

Coatings on metal fasteners —

Part 3: Specifications for electroplated zinc and cadmium coatings

Committees responsible for this British Standard

The preparation of this British Standard was entrusted by the General Mechanical Engineering Standards Policy Committee (GME/-) to Technical Committee GME/9, upon which the following bodies were represented:

- BEAMA Ltd.
- British Constructional Steelwork Association Ltd.
- British Industrial Fasteners Federation
- British Railways Board
- British Steel Industry
- British Steel Industry (Wire Section)
- Gauge and Tool Makers' Association
- Society of Motor Manufacturers and Traders Ltd.
- Washer Manufacturers Association of Great Britain

The following bodies were also represented in the drafting of the standard, through subcommittees and panels:

- British Turned-parts Manufacturers' Association
- Institute of Metal Finishing
- Metal Finishing Association
- Stainless Steel Fabricators' Association of Great Britain
- National Centre of Tribology

This British Standard, having been prepared under the direction of the General Mechanical Engineering Standards Policy Committee, was published under the authority of the Standards Board and comes into effect on 15 September 1993

© BSI 2007
The following BSI references relate to the work on this standard.
Committee reference GME/9
Draft for comment
93/702145 DC

Amendments issued since publication

Amd. No.	Date	Text affected
8181 Corrigendum no. 1	March 1994	Correction to Table C.1

Contents

	Page
Committees responsible	Inside front cover
Foreword	ii
Specification	
0 Introduction	1
1 Scope	2
2 References	2
3 Definitions	2
4 Application and type of coating	2
5 Coating	3
6 Chromate treatment	4
7 Suitability of coatings for components with parallel threads	4
8 Information to be documented and supplied to the coater	4
9 Identification	4
Annexes	
Annex A (normative) Coating thickness for threaded parts	7
Annex B (normative) Measurement of coating thickness	10
Annex C (informative) Guidance on procedures that may be adopted to accommodate thick coatings	11
Tables	
Table 1 — Nominal coating thicknesses	3
Table 2 — Coating designation and corrosion resistance	5
Table 3 — Designation of chromate treatments	6
Table A.1 — Upper limits of nominal coating thickness	8
Table C.1 — Minimum fundamental deviation required to accommodate coatings too thick to be applied to standard threads. Metric threads	12
Figure	
Figure B.1 — Measuring area for local coating thickness measurement on fasteners	11
List of references	13

Foreword

This Part of BS 7371 has been prepared under the authority of the General Mechanical Engineering Standards Policy Committee to provide part of a series of standards on coatings on metal fasteners.

The attention of user of this Part of BS 7371 is drawn to the restrictions placed on the marketing and use of cadmium and its compounds contained in the Environmental Protection (Controls on Injurious Substances (No. 4) Regulations 1992 [1].

WARNINGS. This British Standard calls for the use of substances and/or procedures that may be injurious to health if adequate precautions are not taken. It refers only to technical suitability and in no way absolves wither the designer, the producer, the supplier or the user from statutory obligations relating to health and safety at any stage of manufacture or use.

Compliance with a British Standard cannot confer immunity from legal obligations.

0 Introduction

BS 7371 deals with the performance and selection of coatings on metal fasteners and accessories.

This Part of BS 7371 specifies the requirements for zinc and cadmium electroplated coatings.

Other published Parts of BS 7371 are as follows:

BS 7371-1:1991 *Specification for general requirements and selection guidelines*¹⁾

BS 7371-2:1993 *Specification for torque/clamping force relationship*

BS 7371-11:1993 *Specification for zinc flake non-electrolytically applied cured coatings*

Further Parts of the series to incorporate the following are in preparation:

Specification for electroplated nickel, nickel/chromium and copper/nickel/chromium coatings

Specification for electroplated tin and tin/lead coatings

Specification for electroplated coatings for special purposes

Specification for mechanically applied zinc coatings

Specification for mechanically applied coatings for special purposes

Specification for phosphate and oil coatings

Specification for organic coatings

Zinc and cadmium electroplated coatings covered by this Part of BS 7371 are for use on fasteners and accessories where the following apply:

- a) a coating given galvanic protection is required for ferrous fasteners;
- b) a substrate is required to improve the corrosion resistance of subsequent coatings on ferrous fasteners, e.g. organic;
- c) the risk of hydrogen embrittlement of high tensile steel fasteners is acceptable;
- d) the use of cadmium is acceptable.

The coating has a silver appearance which can be modified to yellow, olive green or black by a chromate conversion (passivation) treatment applied to improve corrosion resistance.

Additional coatings are available to further modify colour but these may influence coating performance, e.g. lubricity or electrical conductivity.

The shape of certain parts may create difficulties in the application of a coating of uniform thickness and reference to the coating of uniform thickness and reference to the coater is recommended to enquire if a difficulty exists or if it can be overcome by the use of specialized processing methods.

Typical difficulties as outlined in BS 4479-1:1990 and BS 4479-2:1990 arise when bulk processing:

- 1) long thin parts;
- 2) parts with flat surfaces that can stick together during processing, e.g. flat washers;
- 3) parts with recesses which do not receive the full coating;
- 4) parts with shapes that induce nesting and interlocking;
- 5) the internal surfaces of hollow parts.

The coatings are suitable for application to metal components such as the following:

- i) parallel threaded fasteners and accessories;
- ii) screws that cut or form their own threads, e.g. self tapping screws (see for example BS 4174:1972);
- iii) woodscrews (see for example BS 1210:1963);
- iv) springs and spring components;
- v) pipe nuts and connectors with parallel or tapered threads.

¹⁾ This is supplementary to all other Parts of BS 7371.

When these coatings are applied to non-ferrous fasteners, the only part of the specification that will apply will be the coating thickness requirement. These coatings should not be specified for application to copper or copper alloys unless an undercoat is also specified, e.g. nickel.

NOTE The coating processes covered by this standard may induce hydrogen embrittlement in certain ferrous fasteners. Attention is drawn to the appropriate requirements in BS 7371-1:1991.

1 Scope

This part of BS 7371 specifies requirements for coatings applied by the electrolysis of solutions of zinc or cadmium. The coatings consist principally of zinc or cadmium and can be lubricated to give controlled torque/clamping force properties when required (see for example BS 7371-2:1993).

In addition to the requirements in this Part of BS 7371, the requirements in Part 1 of the standard which are applicable to zinc and cadmium electroplated coatings apply.

This Part of BS 7371 also specifies requirements for the following:

- a) the coating thickness;
- b) the type of chromate conversion treatment to be applied;
- c) quality assessment of the corrosion resistance of unused coated parts when subjected to neutral salt spray testing (see for example BS 7479:1991);
- d) adhesion test.

Annexes include tables indicating suitable coating grades for standard screw threads and methods of determination of coating thickness.

2 References

2.1 Normative references

This part of BS 7371 incorporates, by reference, provisions from specific editions of other publications. These normative references are cited at the appropriate points in the text and the publications are listed on the inside back cover. Subsequent amendments to, or revisions of, any of these publications apply to this Part of BS 7371 only when incorporated in it by updating or revision.

2.2 Informative references

This Part of BS 7371 refers to other publications that provide information or guidance. Editions of these publications current at the time of issue of this standard are listed on the inside back cover, but reference should be made to the latest editions.

3 Definitions

For the purposes of this Part of BS 7371, the definitions given in BS 7371-1:1991 apply.

4 Application and type of coating

4.1 Cleaning and pretreatment

Parts, fasteners and accessories shall be cleaned and pretreated in accordance with Clauses 4 and 5 of BS 7371-1:1991.

NOTE Restrictions applicable to the avoidance of embrittlement of high tensile parts should be observed.

4.2 Type of coating

The coating shall be either silver in appearance or modified by passivation types C, D or Bk (see Clause 6).

NOTE 1 The colour may be further modified by the addition of an organic top coat.

The coating shall be electrically conductive and galvanically protective to steel under most climatic conditions.

NOTE 2 The presence of passivates, particularly the coloured ones, decreases electrical conductivity at the surface.