

SVENSK STANDARD

SS-EN 15254-7:2012



Fastställt/Approved: 2012-06-23
Publicerad/Published: 2012-06-27
Utgåva/Edition: 1
Språk/Language: engelska/English
ICS: 13.220.50; 91.060.30

Utökad tillämpning av resultat från provning av brandmotstånd – Icke bärande byggnadsdelar – Del 7: Sandwich element med metallskal

Extended application of results from fire resistance tests – Non- loadbearing ceilings – Part 7: Metal sandwich panel construction

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EUROPEAN STANDARD

EN 15254-7

NORME EUROPÉENNE

EUROPÄISCHE NORM

June 2012

ICS 13.220.50; 91.060.30

English Version

Extended application of results from fire resistance tests - Non-loadbearing ceilings - Part 7: Metal sandwich panel construction

Application étendue des résultats d'essais de résistance au feu - Plafonds non porteurs - Partie 7: Panneaux sandwichés métalliques pour la construction

Erweiterter Anwendungsbereich der Ergebnisse von Feuerwiderstandsprüfungen - Nichttragende Unterdecken - Teil 7: Sandwichelemente in Metallbauweise

This European Standard was approved by CEN on 4 May 2012.

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Foreword

This document (EN 15254-7:2012) 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of an identical text or by endorsement, at the latest by December 2012, and conflicting national standards shall be withdrawn at the latest by December 2012.

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

EN 15254 is divided into 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*
- prEN 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 ceilings — Part 7: Metal sandwich panel construction*, [the present document]

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SS-EN 15254-7:2012 (E)

1 Scope

This European Standard defines rules for extended applications, provides guidance, and, where appropriate, specifies procedures, for variations of certain parameters and factors associated with the design of internal non-loadbearing ceilings constructed of metal sandwich panels that have been tested in accordance with EN 1364-2.

This European Standard applies to self-supporting, double skin metal faced sandwich panels which have an insulating core bonded to both facings.

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.

EN 1363-1:2012, *Fire resistance tests — Part 1: General requirements*

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

EN 1364-2:1999, *Fire resistance tests for non-loadbearing elements — Part 2: Ceilings*

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 14509:2006, *Self-supporting double skin metal faced insulating panels — Factory made products — Specifications*

3 Terms, definitions, symbols and abbreviations

3.1 Terms and definitions

For the purpose of this document, the terms and definitions given in EN 14509:2006, EN 1364-2:1999, EN 1363-1:2012 and the following apply.

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

one of the possible variations that may be applied to a parameter

3.1.4

factor influence

one of the potential causes of a change in the fire resistance due to a factor

3.1.5

fastening, fixing

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

3.1.6

fixing system

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

3.1.7

length of assembly

length of the ceiling in the span (or panel length) direction in the reference test or in the end use application

3.1.8

width of assembly

width of the ceiling in the cross direction of the span (or panel length) in the reference test or in the end use application

3.1.9

reference test

fire resistance test on which the extended application is based and the results of which are used as the main source of data for the extended application

Note 1 to entry: The fire resistance test is in accordance with EN 1363-1 and EN 1364-2 and where applicable EN 1363-2.

3.1.10

stiching

device for fixing panels to panels in the longitudinal joint

3.1.11

span length

center to center distance between two consecutive supports to which the sandwich panel is fixed

3.1.12

support structure

construction onto which the panel ceiling 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.

F_{Ed} catenary force acting on the fasteners

F_v vertical force due at g acting at the fastener

F_{Ed1} catenary force acting at the fastener at maximum temperature in the test

F_{Ed2} catenary force acting at the fastener at temperature for the increased span

F_{v1} vertical force due at g acting at the fastener at maximum temperature in the test

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F_{v2}	vertical force due at g acting at the fastener at temperature for the increased span
L	span length
T	temperature
b	width of panel
g	panel weight per square meter
n	number of fasteners
p	relative end movement in the fastener
w	deflection of the ceiling
α	linear coefficient of thermal expansion

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 one tested and described in the test report and/or in the classification document, and which is not covered by the field of direct application of the classification document.

The extended application of the sandwich panels used as a non-loadbearing ceiling shall be based on the reference fire test results performed according to EN 1364-2. It may be complemented by one or more additional small or full-scale tests or by historical data. If historical data are used, they shall comply with the rules given in this document.

4.2 Assumptions in the extended application

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

- the ceiling is required to possess fire resistance in the end-use condition (relevant classes are given in EN 13501-2);
- the ceiling is assumed to be exposed on the entire face of one side (either from above or below) to the standardised heating conditions given in the EN 1363-1 fire resistance test specification;
- the structure to which the ceiling is fixed does not deflect during the fire exposure period; this simulates the non-deflecting nature of the test frame which forms part of the furnace test apparatus;

NOTE In reality constructions deflect and this fact should be taken into account when designing the building and planning the constructional details.

- after delamination of the fire exposed facing, the dead load of the panels is carried by a support structure to which the ends of the sandwich panels are attached; the forces from the dead load will be distributed to the support structure by the panel fixings from which loadbearing capacity shall be evaluated;
- the support structure has at least the same loadbearing capacity, R, of the resistance to fire performance as the sandwich panel ceiling regarding integrity;
- 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.

4.3 Assumed structural behaviour of a sandwich panel in fire

When one face of a sandwich panel assembly is exposed to fire, the following behaviour may be expected. Delamination of the fire-exposed face will occur after a couple of minutes in a fire. After delamination, the flexural strength of the assembly is lost and, unless both faces are restrained at the ends, the panels can collapse. The fastenings for the ends of the panels need to support the dead load of the whole panel for the entire fire resistance period. The behaviour slightly differs depending on the direction of the fire (from above or below). In both cases, the structure acts as a catenary construction.

NOTE Annex A illustrates typical behaviour of panels.

5 Rules for extended applications of the tested product

5.1 General

When performing extended applications for a tested ceiling, 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 either given in Table 1 or Table 2 or 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	no influence	influence	5.2.2.1
	Sheet thickness	influence	no influence ^a	Valid up to ± 50 % of tested nominal thickness but no decrease is allowed for thicknesses below 0.5 mm and fixing capacity shall be checked
	Change from one metal to another	influence	influence	5.2.2.2
	Change in sheet geometry	influence	influence	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 - 5.2.4.7

^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 leakage of hot gases or in joint geometry can also influence the temperature rise near the joint and therefore influence the insulation rating.