

Name and Address of Certificate Holder: **M/s UAL Industries Ltd. UAL-KON\_CRETE 16, Mayfair Road, Kolkata-700019 West Bengal** Tel: (+91-33) 4011 5100-99 Fax: (+91-33) 4011 5139/5199 Email: enquiry@ualind.com Performance Appraisal Certificate No. PAC No.:**1056-P/2021** 

Issue No. 01

Date of Issue: 10.02.2021



# pwlbc

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

Tel: +91-11-2463 6705, 2463 8097; Fax: +91-11-2464 2849 E-mail: <u>info@bmtpc.org</u> Web Site: <u>https://www.bmtpc.org</u>

KON\_CRETE REINFORCED AUTOCLAVED AERATED CONCRETE PANELS

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





## **PERFORMANCE APPRAISAL CERTIFICATE**

FOR

## **KON\_CRETE REINFORCED AUTOCLAVED AERATED CONCRETE PANELS**

**ISSUED TO** 

M/s UAL Industries Ltd., UAL-KON-CRETE, Howrah, West Bengal

## STATUS OF PAC No:1056-P/2021

S.	Issue	Date of	Date of	Amendment		Valid up	Remarks	Signature of
No	No.	Issue	renewal	No.	Date	to (Date)		authorized signatory
1.	2.	3.	4.	5.	6.	7.	8.	9.
1	01	10/02/2021	-			09/02/2022	-	un

PAC No. 1056-P/2021

Issue No. 01 Date of issue: 10/02/2021

# bmlpc



#### **CONTENTS**

PART1 CERTIFICATION	3
1.1 Certificate Holder	3
1.2 Description of Product	3
1.3 Uses & Limitations of the panels	5
1.4 Assessment	5
1.5 Manufacturing Machinery & Equipment	6
1.6 Manufacturing Process	7
1.7 Conditions of Certification	9
1.8 Certification	10
PART 2 CERTIFICATE HOLDER'S TECHNICAL SPECIFICATIONS	11
2.1 General	11
2.2 Specifications for the product	11
2.3 Production & Inspection	11
2.4 Selection and Installation	11
2.5 Storage handling and transportation	11
2.6 Installation Procedure	11
2.7 Critical details	18
2.8 Skills/ training needed for installation	19
2.9 Warranties provided by the PAC holder	19
2.10 Service provided by the PAC holder to the customer	19
2.11Responsibility	19
PART 3 BASIS OF ASSESSMENT AND BRIEF DESCRIPTION OF ASSESSMENT PROCEDURE	20
3.1 Basis of Assessment	20
3.2 Laboratory tests done for assessment	20
3.3 Supply of the Products	21
PART 4 STANDARD CONDITIONS	23
PART 5 LIST OF STANDARDS AND CODES USED IN ASSESSMENT	26
CERTIFICATION	27
PART 6 ABBREVIATIONS	28
PERFORMANCE APPRAISAL CERTIFICATION SCHEME – A BRIEF	29
ANNEX I Quality Assurance Plan (QAP)	30
ANNEX II Manufacture Flow Char ANNEX III Installation Manual	33 34





## PART 1 CERTIFICATION

## 1.1Certificate Holder

M/s UAL Industries Ltd. UAL-KON\_CRETE 16, Mayfair Road, Kolkata-700019 West Bengal Tel: (+91-33) 4011 5100-99 Fax: (+91-33) 4011 5139/5199 Email: enquiry@ualind.com Website: www.ualind.com CIN: U26943WB1974PLC140600

## **1.2** Description of Product

## 1.2.1 Name of the Product – Kon\_Crete Reinforced Autoclaved Aerated Concrete (AAC) Panels for Wall & Floor/Roof

## 1.2.2 Brief Description

KON\_CRETE Reinforced AAC wall & floor/roof panels are innovative Autoclaved Aerated Concrete (AAC) products, having properties such as light weightness, high thermal resistance, acoustics & energy efficiency. It is a steam cured cementitious material manufactured from a mix of flyash, cement and other additives giving the material a unique cellular lightweight internal structure.

The panels can be used for external & internal walls, floor & roof applications in any type of buildings.

## 1.2.3 Type and size:

The KON-CRETE reinforced AAC panels are grouped into two basic types based on its application;

- Wall panel
- Floor / roof panel

## Product specification: Walling Panel

Grade (As per IS 6072: 1971)	Class C	Class D
Mean compressive strength (Mpa)	>5.0	>3.5
Mean dry Density (Kg/ M3)	651-750	551-650
Dry thermal conductivity (W/m2.k)	<0.26	< 0.21
Drying Shrinkage %	<0.09	<0.09





## **Product Dimension**

	Partition Wall	External wall	Floor/ roof
Length	Up to 6 Meter.	Up to 6 Meter.	Up to 6 Meter.
	(Customizable)	(Customizable)	(Customizable)
Width	600 mm. fixed	600 mm. fixed	600 mm. fixed
Thickness	100mm,125 mm	150mm,200mm,250mm	According to
			the design
			criterion.
Lintel	750 mm		
Beams	1000 mm	600 mm	Fixing of Doors
	1200 mm		and Windows
	1500 mm		

The picture of the product (Figure-1) is as per the details below;



Fig. 1

## 1.2.4 Tolerances

## Tolerances for dimensions shall be the following;

Length	+-5 mm
Width	+-1.5 mm
Thickness	+-1.5 mm
Diagonals ( Max)	5 mm
Edge straightness	1.5 mm
deviation( Max)	





The panels shall be produced in accordance with BIS specification IS 6072:1971 (Wall Panels) and IS 6073:2006 (Roof / Floor Panels).

## 1.3 Use of the KON\_CRETE Panels & Limitations

## 1.3.1 Uses

The reinforced AAC panels can be used for all kinds of modern-day construction with applications as external, internal, partition walls & floor / roof etc. Along with suitability for versatile needs of the building process, AAC Panels also possess advantages over conventional building materials for an array of application areas;

- Multistoried residential construction.
- Small modular residential construction.
- Commercial construction.
- Industrial warehouse and Sheds.
- Shopping malls.
- Hotels and resorts.
- Hospitals

## 1.3.2 Limitations

Although reinforced AAC panel has been a long – accepted construction material, the literature is not without reference to limitations in its use. For example used in modular units, any deviations to its standard sizes could lead to extra cost.

Some frequent reported limitations are;

- i) Chipping of material.
- ii) The face tends to get damaged easily, e.g. from scaffolding.
- iii) External faces are highly hydroscopic and it needs protective render which can breathe and should be protected from standing water.
- iv) Anchor fixing on units needs careful planning to avoid pullout, especially for dynamic loads.
- v) Caution should be exercised in transporting and handling the units to avoid damage.

## 1.4 Assessment

**1.4.1** Scope of Assessment – Suitability of KON\_CRETE panels for use as non-load bearing walls, Floor / Roof Slab System and compound/boundary walls in residential and commercial buildings etc.





## 1.4.2 Basis of Assessment

The assessment is based on the followings;

- i) Virtual Inspection of the manufacturing plant and equipment used.
- ii) 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.**
- iii) Reports of tests got done on 2600x600x200 mm and 3000x600x200 panels from Bureau Spectro Analytical Labs, Delhi by the manufacturer & other test results for performance characteristics.
- **1.4.3 Scope of Inspection** Scope of inspection through video conferencing in prevailing scenario of Covid-19 included the verification of production, performance and testing facilities at the factory including competence of technical personnel and status of quality assurance in the factory.

## 1.4.5 Design Consideration

- *i)* The System is presently recommended with non-load bearing application of walls & floor/roofing panels till the time the evaluation results regarding use of such panels as structural members by Institution of Repute (IITs/NITs/CSIR Labs) is provided to BMTPC.
- *ii)* The structural engineers and building designers associated with such type of construction should be thoroughly familiar with the various structural aspects. It is also recommended that Architects and Construction Engineers who undertake such building design and construction gain familiarity with the properties and materials/Panels and its applications.

## 1.5 Manufacturing Machinery & Equipment

The firm has got fully mechanized Production Line of HESS+Dongyue make and Concrete Batching Plant of LATHI Precision make, Truck mounted crane of Palfinger make, Forklifts of Voltas make, JCB Loader and Weigh Bridge. The components of these machines are given below:

## **Production Line**

- i) Cage Welding Machine
- ii) Spot Welding Machine
- iii) Raw material feeding section
- iv) Slurry preparation section





- v) Mixing tower having weighing scale and Automatic batch mixing facility
- vi) Mould Feeding and Transportation system
- vii) De-Moulding Crane
- viii) Automatic Mould Oiling Machine
- ix) Horizontal Cutter and Cross Cutter
- x) Green Separator
- xi) Frame and Bogey handling system
- xii) Autoclave
- xiii) Boiler
- xiv) Packing Line

## 1.6 Manufacturing Process

The manufacturing process of KON\_CRETE wall and roof panels is as follows:

## 1.6.1 Raw material preparation and mixing

The Flyash slurry is stored in slurry tanks and pumped into the slurry weighing hopper in the mixer tower. The binders (lime, cement and anhydrite) are stored in silos. The aluminum powder is prepared in a separate building where it is dispersed in water. All the components are accurately weighed, and are released into the mixer in a predefined order. Recipe and temperature control system constantly monitors this process.

## 1.6.2 Pouring and Pre-Curing

The mould consists of four fixed sides and one detachable platform. The inner mould surfaces are covered with de-moulding release oil before casting. This oil is applied either manually or automatically.

The mix is then poured into the moulds. A mould circulation system conveys the moulds to the rising area, where the cake pre-cures for 2-3 hours after which it is ready for cutting. Depending on the plan design, the moulds are handled by a mould traverser or by a tilting manipulator.

## **1.6.3 Cage manufacturing and insertion:**

- i) Mild steel bars (5-10 mm dia) in coils form are fed to automatic cage making machine and mats of specific sizes.
- ii) Two individual mats are then tied to form a single cage.
- iii) Cages are assembled into a holding frame assembly.
- iv) Whole cage assembly is dipped in an anti-corrosive paint tank by the Crane and dipped into it.





- v) Cage assembly are then stored in an enclosed drying chamber to get dried up and then kept in position for insertion.
- vi) Immediately after the mix has been poured into the mould, the reinforcement frame assembly is inserted. Before cutting of the cake, the holding frames with needles are lifted, leaving the reinforcement in the cake.

## 1.6.4 Tilting

The tilting manipulator tilts the mould by 90°. The manipulator unlocks the mould and removes the mould body, so that the cake remains on one mould side/platform for cutting. This tilting system has proven to be the safest method for tilting the cake into the vertical cutting position, as the cake is remaining on the platform/mould side for the cutting process.

This way of handling results in optimal efficiency in raw material consumption due to the low mechanical forces on the product in the green stage and reduces the risk of cracks and product damage.

## 1.6.5 Cutting

The cake is cut by high-precision cutting machines. Cutting is done by cutting knives and by pneumatically tensioned cutting wires.

- The pre-cutter and vertical cutter cut the block length and panel width. In this station the profiling (tongue and groove) shall be cut into the cake with profiling knives
- The horizontal cutter cuts the block and panel thickness; for special demands in surface finish and thickness accuracy beyond the traditional building standards, HESS AAC SYSTEMS provides proven alternative cutting systems with oscillating wires while maintaining the advantages of the tilt cake cutting system
- The cross cutter cuts the block height and the panel length. Optionally hand-grips can be milled in the blocks in the green stage.

#### 1.6.6 Back tilting and green separation

After the cutting is completed, the cake is tilted back by 90° onto a cooking frame. After the cake has been tilted back into the horizontal orientation, the bottom/bed waste shall be removed before autoclaving. Autoclaving the cake horizontally on the cooking frames allows efficient autoclave loading and, most importantly, will prevent most of the sticking of the layers, which is a typical disadvantage of the traditional tilt-cake systems.

In the green separator the horizontal cuts (now laying vertical) are carefully separated before autoclaving, leaving a small gap between the layers. This eliminates any sticking, which is typical for other tilt-cake systems. Further this green separation substantially improves the autoclaving process as steam can penetrate into the cake more effectively.

## 1.6.7 Autoclaving





In the autoclaves the cakes are cured for approx 10-12 hours at a temperature of  $190^{\circ}$  C with saturated steam at a pressure of 12 bar. The fully automatic autoclave control system ensures a safe and optimal autoclaving process.

## 1.6.8 Packaging

After the Autoclaving, finished products are then packed by unit sizes and transferred to stock yard by a grab forklift.

## **1.7 Conditions of Certification:**

- **1.7.1** *Technical Conditions* –Raw materials and the finished product shall conform to the requirements of the prescribed specifications.
- **1.7.2** *Quality Assurance* The Certificate Holder shall implement & maintain a quality assurance system in accordance with Quality Assurance Plan (QAP) given in the **Annex-I** attached with this Certificate.
- **1.7.3** Brochure/ Guidelines The Certificate holder shall provide detailed instructions for laying of the walls & floors/roofs.
- **1.7.4** Handling of User Complaints
- **1.7.4.1**The Certificate holder shall provide quick redressal to consumer/user complaints proved reasonable & genuine and within the conditions of warranty provided by the customer/ purchaser.
- **1.7.4.2** The Certificate holder shall implement the procedure included in the QAP. 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.

## 1.7.5 Durability

AAC has been in use since nearly 60 years, the first production being in Sweden around 1930. Since then, production has spread to most parts of the world and the material has proved its durability under extreme different climatic and chemical conditions.

*AAC* is an industrial produced uniform and homogeneous material, which is autoclaved. Consequently its chemical and mineral composition is stabilized to form a solid structure with stability more than products formed from normally cured concrete. However, due to its porosity, *AAC* can be penetrated by liquids and gases, which, in some cases, may cause partial destruction of the matrix, either by dissolution or pressure caused by re-crystallization.





AAC is mainly attacked by acids, solutions of acid salts, and acid forming gases. The degree of attack depends on the acid concentration, relative humidity and temperature. Moreover, destruction of AAC can be caused by the formation of ice or salt crystals. In cold countries, possible damage caused by freeze/thaw action is very important.

However due to moisture movement in case of Reinforced AAC panel, steel bars which are embedded inside may get corroded but the most popular practice is to dip the whole cage into anti-corrosive paint tank before putting it in AAC cakes. There is standard method as per Indian standard to measure the effectiveness of anticorrosive coatings on reinforcement bar.

## 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 Part 1&2 of this Certificate, UAL-KON\_CRETE 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 KON\_CRETE wall, floor/roof panels in accordance with the requirements specified in relevant Indian and other Standards (See Part 5). In addition it shall follow Company standards specifying requirements of these sections for various materials used in the manufacturing of the product.

## 2.2 Specifications of the Panels

## **2.2.1 Technical Specifications**

## 2.2.1.1 Raw materials

- i) Cement: Shall conform to IS 269-1967 or IS 455 -1967 or IS 1489-1967
- ii) Lime: Shall satisfy the requirements for class C lime satisfied in IS 712-1964
- iii) Fly ash: Shall conform to IS 3812 part -1966 except that the loss on ignition shall not be more than 6%
- iv) Water: Shall conform to the requirements given 4.3 of IS 456-1964
- v) Reinforcement:
  - a. Plain mild steel bar conforming to grade I of IS 432 part I 1966 of IS 226- 1967
  - Plain medium tensile steel bars conforming to IS 432 part I -1966.

## 2.3 Inspection

## 2.3.1 Inspection

Inspection shall be done at appropriate stages of manufacturing process as given in Clause 1.6 above. Wall panels shall be stored properly to ensure that no damage occurs during transportation. As part of quality assurance system, the inspections shall be carried out by the trained personnel of the PAC holder. *Manufacturing Process flow chart is given in Annex II.* 

## 2.4 Selection & Installation

**2.4.1** The user shall be responsible for the proper use of the product at site. PAC holder shall provide required guidance and instructions for usage of the product at site.





**2.4.2 Good practice for installing the product at site** -KON\_CRETE wall and roof panels shall be used at site in accordance with the applicable specifications, instructions and guidelines of the manufacturer. The user shall also follow the Brochure of the product supplied by the manufacturer.

## 2.5 Storage, Handling and Transportation of the panels

#### 2.5.1 Storage

After the Autoclaving process, Panels are stacked on wooden planks or other supports free from contact with the ground. Panels of different specifications are marked and kept in separate stack. Pattern of stocking the finished product is organized in such a way that material can be dispatched in FIFO system.



All material must be kept dry and preferably undercover. Care should be taken to avoid sagging or damage to ends, edges and surfaces.

Panel must be stacked on edge and properly supported off the ground on a leveled platform. Panel bundles can be stacked in two tires.





## HOW PRODUCT IS HANDLED AT PROJECT SITE (Typical Photographs)



## Handling

Panels are handled by pallets forks of forklift or suitable carne /hydra by using nylon straps, slings.

Excessive handling may cause damage, chipping of material. It is advised to set delivery schedule to match the erection sequence exactly.







## Manual handling

It is recommended to use a trolley or other mechanical apparatus to move the panels around the work site.



Fig 4 Trolley for manual Panel handling

## 2.5.2 Transportation

After complete curing and at the time of shipping of the panels to the site, type of the truck is decided based on the volume of the load being handled. Capacity of the truck is decided varying from 8T to 27T. Wooden logs for buffering are placed on the platforms of the trucks and bundles of panels are placed on them to avoid sudden forces generated during movement of truck in adverse conditions of the road. Only two-tier arrangement (bundle over bundle) is allowed during transportation to safe guard the bottom panels. Proper packing between the bundles with the thermocol is provided for sudden horizontal movement in any eventuality. After loading the trucks with proper layout matching to its carrying capacity and optimum utilization of area/space, the load is tied with heavy duty ribbons arresting the movement of the panels in any direction. UPVC sheets or tarpaulin sheets are used to cover the panels to avoid soaking in rain.

The photos below explain the transportation of panels from casting to shipping out of the plant to the customer sites.

# bmlec







## 2.6 Installation Procedure

## 2.6.1 Preparation

- 1. Layout of wall panels should be marks on the foundation using Chalk
- 2. Nylon offsets lines should be used to ensure outside line of panels,
- 3. Aluminium straight edge should be set to line and level the inner face of the wall
- 4. Use Koncrete Jointing mortar (as guided by the Manufacturer) as a bed for the wall panels.
- 5. Verify dimensions, positions and quantity of panels according to the installation drawing
- 6. First the corner panel is to be installed
- 7. Lift the panel by a lifting hook.







- 2.6.2 Installation of wall panels
  - 1. Place the first panel (corner panel) is position and check for plumb.
  - 2. Wooden wedges are used for temporary support of wall panels and allow for find adjustment in alignment
  - 3. Succeeding panels are to be installed as per part mark on each panel and following KONCRETE Installation Drawings
  - 4. The top edges of wall panels are also aligned and steadied by temporary wall braces at every 3<sup>rd</sup> and 4<sup>th</sup> Panel
  - 5. KONCRETE jointing mortar of 3-4 mm thickness should be applied on the two adjoining edges of the wall panel before fixing them against one another.
  - 6. After the final alignment of the erected wall panels synthetic mesh of 75 mm 100 mm width should be pasted using KONCRETE jointing mortar at each vertical and horizontal joint of wall panels.
  - 7. KONCRETE Wall Panels can be used as lintels on top of windows and door openings. These lintels are supported on and connected to the wall panels adjacent to the openings.







2.6.3 Installation of Floor / Roof Panels

- 1. Place the first panels with groove side in position on the lines as already marked.
- 2. Succeding panels are to be installed as per part mark on each panel and following KONCRETE Installation Drawings.
- 3. After panel / Installation, place steel reinforcement in longitudinal joints and ring beams surrounding panels, as specifed by the Structrual Engineer and / or Architect.
- 4. These longitudinal joints and ring beams are then filled with concrete
- 5. A smooth surface of concrete is required to match the top of panels using a mason's trowel.



The Installation Manual along with the sketches is at Annex III.





## 2.7 Critical Details for Use of KON\_CRETE Wall panels and Main Causes of Defects

## 2.7.1 Critical Details for Use of Precast Panel Walls

One of the critical problems faced by precast panel systems is the occurrence of hairline cracks at the joints between adjacent wall panels. Some of the precautions are listed below to reduce such defects:

- Installation with freshly cast concrete panels shall be avoided. This is because hydration of cement and evaporation of water create the stress within the young concrete, causing shrinkage.
- Gaps shall be provided between the walls and structures: 20mm for top, 20mm for bottom and 10mm for each side.
- It shall be ensured that the mix proportion of grout and water is according to suppliers' recommendations.
- Partial grouting to the horizontal gaps of the panels at the top and bottom shall be carried out immediately after the installation of wall panels to ensure the panels are temporarily secured.
- Grouting of the vertical gaps between the wall panels immediately after installation shall be avoided. Grouting shall be carried after sufficient loadings from upper floors are added.
- Inspection shall be done to ensure that alignment of walls is in order before proceeding to grout the vertical joints and horizontal gaps.
- ➢ It shall be ensured that proper surface preparation is carried out with cleaning of the sides of wall panel and the face of structure that receives the wall panels.
- It shall be ensured that face of the structure is saturated before grouting to avoid rapid absorption of water during grouting.
- A layer of fiber mesh shall be provided over the joints as additional precaution against cracks, if required.
- > Vibration of the surroundings shall be minimized.

## 2.7.2 Main Causes of Defects

The main causes of cracks in the precast wall panels are:

- a) Failure of jointing compound
  - Actual shelf life of product has expired
  - Incorrect mixing proportion of grout and water
  - Surface area of the structure and the panels not properly cleaned
  - Insufficient grout at joints
  - Incorrect grout
- b) Improper supervision/workmanship
  - Correct method statement not followed
  - > Opening not grouted properly after chasing for services





- c) Structural movement
  - Vibration during construction
  - *Excessive loadings from the floors above*

## 2.8 Skills /Training needed for Installation

No special skills other than normal skills of a mason shall be required for installation of these wall panels also. However, the PAC holder shall provide on request necessary guidance to the users at site, if required.

## 2.9 Guarantees/Warranties provided by the PAC Holder

The manufacturer shall furnish a guarantee up to installation of the wall panels, if it is in the scope otherwise the guarantee shall be up to delivery of the wall panels. A brochure giving relevant warrantee details shall be made available to the client.

## 2.10 Services Provided by the PAC Holder to the Customer

- **2.10.1** The PAC holder shall provide pre-sale advisory regarding the product. Customer/user may obtain from the PAC holder details of the advice that may be provided to him.
- **2.10.2** Users/Customers should ascertain from the PAC holder the type of service, the PAC holder is prepared to provide.

## 2.11 Responsibility

- Specific design using Wall 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 Officers of the Council and TAC member through video conferencing in the prevailing COVID-19 scenario. The manufacturing process, raw materials & finished products were found to be in line with the manufacturing process description covered as part of this certificate & Quality Assurance Plan. The technical persons were also found to be conversant with all technical aspects. One demo structure using these panels within factory premise was also displayed & explained during virtual visit.

## **3.2** Tests referred for Assessment

- **3.2.1** The various performance requirement tests as referred for the assessment are as per the details below;
  - **a.** Physical and Mechanical Properties Report for AAC Blocks (Autoclaved Cellular Aerated Concrete blocks)

Month of Testing:September, 2019Lab:Spectro Analytical Labs Limited, Greater Noida

S. No.	Properties	Requirements as	Permissible	Test
		per Standards	value	Result
1.	Block Density, kg/m3	IS 2185 (P-3): 1984	551-650	602
2.	Compressive Strength, N/mm2	IS 2185 (P-3): 1984	4.0 (Min)	4.83
3.	Drying Shrinkage, %	IS 2185 (P-3): 1984	0.05	0.028
4.	Thermal Conductivity in air dry condition, W/mK	IS 3346:1980		0.20

**b.** Test Report for Deflection and Ultimate Load Test of Autoclaved Reinforced Cellular Concrete Floor and Roof Slabs

Test Method	:	IS 6073 (2006)
Test Date	:	24.10.2019
Size of test slab	:	3000 x 600 x 200 mm
Lab	:	Spectro Analytical Labs Limited, Greater Noida





#### Observations

Effective Span	:	2800 mm
Design Load	:	300 kg/m2
Total Area (Slab)	:	1.8 m2
Total Design Imposed Load (W)	:	540kg
Half of Design Imposed Load $(W/2)$	:	270 kg
Total Ultimate Load (1.5*Design dead load + 2.2*W)	:	1578 kg

		Observati	ons and Require	ments	
Time of Loading	Applied Load (kg)	Deflection (Observed)	Requirement	Observation on Surface	Requirement
2:00-2:30 PM (Half Hours)	270	1.1 mm	9.3 mm	No crack seen	Shall not crack after 30 minutes of application of Half of Design Imposed Load
2:30-3:00 PM (Half Hours)	540	1.8 mm	9.3 mm	No crack seen	Shall not crack after 30 minutes of application of Half of Design Imposed Load
3:30-4:00 PM (Total Ultimate Load)	1578	6.2 mm	9.3 mm	No crack seen	Shall not crack after 30 minutes of application of Ultimate Load

Parameter	Observed Load	Requirement
Ultimate Load	1605 kg	1578 kg

#### Result

Tested Slabs showed satisfactory results as per the requirements of Deflection and Ultimate Load test given in IS 6073.

**c.** Test Report for Deflection and Ultimate Load Test of Autoclaved Reinforced Cellular Concrete Wall Slabs

Test Method	:	IS 6072 (1971), RA 2010
Test Date	:	25.10.2019
Size of test slab	:	3000 x 600 x 200 mm
Lab	:	Spectro Analytical Labs Limited, Greater Noida
Observations		
Effective Span		: 2800 mm

	<b>л</b> 2
Design Load : 200 kg/n	.14
Total Area (Slab) : 1.8 m2	
Total Design Imposed Load (W) : 360 kg	
Half of Design Imposed Load $(W/2)$ : 180 kg	
Fotal Ultimate Load (2.5*W):900 kg	





	Observations and Requirements						
Time of	Applied	Deflection (Observed)	Requirement	Observation	Requirement		
Loaunig	(kg)	(Observed)		on Surface			
11:00-11:30 AM (Half Hours)	180	1.5 mm	9.3 mm	No crack seen	Shall not crack after 30 minutes of application of Half of Design Imposed Load		
11:30-12:00 PM (Half Hours)	360	2.1 mm	9.3 mm	No crack seen	Shall not crack after 30 minutes of application of Half of Design Imposed Load		
12:30-1:00 PM (Total Ultimate Load)	900	5.2 mm	9.3 mm	No crack seen	Shallnotcrack after 30minutesofapplicationUltimate Load		

Parameter	Observed Load	Requirement
Ultimate Load	1580 kg	900 kg

Result

Tested Slabs showed satisfactory results as per the requirements of Deflection and Ultimate Load test given in IS 6072.

**d.** Test report Fire Resistance Test of Construction Assemblies with Kon\_Crete AAC Reinforced Panels

Test Method	:	BS 476-20:1987
Test Date	:	12.10.2019
Size of test slab	:	600 x 2600 x 200 mm (w x h x thickness)
Lab	:	Spectro Analytical Labs Limited, Greater Noida

Results

The requirement of the standard was satisfied for;

Stability	240 minutes
Integrity	240 minutes
Insulation	240 minutes

Conclusion: Tested specimens of AAC Reinforced Panel is found Fire Rated for 240 Minutes. It has been checked only for 240 Minutes. In between the Test, the performance of AAC Reinforced Panel Found Satisfactory in terms of Insulation, Stability and Integrity.

## 3.3 Supply of the wall panels

The product has been supplied to PWD, Govt. of Best Bengal and Kolkata Port Trust (Haldia Dock Complex)





## 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 Rules and Regulations made there under. India. 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.

# bmlpc



- **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\_\_\_\_\_\_\_2\_\_\_2\_ Chairman TAC & for and on behalf of Member Secretary, BMBA

Dr. Shatlesh 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

- **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 BS 476-20:1987\*: Fire Tests on Building Materials and Structures-Part-20
  - **5.1.2 IS 6073(2006):** Test for Deflection and Ultimate Load Test of AAC Floor and Roof Panels
  - **5.1.3 IS 6072(1971) RA-2010:** Test for Deflection and Ultimate Load Test of AAC Wall Panels.
  - 5.1.4 IS 2185 (P-3): 1984: Tests of Autoclave Aerated Concrete Blocks.
  - 5.1.5 IS 6441 (P-1): 1972 (RA-2012): Tests for Block Density in Kg/cum.
  - 5.1.6 IS 6441 (P-5): 1972 (RA-2012): Tests for Compressive strengths in N/mm2
  - 5.1.7 IS 6441 (P-5): 1972 (RA-2012): Test for Drying Shrinkage percentage in AAC.
  - **5.1.8 IS 3346:1980:** Test for Thermal Conductivity in Air Dry Condition in W/mK

## 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 Reports of tests got done on 3000x600x100 mm wall panels and 3000x600x200 mm Roof Panels and 600x250x200mm AAC blocks from Spectro Analytical Labs –Delhi in 2019.





## CERTIFICATION

In the opinion of Building Materials & Technology Promotion Council's Board of Agreement (BMBA), **Kon\_Crete Reinforced Autoclaved Aerated Concrete Panels** bearing the mark manufactured by M/s UAL Industries Ltd. is satisfactory if used as set out above in the text of the Certificate. This Certificate PAC No. 1056-P/2021 is awarded to M/s UAL Industries Ltd., UAL-KON\_CRETE, 16, Mayfair Road, Kolkata-700019

The period of validity of this Certificate is as shown on Page 1 of this PAC. This Certificate consists of a cover page and pages 1 to 35.

Mudgrennal



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:....

# bmlpc



## PART 6 ABBREVIATIONS

#### Abbreviations

Board of Agreement of BMTPC
Building Materials and Technology Promotion Council
Central Public Works Department
Executive Director of BMTPC
Inspecting Officer
Member Secretary of BBA
Performance Appraisal Certificate
PAC Holder
Performance Appraisal Certification Scheme
Scheme of Quality Assurance
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: <u>www.bmtpc.org</u>





## ANNEX I

## (Clause 1.4.2)

The Manufacturer has comprehensive Quality, Environment, occupation, Health & Safety (QEOHS) Management System Procedure with procedures, roles & responsibilities clearly defined. As per the same, the some important Quality Assurance aspects are as below;

Raw Materials: Cement (OPC 53)

Test Frequency	Method of Sample Collection	Testing Details	Acceptance Norms	Reference	Report
Every consignment	Collect Samples from each bulker by a Hollow rod • Collect approxim ately 2000 gm of test samples from the mix. • Keep and assembly 4 weeks' sample in airtight buckets.	Physical Test IST – As per WI/LAB/1, IS 4031 (Part –5) 1988 FST – as per WI/LAB/1, IS 4031 (Part – 5) 1988 By Vicat Apparatus Ignition Loss% Clause 4.2 of IS: 4032-1985 by muffle furnace	<ul> <li>a) IST Not less than 30 Minutes</li> <li>b)FST Not more than 600 minutes</li> <li>e)Not more than 5%</li> </ul>	Form No. UKON/QCD/RE C/01 Form No. UKON/QCD/RE C/01 Form No. UKON/QCD/RE C/01	After approval by Head QCD inform to Stores if nonconform ing report to Unit Head and dispose as per their advice

Note: After approval by HOD Quality Control inform to Stores if non con-forming report to GM(Works)/ED and dispose as per their advice.

#### Item: Anti corrosion Paint

Test Frequency	Method of Sample Collection	Testing Details	Acceptance Norms	Reference	Report
Every consignment	Supplier's Test Report				





#### Item : Steel Rod

Test Frequency	Method of Sample Collection	Testing Details	Acceptance Norms	Reference	Report
Every consignment	Supplier's Test Report & third party test report	Physical analysis 1.U.T.S(N/mm2) 2.Yield Stress(N/mm2)	625 to775 Min. 435	Req. as per BS 970-3: 1991, En8(Hardened and tempered + cold draw)	
		3. % of Elong. Chemical Analysis 1. % C 2. % Mn 3. % Si 4. % S 5. % P	Min.12 0.35 to 0.45 0.60 to 1.00 0.05 to 0.35 Max 0.060 Max 0.060	Req. as per BS 970-3: 1991, En8	

## In Process Quality Check

Item	Test Frequen cy	Testing Details	Acceptanc e Norms	DI/Rec ords	Report
Density checking at FLY ASH pit & Cutting Pit	Before Productio n Starts per shift	2 Ltr sample collected. Thoroughly stirred then poured in a 1 Ltr Cylinder. Weight is taken.	1.4 to 1.5 gm/cc		If not in range slurry is added to bring back within range
Soap solution preparation	Every 15 <sup>th</sup> batch	200 Ltr water + 20 Ltr acid slurry + 3.8 kg sodium hydroxide are stirred	10 +. 2 PH		If not in range PH is adjusted
Sodium Dichromate detergent Solution	Every 63 batch	90 Ltr Water + 2.9 kg sodium dichromate + 400 gm Detergent are stirred	None		Adjusted according to rising in final product
Checking thickness of paint on steel	Before Productio n Starts per shift	Viscosity of paint check by B4 cup and thickness on steel check by micrometer			Adjusted by adding thinner
Checking of depth of the mould poured	Each Mould	Inserting the scale	360 mm to 440 mm	Log Sheet	Recycled the rejected casting if the depth is below 600 mm after full rising





Checking of Casting Temp	Each Mould	Inserting Digital Thermometer	Minimum 35 ºC	Log Sheet	If not ok water solid ratio is adjusted in next batch by adding quick lime or hot water
Checking Flow of Pouring	Each Mould	Spread method through a blank cylinder	16 cm to 28 cm	Log Sheet	If not ok water solid ratio is adjusted in next Batch
Checking cutting penetration	Each Mould	Drop penetration rod from certain height	85 mm to 110 mm	Log Sheet	If over 110 mm, Wait before cutting and below 85 mm taken time before next casting
Check dimension groove, tongue	After size change and every shift	Measuring tape	Length ± 5 mm Height ± 5 mm Width ± 2 mm	Log Sheet	

#### **Finish Product**

Test Frequency	Method of Sample Collection	Testing Details	Acceptance Norms	Referen ce/Reco
				rd
After productio n	a) Collect samples min 24 hrs after coming out from autoclave and separation	1.Drying Shrinkage 2.Residual water content at the time of delivery	IS 6072 :1971 / IS 6073 :2006 IS 6441 (PART 2) IS 6072 :1971 / IS 6073 :2006	UKON/R CP/ FINAL INSPECTI ON/00
		3.Compressive Strength	IS 6072 :1971 / IS 6073 :2006 IS 6441 (PART 5)	
		4.Thermal conductivity	IS 6072 :1971 / IS 6073 :2006 IS 3346	
		5.Fire Resistance	IS 6072 :1971 / IS 6073 :2006	
		6.Design load and deflection	IS 3809 IS 6072 :1971 / IS 6073 :2006	
		7.Ultimate load	IS 6072 :1971 / IS 6073 :2006	
		8. Density of element (excluding reinforcement)	IS 6072 :1971 / IS 6073 :2006 IS 6441 (PART 1)	





ANNEX II

(Clause 1.6)

## Manufacturing Process Flow Chart:







**ANNEX III** 

## (Clause 2.6) (Installation Sketch)



Fig. Installation of a typical wall panel



Fig. Wooden wedges being used as temporary support



Fig. Placement of roof / floor panels using a grab







#### Fig. Placement of wall panels using tyre-mounted boom-lift cranes





## Fig. Ring / Bond Beams for end bearings between wall and floor panels



#### Fig. Continuity steel reinforcement placed in notches between adjacent floor panels

÷