International Journal of Advanced Technology in Engineering and Science Vol. No. 09, Issue No. 03, March 2021 www.ijates.com ISSN 2348 - 7550

An Experimental Investigation on the Properties of Foam Concrete Akshata A Mulgund^a, Dr. D K Kulkarni^{*b}

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Abstract: In this article, we have discussed about Foam concrete, its materials, advantages, disadvantages and its applications. It is a kind of Light Weight Concrete, which will have lesser weight, and can be used in precast industries. The objective of this paper is to discuss about the materials to be used for the production of foamed concrete.

Keywords: Foam, Foaming agent; Concrete; I. INTRODUCTION

Foam Concrete is a kind of light weight concrete which is manufactured with cement, fine aggregate and foaming agent. It is also defined as a light cellular concrete which has some random air - voids created from the mixture of foam agents in the mixture of cement and fine aggregate which is also called as foam mortar. The foam is produced with the help of foam generator attached to a compressor by using a foaming agent. The bubbles vary in size from around 0.1 to 15 mm in diameter. Coarse aggregate is not used in the manufacturing of the concrete, and there is no compaction required. Light weight foamed concrete is made by introducing air through the proprietary process to manufacture different types of density of concrete according to the applications required. The density of foamed concrete range from 300 to 1800 kg/m³, which is significantly lower than normal conventional concrete . Foam concrete flows readily. Foamed concrete is simple to produce but, we should provide close control. Foam concrete is manufactured from cement, sand,water, and the foam. Foam concrete can be defined as a cementitious material that consists of minimum 20 percent of foam, that is mechanically entrained into the plastic mortar. The compressive strength of foam concrete determined at 28 days, ranges from 0.2 to 10 N/mm² or can go higher.

Materials:

Ordinary Portland Cement :

Ordinary Portland cement is used, but rapid hardening cement can also be used if necessary. The content of cement range from 300 to 400 kg/m^3 . Cement which can be used is OPC 43 grade and should confirm to the IS Code.

Fine Aggregate :

River sand is used, and it should have lesser fines.Dust in sand increases the demand for water and cement, it also increases shrinkage. A small amount of fines contributes towards strength. The quality of sand should be good, no impurities should be there. Crushed sand should not be used. Locally available river sand should be used. Therefore only fine sand should be used.The fine aggregate should be dried in an oven.

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II. WATER:

Water required in foamed concrete depends upon the materials, and admixtures used. The water to cement ratio range is suggested to be from 0.4 to 1.25. The water used for the foamed concrete mix design should be potable drinking water. A water requirement in foamed concrete depends upon the constituents and the use of admixtures. A low water content causes the mix to be too stiff and bubbles break during mixing. At high water content, the slurry will be very thin.

Foaming agent:

Foaming agents control the concrete density through a rate of air bubbles created in the cement mortar. Foam bubbles are defined as enclosed air – voids. The foam agents are commonly synthetic, protein based. Synthetic and Protein based are two types of foam agents.. The protein based foaming agents result in a stronger and more closed – cell bubble structure which helps in the inclusion of greater amounts of air. The water reducing chemical admixtures are likely to cause instability in the foam and subsequently are not usually used.

Types of Foaming Agent :

There are two types of foaming agent.

Protein based foaming agent:

It is used to prepare light weight concrete. It does not produce any reaction on concrete however it fills in as a layer which is air tapped. It requires more energy to produce foam.

Synthetic based foaming agent:

Utilizing right class of foaming agent has an immense effect in items, for example, its resistance and mechanical properties of concrete.

Production of Foam Concrete :

The production of foam concrete involves the dilution of surfactant in water, which is passed through a foam generator, which will produce foam. The foam produced is mixed with the cement mortar, and foamed quantity of required density is produced.

Mix Design :

Various trials were been made and results were obtained for Compressive Strength and Flexural Strength.

Compressive Strength Test Results

Trials	Density	Compressive Strength
		N/mm ²
Trial 1	940.023	0.88
Trial 2	1129.213	1.033
Trial 3	1036.37	0.956
Trial 4	1196.146	1.033
Trial	1162.836	1.476
5(Mesh)		

International Journal of Advanced Technology in Engineering and Science 🚄

Vol. No. 09, Issue No. 03, March 2021 www.ijates.com





Flexural Strength Test Results

Trial No	Density	Flexural
		Strength N/mm ²
Trial 1	923.8	1.27
Trial 2	1325.13	1.62
Trial 3	1910.4	3.56
Trial 4	1747	3.52
Trial 5	1510.03	2.92



III. CONCLUSION :

After using the different trial mix designs we can see that the results obtained from the mix design, with less water cement ratio and Mesh Reinforcement gives better results.

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International Journal of Advanced Technology in Engineering and Science Vol. No. 09, Issue No. 03, March 2021 ijates

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ISSN 2348 - 7550