Manholes SANECOR

Watertight manholes made of corrugated PVC




Maximum efficiency for sewerage systems

MOLECOR
Smart water

CONTENT

SANECOR® manholes

Full information about the SANECOR® watertight manhole system (product video, technical catalogue, manhole configurator, installation instructions, work units, etc.) is available on the web www.molecor.com

SANECOR® manhole configurator

The SANECOR® manhole configurator is a tool Molecor provides for users on its webpage www.molecor.com who, once registered, have access to a programme where, given the project data and the constraints on the manholes, the best watertight manhole solution can be obtained rapidly and simply. The programme also facilitates all the technical information necessary for planning, costing and installing SANECOR® manholes.

1. Introduction

In urban sewerage collector networks, and more generally in conduits beyond a certain diameter which carry water under gravity, a series of inspection manholes is provided, normally placed no more than 50 m apart. The purpose of these is to offer access to the conduit for inspection, maintenance and repair, etc.

Traditionally, these manholes were constructed in situ with inexpensive materials like reinforced concrete or brickwork, although it has also become common in recent years to build them from prefabricated elements, either of concrete or plastic materials.

In sewerage and drainage networks, plastic materials offer very significant advantages due to their excellent response to chemical attack from the effluents and the gases these give off, and their very high resistance to abrasion by flowing water which, for wastewater bearing solids, can have highly destructive effects on traditional materials. From the hydraulic point of view, the smooth surface of plastic materials optimises water flow, meaning that these offer considerably more flow capacity for a given diameter.

In addition, those of plastic materials usually have watertight connector elements at junctions with pipes. On the one hand, this waterproofness prevents contamination of the environment, while on the other it prevents infiltration of groundwater into the collector network. It often happens that, when these infiltrations are significant, they lead to excessive cost in the transport and treatment of wastewater, as well as, though depending on the amount and nature of the groundwater, possibly hampering or even impeding the purification process.

Finally, it should be said that manholes made of plastic materials are very light, facilitating enormously the work of handling and fitting them, as well as being safer to work with in the trenches where they are buried.

Nevertheless, manholes prefabricated from plastic materials do have two drawbacks. One of these is the price, as the materials are much more costly than traditional ones, although the price difference falls considerably when we include the installation work as well. As has been said, this is because of their lightness and the efficiency of installation.

The other problem these manholes usually present is that they are insufficiently versatile to match well the different points at which connections are made in situ because, being prefabricated pieces, pipe junctions are usually accomplished by welding pipe segments to the manhole shaft. Any variation in the collector angles or heights when these are fitted means that connections must be made using elements not envisaged (special pieces) or, even worse, forcing the welds so as to damage or even break the seals, and thus losing watertightness.

It should also be said that, depending on the manhole wall thickness and the material used, the mechanical strength might not be sufficient to withstand the external loads of the ground or existing traffic. In this case, the manhole must be clad in concrete once it is installed. We should clarify that the collectors in an urban sewerage network usually run beneath the existing roads, where they collect water from the buildings alongside.

Traditional solutions

Watertight solutions

2. SANECOR® watertight manholes

At Molecor, we have extensive experience in manufacturing inspection manholes from different materials. Over the years, we have been able to verify the advantages and drawbacks mentioned above, both for manholes prefabricated from rigid materials (fibre cement and concrete), and plastic ones (GFRP, HDPE and PVC).

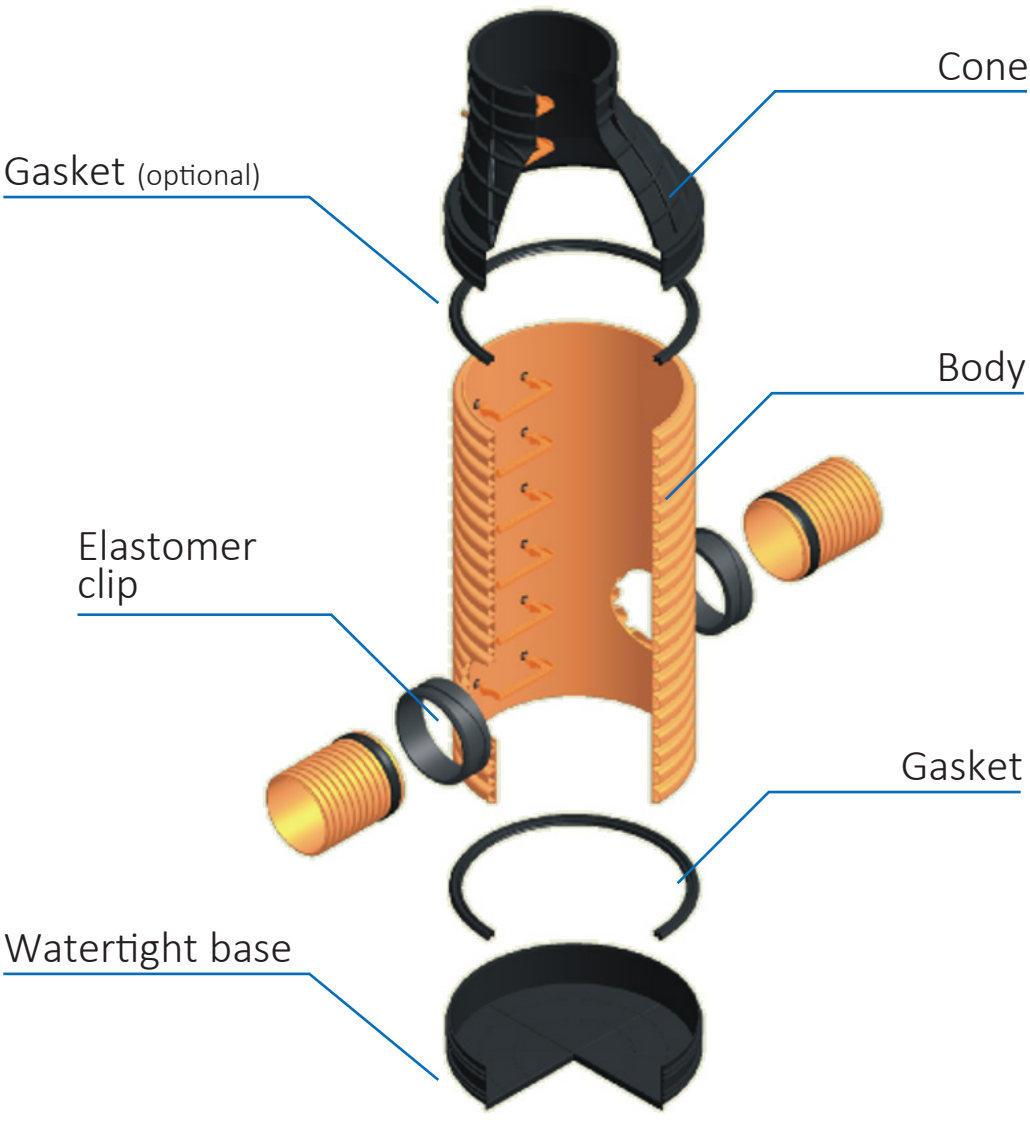
Molecor's product strategy has always focussed on developing solutions that are high quality, cost-competitive, and with the primordial objective of meeting the real needs of the sectors where it is present. This has given rise to a company policy based on innovation and the continuous improvement of its products and services. In the present case, this has let us design and develop a significant range of inspection manholes that, on the one hand, harnesses the benefits of plastic materials and, on the other, overcomes the problems mentioned above that these can present.

This design successfully reduces costs considerably when compared with other plastic manholes and, most importantly, ensures excellent watertightness in the network.

The SANECOR® manholes we describe below have accumulated more than 15 years of use experience, with thousands of references distributed all over Spain.

3. Components of SANECOR® inspection manhole

The following schematic shows the different components of a standard SANECOR® inspection manhole (for collector diameters up to 630 mm). The different elements are then described in detail:



Standard SANECOR® manhole solution schematic.

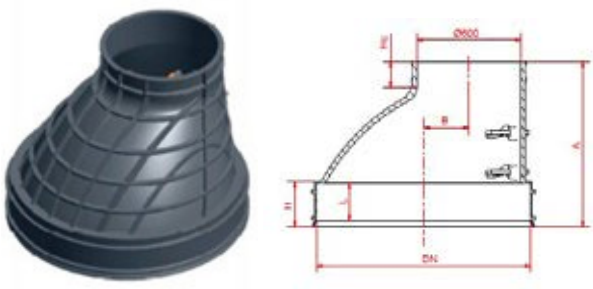
COMPONENTS OF THE STANDARD SANECOR® INSPECTION MANHOLE SOLUTION

3.1. Access cone

The manhole access reducer cone is manufactured from high-quality HDPE using a system that allows very large plastic pieces to be produced at a highly competitive price. The cone, whose entry diameter is 600 mm, is asymmetric and has two steps in manholes of 1000 and 1200 mm, while for 800 m manholes, it is symmetric and does not have steps. The design incorporates braces to ensure great rigidity.

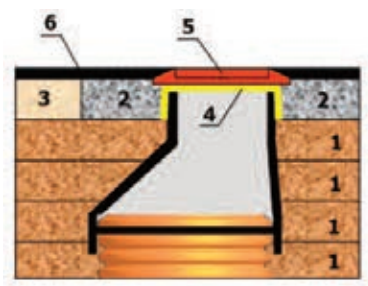
The cone is fitted into the top of the body very simply. Optionally, it is possible to install a gasket between the cone and body to guarantee watertightness in cases of high groundwater levels.

Reducer cone diameter 800 mm



Reducer cone diameter 1000 and 1200 mm

With regard to the execution work, we must take into account the installation recommendations, which are the same for the whole manhole range. As a general rule, a concrete slab must be installed to support the rim and cover, ensuring that the slab is isolated from the plastic cone using expanded polystyrene or a geotextile, etc. This will protect the manhole from the impacts the cover receives from traffic and will prevent small deformations of the manhole that could affect the surface course.



1) Filling compacted to 95% PN
2) Concrete slab
3) Base course
4) Separator between cone and concrete (EPS, geotextile)
5) Cast rim and cover.
6) Surface course

Manhole DN	Thickness (cm)	Slab section (m)	
		With traffic	Without traffic
600	20	1,20 x 1,20	1,00 x 1,00
800	20	1,40 x 1,40	1,20 x 1,20
1.000	20	1,70 x 1,70	1,50 x 1,50
1.200	20	2,00 x 2,00	1,80 x 1,80

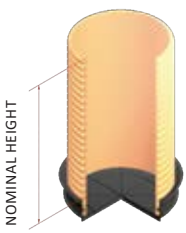
COMPONENTS OF THE STANDARD SANECOR® INSPECTION MANHOLE SOLUTION

3.2. Manhole body

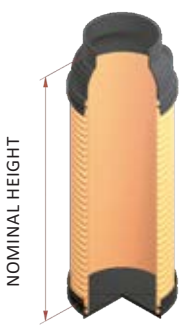
This is manufactured from corrugated PVC piping of nominal rigidity SN8 (SANECOR®), ensuring great strength against external loads throughout the service life of the manhole. This material guarantees that manholes do not need to be concreted to reinforce their rigidity. Indeed, much to the contrary, using a flexible material can be highly advantageous against settlement of the ground. SANECOR® manholes come in a range of diameters from 600 to 1200 mm.

The body of the SANECOR® manhole is manufactured from SANECOR® SN8 piping

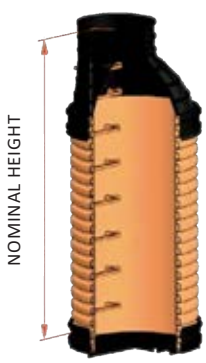
For shallow manholes, boxes of diameter 600 mm (without cone or steps) can be used, which are very suitable for heights of up to 1.5 m, or 800 mm ones for greater heights that have the possibility of incorporating steps. For the most common manholes, of diameters 1000 and 1200 mm, which always have steps unless the order specifies otherwise, the range of heights runs from 1.5 to 9 m.



Manhole DN600 mm



Manhole DN800 mm

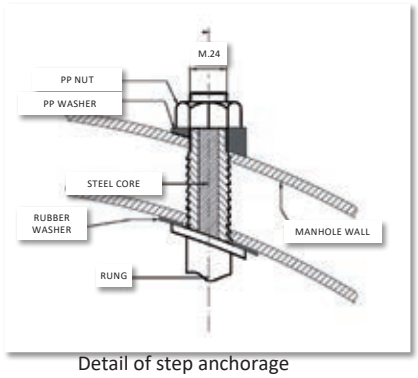


Manhole DN1000 and 1200 mm

Standard range of SANECOR® bodies

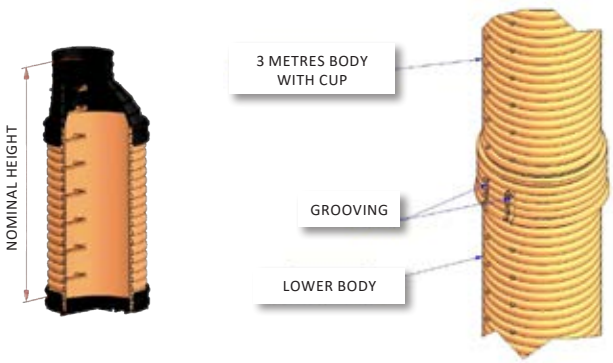
COMPONENTS OF THE STANDARD SANECOR® INSPECTION MANHOLE SOLUTION

The steps prefitted in the manhole body are of steel clad in polypropylene to prevent corrosion, and they have special washers to guarantee watertightness in the event of the entry of groundwater. They are fitted to the crest of the corrugation, with a constant separation of at most 30 cm.



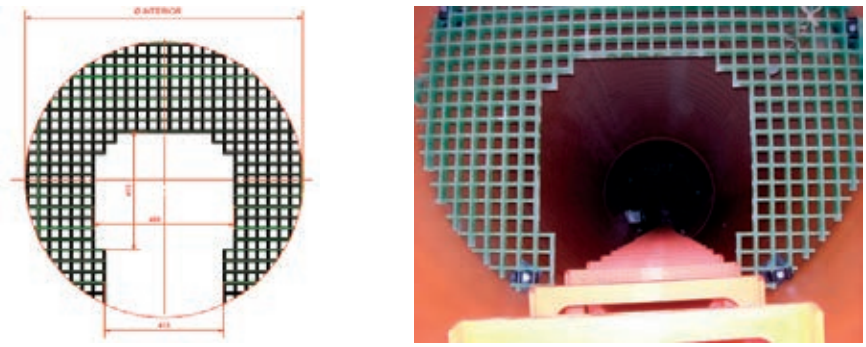
Detail of step anchorage

The body heights are matched to the depths in use at the site (bodies are manufactured in lengths of every 0.5 m), up to a maximum of 5.5 m, for manholes of 6 m. For greater depths, a second top module with one flared end is used so it can be joined to the bottom module.



Deep manholes using 2 modules

In manholes of a certain depth, it is necessary to include safety platforms or gratings which, in addition to protecting against possible accidents, offer the possibility of safe pauses during the descent. It is recommended to install one of these for each 2.5 or 3 m of depth. SANECOR® manholes have customised gratings made of reinforced polyester to avert electrochemical corrosion.



Polyester gratings in SANECOR® manholes

3.3. Elastomer clip

The elastomer clip is the element used to ensure watertightness in the collector couplings and possible later connections to the manhole shaft. The clips are installed by drilling in situ, making the system very **versatile**, because these couplings are made in the exact spot demanded by the job, and this adapts the manhole to the requirements and possible unforeseen events. The very thick corrugated bodies enable the fitting of sufficiently long clips to guarantee absolute **watertightness**, even if there is a certain angular deviation. Therefore, these pieces have been designed to match the dimensions of the corrugations.

For complete watertightness, specific elastomer clips for SANECOR® manholes should be used, which are designed to match the thickness and curvature of the body and the wall of the drill hole, either inside or outside. There exist universal elastomer clips on the market that do not guarantee watertightness.

Accomplishing the couplings is very simple and does not require specialist workers. The clip is supplied with an adhesive template that, stuck to the manhole body there in the trench, makes it possible to drill rapidly and reliably. The sequence below shows the different installation steps for an elastomer clip when a jigsaw is used for drilling.

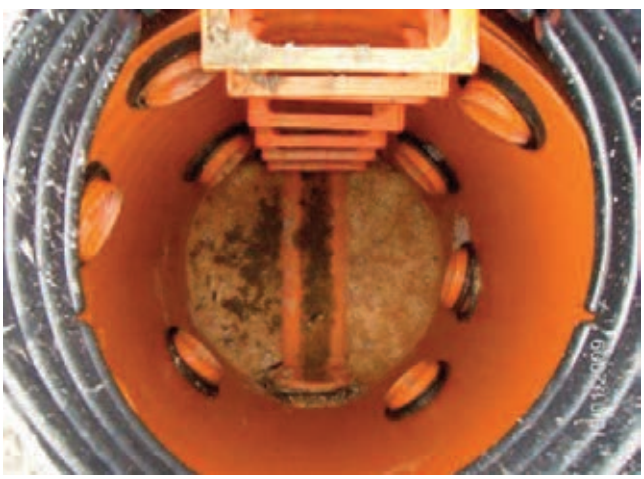
Elastomer clip installation sequence

COMPONENTS OF THE STANDARD SANECOR® INSPECTION MANHOLE SOLUTION

For small diameters (up to 250 mm), drilling can be performed with a cutting crown fitted to a manual tool.

Making a coupling with a cutting crown

This system makes it possible to accomplish the couplings between pipes and manhole body in situ and at exactly the right spot, with no need to make adaptations like those which prefabricated elements require.

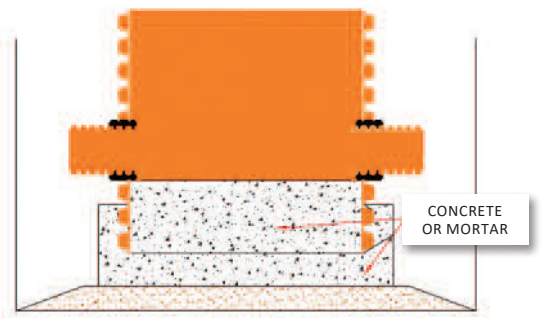


Couplings made in situ

3.4. Watertight base

The manhole is closed at the bottom with a HDPE base that incorporates a watertight gasket to prevent the entry of groundwater. Although optional, this is recommended when the groundwater reaches the level of the manhole. Otherwise, the manhole can be installed without the base directly upon concrete.

Manhole bottom with watertight base (necessary if there is groundwater here)



Manhole bottom finished with concrete (only recommended if there is no groundwater here)

In both cases, the interior finish of the manhole must be done with concrete, forming the conduit with a section of bottom half-pipe traversing the manhole, to minimise the loss of load.

Interior finish of a 180º manhole

Note No. 1: In manholes where connections are made using elastomeric clips, the nominal height of the manhole roughly corresponds to the total height of the manhole minus the base height in manholes with bases, or to the total height of the manhole minus the concrete slab in baseless manholes. In the latter case, the concrete slab must cover the bottom 2 corrugations, except for the short 600 manholes, where it must cover the bottom 3 corrugations. In any case, in these types of manholes, the nominal height does not align with the water level depth, as this will depend on the positioning of the collector connections. This depth will always be less than the nominal height of the manhole.

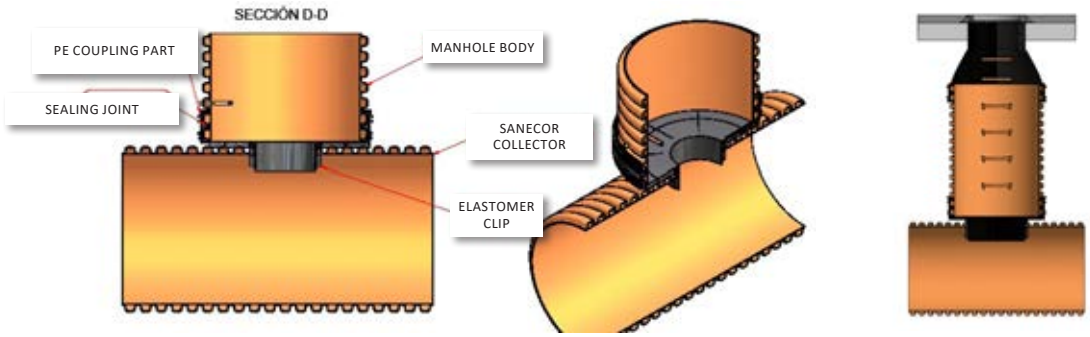
4. Other solutions from the SANECOR® manhole range

4.1. Manholes for large diameter collectors

When the collector diameter is 800, 1000 or 1200 mm, the manhole must be installed with coupling elements other than those indicated above.

4.1.1. Inspection manholes

For manholes of diameter 1000 and 1200 mm, when the collector diameter exceeds 600 mm, the two can be joined using a visitable base. The body is closed below by a base with watertight gasket, but open in the centre, so that a concentric opening remains allowing the collector to be inspected at its crown. This opening is finished with a vertical collar enabling connection to the collector with an elastomer clip to ensure complete watertightness. Given that the piece is of HDPE, to achieve a competitive cost, which would be too high if it were of PVC, this solution cannot be used when there are groundwater levels above it. In addition, whenever this piece is installed it must be concreted, leaving the couplings between collector and manhole free.



Note No. 2: In manholes with a base, the nominal height of the manhole roughly corresponds to the sum of the manhole height above the collector plus the diameter of the collector.

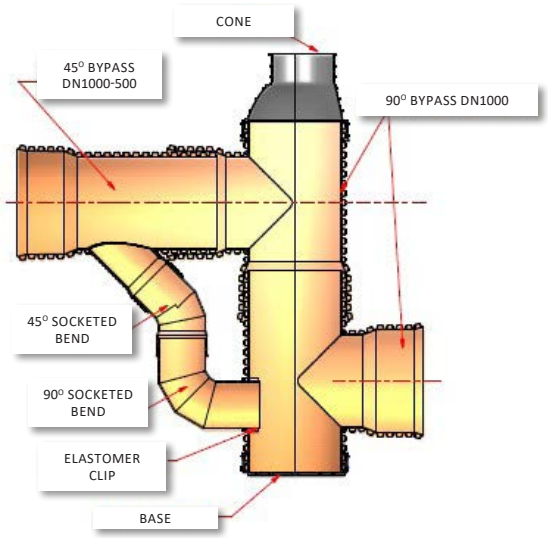
4.1.2. Manholes with junction piece

For manholes of diameter 1000 and 1200 mm, when the collector diameter exceeds 600 mm, the two can be joined using a T-shaped piece made of HDPE. This maintains access to the full section of the collector, which is visitable using the 3 steps incorporated into the body of the piece at its side. To maintain watertightness, the connection with the manhole and the two ends of the collector must be accomplished using the same gaskets employed by pipes to join them together. Given that the piece is of HDPE, to achieve a competitive cost, which would be too high if it were of PVC, this solution cannot be used when there are groundwater levels above it. In addition, whenever this piece is installed it must be concreted, leaving the couplings between collector and manhole free.

Note No. 3: In manholes with junction pieces, the nominal height of the manhole roughly corresponds to the total height of the manhole.

4.1.3. Manholes with welded couplings

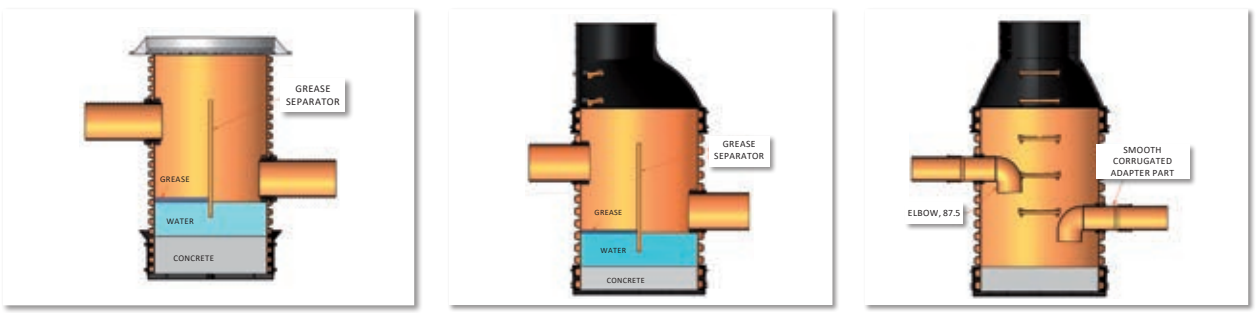
The SANECOR® system also makes it possible to install manholes for collectors of large diameter using chemical welding in plastic. This is necessary when there are entries and exits at different heights (drop manholes), or when the collector must be visitable and there is a change of direction. With this solution, it is necessary to concrete the welds of the couplings to the manhole, leaving the elastic junctions with the collector free.



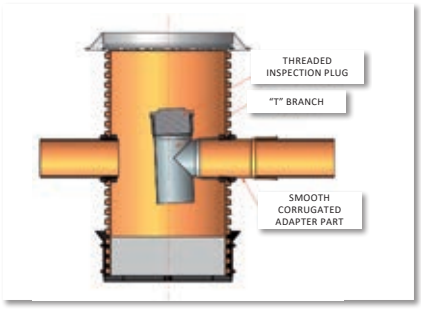
4.2. Waste boxes and special manholes

Using the SANECOR® system, it is possible to execute a multitude of waste box and manhole solutions for different applications.

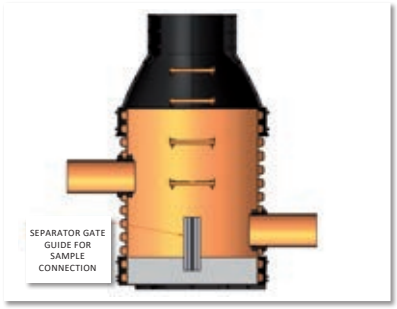
The following figures show some examples which speak for themselves.



Grease separator boxes and manholes



Syphon box



Sampling manhole

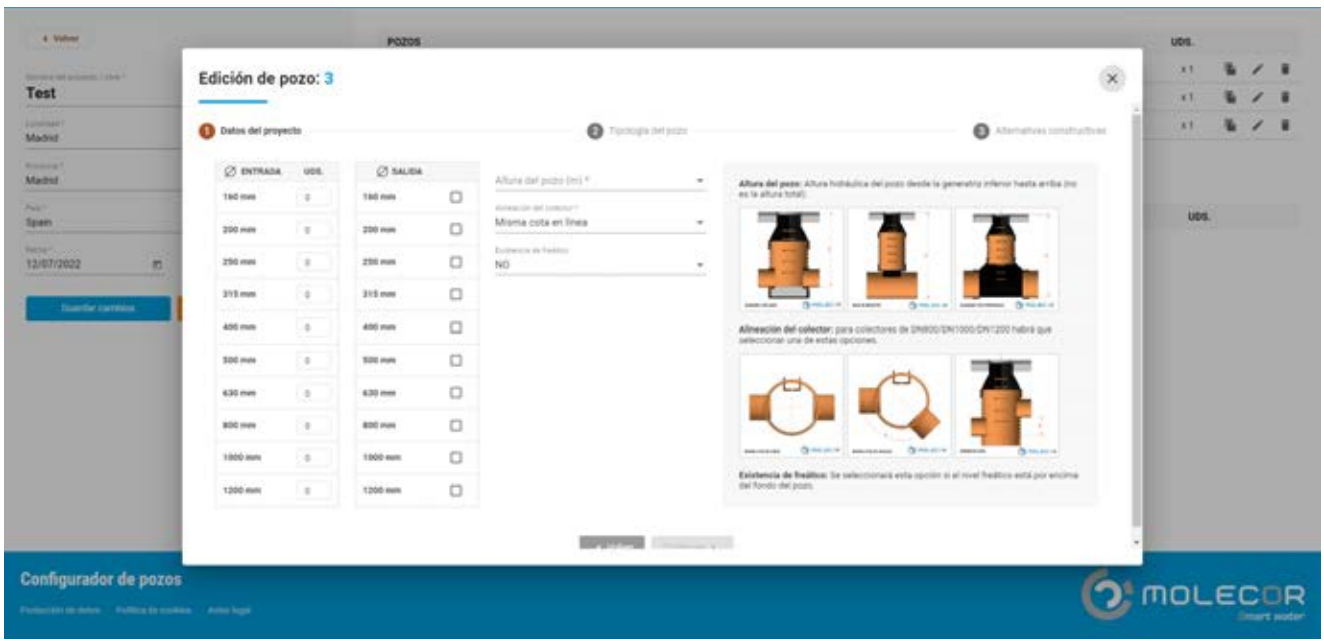
5. Choice of the right manhole

The range of SANECOR® inspection manholes is very broad to meet all the possibilities that may arise at a site. When choosing a SANECOR® inspection manhole, we must take the following points into account:

1. PROJECT DATA
   a. Manhole height.
   b. Diameters of the entry and exit collectors, and of the couplings.
   c. Alignment of collectors (straight-through, angled or at different heights).
   d. Existence of groundwater.

2. MANHOLE TYPE
   a. Nominal manhole diameter.
   b. With or without steps.
   c. Visitable or not.

Given these parameters, we can select the manhole needed. To facilitate this task, Molecor offers its users an application called "SANECOR® Manhole Configurator", installed on its webpage www.molecor.com, where the variables mentioned are entered, and the programme calculates as result the watertight manhole that is the best fit to the project, as well as offering full information about the same (breakdown of the material, drawings, work units, installation instructions, etc.).



The relationship between the nominal diameters of the manhole and collector is a fundamental point when choosing the right manhole for each project. For collector diameters from 800 to 1200 mm, special solutions are required to accomplish the connection between connection and manhole. The table below indicates the different manhole types that are valid for different collector diameters.

OTHER SOLUTIONS FROM THE SANECOR® MANHOLE RANGE

MANHOLE TYPE	COLLECTORS				CONNECTION TYPE
	DN160 - DN315	DN400	DN500-DN630	DN800-DN1200	
INSPECTION BOXES					
 DN630					
INSPECTION MANHOLES FOR SMALL AND —INTERMEDIATE COLLECTORS					
 DN800					
 DN1000 DN1200					
INSPECTION MANHOLES FOR LARGE COLLECTORS					
 Inspec-tion base					
 Junction piece					
 Welding					

Inspection boxes of nominal diameter 630 mm are low and do not have steps, so if there is no groundwater at the trench level they can be supplied without a base.

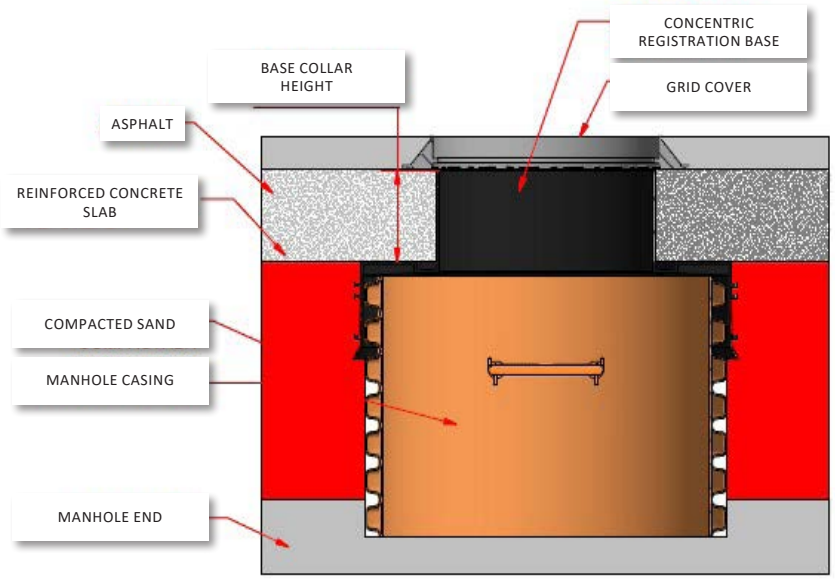
Manholes for collectors of small and medium diameter less than 800 mm have in their turn nominal diameters of 800 (only for collectors up to 400 mm), 1000 or 1200 mm, and heights up to 9 m. Normally, these are supplied with steps installed, although they can optionally be ordered without these and, as in the previous case, they can be supplied without a base provided there is no presence of groundwater.

The manholes are also subject to a minimum height constraint determined by the collector diameters. The table following shows the minimum heights for each manhole diameter in the cases of smallest and largest diameters. These heights can always be reduced by about 20 cm by cutting the collar of the reducer cone.

	COLLECTORS		
	DN 160	DN 400	DN 630
MANHOLE DN800	0.85m	1.12m	-
MANHOLE DN1000	1.14m	-	1.64m
MANHOLE DN1200	1.20m	-	1.70m

Minimum height of manholes with standard cone

If you need a lower height than that given in the table above, we can dispense with the usual cone and in its place use an inverted base as reducer cone: this gives us the option of making shallow manholes with the following minimum specifications:



	COLLECTORS	
	DN 160	DN 630
MANHOLE DN1000	0.73m	1.23m
MANHOLE DN1200	0.69m	1.19m

Minimum height of manholes with short cone.

6. Advantages of the SANECOR® system

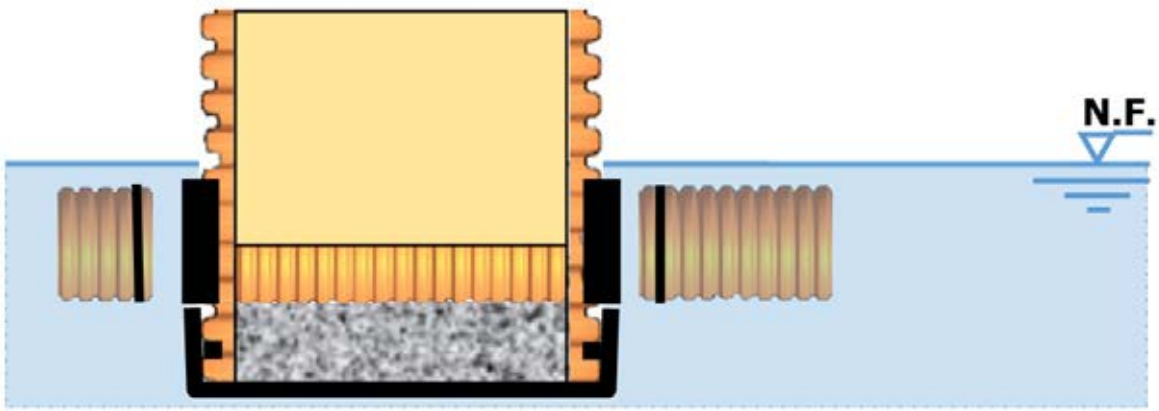
Compared with traditional solutions, SANECOR® inspection manholes bring major advantages to the market: watertightness, rapidity of installation (reducing installation costs and costs to society), safety on-site and versatility of the solution.

Watertightness: the importance of this lies not only in avoiding contamination of the ground and aquifers by possible leaks of effluent, but in preventing infiltrations by groundwater into the sewerage network, raising the costs of pumping and purification, leading to less sustainable sewerage systems. Diluting the wastewater with groundwater can also hamper treatment work by occasioning costly technical problems.

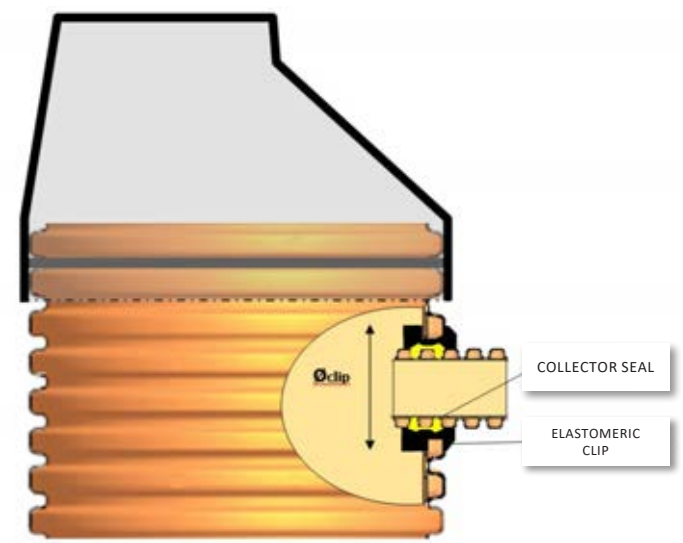
WASTE BOXES AND SPECIAL MANHOLES

The principal contribution of SANECOR® inspection manholes is their complete watertightness, so that the usual two critical points of a conventional inspection manhole are completely assured:

- Where the collector and manhole meet: coupling to the pipes with elastomer clips, which also incorporate elastic gaskets, guarantees perfect watertightness here.
- The manhole bottom: with the plastic base and gasket seal fitted to the bottom of the body, watertightness is also assured here.



- Optionally, watertightness can be ensured in the reducer cone for cases of high groundwater levels by using another gasket here.



WASTE BOXES AND SPECIAL MANHOLES

Rapidity of installation: By working with materials lighter than in traditional solutions and be able to reach the top in a single operation, as the body is supplied in a single piece, installation times are reduced considerably. This means savings on the work itself and a reduction in the costs to society, as these are works in which the nuisance value of having a street closed is very significant.

Safety on-site: Everyone knows that the manhole zone is a critical point of the job, from the perspective of worker safety. In many cases, shoring is interrupted, and these are areas with the risk of slippage.

With the SANECOR® inspection manhole system, the chances of an accident fall significantly because the operatives need to spend less time in the trench.

WASTE BOXES AND SPECIAL MANHOLES

Versatility: As the couplings to the collector and supplies are performed in situ, this makes it much easier for SANECOR® manholes to be adapted to the unexpected at the site, instead of having to adapt the work to the configuration of the manholes. For instance, this versatility makes it possible to make drop shafts and other special types.

Other advantages

The great rigidity of SANECOR® pipes (more than 8kN/m²) from which the bodies of SANECOR® manholes are manufactured makes the whole assemblage very strong. In no case is it necessary to concrete the manhole bodies, as does happen for manholes of other plastic materials.

Compared with traditional solutions (principally made from concrete), SANECOR® offer all the advantages of plastics in general:

- Absence of corrosion.
- Strong chemical resistance.
- Very strong resistance to abrasion.
- Very low losses of load.
- Minimal energy consumption over the product lifecycle.

7. Data sheet

Manhole body

PHYSICAL AND CHEMICAL CHARACTERISTICS	
Density:	1350 ÷ 1520 kg/m3
Coefficient of linear expansion:	8 x 10-5 m/m. ºC
Thermal conductivity:	0.13 kcal/m.h.ºC
Specific heat:	0.2 ÷ 0.3 cal/g.ºC
Vicat Softening Temperature:	≥79ºC, according to standard UNE-EN 727
pH limits:	From 3 to 9, at 20 ºC
Dichloromethane resistance:	At 15 ºC, for 30 min, according to UNE-EN 580
Heat performance:	Conforming to the standard ISO 12091

MECHANICAL CHARACTERISTICS	
Ring Stiffness :	≥ 8 kN/m2, according to UNE-EN ISO 9969
Yield coefficient after 2 years:	≤ 2.5, according to UNE-EN ISO 9967 The real value is below 1.8
Impact Resistance:	According to UNE-EN 744 (Round-the-clock Method)
Ring Flexibility:	20% according to UNE-EN ISO 13968

INTERIOR MANHOLE DIAMETER	
DN630	590.0 mm
DN800	775.0 mm
DN1000	970.0 mm
DN1200	1102.9 mm

Steps

CHARACTERISTICS	
Cladding material:	Non-Copolymer Polypropylene.
Bending Strength:	Calibrated steel F1 with hardness 65 kg/mm2
Reference standard:	EN-13101

Waterproof cone and base

POLYETHYLENE CHARACTERISTICS	
Density:	0.936-0.989 g/cm
Bending Strength:	650 Mpa
Impact resistance:	21 J/mm
Elongation:	700% before Break
Manufacturing process:	Rotomoulding

Elastomer clip

CHARACTERISTICS	
Material:	Natural Rubber
Hardness (º SHORE A) - H:	50 ± 5
Elongation at break (%) - (23ºC after 72 h):	21 J/mm
Tensile strength (Mpa) - A:	≥ 9
Manufacturing Process:	Injection
Reference standard:	UNE-EN-681-1

8. References

Name of project	Province	Year	Public/Private Promoter	No. of man-holes
Sewerage in Carracedelo (Ponferrada)	León	2010	Somacyl	60
Sewerage Network Fernán Caballero (Ciudad Real)	Ciudad Real	2010	Private	40
Sewerage c/ Jose Mª Pemán, Maestro Vallejo and Calvario (Marmolejo)	Jaén	2010	Sociedad Mixta del Agua-Jaén, S.A.	23
Urban development Gullón biscuit factory (Aguilar de Campoo)	Palencia	2011	Private	60
Sewerage and water supply in San Miguel de Langre	Palencia	2011	Castilla y León Regional Government	32
Sewerage for the Madre River (Colindres)	Cantabria	2011	Northern Basin Authority	30
Northern access road (Ciuden)	León	2011	Ponferrada City Council	30
Construction of the vehicle test centre (ITV) in the municipality of Priego de Córdoba	Córdoba	2013	Andalusia Regional Government	23
Avenida Escuela Pías (Daroca)	Zaragoza	2013	Daroca City Council	18
Villamuriel Industrial Estate	Palencia	2014	Villamuriel City Council	60
Sewerage Lapuebla de la Barca	Álava	2014	Álava County Council	50
Giro Group Factory (Teruel)	Teruel	2015	Private	24
Port of Langosteira (A Coruña)	A Coruña	2015	A Coruña Port Authority	20
Refurbishment of manholes in Sur de Huelva urban expansion.	Zaragoza	2015	Private	20
Hospital Línea de la Concepción (La Línea)	Cádiz	2015	Andalusia Regional Government	18
"Los Alisios" Shopping Centre (Las Palmas)	Las Palmas	2016	Private	300
La Marazuela Housing Development (Las Rozas)	Madrid	2016	Ikasa	30
Logistics platform of Badajoz	Badajoz	2017	Ministry of Public Works of Extremadura	152
Sewerage at Puente de Sanabria	Zamora	2017	Castilla y León Regional Government	50
Refurbishment of water networks Avenida Juan Carlos I (Tomelloso)	Ciudad Real	2017	Tomelloso City Council	45
Work on Avenida Capitán Claudio Vázquez (Ceuta)	Ceuta	2017	Ceuta Ministry of Public Works and Environment	40
Puerto de la Caleta (Vélez Málaga)	Málaga	2017	Andalusia Port Authority	33
Improvements to the Breiro River in Boiro	A Coruña	2017	Galicia Water	20
Southwest European logistics platform	Badajoz	2018	Extremadura Regional Government	100
Updating and conservation of the facilities at the vehicle test centre (ITV) in Algeciras.	Cádiz	2018	Andalusia Regional Government	57
Water treatment plant at Maella	Zaragoza	2018	Aragon Water Institute	27
Sewerage at Parque Morales (Santander)	Cantabria	2018	Santander City Council	20
Urban development Avenida General Mayandia (Zaragoza)	Zaragoza	2018	Private	17
Joint discharge and water treatment plant at Nerva-Riotinto (Huelva)	Huelva	2019	Andalusia Environment and Water Agency	150
Construction of the water purifiers at Esguevillas de Esgueva, Valoria La Buena and Quintanilla de Onésimo.	Valladolid	2019	Duero Basin Authority	50
Sewerage around the Arroyo de la Encomienda sports centre	Valladolid	2019	Arroyo de la Encomienda City Council	20
4* hotel and commercial area at White Beach (Lanzarote)	Las Palmas	2020	Private (Yudada, S.L.)	492
Chemical and refining integrated project Singapore	Singapore	2020	Private (Exxon Mobil)	150
Upper sewerage collector at Níjar Villa	Almería	2020	Andalusia Regional Government	130
Sanitation and purification for the waters in the Hervás area (Cáceres)	Cáceres	2020	Tagus Basin Authority	120
Torre Caleido (5th tallest in Madrid)	Madrid	2020	Private	51
Naropa Building (Las Rozas)	Madrid	2020	Private	34
Sewerage at Estepona	Málaga	2020	Acosol	25
Pato urban development (Málaga)	Málaga	2020	Private	23
Los Cortijos housing development phase II (Sevilla la Nueva)	Madrid	2020	Isabel II Water	18
Refurbishment of Sitges collector	Barcelona	2020	Sitges City Council	25
Urban development at Playa de Gandía	Valencia	2020	Gandía City Council	120

Drainage network of Anoeta football pitch (San Sebastian)

Hospital La Línea de la Concepción (Cadiz)

Torre Caleido (5th tallest in Madrid)

Logistics platform in Badajoz

Sewerage in Lapuebla de la Barca (Álava)

Water treatment plant in Maella (Zaragoza)

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