



Flyash EPS (Beads) Cement Sandwich Panels

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

Name and Address of Certificate Holder:

M/s Bhargav Infrastructure Pvt. Ltd.
B-2/20, Hojiwala Industrial Estate
Road No. 9, Sachin Palsana Road,
Surat –394230 (Gujarat)
Tel: 09824193000

Performance Appraisal
Certificate No.

PAC No.1042-S/2018

Issue No. **1**

Date of Issue: **14.11.2018**



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

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PERFORMANCE APPRAISAL CERTIFICATE

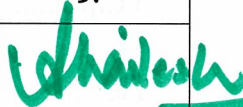
FOR

FLYASH EPS (BEADS) CEMENT SANDWICH PANELS

ISSUED TO

M/s BHARGAV INFRASTRUCTURE PVT. LTD., SURAT

STATUS OF PAC No.:1042-S/2018

S. No.	Issue No.	Date of Issue	Date of renewal	Amendment		Valid up to (Date)	Remark	Signature of authorized signatory
				No.	Date			
1.	2.	3.	4.	5.	6.	7.	8.	9.
1	01	14-11-2018	14-11-2019	--	--	13-11-2019	--	
								Dr. Shailesh K. Agarwal Chairman, TAC
								& Member Secretary, BMBA Building Materials and Technology Promotion Council
								Ministry of Housing & Urban Planning, (Govt. of India) Core 5A, 1st Floor, India Habitat Centre, Lodhi Road, New Delhi-110 003

PAC No.:1042-S/2018

Issue No. 01

Date of issue:

CONTENTS

PART 1 CERTIFICATION	3
1.1 Certificate Holder	3
1.2 Description of System.....	3
1.3 Uses & limitations of the System	4
1.4 Assessment	5
1.5 Manufacturing Machinery & Equipment	5
1.6 Production Process	6
1.7 Conditions of Certification	7
1.8 Certification	8
PART 2 CERTIFICATE HOLDER'S TECHNICAL SPECIFICATION	8
2.1 General	8
2.2 Specifications for the System	8
2.3 Design parameters	9
2.4 Installation & Jointing Procedure.....	10
2.5 Inspection & Testing	11
2.6 Manuals	11
2.7 Skills/ training needed for installation	11
2.8 Warranties provided by the PAC holder	11
2.9 Responsibility	11
PART 3 BASIS OF ASSESSMENT AND BRIEF DESCRIPTION OF ASSESSMENT PROCEDURE	12
3.1 Basis of Assessment	12
3.2 Tests Performed	12
3.3 Execution of Projects	13
PART 4 STANDARD CONDITIONS	14
PART 5 LIST OF STANDARDS AND CODES USED IN ASSESSMENT	16
CERTIFICATION	18
PART 6 ABBREVIATIONS	19
PERFORMANCE APPRAISAL CERTIFICATION SCHEME – A BRIEF	20
ANNEX I QAP	21
ANNEX II Process Flow Chart	22
ANNEX III Typical Installation Process	23
ANNEX IV Jointing & Fixing Details	25

PART 1 CERTIFICATION

- 1.1 Certificate Holder:** M/s Bhargav Infrastructure Pvt. Ltd.
B-2/20, Hojiwala Industrial Estate
Road No. 9, Sachin Palsana Road,
Surat -394230 (Gujarat)
Tel: 09824193000
Email: info@bhargavinfrastructure.com

1.2 Description of System

1.2.1 Name of the System – Flyash EPS Cement Sandwich Panels

- 1.2.2 Brief Description** – Flyash EPS Cement Sandwich Panels are lightweight solid core sandwich panels made of 5mm non-asbestos fiber cement boards on both sides of panels as facing sheet and the core material of expanded polystyrene beads, admixture, cement, sand, fly ash and other bonding materials in mortar form. The core material in slurry state is pushed under pressure into preset molds. Once set, it is moved for curing and ready for use with RCC or steel framed structure. These panels may be installed without any structural support up to 5m only. Due to the sheets, the panels do not require plastering and water curing. These panels are joined with tongue & groove jointing system. Isometric view of the panels are shown in Figs. 1 & 2.

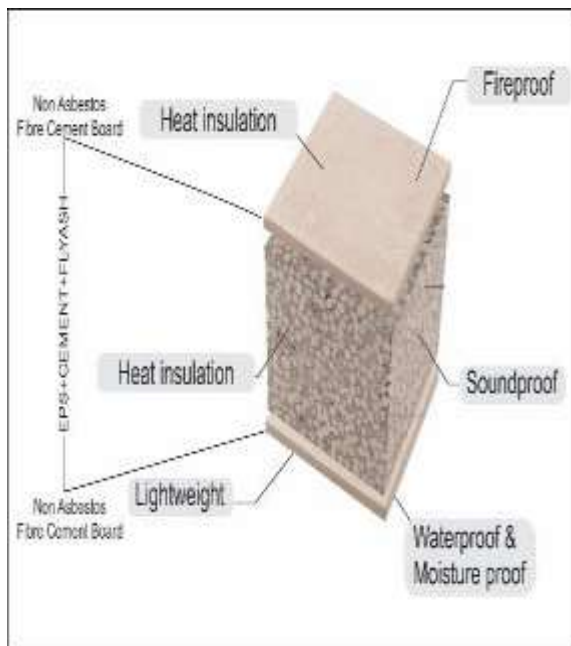


Fig. 1



Fig. 2

1.2.3 *Size and Weight of Panels*

1.2.3.1 Size: Panels are normally produced in sizes and dimensions as given below:

Length: 2440mm (1500mm to 3000 mm)

Width: 610 mm (may be altered as per requirement but should not be too wide since handling of the panels become difficult)

Thickness: 60mm, 75mm, 90mm & 120 mm.

Weight:

60 mm: 44 kg/m²,

75 mm: 54 kg/m²

90 mm: 75 Kg/m²

120 mm: 100 Kg/m²

1.3 **Uses, Limitations and Critical details of Panels**

1.3.1 *Uses:*

These panels may be used as non-load bearing walls/roof/floor panels for structures temporary or permanent, residential and commercial buildings, offices, hospitals, school, malls and shelters etc.

1.3.2 *Limitations on the basis of performance, safety, geo-climatic Conditions:*

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

1.3.3 *Critical details*

(i) While manufacturing the panels, extra care should be taken so As to ensure that composition and mixture of EPS beads may not damage the tongue of the panel.

(ii) The panels, if used for floors/roofs, shall require screeding concrete of 35mm thick with nominal reinforcement/GI wire mesh for shrinkage monolithic action to avoid leakage through the panel joints.

1.4 Basis of Assessment

1.4.1 *Scope of Assessment*

1.4.1.1 Scope of assessment included conformance of manufactured panels to the specified requirements for structures temporary or permanent, residential and commercial buildings, offices, hospitals, school, malls and shelters etc.

1.4.2 *Basis of Assessment*

Assessment of the suitability of the Bhargav EPS Cement Sandwich Panels is based on:

- (i) Tests of Thermal conductivity, Sound transmission and Fire rating conducted on the samples of the panels of thickness 90 mm by Deptt. of Earth Sciences, IIT Bombay in 2015.
- (ii) Tests conducted for performance of the wall panels by National Testing Lab., Delhi in 2011.
- (iii) Compressive strength tests conducted on the samples of 90 mm thick wall panels by Unique Engg. Testing and Advisory Services, Surat in 2012
- (iv) Moisture content and Compressive strength tests conducted on the samples of wall panels by Unique Engg. Testing and Advisory Services, Surat in 2010.
- (v) Inclusion of similar panels under Item No. 26.49 of CPWD DSR 2016 on 10/11/2017 as non-load bearing walls/roof/floor light weight solid core panels.
- (vi) Assessment of quality assurance procedures implemented for Quality Assurance Scheme followed by the Certificate holder for process control as per Quality Assurance Plan attached at Annex I.

1.5 Manufacturing Machinery & Equipment

The manufacturer has the following major machinery installed at the plant:

SI No	Date of installation	Name of machine	Make	Capacity	No. of machines	Remarks
1	18-09-2011	Silo for bulk storage	S.L. Machine	55 Ton each	2 set	Storage of cement & fly ash
2	18-09-2011	Automatic Batching	S.L Machine	1 M ³	1 No.	Ratio scale for raw materials

		PLC System				
3	18-09-2011	Mixer Machine	--	1 M ³	1 No.	Mixing raw material
4	18-09-2011	Slurry injector	S.L. Machine	0.5 M ³	1 No.	Injection molds
5	18-09-2011	Molding machine	--	1set of 13 panels	8 sets	For panels
6	18-09-2011	De-molding machine	--	1set of 13 panels	1 set	Panels come out
7	15-04-2011	Fork lift	--	1.5Ton	1 No.	Material handling

1.6 Manufacturing Process

1.6.1 *Raw materials preparation*

- EPS granules shall be expanded into foam EPS by expanding machine/system with suitable size and store the foam EPS in storage silos ready for next production stage.
- Cement, fly ash and sand shall be transported from the storage silos by the screw conveyors to the mixer according to the programmed ratio and water shall be fed into the mixer in designated proportion.
- The foamed EPS shall be transported through the blower in a programmed quantity at the same time into the mixer and mixed with the slurry.
- Additives shall be added to the mixer at the same time.
- After about 8 minutes of mixing, the finished mixed materials shall be ready and discharged into the filling hopper.

1.6.2 *Materials filling system*

During the materials mixing process, the mould shall be set and two covers of fiber cement board inserted one by one in each mould. Thereafter, the ready-set mold shall be moved under the filling platform by winch machine.

1.6.3 *Material Filling*

Once the mould cars are under the filling hopper, the top platform will open and the material shall be filled into the moulds under pressure.

1.6.4 *Curing*

After the filling is over, the filled mold cars shall be transported by the ferry car to the curing area for about 5 to 6 hours curing. Curing time depends on the site temperature conditions.

1.6.5 *De-moulding process*

- After required period of curing, the panels in the mould shall have gained enough strength and suitable for de-moulding. The de-molding process can be automatic or manual depending on the mold car chosen.
- If the mould car is automatic type, de-moulding machine shall be used to pull the panels out of the mould car automatically. In one step, one panel will be pulled out from the car and stacked.
- If the mould car is manual type, the panels shall move out of the mould cars one by one and stacked.
- Once the stack is sufficient, the fork lift shall move them to the packing area for dispatch.
- After this process is completed, the mould cars shall re-set for the next production cycle.

Manufacturing process flow chart is shown in Annex II.

1.7 Conditions of Certifications

1.7.1 *Technical Conditions*

1. Raw materials and the finished panels shall conform to the requirements of the prescribed specifications.
2. Bhargav Infrastructure shall provide full details of manufacture and erection of the panels to the agency who may be engaged for construction.
3. The Certificate is being issued after visit to the manufacturing plant and various sites.

1.7.2 *Quality Assurance*

The Certificate Holder shall implement & maintain a quality assurance system in accordance with Quality Assurance Plan (QAP) given in Annex I attached with this Certificate.

1.7.3 *Handling of User Complaints*

- 1.7.3.1** The Certificate holder shall provide quick redressal to Consumer/user complaints proved reasonable & genuine and

within the conditions of warranty provided by it to customer/purchaser.

- 1.7.3.2** The Certificate holder shall implement the procedure included in the SQA. As part of PACS Certification, he/she shall maintain data on such complaints with a view to assess the complaint satisfaction and suitable preventive measures taken.

1.8 Certification

- 1.8.1** On the basis of assessment given in Part 3 of this Certificate & subject to the Conditions of Certification, use & limitations set out in this Certificate and if selected, installed & maintained as set out in Parts 1 & 2 of this Certificate, the panels covered by this Certificate are fit for use as set out in the Scope of Assessment.

PART 2 CERTIFICATE HOLDER'S TECHNICAL SPECIFICATIONS

2.1 General

- 2.1.1** The PAC holder shall manufacture the panels in accordance with the requirements specified in the relevant Standards (See Part 5). In addition, it shall follow the specific requirements of these sections for various materials used in the manufacturing of the product.

2.2 Specifications

2.2.1 *Raw Materials*

- (i) OPC 43/53 grade cement shall conform to IS 8112:2013/ 12269:2013.
- (ii) Fly ash shall conform to IS 3812 (Part 1):2013.
- (iii) EPS beads shall conform to IS 4671:1984 and shall have density not less than 15 kg/m³.
- (iv) Fibre cement board shall be of Type A & category C as per IS 14862:2000.
- (v) Calcium silicon board shall conform to EN 14306: 2009.
- (vi) Fine sand & coarse aggregate shall conform to IS 383:2016.
- (vii) MS-C Channel shall be manufactured from pre-galvanized high tensile steel conforming to IS 277:2018.
- (viii) Adhesive & Bonding agents shall conform to the manufacturer specifications.

2.2.2 'C' Section

2.2.2.1 For 60 mm panel

Size for bottom: (A) 28mm x (B) 61mm x (C) 18mm

Size for top: (A) 28mm x (B) 61mm x (C) 28mm

2.2.2.2 For 75 mm panel

Size for bottom: (A) 28mm x (B) 76mm x (C) 18mm

Size for top: (A) 28mm x (B) 76mm x (C) 28mm

2.2.2.3 For 90 mm panel

Size for bottom: (A) 28mm x (B) 91mm x (C) 18mm

Size for top: (A) 28 mm x (B) 91 mm x (C) 28 mm

2.2.2.4 For 120 mm panel

Size for bottom: (A) 28mm x (B) 121mm x (C) 18mm

Size for top: (A) 28mm x (B) 121mm x (C) 28mm

Details of C channels are shown in Figs. 3 & 4.

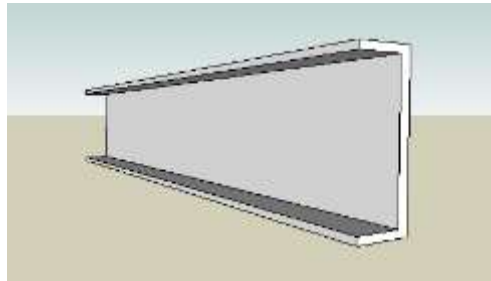


Fig. 3

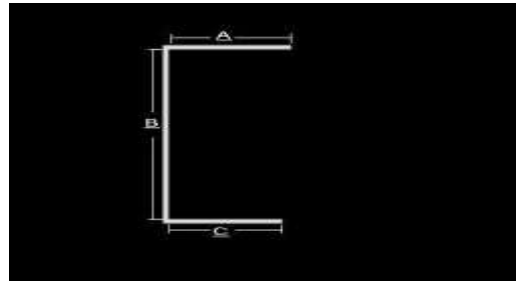


Fig. 4

2.3 Design Parameters

- The EPS Cement panels are produced using cement, EPS and fly ash / sand along with bonding agents to form walling material. The system may be used as an alternate solution to a building designed using conventional brickwork masonry wall.
- M/s Bhargav Infrastructure Pvt. Ltd. shall provide design data for good practices and as ready reckoner for users.
- The system is intended for use where Architectural drawings are available and satisfy the various requirements. The Architect and Engineer designer team of the concerned developer/ owner (client) is responsible for the drawings and overall building design to comply with the various regulatory requirements applicable to the area.
- M/s Bhargav Infrastructure Pvt. Ltd. through the use of chartered Engineers will help the builders / developers in proper design and installation of EPS Cement Panels in the building for each project.
- The design assumptions, detailed calculations, references to necessary and detailed design drawings shall be jointly made and the structural design calculations should clearly

demonstrate structural integrity and stability including connection details.

2.4 Installation of panels & Jointing Procedure

2.4.1 The installation process and jointing procedure of the panels is given in the following steps:

- A line shall be drawn on the plinth where panel is to be fixed
- The panel shall be fixed on floor and top using 1mm/1.2mm thick galvanized C channel
- Screws shall be fixed in wall and pillar
- The panel shall be installed properly with correct alignment and then fixed
- Reinforcement bars shall be fixed in the beam and panels
- Panels shall be joined by tongue & groove joint (Figs. 5 & 6)
- The panels shall be cut for doors and windows, wherever required
- Panels shall be cut at appropriate places to accommodate plumbing pipes
- Panels shall be cut at appropriate places to accommodate electrical conduits and switches
- The panels shall be grouted and glue filled in the joints
- After that fibre mesh and putty shall be applied over the joints.
- On interior walls, paint comprising of 2 coats of acrylic water based emulsion/oil bound distemper/synthetic enamel paint, as required, shall be applied on the panels
- On exterior walls, paint comprising of 2 coats of synthetic enamel paint/exterior grade emulsion/texture paint, as required, shall be applied on the panels.



Fig. 5



Fig. 6

Details of installation and jointing procedure is given in Annex III.

Photos with sketches showing various fixing details, door & window fixing, electrical and plumbing are given in Annex IV.

2.5 Inspections & Testing

Inspections & testing shall be done at appropriate stages of manufacturing process of all the elements. The inspected panels shall be stored & packed to ensure that no damage occurs during transportation. As part of quality assurance, regular in process inspections shall be carried out by the trained personnel of the PAC holder.

2.6 Manuals

PAC holder shall provide Construction & Installation Manuals showing necessary diagrams, drawings, detailing to the customers and / or their structural designer.

2.7 Skilled/Training Needed for Installation

No special training is needed for the installation of these panels except a two days familiarization course to make sure the workers understand how to fix the joints properly and to get use to handling the panels and cutting and sawing as per drawings.

2.8 Guarantees/Warranties Provided by the PAC Holder

PAC holder shall guarantee satisfactory performance of these panels supplied to the customer for a period of 12 months from the date of commissioning or 18 months from the date of receipt of material at site whichever is earlier and shall be responsible for any failure of the material to conform to the standard of performance, proficiency, production and for any defects that may develop and shall remedy such defects at its cost.

2.9 Responsibility

- Specific design using EPS Cement Panels is the responsibility of the designer with the instructions, supervision and guidance of the PAC holder.
- Quality of installation/construction of the system on site is the responsibility of the trade persons engaged by the building owner under the guidance of the manufacturer.

PART 3 BASIS OF ASSESSMENT AND BRIEF DESCRIPTION OF ASSESSMENT PROCEDURE

3.1 Basis of Assessment

3.1.1 The technical assessment was done as per provisions of the Standards listed in Part 5 of this Certificate.

3.1.2 *Plant Inspection*

The manufacturing plant was inspected by the TAC member and Officer of the Council. During inspection the entire manufacturing process along with the equipment was inspected. The in-process inspection and the inspection of the finished panels were in accordance with the SQA approved as a part of the requirements for grant of this PAC.

3.1.3 *Visit to Sites*

A number of sites comprising of school, institutes, religious place and commercial complexes etc., completed and under completion, where panels of 60mm & 75mm thick installed in walls and slabs were inspected by the team members.

3.2 Tests Performed

3.2.1 *Tests conducted on the samples of the panels of thickness 90mm by Deptt. of Earth Sciences, IIT Bombay as given below:*

- i) Sound transmission class: 40dB as per IS 9901:1981
- ii) Thermal conductivity: 0.493 W/m/k as per IS 3346:1980
- iii) Fire rating: 5.5.hrs (350 minutes) upto 750C as per BS 478 (Parts 20 & 22)

3.2.2 *Tests conducted for performance of the wall panels by National Testing Lab., Delhi as given below:*

S.No.	Test conducted	Test Method	Test Result
1.	Compressive strength	ASTM C 495	5.60 N/mm ² (Avg.)
2.	Flexural strength	ASTM C 293	1.53 N/mm ²
3.	Axial load	ASTM C495	36167 N (avg.)
4.	Moisture movement	IS 2185 (Part 1):	5.97%
5.	Load bearing capacity	ASTM C495	60667 N (Avg.)
6.	Single point load	ASTM C 293	4587 N (Avg.)
7.	Impact strength	ISO 179 -2:1999	> 5.0 Kgf

3.3 Execution of the Projects

The manufacturer, as reported, has executed the projects as per the details given below:

S. No.	Name & location of the Project/Client	Approx. quantity of panels in sqm	Period of Execution
1.	Nav Rachana University, Vadodra, Gujarat	1300	June 2014
2.	Shelters on bank of Tapi river, Surat, Gujarat	743	May 2015
3.	Maruti Showroom, Godhra, Gujarat	232	March 2016
4.	The Times of India, Ahmedabad	186	March 2016
5.	Royal Enfield Workshop, Surat, Gujarat	186	April 2016
6.	Nexa Showrrom, Palanpur, Gujarat	288	June 2016
7.	Chaitanya Vatika Banquet & Guest Rooms, Surat, Gujarat	372	April 2017
8.	Sheetal Restaurant, (PEB Structure), Surat, Gujarat	743	May 2017
9.	BMC Varsova & Dardar, (PEB Structure), Surat, Gujarat	372	June 2017
10.	NIIT/BETA Class Rooms, South Gujarat	743	June 2018

PART 4 STANDARD CONDITIONS

The certificate holder shall satisfy the following conditions:

- 4.1** The certificate holder shall continue to have the product reviewed by BMBA.
- 4.2** The product shall be continued to be manufactured according to and in compliance with the manufacturing specifications and quality assurance measures which applied at the time of issue or revalidation of this certificate. The Scheme of Quality Assurance separately approved shall be followed.
- 4.3** The quality of the product shall be maintained by the certificate holder.
- 4.4** The product user should install, use and maintain the product in accordance with the provisions in this Certificate.
- 4.5** This certificate does not cover uses of the product outside the scope of this appraisal.
- 4.6** The product is appraised against performance provisions contained in the standards listed in Part-V. Provisions of any subsequent revisions or provisions introduced after the date of the certificate do not apply.
- 4.7** Where reference is made in this Certificate to any Act of Parliament of India, Rules and Regulations made there under, statutes, specifications, codes of practice, standards etc. of the Bureau of Indian Standards or any other national standards body and the International Organization for Standardization (ISO), manufacturer's company standards, instruction/manual etc., it shall be construed as reference to such publications in the form in which they were in force on the date of grant of this Certificate (and indicated in Part V to this Certificate)
- 4.8** The certificate holder agrees to inform BMBA of their distributors / licensees whenever appointed by him and agrees to provide to BMBA a six monthly updated list thereof.
- 4.9** The certificate holder agrees to provide to BMBA feedback on the complaints received, the redressal provided, and the time taken to provide redressal on complaint to complaint basis as soon as redressal is provided. BMBA agrees to provide the certificate holder the user feedback received by it, if any.
- 4.10** If at any time during the validity period, PACH is unable to fulfill the conditions in his PAC, he should on his own initiative suspend using the PAC and notify Chairman, TAC the date from which he has suspended its use, the reason for suspension and the period by which he will be able to resume. He shall not resume without the prior permission of BMBA. He shall also inform, simultaneously, his agents, licensees, distributors, institutional, government, public sector buyers, other buyers and all those whom he has informed about his holding the PAC. He shall also inform all those who buy his product(s)

during the period of suspension. He shall provide to BMBA at the earliest the list of who have been so informed by him.

- 4.11** In granting this Certificate, BMBA takes no position as to:
- (a) The presence or absence of patent or similar rights relating to the product;
 - (b) The legal right of the Certificate holder to market, install or maintain the product;
 - (c) The nature of individual installations of the product, including methods of workmanship.
- 4.12** BMTPC and the Board of Agreement of BMTPC (BMBA) take no position relating to the holder of the Performance Appraisal Certificate (PACH) and the users of the Performance Appraisal Certificate (PAC) respecting the patent rights / copy rights asserted relating to the product / system / design / method of installation etc. covered by this PAC. Considerations relating to patent / copy rights are beyond the scope of the Performance Appraisal Certification Scheme (PACS) under which this PAC has been issued. PACH and users of this PAC are expressly advised that determination of the Claim / validity of any such patent rights / copy rights and the risk of infringement of such rights are entirely the responsibility of PACH on the one hand and that of the users on the other.
- 4.13** It should be noted that any recommendations relating to the safe use of the product which are contained or referred to in this Certificate are the minimum standards required to be met with when the product is installed, used and maintained. They do not purport in any way to restate or cover all the requirements of related Acts such as the Factory Act, or of any other statutory or Common Law duties of care, or of any duty of care which exist at the date of this Certificate or in the future, nor is conformity with the provisions of this Certificate to be taken as satisfying the requirements of related Acts.
- 4.14** In granting this Certificate, BMTPC and BMBA does not accept responsibility to any person or body for any loss or damage, including personal injury, arising as a direct or indirect result of the use of this product.
- 4.15** The certificate holder indemnifies BMBA, its officers and officials involved in this assessment against any consequences of actions taken in good faith including contents of this certificate. The responsibility fully rests with the certificate holder and user of the product
- 4.16** The responsibility for conformity to conditions specified in this PAC lies with the manufacturer who is granted this PAC. The Board (BMBA) will only consider requests for modification or withdrawal of the PAC.
- 4.17** The PAC holder shall not use this certificate for legal defense in cases against him or for legal claims he may make from others.


For and on behalf of Chairman TAC & Member Secretary, BMBA

Place: New Delhi

Date of issue 14.11.18

Dr. Shaillesh K. Agarwal
Chairman, TAC

& Member Secretary, BMBA

Building Materials and Technology Promotion Council
Ministry of Housing & Urban Poverty Alleviation, (Govt. of India)
150/5A, 1st Floor, Indira Habitat Centre, Lodhi Road,
New Delhi-110 003

PART 5 LIST OF STANDARDS AND CODES USED IN ASSESSMENT

5.1 Standards - These Standards are referred for carrying out a particular test only and do not specify the requirement for the whole product as such.

5.1.1 IS 383:2016 – Specifications for coarse and fine aggregates from natural resources

5.1.2 IS 456:2000 (Reaffirmed 2016) – Code of practice for reinforced cement concrete

5.1.3 IS 516:1959 (Reaffirmed 2013) – Standard test method for flexural strength of concrete specimens

5.1.4 IS 2185 (Part 1):2005 (Reaffirmed 2010) – Specifications for concrete masonry units – hollow and solid

5.1.5 IS 3346:1980 (Reaffirmed 2017) – Method of determination of thermal conductivity of thermal insulation materials

5.1.6 IS 3812 (Part 1):2013 – Specifications for flyash for use as pulverized mixture in cement concrete

5.1.7 IS 4671:1984 (Reaffirmed 2017) -- Specifications for expanded polystyrene for thermal insulation purposes

5.1.8 IS 9901:1981 (Reaffirmed 2007) – Measurement of sound insulation in buildings and building elements

5.1.9 IS 8112:2013 -- Specifications for 43 grade ordinary Portland cement

5.1.10 IS 12269:2013 – Specifications for 53 grade ordinary Portland cement

5.1.11 IS 14862:2000 (Reaffirmed 2010) -- Specifications for fibre cement flat sheets

5.1.12 IS 16700:2017 – Criteria for structural safety of tall concrete buildings

5.1.13 ISO 179 (Part 2):1999 – Determination of properties of charpy impact strength

5.1.14 ASTM C 293 – Standard test method for determination of flexural strength of concrete

5.1.15 ASTM C 495 -- Standard test method for determination of compressive strength of concrete

5.1.16 BS 476 (Part 20-22): 1987 – Method of determination of fire resistance of building materials and structures

5.1.17 EN 14306: 2009 +A1:2013 – Specifications for factory Made Calcium Silicate (Cs) Products

5.2 Company Standards of the PAC holder – The branded design & specifications of the raw materials and finished product are as submitted by the manufacturer. The PAC holder has to make available the company standards to the consumers according to which testing have been done.

5.3 References

5.3.1 -- Inclusion of the panels under Item No. 26.49 of CPWD DSR-2016 on as non-load bearing walls/roof/floor light weight solid core panels of thickness 50mm to 100mm.

5.3.2-- Thermal conductivity, Sound transmission and Fire rating conducted on the samples of the panels of thickness 90mm by Deptt. of Earth Sciences, IIT Bombay in 2015.

5.3.3 -- Tests conducted for performance of the wall panels by National Testing Lab., Delhi in 2011.

5.3.4 -- Compressive strength tests conducted on the samples of 90 mm thick wall panels by Unique Engg. Testing and Advisory Services, Surat in 2012.

5.3.5 -- Moisture content and Compressive strength tests conducted on the samples of wall panels by Unique Engg. Testing and Advisory Services, Surat in 2010.

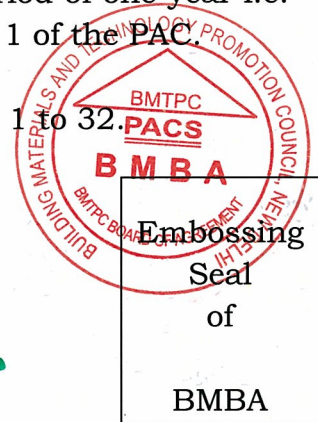
CERTIFICATION

In the opinion of Building Materials & Technology Promotion Council's Board of Agreement (BMBA), **Flyash EPS (Beads) Cement Sandwich Panels** bearing the mark manufactured by M/s Bhargav Infrastructure Pvt. Ltd. is satisfactory if used as set out above in the text of the Certificate. This Certificate **PAC No. 1040-S/2018** is awarded to **M/s Bhargav Infrastructure Pvt. Ltd., Surat.**

The period of validity of this Certificate is for a period of one year i.e. from 14.11.2018 to 13.11.2019 as shown on Page 1 of the PAC.

This Certificate consists of a cover page and pages 1 to 32.





On behalf of BMTPC Board of Agreement, Chairman, Technical Assessment Committee (TAC) of BMBA & Member Secretary, BMTPC Board of Agreement (BMBA) Under Ministry of Housing and Urban Affairs, Government of India

Place: New Delhi, India

Date: **14.11.2018**

PART 6 ABBREVIATIONS

Abbreviations

BMBA	Board of Agreement of BMTPC
BMTPC	Building Materials and Technology Promotion Council
CPWD	Central Public Works Department
ED	Executive Director of BMTPC
IO	Inspecting Officer
MS	Member Secretary of BBA
PAC	Performance Appraisal Certificate
PACH	PAC Holder
PACS	Performance Appraisal Certification Scheme
SQA	Scheme of Quality Assurance
TAC	Technical Assessment Committee (of BMBA)

Performance Appraisal Certification Scheme - A Brief

Building Materials & Technology Promotion Council (BMTPC) was set up by the Government of India as a body under the Ministry of Housing & Urban Poverty Alleviation to serve as an apex body to provide inter-disciplinary platform to promote development and use of innovative building materials and technologies laying special emphasis on sustainable growth, environmental friendliness and protection, use of industrial, agricultural, mining and mineral wastes, cost saving, energy saving etc. without diminishing needs of safety, durability and comfort to the occupants of buildings using newly developed materials and technologies.

During the years government, public and private sector organizations independently or under the aegis of BMTPC have developed several new materials and technologies. With liberalization of the economy several such materials and technologies are being imported.

However, benefits of such developments have not been realized in full measure as understandably the ultimate users are reluctant to put them to full use for want of information and data to enable them to make informed choice.

In order to help the user in this regard and derive the envisaged social and economic benefits the Ministry of Housing & Urban Poverty Alleviation has instituted a scheme called Performance Appraisal Certification Scheme (PACS) under which a Performance Appraisal Certificate (PAC) is issued covering new materials and technologies. PAC provides after due investigation, tests and assessments, amongst other things information to the user to make informed choice.

To make the PACS transparent and authentic it is administered through a Technical Assessment Committee (TAC) and the BMTPC Board of Agreement (BMBA) in which scientific, technological, academic, professional organizations and industry interests are represented.

The Government of India has vested the authority for the operation of the Scheme with BMTPC through Gazette Notification No. 1-16011/5/99 H-II in the Gazette of India No. 49 dated 4th December, 1999.

Builders and construction agencies in the Government, public and private sectors can help serve the economic, development and environmental causes for which the people and Government stand committed by giving preference to materials and technologies which have earned Performance Appraisal Certificates.

Further information on PACS can be obtained from the website: www.bmtpc.org

ANNEX I
(Clause 1.4.2)

Quality Assurance Plan of Flyash EPS (Beads) Cement Sandwich Panels

S. No.	Parameters to be inspected	Requirement Specified	Test Method	Frequency of Testing
I. Raw Materials				
1.	O P Cement 43/53 Grade	As per IS 8112: 2013/12269:2013	Manufacturer's test report	Every batch/lot
2.	Coarse & fine aggregate	As per IS 383:2016	Manufacturer's test report	Every batch/lot
3.	Fly ash Grade 1	As per IS 3812(Part 1):2013	Manufacturer's test report	Every batch/lot
4.	Expanded Polystyrene (ESP)	As per IS 4671: 1984	Manufacturer's test report	Every batch/lot
5.	Fibre cement board	As per IS 14862: 2000	Manufacturer's test report	Every batch/lot
6.	Calcium Silicate Board	EN 14306: 2009 +A1:2013	Manufacturer's test report	Every batch/lot
7.	Additives and bonding agents	Manufacturer's test report	Manufacturer's test report	Every batch/lot
II. Finished Panels				
1.	Density of EPS	IS 4671:1984	Manufacturer's test report	Every six months
2.	Compressive strength	ASTM 495	Manufacturer's test report	Every six months
3.	Flexural strength	ASTM 293	Manufacturer's test report	Every six months
4.	Single point load	ASTM 293	Manufacturer's test report	Every six months
5.	Axial load	ASTM 495	Manufacturer's test report	Every six months
6.	Load carrying capacity	ASTM 495	Manufacturer's test report	Every six months
7.	Thermal conductivity of EPS	IS 3346:1980	Manufacturer's test report	Every six months
8.	Moisture movement	IS 2185 (Part1): 2005	Flow meter	Every six months
9.	Drying shrinkage	IS 2185 (Part1): 2005	Manufacturer's test report	Every six months
10.	Impact strength	ISO 179-2:1999	Manufacturer's test report	Every six months
11.	Sound Transmission class	IS 9901:1981	Manufacturer's test report	Every year

ANNEX II
(Clause 1.6.5)

Process Flow Chart of Flyash EPS (Beads) Cement Sandwich Panels



ANNEX III
(Clause 2.4.1)

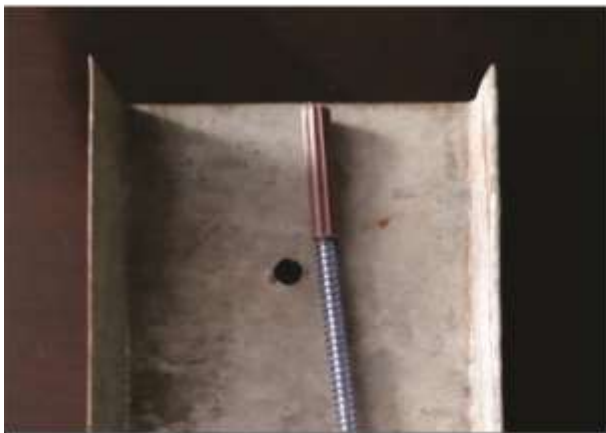
Typical Installation Process



1. Setting the Line



2. Fit the "C" Channel



3. Planting Screw in wall and pillar



4. Installation Panels



5. Correcting, Fixing



6. Planting Bars in Structure Beam



7. Planting Bars in panels



8. Door/Windows Cutting



9. Plumbing Work



10 Installing electrical wires and switches



11. Grouting and filling starch

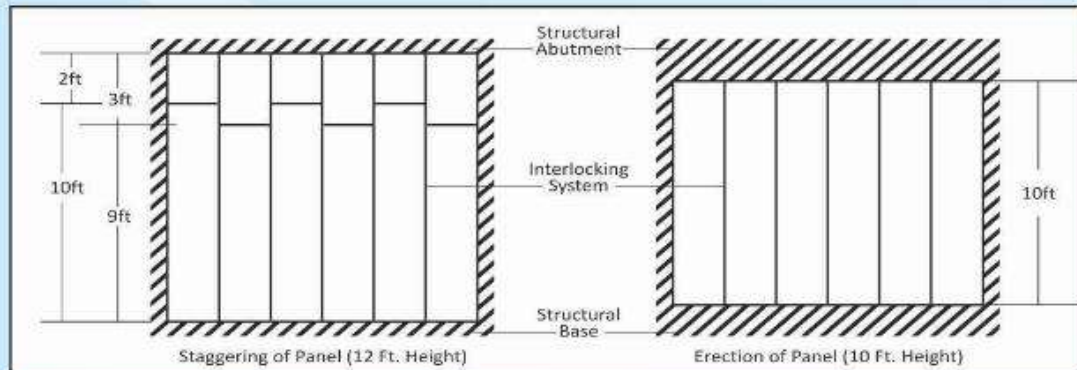


12. Chicken mesh tape and putty

ANNEX IV
(Clause 2.4.1)

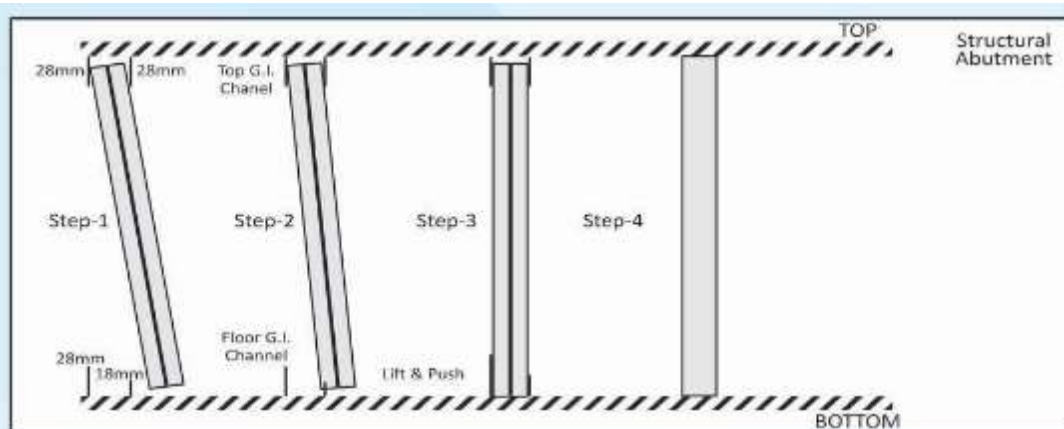
Jointing and Fixing Details

INSTALLATION DETAIL :



Installation Details:

- Step-1: Fixing Of GI-Channel (1.2mm/1mm/0.8mm-Thick) at top & Bottom with Screw
- Step-2: Lift & Push Bhargav Panel to the Appropriate Place
- Step-3: Filling of Joint fillers at interlocking system.
- Step-4: Final Finish



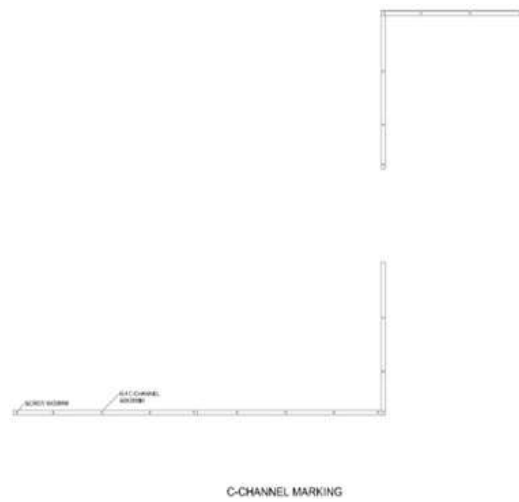
FINAL FINISH DETAIL :

Interior Paint : 2 Coat of acrylic water based emulsion / water based oil bound distemper / synthetic enamel (in special cases as per customer's choice)

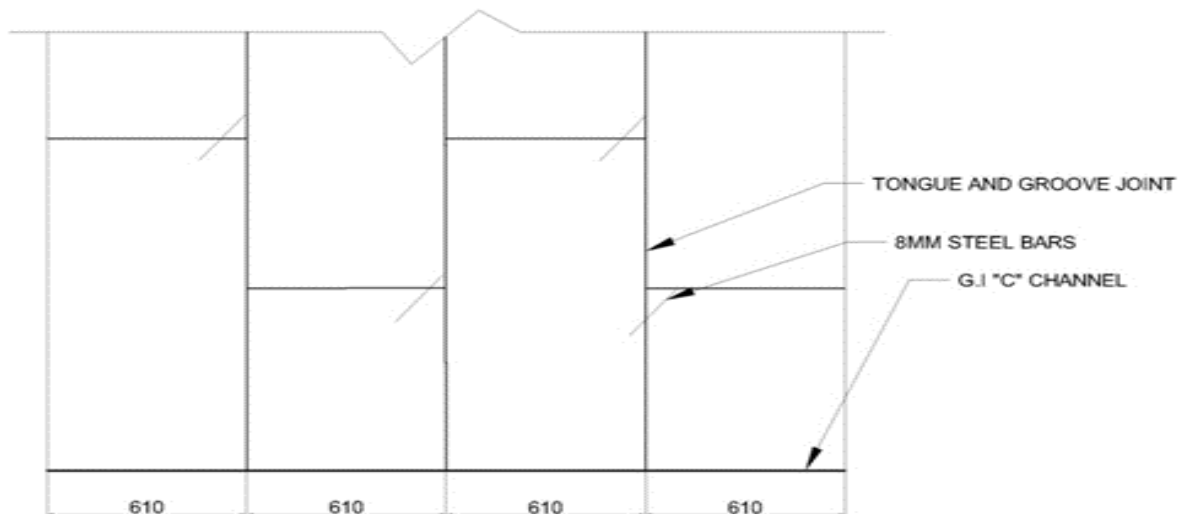
Exterior Paint : 2 Coat of Synthetic enamel / exterior grade emulsion / texture paint as per the choice of customer.

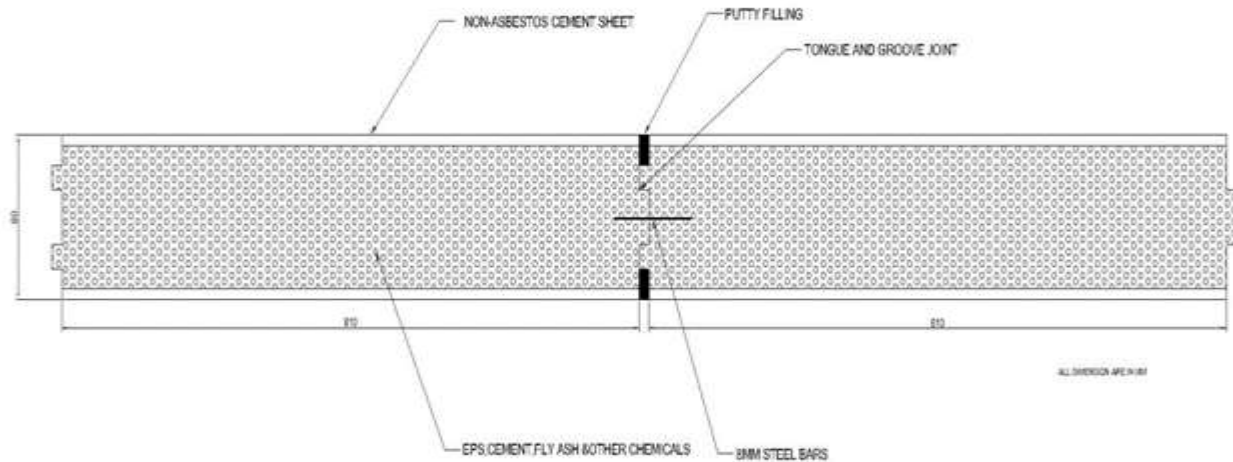
Wall Paper / Veneer : PVA based adhesives.

1. C-Channel marking & cutting of panel

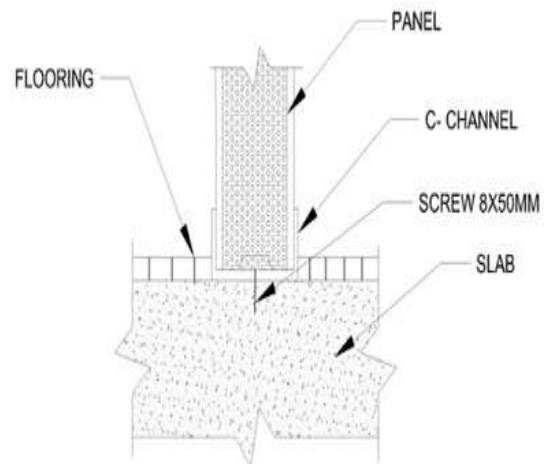


2. Joining of panels with each other

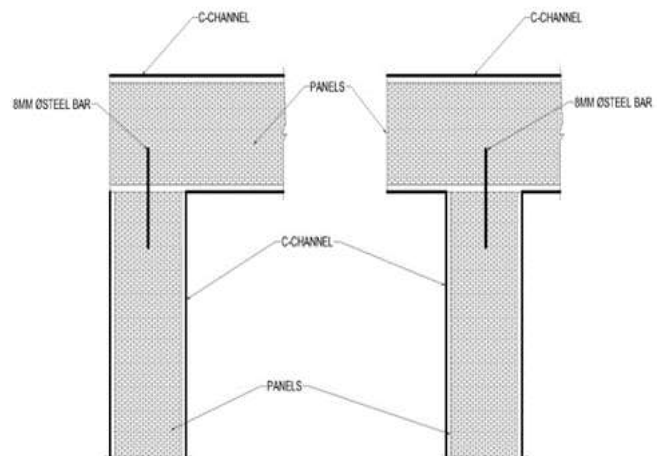




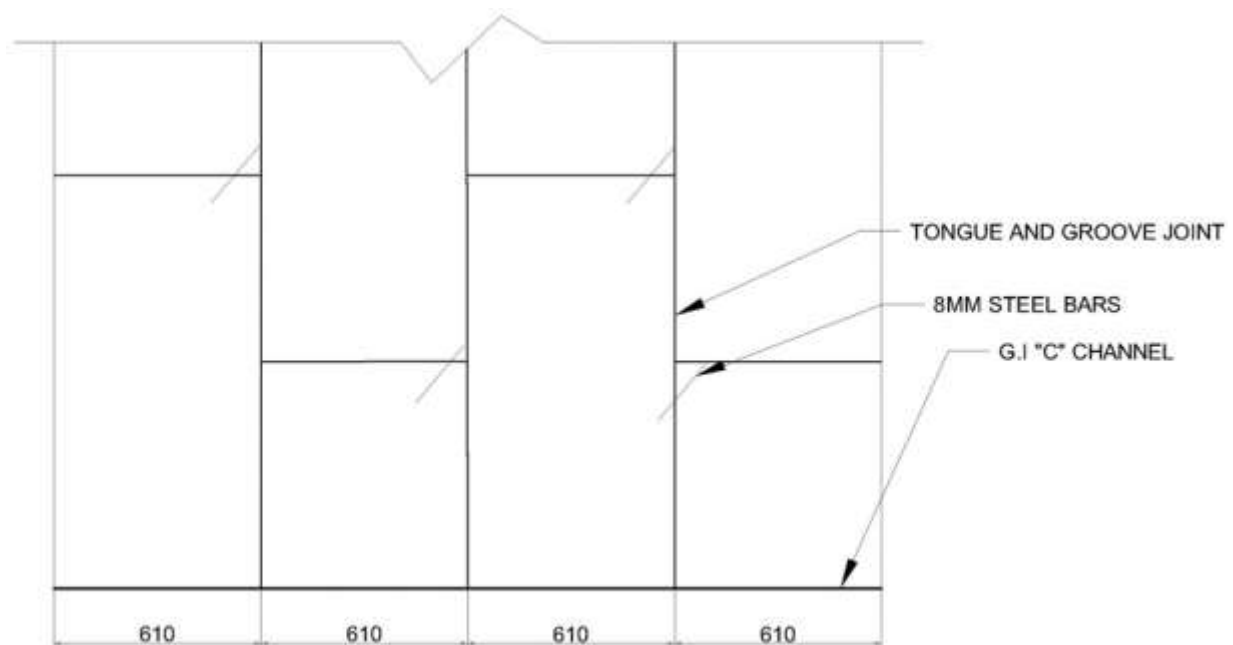
3. Typical joint with floor



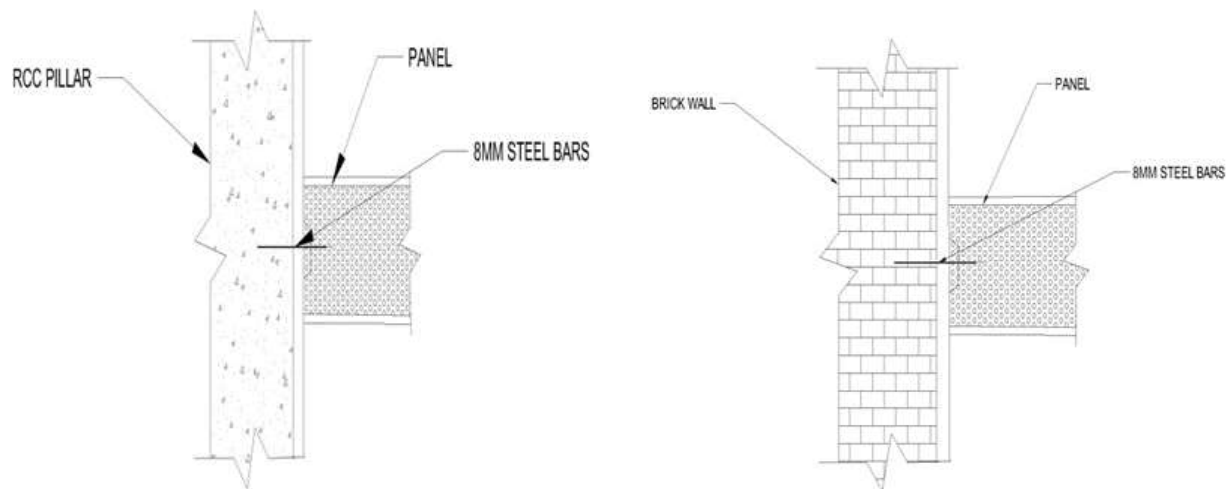
4. L and T joints with panels



5. Joining of upper and lower panels together

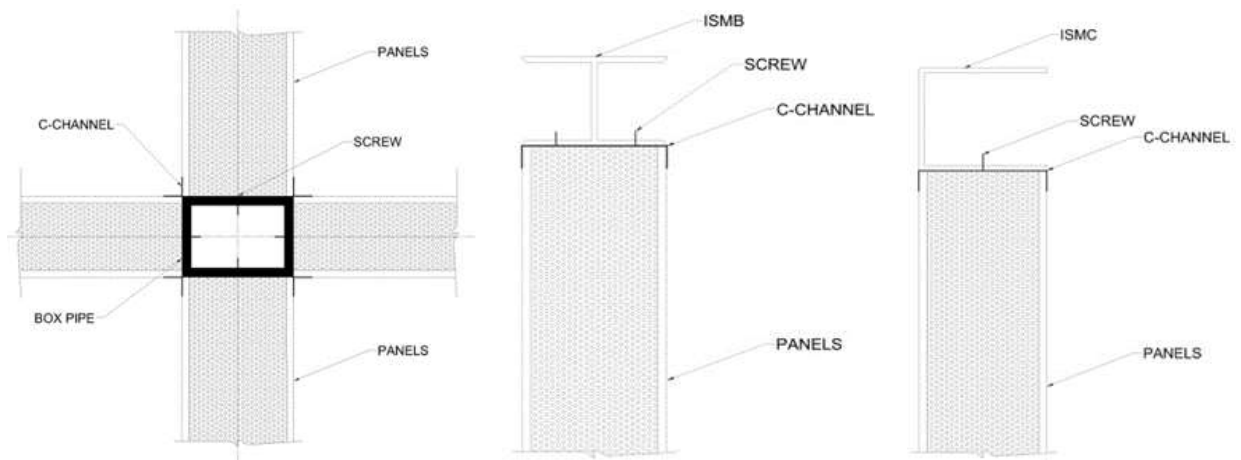


6. Connecting panels with RCC pillar/Brick walls/RCC beams

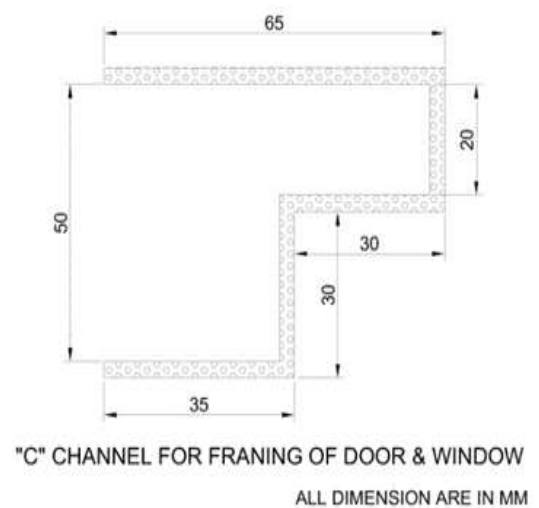
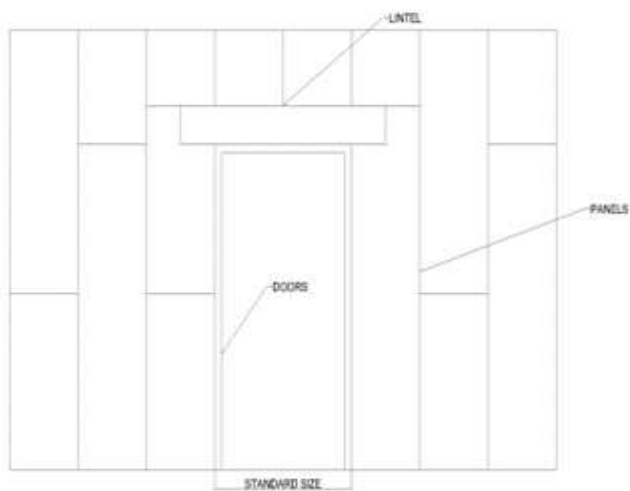


7. Fixing of panels to M.S frame (Beam & Channel)

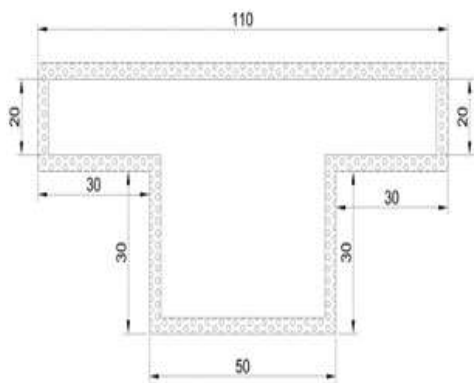
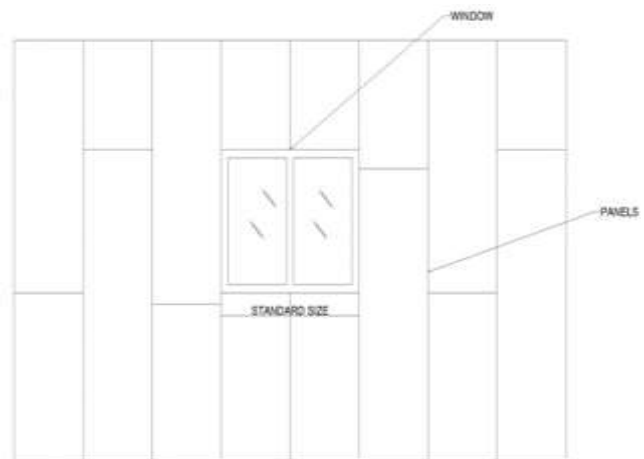




8. Door Fixing



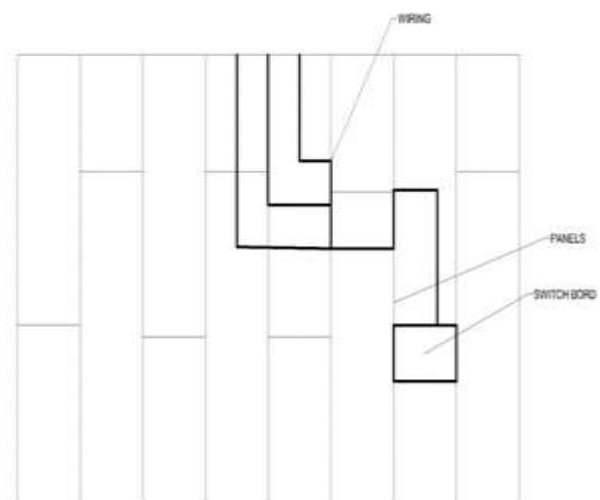
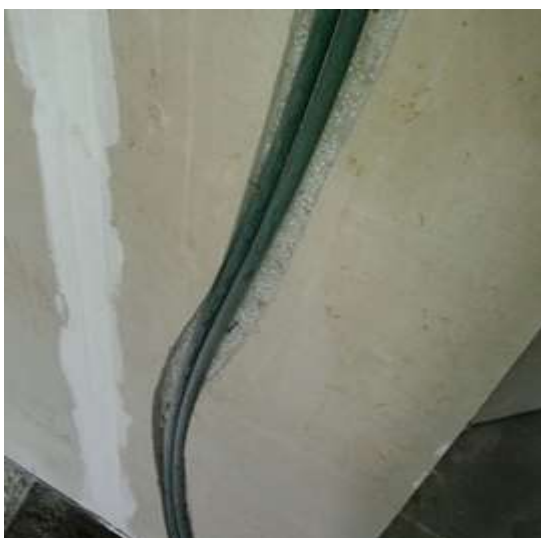
Window Fixing



INTERNAL SECTION FOR FRAMING FOR WINDOW

ALL DIMENSION ARE IN MM

Laying of electrical conduits



Laying of plumbing pipes

