
**Paints and varnishes — Corrosion
protection of steel structures by
protective paint systems —**

**Part 8:
Development of specifications for new
work and maintenance**

*Peintures et vernis — Anticorrosion des structures en acier par
systèmes de peinture —*

*Partie 8: Développement de spécifications pour les travaux neufs et de
maintenance*



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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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 35, *Paints and varnishes*, Subcommittee SC 14, *Protective paint systems for steel structures*.

This second edition cancels and replaces the first edition (ISO 12944-8:1998), which has been technically revised.

The main changes compared to the previous edition are as follows:

- the normative references have been updated;
- the terms and definitions have been updated;
- water soluble contaminants and dust have been added in [Table 1](#) as particular constraints with respect to surfaces and surface preparation;
- [Annex E](#) has been updated with regard to corrosivity classes;
- [Annex I](#) has been updated with regard to surface preparations;
- the bibliography has been updated;
- the text has been editorially revised.

A list of all parts in the ISO 12944 series can be found on the ISO website.

Introduction

Unprotected steel in the atmosphere, in water and in soil is subjected to corrosion that can lead to damage. Therefore, to avoid corrosion damage, steel structures are normally protected to withstand the corrosion stresses to which they will be subjected during the service life required of the structure.

There are different ways of protecting steel structures from corrosion. ISO 12944 (all parts) deals with protection by paint systems and covers, in the various parts, all features that are important in achieving adequate corrosion protection. Additional or other measures are possible but require particular agreement between the interested parties.

In order to ensure effective corrosion protection of steel structures, owners of such structures, planners, consultants, companies carrying out corrosion protection work, inspectors of protective coatings and manufacturers of coating materials need to have at their disposal state-of-the-art information in concise form on corrosion protection by paint systems. It is vital that such information is as complete as possible, unambiguous and easily understandable to avoid difficulties and misunderstandings between the parties concerned with the practical implementation of protection work.

ISO 12944 (all parts) is intended to give this information in the form of a series of instructions. It is written for those who have some technical knowledge. It is also assumed that the user of ISO 12944 (all parts) is familiar with other relevant International Standards, in particular those dealing with surface preparation.

Although ISO 12944 (all parts) does not deal with financial and contractual questions, attention is drawn to the fact that, because of the considerable implications of inadequate corrosion protection, non-compliance with requirements and recommendations given in ISO 12944 (all parts) can result in serious financial consequences.

ISO 12944-1 defines the overall scope of all parts of ISO 12944. It gives some basic terms and definitions and a general introduction to the other parts of ISO 12944. Furthermore, it includes a general statement on health, safety and environmental protection, and guidelines for using ISO 12944 for a given project.

This document is intended as an aid when a corrosion protection specification is to be drawn up.

Paints and varnishes — Corrosion protection of steel structures by protective paint systems —

Part 8: Development of specifications for new work and maintenance

1 Scope

This document covers the development of specifications for corrosion protection of steel structures using protective paint systems. It relates to new work and maintenance in the workshop or on site and is also applicable to the corrosion protection of individual components. This document covers the corrosion protection of steel structures exposed to different corrosion stresses by environments such as indoors, open-air and immersion in water or burial in soil, as well as special stresses, due for example, to medium or high temperatures. The need for different durability ranges is considered.

Steel surfaces that have been hot-dip-galvanized, metal-sprayed, zinc-electroplated or sherardized, and previously painted steel surfaces, are also covered by this document.

In this document, reference areas for assessing the quality of the corrosion protection work and the performance of the protective paint systems used are dealt with. This document provides detailed flow charts for planning new work and maintenance, which are taken into account when writing a specification.

This document can also be used as a guide if extreme corrosion stresses or high temperatures occur, or if the protective paint systems are to be used on other substrates, such as non-ferrous metals or concrete, to define suitable specifications.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 12944-1, *Paints and varnishes — Corrosion protection of steel structures by protective paint systems — Part 1: General introduction*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 12944-1 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

3.1
constituent element

part of a structure that is exposed to a particular environment and which will therefore require a specific *protective paint system specification* (3.8.2)

Note 1 to entry: For example, a storage tank will have more than one constituent element as it comprises internal and external surfaces and possibly also support steelwork.

3.2
dry film thickness
DFT

thickness of a coating remaining on the surface when the coating has hardened

Note 1 to entry: For details, see ISO 12944-5:—¹⁾, 5.4.

3.3
durability

expected life of a protective paint system to the first major *maintenance* (3.5) painting

Note 1 to entry: For further important information on durability and durability ranges, see ISO 12944-1.

3.4
inspector

anyone responsible for ensuring conformity with one or more of the individual *specifications* (3.8)

3.5
maintenance

sum of all measures, as covered by ISO 12944 (all parts), which ensure that the steel structure is protected from corrosion

Note 1 to entry: Maintenance includes, but is not limited to, paint work. Such paint work can be patch painting (repair of degraded spots/areas of the coating system), patch painting followed by overpainting of the structure, or total repainting.

3.6
nominal dry film thickness
NDFT

dry film thickness (3.2) specified for each coat or for the whole paint system to achieve the required *durability* (3.3)

Note 1 to entry: For details, see ISO 12944-5: —¹⁾, 5.4.

3.7
project

whole of the work for which a *specification* (3.8) is being developed and which can include one or more structures

3.8
specification

technical document describing all the requirements to be observed when a steel structure is to be protected against corrosion by using protective coating systems and which consists of several individual specifications

Note 1 to entry: Individual specifications, i.e. *project specification* (3.8.1), *protective paint system specification* (3.8.2), *paint work specification* (3.8.3), *inspection and assessment specification* (3.8.4), are defined.

3.8.1
project specification

specification (3.8) that describes the *project* (3.7) and the requirements relating specifically to it

1) Under preparation.

3.8.2**protective paint system specification**

specification (3.8) that describes the preparation of the surface of the structure and the protective coating system(s) for the structure, in conformity with the *project specification* (3.8.1)

3.8.3**paint work specification**

specification (3.8) that describes the way the coating work is to be carried out, in conformity with the *project specification* (3.8.1) and the *protective paint system specification* (3.8.2), as well as with the *inspection and assessment specification* (3.8.4)

3.8.4**inspection and assessment specification**

specification (3.8) that describes how inspection and assessment are to be carried out

3.9**specifier**

anyone responsible for the development of a *specification* (3.8)

3.10**sample area**

area on which the properties of a newly applied coating are tested

3.11**touch-up**

application of coating material on a small area

4 How to develop a specification for new work or maintenance

It is recommended that the specifier considers the information given in [Clause 5](#) and establishes which specification(s) apply/applies to the project or constituent element to be protected. Then, the specifier should check in the respective table, item by item, which of the items listed are to be taken into account in the specification. The various items are supported by detailed information given in the "Remarks" column in [Tables 1 to 4](#) and in [Annexes A to J](#).

When writing a specification for new work or maintenance, it is important to choose the most suitable protective paint system. Prior to refurbishment, it can be helpful to create sample areas, e.g. to assess the coating suitability and appearance. To achieve this, all relevant parameters shall be taken into consideration, for example:

- required durability;
- environmental conditions and special stresses;
- surface preparation;
- different generic types of paint;
- number and types of coats [priming coat(s), intermediate coat(s) and top coat(s)];
- methods of application and application requirements;
- place of application (shop or site);
- scaffolding requirements;
- requirements regarding (future) maintenance (if any);
- health and safety requirements;
- environmental protection requirements.

These parameters are described in detail in ISO 12944-1 to ISO 12944-7 and ISO 12944-9. In this document, only information which is considered to be particularly important to the specifier is given.

In the drafting of a specification for maintenance work on a structure or constituent element, a decision needs to be made to choose between

- repair,
- partial renewal, or
- complete renewal.

When complete renewal has been decided on, the specification should preferably be developed in accordance with a specification for new work, e.g. using the form given in [Annex G](#).

In [Annex D](#), it is shown how to define the work for different types of maintenance work. The exact definition of which kind of work is necessary shall be decided in dependence of the structure. Test areas can be useful to find a sufficient solution.

At an early stage in the drafting of a project specification, a final decision will have to be taken by the specifier on essential planning parameters, such as protection of slip-resistant connections using high-tensile bolts, the inside surfaces of hollow sections and other hidden steel surfaces (see ISO 12944-3 for details of design).

Exclusions, i.e. items not to be painted, shall be indicated in the specification(s).

The choice of protective paint systems shall be based on practical experience and/or the results of laboratory performance tests, particularly when new coating technology is involved. The protective paint systems shall be tested for compatibility with existing coatings on previously coated surfaces.

The specifier shall further take into account regulations and/or requirements relating to environmental protection, health and safety, and working conditions in the shop or on site.

5 Contents of a specification

5.1 Supply

The items which are preferably to be covered by a specification are listed in [Tables 1](#) to [4](#), under the following headings:

- contents of a project specification (see [Table 1](#));
- contents of a protective paint system specification (see [Table 2](#));
- contents of a paint work specification (see [Table 3](#));
- contents of an inspection and assessment specification (see [Table 4](#)).

For small structures, or those whose protection is not subject to any particular requirements, only certain items shall be taken into account.

NOTE Each table contains sufficient information to enable the specifier to write a specification for any one of the subjects listed above without having to make frequent references to the other tables. This has led to some expressions being repeated in each of the tables: for example, under 1.1, 2.1, 3.1 and 4.1, the items “name of project”, “name of customer” and “name of specifier” are repeated. In practice, such information is to be given only once in the complete specification.

Table 1 — Contents of a project specification

No.	Main item/sub-item ^a	Remarks
1.1	GENERAL INFORMATION	
1.1.1	Name of project	
1.1.2	Name of customer	
1.1.3	Location(s) of structure(s)	
1.1.4	Name of specifier	State organization and person.
1.1.5	Environmental conditions at location(s) of structure(s)	See Annex E and ISO 12944-2.
1.1.6	References to standards and regulations	
1.2	TYPE OF PROJECT	For definitions of project, structure and constituent element, see Clause 3 .
1.2.1	New construction without protection	
1.2.2	New construction blast-cleaned and coated	
1.2.3	Touch-up and final paint work	
1.2.4	Maintenance	See Annexes H, I and J .
1.2.5	New construction and maintenance combined	
1.2.6	Items not to be coated	
1.3	DESCRIPTION OF EACH CONSTITUENT ELEMENT	Each structure should preferably be divided into constituent elements on the basis of the protective paint system(s) to be used and the corrosion stresses associated with each constituent element.
1.3.1	Substrate(s)	Metallic coatings, e.g. zinc, are part of the coating system.
1.3.2	Existing paint system and its condition	See ISO 12944-5.
1.3.3	Areas (m ²)	
1.4	DESCRIPTION OF ENVIRONMENT OF EACH CONSTITUENT ELEMENT	Descriptions are given in ISO 12944-2. See also Annex E .
1.4.1	Atmospheric environmental conditions	See E.1.1 .
1.4.2	Immersed categories	See E.2 .
1.4.3	Special situations	See E.4.1 .
1.4.4	Special stresses	See E.4.2 .
1.5	DURABILITY	
1.5.1	Durability range	See ISO 12944-1.
^a These items are recommended. If, however, a particular sub-item is included in the specification, any instructions in the remarks column shall be followed.		

Table 1 (continued)

No.	Main item/sub-item ^a	Remarks
1.6	PROTECTIVE PAINT SYSTEMS — PARTICULAR CONSTRAINTS WITH RESPECT TO SURFACES AND SURFACE PREPARATION	Details of types of surface, surface preparation grades, surface profiles and surface preparation methods can be found in ISO 12944-4. In the specification, the required surface preparation grade shall be given for each individual protective paint system to be used.
1.6.1	Types of surface and surface preparation grade(s) for new work and maintenance	Besides the surface preparation grade, the specification shall give details of the surface preparation work required. See also Annexes G and H and Table 3 .
1.6.2	Surface preparation method(s)	See ISO 12944-4.
1.6.3	Water-soluble contaminants	See ISO 8502-6 and ISO 8502-9.
1.6.4	Dust	See ISO 8502-3.
1.7	PROTECTIVE PAINT SYSTEMS — PARTICULAR CONSTRAINTS WITH RESPECT TO PAINT MATERIALS	
1.7.1	Choice of the coating system	
1.7.1.1	Protective paint systems for initial protection and complete renewal	See ISO 12944-5, ISO 12944-7, ISO 12944-9 and Annexes G and H , and Table 2 .
1.7.1.2	Protective paint systems for repair and partial renewal	Systems according to ISO 12944-5 and ISO 12944-9. Corrosion protection may be assessed using sample areas.
1.7.2	Particular constraints relating to coatings and paint work	For example: compatibility with existing coatings, edge protection (see ISO 12944-5 and ISO 12944-7), non-skid coatings or spraying with airless rather than conventional equipment.
1.7.3	Special requirements regarding, in particular: — health and safety — environmental protection	For example: low level of harmful substances, protection against pollution by such substances, waste disposal.
1.8	PROTECTIVE PAINT SYSTEMS — PARTICULAR CONSTRAINTS WITH RESPECT TO PAINT WORK	
1.8.1	Location of paint work: workshop and/or on site	See ISO 12944-7.
1.8.2	Conditions for paint work	For example: timetable and climatic conditions (to be taken into account by the operator). See also ISO 12944-7.
1.8.3	Method of application of protective paint systems for new, touch-up and maintenance work	See ISO 12944-7. Any particular requirements shall be given. Special methods of application shall be described in full detail.
1.8.4	Constraints relating to paint work	For example: compatibility with existing coatings, masking of areas to be welded (see ISO 12944-7), edge protection (see ISO 12944-5 and ISO 12944-7).
1.8.5	Special requirements regarding, in particular: — health and safety — environmental protection	For example: low level of harmful substances, protection against pollution by such substances, waste disposal.
^a These items are recommended. If, however, a particular sub-item is included in the specification, any instructions in the remarks column shall be followed.		

Table 1 (continued)

No.	Main item/sub-item ^a	Remarks
1.9	PROPERTIES (OTHER THAN ANTI-CORROSIVE) OF PROTECTIVE PAINT SYSTEMS	
1.9.1	Colours	Colour should preferably be based on colour designations such as those of the Munsell Colour System, RAL 840-HR, NF X 08-002, BS 4800, NS 4054, UNE 48103, JPMA Standard Paint Colours or NCS, in accordance with the relevant national standard where applicable. The colours of all coats of a paint system should normally be different from each other. The last but one coat should normally be of such a colour that the top coat fully hides it.
1.9.2	Stability of top-coat colour	See also No. 1.4.4, this table.
1.10	QUALITY MANAGEMENT	
1.10.1	Quality control, quality assurance and records	
1.11	INSPECTION AND ASSESSMENT	
		See Table 4 .
1.11.1	Inspection by internal bodies	
1.11.2	Inspection by external (e.g. independent) bodies	
1.11.3	Names of external inspection bodies and/or the inspectors themselves	Such bodies and/or inspectors, if any, shall be nominated by the specifier. The level of qualification of the inspector should be specified.
1.11.4	Methods of inspection	The specifier shall indicate the methods and types of instrument required, using International Standards, wherever possible. The specifier shall also indicate the recording and reporting procedures to be used.
1.11.5	Inspection steps	Details of inspection steps, if any, shall be described.
1.12	REFERENCE AREAS	
1.12.1	Records	The specifier should normally specify for which constituent element(s) of each structure of the project reference areas are to be provided. If not specified, any of the interested parties may also request the preparation of reference areas (conditions to be agreed). Reference areas shall normally be prepared in the presence of all parties concerned, e.g. owner, paint manufacturer, sub-contractors and main contractor. See ISO 12944-7 and Annex B .
1.12.2	Responsibility for records	
1.12.3	Location and number of reference area(s)	
1.12.4	Size of reference area(s)	
1.12.5	Marking of reference area(s)	
1.13	HEALTH AND SAFETY; ENVIRONMENTAL PROTECTION	
1.13.1	Applicable regulations	The regulations applicable on site shall be observed. If appropriate, these shall be described by the specifier. See ISO 12944-7.
1.14	SPECIAL REQUIREMENTS	
1.14.1	Procedure for dealing with deviations from the specification, limits of inspection and assessment	Shall be specified by the specifier.
1.14.2	Special factors related to execution and supervision of paint work	Shall be specified by the specifier.
1.14.3	Any further requirements	Requirements concerning transport, loading and unloading, and storage shall be indicated, if any.
^a These items are recommended. If, however, a particular sub-item is included in the specification, any instructions in the remarks column shall be followed.		

Table 1 (continued)

No.	Main item/sub-item ^a	Remarks
1.15	MEETINGS	
1.15.1	Pre-bid meeting and kick-off meeting	Details of pre-bid and kick-off meetings should preferably be specified. The purpose of the kick-off meeting is to settle any remaining questions concerning paint work (see Annexes C and D) and whether previously coated surfaces are acceptable.
1.16	DOCUMENTATION	Types of document required shall be specified, as appropriate, by the specifier.
1.16.1	Documents on surface preparation and protective paint system(s)/paints comprising information on — paint work — constraints, see main items 1.7 to 1.8, this table — properties, see main item 1.9, this table — inspection and assessment	
^a These items are recommended. If, however, a particular sub-item is included in the specification, any instructions in the remarks column shall be followed.		

Table 2 — Contents of a protective paint system specification

No.	Main item/sub-item ^a	Remarks
2.1	GENERAL INFORMATION	
2.1.1	Name of project	
2.1.2	Name of customer	
2.1.3	Name of specifier	State organization and person.
2.2	STEEL DRESSING	
2.2.1	Edges	See ISO 12944-3.
2.2.2	Steel surface imperfections	
2.2.3	Irregularities in welds	See ISO 8501-3.
2.2.4	Welding areas for welding on site	See ISO 12944-3 and ISO 12944-7.
2.3	SURFACE PREPARATION	
2.3.1	Surface preparation grade(s), including preparation of remaining coatings	See ISO 12944-4. Further details on cleaning, degreasing and contaminants, and the condition of any existing coating shall be provided.
2.3.2	Surface profile (roughness)	See ISO 8503-1 to ISO 8503-4.
2.3.3	Welding areas for welding on site	See ISO 12944-3 and ISO 12944-7.
2.4	PROTECTIVE PAINT SYSTEM(S)	
2.4.1	Description of protective paint system(s) in accordance with Annexes G and H	See Annex A and ISO 12944-5, ISO 12944-6, ISO 12944-7 and ISO 12944-9.
2.4.2	Edge protection	
2.4.3	Overcoating interval(s)	Requirements regarding overcoating intervals are to be indicated. See also manufacturers' technical data sheets and instructions for application.
2.4.4	Technical data sheets and safety data sheets for paint materials	These data sheets are prepared and provided by paint manufacturers.
^a These items are recommended. If, however, a particular sub-item is included in the specification, any instructions in the remarks column shall be followed.		

Table 2 (continued)

No.	Main item/sub-item ^a	Remarks
2.4.5	Performance test results	Results of laboratory tests in accordance with ISO 12944-6, ISO 12944-9 and/or other suitability tests, e.g. sample areas, are to be provided or accepted by the coatings manufacturer.
2.5	PAINT MANUFACTURER	
2.5.1	Qualification of paint manufacturer	Procedures should preferably be specified.
2.5.2	List of paint manufacturers	A list of qualified suppliers of the paint materials specified is desirable. If products from other suppliers are to be used, the selection procedure should normally be described.
2.6	QUALITY CONTROL AND QUALITY ASSURANCE FOR PAINT MATERIALS	See Table 4 .
2.6.1	Inspection, quality of inspection and verification	
2.6.2	Inspection by internal bodies	
2.6.3	Inspection by external (e.g. independent) bodies	
2.6.4	Inspectors' names	
2.6.5	Methods of inspection	Methods of inspection to be carried out by the manufacturer shall be described, if any.
2.6.6	Inspection steps	Details of inspection steps, if any, shall be described.
2.6.7	Conformity certificate(s)	Requirements for conformity certificates for paint materials shall be specified, if appropriate.
2.6.8	Reference area(s) or test specimens	See Table 1 , No. 1.12.
2.6.8.1	Records	
2.6.8.2	Responsibility for records	
2.6.8.3	Location and number of reference area(s)	
2.6.8.4	Size of reference area(s)	
2.6.8.5	Marking of reference area(s)	
^a These items are recommended. If, however, a particular sub-item is included in the specification, any instructions in the remarks column shall be followed.		

Table 3 — Contents of a paint work specification

No.	Main item/sub-item ^a	Remarks
3.1	GENERAL INFORMATION	
3.1.1	Name of project	
3.1.2	Name of customer	
3.1.3	Name of specifier	State organization and person.
3.2	PAINT CONTRACTOR/APPLICATOR	
3.2.1	List of paint contractors/applicators	A list of qualified paint contractors/applicators is desirable. If other companies are to do the work, the company-selection procedure should normally be described.
3.2.2	Qualification of paint contractors/applicators	The requirements shall be specified.
3.2.3	Qualification of personnel	The personnel may, for instance, be internal inspectors, supervisors, workmen. See also ISO 12944-7:2017, 4.1.
^a These items are recommended. If, however, a particular sub-item is included in the specification, any instructions in the remarks column shall be followed.		

Table 3 (continued)

No.	Main item/sub-item ^a	Remarks
3.3	PLANNING OF NEW AND MAINTENANCE WORK	
3.3.1	Steps in planning	See Annexes C and D .
3.4	EXECUTION OF NEW AND MAINTENANCE WORK	
3.4.1	Tasks of paint contractors/applicators and procedures for paint work	The individual tasks and procedures shall be described (including the erection of scaffolding, illumination, the use of machinery and equipment, health and safety and environmental protection). See also ISO 12944-3, ISO 12944-4 and ISO 12944-7.
3.4.2	Environment-tolerable waste disposal	
3.5	QUALITY CONTROL AND QUALITY ASSURANCE	See Table 4 .
3.5.1	Inspection, quality of inspection and verification	
3.5.2	Inspection by internal bodies	
3.5.3	Inspection by external (e.g. independent) bodies	
3.5.4	Inspectors' names	
3.5.5	Methods of inspection	The methods of inspection shall be described.
3.5.6	Inspection steps	Details of inspection steps, if any, shall be described.
3.5.7	Reference area(s)	See Table 1 , No. 1.12.
3.5.7.1	Records	
3.5.7.2	Responsibility for records	
3.5.7.3	Location and number of reference area(s)	
3.5.7.4	Size of reference area(s)	
3.5.7.5	Marking of reference area(s)	
^a These items are recommended. If, however, a particular sub-item is included in the specification, any instructions in the remarks column shall be followed.		

Table 4 — Contents of an inspection and assessment specification

No.	Main item/sub-item ^a	Remarks
4.1	GENERAL INFORMATION	
4.1.1	Name of project	
4.1.2	Name of customer	
4.1.3	Name of specifier	State organization and person.
4.2	INSPECTORS	
4.2.1	List of inspectors and inspection bodies	A list of names and addresses of inspectors such as third-party inspectors and clients' inspectors, together with their tasks and responsibilities, shall be provided. The list may be limited to one name only.
4.2.2	Methods of inspection	See Table 1 , No. 1.11.4.
4.2.3	Procedure for dealing with deviations from the specifications	See Table 1 , Nos. 1.14.1 and 1.14.2.
4.3	QUALITY CONTROL AND QUALITY ASSURANCE	
4.3.1	Qualification of inspectors	
^a These items are recommended. If, however, a particular sub-item is included in the specification, any instructions in the remarks column shall be followed.		

Table 4 (continued)

No.	Main item/sub-item ^a	Remarks
4.3.2	Inspection, quality of inspection and recording of inspection results	See Nos. 4.3.7 and 4.3.8, this table.
4.3.3	Inspection by internal bodies	
4.3.4	Inspection by external (e.g. independent) bodies	
4.3.5	Quality assurance and inspection plan	The inspection plan shall describe the inspection tasks and the extent of the inspection work. The extent of inspection shall be in reasonable relation to the size and type of project, structure or constituent element. The severity of the corrosion stresses involved shall also be taken into account.
4.3.6	Inspection steps	Details of inspection steps, if any, shall be described.
4.3.7	Reference area(s) and responsibility for keeping records on reference area(s)	See Table 1 , No. 1.12, Annex B and Nos. 4.3.2 and 4.3.8, this table.
4.3.8	Requirements concerning quality control and quality assurance records	Quality control and quality assurance records should normally be restricted to surface preparation work, general information on the paint materials used, application of the paint materials, environmental conditions during work and results of measurements. Persons shall be nominated to keep such records for the various parts of the work. See Annexes I and J .
4.3.9	Distribution of records	The sender and the recipients of records shall be stated.
^a These items are recommended. If, however, a particular sub-item is included in the specification, any instructions in the remarks column shall be followed.		

Annex A (informative)

Basic information for inclusion in a protective paint system specification for new work and maintenance

PROJECT

Name of project

Owner of project

Location of project

Name of specifier

CONSTITUENT ELEMENT:

CORROSIVITY CATEGORY:

PROTECTIVE PAINT SYSTEM:

ISO 12944-5 PAINT SYSTEM No. (if applicable):

REQUIRED DURABILITY:

WORKSHOP APPLICATION

SURFACE PREPARATION, IF PREFABRICATION PRIMER IS TO BE USED:

PREFABRICATION PRIMER, IF ANY:

SURFACE PREPARATION:

PRIMING COAT(S) (TYPE AND NOMINAL DRY FILM THICKNESS):

1st coat	µm
----------	----

2nd coat	µm
----------	----

EDGE PROTECTION

STRIPE COAT(S), IF ANY:	µm
-------------------------	----

INTERMEDIATE COAT(S) (TYPE AND NOMINAL DRY FILM THICKNESS):

1st coat	µm
----------	----

2nd coat	µm
----------	----

3rd coat	µm
----------	----

TOP COAT(S) (TYPE AND NOMINAL DRY FILM THICKNESS):

1st coat	µm
----------	----

2nd coat		μm
----------	--	----

3rd coat		μm
----------	--	----

TOTAL NOMINAL DRY FILM THICKNESS:		μm
-----------------------------------	--	----

SITE APPLICATION

SURFACE PREPARATION:

PRIMING COAT(S) (TYPE AND NOMINAL DRY FILM THICKNESS):

1st coat	COMPLETE/TOUCH-UP	μm
----------	-------------------	----

2nd coat	COMPLETE/TOUCH-UP	μm
----------	-------------------	----

INTERMEDIATE COAT(S) (TYPE AND NOMINAL DRY FILM THICKNESS):

1st coat	COMPLETE/TOUCH-UP	μm
----------	-------------------	----

2nd coat	COMPLETE/TOUCH-UP	μm
----------	-------------------	----

3rd coat	COMPLETE/TOUCH-UP	μm
----------	-------------------	----

TOP COAT(S) (TYPE AND NOMINAL DRY FILM THICKNESS):

1st coat	COMPLETE/TOUCH-UP	μm
----------	-------------------	----

2nd coat	COMPLETE/TOUCH-UP	μm
----------	-------------------	----

3rd coat	COMPLETE/TOUCH-UP	μm
----------	-------------------	----

TOTAL NOMINAL DRY FILM THICKNESS:		μm
-----------------------------------	--	----

COLOURS (in accordance with [Table 1](#), No. 1.9.1):

Annex B **(informative)**

Reference areas

Reference areas are suitable areas on the structure used

- to establish a minimum acceptable standard for the work,
- to check that data provided by a manufacturer or contractor are correct, and
- to enable the performance of the coating to be assessed at any time after completion.

Thus, reference areas become the standard against which subsequent surface preparation and paint work is judged. They are also a means of deciding whether the performance of the specified protective paint system is as expected.

Reference areas should preferably be prepared on each important constituent element of the structure. This is achieved by the painting contractor preparing the surface and applying each of the specified coats of paint under supervision by an inspector approved by the specifier, the paint manufacturer and/or the owner, or as otherwise specified. Each step in the preparation and painting shall be approved as complying with the specification before the next step is undertaken.

Different environments are likely to exist at different locations on the structure once the steel structure is operational. The reference areas shall therefore be placed so as to take this into account, e.g. by siting them in both the potentially most severe and the mildest environments. Reference areas should normally include welds and other joints, edges, corners and any other areas of the structure which are considered to present a high risk of corrosion.

Reference areas shall be clearly and permanently marked by the contractor/applicator. Detailed records of the reference areas shall be kept and steps taken to ensure they are not destroyed, e.g. by overpainting.

A recommended form for a report on reference areas is provided in [Table B.1](#).

For further details, see ISO 12944-7.

Table B.1 — Recommended form for a report on reference areas

Report on reference areas for corrosion protection work					
Owner:					
Specifier:					
Project:					
Constituent element:					
	Company		Person responsible		
Surface preparation:					
Paint work:					
Supplier of paint materials:					
Reference area ^a				Size in m ²	
Location and marking:					
Original condition of the surface:					
Uncoated surface (information in accordance with ISO 8501-1)					
Rust grade		☐ A	☐ B	☐ C	☐ D
Supplementary information:					
Zinc-coated steel surface, if any:					
☐ Hot-dip-galvanized surface					
☐ Thermally sprayed surface					
☐ Electroplated surface					
Zinc corrosion (e.g. white rust)		☐ YES	☐ NO		
Supplementary information:					
Painted surface					
Type(s) of coat (including thickness and age, if known):					
Degree of blistering in accordance with ISO 4628-2:					
Degree of rusting in accordance with ISO 4628-3:					
Degree of cracking in accordance with ISO 4628-4:					
Degree of flaking in accordance with ISO 4628-5:					
Supplementary information:					
Surface preparation					
Preparation grade (ISO 8501-1/ISO 8501-2/ISO 8501-4)					
☐	Sa 1	☐	Sa 2	☐	Sa 2 1/2
☐	Sa 3	☐	PSa 2		
☐	PSa 2 1/2	☐	PSa 3	☐	St 2
☐	St 3	☐	PSt 2		
☐	PSt 3	☐	PMa	☐	Wa 1
☐	Wa 2	☐	Wa 2 1/2		
Other information relating to preparation method and grade achieved ^{b,c} :					
Remarks:					

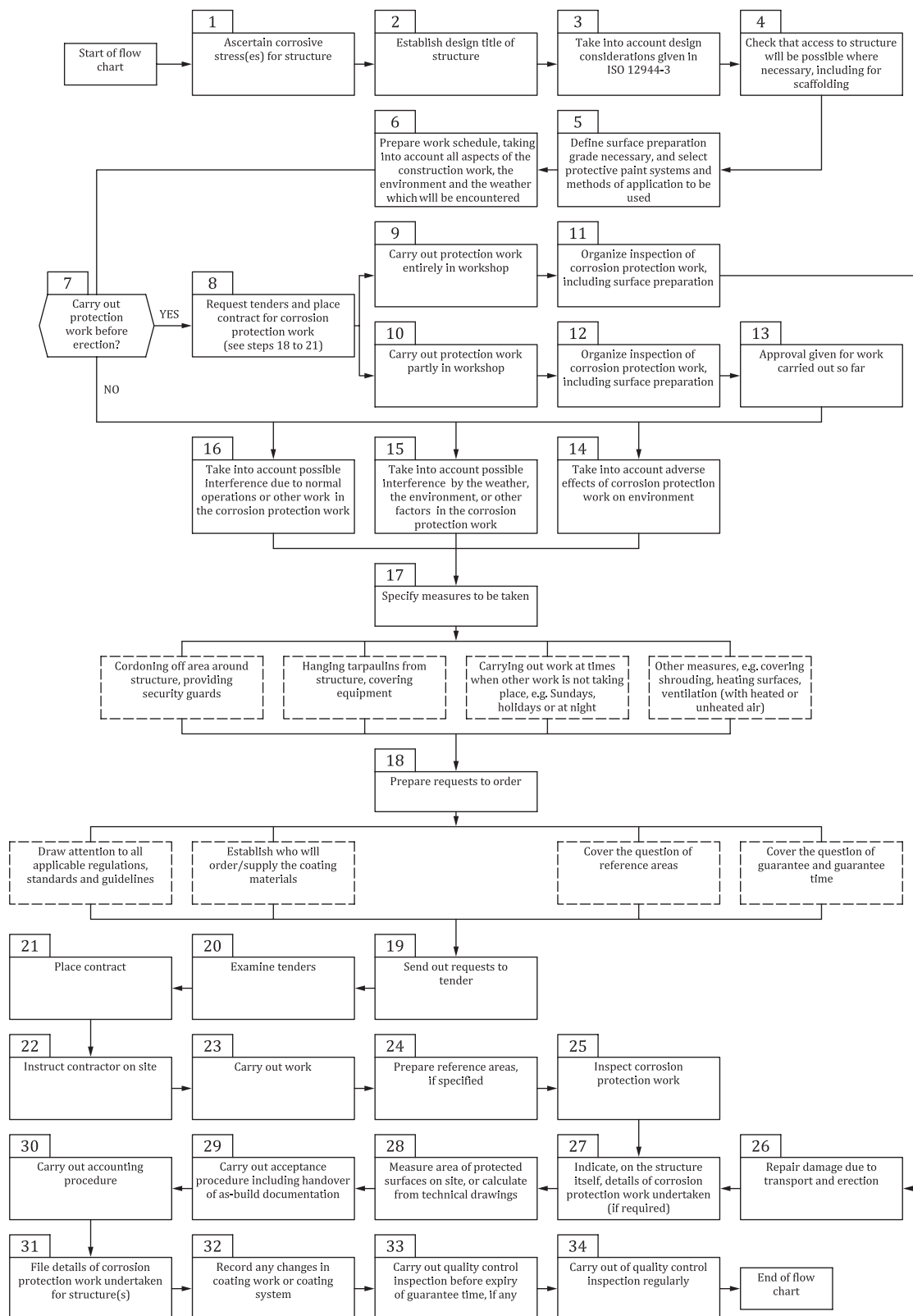
Table B.1 (continued)

Report on reference areas for corrosion protection work						
	1	2	3	4	5	6
	Pre-fabrication primer	Priming coat	d	d	d	Top coat
Paint material						
— Manufacturer						
— Brand name						
— Batch and/or production no.						
Colour ^e						
Application method ^f						
Air temperature, °C						
Relative humidity, %						
Surface temperature, °C						
Dew point, °C						
Weather conditions (brief description)						
Thinner (type and amount) of paint material, if added						
Average film thickness, µm ^g						
— wet						
instrument used						
— dry						
instrument used						
Other measurements, if specified ^g						
Date						
Time						
Location of paint work ^h						
Company name(s)						
Signature(s) of person(s) responsible						

^a Fill in a new sheet for each reference area.
^b For example, for preparation grades St 2 and St 3, whether hand tools or power tools were used.
^c Level of flash rust immediately prior to application.
^d Possible further operations, e.g. application of further coats, edge protection.
^e See [Table 1](#), No. 1.9.
^f See ISO 12944-7:2017, 6.3.
^g List the individual measurements on a separate sheet.
^h For example, steel mill, workshop or on site.

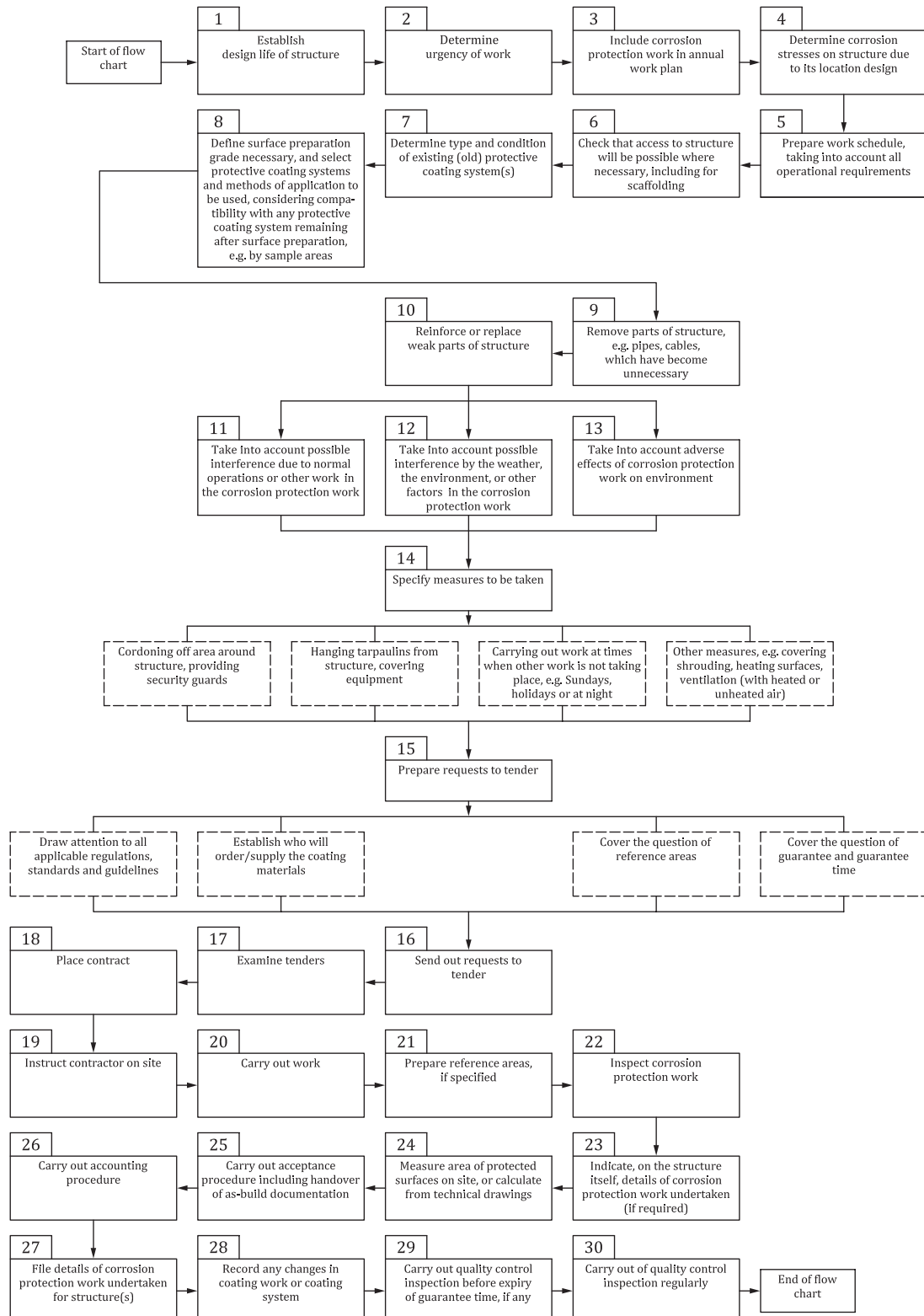
Annex C
(informative)

Flow chart for planning new work



Annex D (informative)

Flow chart for planning maintenance work



Annex E (informative)

Classification of environments — Checklist (derived from ISO 12944-2)

E.1 Environment categories and associated types of atmosphere

E.1.1 Atmospheric corrosivity categories

- a) C1 Very low
- b) C2 Low
- c) C3 Medium
- d) C4 High
- e) C5 Very high
- f) CX Extreme

E.1.2 Types of atmosphere

- a) Rural
- b) Urban
- c) Industrial
- d) Marine
- e) Offshore

E.2 Categories for water and soil

- a) Im1 Fresh water
- b) Im2 Sea or brackish water
- c) Im3 Soil
- d) Im4 Sea or brackish water with cathodic protection

E.3 Climatic conditions

- a) Extremely cold
- b) Cold
- c) Cold temperate
- d) Warm temperate
- e) Warm dry

- f) Mild warm dry
- g) Extremely warm dry
- h) Warm damp
- i) Warm damp, constant

E.4 Special cases

E.4.1 Special situations

- a) Corrosion inside buildings
- b) Corrosion in box members and hollow components

E.4.2 Special stresses

- a) Chemical stresses
- b) Mechanical stresses
- c) Stresses due to condensation
- d) Stresses due to medium or high temperatures
- e) Increased corrosion due to combinations of stresses
- f) Stresses due to exposure to strong UV radiation

For details, see ISO 12944-2.

Annex F (informative)

Recommended form for a protective paint system specification — New work

This form is to be filled in for each constituent element of the structure.

Project:

Name of owner:

Project:	Protective paint system:
Location:	ISO 12944-5 paint system no.:
Constituent element:	Environment:
Drawing no./area:	Required durability:
Position no.:	Sheet no.:

SHOP APPLICATION

SURFACE PREPARATION GRADE:

TYPE OF PREFABRICATION PRIMER (if used):

Paint manufacturer:

Area: m²

PROTECTIVE PAINT SYSTEM	Nominal dry film thickness μm	Overcoating interval		Drying time at .....°C h
		Minimum h	Maximum h	
1st coat				
2nd coat				
3rd coat				
4th coat				
TOTAL				

NOTE For touch-up of damage, see “site application” below.

SITE APPLICATION

SURFACE PREPARATION GRADE:

Touch-up:

Complete:

Paint manufacturer:

Area: m²

PROTECTIVE PAINT SYSTEM		Nominal dry film thickness μm	Overcoating interval		Drying time at .....°C h
			Minimum h	Maximum h	
1st coat					
2nd coat					
Complete:					
1st coat					
2nd coat					
3rd coat					
4th coat					
TOTAL					

Annex G (informative)

Recommended form for a protective paint system specification — Maintenance

This form is to be filled in for each constituent element of the structure.

Project:

Name of owner:

Project:	Protective paint system:
Location:	ISO 12944-5 paint system no.:
Constituent element:	Environment:
Drawing no./area:	Required durability:
Position no.:	Sheet no.:

TOUCH-UP:					
SURFACE PREPARATION GRADE (e.g. according to ISO 8501-2 and/or ISO 8501-4):					
Paint manufacturer:				Area: m²	
CONDITION OF SUBSTRATE (See Annex J , C: ASSESSMENT OF CONDITION OF PROTECTIVE PAINT SYSTEM)					
PROTECTIVE PAINT SYSTEM		Nominal dry film thickness μm	Overcoating interval Minimum h Maximum h		Drying time at .....°C h
1st coat	.....				
2nd coat	.....				
3rd coat	.....				
4th coat	.....				
TOTAL					

SITE APPLICATION SURFACE PREPARATION GRADE (e.g. according to ISO 8501-1, ISO 8501-2 and/or ISO 8501-4): Touch-up: Complete: Paint manufacturer:					
		Area: m²			
PROTECTIVE PAINT SYSTEM		Nominal dry film thickness μm	Overcoating interval Minimum h Maximum h		Drying time at .....°C h
Touch-up:					
1st coat	.....				
2nd coat	.....				
Complete:					
1st coat	.....				
2nd coat	.....				
3rd coat	.....				
4th coat	.....				
TOTAL					

Annex H
(informative)

**Recommended form for a report on paint work progress and
application conditions**

Table H.1

Project: Location:		Drawing no.: Corrosion protection plan no.:				Inspected by:				Comments																	
Constituent element		Position no.: Area:																									
1	Date	2	Time	3	Type of work (i.e. surface preparation, application of priming coats, intermediate coats, top coats)	4	Method used	5	General weather conditions	6	Temperature	7		8	Relative air humidity	9	Dew point	10	Blast-cleaning abrasive designation/ material no.)	11	Paint batch no.	12	Colour	13	Remarks (e.g. ISO standard, surface preparation grade, irregularities)	14	Signature/ initials
											Air	Structure/ constituent element			%	°C	°C										
(Place)		(Date)				(1st signature)				(2nd signature)				(3rd signature)													

Annex I

(informative)

Recommended form for final report on corrosion protection work

Name of structure:	Project no.:		Drawing no.:		
	Protective paint system:				
	ISO 12944-5 paint system no. (if applicable):				
	1st coat	2nd coat	3rd coat	4th coat	5th coat
Paint work contractor:					
New work			Maintenance		
Rust grade of steel surface (ISO 8501-1) ☐ A ☐ B ☐ C ☐ D ☐ Milling imperfections found ☐ Sharp edges and burns removed ☐ Welding residues, including weld spatter, not removed			☐ Degree of rusting Ri (ISO 4628-3) ☐ Not known ☐ Washed, give details		
Specified surface preparation grade (e.g. according to ISO 8501-1, ISO 8501-2 or ISO 8501-4):					
Blast-cleaning	☐ Sa 2	☐ Sa 2 1/2	☐ Sa 3		
	☐ P Sa 2	☐ P Sa 2 1/2	☐ P Sa 3		
Hand and power-tool cleaning	☐ St 2	☐ St 3			
	☐ P St 2	☐ P St 3			
Machine abrading	☐ PMa				
Water jetting	☐ Wa 1	☐ Wa 2	☐ Wa 2 1/2		
Flash rust grade	☐ Light	☐ Medium	☐ Heavy		
Contaminants (e.g. according to ISO 8502-3, ISO 8502-6, ISO 8502-9)					
Water-soluble contaminants	Specified value:				
Dust (ISO 8502-3)	Size: ☐ 0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5				
	Rating: ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5				
Specified surface profile (ISO 8503-1):					
Comparator G ☐	Fine ☐	Medium ☐	Coarse ☐		
Comparator S ☐	Fine ☐	Medium ☐	Coarse ☐		

	Details of surface preparation	Details of paint application				
		1st coat	2nd coat	3rd coat	4th coat	5th coat
Surface preparation grade achieved (ISO 8501-1, ISO 8501-2, ISO 8501-4)						
Surface profile achieved (ISO 8503-2)						
Brand name(s)/types of blast-cleaning abrasive (e.g. in accordance with ISO 11124 series/ISO 11126 series of standards)						
Manufacturer(s) of abrasive						
Date						
Air temperature °C						
Relative humidity %						
Dew point °C						
Surface temperature °C						
Designation of paint and type of coat, product no.						
Colour						
Batch no.						
Paint manufacturer(s)						
Method of application						
NDFT µm						
DFT min. µm						
mean µm						
max. µm						
Number of measurements						
Complies with specification?		Yes/no	Yes/no	Yes/no	Yes/no	Yes/no

Reference areas provided?	☐ Yes	☐ No
Date of preparation		
Remarks		
Use additional sheet, if necessary.		
Date:	Name of inspector:	
Place:	Signature:	

Annex J

(informative)

Recommended form for a detailed inspection report on the condition of an existing protective paint system, including the assessment of the need for maintenance

A	BASIC INFORMATION				
A1	Name of project:				
A2	Name of owner:				
A3	Location of project/structure:				
A4	In order of:				
A5	Paint manufacturer(s):				
A6	Corrosion protection work carried out by:				
A7	Structure:	Area:	m ²		
A8	Constituent element:	Area:	m ²		
A9	Drawing no.:	Position no.:			
A10	Environmental conditions (see Annex E and ISO 12944-2):				
A11	Durability range of protective paint system (see ISO 12944-1):				
A12	Guarantee time:	from:	to:		
B	PROTECTIVE PAINT SYSTEM				
B1	Surface preparation (see ISO 12944-4):				
B2	Surface profile (roughness) (ISO 12944-4):				
B3	Substrate and possible metal coating (e.g. hot-dip-galvanized or thermally sprayed metal):				
B4	Prefabrication primer/batch no.:				
B5	Priming coat/batch no.:				
B6	Intermediate coat/batch no.:				
B7	Top coat/batch no.:				
B8	Period/end of application:				
B9	Date(s) and description of repair work (if any):				

B10	Dry film thickness (DFT) (see ISO 2808 and ISO 19840):			Date of measurement:		
	Measurement device used:					
	Spot/area:					
	DFT min. μm					
	mean μm					
	max. μm					
C	ASSESSMENT OF CONDITION OF PROTECTIVE PAINT SYSTEM					
	Type of defect	Structure/constituent element	Degree of degradation	Photo no./ computer photo no./ sketch no.	Estimated cause of defect	Need for maintenance? (Yes/no)
C1	Degree of blistering ISO 4628-2	Designation: Location: Coat concerned: ☐ Whole surface ☐ Spots				
C2	Degree of rusting (Ri) ISO 4628-3	Designation: Location: Coat concerned: ☐ Whole surface ☐ Spots				
C3	Degree of cracking ISO 4628-4	Designation: Location: Coat concerned: ☐ Whole surface ☐ Spots				

C4	Degree of flaking ISO 4628-5	Designation: Location: Coat concerned: ☐ Whole surface ☐ Spots				
C5	Degree of chalking ISO 4628-6	Designation: Location: Coat concerned: ☐ Whole surface ☐ Spots				
C6	Rusting of welds, etc.	Designation: Location: Coat concerned: ☐ Whole surface ☐ Spots				
C7	Adhesion ISO 16276-1 and/or ISO 16276-2	Designation: Location: Coat concerned: ☐ Whole surface ☐ Spots				
C8	Filiform corrosion ISO 4628-10	Designation: Location: Coat concerned: ☐ Whole surface ☐ Spots				

C9	Other defects					
D	MAINTENANCE					
D1	Nature:	a) Structure b) Constituent element c) Location of surface				
D2	Estimated cause (cross as appropriate):		☐ a) Normal wear and tear ☐ b) Inadequate protective paint system ☐ c) Errors of workmanship			
D3	Recommended measures (cross as appropriate):		☐ a) Maintenance painting unnecessary before next inspection (number of years.....) ☐ b) Maintenance painting required before next inspection (number of years.....) ☐ c) Maintenance painting required within 1 year ☐ d) Maintenance painting required immediately (<4 months)			
D4	Remarks					

Date of inspection:

Signature of inspector:

Bibliography

- [1] ISO 2409, *Paints and varnishes — Cross-cut test*
- [2] ISO 2808, *Paints and varnishes — Determination of film thickness*
- [4] ISO 4624, *Paints and varnishes — Pull-off test for adhesion*
- [5] ISO 4628-2, *Paints and varnishes — Evaluation of degradation of coatings — Designation of quantity and size of defects, and of intensity of uniform changes in appearance — Part 2: Assessment of degree of blistering*
- [6] ISO 4628-3, *Paints and varnishes — Evaluation of degradation of coatings — Designation of quantity and size of defects, and of intensity of uniform changes in appearance — Part 3: Assessment of degree of rusting*
- [7] ISO 4628-4, *Paints and varnishes — Evaluation of degradation of coatings — Designation of quantity and size of defects, and of intensity of uniform changes in appearance — Part 4: Assessment of degree of cracking*
- [8] ISO 4628-5, *Paints and varnishes — Evaluation of degradation of coatings — Designation of quantity and size of defects, and of intensity of uniform changes in appearance — Part 5: Assessment of degree of flaking*
- [9] ISO 4628-6, *Paints and varnishes — Evaluation of degradation of coatings — Designation of quantity and size of defects, and of intensity of uniform changes in appearance — Part 6: Assessment of degree of chalking by tape method*
- [3] ISO 4628-10, *Paints and varnishes — Evaluation of degradation of coatings — Designation of quantity and size of defects, and of intensity of uniform changes in appearance — Part 10: Assessment of degree of filiform corrosion*
- [10] ISO 8501-1, *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 coating*
- [11] ISO 8501-2, *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*
- [12] ISO 8501-3, *Preparation of steel substrates before application of paints and related products — Visual assessment of surface cleanliness — Part 3: Preparation grades of welds, edges and other areas with surface imperfections*
- [16] ISO 8501-4, *Preparation of steel substrates before application of paints and related products — Visual assessment of surface cleanliness — Part 4: Initial surface conditions, preparation grades and flash rust grades in connection with high-pressure water jetting*
- [13] ISO 8502-3, *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)*
- [14] ISO 8502-6, *Preparation of steel substrates before application of paints and related products — Tests for the assessment of surface cleanliness — Part 6: Extraction of soluble contaminants for analysis — The Bresle method*
- [15] ISO 8502-9, *Preparation of steel substrates before application of paints and related products — Tests for the assessment of surface cleanliness — Part 9: Field method for the conductometric determination of water-soluble salts*

- [30] ISO 8503-1, *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*
- [17] ISO 8503-2, *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*
- [18] ISO 8503-3, *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*
- [19] ISO 8503-4, *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*
- [20] ISO 11124 (all parts), *Preparation of steel substrates before application of paints and related products — Specifications for metallic blast-cleaning*
- [21] ISO 11126 (all parts), *Preparation of steel substrates before application of paints and related products — Specifications for non-metallic blast-cleaning abrasives*
- [22] ISO 12944-2, *Paints and varnishes — Corrosion protection of steel structures by protective paint systems — Part 2: Classification of environments*
- [23] ISO 12944-3, *Paints and varnishes — Corrosion protection of steel structures by protective paint systems — Part 3: Design considerations*
- [24] ISO 12944-4, *Paints and varnishes — Corrosion protection of steel structures by protective paint systems — Part 4: Types of surface and surface preparation*
- [25] ISO 12944-5:—¹, *Paints and varnishes — Corrosion protection of steel structures by protective paint systems — Part 5: Protective paint systems*
- [28] ISO 12944-6, *Paints and varnishes — Corrosion protection of steel structures by protective paint systems — Part 6: Laboratory performance test methods*
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- [31] ISO 16276-1, *Corrosion protection of steel structures by protective paint systems — Assessment of, and acceptance criteria for, the adhesion/cohesion (fracture strength) of a coating — Part 1: Pull-off testing*
- [32] ISO 16276-2, *Corrosion protection of steel structures by protective paint systems — Assessment of, and acceptance criteria for, the adhesion/cohesion (fracture strength) of a coating — Part 2: Cross-cut testing and X-cut testing*
- [27] ISO 19840, *Paints and varnishes — Corrosion protection of steel structures by protective paint systems — Measurement of, and acceptance criteria for, the thickness of dry films on rough surfaces*
- [33] RAL 840-HR, *Primary standards*
- [34] NF X 08-002, *AFNOR colour fan*
- [35] BS 4800, *Colour chart*

[36] NS 4054, *Colours for identification*

[37] UNE 48103, *Paints and varnishes — Standardized colours*

