International Standard 4520

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION•МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ•ORGANISATION INTERNATIONALE DE NORMALISATION

Chromate conversion coatings on electroplated zinc and cadmium coatings

Couches de conversion au chromate sur les dépôts électrolytiques de zinc et de cadmium

First edition — 1981-10-15

UDC 621.794 : 669.587 + 669.738 **Ref. No. ISO 4520-1981 (E)**

Descriptors : metal coatings, electrodeposited coatings, zinc coatings, cadmium coatings, chromating, corrosion prevention.

Price based on 2 pages

Foreword

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Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council.

International Standard ISO 4520 was developed by Technical Committee ISO/TC 107, *Metallic and other non-organic coatings*, and was circulated to the member bodies in December 1980.

It has been approved by the member bodies of the following countries :

Australia	India	South Africa, Rep. of
Brazil	Italy	Spain
Czechoslovakia	Japan	Sweden
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France	Poland	United Kingdom
Hungary	Romania	USA

The member body of the following country expressed disapproval of the document on technical grounds :

Germany, F. R.

Printed in Switzerland

Chromate conversion coatings on electroplated zinc and cadmium coatings

0 Introduction

Coatings of zinc and cadmium are chromate treated in order to retard the formation of corrosion products on the surfaces of coatings exposed in corrosive atmospheres. Chromate treatment is particularly effective in retarding the formation of white corrosion products which form on zinc and cadmium coatings under certain conditions.

Thicknesses of electroplated coatings suitable for chromate treatment are covered by the relevant International Standards, i.e. ISO 2081 and ISO 2082.

1 Scope and field of application

This International Standard specifies requirements relating to chromate conversion coatings on zinc and cadmium intended to give protection against corrosion. Finishes for giving particular colours only or specifically to improve paint adhesion are not covered by this International Standard.

2 References

ISO 2081, *Metallic coatings — Electroplated coatings of zinc on iron and steel.*

ISO 2082, *Metallic coatings — Electroplated coatings of cadmium on iron and steel.*

ISO 3613, *Chromate conversion coatings on zinc and cadmium — Test methods.*

ISO 3768, *Metallic coatings — Neutral salt spray test (NSS test).*

ISO 3892, *Conversion coatings on metallic materials — Determination of coating mass per unit area — Gravimetric methods.*

3 Method of application of chromate conversion coatings

Chromate conversion coatings are normally applied by dipping. Chromating solutions are usually acidic and contain hexavalent chromium salts together with other salts which may be varied to affect the appearance and hardness of the film. The colour of the film, and, therefore, the type of conversion coating, depends on the composition of the chromating solution, but is also affected by pH and temperature, the duration of treatment and the nature and surface condition of the coating being treated. Bright, transparent films on zinc and cadmium coatings can be obtained by dipping in appropriate solutions. On zinc, they can also be obtained by bleaching iridescent films in alkaline solutions or in phosphoric acid.

If hot water is used as the final rinse after the chromating process, it is essential that the time of rinsing should be kept as short as possible in order to prevent the dissolution of the hexavalent chromium. The drying of the article shall be carried out at a temperature not exceeding 60 °C to prevent cracking due to dehydration of the chromate coating. (Any heat treatment for the relief of hydrogen embrittlement shall be carried out before a chromate conversion coating is applied.)

4 Classification

Finishes can be applied ranging from thick, dark, olive-green coatings with good protective properties to thin, transparent, sometimes bluish films of attractive appearance but with limited protective value.

Electroplaters can seldom guarantee to supply exact shades of colour with chromate conversion coatings. If it is necessary to have exact shades of colour, it is possible to dye bleached chromate coatings to obtain a wide range of colours, but they can only be expected to give an order of added corrosion resistance similar to that provided by the colourless bleached coatings.

Finishes are divided into two classes, each of which comprises two types; their most important characteristics are listed in table 1.

Finishes may be characterized by class alone or by class and type designation. Typical examples are :

Fe/Cd 8 c 2

Fe/Zn 25 c 1A

where

Fe refers to the basis metal (iron or steel;

Cd and Zn refer to the electroplated coating (cadmium or zinc);

8 and 25 are the thicknesses, in micrometres, of the cadmium and zinc coatings;

c refers to the chromate conversion coating;

2 and 1 are the classes of the chromate conversion coatings;

A designates the type of chromate conversion coating.

5 Requirements

5.1 General

Chromate conversion coatings harden with age by gradual dehydration. They should, therefore, be handled carefully for the first 24 h after treatment, and any tests (including corrosion tests) shall be deferred until the expiry of that period.

5.2 Adhesion of coloured coatings

Coloured coatings shall be adherent and shall be tested by one of the methods specified in ISO 3613.

5.3 Corrosion resistance

When subjected to the neutral salt spray test specified in ISO 3768, the time for formation of white corrosion products on chromated cadmium or zinc coatings shall not be less than the values given in table 2.

NOTE — These requirements are not applicable to the edges of the test specimen.

Table 1 — Classification of chromate conversion coatings

Class	Designation*	Type	Typical appearance	Coating mass per unit area g/m² (see ISO 3892)	Corrosion protection
1	A	Clear	Transparent clear, sometimes with a bluish tinge	⩽ 0,5	Slight, for example against staining during handling or against high humidity in mildly corrosive conditions
	B	Bleached	Transparent with slight iridescence	⩽ 1,0	
2	C	Iridescent	Yellow iridescent	0,5 to 1,5 inclusive	Considerable, including protection against certain organic vapours
	D	Opaque	Olive green, shading to brown or bronze	> 1,5	

* In addition, black coatings can be produced by several methods. Such coatings may have different degrees of corrosion protection and may also differ in coating mass per unit area.

Table 2 — Requirements for corrosion resistance

Designation	Possible classifications*	Minimum time to formation of white corrosion products, h
A	1, 1A	6
B	1B	24
C	2, 2C	72
D	2D	96

* See clause 4, which describes how finishes may be characterized by class alone or by class and type designation.