Disclosure to Promote the Right To Information

Whereas the Parliament of India has set out to provide a practical regime of right to information for citizens to secure access to information under the control of public authorities, in order to promote transparency and accountability in the working of every public authority, and whereas the attached publication of the Bureau of Indian Standards is of particular interest to the public, particularly disadvantaged communities and those engaged in the pursuit of education and knowledge, the attached public safety standard is made available to promote the timely dissemination of this information in an accurate manner to the public.

[CED 2: Cement and Concrete]
Indian Standard

PULVERIZED FUEL ASH — SPECIFICATION
PART 2 FOR USE AS ADMIXTURE IN CEMENT MORTAR AND CONCRETE

(Second Revision)
FOREWORD

This Indian Standard (Part 2) (Second Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Cement and Concrete Sectional Committee had been approved by the Civil Engineering Division Council.

Pulverized fuel ash is a residue resulting from the combustion of ground or powdered or crushed bituminous coal or sub-bituminous coal (lignite). About 80 percent of the total ash is finely divided and get out of boiler along with flue gases and is collected by suitable technologies. This ash generally and in this standard is termed as fly ash. It is sometimes referred as chimney ash and hopper ash. The balance about 20 percent of ash gets collected at the bottom of the boiler and is taken out by suitable technologies and is referred as bottom ash. Fly ash is collected and stored in dry condition. When fly ash alone or along with bottom ash is carried to storage or deposition lagoon or pond in the form of water slurry and deposited, it is termed as pond ash. Whereas if fly ash, alone or along with bottom ash is carried to a storage or deposition site in dry form and deposited, it is termed as mound ash.

Pulverized fuel ash is available in large quantities in the country as a waste product from a number of thermal power stations and industrial plants using pulverized or crushed or ground coal or lignite as fuel for boilers. The effective use of pulverized fuel ash as a pozzolana in the manufacture of and for part replacement of cement, as an admixture in cement, cement mortar and concrete, lime pozzolana mixture and products such as fly ash lime bricks, autoclaved aerated concrete blocks, etc, have been further established in the country in recent years. Recent investigations of Indian pulverized fuel ashes have indicated greater scope for their utilization as a construction material. Greater utilization of pulverized fuel ash will lead to not only saving of scarce construction materials but also assist in solving the problem of disposal of this waste product. The recent investigations have also indicated the necessity to provide proper collection methods for fly ash so as to yield fly ash of quality and uniformity which are prime requirements of fly ash for use as a construction material.

This standard was first published in 1966 in three parts to cater to the requirements of fly ash for three specific uses: Part 1 covering use of fly ash as a pozzolana, Part 2 covering use of fly ash as an admixture for concrete, and Part 3 covering use of fly ash as fine aggregate for mortar and concrete. The Sectional Committee responsible for the formulation of this standard subsequently felt that the performance of fly ash as a pozzolana or an admixture or a fine aggregate, was complementary and not separable and hence requirements of fly ash for these uses should be covered by a single standard. This standard was, therefore, revised in 1981 by combining the three parts into a single standard, also incorporating the modifications found necessary based on the experience gained with the use of earlier standards. This revision classified fly ash in two grades, Grade 1 for incorporation in cement, mortar and concrete and in lime pozzolana mixture, and for manufacture of Portland pozzolana cement, and Grade 2 for incorporation in cement, mortar and concrete and in lime pozzolana mixture.

Improvements have taken place over time in combustion technologies and ash collection technologies. These technological developments have resulted in improvement in ash qualities; specially the fineness and loss of ignition. Technologies have also been developed for a large number of utilizations of wide range of pulverized fuel ash. Application of technologies in the collection, transportation and deposition of ash have also resulted in availability of pulverized fuel ash in four forms, namely, fly ash, bottom ash, pond ash and mound ash. Though the last revision of the standard pertained only to fly ash, number of important applications of fly ash were left uncovered. The Sectional Committee, therefore, felt necessary that a comprehensive specification should be brought out. Separate Indian Standards for fly ash for use in different end applications such as lime pozzolana mixture applications, sintered applications, geotechnical applications and agricultural applications are also being developed.

This revision intends to bring out the standard for pulverized fuel ash in two parts. The other part is:

Part 1 ‘For use as pozzolana in cement, cement mortar and concrete’.

(Continued on third cover)
Indian Standard

PULVERIZED FUEL ASH — SPECIFICATION

PART 2 FOR USE AS ADMIXTURE IN CEMENT MORTAR AND CONCRETE

(Second Revision)

1 SCOPE

1.1 This standard (Part 2) covers the extraction and the physical and chemical requirements of pulverized fuel ash for use as admixture in cement mortar and concrete.

1.2 Pulverized fuel ash to be used as admixture in cement mortar and concrete in accordance with this standard may be fly ash, bottom ash, pond ash or mound ash which may be either in as collected condition or beneficiated, segregated or processed.

2 REFERENCES

The standards given in Annex A contain provisions which through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated in Annex A.

3 TERMINOLOGY

3.0 For the purpose of this standard, the definitions given below shall apply and for other terms definitions given in IS 4305 shall apply.

3.1 Pulverized Fuel Ash — Ash generated by burning of ground or pulverized or crushed coal or lignite fired boilers. It can be fly ash, bottom ash, pond ash or mound ash.

3.2 Siliceous Pulverized Fuel Ash — Pulverized fuel ash with reactive calcium oxide less than 10 percent, by mass. Such fly ash are normally produced from burning anthracite or bituminous coal and has pozzolanic properties.

3.3 Calcareous Pulverized Fuel Ash — Pulverized fuel ash with reactive calcium oxide not less than 10 percent, by mass. Such fly ash are normally produced from lignite or sub-bituminous coal and have both pozzolanic and hydraulic properties.

3.4 Reactive Calcium Oxide (CaO) — That fraction of the calcium oxide which under normal hardening condition can form calcium silicate hydrates or calcium aluminate hydrates.

NOTE — To evaluate this fraction, the total calcium oxide content is to be reduced by the fraction calculated as calcium carbonate (CaCO₃), based on the measured carbon dioxide (CO₂) content and the fraction calculated as calcium sulphate (CaSO₄), based on the measured sulphate (SO₄) content, disregarding the SO₃ taken up by alkalis.

3.5 Fly Ash — Pulverized fuel ash extracted from flue gases by any suitable process such as by cyclone separator or electro-static precipitator.

3.6 Bottom Ash — Pulverized fuel ash collected from the bottom of boilers by any suitable process.

3.7 Pond Ash — Fly ash or bottom ash or both mixed in any proportion and conveyed in the form of water slurry and deposited in pond or lagoon.

3.8 Mound Ash — Fly ash or bottom ash or both mixed in any proportion and conveyed or carried in dry form and deposited dry.

4 EXTRACTION OF PULVERIZED FUEL ASH

4.1 Fly ash may be extracted from flue gases of ground or pulverized or crushed coal or lignite fired boilers by any suitable process; such as by cyclone separation or electrostatic precipitation; bottom ash from the boilers shall not be added to the fly ash. Fly ash collected at later stages of electrostatic precipitator are finer than the fly ash collected at initial stages of electrostatic precipitator.

4.2 Bottom ash may be extracted from the bottom of ground or pulverized or crushed coal or lignite fired boiler by any suitable process. It is generally in the form of clinkers, which are ground or broken to smaller size to facilitate extraction.

4.3 When fly ash and bottom ash are mixed and transported in the form of water slurry to a lagoon or pond for storage, it is called pond ash. Pond ash may be extracted from the pond or lagoon by conventional techniques.

4.4 When fly ash and bottom ash are mixed and transported in dry form to a storage or deposition site, it is called mound ash. Mound ash may be extracted from the mound by conventional excavation techniques.

5 BENEFICIATION, SEGREGATION AND PROCESSING OF PULVERIZED FUEL ASH

5.1 Pulverized fuel ash as collected, if does not conforms to the requirements of this standard or if
required otherwise, may be processed and/or beneficiated and/or segregated to modify its physical or chemical characteristics.

5.2 Appropriate technologies may be applied for beneficiation, segregation and processing of pulverized fuel ash to improve its properties, such as, lime reactivity, loss of ignition, particle size distribution and any of other physical and/or chemical properties. Some of the technologies that may be used are burning/removal of unburned carbon, sieving/grading of fineness, grinding/attrition for reducing particle size, thermal treatment and blending of fly ash of different qualities.

6 CHEMICAL REQUIREMENTS

6.1 Pulverized fuel ash, shall conform to the chemical requirements given in Table 1.

Table 1 Chemical Requirements

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Characteristic</th>
<th>Requirements</th>
<th>Method of Test, Ref to</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Siliceous Pulverized</td>
<td>Calculcareous Pulverized</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fuel Ash</td>
<td>Fuel Ash</td>
</tr>
<tr>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
<td>(4)</td>
</tr>
<tr>
<td>i) Silicon dioxide (SiO₂) plus aluminium oxide (Al₂O₃) plus iron oxide (Fe₂O₃) in percent by mass, Min</td>
<td>70</td>
<td>50</td>
<td>IS 1727</td>
</tr>
<tr>
<td>ii) Silicon dioxide (SiO₂) in percent by mass, Min</td>
<td>35</td>
<td>25</td>
<td>IS 1727</td>
</tr>
<tr>
<td>iii) Magnesium oxide (MgO) in percent by mass, Min</td>
<td>5.0</td>
<td>5.0</td>
<td>IS 1727</td>
</tr>
<tr>
<td>iv) Total sulphur as sulphur trioxide (SO₃) in percent by mass, Max</td>
<td>5.0</td>
<td>5.0</td>
<td>IS 1727</td>
</tr>
<tr>
<td>v) Available alkalies as sodium oxide (Na₂O) in percent by mass, Max</td>
<td>1.5</td>
<td>1.5</td>
<td>IS 4032</td>
</tr>
<tr>
<td>vi) Total chlorides in percent by mass, Max</td>
<td>0.05</td>
<td>0.05</td>
<td>IS 12423</td>
</tr>
<tr>
<td>vii) Loss on ignition in percent by mass, Max</td>
<td>5.0</td>
<td>5.0</td>
<td>IS 1727</td>
</tr>
</tbody>
</table>

6.2 Limits regarding moisture content of pulverized fuel ash shall be as agreed to between the purchaser and the supplier. All tests for the properties specified in 6.1 shall, however, be carried out on oven dry samples.

7 PHYSICAL REQUIREMENTS

7.1 Pulverized fuel ash, when tested in accordance with the methods of test specified in IS 1727, shall conform to the physical requirements given in Table 2.

Table 2 Physical Requirements

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Characteristic</th>
<th>Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>i)</td>
<td>Fineness-specific surface in m²/kg by Blaine’s permeability method, Min</td>
<td>200</td>
</tr>
<tr>
<td>ii)</td>
<td>Particles retained on 45 micron IS sieve (wet sieving) in percent, Max</td>
<td>50</td>
</tr>
<tr>
<td>iii)</td>
<td>Soundness by autoclave test — expansion of specimen in percent, Max</td>
<td>0.8</td>
</tr>
</tbody>
</table>

7.2 Uniformity Requirements

In tests on individual samples, the specific surface and particles retained on 45 micron IS sieve (wet sieving) value shall not vary more than 15 percent from the average established from the tests on the 10 preceding samples or of all preceding samples if less than 10.

8 TESTS

8.1 The sample or samples of pulverized fuel ash for test shall be taken as described and shall be tested in accordance with 6 and 7.

8.2 All tests for the properties of the pulverized fuel ash shall be carried out as it is supplied. In case the pulverized fuel ash supplied is to be beneficiated or segregated or processed, the tests shall be carried out only after beneficiation, segregation or processing as applicable.

8.3 Independent Testing

8.3.1 If the purchaser or his representative requires independent test, the samples shall be taken before or immediately after delivery at the option of the purchaser or his representative, and the tests shall be carried out/arranged by the purchaser in accordance with this standard. The supplier shall make available, free of charge, the pulverized fuel ash required for testing.

8.3.2 After a representative sample has been drawn, tests on the sample shall be carried out as expeditiously as possible.
9 SAMPLING

9.1 Samples for Testing and by Whom to be Taken
A sample or samples for testing may be taken by the purchaser or his representative, or by any person appointed to superintend the work for purpose of which the pulverized fuel ash is required or by the latter's representative.

9.2 In addition to the requirements of 9.1, the methods and procedure of sampling shall be in accordance with IS 6491.

9.3 Facilities for Sampling and Identifying
The supplier shall afford every facility, and shall provide all labour and materials for taking and packing the samples for testing the pulverized fuel ash and for subsequent identification of pulverized fuel ash sampled.

10 STORAGE
Pulverized fuel ash may be stored in accordance with the recommendation given in IS 4082. Additionally, during bulk storage, the fly ash should be suitably covered to avoid getting airborne.

11 DELIVERY
11.1 Supplies of pulverized fuel ash may be made in bulk in suitable quantities mutually agreed upon between the purchaser and the supplier. Where so required by the purchaser, the pulverized fuel ash may also be supplied in bags (jute, jute-laminated, multiple paper or polyethylene lined) bearing the net mass (may be 15 kg, 30 kg, 300 kg, 600 kg as agreed to between the purchaser and the supplier), supplier’s name or registered trade-mark, if any. The tolerance on the mass of pulverized fuel ash in each bag or consignment shall be as mutually agreed upon between the purchaser and the supplier.

11.2 Tolerance Requirements for the Mass of Pulverized Fuel Ash Packed in Bags
11.2.1 The average net mass of pulverized fuel ash packed in bags at the plant in a sample shall be equal to or more than 15 kg, 30 kg, 300 kg, 600 kg as applicable. The number of bags in a sample shall be as given below:

<table>
<thead>
<tr>
<th>Batch Size</th>
<th>Sample Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 to 150</td>
<td>20</td>
</tr>
<tr>
<td>151 to 280</td>
<td>32</td>
</tr>
<tr>
<td>281 to 500</td>
<td>50</td>
</tr>
<tr>
<td>501 to 1 200</td>
<td>80</td>
</tr>
<tr>
<td>1 201 to 3 200</td>
<td>125</td>
</tr>
<tr>
<td>3 201 and over</td>
<td>200</td>
</tr>
</tbody>
</table>

The bags in a sample shall be selected at random (see IS 4905).

11.2.2 The number of bags in a sample showing a minus error greater than 2 percent of the specified net mass shall be not more than 5 percent of the bags in the sample. Also the minus error in none of such bags in the sample shall exceed 4 percent of the specified net mass of pulverized fuel ash in the bag.

NOTE — The matter given in 11.2.1 and 11.2.2 are extracts based on the Standards of Weights and Measures (Packaged Commodities) Rules, 1977 to which reference shall be made for full details. Any modification made in these Rules and other related Acts and Rules would apply automatically.

11.2.3 In case of a wagon or truck load of 5 to 25 tonne, the overall tolerance on net mass of pulverized fuel ash shall be 0 to + 0.5 percent.

11.4 The consignment may also be marked with the Standard Mark.

12 MANUFACTURER’S CERTIFICATE
The manufacturer shall satisfy himself that the pulverized fuel ash conform to the requirements of this standard, and if requested, shall supply a certificate to this effect to the purchaser or his representative.

13 MARKING
13.1 Each bag/consignment of pulverized fuel ash shall be clearly and permanently marked with the following information:

a) Identification of the manufacturer of pulverized fuel ash;
b) Type of pulverized fuel ash that is siliceous or calcareous as applicable;
c) Form of pulverized fuel ash that is, fly ash, bottom ash, pond ash or mound ash as applicable;
d) Batch/Control unit number;
e) Net mass;
f) Month and year of packing; and
g) Any other identification mark as required by the purchaser.

13.2 BIS Certification Marking
The pulverized fuel ash may also be marked with the Standard Mark.

13.2.1 The use of the Standard Mark is governed by the provisions of the Bureau of Indian Standards Act, 1986 and the Rules and Regulations made thereunder. The details of conditions under which a licence for the use of the Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.
14 REJECTION

14.1 Pulverized fuel ash may be rejected if it does not comply with any of the requirements of this standard.

14.2 Pulverized fuel ash in bulk storage for more than 6 months or in bags for more than 3 months after completion of tests, may be re-tested before use and may be rejected, if it fails to conform to any requirements of this standard.

ANNEX A

(Clause 2)

LIST OF REFERRED INDIAN STANDARDS

<table>
<thead>
<tr>
<th>IS No.</th>
<th>Title</th>
<th>IS No.</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>1727:1967</td>
<td>Methods of test for pozzolanic material (first revision)</td>
<td>4305:1967</td>
<td>Glossary of terms relating to pozzolana (revision)</td>
</tr>
<tr>
<td>4032:1985</td>
<td>Method of chemical analysis of hydraulic cement (first revision)</td>
<td>4905:1968</td>
<td>Methods for random sampling</td>
</tr>
<tr>
<td></td>
<td>and components at site (second revision)</td>
<td>12423:1988</td>
<td>Methods for colorimetric analysis of hydraulic cement</td>
</tr>
</tbody>
</table>
ANNEX B

(Foreword)

COMMITTEE COMPOSITION

Cement and Concrete Sectional Committee, CED 2

Organization

In personal capacity ('Chandrika', at 15th Cross 63-64 East Park Road, Malleswaram, Bangalore-560 003)

B. G. Shirke Construction Technology Limited, Pune

Builders Association of India, Mumbai

Building Materials and Technology Promotion Council, New Delhi

Cement Corporation of India Limited, New Delhi

Central Board of Irrigation and Power, New Delhi

Central Building Research Institute, Roorkee

Central Public Works Department, New Delhi

Central Road Research Institute, New Delhi

Central Soil and Materials Research Station, New Delhi

Central Water Commission, New Delhi

Directorate General of Supplies and Disposals, Bangalore

Engineer-in-Chief's Branch, Army Headquarters, New Delhi

Fly Ash Mission, Department of Science and Technology, New Delhi

Gammon India Limited, Mumbai

Geological Survey of India, Jaipur

Grasim Industries Limited, Mumbai

Gujarat Ambuja Cements Limited, Ahmedabad

Hospital Services Consultancy Corporation (India) Ltd, Noida

Housing and Urban Development Corporation Limited, New Delhi

Indian Concrete Institute, Mumbai

Indian Institute of Science, Bangalore

Indian Institute of Technology, Roorkee

Indian Institute of Technology, Kharagpur

Indian Roads Congress, New Delhi

Institute for Solid Waste Research and Ecological Balance, Vishakhapatnam

Larsen and Toubro Limited, Mumbai

Representative(s)

Dr H. C. Vivesvaraya (Chairman)

Shri G. R. Bhakta

Shri T. N. Gupta

Shri J. K. Prasad (Alternate)

Shri Mahesh Kumar

Shri I. K. Wittal (Alternate)

Shri I. K. Prasad

Dr C. L. Verma

Dr B. K. Rao (Alternate)

Shri Mahendra Prasad

Shri P. L. Kashyap (Alternate)

Shri B. L. Kashyap (Alternate)

Shri P. L. Kashyap

Dr A. K. Jain

Col. Sodhier Tamhaneey (Rtd) (Alternate)

Shri J. P. Desai

Dr A. K. Jagtia (Alternate)

Shri P. K. Japuaj (Alternate)

Shri V. Suresh

Shri V. A. A. K. A. (Alternate)

Shri L. N. Apte

Shri D. Srivastav (Alternate)

Prof. T. S. Nagaraj

Prof. A. K. Jain

Dr Ashok Kumar Ghosh

Dr S. S. Sisira

Shri A. K. A. (Alternate)

Dr N. B. A. A. (Alternate)

Shri C. R. V. Srinivasan

Shri N. Kalidas (Alternate)

Shri C. R. V. Subramaniam

(Continued on page 6)
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All India Mini Cement Manufacturer's Association, Hyderabad

Building Materials and Technology Promotion Council, New Delhi

Cement Corporation of India Ltd, New Delhi

Cement Manufacturers' Association, Kolkata

Central Building Research Institute, Roorkee

Central Electricity Authority, New Delhi

Central Public Works Department, New Delhi

In personal capacity, (F-12, Naraina Vihar, New Delhi)

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Member Secretaries

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Joint Director (CED), BIS

SHRI ALOK KESARI
Deputy Director (CED), BIS

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DR N. BHANUMATHIDAS

SHRI C. C. BHATTACHARYA

SHRI I. K. PANDEY (Alternate)

DR S. C. MALLI

DR S. LAXMI (Alternate)

SHRI D. K. KANNGO

SHRI B. B. MEENA (Alternate)

DR S. C. ASHLEWALLI

Superintending Engineer (Design)

Executive Engineer (Alternate)

Joint Director (Std) (B & S)/CB-II

Joint Director (Std) (B & S)/CB-I (Alternate)

Chief Engineer (Navgam Dam)

Superintending Engineer (Alternate)

SHRI S. GOPALAKRISHNAN

SHRI N. P. RAJAMANE (Alternate)

SHRI T. N. TIWARI

DR D. GHOSH (Alternate)

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SHRI P. D. KELKAR (Alternate)

DR H. C. VISVESVARAYA

SHRI D. C. CHATURVEDI (Alternate)

SHRI Y. R. TANIA

SHRI S. K. JAIN, Director and Head (CED)

[Representing Director General (Ex-officio)]
Organization

Central Road Research Institute, New Delhi
Central Soil and Materials Research Station, New Delhi
Central Water Commission, New Delhi
Dalmia Cement (Bharat) Limited, New Delhi
Engineer-in-Chief's Branch, Chandigarh
Fly Ash Mission, Department of Science and Technology, New Delhi
Gammon India Limited, Mumbai
Grasim Industries Limited, Mumbai
Gujarat Ambuja Cements Ltd, Ahmedabad
Gujarat Engineering Research Institute, Vadodara
Indian Concrete Institute, Chennai
Indian Institute of Science, Bangalore
Indian Institute of Technology, Kharagpur
Irnadra Cement Limited, Mumbai
Larsen and Toubro Limited, Mumbai
Madras Cements Ltd, Chennai
Maharashtra Engineering Research Institute, Nasik
Ministry of Commerce and Industry, New Delhi
Ministry of Road Transport and Highways, New Delhi
National Council of Cement and Building Materials, Ballabgarh
National Test House (WR), Mumbai
Orissa Cement Limited, New Delhi
Public Works Department, Chennai
Research, Design and Standards Organization, Lucknow
Tamil Nadu Minerals Limited, Chennai
The Associated Cement Company Ltd, Mumbai
The Hindustan Construction Company Limited, Mumbai

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SHRI N. CHANDRASEKARAN (Alternate)
DIRECTOR (CMDD-II)
DEPUTY DIRECTOR (CMDD-II) (Alternate)
DR K. C. NARANG
SHRI C. S. SHARMA (Alternate)
SHRI HIRA LAL
LT-COL DEVENDRA KUMAR (Alternate)
DR VIMAL KUMAR
SHRI MUKESH MATHUR (Alternate)
SHRI S. A. REDDI
SHRI A. K. JAIN
COL SUDHIR TANAKANEY (RETD) (Alternate)
SHRI J. P. DESAI
SHRI B. K. JAGETIA (Alternate)
DIRECTOR
SHRI J. K. PATEL (Alternate)
DR C. S. VISWANATHA
PROF. M. S. SHETTY (Alternate)
PROF. T. S. NAGARAJ
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SHRI K. K. TAPARIA
SHRI A. K. PRASHAR (Alternate)
SHRI S. CHOWDHURY
DR N. BHANUMATHIDAS
DIRECTOR
RESEARCH OFFICER (Alternate)
SHRI P. K. JAIN
SHRI SHAHID KUMAR (Alternate)
SHRI V. VEILAYUTHAM
SHRI I. K. PANDIT (Alternate)
DR K. MOHAN
DR SHIRMAI S. LAXMI (Alternate)
SHRI B. R. MEEENA
SHRI B. K. MANDAL (Alternate)
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DEPUTY DIRECTOR (B & F)
ASSISTANT DESIGN ENGINEER (B & F) (Alternate)
SHRI K. SUMANITH BABU
SHRI T. N. TIWARI
DR D. GHOUSH (Alternate)
SHRI A. P. PHADKE
SHRI D. M. SAYUR (Alternate)
This standard (Part 2) covers the extraction and the physical and chemical requirements of pulverized fuel ash for use as admixture in cement mortar and concrete. The use of pulverized fuel ash as pozzolana is not covered under this standard and the same is covered in IS 3812 (Part 1).

The significant modifications in this revision includes:

a) Instead of earlier designation of fly ash as Grade I and Grade II, this part will cover pulverized fuel ash for use as admixture in cement mortar and concrete.

b) Four forms of pulverized fuel ash, namely fly ash, bottom ash, pond ash and mound ash have been defined.

c) A new clause on beneficiation, segregation and processing of pulverized fuel ash has been added.

d) The chemical requirements has now been prescribed on the basis of siliceous and calcareous pulverized fuel ash.

e) Requirements for total chlorides has been added.

f) Additional requirement of particle retained on 45 micron IS Sieve (wet sieving) has been added under physical requirements as in optional test.

g) Requirement for drying shrinkage has been deleted.

h) Requirement for lime reactivity and compressive strength have been deleted.

j) A clause on uniformity requirement has also been added.

Considerable assistance has been rendered by Fly Ash Mission, Department of Science and Technology, Government of India in preparation of this standard.

The composition of the Committee responsible for the formulation of this standard is given in Annex B.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2:1960 ‘Rules for rounding off numerical values (revised)’. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.
Bureau of Indian Standards

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Review of Indian Standards

Amendments are issued to standards as the need arises on the basis of comments. Standards are also reviewed periodically; a standard along with amendments is reaffirmed when such review indicates that no changes are needed; if the review indicates that changes are needed, it is taken up for revision. Users of Indian Standards should ascertain that they are in possession of the latest amendments or edition by referring to the latest issue of ‘BIS Catalogue’ and ‘Standards: Monthly Additions’.

This Indian Standard has been developed from Doc : No. CED 2 (7167).

### Amendments Issued Since Publication

<table>
<thead>
<tr>
<th>Amend No.</th>
<th>Date of Issue</th>
<th>Text Affected</th>
</tr>
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