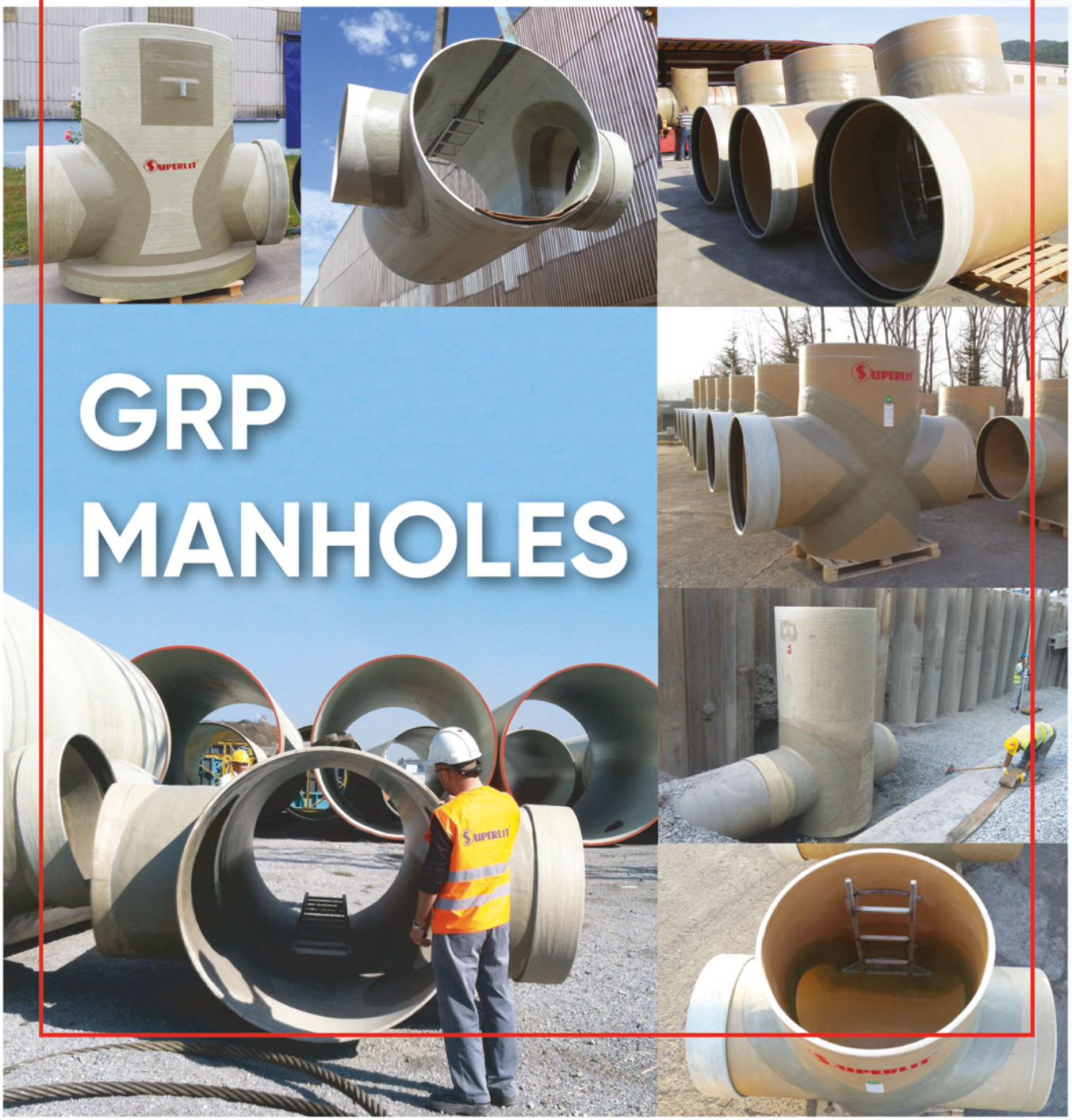
SUPERLIT®



65+ years

COMPANY PROFILE



SUPERLIT, the first company of KARAMANCI HOLDING that has a prominent role in the Turkish industrial sector, was established in 1961.

SUPERLIT, which manufactures and sells pressure and non-pressure GRP (Glassfiber Reinforced Polyester) pipes in compliance with international standards, has become a favored brand on 5 continents worldwide, thanks to a wide range of products, its reliable quality and before-sales and after-sales technical / consultancy services it renders. With regards to installed capacity, SUPERLIT is one of the leading GRP pipe manufacturer in the GRP pipe sector worldwide.

The pipes, manufactured in factories located in Düzce and Malatya in Turkey, in compliance with local and international standards such as EN, ISO, ASTM and AWWA, with a diameter range of DN50 mm to DN4000 mm, with a stiffness of 2500 – 5000 – 10000 (and over by special design), and a pressure resistance between 1 – 32 bars (up to 40 bars by special design), are used in the following applications: clean water and potable water, irrigation, hydroelectric power plant, sewer system, stormwater, water treatment, seawater intake and discharge, jacking & trenchless technologies, water and oil storage tanks, industrial applications such as thermal&nuclear power plants, desalination plants, petrochemical plants etc.

SUPERLIT is the only GRP pipe manufacturer in Turkey that has 3 different pipe production technologies: Continuous Filament Winding, Centrifugal Casting technology, Helical Filament Winding.

Integrated Management Systems Certificates (ISO 9001, ISO 14001 & ISO 45001) have been granted by the internationally recognized and reputable independent organizations.

Being one of the world's leading manufacturers in the pipe industry with an experience of more than half a century, SUPERLIT supplies pipes for projects in many regions of the world from Europe to Africa and from America to Asia and Australia.

PRESENCE IN 6 CONTINENTS

64 YEARS OF EXPERIENCE

3 DIFFERENT PIPE PRODUCTION TECHNOLOGIES

ENGINEERING AND R&D

PROVIDING SITE SUPERVISION

QUALITY MANAGEMENT

ENVIRONMENT FRIENDLY AND SUSTAINABILITY

WIDE FIELD SERVICE

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1. INTRODUCTION

The purpose of this manual is to give guidance above manhole structures on non pressure pipelines, in product, design, and installation aspects. The main idea of introducing Superlit GRP manholes is to design whole system based on GRP products; together with pipe and manholes in order to achieve a complete leak tight system together with the great advantages of glass fibre reinforced composite materials.

Manholes are generally designed on non-pressure lines,

- In order to make an access point over line for inspection, maintenance and cleaning purposes.
- To join lines at junctions, direction, diameter and level changes.
- Ventilation of the gases in the sewage system.

Due to above reasons, manholes are multi-functional important elements over non-pressure lines.



2. ADVANTAGES OF GRP MANHOLES

GRP Manholes have become the choice of infrastructure market due to the advantages compared to cast-in-place concrete, precast concrete, and other type of products. Cast-in-place concrete manholes needs curing time on site which means a lot of time-consuming. Again, precast concrete manholes are heavy-weight structures, sealing (infiltration –exfiltration) problems and low corrosion resistance of concrete are the main significant disadvantages. On the other hand, all advantages of GRP composite materials are also valid for manhole structures. The main advantages can be listed as;

- Non-corrosive composite structure
- Designed to serve in a wide pH range
- Long service life
- Lightweight and easy handling
- Fast and easy installation
- Leak tightness at all parts. Prevents fluid transfer from both directions (inside to outside & outside to inside)
- Wide range of accessories
- Reliable connections to GRP lines

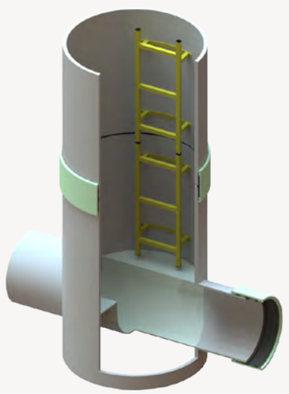


3. COMMON MANHOLE TYPES

The basic models are well accepted by the designers and end users according to the general requirements of the non-pressure lines such as gravity sewer, wastewater lines and stormwater lines. The advantage of GRP gives opportunity to users in order to design various models and combinations in order to full fill project specific requirements. Chapter 6 of this manual provides a quotation form and table of requirements in order to define manhole specs for each different type.

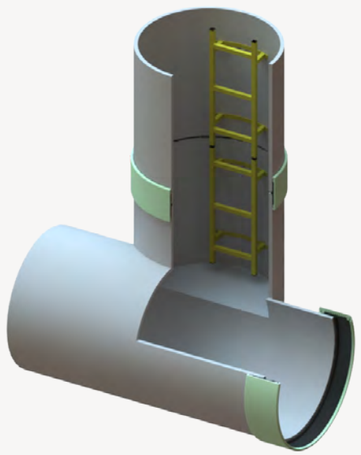
3.1 Standard Manhole

This standard manhole consist of a manhole base with inlet and outlet collector lines which is already manufactured at the factory. Inlet and outlet pipes can be designed with the same or different sizes. Invert levels of main line pipes can be same or can be at different levels. The total shaft height can be adjusted to the project (site) requirements with a GRP coupling and manhole riser. The horizontal angle between inlet and outlet pipe can be specified and manufactured in accordance with the project requirements. Bottom of the shaft can be closed or left open for concrete base pouring on site. Refer to Chapter 4. for available accessories.



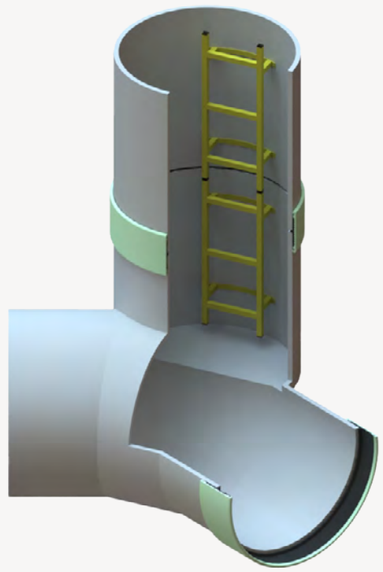
3.2 Tangential Manhole

This model is an option for bigger diameter collector lines where DN > 800. This model can also be adapted to the smaller main line diameters upon request. The manhole riser is generally designed as eccentric. The type of manhole can vary depending on the diameter relation between collector line and manhole. Manhole shaft can be direct tangential without a bench or manhole shaft can be tangential with a bench.



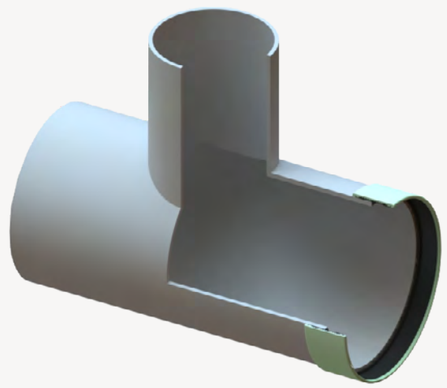
3.3 Tangential Manhole on Bend

This model is an alternative of tangential manhole, where the manhole is located over the directional change point. Manhole can rise over the main line, either at the outer side of the bend, or inner side of the bend as can be selected from the type forms given in Chapter 7 of this manual. Miter quantity of bend is standard configuration as in regular pipe bends. Lengths of the mitered sections can be adjusted depending on the shaft diameter.



3.4 Centric Tee Manholes

In this version, the manhole riser is designed centric like a regular Tee piece. This version is generally preferred where it is possible to make maintenance and cleaning operations without entering inside the pipe , just above the ground level.



4. DESIGN & ACCESSORIES

4.1 Design of Manholes

Manhole elements described in this document are valid for non-pressure systems. Therefore pressure class in this system shall be considered as PN 1. SN class is offered as SN10000 N/m^2 as a default stiffness value. This is generally related to high burial depths of non-pressure lines. If a specific analysis results require higher SN class or allows lower SN, this is available upon request.

Sewage line manholes and storm line manholes can be designed differently due to the chemical resistance requirements. For industrial sewage lines, chemicals and their concentrations should be shared with Superlit in order to choose correct product for the project.

Service temperature of Standard GRP products shall be considered as -40 ^{0}C - +35 ^{0}C. If the fluid temperature is different than the values given here, related information shall be shared with Superlit.

Production methodology of the manhole elements can be either Filament Winding, Centrifugal Casting or Helical Winding. If there is a specific requirement at the technical specification of the project, it has to be considered and Superlit shall be informed.

4.2 Accessories

There are various available accessories options depending on the project and design requirements and/or client's preferences including but not limited to ;

- Closed manhole base with GRP lamination.
- Anti-floatation base plate
- Ladder, (SS 304, SS 316, GRP)
- Bench (sanded or not sanded)
- Lifting lugs
- Connection to other pipe materials

4.2.1 Closed Manhole Base

Manhole base can be selected as open or closed with GRP lamination. When selected as open, manhole base is generally finished with concrete pouring during installation on site for channeling and benching. As an alternative to that, manhole base can be closed with grp lamination plate to increase the leak tightness performance and to achieve durable manhole base.



Inside view of closed base GRP Manhole



Outside view of closed base GRP Manhole

4.2.2 Anti-Floatation Base Plate

As in pipelines, floatation of buried manholes has to be checked when high groundwater table exists. When the Standard manhole base is flush with the exterior surface of the manhole shaft, the resisting forces against buoyancy (uplift forces due to ground water) will be the dead weight of the manhole structure and the frictional forces between manhole and soil. In a case that resisting forces with a safety factor greater than 1.0 cannot be achieved when compared to buoyancy forces; additional design precautions have to be considered in order to confirm stability of the manhole structure. If there is a buoyancy risk, the preventive construction methodology on product side is to extend manhole base with a lip to the outside of the structure. Extended base plate provides additional soil weight above the lips and this will be an added to the self-weight of the manhole structure and frictional forces.



Extended base beyond manhole diameter with GRP material

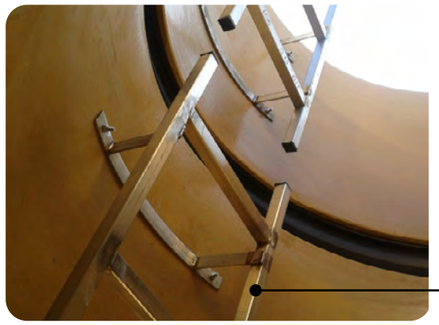
Standard Manhole with an anti-floatation base plate

This method is generally preferred in most cases where there is a risk of floatation of the manhole structure on high groundwater zones - due to the cost efficiency and due to monolithic design of the complete structure.

4.2.3 Ladder

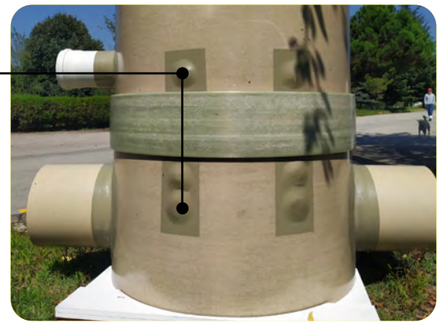
Ladders are integrated elements that allow access to the manhole base. The material of the ladder depends on the customer's requirements. Local regulations should be followed if there is a specific requirement on ladder material. Generally, non-corrosive materials are selected in design as stainless steel (with SS 304 or SS 316 grades).

GRP ladders, aluminium or coated steel ladders are also available upon request. Ladders are bolted to the shaft and bolts are sealed with grp lamination from the outside of the manhole in order to prevent water transition inside the manhole structure.



Sealed ladder bolts with grp lamination

Stainless Steel Ladder

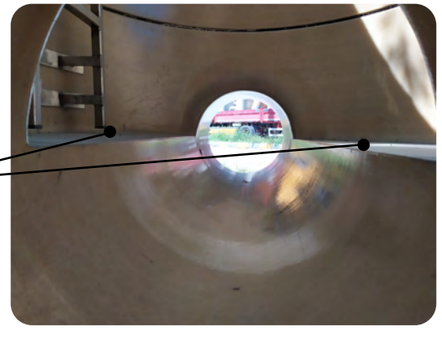


4.2.4 GRP Bench

GRP bench is the preformed unit in the base element constructed on the factory according to customer's requirements. With the help of this design form, channels of fluid and platform for man-step are constructed at factory as a unique monolithic structure. This monolithic structure does not allow water to penetrate through the benching. This design model is the alternative method for site - shaped concrete benching and channelling operations. Preformed GRP benching provides fast and reliable installation to the customers.



GRP bench preformed on a standard manhole



During maintenance works, personnel can stand and move easily over the bench. Benching can be applied either on standard manholes or tangential manholes. As an extra option, bench can be coated with sand to prevent sliding of personnel.

In general, bench is designed with a slope (depends on the local regulations but generally between 1:10 to 1:30), in order to allow flow of over spilled water of waste to turn back to the pipe channel. The smooth surface of the GRP laminate provides self-cleaning of the bench, that makes another advantage on this issue.

4.2.5 Lifting Lugs

During manhole handling and installation operations, fabric textile straps must be used. As a general information, steel cables or chains that can damage GRP surface are not allowed. Steel lifting lugs are alternative accessories fabricated over manholes in order to help handling and installation operations. Lightweight structure allows to design simple and easy lifting lug models. 3 pieces of lifting elements oriented at equal distance on the circumference of shaft.



Lifting lugs



4.2.6 Connections to Special Pipe Materials

In the design and manufacturing of the GRP manholes, according to special project requirements, pipe material connections different than GRP can be adapted. PVC pipe can be directly laminated on the manhole body easily. For other pipe types, alternative technical solution can be provided by producing a grp male or female adaptor end suitable for special connecting pipe dimensions.



PVC pipe laminated to GRP manhole



5. INSTALLATION OF MANHOLES

This chapter gives brief information regarding the installation steps of manholes. There may be other national or local construction codes involved in a specific project, and client has to consult manufacturer when there is a conflict between these parties.

5.1 Handling

During the offloading of manholes, or lowering manholes to the trench, textile straps must be used. All lifting slings, and connection elements must be free from damages and have to be adequate in handling the manhole weight. It is not allowed to use steel cables or chains directly in contact with grp material which can cause a damage in grp material surface. If grp manhole has lifting lugs, all lifting points have to be used with equal force distribution. Chains and steel cables can be used when there are lifting lugs on the manhole, and when they are not in contact with grp surface. Other important points to be followed as below during handling operations.

- Identify proper lifting points and methods
- Visually inspect each product for damages or cracks and report any damage. Damaged goods should not be used unless inspected and repaired by Superlit personnel.
- While loading or unloading and placing manholes on the ground, prevent any impact with rigid objects to avoid structural damage.
- Based on manhole diameters, lengths and weights, as well as jobsite conditions, crane-lifting strap method or forklift can be used for these operations.
- Manholes should not be dropped or rolled, which can cause serious damages.
- Use at least two lifting straps when lifting the manhole in horizontal position. Take care about the accessories which can change the center of gravity.



Lifting manhole in vertical position



Lifting manhole in horizontal position

5.2 Storage

If the manholes will be unloaded to stock area before installation it is recommended to store goods with original packages. General requirements for storage area and related considerations are listed below.

- The storage area should be flat, leveled and clear of objects such as rocks, stones, sharp edges, etc.
- Inlet, outlet branches should not be laid on ground that can cause a damage.
- Tangential manholes shall be laid on horizontal direction above wooden supports.
- Standard manholes shall be stored vertically, as base unit will be sitting on the ground.
- Precautions have to be considered to prevent goods, from rolling or falling due to wind effects.

5.3 Excavation and Trench Preparation

In most applications, GRP pipes and GRP manholes are being installed together. Therefore, general GRP pipe installation instructions shall be applied to GRP manholes.

Following points should be considered during trench excavation:

- Take necessary safety precautions to ensure a safe working environment.
- Prevent water penetration into the trench.
- During excavation, make sure that trench walls keep vertical position.
- For a flat bedding, remove all obstacles and sharp edges such as rocks, gravels, concrete, etc. from the trench.
- Remove all organic items such as plants, tree roots, etc. from trench ground.
- Ensure that trench ground is strong and stable.
- If the trench ground is not stable enough, increase trench depth for stabilization works.
- Discharge groundwater (if there is any) from the trench before bedding preparation.
- When the underground water level is high, it might cause manholes and pipes to float. To prevent floatation, be sure that necessary precautions have been considered.
- Ensure that trench width is sufficient enough for bedding and backfilling compaction works.
- Ensure that excavated materials are piled at a distance from the trench to avoid the possibility of rolling back into the trench.
- Verify the manhole levels.

5.4 Bedding and Backfilling

It is recommended to use granular material for bedding and backfilling zones. Crushed stone, gravel or gravel+sand mixtures can be used.

Trench bedding should be flattened, leveled and compacted all along the trench. Under unstable soil conditions, trench depth and bedding thickness can be increased.

After trench excavation, bedding should be prepared to provide durable and stable support for manholes and pipes. Bedding should not be less than 15cm in height and should be prepared with compacted granular material at minimum 90% Standard Proctor Density.

For backfill zone, it is recommended to use same material as used in bedding. Same procedures as in standard trench applications shall be applied around the manhole. Backfill material should be compacted equally around to prevent movement or tipping of the manhole. Larger size of stones are not allowed in bedding and backfilling zone as in standard practice.

5.5 Installation of GRP Pipes to Manholes

Superlit GRP pipes are delivered with a Full Faced EPDM coupling installed on one end, if not required otherwise.

- Clean the pipe ends from dust and dirt. Visually check pipe ends for delamination
- Clean the rubber gasket and remove any stones, gravel or dust from the grooves of the gasket.
- Apply lubricants on the gasket with a piece of soft fabric. Lubrication material should be organic. Never use petroleum-based lubricants. Superlit advises soft soap or paraffin to be used as a lubricant under standard conditions. Amount of lubricant can be determined from the below table:

Pipe Diameter (DN)	Approximate Lubricant Amount (For each joint)
200-600mm	0,2kg
700-1200mm	0,4kg
1300-2000mm	0,6kg
2000mm and above	0,8kg

- For easier assembly of pipes, a pit should be excavated for the coupling to settle. After assembly of the pipe to the previous pipe, coupling pit should be filled with backfill material and should be compacted.
- Pipes can be assembled into the joint by using below techniques:
  - » With come-along jack
  - » With Backhoe or Bulldozer (a plywood, or a long timber should be used between the pipe end and the bucket (or the blade) to prevent structural damage on the pipe end.
  - » With pliable strap and excavator arm.

In all above-mentioned methods, pipe should be inserted into the coupling until pipe touches the stopper of the coupling. If pipe spigot has been marked with a home line, be sure that pipe is inserted up to the marking line.

- If the manhole base has to be extended with a manhole riser, above procedure for coupling connection can be applied similarly.
- It is advised to provide rocker pipes (short length of pipes) in connection of line pipes with manhole in order to achieve flexibility as close to manhole. Rocker pipe length generally varies between 1m - 2m range but can be also shorter as DN for smaller diameters. In practice following criteria can be applied;

Min. rocker pipe length = Smaller of 1xDN or 1m

Max. rocker pipe length = Smaller of 2xDN or 2m

- For other details not specified regarding the installation of pipes, refer to Superlit Installation Manual of GRP Pipes and Fittings.

If the manhole inlet and outlet pipes, are prepared specifically for other pipe materials, consult to manufacturer for installation techniques.



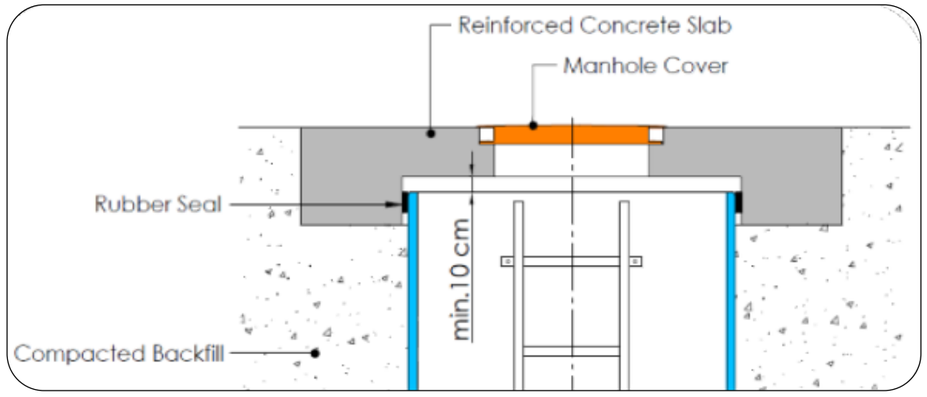
Scan Me !
To Watch Full Faced EPDM Coupling Animation Video

5.6 Cones and Cover Plates

Cones, Load distribution rings and manhole covers can be supplied easily in local markets. Therefore while ordering manhole dimensions, these additional heights should be considered and reduced from the total height. In addition to that, riser shaft can be adjusted in height by easily cutting on site, and can be ordered with an additional tolerance length in order to cover site conditions when there is not an accuracy in levels.

The general application is to eliminate load transfer directly to riser shaft pipe and distribute load to the surrounding soil. An easy way to do this is to pour concrete in the last layer of grade and place cover frame and segment above this. There are also precast elements already designed for this purpose.

A rubber seal is recommended at the interface of concrete and grp shaft as shown in below figure. An approximately 10cm gap can be considered at the clearance between concrete slab and manhole shaft in order to compensate possible future settlements.





Installation of Manhole Cover



Installation Steps of GRP Manhole

5.7 Site Testing

Before starting test process, following visual controls and inspection shall be carried out after installation.

- Control of the joints and connections.
- Checking the levels of the line and manholes
- Control of the test section against damages
- Checking the vertical deflections of pipes.
- Washout and clean the line.

For the testing procedure of manholes and pipelines, guidelines with water test methods for gravity systems shall be followed. Air test of manholes is not preferred/ recommended due to the danger that could be posed to personnel and property.

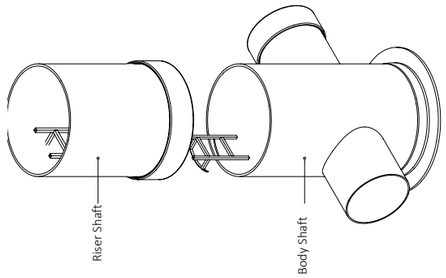
During site water test, guidelines of EN1610-2015 Chapter 13.1&13.3 can be followed in detail. Below steps are general guidelines to be followed during water test of pipes and manholes.

- Reference test level will be the height of manhole (up to under cover slab)
- Fill the pipeline and manholes slowly with water by allowing air release in the system.
- Stand for a period of 1h-2h to stabilize.
- In any section over the line shall not exceed 60 kPa pressure (0.6 bar, or 6 m of water head)
- Restore the original water level by adding measured water where a decrease in the reference level observed
- Accept the test if the added make-up water within 30 min period is less than the requirement. Unless otherwise specified the allowable make up water in 30 min is 0.5 liter / m of pipeline / DN (in m)

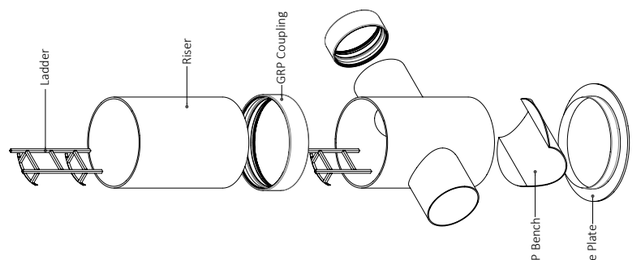
6. MANHOLE ORDER FORMS

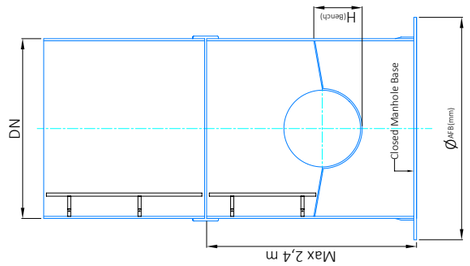
Following pages can be used in order to define and order manhole specs according to project requirements. In any case, additional requests , geometries or accessories can be designed and produced upon request for project special requirements.

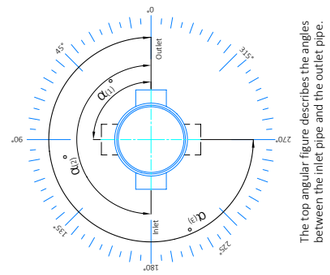




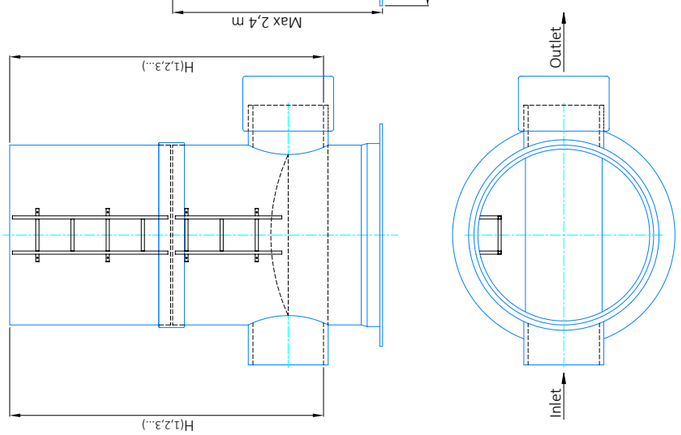
STANDARD MANHOLE					
Manhole Shaft		DN (mm)			
Collector Lines		DN (mm)	Angles α°(1,2,3...) (°)	H (1,2,3...) (mm)	
Inlet Pipe	1				
	2				
	3				
	4				
	5				
Outlet Pipe					
Accessories					
Closed Manhole Base				YES ☐	NO ☐
Anti Floatation Base Plate				YES ☐	NO ☐
		ØAFB(mm)			
Ladder				YES ☐	NO ☐
	CS (Painted)	☐			
	SS304	☐			NO ☐
	SS316	☐			
	Other	☐			
GRP Bench				YES ☐	NO ☐
		H bench (mm)			
Lifting Lugs				YES ☐	NO ☐

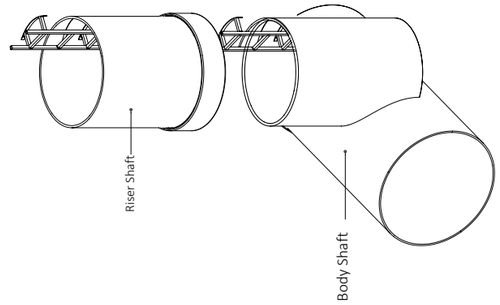




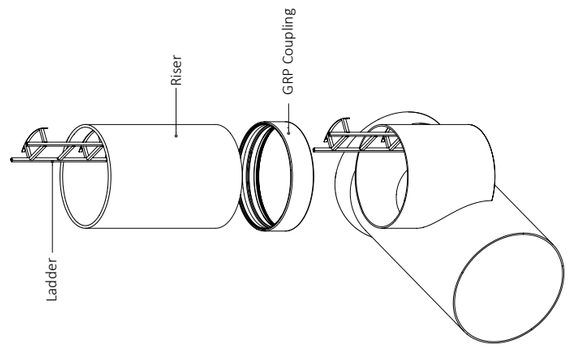


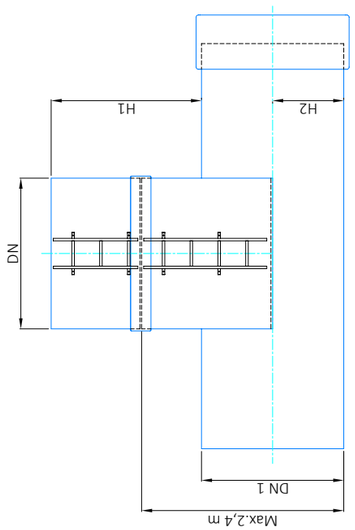
The top angular figure describes the angles between the inlet pipe and the outlet pipe.

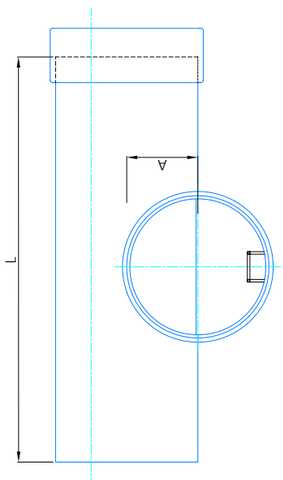


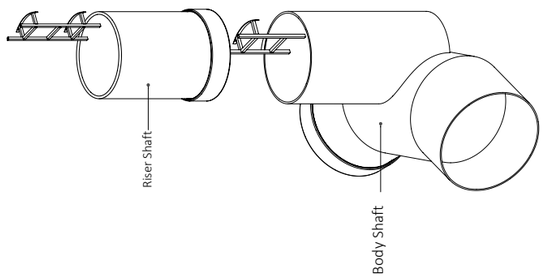


TANGENTIAL MANHOLE		
Manhole Shaft	DN (mm)	
	A (mm)	
	H1 (mm)	
	H2 (mm)	
Manhole Shaft	DN 1 (mm)	
	L (mm)	
Accessories		
Ladder		YES ☐
	CS (Painted)	☐
	SS304	☐ NO ☐
	SS316	☐
	Other	☐
Lifting Lugs		YES ☐ NO ☐

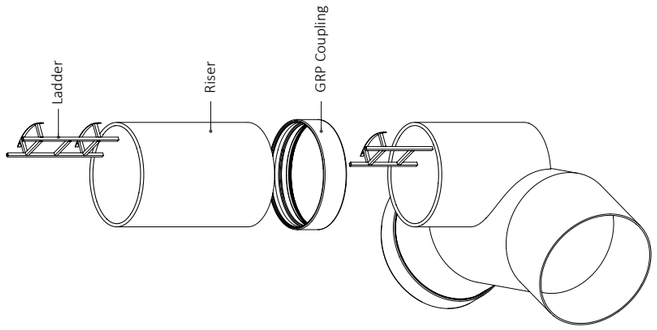


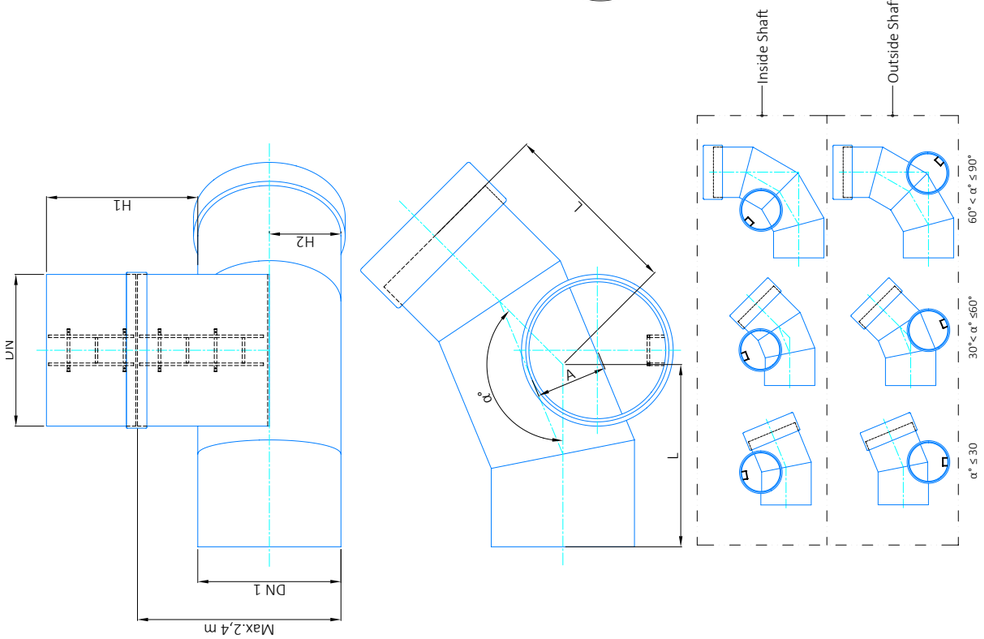






TANGENTIAL MANHOLE ON BEND			
Manhole Shaft	DN (mm)		
	A (mm)		
	H1 (mm)		
	H2 (mm)		
	Inside Shaft	☐	
	Outside Shaft	☐	
Manhole Shaft	DN 1 (mm)		
	α (°)		
	L (mm)		
Accessories			
Ladder	☐ YES		
	CS (Painted)	☐	☐ NO
	SS304	☐	☐ NO
	SS316	☐	
	Other	☐	
Lifting Lugs	☐ YES		☐ NO





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GRP MANHOLES



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