



## Insulated Roof Panel

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

Name and Address of Certificate Holder:

**M/s Sintex Industries Ltd.  
Kalol (N. Gujarat) – 382721  
Gandhinagar, India**

Performance Appraisal  
Certificate No.

PAC No **8 / 2009**

Issue No. **1**

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**bmtpc**

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## **PART – I CERTIFICATION**

- I – 1            **Certificate Holder:**        **M/s Sintex Industries Ltd.**  
Kalol (N. Gujarat) – 382721  
Gandhinagar, India  
Phone No. 95-2764-253500  
Fax No. 91-2764-253800
- I – 2            **Description of Product**
- I – 2.1                **Name of the Product** – Insulated Roof Panel
- I – 2.2                **File Reference** – QA/BMTPC/06
- I – 2.3            **Brief Description** – Insulated roof panels are formed by plain pre-coated sheet in-between foamed with Polyurethane foam (PUF) which acts as core that gives excellent insulation. These are built with leakproof ceiling & thermally insulated walls which are water proof, dust proof & rot proof. These are of lightweight modular design for easy & quick assembly. These insulated walls along with proper air conditioning and proper thermal management system are able to bring about direct savings on opex. Sandwich composite panels have emerged as viable alternatives to the traditional construction materials in the building primarily due to their superior strength & stiffness, low thermal conductivity & adequate durability. The major advantages of such layered construction are their structural rigidity in relation to its weight, quick & easy installation and low labour cost. Sandwich panels are generally layered construction composed of thin facing bonded to a core. This facing carry most of the applied load and provides the panel with its stiffness & strength characteristics. The core acts to separate the facing & transmit shear forces between them.
- I – 2.4            **Construction of wall panels** – The roof panels are made out of pre coated sheet by foaming with PUF.

## **I – 3            Assessments**

**I – 3.1            Scope of Assessment** – Insulated Roof panels are suitable for construction sites where access is difficult and where the ground cannot support traditional construction without making expensive foundations. A building component which can be prefabricated in an industrial plant and then competently assembled on site, promises therefore, a better performance and more economic use of resources than when it is constructed on site. These panels can be used for construction of Telecom Shelters, Office blocks, Toilet blocks & Industrial sheds etc..

**I – 3.2            Scope of Inspection** – Scope of inspection included the verification of production and testing facilities at the factory including competence of technical personnel and status of quality assurance in the factory.

### **I – 3.3            Assessment Summary**

**I – 3.3.1**        The assessment was done through inspection, laboratory testing and field observations of the roof panels.

**I – 3.3.2        Manufacturing & test facilities** – Manufacturing and test facilities available in the factory were found to be suitable & adequate to produce the insulated roof panels as per details listed in Annexures 9 & 13 of DAF No. QA/BMTPC/06.

**I – 3.3.3        Experience in actual use** – A few installed prefabricated shelters made with insulated roof panels were inspected at Bhuj (Gujarat). They showed no distress & were found to be functioning satisfactorily. No complaints have been reported so far.

**I – 3.3.4        Quality Assurance Procedure** – The firm follows a Quality Assurance System for production of insulated roof panels.

### **I – 3.4            Durability**

**I – 3.4.1**        The Insulated roof panels which were inspected were installed during the period 2002. None of them showed any distress and they were fully functional. The persons contacted at the

inspected locations expressed satisfaction on the performance of these panels. The level of maintenance of these panels was satisfactory.

I – 3.4.2 These roof panels are designed for a life span of 25 years.

**I – 4 Use of the insulated roof panels & their limitations**

I – 4.1 **Design Data** – The design data parameters shall depend upon the size & dimensions of the panels to be used

**I – 4.2 Storage & handling at the user end before installation**

I – 4.2.1 **Storage** – At the user's end the panels shall be stacked along the wall or hard surface so that they may not fall & break when taken out for assembling. They shall be stacked inside a shed/building

I – 4.2.2 **Handling**- Insulated roof panels shall be carefully handled during storage or installation in order to prevent occurrences of damage to the faces & edges. The panels shall not be dragged but shall be lifted clear of any surface on which they are stored.

**I – 4.3 Uses of the panels**

I – 4.3.1 The samples of the insulated roof panels tested as per the Company standards have been found suitable against Impact, Deflection, Thrust bearing capacity, Load bearing capacity & Honeycombing in accordance with the acceptance criteria given in test report of M/s CIPET which lead to the conclusion that they can be used as panels for prefabricated buildings provided they are installed in accordance with good engineering practice. The composite shelters have been designed to withstand wind velocity of 150 Km/hr and seismic load for Zone V as per the report approved by IIT, Delhi.

**I – 4.4 Limitations of use**

I – 4.4.1 Not recommended for use where radiation hazards are there

**I – 5            Conditions of Certification**

**I – 5.1            Technical conditions** –Eco-friendly materials shall be used for the manufacture of insulated roof panels.

**I – 5.2            Quality Assurance** – The Certificate Holder shall implement & maintain a quality assurance system in accordance with Scheme of Quality Assurance (SQA) given in Annexure.

**I – 5.3            Handling of User Complaints**

**I – 5.3.1**        The Certificate holder shall provide quick redressal to consumer/user complaints proved reasonable & genuine and within the conditions of warranty provided by him to customer/purchaser

**I – 5.3.2**        The Certificate holder shall implement the procedure included in the 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.

**I – 6            Certification**

**I – 6.1**            On the basis of assessment given in Part III 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 I & II of this Certificate, the insulated roof panels covered by this Certificate are fit for use set out in the Scope of Assessment.

**Part – II        Certificate holder's Technical Specifications**

**II – 1            General**

**II – 1.1**            The PAC holder shall manufacture the insulated roof panels in accordance with requirements specified by Bureau of Indian Standards. In addition it follows Company standards specifying requirements of various materials used in the manufacture of these panels (see V-2)

## II – 2      **Specification for the product & design information**

II – 2.1      **Specification** – The specifications for raw materials & finished panels shall be as per performance criteria when tested in accordance with the company standards & relevant Indian Standards.

### II – 2.2      **Technical Specifications**

#### II – 2.2.1      **Raw Materials**

- (i)      GI pre coated sheet.-- This is procured as per Ispat Standard
- (ii)      Polyurethem foam (PUF) – Density of PUF should be  $40 \pm 2$  kg/m<sup>2</sup> and other parameters as per BIS

#### II – 2.2.2      **Construction & workmanship**

- (i)      Insulating roof panel is a sandwich panel made out of GI Precoated sheet on its outer & inner surfaces with the core injected with high density polyurethane foam (PUF). The edges are covered with GI precoated sheet profile section. The panels have highest fire rating and can resist wind pressure upto 150 Km /Hr. The panels are suitable for all weather conditions and the polyster pre-coating on the GI sheets provide adequate protection from corrosion.
- (ii)      The outer & inner surfaces of the Insulated Roof panel shall be smooth, free from any surface defects like scratches, dents, damages and with uniform Pre-coating and also free from any warpages.

II - 2.2.3      **Design & Dimensions** –These roof panels are designed for withstanding wind velocity of 150 Km/hr & for Seismic Zone V as per the report approved by the IIT, Delhi.

II – 2.3      **Performance criteria of Insulated Roof panels** – The insulated roof panel shall meet the following performance criteria when tested in accordance with IS 11239 -1985, IS 12436-1988 & ASTM C - 177 and as per company standards.



**I – 5            Conditions of Certification**

**I – 5.1            Technical conditions** –Eco-friendly materials shall be used for the manufacture of insulated roof panels.

**I – 5.2            Quality Assurance** – The Certificate Holder shall implement & maintain a quality assurance system in accordance with Scheme of Quality Assurance (SQA) given in Annexure.

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- II – 3.4.4 A proper slope shall be maintained as per drawings
- II – 3.4.5 All roof sheets are fixed with proper overlapping
- II – 3.5 Good practice for installation & maintenance should be followed.

**II – 4 Maintenance requirements**

These panels are practically maintenance free. However, these panels should be refinished in accordance with the recommendations contained in technical literature of the PAC holder. If necessary, the panels should be removed from the prefabricated structure so that the finishes of the edges can be carried out properly.

**II – 5 Skilled /Training needed for installation**

- II – 5.1 Trained manpower shall be engaged for on-site erection

**II-6 Guarantees/Warranties provided by the PAC Holder-** This product is guaranteed for a period of one year from the date of supply against any genuine manufacturing defect provided the products are not subject to any damage whatsoever and are not abused/misused or wrongly installed. During the period of Warranty the products shall be serviced free of cost for any defect observed and subsequent to Warranty period services shall be done at a nominal service charge together with other incidental costs as mutually agreed by the PAC holder and the purchaser.

**II – 7 Services provided by the PAC holder to the customer**

- II – 7.1 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.
- II – 7.2 The PAC holder shall also provide after sales service on customer to customer basis. These include items like pre-finishing, trouble in fixing and usage of pre fabricated

structures. Users/Customers should ascertain from the PAC holder the type of service and the conditions, the PAC holder is prepared to provide.

### **Part III Basis of Assessment and Brief description of Assessment Procedure**

#### **III – 1 Basis of Assessment**

**III – 1.1** The technical basis for assessment is as per the standards listed in Part V

**III – 1.2** The assessment is based on the results & reports of

- (i) Inspection of the factory
- (ii) Inspection of the test equipment used and the test procedures followed in the laboratory of the factory
- (iii) Assessment of quality assurance procedures implemented in the factory
- (iv) Tests done in the factory during inspection
- (v) Tests done is in independent laboratory in random samples of the finished panels taken by the IO during inspection
- (vi) Inspection of insulated roof panel in service

#### **III – 2 Manufacturing process**

**III – 2.1** Raw Materials & pre coated sheets are procured from market. Then the sheet is cut & bent as per the drawings. Thereafter, foaming & pressing is done by hydraulic press. The framed panel is then finished properly & cleaned.

**III – 2.2** Inspections & testing is done at appropriate stages of manufacturing process. The inspected panels are stored & packed to ensure that no damage occurs during transportation. As part of quality assurance regular in process inspections are carried out by the trained personnel of the PAC holder.

#### **III – 3 Factory inspection**

**III – 3.1** The factory was inspected by the technical representatives of the Council. During inspection the entire manufacturing process

along with the equipment was inspected. The manufacturing process was found to conform to the process description given in the Annexure. 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. These were found suitable to produce insulated roof panels satisfying the criteria specified.

### **III – 4 Laboratory Tests done for assessment**

#### **III – 4.1 Testing of samples**

**III – 4.1.1 In the factory** – The tests listed in the report i.e. Visual appearance & Dimensional stability, water vapour transmission, Compressive Strength, Density, Thermal Conductivity and Horizontal burning were done by the IO in the factory on random samples of panel taken by him for checking the product as well as related test equipment. The tests were conducted using standard test method covered by standards listed in the relevant clauses of IS 11239 (Part 2,4,11,12): 1985, IS 12436: 1988 & ASTM C 177. The samples passed in all the tests conducted.

**III – 4.1.2 In independent laboratory** – The performance tests for insulated roof panels specified in IS 11239, IS 12436 & ASTM C 177 – pertaining to Method of test for rigid cellular thermal insulation materials, Specifications for performed rigid & polyurethane foam for thermal insulation & Thermal Conductivity respectively and listed below were got done in an independent laboratory on random samples of insulated roof panels taken by the IO. The samples passed in all the tests.

#### **Test done in an independent laboratory on finished panel**

<b>S. No.</b>	<b>Parameters</b>	<b>Performance Characteristics</b>
1.	Dimensional Stability @ 100°C, 24 Hrs.	0.85%
2.	Visual appearance	No cracks, No colour changes, No shrink & other visual effects
3.	Water vapour transmission	2604 gms/m <sup>2</sup> 3
4.	Compressive strength @ 100%	130.3 Kn/m <sup>3</sup>

	deformation	
5.	Density (PUF)	45.4 kg/m <sup>3</sup>
6.	Horizontal burning	63 mm
7.	Thermal conductivity	0.018 W/m <sup>2</sup> K

**III - 5 Inspection & Supply of Installed roof panels:** - A few Prefabricated shelters made with insulated roof panels during the period 2006-2008 were inspected .None of them showed any distress & were fully functional. The users had no complaints .Details of the prefabricated shelters supplied by the manufacturer are given below:-

S.No.	Occupancy/Building	Location of Building	When installed	Remarks /Condition of panels
1.	HQ 12 Corps	Bhuj, Gujarat	Nov2001 - Feb2002	Satisfactory
2.	Ericsson India P. Ltd.	Various parts of India	Feb2006 - Dec2008	Satisfactory
3.	Reliance Infocom Ltd.	Various parts of India	April2006 - Aug2008	Satisfactory
4.	Hutchison Essar Cellular Limited	Various parts of India	May2007 - Sept2008	Satisfactory

## PART-IV STANDARD CONDITIONS

This certificate holder shall satisfy the following conditions:

- IV-1 The certificate holder shall continue to have the product reviewed by BMBA.
- IV-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.
- IV-3 The quality of the product shall be maintained by the certificate holder.
- IV-4 The product user should install, use and maintain the product in accordance with the provisions in this Certificate.
- IV-5 This certificate does not cover uses of the product outside the scope of this appraisal.
- IV-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.
- IV-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)
- IV-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 there of.
- IV-9 The certificate holder agrees to provide to BMBA feed back 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 feed back received by it, if any.
- IV-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.

**IV-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.

**IV-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.

**IV-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.

**IV-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.

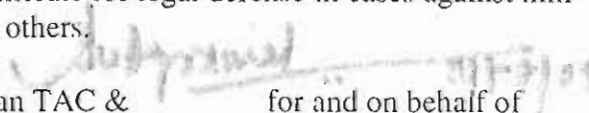
**IV-15** The certificate holder indemnifies BMBA, its officers and officials involved in this assessment against any consequences of actions taken in good faith including contents of this certificate. The responsibility fully rests with the certificate holder and user of the product.

**IV-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.

**IV-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 \_\_\_\_\_

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

Dr. Shashi K. Agarwal  
Chairman, TAC  
& Member Secretary, BMBA  
Building Materials and Technology Promotion Council  
Ministry of Housing & Urban Poverty Alleviation, (Govt. of India)  
Core 5A, 1st Floor, India Habitat Centre, Lodi Road,  
New Delhi-110 003

## **Part – V List of Standards & codes used in Assessment**

**Part – V.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.

**Part-V.1.1 IS 11239 (Part 2,4,11&12): 1985** – Method of test for rigid cellular thermal insulation materials.

**Part-V.1.2 IS 12436:1988** – Specifications for performed rigid polyurethane foam for thermal insulation

**Part-V.1.3 ASTM C – 177** - Thermal Conductivity

**Part – V.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 has been done.



## CERTIFICATION

In the opinion of Building Materials & Technology Promotion Council's Board of Agreement (BMBA) Insulated Roof Panel bearing the mark Manufactured by M/s Sintex Industries is satisfactory if used as set out above in the text of the Certificate. This Certificate PAC No.8 /2009 is awarded to M/s Sintex Industries.

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 19.



On behalf of BMTPC Board of Agreement

New Delhi, India  
Place  
Date

*Shailash Kr. Agarwal*  
Chairman, Technical Assessment Committee (TAC) of  
BMBA & Member Secretary, BMTPC Board of Agreement  
(BMBA) Under Ministry of Housing and Urban Poverty  
Alleviation, Government of India

Dr. Shailash Kr. Agarwal  
Chairman, TAC  
& Member Secretary, BMBA  
Building Materials and Technology Promotion Council  
Ministry of Housing & Urban Poverty Alleviation, (Govt. of India)  
Core 5A, 1st Floor, India Habitat Centre, Lodi Road,  
New Delhi-110 003

## **PART VI ANNEXURE**

### **Annex VI-I**

#### **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 organisations 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 organisations 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](http://www.bmtpc.org)

**ANNEXURE-**

**BUILDING MATERIALS & TECHNOLOGY PROMOTION COUNCIL**

**QUALITY ASSURANCE PLAN FOR INSULATED ROOF PANEL**

S.No	Parameters Characteristic to be Inspected	Relevant IS or Material Standards	Requirement Specified	Test Method	Sample Size	Frequency Of Testing
<b>I. GI PRE-COATED SHEET</b>						
1	Visual		Should be free from any surface defect	Visual	As per sampling plan	For every lot
2	Thickness of Sheet		Minimum as specified	Micrometer Screw	-do-	-do-
3	Hardness		Min. 3H			
4	Scratch Resistance		Scratch Resistant			
5	Impression Resistance		75 in-Ib			
6	Paint Coat 1. Top 2. Back		20 microns 5 microns			
7	Zinc Coating		100 G/sqm.			
<b>II. POLYURETHAN FOAM</b>						
1	Density	IS 12436: 1988	Should be $40 \pm 2$ kg/m <sup>3</sup>	As per IS 12436 : 1988	As per relevant code	Once in 6 months
2	Dimensional Stability	IS 11239 (P2): 1985	As per relevant code	As per IS 11239 (P2): 1985	-do-	Once in 6 months at any approved test house
3	Water Vapour Transmission	IS 11239 (P5): 1985	As per relevant code	As per IS 11239 (P5): 1985	-do-	-do-
4	Compressive Strength	IS 11239 (P11): 1985	As per relevant code	As per IS 11239 (P11): 1985	-do-	-do-
5	Horizontal Burning	IS 11239 (P12): 1985	As per relevant code	As per IS 11239 (P12): 1985	-do-	-do-
<b>III. INSULATED ROOF SHEET</b>						
1	Visual		Should be free from any surface defect	Visual	As per sampling plan	For every lot
2	Dimensional		Should be as per drawings	Measuring tape	-do-	-do-