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Experimental Analysis of Bubble Deck Slab Subjected to Static Loadings

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ABSTRACT

Bubble deck section is a technique for practically taking out all substantial from the center of a story chunk, which isn't filling any underlying role, consequently significantly decreasing primary extra weight. High thickness polyethylene empty circles supplant the in-powerful cement in the focal point of the chunk, in this way diminishing the extra weight and expanding the productivity of the floor. The benefits are less energy utilization - both underway, transport and doing, less emanation - exhaust gases from creation and transport, particularly CO2 and decrease the material, the heap, bring down the expense and it is additionally a green innovation. In the air pocket deck innovation decrease the substantial volume by supplanting the round bubbles, these are locally accessible which is called as PEPSI balls, these balls are comprised of HDPE (High Density polyethylene). In this exploratory program traditional chunk and air pocket deck piece are projected with different air pockets course of action which is persistent game plan of air pockets inside entire section and two kinds of elective air pockets course of action in the chunk. Also attempting to upgrade the expanding strength of that chunk. This infers the acknowledgment of a solid section component, which will be exposed to static gravitational loadings to decide the heap conveying limit of the chunk, disfigurement (diversion), breaking and bombing attributes. The resultant ends will be utilized in characterizing the faltering components and benefits of the air pocket deck chunk are featured.

Keywords : High Density Polyethylene, Conventional Slab, Monolithic Slab, Failing Mechanisms

I. INTRODUCTION

In an overall way, the chunk was planned essentially to oppose vertical burden. Presently a day's kin have as of late needed private climate on which vibration and commotion of the chunk getting principle job. The fundamental Moto of substantial articulation that is even chunk is having incredible weight, which ought as far as possible the range. Because of this

significant advancement of the supported cement should zero in on fostering the range, by decrease in weight or overbear substantial nature shortcoming in strain. In beginning phases, many endeavors had created to make biaxial section which has empty holes to limit the weight. Many endeavors had done before to get ready squares having light weight texture which is polystyrene utilized on top and base support and other sort's network and waffle piece. All these sorts' just waffle chunks are utilized in the commercial center. Simply, the utilization of waffle section is set because of low protection from shear, fire and neighborhood punching

Bubble Deck is a progressive strategy for practically killing cement from the center of a story piece not filling any primary role, accordingly drastically lessening underlying extra weight. Bubble Deck depends on another licensed strategy the immediate approach to connecting air and steel. Void formers in a level chunk wipes out 35% of a pieces self-weight eliminating imperatives of high dead loads and limited abilities to focus.

Consolidation of reused plastic air pockets as void formers grants half longer ranges between segments. Mix of this with a level chunk development approach traversing in two headings - the piece is associated straightforwardly to insitu substantial sections with next to no shafts - produces a wide scope of cost and development benefits including:-

The general floor region is partitioned down into a progression of arranged individual components, either 3 or2.4 meters wide ward upon site access, which are fabricated off-site utilizing MMC procedures. These components involve the top and base support network, estimated to suit the particular venture, combined with vertical cross section braces with the air pocket void formers caught between the top and base lattice support to fix their ideal position. This is named a 'bubble-support' sandwich which is then cast into base layer of pre-projected cement, encasing the base lattice support, to give super durable structure work inside piece of the generally speaking completed chunk profundity.

On location the singular components are then 'sewed' along with free support essentially laid halfway across the joints between components. Graft bars are embedded free over the pre-projected substantial layer between the air pockets and reason made cross section sheets tied across the top support lattice to consolidate the components. After the site completing cement is poured and restored this strategy gives underlying congruity across the entire floor section - to make a consistent floor piece.

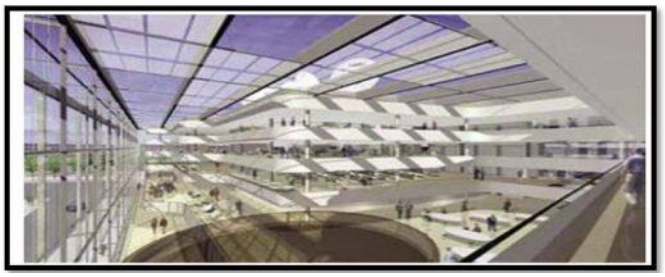
Objectives of Present Work:

- ✓ Used of hollow HDPE balls made up of waste plastic materials in concrete slab.
- ✓ Reduced concrete usage – 1 kg recycled plastic replaces 100 kg of concrete.
- ✓ Environmentally Green and Sustainable – reduced energy & carbon emissions.
- ✓ Reduced Dead Weight– 35% removed allowing smaller foundation sizes, which result in reduced cost

II. LITERATURE REVIEW

This 32,000m2 building was constructed with great transparency, revealing a huge open atrium. This atrium is the fulcrum and heart of the building. The spaces are formed in soft, organic shapes that allow light to spill onto every single workplace in the building.To achieve these wide, open, internal spaces a BubbleDeck structure of post – tensioned 450mm deep floor plates, achieving 16 meter spans between columns was selected – dramatically reducing structure dead weight and enabling long spans. The flexibility of BubbleDeck also facilitated construction

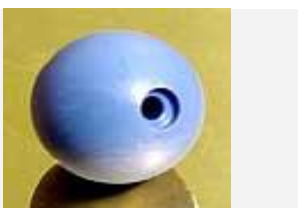
of the soft flowing,organic shapes forming the floors around the central atrium.



Millennium Tower Rotterdam Design by WZMH Architects and AGS Architects, completed in (1997-2000):

The first high rise building erected with BubbleDeck filigree-elements and the second highest building in Netherlands, 34 stories and 131 meter high. BubbleDeck was chosen, in spite of being a completely new product, because of its advantages in cost, construction time and flexibility and because of environmental issues. Beams could be excluded resulting in two more stories than planned in the beginning for the same building height. Built in 1998-2000.

TYPES OF BALLS



(a) Plastic Balls

(b) Hollow Plastic Balls

(c) Polyurethane Balls

(d) Rubber Balls

(e) Steel Balls

(f) Phenolic Balls

Figure. Types of balls

III. METHODOLOGY AND MODELLING

This chapter deals with the course of action of study, i.e. the methodology need to hold out for the achievement of desired goals of it. These methodologies basically have a routine of steps or set of operations discussed. Flow chart of project methodology

1. **Conventional slab:** This is a slab with specifications developed to analyze experimentally with normal concrete of grade M30 by adopting conventional methods of design according IS 456:2000 & IS 10262:2009.
2. **Bubble deck slab:** This is a slab with specifications prepared to analyze experimentally with normal concrete of grade M_{30} by using Hollow strong plastic balls (HDPE- High density polyethylene) with the help of design according to DIN 1045 (1988) or DIN 1045 (2001) code (German code)

3.2.1 There are three cases of bubble deck slab are cast:

a) Continuous bubble deck slab
b) Alternative bubble deck slab (type I)
c) Alternative bubble deck slab (type II)

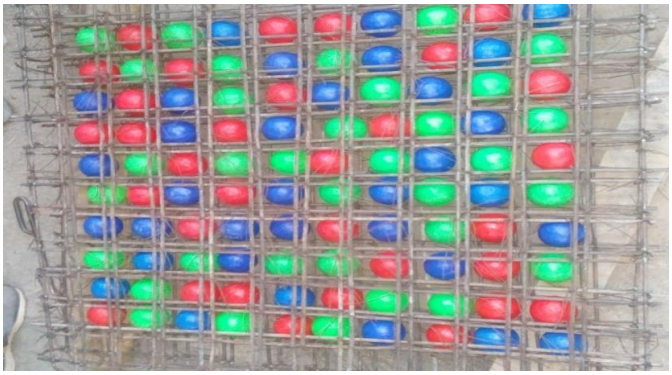


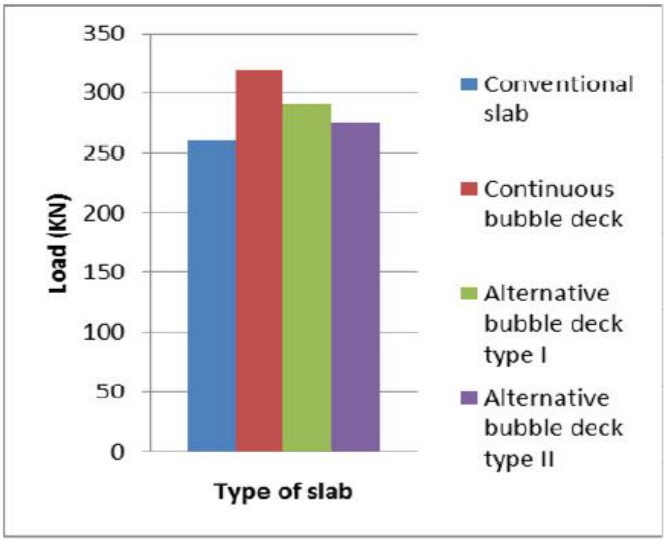
Figure Reinforcement of continuous bubble deck slab

IV. RESULTS AND DISCUSSION

We celebrated the structural parameters are load carrying capacity, deflection behavior, self-weight of the slab and comparison between conventional slab, continuous bubble deck slab, Alternative bubble deck slab (type I), Alternative bubble deck slab (type II) with respect to structural parameters.

Table 1 : load, deflection and weight of different slab

Type of slab	Load (KN)	Deflection (mm)	Weight (Kg)
Conventional Slab	260	8.70	321
Continuous Bubble deck	320	9.20	242
Alternative bubble deck type I	290	8.95	278
Alternative bubble deck type II	275	8.80	281



Graph 5.1: Load carrying capability of the slab

- From graph 5.1, we can conclude that the load carrying capacity of the continuous bubble deck slab is high as compare to other slab.
- It is mentioned three cases of bubble deck slabs carries more freight than the conventional slab.
- The continuous bubble deck slab is 23% more load carrying capacity than the conventional slab.
- The alternative bubble deck slab (type I) is 11% more load carrying capacity than the conventional slab.
- The alternative bubble deck slab (type II) is 6% more load carrying capacity than the conventional slab.

DISCUSSION

- In that experiment found that the bubble deck (continuous) is reduced volume of the concrete so that the weightiness of the slab ultimately decreases. Simultaneously load carrying capacity has also a 23 % increase as compared to conventional slab.
- Only the arrangement of bubbles are effected on load carrying capacity of the slab, in alternative arrangement of bubbles are 11% & 6% increases load carrying capability than a conventional slab but less than a continuous bubble deck slab.
- Simultaneously, bubble deck slab has improved the elasticity property of the slab, such as conventional slab is 6% less deflect than bubble deck slab, and quantity of bubbles in slab also affect on the this elasticity property.
- Weight reduction is the important ingredient is found in bubble deck slab. Conventional slab weight is 33% more than the bubble deck slab.

The graph shows about Load, deflection and weight parameters give better results for bubble deck slab as compared to conventional slab

V. CONCLUSION

- In that experiment found that the bubble deck (continuous) has brought down the concrete volume so that slab of weight ultimately decrease.
- Simultaneously the load along the bubble deck slab (continuous) has also a 23 % increase as compared to conventional slab.
- But the placement of the balls are effected on load carrying capacity of the slab, in alternative arrangement of bubbles are 11% & 6%, increasing the loaded carrying capacity than a conventional slab but less than a continuous bubble deck of the slab.
- Simultaneously, a slab of bubble deck has improved the elasticity property of the slab, such as conventional slab is 6% less deflect than bubble deck, and quantity of bubbles in slab also affect on the this elasticity property.
- Weight reduction is the important ingredient is found in a slab of bubble deck. Conventional slab weight is 33% more than the bubble pack of cards.
- Cost and time saving by using bubbles in slab like the weight of slab, concrete volume indirectly load on the shaft and the walls also

decrease/ less so that building foundations is designed for smaller dead loads.

- It is concluded that Load, deflection and weight parameters give better results for bubble deck slab as compared to conventional slab.

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