

Fly-ash bricks



Figure 01: Fly Ash production at Satna, Madhya Pradesh

Overview

Fly-ash bricks are masonry units made with 60-70% fly ash in the raw material mix. There are two kinds of fly ash bricks – the first type combines fly-ash with lime (5-10%), coarse sand or crushed stone (15-20%) and gypsum (3-5%); the second type combines fly-ash with cement (15-20%), lime (5%) and gypsum (4-5%). The size of flyash bricks is similar to the size of burnt clay bricks.

By far, Fly-ash bricks are the most readily available environment friendly alternative material in the Indian market. Small scale manufacturing units are most common for Fly-ash bricks – the production capacity varies from 600-1600 bricks per day.

Bricks of good structural strength of minimum 60 kg/cm² are available in the Indian market. The bricks can be used in all traditional applications of burnt clay bricks or even in cavity walls. Fly-ash bricks now have a fairly high acceptability in the construction sector, having been promoted by the government as a mandatory material to be adopted, at least in a 100km radius of a thermal power plant. Additionally, they have also become a common means to gain points in rating systems such as GRIHA and LEED/IGBC.

| CATEGORY | ATTRIBUTE | INPUT | SOURCE |
|---------------------|--|--|---|
| Resource Efficiency | Embodied energy and CO ₂ emission | EE: 628.7 MJ/m ² CO ₂ Emission: 108 kgCO ₂ /m ² | Source: Calculations based on data from Strategies for cleaner walling materials in India -SHAKTI Foundation for assembly of 230mm fly-ash brick with 12mm plaster on both sides. (includes transportation) |
| | Critical resource use | 44.7 | Source: Calculated critical use index (0-100) |
| | Current recycled content | Medium to high: Waste utilization ranges from 22% to 70% fly ash plus possible 4-5% gypsum if sourced as industrial waste. | Source: DA analysis of flyash production units in India; FaL-G technology literature developed by INSWAREB |
| | Future reusability | Low reusability. Addition to C&D waste. Better reusability if lime mortar is used | |
| | Water use during construction | 1928L/m ² . 0.15-0.2 litres per brick based on 8-10% water addition during mix preparation. Lesser | BMTPC Techno-Economic feasibility of Fly Ash bricks Environmental and Social Review for FaL-G bricks ; |

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| | and manufacturing | overall water consumption in masonry due to lower water absorption | ‘Strategies for cleaner walling materials in India’-SHAKTI Foundation |
| Operational performance | Durability | High: projected to be as good as burnt clay bricks | |
| | Ease and frequency of maintenance | High ease of maintenance: lower water absorption than solid burnt clay brick masonry | |
| | Impact on cooling or heating loads | Cooling energy (kWh/m ² /y) savings under different climatic zones Composite: 1.77 (4%) Warm & humid: 1.48 (3%) Hot & dry: 1.84 (4%) Temperate: 0.73 (5%) Heating energy savings in cold climate: 1.63 (4%) | 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) | 417 kg/m ² . | Source: Calculation based on Fly Ash Brick specifications; |
| | Thermal performance (flow of heat) | U-value 1.98 W/m ² K for a 230 mm thick wall. | Source: ‘Strategies for cleaner walling materials in India’-SHAKTI Foundation (2011) |
| User experience | Familiarity with the material | High awareness about fly ash bricks, especially in low-rise construction | |
| | Modification ability | Low: more difficult to nail or chase as compared to solid burnt clay brick | |
| Economic impact | Construction Cost | INR 1504/m ² for 230mm thick wall. Cost per block INR.5-8 per brick. | Source: Calculated based on CPWD Delhi schedule of rates 2016; Adlakha Associates |
| | Skill requirement | Medium: 23%; 3 skilled and 10-12 unskilled manpower for average 4000 bricks per day | Source: ‘Strategies for cleaner walling materials in India’-SHAKTI Foundation (2011) |
| | Supply chain | High: one of the most abundant industrial wastes. MoEFCC’s guidelines instruct use of fly ash in construction within 100kms of a thermal power plant, | Source: Compendium for Green Technologies |
| | Duration of Construction | 7.4m ² /day | Source: Project profile on Fly Ash Bricks, DC MSME, India |
| | Job creation | 1.69 mandays/m ² | Source: Calculated value based on data from ‘Strategies for cleaner walling materials in India’-SHAKTI Foundation |