STRUCTURE

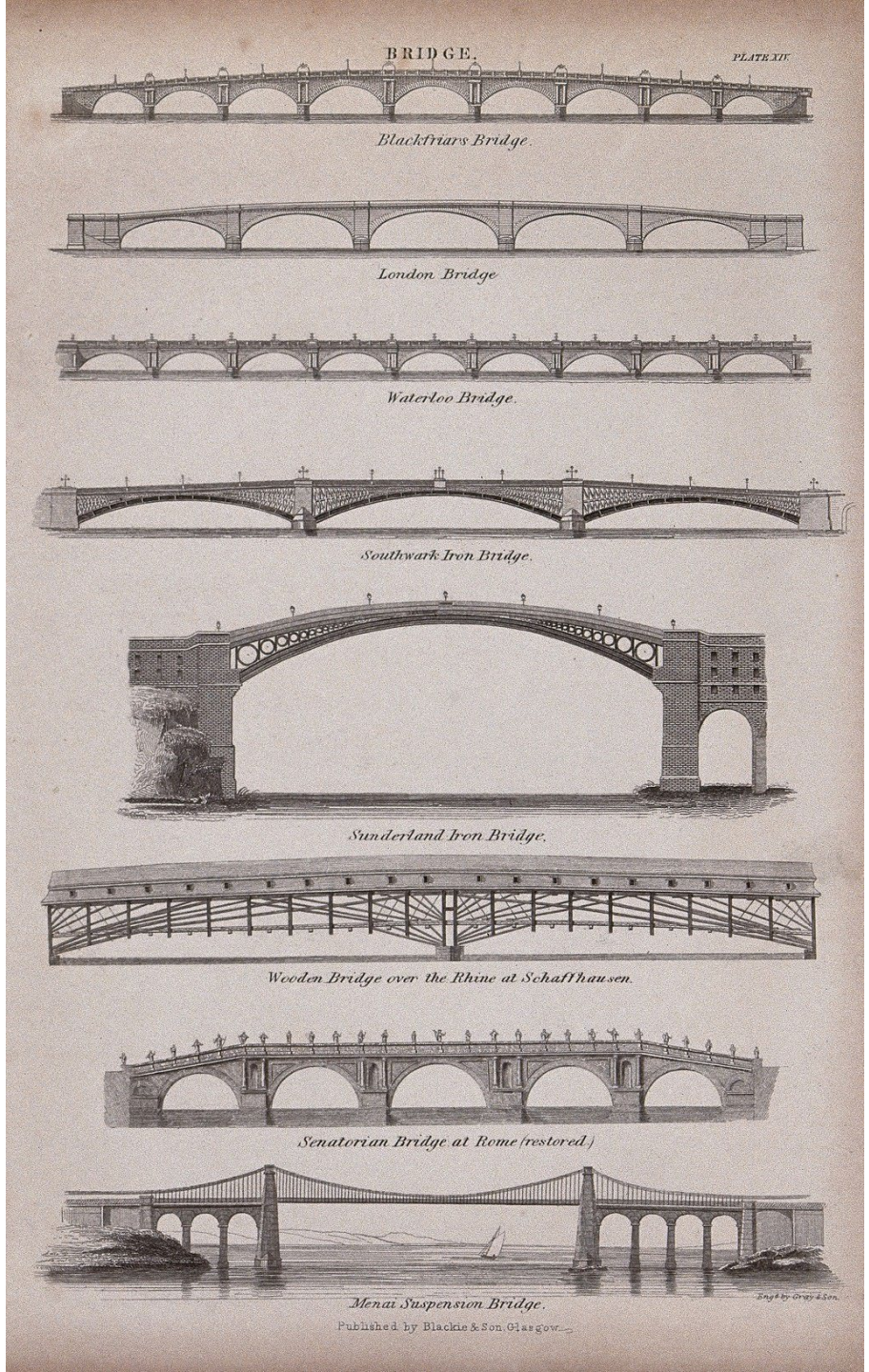
Bridge typologies and analysis

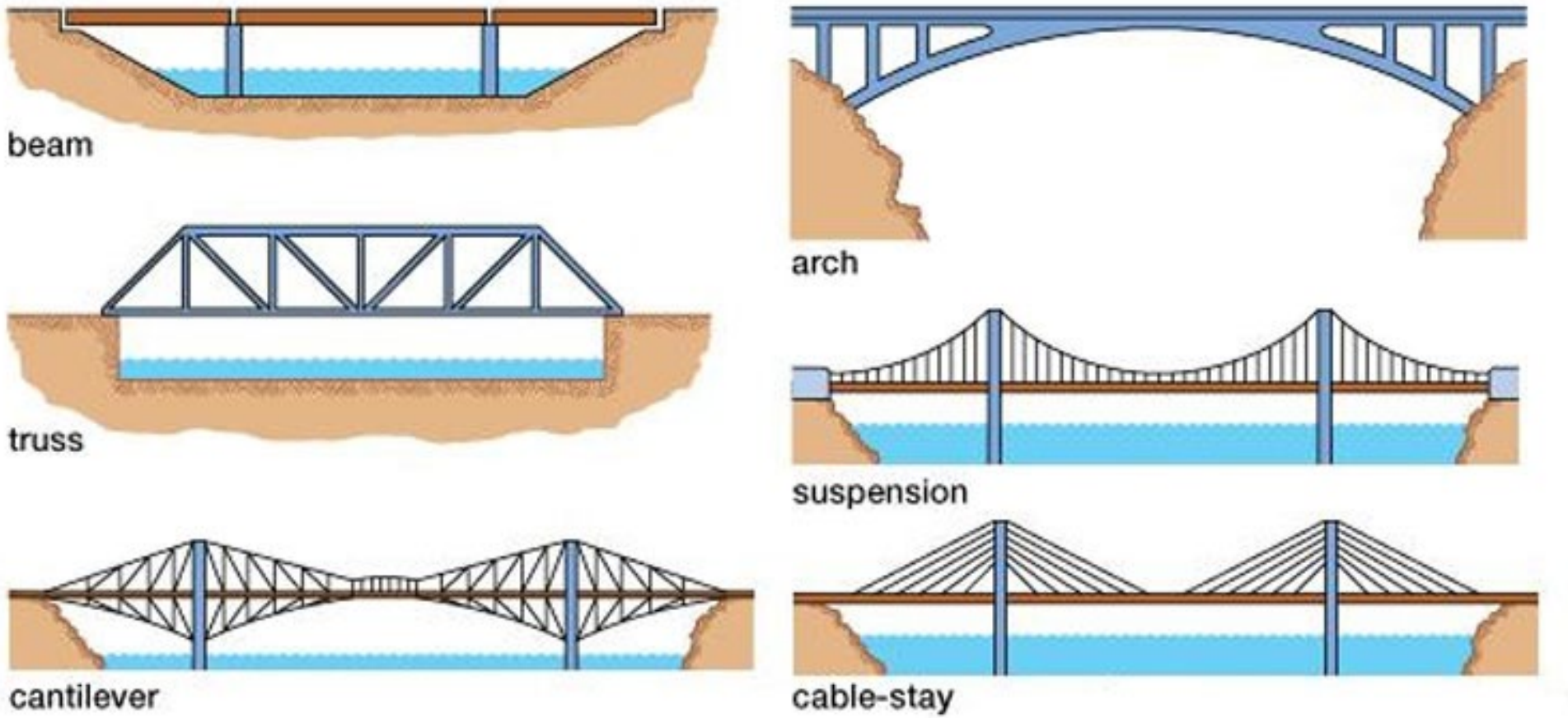
Design Studio One

ARCH5112: School of Architecture: 2023

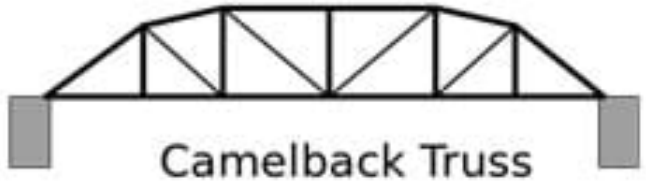
Civil engineering: various bridges in Britain and Europe. Engraving by Gray and Son.

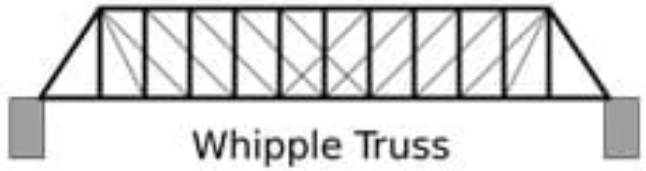
https://wellcomecollection.org/works/z7phvsqy/items?canvas=1&langCode=eng

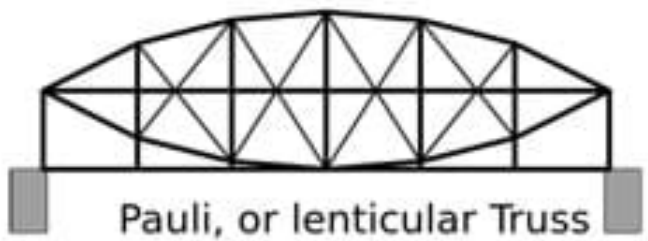




http://engineeringfeed.com/types-steel-bridges



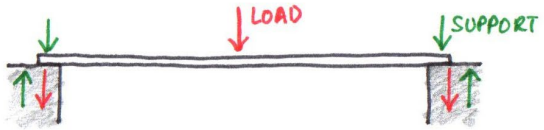




https://www.teachengineering.org/activities/view/wpi_spag_act_joy

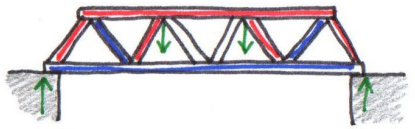
THE FOUR MAIN TYPES OF BRIDGES:

1. BEAM BRIDGE



Weight is applied at either end to counteract the bending at the centre. The beam must be strong in both compression and tension to resist twisting & bending under load.
(can only span 250 ft max)

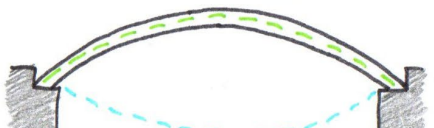
2. TRUSS BRIDGE



- Compression
- Tension
- → Forces

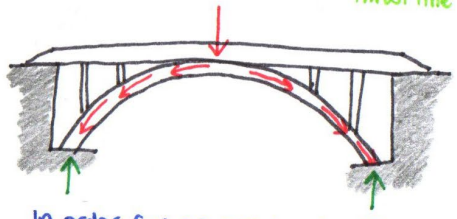
Truss bridges are kept strong by the stiffness of the structure. All the beams/members work together to spread out the load.

3. ARCH BRIDGE



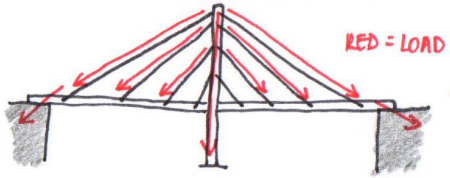
OR...

Light green = Thrust line



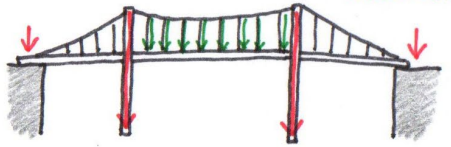
In order for an arch bridge to work it needs to have firm foundations, to allow all the members to push back against each other. The arch needs to be within a thrust line to stay rigid + supportive. This can be found by hanging a chain off the gap + then mirroring it (light blue dotted line).

4. SUSPENSION BRIDGE



4a) Cable-stayed bridge

GREEN = SUPPORT



4b) Suspension bridge

Suspension bridges allow for the longest spans. The bed of the bridge can be continuous, and is held up by cables stretched between piers. In the top bridge, these cables are rigid + directly connected to the bridge deck. In the bottom bridge, they hang vertically off another cable supported by the piers.

http://computerkiddoswiki.pbworks.com/w/page/16304656/Bridge%20Building

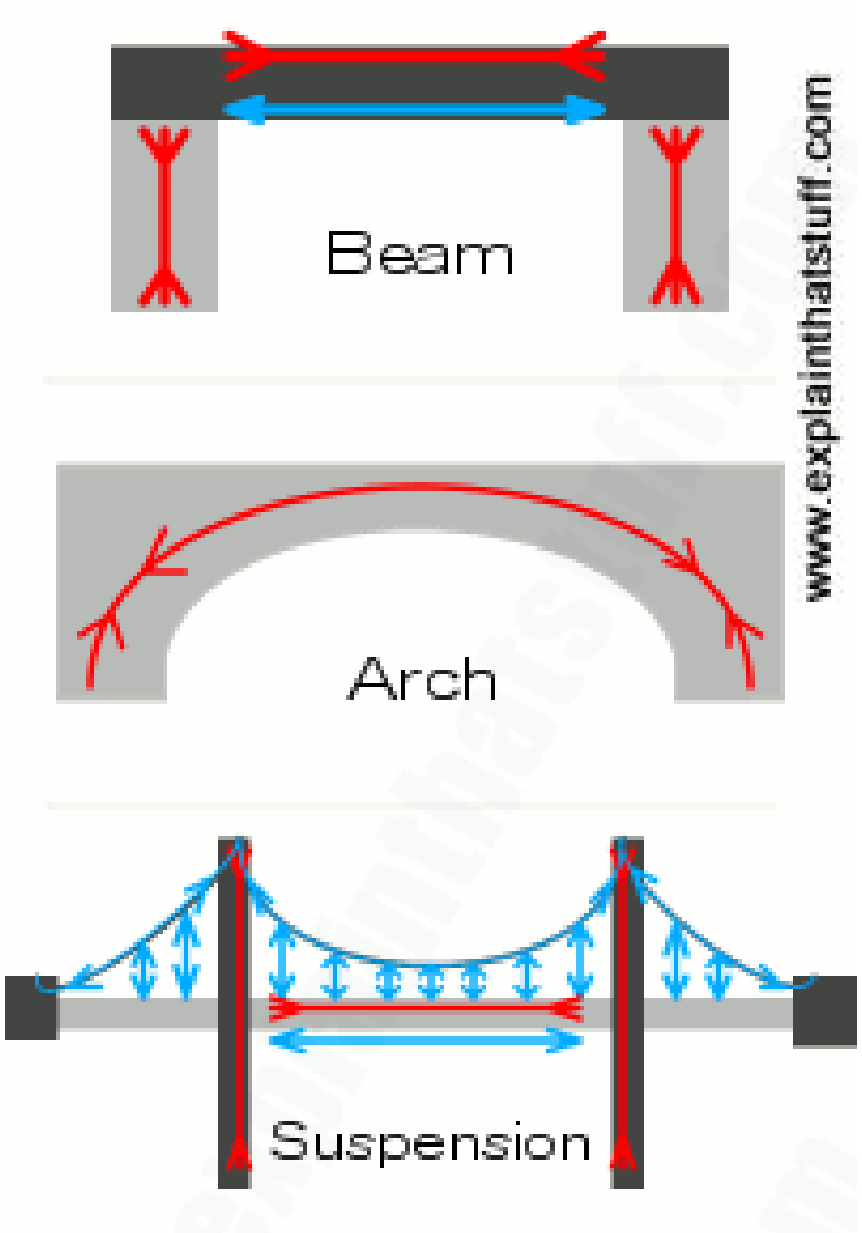
Different types of bridges carry loads through the forces of compression ("squeezing"—shown here by red lines) and tension ("stretching"—shown by blue lines).

A **beam bridge** has its beam partly in tension and partly in compression, with the abutments (side pillars) in compression.

An **arch bridge** supports loads through compression.

A **suspension bridge** has its piers (towers) in compression and the deck hangs from thick suspension cables by thinner cables, all of which are in tension.

https://www.explainthatstuff.com/bridges.html



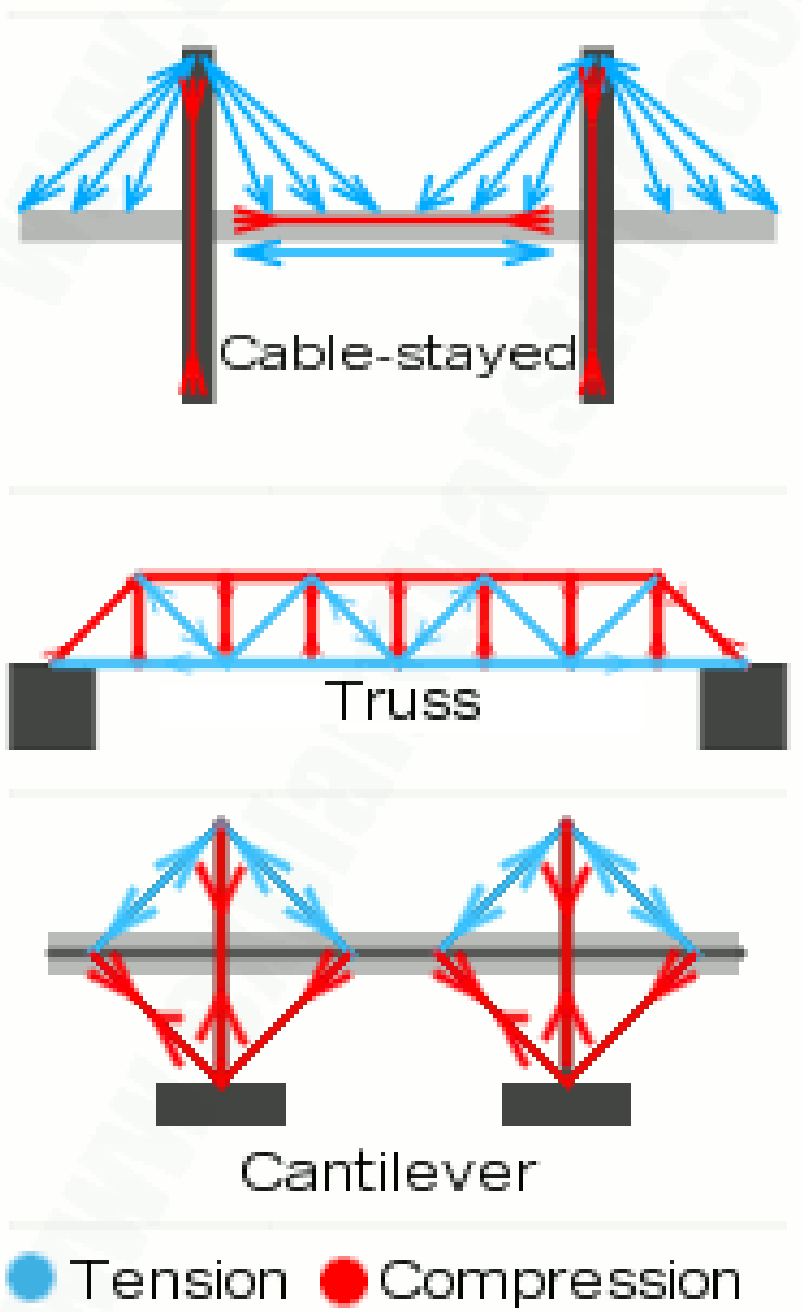
A **cable-stayed bridge** is similar but the deck hangs directly from the piers from cables. The piers are in compression and the cables are in tension.

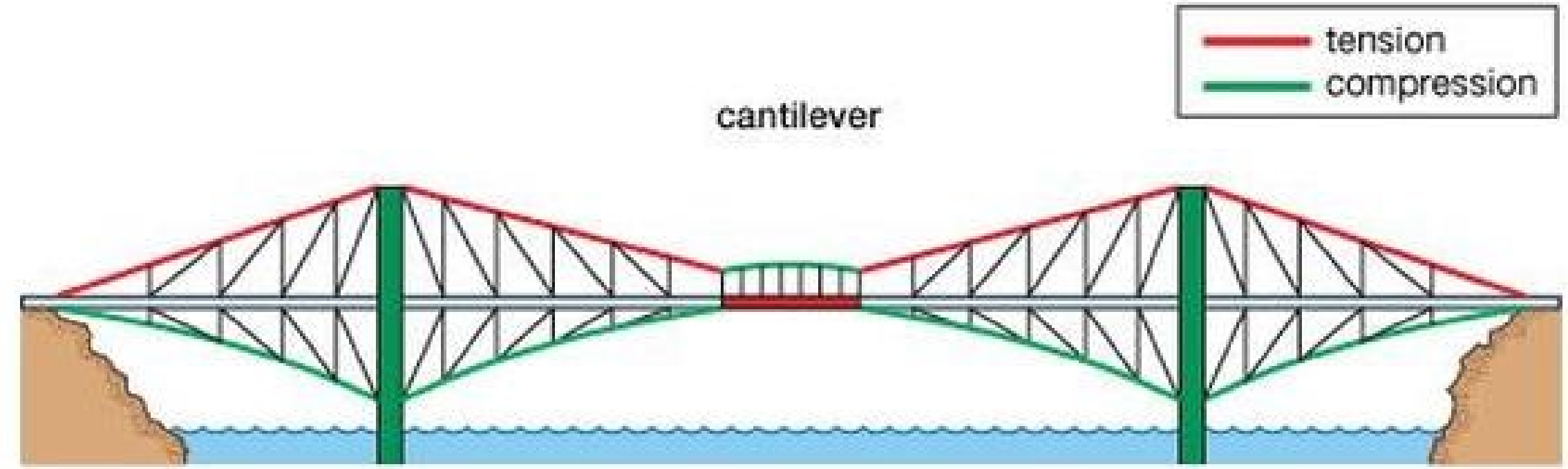
A **truss bridge** is a kind of reinforced beam bridge. Like a beam bridge, the top is in compression and the bottom in tension. The diagonal trusses are in tension and the vertical ones are in compression.

A **cantilever bridge** balances tension forces above the bridge deck with compression forces below.

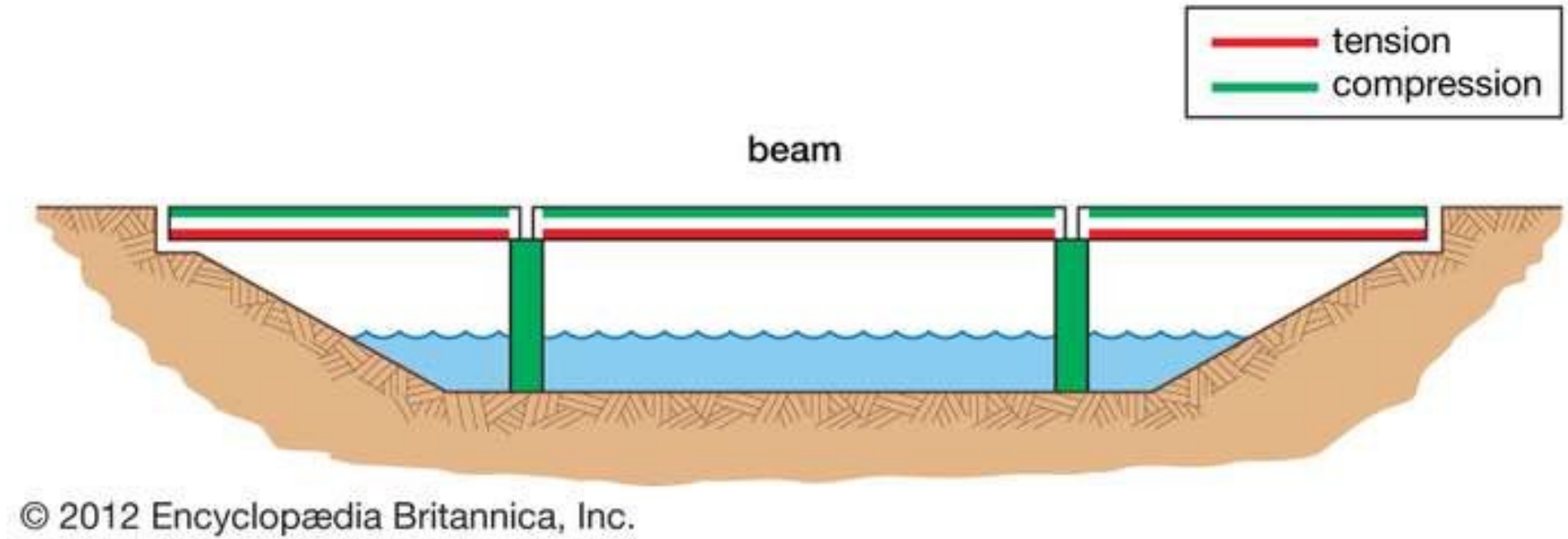
Other kinds of bridges are usually "hybrid" designs that combine one or more of these basic bridge types.

https://www.explainthatstuff.com/bridges.html





https://howbridgeswork.weebly.com/cantilever-bridge.html



A beam bridge, with forces of tension represented by red lines and forces of compression by green lines.*Encyclopædia Britannica, Inc.*

https://www.britannica.com/technology/bridge-engineering