

AALBORG
EXTREME[®]
LIGHT120
HIGH PERFORMANCE CONCRETE (HPC)

HIGH-PERFORMANCE CONCRETE

In the 1980ies, the laboratories of AALBORG PORTLAND A/S, in Denmark, conducted pioneering research to develop very dense cement based binder-matrices, in order to fully exploit the performance of concrete. These efforts resulted in the first ever patented ultra-high performance steel fiber reinforced concrete – bearing the name Compact Reinforced Composite, CRC®. This technology was, and is still today, based on the AALBORG WHITE white cement, which offers perfectly suited chemistry and purity, as well as superior mechanical performance.

Cementir Holding's Innovation Team within AALBORG INWHITE SOLUTION®, synergising together expertise from the Research & Quality Centre in Aalborg, Denmark and market/customer driven trends and insights from global Sales Team, is again taking the lead in further developing

the very complex binder technology behind high and ultra high performance in concrete.

AALBORG EXTREME® Light 120 is based on a further refinement of Aalborg Portland's binder technology, FUTURECEM®, which still offers highly advantageous pozzolanic reactions, but without being constrained by the availability and quality of waste materials from other industries.

The performance of AALBORG EXTREME® Light 120 in fresh and hardened state has been designed to accurately suit the production flows and requirements of our industrial customers.

AALBORG EXTREME® LIGHT120

Is a shrinkage reduced, ready-to-use, self-compacting High-Performance Concrete for the manufacturing of thin/slim concrete products with high aesthetic, mechanical and durability performance. Binder, admixtures and aggregates are included, only water should be added during mixing.

After mixing with water, the product results in a white base coloured High-Performance Concrete for personal tailorization in terms of pigments. Due to its high flowability, fibres can be added to adjust mechanical properties, whilst still maintaining self-compacting properties.

AALBORG WHITE® is the cement used in AALBORG EXTREME® Light 120. This cement is neutral in terms of meeting the EU requirements for a maximum soluble chromium (VI) in cement of 2 mg/kg with no time limits on storage time.



MAIN APPLICATIONS

- **Light weight high strength panels:** façades, cladding, sun-screens, ornamental elements.
- **Artistic and ornamental elements made in concrete.**
- **Wet cast tiles.**
- **Gardening / street architectural elements.**

BENEFITS



WORKABILITY

Self-compacting properties and long flow retention.



STRENGTH

High early and final strength.



PREDICTABLE & RELIABLE PERFORMANCE

balanced chemistry for controlled workability and hydration



SHRINKAGE REDUCED

Minimizes the risk of cracks.



HIGHLY DURABLE

Even when exposed to harsh environment.



COLOR PERFORMANCE

High whiteness ideal for architectural and ornamental elements.

QUALITY STATEMENT

AALBORG EXTREME® Light 120 is produced under the strict quality control procedures defined and audited by Cementir Holding.

Samples of AALBORG EXTREME® Light 120 are frequently cross-checked and fully tested at Cementir Holdings Research and Quality Centre in Denmark.

TRIAL CASTING

AALBORG EXTREME® Light 120 turns into a high-flowable mix with excellent mould filling properties. It is, however, always recommended to carry out a trial casting replicating the intended use of the product (representative moulding, release agents if applicable, casting procedure, ...) before production is initiated, to evaluate the achieved surface properties of the finished concrete product.

The above is particularly relevant if fibers are added to the concrete, leading to progressive reduction in flow and increase in viscosity. The trial casting should hence reveal, if vibration must be applied to the mould in order to reach the targeted surface detailing and finishing.

AUTO-CONTROL

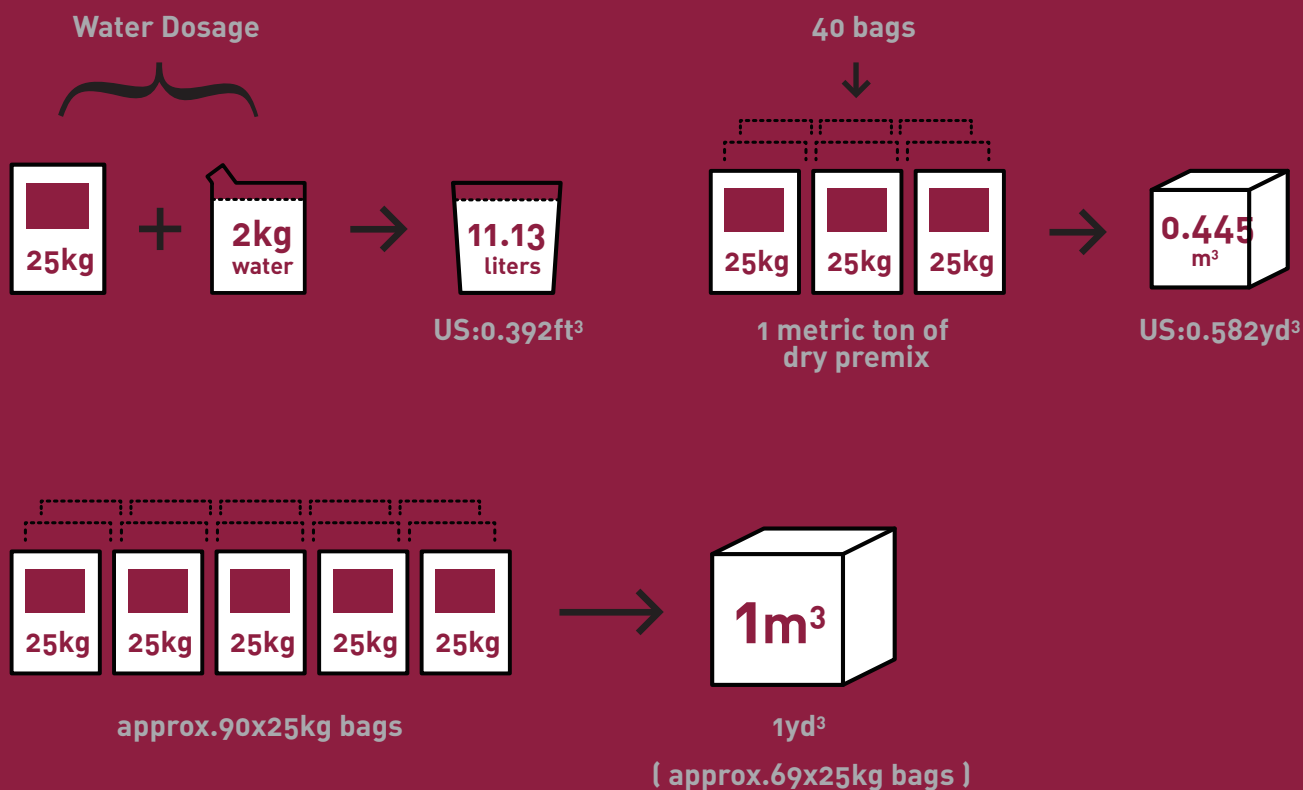
The user of AALBORG EXTREME® Light 120 is expected to implement a quality control testing for monitoring the quality of the mixed concrete against as a link to the data mentioned in the table “Product Information Sheet”, and should at least include:

- Control of water dosage
- Flow and density
- 1 and 28 days compressive strength

SUSTAINABILITY

In our effort to limit the use of scarce materials, AALBORG EXTREME® Light 120 is manufactured with raw materials from sources vastly available in nature. Therefore, it is not constrained by the availability and quality of waste materials from other industries.





FRESH STATE PROPERTIES

AALBORG EXTREME® Light 120 is a self-compacting mortar with long opening time. Its flowability makes it suitable for addition of fibers.

The fresh mix of **AALBORG EXTREME® Light 120** is stable when the recommended water dosage is used, under these conditions, no segregation or bleeding will occur.

The flowability of the material has been measured according to ASTM C230 as a quality routinely test. Also, periodic measurements according to the EN-206 are made to correlate with concrete standards.

Table 1. Flow measurements of AALBORG EXTREME® Light 120

Method	Flow after mixing (mm)	Flow after 45min (mm)
ASTM C230	290 ± 20	290 ± 20
EN-206	900	900





MECHANICAL PROPERTIES

COMPRESSIVE STRENGTH

The compressive strength of AALBORG EXTREME® was determined at 1 and 28 days, on both prisms 40x40x160 mm (in accordance to EN 196-1) and cylinders Ø150x300 mm (in accordance to EN 12390-3). The results are found in table 2.

Table 2. Compressive strength at 1 and 28 days AALBORG EXTREME® Light 120

Dimensions of specimens (mm)	Compressive strength 1d (MPa)	Compressive strength 28d (MPa)
Prisms (40x40x160)	> 75	> 130
Cylinders (150x300)	> 75	> 120

FLEXURAL STRENGTH

Flexural strength was determined at 28 days on 50x50x500mm beams, according to EN 12390-5. Results are shown in Table 3.

Table 3. Flexural strength AALBORG EXTREME® Light 120

Curing time	Flexural strength (MPa)
28 days	> 14 MPa

ELASTIC MODULUS

Elastic modulus was determined at 28 days on Ø100/200 mm cylinder, according to EN 12390-13. Results are shown in Table 4.

Table 4. Modulus of elasticity AALBORG EXTREME® Light 120

Curing time	Modulus of elasticity (GPa)
28 days	51

DURABILITY INDICATORS

AALBORG EXTREME® Light 120 is based on limestone and calcined clay technology FUTURECEM®, developed at Group Research and Quality Center in Aalborg.

Due to the low water content and complex chemical reactions undergoing during the hydration of the cement and the pozzolanic constituents of the binder, the microstructure of the final material is very dense. This translates into outstanding properties in terms of durability.

Table 5 shows the main durability indicators measured on AALBORG EXTREME® Light 120.

Property	Standard	Value
Chloride content		< 0.09% to cement
Water soluble equivalent alkali content (Na ₂ O+0,658xK ₂ O)		< 3.4 Kg/m ³
Chloride migration	28 days 56 days	NT Build 492 0.35 x 10 ⁻¹² m ² /s 0.27 x 10 ⁻¹² m ² /s
Freeze-thaw resistance - Scaling	EN 12390-9	0.00 kg/m ²
Water absorption	EN 1015-18	< 0.02 Kg/ (m ² • min ^{0.5}) W:2

SHRINKAGE

Volume changes of concrete are the main reason for cracking formation, especially in high and ultra high performance concrete formulations. Hence, it is very important to quantify and control shrinkage and/or expansion of concrete at early and later ages.

A further development of the FUTURECEM™ binder technology applied to the mix design of AALBORG EXTREME® Light 120 translates into a shrinkage reduced material.

HYDRAULIC SHRINKAGE

Hydraulic shrinkage was measured on prisms 40x40x160mm after 28 and 90 days of casting, according to EN 12617. Results are shown in table 6.

Table 6. Hydraulic Shrinkage

Time	Hydraulic shrinkage
28 days	< 500 µm/m
90 days	< 600 µm/m

A thin section of AALBORG EXTREME® Light 120 has been prepared for microscope investigation. A thin section is a thin slice of concrete of 20µm which is fixed and placed between two glass plates. Hereby, light can be transmitted through the concrete and a view into the microstructure becomes possible. The concrete is impregnated with fluorescence dye – this enhance air voids and capillary porosity.

Hereby, it is possible to evaluate the micro structure in terms of micro cracking, water-cement ratio, homogenization of cement paste, adhesion of cement paste to aggregates, evaluate secondary reaction, degree of hydration, etc.

Three different light modes are applied (Fig1: normal transmission light, Fig2: crossed polarization light Fig 3: fluorescence light mode) are used for mineral identification, cement paste evaluation, etc.

AALBORG EXTREME® results into a very homogeneous concrete with very low water-cement ratio. No macro- or micro cracks are observed, and a good bonding to aggregates is achieved.



Fig 1: AALBORG EXTREME® in normal light mode at x100 magnification.

Aggregates are white areas whereas cement paste is darker-brownish areas.



Fig 2: AALBORG EXTREME® in crossed polars light mode at x100 magnification.

Dense cement paste with minor amount of portlandite (small sparkling minerals in cement matrix)

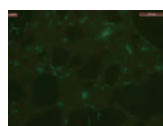


Fig 3: AALBORG EXTREME® in fluorescence light mode at x100 magnification. Dense and homogeneous cement paste and no micro cracking is observed

PIGMENTS

AALBORG EXTREME® is a practical and affordable material suitable for colored concrete to achieve the high architectural aesthetics. High purity and stable Aalborg White® cement is the key to all colored precast concrete elements.

Preliminary tests are always recommended to adjust the dosage of pigment and the fresh state properties of the material. Extra water can be added, up to the maximum amount of water stated in the Product Information Sheet.

RECOMMENDED MIX PROCEDURE WITH PIGMENTS:

1. Mix the dry mix together with the pigment (powder) for 30s.
2. Add the water and mix for 6 minutes.
3. Add the fibers and mix until total mixing time equal to 8 minutes



Cementir Group established a global innovation engine for white cement, InWhite, with the purpose of generating a prioritized and actionable pipeline of high potential customer value proposition global initiatives, bringing new solutions for well-known applications, or completely new applications for white cement-based products, aligned to megatrends detected in the society, such as customization, circular economy and high-energy efficient solutions.

The InWhite process benefits from the Group's global knowledge on both well-established and emerging applications for white cement and technical knowhow of its internationally acclaimed R&D center located at Aalborg, Denmark.

AALBORG INWHITE SOLUTION® has become the umbrella brand for commercialized high value adding and high-performing products, identified and developed under InWhite initiatives, that Cementir Holding will serve to the building industry.

For technical matters related to the product,
please address your request to:

Inwhitesolution@cementirholding.it

For commercial inquiries,
please find your nearest sales office of AALBORG WHITE® at

www.aalborgwhite.com

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