

AUTOCLAVED AERATED
CONCRETE (AAC)

INTRODUCTION TO AAC

Autoclaved Aerated Concrete (AAC), also known as autoclaved cellular concrete (ACC), autoclaved lightweight concrete (ALC), autoclaved concrete, cellular concrete, porous concrete, Air Crete, Hebel Block, and Ytong.

AAC is a lightweight, precast, Foam concrete building material invented in the mid-1920s that simultaneously provides structure, insulation, and fire- and mold resistance.

AAC products include blocks, wall panels, floor and roof panels, cladding (facade) panels and lintels.

PROPERTIES OF AAC

- AAC is a highly thermally insulating concrete-based material used for both internal and external construction.*
- AAC is well suited for urban areas with high rise buildings and those with high temperature variations.*
- AAC is increasingly used by developers, architects, and home builders worldwide.*
- AAC products include blocks, wall panels, floor and roof panels, cladding (facade) panels and lintels.*



*AAC BLOCK WITH 1mm
PERFORATIONS*

Product Types

- AAC products consist of load bearing, non-load bearing and cladding applications.
- Complete load bearing applications, however, are limited to low-rise construction.
- Cladding and large panels are available to take advantage of AAC's insulative, fire proofing, and other benefits on mid- and high-rise projects.
- The large wall, floor, and roof panels, measuring up to 20 feet long, 2 feet wide, and in various thicknesses, are also used in load-bearing capacities and are common in commercial and industrial applications.
- The remainder of the AAC system consists of blocks, also called "units" which are stacked using thin-set mortar, as opposed to the traditional cement-based mortar.



600 x 200 x 200



600 x 200 x 150



600 x 200 x 100



600 x 300 x 200



600 x 300 x 100



600 x 400 x 250

HISTORY OF AERATED BLOCKS

- AAC was perfected in the mid-1920s by the Swedish architect and inventor Dr. Johan Axel Eriksson.

• In the 1940s, the trademark Ytong was introduced, and was often referred to as "blue concrete" in Sweden due to its blueish tinge.

• This version of Ytong was produced from alum shale, whose combustible carbon content made it beneficial to use in the production process.

AAC production though started in Europe has slowed down considerably because during the initial stages the slate deposits used for Ytong also contain uranium, which makes the material give off radioactive radon gas to the building.

- China, Central Asia, India, and the Middle-East are the biggest in terms of AAC manufacturing and consumption.
- Dr. Eriksson was actually looking for an alternate building material similar to wood- high thermal insulation, solid structure & easy to work with- but without the disadvantage of combustibility, decay and termite damage.



- *Lightweight*
- *High Thermal Insulation*
- *Fire Resistance*
- *Durability and Moisture Resistance*
- *Toxicity and Breathability*
- *High load bearing capacity*
- *Excellent sound insulation*

SHAPES AND SIZES

- *The standard block size is 200 mm high and 600 mm long.*
- *Block thickness can range from 500 mm- 300 mm but for Residential construction the most common block size widths used are 100 mm, 150 mm and 200 mm.*
- *Standard Panel size is 600 mm wide by 75 mm thick with lengths ranging from 1200 mm-300mm*



USES OF AUTOCLAVED AERATED CONCRETE

- AAC is a highly thermally insulating concrete-based material used for both internal and external construction.

Quick and easy installation, because the material can be routed, sanded, or cut to size on site using standard carbon steel power tools.

- AAC is well suited for urban areas with high rise buildings and those with high temperature variations.

Highly economical:

- Due to lower density, high rise buildings constructed using AAC require less steel and concrete for structural members.

- Requirement of mortar for laying AAC blocks is reduced due to less number of joints.

- Similarly material required for rendering is also lower due to dimensional accuracy of AAC.

- Even though regular cement mortar can be used, most of the buildings with AAC materials use thin bed mortar in thicknesses around 1/8 inch, depending on the national building codes.



ADVANTAGES OF AAC

AAC has been produced for more than 70 years, and it offers several significant advantages over other cement construction materials, one of the most important being its lower environmental impact.

- Improved thermal efficiency reduces the heating and cooling load in buildings.*
- Porous structure allows for superior fire resistance.*
- Workability allows accurate cutting, which minimizes the generation of solid waste during use.*
- Resource efficiency gives it lower environmental impact in all phases of its life cycle, from processing of raw materials to the disposal of waste.*
- Light weight saves cost & energy in transportation, labour expenses, and increases chances of survival during seismic activity.*
- Larger size blocks leads to faster masonry work.*
- **Environmentally Friendly:** When used, it helps to reduce at least 30% of environmental waste as opposed to going with traditional concrete. There is a decrease of 50% of greenhouse gas emissions. When possible, using autoclaved aerated concrete is a better choice for the environment.*

- **Energy Saver:** *It is an excellent property that makes it an excellent insulator and that means the interior environment is easier to maintain. When it is used, there is usually not a need for any supplementary insulation.*
- **Great Acoustics:** *When you think of concrete, you do not consider it to be excellent for acoustics, however autoclaved aerated concrete has excellent acoustic performance. It is able to be used as a very effective sound barrier.*
- **Fire Resistant:** *Just like with regular concrete, ACC is fire resistant. This material is completely inorganic and not combustible.*
- **Great Ventilation:** *This material is very airy and allows for the diffusion of water. This will reduce the humidity within the building. ACC will absorb moisture and release humidity; this helps to prevent condensation and other problems that are related to mildew.*
- **Non-Toxic:** *There are no toxic gases or other toxic substances in autoclaved aerated concrete. It does not attract rodents or other pests nor can it be damaged by such.*
- **Accuracy:** *The panels and blocks made of autoclaved aerated concrete are produced to the exact sizes needed before they even leave the factory. There is less need for on-site trimming. Since the blocks and panels fit so well together, there is a reduced use of finishing materials such as mortar.*
- **Long Lasting:** *The life of this material is extended because it is not affected by harsh climates or extreme changes in weather conditions. It will not degrade under normal climate changes either.*
- **Light-weight:** *Concrete blocks that are made out of ACC weigh about one-fifth of typical concrete. They are also produced in sizes that are easy to handle for quick construction.*
- *Reduces the cost of the project.*

The major disadvantages of autoclaved aerated concrete are listed below.

- *The **production cost** per unit for ACC is higher than other ordinary concrete.*
- *Number of manufacturer is limited. So, cost will drastically increase in places far from the manufacturer and need to travel a long distance.*
- *It is not as strong as conventional concrete.*
- *Very few contractors who are familiar with **autoclaved aerated concrete**.*
- *Construction with autoclaved aerated concrete may will need special permission.*

Sizes of the bricks, density and compressive strengths:

Thickness	Height	Length	Density	Compressive strength
100 mm	200 mm	600 mm	550-700 kg/m ³	30 - 50 kg/cm ²
150 mm	200 mm	600 mm	550-700 kg/m ³	30 - 50 kg/cm ²
200 mm	200 mm	600 mm	550-700 kg/m ³	30 - 50 kg/cm ²



• *The wastage from AAC / CLC blocks (although negligible), does not have any other use than to put it in plinth filling whereas Brick bats of red clay brick can be easily utilized in :*

Terrace waterproofing : Brick bats for slope

Sunk slab filling (below the toilets)

Soak pit filling

Rain harvesting soak pit near bore well

• *The architectural treatment for elevation such as **cavity walls , pilasters** and projections for ward robes can be done only with red clay bricks . (hats why in many buildings you shall see red clay bricks being exclusively procured for these works).*

Cylindrical manholes or sewage chambers need small size of bricks so that each layer , the curvature can be formed .This calls for Red clay bricks.

These are a few reasons which does not allow for total replacement of red clay bricks with AAC /CLC blocks .

INTRODUCTION TP CLC BLOCKS

- Cellular Lightweight Concrete (CLC) also known as Foamed concrete is one of the most significant type of concrete used for construction purposes due to its various advantages and usages over traditionally produced concret
- Foamed concrete is manufactured by mixing Portland cement, sand, fly ash, water and preformed foam in varied proportions. Cellular lightweight concrete can be produced at building sites using machines and molds devised for normal concrete at ambivalent conditions.



PROPERTIES OF CLC BLOCKS

- **LIGHT IN WEIGHT** – It's density ranges from 300 to 1800 Kg/m³. It is three times less in weight than clay or fly ash blocks. A 100mm thick CLC wall will be equivalent to dense concrete wall having more than 5 times thickness and almost 10 times in weight.
- **ECO - FRIENDLY**– Foam concrete is an eco-friendly material as fly ash and other industrial wastes used in manufacturing blocks and thus protecting the environment. The production process or its use does not release any harmful effluents to the environment. This is also an alternative to plywood partitions and thus control deforestation.
- **SOUND INSULATION**– Excellent for sound insulation.

PROPERTIES OF CLC BLOCKS

- **LOWER WATER ABSORPTION** – It absorbs almost 50% less water as compared to concrete or clay bricks and helps to reduce cracks in the walls.
- **EASY TO HANDLE & INSTAL** – They are easy and quick to install, thus minimizing construction cost. They require minimal maintenance, which reduces long term cost. Foam concrete blocks are saving in cement , sand, water, labour, energy and time.

PROPERTIES OF CLC BLOCKS

- **THERMAL INSULATION**– It keeps house cool in summer and warm in winter, saves energy/electricity for cooling and heating.

FIRE PROTECTION – A 100mm thick wall of density 1000 kg/m³, offers fire endurance by preventing heat transmission for almost 4 hours without releasing any Toxic fumes. Fire rating of cellular concrete are far superior to brickwork or dense concrete

ADVANTAGES

- Lowest Initial Investment & Upgradable
- Quick returns & Highly Profitable
- Future product for Construction Industries
- Eco-Friendly Green Product
- Saves Precious & Fertile Agriculture Saving soil
- Less competition in market
- Easy to handle operations of the plant and can be owned without major engineering expertise
- Very Low Electrical power required to run a plant
- Very Small area is required to setup a plant
- Minimum manpower
- Reduces masonry time & Construction Material & Dead weight.