

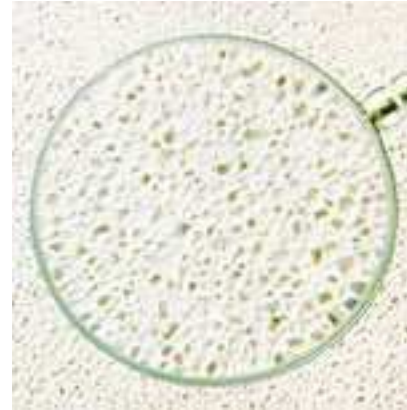


## **Autoclaved Aerated Concrete (AAC): 2005**

### ***Manufactured building block made of all-natural raw materials***

#### Summary

Builders in the U.S. can now use an innovative concrete material that Europeans adopted decades ago. Autoclaved Aerated Concrete (AAC) is a precast, manufactured building stone made of all-natural raw materials. It is an economical, environmentally friendly, cellular, lightweight, structural material that provides thermal and acoustic insulation as well as fire and termite resistance. AAC is available in a variety of forms, ranging from wall and roof panels to blocks and lintels. Although it has been a popular building material in Europe for over 50 years, AAC has only been introduced to the U.S. in the past few years.



In 1914, the Swedes discovered a mixture of cement, lime, water and sand that expands by adding aluminum powder. A material like wood but without the disadvantages of combustibility, decay, and termite damage, the material was further developed to what we know today as autoclaved aerated concrete (also called autoclaved cellular concrete or ACC).

In the product's manufacture, Portland cement is mixed with lime, silica sand, or recycled fly ash (a byproduct from coal-burning power plants), water, and aluminum powder or paste and poured into a mold. Steel bars or mesh can also be placed into the mold for reinforcing. The reaction between aluminum and concrete causes microscopic hydrogen bubbles to form, expanding the concrete to about five times its original volume. After evaporation of the hydrogen, the now highly closed-cell, aerated concrete is cut to size and form and steam-cured in a pressurized chamber (an autoclave). The result is a non-organic, non-toxic, airtight material that can be used in non- or load-bearing exterior or interior wall, floor, and roof panels, blocks, and lintels. According to the manufacturers, the production process generates no pollutants or hazardous waste.

There is a variety of precast AAC units. Panels are available in thicknesses of between 3 inches and 16 inches, 24-inches wide, and spans of up to 20 feet. Blocks come two-feet long, between three and 12 inches wide, and eight inches high.





The cellular AAC not only features structural capabilities, but also excellent thermal, fire, and acoustical properties. Depending on the density, AAC has a compressive strength of 300 to 900 pounds per square inch, which makes it a structural material for low-rise buildings. With an R-value of 1.25 per inch, AAC significantly outperforms conventional concrete block or poured concrete (having about R-0.1 per inch). Study showed that an 8" AAC wall performs much better than a conventional wood stud wall system with R-30 insulation. AAC 4-inch wall panels have a fire rating of 4 hours (ASTM E-119) and acoustically perform with an STC rating of 41.

Consistency in quality and color may be difficult to obtain in AAC made with fly ash. Untreated exterior walls should be finished when exposed to physical damage, dirt, and water, which can collect in the open pores. If installed in high humidity environments, interior finishes with low vapor permeability, and exterior finishes with a high permeability are recommended.

Because of the thermal mass of the AAC and its ability to store and release energy over time, AAC is most beneficial in climates where outdoor temperature fluctuates over a 24-hour period from above to below the indoor temperature setpoint. AAC is typically limited to use in warm climates. When combined with additional insulation, it can be an energy-efficient choice for moderate to cold climates.

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#### PATH Attributes

-  The insulating properties of AAC, when compared with conventional concrete, make it an energy-efficient choice for warm climates.
-  AAC is completely recyclable.
-  The precast material is of uniform dimensions, easing the creation of uniform wall system. Because it does not contain organic matter, it is naturally resistant to fire, termites, and fungal decay. AAC has proven to be very durable.
-  AAC is a solid building material that can deflect projectile debris in high-wind areas. In the finished structure, no pollutants or toxic substance are released that could affect the indoor air quality, even in the event of fire.

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#### Ease of Implementation



AAC can be cut with conventional saws and tools. The lightweight, precast blocks are stacked like conventional concrete masonry units.

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## Initial Cost

Properly installed, higher initial material costs can be compensated by lower labor, finish, maintenance, and energy costs. As a base price, \$3-\$4/s.f. is common.

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## Operational Cost

Compared with conventional CMU, AAC will have lower energy costs.

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## U.S.Code Acceptance

According to the manufacturers, ASTM, UL and ULC approvals have been or are being issued. The National Evaluation Service (NES) has reviewed and accepted AAC products, and has issued National Evaluation Reports (NER). Information on NERs can be obtained by contacting ICC at their web site shown under WebResources ([www.icc-es.org](http://www.icc-es.org))

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## Field Evaluations

### Hughes Construction: Lexington, North Carolina

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## Installation

AAC is used similarly to common types of masonry or prefabricated building panels, however there are some significant differences. Its light weight makes shipping and handling more economical. Instead of commonly used 8"x16" concrete blocks (CMU), AAC can be laid by one mason in blocks up to 12"x 24" or more, cutting labor costs. The solid AAC blocks are laid with a thin-set mortar and can be sawn, drilled, routed, and nailed with common tools.

The material is easy to finish, too. Exterior walls can be painted, plastered, and finished with a veneer or as specified by the manufacturer. Interior surfaces can be plastered, sheet rocked, tiled, painted, or simply left exposed.

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## Warranty

Not Applicable

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## Benefits/Costs

AAC is a good ecological choice in terms of manufacturing, construction, recyclability, and indoor air quality issues. By altering the mixture proportions the

manufacturer can manipulate insulation values and compressive strength, which makes AAC more versatile. Because it is lightweight and workable, AAC saves construction time, waste, and energy.

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Please visit Path's website at [www.toolbase.org](http://www.toolbase.org) for additional and up to date information about this subject.