

EXEED ENGINEERS (I) PVT. LTD.

**GRP Tank
Installation & Maintenance**



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About US

Our Main Address :
Exeed Engineers (I) Pvt. Ltd.

**D - 126, Sathangadu Iron & Steel Market,
Manali, Chennai - 600 068.**

Contact Person :

Mr. Selvaraj, 8939899381
Mr. Balaji, 7200093245

Mail id : exeedengineers@gmail.com

Web : www.exeedtanks.com

- **Company:** Exeed Engineers (I) Pvt. Ltd.
- **Established:** 2012
- **Location:** Chennai, Tamil Nadu
- **Specialization:** GRP Sectional Water Tanks
- Initially offered tank repair services
- Focus on product innovation and quality improvement
- Specialized in Hot Pressed Moulding Sectional GRP Water Storage Tanks
- Dedication to product development and process innovation

Other Branches Located at **Bangalore, Secunderabad, Trivandrum** to reach our Customer easier and faster.

GRP/FRP Material & its Properties

GRP is also called as Composite Plastic or FRP.

Main advantages of fiberglass

- Strength and durability.
- lightweight material, yet it is also very strong and can withstand a great deal of stress and strain.
- Fiberglass is also resistant to heat, chemicals, and moisture.

GRP Applications

- Water Tanks & Water Pipes
- Wind Turbine Blades
- Hand railings
- Electrical & Electronic Enclosures & Safety Grating

GRP is made of

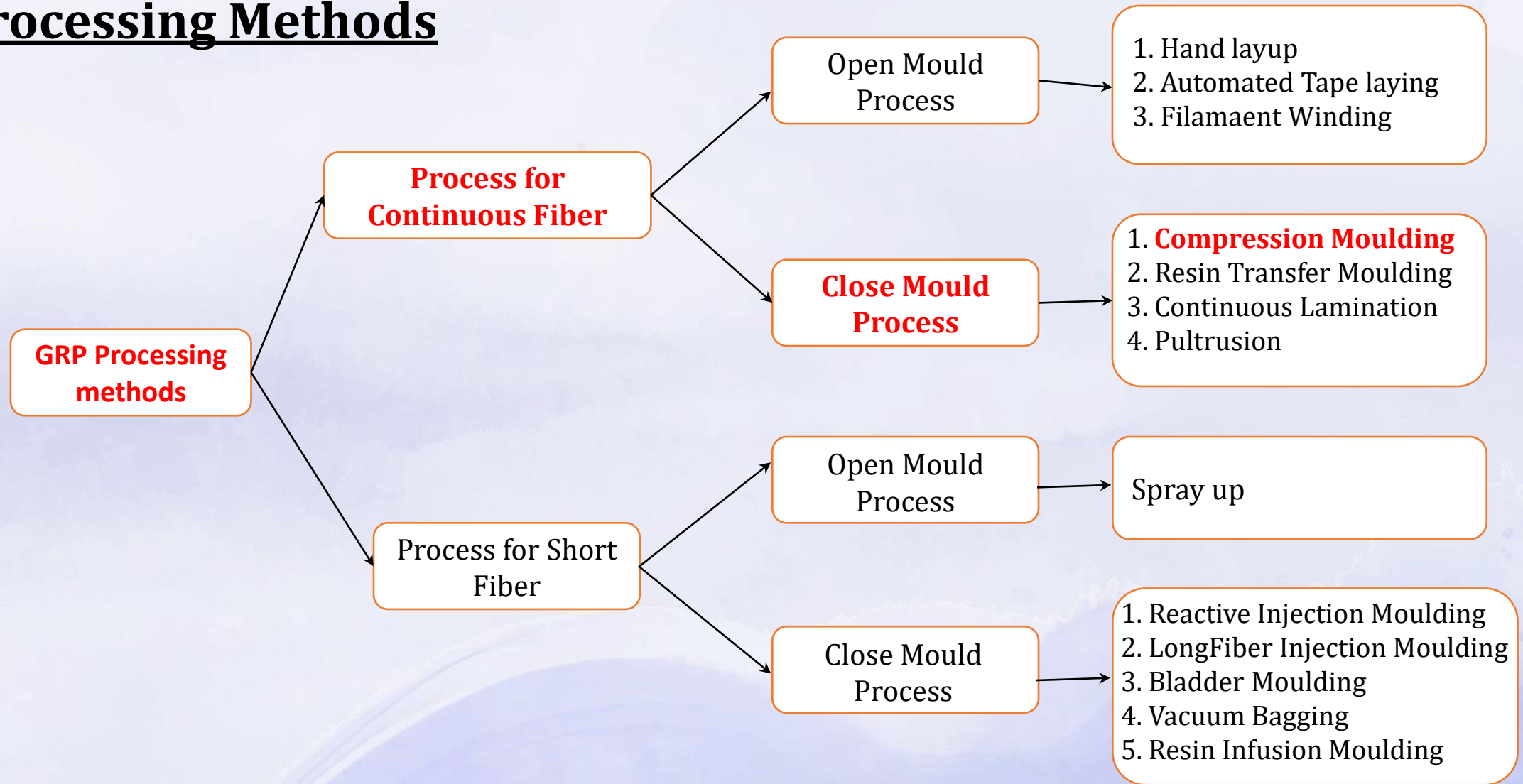
Synthetic Resin
used as a Binder

Glass Fiber
Greater Resistance
(Tensile Strength)

GRP Properties

- Thermal insulation
- High strength-to-weight ratio
- Does not melt
- Chemical resistance
- Corrosion resistance
- Good insulation to heat and sound
- Easy to shape

GRP Processing Methods





Sheet Moulding Compound(SMC) is the raw material consists of

- ❑ Glass fibre
- ❑ Polyester resin
- ❑ Fillers
- ❑ Catalyst

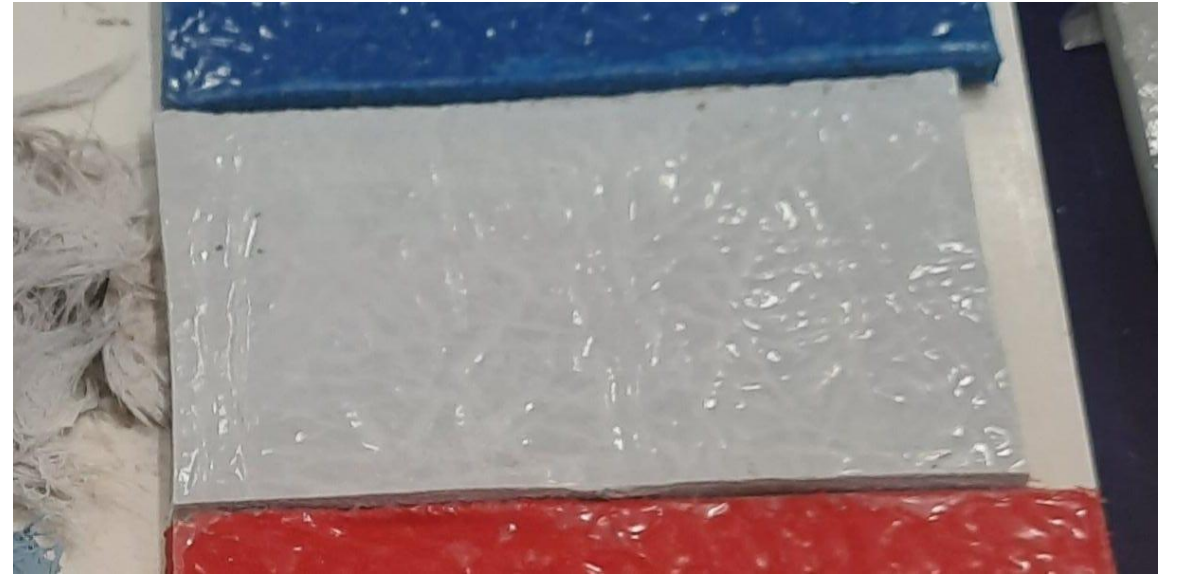
Glass fiber, often spelled “Fibreglass” is a lightweight and durable material made from extremely fine glass fibers. These fibers are typically woven into a fabric or used as a reinforcement material in various applications.



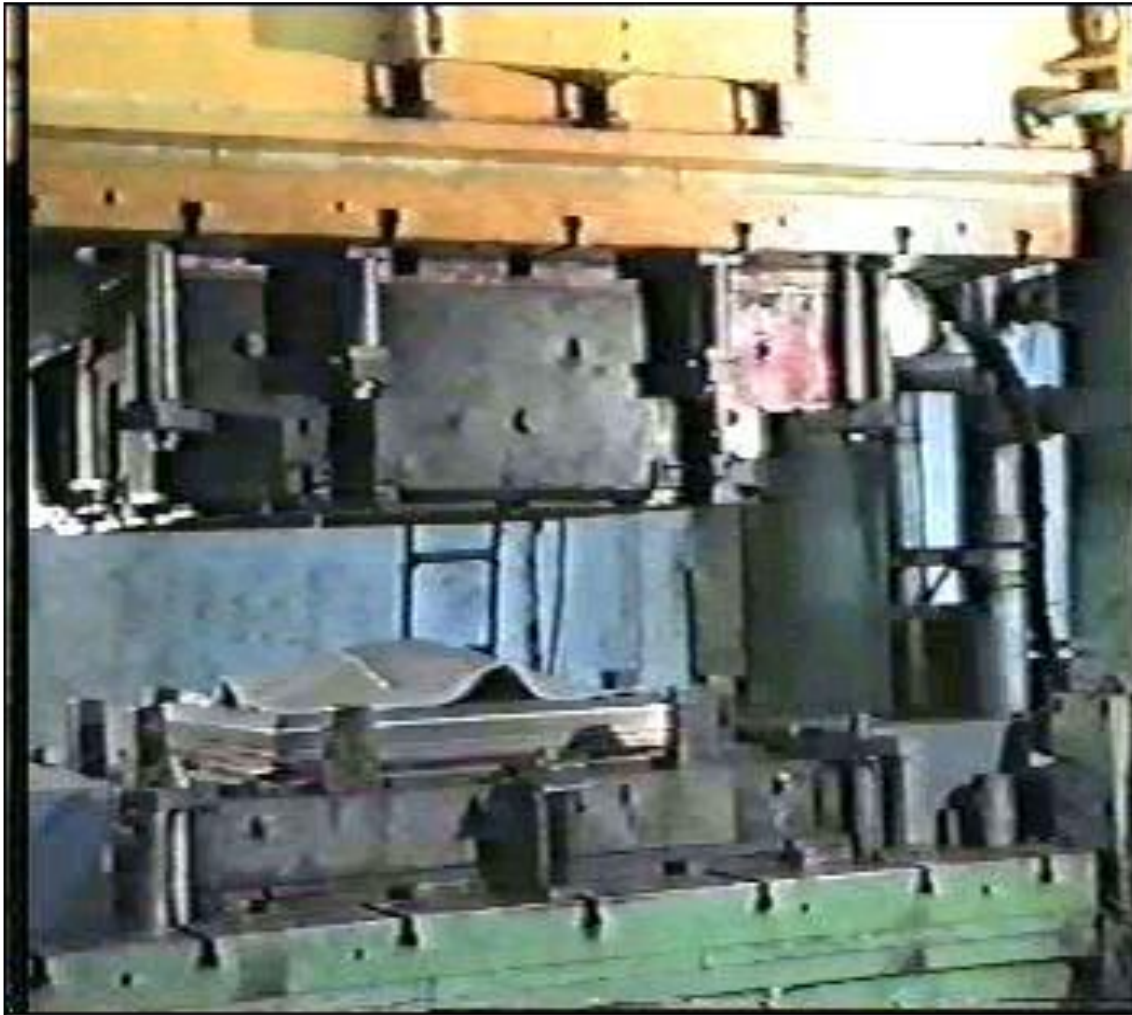


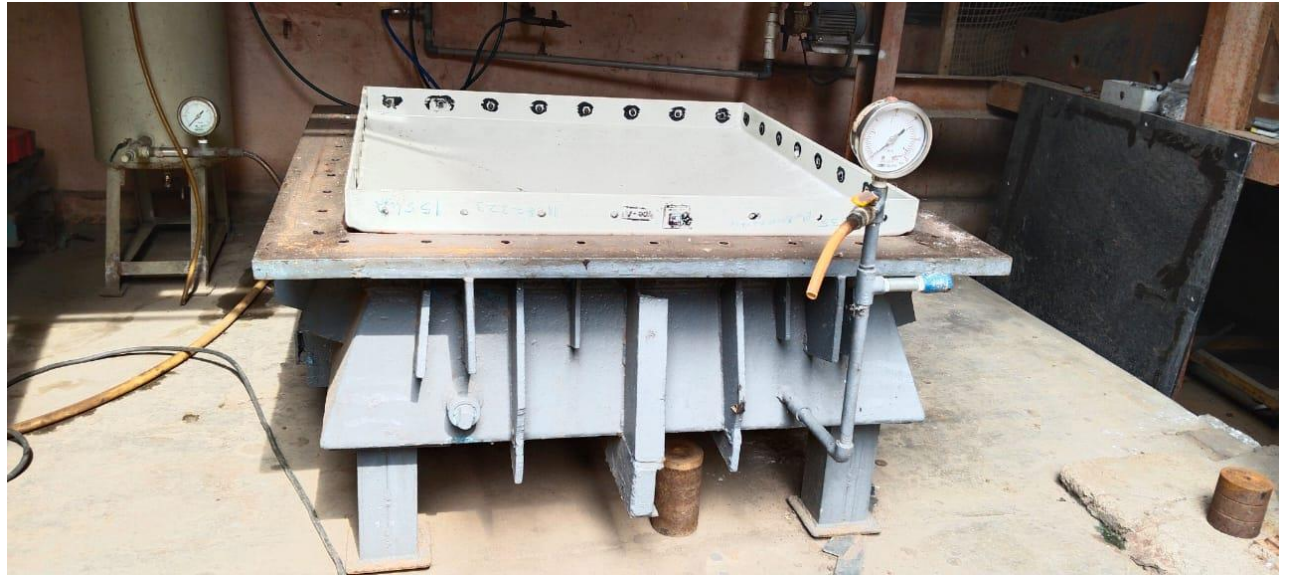


Woven Roving



SMC - RAL7035







Gang Drilling Machine



Why to Choose GRP sectional water Tanks ?

Sheet moulding Compound (SMC) is a pre-made GRP/FRP material primarily used in Compression moulding processes.

The Water tank Panels (Base, wall and Roof) are made of bolting type square panels, which are moulded under high heat and pressure.

The Advantages of GRP sectional water tanks are

- Corrosion Resistance
- Light weight and High Strength
- Customizable sizes and shapes
- Hygienic and non-toxic material suitable for storing potable water
- Ease of Installation
- UV Resistance
- Non - Conductive and Fire resistance
- Easy to handle and Transport

GRP Tank Support System

GRP Tank Side walls can be supported by	
Internal Support System	External Support System
The side walls of the tanks are supported internally	The side walls of the tanks are supported externally
One support - Internal horizontal support provided by tie rods at the center of the tank, passing on either side of the tank.	Two Supports - External vertical support and external horizontal support provided by tie rods at top of the tank will be passing on either sides.
Panels are punctured to fix the internal tie rods.	External supports can be provided either by simple steel sections or by steel clamps.

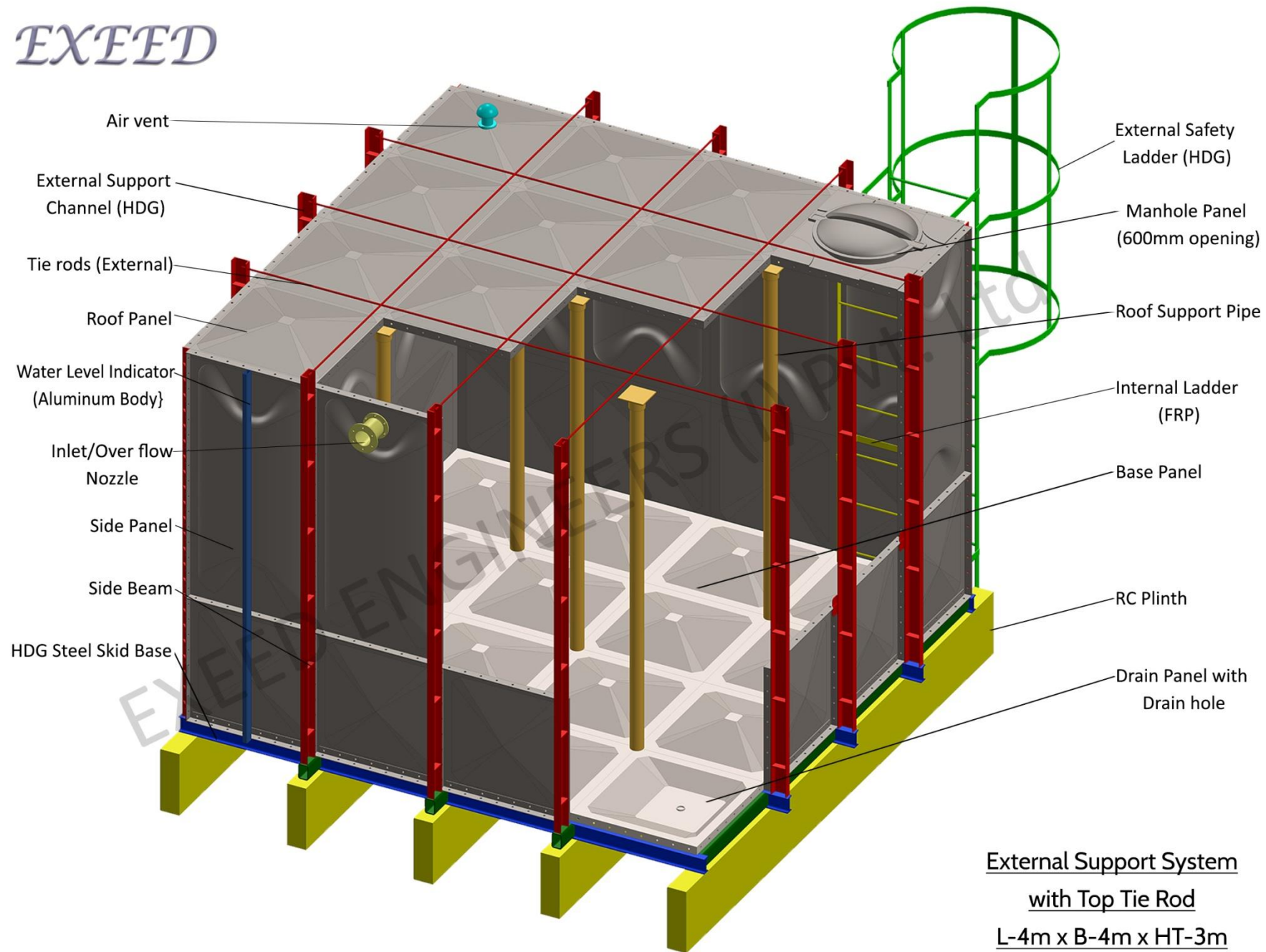
GRP Tank Support System

Internal Support System



External Support System





EXTERNAL BEAM SUPPORT WITH SKID BASE ARRANGEMENT



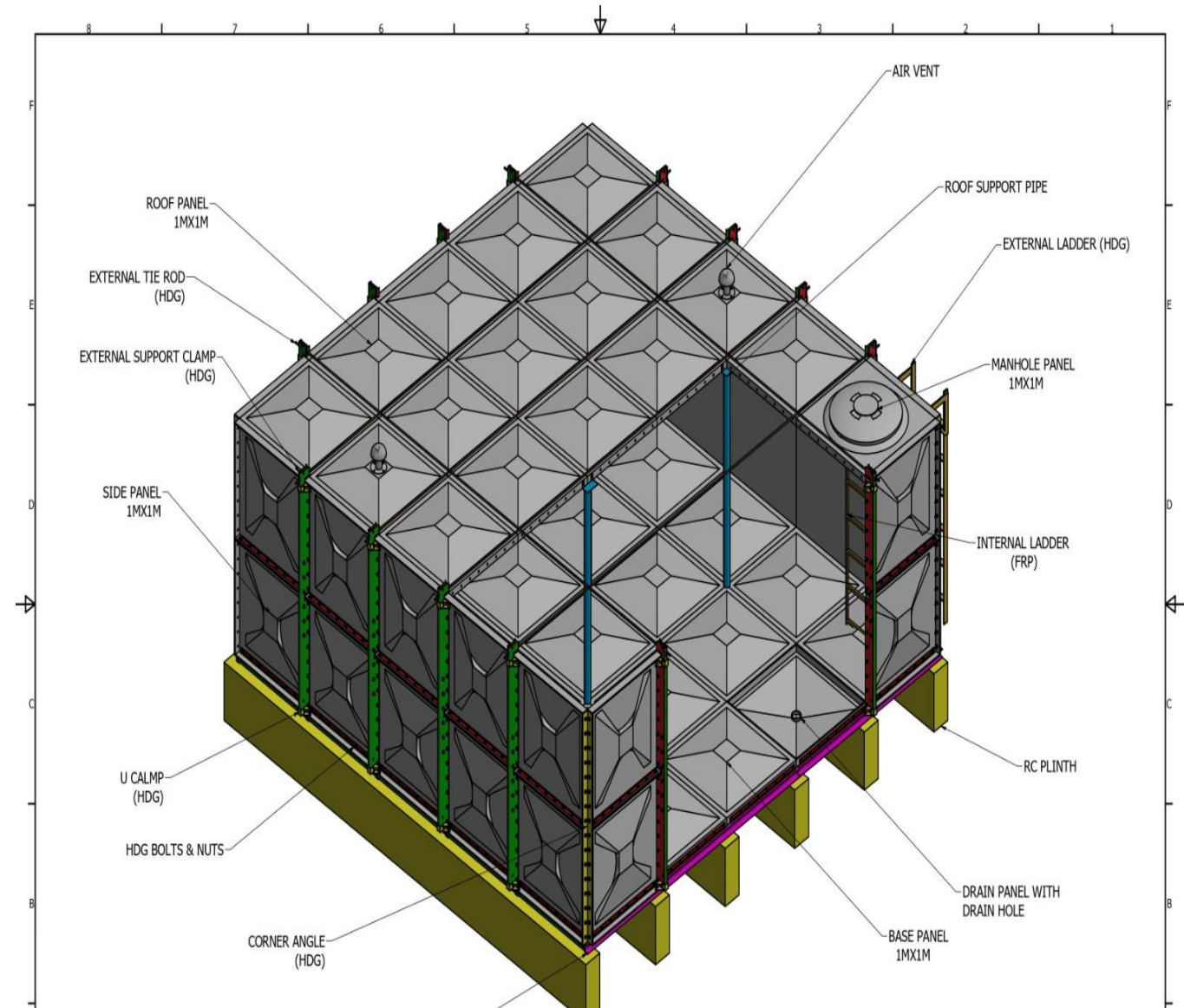
External Supports - Welded



External Supports - Painted

proof mesh. 4. PVC foam gaskets for panel sealing 5. All nuts & bolts are of M12 x 45 Hot Dip Galvanized. 6. HDG External ladder and FRP Internal ladder. 7. HDG External Supporting Clamps at every 1m intervals. with all necessary incidental works, lead and lift etc., complete and as directed by the Engineer-in-charge. (All labour and materials to be supplied by tenderer/contractor only) "

"Trucking out of 52kg Cl.II rails from available location within Chennai division to the

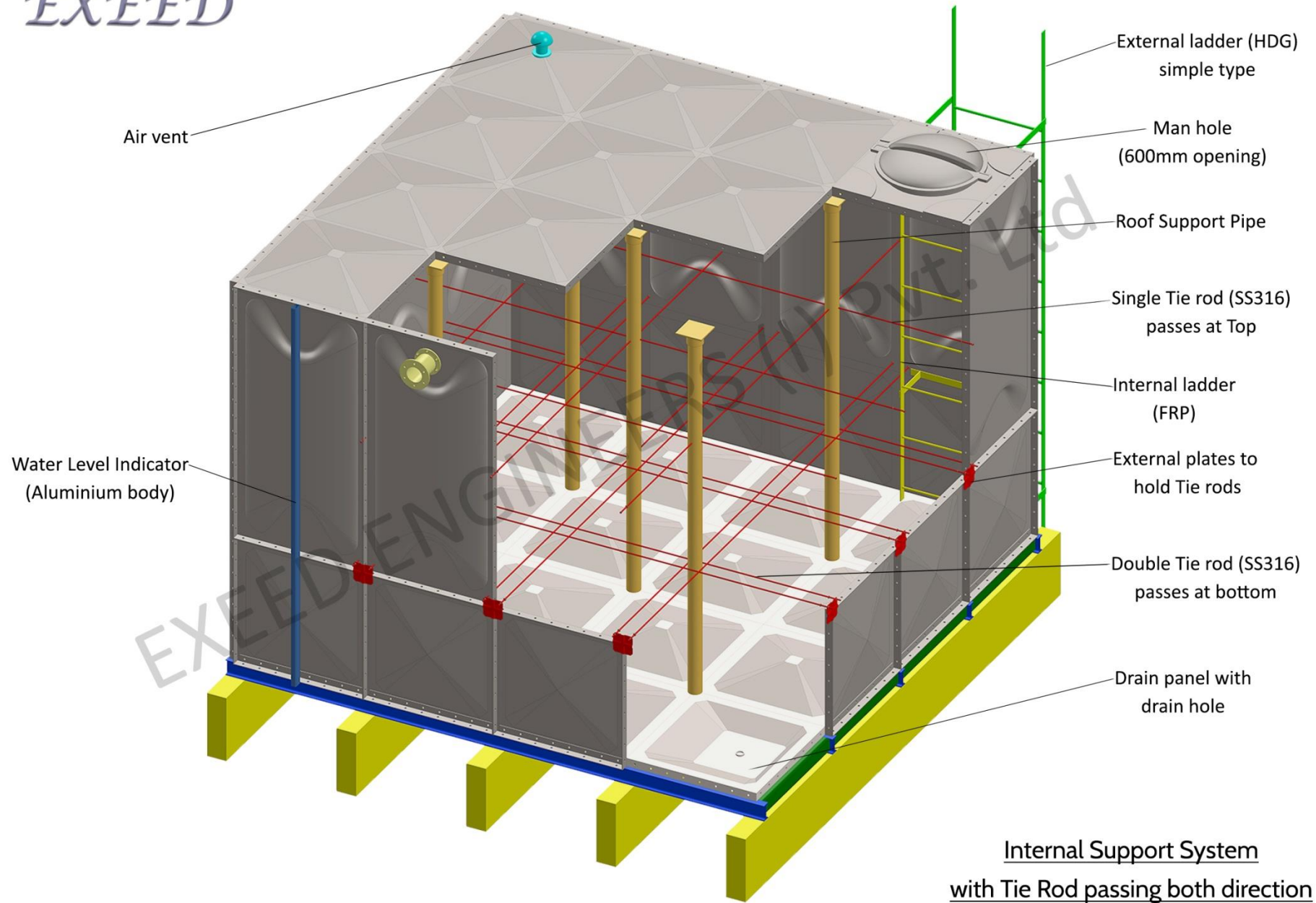




Top Tie rod Arrangement



EXEED



Internal Support System
with Tie Rod passing both direction
L-4m x B-4m x HT-3m

Exeed Tanks

GRP Tank Support System

Advantages of External supporting Steel clamps

1. These clamps are lightweight, making them easier to handle, and their high- strength profile enhances their durability.
2. The clamps are directly fastened to the panels, preventing the stress from bolts from directly affecting the panels.
3. By attaching these clamps directly to the panels, deformations at joints caused by external air pressure can be avoided.
4. Unlike steel sections, welding is not necessary when using these clamps.
5. Tie rods for these clamps serve as additional support, while steel sections require tie rods at the top as a mandatory structural element.



GRP Tank Internal Support System

Why Avoid Internal Tie Rods?

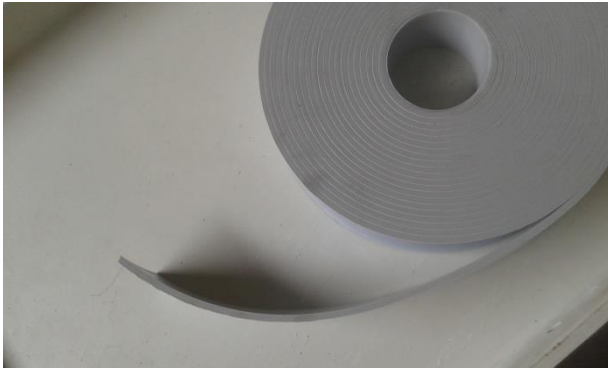


The decision not to support the internal tie rod system is likely based on several reasons that become evident after a few years:

- Corrosion
- Leakage
- Panel Weakening
- Difficulty in Maintenance

Internal Tie Rod Assembly





PVC Gasket



Gasket Layup



HDG Fasteners



2m clamp mid
arrangement



Roof support plate



Roof support
arrangements



Corner angle



Corner angle assembly



Airvents



Internal FRP
Ladder



Clamp arrangement



Spring washer

Providing of Top tie rods



Tank Before Repair



Tank After Repair



Tank Before Repair



Tank After Repair

Installation of GRP Water Tank

Installation of GRP tank are carried out as per IS 14399 (Part 2).

Site Inspection

The following are inspected at site before Tank Installation

- Selected Beam as per drawing, Levelling of Steel base, Dimension as per drawing
- Scaffolding : If the tank is to be installed on elevated structure, proper scaffolding arrangement at the base of the tank for assembly.
- Lifting arrangement for panels & Hardware.
- Electricity near to the site.
- Safety Hand rails & Ladders.

Installation for GRP Tank

Pre - Installation Preparation

- Safety Instructions to the technicians.
- Necessary Tools near the assembly area.
- Required Panels & Hardware to be shifted near the assembly point.
- Panel flanges are inspected for dust free, for gasket laying.

Tank Installation

- As per Method of Statement, Assembly of Panels are done.
- Tank external support assembly with the side panels.
- Internal pipe support and plates connection with roof panels.
- Finally complete fixing of air vents, Tie rods and Ladder assembly.
- After completion of Tank, identify any gaps in-between tank and structure.

Installation of GRP Water Tank

Final Inspection of Tank

- After completion of Tank, identify any gaps in-between tank and structure.
- Ensure the tightness of Fasteners & Tie rod joints.
- Ensure the Inlet/Outlet/Overflow holes are done as per drawing.

Water Testing

- Ensure proper support for pipes so that load of pipes is transferred to steel structure or ground.
- Water to be filled as per the following procedure
 1. Initially fill up to 50% of tank volume and let the tank free for 6 to 8 hrs.
 2. Observe for any leak, if identified, study the reason and rectify at this stage.
 3. If no leak, fill the tank up to overflow and leave it for 24 hrs.
 4. Observe for any leak, if identified, study the reason and rectify the same.

Reasons for GRP Water Tank Failure

Factors for Failure	Reasons	Solution
Air Pressure inside the tank	Inadequate venting during water filling causes <ul style="list-style-type: none">• Increased air pressure.• Excess load and force on base and side walls• Risk of bulging and structural damage.	Proper air vents should be provided in required numbers and ensured not to be blocked.
	Inability for atmospheric air to enter during water drainage. <ul style="list-style-type: none">• Vacuum formation within the tank.• shrinkage of the tank's side walls due to the vacuum effect.	

Reasons for GRP Tank Failure

Factors for Failure	Reasons	Solution
Levelling of steel base	<ul style="list-style-type: none">- Use shims to fill substantial gaps between panels and structure.- Displaced shims can cause bottom panel sagging under water load.- Neglecting the issue can result in bottom panel cracks.	<ul style="list-style-type: none">- Address beam issues during pre-inspection.- For larger gaps, weld supports to the structure after initial water filling.
External stress on panels	<p>If the weight of the pipe is supported by the panels, it can significantly damage the specific panel.</p>	<p>The supports for the pipe should be installed in a manner that ensures the total load is transferred to the nearby rigid structure or the ground.</p>

Reasons for GRP Tank Failure

Factors for Failure	Reasons	Solution
Internal Vertical Supports	If the vertical supports are displaced, it can result in the top panels sagging inward, which can weaken the side walls.	The vertical supports should be connected to the roof panels.
Internal Tie rods	Over time, cracks may develop at the points where the tie rods are inserted due to stress in both conditions, whether the tank is filled with water or empty.	Avoid Internal Tie rod Supports
Top Tie Rod broken /removed from supports	Top tie rod adaptor may be removed	Once in a year, the same can be inspected.

Reasons for GRP Tank Failure

Factors for Failure	Reasons	Solution
External Vertical Supports	If the vertical supports are welded with base structure, if it is unnoticed for a long period of time, the rust will weaken the area where welding is done. To prevent this, painting should be applied at regular intervals	External vertical support clamps can be used as an alternative, eliminating the need for welding, and these clamps can be securely fastened to the panels for added support.
Inspection & Maintenance	The lifespan of the tank can be significantly reduced if regular maintenance is not conducted.	Regular periodic inspections at predetermined intervals will help identify issues at an earlier stage, allowing for timely rectification.

Reasons for GRP Tank Failure

Other Reasons for Tank Failure

- Poor Installation
- Panel Crack
- Aging
- Improper Maintenance
- External Pressure or Stress
- Foundation Settlement
- Natural Calamity

Periodical Inspection & Maintenance

Life Span of GRP/SMC Panel tanks is 40 years with following **Periodical Inspection** (at every 1 year Intervals) :

1. Any water leakage/seepage in any Bolts/Joints of Panels.
2. Any Panel damages.
3. Manhole Lid in closed condition.
4. Support Pipes and ladder inside the tank are in place.
5. Damage/Rust in Steel Base Support.
6. Pipelines supports are Proper.
7. Any Blockage at Overflow & Air vents.
8. Packing in-between Panels & Steel structure
9. External Vertical Support & Top Tie rod are in contact

Periodical Inspection & Maintenance

Periodical Maintenance:

1. Cleaning & Draining of Tank periodically as per the quality of water.
2. Periodically painting the tank's side walls and roof at intervals of 4 to 5 years after our warranty period can significantly extend the durability and improve the tank's performance.
3. Periodical painting of Steel structures and Pipe line support.

Colour of Paint : Epoxy or PU Paint - RAL 7035 or nearer colour.

- Suggested Spray Painting.

Features of Exeed GRP/SMC Panel Water Tank

Our SMC/GRP panel tanks will be EXTERNALLY STIFFENED and will not have any steel member inside the tank.

- Inlet / Outlet Provision** : All our side panels are designed to accommodate holes up to 4" dia with flange type fittings.
- External Support & Top Tie Rods** : Hot Dip Galvanized to ensure long life, eliminating the need for painting.
- Sealant Gasket** : Panel joints will be properly sealed with PVC foam sealant gasket.
- Roof supporting Pipe** : PVC roof support pipes are used alternatively at every joint to prevent sagging of the roof panels
- Internal Ladder** : FRP Internal Ladder
- External Ladder** : Hot Dip Galvanized (HDG) Ladder - 1no / tank

Features of Exeed Tanks

Material Description	Standard	Material	Design
Hot Pressed Panel	IS 14399 (Part1)	GRP/SMC	Working Pressure 1m ht tank - 0.1 bar Working Pressure 2m ht tank - 0.2 bar
1. Bottom Panel 1mx1m			
2. Side Panel 1mx1m			
3. Roof Panel 1mx1m			Designed to support a human load and side walls of the tank.
Fasteners - M12 gr 5.6	IS 1367	Hot Dip Galvanized	Tensile resistance is 30 KN. (8 bolts/mtr at an equal pitch)
Corner Cup		Hot Dip Galvanized	To provide additional strength to the base panel joints, ensuring that water does not leak or sweep out.
Air vents		Hot Dip Galvanized	Calculated for air flow 1cum/min.

Features of Exeed Tanks

Material Description	Material	Design
Flange Support angles	Hot Dip Galvanised	This ensures that the fasteners are resting directly on the flange support 'L' channels rather than the SMC panels, preventing the stress of the bolts from directly affecting our panels.
Spring Washer	Hot Dip Galvanised	To prevent the loosening of bolts.
External supporting clamp	Hot Dip Galvanized	No welding is necessary for this installation.
Top Tie Rods	Hot Dip Galvanized	They are positioned all around the tank to support the side-clamps and top panels to enhance the overall tank rigidity.

All MS parts are Hot Dip Galvanised as per IS 2629

Exeed Tanks & Test Results

Exeed Panels are manufactured inhouse and the same are tested as per standard IS 14399 (Part1) and the results from CIPET (Central Institute of Plastics Engineering & technology) are as follows.

Sl. No.	Property	Method	Unit	Specification	Results
1	Tensile Strength	IS 14399 (Part 1) Annex B	MPa	(min) 70	102
2	Bending Strength (Cross-breaking)	IS 14399 (Part 1) Annex C	MPa	(min) 100	168
3	Elastic Modulus in Bend	IS 14399 (Part 1) Annex D	MPa	(min) 6,000	10,941
4	Glass Content	IS 14399 (Part 1) Annex E	%	(min) 25	43
5	Barcoal Hardness	IS 14399 (Part 1) Annex F	BHU	(min) 50	63
6	Water Absorption	IS 14399 (Part 1) Annex G	%	(max) 0.5	0.15

Exeed Tanks & Test Results

The Pressure test for GRP panels of Types A, B, and C should withstand the hydrostatic pressure as specified in Annex H of IS 14399 (Part 1) without bursting, cracking, or leaking. The following deflection in the panels are noted as against 10mm permitted as per IS code.

Type of Panel	Thickness of Panel	Ht. of Tank in 'm'	Wt. of Panel in 'kg'	Hydrostatic Pressure in 'bar'	Deflection in mm	Permissible deflection as per IS code
A	3mm	1	15	0.4	1.9	10mm
B	4mm	2	18	0.8	3.4	10mm
C	5mm	3	20	1.2	4.5	10mm

IMPORTANT POINTS TO BE FOLLOWED WHILE USING SMC/GRP PANEL WATER STORAGE TANKS		
S.No	Do's	Don'ts
1	Keep manhole Locked to prevent the unauthorized entry	Do not use Acids/Alkalis/Wire brush for cleaning the tank.
2	clean the tank regularly if drinking water used	Do not drop heavy object into the tank.
3	Support ladder foot from Floor level	The tank overflow should not be blocked at any point of time as over filling will permanently damage the tank.
4	Inform our service department person after any natural calamity like earth quake, fire etc.,	Do not disturb the bolts/nuts as they are set to recommended torque.
5	Support all pipe lines from ground level.	Do not store any other media other than water.
6	Periodically check that PVC roof support pipes inside the tank are in place.	If PVC roof support have been displaced from its original position, Do not walk on the tank.
7	Periodical painting and maintenance of the SMC panels, Steel Stiffeners of the tank is required, Which will help extended durability and better performance of the tank.	<ul style="list-style-type: none"> - Do not allow overfill of tank beyond overflow Point. - Do not use high impact equipment on civil foundation of the tank. - Don't support any compressive load on the roof/side of the tank.

Frequently Asked Questions

Q : How to ensure the materials supplied are as per standard ?

A : By Supplier Material Test Certificate & Physical Inspection of Materials

Material TC

1. Panel - Material TC
2. Gasket TC
3. Fasteners TC
4. Galvanising TC

Physical Inspection

1. Grade of Fasteners
2. Galvanised Material

Q : How to ensure the Assembly of Tank is as per standard ?

A : As per IS14399 (Part 2), the tank assembly can be carried out using two standard methods: the Internal Support System or the External Support System. The choice between these methods can be made based on their respective advantages. When finalizing an order or arranging for material supply, it is recommended to request the supplier to include a list of materials to be provided, along with their respective features.

Frequently Asked Questions

Q : What are the site Pre-inspection to be done before tank Installation ?

- A :
1. Selected Steel Strength and interval dimension should be ensured with Supplier.
 2. Top Surface of the welded steel should be in level, so that the panel will sit properly in steel structures.
 3. Joints of Steel sections are properly strengthened
 4. Any undulation or bend in Steel section
 5. Painting of Steel Structure.
 6. If the tank is intended to be placed on elevated structures, it's necessary to install scaffolding at a 1-m level below the steel base to facilitate tank assembly.

All the above will be inspected by our Engineer and Customer also should aware.

Q : What is the importance of Roof Panel ?

- A :
- The roof panel serves not only as a cover for the tank but also needs to withstand the weight of a person and provide support to the side walls of the tank. Our minimum roof panel weight is 12 kilograms to meet these requirements.

Frequently Asked Questions

Q : What is the Panel Thickness and its weight ?

A : The Thickness and Panel weight are as follows

Panels	Wall Thick min. in mm	Flange Thick min in mm	Weight in Kgs
1m ht - Base & Side Panel	5	10	15
2m ht - Base & Side Panel	4	10	18
Top Panel - 1m & 2m Ht	3	10	12

Q : Where Spring washers are used ? Why ?

A : Spring washers are employed in tanks with a height of 2 meters or more, particularly at the joints of the bottom and side panels. They help prevent leaks by ensuring the nuts remain securely tightened.

Frequently Asked Questions

Q : What are the inside supports in your tank ? Why ?

A : Pipes placed at alternate 2-m joints inside the tank.

Secured to top panels.

Hot Dip Galvanized (HDG) plates also attached for maintenance space.

Prevents roof panel sagging during tank use.

Regular inspections needed to ensure support stability.

Top anchor arrangement for secure pipe attachment.



Q : Which is best support system for tanks ? Why ?

A : We have adopted the external support system with top tie rods. Based on our experience, we have encountered several challenges with the internal tie rod system, including addressing leaks, replacing panels, or replacing internal tie rods.

The external support system involves two types of supports: vertical supports placed at every 1-meter interval and horizontal supports at the top of the tank, connecting these vertical supports with tie rods.

Frequently Asked Questions

Q : Whether we can use both the Internal Tie and External support with top tie in a tank ?

A : We can use both tie rod systems in a tank, but one support system serves as an alternative to the other. Here are some considerations:

1. **Internal Tie Rods :** To implement this system, holes must be drilled in the center of the panel, where water pressure is highest. This drilling may potentially lead to future leaks at these locations.
2. **Stress on Panels:** In empty tank conditions, internal tie rods can exert an inward force on the panels, causing stress even when the tank is not filled with water. This can weaken the panels over time.

Frequently Asked Questions

Q : Top Tie rods from what height of tank ? Why ?

A : Tie rods with a diameter of 12mm are provided for tanks with a height of 2 m and above. Our panels and side supports are designed Up to a water height and pressure of 1.5 m. These top tie rods serve as additional stiffeners for our external clamps as the tank height increases.

Q : What will be the Overflow Sizes & Position in tank ?

A : The overflow pipe diameter should be 1.5 times the diameter of inlet pipe, and it should be positioned lower than the inlet pipe. To ensure the tank's strength, water should not be filled up to the top panels. Therefore, it's crucial to prevent any blockage in the overflow pipe. For higher capacity tanks, it is advisable to have multiple overflow pipes.

Frequently Asked Questions

Q : Why air vents are important in our tank ?

A : Vents are used to allow air to pass in or out of the tank during water filling or draining. If the air pressure accumulated above the water increases, it can lift the top panels and also exert pressure on the water, which can weaken the tank's construction. To address this, we provide one air vent with a diameter of 75mm for every 15000 litres of tank capacity.

Q : What is the water testing procedure after completion of tank ?

A : After completion of tank installation, the water testing procedure at initial are,

1. Initially fill up to 50% of tank volume and let the tank free for 6 to 8 hrs.
2. Observe for any leak, if identified, study the reason and rectify at this stage.
3. If no leak, fill the tank up to overflow and leave it for 24 hrs.
4. Observe for any leak, if identified, study the reason and rectify the same.

Frequently Asked Questions

Q : What are the reason for leakage of tank ?

A : 1. Loose Bolts.

2. Panels may have crack.

3. Any levelling problems. Supports in-between gap may displaced.

4. If the tank is not filled for more than 3 months. Gasket property may change.

5. Leak from the flanges. Supports for these may not have been given or disturbed

Q : If leakage is observed after a period of time in tank, What is the first aid to be done ?

A : 1. If the leak is minimum, check for the bolt tightness. If still leak continues consult us.

2. If the leak is major, inspect the panels for any crack or any supports at gap is disturbed.

Consult us to take remedies immediately.

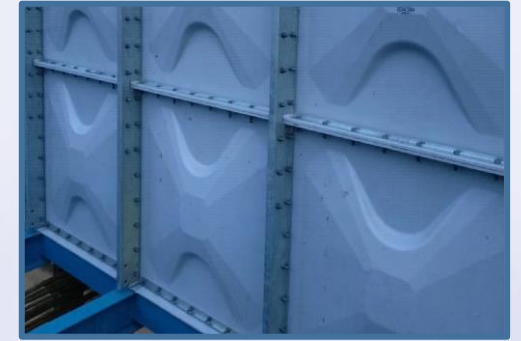
3. If the leak is at Pipe flanges, ensure for proper support.

4. If the tank is empty for more than 3 months, inform us to replace gasket.

Frequently Asked Questions

Q : Instruction for Bolt torque if leak observed.

- A :
1. Fasteners torque depends on height of tank.
 2. For 1m ht tank 30 lbs torque is sufficient
 3. For 2m ht tank 35 to 37 lbs torque is necessary.
 4. For all roof panels torque should be less than 25 lbs.
 5. The tightness can be ensured by Torque Wrench.



Q : Why HDG angles are provided in our tank inbetween Panels & Fasteners ?

- A :
- The HDG (Hot-Dip Galvanized) angle serves to prevent the direct stress of bolts on the panels, and it ensures that the total length of the flange is evenly tightened, thereby ensuring uniform compression of the gasket.

Q : What will happen if frequent maintenance or painting is not done in GRP tank ?

- A :
1. The life of the tank will be reduce by half if periodical maintenance or painting is not done.
 2. If leakage is not attended, longer run will damage the panels.

Frequently Asked Questions

Q : What is the frequency of painting in GRP tank ? Where ?

A : Periodically painting the tank's side walls and roof at intervals of 4 to 5 years after our warranty period can significantly extend the durability and improve the tank's performance.

No painting needed for hot-dip galvanized metals. Epoxy or PU paint in RAL 7035 color preferred for GRP Panels.

Q : What is procedure to clean the tank ?

A : The cleaning of the tank depends on the quality of the water. Typically, in our tanks, leftover sediments are minimal because of the smooth surface, and most sediments pass through the drain. To remove any remaining sediments, flushing with water or using a sponge is sufficient. It's important to avoid using scrubbers or cleaning agents with acidic properties.

Exeed

EXEED ENGINEERS (I) PVT. LTD
Manali, Chennai 68.

GRP/SMC Tank Periodical Inspection Report

Customer :

Date of Inspection :

Location :

Tank Installed on :

Tank Size /capacity :

Support System :

Inspection	Yes	No	Suggesstion / Remarks
Air vent in Position / Sufficient			
Manhole cover Locked			
Tie rod in line & in tight			
Overflow clogging			
Fasteners Tight			
Any displacement of Packing between Tank & Steel base			
Placement of Internal Pipes			
Support of Pipelines			
Panels Condition -			



Exeed Tanks

Any Questions?



Exeed Tanks

Thank You



Exeed Tanks