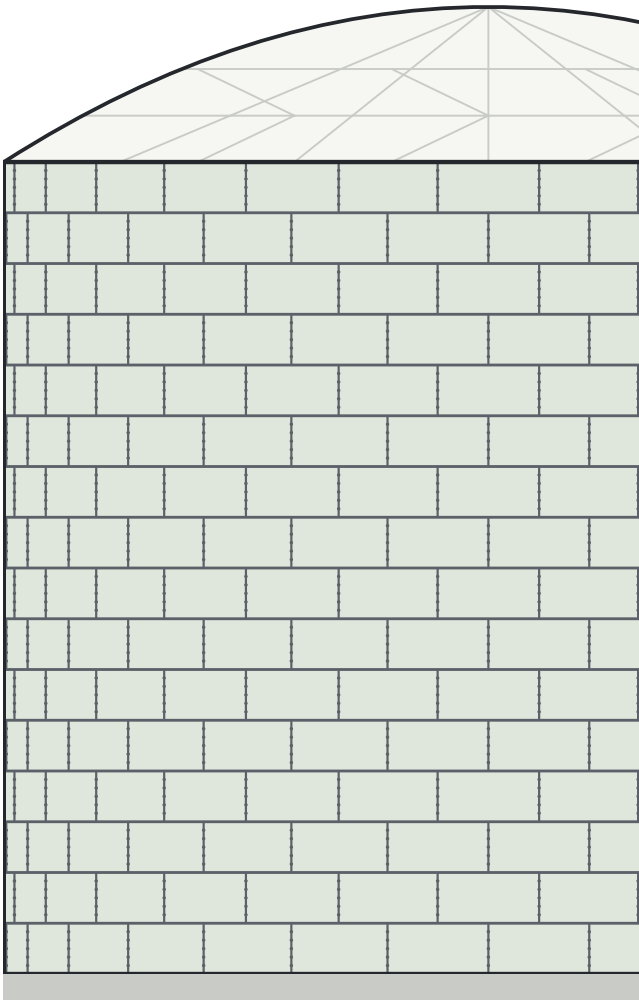
ELSAFA ESTABLISHMENT
WHERE YOU CAN TRUST

Technical datasheet

Bolted Glass-Fused-to-Steel Tanks

Factory-enamelled steel panels, bolted on site into tanks for drinking water, fire water, wastewater, sludge and biogas. Supplied, erected and serviced by Elsafa.

800 °C	firing that fuses the glass into the steel surface
30+ years	design service life of the coating system
Ground level	erection on jacks, so crews never work at height on the shell

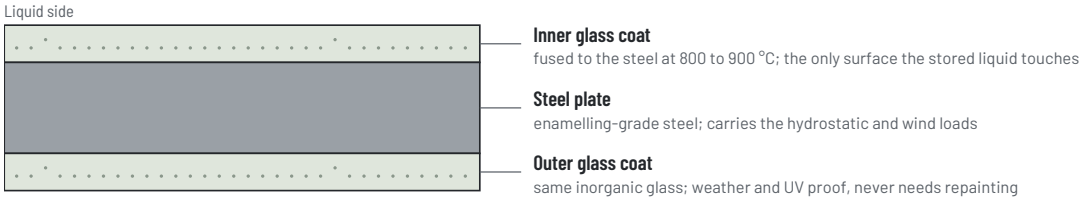


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Product

Glass and steel, fused into one material

Each panel is a steel plate coated on both sides with a glass frit and fired at 800 to 900 °C. The glass melts into the steel surface and bonds to it chemically. What leaves the furnace behaves as one material: the strength of steel with the inertness of glass.



Weather side. Panel section, not to scale; coating 0.25 to 0.45 mm per side.

Coating data

Standard colour	RAL 6002 leaf green; other colours on request
Coating thickness	0.25 to 0.45 mm per side
Coating process	2 coats, 2 firings standard; 3 coats, 3 firings available
Adhesion	3,450 N/cm
Elasticity	500 kN/mm
Hardness	6.0 Mohs
pH range	3 to 11 standard grade; 1 to 14 special grade
Holiday test	900 to 1,500 V, according to service
Service life	more than 30 years

Design standards

AWWA D103	factory-coated bolted carbon steel tanks for water storage
ISO 28765	vitreous and porcelain enamels, design of bolted steel tanks
NFPA 22	water tanks for private fire protection
Seismic and wind	to the governing code of the project site
Drinking water	manufacturer certified to NSF/ANSI 61
Quality	ISO 9001 manufacturing

Why bolted GFS

- Coating applied and tested in the factory, not on site in the weather
- No site welding, blasting or painting
- Glass never needs recoating; damage is repaired locally
- Tanks can be extended in height, dismantled and relocated

Sizing

Diameter, height and capacity

Tanks are built from a standard panel module of 2.4 m arc length by 1.2 m height, so diameter moves in 0.76 m steps and height in 1.2 m steps.

Diameter m	Panels per ring	3.6 m 3 rings	4.8 m 4 rings	6.0 m 5 rings	7.2 m 6 rings	8.4 m 7 rings	9.6 m 8 rings	10.8 m 9 rings	12.0 m 10 rings
4.58	6	59	79	99	119	**139**	158	178	198
6.11	8	106	141	176	211	**246**	282	317	352
7.64	10	165	220	275	330	**385**	440	495	550
9.17	12	238	317	396	475	**554**	634	713	792
10.70	14	323	431	539	647	**755**	862	970	1,078
12.22	16	422	563	704	845	**986**	1,126	1,267	1,408
13.75	18	535	713	891	1,069	**1,247**	1,426	1,604	1,782
15.28	20	660	880	1,100	1,320	**1,540**	1,760	1,980	2,200
16.81	22	799	1,065	1,331	1,597	**1,864**	2,130	2,396	2,662
18.33	24	950	1,267	1,584	1,901	**2,218**	2,535	2,851	3,168
19.86	26	1,115	1,487	1,859	2,231	**2,603**	2,975	3,346	3,718
21.39	28	1,294	1,725	2,156	2,587	**3,019**	3,450	3,881	4,312
22.92	30	1,485	1,980	2,475	2,970	**3,465**	3,960	4,455	4,950
24.45	32	1,690	2,253	2,816	3,379	**3,943**	4,506	5,069	5,632
25.97	34	1,908	2,543	3,179	3,815	**4,451**	5,087	5,723	6,358
27.50	36	2,139	2,851	3,564	4,277	**4,990**	5,703	6,416	7,129

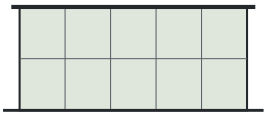
Nominal gross volume in $m^3 = \pi \cdot D^2/4 \times$ shell height. Working capacity is lower by the freeboard and any dead volume below the outlet. Diameters to about 30 m and heights above 12 m are available for reactors and digesters; final dimensions are confirmed on the manufacturer's drawing. The bold column (8.4 m, 7 rings) is a common height for water storage.

Worked example

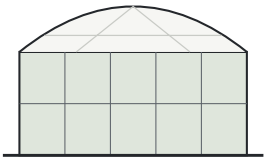
A 1,400 m^3 firewater reserve at 8.4 m height needs 1,400 ÷ 8.4 = 167 m^2 of floor, a diameter of about 14.6 m. From the table, 18 panels (13.75 m) gives 1,247 m^3, too small, and **20 panels (15.28 m) gives 1,540 m^3**. Odd panel counts fill the gaps: 19 panels makes 14.51 m and 1,389 m^3.

Configuration

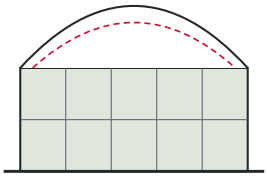
Roofs, foundations and fittings



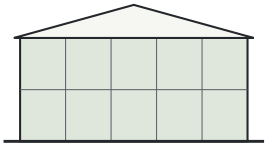
Open top
clarifiers, some process tanks



Aluminium geodesic dome
potable, fire and process water



Double-membrane gas holder
biogas digesters and reactors



Steel or GFS cone roof
small to medium storage

Roof options. The choice follows the stored liquid, the need for gas containment and the span.

Foundations

Standard	reinforced concrete slab with the starter ring embedded in the floor pour
Alternative	GFS floor panels on a concrete ring beam
Sealing	mastic at every lap and bolt, with an internal floor-to-wall joint seal
Design	foundation loads issued with the tank drawing

Applications

Water	drinking water, raw water, fire water, irrigation
Wastewater	municipal and industrial effluent, equalisation, sludge
Reactors	UASB, IC, EGSB and CSTR anaerobic reactors
Energy	biogas digesters, landfill leachate, food and agro waste

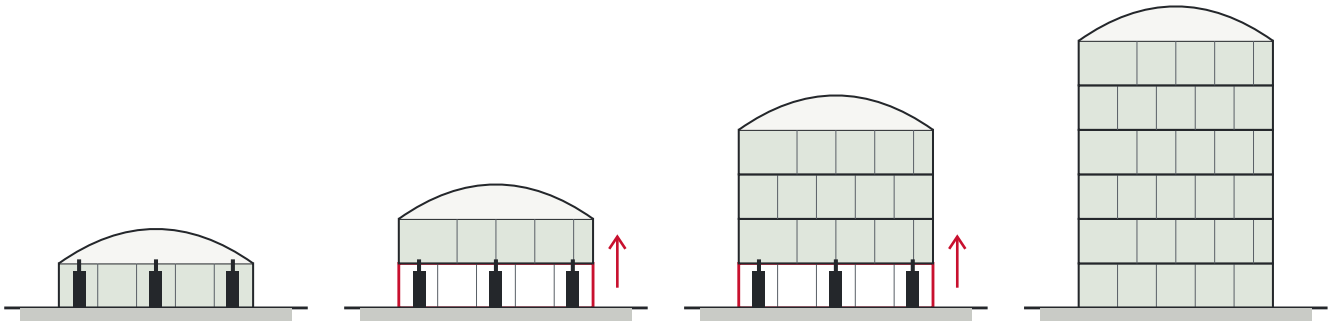
Fittings and accessories

- Shell manholes and roof hatches
- Flanged nozzles for inlet, outlet, overflow and drain
- External caged ladder, landing platforms and handrails
- Internal ladder where required
- Level indicator and vents with insect screen
- Stiffener rings and wind girders to design
- Anti-vortex plates and internal pipework
- Galvanised or stainless steel bolts with sealing caps

Service

Erection, inspection and repair

Elsafa erects GLS tanks from its own jacking equipment, including tanks bought from other suppliers.



1 Roof and top ring built at ground level on the jacks

2 Jacks lift the assembly one ring height; next ring bolted below

3 Repeat, ring by ring, with all work done at ground level

4 Last ring anchored to the foundation; jacks removed

Jack-up erection. Every bolt is made up at ground level, then the whole assembly is lifted by synchronised jacks and the next ring is added underneath.

What Elsafa does

Supply	complete tanks with roof, fittings and accessories
Erection	by Elsafa crews with jacks built in-house
Any brand	erection of GLS tanks supplied by others
Inspection	external and internal condition surveys, holiday testing
Repair	local coating repair, panel replacement, internal lining
Coverage	Egypt, Africa and the Middle East

Quality on site

- Inspection and test plan agreed before mobilisation
- Foundation level and starter-ring checks
- Bolt torque and sealant records ring by ring
- Holiday test of damaged areas after handling
- Hydrostatic leak test before handover



Elsafa jacks at work inside a GLS tank: the lower rings are being bolted while the upper shell stands raised on the jack frames.

For a quotation, send	stored liquid and temperature; required capacity or diameter and height; roof type; site location and wind or seismic data; nozzle list; whether you need supply, erection only, or both; delivery date.

References

Tanks we have built

GLS tanks supplied and erected by Elsafa in Egypt.



New Capital Power Plant, industrial wastewater near-zero liquid discharge plant (2,150 m^3/day), for Elsewedy Electric.



Lesaffre Egypt, Nubaria water treatment plant: GLS tanks erected for Veolia Water Technologies.



Caged ladders, rest platforms and roof handrail fitted during erection.

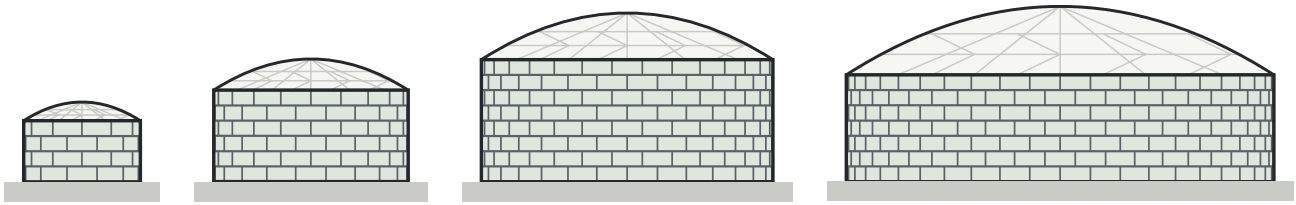


Elsafa storage tank with fixed roof, external ladder and shell manhole.

Contact

Talk to an engineer

Send the data above and we will return a tank size, a general arrangement and a price for supply and erection.



From small water tanks to large digesters: the same panels, bolted to the size you need.

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