

Glass Fiber Reinforced Gypsum (GFRG) Panel



Figure 01: GFRG panels at Kovalam, Kerala

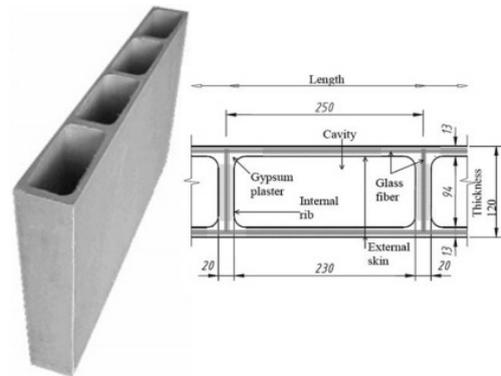


Figure 02: GFRG panel specifications, BMTPC

Overview

Glass Fiber Reinforced Gypsum (GFRG) Panel known as *Rapidwall* is a building panel made-up of calcined gypsum plaster, reinforced with glass fibers. The panel, manufactured to a thickness of 124mm under carefully controlled conditions to a length of 12m and height of 3m, contains cavities that may be unfilled, partially filled or fully filled with reinforced concrete as per structural requirement. Experimental studies and research in Australia, China and India have shown that GFRG panels, suitably filled with plain reinforced concrete possesses substantial strength to act not only as load bearing elements but also as shear wall, capable of resisting lateral loads due to earthquake and wind. GFRG panel can also be used advantageously as in-fills (non-load bearing) in combination with RCC framed columns and beams (conventional framed construction of multi-story building) without any restriction on number of storeys.

The GFRG Panel is manufactured in semi-automatic plant using slurry of calcined gypsum plaster mixed with certain chemicals including water repellent emulsion and glass fibre rovings, cut, spread and imbedded uniformly into the slurry with the help of screen roller. The panels are dried at a temperature of 275° C before shifting to storage area or the cutting table. The wall panels can be cut as per dimensions and requirements of the building planned. It is an integrated composite building system using factory made prefab load bearing cage panels & monolithic cast-in situ RC in filled for walling and floor/roof slab, suitable for low rise to medium rise (single to 10 storeys) building.

CATEGORY	ATTRIBUTE	INPUT	SOURCE
Resource Efficiency	Embodied energy CO ₂ emissions	EE: 836.8 MJ/m ²	Source: Calculations based on technical specifications.
		CO ₂ emissions: 0.4 kgCO ₂ /m ² (excluding transportation)	
	Critical Resource Use	57.6	Source: Calculations based on criticality index (0-100)
	Current Recycled content	High: 60% Phosphogypsum by weight. It is a by-product from phosphoric acid plants.	Source: <u>GFRG Technology profile, BMTPC, No.6/2014</u>
Future reusability	High	Source: <u>GFRG Technology profile, BMTPC, No.6/2014</u>	

	Water use during construction and manufacturing	100L/m ² . No water required for curing	Source: <u>GFRG / Rapidwall Building Structural Design Manual by IIT Madras</u>
Operational performance	Durability	Medium	Source: <u>Cityrene GFRG Profile</u>
	Ease and frequency of maintenance	Medium ease and frequency of maintenance	
	Impact on cooling or heating loads	Cooling energy (kWh/m ² /y) savings under different climatic zones Composite: -3.74 (-7%) Warm & humid: -2.24 (-5%) Hot & dry: -4.39 (-9%) Temperate: -1.99 (-13%) Heating energy savings in cold climate: -9.22 (-22%)	Source: <i>Based on simulations. Values in savings from base case: 225mm solid burnt clay brick with 12.5mm plaster on both sides.</i>
	Noise transmission	40dB	Source: <i>Compendium of prospective Emerging Technologies for Mass Housing, Second Edition, BMTPC, April 2017</i>
	Thermal mass (absorption, storage and release of heat)	328 Kg/m ²	Calculated from material specifications
	Thermal performance (flow of heat)	U-Value: 2.85W/m ² C for a standard 124mm thick GFRG panel filled with cellular concrete (94mm thick cavity).	Source: <i>Compendium of prospective Emerging Technologies for Mass Housing, Second Edition, BMTPC, April 2017</i> <u>Cityrene GFRG Profile</u>
User experience	Familiarity with the material	Low	Source: <i>Based on surveys</i>
	Modification ability	Medium to High	Source: <i>Compendium of prospective Emerging Technologies for Mass Housing, Second Edition, BMTPC, April 2017</i>
Economic impact	Cost of construction	INR 2361 per m ² . Market cost of panel: INR 1120 per m ²	Source: <i>Calculation based on data from Cityrene Builders, Chennai.</i>
	Skill requirement	Low (10%): Training required for handling during transportation and assembly	Source: <i>Cityrene Builders; Rapidwall project, FACT – RCF Building products Ltd. (FRBL)</i>
	Supply chain	Low: Factories producing GFRG in India: FRBL-FACT RCF Cochin, Kerala and RCF Mumbai	Source: <u>GFRG Technology profile, BMTPC</u>
	Duration of construction	6m ² per day; 185m ² (2 storey) in 1 month.	Source: <u>Rapidwall project, FACT – RCF Building products Ltd. (FRBL)</u>
	Job creation	No data available	