Rat-trap bond masonry

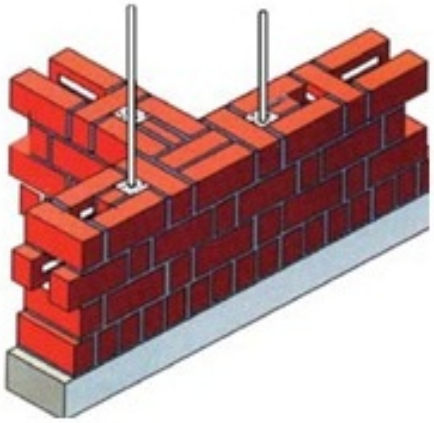

Figure 01: Wall construction with rat-trap bonds

Overview

The rat trap bond is a masonry technique, where the block arrangement creates a cavity within the wall, while maintaining the same wall thickness as for a conventional brick masonry wall. The system of a rat trap bond can be applied through any masonry block (CSEB, fly-ash etc.), but has been considered for solid burnt clay bricks in this document. While in a conventional English bond or Flemish bond, bricks are laid flat, in a rat trap bond, they are placed on edge forming the inner and outer face of the wall, with cross bricks bridging the two faces. The main advantage of Rat-trap bond is reduction in the number of bricks and mortar required as compared to English/ Flemish bond. The cavity also makes the wall more thermally efficient. This reduces the embodied energy of brick masonry by saving number of bricks and the cement-sand mortar. It is suitable for use wherever one-brick thick wall is required. Since early 1970s, rat trap bond has been extensively used in every category of building from large institutional complexes, community buildings. Government offices/village panchayats, individual homes both for high income and middle income and also in EWS housing programmes.

CATEGORY	ATTRIBUTE	INPUT	SOURCE
Resource Efficiency	**Embodied energy and CO_2 emission**	EE: 479.9 MJ/ m^2 ; CO_2 Emission: 59.5 $kgCO_2$ / m^2	*Calculations based on data from Strategies for cleaner walling materials in India'- SHAKTI Foundation*
	Critical Resource Use	69.8	*Source: Calculated critical use index (0-100)*
	Current Recycled content	Nil: dependent on brick units used	
	Future reusability	Low. Better reusability if lime mortar is used. High generation of C&D waste.	
	Water use during construction and manufacturing	422.5 liters per m^2	*Source: Calculations based on Embodied water in building materials; Strategies for cleaner walling materials in India'-SHAKTI Foundation*

Operational performance	**Durability**	High – comparable to conventional solid burnt clay brickwork	
	Ease and frequency of maintenance	Medium frequency of maintenance	
	Impact on cooling or heating loads	Cooling energy (kWh/m^2/y) savings under different climatic zones Composite: 2.68 (5%) Warm & humid: 2.3 (5%) Hot & dry: 2.75 (6%) Temperate: 1.06 (7%) Heating energy savings in cold climate: 2.18 (5%)	*Source: Based on simulations. Values in savings from base case: 225mm solid burnt clay brick with 12.5mm plaster on both sides.*
	Noise transmission	*No data available*	
	Thermal mass (absorption, storage and release of heat)	305 kg/m^2	*Source: Calculations based on material properties.*
	Thermal performance (flow of heat)	U value: 1.79 W/m^2K	*Source: Strategies for cleaner walling materials in India'-SHAKTI Foundation*
User Experience	**Familiarity with the material**	High: in regions where the practice has gained wide acceptance by builders and occupants.	
	Modification ability	*Low*	
Economic impact	**Construction cost**	INR 1207.8/m^2	*Source: Calculations based on Delhi Schedule of Rates 2016; data inputs from Adlakha Associates*
	Skill requirement	Medium (31%), the technique is easily learnt by masons.	*Source: Calculations based on Strategies for cleaner walling materials in India'-SHAKTI Foundation*
	Supply chain	*Not applicable*	
	Duration of Construction	*No data available*	
	Job creation	3.20 man-days/m^2	*Source: Calculated value; Demonstrating Cost Effective Technologies - A Case Study of Bawana Industrial Workers Housing Project, BMTPC Publication*