Build + Connect

#03 Effects of Stiffness

Force follows stiffness: stiffer members and stiffer connections attract the flow of force.

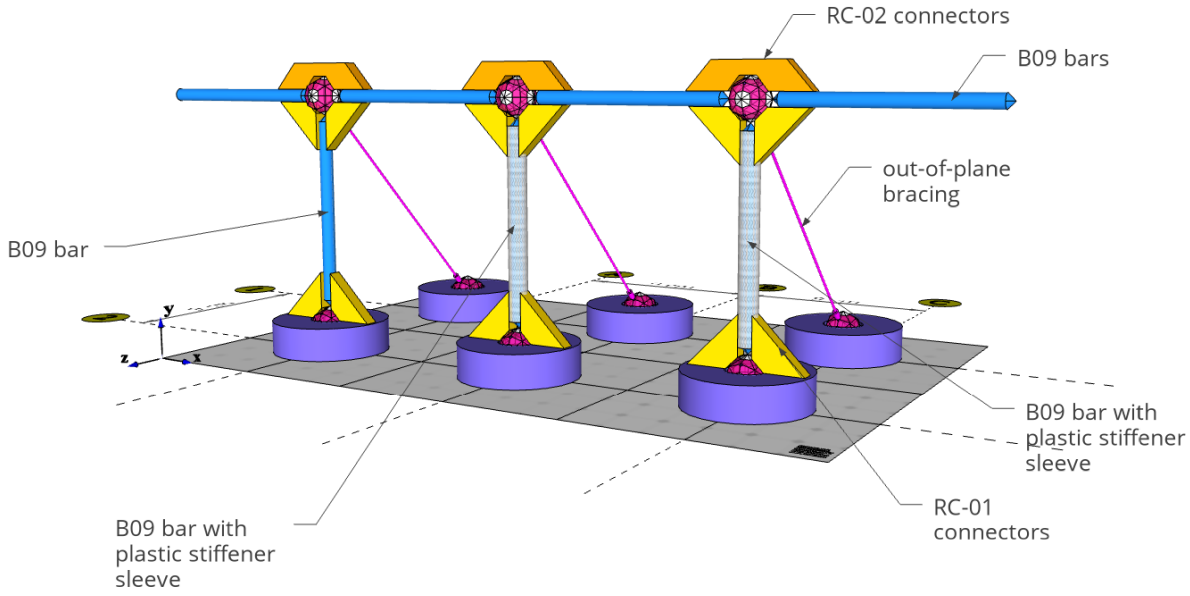
Part I. Stiffness

What is meant by the term stiffness? How about axial stiffness? Flexural stiffness? Torsional stiffness? Why don't we talk about shear stiffness much? Think about what you learned in previous classes, and then supplement your knowledge by searching online and talking with other students.

Part II. Time to build

Open up Structures-03-Effects of Stiffness and build the model. In this structure, a two-bay moment frame, in-plane stiffness is provided by moment (or "fixed") connections at the base and rigid (continuous) connections at the top. Diagonal members brace the structure out-of-plane.

Please note that the columns have different stiffnesses. One column is "naked" and the other two are clad in a plastic stiffener sleeve as shown below.



Part III. Apply loads

First, apply loading scenario 1 (a vertical point load halfway between columns A,2 and B,2. Then, compare that behavior to loading scenario 2 (a vertical point load halfway between columns B,2 and C,2). You can see these loading scenarios in the CAD model by clicking on "views." How do the column stiffnesses change the structural behavior, and the transfer of moment?

Part IV. Reflect and connect

Take a few minutes to make a written reflection to this prompt in your notebook. Draw the structure, the loads, and the deformed geometry. How did this exercise help you think about stiffness in a new way? How should structural engineers think about the relative stiffnesses of members in a structure in design? Did this exercise make you think about symmetry and simplicity in design? How about balance? What other takeaways did you have from the experiment?