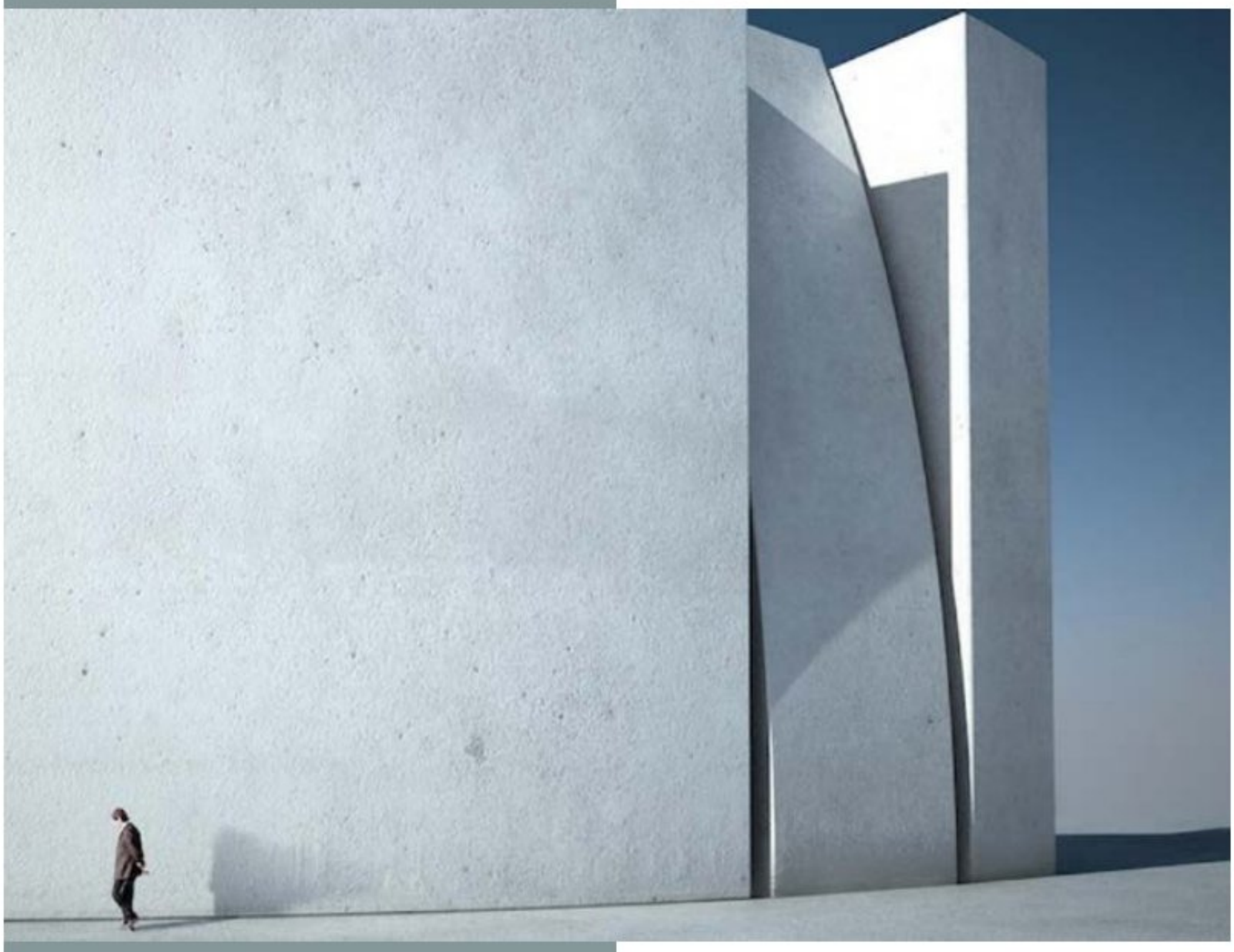
CEMENT ADDITIVES



NEGIN POWDER SHOKOH ARDAKAN
TAHLIL GOSTAR PISHRO
ISFAHAN,IRAIN

MAY,2023

01

MICROSILICA

(90SG , 90SD)

WHAT IS MICROSILICA?

- The American Concrete Institute (ACI) defines Microsilica (also known as Silica Fume) as "very fine noncrystalline silica produced in electric arc furnaces as a by-product of the production of elemental silicon or alloys containing silicon" .Microsilica is a very active pozzolanic material and easily reacts with CH and water and becomes the secondary form of CSH. Through the pozzolanic reaction, microsilica can absorb a large amount of CH and the production of CSH also fills the capillary pores. This process is able to reduce the porosity and permeability of concrete as well as the possibility of chemical reaction of CH with other ions to form harmful products.

- Because of its fine particles, large surface area, and the high SiO2 content, silica fume is a very reactive pozzolan when used in concrete.

PRODUCTION PROCESS

- highly effective pozzolanic material. Microsilica is used in concrete to improve its properties. It has been found that Microsilica greatly improves compressive strength, bond strength, and abrasion resistance; reduces permeability; and therefore helps in protecting reinforcing steel from corrosion.

01

02

03

RAW MATERIAL

Carbon
Coke
Coal
Wood chips
Quartz

SMELTING FURNACE

Temperature
2000 deg C

SILICON METAL

BAGHOUSE FILTER

Off.gas

AS-PRODUCED SILICA FUME

APPLICATION

The micro silica (Silica fume) powder can be well filled in the cement particle space and make the slurry more dense mainly in the following:

01	INCREASE THE DENSITY	increase greatly, adding 5-10% micro silica fume	= the compressive strength increased by 10-30% &	flexural strength will be increased more than 10%
02	FROST RESISTANCE	The impermeability is increased by 5-18 times	&	the anti-chemical ability is increased by more than 4 times
03	INCREASE STRENGTH	After 300-500 rapid freeze-thaw cycles, the relative elastic modulus of micro silica powder decreased by 10-20%, while ordinary concrete decreased to 30-73% through 25-50.		

Silica Fume (Micro Silicon) Applications in Refractories

- As a new material, Microsilica (that is in powder form) is widely used in the refractory industry. It has an important effect on the improvement of the amorphous refractory. The practical application is in the following aspects:

01. Instead of pure aluminum oxide as refractories.

02. The production of amorphous and shaped refractory products as additives makes the strength and high temperature performance greatly improved.

03. The overall casting ladle coagulant.

04. Other cohesive agents, binders, coagulants and additives for other refractory products

SILICA FUME CONCRETE

- concrete with compressive strength in excess of 15,000 psi can be readily produced.
- Silica-fume concrete with a low water content is highly resistant to penetration by chloride ions.
- transportation agencies are using silica fume in their concrete for construction of new bridges or rehabilitation of existing structures.

Silica Fume(Microsilica) Other Applications

A. In Elastomers / Polymers: Used as a filler in rubber or plastic.

B. Fertilizer: Used in defluorination process during the production of dicalcium phosphate

C. Oil & Gas Wells: Used in down hole grouting operations, improvesflow (light-weight) and decreases permeability.

D. Fiber Cement: Used to improve strength and permeability of corrugated roofing panels.

E. Shotcrete – is sprayed concrete: Silica Fume reduces rebound & increases bonding strength, productivity and savings in material cost.

02

POZZOLAN

(PG MAX 12% , PG MAX 6%)

WHAT IS POZZOLAN?

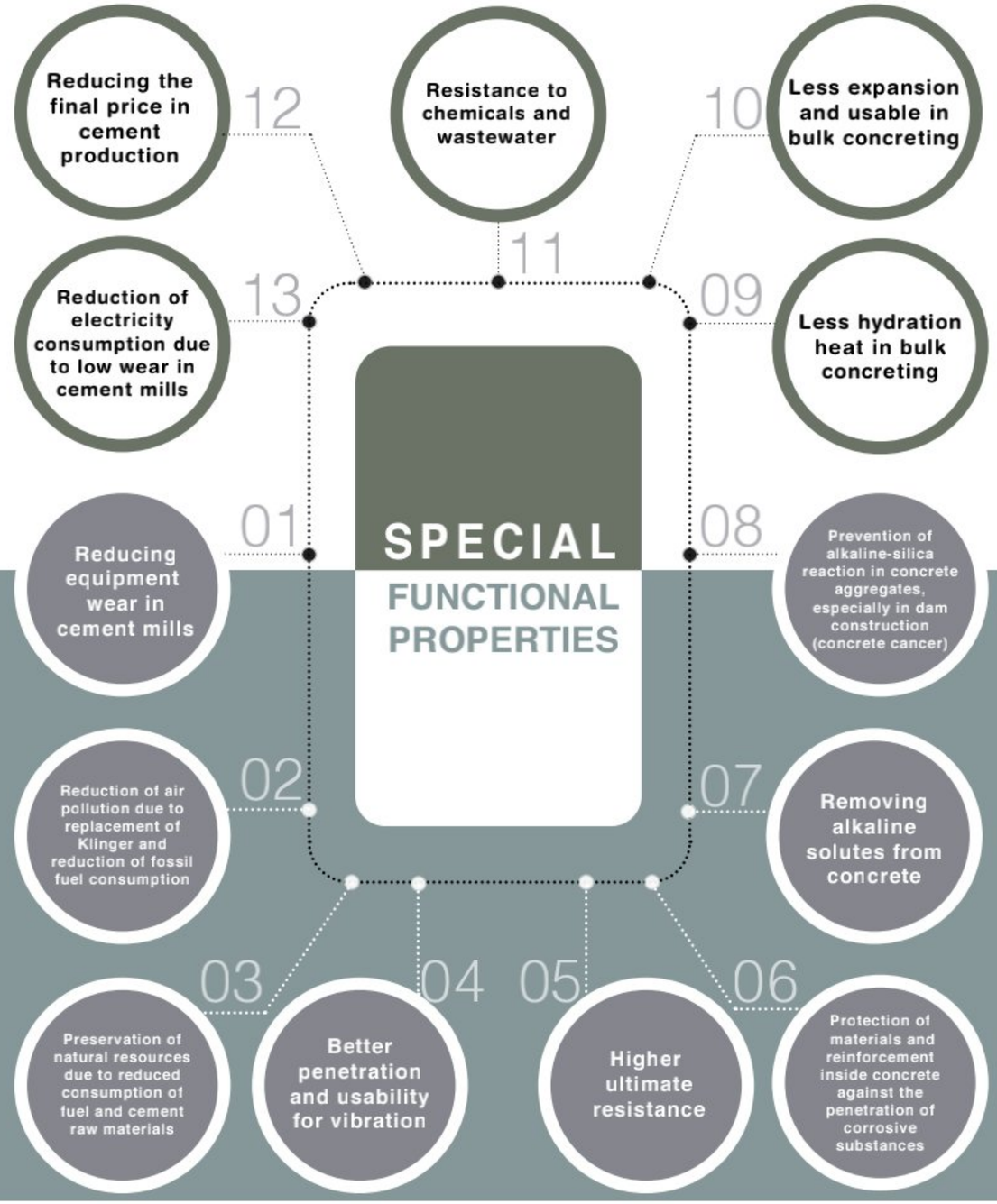
- About 2000 years ago,Romans used the type of volcanic ash whitch was extracted from mine near the city of pozzolan in construction of towers , roads.

- Today, the term Pozzola na, or Pozzolan, refers either to cement itself, or to any soft material containing aluminum silicate that reacts with water in the W presence of lime to form cementitious properties.

SUPER POZZOLAN

- Super pozzolan has a very significant effect on increasing the strength and durability of concrete structures, in fact, its filling properties and pozzolanic reaction can reduce the heat generation of concrete. The calorific value of one gram of super pozzolan is more than one gram of ordinary Portland cement, and in some cases, it can be more than twice that. However, the higher resistance of super pozzolan (2 to about 4 times that of cement) makes it possible to reduce the total amount of concrete cement to achieve a certain strength. Thus, the use of super pozzolan can reduce the heat generation of concrete. implement in neighbouring countries for oil well drilling and town construction

POZZOLAN USAGE ADVANTAGES



POZZOLAN STANDARDS

- The first standard for pozzolanic cement and pozzolanic concrete was written in 1950 in Norway and then tested and researched in other countries such as Sweden, Denmark, Canada, Malaysia, India, Japan and USA. In Iran, a lot of research has been done in this field and acceptable results have been obtained.

- According to the national standard of Iran, pozzolanic cements are classified into pozzolanic Portland cement and special pozzolanic Portland cement.

01 pozzolanic Portland cement (PP)	the pozzolanic material constitutes a minimum of 5% and a maximum of 15% by weight of cement
02 special pozzolanic Portland cement	the pozzolanic material constitutes at least 15% and at most 40% of the cement.

03

FLY ASH

(FLY ASH MAX 10% , FLY ASH MAX 5%)

WHAT IS FLY ASH?

- **Fly ash** is a fine gray powder consisting mostly of spherical, glassy particles that are produced as a byproduct in coal-fired power stations. Fly ash has pozzolanic properties, meaning that it reacts with lime to form cementitious compounds. It is commonly known as a supplementary cementitious material.

WHERE IS FLY ASH USED?

- Currently, over 20 million metric tons (22 million tons) of fly ash are used annually in a variety of en- gineering applications.

01-05 Typical highway engineering applications include:

- **01** portland cement concrete (PCC)
- **02** soil and road base stabilization
- **03** flowable fills
- **04** grouts
- **05** struc- tural fill and asphalt filler cement mills

WHERE MAKES FLY ASH USEFUL?

• Fly ash is most commonly used as a pozzolan in PCC applications. Pozzolans are siliceous or siliceous and aluminous mate- rials, which in a finely divided form and in the presence of water, react with calcium hydroxide at ordinary temperatures to produce cementitious com-pounds. The unique spherical shape and particle size distribution of fly ash make it a good mineral filler in hot mix asphalt (HMA) applications and improves the fluidity of flowable fill and grout. The consistency and abundance of fly ash in many areas present unique opportunities for use in structural fills and other highway application.

ENVIRONMENTAL BENEFITS

• **Fly ash utilization, especially in concrete, has sig- nificant environmental benefits including:**

01 increasing the life of concrete roads and structures by improving concrete durability

02 net reduction in en- ergy use and greenhouse gas and other adverse air emissions when fly ash is used to replace or displace manufactured cement

03 reduction in amount of coal combustion products that must be disposed in landfills

04 conser- vation of other natural resources and materials.

PRODUCTION PROCESS

01 COAL SOURCE

02 COAL PULVERIZER

03 BOILER

04 ELECTROSTATIC PRECIPITATOR OR BAGHOUSE

05 TRANSFER SYSTEM

01 FLY ASH SILO DRY STORANGE

02 POND

01 DRY FLY ASH TO UTILIZATION

01 CONDITIONED FLY ASH TO UTILIZATION OR DISPOSAL

02 UTILIZATION

01 PONDED ASH EXCAVATED AND STOCKPILED

04

TECHNICAL DATA SHEET

(TDS)

Date: 01/06/2023

Number:

TDS (Technical Data Sheet)

1.Definition

Advanced Cement Admixtures

Synonyms: Synthetic Pozzolan, Microsilica, Densified Silica Fume

Market name: NPS_1

Hs code: 3824 40

2.Application

Use as a mineral additive in cement and oil-well cement

High resistance to chlorides and Sulfides

Increased structural strength

Great resistance to corrosivity

3.Technical Specification

- **Composition**

Chemical Composition	SiO_2 min.%	(AL2O3+ Fe2O3) max. %	SO3 max. %	L.O.I max. %
Results	**88**	**5**	**1**	**5**

Color: Light brown- Gray

Melting Point: 1500°C

Bulk Density: 900 -1300 kg/m3

Specific Gravity: 2.1 – 2.5

Solubility Solvents: Low soluble in Water. Insoluble to organic solvents

- **Packing**

• Jumbo bag 1000 - 1500 Kg

4.Handing and Storages

Normal Storage: General storage, best in closed containers, ambient air temperature, keep dry.

Handling Precautions: Avoid generating dust. Handle with adequate ventilation for dust.

Office: Motahari st, Yazd, Ir
Office: Mirdamad Blv, Tehran, Ir
Factory: segzi industrial zone, Esfahan, Ir
Phone Nember: 37261416

Date: 01/06/2023

Number:

TDS (Technical Data Sheet)

1.Definition

Advanced Cement Admixtures

Synonyms: Synthetic Pozzolan, Activated Mineral Powder

Market name: PG_1

Hs code: 3824 40

2.Application

Use as a mineral additive in cement and oil-well cement

High resistance to chlorides and Sulfides

Increased structural strength

Great resistance to corrosivity

3.Technical Specification

- **Composition**

In accordance with *BSEN 15167* standard

Chemical Composition	SiO_2+CaO+MgO min.%	SiO_2 min. %	CaO max. %	MgO max. %	L.O.I max. %
Results	**70**	**35**	**42**	**6**	**3**

Color: White to Dark Grey

Melting Point: >1200°C

Bulk Density: 750-1100 kg/m3

Specific Gravity: 2.0 – 2.2

Solubility Solvents: Low soluble in Water. Insoluble to organic solvents

- **Packing**

• Jumbo bag 750 - 1500 Kg

4.Handing and Storages

Normal Storage: General storage, best in closed containers, ambient air temperature, keep dry.

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ANALYSIS OF PRODUCTION COMPOUNDS

Microsilica

ROW	OXIDE TYPE	TEST RESULT (%)
1	L.O.I*	2.66
2	AL2O3	1.38
3	MgO	0.2
4	CaO	0.42
5	Fe2O3	2.72
6	TiO2	0.01
7	SiO2	92.7

Pozzolan

ROW	TEST	STANDARD TEST METHOD	RESULT (%)
1	SiO2	ASTM C114	75.06
2	AL2O3		10.26
3	Fe2O3		2.64
4	CaO		5.62
5	MgO		0.78
6	SO3		0.38
7	L.O.I*		4.08
8	Na2O	*ASTMC114 & ASTM	0.12
9	K2O		0.74
10	Total Alcalis		0.61

Fly ash

ROW	TEST	STANDARD TEST METHOD	RESULT (%)
1	SiO2	ASTM C311	35.30
2	AL2O3		10.24
3	Fe2O3		3.76
4	CaO		43.42
5	MgO		4.59
6	%W		1.50
7	L.O.I*		0.36

NEGIN POWDER SHOKOH ARDAKAN

TAHLIL GOSTAR PISHRO

Modaresi Alley, Motahari Street, Yazd
NO 154, Kamran Alley, Gohary Alley, East Nazar street, Esfahan, Iran
Ave 2 Shahnazari St, Mirdamad Blv Tehran, Iran

TGPMining.co@gmail.com

+98 9131100632
+31 5401
+31 31330416

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