BS EN 13523-19:2011

BSI Standards Publication

Coil coated metals — Test methods

Part 19: Panel design and method of atmospheric exposure testing

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National foreword

This British Standard is the UK implementation of EN 13523-19:2011. It supersedes BS EN 13523-19:2004 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee STI/27, Paint systems for metallic substrates.

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

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Foreword

This document (EN 13523-19:2011) has been prepared by Technical Committee CEN/TC 139 “Paints and varnishes”, the secretariat of which is held by DIN.

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of an identical text or by endorsement, at the latest by December 2011, and conflicting national standards shall be withdrawn at the latest by December 2011.

This document supersedes EN 13523-19:2004.

The main technical changes are:

Annex B has been amended with the actual ECCA exposure sites.

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.

EN 13523, *Coil coated metals — Test methods*, consists of the following parts:

— *Part 0: General introduction and list of test methods*

— *Part 1: Film thickness*

— *Part 2: Specular gloss*

— *Part 3: Colour difference — Instrumental comparison*

— *Part 4: Pencil hardness*

— *Part 5: Resistance to rapid deformation (impact test)*

— *Part 6: Adhesion after indentation (cupping test)*

— *Part 7: Resistance to cracking on bending (T-bend test)*

— *Part 8: Resistance to salt spray (fog)*

— *Part 9: Resistance to water immersion*

— *Part 10: Resistance to fluorescent UV radiation and water condensation*

— *Part 11: Resistance to solvents (rubbing test)*

— *Part 12: Resistance to scratching*

— *Part 13: Resistance to accelerated ageing by the use of heat*

— *Part 14: Chalking (Helmen method)*

— *Part 15: Metamerism*

— *Part 16: Resistance to abrasion*

— *Part 17: Adhesion of strippable films*

— *Part 18: Resistance to staining*

— *Part 19: Panel design and method of atmospheric exposure testing*

— *Part 20: Foam adhesion*

— *Part 21: Evaluation of outdoor exposed panels*

— *Part 22: Colour difference — Visual comparison*

— *Part 23: Colour stability in humid atmospheres containing sulfur dioxide*

— *Part 24: Resistance to blocking and pressure marking*

— *Part 25: Resistance to humidity*

— *Part 26: Resistance to condensation of water*

— *Part 27: Resistance to humid poultice (Cataplasm test)*

— *Part 29: Resistance to environmental soiling (Dirt pick-up and striping)*

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Introduction

In the past it has been common practice in the northern hemisphere to expose test panels at 45° facing South.

Whilst this orientation is appropriate for degradation of the organic coating, investigations have shown that it has little bearing on the overall corrosion performance of the product when used in building applications.

For example, the 45° facing South exposure takes no account of

— overhangs which produce unwashed areas;

— sheet overlaps;

— low pitched roofing, etc.

The Outdoor Exposure Committee of European Coil Coating Association (ECCA) designed an exposure system which aligns more closely with "real life" situations and which is the basis of this part of EN 13523.

Three panel orientations are specified:

a) PANEL 1: 45° to horizontal facing South. The traditional orientation for evaluation of organic coatings: colour change, gloss change, chalking, etc.;

b) PANEL 2: 90° to horizontal facing North, with an overhang for evaluating general corrosion on side cladding particularly in unwashed areas;

c) PANEL 3: 5° to horizontal facing South. This panel which includes an overlap is principally for evaluating general corrosion in roofing applications.

The selection of one or more panel designs and their corresponding orientations will be chosen according to the exposure data required.

1 Scope

This part of EN 13523 specifies the panel design and describes the procedure for determining the resistance to outdoor exposure of an organic coating on a metallic substrate.

2 Normative references

The following referenced documents are indispensable for the application 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 13523-0:2001, *Coil coated metals — Test methods — Part 0: General introduction and list of test methods*

EN 13523-2, *Coil coated metals — Test methods — Part 2: Specular gloss*

EN 13523-3, *Coil coated metals — Test methods — Part 3: Colour difference — Instrumental comparison*

EN 13523-7:2001, *Coil coated metals — Test methods — Part 7: Resistance to cracking on bending (T-bend test)*

EN 13523-14, *Coil coated metals — Test methods — Part 14: Chalking (Helmen method)*

EN 13523-21, *Coil coated metals — Test methods — Part 21: Evaluation of outdoor exposed panels*

EN ISO 17872, *Paints and varnishes — Guidelines for the introduction of scribe marks through coatings on metallic panels for corrosion testing (ISO 17872:2007)*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 13523-0:2001 apply.

4 Apparatus

4.1 Rack design

The typical rack configuration accommodating the three elevations is shown in Figures 4 a), 4 b) and 5. The actual design and material of manufacture is at the discretion of the individual taking into consideration the corrosivity on the exposure site. Similarly the method of fixing the panels to the rack is up to the individual, but they shall be fixed in such a way as to avoid bimetallic corrosion. The material to provide the overhang on the North-facing panel shall be manufactured from an inert rigid material such as polymethyl methacrylate [1)] and shall give an overhang on the panel of approximately 65 mm (see 2 in Figure 4 a)).

4.2 Apparatus to prepare 90° variable radius bends

Forming the 90° variable radius bends can be made either manually or by an automatic press fitted with a variable radius forming tool and die. The typical design of a suitable tool and die is illustrated in Figure 6 and defined in EN 13523-7:2001, 8.2.2.

1) e.g. Perspex. Perspex is the trade name of a product supplied by Perspecs Distribution Ltd. This information is given for the convenience of users of this document and does not constitute an endorsement of the product named. Equivalent products may be used if they can be shown to lead to the same results.

4.3 Cutting tool, with a hard metal tip having a radius or width capable of exposing at least 0,2 mm of metal substrate in accordance with EN ISO 17872.

NOTE If the substrate is zinc- or zinc-alloy coated steel, the intention is that the scratch should penetrate as far as the zinc coating and not further, to the steel.

4.4 Stainless steel self-tapping fixing screws, with integral sealing ring and plastics cover[2)] (see Figures 2 and 3).

4.5 Aluminium domed rivets, with a stainless steel core (see Figures 2 and 3).

5 Sampling

Shall be in accordance with EN 13523-0.

6 Test panels

6.1 General

Shall be in accordance with EN 13523-0.

6.2 Panel preparation

For exposure at all three orientations, five blanks per set are required (see Figures 1, 2 and 3).

Panels can be made from laboratory prepared samples or coil line production runs.

All panels shall be prepared from an initial blank size of 200 mm × 150 mm. The 200 mm shall be in the rolling direction.

When preparing panels, all cuts and drill holes shall be made such that metal burrs occur on the side of the panel which is not exposed.

All panels shall have a 90° angle bend with a variable radius from 1T to 3T, as described in EN 13523-7.

6.3 Panel design

6.3.1 PANEL 1 (45° facing South, see Figure 1)

Panel 1 consists of a single blank into which a 90° variable radius bend has been produced, 25 mm from and parallel to the 200 mm edge. The variable radius is from 1T to 3T as defined in EN 13523-7.

All dimensions are shown in Figure 1. This panel shall have all edges protected and shall be mounted such that the tightest bend radius is at the bottom of the panel. The method of protecting edges is at the discretion of the individual but recommended practices are taping or coating of the edges.

This panel shall be used predominantly to measure changes in colour according to EN 13523-3, changes in gloss according to EN 13523-2 and degree of chalking according to EN 13523-14.

2) E.g. SELA screws.

6.3.2 PANEL 2 (90° facing North, see Figure 2)

6.3.2.1 General

Panel 2 consists of two blanks each exhibiting: variable radius bends, scribe marks and stainless steel screw fixings with plastics covers. The panel is exposed under an overhang as described in 4.1 and shown in Figure 4.

This panel shall be mounted such that the variable radius bend is vertical with the tightest radius on the bend at the bottom of the panel.

6.3.2.2 Variable radius bends

These bends should be prepared such that the panels are mirror images, i.e. when they are riveted together, the tightest radius bends occur at the same end of the panel.

Position and dimensions of radius bends are shown in Figure 2. To form the variable radius bend in the right hand panel it is necessary to rotate the variable radius punch through 180° in the press.

6.3.2.3 Scribe marks

Two scribes on each blank are arranged at 90° to each other. The scribes are 40 mm in length with the vertical scribe starting at 10 mm from the middle of the horizontal scribe. When the blanks are riveted together, the scribes should be at opposite ends of the panels as shown in Figure 2.

The scribes are prepared by means of the cutting tool (4.3) and extend down just through the organic coating. The scribed indentation shall exhibit a V-shaped profile and shall expose at least 0,2 mm of metal substrate.

The use of any cutting tool other than described in 4.3 is not permitted.

6.3.2.4 Fixings

Two stainless steel fixing screws (4.4) shall be located at opposite ends of the blanks when riveted together, approximately 30 mm from the bends and 50 mm from the top and bottom edges as shown in Figure 2.

6.3.2.5 Rivets

The two blanks shall be riveted together such that the left hand blank overlaps the right one by 20 mm with the tightest radius of both blanks to the bottom of the panel. Rivets shall be domed aluminium with a stainless steel core.

6.3.2.6 Edges

All edges shall be uncoated as the main purpose of the panel is to check corrosion, particularly on the unwashed area under the overhang.

6.3.3 PANEL 3 (5° facing South, see Figure 3)

Panel 3 is prepared from two blanks riveted together as shown in Figure 3, i.e. two blanks with 90° variable radius bends (from 1T to 3T) and overlapped by 80 mm. In this case, the widest radius of the top blank overlaps the tightest in the bottom blank.

This panel shall be mounted such that the variable radius bend follows the 5° pitch with the widest radius on the bend at the bottom of the panel.

A stainless steel fixing screw (4.4) is positioned as shown in Figure 3, 50 mm from the bottom of the panel and 47 mm from the edge.

The blanks are riveted together as shown in Figure 3 at the mid point of the overlap, i.e. 40 mm with domed aluminium rivets with stainless steel cores.

Edges are unprotected as the panel is mainly for corrosion measurement and simulation of low pitched roofs.

7 Procedure

Condition the panels for at least 24 h under ambient conditions of temperature and humidity before forming.

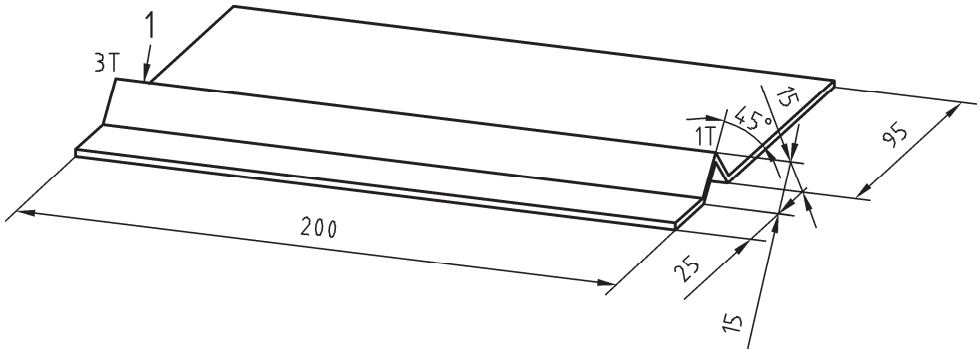
Expose the panels on the racks at the required orientation and an appropriate site that is monitored in the manner described in Annex A. For examples of appropriate sites see Annex B.

Inspect the panels regularly in accordance with EN 13523-21.

8 Expression of results

See EN 13523-21.

Approximate dimensions in millimetres

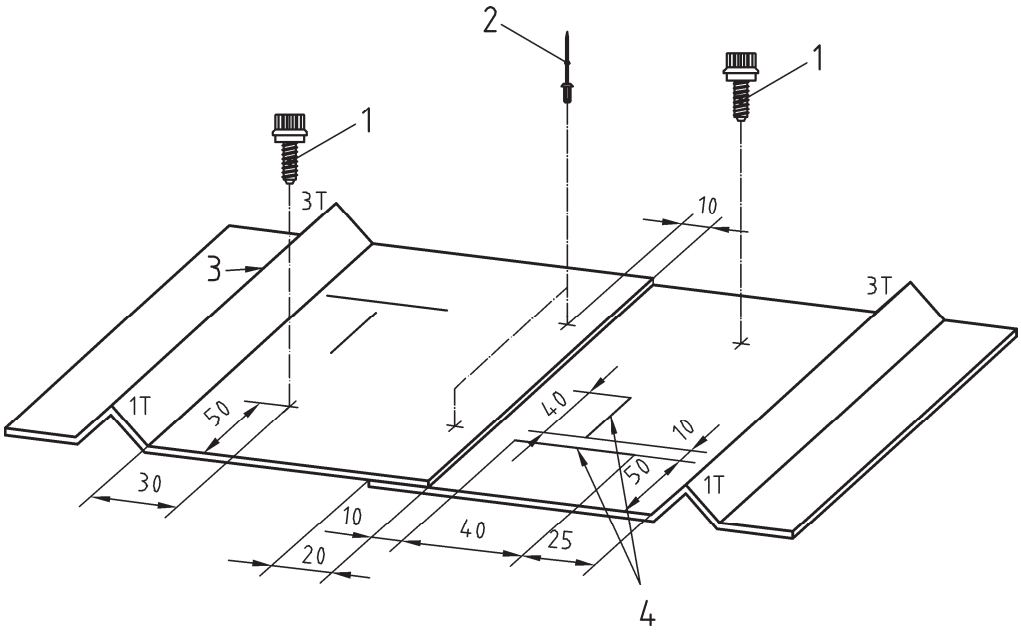


Key

1 variable radius bend

Figure 1 — 45° facing South panel (blank size 200 mm × 150 mm)

Approximate dimensions in millimetres

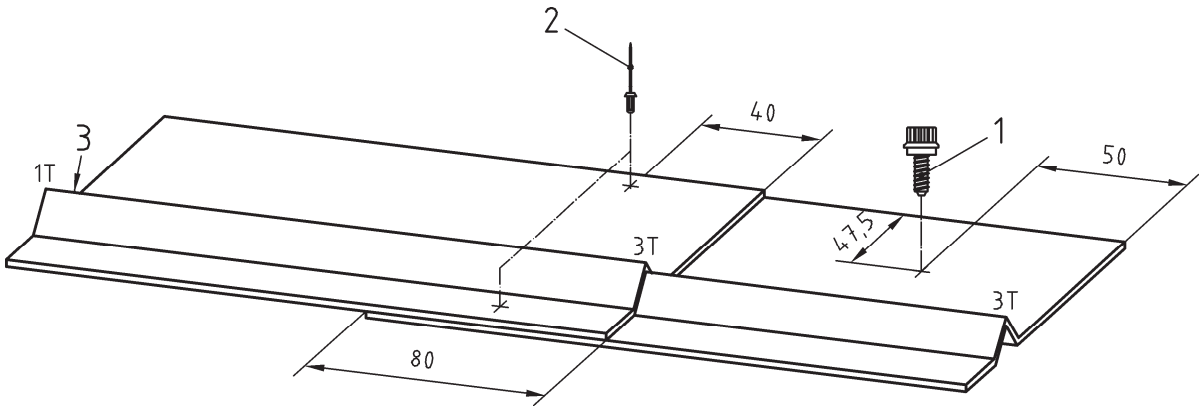


Key

1 fixing screws
2 rivets
3 variable radius bend
4 scribe marks

Figure 2 — 90° facing North panel (blank size 200 mm × 150 mm)

Approximate dimensions in millimetres

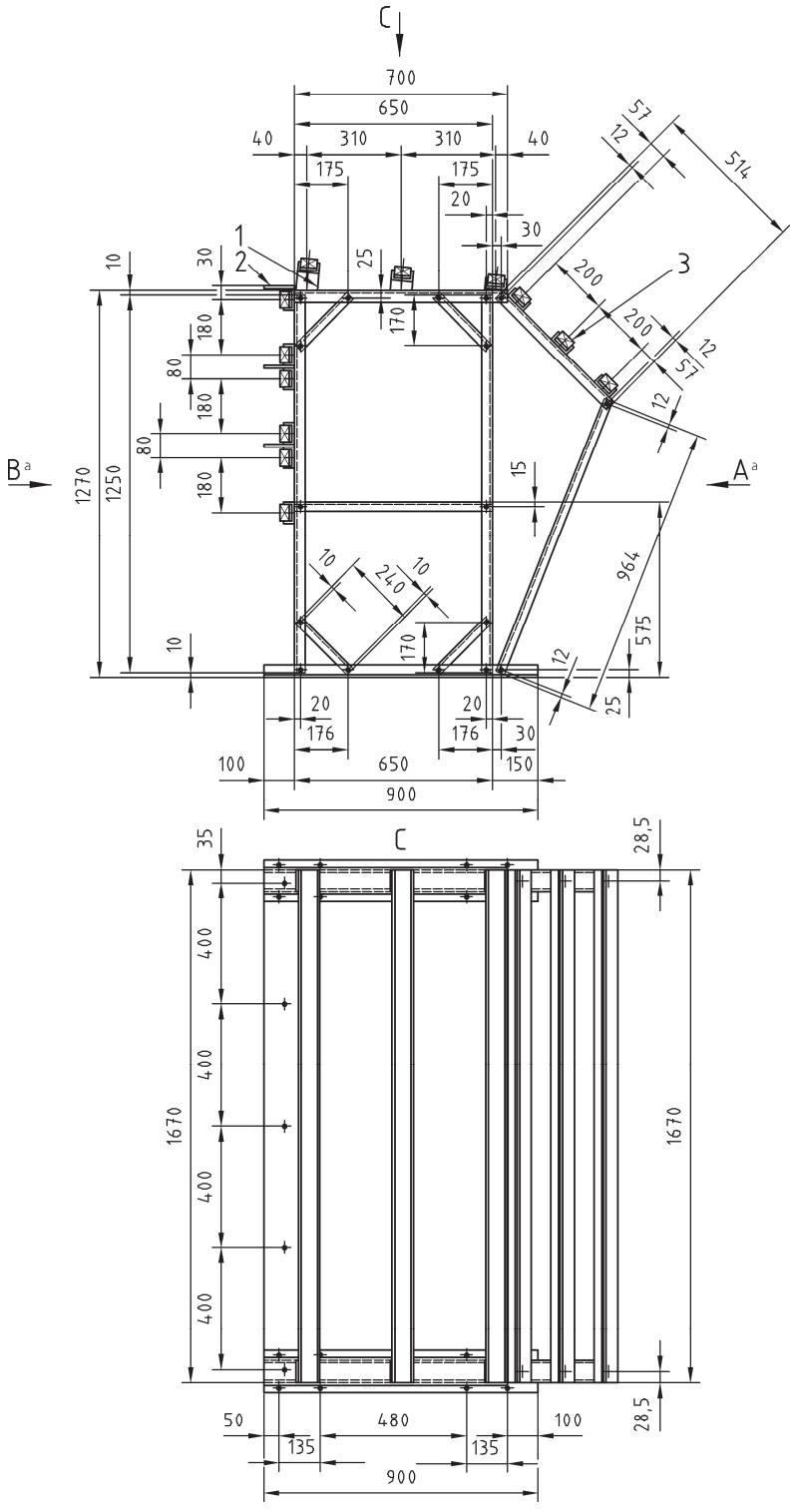


Key

1 fixing screw
2 rivets
3 variable radius bend

Figure 3 — 5° facing South panel (blank size 200 mm × 150 mm)

Approximate dimensions in millimetres



Key

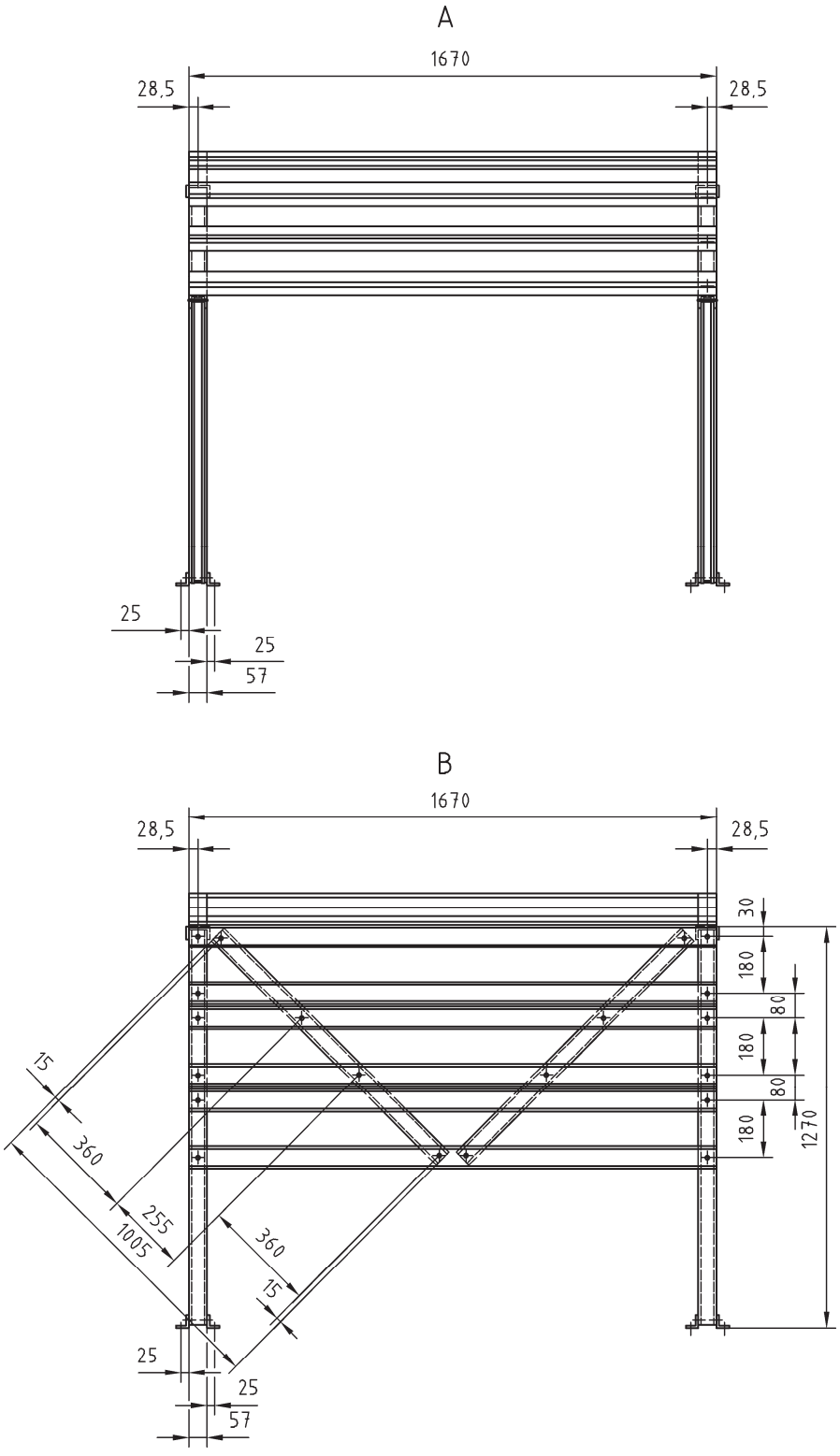
1 spacer to achieve 5° slope
2 overhang
3 panel mounts
[a] see Figure 4 b)

A view of 45° elevation
B view of 90° elevation
C view of 5° elevation

a)

Figure 4 — General arrangement of exposure frame

Approximate dimensions in millimetres



Key

A view of 45° elevation
B view of 90° elevation

b)

Figure 4 — General arrangement of exposure frame *(continued)*

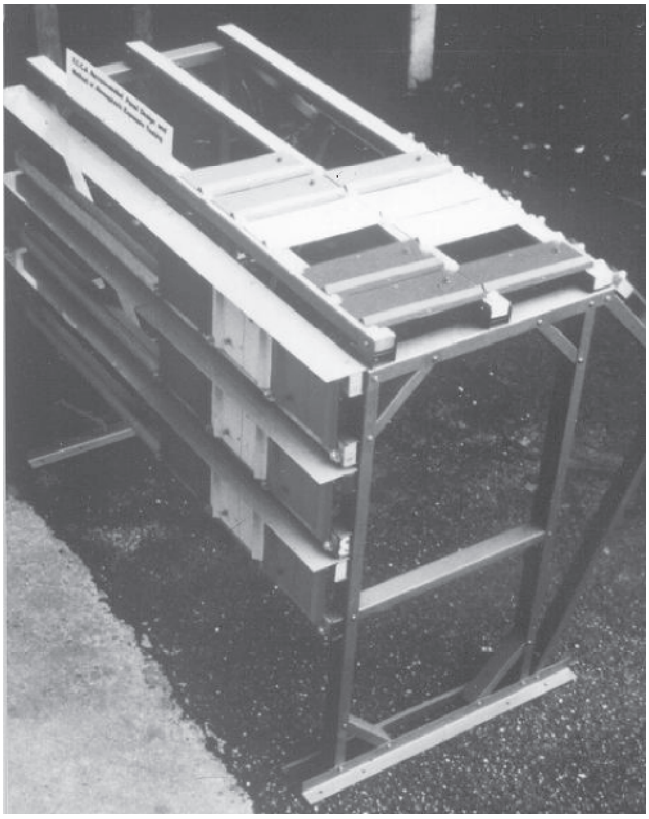
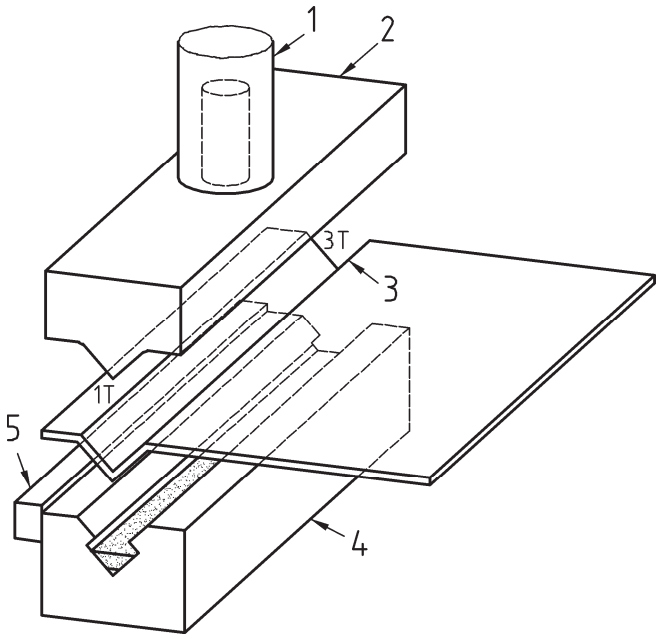


Figure 5 — Exposure rack



Key

1 fly press crosshead
2 variable radii punch
3 main panel blank
4 die with hard rubber insert to allow smooth bending

Figure 6 — Arrangement forming 90° bends

Annex A
(informative)

Parameters that can influence exposure results

Parameters that can influence exposure results and that should therefore be reported are given in Tables A.1 and A.2. Statements given in square brackets [ ] are optional. Table A.2 indicates by X which parameters should be reported for which environment.

Table A.1 — Parameters that can influence exposure results

Parameters	Frequency of measurement	Report	Type of information
Rainfall	daily	Monthly	mm of rain (total) time of rainfall (in hours)
Temperature	daily	Monthly	mean (min./max.)
[Dew point]	[daily]	[monthly]	[mean (min./max.)]
[SO_2 of rain] SO_2 of air NO_x Cl^- [pH of rain]	[2 weeks] daily 2 days monthly [2 weeks]	[monthly] Monthly Monthly Monthly [monthly]	[µg/g (ppm) (mean)] µg/m^3 (mean) µg/m^3 (mean) mg/m^3 (mean) [pH]
Relative humidity	daily	Monthly	percentage (mean)
Total Radiation (Sunshine)	daily	Monthly	J/m^2 or J/cm^2 (total)
[Time of wetness]			

Table A.2 — Sites at which parameters should be reported

Atmospheres [a] → **↓Parameters**	**Rural**	**Urban**	**Industrial**	**Marine/ industrial**	**Marine**	**High UV**
Rainfall	X	X	X	X	X	X
Temperature	X	X	X	X	X	X
[Dew point]	[X]	[X]	[X]	[X]	[X]	[X]
[SO_2 of rain]	-	[X]	[X]	[X]	-	-
SO_2 of air	-	X	X	X	-	-
NO_x	X	X	X	X	-	-
Cl^-	-	-	-	X	X	-
[pH of rain]	[X]	[X]	[X]	[X]	[X]	[X]
Relative humidity	X	X	X	X	X	X
Total radiation	X	X	X	X	X	X
[Time of wetness]	[X]	[X]	[X]	[X]	[X]	[X]

[a] Classification of environments as defined in EN ISO 12944-2.

Annex B
(informative)

ECCA outdoor exposure sites

B.1 General

The European Coil Coating Association (ECCA) approved testing sites are located along a belt mainly on the European coast of the Atlantic Ocean and include the following characterised environments.

B.2 Marine industrial

Located at Hoek van Holland (The Netherlands) at the mouth of the River Rhine just opposite to the industrial petroleum area of Pernis, is managed by Atlas Materials Testing Technologies and has been operational since early 1990. Typical climatic data are for a marine and industrial polluted atmosphere.

B.3 Marine (aggressive)

Located close to the western-most point in France, the weathering site at Brest is exposed to the full force of the Atlantic Ocean and provides an aggressive marine environment. It is managed by Institut de la Corrosion.

B.4 High UV

This site is located at Lumiar-Lisboa (Portugal) and is managed by INETI Laboratory. It is characterised by high UV radiation.

B.5 Continental industrial

This test site is located at Geleen (Southern Netherlands) and offers the required high levels of SO_2 and NO_x. This site is managed by ECCA with the technical help of Atlas Materials Testing Technologies and started in November 1992.

Bibliography

EN 1396, *Aluminium and aluminium alloys — Coil coated sheet and strip for general applications — Specifications*

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

EN ISO 2810, *Paints and varnishes — Natural weathering of coatings — Exposure and assessment (ISO 2810:2004)*

EN ISO 8565, *Metals and alloys — Atmospheric corrosion testing — General requirements for field tests (ISO 8565:1992)*

EN ISO 12944-2, *Paints and varnishes — Corrosion protection of steel structures by protective paint systems — Part 2: Classification of environments (ISO 12944-2:1998)*

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