IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 5, Issue 5, April 2025
Impact Factor: 7.67

Bubble Deck Slab

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Abstract: *The query "Bubble take slab" seems to be related to Bubble Deck Concrete (RBDC) slabs, which integrate hollow bubbles within the concrete structure to reduce weight and material usage. This response will explore the characteristics, applications, and environmental impacts of bubble deck slabs based on the provided documents*

Keywords*:* Bubble take slab

I. INTRODUCTION

Reinforced Bubble Deck Concrete(RBDC) labs:

An Overview Slabs are basic parts of buildings that help support weight and create at surfaces like oors and roofs. Traditionally, slabs are classi ed as one-way or two-way systems based on their de ection behavior. However, Reinforced Bubble Deck Concrete (RBDC) slabs represent a modern innovation, incorporating spherical or elliptical hollow bubbles within the reinforcement to decrease concrete volume without sacri cing structural integrity . This approach offers a departure from conventional slab construction methods.

Design and Characteristics of RBDC Slabs

RBDC slabs are designed to optimize material usage while maintaining structural performance. The integration of hollow bubbles reduces the self-weight of the slab, which can lead to several advantages. The primary bene t is the reduction in concrete consumption, making the structure lighter and more sustainable . This weight reduction can also decrease the load on supporting structural members, potentially leading to further material savings in columns and foundations.

Advantages of RBDC Slabs

RBDC slabs offer a range of bene ts that make them an attractive alternative to traditional concrete slabs. One of the key advantages is their potential for sustainable and cost-effective construction . By reducing the amount of concrete required, RBDC slabs can lower material costs and decrease the environmental impact associated with concrete production. Furthermore, the reduced weight of RBDC slabs can simplify handling and installation, potentially leading to faster construction times and reduced labor costs.

Environmental Impact of Bubble Deck Slabs

The construction sector is a signi cant contributor to greenhouse gas (GHG) emissions, accounting for a substantial portion of global energy-related CO_2 emissions . High-rise buildings, in particular, have considerable environmental impacts due to the extensive materials and energy required for their construction and operation. Therefore, the choice of slab design can signi cantly in uence the overall environmental footprint of a building. analyzes

the environmental impact of different slab designs, including bubble deck slabs, in a high-rise building context. The study compares bubble deck slabs to steel composite and cross-laminated timber (CLT) slabs, evaluating their life cycle assessment (LCA) to determine their embodied greenhouse gas (EGHG) emissions. The results of this study

DOI: 10.48175/IJARSCT-25232

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demonstrate that material choice and slab design have a signi cant impact on a building's environmental footprint, providing crucial insights for sustainable architectural practices and material selection in high-rise construction .

Bubble Dynamics and Material Considerations

While the primary focus of RBDC slabs is structural and environmental performance, the behavior of bubbles within other contexts, such as in electrocatalysis, provides valuable insights into bubble dynamics. "Studied how to reduce gas bubbles on nickel catalysts during oxygen production."Although this research is unrelated to structural engineering, it highlights the challenges associated with gas bubble management in various applications.

The effcient transport of gas is a signi cant challenge in the design of high-performance gas-evolving electrocatalysts . Inef ciencies due to mass transport limitations become more pronounced at the high current densities required in industrial electrolyzers, largely as a result of gas bubbles that obstruct a portion of the electrochemically active surface area of the anode and/or cathode, while also hindering electrolyte transport to the electrode surfaces . This underscores the importance of understanding bubble dynamics for optimizing various technological applications.

Alternative Slab Designs and Applications

While RBDC slabs offer several advantages, other slab designs and construction techniques are also available. For instance, thin whitetopping overlays are used as a rehabilitation technology for exible pavement structures with repeatedly deformed pavement surfaces . This technique involves placing a thin layer of cement concrete over the existing asphalt pavement to improve its structural capacity and surface quality.

In Hungary, a test area of thin concrete was built at a busy city intersection. The deteriorated asphalt layers were milled to a depth of 120 mm, and an 85 m-long whitetopping with a thickness of 120 mm was placed using manual paving techniques. The main quality parameters measured of the fresh cement concrete mixture included slump, air bubble content, density, temperature, and strength [4]. This example demonstrates the use of concrete slabs in pavement rehabilitation, highlighting the versatility of concrete in construction applications. Structural Analysis and Design Considerations The analysis and design of buildings must consider various factors, including seismic forces and load combinations . Structural analysis involves assessing how a structure will react to a given set of loads, while design is the process of determining the structure's proper parameters. Software tools like STAAD can be used to analyze and design buildings ef ciently . A study by compared different commercial building slab con gurations, including conventional slabs, at slabs with drop panels, and grid/waf e slabsThe study looked at how different pressures affect various slab designs using STAAD software .

Fire Resistance of Slabs

The fire resistance of slabs is a critical consideration in building design.investigated the immersion capacity of reinforced concrete ribbed slabs at the borderline stage of loss of integrity. The study aimed to evaluate the fire resistance of ribbed slabs based on the criteria of non-bearing capacity and thermal insulation capacity presented a new method for assessing the fire resistance of monolithic girderless non-accumulating floors of buildings and structures. The method involves conducting thermal (fire) tests of the floor without destruction, based on single indicators of the quality of working fittings and structural concrete of continuous slabs . This approach aims to determine the fire resistance of reinforced concrete slabs without full-scale fire exposure, increasing the reliability of quality control and reducing economic costs.

Sustainable Materials and Construction Practices

The construction industry is increasingly focused on sustainable materials and practices to reduce its environmental impact. discussed the integration of waste materials in extrudable cement mixtures to promote sustainability. The use of materials such as pumice, coal slag, agricultural lignocellulosic residues, and recycled rubber tires can improve the thermal insulation and durability of cementitious composites.The study also explored the use of air-entraining admixtures and their effect on pore size reduction and enhancement of properties . These findings highlight the

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potential of using diverse waste materials in construction, providing a multidimensional approach to waste management, cost optimization, and enhanced sustainability in the context.

II. CONCLUSION

Bubble deck slabs represent a significant advancement in concrete slab design, offering a balance between structural performance, material efficiency, and environmental sustainability . By incorporating hollow bubbles within the concrete matrix, these slabs reduce self-weight and material consumption, leading to potential cost savings and reduced environmental impact . While challenges remain in optimizing their design and application, RBDC slabs hold promise for revolutionizing construction practices in various projects. The integration of sustainable materials and innovative construction techniques, further enhances the potential of bubble deck slabs to contribute to a more sustainable built environment . Further research and development in this area are essential to fully realize the benefits of this technology

REFERENCES

[1]. Abg Adenan, D. S. Q., Kartini, K., & Hamidah, M. S. (2020). Comparative Study on Bubble Deck Slab and Conventional Reinforced Concrete Slab – A Review. Journal of Advanced Research in Materials

[2]. Abg Adenan, D. 5. Q. Kartini, K., & Hamidah, M. 5. (2020) Comparative Study on Bubble Deck Slab and Conventional Reinforced Concrete Slab-AReview. Journal of idvanced Research im Materials Science, 70(1), 18-36. https://dos.org/10.37934/arms 70.1.1826

[3]. Ahmad Halmi, N. Q. & Ismail, Z. (2017). ENVIRONMENTAL POLLUTION AND EXISTING REGULATIONS AREVIEW ANALYSIS. Malaysian Journal of Sistemable Environment: Vol 2 No 1 (2017) M/SE Fol 2 No 1. https://doi.org/10.24191/myse Zil 5577

[4]. Amoushahi Khouzani, M.. Zeynalien, M. Hashemi, M., Mostofinejad, D., & Farahbod, F. (2020). Stady on shear behavior and capacity of branial ellipsoidal voided slabs. Smuenres, 27(June), 1075-1085 https://doi.org/10.1016/jistrue 2020.07.017

[5]. Berni, M. Kamaruddin, K., & Mohd. H. (2019) Application of the Bubble Deck Slab Technology in Malayzia 7(1), 43-53.

[6]. Bhowauk, R., Mukherjee, S., Das, A., & Banerjee, S. (2017). Review on Bubble Deck with Spherical Hollow Balls International Journal of Chil Engmeering ond Technology (IJCIET), 5(8), 979-987

[7]. Chung. J. H. Choi, H. K. Lee, S. C. & Choi. C. S. (2011). Shear capacity of biaxial hollow slab with donut type hollow sphere. https://dos.org/10.1016/j proeng 2011.07.179. Procedia Engineering. 14

[8]. Chung, Joo Hong, hung, H. S. Bae, B. il, Choi, C. 5., & Choi. H. K. (2018) Two-Way Flenmal Behavior of Donut-Type Voided Slabs. International Journal of Concrete Smiennes and Materials. 12(1). https://doi.org/10.1186/40069-018-0247-6

[9]. Dheepan, K. R. Saranya, S. & Aswini, S. (2017). Experimental Study on Bubble Deck Slab uung Polypropylene balls. International Research Journal of Engmeering and Technology (IRJET), 5(4). 716-721.

[10]. Garg, A., Goyal, A., Prince, T., Jangid, C. Hussain, A., Brahm, C., Govemment, P. & College, E. (2019) Bubble Deck: Slab Construction and its Applications International Journal of Engineering Research & Technology (LJERT), 936-942

[11]. Habeeb, M. Al-azzawi, A. A, & Al-zwainy. F. M. S. (2021) Journal of King Saud Univeruty-Engineering Sciences Punching shear behavior of LWA bubble deck slab with different types of shear reinforcement. Journal of King Saud Unversty Engineering Sciences, 35(1), 15-22 https://doi.org/10.1016/jksnes 2020.01.001

[12]. Hai, L. V. Hung. V. D. Thi, TM. Nguyen Thoi, T. & Phuoc, NT (2013) The Experimental Analyus of Bubbledeck: Slab uung Modified Elliptical Balls. Proceedings of the Thirteenth East Asia-Pacific Conference on Smuctural Engineering and Construction (E15EC-13)

[13]. Ibrahim, A.M. Ismael, M. A., Abdul, H. & Abdul, 5. (2019) The Effect of Balls Shapes and Spacing on Structural Behaviour of Reinforced Concrete Bubbled Slabs. Journal of Engineering and Sustainable Development, 23(02), 56-65

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[14]. Ibrahim. Amer M. Oukaili, N.K. A., & Salman, W. D. (2013). Fleural Behaviour and Sustamable Analysis of Polymer Bubbled Remforced Concrete Slabs. December: 11-13.

[15]. Jamal, J. & Jolly, J. (2017). A Study on Structural Behaviour of Bubble Deck Slab using Spherical and Elliptical Balls. International Research Journal of Engineering and Technology (IRJET), 04(05), 2090-2095

[16]. Jamal, J. & Vijayan, V (2018) A Study on Strengthening of Bubble Deck Slab with Elliptical Balls by tising GFRP Sheets. International Journal for Scientific Research & Development, 6(01), 659-663 Lai. T., & Connor, J1 (2010) Structural Belumor of Bubble Deck Slabs And Thew Applicanon. to Lightweight Bridge Decke Massachusetts Institute of Technology

[17]. Lop, N. S. Che Almad, A. & Nik Zulkipli, N. A. D. (2016) THE IMPLEMENTATION OF GREEN BUILDING IN MALAYSIAN CONSTRUCTION INDUSTRY DETERMINATION OF KEY SUCCESS FACTORS. Malaysian Journal of Sustainable Emironment, Vol 1 No 1 (2016)

[18]. Ahmad Halmi, N. Q., & Ismail, Z. (2017). ENVIRONMENTAL POLLUTION AND EXISTING REGULATIONS: A REVIEW ANALYSIS. Malaysian Journal of Susta Amoushahi Khouzani, M., Zeynalian, M., Hashemi, M., Mostofinejad, D.

[19]. bg Adenan, D. S. Q., Kartini, K., & Hamidah, M. S. (2020). Comparative Study on Bubble Deck Slab and Conventional Reinforced Concrete Slab – A Review. Journal of Advanced Research in Mat

[20]. Ahmad Halmi, N. Q., & Ismail, Z. (2017). ENVIRONMENTAL POLLUTION AND EXISTING REGULATIONS: A REVIEW ANALYSIS. Malaysian Journal of Sustainable Enviro Amoushahi Khouzani, M., Zeynalian, M., Hashemi, M., Mostofinejad, D., & Farahbod, F.