Officially Recognised Testing Institute for Plastics

Süddeutsches Kunststoff-Zentrum

Further Education and Technology Forum
Accredited and Officially Recognised Testing Institute
Applications Related Research
Institute Director: Prof. Dr. Schmitt

Test Certificate No.: **36142/98**

Customer: Sika Chemie GmbH
Stuttgarter Straße 117

72574 Bad Urach
Germany

Order: Testing of the joint sealant "Sikaflex TS plus" on the basis of the Approval Principles for Two-component Sealant for Sewage Installations.

Letter of: 1998-10-29 **Ref.:** Ms. Pfleiderer
Order No. 120/45 129 779

Test sample received: 1998-09-03
1998-04-20 **Sample taken: ---**

Time of Testing: from: 1998-10-27 to: 1999-06-29

This certificate comprises 7 pages.

Würzburg, 1999-08-12
Ot/we

by Proxy
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1. Order

By order no. 120/45 129 779 of October 29,1998 the company Sika Chemie GmbH, Stuttgarter Straße 117, 72574 Urach, Germany, instructed the Süddeutsche Kunststoff-Zentrum -SKZ- to test the joint sealant "Sikaflex TS plus" in accordance with the Bau- und Prüfgrundsätze für Abwasseranlagen - BPG - (Building and Testing Principles for Two-component Sealants for Sewage Installations).

2. Test material

On September 3,1998 the SKZ received following test material for testing:

12 film bags	one-component joint sealant
Designation:	"Sikaflex TS plus"
Base material:	polyurethane
Color:	black
Batch:	147798
500 ml	one-component primer
Designation:	Sika-Primer 3
Batch:	65280
1 l	two-component primer
Designation:	"Sikafloor® 156"

3. Test procedure

The testing of the joint sealant "Sikaflex TS plus" was performed by adapting the "Approval Principles for Two-component Sealants for Sewage installations", drafted in June 1995 by the Deutsche Institut für Bautechnik in Berlin. The tests deviated from these principles as the test samples have been stored for four weeks according to DIN EN 28340 in standard conditioning atmosphere 23/50-2 according to DIN EN ISO 291.

3.1 No-sag properties

The no-sag properties were determined on the basis of the test specified in DIN EN 27390 by using the U-profile 20 mm x 10 mm. The test pieces were placed vertically on a glass plate immediately after they had been prepared. Ageing took place at a standard conditioning atmosphere of 23/50-2 in accordance with DIN EN ISO 291.

After full cure of the joint sealant a profile was placed plane parallel on the test piece and the deepest dent measured at right angles to it. Given is the arithmetic mean of the dent in mm, rounded of to the nearest mm.

3.2 Adhesion and extension behaviour

The testing of the adhesion and extension behaviour was performed on the basis of DIN 52455, part 1 (edition April 1987).

As far as test instruments and facilities as well as dimensions and preparation of test pieces are concerned the specifications set forth in DIN 52455, part 1, clause 4, 5 and 6 and DIN 18540 (edition 2/95) clause 4.3.4 apply.

After full cure of the joint sealant the check bodies shall be moved a bit away from the joint sealant and stored such, that air shall have free access to all sides of the test pieces. The test pieces were aged at a standard conditioning atmosphere of 23/50-2 according to DIN EN ISO 291 for a period of 4 weeks. Subsequently the test pieces were aged under the following conditions:

Ageing condition A (immersion in water)
28 days Ca $(OH)_2$-saturated water of (23 ± 1) °C

Ageing condition B (alternating conditions)
3 days (70 ± 2) °C in air
1 day (30 ± 1) °C in Ca $(OH)_2$-saturated water
2 days (70 ± 2) °C in air
1 day (30 ± 1) °C in Ca $(OH)_2$-saturated water
This 7-day-cycle shall be repeated four times.

Ageing condition C (ageing at low temperatures)
7 days at (- 20 ± 2) °C

Conditioning was performed in such a way that air and water gained free access to all sides of each test piece. During ageing in water similar test pieces were aged in a container without moving their liquid.

At the end of the ageing period the test pieces were removed from the ageing media and immediately elongated in a tensile testing machine at a speed of advance of 5 to 6 mm/min.

- In the case of ageing condition A and B by 50 % of the original joint width (from 12 mm to 18 mm). The test was performed at (23 ± 2) °C.

- In the case of ageing condition C by 20 % of the original joint width (from 12 mm to 14.4 mm). The test was carried out at (-20 ± 2) °C.

Once the required elongation had been obtained, distance pieces were inserted sideways to ensure that the test pieces remain in this state for a period of 24 h at the test temperatures stated above. After 24 hours of elongation the test pieces were checked for crack formation and separation from the contact material (concrete).

3.3 Resistance to excess water pressure

The test was performed on a concrete test piece featuring a joint 100 mm x 20 mm x 20 mm in size. The dimensions of the concrete test pieces were 200 mm x 200 mm x 100 mm.

The concrete test piece was prepared in a usual steel mould (die of an edge length of 200 mm) by using an appropriate mixture of concrete (as describee for example in DIN 4062, clause 5.1.1). The recess was realized by inserting styropore.

Before the joint sealant "Sikaflex TS plus" was inserted in the joint gap the lateral contact surfaces were sealed with the primer "Sikafloor® 156". The joint depth of 20 mm was fixed with the aid of a round closed-cell polyethylene foam profile of 25 mm ∅.

After 6 hours, the time it takes the primer's solvent to evaporate, the joint sealant "Sikaflex TS plus" was introduced into the gap. The specimens were then aged for a fortnight in standard conditioning atmosphere of 23/50-2 according to DIN EN ISO 291. Afterwards the test pieces were subjected to a water impermeability

test, using a test pressure of 2 bar. 24 h after applying the test pressure as well every day the joint sealant's arching was measured.

24 hours after the pressure was applied the arching must not exceed 5 mm (value at test start). After 168 hours (i.e. one week) the arching must not exceed 1 mm at constant pressure of 2 bar compared with the value measured after 24 hours. During testing the joints must not show any water penetrating.

3.4 Weight loss after thermal ageing

For the test three aluminium plates were weighed and the weight (G1) determined. Afterwards the joint sealant, 125 mm x 40 mm x 6 mm in dimension, was deposited on the aluminium plates and weighed once more 30 min later (weight G2).

Then the test pieces were aged 7 days in a standard conditioning atmosphere of 23/50-2 according to DINEN ISO 291 followed by 7 days in air at 70 ± 2 °C. At room temperature the test pieces were then allowed to cool off for one hour prior to being weighed (weight G3). The weights were measured with an accuracy of 0.01 g.

The weight loss was determined as follows:

$$\% \text{ weight loss} = \frac{(G2-G1) - (G3-G1)}{(G2-G1)} \times 100$$

Given is the arithmetic mean in % rounded to 0.1.

3.5 Chemical resistance

For this test test pieces with the measurements 100 mm x 20 mm x 10 mm were prepared and subsequently aged in a standard conditioning atmosphere of 23/50-2 for 4 weeks according to DIN EN ISO 291.

After preconditioning the weight and volume was determined with an accuracy of 0.01 g and 0.01 cm^3 respectively. For a period of 7 days the test pieces were then immersed in upright position in the following solutions, tempered at (23 ± 2) °C:

dilute sulphuric acid, where pH = 2
dilute caustic soda solution, where pH = 12

After 7 days of immersion the test pieces were removed from the solutions and their surfaces dabbed with cellulose tissue. The changes in weight and volume were then determined by weighing. The amendments were compared with the first values. The arithmetic mean of the determined changes is given in %, rounded off to 0.1 g. The + or - signs indicate the increase or decrease in weight respectively.

3.6 Microbiological resistance

Remark: So far the many years' experience in sewerage technology have shown that polyurethane-based joint sealants are resistant to microbiological attacks.

4. Test results

4.1 No-sag properties

No arching was measured.

4.2 Adhesion and extension behaviour

During ageing conditions A, B and C no crack formation or separation from the contact material were determined.

4.3 Resistance to excess water pressure

Arching in mm			
24 h/ 2 bar	168h / 2 bar	24 h/ 3 bar	24 h/ 4 bar
6.8	8.0	10.9	fracture after 3 h

4.4 Loss in weight after heat ageing

The loss in weight is 5.3 %.

4.5 Chemical resistance

Solution	Loss in weight in %	Change in volume in %
dilute sulphuric acid pH 2	+ 0.6	+ 0.8
dilute caustic soda solution pH 12	+ 0.7	+ 0.8

4.6 Microbiological resistance

The microbiological resistance was not tested (see item 3.6).

5. Conclusion

The requirements set forth in the Approval Principles for Two-component Sealants for Sewage Installations drafted in June 1995 have been met regarding the items tested.