
**Preparation of steel substrates before
application of paints and related
products — Surface preparation
methods —**

Part 3:
Hand- and power-tool cleaning

*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



Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

International Standard ISO 8504-3 was prepared by Technical Committee ISO/TC 35, *Paints and varnishes*, Sub-Committee SC 12, *Preparation of steel substrates before application of paints and related products*.

ISO 8504 consists of the following parts, under the general title *Preparation of steel substrates before application of paints and related products — Surface preparation methods*:

- *Part 1: General principles*
- *Part 2: Abrasive blast-cleaning*
- *Part 3: Hand- and power-tool cleaning*

Annexes A and B of this part of ISO 8504 are for information only.

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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.

ISO 8504-3:1993(E)

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 St2, St3, PSt2, PSt3 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.

Preparation of steel substrates before application of paints and related products — Surface preparation methods —

Part 3: Hand- and power-tool cleaning

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:—¹⁾, *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.

1) To be published.

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.

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).

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