



## Polyethylene Underground Septic Tank

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 **1001-C/2011**

Issue No. **01**

Date of Issue: **29.06.2011**



# bmtpc

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# PERFORMANCE APPRAISAL CERTIFICATE


FOR

## UNDERGROUND SEPTIC TANK

ISSUED TO

M/s SINTEX INDUSTRIES LTD

STATUS OF PAC 1001-C/2010

S.No	Issue No.	Date of Issue	Date of renewal	Amendment		Valid upto (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. 1001-C/2010

Issue No. 01

Date of issue 29-06-2011

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## **PART I      CERTIFICATION**

### **I.1              CERTIFICATE HOLDER: M/s Sintex Industries Ltd.**

Kalol (N. Gujarat) – 382721

Gandhinagar, India

Phone No. 02764-253500

Fax No. 02764-253800

### **I.2              DESCRIPTION OF THE PRODUCT**

#### **I.2.1          Name of the Product – Underground Septic Tank**

**I.2.2          Brief Description** – Disposal of waste which is anaerobic type of waste water treatment designed for treating waste water from toilet bowl, sink, kitchen and other waste water outlets in a house. Septic tank is an onsite system designed for disposal of biological sanitary waste etc, influent from all domestic activities enters the septic chamber where natural bacterial action decomposes human waste into acceptable level of discharge. It involves decomposition of organic substances present in waste water in the absence of molecular oxygen. Under such conditions, the facultative bacteria convert the complex organic matter into short chain low molecular weight volatile acid along with other products.

### **I.3              ASSESSMENT**

**I.3.1          Scope of Assessment** – Suitability of Polyethylene septic tanks as an alternate solution to the concrete or brick water storage tanks. These underground septic tanks are suitable for houses, schools, hospitals etc.

**I.3.2          Basis of Assessment** – Assessment of suitability of the septic tanks is based on the satisfactory test results of testing of the samples drawn from the manufacturing plant for dimensions, weight, wall thickness, installation of fittings, determination of water tightness, determination of resistance of a partition, determination of resistance to lateral load, top load, uplift load and handling & installation loads vis-à-vis requirements contained in the specifications for Septic tanks, BMBA PC-4:2011 attached along with.

- I.3.3**            **Scope of Inspection** – Scope of inspection included the verification of production, performance and testing facilities at the factory including competence of technical personnel, status of quality assurance and testing in the factory.
- I.3.4**            **ASSESSMENT SUMMARY**
- I.3.4.1**        The assessment was done through inspection and laboratory & testing equipment at the factory, conducting the tests in the factory in the presence of third party namely RITES and field observation of the Septic Tanks.
- I.3.4.2**        **Manufacturing & test facilities** – Manufacturing and test facilities available in the factory were found to be suitable & adequate to produce septic tanks as per the desired specifications. The PAC holder maintains testing laboratory with necessary equipment for quality assurance.
- I.3.4.3**        **Inspection in actual use** – Four septic tanks installed during the year 2008 in Ahmedabad were inspected. They showed no distress & were found to be functioning satisfactorily.
- I.3.4.4**        **Competence of Technical Personnel** – Personnel involved in training were found to be well conversant with testing procedures required for the quality control of the product.
- I.3.4.5**        **Quality Assurance Procedure** – The firm follows a defined Quality Assurance System for production of these tanks (See Quality Assurance Plan attached as Annexure).
- I.4**             **USES OF THE SEPTIC TANKS & THEIR LIMITATIONS**
- I.4.1**           **Design Data** – The design data and information provided in Part II of this Certificate shall be used for selection of the type & size of these tanks.
- I.4.2**           **Storage & handling at the user end before installation**
- I.4.2.1**        **Storage** – At the user's end these tanks shall be stored on a hard & uniform surface so that they may not develop cracks later on.

**I.4.2.2 Handling** –Septic tanks shall be handled carefully during storage or installation in order to prevent occurrence of damages to the face & edges.

**I.4.3 Limitations of use**

**I.4.3.1** Not recommended for use where radiation hazards are there.

**I.4.3.2** Not recommended for use in excessive high water table areas.

**I.4.3.3** These tanks shall not be installed across path of vehicles or heavy equipment.

**I.4.3.4** System shall not be disturbed in terms of BOD.

**I.4.3.5** This type of tanks shall not be installed near underground electric cables or drinking water pipelines.

**I.5 CONDITIONS OF CERTIFICATION**

**I.5.1 Technical conditions** –Raw materials and the finished septic tanks 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 the 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 septic tanks 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 underground septic tanks in accordance with the requirements specified in the Specifications for Septic Tanks attached with this Certificate.

### **II.2 SPECIFICATIONS OF THE PRODUCT**

**II.2.1 Specifications** – The specifications for raw materials & tanks are as per performance criteria when tested in accordance with the Specifications for Septic tanks listed in Part V of this Certificate.

#### **II.2.2 Technical Specifications**

##### **II.2.2.1 Raw Materials**

- (i) Polyethylene (LLDPE of Roto-moulding grade) conforming to IS 10146:2003 and Reliance 'O' - 35042 grade, MFI: 2.0 to 6.0 gm/10 minutes and Density 932 to 943 kg/m<sup>3</sup>
- (ii) Carbon Black Master Batch – Carbon black content: 40%  $\pm$ 1% and Ash content 1% max.

**II.2.2.2 Design** – Weight & wall thickness as per details given below shall be taken in to consideration while designing the septic tanks:

Sr.No.	Capacity	Avg.Weight	Thickness $\pm$ 10%
1.	CCST -100-01(1000Lt)	40.0 $\pm$ 1.0 Kg	7.3 mm
2.	CCST- 200-01(2000Lt)	80.0 $\pm$ 1.0 Kg	6.6 mm
3.	CCST- 300-01(3000Lt)	120.0 $\pm$ 2.0 Kg	6.8 mm
4.	CCST- 400-01(4000Lt)	160.0 $\pm$ 2.0 Kg	7.0 mm
5.	CCST- 500-01(5000Lt)	200.0 $\pm$ 3.0 Kg	7.2 mm
6.	CCST-100-02 (1000Lt)	47.0 $\pm$ 1.0 Kg	6.5 mm
7.	CCST-200-02 (2000Lt)	90.0 $\pm$ 1.0 Kg	6.3 mm
8.	THST-100-01 (1000Lt)	34.0 $\pm$ 1.0 Kg	5.83 mm
9.	THST-200-01 (2000Lt)	48.0 $\pm$ 1.0 Kg	6.28 mm

##### **II.2.3 Performance Characteristics of underground septic tanks**

**II.2.3.1** These septic tanks shall meet the following performance characteristics when tested in accordance with Specifications for Septic Tanks BMBA PC-4:2011\*:

S.No	Performance Characteristics	Test Method	Acceptance Criteria
1.	Dimensions	As per drawings	Shall be as per tolerance given in the drawings
2.	Visual Appearance	Visual Inspection	(i)Each component/ assembly of the system shall be well finished (ii)All loose, fabricated items shall be checked for damages
3.	Weight	Measuring tape/vernier caliper	Shall be $47.0 \pm 1.0$ kg (avg.)
4.	Wall thickness		Shall be 6.0 mm + 10%
5.	Installation of Fitting	Appendix-B*	Water shall not leak through the joints of fittings & tank
6.	Partition Strength Test	Appendix-C*	Partition shall not leak & damage
7.	Water Tightness Test	Appendix-D*	Tank shall not leak
8.	Resistance to Lateral Load (Point/Hydrostatic	Appendix-E/F*	Tank shall not crack or deform permanently
9.	Resistance to Top Load	Appendix-G*	Tank shall not crack or deform permanently
10.	Resistance to Handling & Installation Loads	Clause 2.4.11.2*	Tank shall not be subjected to any damage during loading/unloading for installation
11.	Resistance to Uplift Load from Ground Water	Clause 2.4.11.3*	Tank on installation shall not get lifted due to forces generated by ground water

**II.2.3.2 Types & Sizes** – These tanks are manufactured in different types and various sizes as per details given below:

**I. Cylindrical Vertical Model**

CCST-100-01(1000 Lt), CCST-200-01(2000 Lt), CCST-300-01(3000 Lt), CCST-400-01(4000 Lt), CCST-500-01(5000 Lt), CCST-100-02 (1000Lt) and CCST-200-02 (2000Lt)

**II. TH Type Horizontal Model**

THST-100-01(1000 Lt) and THST-200-01(2000 Lt)



**II.2.4 Marking** – Besides the identification mark of the PAC holder as manufacturer and any other marking he may use, the capacity and batch number shall be marked suitably on each tank.

### **II.3 SELECTION & INSTALLATION**

**II.3.1** The user/installer is responsible for proper selection and installation of the tanks as per the manufacturer's instructions. In this regard, PAC holder shall provide proper guidance in writing.

**II. 3.2 Choosing size** – Appropriate size of the septic tanks shall be chosen to suit the requirements of the user.

**II.3.3 Handling** – Septic tanks shall be carefully handled during storage and installation to prevent occurrences of damage to the faces & edges

#### **II.3.4 Installation instructions**

**II.3.4.1** A small pre-cast base, anchoring arrangements, proper backfilling & proper fittings are all needed for installing a underground tank

**II.3.4.1.1** Place the tank inside excavated pit provided with RCC bedding. Backfill sand / gravel mixture and well compact

**II.3.4.1.2** Fill the tank with water in equal proportion to back fill

**II.3.4.1.3** Be certain to compact backfill under inlet & outlet pipes.

**II.3.4.1.4** When septic tank is filled fully with water, backfill to the surrounding level.

**II.3.4.1.5** Refill the tank with water following periodic septic tank pumping for sludge removal.

**II.3.4.1.6** Maintain level of tank to maintain gravity of fluid and to avoid any stress on tank body.

**II.3.4.1.7** These tanks shall be installed strictly as per the instruction manual given with the tank.

**II.3.5 Good practices for installation & maintenance** – Good practice as per details provided by the manufacturer shall be followed for installation of these tanks.

### **II.4 PRECAUTIONS FOR USE OF SEPTIC TANKS**

**II.4.1** These tanks shall not be installed in excessive high water table areas.

- II.4.2 These tanks shall not be installed across path of vehicles of heavy equipment.
- II.4.3 These tanks shall not be installed near underground electric cables or drinking water pipe lines.
- II.4.4 These tanks shall be used as septic tanks only
- II.5 **MAINTENACE REQUIREMENTS** – These tanks shall be installed strictly as per the guidelines provided by the PAC holder.
- II.6 **SKILLS/TRAINING NEEDED FOR INSTALLATION--** No special skills other than normal skills of a good plumber are needed for installation of these tanks.
- II.7 **GUARANTEES/WARRANTIES PROVIDED BY THE PAC HOLDER**-The PAC holder shall give a warrantee period of at least one year from the date of supply against any genuine manufacturing defect provided these tanks are not subjected to any damage whatsoever and are not abused/misused or wrongly installed. During the period of warranty these tanks 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.8 **SERVICES PROVIDED BY THE PAC HOLDER**
- II.8.1 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.8.2 The PAC holder shall also provide after sales service on customer to customer basis. These include items like pre-finishing, trouble in installation and usage of septic tanks. However, 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 laboratory & test equipment used, test procedures followed and testing personnel involved 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 random samples of the tanks taken by the IO during inspection on the basis of performance characteristics given by the manufacturer
  - (v) Inspection of underground septic tanks in service.

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

**III.2.1** Raw Materials namely Polyethylene & Black Master Bach are stored and tested in the chemical laboratory. Then extending & pulverizing processes are done. These are then loaded in mould as per & weight of the machine. R&R machinery processing is done. Testing of moulded specimens is done in the QC lab for approval of Roto- molding. Roto- moulding shop floor finishes & tested internally. Thereafter, final inspection is done & the tanks are stored outside.

**III.2.2** Inspections & testing is done at appropriate stages of manufacturing process. The inspected tanks are stored 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 INSPECTIONS**

**III.3.1** The factory was inspected by the technical representative of the Council. During inspection the manufacturing process along with the equipment was 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 septic tanks were in accordance with the SQA 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 septic tanks in accordance with the parameters.

### III.4 LABORATORY TESTS DONE FOR ASSESSMENT

#### III.4.1 Testing of samples

III.4.1.1 **In the factory** – The performance tests for septic tanks listed below have been done by the third party namely RITES in the factory on random samples of the tanks taken by the IO for checking the product as well as the related equipment. The tests were conducted using standard test methods specified by the manufacturer & tested as per BMBA PC-4:2011. The samples

confirm to the tests as per the performance requirements and specifications given by the manufacturer:

S.No	Parameters Tested	Test Method/ Requirement	Results Obtained
1.	Overall Dimensions (a) Total Diameter (b) Total Height (c) Manhole I.D.	As per tolerances given in the drawings for each parameter	1523mm 1743mm 403mm
2.	Visual appearance	Shall be well finished and shall have no defects	Free from any defects
3.	Weight	Shall be $90.0 \pm 1\text{kg}$ (avg.)	106.40 kg
4.	Wall thickness	Shall be $6.0\text{mm} + 10\%$	8.14 mm (avg.)
3.	Installation of fittings in sound & water tight manner	Appendix-B* Shall not leak through the joints of fittings	No leakage observed
4.	Determination of Resistance of a Partition to a Hydrostatic Head (Pump out Test)	Appendix-C* Shall not leak & damage	No partition collapsed or leakage through partition and no permanent deformation observed
5.	Determination of Water Tightness	Appendix-D* Shall not leak	No leakage or cracking observed
6.	Determination of Resistance to Lateral Load by Hydrostatic / Point load test method	Appendix-E/ Appendix-F* Shall not crack or deform permanently	No crack or permanent Deformation observed by point load test method
7.	Determination of Resistance to Top Loading	Appendix-G* Shall not crack or deform permanently	No crack / deformation observed
8.	Resistance to Handling &	Clause 2.4.11.2*	No damage observed

	Installation Loads	Shall not be subjected to any damage during loading/unloading for installation	
9.	Resistance to Uplift Load from Ground Water	Clause 2.4.11.3* Shall not get lifted due to forces generated by ground water	Uplifting of tank is less than 10% of the height

• **Specifications for Septic Tanks BMBA PC-4:2011**

**III.5 INSPECTION & SUPPLY OF INSTALLED TANKS: -**

Four septic tanks installed during the year 2008 in the factory and at a locality in Ahmedabad were inspected. None of them showed any distress & were functional. Details of the septic tanks supplied by the manufacturer during the period 2008-2010 are given below:

S.No.	Occupancy/Building	Location of Building	When installed
1.	M/s Tina Properties Pvt. Ltd.	Bangalore	April 2008
2.	Larsen & Toubro Ltd.	Chennai	July 2008
3.	Naluketu Agencies	Kanjiramkulam, Kerala	November 2008
4.	M/s R.K. Enterprises	Ahmedabad	October 2008

## **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 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.
- 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, India 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 a particular test only and not specify the requirement for the whole product as such.
- Part – V 1.1**    **BMBA PC-4:2011** -- Specifications for Septic Tanks
- Part –V.1.2**    **IS 2530:1963** – Method of tests for polyethylene moulding materials & compounds.
- Part –V 1.3**    **IS 7328:1992** – High density Polyethylene materials for Moulding & Extrusion - Specifications.
- 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 have been done.



## CERTIFICATION

In the opinion of Building Materials and Technology Promotion Council's Board of Agreement (BMBA) **Underground Septic Tank** bearing the mark Manufactured by M/s Sintex Industries Ltd. is satisfactory if used as set out above in the text of the Certificate. This Certificate **PAC No.1001-C/2010** 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 68.



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Seal  
of  
BMBA

On behalf of BMTPC Board of Agreement

New Delhi, India  
Place  
AC) of  
Date

Chairman, Technical Assessment Committee (T  
BMBA & Member Secretary, BMTPC Board of  
Agreement (BMBA) Under Ministry of Housing  
and Urban Poverty Alleviation, Government of  
India

Dr. Shaillesh 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 (TAC) and the BMTPC Board of Agreement (BMBA) in which scientific, technological, academic, professional organizations and industry interests are represented.

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

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

Further information on PACS can be obtained from the website: [www.bmtpc.org](http://www.bmtpc.org)

**ANNEXURE**

**BUILDING MATERIALS & TECHNOLOGY PROMOTION  
COUNCIL**

**QUALITY ASSURANCE PLAN FOR UNDERGROUND SEPTIC  
TANKS**

S.No	PARAMETERS TO BE INSPECTED	REQUIREMENT SPECIFIED	TEST METHOD	FREQUENCY OF TESTING
<b>A. PRODUCT</b>				
<b>I. ROUTINE TEST</b>				
I.1	Visual	a) Each component part/assembly of the system shall be well finished with individual items properly fitted/ assembled b) All loose, fabricated items/pipes/fittings etc. should for damages	Visual Inspection	100%
I.2	Dimensions	As per product drawings Tolerances as given in the drawings	Measuring Tape/Vernier Caliper/	Only initially at the time of product validation for each cavity
<b>II. PERFORMANCE TEST</b>				
II.1	Weight	$\pm 1.00$ kg up to 100 kg $\pm 2.00$ kg up to 200 kg $\pm 3.00$ kg > 200kg	Weighing scale	03 Nos. per Lot
II.2	Wall Thickness	Min. Wall thickness 6mm	Micrometer/ Vernier Caliper	10 Nos. per Lot
<b>III. TYPE TEST</b>				
III.1	Installation of Fitting	No leakage of water through the joints of the fittings & tank	<b>BMBA PC-4:2011</b>	

			Appendix-B	Once for 3 Nos. initially during product validation and thereafter 3 Nos. for every 500 Nos. or whenever mould is modified
III.2	Partition Strength Test (Pump out Test)	Partition shall not leak & damage	Appendix-C	
III.3	Water Tightness Test	Tank shall not leak	Appendix-D	
III.4	Resistance to Lateral Load either by Hydraulic Test Method or by Point Load Test Method	Shall not crack or deform permanently	Appendix-E Appendix -F	
III.5	Resistance to Top Load	Shall no crack or deform permanently	Appendix-G	Once for 1 No. initially during product validation and there after 1 No. for every 500 Nos. or whenever mould is modified
III.6	Resistance to Handling & Installation Loads	Tank shall not be subjected to any damages during loading/unloading for installation at site	Clause 2.4.11.2	
III.7	Resistance to Uplift Load from Ground water	Septic tank on installation shall not get lifted due to forces generated by surrounding ground water	Clause 2.4.11.3	

## **B. RAW MATERIAL**

### **I. Polyethylene (LLDPE)**

I.1	M.F.I	2.0 to 6.0 gm/10 minutes	IS: 2530: 1963	Verify with Raw material TC– Once per lot
I.2	Density	932 to 943 kg/m3	IS: 7328: 1992	

### **II. Carbon Black Master Batch**

II.1	Carbon Black Content (CBS)	40 % ± 1%	Conform to the requirements	Verify with Raw material TC – Once per lot
II.2	Ash Content	1.0 % max.		

# SPECIFICATIONS FOR SEPTIC TANKS

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## **1 GENERAL**

### **1.1 Objective**

The objective of this Standard is to identify performance requirements and performance criteria for septic tanks, to specify & technical means of compliance and to provide test specifications that will enable septic tanks to be manufactured to comply with the performance requirements and criteria.

#### **1.1.1**

Performance requirements and criteria for septic tanks are found in Section 2. Sections 3 onwards cover 'means of compliance' and testing for materials currently used to manufacture septic tanks.

### **1.2 Scope**

This Standard covers the manufacture of conventional septic tanks and their associated fittings for the treatment of domestic wastewater only. This range of tanks typically is designed to cater for:

All-waste (Blackwater + Greywater)  
Blackwater only Greywater (with or without kitchen waste included) only and as Holding tanks (collection wells).

Septic tanks covered by this Standard are suitable for a flow of domestic wastewater of up to 14,000 litres per week.

#### **1.2.1**

This flow limit represents an average daily flow of 2000 litres, being from up to 10 persons in a single residence, or an institutional or commercial facility which may have a varying 7 day or 5 day operation averaged out over a full week.

### **1.3 Application**

This Standard is intended for use by consultants, designers, manufacturers, certifying bodies, installers and regulators.



### **1.3.1 General**

This Standard covers only the purpose and requirements of septic tanks and associated fittings. It does not cover the drainage systems leading to the tank, nor the effluent disposal systems associated with septic tanks.

### **1.3.2 Conventional designs and materials**

Traditionally certain materials, designs and techniques have been used and have become established. The materials and associated designs shown in Section 10 of this Standard have been proven through use and are presented as examples of solutions that are a means of compliance with the provisions of this Standard.

### **1.3.3 *Non-standard materials, installations or designs***

This Standard does not preclude the manufacture of septic tanks from any material, or in any unusual design, or installation in any non-standard fashion, provided that the completed product and its installation meets the performance requirements and performance criteria given in Section 2 of this Standard.

### **1.3.4**

It may be necessary to obtain and supply evidence of third party certification or opinion from people or organizations recognized as having the authority to do so before a regulatory authority will accept a new material or design.

### **1.3.5 *Operation and maintenance***

Septic tank systems need maintenance and regular desludging.

## **1.4 Definitions**

*For the purpose of this Standard, the definitions below apply:*

ACCESS OPENING means an opening in the -top surface of the tank fitted with a cover which is removable to allow access for desludging and for visual inspection of the interior of the tank and contents. Access openings are not intended to allow people to enter a tank.

ANCHORAGE means a device/technique for holding the tank in the ground against hydrostatic uplift pressures.

BLACK WATER means wastes discharged from the human body either direct to a vault toilet or through a water closet (flush toilet) and/or urinal.

CAPACITY means the volume of the tank below the invert of the outlet.

COLLECTION WELL (see HOLDING TANK)

CURE means the chemical reaction resulting in the final product. It may be effected at ambient temperature or at an elevated temperature

DAILY FLOW' means the daily flow to the septic tank,

DESLUDGING means removal of the accumulated sludge and scum from a septic tank.

EFFLUENT means the liquid discharged from a wastewater treatment process.

EXTENSION means a structure used to bring the access or inspection cover to ground level.

FOUL WATER (see WASTE WATER)

GAS BAFFLE means a device, usually a simple deflecting plate installed internally on the outlet of a septic tank, or the outlet of a second chamber, to prevent gas borne solids passing from the tank into the effluent land application system.

GEL-COAT means, for glass fibre manufacture, the thin layer of unreinforced resin on the surface of a laminate. The gel-coat covers the fibre of the reinforcement, protects the bond between resin and reinforcement, and provides special surface properties. It may be pigmented.

GREYWATER means the domestic wastes from baths, showers, basins, laundries and kitchens specifically excluding water closet and urinal wastes. Greywater does not normally contain human wastes unless laundry tubs or basins are used to rinse soiled clothing or baby's napkins.

HOLDING TANK means a tank used for holding domestic wastewater prior to pumping out (sometimes called COLLECTION WELL).

**HYDROSTATIC FLANGE** means a horizontal projection on the wall of the septic tank designed to prevent the tank being forced out of the ground by hydrostatic pressure in areas having a high water table. Sometimes called an anchor collar, or ground retention lip.

**INLET FITTING** means a device that allows a connection to be made between the drainage system carrying the wastewater and the septic tank.

**INSPECTION OPENING** means opening in the top surface of the tank which allows for inspection of the inlet or outlet fitting.

**INVERT** means the lowest point of the internal surface of a pipe.

**LAMINATE** means, for glass fibre manufacture, the set layer or layers of reinforcement impregnated with polyester or other resin forming a thick structural membrane. The laminate does not include the gel-coat.

**LAND APPLICATION** means application of effluent to areas of land for further treatment.

**LATERAL LOAD** means the load applied sideways onto a buried tank due to the combined effects of soil, water and traffic.

**LAYING-UP** means, for glass fibre manufacture, a process of applying or producing laminates in position on a mould prior to cure.

**OUTLET FITTING** means a device that allows a connection to be made between the outlet of the tank and the drainage system that conducts the effluent away for further treatment.

**PARTITION** means an internal wall which may or may not permit the passage of liquid and solid waste between compartments within the septic tank.

**PERFORMANCE REQUIREMENTS** means the functions that a system has to perform in order to operator as defined.

**PERFORMANCE CRITERIA** means the qualitative or quantitative description of the performance requirements.

**PRETREATMENT SYSTEM** means a system in which wastewater is partially treated before discharge into the septic tank.

REGULATORY AUTHORITY means the authority which is empowered by statute to be responsible for managing/controlling domestic on-site wastewater.

SCUM means the floating mass of wastewater solids buoyed up by entrained gas, grease or other substances which form an accumulating layer on the liquid surface inside the septic tank.

SEPTIC TANK means a single or multiple chambered tank through which wastewater is allowed to flow slowly to permit suspended matter to settle and be retained, so that organic matter contained therein can be decomposed (digested), by anaerobic bacterial action in the liquid. The term covers tanks used to treat wastewater, grey water and black water.

SERVICEABLE LIFE means the period of time in which with only normal and routine maintenance, the septic tank and associated fittings perform satisfactorily without failure.

SEWAGE means any wastewater, including all faecal matter, mine, household and commercial wastewater that contains human waste.

SLUDGE means the semi-liquid solids settled from wastewater in septic tanks.'

SOLIDS means material in the solid state.

VENT means a device, usually a pipe, which allows odours to be removed from the tank.

WASTEWATER means the spent or used water of domestic or commercial origin which contains dissolved and suspended matter. (NOTE: Wastewater is defined as FOUL WATER in the New Zealand Building Code.)

## **2. PERFORMANCE REQUIREMENTS AND PERFORMANCE CRITERIA**

### **2.1 Scope**

This section of the Standard specifies the performance requirements and performance criteria for septic tanks and associated fittings.

### **2.2 Function and context of use**

### **2.2.1 Function**

The function of a septic tank is to provide a relatively still zone of adequate size for the treatment of all domestic wastewater at all flow rates from a household, or institutional or commercial facility. Scum, and solids capable of settling, is separated from the wastewater flow. The solids are retained, digested and consolidated between maintenance operations. The tank design allows for the liquid above the settled solids (sludge) and below the scum layer to be either discharged to a land application system or to be removed for disposal in some other manner, and for essential regular desludging to be carried out so that the volume for storage and treatment of wastewater is maintained.

### **2.2.2 *Context of use***

**2.2.2.1** Septic tanks are either installed in the ground or freestanding in the open air. In these situations, they are exposed to the effects of the weather, internal loads/pressures, external loads/pressures and any ground movement. In addition corrosion of the tank material is possible internally from the wastewater, and externally from the surrounding environment.,

**2.2.2.2** When installed in the ground, the top surface of the tank is either placed at or just above the ground surface; (so that inspection and access covers are readily accessed and ingress of surface water is prevented), or the tank is installed deeper. When the tank is installed deeper, provision is made for a watertight vertical extension to be installed above the access and inspection openings to hold the access and inspection covers at or just above finished ground level.

## **2.3 Performance requirements**

### **2.3.1 *General***

The tank and associated fittings and extensions shall be constructed of durable materials. The tank shall be watertight, be capable of withstanding loads imposed on its roof and walls, and shall be constructed and installed so that flotation will not occur in areas of high water-table level or when the tank is emptied.

### **2.3.2 *Septic tanks***

Septic tanks shall be constructed:

- (a) With capacity for the settlement of solids from the design wastewater flow;
- (U) To allow for scum and sludge retention between desludging operations;
- (c) To allow entry of waste with the minimum of disturbance to surface layers under normal operating conditions;
- (d) To prevent the direct flow of wastewater between inlet and outlet;
- (e) To avoid the likelihood of blockage;
- (f) So that the entire structure of the tank and its associated inspection and access covers and/c, extensions, is integrally sound and penetration by roots, entry of ground water; or entry of insects avoided,
- (g) To avoid contamination of soils, groundwater and waterways;
- (h) From materials which are resistant or impervious both to the waste contained in the tank and to groundwater for the serviceable life of the tank;
- (i) To avoid the likelihood of foul air and gases creating an odour nuisance and entering buildings.
- (j) With access for removal of tank contents;
- (k) To reduce the likelihood of unauthorized access by people;
- (l) To remain integral for their serviceable life;
- (m) To prevent the likelihood of damage from superimposed loads or normal ground movement;
- (n) To be able to resist hydrostatic uplift pressures;
- (o) To be able to perform adequately with only normal maintenance over their serviceable life.

### **2.3.3 Serviceable Life**

The serviceable life of a septic tank and associated fittings shall be a minimum of 15 years provided the tank is used and installed in accordance with the manufacturer's recommendations as defined in this Standard.

## **2.4. Performance criteria**

Alternative designs or developments must meet the performance requirements of Section 3.3 and the associated performance criteria in this section.

### **2.4.1 Capacities**

Recommended minimum capacities for conventional wastewater treatment units are given in Appendix B.

#### **2.4.1.1 All-waste tanks**

The capacity of all-waste tanks shall be calculated to provide for at least 24 hours retention for the daily flow of waste from the premises plus an allowance of 80 lines/person/year of capacity for scum and sludge accumulation. It shall be assumed that the tank will be desludged at regular intervals of 3 - 5 years.

##### **2.4.1.1.1**

The allowance for scum and sludge accumulated in the conventional all-waste tank does not allow for extra solids from garbage grinders.

#### **2.4.1.2 Greywater tanks**

The capacity of greywater tanks shall be calculated to provide at least 32 hours combined retention and hydraulic buffering for daily greywater flows, with up to 40 hues/person/year of capacity allowed for scum and sludge accumulation. It is assumed that the tank will require pumpout /desludging at intervals of not greater than 5 years.

##### **2.4.1.2.1**

The allowance for scum and sludge accumulation in the conventional greywater tank does not allow for extra solids from garbage grinders. The disposal of garbage grinder solids into conventional greywater tanks is not recommended.

#### *2.4.1.3 Blackwater tanks*

The capacity of blackwater tanks shall be calculated to provide for at least 24 hours retention for daily water-closet flows, with 50 litres/person/year of capacity allowed for scum and sludge accumulation over a 3 - 5 year period when the tank will require pump out/desludging.

#### *2.4.1.4 Design capacity*

The wastewater treatment unit shall be designed to cater for the number of people for which the dwelling is designed.

#### *2.4.1.5 Flow path*

The flow path of wastewater, measured from the inlet to the outlet, shall be a minimum length of 1200 mm

#### *2.4.2 Inlet fittings and outlet fittings*

Inlet and outlet fittings shall have a cross-sectional area sufficiently large to allow the passage of solids of a size expected in the system.

#### *2.4.3 Joints*

The joints between a fitting and the wall of a septic tank and between tank components e.g. wall and lid, shall have a durable seal, be watertight, and have sufficient integral strength and/or flexibility to maintain a sound structure. The verification test for joints around fittings is given in Appendix C.

#### *2.4.4 Partitions*

When a septic tank is divided into chambers:

- (a) The partition(s) shall be sound and fixed without diminishing the integrity of the tank;
- b) The tank shall be able to be pumped out without the partition collapsing, or permanently deforming. A verification test is given in Appendix D.

#### *2.4.5 Access openings and covers*



Access openings are not intended to allow people to enter the tank. Where it is envisaged that a person must be able to enter the tank, e.g. for the purposes of repairs and maintenance, the access opening size shall comply with the appropriate regulations.

- (a) Access openings shall be located to allow access for desludging of the chamber(s);
- (b) Access openings shall be of sufficient size to allow the desludging mechanism to reach all parts of the chamber(s);
- (c) Access openings shall either be at or above ground level, or be able to be extended to the finished ground level if installed underground;
- (d) Access openings and covers shall provide an effective, durable and watertight seal. They shall be able to be resealed each time the cover is removed;
- (e) Access covers shall be durable and able to withstand superimposed loads;
- (f) Access covers shall be secure and shall be designed to prevent removal by children.

#### *2.4.6 Inspection openings and covers*

- (a) Inspection openings shall be located to give access to the inlet and outlet fittings;
- (b) Inspection openings shall have a cross-sectional area of not less than 7,500 mm<sup>2</sup>;
- (c) Inspection openings shall either be at or above ground level, or be able to be extended to the finished ground level if installed underground;
- (d) Inspection openings and covers shall provide an effective, durable and watertight seal. They shall be able to be resealed each time the cover is removed;

(e) Inspection covers shall be durable, and able to withstand superimposed loads,

(f) Inspection covers shall be able to be easily removed and replaced.

#### *2.4.7 Extensions*

(a) Extensions to access and inspection openings shall be fitted so that a watertight seal is achieved;

##### *2.4.7.1*

Requirements for covers to extensions are given in Clauses 2.4.6 and 2.4.7.

(b) Extensions shall be fitted into tank openings so that the extension and the joint are able to withstand external loads and pressures.

#### *2.4.8 Water tightness*

(a) When assembled ready for use the septic tank, fittings and covers shall be watertight;

(b) Test for leakage

When tested in accordance with Appendix E:

Plastic tanks shall show no leakage or damp patches.

#### *2.4.9 Integrity*

**2.4.9.1** The integrity of the tank shall be such that no crack shall develop a width greater than 0.1 mm (approximately) during any stage of production. Further widening or lengthening of any crack shall not occur during subsequent handling, installation, or use.

##### *2.4.9.1.1*

It is known from experience that cracks of less than 0.1 mm will self-seal with time due to solids build-up from the inside of the tank. See Clause 2.4.9

#### *2.4.10 Loads on tanks*

##### *2.4.10.1 General*

Tanks shall be designed and constructed to resist loads incurred during transport and installation. If buried in the ground, tanks shall resist lateral and top loads, uplift loads from groundwater, and where applicable superimposed loads from vehicular traffic. Freestanding tanks shall resist snow loads and shall be anchored against ground movement or seismic loads if such requirement is applicable.

#### **2.4.10.2 Integrity during handling or installation**

There shall be no structural failure when the tank is lifted during installation.

Any cracking shall be limited to that defined in Clauses 2.4.9 and 2.4.10.

Verification test:

A tank shall be selected that matches the manufacturer's nominated delivery weight. The tank shall be lifted using the manufacturer's nominated lifting equipment and shall show no structural failure or subs visible cracking (see above) after being so lifted for 5 minutes.

#### **2.4.10.3 Hydrostatic uplift**

An installed septic tank shall not move when subjected to uplift forces generated by surrounding ground water.

#### **2.4.10.4 Lateral loads**

Septic tanks shall be designed so that there shall be no structural failure or undue deflection due to external hydrostatic ground water and soil loading of 6.6 kN/m<sup>2</sup> depth.

Account shall be taken of any loads imposed on the tank structure as a result of the technique used to anchor the tank in the ground.

Verification test methods are given in Appendix F and in Appendix G. Either test may be used.

#### **2.4.10.5 Top Loads**

Septic tanks shall be designed to withstand a top load of 5kN. The verification test is Appendix H.

In addition, there shall be:

- (i) no cracking in excess of that permitted by Clauses 3.4.9 and 3.4.10
- (ii) no other failure.

### **3 GENERAL REQUIREMENTS OF CONVENTIONAL SEPTIC TANKS**

#### **3.1 Scope**

This section of the Standard specifies general requirements of conventional septic tanks, fittings, access/inspection provisions, partitions and extensions that will be a means of compliance to the performance requirements of Section 2 of this Standard. It contains some performance requirements which allow for new materials, forms of construction etc.

#### **3.2 Septic tank capacities**

This standard does not specify minimum capacities for septic tanks. Recommended minimum capacities for conventional systems are given in an informative appendix, Appendix B.

#### **3.3 Materials durability**

All materials used to manufacture septic tanks and their fittings shall have a serviceable life of at least 15 years.

##### **3.3.1**

The ultimate durability of some materials is unknown. Accelerated test results are difficult to relate to actual in-service conditions. The use of new materials or formulations is usually just on the basis of long term testing,

experience against existing similar materials. This type of evidence for durability should be available to and retained by the manufacturer.

#### **3.4 Design**

The completed design shall meet the performance requirements of Section 3.

### **3.4.1 Tank**

Figure 3.1 shows two typical arrangements of the parts of a septic tank.

### **3.4.2 Tank chambers**

The tanks may be of single or multi-chamber configuration.

#### **3.4.2.1**

For twin chamber septic tanks, the ratio of the volume of upstream chamber to the downstream chamber is recommended to be 2:1.

### **3.4.3 Handling and transport**

Septic tanks shall be able to be handled, transported and installed in accordance with the manufacturer's instructions without damage occurring. See Clause 2.4.11.2.

### **3.4.4 Anchorage**

In situations when flotation due to hydrostatic uplift from a high water-table is possible, the septic tank shall be provided with a means of being anchored. This may be by use of 'extensions' attached to the tank or by other proven means of holding the tank down, details of which shall be provided by the tank manufacturer with the installation instructions.

### **3.4.5 Vehicular loads**

Tanks that will be subjected to top loading from vehicular traffic (e.g. tanks installed underground) shall be designed to carry the expected loads. The tank lid shall be subject to engineering design and a certificate verifying the load-carrying capacity shall be provided with the tank lid.

## **3.5 Inlet fittings and outlet fittings**

### **3.5.1 Performance**

Performance requirements covering inlet and outlet fittings are given in Section 3.

### 3.5.2 Design

The designs requirements of the inlet and outlet fittings are:

- (a) To reduce short-circuiting of liquid between inlet and outlet;
- (b) To allow clearance of any internal blockage;
- (c) To ensure that solids that form the scum layer do not flow through the outlet.

#### 3.5.2.1 Configuration

Two types of fittings are shown in Figures 3.2, and 3.3. These are based on:

- (a) A fitting formed using a 'T' shaped pipe junction, (Figure 3.2) and
- (b) A manufactured baffle that is sealed on to the tank wall (Figure 3.3).

#### 3.5.2.2 Size

Typical minimum dimensions for fittings are shown in Figures 3.2 and 3.3.

##### 3.5.2.2.1 Internal dimensions

- (a) The inlet and outlet fittings of conventional septic tanks shall be capable of passing a 90 mm diameter sphere.

##### 3.5.2.2.1 (a).1

The inlet pipe nominal size is, typically, 100 mm diameter. Pipe sizes smaller than 300 mm may be used but only if there is a pretreatment system that changes the nature or size of the solids.

The outlet pipe nominal size is also, typically, 100mm diameter.

- (b) Any reduction in size of the outlet pipe shall be achieved in the pipe work external to the tank.

##### 3.5.2.2.1 (b).1

Reduction of this size is possible and could be achieved by improving the quality of the outgoing effluent e.g. by use of filters.

##### 3.5.2.2.2 External dimensions

For effective performance several minimum dimensions are identified:

- (a) The inlet and outlet fittings shall extend to not less than 170 mm above the invert of the outlet (the tank liquid level). See Clause 3.6.2.2

**3.5.2.2.2 (a)** This is to prevent scum spilling into the inlet or outlet.

**(b) (i)** The fittings shall extend downwards to be not less than 75 mm below the expected depth of scum after 3 years use.

**(ii)** The outlet fitting shall extend downwards for a sufficient depth to minimize the flow of any grease, fat or scum through the outlet pipe.

**3.5.2.2.2 (b)** The conventional length of fitting is a depth of 205 mm below the invert of the inlet, and 330mm below the invert of the outlet.

### **3.6 Position of inlet and outlet fittings in tank**

#### **3.6.1 Inlet pipe**

The position of the inlet fitting inlet pipe below the tank rim or tank top shall be governed by the depth cover that is intended to be used when installing the tank. This depth of cover takes into account the location of the pipe in terms of vehicular traffic above it.

**3.6.1.1** For installation in areas not subject to vehicular traffic, requires a 300 mm depth of cover for pipes (not made of iron measured from the finished surface to the top of the pipe socket. This depth may only be reduced hi the use of concrete, brick a paving in conjunction with 50 mm of overlay.

#### **3.6.2 *Inlet and outlet fittings***

##### **3.6.2.1 *Inlet and outlet fittings shall be installed so that:***

(a) There is a t between the invert of the inlet and the invert of the outlet of not less than 50 mm;

(b) The top of the fitting (or baffle) is not less than 50 mm below the tank rim or roof whichever is the lower.

These requirements are shown in Figure 3.4.

**3.6.2.2** The requirements of Clauses 3.5.2.2.2(a) and 3.6.2.1 lead, as minimum dimension, to the invert of the inlet being not less than 170 nun

and the invert of the outlet being not less than 220 mm below the underside of the lid, roof or tank rim of the septic tank (whichever is the lowest point), at a point directly above the inlet or outlet.

### 3.7. Gas baffles

A gas baffle is a device designed to prevent the carry-over of gas-borne solids through the outlet. Its use is recommended. Typical designs are shown in Figure 3.5.

### 3.8. Partitions

**3.8.1** Partitions are optional. They have the potential to improve the quality of effluent by preventing carry-over of solids by providing control of short-circuiting of the flow of waste. Partitions allow the tank to be divided to provide a desired chamber size ratio and they assist with hydraulic buffering. Partitions may be manufactured separately, or be integral with the tank, and so may improve long-term structural and hydraulic integrity.

When installed:

- (a) A partition is normally positioned at 90° to the liquid flow;
- (b) The partition shall have a means of allowing fluid to transfer across it which reduces or prevents the transfer of any solid matter. See Figure 3.1;

**3.8.2.** Any opening in the partition for this purpose has traditionally been, a rectangular area of 15000 mm<sup>2</sup> located at half the operating depth. However, the alternate H shaped pipe system operates with a pipe diameter of 100 mm and an area of 7,850 mm<sup>2</sup>.

- (c) The partition shall be able to withstand pump-out. See Clause 2.4.5 and Appendix D;

**3.8.3.** Over time loosely fitting partitions will become sea/ed mm position. During pump-out/desludging this 'seal' may hold or may break releasing

fluid into the chamber being pumped out and thus relieving the hydrostatic head against the partition. However, this effect cannot be assumed to take place in all cases, and partitions must be able to show that they can withstand any effects from the pump-out operation as specified in Clause 2.4.5.

### 3.9 Access openings and covers



**3.9.1** Access openings are typically 500 mm x 450 mm rectangular or 500mm diameter circular located over the tank partition.

**3.9.1.1** The size and sitting of one or more access openings are governed by the size of the desludging equipment and the need to be able to desludge all chambers in a tank.

**3.9.2** Access covers shall be designed to prevent removal by children.

**3.9.3** A corrosion-resistant means of lifting the covers shall be provided.

### **3.10 Extensions**

**3.10.1** The burial of septic tanks so that the access and inspection covers become situated below ground level is forbidden by seine Regulatory Authorities. Other Authorities allow burial but usual! with the expectation that this would be 300 - 500 mm below ground level at the mast and that extensions are used to bring the access and inspection covers up to ground level. In the latter case, the extensions are typically short and in one piece. The following requirements apply to these types of extension.

#### **3.10.2. Performance**

Performance requirements of extensions are given in Section 2.

#### **3.10.3 Installation**

(a) Extensions shall be fitted and made watertight against ingress of water in accordance with instructions provided by the manufacturer;

(c) The installed extensions shall withstand any normally expected loads and pressures. In meeting these requirements, the manufacturer shall base the choice of materials, the design and the installation instructions for extensions, on a certificated report from a structural engineer.

### **3.11 Marking**

Tanks and components of tanks separately manufactured shall be marked as described in Section 5.

### **3.12 Installation**

Recommendations for installation are given in Appendix I.

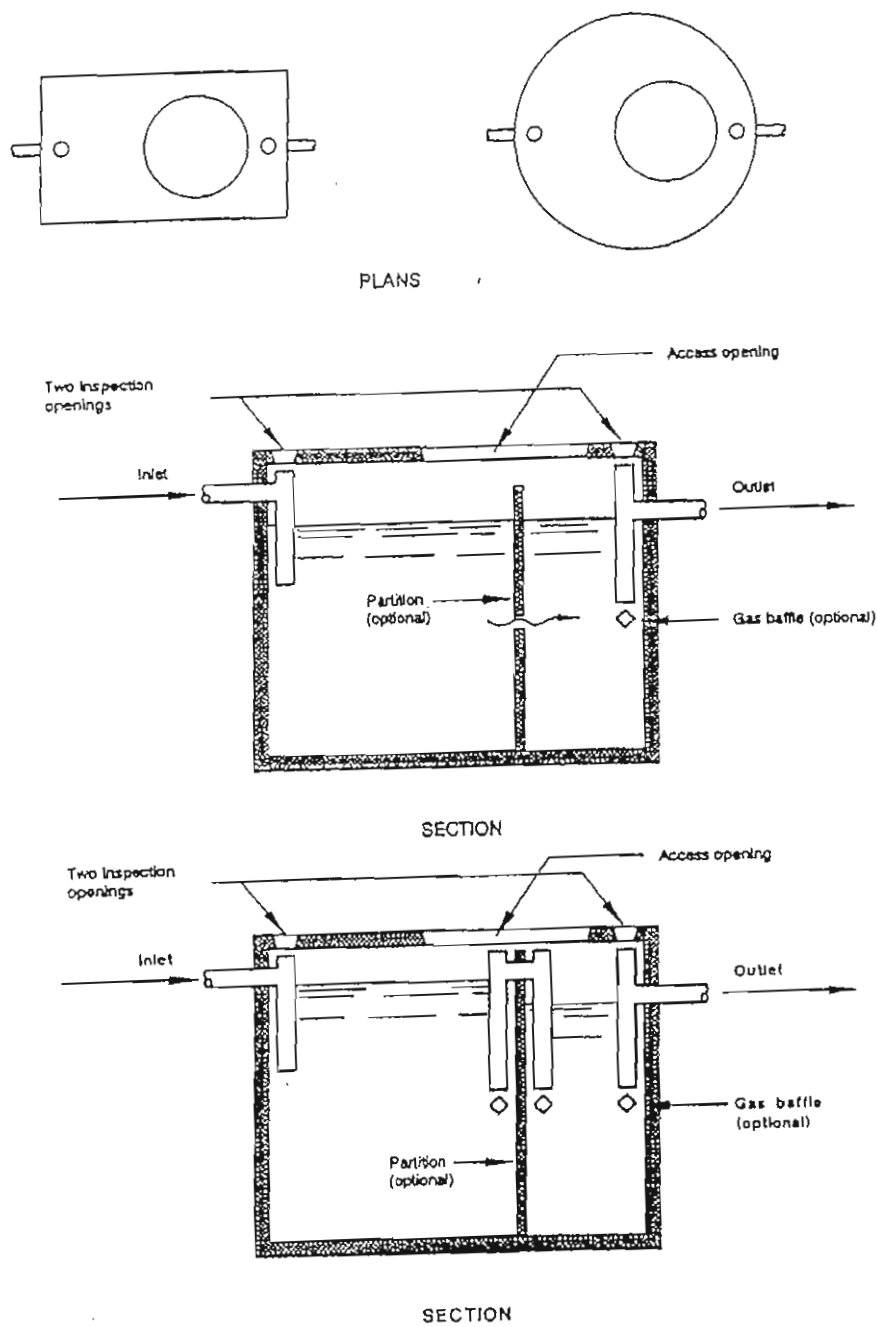
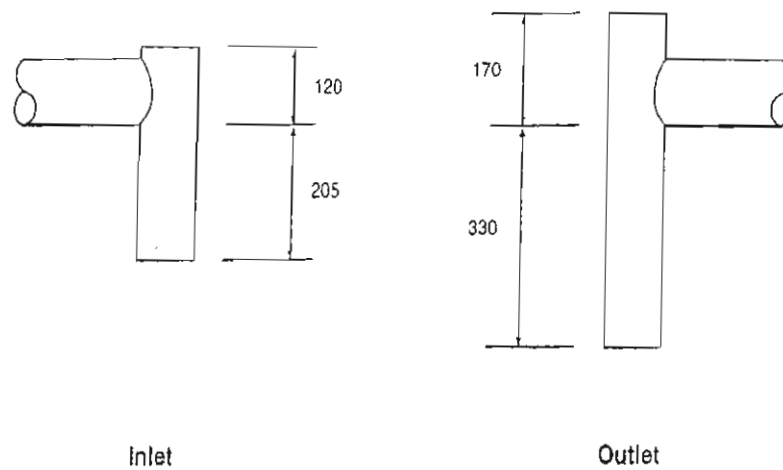
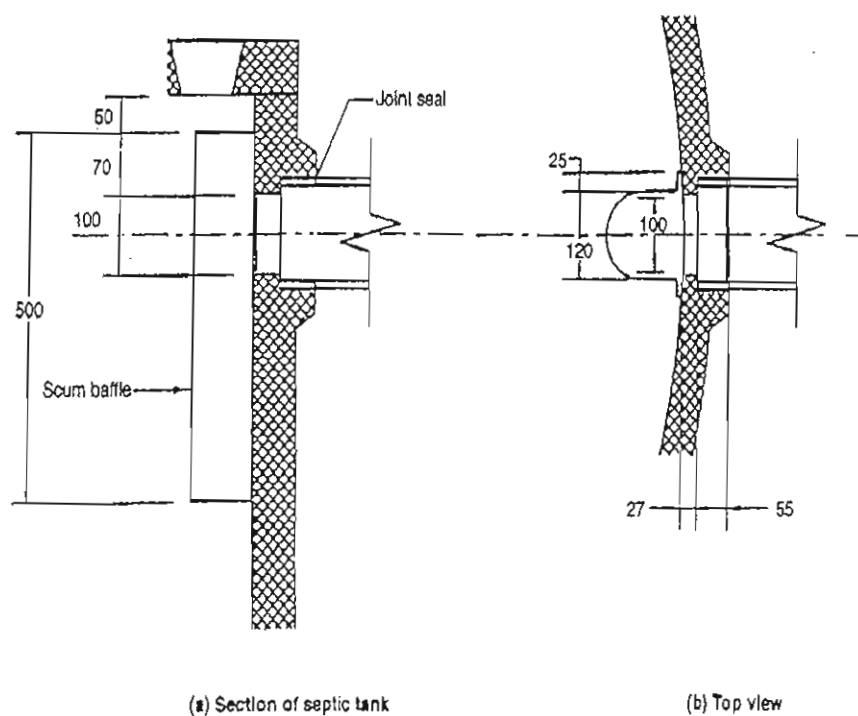


FIGURE 3.1 TYPICAL ARRANGEMENTS OF A SEPTIC TANK  
(Diagrammatic only)



NOTE - All dimensions are minimum and in millimetres

FIGURE 3.2 TYPICAL UPVC FITTINGS  
(Diagrammatic only)



NOTE: All dimensions are minimum and in millimetres

FIGURE 3.3 TYPICAL ALTERNATIVE ARRANGEMENT FOR PRECAST CONCRETE TANKS  
WITH A 'U'-SECTION SCUM BAFFLE (OUTLET ONLY)  
(Diagrammatic only)

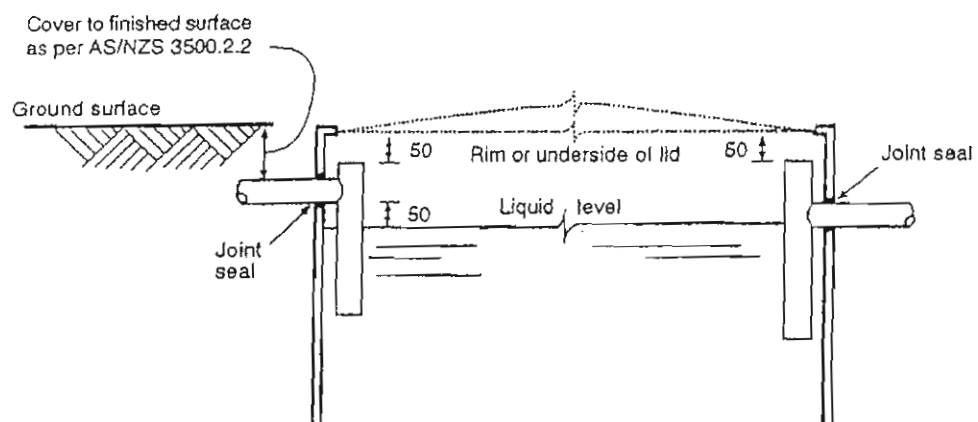


FIGURE 3.4 TYPICAL INSTALLATION ARRANGEMENT OF INLET AND OUTLET FITTINGS  
(Diagrammatic only)

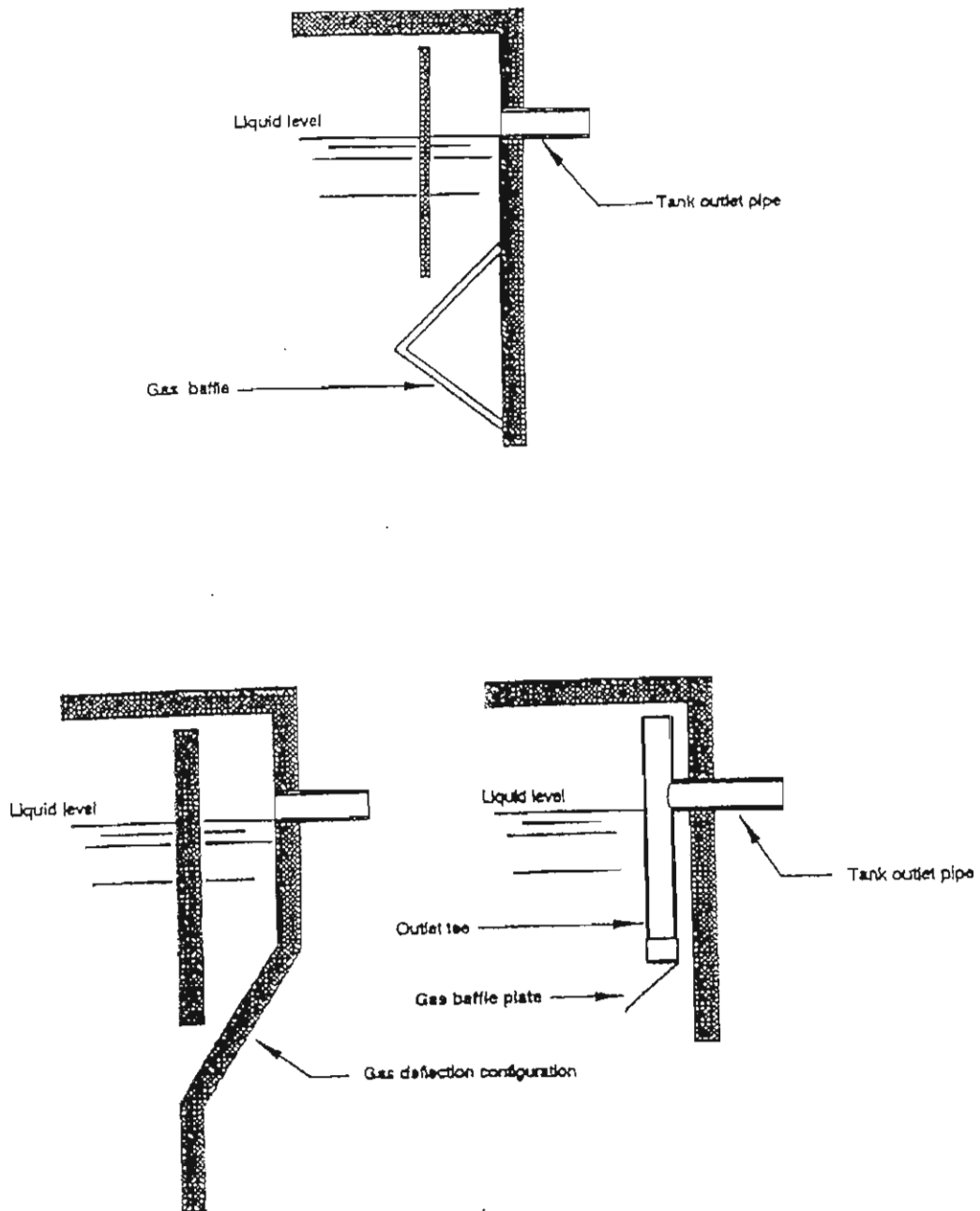


Figure 3.5 : Typical Gas Baffle Designs  
(Diagrammatic only)

## **4 MARKING OF SEPTIC TANKS**

### **4.1 Scope**

This section of the Standard defines the minimum marking requirements for septic tanks.

### **4.2 General**

Marking is necessary to provide a traceable route to the manufacturer and to the date of manufacture.

Marking is often a prerequisite for quality assessment.

### **4.3 Requirements**

#### **4.3.1. *Minimum information***

Tank marking shall include, as a minimum, the following information:

- (a) The manufacturer's name or trademark;
- (b) The date of manufacture;
- (c) The capacity in litres;
- (d) Identification of the inlet to the tank;
- (e) Top load limitations;
- (f) Weight of tank.

Information required by (a) (c) and (e) shall be on the top external face of the tank adjacent to the inlet fitting.

Other information shall be marked either on the top external face or on the tank itself adjacent to the inlet fitting.

#### **4.3.2 *Other components***

Any other component of the tank that may be separately manufactured and subsequently assembled with the tank e.g. a lid, access cover or partitions shall be marked with the date of manufacture.

### **4.3.3 Permanence and visibility**

All marking shall be permanent, legible, and clearly visible when the tank is installed.

#### **4.3.3.1**

This might be achieved through the use of stenciling, or embossing by incorporation in the resin or moulding.

## **5. TESTING REQUIREMENTS OF SEPT TANKS**

### **5.1 Scope**

Two forms of tests are identified in this Standard, type tests and routine process quality control tests.

### **5.2 Type testing**

5.2.1 Section 2.4 specifies a series of type tests which all septic tanks shall be capable of passing. The tests and tile relevant Clauses and Appendices are set out below:

(a) Test for the installation of fittings in a sound and watertight manner. See Clause 2.4.4

Appendix C;

b) F tests for tanks with partitions See Clause 2.4.5(b) Appendix D;

(c) Method of testing the water tightness of tanks. See Clause 2.4.9 and Appendix E;

(d) Resistance to handling and installation loads. See Clause 2.4.11.2;

(e) Resistance to lateral loads. See Clause 2.4.11.4 and Appendix F and 0: either test

may be used;

(f) Resistance to a top load. See Clause 2.4.11.5 and Appendix H.

In addition fibre-reinforced tanks shall meet the integrity test specified for concrete fibre-reinforced tanks. See Clause 2.4.10.2.

Type testing shall be carried out on initial production or whenever a change is made that may affect the performance of the finished tank.

**5.2.1.1** Typically this would be when there is a totally new design, a change of component design a change of materials, techniques of production, etc.

**5.2.2** Systems developed to meet the Section 2 requirements for the water tightness of covers and the proper installation of extensions may require further (specially developed) type testing.

### **5.3 Routine quality testing**

Routine quality control testing shall be carried out to ensure that a consistent quality of product is maintained. These tests are identified in the relevant material-based sections of this Standard.

#### **5.3.1**

Type tests in this standard may also be suitable for use as routine quality control tests.

## **6. PLASTIC (POLYOLEFIN) SEPTIC TANKS**

### **6.1. Scope**

This section of the Standard covers the construction of septic tanks using polyolefin thermoplastics.

#### **6.1.1**

The two most commonly used polyolefins are polyethylene which is usually rotationally moulded, polypropylene which is usually injection moulded.

### **6.2 Performance requirements**

#### **6.2.1. General**

Performance requirements and performance criteria are given in Section 2 of this Standard. Section 3 gives further information about septic tank fittings and accessories.

**6.2.2.** Aspects of the Section 2 requirements that have a greater relevance to polyolefin plastic materials are:



- (a) The resistance of the septic tank, lid, access opening cover and the inspection opening cover to ultraviolet light degradation;
- (b) The design and construction of the tank, lid and access cover to resist installation and in service loads;
- (c) The provision of the septic tank with a means of anchorage (anti floatation measures) to prevent the tank from moving from its installed position.

### **6.2.3 Other Requirements**

- (a) The surfaces of a septic tank, lid, access opening cover and other components shall be smooth and impervious to liquids;
- (b) Fasteners used in plastic septic tanks shall be manufactured from materials which are durable and resistant to the corrosive environment and if inaccessible shall be effective for the serviceable life of the tank. See Clause 10.4.12.

## **6.3 Design**

### **6.3.1. General**

The design of a plastic (polyolefin) tank shall be such as to prevent deformation and flexing and to take into account:

- (a) Internal and external pressures;
- (b) Mass of tank contents;
- (c) Localized loads acting at the supports, lugs and other attachments;
- (d) Normal loads applied during transport and installation;
- (e) Material fatigue;
- (f) Soil conditions and expected loadings.

### **6.3.2. Thickness**

The thickness of (lie tank walls, base, access opening covers and lids shall be not less than 6mm.

Polyolefin materials that allow a thinner component to be made shall meet the performance requirements and tests of this Standard.

### 6.3.3 Anchorage

All plastic (polyolefin) septic tanks shall be provided with means of anchorage.

#### 6.3.3.1

Typical examples are:

(a) *Hydrostatic flange*

An integrally moulded flange of similar size to the anchor collar in 10.3.3 (b).

(b) *Anchor collar to be affixed at the time of installation:*

An L-shaped anchor collar section constructed not less than 65 mm wide and not less than 10 mm thick to be fixed to the outside circumference of the tank with durable material protected from the corrosive environment. The collar may be continuous around the circumference or may be in at least two sections each not less than 600 mm long and welded to opposite sides of the tank.

For a vertical cylindrical tank the flange is fixed not more than 300 mm from the base, and for a horizontal cylindrical tank the flange is situated along the line of the greatest horizontal perimeter.

(c) *Loops to be affixed at the time of installation*

Each side of the tank is held into the ground by a piece of pipe, typically 100 mm; PVC sewer grade pipe, attached to the tank by two durable plastic ropes. These ropes are anchored in the rim of the tank and have a loop in the other end at excavation ground level. Both pipes have a length of not less than the diameter of the tank and each is passed through two loops. Backfilling then covers the pipes.

## 6.4. Manufacture

### 6.4.1 Materials

#### 6.4.1.1 Polymer

The polymer utilized by the manufacturer shall be suitable so that the finished product meets the performance requirements as set out in this Standard.

#### 6.4.1.2 *Fasteners*

All fasteners shall be of durable material, resistant to the corrosive environment, and be either:

- (a) Stainless steel, grade 316
- (b) Copper alloy, grade 443
- (c) a suitable equivalent

#### 6.4.2. *Manufacturing process*

##### 6.4.2.1. *General*

The manufacturing process shall be carried out in a controlled manner to produce a consistent product checked by a quality assurance process.

##### 6.4.2.2. *Joints*

'The lid and the access opening cove, shall be bedded in a bead of flexible mastic sealant in accordance with the manufacturers instructions and then secured In a position with fasteners to provide a permanent water-tight seal.

##### 6.4.2.3. *Fasteners*

Fasteners shall be provided where required in the tank design to ensure joint seals are secure.

##### 6.4.2.4. *Provision of fittings and their assembly*

##### 6.4.2.5. *Inlet and outlet fittings*

- (a) Inlet and outlet fittings may either be installed by the manufacturer prior to delivery of the septic tank, or be installed by the licensed plumber /drain layer at the tune of installation of the septic tank,
- (b) When inlet and outlet fittings, access and inspection covers, partition, anchorage device, and any necessary fasteners are provided separate to the tank for installation on-site detailed installation instructions shall be provide'; by the manufacturer with each tan at the time of dispatch.

##### 6.4.2.6. *Partitions*

The permanent fixing of a partition into the septic tank shall be in accordance with the manufacturer's instructions and maybe carried out on-site at the time of installation of the tank.

## **6.5. Testing**

Refer Section 5: Testing requirements of septic tanks.

### **6.5.1. Type testing**

Type testing of completed septic tanks shall be carried out as required by Section 2 of this Standard against relevant appendices, (listed in Section 5, Clause 5.2.1). All septic tanks shall be capable of complying with these type tests.

### **6.5.2. *Routine quality control testing***

#### **6.5.2.1 General**

Manufacturers shall establish tests on tank materials and/or finished tanks, and a frequency of testing that will demonstrate that a consistent quality of product is being produced.

The testing of the properties of the polyolefin tank material during/after manufacture is essentially an internal quality function because the nature and thickness of materials used will vary from one manufacturer to another.

#### **6.5.2.2 *Test specimen***

- (a) The test specimen shall reflect the manufacturing process;
- (b) The test specimen shall reflect a typical cross section of the septic tank;
- (c) The specimen shall be manufactured at the same time as the septic tank;
- (d) The specimen may be cut from a vertical section of the tank wall using a low speed cutting tool to prevent heat damage or other damage to the specimen;
- (e) The dimensions of the test specimen shall be appropriate for the required tests.

#### **6.5.2.3 Tests**

Manufacturers shall set up tests to determine flexural modulus, and to determine resistance to impact, as a minimum.

#### **6.5.2.4 Frequency**

- (a) The frequency of testing will be governed by the needs of sin' internal quality assurance programme or external quality assessment programme;

#### **6.5.2.5 Pass/Fail**

The test results should meet the criteria set for the tests in this section of the Standard

#### **6.5.2.6 Test records**

The report shall include the following information for each test specimen:

- (a) Identification of persons/organization carrying out test;
- (b) Identification of the sample tested;
- (c) Date of test;
- (d) The test results;
- (e) Reference to the test method.

Test records shall be kept as required by the quality assurance programme,

## APPENDIX B

### SEPTIC TANK CAPACITIES

(Informative)

#### B.1. Scope

This appendix gives recommended minimum capacities for conventional septic tanks.

#### B2 Application and context of use

##### B2.1 Application

The capacities are sufficient for normal domestic premises that are not fitted with devices or a garbage grinder. (Refer also Clause 2.4.1.)

##### B 2.2 Context of use

Septic tanks of these capacities are presented as a guide for authorities and manufacturers to work towards.

The capacities have been calculated using relevant flow data and other considerations.

#### B3 Conventional septic tanks

The minimum capacity of conventional septic tanks for treatment of domestic wastewater flows recommended to be as shown in Table BI:

**TABLE BI CONVENTIONAL SEPTIC TANK CAPACITIES  
(LITRES)**

Type of wastewater	Persons		Bedrooms	
	1 to 5	6 to 10	1 to 3	4 to 6
	L	L	L	L
All waste	3000	4500	3000	4500
Greywater only	1800	2700	1800	2700
Blackwater only	1500	2500	1500	2500

## **APPENDIX C**

### **TEST OF THE MANUFACTURER'S INSTRUCTIONS FOR THE INSTALLATION OF FITTINGS TN A SOUND AND WATER TIGHT MANNER (Normative)**

#### **C1 Scope**

This Appendix sets out a method for the type testing of the manufacturer's instructions for the installation of fittings in a sound and watertight manner, whether the fittings are installed in the factory or on site.

#### **C2 Principle**

The fittings in a tank are subjected to a low hydrostatic pressure from inside the tank.

(It is assumed that a fitting installation that is watertight in this situation will also be watertight in respect of water ingress to the tank through the fittings.)

#### **C3 Testing**

- (a) A tank is setup for the water tightness test as required by Appendix B, Clause E4.1;
- (b) Fittings are installed in accordance with the manufacturer's instructions;
- (c) Openings in the fittings are sealed to allow water to build up behind the fitting during the test;
- (d) The tank shall be filled with water to the rim.

#### **C4 Pass/Fail**

There shall be no leakage of water through the join of the fitting and tank, or through any joins in the fittings themselves.

#### **C5 Test records**

The report shall include the following information for each test specimen:

- (a) Identification of person/organization carrying out test;
- (b) Identification of the fitting systems(s) tested;
- (c) Date of test;
- (d) The results of the test;
- (e) Reference to this test method, Appendix C.

Test records shall be kept as required by the quality assurance programme.

## APPENDIX D

### DETERMINATION OF THE RESISTANCE OF A PARTITION TO HYDROSTATIC HEAD (PUMPOUT TEST)

(Normative)

#### D 1 Scope

This Appendix sets out a method for type testing the resistance of a tank partition to the effects of pumping out fluid from one side of the partition.

#### D 2 Principles

With the removal of fluid from one side of a partitioned tank during pump-out, the partition may be subjected to a hydrostatic pressure head. This test reproduces those conditions and then checks for any signs of weakness or failure of the partition.

#### D3 Testing

This test may be carried out in conjunction with the water tightness test, see Appendix E.

- (a) A tank is set up for the water tightness test as required by Appendix E, Clause E4. I (a) to (c);
- (b) The tank is either filled with water as required by Appendix E, Clause E4.1 (d), or to the top of the partition or to the level of any hole through it;
- (c) Water is pumped out from one side of the partition. If the partition is situated so that there is a greater quantity of water on one side as compared to the other then the water shall be pumped out from the side that has the least quantity
- (d) Observe the reaction of the partition to the effects of the pump out process, and if necessary over a period of at least 5 minutes.

#### D4 Pass/Fail

The tank shall be able to be pumped out without the partition collapsing or permanently deforming.

#### D5 Test records

The report shall include the following information for each test specimen

- (a) Identification of person/organization carrying out test;
- (b) Identification of the tank tested;
- (c) Date of test;
- (d) The results of the test;
- (e) Reference to this test method, Appendix P.

Test records shall be kept as required by the quality assurance programme



**APPENDIX E**  
**DETERMINATION OF WATERTIGHTNESS**  
(Normative)

**E1 Scope**

This Appendix sets out a method of testing of the water tightness of septic tanks. The test is used as a test and as a quality control test when required.

**E2 Principle**

The tank is subjected to a hydrostatic pressure head and is then examined for signs of water leakage.

**E3 Apparatus**

At least three bearing blocks are required 500mm (minimum) length x 100mm wide x 100mm deep;

**E4 Testing**

**E4.1 Procedure**

The procedure shall be as follows:

- (a) Tanks that can be stood in position without the need of support shall be placed on the bearer blocks, (see Figure P1(a));
- (b) Tanks that need support in order to remain in position e.g. horizontal cylinders shall be placed on timber bearers and held in place with chocks, (see Figure P1(b)). Horizontal cylindrical tanks shall be supported sufficiently so as to counter any bending and induced tension;
- (c) Tanks shall be leveled on the supports;
- (d) The tank shall be filled with water to a depth of 900mm or to the invert of the outlet pipe, whichever is the greater depth;
- (e) Allow to stand for a minimum of 4 hours;
- (f) Top up with water and start test observations;
- (g) Observe for any leakage and count the drops per minute from any single point.

**E 4.1(g)**

Damp patches in concrete tanks are not considered leakage.

**E4.2 Frequency**

The frequency of testing will be governed by the needs of an)' internal quality assurance programme, or external quality assessment programme.

**E4.2.1**

When used as o quality control test it is recommended that at least one septic tank per week be tested. This should be representative of the capacity and design of tank made in that week when a number of different capacity or design tanks are made in a manufacturing period then each capacity or design should be rested on a rotation basis of a minimum rate of one per week.

**E5 Pass/fail**

Should the leakage rate be exceeded or there is visible cracking, the septic tank shall be rejected.

**E6 Repair**

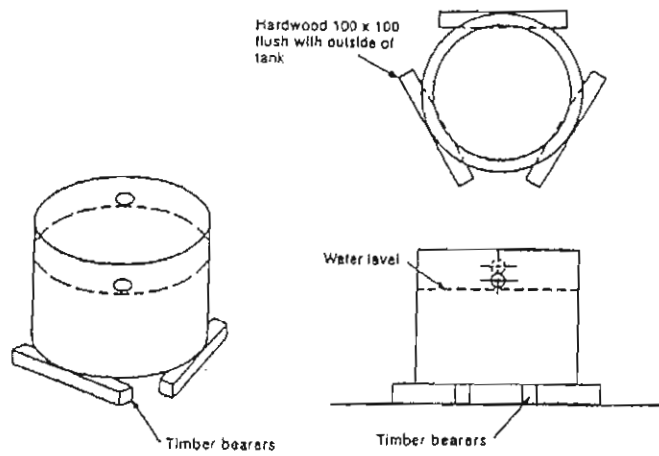
Isolated minor leakages in concrete tanks may be repaired so as to effectively and permanently seal the leak after repair, the tank must he retested.

**E7 Test records**

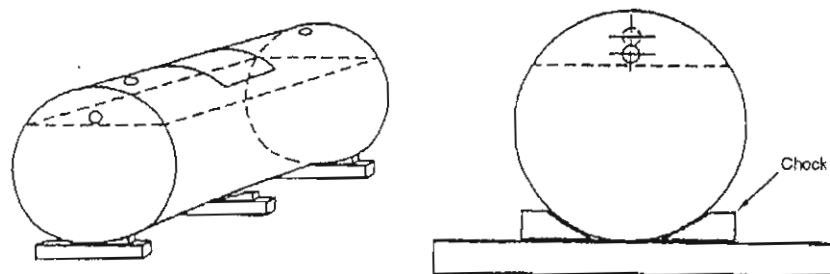
The report shall include the following information for each test specimen

- (a) Identification of person/organization carrying out test:
- (b) Identification of the tank tested;
- (c) Date of test;
- (d) The leakage rate, in drops per minute,
- (e) Reference to this test method, Appendix E.

Test records shall be kept as required by the quality assurance programme,



(a) Vertical septic tank



(b) Horizontal septic tank

Dimensions in millimetres

FIGURE E1 WATERTIGHTNESS TEST ARRANGEMENT FOR HORIZONTAL AND  
VERTICAL TANK  
(Diagrammatic only)

**APPENDIX F**  
**DETERMINATION OF RESISTANCE TO LATERAL LOAD -**  
**HYDRAULIC TEST METHOD**  
(Normative)

**F1 Scope**

This appendix sets out a method for testing the resistance of a septic tank to an applied lateral load. A alternative test (based on point load testing) is given in Appendix G.

**F2 Principle**

The lateral (side loading) forces on a septic tank due to soil in a fully or partially saturated state, together with any accidental (incidental) additional loading due to the presence of earth moving equipment adjacent to the tank wall may be represented by a circumferential load applied to the wall of the septic tank,

These forces equate approximately to the forces applied to an empty tank held submerged in water,

The test method requires that compression forces due to any anchorage technique normally used with the septic tank are simulated during the test.

**F3 Apparatus**

This test is carried out using:

- (a) A container large enough to allow the test tank to fit within and for the tank to be submerged in water;
- (b) Weights or hydraulic ram assembly used to reproduce any compression induced in a tank by the mechanism of anchorage, if any;
- (c) The test tank complete with lid.

**F4 Procedure**

- (a) The container base shall be leveled;

**F4 (a)**

This may be achieved on a sand bed of sufficient area. The top and bottom surfaces of the sand bed should be level and the sand should be not less than 100 mm deep.

- (b) The empty test tank shall be installed and restrained as necessary in the container. If it is necessary to reproduce anchorage compression, weights shall be placed on the upper rim of the tank cylinder

The holding down of the tank shall be such as to not provide any lateral stability to the tank in excess of that of that provided by the lid, when installed.

(c) The outer container shall be filled with water up to the outlet level of the test tank. The water temperature shall not exceed 23°C.

#### **F.5 Assessment**

Inspection shall show that there have been no leaks and that the integrity of the tank has not suffered permanent damage. See Clause 2.4.10.

#### **P.6 Frequency**

The testing shall be carried out as per the requirement of any internal quality assurance programme or external quality assessment programme.

#### **F.7 Retesting**

Should a tank fail the lateral load test a further two tanks shall be selected from the same batch as the tank that failed. These tanks shall be tested as above. If the two additional tanks meet the load requirements the batch shall be deemed to meet the test requirements. If one of the additional tanks fails the batch shall be rejected or every tank subjected to the lateral load test.

##### **F.7.1**

Should a prototype tank fail, a new design and testing programme will be required.

#### **F.8 Test records**

The report shall include the following information for each test specimen:

- (a) Identification of person/organization carrying out test;
- (b) Identification of the tank tested;
- (c) Date of test;
- (d) The presence and size of any cracking, and any other defects noted;
- (e) Reference to this test method, Appendix F.

Test records shall be kept as required by the quality assurance programme.

**APPENDIX G**  
**DETERMINATION OF RESISTANCE TO LATERAL LOAD -**  
**POINT LOAD TEST METHOD**  
(Normative)

**G.1. Scope**

This appendix sets out two methods for testing the resistance of a septic tank to an applied lateral point load. An alternative test is given in Appendix F.

**G.2 Principle**

The lateral (side loading) forces on a septic tank due to soil in a fully or partially saturated state, together with any accidental (incidental) additional loading due to the presence of earth moving equipment adjacent to the tank wall may be represented by a point load applied to the wall of the septic tank.

The lateral load is applied to the tank by the application of thrust on the side wall of the tank through a bearing block using a controlled and measured force. Different loads are applied depending on whether the septic tank is tested empty or full of water.

The test method requires that compression forces due to any anchorage technique normally used with the septic tank are present during the test.

**G.3. Apparatus**

This test is carried out by using:

- (a) A bearing block 250 x 250 x 100 mm shaped to match the external shape of the tank to be tested;
- (b) A rubber pad, 13 mm thick to fit the bearing block, of Shore durometer hardness 45-55;
- (c) A hydraulic ram to which the bearing block is fixed;
- (d) A pressure gauge from which the pressure recorded can be used to calculate the total force applied;
- (e) A frame to hold the hydraulic ram, gauge and pad assembly at the required position depending on the geometry of the tank;

### **G.3.1**

This frame is also used for the top load test described in Appendix H of this Standard.

(f) Circumferential or line support shall be provided;

- (i) Circumferential support. Circular/curved septic tanks shall be supported by a length not greater than one quarter of the external perimeter centrally located opposite the applied lateral point load. The support shall be provided for the full height of vertical tanks or full length of horizontal tanks. For non-circular tanks the support shall be provided to the side opposite the applied lateral load.
- (ii) Line support shall be provided for the full height of vertical tanks or full length of horizontal tanks directly opposite the applied lateral point load.
- (g) A sand bed positioned beneath the test frame of sufficient area to accommodate the test tank. The top and bottom surfaces of the sand bed shall be level and the sand shall be not less than 100mm deep;

### **G.3. (g).1**

This sand bed is also used for the top load test described in Appendix H of this Standard

- (h) Weights or hydraulic ram assembly used to reproduce any compression induced in a tank by the mechanism of anchorage, if any;
- (i) Crack measuring gauge;
- (j) Test tank complete with d.

## **G.4. Procedure**

### **G.4.1. Testing of tank filled with water,**

Tanks may be tested in a vertical or horizontal position.

- (a) Assemble test tank on the bed of sand beneath the test frame complete with circumferential or line support and, if needed, anchorage compression;
- (b) Apply a lateral point load one third of tank height from the base, or at the spring line for horizontal circular tanks;
- (c) Apply a lateral point load of
  - (i) 25 kN if circumferential support is provided, or
  - (ii) 12.5 kN if line support is provided;
- d) The load shall be increased uniformly so that the specified value is reached in 5 minutes.

The load shall be applied via the bearing block and rubber pad.

#### **G.4.2. Testing of empty septic tank**

Testing shall be as described in Clause G4.1 with load applied to be 17 kN if circumferential support is provided or 8.5 kN if line support is provided.

#### **G.5. Assessment**

If cracks occur they shall be checked by means of the test crack measuring gauge. The load shall then be released and the surface again examined to check whether all test cracks have closed.

The tank shall be free of fractures and cracks wider than 0.15mm and residual cracks wider than 0.1 mm (approximately) and from other defects arising from faulty materials or faulty methods of manufacture,

#### **G.6. Frequency**

The testing shall be carried out as per the requirement of any internal quality assurance programme or external quality assessment programme.

#### **G.7. Retesting**

Should a tank fail the load tests a further two tanks shall be selected from the same batch as the tank that failed. These tanks shall be tested as above. If the two additional tanks meet the load requirements the batch shall be deemed to meet the test requirements. If one of the additional tanks fails the batch shall be rejected or every tank subjected to the lateral load test.

##### **G.7.1**

Should a prototype tank fail the load tests, a new design and retesting will be required.

#### **G.8. Test records**

The report shall include the following information for each test specimen:

- (a) Identification of person/organization carrying out test;
- b) Identification of the tank tested;
- (c) Date tested;
- (d) The presence and size of any cracking, and any other defects noted;
- (e) Reference to this test method, Appendix G.

Test records shall be kept as required by the quality assurance programme.



## **APPENDIX H**

### **DETERMINATION OF RESISTANCE TO TOP LOADING** (Normative)

#### **H.1. Scope**

This appendix sets out method for testing the resistance of a septic tank to an applied top load.

#### **H.2. Principle**

A vertical downward top load is applied to the tank lid and access opening cover. The test method allows for both proof and ultimate load testing.

#### **H.3. Apparatus**

- (a) A frame and winch assembly that straddles sand bed, (see Figure H1).
- (b) A bearing block -250 x 250 x 100 mm;
- (c) A rubber pad, 13 mm thick to fit bearing block, of Shore durometer hardness 45-55;
- (d) A proof test load of 5 kN (approx. 510kg);
- (e) Crack measuring gauges.

#### **H.4. Procedure**

##### **H4.1. General**

Three vertical tanks or three horizontal tanks complete with lids and access opening covers, shall be tested with a proof load of not less than 5 kN as shown in Figure H1

##### **H4.2. Load application**

The load shall be increased uniformly so that the specified value is reached in 5 minutes. The load shall be applied via the bearing block and rubber pad.

##### **H.5. Assessment**

If cracks occur they shall be checked by means of the test crack measuring gauge. The load shall then be released and the surface again examined to check whether all test cracks have closed.

The tank, lid and access opening cover shall be free of fractures and cracks wider than 0.15 mm and residual cracks wider than 0.1 mm (approximately) and from other defects arising from faulty materials or faulty methods of manufacture.

#### **H.6. Frequency**

The testing shall be carried out as per the requirement of any internal quality assurance programme or external quality assessment programme.

#### **H.7. Retesting**

Should a tank fail the load tests a further two tanks shall be selected from the same batch as the tank that failed. These tanks shall be tested as above. If the two additional tanks meet the load requirements the batch shall be deemed to meet the test requirements. If one of the additional tanks fails the batch shall be rejected or every tank subjected to the top load test.

##### **H.7.1.**

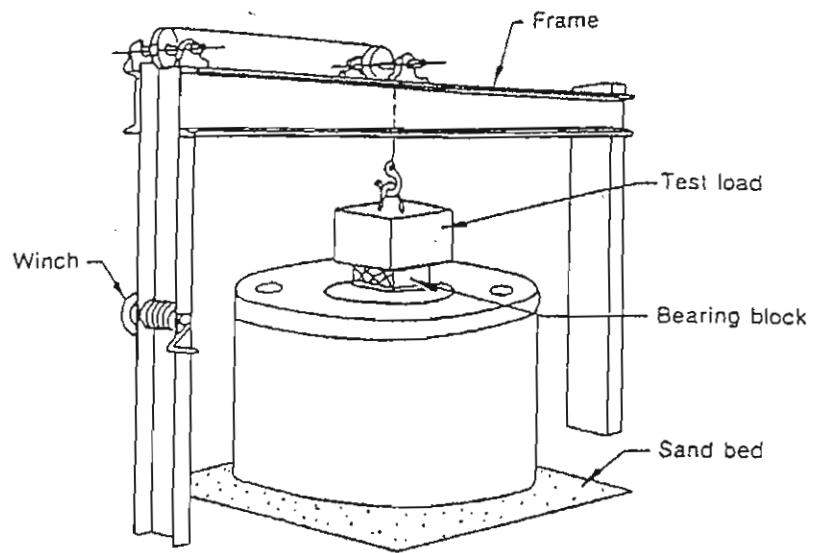
Should a prototype tank fail the load tests, a new design and retesting will be required.

#### **H. 8. Test records**

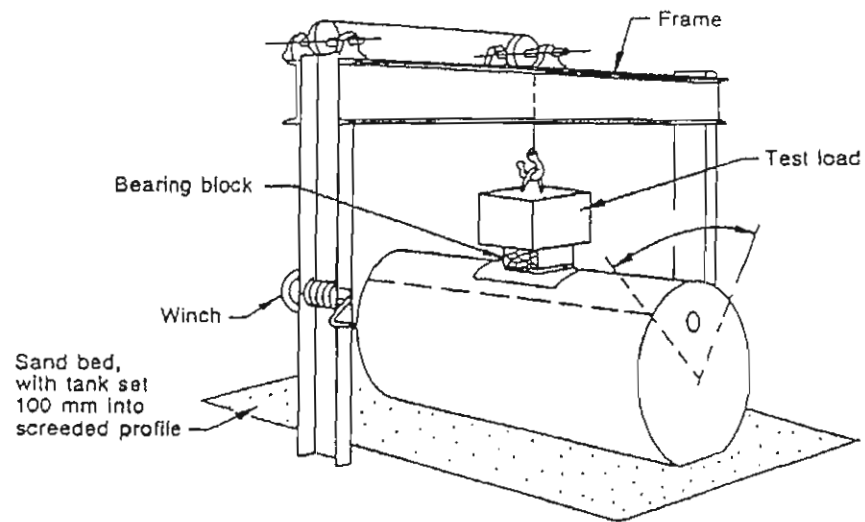
The report shall include the following information for each test specimen.

- (a) Identification of person/organization carrying out test;
- (b) Identification of the tank tested;
- (c) Date of test;
- (d) The presence and size of any cracking, and any other defects noted;
- (e) Reference to this test method, Appendix H

Test records shall be kept as required by the quality assurance programme.



(a) Typical vertical septic tank with lid and access opening cover in place



(b) Typical horizontal septic tank with access opening cover in place

FIGURE H1 TYPICAL LOAD TESTING SET-UP  
(Diagrammatic only)

## **APPENDIX I**

### **INSTALLATION OF SEPTIC TANKS**

(Informative)

#### **11 Scope**

This section gives guidance for the on-site installation of septic tanks.

##### **11.1 Siting of tanks**

###### **General**

In general, tanks should be installed clear of any buildings so as not to affect any structural elements of buildings.

###### **11.1.1**

As a guide tanks should be installed sufficiently clear of buildings to provide an angle of repose of at least  $45^{\circ}$  between the bottom of the footing and the base of the tank.

NOTE: The possible escape of highly explosive gases from septic tanks must receive consideration in the installation design.

##### **11.2 Soil**

Tanks should be installed in stable soil conditions. Where there is doubt the installer should give full details and specifications on how it is intended to provide a sound foundation for the tank.

##### **11.3 Surface Water**

Surface waters should be diverted from the tank installation. Special measures need to be taken in case of a high ground water table or flood prone areas.

##### **11.4 Location on Site**

The location of septic tanks on sites is subject to approval by the regulatory authority. In any case, there shall be compliance with building clearances and block/section boundaries as provided for in by-laws and Regulations.

##### **11.5 Drainage**

All drainage levels should be considered to ensure appropriate gradients leading into the tank and to allow gravity discharge of effluent to the top of the disposal area, (where appropriate).

## **11.6 Desludging**

The tank(s) should be sited with due consideration for future desludging operations and the siting of the effluent treatment system. Where access for desludging by vehicle is not available the application for approval of the installation must state the manner in which it is intended to desludge the tank at the necessary intervals without creating a health nuisance.

## **12 Installation instructions**

### **12.1 General**

Manufacturers should ensure that installation instructions are supplied that are relevant to the material from which the tank is constructed.

### **12.2 Manufacturer**

For each installation the manufacturer should supply written instructions which are specific to their product and the materials used. The instructions should allow installation in a safe and workmanlike manner.

The instructions should cover, but be not necessarily restricted to, the following information:

- (a) Special provisions concerning excavation relevant to the tank type or special provisions if the installation is freestanding;
- (b) The preparation of the bottom of the excavation;
- (c) The method of safe handling and lifting;
- (d) Special instructions where the installation could be subject to ground water or floatation;
- (e) Fining of any components inlets, outlets, partitions, square junctions and gas baffles;
- (f) Backfilling - recommendation of choice of material and the method of backfilling to be adopted;
- (g) Need to fill tank with water during backfilling operations;
- (h) Methods of sealing and re-sealing tank lids and access/inspection covers/openings and associated extensions;
- (i) Commissioning instructions.

### **12.3 Repairs**

Any repairs should be done so that the tank meets the requirements of this Standard.