BMTPC
PACS
PERFORMANCE APPRAISAL CERTIFICATION

PERMANENT WALL FORMS

Name and Address of Certificate Holder:	Performance Appraisal Certificate No.
M/s Kalzen Realty Pvt. Ltd. 4th Floor, Corporate Court, Spacion Business Center, Wing B, Survey No. 115/1&29, Financial District, Hyderabad- 500032 Email: info@kalzenrealty.com	PAC No.: **1050-S/2020** Issue No. **01** Date of Issue: **13.01.2020**

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

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Ministry of Housing & Urban Affairs
Government of India
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PERFORMANCE APPRAISAL CERTIFICATE

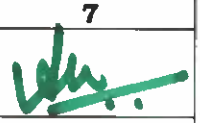
FOR

PERMANENT WALLING SYSTEM

ISSUED TO

M/s KALZEN REALTY PVT. LTD.

STATUS OF PAC No.: 1050-S/2020

S. No	Issue No.	Date of Issue	Date of renewal	Valid up to (Date)	Remarks	Signature of authorized signatory
1	2	3	4	5	6	7
1	1	13/01/2020	13/01/2021	12/01/2021		

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PART 1 CERTIFICATION

1.1 Certificate Holder: M/s KALZEN REALTY PVT. LTD.

4th Floor, Corporate Court,
Spacion Business Center,
Wing B, Survey No. 115/1&29,
Financial Dist., Hyderabad-500032.
Email: info@kalzenrealty.com

1.2 Description of System:

1.2.1 ***Name of the System*** – **"Permanent Wall form" (Permaform)**

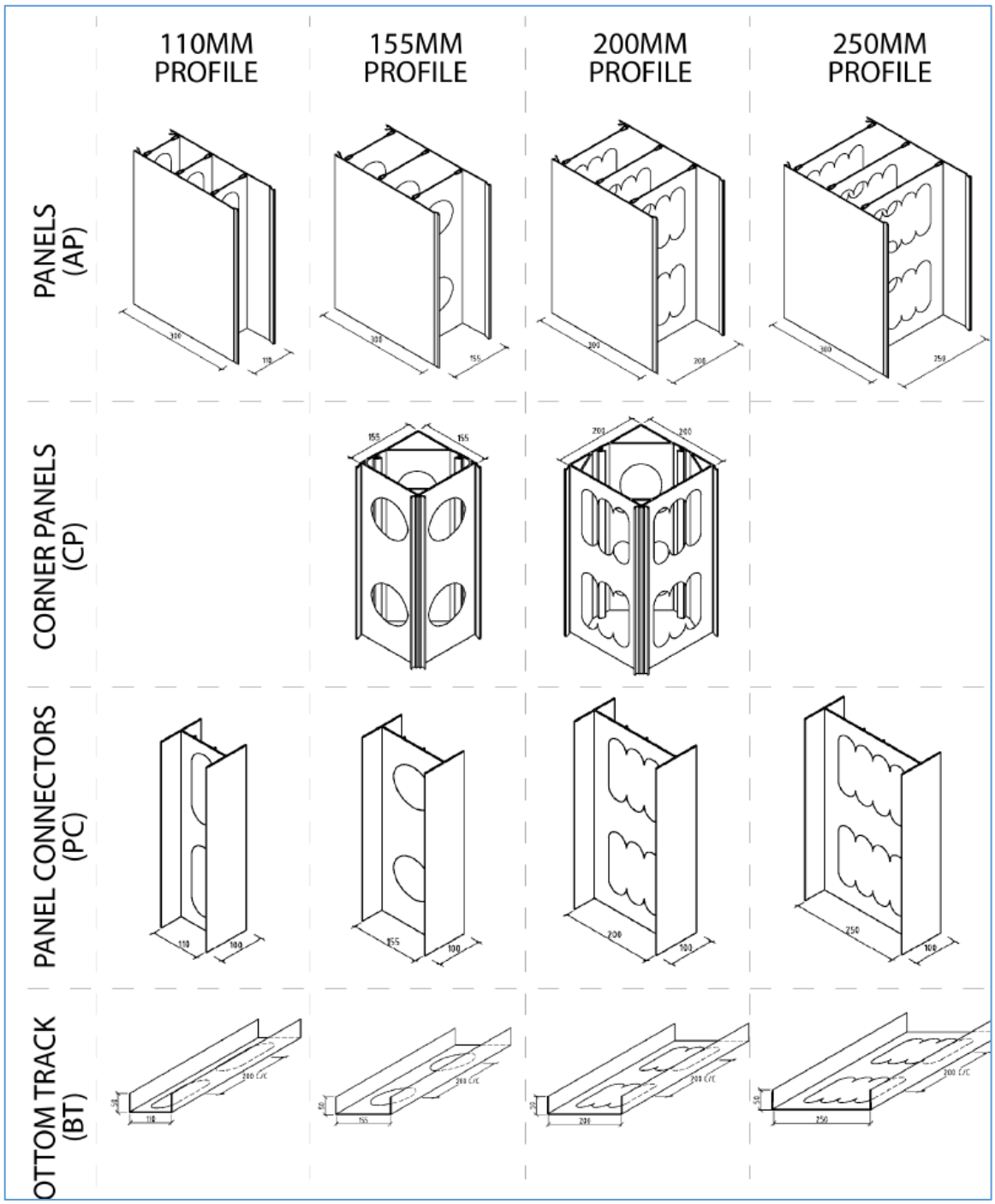
1.2.2 ***Brief Description*** – Permaform is an innovative permanent structural walling system consisting of rigid poly-vinyl chloride (PVC) based polymer components that serve as a permanent durable finished form-work for concrete walls. The extruded components slide and interlock together to create continuous formwork with the two faces of the wall connected together by continuous web members forming hollow rectangular components. The web members are punched with holes to allow easy flow of the poured concrete between the components. Wall components are erected and filled with concrete, in situ, to provide a monolithic concrete wall with enhanced curing capacity due to water entrapment, as the polymer encasement does not allow the concrete to dry prematurely with only the top surface of the wall being exposed to potential drying. The polymer encasement provides crack control vertically and horizontally for the concrete, and provides vertical tension reinforcement thus increasing the structural strength of the wall. The resulting system is unique and provides substantial advantages in terms of structural strength, durability enhancement, weather resistance, seismic resistance, design flexibility, and ease of construction. Steel dowels are necessary to anchor the wall to the concrete foundation.

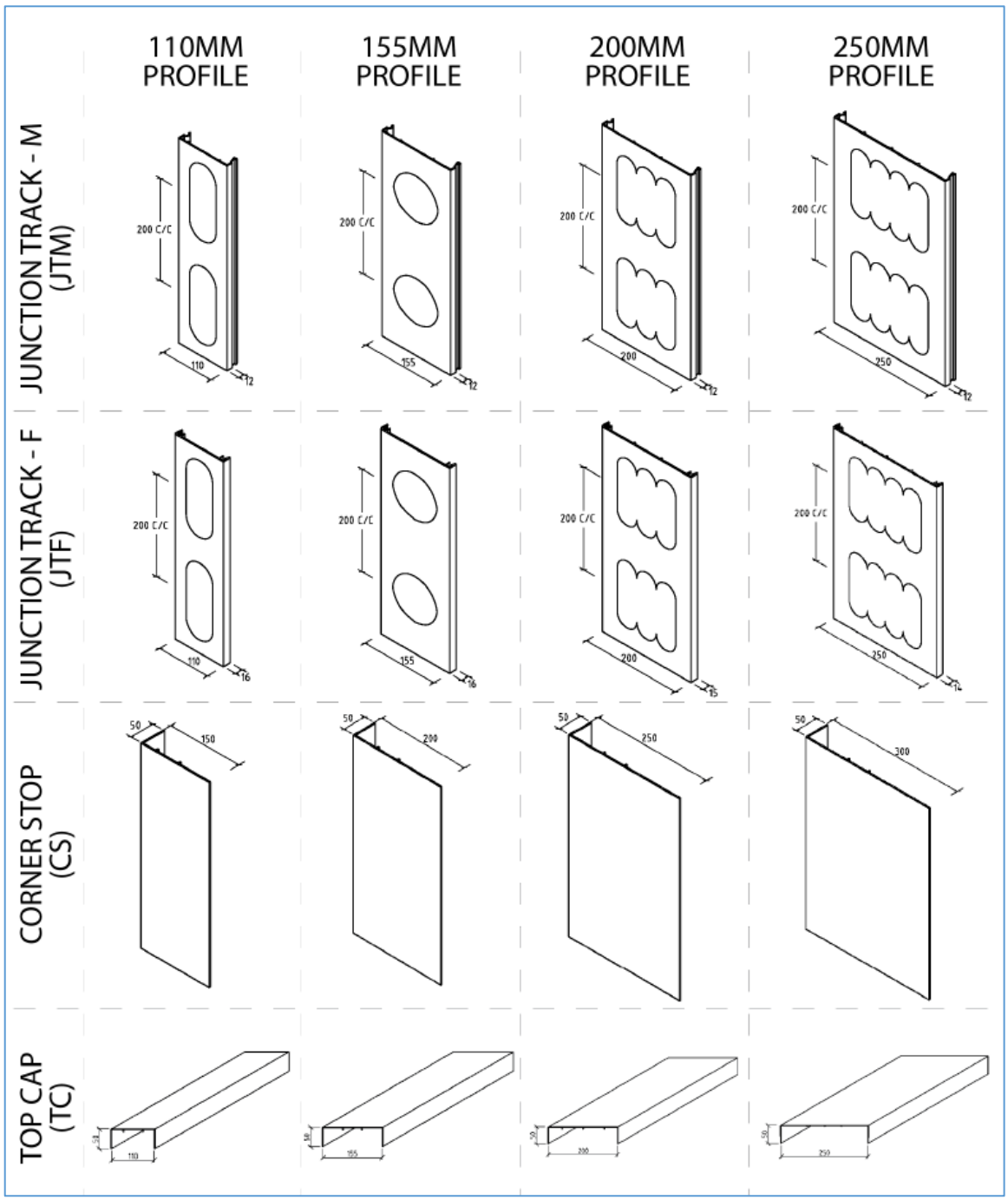
This system is adaptable to any building design i.e. residential, commercial, industrial, low- and high-rise buildings. Wall is very efficient in terms of acoustic performance, weather proof and highly resistant to termites' attack, and is virtually maintenance free. The system has specific advantage to use near coastal areas as durability not affected due to salt-peter action.

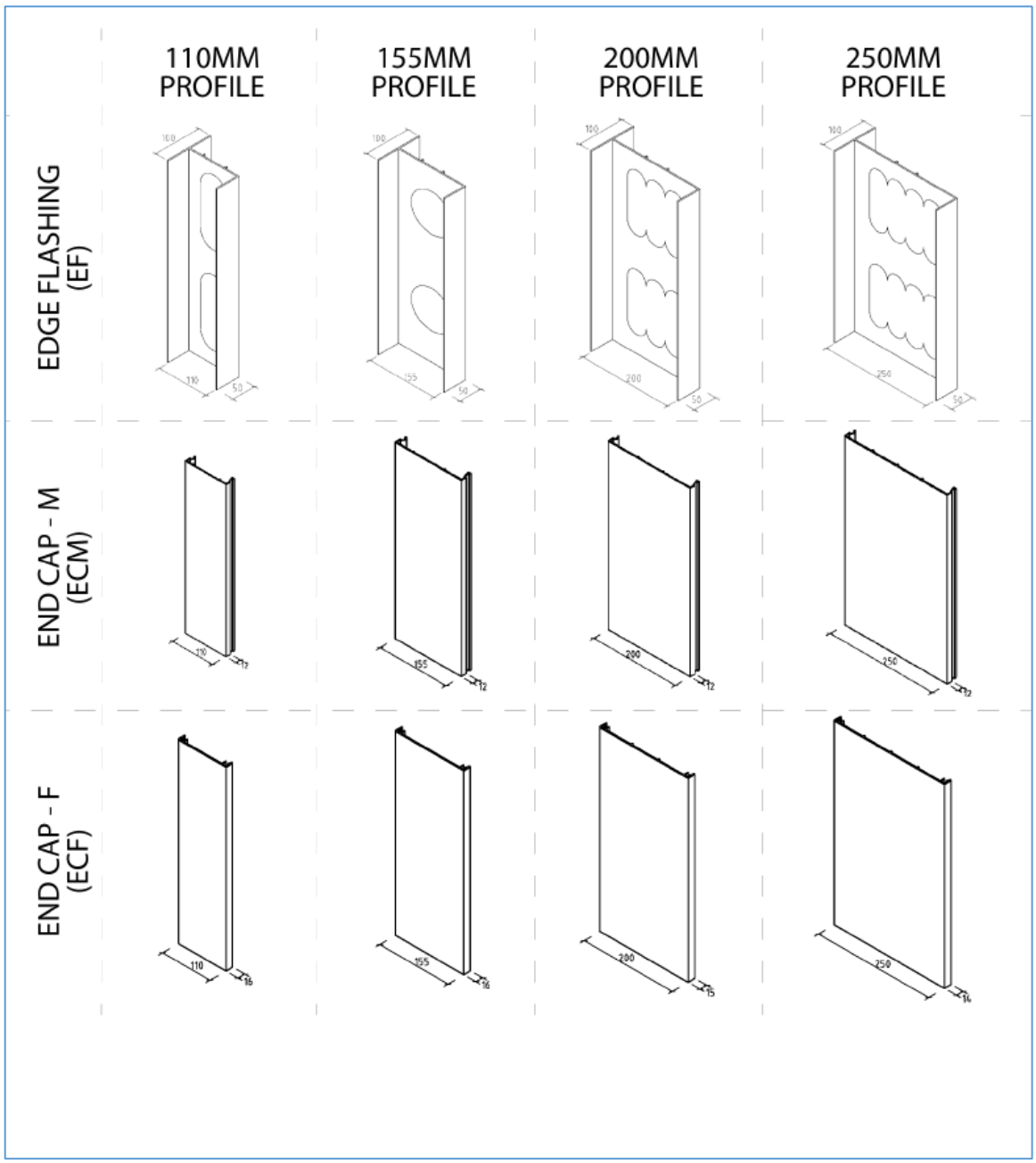
1.2.3 *Size of Panels*

1.2.3.1 Size: The Permaform PVC panels are available in various cross-sectional sizes as per project requirement. The common sizes are 110mm, 155mm, 200mm & 250mm. However customized sizes can also be produced on demand.

1.3 Panel Components




110MM PROFILE
155MM PROFILE
200MM PROFILE
250MM PROFILE
JUNCTION TRACK - M (JTM)
JUNCTION TRACK - F (JTF)
CORNER STOP (CS)
TOP CAP (TC)
200 C/C
110
155
200
250
12
16
50
150
200
250
300


110MM PROFILE
155MM PROFILE
200MM PROFILE
250MM PROFILE
EDGE FLASHING (EF)
END CAP - M (ECM)
END CAP - F (ECF)

1.4 Uses and Limitations of System:

1.4.1 *Uses*:

As high capacity vertical and shear load bearing structural walling in multi-storey construction: the Permaform Wall shall be filled with reinforced concrete suitably designed to resist the combined effect of lateral and gravity loading.

1.4.2 *Limitations* for using Permaform System on the basis of performance, safety, geo-climatic Conditions:

- Permanent PVC Forms Walls shall need preplanned & installed MEP/Services for concealed network.
- Door and Window position shall not be changed after pouring of concrete.
- Erection of panels shall be under supervision of trained staff.

1.5 Design Consideration:

1.5.1 *General*

The aim of structural design is to provide a structure that is durable, serviceable and has adequate strength. The standard sets out minimum requirements for the design and construction of concrete structures and members that contain reinforcing steel or tendons or both. It also sets out minimum requirements for plain concrete members. Walls shall be designed to accommodate a wide range of axial, wind and seismic load conditions, using the equations developed for conventional and slender concrete walls. However, one of the unique properties of Permaform walls is the ability of the permanent polymer formwork to provide concrete confinement and reinforce the concrete in tension. There are two main structural elements used in the wall, namely panel sections and connectors. The webs of these elements have cores which allow lateral flow of the poured concrete between the adjacent cells and provide a mechanical transfer of forces between the concrete and the polymer thus creating a composite action.

1.5.2 *Structural*

1 The buildings constructed with Permaform walls shall be studied and designed as reinforced concrete structure since the parameters required for their design are the same as needed for traditional reinforced concrete.

2 The system is intended for use where Architectural drawings are available and satisfy the various requirements. The Architects and the design team of the concerned developer (client) is responsible for the drawings and overall building

design to comply with the various regulatory requirements applicable to the area.

3 The architects shall liaise with the engineer of the developer and provide the necessary loading information for the design of the foundation.

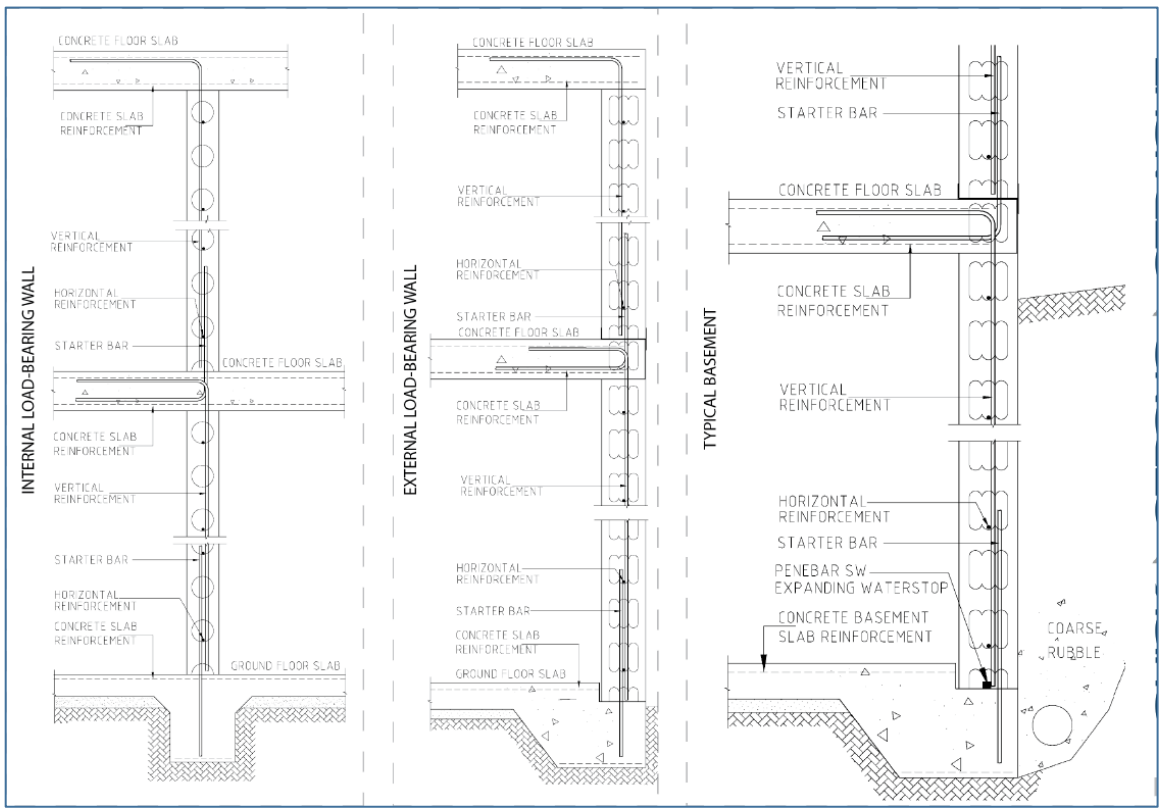
4 The system shall be designed to provide the required performance against the loads to be considered in accordance with codes and the data given by manufacturer for various panels. It shall also provide the required bearing resistance for earthquake and wind forces as per codes wherever applicable.

5 Foundation shall be specifically designed in accordance with provision given in IS 1904:2005. The design concept is same as that of the conventional building design. The safe bearing capacity and soil properties (soil investigation report) shall be provided from the site after soil investigations. Foundation shall be designed based on the soil investigation report. Panels should have starter bars from either foundation or ground floor slab. All foundations should be designed by experienced engineer with appropriate reference.

6 The design assumptions, detailed calculations, references to necessary and detailed design drawings shall be made available on demand, if required. The structural design calculations should clearly demonstrate structural integrity and stability including connection details. Design calculations should have proper sketches annotated in English.

7 In addition, any other requirement regarding safety against earthquake need to be ensured by the designer as per prevailing codal requirements.

1.5.3 *Structural applications*:



1.6 Basis of Assessment

1.6.1 *Scope of Assessment*

1.6.1.1 Scope of assessment- Suitability of Permaform System for use as a load bearing and non-load bearing internal, external and retaining walls to build residential, commercial and industrial buildings.

1.6.2 *Basis of Assessment*

Assessment of the suitability of the PVC Forms for shear walls is based on:

1 Design for Green Building Council of Australia certified by CETEC.

2 Assessment certificate by SGS-CSTC and the CSIRO to comply with fire ratings and heat and smoke release requirements of Building Code of Australia respectively.

3 Scope of inspection included the visit of construction site including competence of technical personnel and status of quality assurance in the factory.

4 Thermal conductivity evaluation on a test specimen of thickness155 mm and110mm with M25 Grade infill concrete by CBRI, Roorkee.

5 Test Reports of acoustic performance, sound transmission and insulation on panel units filled with concrete by Rudds Consulting Engineers Ltd and SLR Acoustics Pty Ltd.

6 Statement of compliance under AS 3610.

1.7 Extrusion Process:

1. Permaform Components are manufactured from extruded polyvinyl chloride (PVC). The extrusions consist of two layers, the substrate (inner) and Modifier (outer). The two layers are co- extruded during the manufacturing process to create a solid profile. A few of the components are manufactured with a single extrusion of solid Modifier material.

2. The extruder for the substrate material laying horizontally and the extruder for the modifier is on approximately a 45^{o} angle. The two extruders operate concurrently. Each extruder has a separate, individual hopper that is filled with the appropriate material. The raw material is fed into the screw barrels of the extruders. The material is heated in the barrels to molten form where the temperature is electronically controlled. The screws push the molten raw material through the die. The substrate and Modifier are combined in the die, with the Modifier covering the base layer substrate.

3. The extruded profile is run through one or more water-cooled vacuum dies until it hardens and is approximately at room temperature. Then the profile is pulled by a belt-puller and is extended through to a chop saw that is activated by a measuring wheel, which ensures pieces are cut to the correct length.

4. Labeling of the components takes place in the coring, cutting, or assembly areas, whichever is performed last.

1.7.1 *Storage*

1. Before and after fabrication, the product is stored on carts, pallets or in isolated stacks. The carts, pallets and stacks are tagged with the Sales Order and Bill of Material Number to provide tracking.

2. Material is stored flat and in a manner that prevents distortion and warping of the finished profiles.

1.7.2 *Packaging and Shipping*

1. Product is normally held for a minimum of 24 hours prior to shipping. Product is packaged in skids, loaded as loose components into trailers or containers, or loaded as assembled sections onto flatbed trucks. Final inspection is performed during packaging and shipping.
2. Packing materials such as cardboard and/or timbers are used to protect product loaded as loose component.

Process flow chart is shown in Annex II.

1.8 Conditions of Certifications

1.8.1 *Technical Conditions*

1. Raw materials and the finished wall components shall conform to the requirements of the prescribed specifications.
2. Kalzen Realty Pvt. Ltd. shall provide full details of erection of the panels to the agency who may be engaged for construction.
3. The Certificate is being issued after visit to the site and satisfactory test results of the panels from Accredited labs/ Institutes as per desired conditions and Standards.

1.8.2 *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.

1.8.3 *Handling of User Complaints*

1.8.3.1 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.

1.8.3.2 The Certificate holder shall implement the procedure included in the Scheme of Quality Assurance (SQA). As part of PACS Certification, he shall maintain data on such complaints with a view to assess the complaint satisfaction and suitable preventive measures taken.

1.9 Certification

1.9.1 On the basis of assessment given in Part 3 of this Certificate & subject to the Conditions of Certification, uses & limitations set out in this Certificate and if selected, installed & maintained as set out in Parts 1 & 2 of this Certificate, the Permaform walling system 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 Permaform Components in accordance with the requirements specified in the relevant Standards. In addition, it shall follow the specific requirements of various materials used in the manufacture of these panels.

2.2 Specifications

2.2.1 ***Raw Materials***

Sr. No.	Major Raw materials/ components
1	PVC-Resin
2.	Calcium carbonate ($CaCO_3$)
3.	Titanium dioxide (TiO_2)
4.	Polyethylene Wax

2.3 Construction and Workmanship

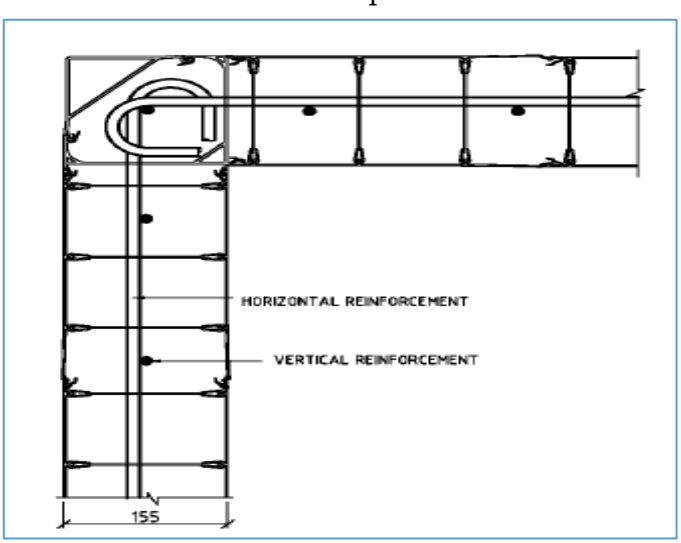
2.3.1 Erection of panels

1. As per the building plan and design, each wall component shall be cut using an automated cutting saw with a fine-tooth blade or grinder fitted with a cutting blade.
2. The Surveyor shall ensure that the walls are clearly and accurately set out. Alignment of bottom track shall be marked and fixed with enough fixtures to ensure the bottom track is securely fastened to the concrete footing or slab.
3. The first course shall begin with a corner piece and the two adjacent panels. The corner piece and adjacent panels needs to be plumbed from adjacent faces.
4. If a panel needs to be cut down to fit within the required dimension (therefore removing a panel anchor), a panel connector shall slide down between the two panels and be secured by screws. It shall be ensured that all the internal rib holes align with each other for the free circulation of concrete through the panels.
5. The pieces shall be checked to ensure that the correct components are installed and properly oriented and that the coring is aligned.
6. Bracing shall be provided at the top and bottom of the corner assembly and the components are screwed together at the top after the assembly is accurately plumbed. Bracing shall be screwed to the panels using one screw per brace ensuring that the screws engaged with the panel face.
7. The erection of Permaform components shall continue sequentially, in accordance with the layout drawings, including the components for doors, windows and openings.
8. Temporary bracing and steel reinforcing bars shall be installed as the wall erection proceeds.

9. A brief checklist of points before pouring of concrete:
   - Metal strip on external wall corners secured by screws to the adjacent panels
   - Aluminum angles on top third of walls
   - Screws on window panels and bottom connectors
   - Sealant on all gaps Bracing for walls at regular intervals
   - Frames for doors and windows
   - 10mm holes on window sill to ensure adequate concrete circulation eliminating voids in the panels

2.3.2 *Placing of Reinforcement*

1. Reinforcing steel bars are to be provided as specified in the structural drawings for the project.
2. Horizontal bars shall be placed through the coring in the components. The horizontal bars shall be spliced to wall at a maximum of 6m length. Once the next stages of panels are installed, it shall be ensured that the concurrent horizontal bar splices over the first bar as per detailed in drawings. The horizontal bars shall be lapped with the previous bars, as specified in structural drawings.
3. Vertical steel reinforcement (re-bar) required as per design shall be placed within the panel cells created by the diaphragms of the panels at regular intervals to correspond with the design of reinforcement required in the wall. The vertical bars shall be tied to the foundation dowels by lifting the connectors approximately 12" (300 mm). This must be done prior to placing the horizontal bars except corners. This will provide solid attachment to footings. The vertical re-bar is most easily put in place full length after the wall assembly is erected and prior to concrete placement. The top of the vertical bar must be tied to the top horizontal bar securing its location.



4. At the first corner, the hooked horizontal bars are installed from both directions. Horizontal hooked bars are installed at the ends of straight walls prior to installing the next corner and are installed at intersections after erecting a sufficient length of wall.

2.3.3 *Concrete Pour*

1. Prior to starting concrete pour, the bracing must be re-checked to ensure that all members are properly installed and that the Permaform walling System components are located, aligned and firm.
2. Concrete shall be poured by boom pump with a 50mm dia. end hose. The concrete specified shall be self-compacting, highly workable, free flowing mix poured from the top into the cavities or as detailed. For small building construction, concrete can be poured manually using a funnel.
3. Filling the panels with concrete shall be done as per pour sequence table shown below. The panels will withstand the dynamic bursting pressure of fresh concrete. Extra midway horizontal bracing is required for panels more than 4m in height.
4. When normal concrete is used, then the use of 25mm concrete vibrator may be recommended to achieve full circulation of concrete around congested areas of reinforcement. Gravitational pressure acts to self-compact the concrete inside the water tight cavities when self-compacting concrete is used.
5. It is preferable and recommended to use SCC (Self compacted concrete) at 150mm slump, such that, it flows freely to all the corners. Gravitational pressure acts to self-compact the concrete inside the water tight cavities when self-compacting concrete is used.

WALLS ABOVE GROUND OR BASEMENT INTERNAL WALLS											
Wall	110MM WALL			155MM WALL				200MM WALL			
Ht(m)	1st pour	2nd pour	3rd pour	1st pour	2nd pour	3rd pour	4th pour	1st pour	2nd pour	3rd pour	4th pour
2.8	1.2	1.6		1.2	1.6			1.2	1.6		
3.0	1.2	1.8		1.2	1.8			1.2	1.8		
3.3	1.2	2.1		1.2	2.1			1.2	2.1		
3.6	1.2	1.2	1.2	1.2	1.2	1.2		1.2	1.2	1.2	
4.0	1.2	1.2	1.6	1.2	1.2	1.6		1.2	1.2	1.6	
5.0				1.2	1.8	2.0		1.2	1.8	2.0	
5.6				1.2	1.2	1.4	1.8	1.2	1.2	1.4	1.8
6.0				1.2	1.2	1.6	2.0	1.2	1.2	1.6	2.0
6.6				1.2	1.4	1.8	2.2	1.2	1.4	1.8	2.2

USE FLOWING SLUMP CONCRETE. ALLOW A MINIMUM OF **45 MINUTES** BETWEEN POURS.
FOR WALLS GREATER THAN 6.6M AND UP TO 8.0M THE FIRST 3 LAYERS FROM THE 6.6M SCHEDU

2.3.4 *Electric and Plumbing Ducts*

The electric and plumbing ducts etc. shall be placed inside the ducts prior to the concrete pour.

2.3.5 *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.

2.4 Manuals

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

2.5 Skilled/Training Needed for Installation

Skilled labourers like carpenter, masons shall be trained on the system and other unskilled labourers shall be supervised by the PAC holder. Training shall be conducted on or off site depending upon the numbers.

2.6 Guarantees/Warranties Provided by the PAC Holder

PAC holder shall provide necessary warranty of the system for manufacturing and installation defects as per contract agreement of construction.

2.7 Responsibility

- Specific design is the responsibility of the architect and structural engineer 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.
- Quality of maintenance of the building is the responsibility of the building owner.
- Providing necessary facilities and space for movement of machines and vehicles is the responsibility of the building developer.

PART 3 BASIS OF ASSESSMENT AND ASSESSMENT PROCEDURE BRIEF DESCRIPTION

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 The assessment is based on the reports of

(i) Design for Green Building Council of Australia certified by CETEC.

(ii) Assessment certificate by SGS-CSTC and the CSIRO to comply with fire ratings, heat and smoke release requirements of Building Code of Australia respectively.

(iii) Statement of compliance under AS 3610.

(iv) Tests done on random samples of the panels taken by IO during inspection on the basis of performance characteristics given by the manufacturer.

(v) Tests have been done in independent laboratories by the manufacturer.

(vi) Construction of a structure at Vetapalem Village in Guntur District, Andhra Pradesh.

Site inspections

Visit of construction site was done. The PVC panel components i.e. corner panel, panel connectors, bottom track and erection process have been seen. Samples have been collected and sent to CBRI for testing. The firm is advised to establish manufacturing unit with complete quality assurance plan at the earliest.

3.2 Tests Performed

3.2.1 *In Independent laboratory*

The performance tests for these panels specified in relevant Standards and listed below have been done on the samples of Concrete (M25) Wall Panel with PVC Form support. The samples conform to the tests as per the performance requirements and specifications given by the manufacturer.

Sr. No.	Material Property	Test	Unit	Value
1.	Moisture content	-		NIL
2.	Thermal Conductivity(K)	ASTM C518: 2017	W/m/K	0.933
3.	Coefficient(U), Wall Thickness, 155mm	ASTM C518:2017	W/m2/K	3.09
4.	Coefficient(U), Wall Thickness, 110mm	ASTM C518: 2017	W/m2/K	3.63

3.3 Execution of Projects

The following projects have been executed as the details given below:

Sr. No.	Building details	Type of building	Status
1	Structure at Vetalpalem village in Guntur District, Andhra Pradesh.	Residential	Completed
2	Sanotio Apartments, Client:Allied Construction, 75-77, West Gosford, NSW, (5 storeys, 41 residences+ basement)	Residential	Completed
3	Melrose Park, Client: Dasco, 661, Victoria (6500 units)	Residential	In progress
4	Lyons Road, Client:Momento projects, 197-199, Lyons Road, Drummoynee, NSW, (15 residences + retail)	Residential	Completed
5	K Apartments, Client:Raw Constructions, 218, Railway PDE, Kograh, NSW, (9 storeys + basement, 45 residences)	Residential	Completed
6	Fleet Lane, Client:RGD, 25-27, Hope Street, South Brisbane, QLD, (66 residences, 10 storeys + 2 basements)	Residential	Completed
7	The Governor, Client:RGD, 44 Brookes Street, Bowens Hill, QLD, (40 residences + retail, 12 storeys + 2 basements)	Residential	Completed
8	The Jade, Client:Monarch, 14 storeys + 3 basements, (172 residences + 5 commercial tenancies)	Residential	Completed
9	Thornton, Client:Urban Property Group, 314 apartments	Residential	Completed
10	Arbor Apartments, Client:RGD, 13 Railway Terrace, Milton QLD, (70 residences, 15 storeys + 3 levels basement)	Residential	Completed

PART 4 STANDARD CONDITIONS

This 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. Complete testing facilities shall be installed for in-process control.

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 clients with details of construction on six monthly basis.

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.

Place: New Delhi
Date of issue: 13.1.2020

Chairman TAC & for and on behalf of
Member Secretary, BMBA
Dr. Shailesh Kr. Agrawal
Chairman, TAC
& Member Secretary, BMBA
Building Materials and Technology Promotion Council
Ministry of Housing and Urban Affairs, Govt. of India
Core 5A, 1st Floor, India Habitat Centre
Lodhi Road, New Delhi-110003

PART 5 LIST OF STANDARDS AND CODES USED IN ASSESSMENT

IS: 875 (Part-1) -1987 (Reaffirmed 2008)	Code of Practice for Design Loads (Other than Earthquake) for Buildings and Structures-Unit Weights of Building Materials and Stored Materials.
IS: 875 (Part-2) -1987 (Reaffirmed 2008)	Code of Practice for Design Loads (Other than Earthquake) for Buildings and Structures-Imposed loads
IS: 875 (Part-3) -1987 (Reaffirmed 2003)	Code of Practice for Design Loads (Other than Earthquake) for Buildings and Structures –Wind Loads
IS: 875 (Part-5) -1987 (Reaffirmed 2003)	Code of Practice for Design Loads (Other than Earthquake) for Buildings and Structures - Special Loads and Load Combinations
IS: 456 -2000 (Reaffirmed 2005)	Code of Practice for Plain and Reinforced Concrete
IS: 1893 (Part-1) -2002	Criteria for Earthquake Resistant Design of Structures - Part 1: General Provisions and Buildings
IS: 13920-1993 (Reaffirmed 2008)	Ductile Detailing of reinforced concrete structures subjected to seismic forces –code of practice.
IS 16700-2017	Criteria for structural safety of Tall Concrete Buildings.
IS: 1904–1986 (Reaffirmed 2006)	Code of practice for Design & Construction of foundations in Soils: General Requirements.
IS: 1642-1989 (Reaffirmed 2000)	Code of practice for Fire Safety of Buildings (General): Details of Construction.
IS 2950 (Part 1):1981 (Reaffirmed 2008	Code of Practice for Design & Construction of raft foundation
IS 2974: 1992 (Part 3) (Reaffirmed 2006)	Code of Practice for Design & Construction of machine foundations.
IS 10262:2009	Guidelines for Concrete Mix Proportioning
ASTM C 518:2017	Standard test methods for steady state thermal transmission properties by means of heat flow meter apparatus
ASTM D 638:2014	Standard test methods for tensile properties of plastic
ASTM D 1621	Standard test methods for compressive properties of rigid cellular plastic
ASTM D 1622:2008	Standard test methods for apparent density of rigid cellular plastic
ASTM D 4226:2016	Standard test methods for impact resistance of rigid PVC building products
ASTM E 84:2007	Standard test methods for surface burning characteristics of building materials
ASTME119-2019	Standard test methods of tests of building construction and materials

CERTIFICATION

In the opinion of Building Materials & Technology Promotion Council's Board of Agreement (BMBA), Permanent Wall Forms bearing the mark manufactured by M/s Kalzen Realty Pvt. Ltd. is satisfactory if used as set out above in the text of the Certificate. This **Certificate No. 1050-S/2020** is awarded to **M/s Kalzen Realty Pvt. Ltd.**

The period of validity of this Certificate is for a period of One year i.e. from 13/01/2020 to 12/01/2021 as shown on Page 1 of the PAC.

This Certificate consists of a cover page and pages 1 to 40.

Embossing Seal of BMBA

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

Dr. Shailesh Kr. Agrawal
Chairman, TAC
& Member Secretary, BMBA
Building Materials and Technology Promotion Council
Ministry of Housing and Urban Affairs, Govt. of India
Core 5A, 1st Floor, India Habitat Centre
Lodhi Road, New Delhi-110003

Place: New Delhi, India
Date: 13.1.2020

PART 6 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

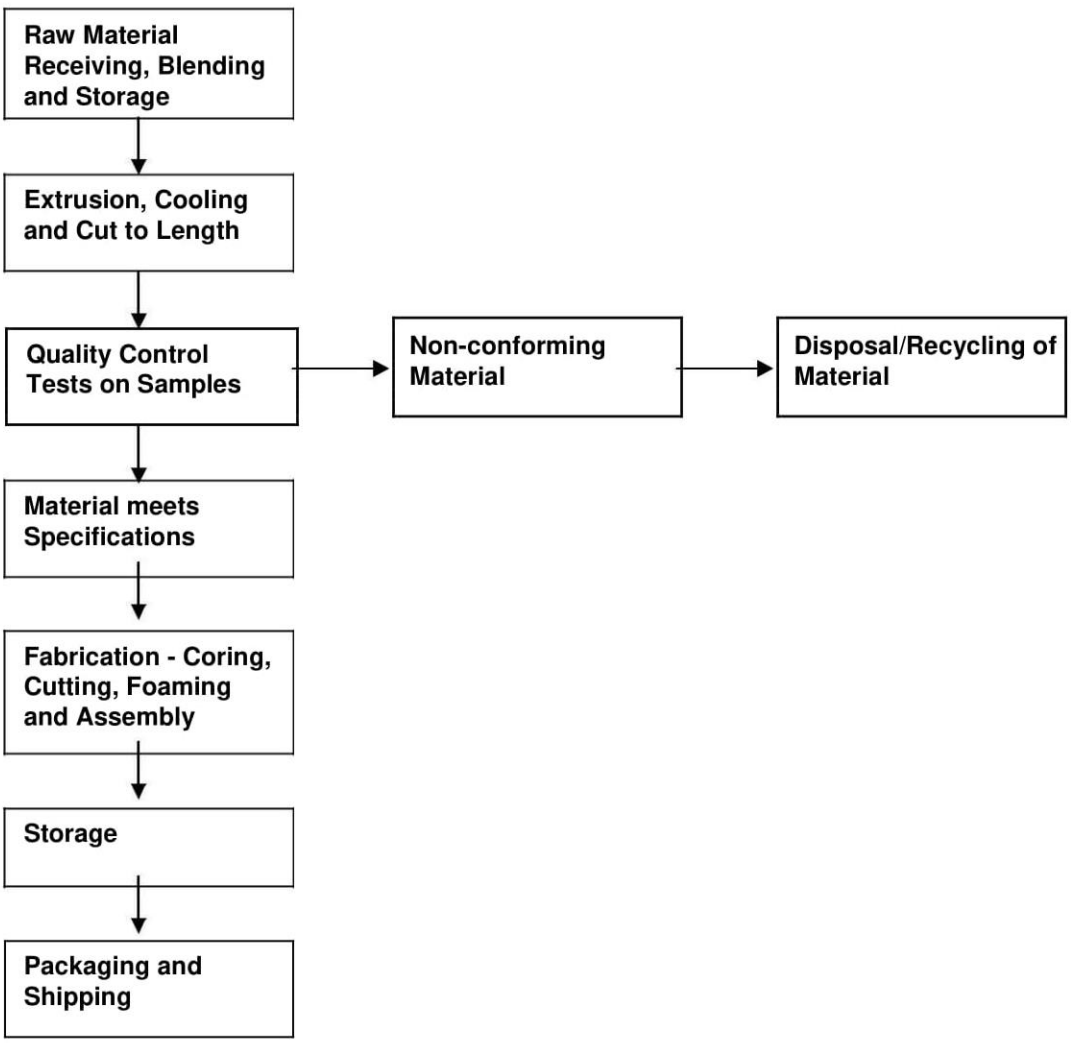
ANNEX I

QUALITY ASSURANCE PLAN FOR PERMANENT FORMWORK SYSTEM – KALZEN REALTY PVT.LTD.

Sr. No.	Performance Characteristics	Criteria	Test Method	Reference to relevant clause of NBC, Building bye laws etc., if applicable
1.	Density	32kg/m^3	ASTM D 1622:2008	One time or as per Requirement
2.	Thermal conductivity	0.150-0.160(at 75^0F)	ASTM C518: 2017	One time or as per Requirement
3.	Flaming	< 250	ASTM E84: 2007	One time or as per Requirement
4.	Tensile strength	30MPa	ASTM D 638:2014	One time or as per Requirement
5.	Impact strength	0.98kg-m	ASTM D 4226:2016	One time or as per Requirement
6.	Fire resistance	240 minutes	ASTM E 119: 2019	One time or as per Requirement

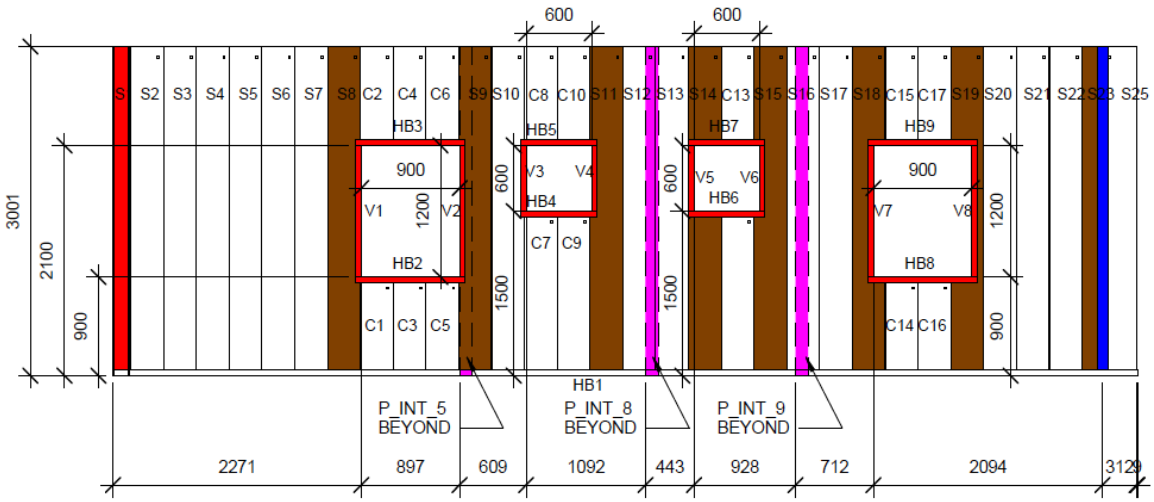
ANNEX II

PRODUCTION FLOW CHART



ANNEX – III

SAMPLE SHOP DRAWINGS AND NOMENCLATURE



AP--- : PERMAFORM PANEL	
AP--- : CUT PANEL	
CP--- : CORNER PART	
CTC--- : COLUMN TOP CAP	
CBC--- : COLUMN BOTTOM CAP	
ECF--- : END CAP FEMALE	
ECM--- : END CAP MALE	
JTF--- : JOINT FEMALE	
JTM--- : JOINT MALE	
PC--- : PANEL CONNECTOR	
BT--- : BOTTOM TRACK	
TC--- : TOP CAP	

ANNEX - IV

ERECTION DETAILS

1. **Bottom track:** Before beginning the installation of Bottom Tracks, ensure the concrete footing/slab is clear, flat and free of debris. The bottom tracks are first laid and fixed into the plinth to create proper channels for fixing the wall panels.

2. **Panel preparation:** The skins and ribs are assembled to prepare the wall panels for installation atop the bottom tracks.

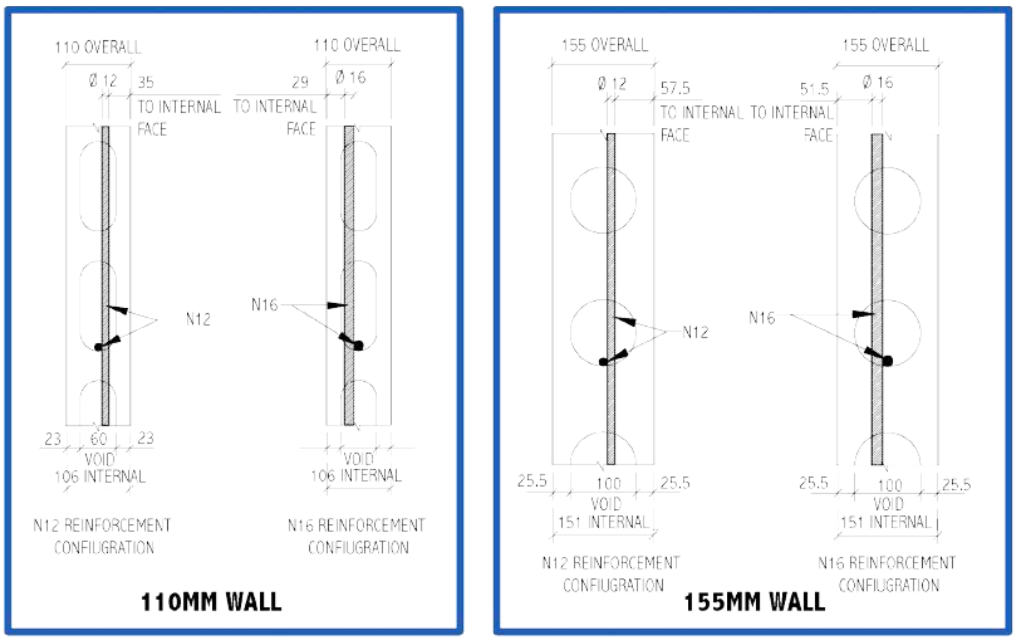
3. **Wall installation:** Beginning with the corner panel, the assembled wall panels are slid into each other side by side till all the walls of the structure are erected. Place panels carefully to accommodate starter bars and other detail. Panels clip and slide into place and lock together with ease. Use a rubber mallet or similar for adjustment and persuasion to height and line. Should any of the starter bars foul on the panel's internal ribs, the bar can be adjusted by being pulled or pushed clear of the rib. Continue to place panel-to-panel, repeating the process of bracing and propping to ensure plumb – and screwing off at bottom tracks.


KALZEN
ConTech
FASTER
AFFORDABLE
SUSTAINABLE

Panels above windows and doors are cut according to size and slide above the frames.

4. **Reinforcements:** The vertical rebars are first slid from atop the panels, tied to starter bar at the bottom. The horizontal rebars are then slid through the holes in the ribs. The bars are bet at the corner as seen here and the vertical rebar slid through the horizontal bents ensure that the bars stay in position. Where the walls continue through to the next floor, the vertical bars are left longer by the amount required to clear the slab and act as the starter bar for the next floor.

Reinforcement configuration:



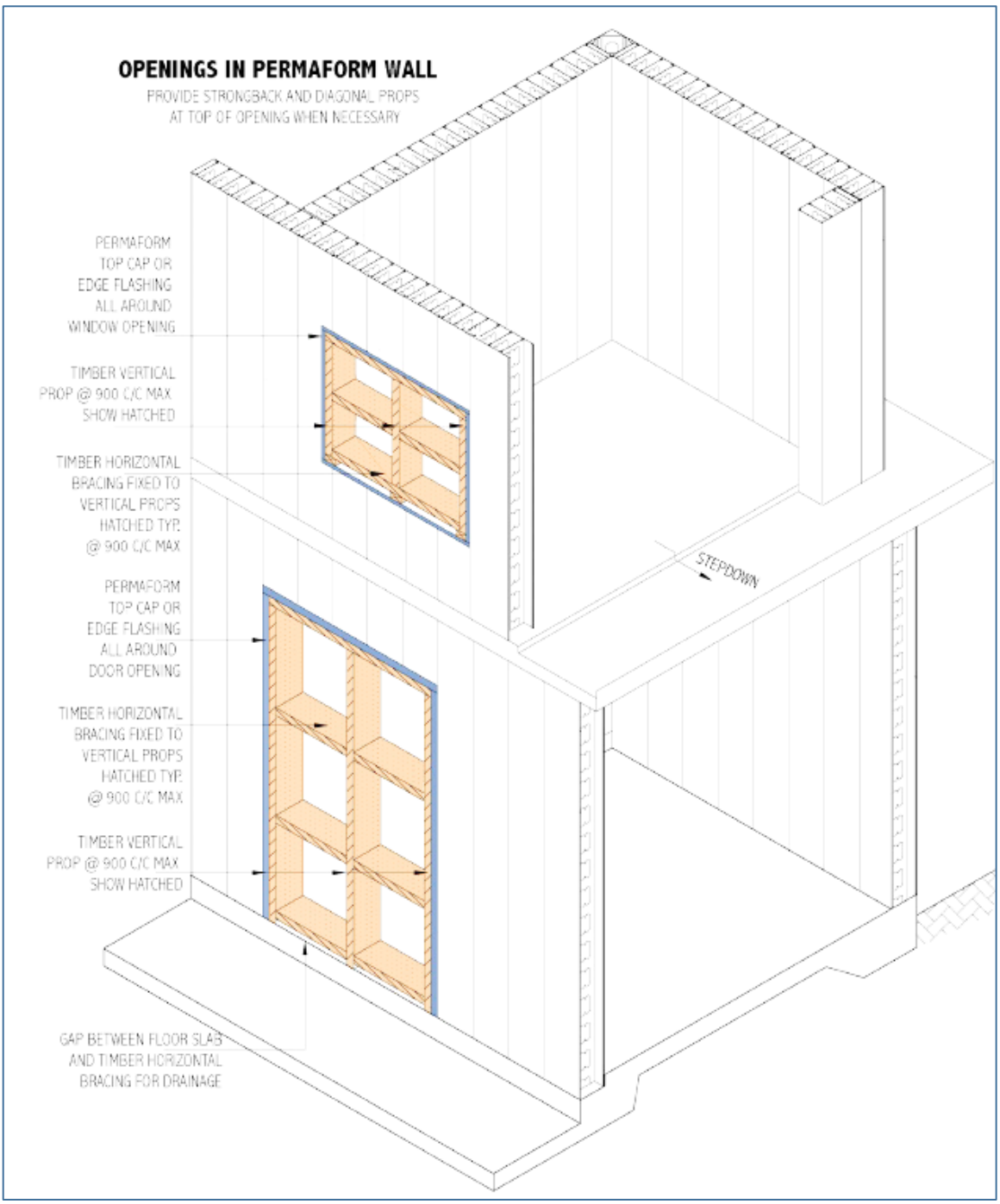
When the vertical bars are in place, tie the top of each vertical bar to a horizontal length of reinforcement (lacer bar) using normal reinforcement tie wire as specified. This holds the bars in the correct place during the concrete pour.

5. Services

The services lines are fixed inside the panels that will be covered by concrete till the outlet.

6. Windows and doors

After the top caps and end caps are put, the frames for doors and windows are set, giving the strength to deal with the concrete pour.


OPENINGS IN PERMAFORM WALL
PROVIDE STRONGBACK AND DIAGONAL PROPS
AT TOP OF OPENING WHEN NECESSARY
PERMAFORM
TOP CAP OR
EDGE FLASHING
ALL AROUND
WINDOW OPENING
TIMBER VERTICAL
PROP @ 900 C/C MAX
SHOW HATCHED
TIMBER HORIZONTAL
BRACING FIXED TO
VERTICAL PROPS
HATCHED TYP.
@ 900 C/C MAX
PERMAFORM
TOP CAP OR
EDGE FLASHING
ALL AROUND
DOOR OPENING
TIMBER HORIZONTAL
BRACING FIXED TO
VERTICAL PROPS
HATCHED TYP.
@ 900 C/C MAX
TIMBER VERTICAL
PROP @ 900 C/C MAX
SHOW HATCHED
GAP BETWEEN FLOOR SLAB
AND TIMBER HORIZONTAL
BRACING FOR DRAINAGE
STEPDOWN

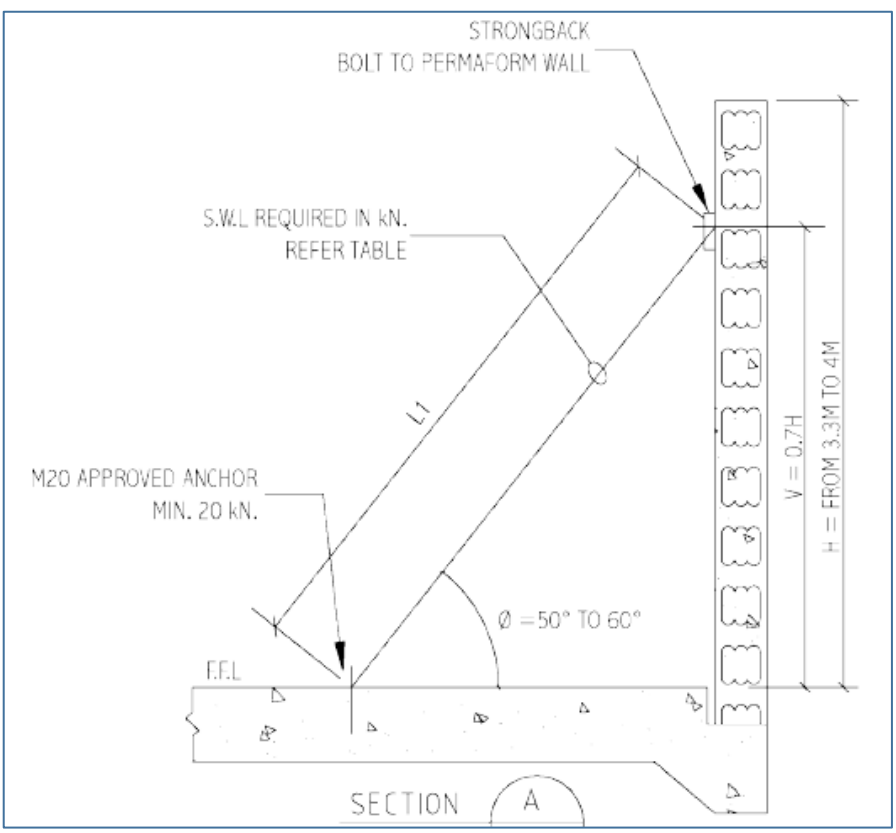
7. Final touches before concreting

- Concrete footing flat and free of debris
- Bottom track installed correctly
- Water proofing/hydrophilic sealant installed correctly
- All walls installed in correct locations as per drawings and survey
- All penetrations locations provided and installed in accordance with site mark-out
- All walls have been installed straight and plumb
- No ribs/diaphragms are damaged, split or cracked
- All wall panels have been clipped in correctly with no visible gaps
- All finish wall heights have been installed as per drawings and specifications
- All corners and stop ends are adequately braced
- All window/door openings have been formed and braced correctly
- All walls checked for areas of minor damage and patched appropriately
- For walls above 4m: midway horizontal strong back to be screwed to panels & propped
- Props installed at a maximum spacing of 1.8m

Corner metal strip

Window end caps

Panel bracings with aluminum angle



8. Top view

9. Concreting

When moving around the walls filling them, remember that the shorter or thinner a section of wall is, the faster it will fill. Do not leave finished concrete surface uneven at the top of forms. Following compaction at the top of the walls, screed the concrete to achieve a smooth and even surface.

ANNEX - V

SAMPLE PANEL ARRANGEMENT