

# SCHEDULE OF ITEMS & RATE ANALYSIS FOR GFRG CONSTRUCTION



Glass Fibre Reinforced Gypsum (GFRG) Panel Building System – A New Solution for Rapid and Affordable Mass Housing



Structural Engineering Division  
Department of Civil Engineering  
IIT Madras



Building Materials & Technology Promotion Council  
Ministry of Housing & Urban Poverty Alleviation  
Government of India

**GFRG BUILDING SYSTEM -  
A NEW SOLUTION FOR RAPID AND  
AFFORDABLE MASS HOUSING**

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Prepared by



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The information presented is supplied in good faith and is based entirely on the test data and design guidelines furnished for GFRG building panel. BMTPC, New Delhi or Indian Institute of Technology Madras is not responsible for incorrectness, if any, in such data furnished for GFRG building panels.

Rs.200/-

## FOREWORD

Glass Fibre Reinforced Gypsum (GFRG) Panel Building System is an emerging construction system replacing conventional masonry/RCC framed construction and has potential to be used for social mass housing at a reasonable cost. Essentially GFRG panel system is a green alternative technology since it makes use of waste byproduct i.e. gypsum from fertilizer industry. Currently these panels are being manufactured at Rashtriya Chemical Fertiliser (RCF) Mumbai and Fertilisers And Chemicals Travancore Ltd. (FACT) Kochi. The technology is originally developed in 1990's by GFRG Building Systems Australia and being studied, evaluated and promoted by IIT Madras for its adoption in Indian context.

In order to mainstream any new construction system, it is imperative to create an equivalent eco system which exists for conventional construction system so that technology can be implemented in the field hassle free. It calls for development of detailed specifications, design guidelines, construction manuals, standards and most importantly Schedule of Rates which will empower construction agencies both public and private to use these systems at level playing field with conventional construction. BMTPC in its pursuit to promote appropriate technological solutions for housing in different geo-climatic condition of India has been associated with the promotion of GFRG technology since 2002-03 along with IIT Madras and other R&D organizations. In the process, the GFRG panel system has been certified by BMTPC through Performance Appraisal Certification Scheme (PAC No.1009-S/2012) and Design Manual has also been published along with IIT Madras. The standard has also been developed and submitted to Bureau of Indian Standards (BIS) which is under wide circulation as of now. BMTPC is also undertaking currently a demonstration pilot project at Saraswathi Nagar of Chowtapalem Village, Venkatachalam Mandal, SPS Nellore, Andhra Pradesh, wherein 40 houses are being constructed with the GFRG technology in association with IIT Madras and FRBL.

A need was felt to develop Schedule of Items and Rate Analysis for GFRG Construction which can be used by any agency which wishes to construct structures using GFRG technology. This publication is the outcome of the recently constructed demonstration building using GFRG by IIT Madras who readily agreed to make use of the data for preparation of the document. Prof. Satyanarayana Murty and Prof. A. Meher Prasad alongwith Prof. Bhaskar Ramamurty, Director, IIT Madras need to be complimented for preparing this useful document for public and at present promoting GFRG panel system as an affordable and rapid solution for mass housing. We are sure that the present document will help the construction industry for preparing tender estimates using the technology. The document will be updated as soon as more buildings come up with the technology and additional data on material and labour constants is generated.

Dr. Shailesh Kr.Agrawal  
Executive Director  
BMTPC





## PREFACE

The Government of India's mission on "Housing for All by 2022" envisages providing affordable housing for all citizens by 2022. This entails construction of about 20 million houses in urban areas and over 30 million houses in rural areas within a period of seven years. The challenge of cost effective housing, to be rapidly delivered and in a sustainable way, cannot be met with conventional technology and methodologies. There is a need a paradigm shift in the way this has to be done.

Glass Fibre Reinforced Gypsum (GFRG) panels based technology has the potential to address the challenges mentioned above. It is a sustainable solution as the raw material Gypsum is a by-product of chemical and fertiliser industries. Large quantities are available around the country. Further, the use of the technology leads to less use of scarce natural resources like sand and aggregates. As demonstrated by various project executed in the country, it is possible to construct at the rate of one floor every two weeks. The labour requirements are also much lesser compared to the conventional construction methods. If economy of scale can be achieved, this technology can deliver at a lower cost, compared to conventional masonry/ RCC based construction, with superior quality of finish.

Based on the research at IIT Madras, the various technical issues related to this technology have been studied and design manuals have been developed. While the GFRG panels are being manufactured in the country and few projects have been executed, one of the constraints for large scale use, especially for Government funded projects, has been availability of schedule of items and rate analysis for estimation and tendering purposes. This publication is intended to fill that gap. While the Delhi Schedule of Rates of CPWD have been used for items that are available in DSR, for non DSR items market rates have been used. The data for rate analysis of non DSR items have been collected from some recent projects that have been executed using GFRG panel technology. As more GFRG buildings are constructed, with experience gained the rate analysis can be further refined.

Building Materials and Technology Promotion Council (BMTPC) identified the need for this document and funded this initiative. Specifically, Dr. Shailesh Kr. Agarwal, Executive Director and Mr. J. K. Prasad, Chief – Building Materials took keen interest and their support and encouragement is gratefully acknowledged. The guidance of Prof. Meher Prasad and Prof. Devdas Menon who have been pioneering the research and development of GFRP technology implementation in India is gratefully acknowledged. Mr. P. K. Gopinathan of RBS India provided valuable inputs in refining the document. Special thanks to Mr. Shinto Paul, Mr. Philip Cherian, Mr. Ajaykrishnan and Mr. K. Narayanaperumal of IIT Madras who assisted in the data collection and compilation.

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## GFRG BUILDING SYSTEM - A NEW SOLUTION FOR RAPID AND AFFORDABLE MASS HOUSING

### 1. Introduction



Fig. 1 GFRG Demo Building, IIT Madras

What you see here is a two-storeyed four-flat apartment building, constructed recently in the sylvan campus of IIT Madras. From the outside, it looks like any other conventional building. So, what's special about this?

Firstly, it has been built much faster than conventional buildings. In just one month! This is made possible by using prefabricated hollow panels, cut to size, and transported from the factory to the site, where the panels are quickly erected.

Secondly, it demonstrates the use of a 'green' alternative technology – making use of industrial waste gypsum and glass fibres in the hollow panels – called GFRG panels – Glass Fibre Reinforced Gypsum panels. This building, which does not need any plastering, uses much less cement, sand, steel and water than conventional buildings. Hence, it consumes much less embodied energy, and less carbon footprint, thus contributing to sustainable development.

Thirdly, the panels are very thin – only 124 mm thick. So, for the same carpet area, the built-up area, and the building footprint is much less



Fig. 2 GFRG Panels

than conventional buildings. This is particularly advantageous in multi-storeyed mass housing.

Fourthly, these panels, which can be used not only as walls – but also as floors, roofs and staircases – are light weight – weighing only 43 kg/m<sup>2</sup>. Even after filling some of the cavities with concrete, the overall building weight is much less, contributing to significant reduction in design earthquake forces and savings in foundations and overall building cost – especially in multi-storeyed buildings. Buildings up to 8 storeys can be designed using this load-bearing system, without the need for any beams and columns.



Fig. 3 Panel Erection

All these advantages suggest that the GFRG building system, as proposed by the research team of IIT Madras, is a promising solution to the tremendous housing shortage – in both rural and urban India. In summary, the construction is rapid, cost-effective and green.

There are presently two manufacturing plants – one at Rashtriya Chemicals & Fertilizers (RCF) at Mumbai, and another at FACT, Kochi. The panels used in the GFRG demo building at IIT Madras came from FACT, Kochi.

Let us now have a quick look into the advantages and disadvantages of this system over conventional buildings.

#### **Advantages over conventional buildings:**

- *High speed of construction: GFRG demo building with four flats in two storeys (total 1981 sq.ft.) built within a month!*
- *Less built-up area for the same carpet area: wall panels are only 124mm thick.*
- *Less embodied energy and carbon footprint: significant reduction in use of cement, sand, steel and water; recycling of industrial waste gypsum.*
- *Lower cost of structure: savings in materials; no plastering.*
- *Lower building weight (panels weigh only 43 kg/m<sup>2</sup>), contributing to savings in foundation and reduction in design for earthquake forces, particularly in multi-storeyed construction.*
- *Buildings up to 8-10 storeys can be designed using this load-bearing system, without the need for beams and columns.*
- *Excellent finishes of prefabricated GFRG panels – used for all the walls, floors and staircases, with minimal embedded concrete: no need for additional plastering.*

#### **Disadvantages over conventional buildings:**

- *Less moldable compared to concrete structures, especially curved structures are not possible.*
- *Shorter span of every slabs should be restricted to 5 metres . In case it exceeds the limit, beams should be provided which in turn will increase duration of construction.*
- *Require enough space on all sides (atleast 2 to 3 sides) for proper maneuvering of crane for panel erection.*
- *Less flexibility in floor plans, that means the same floor plan has to be replicated for all floors in multistorey structures.*



## 2. Panel Dimensions

Typical dimensions of a GFRG building panel are 12.0m × 3.0m × 0.124 m, as shown in Fig. 4. Each 1.0m segment of the panel contains four 'cells'. Each cell is 250 mm wide and 124 mm thick, containing a cavity 230 mm × 94 mm, as shown in Fig. 5. The various cells are inter-connected by solid 'ribs' (20 mm thick) and 'flanges' (15 mm thick), comprising gypsum plaster, reinforced with 300 - 350 mm glass fibre roving, located randomly but centrally.

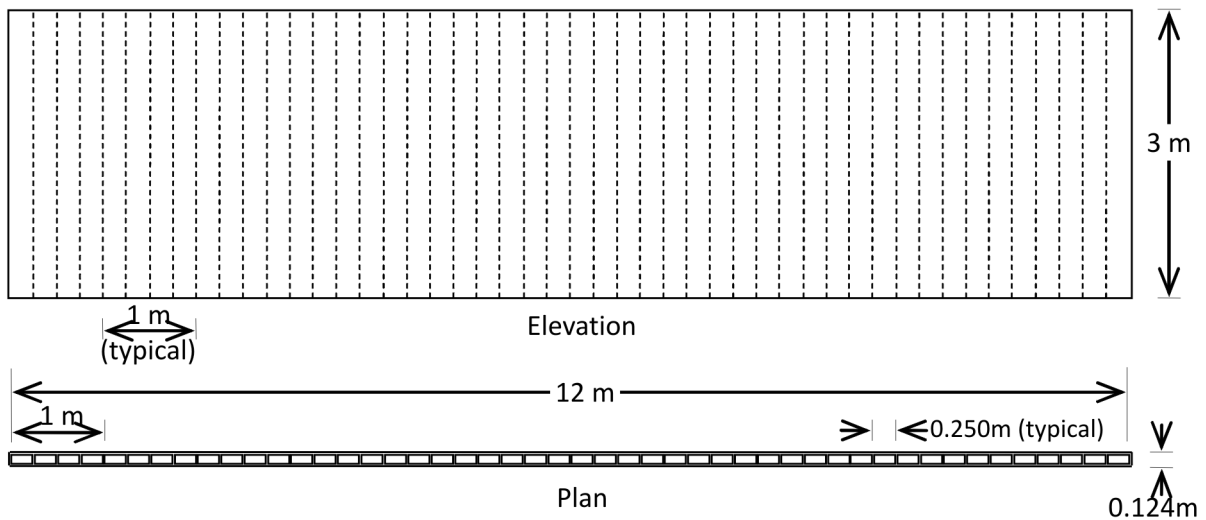


Fig. 4 Typical Cross Section of GFRG Panel

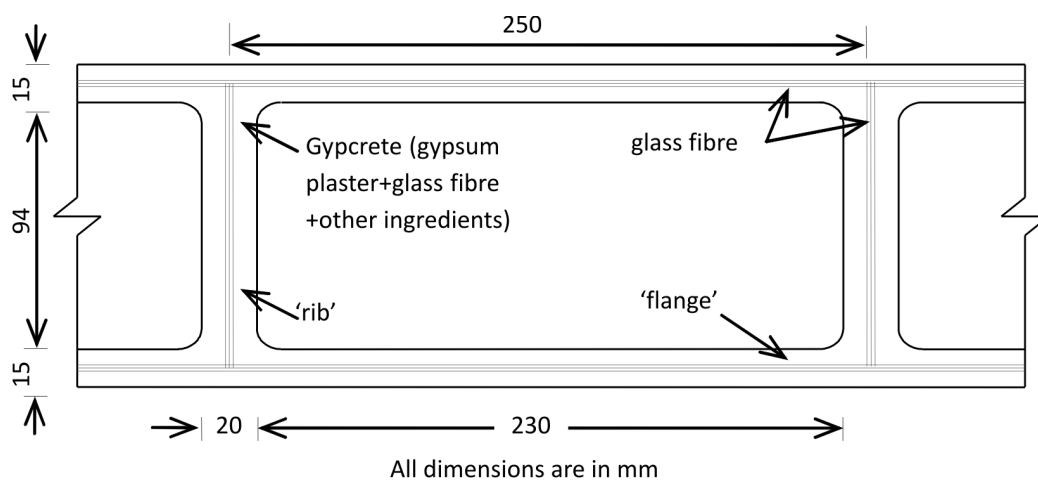


Fig. 5 Enlarged View of a Typical Cell

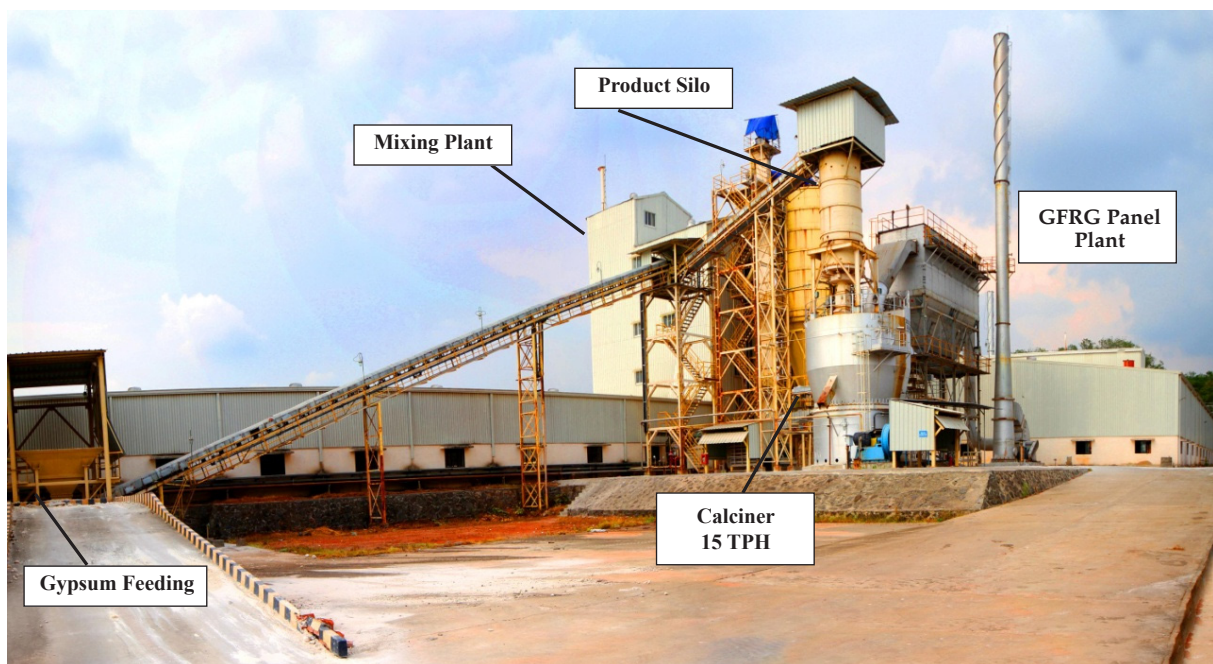
### 3. Manufacturing



**Fig. 6** Gypsum deposit, FACT, Kochi

What you see here in Fig.6 is the stock of waste gypsum – 7 million tonnes of it – with an addition of 2000 tonnes every day – piled up into a hill, awaiting disposal. It is this waste product of the fertilizer industry, reprocessed by calcining to make gypsum plaster, that forms the raw material for the GFRG panel.

The technology for the manufacturing of the panels was originally developed in the 1990s by GFRG Building Systems, Australia. They demonstrated, for the first time, that by combining glass fibres with specially calcined gypsum plaster and some special additives, the panel obtains the desired properties of strength and water resistance – to be used as a building material. Their panel, called ‘GFRG’, is the world’s largest load bearing, light-weight, pre-fabricated building panel – 12m long, 3m high and 124 mm thick with modular cavities. The panels manufactured at RCF Mumbai and FACT Kochi are based on the technology transferred through collaboration with GFRG Building System, Australia.



**Fig. 7** GFRG Manufacturing Plant



**Fig. 8** GFRG Panel Base

First of all, the raw gypsum is subjected to a process called calcination, where the gypsum is heated to about 150°C – till it loses its combined water and recrystallises to a form of plaster (See Fig.7).

The panels are cast, in three stages, on a special table of size 12m by 3m. First, the bottom layer, 15 mm thick, is cast, by pouring a paste of calcined gypsum and other chemical additives. On to this, glass fibres, cut to 300mm size, are spread evenly on to the mix, by means of a screeding and rolling process (See Fig.8).

Next, special aluminium plugs are inserted on top of the finished first layer, with 20mm gaps in between, to form the hollow cavities in the panel. Now, the second pouring of the mix is done into these gaps, along with cut glass fibres, with tamping – to form the ribs of the hollow panel.

In the third stage, the process of the first stage is repeated – to complete the top layer of the panel. After setting, which takes 25 minutes, the plugs are withdrawn, and the casting table is rotated, and in its vertical position, the panel is taken out for drying by means of a special fork lift.

The drying of the panels is done in a drying chamber, in which hot air is circulated to dry the panel evenly for 90 minutes.

After drying, the panels are cut, using an computer-aided and automated process – tailor-made to the specified requirements for any building project. The panel sizes, required for the walls and the floors, etc., including cut-outs for doors and windows, are done, as required. It is important that all this information is carefully planned in advance and furnished at the plant site by means of “cutting drawings”, to be furnished by the architect / engineer.



## 4. Transportation

The GFRG panels are transported from factory to site, generally through trucks or trailers. The panels are kept in a vertical position using “stillages”, so as to avoid any damage during transportation. Stillages are steel framework with adjustable base in which panels are kept and locked for safer transportation. The panels after reaching the site are taken out from trucks using cranes. Forklifts can be used at site for easier movement of panels from one area to another.

## 5. Methodology of Construction

### FOUNDATION

The foundation used in this construction is conventional. It depends on the soil condition of the particular site and the number of storeys of the structure. Generally strip footing is used, as the superstructure consists of load bearing walls. The following steps are involved in the construction:

- Excavation of earth
- Levelling/Ramming of base
- Laying of PCC (Fig.9)
- Waterproofing layer over the entire PCC
- Footing (Generally Strip, but varies according to building type, size and soil conditions)
- Water proofing on 3 sides (exposed sides of footing and plinth beam) as shown in Fig.10
- Plinth beam over the footing with start-up rods from foundation for connectivity of building with foundation (Fig.11).
- Fill inner depressions in footing using excavated earth and ram it well
- Fill up the top with quarry dust (or any inert waste material) 200mm thick
- Laying of PCC layer (100mm) over the filled up area up to plinth beam top
- Final layer of waterproofing over the entire floor area



Fig. 9 PCC Layer



Fig. 10 Waterproofing on foundation



Fig. 11 Startup bars from plinth beam

## SUPERSTRUCTURE

The superstructure of GFRG construction is entirely based on prefabricated panels. The procedure mainly include fixing of wall panels and roof panels using mechanical means, preferably a crane and filling the required joints with reinforced cement concrete as per structural design.

### 1) Wall Panel Erection

- Plinth beams are cast all around the floor where walls have to be erected.
- Wall panels are erected using cranes according to the cutting drawings (Fig.12).
- Steel bars are erected through the cavities and tied up with the startup bars in foundation. These bars should be taken till top of the structure to maintain the connectivity of reinforcement in the vertical walls
- After the wall panels are erected, check its level (perpendicularity) and fix it with the help of supports from both sides.
- Once all the wall panels are placed in position, cut out the panel at required positions and fix the pipes for electrical and plumbing according to the corresponding drawings.
- Also place the steel bars in joints according to the structural details given in drawings. It might be L-shaped, T- shaped or cross type joints. Concrete the joints once the reinforcement is placed.
- Simultaneously you can proceed with lintel works on the outer walls. The reinforcement arrangement is to be prepared prior to fixing and held with the help of shutter and props. The same procedure is carried out for lofts in the inner walls.
- Refer the structural drawing to decide on the number of cavities to be filled with reinforced concrete.
- Once this is done, start pouring of concrete (min. M20 grade) in steps of 50cm height in the required cavities (Generally every third cavity, but varies according to structural design). Refer Fig.13.
- Once the concrete level in cavities reach sill level, fix the sunshades(Fig.14) and window frames. Providing a waterproofing layer



Fig. 12 Erection of panel



Fig. 13 Concreting of cavities



Fig. 14 Fixing of lintels



around window frame is advisable.

- Once the concrete level in cavities reach corresponding level of electrical switchboards or any extra wall fittings, fix them in position and proceed with concreting(Fig.15).
- Once the concrete level in cavities reach top of door level fix the door frames. Providing a waterproofing layer around door frame is advisable.
- After the fixations, you can proceed with concreting till the bottom level of tie beam as per the drawings.
- Fill the rest of the cavities with waste materials preferably fly ash or quarry dust mixed with 5% cement.
- Finish of vertical joints with a layer a waterproofing and then finish with silicone sealant.
- Finish the broken/cut areas with gypsum plaster for a smooth and even finish. Final view is given in Fig.16.



Fig. 15 Openings for electrical works



Fig. 16 Supports for Wall Panels

*Note: Crane having telescopic boom is desirable for panel erection. A special locking system is used to grip the ribs of the panel on top, enabling easy lifting, without any damage to the panel.*

## 2) Roof Panel Erection

- For erection of roof panels, acro spans supported on props are placed, in order to support the roof slab (Fig.17).



Fig. 17 Supports for slab panels

- Slabs are placed in position with a minimum of 40mm bearing (4 side wall support) or 60mm bearing (2 side wall support) as shown in Fig.18.
- Ribs of the wall panels are cut out at the top according to the dimension of tie beam (generally 94 x 200mm) for placing the tie beam encased in wall panel.
- After placing the tie beams, make a shuttering around the external surface at floor level in order to carry out concreting.
- Cut the top flange of required cavities in GFRG slab and place micro-beams (prepared prior to erection) in proper position (Fig.19 & 20).
- Roll a steel mesh (10 gauge size) over the entire slab and with 25mm effective cover from the slab top.
- Carry out concreting for a height of 50 mm above panel top. Use minimum M25 mix and coarse aggregate of size less than 20mm for proper setting (Fig.21).
- Allow sufficient setting time for the floor and provide proper curing.
- Apply a coat of waterproofing above Ground floor wall panels before erecting the first floor wall panels.



Fig. 18 Erection of slab panel



Fig. 19 Slab prior to placing of micro beam



Fig. 20 Slab after placing of micro beam



Fig. 21 Slab during concreting



- Make sure that the vertical rods from wall panels are projecting up so that next wall panel erection become in line with Ground floor wall panels. Also it is essential for the structural integrity.

*Note 1: Tie the vertical steel rods in wall panels to the tie beam and also make sure the micro-beams in slab are connected to tie beams through suitable steel reinforcements. This will give overall structural integrity and stability to the structure.*

*Note 2: The above procedures (1) and (2) in superstructure can be continued for 6-8 floors (storeys). The number of storeys that can be built depends on the earthquake zone of site.*

### 3) Staircase

- Staircase is also an integral part and should be done simultaneously during the wall panel erection. (It should be completed before laying of roof slab so that movement between the floors wouldn't need any extra ladders)
- Mark the position of mid-landing slab and profile of staircase on the adjacent wall panels.
- Cut out the marked positions of mid-landing slab from adjacent wall panels and insert the available precast GFRG slab in position with reinforcement projecting into adjacent walls. Provide enough support( shuttering and props).
- Keep the inclined waist slabs such that the first one will be resting on ground and mid-slab and second one on mid-slab and ground floor roof panel (a beam would be desirable).
- For first flight of slab, cut all top flanges, insert reinforcement and bend it and project it into mid-slab. The start-up rods are bend into the waist slab at bottom and mid-slab reinforcement is bend into waist slab at top.
- Similarly the second flight of slab is done. But here mid-slab reinforcement is bend into waist slab at bottom and roof slab (or beam) reinforcement is bend into waist slab at top. The figure (Fig.13) shows a staircase prior to concreting.
- Check the reinforcement detail. Once it is finished, start concreting. Steps can either be made of concrete with proper shuttering or with bricks.



**Fig. 22** Staircase with reinforcement

#### 4) Finishing

- Finishing work should be started off when all the above mentioned works are finished.
- All the cracks or breakages in the panel are finished off using gypsum plaster or cement plaster.
- First of all provide additional coatings (2 or 3 according to product used) of waterproofing in water prone areas like kitchen and toilets.
- Make the surface (floor) rough by scrapping and apply floor tiles with help of cement plaster and respective tile adhesives.
- Use wall tiles in kitchen and bathroom using the above said procedure.
- All the openings for pipes in bathroom and kitchen have to be packed with thick paste waterproofing products.
- Use wall putty throughout the building for smooth finish. Cement Plastering is not required.
- Apply a primer throughout the interior and exterior surface of building prior to painting.
- Painting is carried out as a final work with any product of your choice.

*Note: Polymer rich flexible sealant material having bonding with both concrete and GFRG panel is to be used to in-fill or seal off various construction joints and encasing the pipe joints.*

#### 5) Terrace Finish

- Depends on Roof Type (Sloped or Flat).
- For a flat roof, provide enough slope so that rainwater drains away completely.
- In case there is parapet wall, apply a waterproofing sealant in joint between wall and roof slab and finish it off by a concrete coving.
- For sloped roof, provide waterproofing along the ridge.
- Provide 3 to 5 waterproofing coats (based on product) on the terrace.
- Finish of the terrace with a suitable weathering course if required.

### 6. Architectural and Structural Limitations

GFRG structures can be constructed in various architecture. But it has some limitations compared to normal buildings plans and designs. The following are some instructions which should be kept in mind by architects/engineers before drawing the building plan. The shorter span of a slab (floor/roof), should be restricted to 5m.

- It would be ideal if the same floor plan is replicated for all floors in a multi-storey structure. (Variations can be done after discussing with a licensed structural engineer)
- Curved walls or domes should be avoided. In case it is essential, use masonry/concrete for that particular area.
- The electrical/plumbing drawings should be such that most of the pipes go through the cavities (In order to facilitate minimum cutting of panels).
- The building drawings should be checked and designed by a licensed structural engineer who have prior experience in GFRG building works.

## 7. Schedule of Items

### Model Schedule of items for the Construction of buildings using Glass Fibre Reinforced Gypsum (GFRG) panels

Even though it is a specialised building, there are items which are common for GFRG construction and common buildings. The schedule of items described below contains rates adopted on DSR items and Market rate (MR) for non DSR items. The corresponding ref. no. is mentioned adjacent to each item. The items which are not covered in the DSR2013 are mentioned as market rate and the same is denoted as MR. The detailed rate analysis for MR items are enclosed separately. Relevant cost index has to be added for corresponding rates to arrive the current rate.

SI. No	DSR Ref No	Description Of Work	Rate (Rs.)	Unit	Remarks
1	2.6.1	Earthwork in Excavation by mechanical / manual means in foundation trenches or drains (not exceeding 1.5m in width or 10 sqm. on plan) including dressing of sides and ramming of bottoms, lift upto 1.5m, including getting out the excavated soil and disposal of surplus excavated soil as directed within a lead of 50m.	146.50	cum	
2	2.27	Supplying and filling in plinth with sand under floors including watering, ramming, consolidating and dressing complete	843.65	cum	Instead of sand, quarry dust can be used
3	4.19.1.2	<p>Providing and laying in position ready mixed plain cement concrete, using fly ash and cement content as per approved design mix and manufactured in fully automatic batching plant and transported to site of work in transit mixer for all leads, having continuous agitated mixer, manufactured as per mix design of specified grade for plain cement concrete work, including pumping of R.M.C. from transit mixer to site of laying and curing, excluding the cost of centring, shuttering and finishing, including cost of curing, admixtures in recommended proportions as per IS : 9103 to accelerate/ retard setting of concrete, improve workability without impairing strength and durability as per direction of the Engineer - in - charge</p> <p>Note: (1) Excess/less cement used than specified in this item is payable/ recoverable separately.</p> <p>(2) Fly ash conforming to grade I of IS 3812 (Part-1) only be used as part replacement of OPC as per IS : 456. Uniform blending with cement is to be ensured in accordance with clauses 5.2 and 5.2.1 of IS: 456 -2000 in the items of BMC and RMC.</p> <p>4.19.1 All works upto plinth level</p> <p>4.19.1.2 M-10 grade plain cement concrete (cement content considered @ 220 kg/cum)</p>	5262.10	cum	

SI. No	DSR Ref No	Description Of Work	Rate (Rs.)	Unit	Remarks
3a	4.1.8	Providing and laying in position cement concrete of specified grade excluding the cost of centring and shuttering - All work up to plinth level : concrete 1:4:8 (1 Cement : 4 coarse sand : 8 graded stone aggregate 40 mm nominal size)	3920.65	Cum	Alternate item for M10 cement concrete
4	MR-1	Brick work with Fly ash solid concrete block of M10 grade in foundation and plinth in: Cement mortar 1:6 (1Cement: 6 coarse sand). The blocks shall be tested as per procedure detailed in IS 2185 (Part I) – 2005.	5157.83	cum	Instead of fly ash solid concrete block, locally available bricks can be used
5		Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centring, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer-in-charge. (Note: Cement content considered in this item is @ 330 kg/cum. Excess/less cement used as per design mix is payable/ recoverable separately).			
5.1	5.33.1	All work up to plinth level	5704.45	cum	
5.2	5.33.2	All work above plinth level and up to floor V	6353.00	cum	
5.3	4.14	Extra for concrete work in superstructure above floor V level for each four floors or part thereof.	517.45	cum	
6	MR2	Supply and filling in foundations and plinth with approved good quality quarry dust in layers of not exceeding 200 mm thick including breaking clods, storing, transportation, double handling, watering, compacting each layer with plate vibrator to obtain the desired density, all leads and lifts, bailing/ pumping out of water to keep site dry while backfilling; cost shall include conveyance of all materials, labour, machinery etc. complete as directed. The rate includes loading, unloading, hire and fuel charges for tools and plants, all royalties, taking statutory approvals as necessary to carry out the works and other incidental charges etc., complete.	1522.00	cum	

SI. No	DSR Ref No	Description Of Work	Rate (Rs.)	Unit	Remarks
		<b>SUPER STRUCTURE (GFRG/ GFRG building part)</b>			
7	MR3	<p>Supplying of standard quality GFRG panel of 124mm thickness with modular cavities purchased from GFRG panel manufacturing plant in the country, cut to required wall sizes and floor/ roof slab sizes in correct length and height, including cutting of door, window and ventilator opening as per the cutting drawing prepared by architects / design engineers or IIT Madras for the construction of GFRG building and loaded in stillages for transportation to the construction site. Cost of panel includes loading charges, hire charges of stillages, cost of transportation in trucks/ lorries without any damages up to 300 km<sup>1</sup> from GFRG mfg plant / factory (including any inter-state taxes to be paid) and unloading at site using suitable fork lift/ crane. Rate for one side area of panel without reduction of opening of door/ window/ ventilator as the panel supplied by manufacturers is on that basis.</p> <p><sup>1</sup><i>For transportation above 300km, additional charges to be paid.</i></p>	1323.00	sqm	
8	MR4	<p>Picking up respective panel according to notation mark referring to building and cutting drawing from stacked panel at site in stillages or otherwise using the crane and prepare the panel for wall corner joints etc with necessary cutting of web etc for wall corner joints using chain saw or electrically operated cutting saw or marble cutter by trained construction/ installation crew for erection of wall panel in ground floor or upper floors in perfect line and plumb. In the case of ground floor after 3 hrs of application of water proofing treatment of (200 mm wide) RCC plinth beam (as per GFRG water proofing manual) it is ready for erection of wall panel in the case of GF. In the case of upper floors 150 mm wide floor slab over which wall panels to be erected. Provide necessary lateral adjustable support to keep the wall panel in safe and vertical position. Also cutting of web for providing reinforcement for 200 mm deep embedded horizontal RC tie beam on top of wall panel as per structural design drawing</p> <p>Cost of erection of wall panel include cost of skilled labourers, providing vertical bars, installation of door/ window frames, providing RC lintel cum sunshade, horizontal embedded RC tie beam and include hire charges of crane and lateral props and necessary tools and tackle like lifting jaw, chain saw etc. But does not include cost of GFRG panel, concrete using 10 mm and under granite aggregate and infilling , reinforcement and labour for bar bending works</p> <p><b>Note-1:</b> The same rate can be applied for GF &amp; first floor, but for 2nd and 3rd floors, 5% additional can be added</p> <p><b>Note-2:</b> For upper floors above 4 floors, each floor is to be given 5% extra. Hire charge of tower crane to be changed as per market rate per day or on monthly basis</p>	219.00	sqm	

SI. No	DSR Ref No	Description Of Work	Rate (Rs.)	Unit	Remarks
		<b>Note-3:</b> Proper scaffolding on external sides to be provided to facilitate erection of panel and application of primer, waterproofing treatment of slab and wall joints at every floor level and rendering/ plastering in thin layer of average 2mm thickness using wall putty or wall plaster mixed with elastobar / equivalent* @ 1:10 for water resistance, piping work of storm water drainage and sanitary pipe lines, water supply etc.			
8	5.33.2	<p>Infilling of cavities of wall panel with M20 concrete with a slump of 70 +/- 20 mm (using granite blue metal size of 7 to 10 mm or suitable size) in GF in 3 stage as given bellow by manual / or by using suitable concrete pump. (In the case of infill or pour concrete using suitable concrete pump, metal size to be as per the instruction given by the manufacturers on the performance of pump. Hose / nozzle to be preferable 50-65 mm dia ).</p> <p>(i) 1st pour / infill of first pour of concrete to be limited to 0.3 to 0.50 m height from bottom of the panel, checking continuously below to ensure over filling or panel damage is not occurring.</p> <p>(ii) 2nd Pour/ infill: infilling shall be done only after 90 minutes interval between successive pours. The maximum height of infill shall be restricted to 1.5m height or up to the top level of door / window.</p> <p>(iii) 3rd pour/infill: After an interval of 90 minutes of second pour, infill or pour the balance height up to the bottom of embedded RC horizontal tie beam.</p> <p>(If any rain falls in between any stages of concrete pour, make sure to cover the panel top to prevent ingress of water or water falling into the cavities. In case of water collection over the concrete inside the panel, drill 10mm hole immediately above concrete filled level to drain out water before pour /in-fill of balance concreting)</p>	6353.00	cum	
8a	MR5	Extra cost for additional labour required for infilling the cavities	221.00	cum	
9	MR6	Infilling of empty cavities in (as shown in the structural design drawing) with quarry dust mixed with 5% cement (by volume). After initial infill of 50mm thick with M20 concrete at base/bottom of cavities to seal off, infill wall panel cavities in 3 stage, with initial infill not more than 0.5 m height, and pour up to 0.3 litre water to dampen the dry mix enough to form cake form. 2 <sup>nd</sup> & 3 <sup>rd</sup> infill up to horizontal tie beam as per instruction as given under the item for infilling the cavities in GFRG panel using concrete. Pour just required potable water after each stage of infill to make the mix damp enough to become cake form	1619.00	cum	



SI. No	DSR Ref No	Description Of Work	Rate (Rs.)	Unit	Remarks
		<b>Floor / Roof Slab</b>			
10	MR7	Supplying and laying of GFRG panel as roof slab panel of GF using crane as per instructions, including providing support system with 25mm thick by 300mm to 400 mm wide plywood, as runner with proper prop or support under concealed beams and there after cutting of top flange of panel to 180 mm wide (leaving 25mm projection on either side) to provide RC embedded micro beam. The runner and prop has to remain for 3 days minimum after concreting of slab. . Reinforcement for micro beams to be provided in position with proper anchorage as per structural design. Electrical cabling, providing fan hooks and piping work by coordinated action before infilling of micro beam with concrete using metal 10mm and under. After casting of micro beam, 10 gauge 100x 100 size weld mesh to be laid properly for RC screed . The runner and prop has to remain for 3days minimum after concreting of slab. The cost of GFRG panel for slab, reinforcement and concrete for embedded RC micro beams and RC screed and cost of 10 Gauge 100x 100mm size weld mesh will be paid separately. (Note: When panel is cut “ A “ side is deemed to be the bottom or ceiling side of the floor/ roof slab)	238.00	sq.m	
11	5.9.20	Centering and shuttering including strutting, propping etc. and removal of form for : Suspended floors, roofs, landings, balconies and access platform. with water proof ply 12 mm thick. The contractor shall obtain approval from Engineer-in-Charge for the form work design & methodology proposed to be adopted in the work. For all works.	462.85	sqm	
12	5.22A.6	Reinforcement for R.C.C works including straightening, cutting, bending, placing in position and binding all complete Thermo-Mechanically treated bars with MS binding wire 18 gauge etc. complete at all levels. (SAIL/ TATA) (Fe415/Fe500)	66500.00	tonne	
23	MR8	Supplying and fixing 10 Gauge weld mesh of size 100x100 for floor/roof slab concrete screed over the micro beams as reinforcement. The weld mesh shall be fixed as per drawing.	276.00	sqm	
		<b>Joineries</b>			
13	21.1.1.2	Providing and fixing aluminium work for doors, windows, ventilators and partitions with extruded built up standard tubular sections/ appropriate Z sections and other sections of approved make conforming to IS: 733 and IS: 1285, fixing with dash fasteners of required dia and size, including necessary filling up the gaps at junctions, i.e. at top, bottom and sides with required EPDM rubber/ neoprene gasket etc. Aluminium sections shall be smooth, rust free, straight, mitred and jointed mechanically wherever required including cleat angle, Aluminium snap beading for glazing / panelling, C.P. brass / stainless steel screws, all complete as per architectural drawings and the directions of Engineer-in-charge.	373.00	kg	Instead of alu- minium, wood can be used



SI. No	DSR Ref No	Description Of Work	Rate (Rs.)	Unit	Remarks
		(Glazing, panelling and dash fasteners to be paid for separately) :  For fixed portion- Powder coated aluminium (minimum thickness of powder coating 50 micron)			
14	21.1.2.2	For shutters of Doors, windows & Ventilators including providing and fixing hinges / Pivots and making provision for fixing of fittings wherever required including the cost of PVC / Neoprene gasket required (Fittings shall be paid for separately) (Rate for applicable for fixed and shutters). Powder coated aluminium (minimum thickness of powder coating 50 micron)	427.60	kg	
15	21.3.1	Providing and fixing Glazing in aluminium doors, windows, ventilator shutters and partitions etc of "SAINT GOBAIN / MODIFLOAT" make or equivalent with PVC / Neoprene gaskets etc. complete as per architectural drawings and directions of Engineer-in-charge in all levels including scaffolding charges etc. (cost of aluminium snap beading shall be paid in basic item) With Float glass panes of 4.0mm thickness	790.00	sqm	
16	9.1.1	Providing wood work in frames of doors, windows, clerestory windows and other frames, wrought framed and fixed in position with hold fast lugs or with dash fasteners of required dia & length (hold fast lugs or dash fastener shall be paid for separately). Second class teak wood.	90495.80	cum	
17	9.20.1	Providing and fixing ISI marked flush door shutters conforming to IS : 2202 (Part I) decorative type, core of block board construction with frame of 1st class hard wood and well matched teak 3 ply veneering with vertical grains or cross bands and face veneers on both faces of shutters. 35 mm thick including ISI marked Stainless Steel butt hinges with necessary screws	2323.55	sqm	
18	9.18.1	Providing and fixing Pre-laminated flat pressed 3 layer (medium density) particle board or graded wood particle board IS : 3087 marked, with one side decorative and other side balancing lamination Grade I, Type II exterior grade IS : 12823 marked, in shelves with screws and fittings wherever required, edges to be painted with polyurethane primer (fittings to be paid separately). 18 mm thick	1176.70	sqm	Instead of wooden panelling, pre-laminated particle board can be used.
19	9.88	Providing and fixing chromium plated brass 100 mm mortice latch and lock with 6 levers and a pair of lever handles of approved quality with necessary screws etc. complete.	712.00	sqm	
20	9.82	Providing and fixing bright finished brass hanging type floor door stopper with necessary screws, etc. complete.	79.60	each	
21	9.97.1	Providing and fixing aluminium tower bolts, ISI marked, anodised (anodic coating not less than grade AC 10 as per IS : 1868 ) transparent or dyed to required colour or shade, with necessary screws etc. complete : 300x10 mm	108.10	each	

SI. No	DSR Ref No	Description Of Work	Rate (Rs.)	Unit	Remarks
22	9.98	Providing and fixing aluminium pull bolt lock, ISI marked, anodised (anodic coating not less than grade AC 10 as per IS : 1868) transparent or dyed to required colour and shade, with necessary screws bolts, nut and washers etc. complete.	69.80	each	
23	10.25.2	Steel work welded in built up sections/ framed work, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer using structural steel etc. as required. In gratings, frames, guard bar, ladder, railings, brackets, gates and similar works.	86.50	kg	
		<b>Tile works</b>			
24	11.38	Providing and laying first quality ceramic glazed floors tiles with spacer bars of 3mm size. The tile manufactured by Johnson / kajaria / somany of size 300x300mm or higher size and minimum thickness of approved shade and pattern in flooring over a bed mortar CM 1:4 (1 cement : 4 coarse sand) with approved water proofing compound (CICO / ROFF) including pointing the joints with epoxy grout of matching colour etc. complete.	834.05	sqm	
25	11.38	Providing and laying Ceramic glazed floor tiles of size 300 x 300 mm (thickness to be specified by the manufacturer), of 1st quality conforming to IS : 15622, of approved make, in all colours, shades, except White, Ivory, Grey, Fume Red Brown, laid on 20 mm thick bed of cement mortar 1:4 (1 Cement : 4 Coarse sand), including pointing the joints with white cement and matching pigments etc., complete.	834.05	sqm	Glazed tile shall be of rough finish. Branded anti skid tiles may also be used in place of glazed tiles. The cost will vary accordingly.
26	11.36	Providing and fixing 1st quality ceramic glazed wall tiles conforming to IS: 15622 (thickness to be specified by the manufacturer), of approved make, in all colours, shades except burgundy, bottle green, black of any size as approved by Engineer-in-Charge, in skirting, risers of steps and dados, over 12 mm thick bed of cement mortar 1:3 (1 cement : 3 coarse sand) and jointing with grey cement slurry @ 3.3kg per sqm, including pointing with epoxy grout matching shade complete .	793.60	sqm	
27	8.2.2.2	Providing and fixing 18 mm thick gang saw cut, mirror polished, premoulded and prepolished, machine cut for kitchen platforms, vanity counters, window sills , facias and similar locations of required size, approved shade, colour and texture laid over 20 mm thick base cement mortar 1:4 (1 cement : 4 coarse sand), joints treated with white cement, mixed with matching pigment, epoxy touch ups, including rubbing, curing, moulding and polishing to edges to give high gloss finish etc. complete at all levels. Granite of any colour and shade: Area of slab over 0.50 sqm	3769.70	sqm	

SI. No	DSR Ref No	Description Of Work	Rate (Rs.)	Unit	Remarks
28	8.3.2	Providing edge moulding to 18 mm thick marble stone counters, Vanities etc., including machine polishing to edge to give high gloss finish etc. complete as per design approved by Engineer-in-Charge. Granite work.	210.65	rm	
		<b>WATER PROOFING</b>			
29	MR9	Application of Zycosil/equivalent* Solution (1 litre of Zycosil/equivalent* & 20 litres of water stirred first & 2 litres of Zycoprime/equivalent* added and stirred (total 23 litres)) by spraying using suitable sprayer over PCC. 23 litres of solution will cover 40 sqm to saturation (by testing as per RILEM or by water drops test in which water drops do not absorb but drops remain or rolls) by trained applicator / skilled person who has the experience in the mixing or preparation of waterproofing chemicals / products and experience on waterproofing treatment of GFRG buildings. Drying time 12-24 Hrs. Application areas: 1) PCC 2) Top and sides(external and internal) of foundation and basement 3) Plinth beam  <i>Equivalent* - Any waterproofing material which is tested on GFRG panels and approved by competent agency</i>	101.00	sqm	
30	MR10	Application of ZMB 60/equivalent * solution (100 Kg ZMB 60/equivalent *, 1 liter ZMB Nano Thinner, 20 litre water & 1 Litre Zycoprime/equivalent* = 122 liter / Kg) over already applied coat of Zycosil/equivalent* & Zycoprime/equivalent* solution on the top of all the RC plinth beams (200 mm wide) by brush / spray coat (brush stroke on horizontal and across - 3 hrs drying time) before erection of GFRG over RC plinth beams in GF . In the case of upper floors 150 mm wide on floor slab for all the external walls, bath / toilet / wet areas (3 hrs drying time) before erection of wall panel on upper floors including erection of parapet wall.  <i>Equivalent* - Any waterproofing material which is tested on GFRG panels and approved by competent agency</i>	228.00	sqm	
31	MR11	Water proofing treatment of vertical joints: water proofing treatment is to be done as per the guidelines issued by Zydex and RBS Pvt Ltd. After erection of GFRG wall panels, seal all GFRG wall joints with paper tape temporarily and inject the diluted Zycosil/equivalent * with 50 ml syringe till the gap and in filled concrete is completely saturated. After removing the paper seal, seal off the vertical joints with water proofing material "Grout RW/equivalent *". Sealing cost excluded.  <i>Equivalent* - Any waterproofing material which is tested on GFRG panels and approved by competent agency</i>	59.00	rm	

SI. No	DSR Ref No	Description Of Work	Rate (Rs.)	Unit	Remarks
32	MR12	In-filling of joints between RC plinth beam / floor slab and wall panel on external wall outer side and internal sides (including parapet wall) with Grout RW/ equivalent * sealant compound after the erection of panel, over RC plinth beam of external walls and toilet / bath room / wet areas walls in ground floor and on all floor slabs and parapet wall over roof slab, stair case head room at the time of erection of GFRG panels. The sealant Grout RW/ equivalent** compound in paste form has to be pushed using suitable tool like thin hand shovel of masons / pop plasterers to fill up the voids/ gap / joint before the infill of concrete in panel cavities and fine finish.	32.00	rm	
		This applies for all horizontal and vertical joints between wall and slab panels.  <i>Equivalent* - Any waterproofing material which is tested on GFRG panels and approved by competent agency</i> <i>Equivalent**- Any grout approved by competent agency</i>			
33	MR13	Vertical joints (of external side and internal side) between door frame, window & ventilator frames (on all four sides) of outer wall over the Zycosil/equivalent* & Zycoprime/equivalent* solution already applied (before the installation of door / window / ventilator frames in position) and fine finish with Grout RW/equivalent** (Rate of item of work is in per number of items for both external and internal sealant / infilling work.) Items: 1) Door 2) Window 3) Ventilator.  <i>Equivalent* - Any waterproofing material which is tested on GFRG panels and approved by competent agency</i> <i>Equivalent**- Any grout approved by competent agency</i>	32.00	sqm	
34	MR14	Application of a coat of Zycosil/equivalent * as per instructions over RC sunshade. Apply Zycosil/equivalent * on top, bottom and three sides of sun shade. Apply Zycosil/equivalent* till it meets the saturation level (by putting water drops over the Zycosil/equivalent * application-drop has to roll over it which indicate the saturation level).  <i>Equivalent* - Any waterproofing material which is tested on GFRG panels and approved by competent agency</i>	111.00	sqm	
35	MR15	In-filling / sealing of joint between RCC lintel cum sunshade and wall (on external side) in all floors by pushing in Grout RW/equivalent * in paste form and coving 20 mm x 20 mm after applying a coat of Zycosil/equivalent* & zycoprime/equivalent * solution before cement plastering of top, bottom and sides of RC sunshade  <i>Equivalent* - Any waterproofing material which is tested on GFRG panels and approved by competent agency</i>	33.00	rm	

SI. No	DSR Ref No	Description Of Work	Rate (Rs.)	Unit	Remarks
36	MR16	<p>Water proofing treatment for toilet: Apply a coat of Zycosil/equivalent * on top of concrete floor and on all walls for a height of 0.150m from the bottom. Apply Zycosil/equivalent* till it meets the saturation level (by putting water drops over the Zycosil/equivalent * application-drop has to roll over it which indicate the saturation level) by skilled person who has the experience in application of water proofing chemicals and oriented on GFRG building. Over the above, apply 2 coats of water proofing compound (ZMB 60/equivalent* Solution) over the area applied with Zycosil/equivalent*. Rich cement plaster 1:3 mix is to be provided as protective coat over the above treated floor and wall surface and cured, but cost of plastering is not included.</p> <p><i>Equivalent* - Any waterproofing material which is tested on GFRG panels and approved by competent agency</i></p>	228.00	sqm	
37	MR17	<p>Application of water proofing chemicals as per instructions above PCC at ground floor, before placing tiles in all rooms, by skilled person who has experience in application of water proofing chemicals. Apply Zycosil/equivalent * till it meets the saturation level (by putting water drops over the Zycosil/equivalent * application-drop has to roll over it which indicate the saturation level).</p> <p><i>Equivalent* - Any waterproofing material which is tested on GFRG panels and approved by competent agency</i></p>	101.00	sqm	
38	MR18	<p>After cleaning the exposed 174 mm wide portion of exterior side of floor slab, apply a coat of water proofing / water resistant chemical compound in line and flush with external wall panel. While applying, make sure that 25 mm heights up and down of exposed floor slab is also applied with Zycosil/equivalent* and compound (coat RW) to prevent ingress of water. Total width covered will be 225 mm.</p> <p><i>Equivalent* - Any waterproofing material which is tested on GFRG panels and approved by competent agency</i></p>	101.00	sqm	
39	MR19	<p>Water proofing /packing of pipe joints (bath, toilet, water supply, rain water pipes from terrace etc) including packing of pipe around using special compound (Mix RW) as per the instruction given in the water proofing manual for water proofing of GFRG building.</p> <p><i>Equivalent* - Any waterproofing material which is tested on GFRG panels and approved by competent agency</i></p>	28.00	rm	

SI. No	DSR Ref No	Description Of Work	Rate (Rs.)	Unit	Remarks
40	MR20	<p>Apply diluted Zycosil/equivalent* 1:20 (1 liter Zycosil/ equivalent* 20 litre water = 21 litres) mixed with 2 liter of Zycoprime/equivalent* with flood application coverage 40 sqm. Also cover 12 inch (300 mm) of vertical inside sides of parapet walls all around. Prepare ZMB Thinner solution. Add 1 liter of ZMB Nano Thinner in 20 liter of water with manual stirring and then add 1 part of Zycoprime/equivalent* under stirring. Take 100 parts of ZMB 60/equivalent * and add 22 parts of ZMB Thinner solution and mix thoroughly with manual stirring. Apply the above prepared solution by brush / mop / spray technique in 5 coats as described in the manual. After applying 2 coats lay Stretch Fab on ZMB 60/equivalent* roller press the fabric.</p> <p><i>Equivalent* - Any waterproofing material which is tested on GFRG panels and approved by competent agency</i></p>	339.00	sqm	
41	MR21	<p>Application of Nano penetrating polymeric primer (after rendering / thin plastering of internal walls including wall corner and joints between ceiling wall all around where ever required to have fine finish and external wall corners etc) using WD-P30 &amp; WD Thinner (1:1, no water to be added) suitable for GFRG for external and internal walls and ceiling (under side of floor / roof slab) using WD-P30 and WD Thinner (1:1) is to be applied on all GFRG/ GFRG internal and external surfaces including parapet wall surfaces before applying finishing coat of paint.</p>	59.00	sqm	
		<b>Plastering works</b>			
42	MR22	<p>Rendering / plastering with thin layer using gypsum wall plaster/ gypsum wall putty (for internal) / water repellent special compound ( for external) :</p>	40.00	sqm	
		<p>Rendering has to be done over rough side (B side) of wall panel, sealing of joints with in-filling/ treatment of wall corner joints, wall and ceiling slab joints, surface of dented or damaged wall panel corners (both internal &amp; external walls)</p>			
		<p>i)After carrying out necessary water proofing treatments by applicators as described in above listed items, it is to provide for internal dry area with thin layer of (1 -2 mm thickness) plastering or rendering of these sealed off joints to make a fine smooth finish /superior finish by skilled gypsum plasterers (Gypsum plaster masons, to be assisted by man or woman helpers to mix plaster etc.), with special tools like thin suitable size of trowel/showel (made of very thin steel plate), using suitable gypsum wall plaster or gypsum wall putty.</p>			
		<p>ii)It is also necessary to fine finish the rough surface ("B side") of wall panel (dry area-excluding bath/ toilet wet walls) with a thin layer of (1 -2 mm thickness) plastering or rendering to make a fine smooth finish / superior finish by skilled plasterer ( skilled plastering mason experienced in POP plastering)</p>			

SI. No	DSR Ref No	Description Of Work	Rate (Rs.)	Unit	Remarks
		iii) Dented or damaged internal wall surface during transport or handling of panel during lifting or erection etc. is also to be applied with proper patching compound like Grout RW/equivalent */Coat RW/Mix RW prescribed in the water proofing solution for GFRG and after grinding by using proper sand paper to make the patched surface even and smooth for applying primer and painting.			
		<b>Painting works</b>			
43	13.51.2	Painting with silicon & acrylic emulsion based water thinnable sealer of approved brand and manufacture on wet or patchy portion of plastered surfaces : Two coats (The contractor should ensure complete covering of floors using tarpaulin / plastic sheet while carrying out the work. The contractor should use tarpaulin / plastic sheets to cover doors, windows, electrical, plumbing fittings and floors at the time of painting to ensure no spillage of paint on these surfaces.)	105.50	sqm	
44	13.62	Painting with synthetic enamel paint of approved brand and manufacture of required colour to give an even shade : Two or more coats on new work over an under coat of suitable shade with ordinary paint of approved brand and manufacture	92.75	sqm	
45	13.47.1	Finishing walls with Premium Acrylic Smooth exterior paint with Silicone additives of required shade : New work (Two or more coats applied @ 1.43 ltr/ 10 sqm over and including priming coat of exterior primer applied @ 2.20 kg/ 10 sqm) The contractor should ensure complete covering of floors using tarpaulin / plastic sheet while carrying out the work. The contractor should use tarpaulin / plastic sheets to cover doors, windows , electrical, plumbing fittings and floors at the time of painting to ensure no spillage of paint on these surfaces.	90.00	sqm	
		<b>SANITARY INSTALLATIONS</b>			
46	17.2.1	Providing and fixing white vitreous china pedestal type water closet (European type W.C. pan) with seat and lid, 10 litre low level white P.V.C. flushing cistern, including flush pipe, with manually controlled device (handle lever), conforming to IS: 7231, with all fittings and fixtures complete, including cutting and making good the walls and floors wherever required: W.C. pan with ISI marked white solid plastic seat and lid.	3189.75	Each	
47	17.31	Providing and fixing 600x450 mm bevelled edge mirror of superior glass (of approved quality) complete with 6 mm thick hard board ground fixed to wooden cleats with C.P. brass screws and washers complete.	762.55	each	
48	12.41	Providing and fixing on wall face unplasticised Rigid PVC rain water pipes conforming to IS : 13592 Type A, including jointing with seal ring conforming to IS : 5382, leaving 10 mm gap for thermal expansion, (i) Single socketed pipes fixed with PVC clip at 1.0m interval..			
48.1	12.41.1	110mm dia pipe	218.60	rm	



SI. No	DSR Ref No	Description Of Work	Rate (Rs.)	Unit	Remarks
48.2	12.41.2	75mm dia pipe	134.50	rm	
48.3	MR23	50mm dia pipe	317.00	rm	
49	12.42	Providing and fixing on wall face unplasticised - PVC moulded fittings/ accessories for unplasticised Rigid PVC rain water pipes conforming to IS : 13592 Type A, including jointing with seal ring conforming to IS : 5382, leaving 10 mm gap for thermal expansion.			
49.1	12.42.5	110 mm plain Bend 87.5° bend	160.25	each	
49.2	12.42.3	110 mm Bend 87.5° (with door)	305.35	each	
49.3	12.42.3.2	110 mm equal Tee (with door)	305.35	each	
49.4	12.42.6.2	110 mm shoe / vent cowl	290.35	each	
49.5	12.42.5	75 mm plain Bend 87.5° bend	160.25	each	
49.6	12.42.3	75 mm Bend 87.5° (with door)	107.50	each	
49.7	12.42.3.1	75mm equal Tee (with door)	210.55	each	
49.8	12.42.6.1	75 mm shoe / vent cowl	166.75	each	
50	MR24	Supplying, fixing and testing of PVC floor trap with CP grating 150mm nominal size square 100mm diameter of the inner hinged round grating various inlet from 40 dia to 110 dia and various outlet from 75 dia to 100 dia with the extension boss tee connections, fixed in sunken floors etc., complete	122.00	Each	
51	17.7.2	Providing and fixing wash basin with C.I. brackets, 15 mm C.P. brass pillar taps, 32 mm C.P. brass waste of standard pattern, including painting of fittings and brackets, cutting and making good the walls wherever require : White Vitreous China Wash basin size 630x450 mm with a single 15 mm C.P. brass pillar tap	1903.25	Each	
52	17.10.2.1	Providing and fixing Stainless Steel A ISI 304 (18/8) kitchen sink as per IS : 13983 with C.I. brackets and stainless steel plug 40 mm, including painting of fittings and brackets, cutting and making good the walls wherever required : Kitchen sink without drain board: 610x510 mm bowl depth 200 mm	4290.80	Each	
		<b>WATER SUPPLY</b>			
53	18.7	Providing and fixing chlorinated Polyvinyl chloride (CPVC) pipes having thermal stability for hot & cold water supply including all CPVC plain & brass threaded fitting including fixing the pipe with clamps at 1.00m spacing. This includes jointing of pipes & fittings with one step CPVC solvent cement and testing of joints complete as per direction of Engineer in charge.			
53.1	18.7.1	15 mm nominal outer dia pipes	155.80	rm	
53.2	18.7.2	20 mm nominal outer dia pipes	182.15	rm	
53.3	18.7.3	25 mm nominal outer dia pipes	222.90	rm	
54	18.8	Providing and fixing Chlorinated Polyvinyl Chloride (CPVC) pipes of Ashirvad / Astra make or equivalent make, SDR-11, having thermal stability for hot & cold water supply including all CPVC plain & brass threaded fittings including fixing the pipe with clamps at 1.00m spacing. This includes jointing of pipes & fittings with one step approved solvent cement, testing the pipelines, joints all complete as per the direction of the Engineer-in-charge			

SI. No	DSR Ref No	Description Of Work	Rate (Rs.)	Unit	Remarks
		Concealed work including cutting chases and making good the walls etc.			
54.1	18.8.1	15 mm nominal outer dia pipes	254.95	rm	
54.2	18.8.2	20 mm nominal outer dia pipes	281.35	rm	
54.3	18.8.3	25 mm nominal outer dia pipes	336.25	rm	
55	18.9	Providing and fixing Chlorinated Polyvinyl Chloride (CPVC) pipes of Ashirvad Astra make or equivalent, SDR-11, having thermal stability for hot & cold water supply including all CPVC plain & brass threaded fittings including fixing the pipe with clamps at 1.00m spacing. This includes jointing of pipes & fittings with one step approved solvent cement, testing the pipelines, joints all complete as per the direction of the Engineer-in-charge			
		External work			
55.1	18.9.3	25 mm nominal outer dia pipes	203.10	rm	
55.2	18.9.4	32 mm nominal outer dia pipes	255.95	rm	
55.3	18.9.5	40 mm nominal outer dia pipes	343.55	rm	
55.4	18.9.6	50 mm nominal outer dia pipes	517.20	rm	
56	18.46	Providing and fixing "R brand / Unique" make or equivalent GI Union including cutting and threading the pipe and making long screws etc complete			
56.1	18.46.3	25 mm nominal bore	190.45	each	
56.2	18.46.4	32 mm nominal bore	231.15	each	
56.3	18.46.5	40 mm nominal bore	306.60	each	
56.4	18.46.6	50 mm nominal bore	379.35	each	
57	18.17	Providing and fixing brass gun metal gate valve "Leader / Audco / Harrison" or equivalent make with brass wheel of approved quality (screwed end) etc.			
57.1	18.17.1	25 mm nominal bore	427.80	each	
57.2	18.17.2	32 mm nominal bore	500.35	each	
57.3	18.17.3	40 mm nominal bore	584.20	each	
57.4	18.17.4	50 mm nominal bore	749.40	each	
58	18.49.1	Providing and fixing C.P. brass bib cock of approved quality conforming to IS:8931 : 15 mm nominal bore	458.40	each	
59	18.53	Providing and fixing C.P. brass angle valve for basin mixer and geyser points of approved quality conforming to IS: 8931 a) 15 mm nominal bore.	506.70	each	
60	18.51.1	Providing and fixing C.P. brass long body bib cock of approved quality conforming to IS standards and weighing not less than 690 gms. 15 mm nominal bore	609.40	each	
61	18.52.1	Providing and fixing C.P. brass stop cock (concealed) of standard design and of approved make conforming to IS:8931. 15 mm nominal bore	618.70	each	
62	18.22.1	Providing and fixing C.P. brass shower rose with 15 or 20 mm inlet : 100 mm diameter	71.40	each	
63	18.65	Providing and fixing PTMT soap Dish Holder having length of 138mm, breadth 102mm, height of 75mm with concealed fitting arrangements, weighing not less than 106 gms.	152.70	each	

SI. No	DSR Ref No	Description Of Work	Rate (Rs.)	Unit	Remarks
64	17.73.1	Providing and fixing PTMT towel rail complete with brackets fixed to wooden cleats with CP brass screws with concealed fittings arrangement of approved quality and colour. 450 mm long towel rail with total length of 495 mm, 78 mm wide and effective height of 88 mm, weighing not less than 170 gms.	408.90	each	
65	18.48	Providing and placing on terrace (at all floor levels) polyethylene water storage tank, ISI : 12701 marked, with cover and suitable locking arrangement and making necessary holes for inlet, outlet and overflow pipes but without fittings and the base support for tank.	6.30	lit	
		<b>DRAINAGE</b>			
66	19.1.2	Providing, laying and jointing glazed stoneware pipes grade 'A' "TACEL or equivalent make with stiff mixture of cement mortar in the proportion of 1:1 (1 cement: 1 fine sand) including testing of joints etc. complete	301.90	rm	
		150 mm diameter			
67	19.2.2	Providing and laying cement concrete 1:5:10 (1 cement: 5 coarse sand: 10 graded stone aggregate 40 mm nominal size) all-round stoneware pipes including bed concrete as per standard design: 150 mm diameter stoneware pipe	664.80	rm	
68	19.3.2	Providing and laying cement concrete 1:5:10 (1 cement: 5 coarse sand: 10 graded stone aggregate 40 mm nominal size) up to haunches of stoneware pipes including bed concrete as per standard design :	418.70	rm	
		150 mm diameter stoneware pipe			
69	19.4.1.1	Providing and fixing square-mouth stoneware gully trap grade 'A' complete with CI grating brick masonry chamber with water tight SFRC cover with frame of 300 x300 mm size (inside) the weight of cover to be not less than 4.50 kg and frame to be not less than 2.70 kg as per standard design:150 x 100 mm size P type	1520.90	each	
		With Fly ash concrete blocks class designation 100			
70	18.33.1	Constructing masonry Chamber 60x60x75 cm inside, in brick work in cement mortar 1:4 (1 cement : 4 coarse sand) for sluice valve, with C.I. surface box 100mm top diameter, 160 mm bottom diameter and 180 mm deep ( inside) with chained lid and RCC top slab 1:2:4 mix (1 cement : 2 coarse sand : 4 graded stone aggregate 20mm nominal size ) , i/c necessary excavation, foundation concrete 1:5:10 (1 cement : 5 fine sand : 10 graded stone aggregate 40 mm nominal size) and inside plastering with cement mortar 1:3 (1 cement : 3 coarse sand) 12 mm thick, finished with a floating coat of neat cement complete as per standard design : With common burnt clay F.P.S.(non modular) bricks of class designation 7.5	6441.05	each	

SI. No	DSR Ref No	Description Of Work	Rate (Rs.)	Unit	Remarks
71	19.7.1	Constructing manhole in cement mortar 1:4 (1 cement: 4 coarse sand) RCC top slab with 1: 2:4 mix (1 cement: 2 coarse sand: 4 graded stone aggregate 20mm nominal size), foundation concrete 1:4:8 mix (1 cement: 4 coarse sand: 8 graded stone aggregate 40mm nominal size) inside plastering 12mm thick with cement mortar 1:3 (1 cement: 3 coarse sand) finished with floating coat of neat cement and making channels in cement concrete 1:2:4 (1 cement: 2 coarse sand: 4 graded stone aggregate 20mm nominal size) finished with a floating coat of neat cement complete as per standard design:	8062.70	each	
		Inside size 90 x 80cm and 45cm deep including C.I. cover with frame (light duty) 455x610mm internal dimensions total weight of cover and frame to be not less than 38kg (weight of cover 23kg and weight of frame 15 kg) with fly ash concrete blocks class designation 100.			
72	19.21.1	Making connection of drain or sewer line with existing manhole breaking into and making good the walls, floors with cement concrete 1:2:4 (1cement : 2 coarse sand : 4 graded stone aggregate 20mm nominal size) cement plastered on both sides with cement mortar 1:3 (1 cement : 3 coarse sand) finished with a floating coat of neat cement and making necessary channels for drains etc. complete for 100 to 230mm diameter	330.50	Each	

## 8. Rate Analysis

The following item contains the detailed break-up rate analysis of MR items given in the above section (Items which are not specified in DSR).

Rate Analysis					
<b>MR1</b>	Brick work with Fly ash solid concrete block of M10 grade in foundation and plinth in: Cement mortar 1:6 (1 Cement : 6 coarse sand). The blocks shall be tested as per procedure detailed in IS 2185 (Part I) – 2005.				
	<b>Materials</b>	<b>Qty</b>	<b>Unit</b>	<b>Rate</b>	<b>Amount</b>
	<b>For 1 Cum Masonry work</b>				
	Block Size 30 x 20 x 15 cm size	115	Each	25	2875.00
	Cement	0.77	Bags	262.00	202.40
	Coarse Sand	0.16	Cum	1120.0	179.76
	Total for Material				3257.16
	<b>Labour</b>				
	Masson	0.47	Each	650.00	305.50
	Beldar	0.47	Each	400.00	188.00
	Coolie	1.80	Each	350.00	630.00
	Bhishti	0.20	Each	300.00	60.00
	Total for Labour				1183.50
	Total Cost of Material and Labour				4440.66
	Add Water Charges 1%				44.41
	Total				4485.07
	<b>Add 15% Contractor's Profit and OH</b>				<b>672.76</b>
	<b>Total for 1 Cum Masonry</b>				<b>5157.83</b>
<b>MR2</b>	Supply and filling in foundations and plinth with approved good quality quarry dust in layers of not exceeding 200 mm thick including breaking clods, storing, transportation, double handling, watering, compacting each layer with plate vibrator to obtain the desired density, all leads and lifts, bailing/ pumping out of water to keep site dry while backfilling; cost shall include conveyance of all materials, labour, machinery etc. complete as directed. The rate includes loading, unloading, hire and fuel charges for tools and plants, all royalties, taking statutory approvals as necessary to carry out the works and other incidental charges etc., complete.				
	<b>Materials</b>	<b>Qty</b>	<b>Unit</b>	<b>Rate</b>	<b>Amount</b>
	Rate - 1 Cum	-			
	Cost of Quarry dust	1.05	Cum	777.48	816.35
	Cost of labour for filling and compaction				
	Belder	0.25	Day	400.00	100.00
	Coolie	0.25	Day	350.00	87.50
	Bhistie	0.25	Day	300.00	75.00
	Hire charges for earth rammer with operator bata including diesel etc	0.15	Day	1500.00	225.00
					1303.85
	W.C 1.5 %				19.56

					1323.41
	Add O.H. & C. P @ 15%				198.51
	<b>Rate for 1 Cum</b>				<b>1521.92</b>
	<b>Say</b>				<b>1522.00</b>
<b>MR3</b>	Supplying of standard quality GFRG panel of 124mm thickness with modular cavities purchased from GFRG panel manufacturing plant in the country, cut to required wall sizes and floor/ roof slab sizes in correct length and height, including cutting of door, window and ventilator opening as per the cutting drawing prepared by architects / design engineers or IIT Madras for the construction of GFRG building and loaded in stillages for transportation to the construction site. Cost of panel include cost and taxes if any to be paid, loading charges, hire charges of stillages, cost of transportation in trucks/ lorries, without any damages, including any inter-state taxes to be and unloading at site using suitable for lift/ crane up to 300 km from GFRG mfg plant / factory. Rate for one side area of panel without reduction of opening of door/ window/ ventilator as the panel supplied by manufacturers is on that basis				
	<b>Materials</b>	<b>Qty</b>	<b>Unit</b>	<b>Rate</b>	<b>Amount</b>
	GFRG Panels	1	Sq.mt	1000	1000.00
	Wastages 5 - 10%				75.0
	Transportation of panel in suitable truck, (Rs. 0.15/sqm/km)	1	1	45	45
	Unloading of panel at site using fork lift or crane	1		10	10
	Hire charges for stillages / lifting jaw	1		20	20
	Total				1150
	Add Contractor Profit and over head charges @ 15%				172.50
	<b>Rate for 1 Sqm</b>				<b>1322.50</b>
	<b>Say</b>				<b>1323.00</b>
<b>MR4</b>	Picking up respective panel according to notation mark referring to building and cutting drawing from stacked panel at site in stillages or otherwise using the crane and prepare the panel for wall corner joints etc with necessary cutting of web etc for wall corner joints using chain saw or electrically operated cutting saw or marble cutter by trained construction/ installation crew for erection of wall panel in ground floor or upper floors in perfect line and plumb. In the case of ground floor after 3 hrs of application of water proofing treatment of (200 mm wide) RCC plinth beam (as per GFRG water proofing manual) it is ready for erection of wall panel in the case of GF. In the case of upper floors 150 mm wide floor slab over which wall panels to be erected. Provide necessary lateral adjustable support to keep the wall panel in safe and vertical position. Also cutting of web for providing reinforcement for 200 mm deep embedded horizontal RC tie beam on top of wall panel as per structural design drawing				
	<b>Labour</b>	<b>Qty</b>	<b>Unit</b>	<b>Rate</b>	<b>Amount</b>
	Assuming labour for erection 4 walls of 3 m x 3m GFRG panel (One room wall panels)				

	Skilled trained crew erection team 4 persons for 4 Hrs	2	Nos	650	1300
	For 2 lintels work: 4 skilled men for 2 hrs	1	Nos	650	650
	Web cutting for horizontal tie beam: 2 skilled men for 4hrs.	1	Nos	650	650
	Placing horizontal tie beam reinforcement: 4 men for 2 hrs	1	Nos	650	650
	Cost for technical supervisor for 4 hrs	0.5	Nos	700	350
	<b>Materials</b>				
	Crane hire charges (Rs 8000 / day)	3	hour	1000	3000
	Hire charge for lateral support & lifting jaws		LS		260
	Total				6860.00
	Add Contractor Profit and over head charges @ 15%				1029.00
	Rate for erection of 4 nos of 3m x 3m wall panel				7889.00
	<b>Rate per sqm</b>				219.00
<b>MR5</b>	Extra cost for additional labour required for infilling the cavities				
	<b>Materials</b>	<b>Qty</b>	<b>Unit</b>	<b>Rate</b>	<b>Amount</b>
	Skilled labour	1.2	Nos	650.00	780.00
	Unskilled labour	1.2	No	550.00	660.00
					1440.00
	Add for water charges @1.5%				21.60
	Total				1461.60
	Add Contractor Profit and over head charges @ 15%				219.24
	Rate for 9 Sqmt				1680.84
	Qty for 1 cum				0.85
	<b>Rate for 1 cum</b>				220.76
	<b>Say</b>				221.00
<b>MR6</b>	Infilling of empty cavities in (as shown in the structural design drawing) with quarry dust mixed with 5% cement (by volume). After initial infill of 50mm thick with M20 concrete at base/bottom of cavities to seal off, infill wall panel cavities in 3 stage, with initial infill not more than 0.5 m height, and pour up to 0.3 liter water to dampen the dry mix enough to form cake form. 2nd & 3rd infill up to horizontal tie beam as per instruction as given under the item for infilling the cavities in GFRG panel using concrete. Pour just required potable water after each stage of infill to make the mix damp enough to become cake form				
	<b>Detail of cost for filling one panel size 9 Sqmt (3 m x3m wall)</b>				
	<b>Materials</b>	<b>Qty</b>	<b>Unit</b>	<b>Rate</b>	<b>Amount</b>
	Quarry dust filling in cavities of size 230x94mm	0.846	Cum	706.8	597.95
	Cement 5% volume of q-dust	60.912	Kg	7	426.38
	Tools and plants hire charges				
	Mixer hire charges	0.1	hour	550	55.00



	<b>Labour for filling the q-dust</b>				
	Skilled labour	0.125	Nos	450.00	56.25
	Unskilled labour	0.125	No	300.00	37.50
					1173.09
	Add for water charges @1.5%				17.60
	Total				1190.68
	Add Contractor Profit and over head charges @ 15%				178.60
	Rate for 9 Sqmt				1369.29
	<b>Rate for 1 cum</b>				1618.54
	<b>Say</b>				<b>1619.00</b>
<b>MR7</b>	Supplying and laying of GFRG panel as roof slab panel of GF using crane as per instructions, including providing support system with 25mm thick by 300mm wide plywood, as runner with proper prop below micro beams and there after cutting of top flange of panel to 180 mm wide (leaving 25mm projection on either side) to provide RC embedded micro beam. The runner and prop has to remain for 3 days minimum after concreting of slab.				
	<b>Labour</b>	<b>Qty</b>	<b>Unit</b>	<b>Rate</b>	<b>Amount</b>
	Considering 3m x 3 m GFRG wall panels				
	providing runner & support system in place for placing panel in position with 40 mm bearing on walls (4 skilled persons for 1/2 Hr/ 1/ 16 day)	0.25	Nos	650	162.50
	Lifting panel from stack by crane and placing in position with 40mm bearing on walls: 4 skilled labour for 1 hrs	0.50	Nos	650	325.00
	cutting & removal of top flange by protruding 25mm on either sides for keying panel into RC micro beams in position (every 3 <sup>rd</sup> Cavities – runner / span in place beneath) and providing concealed beam reinforcement in position, side shuttering for slab for external side (with 6mm groove) also to be provided (mean while providing fan hooks, electrical cabling, piping etc by co ordinate task by concerned skilled persons): 4 skilled labour for 1 hrs	0.50	Nos	650	325.00
	<b>Materials</b>				
	Hire charges for runner and support system and side shuttering for external side of slab for 5 days	-	LS		50.00
	Hire charges of crane for 1Hr @ Rs 8000/ day( 8 Hrs)	1	hrs	1000	1000
	Total				1862.50
	Add Contractor Profit and over head charges @ 15%				279.37
	<b>Rate for 9 Sqm</b>				2141.87
	<b>Rate for Sqm</b>				<b>237.98</b>
	<b>Say</b>				<b>238.00</b>

<b>MR8</b>	Supplying and fixing 10 Gauge weld mesh of size 100x100 for floor/roof slab concrete screed over the micro beams as reinforcement. The weld mesh shall be fixed as per drawing.				
	<b><u>Detail of cost for 3 m x3m</u></b>				
	<b><u>Materials</u></b>	<b>Qty</b>	<b>Unit</b>	<b>Rate</b>	<b>Amount</b>
	Weld mesh	9	sqm	214.92	1934.28
	Waistage	0.45	sqm	214.92	96.71
	<b><u>Labour for filling the q-dust</u></b>				
	Barbender	0.125	Nos	450.00	56.25
	Unskilled labour	0.125	No	300.00	37.50
					2124.74
	Add for water charges @1.5%				31.87
	Total				2156.62
	Add Contractor Profit and over head charges @ 15%				323.49
	Rate for 9 sqm				2480.11
	<b>Rate for 1 sqm</b>				<b>275.57</b>
	<b>Say</b>				<b>276.00</b>
<b>MR9</b>	Application of Zycosil/equivalent* Solution (1 litre of Zycosil/equivalent* & 20 litres of water stirred first & 2 litres of Zycoprime/equivalent* added and stirred (total 23 litres)) by spraying using suitable sprayer over PCC. 23 litres of solution will cover 40 sqm to saturation (by testing as per RILEM or by water drops test in which water drops do not absorb but drops remain or rolls ) by trained applicator / skilled person who has the experience in the mixing or preparation of waterproofing chemicals / products and experience on waterproofing treatment of GFRG buildings. Drying time 12-24 Hrs. Application areas: 1) PCC 2) Top and sides(external and internal) of foundation and basement 3) Plinth beam				
	<b><u>Materials</u></b>	<b>Qty</b>	<b>Unit</b>	<b>Rate</b>	<b>Amount</b>
	Zycosil/equivalent*	1	Ltr	1770	1770.00
	Zycoprime/equivalent*	2	Ltr	213.25	426.50
	Water	20	Ltr	0.5	10.00
	Total cost for 40 sqm coverage				2206.50
	Sprayer cost for 40 sqm coverage	0.28571	no.	4000	1142.86
	Rate for labour per 40 sqm	0.28571	no.	550	157.14
	Technical Supervision (LS)				3.00
	Contractor's profit	15	%		526.43
	<b>Rate for 1sqm</b>				<b>100.90</b>
					<b>101.00</b>
<b>MR10</b>	Application of ZMB 60/equivalent* solution (100 Kg ZMB 60/equivalent*, 1 liter ZMB Nano Thinner, 20 liter water & 1 Liter Zycoprime/equivalent* = 122 liter / Kg) over already applied coat of Zycosil/equivalent* & Zycoprime/equivalent* solution on the top of all the RC plinth beams (200 mm wide) by brush / spray coat (brush stroke on horizontal and across - 3 hrs drying time) before erection of GFRG over RC plinth beams in GF. In the case of upper floors 150 mm wide on floor slab for all the external walls, bath / toilet / wet areas (3 hrs drying time) before erection of wall panel on upper floors including erection of parapet wall.				

	<b>Materials</b>	<b>Qty</b>	<b>Unit</b>	<b>Rate</b>	<b>Amount</b>
	ZMB 60/equivalent * per 122 sqm	100	kg	90	9000.00
	ZMB Thinner per 122 sqm	1	Ltr	1550	1550.00
	Zycoprime/equivalent * per 122 sqm	1	Ltr	213.25	213.25
	Water	20	Ltr	0.5	10.00
	Brush for 122 sqm	1.22	no.	100	122.00
	Skilled labour for 122 sqm	20.3333	no.	650	13216.67
	Technical Supervision (LS)				3.00
	Contractor's profit	15	%		3617.24
	<b>Rate for 1sqm</b>				<b>227.31</b>
					<b>228.00</b>
<b>MR11</b>	Water proofing treatment of vertical joints: water proofing treatment is to be done as per the guidelines issued by Zydex and RBS Pvt Ltd. After erection of GFRG wall panels, seal all GFRG wall joints with paper tape temporarily and inject the diluted Zycosil/equivalent* with 50 ml syringe till the gap and infilled concrete is completely saturated. After removing the paper seal, seal off the vertical joints with water proofing material "Grout RW/equivalent*". Sealing cost excluded.				
	<b>Materials</b>	<b>Qty</b>	<b>Unit</b>	<b>Rate</b>	<b>Amount</b>
	Zycosil/equivalent* per 3m	0.02609	Ltr	1770	46.17
	Zycoprime/equivalent* per 3m	0.05217	Ltr	325	16.96
	Water	0.52174	Ltr	0.5	0.26
	Syringe	1	no	25	25.00
	Skilled labour per 3m	0.125	no	650	81.25
	Technical Supervision (LS)				3.00
	Total cost for 3m coverage				172.64
	Contractor's profit	15	%		25.90
	<b>Rate for 1m run</b>				<b>58.55</b>
					<b>59.00</b>
<b>MR12</b>	In-filling of joints between RC plinth beam / floor slab and wall panel on external wall outer side and internal sides (including parapet wall) with Grout RW/equivalent * sealant compound after the erection of panel, over RC plinth beam of external walls and toilet / bath room / wet areas walls in ground floor and on all floor slabs and parapet wall over roof slab, stair case head room at the time of erection of GFRG panels. The sealant Grout RW/equivalent * compound in paste form has to be pushed using suitable tool like thin hand shovel of masons / pop plasterers to fill up the voids/ gap / joint before the infill of concrete in panel cavities and fine finish. This applies for all horizontal and vertical joints between wall and slab panels.				
	<b>Materials</b>	<b>Qty</b>	<b>Unit</b>	<b>Rate</b>	<b>Amount</b>
	Elastobar/equivalent * per 48m run	1	kg	304.25	304.25
	Cement per 48m run	1.5	kg	7	10.50
	100 mesh silica per 48m run	1	kg	1.5	1.50
	Water per 48 m run	0.5	Ltr	0.5	0.25
	Skilled Labour	1.5		650	975.00
	Technical Supervision (LS)				3.00
	Total Rate for 48m run				1294.50
	Contractor's profit	15	%		194.18
	<b>Rate for 1m run</b>				<b>31.01</b>
					<b>32.00</b>

<b>MR13</b>	Vertical joints (of external side and internal side) between door frame, window & ventilator frames (on all four sides) of outer wall over the Zycosil/equivalent* & Zycoprime/equivalent* solution already applied (before the installation of door / window / ventilator frames in position) and fine finish with Grout RW/equivalent */equivalent * (Rate of item of work is in per number of items for both external and internal sealant / infilling work.) Items: 1) Door 2) Window 3) Ventilator				
	<b>Materials</b>	<b>Qty</b>	<b>Unit</b>	<b>Rate</b>	<b>Amount</b>
	Zycosil/equivalent*	1	Ltr	1770	1770.00
	Zycoprime/equivalent*	2	Ltr	213.25	426.50
	Water	20	Ltr	0.5	10.00
	Rate for labour per 40 sqm	0.28571	no.	550	157.14
	Total cost for 40 sqm coverage				2363.64
	Total cost for 1m run (10mm thick)				0.59
	Elastobar/equivalent * per 48m run	1	kg	304.25	304.25
	Cement per 48m run	1.5	kg	7	10.50
	100 mesh silica per 48m run	1	kg	1.5	1.50
	Water per 48 m run	0.5	Ltr	0.5	0.25
	Skilled Labour	1.5		650	975.00
	Technical Supervision (LS)				3.00
	Total Rate for 48m run				27.56
	Contractor's profit	15	%		4.13
	<b>Rate for 1m run</b>				<b>31.69</b>
					<b>32.00</b>
<b>MR14</b>	Application of a coat of Zycosil/equivalent * as per instructions over RC sunshade. Apply Zycosil/equivalent * on top, bottom and three sides of sun shade . Apply Zycosil/equivalent * till it meets the saturation level (by putting water drops over the Zycosil/equivalent * application-drop has to roll over it which indicate the saturation level).				
	<b>Materials</b>	<b>Qty</b>	<b>Unit</b>	<b>Rate</b>	<b>Amount</b>
	Zycosil/equivalent*	1	Ltr	1770	1770.00
	Zycoprime/equivalent*	2	Ltr	213.25	426.50
	Water	20	Ltr	0.5	10.00
	Total cost for 40 sqm coverage				2206.50
	Skilled labour for 40 sqm coverage (hand spray)	2.5		650	1625.00
	Technical Supervision (LS)				3.00
	Contractor's profit	15	%		575.18
	<b>Rate for 1sqm</b>				<b>110.24</b>
					<b>111.00</b>
<b>MR15</b>	In-filling / sealing of joint between RCC lintel cum sunshade and wall (on external side) in all floors by pushing in Grout RW/equivalent* in paste form and coving 20 mm x 20 mm after applying a coat of Zycosil/equivalent* & Zycoprime/equivalent * solution before cement plastering of top, bottom and sides of RC sunshade				
	<b>Materials</b>	<b>Qty</b>	<b>Unit</b>	<b>Rate</b>	<b>Amount</b>
	Zycosil/equivalent*	1	Ltr	1770	1770.00
	Zycoprime/equivalent*	2	Ltr	213.25	426.50

	Water	20	Ltr	0.5	10.00
	Skilled labour for 40 sqm coverage (hand spray)	2.5		650	1625.00
	Total cost for 40 sqm coverage				3831.50
	Total cost for 1m run (10mm thick)				0.96
	Elastobar/equivalent * per 48m run	1	kg	304.25	304.25
	Cement per 48m run	1.5	kg	7	10.50
	100 mesh silica per 48m run	1	kg	1.5	1.50
	Water per 48 m run	0.5	Ltr	0.5	0.25
	Skilled Labour	1.5		650	975.00
	Technical Supervision (LS)				3.00
	Total Rate for 1m run				27.93
	Contractor's profit	15	%		4.19
	<b>Rate for 1m run</b>				<b>32.12</b>
					<b>33.00</b>

<b>MR16</b>	Water proofing treatment for toilet: Apply a coat of Zycosil/equivalent * on top of concrete floor and on all walls for a height of 0.150m from the bottom. Apply Zycosil/equivalent * till it meets the saturation level (by putting water drops over the Zycosil/equivalent * application-drop has to roll over it which indicate the saturation level) by skilled person who has the experience in application of water proofing chemicals and oriented on GFRG building. Over the above, apply 2 coats of water proofing compound (ZMB 60/equivalent * Solution) over the area applied with Zycosil/equivalent *. Rich cement plaster 1:3 mix is to be provided as protective coat over the above treated floor and wall surface and cured, but cost of plastering is not included				
	<b>Materials</b>	<b>Qty</b>	<b>Unit</b>	<b>Rate</b>	<b>Amount</b>
	Zycosil/equivalent*	1	Ltr	1770	1770.00
	Zycoprime/equivalent*	2	Ltr	213.25	426.50
	Water	20	Ltr	0.5	10.00
	Total cost for 40 sqm coverage				2206.50
	Rate for labour per 40 sqm	2.5	no.	550	1375.00
	Cost per 1sqm				89.5375
	ZMB 60/equivalent * per 122 sqm	100	kg	90	9000.00
	ZMB Thinner per 122 sqm	1	Ltr	1550	1550.00
	Zycoprime/equivalent * per 122 sqm	1	Ltr	213.25	213.25
	Water	20	Ltr	0.5	10.00
	Brush for 122 sqm	1.22	no.	100	122.00
	Skilled labour for 122 sqm	20.3333	no.	650	13216.67
	Technical Supervision (LS)				3.00
	Rate for sqm				108.33
	Total				197.87
	Contractor's profit	15	%		29.68
	<b>Rate for 1sqm</b>				<b>227.55</b>
					<b>228.00</b>

<b>MR17</b>	Application of water proofing chemicals as per instructions above PCC at ground floor, before placing tiles in all rooms, by skilled person who has experience in application of water proofing chemicals. Apply Zycosil/equivalent * till it meets the saturation level (by putting water drops over the Zycosil/equivalent * application-drop has to roll over it which indicate the saturation level).				
	<b>Materials</b>	<b>Qty</b>	<b>Unit</b>	<b>Rate</b>	<b>Amount</b>
	Zycosil/equivalent*	1	Ltr	1770	1770.00
	Zycoprime/equivalent*	2	Ltr	213.25	426.50
	Water	20	Ltr	0.5	10.00
	Total cost for 40 sqm coverage				2206.50
	Sprayer cost for 40 sqm coverage	0.28571	no.	4000	1142.86
	Rate for labour per 40 sqm	0.28571	no.	550	157.14
	Technical Supervision (LS)				3.00
	Contractor's profit	15	%		526.43
	<b>Rate for 1sqm</b>				<b>100.90</b>
	Rate for 1sqm of carpet area				<b>101.00</b>
<b>MR18</b>	After cleaning the exposed 174 mm wide portion of exterior side of floor slab, apply a coat of water proofing/water resistant chemical compound in line and flush with external wall panel. While applying, make sure that 25 mm heights up and down of exposed floor slab is also applied with Zycosil/equivalent * and compound (coat RW) to prevent ingress of water. Total width covered will be 225 mm.				
	<b>Materials</b>	<b>Qty</b>	<b>Unit</b>	<b>Rate</b>	<b>Amount</b>
	Zycosil/equivalent*	1	Ltr	1770	1770.00
	Zycoprime/equivalent*	2	Ltr	213.25	426.50
	Water	20	Ltr	0.5	10.00
	Total cost for 40 sqm coverage				2206.50
	Total Rate for 1m run (225mm thick)				12.41
	Sprayer cost for 40 sqm coverage	0.28571	no.	4000	1142.86
	Rate for labour per 40 sqm	0.28571	no.	550	157.14
	Technical Supervision (LS)				3.00
	Contractor's profit	15	%		526.43
	<b>Rate for 1sqm</b>				<b>100.90</b>
					<b>101.00</b>
<b>MR19</b>	Water proofing /packing of pipe joints (bath, toilet, water supply, rain water pipes from terrace etc) including packing of pipe around using special compound (Mix RW/equivalent *) as per the instruction given in the water proofing manual for water proofing of GFRG building				
	<b>Materials</b>	<b>Qty</b>	<b>Unit</b>	<b>Rate</b>	<b>Amount</b>
	Elastobar/equivalent * per 212m run	1.5	kg	304.25	456.375
	Cement per 212m run	10	kg	7	70
	Sand per 212m run	30	kg	1.2	36
	Water per 212m run	8	kg	0.5	4
	Skilled Labour	6.625	no.	650	4306.25
	Technical Supervision (LS)				157.14
	Total cost per 1m run				23.72532
	Contractor's profit	15	%		3.56

	Rate for 1m run				27.28
					28.00
MR20	<p>Apply diluted Zycosil/equivalent* 1:20 (1 liter Zycosil/equivalent* 20 Liter water = 21 liters) mixed with 2 liter of Zycoprime/equivalent* with flood application coverage 40 sqm. Also cover 12 inch (300 mm) of vertical inside sides of parapet walls all around. Prepare ZMB Thinner solution. Add 1 liter of ZMB Nano Thinner in 20 liter of water with manual stirring and then add 1 part of Zycoprime/equivalent* under stirring. Take 100 parts of ZMB 60/equivalent* and add 22 parts of ZMB Thinner solution and mix thoroughly with manual stirring. Apply the above prepared solution by brush / mop / spray technique in 5 coats as described in the manual. After applying 2 coats lay Stretch Fab/equivalent* on ZMB 60/equivalent* roller press the fabric.</p>				
	<b>Materials</b>	<b>Qty</b>	<b>Unit</b>	<b>Rate</b>	<b>Amount</b>
	Zycosil/equivalent*	1	Ltr	1770	1770.00
	Zycoprime/equivalent*	2	Ltr	213.25	426.50
	Water	20	Ltr	0.5	10.00
	Total cost for 40 sqm coverage				2206.50
	Sprayer cost for 40 sqm coverage	0.28571	no.	4000	1142.86
	Rate for labour per 40 sqm	0.28571	no.	550	157.14
	Technical Supervision (LS)				157.14
	Cost per sqm				91.59
	ZMB 60/equivalent * per 122 sqm	100	kg	90	9000.00
	ZMB Thinner per 122 sqm	1	Ltr	1550	1550.00
	Zycoprime/equivalent * per 122 sqm	1	Ltr	213.25	213.25
	Water	20	Ltr	0.5	10.00
	Brush for 122 sqm	1.22	no.	100	122.00
	Skilled labour for 122 sqm	20.3333	no.	650	13216.67
	Cost per sqm				108.33
	Stretch Fab/equivalent * for 75 sqm( 1 roll 250m)	11	kg	323	3553.00
	Labour for 75 sqm	3.36	no	650	2184.00
	Cost per sqm				76.49
	Concrete 75 mm x 75 mm coving				
	Rate for M20 concrete (ref. DSR 5.33.2)	1	cum	6353	6353
	Rate for one sqm for 1 mm thick				6.353
	Rate of concreting per sqm (2.8125 mm thick)				17.867813
	Total cost				294.29
	Contractor's profit	15	%		44.14
	<b>Rate for 1 sqm</b>				<b>338.43</b>
					<b>339.00</b>



<b>MR21</b>	Application of Nano penetrating polymeric primer (after rendering / thin plastering of internal walls including wall corner and joints between ceiling wall all around where ever required to have fine finish and external wall corners etc) using WD-P30 & WD Thinner (1:1, no water to be added) suitable for GFRG for external and internal walls and ceiling (under side of floor / roof slab) using WD-P30 and WD Thinner (1:1) is to be applied on all GFRG/ GFRG internal and external surfaces including parapet wall surfaces before applying finishing coat of paint.				
	<b>Materials</b>	<b>Qty</b>	<b>Unit</b>	<b>Rate</b>	<b>Amount</b>
	WDP 30 per 50 sqm area	1	Ltr	135	135.00
	WDP Thinner per 50 sqm area	1	Ltr	127	127.00
	Sprayer cost for 50 sqm coverage	0.35714	no.	4000	1428.57
	Rate for labour per 50 sqm	0.35714	no.	550	196.43
	Technical Supervision (LS)				157.14
	Cost per sqm				51.10
	Contractor's profit	15	%		7.67
	<b>Rate for 1 sqm</b>				<b>58.77</b>
					<b>59.00</b>
<b>MR22</b>	Rendering / plastering with thin layer using gypsum wall plaster/ gypsum wall putty (for internal) / water repellent special compound ( for external) : Rendering has to be done over rough side (B side) of wall panel, sealing of joints with in-filling/ treatment of wall corner joints, wall and ceiling slab joints, surface of dented or damaged wall panel corners (both internal & external walls)				
	<b>Materials</b>	<b>Qty</b>	<b>Unit</b>	<b>Rate</b>	<b>Amount</b>
	Wall Putty for 9 sqm area (2 coat)	2.77	kg	25.5	141.27
	Wastage 5%				7.06
	Water	1	Ltr	0.5	0.50
	Labour	0.25	Ltr	650	162.50
	Contractor's profit	15	%		46.70
	Total cost for 9 sqm coverage				358.03
	<b>Rate for 1sqm</b>				<b>39.78</b>
					<b>40.00</b>
<b>MR23</b>	Providing and fixing on wall face unplasticised Rigid PVC rain water pipes conforming to IS : 13592 Type A, including jointing with seal ring conforming to IS : 5382, leaving 10 mm gap for thermal expansion, (i) Single socketed pipes fixed with PVC clip at 1.0m interval..				
	Single socketed pipe 50mm diameter				
	<b>Details cost for 6 Meter</b>				
	<b>Materials</b>	<b>Qty</b>	<b>Unit</b>	<b>Rate</b>	<b>Amount</b>
	Cost of 6 metres pipe	6.00	Meter	210.00	1260.00
	Vat @5%				63.00
	Carriage of materials	13.52	L.S	1.61	21.77
	Sundries for solution and coupler	6.76	L.S	1.61	10.88
	<b>Labours:-</b>				0.00
	Fitter	0.19	Day	450.00	85.50
	Beldar	0.37	Day	350.00	129.50
	Bandhani	0.08	Day	350.00	28.00
	Scaffolding	18.59	L.S	1.61	29.93

					1628.58
	Add W.C 1.5 %				24.43
					1653.01
	Add O.H. & C. P @ 15%				247.95
	Cost for 6 RM				1900.96
	<b>Rate for 1 RM</b>				<b>316.62</b>
				<b>Say</b>	<b>317.00</b>
<b>MR24</b>	Supplying,fixing and testing of PVC floor trap with CP grating 150mm nominal size square 100mm diameter of the inner hinged round grating various inlet from 40 dia to 110 dia and various outlet from 75 dia to 100 dia with the extension boss tee connections, fixed in sunken floors etc., complete				
	<b>Materials</b>	<b>Qty</b>	<b>Unit</b>	<b>Rate</b>	<b>Amount</b>
	Grating	1	Each	72.00	72.00
	<b>Labour</b>				
	Fitter	0.05	Day	400.00	20.00
	Beldar	0.05	Day	250.00	12.50
	Total				104.50
	Add for water charges @1.5%				1.57
	Total				106.07
	Add Contractor Profit and over head charges @ 15%				15.91
	<b>Rate for 1 no.</b>				<b>121.98</b>
				<b>Say Rs</b>	<b>122.00</b>





## About BMTPC

The Building Materials & Technology Promotion Council (BMTPC) under the aegis of the Ministry of Housing & Urban Poverty Alleviation strives to propagate cost effective, energy efficient, eco-friendly and disaster resistant construction technologies for field level applications. Over the years, BMTPC has successfully transferred many alternate building materials & construction systems, developed standards & specifications and brought out meaningful publications, brochures, guidelines for better advocacy and outreach. However, in the recent years in the backdrop of acute housing shortage, it has been realised that potential emerging technologies for social mass housing is the need of the hour and therefore, BMTPC is making concerted efforts so as to identify, study and propagate new technologies. In the process, BMTPC has successfully identified number of technologies and the same are being studied for implementation in Indian conditions through Performance Appraisal Certification Scheme (PACS) being operated by BMTPC. These emerging technologies are being studied so as to bring speed, quality, economy and safety against natural hazards over the conventional way of construction. With fast depleting natural resources; need for environment protection to protect greenhouse effect; need for bringing more speed, durability and quality in construction; it is prudent to bring alternate technologies from within and outside the country.