Innovative Journal for Opportunities and Development in Science & Technology,
Volume 3, Issue 3,April 2023
Paper Id: – IJ2023V3I3 -7A-E,
ISSN 2582-6026

BUBBLE DECK LIGHT WEIGHT SLAB TECHNOLOGY

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ABSTRACT- Slabs are the most important structural element of any building structure and one of the largest consumers of concrete. As such, an alternative two-axle known as bubble deck slab is one of his effective slab systems that improve building design and performance while reducing dead weight by replacing the effective concrete in the center of the slab. A hollow core slab system reduces dead weight and increase slab efficiency.Effective hollow slab solution that reduces slab weight by 30 to 50 percent.One kilogramme of recycl ed plastic can replace one kilogramme of concrete.Bubble deck panels, a novel prefabricated building method, have recently been deployed in numerous industrial projects all over the world.

It has various benefits over conventional reinforced concrete slabs and hollow slabs, including cheaper overall cost, less material consumption, improved structural efficiency, quicker building time, and environmental friend liness.

I. INTRODUCTION

1.1 Basic Concept:

Bubble deck slabs are based on a new patented technology that directly connects air and steel. Void molding with plastic balls in the center of the flat slab reduces the weight of the slab by 30 to 50% and eliminates the constraints of high weight and short span. Its flexible layout easily adapts to irregular and curved floor plan configurations. The system allows for larger spans, faster and more cost-effective assembly, and beam elimination. The Bubble Deck slab floor system is available for mezzanine floors. Loft and ground floor slabs. The weight of the structure is reduced, which helps reduce earthquake damage.

1.2 Types of Bubble deck slab:

Type A- Filigree Elements
Type B-Reinforcement Modules
Type C-Finished Planks

a) **Filigree Elements:** - Steel-concrete composite columns are compression members consisting of either concrete-coated hot-rolled steel sections or concrete-filled hot-rolled steel tube sections, commonly used as structural members in composite frame structures. Filigree Elements Bubble Deck Panels Type A Partially prefabricated panels are a combination of built and unbuilt elements. The 60 mm thick concrete floor, which serves as part of the formwork and finished depth, is pre-fabricated and delivered to the site without bladders and rebar installed. The bladder is supported on precast layers by temporary stands. Additional steel can be introduced depending on the reinforcement/steel mesh integral to the design. The figure shows a cross-section of a typical filigree element.

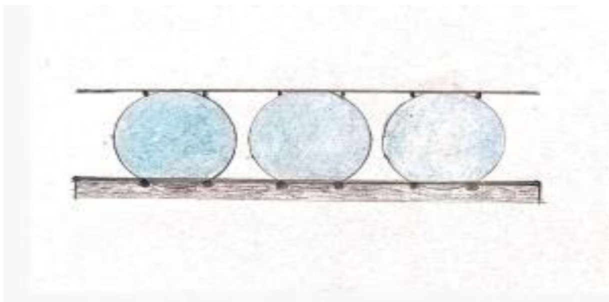

Fig 1: - Filigree Elements bubble deck slab

b) **Reinforcement Module:** -Bubble Deck Slabs Type B Bubble and Steel Mesh Reinforcement Modules are reinforcement modules that consist of pre-assembled sandwiches of steel mesh plastic bladders or "bubble grate". These components are brought to the site, placed in regular or conventional formwork, connected to additional or additional reinforcements, cast at installation, or laid down using conventional methods. This figure shows a cross-section of a typical reinforcement module.

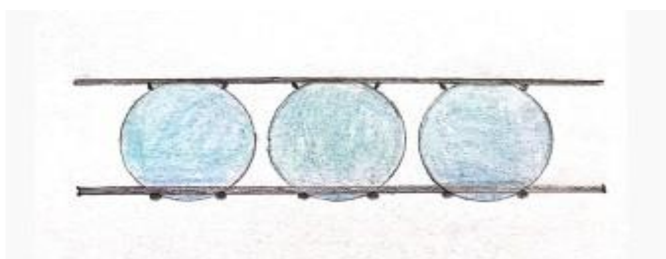

Fig 2: -Reinforcement Modules bubble deck slab

c) **Finished Planks:** -Complete Plank Bubble Deck Slab Type C is a fully prefabricated, factory manufactured module containing plastic balls, reinforcing mesh and concrete in finished form. The bars are manufactured in plank form to their final depth and transported to the job site. Unlike Type A and Type B, it is a unidirectional span design that requires the use of a support beam or load beam. The figure shows a cross-section of the finished plank.

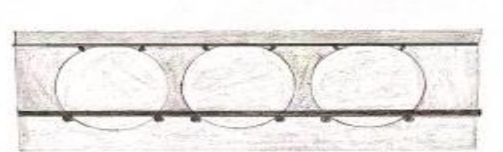

Fig 3: - Finished planks bubble deck

I. EXPERIMENTAL PROGRAM

2.1 Materials

2.1.1Cement

The cement used to cast the sample was Ordinary Pozzolana cement. 1.147 kg Per cube (150x150x150)mm

2.1.2Coarse Aggregate

The maximum size of aggregate used in concrete mix design is 20mm. 3.830 kg per cube (150x150x150) mm

2.1.3Fine Aggregate

Crushed Sand is used as a fine aggregate in concrete mix design. 2.617 kg per cube (150x150x150) mm

2.1.4HDPE granules

HDPE granules are used in concrete mixes as a substitute for fine aggregate in certain proportions.400grm per cube (150x150x150) mm

2.2 Tests on Concrete cube: -

2.2.1 For 7 Days Cube test: -

The materials used for concrete cubes are coarse aggregate, fine aggregate, and HDPE granules (blue color). The concrete type used for the concrete cubes is M20.

Objective:

Ensure concrete achieves expected compressive strength.

Observation table & test results: -

Sr no.	Size-length	Size-width	Size-height	C/s area	Volume of cube	Weight of cube	Density Of Cube	Crushing load	Compressive strength
1.	150.3	150.2	150.5	22575	3397.5	8.404	2474	317.9	14.08
2.	150.1	150.4	150.7	22575	3402.1	8.200	2410	365.0	16.17
3.	150.8	150.6	150.9	22710	3427.0	8.372	2443	335.3	14.76

Average compressive strength (N/mm2) = 15.00

Minimum specified limit (N/mm2) = 13.29

Test method used = IS 516 (Part 1/ Section 1): 2021

Result: -

According to SP 24-1983 (IS 456: 2000 Exp. Handbook), The specified sample meets minimum compressive strength of concrete in the tests performed.

2.2.2 For 28 Days Cube test: -

The materials used for concrete cubes are coarse aggregate, fine aggregate, and HDPE granules (blue color). The concrete type used for the concrete cubes is M20.

Objective:

Ensure concrete achieves expected compressive strength.

Observation table & test results: -

Sr no.	Size-length	Size-width	Size-height	C/s area	Volume of cube	Weight of cube	Density Of Cube	Crushing load	Compressive strength
1.	150.0	150.1	150.4	22515	3386.3	8.396	2479	582.2	25.86
2.	150.3	150.4	150.3	22605	3397.5	8.326	2451	488.5	21.61
3.	150.2	150.0	150.3	22530	3386.3	8.446	2494	454.2	20.16

Average compressive strength (N/mm2) = 22.54
Minimum specified limit (N/mm2) = 20.00
Test method used = IS 516 (Part 1/ Section 1): 2021

II. RESULT & CONCLUSION

According to SP 24-1983 (IS 456: 2000 Exp. Handbook), The specified sample meets minimum compressive strength of concrete in the tests performed. We have successfully able to replace the fine ag gregate from the bubble deck slab to HDPE granules to make bubble deck slab 11 % more lighter in wei ght. By using HDPE granules which are made from recycled plastic we have successfully made this tech nique eco-friendlier.

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