EUROPEAN ASSESSMENT DOCUMENT

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JOINT SEALING TAPE ON THE BASIS OF A PRE-COMPRESSED FLEXIBLE POLYURETHANE FOAM FOR SEALING AROUND WINDOWS AND JOINTS IN BUILDING FACADES

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This European Assessment Document (EAD) has been developed taking into account up-to-date technical and scientific knowledge at the time of issue and is published in accordance with the relevant provisions of Regulation No (EU) 305/2011 as a basis for the preparation and issuing of European Technical Assessments (ETA).

Contents

1 SCOPE OF THE EAD

1.1 Description of the construction product

The construction product is a joint sealing tape made of a flexible impregnated pre-compressed polyurethane foam hereinafter referred as sealing tape. This EAD covers only products of reaction to fire class E or F.

The sealing tape consists of

- precompressed polyurethane foam
- sealing mass

The joint sealing tapes show different dimensions as to width and thickness with a different performance depending on the dimensions and movement capacity of the joint of the construction. For installation purposes they are delivered in various lengths on spools, pre-compressed and with laminated single-sided self-adhesive foil.

The product is not covered by a harmonised European standard (hEN).

Concerning product packaging, transport, storage, maintenance, replacement and repair it is the responsibility of the manufacturer to undertake the appropriate measures and to advise his clients on the transport, storage, maintenance, replacement and repair of the product as he considers necessary.

It is assumed that the product will be installed according to the manufacturer's instructions or (in absence of such instructions) according to the usual practice of the building professionals.

Relevant manufacturer's stipulations having influence on the performance of the product covered by this European Assessment Document shall be considered for the determination of the performance and detailed in the ETA.

1.2 Information on the intended use(s) of the construction product

1.2.1 Intended use(s)

The joint sealing tape is used to seal joints around non-metallic windows and joints in non-metallic building façades to resist penetration of water and air.

The function of sealing tapes remains safe up to severe low temperatures of –20 °C or even lower temperature (-25 °C, -30 °C or –40 °C), as indicated by the manufacturer. This shall be stated in the ETA.

The single-sided self-adhesive foil serves as installation assistance.

The dimensioning of the product for the operating rate of joint width shall be given in the ETA. The highest and lowest value includes possible movements of the joint width due to influence of temperature.

The opened roles have to be closed immediately after finishing work, so that the tape cannot expand.

1.2.2 Working life/Durability

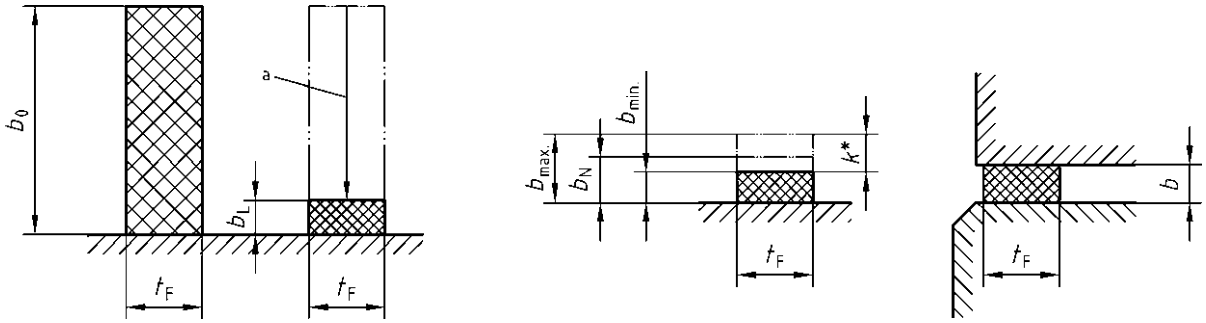
The assessment methods included or referred to in this EAD have been written based on the manufacturer's request to take into account a working life of the sealing tape for the intended use of 10 years when installed in the works provided that the sealing tape is subject to appropriate installation (see 1.1). These provisions are based upon the current state of the art and the available knowledge and experience.

When assessing the product, the intended use as foreseen by the manufacturer shall be taken into account. The real working life may be, in normal use conditions, considerably longer without major degradation affecting the basic requirements for works[1].

The indications given as to the working life of the construction product cannot be interpreted as a guarantee neither given by the product manufacturer or his representative nor by EOTA when drafting this EAD nor by the Technical Assessment Body issuing an ETA based on this EAD, but are regarded only as a means for expressing the expected economically reasonable working life of the product.

1.3 Specific terms used in this EAD

Geometry of the joint and the sealing tape



a) production b) in use

t_F	Width of the sealing tape = minimum depth of the joint
b_0	Thickness of the uncompressed sealing tape
b_{Lmin}	Minimum thickness of the compressed sealing tape at state of delivery
b_N	Nominal width of the joint according to declaration of the manufacturer: $b_{min} + (b_N \times 25\ \%) \leq b_N \leq b_{max} - (b_N \times 25\ \%)$
b_{min}	Minimal joint width [mm]
b_{max}	Maximum joint width [mm]
b	Joint width during installation: $b_{min} \leq b \leq b_{max}$)
a	Degree of compression, $a = b_x/b_0 \times 100$ [%] (100 % is the uncompressed sealing tape)
k*	Movement capacity $k^* = b_{max} - b_{min,}$

1 The real working life of a product incorporated in a specific works depends on the environmental conditions to which that works is subject, as well as on the particular conditions of the design, execution, use and maintenance of that works. Therefore, it cannot be excluded that in certain cases the real working life of the product may also be shorter than the working life referred to above.

2 ESSENTIAL CHARACTERISTICS AND RELEVANT ASSESSMENT METHODS AND CRITERIA

2.1 Essential characteristics of the product

Table 1 shows how the performance of the joint sealing tape is assessed in relation to the essential characteristics.

Table 2 Essential characteristics of the product and methods and criteria for assessing the performance of the product in relation to those essential characteristics

	Essential characteristic	Assessment method	Type of expression of product performance *(level, class, description)*
Basic Works Requirement 1: Mechanical resistance and stability			
	Reaction to fire	2.2.1	In this EAD only specified for class E or F
Basic Works Requirement 3: Hygiene, health and the environment			
	Driving rain tightness	2.2.2	Level, class
	Water vapour diffusion resistance	2.2.3	Level, class
	Air permeability	2.2.4	Level
	Resistance to effects high and low surface temperatures	2.2.5	Level
	Resistance to the effects of actions of UV radiation in the presence of moisture	2.2.6	Level
	Resistance to heat ageing	2.2.7	Level
	Compatibility with adjoining construction	2.2.8	Level

2.2 Methods and criteria for assessing the performance of the product in relation to essential characteristics of the product

2.2.1 Reaction to fire

The joint sealing tape shall be tested, using the test method(s) relevant for the corresponding reaction to fire class according to EN 13501-1. The joint sealing tape shall be classified according to Commission Delegated Regulation (EU) No 2016/364 in connection with EN 13501-1.

2.2.2 Driving rain tightness

The driving rain tightness of the joints and the braces of the joint shall be determined according to EN 1027 method 1A for the highest degree of compression a (a_{test} = (b_{test}/b_0) x 100 %, specified by the manufacturer oriented at b_{max}) and the minimum width t_F of the sealing tape.

A test specimen shall be made with three longitudinal joints for the test. To do so, the sealing tape shall be installed joint width depending on a_{test} between 1,1 m long rectangular tubes of aluminium according to EN 755-1 which are mounted parallel to the width of the joint b_A (see Annex A, Figure 1). For braces of the joint see Annex A, Figure 2.

The driving rain tightness of the joints and the braces of the joint shall be classified according to EN 12208. With the test result and under consideration of the aging influence all sealing tapes with a lower degree of compression a (see calculation according Annex B) and with a higher width t_F are covered. The minimum joint width b_{min} cannot be smaller than b_{Lmin}.

2.2.3 Water vapour diffusion resistance

The water vapour diffusion resistance shall be determined according to EN ISO 12572 with test conditions in sentence C.

The joint width of the test specimen shall be the nominal joint width b_N.

The water vapour diffusion factor μ shall be given in the ETA.

2.2.4 Air permeability

The air permeability shall be determined according to EN 1026. The joint width of the test specimen for the highest degree of compression a ($a_{test}=(b_{test}/b_0)x100\%$, specified by the manufacturer oriented at b_{max}) and the minimum width t_F of the sealing tape. The joint permeability coefficient a [$m^3/(h\ m\ (daPa)^{2/3})$] shall be determined according to EN 12114.

The air permeability shall be classified according to EN 12207. The joint permeability coefficient shall be given in the ETA.

With the test result and under consideration of the aging influence all sealing tapes with a lower degree of compression (see calculation according Annex B) and with a higher width t_F are covered. The minimum joint width b_{min} cannot be smaller than b_{Lmin}.

2.2.5 Resistance to change in temperatures

For testing the resistance to change in temperature the sealing tape shall be built in for the lowest degree of compression a ($a_{testo}=(b_{testo}/b_0)$ x 100 %, specified by the manufacturer oriented at b_{min}) between rectangular tubes of 0,2 m, made of aluminium according to EN 755-1, which are mounted parallel to the width of the joint (see Annex A, Figure 3). Between the sealing tape and one of the rectangular tubes a separating foil shall be arranged which shall prevent the gluing of tape and tube. After pre-storing for 7 days at standard climate one test specimen shall be subject to three times the following cycle of storing:

a) exposure in an oven at 50 ± 2 °C for 22 h,

followed by 2 h in an oven at 80 ± 2 °C.

This process shall be repeated twice.

b) immersion in distilled water at 23 ± 2 °C for 1 day

c) exposure in a freezer at -20 ± 2 °C or lower temperature as indicated by the manufacturer

(-25 °C, -30 °C or –40 °C) for 3 days

Subsequently the test specimen shall be stored one more day at standard climate.

After this procedure the test specimen is tested for water tightness according the following procedure:

The water tightness shall be tested with a head of water of 60 mm in a test tube at standard climate. There shall be no sign of water after 3 min on the backside of the test specimen.

Then the contact surfaces shall be inspected for discolouring and drifting of impregnating agent and the remaining compression deformation of the sealing tape shall be determined after 6 h in accordance with EN ISO 1856.

The joint sealing tape shall remain watertight. If the product fails this test, the intended use shall be limited for the sealing only of joints without standing water (e.g. vertical joints).

No discoloration on the contact surfaces due to the impregnating agent having drifted and are visible at a width of 1 mm at the most next to the sealing tape.

The re-deformation shall at least amount to the nominal joint width + 50 % (≥1,5b_N).

2.2.6 Resistance to the effects of actions of UV radiation in the presence of moisture

Testing of the resistance to the effects of actions of light and moisture is to be done according to EN ISO 4892-2. The test procedure is specified as follows:

Testing shall be performed on a joint sealing tape of a nominal joint width (see Figure 4). Twin determinations shall be performed. For that purpose two sealing tapes are installed in the holding device. The holding device for the specimen consists of a sample holder belonging to the Xenon test apparatus (EN ISO 4892-2) intended for weathering of rectangular samples to be converted for lateral weathering of tapes made of plastic foams.

For that purpose a slot of 16 mm width is centered at the longitudinal sides of which angles were set on both sides so that the depth of the sealing tape amounts to 30 mm. Two angles are equipped with 6 adjusting screws each. Two samples of the sealing tape of a length of 90 mm and a width of 30 mm shall be glued with the self-adhesive side to the sheet metal supports, dimensions 90 mm x 30 mm, thickness of 1 mm. Using the adjusting screws the nominal width of the joint shall be adjusted to 12 mm, after which they shall be fixed to the sample holder. The sample holder with the built-in samples shall be conditioned at standard atmosphere for at least 24 h.

Then the test specimen shall be hung up in a Xenon test apparatus and be weathered for a total of 3 months in the test chamber at a light/dark alternation with cycles according to EN ISO 4892-2, Table 3, Method A, cycle 1. The sum of the radiation during this period per test area amounts to 240 MWs/m^2 ± 5 %. Afterwards the samples shall be stored in the drying oven at 50 °C for 1 h and a further 24 h at standard atmosphere. After opening the sample holder, the condition of the sealing tape and the contact surfaces shall be evaluated and the remaining compression deformation shall be measured after 6 h in accordance with EN ISO 1856.

The joint sealing tape shall remain watertight. There shall be no visible leakage of the impregnating agent. The re-deformation of the sealing tape 6 h after opening the test specimen shall amount to at least the maximum joint width (≥ b_{max}).

The Technical Assessment Body shall evaluate the influence of ageing of the remaining degree of compression for judging the range of joint width for a given set of sealing tapes that the sealing of joints remains watertight at driving rain for all joint width (see Annex B).

2.2.7 Resistance to heat ageing

The remaining compression deformation of a joint tape for the lowest degree of compression a (a_{testo}=(b_{testo}/b_0) x 100 %, specified by the manufacturer oriented at b_{min}) according to EN ISO 1856 shall be determined after heat ageing of 72 h at 70 °C ± 2 °C. The sealing tape shall be compressed between rectangular tubes of 0,2 m, made of aluminium according to EN 755-1, which are mounted parallel to the width of the joint. Measuring the re-deformation shall be performed after a subsequent storing of 24 h at standard atmosphere.

After the treatment and after de-compression the joint sealing tape shall reach at least the nominal joint width + 50 % (≥ 1,5 b_N).

The Technical Assessment Body shall evaluate the influence of ageing of the remaining degree of compression for judging the range of joint width for a given set of sealing tapes that the sealing of joints remains watertight at driving rain for all joint width. (see Annex B)

2.2.8 Compatibility with adjoining construction materials

The compatibility of the sealing tape with concrete, facing brick, calcareous sandstone, white PVC, and pinewood with and without coating shall be tested. For that purpose the sealing tape shall be built in between two approx. 0.2 m long pieces each of the construction material which are mounted at a nominal joint distance of 12 mm. The test specimen shall be tightly wrapped up with aluminium foil and stored in the oven at 80 ± 2 °C for 14 days followed by an assessment of the contact areas.

Compatibility of the joint sealing tape with concrete, facing brick, calcareous sandstone, pinewood with or without coating as well as with white PVC is ensured where no alternations on the contact surfaces develop affecting the functions and discoloration on the contact surfaces due to the impregnating agent having drifted and are visible at a width of 1 mm at the most next to the sealing tape.

3 ASSESSMENT AND VERIFICATION OF CONSTANCY OF PERFORMANCE

3.1 System(s) of assessment and verification of constancy of performance to be applied

For the products covered by this EAD the applicable European legal act is: Decision 98/436/EC.

The system is 4 for any use except for uses subject to regulations on external fire performance or on dangerous substances.

For uses subject to regulations on external fire performance the applicable AVCP systems are 3 or 4 depending on the conditions defined in the said Decision.

For uses subject to regulations on dangerous substances the applicable AVCP system is 3.

3.2 Tasks of the manufacturer

The cornerstones of the actions to be undertaken by the manufacturer of the product in the procedure of assessment and verification of constancy of performance are laid down in Table 3.

Table 3 Control plan for the manufacturer; cornerstones

	Subject/type of control	Test or control method	Criteria, if any	Minimum number of samples	Minimum frequency of control
Factory production control (FPC) [**including testing of samples taken at the factory in accordance with a prescribed test plan**]					
Sealing tape[1)]					
	Determination of width and thickness	measuring with a minimum precision of ± 0.1 mm	value indicated in the ETA ± 5%"		each batch supplied
	Density of impregnated sealing tape	ISO 845 without conditioning	value indicated in the ETA ± 5%"		"
Flexible foam/cellular plastics (raw materials)					
	Apparent density	ISO 845			each batch supplied
	Thickness				"
	Width				"
	Tensile strength and elongation at break	EN ISO 1798			"
	Permeability to air	EN 9237			"
	Stress strain characteristics in compression	EN ISO 3386			Once in 5 years

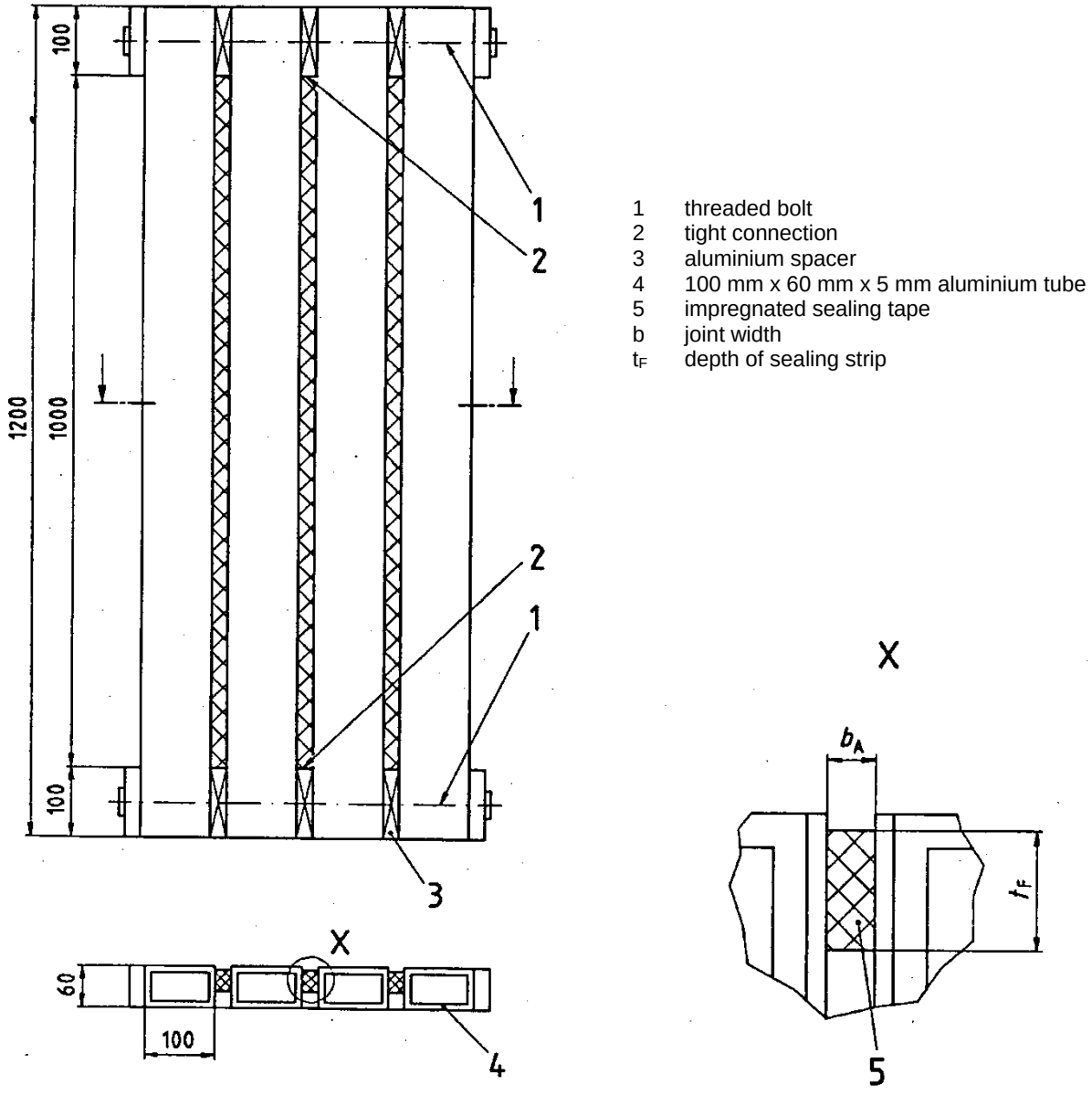
	Subject/type of control	Test or control method	Criteria, if any	Minimum number of samples	Minimum frequency of control
Impregnating agents					
	Viscosity	ISO 2555			twice a year
	Solid content	EN ISO 1666			"
	IR-Spectra	EN 1767			Once in 5 years

4 REFERENCE DOCUMENTS

As far as no edition date is given in the list of standards thereafter, the standard in its current version at the time of issuing the European Technical Assessment is of relevance.

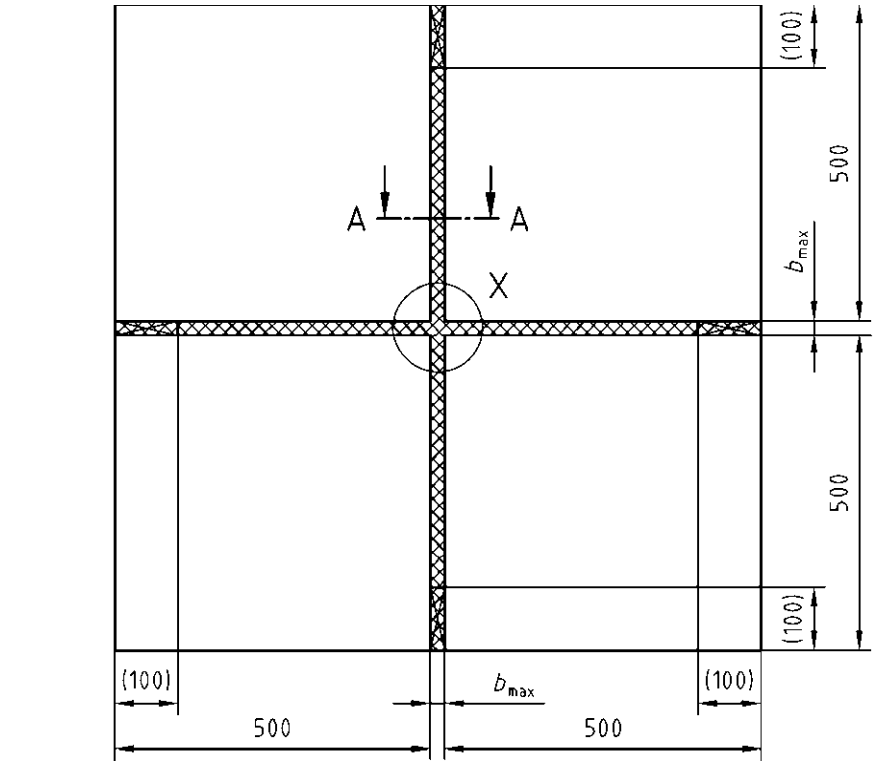
EN 13501-1:2007	Fire classification of construction products and building elements - Part 1: Classification using data from reaction to fire tests
EN ISO 1856:2000amd	Flexible cellular polymeric materials - Determination of compression
EN 1027:2000	Windows and doors – Watertightness – Test method
EN 755-1: 2008	Aluminium and aluminium alloys - Extruded rod/bar, tube and profiles - Part 1: Technical conditions for inspection and delivery
EN ISO 12572:2001	Hygrothermal performance of building materials and products - Determination of water vapour transmission properties
EN 12208-1:2000	Windows and doors - Watertightness – Classification
EN 1026:2000	Windows and doors - Air permeability - Test method
EN 12207:2000	Windows and doors - Air permeability – Classification
EN 12114:2000	Thermal performances of buildings - Air permeability of building components and building elements - Laboratory test method
EN ISO 1856:2007	Flexible cellular polymeric materials - Determination of compression set
EN ISO 4892-2:2013	Plastics – Methods of exposure to laboratory light sources – Part 2: Xenon-arc sources
EN ISO 845:2009	Cellular plastics and rubbers – Determination of apparent (bulk) density. Edition
EN ISO 1798:2008	Flexible cellular polymeric materials – Determination of tensile strength and elongation at break
EN ISO 3386-1:2010	Polymeric materials, cellular flexible – Determination of stress-strain characteristic in compression – Part 1: Low-density materials
EN ISO 9237:1995	Textiles – Determination of permeability of fabrics to air
ISO 2555:1999	Plastics - Resins in the liquid state or as emulsions or dispersions - Determination of apparent viscosity by the Brookfield test method
EN ISO 1666:1998	Starch - Determination of moisture content - Oven-drying method

ANNEX 1: FIGURES: PRINCIPLE OF THE TEST EQUIPMENT



1 threaded bolt
2 tight connection
3 aluminium spacer
4 100 mm x 60 mm x 5 mm aluminium tube
5 impregnated sealing tape
b joint width
t_F depth of sealing strip

Figure 1: Assembly for testing air permeability and tightness to driving rain of joints



1 threaded bolt
2 spacer
3 aluminium box, 3 mm plate thickness
4 impregnated sealing strip
b_{max} maximum joint width
t_F width of sealing tape

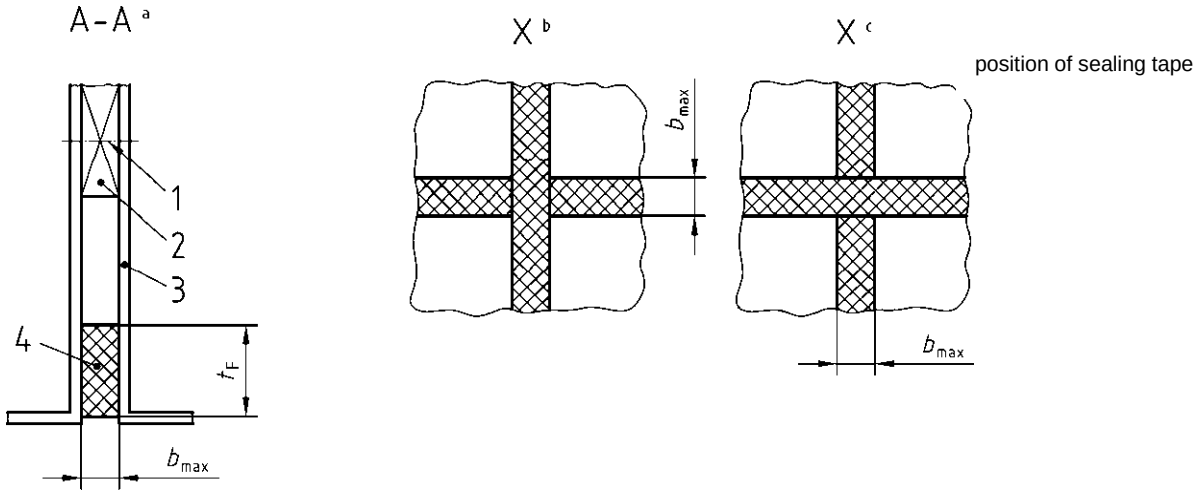
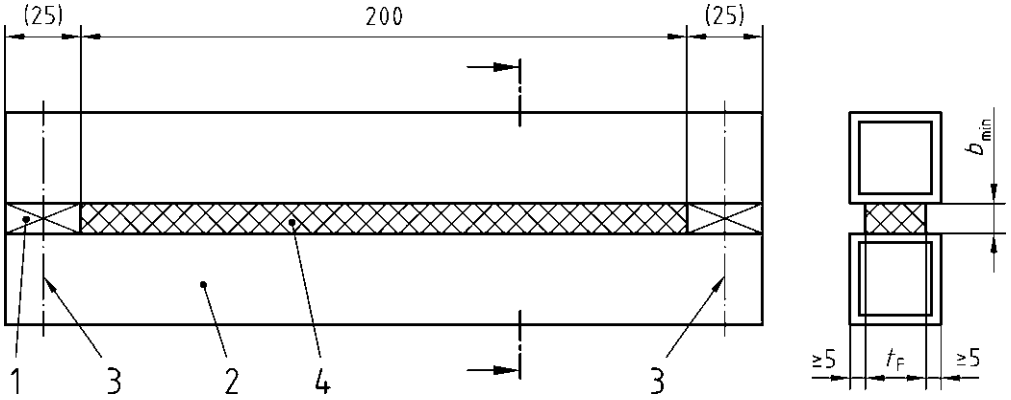


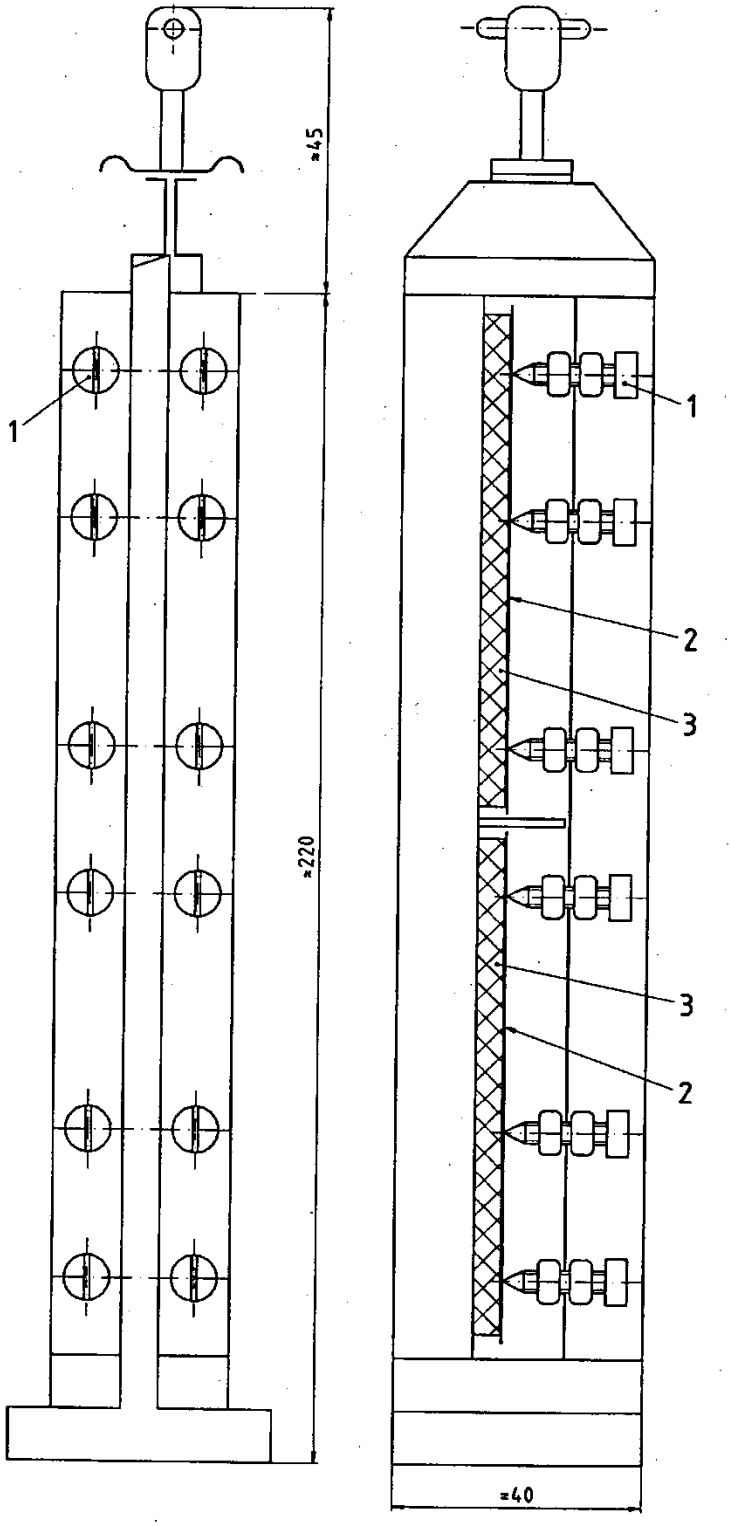
Figure 2: Assembly for testing tightness of braces of joints to driving rain



1 spacer
2 aluminium rectangular tubing, of 5 mm min. wall thickness
3 fixing bolt
4 impregnated sealing tape

b_{min} joint width
t_F width of the sealing tape

Figure 3: Assembly for testing resistance to temperature changes



a) Test holder b) Test holder revolved by 90°

1 adjusting screw
2 bearing plate
3 sealing tape with b_N

Figure 4: Assembly for testing resistance to effects of UV and moisture

ANNEX 2: EXAMPLE OF THE VERIFICATION OF AGING INFLUENCE FOR DIFFERENT DIMENSIONS OF JOINT SEALING TAPES

According to clause 1.2.2.2 of the EAD Design and dimensioning the sealing tapes shall be chosen such that at given maximum joint width related to the allowable degree of compression which had been derived from the attained driving rain tightness and the air permeability under consideration of impact of ageing will not fall short.

This is verified according to the following assessment procedure:

In Table B.1 the manufacturers declaration of the sealing tapes for permissible joint width due to temperature induced movements of joints are given. In relation to the thickness of the noncompressed sealing tape b_0 the degree of compression is given for the highest permissible value of the joint width. That leads to a maximum degree of compression of ε_{max} = 33,8 %.

Table B.1: Joint width in relation to the remaining degree of compression

Dimension of joint width b_{min} – b_{max} [mm]	**Thickness of uncompressed foam manufactures declaration b_0 [mm]**	**Maximum degree of compression a = b_{max} / b_0 x 100 [%]**
2-3	10	30,0
3-5	15	33,3
4-7	21	33,3
5-8	25	32,0
6-10	30	33,3
8-13	40	32,5
10-16	50	32,0
12-20	60	33,3
14-23	70	32,9
16-27	80	**33,8**
18-30	90	33,3
20-33	100	33,0
24-40	120	33,3
30-50	150	33,3

To verify that the joint sealing remain water tight at the maximum degree of compression the driving rain test was carried out with a sealing tape which noncompressed height was 60 mm, which gives higher degree of compression than normally will be used in practice.

Table B.2 gives the results of tapes at that degree of compression

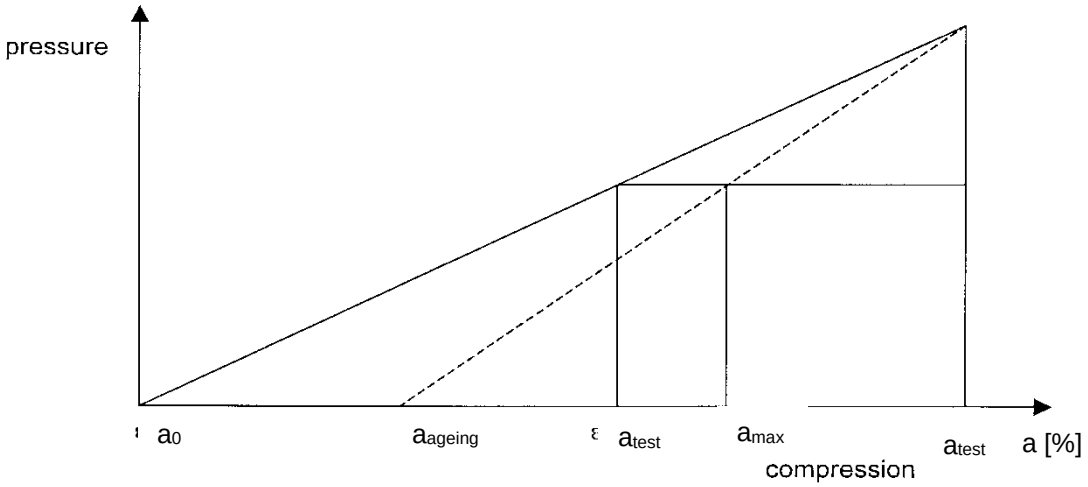
Table B.2: Driving rain test results

Test N°	**Tested tape**	**Tested joint width [mm]**	**Width of sealing tape t_F mm**	**Degree of compression in the test %**	**Tightness at pressure Pa**
1	1	24	20	40,0	≤ 600
2	2	24	25	40,0	≤ 300

To have a sufficient security that the contact stress of the tape to the joint shoulders will be reached also under ageing conditions the proved maximum degree of compression of a_{test} = 40 % will be reduced with the relation of the heat ageing influence to the compression behaviour.

The test of heat ageing and of change in temperature give the lowest decompression up to 45,1 mm for the uncompressed height of the tape of 60 mm i.e. a_{ageing} = 75,2 % by tape N° 1 and the lowest decompression up to 53,2 mm for the noncompressed height of the tape of 60 mm i.e. a_{ageing} = 88,7 % by tape N° 2.

In this case a linear modification is assumed of the influence of ageing to the remaining degree of compression (see sketch and equation).



Equation for determining the maximum allowable degree of compression:

$$a_{max} = (a_{test} - a_{testo}) \times \frac{(a_{ageing} - a_{testo})}{(a_o - a_{testo})} + a_{testo}$$

a_o sealing tape without degree of compression: 100 %

at_{esto} sealing tape starting degree of compression for the driving rain test (see ch. 2.2.8, lowest degree of compression, related to b_{min}.): in this example 20 % in this case 20 %

a_{ageing} sealing tape with remaining degree of compression after ageing (see ch. 2.2.8 degree ofcompression after de-compression): in this example 88,7 %

a_{test} sealing tape with reached degree of compression at driving rain test (see ch. 2.2.3, highest degree of compression, related to b_{max}.): in this example 40,0 %

a_{max} maximum allowable degree of compression of the sealing tape as a result of the equation is in this example 33,8 % for tape N° 1 and 37,2 % for tape N° 2

Table B.3 shows the degree of compression of the joint sealing tape.

	Tape N° 1	**Tape N° 2**
a_o	100 %	100 %
a_{testo}	20,0 %	20,0 %
a_{ageing}	75,2 %	88,7 %
a_{test}	40,0 %	40,0 %
a_{max}	33,8 %	37,2 %

This confirms that the types of joint sealing tapes indicated by the manufacturer are covered by the tests and that the testing procedure was in accordance with the EAD and did not influence the classification according to EN 12208 in class 9a (test pressure ≥ 600 Pa tape N° 1) or the classification according to EN 12208 in class 7a (test pressure ≥ 300 Pa tape N° 2). In this case the classification of the air permeability according to EN 12207 is not influenced negatively for both tapes.

The degree of compression of the sealing tapes must be lower than the maximum allowable degree of compression a_{max} = 37,2 % and a_{max} = 33,8 % .

As it is shown in table B3 the degree of compression of the joint sealing tape is in any case lower than these values.