# PT/251/1005 – AS (October 2005)

# Assessment of Tolverth GEM Lining System for drainage pipes - schedule

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## 1. Scope

To assess the performance and jointing of the Tolverth GEM Lining System. The System comprises 0.5m lengths of injection moulded, black, high density polyethylene pipe.

The system is designed for the replacement or lining of 4inch drainage pipes between manholes without the need for any excavation. The pipes are joined in the manhole via a four start trapezoidal thread with an abrupt stop. This provides a very smooth inner surface with good hydraulic properties. The joint is sealed via an elastomeric O-ring seal located in a moulded groove. The ends of the GEM Lining are grouted into the manholes.

This assessment schedule only applies to the replacement or lining of pitch fibre drain pipes.

## 2. Assessment schedule

2.1 Technical audit of production facilities, including review of type and quality control testing and test results.

2.2 Review of test data and witnessing testing where necessary.

2.3 Audit of written procedures for installation of the System, including on-site witnessing of installation.

## 3. Review of properties

3.1 This Assessment Schedule has taken into account the requirements of the following national and international specifications:
BS EN 476 General requirements for components used in gravity drainage systems:
BS EN 1519-1 Polyethylene systems for waste discharge within the building structure.

3.2 Marking on pipe:
Manufacturer's name/identification
Nominal size 'DN100'
Short term nominal stiffness class 'SN8'
Material – 'PE'
'Drain'
Date of manufacture
Installation direction arrow

**Material properties:**

| | Specification | |
|---|---|---|
| Density of base polymer | ISO 1183 Part1, | >930kg /$m^3$ |
| Stress rupture Circum stress 3.9Mpa, @ 60°C | prEN 13476-1 to method BS EN 921 | 165hr |

The base polymer is a UV stabilised, high density polyethylene suitable for outdoor applications, blended with a black colour masterbatch.

Colour: black darker than 10B29 of BS4901:1976

Sealing ring(s): Elastomeric O ring complying with BS EN 681-1 Type WC. Nominal hardness 60°±5° IRHD. Dimensions 84x3mm.

Grout – Proprietary quick drying cement mortar.

**Pipe properties:**
Appearance: No visible defects that will detract from the performance of the lining.
Dimensions:
Length (incl tolerance) 524 ± 3mm
Outside diameter (incl tolerance) 100 ± 1.5mm


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Wall thickness (incl tolerance) 6.0 ± 0.8mm

Screw thread: 4-start, abrupt start and finish in accordance with manufacturer's drawing PIP0304c.

| | Specification | Pass limit |
|---|---|---|
| Short term ring stiffness | BS EN ISO 9969 | 16kN/m$^2$ |
| Long term ring stiffness (creep ratio) | BS EN ISO 9967 | <4 |
| Resistance to combined temperature cycling and external loads | BS EN 1437 Method 1111B | WIS 4-35-01 clause 6.5 |
| Ring flexibility | BS EN 1446 | >30% deflection<br>>90% recovery of ID |
| Resistance to water jetting | WIS 4-35-01 Appendix C | 300 bar |
| Impact resistance | BS EN 1411 Striker 4.05kg to Table 1 type d25 | No cracking @5.5m drop height |

**Joint properties:**
Leak tightness: 5% deflection on pipe with spigot. Load applied 100mm from joint. Hold 0.3bar vacuum and 0.5bar pressure for 15minutes (based on EN1277, Method 4)
Joint strength under shear: 800N force applied 120mm from joint line without threads parting.

Joint strength, pulling resistance: 7.5kN pulling force with no parting of joint.

## 4. Review of procedures

In addition to the performance of pipes, the following items are checked.

Quality control, as it applies to:

- incoming materials; and,
- control of production.

Installation procedures and available guidance to users.

## 6. Reference documents

1. BS EN 476 General requirements for components used in discharge pipes, drains and sewers for gravity systems.
2. BS EN 681-1: British Standard Elastomeric seals. Material requirements for pipe joint seals used in water and drainage applications. Vulcanized rubber.
3. BS EN 921 Plastics piping systems: Thermoplastic pipes: Determination of resistance to internal pressure at constant temperature.
4. BS EN 1277: British Standard for plastic piping systems - Thermoplastics piping systems for buried non-pressure applications - Test methods for leaktightness of elastomeric sealing ring type joints.
5. BS EN 1411 Determination of resistance to external blows by the staircase method
6. BS EN 1437 Method 1111B: Plastics piping systems. Piping systems for underground drainage and sewerage. Test method for resistance to combined temperature cycling and external loading
7. BS EN 1446 Determination of ring flexibility


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8. BS EN 1519-1 Plastics piping systems for soil and waste discharge (low and high temperature) within the building structure – Polyethylene (PE) – Part 1: Specification for pipes, fittings and the system.
9. BS EN ISO 9969 Determination of ring stiffness.
10. BS EN ISO 9967 Determination of creep ratio.
11. ISO 1183 Plastics – Methods for determining the density and relative density of non-cellular plastics.
12. Sewer jetting code of practice, 1st edition, June 1997, WRc Swindon
13. prEN 13476-1:1999Thermoplastics piping systems for non-pressure underground drainage and sewerage – Structured-wall piping systems of unplasticized poly(vinyl chloride) (PVC-U), polypropylene (PP) and polyethylene (PE) – Part 1: Specifications for pipes, fittings and the system.


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