

# इंटरनेट

# मानक

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“The Right to Information, The Right to Live”

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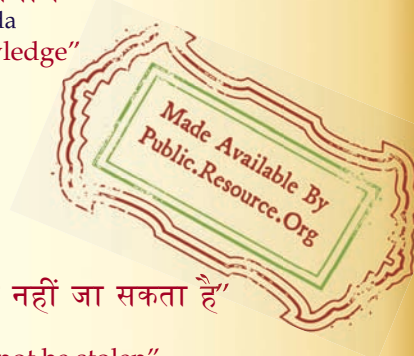
IS 3812-2 (2003): Specification for Pulverized Fuel Ash,  
Part 2: For Use as Admixture in Cement Mortar and Concrete  
[CED 2: Cement and Concrete]



“ज्ञान से एक नये भारत का निर्माण”

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“ज्ञान एक ऐसा खजाना है जो कभी चुराया नहीं जा सकता है”

Bhartrhari—Nitiśatakam

“Knowledge is such a treasure which cannot be stolen”



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भारतीय मानक

चूर्ण ईंधन की राख — विशिष्टि

भाग 2 मसाला (मोर्टार) व कंक्रीट में अपमिश्रण की तरह प्रयोग के लिए  
( दूसरा पुनरीक्षण )

*Indian Standard*

**PULVERIZED FUEL ASH — SPECIFICATION**

**PART 2 FOR USE AS ADMIXTURE IN CEMENT MORTAR AND CONCRETE**

*( Second Revision )*

ICS 91.100.10

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**BUREAU OF INDIAN STANDARDS**  
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG  
NEW DELHI 110002

## 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 alongwith 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 alongwith 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 contents is to be reduced by the fraction calculated as calcium

carbonate ( $\text{CaCO}_3$ ), based on the measured carbon dioxide ( $\text{CO}_2$ ) content and the fraction calculated as calcium sulphate ( $\text{CaSO}_4$ ), based on the measured sulphate ( $\text{SO}_3$ ) content, disregarding the  $\text{SO}_3$  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  
(Clause 6.1)

Sl No.	Characteristic	Requirements		Method of Test, Ref to
		Siliceous Pulverized Fuel Ash	Calcareous Pulverized Fuel Ash	
(1)	(2)	(3)	(4)	(5)
i)	Silicon dioxide (SiO <sub>2</sub> ) plus aluminium oxide (Al <sub>2</sub> O <sub>3</sub> ) plus iron oxide (Fe <sub>2</sub> O <sub>3</sub> ) in percent by mass, <i>Min</i>	70	50	IS 1727
ii)	Silicon dioxide (SiO <sub>2</sub> ) in percent by mass, <i>Min</i>	35	25	IS 1727
iii)	Magnesium oxide (MgO) in percent by mass, <i>Max</i>	5.0	5.0	IS 1727
iv)	Total sulphur as sulphur trioxide (SO <sub>3</sub> ) in percent by mass, <i>Max</i>	5.0	5.0	IS 1727
v)	Available alkalis as sodium oxide (Na <sub>2</sub> O) in percent by mass, <i>Max</i>	1.5	1.5	IS 4032
vi)	Total chlorides in percent by mass, <i>Max</i>	0.05	0.05	IS 12423 <sup>1)</sup>
vii)	Loss on ignition in percent by mass, <i>Max</i>	5.0	5.0	IS 1727

<sup>1)</sup> For the purpose of this test, wherever reference to cement has been made, it may be read as pulverized fuel ash.

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  
(Clause 7.1)

Sl No.	Characteristic	Requirements
i)	Fineness-specific surface in m <sup>2</sup> /kg by Blaine's permeability method, <i>Min</i>	200
ii)	<sup>1)</sup> Particles retained on 45 micron IS sieve (wet sieving) in percent, <i>Max</i>	50
iii)	Soundness by autoclave test — expansion of specimen in percent, <i>Max</i>	0.8

<sup>1)</sup> Optional test.

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 9 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:

Batch Size	Sample Size
100 to 150	20
151 to 280	32
281 to 500	50
501 to 1 200	80
1 201 to 3 200	125
3 201 and over	200

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:

- Identification of the manufacturer of pulverized fuel ash;
- Type of pulverized fuel ash that is siliceous or calcareous as applicable;
- Form of pulverized fuel ash that is, fly ash, bottom ash, pond ash or mound ash as applicable;
- Batch/Control unit number;
- Net mass;
- Month and year of packing; and
- 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

<i>IS No.</i>	<i>Title</i>	<i>IS No.</i>	<i>Title</i>
1727 : 1967	Methods of test for pozzolanic material ( <i>first revision</i> )	4305 : 1967	<i>revision</i> ) Glossary of terms relating to pozzolana
4032 : 1985	Method of chemical analysis of hydraulic cement ( <i>first revision</i> )	4905 : 1968	Methods for random sampling
4082 : 1996	Recommendations for stacking and storage of construction materials and components at site ( <i>second</i>	6491 : 1972	Methods for sampling fly ash
		12423 : 1988	Methods for colorimetric analysis of hydraulic cement

## ANNEX B

## (Foreword)

## COMMITTEE COMPOSITION

## Cement and Concrete Sectional Committee, CED 2

<i>Organization</i>	<i>Representative(s)</i>
In personal capacity ('Chandrika', at 15th Cross 63-64 East Park Road, Malleswaram, Bangalore-560 003)	DR H. C. VISVESVARAYA ( <i>Chairman</i> )
B. G. Shirke Construction Technology Limited, Pune	SHRI G. R. BHARITKAR
Builders Association of India, Mumbai	SECRETARY
Building Materials and Technology Promotion Council, New Delhi	SHRI T. N. GUPTA
	SHRI J. K. PRASAD ( <i>Alternate</i> )
Cement Corporation of India Limited, New Delhi	SHRI MAHESH KUMAR
	SHRI I. K. WATTAL ( <i>Alternate</i> )
Central Board of Irrigation and Power, New Delhi	MEMBER SECRETARY
	DIRECTOR (CIVIL) ( <i>Alternate</i> )
Central Building Research Institute, Roorkee	DR C. L. VERMA
	DR B. K. RAO ( <i>Alternate</i> )
Central Public Works Department, New Delhi	CHIEF ENGINEER (DESIGN)
	SUPERINTENDING ENGINEER (S & S) ( <i>Alternate</i> )
Central Road Research Institute, New Delhi	HEAD
	DIRECTOR ( <i>Alternate</i> )
Central Soil and Materials Research Station, New Delhi	DIRECTOR
	SHRI P. L. KASHYAP ( <i>Alternate</i> )
Central Water Commission, New Delhi	DIRECTOR (CMDD) (N & W)
	DEPUTY DIRECTOR (CMDD) (NW & S) ( <i>Alternate</i> )
Directorate General of Supplies and Disposals, Bangalore	SHRI V. BALSUBRAMANIAN
	SHRI R. P. SINGH ( <i>Alternate</i> )
Engineer-in-Chief's Branch, Army Headquarters, New Delhi	MAJ-GEN YASH MALHOTRA
	SHRI MAHENDRA PRASAD ( <i>Alternate</i> )
Fly Ash Mission, Department of Science and Technology, New Delhi	DR VIMAL KUMAR
	SHRI MUKESH MATHUR ( <i>Alternate</i> )
Gammon India Limited, Mumbai	SHRI S. A. REDDI
	SHRI M. U. SHAH ( <i>Alternate</i> )
Geological Survey of India, Jaipur	DR S. S. AMETA
	DR D. K. RAI ( <i>Alternate</i> )
Grasim Industries Limited, Mumbai	SHRI A. K. JAIN
	COL SUDHIR TAMHANEY (RETD) ( <i>Alternate</i> )
Gujarat Ambuja Cements Limited, Ahmedabad	SHRI J. P. DESAI
	SHRI B. K. JAGETIA ( <i>Alternate</i> )
Hospital Services Consultancy Corporation (India) Ltd, Noida	SHRI J. SARUP
	SHRI P. K. JAIPURIAR ( <i>Alternate</i> )
Housing and Urban Development Corporation Limited, New Delhi	SHRI V. SURESH
	SHRI V. ARUL KUMAR ( <i>Alternate</i> )
Indian Concrete Institute, Mumbai	SHRI L. N. APTE
	SHRI D. SRINIVASAN ( <i>Alternate</i> )
Indian Institute of Science, Bangalore	PROF T. S. NAGARAJ
Indian Institute of Technology, Roorkee	PROF A. K. JAIN
Indian Institute of Technology, Kharagpur	DR ASHOK KUMAR GHOSH
Indian Roads Congress, New Delhi	DR S. S. SEHRA
	SHRI ARUL KUMAR SHARMA ( <i>Alternate</i> )
Institute for Solid Waste Research and Ecological Balance, Vishakhapatnam	DR N. BHANUMATHIDAS
	SHRI N. KALIDAS ( <i>Alternate</i> )
Larsen and Toubro Limited, Mumbai	SHRI C. R. V. SUBRAMANIAM

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Organization	Representative(s)
Madras Cements Ltd, Chennai	SHRI S. CHOWDHURY ( <i>Alternate</i> )
Ministry of Road Transport and Highways, New Delhi	DR N. BHANUMATHIDAS
National Council for Cement and Building Materials, Ballabgarh	SHRI C. C. BHATTACHARYA
National Test House, Kolkata	SHRI I. K. PANDEY ( <i>Alternate</i> )
OCL India Limited, New Delhi	DR S. C. MAITI
Public Works Department, Chennai	DR S. LAXMI ( <i>Alternate</i> )
Research, Design and Standards Organization, Lucknow	SHRI D. K. KANUNGO
Sardar Sarovar Narmada Nigam Limited, District Narmada	SHRI B. R. MEENA ( <i>Alternate</i> )
Structural Engineering Research Centre, Chennai	DR S. C. AHLUWALIA
The Associated Cement Companies Limited, Mumbai	SUPERINTENDING ENGINEER (DESIGN)
The India Cements Limited, Chennai	EXECUTIVE ENGINEER ( <i>Alternate</i> )
The Indian Hume Pipe Company Limited, Mumbai	JOINT DIRECTOR (STD) (B & S)/CB-II
The Institution of Engineers (India), Bangalore	JOINT DIRECTOR (STD) (B & S)/CB-I ( <i>Alternate</i> )
In personal capacity, (F-12, Naraina Vihar, New Delhi)	CHIEF ENGINEER (NAVIGAM DAM)
BIS Directorate General	SUPERINTENDING ENGINEER ( <i>Alternate</i> )
	SHRI S. GOPALAKRISHNAN
	SHRI N. P. RAJAMANE ( <i>Alternate</i> )
	SHRI T. N. TIWARI
	DR D. GHOSH ( <i>Alternate</i> )
	SHRI S. GOPINATH
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	SHRI P. R. C. NAIR
	SHRI P. D. KELKAR ( <i>Alternate</i> )
	DR H. C. VISVESVARAYA
	SHRI D. C. CHATURVEDI ( <i>Alternate</i> )
	SHRI Y. R. TANEJA
	SHRI S. K. JAIN, Director and Head (CED)
	[Representing Director General ( <i>Ex-officio</i> )]
<i>Member Secretaries</i>	
	SHRI SANJAY PANT
	Joint Director (CED), BIS
	SHRI ALOK KESARI
	Deputy Director (CED), BIS

### Cement, Pozzolana and Cement Additives Subcommittee, CED 2 : 1

In personal capacity, ('Chandrika', at 15th Cross 63-64 East Park Road, Malleswaram, Bangalore-560 003)	DR H. C. VISVESVARAYA ( <i>Convener</i> )
All India Mini Cement Manufacturer's Association, Hyderabad	SHRI K. GOPI PRASAD
Building Materials and Technology Promotion Council, New Delhi	SHRI K. MOHAN RAO ( <i>Alternate</i> )
Cement Corporation of India Ltd, New Delhi	SHRI J. K. PRASAD
Cement Manufacturers' Association, Kolkata	SHRI I. K. WATTAL
Central Building Research Institute, Roorkee	SHRIMATI SARASWATHI DEVI ( <i>Alternate</i> )
Central Electricity Authority, New Delhi	SHRI SOMNATH BANERJEE
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	DR MANJIT SINGH ( <i>Alternate</i> )
	SHRI Y. K. SHARMA
	SHRI MOHAN KUMAR ( <i>Alternate</i> )
	CHIEF ENGINEER (CDO)
	SUPERINTENDING ENGINEER (S & S) ( <i>Alternate</i> )

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<i>Organization</i>	<i>Representative(s)</i>
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Central Soil and Materials Research Station, New Delhi	DIRECTOR SHRI N. CHANDRASEKARAN ( <i>Alternate</i> )
Central Water Commission, New Delhi	DIRECTOR (CMDD-II) DEPUTY DIRECTOR (CMDD-II) ( <i>Alternate</i> )
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Engineer-in-Chief's Branch, Chandigarh	SHRI HIRA LAL LT-COL DEVENDRA KUMAR ( <i>Alternate</i> )
Fly Ash Mission, Department of Science and Technology, New Delhi	DR VIMAL KUMAR SHRI MUKESH MATHUR ( <i>Alternate</i> )
Gammon India Limited, Mumbai	SHRI S. A. REDDI
Grasim Industries Limited, Mumbai	SHRI A. K. JAIN COL SUDHIR TAMHANEY (RETD) ( <i>Alternate</i> )
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Gujarat Engineering Research Institute, Vadodara	DIRECTOR SHRI J. K. PATEL ( <i>Alternate</i> )
Indian Concrete Institute, Chennai	DR C. S. VISWANATHA PROF M. S. SHETTY ( <i>Alternate</i> )
Indian Institute of Science, Bangalore	PROF T. S. NAGARAJ
Indian Institute of Technology, Kharagpur	DR ASHOK KUMAR GHOSH
Indorama Cement Limited, Mumbai	SHRI K. K. TAPARIA SHRI A. K. PRASHAR ( <i>Alternate</i> )
Larsen and Toubro Limited, Mumbai	SHRI S. CHOWDHURY
Madras Cements Ltd, Chennai	DR N. BHANUMATHIDAS
Maharashtra Engineering Research Institute, Nasik	DIRECTOR RESEARCH OFFICER ( <i>Alternate</i> )
Ministry of Commerce and Industry, New Delhi	SHRI P. K. JAIN SHRI SHAISH KUMAR ( <i>Alternate</i> )
Ministry of Road Transport and Highways, New Delhi	SHRI V. VELAYUTHAM SHRI I. K. PANDEY ( <i>Alternate</i> )
National Council of Cement and Building Materials, Ballabgarh	DR K. MOHAN DR SHRIMATI S. LAXMI ( <i>Alternate</i> )
National Test House (WR), Mumbai	SHRI B. R. MEENA SHRI B. K. MANDAL ( <i>Alternate</i> )
Orissa Cement Limited, New Delhi	DR S. C. AHLUWALIA
Public Works Department, Chennai	SUPERINTENDING ENGINEER (DESIGN) SENIOR DEPUTY CHIEF ENGINEER ( <i>Alternate</i> )
Research, Design and Standards Organization, Lucknow	DEPUTY DIRECTOR (B & F) ASSISTANT DESIGN ENGINEER (B & F) ( <i>Alternate</i> )
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The Associated Cement Company Ltd, Mumbai	SHRI T. N. TIWARI DR D. GHOSH ( <i>Alternate</i> )
The Hindustan Construction Company Limited, Mumbai	SHRI A. P. PHADKE SHRI D. M. SAVUR ( <i>Alternate</i> )

(Continued from second cover)

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.

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Amendments Issued Since Publication

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