Rev 0
03/22

AETERNUM 1

High efficiency active compound for betones and mortars with high durability

DESCRIPTION

AETERNUM 1 is a new generation powdered reactive compound , adsorbed on active nano micro silicates, combining, with the high pozzolanic activity of the latter, a unique rheology and fluidity without segregation, a high resistance to mechanical compression and chemical and atmospheric aggressions and above all an extraordinary impermeability.
For warm climates, it is recommended to do preliminary tests.

Without Aeternum

With Aeternum

GENERAL CARACTERISTICS

AETERNUM 1 consists of spherical particles a few hundredths of a micron in size, so its specific surface is very High: more than 220,000 cm^2/g (Blaine). Characteristic that gives a high dispersion and reactivity on cement grains and a great ability to capture and fix calcium hydroxide $[Ca(OH)_2]$ and first transform it into a hydrated silicate and then into a stable and irreversible calcium silicate.
It should be noted that, normally in all mixtures containing cement, in order to achieve good workability, it is necessary to use an amount of water always greater than that necessary for the hydration of the cement, and it results, in the hardened cement paste, the formation of capillaries and cavities much more numerous plus the amount of water used.
In any case despite its very high specific surface AETERNUM 1 having inside a phase transfer, ensures, without the use of additional superplasticizers, concretes of easy and good maneuverability, without shrinkage and with superior and durable final performance.
Given the chemical conformation of I' AETERNUM 1 which accelerates the hydration of cement, it is recommended for the summer season, make initial qualifications.
AETERNUM 1 added to the mixture at the rate of 3 to 4% by weight of cement, captures and reacts with free lime, filling the voids present in the cement paste, making it more compact, more impermeable and more resistant to the conglomerate, and therefore more durable over time and with a better appearance.
So well designed, a concrete with AETERNUM 1 seems to have complete waterproof, even to air.
This additive allows the preparation some Concrete rhèoplastiques and CSC rheodinamics and SCC with very low I/O ratios.

AREAS OF APPLICATION

AETERNUM 1 finds its main applications in all quality mortars and concrete, or are necessary homogeneous concrete, superfluid with very low aspect ratio, with an excellent face-to-eye finish, impermeable to aggressive external agents, compensated shrinkage, high flexural and compressive strength.
AETERNUM 1 is used in the preparation of:

- Protective mortar
- Mortar for consolidation injections
- Expansive mortar with compensated shrinkage
- Mortars or concretes with high mechanical strength
- Mortars or concretes with high impermeability

Excellent treatment ability **in the absence of bleeding** with w/c ratios less than 0.45

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- Prestressed concrete resistant to chemical attacks
- Concrete for slippery formwork (slip-shape)
- Mortar or concrete for underwater applications especially in aggressive environments
- Thixotropic mortar for repairs
- Anti-shrink mortars, both premixed and wet

In other circumstances where it is necessary to mortar or concrete for superior performance, such as:

- Mechanical resistance
- Chemical resistance
- Resistance to wear and cavitation
- total Impermeability, even in the air
- Stability and cohesion
- Rwas compensated
- Total sustainability

It is also used to reduce the bleeding of concretes, in pumped concrete and in concretes with high mechanical characteristics and durability.
AETERNUM 1 is also recommended for concrete in which the particle size distribution has an obvious lack of fines.

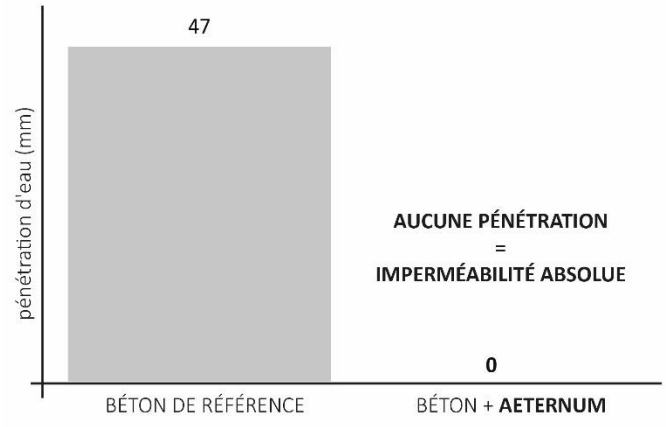
BENEFITS

AETERNUM 1, despite the very small dimensions of the particles:

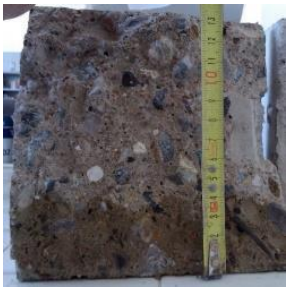
- It is born not requiring the simultaneous use of super plasticizers, on the contrary, thanks to the meme, it is possible to have a self-compacting concrete at very low amounts of water;
- Gives to the Pate greater maneuverability of cement
- Facilitates pumping;
- Ensures high mechanical strength cement paste without plastic shrinkage;
- Ensures a better appearance and degree of finish;
- Ensures waterproofness;
- Ensures durability and therefore resistance to all exposure classes.

DETERMINATION OF THE DEPTH OF PENETRATION OF PRESSURIZED WATER INTO THE CONCRETE

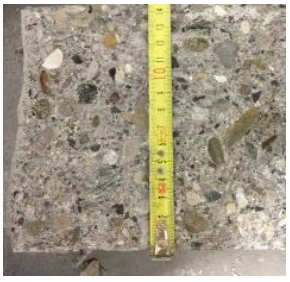
The test procedure was carried out in accordance with the provisions of paragraph 5 of the reference standard (EN 12390-8), i.e. with a pressure of 500 KPa for 72 hours.



From the analysis of all samples, a penetration depth for the reference concrete of 47 mm was verified, while the concrete with the addition of AETERNUM showed ZERO water penetration.



Concrete without Aeternum with sealing additive



Concrete with Aeternum

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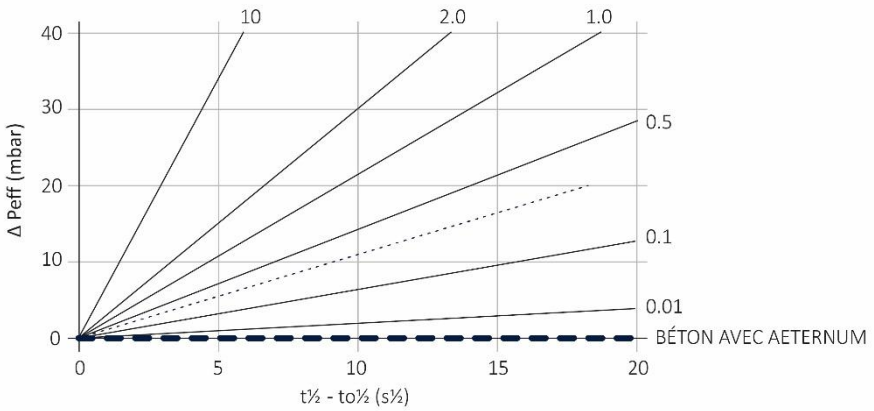
MEASURING THE AIR PERMEABILITY OF THE CONCRETE WITH AETERNUM

Air permeability shows an excellent correlation with the properties related to the durability of concrete: the rate of water absorption by capillarity, chloride permeability and permeability to carbon dioxide and oxygen.



The test shows that a concrete with AETERNUM is of class PK1 (i.e. very low penetration and therefore very low porosity) compared to a concrete without AETERNUM whose penetration, and therefore porosity, is moderate/high.

TEST RESULTS (according to SIA 262/1:2003 and compared to UNI EN 12390-8)

SURFACE	CLASS	Kt	DEPTH	PERMEABILITY	H2O PENETRATION
AETERNUM CUBE	PK1	< 0.01	< 5 MM	VERY LOW	< 1 MM
SAMPLE CUBE	PK3/4	~ 1.0	~ 50 MM	MODERATE/HIGH	~ 35 MM

Permeability classes related to Permea-TORR™

Class	kT coeff. (10^{-16} m^2)	Permeability
PK1	< 0.01	Very low
PK2	0.01 – 0.1	Low
PK3	0.1 – 1.0	Moderate
PK4	1.0 – 10	High
PK5	10 – 100	Very high

FROST RESISTANCE IN THE PRESENCE OF ANTIFREEZE SALTS

The tests are carried out by freezing and thawing cycles of concrete specimens, one side of which is brought into contact with de-icing salts ($CaCl_2$). At the end of the different time cycles, the loss of material detached from the surface of the specimen in contact with the snow removal salt is determined.

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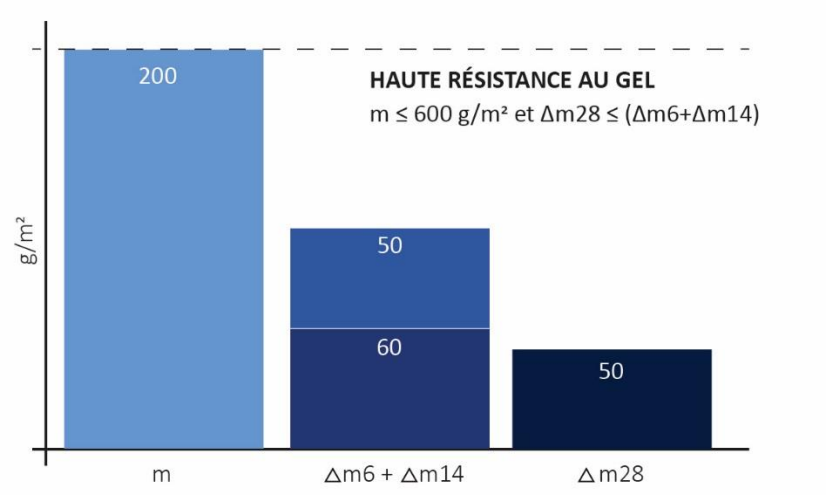
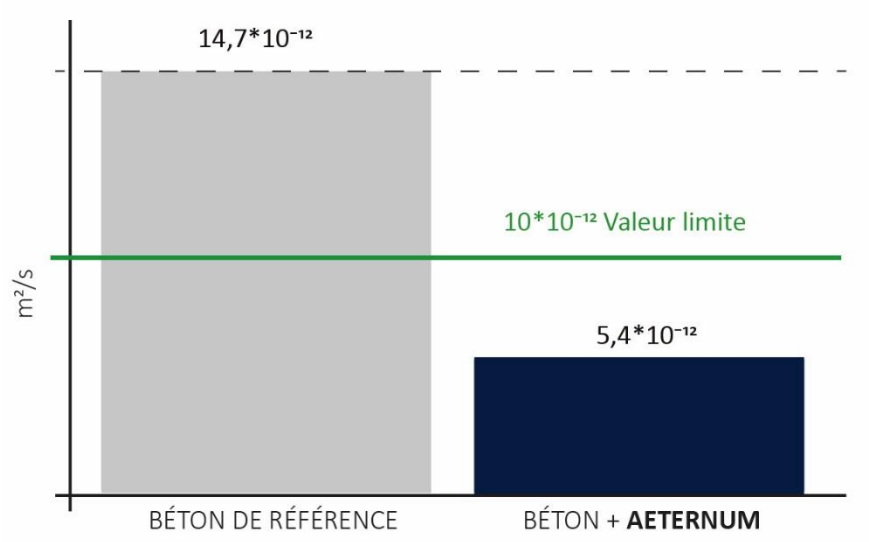


The evaluation of "High frost resistance" highlights how highly sealed concrete with AETERNUM, without any aeration agents (which significantly lowers the mechanical strength), or even with an air percentage of less than 1%, is highly sealed and optimally resists freeze and thaw cycles even in the presence of de-icing salts. AETERNUM promotes the creation of a very compact cementitious matrix with a consequent elimination of water permeability and capillary absorption, counteracting the deleterious effects of de-icing salts. A concrete with AETERNUM, not absorbing water from the outside, has no problem of resistance to freezing and therefore to freeze-thaw cycles

CHLORIDE MIGRATION COEFFICIENT



The average chloride migration coefficient of the reference probes is **14.7*10-12 m²/s** (it should be noted that the permissible limit value for concrete that is very resistant to chloride migration is **10*10-12 m²/s).**

This condition can be achieved with standard concrete with the addition of AETERNUM: the chloride migration coefficient in the test mixture with Aeternum was much lower - **5.4 * 10-12 m²/s** on average.

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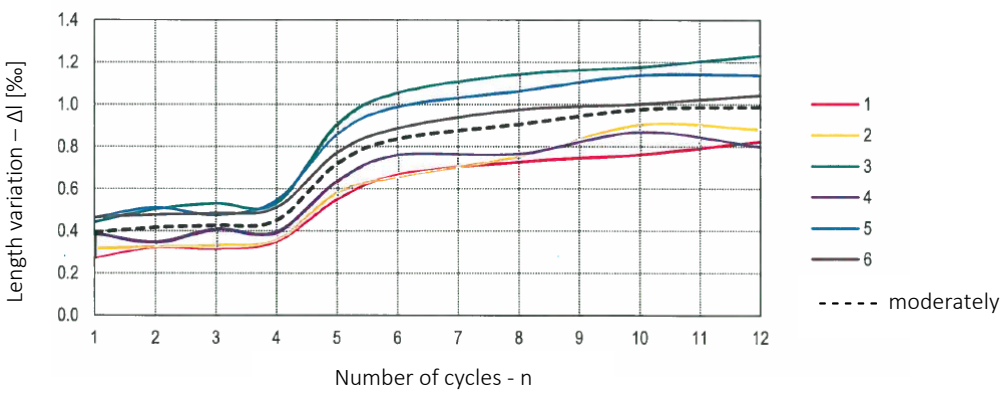
RESISTANCE TO SOLFATES

It is determined by measuring the expansion by expansion of the specimens immersed in a highly concentrated sulphate solution. Since in a concrete immersed in a sulphate solution and therefore subjected to the subsequent sulfatic reaction, phenomena of swelling and surface delamination occur. The data obtained show how concrete with AETERNUM contrasts expansion very effectively, obtaining an average Δls sulphate expansion value of 0.54 ‰ compared to the permissible limit value for a high resistance ≤ 1.2 ‰.



ACCELERATED CARBONATION

The carbonation of concrete is due to the penetration of $_{CO2}$ into the cementitious matrix. This one, by reacting with the free lime of the cement, lowers the pH of the conglomerate favoring the corrosion process of the concrete irons.

The following image shows the results at the end of parking the specimens inside the carbonation chamber:

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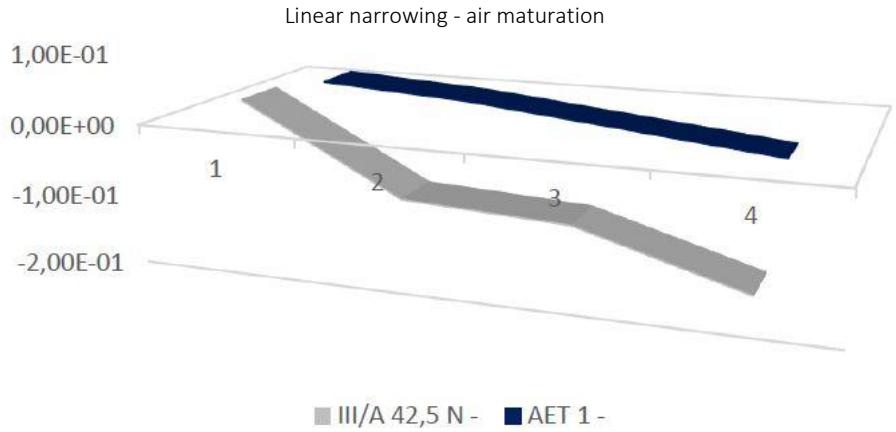
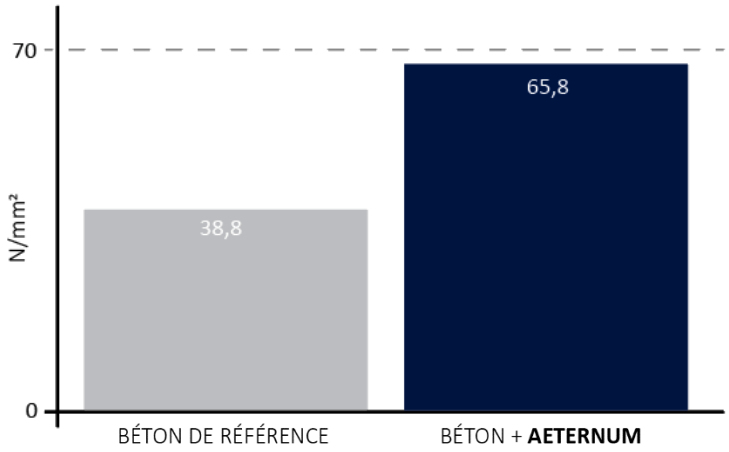
HYDRAULIC WITHDRAWAL



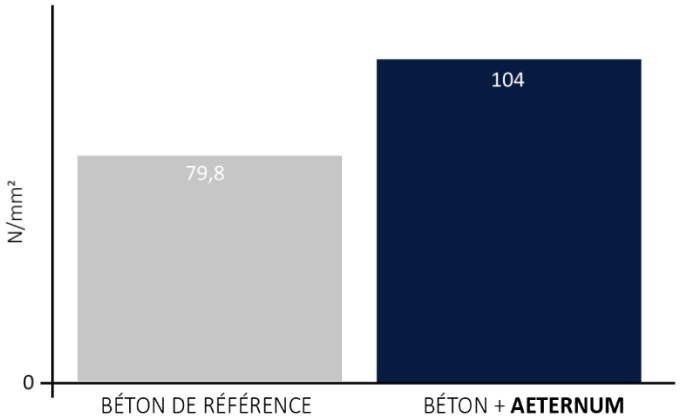
COMPRESSIVE RESISTANCE

Comparative analyses between a reference concrete and a concrete with the addition of Aeternum show the best compressive strength of the latter.

Both in standard concrete :



than in high-strength concrete:



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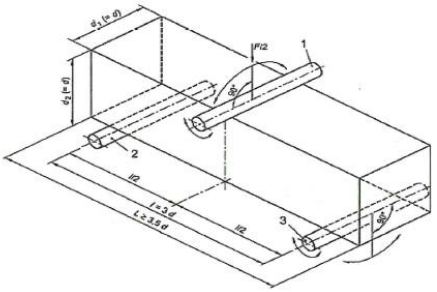
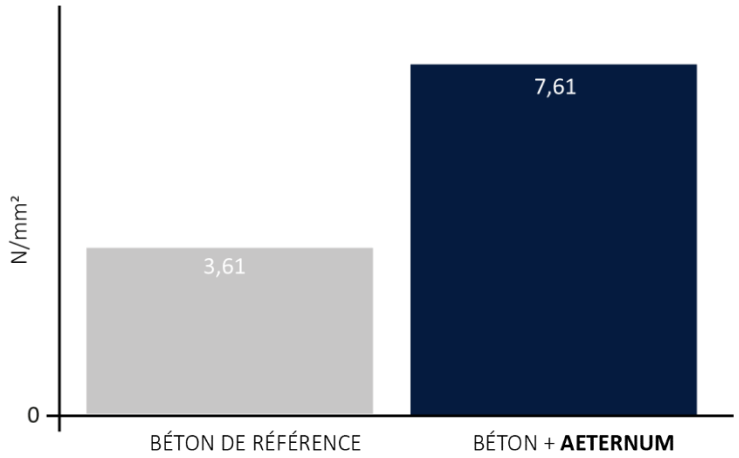
FLEXURAL RESISTANCE

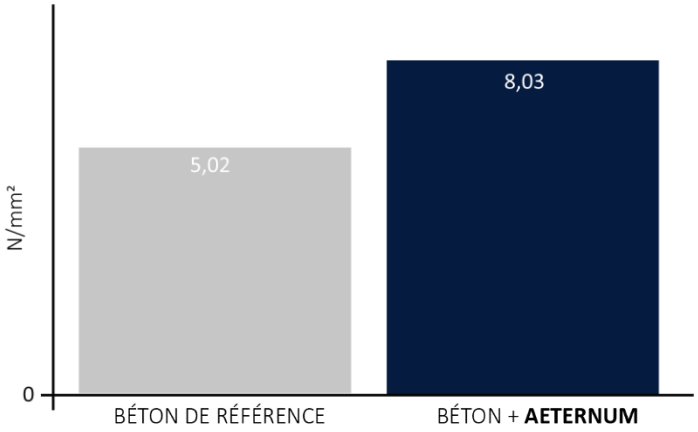
Tests carried out with a central load on specimens with the addition of Aeternum show physico-geometric characteristics indicating good flexural strength.



Both in standard concrete :

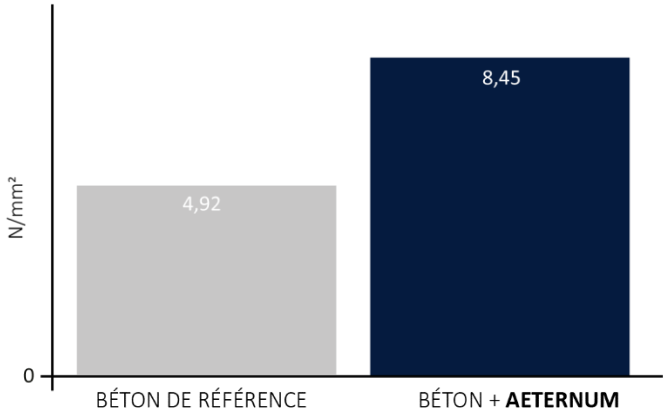


than in high-strength concrete:



RESISTANCE TO INDIRECT TRACTION

The tests carried out with a central load on the specimens with the addition of Aeternum show physico-geometric characteristics indicating excellent tensile strength.



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AETERNUM 1

TECHNICAL

Physical state	powder
Silver color	
Particle size distribution	0-30 µm
Apparent density	400-600 g/dm^3
Solubility in	insoluble water
pH7 ± 1	
Specific area	20-30 m^2/g

DOSAGE

The dosage of AETERNUM 1 is on average 3 to 4% on the weight of cement depending on the mixture to be added and the desired characteristics. It is advised that the ideal dosage it is 3.5% on the weight of cement.
It can be used dosage different from these recommended before having carried out preventive tests.

HARDENING OF THE CONCRETE

Reactions in the pozzolanic environment are quite long and take place in a humid environment; For this reason, it is necessary a correct maturation of the mortar or concrete to prevent drying processes too fast.
In this regard, it is recommended to protect the castings, during the first phase of hardening, with the polyethylene sheets and subsequently applied to the exposed surfaces a film of TEKNAPUR, which will prevent rapid evaporation of the castings and a correct pouzzolanic reaction to the same.

CONFECTIONS

Loose in tanks
Big-bags from 600 to 700 kg
Bags 9 kg

STOCKAGE AND CONSERVATION

AETERNUM 1, if stored in a dry place in the original perfectly closed bags, it is valid for 12 months.
The moisture possibly absorbed by the product does not change the effectiveness, but this makes it difficult and inaccurate to dose and distribute it in the mixture.
It is therefore advisable to carefully close the bags after each use.
AETERNUM 1 is available in bulk, in big-bags or in bags. The bulk product is transported with conventional trucks and can be stored in normal silos for cement and dosed with the equipment of the concrete plant or with a small implementation for big-bags.

WARNINGS/PRECAUTIONS

AETERNUM 1 is harmless in contact with the epidermis.
It is easily removable with soap and water from any surface. Lnhalation can cause slight irritation of the upper respiratol tract so it is recommended to use a dust mask. Accidental loss of the product must be collected in a dry state and disposed of in an authorized landfill.

LEGAL NOTICE

The information contained in this data sheet, while representing the most advanced stage of knowledge, does not exempt the user from carrying out precise preliminary tests under his own conditions of use and operation. We therefore disclaim all liability in the event of misuse of the product.

CE

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EN 934-2

AETERNUM 1

Highly efficient water reducer / superplasticizer T 3.1 / 3.2

Maximum presence of chlorides 0.1%
High presence of alkalis 0.1%

No hazardous substances

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