PRODUCT MANUAL FOR PULVERIZED FUEL ASH – FOR USE AS POZZOLANA IN CEMENT, CEMENT MORTAR AND CONCRETE ACCORDING TO IS 3812 (Part 1): 2013

This Product Manual shall be used as reference material by all Regional/Branch Offices & licensees to ensure coherence of practice and transparency in operation of certification under Scheme-I of Bureau of Indian Standards (Conformity Assessment) Regulations, 2018 for various products. The document may also be used by prospective applicants desirous of obtaining BIS certification licence/certificate.

1.	**Product**	:	IS 3812 (Part 1): 2013
	Title	:	Pulverized Fuel Ash – For use as Pozzolana in Cement, Cement Mortar and Concrete
	No. of Amendments	:	Nil
2.	**Sampling Guidelines:**		
a)	**Raw material**	:	NA
b)	**Grouping guidelines**	:	Each Type of Fly Ash (Calcareous/ Siliceous) shall be tested for all requirements to cover that particular variety in the Scope of Licence.
c)	**Sample Size**	**:**	Fly ash - 5 kg
3.	**List of Test Equipment**	:	Please refer ANNEX – A
4.	**Scheme of Inspection and Testing**	:	Please refer ANNEX – B
5.	**Possible tests in a day :**		
	(i) All possible chemical tests except reactive silica and available alkalis (Clause 6) (ii) Fineness (Clause 7.1) (iii) Particle retained on 45 microns IS sieve (Clause 7.1)		
6.	**Scope of the Licence:**		
	"Licence is granted to use Standard Mark as per IS 3812 (Part 1): 2013 with the following scope:		
	Name of the product		Pulverized Fuel Ash for use as Pozzolana in Cement, Cement Mortar and Concrete
	Type		Calcareous Fly Ash / Siliceous Fly Ash

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ANNEX A

List of Test Equipment

Major test equipment required to test as per the Indian Standard

Sl. No.	Tests used in with Clause Reference	Test Equipment
1	Chemical requirements (Clause 5.1 and 6.1)	**General requirements** - Hot air oven - Weighing balance - Distilled water - Platinum crucible - Muffle furnace
		Chemical requirements – As per IS 1727, IS 4032 - Hydrochloric acid - Sulphuric acid - Hydrofluoric acid - Nitric acid - Phosphoric acid - Ammonium hydroxide - Stannous chloride - Mercuric chloride - Manganese sulphate - Potassium permanganate - Ammonium nitrate - Ammonium oxalate - Ammonium hydrogen phosphate - Barium chloride - Sodium carbonate - Sodium chloride - Ammonia solution - Ammoniacal ammonium nitrate solution - Sodium/ potassium pyrosulphate - 150mm micron IS sieve - Air-tight bottle - Rubber tipped rod - Filter paper – medium, ash less filter paper - Clock glass - Water bath - Hot plate with fume hood - Sodium/ potassium persulphate
		Reactive Silica: - Sodium peroxide - Sodium hydroxide - Sodium carbonate

		- Sodium chloride - Hydrochloric acid - Sulphuric acid - Hydrofluoric acid - Sodium hydroxide - Polyethylene oxide - Boric acid - Potassium hydroxide - Citric acid - Ammonium Molybdate - 1-amino-2-hydroxy-naphthalene-4 sulphonic acid - Sodium sulphite - Sodium meta-bisulphite - Amino-acetic acid - Platinum crucible - Spatula - Brush - Muffle furnace/ electric furnace - Beakers – 400ml, 250ml - Watch glass - Hot plate - Fume hood - Ashless filter paper - Medium filter paper - 500ml volumetric flasks - Polyethylene beaker - Magnetic stirrer - Pipette – 20ml, 5ml, 2ml - pH meter - Flame photometer - Porcelain dish - Glass stirring rod
		Available Alkalis: - Metal spatula - Vial of 25ml capacity - 250 ml casserole - Pestle - Medium textured filter paper - 500 ml Volumetric flask - Hydrated lime - Hydrochloric Acid - Phenolphthalein indicator - Flame photometer - Calcium chloride
		Loss on Ignition: - Platinum crucible - Muffle furnace, Desiccator

2.	Moisture Content (Clause 6.2)	- Petridish – 100mm diameter - Hot air oven - Weighing balance - Desiccator
3.	Fineness (Clause 5.1 and 7.1)	- Blaine's apparatus variable flow type - Stop watch with start-stop mechanism - Mercury for calibration - Balance, - Standard weights - Standard Cement - Manometer liquid (di-butyl phthalate or light mineral oil.) - Mercury of reagent grade or better, - Pyknometer - Circular discs of filter paper of medium porosity (mean pore diameter 7 μ). - Le-Chatelier's flask - Constant temperature water bath to maintain temp. within ± 0.1 ° C
4.	Particle retained on 45 microns IS sieve (Clause 5.1 and 7.1)	- 45 micron IS Sieve - Weighing balance
5.	Lime Reactivity – Average Compressive Strength (clause 5.1 and 7.1)	- 50 mm cubes moulds - Planetary mixer, - paddle, - mixing bowl, - scrapper - Flow table and Accessories - Tamping rod - Trowel etc - Vibration machine with timer & cube mould fitting assembly 12000 ± 400 vibration per min. - Compressive Strength machine - Poking Rod, - Petroleum Jelly - Proving ring with all accessories suitable for calibration of CST machine - Tachometer - Gauging trowel (210 ± 10 g) - gauging plate, stainless steel(non-perforated) - Standard sand grade 1, 2 and 3(as per IS 650) - Curing tank of appropriate size with water circulation arrangement - Graduated glass cylinders 150 to 200ml - Humidity chamber with temperature & RH Control 27 ± 2° C, RH 90 to 100 % - Hydrated lime
6.	Compressive Strength at 28 days (Clause 5.1 and 7.1)	

7.	Soundness by autoclave test (Clause 5.1 and 7.1)	- Auto clave machine with thermostatic control to maintain pressure of 2.1 MPa for 3 hrs, pressure to be attained within 1-1 ¼ hrs; - L-Shape thermometer LC 1 °C - Pressure gauge 0 - 42 kg/cm^2 LC= 0.4 kg/cm^2 - Humidity chamber with temperature & R_h control 27 ± 2 °C, R_h 90 to 100 % - Standard bar 308 mm, max - Bar moulds 25 x 25 x 282 mm - Length comparator with dial gauge - Mineral oil for covering moulds - Weighing balance
8.	Uniformity (Clause 7.2)	Test equipment as mentioned in Sl. No. 4 and 5.

The above list is indicative only and may not be treated as exhaustive.

ANNEX B

Scheme of Inspection and Testing

1. LABORATORY - A laboratory shall be maintained which shall be suitably equipped (as per the requirement given in column 2 of Table 1) and staffed, where different tests given in the specification shall be carried out in accordance with the methods given in the specification.

1.1 The manufacturer shall prepare a calibration plan for the test equipments.

2. TEST RECORDS – The manufacturer shall maintain test records for the tests carried out to establish conformity.

3. LABELLING AND MARKING – As per the requirement of IS 3812 (Part 1): 2013.

4. CONTROL UNIT – Fly Ash of the same type processed in a day from same source of supply of raw material shall constitute a control unit.

5. LEVELS OF CONTROL - The tests as indicated in column 1 of Table 1 and the levels of control in column 3 of Table 1, shall be carried out on the whole production of the factory which is covered by this plan and appropriate records maintained in accordance with paragraph 2 above.

5.1 All the production which conforms to the Indian Standards and covered by the licence should be marked with Standard Mark.

6. REJECTIONS – Disposal of non-conforming product shall be done in such a way so as to ensure that there is no violation of provisions of BIS Act, 2016.

TABLE 1

(1)				(2)	(3)		
Test Details				Test equipment requirement R: required (or) S: Sub-contracting permitted	Levels of Control		
Cl.	Requirement	Test Method			No. of Sample	Frequency	Remarks
		Clause	Reference				
5.1, 6.1, Table 1	**Chemical requirements**						
i)	$SiO_2 + Al_2O_3 + Fe_2O_3$	5.1, 6.1, Table 1	IS 3812 (Part 1) IS 1727	R	One	Daily composite sample	-
ii)	SiO_2	5.1, 6.1, Table 1	IS 3812 (Part 1) IS 1727	R	One	Daily composite sample	-
iii)	Reactive sillica	5.1, 6.1, Table 1 Annex- B	IS 3812 (Part 1)	R	One	Daily composite sample	This test is to be carried out as per agreement between purchaser and manufacturer
iv)	MgO	5.1, 6.1, Table 1	IS 3812 (Part 1) IS 1727	R	One	Daily composite sample	-
v)	Total Sulphur as SO_3	5.1, 6.1, Table 1	IS 3812 (Part 1) IS 1727	R	One	Daily composite sample	-
vi)	Available alkalies as equivalent Na_2O	5.1, 6.1, Table 1 Annex-C	IS 3812 (Part 1)	R	One	Daily composite sample	-
vii)	Total chloride	5.1, 6.1, Table 1	IS 3812 (Part 1) IS 4032	R	One	Daily composite sample	-
viii)	Loss on ignition	5.1, 6.1, Table 1	IS 3812 (Part 1) IS 1727	R	One	Daily composite sample	-

6.2	Moisture Content	6.2, Annex- D	IS 3812 (Part 1)	R	One	Daily composite sample	Supply of fly ash either in dry and wet condition is as per mutually agreement. This test is applicable for supply of fly ash in dry condition.
5.1, 7.1, Table 2	**Physical requirements**						
i)	Fineness	5.1, 7.1, Table 2	IS 3812 (Part 1) IS 1727	R	One	Once in 30 minutes	-
ii)	Particle retained on 45 micron IS sieve	5.1, 7.1, Table 2	IS 3812 (Part 1)	R	One	Daily composite sample	Optional test
iii)	Lime Reactivity – Average Compressive Strength	5.1, 7.1, Table 2	IS 3812 (Part 1) IS 1727	R	One	Daily composite sample	-
iv)	Compressive Strength at 28 days	5.1, 7.1, Table 2	IS 3812 (Part 1) IS 1727	R	One	Daily composite sample	-
v)	Soundness by autoclave test	5.1, 7.1, Table 2	IS 3812 (Part 1) IS 1727, IS 4032	R	One	Daily composite sample	-
7.2	Uniformity	7.2	IS 3812 (Part 1)	R	One	Daily composite sample	-

Note-1: Composite sample shall be made out of hourly samples for the required period.

Note- 2: Levels of control given in column 3 are recommendatory in nature. The manufacturer may define the control unit/batch/lot and submit his own levels of control in column 3 with proper justification for approval by BO Head.