



**Bureau de Normalisation des Liants Hydrauliques**

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**Certificate of Analysis**

**Reference Material SN5c  
Batch....  
Portland Cement  
(CEM I 52,5 N)  
Use before .....**

**Distributed by:**

**SNL  
(Société Nouvelle Du Littoral)**

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**I – Participation and execution of tests**

Each year the “*Association Technique de l’Industrie des Liants Hydrauliques*” (ATILH) organises round robin test campaign involving the participation of the cement production industry laboratories, the cement end-user laboratories and Research and Inspection Centers within the construction materials sector. This participation is compulsory for laboratories accredited by COFRAC for cement testing. The tests are carried out in accordance with standardised methods where latter exist, otherwise according to everyday traditional methods.

**II – Statistical analysis of the results**

Outliers are eliminated via the STUDENT’s test with a confidence level of 98 %. A reiteration is set at this threshold to keep only those values which are related to the “Normal or Gaussian” distribution, the latter being entirely defined by 2 parameters: mean and standard deviation. The coefficient of variation symbolised by “V” is the ratio between the standard deviation “ $\sigma$ ” and the mean value  $\bar{X}$ .

**III – Chemical composition**

X-ray fluorescence spectrometry, fused bead (ISO 29581-2)				Chemical Analysis (EN 196-2)		
Elements	Mean $\bar{X}$ (%)	Standard deviation $\sigma$ (%) reproducibility	Coefficient of variation V (%)	Mean $\bar{X}$ (%)	Standard deviation $\sigma$ (%) reproducibility	Coefficient of variation V (%)
Loss of ignition	-	-	-	1.96	0.09	4.6
SiO <sub>2</sub>	19.72	0.25	1.3	19.67	0.21	1.1
Al <sub>2</sub> O <sub>3</sub>	4.84	0.11	2.3	4.88	0.14	2.9
Fe <sub>2</sub> O <sub>3</sub>	3.54	0.06	1.7	3.54	0.08	2.1
CaO	64.24	0.30	0.5	64.29	0.29	0.4
MgO	1.58	0,04	2.2	1.60	0.10	6.4
MnO	0.04	0.00	11.2			
SO <sub>3</sub>	2.34	0.06	2.6	2.31	0.10	4.1
CaO free <sup>2</sup>				1.15	0.18	15.9
Insolubles <sup>3</sup>				0.47	0.10	21.8
Na <sub>2</sub> O <sup>1</sup>	0.26	0,02	9.0	0.26	0.01	3.8
K <sub>2</sub> O <sup>1</sup>	0.75	0.01	1.9	0.75	0.01	1.4
TiO <sub>2</sub>	0.28	0,02	5.6			
P <sub>2</sub> O <sub>5</sub>	0.31	0.01	4.3			
SrO	0,07	0.01	7.9			

<sup>1</sup> photometric method    <sup>2</sup> all methods combined    <sup>3</sup> gravimetric methods

**IV – Physical determination**

### a) Specific surface and particle size analysis

For the calibration of the Blaine permeability apparatus, follow the requirements of the EN 196-6 standard, paying particular attention to the temperature corrections, if any. To determine the volume of the compacted layer, it is not essential to use the Reference Material (but ensure that enough is taken so that the mass of the mercury does not modify the compaction of the powder layer). Reference Material should be used systematically:

- After 1000 tests ;
- when using another type of manometric liquid, another type of filter paper, a new manometer tube or a new perforated disc.
- If discrepancies are systematic with the secondary reference cement.

Table 1

	Mean value	Dispersion characteristics Reproducibility	
	$\bar{X}$	Caractéristiques de dispersion Reproductibilité	
		min	max
Sieve Residue ( 45 $\mu$ ) " Alpine" Refus à 45 $\mu$ " Alpine"	97.1 %	94.3	99.9
		$\sigma$	V (%)
Particle density (g/cm <sup>3</sup> ) with pycnometer method Masse volumique des grains (g/cm <sup>3</sup> )	3,15	0,02	0.6
Blaine Specific Area (cm <sup>2</sup> /g) with EN 196-6 Surface spécifique Blaine (cm <sup>2</sup> /g)	3918	103	2.6

Table 2

Particle size analysis	by laser diffraction (ISO 13320-1)	Air-jet sieving - Alpine test (NF X11-640)	Reproducibility (all methods combined)
Equivalent size aperture ( $\mu$ m)	Mean $\bar{X}$ (%)	Mean $\bar{X}$ (%)	$\sigma$ (%) (reproducibility)
1.25	7.0		2.3
2.0	11.1		3.2
3.15	16.9		3.5
4.0	21.0		4.0
5.0	25.4		4.1
6.3	30.7		3.6
8.0	36.4		3.7
10.0	43.1	37.0	3.5
12.5	50.9	48.7	3.1
16.0	60.6	61.6	3.1
20.0	70.2	76.1	3.6
25.0	79.5	82.0	3.3
31.5	88.0	92.1	3.0
40.0	94.3	96.6	2.2
45.0	95.8	97.1	1.4
50.0	97.8	98.1	1.0
63.0	99.4	99.1	0.5
80.0	99.8	99,6	0.2
90.0	99.9	99.8	0.1
100.0	99,9	99.8	0.1
125.0	100	99.9	0.1
160.0	100	99.9	0.1

### III – Sample conditioning

The sample of this reference material is packaged in sold in batch of 20 vials of 5g, in a sealed package. Physicochemical properties of the sample are stable until the vial is open.