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Case Study of Foamed Cellular Light Weight Concrete

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Abstract: ***Foam concrete has special qualities that can be taken advantage of in structural designing works. It requires no compaction, however will stream promptly from an outlet to fill confined and sporadic pits, and it tends to be siphoned over huge distances and levels. Along these lines it very well may be considered a free-streaming, self-setting fill. This report gives a rundown of foam. Foam concrete is easy to create be that as it may, as of now, there is a need to give close control during its creation and on location oversight during its situation and restoring. The requirement for such unique prerequisites will diminish as industry turns out to be more acquainted with the person and conduct of the material.***

I. INTRODUCTION

One of the techniques for diminishing the thickness of substantial depends on the presentation of stable voids inside the solidified concrete glue or mortar. The voids can be delivered by gas or via air. Since a foam specialist presents the air, the substantial created is called foam concrete. Foam concrete is a larger part of cement containing no huge totals, just fine sand and with incredibly lightweight materials containing concrete, water and foam. It can be viewed as somewhat homogeneous when contrasted with typical cement, as it doesn't contain coarse total stage. Nonetheless, the properties of foamed concrete rely upon the microstructure and piece, which are impacted by the sort of cover utilized, techniques for pre-formation and restoring. The primary benefit of foam concrete is its lightweight, which guarantees economy of dividers of the lower floors and establishments. It enjoys a few benefits and since it is permeable in nature, it gives warm protection and extensive reserve funds in the material. The significant utilizations of foamed concrete incorporate underlying components, non-primary allotments also, warm protecting materials. Producers created foam cements of various densities to suit the above necessities and these items were utilized in channel restoration, span projection, void filling, rooftop protection, street subbase, divider development, burrowing and so foam

II. PROPERTIES OF FOAM CONCRETE

A. Consistency

1) Stream time utilizing bog cone and stream cone spread tests are embraced to evaluate the consistency of foam concrete
2) The consistency diminishes with an expansion in volume of foam in the blend which might be ascribed to the
3) Decreased self-weight and more prominent union coming about because of higher sir content.
4) Bond between the air pockets and strong particles in the blend expands the solidness of the blend.

B. Stability

The soundness of foam concrete is the consistency at which the thickness proportion is almost one (the deliberate new thickness/plan thickness), with no isolation and dying.

C. Drying Shrinkage

1) Foam concrete has high drying shrinkage because of the shortfall of totals, i.e., up to multiple times greater then those saw on ordinary weight concrete.
2) Autoclaving is accounted for to lessen the drying shrinkage altogether by 12-half of that of sodden restored concrete because of a change in mineralogical structures.
3) The shrinkage of foam concrete lessens with thickness which is ascribed to the lower glue content influencing the shrinkage in low-thickness blends.

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D. Low thickness and High Strength

1) Because of its low thickness, foam concrete forces minimal vertical weight on the base - an especially significant quality in regions touchy to settlement.
2) Heavier thickness (1000 kg/m3+) foam concrete is mostly utilized for applications were water entrance would be an issue - infilling basements, or in the development of rooftop chunks for instance.

E. Self-Leveling

1) Foam concrete is naturally self-leveling and self-compacting, filling the smallest voids, cavities, and seams within the pouring area.
2) In excavations with poor soils that cannot be easily compacted, foam concrete forms a 100% compacted foundation over the soft sub-soil. Compaction of conventional, granular backfilling against retaining structures or deep foundations can cause damage or movement to the adjacent structure. In these situations, foam concrete with its reduced lateral loading is a safe solution.

F. Compressive Strength

1) The compressive strength diminishes dramatically with a decrease in thickness of foam concrete.
2) The boundaries influencing the strength of foam concrete are concrete sand and water-concrete proportions, restoring system, type and molecule size appropriation of sand and kind of foaming specialist.
3) For dry thickness of foam concrete somewhere in the range of 500 and 1000 kg/m3, the compressive strength diminishes with an expansion in void distance across or densities higher than 1000/m3, as the air-voids are far separated to impact the compressive strength, the organization of the glue decides the compressive strength.

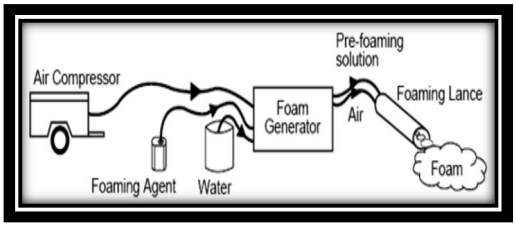
III. MAKING OF FOAM CONCRETE

The components of foam concrete mix should be set by their functional role in order as follows:-

1) Foaming agent
2) Binding agent
3) Water
4) Fine Aggregate
5) Admixtures

A. Making the Slurry

1) The cement used for the slurry is usually type one portland cement although other cements can be used. If sand is specified in the mix design ideally it should be fine with 2mm .
2) The water cement ratio of the slurry is usually between 0.5 and 0.6. If necessary more water can be added to increased the workability.
3) the cement mortor slurry is made at the batching plant, according to the mix design, by either the DRY or WET method.



4) Foam for foamed concrete is made from a concentrated foaming agent. The foam is made using a foam generator. In the foam generator the foaming agent is diluted in water to make a pre-foaming solution.
5) It is important to make the slurry first, before making the foam. Ideally the foam should be generated and delivered directly into the mixer of the ready mix truck that contains the slurry. The mixer should be rotated at approximately 10 revolutions per minute.

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Foam concrete is delivered either by:-

a) Pre-foaming technique contains delivering base blend and stable preformed watery foam independently and afterward completely mixing foam into base blend.

b) Is blended foaming, the surface dynamic specialist is blended alongside base blend fixings and during the most common way of blending foam is created bringing about cell structure in concrete.

IV. TESTING ON FOAM CONCRETE

Testing on hardened concrete specimens

1) *Compression Test:* Compressive strength of concrete can be defined as the measured maximum resistance of a concrete to axial loading. Compression test is the most common test used to test the hardened concrete specimens because the testing is easy to make. The strength of the concrete specimens with different percentage of foam concrete replacement can be indicating through the compression test. The specimens used in the compression test were the cube of 190mm X 90mm X 90mm. There are 3 specimens were used in the compression testing. Differences of the strength among the different percentage of foam concrete used in the age of 28 days also indicated through the compression test. The compressive strength of foam was found about 20.2N/mm2 .
2) *Water Absorption:* For the determination of water absorption of the cured samples, specimen of size 190×90×90 mm were used. The mass of water absorbed by the dry mass of specimen gives the capacity of water absorption. It's normally expressed in percentage.

Percentage of Water Absorption = (B-A/A)*100

Where,

A = Mass of the oven dried sample.

B = Mass of the saturated sample.

The water absorption test perform on Foam brick gives 12.5 percent of water absorption

A. Uses of Foam Concrete

Some of purposes of foam concrete are as per the following.

1) Building Block: Blocks and boards can be made for parcel and burden bearing dividers. They can be made with practically any aspects.
2) Floor Screed: Foamed cement can be utilized for floor tirades, making a level surface on lopsided ground and raising floor levels.
3) Roof Insulation: Foamed Concrete is utilized broadly for rooftop protection and for making a slant on level rooftops. It has great warm protection properties and on the grounds that it is lightweight foamed concrete doesn't force an enormous stacking on the structure.
4) Road sub-base: Foamed concrete is being utilized street subbase on an extension. Foamed concrete is light weight so the stacking forced on the bridges limited.
5) Bridge across stream or lake: as thickness of foamed concrete is exceptionally less so it can drift on water subsequently it tends to be utilized for making the scaffold over waterway or lake.
6) It can be additionally utilized were the fire protection is required.
7) It can be additionally utilized were sound confirmation material is required.
8) Can be utilized for shear divider at high ht. dividers.

V. RESULT

Sr. no	Type of bricks	Sample	7 Days Avg.	14 Days Avg.	28 Days Avg.
1	concrete brick	1,2,3	11.8 N/mm2	16.9 N/mm2	18.9 N/mm2
2	Foam concrete brick	1,2,3	12.6 N/mm2	17.7 N/mm2	20.2 N/mm2

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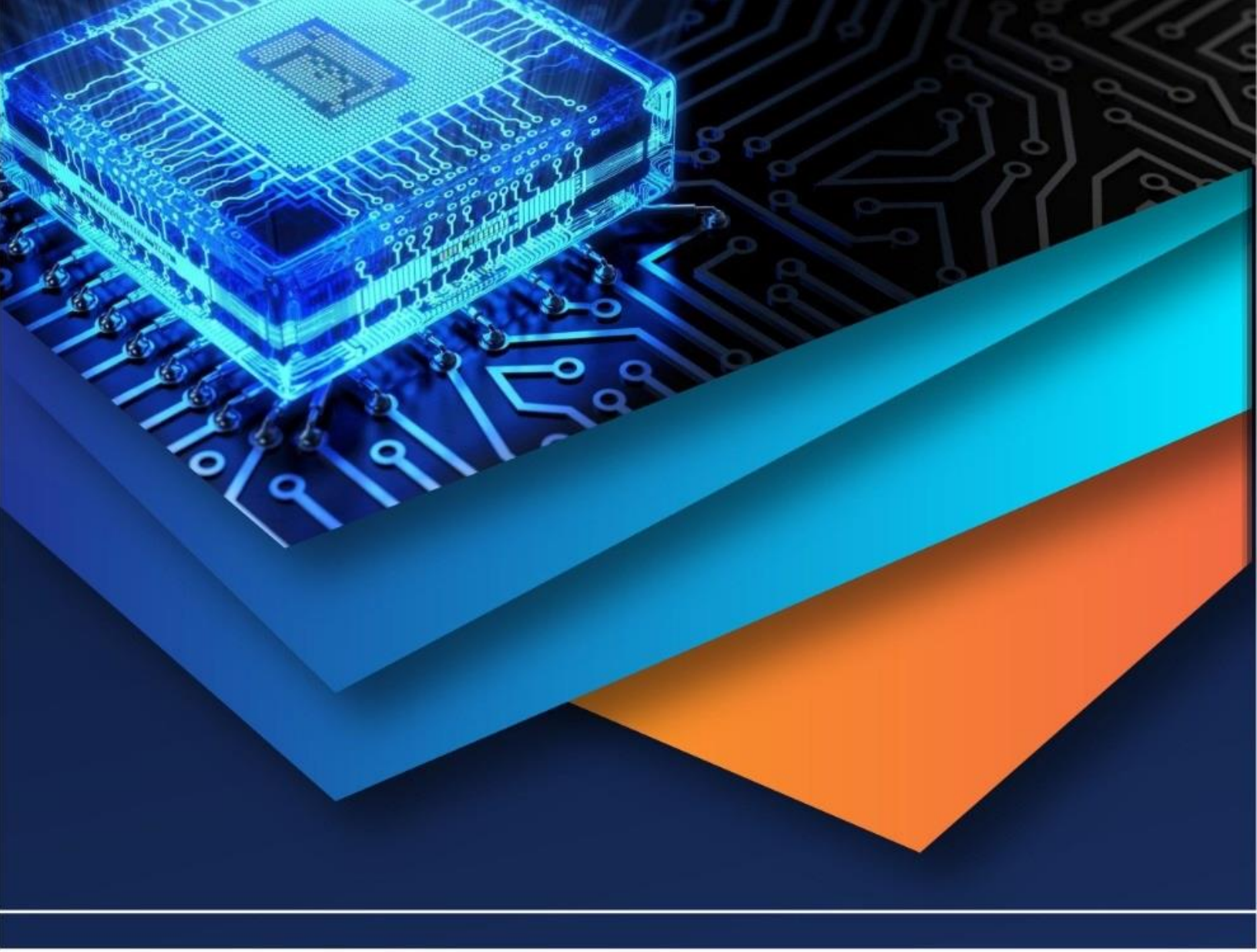
VI. CONCLUSION

1) It will reduces the dead weight of the structure, thus it will leads to cost saving of the structure.
2) It will be light in weight, and will have max. compressive strength
3) Foam concrete bricks will be more suitable for construction than any other bricks for making structure light in weight.
4) By comparing foamed concrete with other bricks it will be seen that the cost reinforcement & size of beams & columns are reduced. Therefore , the cost is also reduced due to load factor.

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