

## CIMENT FONDU®

# Refractory Mortars & Concretes

## 1 Introduction

The high temperature resisting properties of CIMENT FONDU® concretes or mortars depends on the type of aggregates used. These can be, either of natural origin (e.g. siliceous sand), or of synthetic origin (e.g. ALAG®, Chamotte).

Aggregate Type	Maximum temperature limit
Calcareous-Siliceous	450°C
Siliceous	500°C
Limestone	700°C
Perlite, Crushed House brick	1000°C
ALAG®	1100°C
Crushed Firebrick	1150°C
Chamotte (42-46% alumina)	1250°C

Based on one sided heating and assumes a normal thermal gradient through a lining. The maximum service temperature is an approximate guideline and the exact value will depend upon the specific composition of the chosen aggregates as well as the precise environment in which the concretes are to be used.

With regard to placing concretes or mortars containing heat resistant natural aggregates, refer to the advice for concretes or mortars based on CIMENT FONDU® and natural aggregates. Please contact our Technical Department for further information.

With regard to concretes or mortars based on ALAG® refer to the specific implementation advice for these mixtures. Practical Guide available on request.

For concretes and mortars containing Chamotte aggregate, you will find the necessary advice in chapter 2.

## 2 Concrete / mortar containing Chamotte

Type	Dosage
Fine Mortar (chamotte 0-2 mm)	600 kg/m <sup>3</sup>
Mortar (chamotte 0-5 mm)	500 kg/m <sup>3</sup>
Concrete (0-10 mm)	400 kg/m <sup>3</sup>

Information hereafter is given as an indication.

**Allowed maximum temperature with CIMENT FONDU® : 1200°C**

Recommended cement contents can vary from 400 kg/m<sup>3</sup> to 600 kg/m<sup>3</sup>.

In general, proportions used are as follows :

### Granulometry

As for any concrete, it is advisable to use suitable aggregates with fine through to coarse grain size (according to normal code's of practice), in order to obtain good compaction of the concrete.

The size of the coarse aggregate is in relation to the thickness of the section to be made.

In practice, this generally does not exceed 1/5 of the minimum section thickness.

### Composition type

The table below gives indicative compositions in weight for CIMENT FONDU® and litres for Chamotte. For the latter the bulk density is 1,250 kg/m<sup>3</sup> and the specific gravity is 2.5.

Applications	Aggregate Size (mm)	With 50 kg CIMENT FONDU®	
		Aggregates (litres)	Water (litres)
Jointing mortar for small sections	0-0.2 mm	27	25
	0.2-2 mm	57	
Sections of thickness 20-50mm	0-0.2 mm	21	27
	0.2-2 mm	52	
	2-5 mm	42	
Sections of thickness > 50 mm	0-0.2 mm	22	31
	0.2-2 mm	49	
	2-5 mm	40	
	5-10 mm	45	

## Precautions before mixing

The aggregate fraction greater than 5 mm must be pre-wetted before use, so that it does not absorb the gauging water.

In practice the best results are obtained by soaking them or by spraying them a day before they are required for use and letting them drain overnight.

## Mixing

Mixing must be in a clean concrete-mixer, free from any traces of Portland cement. Only use drinking water.

Mix for at least 6 minutes in order to obtain a homogeneous concrete. The angular shape of Chamotte does make mixing more difficult.

Adjust the water, based on the recommendations in the table above, to obtain a concrete with plastic consistency.

Make small batches appropriate to the size of the work, the time of installation should not generally exceed 30 to 45 minutes (depending on the ambient temperature).

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## Installation of the concrete or mortar

Installation within a mould or formwork.

The installation can be done in any type of mould or formwork. In the case of wood or absorbent materials, employ a means of preventing loss of water from the concrete : mould oil, polythene film, etc.

The concrete should be placed using vibration with an appropriate poker vibrator or by rodding. Although of firm appearance, a Chamotte concrete or mortar will flow more readily under vibration.

## Curing

The hardening of the concrete is accompanied by a rise in temperature depending on size of the work. During this period (<12hrs) it is necessary to take precautions so that the surfaces exposed to the air are protected and/or kept wetted. This will prevent poor hydration and subsequent loss of strength of the concrete or of powdering of the surface.

Curing can be carried out using any of the following processes :

- cover with a plastic film.
- preserve the surface moisture by ponding, continuous watering, or using wet Hessian or wetted sand.

## Initial Heating - First Firing

It is advised that the first firing does not take place before 48 hours after casting. Then to carry out a gradual rise of 50°C/hour and holding for at least 3 hours at 110°C before then continuing up to 500°C.