Australian Standard®

Methods for the analysis and testing of coal and coke

Part 19: Determination of the abrasion index of higher rank coal

This Australian Standard was prepared by Committee MN/1, Coal and Coke. It was approved on behalf of the Council of Standards Australia on 25 September 1988 and published on 14 April 1989.

The following interests are represented on Committee MN/1:

Australasian Institute of Mining and Metallurgy

Australian Coal Association

Australian Coal Industry Research Laboratories

Australian Institute of Energy

Bureau of Steel Manufacturers of Australia

Coal Preparation Society of N.S.W.

Coal Preparation Society of Queensland

Confederation of Australian Industry

CSIRO, Division of Coal Technology

Department of Minerals and Energy, N.S.W.

Department of Mines, Qld

Department of Primary Industries and Energy

Electricity Supply Association of Australia

Institution of Engineers, Australia

Joint Coal Board

National Association of Testing Authorities, Australia

Queensland Coal Board

Royal Australian Chemical Institute

Standing Committee on Coalfield Geology of New South Wales

University of New South Wales

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which subscribing members receive, and which gives details of new publications, new editions and amendments, and of withdrawn Standards.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 82048.

Australian Standard®

Methods for the analysis and testing of coal and coke

Part 19: Determination of the abrasion index of higher rank coal

First published as AS 1038.19—1989.

PUBLISHED BY STANDARDS AUSTRALIA
(STANDARDS ASSOCIATION OF AUSTRALIA)
1 THE CRESCENT, HOMEBUSH, NSW 2140

ISBN 0 7262 5318 9

PREFACE

This Standard was prepared by the Standards Australia Subcommittee on Coal Evaluation under the supervision of the Committee on Coal and Coke and the direction of the Minerals Standards Board as an additional method in the series of standard methods for the analysis and testing of coal and coke.

CONTENTS

FOREWORD

The abrasiveness of coal is recognized throughout the coal industry. Mine operators experience the effect of wear on drilling, cutting and conveying equipment caused by this abrasiveness. Abrasive wear also occurs in coal handling equipment.

Because of the high contact pressures developed in pulverizers, operators are especially aware of coal's abrasive properties. Coal to metal contact in pulverizers can cause abrasive wear considerably greater than that occurring in other coal handling plant. Also, some coals are more abrasive than others.

As a result of this concern about the abrasiveness of coal, a test procedure suitable for general use in estimating abrasiveness has been developed. This test has been demonstrated to provide an initial estimate of likely wear in high, medium and low speed mills.*

The abrasion index increases with increasing moisture content of the coal. The degree of change with moisture content varies between coal types and even between seams of the same coal type.† The test method described in this Standard is carried out at the air-dry moisture level which —

(a) can vary from location to location and seasonally; and

(b) is not the condition under which coal is generally pulverized.

As a result, a knowledge of the air-dry moisture of the sample is desirable.

This method is based on the one described by Yancey, Geer and Price (YGP).‡

---

* SLIGAR, N.J., NERDDC Report No. 652, *The Abrasiveness of Coal*.

† MANDYCZEWSKY, R. and WEIR, P., *A Study of the Relationship between Mineral Content and Abrasiveness of Collie Coal*, State Energy Commission of W.A.

‡ YANCEY, GEER AND PRICE, US Bureau of Mines and the School of Mineral Engineering, University of Washington: *Trans AIME Min. Eng.*, March 1951, pp. 262-268.

STANDARDS AUSTRALIA

Australian Standard
Methods for the analysis and testing of coal and coke

Part 19: Determination of the abrasion index of higher rank coal

1 SCOPE. This Standard sets out a method for determining the abrasion index of higher rank coal.

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

AS	
1038	Methods for the analysis and testing of coal and coke
1038.1	Part 1: Total moisture in hard coal
1038.16	Part 16: Acceptance and reporting of results
1100	Technical drawing
1100.101	Part 101: General principles
1152	Test sieves
1204	Structural steels—Ordinary weldable grades
1442	Carbon steels and carbon-manganese steels—Hot-rolled bars and semi-finished products
1817	Method for Vickers hardness test
1817.1	Part 1: Testing of metals
1997	Plain limit gauges
2646	Sampling of solid mineral fuels
2646.6	Part 6: Hard coal—Preparation of samples
2706	Numerical values—Rounding and interpretation of limiting values

3 PRINCIPLE. The mass lost by abrasion from four standard steel blades during their rotation under specified conditions in a 2 kg mass of prepared coal in a special test machine is determined. The abrasion index is calculated from the loss in mass.

4 APPARATUS.

4.1 Abrasion test machine — an example of which is depicted in Figures 1 to 3 — has the following components:

(a) *Blades.*

(i) *Reference blades.* A set of four blades having a Vickers hardness of 160 ±15 when tested in accordance with AS 1817.1. When new, the blades, machined from a bar of carbon steel, shall have the shape, dimensions and surface finish shown in Figure 1.

NOTE: Blades meeting these requirements are known to be available from Babcock Power Ltd, Renfrew, Scotland. Some samples of AS 1204 250 grade and AS 1442 S1040 grade steels have been processed to give blades of the required hardness.

To minimize effects of element segregation, blades shall be machined with the bar rolling direction parallel to the line of the bolt holes.

To reduce the extent of varying hardness near the surface, care should be taken during machining to minimize surface distortion and heating of the blades.

The blades shall be marked for identification.

A new set of blades shall be 'run in' by carrying out a number of abrasion index determinations on 2 kg test portions of the same coal until constant results (within the limits of repeatability, see Clause 9.1) are obtained.

When blades are not in use they should be wrapped in a cloth containing a rust-preventive solution and stored in a desiccator. Immediately prior to use, the blades should be cleaned with a suitable solvent, e.g. methylated spirits, and allowed to air dry in a desiccator.

The reference set of blades shall be discarded when either (or both) of the following conditions occurs:

(A) The wear on the leading edge or corners is greater than 3 mm when checked against a new blade.

(B) The blades cannot be correctly adjusted in the jig.

(ii) *Working blades* — a set of four blades complying with the requirements of Item (i). The blades shall be 'run in' as outlined in Item (i). They should be stored under the same conditions as the reference blades. They shall be checked successively against the reference blades when their original mass has decreased by 2 percent, 3 percent and 4 percent, or more frequently if required.

The working set of blades shall be discarded when the results obtained on a sample using the working set differ, after a minimum of three determinations, by more than the limit of repeatability from the value obtained using the reference set.

(b) *Mill mortar.* The mill mortar shall have dimensions as shown in Figure 2. A dust-tight cover is required.

The lower section of the walls may be recessed to accommodate a replaceable liner.

Hardened metal or hard metal plating is recommended for the mill mortar (or liner if fitted).

The mill mortar shall be discarded (or a new liner fitted) when the tolerance shown in Figure 2 is exceeded.