



WRAS
APPROVED
PRODUCT



SUNG IL **GRP/ENM** WATER TANK



Hot Press Moulded GRP Sectional Panel Tank



SUNGIL GRP

SUNG IL **GRP ENM** WATER TANK

◆ 30 million US dollars exporting of GRP (Composite materials) building materials. ◆

Excellent in Clean & Hygienic and Non-leakage.

GRP Sectional Water Tank for Easy to Design and Installation.

Korea Certificate

Korea : KCW-2013-0135
(Korea water and waste water works Association)

Authority Certificate

U.K : WRAS BS6920
BS EN13280 : 2001

Singapore : PSB SS245 : 1995
SS375 : 2001

Patents Status in Korea

Heat Insulation Panel	: No. 0495287
All-in-one Water Tank	: No. 20-0457565
Reinforced frame for Water Tank	: No. 30-0801784
ENM Water Tank	: No. 30-0867794

Characteristic of GRP Water Tank

GRP Water Tank always keeps clean water with excellent water pressure resistance & corrosion resistance.

Various Capacity Design

Various size panels can use limited space for its best using way so can satisfy your needs.

Intensity and Durability

Glass fiber Reinforced Panel is mulded under condition of high temperature and pressure to maintain the best endurance.

Since using stainless steel for inside structure, plated steel for outside and HDG for outside, it shows best performance against corrosion.

Watertightness

The joints sealed with special sealing tape especially developed for water tank.

Heat Insulation and Dewdrops Prevention

The heat insulation panel with 4 layer structured improves heat insulation effect. Protects water from dewdrops and minimizes temperature variation of the stored water.



The 2nd Hot Press Factory



The 3rd Hot Press Factory

Differentiated SUNGIL GRP Water Tank

GRP Water Tank Panel

ITEM	Unique Characteristics of SUNGIL (Strong Point)	Other Companies
GRP Sheet	SUNGIL produces high-quality and differentiated GRP Sheet in the own GRP Sheet (Raw material) plant	No GRP Sheet plant
Competitive price for panel	Competitive pricing for Panel caused by SUNGIL own GRP Sheet using	Deterioration in product quality & uncompetitive prices
2X1M Roof Panel	2X1M Roof Panel production (it is possible to ensure competitive price)	1X1M Roof Panel only
Manhole Panel	Double Sealant Structure of Manhole cover (No Dust and pollutant)	Single sealant structure
Heat Insulated Panel	As using the patented insulation panel cover (Patent No. 0495287) which nonwoven is applied, secure the perfect insulation & prevent a defect.	As using ABS & not using nonwoven, there are many defect factors.
Automation system construction of hole drill facilities	As constructing automation system of hole drill facilities, it makes the mass production possible & it is possible to ensure competitive price.	Using hand-operated hole drill facilities.
Using high-pressure foaming equipment for panel insulation	As using latest high-pressure foaming equipment for panel insulation, secure effectiveness of insulation & excellent quality.	Using low-pressure & hand-operated foaming equipment.

GRP Water Tank Reinforced materials

ITEM	Unique Characteristics of SUNGIL (Strong Point)	Other Companies
The safety factor for Skid Base	The patented Skid Base of SUNGIL for Water tank (Design registration-0664436) has a better safety factor than general Skid Base	As using general Skid base, there is more unstable and weak against Earthquake
Earthquake resistant design for Skid base	Skid base of SUNGIL is designed with Earthquake resistant & there is stable and safe till magnitude 5.0. (Over magnitude 5.0, it needs additional reinforcement.)	
TIE ROD	Preventing corrosion & rusting issues with PET Coating	Not using PET Coating
Powder painting for internal STS materials	Preventing corrosion & rusting issues with powder Coating on the internal STS materials	No powder Coating
STS Bolts for internal	As using STS304 or STS316 bolt/nut with STS316 washer for internal, solve rusting issue.	Using STS 304 Washer for internal
HDG Bolt for external bolt	As using HDG bolt for external bolt, prevent the rusting issue (with Bolt cap)	Using galvanizing Bolt
Epoxy coating on Internal Bolting hole	Epoxy coating on the all internal bolting parts & connection part for preventing corrosion and rusting issue	No Epoxy coating
Using Bolt Cap	As using acetyl cap bolt for roof panel bolts and using bolt cap(PVC) for external bolts, prevent rusting issue.	No using acetyl cap bolt & bolt cap
GRP Roof support	As using GRP Roof support, it is better easy to install tie rod and strong against loading	Using PVC roof support
Water Level indicator	PE clear tube type with Aluminum case	Using clear tube only
Name plate for water tank	It is easy to check the safety management rules with name plate on the water tank	No name plate

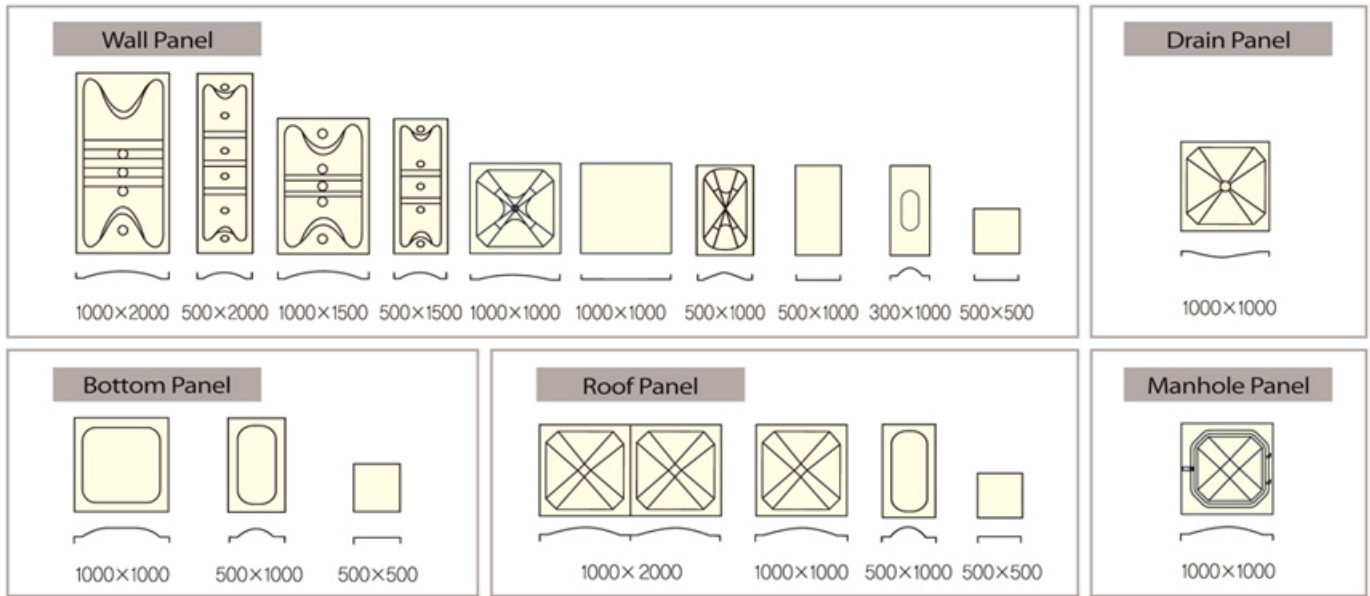


GRP (Raw Material) Stirring Line

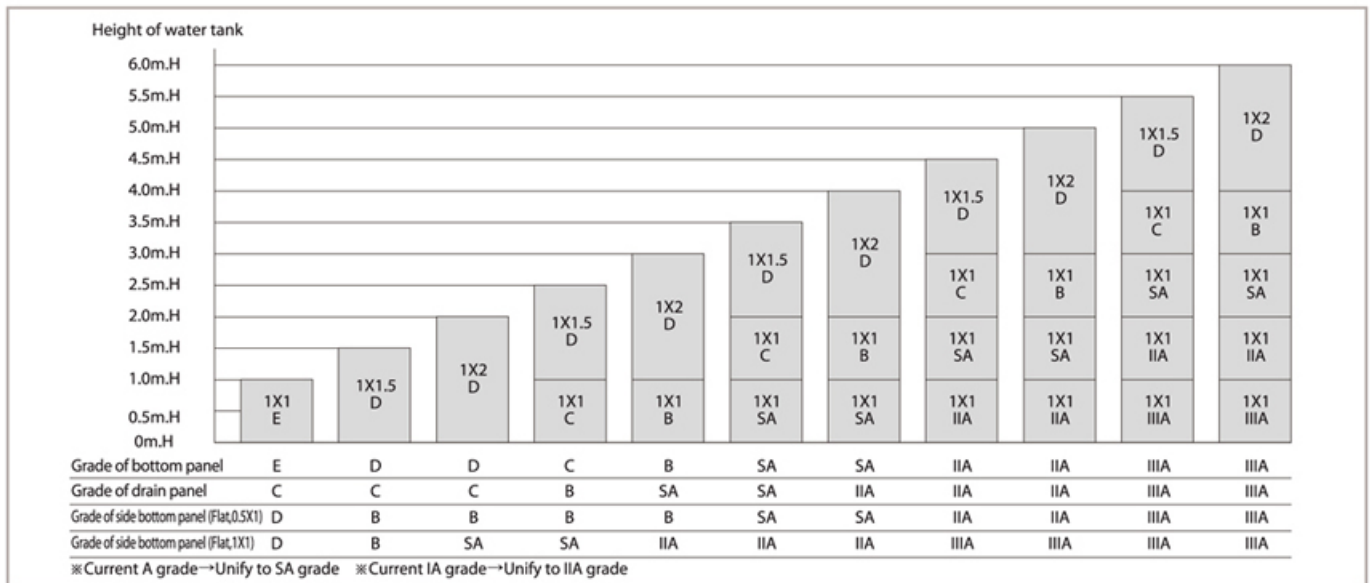


GRP Sheet (Raw Material) Line

GRP Panel Type and Size



GRP Panel Composition by Height



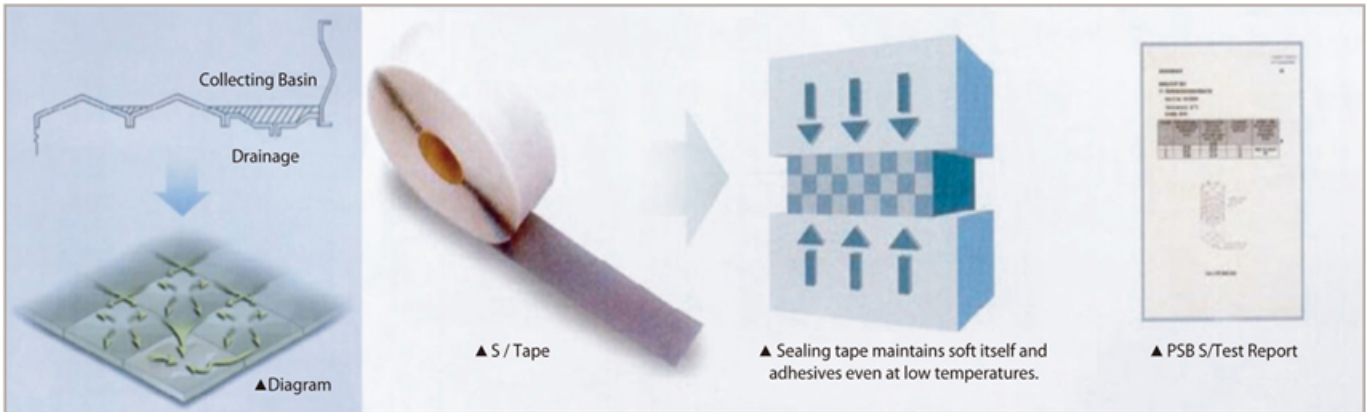
Panel Physical Properties (KS F 4811 Standard)

item	Unit	Standard	Result	Test Method	Remark
Tensile Strength	MPa	Over 60	91.4	KS F 4811:2016	
Bending Strength	MPa	Over 80	200	KS F 4811:2016	
Elastic modulus in Bending	MPa	Over 6000	15287	KS F 4811:2016	
Glass fiber Content	%	Over 25	31	KS F 4811:2016	
Barcol Hardness	-	Over 30	61	KS F 4811:2016	
Water absorption	%	Below 1.0	0.05	KS F 4811:2016	
Hydrostatic pressure	-	Over 4 times	4 times	KS F 4811:2016	

Perfect watertight & Drain System

- As using foaming type sealant tape which is excellent water proof & force of restitution, maintains perfect non-leakage of the Water tank. The concave drain panel facilitates complete and quick drainage.

Type of Sealing Tape		Characteristic
Optional Items	EVA+PVC	Applicable to 50°C
	Butyl+PVC	Preventing to Stick PVC tape out from GRP Panel



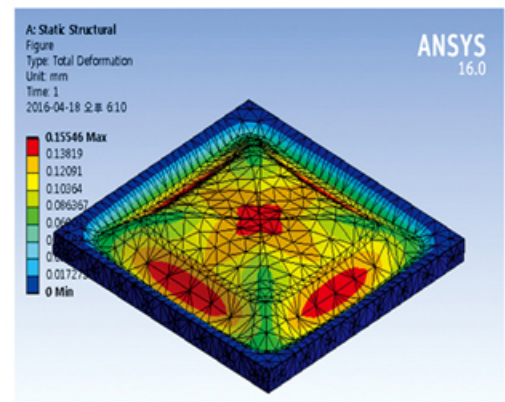
Strength & Durability of GRP Water Tank

Section	Design Standard
Hydrostatic Pressure	Water pressure reinforcement 4 times standard Transformation rate in filled u with water : Less than 1% form water tank heigh
Wind Force	Less than 60m/sec
Earthquake Force	Stable and safe till magnitude 5.0 (Over magnitude 5.0, it needs additional reinforcement)
Snow load	60Kg/m ² , Snow fall less than 30cm
Illumination Rate	Less than 0.1%
Out-fit Force	No leakage under condition of vertical 100Kg after install of 100A fitting with 70mm span supprot
Water Temperature	Usable temperature : Less than 30°C / Limited temperature : Max 70°C
Water quality	Tap water, well water : chlorine below 50mg/ℓ Seawater : applicantion Externally Reinforced water tank (max 3m height)

Stress analysis of GRP Panel

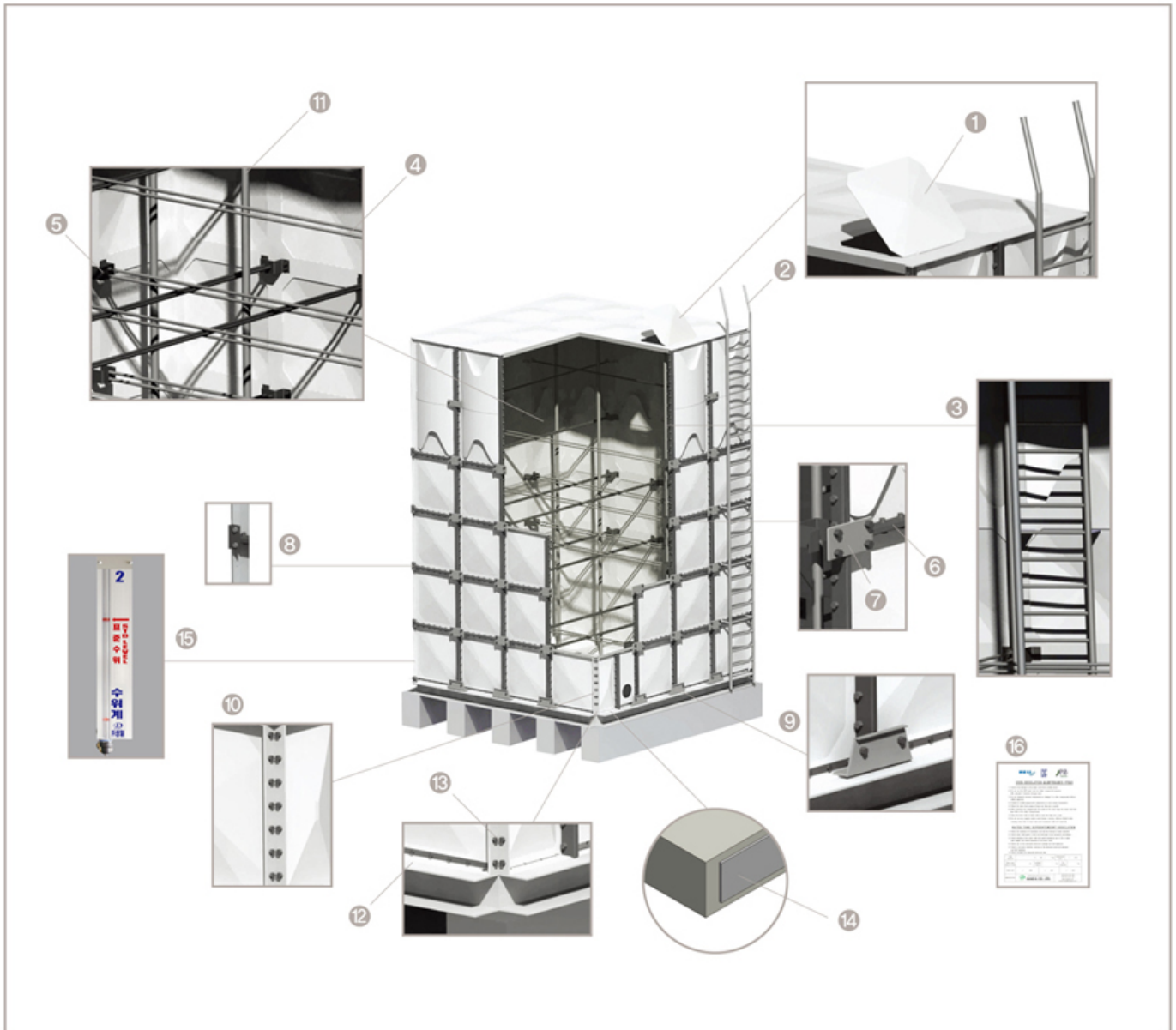
- GRP Water tank panel is designed with special shape for maximizing safety against stress and deformation, so it has better structural strength than normal circle designed panel.

- As GRP Water panel is manufactured by oil-hydraulic press under high temperature and high pressure, it maintains top water pressure strength and there is no dimensional deviation by temperature change.



Internally Reinforced System

- It is possible that various capacity's design and flexible space should be used by GRP panels standardized
- Excellent watertightness, hygienic conditions and non-leakage applied internally reinforced stay(Stainless)



No.	Name	Material
1.	Manhole panel	GRP
2.	External ladder	SS400(HDG)
3.	Internal ladder	GRP (Pultrusion)
4.	Internal Tie Rod	STS(PET coating), STS 304,316
5.	Internal bracket	STS(Powder coating), STS 304,316
6.	Flange bar, Flat bar	SS400(HDG)
7.	External bracket	
8.	Corner bracket	
9.	Bottom bracket	
10.	Corner frame	

No.	Name	Material
11.	Roof support pipe	GRP(Pultrusion)
12.	Base frame	SS400(HDG)
13.	Bolts and Nuts	Inside STS : Bolt/Nut(304, 316), Washer(316)
		Roof Panel: acetyl cap bolt(M10)
		Outside : HDG Bolt + PVC Bolt cap
		Connection: HDG + Acetyl Cap (M14) Size: M10, M14
14.	Sealing Tape	PVC Sealant + Butyl or EVA Sealant + PVC Sealant
15.	Water Level Gauge	Aluminum Case+PE Clear Tube+Socket
16.	Name Plate	Aluminum(Water Tank Safety Management Instructions)

● Features of Internally Reinforced System

○ Excellent Hygienic Conditions

- Internal tie-rod of water tank is coated with PET and internal bracket is coated with powder.
- Internal Bolt for tie-rod and bracket is coated with epoxy after fastening.
- Prevented rust appearance as Chlorine GAS stay through external assembly bolts(HDG) added PVC bolt-caps of water tank.

○ Outstanding View

- Prevented white peril or rust appearance through external assembly bolts added bolt-caps of Water Tank, and outstanding view.

○ Easy to Assembly

- Easy to assembly through internal and external optimized options of reinforced system.

○ Best Structure Stability

- SUNG IL CO., LTD's internally Reinforced System is verified structure stability of water tanks which have built in domestic and international sites for 20years.

- Location : Cheonan Industrial Complex Reservoir
- Size(M): $34 \times (15+15) \times 5h = 5,100m^3$

The biggest GRP Water Tank in South Korea, installed by SUNG IL



Externally Reinforced System

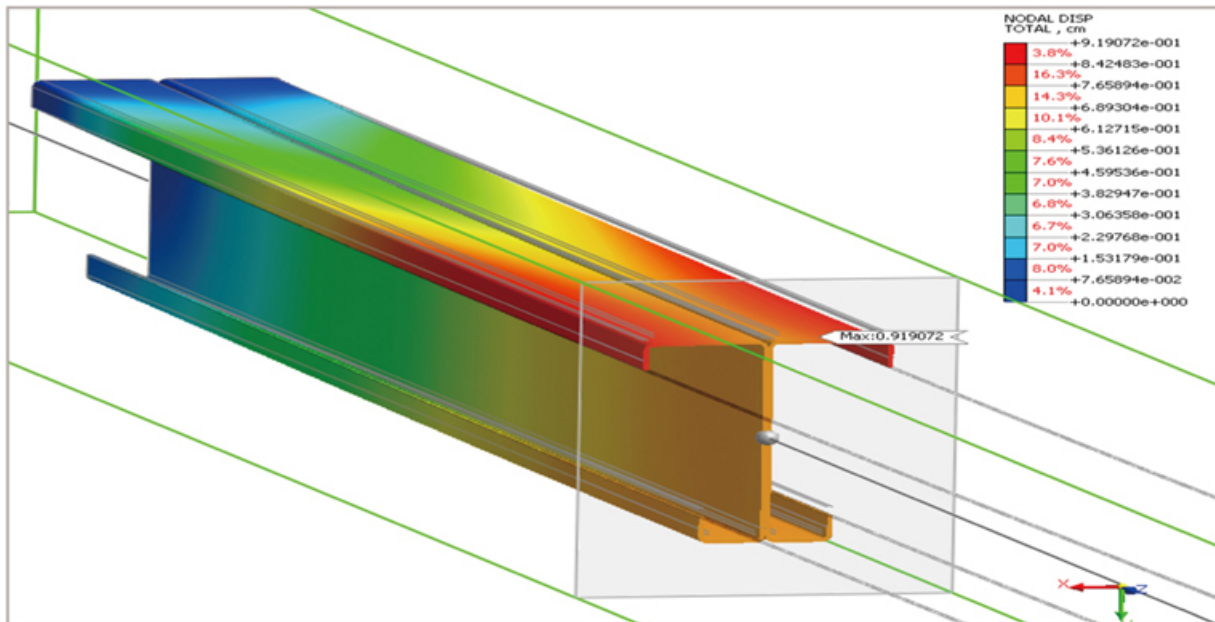


No.	Name	Material
1.	Manhole panel	GRP
2.	External ladder	SS400(HDG)
3.	Internal ladder	GRP (Pultrusion)
4.	Internal Bracket	STS(Powder coating), STS304, 316
5.	External Support Tie-rod	SS400 + Urethane coating.
6.	External Pair Frame	SS400(HDG)
7.	Corner Bracket	
8.	Corner Frame	
9.	Roof support pipe	GRP(Pultrusion)

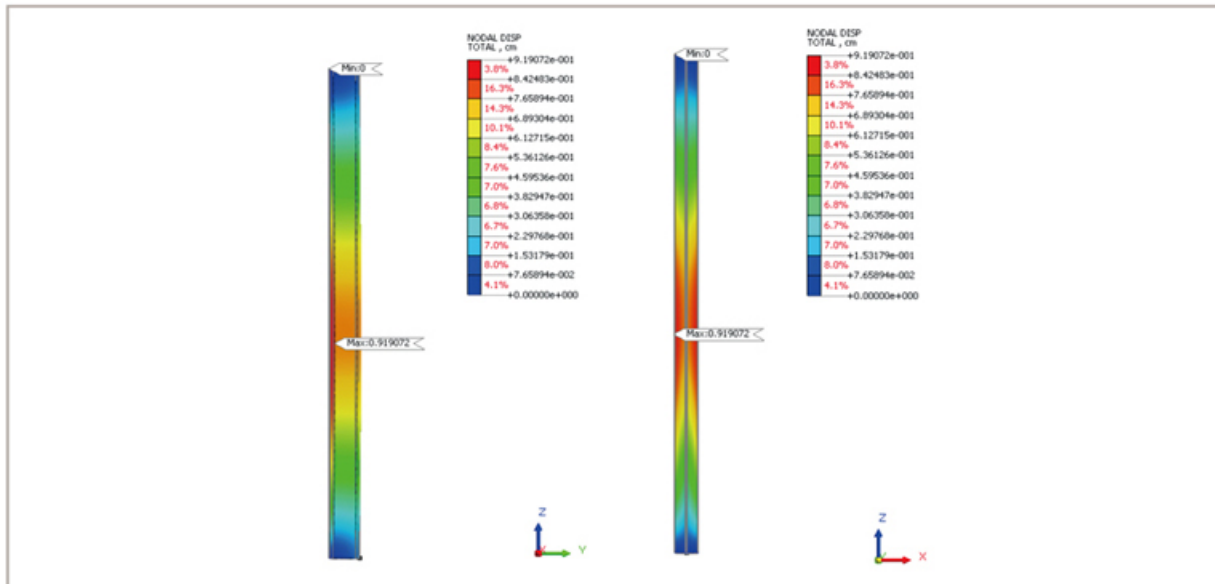
No.	Name	Material
10.	Base frame	SS400(HDG)
11.	Bolts and Nuts	Inside STS : Bolt/Nut(304, 316), Washer(316)
		Roof Panel: acetyl cap bolt(M10)
		Outside : HDG Bolt + PVC Bolt cap
		Connection: HDG + Acetyl Cap (M14)
		Size: M10, M14
12.	Sealing Tape	PVC Sealant + Butyl or EVA Sealant + PVC Sealant
13.	Water Level Gauge	Aluminum Case+PE Clear Tube+Socket
14.	Name Plate	Aluminum(Water Tank Safety Management Instructions)

Externally Reinforced System Structural Analysis

FEM - Water Tank Height (3MH-75m³)



FEM - External Pair Frame (3MH-75m³)



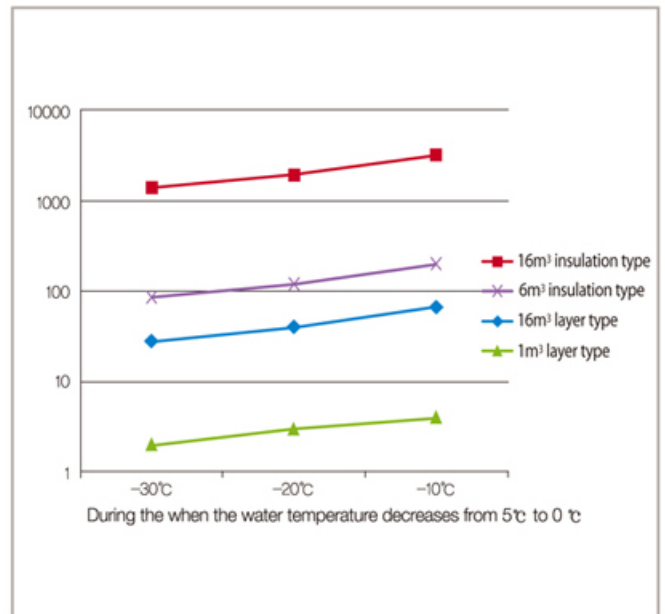
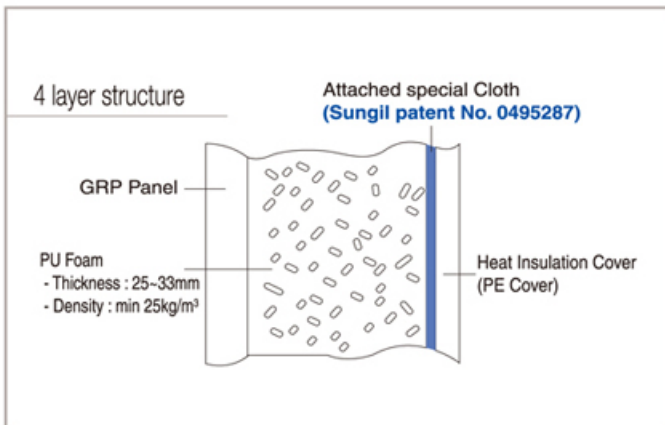
- Result of Skid base strength review (Safety Factor 2.0)

Height	Contents		Bending Stress(kg/cm ²)	Result	Remark
3.0mH	Main Skid Base	Long term	1520 < 1600 (Allowable value)	OK	
		Short term	2130 < 2400 (Allowable value)	OK	

Excellent Heat Insulation

Composition of Insulation panel

- Excellent insulation of GRP Material itself with Eco-friendly Polyurethane heat insulating material prevents freeze & water condensation.
- There is non-woven fabric with excellent adhesion inside GRP insulated panel, ensuring shape stability of panel throughout longer time periods.
- GRP insulated panel with 4 layers structure ensures excellent insulating effect.
- Thickness of insulated panel : 25mm-33mm.



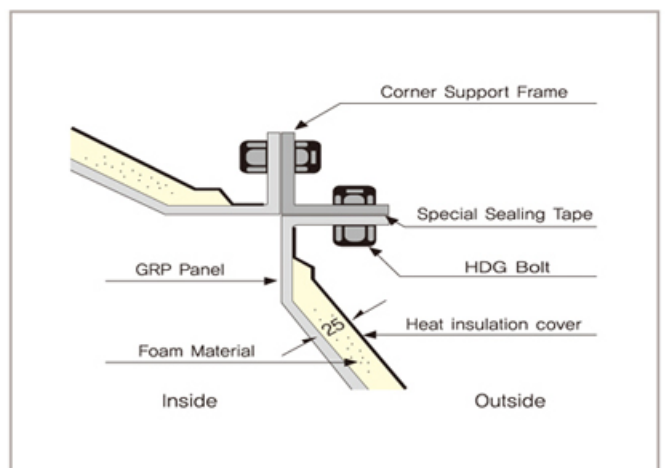
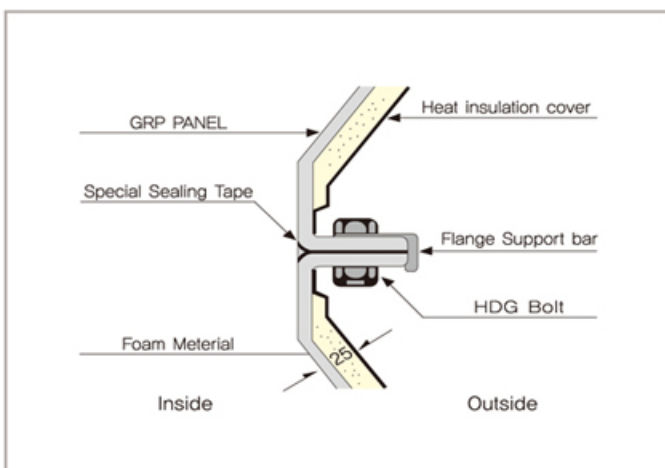
During the time when the water temperature decreases from 5° to 0°

Capacity	Classification	Temperature of Atmosphere		
		-10°C	-20°C	-30°C
16 m ³	Single Layer Type	35 hr	20 hr	13.5 hr
	Insulation Type	164 hr	81 hr	58.5 hr
1 m ³	Single Layer Type	11 hr	6 hr	4 hr
	Insulation Type	37.5 hr	23 hr	13.5 hr

※ Test condition

- Tank is filled with water
- No further water supply, or drainage during the test

Drawing of the panel joint part / corner part



- Heat insulation foam core thickness : 25~33mm

Partition Type Water Tank

- It is possible to eliminate unusable space, and utilize the maximum space, by installing a partition type tank. Economical and effective for maintenance.

Special feature

- Utilizing maximum capacity

In the basement or other confined areas, it is possible to eliminate unusable space, and utilize the maximum space, by installing a partition type tank.

- Various uses

If partition type tanks are installed, one section can be used for drinking water, and the other section for service water (Ex. fire fighting).

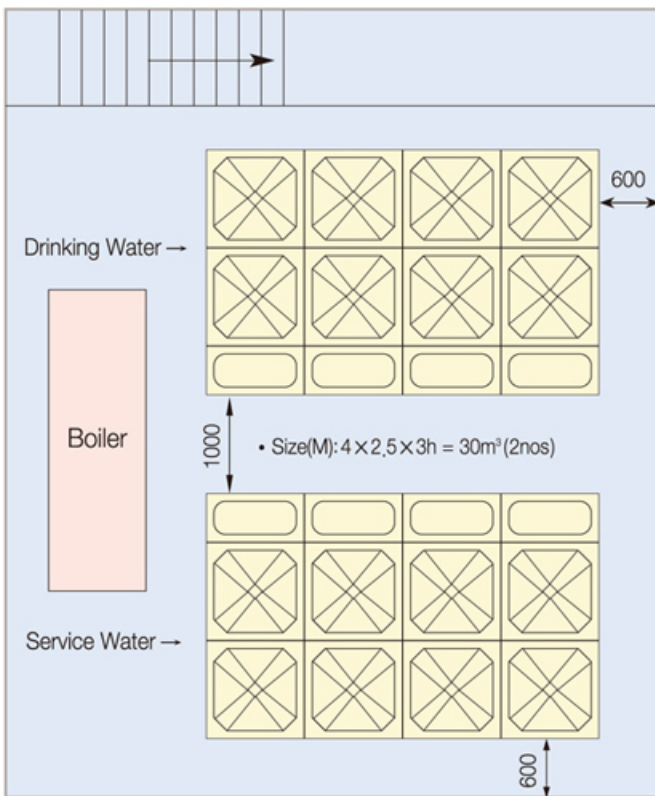
- Easy Maintenance

It is convenient for maintenance, because two tanks can be installed as one unit.

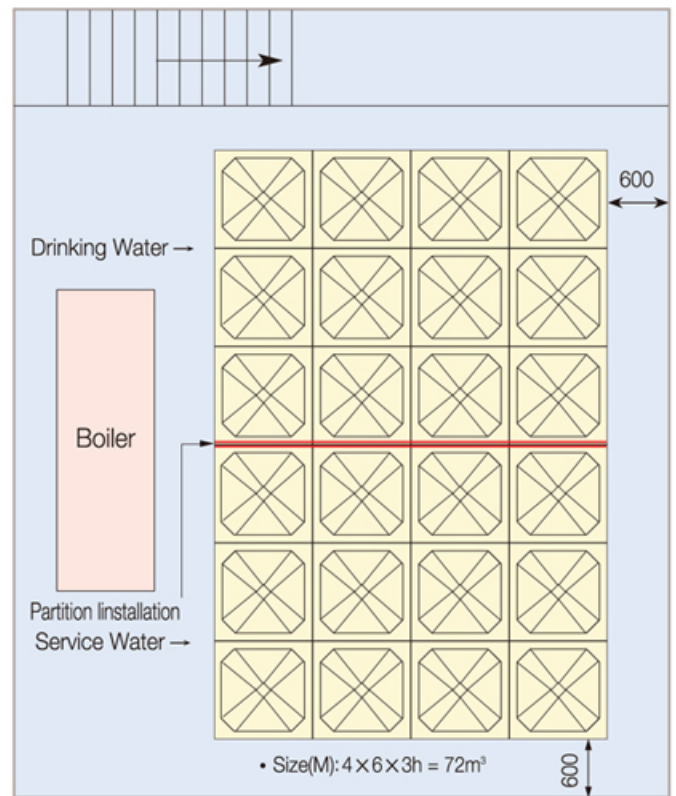
- Cost effectiveness

The cost and installation of 1 partition tank is cheaper than 2 separate tanks.

Partition Installation



(Non Partition Type)



(Partition Type)

Effect for Partition Water Tank System

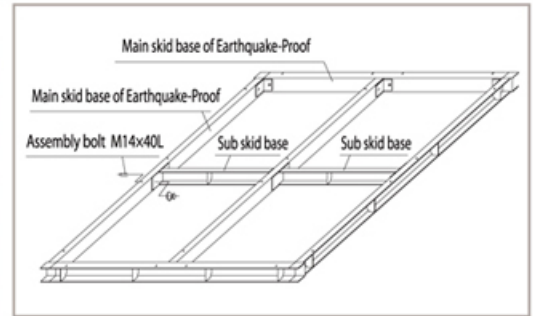
- If tanks for two different uses are needed in a confined area or boiler room, a $72m^3$ partition type tank can be installed to use half for drinking water, and half for service water. If separate tanks are installed, however, you have to installed two tanks with a maximum of $30m^3$, because you need to have 1 meter distance between tanks for maintenance and operating space.

● Earthquake-Proof Skid Base System

-Height of water tank 2.5mH, Height of water tank 4m, GRP Sectional Panel, Putting water to 85% of water tank height, Earthquake-Proof Strength 5.0

•Result of Skid base strength review (Safety Factor 2.0)

Height	Contents		Bending Stress(kg/cm ²)	Drooping(cm)
2.5mH	Main Skid Base	Long term	1170 < 1600(Allowable value) ■ O.K	0.15 < 0.25(Allowable value) ■ O.K
		Short term	1340 < 2400(Allowable value) ■ O.K	0.17 < 0.33(Allowable value) ■ O.K
	Sub Skid Base	Long term	1590 < 1600(Allowable value) ■ O.K	0.21 < 0.25(Allowable value) ■ O.K
		Short term	1830 < 2400(Allowable value) ■ O.K	0.25 < 0.33(Allowable value) ■ O.K
4mH	Main Skid Base	Long term	790 < 1600(Allowable value) ■ O.K	0.06 < 0.25(Allowable value) ■ O.K
		Short term	900 < 2400(Allowable value) ■ O.K	0.27 < 0.33(Allowable value) ■ O.K
	Sub Skid Base	Long term	1540 < 1600(Allowable value) ■ O.K	0.15 < 0.25(Allowable value) ■ O.K
		Short term	1750 < 2400(Allowable value) ■ O.K	0.17 < 0.33(Allowable value) ■ O.K



● Wave Proof Panel for Earthquake-Proof

Sample Size
4.0(W)×4.0(L)×4.0(H)=64.0m³

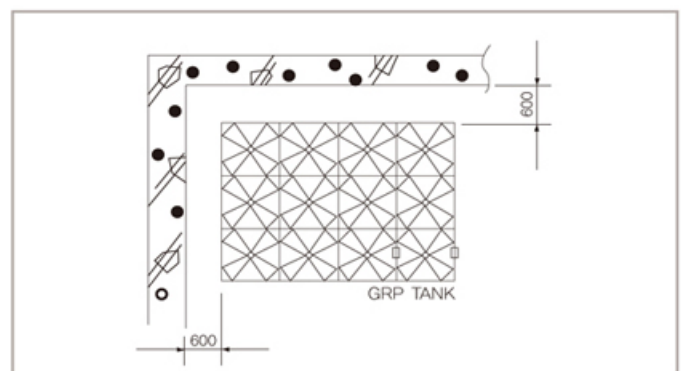
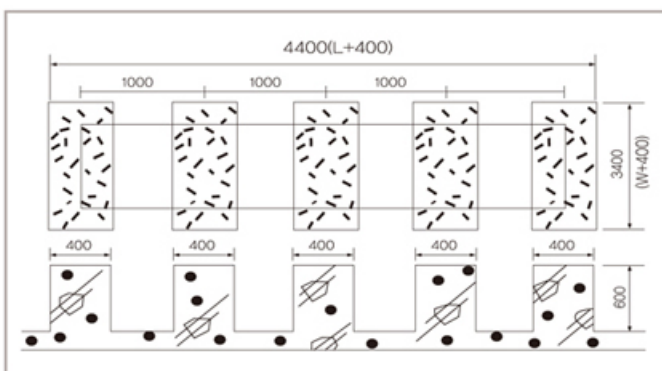
"Earthquake-resistant design and Fire safety standards of Fire fighting facility" The third clause of Article 4

-Wave proof panel shall be installed from the center of water tank to 4 directions, the length must be over one half of water tank length, the height must be over one half of water tank height.

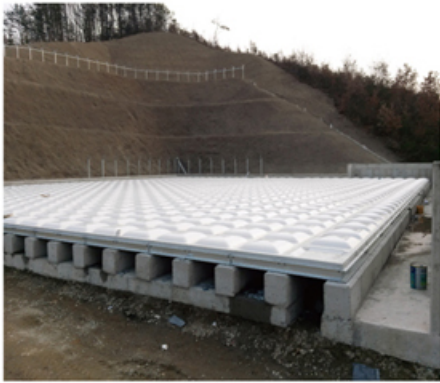
● Installation Standard (Pad and Space)

Standard of Base Concrete PAD Installation and Space

- For maintenance of GRP tank, it needs extra space at least 600mm from wall and 1,000mm from ceiling.



GRP Water Tank Installation Processing



Base Concrete
PAD & Bottom Panel assembly



Wall Panel assembly



Roof Panel assembly



Internal tie-rod & Roof support assembly



Assembly Completed"

Installation and Caution

- 1) Customers are requested to make foundation pad construction according to the designed specifications and the strength of the site.
- 2) Check the evenness of foundation (Within 5mm) and the flatness of base material. (Within 0.5mm)
- 3) Check rust of the external reinforced material and any bolts and nuts, their tightness.
- 4) Check installed state of the external ladders and water level gauge.
- 5) Check bending of the water tank wall panel (maximum up to 1% of water tank height) and check skewness of the water tank.
- 6) Check a corrosion inhibitor coating on the internal reinforced material and bolts tightness.
- 7) Check drooping the internal reinforced stay and check assembled state the internal bracket.
- 8) Check assembled state of the internal ladder and roof supports.
- 9) Check the size of socket for plumbing will be installed.
- 10) Check assembled state of a socket for plumbing.

ENM (Earthquake-resistant type) WATER TANK

■ Excellent Heat Insulation

- Insulated panel with 4 layers structured & using Eco-friendly Polyurethane heat insulating material ensure excellent insulating effect

■ Easy to clean & Excellent hygienic

- Because of wide manhole, it is easy to clean inside of water tank & it has excellent hygienic & watertightness

■ Excellent durability

- It secures excellent surface strength & durability as Using high-temperature & high pressure press machine (2,500 Ton)

■ Competitive Price

- Excellent price competitiveness & High quality Water tank with no tie-rod type

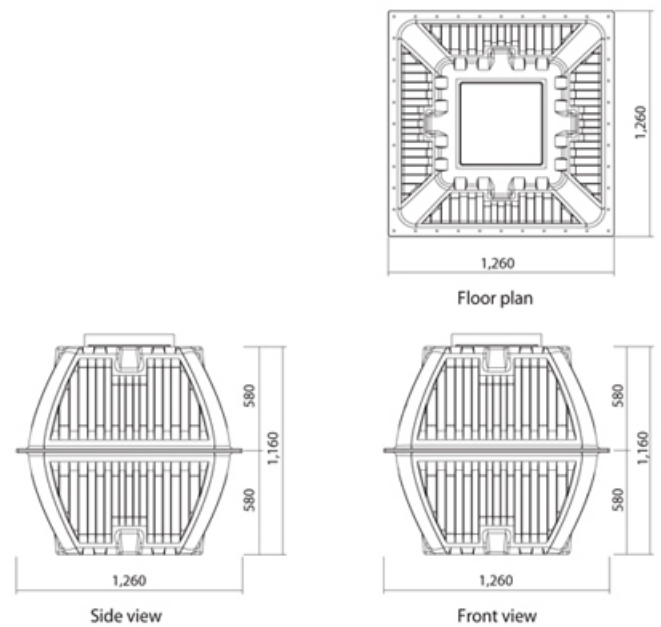
■ Easy & quick to install

- It is easy and quick to install with easy assembly of upper & lower panels

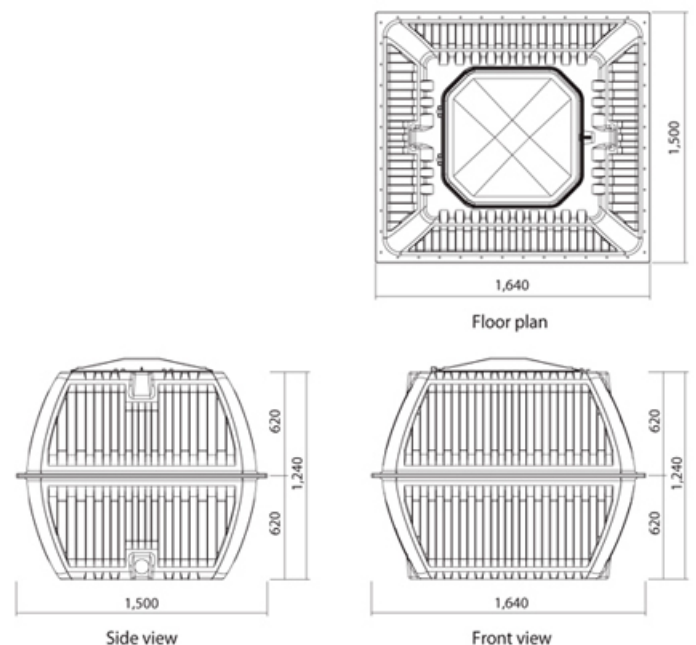
■ Structure of Non Skid base

- Excellent Earthquake-resistant without concrete frame & skid base.

ENM 1m³ TYPE (5m²)

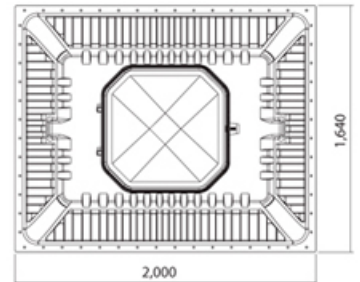


ENM 2m³ TYPE (8m²)

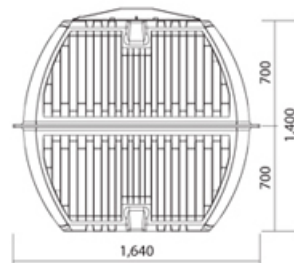


ENM WATER TANK: Earthquake resistant reinforced type

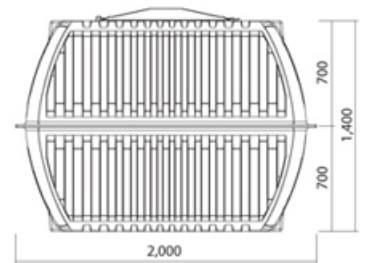
ENM 3m³ TYPE (10m²)



Floor plan

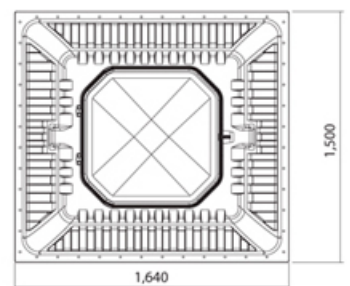


Side view

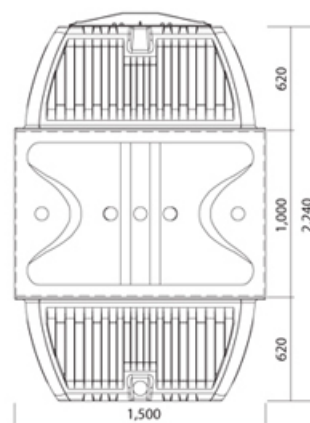


Front view

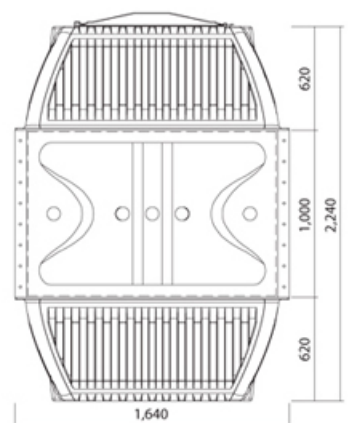
ENM 4m³ TYPE (13.5m²)



Floor plan



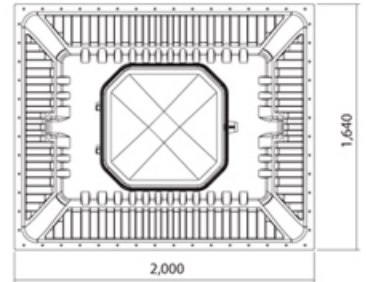
Side view



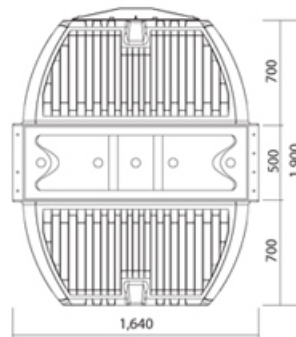
Front view

ENM WATER TANK: Earthquake resistant reinforced type

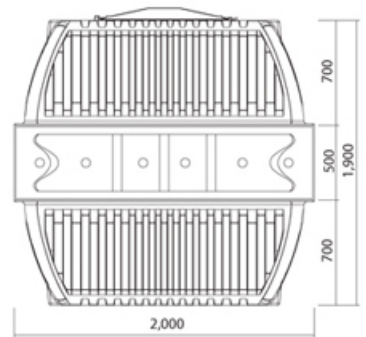
ENM 5m³ TYPE (14m²)



Floor plan

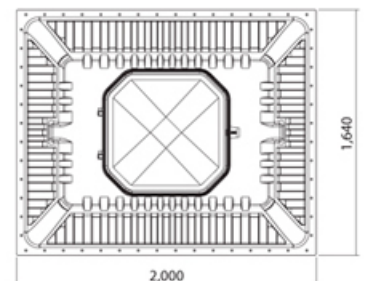


Side view

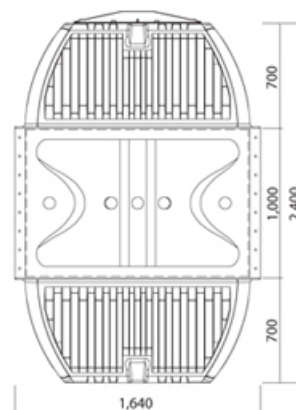


Front view

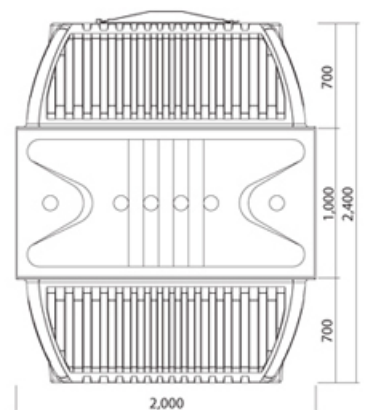
ENM 6m³ TYPE (17m²)



Floor plan



Side view



Front view

Maintenance Control

- To keep the tank clean and ensure its safe use, please perform the following inspection and maintenance work.
- SUNG IL GRP Panel tanks are designed and manufactured for long-term service. Maintenance and inspection must be conducted to secure hygienic and long life. To facilitate easy and safe maintenance and inspection, a proper space must be secured around water tanks.

Maintenance Control

- 1) Caution the damage to the water tank from outside shock.
- 2) Do not use the GRP water tank for other unapproved purpose.
(For example chemical storage tank)
- 3) Do not dismantle internal components or change it to other components without official approval.
- 4) Prohibit to install unapproved components or non-consent equipment.
- 5) Maintain standard water level at all times
(Keep the 85% water level of water tank height)
- 6) Clean the inner side of water tank at least 2 times per a year.
- 7) In case of partition water tank, keep under 50% water level of the water tank height in opposite side when clean water tank.
- 8) Do not use any organic solvent such thinner, acetone, chlorine bleach when cleaning inner side of water tank and recommend with soft material.
- 9) Ventilating Water tank frequently.

•Location : Head office water tank
•Size(M) : 3 X 4 X 6h



Maintenance item

Maintenance item	Interval	Remarks
1. Clean the inner side of water tank	2 times / year	When cleaning inner side of water tank, need to use soft materials like soft cloth or sponge, do not use rough materials like steel brush or wire.
2. Looseness of the bolts and nuts	2times / year	Retighten any loose bolts and nuts. (Do not use impact wrench)
3. Check standard water level	1 time / Month	Checking operation of water level control valve.
4. Check cloginess of Airvent, Overflow	1 time / Month	Removing foreign body and cleaning.
5. Manhole Cover	1 time / Month	Make sure that the manhole cover is completely shut. Always keep it locked.
6. Turbid water	1 time / Month	Check the inner parts of the tank, the outlet and the other places for turbid water.
7. Water leakage and deformation of the tank	1 time / Month	If the water tank leaks or deformed immediately contact the local sales representatives.
8. Internal & External pressure other than hydrostatic pressure	1 time / Month	If any pressure other than hydrostatic pressure applied to the tank, immediately return the tank to its normal state.
9. Looseness of the bolts and nuts for Ladder.	1 time / year	- Fasten loose bolt for ladder - When bolt rusted, need to remove the rusting and coat for rustproofing on the bolt. - When the bolt is corroded, need to replace the bolt.

Certificates for GRP Water Tank

GRP water tank certificates and test reports



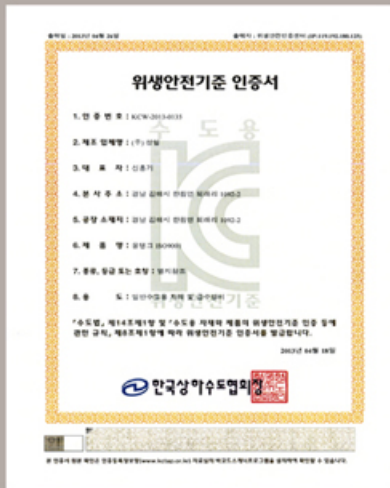
BS Certificate(U.K)



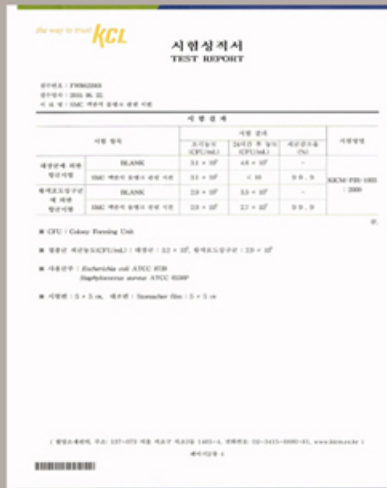
WRAS Certificate(U.K)



PSB Test Certificate(Singapore)



Korea Certificate for water tank



Elvan Test report(Korea)



GRP PANEL Physical Test Report



ISO 9001 Certificate



ISO 14001 Certificate



Inno-Biz Certificate

Patents for GRP Water Tank Related in Korea



Patent for a Strengthening equipment of GRP Water Tank



Patent for GRP Panel with a Double plate structure



Patent for Heat Insulated panel of GRP Water Tank



Patent for Integrated GRP Water Tank



Patent for Antibacterial GRP Water tank that contains Elvan



Registration of Design for GRP 1MX1M Wall Panel



Registration of Design for GRP Manhole Cover



Registration of Design for Strengthening Bar of GRP Water Tank



Registration of Design for Water Level gauge of GRP Water Tank



Registration of Design for Sub skid base of GRP Water Tank



Registration of Design for Internal Strengthening Bar of GRP Water Tank



Registration of Design for External Strengthening Bar of GRP Water Tank



Registration of Design for Strengthening Frame of GRP Water Tank



Registration of Design for GRP Water Tank



Registration of Related Design for GRP Water Tank



Registration of Design for Strengthening Frame of GRP Water Tank



Head Office View



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