



Pipes and Fittings

HDPE

Manholes



NATIONAL INDUSTRIES COMPANY



شركة الصناعات الوطنية

Committed to Quality

Since

1960

منذ

ملتزمون بالجودة

NIC HDPE manholes are custom fabricated for many varied applications including municipal and industrial manholes, sewer and storm water manholes, leachate collection, sewer lift stations, siphon structures, pump stations, bio treatment of sewerage, wet wells and sumps with both single wall and dual contained options.

THE ADVANTAGES HDPE MANHOLES

NIC produces HDPE manholes, the most trouble-free manholes for a long service life.

1- HDPE manholes are light weight and easy to install. Smaller pieces of equipment can be used to position these manholes.

2- HDPE offers a wide range of chemical resistance to acids, bases, and many organic compounds. Because of this resistance, attack from hydrogen sulfide, sulfuric acid and other aggressive chemicals does not occur.

3- In sanitary sewers, hydrogen sulfide is the primary cause of corrosion. Hydrogen sulfide is converted to sulfuric acid, which attacks concrete and eventually destroys concrete manholes and pipe. HDPE is highly resistant to such chemical attack and hence HDPE manholes are best suitable for sanitary systems.

4- Inlets and outlets are positioned, custom made each piece, as per site requirement, during the manufacturing process. These inlets and outlets are factory welded into place to be leak-free.

5- The Industrial effluent is most often corrosive and may also be abrasive as well. Since high density polyethylene pipe and manholes are corrosion and abrasion resistant, they work well for many industrial and chemical applications.

6- Lifting lugs can be fabricated on the HDPE manhole when requested.

7- HDPE ladders can be fabricated inside the HDPE manhole when requested.

8- The benched or half pipe-formed bottom is available connecting to inlet and outlet. A benched bottom adds significant improvement in flow of water.

9- HDPE manholes are fabricated with custom made



inlet and outlets to accept HDPE plain wall pipes, HDPE corrugated pipes, HDPE profiled pipes or uPVC pipes.

10- HDPE manholes can be used under heavy traffic loads, by following recommended installation methods.

11- HDPE manholes can be used with underground water tables by providing recommended anti floatation installation.

12- HDPE manholes are made in large variety of diameters, starting from 600mm to 2400mm.

13- Operating services temperatures may be from -500F (-450C) or lower, up to 1400F (600C). Under some circumstances, the HDPE manholes may handle fluids at temperatures up to 1800F (820C).

14- Black polyethylene material used to make HDPE manholes contains a minimum of 2% carbon black for resistance to degradation from ultraviolet light. Before installation manholes may be stored outdoors and unprotected for period of not exceeding six months in direct sunlight.



STANDARDS

Following international standard specifications are followed while producing HDPE manholes:

PrEN 13598 – 2:

Plastics piping systems for non-pressure underground drainage and sewerage - (PVC-U), (PP) and polyethylene (PE) - Part 2: Specifications for manholes and inspection chambers in traffic areas and deep underground installations

ISO 9969:

Thermoplastic pipes. Determination of Ring Stiffness

EN1610:

Construction and testing of drains and sewers.

prEN 13476-1:

Plastics piping systems for non-pressure underground drainage and sewerage — Structured-wall piping systems of (PVC-U), (PP) and polyethylene (PE) — Part 1: General requirements and performance characteristics.

DIN 16961:

Thermoplastic pipes and fittings with profiled outer and smooth inner surfaces.

DVS 2207-4:

Welding of Thermoplastics. Extrusion welding panel and pipes.

ISO 9001:2000:

Quality management systems.

ASTM D1759:

Standard Practice for Design of HDPE Manholes for Subsurface Applications. (Reference standard)

ASTM F894:

Standard Specification for Polyethylene (PE) Large Diameter Profile Wall Sewer and Drain Pipe. (Reference standard)



HDPE MATERIAL SPECIFICATIONS

No.	Characteristic	Test Method	Limits	Frequency
1.	Density	ASTM DI505	≥941kg/m ²	Once / 2years / material
2.	Modulus of elasticity @ 25°C	EN/ISO 527-2	≥800 MPa	
3.	Modulus of elasticity @ 40°C	EN/ISO 527-2	≥650 MPa	
4.	Tensile strength @ yield	ASTM D638	≥21 MPa	
5.	Elongation at break	ASTM D638	≥350 %	
6.	Thermal stability @ 200 °C (OIT)	EN 728	≥20 minutes	
7.	Viect softening point	ASTM D1525	≥120°C	
8.	Shore hardness type D	ASTM D2240	≥60	
9.	Melt mass-flow rate (MFR-value)	ISO 1133 condition IT	0.15-0.4 (gm/10min)	
10.	Average coefficient of linear thermal expansion	ASTM D1204	0.16-0.20	
11.	Coefficient of thermal conductivity	DIN 8075	<0.6W/MK	
12.	Flexural modulus	ASTM D790 & ISO 527	≥758MPa	
13.	Resistance to liquid chemicals (change in mass & tensile properties, 112 days) @25,40 &60 °C Solutions: Sulfuric acid/sodium Hydroxide/Ammonium Hydroxide Nitric Acid/Ferric Acid Detergent/ Bacteriological	ISO 4433	As per standards	
14.	Resistance to internal pressure with hoop stress 3.9 MPa at 80°C for 165 hrs.	EN 921 ISO 4427	No failure or leakage	
15.	Resistance to internal pressure with hoop stress 2.8 MPa at 80°C for 1000 hrs.			
16.	ESCR (Environmental stress crack resistance)	ASTM D1693 & ISO/ DIN 16670	>600 hrs	
17.	UV stabilizer (Carbon content)	ISO 6964/MPW	≥2%	
18.	Resistance to rapid crack propagation	ISO 13477	No crack growth	
19.	Long term chemical resistance test for 1000 hrs.	ASTM D3681 Method 8.2.2.2	As per standards	

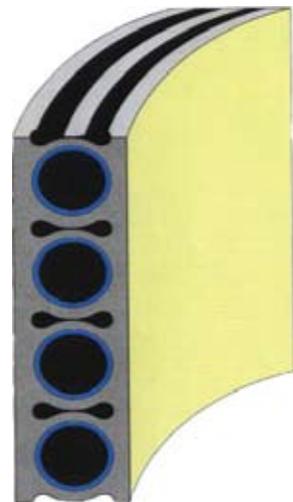


RISER WALL CONSTRUCTION

NIC manufactures manhole risers using a spiral winding process. In spiral winding, a flat polyethylene extrudate is wound over a rotating mandrel. A small corrugated tube is wound over first layer of extrudate to enhance stiffness of pipes. Smooth outer surface is achieved by winding a flat extrudate over stiffener tubes. Additional layers are used to increase the riser's wall thickness & stiffness. Spiral winding is an ID-controlled process. The inside diameter remains fixed regardless of the wall thickness, whereas in conventionally extruded pipe the OD is controlled and increasing the wall thickness reduces the inside diameter. When designing a manhole, it is important to recognize that spirally wound manhole risers are ID sized.

Closed profiled structure gives riser wall very high resistance to circumferential forces such as ring stiffness. Special construction of riser wall also resists longitudinal crushing or buckling of the riser wall. The hollow stiff core is joined wall to wall and two wall layers are supporting core from both sides to provide resistance to crushing or buckling.

Manholes risers are classified based on ring stiffness such as 2 KN/sq.m., 4 KN/sq.m., 6 KN/sq.m., 8 KN/sq.m., etc. The ring stiffness is tested according to ISO 9969.



MANHOLE BASE & BENCHING CONSTRUCTION

The benched or half pipe-formed bottom is constructed manually with extrusion welding connecting to inlet and outlet. The benching adds significant improvement in flow of water through manhole. Slope of 1:6 is normally provided on benching. Slope between inlet and outlet is also provided based on site requirement.

The flat sloped benching is structurally inefficient, so support is provided to benching by filling grout under benching during installation. Holes for injection of grout and holes for air vent are provided on benching.

The grout filling under benching practically eliminates need for flat base under manhole. NIC recommends manholes without base, however, manhole bases can be provided if required by customer.

Because concrete does not seal to polyethylene, installing the manhole in a poured (wet) concrete slab will not reduce groundwater uplift pressure against the manhole. To achieve anti flotation support with concrete slab under manhole, proper anchoring is required between manhole and concrete slab. Providing anti flotation ring is better method than providing anchoring to bottom slab. Please refer anti flotation section.



• Manhole Benching

MANHOLE INLET AND OUTLET CONNECTIONS.

NIC HDPE Manholes are provided with special inlet and outlets to provide following connections between HDPE manhole and system piping.

1. uPVC pipes with controlled outer diameter.
2. HDPE corrugated pipes with controlled inner diameter.
3. HDPE profiled pipes with controlled inner diameter.

All above connections are with rubber seal leak proof joints. Special electro fusion joints are also available for connecting large diameter profiled pipes. Inlet and outlet pipes (stub-out pipes) penetrate the riser wall to form an open channel. Other options include, terminating the connection at the riser wall, or providing a drop within the manhole. Drop connections and internal piping may be constructed using HDPE pipes. When making drop connections, it is recommended the “drop” be inside the manhole, to avoid down drag forces from embedment surrounding the manhole that could damage the connector pipe. Internal HDPE piping preferable be factory installed.

The design Engineer should specify the orientation including the slope for gravity-flow inlet and outlets (stub-outs). The slope should be at least one-percent. It is preferable to place inlet and outlet penetrations close to the manhole’s base or invert, especially with deep manholes.

Each NIC HDPE Manholes is fabricated with exact orientation of inlet and outlets as per design engineers requirements.



• Manhole with uPVC Pipe Connections



• Manhole with Profiled pipes Connections



• Manhole with mix connections

Lifting Lugs

For reliable handling, lifting lugs are extrusion welded at the top of NIC HDPE manholes.



LADDERS

The decision whether or not to provide a permanent ladder in the manhole rests with the Owner, Purchaser, or the Engineer. NIC offers HDPE ladders, which are extrusion welded inside manholes. Ladders are made and tested according to PrEN 13598 – 2



FOUNDATION

The manhole should be installed on a stable foundation. NIC recommends placement of HDPE manhole on concrete slab.

When concrete slab is not used, stable foundation is achieved by extra compacted material. All large rocks and clumps should be removed from the trench bottom. The foundation should consist of a minimum of 200mm (8") of Class I material (as defined by ASTM D 2321) compacted to a minimum of 95% Standard Proctor (as defined by ASTM D 698).



• Manhole Foundation



BACKFILL AND COMPACTION

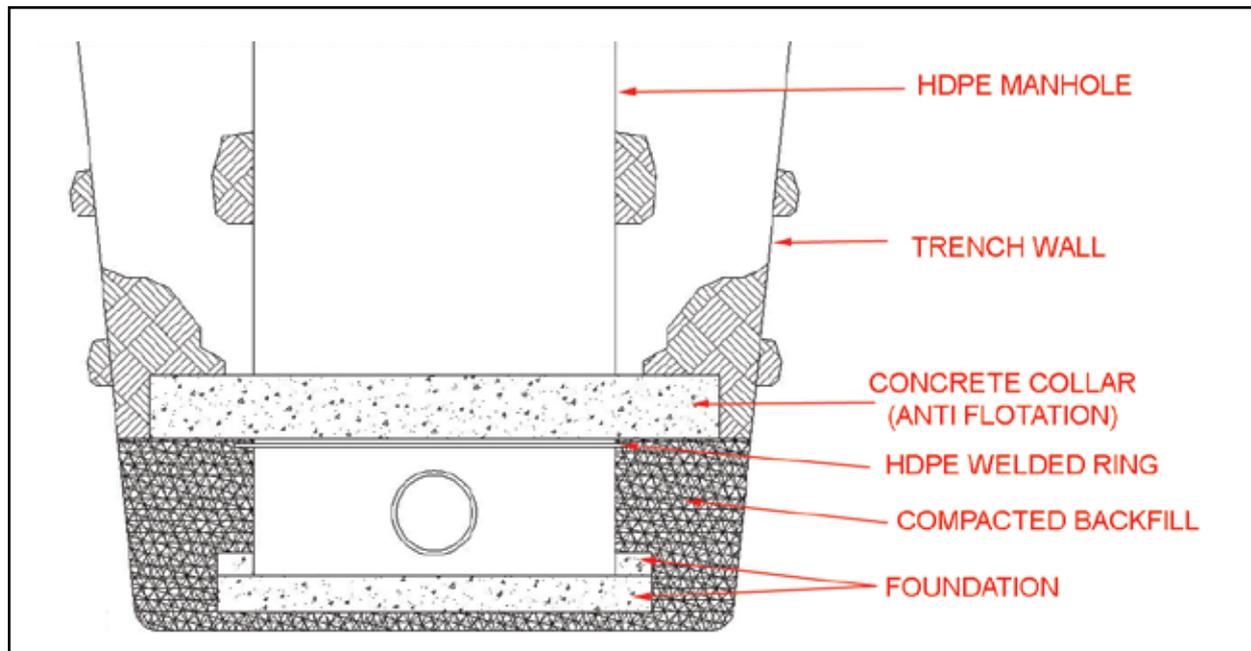
NIC recommends the use of Class I or II material as defined by ASTM D2321 for embedment of the manhole. Place in lifts not exceeding 200mm (8") and mechanically compact to the density specified by the Engineer or 90% Standard Proctor (95% under streets), which ever is higher. Compacted backfill must extend to the trench wall or undisturbed soil. This distance from the manhole (outside surface of the riser) to the trench wall must be at least 1 meter (3.5 feet). When lateral pipe connections enter the manhole, the embedment requirements for the pipe located within the backfill zone of the manhole must meet or exceed both the minimum requirements for the manhole, as well as, the minimum requirements for the pipe.

CONCRETE ANTI-FLOTATION COLLARS

NIC recommends use of concrete anchor collars, as anti-flotation system. To use anchor collars, an anchor connecting HDPE rings is extrusion welded to the riser's outside diameter above manholes inlet and outlets. A reinforced concrete collar is positioned on top of the anchor connection ring so the weight of the soil above the collar resists upward flotation.

The buoyant force acting on the manhole is equal to the weight of the volume of water displaced by the manhole and the stubout pipes under the shadow of the collar. The offsetting downward force is calculated using the weight of the concrete anchor collar plus the buoyant weight of the soil directly above it.

Concrete anchor collar dimensions are normally selected so that the weight of the anchor collar and the soil above the collar offset the buoyant force acting on the manhole and provide an adequate safety factor against flotation.



Notes:

Each manhole should be correctly analyzed for its particular service environment whether that may be in soil, water or grout. The Purchaser or Engineer should contact NIC for guidance. Following are factors important for calculations of manholes.

1. Earth and Groundwater Pressure.
2. Downdrag load from soil settlement.
3. Effect of Groundwater.
4. Traffic load.

This document reports accurate and reliable information to the best of our knowledge. Suggestions and recommendations cannot be guaranteed because the conditions of use are beyond our control.

For Sales Inquires – Contact:

Tel : (+965) 1844555 – Fax : (+965) 24833498 - 24815392

Email : sales@nicbm.com - Web site : www.nicbm.com