



# RACHNA

RESILIENT, AFFORDABLE AND COMFORTABLE HOUSING THROUGH NATIONAL ACTION

## VOCATIONAL TRAINING

*Training C at Bhopal – 23<sup>rd</sup> & 24<sup>th</sup> June 2022*

## PRE-FABRICATED EPS SANDWICH PANEL SYSTEM

### Climate Smart Buildings (CSB)

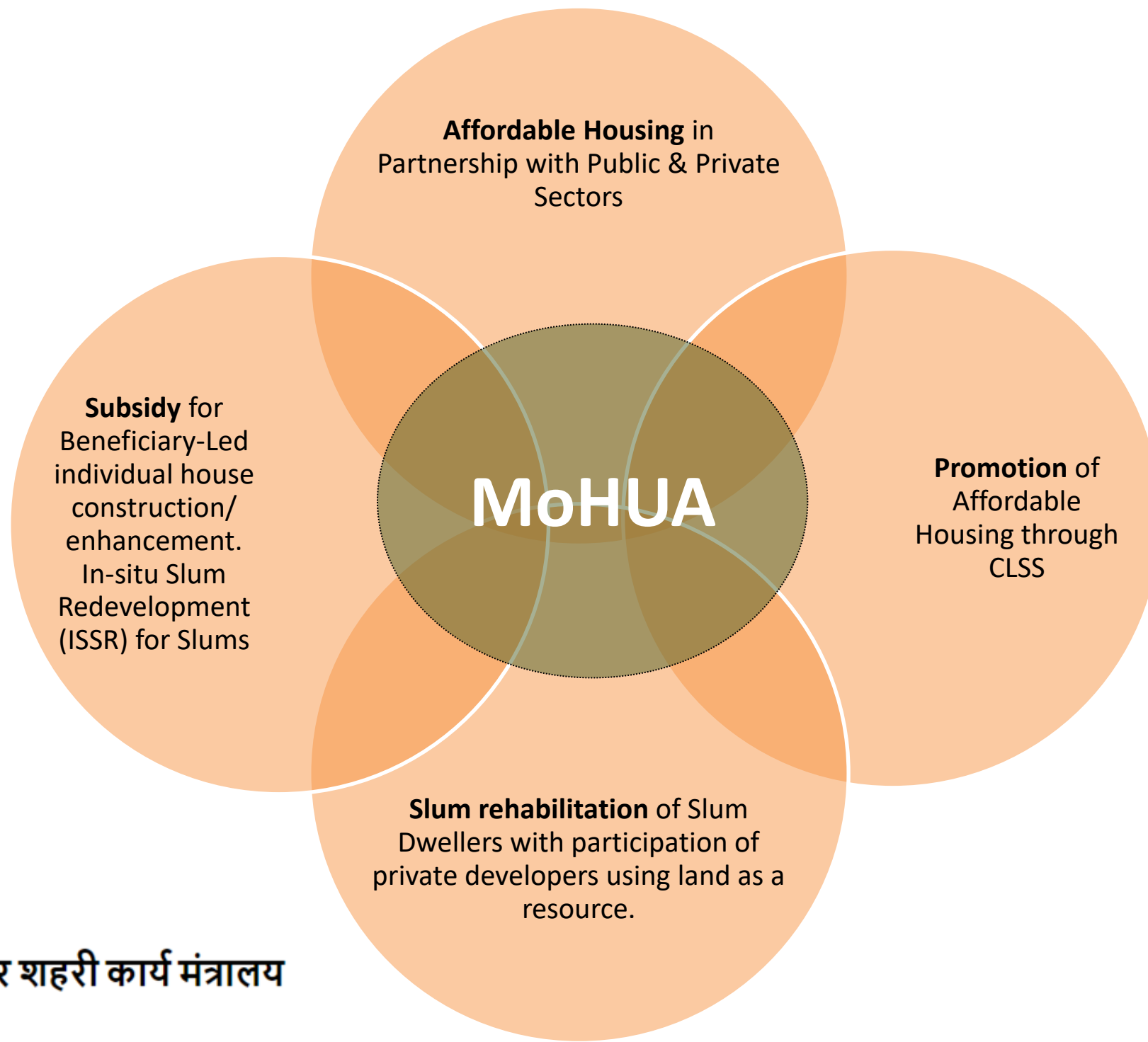
Cluster cell Indore, Madhya Pradesh under Global Housing Technology Challenge - India (GHTC-India)

# 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:



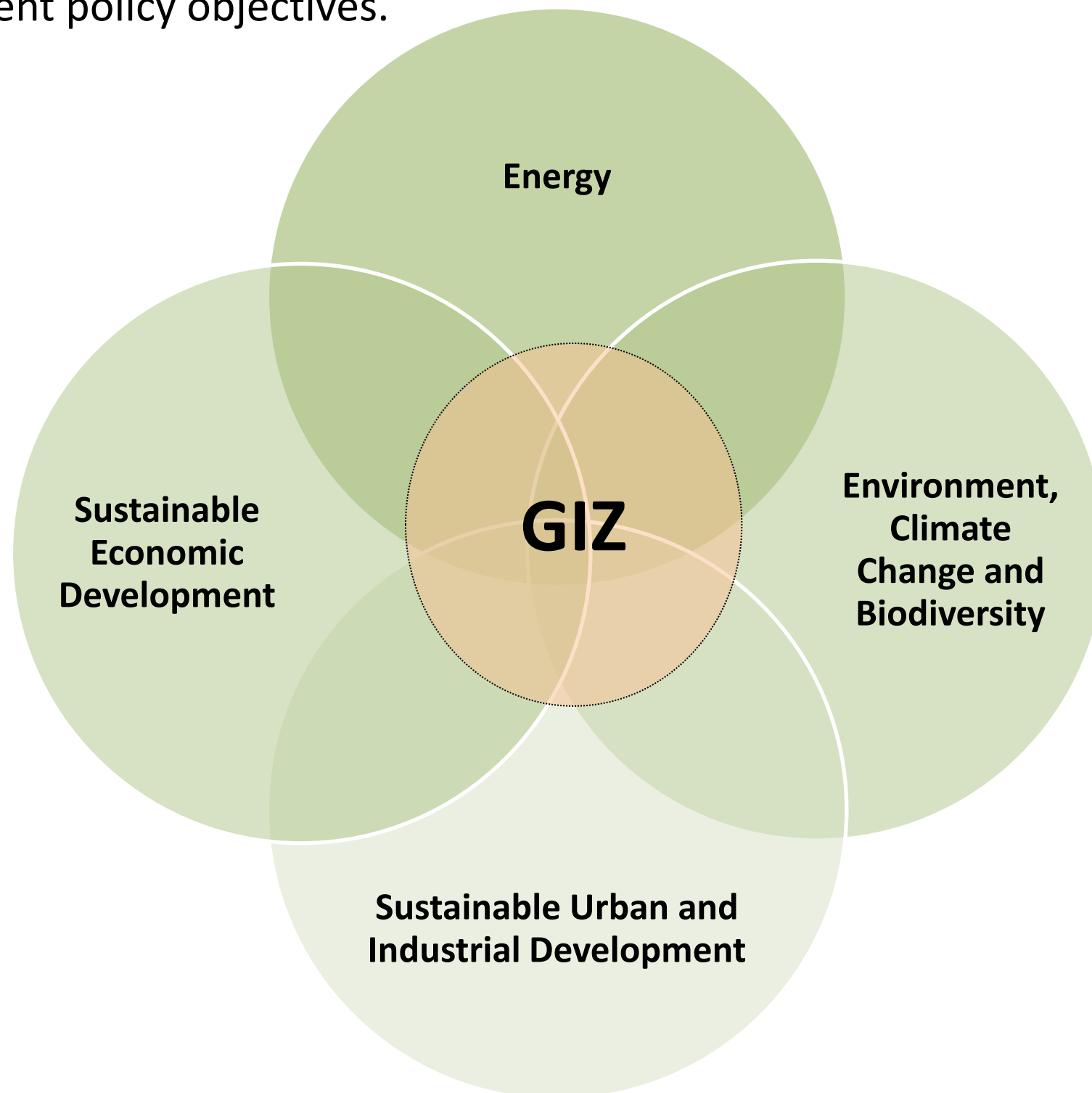
भारत सरकार

आवासन और शहरी कार्य मंत्रालय

सत्यमेव जयते

# 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.

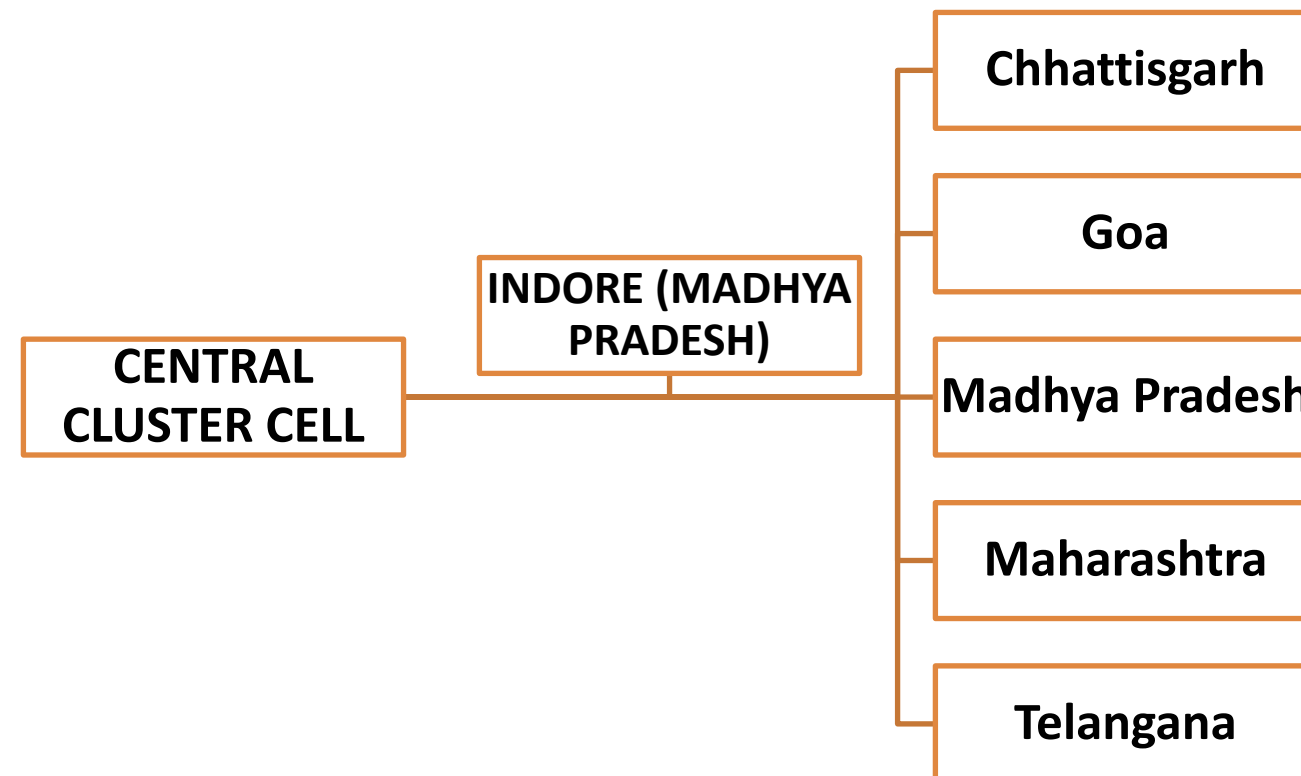


# TASKS PLANNED WITH MoHUA

## 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

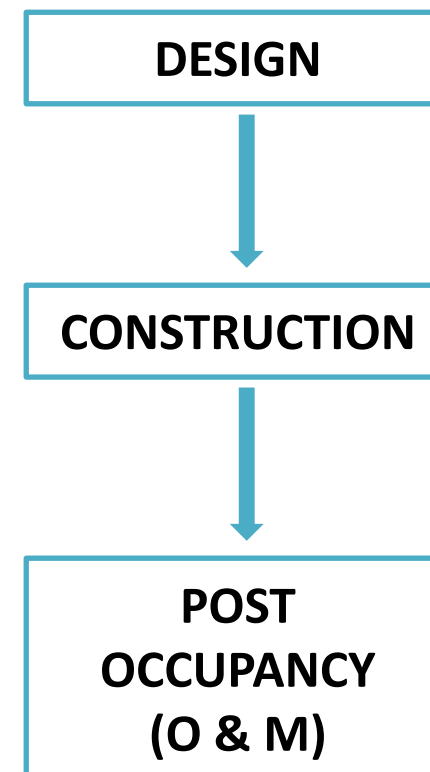
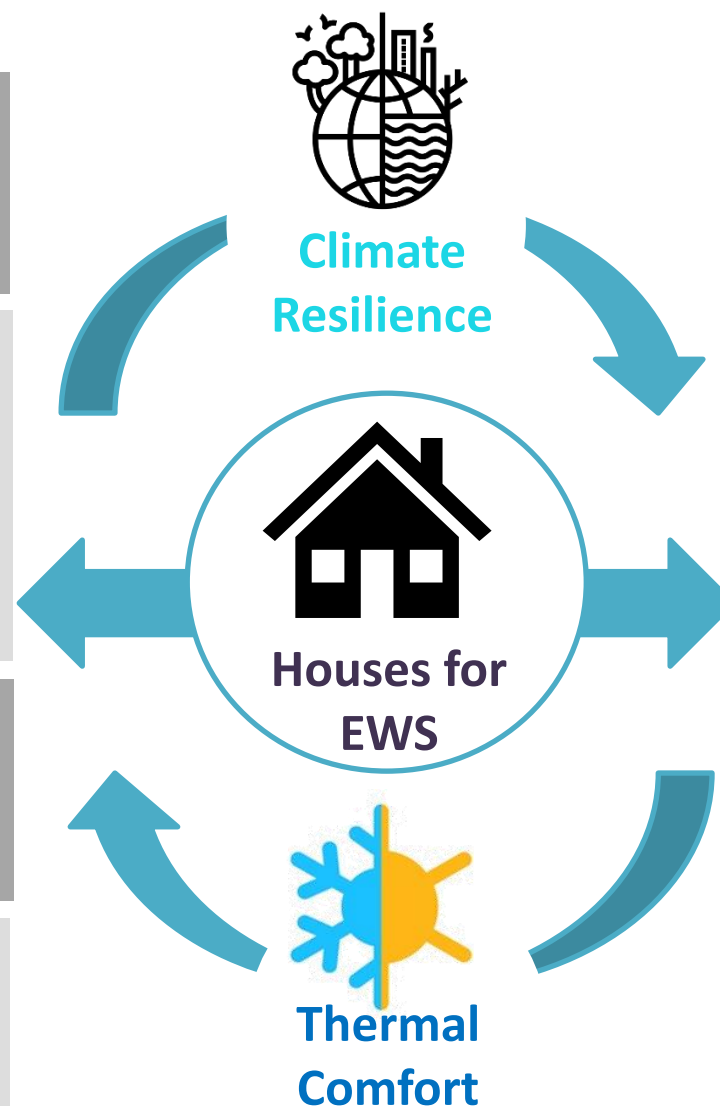


**7 AFFORDABLE AND CLEAN ENERGY**  
Ensure access to affordable, reliable, sustainable, and modern energy for all

**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



**INTEGRATION IN BY-LAWS**



# AIM & CONCEPT

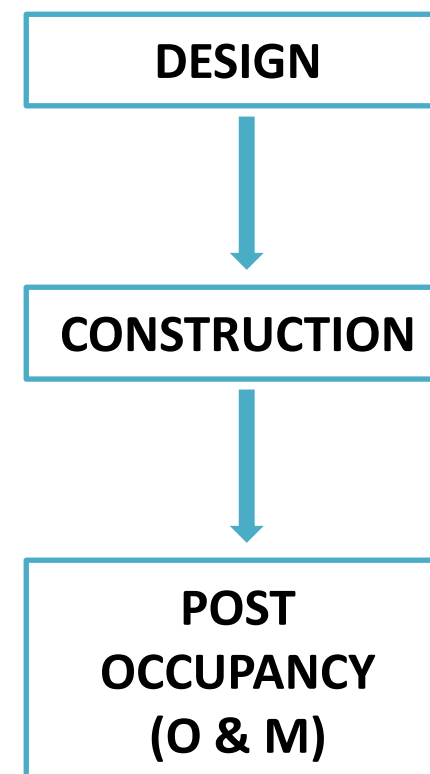
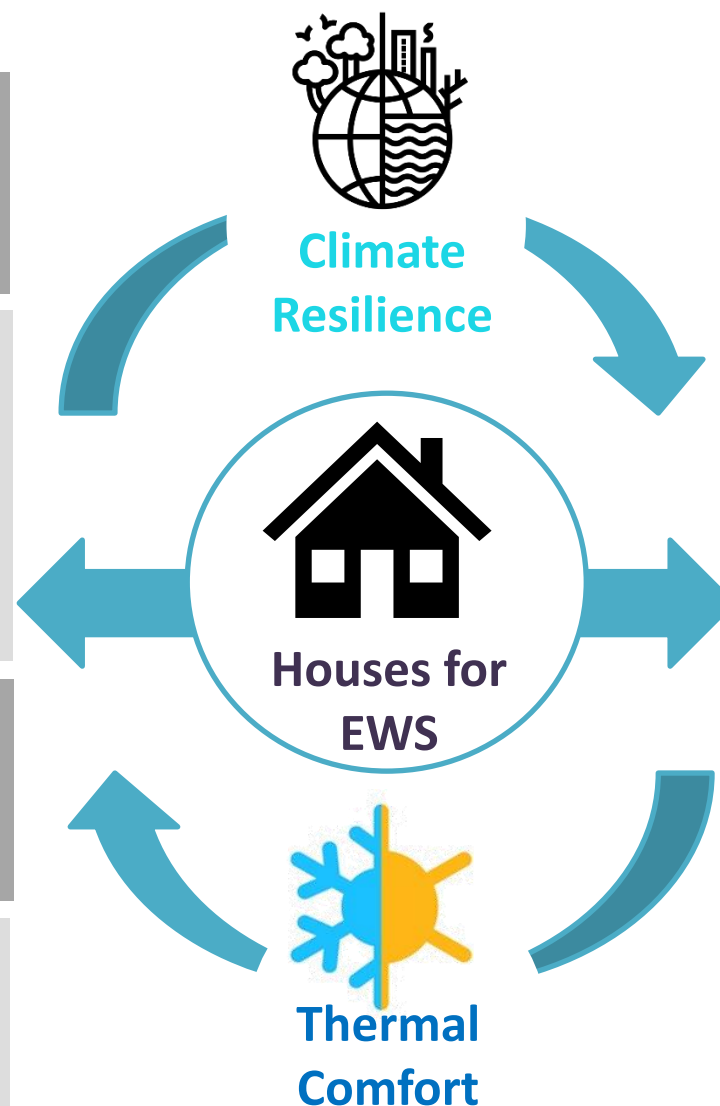


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**INTEGRATION IN BY-LAWS**

# LHP INTRODUCTION

## 6 LHP ACROSS INDIA



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

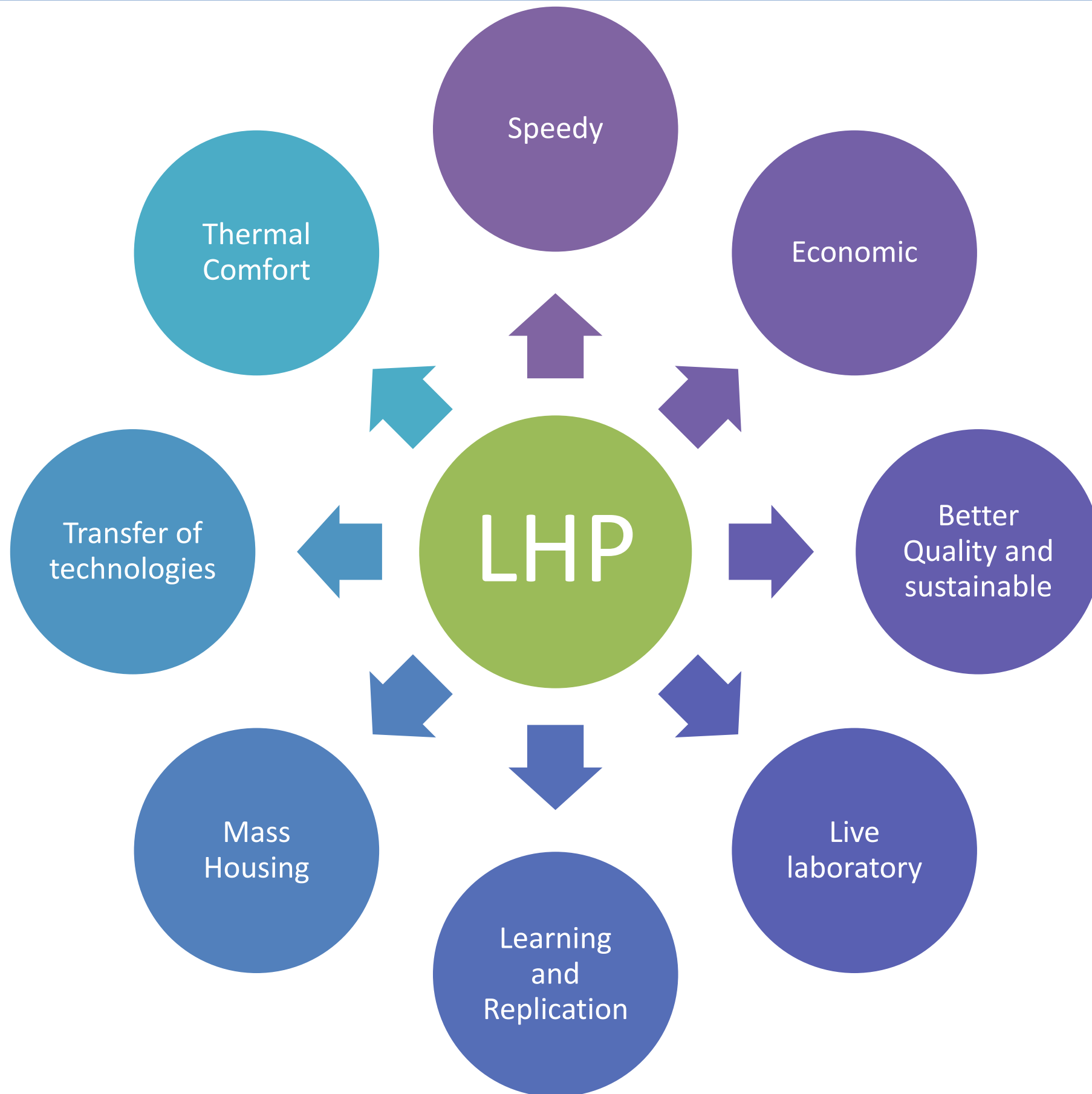
## 6. Lucknow, Uttar Pradesh

- PVC Stay In Place Formwork System

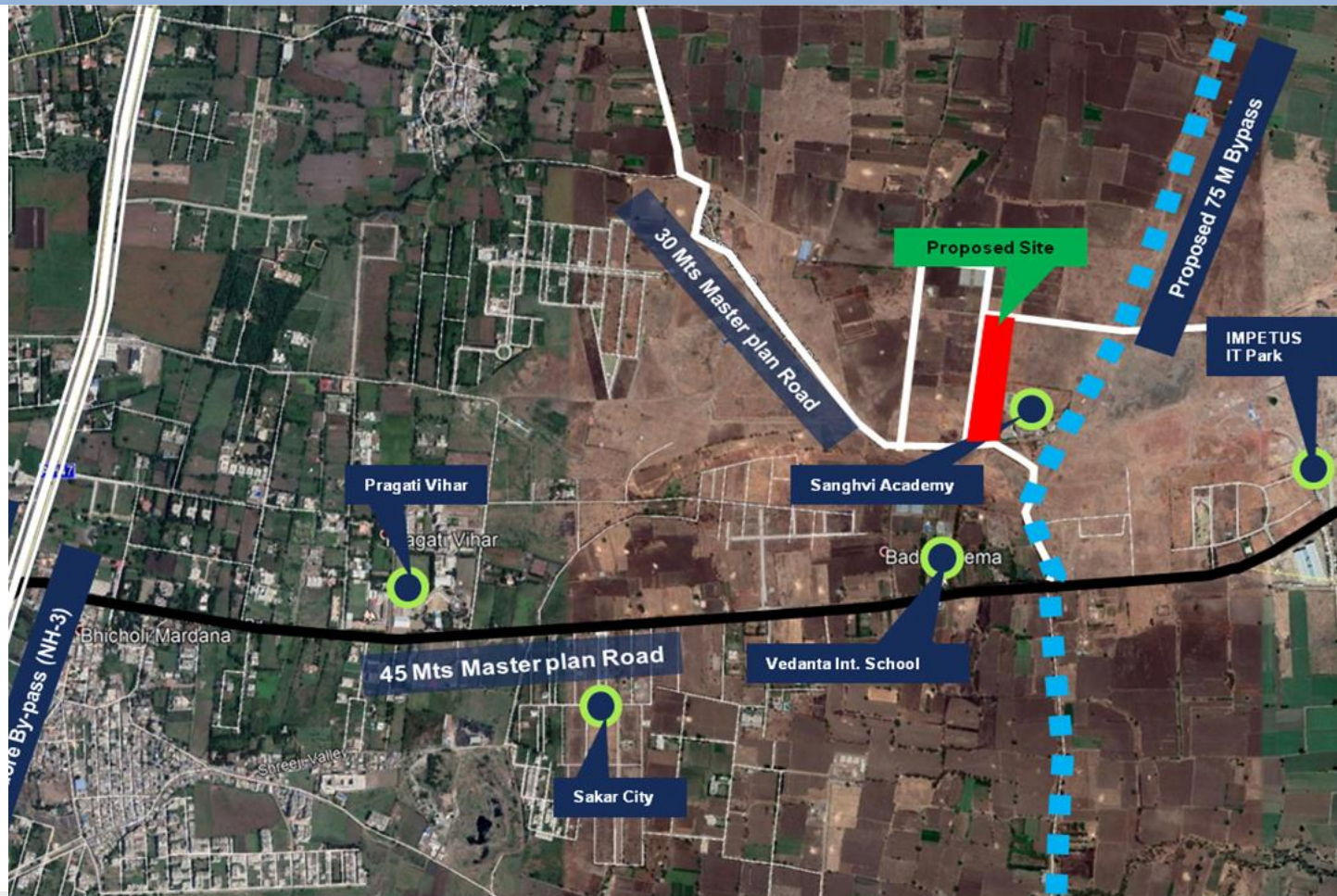


# 6 LHPs Explained Via Video

# 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

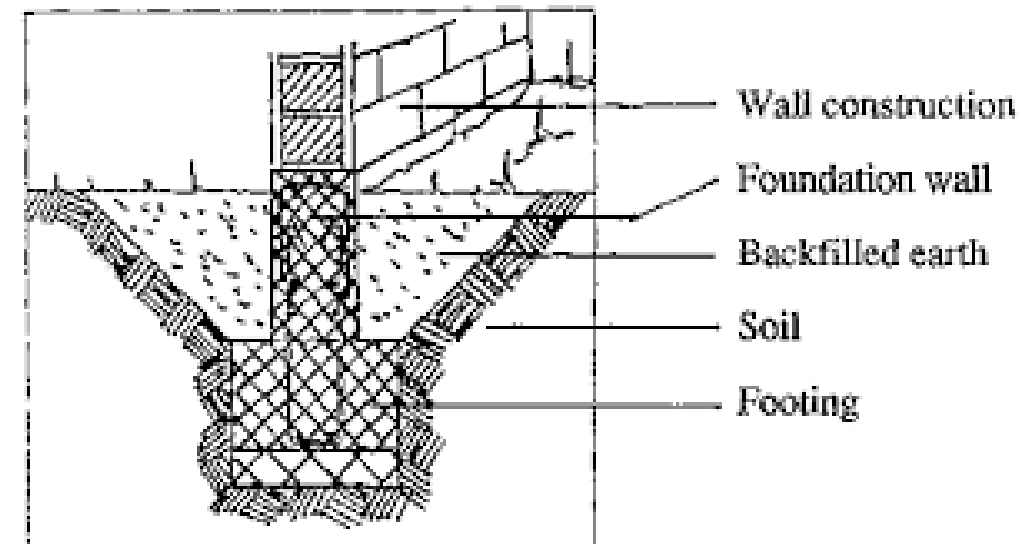


LABOUR HUTMENT



# FOOTING MARKING

## FOOTING MARKING



Footing section with soil layering

PCC FOR FOOTING

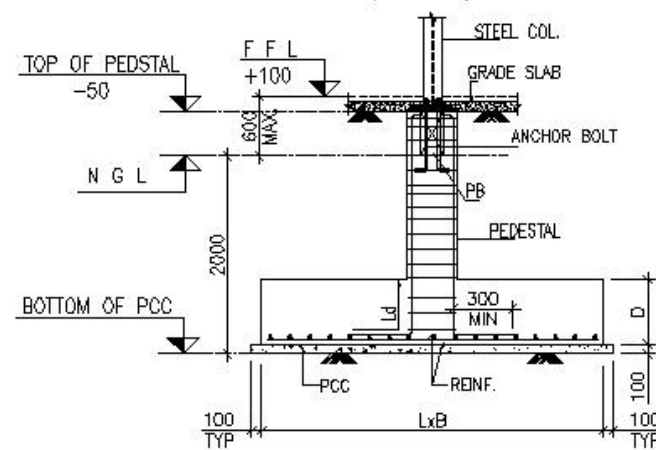
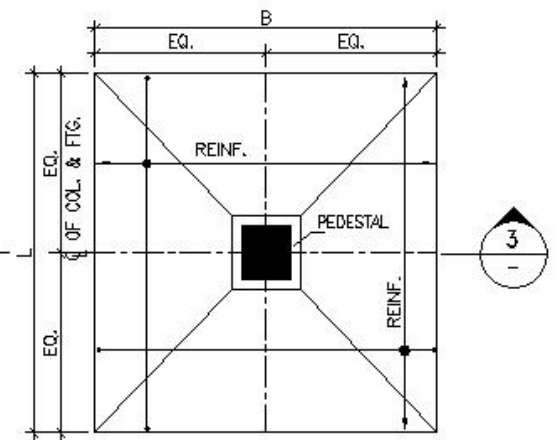
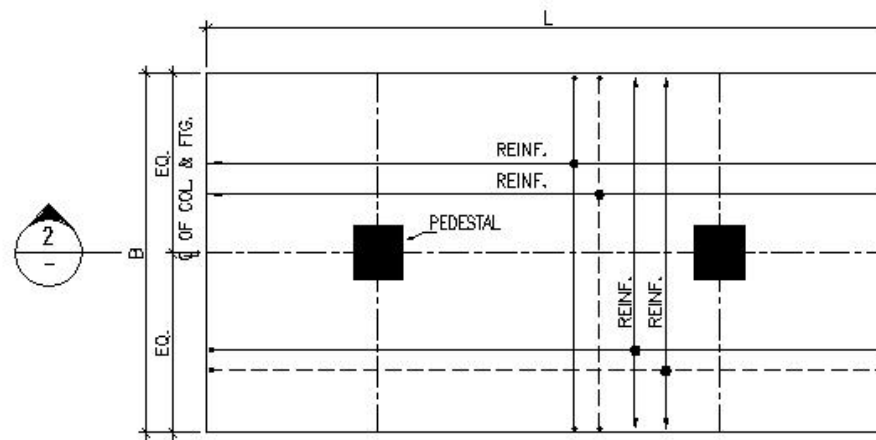
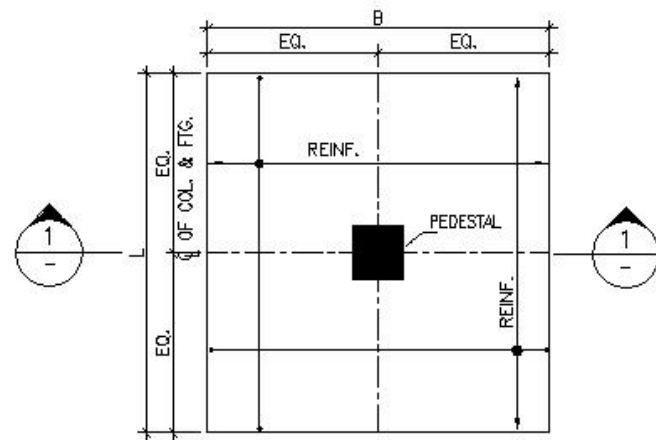
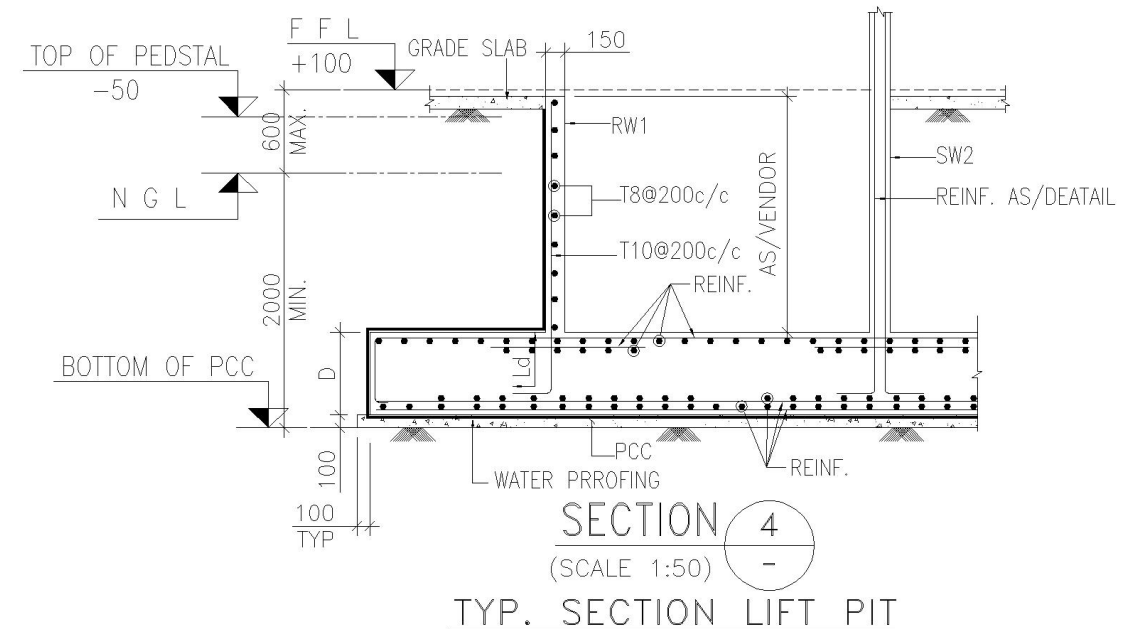


# FOOTING DESIGN & SECTION

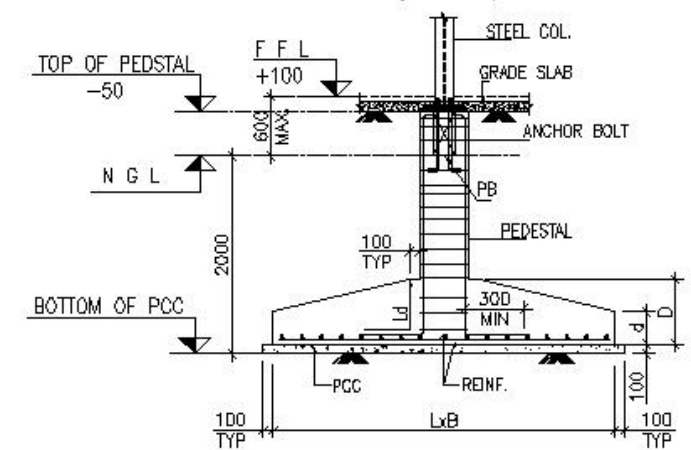
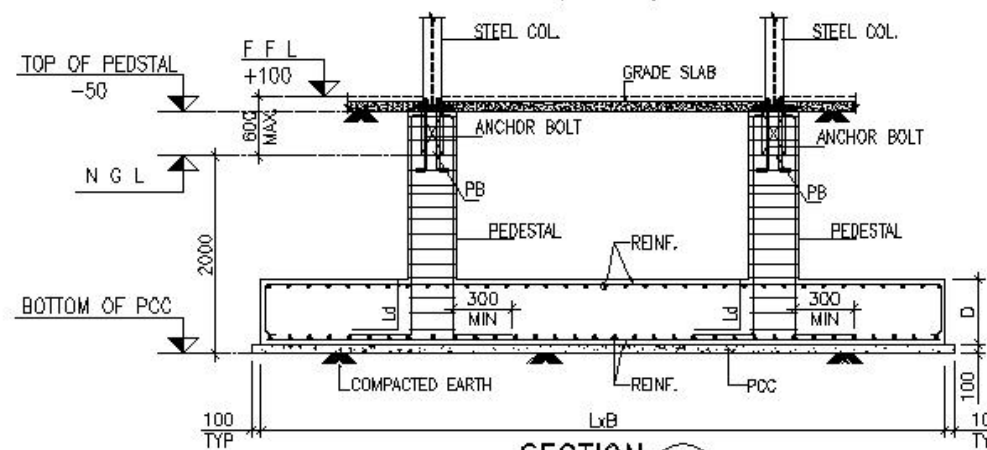
Footing calculations is done as per live load , dead load and wind load

Types of footing in the project

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



TYP STRAIGHT ISOLATED FOOTING DETAIL



TYP SLOPED ISOLATED FOOTING DETAIL

# FOOTING





# PLINTH



RCC COLUMN UP TO PLINTH LEVEL



PLINTH BEAM



# PEB ERRECTION





# PEB ERRECTION Explained Via Video





# LHP INDORE - TECHNOLOGY

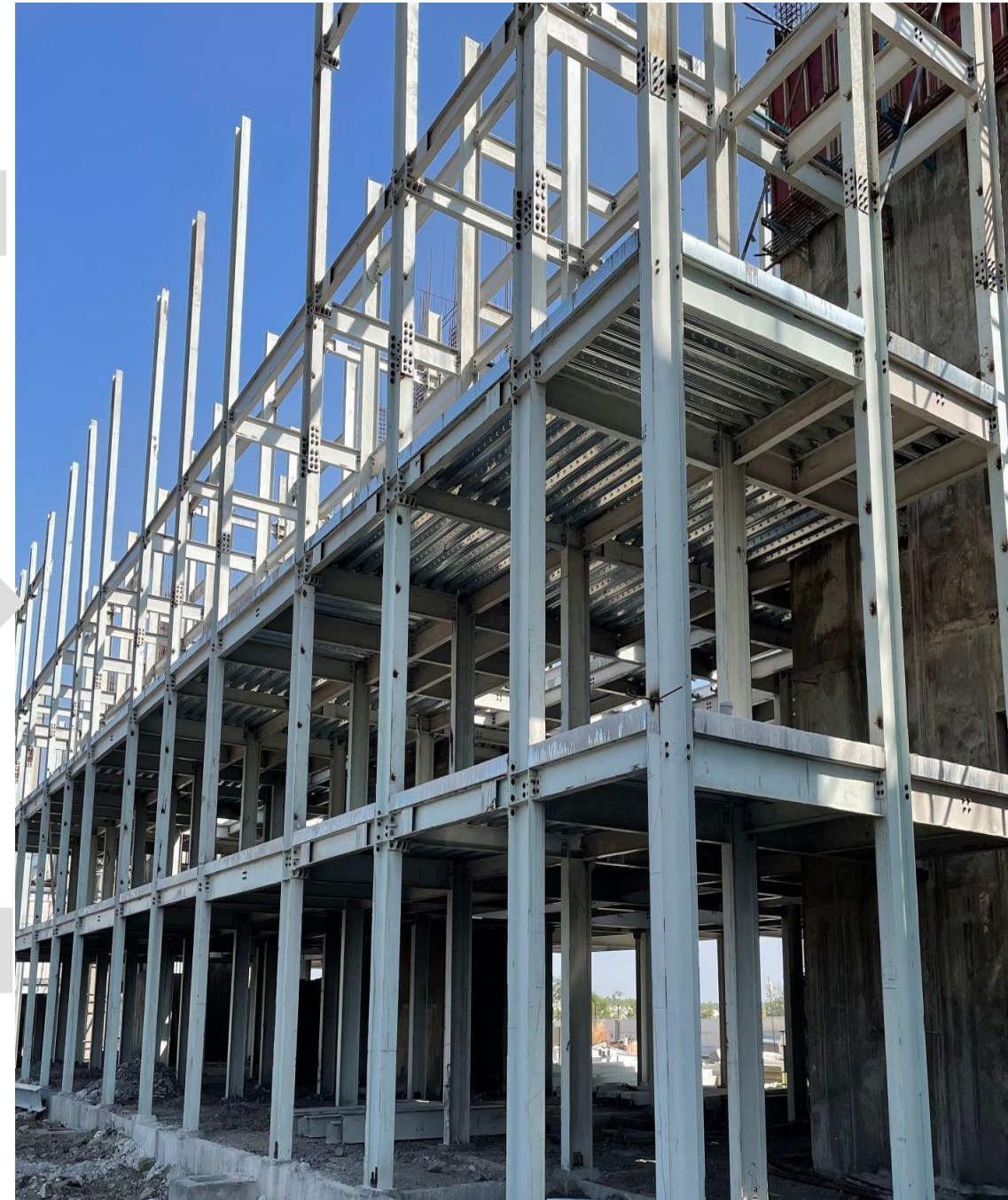
## PEB STRUCTURE

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



*Lifting*

*Assembled Structure*



*Bolting*





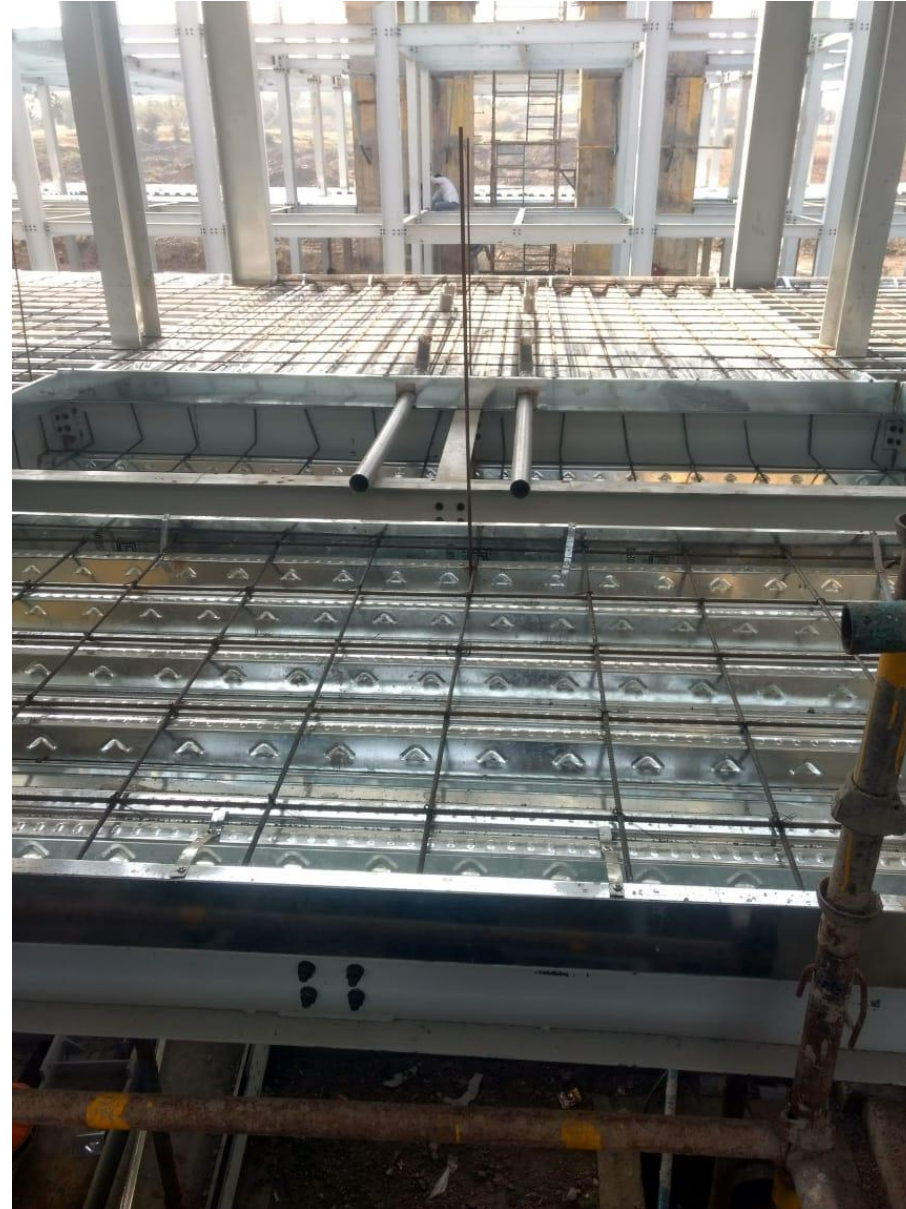
# LHP INDORE - TECHNOLOGY

## DECK SLAB

Deck sheet laying



Services & reinforcement laying



Concreting





# CONSTRUCTION METHODOLOGY



## **6. Staircase –**

Fabricated MS sections are being welded at site for staircase frame preparation



## **1.Substructure**

RCC Isolated column footing



## **5. Lift Wall –**

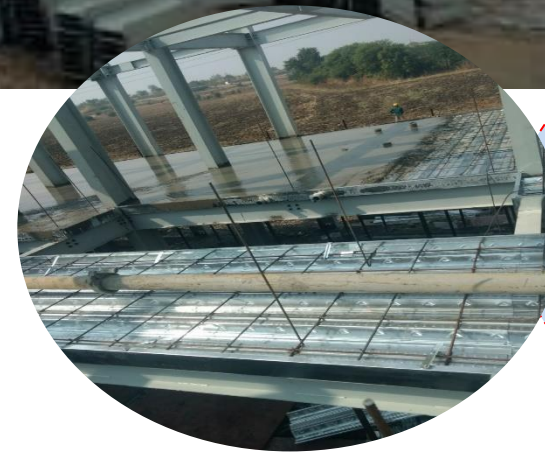
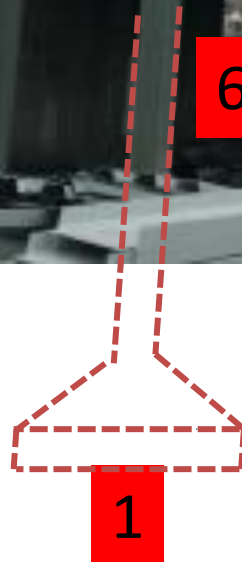
RCC structure is being prepared for lift walls. Onsite RMC plant for RCC material preparation

## **2.Structural System**

Pre Engineered structure consists of factory manufactured steel column and beam erected on site.

## **4. Walling System**

Factory made Prefabricated sandwich panels are being used for wall preparation



## **3. Slab –**

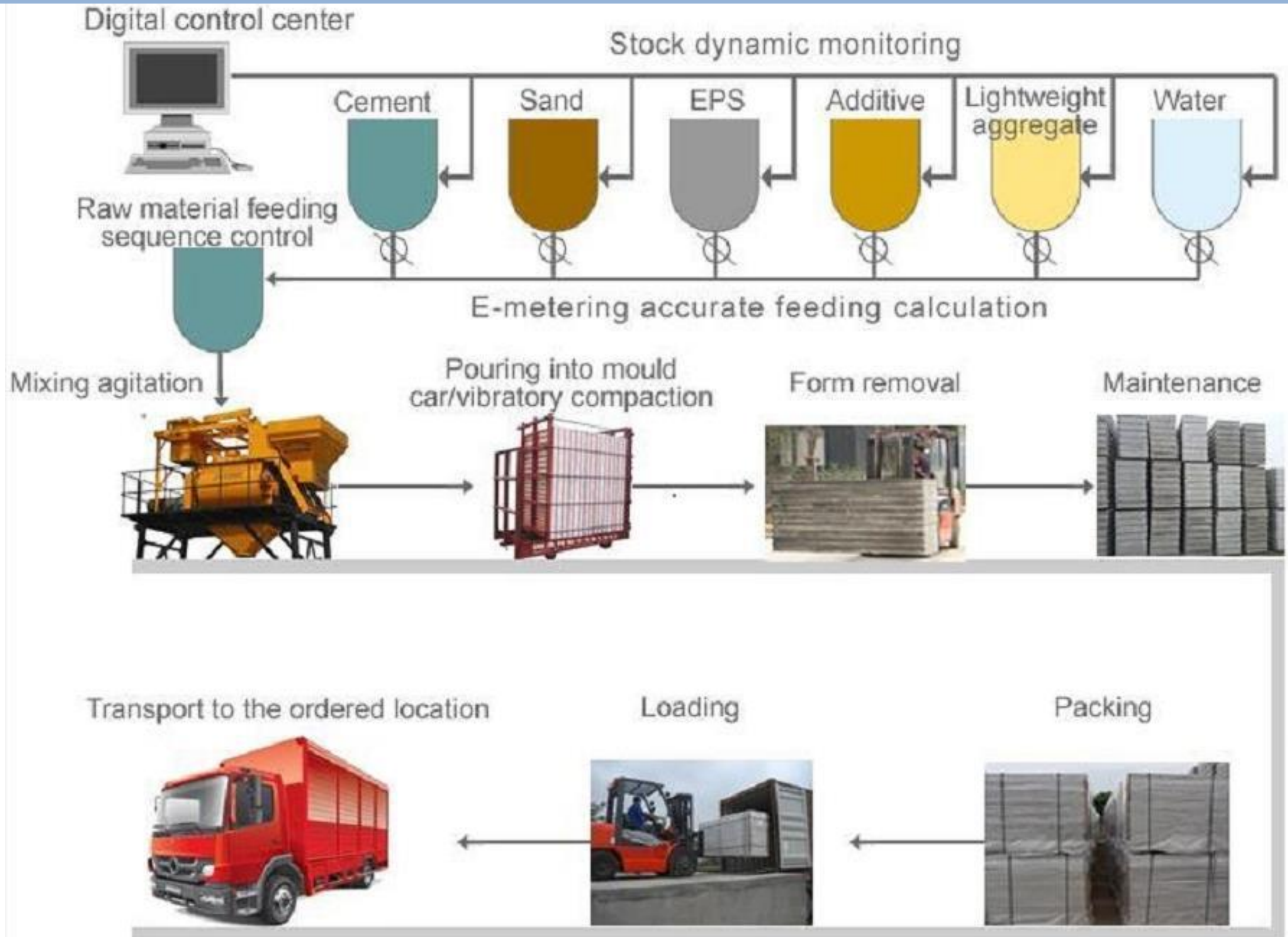
Deck sheet is placed on structure. over it, slab casting is done



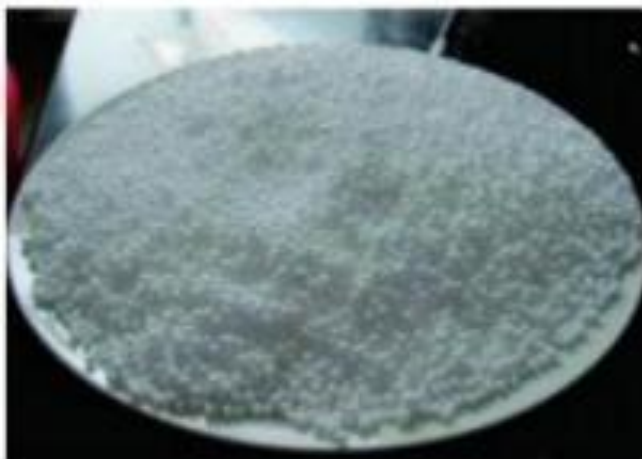
Technology information being explained via Video



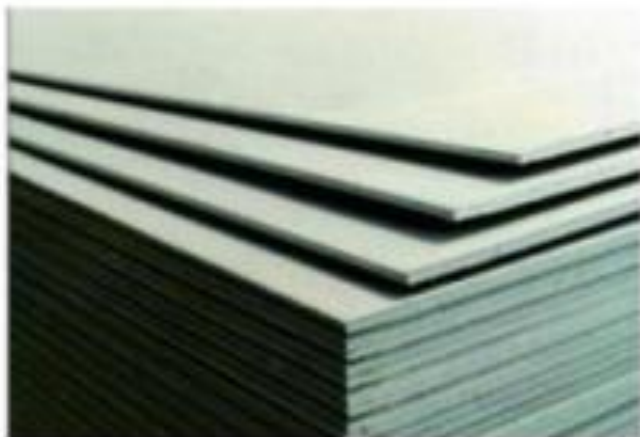
# EPS SANDWICH PANEL MANUFACTURING PROCESS



# EPS SANDWICH PANEL RAW MATERIALS



EPS



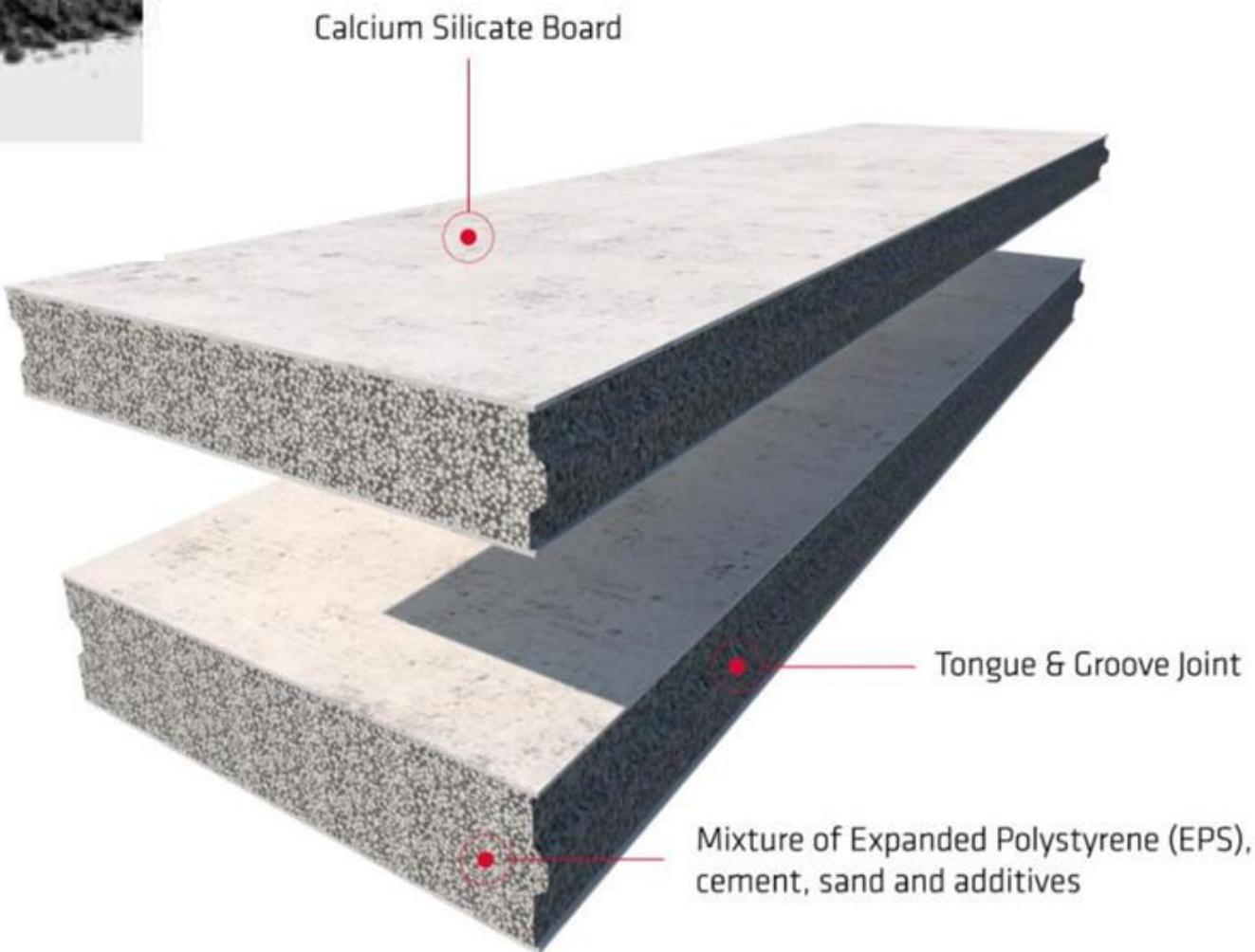
Calcium silicate board



Fly ash












Cement





# 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 SANDWICH PANEL FIXING



Technology information being explained via Video

# EPS PANEL PERFORMANCE APPRAISAL CERTIFICATE

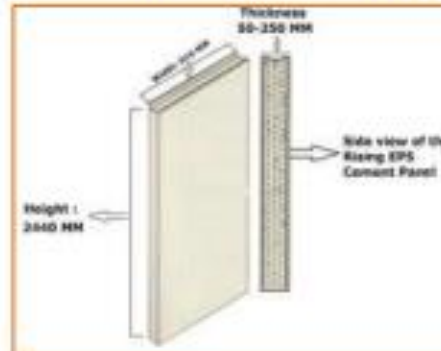


## Rising EPS (Beads) Cement Panels

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>



# 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

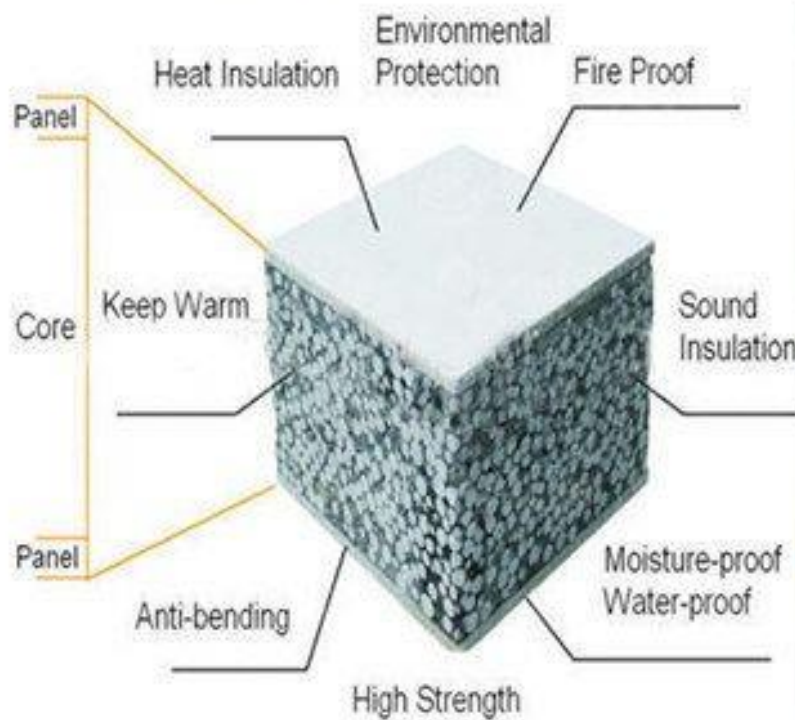
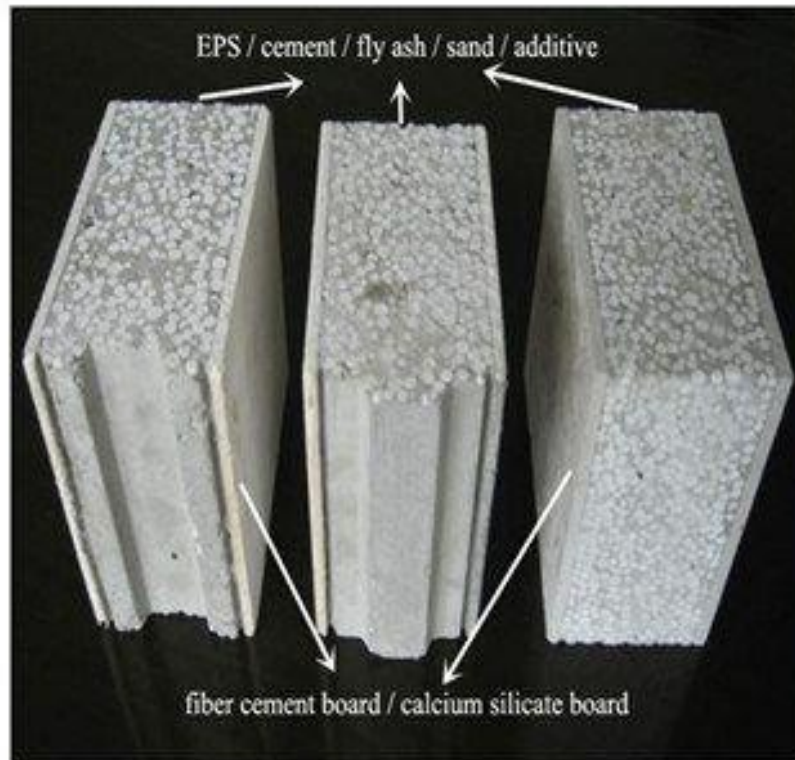
# PANEL TECHNICAL SPECIFICATION

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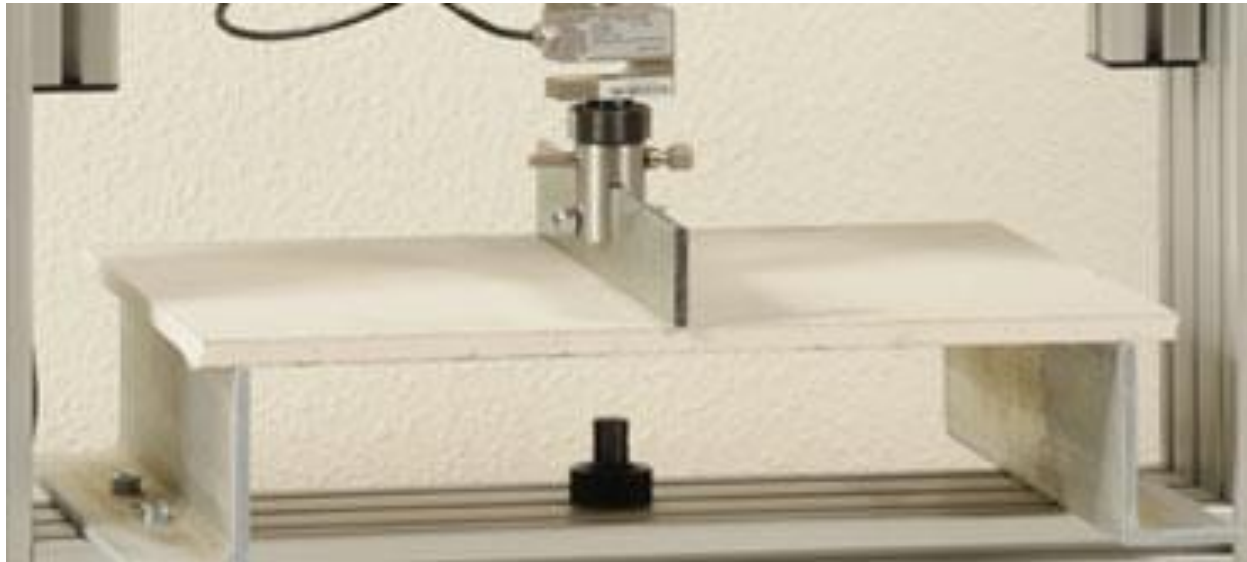
# LHP INDORE – TECHNOLOGY ADVANTAGES



- 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*

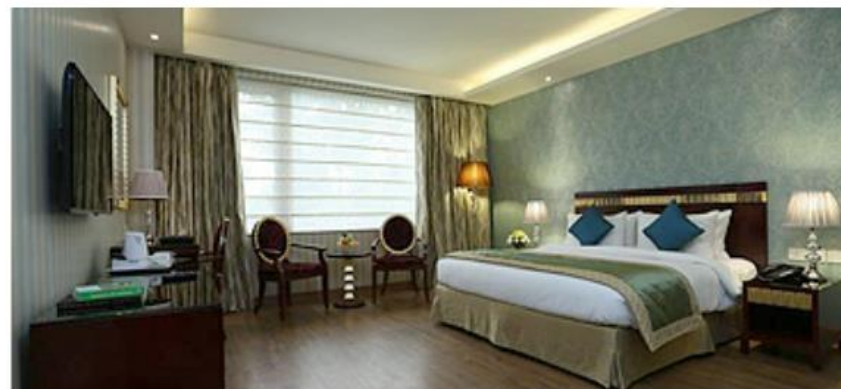


1. Light weight and cost effective
2. Easy and faster construction
3. Fireproof
4. Water proof and damp proof
5. Non-toxic & environment-friendly
6. Energy saving & environment-friendly
7. Water saving due to dry construction
8. Smooth and flat surface, thus no plastering needed
9. High sound insulation
10. Cost effective
11. Ground staff optimization
12. 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



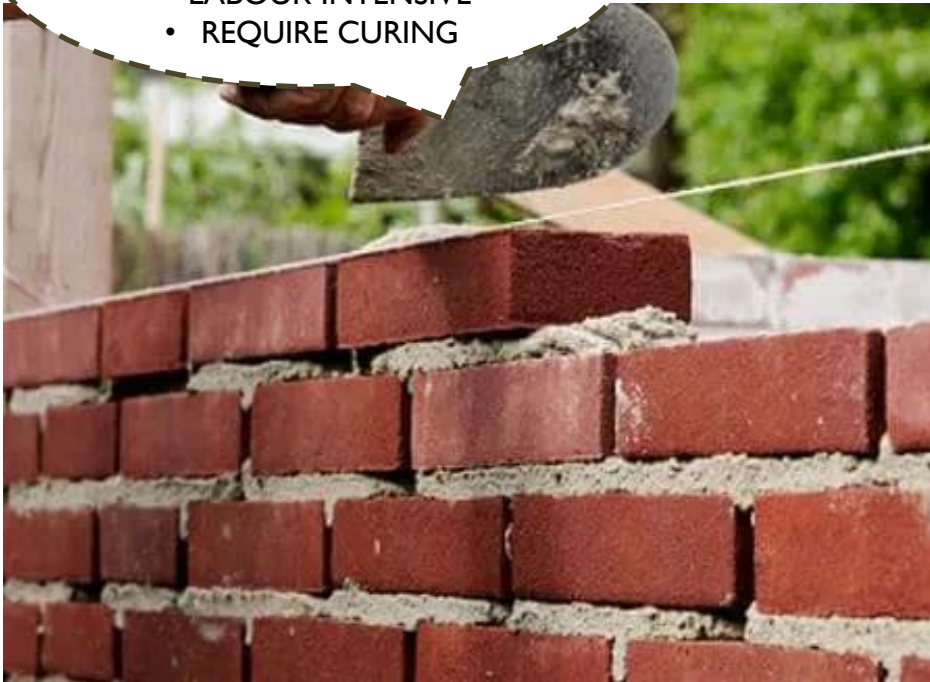
GLOVES



# 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



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

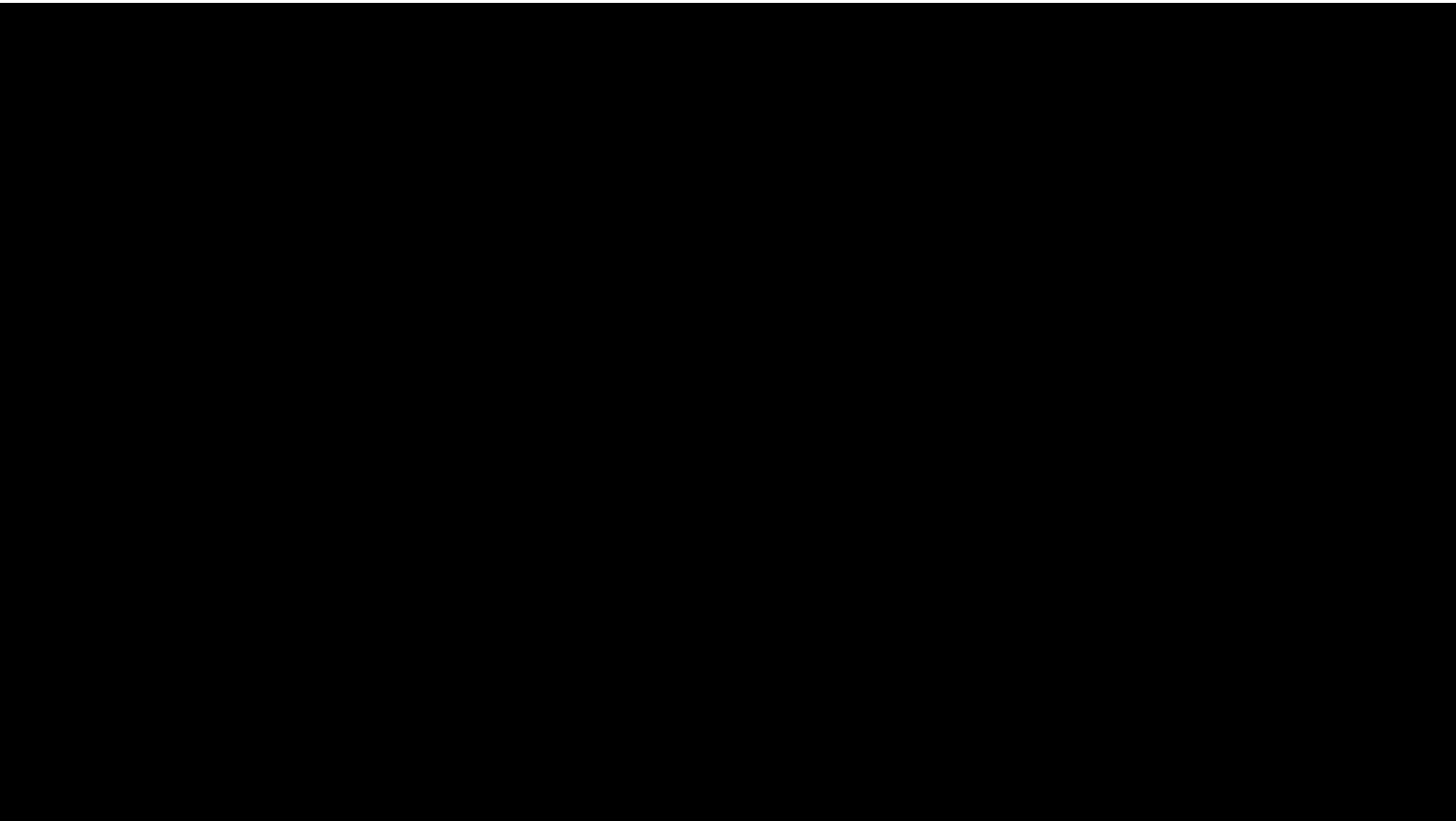
- ☐ Stronger,
- ☐ Durable with better quality control.
- ☐ Their functional performance in terms of acoustics, thermal, fire, rain water penetration, termite is much superior than cast-in-situ walls.
- ☐ These panels can be used as load bearing structural panels to build single to three storey houses 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									





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.