International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 10 Issue: 09 | Sep 2023 www.irjet.net p-ISSN: 2395-0072

# Aerocon Panels: An Alternative Building Walling Solution for the Modern Age

**Siddhi Sandeep Nashte[1], Sandeep Gunpal Dige[2], Anjali Surat Jadhav[3]**

[1]*M. Arch Student (Architectural & Construction Project Management), Shivaji University Kolhapur*
[2]*Professor, SPSMBH College of Architecture, Shivaji University Kolhapur*
[3] *Assistant Professor, SPSMBH College of Architecture, Shivaji University Kolhapur*

---

**Abstract -** *The study focuses primarily on the use of Aerocon panels as an alternative building material in modern construction technologies. Urban population growth necessitates quick building. Modern structures must be designed with a focus on sustainability, thermal comfort, and energy efficiency. Prefabrication, sometimes known as prefab, is frequently used in construction to address issues with cost, time, and space. The project management, planning, material, cost, schedule, and environmental effect requirements should all be met by construction technology. The prefabrication building method collects the necessary components or sub-components from the factory and then transports them to the necessary site. Prefabrication is a good alternative to the conventional construction procedure. Their rising popularity can be largely related to energy savings and rapid installation. In the present, alternative development materials like Aerocon Panels have taken the role of clay bricks and mortar. This cutting-edge technique is being used to produce Aerocon panels in numerous buildings around India. The purpose of this essay is to familiarize readers with the advantages of using Aerocon panels in the building sector and cost-effective, quick construction.*

***Key Words***: **Pre-fabricated wall panel, Aerocon panels, Alternative material, Eco-friendly, Cost-effective, Time saving.**

## 1. INTRODUCTION

Prefabricated materials are units or parts produced in factories and transported to the construction site to be put together. Prefabricated wall panels are a type of construction material that may be produced off-site and put together on-site, offering an alternative to customarily site-based construction (Atishay Singla, 2021). Structural Insulating Panels (SIP), Insulated Concrete Foams (ICF), Timber Frame Panels, Steel Frame Panels, and Concrete Insulated Panels are a few examples of prefabricated wall panel types. A sandwich panel or composite panel are other names for a structural insulated panel (SIP). It has a thin core with two layers of hard material attached to each side. The advantages of employing prefabricated materials are as follows: Improved safety, decreased on-site installation time, increased labor productivity, and decreased material use and waste. With this technology, the panel is produced in a controlled environment at the factory before being delivered to the site, which lessens the amount of erection labor needed there. It provides tidy, dust-free locations (Baldha, 2021). A building or structure that houses business operations meant to make a profit is referred to as a commercial building. Commercial structures can be office buildings, retail establishments, shopping centers, lodging facilities, dining establishments, cold storage facilities, industrial structures, healthcare facilities, and multi-use structures. Commercial buildings require larger carpet space to be more profitable than residential areas. To improve building structures by meeting the needs of the end users, the choice of construction materials should take into account challenges with constrained conditions. Low-Cost Common Materials including Cement, Steel, and Concrete Construction contain up to 98% of the materials utilized. As the construction industry has developed, clay bricks and mortar have been replaced with alternative building materials like Aerocon. Their swift installation and increased popularity are generally credited with this (Auti, 2018).

### 1.1 AEROCON PANEL FEATURES

Sandwich panels known as Aerocon Panels are created by sandwiching a lightweight core constructed of Portland cement, binders, and a combination of silicaceous and micaceous material aggregates between two fiber-reinforced cement sheets. (Council, 2018) The panels are environmentally friendly due to the use of fly ash and the replacement of timber-based products. Aerocon panels can tolerate bad weather since they are resistant to water, fire, termites, and rats. Additionally, they have excellent thermal and acoustic insulation qualities. Panels are lightweight, sturdy, portable, and convenient to relocate. The product's design and technique of use make it appropriate for earthquake and cyclone-prone zones. The removal of onsite wet plastering and drying makes panels ideal for quick construction. The panels can be used for a variety of purposes, including infill or veneer walls with steel or concrete constructions, internal partition walls, flooring, and roofing. Disaster shelters, fire-rated enclosures, mezzanine levels, stair treads, louvers, shelves, and acoustic barriers are all examples of compound walls.

### 1.2 Sizes of Aerocon Panels:

<u>50 mm Thick:</u>

Length - 2400 mm, 2700 mm, 3000mm

Width- 600 mm

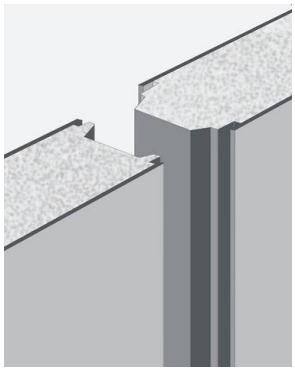
Weight- 39 Kg/m2

75 mm Thick:

Length - 2400 mm, 2700 mm, 3000mm

Width- 600 mm

Weight- 54 Kg/m2



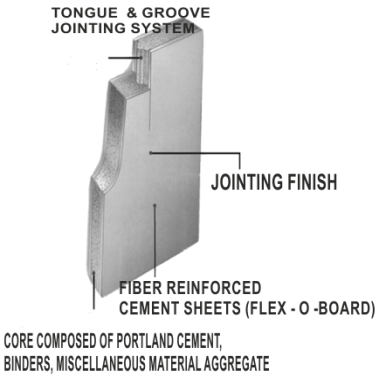



**Fig. 1 Panel Joint** **Fig. 2 Panel Section**

## 2. Types of Panels:

For interlocking, Aerocon Panels have tongue and groove joints.

Square Edge Panels: These are used in various applications, such as Partitioning, Roofing, and Mezzanine.

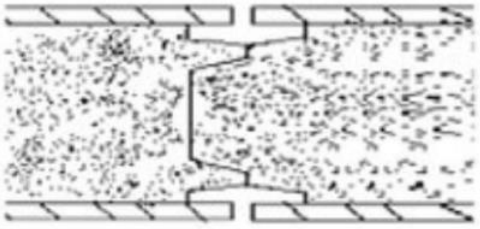


**Fig. 3 Square Edge Panels**

Recess Edge Panels: These are used in various applications, such as Partitioning and they are also used in Prefabricated structures.

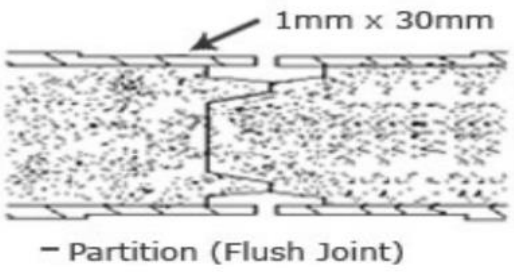



**Fig. 4 Recess Edge Panels**

## 3. AEROCON PANEL INSTALLATION

Steps:

1. Fix ceiling and floor channel.
2. Erect the panel and align it.
3. Apply jointing material in the tongue and groove joint.
4. Apply jointing material and fiber mesh tape to the surface joint.
5. At this point, the surface is prepared for any type of finish, such as paint, tiles, wallpaper, texture, etc.


**Fig. 5 Panel Installation Steps**

## 4. SIGNIFICANT ATTRIBUTES

1. Eco-friendly
2. Faster construction
3. Ease of electrical and plumbing fittings
4. No wet plastering and on-site curing
5. Lightweight
6. High thermal insulation
7. Fire resistant
8. Excellent sound reduction properties
9. Water, termite, and weather resistant
10. Suitable for Seismic and Cyclone prone zones
11. Relocatable
12. Thin walls (space-saving)
13. Smooth finish
14. Construction of structures is possible where sand, water, and cement are not available like in high mountain regions

15. Minimum foundation or ground preparation required
16. Easy workability

## 5. MANUFACTURING PROCESS OF AEROCON PANELS

The core of the panel is made utilizing fillers such as lightweight aggregates, binders like regular Portland cement, reinforcing fibers like cellulose and synthetic fibers, powdered fly ash, and foaming agents. A pair of fiber cement-facing sheets are separated and supported by utilizing normal jigs and fixtures, and these materials are injected between them after being thoroughly mixed with water traditionally. The inorganic bonding used to manufacture the panel in situ is what creates the adhesion between the core material and fiber cement sheets. After a certain amount of time has passed, the panels should be allowed to harden before the jigs or fixtures are separated. Both traditional humid/water curing and high-pressure steam curing are options for curing these panels.

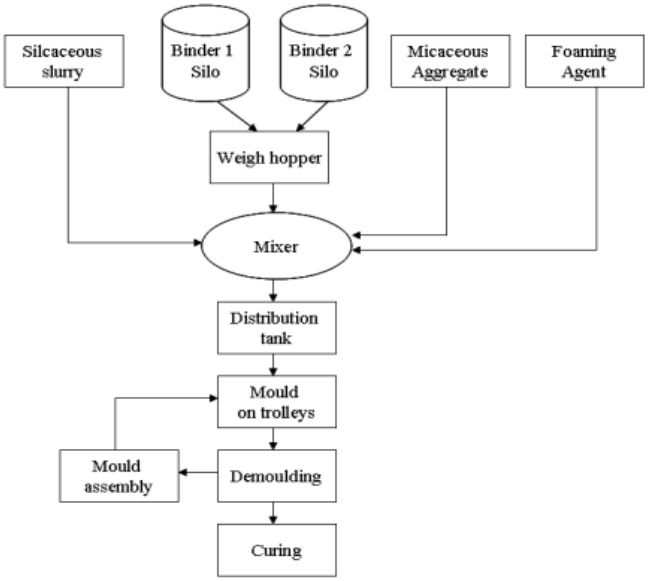



**Fig. 6 Flowchart for Manufacturing Process of Aerocon Panels**

## 6. CHARACTERISTICS OF AEROCON PANELS

**Table no. 1 Characteristics of Aerocon Panels**

| Properties | Units | Thickness | | Remarks |
|---|---|---|---|---|
| | | 50mm | 75mm | |
| Axial Load | KN/m | 53 | 83 | The factor of safety – 2.5 |
| Bending strength 2.9 M Span (U.D.L) (Safe design load) 1.5 M Span | Kg/m | 81<br>220 | 109<br>295 | The factor of safety – 2.5 |
| Flexural Strength | Kg/cm2 | 67 | 58 | Typical Test results |
| Compressive Strength | Kg/cm2 | 50 | 70 | Typical Test results |
| Thermal Conductivity | W/m deg. K | 0.22 | 0.21 | As per BS 4370-Part 2 |
| Transmission Efficiency of Sound | DB | 33 | 36 | IS: 9901 (Part III) – 1981<br>IS: 11050 (Part I) – 1981 |
| Fire rating | minutes | 240 | 240 | BS 476 Part 20 – 22 |
| Surface flame spread | Class | I | I | BS 476 Part 7 – 1971 |
| Class of Fire Propagation Index | Class | I | I | BS 476 Part 6 – 1981 |
| Ignitability | Class | P | P | BS 476 Part 5 – 1968 |

## 7. APPLICATIONS OF AEROCON PANELS IN THE CONSTRUCTION INDUSTRY

- Walls: Partitions walls, Internal walls, and External walls.
- Wall Cladding: Internal and External Cladding.
- Ceilings: Exposed and Concealed Ceiling.
- Mezzanine flooring, Full Height, Half Height Partitions, Prefab Structure, and Low-rise Construction.

## 8. COMPARATIVE PARAMETERS OF THE INNOVATIVE CONSTRUCTION TECHNOLOGY OF AEROCON PANELS WITH BRICK WALL

**Table no. 2 Comparative Parameters**

| Sr. no. | Parameter | Aerocon Panels | Brick |
|---|---|---|---|
| 1. | Raw Materials | Cement, sand, gypsum, and aluminum as aerated compound | Top Soil and Energy |
| 2. | Structural saving due to dead weight reduction | 55% reduction in the weight of walls. For high-rise constructions in earthquake/poor soil areas, significant structural savings No further savings | No additional saving |
| 3. | Water absorption capacity | Less than 20% by volume | 20% by volume |
| 4. | Productivity | 100% output than bricks | Normal |
| 5. | Soil Consumption | Zero soil consumption. The primary raw material is fly ash which is industrial waste generated by coal-based thermal power plants | One sq ft of carpet area with clay brick walling will consume 25.5 kg of topsoil. |
| 6. | Fuel Consumption | One sq ft of carpet area will consume 1 kg of coal | One sq ft of carpet area will consume 8 kg of coal |
| 7. | CO2 Emission | A square foot of carpet will produce 2.2 kg of CO2. | A square foot of carpet will produce 17.6 kg of CO2. |
| 8. | Size | 600 / 625 mm x 200 / 240 mm x 100-300 mm | 225 mm x 100 mm x 65 mm |
| 9. | Compressive Strength | 3-4 N/m2 | 2.5-3 N/m2 |
| 10. | Dry Density | 550-700 kg/m3 | 1800 kg/ m3 |
| 11. | Weight | Lightweight | Comparatively heavier |
| 12. | Cost Benefit | Reduced dead weight leads to savings in steel and concrete. | None |
| 13. | Sound Insulation | 0.36 | 0.05 |
| 14. | Durability | 20 years | 20 years |
| 15. | Time required for installation | 4 days | 20 days |

**Remarks from the Architects, Contractors, and Builders:**

- Value for money Material.
- Speedy and Easy to construct.
- More durable than brick walls.
- Less labor required for Construction.
- Provides Good Sound Insulation.
- Less Heat Tran mission.
- Eco-Friendly Material.

Savings in Time and Labor up to 60%, Savings in Steel, Savings in Cement, (Plastering, Bed Mortar, Joints), savings in Space up to 20%. Hence, Cost-Effective Material.

## 9. CONCLUSIONS

Aerocon Panels are a cutting-edge material in the green building revolution and have several advantages. Commercial buildings are the best buildings for using this prefabricated wall panel material because they are used differently than residential ones. Sand, brick, steel, and other building supplies are among those whose costs are increasing over time. Because of the intensive use of natural resources, it is necessary to adopt alternative construction techniques now more than before. A coordinated strategy is needed to promote Aerocon panels which can be used more creatively as building materials and their advantages can be better understood by the public. Significantly, it is important to raise public awareness of the advantages of employing such alternatives. If Aerocon is applied and encouraged by government authorities to create a greener and sustained eco-friendly atmosphere, it has the potential to transform the construction sector. This prefabrication construction method offers architects and builders a wide variety of materials and lightweight materials to utilize in construction, therefore they should be exposed to it.

## REFERENCES

[1]. Atishay Singla, S. P. (2021). IJREAM.

[2]. Auti, S. D. (2018). IJSR.

[3]. Baldha, V. R. (2021). IJAERS.

[4]. Council, (. B. (2018). Building Materials & Technology Promotion Council Ministry of Housing & Urban Affairs Government of India.

[5]. Ryan E. Smith, S. N. (n.d.). Prefabrication in Developing Countries: a case study of India. University of Utah.