

General Official Construction Test Certificate

For

Object: Roof sealing system "Sealoflex®-System"

we herewith issue a general official construction test certificate.

Applicant: Sealoflex Dichtungssysteme GmbH
Bei der Kirche 2
25474 Ellerbek

Date of issue: 18 November 1998

Valid until: 18 November 2003

**The validity of this abPs is
herewith extended until:**
15. May 2008 -

Test certificate number: P-6308/4676

Signature:
16.05.03 [Herrmann]
Dr. Eng. Knut Herrmann

This general official construction test certificate consists of **8** pages and **10** appendices.

I General Conditions

- 1 This general official construction test certificate confirms the suitability of the construction product listed as the object within the context of Federal Construction Law.
- 2 The general official construction test certificate is no substitute for the relevant legally required licences, permits and certificates for planned construction projects.
- 3 The general official construction test certificate is granted irrespective of the rights of third parties, especially private protection rights.
- 4 Irrespective of further regulations, contained in the "special regulations" listed, the manufacturer and distributor of the construction product must supply the user of the construction product with copies of the general official construction test certificate as well as notify the same with regard to the fact that the general official construction test certificate must be available on site. Upon request all interested parties must be supplied with copies of the general official construction test certificate.
- 5 The general official construction test certificate may be reproduced only in its entirety. Any publication of extracts requires the prior agreement of the Material Test Institute for the Construction Industry Braunschweig. Texts and drawings of advertising material must not contradict the general official construction test certificate. Translations of the general official construction test certificate must carry the note "Unofficial translation of the original document, not checked by the Material Test Institute for the Construction Industry Braunschweig".
- 6 The general official construction test certificate is awarded until it is revoked. The regulations contained within the general official construction test certificate can be added to or amended retrospectively, especially if new technical revelations require such additions.
- 7 The construction product listed as the object of this general official construction test certificate requires confirmation of compliance (compliance certificate) and labelling with the confirmation reference (Ü symbol) of the relevant confirmation register of the counties.

II Special Conditions

1 Object, Application Area and Regulations for Use

1.1 Object

The roof sealing system "Sealoflex®-System" consists of a total of 3 components: a highly elastic, single-component acrylic compounds with the name "Sealoflex Pink", a polyester fibre encased within the same, and a UV-resistant single-component covering paint layer with the name "Sealoflex Topcoat", also on an acrylic base and available in various colours.

1.2 Application Area

The construction product serves for the sealing of roofs and can be allocated to the group of products suitable for "roof sealing with liquid plastics" (serial No. 1.5) according to Chapter 1 of the Construction Regulations List A Part 2¹⁾ (Issue 98/1).

1.3 Regulations for Use

The sealing system is suitable for limited access for maintenance purposes and must be installed with a dry layer thickness of at least 1,1mm.

2 Regulations for the Construction Product

2.1 General

Confirmation of suitability for the purpose of the sealing system was confirmed with the aid of the test process listed in Appendix 1 and 2 compiled by the project group "General Official Construction Test Certificate for Roof Sealants containing Liquid Plastics" in compliance with the "European Technical Permits" of the EOTA²⁾ currently under review and have been finalised by the Deutsche Bauchemie³⁾ on 10 July 1997 together with the German Institute of Construction Technology (DIBt)⁴⁾ in Berlin.

In addition the following investigations were carried out as part of the initial test for the determination of the characteristics of the base materials and the entire construction of the sealing system:

Investigation of Liquid Components "Sealoflex Pink" and "Sealoflex Topcoat"

- infrared spectroscopic investigation
- glow residue
- viscosity

¹⁾ Construction Regulation List A, Construction Regulation List B and List C, Issue 98/1 – Notifications "German Institute for Construction Technology"; Special Brochure 18

²⁾ European Organisation for Technical Approval (EOTA); WG 04.02/01 "Liquid Applied Waterproofing Systems for use in Roof Waterproofing"

³⁾ Deutsche Bauchemie e.V., Karlstraße 21, 60329 Frankfurt/Main

⁴⁾ German Institute for Construction Technology, Kolonnenstraße 30, 10829 Berlin

Investigation of Polyester Insert Layer

- area weight
- maximum capacity
- expansion at maximum capacity

Investigation of Entire Construction

- general consistency
- area weight
- maximum capacity
- expansion at maximum capacity
- elasticity module

2.2 Requirements regarding Characteristics of the Sealing System

According to the test results listed in Appendices 3 to 5 the roof sealing system incorporates the following characteristics:

The “**Sealoflex® Roof Sealing System**”

- complies with the Construction Material Class B2 (normal flammability) and does not drip whilst burning (test process V1).
- is resistant to an airborne spread of fire and heat radiation for a roof inclination angle of 15° without heat insulation (test process V1).
- is waterproof (test process V2)
- is adhesive, and therefore resistant against wind suction forces (test process V3)
- bridges cracks (test process V5)
- is heat resistant (test process V6)
- satisfies the requirements relating to weathering resistance (test process V7)
- is root ingress resistant (test process V8)
- is suitable for limited access for maintenance purposes (test process V9)
- is alkaline resistant (test process V10)
- is open to water vapour diffusion (test process V11)

2.3 Manufacture, Packaging, Transport, Storage and Labelling

2.3.1 Manufacture

The base products for the roof sealing system “Sealoflex®-System” may be manufactured only in factories that have an internal production control system in place.

2.3.2 Packaging, Transport, Storage

All requirements originating from other legal areas listed on the containers, such as for example the Hazardous Goods Transport Law or the Hazardous Material Laws must be adhered to.

The liquid components of the sealing system must be stored in dry conditions in closed containers and protected against frost. With regard to maximum storage periods the information supplied by the manufacturer must be adhered to. The polyester fibre must also be stored in dry conditions.

2.3.3 Marking

All construction products/system components manufactured according to this general official construction test certificate must be clearly and permanently marked as such by the manufacturer. This marking must include the following information:

- Confirmation reference (Ü symbol) according to the Confirmation Reference Regulations of the counties including listing of number of the general official construction test certificate (P-6308/4676) and short description of test institute.
- Product description
- Note highlighting the fact that the item represents a system component of a sealing system.
- The content of section 1.3, "Regulations for Use", must be listed in full.
- Lot number (liquid components)
- Best before date
- Manufacturer

2.4 Confirmation Reference

2.4.1 General

The confirmation of the compliance of the manufacture roof sealing system "Sealoflex®-System" with the regulations listed in this general official construction test certificate must be validated with the aid of a confirmation declaration by the manufacturer based on an internal production control (WEP) for each manufacturing plant.

2.4.2 Internal Production Control (WEP)

The WEP represents the continuous monitoring of production that is to be carried out by the manufacturer, and which is to be instigated at every manufacturing plant and must be based on Appendix 0.3 of the Construction Regulation List A 98/1⁵⁾.

⁵⁾ Construction Regulation List A, Construction Regulation List B and List C, Issue 98/1 Notifications "German Institute for Construction Technology"; Special Brochure 18.

The production control must be carried out according to the regulations associated with the product and its manufacturing requirements listed below:

- In order to confirm compliance with requirements regulating manufacture the tests listed in tables 1 to 3 represent minimum requirements. The requirements listed here are based on the results of the basic and initial tests listed in Appendices 3 to 10.

Characteristics	Test Conditions	Internal Monitoring Min.	Requirements
Dynamic viscosity	DIN 53214	Every lot	Sealoflex Pink $1820 \leq x \leq 2470$ mPas Sealoflex Topcoat $4810 \leq x \leq 6510$ mPas
Glow residue	DIN 53568 Glow temperature 550°C	Every lot	Sealoflex Pink $26\% \leq x \leq 30\%$ Sealoflex Topcoat $29\% \leq x \leq 33\%$
IR spectrum	See text component in Appendix 6	Every 10 th lot, at least twice annually	No important changes

x = average value

Table 1: Type and frequency of the tests to be carried out with the liquid components according to WEP.

Characteristics	Test Conditions	Internal Monitoring Min.	Requirements
Area weight	DIN 53352	Every lot	$100 \leq x \leq 120$ g/m ²
Maximum traction (longitudinal and diagonal)	DIN EN ISO 527	Every lot	longitudinal: $x \geq 100$ N/15mm diagonal: $x \leq 45$ N/15mm
Maximum traction expansion (longitudinal and diagonal)	DIN EN ISO 527	Every lot	longitudinal: $x \geq 10\%$ diagonal: $x \geq 25\%$

Directional information "longitudinal" and "diagonal" refers to the manufacturing, i.e. rolling out direction of the fibre insert; x = average value

Table 2: Type and frequency of the tests to be carried out with the fibre insert according to WEP.

Characteristics	Test Conditions	Internal Monitoring Min.	Requirements
General consistency	DIN 16726/12.86 Chapter 5.1	4 x per year	Free from bubbles, cracks and indentations
Maximum traction (longitudinal and diagonal)	DIN EN ISO 527	4 x per year	longitudinal: $x \geq 140 \text{ N/15mm}$ diagonal: $x \geq 210 \text{ N/15mm}$
Maximum traction expansion (longitudinal and diagonal)	DIN EN ISO 527	4 x per year	longitudinal: $x \geq 15\%$ diagonal: $x \geq 15\%$
Elasticity module ¹⁾	DIN EN ISO 527	4 x per year	$33 \leq x \leq 45 \text{ N/mm}^2$
Water proofing	see Appendix 1 Test process V2	2 x per year	tight
Heat resistance	see Appendix 1 Test process V6	1 x per year	tight under load
Alkaline resistance	see Appendix 2 Test process V10	1 x per year	tight under load

Directional information "longitudinal" and "diagonal" refers to the manufacturing, i.e. rolling out direction of the fibre insert; x = average value

¹⁾ Sample taken at an angle of 45° to rolling out direction

Table 3: Type and frequency of the tests to be carried out with the sealing system according to WEP.

- The results of internal production control must be listed according to Appendix 0.3 of the Construction Regulation List A as well as evaluated and kept on file for at least 5 years. They must be supplied to the test institute that has issued the general official construction test certificate upon request.

2.4.3 Confirmation References

The containers/packages containing the construction product must be marked with the confirmation reference (Ü symbol) according to the conformation reference regulations of the counties.

3 Regulations for Application

Work relating to the application of the sealing material must be according to currently valid rules and guidelines as well as the stipulations of the manufacturer (technical sheet, issue February 1998) for the sealing system.

4 Legal Basis

This general official construction test certificate is issued according to §§24ff of the Construction Laws of Lower Saxony (NBauO) dated 13.07.1995 (Nds. GVBl. page 199), amended with article II of the Law dated 28.05.1996 (Nds. GVBl. 252) in connection with the Construction Regulation List A, issue 98/1. As the County Construction Laws of the other counties incorporate a relevant legal basis this general official construction test certificate is valid for the entire Federal Republic.

5 Legal Instruction

An objection against this general official construction test certificate can be lodged within one month from the issue of the same. The objection must be submitted in writing or dictated to the Directorate of the Material Test Institute for Construction, Hopfengarten 20, 38102 Braunschweig. If this deadline is not adhered to by an authorised representative of the objecting party then this non-adherence will be judged to be on the part of the objecting party itself.

The Director

The Administrators:

pp.

Dr. Eng. K. Herrmann

ORR Dr. Eng. M. Laube
Laurien

Techn. Clerk N.

Braunschweig, the 18th of November 1998

“Test process for the general official construction test certificate for roof sealing with liquid plastics”

- V1: **Testing of “burning characteristics”**
Confirmation of Construction Material Class B2 (normal flammability) and resistance towards an airborne spread of fire and heat radiation according to DIN 4102 Part 1, i.e. Part 7.
- V2: **Testing of “water proofing”**
Confirmation of waterproofing against a static water column of 1m over 24 hours according to prEN 1928 (process A).
- V3: **Testing of “adhesion (wind suction force)”**
Test process according to DIN EN 1607 utilising a stamp with a diameter of 100mm. Requirement regarding adhesion: $\geq 0,1 \text{ N/mm}^2$.
- V4: **Testing of “durability on sloped surfaces”**
Not applicable for the sealing system that has been tested here, as confirmation for products based on polymer dispersions is not required.
- V5: **Testing of “crack bridging capability”**
Confirmation of crack bridging characteristics on coated paving slabs (DIN 485) based on a crack width of 1mm under cyclic loads with a crack width change of +/- 1mm (0mm to 2mm). This test is carried out at a test temperature of -10°C over 500 cycles at a test speed of 16mm/h.
- V6: **Testing of “heat resistance”**
Storage at 60°C above 30d (not accessible/limited accessibility), i.e. 90d (special construction) in water. After 24 hours regeneration and testing of dynamic impression according to test process V9 as well as subsequent testing of water proofing according to test process V2
- and**
- storage at $+80^\circ\text{C}$ above 50d, for modified bitumen alternative: at $+70^\circ\text{C}$ above 100d. After that crack bridging test according to test process V5 with 50 cycles.
- V7: **Testing of “weathering resistance”**
According to ISO 11 507 the test is conducted up to a radiation level of 400 MJ/m^2 at a wavelength of 300nm to 400nm. After that a load is applied in the form of a dynamic impression attempt (test process V9) and a subsequent water proofing test is carried out (test process V2).
- V8: **Testing of “root ingress resistance”**
DIN 4062, Chapter 4.7.

V9: **Testing of “accessibility”**

The evaluation of the accessibility according to the payloads listed in the table below is carried out with the aid of the process for the determination of the resistance against dynamic, i.e. static impressions and subsequent testing of the water proofing (test process V2) described in the draft guidelines stipulated in Appendix II, Chapters 6 and 7 of the Draft Guidelines of the EOTA⁶⁾ working group WG 4.02/01, issue April 1996.

Classification according to Payload		
Payload	Static impression	Dynamic impression
Not accessible	70 N	30mm
Limited accessibility	150 N	20mm
Normal	200 N	10mm
Specials	250 N	6mm

V10: **Testing of “alkaline resistance”**

28-Day storage in saturated lime. Subsequent application of load with the aid of the dynamic impression test (test process V9), and subsequent water proofing test according to test process V2.

V11: **Testing of “water vapour permeability”**

Water vapour diffusion according to DIN EN 1062-2.

⁶⁾ European Organisation for Technical Approval (EOTA); WG 04.02/01 “Liquid Applied Waterproofing Systems for use in roof waterproofing”.

App. 3 of general official construction test certificate No. P-6308/4676 - 18 November 1998

Characteristics of sealing system	Test/Test conditions	Test results	Requirements
<p>Burning characteristics</p> <p>- Normal flammability</p> <p>- Resistance against airborne spread of fire</p>	<p>Test process V1 (see appendix 1)</p> <p>DIN 4102 Part 1</p> <p>DIN 4102 Part 7</p>	<p>The sealing system fulfils the requirements of the Construction Material Class B2 (normal flammability) and is not classed as dripping whilst burning (test process V1).</p> <p>Resistant against airborne spread of fire and heat radiation at a roof angle of 15° within heat insulation. Individual results are listed in the MPS test certificate No. 6308/4676-b – Do/Mü dated 08.05.1998.</p>	<p>Construction Material Class B2</p> <p>Resistant against airborne spread of fire and heat radiation</p>
Water Proofing	<p>Test process V2 (see appendix 1)</p> <p>prEN 1928: process A test duration 24h water column 1m</p>	tight	tight
Adhesion (wind suction force)	<p>Test process V3 (see appendix 1)</p> <p>(DIN EN 1607); DIN ISO 4624</p> <p>Test stamp Ø 100mm Load increase rate 100 N/s</p>	<p>- on concrete: x = 1,33 N/mm² *) s = +/- 0,17</p> <p>- on pine wood: x = 1,58 N/mm² *) s = +/- 0,20</p> <p>- on sheet steel: x = 1,53 N/mm² *) s = 0,07</p> <p>- on aluminium sheeting: x = 1,46 N/mm² *) s = +/- 0,07</p>	<p>x ≥ 0.1 N/mm²</p> <p>x ≥ 0,1 N/mm²</p> <p>x ≥ 0.1 N/mm²</p> <p>x ≥ 0.1 N/mm²</p>
Crack bridging capability	<p>Test process V5 (see appendix 1)</p> <p>Test temperature: -10°C Starting crack width: 1,0mm Crack width change: +/- 1mm No. of cycles: 500 Test speed: 16 mm/h</p>	Free from hairline fractures and cracks	Free from hairline fractures and cracks

*) Cohesion crack within the component "Sealoflex Pink" within the area of the "polyester fibre".

x: average value s: deviation from the norm

App. 4 of general official construction test certificate No. P-6308/4676 - 18 November 1998

Characteristics of sealing system	Test/Test conditions	Test results	Requirements
<p>Heat resistance</p> <p>- Water proofing under load</p> <p>- Crack bridging capability under load</p>	<p>Test process V6 (see appendix 1)</p> <p><u>Load:</u></p> <ul style="list-style-type: none"> - 30-day storage at 60°C - 24-hour storage in normal climate - dynamic impression acc. to test process V5 (test stamp Ø 20mm) - 24-hour load of 1m water column (test process V2) <p><u>Load:</u></p> <ul style="list-style-type: none"> - 50-day storage at 80°C - 24-hour storage in normal climate - crack bridging test acc. to test process V5 for 50 cycles - test temp.: -10°C - starting crack width: 1,0mm - crack change: +/- 1mm - test speed: 16mm/min 	<p>tight</p> <p>Free from hairline fractures and cracks</p>	<p>tight</p> <p>Free from hairline fractures and cracks</p>
<p>Weathering resistance</p> <p>- Water proofing in weathered condition</p>	<p>Test process V7 (see appendix 1)</p> <p><u>Load:</u></p> <ul style="list-style-type: none"> - radiation acc. to ISO 11507, 400 MJ/m² at wavelengths between 300-400 nm - 24-hour storage in normal climate - dynamic impression acc. to test process V9 (test stamp Ø 20mm) - 24-hour load of 1m water column (test process V2) 	<p>tight</p>	<p>tight</p>
<p>Root ingress resistance</p>	<p>Test process V8 (see appendix 1)</p> <p>DIN 4062</p>	<p>Root ingress resistant</p>	<p>Root ingress resistant</p>

App. 5 of general official construction test certificate No. P-6308/4676 - 18 November 1998

Characteristics of sealing system	Test/Test conditions	Test results	Requirements
Accessibility - Water proofing under load	Test process V9 (see appendix 2) <u>Load:-</u> - dynamic impression acc. to EOTA guideline, chapter II.6 - 24-hour load of 1m water column (test process V2)	Dynamic impression with: 10mm test stamp: not waterproof 20mm test stamp: waterproof Classification: limited accessibility	tight
Alkaline resistance - Water proofing under load	Test process V10 (see appendix 2) <u>Load:-</u> - 28-day storage in unsaturated lime - 24-hour storage in normal climate - dynamic impression acc. to test process V9 (test stamp Ø 20mm) - 24-hour load of 1m water column (test process V2)	tight	tight
Water vapour permeability	Test process V11 (see appendix 2) DIN EN 1062-2 Process: free film No. of test samples: 5 Dry layer thickness: 1100µm	Water vapour diffusion density $V = 13,5 \text{ [g/(m}^2\text{·d)]}$ Water vapour diffusion equivalent air layer thickness $S_d = 3,0 \text{ [m]}$	open for diffusion

Characteristics of fluid components	Test/Test conditions	Test results
Glow residue of liquid components	DIN 53 568 Glow temperature: 550°C Individual tests: 3	Sealoflex Topcoat: Sample 1: 30,9% Sample 2: 30,9% <u>Sample 3: 31,0%</u> Average value x: 31,0% Sealoflex Pink: Sample 1: 28,4% Sample 2: 28,5% <u>Sample 3: 28,4%</u> Average value x: 28,4%
Dynamic viscosity	DIN 53 214 Shearing speed D = 65,29 s ⁻¹ Shearing speed D = 41,28 s ⁻¹	Sealoflex Pink: Sample 1: 2090 mPas <u>Sample 2: 2200 mPas</u> Average value x: 2145 mPas Sealoflex Topcoat: Sample 1: 5590 mPas <u>Sample 2: 5730 mPas</u> Average value x: 5660 mPas
IR spectrum	see below	Appendices 7 and 8
<p>As part of the infrared spectroscopic investigations the liquid samples of the individual components were initially applied to 3mm thick sample substrates (ZnSe) without further preparation and spectroscopy treated immediately. The infrared spectrum of both materials, i.e. "Sealoflex Topcoat" and "Sealoflex Pink" (appendix 7) showed deposits of various organic and anorganic components which made an identification more difficult. The materials were therefore shaken with the aid of a suitable solvent, centrifuged, and the resulting sample steamed onto the sample substrate in the form of a film layer, whereafter it was then spectroscopy treated again (for spectrum see appendix 8). In each case the thickness of the layer was chosen in such a way that the requirements of DIN 51 451 with regard to the extinction conditions were adhered to.</p> <p>The recording of the spectrum was carried out on a Perkin-Elmer FTIR unit of the type 1760-X within the wave range of 400 cm⁻¹ to 600 cm⁻¹.</p>		

App. 7 of general official construction test certificate No. P-6308/4676 - 18 November 1998

For graph see original document

Spectrum of liquid component "Sealoflex Pink", untreated

For graph see original document

Spectrum of liquid component "Sealoflex Pink", treated *)

For graph see original document

Spectrum of liquid component "Sealoflex Topcoat", untreated *)

For graph see original document

Spectrum of liquid component "Sealoflex Topcoat", treated

App. 8 of general official construction test certificate No. P-6308/4676 - 18 November 1998

Characteristics of polyester fibre	Test/Test conditions	Test results
Area weight	DIN 53 352	x = 110 g/m ² k = 95 g/m ² g = 124 g/m ²
Behaviour during traction trial	DIN EN ISO 527 Test sample type 2 v = 50 mm/min	Maximum force longitudinal x = 116 N/15mm s = 15,0 diagonal x = 52 N/15mm s = 2,18 Expansion at maximum traction longitudinal x = 16,8% s = 1,61 diagonal x = 32,7% s = 13,8

Directional information "longitudinal" and "diagonal" refers to the manufacturing, i.e. rolling out direction of the fibre insert;

x = average value, s = +/- deviation from the norm, k = smallest value, g = largest value

Characteristics of sealing system	Test/Test conditions	Test results
General consistency	DIN 16726 Chapter 5.1	Free from cracks and indentations
Thickness	DIN 53 353	Total thickness x = 1,11mm k = 1,05mm g = 1,17mm Layer thickness of topcoat x = 0,45mm k = 0,41mm g = 0,49mm
Area weight	DIN 53 352	x = 1640 g/m ² k = 1550 g/m ² g = 1740 g/m ²
Folds at cold temperatures, i.e. at -20°C	DIN 53 361	no cracks
Behaviour during traction test	DIN EN ISO 527 Type 2 v = 50mm/min DIN 53 457 v = 5mm/min	Maximim force longitudinal x = 149 N/15mm s = 5,09 diagonal x = 223 N/15mm s = 11,4 Expansion at maximum force longitudinal x = 18,3% s = 0,59 diagonal x = 22,2% s = 0,97 Elasticity module ¹⁾ x = 38,7 N/mm ² s = 3,33

Directional information "longitudinal" and "diagonal" refers to the manufacturing, i.e. rolling out direction of the fibre insert;

x = average value, s = +/- deviation from the norm, k = smallest value, g = largest value

¹⁾ Sample taken at an angle of 45° to rolling out direction