AS 3582.1—1991

Australian Standard®

Supplementary cementitious materials for use with portland cement

Part 1: Fly ash

STANDARDS AUSTRALIA

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Association of Consulting Engineers Australia
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CSIRO, Division of Building, Construction and Engineering
Electricity Commission of New South Wales
Engineering and Water Supply Department, S.A.
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PREFACE

This Standard was prepared by the Standards Australia Committee on Supplementary Cementitious Materials for use with Portland Cement and supersedes both AS 1129—1971, *Fly ash for use in concrete*, and AS 1130—1971, *Code of practice for use of fly ash in concrete*. This Standard has been redesignated AS 3582.1.

The method of testing for fineness is based on a reassessed reference material which increases the value of residue determined. To avoid confusion, fineness is expressed as a percentage passing a 45 μm sieve.

Fineness based on the 150 μm sieve has been discontinued since it is not applicable to the finer ashes. Also, the use of the Blaine surface-area determination is not used in this Standard as it has very limited application to fly ash; the 45 μm sieve test is more appropriate and more convenient.

In this Standard the 45 μm sieve test is based on a reference fly ash which is calibrated against a precision micromesh sieve rather than a variable woven wire sieve. The method of correction is also altered and these changes will result in a larger residue value more in line with values obtained by tests in other countries.

The limits placed on the requirements for the fine grade are very tight (i.e. 75 percent minimum passing the 45 μm sieve and 4 percent loss on ignition). In previous versions of this Standard the proposed 75 percent passing corresponds to about 15 percent retained. The Committee felt that further limits on variability would be unnecessary.

New performance-based tests are introduced for the determination of relative water requirement and relative strength. These tests are based on BS 3892, *Specification for pulverized-fuel ash for use as a cementitious component in structural concrete*, modified for Australian conditions and testing procedures.

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FOREWORD

Since 1971, there have been many changes in the sources and quality of fly ash, and the technology of its use has been further developed. As a result of the expansion of production facilities over the period, it is now possible to select or modify the characteristics of fly ash, and this Standard recognizes this circumstance by providing for three grades of the material, viz. fine, medium and coarse. Gradation is based on fineness and loss of mass on ignition .

Fine and medium grades are used for normal concrete whereas coarse grades are mainly intended for soil stabilization, lean mix concrete or intergrinding with Portland cement clinker to produce blended cements. For many applications the medium grade is appropriate.

Tests performed at the instigation of Standards Australia provided useful predictions of likely performance of a combination of cement and fly ash in concrete. It should be noted that different fly ashes can behave differently with various cements. However, because of the short history of these tests in Australia, insufficient data exists to specify individual limits and, in consequence, no limits have been set. A limit on the magnesia content of fly ash has been introduced with a method of test for fly ash with a high magnesia content. No such fly ashes are produced at present in Australia.

As a result of the growing concern in Australia and overseas regarding alkali/aggregate reaction, fly ash may be more often used to mitigate this problem. For this reason a test for available alkali content, (AS 3583.12), has been introduced with this Standard for use in cases where fly ash is used to reduce the alkali/aggregate reaction. The test has been taken from ASTM C 311, Sampling and Testing Fly Ash or Natural Pozzolans for Use as a Mineral Admixture in Portland Cement Concrete.

The limits on sulfuric anhydride (sulfur trioxide, SO_3) content are unchanged but due to the possibility of a fly ash and a Portland cement, both with a high anhydride content, being blended, and the resulting combined anhydride content being higher than that allowed in AS 1317, a restriction is placed on the sulfuric anhydride content of fly ash.

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1 SCOPE This Standard sets out requirements for fly ash as a component material for use in hydraulic cement/concrete.

NOTE: Alternative methods for determining compliance with this Standard are given in Appendix A.

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

AS
1199 Sampling procedures and tables for inspection by attributes
1289 Methods of testing soil for engineering purposes
1289.A2 Part A—General and sample preparation—Preparation of disturbed soil samples for testing
1399 Guide to AS 1199, Sampling procedures and tables for inspection by attribute
3583 Methods of test for supplementary cementitious materials for use with portland cement
3583.1 Method 1: Determination of fineness by the 45μm sieve
3583.2 Method 2: Determination of moisture content
3583.3 Method 3: Determination of loss on ignition
3583.4 Method 4: Determination of autoclave expansion
3583.5 Method 5: Determination of relative density
3583.6 Method 6: Determination of relative water requirements and relative strength
3583.8 Method 8: Determination of sulfuric anhydride content
3583.9 Method 9: Determination of magnesia content
3583.12 Method 12: Determination of available alkali
3583.13 Method 13: Determination of chloride ion content
3900 Quality systems—Guide to selection and use
3904 Quality systems—Guide to quality management and quality system elements

ISO
Guide 44—1985 General Rules for ISO or IEC International Third Party Certification scheme for Products

3 DEFINITIONS For the purpose of this Standard the definitions below apply.

3.1 Fly ash—solid material extracted from the flue gases of a boiler fired with pulverized coal.

NOTE: The term does not apply to ash extracted from the bottom of a boiler (furnace ash) or economizer grits.

3.2 Fine fly ash—fly ash selected or processed to meet the requirements of 'fine fly ash' as set out in Table 1 of this Standard.

3.3 Medium fly ash—fly ash selected or processed to meet the requirements of 'medium fly ash' as set out in Table 1 of this Standard.

3.4 Coarse fly ash—fly ash selected or processed to meet the requirements of 'coarse fly ash' as set out in Table 1 of this Standard.

4 MARKING The following information shall appear on the container in which the fly ash is supplied or shall accompany bulk supplies of the fly ash:

(a) Name and section of power station.

NOTE: Where a power station is made up of various sections and these sections contain generating units which produce fly ash of significantly differing characteristics, the full identification is required; e.g. 'Vales Point B' or 'Thomas Playford A'.

(b) Grade of ash in accordance with Clause 5.

5 GRADING Fly ash shall be graded fine, medium or coarse in accordance with the requirements of Table 1. Fineness and loss on ignition shall be determined as specified in Table 2.

TABLE 1
GRADE REQUIREMENTS

Grade	Fineness, percent by mass passing 45 μm sieve, minimum	Loss on ignition, percent, maximum
Fine	75.0	4.0
Medium	60.0	6.0
Coarse	40.0	12.0