

2023

Your Guide to Building with AAC



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1/1/2023

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INTRODUCTION

Thank you for being so interested in this building material. We hope you find this guide helpful in understanding the benefits of Autoclaved Aerated Concrete and more!

Our goal is to provide you with quality products and services to create a safe and lasting return on your most important investment for generations to come. In addition, we want to educate Americans properly when building commercial or residential AAC structures.

Understand that this is a glomerate piece assembled by installers, engineers, architects, manufacturers, scientists, professors, and professionals inside and outside the industry.

WHAT IS AUTOCLAVED AERATED CONCRETE "AAC"?

Autoclaved Aerated Concrete, more commonly referred to as AAC, is a closed-cell masonry product that comes in blocks or panels. This "aerated" product was first developed in Germany in the 1880s, then perfected and patented in the 1920s by a Swedish architect named Johan Axel Eriksson. Sweden and much of Europe were experiencing lumber shortages because of World War I, so an alternative construction method needed to be developed. Dr. Eriksson discovered that by curing the material with heat and pressure in an autoclave, the final product was much more substantial and dimensionally accurate than when it was "air cured."



Figure 1: 12x8x24 AAC Block

WHY HAVE I NEVER HEARD OF AAC BEFORE?

AAC is relatively new in the US. There are over 3,000 AAC manufacturing plants worldwide, but only four operate in North America, with only two in the United States being Haines City, FL., and Marlboro, SC. In addition, two plants are in Mexico, Monterrey, and Mexico City. AAC is widely used in the areas surrounding these plants, but the product is only well known in these regions due to high shipping costs.

WHAT CAN I BUILD WITH AAC?

AAC can be used on almost any type of residential or commercial building. For example, you can use AAC panels to build the entire facility for hotels and dormitory-type structures, including the floors and roofs. An AAC block is used for the exterior (and possibly the interior) walls for a residential project. If an entirely fireproof home is your objective, AAC panels could also be used on the roof to protect your structure from the flying embers that typically start house fires.

HOW DO I RUN ELECTRICAL & PLUMBING THROUGH AAC?

AAC can be pre-cut or pre-channeled, utilizing half the thickness of wall depth for plumbing and electrical for piping and conduits. The most time-effective method is simply running a router or saw to create the preferred channel. See figure 2.



Figure 2: Rough-in Electrical and Plumbing

WHAT ARE THE MAIN BENEFITS OF AAC?

- The porous structure gives superior fire resistance and has the industry's highest UL (underwriters' laboratory) Fire Rating.
Examples:
 - AAC: 1600°C, 2912°F
 - Steel: 1400°C, 2552 °F
 - Fire-Retardant Plywood or Lumber: $\leq 71^{\circ}\text{C}$, $\leq 160^{\circ}\text{F}$
- Superior Thermal Insulation – it's nicknamed High Tech Adobe.
- Energy Savings
- Excellent Acoustic Properties.
- Lighter weight than traditional masonry or cement products.
- Easy to install with basic construction skills making it DIY friendly.
- No off-gassing of toxins when exposed to fire.
- It will not support the growth of mold or mildew.
- Termites will not eat AAC.
- 100% recyclable-all waste material can easily be crushed back into sand.
- Hurricane and Tornado resistant-can be engineered to 200+ mph.
- AAC has a long life and is not affected by harsh climates or extreme weather conditions.

AAC WORLDWIDE USAGE

- Poland 80%
- Germany 65%
- Australia 60%
- China 50%
- England 50%
- United States <.01%



Figure 3: Different-Sized AAC Panels and Blocks

A DEEPER DIVE INTO THE BENEFITS OF AAC

ECONOMIC BENEFITS

Building with AAC can shorten construction cycles. AAC weights from 25-40 lbs. per cubic foot compared to 130 lbs. for standard masonry. This provides extensive savings in shipping (depending on the project's location). In addition, the reduced energy requirements of a building constructed with AAC can save building owners and occupants a great deal of money over the lifetime of the building. One can expect annual savings between 35-60% on the building's utility bills and a national average savings of 65% on the building insurance premiums.

FIRE RESISTANT & NON-COMBUSTIBLE

Hundreds of homes are lost every year, and thousands more are threatened by roaring wildfires that rip through the Pacific Northwest. Hundreds of tests, studies, and real-life scenarios have proven the benefits of AAC as a fire-resistant material. AAC being non-combustible and inorganic, makes it one of the highest hourly fire-resistant materials per inch of building material in today's market, with a melting point of 2,912°F. There have been 2,475 wildfires that have destroyed structures from 2005 – June 2022, in the United States, with a total of 97,196 structures being destroyed. Use the below link to see your area. <https://headwaterseconomics.org/natural-hazards/structures-destroyed-by-wildfire/>

PEST AND MOLD RESISTANCE

Unlike most building materials used today, AAC is 100% inorganic. In climates where termites and other insects flourish, AAC is a perfect application, as pests cannot eat it. Its solid construction also alleviates voids where pests can live and colonize. In addition, AAC's inorganic properties leave no nutritional value for molds and fungi to thrive, leaving it the perfect material for use in wet climate areas.



Figure 4: Moiser, Oregon

SOUND TRANSMISSION

AAC is proven to drastically reduce the impact of noise pollution, both inside and outside of the building. Its noise reduction coefficient is more than seven times that of ordinary concrete. The STC (Sound Transmission Class) rating of an 8" thick AAC wall ranges from 44-50 STC depending on the finishing material (stucco, plaster, drywall, etc.).

STRENGTH AND STABILITY

AAC has an extremely high strength-to-weight ratio. When installed correctly, the resulting wall function as a monolithic (one complete) structure. Depending upon the density, AAC provides a compressive strength of 290 psi to more than 1000 psi. As a result, AAC has been used in seismically active and hurricane-prone regions worldwide. In addition, buildings constructed of AAC can withstand wind forces exceeding 190 MPH. The strength and resiliency of AAC are best exemplified by the survival of all 5,578 homes during the Kobe, Japan earthquake in 1995, which damaged or destroyed over 106,000 buildings.

THERMAL EFFICIENCY

AAC structures give it a thermal efficiency ten times higher than aggregate concrete and two to three times better than clay brick. AAC's excellent inherent thermal insulation properties not only reduce the need for space heating and cooling, thereby cutting carbon dioxide emissions and combating climate change, but also make's using additional insulation materials unnecessary. In addition, AAC is energy-efficient throughout its entire life cycle. Buildings constructed of AAC are warm in winter and cool in summer. As you can see in Figure 5, the thermostat is turned off with an inside temperature of 72°F, while the outside temperature is 88°F.

IS AAC A "GREEN" MATERIAL? WHAT FOOTPRINT ARE WE LEAVING BY USING AAC?

AAC comprises a few simple ingredients; sand, cement, lime, and water. During manufacturing, these naturally abundant materials create a non-toxic, non-pollutant, 100% recyclable product. AAC covers three applications, 1) structure/framing, 2) installation, and 3) interior-ready sub-straight "drywall." AAC, the product uses a third of the cement as a typical CMU (Concert Masonry Unit, also known as cinderblock). The facility uses a substantial amount of power which is a drawback but ultimately produces zero emissions from steam generation or wastewater, accompanied by solar farms. Adjoining future plants could bring AAC products to be net zero or as close as humanly possible. Regarding shipping, we have a low carbon footprint since we use rail and rail facilities.



Figure 5: AAC Home Thermal Comparison

AAC CERTIFICATIONS & TESTING

ACI CERTIFICATIONS

American Concrete Institute "ACI" is a non-profit technical society and standards-developing organization. <https://www.concrete.org/>

- TMS 402/602: Building Code Requirements and Specification for Masonry Structures (Formerly ACI 530)
- ACI PRC-526-19: Guide for Design and Construction with Autoclaved Aerated Concrete Panels

ASTM CERTIFICATIONS

ASTM International, formerly known as the American Society for Testing and Materials, is a scientific and technical organization developing standards for testing different materials. For more information on testing and approval for the items listed below, please visit <https://www.astm.org/>

- ASTM C1452-00: Standard Specification for Reinforced Autoclaved Aerated Concrete Elements
- ASTM C1555-03: Standard Practice for Autoclaved Aerated Concrete Masonry
- ASTM C1660-10: Standard Specification for Thin-bed Mortar for Autoclaved Aerated Concrete (AAC) Masonry
 - (Thin-bed commonly known as "thin-set" mortar)
- ASTM C1686-09: Standard Practice for Installation & Testing of Reinforced Autoclaved Aerated Concrete (AAC) Units
- ASTM C1691-21: Standard Specification for Unreinforced Autoclaved Aerated Concrete (AAC) Masonry Units
- ASTM C1692-18: Standard Practice for Construction & Testing of Autoclaved Aerated Concrete (AAC) Masonry
- ASTM C1693-09e1: Standard Specification for Autoclaved Aerated Concrete (AAC)
- ASTM C1694-09 Standard Specification for Reinforced Autoclaved Aerated Concrete (AAC) Elements

ICC CERTIFICATION

The International Code Council "ICC" publishes building codes that promote safety and fire prevention in commercial, government, and residential structures. These codes are used throughout the US, including enforcement by several federal agencies. <https://www.iccsafe.org/products-and-services/codes-standards/>

- UES ER 0405: AAC Block and Structural Panels

LEED CERTIFICATION

Leadership in Energy and Environmental Design "LEED" is an internationally recognized green building certification system. Developed by the United States Green Building Council (USGBC), LEED provides building owners and operators with a framework for identifying and implementing practical and measurable green building design, construction, operations, and maintenance solutions. LEED promotes sustainable building and development practices through a rating system based on points that recognize projects that implement strategies for better environmental and health performances. USGBC certifies buildings, NOT the materials used to construct the buildings. Therefore, most green building materials will contribute to LEED points. The following description of LEED credits, with the use of AAC, represents qualified LEED points, which can be considered for certification. <https://www.usgbc.org/>

UL CERTIFICATIONS

The Underwriters Laboratory “UL” is a global safety science leader. UL helps companies to demonstrate safety, enhance sustainability, strengthen security, deliver quality, manage risk, and achieve regulatory compliance. <https://ul.org/>

Assemblies for AAC performed under the ASTM E-119 Fire Test of Building Construction, and Materials Standards are as follows:

- UL K909: Restrained and Unrestrained Floor Panel Assembly
- UL P932: Restrained and Unrestrained Roof Panel Assembly
- UL U919: Bearing and Non-Bearing AAC Masonry Assemblies
- UL U920: Bearing and Non-Bearing AAC Panel Assemblies
- UL X901: Steel Column protection Assembly
- UL FF-D 0017, 0018, 0019, 0020: Joint Systems Floor to Floor
- UL FW-D 0012, 0013, 0014, 0015: Joint Systems Floor to Wall
- UL HW-D 0166, 0177: Joint Systems Head to Wall
- UL WW-d 0023, 0024: Joint Systems Wall to Wall
- UL C-BJ 1307, 8010: Through Penetration Systems Masonry Single or Multiple Commodities
- UL W-J 8009: Through Penetration Systems Panels Single or Multiple Commodities
- UL U208: AAC to Frame Firewall Assembly



Figure 6: Concrete Foundation with AAC Block, Bentonville Arkansas

BUILDING & SHIPPING AAC

WHO WILL INSTALL OR BUILD MY AAC PROJECT FOR ME?

While AAC is a masonry product usually installed by a mason, most skilled construction workers can be trained to install AAC. Even a journeyman mason will need a few days of hands-on training to learn the nuances of installing AAC vs. CMU. Our sister company, AACPS (Autoclaved Aerated Concrete Professional Services), can provide this training for your workers either at your job site or at one of our training sites in Oregon. After completing this training program, AACPS will issue workers certification cards indicating they have passed the course. AACPS can also supply all the specialty tools required for AAC installation. Once certified, AACPS can/will sell you the equipment you need to operate a business as a certified installer.

AAC is a DIY-friendly product, but that's said with some reservations. Building even a modest-sized house is a significant undertaking regardless of what material you use. In addition, AAC requires special tools that are not readily available at your local box store, so the DIY approach is only for some. However, if you are an experienced DIY professional, AACPS is ready and willing to help you make your project a success. You can rent the specialty tools from AACPS, and a qualified installation instructor can provide onsite training. We will help you coordinate this training if you buy the AAC from us.

HOW MUCH DOES AAC COST?

Historically, AAC has been considered a premium-cost product only used for expensive custom homes. AAC is very competitive today with most other construction methods, including residential wood construction. Because AAC eliminates many steps in the building process, the cost comparison to other construction methods is a bit complicated sometimes. The houses we are currently building in Oregon and California are selling for the same price as wood-built homes of a similar design.



Figure 7: One Pallet Contains 60 Blocks of 12x8x24.

HOW ARE YOU OVERCOMING THE HIGH SHIPPING COSTS?

Our company has worked with the railroads to perfect the boxcar shipping of AAC. Each boxcar contains almost five semi-loads of the block, so we can eliminate much of the freight cost to bring AAC into our distribution yards throughout the western US. We currently have distribution yards in Boise, ID., Cheyenne, WY., Fontana, CA., Phoenix, AZ., Prineville, OR., Sacramento, CA., Sparks, NV., and Springfield, MO. Additional yards in Albuquerque, NM., Oklahoma City, OK., Salt Lake City, UT., and Seattle, WA. will be opening soon.

HOW DO I CONVINC MY BUILDER TO USE AAC?

It is common for established builders to be reluctant to change their operations. They have a significant investment in tools and equipment for the type of construction that they are building. They most likely also have long-term relationships with subcontractors they trust and like to work with. We understand and appreciate that mentality, but you would not be searching the Internet for a better building product if you were happy with the quality of the current construction products and methods. When thousands of homes are destroyed yearly by wildfires, tornados, hurricanes, and floods, the builder loses his ability to choose what the consumer buys. If you are committed to building with AAC, we will help you find a builder!

HOW DO I GET STARTED?

Any successful construction project starts with a consultation at a local design professional's office. The complexity of the building codes and local restrictions implemented by municipalities usually means disaster for someone unfamiliar with these subjects. Your design professional could be an Architectural firm, or it could be a local home builder within house design capabilities. Your design professional may be reluctant to work with AAC due to their lack of knowledge about the product but don't keep this from stopping you. We have experienced design professionals who are familiar with AAC and ready to assist your design team. If you already have plans for your project, we can help you convert them to AAC. Please send them to one of the following companies below, based on your location.

CONTACTS

CONTRACTORS

Company/Website	Contact Information	Servicing Areas
Carr General Construction	1-541-728-8210 phil.carrconstruction@gmail.com	Idaho, Oregon, Washington
DDV LLC www.metalbuildingsecrets.com	1-307-996-6302 dean@ddvllc.com	Colorado, Idaho, Kansas, Oklahoma, Utah, Wyoming
EcoTerra LLC Consulting	1-479-531-5950 mwallmosaic@gmail.com	Arkansas, Missouri, Oklahoma
Hammel Construction www.hammelconstruction.com	1-541-914-4996 hammelconstructionaac@gmail.com	Oregon
Kingdom Block	1-541-951-3712 nickcook@kingdomblock.com	Arizona
My Energy Geek Construction	1-954-547-9528 codu1161@bellsouth.net	Florida
Northwest AAC www.northwestaac.com	1-541-948-3076 bob@northwestaac.com	Idaho, Oregon, Washington
Old World Construction	1-541-647-0200 bnagy87@gmail.com	California
Slomax Masonry www.slomaxmasonry.com	1-970-576-5656 slomax.sam@gmail.com	Colorado, New Mexico, Utah, and the Midwest

SALES & CONSULTING

Company/Website	Contact Information	Servicing Areas
AAC West & AACPS LLC www.aacwestllc.com	1-928-716-1000 bsteel@aacwestllc.com or aacsteel@gmail.com	Canada, United States
AAC Caribbean LTD	1-264-235-6124 or 1-928-716-1000 (Toll-Free)	Caribbean Islands, Puerto Rico
AC Construction Consulting Inc.	954-547-9528 codu1161@bellsouth.net	East Coast
Northwest AAC www.northwestaac.com	1-541-948-3076 bob@northwestaac.com	United States
Northwest AAC www.northwestaac.com	1-541-280-6363 tomgaylor@verizon.net	California
UAE	011-971-56-460-1991	Abu Dhabi, Dubai