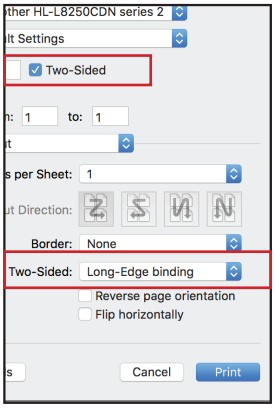
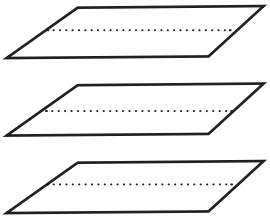
HOW TO MAKE YOUR BOOKLET!

Follow these simple steps to assemble your book:



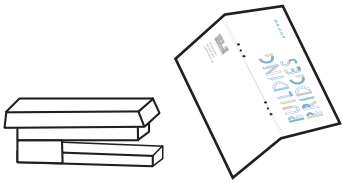
1. Download and open the document ‘BuildingBridges_Guide.pdf’ in Adobe Acrobat or Preview.

2. Print the booklet. In your print dialogue box make sure that your printer is set to print ‘Two-Sided’ with ‘Long-Edge Binding.’ Choose ‘Actual Size’ or ‘100%’ for ‘Scale.’



2. Stack the pages in the exact order that they print. The cover should be on the bottom, face-down. Please note that the page order will only be correct once the booklet is properly folded and assembled.

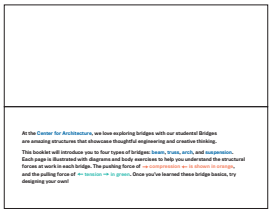
3. Fold the entire stack along the long, middle edge. The inside spread of the book should be ‘Truss Bridges.’

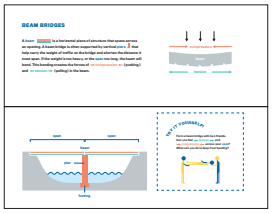


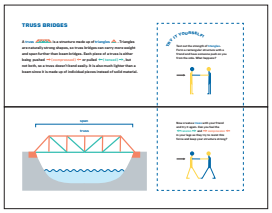
4. Bind your booklet by stapling along the two marks on the cover of the booklet.

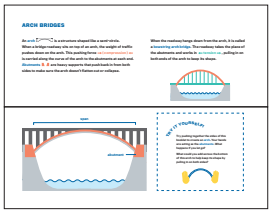
5. Done! You’re ready to learn about Building Bridges.

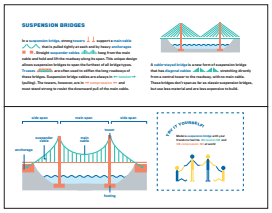
Your final book should appear in the following order:











BUILDING BRIDGES

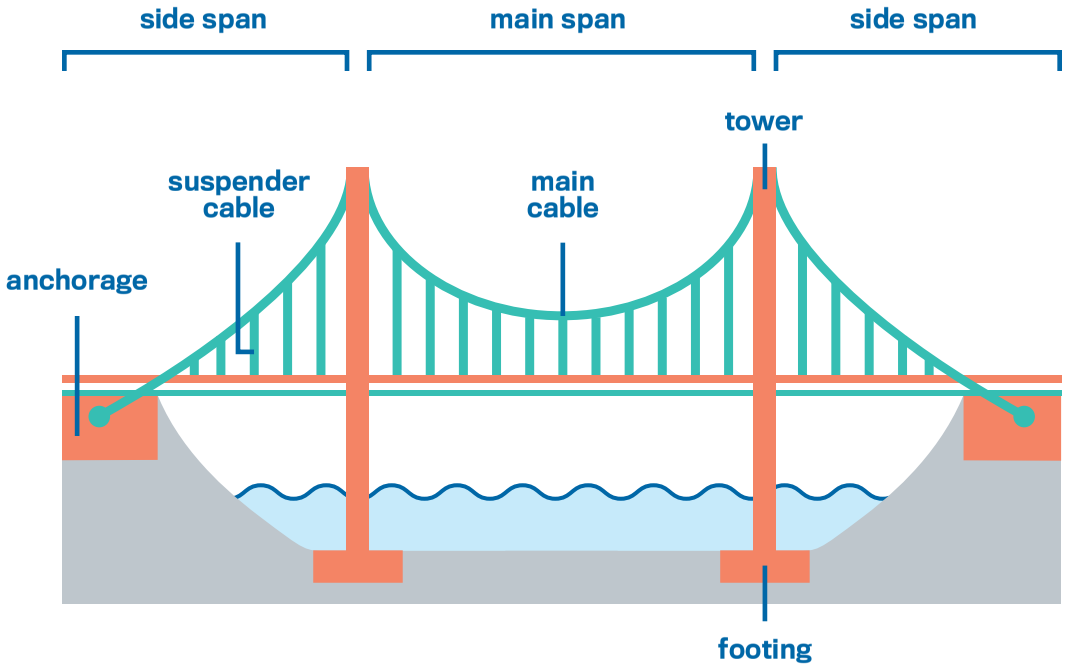
ACTIVITY GUIDE

CENTER FOR ARCHITECTURE

536 LaGuardia Place

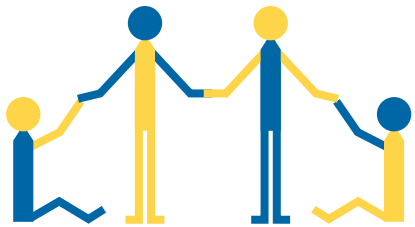
New York, NY 10012

centerforarchitecture.org

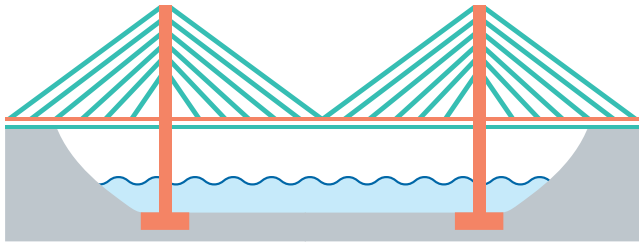


TRY IT YOURSELF!

Model a suspension bridge with your friends to feel the ← tension → and → compression ← at work!



SUSPENSION BRIDGES



In a suspension bridge, strong towers support a main cable that is pulled tightly at each end by heavy anchorages. Straight suspender cables hang from the main cable and hold and lift the roadway along its span. This unique design allows suspension bridges to span the furthest of all bridge types. Trusses are often used to stiffen the long roadways of these bridges. Suspension bridge cables are always in ← tension → (pulling). The towers, however, are in → compression ← and must stand strong to resist the downward pull of the main cable.

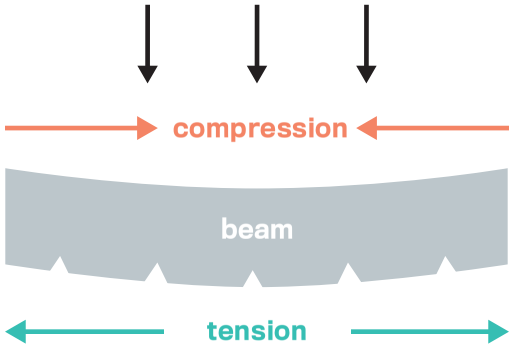
A cable-stayed bridge is a new form of suspension bridge that has diagonal cables stretching directly from a central tower to the roadway, with no main cable. These bridges don't span as far as classic suspension bridges, but use less material and are less expensive to build.

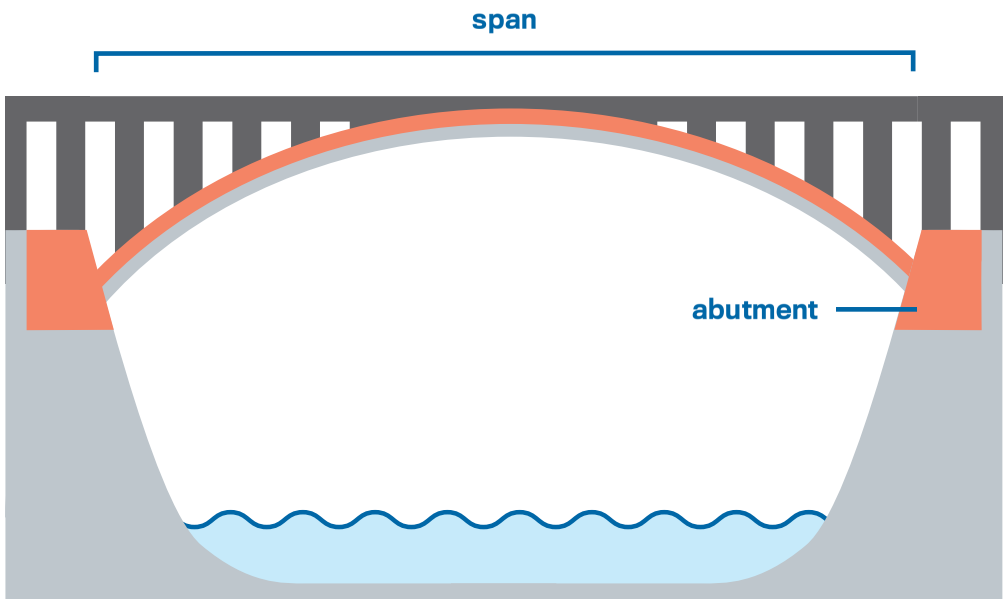
At the Center for Architecture, we love exploring bridges with our students! Bridges are amazing structures that showcase thoughtful engineering and creative thinking.

This booklet will introduce you to four types of bridges: beam, truss, arch, and suspension. Each page is illustrated with diagrams and body exercises to help you understand the structural forces at work in each bridge. The pushing force of → compression ← is shown in orange, and the pulling force of ← tension → in green. Once you've learned these bridge basics, try designing your own!

BEAM BRIDGES

A **beam** is a horizontal piece of structure that spans across an opening. A beam bridge is often supported by vertical **piers** that help carry the weight of traffic on the bridge and shorten the distance it must span. If the weight is too heavy, or the **span** too long, the beam will bend. This bending creates the forces of → **compression** ← (pushing) and ← **tension** → (pulling) in the beam.





TRY IT YOURSELF!

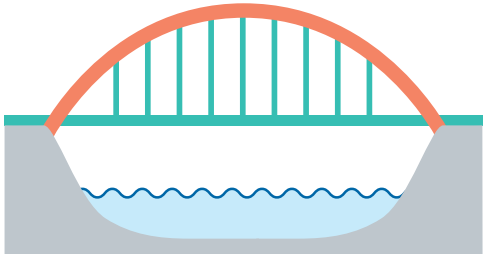
Try pushing together the sides of this booklet to create an **arch**. Your hands are acting as the **abutments**. What happens if you let go?

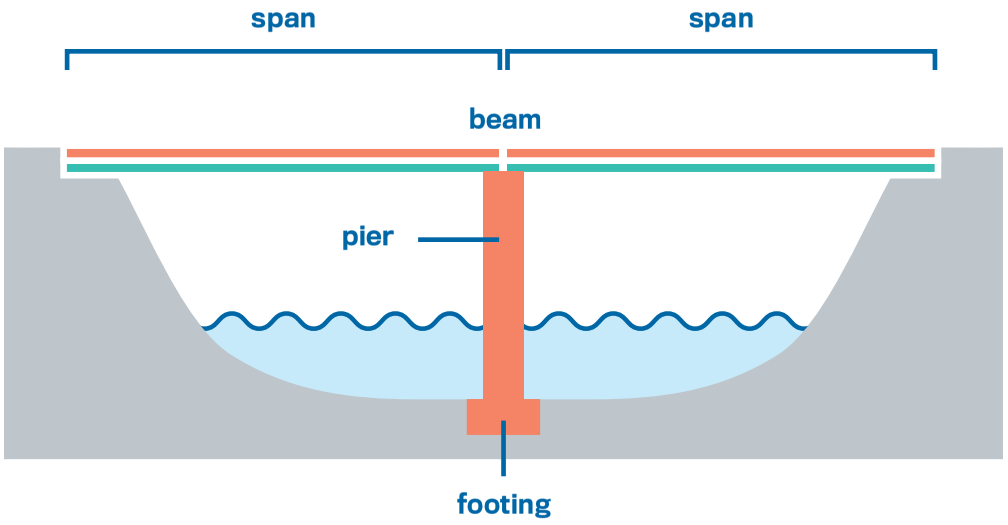
What could you add across the bottom of this arch to help keep its shape by pulling in on both sides?

ARCH BRIDGES

An arch is a structure shaped like a semi-circle. When a bridge roadway sits on top of an arch, the weight of traffic pushes down on the arch. This pushing force → (compression) ← is carried along the curve of the arch to the abutments at each end. Abutments are heavy supports that push back in from both sides to make sure the arch doesn't flatten out or collapse.

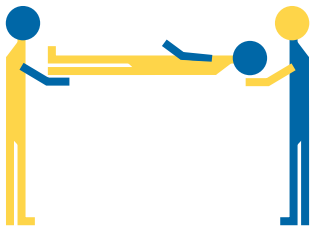
When the roadway hangs down from the arch, it is called a bowstring arch bridge. The roadway takes the place of the abutments and works in ← tension →, pulling in on both ends of the arch to keep its shape.





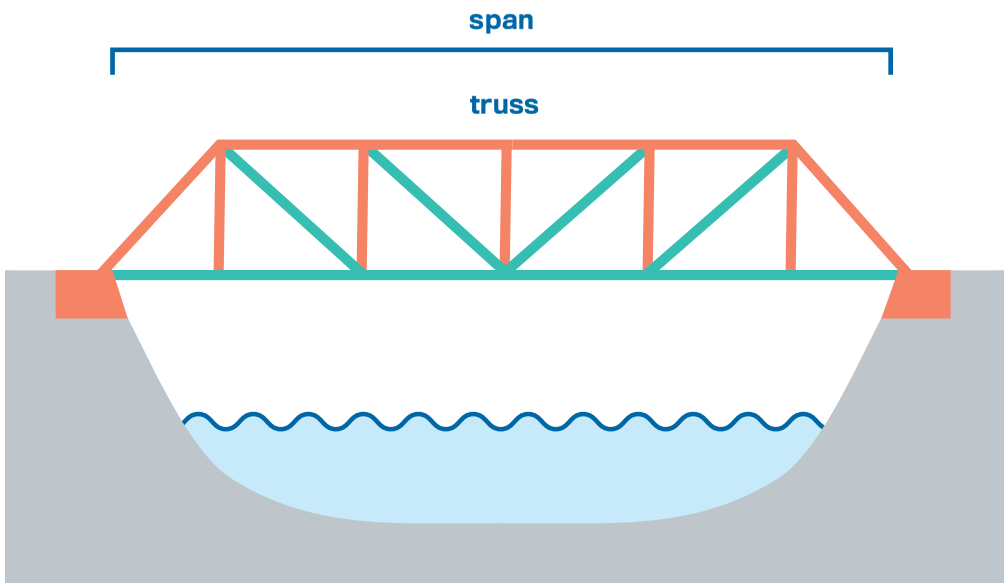
TRY IT YOURSELF!

Form a beam bridge with two friends.
Can you feel ← tension → and
→ compression ← across your span?
What can you do to keep from bending?



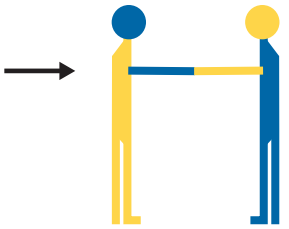
TRUSS BRIDGES

A truss is a structure made up of triangles . Triangles are naturally strong shapes, so truss bridges can carry more weight and span further than beam bridges. Each piece of a truss is either being pushed → (compressed) ← or pulled ← (tensed) →, but not both, so a truss doesn't bend easily. It is also much lighter than a beam since it is made up of individual pieces instead of solid material.



TRY IT YOURSELF!

Test out the strength of triangles. Form a rectangular structure with a friend and have someone push on you from the side. What happens?



Now create a truss with your friend and try it again. Can you feel the ← tension → and → compression ← in your legs as they try to resist this force and keep your structure strong?