Commercial Data Sheet

Reference AN-GE-LAC-02/98

CIMENT FONDU LAFARGE®

Construction Applications

General characteristics

- A rapid hardening cement allowing concrete to be put into service between 6 and 24 hours after placing
- Excellent resistance to chemical attack
- Ideal for high temperature applications
- Used as a Portland cement accelerator in non-structural applications
- Particularly suited to areas subject to abrasion

Furthermore Ciment Fondu Lafarge is ideally suited for heat resistant and refractory concretes.

Concretes and mortars based upon Ciment Fondu Lafarge, having high mechanical performance and low porosity, are particularly suited to those applications where the concrete is subject to abrasion. For example; industrial floors, flume linings, spillways, etc.

Ciment Fondu Lafarge is an accelerator for Portland cement. Applications include renders, screeds and grouting materials. Ciment Fondu Lafarge/Portland cement mixes should not be used for structural concrete.

Typical Properties

Ciment Fondu Lafarge is a cement based on calcium aluminates, rather than calcium silicates which are the basis of Portland cement. This difference gives Ciment Fondu Lafarge properties ideally suited to specific applications which compliment the traditional uses of Portland cement.

Ciment Fondu Lafarge has a setting time similar to that of Portland cement, but is very rapid hardening. Concretes and mortars achieve a high early strength allowing fast stripping of formwork, and a return to service normally between 6 and 24 hours after placing.

Unlike Portland cement, Ciment Fondu Lafarge does not release free lime during hydration. This means that concretes with low porosities have an excellent resistance to chemical attack, from a wide range of aggressive substances.

Specification

The properties of Ciment Fondu Lafarge conform to the standards of the country in which it is manufactured.

- French norm: NF P 15-315 - April 1991 Hydraulic binder; Melted Aluminous Cement - France.
- British Standards Institution: BS 915: Part 2 1972 - United Kingdom.

The specification limits indicated are determined with an acceptable quality level (AQL) of 2.5% in accordance with the sampling standard ISO 3951.

The strict specification limits define the absolute limit of product conformity. The usual range represents typical values of our production.

LAFARGE ALUMINATES
28, rue Emile Ménier 75782 Paris cedex 16 France
Tel.: +33 1 53 70 37 00 Fax.: +33 1 45 53 58 67

1 Chemical analysis

Main contituents (%)

	Usual range	Specification limit
Al_2O_3	37,5 - 41,5	> 37,0
CaO	36,5 - 39,5	< 41,0
SiO_2	2,5 - 5,0	< 6,0
Fe_2O_3 + FeO_3	14,0 - 18,0	< 18,5
MgO	-	< 1,5
TiO_2	-	< 4,0

Minor constituents (%)

	Strict specification limit
S (as sulphide ions)	< 0,1
Cl (as chloride ions)	< 0,1
Na_2O + 0,659 K_2O	< 0,4

The chemical characteristics of Ciment Fondu Lafarge have been determined according to the following :

- EN 196-2: Methods of testing cement - Chemical analysis of cement
- EN 196-21: Methods of testing cement - Measurement of the chloride, carbon dioxide and alkali content of cement.

2 Finesse

	Usual range	Specification limit
Specific Surface Blaine (cm^2/g)	2850 - 3450	> 2700

- Determined in accordance with EN 196-6: Methods of testing cements - Measurement of fineness.

Workability

The flow test ASTM C230 has been chosen to evaluate the workability of Ciment Fondu Lafarge. The test is carried out using a standard siliceous sand mortar.

	Specification limit
Spread after 15 mins (%)	> 30

- Composition of mortar according to NF P15-315 (except water/cement ratio): Cement/Sand ratio = 1/2.7; water/cement ratio 0.45.
- Preparation according to EN196-1.
- Test carried out with 25 shocks after 15 mins retained in cone mould, d1 (diameter of base)=100mm.
- Spread(%) = d2 (mm) - d1(mm).

3 Hydraulic properties - French production in accordance with the standard NF P 15-315

Mortar setting time

	Usual range	Specification limit
Initial set (minutes)	130 - 210	> 120
Final set (minutes)	140 - 230	< 240

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AUSTRALASIA PTY LTD
www.consolidatedrefractories.com.au
info@consolidatedrefractories.com.au

Mechanical strength of mortar

	Usual range		Specification limit	
Age	Flexural	Compres-sive strength	Flexural	Compres-sive strength
6 h	4,5 - 6,5	35,0 - 50,0	> 4,0	> 30,0
24 h	6,5 - 8,5	55,0 - 70,0	> 5,5	> 50,0
28 d	8,0 - 12,0	80,0 - 95,0	> 6,5	> 60,0

- Composition of mortar according to NF P15-315: Cement/Sand ratio = 1/2.7; Water/cement ratio 0.4.
- Test conditions according to EN196-1: Test prisms 40x40x160mm; Temperature 200C; Prisms cured for 24 hours at >90% relative humidity, followed by immersion in water.

4 Hydraulic properties - English production in accordance with the standard BS 915

Pure paste setting time

		Specification limit
Initial set	(minutes)	> 120
Final set	(minutes)	< 480

- Determined in accordance with EN 196-3: Pure cement paste at standard consistency; Mechanical mixing; Vicat test equipment using a 300g test weight; Temperature 200C; Relative humidity >90%.

Mechanical strength of mortar

Age	Compressive strength specification limit
24 h	>42 MPa
3 d	Greater than 24 hour strength and > 49 MPa

5 Informations complémentaires

- Principal mineralogical phase* : monocalcium aluminate CA
- Secondary phases* : C12A7, C2S, C2AS, Ferrites - C4AF
- Bulk density : 1100 kg/m3
- Density : 3.2 - 3.3 g/cm3
- Pyrometric cone equivalent (on neat cement paste) : 1270 - 12900C
- Heat of hydration: 6 hours: 340 kJ/kg
  24 hours: 445 kJ/kg
  5 days: 445 kJ/kg

* *C=CaO A=Al_2O_3 S=SiO_2 F=Fe_2O_3*

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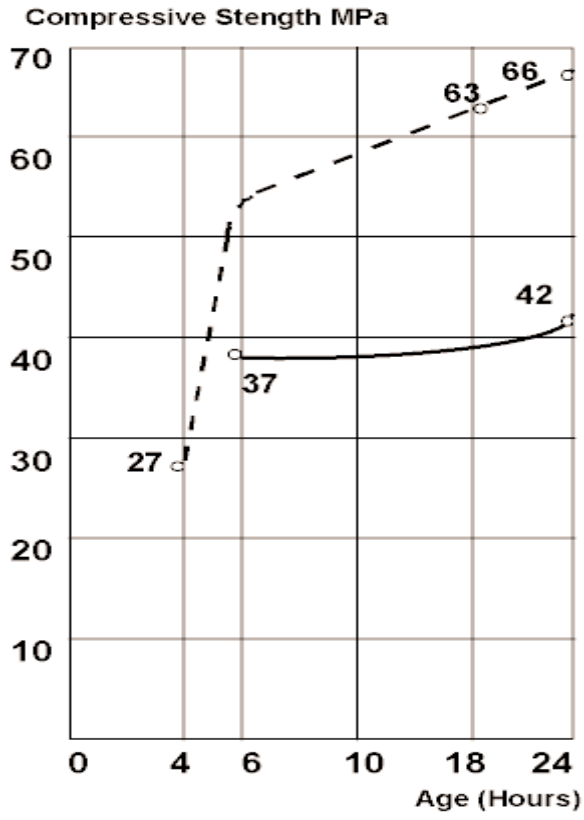
6 Strength development of a Ciment Fondu Lafarge concrete during the first 24 hours after placing

Average of laboratory results: Total water/cement ratio = 0.4; Cement content = 465 kg/m3; Measured on prisms 40 x 40 x 160 mm



- - - Mechanical mixing : curing at T< 25°C, under standard conditions

——— Mechanical mixing : curing under conditions simulating the heat rise in mass concrete (at T > 25°C, possibly up to 85°C)

7 Long term strength development of concretes and mortars based on Ciment Fondu Lafarge

The strength development of concretes and mortars based on Ciment Fondu Lafarge depends on:-

- Mix constituents: Water/cement ratio, cement content, aggregate selection
- Mass of the concrete: Heat released during hydration will cause the temperature of the concrete to increase relative to its mass.
- Environment: The temperature and humidity during curing and throughout the concrete's service life, will influence the rate of conversion and the strength development.

Conversion: This is the process by which Ciment Fondu Lafarge concretes and mortars reach their stable mature condition.

- For concretes and mortars of small cross section, cured at low temperatures (<25oC), no significant heating occurs during hardening, and higher strengths are achieved at very early ages. With time, depending upon conditions of temperature and humidity, conversion occurs. The compressive strength decreases to a minimum before increasing again; this minimum strength is comparable to the 24 hour compressive strength of a concrete subjected to hot conditions during curing. After conversion has occurred, the strength develops slowly and continuously.ISO 9002
- The temperature of mass concrete rises consider ably during hardening and the strength at 24 hours is lower than that achieved if the concrete had been kept cool. However, for practical purposes, this strength will not decrease further, and may be considered as the minimum value.

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Guidance on the correct use of Ciment Fondu Lafarge is available from our Technical Department or current specialised publications (e.g. Concrete Society Technical Report No. 46).

To obtain high mechanical performance and low porosity it is essential that the total water / cement ratio does not exceed 0.4 and the cement content is not less than 400 kg/m^3.

8 Storage and Shelf-Life

In common with all hydraulic binders, Ciment Fondu Lafarge must be stored in dry conditions, off the ground. Ciment Fondu Lafarge will retain its properties for up to six months. In many instances properties are retained for over one year.

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ISO 9002