

Business Offer

GROWING AERATED CONCRETE

The Group of Companies ALTUM offers non-autoclaved, energy efficient, fire-safe, environmentally friendly, waterproof and durable lightweight concrete RGB/GAC (Growing Porous Aerated Concrete).

In 1998, we developed a technology for the manufacture of non-autoclaved, energy-efficient, fire-safe, durable, waterproof and environmentally friendly Growing Porous Aerated Concrete (RGB/GAC). To manufacture Growing Porous Aerated Concrete, unique portable equipment was developed. Both the pore-forming mix for the manufacture of Aerated Concrete and the technology are patented and have no analogue in the world. The concrete is “breathing”, as it takes moisture in humid conditions and gives it back when it is hot, its frost resistance making up 200 cycles.

It is an ideal building material for construction in Africa.

1. Comfortable dwelling place with no necessity of air-conditioning
2. Use of local raw materials
3. No need to use lifting devices
4. No need to train operators, with just one manufacturing technician being enough

Range of Manufacture

1. Aerated concrete blocks, both standard (600x300x200 mm) and any large-format size (1,000x2,000x400), supplied with ready-made façade decoration, which do not require any external protection and additional heat insulation.
2. Monolithic energy efficient and environmentally friendly housing, up to 3 storeys self-supporting. In case of frame construction, there are no restrictions as to the number of storeys, with savings in heating and air conditioning of 50% and more. No heavy construction equipment is required.
3. Façade decoration, heat insulation and noise protection slabs for repair or installation of the décor-façade and heat insulation of façades, basements and foundations instead of materials hazardous to health, such as short-lived, fire hazardous polystyrene and mineral slabs. For energy efficient total housing renovation
4. Fencing blocks

5. Heat-insulated, aerated concrete, waterproof, noise-, moisture- and heat-protective subfloors
6. Heat-insulated, monolithic, waterproof roofing with a 30-year warranty
7. Repair and insulation of façades using both decor-façade heat-insulating slabs and removable formwork with the restoration of bearing capacity of buildings and walls of the “dilapidated housing”
8. Housing and utility services: repair of worn-out housing stock. Restoration of bearing capacity of the destroyed façade stone, basements, foundations and cellars
9. Manufacture of one layer Large Wall Panels with ready-made decor-façade for Frame-Panel Housing Construction instead of multi-layer ones
10. Construction and repair of industrial facilities, heat insulation and heat resistance strengthening of roofs and façades, strengthening of foundations
11. Individual Monolithic Housing Construction with a guarantee of prolongation of residents’ life: “green construction” without chemical heat insulation materials and significant, from 50%, savings on heating and air conditioning
12. In case of frame monolithic housing construction, it is effective as cast-in-place aggregate in removable or non-removable formwork with a metal or wooden frame. This technology is especially effective in energy efficient and economical housing construction.
13. Heat-insulated swimming pools of any form
14. Sarcophaguses to bury hazardous, harmful and radioactive waste
15. Vegetable storages: ideal material for storing vegetable products with self-sustaining microclimate
16. Construction of a full cycle of energy efficient farms and poultry factories: walls, alkali-resistant floors, heat-insulated roofs, with no need for repair for 30 years
17. Restoration (reconstruction) of cultural heritage objects: walls, foundations and bearing capacity of ancient historic landmarks, restoration of façades, strengthening of foundations, with work experience at the request of UNESCO in Bulgaria
18. 3-D printer construction application development
19. Construction of buildings and hotels on water in the form of landing stages.

* Growing Porous Aerated Concrete (RGB/GAC) technology is provided with intellectual property protection in the form of Patents.

The use of only one type of raw materials reduces the scope of delivery of various building materials without the use of heavy construction equipment. The construction of dwelling houses and industrial premises by way of casting-in-place permits to make buildings of various architectural forms using various formwork, etc. Foundations, walls, ceilings, heat-insulated floors, durable roofs – all from Growing Porous Aerated Concrete (RGB/GAC) with different characteristics. The result is a thermos house, which helps significantly reduce construction costs and operating costs. The house turns out to be very warm, with a significant reduction in operating costs of heating. The cost price of such a monolithic house, the “box”, is several times cheaper than the cost price of a house made from other materials, which excludes finishing and insulation work costs. Heating savings of up to 100%.

Advantages

The RGB technology is considerably superior in terms of parameters in comparison with use of other materials

- ✓ Heat and frost resistance of more than 200 cycles
- ✓ Water absorption of only 4.95%
- ✓ Durability from 25 to 120 kg/cm²
- ✓ Wide range of specific weight from 400 to 1,200 kg/m³
- ✓ Achieved due to a pronounced growing effect is an up to 100% increase in volume, a homogeneous concrete structure, a high level of insulation of floors and walls and their durability
- ✓ Capable of restoring the bearing capacity of the destroyed façade and wall stone
- ✓ Possibility of manufacturing customized items of any desired size, as well as decorative façade slabs with various patterns and good heat insulation.

The company YTONG, which supplied 58 autoclaved aerated concrete block manufacturing plants worldwide, does not recommend to build anything from its autoclaved aerated concrete blocks nearer than 70 km from the seas and humid climate due to the presence of lime in the mass and superimposed pores which remain unclosed during pore formation. This is our territory!

This universal technology permits, due to the mobility of equipment, its low weight and low energy consumption (not more than 6 kW), to manufacture various customized unit products, also right on the construction site, using such products in the building being constructed.

- ✓ The manufacture of shaped heat insulating slabs used as permanent formwork is of high efficiency. Such buildings acquire a bright and unique look
- ✓ Any façade paints may be used for painting
- ✓ Self-supporting construction of buildings of up to 3 storey-high. The number of storeys is not limited in case of frame construction

- ✓ Growing Porous Aerated Concrete (RGB/GAC) is environmentally safe due to environmental friendliness and safety of its components for humans, which is confirmed by the Environmental Certificate.

References

The RGB technology was used, in particular, in the following cases:

- ✓ The construction of the RF Interior Ministry building in Moscow
- ✓ The construction of car showrooms in Yekaterinburg
- ✓ The construction of dwelling high-rises in St. Petersburg
- ✓ The construction and repairs of buildings in Ukraine, Kazakhstan, the Dominican Republic, Israel, Turkey, the UAE and Bulgaria
- ✓ During the construction of the Vostochny cosmodrome in Ugleorsk.

There are a number of good references regarding the use of the technology from:

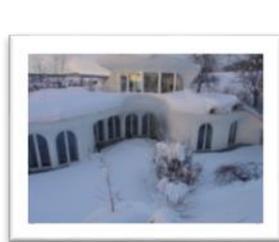
- ✓ the Russian Orthodox Church of the Moscow Patriarchate, Yekaterinburg Diocese
- ✓ owners of dwelling houses in Yekaterinburg, at 2 and 4 Rizhsky Lane
- ✓ OOO Construction Company “XXI Vek”, Yekaterinburg
- ✓ the Construction Firm – RILA, EOOD, a Sole Founder LLC, Kyustendil, Bulgaria
- ✓ the International Construction Company SIMEID, Sofia, Bulgaria
- ✓ Moscow State Humanitarian Institute – Boarding School, Moscow
- ✓ the Committee for Defense and Military-Industrial Complex, St. Petersburg
- ✓ Ekibastuz Science and Technology Center of the Local Administration’s Economics and Budget Planning Department, a Municipal State-Owned Enterprise, Ekibastuz, Kazakhstan
- ✓ OOO Industrial and Financial Company EFFECT, Cherepovets, Vologda region.

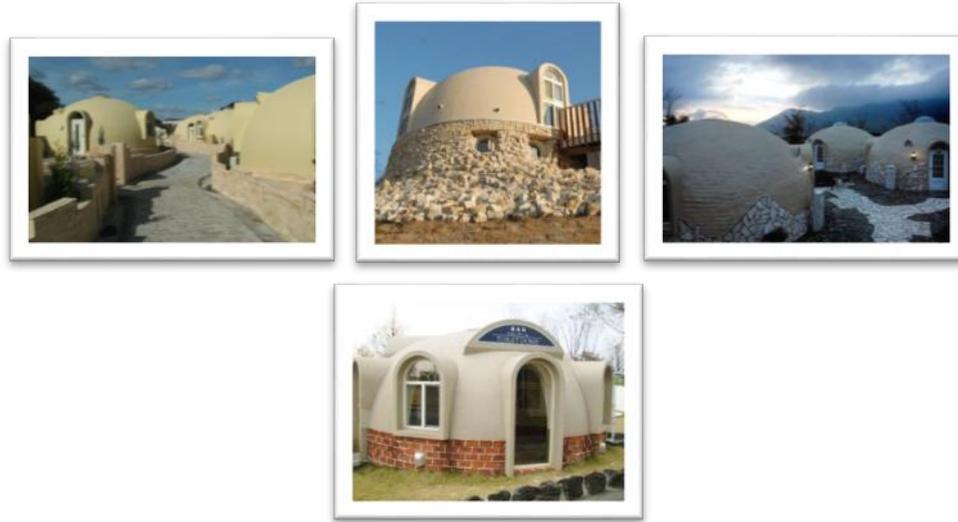
Monolithic Construction of Buildings

Foundations, walls, floors, ceilings, roofs – all from Growing Porous Aerated Concrete with different characteristics, and the result is a thermos house. This significantly reduces construction costs and operating costs.

The construction of dwelling buildings and industrial premises using the monolithic construction method permits to obtain buildings of various architectural forms using various formwork, wood, stone, etc. The house turns out to be very warm like a thermos, with the operating costs of heating such a house significantly reduced. The prime cost of such a monolithic house, the “box”, is several times cheaper than that of a house made from bricks and autoclaved aerated concrete blocks, with no need for heavy finishing work expenses.

Monolithic Buildings on the Basis of RGB Technology for Different Architectural Solutions





Heat-Insulated Hermetically Sealed Floors

Growing Porous Aerated Concrete (RGB/GAC) is widely used as screed coat for heat insulation, sound insulation and waterproofing of floors, basement ceilings and roofs.

Restoration of Bearing Capacity and Heat Insulation of Walls

The cement mortar penetrates into the destroyed façade stone, walls or wood, and, growing in volume, fills all cavities, thus restoring walls, foundations and façades.

Durable Heat-Insulated Roofs

Due to the pronounced growing effect and homogeneous structure of concrete, excellent insulation of roofs and walls, as well as their durability, is achieved. The service life of such roofing is 30 years without repair.

Customized Unit Pieces

Customized pieces of any desired size may be manufactured, as well as decorative façade slabs with various patterns and good heat insulation.

Due to the mobility of equipment, its low weight and low energy consumption (not more than 6 kW), this technology permits to manufacture various customized products, also right on the construction site, using these products for that particular construction. The manufacture of shaped heat-insulated slabs used as permanent formwork is of high efficiency. Such buildings acquire a bright and unique look. Any façade paints may be used for painting, though mineral paints are strongly recommended, as they “breathe” just like Growing Porous Aerated Concrete (RGB/GAC).



Growing Porous Aerated Concrete Technology

The following is included in the delivery package: manufacturing equipment and dry pore-forming mixes. We carry out engineering supervision, in-situ and distance practical training in working with this technology.



Twin-shaft SKD-1.0: for the manufacture of non-autoclaved cast-in-place waterproof aerated concrete. Intended mainly for:

- ✓ preparation of liquid cement-sand mortar (“creamy mass”). Uniform and high-quality mixing in this mortar of the dry pore-forming mix SPS-1 for a limited period of time, in terms of 1 min (nominal time), which will subsequently affect the process of volume growth of the material (approximately 2 times), uniformity of growth throughout the volume and uniformity of distribution of pores (with a diameter of about 2 mm throughout the entire mass).
- ✓ Twin-shaft cavitation mixer, with a 1 cub m tank capacity SKD-1.0 (the volume of equipment is rated for final products).

Contents of Delivery Package

The delivery package includes the following components:

- ✓ Motor AIP 100S4 2 pcs
- ✓ Driven shaft, ready-assembled 2 pcs
- ✓ Discharge hose, D=110 mm, L=2 m 2 pcs
- ✓ Clamp, D=100-140 mm 1 pc
- ✓ Manufacturer’s Specification 1 pc

Spare parts and accessories are kitted up separately based on a prior request and include:

- ✓ Bearing 80205/180205 GOST 1002-90 4 pcs

- ✓ Discharge hose, D=110 mm, L=2 m 2 pcs
- ✓ Shaft, ready-assembled 1 pc
- ✓ Clamp, D=100-140 mm 1 pc
- ✓ Set of wrench spanners (8-22) 1 pc
- ✓ Tape ruler 1 pc
- ✓ Hammer 1 pc
- ✓ V-belt 1500-A GOST
- ✓ Set of screw-drivers 1 pc
- ✓ Instruction Manual 1 pc
- ✓ Package of specification documents for the material 1 pc

Technical Data

Basic technical data of the plant for manufacture of non-autoclaved, cast-in-place, waterproof Growing Porous Aerated Delta-Concrete

No.	Description	Value	Note
1	Dimensions (mm): ➤ length ➤ width ➤ height	2000 750 1500	V=1.0m ³
2	Productivity (m ³ /shift)	up to 24.0	
3	Power consumption (kW)	6.0	
4	Shaft speed (rpm)	600-700	
5	Plant volume (m ³)*	0.5	
6	Current protection (A)	16	
7	Mass (kg)	150	

* The plant volume is rated for finished products

The ready cement-sand mortar is fed from the plant to the pouring site (previously designated segment or into the mold) by means of drain hoses joined at a distance of 2, 4, 6 meters.

List of Equipment for Manufacture of Growing Porous Aerated Concrete (RGB/GAC)

No.	Plant Volume, [m ³]	Dimensions, [m] L x W x H	Power Consumption, [kW]	Production Capacity, up to [m ³ /shift]	Weight, [kg]
1	CK-0.5+ spare parts and accessories (220V)	2.2*0.75*15	2.2	12.0	147.0
3	CKD-1.0+ spare parts and accessories (380V)	2.2*0.75*1.5	6.0	24.0	195.5

CK – cavitation mixer

CKD – twin-shaft cavitation mixer

DIRECTIONS FOR USE OF PORE-FORMER DRY MIX

The dry mix of pore-forming agent is designed to form aerated concrete with a porous structure of pumice type. Changing the ratio of the components, it is possible to vary the density of the resulting aerated concrete within a wide range, i.e. to obtain a material that can be used as structural (900-1600 kg/cubic meter density), structural and heat-insulating (600-900 kg/cubic meter density) or heat-insulating (400-600 kg/cubic meter density).

The quality of aerated concrete is largely determined by the specifics of local conditions.

However, to date, technological methods have been developed and special additives selected that permit to effectively regulate the following processes:

- **setting**, when the concrete mass acquires sufficient viscosity and strength for the emerging bubbles not to leave the material,
- **maturation**, when the material acquires the necessary strength to maintain the shape of the product,
- and **strength gain**, when aerated concrete acquires the required performance characteristics.
- At the first stage of testing the pore-forming agent, it is recommended to use a 0.25m³ to 1.0m³ mixer.

Sequence of Operations:

Prepare:

raw materials (cement, sand, water and pore-forming agent) and a mold for casting a block or solid mass from aerated concrete, class III (Portland Cement) 500 Д 0 GOST 10178-85 cement (with preliminary check for aeration),

not more than 2 mm-fine sand with a high quartz content (the content of silt and clay particles not more than 6%),

process water (ordinary water may be used after testing).

The required ratio of the components (by mass) is used in accordance with the map of components composition.

To begin with, take 1 kg of PC per 15 g of dry pore-forming mix (cement analysis).

The volume of the mold (in liters) must be at least twice the mass of the solid components.

The height of the mold should not exceed 30 cm.

The mixer is filled with up to 260 liters of water. After starting the mixer, cement is evenly poured into it. Mixing lasts for 10-15 minutes, until the mass reaches creamy consistency.

The pore-former is then introduced, and the mass is mixed for another 30-60 seconds.

The mold is cleaned and lubricated with used oil or special anti-adhesion liquid. The finished mass is poured into the mold. Its surface is leveled with a spatula, after which the mold is covered with a damp cloth. Bloating stops after about 2 hours. The upper uneven layer is cut off or rolled.

TECHNICAL AND ECONOMIC CALCULATIONS for Manufacture of Non-autoclaved Blocks

Purpose of work: creation and feasibility study of industrial production of non-autoclaved heat-insulating and structural-heat-insulating aerated concrete.

Characteristics of Manufactured Products

Aerated concrete blocks are intended for laying external and internal walls and partitions in up to 3-storey-high buildings (cottages, manor houses, farm complexes, industrial premises, offices, shops, warm storages, etc.). The main block type has a size of 600 x 200 x 300 (manufacture in other sizes is also possible).

Weight from 15 to 23 kg, depending on density.

One block replaces 8 to 13 wall bricks.

The heat transmission resistance of the wall, depending on the volumetric mass of blocks and its thickness, ranges from 1.2 to 2.5 sq m * degrees/hr (for comparison, a brick wall with a thickness of 640 mm has a heat transmission resistance of 1.1 sq m * degrees/hr).

Blocks manufactured using this technology are not destroyed when tested for frost resistance, with the laboratory test of 75 cycles (winter-summer) and estimated number of cycles 200.

Physical and Mechanical Indicators of Growing Aerated Concrete (RGB/GAC)

No.	Indicator	U.M.	Heat Insul.	Structural-Heat-Insul.	Structur.
1	Dry volume weight	kg/cub m	400-600	600-800	1350
2	Compressive strength in 28 days	kg/sq cm	10-25	30-50	250
3.	Thermal conductivity	ccal/m*hr*g	0.09-0.17	0.17-0.23	0.3
4.	Heat transmission resistance across the wall 200 mm 350 mm	ccal/sq m*hr*degrees		3.24 2.55	0.71-0.95 0.43-0.58
5.	Acoustic characteristics for the wall 200 mm 350 mm	dB	35-37 43-45	40-42 47-49	57 58
6.	Vapor permeabilty	mg/m*hr*Pa	0.2-0.3	0.17-0.23	0.7
7.	Contraction after 90 days	%	0.01	0.03	0.015
8.	Fire-resistance capability	min	120	120	---
9.	Water absoption	%	0.5	0.5	0.2

Technical and Economic Indices of Manufacture

Consumption of Main Materials per 1 cub m

- cement M 500, kg – 400-650
- sand, sawdust, quarry waste, kg – 400-650
- dry pore-forming mix SPS, kg – 5 (3.5)
- water, L – 280-330

Components Composition

Calculated based on 1 cub m of finished growing aerated concrete

№	Materials	500 kg/m ³	600 kg/m ³	800 kg/m ³	1200 kg/m ³
1	Cement, kg	250	300	500	600
2	Sand, kg	250	300	300	600
3	Water, L	220-280	220-280 (not more than 400)	Not more than 600	Not more than 800
4	Recommended mortar temperature, °C	25-30	10-30	10-30	10-30
5	Dry mix, kg	5 (3.5)*	5 (3.5)*	5 (3.5)*	5 (3.5)*
6	Cement-water mixing time, min	5-15	5-15	5-15	5-15
7	Time of mixing with dry mix, sec	15-60	15-60	15-60	15-60

* Quantity depends on softness of water and quality of cement

When making a material using sand, it is necessary to take into account its moisture content. Based on this, amendments to the tables may be made in terms of quantity of water used (the main reference point is solution consistency, which should be similar to “liquid sour cream”). It is recommended to use up to 40% of sand for the manufacture of a material with a specific weight of 400 kg/m³, followed by a slight change in the physical-mechanical and thermal characteristics.

When a material with a higher specific weight (600 and more) is obtained, the mortar viscosity increases accordingly.

Definitions:

- **setting:** when the concrete mass acquires sufficient viscosity and strength for the emerging bubbles not to leave the material,
- **maturation:** when the material acquires the necessary strength to maintain the shape of the product,
- **strength gain:** when the material acquires the required performance characteristics. The dry pore-forming mix is intended for forming aerated concrete with a porous structure.

Changing the ratio of the components and the water-solid state, it is possible to vary the density of the resulting aerated concrete within a wide range:

- with a density of 400-600 kg/m³ – heat-insulating
- with a density of 600-900 kg/m³ – heat-insulating and structural
- with a density of 900-1,600 kg/m³ – structural and thermal insulating

Quality is determined by the quality of raw materials (cement, water – soft, hard)

Materials used:

Water – drinking water, the use of process water is possible after a preliminary check

Cement – grade III (PC) 500 Д-0, the use of other grades is possible after a preliminary check as per GOST 10178-85

Sand – river, quarry, sea, without clay inclusions. Fraction of no more than 2 mm with a test batch.

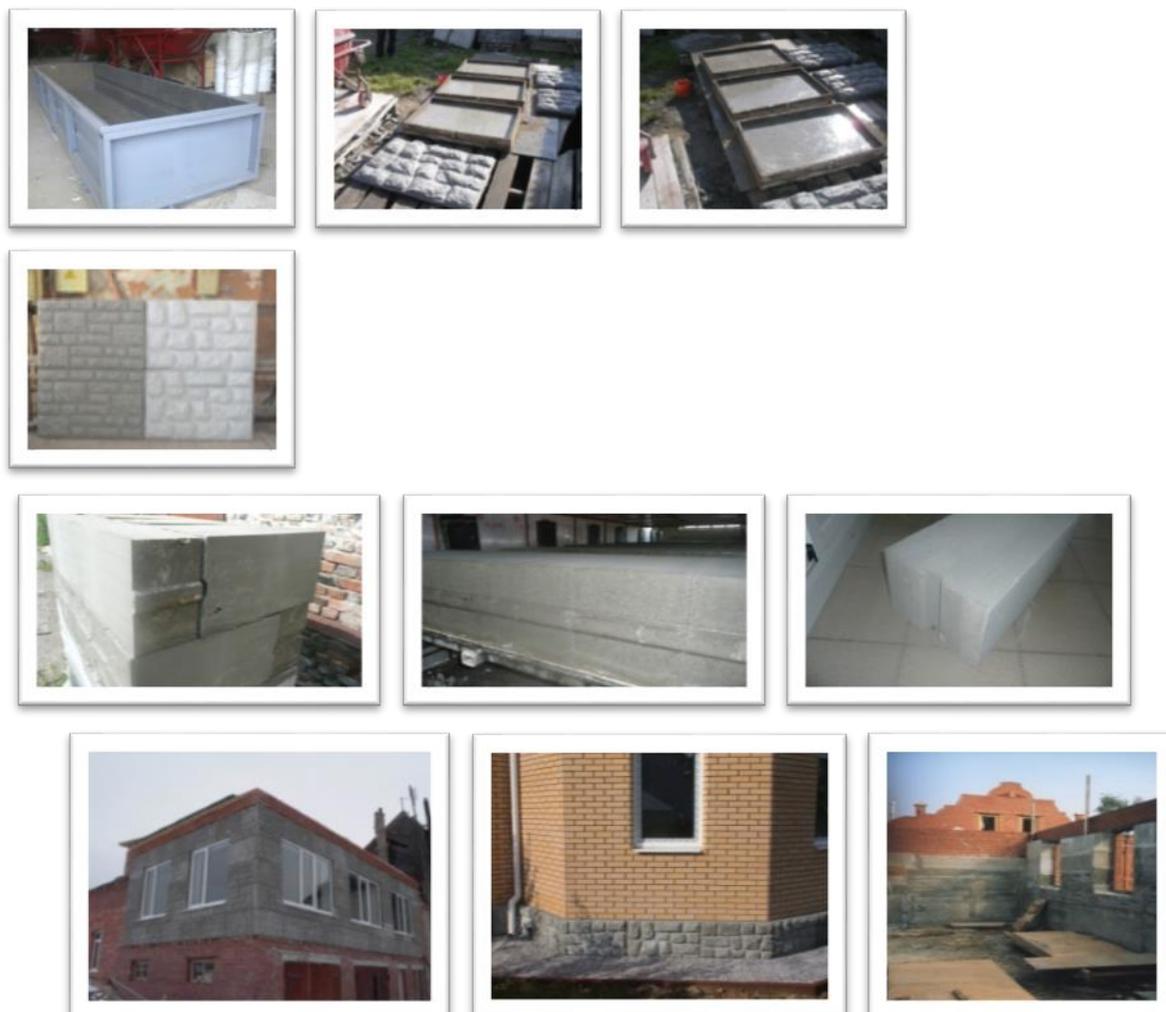
Dry Mix for Manufacture of Non-Autoclaved Site-Cast Growing Porous Aerated Concrete

No.	Package Net Weight, [kg]	Mix Brand
1	20.0	SPS-1
2	20.0	SS-1 Monolith

To make 1 m³ of material, 3.5-5 kg of dry pore-forming mix is required.

SPS-1 – Dry pore-forming mix for the manufacture of growing non-autoclaved aerated concrete

SS-1 - Monolith – Dry mix for the manufacture of RGB, used mainly in monolithic house construction, whose distinctive feature is the increased content of antifreeze and anti-shrink fillers.



ADVANTAGES OF GROWING AERATED CONCRETE

Twofold increase in volume

Lightness: The specific weight of Aerated Concrete is from 400 to 1200 kg/m³.

Strength: from 3.0 to 10.0 MPa. Construction of buildings up to 3 storeys high, with no storey number limitation in case of frame construction

High thermal insulation: from 0.1 to 0.33. A 400 mm-thick concrete wall corresponds to a 1,200 mm-thick brick wall.

Sound absorption and sound insulation: 60-80 dB for a 240 mm-thick wall

Water absorption: For waterproof Aerated Concrete (RGB/GAC) it is from 0.8% to 4.9%. In case of standard concrete it is up to 40%.

Heat/Frost resistance: more than 75 cycles according to laboratory data and more than 200 cycles according to estimated data

Fire resistance: Tested with exposure to fire for 4 hours, which is significantly higher than the fire-resistance of dense concrete.

Easy workability: Growing Porous Aerated Concrete is easy to saw, shave and nail.

