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BSI Standards Publication

External fire exposure of roofs and roof coverings — Extended application of test results from CEN/TS 1187

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National foreword

This Published Document is the UK implementation of CEN/TS 16459:2013.

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A list of organizations represented on this committee can be obtained on request to its secretary.

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Beanspruchung von Bedachungen durch Feuer von außen - Erweiterter Anwendungsbereich der Prüfergebnisse aus CEN/TS 1187

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Foreword

This document (CEN/TS 16459:2013) has been prepared by Technical Committee CEN/TC 127 “Fire safety in buildings”, the secretariat of which is held by BSI.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

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Introduction

Fire tests on individual roofs/roof coverings are carried out in accordance with CEN/TS 1187. The results from these tests can then be classified in accordance with EN 13501-5.

In order to derive classifications for similar roofs/roof coverings based on the data determined from CEN/TS 1187, additional rules are needed.

These rules are direct application rules or extended application rules. Rules within the direct field of application of test results are given in EN 13501-5 (these rules correspond to CEN/TS 1187).

This document outlines a procedure to develop rules for extended application and lists application rules which have already been developed in Annexes A to D for test methods 1 to 4 from CEN/TS 1187, where Annex A is related to test method 1, Annex B relates to test method 2, and so forth.

Annexes A to D have been developed based upon the available information and the roof systems in the market. The objective of this document is to provide a methodology for optimising the number of tests required to cover the maximum field of application.

Whilst special attention has been focused on roofs typically comprising a support deck/substrate, vapour barrier, insulation layer(s), membranes/roof coverings, there will be occasions when other separating layers or intermediate layers will be needed to satisfy other roof characteristics. These layers should be included in the consideration of the roof/the roof covering being classified.

NOTE Tests 1, 3 and 4 are carried out on a roof construction, whereas test 2 is done on a roof covering with its substrate below.

The decision route from the diagram below shows ways to determine which procedure to follow.

The solid line is compulsory, whereas the dotted line is optional.

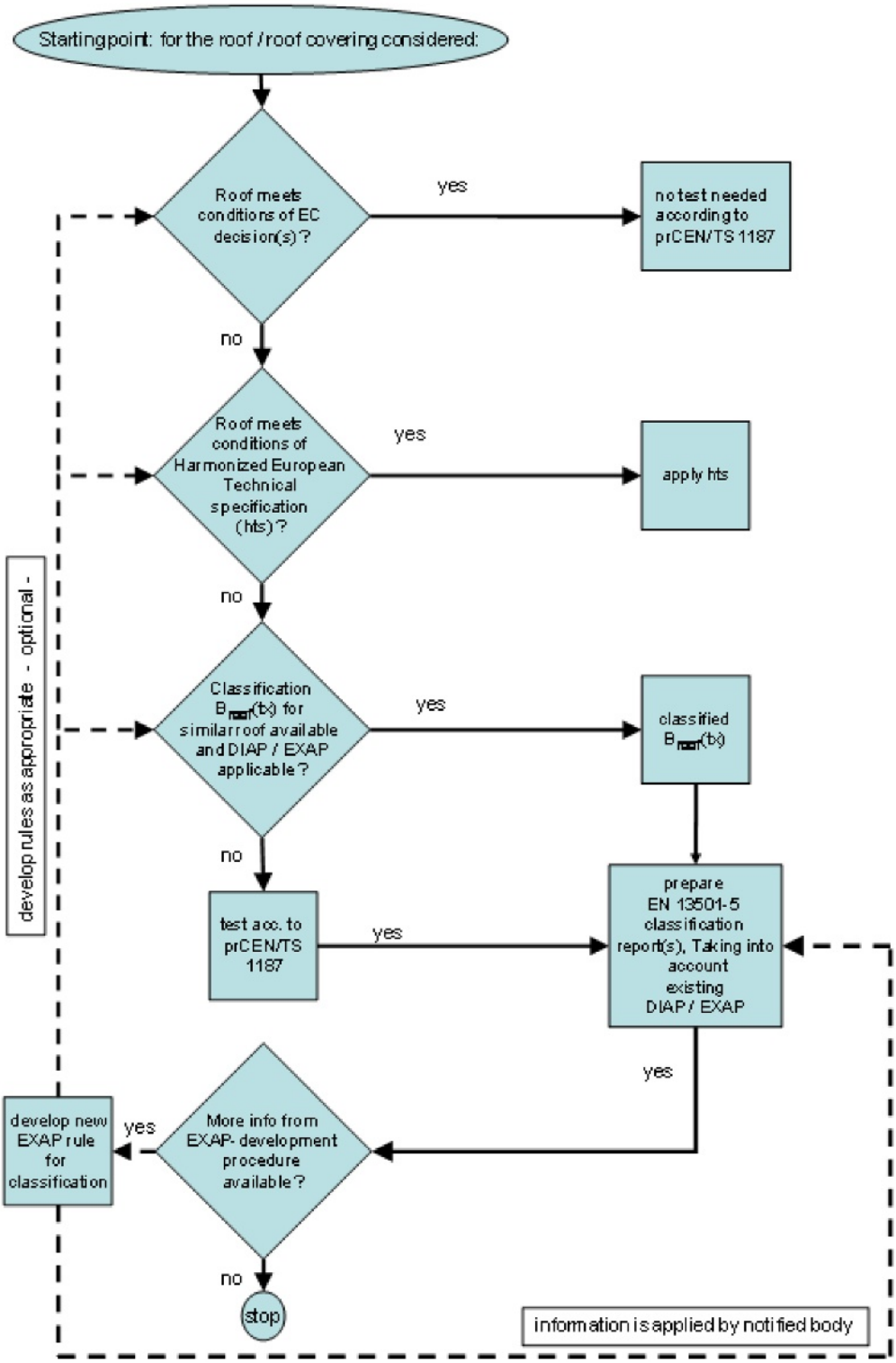


Figure 1 – Decision process on classification of roofs/roof coverings

1 Scope

This Technical Specification gives guidance on the process and development of extended fields of application using test results obtained from CEN/TS 1187 test 1 to 4, and included in test reports, and other relevant information in order to evaluate and classify the performance of roofs/roof coverings. This Technical Specification provides a methodology to consider the possible effect(s) on classification to EN 13501-5 from single or multiple changes to the individual product and end-use application parameters of the roof/roof covering.

Specific application guidance is given in Annexe A, Annex B, Annex C and Annex D for CEN/TS 1187 tests 1 to 4 respectively.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

CEN/TS 1187:2012, *Test methods for external fire exposure to roofs*

EN 490, *Concrete roofing tiles and fittings for roof covering and wall cladding - Product specifications*

EN 492, *Fibre-cement slates and fittings - Product specification and test methods*

EN 494, *Fibre-cement profiled sheets and fittings - Product specification and test methods*

EN 506, *Roofing products of metal sheet - Specification for self-supporting products of copper or zinc sheet*

EN 508-1, *Roofing products from metal sheet - Specification for self-supporting products of steel, aluminium or stainless steel sheet - Part 1: Steel*

EN 508-2, *Roofing products from metal sheet - Specification for self-supporting products of steel, aluminium or stainless steel sheet - Part 2: Aluminium*

EN 508-3, *Roofing products from metal sheet - Specification for self-supporting products of steel, aluminium or stainless steel sheet - Part 3: Stainless steel*

EN 534, *Corrugated bitumen sheets - Product specification and test methods*

EN 544, *Bitumen shingles with mineral and/or synthetic reinforcements - Product specification and test methods*

EN 1013 (all parts), *Light transmitting profiled plastic sheeting for single skin roofing*

EN 1304, *Clay roofing tiles and fittings - Product definitions and specifications*

EN 1849-2, *Flexible sheets for waterproofing - Determination of thickness and mass per unit area - Part 2: Plastic and rubber sheets*

EN 1873, *Prefabricated accessories for roofing - Individual roof lights of plastics - Product specification and test methods*

EN 12326-1, *Slate and stone products for discontinuous roofing and cladding - Part 1: Product specification*

EN 13162, *Thermal insulation products for buildings - Factory made mineral wool (MW) products - Specification*

EN 13163, *Thermal insulation products for buildings - Factory made expanded polystyrene (EPS) products - Specification*

EN 13164, *Thermal insulation products for buildings - Factory made extruded polystyrene foam (XPS) products - Specification*

EN 13165, *Thermal insulation products for buildings - Factory made rigid polyurethane foam (PU) products - Specification*

EN 13166, *Thermal insulation products for buildings - Factory made phenolic foam (PF) products – Specification*

EN 13167, *Thermal insulation products for buildings - Factory made cellular glass (CG) products - Specification*

EN 13169, *Thermal insulation products for buildings - Factory made expanded perlite board (EPB) products - Specification*

EN 13501-5:2005+A1:2009, *Fire classification of construction products and building elements - Part 5: Classification using data from external fire exposure to roofs tests*

EN 13707, *Flexible sheets for waterproofing - Reinforced bitumen sheets for roof waterproofing - Definitions and characteristics*

EN 13956, *Flexible sheets for waterproofing - Plastic and rubber sheets for roof waterproofing - Definitions and characteristics*

EN 14351-1, *Windows and doors - Product standard, performance characteristics - Part 1: Windows and external pedestrian doorsets without resistance to fire and/or smoke leakage characteristics*

EN 14509, *Self-supporting double skin metal faced insulating panels - Factory made products - Specifications*

EN 14782, *Self-supporting metal sheet for roofing, external cladding and internal lining - Product specification and requirements*

EN 14783, *Fully supported metal sheet and strip for roofing, external cladding and internal lining - Product specification and requirements*

EN 14963, *Roof coverings - Continuous rooflights of plastics with or without upstands - Classification, requirements and test methods*

3 Terms and definitions

For the purposes of this document, the relevant terms and definitions given in CEN/TS 1187:2012 and EN 13501-5:2005+A1:2009, together with the following apply.

3.1
adhesive
organic or inorganic material e.g. polyurethane-based, bitumen-based, dispersion adhesive, glue which is used to attach the surfaces of two or more products/components

Note 1 to entry: Adhesives or glues of the kind mentioned above could be applied separately and will thus form a separate layer within the roof built-up, while factory pre-applied adhesives or glues are part of the specific product/component forming a layer.

3.2
'as tested'
this term is used when an application rule does not exist for a specific parameter

3.3
binder content
binder content is the amount of binding material (by % weight or % volume) within the product. The binder could be inorganic or organic in nature. In the case of the latter, it will add a fire load to the product containing the binder, and will be considered within the classification of products or product groups. Within the substructure of products like mineral wool insulation products, particular felt layers, some tiling products, and some multi layer weather-proofing surface products the binder will typically be cured

Note 1 to entry: The definition of this term does not apply to compound waterproofing sheets

3.4
direct field of application of test results
outcome of a process (involving the application of defined rules) whereby a test result is deemed to be equally valid for variations in one or more of the product properties and/or intended end use applications

3.5
end-use application parameter
aspect of the mounting and fixing arrangement of a product reflecting/simulating its end-use application (e.g. type of substrate, fixing method, type and position of joints) which can affect the fire performance

3.6
extended field of application of test results
outcome of a process (involving the application of defined rules that can incorporate calculation procedures) that predicts, for a variation of a product property and/or its intended end use application(s), a test result on the basis of one or more test results to the same test standard

3.7
product group
range of roof products within defined limits of variability (defined by the manufacturer or a Technical Specification) of the product parameters and, if relevant, end-use parameters, for which the reaction of the roof in end use application to external fire exposure remains unchanged (does not get worse)

Note 1 to entry: As Clause 7 is concerned, product groups also include components for Annex A.

3.8
product parameter
aspect of a product (for example thickness, composition, density) which may vary and which can have an influence on the product's fire performance

3.9
roof pitch
inclination of the roof surface to the horizontal

Note 1 to entry: In the case of a tiled roof, the roof pitch is the rafter pitch since the tile pitch will be a few degrees lower due to the overlaps.

3.10
separating layer
functional layer within a roof construction that is typically used to separate layers that do not match for reason of chemical incompatibility, or it is needed as underlay, where applicable

Note 1 to entry: Separating layers are products such as fire protective layers (e.g. glass fleece); under-slating (e.g. polymeric sheet; polymeric sheet reinforced by polymeric fibres; bituminised reinforced sheets); and others such as bituminous kraft paper; aluminium sheet with covering (organic); and similar.

3.11
surfacing
surface finish applied either during construction or prefabricated as part of the surfacing layer

Note 1 to entry: Surfacing may include materials such as lacquer, UV-protective coating,slate chips, ceramic-based granules, products for factory-made lamination with glass-fleece or bituminous roofing felt, or similar.

3.12
test result
outcome of a testing process and its associated procedures detailed within a specific test standard (which can include some processing of the results from the testing of a number of specimens)

Note 1 to entry: A test result is expressed in terms of one or more fire performance parameter(s).

3.13
type of product
products belonging to a subset of a product family (as defined in Guidance Paper G), grouping together products having a similar nature (e.g. polymer modified bituminous roofing felts, single-ply PVC membranes, cement based fibre boards, profiled metal roof sheets) and behaviour (e.g. products that melt or shrink under flame attack, or decompose)

3.14
factory (pre-) applied adhesive
layer of organic or inorganic material e.g. polyurethane-based, bitumen-based, that is factory-applied to products, such as to assist the installation, e.g. self-adhesion

4 Product and end-use application parameters for roof coverings/roof systems

Table 1 is the list of product parameters and end-use application parameters that shall be taken into account in Annexes A to D in making application rules. If other parameters are found to be relevant for a given product, then these too should be considered in accordance with the principles of Clauses 5 and 6.

Relevant information may be contained in other documents, such as harmonized Technical Specifications. This information may be needed to define the end-use application parameters for the particular product (or product group) that could influence the classification results in the external fire exposure tests to CEN/TS 1187 Methods 1 to 4.

Table 1 — List of product parameters and end-use applications parameters

PRODUCT PARAMETERS FOR ROOF COVERINGS/ROOF SYSTEMS
Type of product
Product composition
Reaction-to-fire classification according to EN 13501–1
Colour (consider also pigments)
Binder content
Thickness
Mass per unit area
Density

Geometry (structure, shape and constitutive layers of multi-layer product)
Air gaps (perpendicular to surface)
Joints
Surfacing on lower side (backing)
Surfacing on upper side (facing)
Factory (pre-)applied adhesive
Reinforcement: mass per unit area, type of material; position within layer etc.

END-USE APPLICATION PARAMETERS FOR ROOF COVERINGS/ROOF SYSTEMS
End-use parameters-general
Number of layers (details see for each product)
Order of layer in the roofing system
Orientation of each layer
End-use parameters-support
Roof pitch
Substrate or under-laying construction details
Application on existing roofs (“renovation”)
Spacing of frame elements (non-standard-support)
End-use parameters-mounting and fixing
Mounting method
Fixing method (e.g. adhesive)
Distribution, Spacing and type of mechanical fixing (fasteners)
Joints
Air gaps

5 Extended application

5.1 General principles for extended application for roof coverings/roof systems

There are three options to establish rules for extended application. These are:

— by use of additional test results which, together with the initial test result, enables consideration of a larger range of one or several product parameters and end-use application parameters;

— by use of tests results in combination with application of calculations methods (compare with 5.3) relating the product and end-use application parameters to the fire performance;

— by use of historical data, see 5.4, and other relevant information e.g. data from previous tests.

NOTE Extended application rules are used to develop worst case ‘build ups’. Standard ‘build ups’ are identified in the relevant product standards taking into account worst case ‘build ups’, e.g. where no specific test information is available, indicative testing is used to establish the worst case scenario.

5.2 Extended application by additional tests

5.2.1 Additional tests on one product/end-use application parameter

It is assumed that only one product/end-use application parameter changes and the other parameters remain constant and that there is an initial test result on one value of the product/end-use application parameter.

If the relationship between the fire performance and the product/end-use application parameter is unknown, the tests will be carried out on several variants of the parameter to assess the complete range of the product/end-use application parameter on which the extended application is required and to know this relationship.

From this relationship it will be possible to predict the different levels of fire performance as a function of the levels of the product/end-use application parameter and therefore the level of classification.

If there is an established rule about the relationship between the product/end-use parameter and the fire performance (direct application) of a product or product group, it will be possible to optimize the additional tests, as a function of the classification result which is expected, as follows:

— If the fire performance of the roof is known to be affected by the change of a product/end-use application parameter(s) in a known direction, the test can be carried out on the parameter, the variation of which is known to give the lowest (worst) performance in this instance for this product and/or its end use-application, without changing the classification level.

— If it is known that the fire performance changes with a change of the product/end-use application parameter but the relationship is not known, the number of additional tests shall be sufficient to define the relationship (sufficient means that the relationship is adequately defined over the intended range of parameter variation). For most relationships, this will require at least two additional test results.

When a relationship has been established between the fire performance and a product/end-use parameter, it shall be used to determine the classification of any product or product group covered by this relationship.

5.2.2 Additional tests on several product/end-use application parameters

When more than one roof covering product parameter or end-use application parameter is to change at the same time, and if the types of relationship are not known, it will be necessary to assess the tests needed according to an experimental plan or an empirical approach. Then a more detailed series of tests shall be performed to determine the relationship between these parameters, the external fire exposure performance, and the resultant classification.

The study of this relationship shall be carried out from direct tests according to CEN/TS 1187 Methods 1, 2, 3 or 4 and Classification to EN 13501-5.

If the types of relationship between the fire performance and the product/end use application parameter are not known, a series of tests will be necessary. The test series can be split into parts to get firstly a result on the type of the relationship (qualitative result) and secondly information on the quantitative relationship, if required.

In all cases the limits of field of application shall be complied with. When a limited approach is used, it has to be kept in mind that the resulting relationships are only valid for the particular limits of the other parameters that were kept constant in the test.

NOTE Results from other test methods can be used to determine which product parameter needs to be tested in European Standard methods. Reports on extended application are given in accordance with prEN EXAPRPT – Extended application reports on the fire performance of construction products and building elements.

5.3 Extended application by calculation

For extended application by calculation, it is necessary to have (an) established calculation method(s) shown to be valid for the intended range of parameter(s). This requires the calculation method to be validated in accordance with 5.2.1 or 5.2.2.

NOTE So far, there are no verified and validated published calculation methods that have been established and agreed for use.

5.4 Guidance on the use of historical test data

When undertaking extended application (EXAP) a good understanding of the product performance in fire is required. Some of this information will be known from the EN tests according to CEN/TS 1187, however for some products there shall exist a record of test results against previous standards.

NOTE Under certain circumstances this information can be used as part of the EXAP procedure. This will help to reduce the number of new tests which are required.

In applying these principles, the following conditions shall be met:

— EXAP is only undertaken by a Notified Body;

— Primary data shall be obtained from the relevant CEN/TS 1187 Test 1 to 4.

6 Influence of product parameters and end-use application parameters on external exposure to fire test performance

In Clause 4 of this document, Table 1 shows the list of product and end-use application parameters that can influence the results from external fire exposure tests to roofs.

The following is an analysis of how each of these parameters can influence the test result for each of the four different CEN/TS 1187 test methods, assuming that all other parameters are kept unchanged.

The fire testing in different European countries has historically been based on different exposure to burning brands, to radiant exposure and to wind, as shown in Table 2.

Individual European countries will require fire test 1, 2, 3 or 4 depending on these national regulatory requirements. There is no ranking in the order of test methods.

Table 2 — Exposure conditions for CEN/TS 1187 tests 1 to 4

Use CEN/TS 1187 **test 1, 2, 3 or 4**			
Burning brands	**Burning brands and wind**	**Burning brands and wind and radiant heat**	**Burning brands and wind and radiant heat, in two stages**
Test 1	Test 2	Test 3	Test 4

One of the most important end-use application parameters for the fire performance is the roof pitch. Past traditions in different Member States have caused roofs to be tested at different angles of pitch, as illustrated in Table 3 below.

Table 3 — The standard tested angle of pitch for CEN/TS 1187 tests 1 to 4

Angle of roof to horizontal in the test [degrees]	CEN/TS 1187 **Test 1**	CEN/TS 1187 **Test 2**	CEN/TS 1187 **Test 3**	CEN/TS 1187 **Test 4**
0	-	-	-	For roofs angles up to 10 degrees
5	-	-	For roof angles below 10 degrees	-
15	For roof angle less than 20 degrees	-	-	-
30	-	Standard angle of test. The results apply for any roof angle	For roof angles from 10 to 70 degrees inclusive	-
45	For roof angles of 20 degrees or more	-	-	For roof angles greater than 10 degrees
Special angle of pitch?	Yes, for special roofs, but the data is limited to the roof system as tested	-	Yes, if required in special cases, but the data is limited to the roof systems as tested	-

Unless the following text says that a parameter has no effect on the performance, no general rules can be given. However, for some tests it is be possible to interpolate between or extrapolate from data points from samples having a different value for a particular product and or end-use parameter. It is also possible to group roof coverings /roof systems of a similar nature in order to derive a direct application rule.

The influence of a combination of parameter changes on results from external fire exposure tests to roofs may be inter-related. The combination of parameters that give the lowest performance in the test shall be identified. If the combination giving the worst performance cannot be identified, tests shall be done on a series of combinations of the relevant parameters of the roof system.

Table 4 lists the potential impact on the external fire performance of a roof system from a variation of parameters (as from Table 1), when tested to CEN/TS 1187.

NOTE Specific effects, per product group, are provided in Annexes A to D for test methods 1 to 4 respectively.

Table 4 — Potential impact of parameters and particular characteristics when tested to CEN/TS 1187

PRODUCT PARAMETERS FOR ROOF COVERINGS/ROOF SYSTEMS	Potential impact of parameter and/or its change
Type of product	Organic content/fire load Organic content and/or fire load of the roof may be critical to the outcome of the external fire exposure test e.g. as relevant for fire spread and fire penetration. In some cases, the organic content of layers within the roof could be protected from the effects of the external exposure. The effect of organic content is therefore dependent on the available route for fire penetration into and/or through the roof.
Product composition	The composition of the product may influence the fire performance parameters (in all tests).
Reaction-to-fire classification acc. to EN 13501–1	Any change of product to another reaction-to-fire classification according to EN 13501–1 may have an effect on the external fire performance of the roof.
Colour (consider also pigments)	Colour can affect the surface emissivity and absorptivity of the specimen under test. Dark colours can heat up more quickly than light colours or shiny surfaces.
Binder content	See type of product.
Thickness	The thickness can have an influence on the fire performance.
Mass per unit area	The mass per unit area can have an influence on the fire performance.
Density	The density can have an influence on the fire performance.
Geometry (structure, shape and constitutive layers of multi-layer product)	Geometry may influence the fire performance. The effect could vary depending on the characteristics of parameters defining geometry (e.g. structure, profile, shape and position of layers within a multi-layer product).
Air gaps (perpendicular to surface)	Air gaps can influence the fire performance.
Joints	The type and position of joints can influence the fire performance.
Surfacing	The surfacing on the lower side (backing) and/or on the upper side (facing) can influence the fire performance. Different types of coating or facing can have very different behaviour in fire.
Factory (pre-)applied adhesive	Characteristics of adhesives such as type, position and mass per unit area of the adhesive can influence the fire performance e.g. by adding extra combustible material to the product.
Reinforcement: mass per unit area, type of material; position within layer etc.	Characteristics of reinforcements such as type, position and mass per unit area can influence the fire performance, e.g. a non-combustible intermediate layer may reduce the propensity for penetration.

END-USE PARAMETERS FOR ROOF COVERINGS/ROOF SYSTEMS	**Potential impact of parameter and/or its change**
End-use parameters-general	
Number of layers (see details for each product)	Number of layers can influence the fire performance.
Order of layers in the roofing system	The order of layers can influence the fire performance.
Orientation of each layer	The orientation of each layer can influence the fire performance. For example: — For non-symmetrical products the effect on fire performance of the top and bottom surfaces of a layer may be different. — A different performance in fire may also be due to a directional effect at one face (like a surface with linear trapezoid profiles). The flame spread may be blocked or guided by the directional effect (the profile direction).
End-use parameters-support	
Roof pitch	The roof pitch influences the fire performance. See Table 2.
Substrate or underlying construction details	Substrates/under-laying construction details (e.g. supporting deck) may influence the fire performance. Important parameters include thickness, density, heat capacity, heat conductivity, deformation and the contribution of the substrate/under-laying construction details to the fire penetration. Where the external layer is sufficiently inert to heat, the effect of the substrate may be minimal. *In some cases* CEN/TS 1187 *makes reference to different substrates or supporting decks for different end-use applications.*
Application on existing roofs (“renovation”)	Application on existing roofs (“renovation”) may influence the fire performance.
Spacing of frame elements (non-standard-support)	Spacing of frame elements (non-standard-support) may influence the fire performance.
End-use parameters-mounting and fixing	
Mounting method	The method used to install products can influence the fire performance. NOTE Some additional guidance on the influence of mounting methods is given in CEN/TS 15447.
Fixing method (e.g. adhesive)	The fixing method may influence the fire performance. NOTE Some additional guidance on the influence of mounting methods is given in CEN/TS 15447.
Distribution, spacing and type of mechanical fixing (fasteners)	Distribution, spacing and type of mechanical fixing (fasteners) may influence the fire performance.

Joints	Joints (between products) may influence the fire performance. Observations during fire tests have shown that — Flames may reach the unexposed side of the product and the interior layer(s) via the joints. — Products may deform at the joints leading to small air gaps behind the product. — The presence of joint filler may also influence the test result. NOTE Some additional guidance on the influence of mounting methods is given in CEN/TS 15447.
Air gaps	Air gaps (e.g. cavities) may influence the fire performance. Observations during fire tests have shown that — One effect of air gaps may be that flames attack both sides of the product and reach lower layers. — This attack may be caused by open joints or openings formed at joints (vertical or horizontal)by whatever means under the exposure to fire in the test. — The heating of air in a partially enclosed space may lead to a chimney effect, substantially increasing the severity of the thermal attack. NOTE Some additional guidance on the influence of mounting methods is given in CEN/TS 15447.

7 General guidance to the annexes for Application Rules

The general structure used follows the tabulated contents list for the annexes, as given in Table 5 below.

Table 5 outlines general information/product groups/components, where the effect of product parameters and end-use application parameters has been evaluated.

NOTE In the tables developed in the annexes, the term ‘as tested’ is used when an application rule for a specific parameter does not yet exist. See also definition 3.2.

Table 5 — Contents of annexes, arranged according to product groups (A.3.1/D.3.1 to A.3.12/D.3.12), and information on the contribution of components (A.4.1 to A.4.5) to the fire performance

✓ = rules available from the annexes NOTE All cell entries under Annex A to D are subject to revision if test evidence is available.						
		ANNEX A	ANNEX B	ANNEX C	ANNEX D	Comments arising from enquiry stage
1	General Text	✓ (+ example sketch A)	✓	✓	✓	
2	General rules	✓	✓	✓	✓	rules common to each annex may

						be shifted to a new clause in this document at a later stage of document development
Product Groups and components: **- Product Groups**						
		ANNEX A	ANNEX B	ANNEX C	ANNEX D	Comments
3.1	slates and tiles					
3.1.1	Non-metallic slates and tiles, (Class A1 to A2 –s3,d2; according to EN 13501–1)	✓	✓	✓	✓	some products/materials are covered by EC Decision 2000/553/EC
3.1.2	metallic tiles	no EXAP rules available	no EXAP rules available	no EXAP rules available	no EXAP rules available	EC Decisions 2000/553/EC and 2005/403/EC cover particular products/materials
3.2	small elements (Class B-s1,d0 to F, according to EN 13501–1)					
3.2.2	Bitumen shingles	✓	✓	✓	✓	
3.2.3	Miscellaneous small elements	no EXAP rules available	no EXAP rules available	no EXAP rules available	no EXAP rules available	
3.3	Reinforced bitumen sheets	✓	✓	✓	✓	
3.4	Plastic and rubber sheets	✓	✓	✓	✓	
3.5	Roof-lights	no EXAP rules available	Not applicable	Not applicable	no EXAP rules available	
3.6	Glazing systems	no EXAP rules available	Not applicable	Not applicable	no EXAP rules available	
3.7	Profiled non-metallic sheets					
3.7.1	Profiled fibre cement sheets	no EXAP rules available	no EXAP rules available	no EXAP rules available	no EXAP rules available	some products/ materials are covered by EC Decision 2000/553/EC
3.7.2	Profiled bitumen based	no EXAP rules	no EXAP rules	no EXAP rules	no EXAP rules	

	sheets	available	available	available	available	
3.7.3	Miscellaneous profiled non-metallic sheets	no EXAP rules available	no EXAP rules available	no EXAP rules available	no EXAP rules available	
3.8	Composite metallic sandwich panels	no EXAP rules available	no EXAP rules available	no EXAP rules available	no EXAP rules available	EC Decision 2006/600/EC covers particular products in specific tests
3.9	Profiled metal sheets	no EXAP rules available	no EXAP rules available	no EXAP rules available	no EXAP rules available	EC Decisions 2000/553/EC and 2005/403/EC cover particular products
3.10	Flat metal sheets	no EXAP rules available	no EXAP rules available	no EXAP rules available	no EXAP rules available	
3.11	Liquid applied roof waterproofing kits	no EXAP rules available	no EXAP rules available	no EXAP rules available	no EXAP rules available	
3.12	Miscellaneous	no EXAP rules available	no EXAP rules available	no EXAP rules available	no EXAP rules available	
- Components						
		ANNEX A	ANNEX B	ANNEX C	ANNEX D	Comments
4.1	Adhesive	✓	no EXAP rules available	no EXAP rules available	no EXAP rules available	
4.2	Separating layer	✓	no EXAP rules available	no EXAP rules available	no EXAP rules available	For Annexes B to D: rules are implemented in the particular product group description
4.3	Insulation layer	✓	not applicable	no EXAP rules available	no EXAP rules available	
4.4	Vapour barrier	✓	no EXAP rules available	no EXAP rules available	no EXAP rules available	
4.5	Supporting deck	✓	not applicable	no EXAP rules available	no EXAP rules available	

Annex A
(normative)

Application rules for test results from CEN/TS 1187 test 1, per product group and/or components

A.1 General

This annex gives guidance on the application of external fire test results arising from CEN/TS 1187 Test 1. This is done to assist classification according to EN 13501-5.

Rules for roof systems are arranged in this annex following the general structure outlined in Clause 7 of the main document, for product groups and/or components.

NOTE The extent to which an individual component or layer is directly affected/damaged by the testing conditions will be influenced by those layers and components used around them.

In the tables developed, the term ‘as tested’ is used as an indicator that for a specific parameter an application rule does not yet exist. See 3.2.

If rules listed in this annex do not apply for a specific product /end-use application parameter, the rule “as tested” applies.

Rules on the influence of individual parameters shall be developed by application of the procedure(s) outlined in Clause 6 of the main document.

The product groups and/or components are as detailed below.

The rules for individual product groups and /or components are preceded by:

A.2 General rules, valid for every product within a product group and/or component, for Test 1.

The product groups include:

— A.3.1 Slates and Tiles;

  — A.3.1.1 non-metallic slates and tiles;

  — A.3.1.2 metallic tiles;

— A.3.2 Small elements;

  — A.3.2.2 Bitumen shingles;

  — A.3.2.3 Miscellaneous small elements;

— A.3.3 Reinforced bitumen sheets;

— A.3.4 Plastic and rubber sheets;

— A.3.5 Roof-lights;

- A.3.6 Glazing systems;
- A.3.7 Profiled non-metallic sheets;
  - A.3.7.1 Profiled fibre cement sheets;
  - A.3.7.2 Profiled bitumen based sheets;
  - A.3.7.3 Miscellaneous profiled non-metallic sheets;
- A.3.8 Composite metallic sandwich panels;
- A.3.9 Profiled metal sheets;
- A.3.10 Flat metal sheets;
- A.3.11 Liquid applied roof waterproofing kits;
- A.3.12 Miscellaneous.

The components include:

- A.4.1 Adhesive;
- A.4.2 Separating layer;
- A.4.3 Insulation layer;
- A.4.4 Vapour barrier;
- A.4.5 Supporting deck.

Clause 4, Table 1 lists the product and associated end use application parameters that may or may not influence the classification of external fire performance for each of the identified roofing systems. The following analysis indicates how each of these parameters may influence the classification from test results using CEN/TS 1187 test 1.

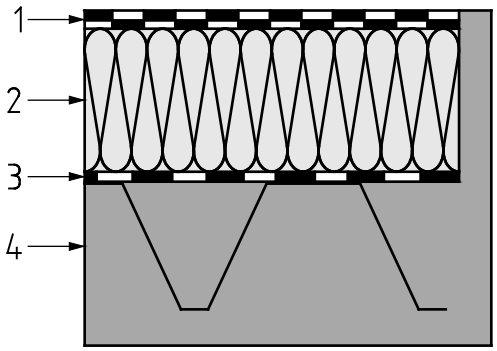
This annex considers the possible effect(s) of single or multiple changes to the individual product and end-use application parameters of the roof on the external fire performance. Since a variation of several parameters at the same time may lead to unexpected results, the rules that are given for a specific product group shall be applied, without exclusion of any one of these rules. In principle, the rules are only valid, if they are applied to one parameter in the roof system, and the others kept unchanged, unless otherwise stated.

For illustration purposes, the example sketch displayed below shows a possible combination of layers to form a roof system. In this example a roof is shown having flexible waterproofing sheets as uppermost layer (i.e. roof covering(s) as defined according to both CEN/TS 1187 and EN 13501-5). Within such a construction various combinations of layers are possible in practice.

The illustrated example combines products from roof sector(s) A3 (uppermost layer (i.e. roof covering(s) as defined according to both CEN/TS 1187 and EN 13501-5)(s)), and A.4.3 (insulation layer) and A.4.4 (vapour barrier) and A.4.5 (supporting deck).

As to the application rules given in this annex, together with direct application rules in EN 13501-5, the impact on the classification from each of those layers intended to be used in the roof system shall be considered.

Where the limit values are not stated, the assumption is made, that the product can be used as it is.



Key

1 reinforced bitumen sheets (according to A.3.3)

2 insulation layer (according to A.4.3)

3 vapour barrier (according to A.4.4)

4 supporting deck (according to A.4.5)

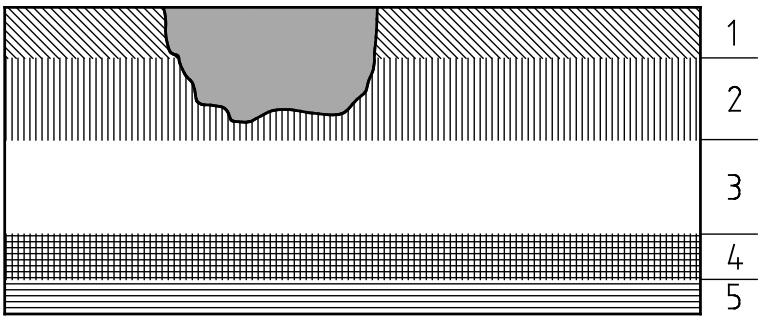
Figure A.1 – Example Sketch

A.2 General rules, valid for every product within a product group and/or component

General application rules cannot be given for each parameter in Table 1 of Clause 4. Based on experience with the external fire performance of widely used, but specific roof systems (e.g. roof systems built with flexible waterproofing layers, insulation boards, metal roof supporting deck (from top to bottom)), the following table lists rules for a restricted set of parameters.

Whenever rules are available for a product group or component (as given in A.3.1 to A.4.5) then these shall be used in addition to rules given here.

Parameter	**Rules**
Thickness	After testing of thinnest and thickest layer of product, respectively, the test result is valid for all thicknesses between these margins, if not specified otherwise.
Mass per unit area	After testing of heaviest and lightest layer of product, respectively, the test result is valid for all masses per unit area between these margins, if not specified otherwise.
Density	After testing of heaviest and lightest layer of product, respectively, the test result is valid for all densities per unit area between these margins, if not specified otherwise.
Order of layer in the roofing system	In regard to layer 3 (see sketch below) the layer positioned below the lowest layer affected by the fire (layer 2, influencing the test result) during the CEN/TS 1187 test, can be replaced by any other material with the same reaction to fire class or better. In regard to the uppermost layer that has not undergone a change relevant to the test result (i.e. layer 3, see sketch below) layer 4 and additional layers positioned below can be replaced by any other layer or layers.

	NOTE Additional national requirements on reaction to fire may apply.
1 uppermost layer (i.e. roof covering(s) as defined according to both CEN/TS 1187 and EN 13501–5) plus any layer between top and lowest affected layers, resp. 2 lowest affected layer 3 uppermost unaffected layer 4 any layer below 3 5 any layer below 4	
Surfacing on lower side (backing) of any layer in the roof system. and/or Surfacing on upper side (facing) of any layer in the roof system.	Note that this rule excludes the substitution of the external (top) layer. Test results are also valid for greater mass per unit area for surfacing with reaction to fire class A1 to A2 s3 d0. Test results are also valid for smaller mass per unit area for surfacing with reaction to fire class B s1 d0 to E, provided the surfacing does not belong to a group of products with built-in fire retardant (e.g. intumescent products). Furthermore, the % or organic content of the surfacing product, by mass, is not increased.
Reaction-to-fire classification (EN 13501–1) of any layer in the roofing system	Substitution is possible for a component or layer with the same or better reaction-to-fire classification when tested in the same end use application provided that the substitute component or layer is of the same generic product group. Note that this rule excludes the substitution of the external (top) layer.
Roof pitch	Covered by CEN/TS 1187 Test 1 or EN 13501–5

A.3 Product groups

A.3.1 Slates and tiles

A.3.1.1 slates and tiles, non-metallic

This subclause applies to discontinuously laid non-metallic roofing products (reaction-to-fire-class A1 to A2-s3,d2 EN 13501-1), that may be covered by European Standards (such as product standards, e.g. EN 490, *Concrete roofing tiles and fittings for roof covering and wall cladding – Product specifications*, EN 1304, *Clay roofing tiles and fittings – Product definitions and specifications*, EN 492, *Fibre-cement slates and fittings – Product specification and test methods*, EN 12326-1, *Slate and stone products for discontinuous roofing and cladding – Part 1: Product specification*).

NOTE Most products/materials in this sector are covered by EC Decisions such as 2000/553/EC.

	Rules
PRODUCT PARAMETERS FOR ROOF COVERINGS/ROOF SYSTEMS	
Type of product	As tested
Product composition	As tested
Reaction-to-fire classification acc. to EN 13501–1	As tested; not applicable for reaction-to-fire-class A1 products.
Colour (consider also pigments)	As tested; no influence for reaction-to-fire-class A1 products.
Binder content	As tested; no influence for reaction-to-fire-class A1 products.
Thickness	Test result is valid for all thicknesses greater than tested
Mass per unit area	Test result is valid for all masses per unit area greater than tested
Density	Test result is valid for all densities greater than tested
Geometry (structure, shape and constitutive layers of multi-layer product)	As tested
Air gaps (perpendicular to surface)	As tested
Joints	Test result is valid for overlapping joints larger than tested
Surfacing on lower side (backing)	See general rule.
Surfacing on upper side (facing)	See general rule.
Factory pre-applied adhesive	As tested
Reinforcement: mass per unit area, type of material; position within layer etc.	A higher mass per unit area of the same reinforcement material having a reaction-to-fire class A1 to A2-s3 d2 is acceptable. A smaller mass per unit area of the same material having reaction-to-fire class B-s1,d0 to F is acceptable. For both options, the specific material shall be kept in the same position within the product.
END-USE PARAMETERS FOR ROOF COVERINGS/ROOF SYSTEMS	
End-use parameters-general	
Number of layers (details see for each product)	As tested
order of layer in the roofing system	See general rules.
Orientation of each layer	As tested
End-use parameters - support	
Roof pitch	See general rule.
Application on existing roofs (“renovation”)	As tested

Spacing of frame elements (non-standard-support)	As tested; compare with A.4.5 Supporting deck.
End-use parameters - mounting and fixing	
Mounting method	As tested
Fixing method (e.g. adhesive)	As tested
spacing and type of mechanical fixing (fasteners)	As tested, narrower spacing included; type of fastener not relevant.
Joints	Test result with butt joints includes step joints or similar.
Air gaps	As tested, smaller gaps included.

A.3.1.2 Metallic tiles

Products covered in this subclause are defined in the following harmonized European Standards such as EN 14783, *Fully supported metal sheet and strip for roofing, external cladding and internal lining - Product specification and requirements*, EN 506, *Roofing products of metal sheet - Specification for self-supporting products of copper or zinc sheet*, EN 508, *Roofing products from metal sheet - Specification for self-supporting products of steel, aluminium or stainless steel sheet* (Part 1 covering steel, Part 2 covering aluminium, Part 3 covering stainless steel).

PRODUCT PARAMETERS FOR ROOF COVERINGS/ROOF SYSTEMS	***Rules***
Type of product	As tested
Product composition	As tested
Reaction-to-fire classification according to EN 13501–1	As tested
Colour (consider also pigments)	As tested, compare with surfacing.
Binder content	As tested
Thickness	Test results are valid for greater thicknesses of the same product.
Mass per unit area	Test results are valid for greater mass per unit areas of the same product.
Density	Test results are valid for greater densities of the same product.
Geometry (structure, shape and constitutive layers of multi-layer product)	As tested
Air gaps (perpendicular to surface)	Joints smaller than tested are acceptable.
Joints (overlapping)	Overlapping joints larger than tested are acceptable.
Factory pre-applied adhesive	As tested
Reinforcement: mass per unit area, type of material; position within layer etc.	As tested

END-USE PARAMETERS FOR ROOF COVERINGS/ROOF SYSTEMS	
End-use parameters-general	
Number of layers (details see for each product)	As tested
Order of layer in the roofing system	As tested
End-use parameters - support	
Application on existing roofs (“renovation”)	As tested
Spacing of frame elements (non-standard-support)	As tested, compare with A.4.5.
End-use parameters - mounting and fixing	
Mounting method	As tested
Fixing method (e.g. adhesive)	As tested
spacing and type of mechanical fixing (fasteners)	As tested, smaller distances acceptable.
Joints	Test results with butt joints are applicable to step joints and similar.
Air gaps	As tested, smaller gaps acceptable.

NOTE Most products in this sector are covered by EC Decisions such as 2000/553/EC and 2005/403/EC.

A.3.2 Small elements

A.3.2.1 General

This subclause applies to discontinuously laid roofing products (reaction-to-fire-class B-s1,d0 to F according to EN 13501-1), that may be covered by European Standards.

A.3.2.2 Bitumen shingles

Products covered in this subclause are defined in Product Standards such as EN 544 Bitumen shingles with mineral and/or synthetic reinforcements

	Rules
PRODUCT PARAMETERS FOR ROOF COVERINGS/ROOF SYSTEMS	
Type of product	As tested
Product composition	As tested

Reaction-to-fire classification according to EN 13501–1	See general rules.
Colour (consider also pigments)	Colour of mineral finishing (e.g. slates, granules) not relevant
Binder content	Not relevant
Thickness	See general rules.
Mass per unit area	See general rules.
Density	See general rules.
Geometry (structure, shape and constitutive layers of multi-layer product)	As tested
Air gaps (perpendicular to surface)	Not relevant
Joints	Test result with overlapped joints allows for overlaps wider than tested.
Surfacing on lower side (backing)	See general rules.
Surfacing on upper side (facing)	See general rules. NOTE Including metal foil surfacing.
Factory pre-applied adhesive	smaller mass per unit area included; for the same material as long as the way of application is unchanged.
Reinforcement: mass per unit area, type of material; position within layer etc.	For filaments: (a) For lower mass of polyester per unit area the test result is valid. (b) For woven glass or glass fleece with a higher mass per unit area of the same type of product the test result is valid. (c) For polyester reinforcement the results are also valid for the same type of sheet with additional glass fleece (e.g. 2 reinforcements or combination).
END-USE PARAMETERS FOR ROOF COVERINGS/ROOF SYSTEMS	
End-use parameters-general	
Number of layers (details see for each product)	As tested
order of layer in the roofing system	As tested
Orientation of each layer	Not relevant
End-use parameters-support	
Roof pitch	See general rules.
Application on existing roofs (“renovation”)	As tested NOTE It is necessary to develop rules for renovation purposes.
Spacing of frame elements (non-standard-support)	Non-standard supporting decks as tested can be replaced by decks belonging to the same type of material provided the supporting characteristics are not reduced.

	NOTE 1 e.g. softwood for wooden frames can be replaced by another softwood. NOTE 2 Trapezoidal steel decks can be replaced by perforated trapezoidal steel decks, provided the hollow spaces are filled or lined with continuous pre-formed acoustic tiles of mineral fibre class A, together with vapour barrier and insulation board above the steel deck. Test results with wood particle board deck (with gaps < 0,5 mm) are valid for trapezoidal steel deck covered with plain steel sheets spanning the troughs.
End-use parameters-mounting and fixing	
Mounting method	As tested
Fixing method (e.g. adhesive)	As tested
spacing and type of mechanical fixing (fasteners)	As tested, narrower spacing included; type of fastener not relevant.
Joints	Test result with overlapped joints allows for overlaps wider than tested.
Air gaps	Not relevant

A.3.2.3 Miscellaneous small elements

This sector covers miscellaneous small elements such as wooden and polymeric shingles. No additional rules have been developed in this document.

A.3.3 Reinforced bitumen sheets

This subclause applies to reinforced bitumen sheets for roof waterproofing that may be covered by harmonized European Standards such as EN 13707, *Flexible sheets for waterproofing - Reinforced bitumen sheets for roof waterproofing - Definitions and characteristics*.

NOTE No common rules are currently available if existing single or multi-layer roof waterproofing systems will be improved by adding different layers on top. The rules may then be applied to every single layer within the multilayer roofing system in the same way as it is done with other layers belonging to a roof system.

	Rule
PRODUCT PARAMETERS FOR ROOF COVERINGS/ROOF SYSTEMS	
Type of product	As tested
Product composition	As tested
Reaction-to-fire classification acc. to EN 13501–1	See general rules.
Colour (consider also pigments)	Colour of mineral finishing (e.g. slates, granules) not relevant
Binder content	Not applicable

Thickness	After successful testing of thickest layer of product, the test results are also valid for thinner products, provided the composition is identical (as to reinforcement, surface coating etc.).
Mass per unit area	After successful testing of heaviest layer of product, the test results are also valid for lighter products, provided the composition is identical (as to reinforcement, surface coating etc.).
Density	After successful testing of heaviest layer of product, the test results are also valid for lighter products, provided the composition is identical (as to reinforcement, surface coating etc.). NOTE If thickness and mass per unit area are defined, additional information on density of bituminous roofing sheets is not needed.
Geometry (structure, shape and constitutive layers of multi-layer product)	As tested
Air gaps (perpendicular to surface)	Not relevant
Joints	In practice, overlaps for reinforced bitumen sheets are around 10 cm wide, with margins of ± 3 cm. Tests performed with 10 cm wide overlaps include this band-width.
Surfacing on lower side (backing)	See general rules.
Surfacing on upper side (facing)	See general rules. NOTE Including metal foil surfacing.
Factory pre-applied adhesive	Smaller mass per unit area included; for the same material as long as the way of application is unchanged.
Reinforcement: mass per unit area, type of material; position within layer etc.	For filaments: (a) For lower mass of polyester per unit area the test result is valid. (b) For woven glass or glass fleece with a higher mass per unit area of the same type of product the test result is valid. (c) For polyester reinforcement the results are also valid for the same type of sheet with additional glass fleece (e.g. 2 reinforcements or combination).
END-USE PARAMETERS FOR ROOF COVERINGS/ROOF SYSTEMS	
End-use parameters-general	
Number of layers (details see for each product)	As tested
order of layer in the roofing system	As tested
Orientation of each layer	Not relevant
End-use parameters-support	
Roof pitch	See general rules.

Application on existing roofs ("renovation")	As tested NOTE It is necessary to develop rules for renovation purposes. If an existing roof system classified as $B_{roof}(t1)$ with bitumen sheets needs to be renovated and a new top layer or roof system is required on top of an existing system, then a new test is required with a 'worst case' build up as follows: — Wooden planks with a 5 mm gap; — EPS EN 13163 insulation 100 mm; — 1st layer oxidized bitumen sheet with 60 g/m^2 glass fleece; — 2nd layer oxidized bitumen sheet with 200 g/m^2 woven glass; — Place the new top layer or roof system according to practice.
Spacing of frame elements (non-standard-support)	As tested; compare with A.4.5 supporting deck.
End-use parameters-mounting and fixing	
Mounting method	As tested
Fixing method (e.g. adhesive)	As tested
spacing and type of mechanical fixing (fasteners)	As tested, narrower spacing included; type of fastener not relevant
Joints	Overlaps for reinforced bitumen sheets are around 100 mm wide, with margins of ± 30 mm. Tests performed with 100 mm wide overlaps include this bandwidth.
Air gaps	Not relevant

A.3.4 Plastic and rubber sheets

This subclause applies to plastic and rubber sheets for roof waterproofing that may be covered by harmonized European Standards such as EN 13956, *Flexible sheets for waterproofing - Plastic and rubber sheets for roof waterproofing - Definitions and characteristics*.

NOTE The following table was developed from experience with single ply sheeting. For special purposes such as renovation, multi-layer roof water-proofing systems may be intended to be used. No common rules are currently available for this purpose. The rules developed for single layers may then be applied to every single layer within the multilayer roofing system in the same way as it is done with other layers belonging to a roof system.

	Rule
PRODUCT PARAMETERS FOR ROOF COVERINGS/ROOF SYSTEMS	
Type of product	As tested
Product composition	As tested
Reaction-to-fire classification acc. to EN 13501–1	See general rules.
Colour (consider also pigments)	As tested. If the darkest and lightest coloured products are tested

	positive (i.e. giving class B_{ROOF}(t1) the results apply to any other colour. For thermoplastic products after EN 13956 with a thickness after EN 1849–2 between 1,2 mm and 2,4 mm the following rules apply: 1) After successful testing of the darkest product the test result is also valid for all lighter colours. 2) After successful testing of any colour the test results is also valid for all colour if the following condition is met: The burnt lengths do not exceed 2/3 of the maximum allowed burned length.
Binder content	Not applicable
Thickness	See general rules. For Thermoplastic products after EN 13956 with a thickness after EN 1849–2 between 1,2 mm and 2,4 mm the following rule applies: After successful testing of thinnest layer of a product the test result is also valid for higher thickness of the same products.
Mass per unit area	See general rules
Density	See general rules
Geometry (structure, shape and constitutive layers of multi-layer product)	As tested
Air gaps (perpendicular to surface)	Not relevant
Joints	Test result with overlapped joints allows for overlaps wider than tested, provided these are within common margins.
Surfacing on lower side (backing)	See general rules.
Surfacing on upper side (facing)	Surfacing (paints) which does not exceed combustible mass per unit area of 250 g/m^2. (dry condition).
Factory pre-applied adhesive	Smaller mass per unit area included; for the same material as long as the way of application is unchanged.
Reinforcement: mass per unit area, type of material; position within layer etc.	For filaments: (a) For lower mass of polyester per unit area the test result is valid. (b) For woven glass or glass fleece with a higher mass per unit area of the same type of product the test result is valid. (c) For polyester reinforcement the results are also valid for the same type of sheet with additional glass fleece (e.g. 2 reinforcements or combination).
END-USE PARAMETERS FOR ROOF COVERINGS/ROOF SYSTEMS	
End-use parameters-general	
Number of layers (details see for each product)	As tested. Additional sheets of glass fleece may be inserted between any succeeding layers.
order of layer in the roofing system	As tested
Orientation of each layer	Not relevant

End-use parameters-support	
Roof pitch	See general rules. In addition, for Thermoplastic products manufactured to EN 13956 with a thickness from EN 1849–2 between 1,2 mm and 2,4 mm the following rule applies: After successful testing of a product with a roof pitch of 45° the test result is also valid for all pitches.
Application on existing roofs ("renovation")	As tested NOTE It is necessary to develop rules for renovation purposes. If an existing roof system classified as $B_{roof}(t1)$ with bitumen sheets needs to be renovated and a new top layer or roof system is required on top of an existing system, then a new test is required with a 'worst case' build up as follows: — Wooden planks with a 5 mm gap; — EPS EN 13163 insulation 100 mm; — 1st layer oxidized bitumen sheet with 60 g/m^2 glass fleece; — 2nd layer oxidized bitumen sheet with 200 g/m^2 woven glass; — Place the new top layer or roof system according to practice.
Spacing of frame elements (non-standard-support)	As tested; compare with A.4.5 supporting deck.
End-use parameters-mounting and fixing	
Mounting method	As tested
Fixing method (e.g. adhesive)	As tested
spacing and type of mechanical fixing (fasteners)	As tested, narrower spacing included; type of fastener not relevant
Joints	Test result with overlapped joints allows for overlaps wider than tested, provided these are within common margins.
Air gaps	Not relevant

A.3.5 Roof-lights

Products covered in this subclause are defined in harmonized European Standards such as EN 1873, *Prefabricated accessories for roofing - Individual roof lights of plastics - Product specification and test methods*, EN 14963, *Roof coverings - Continuous rooflights of plastics with or without upstands - Classification, requirements and test methods*, EN 14351-1, *Windows and doors - Product standard, performance characteristics - Part 1: Windows and external pedestrian doorsets without resistance to fire and/or smoke leakage characteristics.*

Rule for the evaluation of range of thicknesses in a multi-layer roof-light/dome-light:

For multi-layer roof lights and multi-layer dome lights as well, where the light transmitting materials are thermoplastics like polymethylmethacrylate (PMMA), polycarbonate (PC), polyvinylchloride (PVC), Styrene Acrylonitrile (SAN) the following tests shall be performed in order to derive a rule for the specific product in view of the influence of the thickness parameter. It is expected, that the procedure described hereafter provides the "worst case" system built-up.

The following tests are needed (one test per type a) to d) for the evaluation):

a) lowest total thickness;

b) maximum total thickness;

c) test with the thickest layer above a separating layer (glass fleece) with the thinnest layer below;

d) test with the thinnest layer above a separating layer (glass fleece) with the thickest layer below.

Taking the most critical result from the evaluation as a basis for further testing, a full test is performed with this specific built-up. The result is then applicable to type a) to d) built-ups.

A.3.6 Glazing systems

No additional rules have been developed in this document.

A.3.7 Profiled non-metallic sheets

A.3.7.1 Profiled fibre cement sheets

Products covered in this subclause are defined in harmonized European Standard such as EN 494, *Fibre-cement profiled sheets and fittings - Product specification and test methods*.

No additional rules have been developed in this document.

NOTE Most products in this sector are covered by EC Decision 2000/553/EC.

A.3.7.2 Profiled bitumen based sheets

Products covered in this subclause are defined in the following harmonized European Standard EN 534, *Corrugated bitumen sheets - Product specification and test methods*.

No additional rules have been developed in this document.

A.3.7.3 Miscellaneous profiled non-metallic sheets

Products covered in this subclause are defined in harmonized European Standard such as EN 1013, *Light transmitting single skin profiled plastics sheets for internal and external roofs, walls and ceilings - Requirements and test methods*.

No additional rules have been developed in this document.

A.3.8 Composite metallic sandwich panels

Products covered in this subclause are defined in harmonized European Standard such as EN 14509, *Self-supporting double skin metal faced insulating panels - Factory made products - Specifications*.

No additional rules have been developed in this document.

NOTE Some products in this sector are covered by EC Decision 2006/600/EC.

A.3.9 Profiled metal sheets

Products covered in this subclause are defined in the following harmonized European Standard: EN 14782, *Self-supporting metal sheet for roofing, external cladding and internal lining - Product specification and requirements*.

No additional rules have been developed in this document.

NOTE Most products in this sector are covered by EC Decisions 2000/553/EC and 2005/403/EC.

A.3.10 Flat metal sheets

Products covered in this subclause are defined in the following harmonized European Standard EN 14783, *Fully supported metal sheet and strip for roofing, external cladding and internal lining - Product specification and requirements*.

No additional rules have been developed in this document.

NOTE Most products in this sector are covered by EC Decisions 2000/553/EC and 2005/403/EC.

A.3.11 Liquid applied roof waterproofing kits

No additional rules have been developed in this document.

A.3.12 Miscellaneous

Roofs under this subclause are systems not covered by A.3.1 to A.3.11. Examples for this roof sector are thatched roofs; mastic asphalt; etc.

No additional rules have been developed in this document.

A.4 Components

A.4.1 Adhesive

	Rules
PRODUCT PARAMETERS FOR ROOF COVERINGS/ROOF SYSTEMS	
Product parameters-chemical	
Type of product	As tested; can be replaced by other adhesives belonging to the same type of material.
composition	As tested; can be replaced by other adhesives belonging to the same type of material.
Reaction-to-fire classification acc. to EN 13501–1	See general rules.
Colour (consider also pigments)	Not relevant
Binder content	As tested; results are also valid if the tested solids content of another adhesive from the same type of material is within ± 15 % of the tested solid content. NOTE Typical solids contents for polyurethane (PU)-based is 80 % - 90 %, dispersion-based 70 % - 80 %, synthetic rubber contact adhesive 40 %, synthetic rubber adhesive 60 %.

Product parameters-physical	
Thickness	Not applicable, defined by: mass per unit area
Mass per unit area	Smaller mass per unit area included.
Density	Not applicable, defined by: mass per unit area
END-USE PARAMETERS FOR ROOF COVERINGS/ROOF SYSTEMS	
End-use parameters-general	
Number of layers (details see for each product)	Not relevant
order of layer in the roofing system	As tested
Orientation of each layer	Not relevant
End-use parameters-support	
Roof pitch	See general rules.
Application on existing roofs (“renovation”)	As tested
End-use parameters-mounting and fixing	
Fixing method (e.g. adhesive)	As tested NOTE Tested in fully bonded application does not include partially bonded or combinations of the two.

A.4.2 Separating layer

PRODUCT PARAMETERS FOR ROOF COVERINGS/ROOF SYSTEMS	***Rules***
Type of product	As tested
Product composition	As tested
Reaction-to-fire classification acc. to EN 13501–1	See general rules. For glass fleece, additional requirements are to be followed: a specific glass fleece may be replaced by another glass fleece provided the reaction-to-fire Class A1 to A2-s3 d2 or better is valid for both the original and the replacement material. Glass fleece having reaction-to-fire Class B-s1 d0 to F can only be replaced by glass fleece of reaction-to-fire Class A1 to A2-s3 d2 or better.
Colour (consider also pigments)	Not relevant

Binder content	As tested. Results are also valid if the organic content of another separating layer from the same type of material is lower than the relevant value of the tested product.
Thickness	See general rules. NOTE If mass per unit area is defined, additional information on thickness is not needed.
Mass per unit area	See general rules.
Density	See general rules. NOTE If mass per unit area is defined, additional information on density is not needed.
Geometry (structure, shape and constitutive layers of multi-layer product)	As tested
Joints	Test result with overlapped joints allows for overlaps wider than tested.
Surfacing on lower side (backing)	See general rules.
Surfacing on upper side (facing)	See general rules.
Factory pre-applied adhesive	Smaller mass per unit area included; for the same material as long as the way of application is unchanged.
reinforcement: mass per unit area, type of material; position within layer etc.	Polyester fleece with smaller mass per unit area is acceptable. Glass fleece and woven glass mat with higher mass per unit area is included, for the same product. Polyester fleece may be amended by glass fleece and glass filaments. Polyester fleece can be replaced by glass fleece of any kind, and by (oxidized) bitumen membranes including glass fleece 60 g/m^2 or more or woven glass mat 200 g/m^2 or more.
membranes used as separating layers	See rules from Clauses 3 and 4, respectively.
END-USE PARAMETERS FOR ROOF COVERINGS/ROOF SYSTEMS	
End-use parameters-general	
Number of layers (details see for each product)	As tested
order of layer in the roofing system	See general rules.
Orientation of each layer	Not relevant
End-use parameters-support	
Roof pitch	See general rules.
Application on existing roofs (“renovation”)	As tested

Spacing of frame elements (non-standard-support)	As tested ; compare with A.4.5 supporting deck (i.e. narrower spacing included).
End-use parameters-mounting and fixing	
Mounting method	As tested
Fixing method (e.g. adhesive)	As tested
spacing and type of mechanical fixing (fasteners)	As tested, narrower spacing included; type of fastener not relevant
Joints	Test result with overlapped joints allows for overlaps wider than tested.

A.4.3 Insulation layer

PRODUCT PARAMETERS FOR ROOF COVERINGS/ROOF SYSTEMS	***Rules***
Type of product	**Expanded Polystyrene Foam and Extruded Polystyrene Foam:** After testing of a roofing product mounted on an insulation product manufactured to EN 13163 expanded polystyrene (EPS) or EN 13164 extruded polystyrene(XPS) with reaction-to-fire class E, the test result is valid for the same roofing product installed on a similar EPS/EXPS product with a better or equal reaction-to-fire- classification to Class E for reaction to fire. *In addition, the same or smaller compressive strength is required.* Similarly, if the tested EPS/XPS product was reaction-to-fire class D, the test result could be applied for other EPS/XPS products with a better or equal classification to Class D, etc. _____ **Mineral Wool:** After testing of a roofing product mounted on an insulation product manufactured to EN 13162 (MW), the test result is valid for the same roofing product installed on other mineral wool products according to this standard, if the following conditions are met: [a] The burnt lengths did not exceed 2/3 of the relevant classification limit for the roofing system being tested. [b] The reaction to fire class meets A1 according to EN 13501–1 [c] The compressive strength exceeds 60 kPa **Polyurethane (PUR, including PIR):** After testing of a roofing product mounted on an insulation product manufactured to EN 13165 (PUR) with reaction-to fire class E, the test result is valid for the same roofing product installed on a similar PUR product with a better or equal classification to Class E for reaction to fire. Similarly, if the tested PUR product was class D, the test result could be applied for other PUR products with a better or equal classification to Class D, etc.'

	Test results from tests at 15 degrees roof pitch are valid for other PUR products only if the reaction to fire classification of the product to be used is equivalent or better than in the test /classification report. In addition, the same or smaller compressive strength is required. _____ **Phenolic Foam:** After testing of a roofing product mounted on an insulation product manufactured to EN 13166 (PF), the test result is valid for the same roofing product installed on other phenolic foam products according to this standard, if the insulation layer was not involved in the fire as far as its contribution to the heat release of the specimen is concerned. Test results from tests at 15 degrees pitch are also valid for other Phenolic foam products us according to EN 13166 (PF), if the reaction to fire classification according to EN 13501–1 is equivalent. In addition, the same or smaller compressive strength is required. _____ **Cellular Glass:** After testing of a roofing product mounted on an insulation product manufactured to EN 13167 (CG), the test result is valid for the same roofing product installed on other phenolic foam products according to this standard, if the insulation layer was not involved in the fire as far as its contribution to the heat release of the specimen is concerned. Test results obtained on stone wool can be extended to cellular glass. _____ **Expanded Perlite:** After testing of a roofing product mounted on an insulation product manufactured to EN 13169 (EPB), the test result is valid for the same roofing product installed on other expanded perlite products according to this standard, if the insulation layer was not involved in the fire as far as its contribution to the heat release of the specimen is concerned.
Product composition	As tested; and see type of product.
Reaction-to-fire classification according to EN 13501–1	See general rules.
Colour (consider also pigments)	Not relevant
Binder content	Not relevant except for inorganic insulation materials containing additional organic binder e.g. mineral fibre boards: lower binder content of the same binder type is valid; provided the density is within the limits stated.

Thickness	Standard thickness for tests shall be 100 mm. The test result applies for all thicknesses greater than 50 mm. For tests made with thickness less than 50 mm, the test only applies to that particular thickness. After successful testing of thickest and thinnest layer of product, the test results are also valid for all products in between, provided the composition is identical (as to reinforcement, surface coating etc.). NOTE This rule also applies for cut-to-fall insulation and multiple layers of the same insulation boards, but not for multiple layers of different densities.
Geometry (structure, shape and constitutive layers of multi-layer product)	For cut-to-fall insulation: test results from boards with one single thickness are also valid for boards with varying thickness, provided that all other parameters e.g. pitch and minimum thickness, are covered.
Air gaps (perpendicular to surface)	Not applicable
Joints	The test result with butt joints includes step joints or similar. The test result without overlapping surfacing includes overlapping surfacing.
Surfacing on lower side (backing)	See general rules.
Surfacing on upper side (facing)	Test results with surfacing without overlapping joints include overlaps (e.g. EPS rolled insulation). Surfacing made of bitumen sheets: test results are valid for reinforcements of polyester fleece with lower mass per unit area. For glass fleece and woven glass mat higher mass per unit area is included, for the same product. Polyester fleece modified by added glass fleece and/or glass filaments is included. Surfacing membranes with glass fleece reinforcement may be replaced by membranes having glass fleece or woven glass mat as reinforcement, where the mass per unit area shall be equal or higher. A change of the type of product of surfacing on the upper or on the lower side is considered to be a change of the insulation and shall be re-evaluated within the roof system.
Factory pre-applied adhesive	Smaller mass per unit area included; for the same material.
Reinforcement: mass per unit area, type of material; position within layer etc.	As tested
END-USE PARAMETERS FOR ROOF COVERINGS/ROOF SYSTEMS	
End-use parameters-general	
Number of layers (details see for each product)	As tested
order of layer in the waterproofing system	See general rules.

Orientation of each layer	Not relevant
End-use parameters-support	
Roof pitch	See general rules
Application on existing roofs ("renovation")	As tested NOTE It is necessary to develop rules for renovation purposes.
Spacing of frame elements (non-standard-support)	As tested; compare with A.4.5 supporting deck (i.e. narrower spacing included)
End-use parameters-mounting and fixing	
Mounting method	parameter not affecting external fire performance
Fixing method (e.g. adhesive)	As tested
spacing and type of mechanical fixing (fasteners)	As tested, narrower spacing included; type of fastener not relevant
Joints	Test result with butt joints includes step joints or similar. Test result without overlapping surfacing includes overlapping surfacing (e.g. "flaps" on EPS with bitumen facing).

A.4.4 Vapour Barrier

PRODUCT PARAMETERS FOR ROOF COVERINGS/ROOF SYSTEMS	***Rules***
Product parameters-chemical	
Type of product	Vapour barriers as tested can be replaced by other vapour barriers belonging to the same group of materials as identified in the relevant harmonized standards.
Product composition	See type of product.
Reaction-to-fire classification acc. to EN 13501–1	See general rules.
Colour (consider also pigments)	Not relevant
Product parameters-physical	
Thickness	See general rules.
Mass per unit area	See general rules.
Density	See general rules. NOTE If thickness and mass per unit area are defined, additional information on density is not needed.
Geometry (structure, shape and constitutive layers of multi-layer product)	As tested
Joints	Joints test result with overlapped joints allows for overlaps wider than

	tested, provided these are within common margins.
Product parameters-other	
Surfacing on lower side (backing)	See general rules.
Surfacing on upper side (facing)	See general rules.
Factory pre-applied adhesive	Smaller mass per unit area included; for the same material as long as the way of application is unchanged.
Reinforcement: mass per unit area, type of material; position within layer etc.	As tested. And: a) lower mass of polyester per unit area is included; b) higher mass per unit area of woven glass or glass fleece is included, for the same type of material; c) polyester reinforcement is also valid for same type of sheet if combined with additional glass fleece.
END-USE PARAMETERS FOR ROOF COVERINGS/ROOF SYSTEMS	
End-use parameters-general	
Number of layers (details see for each product)	As tested
order of layer in the waterproofing system	See general rules.
Orientation of each layer	Not relevant
End-use parameters-support	
Roof pitch	See general rules.
Application on existing roofs (“renovation”)	As tested NOTE It is necessary to develop rules for renovation purposes.
Spacing of frame elements (non-standard-support)	As tested; compare with A.4.5 supporting deck (i.e. narrower spacing included).
End-use parameters-mounting and fixing	
Mounting method	As tested
Fixing method (e.g. adhesive)	If tested with loose laid vapour barrier positive, also valid for partially or fully bonded, or mechanically fixed systems.
Joints	Joints test result with overlapped joints allows for overlaps wider than tested, Provided these are within common margins.

A.4.5 Supporting deck

Supporting decks are covered both by CEN/TS 1187:2012 4.4.1 (in general), and 4.4.2 (for standard supporting decks). The following rules are restricted to non-standard supporting decks.

PRODUCT PARAMETERS FOR ROOF COVERINGS/ROOF SYSTEMS	***Rules***
Product parameters-chemical	
Type of product	Non-standard supporting decks as tested can be replaced by decks belonging to the same type of material provided the supporting characteristics are not reduced. NOTE 1 e.g. softwood for wooden frames can be replaced by another softwood. NOTE 2 Trapezoidal steel decks can be replaced by perforated trapezoidal steel decks, provided the hollow spaces are filled or lined with continuous pre-formed acoustic tiles of mineral fibre class A, together with vapour barrier and insulation board above the steel deck. Test results with wood particle board deck (with gaps < 0,5 mm) are valid for trapezoidal steel deck covered with plain steel sheets spanning the troughs.
Product composition	See type of product.
Reaction-to-fire classification according to EN 13501–1	See general rules.
Colour (consider also pigments)	Not relevant
Binder content	As tested. Results are also valid if the organic content of another non-standard supporting deck of the same product group is lower than the relevant value of the tested product.
Product parameters-physical	
Thickness	Higher thickness for same supporting deck provided the characteristics of the profile maintain the support of the tested system.
Geometry (structure, shape and constitutive layers of multi-layer product)	In case of wooden framework: results from sawn wood are also valid for planed wood. In case of profiled steel decks test results are also valid for smaller profiled volume.
Air gaps (perpendicular to surface)	Smaller gaps included.
Joints	Test results with butt joints include step joints or similar.
Product parameters-other	
Surfacing on lower side (backing)	See general rules.
Surfacing on upper side (facing)	See general rules.

Factory pre-applied adhesive	Smaller mass per unit area included; for the same product.
Reinforcement: mass per unit area, type of material; position within layer etc.	As tested
END-USE PARAMETERS FOR ROOF COVERINGS/ROOF SYSTEMS	
End-use parameters-general	
order of layer in the roofing system	See general rules.
orientation	As tested
End-use parameters-support	
Roof pitch	See general rules.
Spacing of frame elements (non-standard-support)	Narrower spacing included. NOTE Due to the test procedure it is necessary to place at least one brand directly above a frame element.

Annex B
(normative)

Application rules for test results from CEN/TS 1187 Test 2, per product group

B.1 General

This annex gives guidance on the application of external fire test results arising from CEN/TS 1187 Test 2. This is done to assist classification according to EN 13501-5.

Rules for roof systems are arranged in this annex following the general structure outlined in Clause 7 for product groups and/or components.

NOTE The extent to which an individual component or layer is directly affected/damaged by the testing conditions will be influenced by those layers and components used around them.

In the tables developed the term “as tested” is used when an application rule does not yet exist. See definition 3.2.

Rules on the influence of individual parameters shall be developed by application of procedure(s) outlined in Clause 5.

The product groups are as detailed below.

The rules for individual product groups are preceded by:

B.2 General rules, valid for every product within a product group.

The product groups include:

— B.3.1 Slates and tiles;

  — B.3.1.1 Non-metallic slates and tiles (reaction-to-fire-class A1 to A2-s3 d2 according to EN 13501-1);

  — B.3.1.2 Metallic tiles;

— B.3.2 Small elements (class B-s1,d0 to F according to EN 13501-1);

  — B.3.2.2 Bitumen shingles;

  — B.3.2.3 Miscellaneous small elements;

— B.3.3 Reinforced bitumen sheets;

— B.3.4 Plastic and rubber sheets;

— B.3.5 Roof-lights;

— B.3.6 Glazing systems;

— B.3.7 Profiled non-metallic sheets;

- B.3.7.1 Profiled fibre cement sheets;
- B.3.7.2 Profiled bitumen based sheets;
- B.3.7.3 Miscellaneous profiled non-metallic sheets;

— B.3.8 Composite metallic sandwich panels;

— B.3.9 Profiled metal sheets;

— B.3.10 Flat metal sheets;

— B.3.11 Liquid applied waterproofing kits;

— B.3.12 Miscellaneous.

Clause 4, Table 1 lists the product and associated end use application parameters that can influence the external fire performance for each of the identified roofing systems. The following analysis indicates how each of these parameters may influence the classification from the test results using CEN/TS 1187 Test 2.

This annex considers the possible effect(s) of single or multiple changes to the individual product and end-use application parameters of the roof covering on the external fire performance. Since a variation of several parameters at the same time may lead to unexpected results, the rules that are given for a specific product group shall be applied, without exclusion of any one of these rules. In principle, the rules are only valid, if they are applied to one parameter in the roofing system, and the others kept unchanged, unless otherwise stated.

As to the application rules given in this annex together with direct application rules in EN 13501-5 the impact on the classification from each of those layers intended to be used in the roofing system shall be considered.

B.2 General rules, valid for every product within a product group

General application rules cannot be given for each parameter in Table 1 of Clause 4. Based on experience with the fire performance of widely used, but specific roof systems (e.g. roof systems with flexible waterproofing layers, insulation boards, metal roof supporting deck (from top to bottom)) the following table lists general rules for a restricted set of parameters.

Whenever rules are available for a product group (as given in B.3.1 to B.3.12) then these shall be used in addition to rules given here.

Parameter	**Rules**
Thickness	After testing of the thinnest and the thickest layer of a product, respectively, the test result is valid for all thicknesses between these margins, if not specified otherwise.
Mass per unit area	After testing of the heaviest and the lightest layer of a product, respectively, the test result is valid for all masses per unit area between these margins, if not specified otherwise.
Density	After testing of the greatest and the smallest density of a product, respectively, the test result is valid for all densities between these margins, if not specified otherwise.

Order of layers in the roofing system	As tested
Reaction-to-fire classification according to EN 13501–1	As tested
Surfacing on lower or upper side of a product	A higher mass per unit area of material having a reaction-to-fire class A1 to A2-s3,d2 is acceptable. This rule excludes the substitution of the external (top) layer.
Roof pitch	Covered by CEN/TS 1187 Test 2 and EN 13501–5

B.3 Product groups

B.3.1 Slates and tiles

B.3.1.1 Non-metallic slates and tiles (reaction-to-fire-class A1 to A2-s3 d2 according to EN 13501-1)

This subclause applies to discontinuously laid non-metallic slates and tiles used as roofing products (reaction-to-fire-class A1 to A2-s3,d2 according to EN 13501-1), which are covered by the following harmonized European Standards EN 490, *Concrete roofing tiles and fittings for roof covering and wall cladding – Product specifications*, EN 1304, *Clay roofing tiles and fittings – Product definitions and specifications*, EN 492, *Fibre-cement slates and fittings – Product specification and test methods*, EN 12326-1, *Slate and stone products for discontinuous roofing and cladding – Part 1: Product specification*.

NOTE Some of the products in this sector are covered by Commission Decision 2000/553/EC.

	Rule
PRODUCT PARAMETERS FOR ROOF COVERINGS/ROOF SYSTEMS	
Type of product	As tested
Product composition	As tested
Reaction-to-fire classification according to EN 13501–1	As tested
Colour (consider also pigments)	As tested; no influence (for class A1 products)
Binder content	Not relevant
Thickness	Test result is valid for all thicknesses greater than tested
Mass per unit area	Test result is valid for all masses per unit area greater than tested
Density	Test result is valid for all densities greater than tested
Geometry (structure, shape and constitutive layers of multi-layer product)	As tested

Air gaps (perpendicular to surface)	As tested
Joints	Not applicable
Surfacing on lower side (backing)	See general rules.
Surfacing on upper side (facing)	See general rules.
Factory (pre-)applied adhesive	As tested
Reinforcement: mass per unit area, type of product; position within layer etc.	A higher mass per unit area of the same reinforcement material having a reaction-to-fire class A1 to A2-s3 d2 is acceptable. A smaller mass per unit area of the same material having reaction-to-fire class B-s1,d0 to F is acceptable. For both options, the specific material shall be kept in the same position within the product.
END-USE PARAMETERS FOR ROOF COVERINGS/ROOF SYSTEMS	
End-use parameters-general	
Number of layers	As tested
Order of layer in the roofing system	As tested
Orientation of each layer	As tested
End-use parameters-support	
Roof pitch	Covered by CEN/TS 1187 and EN 13501–5
Substrate or under-laying construction details	Covered by CEN/TS 1187 and EN 13501–5
Application on existing roofs (“renovation”)	As tested
Spacing of frame elements (non-standard-support)	Not relevant
End-use parameters-mounting and fixing	
Mounting method	As tested
Fixing method (e.g. adhesive)	As tested
Spacing and type of mechanical fixing (fasteners)	A test carried out with the minimum allowable head-lap with maximum batten spacing and with the minimum number of fixings may be taken to apply to all fixing configurations.
Joints	As tested
Air gaps	As tested

B.3.1.2 Metallic tiles

Products dealt with in this subclause are covered by the following harmonized European Standard EN 14783, *Fully supported metal sheet and strip for roofing, external cladding and internal lining – Product specification and requirements*.

No additional rules have been developed in this document.

NOTE Some products in this sector are covered by Commission Decisions 2000/553/EC and 2005/403/EC.

B.3.2 Small elements (reaction-to-fire-class B-s1,d0 to F according to EN 13501-1)

B.3.2.1 General

This subclause applies to discontinuously laid roofing products (reaction-to-fire-class B-s1,d0 to F according to EN 13501-1), that are covered by European Standards.

B.3.2.2 Bitumen shingles

Products dealt with in this subclause are covered by the following harmonized European Standard, EN 544, *Bitumen shingles with mineral and/or synthetic reinforcements - Product specification and test methods*.

	Rule
PRODUCT PARAMETERS FOR ROOF COVERINGS/ROOF SYSTEMS	
Type of product	As tested
Product composition	As tested
Reaction-to-fire classification according to EN 13501–1	As tested
Colour (consider also pigments)	Colour of mineral finishing (e.g. slates, granules) not relevant
Binder content	Not relevant
Thickness	See general rules.
Mass per unit area Thickness and mass per unit area are interrelated. The producer can choose either thickness or mass per unit area.	See general rules.
Density	Not relevant (thickness and mass per unit area cover also density)
Geometry (structure, shape and constitutive layers of multi-layer product)	As tested
Air gaps (perpendicular to surface)	Not relevant
Joints	Not relevant
Surfacing on lower side (backing)	See general rules.
Surfacing on upper side (facing)	See general rules.

Factory (pre-)applied adhesive	As tested
Reinforcement: mass per unit area, type of product; position within layer etc.	For filaments: (a) For lower mass of polyester per unit area the test result is valid. (b) For woven glass or glass fleece with a higher mass per unit area of the same type of product the test result is valid. (c) For polyester reinforcement the results are also valid for the same type of sheet with additional glass fleece (e.g. 2 reinforcements or combination).
END-USE PARAMETERS FOR ROOF COVERINGS/ROOF SYSTEMS	
End-use parameters-general	
Number of layers (details see for each product)	As tested
Order of layer in the waterproofing system	As tested
Orientation of each layer	Not relevant
End-use parameters-support	
Roof pitch	See general rules.
Substrate or under-laying construction details	See CEN/TS 1187 and EN 13501–5
Application on existing roofs (“renovation”)	As tested
Spacing of frame elements (non-standard-support)	Not relevant
End-use parameters-mounting and fixing	
Mounting method	Not relevant
Fixing method (e.g. adhesive)	As tested. Results from tests without adhesives apply to products fixed using adhesives.
Spacing and type of mechanical fixing (fasteners)	As tested, narrower spacing included; type of fastener not relevant
Joints	Test result with overlapped joints allows for overlaps wider than tested.
Air gaps	Not relevant

B.3.2.3 Miscellaneous small elements

Products dealt with in this subclause are miscellaneous small elements such as wooden and polymeric shingles.

No additional rules have been developed in this document.

B.3.3 Reinforced bitumen sheets

This subclause applies to reinforced bitumen sheets for roof waterproofing, which are covered by the following harmonized European Standard, EN 13707, *Flexible sheets for waterproofing – Reinforced bitumen sheets for roof waterproofing – Definitions and characteristic*.

NOTE No common rules are currently available if existing single or multi-layer roof waterproofing systems will be improved by adding different layers on top.

The rules shall be applied to every single layer within the multilayer roofing system in the same way as it is done with other layers belonging to a roof system.

	Rule
PRODUCT PARAMETERS FOR ROOF COVERINGS/ROOF SYSTEMS	
Type of product	As tested
Product composition	As tested
Reaction-to-fire classification according to EN 13501–1	As tested
Colour (consider also pigments)	Colour of mineral finishing (e.g. slates, granules) not relevant
Binder content	Not relevant
Thickness	See general rules.
Mass per unit area	See general rules.
Density	Not relevant (covered by thickness and mass per unit area)
Geometry (structure, shape and constitutive layers of multi-layer product)	Not relevant
Air gaps (perpendicular to surface)	Not relevant
Joints	Not relevant
Surfacing on lower side (backing)	Not relevant
Surfacing on upper side (facing)	Higher amount of non-combustible mineral granules or thicker metal foil surfacing accepted.
Factory (pre-)applied adhesive	As tested

Reinforcement: mass per unit area, type of product; position within layer etc.	For filaments: (a) For lower mass of polyester per unit area the test result is valid. (b) For woven glass or glass fleece with a higher mass per unit area of the same type of product the test result is valid. (c) For polyester reinforcement the results are also valid for the same type of sheet with additional glass fleece (e.g. 2 reinforcements or combination).
END-USE PARAMETERS FOR ROOF COVERINGS/ROOF SYSTEMS	
End-use parameters-general	
Number of layers (details see for each product)	As tested
Order of layer in the waterproofing system	As tested
Orientation of each layer	Not relevant
End-use parameters-support	
Roof pitch	See general rules.
Substrate or under-laying construction details	See CEN/TS 1187 and EN 13501–5
Application on existing roofs (“renovation”)	If an existing roof system classified as $B_{roof}(t1)$ with bitumen sheets needs to be renovated and a new top layer or roof system is required on top of an existing system, then a new test is required with a ‘worst case’ build up as follows: — Wooden planks with a 5 mm gap; — EPS EN 13163 insulation 100 mm; — 1st layer oxidized bitumen sheet with 60 g/m^2 glass fleece; — 2nd layer oxidized bitumen sheet with 200 g/m^2 woven glass; — Place the new top layer or roof system according to practice.
Spacing of frame elements (non-standard-support)	Not relevant
End-use parameters-mounting and fixing	
Mounting method	Not relevant
Fixing method (e.g. adhesive)	If tested loose laid, the results apply to mechanically fastened and partially or fully bonded bitumen applications. If tested partially bitumen bonded the results also apply to fully bitumen bonded applications.
Spacing and type of mechanical fixing (fasteners)	Not relevant
Joints	Not relevant
Air gaps	Not relevant

B.3.4 Plastic and rubber sheets

This subclause applies to plastic and rubber sheets for roof waterproofing, which are covered by the following harmonized European Standard, EN 13956, *Flexible sheets for waterproofing – Plastic and rubber sheets for roof waterproofing - Definitions and characteristics*.

NOTE The following table was developed from experience with single ply sheeting. For special purposes such as renovation, multi-layer roof waterproofing systems may be intended to be used. No common rules are currently available for this purpose.

The rules developed for single layers shall be applied to every single layer within the multilayer roofing system in the same way as it is done with other layers belonging to a roof system.

-	***Rule***
PRODUCT PARAMETERS FOR ROOF COVERINGS/ROOF SYSTEMS	
Type of product	As tested
Product composition	As tested
Reaction-to-fire classification according to EN 13501–1	See general rules.
Colour (consider also pigments)	As tested
Binder content	Not relevant
Thickness	See general rules.
Mass per unit area	See general rules.
Density	Not relevant (covered by thickness and mass per unit area)
Geometry (structure, shape and constitutive layers of multi-layer product)	As tested
Air gaps (perpendicular to surface)	Not relevant
Joints	Not relevant
Surfacing on lower side (backing)	See general rules.
Surfacing on upper side (facing)	See general rules.
Factory (pre-)applied adhesive	Smaller mass per unit area included; for the same material.
Reinforcement: mass per unit area, type of product; position within layer etc.	For filaments: (a) For lower mass of polyester per unit area the test result is valid. (b) For woven glass or glass fleece with a higher mass per unit area of the same type of product the test result is valid. (c) For polyester reinforcement the results are also valid for the same type of sheet with additional glass fleece (e.g. 2 reinforcements or combination).

END-USE PARAMETERS FOR ROOF COVERINGS/ROOF SYSTEMS	
End-use parameters-general	
Number of layers (details see for each product)	As tested
Order of layer in the waterproofing system	See general rules.
Orientation of each layer	Not relevant
End-use parameters-support	
Roof pitch	See general rules.
Substrate or under-laying construction details	See CEN/TS 1187 and EN 13501–5
Application on existing roofs (“renovation”)	As tested
Spacing of frame elements (non-standard-support)	Not relevant
End-use parameters-mounting and fixing	
Mounting method	Not relevant
Fixing method (e.g. adhesive)	As tested
Spacing and type of mechanical fixing (fasteners)	As tested, narrower spacing included; type of fastener not relevant
Joints	Not relevant
Air gaps	Not relevant

B.3.5 Roof-lights

Products dealt with in this subclause are covered by the following harmonized European Standard, EN 1873, *Prefabricated accessories for roofing - Individual roof lights of plastics - Product specification and test methods*, EN 14963, *Roof coverings - Continuous roof-lights of plastics with and without up-stands - Classification, requirements and test methods*.

Not applicable for Test 2.

B.3.6 Glazing systems

Not applicable for Test 2.

B.3.7 Profiled non-metallic sheets

B.3.7.1 Profiled fibre cement sheets

Products dealt with in this subclause are covered by the following harmonized European Standard, EN 494, *Fibre-cement profiled sheets and fittings – Product specification and test methods*. No additional rules have been developed in this document.

NOTE Some of the products in this sector are covered by Commission Decision 2000/553/EC.

B.3.7.2 Profiled bitumen based sheets

Products dealt with in this subclause are covered by the following harmonized European Standard EN 534, *Corrugated bitumen sheets – Product specification and test methods*.

No additional rules have been developed in this document.

B.3.7.3 Miscellaneous profiled non-metallic sheets

No additional rules have been developed in this document.

B.3.8 Composite metallic sandwich panels

Products dealt with in this subclause are covered by the following harmonized European Standard, EN 14509, *Self-supporting double skin metal faced insulating panels - Factory-made products - Specifications*.

No additional rules have been developed in this document.

NOTE Some of the products in this sector are covered by Commission Decision 2006/600/EC.

B.3.9 Profiled metal sheets

Products dealt with in this subclause are covered by European Standards, such as EN 14782, *Self-supporting metal sheet for roofing, external cladding and internal lining - Product specification and requirements*.

NOTE Some of the products in this sector are covered by Commission Decisions 2000/553/EC and 2005/403/EC.

B.3.10 Flat metal sheets

Products dealt with in this Clause are covered by European Standards, such as EN 14783, *Fully supported metal sheet and strip for roofing, external cladding and internal lining - Product specification and requirements*.

NOTE Some of the products in this sector are covered by Commission Decisions 2000/553/EC and 2005/403/EC.

B.3.11 Liquid applied waterproofing kits

At this stage, no additional rules have been developed in this document.

B.3.12 Miscellaneous

Products under this sector are meant to be roof coverings/roof systems not covered by B.3.1 to B.3.11.

Examples for this roof sector are thatched roofs and mastic asphalt.

At this stage, no additional rules have been developed in this document.

Annex C
(normative)

Application rules for test results from CEN/TS 1187 test 3, per product group

C.1 General

This annex gives guidance on the application of external fire test results arising from CEN/TS 1187 Test 3. This is done to assist classification according to EN 13501-5.

Rules for product groups are arranged in this annex following the general structure outlined in Clause 7 of the main document, for product groups and/or components.

NOTE The extent to which an individual component or layer is directly affected/damaged by the testing conditions will be influenced by those layers and components used around them. Consideration of any changes to the EN 13501–5 classification of the roof system by variations to the individual components have been addressed, when specific guidance is available, in the appropriate product groups, C.2-C.3.12 below.

In the tables developed, the term “as tested” is used where an application rule has not been developed for a specific parameter. See definition 3.2.

Rules on the influence of individual parameters shall be developed by application of the procedure(s) outlined in Clause 6 of the main document.

The product groups and/or components are as detailed below.

The rules for individual product groups and/or components are preceded by:

C.2 General rules for Test 3.

The product groups include:

— C.3.1 Slates and Tiles;

  — C.3.1.1 Non-metallic slates and tiles (reaction-to-fire-class A1 to A2 – s3 d2, according to EN 13501-1);

  — C.3.1.2 Metallic Tiles;

— C.3.2 Small elements (reaction-to-fire-class B-s1 d0 to F, according to EN 13501-1);

  — C.3.2.2 Bitumen Shingles;

  — C.3.2.3 Miscellaneous small elements;

— C.3.3 Reinforced bitumen sheets;

— C.3.4 Plastic and rubber sheets;

— C.3.5 Roof-lights;

— C.3.6 Glazing systems;

— C.3.7 Profiled non-metallic sheets;

  — C.3.7.1 Profiled fibre cement Sheets;

  — C.3.7.2 Profiled bitumen-based Sheets;

  — C.3.7.3 Miscellaneous profiled non-metallic sheets;

— C.3.8 Composite metallic sandwich panels;

— C.3.9 Profiled metal sheets;

— C.3.10 Flat metal sheets;

— C.3.11 Liquid applied roof waterproofing kits;

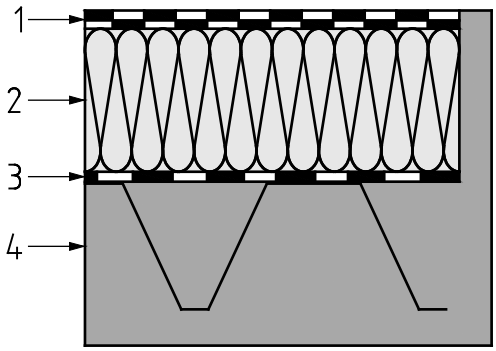
— C.3.12 Miscellaneous.

Clause 4, Table 1 lists the product and associated end-use application parameters that can influence the classification of external fire performance for each of the identified roofing systems. The following analysis indicates how each of these parameters may influence the classification from test results from CEN/TS 1187 Test 3.

This annex considers the possible effect(s) of single or multiple changes to the individual product and end-use application parameters of the roof on the external fire-performance. Since a variation of several parameters at the same time may lead to unexpected results, the rules that are given for a specific product group shall be applied, without exclusion of any one of these rules. In principle, the rules are only valid, if they are applied to one parameter in the roofing system and the others are kept unchanged, unless otherwise stated.

For illustration purposes, the example sketch displayed below shows a possible combination of layers to form a roof system. In this example a roof is shown having flexible waterproofing sheets as uppermost layer (i.e. roof covering(s) as defined according to both CEN/TS 1187 and EN 13501-5). Within such a construction various combinations of layers are possible in practice.

The illustrated example shows a combination of layers in a typical roofing system.



Key

1 roof covering system

2 insulation layer

3 vapour barrier

4 supporting deck

Figure C.1 – Example sketch

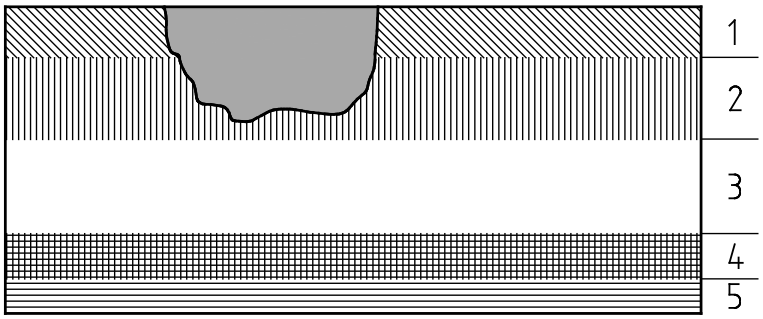
NOTE The rules listed in the following tables only apply if the roof covering products/materials are used in accordance with national provisions on the design and execution of works.

C.2 General rules, valid for every product within a product group

General application rules cannot be given for each parameter in Table 1 of Clause 4. Based on experience with the fire performance of widely used, but specific roof systems (e.g. roof systems built with flexible waterproofing layers, insulation boards, metal roof supporting deck (from top to bottom)), the following table lists rules for a restricted set of parameters.

Whenever rules are available for a product group (as given in C.3.1 to C.3.12) then these shall be used in addition to rules given here.

Parameter	**Rules**
Thickness	After testing of thinnest and thickest layer of product, resp., the test result is valid for all thicknesses between these margins, if not specified otherwise. This general rule is not valid for those products, which are made of numerous layers of different ingredients (like, for instance, reinforced bitumen sheets) in which a change in overall thickness does not describe how internal layers are reorganised.
Mass per unit area	After testing of heaviest and lightest layer of product, resp., the test result is valid for all masses per unit area between these margins, if not specified otherwise. This general rule is not valid for those products, which are made of numerous layers of different ingredients (like, for instance, reinforced bitumen sheets) in which a change in average mass per unit area does not describe variations of internal layers.
Density	After testing of heaviest and lightest layer of product, resp., the test result is valid for all densities per unit area between these margins, if not specified otherwise. This general rule is not valid for those products, which are made of numerous layers of different ingredients. Changes in overall density may not explain important internal variations.

Order of layers in the roofing system	The layer (and its supports) positioned below the lowest layer affected by the fire (influencing the test result) during the CEN/TS 1187 test, may be replaced by any other fire equivalent material. This fire equivalence is judged by having equal or better fire performance (e.g. reaction to fire, thermal capacity, thermal conductivity, …). Layer(s) positioned below the uppermost layer that has not undergone a change relevant to the test result may be replaced by any other layer(s). NOTE Additional national requirements on reaction to fire may apply.
1 uppermost layer (i.e. roof covering(s) as defined according to both CEN/TS 1187 and EN 13501–5) plus any layer between top and lowest affected layers, resp. 2 lowest affected layer 3 uppermost unaffected layer 4 any layer below 3 5 any layer below 4	
Reaction-to-fire classification according to EN 13501–1	Substitution is possible for a component or layer with the same or better reaction-to-fire classification when tested in the same end use application provided that the substitute component or layer is of the same generic product group. This rule excludes the substitution of the external (top) layer.
Surfacing on lower or upper side of a product.	A higher mass per unit area of material having a reaction-to-fire Class A1 to A2-s3 d2 is acceptable. A smaller mass per unit area of material having reaction-to-fire Class B-s1 d0 to F is also acceptable, if not specified otherwise. This rule excludes the substitution of the external (top) layer.
Roof pitch	Covered by CEN/TS 1187 Test 3 or EN 13501–5

C.3 Product groups

C.3.1 Slates and tiles

C.3.1.1 Non-metallic slates and tiles (reaction-to-fire-class A1 to A2 – s3 d2, according to EN 13501-1)

This subclause applies to discontinuously laid non-metallic roofing products (reaction-to-fire-class A1 to A2 – s3, d2 EN 13501-1) that are covered by the following harmonized European Standards e.g. EN 490, *Concrete roofing tiles and fittings for roof covering and wall cladding - Product specifications*; EN 1304, *Clay roofing tiles and fittings - Product definitions and specifications*; EN 492, *Fibre-cement slates and fittings - Product specification and test methods*; EN 12326-1, *Slate and stone products for discontinuous roofing and cladding - Part 1: Product specification*.

NOTE Most products/materials in this sector are covered by EC Decisions such as 2005/553/EC.

	Rules
PRODUCT PARAMETERS FOR ROOF COVERINGS/ROOF SYSTEMS	
Type of product	The test result(s) as used for classification purposes only applies to the parameter specification as tested in the end-use application.
Product composition	The test result(s) as used for classification purposes only applies to the parameter specification as tested in the end-use application.
Reaction-to-fire classification acc. to EN 13501–1	Not applicable (for reaction-to-fire-class A1 products)
Colour (consider also pigments)	No Influence (for reaction-to-fire-class A1 products)
Binder content	No Influence (for reaction-to-fire-class A1 products)
Thickness	Test result is valid for all thicknesses greater than tested.
Mass per unit area	Test result is valid for all masses per unit area greater than tested.
Density	Test result is valid for all densities greater than tested.
Geometry (structure, shape and constitutive layers of multi-layer product)	As tested.
Air gaps (perpendicular to surface)	As tested
Joints	Not applicable
Surfacing on lower side (backing)	Not applicable
Surfacing on upper side (facing)	Not applicable
Self-adhesive	Not applicable
Reinforcement: mass per unit area, type of material; position within layer etc.	Not applicable
END-USE PARAMETERS FOR ROOF COVERINGS/ROOF SYSTEMS	
End-use parameters-general	
Number of layers (details see for each product)	As tested
order of layer in the roofing system	As tested
Orientation of each layer	As tested
End-use parameters-support	
Roof pitch	Covered by CEN/TS 1187 and EN 13501–5
Substrate or under-laying construction details.	If substrate is addressed not applicable. If under-laying construction is addressed, regard as separate layer; as tested.

Application on existing roofs ("renovation")	As tested
Spacing of frame elements (non-standard-support)	As tested
End-use parameters-mounting and fixing	
Mounting method	As tested
Fixing method (e.g. adhesive)	As tested
spacing and type of mechanical fixing (fasteners)	As tested
Joints	As tested
Air gaps	As tested

C.3.1.2 Metallic Tiles

Products covered in this subclause are defined in the following harmonized European Standards, EN 14783, *Fully supported metal sheet and strip for roofing, external cladding and internal lining - Product specification and requirements*, EN 506, *Roofing products of metal sheet - Specification for self-supporting products of copper or zinc sheet*, EN 508, *Roofing products from metal sheet - Specification for self-supporting products of steel, aluminium or stainless steel sheet* (Part 1 covering steel, Part 2 covering aluminium, Part 3 covering stainless steel).

No additional rules have been developed in this document.

NOTE Most products in this sector are covered by EC Decisions such as 2005/553/EC and 2005/403/EC.

C.3.2 Small elements (reaction-to-fire-class B – s1, d0 to F; according to EN 13501-1)

C.3.2.1 General

This subclause applies to discontinuously laid roofing products (reaction-to-fire-class B1-s1, d0 to F – according to EN 13501-1) that may be covered by European Standards.

C.3.2.2 Bitumen Shingles

Products covered in this subclause are defined in the following harmonized European Standard, EN 544, *Bitumen shingles with mineral and/or synthetic reinforcements - Product specification and test methods*.

	Rules
PRODUCT PARAMETERS FOR ROOF COVERINGS/ROOF SYSTEMS	
Type of product	As tested
Product composition	Can be varied, following these rules: — A combustible reinforcement can be replaced by a chemically identical one, having lower mass per unit area, provided it stays at the same position in the shingle. — A non-combustible (NC) reinforcement can replace a

	combustible one, provided it stays at the same position in the shingle. — A non-combustible (NC) reinforcement can be replaced by a heavier NC one, if its weight remains lower than 120 g/m^2 and provided it stays at the same position in the shingle. — A reduction in the amount of combustible (bituminous) coating is accepted when combined with a non-combustible (NC) reinforcement (This reduction can be as much as 20 %).
Reaction-to-fire classification acc. to EN 13501–1	See general rules.
Colour (consider also pigments)	Colour of mineral finishing (e.g. slates, granules) not relevant
Binder content	Not relevant
Thickness	Not relevant
Mass per unit area	See product composition.
Density	Not relevant
Geometry (structure, shape and constitutive layers of multi-layer product)	Position of reinforcements within the product shall remain unchanged. Constitution and mass per unit area may change as described in “Product Composition”.
Air gaps (perpendicular to surface)	Not relevant
Type of joints	Test result with overlapped joints allows for overlaps wider than tested.
Surfacing on lower side (backing)	See general rules.
Surfacing on upper side (facing)	Higher amount of non-combustible mineral finishing, including metal-foil surfacing, is acceptable.
Self-adhesive	The total mass of combustible coating (bitumen or modified bitumen) and gluing material of the system shall remain at a level not exceeding the one of the tested system.
Reinforcement: mass per unit area, type of product; position within layer etc.	See product composition.
END-USE PARAMETERS FOR ROOF COVERINGS/ROOF SYSTEMS	
End-use parameters-general	
Number of layers (details see for each product)	As tested

order of layer in the waterproofing system	As tested
Orientation of each layer	Not relevant
End-use parameters-support	
Roof pitch	See general rules.
Substrate or under-laying construction details	For decks complying with CEN/TS 1187:2012, 6.4.2.2, see rules in CEN/TS 1187:2012, 6.4.2.2 and 6.10.2.
Application on existing roofs ("renovation").	If the test was conducted on a roof covering, installed on a supporting deck meeting following requirements: — wood particle board complying with EN 309, being at least 19 mm thick, not treated with any fire-rating additive; — deck presenting a joint between two particleboards; — this joint being parallel to the long side of the test specimen; — and located 300 mm from its middle then the result is also valid for roof coverings in which the supporting deck was itself already covered with bitumen shingles, no new insulation material being added, provided that: — this old system was itself B_{ROOF}(t3); — or deemed to be B_{ROOF}(t3); — the supporting deck is made of concrete (brickwork) or lightweight concrete, with or without insulation boards.
Spacing of frame elements (non-standard-support)	See 6.10.2.1 of CEN/TS 1187:2012
End-use parameters-mounting and fixing	
Mounting method	As tested
Fixing method (e.g. adhesive)	As tested
Spacing and type of mechanical fixing (fasteners)	As tested, narrower spacing included; type of fastener not relevant
Joints	Test result with overlapped joints allows for overlaps wider than tested.
Air gaps	Not relevant

C.3.2.3 Miscellaneous small elements

This sector covers miscellaneous small elements such as wooden and polymeric shingles.

No additional rules have been developed in this document.

C.3.3 Reinforced bitumen sheets

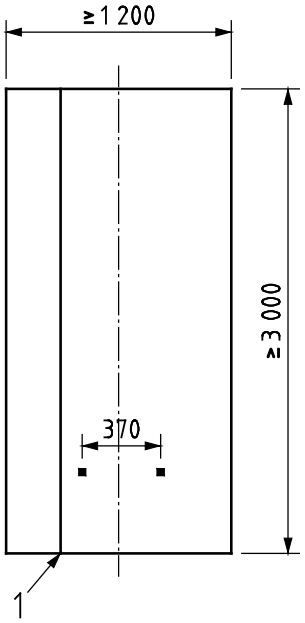
C.3.3.1 General

This subclause applies to reinforced bitumen sheets for roof waterproofing that are covered by the following harmonized European Standard, EN 13707, *Flexible sheets for waterproofing - Reinforced bitumen sheets for roof waterproofing – Definition and characteristics*.

Because the extension rules are based on true testing, gathered from past experience, historical ways of building bituminous roofing represents the basis of present rules. Therefore, to be able to extend as much as possible from a tested system to alternative systems, the following “typical” system shall be tested.

C.3.3.2 Typical roof waterproofing system

Supporting deck: = wood particle board complying with EN 309 being at least 19 mm thick, not treated with any fire-rating additive. This supporting deck presents a joint between two particleboards, this joint being parallel to the long side of the test specimen and located 300 mm from its middle axis (see Figure C.2).



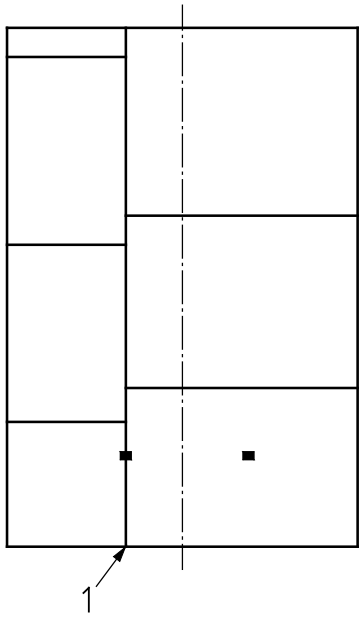
Key

1 Longitudinal joint in the supporting deck

Figure C.2 – Dimensions of the supporting deck of the test specimen for reinforced bitumen sheets

The supporting deck may also comply with the description given in CEN/TS 1187:2012, 6.4.2.2.

Insulation board: = mineral wool, with a thickness from 40 mm to 60 mm, having a density of at least 120 Kg/m^3. This board can be bitumen coated or not, but shall comply with an agreement which allows its usage below flexible waterproofing membranes. These boards will be screwed on the particleboard (5 screws/m^2) and will be assembled in such a way that a joint, parallel to the long side of the test specimen, is situated under the left hand burning brand. The other boards are staggered. (See Figure C.3).



Key

1 longitudinal joint in the insulation layer. Position under the left hand burning brand

Figure C.3 – Outline of insulation boards with one longitudinal joint and staggered joints parallel to the short side of the specimen

Waterproofing system: The installation of the different layers should take care of the following joints positions.

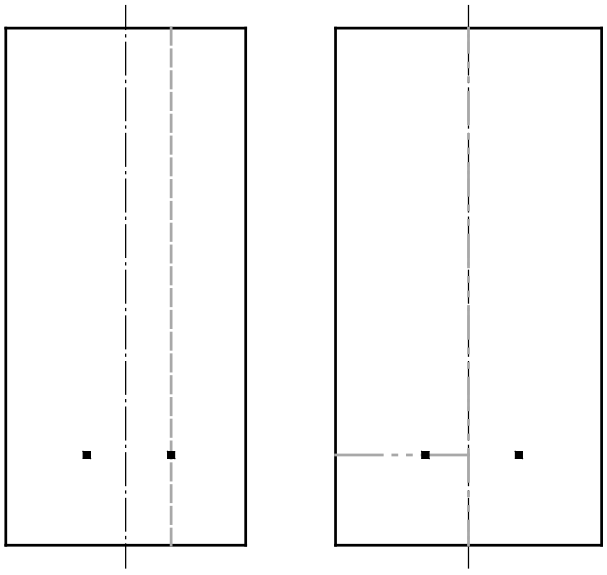
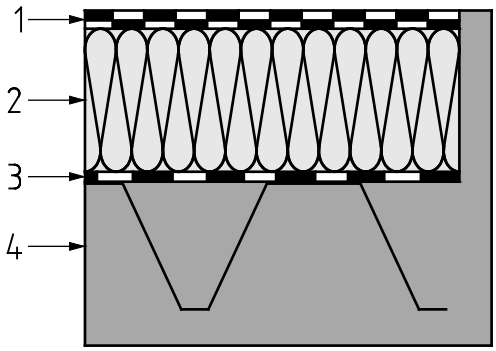


Figure C.4 – Position of joints. Left hand side: joint in the first (lower) layer of a double-layer roof waterproofing system. Right hand side: joints both in the upper layer of a double layer roof waterproofing system and in a single-layer waterproofing system

Several ways of fastening (welding, gluing, mechanical fastening, etc.) are possible.



Key

1 roof covering system

2 insulation layer

3 vapour barrier

4 supporting deck

Figure C.5 – Example sketch

	Rules. These extension rules only apply if original testing was done on the typical system described above.
PRODUCT PARAMETERS FOR ROOF COVERINGS/ROOF SYSTEMS	Used as single or multi layer waterproofing system
Type of product	As tested
Product composition	Can vary following these rules: — A combustible reinforcement may be replaced by a chemically identical one, having lower mass per unit area, provided it stays at the same position in the membrane. — A non-combustible (NC) reinforcement may replace a combustible one, provided it stays at the same position in the membrane. — A non-combustible (NC) reinforcement may be replaced by a heavier NC one, if its weight remains lower than 120 g/m^2 and provided it stays at the same position in the membrane. — Provided the results were obtained on the typical system (see above), a reduction in the amount of bituminous coating is accepted.
Reaction-to-fire classification acc. to EN 13501–1	See general rules.
Colour (consider also pigments)	Colour of mineral finishing (e.g. slates, granules) not relevant
Binder content	Not relevant
Thickness	Not relevant
Mass per unit area	See product composition.
Density	Not relevant
Geometry (structure, shape and constitutive layers of multi-layer	Position of reinforcements within the membrane shall remain unchanged. Constitution and mass per unit area may change as

product)	described in “Product Composition”.
Air gaps (perpendicular to surface)	Not relevant
Type of joints	Test result with overlapped joints allows for overlaps wider than tested.
Surfacing on lower side (backing)	See general rules.
Surfacing on upper side (facing)	Higher amount of non-combustible mineral finishing e.g. for same type of slate/chips; including metal foil surfacing.
Self-adhesive	The total mass of combustible bitumen and gluing material of the system shall remain at a level not exceeding the one from the tested system. This means that membranes from a heat welded system may be heavier (thicker, with more bituminous coating) than the membranes from a mopped system, simply because the amount of mopping bitumen is “integrated” in the layers to be welded.
Reinforcement: mass per unit area, type of product; position within layer etc.	See product composition.
END-USE PARAMETERS FOR ROOF COVERINGS/ROOF SYSTEMS	
End-use parameters-general	
Number of layers (details see for each product)	As tested
order of layer in the waterproofing system	As tested
Orientation of each layer	Not relevant
End-use parameters-support	
Roof pitch	See general rules.
Substrate (Supporting deck) For decks complying with 6.4.2.2 of CEN/TS 1187:2012	See rules in 6.4.2.2 and 6.10.2 of CEN/TS 1187:2012.
Substrate (Supporting deck). For decks built according to the “typical” construction,	The result obtained for the typical specimen is valid for systems with equivalent waterproofing layer(s) (see product composition): — installed on trapezoidal profiled steel decks, the steel being plain, perforated or with holes, insulated with boards chosen from mineral fibres, cellular glass or perlite (see also § substrate – insulation material); — Installed on wood or wood particleboards, insulated with boards chosen from mineral fibres, cellular glass or perlite (see also § substrate – insulation material); — Installed on decking made of concrete (brickwork) or lightweight concrete, non-insulated or insulated with boards chosen from mineral fibres, cellular glass or perlite (see also § substrate – insulation material).
Substrate (insulation material).	The result obtained for this typical specimen is valid for systems in

	which the insulation material is made of boards with or without factory applied bituminous coating, made from mineral wool, perlite, cellular glass, being approved for this usage and having: — a thickness at least 30 mm; — a thermal conductivity λ at least 0,035 W/m°K; — a density ρ at least 110 kg/m^3. Systems with no insulation material having supporting decks made of concrete (brickwork) or lightweight concrete. Test results obtained on stone wool can be extended to cellular glass.
Application on existing roofs (“renovation”)	The result obtained for this typical specimen is valid for systems in which the supporting deck was itself already waterproofed, provided complementary insulation material is installed, these boards complying with: insulation material made of boards with or without factory applied bituminous coating, made from mineral wool, perlite, cellular glass, being approved for this usage and having: — a thickness at least 30 mm; — a thermal conductivity λ at least 0,035 W/m°K; — a density ρ at least 110 kg/m^3. Systems in which the supporting deck was itself already waterproofed, no new insulation material being added, provided that: — this old system was itself B_{ROOF}(t3); — or demed to be B_{roof}(t3); — the supporting deck is trapezoidal profiled steel with an insulation material, or made of concrete (brickwork) or lightweight concrete, with or without insulation boards. The separation layer (if any added) is made of glass fleece or polyester geotextile with mass per unit area not greater than 300 g.
Spacing of frame elements (non-standard-support)	See 6.10.2.1 of CEN/TS 1187:2012.
End-use parameters-mounting and fixing	
Mounting method	Not relevant
Fixing method (e.g. adhesive)	Any result obtained on a system in which the layers were adhered thanks to mopping bitumen, is valid for equivalent systems in which the layers are welded together and to the substrate, provided that: — the total amount of combustible coating bitumen in the new system is not higher than the total amount of bitumen, coating + mopping from the tested system; — The coating bitumen of the individual layers is unchanged; — The reinforcements of the individual layers are identical and

	in same position. Any result obtained on a system in which the layer(s) is (are) mechanically fastened is valid for a system in which equivalent layer(s) is (are) heat fused provided that: — the total amount of combustible coating bitumen in the new system is not higher than the total amount of bitumen, from the tested system; — The coating bitumen of the individual layers is unchanged; — The reinforcements of the individual layers are identical and in same position. Any result obtained on a system in which the layers were fully adhered, is valid for equivalent systems in which: — the bottom layer is bonded to the substrate through a perforated felt complying with the national regulation; — the bottom layer is partly welded; — the bottom layer is self adhesive provided that — the total amount of combustible coating bitumen in the new system is not higher than the total amount of bitumen, from the tested system; — The coating bitumen of the individual layers is unchanged; — The reinforcements of the individual layers are identical and in same position.
spacing and type of mechanical fixing (fasteners)	As tested, narrower spacing included; type of fastener not relevant
Joints	Test result with overlapped joints allows for overlaps wider than tested.
Air gaps	Not relevant

C.3.4 Plastic and rubber sheets

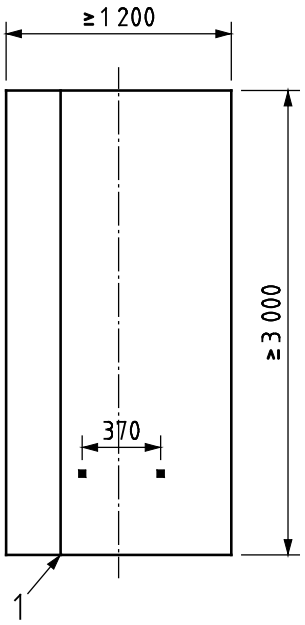
C.3.4.1 General

This subclause applies to plastic and rubber sheets for roof waterproofing that are covered by the following harmonized European Standard, EN 13956, *Flexible sheets for waterproofing – Plastic and Rubber Sheets for roof waterproofing – Definitions and Characteristics*.

Because the extension rules are based on true testing, gathered from past experience, historical ways of building synthetic single ply roofing represents the basis of present rules. Therefore, to be able to extent as much as possible from a tested system to alternative ones, a “typical” system shall be tested.

C.3.4.2 Typical roof waterproofing system

Supporting deck: = wood particle board complying with EN 309, being at least 19 mm thick, not treated with any fire-rating additive. This supporting deck presents a joint between two particleboards, this joint being parallel to the long side of the test specimen and located 300 mm from its middle axis (see Figure C.6).



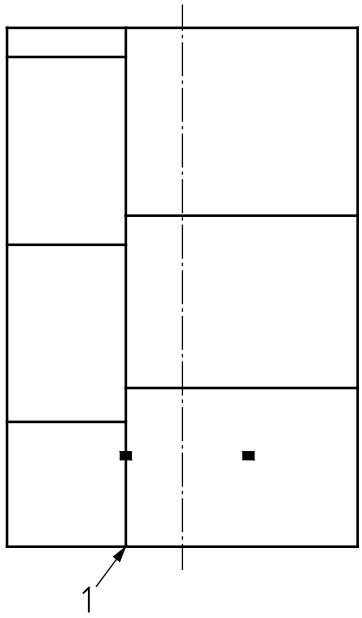
Key

1 longitudinal joint in the supporting deck, located 300 mm from its middle axis

Figure C.6 – Dimensions of the supporting deck of the test specimen for plastic and rubber sheets

The supporting deck may also comply with the description given in CEN/TS 1187:2012, 6.4.2.2.

Insulation board: = mineral wool, with a thickness from 40 mm to 60 mm, having a density of at least 120 Kg/m^3. This board shall comply with an agreement, which allows its usage below flexible waterproofing membranes. These boards will be screwed on the particleboard (5 screws/m^2) and will be assembled in such a way that a joint, parallel to the long side of the test specimen, is situated under the left hand burning brand. The other boards are staggered. (See Figure C.7).



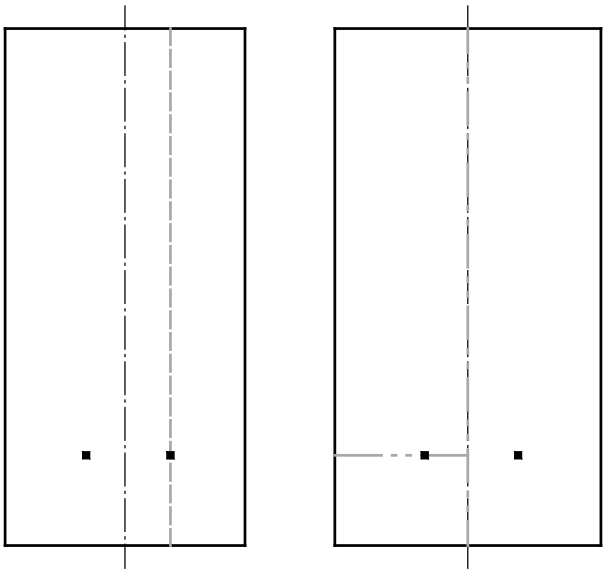
Key

1 longitudinal joint in the insulation layer. Position under the left hand burning brand

Figure C.7 – Outline of insulation boards with one longitudinal joint and staggered joints parallel to the short side of the specimen

Waterproofing system: The installation of the different layers should take care of the following joints positions.

Most frequently (if not always), plastic and rubber sheets are used as single plies. The single ply then shall be considered as the uppermost layer (i.e. roof covering(s) as defined according to both CEN/TS 1187 and EN 13501-5).



Bottom layer / Top layer

Figure C.8 – Position of joints. Left hand side: joint in the first (lower) layer of a double-layer roof waterproofing system. Right hand side: joints both in the upper layer of a double layer roof waterproofing system and in a single-layer waterproofing system

Several ways of fastening (welding, gluing, mechanical fastening, etc.) are possible.

	Rules. These extension rules only apply if original testing was done on the typical system described above
PRODUCT PARAMETERS FOR ROOF COVERINGS/ROOF SYSTEMS	
Type of product	As tested
Product composition	Can vary following these rules: — A combustible reinforcement may be replaced by a chemically identical one, having lower mass per unit area, provided it stays at the same position in the membrane. — A non-combustible (NC) reinforcement may replace a combustible one, provided it stays at the same position in the membrane. — A non-combustible (NC) reinforcement may be replaced by a heavier NC one, if its weight remains lower than 120 g/m^2 and provided it stays at the same position in the membrane. — Provided the results were obtained on the typical system, a reduction in the amount of plastic or rubbery coating is accepted.
Reaction-to-fire classification acc. to EN 13501–1	See general rules.
Colour (consider also pigments)	Not relevant

Binder content	Not relevant
Thickness	See product composition.
Mass per unit area	See product composition.
Density	Not relevant
Geometry (structure, shape and constitutive layers of multi-layer product)	Position of reinforcements within the membrane shall remain unchanged. Constitution and mass per unit area may change as described in “Product Composition”.
Air gaps (perpendicular to surface)	Not relevant
Joints	Test result with overlapped joints allows for overlaps wider than tested.
Surfacing on lower side (backing)	With no variation elsewhere, a test result that was obtained with a mechanically fastened sheet is valid for an adhered membrane, as long as the total amount of combustible plastic or rubbery compound is maintained at the same level.
Surfacing on upper side (facing)	Not relevant
Self-adhesive	The total mass of combustible plastic and rubbery compound plus gluing material of the system shall remain at a level not exceeding the combustible compound from the tested system.
Reinforcement: mass per unit area, type of product; position within layer etc.	See product composition.
END-USE PARAMETERS FOR ROOF COVERINGS/ROOF SYSTEMS	
End-use parameters-general	
Number of layers (details see for each product)	As tested
order of layer in the waterproofing system	As tested
Orientation of each layer	Not relevant
End-use parameters-support	
Roof pitch	See general rules.
Substrate (Supporting deck)	
Substrate (Supporting deck). For decks complying with 6.4.2.2 of CEN/TS 1187:2012	See rules in 6.4.2.2 and 6.10.2 of CEN/TS 1187:2012.
Substrate (Supporting deck). For decks built according to the “typical” construction	The result obtained for the typical specimen is valid for systems with equivalent waterproofing layer(s) (see product composition): — Installed on trapezoidal profiled steel decks, the steel being plain, perforated or with holes, insulated with boards chosen from mineral fibres, cellular glass or perlite (see also § substrate – insulation material). — Installed on wood or wood particleboards, insulated with boards chosen from mineral fibres, cellular glass or perlite

	(see also § substrate – insulation material). — Installed on decking made of concrete (brickwork) or lightweight concrete, non-insulated or insulated with boards chosen from mineral fibres, cellular glass or perlite (see also § substrate – insulation material).
Substrate (insulation material).	The result obtained for the typical specimen is valid for systems in which the insulation material is made of boards made from mineral wool, perlite, cellular glass, being approved for this usage and having: — a thickness at least 30 mm; — a thermal conductivity λ at least 0,035 W/m°K a density ρ at least 110 kg/m^3. Systems with no insulation material having supporting decks made of concrete (brickwork) or lightweight concrete. Test results obtained on stone wool can be extended to cellular glass.
Application on existing roofs (“renovation”)	The result obtained for the typical specimen is valid for systems in which the supporting deck was itself already waterproofed, provided complementary insulation material is installed, these boards complying with: insulation material made of boards made from mineral wool, perlite, cellular glass, being approved for this usage and having: — a thickness at least 30 mm; — a thermal conductivity λ at least 0,035 W/m°K; — a density ρ at least 110 kg/m^3. Systems in which the supporting deck was itself already waterproofed, no new insulation material2 being added, provided that: — this old system was itself B_{ROOF}(t3)or deemed to be B_{ROOF}(t3); — the supporting deck is trapezoidal profiled steel with an insulation material, or made of concrete (brickwork) or lightweight concrete, with or without insulation boards. The separation layer (if any added) is made of glass fleece or polyester geotextile with mass per unit area not greater than 300 g.
Spacing of frame elements (non-standard-support)	As tested
End-use parameters-mounting and fixing	
Mounting method	As tested
Fixing method (e.g. adhesive)	Any result obtained on a system in which the layers were adhered, is valid for equivalent systems in which the layers are welded together and to the substrate, provided that: — The total amount of combustible plastic and rubbery coating in the new system is not higher than the total amount of plastic

	and rubbery coating + glue from the tested system. — The plastic and rubbery coating of the individual layers is unchanged. — The reinforcements of the individual layers are identical and in same position. Any result obtained on a system in which the layer(s) is (are) mechanically fastened is valid for a system in which equivalent layer(s) is (are) heat fused provided that: — The total amount of combustible plastic and rubbery coating in the new system is not higher than the total amount plastic and rubbery coating, from the tested system. — The plastic and rubbery coating of the individual layers is unchanged. — The reinforcements of the individual layers are identical and in same position. Any result obtained on a system in which the layers were fully adhered, is valid for equivalent systems in which: — the bottom layer is bonded to the substrate through a perforated felt complying with the national regulation; — the bottom layer is partly welded; — the bottom layer is self adhesive. provided that — the total amount of combustible plastic and rubbery coating in the new system is not higher than the total amount of plastic and rubbery coating, from the tested system; — the plastic and rubbery coating of the individual layers is unchanged; — the reinforcements of the individual layers are identical and in same position.
spacing and type of mechanical fixing (fasteners)	As tested, narrower spacing included; type of fastener not relevant
Joints	Test result with overlapped joints allows for overlaps wider than tested.
Air gaps	Not relevant

C.3.5 Roof-lights

Products covered in this subclause are defined in the following harmonized European Standards, EN 1873, *Prefabricated accessories for roofing - Individual roof lights of plastics - Product specification and test methods*, EN 14963, *Roof coverings - Continuous rooflights of plastics with or without upstands - Classification, requirements and test methods*, EN 14351-1, *Windows and doors - Product standard,*

performance characteristics - Part 1: Windows and external pedestrian doorsets without resistance to fire and/or smoke leakage characteristics.

No additional rules have been developed in this document.

Not applicable for Test 3.

C.3.6 Glazing systems

Not applicable for Test 3.

C.3.7 Profiled non-metallic sheets

C.3.7.1 Profiled fibre cement sheets

Products covered in this subclause are defined in the following harmonized European Standard, EN 494, *Fibre-cement profiled sheets and fittings - Product specification and test methods*.

No additional rules have been developed in this document.

NOTE Most products in this sector are covered by EC Decision 2000/553/EC.

C.3.7.2 Profiled bitumen-based Sheets

Products covered in this subclause are defined in Product Standards such as EN 534, *Corrugated bitumen sheets - Product specification and test methods*.

No additional rules have been developed in this document.

C.3.7.3 Miscellaneous profiled non-metallic sheets

Products covered in this subclause may be defined in Product Standards such as EN 1013, *Light transmitting single skin profiled plastics sheets for internal and external roofs, walls and ceilings - Requirements and test methods*.

No rules available at present. The influence of individual parameters not covered by the general rules will require separate testing.

C.3.8 Composite metallic sandwich panels

Products covered in this subclause are defined in the following harmonized European Standard, EN 14509, *Self-supporting double skin metal faced insulating panels - Factory made products - Specifications*.

No additional rules have been developed in this document.

NOTE Some products in this sector are covered by EC Decision 2006/600/EC.

C.3.9 Profiles metal sheets

Products covered in this subclause are defined in the following harmonized European Standard: EN 14782, *Self-supporting metal sheets for roofing, external cladding and internal lining — Product specification and requirements*.

No additional rules have been developed in this document.

NOTE Most products in this sector are covered by EC Decision 2000/553/EC and 2005/403/EC.

C.3.10 Flat metal sheets

Products covered in this subclause are defined in harmonized European Standard, EN 14783, *Fully supported metal sheet and strip for roofing, external cladding and internal lining - Product specification and requirements*.

No additional rules have been developed in this document.

NOTE Most products in this sector are covered by EC Decision 2000/553/EC and 2005/403/EC.

C.3.11 Liquid applied roof watering kits

No additional rules have been developed in this document.

C.3.12 Miscellaneous

Roofs under this sector are meant to be systems not covered by C.3.1 to C.3.11. Examples for this roof sector are thatched roofs, mastic asphalt, etc.

No additional rules have been developed in this document.

Annex D
(normative)

Application rules for test results from CEN/TS 1187 Test 4 for individual product groups

D.1 General

This annex gives guidance on the application of external fire test results arising from CEN/TS 1187 Test 4; this is done to assist classification according to EN 13501-5.

Rules for roofing systems are arranged in this annex following the general structure outlined in Clause 7 of the main document for product groups and/or components.

NOTE The extent to which an individual component or layer is directly affected/damaged by the testing conditions will be influenced by those layers and components used around them.

In the tables developed, the term ‘as tested’ is used when an application rule does not exist for a specific parameter. See definition 3.2.

Rules on the influence of the individual parameters not covered in this annex shall be developed by application of the procedure(s) outlined in Clause 6 of the main document.

The rules for individual product groups are preceded by:

D.2 General rules for Test 4.

The product groups are as detailed below:

— D.3.1 Slates and Tiles;

  — D.3.1.1 Non-metallic slates and tiles;

  — D.3.1.2 Metallic slates and tiles;

— D.3.2 Small Elements;

  — D.3.2.2 Bitumen shingles;

  — D.3.2.3 Miscellaneous small elements e.g. plastic tiles;

— D.3.3 Reinforced bitumen sheets;

— D.3.4 Plastic and rubber sheets;

— D.3.5 Roof-lights;

— D.3.6 Glazing systems;

— D.3.7 Profiled non-metallic sheets;

  — D.3.7.1 Profiled fibre cement sheets;

- D.3.7.2 Profiled bitumen based sheets;
- D.3.7.3 Miscellaneous profiled non-metallic sheets;

— D.3.8 Composite (including metal faced) sandwich panels;

— D.3.9 Profiled metal sheets;

— D.3.10 Flat metal sheets;

— D.3.11 Liquid applied roof waterproofing kits;

— D.3.12 Miscellaneous.

Clause 4, Table 1 lists the product parameters and associated end use application parameters that can influence the classification of the external fire performance for each of the identified roofing systems. The analysis in this annex relates to the rules for CEN/TS 1187 Test 4 and indicates how each of these product and end use parameters can influence the classification according to EN 13501-5.

This annex considers the possible effect(s) of single or multiple changes to the individual product and end-use application parameters of the roof on the external fire performance. Since a variation of several parameters at the same time may lead to unexpected results, the rules that are given for a specific product group shall be applied, without exclusion of any one of these rules. In principle, the rules are only valid, if they are applied to one parameter in the roofing system, and the others are kept unchanged, unless otherwise stated.

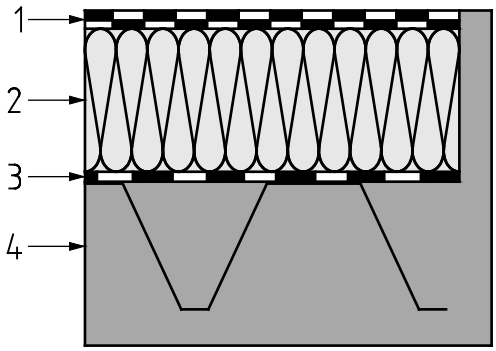
NOTE Within this annex the following definitions apply:

[a] Combustible is defined as products with a reaction-to-fire-class B – s1, d0 to E when classified to EN 13501–1;

[b] Non-combustible is defined as products with a reaction-to-fire-class A1 to A2–s3, d2 when classified to EN 13501–1.

For illustration purposes, the example sketch displayed below shows a possible combination of layers to form a roof system. In this example a roof is shown having flexible waterproofing sheets as uppermost layer (i.e. roof covering(s) as defined according to both CEN/TS 1187 and EN 13501-5). Within such a construction various combinations of layers are possible in practice.

The illustrated example combines products from roof sector (uppermost layer (i.e. roof covering(s) as defined according to both CEN/TS 1187 and EN 13501-5) with an insulation layer and a vapour barrier and a supporting deck.



Key

1 roof covering system

2 insulation layer

3 vapour barrier

4 supporting deck

Figure D.1 – Example sketch

D.2 General EXAP rules for CEN/TS 1187 test 4, valid for every product within a product group

General application rules cannot be given for each parameter in Table 1 of Clause 4. Based on experience with the fire performance of widely used, but specific roof systems (e.g. Roof systems built with flexible waterproofing layers, insulation boards, metal roof supporting deck (from top to bottom)), the following table lists rules for a restricted set of parameters.

Whenever rules are available for a product group (as given in D.3.1 to D.3.12) then these should be used in addition to rules given here.

General rules, valid for every product within a product group	**Rules**
Thickness or Mass per unit area or Density	Following the classification of the roofing systems to EN 13501–5 using the maximum and minimum values of the given parameter for the component layer under investigation, where no change in class occurs, the resulting classification for the roofing system is valid within and including the limits of the component layer.
Position of layer	The extent to which individual layers are directly affected/damaged by the heat source will be influenced by those layers used around them. Therefore, no general rules are available. Where specific guidance is available it has been included in the relevant sectors D.3.1-D.3.12 below.
Reaction-to-fire classification (EN 13501–1) of any layer in the roofing system	Substitution is possible for a component or layer with the same or better reaction-to-fire classification when tested in the same end use application provided that the substitute component or layer is of the same generic product group. Note that this rule excludes the substitution of the external (top) layer.

Surfacing on lower side (backing) of any layer in the roof system.	The % of organic content of the surfacing product (by mass) shall not be increased. Note that this rule excludes the substitution of the external (top) layer.
Surfacing on upper side (facing) of any layer in the roof system.	The % of organic content of the surfacing product (by mass) shall not be increased. Note that this rule excludes the substitution of the external (top) layer.
Roof pitch	Covered by CEN/TS 1187 Test 4 and EN 13501–5

D.3 Product groups

D.3.1 Slates and tiles

D.3.1.1 Non-metallic slates and tiles

This subclause applies to discontinuously laid non-metallic slates and tiles used as roofing products (reaction-to-fire-class A1 or A2 – s3,d2 according to EN 13501-1), which may be covered by the following harmonized European Standards, EN 490, *Concrete roofing tiles and fittings for roof covering and wall cladding – Product specifications*, EN 1304, *Clay roofing tiles and fittings – Product definitions and specifications*, EN 492, *Fibre-cement slates and fittings – Product specification and test methods*, EN 12326-1, *Slate and stone products for discontinuous roofing and cladding – Part 1: Product specification*.

NOTE Many of the products/materials in this sector are covered by EC Decisions such as 2000/553/EC.

Non metallic slates and tiles – D.3.1.1	**Rules**
PRODUCT PARAMETERS FOR ROOF COVERINGS/ROOF SYSTEMS	
Type of product	The product shall be tested with the maximum % organic content by mass or volume. The results shall be applicable to any similar product with lower organic content.
Product composition	The product shall be tested with the maximum % organic content by mass or volume. The results shall be applicable to any similar product with lower organic content.
Reaction-to-fire classification acc. to EN 13501–1	Not applicable for external (top) layer
Colour *and reflectivity* (also consider pigments)	No influence, but refer to product composition.
Binder content	The product shall be tested with the maximum % organic content by mass or volume. The results shall be applicable to any similar product with lower organic content.
Thickness	See 'general rule' in D.2.
Mass per unit area	
Density of the material	

Geometry (structure, shape and constitutive layers of multi-layer product)	See 'End-use parameters/mounting and fixing'.
Air gaps (perpendicular to surface)	
Joints	
Surfacing on lower side (backing)	See 'general rule' in D.2.
Surfacing on upper side (facing)	
Factory pre-applied adhesive	Not generally applicable – Use the classification from results as tested, if required.
Reinforcement: mass per unit area, type of material; position within layer etc.	
END-USE PARAMETERS FOR ROOF COVERINGS/ ROOF SYSTEMS	
End-use parameters-general	
Number of layers (see details for each product)	See 'mounting and fixing' subclause below.
order of layer in the roofing system	
Orientation of each layer	
END-USE PARAMETERS-SUPPORT	
Roof pitch	To be tested in accordance with CEN/TS 1187 Test 4 and EN 13501–5
Substrate or under-laying construction details	See 'mounting and fixing' subclause below.
Application on existing roofs ("renovation")	Not applicable to this product type. Any damaged external roof covering should be removed and replaced, as per original classified roof system.
Mounting method	The products shall be laid in accordance with the manufacturer's laying specifications, with the minimum permitted timber batten size. OPTION 1 - Tiles/slates shall be laid and tested on battens with an underlay beneath. The results apply for all roofs with underlay. For underlays positioned below the tiles /slates which have not been damaged (see CEN/TS 1187:2012, 3.3) in the test they may be substituted with a similar layer (with a reaction to fire classification according to EN 13501–1 equal to or better when tested in the same end use applications) as follows: — An unsupported underlay; — A supported underlay;

	— A rigid underlay. OPTION 2 - Tiles/slates shall be tested on battens without an underlay. The results apply for all roofs without underlay. OPTION 3 - They shall be tested with the actual roof construction, including applications where metal battens or other proprietary systems are used and shall only apply to the roof configuration tested.
Fixing method (e.g. adhesive)	As tested
Spacing and type of mechanical fixing (fasteners)	A test should be carried out with the minimum allowable head-lap, with maximum batten spacing and maximum number of fixings (both nails and clips as appropriate). The results may be taken to apply to all greater laps and smaller batten spacing, and reduced number of fixings.
Joints	Slates and tiles are discontinuously laid. Therefore the test result obtained using one head-lap shall apply to all head-lap joints with greater lap dimensions. In the case of side laps, the test result obtained with one lap will apply to all greater laps. In the test, any underlay should be laid with horizontal and vertical overlap joints across the centre of the test specimen.
Air gaps	Air gaps are an integral part of this type of roof construction. See details above in ‘mounting method’.
INSULATION LAYER	**Rules**
PRODUCT PARAMETR FOR ROOF COVERINGS /ROOF SYSTEMS	
Type of material	As tested
Product composition	As tested
Reaction to fire classification to EN 13501–1	See ‘general rules’ in D.2.
Colour [also consider pigments]	Not relevant
Binder content	Not relevant except for insulation materials containing additional organic binder e.g. mineral fibre boards. Lower binder content of the same binder type is valid provided that the density is within the tested limits.
INSULATION LAYER	
Thickness	Where the roof covering system is laid and tested on an insulation layer, the classification obtained shall apply to the insulation thicknesses between those tested provided that the generic insulation product remains unchanged.

Mass per unit area	Not relevant
Density	As tested at nominal density as defined in the relevant Product standards The classification obtained shall apply to the insulation densities between those tested provided that the generic insulation product remains unchanged.
Geometry (structure, shape and constituent layers of multi-layer product)	The classification for cut to falls insulation systems, shall be based on the classification obtained from uniform thickness insulation boards where the maximum and minimum tapered insulation thickness range is covered by the classification where the worst performing classification shall be applied.
Air gaps (perpendicular to surface)	Not relevant
Joints	As tested
INSULATION LAYER	
Surfacing on lower side [backing]	See 'general rules' in D.2.
Surfacing on upper side [facing]	See 'general rules' in D.2.
Factory pre-applied adhesive	As tested
Reinforcement mass per unit area, type of material, position within layer	As tested *Note that the location of the mat within the layer should remain constant across product thickness range.*

D.3.1.2 Metallic slates and tiles

Products covered in this subclause are defined in the following harmonized European Standards, EN 14783, *Fully supported metal sheet and strip for roofing, external cladding and internal lining - Product specification and requirements*, EN 506, *Roofing products of metal sheet - Specification for self-supporting products of copper or zinc sheet*, EN 508, *Roofing products from metal sheet - Specification for self-supporting products of steel, aluminium or stainless steel sheet* (Part 1 covering steel, Part 2 covering aluminium, Part 3 covering stainless steel).

No additional rules have been developed in this document.

NOTE Most products/materials in this sector are covered by EC Decisions such as 2000/553/EC.

D.3.2 Small elements

D.3.2.1 General

This subclause applies to discontinuously laid roofing products (reaction-to-fire-class B-s1, d0 to F according to EN 13501-1) roofing products, which may be covered by European Standards.

D.3.2.2 Bitumen shingles

Products covered in this subclause are defined in the following harmonized European Standard such as EN 544*, Bitumen shingles with mineral and/or synthetic reinforcements - Product specification and test methods*.

Product D.3.2.2 **Bitumen shingles**	**Rules**
PRODUCT PARAMETERS FOR ROOF COVERINGS/ROOF	
Type of product	The product shall be tested with the maximum % organic content by mass or volume. The results shall be applicable to any similar product with lower organic content.
Product composition	The product shall be tested with the maximum % organic content by mass or volume. The results shall be applicable to any similar product with lower organic content.
Reaction-to-fire classification acc. to EN 13501–1	Not Applicable – No variations to product parameter are available based on EN 13501–1 classification.
Colour (consider also pigments)	No influence, but refer to product composition.
Binder content	The product shall be tested with the maximum % organic content by mass or volume. The results shall be applicable to any similar product with lower organic content.
Thickness, mass per unit area, density	See ‘general rules’ in D.2.
Geometry (structure, shape and constitutive layers of multi-layer product)	As tested
Air gaps (perpendicular to surface)	Not relevant
Joints	Test at maximum and minimum specified joint over-lap. The results then apply to all over-laps between these limits.
Surfacing on lower side (backing)	See ‘general rules’ in D.2.
Surfacing on upper side (facing)	As tested
Factory pre-applied adhesive and/ or additional adhesive layers	Test with maximum and minimum application rate for the given generic adhesive type. The results then apply to all application rates between these limits.
Reinforcement: mass per unit area, type of material; position within layer etc.	Tests on given mass of polyester per unit area will apply to lower masses. Limits to be agreed.

END-USE PARAMETERS FOR ROOF COVERINGS/ROOF SYSTEMS	
END-USE PARAMETERS-GENERAL	
Number of layers (details see for each product)	As tested
order of layer in the waterproofing system	
Orientation of each layer	
END-USE PARAMETERS-SUPPORT	
Roof pitch	See 'general rules' in D.2 and classification document EN 13501–5.
Substrate or underlying construction details	Where the roofing system is laid directly onto a combustible substrate such as plywood or particle board of a tested thickness, the classification results apply to all such roof covering systems using thicker boards made from the same type of combustible substrate. Similarly, for non-combustible substrates, such as un-perforated steel, the classification will apply to all thicker substrates than that tested.
Application on existing roofs ("renovation")	'Doubling' the load from the roof covering layer [by adding extra new layer] could affect the classification. In such cases, the classification will only be as tested. In most cases, the 'General rules' of D.2 should be used, except where national 'rules' may allow an additional layer to be added for repair purposes only. Manufacturers should be encouraged to obtain fire performance data for traditional 'refurbishment' installation methods.
END-USE PARAMETERS-MOUNTING AND FIXING	
Mounting method	As tested
Fixing method (e.g. adhesive)	Test with maximum and minimum application rate for the given generic adhesive type. The results then apply to all application rates between these limits.
spacing and type of mechanical fixing (fasteners)	As tested
Joints	As tested, see CEN/TS 1187
Air gaps	Not relevant These elements in these roofs are normally tested and installed with no air gaps between the layers, and no air leakage beyond nationally agreed limits.

INSULATION LAYER	**Rules**
PRODUCT PARAMETR FOR ROOF COVERINGS /ROOF SYSTEMS	
Type of material	As tested
Product composition	As tested
Reaction to fire classification to EN 13501–1	See 'general rules' in D.2.
Colour (also consider pigments)	Not relevant
Binder content	Not relevant except for insulation materials containing additional organic binder e.g. mineral fibre boards. Lower binder content of the same binder type is valid provided that the density is within the tested limits.
Thickness	Where the roof covering system is laid and tested on an insulation layer, the classification obtained shall apply to the insulation thicknesses between those tested provided that the generic insulation product remains unchanged.
Mass per unit area	Not relevant.
Density	As tested at nominal density as defined in the relevant Product standards The classification obtained shall apply to the insulation densities between those tested provided that the generic insulation product remains unchanged.
Geometry [structure, shape and constituent layers of multi-layer product	The classification for cut to falls insulation systems shall be based on the classification obtained from uniform thickness insulation boards where the maximum and minimum tapered insulation thickness range is covered by the classification where the worst performing classification shall be applied.
Air gaps [perpendicular to surface]	Not relevant
Joints	As tested
Surfacing on lower side [backing]	See 'general rules' in D.2
Surfacing on upper side [facing]	See 'general rules' in D.2
Factory pre-applied adhesive	As tested
Reinforcement mass per unit area, type of material, position within layer	As tested

D.3.2.3 Miscellaneous small elements, e.g. plastic tiles

This sector covers miscellaneous small elements such as wooden and polymeric tiles and shingles.

No rules outside the 'General rules' in D.2 are available at present. The influence of individual parameters not covered by the general rules will require separate testing.

D.3.3 Reinforced bitumen sheets (same as bitumen shingles)

This subclause applies to reinforced bitumen sheets for roof waterproofing that may be covered by the following harmonized European Standard, EN 13707, *Flexible sheets for waterproofing - Reinforced bitumen sheets for roof waterproofing - Definitions and characteristics*.

NOTE No common rules are currently available if existing single or multi-layer waterproofing systems will be improved by adding different layers on top. The rules developed for single layers may then be applied to every single layer within the multilayer roofing system in the same way as it is done with other layers belonging to a roof system.

Table D.1 — Reinforced bitumen membranes and product parameters

NOTE Single- or multi-layer waterproofing systems with reinforced bituminous roofing membranes do differ in respect of DIAP rules. For multi-layer systems each layer can be identified. The effect of each layer on the external fire performance characteristics of the system is considered.

Product D.3.3 **Reinforced bitumen sheets** used as single or multi layer waterproofing system	**Rules**
PRODUCT PARAMETERS FOR ROOF COVERINGS/ROOF	
Type of product	The product shall be tested with the maximum % organic content by mass or volume. The results shall be applicable to any similar product with lower organic content.
Product composition	The product shall be tested with the maximum % organic content by mass or volume. The results shall be applicable to any similar product with lower organic content.
Reaction-to-fire classification acc. to EN 13501–1	Not Applicable – No variations to product parameter are available based on EN 13501–1 classification.
Colour (consider also pigments)	No influence, but refer to product composition.
Binder content	The product shall be tested with the maximum % organic content by mass or volume. The results shall be applicable to any similar product with lower organic content.
Thickness Mass per unit area Density	See ‘general rules’ in D.2
Geometry (structure, shape and constitutive layers of multi-layer product)	As tested

Air gaps (perpendicular to surface)	Not relevant
Joints	Test at maximum and minimum specified joint over-lap. The results then apply to all over-laps between these limits.
Surfacing on lower side (backing)	See 'general rules' in D.2.
Surfacing on upper side (facing)	As tested
Factory pre-applied adhesive and /or additional adhesive layers	Test with maximum and minimum application rate for the given generic adhesive type. The results then apply to all application rates between these limits.
Reinforcement: mass per unit area, type of material; position within layer etc.	Tests on a given mass of polyester per unit area will apply to lower masses. Limits to be agreed
END-USE PARAMETERS FOR ROOF COVERINGS/ROOF SYSTEMS	
END-USE PARAMETERS-GENERAL	
Number of layers (details see for each product)	As tested
order of layer in the waterproofing system	
Orientation of each layer	
END-USE PARAMETERS-SUPPORT	
Roof pitch	See 'general rules' in D.2 and classification document EN 13501–5.
Substrate or underlying construction details	Where the roofing system is laid directly onto a combustible substrate such as plywood or particle board of a tested thickness, the classification results apply to all such roof covering systems using thicker boards made from the same type of combustible substrate. Similarly, for non-combustible substrates, such as un-perforated steel, the classification will apply to all thicker substrates than that tested.
Application on existing roofs ("renovation")	'Doubling' the load from the roof covering layer [by adding extra new layer] could affect the classification. In such cases, the classification will only be as tested. In most cases, the 'General rules' of D.2 should be used, except where national 'rules' may allow an additional layer to be added for repair purposes only. Manufacturers should be encouraged to obtain fire performance data for traditional 'refurbishment' installation methods.

END-USE PARAMETERS-MOUNTING AND FIXING	
Mounting method	As tested
Fixing method (e.g. adhesive)	Test with maximum and minimum application rate for the given generic adhesive type. The results then apply to all application rates between these limits.
spacing and type of mechanical fixing (fasteners)	As tested
Joints	As tested, see CEN/TS 1187
Air gaps	Not relevant These elements in these roofs are normally tested and installed with no air gaps between the layers, and no air leakage beyond nationally agreed limits.
INSULATION LAYER	**Rules**
PRODUCT PARAMETER FOR ROOF COVERINGS /ROOF SYSTEMS	
Type of material	As tested
Product composition	As tested
Reaction to fire classification to EN 13501–1	See 'general rules' in D.2.
Colour [also consider pigments]	Not relevant
Binder content	Not relevant except for insulation materials containing additional organic binder e.g. mineral fibre boards. Lower binder content of the same binder type is valid provided that the density is within the tested limits.
Thickness	Where the roof covering system is laid and tested on an insulation layer, the classification obtained shall apply to the insulation thicknesses between those tested provided that the generic insulation product remains unchanged.
Mass per unit area	Not relevant.
Density	As tested at nominal density as defined in the relevant Product standards The classification obtained shall apply to the insulation densities between those tested provided that the generic insulation product remains unchanged.
Geometry (structure, shape and constituent layers of multi-layer product)	The classification for cut to falls insulation systems, shall be based on the classification obtained from uniform thickness insulation boards where the maximum and minimum tapered insulation thickness range is covered by the classification where the worst performing classification shall be applied.
Air gaps (perpendicular to surface)	Not relevant
Joints	As tested

Surfacing on lower side [backing]	See ‘general rules’ in D.2.
Surfacing on upper side [facing]	See ‘general rules’ in D.2.
Factory pre-applied adhesive	As tested
Reinforcement mass per unit area, type of material, position within layer	As tested Note that the location of the mat within the layer remains constant across product thickness range.

D.3.4 Plastic and rubber sheets

This subclause applies to plastic and rubber sheets for roof waterproofing that may be covered by the following harmonized European Standard, EN 13956:2006, *Flexible sheets for waterproofing - Plastic and rubber sheets for roof waterproofing - Definitions and characteristics*.

NOTE The following table was developed from experience with single ply sheeting. For special purposes such as renovation, multi-layer waterproofing systems may be intended to be used. No common rules are currently available for this purpose. The rules for single layers may then be applied to every single layer within the multi-layer roofing system in the same way as it is done with other layers belonging to a roof system.

PRODUCT D.3.4 - PLASTIC AND RUBBER SHEETS	**RULES**
PRODUCT PARAMETERS FOR ROOF COVERINGS/ROOF SYSTEMS	
Type of product	The product shall be tested with the maximum % organic content by mass or volume. The results shall be applicable to any similar product with lower organic content.
Product composition	The product shall be tested with the maximum % organic content by mass or volume. The results shall be applicable to any similar product with lower organic content. NOTE The composition may vary dependent on: Polymer (>50 % of coating); stabilizers; fillers; fire retardants (some products); reinforcement (some products): polyester, glass; backing (some products): polyester or polypropylene fleece.
Reaction-to-fire classification acc. to EN 13501–1	See ‘general rules’ in D.2.
Colour (consider also pigments)	Not relevant
Binder content	Not relevant but see product composition.
Thickness	See ‘general rules ’in D.2.
Mass per unit area	Test minimum and maximum product thickness for the product range, excluding overlaps and cover strips.
Density	Not relevant
Geometry (structure, shape and constitutive layers of multi-layer product)	As tested For information - Thermoplastics are all roll-goods. Some elastomers are large sheets folded for transport.
Air gaps (perpendicular to surface)	not relevant

Joints	Include tests at maximum and minimum specified joint over-lap. The results then apply to all over-laps between these limits.
Surfacing on lower side (backing)	As tested
Surfacing on upper side (facing)	As tested
Adhesive	Test with maximum and minimum application rate for the given generic adhesive type. The results then apply to all application rates between these limits.
Reinforcement: mass per unit area, type of material; position within layer etc.	As tested Note that the location of the mat within the membrane build-up remains constant across product thickness range.
END-USE PARAMETERS FOR ROOF COVERINGS/ROOF SYSTEMS	
END-USE PARAMETERS-GENERAL	
Number of layers (details see for each product)	As tested
order of layer in the waterproofing system	As tested
Orientation of each layer	Not relevant
END-USE PARAMETERS-SUPPORT	
Roof pitch	See EN 13501–5
Substrate or underlying construction details	Where the roofing system is laid directly onto a combustible substrate such as plywood or particle board of a tested thickness, the classification results apply to all such roof covering systems using thicker boards made from the same type of combustible substrate. Similarly, for non-combustible substrates, such as un-perforated steel, the classification will apply to all thicker substrates than that tested. Test with vapour control layer with defined reaction-to-fire class E or better. The Vapour control layer can then be replaced with product of equal or better performance. Insulation Where the roof covering system is laid and tested on an insulation layer, the classification obtained shall apply to the insulation thicknesses between those tested provided that the generic insulation product remains unchanged, see insulation layer information below.
Application on existing roofs (“renovation”)	As tested. ‘Doubling’ the load from the roof covering layer [by adding extra new layer] could affect the classification. In such cases, the classification will only be as tested. In most cases, the ‘General rules’ of D.2 should be used, except where national ‘rules’ may allow an additional layer to be added for repair

	purposes only. Manufacturers should be encouraged to obtain fire performance data for traditional 'refurbishment' installation methods.
END-USE PARAMETERS-MOUNTING AND FIXING	
Mounting method	As tested Note that single ply membrane may be adhered to deck or insulation by a continuous covering of adhesive, or by a pattern of strips of adhesive. The classification may vary accordingly.
Fixing method (e.g. adhesive)	As tested
Spacing and type of mechanical fixing (fasteners)	As tested Single ply membrane may be secured mechanically to the deck by individual fasteners placed along the lap between adjacent sheets or by a continuous bar secured across the roll width or by adhesion of the underside to individual fasteners with compatible plates uppermost. The classification may vary.
Joints	As tested. See CEN/TS 1187
Air gaps	Not relevant
INSULATION LAYER	**Rules**
PRODUCT PARAMETR FOR ROOF COVERINGS /ROOF SYSTEMS	
Type of material	As tested
Product composition	As tested
Reaction to fire classification to EN 13501–1	See 'general rules' in D.2.
Colour [also consider pigments]	Not relevant
Binder content	Not relevant except for insulation materials containing additional organic binder e.g. mineral fibre boards. Lower binder content of the same binder type is valid provided that the density is within the tested limits.
Thickness	Where the roof covering system is laid and tested on an insulation layer, the classification obtained shall apply to the insulation thicknesses between those tested provided that the generic insulation product remains unchanged.
Mass per unit area	Not relevant
Density	As tested at nominal density as defined in the relevant Product standards The classification obtained shall apply to the insulation densities between those tested provided that the generic insulation product remains unchanged.
Geometry (structure, shape and constituent layers of multi-layer product)	The classification of cut to falls insulation systems, shall be based on the classification obtained from uniform thickness insulation boards where the maximum and minimum tapered insulation thickness range is covered by the classification where the worst performing classification shall be applied.

Air gaps (perpendicular to surface)	Not relevant
Joints	As tested
Surfacing on lower side [backing]	See ‘general rules’ in D.2.
Surfacing on upper side [facing]	See ‘general rules’ in D.2.
Factory pre-applied adhesive	As tested
Reinforcement mass per unit area, type of material, position within layer	As tested Note that the location of the mat within the layer remains constant across product thickness range.

D.3.5 Roof-lights

Products covered in this subclause are defined in the following harmonized European Standards as EN 14351-1, *Windows and doors - Product standard, performance characteristics - Part 1: Windows and external pedestrian doorsets without resistance to fire and/or smoke leakage characteristics*, EN 1873, *Prefabricated accessories for roofing - Individual roof lights of plastics - Product specification and test methods*, EN 14963, *Roof coverings - Continuous rooflights of plastics with or without upstands - Classification, requirements and test methods*.

No additional rules have been developed in this document.

D.3.6 Glazing systems

No additional rules have been developed in this document.

D.3.7 Profiled non-metallic sheets

D.3.7.1 Profiled fibre cement sheets

Products covered in this subclause are defined in the following harmonized European Standard as EN 494, *Fibre-cement profiled sheets and fittings - Product specification and test methods*.

No additional rules have been developed in this document.

Products in this sector may be covered by ‘deemed to satisfy EC Decision 2000/553/EC.

D.3.7.2 Profiled bitumen based sheets

Products covered in this subclause are defined in the following harmonized European Standard as EN 534, *Corrugated bitumen sheets - Product specification and test methods*.

No rules outside general rules are available at present.

D.3.7.3 Miscellaneous profiled non-metallic sheets

Products covered in this subclause are defined in the following harmonized European Standard, EN 1013, *Light transmitting single skin profiled plastics sheets for internal and external roofs, walls and ceilings - Requirements and test methods*.

No rules outside general rules are available at present.

D.3.8 Composite (including metal faced) sandwich panels

Products covered in this subclause are defined in the following harmonized European Standard such as EN 14509, *Self-supporting double skin metal faced insulating panels - Factory made products - Specifications*.

No additional rules have been developed in this document.

Products in this sector may be covered by 'deemed to satisfy' EC Decision 2006/600/EC and CWFT decisions.

D.3.9 Profiled metal sheets

Products covered in this subclause are defined in the following harmonized European Standards as EN 14509, *Self-supporting double skin metal faced insulating panels - Factory made products - Specifications* and EN 14782, *Self-supporting metal sheet for roofing, external cladding and internal lining - Product specification and requirements*.

Products in this sector may be covered by 'deemed to satisfy' EC Decision 2006/553/EC or CWFT Decision 2005/403/EC. No additional rules have been developed in this document.

D.3.10 Flat metal sheets

Products covered in this subclause are defined in harmonized European Standard, EN 14783, *Fully supported metal sheet and strip for roofing, external cladding and internal lining – Product specification and requirements*, and may be covered by 'deemed to satisfy' EC Decision 2006/553/EC or CWFT Decision 2005/403/EC.

No additional rules have been developed in this document.

D.3.11 Liquid applied roof water-proofing kits

No additional rules have been developed in this document.

D.3.12 Miscellaneous

Roofs under this sector are meant to be systems not covered by roof covering sectors D.3.1 to D.3.11 above. Roof systems falling under this sector may be e.g. thatched roofs; mastic asphalt.

No additional rules have been developed in this document.

Bibliography

[1] CEN/TS 15117, *Guidance on direct and extended application*

[2] CEN/TS 15447, *Mounting and fixing in reaction to fire tests under the Construction Products Directive*

[4] EN ISO 13943, *Fire safety - Vocabulary (ISO 13943)*

[5] ISO 16730, *Fire safety engineering — Assessment, verification and validation of calculation methods*

[6] EC Decision 2005/403/EC of 25 May 2005 establishing the classes of external fire performance of roofs and roof coverings for certain construction products as provided for by Council Directive 89/106/EEC

[7] EC Decision 2000/553/EC of 6 September 2000 implementing Council Directive 89/106/EEC as regards the external fire performance of roof coverings

[8] EC Decision 2006/600/EC of 4 September 2006 establishing the classes of external fire performance for certain construction products as regards double skin metal faced sandwich panels for roofs

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