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COMPARISON BETWEEN BUBBLE DECK SLAB AND CONVENTIONAL SLAB

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Abstract: - The various structural behavior of voided slab or bubble deck slab and their structural benefits over traditional concrete slab is observed. Bubble deck slab is a method of eliminating concrete from the middle of a slab, which is not performing any structural function, thereby dramatically reducing structural dead weight. High density hollow spheres replace the ineffective concrete in the center of slab, thus decreasing the dead weight and increasing the efficiency of the floor. A biaxial hollow slab system is widely known as one of the effective slab system which can reduce the self - weight of slabs. A Bubble Deck slab has two dimensional arrangements of voids within the slab to reduce self-weight. The behavior of Bubble Deck slabs is influenced by the ratio of bubble diameter to slab thickness.

Kewwords: slab, bubble deck, conventional slab, reinforcement mesh.

1. Introduction

Concrete is strong in compression and weak when under tension. While considering a reinforced concrete slab, all the concrete above the neutral axis is subject to compressive forces and all the concrete below the neutral axis is subject to tensile forces. dead load which is additional in nature and does not serve any positive purpose can be removed. This is done by introducing voids in the slab. voids cannot be made to form on their own, hollow balls or low weight balls are placed in the concrete to reduce the overall weight of the concrete. This concept bubble deck slab has hollow spheres made from recycled plastic placed between two layers or meshes of reinforcement. A bubble deck slab reduces volume of concrete up to 33% in the slab itself. This reduction is done by removing the volume of concrete in the center portion where there is no need of concrete structurally. Time is also saved in laying a bubble deck slab as the amount of concrete needed to be handled is far less than a conventional slab. The number of manual labors involved in the task can also be reduced for the same area of the slab. It was observed that a bubble deck slab is developed 20% fast that a conventional slab of same area.

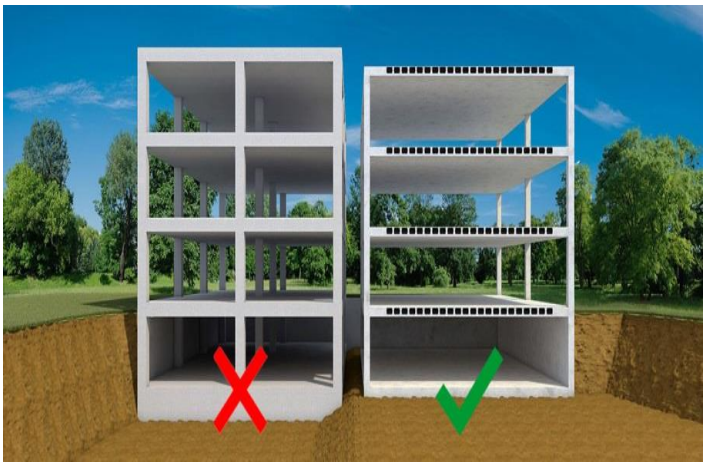

Fig. 1. Bubble deck slab structure

2. Objective

- To use hollow polyethylene balls in a slab.
- To show the comparasion between the bubble deck slab and conventional slab.
- To study and compare the self weight of the slab.

3. Material used for making bubble deck slab

Cement

Ordinary Portland cement 53 grade was used.

Aggregate

Those fractions from 4.75 mm to 150 micron are termed as fine aggregate. The river sand and crushed Sand is being used as fine aggregate conforming to the requirements of IS: 383.

The fractions from 10 mm to 4.75 mm are used as coarse aggregate. The Coarse Aggregates from 10 mm are used conforming to IS: 383 is being use.

Water

Potable water is used for mixing and curing as per IS 456:2000. From durability consideration water cement ratio should be restricted as in case of normal concrete and it should preferably be less than 0.45.

Hollow bubbles

The bubbles are made using high density polyethylene materials. These are usually made with nonporous material that does not react chemically with the concrete or reinforcement bars. The bubbles have enough strength and stiffness to support safely the applied loads in the phases before and during concrete pouring.

4. Bubble deck slab preparation

Step 1: Initially, collection of all the material required for making bubble deck slab like aggregated cement, sand, reinforcement bars, binding wire and plastic balls.

Step 2: After preparing the whole mesh, the balls were placed and the orientation was checked. Later, spacing and the support condition of the balls were checked and corrected. Reinforcement mesh was applied on the upper portion of the bubble deck.

Step 3: Oiling of the finished moulds with oil in order to keep off the concrete form being stick to the base.

Fig. 2. Reinforcement mesh.

Fig. 3. Mould.

Fig. 4. Arrangemet of bubble deck in mould.

Step 4: Placing the concrete cover before placing the mesh and the balls. After the balls and the mesh was placed, the concrete was poured, then the top mesh

was placed and the cover was provided. The top finish was given and the slab was left for drying.

Step 5: The second slab was prepared in the same way as the previous one. Only difference was there were no balls in the second sample.

Step 6: After 14 days the strength was to be measured. The machine used was universal testing machine. The load was increased gradually and the gentle cracking was observed. Some unbounded coarse aggregated fell first then followed by gentle cracks appearing on it.

Fig. 5. Concreting on bottom part.

Fig. 6. Finishing after placing top reinforcement mesh.

Fig. 7. Preparing conventional slab.

- Two slab were prepared one is with bubble deck and other with no bubble deck.
- The size of both the slab is same which is 385mm*335mm*90mm.

Conventional slab.

Testing was done on the UTM after curing for 14 days. Its weight when measured was 27.5 kg. maximum load on slab was observed as 660 KN.

Bubble deck slab.

Testing was done on the UTM after curing for 14 days. Its weight when measured was 23 kg. maximum load on slab was observed as 649 KN.

Weight comparison of both the slabs.

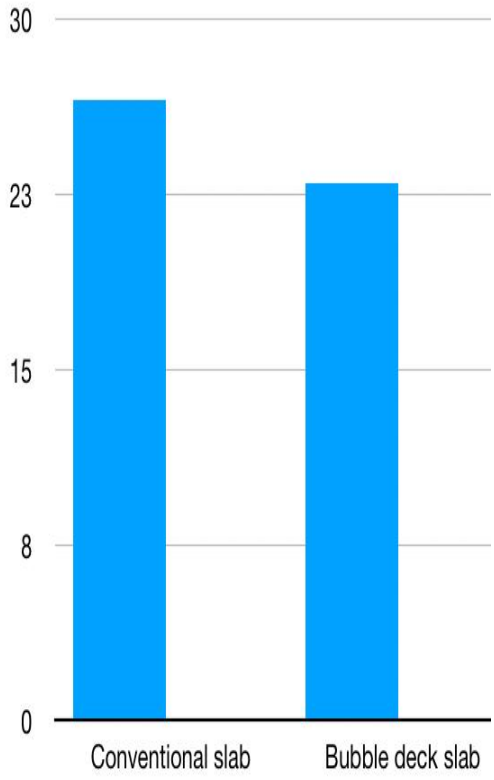

Fig. 8 weight comparison of both the slab

5. Properties of a bubble deck slab

Flexural Strength

Bubble deck slab is conceived to get rid of big volume of concrete as compared to a solid slab within the central core where the slab is principally un-stressed in flexure. In terms of flexural strength, the moments of resistance are an equivalent for solid slabs provided this compression depth is checked.

Fire Resistance

The fire resistance of the slab may be complex matter but is chiefly hooked into the power of the steel to retain sufficient strength during a fireplace when it'll be heated and lose significant because the temperature rises. The temperature of the steel is controlled by the hearth and therefore insulation of the steel from the hearth. In any case, all concrete is cracked and, in a fire, it's likely that the air would escape and therefore pressure dissipated. If the quality bubble material is employed (HDPE), the products of combustion are relatively good, certainly compared to other materials that might be burning within the vicinity. In an intense, prolonged fire, the ball would melt.Fire resistance depends on concrete cover nearly 60-180 minutes. Smoke Resistance is about 1.5 times the heat.

Durability

Durability of bubble deck slab isn't different from ordinary solid slab. When the filigree slabs are manufactured, the reinforcement module and balls are vibrated into the concrete and therefore the standard and uniformity of compaction is such a density of surface concrete is produced which a minimum of impermeable. This is often a primary function of the Cracking in Bubble deck slab isn't worse, and doubtless better, than solid slabs designed to figure at an equivalent stress level. In fact, Bubble deck slab possess endless mesh, top and bottom, throughout the slab and this ensures shrinkage restraint is well provided for and that cracking is kept to a minimum whether it's intrinsic or extrinsic cracking.

CONCLUSION

- In that experiment found that the bubble deck is reduced the concrete volume so that slab of weight ultimately decrease.
- Simultaneously the load on the bubble deck slab is able to resist the similar load as compare to conventinal slab.
- But the arrangement of the balls are effect on load carrying capacity of slab, in alternative arrangement of bubbles are 11% & 6% increasing the loaded carrying capacity than conventional slab but less than continuous bubble deck of slab.

- Weight reduction is the important factor is found in slab of bubble deck. Conventional slabs weight is 33% more than the bubble deck.
- Cost and time saving by using bubbles in slab like weight of slab, concrete volume indirectly load on the beam and walls also decrease/ less so that building foundations is designed for smaller dead loads.
- It is concluded that Load, deflection and weight parameters gives better result for bubble deck slab as compared to conventional slab.

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