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**Paints and varnishes**  
Standard panels for testing  
(ISO 1514 : 2004)  
English version of DIN EN ISO 1514

Beschichtungsstoffe – Norm-Probenplatten (ISO 1514 : 2004)

*A comma is used as the decimal marker.***National foreword**

This standard has been published in accordance with a decision taken by CEN/TC 139 to adopt, without alteration, International Standard ISO 1514 as a European Standard.

The responsible German body involved in its preparation was the *Normenausschuss Beschichtungsstoffe und Beschichtungen* (Coatings and Coating Materials Standards Committee), Technical Committee *Allgemeine Prüfverfahren für Beschichtungsstoffe und Beschichtungen*.

**Amendments**

This standard differs from the September 1997 edition in that it has been completely revised.

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**English version**

**Paints and varnishes**

Standard panels for testing  
(ISO 1514 : 2004)

Peintures et vernis – Panneaux normalisés pour essais (ISO 1514 : 2004)

Beschichtungsstoffe – Norm-Probenplatten (ISO 1514 : 2004)

This European Standard was approved by CEN on 2004-11-08.

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**CEN**

European Committee for Standardization  
Comité Européen de Normalisation  
Europäisches Komitee für Normung

**Management Centre: rue de Stassart 36, B-1050 Brussels**



Foreword

International Standard  
ISO 1514 : 2004 Paints and varnishes – Standard panels for testing,  
which was prepared by ISO/TC 35 ‘Paints and varnishes’ of the International Organization for Standardization,  
has been adopted by Technical Committee CEN/TC 139 ‘Paints and varnishes’, the Secretariat of which is held  
by DIN, as a European Standard.  
This European Standard shall be given the status of a national standard, either by publication of an identical  
text or by endorsement, and conflicting national standards withdrawn, by June 2005 at the latest.  
In accordance with the CEN/CENELEC Internal Regulations, the national standards organizations of the follow-  
ing countries are bound to implement this European Standard:  
Austria, Belgium, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary,  
Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal,  
Slovakia, Slovenia, Spain, Sweden, Switzerland, and the United Kingdom.

Endorsement notice

The text of the International Standard ISO 1514 : 2004 was approved by CEN as a European Standard without  
any modification.

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## Introduction

For many of the test methods most widely used for paints and varnishes, the type of panel used and the particular way in which it is prepared for use can effect the test results to a significant degree. Consequently, it is important to standardize as carefully as possible both the panels and the procedures used to prepare the panels prior to painting. It is equally desirable to reduce to a minimum the number of different "standard panels" required for use in a paint testing laboratory.

It is not possible to include in an International Standard all the types of panels and preparation needed for paint testing and, in selecting those described in this standard, a distinction has been drawn between three different situations.

The first situation arises when the paint, varnish or other product is being tested in relation to a particular industrial application. This testing is most conveniently carried out on a panel or substrate that corresponds closely (regarding material, cleaning procedure and subsequent surface preparation, such as grit-blasting or chemical pretreatment) to the actual industrial application involved. In such instances, the only guidance that needs to be given regarding the panel is to state

- a) that the interested parties should reach agreement beforehand on the details of the materials and procedures to be used in preparing the substrate, and
- b) that these should be stated in the test report.

The second situation arises when the test method requires, in order to be carried out, a specially prepared test panel specific to that test; for example, an optically plane panel might be required for gloss measurement. In such instances, a detailed specification for both the panel and the preparation procedure should be given in the description of the test method concerned.

The third situation arises when neither of the above two situations applies. In such cases, the product needs to be tested on an agreed surface which is capable of good reproducibility. It is desirable to use a material that is generally available in standard quality and can be conveniently cleaned or otherwise prepared so as to provide a consistent surface. The fact that this might not necessarily be the type of surface on which the product will be applied in practice is of less significance.

This International Standard is concerned with the third situation. It lays down preparation procedures that are known to be reproducible and gives additional guidance in instances where there might still be doubt because of lack of international uniformity of procedure.



**WARNING —** This International Standard prescribes the use of chemicals, including hexavalent chromium, and apparatus that can pose health and safety hazards. The standard does not purport to address all of the safety problems associated with its use. It is the responsibility of the user of this standard to establish appropriate safety practices and to determine the applicability of regulatory limitations prior to use.

## 1 Scope

This International Standard specifies several types of standard panel and describes procedures for their preparation prior to painting. These standard panels are for use in general methods of test for paints, varnishes and related products.

The following types of standard panel are specified:

a) steel panels, prepared by

- solvent cleaning,
- aqueous cleaning,
- abrasion,
- phosphate treatment,
- blast-cleaning (notes for guidance only);

b) tinplate panels, prepared by

- solvent cleaning,
- aqueous cleaning,
- abrasion (burnishing);

c) zinc-coated panels, prepared by

- solvent cleaning,
- aqueous cleaning,
- abrasion,
- chemical treatment;

d) aluminium panels, prepared by

- solvent cleaning,
- aqueous cleaning,
- abrasion (burnishing),
- chromate conversion coating;



- e) glass panels, prepared by
  - solvent cleaning,
  - detergent cleaning;
- f) hardboard panels;
- g) paper-faced plasterboard panels;
- h) fibre-reinforced cement panels.

NOTE Panels made from other materials and by other preparation procedures may be used by agreement, when specified for the product under test.

## 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.

ISO 209-1:1989, *Wrought aluminium and aluminium alloys — Chemical composition and forms of products — Part 1: Chemical composition*

ISO 2695, *Fibre building boards — Hard and medium boards for general purposes — Quality specifications — Appearance, shape and dimensional tolerances*

ISO 2696, *Fibre building boards — Hard and medium boards for general purposes — Quality specifications — Water absorption and swelling in thickness*

ISO 3574, *Cold-reduced carbon steel sheet of commercial and drawing qualities*

ISO 3696:1987, *Water for analytical laboratory use — Specification and test methods*

ISO 8336, *Fibre-cement flat sheets*

ISO 10546, *Chemical conversion coatings — Rinsed and non-rinsed chromate conversion coatings on aluminium and aluminium alloys*

ISO 11949, *Cold-reduced electrolytic tinplate*

## 3 Steel panels

### 3.1 Material

Steel panels intended for general testing (as opposed to panels intended for testing for particular applications and uses) shall be manufactured from flattened mild steel in sheet or strip form. The steel used shall be free from rust, scratches, staining, discoloration and other surface defects. The physical dimensions of the panel shall be as specified in the description of the test method, or as otherwise agreed. Unless otherwise agreed upon between the purchaser and the seller, the steel shall be of one of the types specified below. For certain types of testing, it might be necessary to use steel of a greater thickness than specified for the types listed below.

- a) Type 1 steel is a commercial quality cold-reduced type with a sheet thickness of 0,60 mm to 1,00 mm. Type CR1 steel, conforming to the requirements of ISO 3574, is a suitable commercial quality cold-reduced steel. The steel shall have a matt finish, with a surface roughness ( $R_a$ ) of 0,63  $\mu\text{m}$  to 1,65  $\mu\text{m}$ . This finish is typical of steel used for painted surfaces on automobiles and appliances.



- b) Type 2 steel is a fully killed, cold-reduced type with a sheet thickness of 0,75 mm to 0,80 mm. Type CR4 steel, conforming to the requirements of ISO 3574, is a suitable fully killed cold-reduced steel. The panels shall show a minimum of surface roughness and discoloration. It is recommended that the surface roughness ( $R_a$ ) of the steel, as received, does not exceed 1,2  $\mu\text{m}$ .
- c) Type 3 steel is a commercial quality cold-reduced type with a sheet thickness of 0,25 mm to 0,60 mm. The steel shall have a smooth finish, with a surface roughness ( $R_a$ ) not higher than 0,51  $\mu\text{m}$ . This finish is useful for measuring colour, gloss, flexibility or adhesion of coatings, where it is desirable to minimize the effects of variability in the surface finish.

NOTE Guidance on blast-cleaning is given in Annex A for use when blast-cleaned steel panels are required (see also 3.7).

### 3.2 Storage prior to preparation

Prior to preparation, panels shall be stored in a manner that protects them from corrosion. Suitable methods include wrapping the panels in paper treated with a vapour-phase inhibitor and storage in a neutral light mineral oil or hydrocarbon solvent free from additives.

NOTE For example, panels may be either totally immersed in oil or coated with oil and then wrapped individually in paper impregnated with it. Alternatively, the panels may be stored in a desiccator containing an active desiccant (silica gel, for example).

### 3.3 Preparation by solvent cleaning

Wipe the panel to remove any excess oil, and then wash it thoroughly with a suitable solvent to remove all traces of oil.

NOTE Solvents which evaporate quickly may be used, provided that they are neither acidic nor alkaline and that toxicity hazards are avoided (see WARNING).

Ensure that any small fibres deposited by cleaning cloths are removed in the cleaning process, and that cloths are changed at predetermined intervals to avoid redeposition of oily residues. Do not contaminate the cleaned panels. Allowing the solvent to evaporate, lightly wiping the panels with a clean linen cloth and subjecting the panels to a stream of warm air are suitable methods of drying. If necessary, lightly warm the panels to remove any traces of condensed moisture.

If a large number of panels is prepared, it is prudent to check every 20th panel for cleanliness. The suggested method for checking the cleanliness is to wipe the panel with a clean, white paper tissue. The cleaning process shall be regarded as satisfactory if there is no pickup of soil on the tissue. If there is found to be residual soil on the panel being checked, it is necessary to repeat the cleaning process on all of the panels cleaned since the previous wipe test.

If it is not feasible to apply the paint coating immediately after cleaning, the cleaned panels shall be stored in a dry and clean atmosphere, such as a desiccator containing an active desiccant, until required for use. It is also acceptable practice to wrap the panels in paper treated with a vapour-phase inhibitor.

### 3.4 Preparation by aqueous cleaning (spray or immersion process)

Clean the panels with a commercially available aqueous alkaline cleaner. A spray cleaning process is recommended, but an immersion cleaning process is also acceptable. Maintain the cleaner concentration and temperature in accordance with the recommendations of the cleaner manufacturer.

Cleaning by a spray process requires the following four steps:

- a) Clean each side of the panel for a period of not less than 10 s. Regulate the temperature and spray pressure in accordance with the recommendations of the cleaner manufacturer.



- b) Rinse each side of the panel with tap water. Take steps to ensure that the rinse water does not become significantly contaminated during the cleaning process. This can be accomplished by allowing clean tap water to run into the rinse tank in such a way that the tank overflows continuously or periodically.
- c) Rinse each side of the panel with deionized water having a conductivity of not greater than 20  $\mu\text{S}/\text{cm}$ .
- d) Immediately after rinsing, force-dry the panels in an oven or in a stream of hot air.

If a large number of panels is prepared, it is prudent to check the panels periodically for cleanliness. In addition to the white cloth wipe method specified in 3.3, a water break test should be used on panels prepared by aqueous cleaning. The surface of a cleaned panel should be water break free. This is determined by immersing the panel momentarily in distilled or deionized water. When the panel is removed, the water should form a continuous unbroken film on the surface of the panel, without beading up into discrete droplets or other water breaks.

## 3.5 Preparation by abrasion

### 3.5.1 General

Some testing applications require a more uniform and reproducible surface than is available on steel, as rolled by the mill. In such cases, it is necessary to remove surface variability and contamination through mechanical abrasion. To ensure complete removal of contamination and variability, it is necessary to completely remove the original mill surface. The amount of surface removal required will depend somewhat on the original surface profile, but it shall never be less than 0,7  $\mu\text{m}$ , which may conveniently be determined by measuring the loss in mass of the abraded panel (a mass loss per unit area of 5  $\text{g}/\text{m}^2$  to 6  $\text{g}/\text{m}^2$  is approximately equal to a thickness decrease of 0,7  $\mu\text{m}$ ).

Prior to abrading, panels should be cleaned as described in 3.3 or 3.4. Unless otherwise agreed, the surface removal shall be accomplished as described in 3.5.2 to 3.5.4.

NOTE Subject to prior agreement, mineral solvent may be used as a lubricant in the abrasion operations.

### 3.5.2 Hand abrasion

This involves abrading the panel by hand using P220 silicone carbide paper. The following is a suitable sequence of operations for use in hand abrasion:

- a) Abrade the panel uniformly straight across its face in a direction parallel to any one side.
- b) Abrade the panel at a right angle to the initial direction until all signs of the original abrasion have been removed.
- c) Abrade the panel using a circular motion, with a diameter of approximately 80 mm to 100 mm, until a pattern is produced consisting solely of circular abrasion marks, superimposed one upon another.

### 3.5.3 Circular mechanical abrasion

This involves burnishing the panel by mechanical means using P220 silicon carbide paper. When this method is employed, the panel shall be burnished using a circular motion, with a diameter of approximately 80 mm to 100 mm. The operation shall be considered complete when no sign is visible of the original surface or any undulations.

### 3.5.4 Linear grinding

This involves a conveyor system using an abrasive belt mounted on a vertical grinding head to remove the original mill surface and produce a linear scratch finish on the panel. Grinding the surface with abrasive belts removes contamination and provides a surface that is more uniform and reproducible than a typical mill finish.



A P100 aluminium oxide abrasive belt is suitable for use in this operation. The surface roughness ( $R_a$ ) of the polished panel shall be between 0,50  $\mu\text{m}$  and 1,14  $\mu\text{m}$ .

### 3.5.5 Inspection and cleaning

Inspect the abraded panels to ensure that the original surface has been completely removed. Clean the panels thoroughly as described in 3.3 or 3.4 to remove any loose grit, steel particles or other contaminants. Do not contaminate the cleaned panels.

If it is not feasible to apply the subsequent coating immediately, store the clean panels in a clean and dry atmosphere, such as a desiccator containing an active desiccant, or wrap the panels in paper impregnated with a vapour-phase inhibitor.

## 3.6 Preparation by phosphate treatment

### 3.6.1 General

Phosphate conversion coatings are available from a number of sources, as proprietary compounds or processes, for application by spray or immersion. Follow the manufacturer's directions as to the application of the conversion coating. Preparation of test panels may consist of one or more steps of cleaning, rinsing and conditioning prior to the application of the conversion coating. Additional rinsing will usually be required after the conversion coating has been applied. If phosphate-treated panels are required use one of the following methods of preparation.

### 3.6.2 Crystalline zinc phosphate treatment

This conversion coating method consists of reacting the steel surface in a zinc acid phosphate solution containing oxidizing agents and accelerating salts. The steel surface is converted to a crystalline phosphate coating that inhibits corrosion and increases the adherence and durability of subsequently applied paint films. This treatment can be applied by spraying, by immersion or by a soft-bristle nylon brush. Solution temperatures, concentrations and contact times will vary with the method of application and should be maintained in accordance with the chemical manufacturer's recommendations. Zinc phosphate coatings are typically grey to grey-white in colour.

### 3.6.3 Amorphous iron phosphate treatment

This conversion coating method consists of reacting the steel surface in an acid phosphate solution containing oxidizing agents and accelerating salts. The steel surface is converted to an amorphous iron phosphate coating that improves the adhesion of subsequently applied coatings and inhibits corrosion to a lesser degree than the crystalline zinc phosphate coating. This treatment can be applied by spraying or immersion. Solution temperatures, concentrations and contact times will vary with the method of application and should be maintained in accordance with the chemical manufacturer's recommendations. Iron phosphate coatings typically range in colour from yellow-blue to purple.

## 3.7 Preparation by blast-cleaning

Before blast-cleaning, clean the panels using the procedure described in 3.3 or 3.4.

General guidance on the preparation of steel panels by blast-cleaning is given in Annex A.

**NOTE** It is emphasized, however, that this preparation by blast-cleaning is not intended for cold-rolled steel panels that are specified in 3.1 for general testing purposes.



## 4 Tinplate panels

### 4.1 Material

The panel shall be bright-finish standard grade tinplate conforming to the requirements of ISO 11949, of nominal thickness between 0,2 mm and 0,3 mm, temper number T52 (coated equally with tin on both sides). When the tinplate panels prepared in accordance with this International Standard are subsequently used in a test method, it is important that the designation code for the tinplate used is recorded in the test report for the test method concerned.

### 4.2 Preparation by solvent or aqueous cleaning

It is not necessary for tinplate panels to be specially protected during storage in the same manner as bare steel panels. Nevertheless, the surface of the panels can become contaminated with lubricants during processing. It is therefore recommended that the panels be cleaned prior to use by the procedure specified in 3.3 or 3.4 for steel panels.

**NOTE** Although solvent and aqueous cleaning processes will not entirely remove the organic post-plating treatment, the remaining residue has been found not to have a significant effect on the precision of test results.

### 4.3 Preparation by abrasion

Abraded tinplate panels are recommended if a test surface more uniform than that produced by solvent or aqueous cleaning is required. Carry out the cleaning operation as described for steel panels (see 3.5) except that the abrasion shall be performed much more lightly to avoid embedding abrasive in the surface and to avoid the complete removal of the tin plating at any point. It is, therefore, recommended that a good quality, fine silicon carbide paper be used, such as grade P320.

Continue the abrasion until the whole of the surface of the panel is covered by a pattern of circular abrasion marks superimposed one upon another and the original surface pattern is no longer visible to the naked eye.

Clean the abraded panels thoroughly before use, as described in 3.3 or 3.4, to ensure that all loose grit, tin particles and other contaminants are removed. Do not contaminate the cleaned panel.

If the paint coating cannot be applied immediately, store the cleaned panels in a dry and clean atmosphere, such as in a desiccator containing an active desiccant, or wrap the panels in paper which has been impregnated with a vapour-phase inhibitor until required.

## 5 Zinc- and zinc-alloy-coated panels

### 5.1 Material

The panel shall be cold-rolled carbon steel sheet coated with zinc or a zinc alloy. The specific type of zinc or zinc-alloy coating, as well as the thickness and physical dimensions of the panel shall be agreed between the purchaser and the seller. The different types of zinc and zinc-alloy coating are described in Annex B.

The panel shall be free of chemical passivating treatments as these treatments will interfere with the adhesion of subsequently applied coatings.

A passivating treatment, usually in the form of a sodium dichromate solution, is applied at the mill in order to prevent wet storage stain (or white rusting) of the zinc-coated surface during storage. This passivating treatment, if not removed, interferes with the adhesion of subsequently applied coatings. In order to obtain unpassivated zinc-coated steel, it is generally necessary to order the material specially from the mill. If this is not feasible, remove the passivating treatment by abrasion as described in 4.3.



## 5.2 Preparation by solvent cleaning

If clean panels are required, without further preparation, use the cleaning procedure specified in 3.3 for steel panels.

## 5.3 Preparation by aqueous cleaning

If clean panels are required, without further preparation, use the cleaning procedure specified in 3.4 for steel panels. In general, cleaner concentration, temperature and contact time will be lower when cleaning zinc-coated steel. Highly alkaline cleaners will attack the zinc coating. For this reason, the alkaline solution used to clean zinc-coated steel should be in the pH range of 11 to 12, and never higher than 13.

## 5.4 Preparation by chemical treatment

### 5.4.1 General

If chemically treated panels are required, use one of the methods given in 5.4.2 to 5.4.4 to treat the panels.

### 5.4.2 Crystalline zinc phosphate treatment

This conversion coating method consists of reacting the zinc surface in a zinc acid phosphate solution containing oxidizing agents and accelerating salts. The zinc surface is converted to a crystalline phosphate coating which inhibits corrosion and increases the adherence and durability of subsequently applied paint films. This treatment can be applied by spraying, by immersion or by a soft-bristle nylon brush.

### 5.4.3 Chromate treatment

**WARNING — Chromium trioxide is classified as carcinogenic (see EU Directive 67/548/EEC) and could cause cancer with inhalation. The use of chromium trioxide in an immersion solution or spray could cause hazard to those working with it. Appropriate safety practices should therefore be used. It is preferable to use an alternative method or substance.**

This treatment consists of an immersion or spray treatment with a dilute proprietary solution containing chromium trioxide and other acids, along with a suitable accelerator. This treatment produces a thin amorphous chromate coating that increases corrosion resistance and paint adhesion. This coating is not the same as that obtained with a passivating treatment.

### 5.4.4 Aqueous organic-chromium treatment

Certain water-soluble resins, when properly formulated with chromium compounds, may be applied to zinc surfaces by roller coating or other suitable means, e.g. using dip or squeegee rolls. This may be done over a wide temperature range provided the film is properly baked or cured, or both, as required by the paint system to be applied. The resultant coating provides a corrosion-resistant film that increases the adhesion of subsequently applied paint films.

## 6 Aluminium panels

### 6.1 Material

Aluminium alloy panels intended for general testing shall be of sheet or strip conforming to the requirements of the chemical composition for grade Al Mn1Cu or Al Mn0,5Mg0,5 as defined in ISO 209-1:1989. Where other aluminium alloys are required for testing, the alloy shall be stated in the test report. The temper shall be as specified for the particular test method. The thickness and other dimensions of the panel shall be as specified in the test method or as otherwise agreed.



The sheet and strip shall show no cracks when a test piece of the metal, 20 mm wide and of convenient length, cut with the longer axis transverse to the direction of rolling and with the longer edges carefully rounded and smoothed longitudinally, is bent through 180° flat upon itself, in the case of soft aluminium, or through 180° on a cylindrical former of radius equal to the thickness of the sheet, in the case of hard aluminium.

## 6.2 Preparation by solvent cleaning

If clean panels are required, without any further preparation, use the cleaning procedure specified in 3.3 for steel panels.

## 6.3 Preparation by aqueous cleaning

If clean panels are required, without any further preparation, use the cleaning procedure specified in 3.4 for steel panels. In general, cleaner concentration, temperature and contact time will be lower when cleaning aluminium. In addition, it is important to verify that the selected alkaline cleaner is safe for use with aluminium. Some alkaline cleaners will etch aluminium. These cleaners shall not be used in the preparation of aluminium panels for general testing. Consult the cleaner manufacturer to determine if the product is safe for use with aluminium, and at what temperatures and concentrations it may be safely used. Panels cleaned by this method should be water break free. This can be determined by momentarily immersing the panel in distilled or deionized water. When the panel is removed, the water should form an unbroken film on the metal surface, without beading up into discrete droplets or other water breaks.

## 6.4 Preparation by abrasion

If abraded panels are required, the abrasive shall be applied to a cloth pad and shall consist of calcined alumina powder conforming to the requirements of Table 1.

**Table 1 — Particle size of abrasive if abraded panels are required**

Particle size	Mass fraction
Greater than 63 µm	10 % max.
Less than 20 µm	70 % min.
Less than 10 µm	60 % min.

The sequence of abrading operations shall be as specified in 3.5.2, but the abrasive shall be wetted with a mineral solvent, such as white spirit, and applied to the panel surface on a pad of soft cloth or other suitable material.

Continue the abrasion until the whole of the surface of the panel is covered by a pattern of circular burnishing marks superimposed one upon another and the original surface pattern is no longer visible to the naked eye.

Clean the abraded panels thoroughly before use, as described in 3.3, to ensure that all loose grit, aluminium particles and other contaminants are removed. Do not contaminate the cleaned panels.

Aluminium panels shall be prepared immediately prior to painting.

## 6.5 Preparation by chromate conversion coating

Aluminium or aluminium alloy panels prepared by chromate conversion coating for use in general testing shall be prepared in accordance with ISO 10546.

The aluminium shall be cleaned as specified in 6.2 or 6.3. The chromate conversion coating shall be applied using a commercially available pretreatment chemical formulation. The water used to make up the chromate solution shall conform at least to the requirements of grade 3 as defined in ISO 3696:1987. Rinsed or non-rinsed chromate conversion coatings may be used. The coating may be applied in a spray, immersion or roll



coat process in accordance with the recommendations of the chemical manufacturer. Solution temperatures, concentrations and contact times will vary with the method of application. These parameters shall also be maintained in accordance with the manufacturer's recommendations.

The coating shall range from clear to golden in colour. Unless otherwise agreed, the coating mass per unit area shall be in the range of 0,1 g/m<sup>2</sup> to 1,3 g/m<sup>2</sup>. The coating shall be adherent and not powdery. The coating should preferably be fairly uniform, and free from stains and voids.

It is good practice to paint the chromate panels as soon as possible after conversion coating.

## 6.6 Preparation by non-chromate conversion coating

Due to environmental restrictions on the handling and disposal of chromium compounds, a number of alternative non-chromate conversion coatings have been developed. There are a number of different technologies, with the most common being based on Zr/Ti salts, silanes and water-based polymer solutions.

The aluminum shall be cleaned as specified in 6.2 or 6.3. The non-chromate conversion coating shall be applied using a commercially available pretreatment chemical formulation. The water used to make up the pretreatment solution shall have a conductivity of not greater than 20 µS/cm. The coating may be applied in a spray, immersion or roll coat process in accordance with the recommendations of the chemical manufacturer. Solution temperatures, concentrations and contact times will vary with the method of application. These parameters shall also be maintained in accordance with the manufacturer's instructions. Unless otherwise agreed, the coating mass per unit area shall be in the range of 5 mg/m<sup>2</sup> to 150 mg/m<sup>2</sup>. The coating shall be adherent and free from powdery residue. The coating should preferably be fairly uniform and free from stains and voids.

It is good practice to paint the conversion-coated panels as soon as possible after pretreatment.

## 6.7 Preparation by acid chromating

If aluminium panels are prepared by acid chromating for general testing as opposed to those required for particular applications, the procedure is as follows:

Prepare an acid chromate solution by dissolving approximately 100 g of analytical-grade potassium or sodium dichromate in 1 000 ml of water, the water having a conductivity of not greater than 20 µS/cm. Slowly add to this solution, while stirring, 170 ml of analytical-grade sulfuric acid ( $\rho \approx 1,84$  g/ml).

During use, keep the volume of the solution constant by adding water with a conductivity of not greater than 20 µS/cm.

Do not allow the chromic acid content of the solution to fall below 30 g/l. Regenerate the solution, if necessary, by adding appropriate quantities of sulfuric acid and potassium or sodium dichromate.

Discard the solution when solid material begins to separate out on cooling the solution to room temperature, or at the first signs of pitting of the aluminium panels, whichever occurs first.

Clean the panels as described in 6.2 and immerse them for 20 min at  $(55 \pm 5)$  °C in the acid chromate solution, contained in a glass or polystyrene vessel.

Remove the panels from the solution and wash them thoroughly and as rapidly as possible in cold and then hot water having a conductivity of not greater than 20 µS/cm at a temperature of  $(60 \pm 2)$  °C for between 30 s and 40 s. Allow the panels to dry either at room temperature or, preferably, in a well-ventilated oven at  $(70 \pm 2)$  °C.

It is good practice to paint the panels as soon as possible after acid chromating. Painting should take place on the same day as acid chromating if at all possible.

Do not contaminate the clean panels.



## 7 Glass panels

### 7.1 Material

The panels shall be of flat or polished float glass. The thickness and other dimensions of the panel shall be as specified in the test method or as otherwise agreed.

### 7.2 Preparation by solvent cleaning

Clean the panels on the day of use by the procedure specified in 3.3 for steel panels.

### 7.3 Preparation by detergent cleaning

Wash the panels thoroughly in a warm, aqueous solution of a non-ionic detergent. Rinse thoroughly with warm water having a conductivity of not greater than 20  $\mu\text{S}/\text{cm}$ .

Dry the cleaned panels by allowing the rinse water to evaporate from the surface. If necessary, warm the panels slightly to remove remaining traces of moisture. Do not contaminate the cleaned panels.

## 8 Hardboard

### 8.1 Material

Fibre building boards are sheet materials manufactured from ligno-cellulose fibres with primary bonding derived from the felting of the fibres and their inherent adhesive properties. The strength of these boards can be enhanced by the use of bonding materials or additives. Hardboard is classified as having a density greater than 0,80  $\text{g}/\text{cm}^3$ . The hardboard shall conform to the requirements of ISO 2695 and ISO 2696.

### 8.2 Preparation

Cut the sheet to produce test panels of the required size. Using a dry cloth, wipe both sides and all edges of each panel until free from dust. Store the panels at  $(23 \pm 2)^\circ\text{C}$  and at  $(50 \pm 5)\%$  relative humidity, with free access to air, for a period of not less than three weeks. The moisture content of the hardboard panels shall be  $(6 \pm 2)\%$  (mass fraction). Do not contaminate the cleaned panels. Use the smooth surface for testing the paint or related product.

## 9 Paper-faced plasterboard

### 9.1 Material

Paper-faced plasterboard is a building board composed of a core of set gypsum plaster ( $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$ ) enclosed between, and bonded to, two sheets of thick paper. The core may be solid or cellular gypsum, and may contain a small proportion of fibre. The thickness of the board is approximately 10 mm. One paper face of the board is designed to be directly decorated, without the initial application of a plaster coat or coats. This face shall be used for testing the paint or related product. When stored in direct sunlight, the paper facing can have a tendency to discolour or "bleed" when coated with certain types of paint.

### 9.2 Preparation

Cut the paper-faced plasterboard under dry conditions to produce test panels of the required size. Seal the edges of each test panel with a suitable adhesive tape. Wipe the panels free from dust with a dry cloth. Store the panels at  $(23 \pm 2)^\circ\text{C}$  and  $(50 \pm 5)\%$  relative humidity, with free access to air, for a period of not less than three weeks. The panels should not be exposed to direct sunlight during storage. Do not contaminate the cleaned panels. Wipe all panels free from dust immediately prior to use.



## 10 Fibre-reinforced panels

The material and preparation shall conform to the requirements of ISO 8336.

### Annex A (informative)

#### General guidelines on preparation of steel panels by blast-cleaning

Preparation of steel panels by blast-cleaning is not intended for cold-rolled steel sheet, but can be required for hot-rolled steel to remove rust, mill scale, etc. For such purposes, the following general guidance is given. For additional information, consult ISO 8504-2.

The selection of abrasive size and type should be based on the hardness and surface condition of the steel to be cleaned, the type of blast-cleaning to be employed and the surface profile to be produced. For general testing purposes, the abrasive used should be angular or sub-angular and be of a material harder than the steel to be cleaned. Suitable abrasives include steel grit, aluminium oxide, garnet, and copper or coal slag. The particle size of the abrasive used may conveniently be between 0,5 mm and 1,2 mm. Other abrasives and sizes may be specified for particular tests. Requirements for blast-cleaning abrasives are given in ISO 11124 and ISO 11126. It should be noted that the use of abrasive containing free silica is subject to regulations in many countries.

Before blast-cleaning, remove any visible deposits of oil or grease by solvent cleaning, aqueous cleaning or any other suitable method. These deposits, if not removed, will contaminate the abrasive, resulting in contamination of subsequently blast-cleaned panels. Any other surface imperfections, such as sharp edges or burrs, should also be removed.

Clean, dry compressed air should be used for nozzle blasting. Moisture separators, oil separators, traps or other equipment might be necessary to meet this requirement. Any of the methods of blast-cleaning described in Clause 5 of ISO 8504-2:2000 can be used to achieve a blast-cleaned surface. Compressed-air abrasive blast-cleaning and centrifugal abrasive blast-cleaning are effective for this purpose. It should be noted that some methods are less effective than others and can require more time to achieve the required surface. Consult ISO 8504-2 regarding the effectiveness of the various methods.

It should be noted that, when steel is cleaned with a wet abrasive, it can rust rapidly. It might be necessary to add rust inhibitors to the water to temporarily prevent rust formation. Suitable inhibitors include sodium nitrite, chromic acid and sodium dichromate. Some inhibitors can interfere with the performance of certain coating systems.

For best results, direct the abrasive at angles of 70° to 90° to the surface being cleaned and from a distance that ensures the abrasive is travelling at the optimum speed. The optimum speed and distance are somewhat dependent on the type of abrasive blast-cleaning used.

Blast-cleaning should be continued until the surface shows a blast-cleaned pattern completely free from any visible contamination or discoloration and corresponding to preparation grade Sa 3 as defined in ISO 8501-1:1988. Panels prepared as above should have a surface roughness  $R_z$  (maximum height of profile) of not greater than 30 % of the recommended dry film thickness of the coating to be applied. After dry abrasive blast-cleaning, remove dust and loose residues from the surface by vacuum, by brushing or by blowing off with a stream of compressed air which is clean and dry. After wet abrasive blast-cleaning, rinse the surface with fresh water to remove loosely adhering residue. Dry the surface using compressed or heated air prior to application of paint. Unless otherwise agreed, the panels should be painted as soon as possible after blast-cleaning, and certainly within four hours. Do not contaminate the cleaned panels.

Blast-cleaned panels are susceptible to rusting if they are not coated immediately after cleaning. To minimize the risk of rust formation, it is not advisable to blast-clean panels unless the temperature of the panel is at least 3 °C higher than the dew point of the surrounding air.



## **Annex B** (informative)

### **Characterization of zinc and zinc-alloy coatings**

#### **B.1 General**

This annex describes briefly some of the zinc and zinc-alloy coatings which are commercially available. Additional information regarding zinc-coated steel can be obtained from the applicable ISO standards.

#### **B.2 Hot-dipped zinc-coated (ISO 3575)**

This product is commonly referred to as hot-dipped galvanized steel. The coating process involves immersing cold-rolled steel sheet or strip in a bath of molten zinc. The molten zinc bath might contain traces of aluminium which suppress the formation of zinc-iron alloys during the coating process. This results in a virtually pure zinc coating on the surface of the steel strip. Unless special steps are taken, the zinc coating will exhibit a "full spangle" pattern of zinc crystals, like the familiar pattern seen on sheet metal air ducts. For improved paint appearance, special processing can create a "minimized spangle" or a "spangle-free" zinc coating. Zinc coating mass per unit area can be as high as Z700 (700 g/m<sup>2</sup>), but a coating mass per unit area of Z350 (350 g/m<sup>2</sup>) or Z275 (275 g/m<sup>2</sup>) is more common. Hot-dipped zinc coatings can also be produced with a different coating mass per unit area on each side of the strip, or with a coating on only one side of the strip.

#### **B.3 Zinc-iron alloy coated (ISO 3575)**

This type of coating is often referred to as "galvannealed". The coating is produced by heating or wiping a hot-dipped zinc-coated surface in a manner that causes the zinc coating to alloy with iron from the steel surface. The resulting zinc-iron alloy coating has a dull grey appearance. Standard coatings with given mass per unit area are available up to ZF180 (180 g/m<sup>2</sup>). The coating designation specifies the total mass of the coating on both sides of the sheet.

#### **B.4 Electrolytically zinc-coated (ISO 5002)**

This type of coating is often referred to as "electrogalvanized". To produce this type of coating, pure zinc is electroplated onto a steel surface in a continuous process. Common coating designations range from ZE10/10 (1,0 µm each side) to ZE75/75 (7,5 µm each side). Variations of this coating include zinc-nickel and zinc-iron alloy electroplated coatings, as well as differentially coated (where the coating mass per unit area is different on each side of the strip) and coated on one side only.

#### **B.5 Zinc-5 % aluminum alloy coated (ISO 14788)**

This type of coating is often referred to as "galfan". Coating application is similar to that used in hot-dip zinc coating, except that the molten zinc bath contains a mass fraction of approximately 5 % aluminium. Standard coating mass per unit area ranges up to 700 g/m<sup>2</sup>. The coating mass represents the total amount of coating on both sides of the steel sheet or strip.

#### **B.6 Aluminum 55 %-zinc alloy (EN 10215)**

This type of coating is often referred to as "galvalume". Coating application is similar to that used in hot-dip zinc coating, except that the molten zinc bath contains a mass fraction of approximately 55 % aluminium.



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