# Pasco Models

## Purpose:

When analyzing structures in equilibrium, it can be difficult to visualize the forces since they are not causing anything to move. This model is intended to have just enough give so that students can push on it to simulate the load on their roof and feel the resulting forces throughout the model by noticing the small movements it makes in response.

In particular, as students push down on the peak of the structure, they should feel that the ridge boards and posts are getting “squashed” (i.e., that they are in compression), but that the posts are pulling away from each other, and thus the crossbeam is being “stretched” (i.e., is in tension). This will help the students understand which way the forces are pointing as they draw their free body diagrams and set up their equilibrium equations.

## Functionality:

The model is made to reflect the shape of one end of the students’ structures. There are two vertical posts, connected at the top by a horizontal crossbeam. On top of this, two diagonal rods connect to each end of the crossbeam and rise to meet each other at a peak. This roughly forms the shape of an ‘A’ (except with straight legs).

The Pasco pieces, by nature, have a little bit of give in the joints, which allows some of the movement that this model is intended to have.

### (Optional) Tactile Crossbeam

The authors of this lesson have also designed a special 3D printed crossbeam that has some springiness so that the beam itself can stretch and compress. This feature can help make the compressive and tensile forces even more apparent, but the piece can be somewhat finicky, as is described further in the construction section. It is left up to the reader to determine if this is worthwhile to implement.

## Construction:

This model is constructed from two Pasco rods (either medium or long) as posts, two Pasco medium rods as rafters, one long rod (either Pasco or 3D printed) as a crossbeam, three Pasco joint pieces, and appropriate Pasco screws. The pieces should be assembled as described above.

### (Optional) Tactile Crossbeam

If you choose to use the tactile crossbeam, three pieces need to be 3D printed from the included files for each crossbeam. (One center rod and two end pieces.) The areas of the parts around the cross holes (the approximately 1/4” round holes going through the pieces) are very narrow, so you may have to carefully adjust your printer settings to make sure that these parts print correctly. Also, because these spots are so thin, they can be prone to breaking if not handled carefully during assembly and use.

Once the pieces are all printed, insert the center rod into each of the end pieces such that the cross holes line up and insert a standard foam earplug into each of the cross holes. Insert the earplugs the same way you would put one in your ear, by squishing/twisting it until it is very narrow, inserting it, and allowing it to expand back to its original size. Using earplugs as the connections is what creates the springiness in the overall length of the beam.

Once assembled, the crossbeam can be used in place of any standard long Pasco beam.

## Supporting Files: