

निर्माण सामग्री एवं प्रौद्योगिकी संवर्द्धन परिषद्

आवासन और शहरी कार्य मंत्रालय, भारत सरकार

BUILDING MATERIALS & TECHNOLOGY PROMOTION COUNCIL

Ministry of Housing & Urban Affairs, Government of India

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From the Desk of the Executive Director



BMTPC has been constantly working towards bringing technology transition in the construction sector by transferring emerging construction systems in the field. These innovative systems are set to replace conventional cast-in-situ RCC framed & load bearing masonry construction. Over the years, it has been recognized that conventional systems are not sustainable being not only based on natural resources, emitting GHGs, energy intensive but also time consuming, waste generating & labour intensive.

The developers & private players have already been using innovative formwork systems & host of off-site building elements such as walls, slabs, floors, pod elements etc. However, the major momentum to the technology was given when Ministry of Housing & Urban Affairs, Govt. of India organized GHTC-India & shortlisted 54 emerging systems from world over. These systems bring in resource efficiency in terms of natural resources & human resource; help in fast track the construction with low life cycle cost, less wastages & superior structural & function performance.

To showcase efficacy & adapt these systems for future construction, several novel initiatives have been taken by Govt. of India e.g. construction of LHPs & DHPs, building capacities of professionals through enrolment as Technograhis & e-courses, webinars, site visits.

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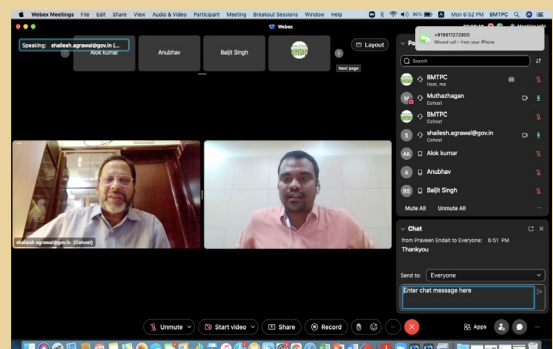
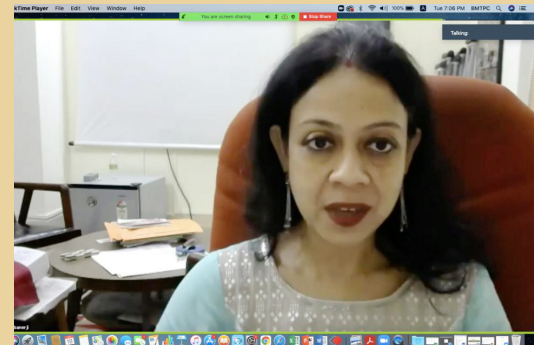
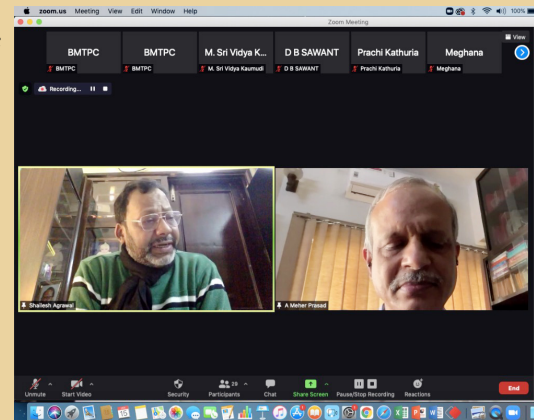
Shailesh
(Dr. Shailesh Kr. Agrawal)

NAVARITI : Certificate Course on Innovative Construction Technologies - 8th and 9th Batch

The Ministry of Housing & Urban Affairs in collaboration with BMTPC and School of Planning & Architecture (SPA), New Delhi initiated a Certificate Course on emerging housing technologies namely NAVARITI (New, Affordable, Validated, Research Innovation Technologies for Indian Housing), in order to build capacities amongst building professionals about the new and emerging building materials and technologies for construction industry. The Course was launched by Hon'ble Prime Minister on 1.1.2021.

The major objectives of the Certificate Course are to (a) Familiarise the professionals with the latest materials and technologies being used worldwide for housing, (b) Provide an awareness of the state of art of materials and technologies in terms of properties, specifications, performance, design and construction methodologies so that professionals can successfully employ these in their day to day practice and (c) Provide exposure to executed projects where such materials and technologies have been implemented.

The eighth batch of NAVARITI was conducted successfully from January 14 to 21, 2022 and ninth batch was conducted from March 25 to April 1, 2022 wherein engineers, architects and other stakeholders participated. So far more than 850 participants have attended the NAVARITI Course. The tenth batch of the NAVARITI Course has also been announced for which online classes will start from May 27, 2022 onwards. It is first of its kind course and the curriculum covers alternate & innovative materials and construction technologies. The resource persons are experts from IITs, Research Institutions and Industry.



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Emerging Technologies for Building Construction

Volumetric (3D) Concrete Printing Technology (VCPT)

(Certified under BMTPC Performance Appraisal Certification Scheme (PACS), PAC No. : 1059-S/2022)

3D Printing, also known as additive manufacturing, is an automated process that produces complex shaped geometries from a 3D Model (Computer-aided design (CAD) model) on a layer-by-layer basis. It is used in various manufacturing industries such as automobile, aerospace, medical etc. 3D Concrete printing technology (3DCP) constructs concrete structures 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 eliminating the need for formwork to construct walls. It is either executed on the site (Like cast In-situ) or Offsite in a centralised set-up (Like precast). In offsite 3DCP, the units or components are printed in the factory and then transported to the assembly site. In onsite 3DCP, the units are constructed at the site directly.

Special features of the system include;

- Eliminates the use of formwork
- Automated construction ensures excellent build quality and safety
- Rapid construction with significant improvement in productivity
- Cost optimisation possibilities that are constrained in conventional formwork & execution methods
- Innovative design possibilities to elevate aesthetics and convenience to end users
- Optimum usage of skilled workmen
- Highly digitised 3DCP workflow offers good predictability of the execution results
- 3D printers are lightweight systems that can be easily shifted, erected, and commissioned at job sites

Uses of the System

VCPT is a digitised version for replacing conventional concreting process at locations having facilities for mechanization and automation. The end product from this process is similar to regular concrete products and can be used with appropriate engineering at all suitable locations requiring concrete construction.

Special Aspects of Use /Limitations

- Basic performance and analysis behaviour shall be similar to regular concrete buildings.
- Skilled manpower with appropriate engineering and implementation techniques is required.
- Climatic conditions as required for regular concrete production will suffice. Efficiency and quality of product is further enhanced if factory like controlled environment is provided.

Maintenance aspects Maintenance is required for;

- External surface having primer with external grade paint finish
- Internal surfaces having primer with Internal grade paint finish

- Wet areas having suitable water proofing with protective plastering
- Maintenance frequency shall be as similar to regular conventional buildings and will be as per usage.

Specifications of Raw materials

3D concrete mix design requires paradoxical combination of concrete ingredients to achieve successful printing. An appropriate proportion of aggregate, cement, mineral admixtures and reinforcing fibres enables a wider particle size distribution, making it possible for the fresh mixture to achieve good mix.

The material must maintain its shape and sustain subsequent layers after extrusion. Due to difference between conventional construction methods and 3D-printing process, it is important to consider both fresh and hardened properties of materials.

Manufacturing Machinery

It primarily comprises of the following subsystems,

- Batching Plant
- Pumping system
- Positioning system (Typically, a part of 3D Concrete Printer)
- Extrusion system (Typically, a part of 3D Concrete Printer)

Printing Process

There are 4 stages of printing to finish a floor.

- Printing with start rebars in place (Max possible height of 400mm)
- Continuous normal printing for a height of 2850mm
- Printing of Lintel level layers as an exception that spans from 2100 mm to 2200 mm.
- Printing of the top layer from 2850 mm to 3000mm



3D Printed House at Kanchipuram by L & T



Light House Project (LHP) at Indore, Madhya Pradesh



Project Brief:	
Location of Project	Kanadia Ext., Sanyogitaganj Mandal, Indore, Madhya Pradesh
No. of DUs	1,024 (S + 8)
Plot area	34,276 sq.mt.
Carpet area of DU	29.92 sq.mt.
Technology being used	Prefabricated Sandwich Panel System with pre-engineered steel structural system
Other provisions	Community Centre/Hall
Foundation	RCC isolated column footing
Structural Frame	Pre-engineered steel structural frame
Walling	Prefabricated EPS Cement Panel
Floor Slabs/Roofing	Cast in-situ deck slab with concrete screed
Door/Window Frame/ Shutters	<ul style="list-style-type: none"> • Pressed steel door frame with flush shutters, • PVC door frame with PVC Shutters in toilets, • uPVC window frame with glazed panel and wire mesh shutters.
Flooring	<ul style="list-style-type: none"> • Vitrified tile flooring in Rooms & Kitchen, • Anti-skid ceramic tiles in bath & WC, • Kota stone Flooring in Common area, • Kota stone on Stair-case steps.
Wall Finishes	<ul style="list-style-type: none"> • Weather Proof Acrylic Emulsion paint on external walls, • Oil Bound distemper over POP on internal walls

Demonstration Housing Project (DHP) at Panchkula, Haryana



Project Brief	
Location of Project	Panchkula, Haryana
No. of DUs	40 (G + 3)
Plot Area for DHP	1412.36 Sq.mts.
Carpet area of a unit	21.86 Sq.mts.
Total Covered Area	2015.95 Sq.mts.
Technology being used	Light Gauge Steel Framed Structures (LGSF) with Cement Fibre board on both side of walls and infill of rock wool
Other provisions	Guest Room Medical Room, Care Taker Room, Daycare Centre, Common Room/ Dining Room and Laundry.
Foundation	Isolated RCC column footing with Plinth beam
Walling	Light Gauge Steel Framework System (LGSFS) with Cement Fiber board on both side of walls and infill of rock wool.
Floor Slabs/Roofing	Light Gauge Steel roof truss with MS deck sheeting resting on web joist and concrete screed with false ceiling of gypsum board.
Door/Window Frame/Shutters	<ul style="list-style-type: none"> • Pressed steel door frame with flush shutters, • PVC door frame with PVC Shutters in toilets, • uPVC window frame with glazed panel and wire mesh shutters.
Flooring	<ul style="list-style-type: none"> • Vitrified tile flooring in Rooms & Kitchen, • Anti-skid ceramic tiles in bath & WC, • Anti skid tiles Flooring in Common area, • Granite stone on Staircase steps.
Wall Finishes	<ul style="list-style-type: none"> • Weather Proof Acrylic Emulsion paint on external walls, • Oil Bound distemper over POP on internal walls

The LHPs and DHPs are being taken up across the country to showcase & spread know-how on emerging construction systems under PMAY(U).



18th Meeting of Technical Assessment Committee (TAC) of PACS

The 18th meeting of Technical Assessment Committee (TAC) for the consideration of new applications & review of overall status under PACS was held on March 11, 2022 at BMTPC Conference Hall, New Delhi. The Performance Appraisal Certificates (PAC) for four new systems/ products namely; (i) Volumetric (3D) Concrete Printing Technology (VCPT), (ii) PUF Sandwich Panel with Pre Engineered Building Structure, (iii) Everest Rapicon Panel / Solid Wall Panel, & (iv) Wood Polymer Composite (WPC) Door Shutter and Frame, were approved by the Committee after due discussion & incorporation of comments by the members. The Committee also took note of Renewal of Performance Appraisal Certificates, & new applications received by BMTPC under PAC since the last (17th) meeting of TAC.

Senior Officials/ Experts from various Organizations including Bureau of Indian Standards (BIS), Delhi Development Authority (DDA), HUDCO, Builders Association of India (BAI), L&T & Adlakha Associates participated in the meeting as TAC members. Executive Director, BMTPC & Chairman TAC also shared with the members that PAC Certified technologies are playing important role in Ministry of Housing & Urban Affairs, Govt initiative of mainstreaming new & sustainable technologies in the Construction sector, and thanked members for their continued support.



Webinar on e-Learning & webcasting of Light House Project at Rajkot, Gujarat

The Ministry of Housing & Urban Affairs (MoHUA) in collaboration with BMTPC and GIZ is hosting series of 'e-Learning sessions and webcasting of LHP construction process' webinar to widespread the knowledge about the technologies, construction processes, sustainability, and mass-cum- fast construction to Technograhis. As of now, over 35,000 stakeholders have enrolled as Technograhis and are learning the use of such technologies to promote their replication in Indian context.

The main purpose of e-Learning sessions and webinars is to create awareness of the different technologies used in the construction of LHPs through technical session and webcasting of work at site. The virtual on-site tour to LHP site is also being organised to educate the Technograhis on various stages of construction, new techniques, and key features.

The first webinar in the series was organised on March 11, 2022 at Rajkot, Gujarat and second webinar was organised on March 24, 2022 at Indore, Madhya Pradesh under the chairmanship of Shri Kuldeep Narayan, JS&MD (HFA), MoHUA. The technical session, explaining in detail about the innovative construction technologies, details and specifications of LHPs at Rajkot and Indore, use of technologies was shared by BMTPC. A virtual tour of LHP Rajkot site was also undertaken.



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