METHODOLOGY OF AUTOCLAVED AERATED CONCRETE BLOCKS

[1]Giriraj Rathod, [2]Maulik Gajjar, [3]Nishith Busa, [4]Shweta Chauhan

[1,2,3]Research Scholars, [4]Professor,
Department of Civil Engineering
Sardar Patel College of Engineering, Bakrol-Anand, India

***Abstract*—Autoclaved aerated concrete a new technology entered in the Indian construction industry in these days. AAC blocks are a leading construction material in now a day. AAC blocks have very low weight and have high deformability which tends to reduce inertia force on the building induced by seismic motion. This project gives detailing on manufacturing process of AAC blocks.**

***Index Terms*—AAC, AAC Block,Environment,Inertia, Seismic Motion.**

I. INTRODUCTION

Autoclaved aerated concrete is a construction material that is made in factory and available to the user in the form blocks and precast units for walls and floors. AAC Blocks are prepared without any reinforcement. There are no course materials in the AAC blocks. Autoclaving of the material at high temperature and pressure imparts strength, stability, and other properties of the block. The autoclaved aerated concrete building material is obtained as the result of a reaction between the binder containing calcium oxide and a silica component cured in an autoclave, and a cellular structure producing ingredient. Autoclaved aerated concrete is a one type of cellular concrete. Another type, using preformed foam and cast in situ, is commonly used in the us. For floor and roof fills.

II. RAW MATERIALS

i. FLYASH OR SAND

Key ingredient for manufacturing AAC blocks is silica rich material like fly ash or sand. Most of the AAC companies in India use fly ash to manufacture Autoclaved aerated concrete blocks. Fly ash is mixed with water to create fly ash slurry. Slurry is mixed with other ingredients like lime powder, cement, gypsum and Aluminum powder.

ii. LIME POWDER

Lime powder required for Autoclaved aerated concreteproduction is obtained either by crushing limestone to fine powder at AAC factory or by directly purchasing it in powder form. Purchasing lime powder will be costly. mortar depending of individual preferences.

iii. CEMENT

53-grade OPC from manufacturer is required for manufacturing Autoclaved aerated concreteblocks.Such factories can opt for ‘major plant’ clinker and manufacture their own cement for AACproduction. Cement is usually stored in silos.

iv. GYPSUM

Gypsum is easily available in the market and is used in powder form. It is stored in silos.

v. ALUMINIUM POWDER/PASTE

Aluminum powder/paste is easily available from various manufacturers. As very small quantity of Aluminumpowder/paste is required to be added to the mixture, it is usually weighed manually and added to the mixing unit.

III. PRODUCTION PROCESS

The first step of AAC production is grinding of silica rich material in ball mills. For different materials, different process is adopted. There are two methods for mixed milling. First method is dry mixing to produce binding material, and the second method is wet mixing. Gypsum is normally not ball milledseparately. It isgrinded with fly ash or with quicklime, or it could be grinded with the same miller for quicklime in turn. Raw material storage assures the continuous production and material stability. The continuous production guarantees the nonstop and on-time supply, and the material stability guarantees the quality of products, since the raw material might come from different sources, with different qualities. Raw material preparation and storage is the pre-step for proportioning batching. This pre-step guarantees the raw material meet the standard for AAC production, and it is also finishes the storage,

a. **DOSING AND MIXING**

Maintaining ratio of all ingredients as per the selected recipe is critical to ensure consistent quality of production. This is accomplished by using various control systems to measure and release the required quantity of various raw materials. A dosing and mixing unit is used to form the correct mix to produce Autoclaved Aerated Concrete blocks. Once the desired weight is poured in, pumping is stopped. Similarly lime powder, cement and gypsum are poured into an individual container. Once required amount of each ingredient is filled into their individual containers control system releases all ingredients into mixing drum. Steam might also be fed to the unit to maintain temperature in range of 40-42 ^{o} C. A smaller bowl type structure is also attached as a part of mixing unit. Once the mixture has been churned for set time, it is ready to be poured into molds using. Dosing unit releases this mixture as per set quantities into molds for foaming. In modern plants, entire dosing and mixing operation is completely automated and requires less labors.

b. **CASTING, FOAMING AND PRE-CURING**

Once the desired mix is ready, it is poured into molds. These molds can be of various sizes depending on the production capacity of a manufacturing unit. Once mix is poured into molds, it is ready for procuring. After casting, the slurry in molds will be in the pre-curing chamber to finish foaming and hardening. Foaming and hardening actually starts when the slurry is fed into molds, which includes gas forming expansion and perform to achieve certain strength, which is enough for cutting. Pre-curing is always done under set temperature; hence it is also called as heating-room pre-curing. Pre-curing is not a complicated process, but should avoid vibration. Operators must keep eyes to monitor the slurry change during foaming and provide feedback to dosing, mixing and casting operators. Perform defects (cracking, sinking, etc) mainly occur during the process.

IV. CUTTING & AUTOCLAVED CURING

a. **Cutting**:
During this process, the pre-cured blocks are cutting and shaping, into different size and shapes as per requirements. The high workability and large variety of sizes make autoclaved aerated concrete production more suitable for massive production. With a cutting machine, the production efficiency and dimensional accuracy is easily achieved.

b. **Autoclaved Curing**
After cutting into the desired sizes and shapes, AAC blocks are transferred into autoclaves. Autoclaves are used for steam curing under pressure. AAC must be pre-cured and steam cured to finish the physical and chemical changes, and then to achieve enough strength for desired usage. A batch of Autoclaved aerated concrete blocks is steam cured for 10-12hours at a pressure of 12 bars and temperature of 190°C. In hot and humid conditions, AAC blocks undergo last stages of hydrothermal synthesis reaction to transform into a new product with required strength and various physical performances. Autoclaved curing imparts inherent properties and performance of AAC.

V. CONSTRUCTION GUIDELINE OF USING AAC BLOCK

1. **Mortar for masonry**

   The AAC blocks shall be embedded with a mortar, the strength of which is relatively lower than that of the mix used for production of blocks. A 1:6 cement - sand mortar is to be used.
2. **Wetting blocks**

   These blocks do not require to be wetted before or during the laying in the walls; in case the climatic condition, the top and the sides of the blocks may be moistened slightly.
3. **Coping beams**

   Horizontal coping at 0.9 to 1.2 meter height & Vertical coping in center if wall length is more than 3 meters, with 2nos of 8mm dia. reinforcement, M20 grade concrete.
4. **Storage**

   The blocks should be stored in dry place to avoid the moisture contact.
5. **Mortar Thickness**

   The thickness of mortar should be limited to 10 to 12 mm in cement sand mortar and 3 to 4 mm in ready mix mortar.
6. **Plaster**

   The internal and external plaster thickness required is 10 to 12 mm and 15 to 17 mm relatively.

7. **Electric & Sanitary Chases**

Chase to be grooved before plaster of wall and use electric wall chasing machine for zero vibration and good quality work, do not chase on joints.

8. Beam and column

Use wire mesh or fiber mesh for RCC Masonry joints and coping

VI. CONCLUSION

We have analyzed the basics of the AAC blocks in this project like Raw material used and production process etc. and in future we will do check the compressibility, strength, durability. With this innovative idea we want to aware the general public to the use of the AAC blocks. Make sure that general public will use this AAC blocks as a main material.

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[3] Ahsan Habib, Hosne Ara Begum, Eng. RubaiyetHafizaHousing and Building Research Institute Darus-Salam 120/3, Mirpur, Dhaka-1216, Bangladesh
[4] Jan Kosny Buildings Technology Centre, Oak Ridge National Laboratory
[5] JAYESHKUMAR PITRODA Final year B. E. Civil Engineering, B.V.M. Engineering College, Vallabh Vidyanagar, Gujarat India.
[6] Ali J. Hamad Department of Building and Construction Technology Engineering/Engineering Technical College, Mosul, Iraq.
[7] Prakash T M, Department of Civil Engineering, P E S College of Engineering, Mandya, Karnataka, India.
[8] Jikui Miao Key Laboratory of Renewable Energy Utilization Technologies in Buildings of Ministry of Education, Shandong Jinzhou University, Jinan, 250101, China.
[9] Mr. Ashish S. Moon Dr. Valsson VargheseM.Tech Student Professor & Head Senior Scientist Department of Civil Engineering K. D. K. C. E Nagpur CSIR-NEERI, Nagpur.