

1. SCOPE

This schedule specifies characteristics for the Brandenburger BB^{2.5}, BB^{1.0} and BB^{2.0} full length UV cured-in-place pipe (CIPP) liner systems as manufactured by Brandenburger GmbH & Co Kg. It is applicable to the renovation of gravity drains and sewers.

The Brandenburger BB^{2.5} liner system has a range of internal diameters from 150mm to 1600mm and egg-shaped pipes between 250mm x 375mm (DN250 equivalent) and 1200mm x 1800mm (DN1600mm equivalent) with a maximum wall thickness of 25.2mm.

The Brandenburger BB^{1.0} liner system is available in nominal diameters from 150mm to 600mm.

The Brandenburger BB^{2.0} liner system is available in nominal diameters from 150mm to 1600mm.

They are not applicable to:

- The installation or reconnection of the laterals.
- Performance of the liner end seals.

2. PRODUCT DESCRIPTION

2.1 Introduction

All systems comprise of a glass fibre reinforcement woven sleeve which is factory impregnated with an ultra violet (UV) light curing polyester or vinyl ester thermosetting resin. When installed and cured this forms a full length cured-in-place structural liner within the host pipe.

2.2 Relevant Standards

The following relevant standard was identified for cured-in-place liners:

- BS EN ISO 11296-4:2018⁽¹⁾

2.3 Approval History

This is the first re-approval of the Brandenburger BB^{2.5} liner system and first inclusion of the BB^{1.0} liner system in March 2021 and the BB^{2.0} liner system in May 2021.

- PT/351/0614 (June 2014 and revised December 2016).

This approval supersedes previous issues.

3. REQUIREMENTS AND TESTING

3.1 Structural Design

The liners can be designed using any of the recognised international design codes dependent upon the country of installation. The Brandenburger default design for the BB^{2.5}, BB^{1.0} and BB^{2.0} liners is DWA-A143-2⁽²⁾ or ASTM1216-16⁽³⁾.

3.2 Type Testing

The Brandenburger BB^{2.5}, BB^{1.0} and BB^{2.0} liner systems shall comply with the following test requirements which are based upon BS EN ISO 11296-4.

Appearance: The internal surface of the lining shall be smooth, clean and free from scoring, cavities, wrinkling and other surface defects that would prevent the Brandenburger BB^{2.5}, BB^{1.0} and BB^{2.0} liner systems from meeting the general fitness for purpose requirement.

Mechanical Characteristics Testing: Mechanical testing requirements of BS EN ISO 11296-4 are listed in Tables 1, 2 and 3.

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Table 1 BB^{2.5} liner mechanical characteristics

Parameter	Declared
Short-term flexural modulus DN150-875mm DN 875-1600mm	11,800 MPa 13,600 MPa
Long-term flexural modulus DN150-875mm DN 875-1600mm	9,290 MPa 10,708 MPa
Initial specific ring stiffness DN150-875mm DN 875-1600mm	14,200 MPa 16,875 MPa
Long-term ring stiffness DN150-875mm DN 875-1600mm	11,180 MPa 13,288 MPa
Short-term stress at first break	200 MPa
Long-term stress at first break	157 MPa
Long term strain corrosion test (10,000h)	Minimum: 0.45% Declared: 1.01%

Table 2 BB^{1.0} liner mechanical characteristics

Parameter	Declared
Short-term flexural modulus	4,758 MPa
Long-term flexural modulus	2,782 MPa
Initial specific ring stiffness	4,758 MPa
Long-term ring stiffness	2,782 MPa
Short-term stress at first break	115 MPa
Long-term stress at first break	67 MPa
Long term strain corrosion test (10,000h)	Minimum: 0.45% Declared: 1.01%

Table 3 BB^{2.0} liner mechanical characteristics

Parameter	Declared
Short-term flexural modulus	9,000 MPa
Long-term flexural modulus	5,806 MPa
Initial specific ring stiffness	8,700 MPa
Long-term ring stiffness	5,600 MPa
Short-term stress at first break	150 MPa
Long-term stress at first break	95 MPa
Long term strain corrosion test (10,000h)	Minimum: 0.45% Declared: 1.01%

Samples are taken each day or from each batch of impregnated linings and cured. The cured sample is tested in accordance with Table 4.

Table 4 BS EN ISO 11296-4 Quality Control tests

Parameter	Requirement
Wall structure	Clause 8.4.2
Wall thickness	Clause 8.4.3
Initial specific ring stiffness or short-term flexural modulus	Clause 8.5.2 Table 5
Flexural stress at first break	Clause 8.5.2 Table 5
Flexural strain at first break	Clause 8.5.2 Table 5

3.3 Manufacture

To ensure the quality and performance of Brandenburger BB^{2.5}, BB^{1.0} and BB^{2.0} liners, the manufacturing process shall include appropriate systems for:

PT/440/0719 - AS (May 2021)

Assessment Schedule for the Brandenburger BB^{2.5}, BB^{1.0} and BB^{2.0} UV Cure CIPP liner systems as supplied by Brandenburger GmbH & Co. KG



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- Verification of component materials received are to specification.
- Handling and storage of all component materials and finished units.
- Records of manufacturer.
- Inspection and maintenance of manufacturing equipment.

The production of Brandenburger BB^{2.5}, BB^{1.0} and BB^{2.0} linings and related Quality Control procedures shall comply with requirements to ensure the stated performance of the product is reliably achieved.

3.4 Installation

When installed in accordance with the installation documentation⁽⁴⁾, the installation shall be practicable and suitable for conditions that could reasonably be expected on site.

4. APPROVAL

The Brandenburger BB^{2.5}, BB^{1.0} and BB^{2.0} UV cure CIPP liners have been audited and have successfully met all the requirements stated within this assessment schedule.

Signed:

A handwritten signature in dark blue ink that reads 'A Russell'.

Valid until 1st July 2024

5. REFERENCES

1. BS EN ISO 11296 Part 4:2018 Plastic piping systems for renovation of underground non-pressure drainage and sewerage networks. Part 4 Cured-in-place-pipes.
2. DWA-A 143.2- Rehabilitation of drainage systems outside buildings - Part 2: Static calculation for the rehabilitation of wastewater pipes and pipes with lining and assembly methods (July 2015)
3. ASTM1216-16 Standard Practice for Rehabilitation of Existing Pipelines and Conduits by the Inversion and Curing of a Resin-Impregnated Tube.
4. Installation recommendations for Brandenburger BB^{2.5}, BB^{1.0} and BB^{2.0} CIPP liner, version 1.7 en: August 2020.