प्रधान मंत्री आवास योजना-शहरी
Pradhan Mantri Awas Yojana-Urban

GLOBAL HOUSING TECHNOLOGY CHALLENGE INDIA

सत्यमेव जयते
Ministry of Housing & Urban Affairs
Government of India

G20 भारत 2023 INDIA

आज़ादी का अमृत महोत्सव

Compendium of Innovative Building Materials and Construction Technologies

showcased during

INDIAN URBAN HOUSING CONCLAVE 2022
RAJKOT, GUJARAT

Indian Urban Housing Conclave

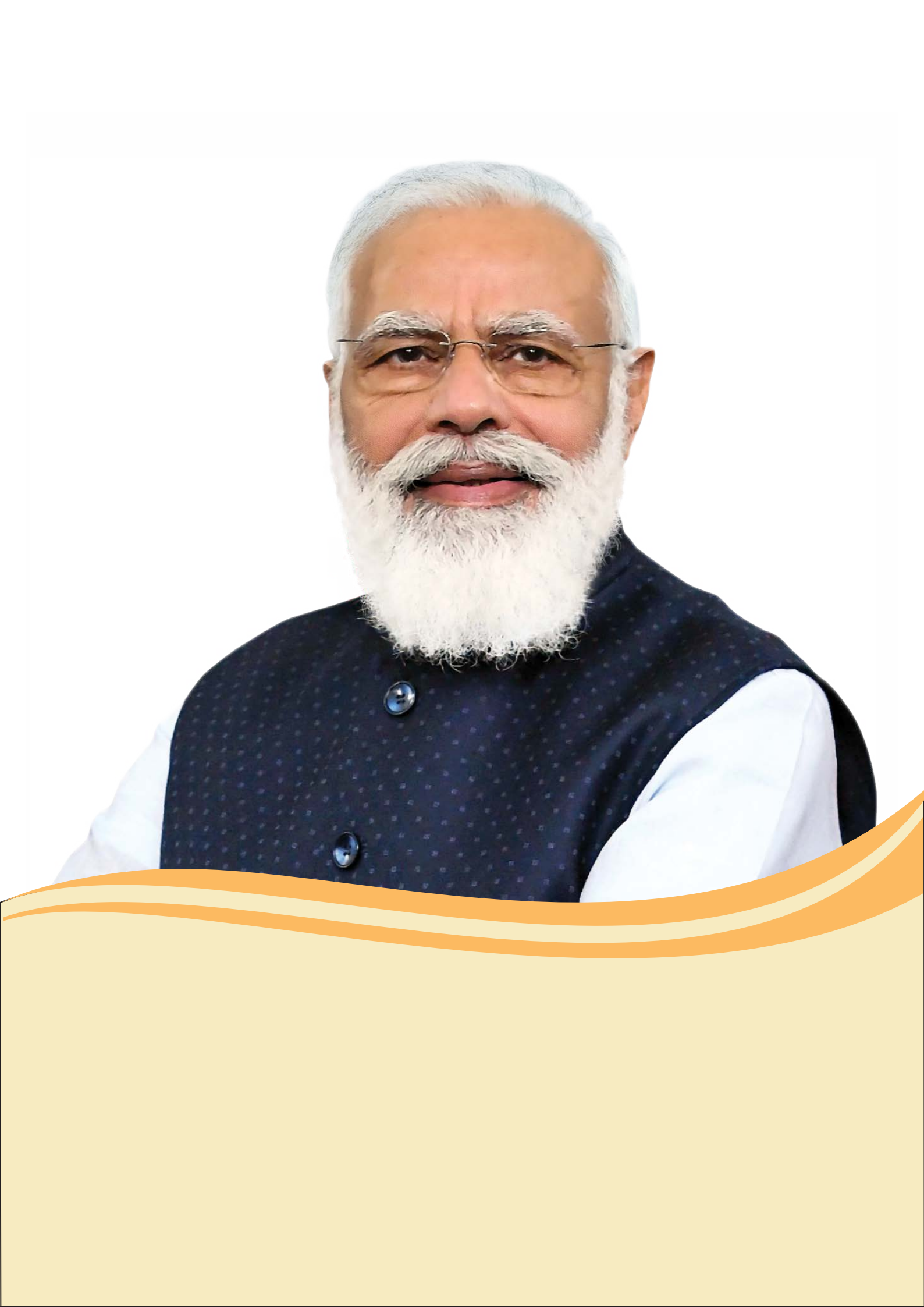
19-21 October 2022 – Shastri Maidan, Rajkot, Gujarat

Promoting Proven and Potential Technology,
Materials, Skills, Construction
Techniques & Processes

आज़ादी का अमृत महोत्सव

"भारत में कंस्ट्रक्शन की अप्रोच में हमने एक और बदलाव किया है। अब चाहे सड़कें हों, रेज़िडेंशियल अपार्टमेंट्स हों या फिर कमर्शियल बिल्डिंग्स, इको फ्रेंडली, डिजास्टर रेजिसटेंट, और एनर्जी एफ़िशिएन्ट निर्माण को प्रोत्साहन दिया जा रहा है..."

– नरेन्द्र मोदी



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Background

Ministry of Housing and Urban Affairs (MoHUA) is implementing Pradhan Mantri Awas Yojana-Urban (PMAY-U) which aims to provide all weather pucca houses to eligible beneficiaries in urban areas by year 2022. PMAY(U) targets the provision of pucca houses to about 11.20 million households in the country.

In the PRAGATI1 meeting held on 12th July 2017, Hon'ble Prime Minister emphasized and exhorted the States/UTs to accelerate adoption of innovative and alternative construction technologies to improve the pace and quality of work under PMAY-U and address the challenges of rapid urban growth and its attendant requirements.

Construction of houses at the scale of PMAY (U) offers an opportunity for inviting alternative technologies from both within the country and across the globe. This may trigger a major transition through introduction of cutting-edge building materials, technologies and processes. Under PMAY (U), a Technology Sub Mission (TSM) has been set up to facilitate adoption of modern, Innovative, green technologies and building materials for faster and quality construction of houses. The sub mission, inter alia, works on green buildings using natural resources, innovative technologies and materials, earthquake and other disaster resistant technologies and design.

In the light of the above, MoHUA initiated Global Housing Technology Challenge India (GHTC-India) in January 2019 which aimed to identify and mainstream the globally best available proven construction technologies that are sustainable, green and disaster resilient through a challenge format which can bring a paradigm shift in construction practices for affordable housing. GHTC-India has three components viz. i) Construction Technology India (CTI): biennial Expo-cum-Conference, ii) Identifying Proven Demonstrable Technologies from across the globe to construct Light House Projects (LHPs),and iii) Providing Incubation and Acceleration support for promoting Potential Future Technologies (domestic) through establishment of Affordable Sustainable Housing Accelerators- India (ASHA-India).

Construction Technology India (CTI), 2019, the 1st Biennial Expo-cum-Conference was organized on 2-3 March 2019 for providing a platform for exhibition, assessment and promotion of Innovative Construction Technologies from across the globe. Both Indian and International Technology Providers/Companies participated in this challenge process. Various initiatives under GHTC – India are as follows:

a. In the CTI-2019 Expo-cum-Conference 54 Innovative Construction Technologies were shortlisted as per the suitability of construction in different geo-climatic regions of the country and grouped into six broad categories namely (i) Precast Concrete Construction System - 3DPrecast volumetric (ii) Precast Concrete Construction System - Precast components assembled at site (iii) Light Gauge Steel Structural System & Pre-engineered Steel Structural System (iv)Prefabricated Sandwich Panel System (v) Monolithic Concrete Construction, and (vi) Stay in Place Formwork System.

1 *PRAGATI (Pro-Active Governance And Timely Implementation) is a multi-purpose and multi-modal platform chaired by Hon'ble Prime Minister, aimed at addressing common man's grievances, and simultaneously monitoring and reviewing important programmes and projects of the Government of India as well as projects flagged by State Governments.*

These technologies were mostly found to be suitable for high rise structures and have great potential to be used under Affordable Housing in Partnership (AHP), In-situ Slum Rehabilitation (ISSR) verticals of PMAY-U and other high-rise housing projects being constructed in the country.

b. As a part of GHTC-India, to promote the application of shortlisted proven technologies in real projects, six Light House Projects (LHP) consisting of about 1,000 houses each with physical & social infrastructure facilities were initiated at six places across the country namely Indore (Madhya Pradesh); Rajkot (Gujarat); Chennai (Tamil Nadu); Ranchi(Jharkhand); Agartala (Tripura) and; Lucknow (Uttar Pradesh) with six distinct technologies –from each of the broad six groups of technologies. The foundation stone of all Six LHPs was laid by the Hon'ble Prime Minister on 01.01.2021 .Two of the projects at Chennai and Rajkot have been completed and inaugurated by Hon'ble Prime Minister. Others are at advance stages of construction.

c. These LHPs are showcasing the use of innovative technologies for field level application, learning and replication. The LHPs aim to demonstrate and deliver ready to live mass housing at an expedited pace as compared to conventional brick and mortar construction and will be more sustainable, durable and of high quality. These projects have served as Live Laboratories for all stakeholders including Research & Development leading to the successful transfer of technologies from the lab to the field. The whole process of Live Laboratory is based on the principles of Learning, Exploration, Adaptation and Replication through on-site learning, multi stakeholder consultation, finding ideas for solutions, learning by doing, experimentation and innovation for further adaptation of these disruptive technologies as per local needs and contexts.

d. A drive for free online enrolment of Technograhis has been started for exposing interested stakeholders to innovative construction technologies through onsite activities. Technograhis. Through Offsite Workshops/ Webinars, Webcasting, Mentoring on Technical know-how/Module etc Technograhis are learning about different aspects of these technologies They will be change agents of innovative and sustainable technologies to bring about technology transition in the construction sector and its adoption in the country.

e. A e-Learning module on GHTC-India website has been developed related to Live Laboratories i.e. https://ghtc-india.gov.in wherein all stakeholders can register themselves to visit six LHPs, learn the use of latest innovative technologies, innovate and adapt as per their local needs and contexts as new construction technologies to be adopted as 'Make in India'.

f. The Ministry is also conducting an online certificate course named NAVARITIH (New, Affordable, Validated, Research Innovation Technologies for Indian Housing) In collaboration with Building Materials and Technology Promotion Council (BMTPC) and School of Planning & Architecture (SPA), Delhi with an aim to enhance the capability of building professionals about the new and emerging building materials, technologies and processes for construction.

g. Further, under ASHA-India, Incubation Centres have been set up in four Indian Institutes of Technology (IITs) in Bombay, Kharagpur, Madras, Roorkee and at CBRI-CSIR at North-East Institute of Science and Technologies (NEIST), Jorhat to provide Incubation Support to potential future technologies that are not yet market ready and undergoing iterative design and development phase. For those potential future technologies that have completed prototype stage and are at various stages of readiness and require up-scaling, investment, publicity and market support, Acceleration support through Accelerator Workshops and Master Classes on various aspects are being provided.

Through PMAY (U), a basket of options is offered to ensure inclusion of a greater number of people depending on their income, finance and availability of land through four Verticals i.e. In Situ Slum Rehabilitation (ISSR), Affordable Housing in Partnership (AHP), Beneficiary Led Construction (BLC) and Credit Linked Subsidy Scheme (CLSS).

Realizing the need of different requirements of technologies/materials for owner driven single or double storey houses { about 60 % of total sanctioned under PMAY (U)}, Indian Housing Technology Mela (IHTM) was organized from 5th -7th October 2022 at Lucknow to promote indigenous Alternate/ Sustainable Building Materials and Innovative Construction Systems/ Technologies for Low & Mid-Rise Structures for Affordable Housing in the country. Under IHTM, 84 indigenous innovative technologies, materials and processes were shortlisted. A compendium was prepared on all these technologies with relevant information about the technologies and associated Agencies and was circulated to all States for information and use.

Technology change is a dynamic process and goes on evolving. All the initiative of MoHUA has generated tremendous scope and interest among Innovators, Start-ups, Entrepreneurs, and Small & Medium Developers on use of Innovative and Alternate Construction Systems, Materials, Components and Processes for housing construction. Through Light House Projects and Demonstration Housing projects of MoHUA, the application of proven technologies in projects is being demonstrated. Further, Since inception of GHTC-India in 2019 and IHTM, various other innovative construction technologies, materials and processes may have been developed through R & D by various stakeholders across the world which may also be included for further adoption and mainstreaming in the domestic context.

in order to widen the horizon and to bring technology transition in the construction sector for sustainable development, as a part of Indian Urban Housing Conclave, an Exhibition was organized at Rajkot from 19 – 21 October,2022. This provided a platform to Technology Providers of Innovative materials, Components, Construction systems & Machineries, Technical Institutions including those who took part in GHTC-India & IHTM, as well to the agencies involved in construction of Light House Projects & Demonstration Housing Projects to showcase their innovations and technology and projects. 54 Agencies participated with varied materials, components, systems, projects {Light House Projects, Demonstration Housing projects and Affordable Rental Housing Complexes (ARHC) projects} and Project Management tools. The agencies also gave presentation before a Technology Evaluation Committee (TEC) set up by MoHUA.

The exhibits presented by participating agencies covered different aspects/ elements of construction of houses /buildings like Structural systems, Walling, Roofing, Joineries, Construction Chemicals for improving durability of concrete, Project Management tools. Display

of field application of earlier shortlisted Construction technologies under GHTC – India in Indian Context generated lot of interest amongst all stake holders especially from different States, builders and developers and general public.

There were a total of 88 exhibitors, out of which 54 exhibitors were covered under technologies/ systems/ products/ materials/ components category and 34 exhibitors included State Govt. departments /financial institutions/ Agencies promoting/ working in sustainable developments etc.

This Compendium provides information about the participating agencies and associated innovation in development and use of structural systems/ materials/ components/ machineries / Management Tools.

This will work as an additional tool for all stakeholders to learn about the innovations showcased during Indian Urban Housing Conclave for further use in their projects. All these initiatives by MoHUA is towards bringing a transitional change in construction Industry in the Country to achieve the Hon'ble Prime Minister's vision of" Atma Nirbhar Bharat".

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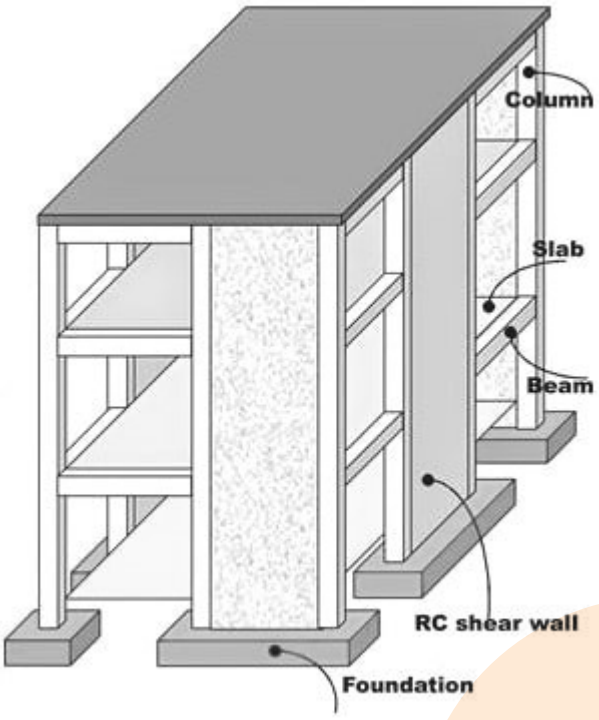
INDIAN URBAN HOUSING CONCLAVE 2022
RAJKOT, GUJARAT

Alternate Structural / Building Systems



Category: Alternate Structural/ Building Systems

01 Accucel Modular Building System (AMBS)

Scan QR Code for Technology Detail

ACCUCEL
The Environment-Friendly Alternative

Name of agency
M/s Accura Polytech Pvt Ltd.

Alternate to
Conventional Load Bearing Construction

Brief

Accura Polytech Pvt. Ltd. was established in 1994 to manufacture "Accucel" the solid UPVC foam profiles using technology from Italy.

Accucel solid UPVC foam products are as elegant as any premium wood in appearance and equally workable like wood and offer almost unlimited possibilities for shape, size and color and can be produced with variety of surface finishes.

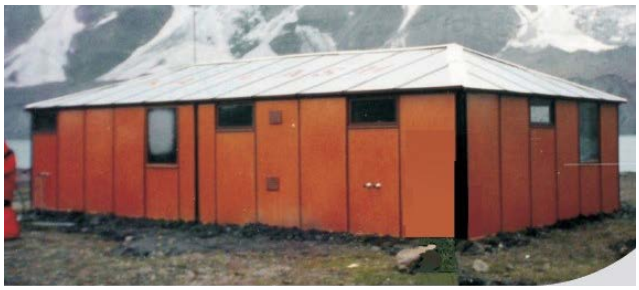
Accucel Modular Building System consists of the following components:

Structural Frame — Structural frame is made of MS heavy duty pipe base frame, Vertical columns, trusses and purlins, LGSF frame as top member for structural support and electrical wiring and conduit piping as per the drawing to withstand high wind velocity and earthquake resistant upto seismic zone V. Heavy duty Special GI 'Z' & 'L' section and MS Plates are used for fixing wall panels, roof panels and for foundations.

PUF Wall Panel	The PUF Wall Panel is made up of 50mm thick composite PUF sandwich 0.5 / 0.4mm between Pre-Painted Galvanized Iron Sheet. The panels are made of micro ribbing Pre-Painted Galvanized Iron Sheet on both sides with 50mm thick layer of PU foam of density of 40±2 kg/m3 as insulation. The panels have tongue & groove arrangement. Top & Bottom covering on Wall panels has micro ribbing pre-coated galvanized iron sheet.
PUF Roof Panels	The insulated roofing is 30+30mm thick PUF insulated Sandwich panels with density of 40±2 kg/m3. The top covering on roof panels is 0.5/0.4mm trapezoidal Pre-coated galvanized iron sheet with crest height 30±1mm, crest width 24±1mm and pitch 200±1mm & bottom covering on roof panels is micro ribbing Pre-coated galvanized iron sheet .
Doors	Main & Internal ACCUCEL Doors are 28mm thick sandwich type. Toilet doors are 28mm thick panel type door.
Windows	ACCUCEL Sliding window shutter are made of 4mm thick Ribbed polycarbonate sheet.Ventilators are louvers type.
Flooring	Ceramic Tiles are provided on IPS flooring.

Salient Features

- Products are Modular designed and are Light weight, easy to transport, easy and faster to install and relocate. Requires minimum tools & manpower to install within a short time.
- It is Waterproof and termite proof.
- Structural frame & Components are coated with corrosion resistant paints
- Fire Retardant
- Environment Friendly as no wood used.
- Interlinked base frame, trusses, roof & columns with foundation makes it high wind velocity resistant (High Wind Load up to 100 km/hour) and earthquake resistant
- Low Maintenance, longer service life
- Good sound insulation



Major Projects

- Rehabilitation units and Anganwadi for UNICEF and Prefab community toilets for OXFAM-UK for earthquake affected people in Kutch, Gujarat.
- Prefab resorts and bio toilets for tourists at Mount Abu, Panchkula and Goa etc. & Prefab toilets for Sarva Shiksha Abhiyan(schools) in various districts districts in Telangana
- Prefab control rooms and security cabins for military personnel at Rudra Prayag Joshi Math, Mana, Airoli and other places in Uttarakhand.
- Prefab bio toilets for labour camps for infrastructure projects and reality builders in 14 States in the Country.
- Prefab offices for mining projects in Congo South Africa.
- Doors, windows, kitchen and wardrobe shutters, false ceiling and wall panelling, duct covers, school furniture, trellis, staircase railings, decking's, partitions, workstations, etc for govt. Projects (CPWD, MAP, MES, RNB), and private and corporate clients.
- Export of door shutters with frame to prestigious project of 68 storeyed twin inclined tower (Altair) in Sri Lanka.

Certification/Indian Standard/Endorsements

- CPWD
- MES, E-N-C, MAP
- MHADA, CIDCO
- Govt. and Corporate Sector-Reliance, L&T, JMC, Shapoorji Pallonji, Coromandal Engg., Torrent, GWSSB, GMB, Sports Authority Of India, ISRO, Police Housing, ONGC, etc.
- Reputed Builders and International NGO like UNICEF, OXFAM-UK, FICCICARE. etc.

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Category: Alternate Structural/ Building Systems

02 Prefabricated Building Construction using LGSF Technology & Hot Rolled Steel Section

Scan QR Code for Technology Detail

AISHRA TECHNOFAB ENGINEERS

Name of agency
M/s Aishra Technofab Engineers

Alternate to
Conventional Construction System

Brief

Aishra Technofab Engineers uses structural light gauge steel framing materials in lieu of traditional building materials.

Aishra Techno fab Engineers started its operation in the year 2018. It is one of the first partnership MSME firms to provide turnkey solution in innovative construction in Bihar. It has been recently incorporated as Private Limited Company & has also been recognized as Start-up company by Department of Industrial Policy & Promotion (DIPP), Govt of India. In the first year, the company was conferred the tittle of Debutant of the year by TATA STEEL NEST-IN.

LGS framing system consists of structural frames fabricated using cold-formed steel sections. It can be used throughout a structure, including the load-bearing exterior wall, interior non-load-bearing walls, floor joists, curtain walls and roof trusses. LGS framing is becoming more of a common material used on construction worksites. These structures have superior corrosion

resistance than many other commonly used materials & are noncombustible and are suitable for use on residential and commercial projects of all relevant applications. It is also flexible and can be fabricated and engineered as required to suit the design needs. This opens the door to increased design possibilities and more innovative efficiencies across the entire project.

Salient Features

- Foundations are about 25% lighter than that of Brick-Mortar Buildings.
- Production in controlled factory condition brings resource efficiency.
- Pre-engineered and prefab components offer versatility.
- Better Quality and Durability.
- Good as earthquake Resistant structures due to lighter weight
- Environmental Friendliness.
- Permanent structure are re-usable & re-locatable. Ease of Working.
- Brings speed in construction.

Major Projects

- Construction of 2 nos. of RRI Building (G+2), in Mughal Sarai Division for Indian Railways, in the year 2019. These are one of the largest PREFAB RRI Buildings in India. These buildings were constructed using Hot rolled steel and Cold form steel also called Hybrid method of construction.
- Construction of 4 nos. of RRI Building (G+1), in Mughal Sarai Division for Indian Railways, in the year 2019. This building was made with LGSF and was constructed during peak COViD-19 period.
- IOCL Turnkey project for 108 LGSF based Sales and Revenue building of various sizes in different regions of Kerela, Odisha, Karnataka, Tamil Nadu, Andhra Pradesh, and Telangana.
- IOCL Turnkey project for construction of Prefabricated Structure quantity for 120 buildings in different states i.e Maharashtra, Chhattisgarh, Madhya Pradesh, Odisha, and Kerala.
- Apart from this company also Installed 300+ prefab Toilets in Patna city under Patna Municipal Corporation in the year 2018-19.
- Construction of Training center in Paradip, IOCL (Indian Oil Corporation Limited).

- 5 Building of +6,500 Sq ft. for CAO South Project EC Railway
- 9 Buildings of +3,500 Sq ft. for Sonepur Railway Division EC Railway

Ongoing Projects

- 1 Building of +10,000Sq. Ft. for Safety Park IOCL Pradip.
- 120 Buildings of +60,000Sq ft. Sales building and Driver Facility IOCL (Tamil Nadu, Andhra Pradesh, Telengana, Odisha, Kerala)
- 120 Cabins of +3,500 Sq ft. Modular PEB (Porta Cabin), IOCL (Gujarat, Madhya Pradesh, Chattisgarh, Maharashtra, Goa)
- 1 Building of +1,000 Sq ft. Rest room for Indian Railways.

Certification/Indian Standard / Endorsements

- The company is executing projects for Patna Municipal Corporation, Indian Oil Corporation Limited, Indian Railways.

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Category: Alternate Structural/ Building Systems

03 Steel Building Solution - MS Steel Tubes and Efficiency Solutions

Scan QR Code for Technology Detail

Name of agency
M/s Apl Apollo Tubes ltd.

Alternate to
Conventional construction system

Brief

The company is manufacturer of steel pipes and tubes using high frequency welding technique. It is into design & fabrication of Pre-engineered building structures using hollow steel sections which reduces the overall time of construction, cost, improves the quality and is environment friendly.

The company also produces Prefabricated steel door and window frame, Planks, handrail etc.

Salient Features

i. The use of prefabricated steel tubes helps in fast construction, thus reducing construction time & bringing associated benefits.

ii. With steel tubes larger span structure can be made, which is aesthetically better and gives higher carpet area.

iii. With steel tubes as structural members (column & beam), any non-load bearing dry walls can be used, thus reducing the wastage & pollution at site.

iv. Highly sustainable as materials are infinitely recyclable

v. The product can be used to build High rise buildings, warehouses, factory sheds or any type of buildings.

vi. Setting up of fabrication unit for steel does not require very high capital.

Major Projects

i. PWD Hospital projects at Delhi (7 Hospitals in Delhi)

ii. Tricoat Shed at Dujana-UP

iii. Industrial Shed at Raipur, Chhattisgarh

Certification/Indian Standard / Endorsements:

Steel based structural system is established System with design, fabrication & construction covered under Indian Standard (IS: 800).

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Category: Alternate Structural/ Building Systems

04 Quik Build – 3D EPS Core Panel System

Scan QR Code for Technology Detail

BEARDSELL

Name of agency
M/s Beardsell Limited

Alternate to
Conventional construction System

Brief

Quik Build Construction System uses prefabricated panels consisting of insulated core of expanded polystyrene sandwiched between two custom engineered sheets of special rust protected steel welded mesh to create a strong shell for the building. 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 behaviour, which provides rigidity and shear for a full composite behaviour. These panels are used in the construction of exterior and interior load bearing and non-load bearing walls and floors of buildings of all types Construction. A special mix of concrete is then applied using traditional method or a shotcreting machine to create a monolithic structure. Quik Build brings the strength of steel into the walls while providing space saving, lower air conditioning cost etc. The complete structure is reinforced with 2-3 mm (zinc quoted steel wire mesh specially designed such that up to G+2 structure there is no need of beams & columns and even Lintel are not required.

Salient Features

- There is no need of beams & columns and even Lintel are not required in the Quik Build system.
- Light weight, easy to handle and assemble
- Fast in Installation with saving in time (50 % of time vs conventional construction)
- Insulated and soundproof.
- Fire resistant (Fire rating up to 2 hours).
- Are designed for flexibility making any kind of geometrical form.
- Earthquake, cyclone, and weather resistant.
- Termite proof.
- The Quikbuild structure can be designed to withstand wind loads of up to 400KM/hour
- Provides 10% more carpet area.
- Structure being thermally insulated reduces consumption of energy (30- 40% saving).
- Suitable to all climatic conditions.
- Compatible with any kind of technology.

Major Projects

- Himalaya Drug Bangalore (G+1 2,000 Sqm) 2016
- Vaga Auto Ltd Rudrapur, Uttarakhand (G+2 5,000 Sqm) 2017
- Bihar Police Building Construction Corporation, Patna (Ground Floor 1,500 Sqm) 2017
- Demonstration Housing Project under PMAY(Urban) at Jammu
- East Coast Railway Khurda Road, Odisha (G+3 3,000 Sqm) 2018
- IIT-Jammu/ CPWD Jagti, Jammu (G+2 30,000 Sqm) 2019
- Tamil Nadu Police Housing Corporation Ltd.Jeevodaya Hospital, Chennai
- PMSSY, Jhansi Medical
- PMSSY, Odisha Medical
- Govt. Hospital Karnataka Mortuary
- Hotel at Kodaikannal, Tamilnadu
- Old Age Homes, Coimbatore, Tamilnadu
- Anganwadi Paderu taluk Vizag Dist., Andhra Pradesh
- Northern Railway – G+1 S&T Building at Varanasi, Uttar Pradesh
- UHBVN Panchkula – G+7 External Wall
- HQ 4 Corps, 102 Regiment, Indian Army- Tezpur

Certification/Indian Standard / Endorsements

- Quik Build is tested and certified by various govt. Institutions like IIT-Madras, CISR- SERC Chennai
- Certified by BMTPC under PACS
- MSME Mumbai.
- Platinum rating award for Quik Build Farmhouse given by Indian Green Building Council.

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Category: Alternate Structural/ Building Systems

05 Precast Concrete Construction System - Precast Component Assembled at Site

Scan QR Code for Technology Detail

Name of agency

M/s B.G. Shirke Construction Technology Pvt. Ltd.

Alternate to

Conventional Construction System

Brief

The Shirke Group is one of the largest construction companies of mass housing projects with its proven industrialized '3-S' Prefab Technology in India. The company has constructed more than 2 lakh Dwelling Units ranging from G+3 to G/S+25 storeys in all climatic conditions. Performance evaluation of the system / actual load test / reverse cyclic load test etc. to evaluate performance under seismic Zone-IV has been carried out at reputed national institutions like CBRI Roorkee, IIT Mumbai, TOR Steel Research Foundation of India, Bangalore etc. and it has been concluded that 3-S Precast System satisfies all the technical parameters and Codal requirements.

'3-S' Prefab Technology/ Pre-cast Concrete Structural system comprises of pre-cast column, beam, precast concrete / light weight slab, AAC blocks/ infill concrete walls. Structural members are cast in the factory and assembled at site. 3S system incorporates precast dense reinforced cement concrete hollow core columns, structural RCC shear walls (as per design demand), T/L/Rectangular shaped beams, stairs, floor/roof solid Precast RCC slabs, lintels, parapets

and chajjas. AAC blocks are used for partition walls. Hollow core columns are erected above substructure, over which beams are integrated in the column notches followed by erection of slabs. 3S Prefab Technology completely eliminates the use of timber and forest produce of any category. On the contrary, use of fly ash and GGBS enhances the sustainability. The thermal and acoustic insulation provided by the AAC block masonry, facilitates reduction in energy towards maintaining comfort level temperature within enclosed habitat space. Also, considerable reduction in dead load is achieved due to use of form finish precast components & AAC material resulting into better performance under seismic loads.

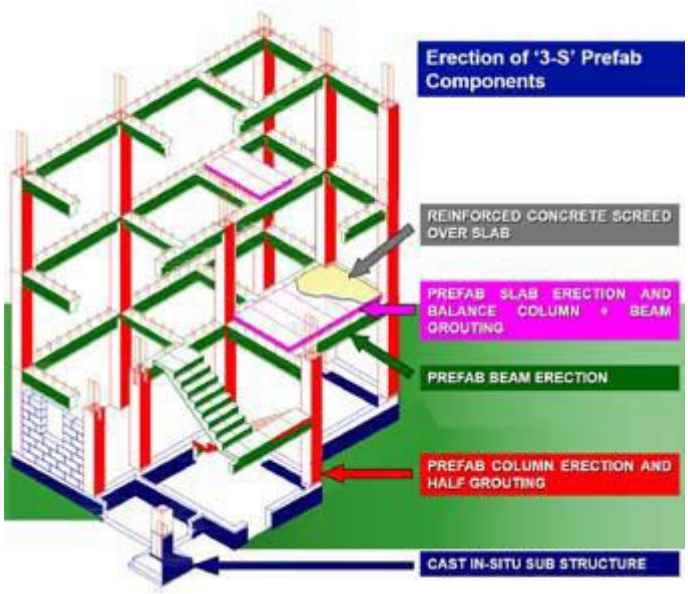
All the structural components are pre-engineered and manufactured in factories / site factories with objective quality control resulting into dimensional accuracy, correctness in spacing of reinforcement, uniform protective cover, full maturity of components and assurance on design strength due to use of design mix concrete having minimal water cement ratio which ultimately results into durable structure. Plants & Machineries for production of components available in Pune, Mumbai, Bangalore and Delhi. These can be setup at / nearby project site within very short time.

Salient Features

- Pre cast construction use causes reduction in construction time.
- The controlled factory environment brings resource optimization, and improved quality, precision & finish.
- Reuse factory waste as fly ash, etc., conserves natural resources.
- Increased safety on site
- Decreased dependency on skilled labours
- Increasing numbers of parallel activities
- Minimize air, water and noise pollution at work site
- Very minimal requirement of water for construction is required.
- Eliminates of use of timber / wooden scaffolding/ Shuttering.
- Reduces wastages considerably owing to better quality / process controls and repetitive task. Non-generation of construction debris
- Due to centralized precast facility, storage of raw materials and requirement of concrete is mainly at one place.
- Ensures better controls on material management.
- Suitable in all weather conditions for mass housing.
- Tested for earthquake resistance for seismic Zone-IV. Not ready for Seismic zone –V.

Major Projects

- Light House Project (LHP) at Chennai (1152 Dwelling Units)
- Moulay Idriss - City Fes Morocco (3,600 Units) 2013
- Manazil Ismailia – City Meknes Morocco (1,000 Units) 2013
- Ville Nouvelle Project Dambri – City Constantine Algeria (1,000 Units) 2014
- Sampada Navi, Mumbai, India (2,064 Units, Apartment Complex of 60 Buildings)
- MHADA, Marsova, Mumbai.
- CIDCO Projects, Mumbai
- Judicial Quarter, Bangalore.
- DDA housing in Delhi.



Light House Project at Chennai under PMAY(U)

Certification/Indian Standard/Endorsements

- ISO 9001-2015, ISO 14001 – 2015, ISO 45001-2018
- Recommended by Govt. of India – CPWD, BMTPC & CBRI Roorkee

Light House Project at Chennai under PMAY(U)

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Category: Alternate Structural/ Building Systems

06 Stay-in-place Formwork System(Coffor)

Scan QR Code for Technology Detail

Name of agency

M/s Coffor Construction Technology Pvt Ltd.

Alternate to

Conventional Construction System

Brief

It is a patented structural stay in place formwork system 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 vertical steel channels and horizontal steel bars act as steel reinforcement for load bearing wall. The connectors help to fold the formwork for easy transportation.

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 may be done with a pump, bucket or with a shovel loader. The inside and outside walls are finished with cement plaster of suitable grade.

Coffor Insulated Panel

Coffor Double Panel

The panels are prefabricated according to a structural plan (based on client's architectural plans) designed by structural engineers. Coffor India supplies four types of panels.

- Standard Double panel- to build internal and external wall
- Standard Single panel- for slab shuttering, or as shuttering for RCC wall having thickness more than 350mm
- Fibre Cement Double panel- to build walls and infrastructure projects
- Insulated double panel – to build external walls for hot climatic conditions.

Salient Features

- Speedy construction.
- Reduced number of skilled labour required.
- Earthquake resistant structures.
- Reduces transportation cost.
- Requires minimal reinforcement and its wastage.
- No Heavy Machinery required.
- Easy insertion of electrical and plumbing, no need to cut the walls except electrical boxes.
- Reduce maintenance Cost.
- Reduced material wastage and construction debris
- Eliminates de-shuttering activates, as Coffor panels remain in the structure and are part of the structure.
- Wood consumption is very minimal and possible to use recycle scaffolding materials.
- Coffor insulated panels provides good thermal insulation
- Can be made available PAN India.
- It can be used to build all types of RCC structures including load bearing walls and retaining walls.
- Compound wall can be constructed with speed of construction at the rate of 100 Rmt / Day.
- Suitable for all type of water retaining structures.

Major Projects

- G+3 Building at Telangana & G+2 Building at Bihar Sharif (BMTPC)
- Construction of Bunker at Northeast, Military Engineering Services (MES)
- Construction of Police Barrack-3 Nos, Siliguri, West Bengal
- Demonstration Housing Project (DHP), Agartala (BMTPC) G+1 Structure.

Certification/Indian Standard/Endorsements

- Certified by IIT Mumbai
- Certified by BMTPC under PACS
- Military Engineering Services (MES)
- Inclusion in PWD MP SoR – Vol II , Chapter 31

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Category: Alternate Structural/ Building Systems

07 Reinforced Concrete Panels "Lost Form Shuttering"

Scan QR Code for Technology Detail

Name of agency

Department of Earthquake Engineering, IIT- Roorkee (Incubation Support)

Alternate to

Conventional Shuttering System

Brief

Indian Institute of Technology (IIT) Roorkee is one of the Incubation Support Institutes set up under Affordable Sustainable Housing Accelerator - India (ASHA-India) component of Global Housing Technology Challenge - India (GHTC-India) for providing incubation support to Potential Future Technologies for main streaming their products in the affordable housing sector. Incubation Support Institute provides workplace, research and guidance, mentoring, financial advice, networking and branding support, access to testing and other facilities including library. Department of Earthquake Engineering, IIT Roorkee has State of the Art Laboratories for Experimental studies of New Housing Technologies. The Institute is providing incubation support to the technology.

Often the cast-in-situ RC components constructed within-site formwork do not yield good finishing and often require plaster for better finishing. The plastering mortar is mainly composed of natural sand and cement. The natural sand is extracted from river beds which is not sustainable.

The technology is Lost Form Shuttering for reinforced concrete members and infill walls. These panels and beam, column elements are useful as formwork. The wall panels and beam-column formwork can be constructed with 25 mm or 30 mm concrete panels. This Technology Consists of Reinforced concrete plank "Lost Form Shuttering" which means Concrete planks will become the part of structure at the time of casting of columns, beams & Slab etc. These planks will be of thickness 25 to 30 mm and prepared in casting yard and will be used as shuttering material (form work) for all structural work. The wall plates and beam-column form work elements are made in the casting yard. Therefore, have better finishing. Reinforcement is provided during the casting of these elements.

Salient Features

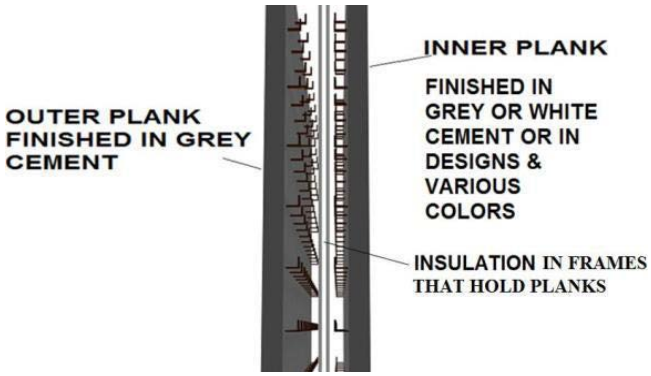
- Speedy construction: one can occupy a house earlier as compared to conventional construction with finished reinforced cement concrete (RCC) walls and RCC roof.
- Significant saving in construction cost due to the elimination of formwork, scaffolding and plaster.

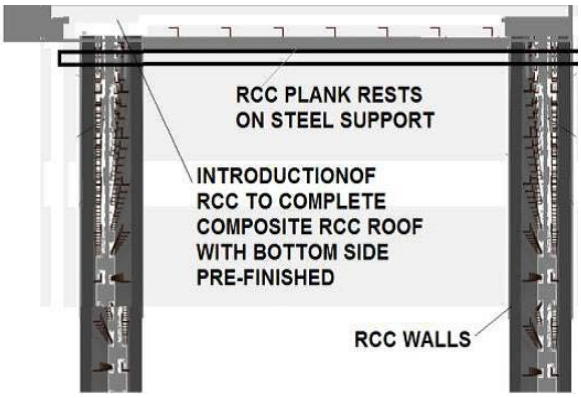
Major Projects

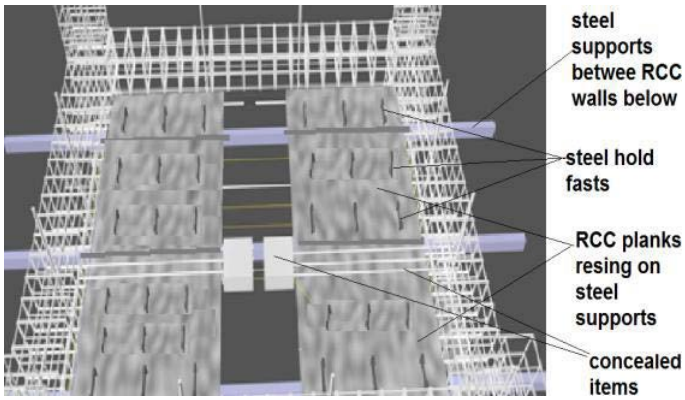
- The Technology is under Incubation stage.

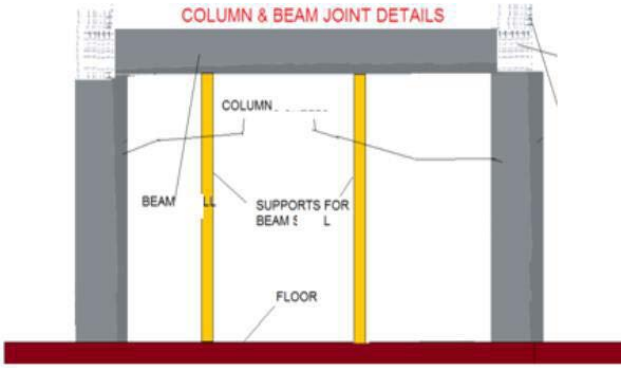
Certification/Indian Standard/Endorsements

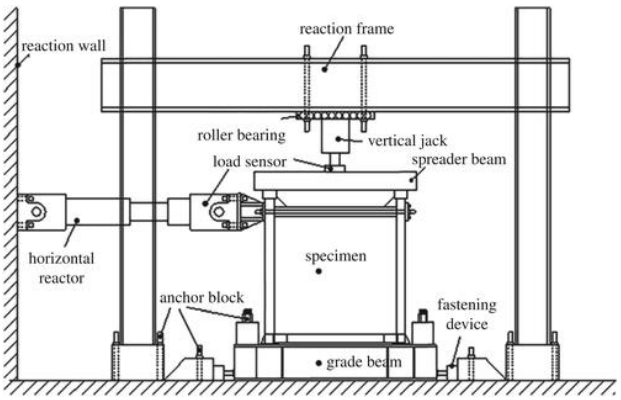
- Shortlisted as one of the Potential Technology Providers under GHTC-India in Incubation Category & getting Incubation Support under ASHA-India











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Incubatee:
Sh. Suresh Chawla,New Delhi.

Category: Alternate Structural/ Building Systems

08 Ferrobuild Design System (Ferron panels and light gauge steel composite structural system)

Scan QR Code for Technology Detail


Hedvi, Maharashtra

Ferro Build

Name of agency
M/s Ferrobuild Design Systems

Alternate to
Conventional Construction System

Brief

Ferrobuild Design System uses patented Ferron panels (Ferro cement panels) along with light gauge steel sections to mobilize the composite action enhancing the load carrying capacity of the structure.The Ferron panels are available in size of 900 mm x 600 mm x 18 mm and have high tensile and compressive strength. It is pasted /screwed on steel section. The panels uses mortar with minimum compressive strength of 35 MPa, have water absorption of 8%, fire rating of 2 hrs, acoustics dampening of 100 Db+ & have zero knocking effect. The panels are used both for wall and slab.

Ferron panels have performance characteristics same or even better when compared to RCC construction. Essentially it is modified precast construction technique overcoming disadvantages of cast in situ and fully precast RCC construction. It is a viable, economical and eco-friendly alternative to RCC construction.

Salient Features

i. The composite action between steel section and ferron panels enhance the capacity of steel sections. Therefore, the steel consumption is greatly reduced.

ii. All the walls act as load bearing shear walls under lateral loads. Therefore, the structure overall has excellent lateral resistance.

iii. Walls are hollow with 90 mm air gap acting as insulating agent. This greatly helps in maintaining the room temperatures. The 90 mm air gap can be filled with insulating agents to further enhance the thermal & acoustic performance.

iv. Total weight of entire structure reduces by 50% leading to economical foundations and smaller seismic demands.

v. The material (cement, sand, coarse aggregates and steel) consumption is reduced leading to carbon footprint reduction and eco-friendly construction.

vi. Entire construction does not need any curing.

vii. All components are factory made enabling excellent quality control.

viii. All components have self-weight less than 25 kg eliminating the requirement of cranes and reducing the final cost.

Major Projects

- Resort in Konkan, Maharashtra
- G+2 building at Pune,
- ISB&M hostel building Extension in Pune
- 4500 sqft villa in Delhi
- Residential cottage in Bangalore

Certification/Indian Standard/Endorsements

- Indian standard (IS)/ ASTM Codes are available for various components of LGSF. Code of Practice (IS) is available for Use of Cold Formed Light Gauge Steel Structural Members.

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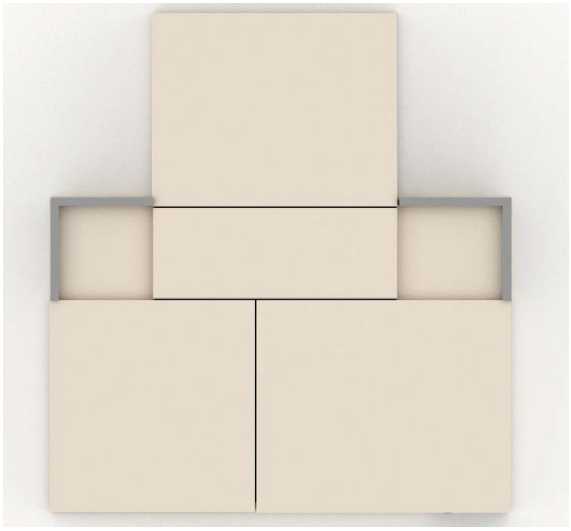
Category: Alternate Structural/ Building Systems

09 3D Precast Prefinished Volumetric Construction Technology - 3D PPVC

Scan QR Code for Technology Detail



SLABS

Name of agency

IIT Madras - M/s Slabs Engineering Pvt. Ltd. (Incubation Support)

Alternate to

Conventional Construction System

Brief

The Agency is one of the shortlisted Potential Technology Providers under GHTC-India in Incubation Category & presently getting incubation support at IIT, Madras under Affordable Sustainable Housing Accelerator (ASHA-India). The Agency is engaged in planning & designing of 3D Volumetric Pre-cast building/development. It is working with the Institute to refine its designs and to develop standards and specifications so that the adoption of the system can be enabled. The various activities include Development of design recommendations for sizing of 3D precast modules, Research, engineering and design of seamless (and invisible), workable and cost-effective 3D connections, Formulation of design aids towards selection, sizing, analysis, design, detailing, erection and finishing in mass housing using 3D volumetric precast technology, etc.

Salient Features

The salient features/ expected outcome of the Incubation Support Program are as below;

i. Development of connections for 3D volumetric precast construction.

ii. Development of Mould Technology for 3 D Volumetric construction - Make in India

iii. Development of analysis and design guidelines for 3D precast modules leading to application of such modules to high-rise mass housing.

iv. Development of implementation guidelines for application of 3D precast technology in mass housing.

v. Trained manpower that will work on the project

Major Projects

- The Agency is presently getting incubated at IIT, Madras for 3D Precast Volumetric concrete Construction Technology.
- The Agency has team of Structural engineers specialized in Pre-cast technology & has designed more than 9 lakhs sqft of projects using Pre-cast technology

Certification/Indian Standard/Endorsements

Shortlisted as one of the Potential Technology Providers under GHTC-India in Incubation Category & getting Incubation Support under ASHA-India at IIT, Madras.

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Category: Alternate Structural/ Building Systems

10 3D Concrete Printing Technology

Scan QR Code for Technology Detail

Name of agency
M/s Larsen & Toubro Limited

Alternate to
Conventional Construction System

Brief

With 3D Concrete printing technology concrete structures are constructed by selectively placing a special quick-setting concrete mix using a numerically controlled robotic printer layer by layer as per a 3D CAD model. The operation can be performed with minimal human intervention/ support and eliminates the need for formwork to construct walls.

The Agency has developed 3D Printable Concrete Mix by using locally available regular construction materials. The print Speed available is up to 250 mm / sec with print width upto 300 mm.

Salient Features

i. Automated construction ensures excellent build quality and safety
ii. Rapid construction with significant improvement in productivity
iii. Since no formwork is required, it eliminates the use of timber in shuttering process thus contributing to sustainable construction.
iv. Supplementary materials uses in the concrete mix reduce CO_2 emission.
v. Innovative design possibilities to elevate aesthetics and convenience to end users
vi. Optimum usage of skilled workmen
vii. Highly digitized workflow offers good predictability of the execution results

viii. 3D printers are lightweight systems that can be easily shifted, erected, and commissioned at job sites

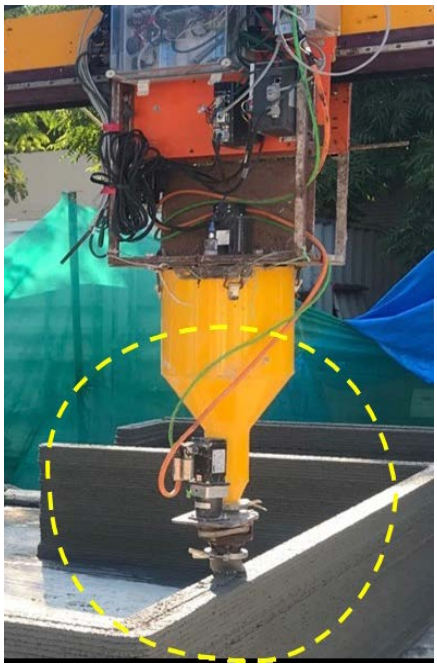
ix. The voids in the wall can be used to provide services. It also helps to improve thermal properties of the structure.

Major Projects

- One G+1 Building with BUA of 700 Sqft, GF - 1 BHK Residence (typical mass housing layout) & FF - Office space, With Rebar & Wall Thickness of 120 mm, in Chennai (December, 2020)
- 3D Concrete Printing of 3BHK Flat at Chennai (September, 2022)
- Replica of Typical Mass housing Project with Built-up área of 250 Sqft, Single Storey Building (Wall thickness: 100mm), in Chennai (November, 2019)

Certification/Indian Standard/Endorsements

- PAC issued by BMTPC
- The structural safety certificate for G+3 building from IIT Madras



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Category: Alternate Structural/ Building Systems

11 3D Modular Precast Housing system

Scan QR Code for Technology Detail

Name of agency

M/s Magicrete Building Solutions Pvt. Ltd.

Alternate to

Conventional Construction System

Brief

3D Modular Precast/ Magic Pods using steel mould and high performance concrete of building modules in factory/ casting yard. These pods are transported to the construction site & assembled. This 3D Volumetric concrete construction is the modern method of building by which solid precast concrete structural modules like room, toilet, kitchen, bathroom, stairs etc. & any combination of these are cast monolithically in Plant or Casting yard in a controlled condition. These Modules termed as Magic Pod are transported, erected & installed using cranes and push-pull jacks and are integrated together in the form of complete building unit. Subject to the hoisting capacity, building of any height can be constructed using the technology.

Construction & installation process

Sequential construction in the project here begins with keeping the designed foundation of the building ready, while manufacturing of precast concrete structural modules are taking place at the factory. Factory finished building units/modules are then installed at the site with the help of tower cranes. Gable end walls are positioned to terminate the sides of building. Pre stressed slabs are then installed as flooring elements. Rebar mesh is finally placed for structural screed thereby connecting all the elements together. Consecutive floors are built in similar manner to complete the structure.

Construction & installation process

- Upto 90% industrialization ensures savings in wastages in every raw material as it is manufactured in controlled environment with automated machines reducing errors.
- Reduction in manpower by 60%.
- Eliminates use of plaster
- 50% faster construction speed
- Seismic stability: Suitable up to Zone: 04
- Acoustic Performance: ≤45 dB
- High performance concrete of grade M - 40 and above
- Faster construction speed.
- Reduced use of water.
- Suited for all weather conditions.
- Heavy machinery required.
- Unsuitable for small scale projects.
- Available Pan India.

Major Projects

- Light House Project (LHP)-Ranchi with 1008 DUs in G+8 Configuration (Under construction)
- Rabweh Heights Apartments Lebanon 8 buildings G+4/5, 32,000 m^2 approx. (USD 30mn) 2014
- Al Ain Offices AL AIN UAE, Supply and erection of modules for 3 and 2 storey workers accommodation building
- 16,000 m^2 approx. (USD 15mn) 2012, Light House Project (LHP)-Ranchi (under construction)
- Shell Retail outlets Pvt. Ltd.,
- SRF, KCIL, Panoliinter mediates.

Certification/Indian Standard/Endorsements

- Recommended technology under GHTC

Light House project at Ranchi using 3D Volumetric Precast Construction

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Category: Alternate Structural/ Building Systems

12 Light Guage Steel Frame (LGSF) Technology

Scan QR Code for Technology Detail

Name of agency

M/s Mitsumi Housing Private Ltd.

Alternate to

Conventional Construction System

Brief

Cold Formed Steel Construction or commonly called Light Gauge Steel Frame construction is an advanced precise system using the state of the art technology. It provides a building system with the key competitive advantages of speed maximisation and waste minimisation. For the construction of a building, the Light Gauge Steel Frames (LGSF) can be manufactured in a factory and then transported to the construction site and erected wall by wall on a pre-built concrete floor as per the floor plan of the building. This technology can be effectively used to create Single Storied or Multi Storied buildings as per the requirement. Cold Formed Light Gauge Steel Frame (LGSF) Construction Technology has light gauge Steel frames hybrid with Pre-engineered Steel (as per design requirement) as structural member with various options of walling (Cement fibre board, concrete panels etc. with insulating material as core) & flooring (in-situ concrete on deck sheet etc.)

Salient Features

- Dead Load of LGSF is around 40% of the conventional brick wall dead load which in turns saves cost of construction in foundation & overall weight of building
- More sustainable than conventional construction as minimum use of cement and natural resources like sand, water, aggregates etc. in the whole structure
- Almost nil wastage of material at site and in factory.
- Reduced labour requirement for erection work as the components are light in weight.
- Less consumption of electricity as well as fuels in the work of erection at site.
- Majority of components are prefabricated & light and hence reduction in the time of execution at site by more than 20-40 %.
- Reduced power usage.
- Minimum usage of natural resources.
- Suitable for extreme temperatures and hence successfully used in 128 Countries all across the globe.

Major Projects

- Ministry of Transport, Infrastructure, Housing and Urban Development Mombasa, Nairobi, Kenya (1800 Units 81,000 Sqm) 2017
- AGI, West Africa (1250 Units, 44,594 Sqm) 2015
- CWG, White Horse YK, Canada (282 Suits, 28,800 Sqm) 2007
- Light House Project (LHP) at Agartala (under construction)
- 20 small housing projects at various locations in Kerala awarded by Kerala Life Mission.

Certification/Indian Standard/Endorsements

- Indian standard (IS)/ ASTM Codes are available for various components
- Design vetted by IITs/ NITs/ other Reputed Institutions
- IS 801 -1975 Code of Practice for use of Cold formed light gauge steel structural members in general building construction.

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Category: Alternate Structural/ Building Systems

13 Prefabricated Concrete Precast Construction

Scan QR Code for Technology Detail

Name of agency
M/s N M Roof Designers

Alternate to
Conventional Construction System

Brief

M/s N M Roof Designers (NMRD) have been into structural consultancy and turnkey construction including prestressed and precast concrete works. NMRD has an innovative cost-effective, precast RCC system for construction of houses using patented “Sogani Jointing Technique”. It is a building system which employs fully precast concrete components e.g. floor, walls and roof with special cast-in-situ patented jointing system at site.

The precast construction system has already been approved under Global Housing Technology Challenge –India under Precast Concrete Construction System-Precast Components assembled at site category and is suited for high to mid-rise structures. However, NMRD claims that the precast technology can be extended for isolated single storey houses with their innovative solution and will be economical enabling faster delivery of quality affordable houses.

The company holds Guinness World Record for design and construction of reinforced cement concrete flat roof with single span of 119 ft. which is the largest RCC span in the world.

Salient Features

- The structure is entirely made of precast reinforced panels for foundations, shear-walls, and slabs.
- The precast floors, walls and roofs are joined on site using patented “Sogani Jointing Technique”.
- Special treatment of joints for water tightness.
- The structure has smooth finish, higher strength & good quality and facilitates faster construction.
- A fully finished 250 sqft. Carpet area house with one bedroom, living, kitchen and toilet can be handed over in 5 days complete with doors, windows, flooring, painting, plumbing fixtures, electrical fixtures, kitchen counter, etc as claimed by NMRD.
- Being patented system, NMRD can set up the plant near site or supply the components as per the project requirements and viability anywhere in India.
- Precast concrete construction enables use of industrial waste such as fly ash, blast furnace slag and other pozzolanic materials in house construction.
- Strong and durable with multi-hazard resistant construction with respect to earthquakes, wind/cyclone and floods.
- The precast concrete construction has advantages over conventional cast-in-situ construction such as resource efficiency, low life cycle cost, less maintenance, waste minimization, affordability, and durability.
- The precast concrete construction has high thermal mass and long lag times.
- In building design, thermal mass is a property of the mass of a building which enables it to store heat, providing “inertia” against temperature fluctuations.
- Suitable for construction of single storied & up to G+3 buildings

Major Projects

- Houses in Rajahmundry,Andhra Ptradesh
- AP, Jaipur National University Musepur, Rajastahn
- Pilibhit Tiger Reserve, Uttar Pradesh

Certification/Indian Standard/Endorsements

- Technology certified by IIT Delhi & JNTU Kakinada.

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Category: Alternate Structural/ Building Systems

14 Light Guage Steel Frame (LGSF) Construction Technology

Scan QR Code for Technology Detail

Name of agency

M/s Nipani Infras & Industries Pvt. Ltd.

Alternate to

Conventional Construction System

Brief

The agency is into Designing, providing, installing and fixing factory finished custom designed cold form Light Gauge Steel Framed super structure comprising of steel wall panel, trusses, purlins etc manufactured out of 0.75 mm to 2.50 mm thick steel sheet as per design requirements. The steel sheet is galvanized (AZ-150 GSM Aluminium Zinc Alloy coated steel having yield strength 300- 550 Mpa) conforming to AISI specifications and IBC 2009 for cold formed steel framing and construction. The design is done using relevant Indian standards. The framing section are cold form C-type having minimum web depth 89 mm x 39mm flange x 11mm lip in required length as per structural design requirement duly punched with dimple/slot at required locations as per approved drawings. The slots will be along centre line of webs and shall be spaced minimum 250mm away from both ends of the member. The frame can be supplied in panelised or knock down condition in specific dimensions and fastened with screws extending through the steel beyond by minimum of three exposed threads.

The technology is suitable for Hospitals, schools, colleges, low rise & high-rise buildings for residential or official use, hotels, rooftop extension, warehouses, industrial facilities & Army barracks.

Salient Features

- Light weight
- Faster construction
- Corrosion resistance
- Better thermal insulation
- Sustainable green technology
- Cost efficient
- Advance engineering & precision
- Low life cycle cost.
- Suitable for all type of climate conditions
- Fire rating up to 2 hours, better acoustics properties and better thermal conductivity, low heat loss
- Is suitable for high seismic zone areas.

Major Projects

- Simula Global Paradise Apartments, Jammu (S+13 - 13,234 Sqm) 2015
- CPWD Trichur Central Division, Trichur, Pallakkad, Kerala (G+1 & G+2 of 6,318 Sqm.) 2019
- The Orrisa Police Housing & Welfare Corp. ltd (OPHWC), Janpath, P.O. Bhoinagar, Bhubaneswar,Malkangiri Orissa, (G+1 of 7,442 Sqm)

Evaluation/ certification/ Indian standards

Design certified by IIT Madras.


WORKING WOMEN HOSTEL
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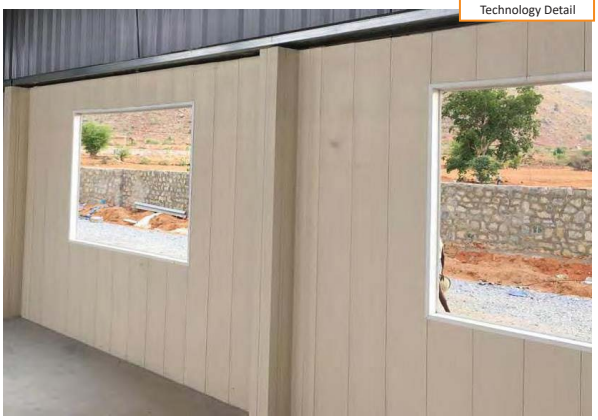
Category: Alternate Structural/ Building Systems

15 Novel Wall System - Stay in Place PVC Formwork

Scan QR Code for Technology Detail



Name of agency
M/s Novel Assembler Pvt Ltd.

Alternate to
Conventional Brick /Block Masonry walls

Brief

Novel wall System consists of rigid poly-vinyl chloride (PVC) based polymer components that serve as a permanent stay-in-place durable finished formwork for concrete walls. The extruded components slide and interlock together to create continuous formwork with the two faces of the wall connected together by continuous web members forming hollow rectangular components. The web members are punched with oval shaped cores to allow easy flow of the poured concrete between the components. The hollow Novel Wall components are erected and filled with concrete, in situ, to provide a monolithic concrete wall with enhanced curing capacity due to water entrapment, as the polymer encasement does not allow the concrete to dry prematurely with only the top surface of the wall being exposed to potential drying. The polymer encasement provides crack control vertically and horizontally for the concrete. The resulting system is unique and provides substantial advantages in terms of structural strength, durability enhancement, weather resistance, seismic resistance, design flexibility, and ease of construction. Steel dowels are necessary to anchor the wall to the concrete foundation. Novel offers pre-finished concrete wall solution, serving the residential, commercial, industrial, and agricultural sectors, with unique Concrete Forming Technology in which Components interconnect together to create a finished concrete wall.

Salient Features

- Avoids many trades such as mason, painter etc. therefore faster project execution with 20% time saving
- 25% labour saving during superstructure construction.
- Plaster-Paint free surface reduces maintenance cost
- Design Flexibility, Pre-cut components for easy on site-assembly
- Durable, weatherproof, clean & hygienic.
- Safe from termite's attack, peel, chip, stains, moulds, fungi, bacteria, insects, rodents.
- Coastal region application due to Waterproof joints
- 200mm Sections with insulation highly suitable for Himalayas extreme cold
- Fast and easy construction.
- No curing is required.
- Unskilled labours can be used for erection at site.
- Better fire resistance & thermal efficiency.
- The polymer components contain over 55% recycled content and are recyclable and non-toxic.
- Energy efficient building envelopes.
- Low life-cycle costs - Product is recyclable.
- There is zero waste while manufacturing Novel Walls as all the manufacturing waste is recycled.
- The polymer components do not decay or deteriorate over a lifespan.
- Suitable to all Climatic conditions.
- Availability across the country.
- Stay in Place PVC Forms Walls need pre-planned & installed MEP/Services for concealed network.
- Door-Window openings & MEP all needs to be pre-planned before execution.
- Novel has over 100,000 Sq. Ft of Manufacturing Facilities in India.

Major Projects

- Light House Project (LHP)of 1040 houses at Lucknow, Uttar Pradesh in Stilt+13 Configuration (under construction)
- Factory, Silvassa
- Residential Structures at Silvassa
- NBCC, Port Blair, Andaman & Nicobar Island.
- Penukonda, Andhra Pradesh

Certification/Indian Standards/Endorsement

Certified by BMTPC under PACS

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Category: Alternate Structural/ Building Systems

16 Monolithic Concrete Construction using Tunnel Formwork

Scan QR Code for Technology Detail

Name of agency
M/s Outinord Formworks Pvt Ltd

Alternate to
Conventional Construction system

Brief

Outinord is the leading designer & manufacturer of steel formwork for cast in situ concrete construction, which pioneered "Tunnel form" construction technology - a cast in situ RCC system, based on the use of high-precision, re-usable, room-sized, steel forms or moulds. It is based on two half shells which are placed together to form a room or cell. Several cells make an apartment. With tunnel forms, walls and slab are cast in a single day. Typically, it is used for the fast-track and cost-effective construction of Apartments, High Rise Apartment, Affordable and mid-cost housing, villas, hotels, hostel, and jail also.

Salient Features

- The formwork is specially adapted for each project. The repetitive nature of the system and the use of prefabricated forms and reinforcing mats/cages simplify the whole construction process, producing a smooth and fast operations
- High resistance against horizontal forces of earthquakes and wind due to monolithic slab & walls construction
- Large number of repetitions (About 500) can be achieved with Steel form
- Suitable for all type of construction, such as villa, low rise, to high rise buildings,
- Available across the country from Pune

Major Projects

- Light House Project (LHP) at Rajkot, Gujarat with 1,144 Units in Stilt +13 configuration
- Tulip Inn - Bhaghaystan Talegaon Pune -288 Units, 7 Floors
- Godrej Propeties, Pune 1,282 Units, 22 Floors
- Play tor Karegaon, Pune -330 Units, 5 Floors
- Runwal Group, Mumbai-21 floors
- Sampada , Mumbai by B.G. Shirke Construction Co ,2,064 Apartment
- Eden Park In Chennai By L & T -14 Floor, 8 Towers, 2064 houses

Certification/Indian Standards/Endorsement

- Technology recommended under GHTC-India
- Certified by BMTPC under PACS
- Included in the DSR of CPWD

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Light House Project at Rajkot under PMAY (U)

Light House Project at Rajkot under PMAY (U)

Category: Alternate Structural/ Building Systems

17 Reliable ICF-Stay in Place Insulated Concrete Formwork System

Scan QR Code for Technology Detail

Name of agency
M/s Reliable Building Solutions

Alternate to
Conventional Brick/Block Masonry wall

Brief

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 is 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 per design requirement. Upper and lower surfaces of the polystyrene panels are castellated and the vertical mating surfaces in tongue-and-groove form a tight fit when joined together. The rigid formwork does not require supporting formwork. The inner surfaces have tapered grooves

running vertically and have offset on opposite faces to ensure uniform concrete thickness. It also form locks for end stops. The outer surfaces are grooved vertically at 50mm centers to aid cutting and trimming.

Salient Features

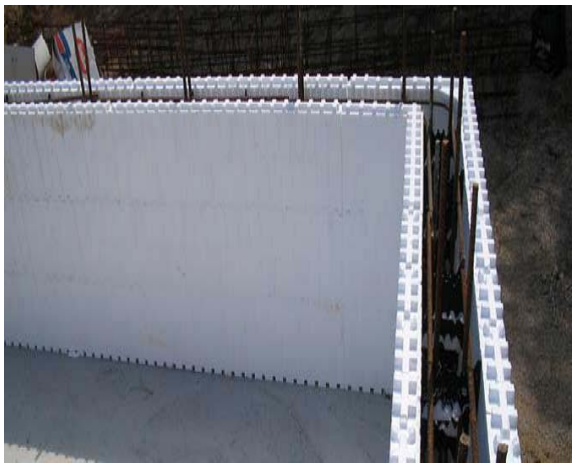
- No water is used at site as concrete curing is due to adiabatic process (both sides covered).
- Disaster resistant structures due to monolithic concrete with joint free 3-D Box construction.
- High energy efficiency due to insulation layers, saves up to 80% of HVAC costs, low maintenance & operational costs.
- Good acoustic insulation.
- Light weight, interlocking and hollow panels make the forms easy to transport, handle & assemble.
- Least wastage & debris generated due to modular formwork which is easy to cut to match any wall dimensions.
- No heavy or expensive machines required for installation.
- Significantly faster construction with lesser manpower.
- Needs no columns or beams for span <20m
- Ideal for all types of low-rise houses
- Suited for all weather conditions, particularly remote locations or with harsh climate, natural hazards prone areas.

Major Projects

- Sports Hostel – 4 floors, Bhopal (MP) Demonstration Housing Project under PMAY(U).
- Reliable insupacks Surajpur (1 Building 2 storeys 1,675 Sqm)
- Commercial Building- 4 storeys, Indore (MP)
- Multifamily housing – basement, stilt +3 floors, New Delhi
- Industrial Warehouse -Basement + Ground Floor, Gr. Noida (UP)
- Office Building -G+1, Gr. Noida (UP)
- Villa - 2 floors, 60 km above Shimla (HP)
- Farmhouse – 2 floors, Khammam, Telangana

Certification/Indian Standards/Endorsement

- Technology recommended under GHTC-India
- Certified by BMTPC under PACS



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Category: Alternate Structural/ Building Systems

18 Light Gauge Steel Frame Structure (HabiNest)

Scan QR Code for Technology Detail

Name of agency
M/s Tata Centre

Alternate to
Conventional Construction System

Brief

Light Gauge Steel Framed Structures (LGSF) is based on factory made galvanized light gauge steel components. The components/sections are 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 typically ideal for one to four storey high buildings, especially for residential and commercial buildings & for buildings higher than G+3, it can be used with hot rolled Steel sections.

The flooring / slab can be with deck sheet supported on floor joists with in-situ reinforced concrete on the top or in-situ conventional RCC slab. Wall cladding used (high density cement fiber board, concrete panels etc.) shall resist the wind load & conform to the functional requirements.

The sequence of construction comprises of foundation laying, fixing of tracks, fixing of wall panels with bracings as required, fixing of floor panels, fixing of roof panels, decking sheet, fixing of electrical & plumbing services and finally fixing of insulation material & walling panels.

HabiNest LGSF (Light gauge steel frame) construction is based on factory made Galvalume (AZ 150) light gauge cold formed steel of 550 Mpa, assembled as panels at site forming structural framework of a building of varying sizes of wall and floors. As these are light in weight requires a nominal civil foundation and has excellent earthquake resistance making it ideal for building in difficult terrains such as mines.

Structural Members (LGSF) consist of Mild steel Galvanized Structure with the yield strength not less than 550 MPa and a Zinc and aluminium coating AZ 150. The Size and thickness will be based on design criteria.

Roofing (Pitched /Flat roof) : With PPGL 0.45 mm sheet and 50mm insulation/ with 0.8mm deck sheet and 75mm concrete flooring.

Boarding: 2 layers of High-density Fiber cement boards (6 mm+ 9mm HD FCB) external & 2 layer of fiber cement board and gypsum board internal (8mm FCB + 12.5mm Gypsum) all with100mm rock wool insulation.

PUF Sandwich Panel (Nestudio)

Sandwich panels are single piece, prefabricated, modular, factory-made units which consist of an insulating layer of rigid polyurethane foam between two layers of metal sheets. The panels comprise of PUF bonded between two sheets of Pre-coated GI sheets of 0.5 mm thick to produce straight-to-finish panels. Insulation core provides effective insulation and strong bonding for better structural stability to facilitate higher loading and wider spans.

0.5mm Sandwich panel, RMP wood coated steel, 60mm thickness panel filled with PUF, ensures fire, acoustics, and thermal insulation.

Salient Features

Light Gauge Steel Frame Structure (HabiNest)

- As these are light in weight requires a nominal foundation. High earthquake resistance making it ideal for building in difficult terrains
- Speed of construction is very high
- Overall life cycle cost is lesser than RCC
- Saving of natural resources like sand, limestone water etc.
- Eco-friendly technology, leading to almost zero pollution.
- Structures designed for 25years of life and can be designed for 50+ years too.
- Very easy to execute
- High on energy efficiency and can also be integrated with solar panels.
- Suitable for all climate conditions.
- Available across the Country.

Major Projects

- PUF Panel (Nestudio) -100+ Projects across India, ranging from 200 sft.to 6000 sft. independent houses.
- LGSF (HabiNest) – more than 1.5 lakh Sqft already executed in various locations across India. More than 3 lakh Sqft work under execution.

Certification/Indian Standards/Endorsement

- HabiNest is certified by IIT Delhi.

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Category: Alternate Structural/ Building Systems

19 Industrialized RCC Precast Construction

Scan QR Code for Technology Detail

Campus and Hostel Building for Indian Institute of Information Technology at Sethurpatty - Trichy

Name of agency

M/s Teemage Builders Pvt. Ltd.

Alternate to

Conventional Construction System

Brief

The Agency deals in design & construction of building structures with RCC Precast components. The precast components comprise of beams, columns, staircase, slab, hollow core slab etc. manufactured in controlled environment in plant & erected on site. The manufacturing facility was first installed in Kangeyam, Tamilnadu and commissioned in February 2012. The company provides cost effective and high quality precast concrete construction by embarking on modern and sophisticated Technology. The industrialization of the construction industry implies the change of the whole building process. Proper planning, detailed design & coordination of the project prior to construction activities is done to ensure minimal changes at site during execution.

Salient Features

- Teemage precast, pre-stressed building solutions require less maintenance, withstand the stresses of shifting environmental conditions.
- Speedy installation helps faster occupation of the building.
- Teemage precast, pre-stressed building components can be designed, constructed and installed as per client requirement.
- Precast is a sustainable solution that provides durability, fire resistance and sound/vibration attenuation.
- Precast Concrete structure has a longer service life.
- The high-density Precast Concrete is more durable to acid attack, corrosion, impact, reduces surface voids and resists the accumulation of dust.
- The architect has several options for designing a wall or facade consisting of precast concrete elements. Depending on the quality of the concrete and the skills of the mould maker, the smallest details and elements can be incorporated.

Major Projects

- Covid Speciality Block over an area span of 69,200.25 Sq.ft. at the Government Erode Medical College and Hospital in 45 days
- Ayyanna IT Park (2B+S+9) for Ayyanna Infra Pvt. Ltd. at Kondapur - Hyderabad
- 251 Nos. Residential Quarters (G+3) at CTC - II, CRPF Coimbatore
- 480 Multi Storeyed Tenements of Rehabilitation of NTO Scheme at Thiruvottriyur - Chennai
- Hostel Beneficiaries and Associated Buildings (G+7) for National Institute of Empowerment of Persons with Multiple Disabilities at Muttukkadu - Chennai
- Married Accomodation (93 Nos Type - III) for EPs of Indian Coast Guard at Coast Guard Enclave, Vishakapatnam
- Outreach Facility Building for National Remote Sensing Centre at ISRO - Hyderabad
- Executive Apartment Buildings (S+10) for Nuclear Power Corporation India Ltd.
- 336 Nos Hostel Building (G+6) for Indian Institute of Technology at Hyderabad
- Corporate Office Building (2B+S+8) for NLC India at Kilpauk - Chennai
- International Hostel Building for JIPMER Campus at Puducherry
- Campus and Hostel Building for Indian Institute of Information Technology at Sethurpatty - Trichy

- Boys Hostel (G+6), Classroom (G+5) and Dining Hall for Rashtriya Sanskrit Vidyapeetha at Andhra Pradesh
- Staff Quarters, CSIF Barracks, Dog Kennel & Community Hall at Trichy International Airport. Staff Quarters, at Coimbatore International Airport

Certification/Indian Standards/Endorsement

- ISO 9001, 14001, 18001 Certified Company
- CPWD Class 1AAA Registered Company
- Special Class Contractor Registered in Andhra Pradesh
- Approved Precast Contractor in ISRO, NBCC & DMRC

Staff Quarters, Type B (S+7 & S+4), Type C (S+8), Type E (S+2), Hostel Accommodation (S+2), Amenities Block, Security Hut, CSIF Barracks, Dog Kennel & Community Hall at Trichy International Airport

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480 Multi Storeyed Tenements of Rehabilitation of NTO Scheme at Thiruvottriyur - Chennai

Hostel Beneficiaries and Associated Buildings (G+7) for National Institute of Empowerment of Persons with Multiple Disabilities at Muttukkadu – Chennai

Executive Apartment Buildings (S+10) for Nuclear Power Corporation India Ltd

336 Nos Hostel Building (G+6) for Indian Institute of Technology at Hyderabad

Category: Alternate Structural/ Building Systems

20 3D Concrete Printing

Scan QR Code for Technology Detail

Name of agency
M/s Tvasta Manufacturing Solutions Pvt. Ltd.

Alternate to
Conventional Construction System

Brief

M/s Tvasta is a start-up company, which has developed end to end 3D Printing Technology for the construction of house/building. The developed Printing Technology comprises of;

- Hardware (3D Printer, Material delivery system etc.) & Software (Digital Construction software that can print with a BIM file).
- Material (Specialized concrete mix design that can be used for 3D Printing).
- Development of Printing Strategy and Design for Additive manufacturing.

The company has presently filed seven patents & several others are in pipeline, these are in the domain of 3D Printing system, materials delivery system, hardware software integration etc. One of its innovations is on material side where it has considerably brought down the cost of material for 3D Printing to comparable level with normal concrete. The company aims to automate 80% of construction including activities such as painting and plastering.

Salient Features

- Faster Construction as walls and foundation can be printed in days.
- Precision with respect to construction is very high.
- India's first concrete 3D Printer which can print 3D concrete mixture layer by layer with the help of inhouse developed specialized software.
- Less waste as 3D printer will utilize the exact amount of material needed.
- Increased affordability due to less wastage and reduced labour dependency. Once the training is done the construction is very easy.
- Labour safety is very high.
- Reduces the carbon footprint by introducing other industry waste like fly ash, Silica fume, construction & demolition waste etc.
- Reduces the overall material quantity.
- Suited for all weather conditions.

Major Projects

- 2018 - India's first Concrete 3D Printed Structure inside IIT Madras
- 2021 - Installed 3 Doffing Unit for the Covid - Ward Doctors across Chennai in 3 different hospitals
- Guest House (2×750 sqft), Gandhinagar
- Sanitary blocks (2×150 sqft), Jaisalmer
- Bus shelter (3×80 sqft), Mumbai

Certification/Indian Standards/Endorsement

- Under Incubation at IIT, Madras

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Category: Alternate Structural/ Building Systems

21 Autoclaved Aerated Concrete Reinforced Panel for Walls & Roofs

Scan QR Code for Technology Detail

Name of agency
M/s UAL Industries Ltd.

Alternate to
Conventional Construction System

Brief

Konark Autoclaved Aerated Concrete(AAC) Reinforced Panel are autoclaved aerated concrete panels are manufactured using fly ash, cement, gypsum, lime, sand, aluminium powder, steel reinforcement, and anti-corrosive paint. These panels are manufactured with latest technology and come in the form of ready to build wall, roof and floor which minimizes the use of materials and saves construction time enabling faster construction.

AAC panels are available in sizes with length ranging from 1m to 6m, width 600mm and thickness 150mm /200mm / 250mm (with tongue & groove) for external wall and thickness 100mm / 125mm for internal wall or partition wall, which are suitable for multi-storied residential & commercial constructions, industrial warehouses and sheds, shopping malls, hospitals, and small modular residential constructions.

These innovative AAC reinforced panels can be used for load bearing and non-load bearing applications. The conventional brick wall is essentially a wet wall construction making use of bricks laid over mortar whereas AAC wall construction is a dry wall construction requiring no water.

Salient Features

- Light in Weight & durable.
- Reduce structural cost because of light weight.
- High Thermal & acoustics insulation.
- Speedy Construction Process.
- Design flexibility, customizable, ease of working.
- Energy efficiency.
- Smooth finish with reduced/ no plaster requirement.
- Environment Friendly, utilizes Fly Ash as major ingredient.
- Resource efficient with reduced water consumption.
- Good Fire resistance.
- Termite resistant.
- Higher flexural strength.
- Fewer Joints leading to less jointing mortar consumption and leakages.
- Number of Auxiliary Columns can be minimized & Intermediate bond beams can be eliminated.
- Less number of labour and storage space.
- Better aesthetic look of construction.
- Suitable for all climatic conditions

Major Projects

- Government of West Bengal PWD, Alipore Division, Bhabani Bhaban New Building
- Haldia Port, West Bengal
- Mani Pushpak Nirman Pvt. Ltd. - Ware House at Bantala Leather Complex, West Bengal

Certification/Indian Standards/Endorsement

- PAC By BMTPC
- BIS Certification
- IGBC (CII) Certification
- GRIHA Certification
- IS: 6072-1971 & IS: 6073-2006 for AAC Reinforced Wall & Roof Panel respectively

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Category: Alternate Structural/ Building Systems

22 3D Monolithic Modular Precast Construction System

Scan QR Code for Technology Detail

Name of agency

M/s UltraTech Cement Limited & hoMMISSION

Alternate to

Conventional Construction System

Brief

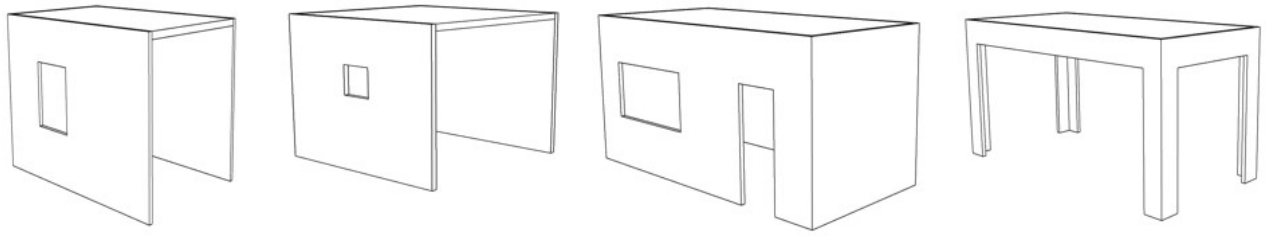
The structure is erected with basic modules made monolithically with RCC. One module is of 15 sqm. Based on the requirements of houses as per PMAY (U), Modules are added. 2 modules of 30 sqm for EWS, 3 modules of 45 sqm for LIG, 6 modules of 90sqm for MIG1 and 7 modules of 105sqm for MIG2 can be used. The sizes of Units can vary in Length, Height, Wall Thickness, Opening Sizes & Position.

DFMA combines two methodologies Design for Manufacture (DFM) and Design for Assembly (DFA). Design Approach focuses on ease of manufacture and efficiency of transportation & assembly. Simplifying Design enables efficient Manufacture & Assembly in minimum time and at lower cost.

3D Monolithic Modular Precast is manufactured as Monolithic RCC Modules and erected. Production is done in controlled plant conditions with Concrete & Steel.

First MEP is installed at the time of casting. Modules are fitted together side-by-side or atop of each other to create the structure - similar to Lego blocks.

Design is done as per existing Building Codes. There are no Joints in Monolithic Modules. No Plastering are required in modules which are ready to paint with preinstalled MEP lines. It can embed Thermal Insulation as per requirement.



Production and erection are done with provision for no pollution, debris free site and increased safety & security of men & equipment.

Special Features

- High Speed of Construction.
- Improved Quality of Construction.
- All Weather & All Year Construction.
- Predictability of Time & Cost.
- Dwindling Skills / Labour
- Disaster Resistance
- Resource Efficient

Major Projects

Tata Boisar Project at Boisar, Maharashtra

Certification/Indian Standards/Endorsement

- The Technology has been recommended under GHTC-India

5-storey Building with 20 Apartments

Cast & Assembled in under 33 Days

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INDIAN URBAN HOUSING CONCLAVE 2022
RAJKOT, GUJARAT

Application of Alternate Structural/ Building System in Housing Projects

Category: Application of Alternate Structural/ Building System in Housing Projects

23 Stay in Place Formwork System (Coffor)

Scan QR Code for Technology Detail

Name of agency

M/s Advanced Contractors & Engineers Pvt Ltd (ACEPL)

Alternate to

Conventional Construction System

Brief

M/s Advanced Contractors & Engineers Private Limited is a Contracting firm involved in construction of Residential and commercial buildings.

The agency in association with Coffer Construction Technology Pvt. Ltd. has completed the Demonstration Housing project at Agartala using Stay in place form work system-Coffor 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. After the erection of formwork panels in alignment, corners, and edges of doors and windows frame are closed with rebar positioning & concrete of required grade and workability is poured in the panels. The concreting may be done with a pump or, bucket with a shovel loader. The inside and outside walls are finished with cement plaster of suitable grade. The vertical steel channels and horizontal steel bars act as steel reinforcement for load bearing wall. The connectors help to fold the formwork for easy transportation. The panels are prefabricated according to a structural plan (based on client's architectural plans) designed by structural engineers.

Special Features

- *Economic Aspects-* Direct cost savings due to reduced labour, reduced material and cheaper construction equipment. light weight of formwork also reduces logistical costs.
- *Fast Implementation-* The simple design, efficient production, easy transportation and quick erection of the building unit reduces timelines of projects of all sizes by up to 60 percent.
- *Structural Integrity-* Due to monolithic construction brings higher safety against earthquakes, hurricanes and high wind forces.
- *Uniform Quality-* As a standardized factory product, the Coffor panel brings uniformly and high quality to a construction project of any size.
- *Simple Construction-* The Coffor Technology system consolidates the masonry, insulation, plastering and utilities addition steps thus reducing the construction complexity.

Major Project

Demonstration Housing Project - Agartala (Client– BMTPC).

Certification/Indian Standards/Endorsement

- Technology Certified by IIT Mumbai
- Technology recommended under GHTC-India
- Performance Appraisal certificate (PAC) by BMTPC

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Category: Application of Alternate Structural/ Building System in Housing Projects

24 Stay in Place Formwork System with PEB Structure

Scan QR Code for Technology Detail

Name of agency

M/s JAM Sustainable Housing LLP

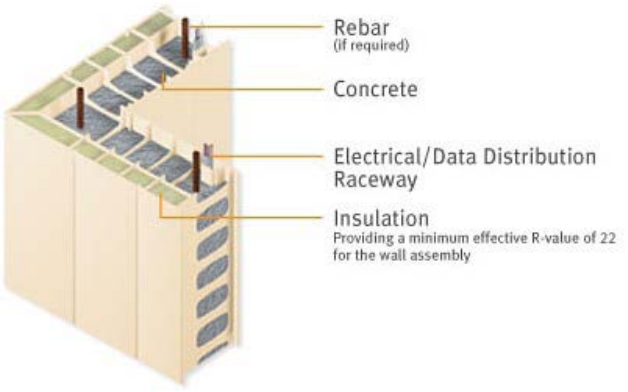
Alternate to

Conventional Construction System

Brief

Stay in place PVC formwork System consists of rigid poly-vinyl chloride (PVC) based polymer components that serve as a permanent stay-in-place durable finished formwork for concrete walls. The extruded components slide and interlock together to create continuous formwork with the two faces of the wall connected by continuous web members forming hollow rectangular components. The web members are punched with oval-shaped cores to allow easy flow of the poured concrete between the components. The hollow Wall components are erected and filled with concrete, in situ, to provide a monolithic concrete wall with enhanced curing capacity due to water- entrapment, as the polymer encasement does not allow the concrete to dry prematurely with only the top surface of the wall being exposed to potential drying.

The polymer encasement provides crack control vertically and horizontally for the concrete and provides vertical tension reinforcement thus increasing the structural strength of the wall. The resulting system is unique and provides substantial advantages in terms of structural strength, durability enhancement, weather resistance, seismic resistance, design flexibility, and ease of construction. Steel dowels are necessary to anchor the wall to the concrete foundation.



Stay in place formwork has been used with Pre engineered Steel structures in LHP Lucknow of 1040 houses in S+13 configuration.

This system is very efficient in terms of acoustic performance, weatherproof and highly resistant to termite's attack, and is virtually maintenance free.

Special Features

- Fast & Easy Construction Method impacts on overall project speed and cost.
- Doesn't require Paster & Paint.
- Design Flexibility, Pre-cut components for easy on site-assembly.
- Outer PVC layer makes it durable, weatherproof, clean & hygienic.
- Free from termite's attack, peel, chip, stains, molds, fungi, bacteria, insects, rodents.
- 200mm Sections with insulation highly suitable for Himalayas extreme cold
- Maintenance requirements are minimal.
- Plaster-Paint free reduces Construction cost.
- Minimum labour requirements.
- The formwork system is designed to resist the combined effect of lateral and gravity loading.
- Stay in place formwork System can sustain in all climatic conditions and regions including Hot and cold.
- This system is adaptable to any building design i.e. residential, commercial, industrial, low and high rise buildings.
- Concrete, being encased, is free from adverse environmental effect.
- Door and Window position shall not be changed after pouring of concrete.
- Erection of panels shall be under supervision of trained staff.
- The system has specific advantage to use near coastal areas as durability not affected due to salt-peter action.

Major Project

On going Light House Project of 1040 houses(Stilt +13 configuration) at Lucknow, Uttar Pradesh

Certification/Indian Standards/Endorsement

- Recommended Technology under GHTC-India as hybrid construction with Steel frame structure.

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Category: Application of Alternate Structural/ Building System in Housing Projects

25 Monolithic Concrete Construction using Tunnel Formwork

Scan QR Code for Technology Detail

Name of agency
M/s Malani Construction Company

Alternate to
Conventional Construction System

Brief

Malani Construction Co is a contracting firm from Gujarat. The agency has constructed Light House project of 1144 houses at Rajkot for MoHUA with monolithic concrete construction using Tunnel Form System. Tunnel formwork is customized engineering formwork replacing conventional steel/plywood shuttering system. It is a mechanized system for cellular structures. It is based on two half shells which are placed together to form a room or cell. Several cells make an apartment. With tunnel forms, walls and slab are cast in a single day.

Tunnel formwork is customized engineering formwork replacing conventional steel/plywood shuttering system. It is a mechanized system for cellular structures. It is based on two half shells which are placed together to form a room or cell. Several cells make an apartment. With tunnel forms, walls and slab are cast in a single day. The structure is divided into phases. Each phase consists of a section of the structure that will be cast in one day. The phasing is determined by the program and the amount of floor area that can be poured in one day. The formwork is set up for the day's pour in the morning. The reinforcement and services are positioned, and concrete is poured in the afternoon. Once reinforcement is placed, concrete for walls and slabs shall be poured in one single operation. The formwork is stripped the early morning next day and positioned for the subsequent phases. The on-site implementation of 24-hour cycle is divided into following operations:

- Stripping of the formwork from the previous day.
- Positioning of the formwork for the current day's phase, with the installation of mechanical, electrical and plumbing services.
- Installation of reinforcement in the walls and slabs.
- Concreting and if necessary, the heating equipment.
- Positioning of the formwork for the current day's phase, with the installation of mechanical, electrical, and plumbing services.
- Installation of reinforcement in the walls and slabs.

Special Features

- *Maximum span* between walls shall be 5.60 m without accessory units and 7.00 m with accessory units.
- *Height of the formwork* – The forms are designed for floor to ceiling height of 2.51 m minimum with the possibility to increase this by action of the leg jacks or with the use of movable panels in the event of extra heights.
- *Appearances of the faces after form removal* – The surfaces obtained allow direct application of finishing paint or wallpaper after sanding off the fins at the joints connecting the units and smoothing with paint filler.
- *Working rhythm using the system* – Under average temperature conditions, with the use of ordinary cement, the normal rhythm is two days per cycle with one day and two nights for drying and setting of the concrete.
- *Cost effectiveness:* Highly cost effective due to repetition of formwork. (24 hours cycle)

- *Ease of Working:* can be operated very easily using mechanical means hence reduce manpower and speed up the construction work.
- *The formwork* is specially adapted for each project. The repetitive nature of the system and the use of prefabricated forms and reinforcing mats/cages simplify the whole construction process, producing a smooth and fast operation.
- *High resistance* against horizontal forces of earthquakes and wind due to monolithic slab & walls construction
- Adequate working space is required to remove Tunnel formwork.
- Architectural design and planning should be suitable for Tunnel formwork.
- Unsuitable for small scale projects

Major Project

Light House Project of 1144 houses (Stilt +13 configuration) at Rajkot, Gujarat

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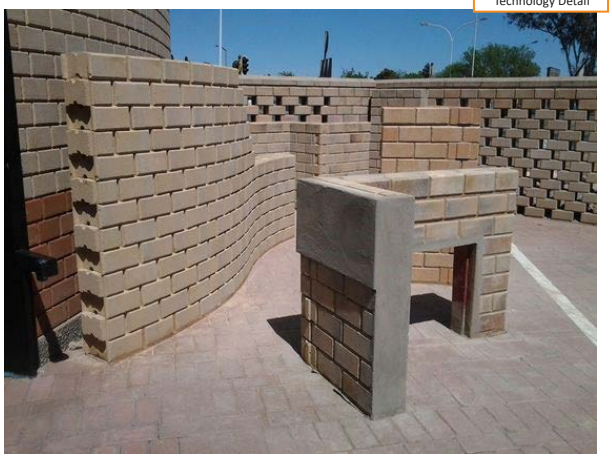
Category: Application of Alternate Structural/ Building System in Housing Projects

26 Integrated Hybrid Solutions – One

Scan QR Code for Technology Detail



Name of agency

M/s Matharoo Constructions

Alternate to

Conventional Construction System

Brief

Matharoo Constructions is a civil contracting firm involved in construction of building and other structures. It is constructing a Demonstration housing Project at Ahmedabad with cost effective Integrated Hybrid Solutions.

"Integrated Hybrid Solution(IHS) – ONE" is an Intermediate Building system having three main components: walls, floor/roof and stairs integrated to construct a building.

It has the integration of Walls : Hydraform Prefabricated Mortarless Interlocking Technology, precast concrete stairs and Precast concrete RC plank and Joist system for roofing.

Prefabricated Interlocking Block Technology (without mortar technology is sourced from South Africa and indigenized in Local conditions.

The interlocking blocks are manufactured with a block making machine offsite or onsite in an open shed. The blocks can be of cement-flyash-block or cement-soil block.

Interlocking Fly-Ash Blocks/ Compressed Earth: The blocks replaces conventional bricks/ blocks. Doesn't require sand-Cement mortar i.e., dry stack masonry is done/binding is through gravity/ interlocking. Interlocking blocks have smooth & even finish on both sides thus saving on plaster.

RCC Planks and Joist System: A precast concrete flooring/roofing system for single and multi-storey buildings. It consists of precast R.C. planks supported over partially precast R.C.C. joists. The completed floor/roof with 40 mm thick in-situ concrete filling forms the monolithic T-beam slab resting over walls. The system is developed by CBRI, Roorkee.

Special Features

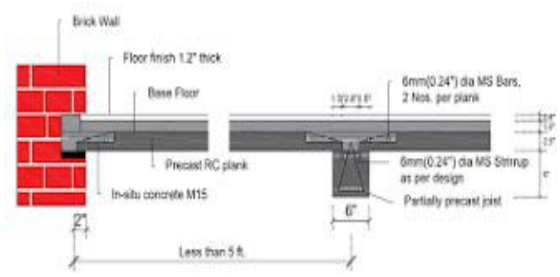
- Simple technologies which can be easily adopted by semi-skilled labour.
- Time tested and proven
- Energy Efficient and recyclable.
- Environment friendly.
- Cost Effective and time saving.
- Creates local employment.
- Pre-fabrication in factory or at project site leads to better quality control.
- Do not require mechanical handling and erection equipment.
- Suitable technologies for PMAY(Urban/Rural).
- it is greener and sustainable with reduced carbon footprints.
- Considerable reduction in use of cement and steel.
- The components can be locally cast near construction site
- It can also be produced by small entrepreneurs and supplied to consumers at State/ Block/village level.

Major Projects

- Inno Geocity township, (phase 1), Oragadam, Chennai (2.5 stories, 500 Units of 3 types as: Type 1: 105 Sqm, Type 2: 106 Sqm & Type 3: 88 Sqm) of total area of 52500 sqm.
- Housing for Welspun Industries Limited, Vapi, Gujarat (4 Stories) of total area of 12128 Sqm
- DSIIDC Technical Centre Building, Wazirpur Industrial Area, Delhi (3164 Housing 105556.36 Sqm) 2003-2006

Certification/Indian Standards/Endorsement

- IS 13990:1994 – Specification for precast RCC Planks and Joist System for roofing and flooring
- IS13994:1994 – Code of Practice for design and construction for RCC Planks and Joist System for roofing and flooring.



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Category: Application of Alternate Structural/ Building System in Housing Projects

27 Light Gauge Steel Framing (LGSF) and PEB

Scan QR Code for Technology Detail

Kapkot

Name of agency

M/s Prompt Building Solution Pvt Ltd.

Alternate to

Conventional Construction System

Brief

Prompt Building Solution Pvt. Ltd. commenced its operations in 1984 and offers one of the most comprehensive Pre-engineered steel buildings-PEB product portfolios globally, with applications in major market segments including heavy industry, infrastructure, high-rise buildings, warehouses, factories, oil and gas and leisure structures. Prompt Building Solutions Pvt Ltd is a certified green building partner and all their products comply with LEED and IGBC norms.

The Agency is presently executing a Demonstration Housing Project of BMTPC under PMAY (Urban) at Guwahati, using Light Gauge Steel Frame system. The Light Gauge Steel frames consist of high yield strength (550 MPa) roll formed GI 'C' cross sections of 63 mm to 150 mm with built-in notch, dimpling, slots, service holes etc. produced by computerized roll forming machines. The frames are clad with Cement fibre board with inside core filled with light weight concrete. Other options for cladding are also available.

Special Features

- The technology offers Cost Effectiveness since foundations are comparatively lighter than that of Brick-Mortar Buildings.
- Total prefabricated construction results in Resource Efficiency
- Prefabrication in factory gives better quality and durability.
- Earthquake Resistant due to lighter weight & tensile property of steel
- Permanent structure which can be reused & re-locatable.
- Majority of components are prefabricated & light and hence reduction in the time of execution at site by more than 20-40 %.
- Less manpower requirement due to prefabrication and only assembly of components at site.
- Reduced wastages at site and factory.
- Minimum usage of natural resources.

Major Projects

- Nursing College Almora, Uttarakhand
- Café Vrindavan, Uttar Pradesh
- Haldwani Warehouse, Uttarakhand

Nursing College Almora

Certification/Indian Standards/Endorsement

- One of the recommended technologies under GHTC- India
- Indian standard (IS)/ ASTM Codes are available for various components of LGSF. Code of Practice (IS) is available for Use of Cold Formed Light Gauge Steel Structural Members.

Haldwani Warehouse

Café Vrindavan

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Category: Application of Alternate Structural/ Building System in Housing Projects

28 Monolithic Concrete Construction using Aluminium Formwork

Scan QR Code for Technology Detail

Name of agency

M/s Sivaani Infra Private Ltd.

Alternate to

Conventional Construction System

Brief

A multi storey (more than 15 floors) integrated Rental Housing Complex consisting of 14490 beds is being constructed with Monolithic Construction Technology using aluminum formwork by the Agency at Nizampet, Telangana.

Aluminium formwork is a construction system for forming cast in place concrete structure of a Building. Auto formwork system provides aluminium formwork for RCC, load bearing, multi-storeyed buildings and enables the walls and slab to be poured in the same operation. This increases efficiency, and produces a strong structure with excellent concrete finish. In this system, the lateral and gravity load resisting system consist of reinforced concrete walls and reinforced concrete slabs. Reinforced concrete structural walls are the main vertical structural element with a dual role of resisting both the gravity and lateral loads.

Special Features

- Faster construction / completion of floors
- Monolithic Formwork requires relatively less labour
- Lesser number of joints and reduced leakages
- Smooth finishing of wall and slab
- Good quality construction work
- No need for plastering
- Lightweight shifting materials
- Clear working space – No hindrance, being monolithic, it is a good lateral resisting system against all kind of lateral force (Seismic, wind effects etc.)
- Less Dependency on Skilled Workers
- Aluminum Formwork after repeated use is recycled. Has good salvage value.
- Uses less water
- Overall life cycle cost is lesser than RCC
- Initial investment is high, not suitable for less repetition in building
- Post construction alterations are difficult.
- Pan India Availability of Aluminium Formwork

Major Projects

1. Construction, Operation and Maintenance of ARHCs" being implemented by M/s Sivaani Infraa Pvt Ltd, Hyderabad, Telangana covering the total Dormitory beds of 14,490 using monolithic concrete construction technology

Certification/Indian Standards/Endorsement

- Recommended Technology under GHTC – India. The structure is designed as per the relevant Indian Standards.
- Included in CPWD DSR

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Category: Application of Alternate Structural/ Building System in Housing Projects

29 Light Gauge Steel Frame (LGSF) System

Scan QR Code for Technology Detail

Name of agency
M/s Step-Up Building Solutions Pvt Ltd

Alternate to
Conventional Construction System

Brief

Step- up Building Solution pvt. Ltd. Is one of the construction companies in Madhya Pradesh. with three specialized branches specific for Construction, Smart Home Technologies, and Trading. The Agency is presently executing a Demonstration Housing Project of BMTPC under PMAY (Urban) at Ayodhya, using Light Gauge Steel Frame system. The Light Gauge Steel frames consist of high yield strength (550 MPa) roll formed GI 'C' cross sections of 63 mm to 150 mm with built-in notch, dimpling, slots, service holes etc. produced by computerized roll forming machines. The frames are clad with Cement fiber boards with inside core filled with rockwool.

Special Features

- The technology offers Cost Effectiveness since foundations are comparatively lighter than that of Brick-Mortar Buildings.
- Total prefabricated construction results in Resource Efficiency
- Earthquake Resistant due to lighter weight & tensile property of steel

- Permanent structure which can be reused & re-locatable.
- Majority of components are pre-fabricated & light and hence considerable reduction in the time of execution at site .
- Less manpower requirement due to prefabrication and only assembly of components at site.
- Reduced wastages at site and factory.
- Minimum usage of natural resources
- Suitable in all kinds of buildings in different climate zones.

Major Projects

- Construction of Railway Officers Club,
- Construction of Sports Complex at Railway Stadium,
- Addition /Alteration of DRM Building, Jabalpur.
- Construction of Community Complex at Madan Mahal Railway Station.
- Construction of Activity Centre at Haobagh Station.
- Construction of Auditorium Building at Dronachal Army Training Centre,
- Construction of Aero Bridge at Dabolim Airport ,Goa.
- Upgradation of Court Rooms and Conference Halls M.P High Court.
- Construction of Prefabricated IBS Rooms at Various Location.

Certification/Indian Standards/Endorsement

- One of the recommended technologies under GHTC- India
- Indian standard (IS)/ ASTM Codes are available for various components of LGSF. Code of Practice (IS) is available for Use of Cold Formed Light Gauge Steel Structural Members.

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Category: Application of Alternate Structural/ Building System in Housing Projects

30 Monolithic Concrete Construction using Aluminium Formwork

Scan QR Code for Technology Detail

Name of agency

M/s SPR Group/ B&C Mills, SPR India

Alternate to

Conventional Construction System

Brief

SPR Group, founded in 1972, is a leading real estate developer dedicated to the acquisition and development of residential and commercial projects in South India. It has successfully delivered around 2.2mn sft & over 6.2mn sft is under implementation in SPR City project. Currently, it is developing ARHCs project at Perumbudur, Tamil Nadu using Monolithic Construction Technology with Aluminium formwork.

Monolithic Construction Technology, is a modern technology in which all walls, slabs, stairs, together with door and window opening are cast in–situ in single operation at site by use of specially designed modular formwork made of aluminium, which is easy to handle with less labour & equipment support.

Special Features

- Being monolithic, it is a good lateral resisting system against all kind of lateral force (Seismic, wind effects etc.)
- Construction speed is fast.
- Proven technology in reducing cost & time.
- The product is suitable for all kind of climatic conditions.
- Aluminum Formwork after repeated use is recycled. Has got salvage value.
- With use of industrial wastes like fly ash and ground granulated blast furnace slag, it helps reducing greenhouse gas emission.
- Overall life cycle cost is lesser than RCC
- Initial investment is high, not suitable for less repetition in buildings, control is difficult to do the changes.

Major Projects

Construction, Operation and Maintenance of ARHCs" being implemented by M/s SPR City Estates Pvt. Ltd., Perumbudur, Tamil Nadu covering the total beds of 5045 (5 Double Bedroom & 5040 Dormitories bed) Monolithic Construction Technology with Aluminium formwork.

Certification/Indian Standards/Endorsement

- Recommended Technology under GHTC – India. The structure is designed as per the relevant Indian Standards.
- Included in CPWD DSR

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Category: Application of Alternate Structural/ Building System in Housing Projects

31 Monolithic Concrete Construction using Aluminium Formwork

Scan QR Code for Technology Detail

Name of agency

State Industries Promotion Corporation (SIPCOT) of Tamil Nadu

Alternate to

Conventional Construction System

Brief

State Industries Promotion Corporation of Tamilnadu Ltd (SIPCOT) was established in the year 1971 to develop industrial growth in Tamil Nadu. To give main thrust to area development activities, the organization involves in the formation of industrial complexes by providing basic and comprehensive infrastructure facilities for the industries to set up their units. SIPCOT has so far developed 24 Industrial Complexes in 15 districts and 6 Sector Specific Special Economic Zones (SEZs) across Tamil Nadu. SIPCOT also acts as a Nodal Agency of Government of Tamil Nadu in the sanction / disbursement of Structured Package of Assistance to large industrial units.

SIPCOT is presently developing Affordable Housing Complex of 18720 dormitories. For the construction of the Complex Monolithic Concrete Construction system using Aluminium Formwork from is being used.

Monolithic Construction Technology, is a modern technology in which all walls, slabs, stairs, together with door and window opening are cast in –situ in single operation at site by use of specially designed modular formwork made of aluminium, which is easy to handle with less labour & equipment support. In this system, the lateral and gravity load resisting system consists of reinforced concrete wall and reinforced concrete slabs.

Special Features

- Good resisting system against all kind of lateral force (seismic, wind effects, etc.).
- Construction speed is high.
- Proven technology in reducing cost, time.
- The final product needs no plastering/putty works .
- The product is suitable for all kind of climatic conditions.
- Being monolithic, it is a good lateral resisting system against all kind of lateral force (Seismic, wind effects etc.,)
- Aluminum Formwork after repeated use is recycled. Has good salvage value.
- Overall life cycle cost is lesser than RCC
- Initial investment is high, not suitable for less repetition building, Post construction alternations are not recommended.

Major Projects

Construction, Operation and Maintenance of ARHCs" submitted by M/s State Industries Promotion Corporation of Tamil Nadu (SIPCOT), Chennai, Tamil Nadu covering the total dormitory beds of 18720 numbers.

Certification/Indian Standards/Endorsement

- Recommended Technology under GHTC – India. The structure is designed as per the relevant Indian Standards.
- Included in CPWD DSR

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Category: Application of Alternate Structural/ Building System in Housing Projects

32 Precast Concrete Prefabricated System (3S system)

Scan QR Code for Technology Detail

Name of agency

M/s Vidiyal Residency Pvt. Ltd.

Alternate to

Conventional Construction System

Brief

The company is engaged in the construction of Affordable Rental Housing Projects (ARHCs) at Krishnagiri district of Tamil Nadu using Precast Technology. The agency is subsidiary of Tata Group.

M/s B.G. Shrike construction Technology Private Ltd is the construction agency and technology provider.

3-S' Prefab Technology/ Pre-cast Concrete Structural system comprising of pre-cast column, beam, precast concrete / light weight slab, AAC blocks/ infill concrete walls. Structural members are cast in the factory and assembled at site.3S system incorporates precast dense reinforced cement concrete hollow core columns, structural RCC shear walls (as per design demand), T/L/Rectangular shaped beams, stairs, floor/roof solid Precast RCC slabs, lintels, parapets and chajjas. Walls are made of precast concrete.. Hollow core columns are erected above substructure, over which beams are integrated in the column notches followed by erection of slabs.3S Prefab Technology eliminates the use of timber and forest produce of any category. Use of Flyash and Ground granulated blast furnace slag makes the concrete sustainable and green.

Special Features

- Precast construction uses causes reduction in construction time. ARHC project planned to be completed in early in 15 months to make it functional.
- The controlled factory environment brings resource optimization, and improved quality, precision & finish.
- Use of industrial waste like fly ash, ggbs etc. helps in conservation of natural resources.
- Increased safety on site.
- Reduced wastage.
- Minimizing air, water, and noise pollution at work site.
- Brings water conservation.
- Non-generation of construction debris.
- Elimination of use of timber / wooden scaffolding/ Shuttering.
- All weather site execution
- Not tested for construction in Seismic Zone V.
- Precast unit either in factory or at site is required. Not economical for small project.

Major Projects

Construction, Operation and Maintenance of ARHCs" being implemented by M/s Vidiyal Residency Private Limited (VRPL), Krishnagiri District, Tamil Nadu covering the total of 13500 Units (Dormitory Bed -4 bedded, 13096 Beds & Single Bedroom- 404 DUs)

Certification/Indian Standards/Endorsement

- IS 15916: Building design and erection using prefabricated concrete
- IS 15917: Building design and erection using mixed/ composite construction
- Performance Evaluation & Certification of 3-S Prefab Jointing Method has been done - by IIT Roorkee, CBRI Roorkee, IIT Bombay, Thapar University, Stanford University, TRFI Bangalore separately.

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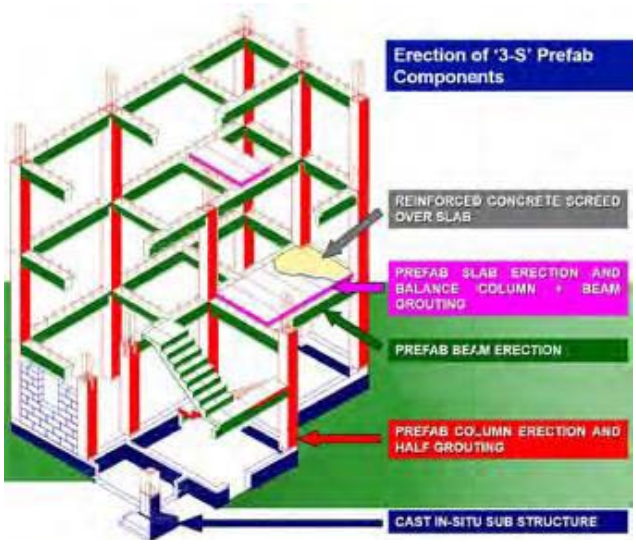
Erection of '3-S' Prefab Components
REINFORCED CONCRETE SCREED OVER SLAB
PREFAB SLAB ERECTION AND BALANCE COLUMN + BEAM GROUTING
PREFAB BEAM ERECTION
PREFAB COLUMN ERECTION AND HALF GROUTING
CAST IN-SITU SUB STRUCTURE


Light House Project
Perumbakkam, Chennai, Tamil Nadu

Category: Application of Alternate Structural/ Building System in Housing Projects

33 Monolithic Concrete Construction

Scan QR Code for Technology Detail

Name of agency

M/s Coastal Developers Private Limited

Alternate to

Conventional RCC/Load Bearing Construction

Brief

Coastal Developers Private Limited is one of the leading real estate organizations aspiring to serve in real estate and renting activities across India. The company, incorporated in 1995, is classified as non-Govt Company and is registered in Andhra Pradesh.

Their activities include buying, selling, renting, and operating of self-owned or leased real estate such as apartment building and dwellings, non-residential buildings, developing and subdividing real estate into lots etc including operation of apartment hotels and residential mobile home sites.

The Agency has initiated two ARHC projects under PMAY(Urban), one of 736 DUs (64 single bedroom houses & 672 dormitiories) at Ponnande village, U -Kothapalli mandal , East Godavari and other of 652 DUs(52 single bedroom & 600 dormatories beds) at Narapam village, Kotavasa Mandal, Vizanagaram, Andhra Pradesh with Shear wall technology (Monolithic Concrete Construction) using modular Aluminum Formwork.

Special Features

- Very suitable for multistoried building having similar design of apartrments. Because of repetitive design, for ARHC type of buildings, it is economical.
- Eliminated wooden shuttering
- These are easy to fix. Semiskilled workers can easily do it.
- Formwork are light in weight and easy to transport. No heavy machineries are required.
- Very suitable for multistoried building having similar design of apartrments. Because of repetitive design, for ARHC type of buildings, it is economical .
- Construction is faster as compared to conventional construction.
- Being monolithic, the structure is safe against earthquakes, cyclone.
- Eliminates plastering thus saving in cost & time.

Major Projects

The two projects of ARHCs are with Modular Aluminium formwork system by the agency;

i. 736 Units (64 single bedroom houses & 672 dormitiory beds) at Ponnande village, U -Kothapalli mandal , East Godavari, Andhra Pradesh

ii. 652 DUs(52 single bedroom houses & 600 dormatory beds) at Narapam village, Kotavasa Mandal, Vizanagaram, Andhra Pradesh

Certification/Indian Standards/Endorsement

- Recommended Technology under GHTC – India. The structure is designed as per the relevant Indian Standards.
- Included in CPWD DSR

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INDIAN URBAN HOUSING CONCLAVE 2022
RAJKOT, GUJARAT

Walling/ Roofing/ Doors & Windows

Category: Walling/ Roofing/ Doors & Windows

Magic Lite ALC Wall Panels

Scan QR Code for Technology Detail

magicrete
magic behind happy homes

Name of agency

M/s Magicrete Building Solutions Pvt. Ltd.

Alternate to

Conventional Brick/Block masonry wall

Brief

Magic Lite ALC Wall Panels are reinforced with corrosion-protected steel, making it a lightweight yet heavy-duty product. With great success in global markets, the ALC Wall Panel technology offers durable & high-quality construction in the shortest possible time.

It has the high thermal rating in the industry (K-value: 0.16). Its cellular structure provides a well-insulated interior, keeping indoor cool in summer & Warm in winter. According to some studies, it is found to have conserved up to 30% in air-conditioning bills.

Magic Lite Panels are highly resource-efficient, ensuring low environmental impact. The panels have close air pockets that result into excellent sound insulation, adequately suppressing the outside noise. In addition, its 4-hour fire rating allows for thinner wall sections, thereby increasing floor space for the end-user. They come in full height lengths (from floor to ceiling) with varied thicknesses and are 600 mm wide.

The reinforcement in the panels provides additional flexural strength to the product, and hence even larger heights, there is no issue of deflection, warping, buckling effect.

Construction cost is mainly bifurcated into two parts: Material Cost and Labour Cost. The best option for budget homes is to reduce the labour cost by utilizing techniques that can reduce the project timelines. Trying to reduce the material cost might have an implication on the quality.

Special Features

- Thermally Insulated, Fire Resistant, Earthquake Resistant, Noise Pollution Resistant and Water Resistant.
- Green Building material with High Strength.
- Resource efficient, about 70% reduction in raw material usage.
- No need for plastering and curing at site.
- Excellent thermal efficiency about 30% energy saving.
- High acoustic insulation with a sound reduction index of more than 40 db.
- Low manpower requirement, can be installed by Semi-skilled workers.
- Magic Lite Panels are Recyclable, inert & non-toxic.
- Low life-cycle cost.
- Supports LEED credits.
- Suited for all weather conditions.
- ALC Wall Panel technology offers durable & high-quality construction in the shortest possible time.
- MagicLite House can be used for Load Bearing Structures upto G+2.
- Available pan India.

Major Projects

- L&T Constructions, Godrej, Mahindra,
- Lodha, Alembic, Advent Construction Ltd.,
- Kalantari Puranics, Global Warehouse Solutions, Panoli intermediates.

Certification/Indian Standards/Endorsement

IS 6072: 1971 (Reaffirmed 2010) - Specification for Autoclaved reinforced cellular concrete wall slabs.

IS 6073:2006 (Reaffirmed Year : 2022) - Autoclaved reinforced cellular concrete floor and roof slabs.

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Category: Walling/ Roofing/ Doors & Windows

34 Prefabricated Cement Sandwich Panels

Scan QR Code for Technology Detail

Name of agency
M/s Bhargav Infrastructure Pvt. Ltd

Alternate to
Conventional Brick/Block masonry wall

Brief

These are factory produced lightweight solid core sandwich panels made of 5mm non asbestos fiber cement boards on both sides as facing sheets and the core material of expanded polystyrene beads, admixture, cement, sand, fly ash and other binding materials in mortar form. The ready to install panels are user friendly alternate to conventional walls. The panels use fly ash, an industrial waste, have low density with less quantity of materials consumed, result in lower foundation size in buildings, & along with high thermal efficiency, make this product sustainable.

The dimension of panel is 3000mmX610mm-60mm/ 75mm/ 90mm. It is primarily non-load bearing walling panels, which is used in the construction of houses/buildings etc. The product has been developed by the Agency in the year 2011 at Surat, Gujarat.

Special Features

- The system is dry walling system, brings speed in construction, water conservation (no use of water for curing of walling components at site).
- The sandwich panels have light weight material as core material, which brings resource efficiency, better thermal insulation, acoustics & energy efficiency
- Being light in weight results in lower dead load of building & foundation size
- Higher stories can be constructed using structural frames
- Being factory produced, ensure consistent quality
- Durable for about 45 years.
- Being factory-produced component, the cost competitiveness depends on economy of scale.
- Due to Good Insulation property, it is suitable for all zones. Structures can be designed as per local climate and geographical requirements.
- Available at all places. The plant can be installed near the project site if the quantum of product requirement is high.
- The joints of panels with each other need to be perfectly locked by materials (cement, glue, dowel bars, polymer modified mortar etc.) & mechanism (levelling of panels etc.) prescribed by Panel manufacturer
- Cutting/chiselling of panels for openings such as doors, windows, service conduits etc. requires little training & through tools/machines prescribed by Panel manufacturer
- The panels if used as floors/ roofs, shall require screeding concrete of minimum 35 mm thickness with nominal reinforcement/ GI wire mesh for monolithic action to avoid leakage through panel joints
- Multi stories houses/buildings require structural framing system with Steel section/RCC Column, beams etc.

Major Projects

- Hubtown/GSRTC Surat, Mehsana Ahmedabad, Gujarat (G+3, 5,110 Sqm - 2014/2015-2016/2017)
- Navrachana University/ International School, Vadodara (G+3 4,683 Sqm) 2013
- Labour Shelter, Pal, Surat (G, 5,110 Sqm) 2013
- Navarachana University, Vadodara
- Bhagwan Mahavir University, Surat
- Pithawala College, Automobile -Nexa Godhra, Royal Enfield- Surat, Bardoli – on going
- HBK Contracting Labor camp, Qatar, 500 quarters with G+4 configuration.

Certification/Indian Standards/Endorsement

- PAC by BMTPC.
- Panel is covered under CPWD DSR 2021.

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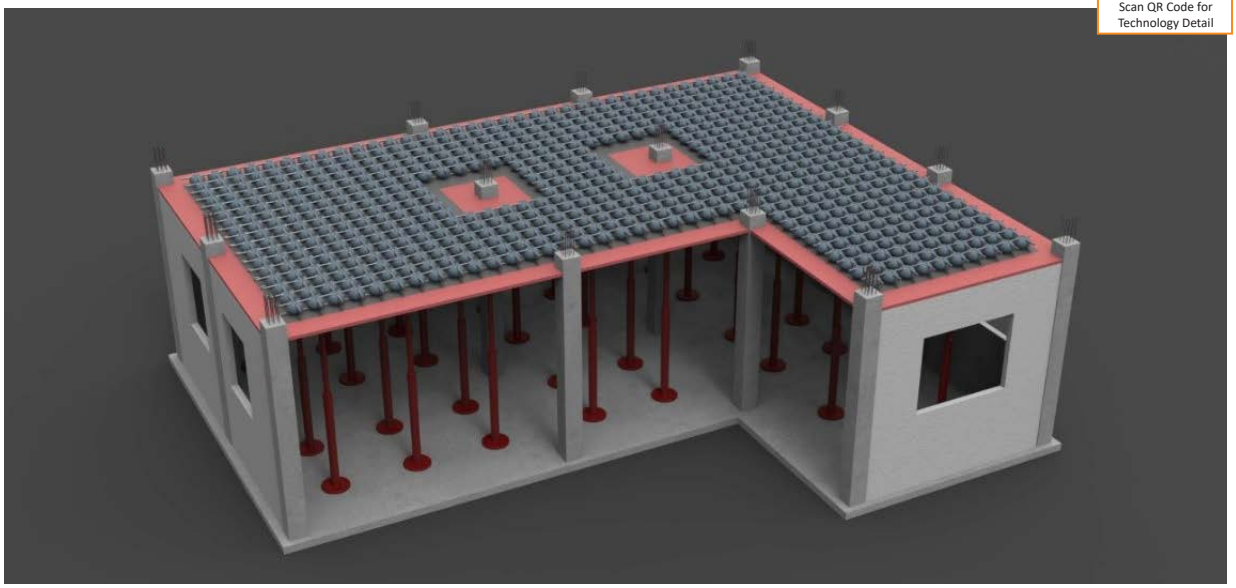
Category: Walling/ Roofing/ Doors & Windows

35 Voided Slab System

Scan QR Code for Technology Detail



Name of agency
M/s Ensimulated Solutions LLP

Alternate to
Conventional RCC Slab

Brief

Voided slab is a type of reinforced concrete slab which incorporates air-filled voids to reduce the volume of concrete. These voids enable cheaper construction and less environmental impact. The Agency uses Plasticated Ellipsoid Former made from waste plastic to create voids in the slab. One major benefit of the system is reduction in slab weight compared with regular solid slab (Up to 50% of the slab volume may be removed in voids), resulting in less load on structural members.

Special Features

i. As Weight to strength ratio is much lower than conventional RCC slab so there is overall reduction of load resulting in optimization of design.

ii. These slabs have 1-2 hours fire resistance and good acoustics and insulation properties

iii. The system is advantageous in case of earthquake and cyclone, due to lower self-weight

iv. The careful planning, designing & execution is needed as voided slab requires high strength concrete, meticulous design and quality control.

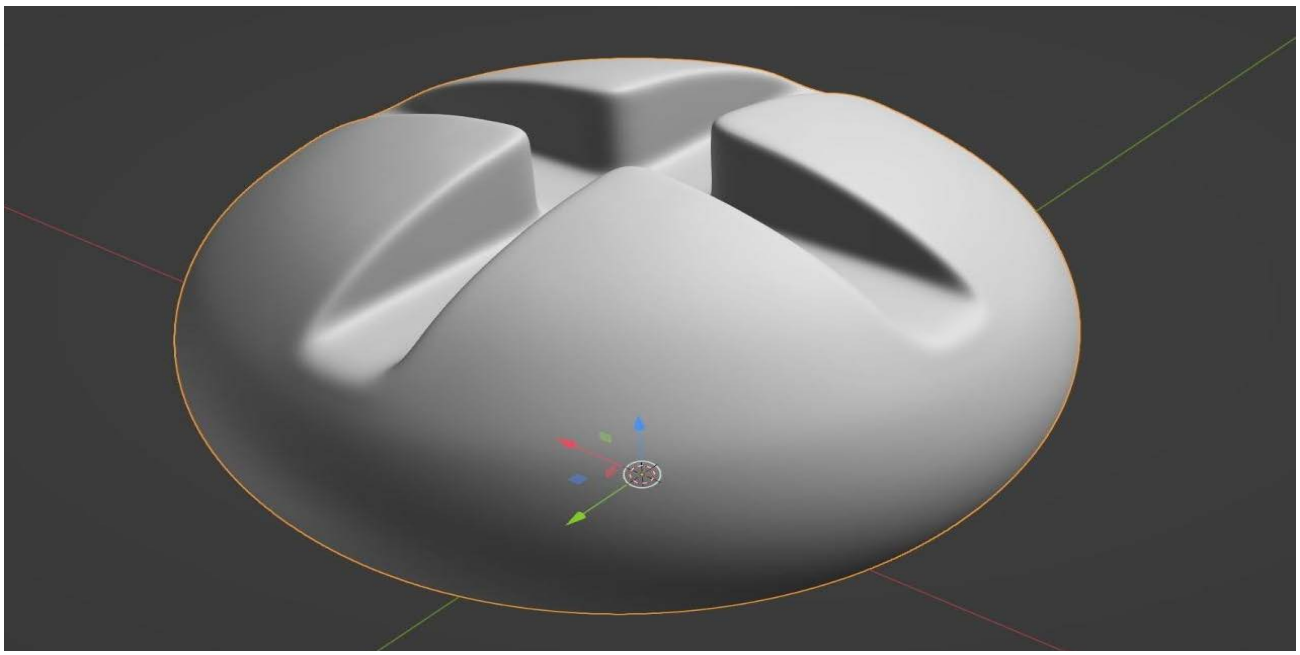
Major Projects

By other Agencies (Using voided slab system)

- Govt Housing Project for ESI Staff at Chennai
- 20.00-Meter Cantilever Canopy at Raipur
- Shree-Cement Factory's Administrative Building

Certification/Indian Standards/Endorsement

The design has been approved by IIT Madras.



1) SLAF System, Korea

2) Cobiax, Switzerland

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Category: Walling/ Roofing/ Doors & Windows

36 Cement Bonded Particle Board (Bison Panel)

Scan QR Code for Technology Detail

Name of agency

M/s NCL Industries Ltd.

Alternate to

Alternative to conventional wooden boards/panels

Brief

NCL Industries Ltd. was established in 1980's which started manufacturing cement. The product range of Cement Division includes Portland Pozzolana Cement (PPC), Ordinary Portland Cement (OPC) and Special Cement for manufacture of Railway Sleepers. NCL also has a Ready Mix Concrete Division, which supplies ready mix concrete. The company set up a plant to manufacture cement bonded particle Boards to be used as partitions, roofs and panels. This was started in collaboration with Bison Werke of Germany, the world leaders in particle board technology. Bison Panels now have several features that provides flexibility and adaptability to suit varying requirements.

Bison Panel is a cement bonded particle board made from about 62% cement & 28% wood and 10% of non-hazardous chemicals and water. The wood used is of fast-growing species like Eucalyptus/ Poplar, waste of wood logs. As the wood particles in the board are mineralized with chemicals during the manufacturing process, the particles become termite & vermin resistant. These panels are available in thickness of 6mm to 40mm used for various applications including internal and external. Due to adoption of a special manufacturing process, the panel acquires the strength & durability of cement, & the easy workability of wood - a combination of qualities absents in other boards. Cement is strong & durable, & is not affected by fire, weather, termites, etc. Wood is light & strong & is easily workable.

Special Features

- Construction with Bison is, extremely, time efficient, resulting in additional savings in labour& transport.
- Texture and laminated, which are termite proof, moisture, and fire resistance, durable, the life is more than 25 years.
- The boards are fire, water, weather, termite, vermin resistant, & do not support fungal growth.
- With cement constituting 62% of its composition, Bison offers excellent resistance to weather.
- Bison is radiologically fit for use as per BARC (Bhabha Atomic Research Centre) test reports.
- No special machinery required for installation.
- Bison is affordable and results in cost saving.
- Bison structures can be dismantled with ease & transported elsewhere.
- Bison is eco-friendly with IGBC certificate & GRIHA / SVAGRIHA compliance.
- Environment friendly as includes use of agro-industrial wastes, using farm wood or waste of wood logs.
- Bison contains no hazardous material like Asbestos or Formaldehyde. Its process dust is harmless.

Major Projects

BMTPC Demonstration Housing Project (G+3 House), Hyderabad under PMAY (Urban).

Certification/Indian Standards/Endorsement

- IS: 14276:2016, IS: 1578BIS – 14276:1995
- ISO-9001:2008
- GRIHA CERTIFIED
- IGBC CERTIFIED
- DNV- Management System Certificate
- CE Certified
- FSC certified
- Radioactive Test by Department of Atomic Energy
- Fire test by CBRI Roorkee
- Thermal Conductivity test by ISOLLOYED
- STC Test by Prasar Bharti

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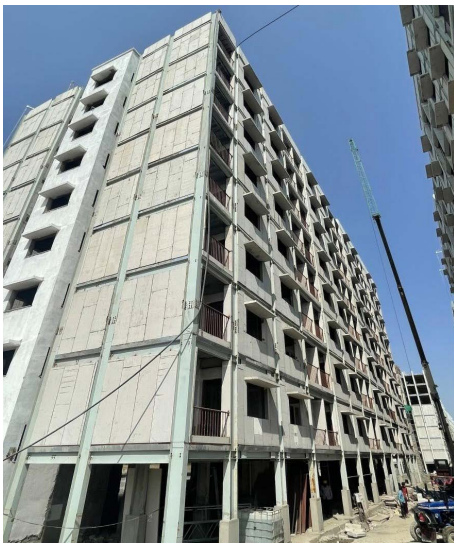
Category: Walling/ Roofing/ Doors & Windows

37 EPS Cement Sandwich Panels

Scan QR Code for Technology Detail



Rising Japan Infra
Complete Building Solutions

Name of agency
M/s Rising Japan Infra Private Limited

Alternate to
Brick/ Block masonry walls

Brief

Rising EPS (Beads) Cement Panels are lightweight composite wall, floor and roof sandwich panels made of thin fibre-cement/calcium silicate board as face covered boards and the core material is EPS granule balls, adhesive, cement, sand, fly ash and other bonding materials in mortar form. The core material in slurry state is pushed under pressure into preset moulds. Once set, it shall be moved for curing and ready for use with RCC or steel support structure beams and pillars.

These panels are primarily used as walling material but can also be used as floor and roof panels. These are non-load bearing panels to be used with structural support frame only. Precast Hybrid Building System comprises of ready-to-install EPS Cement Panels for walling & Pre-Stressed Hollow Core slabs for roofing.

Special Features

- The panels being light weight, helps in easy installation, transportation & reduction in construction time.
- The EPS core has high thermal & acoustics efficiency, which can further be customized to deliver specific thermal insulation requirements.
- Buildings made using panels are lightweight but are at the same time rigid due to two sheets of reinforced plaster that interact to create an enveloping 'shell' of the whole structure. This aspect makes the building seismic & wind resistant.
- Building with any geometric shape/complex architectural drawings can be constructed.
- Increase in carpet area upto 11%.
- Water saving due to dry construction.
- High compressive strength,
- Environment friendly and non-toxic.
- Suitable for all kind of climate conditions.
- Two plants at Pune and Nagpur so far and third one is in the process so that the product can be available all over India.
- These panels can be used load bearing walling up to G+1. For higher stories, panels can be used with additional structural support, steel or RCC depending on the design. In Light House Project At Indore Steel Frame has been used.
- Door-Window openings & MEP all needs to be pre-planned before execution.

Major Projects

- Light House Project, Indore (1024 flats) (under construction).
- Projects at various locations in the Country.
- Tower- 15 NBCC Apartments, New Kidwai Nagar, New Delhi.
- Hotel Atrio Boutique Resort, New Delhi.
- Nanning Ivgang int. Centre (1.5 million sq. Meters panels), China
- 4 Floor Apartment Building, Nagpur

Certification/Indian Standards/Endorsement

- Shortlisted by MoHUA under GHTC- India as proven technology.
- Certified by BMTPC under PACS.
- CPWD – Schedule of Rates.
- NBCC India Limited – Approved new technology (Mandatory use).

- MIT - Test certification and approval.
- ILT – London.
- ISO 9001-2008
- CE, GB/T on ISO.

Light House Project at Indore

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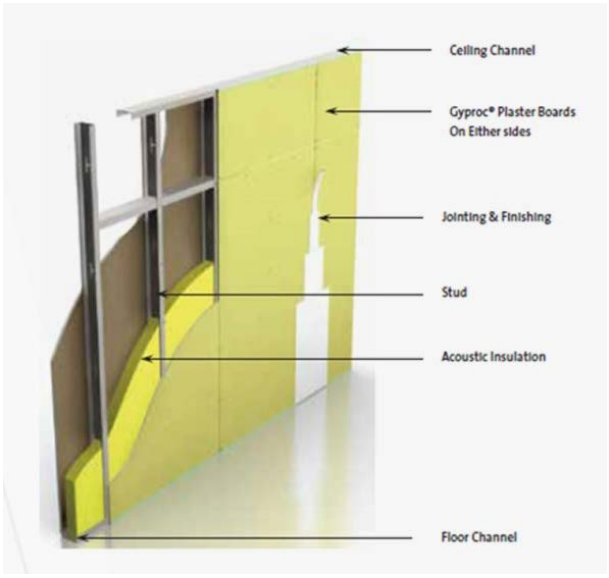
Category: Walling/ Roofing/ Doors & Windows

38 Light Weight Drywall Technology

Scan QR Code for Technology Detail



Name of agency

M/s Saint Gobain India Pvt Ltd

Alternate to

Conventional Brick/ Block masonry walls

Brief

Saint Gobain Gyproc India is pioneer in offering dry wall and false ceiling solution in India for last three decade. Dry wall is a high performance lightweight partition system consisting of GI sheet frame encased with gypsum plaster board on either side attached through self-drilling drywall screws. The joints are then taped and finished with gypsum jointing compounds.

Gyproc Drywall Systems comes with the thickness (75mm to 300mm & above), Fire rating (30 mins up to 240 min), Sound insulation (34 db to 75 db), height (2.4 mtr to 16 mtr & above) & with the Duty Rating as Medium ,Heavy & Severe.

Special Features

i. Speed of installation of Gyproc is 3-4 times faster then masonry construction.

ii. It is 8-10 times lighter in weight than masonry structure, bringing reduction in the size of structural framing members & foundation.

iii. The Dry mode of construction provides clean and dust free working environment.

iv. It reduces the need of labour and speeds up the construction process.

v. It can be used to provide Fire protection upto 4 hours and have excellent sound insulation and thermal properties.

vi. It is sustainable and environmental friendly product.

Major Projects

i. Lodha World Tower, Mumbai

ii. Crown Plaza, Cochin

iii. Hilton Garden Inn, Trivandrum

iv. Dr. Rammanohar Lohia Hospital, Delhi

v. ISB, Hyderabad & Mohali

vi. Airport Terminal -3, Delhi

Certification/Indian Standards/Endorsement

Certified from GRIHA, IGBC, ISI (BIS)

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Category: Walling/ Roofing/ Doors & Windows

39 UPVC Doors and Windows

Scan QR Code for Technology Detail

Name of agency
M/s E Quantum Solutions Pvt Ltd

Alternate to
Wooden Doors and Windows

Brief

Established in the year 2021, E Quantum Solutions Pvt Ltd is the manufacturer and trader of a broad assortment of UPVC Windows, UPVC Doors, UPVC Mosquito Net Doors, Aluminum System Windows, Glass Railing, etc. These products are manufactured with modern technologies and skilled workforce. Optimum grade inputs and experts ensure that these products are precisely engineered in adherence to the industry quality parameters. Due to their excellent quality, easy installation, less maintenance and longer service life, these are highly acknowledged by the clients. The quality controllers check the quality of the offered range from the first phase of selecting the material from the vendors till the last establishment. Moreover, each completed range is altogether tested on specific parameters to guarantee its perfection.

Quantum fenestrations offers the varied range of contemporary styles and designs in white and natural wood finishes and a myriad of shades. Slim frames and higher visibility of the glass surface maximize light and clarity. Low level, concealed, grey-colored gaskets add to the aesthetic quality of white windows while customized production ensures that quality, is never compromised.

Special Features

- Weather resistant
- Sound / Termite Proof
- Wear resistant
- Easy to Install
- Fire Retardant
- UPVC doors and windows are suitable for residential use in Single and multi-story buildings.

Major Projects

- Demonstration Housing Project at Ahmedabad: 40 number of flats.

Certification/Indian Standards/Endorsement

The clients of the company include PWD U.P, PWD H.P, Maruti Suzuki, JSW energy, Fortis, GMR Construction etc.

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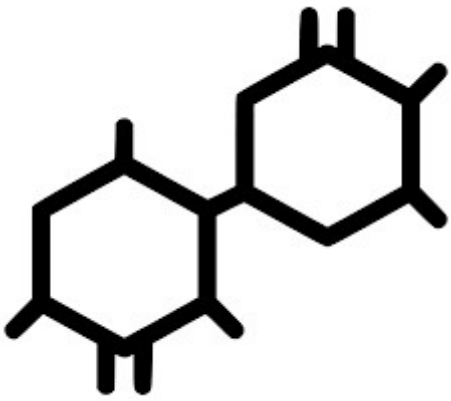
INDIAN URBAN HOUSING CONCLAVE 2022
RAJKOT, GUJARAT

Chemical Admixtures / Water Proofing Chemicals



Category: Chemical Admixtures / Water Proofing Chemicals

40 AC-Crystacrete (Durability Enhancing Admixtures for Concrete)

Scan QR Code for Technology Detail

Name of agency

APPLE CHEMIE
The Construction Chemical Company

M/s Apple Chemie India Pvt. Ltd.

Alternate to

Conventional Concrete Admixture

Brief

The Agency is involved in manufacture of construction chemicals. One of its products AC-Crystacrete, is a crystalline durability enhancing admixture for cement concrete, which is a single component powder based cementitious admixture. The crystalline admixture is hydrophilic, and the active ingredients react with water and cement particles in the concrete to form calcium silicate hydrates and/or pore-blocking precipitates in the existing micro-cracks and capillaries. Crystalline deposits become integrally bound with the hydrated cement paste. The resulting concrete significantly increases resistance to water penetration under pressure.

Special Features

i) AC-Crystacrete is durability enhancing admixture for concrete structure for both exterior and interior use.

ii) It resists extreme hydrostatic pressure from either side.

iii) It has a self-healing property for cracks up to 0.5mm.

iv) The system is chloride free and protects concrete and reinforcements against corrosive & water borne substances.

v) It is Permeability reducing admixture for hydrostatic conditions (PRAH) & complies with the specification of ACI.

Major Projects

- AC-Crystacrete has been used in various projects of CIDCO, MHADA and other Government agency. The major project includes PMAY Projects in Mumbai by L&T, BG Shirke, Shapoorji Pallonji Group etc.
- Dr.Babasaheb Ambedkar International Centre, Nagpur
- Nagpur Metro Project
- Aurangabad Smart City Project

Certification/Indian Standards/Endorsement

- Central Road Research Institute (CSIR)
- V.N.I.T, Nagpur
- Bereau Vertias (India) Pvt Ltd. Navi Mumbai

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Category: Chemical Admixtures / Water Proofing Chemicals

41 Spanocrete – Additive for Concrete

Scan QR Code for Technology Detail

Name of agency
M/s Nanospan India Pvt Ltd

nanospan
Making Small Matter

Alternate to
Conventional Concrete Additives

Brief

Nanospan Spanocrete is a Nano engineered graphene additive for concrete that brings extended durability to concrete structures with various benefits . It is suitable for RMC, Self compacted concrete (SCC), pre-cast, and other extreme weather construction projects.

Special Features

Use of spanocrete in the concrete, results in

i. About 40% higher compression strength of concrete
ii. Crack resistant concrete with low water permeability
iii. Reduction in cement use by about 10%
iv. Reduction in water consumption upto 50%
v. Shorter curing cycle by about 50%
vi. Bringing economy in overall project costs due to comprehensive functionality,
vii. With advantages as above, there is reduction in carbon footprint of the construction

Major Projects

1. High rise building terrace slabs
2. Irrigation Tunnel
3. Special concrete for RMC's

Certification/Indian Standards/Endorsement

- ASTM C494 (Type S)

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Category: Chemical Admixtures / Water Proofing Chemicals

42 Z- Power (Zinc Nano particles for enhancing quality and durability of concrete)

Scan QR Code for Technology Detail

Name of agency

Thakur College of Engineering and Technology

Alternate to

Conventional concrete Admixtures

Brief

Z- Power involves incorporation of biologically synthesized nanoparticles in the conventional concrete mix with some percentage replacement with cement. The preliminary research study involved identification and testing of nano concrete cubes incorporated with three different kinds of nanoparticles: tin, copper and Zinc. Zinc Nanoparticles were then chosen for the secondary research study as they exhibited optimum increase in the compressive strength as compared to the conventional concrete cube.

The product is based on two important pillars of Nanotechnology and Concrete Technology. The former being utilised in the biological synthesis of ZnO nanoparticles whereas the latter in curating an optimal concrete design mix, which would optimise the properties of ZnO nanoparticles when incorporated in the concrete mix.

Special Features

i. Z-Power enhances the properties of concrete by increasing its compressive strength by 18-20%, reducing the porosity of the concrete and rendering it anti-microbial in nature thus increasing its durability.

ii. It is about 75% more economical as compared to the ZnO nanoparticles currently available in the market.

iii. Z-Power is a sustainable alternative as its manufacturing process leaves no chemical residue and is completely based on sustainable practices.

Major Projects

After the lab scale investigations, the commercial uses of the product are being explored by the Institution.

Certification/Indian Standards/Endorsement

The Recognition of the Project by University of Mumbai, in the 14th Intercollegiate/ Institute/ Department AVISHKAR Research Convention 2019-20. Product is at Developmental stage.

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INDIAN URBAN HOUSING CONCLAVE 2022
RAJKOT, GUJARAT

Thermal Comfort/ Energy Efficient Solution/ Green Technologies/ Waste Utilization

Category: Thermal Comfort/ Energy Efficient Solution/ Green Technologies/ Waste Utilization

43 ReUrban (C&D Waste Recycling Solutions)

Scan QR Code for Technology Detail

cde.asia

Name of agency

M/s CDE Asia Limited

Alternate to

Conventional building materials (Natural Sand, Aggregate etc.)

Brief

CDE Asia is one of the leading "make in India" manufacturers of C&D waste processing equipment. It's Eco-friendly Portable system provides C&D Waste Recycling Solution through Cutting Edge wet processing Technology. The first recycling plant in India (Burari) commissioned by it was for Delhi Municipal Corporation and have since commissioned 10 recycling plants throughout the country, in cities like Delhi, Hyderabad, Surat, Kolkata, Thane, Pune, etc.

Special Features

i. It uses wet processing technology which is eco-friendly. In the system, 95% water used is recycled with zero liquid discharge, and there is no dust & noise pollution.

ii. Greater than 95% material is recovered from the waste, with the majority of waste converted to sand, with option of flexible product mix also.

iii. The System is Portable with Easy to Relocate

iv. System is IoT enabled to ensure traceability

v. Superior Sand Dewaters - The patented dewatering screen technology delivers washed sand that's ready for market straight from the belts - allowing the products to turn into revenue as quickly as possible.

vi. Verities of value added products can be manufactured from recycled waste as Paver Block, Kerb Stone Tile, Fence Post, Pre-cast Compound Wall, Park Bench, Drain Cover etc.

Major Projects

Burari, North Delhi Municipal Corporation - 2000 TPD, Surat, Surat Municipality - 300 TPD, Daighar, Thane Municipal Corporation - 300 TPD, Bakkarwala, South Delhi Municipal Corporation - 500 TPD, Fatehgouda, Hyderabad, 500TPD, Pimpri, 300 TPD, Kolkata Municipal Corporation- 500 TPD, Samhueng Korea -500 TPD

Certification/Indian Standards/Endorsement

- ISO: 9001 - Quality Management
- ISO: 14001 - Environmental Management
- DSIR Recognition

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Category: Thermal Comfort/ Energy Efficient Solution/ Green Technologies/ Waste Utilization

44 Motarless Interlocking Block Masory with Hemp Concrete

Scan QR Code for Technology Detail

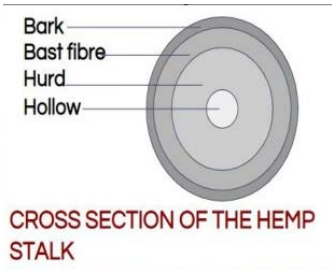
Humengi®

Name of agency
M/s Humengi Gohemp

Alternate to
Convenational Brick/ Block Masonry

Brief

Two winners of ASHA India initiative of MOHUA namely, Gohemp Agroventures from Uttarakhand and Humengi have jointly developed an eco friendly mortarless interlocking block technology for faster and durable construction using hempcrete, manufactured from abundantly available hemp crop residue especially designed for eco sensitive Himalayan region.



CROSS SECTION OF THE HEMP STALK

The interlocking hemp blocks can be deployed to any site for faster, durable, and affordable construction.

Hemp is one of the oldest domesticated crops known to man. It has been used for paper, textiles, and cordage for thousands of years. Hemp, also referred to as industrial hemp, is the low-THC, oil seed and fiber varieties of Cannabis, which is grown for their seeds, stalk, and fiber. Hemp is used to refer to the non-psychoactive variety, which grows up-to 4 meters tall, and has long massive stalks.

Hemp is a 100-day crop which can be harvested twice a year. This crop requires less fertilizers, less pesticides, and less water. It naturally stops weed growth around, enhances the fertility and prevents soil erosion.

Hemp is an attractive rotation crop for farmers. As it grows, hemp breathes in and locks CO_2 in its biomass. It also detoxifies the soil, and is used for phyto remediation. What's left after harvest breaks down into the soil, providing valuable nutrients. Best part for Himalayan farmers is that monkey and wild boars do not damage this crop.

It is a low cost, high quality, highly accurate mass-production mortar-less self-interlocking load bearing or non-load bearing CMU system for cheaper, faster, stronger and safer construction. It allows for considerable time, and in-turn, cost reductions in construction by setting new levels of standardization.

Special Features

- Humengi® Gohemp combined technologies can be constructed as hybrid structures using structural material in Humengi® blocks for the structural skeleton and Gohemp material for the non-structural aspects of a structure, all interlocked together as a monolith.
- Humengi® reduces the use of materials used in construction, increases construction efficiency from design to building site.
- Skilled labor is not needed.
- It can help attain a higher level of organized construction at any building site, from small single-family to big buildings.
- Direct cost reductions include the use of less material, streamlined design process with high precision & less construction waste at site.
- Indirect cost Savings include faster implementation at the building site, faster project completion and more efficient use of labor.
- Absorbing and emitting moisture to regulate internal humidity and avoid trapped moisture and mold growth.
- Excellent acoustic and thermal insulation and thermal mass.
- Lightweight and environmentally friendly.
- Extremely suitable and extra effective in 'vapour permeable' building constructions
- It is a Carbon negative material.

Major Projects

It is at developmental stage.

Certification/Indian Standards/Endorsement

Both Hemcrete and Interlocking blocks have been shortlisted as Potential Technology under GHTC-India, MoHUA, GoI.

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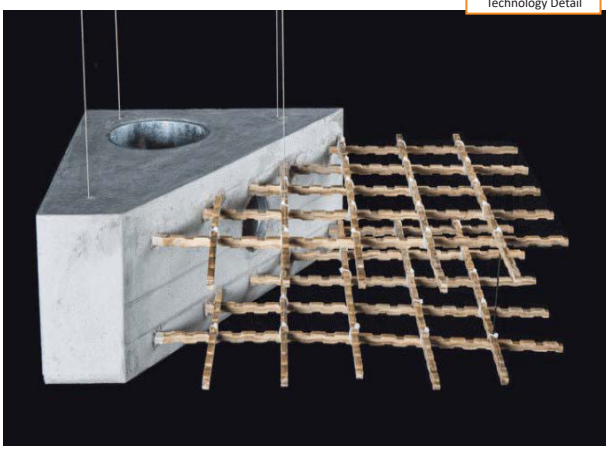
Category: Thermal Comfort/ Energy Efficient Solution/ Green Technologies/ Waste Utilization

45 Bamboo Reinforced Concrete Structure

Scan QR Code for Technology Detail



Name of agency

IIT Kharagpur

Alternate to

Conventional Construction System

Brief

This technology replaces steel rebar with bamboo reinforcement in concrete structures, providing a cheaper, cleaner, and sustainable alternative to steel reinforced concrete structures, while providing a comparable degree of disaster-resiliency and durability. The high tensile strength of Bamboo is utilized in conjunction with concrete for structural stability. The suitable adhesives are used to improve bonding between bamboo and concrete.

As regards the technology, the extensive experimentations have been carried out at the structural engineering laboratory at IIT Kharagpur over the past fifteen years. The results have been published in international journals and are highly cited. The technology has potential to save steel to a large extent in housing construction

Special Features

Bamboo is environment friendly as it is natural, recyclable & locally available.

- Quality & durability of bamboo reinforced concrete is similar to steel reinforced concrete structures, once bamboo is properly treated chemically to prevent infestation and rotting.

- In terms of energy efficiency, it is superior to reinforced concrete structure since steel production is replaced by the use of natural and fast-growing plant bamboo.
- Houses constructed using this technology have performed satisfactorily for more than seven years, after being exposed to several natural calamities like cyclones and floods .
- The developed technology can be implemented in rural areas with the help of local people which is cost effective & easy to implement.
- Local labor can easily be trained
- The research study & technical know-how is available with IIT Kharagpur.
- Bamboo framed structure housing technology are being standardized by laboratory testing, computer simulation, 3D modelling, design drawing and detailing. Standardized test results, handbooks, manuals, drawings etc. will be widely distributed to permit global uptake on a local-to-national scale.

Major Projects

Two houses, 1BHK and 2BHK, with area 275 Sqft and 390 Sqft respectively, have been constructed at the school premises of Jagriti Vidya Mandir near IIT Kharagpur. These houses are being used for office purpose in the school presently.

Certification/Indian Standards/Endorsement

- Structural designs as per IS 456 (Plain and reinforced concrete), Mix design as per IS 10262 (concrete mix proportioning), bamboo testing as per IS 6874.
- Extensive Research & experimentations at Structural Engineering Laboratory at IIT Kharagpur

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Precast wall panels

Houses at IIT Kharagpur

Category: Thermal Comfort/ Energy Efficient Solution/ Green Technologies/ Waste Utilization

46 Bamboo Wood Products

Scan QR Code for Technology Detail

Name of agency

M/s Mutha Industries Pvt Ltd

Alternate to

Conventional hard wood-based products used in building applications.

Brief

M/s Mutha Industries Pvt. Ltd. manufactures bamboo wood products under the brand name of EPITOME. The various EPITOME - Bamboo wood products are flooring panels, decking panels, wall panels, ceiling, claddings, furniture, poles, doors & windows including bamboo wood structures. These Bamboo wood products are made from Strand woven bamboo which is an eco-friendly product made from plantation timber bamboo. It is a conversion of bamboo to wood. Before using bamboo for manufacturing durable products it needs to be treated chemically. Bamboo is first boiled/or burned under high pressure steam to remove starch and sugar content to make it termite resistant. Further, VOC compliant phenolic resin is used as binder. The products such made have excellent engineering properties and better than hard wood since made from naturally occurring plantation timber.

These products are environmentally friendly, natural and stronger than most hardwood in the market. The bamboo wood can also be converted in the form of bamboo lumber which can be

used as an alternate to RCC or steel girders. While using for building applications these products are coated with UV/PU/Oil coatings for longer life, better abrasion resistance, durability and resistance to fire, termite and moisture. Normally, flooring, celling and wall panels are coated with 9 layers of UV coat while decking panels are coated with oil and other items with water based polyurethane coating.

Special Features

- It displays higher tensile strength than many alloys of steel. It has capabilities for higher compressive strength than many mixtures of concrete.
- The high silica in bamboo makes it indigestible to termites.
- Bamboo wood flooring is an eco-friendly product Bamboo is by far the fastest growing natural resource in the world. It grows to maturity in just 4-5 years- in contrast to a tree which take decades to mature.
- Bamboo wood offers the sheen, durability and luxurious finish of hardwood—but without the ecological damage.
- The root system of bamboo continues to grow after harvesting preventing soil erosion and maintaining nutrients
- Bamboo plants release upto 30% more oxygen and absorb more CO_2 than hardwood trees
- The bamboo-based products are economical than hard wood based products and are green products.
- Low greenhouse gas emissions
- Low embodied energy.
- Reduced carbon footprints
- Higher strength to weight ratio
- Excellent thermal conductivity and sound insulation
- Bamboo being lighter in weight provides better seismic resistance.
- Based on local material generates local employment

Major Projects

- Samrat Ashoka Convention Center, Patna
- New Parliament building, New Delhi (Ongoing)
- Guwahati Airport
- Godrej Bhawan, Mumbai
- Social Forestry Range, Dept. of Forest, Govt. of Tripura
- H.Q., BSF, Tripura

- NIT, Agartala
- IHHR Hospitality Andhra Pvt. Ltd., Hyderabad
- ONGC Ltd., Agartala
- Asian Construction Company, Mumbai
- Project of World Bank & Govt. of West Bengal, Digha

Certification/Indian Standards/Endorsement

- ISO 9001:2008; 14001:2004 & 18001:2007, GRIHA Certified
- Certified by BMTPC under PACS.

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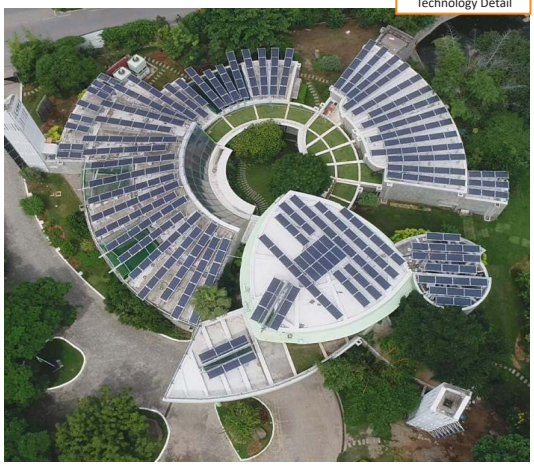
Category: Thermal Comfort/ Energy Efficient Solution/ Green Technologies/ Waste Utilization

47 Heat Reflective High SRI Paints for Insulation and Energy efficiency Solutions

Scan QR Code for Technology Detail



Name of agency

M/s Panache Greentech Solutions Pvt. Ltd.

Alternate to

Conventional Thermal Treatments

Brief

The solution uses Infrared (IR) reflective technology which reflects the heat generating IR component from the sunrays off the roofs and walls, which otherwise would have penetrated into the building surface. The High Solar Reflectance Index (SRI) Paints reduce surface temperatures by up to 15-20 degrees and ambient temperature by 4-8 degrees Celsius, thus reducing the environmental impact, UHI impacts, while giving Cool buildings.

It is a cooling system comprising of multiple coatings with Primer, Elastomeric Reflective Coat & Transparent Protective Coat. The protective coat of Tran seal has anti dust, algae & anti fungal properties, and it is water protecting, flexible, non-tacky & UV Resistant.

Special Features

i. Cool roofs with associated reduction in heat gain from the building surface can help (Individual Building / City Level);
   - Improve the Operational energy efficiency of the buildings
   - Address climate change by lowering CO_2 and other emissions associated with fossil fuel-generated electricity used for Air Conditioning.
   - Reduce the Urban Heat Island effect (UHI) and associated public health risks from increased building temperatures
   - Raise the global albedo, thereby reducing the effect of Global warming.
   - Control heat pollution & air pollution.

ii. Applicable on various kind of surfaces (Roofs, walls, Pavements, Cycle tracks, Bridges etc) based on Cement/ Concrete, Metal, Asbestos, Bitumen, Asphalt, etc.

iii. The paint has life of about 10 years and can bear the harsh conditions of climate/ high temperature.

iv. It requires manual labour for application. The agency indicates that it is coming up with a drone spraying mechanism which can do away with this manual labor issue to an extent but surface preparation and cleaning has to be done through manual labour only which might be an issue in isolated or unapproachable areas.

Major Projects

The Agency indicates to have covered /applied paints more than a Crore Sq. ft. in various projects across the Indian Sub-continent. Some important projects include;

Project	Area Covered	Duration
Aga Khan India Habitat	200000 Sqft	2021- Ongoing
Warangal Smart City	All Schools	2020- Ongoing
IGBC HQ, Hyderabad	12000 Sqft	2019
Asian Paints	15000 Sqft	2019 – 2020
IOCL/ Econ Packaging	100000 Sqft	2020
CEAT Tyres	10,000 Sqft	2019
Metro, Hyderabad, Delhi/ Kanpur	1,00,000 Sqft	2019 – 2021 - Ongoing
Shiv Nadar University, Delhi	4,84,200 Sqft	2020

Certification/Indian Standards/Endorsement

GreenPro, GRIHA, CEPT, National Test House (NTH) certified products (Certifications are available on demand)

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Category: Thermal Comfort/ Energy Efficient Solution/ Green Technologies/ Waste Utilization

48 Thermally Comfortable Energy Efficient Solutions

Scan QR Code for Technology Detail

Name of agency
RMI India Foundation

Alternate to
Thermal Aspects in Conventional Buildings

Brief

RMI Energy Solutions India Foundation's ("RMI India Foundation") mission is to support the transformation of India's economy into a clean, thriving, and inclusive energy future. This mission is in line with the country's ambition to achieve a net-zero emissions economy by 2070. The company aims to drive impact on the ground through deep research and analysis, which disseminates the development of sustainable clean energy policies and programs across the country to enhance the lives and livelihood.

Special Features

India's rapid urbanization is driving a large and growing need for new housing stock. At the same time, soaring temperatures portend sharp increases in energy and peak loads for cooling, making heat-resilient housing more important than ever.

The low-income housing including the Beneficiary led houses are significant part of Housing growth & it is very important to make such houses thermally comfortable & energy efficient. For this, the indicative set of solutions by the Agency includes;

- Building design (orientation, shading, window-to-wall ratio),
- Low embodied carbon and energy efficient materials,
- Passive cooling (natural ventilation/mix mode ventilation)
- Cool roof
- Super-Efficient Ceiling fans

The vision of the proposed solutions is to reduce residents' energy burden, improve living conditions, and enhance the health and well-being of millions of people moving from slums into social housing. The scalability of the solution is proposed through the following strategies:

- Procurement guidelines at the State/City level
- Business models and financing mechanisms
- Skill enhancement of building trade workers
- Awareness campaigns about the identified solutions

Major Projects

1. **Lodha Net Zero Urban Accelerator:** The Accelerator is founded with an overarching goal to make net zero the new normal for new developments by 2030 and maximize the building sector's contribution toward India's 2070 net-zero emissions target while increasing resilience, health, affordability, and access to energy services. The Lodha Group's flagship Palava city project has the potential to be a unique living laboratory to the Accelerator, to catalyse the adoption of sustainable practices in the Indian real estate sector. The Agency is an stakeholder in this Accelerator.

2. **From the Ground Up: A Whole Systems Approach to Net Zero Energy Buildings for India**

   RMI in collaboration with the National Institute of Urban Affairs (NIUA) has recently published a first-of-its-kind report on "A whole-systems approach to decarbonising India's building sector". This report provides a structured perspective to transform India's building sector, providing a broad range of cost-effective solutions that could reduce CO_2 emissions by more than three quarters by 2050 compared to a baseline scenario.

Certification/Indian Standards/Endorsement

No certification/endorsement reported by the company.

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Category: Thermal Comfort/ Energy Efficient Solution/ Green Technologies/ Waste Utilization

49 Housing for Migrant, Displaced and Climate Vulnerable Communities - Design & Implementation

Scan QR Code for Technology Detail

SELCO Foundation

Name of agency

SELCO Foundation

Alternate to

Conventional Housing

Brief

SELCO is a multidisciplinary organization and works closely with communities to identify livelihood challenges and solve them using energy efficient technologies and appropriately designed solar system. SELCO believes that an end-user centric, demand driven approach on ecosystem building leads to interventions that are long-term and replicable. It supports local ownership from end to end with very few dependencies on externalities: a holistic and decentralized approach to development.

About 200 Partners work with SELCO foundation on piloting and scaling sustainable energy solutions. The Built Environment team works on sustainable, climate-smart, resilient, thermally comfortable and productive designs and innovations catering to the poor. The team comprises practitioners in design, construction, project management, and finance with expertise in housing, healthcare, education & livelihoods.

Special Features

- SELCO defines Eco system as a combination of 5 critical enabling conditions that spur the creation, adoption, replication and need based sustainable energy solutions
  - Innovations
  - Finance
  - Skill and Capacity Building
  - Backward and forward linkages
  - Framing Policy
- SELCO benchmark and optimize technology driven solutions as per the need of the end user. This ensures that poor consumes less energy and improves affordability of solutions.
- Technological solutions and coupled with financial and social innovation to ensure affordability and long term sustainability.

Major Projects

It has been claimed that SELCO has been involved in development and demonstration of 120 energy driven solutions in North Eastern Regions, Odisha, Jharkhand & various other regions of the country.

1. Improved roofing solutions for houses and livelihoods

Roofing constitutes about 70% of the total indoor heat gain. By introducing a more sustainable and climate adaptive roofing system brings down the indoor temperatures by up to 4 degrees Celsius. "Improved Roofing Program" by SELCO's Built Environment team focuses on building ecosystems for integration of "Cool Roofing technologies" in heat-stressed regions of the country like North Karnataka, Tamil Nadu, Maharashtra, Odisha, Assam, etc. Simple interventions like careful selection of roofing materials, building technology, building layouts, increasing the building height, addition of roof fenestrations or openings, active cooling mechanisms using renewable energy solutions, etc. would be the ideal solutions in low resource settings.

90+ Improved Roofing Solutions have been implemented up to 2022.

2. Construction Workers Housing

There is a dire need for the construction labours migrated to urban areas, to optimise the limited space available, create natural ventilation, thermal comfort and use durable and high quality and adaptive materials and construction technology to fit the needs in a post-covid world. Multiple Worker Housing Typologies have been developed for construction workers housing, including one dormitory typology construction worker housing in Bangalore integrated with best practices on habitable area per person, natural light and ventilation solutions, kitchen spaces, health care and community spaces and climate adaptive building materials and technologies have been adopted in the construction workers housing.

3. Housing for Low Income communities in Heat Stressed Regions of Karnataka and Maharashtra

New construction of Pucca houses for low-income households living in Kuthca houses made with mud walls and thatched, tin sheet and asbestos roofs. The occupants faced issues of water leaks during monsoons, heat stress in summers and recurring annual expenses due to partial destruction of the houses (in Cyclone prone areas). The houses are designed and built using locally available building materials and human resources. The roofs are waterproofed and cool paint has been applied to avoid thermal discomfort. Habitable area per person considered to avoid space constraints. The houses were integrated with energy efficient appliances and solar home energy systems, which also ensured independence from irregular grid electricity and reduction in energy bills as well as shift to a sustainable source of energy.

Certification/Indian Standards/Endorsement

As per the Agency, many organizations including State Governments in the country have endorsed its projects.

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Category: Thermal Comfort/ Energy Efficient Solution/ Green Technologies/ Waste Utilization

50 Bamboo Corrugated Roofing Sheets & Bamboo Mat Wall Panels

Scan QR Code for Technology Detail

Name of agency

M/s Timpack Pvt. Ltd.

Alternate to

GI/ Asbestos Corrugated sheet

Brief

It is a patented bamboo-based technology developed by Indian Plywood Industries Research & Training Institute (IPIRTI), Ministry of Environment, Forest and Climate Change, Govt. of India & Building Materials & Technology Promotion Council (BMTPC), Ministry of Housing & Urban Affairs, Govt. of India. Bamboo mat corrugated sheets, Ridge cap and Bamboo mat board are made out of multi-layer Bamboo mats soaked in PU resin and pressed in hot press.

The manufacturing process involves application of specially formulated Phenol Formaldehyde (PF) resin to the mats, assembling the resin coated mats and hot pressing in hydraulic press at specified temperature and pressure. Bamboo Mat Corrugated Roofing Sheets (BMCS) conforming to IS:15476-2004 Specification for Corrugated bamboo roofing sheets (CBRS) are an excellent alternative to corrugated metal, plastic, or asbestos roofing sheets.

Bamboo sheets are durable and strong with excellent internal bond strengths and a high resistance to weathering, fire or insect attacks. They have an attractive and natural appearance and are easy to work with (cutting, drilling, etc.). The main raw material for the product is bamboo, which is the fastest growing plant and occurs naturally in the forests and is also

suitable for plantation even over degraded lands. For manufacturing BMCS, bamboo is to be converted into mats that are hand woven by rural/tribal people, particularly women. Thus, the product is both environment and people friendly. These products are certified as per IS relevant codes.

Special Features

- Green, Eco-Friendly, Sustainable, Renewable.
- Energy Efficient, Low thermal conductivity.
- Combined total energy consumption for the manufacturing Bamboo Corrugated Sheet is much less than Aluminium, Galvanized iron and fibre reinforced plastic sheets.
- Based on weather-o-meter and accelerator test conducted at IPIRTI, it is expected that products service life will be around 25 years.
- High Load Bearing capacity, good sound insulation.
- Surface rust proof, Fungus proof.
- Thermal conductivity is low and sound insulation is high
- 100% Boiling waterproof, Termite resistance & fire retardant
- Light-weight construction materials, quick to install, versatile, very sturdy & resilient.
- Products are detachable and can be dismantled and re-installed at different locations of the same design, size and dimensions.
- Can be made available in any part of the country.
- Technical specifications of BMCS
    - Water absorption – 15% max
    - Density 0.92 gm/cc
    - Load bearing capacity -4.0 N/mm2 for dry state and 3.0 N/mm2 for wet state
    - Available in dimensions of 1800mm X 1050mm X 3.8mm, 2140mm X 1050mm X 3.8mm & 2440mm X 1050mm X 3.8mm
- Energy consumption per ton is 22784 MJ. Four times less than the pre-coated GI sheets.
- BMCS has social impact as it creates huge indirect employment in the rural/ tribal villages for the woven bamboo mat weavers/bamboo strip makers

Major Projects

- Railways, Metro Railways, Airports, Tourism, Universities, etc.
- Prefabricated Structures & Housing in various parts of Country
- Being included in CPWD Schedule of Rates and Railways. The product is accepted Pan India and being used.

Certification/Indian Standards/Endorsement

- IS: 15476:2004 Specifications for bamboo mat corrugated sheets
- IS: 13958:1994 Specifications for bamboo mat board for general purpose
- Included in CPWD - DSR 2021

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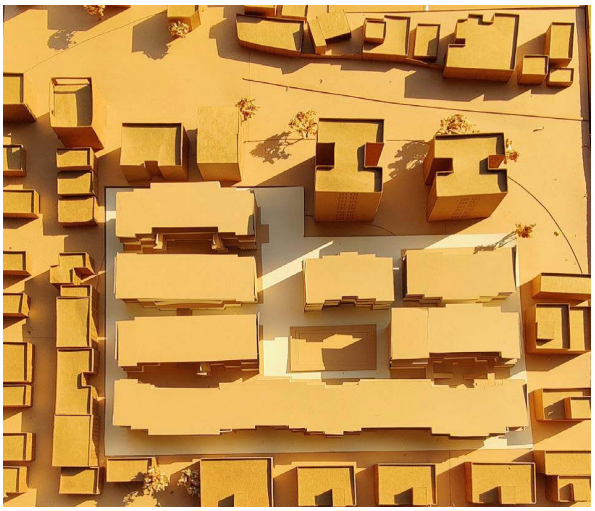
INDIAN URBAN HOUSING CONCLAVE 2022
RAJKOT, GUJARAT

Project Planning & Management and Software Solutions

Category: Project Planning & Management and Software Solutions

51 Architectural Design Solution for Redevelopment of Mass Housing

Scan QR Code for Technology Detail



INDUBHAI PAREKH SCHOOL OF ARCHITECTURE

Name of agency

Indubhai Parekh School of Architecture

Alternate to

Concepts for Re-Development of Housing

Brief

Indubhai Parekh School of Architecture, a part of the larger framework of Vyavasayi Vidya Pratisthan Trust and affiliated to Saurashtra University, is the first institution in architectural education in Saurashtra and Kutch region of Gujarat. During IUHC, students from the college displayed their concept of mass housing/ redevelopment through case studies. The case study taken is re-densification housing Ambika Park, Raiya Road, Rajkot, Gujarat. Ambika Park is located near Hanumanmadhi chowk and has a mixed development-edge of housing is developed as commercial and interior part of the neighbourhood has residential development. Students had to propose their redevelopment design keeping the number of houses same as existing but with more living area and better habitable planning. Another case study was re-densification of government housing Naval Nagar, B/H R World, Sadar, Rajkot.

The following redesign models were displayed during IUHC, Rajkot.

Special Features

i) Re-densification housing Ambika Park, Raiya Road, Rajkot
Students Name - Rutvi Rajgor, Smit Isamaliya

Housing is about community and group of people who used to live together in society. Our site Ambika park is located near Hanuman madhi chowk which is mixed use commercial and residential development area. Our brief is to make a community housing for Ambika park users with same number of existing houses however the challenge is to give more area than they have now. There was 2 BHK and 1 BHK unit are in this housing. We have to give them 2 BHK and 3 BHK houses. As per brief we decide to give whole new experience to the housing design. We studied about some elements and methodology about housing design. When somebody enter through the main gate, there is an experience which we created through walkability. After that we give them flexibility as individual unit. There is also hierarchy of courtyards which provides an experience of neighbourhood. In our region, neighbourhood has special effect on community and society. We have to design good neighbourhood spaces for good living of community. Here, we try to continue that experience of living.

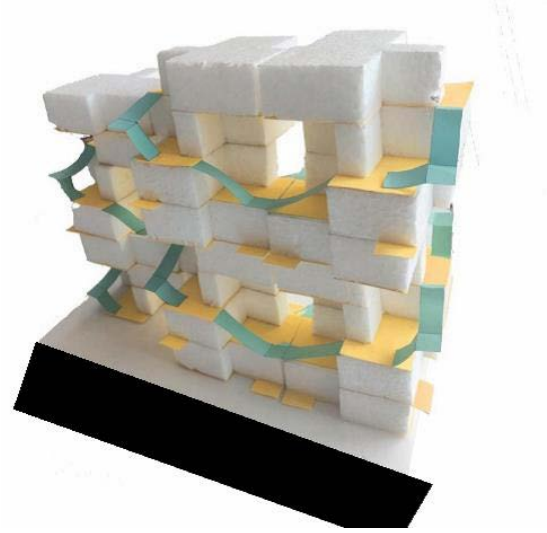
ii) Re-densification housing Ambika Park, Raiya Road, Rajkot
Students Name - Bhargav Chotaliya ,Yashvi Sandhel

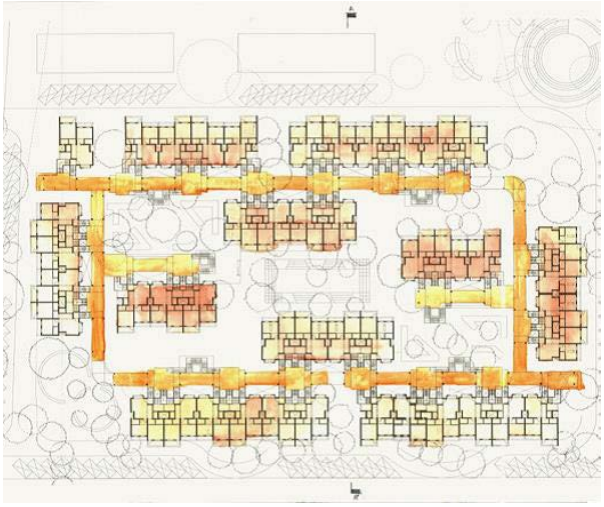
Housing is an urban tissue building city fabric and acts as an integral part of its systems. Housing serves society through its qualitative built environment. As an urban module, it helps the city administration to plan and manage its infrastructure for future needs, same time allowing the control over qualitative living environment. In a contemporary scenario, the present practice model and housing type fail to do both. We have not been able to derive an appropriate type, to meet people's aspirations and maintain the environment, so lacks the sense of community, sense of belonging and cultural identity. Hence brief is carried out in such a way that a proper living environment is made for the people providing basic need in terms of personal as well as socio- cultural space in form of housing. The site has 10850 sqm of the area and has 252 dwelling units.

iii) Re-densification of government housing Naval Nagar,B/H R World, Sadar, Rajkot.
Students Name - Ronak Chavda, Kavta Padharia

In most cities of developing countries, old buildings always tend to undergo redevelopment. There are one or more than one reason for this. This activity of building redevelopment is much visible in Rajkot city for the past few years. Urban areas certainly transform themselves over time. Old buildings are required to be redeveloped once they surpass their useful life. There is appreciation in land and depreciation in the structure of the building. For this, reasons are many such as fear of collapse due to dilapidated conditions of buildings, uneconomic to repair or need of more area or amenities or funds. Due to quite a few gains, the community goes for the redevelopment of their buildings despite the risks and challenges involved. The government housing was designed and developed by the PWD department in the year of 1976. This housing was constructed to accommodate government employees of various sectors such as medical, police, state & district level administrative officers. The housing is located on Shroff road which is prominent

for government offices. The site has very low density built up and many houses are in decapitated condition.





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Category: Project Planning & Management and Software Solutions

52 Home Inspection Service

Scan QR Code for Technology Detail

Name of agency

M/s NS Property Guide Advisors Pvt Ltd (PropChk)

Alternate to

Third Party Quality Monitoring (Home Inspection) Agency

Brief

Prop Chk is a start-up in the home inspection with pan India operations. At present this is a Greenfield opportunity and the company wishes to capitalize on this opportunity by establishing as thought leaders in this space. The mission is to spread awareness amongst the masses about the importance of getting a home inspected before concluding a home purchase decision or even before moving into a new rental property.

Special Features

- A 3D Walkthrough of the property is given which pinpoints all the issues in a 3D environment for accurate understanding of the defects.
- A complete quality check of a property is done by a professionally trained Civil Engineer. Every element of a property is thoroughly inspected for minor to major defects.
- The material used in building the property is inspected and reported. All the brands of fit outs in the property are recorded in the home inspection report.
- Prop Chk inspectors use high tech equipment like thermal cameras, Ricoh Camera etc. The inspection is carried out using a custom-built mobile app. A digital twin of the property using 360° Camera is created which can accurately pinpoint all the defects in the property.
- A comprehensive report enlisting all the issues is submitted to the client with photographic evidence.
- Over 400 checkpoints are thoroughly inspected by PropChk inspectors
- The inspection covers digitally measuring the carpet area of the property. All the dimensions of the various elements like doors, windows, ceiling height etc are measured.
- This service helps home buyers in buying a defect free home. Helps builders get to deliver a defect free product to their customers thereby improving their credibility.

Major Projects

- Services available in Delhi, NCR, Mumbai, Pune, Bangalore, Hyderabad, Chennai, Kolkata,Vizag

Certification/Indian Standards/Endorsement

- No certification/endorsement reported by the company.

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Category: Project Planning & Management and Software Solutions

53 Complete Software Solution for Modular & Prefab Structure (Vertex BD & STRAP Software)

Scan QR Code for Technology Detail

Name of agency
M/s Ram Caddsys Pvt. Ltd.

Change for better
RAM CADDSYS

Alternate to
Conventional Design System

Brief

Vertex BD is the complete software solution from detailing to the manufacturing of cold-formed steel & wood/timber based structures. It is based on professional BIM Software that automates the design and manufacturing processes. The software automates generating accurate architectural drawings sets, panel fabrication drawings, structural layouts, cut lists, material reports, and manufacturing data, all from the BIM model. It is one of the leading players for modular and prefab structure Industry & compatible with most CNC machines in the market.

Special Features

i. Vertex BD cold-formed steel framing software can be used for prefab, modular, residential, and commercial construction, from modeling, designing & linking to CNC Macines.

ii. The design of hot-rolled, welded or cold-formed steel frames are according to code requirements.

iii. More Analytical and less Repetitive Work Flow

iv. Cost Efficient Productive Solution.

v. Automated Workflow to ensure Timely delivery

vi. Construction of error-free Projects.

vii. E-Course is available for the analysis and design of LGSF structures using STRAP by the Agency

Major Projects

The case studies related to success of LGSF technology adoption are listed on Vertex BD website at https://vertexcad.com/bd/case-studies/

Certification/Indian Standards/Endorsement

Cold Frame Structure design is covered in Indian Standard & International Codes as ASTM, BS etc.

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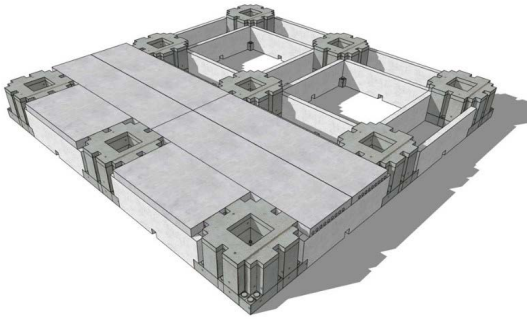
Category: Project Planning & Management and Software Solutions

54 DNA-D Construction Technology

Scan QR Code for Technology Detail

Adaptable Wall



Floatable Plinth

Name of agency

M/s Tri-OM Adaptive Solutions Pvt. Ltd.

Alternate to

Conventional Construction System

Brief

The Agency provides consultancy services in Planning, Design and Construction for Residential, Industrial and Commercial projects. The company is working on innovative design solutions to provide the best sustainable and affordable design solutions to the client. Currently it is experimenting with new technologies in real estate led by Artificial Intelligence (AI), to bring AI solutions in the field of real estate. The new technologies include;

DNA-D Frame Structure: It is a construction technique for making structural frame of the building. It is a hybrid construction technique where material strength dependency is replaced by the strength achieved though geometry design and pressurizes system.

Adaptable wall: Strong & insulated walling options.

Floatable Plinth: The design allows the plinth to be light weight and modular, which can float during flood situations.

Special Features

i. All the components of Framing, walling & plinth use prefabricated, modular components resulting in faster construction.

ii. All the components used for building are replaceable & reusable in design. Very little demolition work required during maintenance, renovation, re-planning, re-structuring or removing of a building.

iii. Components can be easily equipped with fireproof materials, acoustic materials, insulated materials or any new materials which could perform effectively under changing climate conditions or architectural requirements.

iv. The use of Pressurized System framing helps gravity load transfer & earthquake Absorptio

Major Projects

Yet to be launched in the Market. Filed for provisional patent in August 2022 in India

Certification/Indian Standards/Endorsement

Currently at Testing & Experimentation Stage at IIT, Roorkee

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