Test Method: 1 1 5th July 2002

Standard Test Method for Adhesion-Cohesion before and after artificial heat ageing

l . SCOPE

This test has been devised to test the adhesion of strip sealants against preformed coated steel substrates (Plastisol coating to one face and alkyd paint coating to the other)

2. APPLICABLE DOCUMENTS

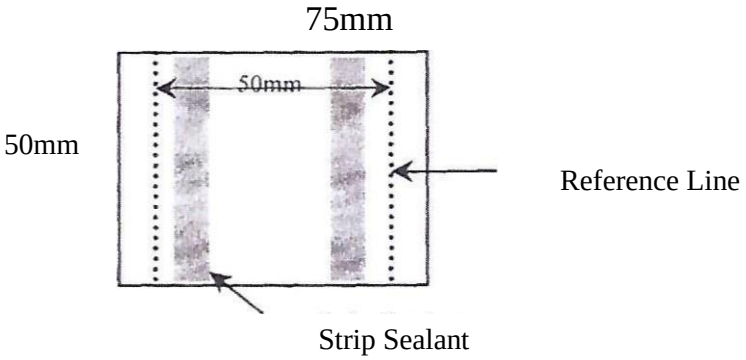
French Standard: NF P 30-305 1995 (section 4.2)'Building covering/roofing, Extruded mastic sealing strips for metallic roofing'

3. APPARATUS

Steel substrates
Aluminum plates Tensile Testing machine
(Plastisol coating to one side and alkyd paint to the other of 75 x 500 x 0.7mm dimensions) (Dimensions, 6mm thickness, 125mm length, 75mm width) (Capable of compression and separation rates of 5mm/min)

4. TEST SPECIMEN

4.l. For each trip sealant under test prepare two test specimen as follows
4.2. Dry wipe the surface of the substrate with an industrial paper towel
4.3. Draw reference lines on the substrates as shown below (50mm apart)
4.4. Place the strip sealant of dimensions 9 x 3mm approximately 3mm inside both reference lines as shown below



4.5. Measure the initial thickness of the sealant strip
4.6. Place a second substrate panel over the strip sealant perpendicular to the first substrate aligning its edges with the reference lines of the lower substrate. Ensure there is intimate contact but take care not to affect the thickness of the strip
4.7. Compress the test coupon by 20% of its initial thickness at a rate of 5mm/min and allow to condition at 23 ^{0} C ± 2^{o}c for a period of 24 hours

5. CONDITIONING

5.l. Condition one test specimen for each sealant to be evaluated under the following conditions prior to testing

5.2. Adhesion before ageing - Place the test specimens laid horizontally allow to condition at $23^0C \pm 2^oc$ for 4 weeks

5.2. l . After 4 weeks remove the test coupons from the oven and store in conditions of $23^0C \pm 2^oc$ for 24 hours before testing

5.3. Adhesion after ageing - Place the test specimens laid horizontally in an air circulating oven and allow to condition at a predefined temperature of $80^0 C \pm 2^o c$ for 4 weeks

5.3. I. After 4 weeks remove the test coupons from the oven and store in conditions of $23^0C \pm 2^oc$ for 24 hours before testing

6. PROCEDURE

6.l. Measure the thickness of the test coupon

6.2. Place the test specimen on test equipment capable of performing a tensile test with a separation rate of 5 mm/minute until the test coupon is extended by 30% of its thickness at the start of the test.

6.3. Remove the sample from the tensile tester and visually inspect the sample for any cohesive/adhesive failure.

7. PASS CRITERIA

7.1. Category A 'No loss of adhesion when the joint is extended by 30% of its compressed thickness before and after aging.

7.2. Category B 'No loss of adhesion when the joint is extended by 30% of its compressed thickness before and after aging'

Standard Test Method for Low Force Static

I. SCOPE

I. l . This test can be applied to strip sealants to assess their ability to resist slump and creep at elevated temperatures

2. APPLICABLE DOCUMENTS

2.l . (Plastisol coating to one side and alkyd paint to the other of 75 x 30 x 0.7mm dimensions)
2.2. (Capable of operating at elevated temperatures of+80^{0}C ± 2^{0}C)

3. APPARATUS

3.1. Steel panels— 125 x 75 x 6 mm
3.2. Vented Air circulating
3.3. Oven
3.4. Weights
3.5. Aluminum plates

4. TEST SPECIMEN

4.1. Prepare ovo test coupons for each sealant to be tested as follows;
4.2. Drill a 3mm 0 hole positioned centrally across the width and 5mm from one end of each steel panel of dimension 75 x 30mm
4.3. Degrease the steel panels using Propan-2-ol, and allow to air dry.
4.4. Draw a reference line on the textured su±ce of the panel 30mm in from the end opposite to the drilled hole
4.5. With the textured surface of the panel facing upwards place two runs of sealant spaced evenly between the 30mm reference line and the undrilled edge of the panel.
4.6. Place a second steel panel again with the textured surface 6cing upwards against the strip sealant ensuring that the hole is away from the formed sealant joint
4.7. Cut any excess so-ip using a sharp blade.
4.8. Place each assembled test coupon between aluminum plates and apply a 50N force for a period of 60 seconds.

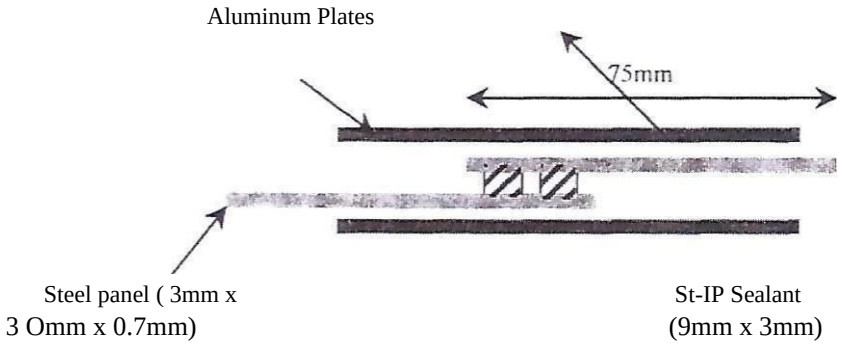


Diagram A: Static Shear test coupon

5. CONDITIONING

5. l . Leave the test specimens at 23^{0}C ± 2^{0}C for a period of I hour

6. TEST PROCEDURE

6.I. Suspend weights from the hole in the lower steel panel according to the category to which the sealant is to be tested making sure that the toul weight supported by the sealant (i.e. the sum weight of the lower aluminum panel and any additional weights) equals the following,

Category A 50 cams

Category B 10 to 12.5 grams (usually the weight of the bottom steel panel only)

6.2 Suspend the test samples (together with any required additional weights) in an air circulated oven at a predefined temperature of $80^0C \pm 2^0C$ using the hole drilled in the top panel

6.3 Measure and record any separation betvveen the ends of the aluminum and their corresponding reference lines every 24 hours.

7. PASS CRITERIA

7.1. Category A	50 grams weight	Separation less than 5mm after a 7 day period
7.2. Category B	10 to 12.5 gnms weight	Separation less than 5mm after a 7 day period

Standard test method for Water Resistance Test

I. SCOPE

I . l . This test can be applied to strip sealants to assess their ability to act as a water barrier.

2. APPLICABLE DOCUMENTS

2.1. A AM A Test Method 2.13 Water Resistance 1 986

3. APPARATUS

3.1. Steel panel of dimensions 150 x 100 x 0.7mm (Plastisol coating to one side and alkyd paint to the other)

3.2. Glass plate of dimensions 150 x 100 x 4mm

4. TEST SPECIMEN

4.1. Prepare the test specimen as follows:

4.2. Clean the steel and glass plates with propan-2-ol.

4.3. Apply the strip sealant, of dimensions 9 x 3mm cross-section and 30cm long, to the textured surface of one steel panel and the alkyd paint side of a second steel panel forming a U-shape such that the vertical sides of the U-Shape are approximately 10 to 12 cm long. Ensure that good contact is made to the steel plate.

4.4. Remove the release backing.

4.5. Apply the glass plate on top of the sealant and in line with the steel plate below.

4.6. Place a 10kg weight on top of the glass plate for 15 minutes to provide good surface contact between the strip sealant and the glass/steel substrates

s. CONDITIONING

5.1. After preparation allow the test assembly to condition in a horizontal plane at 23 ^{o}c ± 2 ^{0}C for one hour.

6. PROCEDURE

6.1. After conditioning, stand the assembly in a vertical position and fill the U-shape with water. Mark the water level on the glass.

6.2. Store in a vertical position for 21 days at 23 ^{0}C ± 2^{0}C

6.3. Visually examine the specimen for any leaks at 24 hour intervals

6.4. If necessary, top up the water occasionally to overcome evaporation losses.

7. PASS CRITERIA

7.1. Category A No leaks during test period against the textured plastisol coated surface and the smooth alkyd paint surface

7.2. Category B No leaks during test period against the textured plastisol coated surface and the smooth alkyd paint surface

Test Method: IS" I July 2002

Standard test method for Compression Test

I. SCOPE

I . I. This test can be applied to strip sealants to assess their ability to be compressed.

2. APPLICABLE DOCUMENTS

2.1. French Standard: - NF P 30-305 1995 (section 4.2) "Building covering/roofing, Extruded mastic sealing strips for metallic roofing'

3. APPARATUS

3.1. Machine for carrying out compression tests at a rate of 5mm/min
3.2. Steel compression plate attachments for the above machine of dimensions 1.5mm thickness by 25mm width by 75mm length
3.3. Cool-box for storing samples & carrying out tests at $5\ ^0C \pm 2^0C$

4. CONDITIONING

4.1. Cut five strips of sealant, of dimensions 9 x 3mm in cross-section and 50mm long, for each test temperature.
4.2. Condition the strips either at temperatures of $23\ ^0C \pm 2^0C$ for 24 hours, or at $5\ ^0C \pm 2^0C$ for 24 hours

s. TEST SPECIMEN

5.1 . Prepare test specimen as follows:
5.2. Measure the thickness of the strip
5.3. Place the strip sealant on the bottom steel compression plate.
5.4. Apply light finger pressure to ensure intimate contact of the sealant with the steel compression plate.
5.5. Remove the release paper from the test specimen

6. PROCEDURE

6.1. Compress the sample by 20% of the original thickness, at a separation rate of 5mm per minute.
6.2. Carry out the test 5 times
6.3. Record the maximum load
6.4. Calculate the resistance to compression by taking the average of the five maximum load values achieved and dividing by the surface area of the tape. Express the results in kg/cm^2 .

7. PASS CRITERIA

7.1. Category A - For samples tested at $23\ ^0C$, maximum compression 1.5 kg/cm^2 For samples tested at $5\ ^0C$, maximum compression 2.5 kg/cm^2
7.2. Category B- For samples tested at $23\ ^0C$, maximum compression 1.5 kg/cm^2 For samples tested at $S\ ^OC$, maximum compression 2.5 kg/cm^2

Test Method: 1 5 th July 2002

Standard Test Method for Shear retention before and after ageing / cycle testing

l . SCOPE

This test has been devised to provide a means to determine how sealants perform after ageing then subject to cyclic shear movement.

2. APPLICABLE DOCUMENTS

3. APPARATUS

3.1. Two plastisol-coated steel panels (Dimensions - 0.7mm thick, 150mm length, 75mm width) with 8mm O holes drilled in the positions shown in diagram B.

3.2.

(A) Topside textured painted side

(B) Underside alkyd paint

Machine capable of cycling the joint by ± 3mm at speeds of 20 cycles per minute.
Oven capable of 80 + 2^0C
Tensile testing machine capable of cross-head speeds of 100 mm/min

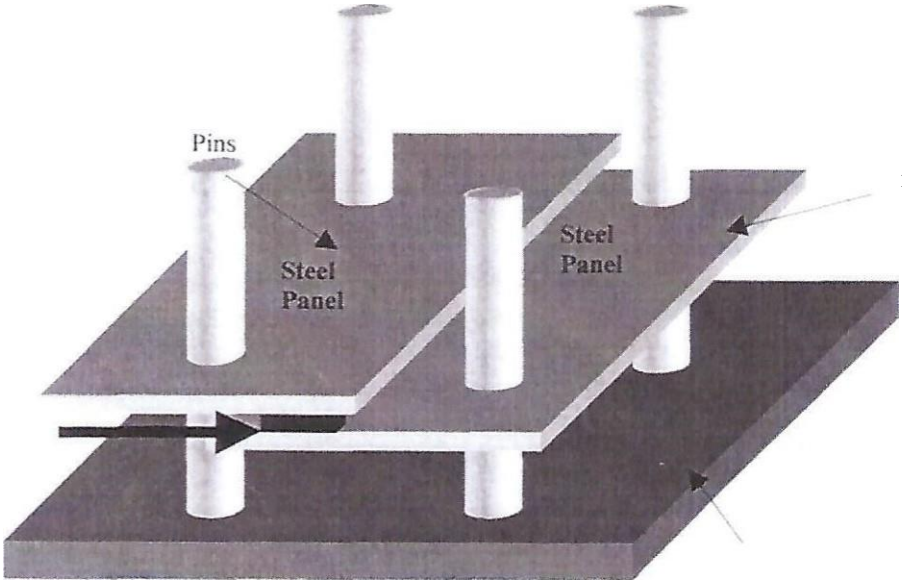
4. TEST SPECIMEN

4.1 . Prepare test specimens as follows:

4.2. Place the steel panels (side A showing) on the testing rig

4.3. Apply a strip of dimensions 9 x 3 mm in cross-section and 100mm long, approximately 5mm from the edge of the drilled hole of the steel panel.

4.4. Remove the release backing paper and apply a second steel panel (side B facing the strip sealant) over the strip sealant allowing an overlap of approximately 30mm.



rest Coupon

Strip Sealant

Base

Diagram A: Shows a sample constructed on a the assembly rig

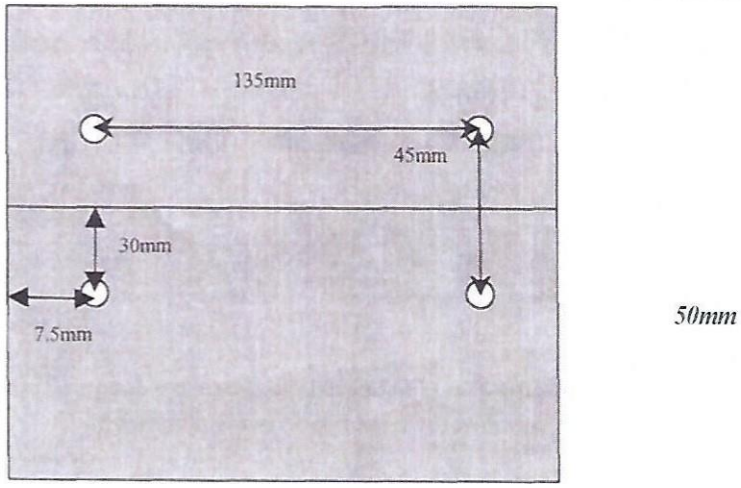


Diagram B: Shows the steel panel dimensions

5. CONDITIONING

5.I . For each material to be tested make up 6 assemblies.

5.2. Three assemblies should be conditioned at $23^0C + 2^oc$ for 24 hours, and then tested in shear as in step 6. l. These are the control samples.

5.3. Condition the other three assemblies in an oven at $80 + 2^0C$ for a period of 4 weeks. Once a week change the location of the assemblies in the oven to take account of any irregularities in temperature.

5.4. On completion of conditioning allow assemblies to stand for 24 hours at $23\ ^0C + 2^0C$

5.5. After conditioning, carry out cycling testing at a rate of 20 cycles per minute and amplitude of + 3mm. The total number of cycles should be 8000.

6. PROCEDURE

6.l. On completion of conditioning and / or cycling testing, place assembly into the tensile testing machine, and perform a shear test at a rate of 100mm per minute.

6.2. Record the maximum load for each sample

6.3. Calculate the average maximum load for both the unaged (control) and the aged samples 6.3 Calculate the retention of shear strength by taking the average maximum load for the aged samples and dividing by the average maximum load for the unaged 'control' samples and expressing as a percentage.

i.e Average Maximum Load (Aged Samples) Average Maximum (Unaged 'Control' samples)
100% = Sheer Retention %

7. PASS CRITERIA

7.l . Category A Materials — Minimum 60N shear strength before ageing 70% of shear strength

7.2. Category B Materials — Minimum 45N shear strength before ageing. Minimum 45% retention of shear strength