10 steps towards successful installation

10 December 2007

0. Introduction

Supporting your experience

Municipalities and water companies who adopt gravity sewers and sewer pressure systems need to be sure that each completed scheme will provide the reliability and quality of performance they need.
As an experienced installer or contractor of sewer pipe work, you'll recognise the importance of correct installation whichever type of system is used.

Proven products

In recent years, plastic pipes and fittings have increasingly become the preferred type of piping system. Millions of metres have already been successfully installed as sewer systems in Europe and around the world.
Their installation is no more complicated than for any other pipe materials. In some respects they are easier. For instance, you'll appreciate their light weight and the fact that fewer joints are needed. Supporting documents are the ENV 1046 and the EN 1610. For technical background information TEPPFA practical field studies have been used.

A reminder of important details

This leaflet is designed to help achieve the correct installation of plastic piping systems based on experiences in daily practice on various locations and with varying soil conditions. It provides a useful reference and reminder of the detailed installation procedures which you are asked to follow. In so doing, it will assist you in your own professional commitment to Best Practice.

A brief history

Plastic pipes have been used since the 1960's for water distribution and waste water transport. Today plastics piping systems are available in various types and constructions all fulfilling customers needs and performances.

Guidance Notes

Working together to ensure best practice for gravity sewers and sewer pressure systems up to 630 mm:

1. Storage

- Support pipes completely
- Decolourization due to outside exposure will not affect functional performance
- If the expected storage time > 6 months precautions should be taken to avoid direct sunlight exposure
- For storage of coils the manufacturers instructions should be followed (no vertical storage to avoid out of roundness and buckling)
- Store on level ground on battens with side support at intervals of maximum 2 m. Precautions to prevent rolling shall be taken as appropriate

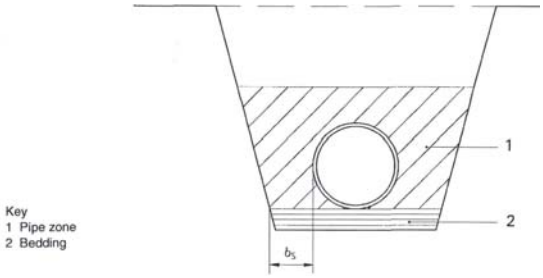
2. Transport and Handling

- Metal slings/chains should not be used for (un) loading. Use forklift or web sling, nylon slings or ropes
- Pipes and fittings should not be dropped or dragged across the ground
- For lengths more than 10 m a tongue is preferred for (un)loading
- Pipes and pipeline components shall be inspected on delivery to ensure from the markings that they are in accordance with the design requirements.

3. Trench

Excavated material should be transported to at least 0, 5 m from the edge of the trench.

Minimum dimensions



Nominal size DN	b_S mm
DN ≤ 300	200
300 < DN ≤ 900	300
900 < DN ≤ 1600	400
1600 < DN ≤ 2400	600
2400 < DN ≤ 3000	900

- Allow 50 – 150 mm below base of pipe
- If construction access is required to the outside face of underground structures e.g. manholes a working space of 0.5 m shall be provided. The minimum width of excavation each side of the pipe(bs) is given in the table above
- Depth of cover should be at least 600 mm
- Care should be taken to protect pipelines from construction traffic prior to the completion of backfilling

4. Bedding

Materials, bedding, support and embedment layers shall be in accordance with the design requirements.

_ Must fully support pipeline base: No voids
- Pipe backfill primary (beside the pipe)
- Backfill secondary from >0.7 D (pipe diameter)
- For unstable soils e.g. peat, running sand special construction measures will be necessary. Replacement of native soil with sand or gravel may be considered

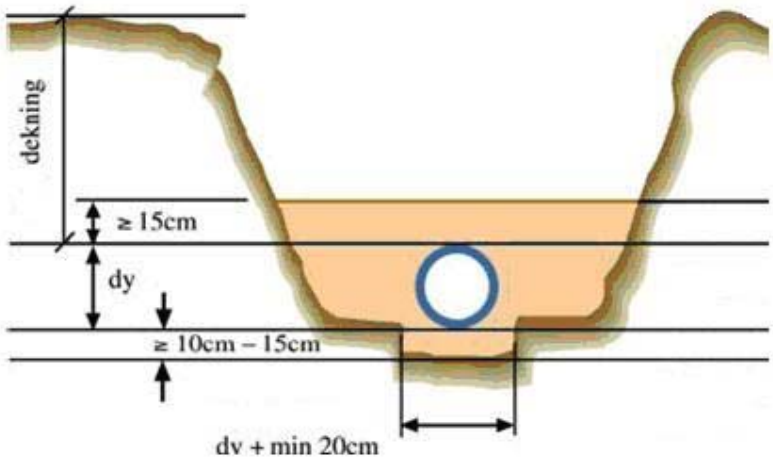
5. Compaction conditions

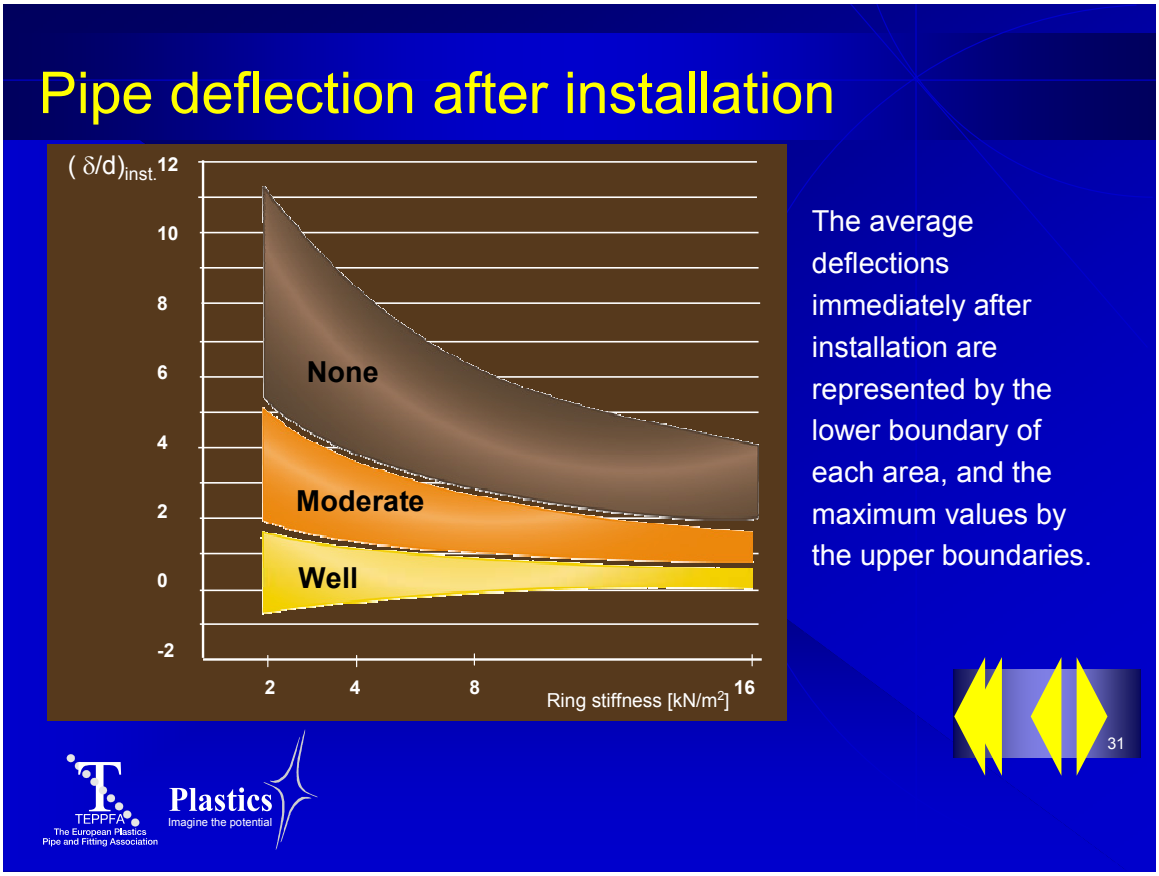
The behaviour of a pipe when subject to a load depends upon whether it is flexible or rigid. Plastics pipes are flexible. When loaded a flexible pipe deflects and presses into the surrounding material. This generates a reaction in the surrounding material which controls deflection of the pipe. Flexible pipes rely for their load bearing properties on the bedding and side fill materials.

Flexible pipes deflect under load and can be deflected to a high degree without fracture. The level of deflection reached by a buried pipe depends on the properties of the surrounding material and to a much lesser extent on the stiffness of the pipe but not on its strength properties.

When a flexible pipe is installed and backfilled it will be deflected. This is the initial deflection. After settlement of the surrounding soil the pipe will reach its final deflection. To minimize both initial and final deflections backfilling and compaction conditions of the surrounding soils are very important

Generally the choice of pipe stiffness depends upon the native soil, the pipe zone backfill and its compaction, the depth of the cover and the loading conditions

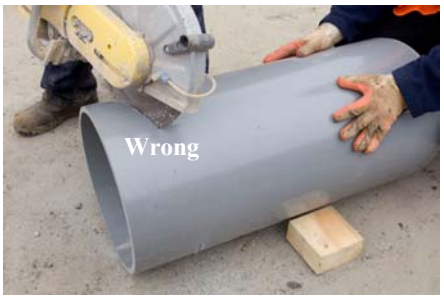




6. Pipe cutting

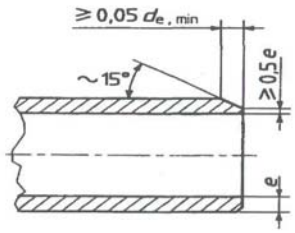
Cutting should be performed as recommended by the pipe manufacturer to ensure adequate performance for jointing

- Use handsaw
- Cut mid-way between ribs/corrugations (if relevant)
- Keep saw square to pipe (use newspaper to ensure perpendicular cutting)
- Ensure pipe end is supported during cutting
- Clean pipe and remove burrs



7. Chamfering

For rubber ring joints the pipes with smooth outside surface must be chamfered at the end as shown in the figure hereunder.



8. Jointing

8.1 General

In plastic piping systems various types of joints are in use depending on the type of plastic and application (pressure or non-pressure).

Joints can be divided in two categories:

A: Joints which are capable of withstanding end thrust. Examples: fusion joints, solvent cemented joints (PVC-U) and mechanical joints (flanges).
B. Joints which are not capable of withstanding end thrust. Examples: spigot/socket-joints with elastomeric seals or sealing gaskets are commonly used.

Flange joints or special designed reducers are used for connections to other (traditional) piping systems, cast iron, clay and concrete.

For profiled structured wall pipes suitable fittings shall be used only in accordance with the manufactures' instructions
Fit ring seal before laying each section
Fittings used with Structured Wall Piping systems which have a smooth outside surface are generally interchangeable.

The depth of the engagement should be marked on the spigot end of the pipe.

8.2 Spigot/socket jointing

- Remove any dirt and debris from pipe end and socket
- Verify that the rubber ring seal is correctly located in the seal housing
- Lubricate inner surface of socket and ring seal
- Place pipe end in socket
- Push smaller pipe sizes manually, using bar and piece of timber on the other end of the pipe
- Push larger pipe sizes with mechanical assistance
- Ensure that the pipe is fully inserted to the correct depth

9. Cold bending on site

Plastic piping systems have a degree of flexibility and can follow the undulations of the ground and within limits changes of directions. The allowed radius of curvature varies with the pipe material and the pipe diameter.

As a guidance the values in the table may be used.

Diameter (mm)	Curvature in PVC-U (R)	Curvature in PE / PP (R)
=< 160	300 * diameter	75 * diameter
200 =< diameter < 355	400 * diameter	100* diameter
>= 400	500 * diameter	100* diameter

10. Testing

10.1 Visual inspection

For visual inspection the following means are commonly used:

_CCTV-inspection
_ Mirror check from manhole to manhole

Visual inspection includes:

_Line and level
_Joints
_Damage or deformation
_Connections

10.2 Leak tightness

Leak tightness testing of pipelines, inspection chambers and manholes should be conducted before any side fill is placed. Testing of pipelines can be performed by air or water. The choice of testing by air or water may be given by the specifier.
Water testing is recommended because of difficulties in air testing of inspection chambers and manholes and beyond that special precautions and care are required for safety reasons.

The test pressure is the pressure equivalent to or resulting from filling the test section up to the ground level of the downstream or upstream manhole as appropriate with a maximum pressure of 50 kPa and a minimum pressure of 10 kPa measured at the top of the pipe.
Higher test pressures may be specified for pipelines which are designed to operate under permanent or temporary surcharge.

10.3 Testing conditions

After filling the pipeline 1h may be necessary for conditioning depending on local situations.

Testing time: > 30 minutes
Requirements: no leakage unless otherwise specified

Pressure pipelines shall be tested by 1.5 * PN (nominal pressure) as required by the specifier.