

#1 Types of Connections

Let's make sure our fundamentals are sound!
Pins, pinned connections, fixed connections, etc.

Part I. It's all about the moment.

As you know from prior coursework, in structural analysis, we typically model connections between components with perfectly frictionless pins or with rigid bends / fixed connections. Sketch a few real-world connections in 2D or 3D and note whether you'd model them as a pin connection or a fixed connection. Explain your reasoning, too. I encourage you to use your direct observations of the world around you as a first source. These can be legitimate structural connections from buildings or bridges, or more accessible connections that you can find in your dishwasher, curtain supports, furniture, hand tools, and kitchen gadgets. If you get stuck (and only if you get stuck), resort to an internet search.

Part II. Learn how to manipulate the *Seeing Structures* visualizations.

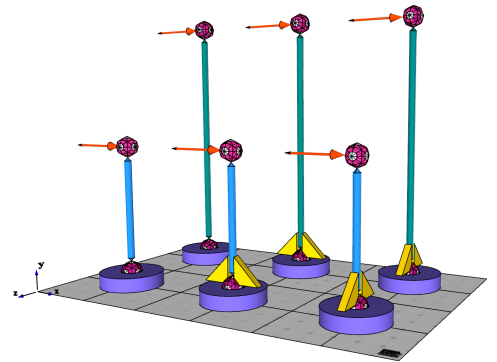
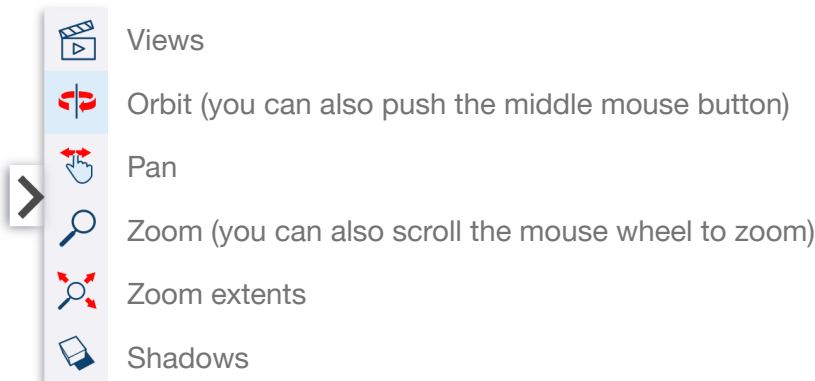
Take a few minutes to familiarize yourself with my repository of *Seeing Structures* models:

<https://3dwarehouse.sketchup.com/by/SeeingStructures>

The models are organized into a few different collections (Statics, Mechanics of Materials, etc.). Most of the models that we will use in this course will be placed in the "Structures" collection. You can always use the search functionality if any of my links are broken.

Open the model titled [Structures-01-Types Of Connections](#). You should see something similar to the screenshot at right.

At the right side of the screen is a menu similar to the picture below.



Experiment with these buttons until you can manipulate the model fairly fluently. You can also scroll the mouse wheel to zoom in and out.

Important: note that when you click "Views," you can make a variety of axonometric and perspective views (the little pictures of a house at the top). Below, there are views that I have pre-programmed. For example, click on the one that says "IP + Copyright."

Part III. Time to build (make connections, literally)

Use the Mola Structural Kits to build the model titled [Structures-01-Types Of Connections](#). Use a finger to apply a lateral load to each column. Note that some of these structures are more stable than others; some will be prone to collapse. For the ones that are stable, experiment with both static loading and impact loading (considered to be a dynamic load).

Part IV. Reflect (make connections, figuratively)

Which Mola component or components best correlate to each of the following concepts?

- a plane of fixity (or fixed plane)
- a pin
- a pinned connection (a pin that is pinned)
- a fixed connection

How did the member length (the B18 member vs. the B09 member) affect the structural behavior?

Was the orientation of the RC-01 connections (x-direction vs. z-direction) important? How so?

Are any of these magnetic connections so-called “perfect pins?” Are any “perfectly rigid?” How might structural engineers model these types of connections in real life? What tools / philosophies / approaches might help us think through this problem? And how important is it for a structural analysis model to realistically reflect the complexity of every connection we use?

Did these experiments clear up your understanding of these concepts? Which concepts and/or classes did the experiment clarify for you? Was this activity helpful and useful to you?