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Agrément Certificate

19/5715

Product Sheet 2

ADFIL FIBRE FOR CONCRETE

FIBRIN XT

This Agrément Certificate Product Sheet⁽¹⁾ relates to Fibrin XT, a polypropylene monofilament fibre for use in concrete mixes to reduce the occurrence of plastic shrinkage cracking and plastic settlement, and to enhance the properties of the hardened 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

Plastic shrinkage cracking — the product will reduce the occurrence of plastic shrinkage cracking in concrete mixes (see section 6.1).

Bleeding and plastic settlement — the product reduces bleed, segregation and plastic settlement in concrete mixes (see section 6.2).

Resistance to freeze / thaw — concrete containing the product will have greater resistance to freeze / thaw actions than the equivalent plain concrete mix (see section 7.1).

Resistance to impact — concrete containing the product will have greater resistance to impact than the equivalent plain concrete mix (see section 7.2).

Durability — concrete containing the product is generally more durable than the equivalent plain concrete mix (see section 10).



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

Date of First issue: 17 January 2020

Hardy Giesler
Chief Executive Officer

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 MUST check the validity and latest issue number of this Agrément Certificate by either referring to the BBA website or contacting the BBA directly.

Any photographs are for illustrative purposes only, do not constitute advice and should not be relied upon.

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Regulations

In the opinion of the BBA, the use of Fibrin XT is not subject to the national Building Regulations.

Construction (Design and Management) Regulations 2015 **Construction (Design and Management) Regulations (Northern Ireland) 2016**

Information in this Certificate may assist the client, designer (including Principal Designer) and contractor (including Principal Contractor) to address their obligations under these Regulations.

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

Additional Information

NHBC Standards 2020

In the opinion of the BBA, Fibrin XT, if installed, used and maintained in accordance with this Certificate, can satisfy or contribute to satisfying the relevant requirements in relation to *NHBC Standards*, Chapter 3.1 *Concrete and its reinforcement*.

CE marking

The Certificate holder has taken the responsibility of CE marking the product in accordance with harmonised European Standard BS EN 14889-2 : 2006.

Technical Specification

1 Description

1.1 Fibrin XT consists of 22 μm diameter monofilament polypropylene fibres cut to 13 and 19 mm lengths⁽¹⁾.

(1) Other fibre lengths are available but have not been assessed and are therefore outside the scope of this Certificate.

1.2 Fibres are coated with surfactant to:

- improve wetting
- improve dispersion within the cement paste
- increase the extent of contact
- improve bond to the hardened concrete.

2 Manufacture

2.1 The fibres are produced from multifilament polypropylene yarn manufactured in a continuous extrusion process. The extruded material is heated, stretched to improve tensile strength, coated with surfactant and cut to length. When mixed in concrete, the short-length fibre-bundles separate into individual monofilaments.

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 ADFIL NV has been assessed and registered as meeting the requirements of BS EN ISO 9001 : 2015 and BS EN ISO 14001 : 2015 by BQA nv (Certificates BQA_QMS_C_2019858 and BQA_EMS_C_2019858 respectively).

3 Delivery and site handling

3.1 The fibres are packed in measured quantities (0.91 kg) in dispersible paper bags, suitable for addition to 1 m³ of concrete. The bagged fibres are delivered in cardboard boxes for ease of handling.

3.2 Boxes of fibres must be stored on a clean surface in dry conditions, under cover and away from the possibility of damage.

3.3 Each box bears the Certificate holder's name, the batch number, and the BBA logo incorporating the number of this Certificate.

Assessment and Technical Investigations

The following is a summary of the assessment and technical investigations carried out on Fibrin XT.

Design Considerations

4 Use

4.1 Fibrin XT is satisfactory for use in concrete mixes at an addition rate of 0.91 kg.m⁻³.

4.2 The product may be used for crack control purposes when sufficient movement joints are detailed in a slab, but is not a substitute for conventional structural steel reinforcement or normal good curing procedures for concrete.

4.3 Concrete mixes containing the product must be properly designed and placed, and comply with the relevant requirements of BS 8204-1 : 2003 and BS 8204-2 : 2003 and the guidelines given in BS 8500-1 : 2015.

4.4 The addition of the product does not normally require adjustment to the concrete mix design.

5 Practicability of installation

The product is designed to be used by competent contractors experienced with this type of product.

6 Mixed concrete properties

Plastic shrinkage cracking

6.1 The reduction in plastic shrinkage, bleed water migration and segregation contribute to reducing both the occurrence and degree of plastic cracking. The addition of the product reduces the amount of plastic shrinkage cracking when compared with concrete made from the equivalent plain mix.

Bleeding and plastic settlement

6.2 The use of the product in a concrete mix reduces the amount of bleeding and reduces the plastic settlement (volume change) of concrete. Concrete containing the fibres generally has better surface integrity than plain concrete with the same mix design.

Workability

6.3 The fibres increase the apparent cohesiveness and generally reduce the slump of a concrete mix.

6.4 Care must be taken when using slump test data as a general indicator of uniformity of concrete mixes containing fibres. The value obtained may suggest a misleading low workability and their compaction under vibration is likely to be better than indicated.

6.5 The presence of the fibres does not affect the compacting factor of the concrete.

6.6 Additional water must not be added to increase the slump of fibre concrete mixes.

Distribution of fibres

6.7 The fibres are uniformly and rapidly dispersed throughout the concrete mix without balling or agglomeration.

Setting times

6.8 The addition of the product slightly reduces the setting times but does not affect the hydration rate of the concrete.

7 Hardened concrete properties

Resistance to freeze/thaw

7.1 Results of freeze/thaw resistance tests indicate that concrete containing the product has a greater resistance to frost attack than the equivalent plain mix.

Resistance to impact

7.2 Concrete containing the product has a greater resistance to impact than the corresponding plain concrete. The degree of spalling and damage to arrises of joints will be lessened.

Water absorption

7.3 The addition of the product results in a slight decrease in water absorption of the hardened concrete. The reduced porosity at exposed surfaces improves penetration resistance against de-icing salts.

Strength characteristics

7.4 The product does not significantly affect the compressive and flexural strength of concrete, and structural reinforcement will still be required as for the equivalent plain concrete, if specified.

Chemical resistance

7.5 The fibres are inert and alkali-resistant, and their presence does not alter the chemical resistance of the concrete.

Surface appearance

7.6 The fibres improve the surface quality of concrete by reducing the number of bleed holes. Consequently, both water and dirt are absorbed more slowly and evenly into the surface, resulting in a more uniform appearance.

7.7 The fibres are not readily visible on the concrete surface.

8 Performance in relation to fire

8.1 When exposed to fire, the structural integrity of concrete containing polypropylene fibres is not compromised and will be the same as for the equivalent plain concrete; but the potential for explosive spalling will be reduced

8.2 Fire will destroy fibres located close to the surface, resulting in an increase in porosity of the concrete.

9 Maintenance

9.1 The product does not require direct maintenance. However, hardened concrete containing the product requires maintenance appropriate to the degree of environmental exposure and amount of use imposed on the structure.

9.2 As the product provides improved durability to hardened concrete (see section 10), the required level of repair to affected structures is likely to be reduced in comparison with those constructed with the equivalent plain concrete.

10 Durability

The presence of the product in conventional concrete mixes reduces the amount of plastic shrinkage cracking and bleeding in its plastic state, and improves the resistance to impact, water absorption and freeze/thaw of the hardened concrete. Concrete containing the product is therefore generally more durable than plain concrete to the same mix design.

Installation

11 General

11.1 Fibrin XT must be added to the concrete mix strictly in accordance with the Certificate holder's instructions.

11.2 The quality of work must comply with the relevant requirements of BS 8000-0 : 2014.

12 Procedure

Mixing

12.1 Fibres are preferably added at the batching plant. Where this is not practical, the fibres may be added to the ready-mix truck on site, with care taken to ensure that adequate mix control and supervision is available.

12.2 When dry mixing, the fibres should be added first, followed by the fines and the coarse aggregates.

12.3 When wet mixing, it is important that the consistency of the concrete ensures that the fibres are immediately dispersed and intermixed. This is achieved by adding the fibres at the same time as the aggregate, but if this is not possible the fibres are added as detailed in section 12.2.

12.4 The concrete should be mixed for a minimum of 70 revolutions at full mixing speed (approximately 12 revolutions per minute), to ensure a uniform fibre dispersion.

Placing

12.5 Concrete mixes containing the product can be transported by conventional methods and the presence of the fibres lessens the possibility of segregation. When assisted by very light vibration, fibre concrete mixes flow easily out of the hopper outlet.

12.6 Special precautions are not necessary when pouring into moulds or shutters.

12.7 Fibre concrete mixes will flow around reinforcement, into restricted areas and against mould faces, as for plain concrete of similar mix proportions.

12.8 Fibre concrete mixes can be hand tamped or vibrated by conventional means to provide the necessary compaction.

Curing

12.9 It is essential that all normal good curing procedures are strictly followed.

12.10 The fibres are made from polypropylene and must not be used when steam curing is to be carried out at temperatures in excess of 140°C.

Finishing

12.11 Placed concrete mixes containing the fibres may be floated and trowelled using any normal hand or power tool, to provide a smooth, fibre-free surface appearance.

Technical Investigations

13 Tests

13.1 Tests and assessments were conducted on the fibres in accordance with BS EN 14889-2 : 2006 to determine:

- length
- linear density
- equivalent diameter
- tensile strength.

13.2 Tests on Fibrin XT fibres were conducted by the addition of fibres to two different water : cement ratio concrete mixes. The results were assessed against control concretes to determine:

mixed state concrete properties

- air content
- consistence
- compaction factor
- bleeding rate
- flow
- setting time (initial and final)
- change in height
- resistance to plastic cracking of rings
- resistance to plastic cracking of slabs
- distribution of fibres.

hardened state concrete properties

- initial surface absorption (air dried)
- permeability of cores
- water absorption
- impact resistance (7 and 28 days)
- flexural strength
- compressive strength
- freeze/thaw resistance (after 100 cycles)
- surface hardness
- distribution of fibres
- abrasion resistance.

14 Investigations

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

14.2 Visits were made to sites in progress and existing sites to establish Fibrin XT concrete's practicability and performance in service.

Bibliography

BS 8000-0 : 2014 *Workmanship on construction sites — Introduction and general principles*

BS 8204-1 : 2003 + A1 : 2009 *Screeds, bases and in situ floorings — Concrete bases and cementitious levelling screeds to receive floorings — Code of practice*

BS 8204-2 : 2003 + A2 : 2011 *Screeds, bases and in situ floorings — Concrete wearing surfaces — Code of practice*

BS 8500-1 : 2015 + A2 : 2019 *Concrete — Complementary British Standard to BS EN 206 — Method of specifying and guidance for the specifier*

BS EN 206 : 2013 + A1 : 2016 *Concrete — Specification, performance, production and conformity*

BS EN 14889-2 : 2006 *Fibres for concrete — Polymer fibres — Definitions, specifications and conformity*

BS EN ISO 9001 : 2015 *Quality management systems — Requirements*

BS EN ISO 14001 : 2015 *Environmental management systems — Requirements with guidance for use*

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.