

# Design Challenge Handout

## Zero-Energy Housing Project

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Group Name:

Date:

### Your Goal

To design and build a one-bedroom model house within the design constraints, utilizing passive solar heating techniques to warm up the house as much as possible and sustain that temperature as long as possible.

#### Things to keep in mind...

- Insulation
- Thermal mass
- Size of home (the space needed to be heated)
- Orientation of home (from which directions are the sun and wind coming?)
- Color
- Be creative! (house can be of any design you can imagine and build with given materials)

#### Design constraints

- Floor size  $\geq 70$  square inches
- Roof height  $\geq 4$  inches
- Door size must be able to accommodate a thermometer that can be placed entirely inside the middle of the model with the door closed, and be able to be read through a window (find out thermometer dimensions from your teacher)

#### Materials

- foam core board
- thin clear plastic
- aluminum foil
- thin rubber
- black fabric
- tacky glue
- thumbtacks
- scotch tape
- masking tape

#### Testing

You will place a thermometer in your model house and then blast your model with a large light bulb (representing the sun) for 8 minutes at an angle of 45 degrees. During this time, you will record the temperature inside your model to see how much it warms up. Then, you will

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simulate nighttime and record the temperature with the light off and the wind blowing (a fan). This part of the test will show how well your model home retains heat.

### Tips

- While cutting the board, use a straight edge (metal ruler) to hold the scissors in place.
- Glue reinforced by tape usually works best for holding walls together.