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Review on Parametric Study & Seismic Analysis of AAC Block using STAAD. Pro V8i SS6

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Abstract - *In India, Now a days lightweight brick is most important component of building construction. In each seismic zones we cannot predict earthquake intensity which can affect the structures. As impact of earthquake is directly proportional to weight of building, So the building constructed using AAC block are more reliable and safer. Also AAC blocks are highly superior in terms of strength. To understand the seismic performance of autoclaved aerated concrete block in different earthquake zones for that we are doing parametric study and seismic analysis of AAC block using STAAD.Pro V8i SS6.*

Key Words: Aereated Autoclaved Concrete Block (AAC Block), STAAD.Pro V8i SS6

1. INTRODUCTION

Aerated Autoclaved Concrete block is also one of the ecofriendly and green building material. AAC block was invented in 1920s by swedish architect. Most of the part of europe used AAC block as a building material. And also it is used in other countries. Materials which has good thermal insulation capability can reduce energy consumption for indoor cooling. AAC block is currently widely used because it has good thermal capability. It has a porous structure so it lowers density and good thermal insulation. Smallest thermal conductivity value better its insulation capacity. AAC block has porous structure so it has lower density and good thermal insulation. Thermal insulation capability of materials including lightweight brick is determined by thermal conductivity and smaller conductivity value indicates better thermal insulation capacity. Autoclaved aerated concrete is a mixture of sand, cement, lime, quartzite and gypsum with minimum amount of aluminum powder as a binding material. Autoclaved manufacturing process and aluminum gas it becomes porous in nature. The round hole structure formed by following ways: By producing air bubbles, By chemical reactions also mixing with a foaming agent and mixing with air bubbles. At present most of countries used hydrogen air bubbles to produce holes by adding aluminum metal powder. It has many advantages such as lightweight, high performance thermal insulation, sound absorption and so on. Autoclaved aerated concrete block is also a new energy saving building structure. It also has good physical properties like load bearing capacity of structure. So it clear that the AAC structural system has good performance and development prospects.

1.2 Objectives

We will study the detailed parameters of AAC block. Also we conduct lab test on AAC block and clay brick to find physical and chemical properties. And after we will do seismic analysis of AAC block using STAAD PRO software.

2. LITERATURE REVIEW

As the topic of this research is modern and very high end not much of the literature is available on it. Some of the research has been performed on it and the collect information of AAC block around the World and most important aspects in it. The following are the few mentioned main objective of given literature.

2.1 Collection of Data

1. Avdhoot Bhosale, Nikhil P. Zade, Robin Davis, Pradeep Sarkar "Experimental Investigation of autoclaved areated concrete masonary." Volume 3 Issue No.2 2015.

"The strength and stiffness characteristics of infill masonry wall significantly influence the behaviour of reinforced concrete framed structure. Although such characteristics for conventional masonry infill wall like clay and fly ash bricks, were well documented in the literature, experiments for evolution of similar properties for modern infill wall using autoclaved aerated concrete (AAC) block are limited. This paper reports the experimental result of an investigation of the structural property of AAC block masonry required mathematical modeling of AAC masonry infilled framed structure. It also investigates some of physical properties of AAC block that influence their structural properties and overall behaviour"

2. Yuan quan, Yang nianxiang "Applications of Autoclaved areated concrete block in new energy-saving building structure." Volume 5 Issue No.14 2010.

"The autoclaved aerated concrete block was based on cement, lime, gypsum, fly ash and sand as a raw material. It had a porous concrete by autoclaved manufacturing process and aluminium as gas producing agent. It had many advantages such as lightweight, high performance thermal insulation, sound absorption and so on. Aerated concrete block where usually used for maintenance structure in

building. Application of AAC block in new energy saving building structure was introduced in this paper"

3. Baris Binice, Ardem Canbay, Koray Bulbul, Ahmet Yakut "Seismic Behavior And Improvement Of Autoclaved Aerated Concrete Infill Wall." Volume 11 Issue No.68 2019.

"Performance of infill wall in reinforced concrete frame was generally questionable under the combined action of in-plan and out-of-plan seismic demand despite the wast number of test investigating the behaviour of brick masonry infill wall in RC frame, past research is limited for infill wall made of AAC block"

4. Zdzislawa Owsiak, Anna Soltyas, Przemyslaw Sztaboroski, Monika mazur "Properties of autoclaved areated concrete with halloysite under industrial conditions." Volume 8 Issue No.3 2015.

"This paper present result from study of effect of halloysite powder on performance of slow setting silicate based AAC (SW production technology). The clay mineral wall used as cement replacement. Material was tested at industrial scale. Test result indicate relationship between halloysite chemical properties and properties of readymade product. Most important property of mineral from the kaolinite group include high specific area and chemical composition. Physical and mechanical properties where tested in terms of bulk density, porosity, thermal conductivity and compressive strength of finished product. In addition, the testing program included determining influence of halloysite of face composition and microstructure of aerated concrete, using XRD analysis and SEM imaging"

5. Alexandre A. Costa, Guido Magenes, G. Michele Clavi

"Code specification for masonry element had been often developed after experimental study on construction material and techniques. AAC wall can represent a very effective solution for thermal insulation purpose, lightness and workability both for structural masonry and infill panel. In this work their seismic behaviour had been assessed by cyclic testing of bearing walls and infilled frame: the performance of different solution of slide reinforcement had been also compared and evolved"

6. H.F.W Taylor "Relation Between Structure And Mechanical Properties Of Autoclaved Aerated Concrete." Volume 9 Issue No.4 1979.

"The shrinkage decreased with increasing crystallinity and strength increased and the linear relation between the logarithm of porosity and compressive strength was found."

7. H . Kurama, I.B. Topcu, C. Karakurt "Properties of the Autoclaved Aerated Concrete Produce from coal bottom ash" volume 6 Issue No.767-773 2009.

"The coal bottom can be used as an aggregate in AAC production it lowers unit weight and decreased in thermal conductivity also increases in strength"

8. N. Narayanan, K. Ramamurthy "Structure And Properties Of Areated Concrete: A Review" Volume 8 Issue No.321-329 2000.

"By using aerated concrete chemical composition varies with method of curing and this help in increasing the strength and exhibits good functional performance characteristics"

9. Takaeshi Mitsuda, Kaori sasaki, Hideki Ishida "Phase Evaluation During Autoclaving Process of Aerated Concrete." Volume 75 Issue No.7 1992.

"Tobermite and calcium silicate hydrates in use as a binding material and variation form due to this binding material were the pore volume remains unchanged and after completion of reaction of curing causes a decrease of compressive strength"

10. Yavuz Yardim, A.M.T Waleed, Mohd. Saleh Jaafar, Saleh Laseima "AAC – Concrete Light Weight Precast Composit Floor Slab." Volume 10 Issue No. 405-410 2013.

"The use of autoclaved aerated concrete (AAC) as an infill material for semi precast panel was investigated experimentally. The effectiveness of proposed light weight slab was reached by comparing the behaviour of specimen with that of conventional solid precast slab"

2. METHODOLOGY

Manufacturing process of AAC block

As Fig No:1 Shows that AAC blocks are produced without aggregate larger than sand. In AAC blocks quartz sand, gypsum, lime and water is used as binding material. Aluminum powder is used at rate of 0.05%-0.08% by volume. In india and china fly ash is used as aggregate.

When this material is mixed with proper proportion the mixture is placed in autoclave chamber for 12 hours. After autoclaving process the AAC blocks are ready for immediate use on construction site.

Fig. No-1: AAC Blocks(Actual Pic)

We will conduct lab test on AAC block and clay brick then after we will compare result of both of them and we will findout the result.

Also we will doing seismic analysis by using STAAD.Pro V8i SS6. We will show result in graphical representation

3. CONCLUDING REMARK

We have gone through above mentioned International, National research papers; from this paper we understand different methods used for Study of AAC block.

We will perform Different Field and Lab tests on AAC Block and Compare the results with Clay Brick. We are trying to study seismic behavior of AAC block building using STAAD.Pro V8i SS6 and we will analyze and compare seismic behavior with Clay brick. From the Results we will aware the Construction Industries and Society for the use of AAC Block Structures.

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