**You may delete this page from the document that follows after reading.**
It contains plain language about the copyright we've adopted from **Creative Commons**.

It also contains a link to the summary for our copyright license. This summary should be consulted if you intend to copy and redistribute this material in any medium or format, or adapt, remix, transform, or build upon this material.

Click Here for information on the Creative Commons License we've adopted.


From **Creative Commons**:

This is a human-readable summary of (and not a substitute for) the license. Disclaimer.

## You are free to:

- **Share** — copy and redistribute the material in any medium or format
- **Adapt** — remix, transform, and build upon the material

The licensor cannot revoke these freedoms as long as you follow the license terms.

## Under the following terms:

- **Attribution** — You must give appropriate credit, provide a link to the license, and indicate if changes were made. You may do so in any reasonable manner, but not in any way that suggests the licensor endorses you or your use.
- **NonCommercial** — You may not use the material for commercial purposes.
- **ShareAlike** — If you remix, transform, or build upon the material, you must distribute your contributions under the same license as the original.

**No additional restrictions** — You may not apply legal terms or technological measures that legally restrict others from doing anything the license permits.

# Building A Passive Solar Home

## Instructor's Guide

### Objectives:

- Students will understand the concept of a home energy load profile.
- Students will understand the variables of sun, seasonal changes, architecture, and landscaping in the design of a home that reduces energy load profile.

### The Main Thing:

In **Building a Passive Solar Home** students design a home to take advantage of its natural surroundings and to manage or lessen the disadvantages of its environment. In this largely student-paced activity, students "build" a passive solar home using paper, markers, tape, and pipe cleaners. Properly constructed, their home will take advantage of "free" solar energy, and dramatically reduce unnecessary energy uses typically built in to a conventional home. Such a passive solar home will have a low energy load profile. It will also be a good candidate for the installation of an active renewable energy system, perhaps offering its owners the opportunity to live "off the grid." Active renewable energy systems work best in energy efficient homes. They don't have to overcome as many energy losses. This means a smaller and more affordable system can be installed to begin with.

### Teacher Notes:

The teacher of this activity will first have to decide on an individual or group approach to its completion. A group approach is recommended as this allows students to brainstorm ideas. After introducing the lesson, Building a Passive Solar Home is largely student-paced. It is expected that some kind of short student presentation or report, and discussion go with each student-designed home so that correct passive solar design principles do, in fact, emerge. Design hints are occasionally given in the instructions. For the most fertile discussions, it is probably best to have students design and build on the basis of their own knowledge, research, and the information given.

These basic passive design principles must be developed:

- Wasted energy, resources, pollution, and money will be the day after day price paid for mistakes made in the design and construction of any new home—the "100 year mistake" (question 1).
- Generally, the better dwelling design is House #1, a "lean-to" type of design. With the horizontal roof overhang facing generally south, it will usually do better than the more traditional House #2 in shading hot sun in the summer and promoting solar gain through windows in the winter.

- The home should be oriented so that the roof overhang faces generally south (reasons given above).
- The home should maximize south-facing windows (that are correctly shaded from summertime heat gain) and must have fewer facing north, east, and west. With the proper home orientation, this maximizes solar gain and minimizes heat loss in winter.
- Deciduous trees should be planted on the sunny side of the home, to the south and west. This enables them to shade sunny windows in the summer and allows solar gain to occur during the winter when their leaves are gone. Deciduous trees should not form a windbreak, or block summer winds. Summer breezes help to naturally cool the home.
- Evergreens should be planted to the north and east as a windbreak to block the cold winter winds that generally come from these directions.

In addition:

- Double-pane or triple-pane windows should be used to promote energy efficiency. Beyond this, other window features and designs are available to promote further efficiency (question 9).
- A wide variety of materials may be used to build a home of this kind. Materials that insulate well will work best at preventing heat gain in summer and preventing heat loss in winter. Going further, some interior construction materials can be used to help keep a passive solar home cooler in summer and retain heat in winter (question 9).
- 2” X 6” (or 2” X 8”, or 2” X 10”, or 2” X 12”) building framing lumber can be used to provide additional space in walls to insulate a home beyond normal or conventional levels (question 11). Plainly this adds “up front” costs, too.
- When designing a home in which you will use your own renewable energy resources to live independently, it is very important to reduce the home’s energy load profile. To install your own active solar system is expensive, and the larger the system, the more expensive it is. If cost is an issue, and it usually is, you will reduce your energy load profile to the lowest reasonable levels. Then you install a system just a little larger than that which will be required to provide for your load. Doing so will enable you to live within the limits of the energy your system will provide (question 14). Doing so will also prevent you from regularly losing a portion of the renewable energy you’re producing.

Consider asking students to make a modification to their home that isn’t part of the instructions. This will require them to do some research, and will add a little competition to the home designs springing up in your classroom. It may give you the opportunity to showcase some advancements in energy efficient home design and emphasize places

where superior systems and designs are promoted (Wisconsin Focus on Energy; U.S. Green Building Council Leadership in Energy and Environmental Design [LEED]).