Revision 1 of EN 14509
Changes and news

Klaus Berner

EN 14509 valid version

November 2006

EN 14509:2006: valid version
Date of applicability of the standard as harmonised
European Standard: 2009.01.01
Revision 1 of EN 14509: Basic principles

- For European Standards it is generally required to make a revision after five years validation. Therefore a revision 1 is conducted for EN 14509 on the base of the following resolution of 2011.10.05:
  - „Resolution No. 16, CEN/TC 128 SC 11 Plenary Meeting: Acceptance of Draft First Revision of EN 14509 for UAP“.

Revision 1 of EN 14509: Time schedule

- Editing of the revision until 2013.06.17 (finished)
- Voting of the national members until 2013.07.20. The voting was positive with 15:1 votes
- Up to 2013.08.20 text available of the complete revision. Final version for translation
- Translation finished in Sept. 2013
- Final version of revision 1 in Oct. 2013
- Announcement in the official journal of the EU in Nov./Dec. 2013 (planned)
- Introduction until 2014.02.02 (planned)
- Request for the period of coexistence: 12 months
Revision 1 of EN 14509: Final version

EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN 14509

ICNIR 1913-80
Supersedes EN 14508:2000

October 2013

This European Standard was approved by CEN on 14 July 2013.

EN 14508:2000 (E)

Example of one page of Rev.1 version

EN 14508:2013 (E)

When two overlapping joints are required between the test panels and for the supports. When testing samples which are not stacking, the joints should be laid in a horizontal position. The test panels shall be fastened to the supports. The overlap of the test panels shall be at least 1.5 times the thickness of the test panel.

The overlap of the test panel shall not be less than 80 mm. This overlap may be increased as required in order to meet overall requirements of the test. The joint distance between the test panels shall be at least 1.5 times the thickness of the test panel.

The support members shall be such as to apply no restraint to the motion of the panel about the line of testing.

A.2.2 Test specimens

Sampling and conditioning of the test specimens shall comply with 8.2.2 and 8.3.1.

The panel shall be placed on a level surface in a horizontal position. The test panels and testing samples shall be fastened to the supports and test panel shall be at least 1.5 times the thickness of the test panel.

The overlap of the test panel shall be more than 10 times the thickness of the test panel. The test panel shall be fastened to the supports and test panel shall be at least 1.5 times the thickness of the test panel.

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### Annex F of Rev. 1 version

**Annex F (informative)**

Significant technical changes between this European Standard and the previous edition

Annex F provides details of significant technical changes between this European Standard and the previous version.

Table F.1: Technical changes in this European Standard

<table>
<thead>
<tr>
<th>Section</th>
<th>Clause/Table/Figure</th>
<th>Type of change</th>
<th>Note</th>
</tr>
</thead>
</table>
| Annex A | A.1.3 | Modified | Reference to incomplete bailed panels.
| | A.1.4.A.4 | Modified | Figure 1.2 corrected.
| | A.1.5.A.5 | Modified | Calculation of procedures.
| | A.3.3 | Modified | Figure 4.5.
| | A.3.5 | Figure 4.5 | New |Figure 4.5 corrected.
| | A.3.6 | New | Calculation procedure modified.
| | A.3.5.A.5.A.6 | Modified | Calculation of deflections.
| | A.3.5.1.A.5.2 | New | Close covering incomplete bailed panels.
| | A.3.6 | Modified | Calculation procedure modified.
| | A.4.1.A.4 | Modified | Major section covering appropriate procedures and procedures.
| | A.4.5 | New | Calculation procedure modified.
| | A.5.1.A.5 | Modified | Configuration of testing, support and procedures.
| | A.5.4 | Modified | Test procedure modified.
| | A.5.5.A.5.4 | Modified | Major test.
| | A.5.6 | Modified | Test.
| | A.5.8.A.5.8 | Modified | Calculation.
| | A.5.8 | Modified | Revised test procedure.

### Example of one page Rev. 1, Visible changes

- **A.3 Test specimens**
  - Density and homogeneity of test specimens shall comply with 9.2.3 and 9.3.3.

- **A.5.6 Procedure**
  - The test shall be carried out by adding a specially supported load to the test load and lowering to the required load.

- **A.5.8.A.5.8**
  - Calculation of test results and presentation of test results.

- **Annex C**
  - Force measurement of test specimens.

- **Annex D**
  - Material test results and presentation of test results.

- **Annex E**
  - Force measurement of test specimens.

- **Annex F**
  - Technical changes in this European Standard.

- **Annex G**
  - Force measurement of test specimens.
### Example of one page of a table for changes

#### Table Ae: General Changes

<table>
<thead>
<tr>
<th>Pt</th>
<th>Topic</th>
<th>Chapter</th>
<th>Changes in Rev 1</th>
<th>Kind of changes</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>List of changes in Rev 1 compared to the previous edition.</td>
<td>Forward</td>
<td></td>
<td>new</td>
<td>In this appendix practical all changes are listed; however only with very short remarks (keywords) regarding the single changes.</td>
</tr>
<tr>
<td>2</td>
<td>Use of Data obtained from earlier tests</td>
<td>Forward</td>
<td></td>
<td>new</td>
<td>important remark Comments s 4.2.2.2</td>
</tr>
<tr>
<td>3</td>
<td>Evaluation of concreteness, testing, assessment and sampling methods</td>
<td>6.1</td>
<td>The principle of grouping product into families may be used ...</td>
<td>new</td>
<td>Procedure is suitable to obtain more uniform characteristic values and material safety factors as the parameters within a range of similar products are varied, or to reduce testing costs. More information s para 6.4</td>
</tr>
<tr>
<td>4</td>
<td>...</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### List of tables for important changes

The changes are selected in the following tables to relevant issues:

- **Table Nr. Ae:** General Changes
- **Table Nr. Be:** Mechanics
- **Table Nr. Ce:** Fire
- **Table Nr. De:** Insulating
- **Table Nr. Ee:** Steel faces
- **Table Nr. Fe:** Durability
- **Table Nr. Ge:** Tightness
- **Table Nr. He:** Tolerances
- **Table Nr. Ie:** FPC-Control

all together ca 30 pages

See Internet Address:
[www.is-eng.de/downloads.html](http://www.is-eng.de/downloads.html)
Rev.1 EN 14509 : General Changes

Use of Data obtained from earlier tests, chapt.6.2.2
Table Ae, Pt. 2 and 4

In general, it is not required to repeat ITT tests previously performed in accordance with the provisions of EN 14509:2006. There are two exceptions as follows:

a) Reaction to fire test EN ISO 11925-2. In cases where the edge was protected in the original test and is unprotected in the new test (See C.1.2) the product shall be retested.

b) Where the thermal transmittance was calculated using the tabulated values in A.10, the thermal transmittance shall be recalculated.

Rev.1 EN 14509 : General Changes

Shortening testing programme, chapt. 6.2.5.
Table Ae, Pt. 6, 7, 8

If there is only a change of the core material or the adhesive for a panel family, a shortened test programme (not the whole range of ITT) – see Table 6 may be used to compare the values of shear strength and modulus; tensile strength and modulus; compression strength and modulus of the core; and creep against the values from the original ITT.
Provided that all of these characteristic material values for the new core material are better than or equal to the values declared as a result of the original ITT test, the existing declared value for the mechanical properties of the panel may be retained without further ITT.
If there is only a change in the grade of the facing material a shortened test programme to compare the bending moment capacity values shall be used (see Table 6).
Rev.1 EN 14509 : General Changes

- Shortening testing programme, chapt. 6.2.5.3
- Table Ae, Pt. 6, 7, 8

Where there is a change of the core material or the adhesive for a panel family, there is no shortened test programme for the remaining characteristics listed in Table 5 – density, thermal transmittance, durability, fire, permeability and sound. New ITT tests shall be carried out where applicable.

In the case of the fire characteristics any requirement for a retest shall be in accordance with the direct application rules, C.1.3 – reaction to fire and C.2.4 – fire resistance.

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Rev.1 EN 14509 : General Changes

- Characteristic values from families of tests, chapt. 6.1
- Table Ae, Pt. 3

The principle of grouping products into families may be used in order to obtain

more uniform characteristic values and material safety factors as the parameters within a range of similar products are varied,

or to reduce testing costs.
The evaluation of families of test results shall follow the principles given in EN 1990:2002, Annex D. The procedure that follows is a simplified version of the more general procedure given in EN 1990, which is deemed to be adequate for the purposes of this European Standard.

The characteristic resistances of the members of the family shall be determined on the basis of a suitable design expression $x_{des}$ that relates the test results to all of the relevant parameters. This design expression may either be based on the appropriate formulae of structural mechanics or determined on an empirical basis.
**Rev.1 EN 14509 : General Changes**

- Example of an evaluation separately for the panel thicknesses and as a family

<table>
<thead>
<tr>
<th>Panel thickness (mm)</th>
<th>5% fractile value σx separated evaluation</th>
<th>5% fractile value σx family evaluation</th>
<th>Mean value σx</th>
<th>σx-1</th>
<th>3σx-1</th>
<th>n-1</th>
<th>n-1</th>
<th>3σx-1</th>
</tr>
</thead>
<tbody>
<tr>
<td>40</td>
<td>88.77</td>
<td>0.00584</td>
<td>0.352</td>
<td>0.004</td>
<td>0.352</td>
<td>12</td>
<td>11</td>
<td>0.004</td>
</tr>
<tr>
<td>60</td>
<td>115.77</td>
<td>0.00584</td>
<td>0.352</td>
<td>0.004</td>
<td>0.352</td>
<td>12</td>
<td>11</td>
<td>0.004</td>
</tr>
<tr>
<td>85</td>
<td>146.77</td>
<td>0.00584</td>
<td>0.352</td>
<td>0.004</td>
<td>0.352</td>
<td>12</td>
<td>11</td>
<td>0.004</td>
</tr>
<tr>
<td>120</td>
<td>208.77</td>
<td>0.00584</td>
<td>0.352</td>
<td>0.004</td>
<td>0.352</td>
<td>12</td>
<td>11</td>
<td>0.004</td>
</tr>
<tr>
<td>220</td>
<td>278.77</td>
<td>0.00584</td>
<td>0.352</td>
<td>0.004</td>
<td>0.352</td>
<td>12</td>
<td>11</td>
<td>0.004</td>
</tr>
</tbody>
</table>

**Rev.1 EN 14509 : General Changes**

- Classification and designation, chapt. 7, Table 10, Footnote c

A sandwich panel shall be classified and designated in accordance with Table 10!

New:

Either the wrinkling strength or bending resistance shall be declared.

Thermal transmittance and thermal conductivity: \(W/m^2\cdot K\) and \(W/m \cdot k\)

Air permeability: \(C\) and \(n\) values
Marking, labelling and packaging, chapt. 8.1, 1.paragraph
Table Ae, Pt. 11

The following information shall be supplied by the manufacturer with or attached to every pack, or bundle of sandwich panels or supplied with the commercial documentation:

New:
remark f) including grade of metal, and coatings where applicable;

Interpolation and extrapolation of test results, chapt. A.16.4
Table Ae, Pt.12

In the case of panels of the same type the minimum requirement is that the greatest and least thickness shall be tested together with a panel from the middle of the range. If only three thicknesses are tested, the values for products of intermediate thickness and of greater thickness up to 20 % but not more than 30 mm higher may be interpolated or extrapolated linearly.
The serviceability limit state shall be characterized…:  
- The attainment of specified amounts of axial movement in the panel due to thermal expansion and contraction in the faces.  
… This effect is likely to be a potential problem only in special cases with long panels e.g. 20 m with aluminium facings, particularly at end laps.

A safe approximation to the net thermal movement over the length L of a long panel may be determined……

New formulas:

\[
\text{Elongation of face 1} = L \alpha_1 T_1 + \rho \frac{M_2 L}{e A_{F_1} E_{F_1}}
\]

\[
\text{Elongation of face 2} = L \alpha_2 T_2 - \rho \frac{M_2 L}{e A_{F_2} E_{F_2}}
\]

Sandwich component of bending moment, \( M_s \) = \( \frac{E_{12} \alpha_1 E_{21} \alpha_2}{E_{11} \alpha_1 + E_{22} \alpha_2} \left( T_1 \alpha_1 - T_2 \alpha_2 \right) \)
The design thickness of a steel facing sheet shall be taken as
\[ t_d = t_{nom} - t_{zinc} - 0.5 \cdot t_{tol}, \]
where
- \( t_{nom} \) is the nominal thickness of the steel sheet,
- \( t_{zinc} \) the total thickness of the zinc layers (or similar protective coating) and
- \( t_{tol} \) the normal or special tolerance according to EN 10143.

If the special tolerance according to EN 10143 is fixed, the design thickness shall be taken as \( t_d = t_{nom} - t_{zinc} \) (without any reduction).

**Example:**
Panel: PU-core, D = 100 mm, \( t_{nom1} = 0.60 \) mm, \( t_{nom2} = 0.40 \)
special tolerance according to EN 10143

- acc. EN 14509:2006:
  - Design thickness: \( t_d = t_{nom} - t_{zinc} - 0.5 \cdot t_{tol} \)
  - Outer face: \( t_{d1} = 0.60 - 0.040 - 0.5 \cdot 0.040 = 0.540 \) mm
  - Inner face: \( t_{d2} = 0.40 - 0.040 - 0.5 \cdot 0.035 = 0.343 \) mm

- acc. EN 14509 (Rev1):
  - Design thickness: \( t_d = t_{nom} - t_{zinc} \)
  - Outer face: \( t_{d1} = 0.60 - 0.040 = 0.560 \) mm
  - Inner face: \( t_{d2} = 0.40 - 0.040 = 0.360 \) mm

Allowable span: 2-span, Color Group III, wind +0,36 kN/m² / -0,60 kN/m²
- acc. EN 14509:2006 (valid Standard): \( zul. \ L = 6.19 \) m
- acc. EN 14509 (Rev1): \( zul. \ L = 6.34 \) m
Rev. 1  EN 14509 : General Changes

- Panels with special profiles, chapt. E.8, E.8.1
- Table Ae, Pt 18

Panels with special profiles:
A typical example of a special profile is an outer metal face which is formed in 3-dimensions to simulate a tiled profile.

Sandwich panel with outer tile shaped face

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Rev. 1  EN 14509 : General Changes

- Information accompanying CE Marking symbol —Roof, chapt. ZA.3.4
- Table Ae, Pt 19

Changed:

- description of the product: generic name, grade and thickness of facing materials, metallic coating mass and coating type and thickness, core material and thickness, mass, density and intended use;
- resistance to point loads – roofs – where required. The maximum achieved load and tested span shall be declared;
- resistance to access loads. (for occasional foot traffic without additional protection) – roofs – where required. Pass required before affixing CE Marking
### Rev.1 EN 14509 : General Changes

- Example of CE Marking (roofs): accompanying information, Figure ZA.2
- Table Ae, Pt. 20

Mass: 12 kg/m².

For **non-standard steels** properties of yield stress, ultimate strength and elongation are to be declared from tests.

Reaction to fire: B–s2,d0 *(with steel flashing details)*

Air permeability: \( n = 0.9 \): \( C = 0.001 \)

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### Rev.1 EN 14509 : Mechanical issues

- Shear strength \( (f_{cv}) \) and shear modulus \( (G_c) \), 5.2.1.2 whole chapter
- Table Be, Pt. 1

The declared values of the shear strength and shear modulus of the core shall be determined using the appropriate test procedures from A.3 or A.4.

In principle, each test method is suitable for panels with flat, lightly profiled or profiled facings.
Bending moment capacity ($M_u$) and wrinkling stress ($\sigma_w$), chapt. 5.2.1.7 whole chapter

Table Be, Pt. 2

Wrinkling stress is related to bending moment by a simple mathematical relationship so that it is not necessary to declare both the bending resistance and the wrinkling strength.

If it is intended that design shall be carried out on the basis of calculations in accordance with Annex E, it is preferable to declare the wrinkling strength wherever possible.

The bending resistance shall be declared together with the span of the test specimen.

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Test speed, chapt. A1.4, A2.4, A3.4, A5

Table Be, Pt. 3

Test for Cross panel tensile and Compressive strength:
The deflection rate shall have a minimum value of 1 % of $d_c$ per minute and shall not exceed 3 % of $d_c$ per minute.

Shear test:
The loading rate shall be uniform and such as to result in failure between 1 min and 5 min after the commencement of the test.

bending moment capacity:
The loading rate shall be such as to result in failure between 5 min and 15 min after the commencement of the test.
Rev.1 EN 14509: Mechanical issues

- Shear strength of Incompletely bonded panels, chapt. A.3.5.3
- Table Be, Pt.4

If the core is not completely bonded with the faces the declared values shall be calculated using the following procedures based on the dimensions illustrated in Figure A.6.

Where $b_{nd} \leq 2 \cdot d_c \cdot 0.58$ the unbonded area has only a small influence on the recorded values. The declared value of the shear strength $f_C$ shall be determined using normal Formulas.

Where $b_{nd} > 2 \cdot d_c \cdot 0.58$ the declared values shall be reduced in accordance with Formulae (A.8) and (A.9).

\[ f_{C,red} = f_C \left(1 - \frac{b_{nd} - 1.16d_c}{p}\right) \]  \hspace{1cm} (A.8)

\[ G_{C,red} = G_C \left(1 - \frac{b_{nd} - 1.16d_c}{p}\right) \]  \hspace{1cm} (A.9)
The chapter A.4 is completely revised with precisely described test procedure and complete description of all formulas which are needed for elements with profiled faces the evaluation is only iterative possible. The expressions to determine the shear properties of panels with profiled faces (see A.4.5.3 and A.4.5.5) become relatively complicated and require the use of design charts or computer software.
Rev.1 EN 14509 : Mechanical issues

- Test to determine the shear properties of a complete panel, chapt. A.4
- Table Be, Pt 6 to 8

Advantage of the procedure:
No short beam specimens must be cut.

Disadvantage:
Test arrangements must be available for complete (short) panels with full width.
The evaluation of tests for elements with profiled faces is rather complicated.

Rev.1 EN 14509 : Mechanical issues

- wrinkling stress ($\sigma_w$) of a flat or lightly profiled face, chapt. A.5.5.3
- Table Be, Pt. 10

For panels of nominally identical inner and outer faces, the wrinkling stress for design purposes shall be based on the least favourable wrinkling stress.
Rev.1 EN 14509: Mechanical issues

- Determination of the creep coefficient ($\varphi_t$), chapt. A.6
- Table Be, Pt. 11 and 12

New:
Detailed comments regarding the test procedure.
Very useful for the laboratories
Some new statements, e.g.:
Where the range of thickness is up to 200 mm the thickest panel shall be tested. If the thickest panel exceeds 200 mm, it is sufficient to test a panel of 200 mm thickness.

Rev.1 EN 14509: Fire behavior

- Fire performance tests – additional instructions and direct field of Application, chapt. C
- Table Ce, Pt. 1-13

The used standards and decisions of the Commission are updated. But no new essential change (except one) for testing and assessment of the fire behavior are resultant.
In summary it can be said that regarding the fire behavior the standard is updated and a lot of details for the test procedures for reaction to fire and fire resistance are more exact and understandable.
Rev.1 EN 14509: Fire behavior

- Fire performance tests – additional instructions and direct field of Application, chapt. C.1.2
- Table Ce, Pt. 6

An essential change is introduced in the new chapter C.1.2 regarding the testing of reaction to fire:
It is now for the tests according to EN ISO 11025-2 strictly required that the flame shall be applied directly to the insulating core of the sandwich panel without any facing, flashing or covering and shall be carried out on the middle of the thickness of the insulating core (specimen turned 90°). With this it is ensured that for elements which are placed in the fire class E or better also the insulating core itself fulfill at least the class E.

Rev.1 EN 14509: Thermal transmittance

- Thermal Transmittance, chapt. 5.2.2, A.10
- Table D, Pt. 1-3

The thermal transmittance value for the panel (U), incorporating the declared thermal conductivity for the core material (λ Declared) and the joints and any profiled facings, shall be determined in accordance with A.10.
Both λ Declared and the U d,s -value shall be declared.

For thermal transmittance a lot of changes are stated. Special comments are given in a separate EPAQ document.
Rev.1 EN 14509 : Durability testing

- Durability testing, chapt B2 – B6
- Table Fe, Pt. 1

For the test procedure and evaluation of tests there are stated several small changes e.g:

- Cutting and storage of the test specimens.
- DUR1 Temperature test: ....Set 3: Condition for 84 days (instead of 24 weeks) at T °C followed by tensile test;

If new tests are provided, the changes should be taken in account.

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Rev.1 EN 14509 : Durability testing

- Thermal shock test, chpt. B.7
- Table Fe, Pt. 2

Comprehensive new information about test arrangement, test specimens, optional measurements and assessment of the results.

Important new chapter, special if new tests are planned.
The air permeability (air loss) shall be determined in accordance with EN 12114. The air permeability test should begin with a pressure difference $\Delta p_{\text{max}}$ of at least $200 \, \text{Pa}$ between the inside and outside of the test assembly. The values $n$ and $C$ shall be declared on the basis of the test results (according to EN 12114, app. B, Formula (B.8)). The air loss $V$ can be calculated using $C = \exp(\alpha) \quad \text{and} \quad V = C \cdot \Delta p^n$.
Rev.1 EN 14509 : Sound

- Airborne sound and Sound Absorption, test specimens, chapt. A.13, A.14
- Table Ge, Pt. 3 and 4

The specimen shall be mounted in accordance with EN ISO 140-3, Clause 5.2.1, Partitions and EN ISO 354:2003, Annex B Type A.

Rev.1 EN 14509 : Tolerances

- Dimensional tolerances, chapt. 5.2.5 and D
- Table H, Pt. 1 and 2

There are some smaller changes, e.g.
Deviation of straightness:
Tolerance: 2.0 mm for each metre length but not greater than 20 mm (instead of 10 mm)
Factory Production Control (FPC), General, chapt. 6.3.1
Table Ie, Pt.1

Where this European Standard permits alternative test procedures to be used, all FPC tests shall be carried out using the test procedure that was used for the corresponding ITT tests. Where CE marking is based on the use of existing ITT test data in accordance with 6.2.2., it is permissible to use the same test speed for FPC tests that was used for the original ITT tests.

Factory Production Control (FPC), Results of FPC tests, chapt. 6.3.2
Table Ie, Pt.2

Where values shall be reduced, any related characteristics that are not subject to FPC shall be adjusted.
If a shear modulus of 5.0 MPa must be reduced to 4.0 MPa the relevant wrinkling stresses shall be also reduced, e.g. with the factor

$$\sqrt{\frac{G_{\text{reduced}}}{G_{\text{existing}}}} = \sqrt{\frac{4.0}{5.0}} = 0.928$$

in dependence on EN 14509, A.5.5.3 [2]

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Core material:
Check of raw material or chemical formulation and density (A.8)
1 per shift/6 or 8h (instead of 1 per day)
Thank you for your attention!

Keep in mind for the tables with changes:
www.is-eng.de/downloads.html

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