A REVIEW ON FOAMED CONCRETE

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ABSTRACT

Foamed concrete has unique characteristics that can be exploited in civil engineering works. it requires no compaction but will flow readily from an outlet to fill restricted and irregular cavities and it can be pumped over significant distances and height .thus it could be thought of as free flowing , self setting fill . This review paper provides are compact's of foam concrete. Covering its constituents, production, engineering properties and uses. Foamed concrete is simple to produce but at present there is a need to provide close control during its production and on site supervision during its placement and curing. The need for such special requirements will reduce as industry become more familiar with the character and behaviour of the material. Research is still required on some aspect of the properties of foam concrete.

I. INTRODUCTION

Foamed concrete is a versatile material which consists primarily of a cement based mortar mixed with at least 20% of volume air. It possesses high flow ability, low self-weight, minimal consumption of aggregate, controlled low strength and excellent thermal insulation properties. It can have a range of dry densities, typically from 400 kg/m3 to 1600 kg/m3 and a range of compressive strengths, 1 MPa to 15 MPa Foamed concrete typically consists of slurry of cement and fly ash or sand and water, although some suppliers recommend pure cement and water with the foaming agent for very lightweight mixes. This slurry is further mixed with a synthetic aerated foam in a concrete mixing plant.[8] The foam is created using a foaming agent, mixed with water and air from a generator. The foaming agent used must be able to produce air bubbles with a high level of stability, resistant to the physical and chemical processes of mixing, placing and hardening. Foamed concrete mixture may be poured or pumped into moulds, or directly into structural elements. The foam enables the slurry to flow freely due to the thyrotrophic behaviour of the foam bubbles, allowing it to be easily poured into the chosen form or mould.[8] The viscous material requires up to 24 hours to solidify (or as little as two hours if steam cured with temperatures up to 70 °C to accelerate the process.[9][10]), depending on variables including ambient temperature and humidity. Once solidified, the formed produce may be released from its mould.

II. LITERATURE REVIEW

1. M. R. Jones and A. McCarthy

This paper describes a laboratory study of the development of foamed concrete, utilising two types of fly ash, with the potential for use in structural applications. 'Fine' fly ash (i.e. to BS EN 450) was used to partially replace Portland cement and a 'coarse' fly ash (i.e. to BS 3892-2) to replace sand fine aggregate. In addition, the potential of polypropylene fibres in foamed concrete to enhance plasticity and tensile strength was examined. The key early age, engineering and durability properties were measured and these data show that foamed concrete is indeed viable for structural uses. To further demonstrate the concepts, the results of full-scale pilot tests on conventionally reinforced foamed and normal weight concrete beams are also reported and their performance compared with the BS 8110 and Eurocode 2 requirements for serviceability.

2. Norasyikin ht. Md. Yusof

The objective of this thesis is to determine strength of concrete by using different material such as super plasticizer and without using super plasticizer follow by mixing by using water and without using water. The addition of chemical admixture such as super plasticizer (in the form of liquid) can help achieve as it can produce mortar of normal workability but with an extremely high strength owing to a very substantial reduction in the Water/cement ratio. There are three test that been through at concrete laboratory such As Flow Table Test, Curing Test and Strength test in order to understand and look out Character of the concrete. An inspection from this project can show the nature of Foamed concrete when strength test will be done

3. Qingyuan Wang

Foamed concrete (400 kg/m^3) was prepared through a physical foaming method using ordinary Portland cement (42.5R), vegetable protein foaming agent, fly ash, and glazed hollow beads (GHB, K46) as raw materials. The performance of cement paste as well as the structure and distribution of air voids was characterized by rheometry, SEM, and XRD analyses with imaging software. The effects of GHBs on the compressive strength and thermal conductivity of the foamed concrete sample were also explored. Results show that the proportion of 50–400 μm air voids, average air-void diameter, 28 d compressive strength, and thermal conductivity of the test sample mixed with 2.4 wt% GHBs are 94.44%, 182.10 μm, 2.39 MPa, and 0.0936 w/(m·k), respectively. Excessive amount of GHBs (>2.4 wt%) increases the amount of air voids with diameter smaller than 50 μm in the hardened foamed concrete as well as the degree of open porosity. Moreover, the proportion of 50–400 μm air voids, average air-void diameter, 28 d compressive strength, and thermal conductivity of the sample mixed with 4.0 wt% GHBs are 88.54%,140.50 μm,2.05 MPa and 0.0907 w/(m·k), respectively.

4. Fahrizal Zulkarnain1

One type of a new product for the usefulness of panel wall material containing mixed composite of cement, sand and

recycle paper called as Paper Fiber Reinforced Foam Concrete (PFRFC) as upon of the reinforcement addition is expected can improve materials quality for non load bearing wall. Pursuant to study of paper fiber in mixture of concrete it was produce a strong structure materials, environmental friendly and economical. By that, this study have practiced using paper fiber with other mixture of lightweight foamed concrete to search out the good material for lightweight concrete in term of the tension strength, compression strength and absorption of noise. Paper fiber come from wood fiber which have experienced of crushing process, condensation, and pickling have idiosyncrasy in absorbent strength of sound and strength of tension but it is sensitive to water, slow harden and increase the density of foam concrete specimens. Experimental work of PFRFC have been conducted in the form of prism specimen, panel wall and cube, with water ratio, cement, and sand is 0.45 : 1 : 1.5 and mixed with 5%, 10%, 15% and 20% of paper fiber. The research vie shows that with addition of paper fiber, the flexural strength of the Paper Fiber Reinforced Foam Concrete (PFRFC) is increases although the compression strength of PFRFC is not as good as the flexural strength. The strength of wall panel of PFRFC is better compared to Normal Foam Concrete (NFC) wall panel in terms of the flexural strength and noise absorption. The density discovered is less than normal concrete density, which are 2400 kg/m3. The PFRFC density is appropriate for the lightweight material for wall panel, which is the range of density, are 800 - 900 kg/m3 for the specimen of PFRFC cube.

5. Abdul Muthalib Bin Abd Rahman

Foamed concrete is classified as a lightweight concrete. Hardened foam concrete contains a lot of pore whereas this pore makes it lighter than normal weight concrete and reduces the density. Thus, it causes an ultimate compressive strength of foamed concrete that tends to be lower than normal weight concrete. Portland cement, fine aggregate, water and stable foam are basic materials that been used in this study to produce the foam concrete mixture. This study focuses on understanding the effectiveness of curing and drying method and investigates variety of mix proportions in order to achieve the ultimate strength of foam concrete with density below 1000kg/m3. There are two tests that have been done which are Mini Slump Cone Test and Compressive Strength test. The compressive strength test of the foamed concrete cubes was measured at the ages of 7, 14 and 28 days. The experimental result showed that the slump spread of fresh foam concrete in this study was affected by water cement ratio and amount of cement, thus caused the internal segregation of hardened foam concrete. The combination of water and air (drying) cured with equal volume of mix proportion increased the strength of foamed concrete sample as the ages increased and achieved the ultimate strength in this study.

6. Ashish S. Moon

Concrete is one of the most popular construction materials used since hundred years ago. Because of its flexibility and its usage many structures around us build by concrete. A green building is an environmentally conscious building, designed, constructed and operated to minimise the total environmental impacts. Carbon dioxide (CO2) is the primary greenhouse gas emitted through human activities. It is claimed that 5% of the world's carbon dioxide emission is attributed to cement industry, which is the vital constituent of concrete. Due to CO2 there is significant contribution to the environmental pollution, there is a need for finding an optimal solution along with satisfying the civil construction needs. Foam concrete is a new innovative technology for sustainable building and civil construction which fulfills the criteria of being a Green Material. This paper concludes that Foam Concrete can be an effective sustainable material for construction and also focuses on the cost effectiveness in using Foam Concrete as a building material in replacement with Clay Brick or other bricks.

III. CONCLUSION

As result according to the experimental test that has been done, the amount of density and materials that has been used influence the performance of foamed concrete. The slump spread of fresh foam concrete in this study was affected by water cement ratio and amount of cement, thus caused the internal segregation of hardened foam concrete. The combination of water and air (drying) cured with equal volume of mix proportion increased the strength of foamed concrete sample as the ages increased and achieved the ultimate strength in this study. The physical descriptions of the cube sample, it shows that shrinkage occurred due to un-homogenous mix. Thus, the material in the mixture tends to settle to the lower part of mould whereas foam rises to the surface and disappeared. Due to unlimited time, there are only few tests that can be conducted in the study.

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