SgTank
Sectional Water Storage Tank

- Introduction to FRP Sectional Water Tank
- Highlight of changes from SS245:1995 to SS245:2014
- PUB concerns
- Safety concerns
- Storage capacity concerns
- FRP Sectional Tank Specification
- Introduction to Pressed Sectional Steel Tank
- Amendments to SS22:1979
- Why SgTank?
- Advantages of SgTank

SgTank

Introduction to FRP Sectional Water Tank

Simplest definition
- A plastic pail.

Advantages:
- Space saving.
- Easy to handle.
- Easy to transport.
- Quick to install.

Disadvantages:
- Raw material quality differs.

(Good quality ingredients are not cheap)
- Requires moderate experience to install.
- Don't last forever.

Singapore application – it can be used for all water storage applications except fire protection systems (ie. hosereel and sprinkler tank = No, No. FSB say so.)

SgTank

Is it GRP or FRP? *(FYI only)*

http://jmccomposites.co.uk/2015/09/what-is-the-difference-between-frp-and-grp/

- *In practice, the vast majority of "composites" are fibre reinforced plastics, hence the term FRP. The type of fibre could be glass, carbon, aramid etc. and the type of matrix would be resins such as polyester, vinyl ester, epoxy. If the reinforcing fibre is glass, the composite can also be referred to as glass reinforced plastic or "GRP".*

- *Although the terms 'Composite' and 'FRP' are generally synonymous, i.e. they are both taken to mean fibre reinforced plastic or polymer, the term "composite" tends to imply the use of carbon fibre reinforcing fibres and to be associated more with the high performance end of the market, e.g. aerospace. "FRP" is a term more likely to be used when referring to engineering materials used in industrial applications.*

- *"GRP", glass reinforced plastic, on the other hand is rarely used for high performance applications and although can refer to true engineering composites, "GRP" is a term usually reserved for low performance applications such as swimming pools, shower cubicles, etc.*

In real world sense, "FRP" or "GRP" for sectional water tanks mean the same.

SgTank

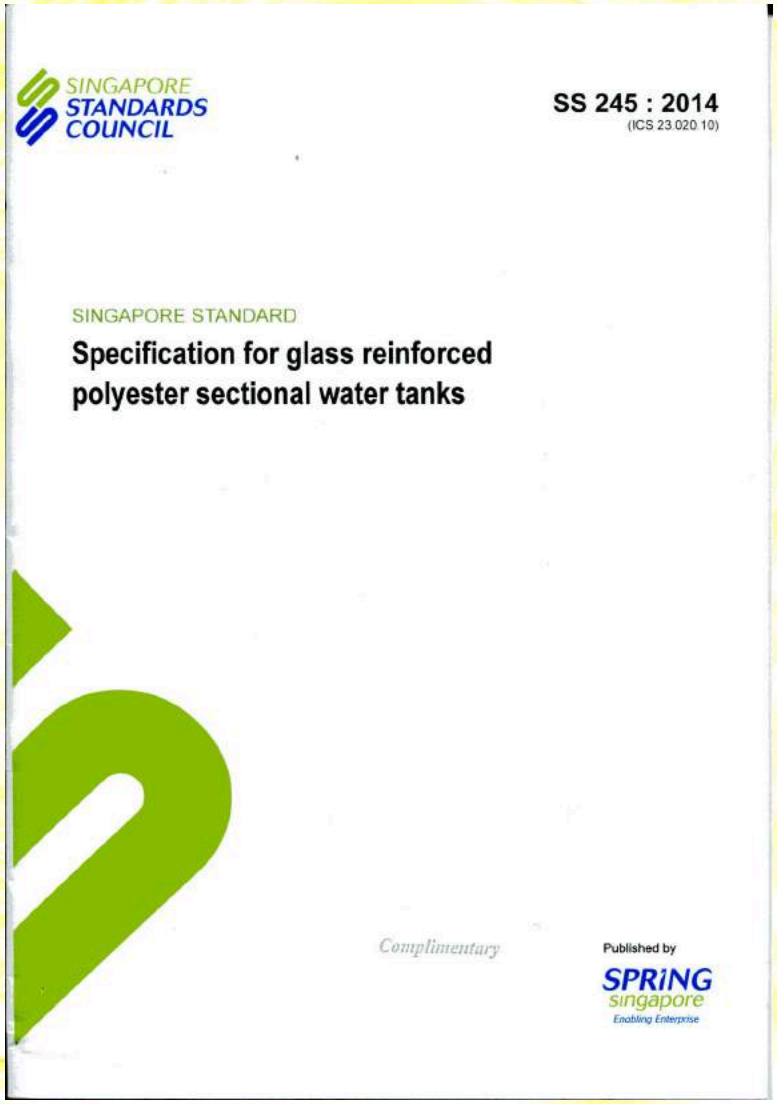
What is SS245?

- Applicable to all fibreglass sectional water tanks used for storing Potable water, Cooling tower makeup, Newater and Process water in Singapore.

- Revision history
  - SS245:1981 – First version where it all started (by SISIR).
  - SS245:1995 – Second revision.
  - SS245:2014 – Third revision.

- So what changed from 1995 to 2014 version?
  - No change to tank panel chemical, mechanical or dimensional composition and its test methods.

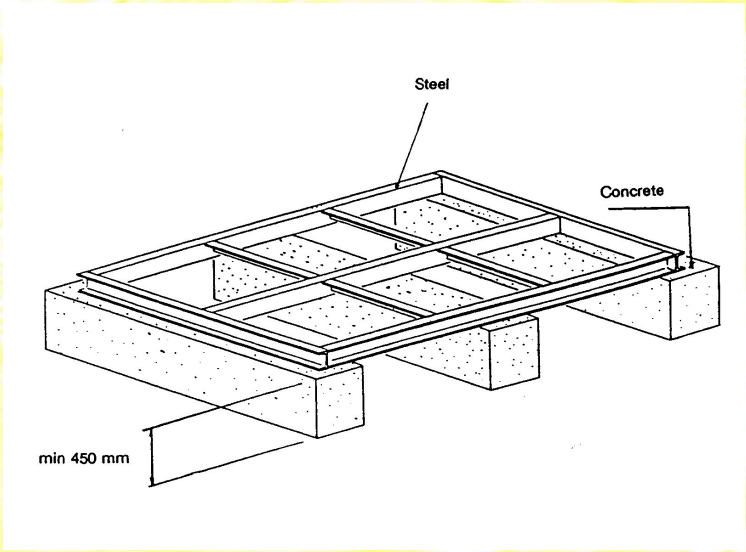
- But…….



SgTank

SS245:2014

What changed?



- Concrete Plinth Considerations
  - In 1981 & 1995 version,
    - Plinth span was not specific.
    - Plinth length was not specific.
    - Plinth leveling was not specific.

SgTank

SS245:2014

- Concrete Plinth Considerations

  Length = Min 300mm longer than tank

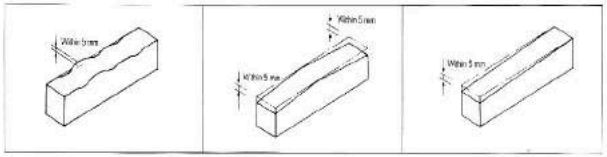
  Width = Min 300mm

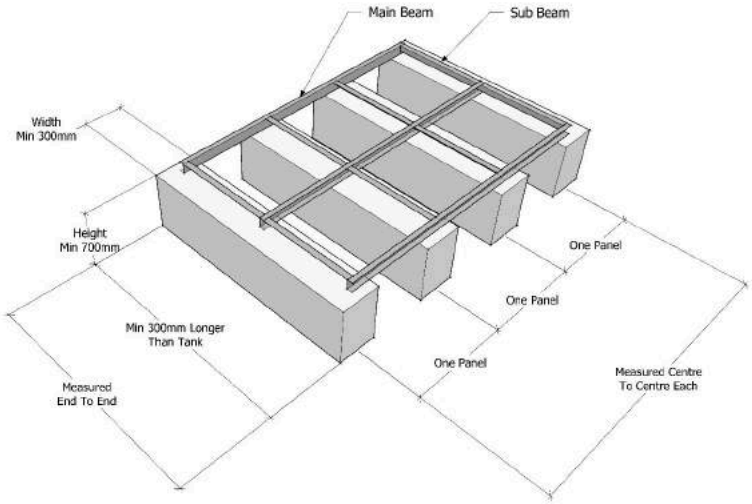
  Height = Min 700mm

  Level = Within +/- 5mm

  Single direction layout

  Plinth to Plinth Span = One or Two panel width apart.





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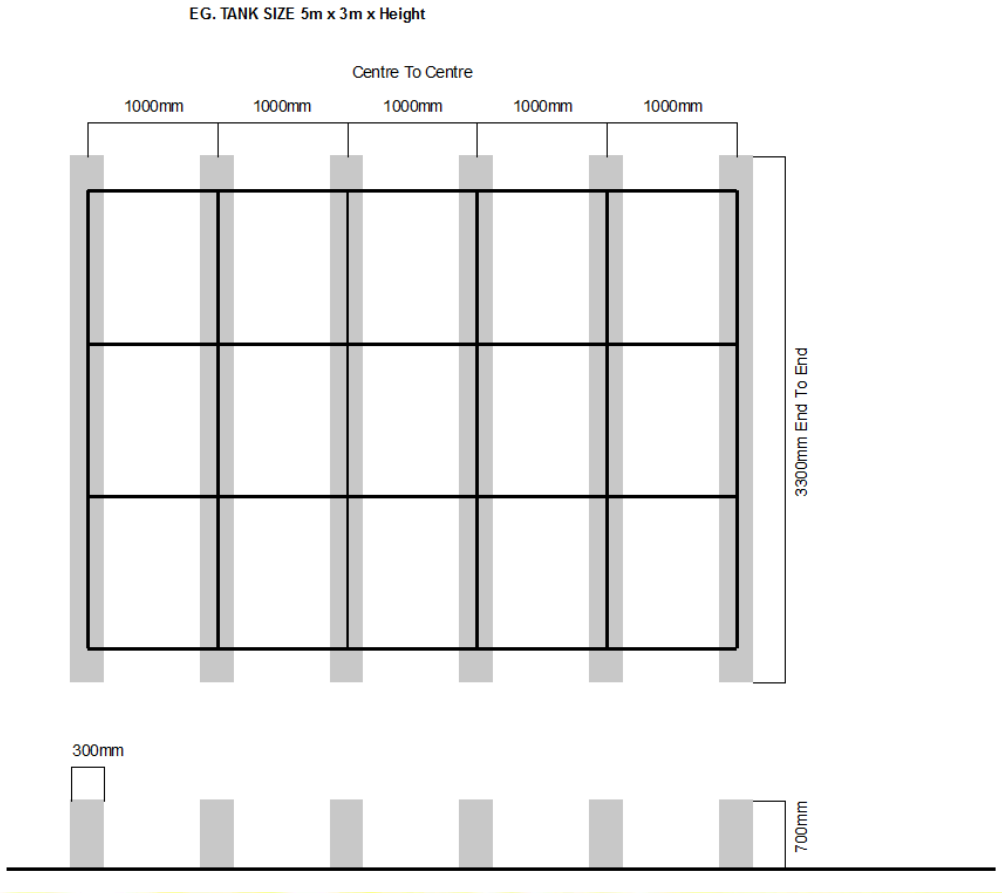
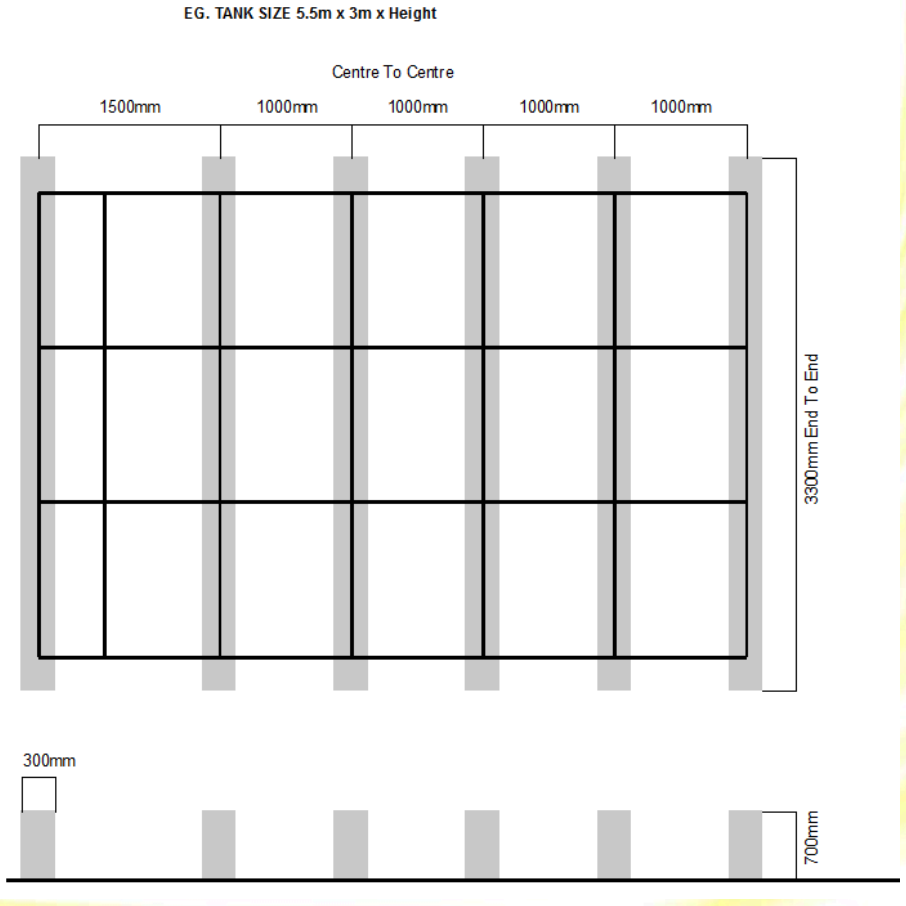
SS245:2014

- Concrete Plinth Considerations





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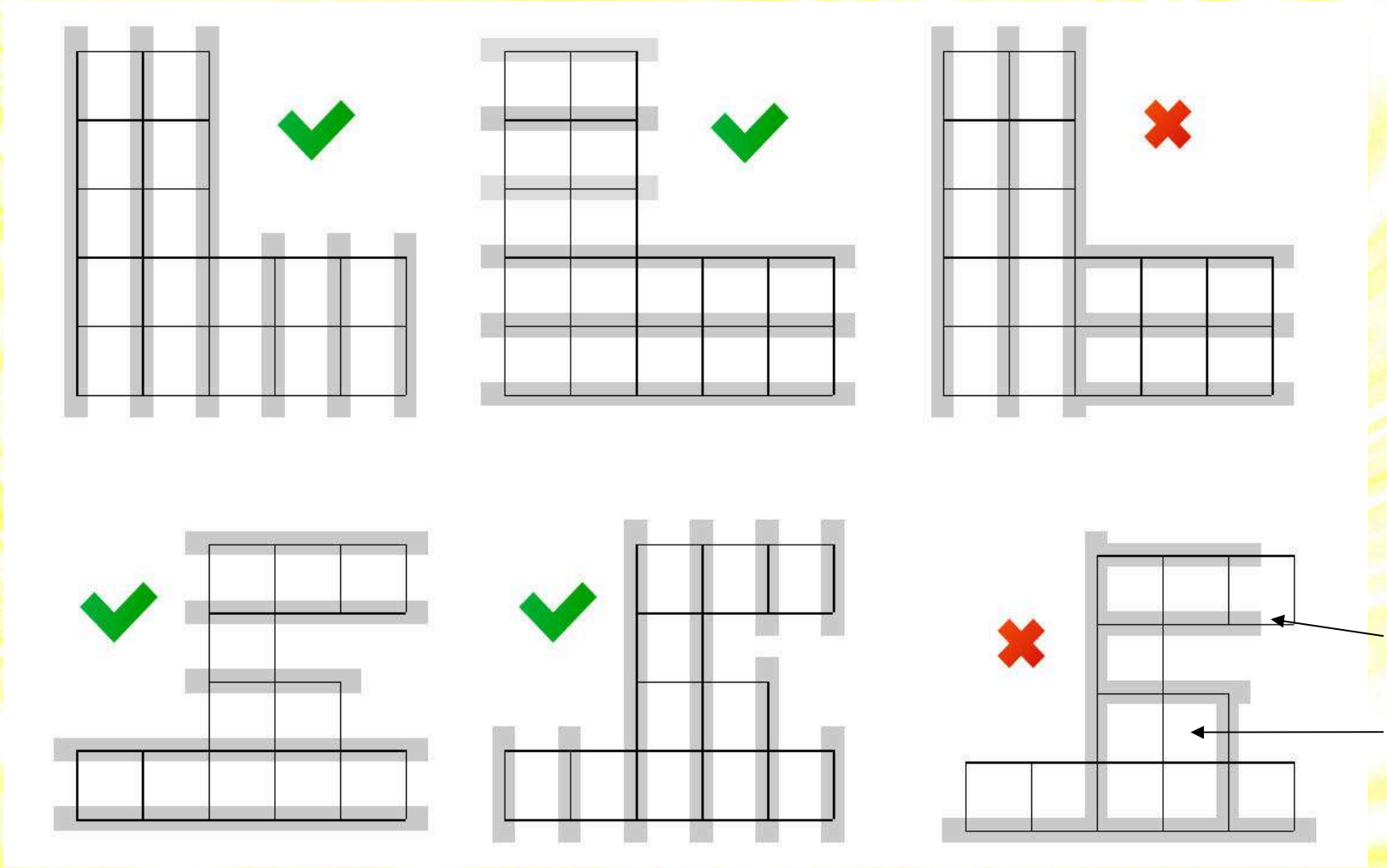
SS245:2014

- Concrete Plinth Considerations (Odd Shape Tank)



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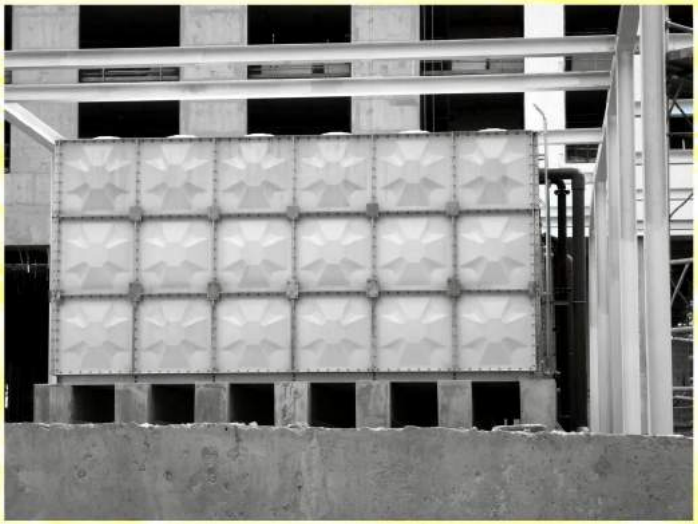
SS245:XXXX

- Objective is to establish a safe and stable foundation support for the tank.



2016 Toyota Vios = 1045kg

A typical tank of size size 6m x 3m x 3m height with operating water stored is about 49,000kg. That's….

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SS245:XXXX

- Other Concrete Plinth Consideration

Tank and skid base by tank supplier

Additional steel support required by builder.

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- PUB Consideration
  - Still SS245:1995

STIPULATED STANDARDS AND REQUIREMENTS

5 WATER STORAGE TANKS –

Fibreglass Integral Water Storage Tank

5.1	**Standards to comply with**	**Tests**
	SS 245 : 1995	Full compliance
	The water storage tank shall be certified by a Professional Engineer to be structurally sound with regard to hydrostatic, deflection and leakage. In addition, product shall also comply with the stipulation standards and requirements in pages 8 & 9, where applicable.	

FRP / GRP Sectional Water Storage Tank

5.2	**Standards to comply with**	**Tests**
	SS 245 : 1995	Full compliance: -Construction -Dimensions -Visual Defects -Physical properties of GRP panels -Hydrostatic test -Leakage test -Deflection test -Luminous transmittance test -Marking
	In addition, product shall also comply with the stipulation standards and requirements in pages 8 & 9, where applicable.	

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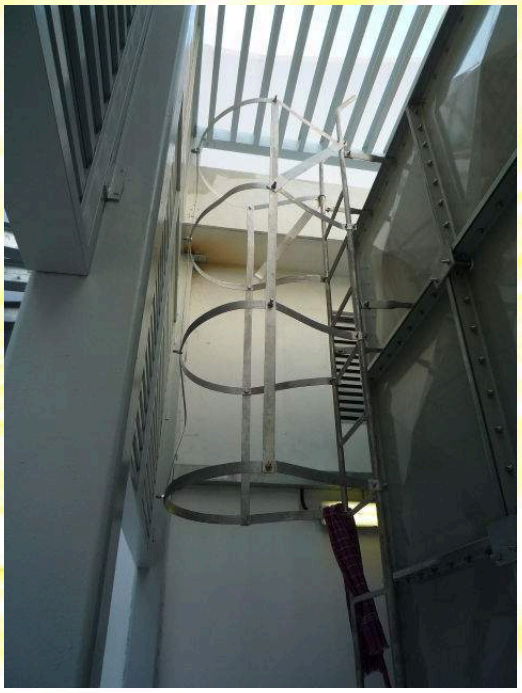
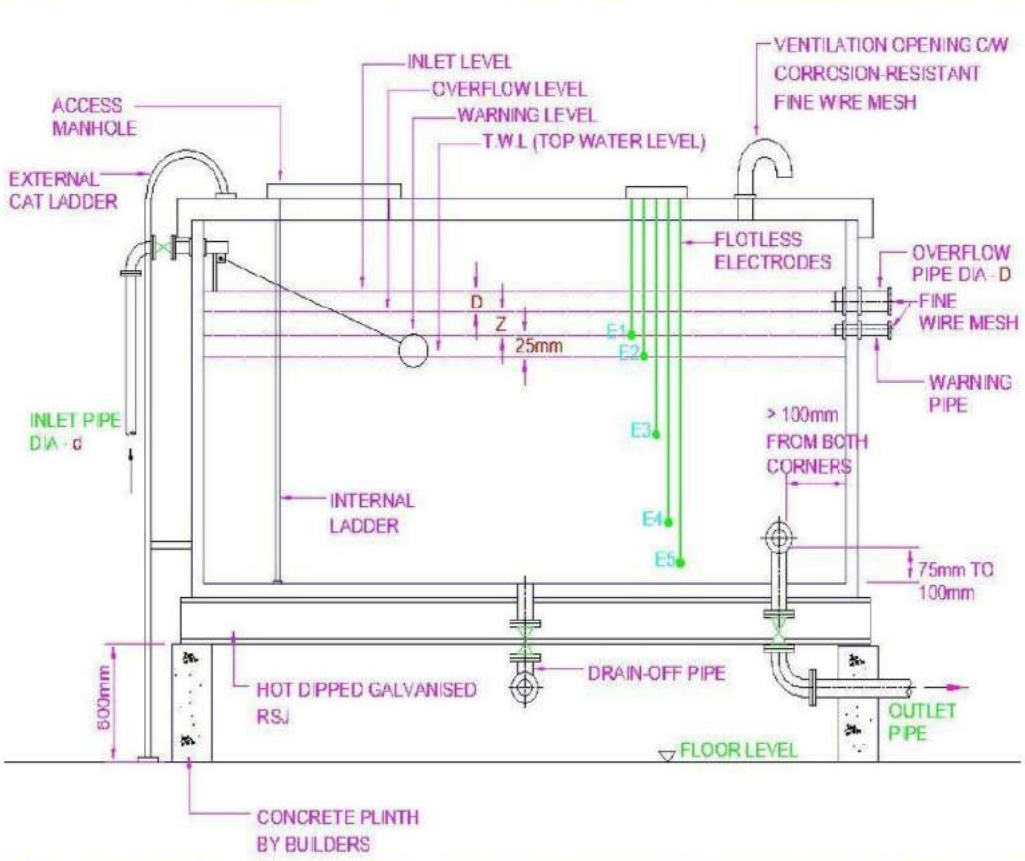
- PUB Consideration
- CP48:2005 – Code of Practice For Water Services
  - Clearance requirement

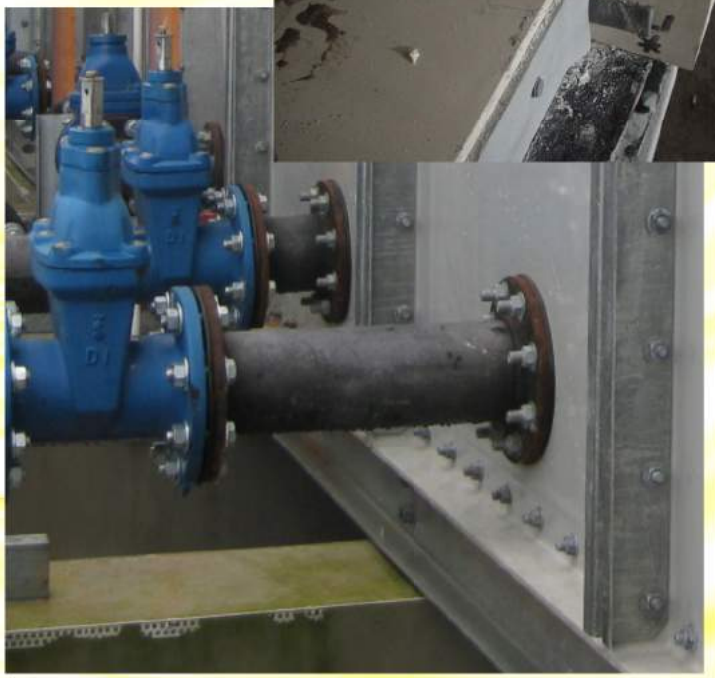
3.3.3 Storage tanks shall be fixed in such positions that will enable the interiors to be readily inspected and cleaned, and where they will not be exposed to high temperature. Adequate spacing of at least 0.6 m shall be provided all round the tank for maintenance and inspection purposes.



SgTank

Storage Capacity





Inlet - d (mm)	20	25	30	40	50	65	100	150	200	300
Overflow Minimum D(mm)	25	30	40	50	65	100	150	200	300	500
Minium Z (mm)	50	50	50	50	50	50	50	50	50	50

SgTank

- WSH Safety Considerations.

All FRP sectional tanks are not designed to act as a supporting structure or platform. The roof loading is designed only for occasional, short-term maintenance and cleaning jobs.

For Illustration only

3.3 Working on Fragile Roof Surfaces

Fragile roof surfaces account for about half of fatal falls from roofs from 2009 to 2011. Falls through fragile roof surfaces are a particular problem in both roof and building maintenance works. Everyone responsible for this type of work, at whatever level, should treat such falls as a priority. This is also important for small, short-term maintenance and cleaning jobs.

In general, fragile roof surfaces refer to parts of the roof which are not designed to bear load and thus are unable to support a person's weight. Persons standing on fragile and brittle roof surfaces, including skylights, are at risk if the roof breaks and gives way under their weight. These roofs typically include those that are constructed from moulded or fabricated materials such as cellulose cement roof sheets, glass, fiberglass, acrylic or other similar synthetic materials.

The following are likely to be fragile:

- roof skylights;
- glass (including wired glass), fiberglass, polycarbonate roof;
- old ceramic roof slates and tiles;
- corroded metal roof sheets; and
- rotting or termite-infested wooden roof structure or similar.

SgTank

- WSH Safety Considerations.

Unlike steel or concrete, FRP impact and tear resistance are weaker.

Where operation or service platform is necessary, it has to be built and supported independently from the tank.

Let's not give anyone a false sense of workplace safety…… because……

SgTank

- WSH Safety Considerations.

…..sometimes, life is really unpredictable.

SgTank

- WSH Safety Considerations.

5/26/2014 Workplace Safety and Health Council

6. Provide walk-through handrail mounted on landing surface.

7. Provide safety cage when a fixed vertical ladder rises a vertical distance of more than 3 metres.

8. Ensure that each worker deployed to work at heights (WAH) has received adequate safety and h
training and is familiar with the (i) hazards of working at height, and (ii) precautions to be taken.

9. Ensure that Safe Work Procedures (SWP) are being established for WAH.

10. Provide adequate supervision by a competent person for all WAH activities to ensure that worke
to the SWP at all times.

SgTank

- WSH Safety Considerations.

No further work done so no need for installers to enter tank interior after closing last wall panel.

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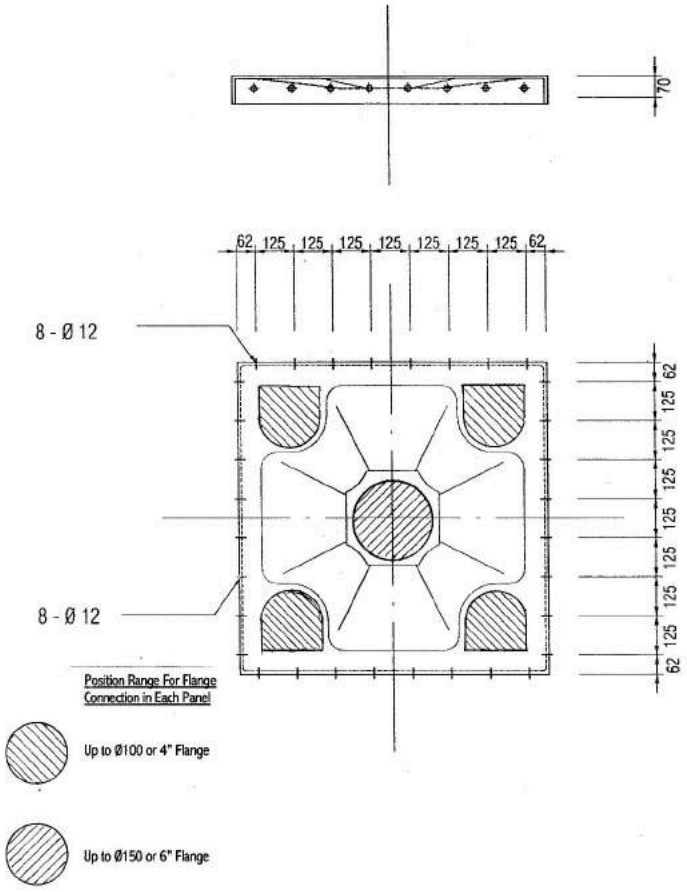
• WSH Safety Considerations

- No hot works. No chemicals used. Only electrical hand tools (eg. wrench, jigsaw, drill) used.
- No Confine Space concerns in our installation as there is sufficient air ventilation, even indoors and basement location.
- Everything is finished from the outside at the end stage after closing last wall panel.
- If required during installation stage, our trained installers will remove adequate wall panels to access the tank interior and not by the manhole.
- When in doubt, it is the duty of the site occupier safety team to access tank surroundings for adequate air and safety.

SgTank

SgTank panel design – No other panel design beats us in piping versatility.



Test Report No. 7191046483-MEC12-OKB
dated 25 Feb 2013

APPENDIX 1

PSB Singapore

Figure 2: Erected Erected "SgTank" FRP water storage tank system with locations of transducer points.

Page 4 of 6

Test Report No. 7191046478-MEC12-OKB
dated 25 Feb 2013

PSB Singapore

TEST RESULTS:

Date of test: 24 Oct 2012

Test sample	Hydrostatic test	
	Obsevation	SS 245: 1995 Requirements
SgTank" FRP water storage tank panel (Size: 1m X 1m)	Complied	Shall not burst, crack or leakage up to test pressure of 2.4 Bar

Note: Test pressure, $\frac{\rho h}{10^3} = \frac{(9.81 \times 4.0 \times 1000 \times 6)}{10^5} = 2.4$ Bar

Test sample	Thickness measurements (mm)		
	1	2	3
SgTank" FRP water storage tank panel (Size: 1m X 1m)	14.5	16.7	8.8

Figure 1: Thickness measurements points.

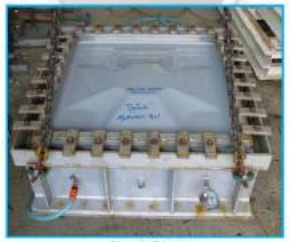


Photo 2: Test setup.

Page 2 of 4

SgTank

Different tank brands deploys different tie-rod system.
Our tie-rod - Minimum of 2 tie-rod. Minimum size of Ø12mm.

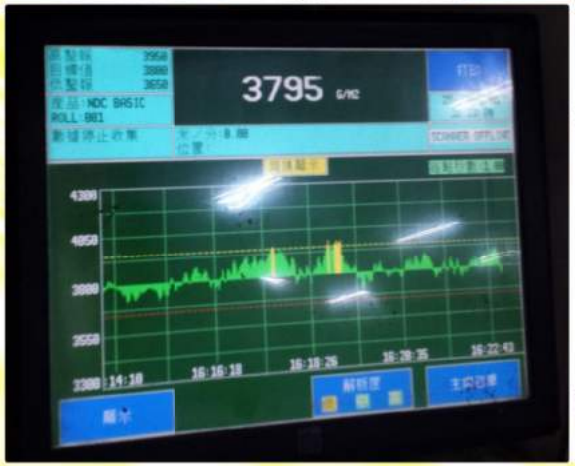
Others

SgTank

SgTank

Raw plastic resin and Glass fibre

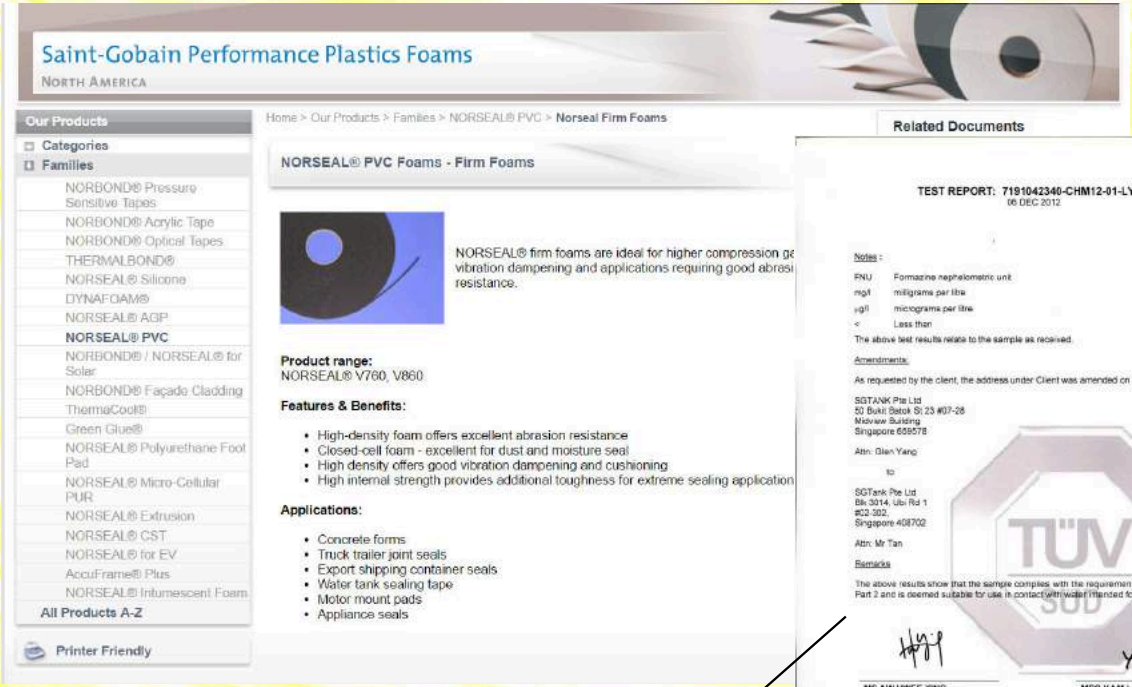
Different manufacturer = different raw material & different process controls.
Our resin = 100% OEM Japan formulation and 100% continuous x-ray QC by computer to ensure 100% resin consistency.

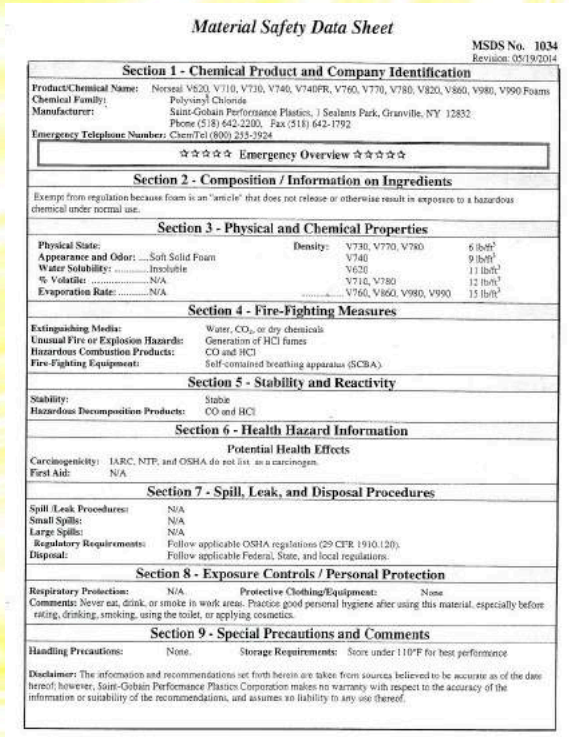


SgTank

Gasket Sealant

We use Saint-Gobain Norseal as standard for all wall and base panel seal. Tested to SS375.





Remarks

The above results show that the sample complies with the requirements of SS 375 2001 Part 1 and Part 2 and is deemed suitable for use in contact with water intended for human consumption.

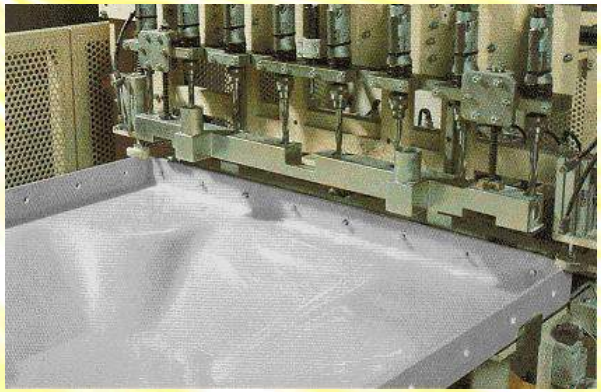
SgTank

It's in the quality.

Our production system:

- 800tonne PLC controlled (by Hirata Corpn, Japan) hydraulic press. Can't cheat in our process cycle.
- Just added another press and production line in 2016.
- Automated drill jig to ensure accurate drill positioning.

In house testing facilities. We kiasu. Our factory kiasi.



SgTank

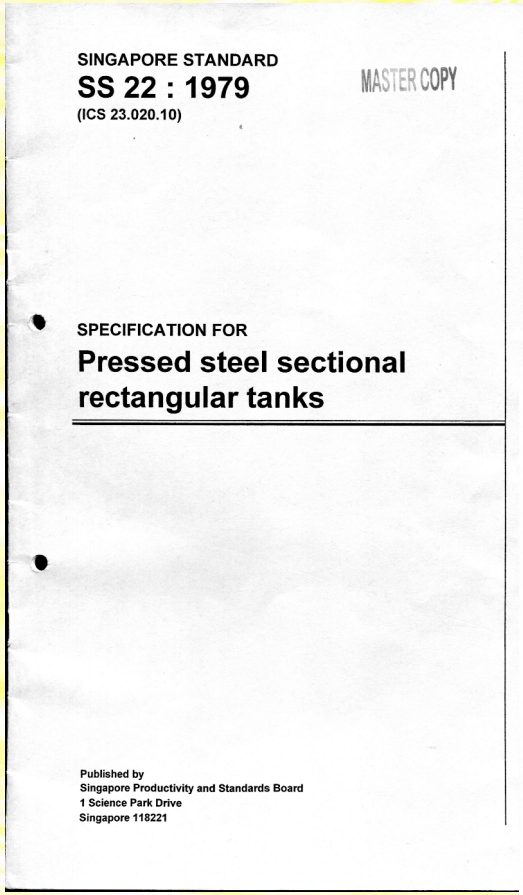
Pressed Steel Sectional Tank

Singapore Standard
SS22:1979

Amendment No. 3 dated
December 2012

- Updates all BS xxxx standard references to BS EN xxxxxx

- Nothing else changed.

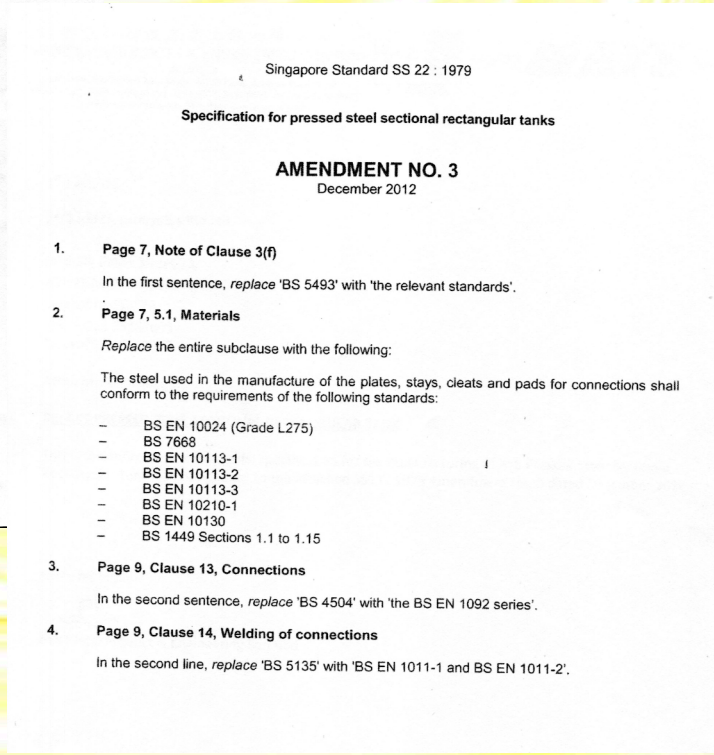


SINGAPORE STANDARD
SS 22 : 1979
(ICS 23.020.10)

MASTER COPY

SPECIFICATION FOR
Pressed steel sectional rectangular tanks

Published by
Singapore Productivity and Standards Board
1 Science Park Drive
Singapore 118221



Singapore Standard SS 22 : 1979

Specification for pressed steel sectional rectangular tanks

AMENDMENT NO. 3
December 2012

1. **Page 7, Note of Clause 3(f)**

   In the first sentence, *replace* 'BS 5493' with 'the relevant standards'.

2. **Page 7, 5.1, Materials**

   Replace the entire subclause with the following:

   The steel used in the manufacture of the plates, stays, cleats and pads for connections shall conform to the requirements of the following standards:

   - BS EN 10024 (Grade L275)
   - BS 7668
   - BS EN 10113-1
   - BS EN 10113-2
   - BS EN 10113-3
   - BS EN 10210-1
   - BS EN 10130
   - BS 1449 Sections 1.1 to 1.15

3. **Page 9, Clause 13, Connections**

   In the second sentence, *replace* 'BS 4504' with 'the BS EN 1092 series'.

4. **Page 9, Clause 14, Welding of connections**

   In the second line, *replace* 'BS 5135' with 'BS EN 1011-1 and BS EN 1011-2'.

SgTank

Pressed Steel Sectional Tank

"….not recommended for depth greater than 4880mm"

S.S. 22 : 1979

SINGAPORE STANDARD

SPECIFICATION FOR PRESSED STEEL SECTIONAL RECTANGULAR TANKS

FOREWORD

This Singapore Standard was prepared by the Technical Committee on Pressed Steel Sectional Rectangular Tanks under the authority of the Building and Construction Industry Standards Committee.

This Standard was originally based on BS 1564 : 1949 and was first published in 1970. The present revision based on BS 1564 : 1975 (revised) was undertaken to provide tank sizes in metric units and to cater in particular for plates which are now being supplied in metric thicknesses. It is pointed out however, that the sectional dimensions in this revision are interchangeable with the imperial dimensions in the 1970 edition of the standard.

Sectional tanks provide a convenient means for the bulk storage of a variety of liquids not subject to pressure other than static head. As with all sectional assemblies, the components are readily transportable and, subject to unit multiples, can be erected to give varying proportions of length to breadth and depth. It is also possible, by arrangement between the purchaser and the manufacturer at the time of the enquiry and order, to make provision for future extension in capacity by increase in floor area or (within limits) depth.

Tanks with internal flanges to the bottom are suitable for use where they are to be erected on a solid level floor or with internal flanges throughout where access to the exterior for erection is precluded by reasons of space inside a building.

Tanks with external flanges are suitable for use where a pla surface is necessary, or where there are no restrictions as to external access erior of the tank is to be lagged.

Pressed steel tanks are not recommended for a depth greate an 4880 mm.

It is recommended that all pressed steel sectional tanks sho e inspected e and outside at intervals not greater than 12 months. At such periodic uld be taken to examine the stays, stay cleats, through bolts and nuts, of the plates. Where there is excessive corrosion apparent the component affected be replaced.

Water and other liquids vary in their corrosive action on the inside of the tank. Corrosive action on the outside of the tank varies according to location and climatic and other conditions. It has not therefore been found practicable to specify appropriate internal or external coatings; these should be the subject of mutual arrangement between the purchaser and the manufacturer at the time of the enquiry and order, who may refer to BS 5493 for details on use of relevant protective coatings.

5

SgTank

Pressed Steel Sectional Tank

Available in Hot dipped galvanised (HDG) finish, SS304, SS316.

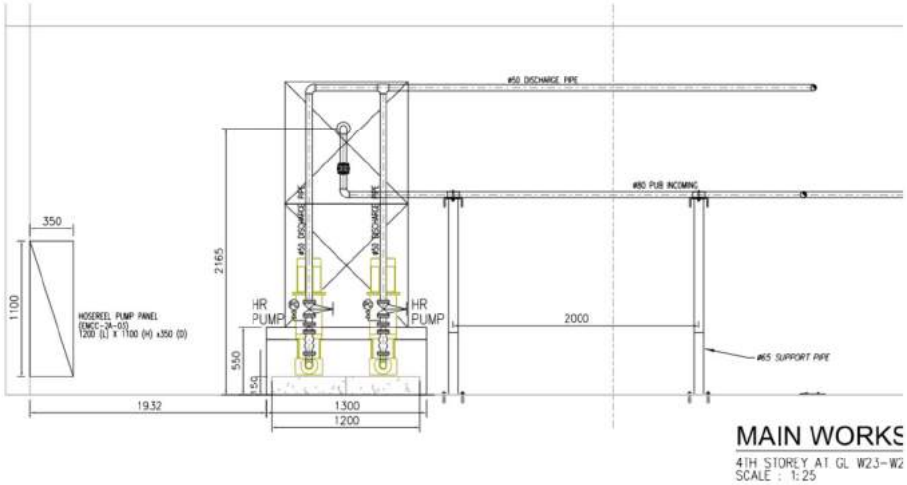


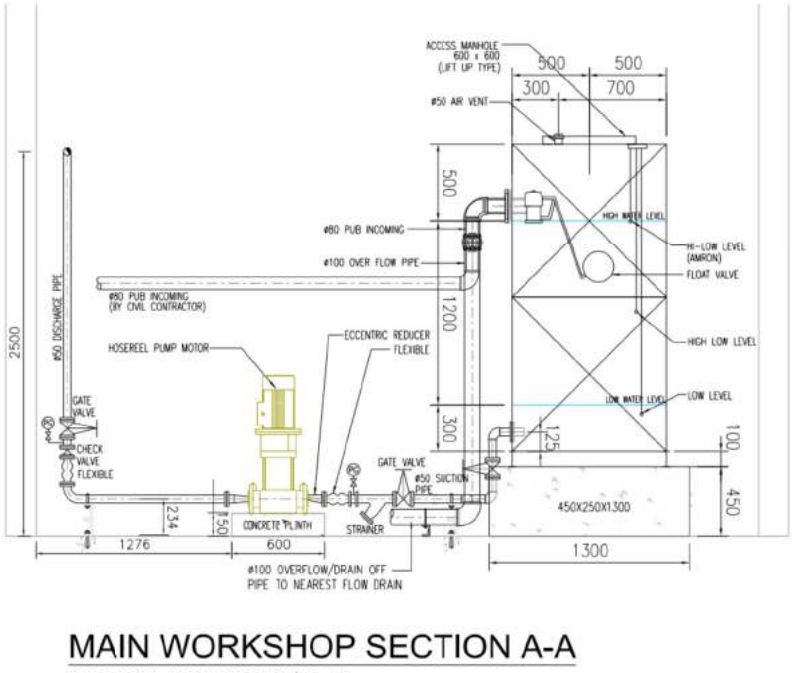
In Singapore,

- HDG, SS304 can be used for all water storage application except potable water for drinking purposes.
- Only SS316 (and FRP sectional water tank meeting SS245) can be used for storing drinking water (ref: PUB).

SgTank

Pressed Steel Sectional Tank





MAIN WORKSHOP SECTION A-A

Details Required From Buyer:

- Pipe Sizes (eg Ø100, etc) for ALL INDIVIDUAL OPENINGS.
- Pipe Opening Location (eg. how high is it located, where is it location from the panel edge, etc)

Note: Tank Manufacturer will not assume. No indication = No opening.

SgTank

- Singapore first brandname FRP sectional water tank.
  Singapore SISIR started SS245, now used globally by other countries to define FRP sectional water tank for themselves. And we asked “Singapore don’t have a tank to be proud for ourselves?”……...well, now we do.
- We appoint our own SMC resin source.
  Custom formulated resin to withstand hydrostatic loading of stored water.
  Produced by an SMC manufacturer located in Taiwan. (OEM SMC resin manufacturer for DaiNippon Ink Japan).
  Uses Owens Cornings glass fiber.
- Manufactured up to Singapore building & construction industry expectation using Japan molding technology and hydraulic press system.
- Manufactured to satisfy our own quality expectation on perfection (because we weren’t happy with other makes)

J-EMS Enterprise Pte Ltd

Supplying and installing sectional water tanks since 1994.

Professionalism. Quality Conscious. Reputation.

J-EMS Enterprise Pte Ltd

SS 245 : 2014

The Working Group, appointed by the Technical Committee to assist in the preparation of this standard, comprises the following experts who contributed in their *individual capacity*:

		Name
Convenor	:	Mr Christopher Chua
Members	:	Er. Chng Kheng Peng
		Mr Goh Sheng Jie
		Mr Lee Cai Jie
		Mr Karl Loh
		Mr Muhammad Zaki Bin Mohamedzen
		Mr Ong Khay Beng
		Mr Tan Hong Kian
		Mr Tong Kam Fei
		Mrs Angelia Yang ★
		Mr Glen Yang

The organisations in which the experts of the Working Group are involved are:

Association of Consulting Engineers Singapore
Housing & Development Board
Institution of Engineers Singapore
J-EMS Enterprise Pte Ltd ★
Polyline Pte Ltd
PUB, the National Water Agency
SETSCO Services Pte Ltd
TUV SUD PSB Pte Ltd

J-EMS Enterprise Pte Ltd

CST
J-EMS

STRATEGIC PARTNERSHIP AGREEMENT BETWEEN CST INDUSTRIES, INC. AND (J-EMS) ENTERPRISE PTE LTD.

CST INDUSTRIES, INC. is pleased to announce a new strategic partnership agreement with J-EMS ENTERPRISE PTE LTD. for the Republic of Singapore.

In order to enhance the cooperative relationship between J-EMS and CST Industries, Inc., and to improve the mutual development and long term cooperation, both parties are planning to work closer together in the field of water tanks for industrial and commercial use in Singapore.

CST is the global leader in the design, manufacture and supply of bolted storage tanks, silos, aluminum domes, aluminum flat covers and aluminum architectural structures and covers; serving the water, wastewater, industrial liquids, oil, gas, petrochemical, bio-energy, biomass, dry bulk materials, mining, minerals, food, chemical, petrochemical, and agricultural markets.

J-EMS made its name as a distributor of water tanks from renowned water tank and is one of the leading suppliers of replacement GRP tanks for Singapore since 1994 with a solid reputation for integrity, transparency and reliability.

Together, we have created an alliance that is an incredible opportunity for both organizations to grow together, and to better serve the Singapore market place. And we plan to work tirelessly for the success of our newly formed partnership and our customers.

CST Industries, Inc. Website: www.cstindustries.com

Contact information: Mr. Glen Yang
50 Bukit Batok St, 23 #07-28 Midview Building, Singapore 659578.
Mail: sales@j-ems.com Website: http://www.j-ems.com
Tel: (65) 6316 7005 Fax: (65) 6316 7056

Reversed Osmosis Water Tank

Sulphuric Acid Tank, Singapore

Fertilizer Factory, Shah Alam

SgTank

Honest tank manufacturer + proper installation + strict CP48 maintenance regime = healthy and problem free tank.

Thank You
Q & A