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Extended application of results from fire resistance tests - Non-loadbearing walls - Part 5: Metal sandwich panel construction

Erweiterter Anwendungsbereich der Ergebnisse von Feuerwiderstandsprüfungen - Nichttragende Wände - Teil 5: Sandwichelemente in Metallbauweise

Application étendue des résultats des essais de résistance au feu - Murs non porteurs - Partie 5 : Panneaux sandwiches métalliques pour la construction

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ICS:

13.220.50	Požarna odpornost gradbenih materialov in elementov	Fire-resistance of building materials and elements
91.060.10	Stene. Predelne stene. Fasade	Walls. Partitions. Facades

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English Version

Extended application of results from fire resistance tests - Non-loadbearing walls - Part 5: Metal sandwich panel construction

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COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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European foreword

This document (EN 15254-5:2018) has been prepared by Technical Committee CEN/TC 127 “Fire safety in buildings”, the secretariat of which is held by BSI.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by October 2018, and conflicting national standards shall be withdrawn at the latest by October 2018.

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

This document supersedes EN 15254-5:2009.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association.

This standard is currently composed of the following parts:

— EN 15254-2, *Extended application of results from fire resistance tests — Non-loadbearing walls — Part 2: Masonry and Gypsum Blocks;*

— EN 15254-4, *Extended application of results from fire resistance tests — Non-loadbearing walls — Part 4: Glazed constructions;*

— EN 15254-5, *Extended application of results from fire resistance tests — Non-loadbearing walls — Part 5: Metal sandwich panel construction;*

— EN 15254-6, *Extended application of results from fire resistance tests — Non-loadbearing walls — Part 6: Curtain walling;*

— EN 15254-7, *Extended application of results from fire resistance tests — Non-loadbearing walls — Part 7: Non-load bearing sandwich panels — Ceilings.*

According to the CEN-CENELEC Internal Regulations, the national standards organisations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

1 Scope

This document defines rules for extended applications, provides guidance, and, where appropriate, defines procedures, for variations of certain parameters and factors associated with the design of internal and external non-loadbearing walls constructed of metal sandwich panels and that have been tested in accordance with EN 1364-1, which could generate a classification in accordance with EN 13501-2.

EN 15254-5 applies for self-supporting, double skin metal faced sandwich panels having an insulating core bonded to both facings as defined in EN 14509.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 1363-1, *Fire resistance tests — Part 1: General Requirements*

EN 1363-2, *Fire resistance tests — Part 2: Alternative and additional procedures*

EN 1364-1, *Fire resistance tests for non-loadbearing elements — Part 1: Walls*

EN 1993-1-2, *Eurocode 3: Design of steel structures — Part 1-2: General rules — Structural fire design*

EN 13501-2, *Fire classification of construction products and building elements — Part 2: Classification using data from fire resistance tests, excluding ventilation services*

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

EN 15725, *Extended application reports on the fire performance of construction products and building elements*

EN ISO 13943, *Fire safety — Vocabulary (ISO 13943)*

3 Terms and definitions, symbols and abbreviations

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 14509, EN 15725, EN 1364-1, EN 1363-1 and EN ISO 13943 the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— IEC Electropedia: available at http://www.electropedia.org/

— ISO Online browsing platform: available at http://www.iso.org/obp

3.1.1
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

3.1.2
extended field of application of test results
outcome of a process (involving the application of defined rules that may 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

3.1.3
factor
variation that may be applied to a parameter, e.g. a change in the core thickness

3.1.4
factor influence
potential cause of a change in the fire resistance when the factor is changed, e.g. an increase in fire resistance as result of an increase of the thickness of the core

3.1.5
fastening
fixing

component that fastens the panels to a support structure or to the test frame

3.1.6
fixing system

system consisting of fastenings and possible other means to fasten the panels to a support structure or to the test frame

3.1.7
height of assembly
height of the wall in the reference test or in the end-use application for horizontally or vertically installed wall panels

3.1.8
length of assembly
length of the wall in the reference test or in the end-use application for horizontally or vertically installed wall panels

3.1.9
reference test
fire resistance test in accordance with EN 1363-1 and EN 1364-1, and where applicable EN 1363-2, on which the extended application is based and the results of which are used as the main source of data for the extended application

3.1.10
stitching
component for fixing panels to panels in the longitudinal joint

3.1.11
span length
centre to centre distance between the supports of a panel and/or intermediate supports to which the sandwich panel is fixed

3.1.12
support structure
construction onto which the panel wall is fastened in the end-use application

3.1.13
test frame
frame containing the test construction for the purpose of mounting onto the furnace

3.2 Symbols and abbreviations

For the purposes of this document, the following symbols and abbreviations apply.

E	etanchéité
F	load
F_t,E_d	the tensile load on the fasteners
$F_{v,Ed}$	the shear load on the fasteners
$F_{t,Rd}$	the design tensile load on the fastener at normal temperature
$F_{v,Rd}$	the design shear load on the fastener at normal temperature
I	isolation
L	span length
L_1	distance between midspan of two adjacent panels
L_2	overlap of the metal facing at the panel to panel joint
PCS	gross calorific potential
R	resistance, loadbearing capacity
b	width of panel
c_1	opening in adjacent metal sheet joints at normal room temperature on unexposed side
c_2	opening in adjacent metal sheet joints during the reference test on unexposed side
d_c	depth of core
f_j	deflection of panel to panel joint in the reference test (deflection into the furnace to be taken as positive)
f_1, f_2	deflection of two adjacent panels at midspan in the reference test (deflection into the furnace to be taken as positive)
g	panel weight per square meter
k	yield strength factor
n	number of fasteners
q	pressure action on the panel in a fire situation
Δc	relative increase in opening of the metal sheet joint in the reference test
Δf	relative deflection of the joint compared to the adjacent panels in the reference test (to be calculated taking into account the positive and negative directions of the deflections)

4 Establishing the field of extended application

4.1 General

An extended application analysis is required when the application differs in one or more parameters from the tested one described in the test report and/or in the classification document, and which is not covered by the direct field of application of the classification document.

Extended application is a prediction of the expected fire resistance of fire resistant metal faced sandwich panels. It may be based on interpolation between or extrapolation from test data. The fundamental consideration shall be that the fire resistant metal faced sandwich panels after extension would achieve the required fire performance if it were to be tested according to EN 1364-1.

The extended application of test results from metal faced sandwich panels used as a non-loadbearing wall shall be based on the reference fire test results performed according to EN 1364-1 and may be complemented by one or more additional tests. The general rules in EN 15725 shall be followed.

4.2 Assumptions in the extended application

The following assumptions are considered when evaluating extended applications for sandwich panels:

a) the wall is required to provide fire resistance in the end-use condition; relevant classes are given in EN 13501-2;

b) the wall is assumed to be exposed on the entire face of one side to the standardized heating conditions given in the EN 1363-1 fire resistance test specification or to alternative and additional procedures given in the EN 1363-2;

c) the structure above and below the wall does not deflect vertically during the fire exposure period; this simulates the non-deflecting nature of the test frame which forms part of the furnace test apparatus;

   In reality constructions deflect and this should be taken into account by the building designer when designing the building and planning the constructional details so that no vertical loads are applied to the wall.

d) after delamination of the fire-exposed facing the dead load of the sandwich panels is carried by a support structure to which the ends of the sandwich panels are attached;

e) the support structure has at least the same loadbearing capacity, R, of the resistance to fire performance as the sandwich panel wall regarding integrity;

f) the self weight of the facing and core is calculated from the volume and density of the materials;

g) the calculation of the reduction in the strength properties of steel at elevated temperature shall be in accordance with EN 1993-1-2.

5 Rules for extended applications of the tested product/construction

5.1 General

When performing extended applications for a tested wall changes can occur either in the materials and/or in the construction. Both are dealt with in this standard. Table 1 and Table 2 list the changes which may or may not be made in an extended application assessment. The rules for the changes are given in 5.2 and 5.3.

Table 1 — Material changes relevant to extended application

Parameter	Factors	Factor influence on performance		Rules
		Integrity E	Insulation I	
Changes in metal facings	Chemical composition of coating	influence	no influence [a]	5.2.2.1
	Change from coated to non coated metal	influence	influence	5.2.2.1
	Sheet thickness	influence	no influence [a]	Allowed up to ± 0,2 mm of tested thickness.
	Change from one metal to another	no information	no information	5.2.2.2
	Change in sheet geometry	no information	no information	5.2.2.3
Changes in adhesive	Amount	influence	influence	5.2.3
	Type	influence	no influence [a]	5.2.3
Changes in core material	Type	major influence	major influence	5.2.4
	Change in composition.	major influence	major influence	5.2.4.2 - 5.2.4.6

[a] It is understood that when a change in a factor can influence the integrity of a joint, there is a possibility that a change in the leakage of hot gases or in joint geometry can also influence the temperature rise near the joint and therefore influence the insulation rating.

Table 2 — Constructional changes relevant to extended application

Parameter	Factors	Factor influence on performance		Rules
		Integrity E	Insulation I	
Span length	Decrease	no influence	no influence [a]	Allowed
	Increase	influence	no influence [a]	5.3.1
Orientation		influence	no influence [a]	5.3.2
Panel width	Decrease	no influence	no influence [a]	Test results valid
	Increase	influence	no influence [a]	Test results valid up to + 20 %
Panel thickness e.g. core thickness	Decrease Increase	no information	major influence	5.3.3
Joint construction	Type	major influence	major influence	5.3.4
	Stiching decreased	influence	influence	Not allowed
	Stiching increased	influence	influence	5.3.4
	Sealants	influence	influence	5.3.4
Fixing system	Type	major influence	no influence [a]	5.3.5
	Amount decreased	major influence	no influence [a]	5.3.5
	Amount increased	influence	no influence [a]	Allowed
	Protection decreased	major influence	influence	5.3.5
	Protection increased	influence	influence	Allowed
Length of assembly	Vertical installation	no influence	no influence [a]	5.3.6
	Horizontal installation			See span length 5.3.1
Height of assembly	Vertical installation			See span length 5.3.1
	Horizontal installation	influence	no influence [a]	5.3.6
Support structure	Changes	no information	no influence [a]	5.5

[a] It is understood that when a change in a factor can influence the integrity of a joint, there is a possibility that a change in the leakage of hot gases or in joint geometry can also influence the temperature rise near the joint and therefore influence the insulation rating.