



## FRP Manhole

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 **1005-C/2011**  
Issue No. **01**  
Date of Issue: **29.06.2011**



# bmtpc

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

Tel: +91-11-2463 8096, 2463 8097; Fax: +91-11-2464 2849  
E-mail: [bmtpc@del2.vsnl.net.in](mailto:bmtpc@del2.vsnl.net.in) Web Site: <http://www.bmtpc.org>

# PERFORMANCE APPRAISAL CERTIFICATE


FOR

FRP MANHOLE

ISSUED TO

M/s SINTEX INDUSTRIES LTD

STATUS OF PAC 1005-C/2011

S.No	Issue No.	Date of Issue	Date of renewal	Amendment		Valid up to (Date)	Remarks	Signature of authorized signatory
				No.	Date			
1.	2.	3.	4.	5.	6.	7.	8.	9.
1	01	29-06-11	29-06-13	--	--	28-06-13	----	

PAC No.1005-C/2011

Issue No. 01

Date of issue 29- 06-2011

## CONTENTS

<b>PART1 CERTIFICATION</b> .....	3
1.1 Certificate Holder .....	3
1.2 Description of Product .....	3
1.3 Assessment .....	3
1.4 Tests of the Product and its Limitations .....	4
1.5 Conditions of Certification .....	4
1.6 Certification .....	5
<b>PART II CERTIFICATE HOLDER'S TECHNICAL SPECIFICATION</b> .....	5
II.1 General .....	5
II.2 Specifications for the product .....	5
II.3 Selection and Installation .....	7
II.4 Critical details .....	8
II.5 Skills/ training needed for installation .....	8
II.6 Warranties provided by the PAC holder .....	8
II.7 Service provided by the PAC holder .....	9
<b>PART III BASIS OF ASSESSMENT AND BRIEF DESCRIPTION OF ASSESSMENT PROCEDURE</b> .....	9
III.1 Basis of Assessment .....	9
III.2 Manufacturing Process .....	9
III.3 Factory Inspection .....	10
III.4 Laboratory tests done for assessment .....	10
III.5 Inspection of the product .....	11
<b>PART IV STANDARD CONDITIONS</b> .....	12
<b>PART V LIST OF STANDARDS AND CODES USED IN ASSESSMENT</b> .....	14
<b>CERTIFICATION</b> .....	15
<b>PARTVI ABBERVIATIONS</b> .....	16
<b>PERFORMANCE APPRAISAL CERTIFICATION SCHEME – A BRIEF</b> .....	17
<b>ANNEXURE</b> .....	18

## **PART I CERTIFICATION**

- 1.1 CERTIFICATE HOLDER:** M/s Sintex Industries Ltd.  
Kalol (N. Gujarat) – 382721  
Gandhinagar, India  
Phone No. 02764-253500  
Fax No. 02764-253800
- 1.2 DESCRIPTION OF PRODUCT**
- 1.2.1 Name of Product** – FRP Manholes
- 1.2.2 Brief Description** –FRP Manholes are made of Polyester resin, Fibre glass and fillers. These are ideal for use in underground sewer, storm water and water pipe lines. These manholes are factory made. They do not corrode, have no joints, hence leak proof and prevents ingress in the manholes. These are easy & fast to erect.
- 1.3 ASSESSMENT**
- 1.3.1 Scope of Assessment** – Suitability of FRP Manholes for underground applications only.  
**Sizes:** FRP Manholes are available in sizes of 1.22m (4ft), 1.52m (5ft), 1.83m (6ft) & 2.44m (8ft) in diameter and 0.91m (3ft) to 12.80m (42ft) in height.
- 1.3.2 Scope of Inspection** – Scope of inspection included verification of production, performance and testing facilities at the factory & competence of technical personnel, status of quality assurance and testing in the factory.
- 1.3.3 Assessment Summary**
- 1.3.3.1** The assessment was done through inspection, laboratory testing & equipment at the factory, conducting the tests in the laboratory and field observations of the manholes.
- 1.3.3.2 Manufacturing & test facilities** – Manufacturing and test facilities available in the factory were found to be suitable & adequate to produce manholes as per the desired specifications. The PAC holder maintains testing laboratory with necessary equipment for quality assurance.
- 1.3.3.3 Competence of Technical Personnel** – Persons involved in testing were found to be well conversant with testing procedures required for the quality control of the product.

**I.3.3.4 Inspections in Actual use** – Ten manholes installed alongside a road in a locality in Ahmedabad in the year 2007 were inspected. They showed no distress & were found to be functioning satisfactorily.

**I.3.3.5 Quality Assurance Procedure** – The firm follows a defined Quality Assurance System for production of FRP Manholes. (See Quality Assurance Plan attached as Annexure)

#### **I.4 TESTS OF THE MANHOLES & THEIR LIMITATIONS**

**I.4.1 Design Data** – The data & information provided in Part II of this Certificate shall be used for selection of size of these manholes.

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

**I.4.2.1 Storage** – At the user's end the manholes shall be stored on a hard & uniform surface so that these may not develop cracks later on. They shall be stacked flat on bearer strips properly covered to exclude moisture and inside a shed / building.

**I.4.2.2 Handling** – FRP Manholes shall be handled carefully during storage or installation in order to prevent occurrence of damage to the faces & edges. The manholes shall not be dragged along the surface but shall be lifted clear of any surface on which they are stored.

##### **I.4.3 Tests of the manholes**

**I.4.3.1** The samples of the manholes tested as per various Standards listed in Part V of this Certificate have met the requirements of all the tests namely Visual inspection & Overall dimensions, Load rating & Deflection, Soundness (Hydrostatic), Field vacuum, Stiffness, Compressive Strength, Flexural strength, Flexural modulus and Barcol Tests in accordance with the test reports of CIPET which led to the conclusion that they can be used as manholes provided they are installed in accordance with the manufacturer's instructions & guidelines.

#### **I.5 CONDITIONS OF CERTIFICATION**

**I.5.1 Technical conditions** – Raw materials and the finished manholes shall conform to the requirements given in Clause II-2.2.

**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 attached with this Certificate.

**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 FRP Manholes covered by this Certificate conforms to the requirement of the specifications.

**PART II CERTIFICATE HOLDER'S TECHNICAL SPECIFICATIONS**

**II.1 GENERAL**

**II.1.1** The PAC holder shall manufacture the manholes in accordance with requirements specified in the relevant Standards and Clause II-2.4.

**II.2 SPECIFICATIONS FOR THE PRODUCT**

**II.2.1** **Specifications** – The specifications for raw materials and the manholes are as per performance criteria when tested in accordance with the company and relevant Standards listed in this Certificate.

**II.2.2 Technical Specifications**

**II.2.2.1 Raw Materials**

Sl.No.	Parameters of Raw Material	Specifications
<b>A. Resin (Unsaturated Polyester Resin) – Commercial grade</b>		
1.	Viscosity	400 ± 50 Cps
2.	Gel Time	25 ± 5 minutes
<b>B. Glass (E-glass) – Commercial grade</b>		
1.	Moisture Content	≤ 0.2%
2.	Loss on ignition	1.25 ± 0.20%
3.	Tex value	2400 ± 192
<b>C. Sand</b>		
1.	Silica Content	98 % min.

### II.2.2.2 Thickness wise/ Size wise/ Weight

Thick ness (mm)	Total Height (mm)	Average weight of Conical portion on nominal thickness (Kg)				Average weight of cylindrical portion on nominal thickness (Kg)			
		Dia/ Size of manhole				Dia/Size of manhole			
		1.22m / 4 ft	1.52m / 5ft	1.83m / 6ft	2.44m / 8ft	1.22m / 4ft	1.52m / 5ft	1.83m / 6ft	2.44m / 8ft
7.5 ± 0.5	Up to 3m	41.85	54.00	125.5	168.7	15.76	19.63	23.65	31.52
9.0 ±0.5	3m to 5m	50.22	64.80	150.7	202.5	18.92	23.57	28.37	38.00
12.0 ± 0.5	Above 5m	67.00	86.40	200.9	270.0	25.25	31.42	37.85	50.44

**II.2.3 Construction & workmanship** – The exterior surface of the manholes shall be relatively smooth with no sharp projections. The exterior surface shall be free of blisters larger than 1mm in dia and de-lamination. Fibers loosely attached (can be removed with brush) are allowed if not excessive. Paint or other coatings that impair the visual inspection of the laminate shall not be allowed. Indentations or other shapes, imperfection that will not affect performance shall be allowed. Hand-work finish shall be acceptable if enough resin is present to saturate all fibers. The interior surface shall be resin rich with no expose fibers. The surface shall be free of de-lamination, crazing, blisters larger than 1mm. in dia.

**II.2.4 Performance characteristics of FRP Manholes** – The manholes shall meet the following performance criteria when tested in accordance with the relevant Standards:

S.No.	Performance Characteristics	Test Method	Acceptable Criteria
1.	Visual Appearance	Visual	Shall be smooth & free from sharp projections and shall be resin rich
2.	Dimensions	Measuring tape/ vernier caliper	As per product drawings
3.	Thickness		Shall be min. 6.0 mm
4.	Compressive Strength	IS13360 (Part 5, Sec 8):1996	Shall be min. 115 N/mm <sup>2</sup>
5.	Flexural Strength	IS13411:1992	Shall be min. 84 N/mm <sup>2</sup>
6.	Flexural Modulus	IS13411:1992	Shall be min. 2907 N/mm <sup>2</sup>

7.	Barcol Hardness	IS 14399 (Part1):1996	Shall not be less than 90% of the value of the cured resin
8.	Stiffness Test at 5% & 10% deflection	ASTM D 3753-2005	Shall be min. 0.55 N/mm <sup>2</sup> for 2 m length
10.	Soundness (Hydrostatic) Test		Shall not leak at the laminate, joints or repairs on pressure of 2.1 to 3.5 N/mm <sup>2</sup>
11.	Field Vacuum Test		Shall be capable of withstanding a field applied vacuum of 3.5 N/mm <sup>2</sup>
12.	Load rating Test at 10896 Kgf		Shall not deflect vertically more than 6.35 mm
13.	Load rating Test at 18160 Kgf		Shall not crack or damage

**II.2.5 Size & Capacity** – FRP Manholes shall be available in sizes varying from 1.22m to 2.44m (4 to 8 ft) in diameter and 0.91m to 12.80m (3 to 42 ft) in height. These shall be generally available in capacities varying from 1000L to 5000L.

**II.2.6 Marking** – Besides the identification mark of the PAC holder as manufacturer and any other marking he may use, capacity & batch number shall be marked suitably on each manhole.

### II.3 SELECTION & INSTALLATION

**II.3.1** The user/installer shall be responsible for proper installation and installation of the manholes at site as per manufacturer's instructions. In this regard PAC holder shall provide proper guidance in writing.

**II.3.2 Choosing size** – Appropriate capacity & size of the manhole shall be chosen to suit the requirement.

**II.3.3 Handling** – Manholes shall be carefully handled during storage or installation in order to prevent occurrences of damage to the faces & edges.

#### II.3.4 Installation Instructions

**II.3.4.1 Make Manhole cut-outs** – Prepare excavation in a normal manner. Insure the depth of manhole is sufficient to allow one course of brick or one concrete ring for adjustment of ring and cover at top of final grade. Mark manhole for pipe cut-outs. Stencil quarter round marks on the manhole at factory to facilitate cut-out marking.

**II.3.4.2 Pour concrete base** – Pour concrete of M20 grade slab base at least 2m x 2m x 15cm thick or a 2m diameter by 15cm thick for 1.20m



diameter manholes. Larger diameter manholes require a concrete slab dimension that will result in 30cm of concrete beyond pipe diameter.

**II.3.4.3 Set manhole** – To lift manhole, insert 1.20m x 10cm timber crosswise inside the manhole to the underside of the collar with a rope or chain attached to backhoe or lifting device.

**II.3.4.4 Backfill** – Native soil (or sand in unstable areas) free of large stones, debris or concrete chunks may be used for backfill. This fill shall be added in 30cm lifts all around the manhole to avoid uneven lateral pressure which could move the manhole out of plumb.

**II.3.4.5 Bring to grade** – To bring the manhole to finished grade and provide support for ring & cover, construct chimney using pre-cast concrete rings or brick & mortar.

**II.3.5 Good practice for installation & maintenance** - Good practice as per details provided by the manufacturer shall be followed for installation of the manholes.

## **II.4 CRITICAL DETAILS**

**II.4.1** FRP Manholes shall be provided with a diameter of 600mm for fitment of standard circular manhole cover of 600mm dia.

**II.4.2** FRP Manholes shall be designed and manufactured as per the following performance criteria as:

1. Dynamic load rating of 7200Kgf for which these manholes shall be load tested at 18160Kgf to ensure that they do not develop any crack or suffer any damages thereby causing leakages on installation.
2. These manholes shall be tested vertically downwards with frontal load of 10896Kgf to ensure that the vertical downward deflection shall not exceed 6.35mm
3. These manholes shall also be tested to withstand water pressure from 2.1 to 3.5 N/mm<sup>2</sup> to ensure that they do not develop any leakages

## **II.5 SKILLS/ TRAINING NEEDED FOR INSTALLATION**

No special skills other than the normal skills of a good plumber are needed for installing the manholes.

**II.6 GUARENTEES/WARRANTEES PROVIDED BY THE PAC HOLDER** – The PAC holder shall give warrantec period of at least one year after installation.

## **II.7 SERVICES PROVIDED BY THE PAC HOLDER**

The users / customers shall ascertain from the PAC holder the type of service, 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 in the presence of third party namely RITES on the random samples of manholes taken by IO during inspection
- (v) Tests got done in independent laboratory namely CIPET on random samples of manholes taken by IO during inspection
- (vi) Inspection of FRP Manholes in service

### **III.2 MANUFACTURING PROCESS**

**III.2.1.1** **Fiberglass material** -- Fiberglass reinforced polyester manhole shall be manufactured from commercial grade polyester resin with fiberglass reinforcements. The manhole liner shall be a one piece unit manufactured to meet all the required specifications.

**III.2.1.2** **Resin** -- The resins used shall be of commercial grade unsaturated polyester resin.

**III.2.1.3** **Reinforcing materials** -- The reinforcing materials shall be commercial grade E type glass in the form of continuous roving and chop roving having a coupling agent that will provide a suitable bond between glass reinforcement and resin.

**III.2.1.4** **Interior surface material** -- The inner surface exposed to chemical environment shall be a resin rich layer of 0.25 to 0.50mm thick (See II-2.2.1.A). The inner surface layer exposed to corrosive environment shall be followed with a minimum of two passes of chopped roving of min. length of 13mm to max. length of 51mm which shall be applied uniformly(See II-2.2.1.B). Each pass of chopped roving shall be well rolled prior to the application of additional reinforcement. The combined thickness of the inner surface and interior layer shall not be less than 2.5mm.

**III.2.1.5** **Wall construction procedure** -- After inner layer has been applied, the manhole liner wall shall be constructed with chop & continuous strand filament wound manufacturing process which ensures continuous reinforcement and uniform strength & composition. The cone section, if

produced separately, shall be affixed to the barrel section at the factory with resin-glass reinforced joint resulting in a one-piece unit. Seams shall be fiber-glassed on inside and outside using the same glass- resin jointing procedure. Field joints shall not be acceptable by anyone except the manufacturer.

**III.2.2** Inspections & testing shall be done at appropriate stages of manufacturing process. As part of quality assurance regular in-process inspections shall be carried out by the trained personnel of the PAC holder.

**III.3 FACTORY INSPECTIONS**

**III.3.1** The factory was inspected by the technical representative of the Council. During inspection the entire manufacturing process along with the equipment and machinery were inspected. The manufacturing process was found to conform to the process description given by the manufacturer. The in-process inspection and the inspection of the manholes were in accordance with the SQA approved as a part of the requirements for grant of this PAC. It is the responsibility of the PAC holder to maintain and calibrate equipment for manufacturing and testing periodically to manufacture the manholes in accordance with the specified parameters.

**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 inspection, Overall dimensions, Load rating & Deflection, Soundness (Hydrostatic), Field vacuum, Stiffness, Barcol hardness, Compression, Flexural strength & Flexural modulus were done in the factory for checking the product as well as the related test equipment. The tests were conducted using standard test methods covered by the relevant Standards listed in Part V of this certificate. The samples passed in all the tests conducted.

**III.4.1.2 In independent laboratory** – The performance tests for these manholes specified in the relevant Standards and listed below have been got done in an independent laboratory namely CIPET, Ahmedabad on random samples of the product taken by the IO. The samples conform to the tests as per performance requirements and specifications given by the manufacturer.

**Tests done in an independent laboratory**

S.No.	Parameters	Test Method/ Requirement	Results Obtained
1.	Visual Appearance	Visual -- Shall be	Exterior & interior surfaces

		smooth & free from sharp projections and shall be resin rich	found smooth and free from sharp projections and any loosely attached fiber
2.	Dimensions Manhole Length Manhole I.D. Thickness (average)	As per drawings -- Shall be as per the tolerances specified	1840mm 602mm 7.20mm
3.	Compressive strength	IS 13360 (Part5, Sec 8): 1996/ Shall be min 115N/mm <sup>2</sup>	218 N/mm <sup>2</sup>
4.	Flexural Strength	IS 13411: 1992/Shall be min. 84 N/mm <sup>2</sup>	126 N/mm <sup>2</sup>
5.	Flexural Modulus	IS 13411:1992/ Shall be min 2907 N/mm <sup>2</sup>	4130 N/mm <sup>2</sup>
6.	Barcol Hardness	IS 14399 (Part 1): 1996/ Shall not be less than 90% of the cured resin	42
7.	Stiffness Test (i) 5% deflection (ii) 10% deflection	ASTM D 3753-2005/ Shall not be less than 0.55 N/mm <sup>2</sup>	1.148 N/mm <sup>2</sup> 1.036 N/mm <sup>2</sup>
8.	Hydrostatic (Soundness) at 2.8 N/mm <sup>2</sup> (4Psi)	ASTM D 3753-2005/ Shall not leak at the joints etc on pressure of 2.1 to 3.5 N/mm <sup>2</sup>	No leakage observed on joints or any repairs
9.	Field Vacuum Test	ASTM D 3753-2005/ Shall be capable of withstanding applied vacuum of 3.5 N/mm <sup>2</sup>	No crack or damage observed at 3.5 N/mm <sup>2</sup>
10.	Load Rating Test (i)108000 N (24000Lb) (ii)180000N (40000 Lb)	ASTM D 3753-2005/ Shall not deflect vertically > 6.35 mm Shall not crack /damage	Deflection 5.5mm No crack or damage observed at 1980000N

**III.5 INSPECTION & SUPPLY OF INSTALLED MANHOLES**– Ten FRP Manholes installed in the factory and alongside a road in Ahmedabad during the year 2008 were inspected. None of them showed any distress and were functional. Details of the manholes supplied by the manufacturer during the period 2008 to 2010 are given below:-

S.No.	Supplied to	Location of Building	When Supplied
1.	AUDA	Ahmedabad	August 2008
2.	Piramal Healthcare	Ahmedabad	December 2008
3.	American Consulate	Bangalore	April 2009
4.	SIDGCL	Goa	May 2010

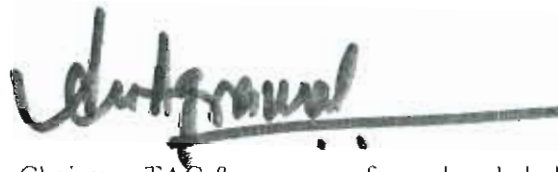
## **PART IV STANDARD CONDITIONS**

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 thereof.
- 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 feedback 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. Shailesh 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, Indira Habitat Centre, Lodhi 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 particular tests only and do not specify the requirement for the whole product as such:
- Part V.1.1**    **IS 1726:1991** – Specifications for CI Manholes & Manhole covers
- Part V.1.2**    **IS 4111 (Part 1):1986** – Code of practice for ancillary structures in sewerage system: Manholes
- Part V.1.3**    **IS 13411:1992** – Glass Reinforced Polyester Dough Moulding Compound (DMC)
- Part V.1.4**    **IS 13360: (Part 5, Sec 8)** – Plastics – Methods of Testing – Determination of Compressive Properties
- Part V.1.5**    **IS 14399 (Part 1): 1996** – Hot pressed moulded thermosetting Glass Fibre Reinforced Polyester Resin (GRP)-Specifications for Panels
- Part V.1.6**    **ASTM D 3753:2005** -- Standard Specifications of Glass Fiber Reinforced Polyester Manholes
- Part V.2**      **Company Standards of the PAC holder** – The branded design and specifications of the raw materials and finished products are as specified by manufacturer. The PAC holder has to make available the company standards to the consumers according to which testing have been done.

## CERTIFICATION

In the opinion of Building Materials & Technology Promotion Council's Board of Agreement (BMBA) **FRP Manhole** 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. 1005-C/2011** is awarded to **M/s Sintex Industries Ltd.**

The period of validity of this Certificate is as shown on Page 1 of this PAC. This Certificate consists of pages 1 to 19.



Embossin  
g  
Seal  
of  
BMBA

On behalf of BMTPC Board of Agreement

New Delhi, India  
Place  
Date

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. Shailesh 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, Lodhi Road,  
New Delhi-110 003



## PART -- VI ABBREVIATIONS

### Abbreviations

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

## Performance Appraisal Certification Scheme - A Brief

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

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

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

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

To make the PACS transparent and authentic it is administered through a Technical Assessment Committee (T AC) 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](http://www.bmtpc.org)

ANNEXURE

BUILDING MATERIALS & TECHNOLOGY PROMOTION COUNCIL

QUALITY ASSURANCE PLAN FOR FRP MANHOLES

S.No	PARAMETER TO BE INSPECTED	REQUIREMENTS SPECIFIED	TEST METHOD	FREQUENCY OF TESTING
<b>A. PRODUCT</b>				
<b>A.I. ROUTINE TEST</b>				
A.I.1	Visual Appearance	Exterior surface shall be smooth and free from sharp projections & defects. Interior surface shall be resin rich with no exposed fiber	Conform to ASTM D 3753-2005 Clause No. 6.1.1	10% in every lot
A.I.2	Dimensions	Shall conform to approved drawings	Measuring Tape or vernier caliper as appropriate	5 Nos at the time of initial validation and thereafter 1 No in lot
<b>II. ACCEPTANCE TEST</b>				
A.II.1	Dimensions & thickness	Shall conform to approved drawing	Measuring Tape or Vernier Caliper as appropriate	1 No. in Lot
A.II.2	Stiffness Test	Shall have min. pipe stiffness values as given below. The section tested shall be free of any joints, repetitive features or repairs Manhole length Requirement 1829 mm      4.96KPa 3658 mm      8.69KPa 6096 mm      13.86KPa 7620 mm      20.82KPa 10668 mm     36.13KPa	Conform to ASTM D 3753-2005 Clause No. 8.5	-do-
A.II.3	Soundness Test (Hydrostatic)	Shall not leak at the laminate, joints or repairs when air or water pressure is applied. The established pressure shall vary from 2.1 N/mm <sup>2</sup> to 3.5 N/mm <sup>2</sup>	Conform to ASTM D 3753-2005 (Clause No. 8.6)	1 No. at the time of initial validation
A.II.4	Compressive	115 N/mm <sup>2</sup> min.	Conform to	5 Nos. at the

	Strength		IS 13360 (Part 5, Sec 8):1992	time of initial validation
A.II.5	Flexural Strength & Modulus	Flexural strength – 84 N/mm <sup>2</sup> min Flexural modulus –2907 N/mm <sup>2</sup>	IS 13411:1992 (Annexure F)	--do--
A.II.6	Barcol Hardness Test	Shall not be less than 90% of the value of the cured resin as per the manufacturer's TC	Conform to IS 14399 (Part 1): 1996 Clause 8	--do--
A.II.7	Field Vacuum Test	Shall be capable of withstanding field applied test vacuum of 3.5 N/mm <sup>2</sup>	Conform to ASTM D 3753-2005 (ClauseNo. 6.9)	1 No. in lot
<b>A.III TYPE TEST</b>				
A.III.1	Load rating Test a) Eccentric Manhole b) Concentric Manhole	The top of manhole shall not deflect vertically more than 6.35mm when tested under specified load of 10896 Kg & shall not crack or damage on 18160 Kg	Conform to ASTM D 3753-2005 (Clause No.8.4.1.1)	1 No. at the time of initial validation
A.III.2	Chemical resistance Test	After the tests that determine flexural strength, flexural modulus & barcol hardness, plot a graph for avg. % retention of proportion against time in hours after 100000 hours. It shall retain at least 50% of original values.	Conform to ASTM D 3753-2005 (Clause No. 8.7)	--do--
<b>B. RAW MATERIAL</b>				
B.1	Resin	Commercial grade unsaturated polyester resin	To be verified from Supplier's Test certificate	
B.2	Glass	Commercial grade E-type glass in the form of mat, continuous roving & chopped roving	To be verified from Supplier's Test certificate	