

TANKS FOR LIQUIDS

This invention relates to tanks for the storage of liquids, in particular water tanks. Numerous kinds of tank are known and all suffer from disadvantages.

5 Circular steel plate tanks are economical in material as the steel can be highly stressed, but circular tanks take up more space than rectangular tanks of equivalent volume and are therefore undesirable as rooftop tanks where space and appearance are important factors.

10 Rectilinear steel bolted plate tanks must be constructed to limit deflection (to prevent springing of the bolted joints) and therefore supporting steel beams are understressed and not economically designed. Caulking is required and internal ties and stays may be
15 needed to maintain shape of the tank.

All steel tanks must have an inert coating or lining to prevent corrosion.

Reinforced concrete circular tanks are reasonably economical for large tanks but unsatisfactory for rooftop use. The stresses in the reinforcement must be kept relatively low to avoid cracking, and the wall sections must be carefully jointed.

Circular prestressed concrete tanks are satisfactory as large tanks but not as rooftop tanks.

All concrete tanks require an inert internal lining or coating.

Rectangular concrete tanks are more economical of space than circular tanks, but much more expensive structurally and are more prone to structural cracking and require particularly careful construction and joining.

Glass-reinforced resin tanks are commonly used as small tanks, composed of bolted panels or sections. They are liable to deteriorate under heat and light and great care must be taken that the glass fibres or resin do not get into the water, especially if this is for drinking.

According to the present invention, there is provided a tank for water or other liquids, which consists of a unitary body of stiff or rigid impervious substantially self-supporting inert high density polyethylene plastics material of which the surface is in use in contact with the contained liquid, and a substantially rigid self-supporting free-standing frame or cage, wherein the body is located within and by the frame or cage.

Since HDPE sheet, is completely inert and substantially indestructible, it requires no additional treatment, internal coating or liner. Because it is itself of substantial strength and can be substantially or completely self-supporting, the supporting structure, for example of steel, can be designed so as to be fully stressed. Because the plastics tank material nevertheless has some flexibility, deflections of the supporting structure can be tolerated. Similarly, there is no need for internal ties or stays.

The rigid HDPE sheet can be integrally formed or welded to the required shape, for example HDPE sheet as supplied by Messrs. Schlegel and extrusion-welded by the Schlegel process. This material is physically durable, strong, and chemically inert.

HDPE sheet, such as VESTOLEN 3512 (registered Trade Mark) of Schlegel, has a capacity for high deformation and unusual capability for internal stress relaxation. It can therefore tolerate

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deformation of the surrounding or supporting structure without build-up of stress concentrations or over-stressing. It is very weather-resistant even under extreme conditions and resists most forms of chemical, biological and physical attack. When extrusion welded by the Schlegel process it can provide an impervious body of any desired size or shape with joints comparable in properties to the bulk sheet material. It is available in very large sheets, minimising the need for joints, with thicknesses of 2 mm - 5 mm and dimensions up to 10 m x 200 m.

The cage or frame can be constructed very simply, for example from steel angle, channel, or other sections welded or bolted together, optionally with a steel or other mesh surrounding the HDPE tank proper as a load spreader, though this mesh is not essential in view of the strength and deformation resistance of the HDPE walls.

By way of example only, the accompanying drawing is a vertical cross section of a small rectangular rooftop water tank embodying the invention.

The illustrated tank is a cube. The tank itself consists of rigid HDPE, for example welded panels of this material, typically with a thickness of about 2 mm and with external dimensions of for example 1200 mm each

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way. A preferred material is Schlegel Vestolen/3512 HDPE. The HDPE tank is strong enough to be largely self-supporting but is seated in a steel cage 2 which in use rests on a suitable supporting structure or directly on a roof or floor.

The cage consists of steel angle members, for example 75 mm angle, bolted or welded together. The illustrated cage comprises top angles 3, bottom angles 4, upright angles 5 on one pair of opposite sides, and horizontal angles 6 on the other pair of opposite sides, and base angles 7.

The frame or cage is lined with steel mesh 8 secured in any convenient way, for example by being trapped between the top and bottom angles, and the uprights as shown in the drawing. The steel mesh retains the HDPE sheet and braces the cage, providing a structure which is strong and stiff but light.

In the case of the illustrated tank, a suitable mesh may comprise 2 mm HT steel wire welded at a 50 mm spacing.

The HDPE sheet tank 1 has a top lip or flange 9 which overlies the top angles 3.

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A generally similar construction can be used for tanks of other sizes, but materials of greater dimensions or thickness may be required for large tanks.

5 The illustrated roof tank is provided with a cover not shown also constructed of a steel angle frame, stiffening mesh and HDPE sheet as a lining. In use, this is fastened to the flanges of the top angles and acts as a top wall tie for the tank.

10 As mentioned above, the steel mesh may be omitted. Alternatively, the cage may be a self-supporting steel mesh cage without the described steel angle framework, or with a framework at the edges only, for example being constructed of steel mesh pallets which are commercially available in the size 1200 mm sq.

15 The invention is also applicable to the construction of circular tanks, including large circular tanks suitable for mounting on steel or concrete towers for small town or suburban water supply. Such tanks can be constructed to hold for example 600000 litres., being
20 typically 15 m in diameter by 4 m high. In such a construction, the tank proper is, again, an integral or welded unitary tank of HDPE of suitable thickness. The enclosing cage may be constructed of wall panels for example of steel angle, channel or other section frames
25 with welded steel mesh. The cage will have a ring beam

at the bottom with beams (and steel mesh) to support the bottom of the tank, and a ring beam at the top. These ring beams are to resist the full bursting pressure of the tank. The wall panels transfer load from the HDPE tank to the top and bottom ring beams. The tank roof, if provided, preferably comprises a roof portion of HDPE integral with, or welded to, the HDPE of the main tank body and suspended from a steel roof structure.

Smaller circular tanks, for example of dimensions 1500 by 1500 mm or 2500 by 2500 mm, can also be constructed using an HDPE tank in a cage consisting only of steel mesh with a top and/or bottom stiffening flange. Such tanks can rest on suitable concrete pads.

In the case of larger tanks, the roof is preferable sloping, ridged or conical. A vent is normally provided in the roof.

The tanks are provided with substantially conventional inlet and outlet connections. The piping can be sealed directly to the HDPE tank wall, for example by means of HDPE or other plastics flanges on plastics piping.

By way of example only, the drawing illustrates a water supply inlet 10, for example provided with a ball valve (not shown), an overflow pipe 11, a supply outlet

pipe 12 and a normally closed drain-out pipe 13, all provided with flanges 14 which are welded to the HDPE sheet material of the tank. All these pipes are held in place by hook bolts or U bolts fastened to suitable angle members of the cage.

Vents for tank covers can similarly be fastened to frame members of the cover by U bolts, and sealed to the HDPE roof lining by flanges of the vent pipes welded to the HDPE lining material.

Tanks and water towers built in accordance with the invention can be made self-supporting, reducing the need for a heavy structural grillage to support the tank.

In one embodiment of the invention, a self-supporting tank of appreciable span has walls composed of wall panels and includes diagonal members in the wall panels, and a continuous tie extending through bottom members of the panels or suitable joints between the bottom members so that these operate as a continuous tie; thus the frame and diagonals of the wall panels act as a triangulated truss and can be supported only at the wall ends.



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Claims

- 1) A tank for for water or other liquids, which consists of a unitary body of stiff or rigid impervious substantially self-supporting inert high density polyethylene plastics material of which the surface is in
5 use in contact with the contained liquid, and a substantially rigid self-supporting free-standing frame or cage, wherein the body is located within and by the frame or cage.
 - 2) A tank as claimed in claim 1 in which the frame or
10 cage is constructed of metal sections fabricated together.
 - 3) A tank as claimed in claim 2, further including a metal mesh in contact with the plastics material and consituting a load spreader.
 - 4) A tank as claimed in claim 1 or 2 in which the cage is
15 a self supporting metal mesh cage.
 - 5) A tank for liquids substantially as herein described with reference to the accompanying drawing.
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