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Utilizing Fly ash & Quarry Fine in Concrete

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Abstract: Lightweight concrete has been wide utilised in several structural applications and its consumption grows each year on a worldwide base. The cause for this is often that mix treatment of light-weight concrete has several benefits. These include: a discount within the loading of the structure, that minimizes the size of structural members; the assembly of lighter and smaller pre-cast parts with cheap casting, handling and shipping operations; the look of extra space as a result of the diminution in size of the structural members; a decrease within the peril of earthquake damage; and enlarged thermal insulation and flame resistance. In India, among the multiple construction applications, masonry structures type the best proportion of the uses of typical burnt clay bricks, ash bricks, hollow concrete block, that have several drawbacks (like an excellent weight, non-uniform form and size, low thermal insulation and fireplace resistance etc.), which will be improved by mixed treatment of light-weight concrete. the employment light-weight concrete, provides improved thermal insulation and flame resistance, thereby it's thought of a good approach not solely in fireplace protection however conjointly in reducing the U-values (it's the live of warmth passing through a structural element) of structures . In this dissertation Foam Concrete blocks are cast with 65% of Fly ash and 35% of cement with foam content 1.5% of total weight and to increase its strength sand and Quarry Fine is added in their composition which replaces fly ash up to 30% at an interval of 5%. To check properties of these cellular lightweight concrete (FC) block test like compressive strength, density and water absorption is performed in the lab.

Keywords: Compressive Strength, Fly Ash, Foam Concrete block , hollow concrete block, Quarry Fine,.

I. INTRODUCTION

The cellular lightweight concrete (CLC) or sometimes might often call that foamed concrete is either a cement paste or mortar, classified as lightweight concrete, in which air voids are entrapped in mortar by suitable foaming agent. Cellular light weight concrete is produced by the mixing of Portland cement, sand including or alone fly ash, water and suitable foaming agent . Foam concrete is produced either by pre-foaming method or mixed foaming method.

Cellular Concrete was first developed in Stockholm, Sweden in the early 1900's. The original material was known as "gas concrete" to be used in producing heat-insulated building materials. This led to the development of related lightweight concrete which are now known as cellular concrete, foamed concrete, aerated concrete and autoclaved cellular concrete .After the Second World War, this technology quickly spread to different parts of the world, mostly Europe and the Soviet Union. A detailed study concerning the composition, physical properties and production of foamed concrete was first carried out in the 1950s and 60s. Following this research, new admixtures were developed in the late 1970s and early 80s, which led to the commercial use of foamed concrete in construction projects. The applications were for floor, roof and wall units. Having low compression strengths, it limited this product to fills and insulation only.

Foamed concrete, also called cellular light weight concrete is produced by the mixing of Portland cement, sand including or alone fly ash, water and preformed stable foam (or Foaming Admixture). The foam is produced with the help of a foam generator by using foaming agent. The air content is typically between 30 to 80 percent of the total volume. The bubbles vary in size from around 0.1 to 1.5 mm in diameter The role of foaming agents in cellular concrete is to create small and enclosed air bubbles by reducing the surface tension of a solution and increasing the stability of air bubbles.

Foamed concrete differentiates from (a) gas or aerated concrete, where the bubbles are chemically formed through the reaction of aluminium powder with calcium hydro oxide and other alkalis released by cement hydration and (b) air entrained concrete, which has a much lower volume of entrained air is used in concrete for durability. Presently, cellular concrete is used for sound and heat insulation, building blocks and panels, fire protection wall, energy absorbing pads in roads, road sub-base, structural fill, foundations, geotechnical and mine fill applications In present days; India has lots of building projects, so finding alternative construction material is one of the solutions to construct economical and sustainable buildings.

II. MATERIALS & METHODOLOGY

The following materials are used during the research work-

- Cement
- Fine aggregates (Sand)
- Coarse Aggregates(12.5 -20mm)
- Coarse Aggregates(10mm)
- Quarry Fine
- Fly Ash (untreated)
- Foaming Agent
- Water

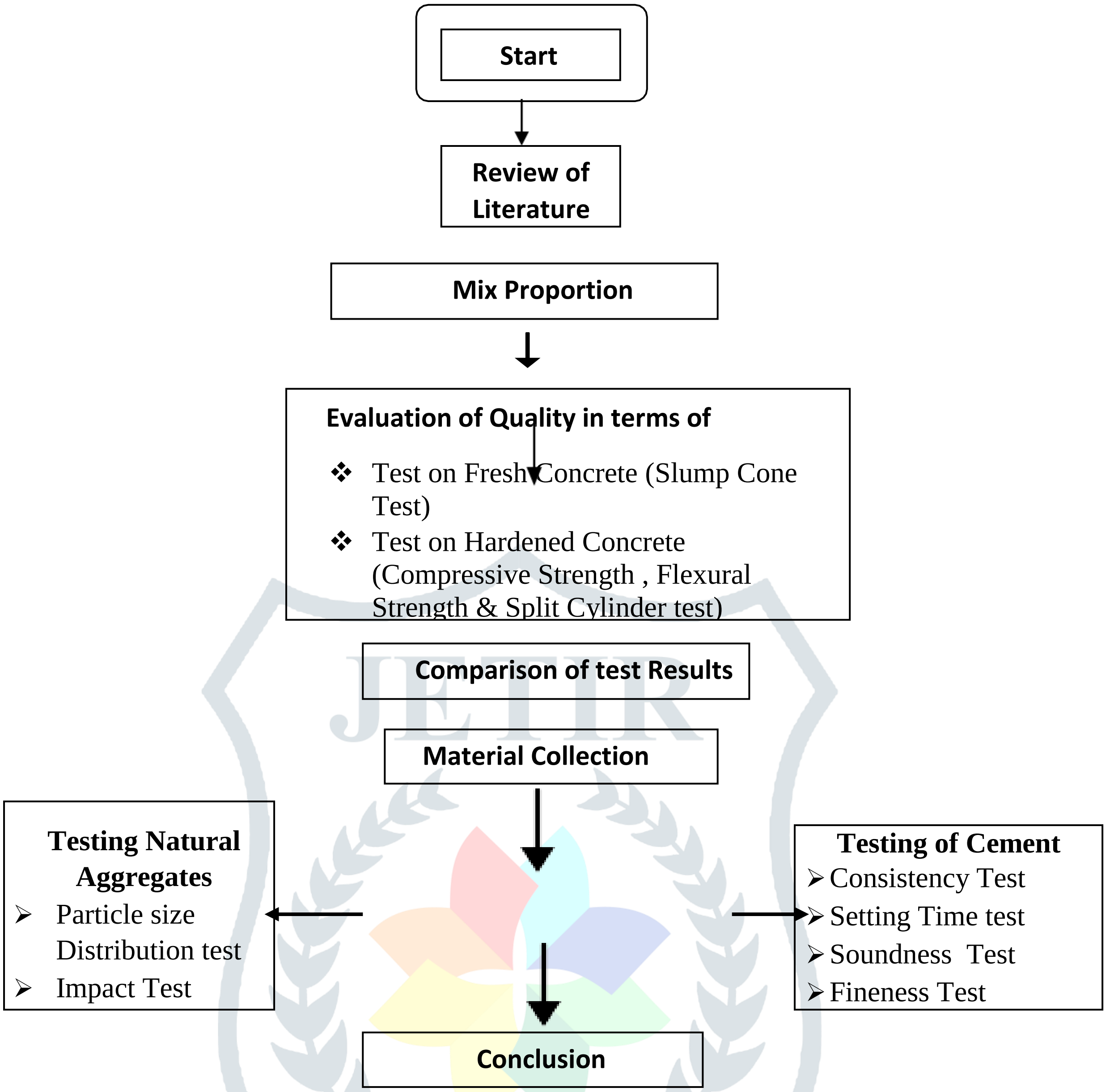

Table 1 Cases considered for study

Mix Name	Cement Content (%)	Fly Ash Content (%)	Quarry Fine (%)
CC	35	65	0
T1	35	60	5
T2	35	55	10
T3	35	50	15
T4	35	45	20
T5	35	40	25
T6	35	35	30

III. RESULTS AND DISCUSSIONS

Table 2 Result of Dry Density of Foam Concrete

Mix	Density (kg/m^3)
CC	1510
T1	1524
T2	1538
T3	1541
T4	1549
T5	1550
T6	1568

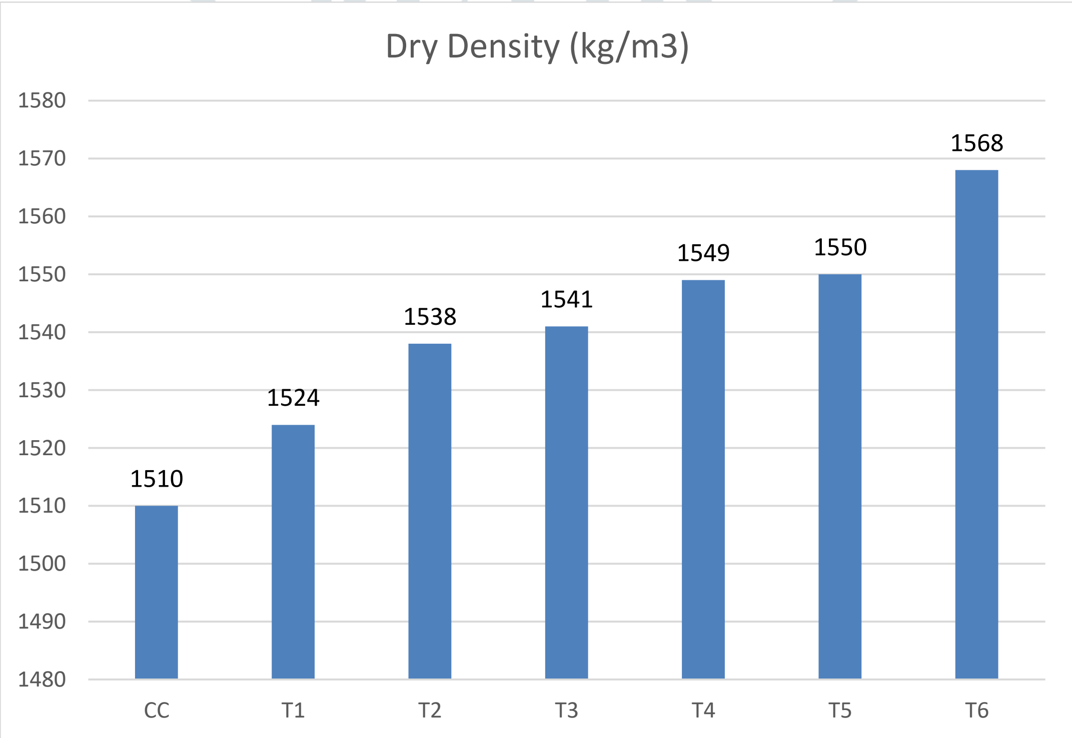

Fig 1 : Result of Dry Density of Foam Concrete

Table 3 : Result of Water Absorption of Foam Concrete

Mix	Water Absorption (%)
CC	14.78
T1	13.52
T2	12.91
T3	12.11
T4	11.67
T5	10.97
T6	10.34

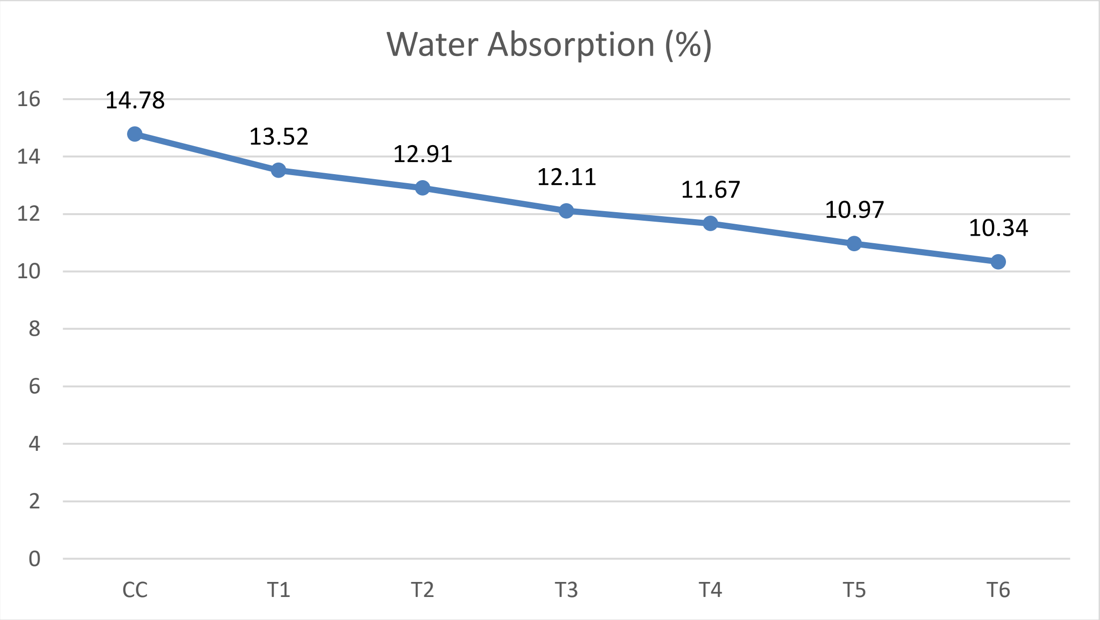

Fig 2 : Result of Water Absorption of Foam Concrete (Line Graph)

Table 4 : Result of Compressive Strength of Foam Concrete

Mix	Compressive Strength (Mpa)	
	7 Days	28 Days
CC	2.35	5.78
T1	3.67	6.51
T2	4.12	6.92
T3	4.95	7.34
T4	5.37	8.12
T5	5.74	8.38
T6	6.17	8.67

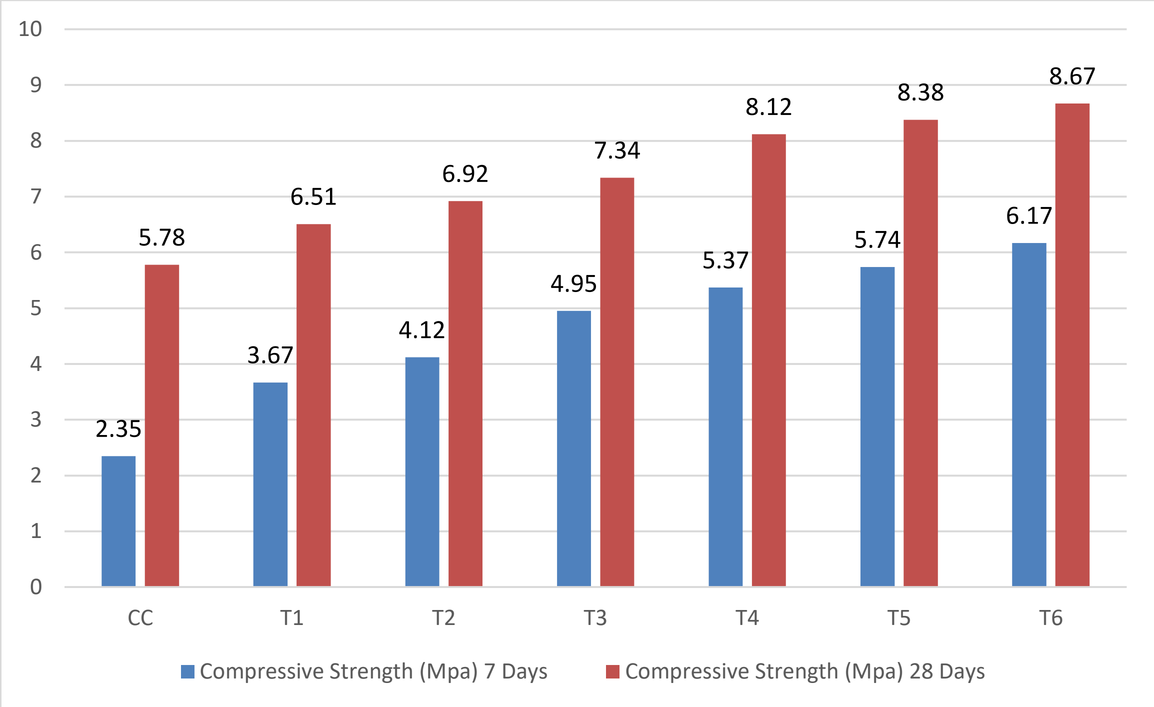

Fig 3 : Result of Compressive Strength of Foam Concrete (Bar Chart)

IV. CONCLUSION

Present study contains a study of properties of Foam Concrete and also the use of Quarry Fine in the proportion of Foam Concrete. Conclusions are drawn from the present study is given below:

Dry density of the foam Concrete is raised once Quarry Fine is part replaced by fly ash content in it. It's additionally ended that increasing content of Quarry Fine within the constitution, will increase the density of foam Concrete, replacement of fly ash by Quarry Fine up to 30% possess increment of 3.70% in dry density. Water absorption of foam Concrete is folded once Quarry Fine is partially replaced by fly ash content in it, when increasing content of Quarry Fine within the composition, decreases the water concentration of foam Concrete, replacement of fly ash by Quarry Fine up to 30% possess decrement of 30.04% in water concentration. Compressive Strength of the foam Concrete is raised once Quarry Fine is part replaced by fly ash content in it. It's additionally determined that increasing content of Quarry Fine within the composition, increases the compressive strength of foam Concrete, replacement of fly ash by Quarry Fine up to30% possess increment of 33.33% in compressive strength.

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