



Environmental Studies Program

Issues Update: ENERGY EFFICIENT BUILDINGS

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Keywords

Efficient Site Design, Energy Efficiency, LEED, Straw Bale Architecture

Overview

Site Design and Energy Efficiency-Examples of Good Design

Practices:

When planning a site, impacts will be felt by the immediate natural community and the site decision will impact the amount of energy the building uses. The amount of energy a building uses includes the building and maintenance of the building and grounds once it is built. For example:

- Site choice can minimize site clearing and can help to preserve natural vegetation while making maintenance of the surrounding landscape much easier.
- Thoughtfully placing a building on a site can conserve energy by using the natural landscape to its advantage. Things such as topography, sunlight shade and breezes can be used to reduce energy use by providing for passive solar and natural ventilation.
 - The orientation of the building can optimize solar gains in the winter and reduce them in the summer if it is placed with the long side in line with the east-west axis.
- Placing parking lots where they are blocked by the building from wind can reduce the amount of snow accumulation and thus the amount of plowing needed.

Innovative Green Buildings

Straw Bale Construction:

- Renewable.
 - 200 million tons of waste straw are produced each year. Building with straw, instead of burning it keeps the atmosphere cleaner.
- Materials in the construction of conventional homes contribute to pollution in their manufacture and transport. Straw is most often a local or regional resource that doesn't have to travel very far. Also, since waste straw is most often used, its manufacture doesn't require vast amounts of extra energy.
- Much better insulation quality. Can reduce heating needs by 75%, reducing energy demands for heating.
- Three times less flammable thus conserving building materials.

LEED (Leadership in Energy and Design)

LEED is a green building rating system that was developed by the US Green Building Council in 1994 to create a clear definition of what a "green building" is to acknowledge those who aimed to create such buildings.

- Sets standards for sustainable construction and promotes a whole-system thinking approach to building.
- Certification is granted when an application is presented that documents compliance with the rating system and after fees have been paid to the Green Building Council.
- Six major areas of LEED rating system:
 - Sustainable Sites
 - Water Efficiency
 - Energy and atmosphere
 - Materials and resources
 - Indoor environmental quality
 - Innovation and design process

Since LEED sets a "standard" for Green Building some people worry that it hinders creativity and the emergence of new building designs.

CASE STUDY: Earthships: *Homes not of our world*

Introduction

Earthships are a type of passive solar homes that are constructed of materials that are natural and/or recycled. This style of building started to come about in the 1970s from the ideas of Mike Reynolds. In most cases, earthships are off-the-grid homes. This means that they do not rely on outside sources of electricity and can thus reduce their reliance on fossil fuels and dirty energy sources.

Approach

Houses are oriented towards the sun to utilize passive solar energy and other local resources. Homes are generally made with earth filled tires and are substantially bermed on three sides. The south sound is composed of glass to let in the maximum amount of sun for heating. The internal walls are non-load-bearing and make use of recycled materials by using such things as aluminum cans to create a honeycomb structure which is then plastered with stucco. Since most earthships are off-the-grid they have their own source of electricity such as solar or wind. In most cases these homes collect their own water and make use of grey and black water systems.

Results

The thermal mass of the earth filled tires regulates indoor temperatures in the summer and winter by acting as a very effective insulator. Also, the densely packed tires are very resistant to fire. Individual builders can add their own flavors their decorative style by using too many different kinds of recycled materials such as glass seen below.



Outstanding/Unresolved Issues

There has been some controversy on whether the aluminum cans should be recycled as it requires much less energy to recycle it than to create more. The same for other things such as glass bottles and tires. In some areas, houses have been found to overheat because they were too effective at capture sunlight and didn't have proper ventilation systems.

Resources

Energy Efficiency and Renewable Energy
U.S. Green Building Council
Straw Bale Construction
Green Home Construction
Wikipedia
Earthship Landing
Green Home Construction

References

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