Anti-Funicular Form Building Activity Guidelines

Anti-funicular forms are very efficient for specific loading conditions. Engineers and architects including Heinz Isler, Felix Candela, and Antoni Gaudi regularly built anti-funicular forms to help guide their designs. Anti-funicular forms are primarility in compression so must they must be constructed of materials that are able to resist compression such as steel, concrete, or plaster.

Design Goal: Design and build an anti-funicular form. What type of form do you wish to design? Will your model serve a certain purpose or do you just wish to experiment with different forms? Will your anti-funicular form be able to support loads? Maybe the load of a heavy book?

Supplies:

- Cheesecloth works best for anti-funicular forms but a lightweight fabric will also work; we typically use Grade 60 cheesecloth with a 32x28 thread count
- Plaster of Paris
- Tape
- String

Alternatively: you can create a paper maché anti-funicular form using newspaper, flour, water, tape and string.

Question: Research different anti-funicular forms designed by Heinz Isler, Felix Candela, Antoni Gaudi and others. Or sketch designs of your own. What forms do you like? Why? Will your anti-funicular form include openings? How will it be supported? Will you apply additional loads?

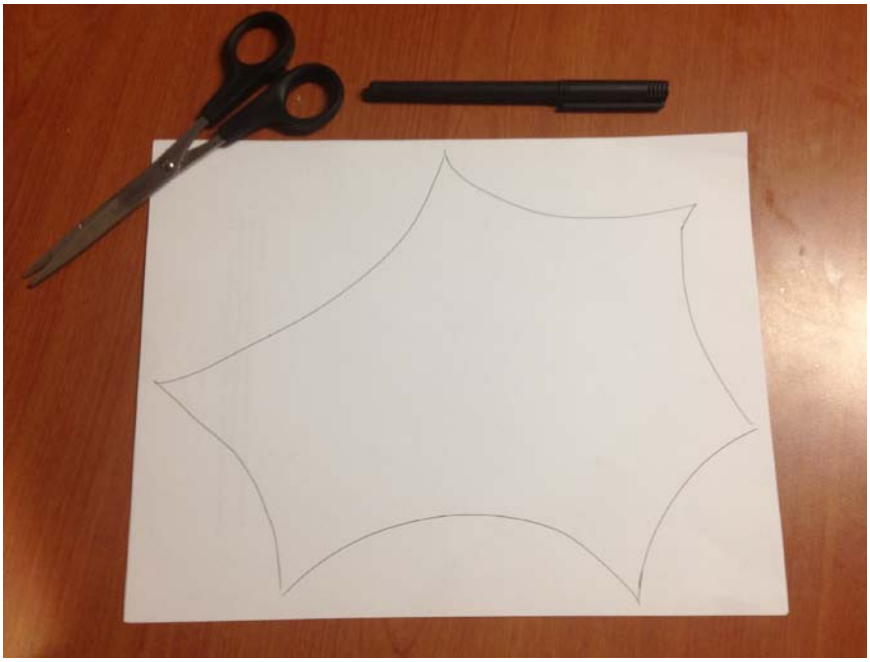
Brainstorm: Sketch or build lots of different models of anti-funicular forms. You can build simple models using paper.

Select Alternatives: Be sure to select alternatives that meet your design goal. If your anti-funicular form will support a load be sure to create a stable place to load the structure.

Design and Prototype: Below are some guidelines for creating an anti-funicular form first using cheesecloth and plaster and later using paper maché. Build several different prototypes to experiment with form. **See Page 2 for general step-by-step directions.**

Test and Reflect: How do the forces flow through your anti-funicular form? Can your anti-funicular form support a load? Try pushing down on the top of the form or placing a book on the top. Do you need to add supports at the base? Or is your form self-supporting?

Step 1: Create an outline of your form. I find it easier to first draw it on paper.



Step 2: Cut out your design in cheesecloth using your paper model as a guide.

Step 3: Tie strings at locations where you plan to hang your funicular form. Rather than trying to create holes in the cheesecloth I find it easier to simply tie the string around the corner of the cheesecloth. You'll need to find some place to hang your funicular form: a drying rack or laundry basket or cardboard box work well. Be creative finding someplace to hang the form!

Step 4: Mix up plaster or paper mache. I used a metal tray to mix the plaster but you could use a paper plate or different type of container. **Plaster can't be washed down the sink, as it may clog pipes or drains.** When you're done with this project, just scrape any leftover or dried plaster into the trash. To make clean-up easier, mix the plaster in a plastic bag and throw it away as soon as you're done. Two recipes are given below. Always add water slowly while stirring and stop once the consistency is smooth.

-Plaster Recipe: ½ cup plaster, ¼ cup water

-Paper Mache Recipe: ½ cup water, ½ cup flour (if you have it, add a tablespoon of white glue for a smoother finish)

Step 5: Dip your funicular form in plaster. Hang your funicular form by connecting the strings to whatever frame you've chosen – tape or binder clips work well to support the strings.

Step 6: Once the plaster is dry, cut the strings, flip over your funicular form and Voilà, an anti-funicular form.