►SEWER

Today, plastic sewer pipes can be found across the world. Compared to traditional materials, their performance is excellent and their contribution to public health and sanitation is significant. These sewer pipes may well be buried and thus out of sight, but their usefulness is certainly not out of mind.

In our September issue, we talk to industry experts about:

- Inspection Chambers
- Structured Wall Pipes
- Response to attacks from clay
- Jetting

►INSPECTION CHAMBERS

Plastic inspection chambers have been around for the last twenty years. It was inevitable that their popularity in Europe would prompt a move towards standardisation. But where to begin? Frans Alferink picks up the story to find common ground - for what can be usefully found underground!

All over Europe, the technical jury is out on the final agreement for the standardisation. If all goes well, by mid 2008, the European standard will be published. This process has taken many years and according to Frans Alferink, a member of the Dutch technical standards committee: "Once accepted, this standard will lead to the application of good quality chambers and therefore performance."

Frans Alferink

Vision

Alfrink has a clear vision of the application of plastic pipes systems including plastics manholes and inspection chambers as well as plastics pipes.

"The function of a buried pipe system is that it maintains a system of smooth and tight holes in the ground for a long period of time." Says Alferink.

"The benefits of plastic inspection chambers are widely appreciated. In addition to their obvious handling, transport and long life advantages, plastic chambers are a lot more resistant to the corrosive gases and products caused by our waste products as they flow through the underground sewer network."

"And the wonderful characteristic of plastics is the absolute control in the manufacturing process - enabling us to make products that will perform exactly as intended and for a long time."

Alferink acknowledges that the industry is well aware of some of the problems of non-plastic materials:

PIPES

- Leaking joints
- Deteriorating pipes caused by H_2S
- Cracked pipes

CHAMBERS

- Leaking pipe connections with non-plastic chambers
- Leaking chambers
- Deteriorating chambers caused by H_2S

Alferink points out that, "Suppliers of plastic pipe systems have to be alert not to enter the market with poor quality products, as this will jeopardise the good image and record of plastics pipe systems. It is therefore of prime importance to establish standards that ensure good products to be used in sewer systems."

According to Alferink, the essential properties of inspection chambers are **structural integrity, good operational performance, tightness and durability.**

Integrity

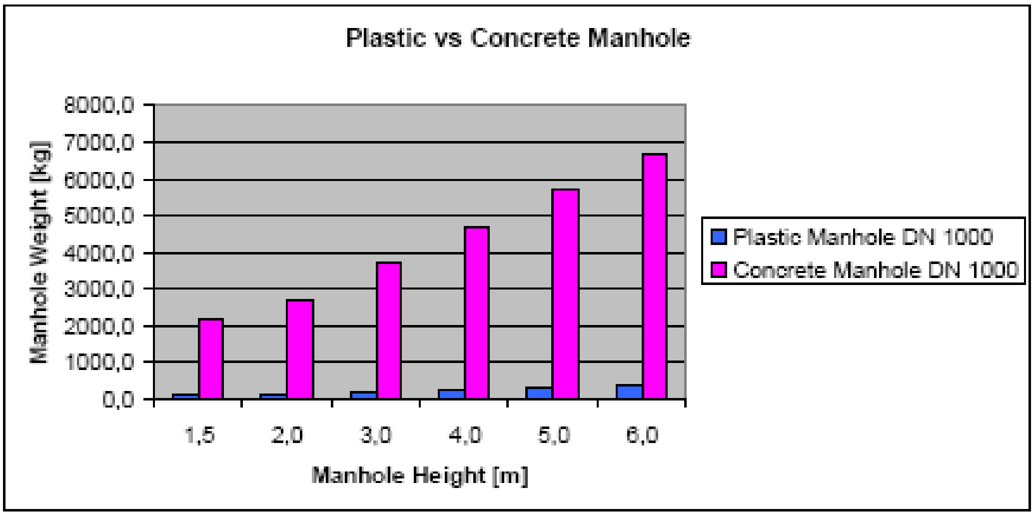
Plastic inspection chambers can withstand all chemicals that normally occur in sewers. Their durability is all the more relevant since unlike non-plastic chambers, they are not subject to chemical attack of biogenic "sulphuric acid" in the form of corrosion. Corrosion clearly has an adverse effect on flow properties and may affect the structural integrity. the diameter of the host pipe.

Furthermore, given that in most EU-countries there is a trend towards separation of sewer systems in to black (foul) water and rainwater, the concentration of chemicals in the sewer system may increase.

Lightweight is clearly a fundamental feature of plastic chambers. The benefits of easy transport, handling and installation without any special equipment are clearly worthwhile. As a general rule, the weight of a typical concrete manhole (inspection chamber diameter in excess of 600mm!) is 18 times that of a plastic manhole of the same height. See chart on following page.

Manhole deterioration

Manhole as sulphur factory

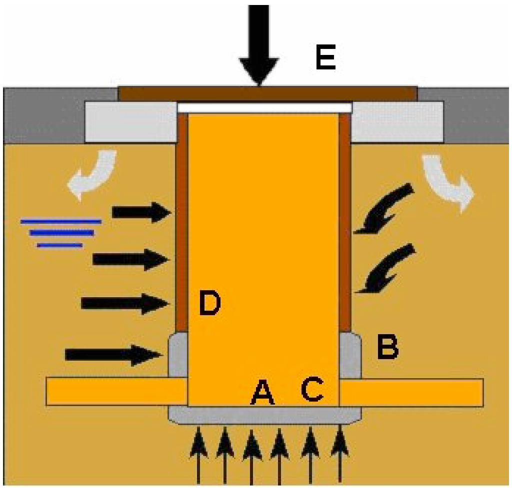


Performance

Whereas plastic chambers are lightweight, there can be no argument for focusing on lowest cost when it comes to buried products that establish such vital systems for society, as those of sewer. "These products must withstand traffic, soil and ground water loads: their functional performance should be excellent."

"Good design of flow profile is also important. Optimal flow profiles are a condition to be fulfilled in order to avoid high operational costs for the future. In Denmark, a test (DS2379) exists where the flow performance is tested. Especially so-called "multi-functional" chambers suffer from poor flow performance. However, the upcoming new European standard will not address the issue of flow, because except from Denmark, this issue is not considered as so important in other countries of Europe."

Alferink explains that the application windows of plastic chambers can be rather different. Some may be produced for low depth installation, whereas others may focus on deep burial in combination with high groundwater levels. The best way therefore is to classify the chambers according to their proven application window. The upcoming European standard provides test methods and procedures to carry out this classification.



(Figure 1) Loads on buried chambers

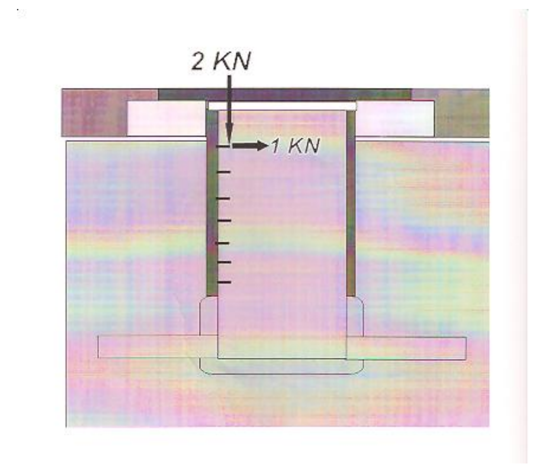
Load testing

An important function of the chamber is to maintain the hole in the ground. And in order to be able to do that, it needs to cope with the loads exerted upon the chamber.

For almost all these loadings, test methods and requirements have been developed by a working group under CEN.

Aspect (referring to figure 1)	Description	Test	Method
A	Stability of flow profile	Vacuum test on base product. Vacuum relates to allowable groundwater depth with a minimum of 2 metre	EN14830
B	Tightness	Normal joint tightness requirements. Additional tightness under shear load	EN 1277 EN295-3
C	Impact resistance	Impact test	
D	Shaft stiffness	Minimum stiffness is 2 kPa	EN14982
E	Cover load test	Test load depending on type of road	EN14802

Steps and ladders could also be tested for how much weight they can withstand. “A downward vector of 2 KN and horizontal vector of 1 KN should be ideal for the fit purpose.”



For the shaft the ring stiffness is the most important parameter to be considered as the shaft should not collapse under the load of ground and groundwater. In figure 2 the maximum allowable depth (H) is shown for chambers when buried in sand, clay and in very weak soils. The groundwater level is 0.5 meter below the surface.

For the calculation, use is made of the following buckling formula:
qcrit = 5.63 √ (Et * SN)

qcrit=critical buckling pressure [kPa]

SN = pipes ring stiffness [kPa]

Et =tangent modulus (E_s) of soil[kPa]

For sand, a secant modulus of 1500 kPa is used and for clay a modulus of 500 KPa. These values are arbitrary and are actually depth dependant. However, for a conservative estimation, these values can be used.

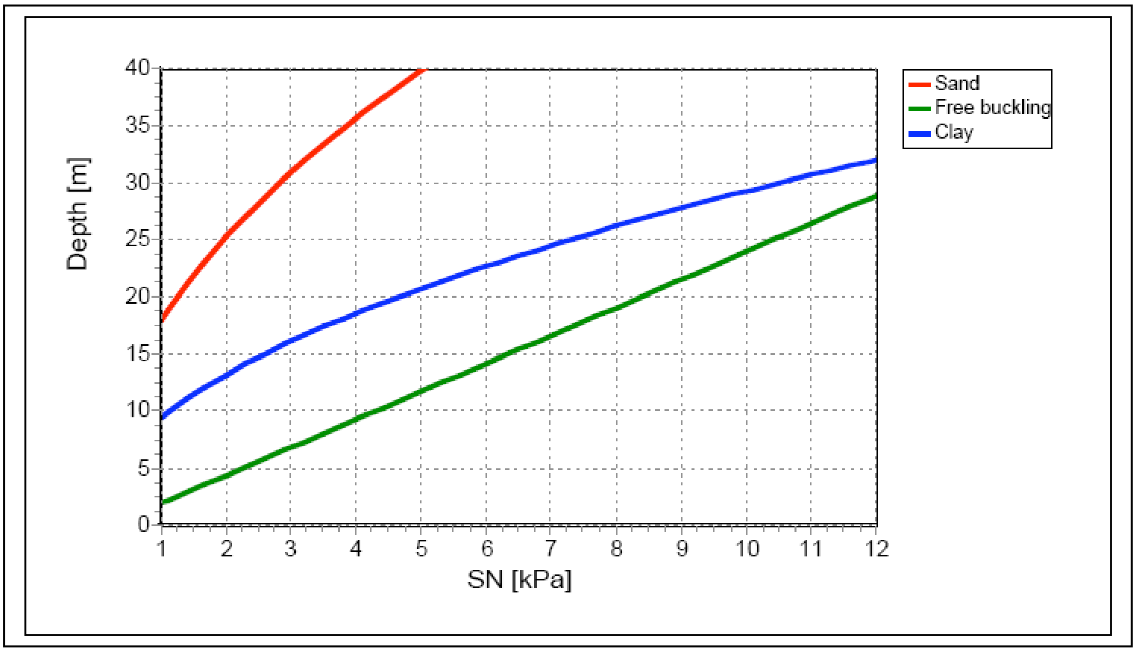


Figure 2) Allowable depth

What the above shows is that a ring stiffness of 1 KPa could also be used when installed in well-compacted sand. In clay it would also work.

"However, in soft soils and ultimately in water-like soils, the shaft would buckle when the depth would be more than 2 metres. In the draft standard, a minimum stiffness of 2 KPa has been proposed. The reason for that is that the installation may well result in uneven loading, especially when clay or big lumps of soil are dumped around the shaft. Experience in Europe has shown that the stiffness of 2 KPa is a safe limit," says Alferink.

Integrity

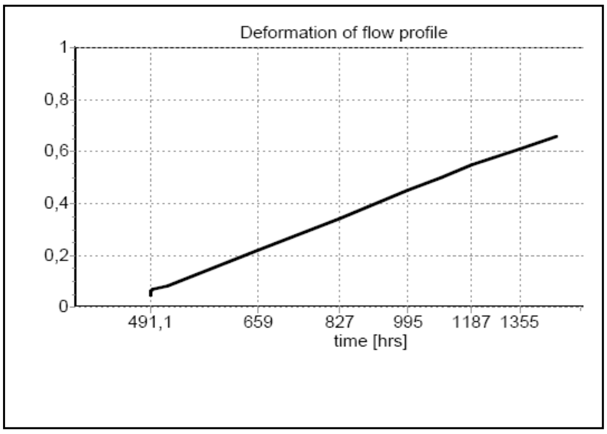
Structural integrity of the base of the chamber is also an important criterion. "There is no point in manufacturing flimsy structures that will yield to deformation and thus create flow problems."

Impression of measuring spots, mid-point deformation and horizontal deformation

The stability of the flow profile can be tested using a vacuum test or an external water pressure test.

"In both cases a pressure difference is established over the load bearing part of the chamber. The deformation of the flow profile is measured during the test. Both the vertical deformation of the midpoint of the flow profile as well as the horizontal deformation is recorded during 1000 hours at ambient temperature."

Alferink points out that by using a similar extrapolation technique as in ISO 9969, the 50 years deformation prediction is estimated. If the construction is not stable in the long term, then this test will certainly tackle that.



Deformation of flow profile (vertical axis plotted in mm)

Reality

Europe with its tapestry of cultures and customs is not the best of all possible worlds to reach agreement.

Alferink says it could be another year before the standard is eventually agreed and accepted. "But we are confident that the customer's best interests will be served through an optimal functioning sewer system!"

Zoran Davidovski who is closely following developments for the Civils Working Group of TEPPFA is reasonably optimistic that the 2008 deadline will be reached. "Following a certain amount of testing, outstanding differences are to be discussed imminently. The document can then be released for voting by end of 2007 and then depending on the procedure chosen, voting can last three to six months. The best case scenario is therefore mid 2008."