

Design Brief: Cooler

Background: In May, we will be going on a picnic to celebrate the end of the school year. The weather will be hot (we hope!), but we will want to keep our food and drinks cold. Since we have been studying heat transfer, rather than buying coolers you will get a chance to make one. Each team will make a 1:3 scale prototype model. The best insulating cooler from each class will make a full-size cooler that we will use on our picnic.

Constraints:

- The maximum exterior dimensions of the full-size cooler are 24" x 36" x 24".
- The minimum interior dimensions of the full-size cooler are 18" x 30" x 18".
- You will be given \$95 to "purchase" your materials from the available materials list. Once you "spend" your money, you will not be able to get any additional materials, so choose wisely.
- You are required to purchase certain materials needed to build a cooler (handles, fasteners, hinges, etc.) You may not remove those required purchases from your spreadsheet.

Materials:

See the "[Cooler materials cost sheet](#)" for a list of available materials and their prices.

Testing:

You will be given a certain amount of ice. You will place the ice in your cooler. Then, you'll let your cooler sit in the sun for a specified trial period. The team with the least percent of the ice melted at the end of the trial period will be selected to build their full-scale cooler. (If you go over budget, you are disqualified.)

VA SOLs:

PS.7 The student will investigate and understand temperature scales, heat, and thermal energy transfer.

Research resources:

Thermal Insulation Prevents Heat from Escaping:

http://www.school-for-champions.com/science/thermal_insulation.htm

How Insulation Prevents Heat Transfer:

http://www.lowes.com/cd_Understand+Heat+Transfer+and+Insulation_974680410

Good insulators: <http://www.newton.dep.anl.gov/askasci/gen99/gen99832.htm>

R-value home calculator: http://www.jm.com/insulation/technical_info/3001.htm

Bubble wrap as insulation: http://wiki.answers.com/Q/How_is_bubble_wrap_a_good_insulator

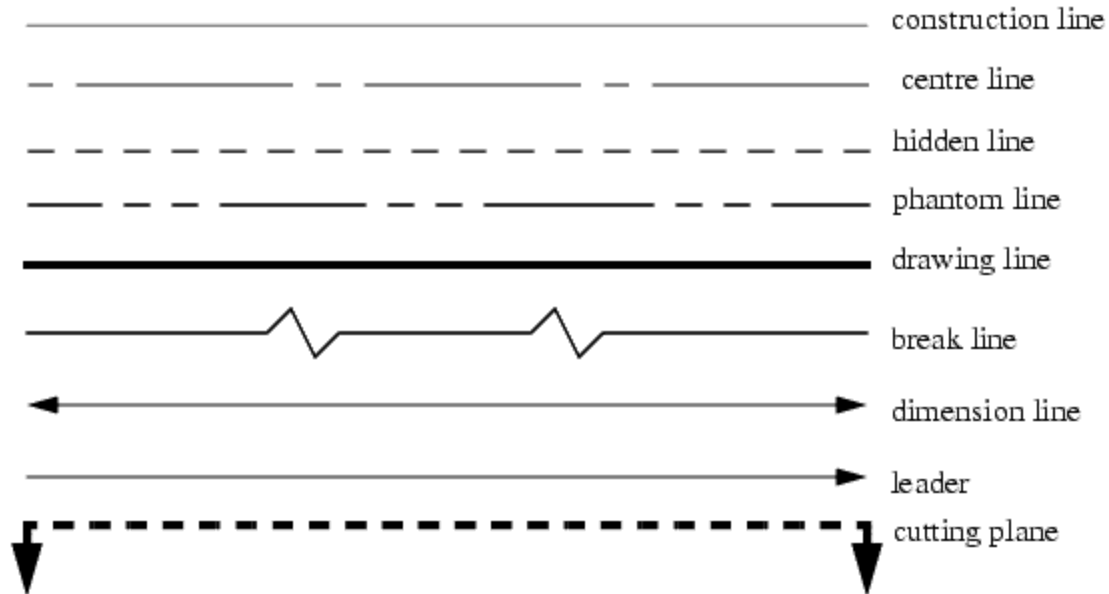
Polystyrene: http://en.wikipedia.org/wiki/Polystyrene#Sheet_or_molded_polystyrene

Radiant Barriers: <http://energy.gov/energysaver/articles/radiant-barriers>

Grading/Scoring:

- _____ /20 Team produced an accurate cost sheet using the prices provided.
- _____ /20 An orthographic sketch with 3 views was provided. Sketch was labeled with full-scale measurements. Sketch includes hidden lines to represent the model's interior.
- _____ /30 Prototype model represented a 1:3 scale based on the sketch.
- _____ /20 Design was tested as instructed.
- _____ /10 Team worked productively each day during the entire class period.

Resources:



Source: engineeronadisk.com