Group name: _____ **Date:** _____

Design Challenge Handout

Zero-Energy Housing Project

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 >= 70 square inches
- Roof height >= 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

- 32 x 20-inch sheet 1/8-inch foam core board
- 1 sq ft thin clear plastic
- 4 sq ft aluminum foil
- 2 sq ft thin rubber
- 2 sq ft black fabric
- hot glue and/or 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 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 cutting blade in place.
- Glue reinforced by tape usually works best for holding walls together.