



ECOCON LIGHTWEIGHT CELLULAR CONCRETE

DECORATIVE CORNICES AND FRAMES

Lightweight cellular concrete decorative cornices and frames for decoration of facades, doors, windows and other architectural elements of the building

MATERIAL SUBMITTAL

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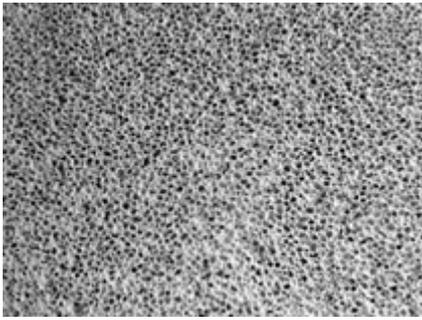
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¹ ECOCON Technologies F.Z.C. is a part of ECOCON Group of Companies



Non-autoclave lightweight cellular concrete is a new construction material which combines all advantage related to this type of construction products



During Big 5 Construction Exhibition in Dubai ECOCON was awarded with Gaya Award for the most innovative and ecological construction product

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1. Introduction

In accordance with latest trends in construction industry new innovative construction materials should be introduced to the UAE as well. Builders in the UAE can now use the unique concrete material that was already adopted in Russia and in many countries where the thermal insulation, durability and accessibility of construction materials are vital.

Non-autoclave aerated lightweight cellular concrete is an artificial building stone made with natural, non-organic raw materials. Ordinary cement and natural neutral filler (sand, stone dust, fly ash, etc.) are applied in production process.

The non-autoclave lightweight cellular concrete has been only recently introduced to the UAE. It can be produced in various forms such as: blocks, precast panels, decorative architectural units and construction mortar which can be used for lightweight cellular concrete production "in-situ" by simple watering and mixing processes.

Outstanding qualities of non-autoclave lightweight cellular concrete due to its porous structure and non-organic contents include: good thermal insulation, soundproofing, fire resistance, termite resistance and others.

During Big 5 Exhibition in Dubai non-autoclave aerated lightweight concrete (nanocrete) and related construction system were recognized as Gaya Award winner in cement category.

Keeping in mind that Gaya Award is the prize for the most ecological and innovative product in the Middle East and Africa, construction professionals in the UAE will be interested in using non-autoclave aerated concrete products in on-going projects.

1.1 Information about the Company

ECOCON Group was established in 2012. Today ECOCON activities cover all major areas of the construction business: production of building materials, construction of houses and buildings, scientific and technical studies and research in the field of construction technology. ECOCON Group of Companies currently consists of three companies: ECOCON Industries LLC, ECOCON General Contracting LLC and ECOCON Technologies FZC.

ECOCON Group is capable of solving a wide range of business tasks: from scientific and technical development to the development of building technology and practical application of innovative methods in construction. ECOCON team of experienced professionals has ambitious goals, such as commitment to green building, ecological and affordable construction. Today, the company's main goal is to develop a network of factories working on ECOCON technology around the world, because the demand for eco-friendly new materials and technologies, such as non-autoclave aerated lightweight cellular concrete technology is growing rapidly around the world.

ECOCON Industries LLC operates a plant, which produces non-autoclave aerated lightweight cellular concrete construction materials. The factory can be safely attributed to the most innovative and environmentally friendly manufacturing projects open recently in the Middle East.

The plant is designed to produce up to 6 000 MT of ECOCON brand dry mix and up to 4 500 m³ of ECOCON blocks and panels monthly. A yearly production capacity is more than 200 000 square housing meters,

Photo 1.1 First in the region plant producing ECOCON products is located in Al Ghail Industrial Area (Ras Al Khaimah, UAE)



ECOCON Dry Mix



ECOCON Masonry Units



ECOCON panel



Installation of ECOCON Panel

consisting of a full range of materials for the construction of structural elements and finishes, including floor, roof, dry mix and a universal adhesive, which can be ideally used for tiling. ECOCON plant is a fully automated production facility, which is not hazardous to human health or the environment and its waste is fully recycled.

The plant is located in Al Gail Industrial Area in Ras Al Khaimah, UAE (Photo 1.1). It is the fourth one built by ECOCON Group of Companies.

1.2 ECOCON Technology and ECOCON Products definitions

“**ECOCON Technology**” is the complex of inventions, innovations, technical documents, technological solutions, descriptions, methodologies and researches related to production and application of non-autoclave aerated lightweight cellular concrete in plant conditions and “in-situ”.

Non-autoclave aerated lightweight cellular concrete produced in accordance with **ECOCON Technology** is called “**ECOCON Nanocrete**”.

“**ECOCON Technological Process**” is a specially designed and adjusted milling process (mechanical activation of cement and sand), where the mixture particles are modified and activated on a nano-dimensional level. The process incorporates also automated weighting, dosing and transporting equipment, monitoring and control system, optional and auxiliary tools and equipment.

ECOCON Nanocrete is produced as dry mortar (powder form) which can be packed into bags and applied “in-situ” by simple mixing with water or transported to block production line, where it is mixed with water, cured and cut into blocks or panels inside industrial facility. The handicraft production of blocks is also possible in the rural areas where setting up of industrial facility is impossible or non-feasible. The wooden or steel dismountable moulds should be produced in order to organize handicraft blocks production.

ECOCON Nanocrete being a very workable easy-to-form material can be used for producing decorative elements of the building.

“**ECOCON Decorative Cornices**” or “**ECOCON Decorative Windows and Doors Frames**” are decorative elements of the building made with **ECOCON Nanocrete lightweight cellular concrete** by processing the material with figured horizontal cutting machine

Dry Mix composition (dry mortar), which is specially processed at ECOCON plant and used for preparation of **ECOCON Nanocrete lightweight cellular concrete** to be referred to “**ECOCON Nanocrete Dry Mix**” or “**Basic Mix**”.

ECOCON blocks which have dimensions corresponding to standard masonry units and dry density from 500 kg/m³ to be referred to



ECOCON Cornices



Cornices are ready to paint

Main Idea of ECOCON Cornices

- *Made with ECOCON Nanocrete*
- *Lightweight*
- *Easy to fix*
- *Fast*
- *Cheaper than competitors*
- *Can be produced any Shape*

“ECOCON Nanocrete Masonry Units”.

All other ECOCON blocks to be referred to **“ECOCON Partitioning Panels”**.

ECOCON blocks produced with dimensions, which have dimensions corresponding to standard filler (hordy) blocks to be referred to **ECOCON Filler (Hordy) Block**.

ECOCON blocks, which have one of, dimension less than 100 mm and dry density from 200 kg/m³ to 400 kg/m³ to be referred to **“ECOCON Thermal Façade Panels”**.

“ECOCON Thermal Façade Panels” are used for thermal insulation of facades, concrete and steel structures.

Construction Dry Mortars such as adhesives, putties, grouts, plasters and others that are manufactured with application of ECOCON Technological Process to be referred to **ECOCON Construction Dry Mortars**.

ECOCON Technological Process allows production of different lightweight cellular concrete construction materials, which are in high demand in the modern construction.

They are:

- ECOCON Nanocrete Dry Mix
- ECOCON Nanocrete Masonry Units
- ECOCON Nanocrete Partitioning Panels
- ECOCON Nanocrete Façade Thermal Panels
- ECOCON Nanocrete Façade Decorative Panels
- ECOCON Nanocrete Decorative Cornices
- ECOCON Nanocrete Construction Dry Mortar (Adhesives, Grouts, Putties, etc.)

“ECOCON Construction System” is the innovative way of building construction and part of **ECOCON Technology**. The core of **ECOCON Construction System** is combination of Light Gauge Steel (LGS) frame with **ECOCON Nanocrete** that is applied in a dual way: 1) as shattering panels fixed to LGS frame from both sides with self-tapping screws and 2) as filling material which is used for filling the gap between two panels.

1.3 ECOCON Decorative Cornices Production Process

The production of panels is based on:

- 1) Producing ECOCON Nanocrete Dry Mix
- 2) Mixing ECOCON Nanocrete Dry Mix with water, chemicals and Cell Generating Powder (CGP) in special mixing device;
- 3) Molding ECOCON Nanocrete massif;
- 4) Cutting massif in special automatic cutting complex into pre-sized blocks
- 5) Curing blocks in three stages at natural conditions and
- 6) Processing the block with figured horizontal cutting machine

From silo the dry mix is delivered to weight batch hopper for dosing. From weight batch hopper it is delivered to "wet" (liquid) mixer, which is suitable for mixing materials of light foamy consistency. Water is delivered to wet mixer from the water tank, which is equipped with water dosing pump and flow meter. Solution with chemicals is delivered to "wet" mixer from the chemicals tank, which is equipped with water dosing pump and flow meter

Cell Generating Powder (CGP) is delivered to the wet mixer at 5 minutes after start of mixing from CGP hopper, which is equipped with piston discharge system. Operator places fiber to wet mixer manually when and where technologist defines this.

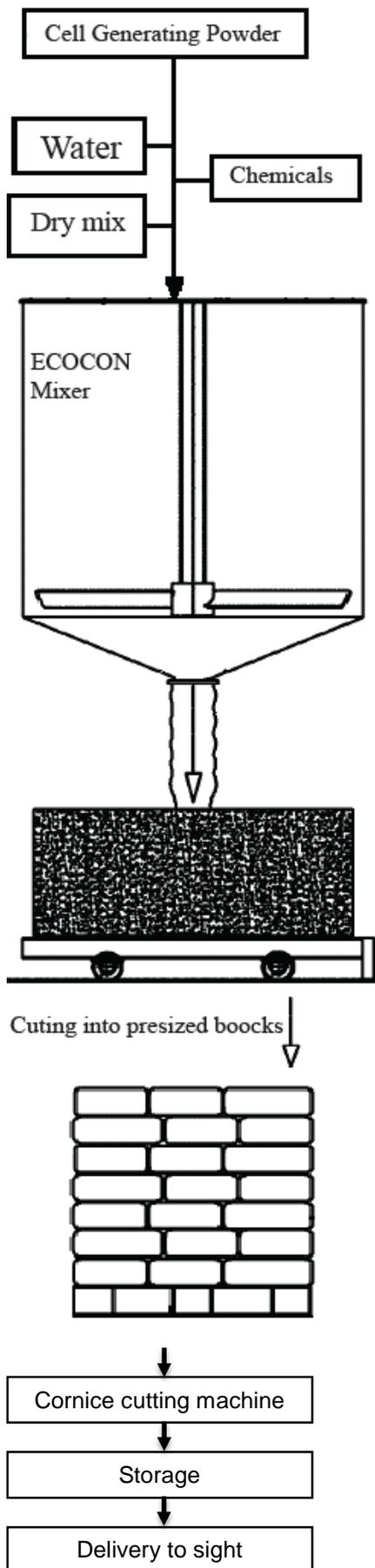
The mixture after mixing is discharged into the assembled mould installed on a movable trolley. When the discharge flow from wet mixer is over, the trolley with mould is moved to the vibration table where the process of aeration starts. While the process of aeration is ongoing, the operator switches on the vibration table each ten minutes in order to achieve better results for aeration process.

After accomplishing of aeration process, the trolley with mould is moved automatically to the initial curing section, where the trolley with mould stays for 3-6 hours (achieving stripping strength).

After staying in the initial curing chamber for 3-6 hours (depending on temperature conditions), the trolley is transported to cutting section where the side parts of the mould are removed with lifting manipulator and the trolley with nanocrete massif is automatically transported to primary cutting machine of the cutting complex. After removing mould, walls are cleaned, lubricated and moved for installation on new trolley.

After passing the primary cutting machine, cutting top and bottom surfaces of the massif, the trolley with massif is transported and positioned at main cutting machine of the cutting complex with the help of positioning transporters. The main cutting machine includes horizontal contour band module and coordinating-transporting unit. All mechanisms have variable-frequency electric drive. Cutting complex is equipped with convenient and easy-to-operate control panel. Necessary dimensions of cut (block's dimensions) are set on electronic panel of operator. None of additional operations for machine changeover for new sizes are necessary. The display on the operator panel shows the analysis of machine works in real-time mode. Manual control is provided for complex adjustment and for working in semi-automatic mode. Positioning and transporting of the massif take place on the coordinating table of the machine.

After passing the cutting complex, the trolley with massif is moved to the secondary curing area, where it will remain until the strength of massif allows panels removal from the trolley. Usually the secondary curing process lasts for 20 – 24 hours. Blocks are manually transferred to



Note

- After primary cutting coming secondary curing process
- blocks pass through the horizontally set figured rotating knife
- Ready done cornices are delivered to the sight

ECOCON Decorative Cornices and Window (Door) Frames combine elegant appearance with low weight, excessive durability and relatively high strength.



Photo 2.1: Different ECOCON Decorative Cornices and Window (Door) Frames installed at the villa project in Dubai (Location: The Central Development; Contractor: Conforce; Consultant: Em Square Engineering Consultancy)

pallets and wrapped with PU film. The pallet with blocks then is transported to final curing (storage) area, remaining for 2-3 weeks before being sent to decorative cornices cutting machine. The empty trolley is transported to the molding section. Mould walls, cleaned and oiled, are joined with a trolley then the completely assembled mould is moved to wet mixer for filling.

All movements of trolleys are controlled in semi-automatic mode (operator controls the movement when and where it is necessary with the help of special control units with buttons).

After arriving to the decorative cornices cutting machine, blocks pass through the horizontally set figured rotating knife. The machine has electric or manual-moving drive, which allows block passing through machine with speed adjusted in accordance with cornice dimensions or/and density. Steel stoppers prevent block from going to side and ensuring the exact dimensions of the sample.

The processing of cornices with high density (more than 500 kg/m³) requires systematic check up and replacement (if necessary) of the saw blade. Low-density cornices can be produced with one blade, which should be replaced after producing 350 m of cornices.

2. ECOCON Lightweight Cellular Concrete Decorative Cornices and Window (Door) Frames Technical Specifications

2.1 ECOCON Decorative Cornices and Window (Door) Frames Visual Parameters

Appearance: ECOCON Decorative Cornices and Window (Door) Frames have a medium textured surface of natural cement grey color. Each product type is supplied in wooden pallet. ECOCON Decorative Cornices and Window (Door) Frames combine elegant appearance with low weight, excessive durability and relatively high strength. ECOCON Nanocrete lightweight concrete is completely non-combustible material and does not produce smoke fumes or flame in case of open fire.

Work size: The size of ECOCON Decorative Cornices and Window (Door) Frames specified for manufacture, to which its actual size should conform within specified permissible deviations. The purchaser shall specify the work size. The height, width and length of each decorative unit are referred to "Main Dimensions". Other sizes are to be referred to "Other Dimensions" (See Pic. 2.1).

Table 1 gives tolerances of the Main Dimensions of decorative units in accordance with working sizes.

Table 1

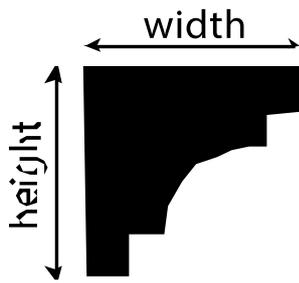
Main Dimensions	Working sizes (mm)			Notes
	1...100	100 450	450 and more	
Width	1	1	1	
Height	1	1	1	
Length	2	2	2	

When measured in the manner described in BS EN 772-16, the tolerances in length, height or thickness of each panel from the sample shall not exceed the limits shown in Table 1.

2.2 Mechanical properties of ECOCON Decorative Cornices and Frame

The mechanical properties of ECOCON Decorative Cornices and Frames depend upon the dry density of material.

The ranges of various mechanical properties are summarized in Table 2 for ECOCON Lightweight Concrete formulations subjected to a satisfactory curing regime and tested at 28 days.



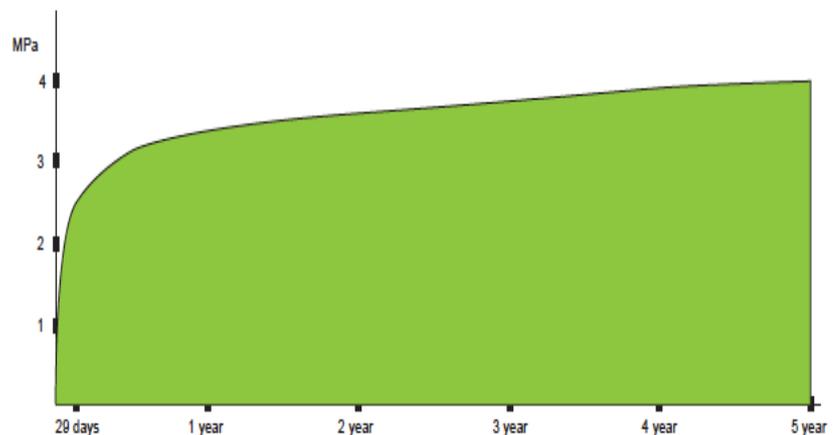
Pic. 2.1 The height, width and length of each decorative unit are referred to "Main Dimensions". Other sizes are to be referred to "Other Dimensions".

Table 2

Dry density (kg/m ³)	400	500
Compressive Strength (MPa)	1.5 – 2.0	2.0 – 2.5
Elastic modulus (GPa)	0.6-0.8	1.0-1.4
Impact strength (kJ/m ²)	10	12
Drying Shrinkage (mm/m)	0.5 - 1	0.5 - 1

2.3 Advantages

Durability: ECOCON Decorative Cornices and Frames are durable materials that are not affected by distraction, and resist atmosphere impact, UV-rays, arid in distinction to other materials; they improve physics and technical characteristics with time flow. ECOCON Lightweight Cellular Concrete products are not affected by harsh climatic conditions and will not degrade under normal atmospheric conditions (Graph 2.2). Due to inactive, non-organic contents ECOCON Lightweight Cellular Concrete does not interact with water and doesn't change its properties (strength, durability) in wet and high moisture conditions.



Graph 2.2 The strength of non-autoclave aerated concrete increases 30-80% between 28 days and 6 months, and marginally beyond this period

Workability: ECOCON are made with non-organic cement materials and can be plastered with cement-based plaster. Cornices and frames can be easily drilled, cut, adjusted with common instruments such saw, drill, etc.

Light Weight: ECOCON Lightweight Cellular Concrete weight is 4 times less than common concrete or GRC structure. This gives opportunity to arrange easy fixing, reduce the total weight of building and reduce the cost of loading - unloading works.

Accuracy: The accurate manufacturing process ensures that ECOCON Aerated Concrete panels and blocks are always produced to size as they leave the factory. This results in less on-site trimming and reduced quantities of mortar and finishing materials use

Biological Stability: Fungus, mustiness, insects and microorganism do not affect ECOCON Lightweight Cellular Concrete.

Fire Resistance: ECOCON Lightweight Cellular Concrete provides full fire resistance and even fire protection. It doesn't catch fire under any circumstances, does not become hot even contacting the open flame.

Eco-friendless: As far as ecology is concerned, the material is the second after the wood, but it does not rot and get aged.



Recommended uses: ECOCON Cornices & Frames are used outside and inside buildings as decorative finishing items.

ECOCON products are not classified as dangerous according to CHIP.



Stable product with no known adverse environmental effects.

List of References

Publications referred to

BS 12 Specification for Portland cement
BS 1881: Part 124 Method for analysis of hardened concrete
BS 6073: Part 1 Specification for precast concrete masonry units
BS 6073: Part 2 Method for specifying precast concrete masonry units
BS EN 772-16 Determination of dimensions
BS EN 1008 Mixing water for concrete
GOST 25485-89 Government Standard of Russian Federation "Cel Concrete Specifications" dated by 1/01/1990

GSO EN 771-4:2008 (E) Specification for masonry units – Part 4

3. Health & Safety

3.1 Identification of substances / preparation and company

ECOCON Decorative Cornices & Frames
ECOCON Glue UA type

Supplier ECOCON Industries L.L.C.
Plots 180, 181, 182, Al Ghail Industrial Area,
Ras Al Khaimah, UAE

Telephone +971 7 2216007

Recommended uses: ECOCON Cornices & Frames are used outside and inside buildings as decorative finishing items.

3.2 Composition / Information on ingredients

General composition of cornices: cement, construction sand, polypropylene (basalt) fiber, non-substantial amount of aluminum oxide.

3.3 Hazards identification

ECOCON products are **not** classified as dangerous according to CHIP. THE MOST IMPORTANT HAZARD IS:
Dust from sawing or sanding may irritate the respiratory system, skin and eyes.

3.4 First aid and measures

<u>Eye contact</u>	Wash eyes with clean water
<u>Skin contact</u>	Wash thoroughly with soap and water.
<u>Ingestion</u>	DO NOT INDUCE VOMITING. Rinse out mouth thoroughly and give plenty of water.
<u>Inhalation</u>	If irritation occurs, remove person to fresh air.
<u>General</u>	Get medical attention if any symptoms persist.

3.5 Fire fighting measures

The product does not pose a fire hazard. However, some packaging materials (stretch film, wooden pallets) may burn.
Suitable extinguishing media – water, foam, carbon dioxide or dry powder.

3.6 Ecological information

Stable product with no known adverse environmental effects.

4. Combustibility

ECOCON Thermal Façade Panel is a non-combustible material because it neither burns nor gives off flammable vapors in sufficient quantity for self-ignition when heated to approximately 750°C, this being determined in accordance with the Fire Test Procedures Code.