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(REVIEW ARTICLE)



# A review on the fabrication and performance evaluation of autoclaved aerated concrete (AAC) blocks

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## Abstract

Autoclaved Aerated Concrete (AAC) blocks are lightweight, precast building materials made from a mixture of cement, lime, silica (usually sand), water, and aluminum powder, which causes the material to expand and form a porous structure. The standard mix proportions typically consist of 10-15% cement, 20-30% lime, 50-60% silica, and a small amount of aluminum powder. The production process includes mixing, molding, curing using water curing, and drying. AAC blocks are tested for compressive strength, water absorption, durability, and thermal insulation. These properties make AAC blocks an ideal choice for sustainable, energy-efficient construction, offering significant advantages in terms of strength, insulation, and environmental performance.

This study focuses on the fabrication of Autoclaved Aerated Concrete (AAC) blocks and aims to evaluate their properties, such as compressive strength, using a Universal Testing Machine. Additionally, the study will compare the properties of AAC blocks with those of traditional bricks to assess the sustainability of AAC blocks

**Keywords:** AAC Blocks; Lightweight concrete; Compressive Strength; Sustainability

## 1. Introduction

Autoclaved Aerated Concrete (AAC) was first developed in the early 20th century to address rising energy costs and material shortages. It consists of inorganic materials like quartz sand, gypsum, lime, cement, water, and a small amount of aluminum powder. The interaction of aluminum with calcium hydroxide releases hydrogen gas, creating small air pockets, resulting in the characteristic porous structure of AAC blocks. This introduction provides a foundation for understanding the significance of AAC in modern construction, especially in high-rise buildings and sustainable development projects. Autoclaved Aerated Concrete (AAC) was first developed in the early 20th century to address rising energy costs and material shortages. It consists of inorganic materials like quartz sand, calcite gypsum, lime, cement, water, and a small amount of aluminum powder. The interaction of aluminum with calcium hydroxide releases hydrogen gas, creating small air pockets, resulting in the characteristic porous structure of AAC blocks. This introduction provides a foundation for understandings the significance of AAC in modern construction, especially in high-rise buildings and sustainable development projects.

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## 2. Literature review

- **Author(s): Narayanan N., Ramamurthy K .**They studied on Autoclaved Aerated Concrete: Properties, Testing and Design" his report was published in 2000. This paper reviews the structural and physical properties of AAC blocks, focusing on the impact of material composition and autoclaving processes on strength and thermal performance.
- **Author(s): Wong Y.C., Ravindran V., Hamid Z.A.** They studied Compressive Strength of AAC Blocks in Structural Applications his report was Published: 2012 The paper investigates the compressive strength of AAC blocks and compares them with other conventional masonry materials. Results indicate that AAC blocks meet the required standards for non-load-bearing walls.
- **Author(s): Ghafoori N., Ramyar K.**Durability They studied of "Autoclaved Aerated Concrete under Harsh Environmental Conditions" his report was Published: 2016.This study focuses on the durability of AAC blocks, particularly their resistance to moisture and freeze-thaw cycles.
- **Author(s): Patel H., Shah S.** They studied "Energy Efficiency in Buildings Using AAC Blocks his report was"Published: 2017.Abstract: A study demonstrating how AAC blocks contribute to the energy efficiency of buildings by reducing heat transfer.
- **Author(s):Yewale P.S., Pise A.T**. They studied "Sustainability of AAC Blocks in Green Building Design" his report was Published: 2016.This paper evaluates the environmental benefits of AAC blocks, emphasizing their energy efficiency and lower carbon footprint compared to traditional building materials. It also highlights their role in reducing building cooling and heating loads.
- **Author(s): Karthikeyan K., Saravanan R** They studied "Thermal Insulation Performance of AAC Blocks in Energy-Efficient Buildings" his report was Published 2018. This study examines the thermal insulation properties of AAC blocks, showcasing their effectiveness in reducing energy consumption in buildings, particularly in regions with extreme temperature variations.
- **Author(s): Rahman M.M., Biswas S., Kumar D**. They studied "Water Absorption and Shrinkage Behavior of AAC Blocks" his report was Published: 2016. This research evaluates the water absorption and shrinkage characteristics of AAC blocks, concluding that their porosity leads to higher water absorption compared to concrete blocks, necessitating surface treatments.
- **Author(s): Kumar S., Jain V.** They studied "Influence of Aluminum Powder on AAC Block Properties" his report was Published: 2013. This paper explores the role of aluminum powder in the AAC manufacturing process, emphasizing how its quantity affects the aeration process and the resulting block density, strength, and insulation properties.
- **Author(s): Liang H., Wang P., Zhao L.** They studied "Improving the Durability of AAC Blocks in Humid Conditions" his report was Published: 2019 . The study focuses on enhancing the durability of AAC blocks in humid environments through surface treatments.

- **Author(s): Das A., Banerjee P., Sharma R.** They studied "Moisture Resistance of AAC Blocks in Coastal Areas" his report was Published: 2018. Abstract: This study examines the performance of AAC blocks in coastal areas with high humidity and salt exposure.

## 3. Methodology

### 3.1. Material

#### *3.1.1. Cement*

Cement is a fine powder that is used as the binding agent in concrete, mortar, and other construction materials. It is a key component in the construction industry, playing a crucial role in holding structures together. Provides binding properties and Strength. Cement is the primary binding material in AAC blocks. Ordinary Portland Cement (OPC), usually of 43 or 53 grade, is commonly used. It reacts with water and other materials to form a hardened matrix that gives the block its strength. The specific gravity of cement is approximately 3.15, indicating its relatively high density.

#### *3.1.2. Sand*

Sand is a naturally occurring granular material composed of finely divided rock and mineral particles. It's a vital component of many ecosystems and has various industrial applications. Adds Strength, Durability, and Thermal insulation. Sand, particularly fine quartz sand, is used as a silica source. It reacts with lime during the autoclaving process to form calcium silicate hydrates, which are responsible for the block's structural strength. The specific gravity of sand typically ranges from 2.60 to 2.70.

#### *3.1.3. Fly Ash*

Fly ash is a fine powder produced as a byproduct of coal combustion in power plants. It's a key component in various construction and industrial applications. Enhance Workability, Reduces Cement Content. Fly ash is often used as a partial or full replacement for sand in AAC blocks. It is a byproduct of coal combustion and is highly pozzolanic, meaning it reacts with calcium hydroxide to form additional cementitious compounds. Fly ash improves the workability and insulation properties of AAC blocks. Its specific gravity is generally around 2.10 to 2.30.

#### *3.1.4. Aluminum Powder Or Paste*

Aluminum powder is a fine, granular or powdered form of aluminum metal. It is commonly used in various industrial, commercial, and consumer applications due to its unique properties. Foaming agent, Creates Air bubbles. Aluminum powder or liquid aluminum is used as a foaming agent. When mixed into the slurry, it reacts with the alkaline components (especially lime) and releases hydrogen gas. This gas forms small, evenly distributed bubbles that remain trapped in the mixture, giving the AAC block its characteristic porous and lightweight structure. The specific gravity of aluminum liquid or powder typically ranges from 2.50 to 2.70.

#### *3.1.5. Water*

Water is a clear, colorless, and odorless liquid substance that is the most abundant compound on Earth. It is a vital component of all living organisms and plays a crucial role in many biological, chemical, and physical processes. Hydrates Cement, facilitates mixing.

#### *3.1.6. Lime*

Lime is a versatile and widely used building material, known for its binding, whitening, and disinfecting properties. Stabilizes pH, Improves workability. Lime, usually in the form of quicklime (calcium oxide), is essential for the chemical reaction with silica to form the strength-giving compounds during autoclaving. Lime also contributes to the expansion process when reacting with aluminum powder. Its specific gravity ranges between 2.20 and 2.40.

#### *3.1.7. Gypsum*

Gypsum plays a key role in brick production, primarily as an accelerator and strength enhancer in fly ash-lime-gypsum bricks. Gypsum is added in small quantities to regulate the setting time of the cement. It helps prevent flash setting and improves the finish of the blocks. Gypsum also aids in the formation of stable compounds during curing. Its specific gravity is approximately 2.30.

### 3.2. Manufacturing Process of AAC Block

The process of making AAC (Autoclaved Aerated Concrete) blocks involves several key steps that transform raw materials into lightweight, durable building blocks. Here's a detailed breakdown of the AAC block-making process:

#### *3.2.1. Raw Materials Preparation*

The primary raw materials used to make AAC blocks are:

- Cement: Portland cement is the primary binder.
- Lime: High-calcium lime is used as an essential ingredient.
- Fly Ash : Fly ash serves as the primary source of silicon.
- Water: Water activates the chemical reaction and helps form the concrete mixture.
- Aluminum powder: This acts as a foaming agent.

These ingredients are prepared and stored properly for efficient mixing.

#### *3.2.2. Mixing*

The ingredients are mixed in a high-efficiency mixer to form a slurry. The process follows these general steps:

- Cement, lime, and Fly Ash are mixed with water to form a thick paste.
- Aluminum powder is added in a controlled amount, which reacts with the lime and water to produce hydrogen gas. This reaction causes the mixture to rise, forming bubbles or air pockets in the mix.
- The aluminum powder reaction creates a foamy structure, which is the key to AAC's lightweight properties.

#### *3.2.3. Pouring into Molds*

The foam mixture is then poured into molds, usually made of steel or plastic. The molds are typically sized to produce blocks with dimensions such as 600 x 200 x 150 mm (or other customizable sizes).

#### *3.2.4. Curing in molds*

After pouring, the mixture is left to cure in the molds for a specific time, typically around 1 to 3 hours, during which the mixture hardens to a semi-solid state.

#### *3.2.5. Cutting and Shaping:*

Once the mixture has set and become sufficiently firm, the large block of AAC material is removed from the molds. This block is still soft enough to be cut using specialized wire cutters or saws. The cutting process includes:

- Cutting the large block into smaller, uniform-sized blocks (for example, 600 x 200 x 150 mm blocks).

#### *3.2.6. Shaping:*

The blocks are shaped with precise dimensions, ensuring uniformity for easy installation.

#### *3.2.7. Curing*

- The autoclave provides the necessary heat and pressure to complete the chemical reactions, which strengthens the blocks and gives them their lightweight, durable, and insulating properties.
- The curing time typically lasts between 8 to 12 hours, during which the blocks undergo a transformation that significantly improves their structural integrity.

#### *3.2.8. Finishing*

Once the blocks have cooled down, they are inspected for quality control. This includes checking for:

- Dimensional accuracy
- Strength(measuring compressive strength)
- Surface finish (smooth or rough depending on requirements)
- Any defects such as cracks, air pockets, or inconsistent foaming.

If the blocks pass quality checks, they may be labeled, packed, and stored. If any defects are found, the blocks may be reprocessed or discarded.

## 4. Conclusion

Autoclaved Aerated Concrete (AAC) blocks present a promising alternative to conventional clay bricks, particularly in the context of sustainable and energy-efficient construction. Their lightweight, porous structure—achieved through the controlled chemical reaction of aluminum powder with other mix components—provides excellent thermal insulation, sound resistance, and ease of handling. The study highlights the standard mix proportions and outlines the fabrication process involving water curing and drying. Through property evaluation using tools such as the Universal Testing Machine (UTM), AAC blocks demonstrate competitive compressive strength and durability, alongside significant environmental advantages due to their lower embodied energy and use of industrial by-products. Overall, AAC blocks emerge as a superior building material when compared to traditional bricks, especially for modern construction demands emphasizing performance, sustainability, and efficiency

## Compliance with ethical standards

*Disclosure of conflict of interest*

No conflict of interest to be disclosed.

## References

[1] Albayrak, M., Yörükoğlu, A., Karahan, S., Atlıhan, S., Yılmaz Aruntaş, H., & Girgin, İ. (2007).“Influence of zeolite additive on properties of autoclaved aerated concrete.” Building and Environment, 42(9), 3161–3165. https://doi.org/10.1016/j.buildenv.2006.08.003

[2] Alexanderson, J. (1979). “Relations between structure and mechanical properties of autoclaved aerated concrete.” Cement and Concrete Research, 9(4), 507–514. https://doi.org/10.1016/0008-8846(79)90049-8

[3] Beben, D., & Zee Manko, Z. (2011). “Influence of selected hydrophobic agents on some properties of autoclaving cellular concrete (ACC).” Construction and Building,MAterilas,25(1),282–287. https://doi.org/10.1016/j.conbuildmat.2010.06.028

[4] Cai, L., Li, X., Liu, W., Ma, B., & Lv, Y. (2019). “The slurry and physical-mechanical performance of autoclaved aerated concrete with high content solid wastes: Effect of grinding process.” Construction and Building Materials, 218, 28–39. https://doi.org/10.1016/j.conbuildmat.2019.05.107

[5] Kumbhare, P. P., Kale, S. M., Katkar, M. B., & Nemade, P. D. (2020). Monitoring and evaluation of water quality of Bhima river based on physico-chemical data. In Techno-Societal 2018: Proceedings of the 2nd International Conference on Advanced Technologies for Societal Applications-Volume 1 (pp. 751-762). Springer International Publishing. https://doi.org/10.1007/978-3-030-16848-3_68

[6] Kumbhare, P. P., Kale, S. M., Katkar, M. B., & PD, N. Monitoring and evaluation of water quality of BHIMA River based on Physico-Chemical data.

[7] Kale, S. M., Shinde, A. D., Shaikh, S., Suryawanshi, V. L., & More, O. K. Assessing Rapid Chloride Penetration in Concrete with Aluminium Powder: Effects of Saline Water Curing. International Journal of Advances in Engineering and Management (IJAEM) Volume, 5, 1081-1085.

[8] Maruti, Kale S., et al. "Physico-chemical Analysis of Ground Water a Review." JournalNX, 2018, pp. 39-40.

[9] Prof. P. R. Admile, Prof. M. B. Katkar, Prof. S.M.Kale "Behaviour of Cold Formed Z-Section with Sag Rod in Pre-Engineered Building" International Journal of Scientific Research in Science, Engineering and Technology (IJSRSET), Print ISSN : 2395-1990, Online ISSN : 2394-4099, Volume 11, Issue 7, pp.457-466, May-June-2024.

[10] Sandip Maruti Kale, Sourabh Kare, Prathmesh Kshirsagar, Ganraj Nagare, Aman Pathan "Innovative Self-Curing Concrete: Enhancing Durability through RCPT Analysis" International Journal of Scientific Research in Science, Engineering and Technology (IJSRSET), Print ISSN : 2395-1990, Online ISSN : 2394-4099, Volume 11, Issue 7, pp.435-444, May-June-2024.

[11] Kale Sandip Maruti, Kumbhare Pooja Pramod, & Dr. P.D. Nemade. (2021). PHYSICO-CHEMICAL ANALYSIS OF GROUND WATER A REVIEW. JournalNX - A Multidisciplinary Peer Reviewed Journal, 39–40. Retrieved from https://repo.journalnx.com/index.php/nx/article/view/2410

[12] "A Study of Tensile Strength of Concrete Containing Pond Ash and Micro-Silica", International Journal of Emerging Technologies and Innovative Research (www.jetir.org | UGC and issn Approved), ISSN:2349-5162, Vol.3, Issue 12, page no. pp172-176, December-2016, Available at : http://www.jetir.org/papers/JETIR1612025.pdf

[13] Prof. M. B. Katkar, Prof. S. M. Kale, Prof. P. R. Admile, “Innovative Solutions for Sustainable Pavements: Plastic Coated Aggregates in Bituminous Mixes” International Journal of Scientific Research in Science, Engineering and Technology (IJSRSET), Print ISSN : 2395-1990, Online ISSN : 2394-4099, Volume 11, Issue 7, pp.435-444, May-June-2024.

[14] Prof. V. S. Bere, Prof. M. V. Gaikwad, Prof. A. A. Burungale, Prof. S. M. Kale, “Design of Traffic Control System” International Journal of Scientific Research in Science, Engineering and Technology (IJSRSET), Print ISSN : 2395-1990, Online ISSN : 2394-4099, Volume 11, Issue 7, pp.435-444, May-June-2024.

[15] Kumbhare, P.P., Kale, S.M., Katkar, M.B., Nemade, P.D. (2020). Monitoring and Evaluation of Water Quality of BHIMA River Based on Physico-chemical Data. In: Pawar, P., Ronge, B., Balasubramaniam, R., Vibhute, A., Apte, S. (eds) Techno-Societal 2018 . Springer, Cham. https://doi.org/10.1007/978-3-030-168483_68

[16] Kale Sandip Maruti, Kumbhare Pooja Pramod, and Dr. P.D. Nemade, “PHYSICOCHEMICAL ANALYSIS OF GROUND WATER A REVIEW”, JournalNX, pp. 3940, Feb. 2021.

[17] Prof. Kale Sandip Maruti. “Feasibility of Concrete Containing Pond Ash and Micro Silica” Journal of Emerging Technologies and Innovative Research (JETIR) www.jetir.org February 2018, Volume 5, Issue 2

[18] Kale Sandip Maruti, Ghogare Ram, “Feasibility of Concrete Containing Pond Ash and Micro Silica,” Journal of Emerging Technologies and Innovative Research (JETIR) www.jetir.org Volume 5, Issue 2 Feb. 2018.

[19] Kale Sandip Maruti."A Study of Tensile Strength of Concrete Containing Pond Ash and Micro-Silica", International Journal of Emerging Technologies and Innovative Research (www.jetir.org | UGC and issn Approved), ISSN:2349-5162, Vol.3, Issue 12, page no. pp172-176, December-2016, Available at : http://www.jetir.org/papers/JETIR1612025. pdf.

[20] Kale Sandip Maruti, Kumbhare Pooja Pramod, and Dr. P.D. Nemade, “PHYSICO-CHEMICAL ANALYSIS OF GROUND WATER A REVIEW”, JournalNX, pp. 39–40, Feb. 2021.

[21] Prof. Kale Sandip Maruti. “Feasibility of Concrete Containing Pond Ash and Micro Silica” Journal of Emerging Technologies and Innovative Research (JETIR) www.jetir.org February 2018, Volume 5, Issue 2

[22] Kale Sandip Maruti, Ghogare Ram, “Feasibility of Concrete Containing Pond Ash and Micro Silica,” Journal of Emerging Technologies and Innovative Research (JETIR) www.jetir.org Volume 5, Issue 2 Feb. 2018.

[23] Kale Sandip Maruti."A Study of Tensile Strength of Concrete Containing Pond Ash and Micro-Silica", International Journal of Emerging Technologies and Innovative Research (www.jetir.org | UGC and issn Approved), ISSN:2349-5162, Vol.3, Issue 12, page no. pp172-176, December-2016, Available at : http://www.jetir.org/papers/JETIR1612025.pdf

[24] Sandip Kale “Comparative Study of Rapid Chloride Penetration Test (RPCT) on Self

[25] Compacting Concrete (SCC)” International Journal for Research in Applied Science & Engineering Technology (IJRASET) ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538 https://doi.org/10.22214/ijraset.2023.53063

[26] Kale, Sandip Maruti, et al. "Assessing Rapid Chloride Penetration in Concrete with Aluminium Powder: Effects of Saline Water Curing." International Journal of Advances in Engineering and Management (IJAEM) Volume 5, Issue 5 May 2023, pp: 1081-1085 www.ijaem.net ISSN: 2395-5252

[27] PP Kumbhare, SM Kale, MB Katkar, PD Nemade “Monitoring and evaluation of water quality of Bhima river based on physico-chemical data” Techno-Societal 2018: Proceedings of the 2nd International Conference on Advanced Technologies for Societal Applications-Volume 1,

[28] Sandip Maruti Kale, Anand Dattatray Shinde, SahirAyub Shaikh, Vikas Laxman Suryawanshi, Omkar Kalidas More “Assessing Rapid Chloride Penetration in Concrete with Aluminium Powder: Effects of Saline Water Curing”

International Journal of Advances in Engineering and Management (IJAEM) Volume 5, Issue 5 May 2023, pp: 1081-1085 www.ijaem.net ISSN: 2395-5252

[29] Kale Sandip Maruti, Kumbhare Pooja Pramod, and Dr. P.D. Nemade, "PHYSICOCHEMICAL ANALYSIS OF GROUND WATER A REVIEW", JournalNX, pp. 39– 40, Feb. 2021

[30] Prof. Kale Sandip Maruti. "Feasibility of Concrete Containing Pond Ash and Micro Silica" Journal of Emerging Technologies and Innovative Research (JETIR) www.jetir.org February 2018, Volume 5, Issue 2

[31] Kale Sandip Maruti, Ghogare Ram, "Feasibility of Concrete Containing Pond Ash and Micro Silica," Journal of Emerging Technologies and Innovative Research (JETIR) www.jetir.org Volume 5, Issue 2 Feb. 2018.

[32] Kale Sandip Maruti."A Study of Tensile Strength of Concrete Containing Pond Ash and Micro-Silica", International Journal of Emerging Technologies and Innovative Research (www.jetir.org | UGC and issn Approved), ISSN:2349-5162, Vol.3, Issue 12, page no. pp172-176, December-2016, Available at : http://www.jetir.org/papers/JETIR1612025. pdf

[33] Kale, Sandip Maruti, et al. "Assessing Rapid Chloride Penetration in Concrete with Aluminium Powder: Effects of Saline Water Curing." International Journal of Advances in Engineering and Management (IJAEM) Volume 5, Issue 5 May 2023, pp: 1081-1085 www.ijaem.net ISSN: 2395-5252

[34] Sandip Kale "Comparative Study of Rapid Chloride Penetration Test (RPCT) on Self Compacting Concrete (SCC)" International Journal for Research in Applied Science & Engineering Technology (IJRASET) ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538 https://doi.org/10.22214/ijraset.2023. 53063

[35] 1.Sandip Maruti Kale, Innovative Self-Curing Concrete: Enhancing Durability through RCPT Analysis" ICEST-2K24 [ International Conference on Engineering, Science and Technology] In Association with International Journal of Scientific Research in Science, Engineering and Technology Print ISSN - 2395-1990 | Online ISSN : 2394-4099 (www.ijsrset.com)

[36] 2., Prof. S. M. Kale, "Innovative Solutions for Sustainable Pavements: Plastic Coated Aggregates in Bituminous Mixes" ICEST-2K24 [ International Conference on Engineering, Science and Technology] In Association with International Journal of Scientific Research in Science, Engineering and Technology Print ISSN - 2395-1990 | Online ISSN : 2394-4099 (www.ijsrset.com)

[37] 3.Sandip Maruti Kale "Paving the Way for Sustainable Infrastructure: Plastic Coated Aggregates in Bituminous Mixes for Flexible Pavements" ICEST-2K24 [ International Conference on Engineering, Science and Technology] In Association with International Journal of Scientific Research in Science, Engineering and Technology Print ISSN - 2395-1990 | Online ISSN : 2394-4099 (www.ijsrset.com)

[38] Prof. V. S. Bere, Prof. M. V. Gaikwad, Prof. A. A. Burungale, Prof. S. M. Kale "Design of Traffic Control System" ICEST-2K24 [ International Conference on Engineering, Science and Technology] In Association with International Journal of Scientific Research in Science, Engineering and Technology Print ISSN - 2395-1990 | Online ISSN : 2394-4099 (www.ijsrset.com)

[39] Sandip Maruti Kale, Sourabh Kare, Prathmesh Kshirsagar, Ganraj Nagare, Aman Pathan, " Innovative Self-Curing Concrete: Enhancing Durability through RCPT Analysis, International Journal of Scientific Research in Science, Engineering and Technology(IJSRSET), Print ISSN : 2395-1990, Online ISSN : 2394-4099, Volume 11, Issue 7, pp.435-444, May-June-2024.