भारतीय मानक

Indian Standard

IS 18727 : 2024

सौर संग्रहक ऑल ग्लास इवेक्यूएटिड ट्यूब्स सिस्टम हेतु मैनिफोल्ड प्रकार की पानी स्टोरेज टंकी — विशिष्टि

Manifold Type Storage Water Tank for All Glass Evacuated Tubes Solar Collector Systems — Specification

ICS 27.160

भारतीय मानक ब्यूरो
BUREAU OF INDIAN STANDARDS
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April 2024 **Price Group 5**

Renewable Energy Sources Sectional Committee, MED 04

FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Renewable Energy Sources Sectional Committee had been approved by the Mechanical Engineering Division Council.

This standard is being to keep pace with the latest technological developments and international practices. Also, the standard has been brought into the latest style and format of Indian Standards, and references of Indian Standards, wherever applicable have been updated. BIS certification marking clause has been mentioned to align with the revised *Bureau of Indian Standards Act,* 2016.

The requirements for all glass evacuated solar collector tubes is covered in IS 16543 : 2016 'All glass evacuated solar collector tubes — Specification' and the requirements for all glass evacuated tubes solar water heater system is covered in IS 16544 : 2016 'All glass evacuated tubes solar water heating system'. Tank with capacity less than 500 litres for use with evacuated tubes solar water heater system is covered in IS 16542 : 2016 'Direct insertion type storage water tank for all glass evacuated tubes solar collector — Specification'.

Committee felt that there is need of a standard to address the need of industrial user regarding water tank over 500 litres, accordingly this standard has been drafted.

The relevant SI units and corresponding conversion factors are given below for guidance:

Pressure 1 Pa (Pascal) = 1 N/m^2

1 kgf/mm^2 = 9.806 65 MPa

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

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

MANIFOLD TYPE STORAGE WATER TANK FOR ALL GLASS EVACUATED TUBES SOLAR COLLECTOR SYSTEMS — SPECIFICATION

1 SCOPE

This standard specifies requirements of storage water tank of water capacity more than 500 litres with manifold of all glass evacuated tubes solar collector. This standard covers only vented type storage water tank.

2 REFERENCES

The standards given below contain provisions which, through reference in this text, constitute provision 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:

IS No.	*Title*
IS 1079 : 2017	Hot rolled carbon steel sheet, plate and strip — Specification (*seventh revision*)
IS 6911 : 2017	Stainless steel plate, sheet and strip — Specification (*second revision*)
IS 9730 : 2008	Non-stick unreinforced plastics coatings on domestic cooking utensils — Specification (*first revision*)
IS 14246 : 2024	Continuously pre-painted galvanized steel sheets and strips — Specification (*second revision*)
IS 16368 : 2015	Test procedure for thermosyphon type domestic solar hot water heating systems

3 DEFINITIONS

3.1 Vented Storage Water Tank — Storage water tank having opening to the atmosphere and pressure inside the tank is always equal to atmospheric pressure all the time.

3.2 Working Pressure — Working pressure is 0.3 bar (*Min*).

4 DESIGN OF STORAGE WATER TANK

Manifold of evacuated glass tubes collector are directly connected to storage water tank. A typical solar collector manifold and storage tank is shown in Fig. 1.

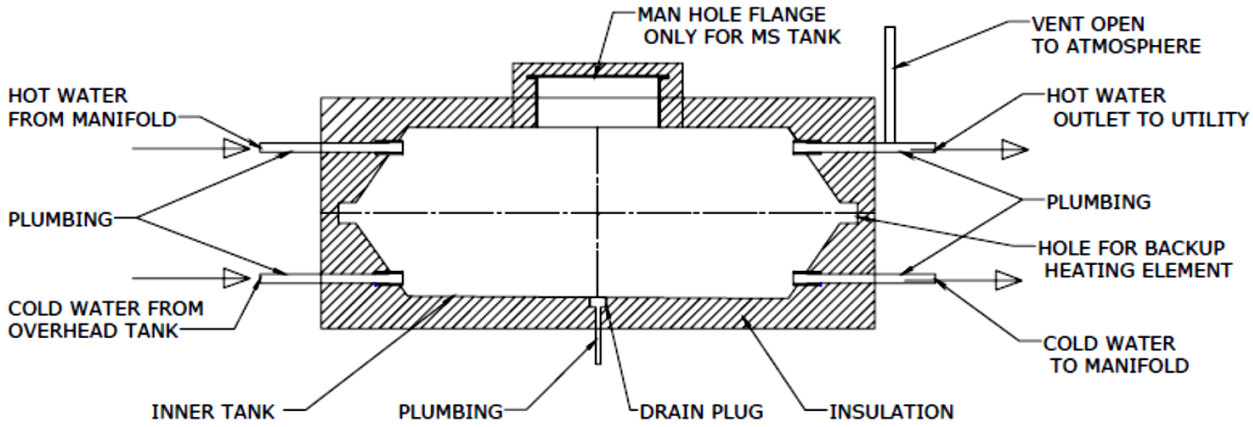

FIG. 1 STORAGE WATER TANK

To access Indian Standards click on the link below:

https://www.services.bis.gov.in/php/BIS_2.0/bisconnect/knowyourstandards/Indian_standards/isdetails

5 MAIN PARTS OF STORAGE WATER TANK

5.1 Inner Tank

Inner tank shall be manufactured from any of the following materials:

5.1.1 Stainless steel sheet conforming to grade X02Cr19Ni10 or X02Cr17Ni12Mo2 of IS 6911. The thickness of sheet shall be minimum 1.2 mm for up to 1 250 litre water capacity and 1.5 mm for above 1 250 litre water capacity but below 3 000 litres and shall withstand a pressure of 1.5 times working pressure.

5.1.2 Mild steel sheet conforming to IS 1079 with anti-corrosive coating. The thickness of mild steel sheet shall be minimum 3.0 mm up to 4 000 litres water capacity. The thickness of coating shall be minimum 80 micron and should be capable to withstand minimum five years of performance. Anti-corrosive coating should be enamel coating (glass lining or enamel lining) or any other food grade coating conforming to IS 9730, which can withstand 80 °C continuous operations.

NOTE — For purpose of protective coating on mild steel plate total dissolved solids (TDS) considered is not more than 300 ppm and chlorides contents not more than 50 ppm in water.

5.1.3 GI sheets conforming to IS 277. The thickness of GI sheet shall be minimum 2.0 mm for less than 2 000 litre water capacity. The thickness of coating on welding joint should be capable to withstand minimum five years of performance. Anti-corrosive coating shall be of any food grade conforming to suitable IS.

NOTE — For purpose of protective coating on GI sheet plate TDS considered is not more than 300 ppm and chlorides content not more than 50 ppm in water.

5.2 Outer Cladding

The material of outer cladding shall be pre-painted galvanized steel conforming to IS 14246. Alternatively, material of outer cladding may be aluminum/stainless steel/FRP of suitable thickness.

5.3 Insulation Layer

The insulation layer shall be pre-injected poly urethane foam (PUF) of a minimum thickness 50 mm. The density of PUF shall be 28 kg/m^3 to 36 kg/m^3. Alternatively, rock wool of density 48 kg/m^3 (*Min*) and thickness of minimum 100 mm should be used.

5.4 Inner Sealing

The material of inner sealing shall be high temperature resistant silicon rubber.

5.5 Outer Sealing

The material of outer sealing shall be ethylene propylene diene monomer (EPDM) rubber.

5.6 Sacrificial Anode (Optional)

Additional corrosion protection may be provided by the installation of a sacrificial anode. The anode shall be manufactured from magnesium/aluminium (or a material with higher protection potential) cored with a steel rod to ensure mechanically and wear strength suitable for the duty it has to perform and to withstand the mechanical shocks which may be induced during transport and installation. The anode shall be mounted in a robust manner at the end of the tank and shall be in electrical contact with the inner tank. The anode shall be easily replaceable.

6 GENERAL REQUIREMENTS

6.1 The outer cladding shall be smooth without any crack or obvious scratch and no coating peeling off.

6.2 Insulation layer shall be stuffed tightly. There shall be no obvious shrinkage or bulging of insulating material.

6.3 Outer sealing shall be without any defect.

6.4 Access door may be provided for easy periodic cleaning of the tank (for tank with MS).

6.5 All holes of tank may be provided with protective caps to avoid entry of any foreign material in the tank before its installation in the system.

6.6 Protective caps shall be provided at inlet and outlet of the tank.

7 TEST REQUIREMENTS

7.1 Measurement of Storage Water Tank Capacity

The capacity of storage water tank shall be within + 5 percent of declared capacity when measured as per 8.1.

NOTE — The declared capacity of storage water tank shall be equal to capacity of the system. Volume of water in evacuated tubes and manifold shall not be accounted in the capacity of storage water tank.

7.2 Leakage Test

No leakage when tested as per 8.2.

7.3 Idle Heating Test

There shall be no deformation, crack or other damage when tested as per 8.3.

7.4 Integral Test

There shall be no leakage or damage when tested as per 8.4.

7.5 Performance Test

Heat loss coefficient of the system (U_L) shall be < 2 W/(m^2 .°C), when tested as per 8.5.

7.6 Thermal Shock Test for Inner Sealing

The sample of silicon rubber shall be kept in an electric oven at a temperature of 150 °C for 4 h. After heating, the samples shall be taken out and cooled in air for 2 h and shall again be put in the oven at 150 °C for 4 h. The sample shall be taken out and cooled and shall be inspected for any appearance of cracks or brittleness.

7.7 Thermal Shock Test for Outer Sealing

The sample of EPDM rubber shall be kept in an electric oven at a temperature of 125 °C for 4 h. After heating, the samples shall be taken out and cooled in air for 2 h and shall again be put in the oven at 125 °C for 4 h. The sample shall be taken out and cooled and shall be inspected for any appearance of cracks or brittleness.

8 TEST PROCEDURE

8.1 Measurement of Storage Water Tank Capacity

Volume of water required to fill the empty storage water tank at ambient temperature shall be measured to find the capacity in litres.

8.2 Leakage Test

Fill the storage water tank with clean water and release the air inside the tank. Close air vent and increase the pressure to 1 bar and maintain the pressure for minimum of 15 min. There shall be no leakage or permanent deformity.

8.3 Idle Heating Test

Install the system with water storage tank under test outdoors according to operating conditions. There shall be no presence of water inside the system. Measure the daily cumulative solar irradiance on the plane of the collector which shall be more than 16 MJ/m^2. The average wind velocity shall be 4 m/s or less. This test is to be conducted for three consecutive days. At the end of the test there shall be no deformation, crack or other damage to storage water tank.

8.4 Integral Test

Install the system with water storage tank under test outdoors according to operating conditions. The system is filled with water. Measure the daily cumulative solar irradiance on the plane of the collector which shall be more than 16 MJ/m^2. The average wind velocity shall be 4 m/s or less. This test is to be conducted for three consecutive days. At the end of the test there shall be no leakage or damage to storage water tank.

8.5 Performance Test

Test the system with water storage tank under test for heat loss coefficient as per IS 16368.

9 TYPE OF TEST

9.1 Routine Test

Each inner tank shall be tested for leakage as per 8.2 for a period of 15 min by manufacturer.

9.2 Type Test

All the tests specified in 7.1 to 7.7 are type tests and shall be carried out initially for each capacity either in manufacturer's lab or outside approved lab for testing of the product. These tests shall be repeated every two years after initial approval or before if there is any change in design, technology or materials.

10 MARKING

10.1 The following information shall be marked on the storage water tank:

a) Name of the manufacturers or trade mark;
b) Water capacity in litres;
c) Serial no.;
d) Month and year of manufacture;
e) Material and thickness of the inner tank; and
f) Material and density of insulation.

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(s) may be marked with the Standard Mark.

11 PACKING

The storage water tanks shall be suitably packed to avoid any damage during handling, storage and transportation.

ANNEX A

(*Foreword*)

COMMITTEE COMPOSITION

Renewable Energy Sources Sectional Committee, MED 04

Organisation	*Representative(s)*
Ministry of New and Renewable Energy, New Delhi	DR A. K. TRIPATHI **(*Chairperson*)**
Bharat Heavy Electrical Limited, New Delhi	SHRI AMRISH GUPTA SHRI SAUMEN KUMAR BHAUMIK (*Alternate* I) SHRI SUBHASHISH GUPTA (*Alternate* II)
Biogas Forum India, New Delhi	SHRI A. R. SHUKLA
Cement Manufacturers Association, New Delhi	SHRI RAJU GOYAL SHRI MANMOHAN RATHI (*Alternate* I) SHRI SHUBHO CHAKRAVARTY (*Alternate* II)
Central Arid Zone Research Institute, Jodhpur	DR H. L. KUSHWAHA DR SURENDRA POONIA (*Alternate*)
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Solar Thermal Federation of India, Pune	SHRI JAIDEEP N. MALAVIYA
The Energy and Resources Institute, New Delhi	SHRI N. K. RAM
In Personal Capacity (*C-103 A, JVTS Garden Chhatarpur Extension, New Delhi - 110074*)	SHRI ATAM KUMAR
BIS Directorate General	K. VENKATESWARA RAO, SCIENTIST 'F'/SENIOR DIRECTOR AND HEAD (MECHANICAL ENGINEERING) [REPRESENTING DIRECTOR GENERAL (*Ex-officio*)]

Member Secretary
SHRI ANKITA VIDHYARTHI
SCIENTIST 'D'/JOINT DIRECTOR
(MECHANICAL ENGINEERING), BIS

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Amendments Issued Since Publication

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