

## Delivery and installation instructions for GRP tanks

### General information

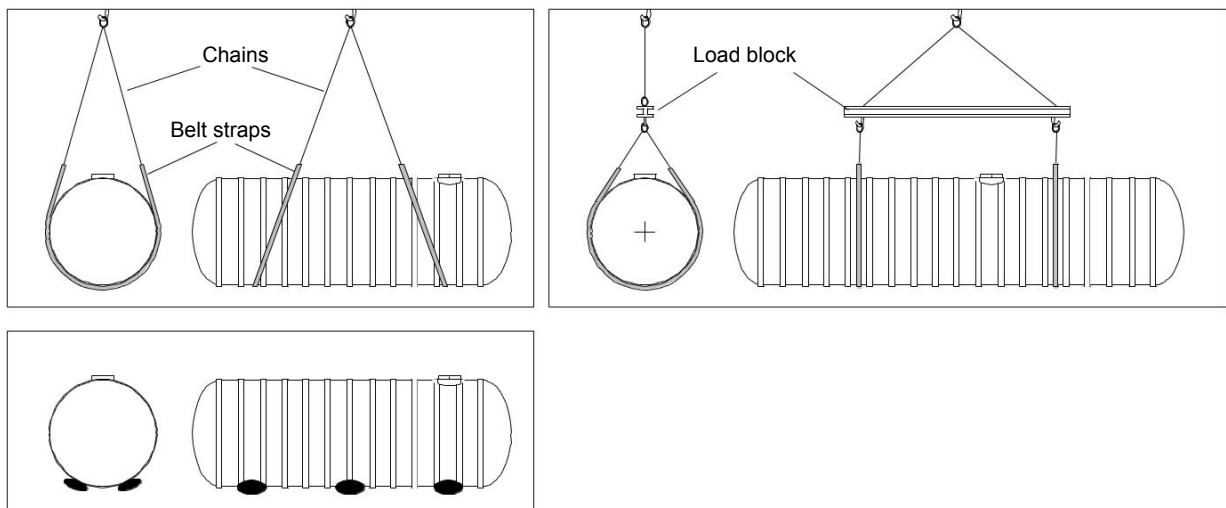
These installation instructions are only valid for the underground series of GRP tanks. For special installation cases or any questions, please contact INTEWA GmbH directly.

### Freight, delivery time and delivery

We deliver the GRP tanks to Germany, the Netherlands, Belgium and France. Usually delivery time is approx. 6 weeks. The date of delivery cannot be given to the exact hour due to road conditions, weather, etc. Please allow sufficient time for the provision of personnel and work equipment. A crane for unloading must be provided on site. With tanks, which are longer than 8 m, unloading must be done with lifting beams (depending on length of tanks).

### Transport, unloading and storage

1. The tank must be secured during transport with flat belts. The use of round ropes and chains in direct contact with the tank wall is not permitted.
2. Do not overtighten transport safety belts so as not to deform the tank.
3. Tanks are lifted by crane - again, no chains or ropes in direct contact with the tank.
4. For tanks that are longer than 8 m, lifting beams are to be used. Smaller tanks can be raised centrally by a hook and two straps. Make sure the belts act symmetrically on the tank.
5. Place the tank, by raising and lowering into position. Never pull or roll. Even when unloading from the delivery platform, never roll or push the tank.
6. During interim storage of tanks place on a safe, smooth, horizontally aligned, uniform surface (eg. sand bed, free from stones and other objects that could cause a point load on the tank).
7. Secure the tank sides with tires, sandbags or similar to prevent rolling.
8. Secure tank with additional belts in order to prevent movement in the wind.



## Verification prior to installation

1. Check tank during delivery and shortly before installation in the ground.
2. Any damage must be noted on the loading documents and counter-signed by the truck driver and later documented with photographs.
3. No unauthorized repairs are to be carried out as this will invalidate the warranty.
4. Check the tank, in particular for fractures, flaking, bruises, cracks or scratches deeper than 1.5 mm.
5. Check correct tank delivery (height, width, length) and whether the connection-piping is available in the correct size and arrangement.

## Excavation dimensioning

The excavation conforms to DIN 4124 ("Excavations and trenches - Slopes, planking, and strutting breadths of working spaces") as well as to DIN 4123 ("Excavations, foundations and underpinnings in the area of existing buildings"). The excavation must at least be large enough that the tank has 450 mm on all sides. This distance must be maintained between two adjacent tanks. For the excavation, the embankment angle is independent of the soil solubility referenced by the mechanical soil properties. The embankment angle is also dependent on the time during which the excavation or trench is open, and external influences acting on the embankment must be considered.

The following embankment angles cannot be exceeded without proof of stability calculation:

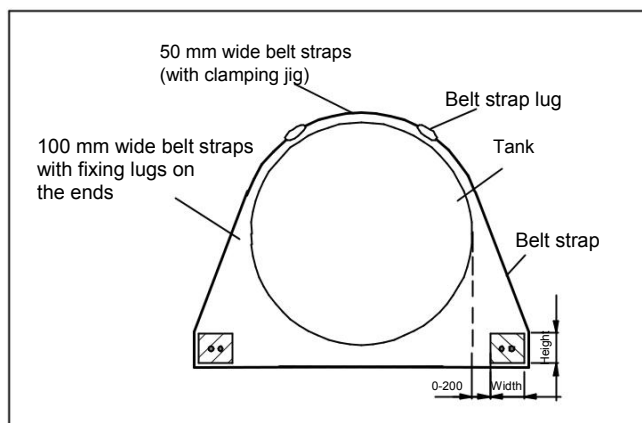
- $\beta = 45^\circ$  with non-cohesive or weakly cohesive soil,
- $\beta = 60^\circ$  with minimally stiff cohesive soils,
- $\beta = 80^\circ$  with rock.

The stability of sloped walls must be proven according to DIN 4084 or by expert opinion, if

- an embankment is more than 5.00 m high,
- special influences (eg. fillings, water layers, flowing sands, etc.) are present,
- hazards from existing buildings, power lines, traffic areas etc. cannot be with absolute certainty excluded or
- it can be expected that the surface of an embankment is endangered by daily water, drought, frost or similar.

## Buoyancy control

Steel reinforced concrete beams (2 x 20 mm) are placed on the longitudinal sides of the tank with a distance between them and the tank of about 0-200 mm (projection). The 100 mm wide straps are among guided under the concrete beams and around the tank. The buoyancy control material (straps, tensioners, belt-eyes, etc.) can be ordered as an accessory through INTEWA GmbH. The number of required belt supports is dependent on the length of the tank. Approximately every 2 m is required. A more accurate sizing is performed by INTEWA GmbH.



Tank diameter [mm]	Height [mm]	Width [mm]
2600	300	300
3150	300	450
4150	200	900

Whether buoyancy control is required can be taken from the table below.

Tank type	Groundwater level from tank bottom	Buoyancy control required with ground cover of 1 m	Buoyancy control required with ground cover of 2 m
GRP-.../2,5	1	no	no
	2	yes	no
	2,5	yes	no
GRP-.../3	1	no	no
	2	yes	no
	3	yes	yes
GRP-.../4	1	no	no
	2	yes	no
	3	yes	yes
	4	yes	yes

### Primary backfill

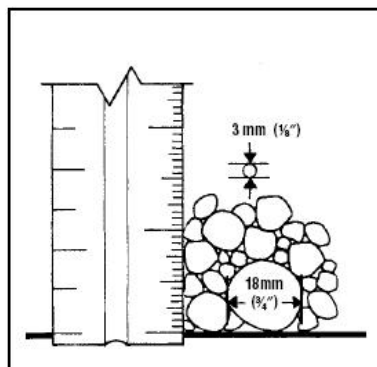
The primary backfill used can be washed, round gravel (3/18) or crushed rock (3/12). When filling with round gravel (3/18) a relative density of >70% is compacted, in broken material (3/12), a relative density of >40%. In both materials the undersize fraction (<2.36 mm sieve size) may not be more than 5%.

Above the specified backfill, a 300 mm thick and compacted subsoil is created. (200 mm when a reinforced concrete slab is used (s. Buoyancy control)). The dry gravel/rock must have a density of 1500 kg/m<sup>3</sup>. The compaction should be done by a rolling or vibrating plate, until the desired height is achieved.

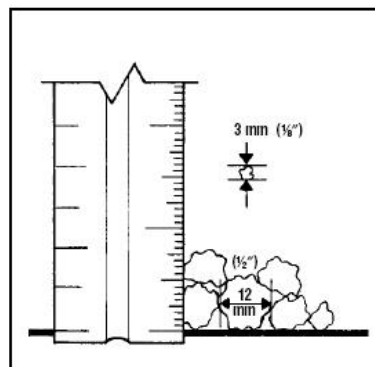
The lateral backfill and compaction of the tank takes place in layers (300 mm) evenly around the whole tank, so that the tank does not undergo unilateral load and therefore experiences no undue stress on the tank walls. The tank must be surrounded with at least 450 mm primary backfill. Further out, secondary backfill be placed.

Note: The filling material must be free of ice and snow. Frozen backfill (clumps) may not be used.

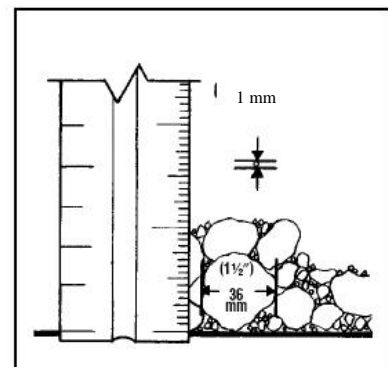
Note on sumps: If the tank is equipped with sumps, the compacted subsoil, as described above is viable. In the area of the sumps corresponding wells are prepared, so later the area can be filled with pourable concrete (C25 / C30, pourable F4).



Primary backfill  
gravel (3/18)



Primary backfill  
crushed rock (3/12)



Secondary backfill  
sand / gravel / rock (1/36)

## Secondary backfill

As a secondary backfill, a sand-gravel mixture or crushed stone (max. 36 mm) may be used. With both materials the undersize fraction (<0.075 mm sieve size) may not be more than 5%. With layered filling, the material must be compacted to 95% relative density.

## Installation depth and ground cover

The tanks of the GRP series are intended for underground installation with coarse backfill. The maximum height of the ground cover above the tank shall not exceed 2 m with SLW30. For deeper installation and/or higher loads, reinforced tanks must be used. More information on this can be requested from INTEWA GmbH.

Minimum ground cover			
Tank diameter [mm]	Walkable [mm]	Trafficable SLW30 [mm]	Trafficable SLW60 [mm]
2600	500	900	1200
3150	500	1000	1200
4150	500	1200	1200

Attention: If the ground cover used is outside these defined parameters regarding the minimum and maximum depths, irreparable damage can be caused to the tank.

Note: The minimum ground cover can be reduced by using a reinforced concrete slab above the tank. For this special installation case contact INTEWA GmbH.

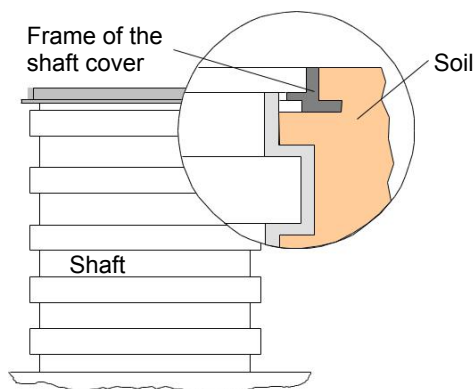
## Control of groundwater levels during installation

The containers may be exposed during installation / backfilling to buoyancy forces (even when the container is mounted with buoyancy control straps). The excavation should therefore be kept water free until the time at least 300 mm ground cover is filled and compressed above the tank.

## Shaft seal and shaft cover

The junctions of the manhole extensions should be sealed with sealant (eg. Sikaflex -291 or similar) to prevent the penetration of groundwater or leachate. Adequate sealing is to be ensured on site.

The soil required for the shaft essays can be reduced. The frame of the manhole cover is floating, relying only on the surrounding soil for support. A load on the cover does not lead to stress on the shaft and thus the tank.



## Installation steps in short form

1. Creation of the excavation and, if buoyancy control is required due to high groundwater level, follow the preceding descriptions. Surface water and groundwater must be pumped out in order to install the tank in a dry pit.
2. The tank bed follows, as indicated in the installation instructions. Make sure that the material meets the specifications and does not constitute an excessive oversize grain fraction.
3. Place the container into the pit, and check the position for pipe connections.
4. With use of the buoyancy control, the tank will be fixed here.
5. Connect any underlying pipes.
6. Fill around the tank in layers of 300 mm thickness (note permissible backfill). Laterally outgoing pipes are also to be properly filled around and compacted without stresses occurring on the pipe connections to the tank.
7. Continue filling the material around the tank evenly until at least 300 mm above the tank shoulder. Remember to seal the connections of the tank shaft extensions.
8. The subsequent cover can be done with primary or secondary backfill.
9. For compactors, lightweight rollers or vibrating plates may be used till "traffic" depth has been reached.
10. The compaction around existing manholes also has to be uniform to avoid displacements.
11. Shorten the shaft extensions and adjust the manhole cover with frame.
12. Important: The frame of the manhole cover must be stationed as floating. The frame construction should allow movement.
13. Check the tank interior to ensure integrity of walls; deformation must not exceed 1% of the tank diameter.