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Preparation of steel substrates before application of paints and related products — Visual assessment of surface cleanliness —

Part 3: Preparation grades of welds, cut edges and other areas with surface imperfections

*Préparation des subjectiles d'acier avant application de peintures et de
produits assimilés — Évaluation visuelle de la propreté d'un subjectile —*

*Partie 3: Degrés de préparation des soudures, arêtes de coupe et autres
zones présentant des imperfections*



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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

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.

Attention is drawn to the possibility that some of the elements of this part of ISO 8501 may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

International Standard ISO 8501-3 was prepared by Technical Committee ISO/TC 35, *Paints and varnishes*, Subcommittee SC 12, *Preparation of steel substrates before application of paints and related products*.

ISO 8501 consists of the following parts, under the general title *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*

Informative supplement to part 1: Representative photographic examples of the change in appearance imparted to steel when blast-cleaned with different abrasives

- *Part 2: Preparation grades of previously coated steel substrates after localized removal of previous coatings*
- *Part 3: Preparation grades of welds, cut edges and other areas with surface imperfections*
- *Part 4: Preparation grades of coated and uncoated steel substrates after removal of rust and previous coatings by high pressure water jetting*

Annex A of this part of ISO 8501 is for information only.

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 system 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 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 below 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.

Imperfections at welds, cut edges and other areas of steel substrates are generally starting points for corrosion. Such areas are also difficult to protect by application of paints and related products. In order to assist in achieving efficient corrosion protection, this part of ISO 8501 defines certain preparation grades for such areas.

Preparation of steel substrates before application of paints and related products — Visual assessment of surface cleanliness —

Part 3:

Preparation grades of welds, cut edges and other areas with surface imperfections

1 Scope

This part of ISO 8501 describes preparation grades of welds, cut edges and other areas, on steel surfaces with imperfections. Such imperfections may occur and become visible before and/or after the blast-cleaning process.

The preparation grades described in this part of ISO 8501 are to make steel surfaces with imperfections, including welded and fabricated surfaces, suitable for the application of paints and related products.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of ISO 8501. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of ISO 8501 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

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

ISO 12944-3:1998, *Paints and varnishes — Corrosion protection of steel structures by protective paint systems — Part 3: Design considerations*.

3 Types of imperfection

This part of ISO 8501 deals with imperfections on:

- welds;
- cut edges;
- steel surfaces generally.

The various types of imperfection are illustrated and described in Table 1.

4 Preparation grades

There are three preparation grades for making steel surfaces with imperfections suitable for the application of paints and related products:

P1 Light preparation: minimum preparation considered necessary before application of paint;

P2 Thorough preparation: most imperfections are remedied;

P3 Very thorough preparation: surface is free of significant visible imperfections.

The significance of visible imperfections shall be agreed between relevant parties, depending on the specific application.

Requirements for the preparation grades are given in Table 1.

NOTE 1 It is important that the preparation methods used to achieve these preparation grades are not deleterious to the integrity of the steel surface or welded areas. For example, strong grinding pressure can result in the formation of heat-affected areas on a steel surface, and removal of defects by grinding may leave sharp edges at the edges of the grind pattern.

Annex A gives a correlation between the preparation grades and the corrosivity category of the environment.

NOTE 2 A replica (known as NACE standard RP 0178) shows examples of weld imperfections and certain levels of preparation. It may be obtained from NACE International, P.O. Box 218340, Houston, Texas 77218-8340, USA.

Table 1 — Imperfections and preparation grades

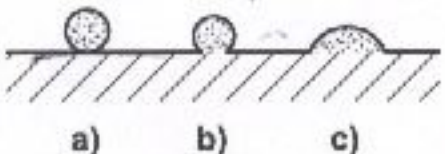
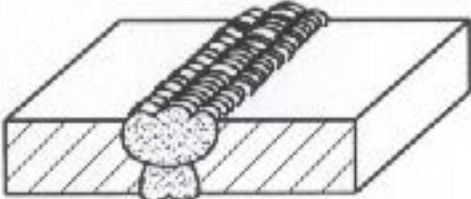
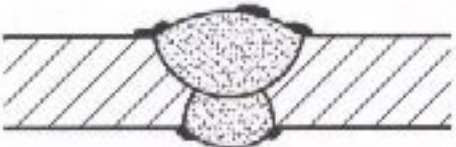

Description	Type of imperfection Illustration	Preparation grades		
		P1	P2	P3
1 Welds				
1.1 Welding spatter		Surface as obtained	Surface shall be free of all loose welding spatter [see a)]	Surface shall be free of all welding spatter other than that without under-cutting [see c)]
1.2 Weld ripple/profile		As welded	Surface shall be dressed to remove irregular- and sharp-edged profiles	Surface shall be fully dressed, i.e. smooth
1.3 Welding slag		Surface shall be free from welding slag	Surface shall be free from welding slag	Surface shall be free from welding slag
1.4 Undercut		Surface as obtained	Surface shall be free from sharp undercuts	Surface shall be free from deep or jagged undercuts

Table 1 — Imperfections and preparation grades (*continued*)

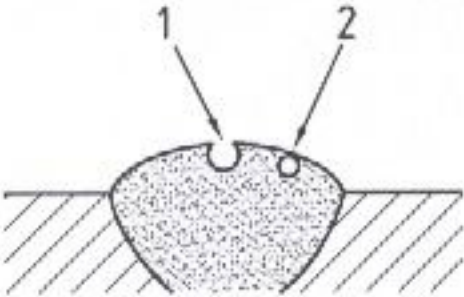

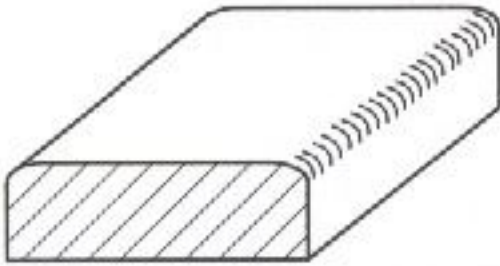
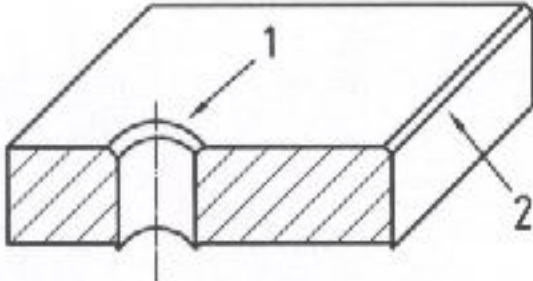
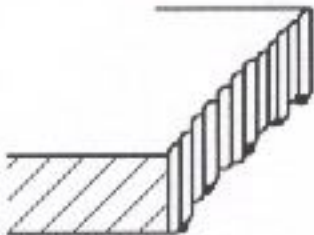

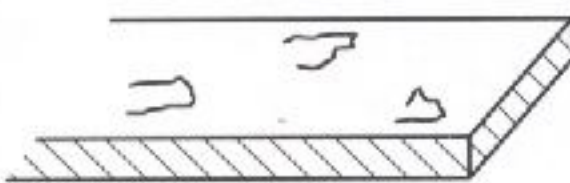

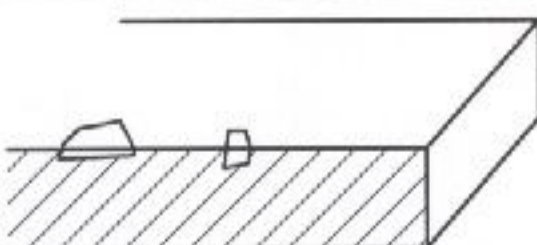

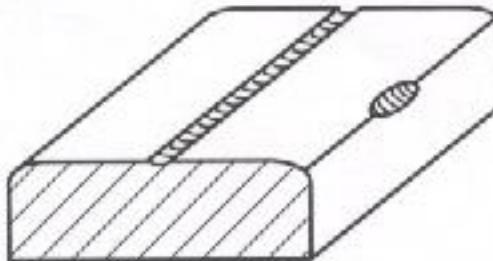
Description	Type of Imperfection	Preparation grades		
	Illustration	P1	P2	P3
1.5 Weld porosity	 <p>Key 1 Visible 2 Invisible (may open after blast-cleaning)</p>	As welded	Surface pores shall be sufficiently open to allow penetration of paint, or dressed out	Surface shall be free from visible pores
1.6 End craters		End craters as obtained	End craters shall be free from sharp edges	Surface shall be free from visible end craters
2 Edges				
2.1 Rolled edges		Surface as rolled	Surface as rolled	Edges shall be rounded with a radius of not less than 2 mm (See ISO 12944-3)
2.2 Edges made by punching, shearing or sawing	 <p>Key 1 Punching 2 Shearing</p>	No part of the edge shall be sharp; the edge shall be free from fins	Edges shall be reasonably smooth	Edges shall be rounded with a radius of not less than 2 mm (See ISO 12944-3)
2.3 Thermally cut edges		Surface shall be free of slag and loose scale	No part of the edge shall have an irregular profile	Cut face shall be removed and edges shall be rounded with a radius of not less than 2 mm (See ISO 12944-3)

Table 1 — Imperfections and preparation grades (*continued*)

Description	Type of Imperfection	Preparation grades		
	Illustration	P1	P2	P3
3 Surfaces generally				
3.1 Pits and craters		Pits and craters shall be sufficiently open to allow penetration of paint	Pits and craters shall be sufficiently open to allow penetration of paint	Surface shall be free of pits and craters
3.2 Shelling NOTE In English-language usage, the terms "roaks", "slivers" and "hackles" are also used to describe this type of imperfection.		Surface shall be free from lifted material	Surface shall be free from visible shelling	Surface shall be free from visible shelling
3.3 Roll-overs/roll laminations/cut laminations		Surface shall be free from lifted material	Surface shall be free from visible roll-overs/laminations	Surface shall be free from visible roll-overs/laminations
3.4 Rolled-in extraneous matter		Surface shall be free from rolled-in extraneous matter	Surface shall be free from rolled-in extraneous matter	Surface shall be free from rolled-in extraneous matter
3.5 Grooves and gouges formed by mechanical action		As found	The radius of grooves and gouges shall be not less than 2 mm	Surface shall be free from grooves, and radius of gouges shall be greater than 4 mm
3.6 Indentations and roll marks		As found	Indentations and roll marks shall be smooth	Surface shall be free from indentations and roll marks

Annex A

(informative)

Correlation between preparation grades and corrosivity categories

The preparation grades described in this part of ISO 8501 can be broadly correlated with the corrosivity categories given in ISO 12944-2. A general correlation is given in Table A.1.

Table A.1 — Correlation between preparation grades and corrosivity categories

Preparation grade	Corrosivity category
P1	C1 and C2
P2	C3 and C4
P3	C5-I and C5-M Im1 to Im3

It is possible that different kinds of imperfection will require a mixture of preparation grades. For example, undercut (Table 1, 1.4) may require P3 preparation while all other imperfections require P2 preparation. This can, in particular, be the case when there are requirements for the aesthetic appearance of the finish. In such cases, P3 could be specified even if there are no apparent corrosivity requirements.

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