

Australian Standard[®]

**Metal finishing—Preparation and
pretreatment of surfaces**

**Part 5: Pickling, descaling and
oxide removal**

This Australian Standard was prepared by Committee MT/9, Metal Finishing. It was approved on behalf of the Council of Standards Australia on 7 March 1994 and published on 16 May 1994.

The following interests are represented on Committee MT/9:

Aluminium Development Council
Australasian Institute of Metal Finishing
Australian Chamber of Commerce and Industry
Department of Defence
Metal Trades Industry Association of Australia
Royal Australian Chemical Institute
Telecom Australia
University of Queensland

Additional interests participating in preparation of Standard:

AUSTROADS
Blast Cleaning and Coating Association of Australia

Review of Australian Standards. To keep abreast of progress in industry, Australian Standards are subject to periodic review and are kept up to date by the issue of amendments or new editions as necessary. It is important therefore that Standards users ensure that they are in possession of the latest edition, and any amendments thereto.

Full details of all Australian Standards and related publications will be found in the Standards Australia Catalogue of Publications; this information is supplemented each month by the magazine 'The Australian Standard', which subscribing members receive, and which gives details of new publications, new editions and amendments, and of withdrawn Standards.

Suggestions for improvements to Australian Standards, addressed to the head office of Standards Australia, are welcomed. Notification of any inaccuracy or ambiguity found in an Australian Standard should be made without delay in order that the matter may be investigated and appropriate action taken.

This Standard was issued in draft form for comment as DR 92232.

Australian Standard[®]

**Metal finishing—Preparation and
pretreatment of surfaces**

**Part 5: Pickling, descaling and
oxide removal**

First published as AS CK9.5—1965. Revised and redesignated AS 1627.5—1975. Second edition 1994.
--

PREFACE

This Standard was prepared under the direction of the Multitechnics Standards Policy Board by the Standards Australia Committee on Metal Finishing to supersede AS 1627.5—1975, *Metal finishing—Preparation and pretreatment of surfaces*, Part 5: *Pickling steel surfaces*. It has been expanded to include methods for the preparation of other metals, in addition to steel, and now contains information on hydrogen embrittlement relief and stress relief of metals.

This Standard is one of a series of Standards covering the preparation and pretreatment of metal surfaces used in metal finishing. Others in the series are as follows:

AS

- | | | |
|---------|----------|---|
| 1627.0 | Part 0: | Method selection guide for preparation and pretreatment of steel surfaces |
| 1627.1 | Part 1: | Cleaning using liquid solvents and alkaline solutions |
| 1627.2 | Part 2: | Power tool cleaning |
| 1627.3 | Part 3: | Flame descaling |
| 1627.4 | Part 4: | Abrasive blast cleaning |
| 1627.6 | Part 6: | Chemical conversion treatment of metals |
| 1627.7 | Part 7: | Hand tool cleaning of metal surfaces |
| 1627.9 | Part 9: | Pictorial surface preparation standards for painting steel surfaces |
| 1627.10 | Part 10: | Cleaning and preparation of metal surfaces using acid solutions (non-immersion) |

The terms 'normative' and 'informative' have been used in this Standard to define the application of the appendix to which they apply. A 'normative' appendix is an integral part of a Standard, whereas an 'informative' appendix is only for information and guidance.

© Copyright — STANDARDS AUSTRALIA

Users of Standards are reminded that copyright subsists in all Standards Australia publications and software. Except where the Copyright Act allows and except where provided for below no publications or software produced by Standards Australia may be reproduced, stored in a retrieval system in any form or transmitted by any means without prior permission in writing from Standards Australia. Permission may be conditional on an appropriate royalty payment. Requests for permission and information on commercial software royalties should be directed to the head office of Standards Australia.

Standards Australia will permit up to 10 percent of the technical content pages of a Standard to be copied for use exclusively in-house by purchasers of the Standard without payment of a royalty or advice to Standards Australia.

Standards Australia will also permit the inclusion of its copyright material in computer software programs for no royalty payment provided such programs are used exclusively in-house by the creators of the programs.

Care should be taken to ensure that material used is from the current edition of the Standard and that it is updated whenever the Standard is amended or revised. The number and date of the Standard should therefore be clearly identified.

The use of material in print form or in computer software programs to be used commercially, with or without payment, or in commercial contracts is subject to the payment of a royalty. This policy may be varied by Standards Australia at any time.

CONTENTS

	<i>Page</i>
FOREWORD	4
 SECTION 1 SCOPE AND GENERAL	
1.1 SCOPE	5
1.2 REFERENCED DOCUMENTS	5
1.3 DEFINITIONS	6
1.4 SURFACE CONDITION REQUIREMENTS AFTER TREATMENT	6
1.5 SAFETY PRECAUTIONS	6
1.6 DISPOSAL OF WASTE SOLUTIONS	7
 SECTION 2 PROCEDURES	
2.1 GENERAL	8
2.2 EQUIPMENT	8
2.3 PICKLING AND DESCALING METHODS FOR FERROUS MATERIALS	8
2.4 CLEANING AND OXIDE REMOVAL FROM ALUMINIUM AND ALUMINIUM ALLOYS	9
2.5 CLEANING AND OXIDE REMOVAL FROM COPPER AND COPPER ALLOYS	10
2.6 CLEANING AND OXIDE REMOVAL FROM ZINC AND ZINC ALLOYS	11
2.7 CLEANING AND OXIDE REMOVAL FROM NICKEL AND NICKEL ALLOYS	12
2.8 RINSING AND DRYING	13
2.9 FINAL CLEANING	14
2.10 CORROSION PROTECTION	14
 APPENDICES	
A PURCHASING GUIDELINES	15
B WET SMUT TEST	16
C ADVICE ON HEAT TREATMENT OF STEEL FOR RELIEF OF HYDROGEN EMBRITTLEMENT AND STRESS	17

FOREWORD

Pickling is used for the complete removal of scale, metallic oxides or other contaminants from metal surfaces prior to the application of a suitable protective coating. It is used as an alternative to mechanical methods such as abrasive blast cleaning.

The surface produced by pickling is generally smooth, and may not be suitable for the application of some coatings, e.g. inorganic zinc and high-build epoxy coatings, or for metal spray coatings. The use of corrosion inhibitors in rinse solutions to prevent early rusting of a pickled surface may also cause incompatibility with subsequent coatings. Coating manufacturers or suppliers should be consulted before the application of coating systems to pickled surfaces is carried out.

The two most common acids used for pickling are sulfuric acid and hydrochloric acid. With increasing enforcement of anti-pollution regulations, the popularity of the cheaper sulfuric acid is declining, as hydrochloric acid is more easily recovered in acid regeneration plants and hence is favoured for continuous pickling installations. Hydrochloric acid is also more practicable for batch pickling because the high heat of reaction reduces the amount of external heating necessary. It also dissolves scale faster than sulfuric acid. Acid fuming, often cited as a major deterrent to hydrochloric acid pickling, can be effectively controlled by adhering to correct operating procedures. Other acids, such as phosphoric, nitric, hydrofluoric, citric and sulfamic, are used for special purposes. An inhibitor should always be used with any acid to prevent excessive attack on the base metal during pickling. Special finishing precautions, including fresh water rinsing, are necessary to remove residues of unreacted acid. Final rinses containing dilute phosphoric or chromic acid are often used to temporarily passivate the pickled surface. Pickled steel, like blast-cleaned steel, should be painted as soon as possible after cleaning and drying.

During the design of fabricated steel, special consideration should be given to the elimination of pockets or crevices which can trap acid during pickling.

STANDARDS AUSTRALIA

Australian Standard

Metal finishing—Preparation and pretreatment of surfaces

Part 5: Pickling, descaling and oxide removal

SECTION 1 SCOPE AND GENERAL

1.1 SCOPE This Standard sets out procedures for preparing metal surfaces by immersion, or by other means, employing chemical solutions to remove oxidation products (scale), corrosion products and related foreign materials.

It includes acid pickling and alkaline descaling methods for the following materials:

- (a) Steels.
- (b) Cast iron.
- (c) Aluminium and aluminium alloys.
- (d) Copper and copper alloys.
- (e) Zinc and zinc alloys.
- (f) Nickel and nickel alloys.

NOTE: Advice and recommendations on information to be supplied by the purchaser at the time of enquiry or order are contained in Appendix A.

1.2 REFERENCED DOCUMENTS The following documents are referred to in this Standard:

AS

- 1319 Safety signs for the occupational environment
- 1337 Eye protectors for industrial applications
- 1470 Health and safety at work—Principles and practices
- 1627 Metal finishing—Preparation and pretreatment of surfaces
 - 1627.1 Part 1: Cleaning using liquid solvents and alkaline solutions
 - 1627.2 Part 2: Power tool cleaning
- 1715 Selection, use and maintenance of respiratory protective devices
- 1716 Respiratory protective devices
- 1874 Aluminium and aluminium alloys—Ingots and castings
- 2161 Industrial safety gloves and mittens (excluding electrical and medical gloves)
- 2453 Electroplated coatings of chromium for engineering applications
- 2848 Aluminium and aluminium alloys—Compositions and designations
 - 2848.1 Part 1: Wrought products

ASTM

- A380 Practice for cleaning and descaling stainless steel parts, equipment, and systems