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Agrément Certificate

13/5051

Product Sheet 5

TRIFLEX COLD LIQUID APPLIED WATERPROOFING AND SURFACING SYSTEMS

TRIFLEX TOWERSAFE SOLVENT-FREE WIND TURBINE FOUNDATION AND JOINT WATERPROOFING SYSTEM

This Agrément Certificate Product Sheet⁽¹⁾ relates to the Triflex Towersafe Solvent-Free Wind Turbine Foundation and Joint Waterproofing System, for use in waterproofing the foundations of wind turbine towers and wind turbine tower joints.

(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

Weathertightness — the system will resist the passage of moisture into a structure (see section 6).

Adhesion — the system will resist the effects of any likely wind suction acting on the structure (see section 7).

Resistance to mechanical damage — the system will accept the traffic loads and effects of thermal and other minor movement likely to occur in practice (see section 8).

Resistance to penetration by roots — the system will resist penetration by plant roots and rhizomes (see section 10)

Durability — under normal service conditions, the system will have a service life in excess of 25 years (see section 11).



The BBA has awarded this Certificate to the company named above for the system described herein. This system 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 Second issue: 9 April 2020

Originally certificated on 20 November 2013

Certificate amended on 21 May 2020 to correct section 13.9.

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 Triflex Towersafe Solvent-Free Wind Turbine Foundation and Joint Waterproofing System 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* (3.2 and 3.3) of this Certificate.

Additional Information

CE marking

The Certificate holder has taken the responsibility of CE marking the system in accordance with ETA 05/0205, issued by the DIBt under ETAG 005 : 2004, Parts 1 and 4.

Technical Specification

1 Description

1.1 The Triflex Towersafe Solvent-Free Wind Turbine Foundation and Joint Waterproofing System is based on a reinforced, two-component, solvent-free, liquid-applied polymethylmethacrylate membrane. The system is comprised of the following components:

- Triflex Towersafe — a polymethylmethacrylate resin
- Triflex Catalyst — a benzoyl peroxide catalyst
- Triflex 110 g Reinforcement — a polyester fleece with a nominal mass per unit area of 110 g·m⁻².

1.2 The system is available in winter and summer grades, for use where application temperatures are between -5 and 20°C, and 10 and 40°C respectively.

1.3 The system is applied to provide a waterproofing membrane with a minimum dry film thickness of 1.8 mm.

1.4 The system is the subject of ETA 05/0205 as a roof waterproofing, issued by Deutsches Institut für Bautechnik (DIBt). In accordance with ETAG 005 : 2004, Parts 1 and 4, the levels of Use Categories are:

External fire performance class	B _{ROOF} (t1), B _{ROOF} (t2), B _{ROOF} (t3) and B _{ROOF} (t4)
Reaction to fire Euroclass	E
Categorisation by working life	W3 (25 years)
Categorisation by climatic zones	M (moderate) and S (severe)
Categorisation by imposed loads	
most compressible substrate	P4
least compressible substrate	P4
Categorisation by roof slope	S1 (<5%) to S4 (>30%)
Categorisation by surface temperature	
lowest	TL4 (-30°C)
highest	TH4 (90°C)
Resistance to wind loads	>50 kPa
Statement on dangerous substances ⁽¹⁾	none contained.

(1) Dangerous substances as listed in the European Commission database.

1.5 Ancillary items which may be necessary for installation of the system and which are included in this assessment are:

- Triflex Towersafe Primer — a two-component, polymethylmethacrylate primer for use on porous substrates such as concrete and cementitious screeds
- Triflex Towersafe Finish — a two-component, polymethylmethacrylate-based decorative finish available in a range of colours
- Triflex Reinforced Tape — for use over joints to act as a de-bonding tape
- Graded quartz aggregate (0.7 to 1.2 mm) for incorporating into the system for anti-slip properties
- Triflex Cleaner — cleaner used for cleaning tools, cleaning substrates and the reactivation of the cured Triflex Towersafe membrane prior to overcoating when work is interrupted for periods in excess of 12 hours.

1.6 Other items or components which may be used with the system, but which are outside the scope of this Certificate, are:

- primers and pre-treatments for open textured and porous cementitious substrates, metals and coated metals
- anti-corrosion and etch primers for metals
- compounds for small and large scale filling, levelling and repair
- fibre reinforced detailing resin for complex, less critical and difficult-to-access details.

Details of suitable products/specifications may be obtained from the Certificate holder.

2 Manufacture

2.1 The system components are manufactured by batch processes.

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 the manufacturer has been assessed and registered as meeting the requirements of EN ISO 9001 : 2015 by DEKRA (Certificate 80408283/4-3).

3 Delivery and site handling

3.1 The components of the system are delivered to site in packs consisting of liquid base resin and powder catalyst components. The packs bear a label that includes the component's name, health and safety information, and batch number. The components are available in the pack sizes detailed in Table 1.

Table 1 Pack sizes

Component	Pack sizes
Triflex Towersafe	15 kg
Triflex Towersafe Finish	10 kg, 980 kg
Triflex Catalyst	100 g, 1 kg (bags), 25 kg (box)
Triflex Towersafe Primer	10 kg, 910 kg
Triflex Cleaner	9 litre, 27 litre
Triflex 110g Reinforcement	50 m (length) x 15, 20, 26.25, 35, 52.5, 70 or 105 cm (widths) rolls

3.2 The system components must be stored in a cool, dry location and protected from freezing temperatures and direct sunlight. When stored in accordance with the manufacturer's instructions they will have a shelf-life of at least six months. Rolls of Triflex 110 g Reinforcement must be stored flat in a dry, clean environment and protected from

moisture. Triflex Catalyst must be stored at a temperature below 30°C in closed containers, away from sources of ignition and protected from direct sunlight.

3.3 The Certificate holder has taken the responsibility of classifying and labelling the system components under the *CLP Regulation (EC) No 1272 / 2008 on the classification, labelling and packaging of substances and mixtures*. Users must refer to the relevant Safety Data Sheets.

Assessment and Technical Investigations

The following is a summary of the assessment and technical investigations carried out on the Triflex Towersafe Solvent-Free Wind Turbine Foundation and Joint Waterproofing System.

Design Considerations

4 Use

4.1 The Triflex Towersafe Solvent-Free Wind Turbine Foundation and Joint Waterproofing System is satisfactory for use as a fully adhered waterproofing layer on concrete wind tower foundation bases, including joints.

4.2 The substrate to which the system is to be applied must be structurally sound, clean, dry and free from laitance and other contamination that could affect the adhesion of the system.

4.3 The suitability of the substrate must be confirmed on a case-by-case basis by the Certificate holder.

4.4 The design of the joint detailing must be confirmed on a case-by-case basis. The Certificate holder must be consulted for suitable designs.

4.5 Measures must be taken to prevent moisture reaching the system from below. The Certificate holder must be consulted for suitable methods.

4.6 The system has been assessed for use on concrete primed with Triflex Towersafe Primer and unprimed steel (also see section 12.5).

5 Practicability of installation

The system should only be installed by installers who have been trained and approved by the Certificate holder.

6 Weathertightness

The system will adequately resist the passage of moisture into the structure and is capable of accepting minor structural movement.

7 Adhesion

The adhesion of the system to the substrates listed in section 4.6 is sufficient to resist the effects of any wind suction, elevated temperature, thermal shock or structural movement likely to occur in practice. Acceptable adhesion to other substrates must be confirmed by test.

8 Resistance to mechanical damage

8.1 The system can accept the limited foot traffic and light concentrated loads associated with installation and maintenance. Reasonable care should be taken to avoid puncture by sharp objects or concentrated loads.

8.2 Where heavy trafficking is envisaged, an additional coat of Triflex Towersafe resin can be applied, filled with aggregate and sealed with a coat of Triflex Towersafe Finish.

9 Maintenance

9.1 The system must be periodically inspected for damage to ensure continued performance.

9.2 Maintenance should include checks and operations to ensure that the build-up of silt and other debris does not occur.

9.3 In the event that the system is contaminated by oil, grease or other chemicals, the advice of the Certificate holder must be sought.

9.4 Damage to the system must be repaired at the earliest opportunity. See sections 14.1 to 14.3.

10 Resistance to penetration by roots

The system will resist penetration by plant roots and rhizomes.

11 Durability

Under normal conditions, the system will have a service life in excess of 25 years.

Installation

12 General

12.1 Installation of the Triflex Towersafe Solvent-Free Wind Turbine Foundation and Joint Waterproofing System must be in accordance with the Certificate holder's instructions and this Certificate.

12.2 Installation must not be carried out during inclement weather, eg rain, fog or snow, and the ambient air and substrate temperature must be between -5 and 40°C and at least 3°C above the dew point.

12.3 Substrates to which the system is to be applied must be sound, clean, frost free and dry. The Certificate holder's advice must be sought on the suitability of the substrate to receive the system and for suitable cleaning procedures and the use of a proprietary surface cleaner/HSE approved fungicidal wash where required.

12.4 Previously coated areas must be checked for integrity and adequate adhesion to the substrate. Defects such as cracks and blisters should be repaired prior to application of the system in accordance with the Certificate holder's instructions.

12.5 Adhesion checks must be carried out to ensure that the system is compatible with the existing surfaces. The Certificate holder must be consulted for details of suitable test methods and requirements.

12.6 All equipment must be cleaned with Triflex Cleaner.

13 Procedure

13.1 The Triflex Towersafe base component is mixed thoroughly using a slow speed agitator fitted with a suitable mixing paddle. The required quantity of catalyst is added, and stirring is continued until the mixture is lump-free, and in any event for at least two minutes. The amount of catalyst required will depend on the ambient temperature, and the manufacturer's technical data sheet/product label must be consulted for the required amount.

Joint treatment and detailing

13.2 Joints and details must be pre-treated prior to the final waterproofing layer being applied.

13.3 Transition joints between the tower and the foundation and other component joints may be sealed with a suitable joint sealant, if required, but must be taped over with Triflex Reinforced Tape as a minimum.

13.4 A layer of the mixed Triflex Towersafe is applied with a lambswool roller to the clean, prepared and, if required, primed substrate at a minimum application rate of $2.0 \text{ kg}\cdot\text{m}^{-2}$.

13.5 Triflex 110 g Reinforcement is rolled and embedded into the wet coating, avoiding creasing and trapped air. Adjacent lengths of the reinforcement must overlap by a minimum of 50 mm (100 mm if left over 12 hours) ensuring that there is sufficient coating to fully encapsulate it. Additional coating is applied if required.

13.6 A second coat of mixed Triflex Towersafe resin is applied, wet on wet, by roller at a minimum application rate of $1.0 \text{ kg}\cdot\text{m}^{-2}$.

13.7 At each stage a check should be made to ensure that the system has been applied to the minimum consumption. If a localised area has been applied below the minimum consumption, the affected area must be removed and reapplied to the specification.

13.8 The entire area is coated with Triflex Towersafe resin as described in sections 13.4 to 13.6, ensuring a minimum 50 mm overlap (100 mm if left over 12 hours) of adjacent sheets of Triflex 110 g Reinforcement.

13.9 Where a heavy-duty anti-slip finish is required, another layer of Triflex Towersafe resin is applied at a rate of $1.0 \text{ kg}\cdot\text{m}^{-2}$ and immediately broadcast with (0.7 – 1.2 mm) graded quartz sand at an approximate rate of $6 \text{ kg}\cdot\text{m}^{-2}$, ensuring that the areas around joints are avoided. Once cured, excess quartz is removed and a layer of Triflex Towersafe Finish is applied at a coverage rate of $0.6 \text{ kg}\cdot\text{m}^{-2}$.

13.10 If work is interrupted for periods in excess of 12 hours, the cured membrane must be reactivated by wiping with Triflex Cleaner. Overcoating must proceed after evaporation of the cleaner has occurred (approximately 20 minutes), but within 60 minutes, otherwise the process must be repeated.

14 Repair

14.1 Areas of damaged system must be cut back to sound, well-adhering material and cleaned with Triflex Cleaner.

14.2 After the cleaner has evaporated, the system is installed as described in section 13, ensuring that there is at least a 100 mm overlap over the existing sound material.

14.3 A check for adequate adhesion must be carried out once the system has cured.

Technical Investigations

15 Tests

Tests were conducted on samples of the Triflex Towersafe Solvent-Free Wind Turbine Foundation and Joint Waterproofing System to determine:

- water vapour permeability/water vapour diffusion resistance coefficient (μ)
- tensile strength and elongation
- watertightness
- tensile bond strength
- resistance to fatigue
- crack bridging capability
- resistance to dynamic indentation
- resistance to static indentation
- resistance to low temperatures
- resistance to high temperatures
- effect of heat ageing
- effect of exposure to surface water
- effect of exposure to UV-A radiation.

16 Investigations

16.1 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.

16.2 Test data relating to the components of the system were assessed.

16.3 Existing installations were visited to provide additional evidence of the system's in-service durability.

Bibliography

EN ISO 9001 : 2015 *Quality managements systems — Requirements*

ETAG 005 : 2000, Rev 2004 Part 1 *Guideline for European Technical Approval of Liquid Applied Roof Waterproofing Kits – General*

ETAG 005 : 2000, Rev 2004 Part 4 *Guideline for European Technical Approval of Liquid Applied Roof Waterproofing Kits – Specific Stipulations for Kits Based on Flexible Unsaturated Polyester*

17 Conditions

17.1 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.

17.2 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.

17.3 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.

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

17.5 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.

17.6 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.