

TAMDID PIPES GRP MANHOLE BROCHURE

1) Types & Description of Manholes:

Tamdid Pipes offer two types of Manholes; Structural and Liner Manholes:

a. Structural Manholes

Tamdid Pipes offers concentric and eccentric GRP manholes. A standard manhole is usually without any branched connections. Tamdid Pipes Manholes vary from ND 1200-3000 mm and are available in heights up to 12 m including the neck height which depends on the client's request.

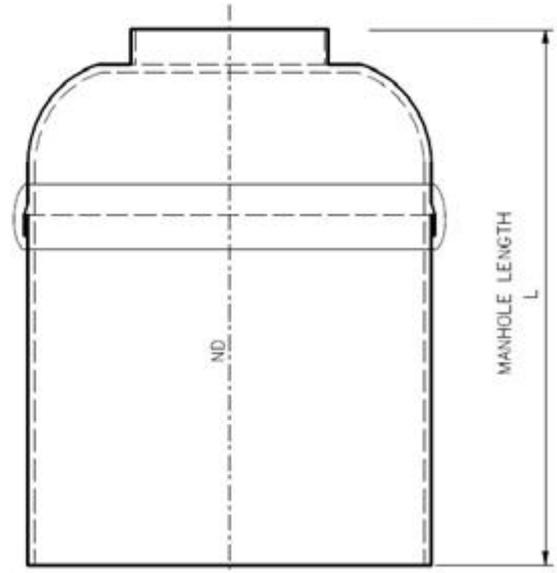


Figure 1: Standard Manhole

This kind of manhole is fabricated by connecting a GRP Pipe (cylindrical part) to a prefabricated manhole dome by lamination.

The standard manhole can be supplied with or without an access ladder upon request. The Ladder is joined to the manhole's inside wall surface by lamination. These ladders can be of GRP, Wood or Steel coated with fiber glass depending on agreement with the client.

Tamdid Pipes can also provide multi-branched Manholes which connect more than one pipeline into one inspection manhole. Such inspection manholes can be used for collecting waste water, storm water, drainage water, or can be an inspection chamber containing valves or other equipment.

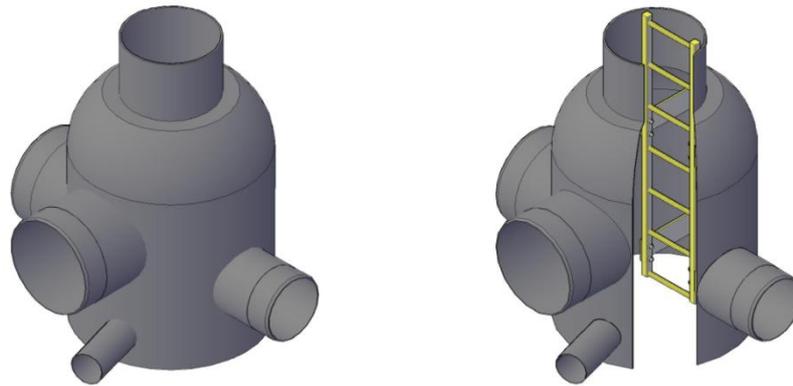


Figure 2: Multi-branched Manhole with or without ladder

Tamdid Pipes offers complete Manhole Detailed Drawings showing all the dimensions, ladder details, branch elevations and locations as shown below. After preparation, these drawings are sent to the client for Review / Comments prior to fabrication.

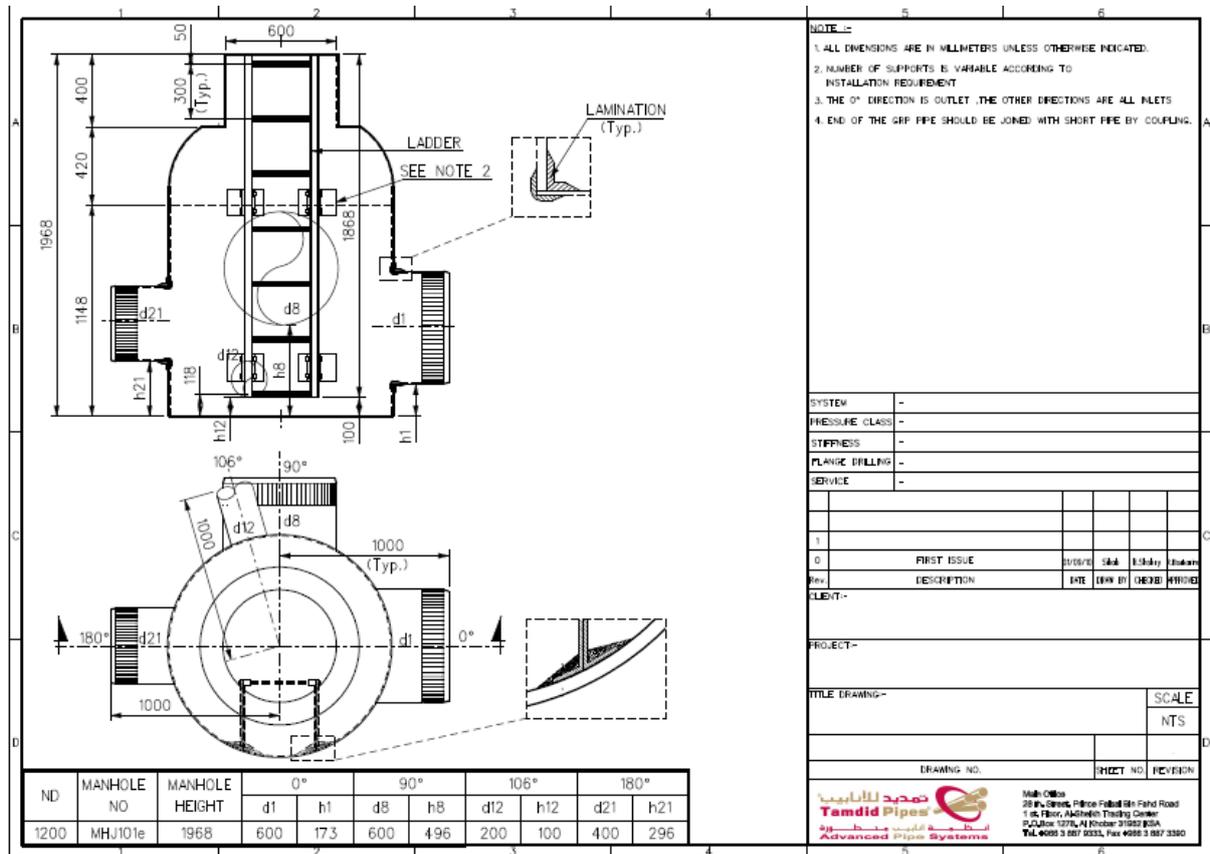


Figure 3: Manhole Detail Drawing

b. Liner Manholes

The second type of manholes offered by Tamdid Pipes is Liner Manholes.

We have to differentiate between a Liner Manhole and a standard manhole. Such liners are usually supplied in concentric configurations (as shown in Figure 4.) where concrete is poured in between the liners. The role of these two liners is to isolate the concrete from the conveyed water on the inside and to isolate the concrete from contact with soil on the outside. GRP liners play the role of preventing corrosion and abrasion effects that can degrade and eventually destroy the filling concrete.



Figure 4: Liner Manhole

This type of manhole liners is simply a thin GRP pipe not designed to have significant pressure and stiffness ratings since concrete will be encased in between the concentric liners. Instead, it is a flexible light weighted cylinder but at the same time provides the GRP anti-corrosive properties.

2) Installation Tips:

In order to avoid any possible differential settlement resulting from the weight of the manhole, a short pipe, also known as rocker pipe, must be installed in order to absorb this settlement through the angular deflection in the rocker pipe without inducing excessive bending stresses. This practice is applicable to both kinds of manholes, structural and liners and is demonstrated in Figure 5 below.

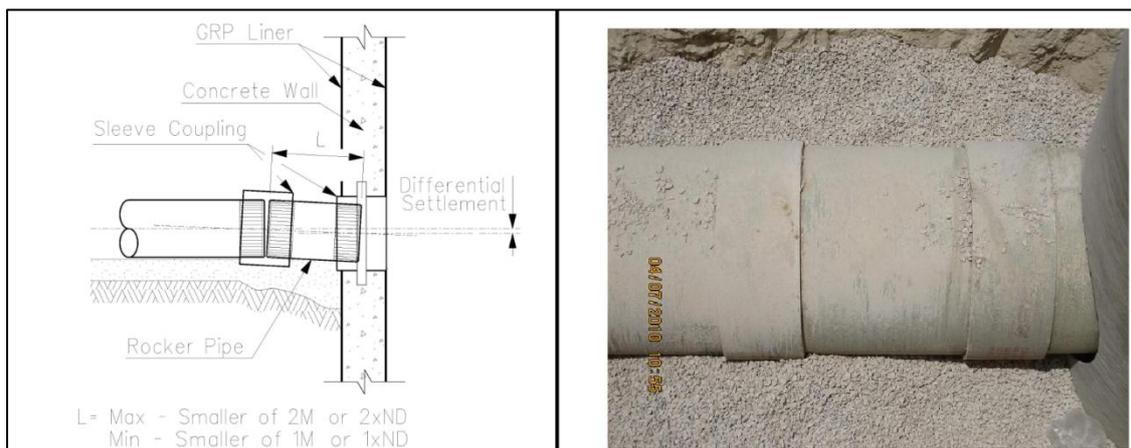


Figure 5: Installation Tip (Rigid Connection)

3) Manufacturing Details of Fiberglass Manholes:

Fiberglass Manholes (structural cylinder and Liners) are produced on a continuous filament winding machine. Fiberglass reinforced manholes are manufactured from resin with fiberglass reinforcements and shall be a one-piece unit manufactured to meet or exceed the specifications of ASTM D-3753.

a. MATERIAL:

Resin: The resin used is a commercial grade unsaturated resin.

Reinforcing Materials: The reinforcing materials used is commercial Grade "E" type glass in the form of continuous roving and chop roving, having a coupling agent that will provide a suitable bond between the glass reinforcement and the resin.

Interior Surface: The inner surface exposed to the chemical environment shall be a resin-rich layer of normally 1 mm thickness. The inner surface layer exposed to the corrosive environment is followed by a Barrier layer composed of reinforcing chopped roving (Chop). The thicknesses of the Inner layer can vary depending on the client's request.

Wall Construction Procedure: After the inner layer has been wound, the manhole wall shall be constructed with Chop and continuous strand filament wound manufacturing process which insures continuous reinforcement and uniform strength and composition. The dome section, since produced separately, is affixed to the cylindrical section at the factory with resin-glass reinforced joint resulting in a one-piece unit. Seams shall be fiber glassed on the inside and the outside using the same glass-resin jointing procedure. Field jointing shall not be acceptable by anyone except Tamdid Pipes.

Exterior Surface: The exterior surface exposed to surrounding soil normally is a resin-rich layer of normally 0.3 mm thickness but can vary depending on the client's request. For aboveground applications, a UV inhibitor may be added to the resin mixture during manufacturing the liner pipe upon the client's request.

Fillers and Additives: The fillers used during manufacturing the manhole pipe/liner are inert to the environment and manhole construction and is most of the time Silica Sand. Additives, such as thixotropic agents, catalysts, promoters, etc., may be added as required by the specific manufacturing process to be used to meet specific requirements.

b. FABRICATION REQUIREMENTS:

Exterior Surface: The exterior surface is relatively smooth with no sharp projections. Hand-work finish is acceptable if enough resin is present to eliminate fiber show. The exterior surface shall be free of blisters larger than 12.7 mm in diameter as well as delamination.

Interior Surface: The interior surface shall be resin rich with no exposed fibers. The surface shall be free of crazing, delamination, blisters larger than 12.7 mm in diameter and wrinkles of 3.2 mm or greater in depth. Surface pits shall be permitted if they are less than 19mm in diameter and less than 1.6 mm deep. Voids that cannot be broken with finger pressure and that are entirely below the resin surface shall be permitted if they are less than 12.7 mm in diameter and less than 1.6 mm thick.

Repairs: Any manhole repair is subject to meet all requirements of this specification and is only approved by Tamdid Pipes repair methods.

Manhole Length: Manhole lengths are normally in 6 inch increments +/- 2 inches, but are not restricted to these values since any custom height manhole can be fabricated by Tamdid Pipes but at the same time realize the truck/delivery limitations.

Diameter Tolerance: Tolerance of inside diameter shall be +/- 1% of required manhole diameter.

Load Rating: The complete manhole shall have a minimum dynamic-load rating of 16,000 lbs. when tested in accordance with ASTM D 3753, section 8.4. To establish this rating, the complete manhole shall not leak, crack, or suffer damage when load tested on 40,000 lbs. and shall not deflect vertically downward more than 6.4 mm at the point of load application when loaded up to 24,000 lbs. (Please observe the Section C below about in-house Manhole Testing according to ASTM D 3753.

c. MANHOLE TESTING:

Tamdid Pipes has conducted a qualifying manhole test according to ASTM 3753 as explained below.



Figure 6: Sample Manhole Test conducted at Tamdid Pipes

Tamdid Pipes Manhole Test:

A loading test was conducted on a 1200 x 600 mm concentric manhole manufactured in order to demonstrate that Tamdid Pipes standard GRP manhole could resist the loading criteria according to ASTM D 3573.

The test followed the guide lines of ASTM D3753 “Standard Specification for Glass Fiber – reinforced Manholes” and proved that Tamdid Pipes Standard Concentric Manhole was found to be capable of resisting the loading requirements as stipulated in this Standard.

The goal of this test is to prove that the manhole will not crack or suffer other damage when loaded to 40000 lbf (177929 N) approx 18.2 tons and will not be deflected vertically downwards more than 0.25 inch(6.35mm) when loaded to 24000 lbf (106757 N) approx 10.9 tons.

Procedure:

The specified load is applied eccentrically on a 6” x 6” x 12” (152*152*12.7 mm) steel plate resting on the manhole cover. The center of the steel plate is located such that it is within 4 inch (102 mm) from the edge cover. The manhole is located in increments of 2 tons till the desired load is reached; deflections are not at each point.

Load (Ton)	Actual Deflection (mm)	ASTM Requirements	
		Load (Ton)	Deflection
0	0		<6.35 mm
2	0.39		<6.35 mm
4	0.73		<6.35 mm
6	1.4		<6.35 mm
8	1.95		<6.35 mm
10	2.2		<6.35 mm
11	<u>3.2</u>	10.7	<6.35 mm
15	4.8		No Damage
18.2	6.3	Load plate damage	No Damage
24	-	-	No Damage

Table 1: Test Recordings

Test Observation and Conclusion:

At a load of 11 tons (>24000 lbf) the deflection noted was 3.2 mm verses the allowable of 6.35 mm. After subjecting the manhole to a load of 18 Tons, the load Plate was damaged (see Figure 7), while the manhole was visually inspected and no sign of cracks or any other damages occurred.



Figure 7: Load Plate Damage

From the observations cited above, it was concluded that Tamdid Pipes standard concentric structural manhole exceeds the loading criteria as mentioned in ASTM D 3753.

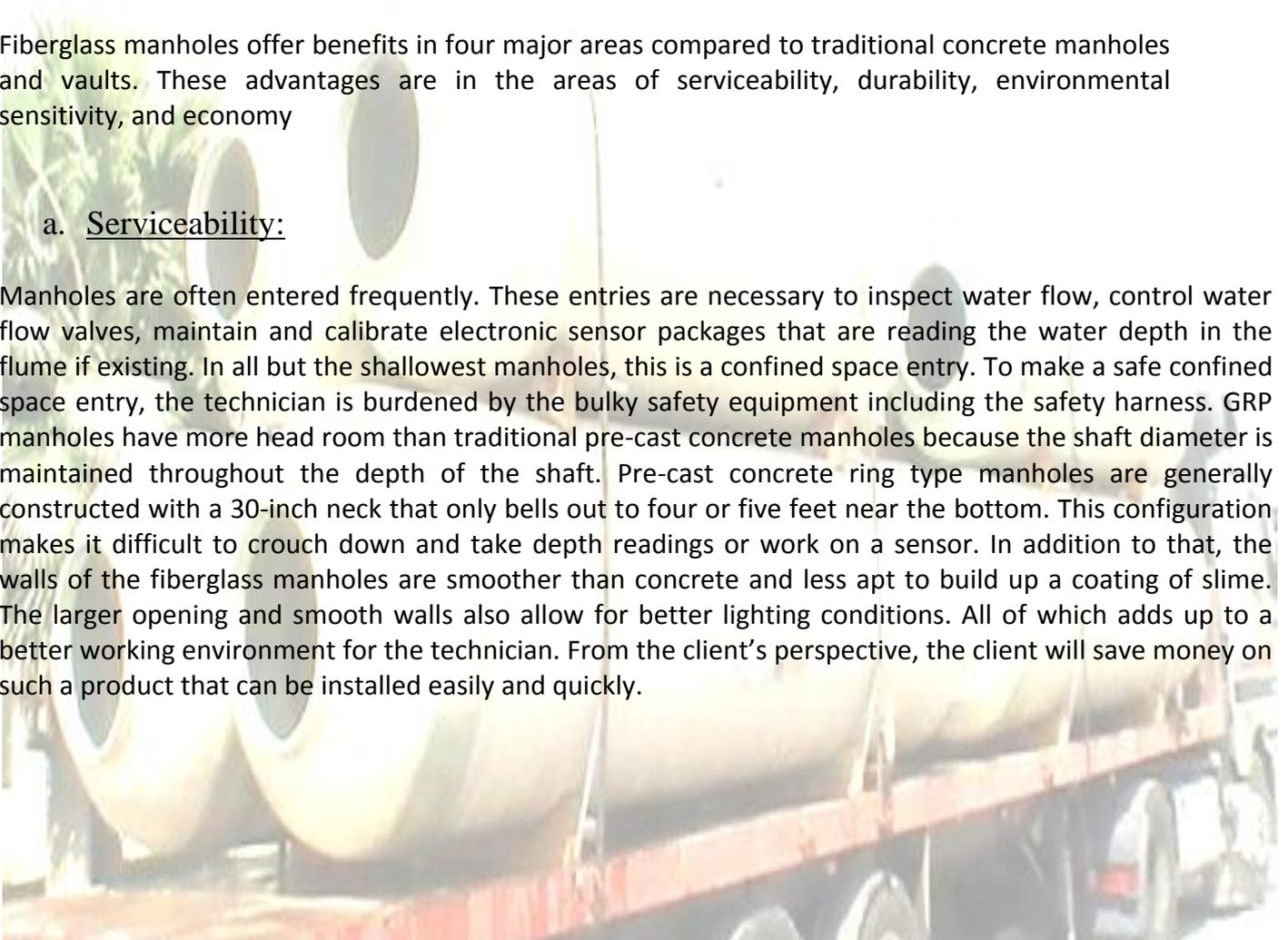
The test stated above is not applicable to Liner Manholes. Liner Manholes undergo Raw Material Tests (L.O.I. acc. To ASTM D2584), (Barcol Hardness acc. to ASTM D 2583), (Standard Raw Material Testing), (Dimensional Control acc. to ASTM D3567), and (Visual Inspection acc. to ASTM D 2563).

4) GRP Manhole Advantages:

Fiberglass manholes offer benefits in four major areas compared to traditional concrete manholes and vaults. These advantages are in the areas of serviceability, durability, environmental sensitivity, and economy

a. Serviceability:

Manholes are often entered frequently. These entries are necessary to inspect water flow, control water flow valves, maintain and calibrate electronic sensor packages that are reading the water depth in the flume if existing. In all but the shallowest manholes, this is a confined space entry. To make a safe confined space entry, the technician is burdened by the bulky safety equipment including the safety harness. GRP manholes have more head room than traditional pre-cast concrete manholes because the shaft diameter is maintained throughout the depth of the shaft. Pre-cast concrete ring type manholes are generally constructed with a 30-inch neck that only bells out to four or five feet near the bottom. This configuration makes it difficult to crouch down and take depth readings or work on a sensor. In addition to that, the walls of the fiberglass manholes are smoother than concrete and less apt to build up a coating of slime. The larger opening and smooth walls also allow for better lighting conditions. All of which adds up to a better working environment for the technician. From the client's perspective, the client will save money on such a product that can be installed easily and quickly.



b. Durability:

Fiberglass manholes resist degradation from groundwater, sewage, and corrosive chemicals far more effectively than concrete. While the ultimate life span of a given GRP manhole would be dependent on the types of chemicals present in either the groundwater or the waste-stream, it is possible to state that fiberglass will far outlast traditional degradable concrete in every application. In certain industrial applications and at landfill monitoring sites, the durability of fiberglass may be the most important criteria. Fiberglass manholes are extremely resistant to chemical corrosion. The contractor's main concern with respect to durability is whether the product is sufficiently rugged enough to withstand damage during installation. In this respect, the durability of the GRP manhole is more than sufficient.

c. Environmental Sensitivity:

Since ground water contamination is a major concern, GRP manholes make sure that the wastewater being conveyed is isolated from the environment. This advantage is paired with the durability of GRP manholes. An all fiberglass manhole vastly reduces the possibility of ground water intrusion. Ground water resources are therefore protected, and expensive manhole rehabilitation to prevent ground water contamination can often be avoided indefinitely.

d. Economy:

On a first cost basis, GRP manholes with very large flumes are less expensive than large concrete vaults. This is because by using fiberglass we are able to extend the up and downstream portions of the flume that do not require service access outside the manhole. The laminated fiberglass cover permits these parts of the flume to be directly buried in the soil. Using concrete construction, an expensive vault must be built that is large enough to cover all parts of the flume. Concrete construction has a lower first cost for small flumes that can be contained in a four, five, or six foot diameter circle. If the greater durability of fiberglass is considered, the lifetime cost of fiberglass may be far lower than concrete due to the high cost of rehabilitating or replacing a concrete structure. At industrial sites or in cases where the municipality is predisposed to consider the long-term costs of maintaining manholes, it is found that fiberglass is highly beneficial. Often at a first glance, the cost picture is misleading. GRP manholes provide hidden cost benefits in the areas of installation and reduced likely-hood of spoiling the flume during installation. Often the apparent savings offered by a cheaper pre-cast concrete manhole evaporate when the true cost of installing a complete metering station is factored in. Not to forget that one-piece design GRP manholes are relatively light - weight compared to concrete manholes which eliminates the need for heavy equipment on the job site and installation is therefore less time consuming.

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