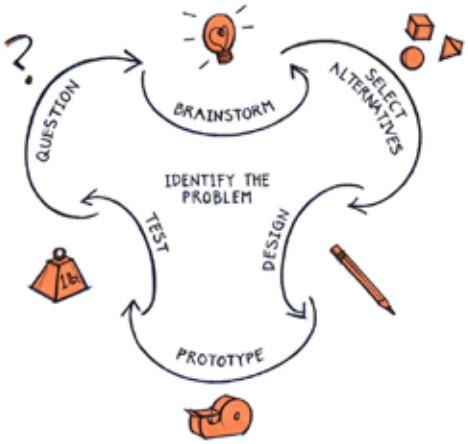
Design Challenge:
Cardboard Chair Guidelines

THAYER SCHOOL OF ENGINEERING AT DARTMOUTH

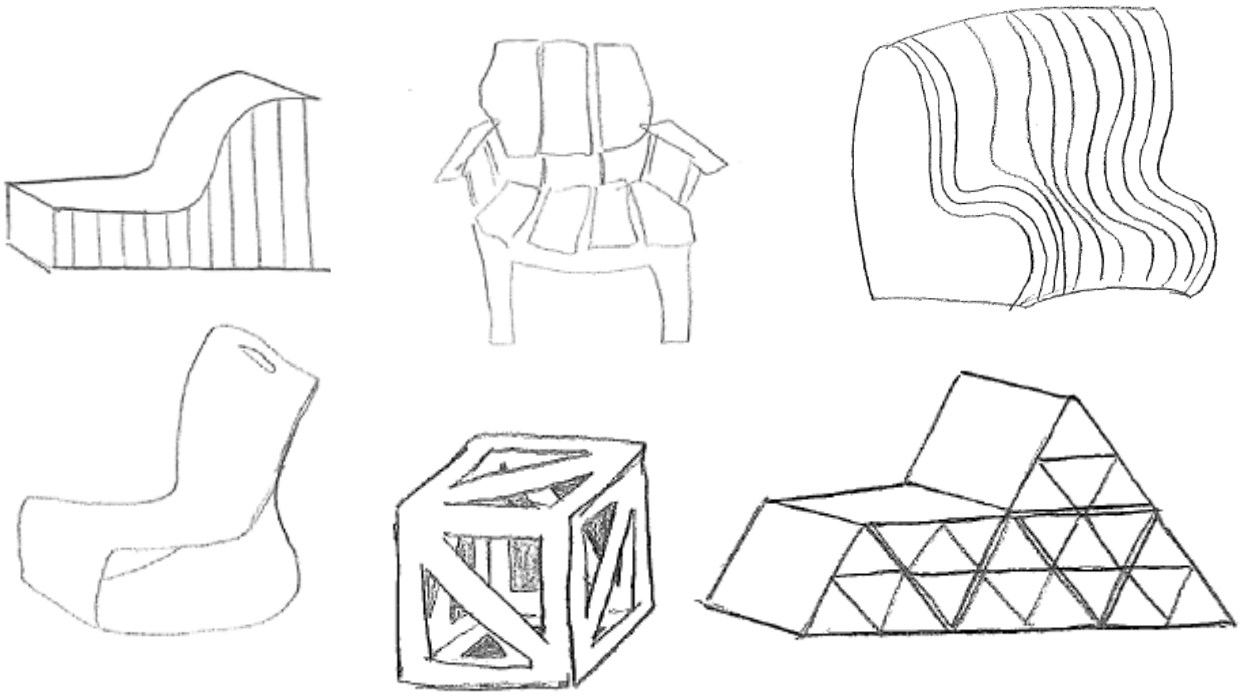


Design Goal: Design a chair to support your weight using cardboard, string or yarn, glue, and duct tape. The seat of the chair should be a minimum of 300mm from the ground. The chair should be comfortable and your design should be creative.

Supplies: Cardboard (or foam-core), duct tape, string [optional], X-acto knife or utility knife or scissors, glue [optional], prototyping supplies (paper or poster board or manila folders and tape).

Question: A chair is really just a small-scale structure. Like a building or bridge your chair must safely support loads, be economical, and be aesthetically pleasing. How can you build a chair out of cardboard? What will make your chair comfortable? What are some fun chair designs that you've seen? Measure chairs in your home and search for images online.

Brainstorm: Come up with LOTS of ideas. It is okay to look at existing chairs but remember that one of your goals is to come up with a creative design.



Select Alternatives: Be sure to select alternatives that meet your design goals: safety, comfort, and creativity.

Design and Prototype: I recommend sketching and building small-scale prototypes to start before building full-scale chairs. I often use manila folders or poster board to build small-scale prototypes of my design ideas. The more time you spend experimenting and building the more successful you'll be with your final chair design.

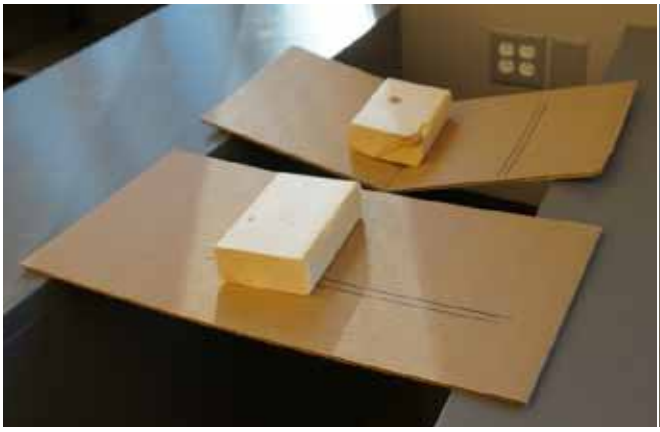
Small-scale Prototypes:

Full-Scale Prototype:

Tips for Building with Cardboard:

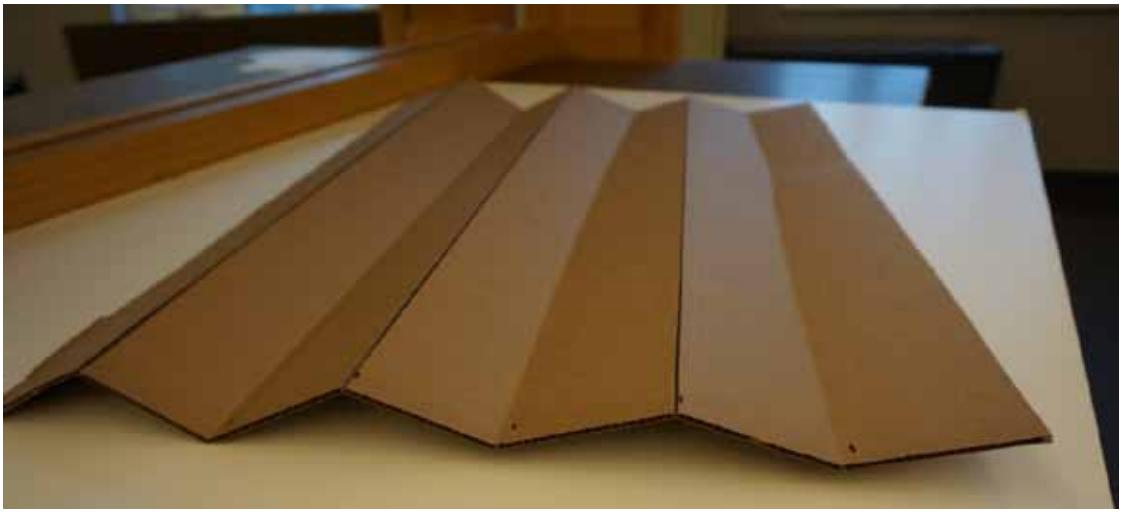
- Use an X-acto knife or utility knife with a sharp blade – if you start getting a rough edge when cutting it is time to change the blade.
- Use a ruler, the wider the better, to help cut straight lines and protect your hands.
- Rather than trying to cut the cardboard all the way through on the first pass, make several passes using light pressure.
- Score cardboard by cutting only through the top layer to create bends and corners.
- Pay attention to the orientation of the corrugations in the cardboard: cardboard can be quite strong in one direction (parallel to the corrugation) but quite weak in the other direction (perpendicular to the corrugation). Experiment a bit with pieces of cardboard to determine the stronger direction.

Corrugations:



The black lines indicate the direction of the corrugations.

Scoring:



Test and Reflect: Test your design by sitting on it – and leaning back. Be sure to measure the height of the seat as well.

- Does your chair support your weight without too much deflection?
- Is it comfortable? You might want to have friends or family help you to evaluate the comfort and creativity.

Remember to reflect on your design:
What worked? What didn't?
What factors seem to affect strength, stiffness and stability?