III. Economics

Use of AERCON resulted in 3-month schedule reduction on this $23 million, 245,000-sq. ft. Residence Hall Complex.

A. General

A decision to construct a building and choosing appropriate building materials are clearly determined from an economic point of view. As an Owner, Architect, Engineer, or Contractor, the cost of construction must be minimized while still maintaining technical requirements and high quality standards. In addition to the initial construction costs, stabilizing and maintaining low, long-term operating and energy costs is important.

With AERCON products, all elements for the walls, floor and roof can be combined into a complete system with one construction material. By limiting the types of materials, economy can be achieved during both the design and construction phases of a project. An advanced building system, such as AERCON, guarantees long durability combined with minimized maintenance costs.

This 900 square foot communication equipment building shell made of AERCON wall and roof panels was built from start to finish in 8 hours.

B. Initial Capital Costs

Lower Transportation Costs

Due to the low weight of AERCON AAC products (as little as one-fifth the weight of concrete), the capacity for transporting the material is maximized and related freight costs reduced.

Quicker Construction

The large size of the panel and block allows much higher productivity than most materials. Construction crews can complete their work and move to the next project. Panels allow up to 40 square feet to be placed in a single lift accomplished by two men and a crane/operator in just a few minutes. The lower material weight also allows longer crane reaches and better accessibility by mobile equipment.

Reduced Finish Material Costs

Because of the fire, thermal, acoustic, and surface properties, finish materials such as insulation and gypsum board are not needed. Smaller HVAC systems are usually possible when using AAC material.

Quicker Application of Finishes

Since AAC compatible finishes can usually be directly applied with spray equipment in a one-coat application, the time associated with finishing the building is minimized. Many products can also be specified with integral color, eliminating the costs and time associated with painting.

Shown here is a truck with AERCON panels. An AERCON panel weighs approximately 25% of standard cast-in-place concrete.

C. Life Cycle Costs

Energy Conservation

AERCON material has excellent thermal insulation and thermal storage capability (see Thermal Efficiency Section). These properties reduce energy requirements for both heating and cooling. Smaller HVAC systems also improve efficiency. In locations where off peak energy rates are available, the thermal mass characteristics allow more of the air conditioning load to take place in lower cost periods of the day.

While energy reduction capability is different for each building design, and should be evaluated by the project architect, a general analysis of energy savings using typical design assumptions can be useful. This provides an estimate when doing a preliminary life cycle cost analysis. One method for this preliminary estimate is shown below. Standard design data is typically obtained from architectural standards manuals or ASHRAE publications.

Step 1 – Calculate peak heating and cooling energy use (Btuh) for any system alternative where "$Btuh_{heating}$" is equal to the building surface area multiplied by the temperature difference between the design indoor and outdoor temperatures (TD), and divided by the total R value, or

$$Btuh_{heating} = \frac{(area) \times (TD)}{R}$$

and "$Btuh_{cooling}$" is equal to the surface area multiplied by the Equivalent Temperature Difference (ETD), and divided by the total R value, or

$$Btuh_{cooling} = \frac{(area) \times (ETD)}{R}$$

Step 2 – Determine the annual energy savings (Btu) by multiplying the difference in peak energy use by the number of annual heating and cooling hours for the location, or

$$Btu_{heating} = (\Delta Btuh_{heating}) \times (\text{heating hours/year}), \text{ and;}$$

$$Btu_{cooling} = (\Delta Btuh_{cooling}) \times (\text{cooling hours/year})$$

Step 3 – Total the energy savings and multiply by the applicable energy rate being paid for the facility.

The following analysis uses Chicago and Phoenix as typical cold and warm weather locations. The table shows typical data for each location. Compared to the R-Value shown, a 25% energy savings associated with the use of AERCON materials is considered. Charts 1 & 2 on the following page show the calculated energy savings for residential and commercial buildings of various sizes while Charts 3 & 4, located on page III-7, indicate potential owner's annual cost savings associated with various levels of energy conservation at rates varying from $0.04 to $0.10 per kilowatt-hour.

Design Data

	Chicago	Phoenix
Temperatures		
Indoor - °F	72	72
Outdoor – winter °F	2	34
Outdoor – summer °F	91	107
Annual Heating Hours	2500	1000
Annual Cooling Hours	650	2000
*ETD - Wall	29	21
*ETD - Roof	49	41
R-Value	11	11

*Equivalent Temperature Difference (ETD)

Chart 1

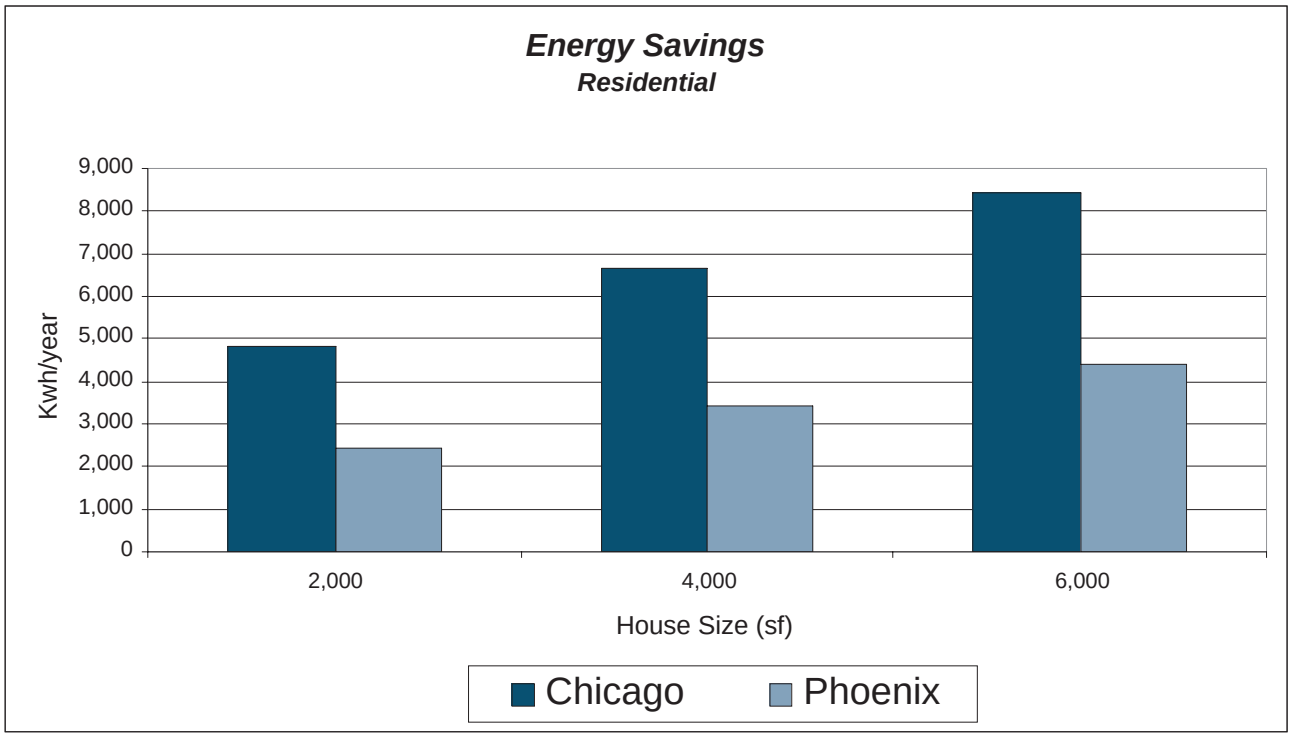


Chart 2

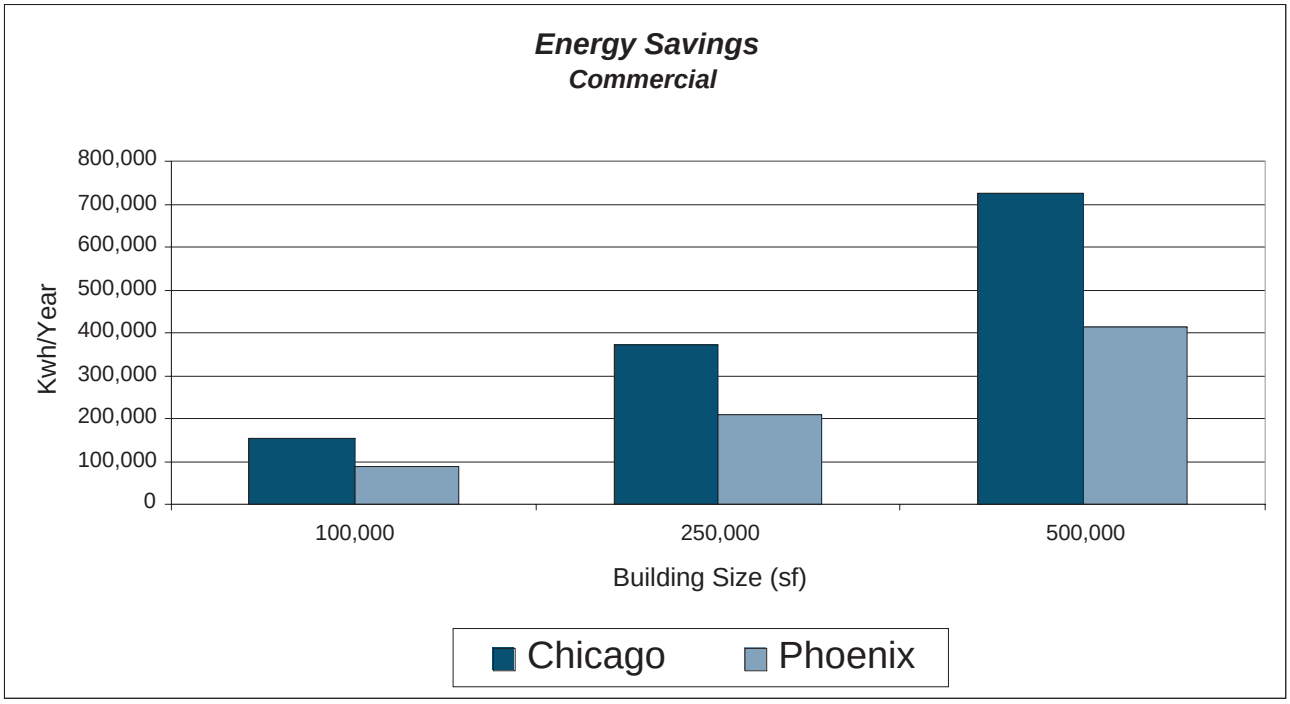


Chart 3

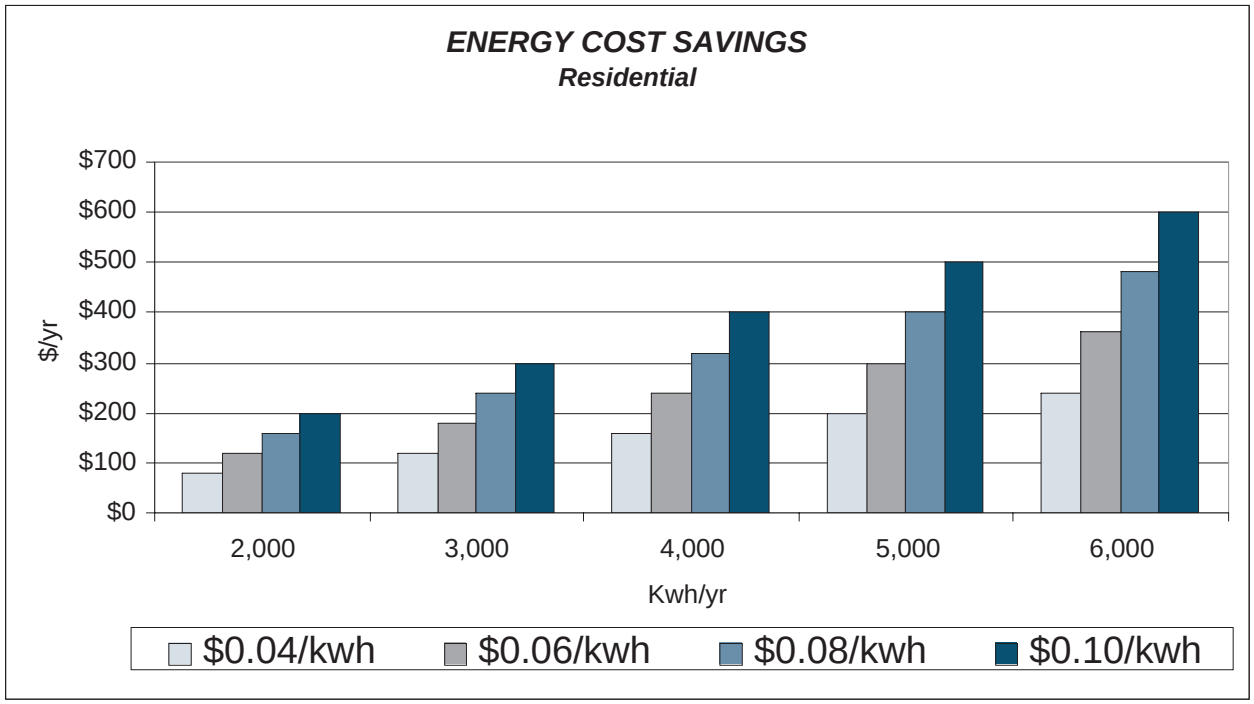
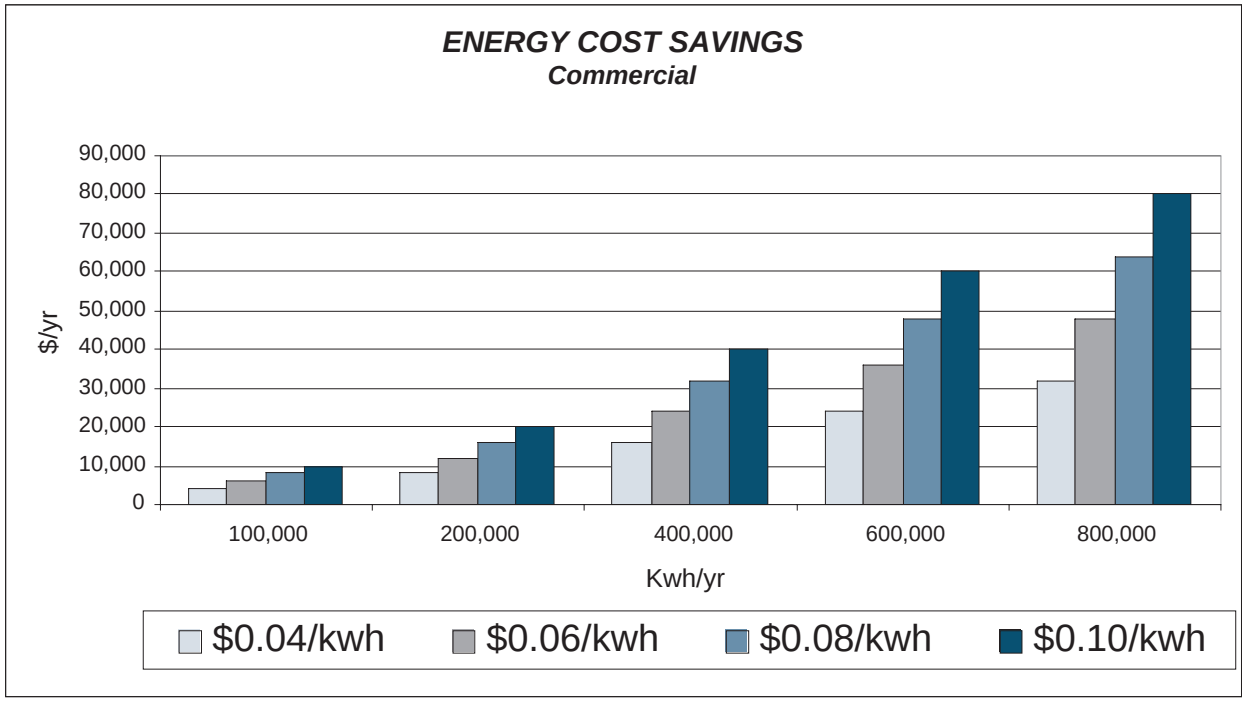


Chart 4



Maintenance and Operations

AAC material is inorganic and resistant to insect damage and infiltration. Since AERCON is a solid material, there are no voids in the construction that present an opportunity for insect and pest habitation. Costs for pest control and treatment can be substantially reduced, if not eliminated. AERCON walls are not susceptible to damage such as occupants accidentally breaking a hole through the wall like in the case of gypsum board. This makes them especially cost effective for rentals, multifamily housing, or high traffic buildings. Since AAC material will not burn and contains fires, insurance carriers may provide a reduction in insurance premiums.

The durability of AERCON minimizes ongoing maintenance and repair costs normally expected in conventional construction.