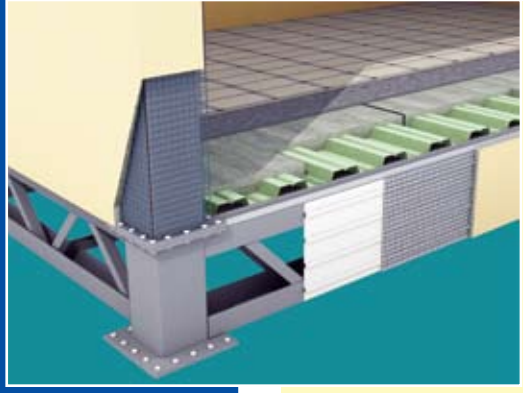

Prospective Construction Systems for Mass Housing

No.
7/2014

TECHNOLOGY PROFILE

Factory Made Fast Track Modular Building System

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

System in Brief

Factory Made Fast Track Modular Building System is based on prefabricated steel structure with different walling components. About 70 percent of the work is done in the factory with minimal usage of concrete, which enables system to deliver the building within a few days of work at site. The steel modular are pre-fitted with flooring, ceiling tiles, electrical and plumbing fittings. The assembled steel modular are transported to the site for installation which is done using crane and other required machineries. Once all the components are assembled and erected at site, wall panels are fixed, using factory made 3–D Expanded Polystyrene (EPS) panels and shortcreting from both sides.

The uniqueness of system is the efficient and simultaneous activities of site preparation and building construction in factory, rather than two phased customary process.

Details of Structure	
Foundation	Foundation shall be either strip or raft designed and constructed as per IS 1904:1986 and other related Indian Standards, as applicable.
Steel Structure	The structure consists of steel pillars, modules and other components designed for worst loading conditions as per design code i.e. IS 800:2007 and IS 801:1975. It shall provide, besides other requirements, the required bearing resistance for earthquake and wind forces as per IS 1893(Part 1): 2002 and IS 875 (Parts 3):1987, both individually and in combination, as applicable. Steel pillars shall be made by welding MS plate of 16mm thickness and steel tubes of size 200mm x 200mm and of thickness varying from 3mm to 16mm depending upon the number of floors. The smaller pillar is fixed with sub-assemblies for modules. All the columns shall be checked for their safety and computations shall be done for the same for satisfying requirements of IS 800:2007 and IS 801:1975.
Steel Staircase	Steel staircase shall be designed and fabricated using HR steel sheet of thickness 3mm / 4mm with MIG welding process. Staircase is pretreated for surface cleaning using steel cleaning agent and painted with two coats of anti-corrosion primer and fire proof paint.
Flooring	The floor is made up of deck sheet and wire mesh of size 100mm x 100mm x 3mm thickness. The deck sheet is fixed on the modules ready after providing with utilities like plumbing and electrical etc. fixed. Flooring, roofing and ceramic tiles are fixed as per the relevant specifications.
Walling	Walling is completed by using factory made EPS based wire mesh welded 3D panels. The panels are easy to install and are manufactured using insulated polystyrene core covered on both sides by hot GI coated round wire square mesh, duly connected by 33 connectors per m^2.

Door and Window	The structure can accommodate any types of door and window frames and panels generally used. Metal door frame pressed from 1.2/1.5mm thick galvanized steel sheet with mitered and welded construction may also be fixed. The doors used, however, should satisfy the performance requirements as per relevant Indian Standards. For doors not covered by any Indian Standards, third party certification may be adopted. Performance characteristics for dimensions & squareness, general flatness, impact indentation, flexure test, edge loading, shock absorption, buckling resistance, slamming and misuse as per relevant parts of IS 4020:1998 shall be required before accepting any doors for use.
Utilities	i) Once the steel structure module is ready for electrical and plumbing work as per the drawings, these utilities are planned & executed based on the services/utilities layout design and requirement of the floor area. ii) After completion of services/utilities, the module is covered with deck sheet. Wire mesh and MS studs of required size are fixed on the deck sheet before laying of PCC flooring. After decking, PCC of M25 grade is laid for a total depth of 76mm and flooring tiles are fixed wherever required depending upon utilization of area. With all fittings the module is ready for shifting to the site.

Transport of Modules and Pillars along with accessories

All the handling/transportation at site for erection are done by mechanical equipments such as tower & mobile cranes and trucks etc. Due care should be taken to avoid any damage to these modules, pillar and other elements. For this, special lifting points are provided in these modules so that handling stresses are kept to the minimum. Transportation are carried out in mainly two stages:

i) From manufacturing plant to stacking yard.

ii) From stacking yard to erection site. The transportation is carried out by using trucks of desired capacity and length. Erection are carried out by cranes of suitable capacity at site.

Performance Evaluation

Structure	Seismic Performance Evaluation of Model of a G+7 CRC framed structure for ground motion compatible to zone V spectrum was performed at SERC, Chennai and found to be satisfactory.
On Walling Component	Evaluation on the behavior of reinforced EPS Panel under flexural and Axial Compression load on 100 mm and 150 mm thick panels were satisfactory. Other performance characteristics are:

Thermal transmittance of Single Panel	0.537 w/m^{2}k
Acoustic Behavior	37 dB (noise reduction)
Water Penetration	No penetration after 3h
Resistance to impact with softbody and hardbody	Impacts of 90 & 1200 J –No crack

Under Performance Appraisal Certification Scheme, PAC No. 1011-S/2013 has been issued for the system to M/s Synergy Thrislington, A1 Phase- I, Industrial Area, Mohali.
(Available for download from BMTPC website : www.bmtpc.org)

References:

- Performance Appraisal Certificate PAC No. 1011-S/2013, issued by BMTPC, New Delhi
- Inspection Report of the visit for Performance Appraisal Certification.
- Report of Seismic Evaluation of Model of G+7 CRC framed structure for a ground motion compatible to zone V spectrum by SERC, Chennai.
- IS 800:2007 - General Construction In Steel - Code of Practice
- IS 801:1975 - Code of Practice for Use of Cold Formed Light Gauge Steel Structural Members In General Building Construction
- IS 875(Part 1):1987 - Code of Practice For Design Loads (Other Than Earthquake)For Buildings And Structures Part 1 Dead Loads - Unit Weights of Building Material And Stored Materials (Incorporating IS 1911 : 1967)
- IS 875(Part 2):1987 - Code of Practice for Design Loads (Other Than Earthquake) For Buildings And Structures: Part 2 Imposed Loads
- IS 1893(Part 1):2002 - Criteria for Earthquake Resistant Design of Structures - Part 1 : General Provisions and Buildings
- IS 4020(Part 1 to 16): 1998 - Door Shutters - Methods of Tests
- SP 7:2005 - National Building Code of India 2005.

About BMTPC

Set up in 1990, Building Materials & Technology Promotion Council (BMTPC) an autonomous organisation under the Ministry of Housing & Urban Poverty Alleviation strives to bridge the gap between laboratory research and field level application in the area of building materials & construction technologies.

Vision

"BMTPC to be world class knowledge and demonstration hub for providing solutions to all with special focus on common man in the area of sustainable building materials, appropriate construction technologies & systems including disaster resistant construction."

Mission

"To work towards a comprehensive and integrated approach for promotion and transfer of potential, cost-effective, environment-friendly, disaster resistant building materials and technologies including locally available materials from lab to land for sustainable development of housing."

For more information, kindly contact:

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