AS 3880:2017

Flow properties of coal

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- Australasian Institute of Mining and Metallurgy
- Australian Coal Industry Reference Samples
- Australian Coal Preparation Society
- Australian Energy Council
- Coalfield Geology Council of NSW
- CSIRO
- Department of Natural Resources and Mines, Qld
- Minerals Council of Australia
- National Association of Testing Authorities Australia
- University of Newcastle
- University of New South Wales
- University of Queensland

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Australian Standard®

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PREFACE

This Standard was prepared by the Standards Australia Committee, MN-001, Coal and Coke, to supersede AS 3880—1991, *Bin flow properties of coal*.

The objective of this Standard is to provide laboratory techniques that allow comparison of handleability of different coals. It also seeks to identify the interface between reliable flow and possible limiting or no flow conditions at various critical locations such as bin outlets or chutes. It outlines a series of three tests to identify the flow material characteristics in instantaneous condition and after time storage, depending on specific design requirements:

(a) Test 1: Measurement of yield locus. This test permits determination of the stress necessary to shear a coal under a given load.

(b) Test 2: Measurement of wall yield locus. This test concerns the determination of the rate of shear of coal interfacing with a wall lining material.

(c) Test 3: Bulk density test. This consists in measuring the compressibility of a coal under various consolidation loads.

Although the emphasis of this Standard is on the determination of flow properties in instantaneous conditions, a method is given for determination of flow properties with time consolidation to simulate conditions during storage. This is of particular importance for those materials whose cohesive strength may change after rest. Further tests can be carried out to determine flow properties at different temperatures and under known vibration conditions using the test equipment described in this Standard. While those tests are mentioned for information purpose, they do not form part of this Standard.

While the laboratory techniques presented in this revision are fundamentally the same as in AS 3880—1991 edition, this revision includes more details on the equipment design and set-up. This aims to allow for all Jenike type shear cells to be similar and the scattering in the results obtained from different labs to be reduced. Another focus of the revision has been to clarify the test procedure. While particular attention has been given to include all details relevant to achieve best repeatability between two similar tests and between labs, it is acknowledged that a certain divergence between results will always remain.

It is recognized that the material presented in this Standard represents a lengthy and complex laboratory procedure that could not yet be successfully simplified despite major research effort. Experience has shown that the level of qualification and experience of the personnel practicing the tests have a significant impact on the quality and meaning of the results. While no certification is required to carry out the test, it is strongly recommended that only suitable, competent and properly trained personnel be engaged for both the tests and material preparation. In fact, due to high dependency between flow properties and moisture content, the reliability of the test results also largely depends on material preparation and handling.

Some coals or other particulate materials may fail to give meaningful results with the Jenike type shear cell. This is because they do not reach the critical consolidation state required for the measurements. It cannot be predicted ahead of the test whether a material can be tested with the Jenike shear cell or not. If not, different tests are required to assess suitable design criteria.

The term ‘informative’ has been used in this Standard to define the application of the appendix to which it applies. An ‘informative’ appendix is only for information and guidance.

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APPENDICES

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SECTION 1 SCOPE AND GENERAL

1.1 SCOPE

This Standard sets out a series of tests to characterize the flow properties of coal as the basis for designing equipment to achieve reliable flow at the desired flowrate. Not all the tests described have to be carried out on a material. The selection of the relevant tests depends on the information sought:

(a) Test 1: Yield locus, covers the measurement of the stress necessary to shear a coal under a given load. From this, the coal flow function can be established which gives indication of the material cohesive strength. This test also gives output of material characteristics such as internal friction angle, which are required for design calculations and computer simulation purpose.

(b) Test 2: Wall yield locus, consists of determining the angle of wall friction that describes the interactions between a coal and a selected wall material.

(c) Test 3: Bulk density, describes the determination of coal bulk density and compressibility. The bulk density is of particular relevance in assessing the flow properties of a bulk material as often, the cohesive strength of a material will depend on its consolidation state reflected by its bulk density.

This Standard is nominally for coal. However, the principles and apparatus may be used for coke and other semi-cohesive particulate materials when a knowledge of flow properties is required.

This Standard also provides some guidance on the presentation of the test results for analysis and design. However, it does not cover the application of the results to industrial design.

NOTE: Appendix A for more information on application of flow properties results.

1.2 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: Coal and coke—Analysis and testing—Higher rank coal—Total moisture
3774	Loads on bulk solids container
3881	Higher rank coal—Size analysis
ISO	
13909	Hard coal and coke—Mechanical sampling (series)