

WRAS
APPROVED
PRODUCT

MEMBER
 **Water
Quality.**
ASSOCIATION

| Sl. No | Description | Page No. |
|--------|---|----------|
| 1. | About GRP Panel Tanks | 3 |
| 2. | Features of MULTANK | 4-5 |
| 3. | GRP Panel Insulation & FEM Test | 6 |
| 4. | Anti-Bacterial / Hygenic GRP Panel | 7 |
| 5. | Certifications | 8 |
| 6. | Safety | 9 |
| 7. | Design Structure | |
| | * Internal Compartment System | 10 |
| | * External Compartment System | 11 |
| | * Panel Composition BY Height | 12-13 |
| 8. | Panel Characteristics | 14 |
| 9. | Panel Sizes, Chamber Box& Partition Reinforcement | 15 |
| 10. | Free Capacity Design & Installation Space | 16 |
| 11. | Skid Design | 17 |
| 12. | Scope of Construction | 18 |
| 13. | Accessories | 19 |

About us

MULTANK is the industry leader in providing long-term protective solutions to combat the problem of corrosion and erosion of water retaining structures, utilising the very best in high performance, solvent free coating technology.

Consequently, we have been instrumental in assisting many high profile clients to meet the ultimate goal of supplying consistently fresh, high quality, potable and drinking water.

We don't just provide water tanks,

We provide a long term solution for the structure of your tank.

About GRP Panel Water Tanks

What is Sectional Tank?

Sectional water tanks are an ideal solution for the storage of large volumes of water and for applications where access is restricted. They are manufactured to specific applications in panel format and assembled at site.

Sectional panels manufactured from sheet moulding compound (SMC) enable much larger tanks to be constructed or overcome access restrictions.

Below are some of the many advantages:

Prevention of leakage

Convex base panels, with exclusive foam type sealant, create a self-sealing characteristic, which enhances as water pressure increases.

Ease of handling & installation

Components for a complete tank up to 18m³ may be packed in to a single pallet for efficient transport. Individual panels may be carried to the final assembly point, with no lifting equipment required. Assembly is straightforward, requiring no special skills or equipment.

Unlimited sizes and configuration

With the appropriate combination from different panel designs, units of any capacity from 1 to 10,000m³ or over may be constructed, in a configuration to respect any existing site restrictions.

Easy maintenance

The design and material specifications of the tanks ensure that routine maintenance requirements are minimal. The exclusive design of the base panels ensures total free drainage, eliminating any possibility of residue from static water or from cleaning materials. By installing a partition, tanks may be cleaned one compartment at a time without interrupting supply.

Causes of Water Contamination

The principal problems leading to contamination of stored water are:

Light transmission:

Growth of algae will occur if light is permitted to enter the tank, this will adversely affect the water taste, and can lead to disease such as gastroenteritis.

Rough internal surface of the tank:

The cavities in the internal surface allow bacteria to nest and proliferate. Bacteria protect itself from the effect of Chlorine by creating a bio-film. Chlorinated water also loses its bactericidal properties after a few hours, if not constantly replenished. At one point in time, this bio-film breaks and the bacteria is killed by the chlorine.

Incomplete or Poor drainage:

If the tank design does not ensure complete free-flow drainage, a build-up of residual static water will result. This will harbor contaminants referred to above, as well as particles from internal corrosion or introduced externally.

Features of MULTANK

Adaptability & Multiuse :

MULTANKs are primarily designed to store potable water, due to its exceptional strength and modular design it can be used as a fire tank at the same time with different outlet levels.

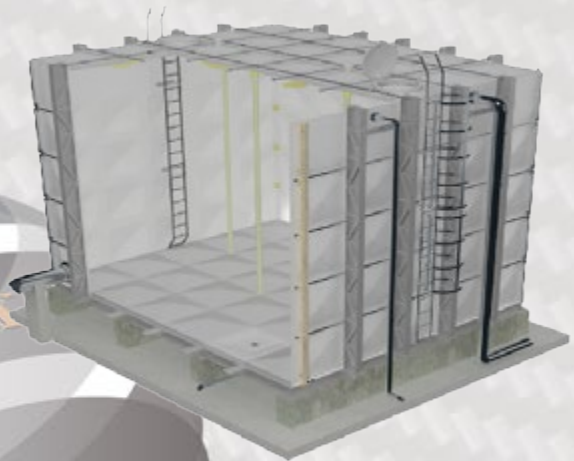
The tanks have also been successfully deployed as sea water intake tanks, surge tanks, balancing tanks, grey water storage, retention runway tanks, recycled/ reuse water tanks, irrigation tanks, rainwater tanks, industrial process water tanks, chilled water storage, warm water storage, etc..

MULTANKs could also be used to certain chemical with additional and/or other optional material modifications on demand.

MULTANKs are well suited for either outdoor or indoor, and is particularly useful in established structures with limited access to either supply new storage or to replace older tanks.

Seismic, Snow & Wind Loads:

MULTANKs can be delivered to cover the most severe specification needs, on demand to be able to withstand seismic zone 4, high snow and/or wind load specifications.



Extendable:

Due to the modular nature of our **MULTANKs** it can also be extended by adding more panels in future when more capacity is required.

Partitions & Baffles:

MULTANKs can also be partitioned or have baffles inside in order to have separate operating compartments or for water flow characteristics.

Re-locatable:

MULTANKs could be relocated to another location even after years of usage. Simple un-bolting and re-bolting procedures are required.

Perfect Strength & Durability :

The glass fiber reinforced panels are molded at temperatures up to 150°C using isophthalic unsaturated polyester resins and are pressed under hot press molding process to realize optimum condition for maintain the best endurance. The manufacture and the design of the hot pressed molded GRP sectional storage water tank in comply with the quality standard of BS EN ISO 9001 and the tank panels have been fully compliant with the requirements of BS7491:1994:Part 3 / BS EN 13280.

Panel Design & Rigorous Testing:

Computer aided panel design, allied to the immense inherent strength of GRP material combined with the resilience of a flexible joint system, makes **MULTANKs** unmatched in the world for reliability. The tank design has been rigorously tested and experimented for the worst environmental conditions. Exposed to ensure a reliable design under all conditions.

Features of MULTANK

No Bacterial Growth:

MULTANKs are hot press molded with perfectly smooth finish, eliminating the problem at the source. Conventional tanks allow stored water to be in contact with rough surfaces, this creates a breeding ground for bacterial growth.

Minimal Clearing Requirement:

The smooth interior surfaces, and free-draining design, of the MULTANKs minimizes any opportunity for pollutants, whether originating internally or externally, to develop and accumulate. Routine cleaning requirements are consequently simple and infrequent, with no risk of leaving residual material or cleaning agents inside the tank.

Complete Drainage:

The base of the MULTANK is constructed with convex bottom panels. This not only provides a positive sealing pressure, which increases as the water height increases, but also enables a free flow of water from all parts of the tank to the concave drainage panel. Complete and fast drainage from the lowest point is thus ensured, with no possibility for static water to accumulate and become stale or contaminated.

Quality Control :

All raw materials used in the manufacture of MULTANKs are agreed to with quality guidelines and parameters to suppliers. All deliveries are batch tested and crosschecked with supplier quality data before entering the production environment. Our manufacturing facility is ISO 9001 certified.

Manufacturing process:

MULTANK panels are hot press molded in glass reinforced plastics (GRP) using isophthalic unsaturated polyester resins and electrical glass fiber reinforcement.

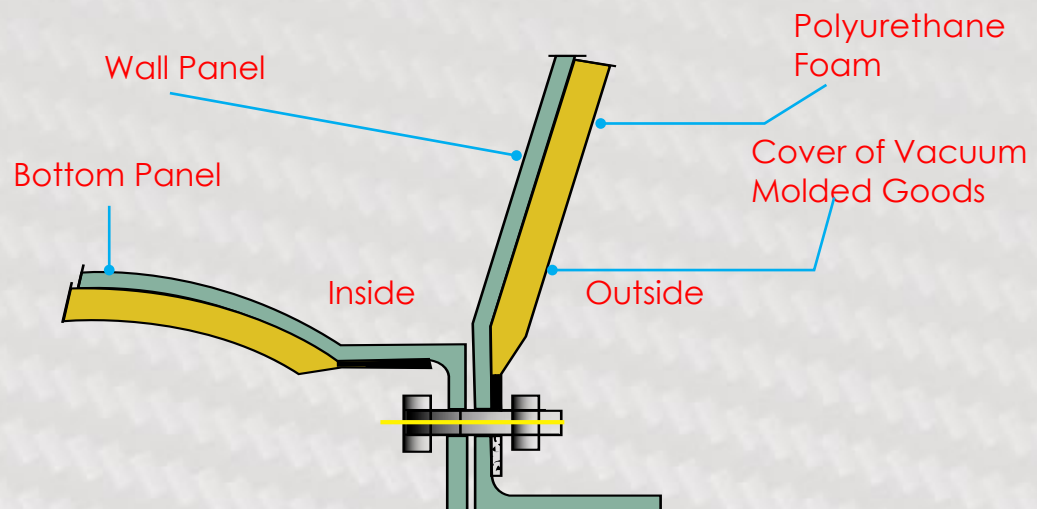
The panels are moulded at temperatures up to 150°C under strict quality control disciplines. The process results in strong, consistent panels which are fully cured, accurate dimension with sharply defined profiles and smooth surfaces on both faces.

Drilling and finishing of the panels is undertaken in a purpose built controlled area, where high technology automated drilling equipment is used to complete production to exacting tolerance levels.



Panel Insulation

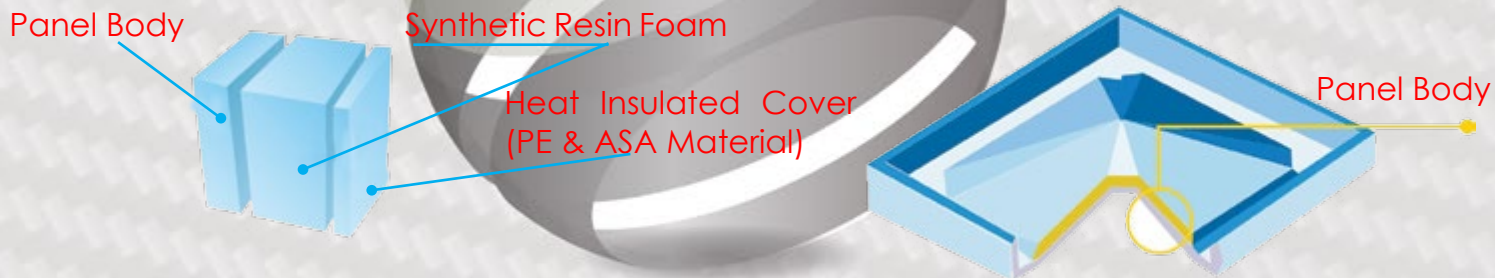
Polyurethane insulation and cover minimize the water temperature difference and prevent freezing and condensation.



Insulated panel shall be composed of three layers of SMC panel, Polyurethane (40 Kg/M³) and SMC Cover or Vacuum formed cover. The thickness of insulation is available at 25mm, 30 mm, 40 mm and 50 mm with water-tightness structure. But, on the part where it is difficult to assemble the panel, it is possible to use insulation part of below 10mm thickness.

(Side Cover: Weather proof treated ASA Material)

Our tank demonstrates outstanding thermal effect and prevent freezing/heating and dew condensation and resistant to Ultraviolet radiation

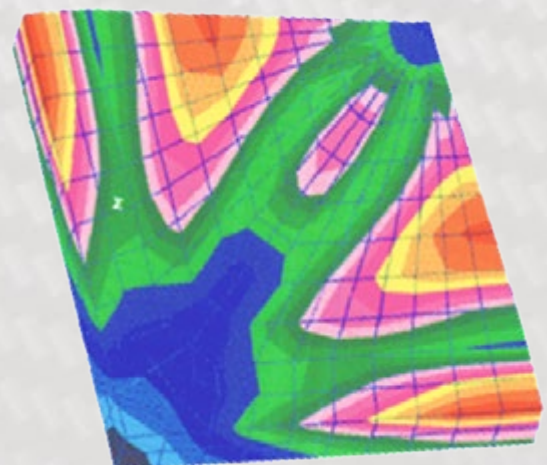


Stress Analysis of Panel (FEM)

By modeling the radial symmetrical cubic to $\frac{1}{4}$ sizes, we estimate the strain level of each part when the load is input. On the part where the stress has been intensified, we set the load again or increase the thickness of the panel in order to pursue an ideal model and develop a high-strength panel Specification of Optimum design Finite through Element Method (FEM) using computer and procurement of reliability through quality maintenance of designed material property using intron and hydraulic pressure test.

***Tolerance of dimensions of each panel shall be within $\pm 0.03\%$ of the nominal dimensions. Tolerance regard to panel and flange angle shall be within $\pm 0.3\%$.

**** Panel Strength Tested, giving a factor of safety in excess of 6 times working pressure against rupture.



Anti-Bacterial / Hygienic Panel

Inorganic Anti-Bacterial agent

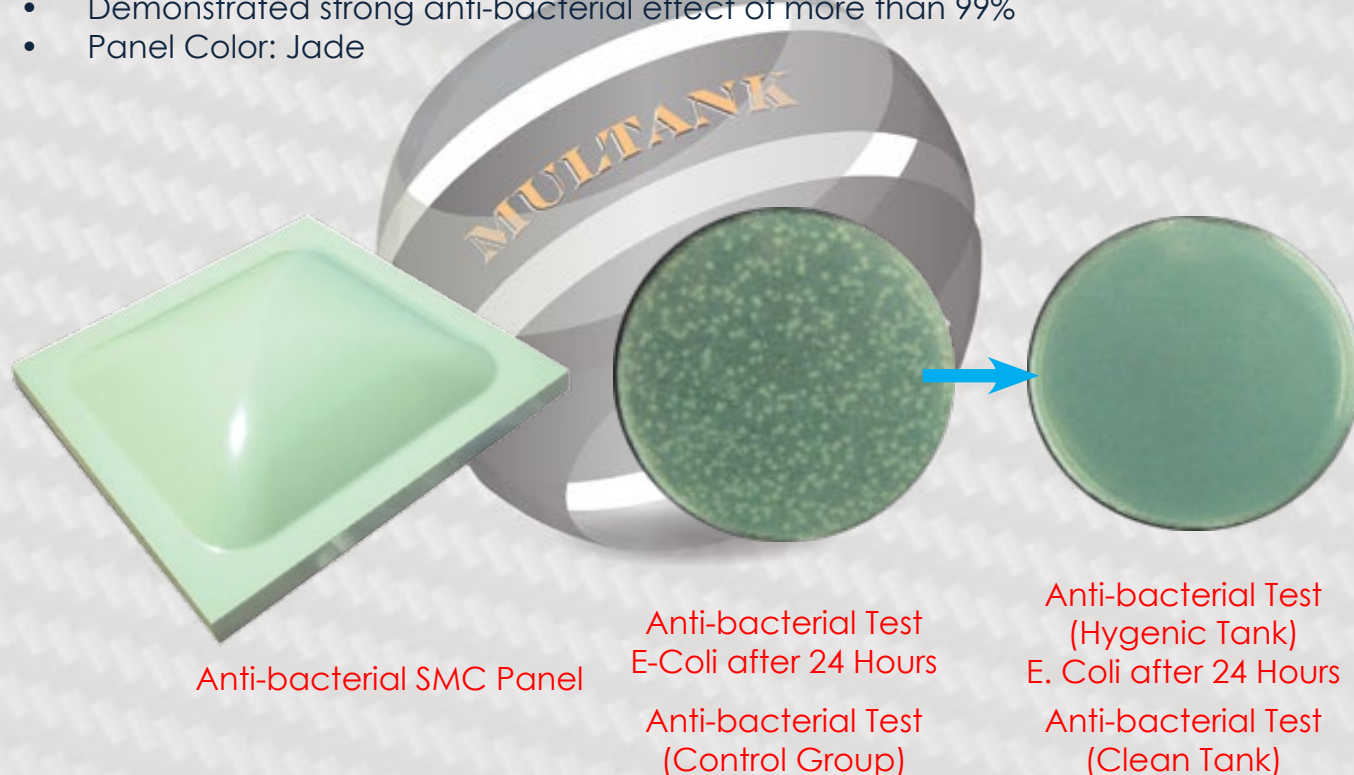
- Non-toxic anti-bacterial agent of which main ingredient is silver (Ag) ion
- Differences from organic anti-bacterial agent
- Safe at high temperature
- No volatility and no elution
- Long sustainability of anti-bacterial function

Bio-Ceramic

- Fair infrared ray radiator of porous crystalline material
- Effects of bio-ceramic
- Activation of water
- Maintaining freshness and improving taste
- Removing bad odor and purifying water.

Characteristics of Anti-Bacterial SMC Panel

- Inorganic anti-bacterial agent and bio-ceramics is added to SMC.
- Excellent mechanical strength owing to reinforced plastic material
- Nothing found in the test that checked for toxic substance elution
- Demonstrated strong anti-bacterial effect of more than 99%
- Panel Color: Jade



Performance Evaluation Criteria

| Item | Performance Criteria | Anti-Bacterial SMC Panel |
|-----------------------|----------------------|--------------------------|
| E-Coli | More than 95% | More than 99.2% |
| Staphylococcus Aureus | More than 95% | More than 99.7% |

Certificates

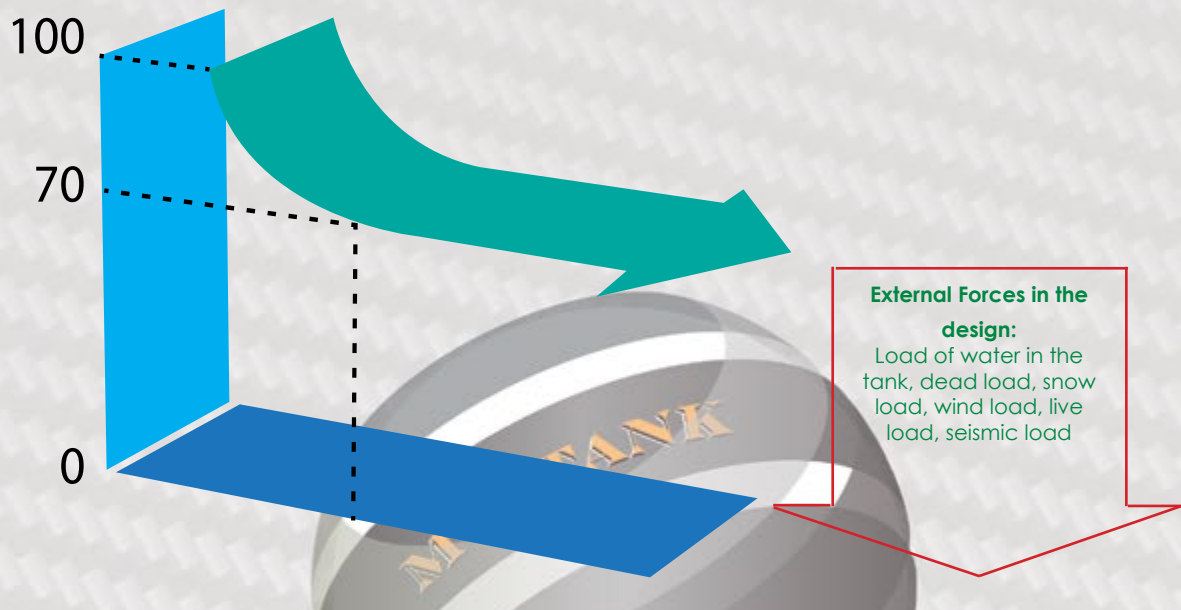


Safety

We pursue the best system through strict design criteria, quality management, and reliable structural strength analysis.

The basic of structure analysis is designed by safety factors against threshold values. We know-how lies in the optimal safety factor in consideration of external force in the design that is expected base on physical properties after long-term use of SMC material.

In designing, the tanks ignores initial value(100%) of the physical properties of SMC material and considers the safety factor to a minimum value(70%). Therefore, our water tank guarantees long-term endurance.

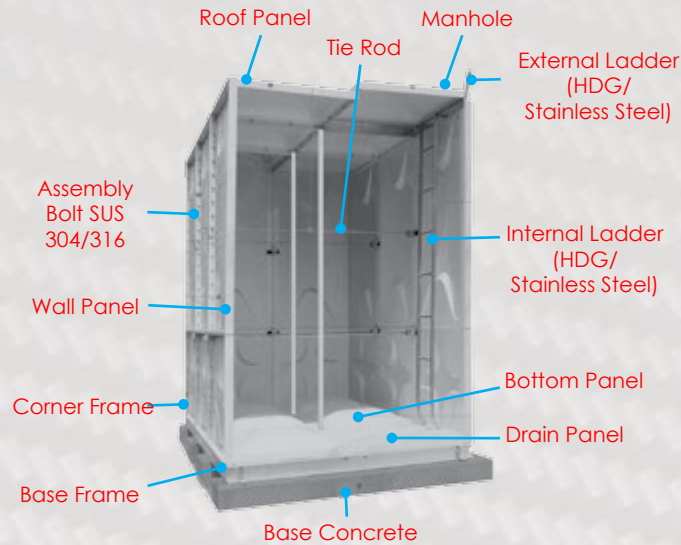


| Items | Design Conditions |
|----------------------------------|-------------------------------------|
| Earthquake | Lateral Seismic Coefficient KH=1/3G |
| intensity of illumination | less than 0.1% |

| Design Conditions | Hydrostatic Pressure | | | | | | |
|---|----------------------|------|------------------------|-------|----------------------|-------|---------------|
| Wind Velocity: 60m/sec. 134 mph Snowload: 60kgf/m ² or 12.3lb/ft ² Man load: 120kgf or 265 lb Seismic load: Horizontal SeismicCoefficient: Kh=0.3 Water temperature 60°C (max) or 104°F, this could be increased to 80°C or 176°F with special sealant. Anchor bolts shall be used to tie down a tank at the designed points. Note: 1. Panel strength is the actual bursting' pressure 2. Design can also be made for Kh 2/3, 1.0 and 1.5 | Depth of Tank | | Panel Strength | | Hydrostatic Pressure | | Safety Factor |
| | (m) | (ft) | (kgf/cm ²) | (Psi) | kgf/cm ² | (Psi) | PS/HP |
| | 1 | 3.3 | 0.06 | 8.53 | 0.07 | 1 | 8.53 |
| | 1.5 | 4.9 | 1 | 14.52 | 0.12 | 1.7 | 8.54 |
| | 2 | 6.5 | 1.3 | 18.5 | 0.16 | 2.28 | 8.11 |
| | 2.5 | 8.2 | 1.7 | 24.2 | 0.21 | 2.99 | 8.09 |
| | 3 | 9.8 | 2.1 | 29.9 | 0.26 | 3.7 | 8.08 |
| | 3.5 | 11.5 | 2.5 | 35.56 | 0.31 | 4.41 | 8.06 |
| | 4 | 13.1 | 2.9 | 41.25 | 0.36 | 5.12 | 8.06 |

Design Structure

Internal Reinforcement System



The excellent strength, durability and water tightness of the MULTANK are obtained by connecting inner panels with stainless steel braces & tie-rods are installed inside of the tank to improve the strength and stability of the tank structure. Corrosion-proof PE heat treated stainless steel tie-rods and GRP tie - rods are applied.

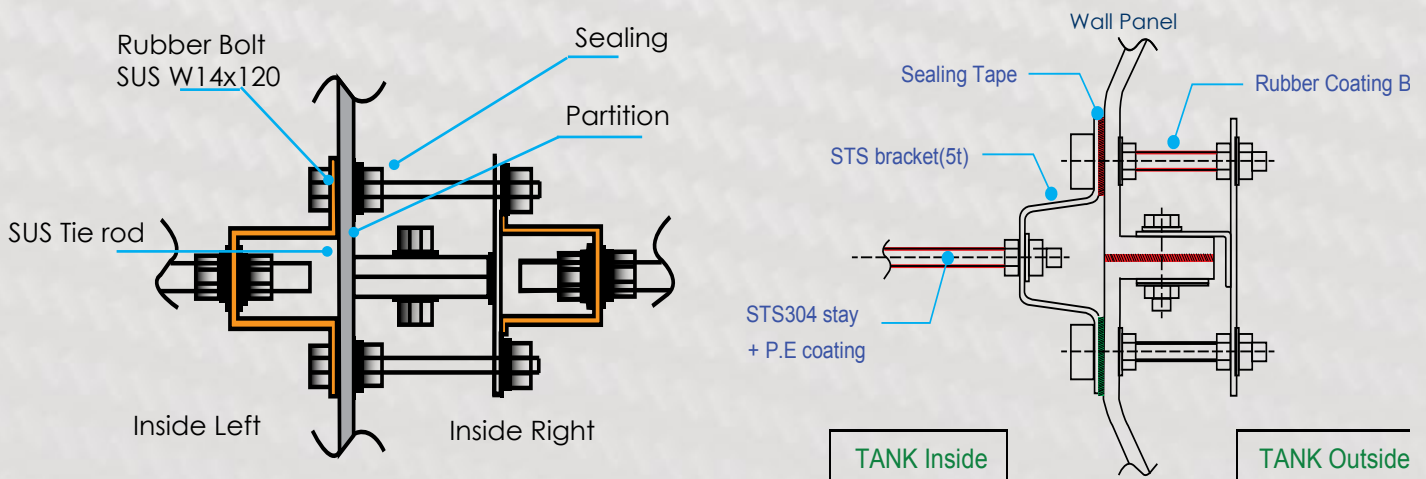
| | | | |
|---|----------------|----|-------------------|
| 1 | Base Bracket | 8 | Flange Bar |
| 2 | Anchor Bracket | 9 | Tie rod |
| 3 | Base Frame | 10 | Roof Stay |
| 4 | Air Vent | 11 | Roof Stay Fixer |
| 5 | Corner Frame | 12 | Ladder |
| 6 | Corner Bracket | 13 | liner |
| 7 | Cross Plate | 14 | Water Level Guage |

Internal Stay Configuration

1. Materials
2. Inner stay configuration

Minimize the transformation of the side(transformation of 1% or less of the tank height), and it should be so designed as to improve the safety and life of tanks.

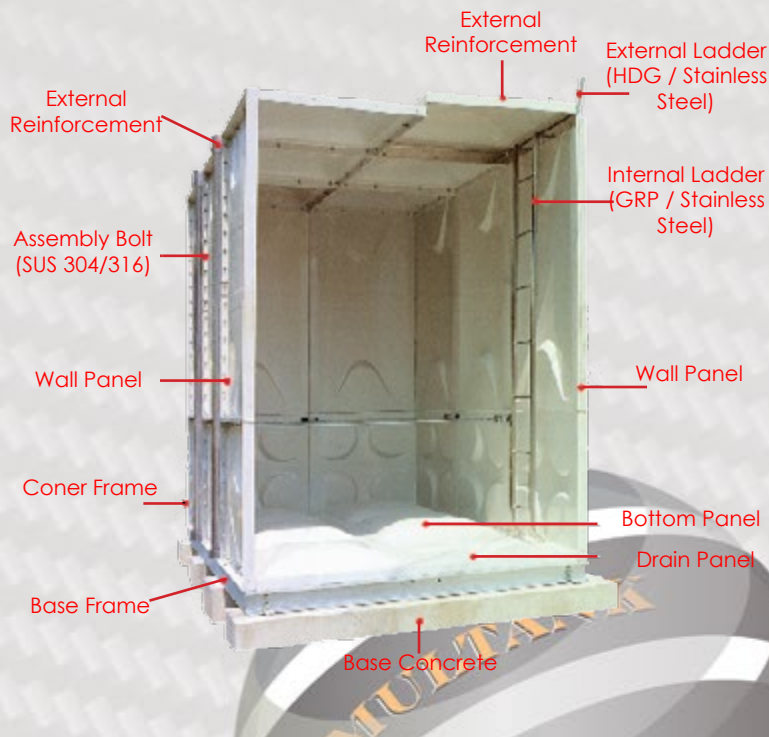
| Item | Materials | Specification | Design According |
|------------------|-----------------------|---------------------------------------|------------------|
| Inner Stay | STS 306 + P.E Coating | Round Bar Ø10.6 (M12Screw Processing) | BS5950 |
| Internal Bracket | STS 316 Over | 170 X 60 X 5T Over | BS5950 |



Design Structure

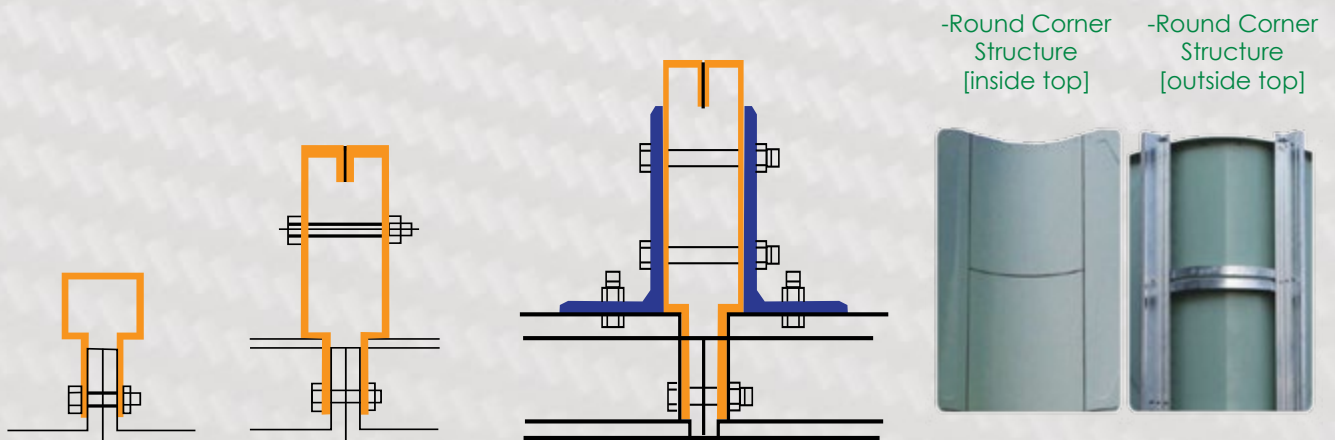
External Reinforcement System

MULTANK exterior reinforcement system refers to a system that has been designed to withstand stress that occurs due to the hydraulic pressure exerted on the outer part of the tank.



| | |
|---|---------------------|
| 1 | Air Vent |
| 2 | Corner Frame |
| 3 | External Flange Bar |
| 4 | External Bracket |
| 5 | External Ladder |
| 6 | External Frame |
| 7 | Partition Frame |

| | |
|----|-----------------------|
| 8 | Partition Frame Fixer |
| 9 | Lower Frame Fixer |
| 10 | Roof Stay |
| 11 | Roof Stay Fixer |
| 12 | Partition Frame Fixer |
| 13 | Lower Frame Fixer |
| 14 | Water Level Guage |

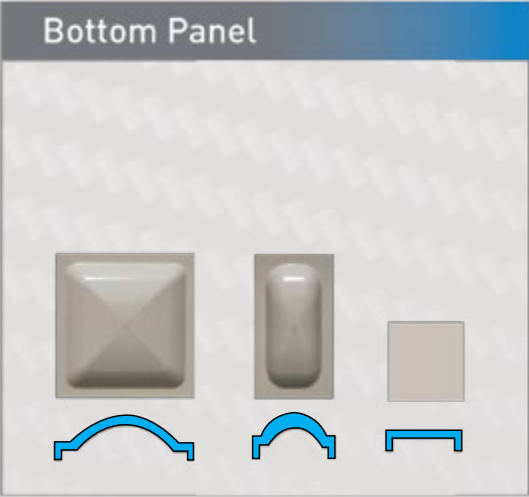
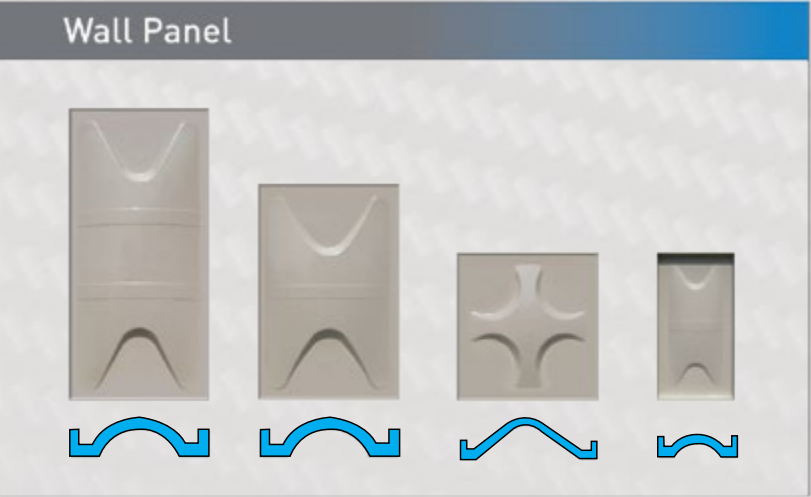
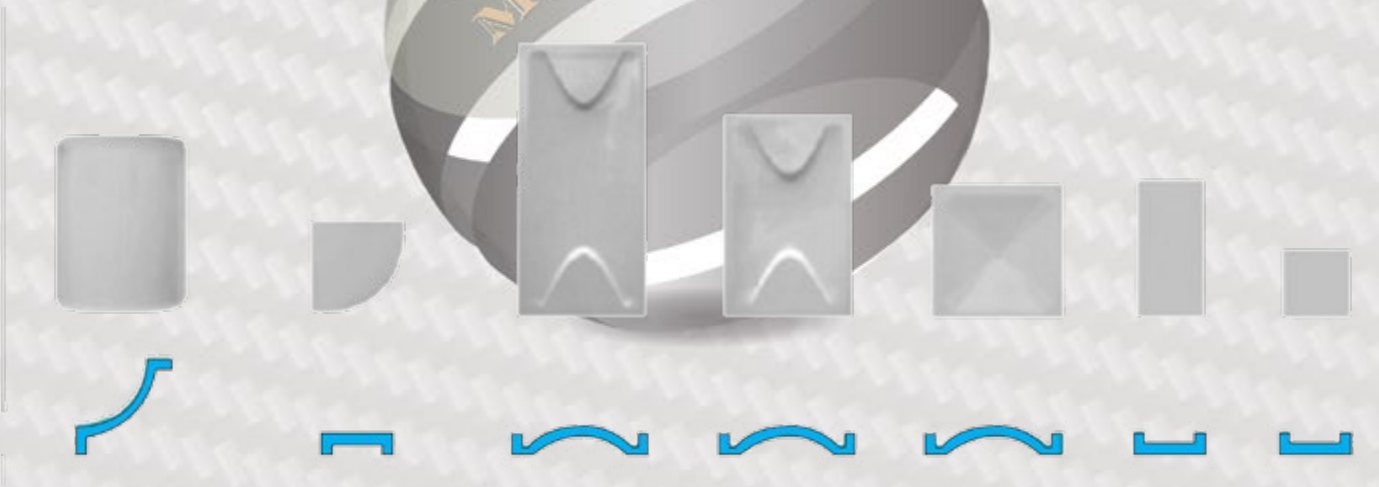


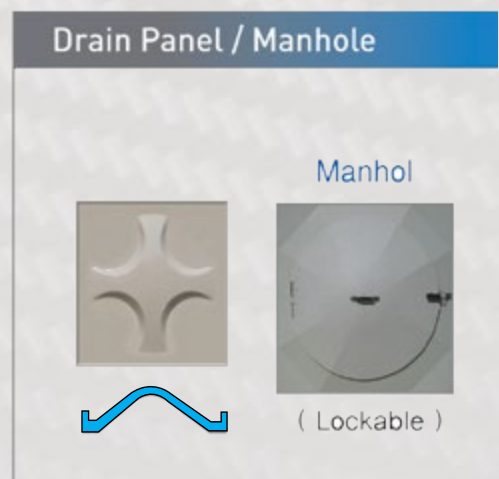
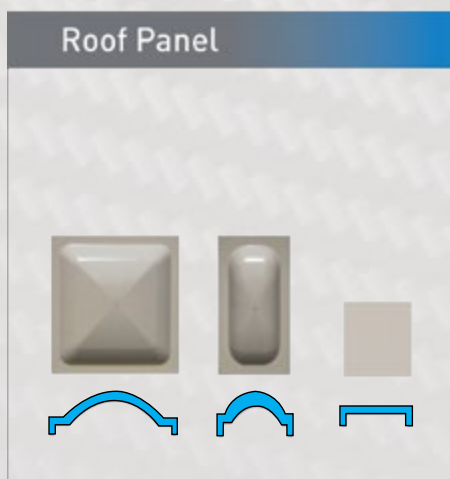
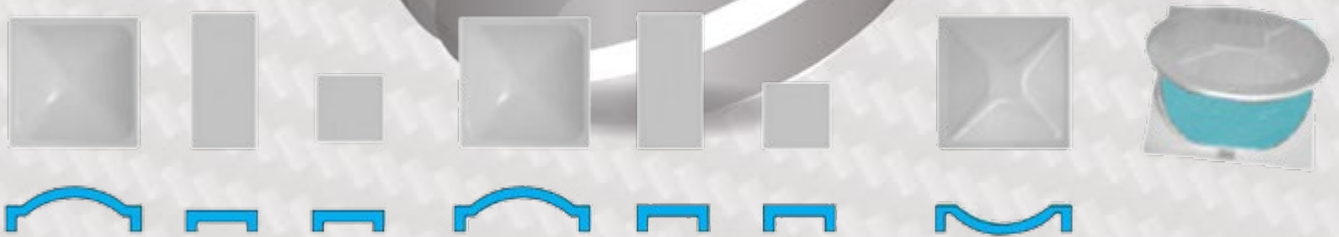
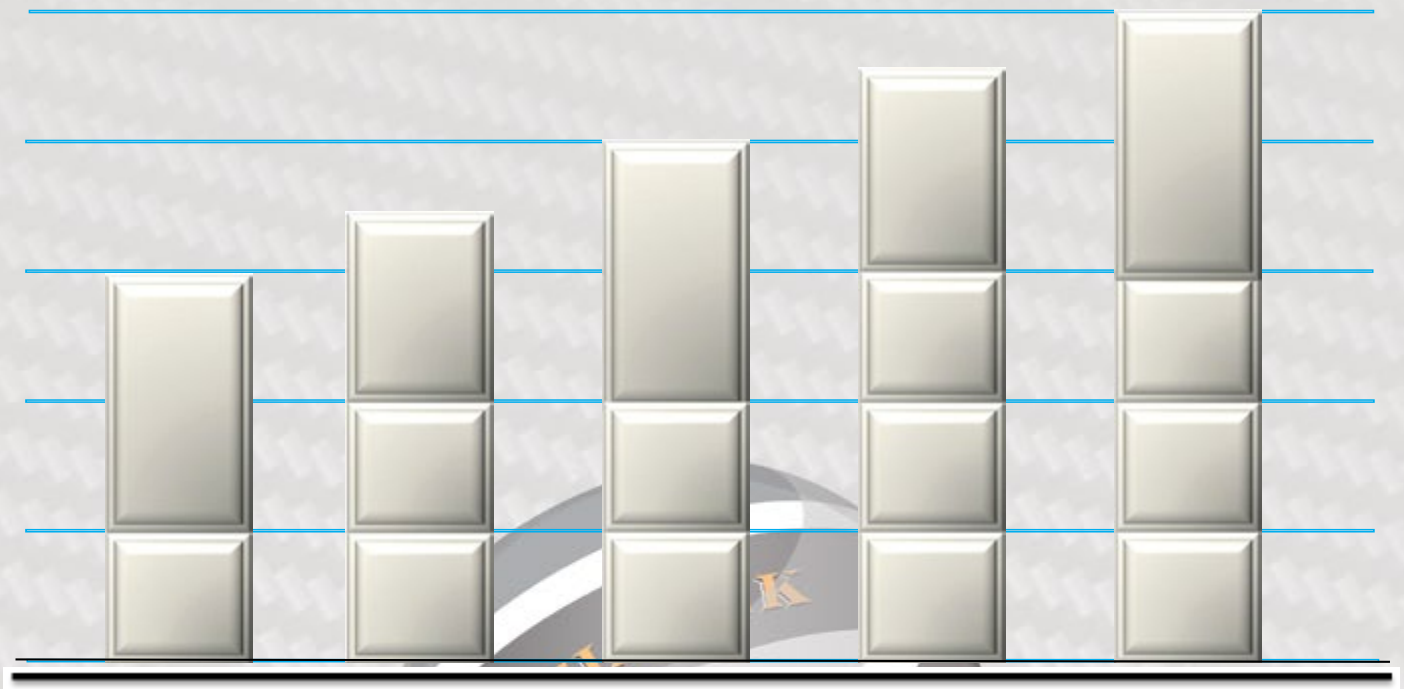
The main frame, sub frames, horizontal reinforcement are fixed & bond with each other

We introduce new design by using a panel of Round corner, a new concept that has a Structural Stability & Hygiene

Design Structure

Panel Composition by Height





Panel Characteristics

| Description | GRP |
|----------------------------------|------------------------|
| Specific Gravity | 1.8 |
| Glass Fiber Content | More than 40% |
| Tensile strength | 100 Mpa |
| Flexural modules | 16.4 Gpa |
| Flexural strength | 254 Mpa |
| Impact strength | 97 Kj/m ² |
| Density | 1800 Kg/m ³ |
| Compression / Shear strength | 100 Mpa |
| Young's Modulus | 93 Mpa |
| Barcol Hardness | 71 |
| Toxicity | NIL |
| ODP (Ozone Deflection Potential) | 0.00 |
| GWP (Global Warming Potential) | 1 |
| Odor & Taste | No Defects |
| Total Residual Chlorine | No Defects |

THERMAL CONDUCTIVITY

| | Thermal Conductivity Kcal/m hr°C (KJ/m hr°C) | |
|----------------|---|----------|
| Steel | 14.3 (59.9) | 24 (100) |
| GRP (Standard) | 3.0 (13.0) | 5 (21) |

THERMAL PROPERTIES

| Description | Value | |
|--|-------------------|--|
| Thermal Expansion | 2.16×10-5/°C | |
| Thermal Conductivity | (Single Panel) | 0.15 Kcal/m hr °C (630 J/ m hr °C) |
| | (Insulated Panel) | 0.02 Kcal/m hr °C (84 J/ m hr °C) |
| Coefficient of overall heat Transmission | (Single Panel) | 5.0 Kcal/m ² hr °C (21 KJ/ m ² hr °C) |
| | (Insulated Panel) | 1.0 Kcal/m ² hr °C (4.2 KJ/ m ² hr °C) |
| Water Absorption | Less than 0.05% | |
| Cavity | Less than 2% | |
| Light transmission | 0.00% | |

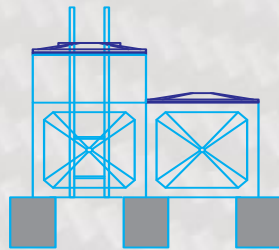
Panel Sizes

| | | |
|---|-----------------|---|
| 1 | Side Panel | 500 X 1000mm, 1000 X 1000mm, 1000 X 1500mm, 1000 X 2000mm |
| 2 | Bottom Panel | 500 X 1000mm, 1000 X 1000mm |
| 3 | Roof Panel | 500 X 1000mm |
| 4 | Partition Panel | 500 X 1000mm, 1000 X 1000mm, 1000 X 1500mm, 1000 X 2000mm |
| 5 | Drain Panel | 1000 X 1000mm |

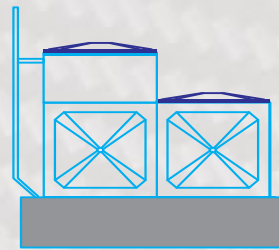
Chamber Box (Optional):

Float valve chambers shall be provided with central hinged lockable ABS lid with options of 1m x 1m with options for depth as 180mm, 300mm or 500mm having provision for type A air gap in compliance with BS6281: Part 1:1992

Chamber Box Front



Chamber Box Side

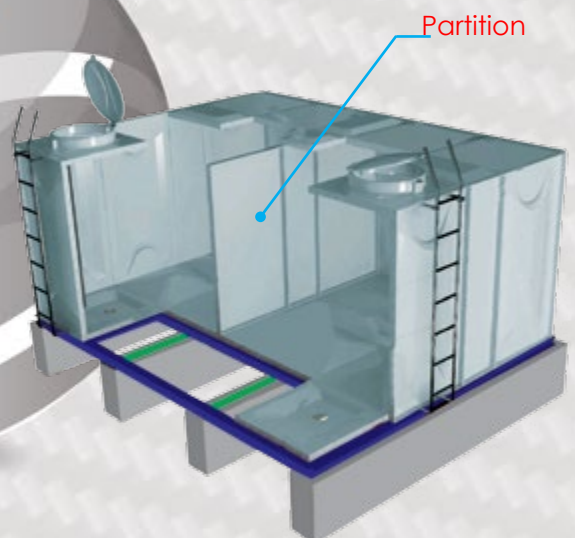


Partition Reinforcement

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

Features:

- Utilizing maximum in the basement or other confined areas, it is possible to eliminate unusable capacity space and utilize the maximum space, by installing a partition type tank.
- If partition type tanks are installed, one section can be used for various uses water and the other section for service water (firefighting etc.)
- 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.



Internal Compartment System:

If tanks for two different uses are needed in a confined area or boiler room, a 16 ton 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 install two tanks with a maximum of 6 tons, because you need to have 1 meter distance between tanks for maintenance and operating space.

1. Utilizing maximum capacity

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

2. Various uses

In partition type tank are installed, one section can be used for drinking water, and the other section for service water, (fire water tank)

3. Easy maintenance

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

4. Cost effectiveness

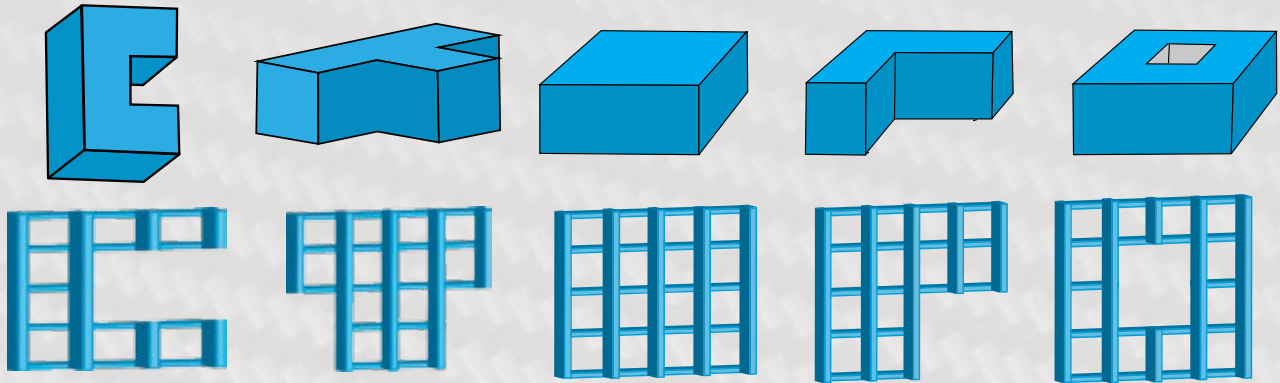
The cost and installation of 1 partition tank is cheaper 2 separate tank.

Free Capacity Design

Using panels of various sizes, the MULTANK utilizes horizontal and vertical space at the maximum and those are suitable for an underground reserve tank of large capacity. It operates a corner-type system.

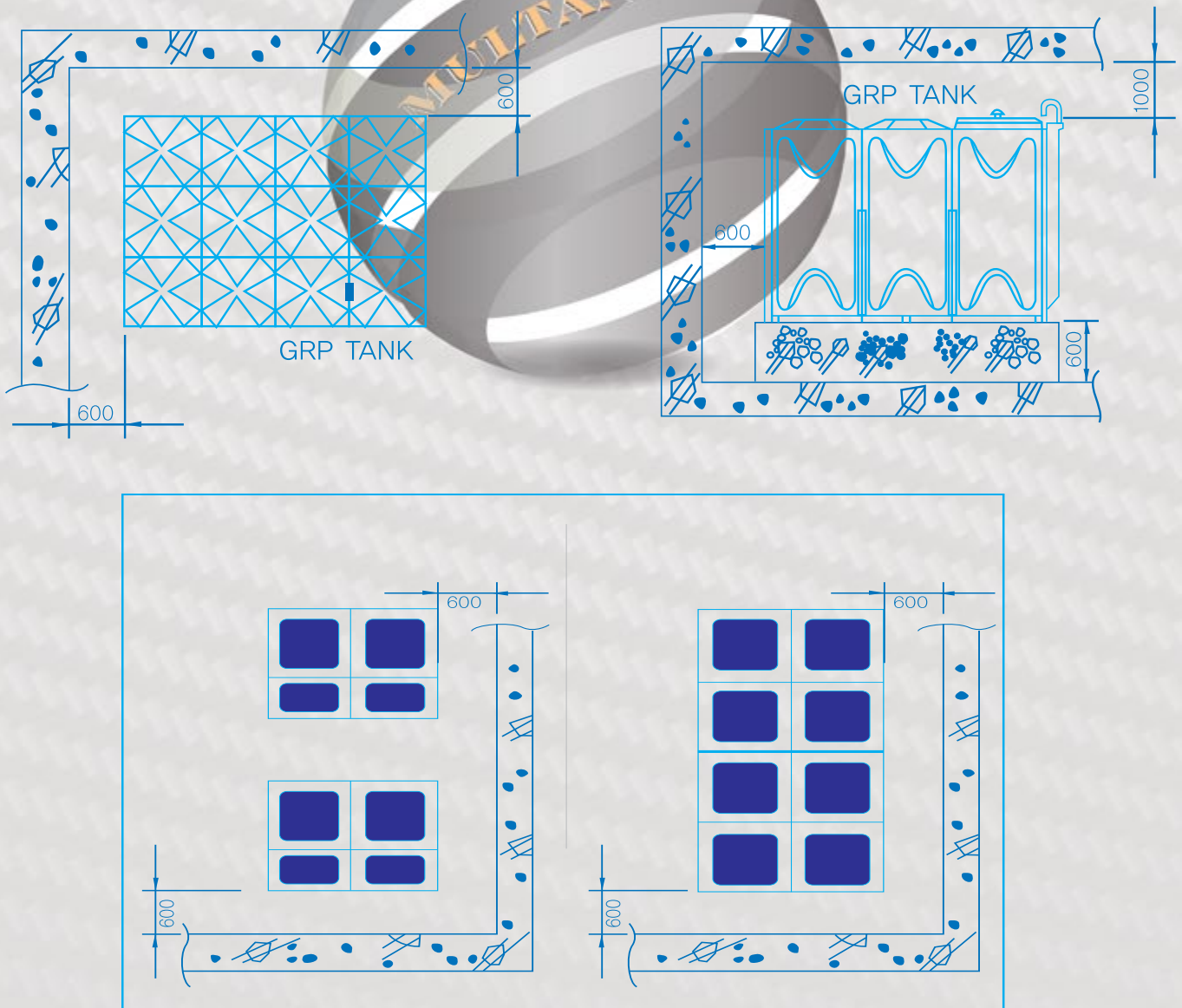
Possible Height to install tank: 1.0 M up to 5.0 M

Possible Capacity to install tank: 1Ton~5,000 Tons



Installation Space

A space for 600mm apart from the walls in four directions (1000mm for the upper part) is required for the installation of a tank and for its inspection & maintenance.

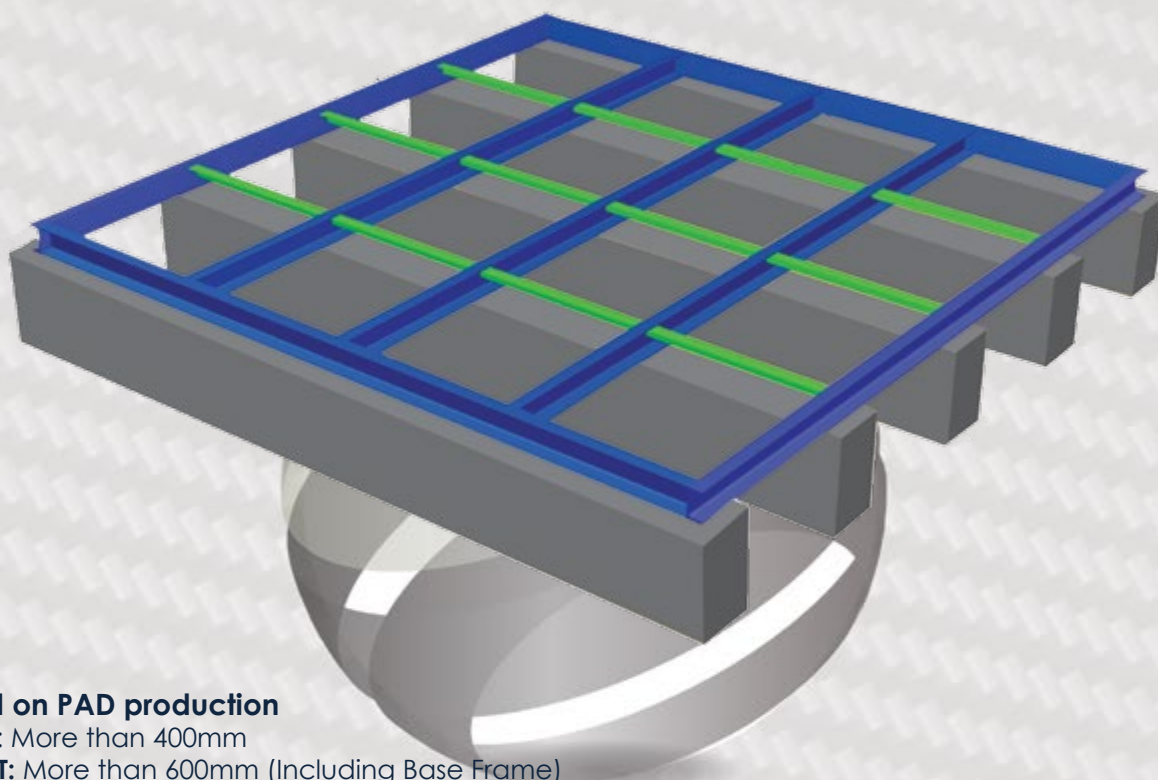


Skid Base

MULTANK reserves the right to provide alternate skid base designs. We recommend an ideal concrete plinth size of 400mm (W) x 475mm (H) with maximum variance in height of not more than 2mm.

External Base frame designed to BS729 HDG and the specification for materials used by tank specification is:

| Tank Height | Main Frame | Sub Frame | Design According |
|---------------|-----------------------------|----------------------|------------------|
| 2.5M Below | Angle 75 X 75 X 6t | Channel 75 X 40 X 5t | BS729 |
| 3.0 m & Above | Channel Frame 125 X 65 X 6t | Channel 75 X 40 X 5t | BS729 |



Based on PAD production

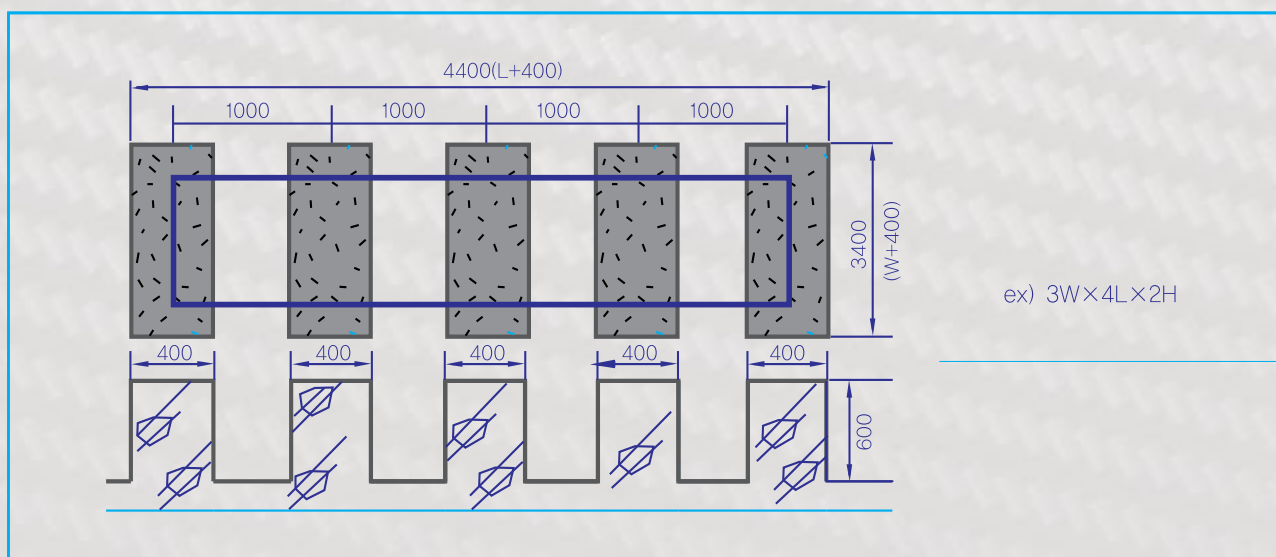
WIDTH: More than 400mm

HEIGHT: More than 600mm (Including Base Frame)

INTERVAL DISTANCE: Less than 1m max.

OUTLINE DIMENSION: W,L+400mm

Horizontality Degree: Less than 1/500(Maintains Smoothness at the upper part)



Scope of Construction

1. Foundation work

- The foundation work should be publicized by the customer with the specifications designed in consideration of ground endurance for the tank to be installed.
- Construction with anchor bolts will be done by our company
- The concrete strength for the foundation work should be more than 180kg/cm²
- The thickness of the finishing mortar on the foundation concrete should be less than 20mm.

2. Pipe work

- Our company supplies the sockets for piping in advance to the location requested by the customer. Therefore, customers should decide on the inlet and outlet for water, the overflow, and the size and location of drainage accurately when ordering the tank.

Cautions for Handling

1. Transportation

Take precaution to avoid any partial great force such as an intensified load or shock to the tank. Be sure to put buffering materials on the part where a rope or vehicle contacts.

2. Piping

- When doing piping work, install the support strut to prevent excessive load to inlets and outlets.
- Install the pipes beginning from the tank and take precautions to prevent a biased load.
- Avoid flammables when doing welding work

3. Repair and maintenance

- In case of non-use for a long period of time, be sure to drain the water from the tank
- Since the tank is for storing water for living, regular safety inspection is required. (More than twice a year)

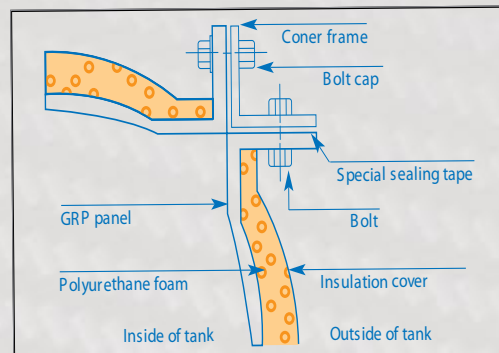
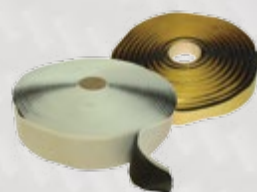
Regulations for Installation Criteria for Construction Foundation Work

- The upper part of a water tank shall be installed from more than 100cm from the construction and the other side be a distance of more than 60cm.
- The outlet for the water shall be installed at the bottom of the opposite side from the inlet and apart from the bottom of the tank so as not to discharge the sediments on the bottom. Install the water partition in order to prevent stagnation in the tank.
- Install more than one square manhole of which one side is more than 90cm or a round manhole of more than 90cm in diameter so that any person or equipment may enter for cleaning. Take the necessary actions to prevent any dust or foreign substances from entering into the tank through the manhole provided, the side or diameter of the manhole in a small tank of less than 5m³ in size may be more than 60cm for installation.
- For cleaning, hygiene inspection, and repair, a tank shall be partitioned into more than two parts, or more than two tanks shall be installed, except for the small-size tank of less than 5m³
- An alarm shall be installed for warning when the water level in tank exceeds or reduces to a certain level. The alarm receiver shall be installed in the control center.
- In the event that the tank is installed underground, it shall be installed more than 5 meters away from toxic facilities such as excretions or wastes faculties and equipment shall be installed so that people cannot access around the manhole easily. In the event of an unavoidable situation where the tank has to be installed not more than 5 meters away from toxic facilities, a blocking fence shall be installed around the tank.
- The materials for the tank and the ladder to the tank, etc., shall be anti-corrosion such as fiber reinforced plastic, stainless steel, concrete, etc.
- A pipe for air purification and the overflow pipe for controlling the water level shall be installed in the tank. Take actions to prevent any polluted substances such as insects from entering into the pipe.

Accessories

MULTANK Sealant Tapes have following features:

- Excellent adhesion to a wide range of substrates
- Good UV resistance
- The foam component allows good compression without squeezing the sealant out of the joint
- Good resistance to mild acids and alkalis
- Can be repositioned during tank construction if applied foam-side down
- Easy and accurate to use with little waste and no mess

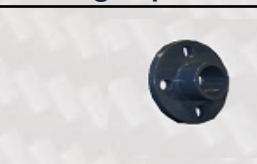


Sealing Tape



Water Level Indicator:

"MULTANK uses Level Indicator consists with a glass or transparent tube protected with Aluminum case having one safety valve in the bottom. The level indicators are available in all sizes up to 5 meters."



Flanges

Flanges shall be of upvc type.



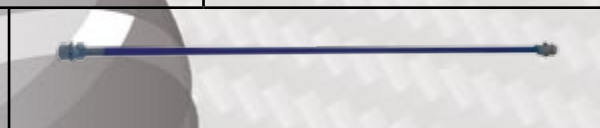
Ventilation

"The air vents used by MULTANK are ABS material (50mm or 100mm) with PE insects guard



Roof Support.

"Used GRP / FRP which is same material for the panel, contains no rust and does have excellent mechanical strength"



Tie Rod

All tie rod is a slender structural unit with PE \mesh coating used as a tie and (in most applications) capable of carrying tensile loads only.



Internal Ladder : FRP/GRP (Optional SS)
External Ladder: HDG (Optional SS)



Rubber Head Bolts: SS316/A4,
Assembly Bolts: SS304/A2 & 316/A4, Bolts for Skid Base
Frames: HDG

| | | | |
|-------------------------------|--------------------------|--------------------------|-----------------------------|
| | | | |
| Anchor Bracket (HDG) | Brass Socket | Wall Bracket (HDG/SS316) | |
| | | | |
| Steel Skid Base – Channel HDG | External Mainframe (HDG) | Wall Bracket (HDG/SS316) | Partition Main Frame SS 316 |