

الهيئة السعودية للمواصفات والمقاييس والجودة

Saudi Standards, Metrology and Quality Org. (SASO)



SASO DS 2974 :2025

Blow molded Polyethylene Water Storage Tanks

ICS: 23.020.10

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Forward

The technical team " Plastic " of Saudi Standards, Metrology and Quality Organization (SASO) has update the Saudi Standards No. 2974/2022 for " **Blow molded Polyethylene Water Storage Tanks** " based on relevant ADMO, International and National foreign Standards and references. The approved Saudi Standard will replace and supersede the Saudi Standard No.2974/2022.

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Blow molded Polyethylene Water Storage Tanks

1.Scope

This Saudi Standard specifies requirements for materials, physical properties, performance and test methods for blow molded polyethylene tanks, with or without reinforcement, for the above ground storage of water.

It is only applicable to static blow molded polyethylene tanks for (Horizontal tanks or Vertical tanks), which are subjected to atmospheric pressures but not subject to any external loading and having a volume of 500 L to 10 000 L. Except for periodic temperature fluctuation their normal operating temperature does not exceed 65 °C.

2.Normative references

- 2.1** SASO ISO 293, Plastics Compression molding of test specimens of thermoplastic materials
- 2.2** SASO 527-2 Plastics Determination of tensile properties Part 2: Test conditions for molding and extrusion plastics
- 2.3** SASO ISO 1133-1 Plastics - Determination of the melt mass-flow rate (MFR) and melt volume-flow rate (MVR) of thermoplastics – Part 1: Standard method
- 2.4** SASO ISO 1183-1 Plastics — Methods for determining the density of non-cellular plastics Part 1: Immersion method, liquid pycnometer method and titration method
- 2.5** SASO ISO 1183-2 Plastics — Methods for determining the density of non-cellular plastics Part 2 Density gradient column method
- 2.6** SASO ISO 17855-2 Plastics — Polyethylene (PE) molding and extrusion materials — Part 2: Preparation of test specimens and determination of properties
- 2.7** BS 6920 Suitability of non-metallic products for use in contact with water for human consumption with regard to their effect on the quality of water.
- 2.8** SASO-GSO-1831:2021 Rotational molded Polyethylene Water Storage Tanks.
- 2.9** GSO 1863/2021, "Food Packages – Part 2: Plastic Packages – General Requirements".
- 2.10** FDA 21 CFR 177.1520 U.S. Food and Drug Administration (FDA) that outlines the safety and specifications for olefin polymers (such as polypropylene and polyethylene) intended for use in food-contact applications.

3. Terms and definitions

3.1 Water Storage Tank

Water Storage Tanks for the storage of water at atmospheric pressure which retains its designed shape without any support when filled with water.

3.2 Brimful capacity / Gross Capacity (of a tank)

Total internal volume of the tank when filled to the top without air space.

3.3 Maximum filling capacity / Net Capacity / Actual Capacity (of a tank)

Total internal volume of the tank when filled to the lowest level of overflow.

3.4 Regrind

material prepared from clean, rejected, unused tanks, including trimmings from the production of tanks that will be reprocessed in a manufacturer's plant after having been previously processed by the same manufacturer in the production of tanks.

3.5 Raw Material

High density polyethylene (HDPE) shall be 100 % virgin, Food grade Material.

4. Requirements for materials

- 4.1 Material Classification—High density polyethylene (HDPE) materials allowable for use in this specification shall be fulfil the requirements according to Table 1.
- 4.2 Masterbatch shall be food grade without any fillers.
- 4.3 All layers shall be free from any type of filler.
- 4.4 All layers and accessories (cap/lid/fittings) coming in direct contact of water should be 100% virgin, food grade material. Only outer layer that is in direct contact with sunlight needs to be UV-stabilized.
- 4.5 Regrind Material can be used only in middle Black layer for environment sustainability.
- 4.6 The percentage of Carbon Black content in black layer compound shall be 2.25 +/- 0.25%.
- 4.7 Samples taken from the tanks shall be tested and fulfil the requirements according to Table 1

Table 1 — Material requirements

Material Type	Property	Requirement	Test Method
High Density Polyethylene (HDPE)	Density	shall not be less than 938 kg/m ³	SASO ISO 1183-1 or SASO ISO 1183-2
	Melt flow rate	shall be less than 12 g/10 min at 190 °C, 21.6 kg load.	SASO ISO 1133-1
	Tensile strength	• Tensile strength at yield shall not be less than 21 MPa • Elongation at yield shall not be more than 15 %, • Elongation at break shall not be less than 200 %	SASO ISO 527-2
	soluble fraction in xylene	Determination for Food grade on polymers, Soluble fraction in xylene Maximum 30 % at 25 °C	FDA 21 CFR 177.1520 The test methods are specified in paragraph (d) on page 295.
	extractable fraction in n- hexane	Determination for Food grade on polymers, the maximum allowable extractables from the polyethylene after a 2-hour n-hexane reflux at 50 °C is 2.6 % of the sample weight. (2.6 pct at 50 °C)	FDA 21 CFR 177.1520 The test methods are specified in paragraph (d) on page 295.

5. Design requirements

5.1 Filling systems

In the case of direct fill, the opening for filling shall be a minimum of 250 mm in diameter and shall be covered with a cap or lid.

5.2 Venting systems

All tanks shall be equipped with venting facilities. The cross-sectional area of the venting shall not be less than the cross-sectional area of the filling system. The cross-sectional area shall be sufficient to avoid either over- or under-pressure.

5.3 Suction/outlet system

Tanks shall be equipped with an opening permitting the safe and reliable connection of withdrawal systems.

All fittings shall be corrosion resistant. The tank outlet may be installed above or below the water level.

5.4 The tank, lid, ventilation, and filling/suction systems shall be designed to prevent dust or contamination during storage or use.

6 Requirements for tanks

Blow-molded tanks shall be tested according to Table 2.

Table 2 — Requirements for blow-molded polyethylene thermoplastic tanks

Property	Requirement		Test Method
Capacity	The brimful capacity shall be measured the maximum filling capacity, declared by the manufacturer shall be checked.		A.1
Visual inspection	There shall be no bubbles, blisters or other defects in the tank wall which could cause a hole or a fracture		A.2
Wall thickness	For maximum filling Capacity	Minimum(AVERAGE) wall thickness	A.4
	≥ 500 , < 1 000 liter	4 mm	
	≥ 1 000 , < 1 500 liter	4.3 mm	
	≥ 1 500 , < 2 000 liter	4.5 mm	
	≥ 2 000 , < 2 500 liter	4.5 mm	
	≥ 2 500 , < 3 000 liter	5 mm	
	≥ 3 000 , < 3 500 liter	5 mm	
	≥ 3 500 , < 5 000 liter	7 mm	
	≥ 5 000 , < 10 000 liter	10 mm	
Impact resistance	No Cracking or puncture shall appear when tested as per A.5		A.5
Resistance To Deformation	Difference in measurement should not be more than 2% when tested as per A.6		A.6
Opacity Test	The opacity of the tanks wall shall not transmit more than 0,2 % of visible light when tested according to method described .		A.7

6.1 Tank Sizes, Dimensions & Weight

Standard horizontal type tanks are available from 500 liters to 5000 liters (Table 3) and standard vertical type tanks are available from 500 liters to 10,000 liters (Table 4). Height should be measured with Lid/cap only. Permissible tolerance range of 15% subject to design and volume requirements. Dimensions are for guide for standard reference only.

Table 3 — Sizes, Dimensions, and Weight for Horizontal Type Blow-molded Tanks

HORIZONTAL TYPE BLOW MOLDED TANKS					
Size (Liters)	Tank Dimensions (mm)				Minimum Weight (kg)
	Length	Width (Dia)	Height	Minimum Manhole Opening	
500	1300	850	1,000	250	22
1,000	1600	1150	1,300	420	41
1,500	1900	1300	1,400	420	62
2,000	2100	1400	1,550	420	72
3,000	2250	1600	1,750	420	100
4,000	2650	1700	1,900	420	140
5,000	2650	1850	2,000	420	158

Horizontal Tank's Dimensions:

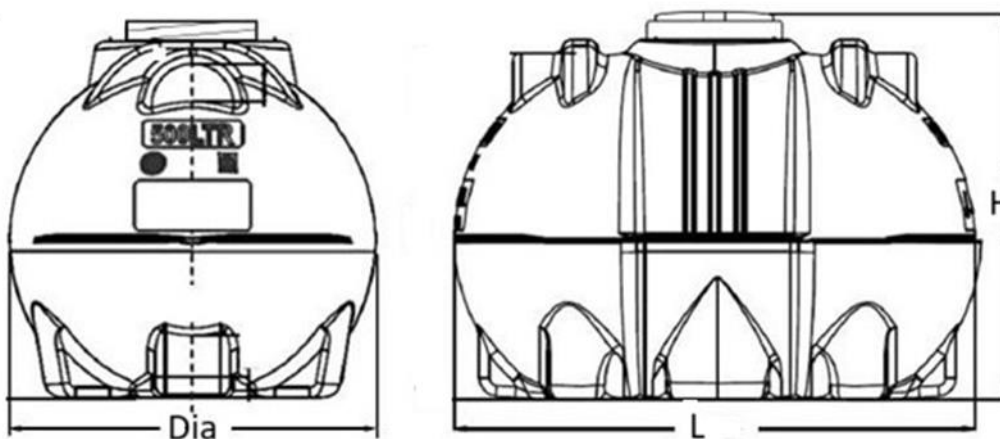
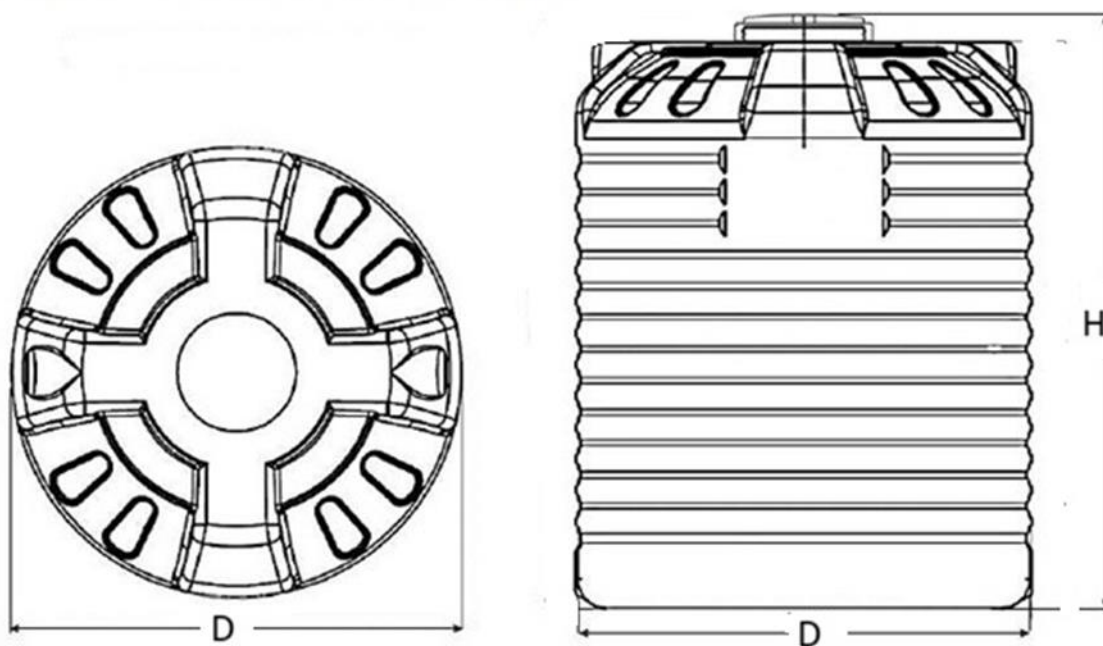


Table 4 — Sizes, Dimensions, and Weight for Vertical Type Blow-molded Tanks

VERTICAL TYPE BLOW MOLDED TANKS				
Size (Liters)	Tank Dimensions (mm)			Minimum Weight (kg)
	Diameter	Height	Minimum Manhole Opening	
500	850	1100	250	12
1,000	1050	1350	420	24
1,500	1250	1500	420	36
2,000	1400	1750	420	48
2,500	1600	2000	420	60
3,000	1750	2100	420	66
4,000	1800	2250	420	88
5,000	1950	2400	420	110
6,000	2000	2550	420	132
8,000	2200	2700	420	176
10,000	2350	2900	420	220

Vertical Tank's Dimensions:

6.2 Extraction metals

The amount of metals in the final extracts should not exceed the specific limit given in Table 5 when tested according to standard in BS 6920 “Suitability of non-metallic products for use in contact with water for human consumption with regard to their effect on the quality of water”.

Table 5 — Maximum allowable concentration of certain metals

Metal	Maximum allowable Concentration µg/L
Aluminum	200
Antimony	10
Arsenic	50
Barium	1000
Cadmium	5
Chromium	50
Iron	200
Lead	50
Manganese	50
Mercury	1
Nickel	50
Selenium	10

7. Sampling

For conformity purpose, a representative sample should be taken and tested for the suitability of design, performance requirement, and marking.

8. Testing

The following tests shall be carried out on samples drawn in accordance with item (7)

8.1 Visual inspection for the followings:

- Design requirements according to 5.
- Visual inspection for defects according to A.2.

8.2 Density for resin (raw materials).

8.3 Melt flow rate for resin (raw materials).

8.4 Determination for Food grade by extractable fraction n- hexane

8.5 Determination for Food grade by soluble fraction in xylene

8.6 Tensile strength

8.7 Resistance to Impact

8.8 Resistance to Deformation

8.9 Opacity

8.10 Measuring of wall thickness.

8.11 Measuring of tank Size, dimension and weight according to Table 3 & 4.

8.12 Determination of Extraction metals according to 6.2.

8.13 Food Contact Declaration from the raw material Manufacturer.

9. Marking

Each tank shall be legibly and indelibly marked with the following information in Arabic or in both Arabic and English:

- 9.1 Plastic type.
- 9.2 Name of the manufacturer or trademark and country of origin.
- 9.3 Type of use.
- 9.4 Method of Production : Blow Molding
- 9.5 Net capacity in liters.
- 9.6 Wall thickness in mm and Dimensions.
- 9.7 Number of layers.
- 9.8 Batch number.
- 9.9 Date of production.
- 9.10 SASO Standard No.

Annex A

(normative)

Test methods for determination of tank characteristics

A.1 Capacity

The tank shall be conditioned at $(20 \pm 5) ^\circ\text{C}$ for 48 h and then be filled to the point of overflow at a rate of (150 ± 40) l/min with water at $(15 \pm 5) ^\circ\text{C}$. After 10 min the tank shall be filled again to overflow and the capacity shall be measured to an accuracy of $\pm 1 \%$.

A.2 Visual inspection

The visual inspection shall be carried out with suitable illumination in order to detect faults according to Table 2 as applicable.

The marking in accordance with Clause 9 shall be checked.

A.3 Weight

The weight of the tank shall be measured with all molded-in inserts, without reinforcements and accessories to an accuracy of $\pm 0,5 \%$.

Record the Weight of the tank.

A.4 Wall thickness

The wall thickness shall be determined round to the nearest 0,1 mm using ultrasonic wall thickness measurement equipment calibrated in accordance with the manufacturer's instructions. A reference test piece of similar thickness, manufactured by the same process and from the same raw material as the tank, shall be used for calibration.

A.5 Resistance to Impact

No failure, cracking or puncture should appear when the tank is inverted and the base of the tank is struck with a 25 mm diameter hemi spherically ended striker of mass 2.5 Kg falling freely from a height of 3.0 meter at the midpoint of the tanks base. Three impacts with the same striker shall be repeated as close to the edge of the base.

A.6 Resistance to Deformation

When water storage tanks are tested by filling 98 % of net capacity and circumferential measurement shall be made parallel to the base at a distance of one third the effective height. The tank shall be filled upto the effective height at a minimum rate of 23 L/min with water at temperature of not less than 15°C . The tank and water shall be maintained at temperature not less than 15°C and after 3 days a circumferential measurement shall be made at the previously determined level the difference between the circumferential measurement shall not be greater than 2 % of the original measurements.

Reference: IS 12701.

A.7 Opacity Test

The opacity of the tanks wall shall not transmit more than 0,2 % of visible light when tested according to method described . As per ISO 7686.

References

- [1] EN 13575 Static thermoplastic tanks for the above ground storage of chemicals. Blow molded or rotationally molded polyethylene tanks. Requirements and test methods.
- [2] FDA 21 CFR 177.1520.
- [3] National Factories.

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