

Proposal of amendments on EN 1993-1-3:2006

1. General

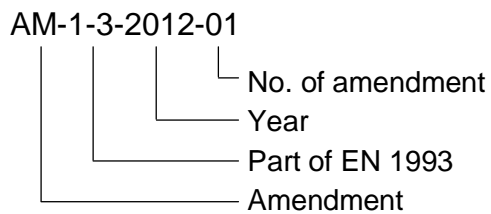
This paper includes a brief summary for the decision of amendments on EN 1993-1-3:2006 within CEN/TC250 Subcommittee 3 (SC3) “Steel Structures”.

2. Background for Amendments

3. Summary of Amendments

3.1 Numbering System

Each amendment will be identified using the following numbering system:



3.2 Proposed Amendments

| AM-1-3-2013-55 | |
|----------------------------------|--|
| Subject | Taking into account of the intermediate outward stiffener in the sheeting flange |
| Clause No./ Subclause No./ Annex | Section 5.5.3.3, new clause 5.5.3.3(12) |
| Reason for amendment | <p>In current practice of composite slabs, in order to increase the horizontal shear resistance between the steel sheeting and concrete, the outward intermediate stiffeners in dovetail form are used in the upper flange.</p> <p>However, the current version EN 1993-1-3 does not provide the information to enable the taking into account this kind of stiffener in the calculation of the bending resistance of the section.</p> |
| Proposed change | <p>Add a new clause in the section 5.5.3.3:</p> <p>(12) For intermediate stiffeners facing outwards and intermediate stiffeners facing inwards, the calculations should be performed by taking the stress in the stiffener as equal to the stress in the flange.</p> |
| Background information | <p>RFCS research project GRISPE:</p> <p>C. FAUTH (KIT) "WP1 Test report of steel trapezoidal sheeting with and without embossments and outward stiffeners ", GRISPE D1.3, 2014</p> <p>A. PALISSON (Sokol Palisson Consultants) "WP1 TEST ANALYSIS AND INTERPRETATION", GRISPE D1.4, 2015</p> <p>A. PALISSON (Sokol Palisson Consultants) " WP1 Background guidance for EN 1993-1-3 to design of special shape sheeting with outwards stiffeners in the flange", GRISPE D1.6, June 2015</p> <p>Proposal from A. Palisson, D. Izabel, L. Sokol</p> |

| AM-1-3-2013- 56 | |
|----------------------------------|---|
| Subject | Effective section of sheeting with indentation and/or embossment |
| Clause No./ Subclause No./ Annex | Section 5, adding new section 5.7 |
| Reason for amendment | <p>Composite behaviour between profiled sheeting and concrete is ensured by means of mechanical interlock provided by local deformations in the profile such as indentations or embossments.</p> <p>The clause 9.4.1 (1) of EN 1994-1-1 stipulates that the design of the profiled steel sheeting as shuttering should be in accordance with EN1993-1-3.</p> <p>However, the current version EN 1993-1-3 does not provide the information to enable the taking into account of the indentations or embossments in calculation of the resistance moment under this action.</p> |
| Proposed change | <p>Add a new section:</p> <p>5.7 Sheeting used in composite slabs, with indentations or embossments</p> <p>(1) The effective width of plane wall with indentations (Fig. 5.15a) or embossments (Fig. 5.15b) should be first calculated according to 5.5.1(2)</p> |

(2) In the second step, the indentation or embossment should be taken into account considering the embossments / indentations (Fig. 5.15a / 5.15b) as plate elements with reduced thickness $t_{red} = \rho * t$ where:

$$\rho = A * h + B \quad \dots (5.43)$$

h is height of the indentation / embossment in mm (see Figures 5.15a and 5.15b)

A and B are coefficients given in table 5.3.

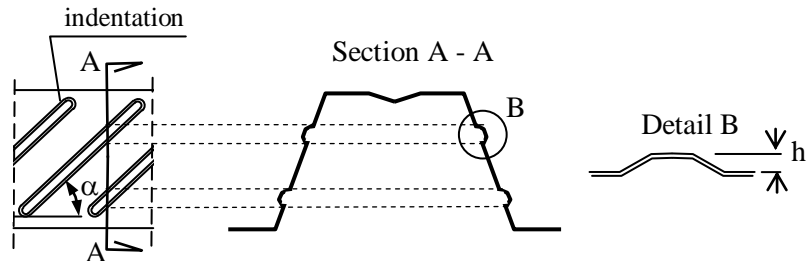


Figure 5.15a Example of sheeting with indentations

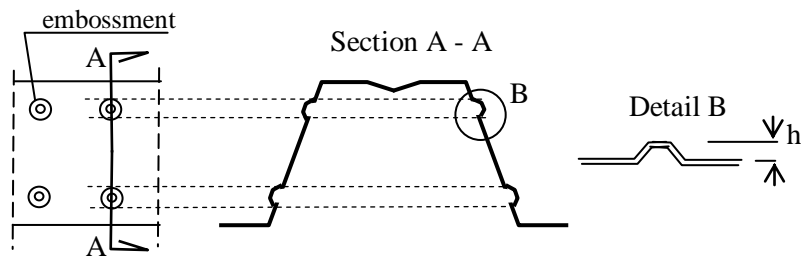


Figure 5.15b Example of sheeting with embossment

Table 5.3: Values of coefficients A and B (equation (5.43))

| Type of local deformation | t (mm) | h (mm) | A | B |
|---------------------------|--------|------------|--------|-------|
| Indentation | 0.71 | 0 - 1.5 | -0.533 | 1.000 |
| | | 1.5 - 2.75 | -0.112 | 0.368 |
| | | 2.75 - 4.0 | -0.025 | 0.128 |
| | 0.96 | 0 - 1.5 | -0.467 | 1.000 |
| | | 1.5 - 2.75 | -0.186 | 0.580 |
| | | 2.75 - 4.0 | -0.020 | 0.122 |
| | 1.21 | 0 - 1.5 | -0.401 | 1.000 |
| | | 1.5 - 2.75 | -0.260 | 0.792 |
| | | 2.75 - 4.0 | -0.015 | 0.116 |
| Embossment | 0.71 | 0 - 1.5 | -0.267 | 1.000 |
| | | 1.5 - 2.75 | -0.056 | 0.684 |
| | | 2.75 - 4.0 | -0.013 | 0.564 |
| | 0.96 | 0 - 1.5 | -0.234 | 1.000 |
| | | 1.5 - 2.75 | -0.093 | 0.790 |
| | | 2.75 - 4.0 | -0.010 | 0.561 |
| | 1.21 | 0 - 1.5 | -0.201 | 1.000 |
| | | 1.5 - 2.75 | -0.130 | 0.896 |
| | | 2.75 - 4.0 | -0.008 | 0.558 |

(3) The cross section for calculation of the effective section should be positioned so as to cause the most unfavorable effect

(4) Range of validity

| | |
|------------------------|---|
| | $0,71 \text{ mm} \leq t \leq 1,21 \text{ mm}$ $h \leq 4,0 \text{ mm}$ $30^\circ \leq \alpha \leq 60^\circ$ <p>(5) For intermediate thicknesses the reduction factor ρ may be determined by means of linear interpolation between the neighboring t values given in the Table 5.3.</p> <p>For $t > 1,21 \text{ mm}$ the values given for $t = 1,21 \text{ mm}$ may be conservatively adopted.</p> |
| Background information | RFCS research project GRISPE: C. FAUTH (KIT) "WP1 Test report of steel trapezoidal sheeting with and without embossments and outward stiffeners ", GRISPE D1.3, 2014 A. PALISSON (Sokol Palisson Consultants) "WP1 TEST ANALYSIS AND INTERPRETATION", GRISPE D1.4, 2015 A. PALISSON (Sokol Palisson Consultants) " WP1 Background guidance for EN 1993-1-3 to design of special shape sheeting with outwards stiffeners in the flange", GRISPE D1.6, June 2015 |
| | Proposal from A. Palisson, D. Izabel, L. Sokol |

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| AM-1-3-2013- 57 | |
| Subject | Resistance of sheeting with indentations or embossment to combined bending moment and local load or support reaction |
| Clause No./ Subclause No./ Annex | Section 6.1.11, adding new clause (2) |
| Reason for amendment | <p>The clause 9.4.1 (1) of EN 1994-1-1 stipulates that the design of the profiled steel sheeting used in composite slabs, working as shuttering in the construction stage, should be in accordance with EN1993-1-3.</p> <p>However, the current version EN 1993-1-3 does not provide the information to enable the taking into account of the indentations or embossments in calculation of the resistance to web crippling at the end support and to the combined action of moment and reaction at the intermediate supports.</p> |
| Proposed change | Add a new clause: (2) In case of sheeting with indentations or embossments, the equations (6.28a), (6.28b) and (6.28c) from the AMD-1-3-2013-14 may be used with: $M_{c,Rd}$ = resistance moment determined considering the indentations and/or embossments according to the Amendment AM-1-3-2013-59 $R_{w,Rd}$ = local transverse resistance determined without considering the indentations and/or embossments |
| Background information | RFCS research project GRISPE: C. FAUTH (KIT) "WP1 Test report of steel trapezoidal sheeting with and without embossments and outward stiffeners ", GRISPE D1.3, 2014 A. PALISSON (Sokol Palisson Consultants) "WP1 TEST ANALYSIS AND INTERPRETATION", GRISPE D1.4, 2015 A. PALISSON (Sokol Palisson Consultants) " WP1 Background guidance for EN 1993-1-3 to design of special shape sheeting with outwards stiffeners in the flange", GRISPE D1.6, June 2015 |
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