

Fibertex Nonwovens A/S

Svendborgvej 16
DK-9220
Aalborg Øst
Denmark

Tel: 00 45 9635 3535 Fax: 00 45 9815 8555
e-mail: fibertex@fibertex.com
website: www.formtex.dk



Agrément Certificate
03/4038
Product Sheet 1

FORMTEX FORMWORK LINERS

FORMTEX CONTROLLED PERMEABILITY FORMWORK LINER

This Agrément Certificate Product Sheet⁽¹⁾ relates to Formtex Controlled Permeability Formwork Liner, a two-layer, nonwoven polypropylene fabric liner, used to enhance the durability and surface appearance of cast concrete.

(1) Hereinafter referred to as 'Certificate'.

CERTIFICATION INCLUDES:

- factors relating to compliance with Building Regulations where applicable
- factors relating to additional non-regulatory information where applicable
- independently verified technical specification
- assessment criteria and technical investigations
- design considerations
- installation guidance
- regular surveillance of production
- formal three-yearly review.



KEY FACTORS ASSESSED

Properties of the resultant concrete — when compared with equivalent concrete cast without the product, concrete cast against controlled permeability formwork (CPF) has enhanced resistance to carbon dioxide, ingress of chloride ions and frost attack, and reduced permeability, enhanced surface tensile strength and enhanced surface hardness (see section 6).

Behaviour in relation to fire — the product melts at 165°C and starts shrinking significantly above 120°C, and therefore direct exposure to heat should be avoided (see section 7).

Durability — when compared with equivalent concrete cast without the product, cured concrete cast using CPF has been shown to have enhanced properties with increased durability (see section 9).

The BBA has awarded this Certificate to the company named above for the product described herein. This product has been assessed by the BBA as being fit for its intended use provided it is installed, used and maintained as set out in this Certificate.

On behalf of the British Board of Agrément

Simon Wroe
Head of Approvals — Materials

Claire Curtis-Thomas
Chief Executive

Date of Second issue: 3 June 2014

Originally certificated on 16 September 2003

The BBA is a UKAS accredited certification body — Number 113. The schedule of the current scope of accreditation for product certification is available in pdf format via the UKAS link on the BBA website at www.bbacerts.co.uk

Readers are advised to check the validity and latest issue number of this Agrément Certificate by either referring to the BBA website or contacting the BBA direct.

British Board of Agrément
Bucknalls Lane
Watford
Herts WD25 9BA

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tel: 01923 665300
fax: 01923 665301
e-mail: mail@bba.star.co.uk
website: www.bbacerts.co.uk

Regulations

In the opinion of the BBA, there are no requirements in these Regulations relating to the use of Formtex Controlled Permeability Formwork Liner:



The Building Regulations 2010 (as amended) (England and Wales)



The Building (Scotland) Regulations 2004 (as amended)



The Building Regulations (Northern Ireland) 2012

Construction (Design and Management) Regulations 2007

Construction (Design and Management) Regulations (Northern Ireland) 2007

Information in this Certificate may assist the client, CDM co-ordinator, designer and contractors to address their obligation under these Regulations.

See section: 3 *Delivery and site handling* (3.1) of this Certificate.

Additional Information

NHBC Standards 2014

In the opinion of the BBA, the use of Formtex Controlled Permeability Formwork Liner, in relation to this Certificate, is not subject to the requirements of these Standards.

Technical Specification

1 Description

1.1 Formtex Controlled Permeability Formwork Liner is a two-layer, non-woven polypropylene fabric, which can be tensioned over or glued to most conventional types of formwork.

1.2 The product has the following nominal characteristics:

Weight ($\text{g}\cdot\text{m}^{-2}$)	250
Thickness at 2 kPa (mm)	1.2
Tear strength (N)	
longitudinal	250
transverse	200
Air permeability ($\text{l}\cdot\text{s}^{-1}\cdot\text{m}^{-2}$)	250
Mean pore size (μm)	<30

1.3 The fabric is thermally bonded on one side to create a filter, with the non-thermally bonded side functioning as a drainage layer. The pore size of the filter is designed to retain the cement particles while allowing water and air to pass through.

1.4 When fresh concrete is placed and vibrated in contact with the product, excess water and entrapped air are drained from the concrete surface by the liner. If the liner is left on the concrete, it can be used to assist with further curing.

2 Manufacture

2.1 The product is manufactured from polypropylene fibres formed into two non-woven fabrics, which are then thermally bonded.

2.2 As part of the assessment and ongoing surveillance of product quality, the BBA has:

- agreed with the manufacturer the quality control procedures and product testing to be undertaken
- assessed and agreed the quality control operated over batches of incoming materials
- monitored the production process and verified that it is in accordance with the documented process
- evaluated the process for management of nonconformities

- checked that equipment has been properly tested and calibrated
- undertaken to carry out the above measures on a regular basis through a surveillance process, to verify that the specifications and quality control operated by the manufacturer are being maintained.

2.3 The management system of Fibertex A/S has been assessed and registered as meeting the requirements of BS EN ISO 9001 : 2008 by DS Certificering (Certificate DSC 00028).

3 Delivery and site handling

3.1 The product is supplied in rolls of widths⁽¹⁾ 2.75 m, 3.2 m and 4.0 m, and lengths of 50 m and 100 m, weighing from 34 kg to 100 kg.

(1) Special widths can be produced for larger projects.

3.2 The product is delivered in rolls, wrapped in polythene, bearing a self-adhesive label showing the Certificate holder's name and roll identification number.

3.3 The rolls should be stored vertically or horizontally on a smooth, clean surface. Opened rolls should be protected from direct sunlight. Formwork liner already installed on formwork should not be exposed to sunlight for periods exceeding two weeks.

Assessment and Technical Investigations

The following is a summary of the assessment and technical investigations carried out on Formtex Controlled Permeability Formwork Liner.

Design Considerations

4 General

4.1 Formtex Controlled Permeability Formwork Liner is satisfactory for use as a formwork liner for cast concrete, and reduces the risk of cracks and micro cracks normally associated with the early drying of a concrete surface.

4.2 The product should only be used once. Its reuse is not covered by this Certificate.

5 Practicability of installation

The formwork liner is designed to be installed by operatives experienced with this product type. The level of supervision during the installation should be sufficient to ensure the quality of workmanship as described in BS 8000-0 : 2014, BS 8500-1 : 2006, BS 8500-2 : 2006, BS EN 206 : 2013 and BS EN 13670 : 2009.

6 Properties of the resultant concrete

6.1 Tests were carried out to determine the comparative properties of concrete produced with and without Formtex Controlled Permeability Formwork Liner on one side, and the results are listed in Table 1. The concrete used was a C45 grade concrete with a Portland cement content of 340 kg·m⁻³ and water/cement ratio of 0.53.

Table 1 Tests on panels and cores⁽¹⁾

Test	Formtex concrete	Control concrete	Test method
Surface tensile test (pull-off) (MPa)	3.1	1.6	BS 1881-207
ISAT (ml·m ⁻² ·s ⁻¹)			BS 1881-208
10 min	0.028	0.181	
30 min	0.000	0.094	
60 min	0.000	0.060	
Surface hardness	49.0	37.5	BS 1881-202
Carbonation resistance [depth (mm)]	3.9	13.9	prEN 104-839
Sorptivity (mm min ^{-1/2})	0.15	0.31	TM/95/01/issue 1 ⁽²⁾
Chloride diffusion (m ² ·s ⁻¹ at 20°C)	6.56 x 10 ⁻¹³	12.9 x 10 ⁻¹³	130S/MW001/JM/issue 1 ⁽³⁾
Freeze/thaw [weight loss (mg·mm ⁻²)]			Rilem recommendation CDC 2 : 1977
10 cycles	no damage -0.00	considerable damage -0.07	
20 cycles	no surface damage -0.01	severe surface damage -1.41	
25 cycles	basically undamaged -0.01	very severe damage -2.21	

(1) Tests performed by Taywood Engineering Ltd.

(2) Sorptivity of oven-dried specimens to TEL in-house test procedure Water sorption test.

(3) Chloride diffusion to test procedure 1 in accordance with TEL method.

6.2 The conclusions drawn from the tests carried out are that, when compared to equivalent concrete cast without the product, concrete cast against Formtex Controlled Permeability Formwork Liner:

- has an enhanced resistance to carbon dioxide and ingress of chloride ions
- has an enhanced resistance to frost attack
- has reduced permeability
- has an enhanced surface tensile strength and surface hardness.

7 Behaviour in relation to fire

7.1 The product melts at 165°C and starts shrinking significantly above 120°C. Direct exposure to heat should therefore be avoided.

7.2 Care should be taken not to damage the liner when welding or steel cutting.

8 Maintenance

As the product is used as a temporary lining to formwork, no maintenance is required.

9 Durability

9.1 The product enhances the durability and surface appearance of concrete, significantly reducing the permeability of the concrete by reducing blowholes and other surface defects.

9.2 When compared with equivalent concrete cast without the product, cured concrete cast using the product has been shown to have enhanced properties and hence increased durability.

10 Reuse and recyclability

The product comprises polypropylene, which can be recycled.

Installation

11 General

11.1 Formtex Controlled Permeability Formwork Liner must only be specified and used strictly in accordance with this Certificate and the Certificate holder's instructions.

11.2 The product must be correctly tensioned in accordance with section 12.

11.3 The product is used with Portland cement or blended Portland cement concretes of all accepted grades.

11.4 The Certificate holder should be consulted for advice on design, and on the suitability of any proposed admixtures.

11.5 Some colour variation of the concrete surface may occur.

11.6 Form oils or release agents must not be used with the product.

12 Fixing

12.1 The product must be tensioned or glued over the face of the backing formwork in accordance with the Certificate holder's instructions. It is important that the product is tensioned in both the longitudinal and transverse directions, to avoid the formation of folds.

12.2 The liner should continue under the formwork to ensure the adequate dispersal of water.

Technical Investigations

13 Tests

13.1 Tests were carried out, and the results assessed, to determine the effect of concrete cast against Formtex Controlled Permeability Formwork Liner in relation to:

- surface hardness and strength
- ISAT water absorption
- resistance to carbonation
- sorptivity
- chloride ion diffusion
- resistance to freeze-thaw.

13.2 An assessment was made of the following existing data on the product:

- pore size
- weight
- thickness
- air permeability
- tear strength
- composition.

14 Investigations

The manufacturing process was evaluated, including the methods adopted for quality control, and details were obtained on the quality and composition of the materials used.

Bibliography

- BS 1881-202 : 1986 *Testing concrete — Recommendations for surface hardness testing by rebound hammer*
- BS 1881-207 : 1992 *Testing concrete — Recommendations for the assessment of concrete strength by near-to-surface tests*
- BS 1881-208 : 1996 *Testing concrete — Recommendations for the determination of the initial surface absorption of concrete*
- BS 8000-0 : 2014 *Workmanship on construction sites — Introduction and general principles*
- BS 8500-1 : 2006 *Concrete — Complementary British Standard to BS EN 206-1 — Method of specifying and guidance for the specifier*
- BS 8500-2 : 2006 *Concrete — Complementary British Standard to BS EN 206-1 — Specification for constituent materials and concrete*
- BS EN 206 : 2013 *Concrete — Specification, performance, production and conformity*
- BS EN 13670 : 2009 *Execution of concrete structures*
- BS EN ISO 9001 : 2008 *Quality management systems — Requirements*
- prEN 104-839 : 1997 *Carbonation resistance*
- RILEM *Technical Recommendations for the Testing and Use of Construction Materials, Part Eight, Durability and ServiceLife, CDC 2 Methods of carrying out and reporting freeze/thaw tests on concrete with de-icing chemicals*
1977

15 Conditions

15.1 This Certificate:

- relates only to the product/system that is named and described on the front page
- is issued only to the company, firm, organisation or person named on the front page — no other company, firm, organisation or person may hold or claim that this Certificate has been issued to them
- is valid only within the UK
- has to be read, considered and used as a whole document — it may be misleading and will be incomplete to be selective
- is copyright of the BBA
- is subject to English Law.

15.2 Publications, documents, specifications, legislation, regulations, standards and the like referenced in this Certificate are those that were current and/or deemed relevant by the BBA at the date of issue or reissue of this Certificate.

15.3 This Certificate will remain valid for an unlimited period provided that the product/system and its manufacture and/or fabrication, including all related and relevant parts and processes thereof:

- are maintained at or above the levels which have been assessed and found to be satisfactory by the BBA
- continue to be checked as and when deemed appropriate by the BBA under arrangements that it will determine
- are reviewed by the BBA as and when it considers appropriate.

15.4 The BBA has used due skill, care and diligence in preparing this Certificate, but no warranty is provided.

15.5 In issuing this Certificate, the BBA is not responsible and is excluded from any liability to any company, firm, organisation or person, for any matters arising directly or indirectly from:

- the presence or absence of any patent, intellectual property or similar rights subsisting in the product/system or any other product/system
- the right of the Certificate holder to manufacture, supply, install, maintain or market the product/system
- actual installations of the product/system, including their nature, design, methods, performance, workmanship and maintenance
- any works and constructions in which the product/system is installed, including their nature, design, methods, performance, workmanship and maintenance
- any loss or damage, including personal injury, howsoever caused by the product/system, including its manufacture, supply, installation, use, maintenance and removal
- any claims by the manufacturer relating to CE marking.

15.6 Any information relating to the manufacture, supply, installation, use, maintenance and removal of this product/system which is contained or referred to in this Certificate is the minimum required to be met when the product/system is manufactured, supplied, installed, used, maintained and removed. It does not purport in any way to restate the requirements of the Health and Safety at Work etc. Act 1974, or of any other statutory, common law or other duty which may exist at the date of issue or reissue of this Certificate; nor is conformity with such information to be taken as satisfying the requirements of the 1974 Act or of any statutory, common law or other duty of care.