BS EN 505:2013

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Roofing products from metal sheet — Specification for fully supported roofing products of steel sheet

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National foreword

This British Standard is the UK implementation of EN 505:2013. It supersedes BS EN 505:2000, which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee B/542/6, Corrugated sheeting materials.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

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March 2013

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Supersedes EN 505:1999

English Version

Roofing products from metal sheet - Specification for fully supported roofing products of steel sheet

Produits de couverture en tôle métallique - Spécification pour les produits de couverture en feuille d'acier totalement supportés

Dachdeckungsprodukte aus Metallblech - Spezifikation für vollflächig unterstützte Dachdeckungsprodukte aus Stahlblech

This European Standard was approved by CEN on 5 February 2013.

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Foreword

This document (EN 505:2013) has been prepared by Technical Committee CEN/TC 128 "Roof covering products for discontinuous laying and products for wall cladding", the secretariat of which is held by NBN.

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of an identical text or by endorsement, at the latest by September 2013, and conflicting national standards shall be withdrawn at the latest by September 2013.

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

This document supersedes EN 505:1999.

In comparison to the previous edition, the following sections were changed or added: Clause 2, Clause 3, 4.3.1, Annex B, B.3.2, Table C.1, Table C.2 and Annex D.

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, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

Introduction

Figure 1 indicates the position of this European Standard in the CEN framework of standards concerning roofing product of metal.

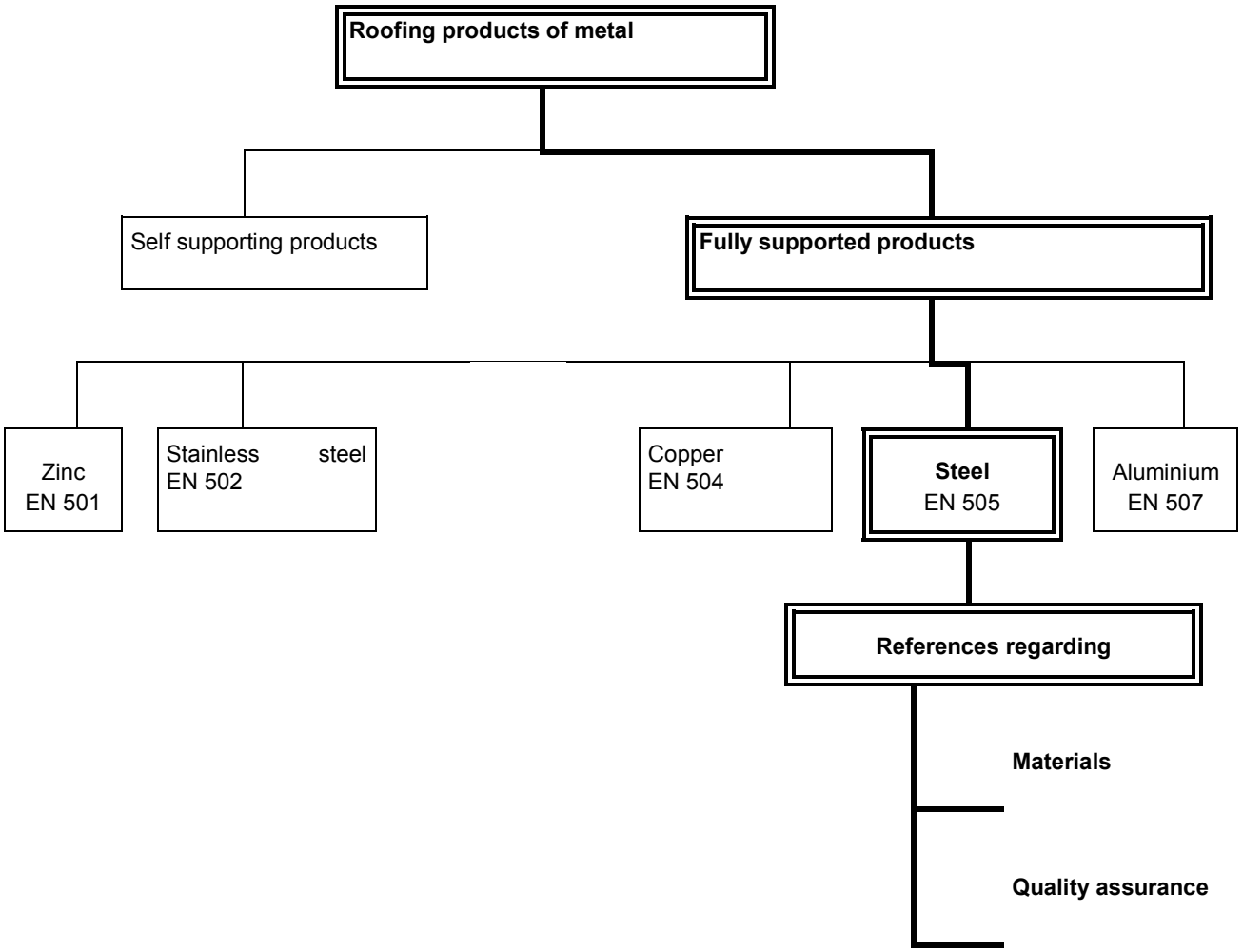


Figure 1 — Framework of standards

In this European Standard, the performance of the product has been defined in terms of a number of type tests.

The performance of a roof constructed with these products depends not only on the properties of the product as it is required by this European Standard, but also on the design, construction and performance of the roof as a whole in relation to the environment and conditions of use.

Metallic coated steel sheet can be easily fabricated. It can be sheared, punched, pressed, drawn, folded, roll-formed without difficulty within the given limits of the properties listed in the respective material specifications.

Coil coated sheet can be fabricated like metallic coated steel sheet in most applications, but minimum bend radii, design of forming tools, process temperature etc are chosen according to material properties.

1 Scope

This European Standard specifies requirements for roofing products used for assembly into coverings for pitched roofs, made from metallic coated steel sheet with or without additional organic coatings.

The European Standard establishes general characteristics, definitions and labelling for the products, together with requirements for the materials from which the products can be manufactured. It is intended to be used either by manufacturers to ensure that their products comply with the requirements or by purchasers to verify that the products comply before they are despatched from the factory. It specifies the requirements for products which enable them to meet all normal service conditions. Products can be prefabricated or semiformed products as well as strip, coil and sheet for on-site-formed applications (e.g. standing-seam and clip fixroofs).

The European Standard applies to all discontinuously laid and fully supported roofing products made of steel sheets. No requirements for supporting construction, design of roof system and execution of connections and flashings are included.

NOTE The European Standard deals partly with flat products, partly with formed (prefabricated) products. Requirements for preformed self-supporting products are given in EN 508-1.

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 508-1, *Roofing products from metal sheet — Specification for self-supporting products of steel, aluminium or stainless steel sheet — Part 1: Steel*

EN 1427, *Bitumen and bituminous binders — Determination of the softening point — Ring and Ball method*

EN 10079:2007, *Definition of steel products*

EN 10143, *Continuously hot-dip metal coated steel sheet and strip — Tolerances on dimensions and shape*

EN 10169, *Continuously organic coated (coil coated) steel flat products — Technical delivery conditions*

EN 10204, *Metallic products — Types of inspection documents*

EN 10346, *Continuously hot-dip coated steel flat products — Technical delivery conditions*

EN ISO 6270-1, *Paints and varnishes — Determination of resistance to humidity — Part 1: Continuous condensation (ISO 6270-1)*

EN ISO 6988, *Metallic and other non-organic coatings — Sulfur dioxide test with general condensation of moisture (ISO 6988)*

EN ISO 9227, *Corrosion tests in artificial atmospheres — Salt spray tests (ISO 9227)*

3 Terms, definitions, symbols, units and abbreviated terms

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 10079:2007 and the following apply.

3.1.1
hot-dip zinc coated steel sheet (type Z)
product obtained by continuously hot-dip zinc coating cold reduced strips of either low carbon steel for cold forming to EN 10346 or steel of structural quality to EN 10346

3.1.2
hot-dip zinc-aluminium coated steel sheet (type ZA)
product obtained by continuously hot-dip coating cold reduced strips of low carbon steel for cold forming steel or steel of structural quality on a production line using an alloy consisting of:

— 5 % aluminium (mass fraction);

— 95 % zinc (mass fraction);

— small amounts of mischmetal

Note 1 to entry: EN 10346 refers to this type of steel.

3.1.3
hot-dip aluminium-zinc coated steel sheet (type AZ)
product obtained by continuously hot-dip coating cold reduced strips of low carbon steel for cold forming or steel of structural quality on a production line using an alloy consisting of:

— 55 % aluminium (mass fraction);

— 1,5 % silicon (mass fraction);

— balance zinc

Note 1 to entry: EN 10346 refers to this type of steel.

3.1.4
hot-dip aluminium-coated steel sheet (type A)
product obtained by continuously hot-dip aluminium coating cold reduced strips of low carbon steel for cold forming or steel of structural quality on a continuous production line

Note 1 to entry: See Annex A.

3.1.5
organic coated steel sheet
product obtained by factory application of paint by roller or spray processes, or factory applied organic film, on substrates of type Z, type ZA, type AZ or type A coated steel sheet

Note 1 to entry: EN 10169 refers to this type of coated steel.

3.1.6
multilayer coated steel sheet
product obtained by continuously coating on both sides hot-dip zinc coated cold reduced strips of low carbon steel for cold forming or steel of structural qualities with one or multiple applications of thermoplastic asphalt compounds and subsequent lamination of a metal foil with or without decorative painting

Note 1 to entry: See Annex B.

Note 2 to entry: Minimum thickness of coating 1,5 mm.

3.1.7
fully supported
installation conditions such that the bottom flat portions of the product are supported by a continuous construction

3.2 Symbols and abbreviated terms

Z	Hot-dip zinc coated steel
ZA	Hot-dip zinc/aluminium coated steel
AZ	Hot-dip aluminium/zinc coated steel
A	Hot-dip aluminium coated steel
ML	Multilayer coated steel
AY	Acrylic paint coating
SP	Polyester paint coating
SP-SI	Silicone-modified polyester paint coating
PVDF	Polyvinylidenefluoride paint coating
PVF(F)	Polyvinylfluoride-film coating
PVC(P)	Polyvinylchloride (plastisol)-coating, applied by coil coating process.
PUR	Polyurethane paint coating
SP-PA	Polyamid-modified polyester paint coating
EXAMPLES	
Z275 PVDF	PVDF paint coating, applied to steel sheet with hot-dip zinc coating. Nominal zinc coating mass 275 g/m^2 total both sides.
Z275	Hot-dip zinc coating, nominal coating mass 275 g/m^2 total both sides.
ZA255	Hot-dip 5 % Al-Zn alloy-coating, nominal coating mass 255 g/m^2 total both sides.
AZ185	Hot-dip 55 % Al-Zn alloy-coating, nominal coating mass 185 g/m^2 total both sides.

4 Requirements

4.1 General

The product shall be manufactured from materials complying with 4.2.

The supplier of the materials is responsible for carrying out the tests necessary to verify that the materials supplied to the manufacturer comply with the requirements and should provide appropriate inspection documents (according to EN 10204) on request.

NOTE The symbols and abbreviations that are used to designate the steel grade, the type and mass of the metallic coating are those of the standards referred to in Clause 2.

A permanent quality control system shall be adopted by the manufacturer.[1)]

1) For example, a Quality Management System based on EN ISO 9000.

4.2 Materials

4.2.1 Steel

All steel grades in EN 10346 are suitable for fabrication of fully supported roofing products, either in an industrial process or by an on-site-process. Depending on processing conditions and/or requested mechanical properties, higher steel grades may be chosen according to the grade values given in the respective material standards.

4.2.2 Nominal metallic coating

The minimum nominal metallic coating mass depends on geographic and climatic conditions and shall be chosen from Table 1. The metallic coating mass shall be the sum of the coating masses on both sides in grams per square metre measured and with tolerances as specified in the appropriate standard.

NOTE The minimum nominal metallic coating masses specified in some countries in their regulations or codes of practice are listed in Annex C.

Table 1 — Nominal metallic coating masses

Hot-dip coating type	Coating designation	
	with organic coating	without organic coating
Zinc type Z	Z200 Z225 Z275	Z275 Z350 Z450
5 % Al-Zn type ZA	ZA200 ZA255	ZA255 ZA300
55 % Al-Zn type AZ	AZ150	AZ150 AZ185
Aluminium-coating type A	A195	A230

4.2.3 Organic coatings

The main weather resistant organic coatings suitable for application to metallic coated steel substrates are given in Table 2.

Table 2 — Factory applied organic coatings

Type of coating		Designation
Factory applied coatings	Acrylic Polyester Silicone-modified polyester Polyvinylidene fluoride Polyvinyl chloride (Plastisol) Polyurethane Polyamide-modified polyester Multicoat polyvinylidenefluoride Multicoat polyurethane	AY SP SP-SI PVDF PVC (P) PUR SP-PA - -
Factory applied laminated film	Polyvinylfluoride	PVF (F)

The reverse side coating should be chosen as appropriate, it being required for handling, storage and for corrosion protection in some conditions. Performance requirements and test methods for organic coated steel are given in EN 10169.

NOTE No requirements are given for coatings which are applied after the product is formed. Where appropriate the tests in EN 10169 can be used.

Special coatings or films may be applied to the reverse side to reduce the dripping of moisture caused by condensation.

4.3 Products

4.3.1 Mechanical properties

Mechanical properties for steel grades shall be in accordance with the appropriate references in Table 3.

Table 3 — Steel grades

Grades	Reference
Hot-dip galvanised steel sheet and strip (type Z) :	
— forming grades	EN 10346
— structural grades	EN 10346
Aluminium coated steel sheet and strip (type A)	Annex A
Multilayer coated steel sheet and strip	Annex B
Continuously hot-dip zinc-aluminium coated steel sheet and strip (type ZA)	EN 10346
Continuously hot-dip aluminium-zinc coated steel sheet and strip (type AZ)	EN 10346

If special processing operations or service conditions necessitate the use of other grades, or higher coating mass, or special surface finish, this shall be specified at the time of ordering. In this case, the full designation of material should be used as given in the respective material standard/specification.

No short designations are listed for post-fabrication painted or organic coated steel sheet, as these combinations should be specified in detail at the time of ordering.

4.3.2 Dimensions and tolerances

4.3.2.1 Flat products

Dimensional tolerances shall be in accordance with EN 10143.

The minimum nominal thickness (including metallic coatings but excluding organic coatings) shall be as follows:

— for fully supported coverings : 0,6 mm;

— for clips (fixing clips, sliding clips) : 0,6 mm;

— for line-fixing strips : 0,5 mm.

4.3.2.2 Formed (prefabricated) products

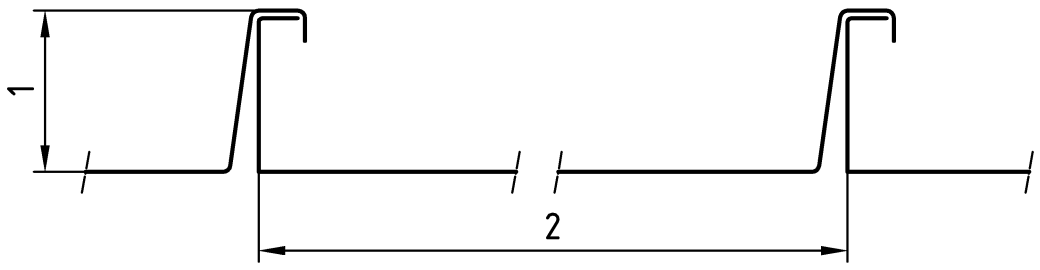
Thickness shall be selected according to processing and service conditions.

Depending on dimensional requirements for fixing and fabrication, manufacturing tolerances for the formed product shall be agreed at the time of ordering. However, the minimum tolerances on geometrical characteristics, as illustrated in Figures 2 and 3, shall be as given in Table 4 (dimensions measured in the factory at sample temperature of 20 °C).

Measurements shall be made at 200 mm from the ends of the product.

Table 4 — Dimensional tolerances on formed (prefabricated) products

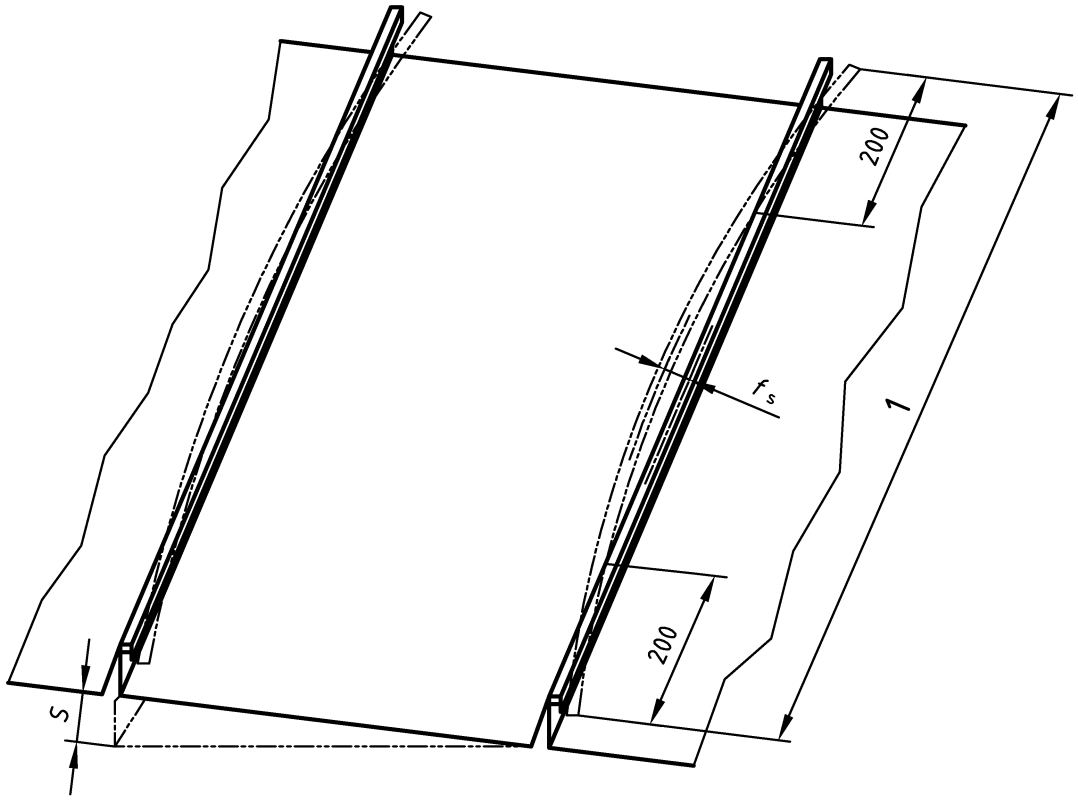
Geometric characteristics	Tolerances
Length (ℓ): — up to 3 000 mm — 3 000 mm and more	 $^{-3}_{+5}$ mm $^{-0,1}_{+0,2}$ % of nominal length
Squareness (S)	3 mm/m width
Straightness (f_s)	Deviation of 2 mm per metre length, up to a maximum deviation of 10 mm
Cover width (b)	$^{-5}_{+5}$ mm
Depth (h)	$^{-1}_{+1,5}$ mm



1 depth (h)
2 cover width (b)

Figure 2 — Standing seam construction (as example), section before installation

Dimensions in millimetres



1 length (ℓ)

Figure 3 — Standing seam construction, before installation

4.3.3 Safety in case of fire

Until appropriate European Standards are published, products coated with organic coatings shall comply with national building regulations regarding fire properties.

NOTE 1 All products referred to in this European Standard are resistant against sparks and heat radiation.

NOTE 2 All products referred to in this European Standard without organic coating are incombustible.

5 Sampling and test methods

5.1 Flat products

The sampling and test methods for products made from hot-dip zinc coated steel sheet (type Z), zinc-aluminium coated steel sheet (type ZA) and aluminium-zinc coated steel sheet (type AZ) with or without organic coating shall be in accordance with the relevant material standard. For products made from Al-coated steel sheet (type A) and multilayer coated steel sheet, sampling and test methods shall be agreed at the time of ordering.

5.2 Formed (prefabricated) products

5.2.1 Sampling

From each delivery of products, the number required for the tests in accordance with the relevant material standard shall be selected.

5.2.2 Testing

5.2.2.1 General

The products shall be supplied with inspection documents to comply with the requirements of this European Standard.

The following information shall be given at the time of ordering:

— type of test (specific or non-specific test, see EN 10204) ;

— type of inspection document, see EN 10204.

5.2.2.2 Test unit

For dimensional tolerances, the test unit shall consist of at least one complete piece from the delivery.

If specially agreed at the time of ordering, the test unit may consist of more than one piece.

5.2.2.3 Number of tests

One series of measurements shall be carried out per test unit to determine the geometrical characteristics.

6 Designation

Products covered by this European Standard shall be designated as follows:

— type of product (e.g. sheet, coil, slit coil, cut length, roof panel, clip, tile);

— short designation of material (see 3.2) if applicable or full designation of material according to material standard specification;

— number of this European Standard (EN 505).

EXAMPLE Roof panel, made from hot-dip galvanised steel (nominal coating mass 275 g/m^2) with PVDF-paint coating, for fully supported installation :

Roof panel - EN 505 - Z275-PVDF

7 Marking, labelling and packaging

7.1 Marking and labelling

At least the following information shall be attached to every pack, coil, bundle or delivery unit:

— name or registered identification of the manufacturer;

— designation of the product (see Clause 6);

— order number;

— ordered dimension and quantity;

— gross mass (kg).

7.2 Packaging and any special ordering conditions

The packaging requirements and any special requirements to take account of particular conditions shall be agreed between manufacturer and purchaser at the time of ordering.

7.3 Transport, storage and handling

Any instructions regarding handling or storage shall be clearly visible on package.

NOTE Moisture, in particular condensation inside packages, can lead to the formation of stains, white rust on zinc and zinc-alloy coatings, and if there is prolonged contact with moisture, can cause damage to the corrosion protection of coatings. During transport, dark spots can appear on the hot-dip metallic coated surfaces as a result of friction when packaging allows movement between neighbouring surfaces.

The packages should be fully supported by means of battens or pallets providing sufficient space to permit good ventilation while avoiding any permanent deformations of the products. The packages should be inclined in order to promote drainage.

The packages should be stored under a covered warehouse or under a cover made form tarpaulin over a frame. The frame should allow sufficient space between tarpaulin and packages to allow air to circulate.

If severe service conditions are expected during transportation, storage or processing, the product can be supplied with an additional protection of a temporary, strippable film, wax or oil.

Type, thickness, adhesion properties, formability, tear strength and light fastness should be taken into consideration when choosing protective films.

All protective films can only be exposed to outdoor weathering for a limited period.

Annex A
(informative)

Aluminium coated steel sheet (type A)

A.1 General

The definition of this type of coating is given in 3.1.4.

In addition to the references given in Clause 2, the following are relevant to this annex:

— NF A 36-345, *Iron and steel — Aluminium coated sheet — Cut lengths and coils*

— ASTM A 463-83, *Steel sheet, cold rolled aluminium coated, type 1 and type 2*

A.2 Roof covering products

A.2.1 Steel grades

The steel grades given in Table A.1 should be used.

Table A.1

Steel grade		Yield strength	Tensile strength	Elongation
Steel name	**Steel number**	R_e N/mm^2 min	R_m N/mm^2 min	A_{80} **%** min [a]
S250GD	1.0242	250	330	19
S280GD	1.0244	280	360	18
S320GD	1.0250	320	390	17
S350GD	1.0529	350	420	16

[a] For product thicknesses ≤ 0,7 mm (including aluminium coating), the minimum elongation values (A_{80}) shall be reduced by 2 units.

A.2.2 Coating mass

The coating designation corresponds to the mass in g/m2 referring to the total mass on both surfaces (see Table A.2).

Table A.2

Coating designation	Triple spot test	Single spot test
A195 [ab]	195 g/m^2	180 g/m^2
A230 [a]	230 g/m^2	210 g/m^2
A305 [c]	305 g/m^2	275 g/m^2
[a] Sheet with this coating can be used as substrate for organic coil coating. [b] ASTM designation : Al T2 65. [c] ASTM designation : Al T2 100.		

The density of the coating is approximately 3 000 kg/m^3.

A.2.3 Dimensional tolerances

Dimensional tolerances other than those for coating thickness are those given in EN 10143.

Annex B
(normative)

Multilayer coated steel sheet

B.1 General

Multilayer coated steel sheet shall be obtained by continuously coating on both sides hot-dip metal-coated structural steel with one or multiple applications of thermoplastic bituminous compounds and subsequent lamination of a metal foil or plastics film, with or without further coatings.

NOTE The common coating materials used for multilayer coated steel sheet are:

— bitumen to which additives and fillers have generally been added;

— embossed aluminium foil with or without paint or plastics film;

— embossed copper foil with or without plastics film;

— embossed stainless steel with or without plastics film;

— plastics film with or without paint or metal foil.

External coatings shall overlap with each other to wrap the lateral edges.

B.2 Substrate materials

The base material for multilayer coated steel products shall be a continuously hot-dip metal-coated steel of structural quality conforming to EN 10346 or EN 508-1.

B.3 Specific requirements

B.3.1 Minimum nominal values of thickness

The minimum nominal values of thickness shall be as follows:

— finished product total thickness: (2,4 ± 0,2) mm;

— aluminium foil: (50 ± 5) μm;

— aluminium foil with plastics film: (50 ± 10) μm;

— copper and stainless steel foils: (40 ± 5) μm;

— plastics film: (8 ± 2) μm.

B.3.2 Bituminous coating specification

The softening point of the bituminous coating, determined according to EN 1427, shall be at least 90 °C.

B.3.3 Durability

The multilayer coated steel sheet shall be tested in accordance with EN ISO 6270-1 (Resistance to humidity), EN ISO 6988 (Resistance to sulphur dioxide) and EN ISO 9227 (Salt spray test).

B.4 Freedom from defects

The multilayer coated steel sheet shall be manufactured such that all layers adhere without blistering or peeling.

When subjected to visual inspection without magnification, the top side coating shall be free from visible cracks.

Annex C
(informative)

Metallic coatings

The minimum metallic coating mass for steel sheet used to form the products specified in this European Standard should be selected according to the values given in Tables C.1 and C.2 for the country in which they are to be used. Where no value is shown, the country concerned has not declared a minimum to CEN for the purposes of standardization.

Table C.1 — Minimum metallic coating mass for steel sheet without organic coating for interior and exterior applications

Coating type	**Type Z**	**Type ZA**	**Type AZ**	**Type A**
Standard	EN 10346	EN 10346	EN 10346	-
Metallic mass on both sides g/m^2				
Germany	NR	NR	185	NP
Austria	350	255		
Belgium	350	255	185	
Spain	275		185	230
Finland	350	300	NP	NP
France	350	255	185	230
Ireland	450		185	
Czech Republik	NR	NR	185	
United Kingdom	350	NR	185	230
Sweden	350		185	NR
NP = Not permitted by National Regulation. NR = Not recommended without organic coating.				

Table C.2 — Minimum metallic coating mass for steel sheet with organic coating for interior and exterior applications

Coating type	Type Z	Type ZA	Type AZ	Type A
Standard	EN 10346	EN 10346	EN 10346	-
Metallic mass on both sides g/m^2				
Germany	275	255	150	NP
Austria	275	255		
Belgium	275	255	185	
Denmark	275	255	150	
Finland	275	255	NP	NP
France	225	200	150	195
Ireland	275		150	
Italy	200			
Czech Republik	275	255	150	
United Kingdom	275	255	150	NP
Sweden	275		150	NP
NP = Not permitted by National Regulation. NR = Not recommended without organic coating.				

Annex D
(informative)

A-deviations

A-Deviation: National deviation due to regulations, the alteration of which is for the time being outside the competence of the CEN-CENELEC national member.

This European Standard does not fall under any Directive of the EU.

In the relevant CEN-CENELEC countries these A-deviations are valid instead of the provisions of the European Standard until they have been removed.

Sweden: The following national regulations shall be complied with:

— ordinance AFS 1983 :12 : Work on roofs (§ 17);

— building code BFS 1993 :57,8 :22.

Bibliography

[1] EN ISO 1519, *Paints and varnishes — Bend test (cylindrical mandrel) (ISO 1519)*

[2] EN ISO 9000, *Quality management systems — Fundamentals and vocabulary (ISO 9000)*

[3] NF A36-345, *Iron and steel — Aluminium coated sheet — Cut lengths and coils*

[4] ASTM A 463-83, *Steel sheet, cold rolled aluminium coated, type 1 and type 2*

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