

Ferrocement Roof Channel



Figure 01: Construction of FC Roof channel

Overview

Ferrocement comprises of a uniform distribution of reinforcement by use of chicken wire mesh and welded mesh encapsulated in rich cement mortar, thereby achieving significant reduction in both steel reinforcement and dead weight of roof. This composition provides a more uniform distribution of strength as compared to RCC. The roofing system uses pre-cast ferrocement roofing channels of a segmental arch profile which are placed adjacent to each other and spanning over two supports. After partly filling the valley between channels with concrete, the channels form an idealized T-beam and are able to carry the load of a roof or an intermediate floor. As per span of the channel and loading conditions, ferrocement elements can be designed and produced in a variety of profiles. Typically, a channel of bay width 85 cm and rise at center 30 cm can be used for a span of up to 6 meters. 20% saving in cost possible because of reduction in steel quantity and elimination of coarse aggregates and shuttering. It can successfully be used in any geo-climatic region where flat roofs are to be used, but it is most suited to applications where the economies of scale of use can justify the setting up of a decentralized production facility.

CATEGORY	ATTRIBUTE	INPUT	SOURCE
Resource Efficiency	Embodied energy and CO ₂ emission	EE: 400 MJ/m ² ; CO ₂ Emission: 109.5kg/m ² (0.29 kg CO ₂)	Calculations based on data from Strategies for cleaner walling materials in India'- SHAKTI Foundation Source: Calculation based on India Construction Materials Database of Embodied energy and Global Warming Potential
	Critical resource use	78.7	Source: Calculated critical use index (0-100)
	Current recycled content	Nil	
	Future reusability	Low-Medium	
	Water use during construction and manufacturing	319.5 L/m ²	Source: Calculations based on material specifications. DA BMTPC Ferrocement channel roof technology profile
	Durability	High (dependent of quality of wire mesh used)	Source: DA: "Ferrocement: An enabling Habitat Technology"

Operational performance	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: 2.48 (5%) Warm & humid: -3.73 (-8%) Hot & dry: -4.63 (-10%) Temperate: 2.17 (14%) Heating energy savings in cold climate: 4.47 (11%)	<i>Source: Based on simulations. Values in savings from base case: 100mm RCC + 100mm lime concrete roofing.</i>
	Noise transmission	<i>No data available</i>	
	Thermal mass (absorption, storage and release of heat)	398.5 kg/m ² for the complete assembly.	<i>Source: Calculations based on material specifications</i>
	Thermal performance (flow of heat)	U-value 2.56 W/m ² K for assembly of 25mm thick channel with 75mm brickbat concrete and 30mm screed.	<i>Source: C. Kabre - A new thermal performance index for dwelling roofs in the warm humid tropics. Building and Environment 45(2010) 727-738</i>
User experience	Familiarity with the material	Low	
	Modification ability	Low-medium for roof elements	
Economic impact	Construction Cost	INR 1839/m ²	<i>Source: Calculated based on CPWD Delhi schedule of rates 2016</i>
	Skill requirement	Medium: Semi-skilled labor	<i>Source: DA: "Ferrocement: An enabling Habitat Technology"</i>
	Supply chain	On-site construction	
	Duration of Construction	5m ² per day. 12 man-days for 12x15' FC channel roof	<i>Source: DA BMTPC Ferrocement channel roof technology profile</i>
	Job creation	1.84 man-days/m ² .	<i>Source: Calculated based on CPWD Delhi schedule of rates 2016</i>