भारतीय मानक **IS 18797 : 2024**

Indian Standard

पूर्वनिर्मित मलजल उपचार संयंत्र — विशिष्टि

Packaged Sewage Treatment Plant — Specification

ICS 13.060.30; 93.030

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Public Health Engineering Sectional Committee, CED 24

FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Public Health Engineering Sectional Committee had been approved by the Civil Engineering Division Council.

Sanitation is fundamental to an improved quality of life due to the protection against-pollution of water resources and the reduction in water and vector-borne diseases that it provides. Owing to the limited access of a high share of urban and rural population to sewerage systems in India, strengthening the ecosystem for non-networked sanitation becomes imperative. To facilitate the achievement of the desired public health and environmental outcomes through non-networked sanitation, it is crucial to safeguard the quality of existing on-site sanitation systems. Furthermore, the varying characteristics of settlements, hydrogeology, and environmental sensitivity necessitate innovations in product design to respond to the needs of these diverse contexts.

Packaged sewage treatment systems (PSTP) can provide a turnkey solution to the need of advanced on-site sewage treatment and are suitable for installation at the level of individual households or as a decentralized community-level solution. This standard for packaged sewage treatment plant (PSTP) aims to ease the implementation of these products as India amplifies its efforts to meet the United Nations Sustainable Development Goal 6 ‘Clean water and sanitation for all’. This standard provides a comprehensive framework to manufacturers of packaged sewage treatment systems for assuring the quality and performance of their products such that they can provide consistent and adequate on-site sewage treatment and aid in the achievement of safe sanitation for all.

In this revision, references have also been made to various provisions regarding PSTP in the manual on sewerage and sewage treatment: 2013, Central Public Health and Environmental Engineering Organisation (CPHEEO), Government of India.

The composition of the Committee responsible for formulation of the standard is given in Annex G.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 2022 ‘Rules for rounding off numerical values (*second revision*)’. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

PACKAGED SEWAGE TREATMENT PLANT — SPECIFICATION

1 SCOPE

1.1 This standard covers the requirements of materials, design, structural strength, performance and inspection and testing for compliance of packaged sewage treatment plant (PSTP) made using glass fibre reinforced plastic (GFRP), polyethylene (PE), poly propylene (PP) or dicyclopentadiene (DCPD). On-site sanitation systems, like the PSTP, are alternatives to centralized sewerage systems where the latter is infeasible or unavailable in both urban and rural areas.

1.2 The PSTP units are designed to serve a population equivalent to minimum 5 people for complete treatment of sewage on-site and are suitable for underground installation at standard temperature and pressure conditions.

1.3 The PSTP system is designed to treat raw sewage using a natural biological process without any biological additives such as enzymes, effective microorganisms or any equivalent substances.

1.4 This standard does not cover on-site assembled PSTP. It only covers PSTP that are assembled off-site by a single manufacturer and tested as a complete and fully functional unit.

2 REFERENCES

The standards listed in Annex A contain provisions which through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent edition of these standards.

3 TERMINOLOGY

For the purpose of this standard, the following definitions shall apply.

3.1 Blackwater — Waste water and excreta from water closets, excluding water from baths, showers, hand basins, sinks and kitchen.

3.2 Disinfectants — A chemical substance which is capable of destroying or inactivating microorganisms.

3.3 Domestic Wastewater — Used water produced as a result of activities such as personal hygiene practice, washing, toilet usage and others.

3.4 Flexural Modulus — The ratio of stress difference to the corresponding strain difference in a bending test. It is used as an indication of a material's stiffness during bending.

3.5 Hydraulic Retention Time (HRT) — Theoretical average period of time a soluble compound remains in the treatment unit. The hydraulic retention time (HRT) is calculated as net digester volume (m^3)/daily feedstock input (m^3/day).

3.6 Packaged Sewage Treatment System (PSTP) — A packaged system for the treatment of incoming sewage/domestic wastewater (grey and black water) installed on-site to serve individual premises or small populations such that the effluent meets the norms set by the relevant authority.

3.7 Scum — The floating layer of froth comprised of substances such as oil, grease, and dust on the surface of sewage.

3.8 Sewage — Wastewater generated by a household or community which may also include human excreta and discharged into a sewerage network for conveyance to an off-site treatment facility like a sewage treatment plant.

3.9 Sludge — Sludge is the settled solid matter in semi-solid condition.

3.10 Sullage (Greywater) — The fraction of wastewater which doesn't contain human excreta and typically originates from activities such as bathing, washing, kitchen activities, cleaning, among others.

3.11 Supernatant — The clear layer of liquid separated/ produced as a result of solid-liquid separation following precipitation or settling.

3.12 Suspended Solid — Small to fine solid particles which remain in suspension in wastewater and are capable of being trapped by a physical filter.

4 DESIGN

4.1 General

Packaged sewage treatment plant (PSTP), hereby

also referred to as 'the system', shall be designed such that they provide complete treatment and disinfection (by means of chlorination, ozonation, UV, etc) of incoming wastewater in compliance with the requirements of this standard and thereby shall not discharge raw or partially treated wastewater to the open environment.

4.2 Inlet and Outlet

4.2.1 The inlet shall be designed to introduce the incoming wastewater with the least possible disturbance of the settled sludge or the surface scum. Similarly, the outlet shall be designed to ensure that solids that form the scum layer do not flow out of the system.

4.2.2 The internal pipework and connections shall be designed such that they allow self-cleansing for the prevention of sludge accumulation and resulting backflows, blockages and surcharging during normal operation.

4.2.3 The minimum internal diameter of inlet and outlet pipes shall be 100 mm.

4.2.4 The invert of the outlet pipe shall be a minimum of 25 mm below the invert of the inlet pipe to ensure that no surcharge or backflow in the inlet pipe occurs at the maximum flow rate, except at the inlet of the STP. Furthermore, the invert of the inlet pipe shall be a minimum of 50 mm from the top of the tank (ID).

4.3 Sizing and Dimensions

4.3.1 The system may be sized for wastewater generation according to prevailing regulations of the concerned authority regulating the sewage treatment and disposal.

NOTE — For residential areas, the wastewater generation is generally considered as 108 LPCD (80 percent of 135 LPCD water supply).

4.3.2 The system shall be designed for raw sewage quality specified in Table 6.

4.3.3 The system shall be designed with two or more compartments.

4.3.4 The system shall be sized such that it is able to safely store at least six month's sludge production without compromising the treatment performance OR the system shall be designed to have a minimum desludging period of six months under normal operating conditions.

4.3.5 The minimum HRT of the system shall be 16.5 h for average sewage temperature of 25 °C or above. However, the HRT shall be significantly higher for colder areas. Alternatively, heating element may be used for maintaining the desired temperature.

4.3.6 The manufacturer shall declare the desludging period of the system as part of the labelling and instructions accompanying the product, as further stipulated in 7 and 9.

4.3.7 A minimum freeboard of 100 mm shall be provided in the system as measured from the level of the outlet invert to the top of the tank (ID).

4.3.8 Thickness shall be measured with an accuracy of ± 5 mm and other dimensions shall be declared by the manufacturer along with their relevant tolerance.

4.4 Watertightness

When assembled with all necessary fittings and ready to use, the system shall meet at least one of the requirements listed to demonstrate water tightness when tested according to the methods described in Annex D of IS 18666.

4.4.1 *Water Test*

No leakage shall be observed.

4.4.2 *Pneumatic Pressure Test*

Either one of the following conditions shall be met.

4.4.2.1 When tested in the conditions given in **D-2.2.2.1** of IS 18666, the pneumatic pressure chosen for the test does not decrease by more than 0.005 bar during the related test period.

4.4.2.2 When tested in the conditions given in **D-2.2.2.2** of IS 18666, the pneumatic pressure 0.3 bar shall be maintained for a period of 180 s within limits of ± 10 percent.

4.4.3 *Leakage Test*

The tank is to be subjected to a pressure of 5 psi for 10 minutes and a leakage detection liquid is to be sprayed on entire tank surface. Continuous formation of bubble at any location of tank is the evidence of leakage.

4.5 Ventilation

Adequate ventilation of the system shall be provided as defined in Part 8/Section 1 of National Building Code of India 2016.

4.6 Treatment Efficiency

4.6.1 The treatment efficiency of the system shall be

ascertained as per the methodology described in Annex B and in accordance with the sampling and testing methods for wastewater provided in IS 3025.

4.6.2 The final effluent from the system being discharged to the open environment shall meet the discharge standards set forth by the Ministry of Environment, Forest, and Climate Change (MoEFCC) notified as General Discharge Standards in Schedule VI of *The Environment* (*Protection*) *Rules,* 1986 (*see* Table 1).

4.6.3 Based on nutrient removal types, the PSTPs shall be further classified as per Table 2.

Table 1 STP Effluent Discharge Standards

(*Clause* 4.6.2)

Sl No.	Parameter	Concentration Not to Exceed
(1)	(2)	(3)
i)	*p*H	5.5 to 9.0
ii)	Biological/biochemical oxygen demand (BOD)	30 mg/l
iii)	Chemical oxygen demand (COD)	250 mg/l
iv)	Total suspended solids (TSS)	100 mg/l
v)	Total nitrogen (TN)	100 mg/l
vi)	Dissolved PO_4 as P	5 mg/l

NOTE — The above table has been reproduced from MoEFCC General Discharge Standards in Schedule – VI of *The Environment* (*Protection*) *Rules*, 1986.

Table 2 Nutrient Removal Types

(*Clause* 4.6.3)

Sl No.	Parameter	BOD Removal Type	Nitrogen Removal Type	Nitrogen and Phosphorous Removal Type
(1)	(2)	(3)	(4)	(5)
i)	*p*H	Yes	Yes	Yes
ii)	Biological/biochemical oxygen demand (BOD)	Yes	Yes	Yes
iii)	Total suspended solids (TSS)	Yes	Yes	Yes
iv)	Total nitrogen (TN)[1]	No	Yes	Yes
v)	Total phosphorous (TP)[1]	No	No	Yes
vi)	Faecal coliforms (FC)	Yes	Yes	Yes

[1] To be evaluated for both influent and effluent.

4.7 Access for Maintenance

4.7.1 The system shall be designed to provide access openings for desludging and any other maintenance works.

4.7.2 The access openings shall have a minimum diameter or width, as applicable, of 400 mm.

4.7.3 The covers for each of the access openings should have a locking mechanism to prevent unauthorized access to the system when secured. The covers shall be fitted with corrosion-resistant accessory for lifting.

4.7.4 Extensions shafts, if provided, shall be fit for purpose and less than 300 mm in height.

4.7.5 Any filter media used in the system shall be easily accessible and removable during maintenance operations. Adequate ventilation should be available during maintenance operations.

4.8 Aerobic Treatment

4.8.1 The aeration system, if installed, shall be capable of supplying oxygen at levels higher than the designed airflow rate.

4.8.2 The blower, if installed, shall allow continuous operation with an ambient temperature range of - 10 °C to 40 °C and have low moisture absorption under normal operating conditions.

4.9 Power Consumption

The manufacturer shall declare the power consumption of the system expressed as kWh/day under normal operating conditions with a tolerance of ± 5 percent.

4.10 Noise

The noise level at the installed location shall not exceed the acceptable noise levels as given in IS 4954.

4.11 Safety

The system shall be designed to not cause electric shock, fire, or any other hazards or dangers.

5 STRUCTURAL STRENGTH AND INTEGRITY

5.1 Primary Raw Material

PSTP made using glass fibre reinforced plastic (GFRP), polyethylene (PE), poly propylene (PP) or dicyclopentadiene (DCPD) as the primary raw material is covered in this standard. The use of other materials for the manufacture of the system are not included as part of the scope of this standard. The primary raw material and laminates shall conform to the requirements listed in Table 3. The manufacturer shall procure and maintain records of the certificate for the properties of the raw material from the supplier.

5.2 Internal Partitions

Any compartmentation and partitions provided in the system shall be structurally sound and be able to withstand pump-out during the desludging of the system.

5.3 Filter Media

The filter media shall be composed of such materials which shall last for at least 15 years.

5.4 Ancillary Components

5.4.1 All internal and external parts and components of the system, such as the outer casing, partitions, filter media, blower(s), pump(s), control panel(s), valves, pipes, etc, shall be suitable for use in the corrosive wastewater environment and possess durability over the intended service life. If inaccessible upon installation and the commencement of operation, the parts shall be effective for the serviceable life of the system.

5.4.2 All ancillary equipment in use by the system shall be highly resistant to mechanical failures even during extended periods of continuous operation. Their structural strength and integrity shall be tested as per the relevant standards and the specifications as declared by the manufacturer.

5.5 Finish

5.5.1 The finish of all internal and external surfaces of the system shall have a smooth, unbroken and homogenous appearance.

5.5.2 The external surface shall be free from visual defects such as foreign inclusions, air bubbles, pinholes, discoloration and cracking.

NOTE — When GFRP is used as the primary raw material, the external surface shall be remarkably free from visual defects.

5.6 Structural Strength

A representative specimen from the final manufactured product, namely, the PSTP, shall conform to the requirements as specified in Table 4 for FRP material.

5.7 Load Bearing Capacity

5.7.1 The system shall be designed such that no structural failure, undue distortion or surface

cracking occurs due to all applicable loads, including hydrostatic, pedestrian, and backfill loads during operation. It shall also be able to resist any additional loads resulting from its handling, transportation, installation and maintenance (desludging) for its design life.

5.7.2 The system shall be able to withstand a minimum loading of 9.8 kPa/m depth due to hydrostatic groundwater and soil load acting on an empty tank when tested as per methods described in Annex D. It shall be declared as the maximum height of backfill achievable during installation and the possibility of installing the system in wet or dry site as part of the installation instructions in **8**.

6 SAMPLING AND TESTING

6.1 Lot

All PSTP systems in a single consignment of the same size, same treatment technology, same design, same raw material and manufactured under essentially similar conditions shall constitute a lot.

For ascertaining conformity of the lot to the requirements of the standard, samples shall be tested from each lot separately.

6.2 Acceptance Test

Acceptance tests are carried out on samples taken from the lot for the purpose of acceptance of the lot.

6.3 Type Test

6.3.1 Type tests are intended to prove the suitability and performance of a PSTP of a new composition, a new technique, a new design, a new size or shape, or modified wall thickness. These shall also be done whenever a change is made in the raw material, raw material supplier or method of manufacturing.

6.3.2 The manufacturer shall mandatorily undertake the type tests for the properties indicated in col (4) of Table 5 before commencing mass production.

6.3.3 If no change is envisaged in the parameters listed in **6.3.1**, at least one sample of any size shall be put to the type tests once in a year for parameters specified in col (4) of Table 5 with the exception of treatment efficiency. In case of treatment efficiency, in case no change is envisaged in the aforementioned parameters, at least one sample of any size shall be put to the type tests once every four years.

6.4 The conformity of the product with the requirements of this standard shall be demonstrated by the manufacturer through type tests and acceptance tests in accordance with Table 5. The scale of sampling and criteria for conformity for the routine tests specified in Table 5 shall be as given in Annex E.

Table 3 Requirements of Raw Material and Laminate for FRP

(*Clause* 5.1)

Sl No.	Parameter	Threshold	Method of Test, Ref to
(1)	(2)	(3)	(4)
i)	Minimum heat distortion temperature	> 65 °C	Annex C
ii)	Percent (w/w) glass content*	> 30 % (w/w)**	IS 14856
iii)	Surface hardness for FRP tank	> 35 BHU	IS 13360 (Part 5/Sec 14)

Table 4 Requirements for Demonstrating Structural Strength of FRP

(*Clause* 5.6)

Sl No.	Parameter	Threshold	Method of Test, Ref to
(1)	(2)	(3)	(4)
i)	Tensile strength	≥ 60 MPa	IS 13360 (Part 5/Sec 1)
ii)	Flexural strength	≥ 100 MPa	IS 14856
iii)	Tensile modulus	≥ 6 500 MPa	IS 13360 (Part 5/Sec 1)
iv)	Flexural modulus	≥ 5 800 MPa	IS 13360 (Part 5/Sec 7)

* Percent (w/w) glass content is not applicable to rotomoulded PE tanks.
** For GFRP manufactured by chop hoop winding process, minimum glass content required may be reduced to 22 percent.

Table 5 Scale of Sampling and Criteria for Conformity

(*Clauses* 6.3.2, 6.3.3 *and* 6.4)

SI No.	Requirements	Acceptance Tests	Type Tests
(1)	(2)	(3)	(4)
i)	Raw material	No	Yes
ii)	Overall dimensions (inlets, outlets, pipework and connections, access)	Yes	Yes
iii)	Watertightness	Yes	Yes
iv)	Treatment efficiency	No	Yes
v)	Power consumption	No	Yes
vi)	Wall thickness	Yes	Yes
vii)	Load bearing capacity	No	Yes

7 FACTORY PRODUCTION CONTROL

7.1 The manufacturer shall establish and document a factory production control system consisting of procedures for the internal control of production to ensure that the final products comply with the requirements of the present standard.

7.2 The manufacturer shall verify the specifications of incoming raw materials and components.

7.3 The relevant features of the system and production process shall be defined by giving the frequency of the inspection checks and tests, together with the criteria required for the controlling and manufacturing processes in accordance with the requirements of this standard. The factory production control system shall specify the action to be taken when the control values or criteria specified are not met.

7.4 Measuring equipment shall be verified and the procedure, frequency and criteria documented.

7.5 A sampling plan shall be prepared in accordance with Annex E for the routine quality testing of finished products. The results of tests shall be recorded and stored by the manufacturer for a minimum of five years (may be physical or digital records) and shall be made available for use.

7.6 The stock control of finished products, together with procedures for dealing with non-conforming products, shall be documented.

8 INSTALLATION INSTRUCTIONS

The manufacturer shall supply installation instructions with each system written in either one or both of Hindi, English and applicable regional language(s). These instructions shall contain information on the following parameters:

a) Installation of the system, including the installation of other tanks where large capacities are required by the user;

b) Pipe and valve connections;

c) Commissioning and start-up procedures;

d) Properties of backfill material to be used;

e) Maximum backfill height;

f) Suitability for dry/wet site;

g) Top load limitation;

h) Maximum depth of extension shaft;

j) Treatment efficiency;

k) Anchoring arrangement; and

m) Foundation preparation.

NOTE — Back-filling of the under-ground FRP STP tank shall be done with aggregate dust of size 4 mm to 12 mm only.

9 OPERATION AND MAINTENANCE INSTRUCTIONS

The manufacturer shall provide the products with comprehensive product selection instructions and operation and maintenance instructions, written in either one or both of Hindi, English and applicable regional language(s). The instructions shall clearly specify the optimal desludging frequency for the system. The typical O and M procedures are provided in Annex F.

10 MARKING

10.1 A durable and easily legible label with information listed as given below shall be printed on the system such that it is visible without requiring

the contents of the system to be emptied.

a) Manufacturer's name and recognized trademark, if any;

b) Model name or number of the system;

c) Lot or batch number and year of manufacture; and

d) Nominal size in litres and population equivalent.

10.2 BIS Certification Marking

The product(s) conforming to the requirements of this standard may be certified as per the conformity assessment schemes under the provisions of the *Bureau of Indian Standards Act*, 2016 and the Rules and Regulations framed thereunder, and the product may be marked with the Standard Mark.

11 OPERATIONAL ASSESSMENT

To ensure continued performance of the system in the service of a clean environment and improved public health, the competent authority may undertake periodic assessments of the effluent quality, in accordance with the prevailing laws and guidelines, during the continuing operation of the system.

ANNEX A

(*Clause* 2)

LIST OF REFERRED STANDARDS

IS No.	*Title*
IS 3025 (all parts)	Methods of sampling and test (physical and chemical) for water and wastewater
IS 4905 : 2015/ ISO 24153 : 2009	Random sampling and randomization procedures (*first revision*)
IS 4954 : 1968	Recommendations for noise abatement in town planning
IS 13360	Plastics — Methods of testing:
(Part 5)	Mechanical properties,
(Sec 1) : 2021/ ISO 527-1 : 2019	Determination of tensile properties — General requirements (*second revision*)
(Sec 7) : 2022/ ISO 178 : 2019	Determination of flexural properties (*second revision*)
(Part 6/Sec 3) : 2022/ISO 75-1 : 2020	Thermal properties, Section 3 Determination of temperature of deflection under load — General test method (*third revision*)
IS 14856 : 2000	Glass fibre reinforced plastic (GRP) panel type door shutters for internal use — Specification
IS 18666 : 2024	Rotationally moulded polyethylene septic tanks — Specification
SP 7 : 2016	National building code of India

ANNEX B

(*Clause* 4.6.1)

TREATMENT PERFORMANCE

B-1 The treatment performance of the PSTP shall be measured through an NABL accredited laboratory assessment for an evaluation period of 48 weeks + α, where α is the acclimatization period for the system ranging from 0 to 8 weeks. Seeding agents or sludge may be used for acclimatization. The location of evaluation shall be as determined by the laboratory.

B-2 The system shall be evaluated for low temperature as in hilly areas by the manufacturers or the qualified person where the ambient as well as wastewater temperature are much lower in winter months. The sizing of the PSTP for hilly areas shall be much higher compared to other areas.

B-3 The actual PSTP or a full-scale test specimen of the same design as the PSTP shall be used for the evaluation.

B-4 The raw sewage after screening and grit chamber of a sewage treatment plant or domestic wastewater originating from any other source with equivalent characteristics shall form the raw wastewater introduced to the PSTP under testing. The value of specified parameter to characterize the influent shall be within ± 20 percent or more than the concentration specified in col (4) of Table 6 throughout the evaluation period. The quality of the raw influent may be adjusted using the chemicals specified in col (5) of Table 6 to meet the criteria, if required.

B-5 The system shall be tested for average flow, if equalization tank is provided, otherwise it shall be tested for hourly variation of inflow. An illustrative temporal pattern of inflow rate diagram for such systems is described in Fig. 1 with an allowable error of ± 5 percent. The evaluation shall be conducted under three modes of flow rates: normal flow mode (Q) for a period of 40 weeks, low flow mode ($0.5Q$) for 4 weeks and high flow mode ($1.25Q$) for 4 weeks for a total of 48 weeks.

B-6 The assessor shall prepare and maintain a survey plan to measure the system performance with evaluation frequencies as described in Table 7. The method of sampling and physicochemical characterization of influent, effluent, and sludge at all stages of the assessment shall be in accordance with the relevant parts of the IS 3025. The assessor shall also maintain records of any maintenance activities.

B-7 The PSTP shall be considered to have passed the overall assessment if the evaluated effluent quality meets the prescribed limits in 75 percent of the total survey cases (minimum 48, with 40 from normal flow mode and a total of 8 from low and high flow modes).

Table 6 Influent Characteristics for Evaluation of PSTP

(*Clauses* 4.3.2 *and* B-4)

Sl No.	Parameter	Unit	Concentration	Chemical for Adjustment
(1)	(2)	(3)	(4)	(5)
i)	Biological/biochemical oxygen demand (BOD)	mg/l	250	Methanol
ii)	Chemical oxygen demand (COD_{cr})	mg/l	425	Methanol
iii)	Total suspended solids (TSS)	mg/l	375	Cellulose
iv)	Total nitrogen (TN)	mg/l	50	Urea, ammonium chloride
v)	Total phosphorous (TP)	mg/l	7.1	Potassium phosphate

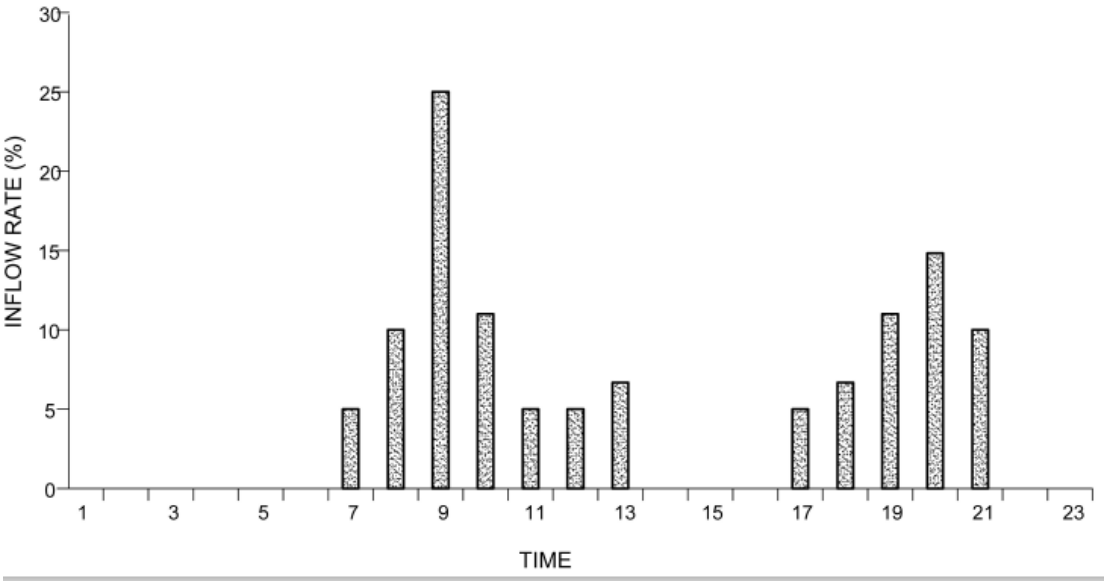

FIG. 1 TEMPORAL PATTERN OF INFLOW RATE

Table 7 Parameters for Evaluation and Frequency of Testing

(*Clause* B-6)

Sl No.	Parameter	Unit	Frequency
(1)	(2)	(3)	(4)
i)	Daily influent flow	litre/day	As desired
ii)	Inflow period	hour/day	As desired
iii)	Inflow pattern	Percentage versus hour	As desired
iv)	Peak influent flow	litre/minute	As desired
v)	Temperature of influent	°C	As desired
vi)	Daily effluent flow	litre/day	As desired
vii)	Sludge level	metre	Monthly (or more frequent)
viii)	Scum level	metre	Weekly (or more frequent)
ix)	Biological/biochemical oxygen demand (BOD)[1]	mg/l	Weekly (or more frequent)
x)	Chemical oxygen demand (COD_{cr})[1]	mg/l	Weekly (or more frequent)
xi)	Total suspended solids (TSS)[1]	mg/l	Weekly (or more frequent)
xii)	Total nitrogen (TN)[1]	mg/l	Weekly (or more frequent)
xiii)	Total phosphorous (TP)[1]	mg/l	Weekly (or more frequent)
xiv)	Faecal coliform (FC)	Most probable number (MPN) per 100 ml	Weekly (or more frequent)
xv)	*p*H[1]		Weekly (or more frequent)

[1] To be evaluated for both influent and effluent.

ANNEX C

[*Table* 3, *Sl No.* (i)]

WORK INSTRUCTIONS FOR HEAT DISTORTION TESTING

C-1 DEFLECTION TEMPERATURE OF PLASTICS UNDER FLEXURAL LOAD IN THE EDGEWISE POSITION

C-1.1 To determine deflection temperature of plastic under flexural load in the edgewise position as per IS 13360 (Part 6/Sec 3).

C-1.2 This test method applies to moulded and sheet material available in thicknesses of 3 mm or greater and which are rigid or semi rigid at normal temperature.

C-2 WORK INSTRUCTIONS

C-2.1 Apparatus

Heat distortion temperature testing machine [as per IS 13360 (Part 6/Sec 3)] (HDT/VSP tester), dial indicator, dead weights, micrometre.

C-2.2 Test Specimen — 127 mm × 13 mm × (3 mm to 13 mm)

C-2.3 Procedure

C-2.3.1 Measure the width and depth of each specimen with a suitable micrometre. These values are used to determine the amount of applied force necessary to produce the specified fibre stress in each specimen by the following load calculation.

$$F = \frac{2Sbd^2}{3L}$$

where

F = load, in N;
S = fibres in specimen (0.455 MPa or 1.82 MPa);
b = width of the specimen, in mm;
d = depth of specimen, in mm; and
L = distance between support, in mm.

C-2.3.2 Position the test specimen edgewise in the apparatus. Start the heating and steering. The temperature of the medium is measured when the test bar has deflected 0.25 mm.

C-2.4 REPORT

Record the temperature at specified deflection on inspection report.

ANNEX D

(*Clause* 5.7.2)

WORK INSTRUCTIONS FOR LOAD TESTING

D-1 LOAD TEST (WATER LOAD AND EARTH LOAD)

D-1.1 This test applies to both the water load and earth load condition.

D-1.2 This test method applies to FRP tanks for underground application. Earth load test is not applicable to rotomoulded LLDPE tanks. However, the load test shall be done as per IS 18666.

D-2 WORK INSTRUCTIONS

D-2.1 Water Load Test Procedure

A tank shall be:

a) Placed in sand so that one-eighth of the tank diameter is buried; and

b) Filled to the capacity for one hour.

The tank shall not get damaged during testing.

D-2.2 Earth-Load Test Procedure

a) An empty tank shall be installed in a pit, back filling to be done as per manufacture's instruction. The tank is to be covered so that it is 0.9 m below the surface of fill. The tank is to remain buried for one hour.

b) The tank is then to be subjected to leakage test. The system shall meet at least one of the requirements listed in **4.4**.

D-3 REPORT

Record the temperature at specified deflection on inspection report.

ANNEX E

(*Clauses* 6.4 *and* 7.5)

SCALE OF SAMPLING AND CRITERIA FOR CONFORMITY FOR ACCEPTANCE OF TESTS

E-1 SCALE OF SAMPLING

E-1.1 In any consignment, all the systems of same size, design and type made from same raw materials and manufactured under similar conditions shall be grouped together to constitute a lot.

E-1.2 For ascertaining the conformity of the systems to the requirements of the standard, samples shall be tested from each lot separately.

E-1.3 The number of systems to be selected from a lot shall depend on the size of the lot according to Table 8 for testing overall dimensions, watertightness, wall thickness and Table 9 for testing load bearing capacity.

E-1.4 The systems for testing shall be selected at random from the lot. To ensure the randomness of selection, procedures given in IS 4905 may be followed.

E-2 NUMBER OF TESTS AND CRITERIA FOR CONFORMITY

E-2.1 For each of the systems selected for testing of overall dimensions, watertightness, and wall thickness, a system failing to satisfy one or more of the requirements relating to these tests shall be considered as defective. The lot shall be deemed to have satisfied these requirements if the number of defective systems found in the sample is less than or equal to the corresponding acceptance number given in col (4) of Table 8.

E-2.2 The lot having been found satisfactory according to **E-2.1** shall be further tested for load bearing capacity. The number of test samples shall be selected from the satisfactory lot in accordance with Table 9. The lot shall be declared to have satisfied the requirements of these tests if none of the sample tested fails.

Table 8 Scale of Sampling and Criteria for Conformity for Overall Dimensions, Watertightness, and Wall Thickness

(*Clauses* E-1.3 *and* E-2.1)

SI No.	Lot Size	Sample Size	Acceptance Number
(1)	(2)	(3)	(4)
i)	Up to 50	5	0
ii)	51 to 150	20	1
iii)	151 to 280	32	2
iv)	281 to 500	50	3
v)	501 and above	80	5

Table 9 Scale of Sampling and Criteria for Conformity for Load Bearing Capacity

(*Clauses* E-1.3 *and* E-2.2)

SI No.	Lot Size	Sample Size
(1)	(2)	(3)
i)	Up to 500	2
ii)	501 and above	3

ANNEX F

(*Clause* 9)

ROUTINE OPERATION AND MAINTENANCE PROCEDURES

F-1 ROUTINE OPERATION AND MAINTENANCE PROCEDURES

F-1.1 The following routine inspection shall be carried out by the user once a week:

a) Check pretreatment units (bar screens, O and G trap, grit chamber, etc);

b) Check state of operation of blowers;

c) Check state of operation of pumps and float switch/level switch/float; and

d) Check state of operation of disinfection system.

F-1.2 The following routine inspection shall be carried out by the service provider once a month:

a) Check media or filter conditions;

b) Clean air filters of blowers; and

c) Check leakage, clogging, etc, in influent, effluent, internal, inter-connection, aeration pipes for leakage, clogging.

F-1.3 The following routine inspection shall be carried out by the service provider once in six months:

a) Replacement of air filters of blowers;

b) Sludge level check;

c) Check scum in all chambers;

d) Sludge removal; and

e) Cleaning of media and filter.

ANNEX G

(*Foreword*)

COMMITTEE COMPOSITION

Public Health Engineering Sectional Committee, CED 24

Organization	*Representative(s)*
In Personal Capacity (*840, Sector - 17, Faridabad*)	SHRI A. K. SARIN **(*Chairperson*)**
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Working Group for Packaged Sewage Treatment Plant — Specification, CED 24/ WG7

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