Piloting Innovative Technologies through Demonstration Construction

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

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PREFACE

BMTPC since its establishment in 1990 works towards field level application of alternate innovative building materials & construction systems with the objective to facilitate proliferation & successful transfer of these innovations in the field. One of the most significant steps in technology transfer cycle is to run pilots through Demonstration Construction i.e. learning by doing. These demonstration construction projects not only help assimilate the nuances of innovative technology for further adaption but also works towards wider advocacy & outreach, sensitizing masses, training professionals & artisans.

Under PMAY-U, a flagship mission of Ministry of Housing & Urban Affairs (MoHUA), Govt. of India to provide pucca house to poorest of the poor urban household, a Technology Sub Mission (TSM) is setup to facilitate adoption of modern, innovative & green technologies for faster & quality construction of houses across the country. Under TSM, MoHUA entrusted BMTPC to execute Demonstration Housing Projects (DHPs) at least one in each state of India showcasing different innovative construction systems & other sustainable practices. A typical DHP comprises of 40 houses with basic & social infrastructure and can be used either as housing project or for any other social/welfare purpose as concerned state deem appropriate. The land is provided by the state govt. free of cost and the funding pattern remains the same as in PMAY-U with the exception that here an additional Technology Innovation Grant (TIG) is also given so as to promote innovative technologies in the field.

BMTPC has successfully completed 7 DHPs so far under PMAY-U and work on another 7 projects is ongoing. It was felt that BMTPC should publish a booklet on these DHPs so that technical information is available at one place & can be readily used by stakeholders willing to use these technologies. It is also pertinent to mention here that alternate construction systems being used in these DHPs are the approved shortlisted technologies through Global Housing Technology Challenge-India organized by MoHUA in 2019. Also, most of these systems are evaluated & certified by BMTPC through Performance Appraisal Certification Scheme (PACS). Prior to PMAY-U also, BMTPC has been showcasing alternate technologies in different parts of the country through construction of houses, community buildings & other social structures.

I hope that information given in this publication will help engineers & architects including policy makers to explore these emerging construction technologies which are resource efficient, climate responsive, cost effective, disaster resilient and above all fast track the construction with superior structural & functional performance than the conventional brick-mortar/cast-in-situ frame construction.

New Delhi
September 20, 2022

(Dr. Shailesh Kr. Agrawal)
Executive Director, BMTPC

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Background

Housing for All under Pradhan Mantri Awas Yojna is one of the important mission mode programme of Government of India. For realisation of this ambitious plan, the Govt. of India has also adopted an approach to act as a 'facilitator' and 'enabler' by developing suitable instruments to be used by the State Government for promotion of housing for the Economically Weaker Section (EWS) and Low Income Group (LIG) serviced with basic amenities.

The task of building safe, affordable and sustainable houses and habitats involves inter-alia an effort to equip the local communities, delivery agents and government agencies with adequate knowledge and skills with regard to various proven/green, emerging and disaster resistant construction technologies and processes.

The cost of building construction is also increasing at a much higher rate, making the housing unaffordable. Due to the large volume of housing to be undertaken in both urban and rural areas with limited availability of building materials and finance available, it is important that proven/green and faster construction systems are used, with due care for structural and functional requirements. All such innovations are required to be brought to the level of field application to achieve the desired goal.

Depletion of natural resources required for Building construction in conventional way, rising cost of traditional building materials and construction practices; environmental concerns of producing and using such materials; scarcity of basic ingredient of coarse and fine sand / aggregates in different parts of the country, use of energy intensive building materials & products in traditional construction & manufacturing; high Green House Gas emissions; vulnerability to natural hazards; shortage of skilled labour and need to bring efficiency, speed & quality in construction demand proper dissemination of new emerging and proven building materials and technologies both developed and successfully used within the country and abroad among professionals and public in large.

Another concern is the low levels of awareness about these technology options at the level of practicing professionals, artisans dealing with house construction and among the general public. Initiatives to propagate and grass-root implementation of some of these technology options have been sporadic. In view of the fact that general awareness has not been raised to the desired level to make an impact, these technologies have not got into mainstream practice.

In the context of the massive housing initiatives from the Government of India, State Government under various programmes as well general thrust in housing, it is opportune time to reorient the entire process, to propagate and popularize the proven/green & emerging technologies and introduce appropriate interventions to close the gap between availability of these technology options and application of the same increasingly in large scale housing initiatives.

BMTPC has been promoting proven and emerging building materials & technologies in different regions of the country through identification, evaluation, standardization, certification, capacity building, training and field level application of such technologies. In the recent past, the Council has constructed a number of demonstration houses in various parts of the country. The efforts of BMTPC have helped in building up confidence and acceptability of proven and emerging technologies among public and private construction agencies, professionals and others. BMTPC has so far evaluated 42 emerging technologies suitable for mass housing.

Demonstration Construction

The Ministry of Housing and Urban Affairs (MoHUA), Government of India has set up a Technology Sub-Mission (TSM) under PMAY-HFA (Urban) mission with the objective of providing "Sustainable Technological Solutions for Faster & Cost Effective Construction of Houses suiting to Geo-Climatic and hazard conditions of the Country".

In order to showcase the field application of new emerging technologies, MoHUA has taken an initiative to construct Demonstration Houses as a part of TSM through BMTPC. These Demonstration Housing Projects (DHPs) act as resource projects for providing training and skills to professionals and construction workers on emerging technologies in respective States.

The Ministry of Housing & Urban Affairs, Govt. of India vide letter No.I-14022/16/2017-HFA-V-UD (FTS 3019656) dated June 5, 2017 issued Operational Guidelines for construction of DHPs. Later on revised Operational Guidelines were issued by the MoHUA vide letter No.I-11019/8/2017-HFA-UD(FTS 9032027) dated April 29, 2018.

The Secretary, MoHUA vide letter No. I-11019/8/2017-HFA-UD dated May 29, 2018 requested various States and UT Governments for participation in the "Demonstration Housing Project" to further popularize and mainstream the proven and new/alternate technologies in construction. An overwhelming response was received for partnering in the construction of Demonstration Houses/ structures using alternate building technologies.

The construction of demonstration housing projects in different parts of the country aims to facilitate wide spread dissemination and adoption of both existing proven, emerging and sustainable building materials and technologies in preference to the conventional and create enabling environment for the large scale adoption of such materials & technologies in different geo-climatic parts of the country, thus making housing more affordable and accessible. During the construction of demonstration houses, training of professionals and construction work force is also being undertaken.

Use of New Construction Technologies

With the global buzz about sustainability, reduction of carbon emissions, climate change mitigation, the use of greener practices in the construction sector has gained importance and has become relevant in today's context. BMTPC under Ministry of Housing & Urban Affairs, Govt. of India has been promoting sustainable technologies for field level applications since 1990, however, during last few years, BMTPC is in the process of mainstreaming new housing technologies other than conventional ones which are suitable for affordable mass housing specially in urban areas. These new construction systems offer a basket of appropriate structural systems which are not only superior than the existing RCC/load bearing construction but also deliver quality, safe & sustainable houses at a much faster rate with much improved functional performance.

BMTPC also operates Performance Appraisal Certification Scheme (Gazette Notification No. I-16011/5/99 H-II in the Gazette of India No. 49 dated December 4, 1999) under which 42+ new technologies for mass housing have been identified, assessed for their suitability in different geo-climatic regions of the country & certified for usage by public & private agencies. The certified technologies are from the specific firms/agencies/technology providers with their specific trade names, however, they can be generalized and classified broadly. These technologies have been classified as under:

Precast Concrete Construction System – 3d Precast Volumetric

1 Volumetric (3D) Concrete Printing Technology (VCPT)

Precast Concrete Construction System – Precast Components Assembled at Site

2 SRPL Building System (Waffle-Crete)
3 Walltec Hollowcore Concrete Panel
4 Precast Large Concrete Panel System
5 Industrialized 3-S system using RCC precast with or without shear walls, columns, beams, Cellu-lar Light Weight Concrete Slabs/Semi-Precast Solid Slab
6 Robomatic Hollowcore Concrete Wall Panels
7 K-Wall Panels
8 Urbanaac Precast Construction Technology
9 Integrated Hybrid Solution - One
10 Kon_Crete Reinforced Autoclaved Aerated Concrete Panels

Light Gauge Steel Structural System & Pre-Engineered Steel Structural System

11 Factory Made Fast Track Modular Building System
12 Speed Floor System
13 Light Gauge Steel Framed Structure (LGSF)
14 Light Gauge Steel Framed Structure with Infill Concrete Panel Technology
15 Continuous Sandwich (PUF) Panels With Steel Structure
16 PUF Sandwich Panel with Pre Engineered Building Structure

Prefabricated Sandwich Panel System

17 Advanced Building System – Emmedue
18 QuickBuild 3D Panels
19 Reinforced EPS Core Panel System
20 Rapid Panels
21 Prefabricated Fibre Reinforced Sandwich Panels
22 Concrewall Panel System
23 Rising EPS (Beads) Cement Panels
24 PIR Dry Wall Pre-Fab Panel System
25 Baupanel system
26 Flyash EPS (Beads) Cement Sandwich Panels
27 V-Infill Wall (Light Weight EPS Wall)
28 Nano Living System Technology
29 Factory Assembled Insulated Sandwich Panels using Mineral Wool
30 Factory Assembled Insulated Sandwich Panels using PUF
31 Everest Rapicon Panel / Solid Wall Panel

Monolithic Concrete Construction

32 Monolithic Concrete Construction System
- using Plastic-Aluminium Formwork
- using Aluminium Formwork
33 Modular Tunnel Form

Stay In Place Formwork System

34 Glass Fibre Reinforced Gypsum Panel System
35 Sismo Building Technology
36 Insulating Concrete Forms
37 Monolithic Insulated Concrete System
38 Lost-in-place formwork system- Plasmolite Wall Panels
39 Lost-in-place formwork system- Plaswall Panel system
40 Structural Stay-in-place formwork system
41 Stay-In-Place PVC Wall Forms
42 Permanent Wall Form (PVC)

To give further impetus to the new construction systems, Ministry of Housing and Urban Affairs (MoHUA) conceptualized the Global Housing Technology Challenge – India (GHTC-India) as a platform with which a holistic eco-system can be facilitated so that appropriate technologies from around the world and relevant stakeholders can be catalysed towards effecting a technology transition in the housing and construction sector of India. The challenges had three components (i) Conduct of a biennial Construction Technology India, Expo-cum-Conference, to provide a platform for all stakeholders to exchange knowledge and business (ii) Identifying Proven Demonstrable Technologies from across the world, and mainstreaming them through field level applications in Light House Projects (LHPs) across India, (iii) Promoting Potential Future Technologies through the establishment of

Affordable Sustainable Housing Accelerators-India (ASHA-India) for incubation and accelerator support.

GHTC-India was launched by the then Hon'ble Minister of State (Independent Charge), MoHUA on 14.01.2019 at New Delhi. Subsequently, Construction Technology India – 2019 (CTI-2019) : Expo-cum-Conference was held at Vigyan Bhawan, New Delhi during 02-03 March, 2019 to bring together multiple stakeholders involved in innovative and alternative housing technologies, for exchange of knowledge and business opportunities and master classes. The Expo-cum-Conference was inaugurated by Hon'ble Prime Minister of India.

54 alternate technologies were shortlisted and are being promoted as future technologies for the construction sector. These 54 technologies have been further categorized into 6 broad categories and are given below. These technologies/construction systems are being showcased through six Light House Projects (LHPs) where 1000+ houses are being constructed in six States namely Chennai, Rajkot, Indore, Agartala, Lucknow and Ranchi. Apart from the LHPs, the Demonstration Housing Projects are also being constructed using these 54 shortlisted technologies and PACS certified technologies.

S. No.	Technology	Company
A.	**Precast Concrete Construction System - 3D Precast volumetric (4)**	
1.	Pre-cast concrete system with columns, beams, walls, slabs, hollow core slabs & also 3D Volumetric components	M/s Katerra India Private Limited Velankani Tech Park, No.43, Hosur Road, E-City Ph1, Bangalore, India
2.	Vertical structural modules cast in Plant/Casting yard are assembled together through casting of floor panel. The unit is transported & installed at site.	M/s Moducast Pvt. Ltd 105 Kethana Residency, 16th Cross, 1A Main, Vignan Nagar, Bengaluru, India
3.	3D Modular casting using steel mould and high performance concrete of building modules in factory. These pods are transported to the construction site & assembled.	M/s Magicrete Building Solutions 101, Ritz Square, Ghod dod road, Surat, India
4.	Modules with 3D Volumetric Precast concrete unit, various units make on house	M/s Ultratech Cement Ltd, Ahura Centre, 3rd Floor, Mahakali Caves Road, Andheri (W), Mumbai, India
B. Precast Concrete Construction System – Precast components assembled at site (8)		
5.	Precast Large Concrete Panel (PLCP) System with structural members (wall, slab etc.) cast in a factory/ casting yard and brought to the building site for erection & assembling.	M/s Larsen & Toubro 5th Floor, B-Wing, TC-II Building, L&T Business Park, Gate No. 5, Saki Vihar Road, Powai, Mumbai, India
6.	Pre-cast Concrete Structural system comprising of pre-cast column, beam, precast concrete / light weight slab, AAC blocks/ infill concrete walls.	M/s B.G. Shirke Construction Technology Pvt. Ltd, 72-76, Industrial Estate, Mundhwa, Pune, India
7.	Optimal Pre-cast concrete System through structural Analysis, design & equipment support	M/s Elematic India H-38, 1st Floor, Bali Nagar, New Delhi, India
8.	Precast concrete construction system using precast walls with precast plank floor.	M/s PG Setty Construction Technology Pvt Ltd., 74, Sandesh Arcade, 3rd Floor, Sahukar Chenaiah Road, Kuvempunagar North, Saraswathipuram, Mysuru, India
9.	Pre cast components comprising of beams, columns, staircase, slab, hollow core slab etc. manufactured in plant & erected on site	M/s Teemage Builders Pvt Ltd Dr.no-7/67, Koduvai, South Avinashipalayam, c/o-MPNMJP, D.S, Chennimalai, Tiruppur, India

S. No.	Technology	Company
10.	Pre-cast sandwich panel system & Light weight Pre cast concrete slab	M/s Nordicflex House Ahura Centre, 3rd Floor, Mahakali Caves Road, Andheri (W), Mumbai, India
11.	Prefabricated Interlocking Technology (without mortar) with Roofing as Mechnized Precast R.C. Plank & Joist system	M/s Aap Ka Awass Adlakha Associates Pvt. Ltd F-70, Bhagat Singh Market, Gole Market, New Delhi, India
12.	Large Hollow wall prefab concrete Panel (lightweight, interlocking, concrete panel) using factory produced large standard hollow interlocking concrete block.	M/s William Ling 15 Mount Sinai Rise #05-01, Singapore, Pincode : 276906
C. Light Gauge Steel Structural System & Pre-engineered Steel Structural System (16)		
13.	LGS Framing with various walling & roofing options	M/s Mitsumi Housing Pvt. Ltd 202, Radhe Kishan Arista OPP Hirabhai tower Jawaharchowk - Isanpur Road Maninagar, Ahmedabad, India
14.	LGS Framing with various walling & roofing options	M/s Everest Industries Ltd Everest Technopolis, D206, Sector 63, Noida, India
15.	LGS Framing with various walling & roofing options	M/s JSW Steel Ltd. JSW Steel Ltd, JSW Centre, BKC, Bandra east, Mumbai, India
16.	LGS Framing with various In-situ light weight concrete walling & in-situ concrete slab	M/s Society for Development of Composites No. 205, Bandematt, K.S.Town, Bangalore, India
17.	LGS Framing with various walling & roofing options	M/s Elemente Designer Homes Unit-2416, B-36, Express Trade Tower-2, Noida, India
18.	LGS Framing with various walling & roofing options	M/s MGI Infra Pvt. Ltd. 7/18 Nehru Enclave, New Delhi, India
19.	LGS Framing with various walling & roofing options	M/s RCM Prefab Pvt. Ltd 71, Mayfair Apartments, Mayfair Gardens, Haus Khas, New Delhi
20.	LGS Framing with various walling & roofing options	M/s Nipani Infra and Industries Pvt. Ltd. Nipani Industries , 2nd Floor Bhasin Arcade Main Road Gorakhpur, Jabalpur, India
21.	LGS Framing with Ecopanely boards as facing material made from agricultural wastes	M/s Strawcture Eco 52, Hari Om Nagar Colony , Phase-Ii Civil Lines, Goakhpur, India
22.	LGS Framing with walling as Lightweight concrete (Cement, sand, EPS & proprietary additive) mixed with water & poured between V Premium boards (Autoclaved Cement fibre boards) as facing sheet & various roofings	M/s Visakha Industries Ltd. A-14, I Floor, Sector-10, Noida, Noida, India
23.	Prefabricated steel structural system with Dry wall system as AAC panels, Puf panels etc	M/s RCC Infra Ventures Ltd. 14 Gf, Vipul Agora, Mg Road, Gurugram, India
24.	Hot rolled steel frame with speed floor	M/s Jindal Steel & Power Ltd. Plot no.2, Sector 32, Gurgaon,122001, Gurgaon, India
25.	Hot rolled steel section with AAC Panels as floor & slab	M/s HIL Ltd. A-76, Suraksha Building, 2nd Floor, Sector 4,, Noida, India
26.	AAC wall and roof panel system to provide integrated solution. AAC products are reinforced and used in both load and non-load bearing applications.	M/s Biltech Building Elements Ltd 71 & 83 Okhla Industrial Estate Phase III , Delhi, India
27.	AAC Panels are Wire mesh/ steel reinforced for use as wall & slab. Appears to be non load bearing panels to be used with structural framing.	M/s SCG International India Pvt Ltd Unit No. 609, 6th Floor, Emaar Palm Spring Plaza, Golf Course Road, Gurugram, India

S. No.	Technology	Company
28.	Precast Light Weight Hollow-core wall Panel is a non-structural construction material with framed structures.	M/s Pioneer Precast Solutions Private Limited Greenways Towers, 2nd Floor, No.119, St.Mary', Chennai, India
D. Prefabricated Sandwich Panel System (9)		
29.	Reinforced Expanded Polystyrene sheet core with sprayed concrete as wall & slab	M/s Worldhaus 301, SLV Heights , DNP Layout, Bangalore, India
30.	EPS Cement sandwich Panel): wall & slab with EPS Cement sandwich Panel to be used with RCC or Steel structural frame.	M/s Bhargav Infrastructure Pvt.Ltd B-2/20Hojiwala Ind Est Sachin Palsana Road, Surat, India
31.	EPS Cement sandwich Panel): wall & slab with EPS Cement sandwich Panel to be used with RCC or Steel structural frame. Load bearing upto G+1 storey	M/s Rising Japan Infra Private Limited I-203, Som Vihar, R. K. Puram, New Delhi, India
32.	Reinforced Expanded Polystyrene sheet core with sprayed concrete as wall & slab	M/s Bau Panel Systems India Pvt Ltd, 42, 4th floor, Vigyan lok, Delhi, India
33.	Reinforced Expanded Polystyrene sheet core with sprayed concrete as wall & slab	M/s BK Chemtech Engineering 1 Jeremiah Road, Frazer town, Bangalore, India
34.	Reinforced Expanded Polystyrene sheet core with sprayed concrete as wall & slab	M/s MSN Construction No 666, 47th Street, 9th Sector, K K Nagar, Chennai, India
35.	Reinforced Expanded Polystyrene sheet core with sprayed concrete as wall & slab	M/s Beardshell Ltd. 114, Jyotishikhar Building, 8 Distt Centre, Janakpuri, New Delhi, India
36.	Pre-fab PIR (Poly-isocyanurate) based Dry Wall Panel System" as non-load bearing wall.	M/s Covestro India Pvt. Ltd. Plot 1A, Udyog Kendra, Ecotech III, Greater Noida, India
37.	Sandwich panels as wall & slab	M/s Project Etopia Group United Kingdom
E. Monolithic Concrete Construction (9)		
38.	Aluminium form work system for Monolithic Concrete construction	M/s Maini Scaffold Systems Pvt. Ltd. B1/A-21, Mohan Co-operative Industrial Estate, Mathura Road, New Delhi , Delhi, India
39.	Aluminium form work system for Monolithic Concrete construction	M/s KumkangKind India Pvt. Ltd 304, Jmd Regent Square, Mg Road, Gurgaon, India
40.	Aluminium form work system for Monolithic Concrete construction	M/s S-form India Pvt. Ltd. Unit No 323, 3rd Floor, Tower B4, Spazeit Park, Sohna Road, Sector 49, Gurugram, India
41.	Aluminium form work system for Monolithic Concrete construction	M/s ATS Infrastructure Ltd. Plot Number 16, Sector 135, Noida, India
42.	Monolithic Concrete construction using MIVAN technology	M/s Innovative housing & Infrastructure Pvt. Ltd., PCL House- SCO 198, Sector 7C, New Chandigarh, Chandigarh, India
43.	Aluminium form work system for Monolithic Concrete construction	M/s MFS formwork Systems Pvt. Ltd. A1/268 1st Floor Indusand Bank Neelam Bata Road, NIT Faridabad, Faridabad, India
44.	Aluminium form work system for Monolithic Concrete construction	M/s Knest Manufacturers LLP. Khanna House, Plot 39 & 40, Nehru nagar, pimpri., Pune, India
45.	'Tunnel form' construction technology, an cast in situ RCC system, based on the use of high-precision, re-usable, room-sized, steel forms or moulds for monolithic concrete construction	M/s Outinord Formworks Pvt. Ltd. Gate No. 628, 629, Tal Khed Kuruli Chakan, Pune, India

S. No.	Technology	Company
46.	Aluminium form work system for Monolithic Concrete construction	M/s Brilliant Etoile Information Not Provided
F. Stay In Place Formwork System (8)		
47.	Expanded-Steel Panel reinforced with all-galvanised Steel Wire-Struts serving both as the load-bearing steel structure and as the stay-in-place steel formwork filled with EPS-alleviated concrete.	M/s JK Structure 59 Hyde Park Gate, London, United Kingdom, Pincode : SW75ED
48.	Factory made prefab Glass fibre reinforced Gypsum cage panels suitable for wall & slab with reinforcement & concrete as infill as per the requirement.	M/s FACT RCF Building Products Limited, FRBL, Fact Cd Campus, Ambalamedu Post, Kochi, Kerala, India
49.	Structural Stay In Place Galvanized Steel formwork system for walling with the same bottom single layer formwork for slabs/ in-situ slab	M/s Coffor Construction Technology Pvt. Ltd., Chandan Metal Compound,Near Gorwa BIDC,Gorwa,Vadodara,Gujarat, India
50.	Factory produced PVC Stay in place formwork with concrete & reinforcement in walling units with cast in-situ RCC Slab.	M/s Joseph Jebastin (Novel Assembler Private Limited), 1418 B-Wing, Dalamal Tower, F.P. Journal Marg, Nariman Point, Mumbai City, India
51.	Fully load bearing walls with 150 mm monolithic concrete core sandwiched inside two layers of EPS as walling.	M/s Reliable Insupack Building Solutions Sector-82, Noida, India
52.	Ready to use Stay in place polymer formwork, light weight, with flooring slab (combination of ferro cement and natural stone) placed on RCC precast joists)	M/s Kalzen Realty Pvt. Ltd 2-22-223/1/G1 Aruna Co-Op Society,Hyderabad, India
53.	FastBloc, Insulated Concrete Form (ICF), acts as formwork for concrete and rebar, Coloumn/ post and beam construction, creating an strong skeleton in the walls.	M/s Fastbloc Building Systems 48 Tapadero Lane, Las Vegas, United States, Pincode : 89135
54.	Formwork system "Plaswall" with Two fibre cement boards (FCB) & HIMI (High Impact Molded Inserts) bonded between two sheets of FCB in situ and erected to produce a straight-to-finish wall with in-situ concrete.	M/s FTS Buildtech Pvt.Ltd 302, Vishakha Arcade, Opp. Courtyard Hotel, Off Veera Desai Road, Andheri West, Mumbai, India

These systems are being used world over successfully and now most of the States/UTs along with govt. agencies & departments, construction agencies, development authorities & housing boards have shown interest & are adopting them. About 15+ lakhs houses are being constructed with emerging construction systems in India under PMAY-U and other state-run schemes.

Ministry of Housing & Urban Affairs, Government of India also organised Indian Housing Technology Mela (IHTM) as part of New Urban India Conference cum Expo during 5th-7th October 2021 in Lucknow, Uttar Pradesh. The objective of the Mela was to provide a platform for indigenous and innovative building materials, components, tools & equipment, construction processes and technologies that are sustainable and suitable for construction of low and medium rise (upto G+3 storey) houses for demonstration, cross learning, enabling better adoption, market linkages and achieving desired scale. The IHTM was inaugurated by Hon'ble Prime Minister of India. 84 innovative technologies/systems/products/materials/machinery were shortlisted during Indian Housing Technology Mela (IHTM). The details of these innovations can be assessed at https://ghtc-india.gov.in/IHTM.

Demonstration Housing Projects - at a glance

COMPLETED

Bhubaneshwar
Odisha
(PMAY(U) Beneficiaries)

Bihar Shariff
Bihar
(Sports Hostel & other social welfare activities)

Lucknow
Uttar Pradesh
(Rental basis for Hospital patients & their attendees)

Hyderabad
Telangana
(Training Hostel)

Nellore
Andhra Pradesh
(Social welfare activities)

Panchkula
Haryana
(Working women hostel)

Agartala
Tripura
(Old Age Home)

IN PROGRESS

Ahmedabad
Gujarat
(PMAY (U) Beneficiaries)

Bhopal
Madhya Pradesh
(Sports Hostel)

Guwahati
Assam
(Contractual Safai Karamcharis)

Ayodhya
Uttar Pradesh
(Destitute Widow Ashram and Orphanage)

Tiruppur
Tamil Nadu
(Working Women Hostel and Widow Home)

Dimapur
Nagaland
(Working Women Hostel)

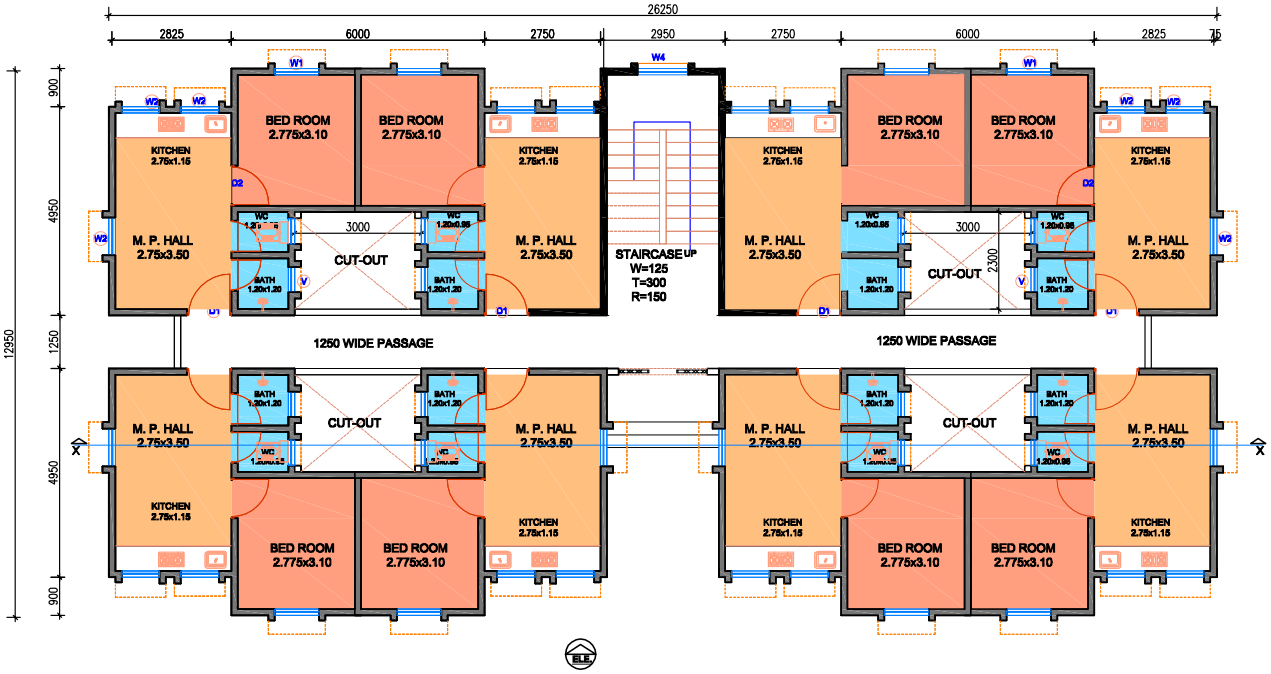
Jammu
Jammu & Kashmir
(Sports Hostel)

DHP AT BHUBANESWAR, ODISHA

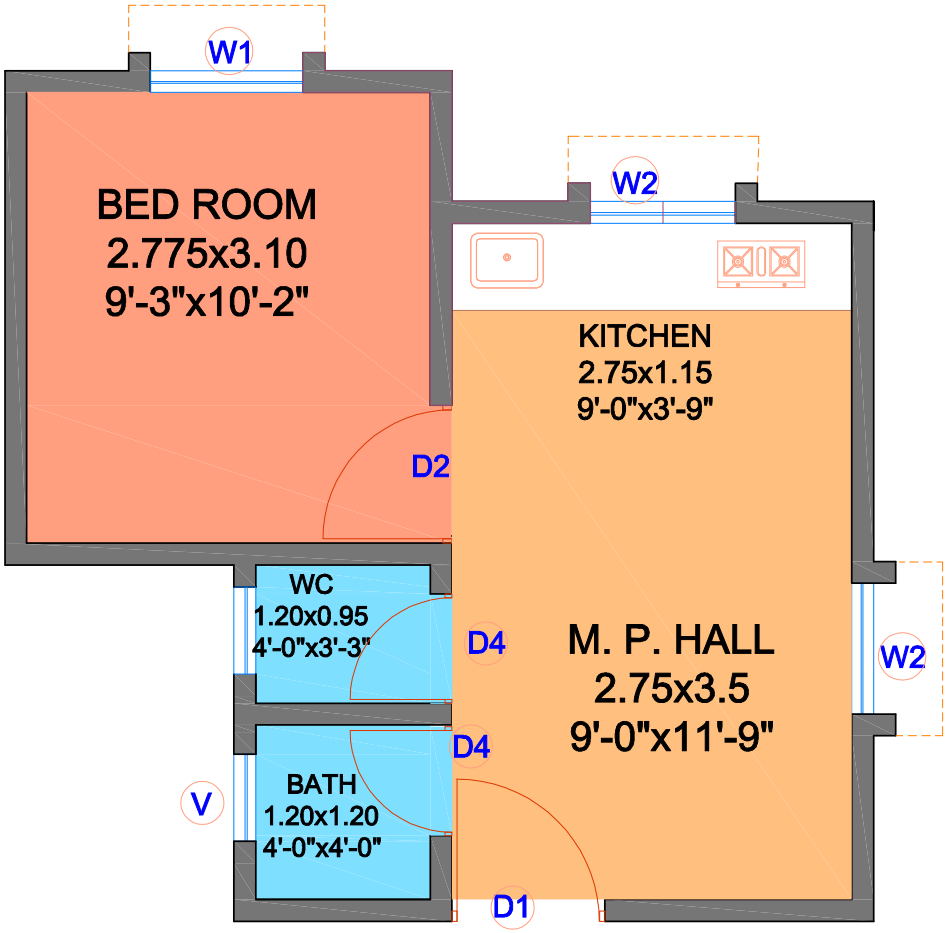
The Housing & Urban Development Department, Government of Odisha through Bhubaneswar Development Authority (BDA) allotted 0.43 acres land for construction of Demonstration Houses at Chandrashekharpur, Bhubaneshwar, Odisha. The technology used is PREFABRICATED SANDWICH PANEL SYSTEM - Reinforced Expanded Polystyrene sheet core with sprayed concrete for wall & slab. The plan, sections, layout plan of Demonstration Housing Project were approved by Bhubaneswar Development Authority (BDA). BMTPC has completed construction of 32 Demonstration Houses (G+3).

Besides Pradhan Mantri Awas Yojana (Urban), the other Partnering & Funding agencies for the project were Department For International Development (DFID) & National Housing Bank (NHB). DFID and NHB are working on "Making affordable housing market work for faster & sustained economic growth" in eight identified low income States in India and one of the strategies is to test innovative technologies and approaches for Green construction. Under this strategy, NHB and DFID have become partners with BMTPC in Demonstration Housing Project implemented in Odisha and provided partial financial support.

Layout Plan



Typical Floor Plan



Unit Plan

Project Profile

- Location: Chandrashekharpur, Bhubaneshwar, Odisha
- State Level Nodal Agency : Housing & Urban Development Department, Government of Odisha
- Land Allotted by: Bhubaneswar Development Authority (BDA)
- Usage : PMAY(U) Beneficiaries
- Plot area of project : 1023 sqm.
- No. of houses : 32 (G+3)
- Carpet area of each unit : 23.97 sqm.
- Built up area of each unit : 34.10 sqm.
- Total built up area : 1095 sqm.
- Technology Used: PREFABRICATED SANDWICH PANEL SYSTEM - Reinforced Expanded Polystyrene sheet core with sprayed concrete
- Each Unit consists of One living room, one bedroom, cooking space, Bath and WC.
- Includes Earthquake Resistant Features.
- Infrastructure facilities : Pathways with concrete pavers, boundary wall, water supply work, horticulture work, UGT, septic tank, drainage & disposal and external electrification using solar panels, rain water harvesting, etc.
- Year of completion : December 2017
- Cost per sqft. without infrastructure : Rs.1442
- Cost per sqft. with infrastructure : Rs.1494

About the Technology

Expanded Polystyrene (EPS) core Panel system is a modern, efficient, safe and economic construction system for the construction of buildings. These panels can be used both as load bearing as well as non-load bearing elements. The light weight panels have a sandwich construction with expanded polystyrene as core and self-compacting concrete skins.

The EPS panels consist of a 3-dimensional welded wire space frame utilizing a truss concept for stress transfer and stiffness. EPS panel includes welded reinforcing meshes of high-strength wire, diagonal wire and self-extinguishing expanded polystyrene uncoated concrete, manufactured in the factory and shotcrete is applied to the panel assembled at the construction site, which gives the load bearing capacity to the structure.

EPS panels after shotcrete have the following five components:

- The outer layer of shotcrete,
- Welded reinforcing mesh of high tension GI wire
- The core of expanded polystyrene sheet
- Diagonal wire (stainless or galvanized wire)
- The inner layer of shotcrete.

In this project, EPS panel have been used as infill panels in RCC framed structure. The thickness of EPS panel is 80mm and 40mm shotcreting/plaster on both side of wall.

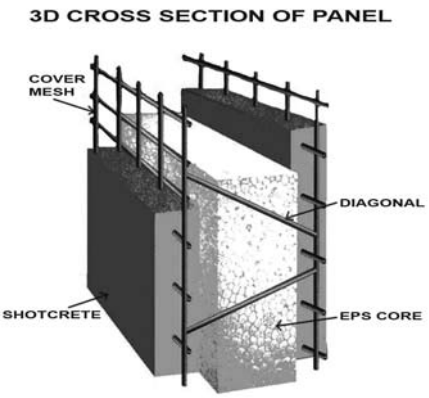
Technologies/Specifications for Demonstration Houses

Foundation

- Isolated Column foundation

Structural System

- RCC framed structure
- Expanded Polystyrene Core Panel System with Sprayed Concrete Structural Plaster for wall/slab/ roof



Door frames & Doors

- Pressed Steel Door Frame with flush door shutter
- PVC door frame & shutter in toilet

Window frames

- MS Section window frame with guard rail and glazed shutter

Flooring

- Ceramic tile flooring in rooms
- Ceramic tile flooring in WC & Bath
- Kota stone flooring in passage and stair-case

Kitchen Counter

- RCC cooking counter top with marble

Wall finishes

- Oil bound distemper on internal walls
- Weather resistant paint on external walls

Others

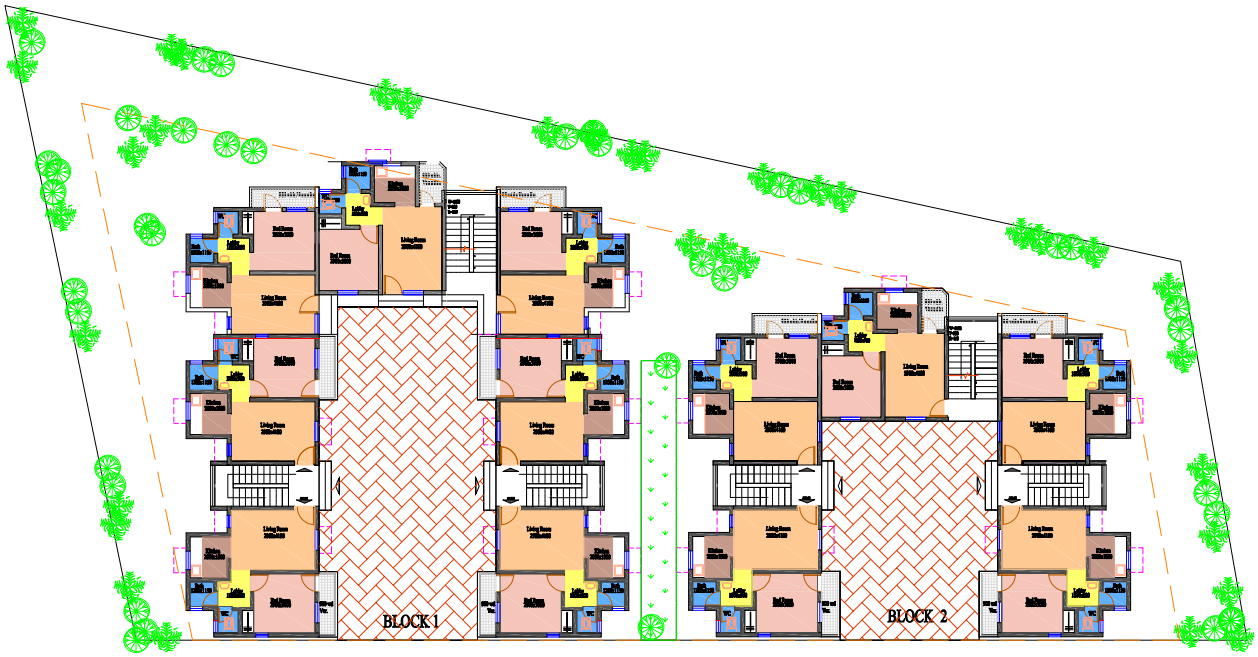
- Common area and outside building lighting with solar panels
- Pathways with concrete pavers

The structural design of the DHP has been vetted by NIT Warangal and technical evaluation of the project was carried out by School of Planning & Architecture, New Delhi.

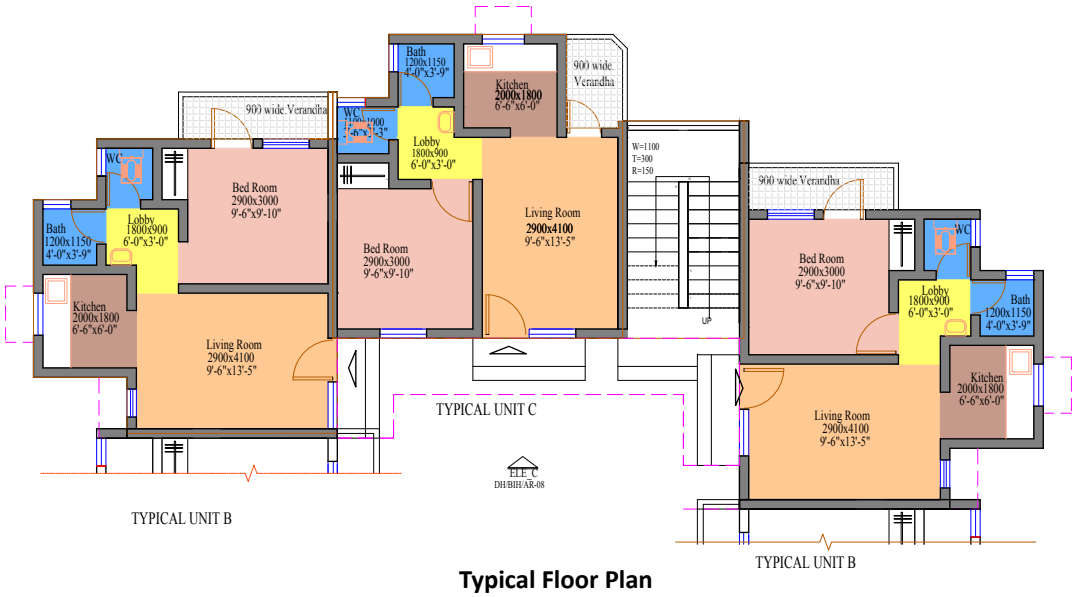
DHP AT BIHARSHARIFF, BIHAR

The Urban Development & Housing Department, Govt. of Bihar through Biharsharif Nagar Nigam allotted land measuring 1350 sqm. for the Demonstration Housing Project in Biharsharif. The technology, plan, sections, layout plan of Demonstration Housing Project were approved by Biharsharif Nagar Nigam. BMTPC has completed construction of 36 Demonstration Houses (G+2) using emerging technology namely, STAY IN PLACE FORMWORK SYSTEM - Structural Stay In Place Steel Formwork System.

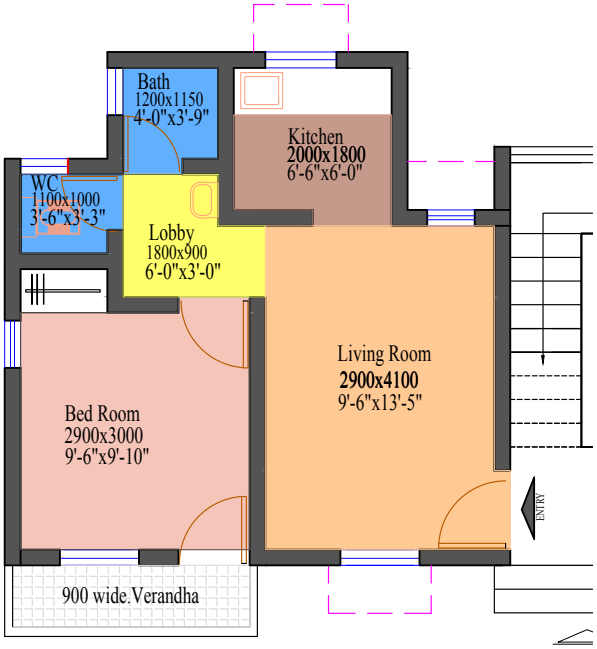
Besides Pradhan Mantri Awas Yojana (Urban), the other Partnering & Funding agencies for the project are Department For International Development (DFID) & National Housing Bank (NHB).



Layout Plan



Typical Floor Plan



Unit Plan

Project Profile

- Location: Sohan Kuan, Mauza Chakhajiyan, Biharshariff, Bihar
- State Level Nodal Agency : Urban Development & Housing Department, Govt. of Bihar
- Land Allotted by: Biharsharif Nagar Nigam
- Usage : Sports Hostel & other social welfare activities
- Plot area of project : 1353 sqm.
- No. of houses : 36 (G+2)
- Carpet area of each unit : 29.67 sqm.
- Built up area of each unit : 46.65 sqm.
- Total built up area : 1640 sqm.
- Technology Used: STAY IN PLACE FORMWORK SYSTEM - Structural Stay In Place Steel Formwork System
- Each Unit consists of One living room, one bedroom, kitchen, Bath, WC and balcony.
- Includes Earthquake Resistant Features.
- Infrastructure facilities : Pathways with concrete pavers, CC road, boundary wall, septic tank, water supply work, tube well, horticulture work, UGT, drainage & disposal and external electrification using solar panels, rain water harvesting, etc.
- Year of completion : January 2019
- Cost per sqft. without infrastructure : Rs.1645
- Cost per sqft. with infrastructure : Rs.1895

About the Technology

This patented structural stay in place formwork system is known as 'Coffor' to build load bearing monolithic concrete wall structures based on shear wall concept. The formwork system comprises of two filtering grids made of rib mesh reinforced by 'C' channel vertical stiffeners. The grids are connected by rebar which act as horizontal stiffeners and connector which act as a shear link. The grids on both faces act as sacrificial formwork in which concrete is poured in-situ.

After the erection of formwork panels in alignment, corners, edges of doors and windows frame are closed with rebar positioning & concrete of required grade is poured in the panels. The concreting is done with a pump, bucket or with a shovel loader. The inside and outside walls are finished with cement plaster of suitable grade. The panels are prefabricated according to a structural plan (based on architectural plans) designed by structural engineers.

In this project, this system has been used as load bearing panels with infill of cement concrete. The thickness of panel is 140mm and 20mm cement plaster on both side of wall.

Technologies/Specifications for Demonstration Houses

Foundation

- Isolated column foundation

Wall/Slab/Roof

- Structural Stay-in-Place CR Steel Specially Designed Formwork System (Coffor) for walls (load bearing) with infill of concrete
- RCC Slab

Door frames & Doors

- Pressed Steel Door Frame instead of wood

- Flush door shutters as wood substitute
- PVC door frame & shutter in toilet

Window frames

- MS Section window frame with guard rail and glazed shutter

Flooring

- Ceramic tile flooring in rooms
- Ceramic tile flooring in WC & Bath
- Kota stone flooring in passage and staircase

Kitchen Counter

- RCC cooking counter top with marble and steel sink

Wall finishes

- Oil bound distemper on internal walls
- Weather resistant paint on external walls

Others

- Pathways with concrete pavers
- Boundary wall

The structural design of the DHP has been vetted by IIT Mumbai and technical evaluation of the project was carried out by Indian Institute of Technology (IIT), Roorkee.

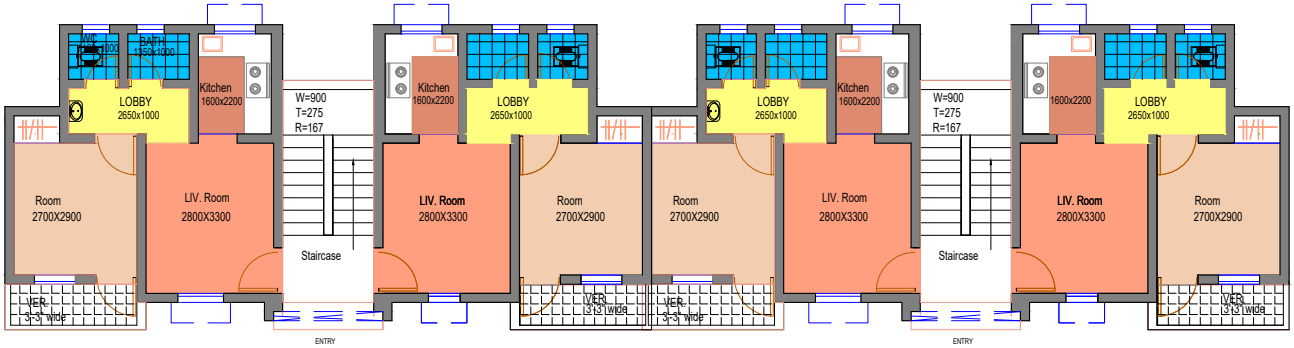

BLOCK A

DHP AT LUCKNOW, UTTAR PRADESH

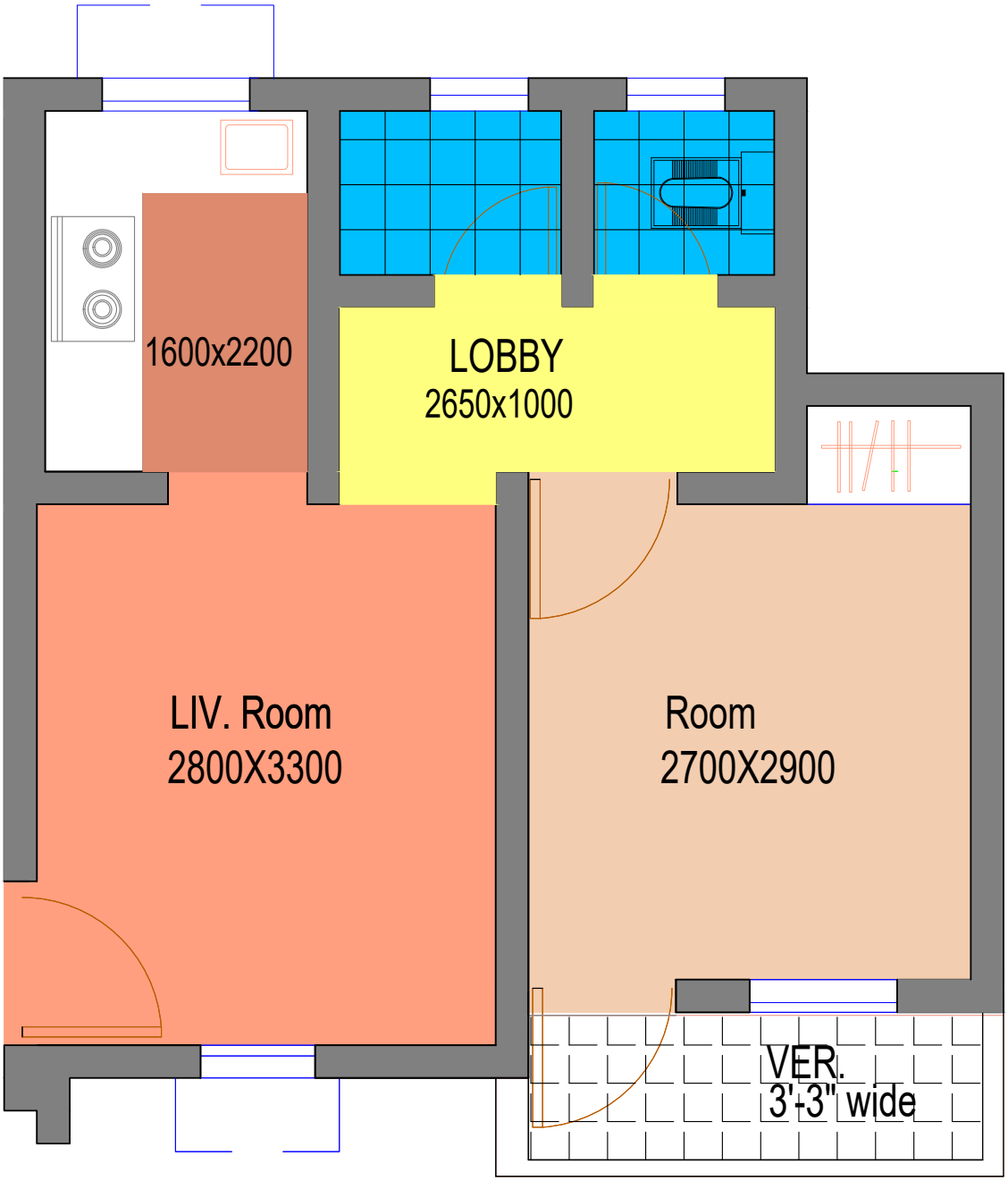
State Urban Development Agency (SUDA), Lucknow through Nagar Nigam Lucknow allotted 0.385 hectare of land at Aurangabad Jagir, Tehsil Sarojini Nagar, Lucknow for Demonstration Housing Project. The Building Plan, Sections and Layout Plan of Demonstration Housing Project was approved by Nagar Nigam Lucknow. The demonstration housing project consists of 40 Demonstration Houses (G+1) using emerging technology STAY IN PLACE FORMWORK SYSTEM- Stay in place EPS based double walled panel system with infill concrete has been completed.

The DHP was undertaken as part of PMAY(U). The Department For International Development (DFID) & National Housing Bank (NHB) are other Partnering & Funding agencies for the project.

Layout Plan



Typical Floor Plan



Unit Plan

Project Profile

- Location: Aurangabad Jagir, Tehsil Sarojini Nagar, Lucknow
- State Level Nodal Agency : State Urban Development Agency
- Land Allotted by: Nagar Nigam Lucknow
- Usage : Hospital Patients and their attendees
- Plot area of project : 3850 sqm.
- No. of houses : 40 (G+1)
- Carpet area of each unit : 26.40 sqm.
- Built up area of each unit : 40.31 sqm.
- Total built up area : 1612 sqm.
- Technology Used: STAY IN PLACE FORMWORK SYSTEM- Stay in place EPS based double walled panel system with infill concrete
- Each Unit consists of One living room, one bedroom, kitchen, Bath, WC and balcony.
- Includes Earthquake Resistant Features.
- Infrastructure facilities : CC Road, pathways with concrete pavers, boundary wall, water supply work, UGT, septic tank, horticulture work, drainage & disposal and external electrification using solar panels, rain water harvesting, electric sub-station, etc.
- Year of completion : December 2018
- Cost per sqft. without infrastructure : Rs.1620
- Cost per sqft. with infrastructure : Rs.2080

About the Technology

Sismo Building Technology is an insulating shuttering kit for whole building based on a three-dimensional lattice made of galvanized steel wire. The lattice is filled with materials of different nature to serve as formwork. The basic structure of the Sismo building module is steel wire lattice. At the exterior sides of the lattice, infill panels are inserted, which transform the lattice into a closed structure that can be filled with concrete. The type of infill panels used depends on the purpose of the wall: load bearing or non-load bearing, insulated or otherwise, etc. The steel wire also acts as armature and anchoring for the finished material and it holds reinforcement bars in place during concrete filling. The various components of the system are 3D lattice, infill panels, structural filler and finishing. This technology was initially developed in Belgium.

In this project, this system has been used as load bearing panels with infill of cement concrete. The thickness of panel is 200mm and 20mm cement plaster on both side of wall. The thickness of roof slab is 120mm with micro beams.

Technologies/Specifications for Demonstration Houses

Foundation

- RCC strip foundation

Wall/Slab/Roof

- Stay in Place EPS based Double Walled Panel System (Sismo) for wall(load bearing)/slab/roof

Door frames & Doors

- Pressed Steel Door Frame instead of

wood
- Flush door shutters as wood substitute
- PVC door frame & shutter in toilet

Window frames
- MS Section window frame with guard rail and glazed shutter

Flooring
- Ceramic tile flooring in rooms
- Ceramic tile flooring in WC & Bath
- Kota stone flooring in passage and stair-case

Kitchen Counter
- RCC cooking counter top with marble and steel sink

Wall finishes
- Oil bound distemper on internal walls
- Weather resistant paint on external walls

The structural design of DHP has been vetted by IIT Roorkee and technical evaluation of the project was carried out by Indian Institute of Technology (IIT), Kanpur.

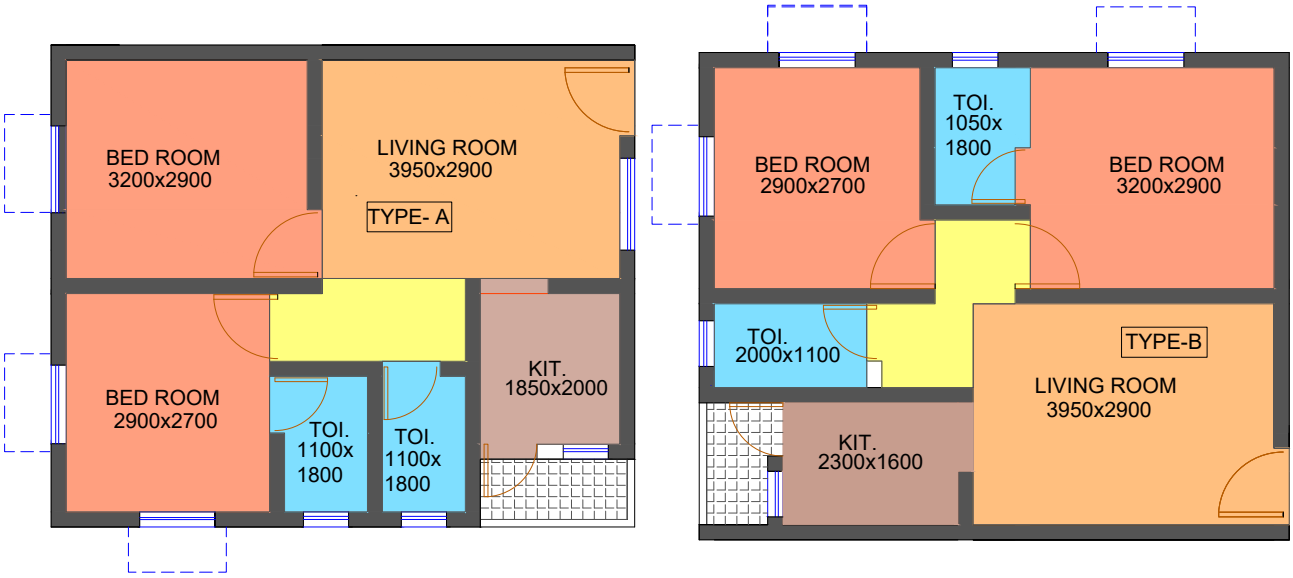
DHP AT HYDERABAD, TELANGANA

The Telengana State Mission for Elimination of Poverty in Municipal Areas (TMEPMA) through Telengana State Housing Corporation Limited (TSHCL), Hyderabad allotted 1085 sq.mts. of land at Nirmithi Kendra, Gachibowli, Hyderabad for the Demonstration Housing Project. The Plans, Sections and Layout Plan of Demonstration Housing Project were approved by TSHCL.

In order to demonstrate different emerging technologies, the Council constructed, two blocks for 32 Demonstration Houses (G+3) using two different technologies i.e (i) STAY IN PLACE FORMWORK SYSTEM - Structural Stay In Place Steel Formwork System (16 houses) and (ii) LIGHT GAUGE STEEL STRUCTURAL SYSTEM (16 houses) under this project as part of PMAY(U).

Layout Plan

Typical Floor Plan



Unit Plan - Type A **Unit Plan - Type B**

Project Profile

- Location: Nirmithi Kendra, Gachibowli, Hyderabad
- State Level Nodal Agency : Telengana State Mission for Elimination of Poverty in Municipal Areas (TMEPMA)
- Land Allotted by: Telengana State Housing Corporation Limited (TSHCL)
- Usage : Training Hostel
- Plot area of project : 1085 sqm.
- No. of houses : 32 (G+3)
- Carpet area of each unit : 38.74 sqm. (Type A), 39.50 sqm. (Type B)
- Built up area of each unit : 53.18 sqm. (Type A), 53.10 sqm. (Type B)
- Total built up area : 1702 sqm.
- Technology Used: (i) STAY IN PLACE FORMWORK SYSTEM - Structural Stay In Place Steel Formwork System (16 houses) and (ii) LIGHT GAUGE STEEL STRUCTURAL SYSTEM (16 houses)
- Each Unit consists of One living room, two bedroom, kitchen, two Bath & WC and balcony.
- Includes Earthquake Resistant Features.
- Infrastructure facilities : CC Road, pathways with concrete pavers, water supply work, UGT, septic tank, horticulture work, drainage & disposal and external electrification using solar panels, rain water harvesting, etc.
- Year of completion : January 2019
- Cost per sqft. without infrastructure : Rs.1633
- Cost per sqft. with infrastructure : Rs.1861

About the Technologies

Structural Stay In Place Steel Formwork System

This patented structural stay in place formwork system is known as 'Coffor' to build load bearing monolithic concrete wall structures based on shear wall concept. The formwork system comprises of two filtering grids made of rib mesh reinforced by 'C' channel vertical stiffeners. The grids are connected by rebar which act as horizontal stiffeners and connector which act as a shear link. The grids on both faces act as sacrificial formwork in which concrete is poured in-situ.

After the erection of formwork panels in alignment, corners, edges of doors and windows frame are closed with rebar positioning & concrete of required grade is poured in the panels. The concreting is done with a pump, bucket or with a shovel loader. The inside and outside walls are finished with cement plaster of suitable grade. The panels are prefabricated according to a structural plan (based on architectural plans) designed by structural engineers.

Light Gauge Steel Structural System

Light Gauge Steel Framed Structures (LGSF) is based on factory made galvanized light gauge steel components, designed as per codal requirements. The system is produced by cold forming method and assembled as panels at site forming structural steel framework of a building of varying sizes of wall and floor. The assembly is done using special types of screws and bolts. LGSF is a well-established technology for residential construction in North America, Australia and Japan and is gaining ground in India.

LGSF is typically ideal for one to three storey high buildings, especially for residential and commercial buildings. Due to its flexibility, fast construction and durability, this technology has great potential for counties like India. LGSF can be combined with composite steel / concrete deck resting on light steel framing stud walls.

In this project, these systems have been used as load bearing wall panels. The thickness of structural stay in place formwork panel is 160mm with infill of cement concrete and

15mm cement plaster on both side of wall. The single panel roof slab of structural stay in place formwork panel is used in roof slab with 120mm thickness of concrete. The total thickness of wall in case of LGSF system is 124mm having 89mm thickness of LGSF and 9mm & 6mm thick fibre cement board with vapour barrier on outside wall and 8mm thick fibre cement board with 12mm gypsum board inside of wall. Rockwool have been used as infill material.

Technologies/Specifications for Demonstration Houses

Foundation

- RCC strip & Coffor wall foundation

Wall/Slab/Roof

- Structural stay in place CR steel specially designed formwork system
- Light Gauge Steel Structural System (LGSF)
- RCC slab & LGSFS slab with concrete screed

Door frames

- Pressed Steel Door Frame instead of wood
- Flush door shutters as wood substitute
- PVC door frame & shutter in toilet

Window frames

- MS Section window frame with guard rail and glazed shutter

Flooring

- Ceramic tile flooring in rooms
- Ceramic tile flooring in WC & Bath
- Kota stone flooring in passage & staircase

Kitchen Counter

- RCC cooking counter top with marble

Wall finishes

- Oil bound distemper on internal walls
- Weather resistant paint on external walls

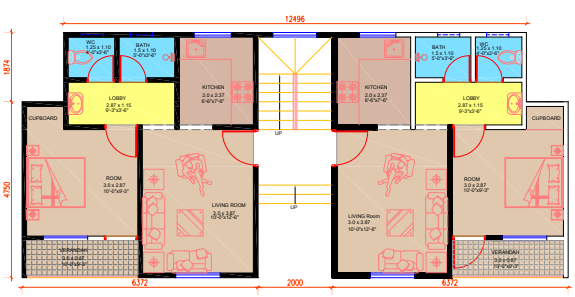
The structural design of DHP has been vetted by IIT Mumbai (Coffor) & IIT Madras (LGSF) and technical evaluation of the project was carried out by Indian Institute of Technology (IIT), Hyderabad.

DHP AT NELLORE, ANDHRA PRADESH

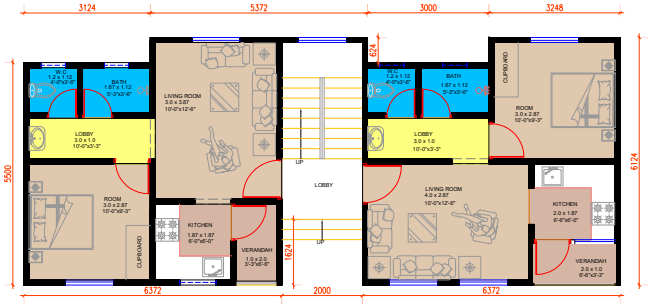
The District Magistrate and Collector, SPS Nellore, Government of Andhra Pradesh allotted land admeasuring 1.85 acres for construction of 36 Demonstration Houses and a Demonstration Community Building at Saraswathi Nagar, Chowtapalem Village, Venkatachalam Mandal, SPS Nellore District on the request of Andhra Pradesh State Housing Corporation.

The project was undertaken in association with IIT Madras, FRBL and Andhra Pradesh State Housing Corporation Ltd. using STAY IN PLACE FORMWORK SYSTEM - Glass Fibre Reinforced Gypsum Panel (GFRG) technology for houses and flyash blocks with filler slabs for community building. The designs of the houses were vetted by IIT Madras and the execution for 36 houses was undertaken by FRBL Kochi, a Govt. of India undertaking. The construction of Community Centre building was undertaken by Andhra Pradesh State Housing Corporation Ltd. The IIT Madras was involved right from the planning and designing of the project to capacity building till completion of the project.

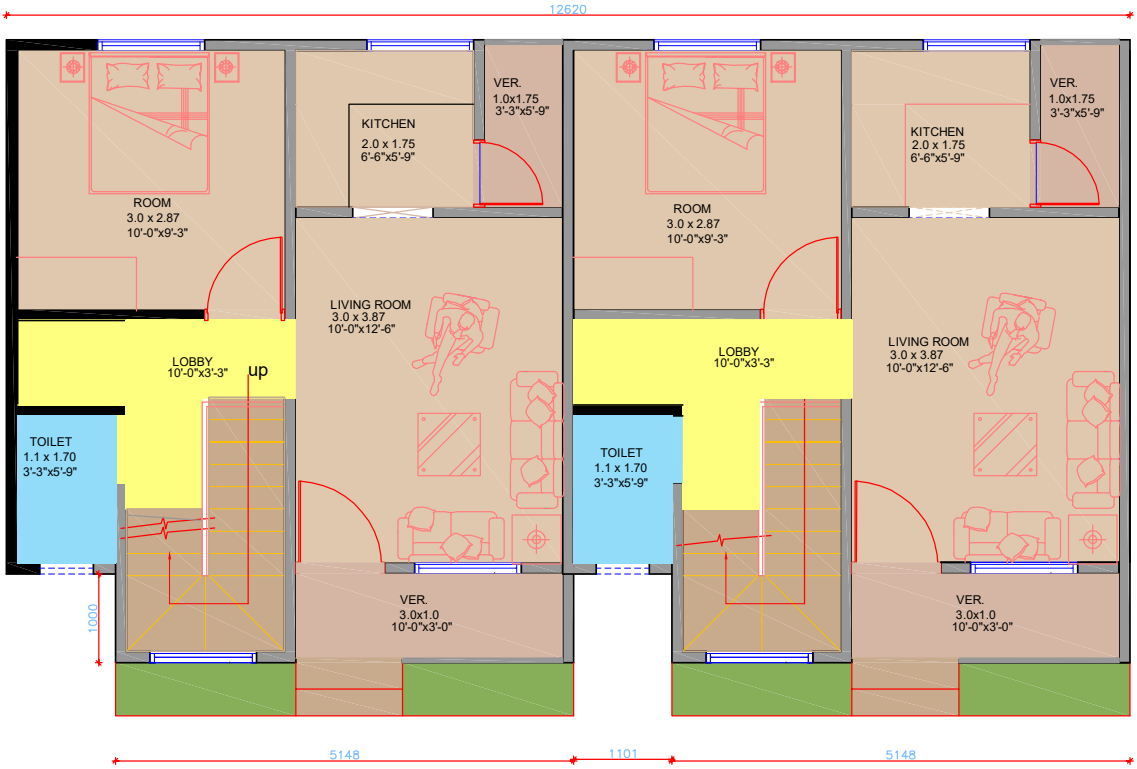
Layout Plan



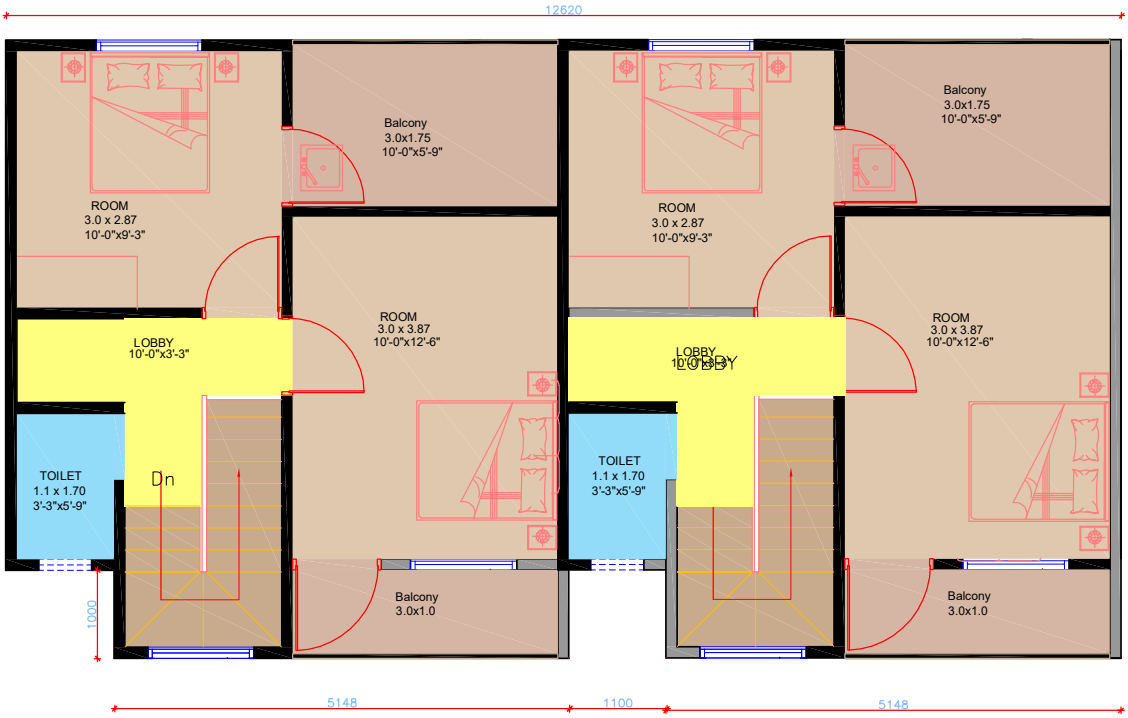
Typical Floor Plan - Type A



Typical Floor Plan - Type B



Ground Floor Plan - Type C



First Floor Plan - Type C

A. HOUSING UNITS

- Location: Saraswathi Nagar, Chowtapalem Village, Venkatachalam Mandal, SPS Nellore District
- State Level Nodal Agency : Andhra Pradesh State Housing Corporation
- Land Allotted by: Revenue Deptt., SPS Nellore, Government of Andhra Pradesh
- Usage : Training Centre
- Plot area of project : 7487 sqm.
- No. of houses : 36 (G+1)
- Carpet area of each unit : 31.061 sqm. (Type A-16 DUs), 29.39 sqm. (Type B-16 DUs) 56.74 sqm. (Type C-4 DUs)
- Built up area of each unit : 45.51 sqm. (Type A), 42.24 sqm. (Type B), 77.86 sqm. (Type C)
- Total built up area : 1791 sqm. for houses and 641 sqm. for community building
- Technology Used: STAY IN PLACE FORMWORK SYSTEM - Glass Fibre Reinforced Gypsum Panel (GFRG) technology for houses and flyash blocks with filler slabs for community building
- Each Unit consists of

  Type A & B Unit consist of : Living room, Bedroom, Kitchen, Bath, WC and Balcony

  Type C Unit consist of : Living room, 3 Bedroom, Kitchen, 2 WC & Bath and Balcony & Terrace
- Includes Earthquake Resistant Features.
- Infrastructure facilities : CC Road, pathways with concrete pavers, water supply work, UGT, septic tank, horticulture work, drainage & disposal, LED street lights and rain water harvesting, etc.
- Year of completion : September 2016
- Cost per sqft. without infrastructure : Rs.1693
- Cost per sqft. with infrastructure including community building : Rs.2364

About the Technology

Glass Fibre Reinforced Gypsum (GFRG) Panel also known as Rapidwall is made-up of calcined gypsum plaster, reinforced with glass fibers. The panel was originally developed by GFRG Building System Australia and used since 1990 in Australia for mass scale building construction. In recent times, these panels are being produced in India and the technology is being used in India.

GFRG is an integrated composite building system using factory made prefab load bearing cage panels and monolithic cast in-situ RC infilled for walling and floor/roof slabs, suitable for single storey to ten storey building. It is made of calcined gypsum plaster, reinforced with glass fibres and panels manufactured to a thickness of 124mm under carefully controlled conditions to a length of 12m and height of 3m, containing cavities. The cavities are filled with reinforced concrete or any other filler material as per design requirements. The panel are being produced at FRBL Kochi and RCF Mumbai and being promoted by IIT Madras.

In this project, the system have been used as load bearing wall panels. The thickness of GFRG panel is 125mm with infill of cement concrete. The GFRG panels with micro beams have been used for roof slab along with screed of concrete.

Technologies/Specifications for Demonstration Houses

Foundation

1. Isolated Column foundation

Walling

2. GFRG Panel filled with M20 concrete

Roof/Floor

3. GFRG Panel Slab for floor & roof

Doors/Windows

4. Wooden Door & Aluminum Window Frames

Flush door Shutter

5. PVC door and frames in toilet
6. Glazed aluminum windows

Flooring & Finishing

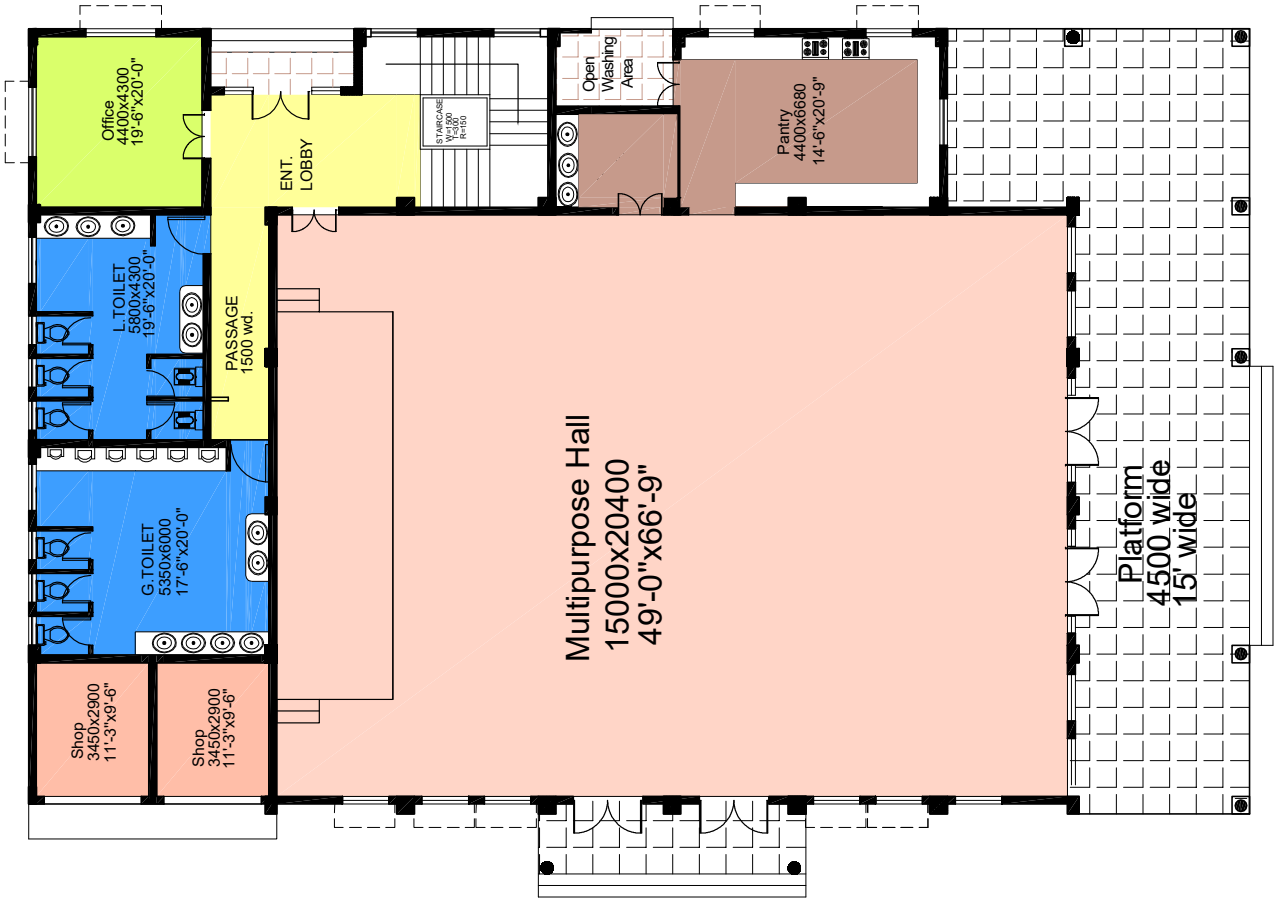
1. Ceremic tile flooring
2. Interlocking pavers block at entrance lobby
3. Oil bound distemper on internal surface
4. Exterior walls with weather proof paint

Staircase

1. GFRG Panel with polished cuddapa stone as tread and riser

B. COMMUNITY BUILDING

BMTPC, in continuation of its efforts to demonstrate cost effective and disaster resistant technologies, constructed Community Building having an area of 6900 sq.ft. using green technologies like flyash bricks, filler slabs, etc. The Community Building consists of a multi-purpose hall, kitchen/pantry area, office space, utility area, ladies and gents' toilets.



Layout Plan - Community Building

Technologies/Specifications for Community Building

Foundation

- Isolated Column foundation with grade beams

Walling

- 200 mm thick walls using Fly ash blocks

Roof/Floor

- Filler slab using earthen pots
- RCC Sloping roof over the courtyard and entrance lobby using designer tiles as cladding

Doors/Windows

- Aluminium Door & Window Frames
- Glazed aluminum door shutter
- PVC door and frames in toilet
- Glazed aluminum windows

Flooring & Finishing

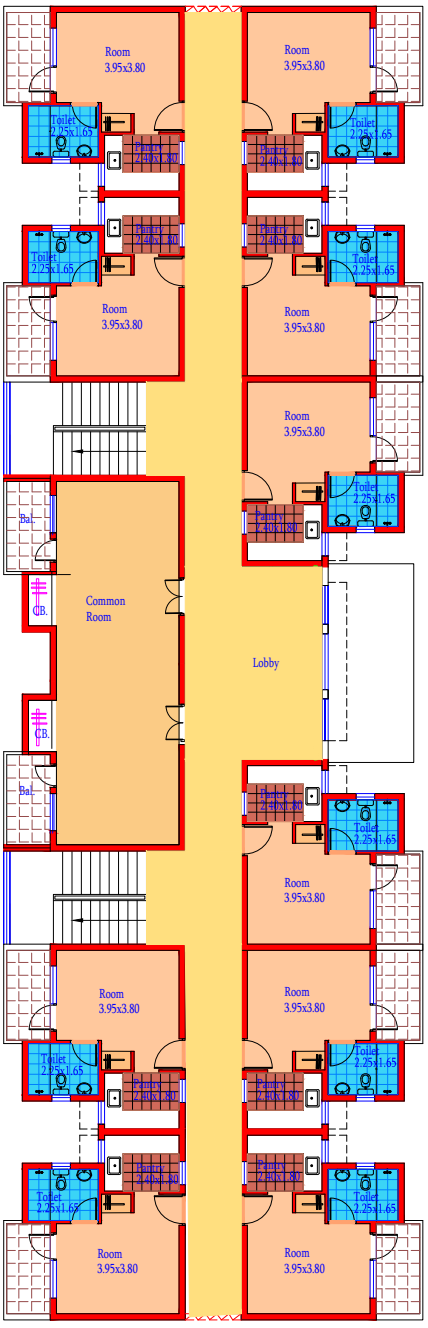
- Vitrified tiles flooring
- Interlocking pavers block in entrance lobby
- Oil bound distemper on internal plastered surface
- Exterior walls with weather coat paint

The vetting of structural design and technical evaluation of the project have been carried out by Indian Institute of Technology (IIT), Madras.

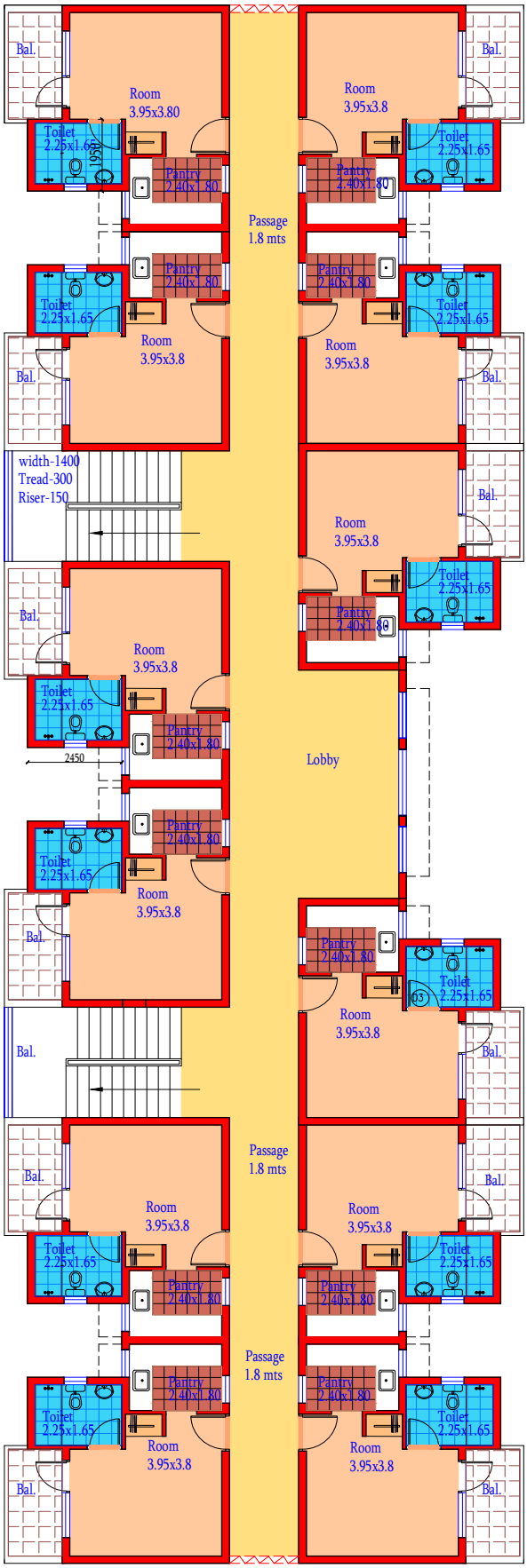
DHP AT PANCHKULA, HARYANA

State Urban Development Authority, Panchkula, Haryana allotted land measuring 1412 sqm. in Sector 27, Panchkula owned by Municipal Corporation, Panchkula for the construction of Demonstration Housing Project to be used for working women hostel. Municipal Corporation Panchkula approved plan of Working Women Hostel consisting of 40 units along with common area / Dining area, day care centre, care taker room etc. was finalized. The DHP is in G+3 configuration and constructed using LIGHT GAUGE STEEL STRUCTURAL SYSTEM - Light Gauge Steel Framework System (LGSF) with Cement Fibre board on both side of walls and infill of mineral wool.

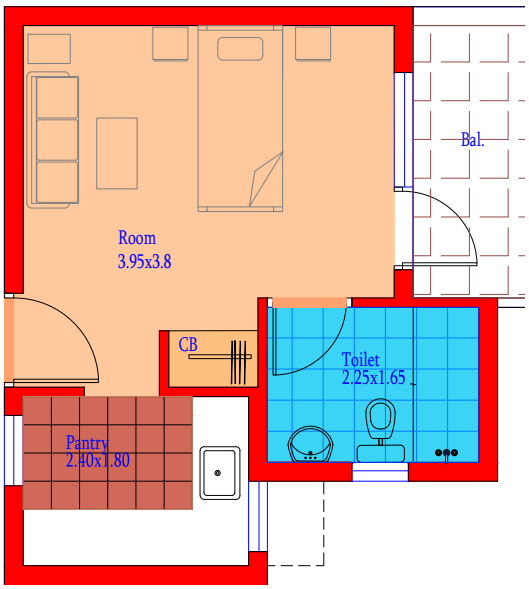
Layout Plan



First Floor Plan



Typical Floor Plan



Typical Unit Plan

Project Profile

- Location: Sector 27, Panchkula, Haryana
- State Level Nodal Agency : State Urban Development Authority, Panchkula
- Land Allotted by: Municipal Corporation, Panchkula
- Usage : Working Women Hostel
- Plot area of project : 1412 sqm.
- No. of houses : 40 (G+3); Other provisions includes Guest Room Medical Room, Care Taker Room, Daycare Centre, Common Room/Dining Room and Laundry.
- Carpet area of each unit : 26.57 sqm.
- Built up area of each unit : 31.51 sqm.
- Total built up area : 2016 sqm.
- Technology Used: LIGHT GAUGE STEEL STRUCTURAL SYSTEM
- Each Unit consists of One living room, pantry, combined Bath & WC and balcony.
- Includes Earthquake Resistant Features.
- Infrastructure facilities : CC Road, pathways with concrete pavers, water supply work, UGT, septic tank, horticulture work, boundary wall, drainage & disposal and external electrification using solar panels, rain water harvesting, fire fighting system, etc.
- Year of completion : May 2021
- Cost per sqft. without infrastructure : Rs.2199
- Cost per sqft. with infrastructure : Rs.2401

About the Technology

Light Gauge Steel Framed Structures (LGSF) is based on factory made galvanized light gauge steel components, designed as per codal requirements. The system is produced by cold forming method and assembled as panels at site forming structural steel framework of a building of varying sizes of wall and floor. The assembly is done using special types of screws and bolts. LGSF is a well-established technology for residential construction in North America, Australia and Japan and is gaining ground in India.

LGSF is typically ideal for one to three storey high buildings, especially for residential and commercial buildings. Due to its flexibility, fast construction and durability, this technology has great potential for counties like India. LGSF can be combined with composite steel / concrete deck resting on light steel framing stud walls.

In this project, the total thickness of wall is

124mm having 89mm thickness of LGSF and 9mm & 6mm thick fibre cement board with vapour barrier on outside wall and 8mm thick fibre cement board with 12mm gypsum board inside of wall. Mineral wool have been used as infill material.

Technologies/Specifications for Demonstration Houses

Foundation

- Isolated RCC column foundation with Plinth beam

Walling

- Light Gauge Steel Framework System (LGSFS) with Cement Fiber board on both side of walls and infill of mineral wool.

Floor Slabs/Roofing

- Light Gauge Steel roof truss with MS deck sheeting resting on web joist and concrete screed with false ceiling of gypsum board.

Door frame/shutters:

- Pressed steel door frame with flush shutters
- PVC door frame with PVC Shutters in toilets.

Window Fame/ Shutter:

- uPVC frame with glazed panel and wire mesh shutters.

Flooring:

- Vitrified tile flooring in Rooms & Kitchen
- Anti-skid ceramic tiles in bath & WC
- Anti skid tiles Flooring in Common area.
- Granite stone on Staircase steps.

Wall Finishes:

- Weather Proof Acrylic Emulsion paint on external walls
- Oil Bound distemper over POP on internal walls

Others:

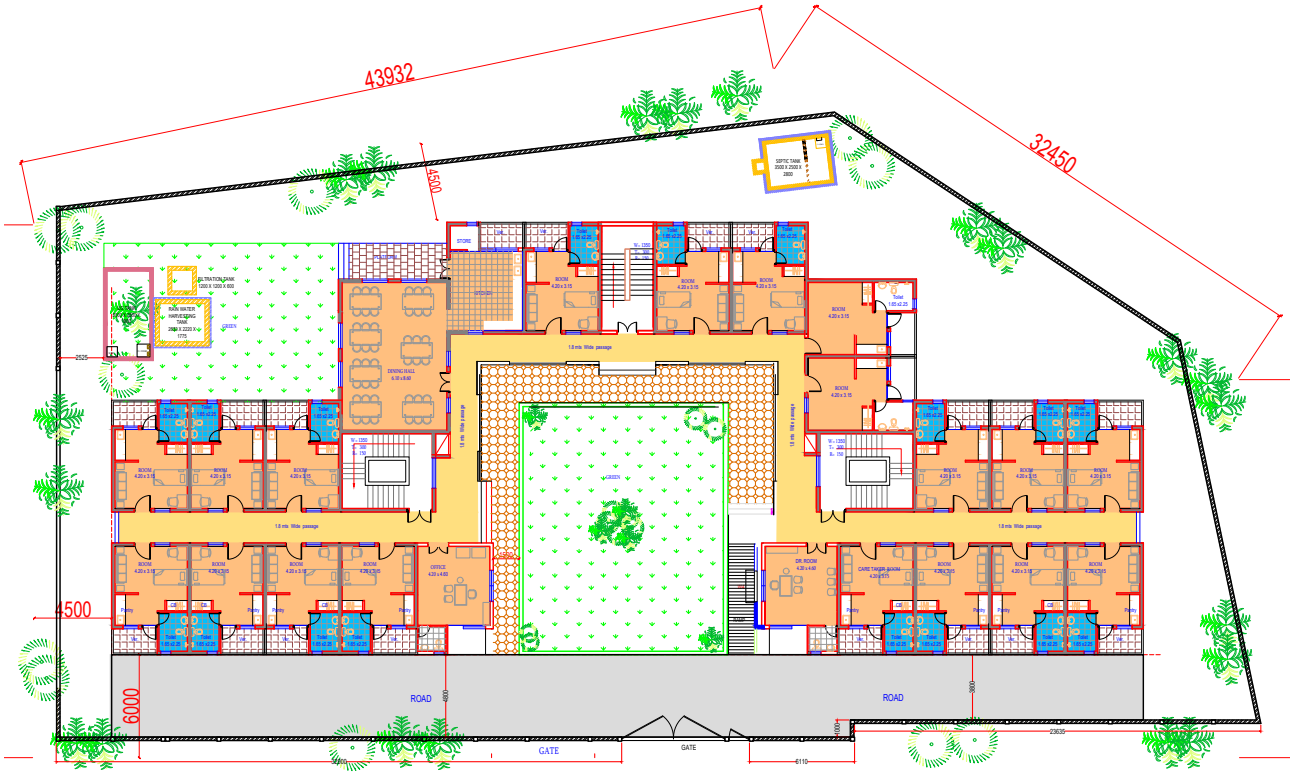
- Electrical fixtures such as ceiling fans, LED tube lights, exhaust fan; wooden shutters in cupboard and under kitchen cabinet

The structural design of DHP has been vetted by IIT Roorkee and project have been technically evaluated by Punjab Engineering College, Chandigarh.

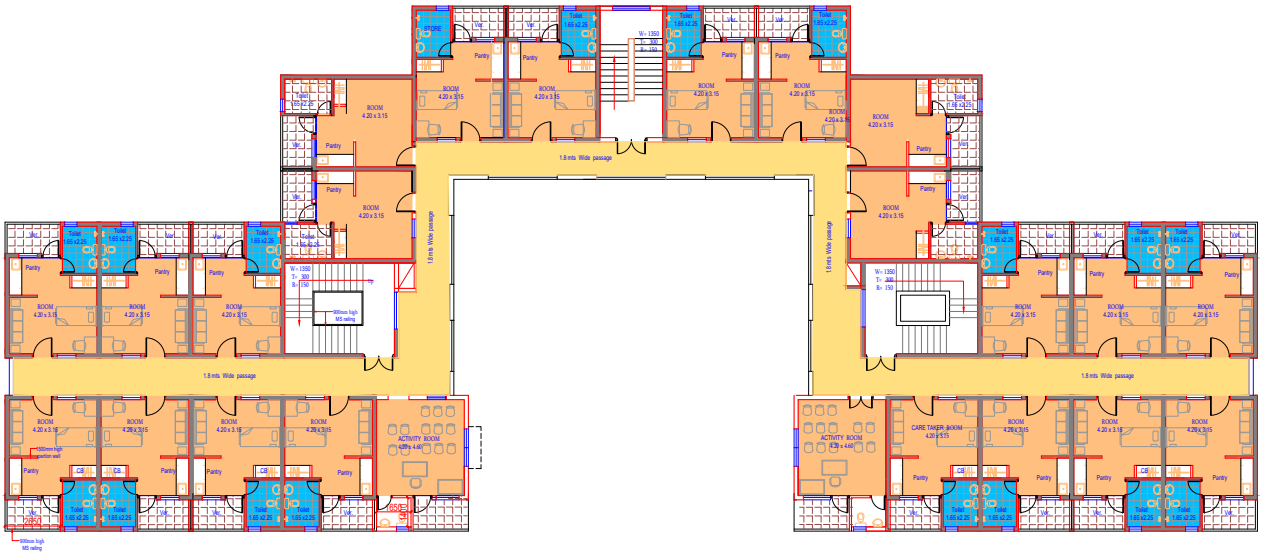

REDMI NOTE 9 PRO
AI QUAD CAMERA

DHP AT AGARTALA, TRIPURA

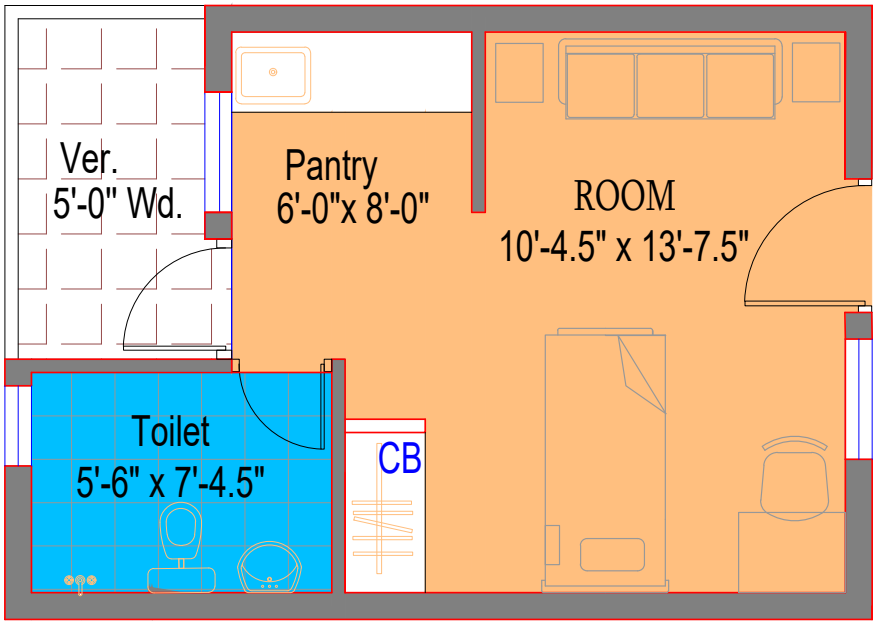
The Urban Development Department, Government of Tripura allotted land measuring 2364 sqm. owned by Social Welfare & Education Department, Government of Tripura at Narsinghgarh, Tehsil-Gandhigram, Agartala, West Tripura as Old Age Home using STAY IN PLACE FORMWORK SYSTEM - Structural Stay In Place Steel Formwork System (COF-FOR). The Demonstration Housing Project consists of 40 units in G+1 configuration with other provisions.



Layout cum Ground Floor Plan



First Floor Plan



Typical Unit Plan

Project Profile:

- Location: Narsinghgarh, Tehsil-Gandhigram, Agartala, West Tripura
- State Level Nodal Agency : Urban Development Department, Government of Tripura
- Land Allotted by: Welfare & Education Department, Government of Tripura
- Usage : Old Age Home
- Plot area of project : 2364 sqm.
- No. of houses : 40 (G+1); Other provisions includes Guest Room, Medical Room, Care Taker Room, Common Dining Room with Kitchen and Activity Rooms
- Carpet area of each unit : 25.84 sqm.
- Built up area of each unit : 29.90 sqm.
- Total built up area : 1834 sqm.
- Technology Used: STAY IN PLACE FORMWORK SYSTEM - Structural Stay In Place Steel Formwork System
- Each Unit consists of One living room, pantry, combined Bath & WC and balcony.
- Includes Earthquake Resistant Features.
- Infrastructure facilities : Pathways with concrete pavers, water supply work, UGT, septic tank, horticulture work, boundary wall, tube well, drainage & disposal and external electrification using solar panels, rain water harvesting, fire fighting system, etc.
- Year of completion : December 2021
- Cost per sqft. without infrastructure : Rs.3025
- Cost per sqft. with infrastructure : Rs.3461

About the Technology

This patented structural stay in place formwork system is known as 'Coffor' to build load bearing monolithic concrete wall structures based on shear wall concept. The formwork system comprises of two filtering grids made of rib mesh reinforced by 'C' channel vertical stiffeners. The grids are connected by rebar which act as horizontal stiffeners and connector which act as a shear link. The grids on both faces act as sacrificial formwork in which concrete is poured in-situ.

After the erection of formwork panels in alignment, corners, edges of doors and windows frame are closed with rebar positioning & concrete of required grade is poured in the panels. The concreting is done with a pump, bucket or with a shovel loader. The inside and outside walls are finished with cement plaster of suitable grade. The panels are prefabricated according to a structural plan (based on architectural plans) designed by structural engineers.

In this project, the system has been used as load bearing wall panels. The thickness of structural stay in place formwork panel is 160mm with infill of cement concrete and 15mm cement plaster on both side of wall.

Technologies/Specifications for Demonstration Houses

Foundation

- Isolated RCC column foundation with Plinth beam

Walling

- Structural Stay in Place Steel Formwork (Coffor)
- Floor Slabs/Roofing Cast in situ RCC Slab

Door frame/shutters:

- Pressed steel door frame with flush shutters
- PVC door frame with PVC Shutters in toilets.

Window Fame/ Shutter:

- o uPVC frame with glazed panel and wire mesh shutters.

Flooring:

- o Vitrified tile flooring in Rooms & Kitchen
- o Anti-skid ceramic tiles in bath & WC
- o Kota Stone Flooring in Common area and Staircase

Wall Finishes:

- o Weather Proof Acrylic Emulsion paint on external walls
- o Oil Bound distemper over POP on internal walls

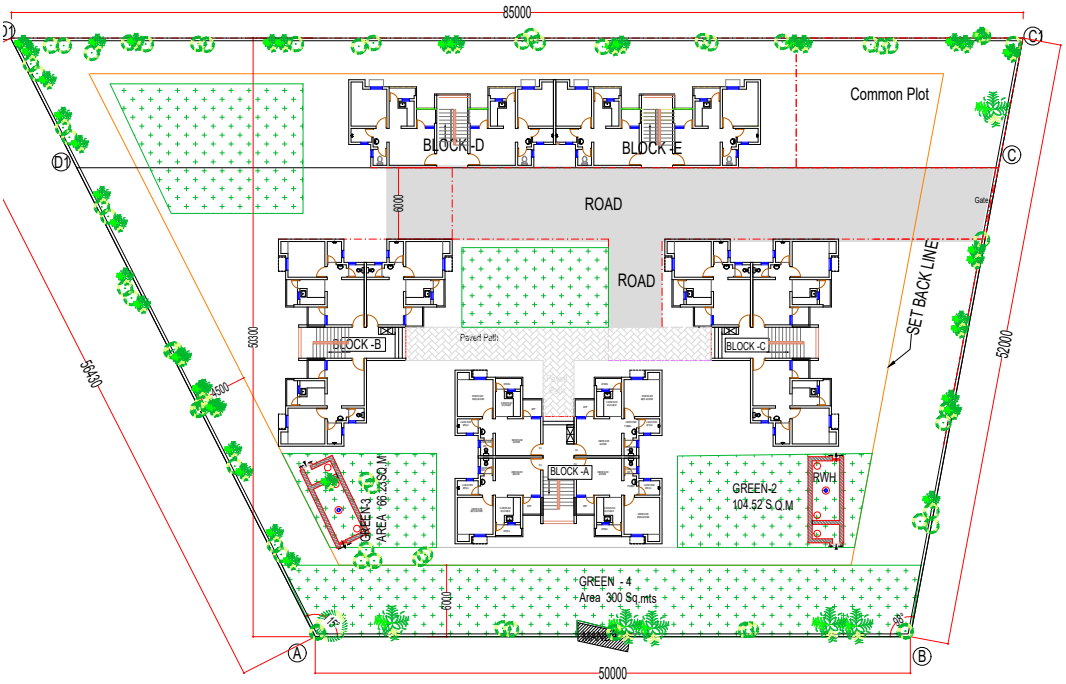
Others:

- o Electrical fixtures such as ceiling fans, LED tube lights, exhaust fan; wooden shutters in cupboard and under kitchen cabinet

The structural design of DHP has been vetted by NIT Bhopal and Technical evaluation of the DHP has been carried out by National Institute of Technology, Agartala.

DHP AT AHMEDABAD, GUJARAT

The Affordable Housing Mission, Ahmedabad, Gujarat allotted a land measuring 3400 sqm. owned by Gujarat Housing Board at Vivekanand Nagar, Hathijan, Ahmedabad for construction of Demonstration Housing Project to be allotted to PMAY(U) beneficaries. The Ahmedabad Municipal Corporation approved the layout, plans, sections etc. of the project. The DHP will consists of 40 dwelling units in G+2 configuration using new technology namely PRECAST CONCRETE CONSTRUCTION SYSTEM - Integrated Hybrid Solution-One. The project is partially funded by Ministry of Housing & Urban Affairs as per the guidelines of PMAY(U) and remaining share is contributed by State and beneficiaries.



Layout Plan

Typical Unit Plan

Project Profile:

- Location: Vivekanand Nagar, Hathijan, Ahmedabad
- State Level Nodal Agency : Affordable Housing Mission, Ahmedabad
- Land Allotted by: Gujarat Housing Board
- Usage : PMAY(U) Beneficiaries
- Plot area of project : 3400 sqm.
- No. of houses : 40 (G+2)
- Carpet area of each unit : 35.78 sqm.
- Built up area of each unit : 51.42 sqm.
- Total built up area : 2179 sqm.
- Technology Used: PRECAST CONCRETE CONSTRUCTION SYSTEM - Integrated Hybrid Solution-One
- Each Unit consists of living room, bed room, lobby kitchen, bath, WC, verandah and separate wash area.
- Includes Earthquake Resistant Features.
- Infrastructure facilities : CC Road, pathways with concrete pavers, water supply work, UGT, septic tank, horticulture work, drainage & disposal and external electrification using solar panels, rain water harvesting, fire fighting system, etc.
- Status of project : Under construction

About the Technology:

Load bearing 200mm thick interlocking blocks manufactured with special machines, having strength of 75 kg/cm^2 made out of cement, coarse sand and flyash. The blocks shall be laid without mortar. Intermediate floor / roof shall be in precast R.C. Planks & joists, system. The planks shall be precasted with moulds on vibrating table and pallets in M-25 concrete. The planks shall have 3 nos. 6mm dia main bars and 6mm dia at 200mm c/c distribution bars. The RC planks shall have haunches which shall be filled with M-25 in situ concrete. The joists shall be 150mm wide. The depth and reinforcement shall be as per design and shall be partially precast with M-25 concrete. The RC planks shall be placed on wall to joist, joist to joist and joist to wall. After placing the RC planks, 6mm dia extra bars will be placed through the haunches (2 nos. in each RC plank across the joists) providing temporary supports below the joists before laying in-situ concrete. Within 24 to 72 hours of laying slab, in-situ concrete a course/ layer of ferrocement 12mm thick with mesh reinforcement shall be laid, mixed with water proofing compound on the slab including the walls area. Thus the total thickness of the effective slab shall be 72mm.

Technologies/Specifications being Used

Foundation

- Strip foundation with plinth band

Walling

- Load bearing interlocking blocks (Hydra Form Blocks)

Floor Slabs/Roofing

- Precast RC Planks and Joists System with concrete screed.

Door frame/shutters:

- Pressed steel door frame with flush

shutters

- PVC door frame with PVC Shutters in toilets.

Window Fame/ Shutter:

- uPVC frame with glazed panel and wire mesh shutters.

Flooring:

- Vitrified tile flooring in Rooms & Kitchen
- Anti-skid ceramic tiles in bath & WC
- Kota Stone Flooring in Common area and Staircase

Wall Finishes:

- Weather Proof Acrylic Emulsion paint on external walls
- Oil Bound distemper over POP on internal walls

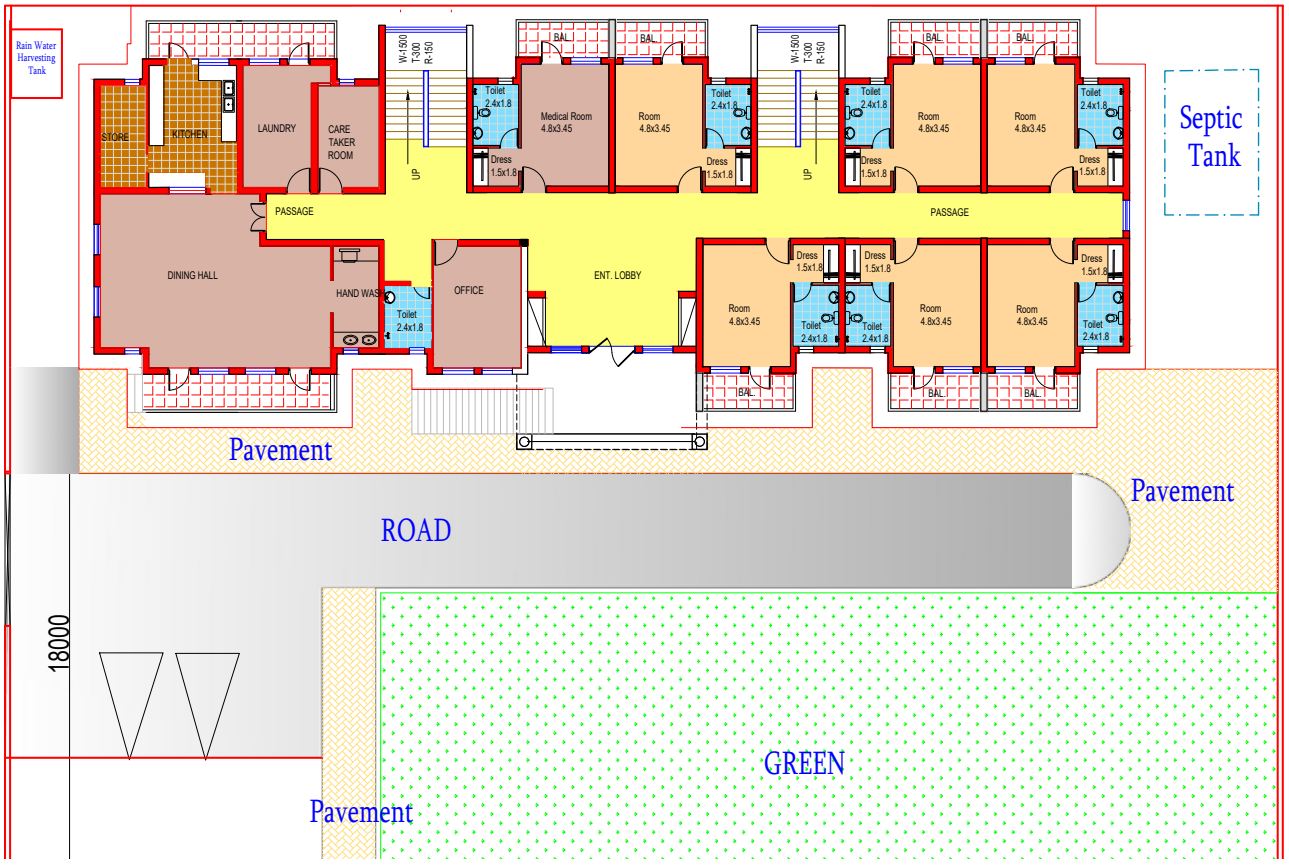
Others:

- Electrical fixtures such as ceiling fans, LED tube lights, exhaust fan; wooden shutters in cupboard and under kitchen cabinet

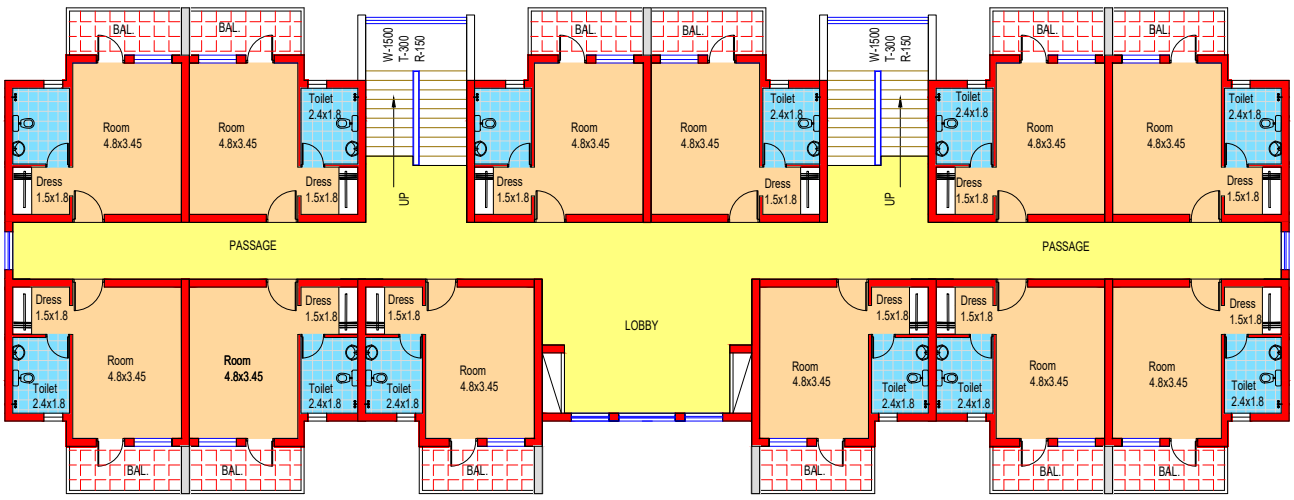
The structural design of DHP has been vetted by Faculty of Engineering and Technology, Jamia Millia Islamia, Delhi and Technical evaluation is being carried out by CEPT University, Ahmedabad.

DHP AT BHOPAL, MADHYA PRADESH

Directorate of Urban Administration & Development, Bhopal, MP allotted the land measuring 2709 sqm. in premises of SPNIUM Campus at Bhouri, Bhopal to be used as Sports Hostel. The Bhopal Municipal Corporation approved the plan and layout consisting of 40 Dwelling Units with other provisions. The DHP is in G+3 configurations and being constructed using STAY IN PLACE FORMWORK SYSTEM - Insulating Concrete Forms (ICF).



Layout Plan



Typical Floor Plan

Project Profile:

- Location: SPNIUM Campus at Bhouri, Bhopal
- State Level Nodal Agency : Directorate of Urban Administration & Development, Bhopal
- Land Allotted by: Directorate of Urban Administration & Development, Bhopal
- Usage : Sports Hostel
- Plot area of project : 2709 sqm.
- No. of houses : 40 (G+3); Other Provisions includes Office with Toilet, Dining Hall with Kitchen and store, Common Room with toilet, Medical Room with toilet, Care Taker Room, Activity Rooms & Laundry
- Carpet area of each unit : 29.05 sqm.
- Built up area of each unit : 34.15 sqm.
- Total built up area : 2180 sqm.
- Technology Used: STAY IN PLACE FORMWORK SYSTEM - Insulating Concrete Forms (ICF).
- Each Unit consists of one room, dressing, combined Bath & WC and balcony.
- Includes Earthquake Resistant Features.
- Infrastructure facilities : CC Road, pathways with concrete pavers, water supply work, UGT, septic tank, horticulture work, boundary wall, drainage & disposal and external electrification using solar panels, rain water harvesting, fire fighting system, etc.
- Status of project : Under construction

About the Technology:

Insulating concrete Forms (ICF) System comprises of a panel of two walls of Expandable Polystyrene (EPS) separated by a nominal distance of 150mm by hard plastic ties. These are assembled on site to hold reinforced concrete. The forms are open ended hollow polystyrene blocks which fit tightly together to form a shuttering system. Concrete poured into the hollow space to form a continuous wall. When cured, this wall supports the structural loads from floors and roofs, and the shuttering provides thermal insulation. Reinforcing steel shall be as required from design.

Upper and lower surfaces of the polystyrene panels are castellated and the vertical mating surfaces are tongue-and-groove to form a tight fit when joined together. The rig-

id formwork does not require supporting falsework. The inner surfaces have tapered grooves running vertically and have offset on opposite faces to ensure uniform concrete thickness. They also form locks for end stops. The outer surfaces are grooved vertically at 50mm centres to aid cutting and trimming.

In this project, the system has been used as load bearing wall panels. The thickness of ICF panel is 250mm with infill of 150mm cement concrete and 5mm polymerised cementitious plaster on both side of wall.

Technologies/Specifications being Used

Foundation

- Isolated RCC column/strip footing with Plinth beam

Walling

- Insulating Concrete Forms (ICF) Concrete filled Expandable Polystyrene (EPS) blocks.

Floor Slabs/Roofing

- RCC slab/Roof as per specifications

Door frame/shutters:

- Pressed steel door frame with flush shutters
- PVC door frame with PVC Shutters in toilets

Window Fame/ Shutter:

- uPVC frame with glazed panel and wire mesh shutters.

Flooring:

- Vitrified tile flooring in Rooms & Kitchen
- Anti-skid ceramic tiles in bath & WC
- Kota Stone Flooring in Common area and Staircase

Finishing:

- Weather Proof Acrylic Emulsion paint on external walls
- Oil Bound distemper over POP on internal walls

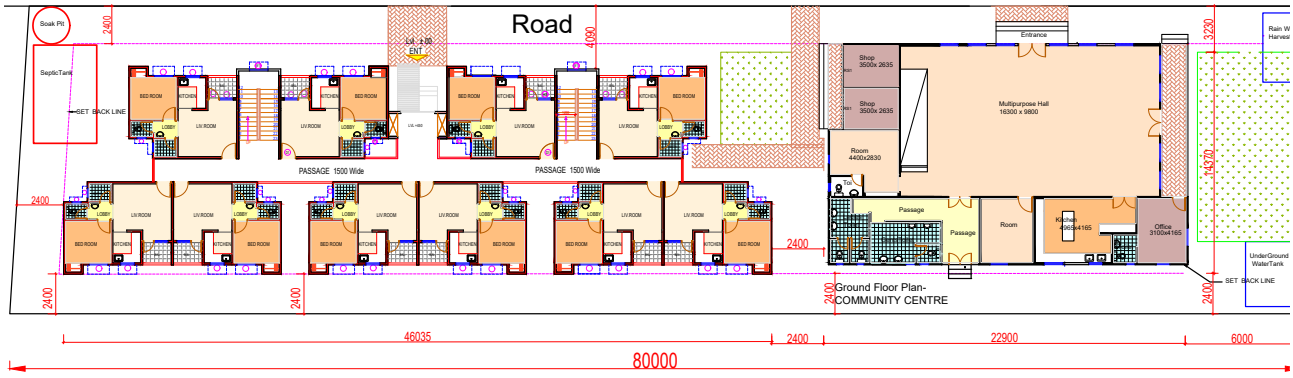
Others:

- Electrical fixtures such as ceiling fans, LED tube lights, exhaust fan; wooden shutters in cupboard and under kitchen cabinet

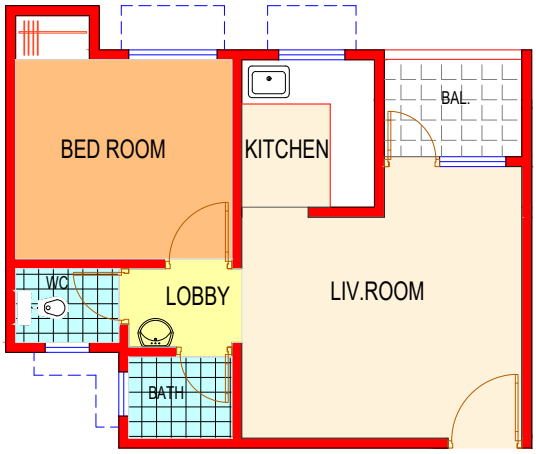
The structural design of DHP has been vetted by Shibpur Engineering College, Kolkata and Technical evaluation is being carried out by Samrat Ashok Technological Institute (SATI) Vidisha.

DHP AT GUWAHATI, ASSAM

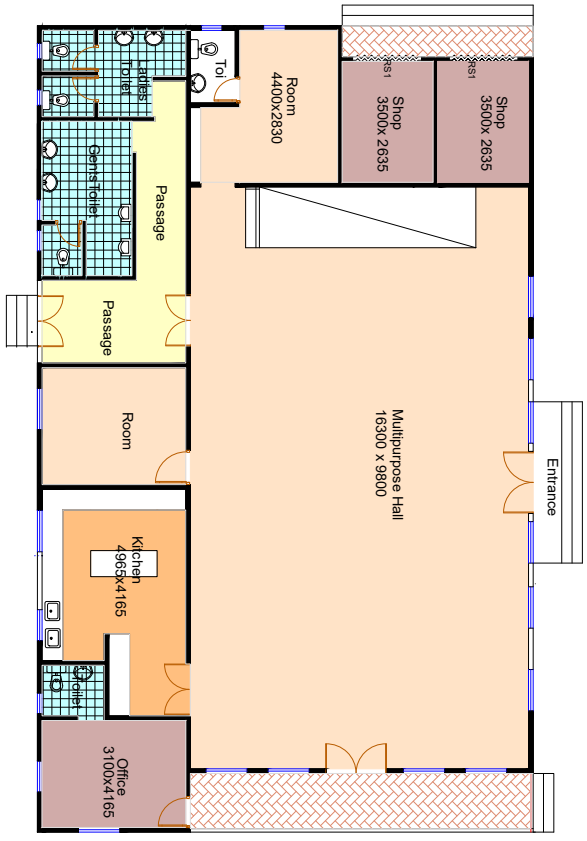
Mission Director, PMAY-HFA(U)-Assam, Guwahati has allotted the land measuring 1600 sqm. owned by Guwahati Municipal Corporation (GMC) at Fatashil Ambari, Guwahati to be used as rental accommodation for Contratual Safai Karamchari of GMC. The Guwahati Municipal Corporation approved the plan and layout consisting of 40 Dwelling Units with other provisions and a community centre. The houses under DHP are in G+3 configurations and community centre (G) are being constructed using LIGHT GAUGE STEEL STRUCTURAL SYSTEM - Light Gauge Steel Framework System (LGSFS) with V-infill walls and Pre-engineered Building (PEB) steel structure.



Layout cum Typical Floor Plan



Typical Dwelling Unit Plan



Community Centre Plan

Project Profile:

- Location: Fatashil Ambari, Guwahati
- State Level Nodal Agency : Mission Director, PMAY-HFA(U)-Assam, Guwahati
- Land Allotted by: Guwahati Municipal Corporation (GMC)
- Usage : Rental accommodation for Contratual Safai Karamchari of GMC
- Plot area of project : 1600 sqm.
- No. of houses : 40 (G+3)
- Community Centre having built up area of 336 sqm. consist of Single storey Multi-purpose Hall with Kitchen, office, green room, shops and toilet.
- Carpet area of each unit : 31.06 sqm.
- Built up area of each unit : 36.09 sqm.
- Total built up area : 2190 sqm. including community centre
- Technology Used: LIGHT GAUGE STEEL STRUCTURAL SYSTEM - Light Gauge Steel Framework System (LGSFS) with V-infill walls
- Each unit consist of a living room, a bed room, a kitchen, a bath room, a W.C., a lobby and a balcony.
- Includes Earthquake Resistant Features.
- Infrastructure facilities : CC Road, pathways with concrete pavers, water supply work, UGT, septic tank, horticulture work, boundary wall, tube well, drainage & disposal and external electrification using solar panels, rain water harvesting, fire fighting system, etc.
- Status of project : Under construction

About the Technology

Light Gauge Framed Steel Structure (LGFSS) is based on factory made galvanized light gauge steel components produced by the cold forming method assembled as panels at site forming structural steel framework of a building and varying wall and floor construction. The panels are assembled on site with screws and bolts to form the internal and separating walls and inner leaf of the external walls of a building and floors & ceiling. The building is completed by the installation of V-Infill Wall elements.

V-Infill Wall is an innovative emerging building and construction technology using factory made 8/10mm fibre cement boards (Vboard) on either side of GI

studs and erected to produce straight to finish walls which are filled with light weight concrete made of EPS, cement, sand and additive. The system can incorporate all types of architectural features like coving, boxes, cantilevers, projections, infill walls, mezzanine floors etc. This system can also incorporate all types of services viz. electrical, gas and plumbing etc.

In this project, the total thickness of wall is 124mm having 89mm thickness of LGSF and 9mm & 6mm thick fibre cement board with vapour barrier on outside wall and 8mm thick fibre cement board with 12mm gypsum board inside of wall. V-infill wall material have been used as infill material with Pre-engineered Building (PEB) steel structure..

Technologies/ Specifications being used

Foundation:

- Pile foundation /Isolated RCC column footing with Plinth beam

Superstructure:

- Light Gauge Steel Framework System (LGSFS) with V-infill walls
- Light Gauge Steel roof truss with MS deck sheeting resting on web joist with false ceiling of gypsum board.

Joinery & Finishing:

- Flush door shutters fitted in pressed steel door frames
- FRP door frames & shutter in toilets
- uPVC window frame with glazed panel and wire mesh shutter in rooms and toilet

Flooring:

- Vitrified tile flooring in Rooms, Kitchen & Balcony
- Marble stone on pantry/kitchen counter
- Anti-skid ceramic tiles in toilet
- Kota stone Flooring in common areas and staircase

Wall Finishes:

- Weather proof paint on external walls
- Oil Bound distemper over Putty on internal walls.

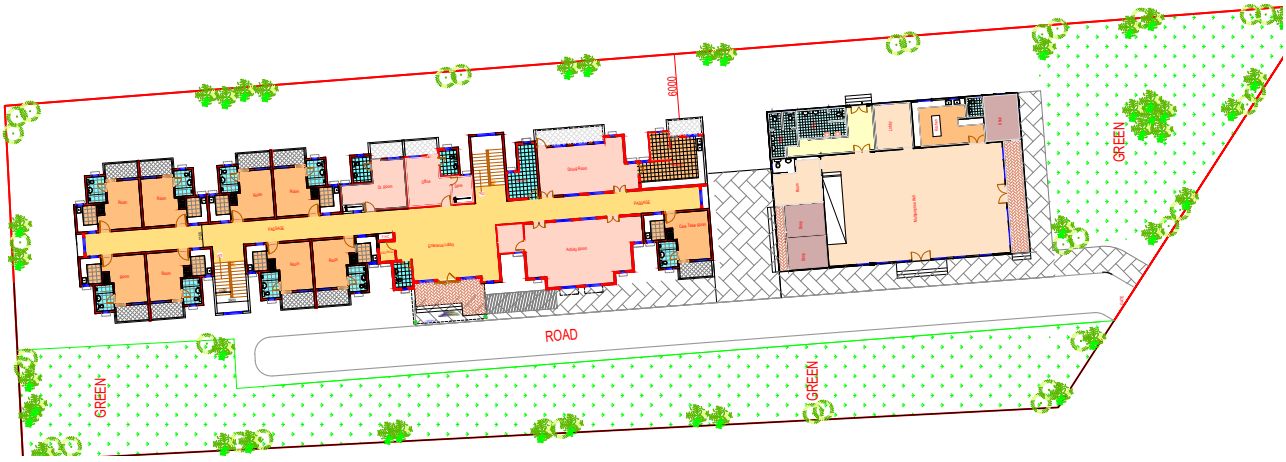
Others:

- Electrical fixtures such as ceiling fans, LED tube lights, exhaust fan; wooden shutters in cupboard and under kitchen cabinet

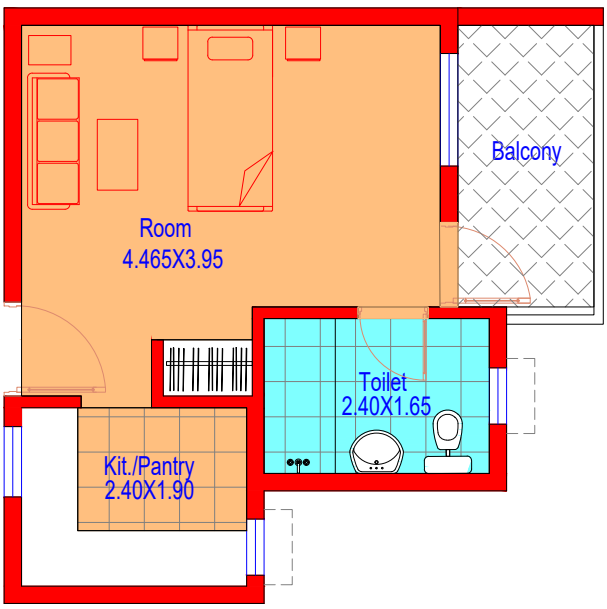
The structural design of DHP has been vetted by BHU (IIT) Varanasi and IIT Guwahati has been approached for Technical evaluation of the DHP .

DHP AT AYODHYA, UTTAR PRADESH

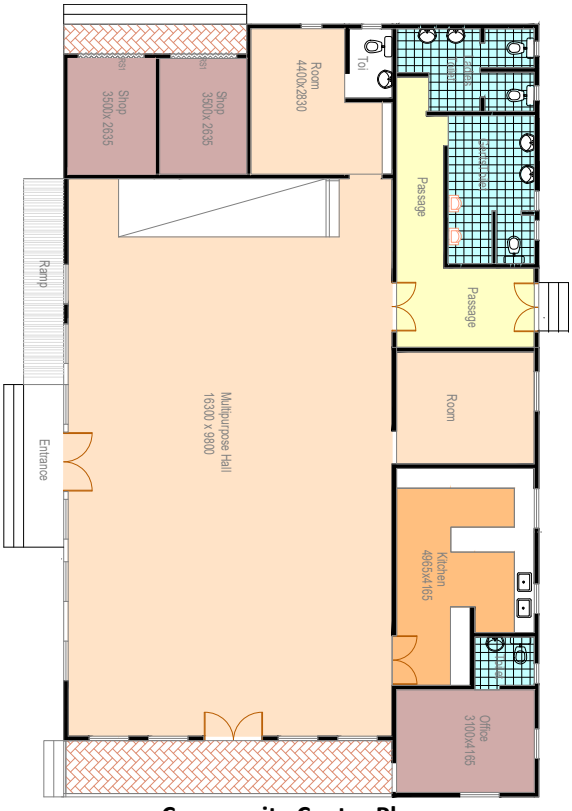
State Urban Development Authority (SUDA), Lucknow allotted land measuring 3600 sqm. at Village Malikpur, Pargana Avadh, Tehsil Sadar, Janpad, Ayodhya, Uttar Pradesh owned by Mahila Kalyan Vibhag/Siksha Vibhag, Ayodhya to be used as Destitute Widow Ashram and Orphanage for construction of DHP. The layout plan, architectural plans, etc. were approved by the Ayodhya Development Authority, Ayodhya. The DHP is in G+2 configuration with other provisions and a community centre (G) and being constructed using LIGHT GAUGE STEEL STRUCTURAL SYSTEM - Light Gauge Steel Framework System (LGSF) with Cement Fibre board on both side of walls and infill of rock wool.



Layout Plan



Typical Dwelling Unit Plan



Community Centre Plan

Project Profile:

- Location: Village Malikpur, Pargana Avadh, Tehsil Sadar, Janpad, Ayodhya
- State Level Nodal Agency : State Urban Development Authority (SUDA), Lucknow
- Land Allotted by: Mahila Kalyan Vibhag/Siksha Vibhag, Ayodhya
- Usage : Destitute Widow Ashram and Orphanage
- Plot area of project : 3600 sqm.
- No. of houses : 40 (G+2); Other provisions includes Dining Hall with Kitchen & store, Common Room with toilet, General office, Medical Room with toilet, Care Taker Room, Activity Rooms and Laundry
- Community Centre having built up area of 342 sqm. consist of Single storey Multi-purpose Hall with Kitchen, office, green room, shops and toilet.
- Carpet area of each unit : 29.47 sqm.
- Built up area of each unit : 34.34 sqm.
- Total built up area : 2661 sqm. including community centre
- Technology Used: LIGHT GAUGE STEEL STRUCTURAL SYSTEM - Light Gauge Steel Framework System (LGSFS)
- Each unit consist of a room with attached toilet, pantry and balcony
- Includes Earthquake Resistant Features.
- Infrastructure facilities : CC Road, pathways with concrete pavers, water supply work, UGT, septic tank, horticulture work, boundary wall, tube well, drainage & disposal and external electrification using solar panels, rain water harvesting, fire fighting system, etc.
- Status of project : Under construction

About the Technology

Light Gauge Steel Framed Structures (LGSF) is based on factory made galvanized light gauge steel components, designed as per codal requirements. The system is produced by cold forming method and assembled as panels at site forming structural steel framework of a building of varying sizes of wall and floor. The assembly is done using special types of screws and bolts. LGSF is a well-established technology for residential construction in North America, Australia and Japan and is gaining ground in India. LGSF is typically ideal for one to three storey high buildings, especially for residential and commercial buildings. Due to its flexibility, fast construction and durability, this technology has great potential for counties like India. LGSF can be combined with composite steel / concrete deck resting on light steel framing stud walls.

In this project, the total thickness of wall is 185mm having 150mm thickness of LGSF and 9mm & 6mm thick fibre cement board with vapour barrier on outside wall and 8mm thick fibre cement board with 12mm gypsum board inside of wall. Rock wool have been used as infill material.

Technologies/ Specifications being used

Foundation

- Isolated RCC column footing / Pile Foundation with Plinth beam

Walling

- Light Gauge Steel Frame structure with cement fiber board and rock wool as infill.

Roofing

- Deck sheet over Light Gauge Steel Structure with Screed Concrete.

Joinery & Finishing

- Flush door shutters fitted in pressed steel door frames
- PVC door frames & shutter in toilets
- uPVC window frame with glazed panel and wire mesh shutter in rooms and toilet

Flooring

- Vitrified tile flooring in Rooms, Pantry & Balcony
- Marble stone on pantry/kitchen counter
- Anti-skid ceramic tiles in toilet
- Kota stone Flooring in common areas and staircase

Wall Finishes

- Weather proof paint on external walls
- Oil Bound distemper over Putty on internal walls.

Others:

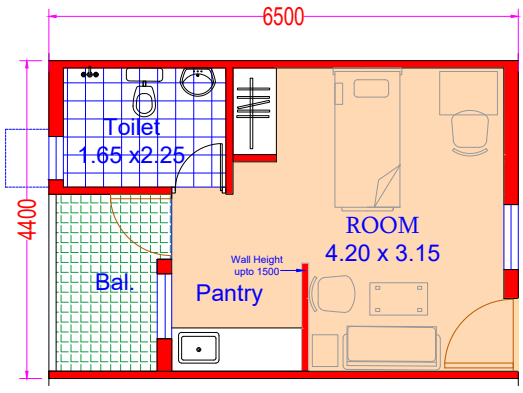
- Electrical fixtures such as ceiling fans, LED tube lights, exhaust fan; wooden shutters in cupboard and under kitchen cabinet

The structural design of DHP has been vetted by BHU (IIT) Varanasi and Institute of Engineering & Technology, Dr. Ram Manohar Lohia Avadh University, Ayodhya has been approached for Technical evaluation of the DHP.

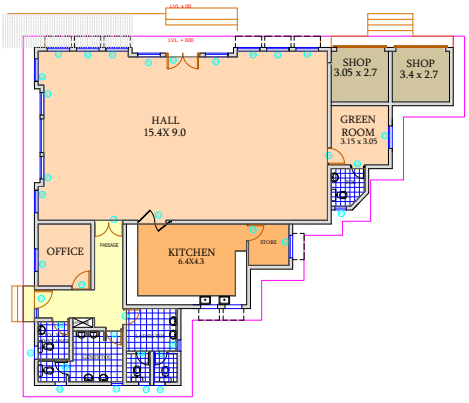
DHP AT DIMAPUR, NAGALAND

The Works & Housing Department and Municipal Affairs Department, Government of Nagaland allotted land measuring 2819 sqm. at PWD Housing Complex Sematila, Dimapur, Nagaland for the Demonstration Housing Project to be used as Working Women Hostel. The layout plan, architectural plans, etc. were approved by the PWD Housing, Kohima, Nagaland. The DHP is in G+2 configuration with other provisions and a community centre (G) and being constructed using Prefabricated Sandwich Panel System-EPS Cement Sandwich Panels with steel structure.

Layout Plan



Typical Dwelling Unit Plan



Community Centre Plan

Project Profile:

- Location: PWD Housing Complex Sematila, Dimapur, Nagaland
- State Level Nodal Agency : Municipal Affairs Department, Government of Nagaland
- Land Allotted by: Works & Housing Department, Government of Nagaland
- Usage : Working Women Hostel
- Plot area of project : 2819 sqm.
- No. of houses : 40 (G+2); Other provisions includes a Dining Hall with Kitchen, Activity Room, Medical Room with toilet, Office with Toilet, Care Taker Room with toilet.
- Community Centre having built up area of 272 sqm. consist of Single storey Multipurpose Hall with Kitchen, office, two shops, two toilets & one toilet for physically handicapped.
- Carpet area of each unit : 25.21 sqm.
- Built up area of each unit : 28.60 sqm.
- Total built up area : 2050 sqm. including community centre
- Technology Used: Prefabricated Sandwich Panel System-EPS Cement Sandwich Panels with steel structure
- Each unit consist of a room, a pantry, Toilet & Balcony
- Includes Earthquake Resistant Features.
- Infrastructure facilities : CC Road, pathways with concrete pavers, water supply work, septic tank, horticulture work, boundary wall, drainage & disposal and external electrification using solar panels, rain water harvesting, fire fighting system, etc.
- Status of project : Under construction

About the Technology




Prefabricated Sandwich Panel System-EPS Cement Sandwich Panels with steel structure are lightweight solid core sandwich panels made of 5mm non-asbestos fiber cement boards on both sides of panels as facing sheet and the core material of expanded polystyrene beads, admixture, cement, sand, fly ash and other bonding materials in mortar form. The core material in slurry state is pushed under pressure into preset molds. Once set, it is moved for curing and ready for use with RCC or steel framed structure. These panels may be installed without any structural support up to 5m only. Due to the sheets, the panels do not require plastering and water curing. These panels are joined with tongue & groove jointing system.

These are non–load bearing panels and should be used as walling, floor and roofing with additional structural support, steel or RCC depending on the design. However, these may be used as single floor construction or stairs case slabs, kitchen/bathroom slabs etc. without support structure. Therefore, here the panels are being used with steel structure.

In this project, the total thickness of external walls is 90mm and internal walls is 75mm. The frame structure of the building is in steel (ISMB, ISMC) with prefabricated sandwich panel as infill. The roof slab is also made of prefabricated sandwich panel with concrete screed.

Technologies/ Specifications being used:

Foundation

- Isolated RCC column footing with Plinth beam

Walling

- EPS Cement Sandwich Panels with steel structure

Roofing

- EPS Cement Sandwich Panels over steel structure

Joinery & Finishing

- Flush door shutters fitted in pressed steel door frames
- PVC door frames & shutter in toilets
- uPVC window frame with glazed panel and wire mesh shutter in rooms and toilet

Flooring

- Vitrified tile flooring in Rooms, Pantry & Balcony
- Marble stone on pantry/kitchen counter
- Anti-skid ceramic tiles in toilet
- Kota stone Flooring in common areas and staircase

Wall Finishes

- Weather proof paint on external walls
- Oil Bound distemper over Putty on internal walls.

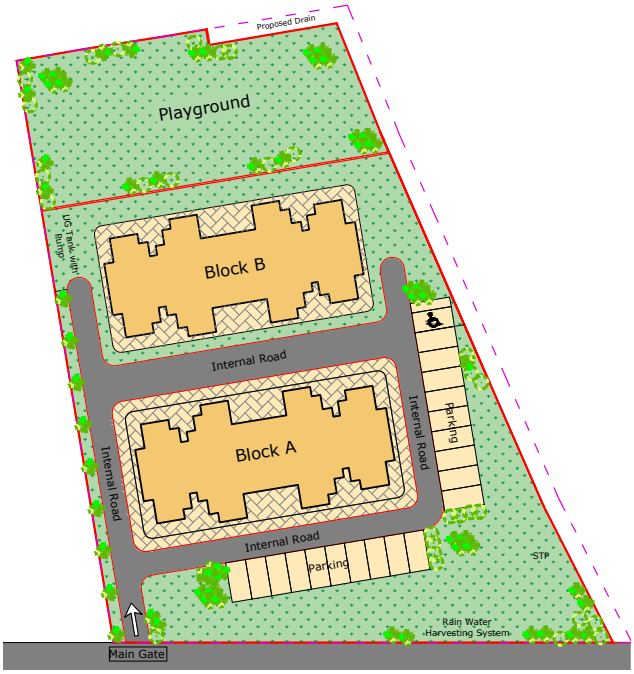
Others:

- Electrical fixtures such as ceiling fans, LED tube lights, exhaust fan; wooden shutters in cupboard and under kitchen cabinet

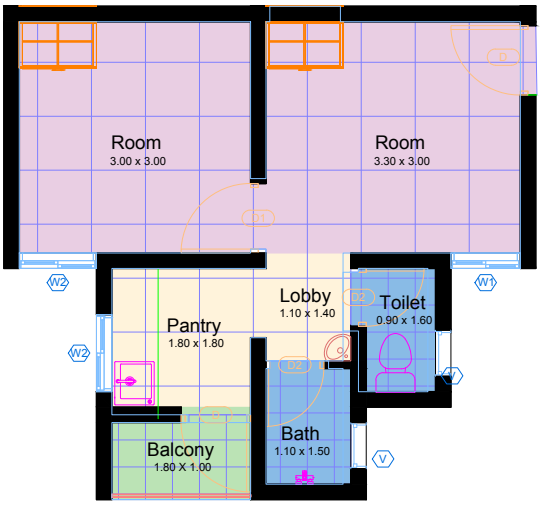
The structural design has been vetted by NIT, Surat and NIT Nagaland have been approached for Technical evaluation of the DHP.

DHP AT JAMMU, JAMMU & KASHMIR

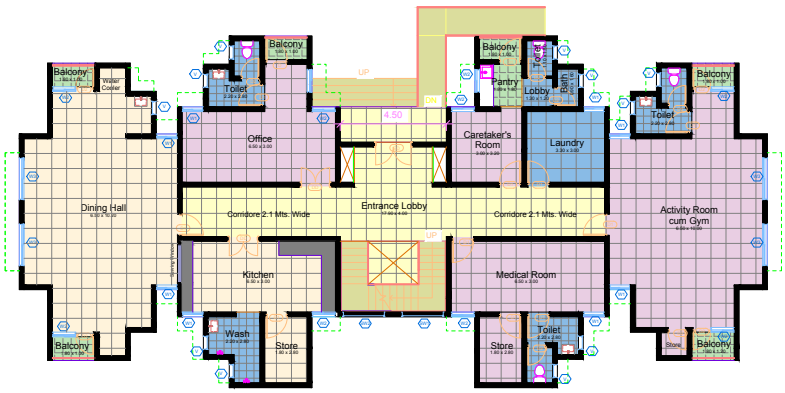
The J&K Housing Board, Government of J&K allotted land measuring 4048 sqm. at Bhalwal, Jammu for the Demonstration Housing Project to be used as Sports Hostel. The layout plan, architectural plans, etc. were approved by the J&K Housing Board, Government of J&K. The DHP is in G+2 configuration with other provisions and being constructed using Prefabricated Sandwich Panel System - EPS core panel using Quikbuild Panels.



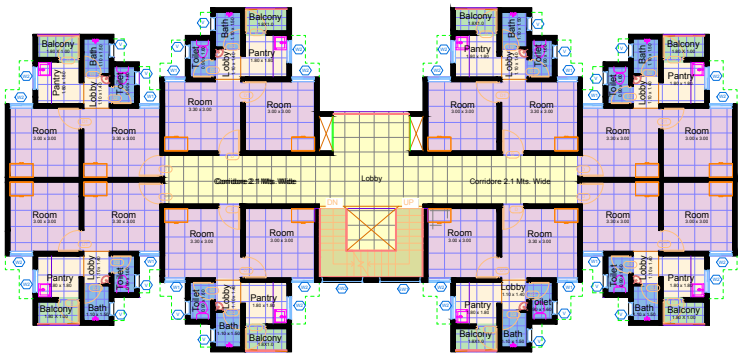
Layout Plan



Typical Dwelling Unit Plan



Ground Floor Plan



Typical Floor Plan

Project Profile:

- Location: Bhalwal, Jammu
- State Level Nodal Agency : J&K Housing Board, Government of J&K
- Land Allotted by: J&K Housing Board, Government of J&K
- Usage : Sports Hostel
- Plot area of project : 4048 sqm.
- No. of houses : 40 (G+2); Other provisions includes a Office with Toilet, Dining Hall with Kitchen & store, Activity Room cum Gym, Medical Room with toilet and store, Care Taker Room with toilet, Laundry Room.
- Carpet area of each unit : 28.57 sqm.
- Built up area of each unit : 35.35 sqm.
- Total built up area : 2054 sqm.
- Technology Used: Prefabricated Sandwich Panel System - EPS core panel using Quikbuild Panels
- Each unit consist of 2 Rooms, Kitchen, Toilet & Balcony
- Includes Earthquake Resistant Features.
- Infrastructure facilities : CC Road, pathways with concrete pavers, water supply work, septic tank, tube well, horticulture work, boundary wall, drainage & disposal and external electrification using solar panels, rain water harvesting, fire fighting system, etc.
- Status of project : Under construction

About the Technology

EPS core panel using Quikbuild Panels as walling (Prefabricated Sandwich Panel System)and EPS roof/slab Panel with concreting - QuikBuild panel system consists of a welded wire space frame integrated with a polystyrene insulation core. The wall panel is placed in position and a wythe of concrete is applied to both sides. The wall panel receives its strength and rigidity from the diagonal cross wires welded to the welded-wire fabric on each side. This combination produces a truss behavior, which provides rigidity and shear terms for a full composite behavior. Steel trusses are pierced through the polystyrene core and welded to the outer layer sheets of galvanized steel mesh to form a rigid panel. The shell of the structure is built by manually erecting the panels directly onto the slab with reinforcement rods. Desired utilities like doors, windows and ventilators may be pre-built while plumbing,

electrical conduits may be added onsite. The wall is then finished by plastering with cement using the traditional method or by shotcreting machine to create a monolithic structure. These panels are used in the construction of exterior and interior loadbearing and non-load bearing walls and floors of buildings of all types of construction.

In this project, the system has been used as load bearing wall panels. The total thickness of wall is 180mm with EPS thickness of 80mm and 50mm shortcreting/plastering on both side of the wall.

Technologies/ Specifications being used:

Foundation

- Isolated RCC column footing with Plinth beam

Walling

- Prefabricated Sandwich Panel of EPS with sprayed concrete.

Roofing

- EPS Sandwich Panels with screed concrete.

Joinery & Finishing

- Flush door shutters fitted in pressed steel door frames
- PVC door frames & shutter in toilets
- uPVC window frame with glazed panel and wire mesh shutter in rooms and toilet

Flooring

- Vitrified tile flooring in Rooms, Pantry & Balcony
- Marble stone on pantry/kitchen counter
- Anti-skid ceramic tiles in toilet
- Kota stone Flooring in common areas and staircase

Wall Finishes

- Weather proof paint on external walls
- Oil Bound distemper over Putty on internal walls.

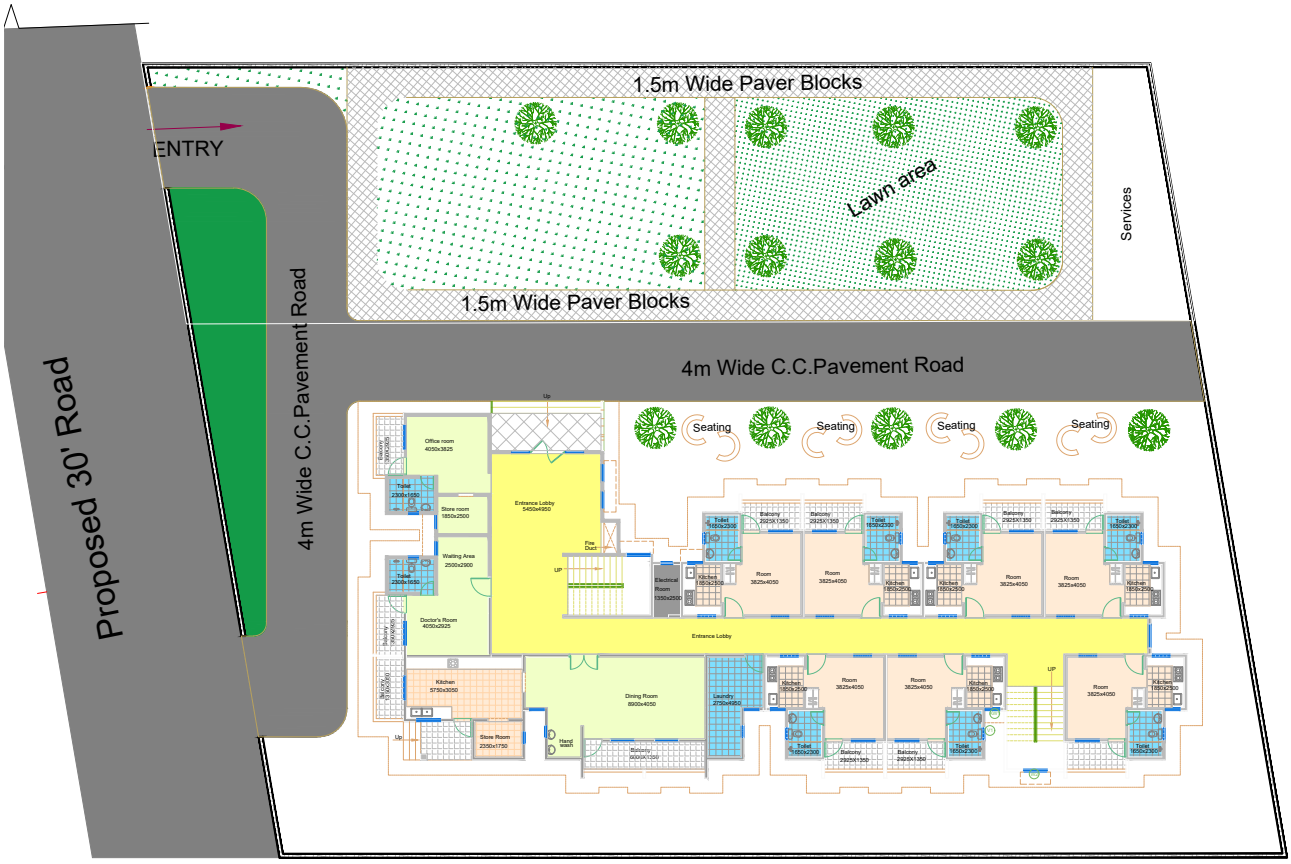
Others:

- Electrical fixtures such as ceiling fans, LED tube lights, exhaust fan; wooden shutters in cupboard and under kitchen cabinet

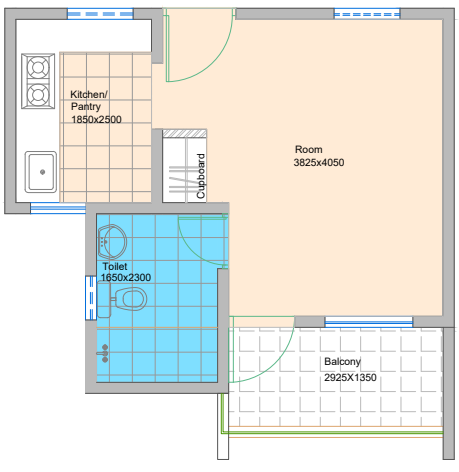
The structural design of DHP has been vetted by Faculty of Engineering and Technology, Jamia Millia Islamia, Delhi and IIT Jammu has been approached for Technical evaluation of the DHP.

DHP AT TIRRUPUR, TAMIL NADU

The Tamil Nadu Urban Habitat Development Board, Chennai, Tamil Nadu allotted land measuring 2000 sqm. through District Collector, Tiruppur at Survey No.24/3, Village Sempiyanallur, Taluk Avinashi, Tiruppur District, Tamil Nadu for the Demonstration Housing Project to be used as Working Women Hostel & Widow Home. The layout plan, architectural plans, etc. is being approved by the District Town and Country Planning Office, Tiruppur. The DHP is in G+3 configuration with other provisions and being constructed using Precast Concrete Construction System –Precast Components Assembled At Site.



Layout Plan



Typical Unit Plan

3D View

Ground Floor Plan

Project Profile:

- Location: Survey No.24/3, Village Sempiyanallur, Taluk Avinashi, Tiruppur District, Tamil Nadu
- State Level Nodal Agency : Tamil Nadu Urban Habitat Development Board, Chennai
- Land Allotted by: District Collector, Tiruppur
- Usage : Working Women Hostel & Widow Home
- Plot area of project : 2000 sqm.
- No. of houses : 40 (G+3); Other provisions includes a Dining Hall with Kitchen and store, Common Room with toilet, General office, Medical Room with toilet, Care Taker Room, Activity Rooms and Laundry
- Carpet area of each unit : 26.66 sqm.
- Built up area of each unit : 31.51 sqm.
- Total built up area : 2044 sqm.
- Technology Used: Precast Concrete Construction System –Precast Components Assembled At Site
- Each unit consist of a room with attached toilet, kitchen and balcony
- Includes Earthquake Resistant Features.
- Infrastructure facilities : CC Road, pathways with concrete pavers, water supply work, septic tank, tube well, horticulture work, boundary wall, drainage & disposal and external electrification using solar panels, rain water harvesting, fire fighting system, etc.
- Status of project : Drawings are under approval

About the Technology

Precast construction technology is a system of casting concrete in a reusable mould or "form" which is then treated in a controlled environment, conveyed to the construction site and lifted to the place. Precast Construction Technology consists of various precast elements such as walls, beams, slabs, columns, staircase, landing and some customized elements that are standardized and designed for stability, durability and structural integrity of the building. Precast residential building construction involves design, strategic yard planning, lifting, handling and transportation of precast elements. This technology is suitable for construction of high rise buildings resisting seismic and wind induced lateral loads along with gravity loads. The building framing is planned in such a way that maximum number of repetitions of moulds is obtained. These elements are cast in a controlled factory condition. The factory is developed at or near the site which provides an economical solution in terms of storage and transportation.

In this project, the system has been used as load bearing wall panels. The total thickness of wall is 150mm and precast slab of 100mm.

Technologies/ Specifications being used:

Foundation

- Isolated RCC column footing with Plinth beam

Walling

- Precast Concrete wall Panels

Roofing

- Precast Concrete Slab

Joinery & Finishing

- Flush door shutters fitted in pressed steel door frames
- PVC door frames & shutter in toilets
- uPVC window frame with glazed panel and wire mesh shutter in rooms and toilet

Flooring

- Vitrified tile flooring in Rooms, Pantry & Balcony
- Marble stone on pantry/kitchen counter
- Anti-skid ceramic tiles in toilet
- Kota stone Flooring in common areas and staircase

Wall Finishes

- Weather proof paint on external walls
- Oil Bound distemper over Putty on internal walls.

Others:

o Electrical fixtures such as ceiling fans, LED tube lights, exhaust fan; wooden shutters in cupboard and under kitchen cabinet

The structural design of DHP has been vetted by NIT Tiruchirappalli and has also been approached for technical evaluation of the DHP.

About BMTPC

Building Materials & Technology Promotion Council (BMTPC), established in 1990, is an autonomous grant-in-aid organisation of the Ministry of Housing & Urban Affairs, Govt. of India. BMTPC is mandated to promote and transfer cost-effective, environment-friendly, energy-efficient and emerging building materials and housing technologies including disaster resistant construction practices for large scale field application.

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."

Broad Areas of Activities

- **Building Materials & Construction Technologies:** To promote development, standardization, mechanization and large scale field application of proven innovative and emerging building materials and technologies in the construction sector.
- **Capacity Building and Skill Development:** To work as a Training Resource Centre for capacity building and promotion of good construction practices to professionals, construction agencies, artisans and marketing of building technologies from lab to land.
- **Disaster Mitigation & Management:** To promote methodologies and technologies for natural disaster mitigation, vulnerability & risk reduction and retrofitting/ reconstruction of buildings and disaster resistant planning for human settlements.
- **Project Management & Consultancy:** To undertake project management and consultancy services including appraisal, monitoring and third party inspection of housing projects under the various Central/State Schemes

Building Materials and Technology Promotion Council
Ministry of Housing & Urban Affairs, Govt.of India
Core-5A, First Floor, India Habitat Centre,
Lodhi Road, New Delhi
Tel: 91-11-24636705, 24638097, Fax: 91-11-24642849
E-mail: info@bmtpc.org

@bmtpcdelhi bmtpc.mhua www.bmtpc.org