy for formation as compared to other foaming agents. It is highly recommended to use in the constructional fields where requriment of light weight floating concrete is increasing by time.

3.6 Thermocole:

Thermocol is another name for polystyrene. Whereas polystyrene is a synthetic aromatic polymer made from the monomer styrene. Thermocol is one of the most cost-effective protective packaging materials available and is used all over the world to protect goods from transit damage. It possesses an extraordinary combination of lightness, rigidity and shock absorption and can be molded to virtually any desired shape. It is also used widely for low temperature thermal insulation because of its low thermal conductivity and closed cell structure.

4.TESTS CONDUCTED ON MATERIALS USED:

The following are the materials that are tested in our project

1.Cement
2.Sand
3.Pumice

4.1 CEMENT

The following are the different types of tests conducted on cement

1. Standard consistency of cement
2. Initial and final setting time of cement
3. Fineness of cement

4.1.1 . STANDARD CONSISTENCY OF CEMENT

The basic aim is to fine out the water content required to produce a cement paste of standard consistency as specified by the IS :4031. The principle is that standard consistency of cement is that consistency at which the vicat plunger penetrates to a point 5-7mm from the bottom of vicat mould.

% of water added	Reading on gauge
26	23
28	17
30	6
32	0

4.1.2. INITIAL AND FINAL SETTING TIME OF CEMENT

When the vicat apparatus with dash pot is used, place the mould filled with cement and the non-absorbent plate on the base of the vicat apparatus. Raise the in the beginning the needle will completely pierce the block repeat the procedure until the needle fails to pierce block for 5+- 0.5mm measured from bottom of the mould.The beginning of solidification,called the initial set, marks the point in time when the paste has become unworkable. The period elapsing between the time when the water is added to the cement and the time at which the needle fails to make an impression on the surface of the test block shall be final setting time.

The initial setting time of the given sample of cement is **30 minutes.**

The final setting time of the given sample of cement is **10 hours.**

4.1.3. FINENESS OF CEMENT

Take 100 g of cement sample is taken and air-set lumps, if any, in the sample arebroken with fingers. The sample is placed on a 90-micron sieve and continuously sieved for 15minutes.

Weigh the residue left after 15minutes of sieving. This completes the test.

$$\% \text{ weight of residue} = \frac{\text{Wt. of sample retained on the sieve}}{\text{Total weight of the sample}}$$

$$= 6/100$$

$$= 6\%$$

The fineness of cement is found to be **6%.**

4.2 SAND

The following are the different types of tests conducted on sand

1.Sieve analysis
2.Specific gravity of fine aggregate by pycnometer method
3.Bulking of sand

4.2.1.SIEVE ANALYSIS:

The main aim of the test is to determine the effective size of soil and uniformity coefficient of soil by using grain size analysis.

Coefficient of uniformity, (Cu)

$$= (D_{60})/(D_{10})$$
$$= (0.9)/(0.6)$$
$$= 1.5$$

Coefficient of curvature, (C_c)

$$= (D_{30}^2)/(D_{10})\times(D_{60})$$
$$= (0.46)^2/(0.9 \times 0.6)$$
$$=0.39$$

Result:

1. Coefficient of uniformity, (C_u) = 1.5
2. Coefficient of curvature, (C_c) = 0.39

Table-1 results of sieve analysis

IS sieve designation	Weight of retained	% weight retained	Cumulative weight retained	%passing through

			Retained	Passing
4.75mm	32	3.2	3.2	100
2.36mm	70	7	10.2	96.8
2.00mm	36	3.6	13.8	89.8
1.18mm	178	17.8	31.6	86.2
600 microns	226	22.6	54.2	68.4
425 microns	208	20.8	75	45.8
300 microns	102	10.2	85.2	25
150 microns	64	6.4	91.6	14.8
75 microns	62	6.2	97.8	8.4
Pan	22	2.2	100	2.2

4.2.2.SPECIFIC GRAVITY OF SAND

In order to determine the specific gravity of fine aggregate i.e. sand we have two methods one is by using pycnometer and the other is by usind density bottle.here we have determined the specific gravity by using pyconometer.

Table-2 Specific Gravity Of Sand

Description	Trail 1	Trail 2	Trail 3
Weight of empty bottle (w_1)	640	640	640
Weight of bottle + sand (w_2)	1392	1402	1416
Weight of bottle+sand+water (w_3)	1790	1794	1804
Weight of bottle + water (w_4)	1340	1340	1340
Specific gravity $=\frac{\omega_2-\omega_1}{(w_2-\omega_1)-(\omega_3-\omega_4)}$	2.49	2.47	2.48

The specific gravity of fine grained soil is **2.48**

4.2.3.BULKING OF SAND:

To determine the bulking of sand at a given percentage of water content. For this 3 litres' water, Balance and weights, Measuring cylinder**,** Tamping rod andMixing tray.

Compact the sand in 3 layers in the vessel, each layer being given 25 stokes and strike level at the top. Note down the weight of compact the sand as w1. Dump the sand in to the mixing tray. Add a certain percentage of water (2%) by weight of dry compacted sand. Mix well till the sand uniformly moist. Fill container with the wet sand without any tamping. Strike top surface and find the weight of the wet loose sand as w2. Repeat the same with the water contents of 4%, 6%, 8%, 10%, 12% respectively. Plot a graph between bulking factor (y-axis) and water content (x-axis).

Table-3 Changes In Volume Due To Addition Of Water.

% water added to sand	Bulking of sand
0	500
2	570
4	600
6	610
8	620
10	660
12	590
14	570
16	520

The bulking of sand is seen at 10% water content with an increase in height upto **660 ml.**

4.3.PUMICE:

Los Angeles abrasion test was conducted on pumice stone. The test sample consists of clean aggregates dried in oven at 105° – 110°C. The sample should conform to any of the gradings.

Observations of Los Angeles Test

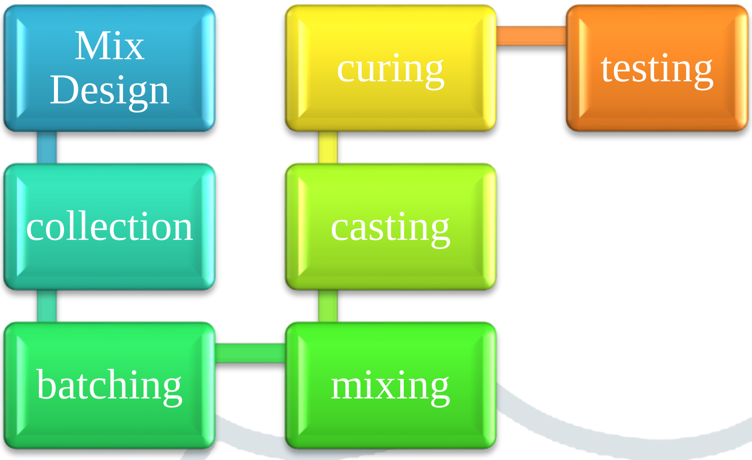
Original weight of aggregate sample = W_1 g=1500

Weight of aggregate sample retained = W_2 g=214

Abrasion Value = W_2 / W_1 X 100

Los Angeles Abrasion Value =**14.2%**

5.METHODOLOGY



5.1.MIX DESIGN:

The quantity of materials required for the preparation of sample moulds. The estimation is done based on the codes of IS 10262:2009.

The grade of concrete = M_{20}
Mix proportions for M_{20} grade concrete = 1: 1.5: 3
Dimensions of moulds used = 150×150×150 mm
Volume of each mould = 150×150×150 mm
= 3375×10^{3} mm^{3}
= 3.375×10^{-3} m^{3}

Calculations for 150x150x150 mould:

Cement $= \frac{1}{5.5} * 1440 * 1.54 * 3.375 * 10^{-3}$
=1360 gms

Sand $=\frac{1.5}{5.5} * 1520 * 1.54 * 3.375 * 10^{-3}$
=2150 gms

Pumice aggregate $=\frac{1.5}{5.5} * 250 * 1.54 * 3.375 * 10^{-3}$
=708 gms

Total weight **=4218 gms**
Thermocole =0.3% of total weight
$=4218 * \frac{0.3}{100}$
=12.6 gms

Calculations for 60x20x10 beam mould:

Cement $= \frac{1}{5.5} * 1440 * 1.54 * 0.012$
=4830 gms

Sand $=\frac{1.5}{5.5} * 1520 * 1.54 * 0.012$
=7660 gms

Pumice aggregate $=\frac{1.5}{5.5} * 250 * 1.54 * 0.012$
= **2520 gms**

Trail-1: without using foaming agent:

Materials used and their quantities:

Materials: cement, sand, pumice stones, water, Thermocole

Quantities for each mould of size 150x150x150mm.

Cement : 1360gms
Sand : 2150gms
Pumice stones : 708gms
Thermocole : 16gms (4% of total weight)
adopted water cement ratio: 0.5
amount of water added : 680ml

Trail-2: with foaming agent:

Materials used and their quantities:

Materials: cement, sand, pumice stones, Foaming, Thermocole, water

Quantities for each mould of size 150x150x150mm.

Cement : 1360gms
Sand : 2150gms
Pumice stones : 708gms
Thermocole : 16gms (4% of total weight).
foaming agent : 20ml per one ltr of water

Trail-3: Casting a beam mold with foaming agent:

Materials used and their quantities:

Materials: cement, sand, pumice stones, Foaming, Thermocole, water

Quantities for each mould of size 600x200x100mm.

Cement : 4830gms
Sand : 7660gms
Pumice stones : 2520gms
foaming agent : 25ml per one ltr of water.

5.2.COLLECTION OF MATERIALS: -

The materials are collected based on the Indian standards

Cement: In this project cement of 53 grade manufactured by UltraTech is used. The cement should be freshly taken from packing and it is free from lumps and moisture.

Sand:The sand passing through 4.75mm sieve is collected and used in this project. The collected sand is free from moisture and foreign matter.

Pumice aggregate:The maximum size of coarse aggregate (crushed stone) used is 20mm. The aggregate is free from surface moisture and dust.

Foaming agent: The maximum amount of foaming agent used in this is 25 ml per one liter of water. We used protein based foaming agent.
Thermocole: Thermocole is grained into fine particles. Those fine particles are mixed in the concrete.

5.3.Batching:

In vatching, materials are measured on the basis of volume. It is less precise method of batching.Measurement boxes or gauge boxes of known volume are used to measure materials. Cement is taken in the form of bags, where volume of one bag of cement (50 kg) is taken as 35 liters.Volume of Gauge box used is made equal to the volume of one bag of cement which is 35 liters or multiple thereof.Gauge boxes are generally deeper and contains narrow top surface and they are made of timber or steel or iron.Volumes of different sized fine aggregate and coarse aggregate are measured individually by these gauge boxes.Water is measured using water meter or water cans of known volume are used.

5.4.MIXING:

Hand mixing is the process of mixing the various materials of concrete manually. Mixing concrete without a mixer is used only for small works. Mixing of materials shall be done on masonry platform or flat iron sheet plates.Spread the measured quantity of sand on the platform, and then cement shall be dumped on the sand. The sand and cement shall be mixed thoroughly with the help of shovels in the dry state. The measured amount of coarse aggregate shall be spread out, and the mixture of sand cement spread on it mixed properly.Depression is made at the centre of the mixed materials.Add 75% of the required quantity of water in the depression and mix with the help of shovels.Add the remaining amount of water and continue the mixing process till a uniform color and consistency of concrete is obtained.

Fig.5.1 Hand Mixing

5.6.CASTING OF CUBES:

Concrete is placed on form works. The form works should be cleaned and properly oiled. If concrete is to be placed for foundation, the soil bed should be compacted well and is made free from loose soil.Concrete should be dropped on its final position as closely as possible. If it is dropped from a height, the coarse aggregates fall early and then mortar matrix. This segregation results into weaker concrete.

5.7.COMPACTING:

In the process of placing concrete, air is entrapped. The entrapped air reduces the strength of concrete up to 30%. Hence it is necessary to remove this entrapped air. This is achieved by compacting the concrete after placing it in its final position. Compaction can be carried out either by hand or with the help of vibrators.

HAND COMPACTION:

In this method concrete is compacted by ramming, tamping, spading or by slicing with tools. In intricate portions a pointed steel rod of 16 mm diameter and about a meter long is used for poking the concrete.

Fig.5.2 Hand Compaction

5.8.CURING:

There are various methods of curing. The adoption of a particular method will depend upon the nature of work and the climatic conditions. The following methods of curing of concrete are generally adopted.

- Shading concrete work
- Covering concrete surfaces with hessian or gunny bags
- Sprinkling of water
- Ponding method
- Membrane curing

- Steam curing

5.9. TESTING:

5.9.1Compressive strength of concrete:

Out of many tests applied to the concrete, this is the utmost important which gives an idea about all the characteristics of concrete. By this single test one judge that whether Concreting has been done properly or not. Compressive strength of concrete depends on many factors such as water-cement ratio, cement strength, quality of concrete material, quality control during production of concrete etc.Test for compressive strength is carried out either on cube or cylinder. Various standard codes recommend concrete cylinder or concrete cube as the standard specimen for the test.

RESULTS:

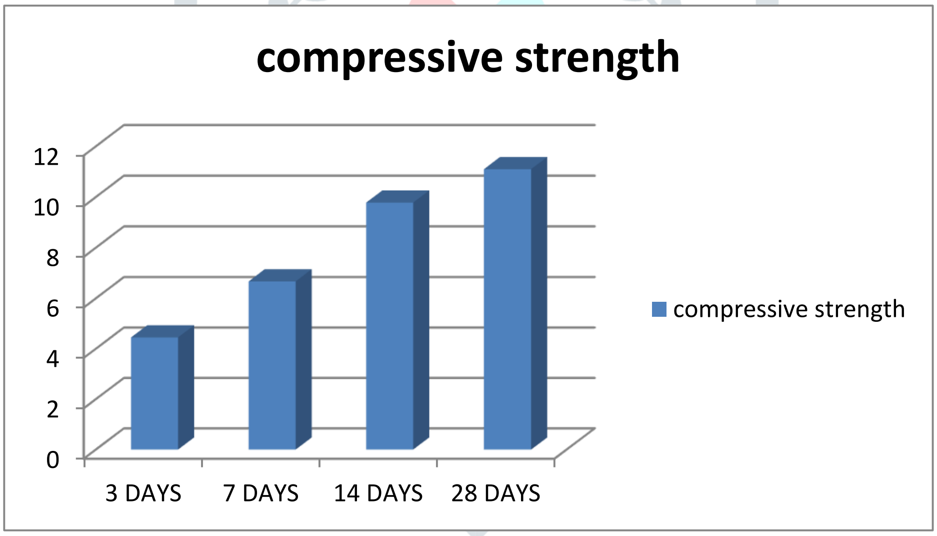
Table-4 Compressive strength of Cubes With out using foaming agents

S.no	No of days	Weight of cube Kg	Density of cube kg/m^3	Load applied Kn	Compressive strength n/mm^2
1	3 days	4.23	1253	100	4.45
2	7 days	4.31	1277	150	6.678
3	14 days	4.38	1297	220	9.78
4	28 days	4.34	1285	250	11.1

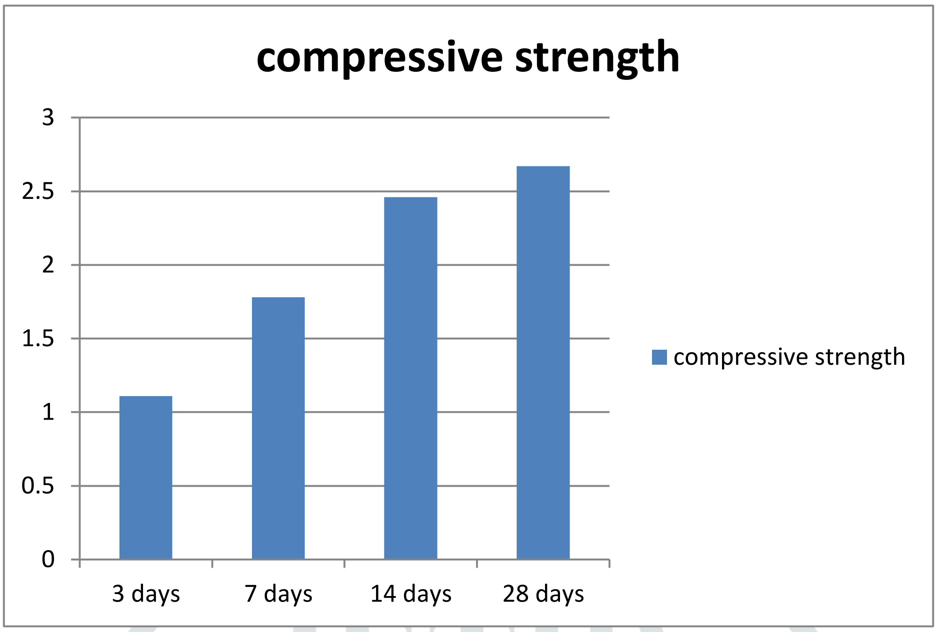
Table-5 Compressive strength of cubes with foaming agent

S.no	No of days	Weight of cube Kg	Density of cube kg/m^3	Load applied Kn	Compressive strength n/mm^2
1	3 days	2.36	699	25	1.11
2	7 days	2.49	739	40	1.78
3	14 days	2.58	752	55	2.46
4	28 days	2.43	720	60	2.67

Graph-1 Compressive Strength of cubes without Foaming agent



Graph-2 Compressive Strength of cubes with Foaming agent



6.CONCLUSION:

For developing floating concrete we adopted M20 mix proportions by this we came to know that water absorption is seen in the cube while floating on the water and we suggest that in order to reduce the water absorption capacity we have to use some water proofing agents.

In first trail we made blocks by using light weight aggregates (pumice aggregates) in this a moderate strength concrete is developed with a density ranging from 800-1350 kg/m^3 and giving a compressive strength of 8 N/mm^2 as the density is more than that of water this is not floating on the water .

In second trail we have introduced foaming agent.A low density concrete is developed with a density ranging from 300-800 N/mm^2 giving a compressive strength of1.9 N/mm^2 . as its density is less than that of water cube is successively floating on the water surface but the only drawback we observed in this experiment is the cube is absorbing the water so we suggest the uasage of waterproofing agents in the floating concrete.

pumice and thermocol beads could be used as an alternative for coarse aggregates. Use of light weight aggregates like pumice and thermocol beads results in reduction of density and thus floating concrete could be developed. Crushed pumice with a lower specific gravity could also be used as a replacement to sand with higher specific gravity.

Scope For Future Studies :

1. Attempts can be made to develop floating concrete with higher compressive strength.
2. Attempts can be made to develop floating concrete with other cementitious materials having lower specific gravity.
3. Attempts can be made to develop floating concrete with lighter aggregates.

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