

BURIED PIPES – RIGID VS FLEXIBLE

FLEXIBILITY – THE ADVANTAGE OF BURIED PLASTIC PIPES

Plastic pipes are flexible and although they can support certain external loads by themselves, their real behaviour derives from their deformation as they take on the lateral passive pressure of the ground that surrounds them. The pressure comes from both the fixed loading of the filling material and the variable loading due to traffic.

The maximum deformation in flexible pipes has been established to be 5% after 50 years. As rigid pipes can't be deformed, they have to be able to fully support the loads themselves, meaning the possibility of a break is higher.

PRESENT SITUATION

- The design practices used for rigid pipes often prevails
- Flexibility is considered a physical weakness
- Designers are not always familiar with the behaviour of buried plastic pipes
- Certified quality pipes are not always chosen, and often priority is given to price over quality
- In many installations, inspection openings and/or manholes are used in situ with bricks and/or concrete, instead of using plastic systems.

RIGID PIPES

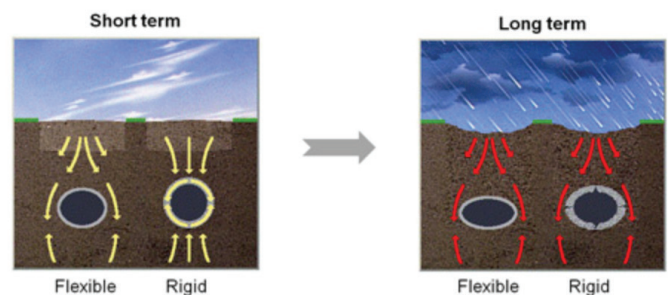
Rigid pipes are always more robust and rigid than the surrounding ground, therefore the loading is concentrated in the pipes. The pipe has to be able to support this loading during its lifetime. With movement of the ground (e.g. caused by nearby installations or by the variations in groundwater etc.) this loading has the tendency to increase.

FLEXIBLE PIPES

Flexible pipes don't have to support the extra loading. They deflect and transfer the load and the filling material and ground adjusts in support. The deflection of the pipe is a reaction to the settlement of the ground together with the pipe. This arrangement is stable and rigid enough to support the traffic loads and those from its own weight, and the filling material of the pipe installation.

DIFFERENCE BETWEEN RIGID AND FLEXIBLE PIPES

The wall thickness of rigid pipes must be able to support the loading that will be produced when installed as it is the pipe itself which has to support the load. With a flexible pipe, it will produce a small deflection when a vertical load is transmitted to the pipe. The vertical deformation creates a horizontal expansion of the pipe, counteracted by the compacted filling material.

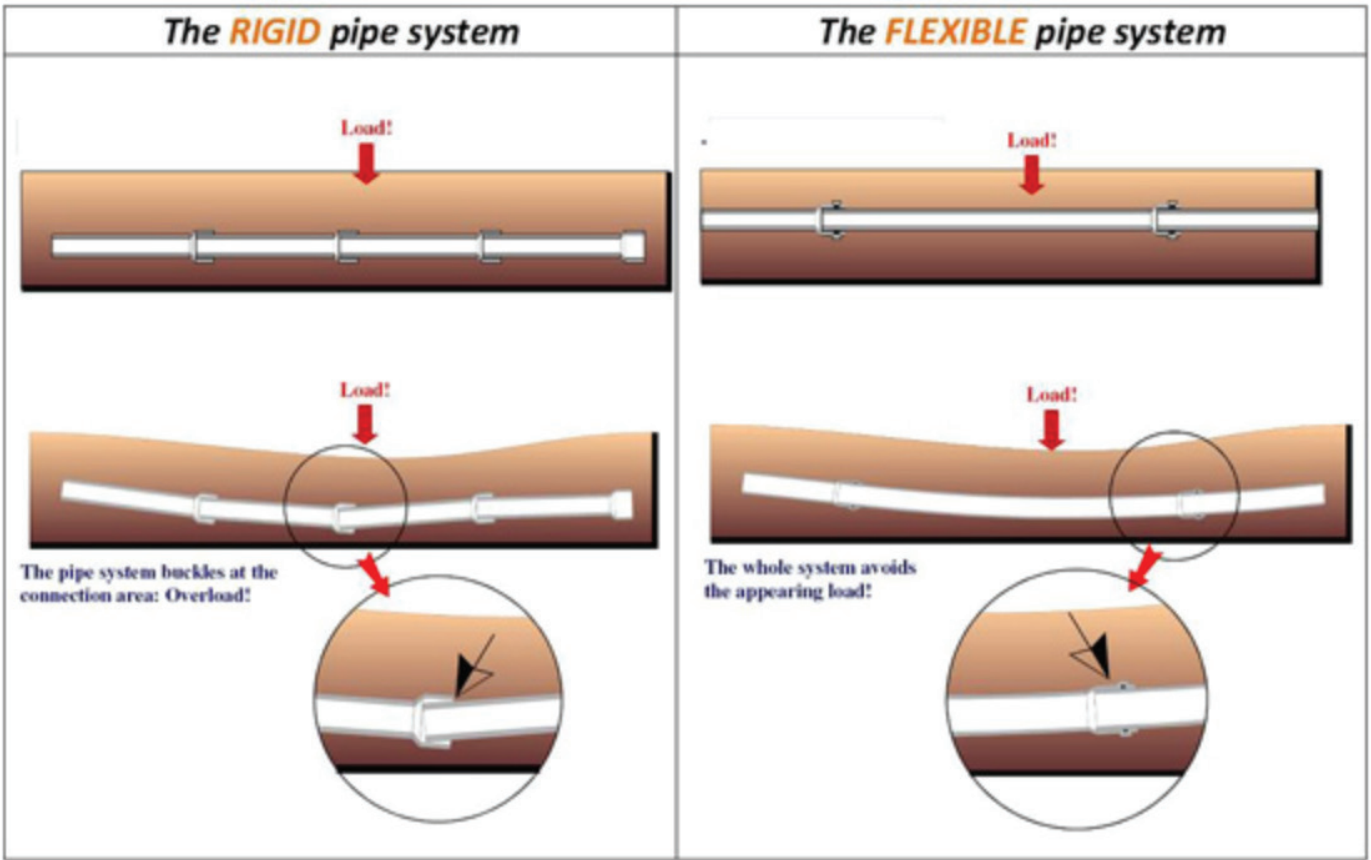


Research performed by **TEPPFA** (The European Plastic Pipe and Fittings Association) has demonstrated that after approximately 1.5 years the interaction between the pipe and the ground has settled and there is no further increase in pipe deflection. You can see in the long-term picture above how the loads of the rigid pipe support the ground only once the pipe has broken.

In the case of flexible pipes both the pipe and the ground surrounding it absorb the loading. This means that with good ground compression the depth of the line is almost unlimited.

DIFFERENT BEHAVIOUR

A flexible pipe can absorb deformations by settlement of the ground without affecting its tightness, however, in a rigid pipe, the system can't be deformed because it could break.



Many engineers have experience in the utilisation of rigid pipes and still think that all buried pipes must be sufficiently robust enough to support all the loading of the pipe installation. This is true (and a problem) for rigid systems. Plastic pipes use a different approach. They deliberately have an inferior rigidity to the surrounding ground, with the aim of passing loading to the ground and creating support from the fill.