

Brick & Mortar vs. Traditional Adobe Housing in Southwest



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Introduction

- Buildings have been used for centuries as forms of shelter, gathering places, and even places of storage. Currently, buildings account for **30%** of energy consumption and nearly **55%** of global electricity requisition.
- Both current buildings as well as construction of newly developed buildings total **36%** of global final energy consumption and approximately **40%** of total and indirect **CO2 emissions**.
- This case study will thoroughly illustrate how the sustainable building design built out of thermal mass construction, with **Brick and Mortar** being the main material in **hot and arid climate**, is potentially the new era of building that designers are gearing towards.
- The study will also include an analysis of **Traditional Adobe construction** which may be a superior option for home construction in the **Southwest**.
- The two styles of building will be tested through a program known as **Energy-10** which allows to test energy modeling throughout either building.

Sustainability Background

- Sustainability** can be defined in different ways throughout the world, but one thing can be universally agreed upon: sustainability is ultimately always linked to all things on earth.
- The three pillars can be useful to explain the importance of sustainability. Such pillars are known as the **economic, social, and environmental pillars**. If any of these three pillars are weak, the system as a whole is unsustainable.

Methods

- This capstone will be an analysis of someone's future home based on the comparison on both **Sustainable housing**, defined as using modern construction techniques and materials versus **Traditional Adobe** homes in the Southwest.
- The study will use two different **Quantitative methods** combined to create one outcome that will create results of which style of housing is preferable over the other.
- The first portion of this study is creating two different models and testing them through **Energy-10**, a simulation, which will help to view both outputs.
- The second portion is a **Cost Benefit Analysis**. This allows the readers to observe the process of constructing a home from start to finish.

Location



*About the Southwest Region. Official Web Page of the US Fish and Wildlife Service. www.fws.gov/southwest/AboutUs.

Adobe Home



"Cutting to the Chase." The Catalina Foodhills, www.thetucsonfoodhills.com/2010/06/cutting-to-the-chase.html.

Brick & Mortar



"SPEC MIX Colored Building Stone Mortar Plays a Huge Role in an Arizona Masterpiece." Mason Contractors Association of America www.masoncontractors.org/2014/09/17/spec-mix-colored-building-stone-mortar-plays-a-huge-role-in-an-arizona-masterpiece.

Results

	Sustainable Housing (Brick & Mortar)	Traditional Adobe Housing
Floor area	2,000 sq. ft.	2,000 sq. ft.
Floor Type Insulation	Slab on grade Reff= 12.2	Slab on grade Reff= 27.4
Heat/ Cool performance	Air Source Heat Pump COP= 2.9, EER= 8.9	Air Source Heat Pump COP= 4.3, EER= 13.0
Peak Electric	10.20 kWh	5.57 kWh
Daylighting	No	Continuous Diming
Total Electric	22,721 kWh annually	18,401 kWh annually
Construction Costs	\$318,727	\$381,171

Limitations

- One may consider the costs of creating a more sustainable living condition to be **too costly and time consuming**. As a result, the homeowner may be persuaded into a traditional style of design due to the contractor's limited knowledge of sustainable housing.
- While **education** of the profession is important, **creating material** that is easy for homeowners to find and understand is equally so.

Conclusion

- The results of the study indicate that **sustainable housing** methods will result in **greater savings** when comparing the entire life-cycle costs between both styles of building in the **Southwest**.
- In the study, the two building styles resulted in a 0.318 (Net Present Value) for the life-cycle benefit cost ratio.
- Although the Adobe style of building came close to surpassing the brick and mortar methods in a few categories such as paying less property tax and having a smaller mortgage, the **sustainable housing** (Brick and Mortar) method outperformed through longevity.
- Finally, **capital costs** will always be a considerable component to the direction of a **design process** in order to meet within the current budget.