

Compressed Stabilized Earth Block



Figure 01: Hamsa House by Biome Environmental Solutions, Bangalore

Overview

This building system uses soil water and cement as a stabilizing agent. The mixture is compressed in a manual/mechanized machine and cured. The soil, raw or stabilized, for a compressed earth block (CEB) is slightly moistened, poured into a steel press (with or without stabilizer) and then compressed either with a manual or motorized press. CSEB can be compressed in many different shapes and sizes. For example, the Auram press 3000 produces 16 types of blocks. The input of soil stabilization allowed people to build higher with thinner walls, which have a much better compressive strength and water resistance. With cement stabilization, the blocks must be cured for four weeks after manufacturing. After this, they can dry freely and be used like common solid burnt clay bricks with a soil cement stabilized mortar. Since the early days, compressed earth blocks are mostly stabilized. Cement content of 6-7% cement and clay content of about 15% can yield blocks having wet compressive strength of 3.0 MPa, sufficient for two storied building. Higher strength for the block can be obtained by increasing the quantity of stabilizer.

CATEGORY	ATTRIBUTE	INPUT	SOURCE
Resource Efficiency	Embodied energy and CO ₂ emission	EE: 221.3 MJ/m ² ; CO ₂ emission: 55.5 KgCO ₂ /m ²	Source: Calculated value
	Critical Resource Use	51.7	Source: Calculated critical use index (0-100)
	Current Recycled content	Low	
	Future reusability	Low. Better reusability if lime mortar is used.	
	Water use during construction and manufacturing	682.5 liters per m ² ; 6L per block. 275 liters per sq.m in block production	Source: Calculation based on ' Strategies for cleaner walling materials in India '- SHAKTI Foundation
Operational performance	Durability	Medium-high, depending on design of building and detailing for water resistance	Source: Building with compressed earth block, DA publication

	Ease and frequency of maintenance	Medium to High frequency of maintenance	
	Impact on cooling or heating loads	Cooling energy (kWh/m ² /y) savings under different climatic zones: Composite: 2.25 (4%) Warm & humid: -3.29 (-7%) Hot & dry: -5.76 (-12) Temperate: 1.06 (7%) Heating energy savings in cold climate: 1.41 (3%)	Source: Based on simulations. Values in savings from base case: 225mm solid burnt clay brick with 12.5mm plaster on both sides.
	Noise transmission	40-50dB	Coefficient of acoustic attenuation for 40 cm thick wall at 500 Hz
	Thermal mass (absorption, storage and release of heat)	348 kg/m ² . Lag time 10-12 hours for 40cm thick wall	Source: Calculations based on data from ‘Strategies for cleaner walling materials in India’-SHAKTI Foundation and Auroville Earth Institute ;
	Thermal performance (flow of heat)	U-value 1.94 W/m ² .K,	Source: ‘Strategies for cleaner walling materials in India’-SHAKTI Foundation
User Experience	Familiarity with the material	High	
	Modification ability	Medium	
Economic impact	Construction Cost	INR 911/m ² cost of masonry. One time cost of machinery: INR 10.25 Lakh.	Source: Calculated based on CPWD Delhi schedule of rates 2016; Adlakha Associates
	Skill requirement	Medium (33.3%): Unskilled Labour can be trained for using the pressing machine.	Source: Adlakha Associates
	Supply chain	Dependent on quality of soil available on or near site,	Source: “Building with compressed earth blocks”, DA publication
	Duration of Construction	7.5m ² /day. Production of 1200-1500 blocks per day with 5 people.	Source: Building with compressed earth blocks, DA publication *Using the Balram Press
	Job creation	1.3 man-days/m ² ; 11-13 workers.	Source: Auroville Earth Institute