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

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

Exposition des toitures et des couvertures à un feu extérieur - Application étendue des résultats d'essai de la 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.

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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.

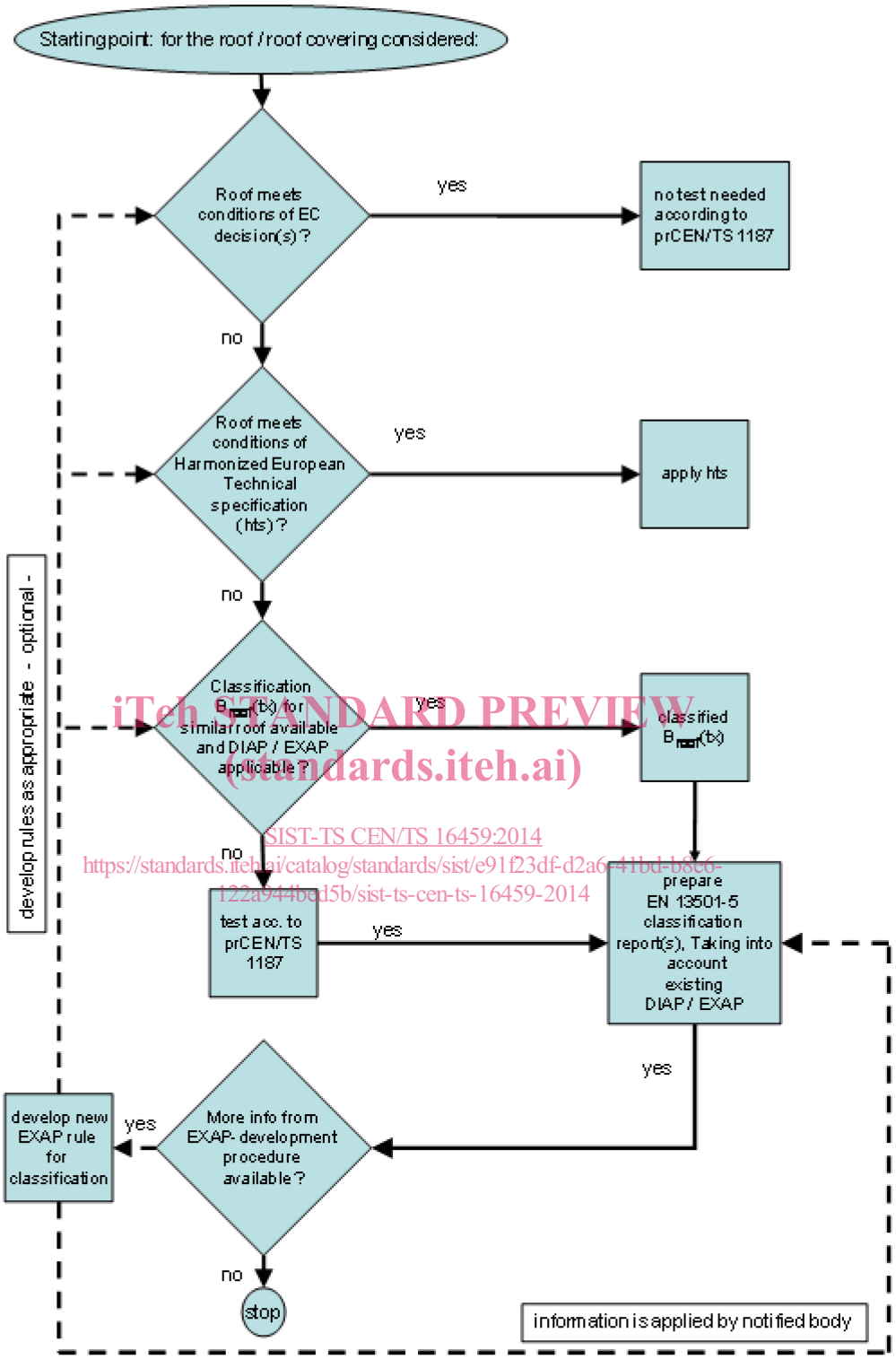

Figure 1 – Decision process on classification of roofs/roof coverings

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.