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

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General principles

ISO 8504-1:1992

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Préparation des subjectiles d'acier avant application de peintures et de produits assimilés — Méthodes de préparation des subjectiles —

Partie 1: Principes généraux



Reference number
ISO 8504-1:1992(E)

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 8504-1 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*

Further parts are planned.

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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 ad-

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hesion 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 the general principles for the selection of surface preparation methods. It should be read in conjunction with ISO 8504-2 and subsequent parts of ISO 8504 that describe particular surface preparation methods.

It is stressed that there is a very wide variation in the condition of steel surfaces requiring cleaning prior to painting. This particularly applies to maintenance of an already coated structure. The age of the structure and its location, the quality of the previous surface, the performance of the existing coating system and the extent of breakdown, the type and intensity of previous and future corrosion environments, and the intended new coating system all influence the amount of treatment required.

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

Part 1: General principles

1 Scope

This part of ISO 8504 describes the general principles for the selection of methods for the preparation of steel surfaces before coating with paints and related products. It also contains information on features that must be taken into account before certain surface preparation methods and preparation grades are selected and specified.

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 4628-2:1982, *Paints and varnishes — Evaluation of degradation of paint coatings — Designation of intensity, quantity and size of common types of defect — Part 2: Designation of degree of blistering.*

ISO 4628-3:1982, *Paints and varnishes — Evaluation of degradation of paint coatings — Designation of intensity, quantity and size of common types of defect — Part 3: Designation of degree of rusting.*

ISO 4628-4:1982, *Paints and varnishes — Evaluation of degradation of paint coatings — Designation of intensity, quantity and size of common types of defect — Part 4: Designation of degree of cracking.*

ISO 4628-5:1982, *Paints and varnishes — Evaluation of degradation of paint coatings — Designation of intensity, quantity and size of common types of defect — Part 5: Designation of degree of flaking.*

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/TR 8502-1:1991, *Preparation of steel substrates before application of paints and related products — Tests for the assessment of surface cleanliness — Part 1: Field test for soluble iron corrosion products.*

ISO 8502-2:1992, *Preparation of steel substrates before application of paints and related products — Tests for the assessment of surface cleanliness — Part 2: Laboratory determination of chloride on cleaned surfaces.*

1) To be published.

ISO 8502-3:1992, *Preparation of steel substrates before application of paints and related products — Tests for the assessment of surface cleanliness — Part 3: Assessment of dust on steel surfaces prepared for painting (pressure-sensitive tape method)*.

ISO 8502-4:—¹⁾, *Preparation of steel substrates before application of paint and related products — Tests for the assessment of surface cleanliness — Part 4: Guidance on the estimation of the probability of condensation prior to paint application*.

ISO 8503-1:1988, *Preparation of steel substrates before application of paints and related products — Surface roughness characteristics of blast-cleaned steel substrates — Part 1: Specifications and definitions for ISO surface profile comparators for the assessment of abrasive blast-cleaned surfaces*.

ISO 8503-2:1988, *Preparation of steel substrates before application of paints and related products — Surface roughness characteristics of blast-cleaned steel substrates — Part 2: Method for the grading of surface profile of abrasive blast-cleaned steel — Comparator procedure*.

ISO 8503-3:1988, *Preparation of steel substrates before application of paints and related products — Surface roughness characteristics of blast-cleaned steel substrates — Part 3: Method for the calibration of ISO surface profile comparators and for the determination of surface profile — Focusing microscope procedure*.

ISO 8503-4:1988, *Preparation of steel substrates before application of paints and related products — Surface roughness characteristics of blast-cleaned steel substrates — Part 4: Method for the calibration of ISO surface profile comparators and for the determination of surface profile — Stylus instrument procedure*.

ISO 8504-2:1992, *Preparation of steel substrates before application of paints and related products — Surface preparation methods — Part 2: Abrasive blast-cleaning*.

3 General

When selecting a surface preparation method, it is necessary to consider the preparation grade required to give a level of surface cleanliness and, if required, a surface profile (roughness), such as coarse, medium or fine (see ISO 8503-1 and ISO 8503-2), appropriate to the coating system to be applied to the steel surface. Since the cost of surface preparation is usually in proportion to the level of cleanliness, a preparation grade appropriate to the purpose and type of coating system or a coating system appropriate to the preparation grade which can be achieved should be chosen.

Firms carrying out surface preparation work should have the personnel and technical knowledge of the processes involved to enable them to carry out the work adequately. All relevant health and safety regulations shall be observed. The surfaces to be treated should preferably be readily accessible and sufficiently illuminated. All surface preparation work should be properly supervised and inspected.

Details regarding the preliminary treatment of welds, the removal of weld spatter and removal of burrs and other sharp edges should be provided. These measures should normally be taken in connection with the manufacturing process before the surface preparation.

If the specified preparation grade has not been achieved by the preparation method selected or when the condition of the prepared surface has subsequently changed before the application of the coating system, relevant parts of the procedure should be repeated so as to obtain the specified preparation grade.

4 Condition of the surface to be prepared

4.1 Assessment of the surface condition

As the cost of surface preparation is significantly influenced by the condition of the surface to be prepared, information as given in a) or b) below should be available before particular surface preparation methods and preparation grades are specified. The rust grade assessed in accordance with ISO 8501-1 will determine which representative photographic example(s) is (are) to be used in accordance with ISO 8501-1 or ISO 8501-2.

- a) for uncoated surfaces
 - the type of steel (including special treatments that influence the surface preparation, for example cold-rolling processes) and the thickness of the steel;
 - the worst rust grade, assessed in accordance with ISO 8501-1, that is evident, together with any relevant supplementary details (for example “rust grade D with heavy rust layers”);
 - supplementary details concerning, for example, chemical and/or other contaminants.
- b) for coated surfaces
 - the type (for example type of binder and pigment), approximate film thickness, condition and age of the coating or coating system;

- the degree of rusting assessed in accordance with ISO 4628-3, together with any relevant supplementary details on apparent underrust;
- the degree of blistering assessed in accordance with ISO 4628-2;
- the degree of cracking assessed in accordance with ISO 4628-4;
- the degree of flaking assessed in accordance with ISO 4628-5;
- supplementary details concerning, for example, adhesion and chemical and/or other contaminants.

4.2 Influence of on-site environmental conditions

In order to hold down the cost of surface preparation and because of possible severe contamination by corrosion-stimulating substances that are difficult to remove, storage of unprotected steel in industrial or marine environments should be avoided. As far as possible, surface preparation should take place when rust grade A or A to B as defined by ISO 8501-1 is present, followed by application of suitable priming paints as soon as possible.

No surface preparation work using dry or moisture injection (see ISO 8504-2) blast-cleaning methods or other dry surface preparation methods should be carried out on site during rainfall or other precipitation. To minimize condensation, the temperature of the surface being prepared should be higher than the dew point of the surrounding air. If the work has to be continued even under unfavourable conditions, it is essential to take special precautions such as working under a cover, enclosing in a tent, warming the surface and/or drying the air (see ISO 8502-4).

Surface preparation work in areas where there is a fire or explosion hazard requires special precautions (for example low-spark, electrical-grounding or flame-free procedures).

4.3 Removal of contaminants

Oil, grease, dirt and similar contaminants shall be removed prior to surface preparation using the selected method. In addition, prior removal of heavy, firmly adhering rust and mill scale by suitable manual or mechanical techniques may be necessary.

If specified or agreed, soluble salts may also be removed, using other techniques, prior to and/or after application of the selected surface preparation method.

5 Selection of the surface preparation method

The selection of the method to be used for the preparation of a given surface will depend on

- the surface condition (see clause 4 and ISO 8502 and ISO 8503);
- practicability (for example operating conditions; target dates; and health, safety and environmental considerations such as evolution of dust, amount of water required and flame application);
- whether the complete surface or only parts of it are to be prepared;
- the specified or required preparation grade;
- the coating system to be applied;
- economic considerations;
- particular requirements with regard to operating conditions or the required result of the surface preparation procedure (for example surface profile or removal of soluble salts).

6 Selection of the preparation grade

The selection of the preparation grade for a given surface will depend on

- the surface condition (see clause 4 and ISO 8502 and ISO 8503);
- the coating system to be applied;
- the corrosivity of the environment to which the coated surface will be exposed;
- whether the complete surface or only parts of it are to be prepared;
- the practicability of the surface preparation method associated with the preparation grade;
- economic considerations.

Normally the preparation grades specified in ISO 8501-1 and ISO 8501-2 are used. Other preparation grades, defined either by special reference specimens or by reference areas that are part of the object to be treated, can be used by agreement between the interested parties. If reference areas are agreed, these should be either effectively protected against change or photographed.

Preparation grades corresponding to the highest degree of surface cleanliness, for example Sa 3 as defined in ISO 8501-1, should be specified only when

a) they are required by the surface condition (for example considerable amount of corrosive contaminants), by the intended coating system and/or by the corrosivity of the environment for which the coated surface is intended

and

b) the conditions for achieving and maintaining the preparation grade (for example dry and clean air) can be met.

The highest degree of surface cleanliness may also be justified when the maintenance intervals are prolonged, thus reducing costs of later maintenance work (for example costs for scaffold work or production shut-down).

7 Assessment of the prepared surface

The appearance of the prepared surface depends on

- the condition of the surface prior to treatment;
- the type of steel;
- the surface preparation method, including the tool or material (for example blast-cleaning abrasive) used.

All prepared surfaces should be assessed in accordance with ISO 8501-1 or ISO 8501-2.

If specified or agreed, the surfaces should additionally be assessed in accordance with ISO/TR 8502-1, ISO 8502-2 and ISO 8503-2.

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