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European Assessment Document for

Low bitumen mass shingles, laminated or not, with mineral or synthetic reinforcement

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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 (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

This European Assessment Document applies to bitumen shingles with a mineral reinforcement, synthetic reinforcement or a mixture of the two (in the following named “Low bitumen mass shingles”). The reinforcement is coated with bitumen and surfaced on the upper side (i.e., the side of the shingle which is exposed to the weather) with mineral granules, flakes of slate or metal foil, and on the underside with talc, sand or a plastic film. The shingle may be composed of one layer or two or more laminated layers bonded by an adhesive. In this document, the term “low bitumen mass shingle” is used throughout, referring both to laminated shingles and those that are not.

Low bitumen mass shingles are not fully covered by the harmonized technical specification EN 544[1]; in particular, the following two characteristics are lower in comparison with those of the products subject to EN 544:

- Mass: the minimum bitumen mass of the low bitumen mass shingles is 725 g/m², while EN 544 envisages a minimum of 1300 g/m² per layer for monolayer shingles and less than a minimum of 1500 g/m² per layer for multilayer shingles. The maximum bitumen mass of the product is 1300 g/m² per layer for monolayer shingles and 1500 g/m² per layer for multilayer shingles (above this maximum bitumen mass per layer EN 544 is applicable) while EN 544 does not envisage a maximum bitumen mass per layer.
- Tensile strength: low bitumen mass shingles have a mean tensile strength of at least 400 N/50 mm in both the directions of the shingle (in the direction of the shingle width - or in direction of fabrication - and in the direction of the shingle height - or perpendicular to the direction of fabrication). On the contrary EN 544 envisages 600 N/50 mm in the direction of fabrication.

In addition, the essential characteristic water tightness (envisaged in EN 544) is not relevant for low bitumen mass shingles, because such performance is only guaranteed from the geometry of the product and the specific method of installation (see below).

Low bitumen mass shingles may have a factory applied, thermally activated, self-sealing adhesive and a protective strip on either side.

Low bitumen mass shingles have an overall rectangular shape with dimensions of 1200 mm maximum in width and 250 mm minimum in height. They may have overlay features and may be divided by slits or cut-outs into several tabs that may be angular or scalloped (see figure 1.3.2.1).

The European Assessment Document applies to bitumen shingles where the water tightness of the roof covering or wall cladding system is ensured by overlapping, by different adhesive systems or by a combination of these, according to the manufacturer’s installation instructions, intended to be laid as discontinuous covering for pitched roofs and/or wall cladding. The minimum pitch of the underlying structure shall be stated in the ETA. To ensure watertightness of assemblies made out of low bitumen mass shingles with slits, the maximum height of slit ‘h1’ shall be less than the overall height of the single ‘H’ minus 25 mm or 22,5 mm if a minimum width of 15 mm is specified for the adhesive surface above the slit and in the zone with the least covering.

The low bitumen mass shingles are to be placed on a continuous, panelled surface with joints not wider than 2 mm. Consecutive panels shall not present a height difference perpendicular to the plane of more than 2 mm and the panels shall be placed in a running bond manner. Every part of the roof should present a unidirectional slope in accordance with the Manufacturer's Product Installation Instructions (MPII), which shall be specified in the ETA.

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.

1 All undated references to standards or to EADs in this EAD are to be understood as references to the dated versions listed in chapter 4

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)

Low bitumen mass shingles are intended to act as a water-shedding element on walls, ceilings, soffits and pitched roofs and as a protective covering to the wall structure, ceiling structure or roof deck from weathering elements such as rain, snow, ice, windborne dust, UV radiation and other matters.

Roof surfaces are not accessible without protection and security assessment. Low bitumen mass shingles are not assessed for slipperiness.

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 low bitumen mass shingle for the intended use of 10 or 25 years when installed in the works; in particular, the fulfilment of the criteria set for durability assessment in 2.2.5 and 2.2.7.4 leads to a working life of 10 years; the fulfilment of the criteria set in 2.2.5, 2.2.7 and 2.2.8 leads to a working life of 25 years. 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[2].

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

Below, only the terms which are not provided in EN 544 or which are different from what envisaged in EN 544 are mentioned.

1.3.1 Laminated shingle

The product is a reinforced bitumen product of an overall rectangular shape, of width *W* and height *H*, with or without bitumen adhesive points or areas, composed out of 2 or more layers bonded together by an adhesive (see Figures 1.3.2.1 and 1.3.2.2).

[2] 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 referred to above.

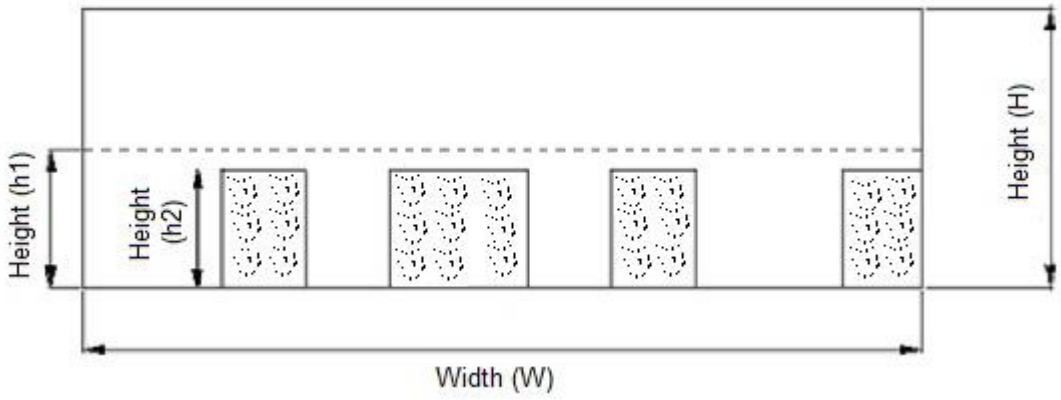


Figure 1.3.2.1 – Top side of laminated shingle
(there may be different shapes of these shingles, this figure is to be considered as an example only)

Figure 1.3.2.2 – Bottom side of laminated shingle
(there may be different shapes of these shingles, this figure is to be considered as an example only)

Key

H	height
W	width
h_1	height of second part
h_2	height of first part

1.3.2 Reinforcing material

The function of the reinforcing material is to carry the bitumen coating, the mineral granules and to ensure dimensional stability and mechanical resistance of the product.

1.3.3 Bitumen

Bitumen or modified bitumen used for impregnation and coating and as an adhesive, if any.

1.3.4 Upper side surfacing

Factory applied material used for protection of the product's face exposed to the weather. The function of the surfacing is to provide UV resistance to the bitumen coating. The surfacing may be composed of mineral granules, flakes of slate or metal foil and may be coloured to provide aesthetic value to the shingle.

1.3.5 Underside surfacing

Typically, inert materials in powder form (for example talc or sand), plastic film or alike applied to the side of the shingle which is not exposed to the weather. This factory applied protection is intended to prevent the underside from sticking. This surface treatment shall ensure that the shingles can be removed individually from their packaging without being damaged.

1.3.6 Tab

A tab is a part of the product separated by cut-outs or slits; the tab outlines an identifiable entity on the surface.

1.3.7 Cut-out or Slit

A cut-out or slit is the gap separating the tabs, of constant width or special form.

1.3.8 Adhesive system

1.3.8.1 Adhesive point; strip

Point, or continuous or discontinuous strip, intended to ensure the adhesion of the tabs, after installation on the roof or wall.

1.3.9 Protection strip

Plastic or non-adhesive release material intended to prevent the self-sealing adhesive from adhering, prior to the shingle being installed on the roof or wall.

1.3.10 Guiding tab or cuts

Small notch or extension on one end of the shingle with a similarly shaped indentation on the other end. Its function is to facilitate horizontal alignment during installation on the roof or wall.

1.3.11 Overlay shingle

Shingle with a second coating of mineral stabilized bitumen and mineral granules to provide aesthetic depth to the surface of the upper side.

1.3.12 Rectangular

For a shingle to be considered “rectangular”, the longitudinal side of the shingle without slits shall:

- not be curved or crooked, i.e., continuing in the same direction without deviating; the deviation from straightness, e, shall not exceed 2 mm.
- have square angles; the divergence from squareness, d, shall not exceed 2 mm.

2 ESSENTIAL CHARACTERISTICS AND RELEVANT ASSESSMENT METHODS AND CRITERIA

2.1 Essential characteristics of the product

Table 2.1.1 shows how the performance of Low bitumen mass shingles is assessed in relation to the essential characteristics.

Table 2.1.1 Essential characteristics of low bitumen mass shingles and methods and criteria for assessing the performance of the product in relation to those essential characteristics

No	Essential characteristic	Assessment method	Type of expression of product performance
Basic Works Requirement 2: Safety in case of fire			
1	Reaction to fire	2.2.1	class
2	Façade fire performance	2.2.2	Description
3	External fire performance of roofs	2.2.3	class
Basic Works Requirement 3: Hygiene, health and the environment			
4	Geometrical properties (width and height)	2.2.4	Level
Basic Works Requirement 4: Safety and accessibility in use			
5	Tensile strength (in the direction of the shingle height)	2.2.5.1	Level
6	Tensile strength (in the direction of the shingle width)	2.2.5.2	Level
7	Nail shank tear resistance	2.2.5.3	Level
Aspects of durability			
	Durability of water permeability (of the roof covering) (related to BWR 3)		
8	Flow resistance at elevated temperature	2.2.6.1	Level
9	Adhesion of mineral granules and flakes of slate	2.2.6.2	Level
10	Resistance to peeling for metal-surfaced shingles	2.2.6.3	Level
11	Water absorption	2.2.6.4	Level
	Durability of mechanical resistance (related to BWR 4)		
12	Resistance to UV radiation	2.2.7.1	Level
13	Resistance to heat ageing	2.2.7.2	Level

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

This chapter is intended to provide instructions for TABs. Therefore, the use of wordings such as “shall be stated in the ETA” or “it has to be given in the ETA” shall be understood only as such instructions for TABs on how results of assessments shall be presented in the ETA. Such wordings do not impose any obligations for the manufacturer and the TAB shall not carry out the assessment of the performance in relation to a given essential characteristic when the manufacturer does not wish to declare this performance in the Declaration of Performance.

Sample taking and preparation are specified in Annex A.

2.2.1 Reaction to fire

Low bitumen mass shingle shall be tested according to the method(s) referred to in EN 13501-1 and relevant for the corresponding reaction to fire class. The product shall be classified according to the Commission Delegated Regulation (EU) No 2016/364. Where relevant, mounting and fixing provisions for testing in accordance with EN 13823 shall be as specified in EN 492, 7.5.2.2.2.

2.2.2 Façade fire performance

If the manufacturer intends to declare the façade fire performance of the product, in absence of a European assessment approach, the ETA shall state the results of the product assessment(s) according to the assessment method(s) required by the regulatory provisions of those countries, in which the manufacturer intends to make the product available on the market, according to the table given in Annex B.

2.2.3 External fire performance of roofs

The roof (including the complete roof covering) in which the low bitumen mass shingles are intended to be incorporated, installed or applied shall be tested according to the test method referred to in EN 13501-5 and relevant for the corresponding external fire performance roof class, in order to be classified according to Commission Decision 2001/671/EC amended by Commission Decision 2005/823/EC.

Under the specific conditions cited in Decision 2000/553/EC regarding products intended to be fully covered in normal usage (by the inorganic coverings listed in Decision 2000/553/EC), the roof (including the complete roof covering) in which the low bitumen mass shingles are intended to be incorporated, installed or applied is considered to satisfy all of the requirements for the performance characteristic ‘external fire performance’ in accordance with the Decision 2000/553/EC without the need for further testing on the basis of its fulfilling the conditions set out in that Decision and its intended use being covered by that Decision.

2.2.4 Geometrical properties (width and height)

Low bitumen mass shingle shall be assessed as described in EN 544, § 6.3 with guidance as described in EN 544, § 4.2.1.

The results of at least 10 individual measurements in millimetres shall be registered and the medium value shall be given in the ETA.

2.2.5 Mechanical resistance

2.2.5.1 Tensile strength (in the direction of the shingle height)

The low bitumen mass shingle shall be assessed as described in EN 544, § 6.4.1.

The test results of each individual test piece shall be registered and the minimum value shall be given in the ETA, commented towards the threshold value described in § 1.1.

2.2.5.2 Tensile strength (in the direction of the shingle width)

The low bitumen mass shingle shall be examined as described in EN 544, § 6.4.1.

The test results of each individual test piece shall be registered, and the minimum value shall be given in the ETA, commented towards the threshold value described in § 1.1.

2.2.5.3 Nail shank tear resistance

The low bitumen mass shingle shall be examined as described in EN 544, § 6.4.2, with guidance as described in EN 544, § 4.3.2.

The test results of each individual test piece shall be registered and the minimum value shall be given in the ETA, commented towards the threshold value described in EN 544 § 4.3.2.

2.2.6 Durability of water permeability (of the roof covering)

2.2.6.1 Flow resistance at elevated temperature

The low bitumen mass shingle shall be assessed as described in EN 1110, starting the preliminary tests as described in EN 1110 § 8.3 at the temperature of (90 ± 2) °C, with guidance as described in EN 544, § 4.4.4.

The test results of each individual test piece shall be registered and the maximum value shall be given in the ETA, commented towards the threshold value described in EN 544 § 4.4.4.

2.2.6.2 Adhesion of mineral granules and flakes of slate

The low bitumen mass shingle shall be assessed as described in EN 544, § 6.4.7, with guidance as described in EN 544, § 4.4.5.

The test results of each individual test piece shall be registered and the maximum value shall be given in the ETA, commented towards the threshold value described in EN 544 § 4.4.5.

2.2.6.3 Resistance to peeling for metal-surfaced shingles

The low bitumen mass shingle shall be assessed as described in EN 544, § 6.4.8, with guidance as described in EN 544, § 4.4.6.

The test results of each individual test piece shall be registered and the minimum value shall be given in the ETA, commented towards the threshold value described in EN 544 § 4.4.6.

2.2.6.4 Water absorption

The low bitumen mass shingle shall be assessed as described in EN 544, § 6.4.3, with guidance as described in EN 544, § 4.4.1.

The test results of each individual test piece shall be registered and the maximum value shall be given in the ETA, commented towards the threshold value described in EN 544 § 4.4.1.

2.2.7 Durability of mechanical resistance

2.2.7.1 Resistance to UV radiation

The low bitumen mass shingle shall be assessed as described in EN 544, § 6.4.4, with guidance as described in EN 544, § 4.4.2. Subsequently the individual test pieces shall be subject to:

- determination of tensile strength (in the direction of the shingle height) as per 2.2.5.1,
- tensile strength (in the direction of the shingle width) as per 2.2.5.2, and
- nail shank tear resistance as per 2.2.5.3.

The test results of each individual test piece shall be registered. The expression of the value shall be as per § 2.2.5.1, § 2.2.5.2 or § 2.2.5.3.

2.2.7.2 Resistance to heat ageing

The test specimens shall be conditioned at (80 ± 2) °C in a ventilated oven for 12 weeks (84 days). After this period the test specimens shall be removed and cooled for at least 2 hours at (23 ± 2) °C. Subsequently the individual test pieces shall be subject to:

- flow resistance at elevated temperature as per 2.2.6.1,
- adhesion of mineral granules and flakes of slate as per 2.2.6.2,
- determination of tensile strength (in the direction of the shingle height) as per 2.2.5.1,
- tensile strength (in the direction of the shingle width) as per 2.2.5.2, and
- nail shank tear resistance as per 2.2.5.3.

The test results of each individual test piece shall be registered. The expression of the value shall be as per § 2.2.6.1, § 2.2.6.2, § 2.2.5.1, § 2.2.5.2 or § 2.2.5.3.

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 and 87/437/EC, as amended by Decision 2001/596/EC.

Table 3.1.1 - System of assessment and verification of constancy of performance applicable to low bitumen mass shingles

Product(s)	Intended use(s)	Level(s) or class(es)	AVCP system(s) [a]
Wall and roof shingles	Roof coverings subject to reaction to fire regulations	A1*, A2*, B*, C*	1
		A1**, A2**, B**, C**, D, E	3
		A1***, A2***, B***, C***, D***, E***, F	4
	Roof coverings subject to external fire performance regulations****	Products requiring testing	3
		Products 'deemed to satisfy' without testing	4
	As internal or external finishes in walls or ceilings, as relevant, subject to regulations on dangerous substances	-	3
	All uses not referred to above	-	4

[a]	See Annex V to Regulation (EU) N° 305/2011
*	Products/materials for which a clearly identifiable stage in the production process results in an improvement of the reaction to fire classification (e.g., an addition of fire retardants or a limiting of organic material)
**	Products/materials not covered by footnote (*)
***	Products/materials that do not require to be tested for reaction to fire (e.g., products/materials of class A1 according to Commission Decision 96/603/EC, as amended by Commission Decision 2003/424/EC)
****	Only applicable for shingles intended to be used on pitched roofs.

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 3.2.1.

Table 3.2.1 Control plan for the manufacturer; cornerstones

No	Subject/type of control	Test or control method [d]	Criteria, if any	Minimum number of samples [d]	Minimum frequency of control [d]
Factory production control (FPC) [including testing of samples taken at the factory in accordance with a prescribed test plan]					
1	Reaction to fire	2.2.1	According to Control plan	Annex A1.2	[a]
2	External fire performance of roofs	2.2.3	According to Control plan	Annex A1.3	[a]
3	Thickness	3.4.1	The average measured value may deviate by ± 5% from PDA [*]	Annex A1.5	According to Control plan
4	Mass of bitumen	3.4.2	PDA [*] ± 150 g/m² (and ≥ 725 g/m² and < 1300 g/m² or < 1500 g/m²)	Annex A1.4	1/month [e]
5	Mass per unit area	EN 1849-1 § 5	PDA [*] ± 15%	Annex A1.5	According to Control plan
6	Geometrical properties • width, height • straightness • squareness • height of slits	 2.2.4 3.4.3 3.4.4 3.4.5	 ≥ MLV [*] (or ± 3 mm (cf. EN 544 § 4.2.1) ≥ MLV [*] ≥ MLV [*] ≥ MLV [*]	 Annex A1.5 Annex A1.5 Annex A1.5 Annex A1.5	 1/batch 1/batch 1/batch 1/batch
7	Durability of water permeability (of the roof covering)	2.2.6	According to Control plan	Annex A1.8	Twice per year [a], [c]
8	Adhesion of mineral granules and flakes of slate	2.2.6.2	≤ MLV [*], and ≤ 2,5 g (cf. EN 544 § 4.4.5)	Annex A1.9	According to Control plan
9	Resistance to blistering	3.4.6	According to Control plan	Annex A1.11	Twice per year [a], [c]
10	Visual assessment	3.4.7	According to Control plan	According to Control plan	1/batch
11	Tensile strength	2.2.5.1, 2.2.5.2	Depending on the nature of reinforcement: - mineral reinforcement: ≥ MLV [*] - synthetic reinforcement: PDA [*] ± 20%	Annex A1.6	1/week [b],[e]
12	Elongation at maximum tensile force	2.2.5.1, 2.2.5.2	Depending on the nature of reinforcement: - mineral reinforcement: ≥ MLV [*] - synthetic reinforcement: PDA [*] ± 20%	Annex A1.6	1/week [b],[e]
13	Durability of mechanical resistance	2.2.7	According to Control plan	Annex A1.12	[a]

No	Subject/type of control	Test or control method [d]	Criteria, if any	Minimum number of samples [d]	Minimum frequency of control [d]
Product characteristics, methods of verification of the coating medium					
14	Fines content or Ash content	relevant methods of assessment shall be declared by the manufacturer	PDA [*] ± 5% abs.	According to Control plan	According to Control plan
15	Ring and ball softening temperature	EN 1427	≥ MLV [*]	According to Control plan	According to Control plan
16	Penetration at 60°C (for plastomer modified bitumen)	EN 1426 § 7.2	≥ MLV [*]	According to Control plan	According to Control plan
Product characteristics, methods of verification of the reinforcement					
17	Nature of the reinforcement	relevant methods of assessment shall be declared by the manufacturer		According to Control plan	According to Control plan
18	Mass per unit area	EN 29073-1	PDA [*] ± 15%	According to Control plan	According to Control plan
19	Maximum tensile strength	EN 29073-3	- Mineral non-woven reinforcement: ≥ MLV [*] - All other reinforcements: PDA [*] ± 20%	According to Control plan	According to Control plan
20	Elongation at maximum tensile force (for non-mineral reinforcement)	EN 29073-3	PDA [*] ± 15 % (absolute)	According to Control plan	According to Control plan
21	Mesh number (for woven fabrics and nets)	relevant methods of assessment shall be declared by the manufacturer	PDA [*] ± 2 absolute measured over 200 mm	According to Control plan	According to Control plan

[a] Indirect control, e.g., of raw materials and the production process, with a frequency sufficient to ensure that the results from initial type testing remains representative for current production. This frequency shall be given in the manufacturer's FPC system documentation

[b] In the case where the manufacturer is continually producing numerous different shingles which contain the same carrier (type and mass) and the same type of coating, the frequency of these test which relate essentially to the carrier, may be considered on the total number of these different shingles

[c] In the case where a manufacturer is continually producing numerous differently reinforced shingles and/or shingles which differ only by the presence of incorporated protection, whilst using the same type of coating and having a similar normal thickness, the frequency of these tests, which relate essentially to the type of coating, may be considered on the total number of these different shingles

[d] The manufacturer is allowed to use similar test or control methods, using different equipment and test samples under different conditions, as long as the manufacturer ensures constant product performances, but the frequency of control shall be respected.

[e] If production only takes place on 1 or 2 different dates, samples shall only be taken respectively from the production date or both production dates. Contrary to assessment testing, only 1 test piece per production date is required.

[*]: PDA: Values obtained from maintaining the control plan, with a declared tolerance. The arithmetic mean value calculated from a number of test results shall be within the tolerance declared for the characteristic and 95 % of the individual results shall be within the declared tolerance.
MLV: Values obtained from maintaining the control plan, with an upper or lower bound.

3.3 Tasks of the notified body

The intervention of the notified body under AVCP system 1 is only necessary for reaction to fire for products/materials for which a clearly identifiable stage in the production process results in an improvement of the reaction to fire classification (e.g., an addition of fire retardants or a limiting of organic material).

In this case the cornerstones of the tasks to be undertaken by the notified body under AVCP system 1 are laid down in Table 3.3.1

Table 3.3.1 Control plan for the notified body; cornerstones

No	Subject/type of control	Test or control method	Criteria, if any	Minimum number of samples	Minimum frequency of control
Initial inspection of the manufacturing plant and of factory production control carried out by the manufacturer regarding the constancy of performance related to reaction to fire *(for system 1 only)*					
1	Where the intervention of the Notified Body is necessary only because the conditions for the applicability of system 1 are fulfilled for reaction to fire, the notified body will consider especially the clearly identifiable stage in the production process which results in an improvement of the reaction to fire classification (e.g., an addition of fire retardants or a limiting of organic material).	Verification of the complete FPC as described in the control plan agreed between the TAB and the manufacturer	As defined in the control plan agreed between the TAB and the manufacturer	As defined in the control plan agreed between the TAB and the manufacturer	When starting the production or a new line
Continuous surveillance, assessment and evaluation of factory production control carried out by the manufacturer regarding the constancy of performance related to reaction to fire *(for system 1 only)*					
2	Where the intervention of the Notified Body is necessary only because the conditions for the applicability of system 1 in the Decisions regarding reaction to fire are fulfilled, the notified body will consider especially the clearly identifiable stage in the production process which results in an improvement of the reaction to fire classification (e.g., an addition of fire retardants or a limiting of organic material)	Verification of the controls carried out by the manufacturer as described in the control plan agreed between the TAB and the manufacturer with reference to the raw materials, to the process and to the product as indicated in Table 3.2.1	As defined in the control plan agreed between the TAB and the manufacturer	As defined in the control plan agreed between the TAB and the manufacturer	As defined in the control plan agreed between the TAB and the manufacturer. Indirect control, e.g., of raw materials and the production process, with a frequency sufficient to ensure that the results from initial type testing remains representative for current production.

3.4 Special methods of control and testing used for the assessment and verification of constancy of performance

3.4.1 Thickness

Low bitumen mass shingle shall be assessed as described in EN 1849-1 § 4 with the following clarifications:

- for sheets with incorporated mineral protection or with a metallic protection, the thickness has to be measured on the selvedge (where the protection does not exist, EN 13707 § 5.2.2), in machine direction, approximately at 2/3 from the edge;
- a synthetic protection (film, non-woven or fabric) with a mass per unit area less than 80 g/m² shall be considered as integral part of the thickness;
- for multi-layer systems, the thickness is the sum of the thicknesses of the individual sheets, without taking into account the eventual thickness of the adhesive (hot bitumen, cold adhesive or any other type of adhesive).

3.4.2 Mass of bitumen

Low bitumen mass shingle shall be assessed as described in EN 544, § 6.2.

Contrary to EN 544, § 5.2, nine test pieces shall be cut from different shingles, produced on 3 different production dates (3 test pieces per production date) and contrary to EN 544, § 6.2.4, the mean of the individual results of those nine test pieces shall be determined.

The individual test results of the nine test pieces shall be registered.

3.4.3 Straightness

Straightness shall be measured on the longitudinal side of the shingle without slits. The shingle is placed on the test surface with its longitudinal edge in contact with a straight metal ruler. The maximum deviation *e* (either concave or convex) is determined (see figure 3.4.3.1). The result is rounded up or down to the next full millimetre.

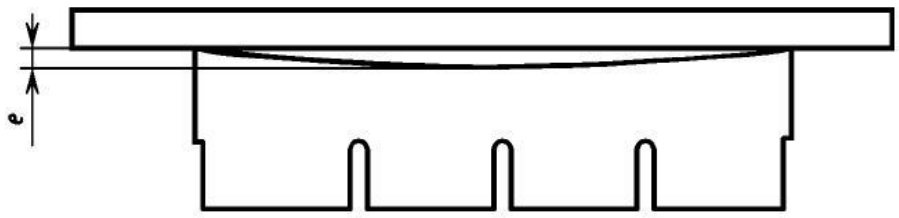


Figure 3.4.3.1: Verification of straightness carried out on a shingle at its longitudinal side

The value *e*, shall be expressed in millimetres.

The results of at least 10 individual measurements shall be registered.

3.4.4 Squareness

The square is placed on the test surface. The shingle is placed in a way that it is in contact with the sides of the square (see figure 3.4.4.1). One of the edges is held close to the square and then the maximum distance *d* between shingle and other side of the square is measured with an accuracy of 0,5 mm. The squareness of both shingle widths is measured using this method.

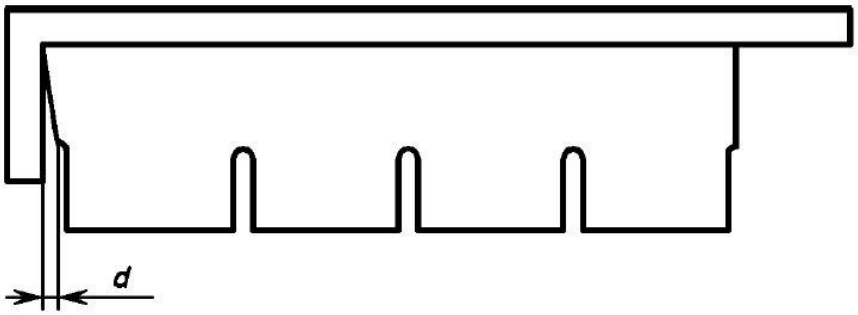


Figure 3.4.4.1: Verification of squareness

The divergence from squareness, d, shall be expressed in millimetres.

The results of at least 10 individual measurements shall be registered.

3.4.5 Height of slits

The shingle is placed on the test surface ensuring that the longitudinal side with slits is in contact with the straight metal ruler (see figure 3.4.5.1). The heights h_1, h_2, h_3, ..., h_n are measured with a ruler to the nearest millimetre.

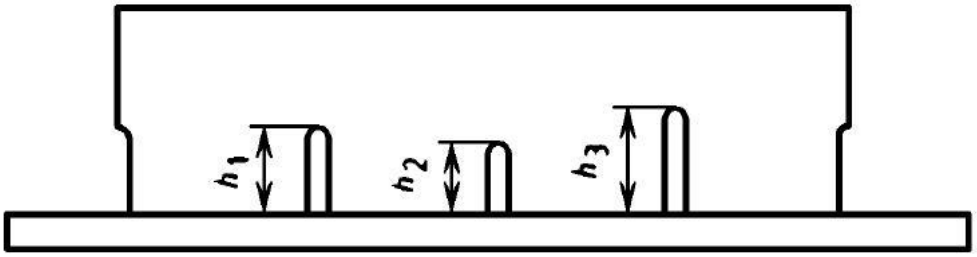


Figure 3.4.5.1: Verification of height of slits

The height of slits shall be measured.

The results of at least 10 individual measurements shall be registered.

3.4.6 Resistance to blistering

Low bitumen mass shingle shall be assessed as described in EN 544, § 6.4.5, with guidance as described in EN 544, § 4.4.3; however:

- 10 specimens as described in EN 544, § 5.8 shall be prepared,
- the conditioning shall be performed by immersion in water for (24 ± 1) h at (23 ± 2) °C,
- the number of cycles shall be 25, and
- each cycle shall consist of storing for (8 ± 0,5) h at (-20 ± 1) °C followed by storing for (16 ± 0,5) h at (50 ± 5) °C

After these cycles, the test specimens shall be examined visually for surface defects or cracks.

The test results of each individual test piece shall be registered.

3.4.7 Visual assessment

The low bitumen mass shingle shall be examined visually for being free of visible defects such as holes, edges not cleanly cut, rents, cracks, or indentations and for not unduly sticking to other shingles at ambient temperatures.

4 REFERENCE DOCUMENTS

EN 492:2012+A2:2018	Fibre-cement slates and fittings - Product specification and test methods
EN 544:2011	Bitumen shingles with mineral and/or synthetic reinforcements – Product specification and test methods
EN 1110:2010	Flexible sheets for waterproofing - Bitumen sheets for roof waterproofing - Determination of flow resistance at elevated temperature
EN 1426:2015	Bitumen and bituminous binders - Determination of needle penetration
EN 1427:2015	Bitumen and bituminous binders - Determination of the softening point - Ring and Ball method
EN 1849-1:1999	Flexible sheets for waterproofing - Determination of thickness and mass per unit area - Part 1: Bitumen sheets for roof waterproofing
EN 12310-1:1999	Flexible sheets for waterproofing - Part 1: Bitumen sheets for waterproofing - Determination of resistance to tearing (nail shank)
EN 13501-1:2018	Fire classification of construction products and building elements - Part 1: Classification using test data from reaction to fire tests
EN 13501-5:2016	Fire classification of construction products and building elements – Part 5: Classification using data from external fire exposure to roof tests
EN 13707:2013	Flexible sheets for waterproofing - Reinforced bitumen sheets for roof waterproofing - Definitions and characteristics
EN 13823:2020+A1:2022	Reaction to fire tests for building products - Building products excluding floorings exposed to the thermal attack by a single burning item
EN 29073-1:1992	Textiles - Test methods for nonwovens - Part 1: Determination of mass per unit area
EN 29073-3:1992	Textiles - Test methods for nonwovens - Part 3: Determination of tensile strength and elongation

ANNEX A: SAMPLING AND PREPARATION OF TEST SPECIMENS

A1.1 General

A1.1.1 Cutting of test pieces

The test specimens shall be taken from different shingles chosen at random.

Test specimens are cut using a cutting tool or hollow punch, as far as possible excluding hand-held scissors, avoiding, for some particular tests, self-adhesive areas with their protective film or paper.

Test specimens are taken from a single layer where possible. If it is not possible to take a sample from a single layer, 2 layers are carefully delaminated until a sample can be taken.

A1.1.2 Marking of test specimens

Every test specimen shall have on its underside: a reference identifying the batch from which the test sample was taken, where appropriate, a reference identifying the direction of cutting, if this is specified in the procedures described below.

A1.2 Reaction to fire

For reaction to fire testing a sufficient number of shingle samples shall be taken to allow either the test specimens to be prepared or for test specimens to be cut.

A1.3 External fire performance

For external fire performance a sufficient number of shingle samples shall be taken to form the test specimens.

A1.4 Mass of bitumen

For the measurement of the mass of the bitumen, three times (three different production dates) three test specimens of ((100 ± 1) x (100 ± 1)) mm shall be cut from different shingles. The test specimens shall be cut from the exposed area with adhesive system if any.

In case of multilayer shingles, two test pieces shall be taken one from the monolayer part and one from the multilayer part of the shingles.

A1.5 Geometrical tests

For the geometrical tests, five different shingles chosen at random shall be taken.

A1.6 Tensile strength

For the measurement of the tensile strength, cut two series of test specimens from different shingles:

- five in the transverse direction (height),
- five in the longitudinal direction (width).

These test specimens shall have dimensions ((50 ± 1) x minimum 250) mm (see Figure A1.6.1). Delaminate carefully if necessary.

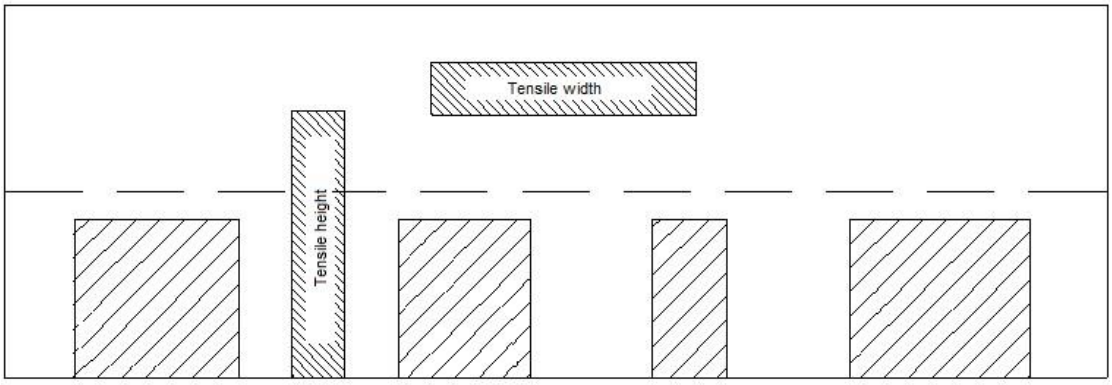


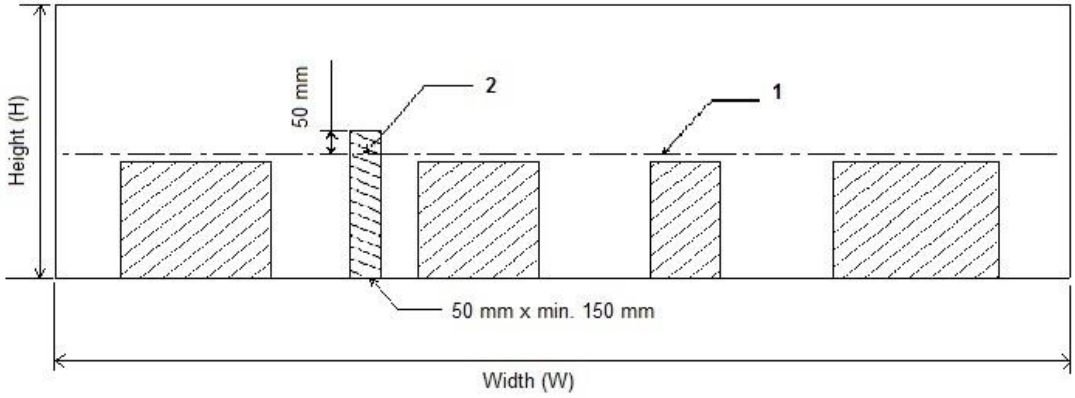
Figure A1.6.1 – Example of cutting the sample for the tensile strength test

A1.7 Nail shank tear resistance

The nail shank tear resistance shall be determined in accordance with EN 12310-1 parallel to the shingle height, delaminate if necessary.

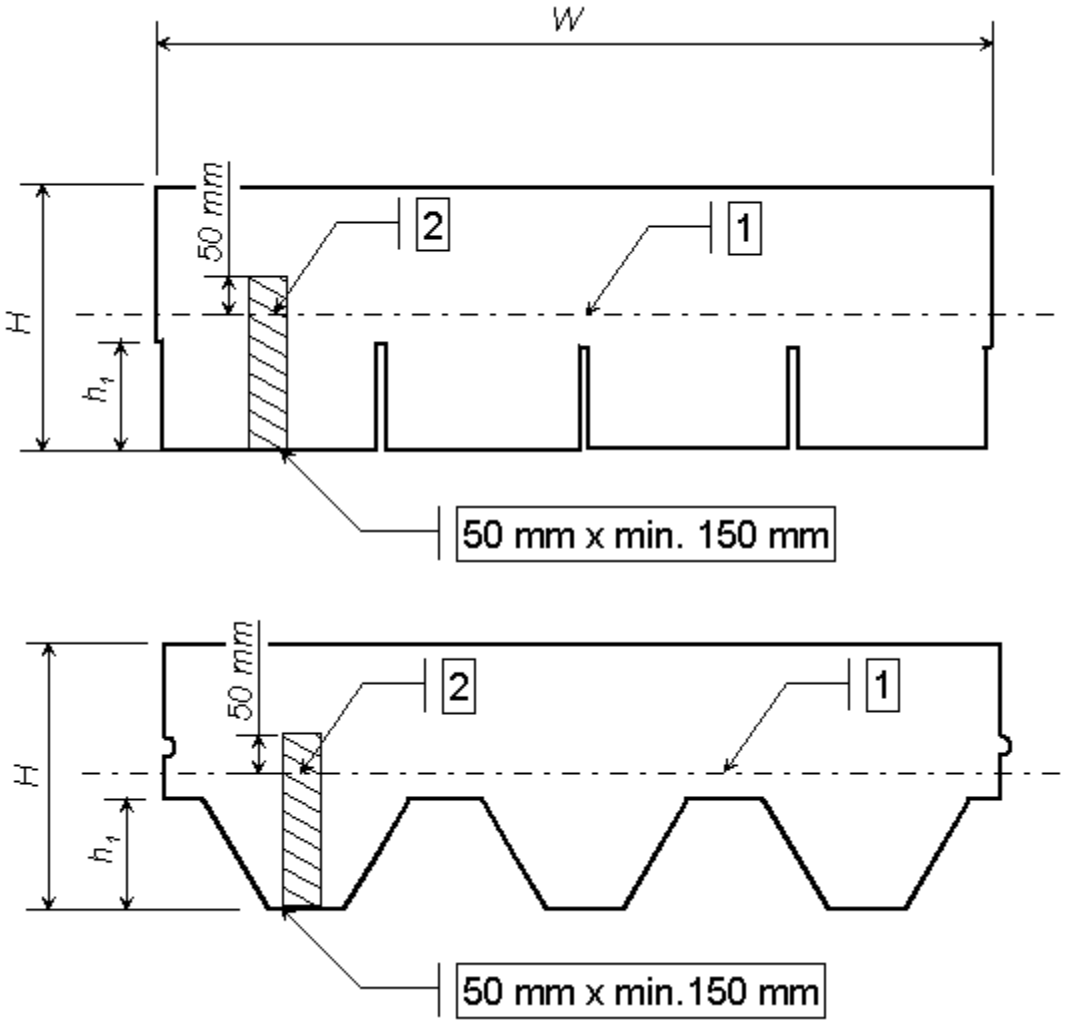
For the measurement of nail shank tear resistance, cut five test specimens from different shingles in direction of the height. These test specimens shall have a dimension of ((50 ± 1) x minimum 150) mm ((50 ± 1) mm in the direction of width and minimum 150 mm in the direction of height).

The nail position in the test specimens shall be at the vertical height corresponding to the intended nailing position in the manufacturer‘s installation instructions (see Figures A1.7.1 and A1.7.2).



Key
1 nailing axis
2 nailing of the sample
H height
W width

Figure A1.7.1 – Example of cutting the sample for the resistance to tearing (nail shank) test



Key

1	nailing axis
2	nailing of the sample
(H)	height
(W)	width
h_1	height of slits

Figure A.1.7.2 – Example of cutting the sample for the resistance to tearing (nail shank) test

It is essential to apply the nail in the test to the same vertical position as presented in the MPII. In absence of the MPII, a nailing position representing normal nailing methodology will be chosen.

A1.8 Flow resistance at elevated temperature

For the measurement of flow resistance, cut five test specimens of ((100 ± 1) x (115 ± 1)) mm from the exposed area of different shingles.

A1.9 Adhesion of mineral granules and flakes of slate

For the measurement of the granules and flakes of slate adhesion, cut five test specimens more than (285 x 50) mm from the area of the shingle which is intended to be exposed to the weather, 10 mm away from the side edges, with the 285 mm dimension being in the direction of shingle width.

If the dimension of the exposed area is not large enough, the test specimens shall be composed of two parts joined together.

A1.10 Water absorption

For the measurement of water absorption, cut five test specimens of ((100 ± 1) x (100 ± 1)) mm from five different shingles, without self-adhesive areas, points or protection strips.

A1.11 Blistering

For the measurement of blistering, cut five test specimens of ((125 ±1) x (225 ± 1)) mm from different shingles.

A1.12 Resistance to UV radiation

For testing of resistance to UV radiation, cut one test specimen for every sample required from the shingle, of minimum 200 mm in the direction of width and minimum 50 mm in the direction of height. The sample may comprise 1 or more layers (see Figure A1.12.1).

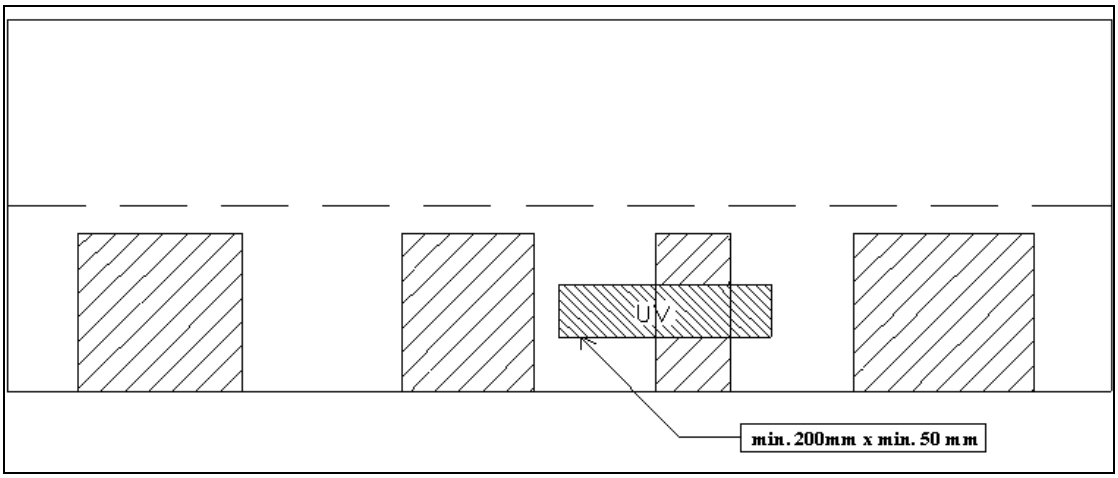


Figure A1.12.1 – Example of cutting the sample for the resistance to UV radiation test

1.13 Resistance to peeling for metal-surfaced shingles

For the measurement of peeling, cut five test specimens of ((100 ± 1) x (200 ± 1)) mm from different shingles.

ANNEX B: ASSESSMENT METHODS APPLIED IN EU/EFTA MEMBER STATES FOR ASSESSING THE FIRE PERFORMANCE OF FACADES

Country	Assessment method
Austria	ÖNORM B 3800-5
Czech Republic	ČSN ISO 13785-1
Denmark, Sweden, Norway	SP Fire 105
Finland	• SP Fire 105 • BS 8414
France	LEPIR 2
Germany	• DIN 4102-20 Complementary reaction-to-fire test for claddings of exterior walls, • Technical regulation A 2.2.1.5
Hungary	MSZ 14800-6:2009 Fire resistance tests. Part 6: Fire propagation test for building façades
Ireland	BS 8414 (BR 135)
Poland	PN-B-02867:2013
Switzerland, Liechtenstein	• DIN 4102-20 • ÖNorm B 3800-5 • Prüfbestimmung für Aussenwandbekleidungssysteme