
**Zinc coatings — Guidelines and
recommendations for the protection
against corrosion of iron and steel in
structures —**

**Part 1:
General principles of design and
corrosion resistance**

*Revêtements de zinc — Lignes directrices et recommandations
pour la protection contre la corrosion du fer et de l'acier dans les
constructions —*

Partie 1: Principes généraux de conception et résistance à la corrosion



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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 107, *Metallic and other inorganic coatings*, Subcommittee SC 4, *Hot dip coatings (galvanized, etc.)*.

This second edition cancels and replaces the first edition (ISO 14713-1:2009), of which it constitutes a minor revision following the publication of ISO 17668:2016 and ISO 9223:2012, with the following changes:

- ISO 17668 has replaced EN 13811;
- revisions to [Table 1](#) to align with corresponding descriptions of typical environments in ISO 9223:2012, Table C.1 and to make clearer that the corrosion rates presented are for the first year of exposure.

A list of all parts in the ISO 14713 series can be found on the ISO website.

Zinc coatings — Guidelines and recommendations for the protection against corrosion of iron and steel in structures —

Part 1: General principles of design and corrosion resistance

1 Scope

This document provides guidelines and recommendations regarding the general principles of design which are appropriate for articles to be zinc coated for corrosion protection and the level of corrosion resistance provided by zinc coatings applied to iron or steel articles, exposed to a variety of environments. Initial protection is covered in relation to

- available standard processes,
- design considerations, and
- environments for use.

This document applies to zinc coatings applied by the following processes:

- a) hot dip galvanized coatings (applied after fabrication);
- b) hot dip galvanized coatings (applied onto continuous sheet);
- c) sherardized coatings;
- d) thermal sprayed coatings;
- e) mechanically plated coatings;
- f) electrodeposited coatings.

These guidelines and recommendations do not deal with the maintenance of corrosion protection in service for steel with zinc coatings. Guidance on this subject can be found in ISO 12944-5 and ISO 12944-8.

NOTE There are a variety of product-related standards (e.g. for nails, fasteners, ductile iron pipes, etc.) which provide specific requirements for the applied zinc coating systems which go beyond any general guidance presented in this document. These specific product-related requirements will take precedence over these general recommendations.

2 Normative references

ISO 1461, *Hot dip galvanized coatings on fabricated iron and steel articles — Specifications and test methods*

ISO 2063, *Thermal spraying — Metallic and other inorganic coatings — Zinc, aluminium and their alloys*

ISO 2064, *Metallic and other inorganic coatings — Definitions and conventions concerning the measurement of thickness*

ISO 8044:2015, *Corrosion of metals and alloys — Basic terms and definitions*

ISO 12683, *Mechanically deposited coatings of zinc — Specification and test methods*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 1461, ISO 2063, ISO 2064, ISO 8044, ISO 12683 and ISO 17668 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 atmospheric corrosion

corrosion with the earth's atmosphere at ambient temperature as the corrosive environment

[SOURCE: ISO 8044:2015, 3.4]

3.2 elevated temperatures

temperatures between +60 °C and +200 °C

3.3 exceptional exposure

special cases such as exposure that substantially intensifies the corrosive exposure and/or places increased demands on the corrosion protection system

3.4 life to first maintenance

time interval that can elapse after initial coating before coating deterioration reaches the point when maintenance is necessary to restore protection of the basis metal

4 Materials

4.1 Iron and steel substrates

In hot dip galvanizing, the reactivity of the steel is modified by its chemical composition, particularly by the silicon plus phosphorus contents (see ISO 14713-2). The metallurgical and chemical nature of the steel is irrelevant to protection by thermally sprayed or sherardized coatings.

The broad range of steels likely to be subject to zinc coating will commonly fall into the following categories:

- carbon steel, composed simply of iron and carbon, accounts for 90 % of steel production [e.g. EN 10025-2 and EN 10080 (steel reinforcement)];
- high-strength, low-alloy (HSLA) steels have small additions (usually <2 % by weight) of other elements, typically 1,5 % manganese, to provide additional strength for a modest price increase (e.g. EN 10025-6);
- low-alloy steel is alloyed with other elements, usually molybdenum, manganese, chromium, or nickel, in amounts of up to 10 % by weight to improve the hardenability of thick sections (e.g. EN 10083-1).

Steel can be hot rolled or cold formed. Hot rolling is used to produce angle, "I", "H" and other structural sections. Some structural sections, e.g. safety barriers, cladding rails and cladding panels, are cold formed.

Cast and wrought irons are of various metallurgical and chemical compositions. This is irrelevant to protection by thermally sprayed or sherardized coatings but special consideration is needed regarding the cast irons most suitable for hot dip galvanizing (see ISO 14713-2).

4.2 Zinc coatings

The application of zinc coatings provides an effective method of retarding or preventing corrosion of ferrous materials (see [Clause 1](#) for the range of zinc coatings/processes covered by this document). Zinc coatings are used in this regard because they protect iron and steel both by barrier action and by galvanic action.

5 Selection of zinc coating

The zinc coating system to be used should be selected by taking the following items into account:

- a) the general environment (macro-climate) in which it is to be applied;
- b) local variations in the environment (micro-climate), including anticipated future changes and any exceptional exposure;
- c) the required life to first maintenance of the zinc coating system;
- d) the need for ancillary components;
- e) the need for post-treatment for temporary protection;
- f) the need for painting, either initially (duplex system) or when the zinc coating is approaching the end of its life to first maintenance to achieve minimal maintenance cost;
- g) the availability and cost;
- h) if the life to first maintenance of the system is less than that required for the structure, its ease of maintenance.

NOTE The life for a zinc coating in any particular atmospheric exposure condition is approximately proportional to the thickness of the coating.

The operational sequence for applying the selected system should be determined in consultation with the steel fabricator and the applier of the zinc coating system.

6 Design requirements

6.1 General principles of design to avoid corrosion

Design of structures and products should influence the choice of protective system. It may be appropriate and economic to modify the design to suit the preferred protective system.

The items in a) to j) should be considered.

- a) Safe and easy access for cleaning and maintenance should be provided.
- b) Pockets and recesses in which water and dirt can collect should be avoided; a design with smooth contours facilitates application of a protective coating and helps to improve corrosion resistance. Corrosive chemicals should be directed away from structural components, e.g. drainage tubes should be used to control de-icing salts.
- c) Areas which are inaccessible after erection should be given a coating system designed to last the required life of the structure.
- d) If bimetallic corrosion (corrosion due to contact between dissimilar materials: metals and/or alloys) is possible, additional protective measures should be considered (see ISO 14713-2).
- e) Where the coated iron and steel are likely to be in contact with other building materials, special consideration should be given to the contact area; e.g. the use of paint, tapes or plastic foils should be considered.