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**METHODS OF TEST FOR  
VITREOUS ENAMEL COATINGS**

**PART 2.3: PHYSICAL TESTS—  
DETERMINATION OF ABRASION  
RESISTANCE OF VITREOUS  
ENAMEL COATINGS**

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The following scientific, industrial and governmental organizations and departments were officially represented on the committee entrusted with the preparation of these standard methods:

Australian Electrical Manufacturers Association

Australian Gas Association

Australian Vitreous Enamellers Institute

Bureau of Steel Manufacturers of Australia

Confederation of Australian Industry

Department of Science

Electricity Supply Association of Australia

Gas Appliance Manufacturers Association of Australia

Health Commission of N.S.W.

Metal Trades Industry Association of Australia

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**AS 2219**  
**December 1978**

## PREFACE

These standard methods were prepared by the Association's Committee on Vitreous Enamel Finishes as the revision, metrication and extension of the methods in AS K95—1961 which they accordingly supersede.

During its work on these standard methods, the committee took particular note of ISO/TC 107/SC 7 published documents and standards, and accordingly has introduced test methods and equipment which have been adopted as international standards. These include:

ISO 2722	Vitreous and Porcelain Enamels— Determination of Resistance to Citric Acid at Room Temperature
ISO 2723	Vitreous and Porcelain Enamels for Sheet Steel— Production of Specimens for Testing
ISO 2724	Vitreous and Porcelain Enamels for Cast Iron— Production of Specimens for Testing
ISO 2733	Vitreous and Porcelain Enamels— Apparatus for Testing with Acid and Neutral Liquids and their Vapours
ISO 2734	Vitreous and Porcelain Enamels— Apparatus for Testing with Alkaline Liquids
ISO 2742	Vitreous and Porcelain Enamels— Determination of Resistance to Boiling Citric Acid
ISO 2743	Vitreous and Porcelain Enamels— Determination of Resistance to Boiling Hydrochloric Acid
ISO 2744	Vitreous and Porcelain Enamels— Determination of Resistance to Boiling Water and Water Vapour
ISO 2745	Vitreous and Porcelain Enamels— Determination of Resistance to Hot Sodium Hydroxide
ISO 2746	Vitreous and Porcelain Enamels— Enamelled Articles for Service under Highly Corrosive Conditions —High Voltage Test

International tests for the determination of abrasion resistance have not yet been finalized; accordingly, this standard relies on the test developed by the Porcelain Enamel Institute in America as specified in ASTM C448 —1964.

The introduction of continuous cleaning enamels on the commercial market has necessitated the inclusion of a test method to test their efficacy.

These standard methods may require reference to the following standards:

AS 1580	Methods of Test for Paints, Varnishes, Lacquers and Related Materials (Metric Units)— Method 602.2, Specular Gloss
AS 1914	Glossary of Terms Relating to Vitreous Enamel Coatings
BS 1041	Code for Temperature Measurement

LIST OF METHODS

Number	Title
PART 1—CHEMICAL TESTS	
AS 2219.1.1—1978	Determination of resistance of vitreous enamel coatings to hot sodium hydroxide
AS 2219.1.2—1978	Determination of resistance of vitreous enamel coatings to boiling water and water vapour
AS 2219.1.3—1978	Determination of resistance of vitreous enamel coatings to boiling hydrochloric acid
AS 2219.1.4—1978	Determination of resistance of vitreous enamel coatings to boiling citric acid
AS 2219.1.5—1978	Determination of resistance of vitreous enamel coatings to citric acid at room temperature
PART 2—PHYSICAL TESTS	
AS 2219.2.1—1978	Determination of resistance of vitreous enamel coatings on steel to thermal shock
AS 2219.2.2—1978	Determination of the heat resistance of vitreous enamel coatings on cast iron
AS 2219.2.3—1978	Determination of abrasion resistance of vitreous enamel coatings
PART 3—MISCELLANEOUS TESTS	
AS 2219.3.1—1978	Determination of the performance of continuous cleaning vitreous enamel coatings

## STANDARDS ASSOCIATION OF AUSTRALIA

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PART 2—PHYSICAL TESTS

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AS 2219.2.3  
DETERMINATION OF ABRASION RESISTANCE OF  
VITREOUS ENAMEL COATINGS

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## FOREWORD

When a vitreous enamel coating is first subjected to abrasion of the type involved in these tests, the rate of wear or attrition is relatively low. As the enamel is subjected to continued abrasion, the rate of wear increases until it reaches a steady value. Thereafter, the rate of wear remains almost constant until the enamel is penetrated and the underlying ground coat or metal exposed. For convenience, the abrasion that occurs during the period of increasing rate of loss in mass is defined as surface abrasion; that which occurs during the period of steady rate of loss in mass is defined as subsurface abrasion. Since these two types of abrasion are not necessarily proportional, and since it is desirable to be able to determine the resistance of vitreous enamel to both types of abrasion, it is necessary to deal with each one separately.

## METHOD

**1 SCOPE.** This standard describes procedures for assessing the resistance of vitreous enamel coatings to withstand surface abrasion and subsurface abrasion.

**2 PRINCIPLES.** The principles for the three procedures described are as follows:

- (a) The test for the determination of the resistance to surface abrasion of vitreous enamel coatings for which the 45-degree specular gloss is more than 30 gloss units consists essentially in measuring the specular gloss of test panels before and after a specified abrasive treatment of the surface. The percentage of the original specular gloss retained after treatment is taken as the index of surface abrasion.