



# RACHNA 2.0

RESILIENT, AFFORDABLE AND COMFORTABLE HOUSING THROUGH NATIONAL ACTION

## VOCATIONAL TRAINING

*Training C at Akola – 17, 18 Dec'2022*

## PRE-FABRICATED EPS SANDWICH PANEL SYSTEM

### Climate Smart Buildings (CSB)

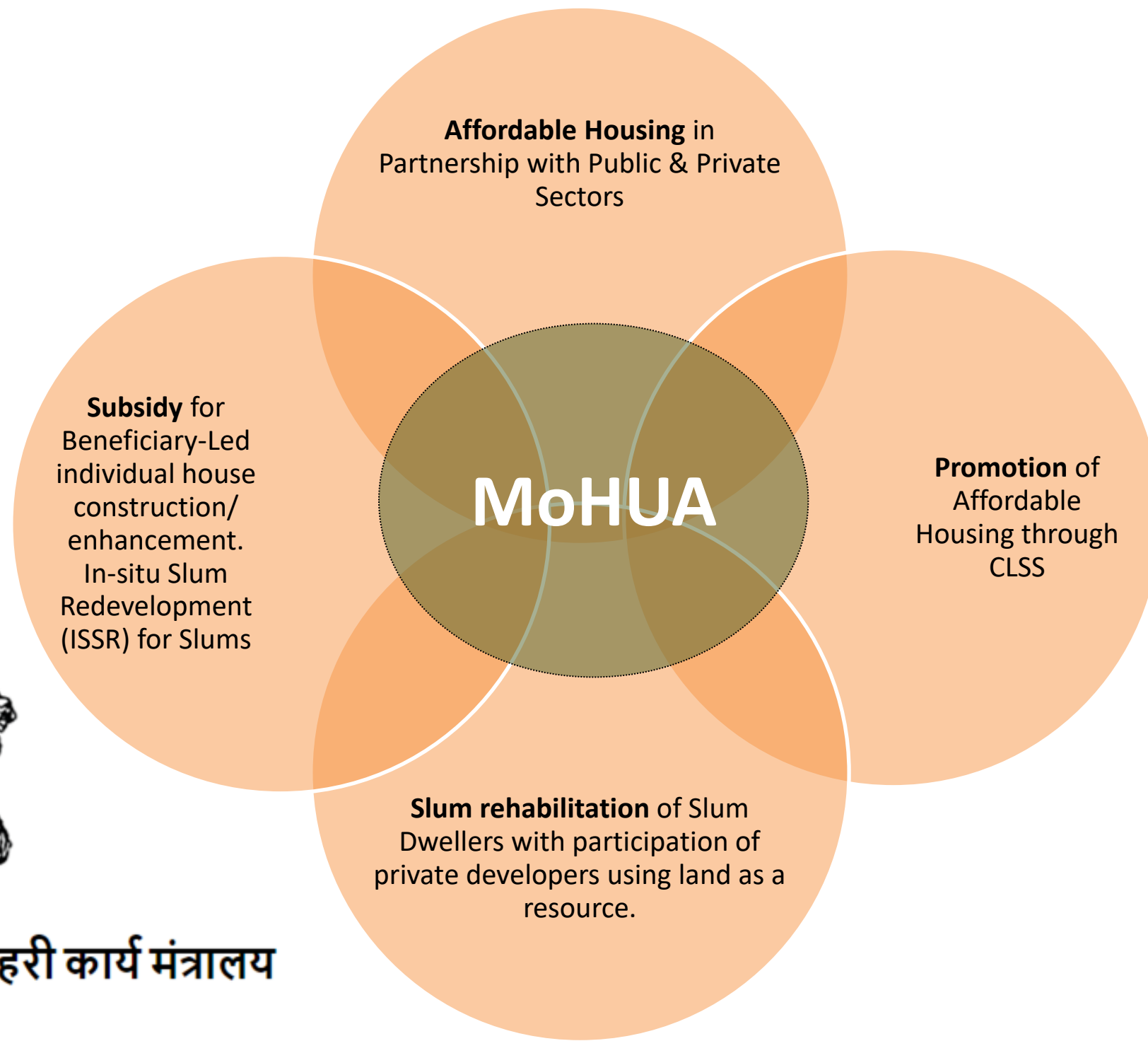
Cluster cell Indore, Madhya Pradesh under Global Housing Technology Challenge - India (GHTC-India)

# INTRODUCTION - MoHUA

## ***‘Housing for All’ by 2022.***

Under the Mission, Ministry of Housing and Urban Affairs (MoHUA), provides Central Assistance to implementing agencies through States and Union Territories for providing houses to all eligible families/beneficiaries by 2022.

Addressing the affordable housing requirement in urban areas through:

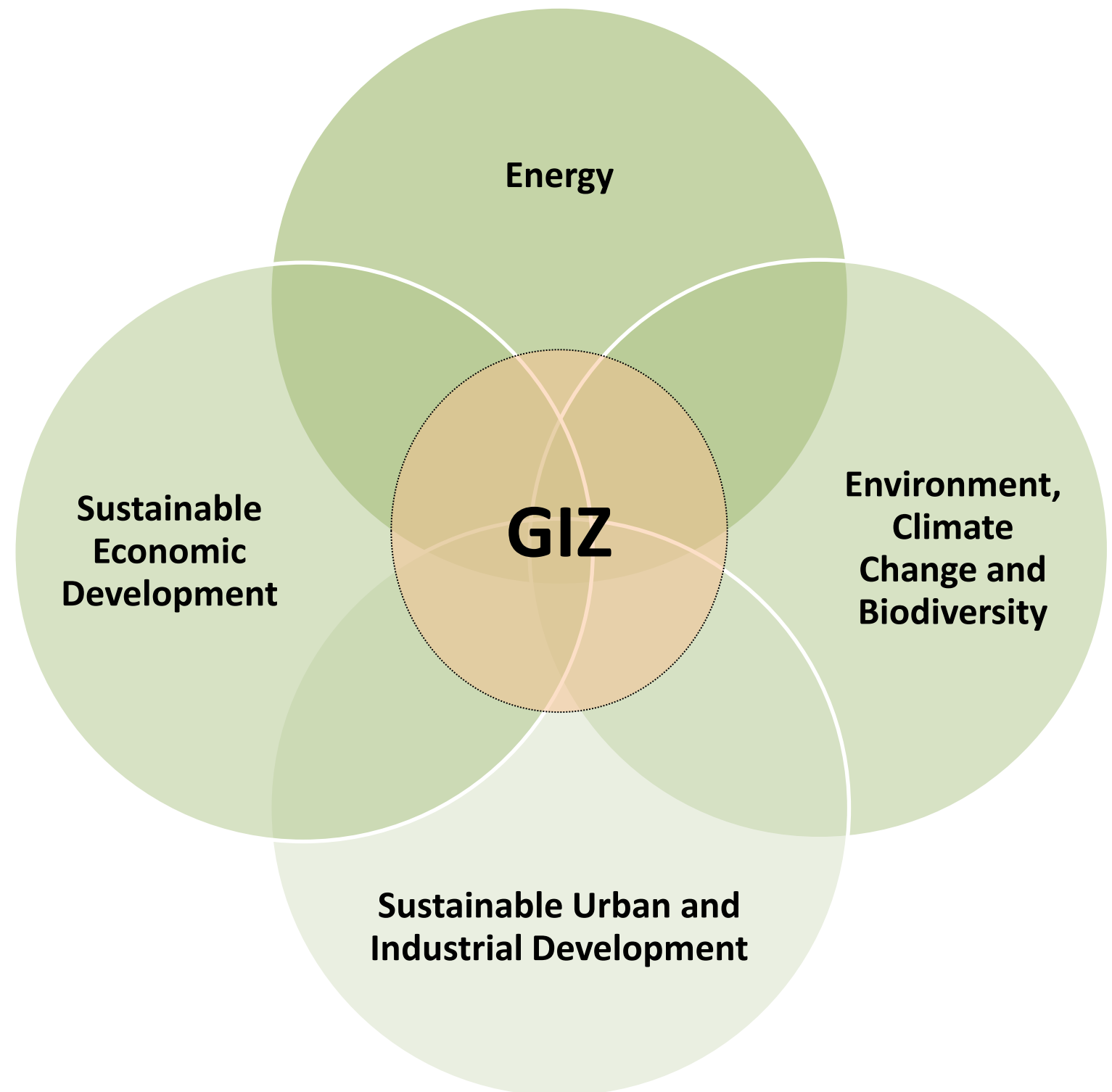


भारत सरकार

आवासन और शहरी कार्य मंत्रालय

# INTRODUCTION - GIZ

- GIZ is an international cooperation enterprise for sustainable development which operates worldwide, on a public benefit basis.
- GIZ is fully owned by the German Federal Government, GIZ implement development programs in partner country on behalf of the German Government in achieving its development policy objectives.
- For over **60 years**, the GIZ has been working jointly with partners in India for **sustainable economic, ecological, and social development**.

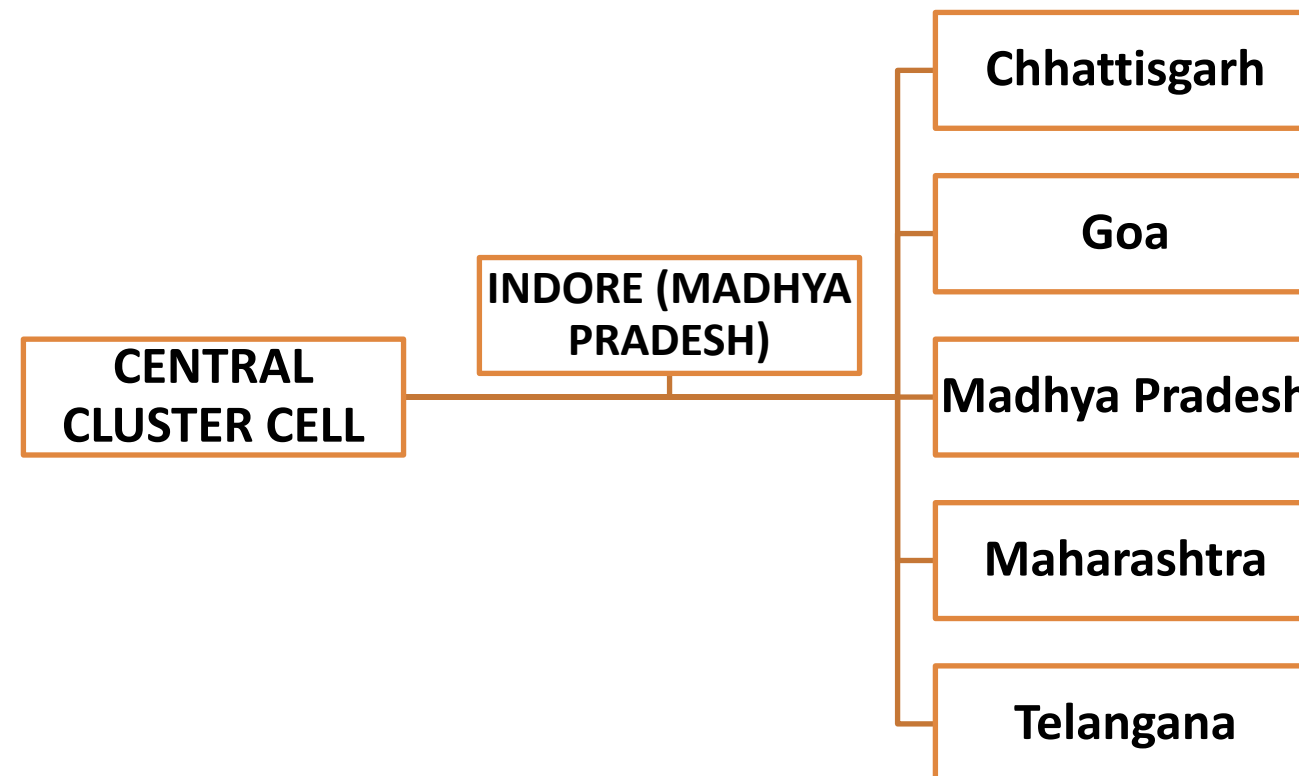


# TASKS PLANNED WITH MoHUA

## CLIMATE SMART BUILDING

- Technical assistance in developing thermal comfort action plan for climate resilience building for mass scale application in selected states for Affordable Housing
- Technical support in implementation of Global Housing Technology Challenge-India (GHTC-India)

*States and UT's under central cluster cell established at Indore*



# AIM & CONCEPT



## 7 AFFORDABLE AND CLEAN ENERGY

Ensure access to affordable, reliable, sustainable, and modern energy for all

## 9.INDUSTRY, INNOVATION AND INFRASTRUCTURE

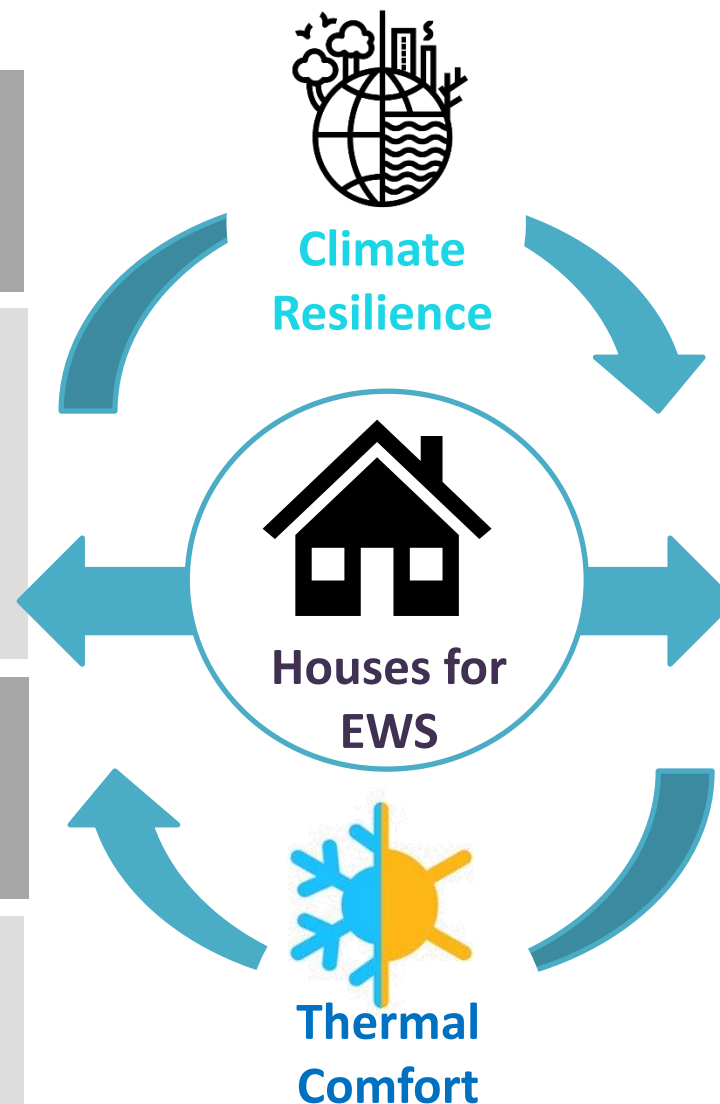
Build resilient infrastructure, promote inclusive and sustainable industrialization, and foster innovation

## 11.SUSTAINABLE CITIES AND COMMUNITIES

Make cities and human settlements inclusive, safe, resilient, and sustainable

## 13. PROTECT THE PLANET

Take urgent action to combat climate change and its impacts



DESIGN

CONSTRUCTION

POST  
OCCUPANCY  
(O & M)

INTEGRATION IN BY-LAWS



# AIM & CONCEPT

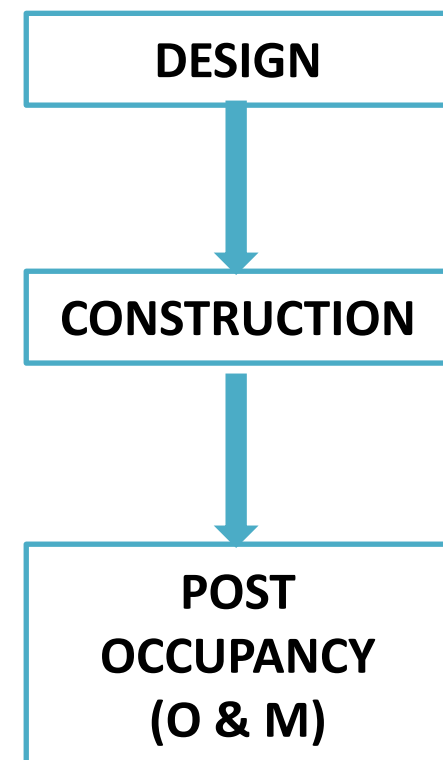
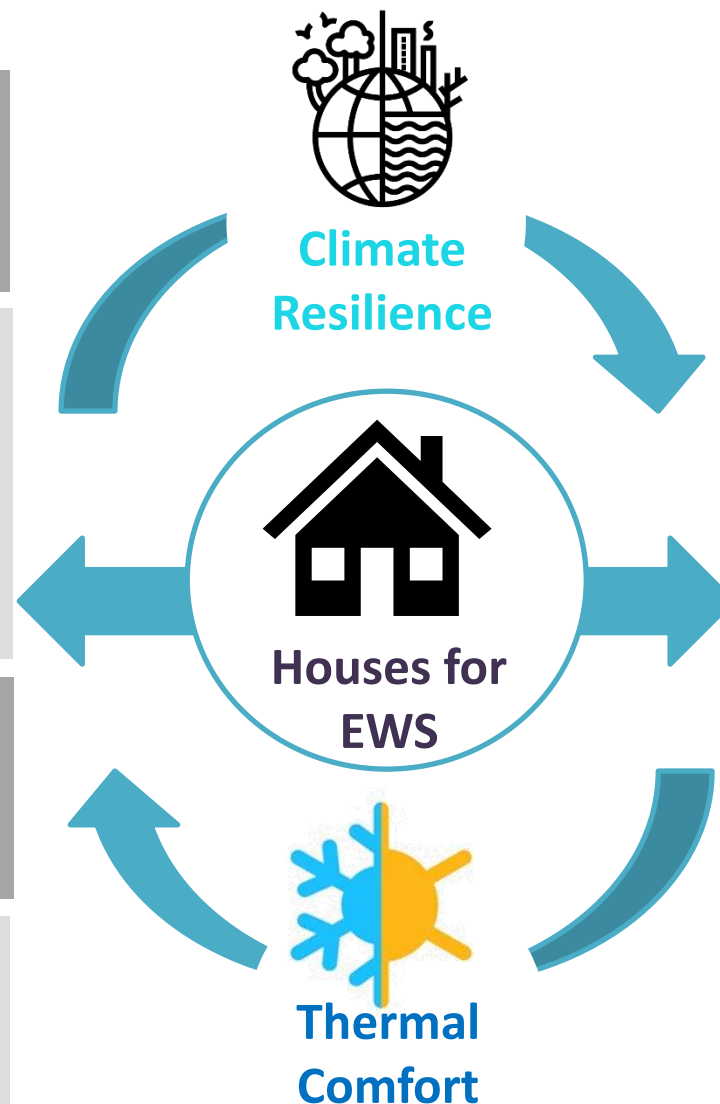


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**INTEGRATION IN BY-LAWS**

# LHP INTRODUCTION

## 6 LHP ACROSS INDIA



*Map showing six different LHP Locations*

LHPs shall serve as **LIVE Laboratories** for different aspects of **Transfer of technologies**

# 6 LHPs

## 1.Indore,Madhya Pradesh

- Prefabricated Sandwich Panel System

## 2.Rajkot,Gujarat

- Monolithic Concrete Construction using Tunnel Formwork

## 3.Chennai,Tamil Nadu

- Precast Concrete Construction System – Precast Components Assembled at Site

## 4.Ranchi,Jharkhand

- Precast Concrete Construction System – 3D Volumetric

## 5.Agartala,Tripura

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

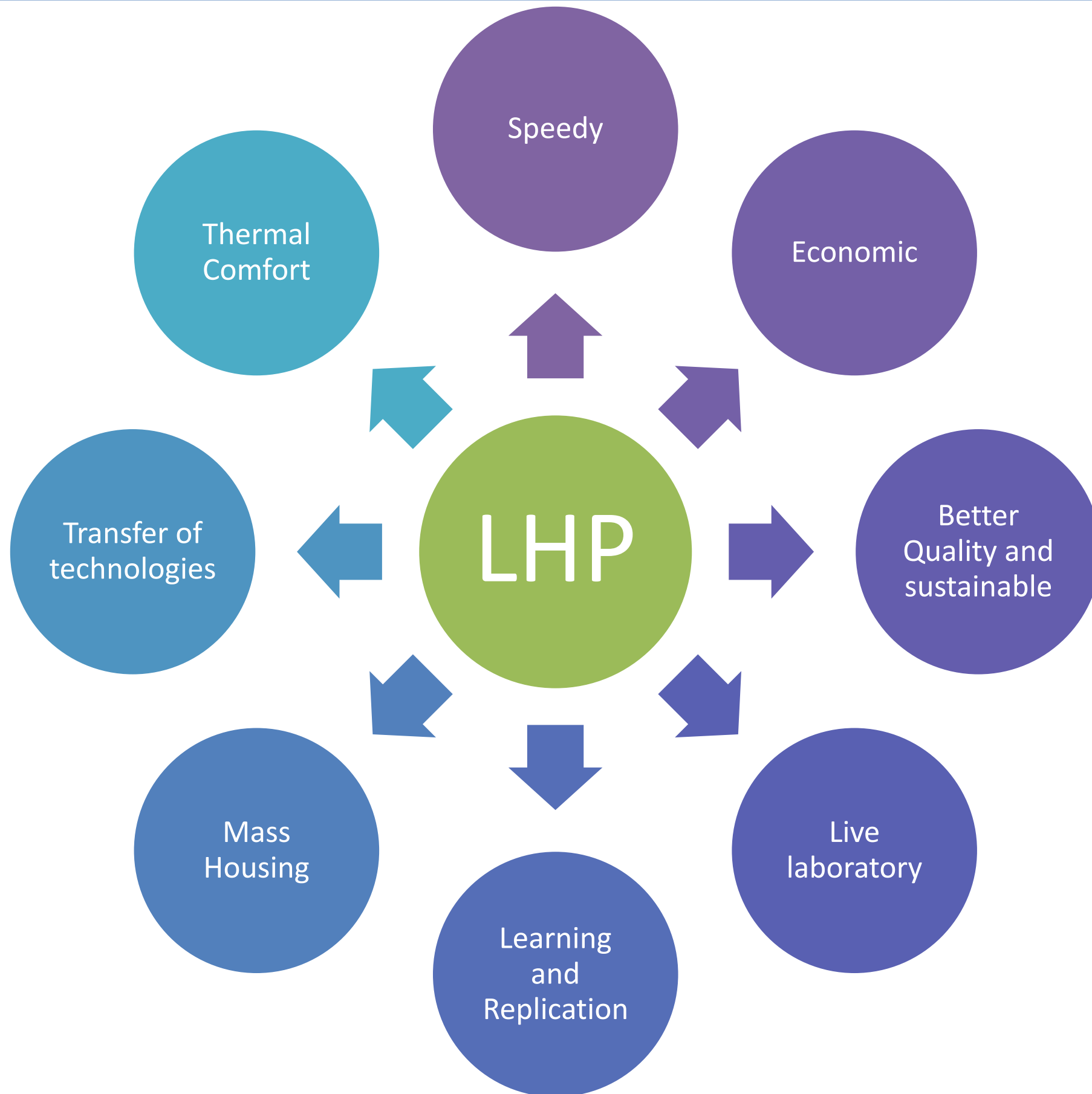
## 6.Lucknow,Uttar Pradesh

- PVC Stay In Place Formwork System



# 6 LHPs Explained Via Video

# 6 LHPs – FOCUSES ON



# LHP INDORE



Description	Unit	Length	Width	Area
Living Room	Sqmt	3.12	3.08	9.61
Bed Room	Sqmt	3.12	2.99	9.33
Kitchen	Sqmt	2.1	1.81	3.80
Toilet	Sqmt	2.1	1.2	2.52
Balcony	Sqmt	2.07	1.06	2.19
Circulation Area	Sqmt	2.19	0.9	1.97
Thresold Area	Sqmt			0.50
Total Carpet Area	Sqmt			29.92





# LHP INDORE



## Project Details

*Land Area – 41920 sqm*  
*Net Plot Area – 34276 sqm*  
*No's of Dwelling Unit – 1024*  
*No's of Tower – 08*  
*No's of Floor – SF + 08*  
*No's of DU / Tower – 128*  
*Community Hall – 169.5 sqm*

## Key Highlights

*Technology – Pre-Fabricated Sandwich Panel & PEB Structure*  
*Project Start Date – 01-01-2021*  
*Amenities –*  
Rain Water Harvesting, Rooftop Solar Power System  
Fire Equipment (s), Elevator / Lift  
Emergency Power Back-up, Sewage Treatment Plant  
Central Waste Collection Plant



# LHP INDORE - TECHNOLOGY

*Structural System – Pre Engineering Building **Slab**- Deck Sheet Slab*  
*Walling System - Pre fabricated sandwich panel system*



PEB STRUCTURE



DECK SHEET SLAB



PREFABRICATED SANDWICH PANEL WALLING



# SITE PREPARATIONS



SITE EXCAVATION



LABOUR HUTMENT



SITE OFFICE, STORE AND FRONT SIDE BARRICADING

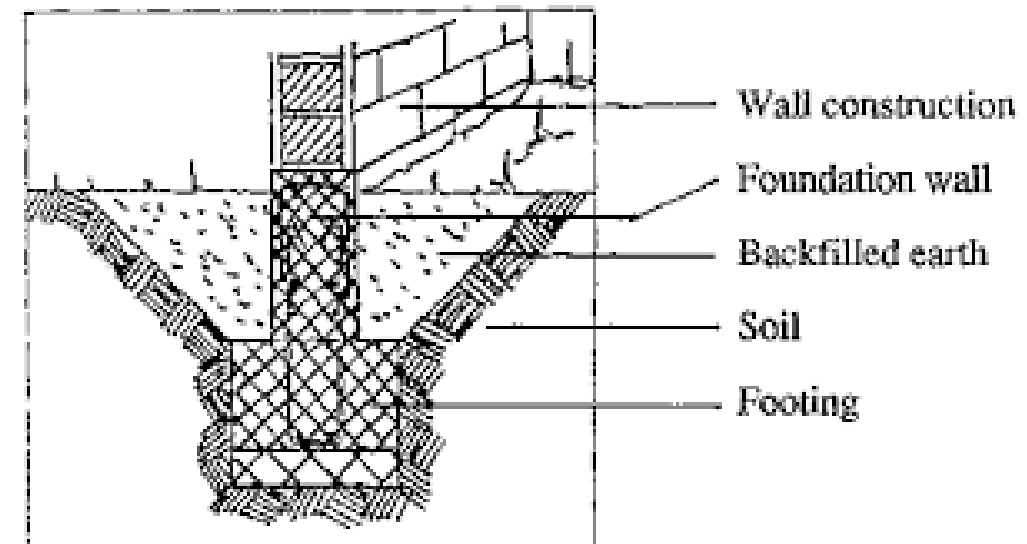


LABOUR HUTMENT



# FOOTING MARKING

## FOOTING MARKING



Footing section with soil layering

PCC FOR FOOTING



# FOOTING DESIGN & SECTION

Footing calculations is done as per live load , dead load and wind load

## Types Of Footing In The Project

- Straight isolated footing
- Combined footing
- Inclined isolated footing
- Raft footing





# PLINTH



RCC COLUMN UP TO PLINTH LEVEL



PLINTH BEAM



# PEB ERRECTION

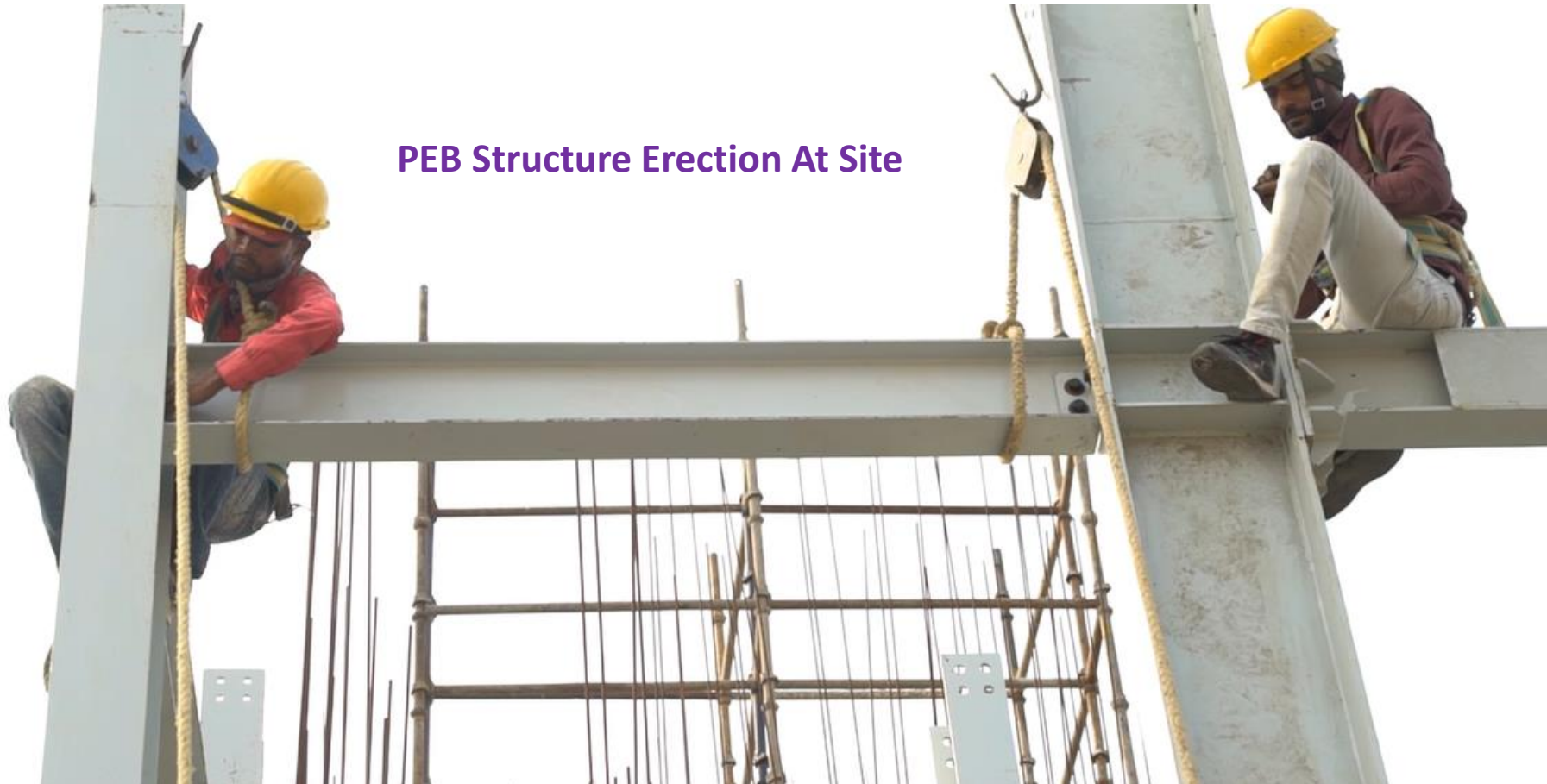
PEB Material Stacking At Site



PEB Material Lifting At Floors Via Crane



PEB Structure Erection At Site





# PEB ERRECTION Explained Via Video





# LHP INDORE - TECHNOLOGY

## PEB STRUCTURE

- With **Pre-engineered steel building** systems, multi-stories can now be scripted in the shortest “set-up” time
- Speed in Construction



*Lifting*

*Floor Structure*



*Bolting*





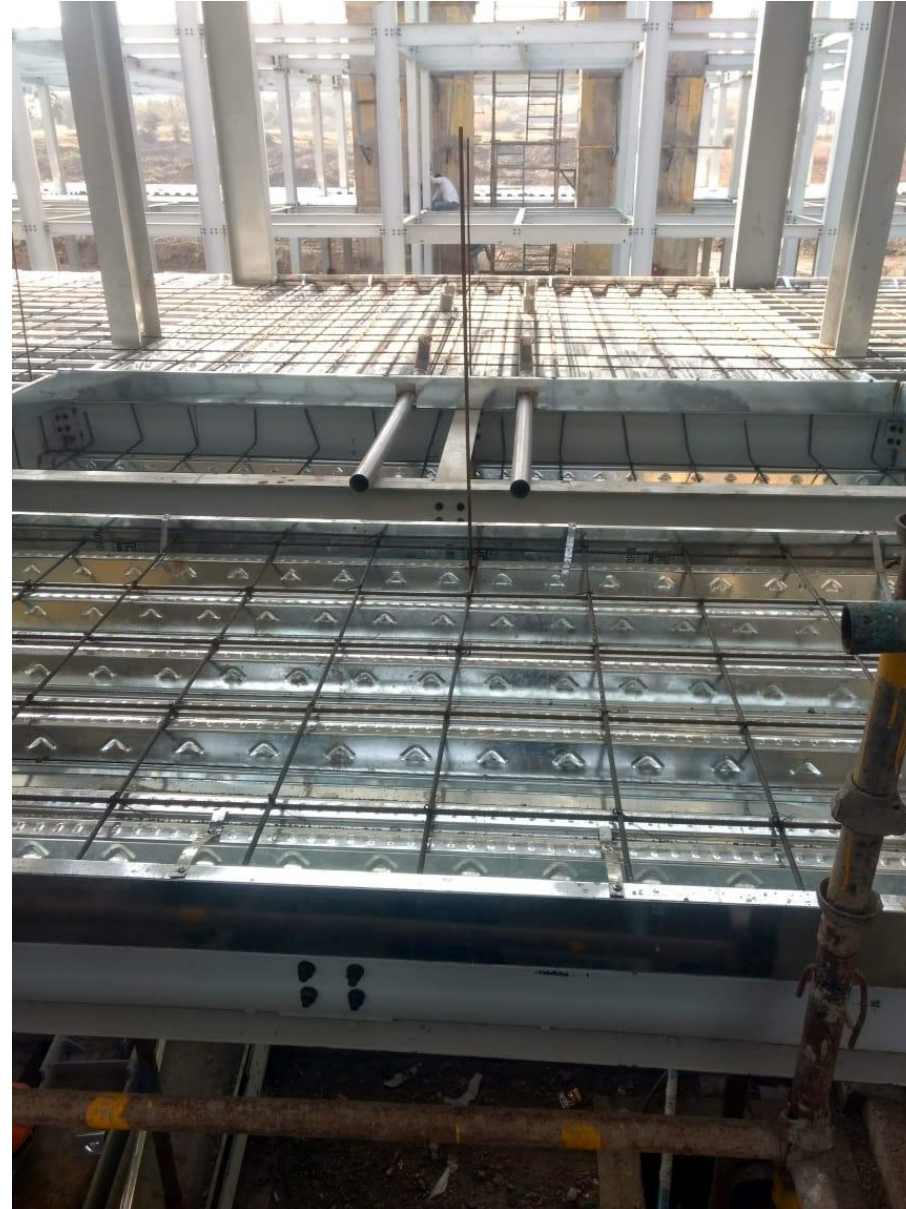
# LHP INDORE - TECHNOLOGY

## DECK SLAB

Deck Sheet Laying



Services & Reinforcement Laying



Concreting





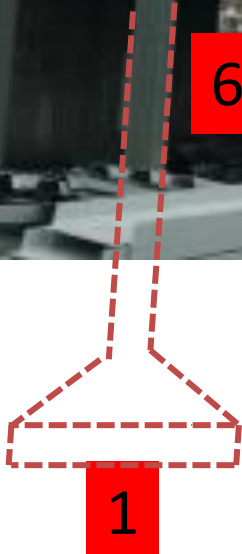
# CONSTRUCTION METHODOLOGY



**1. Substructure**  
RCC Isolated column footing

**2. Structural System**  
Pre Engineered structure consists of factory manufactured steel column and beam erected on site.

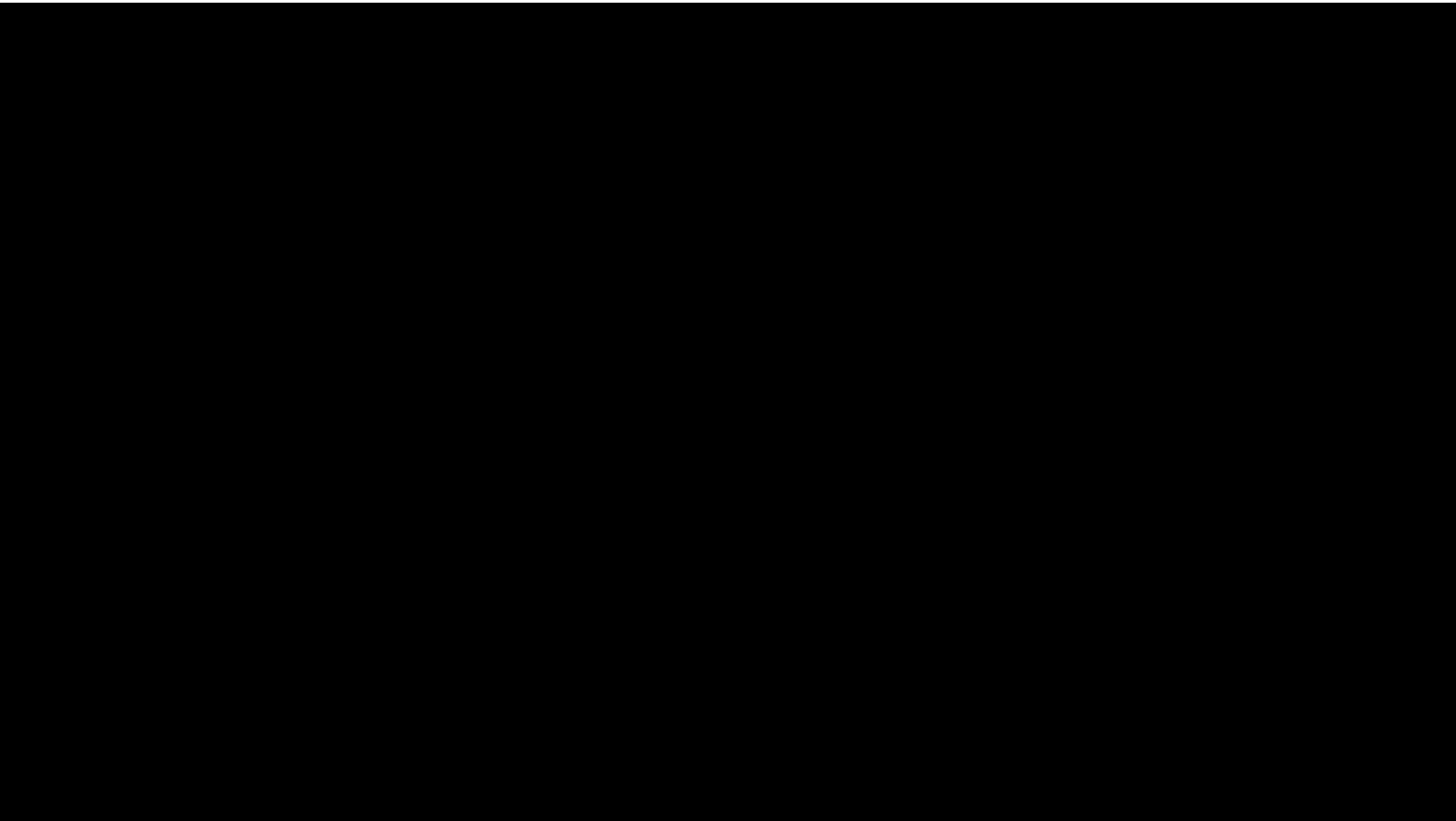
**3. Slab –**  
Deck sheet is placed on structure. over it, slab casting is done



**4. Walling System**  
Factory made Prefabricated sandwich panels are being used for wall preparation

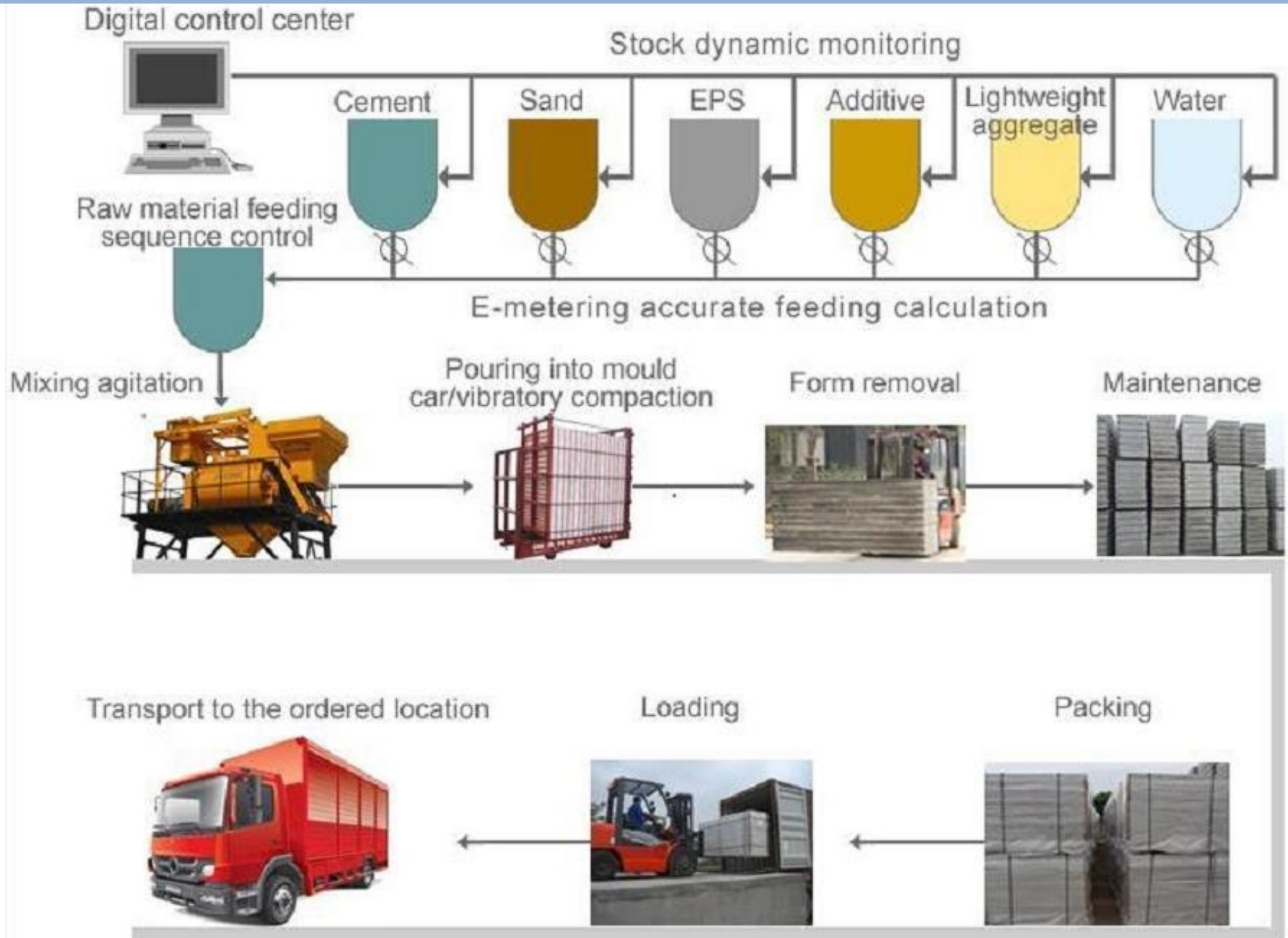
**5. Lift Wall –**  
RCC structure is being prepared for lift walls. Onsite RMC plant for RCC material preparation

**6. Staircase –**  
Fabricated MS sections are being welded at site for staircase frame preparation

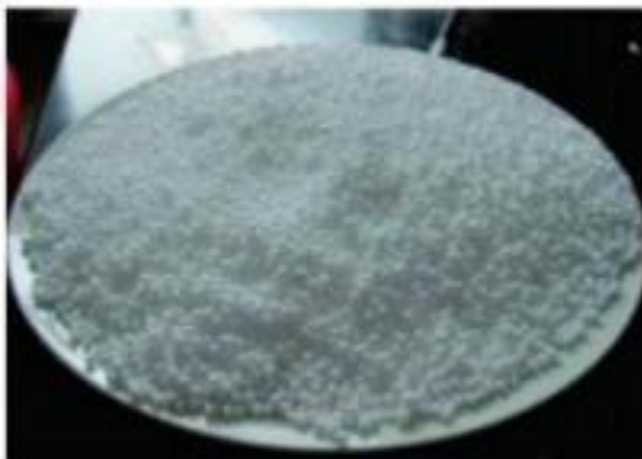




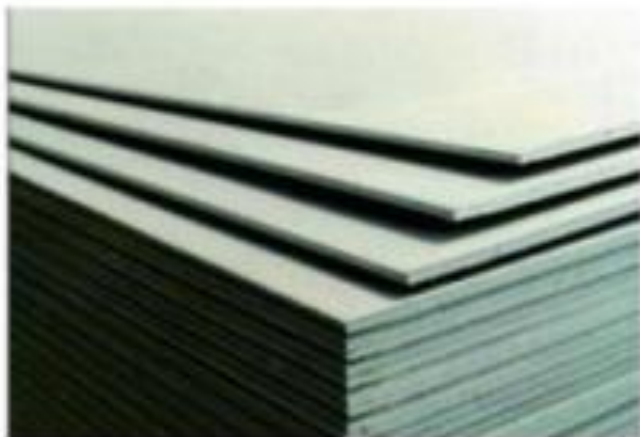
# EPS SANDWICH PANEL MANUFACTURING PROCESS



# EPS SANDWICH PANEL RAW MATERIALS



EPS



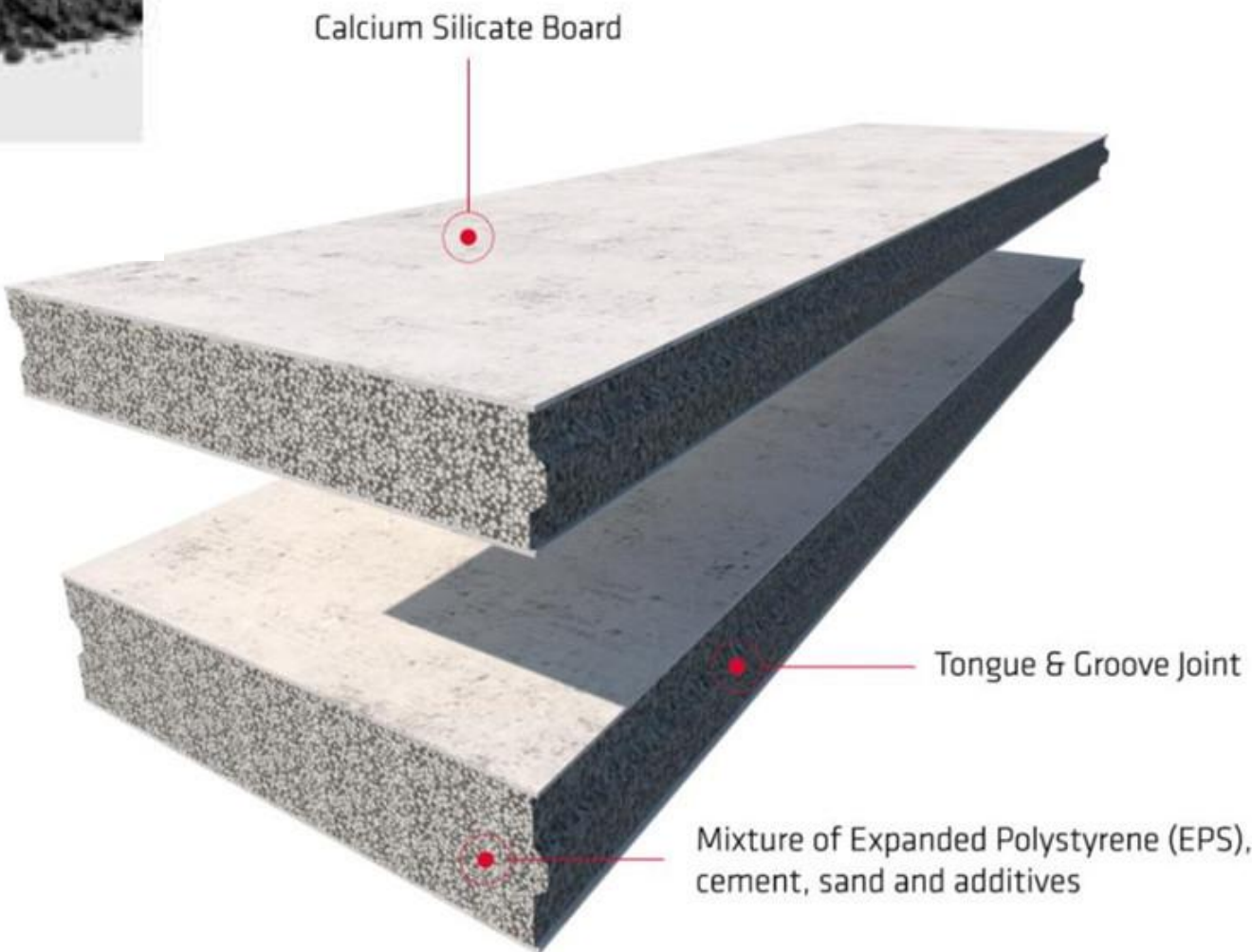
Calcium silicate board



Cement










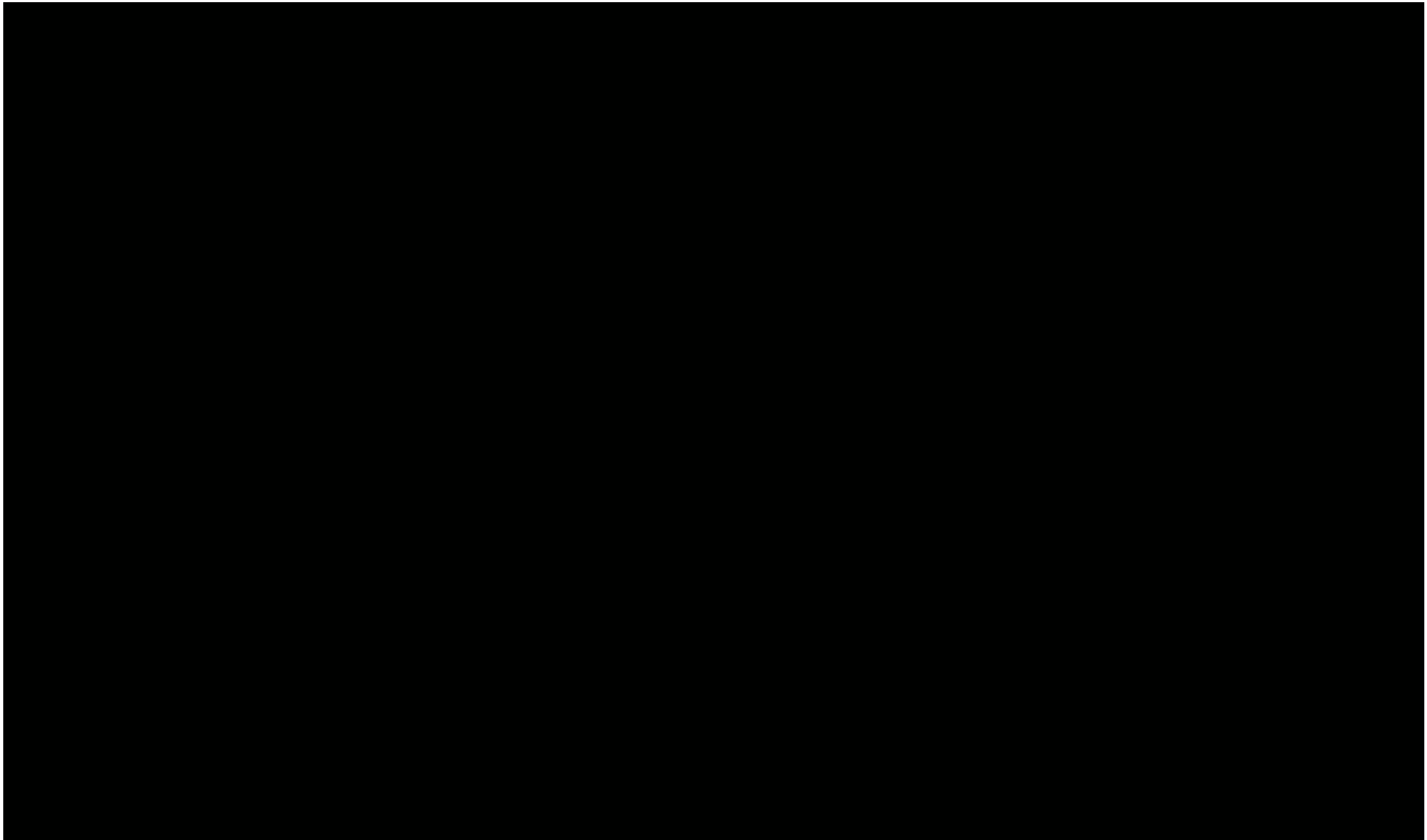
Fly ash





# EPS SANDWICH PANEL- FIXING TOOLS

No.	Name	Picture	Function	Picture
1	Cement adhesive		Special cement adhesive for EPS cement sandwich panel connection	
2	Triangle wood		Support, ensure the panel be stucked firmly	
3	Steel bar		Reinforce the connection of the EPS cement sandwich panels	
4	PU foam		Filling the gaps between panel and structure, door, window.	
Decoration remark: if you choose painting for the decoration, you need to put fiber mesh cloth on the wall or fiber mesh tape at the joint before painting, if you decorate the wall by wallpaper, wall tile or other covered materials, no need for the following materials, can put the wallpaper, wall tile on the wall directly.				
5	Fiber mesh cloth		For whole wall anti-crack	
6	Fiber mesh tape		Between panels connection for anti-crack	
7	Anti-crack mortar		Stick (cover) the fiber mesh cloth/fiber mesh tape on the panel	





# EPS PANEL PERFORMANCE APPRAISAL CERTIFICATE

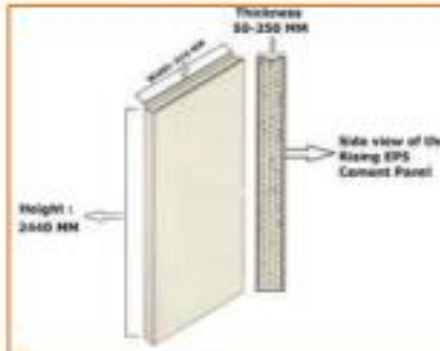


## Rising EPS (Beads) Cement Panels

User should check the validity of the Certificate by contacting Member Secretary, BMBA at BMTPC or the Holder of this Certificate.

Name and Address of Certificate Holder:  
**M/s Rising Japan Infra Pvt. Ltd.,**  
I-203, Som Vihar, R K Puram  
New Delhi -- 110022  
Tel: 08826195032  
E-mail: [rpg@rijapaninfra.com](mailto:rpg@rijapaninfra.com)

Performance Appraisal  
Certificate No.  
PAC No.: 1032-S/2017  
Issue No. 01  
Date of Issue: 04.07.2017



**Building Materials & Technology Promotion Council**  
Ministry of Housing & Urban Poverty Alleviation  
Government of India  
Core 5A, First Floor, India Habitat Centre,  
Lodhi Road, New Delhi – 110 003

Tel: +91-11-2463 8096, 2463 8097; Fax: +91-11-2464 2849  
E-mail: [bmtpc@del2.vsnl.net.in](mailto:bmtpc@del2.vsnl.net.in) Web Site: <http://www.bmtpc.org>

## Rising EPS Cement Panels



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Phone: +91-751-2409300 Fax: +91-751-2664684 Email: [infomitsgw@gmail.com](mailto:infomitsgw@gmail.com) website: [www.mitsgw.ac.in](http://www.mitsgw.ac.in)

Ref: Civil/AT/Material Testing / 886

Date: 04/04/17

To  
The Director  
Rising Japan Infra Private Limited  
I-203, Som Vihar, R K Puram  
New Delhi-110022

Subject: Testing of Rising EPS Cement Sandwich Panels of 90mm Thickness samples  
Ref: Your letter No. NIL dated 28.02.2017

Dear Sir,

Please find herewith a consolidated test report of 90mm thickness Rising EPS Cement sandwich panels samples sent by you vide above mentioned reference and subject: This table of results is a summary of the detailed individual tests conducted on the panel samples as per listed tests.

### Report of the results of the Tests

Sl No.	Test conducted	Standards Applied	Lab Results	Remarks
1.	Density & Flammability of EPS	ASTM 7309-07	780 kgs/ M <sup>3</sup> (Flammability)	Qualified
2.	Axial compression	EN520:2004+ A1:2009	4.27 MPa	Qualified
3.	Resistance to continuous heating	ASTM F 1939	80°C	Qualified
4.	Flexural Strength	ASTM 293	1.53 MPa	Qualified
5.	Acoustic Performance	IS 9901-1981	40 dB	Qualified
6.	Thermal conductivity	IS 3346 1980	0.22 W/ mk	Qualified
7.	Thermal Resistance	IS 3346 1980	0.42 mk/W	Qualified
8.	Water penetration	EN1609	No dampness or leakage	Pass
9.	Fire rating of the panels	BS 478 part 20/ 22	Grade -1 / 3 Hrs.	Pass
10.	Resistance to structural damage from a large light body	BS5234: Part2: 1992, Annex E	No collapse or dislocation	Pass
11.	Anti-bending damage load	BS 5234: Part 2	3 Times of its weight	Qualified
12.	Non-combustibility	GB8624-1994	A Level	Qualified
13.	Water tightness	ASTM C1185	No droplets observed behind panels after 24 Hrs. at 250mm Water head	Qualified
14.	Drying Shrinkage value	IS 2185 Part 1-0C	0.083 %	Pass
15.	Single point hanging strength	BS 5234: Part 2	1300 N	Pass

Remarks: "Qualified" with regards to relevant tests.

The above tests results are only for the information to the referred agency / client. The institute does not take any responsibility of these tests results for any other purpose, legal or otherwise.

Prof I/C Material Testing

*Signature*  
H.C.E.D

Forwarded by:

*Signature*  
DIRECTOR





# EPS SANDWICH PANEL- PANEL SIZES

EPS Cement Sandwich Panel			
Specification L*W*T (mm)	Weight (kg/m2)	Packing (pcs/m2 per 20' GP / 40' HQ)	Application
2270 / 2440 x 610 x 60	45-48	315pcs*436m2/ 384pcs*572m2	Interior wall/ Roof system
2270 / 2440 x 610 x 75	50-53 / 55-58	252pcs*349m2/ 312pcs*464m2	Interior wall
2270 / 2440 x 610 x 90	55-58 / 69-72	207pcs*287m2/ 251pcs*375m2	Interior/ Exterior wall
2270 / 2440 x 610 x 100	60-65 / 72-75	189pcs*262m2/ 240pcs*357m2	Interior/ Exterior wall
2270 / 2440 x 610 x 120	65-75 / 90-93	153pcs*212m2/ 192pcs*286m2	Exterior wall
2270 / 2440 x 610 x 150	80-90 / 111-114	126pcs*175m2/ 156pcs*232m2	Exterior wall

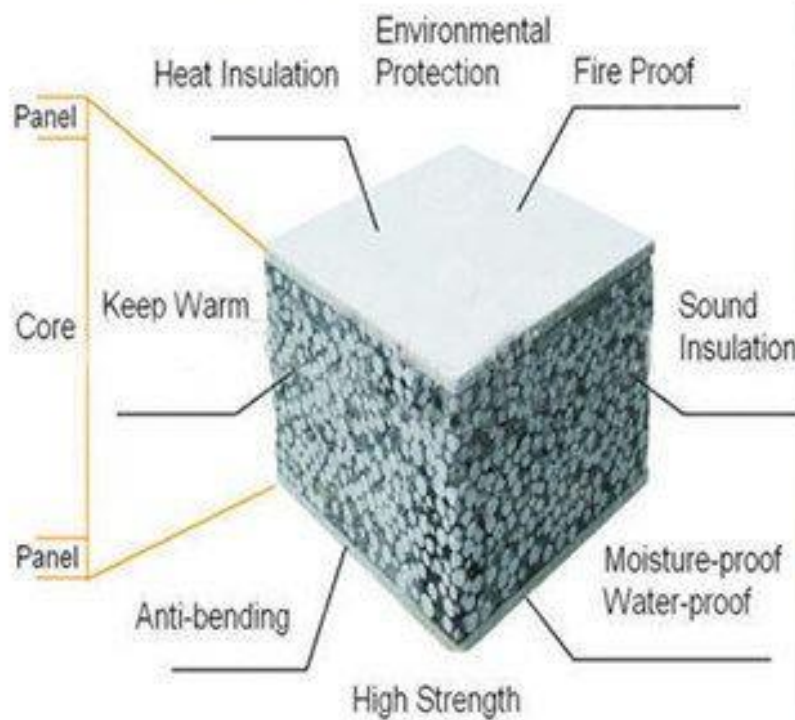
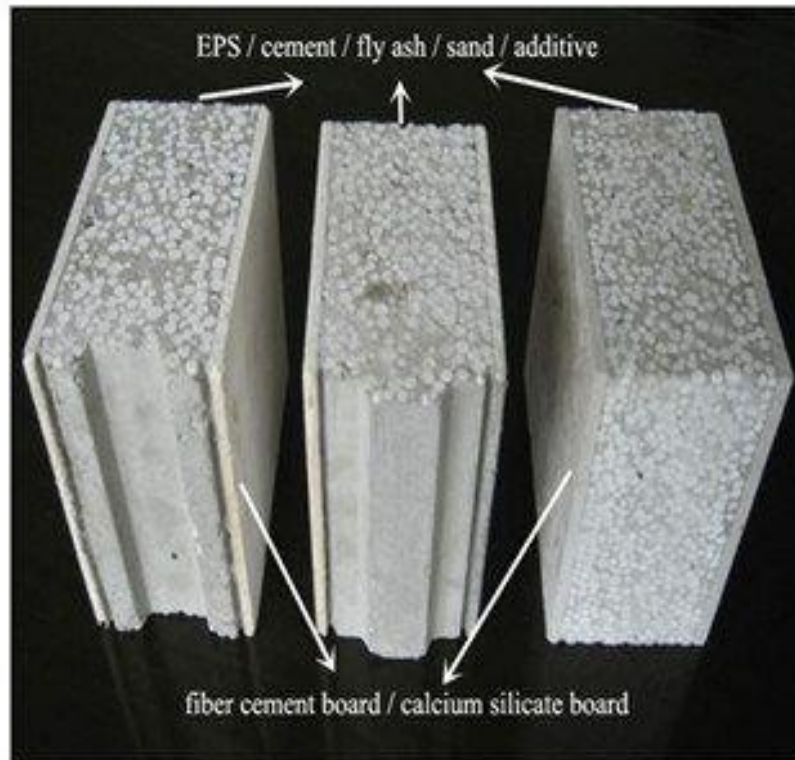
# PANEL TECHNICAL SPECIFICATION

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# EPS PANEL INSTALLATION Via Video



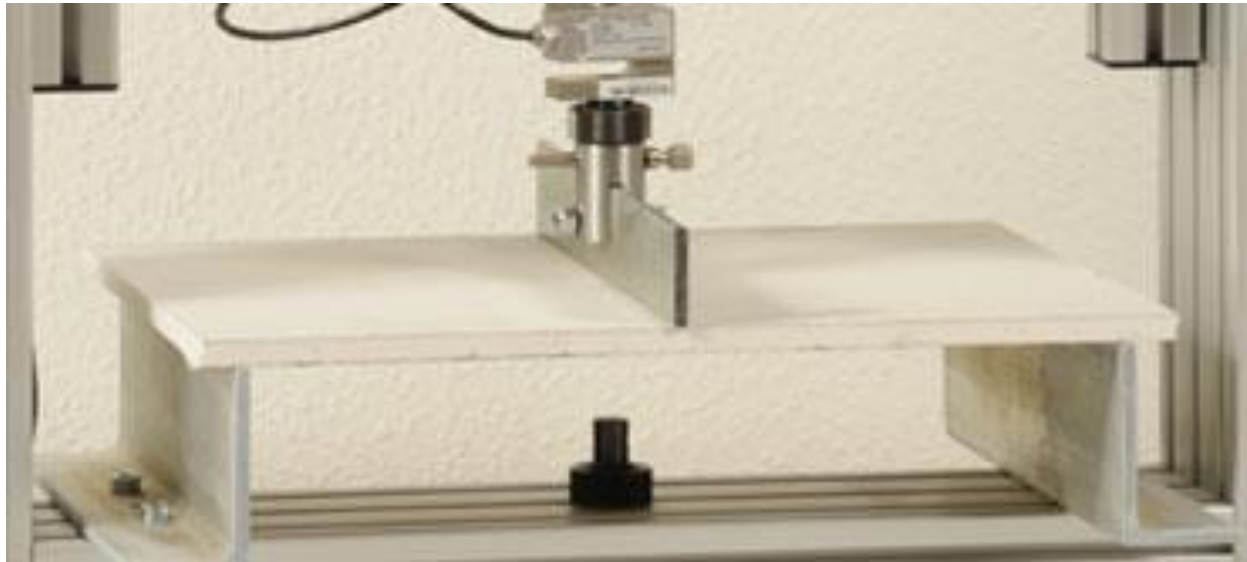
# LHP INDORE – TECHNOLOGY ADVANTAGES



- ✓ Speed in Construction
- ✓ No use of water in curing
- ✓ Panels bring resource efficiency, better thermal insulation, acoustics & energy efficiency



# LHP INDORE – TECHNOLOGY ADVANTAGES



**Strength Test**



**Fast and Easy Construction**



**Fire Resistance Test**

*Energy saving by  
thermal resistance*



*Recyclable*



*Eco friendly  
dry construction*

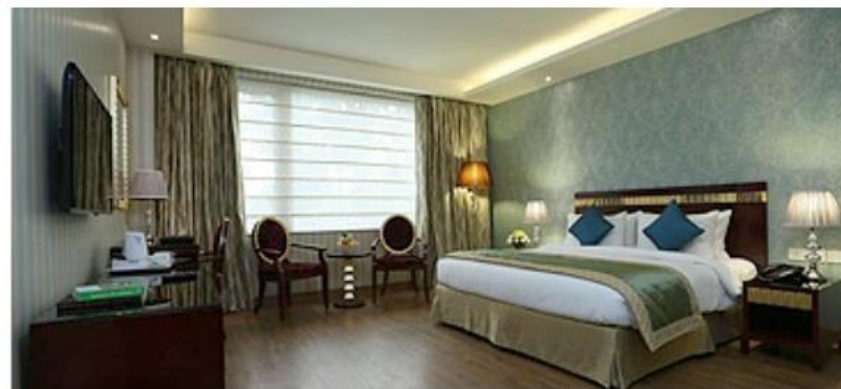


- ✓ Light weight and cost effective
- ✓ Easy and faster construction
- ✓ Fireproof
- ✓ Water proof and damp proof
- ✓ Non-toxic & environment-friendly
- ✓ Energy saving & environment-friendly
- ✓ Water saving due to dry construction
- ✓ Smooth and flat surface, thus no plastering needed
- ✓ High sound insulation
- ✓ Cost effective
- ✓ Ground staff optimization
- ✓ Increase in carpet area up to 15% which saves money





# CASE STUDY – India - Hotel Projects





# CASE STUDY – Iran - High Rise Construction





# CASE STUDY





# PRACTICAL CHALLENGES WITH SOLUTIONS

**Challenge:** raw material transportation

**Solution:** can be solved if having multiple projects

**Challenge:** panel cutting disposal

**Solution :** can be used in the sunk filling as this is light weight material

**Challenge:** panel lifting on floors

**Solution :** if the site scale is large , it can be done via crane

**Challenge:** Panel fixing with PEB structure

**Solution :** panel fixing can be done by welding steel bars and adding an adhesive (S- Bond) for further strengthening the joinery

**Challenge:** safety measures while dealing with wall preparation

**Solution :** while working on height, working staff should have proper safety measures (helmet, shoes, mask, safety glasses)



SHIRT SLEEVES



LONG PANTS



STEEL TOE BOOTS

**SAFETY  
GEAR**



HARD HAT



SAFETY GLASSES



HIGH VISIBILITY  
VEST



GLOVES

# PLANNING ASPECTS

WALL CONSTRUCTED  
BRICK BY BRICK / LAYER BY  
LAYER

- LABOUR INTENSIVE
- REQUIRE CURING



## DESIGN PROCESS SELECTION OF TECHNOLOGIES

**Sandwich  
Panel System  
Replaces  
Brick-mortar  
With Dry  
Wall**

FACTORY MADE EPS PANELS  
ARE PRE FINISHED

- REQUIRES NO CURING,
- NO PLASTERING



The cast-in-situ conventional construction systems need to be replaced by industrialized systems which

- ☐ Reduce the construction time
- ☐ Produce quality,
- ☐ Resilient and
- ☐ Sustainable structures.

**These panels are**

- ☐ Stronger,
- ☐ Durable with better quality control.
- ☐ Their functional performance in terms of acoustics, thermal, fire, rain water penetration, termite is much superior than cast-in-situ walls.
- ☐ These panels can be used as load bearing structural panels to build single to three storey houses or as non-load bearing infill walls to replace brick masonry walls between RCC frame.
- ☐ These panels can be cut to suitable sizes, made hollow so as to minimize wastages & accommodate services.



# COST COMPARISION

Considering 10 Sq. M. Wall										
S.no.	EPS WALL 120MM					BRICKWORK 230MM				
	Description	Area		Rate	Total	Description	Area		Rate	Total
1	EPS PANEL	10	Nos	1440	14400	Bricks	1065	Nos	7	7455
2	Tape	20	m	5	100	Mortar	0.46	Cu m	1850	851
2	Mortar	10	Kg	12	120	Plaster	20	sq m	530	10600
4	Labour	10	Sq M	190	1900	Labour	2.3	Cu m	700	1610
					16520					20516
				Per Sq M	1652				Per Sq M	2051.6
		Carpet Area - Increased by 1.1 SQ M								

Tentative Saving Analysis				
Particulars	Brick Work	EPS Work	Saves	% Saves
Material (EPS)	18133113	17033872.1	1099241	6%
Water	1947600	1175400	772200	40%
Resources	12646778	6546507.01	6100270	48%
			Values in INR	



**SHORT FILM ON LHP, INDORE**



time for a little  
*question & answer*  
session

Query Session

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

– नरेन्द्र मोदी

Thank you.