Autoclaved Aerated Concrete (AAC) blocks

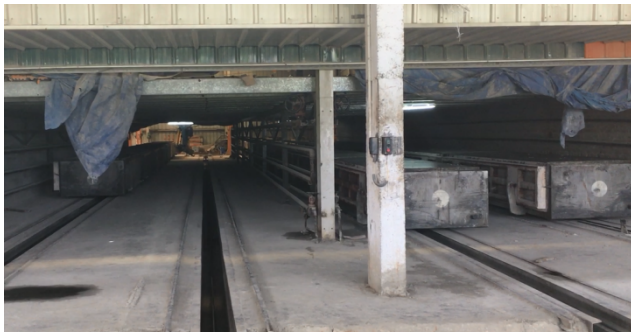

Figure 01: AAC block production at NOIDA

Overview

Autoclave Aerated Concrete (AAC) is a lightweight, cellular concrete which is plant-manufactured as blocks or panels for exterior and interior walls. It is produced by combining ground silica sand, cement, lime, water and an air-entraining agent which is typically finely ground aluminum powder. Its density is normally 30 to 50% of conventional concrete - in the range of 450 to 1000 kg/m^3, which also reduces its compressive strength. Their compressive strength is between 2 to 7 N/mm^2. The lower mass of an AAC building also reduces the load on foundations and lateral forces generated by earthquakes. The production capacity is 350-400 m^3 per day (8 hour shift)

The blocks are generally available in size 600mm x 200mm with thicknesses of 75/ 100/150/200mm. In principle, their use is similar to concrete blocks but the two unique advantages of AAC blocks are their superior thermal resistance and light-weight. Due to their mechanized production and extrusion process, they have much better edges and appearance than conventional concrete blocks and can be easily chased by cutters for conduiting.

The blocks are fire resistant up to 1600°C and offer sound attenuation of 45 dB.

There is a high market demand for AAC blocks in high rise construction due to faster construction which also saves cost. However, there is almost no penetration in the EWS/LIG category presently, where awareness about this material is very low and also because low-rise housing normally uses load bearing construction.

CATEGORY	ATTRIBUTE	INPUT	SOURCE
Resource Efficiency	**Embodied energy and CO_2 emission**	EE: 531 MJ/m^2 ; CO_2 Emission: 66.24 kgCO_2	*Source: calculation as per technical specifications. Kishore, Naveen & S. Chouhan, J. (2014). Embodied Energy Assessment and Comparisons for a Residential Building Using Conventional and Alternative Materials in Indian Context. Journal of The Institution of Engineers (India)*
	Critical Resource Use	29.9	*Source: Calculated critical use index (0-100)*
	Current Recycled content	Medium: average 30% Fly ash, (can vary from 10% to 60% depending on sand based or fly-ash based production.)	*Source: data gathered at Ashtec India Pvt. Ltd.*

	Future reusability	Low-medium. better reusability if lime mortar is used Good potential for recycled C&D waste	
	Water use during construction and manufacturing	453.5 litres per m^2 for production.	*Calculated from material specifications, 'Strategies for cleaner walling materials in India'-SHAKTI Foundation*
Operational performance	**Durability**	Medium to low: High water absorption in absence of protective coating causes deterioration, because of high porosity of blocks.	*Source: Product characteristics.*
	Ease and frequency of maintenance	Medium ease of maintenance. High if a water resistant coating is added to the blocks.	
	Impact on cooling or heating loads	Cooling energy ($kWh/m^2/y$) savings under different climatic zones Composite: 14.22 (28%) Warm & humid: 13.23 (29%) Hot & dry: 13.73 (30%) Temperate: 3.95 (26%) Heating energy savings in cold climate: 5.31 (13%)	*Source: Based on simulations. Values in savings from base case: 225mm solid burnt clay brick with 12.5mm plaster on both sides.*
	Noise transmission	45dB for 200mm thick wall	*Source: EcoGreen Products, Technical Specifications*
	Thermal mass (absorption, storage and release of heat)	247.6 kg per m^2	*Calculated from material specifications, 'Strategies for cleaner walling materials in India'-SHAKTI Foundation*
	Thermal performance (flow of heat)	U value 0.7 W/m^2K for a wall using 200mm thick blocks.	*Source: 'Strategies for cleaner walling materials in India'-SHAKTI Foundation (2011)*
User Experience	**Familiarity with the material**	Low consumer awareness about AAC blocks	
	Modification ability	Difficult: cannot be nailed or changed, chances of breakage.	
Economic impact	**Construction Cost**	INR 1364/m^2 for 200mm thick wall.	*Source: Calculations based on Delhi Schedule of Rates 2016; Adlakha Associates;*
	Skill requirement	High, both for production and application. 30% skilled, 70% semi-skilled	*Source: Study – 'Strategies for cleaner walling materials in India'-SHAKTI Foundation*
	Supply chain	High: well developed and consistent supply chain	
	Duration of Construction	6.53m^2/day of plastered wall.	*Source: Calculated value based on data from 'Strategies for cleaner walling materials in India'-SHAKTI Foundation*
	Job creation	1.16 man-days/m^2. 35-45 manpower per day;	