

The Comparison Between Clay Bricks And AAC Block

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Abstract

In India, traditional clay brick is the most common material used in building. The materials used in construction have an influence on both the constructed environment and the project cost. clay brick and AAC block are most applicable material in India. In this work, a comparison of AAC and clay bricks is explored. Although AAC blocks have been utilised in building since 1924, they now account for just 17-20% of all construction in India. AAC blocks have desirable mechanical qualities in proportion to their low bulk density, improved thermal and acoustic properties, light weight, and ease of installation, making them an alternative to replace clay bricks. The purpose of this study is to analysed the material properties of AAC blocks and clay bricks and to encourage its usage in construction to create more energy efficient and sustainable buildings.

Keywords —Clay bricks, autoclaved aerated concrete (AAC) blocks, strength parameter, environmental impact.

Introduction

Bricks are the world's oldest building material and important material in construction. Traditional clay bricks are made from clay and fired at high temperatures, consuming a lot of energy and leaving a huge carbon footprint. These are made from the top fertile layer of the soil, resulting in soil sterility and erosion. Nearly 15% of overall air pollution is caused by brick kilns, which has become a serious environmental problem. There is a necessity to replace this material, and AAC has emerged as the best clay brick substitute. AAC blocks are mostly used for load-bearing masonry structures in seismic zones. And it growing globally as more sustainable construction techniques are adopted. AAC blocks are light weight material, which makes them a better material for usage in strong seismic areas because it decreases the mass of structure. AAC blocks are a relatively new building material in India, particularly in mountainous regions such as Himachal Pradesh.

This article presents a comparison between clay bricks with Autoclaved Aerated Concrete blocks in terms of environmental effect, cost, physical and mechanical qualities such as water absorption, compressive strength, dry density, and weight.

Environmental impact

autoclaving recycling process which decreases CO₂ emissions. The cost of transportation is dramatically reduced by using AAC blocks. It is much lighter than regular bricks, making it easier and less expensive to transport. The use of AAC blocks considerably decreases a building's total dead weight, enabling for the construction of higher structures. Because it is so light, it helps to minimise the bulk of a construction. AAC blocks' structure provides optimum thermal insulation for walls and building interiors, reducing heat loss in buildings. The substance has microscopic air pockets, and hydrogen is used to foam the concrete, providing it exceptional heat insulation properties

that allow for mild winter temperatures and cool summer ones. As a result, it can help you save up to 25% on your air conditioning expenditures.

Ingredient properties of clay bricks

Normally, bricks contain the following ingredients-

1.Silica – Silica (sand) – 50% to 60% by weight

It prevents raw bricks from shrinking, warping and cracking. excess amount silica gives uniform and sharp shape to the bricks. Although, excess silica makes brick brittle and weak. proper proportion of silica and alumina increase durability of bricks .

2.alumina - 20% to 30% by weight

It is the main constituent of clay. Due to the presence of alumina bricks clay showing plasticity. This plasticity ensures that bricks can be moulded. An excess amount of alumina in clay may cause the bricks to warp, shrink or crack on drying and burning as any other cementing material.

3.lime - Lime – 2 to 5% by weight

Bricks should contain a less amount of finely powdered lime.at the furnace temperature of 1650°C . It enables silica required to melt and binds the particles of brick together resulting in durable and strong bricks. Excess lime in brick clay will cause vitrification. 4.iron oxide - Iron oxide – $\leq 7\%$ by weight

Bricks contain a small quantity of Iron Oxide. It gives a red colour to bricks after burning. Iron also increases the impermeability and durability of the bricks.

5.magnease - less than 1% by weight

magnesium help to decreases shrinkage and it impart a yellow tint to the bricks. An excess amount magnesium causes bricks to decay.

Properties of clay bricks

1.Colour - Colour should be uniform and bright.

2.Shape – Bricks should have plane faces. They should have sharp and true rightangle corners.

3.Size – Bricks should be of standard sizes.

4.Hardness – finger scratching should not produce any impression on the brick.

5.Water absorption – water absorption should not more than 20% by weight after immercing the brick in water for 24 hours.

6.Efflorescence – bricks should not show white patches when soak in water for 24 hours and then allowed to dry in shade. white patches area due to the presence of sulphate of calcium,magnesium and potassium. they keep the masonry permanently in damp and wet conditions.

7.Thermal conductivity – Bricks should have low thermal conductivity, so that buildings built with them are cool in summer and warm in winter.

8.Sound insulation – Heavier bricks area poor insulators of sound while light weight and below bricks provide good sound insulation.

. Fire Resistance -fire resistance off bricks is usually good in fact bricks are used to encase steel columns to protect them from fire.

Ingredient properties of AAC Block

Normally, AAC block contain the following ingredients –

1.Fly ash: - Fly ash is waste industrial product used for reduction of construction cost. The density of fly ash ranges from 400-1800kg/m³. It provides fire resistance, thermal insulation and sound absorption.

2.Sand: - Fine aggregate are basically sand consists of crushed stone with maximum particles passing through a 4.75mm sieve,

3.Limestone:-In the fly ash contains 20% lime (CaO).

Limestone is made up of calcite aragonite.

4. Aluminium powder: -Aluminium is an expansion agent. When the raw material reacts with aluminium powder, in reaction between calcium hydroxide, aluminium and water and hydrogen gas is released with air bubbles.

5.Gypsum:- It is used in powder form. And Gypsum is easily available in the market.

Properties of AAC block

1.Cost effective – Using concrete block in construction significantly reduces cost in various ways. Each block can save approximately 25% than using bricks.

2.Made from waste – They do not harm or deplete nature for being made they are made from fly ash,which is nothing but a residue of thermal power plants.

3.Strength – Concrete block have enough resistance for earthquakes which are happening quite frequently these days.

4.Soundproof – concrete block have high density they offer a good soundproofing. They have efficient acoustic insulation is big help if your home is constantly surrounded by noise that could keep you from getting a sound sleep.

5.Speed of construction – A concrete block building can often be completed in less time than brick structure. Because they are bigger in size.

6.Durability - Bricks can last for a longer time than concrete blocks (hollow)that means some types of concrete blocks are less durable.

7.weak insulation – concrete block have weak insulation than bricks.

Water absorption	12 % to 15% by weight	15 to 17 % by weight
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Summer heat protection -

Due to high thermal density, it allows them to absorb more heat than AAC blocks. By using bricks you get the best possible choice for keeping your home warm in the winter and cool in the summer. The bricks absorb heat during day time and release it at night. In Day time need less heat than nights, which is where the thermal insulation property plays a part.

Environmentallyfriendly-

Accordingenvironmental issues of making red bricks completely overlook the fact that these bricks are made from materials that can be quickly recycled and used in landfills. But for burning process of bricks create lots of pollution. during manufacturing process it emits more amount of CO2. on the other hand, for different situation. AAC block are light weight material and made of fly ash which is waste product of thermal plants. Red bricks are primarily made from clay which is ash Red bricks are primarily made from clay which is obtained from topsoil of the earth’s surface. Due to continuous production of red bricks, the fertile topsoil is lost and hence the land available for agriculture decreases. during manufacturing process it emits less amount of CO2. Hence red bricks are not considered environment friendly.

Comparative analysis

Specifications	Clay bricks	Acc block
Size (in mm)	240x80x120	650x180x (80to 400)
Drying Shrinkage	-	0.038 %
Fire resistance (in hour)	2.5	3 to 6.5
Sound reduction index (in decibel)	60 (in case of 250 thick wall)	50 (in case of 220 thick wall)
Thermal conductivity (K)	0.80	0.15 -0.17
Normal Dry Density (in kg /m2)	1850	560-660
Compressive strength in N/mm2	2.4 to 3.4	3.2 to 4.4
Energy economics	No economics	Nearly 25% drop in heavy loads
Accessibility	In specific season	Any time
Carpet area	Relatively less	More
Quality	Varies	uniform
Speed of construction	Relatively slow	Faster due to large size
Breakage	10% to 14 %	2 % to 3%
Use of masonry	more because rough surface	Less because surface is plain

Durability -

Red clay bricks are not as durable as compared to AAC blocks are designed to be more durable and offer greater resistance to fire, moisture, seismic activities, termites.

Cheaper option –

Requires more mortar due to irregular surfaces and more number of joints. Due to its brittleness its become more breakable. And also covered less carpet area. as compared to AAC block Requires less mortar due to flat and even surfaces and less number of joints. And it has negligible breakage. And also covered more carpet area.

Water usage during manufacturing -

AAC blocks are cured by steam and block masonry also requires less curing hence less water is used and there is saving in electricity bill. In the case of clay bricks. Requires more water for curing and hence high amount of electricity bill and labour cost.

Conclusion

The fly ash based (AAC) blocks are valuable material for construction industry obtained from waste material from coal based thermal power plants. The use of AAC block reduces the overall cost of project. Also increased Speed of the construction process as installation of AAC blocks is easy as compared to clay bricks. It helps in reducing dead load of structure and hence can be used as replacement of clay bricks as an infill material in high seismic zones. AAC is efficient and eco-friendly. Since AAC blocks use readily available raw materials in the manufacturing process, have excellent durability, are energy efficient, and cost-effective, therefore AAC can be referred as a sustainable building material.

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