

## Flexible Plastic Piping

New Economic Connection Solution for Flexible Piping

# Optimized Heating and Cooling Systems for Low Energy Housing Developments

Most district heating companies are faced with the same problem: The power consumption per customer decreases but the demand for hot water tends to rise. The problem becomes even more acute in low energy housing developments. The energy efficiency has to be increased but the connection costs per house should become more economic. In addition, a long life and a maintenance-free system must be guaranteed. Flexible plastic piping is a possibility for reducing costs in low temperature systems. The new EN 15632 created the necessary basis for certification of these systems.

The first development cooperation on flexible plastic systems began as early as 1980 with the Austrian electricity group Steweag (figure 1). Steweag wanted a pre-insulated piping system that would be as easy to install as an electric cable. The first joint Flexalen project was successfully completed one year later. Today Steweag has laid more than 200 km of Flexalen pipe.

### The new flexible pipe generation

In 2001 the Dutch energy supplier Nuon initiated cooperation with Thermaflex to develop more flexible and moisture-proof piping systems. Once again the objective was to reduce the connection costs in new district heating projects. This newly developed system is called Flexalen 600 (figure 2). It consists of a Polybutene (PB) medium pipe and Polyolefine foam insulation which is welded to the corrugated HDPE outer casing. The goals of corrosion resistant and moisture-proof insulation were achieved.



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### Reduction in installation costs

The most important advantage is the potential for shortening the installation time with flexible systems and roll lengths  $\geq 100$  m. Compared to rigid systems, the relative costs shown in table 1 have been achieved in concrete projects:

The material costs mainly depend on the system selection. If pipe sizes and lengths are optimized for the advantages of PB pipes and connection systems, the material costs for Flexalen can be reduced. Installation costs have been verified in practice for nearly 30 years. Flexalen systems can be laid five times faster than rigid systems. Although the material costs for plastic pipes are higher, particularly for larger sizes, the costs for the complete installed system are lower, particularly if twin pipe systems are used.

### New solutions for branches

The demand for more economic connection solutions led to further innovations generated by the coop-

eration between the Dutch energy supplier Eneco and Thermaflex.

### Pre-fabricated systems

A new type of pre-fabricated system was developed; the goal was high flexibility and a minimum of joints. The result was the Flexa Link solution: a very compact, flexible and 100% waterproof branch system which is pre-fabricated and pressure-tested by Thermaflex. These new solutions utilize the advantages of flexible, welded systems to reduce the number of connection points on-site (figure 3). The solution combines the following advantages:

- energy efficient and waterproof branch solution
- joints are formed under clean production conditions. No weather effects, no error costs
- lightweight and flexible: the pipes are easy to lay in the trenches
- short installation time (8 to 9 houses per day)
- connection costs are reduced
- fewer system parts on-site

### Pre-fabricated systems for new projects

The Dutch energy suppliers Eneco and Nuon are investing in this new solution on new construction projects. A high degree of pre-fabrication can be offered, particularly for systems with short distances between the branches and the building connections.

### The importance of system design

Flexible PB piping systems offer benefits in design and construction compared with other plastic and steel systems: Flexible PB systems can be laid more directly than steel pipes because the system is fully self-compensating. Expansion loops

	Pre-insulated steel pipes	Flexalen
Material costs	100%	90 – 150%
Installation time	100%	20 – 25%
Trench excavation	100%	50 – 70%
Total	100%	60 – 85%

Table 1. Relative costs



Figure 1. Flexible plastic systems: the first Flexalen installation in 1981



Figure 2. The new flexible pipe generation: Flexalen 600

and pre-tensioning are not necessary. The saving in pipe length can be calculated with 7 to 10%.

PB systems have a low friction loss and lime deposits or incrustations do not form during their life. The polyfusion welded fittings have at least the same inside diameter as the pipe and equally high abrasion resistance. Given this aspect, additional safety factors in the pipe dimensions can be left out. PB systems can be operated at much higher flow rates, so that smaller sizes can be used for the same load requirement.

In relation to low energy developments, the following objectives can be achieved with this concept:

- Maximum energy efficiency through the use of small pipe cross-sections (e.g. DN15 for a power demand of up to 14 kW), factory prefabrication and greater insulation thickness.
- Cost savings of up to 50% by reducing the joints on-site by 66%.
- Energy savings up to 40% due to lower heat loss.

New connection solutions which meet the requirements of the energy companies in terms of energy efficiency, lower investment costs, shorter installation times and durability have been developed by the cooperation between Thermaflex and energy suppliers in Austria and the Netherlands. These solutions are based on flexible, weldable plastic

systems and have been used for up to 31 years in secondary systems with maximum operating temperatures of 95 °C (peak temperature) and maximum pressure of 8 bar.

The latest development moves towards a higher degree of pre-fabrication: the entire connection line to the buildings and parts of the main line are both factory made in one piece, put together and pressure-tested as a whole. Experience from

the latest projects indicates installation times 5 to 10 times faster than traditional pre-insulated steel. The number of joints on site is greatly reduced. ■

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Figure 3. Pre-fabricated systems: laying Flexa Link