

# Preparation of steel substrates before application of paints and related products —

## Part 3: Hand- and power-tool cleaning

This European Standard EN ISO 8504-3:2001 has the status of a British Standard

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## Committees responsible for this British Standard

The preparation of this British Standard was entrusted by the Surface Treatments and Coatings Standards Policy Committee (STC/-) to Technical Committee STC/21, upon which the following bodies were represented:

Association of Consulting Engineers  
 British Chemical Engineering Contractors' Association  
 British Coatings Federation Ltd.  
 British Constructional Steelwork Association Ltd.  
 British Gas plc  
 British Grit Association  
 British Railways Board  
 British Steel Industry  
 Department of Transport  
 Electricity Association  
 Institute of Corrosion  
 National Federation of Painting and Decorating Contractors  
 Oil and Colour Chemists' Association  
 Paint Research Association  
 Royal Society of Chemistry

This British Standard, having been prepared under the direction of the Surface Treatments and Coatings Standards Policy Committee, was published under the authority of the Standards Board and comes into effect on 15 November 1993

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### Amendments issued since publication

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The following BSI references relate to the work on this standard:  
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## National foreword

This British Standard is the official English language version of EN ISO 8504-3:2001. It is identical with ISO 8504-3:1993.

The British Standards which implement international or European publications referred to in this document may be found in the BSI Standards Catalogue under the section entitled "International Standards Correspondence Index", or by using the "Find" facility of the BSI Standards Electronic Catalogue.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

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### Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, the EN ISO title page, the EN ISO foreword page, pages 1 to 7 and a back cover.

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English version

Preparation of steel substrates before application of paints  
and related products — Surface preparation methods —  
Part 3: Hand- and power-tool cleaning

(ISO 8504-3:1993)

Préparation des subjectiles d'acier avant  
application de peintures et de produits  
assimilés — Méthodes de préparation des  
subjectiles —  
Partie 3: Nettoyage à la main et à la machine  
(ISO 8504-3:1993)

Vorbereitung von Stahloberflächen vor dem  
Auftragen von Beschichtungsstoffen —  
Verfahren für die Oberflächenvorbereitung —  
Teil 3: Reinigen mit Handwerkzeugen und mit  
maschinell angetriebenen Werkzeugen  
(ISO 8504-3:1993)

This European Standard was approved by CEN on 7 March 2001.

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This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Management Centre has the same status as the official versions.

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**CEN**

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

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## Foreword

The text of the International Standard from Technical Committee ISO/TC 35, Paints and varnishes, of the International Organization for Standardization (ISO) has been taken over as an European Standard 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 November 2001, and conflicting national standards shall be withdrawn at the latest by November 2001.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

NOTE Normative references to International Standards are listed in annex ZA (normative).

## Introduction

The performance of protective coatings of paint and related products applied to steel is significantly affected by the state of the steel surface immediately prior to painting. The principal factors that are known to influence this performance are:

- a) the presence of rust and mill scale;
- b) the presence of surface contaminants, including salts, dust, oils and greases;
- c) the surface profile.

International Standards ISO 8501, ISO 8502 and ISO 8503 have been prepared to provide methods of assessing these factors, while ISO 8504 provides guidance on the preparation methods that are available for cleaning steel substrates, indicating the capabilities of each in attaining specified levels of cleanliness.

These International Standards do not contain recommendations for the protective coating systems to be applied to the steel surface. Neither do they contain recommendations for the surface quality requirements for specific situations even though surface quality can have a direct influence on the choice of protective coating to be applied and on its performance. Such recommendations are found in other documents such as national standards and codes of practice. It will be necessary for the users of these International Standards to ensure that the qualities specified are:

- compatible and appropriate both for the environmental conditions to which the steel will be exposed and for the protective coating system to be used;
- within the capability of the cleaning procedure specified.

The four International Standards referred to above deal with the following aspects of preparation of steel substrates:

ISO 8501 — *Visual assessment of surface cleanliness;*

ISO 8502 — *Tests for the assessment of surface cleanliness;*

ISO 8503 — *Surface roughness characteristics of blast-cleaned steel substrates;*

ISO 8504 — *Surface preparation methods.*

Each of these International Standards is in turn divided into separate parts.

The primary objective of surface preparation is to ensure the removal of deleterious matter and to obtain a surface that permits satisfactory adhesion of the priming paint to the steel. It should also assist in reducing the amounts of contaminants that initiate corrosion.

This part of ISO 8504 describes methods for hand- and power-tool cleaning. It should be read in conjunction with ISO 8504-1.

Hand- and power-tool cleaning are methods of surface preparation that generally provide a surface cleanliness which is inferior to that achieved by abrasive blast-cleaning. When a result similar to that of abrasive blast-cleaning is required, these methods need in most cases the use of more than one type of power tool which makes surface preparation complicated and expensive. It is usually not possible to remove oil, grease and corrosion-stimulating substances such as chlorides and sulfates.

Power-tool cleaning will generally provide a better foundation for the priming paint than hand-tool cleaning, which will result in better paint performance.

Hand- and power-tool cleaning are both suitable methods for surface preparation. Hand-tool cleaning particularly requires the use of priming paints having good surface wetting ability. Power-tool cleaning is appropriate when a higher-quality surface preparation grade is required and when blast-cleaning is not permitted or the interested parties decide that it is not feasible.

Representative photographic examples for St 2, St 3, PSt 2, PSt 3 and PMA are available (see ISO 8501-1 and ISO 8501-2) for assessing some new and previously coated steel surfaces cleaned using hand or power tools. Because of the many different situations that arise in the preparation of surfaces, these photographs may not be sufficient to describe specific instances and it is recommended that special photographs of a treated reference area that are acceptable to the interested parties be produced for use as a basis for further surface preparation procedures.

## 1 Scope

This part of ISO 8504 describes methods for hand-tool and power-tool cleaning of steel substrates before application of paints and related products. It applies both to new steelwork and to steel surfaces that have been coated previously and that show areas of breakdown requiring maintenance painting. It describes the equipment to be used and the procedure to be followed.

## 2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this part of ISO 8504. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this part of ISO 8504 are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 8501-1:1988, *Preparation of steel substrates before application of paints and related products — Visual assessment of surface cleanliness — Part 1: Rust grades and preparation grades of uncoated steel substrates and of steel substrates after overall removal of previous coatings.*

ISO 8501-2: —<sup>1)</sup>, *Preparation of steel substrates before application of paints and related products — Visual assessment of surface cleanliness — Part 2: Preparation grades of previously coated steel substrates after localized removal of previous coatings.*

ISO 8504-1:1992, *Preparation of steel substrates before application of paints and related products — Surface preparation methods — Part 1: General principles.*

## 3 Definitions

For the purposes of this part of ISO 8504, the following definitions apply.

### 3.1

#### **hand-tool cleaning**

method of preparing steel substrates by the use of hand tools, without power assistance

NOTE 1 Chipping hammers, hand scrapers, hand wire brushes, abrasive papers and plastic fleece with embedded abrasive are generally used. Hand-tool cleaning is sometimes carried out initially in order to remove relatively loose contaminants prior to the use of power tools.

### 3.2

#### **power-tool cleaning**

method of preparing steel substrates by the use of power-assisted hand tools, but excluding blast-cleaning

NOTE 2 Rotary de-scalers, rotary wire brushes, sanding machines, sanding discs, rotary abrasive-coated paper wheels (flap wheels), abrasive grinders, plastic fleece with embedded abrasive, chipping hammers and needle guns, driven by electric or pneumatic power, are examples of equipment generally used.

### 3.3

#### **solvent cleaning**

method for removing visible oil, grease, soil and machining lubricants, and other soluble contaminants, from steel surfaces

NOTE 3 These methods generally include simple wiping with cloths moistened with the solvent, total or partial immersion in the solvent, solvent spray systems and treatment with water or steam with or without emulsion or alkaline cleaners.

### 3.4

#### **contaminated surface**

surface on which matter deleterious to the performance of a protective coating system is present

NOTE 4 Typical contaminants include slag, rust, laminated rust scale, mill scale, oil, grease, welding flux and weld spatter, soluble iron corrosion products and other soluble salts, including chlorides and sulfates.

### 3.5

#### **cleaned surface**

surface from which the contaminants have been removed to a specified level

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<sup>1)</sup> To be published.



## 4 Procedure

**CAUTION** — All the cleaning operations described in this part of ISO 8504 shall be carried out in compliance with applicable safety regulations.

### 4.1 Initial treatment

Before hand- and/or power-tool cleaning, remove heavy oil or grease by means of a scraper and then, as far as possible, remove further contamination by one or a combination of the following methods:

- a) brushing with stiff fibre or wire brushes;
- b) abrasion (see Annex B)
- c) cleaning with appropriate solvents or solutions (for example emulsion or detergent cleaners), provided that they are followed by rinsing with potable (tap) water;

NOTE 5 The solvents or solutions may be applied with a stiff fibre or wire brush.

- d) treatment with potable (tap) water or steam.

### 4.2 Hand-tool cleaning (see Annex A)

Hand-tool cleaning should preferably be carried out in the following sequence of operations:

- a) Use impact hand tools to remove laminated rust and rust scale.
- b) Use impact hand tools to remove all loose weld slag and weld spatter.
- c) Use hand wire brushing, hand abrading, hand scraping or other similar non-impact methods to remove all loose mill scale, all loose or non-adherent rust and all loose paint.

### 4.3 Power-tool cleaning (see Annex B)

Power-tool cleaning should preferably be carried out in the following sequence of operations, modified as necessary if hand-tool cleaning (4.2) is carried out initially.

- a) Use rotary or impact power tools to remove laminated rust or rust scale to the specified or agreed preparation grade.
- b) Use rotary or impact power tools to remove weld slag and weld spatter to the specified or agreed preparation grade.
- c) Use power wire brushing, power abrading, power impact or power-assisted rotary tools to remove loose mill scale, loose or non-adherent rust and loose paint to the specified or agreed preparation grade. Take care not to burnish the surface.

### 4.4 Final preparation before painting

Remove any burrs, sharp ridges or sharp cuts that have been produced during the cleaning operation (see also ISO 8504-1).

Immediately before painting, unless otherwise specified, ensure that any remaining sound paint has no residual gloss. Ensure that the edges of any remaining intact paint have been feathered (bevelled) using one of the methods given in 4.2 or 4.3.

Dry the surface, if necessary, and remove any residual loose matter resulting from the cleaning methods by brushing, vacuum cleaning or a blast of clean, dry compressed air.

## 5 Reference standards

Unless otherwise agreed, visual reference standards shall be used to supplement the cleaning criteria given in clause 4. These reference standards shall be either samples or photographs provided by one of the parties or published reference standards as given in ISO 8501-1 or ISO 8501-2 (see also introduction, last paragraph).

## 6 Inspection

It is recommended that each stage of the cleaning procedure (clause 4) should be subject to inspection.

## **Annex A (informative)**

### **Types of hand tools and their uses**

The materials and hand tools which may be used include the following:

- a) knives, scrapers, chisels and chipping hammers for removing slag, laminated rust scale, chipping old paint, loose rust, etc.;
- b) hand wire brushes, abrasive coated paper and plastic fleece with embedded abrasive for final hand preparation including feathering edges of any firmly adhering coating system.

The use of “non-spark” tools may be necessary in areas subject to fire or explosion hazards. However, tools made from metals whose residues may lead to galvanic corrosion, for example those made from bronze, are not suitable in such cases. Tools having bristles consisting of plastic materials with embedded abrasive may be a suitable alternative.

## **Annex B (informative)**

### **Types of power tools and their uses**

**B.1** Acceptable power tools are those driven by either compressed air or electricity.

The types of tool which may be used include the following:

- a) chipping hammers and rotary descalers for removal of rough scale, including heavy laminated scale;
- b) needle guns for welds, recessed work and fasteners;
- c) sanding machines, sanding discs, rotary wire brushes, rotary abrasive-coated paper wheels (flap wheels), rotary finishing brushes having filaments impregnated with abrasive grit, and plastic fleece with embedded abrasive for removing rust, rust scale and paint;
- d) power grinders to smooth welds, edges, etc., prior to general finishing.

**B.2** Power-tool cleaning requires care to prevent excessive roughening of the steel surface. Ridges and burrs contribute to paint failures as sharp edges are often not covered by the specified thickness of paint. Similarly excessive power wire brushing or discing can also be detrimental to paint adhesion, for instance residual mill scale can easily be burnished to a smooth surface to which paint will poorly adhere. The use of needle guns should be limited to welds, corners, uneven edges, etc., as the impact of the needles can cause an unacceptable profile on flat surfaces. “Non-spark” tools may be necessary in areas subject to fire or explosion hazards (see Annex A, last paragraph).

**Annex ZA (normative)****Normative references to international publications with their relevant European publications**

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

NOTE Where an International Publication has been modified by common modifications, indicated by (mod.), the relevant EN/HD applies.

Publication	Year	Title	EN/HD	Year
ISO 8501-1	1998	Preparation of steel substrates before application of paints and related products — Visual assessment of surface cleanliness — Part 1: Rust grades and preparation grades of uncoated steel substrates and of steel substrates after overall removal of previous coatings	prEN ISO 8501-1	2000
ISO 8501-2	1994	Preparation of steel substrates before application of paints and related products — Visual assessment of surface cleanliness — Part 2: Preparation grades of previously coated steel substrates after localized removal of previous coatings	prEN ISO 8501-2	2000
ISO 8504-1	1992	Preparation of steel substrates before application of paints and related products — Surface preparation methods — Part 1: General principles	EN ISO 8504-1	2001



## List of references

See national foreword.

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British Standards are updated by amendment or revision. Users of British Standards should make sure that they possess the latest amendments or editions.

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