

Construction of the Suspension Bridge Chains

The “chains” are one of the most important components of the bridge (Fig. 1), and we found that it was important to lay them out with care. If particular cable segments were of the wrong length by as little as one or two links, the bridge would not hang quite right, and students became frustrated when they tried to assemble it.

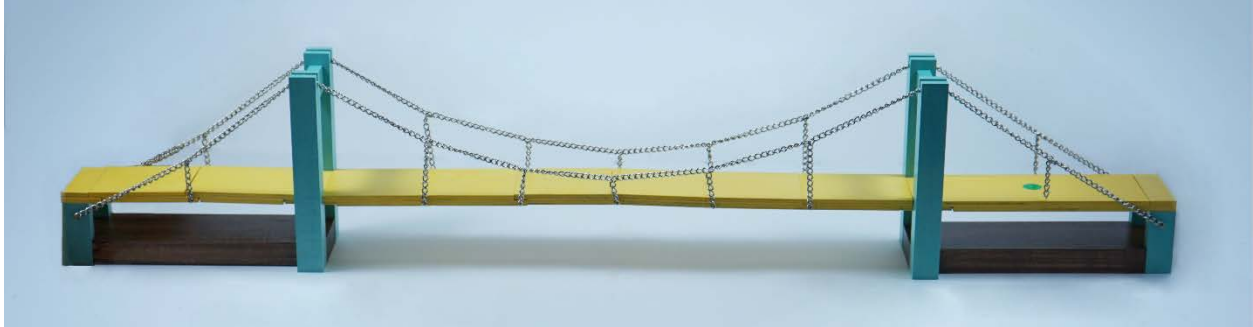


Fig 1 – Side view of the Suspension Bridge

The chains should be made from metal chain that has links that can be opened and re-closed using pliers. Then the suspenders can be easily attached to the sides of the main chains (Fig. 2).



Fig 2 – Detail of Suspender Attachment to Main Chain

We used chain that had links with a pitch of approximately $\frac{1}{4}$ " (7 to 8 mm), and we found that this allowed the suspenders to be positioned sufficiently accurately.

We found it best to build the chains by laying them out on a board (Fig. 3) and using pins to hold them in place. Unfortunately, we did not get a good photo of us doing so. The suspender lengths were calculated mathematically on the basis that the cables took a parabolic shape. No extra links should be left on the ends of the suspenders as their presence makes it more difficult to assemble the model. The spacing of the suspender attachment points along the main cable were determined graphically, as the inter-suspender spacing varies with the cable angle.



Fig. 3 – The Board Used to Lay Out the Chains – and the Helpful Students Who Did the Work

The approximate number of links in each of the segments in our chains are shown in Fig. 4. Because the suspenders had to be attached at discrete points, the inter-suspender distances had to sometimes be “fudged” by one link so that multiple adjacent segments or mirror imaged segments were not all rounded up (or down) to the next integer number of links, and the total chain length inadvertently stretched (or shortened).

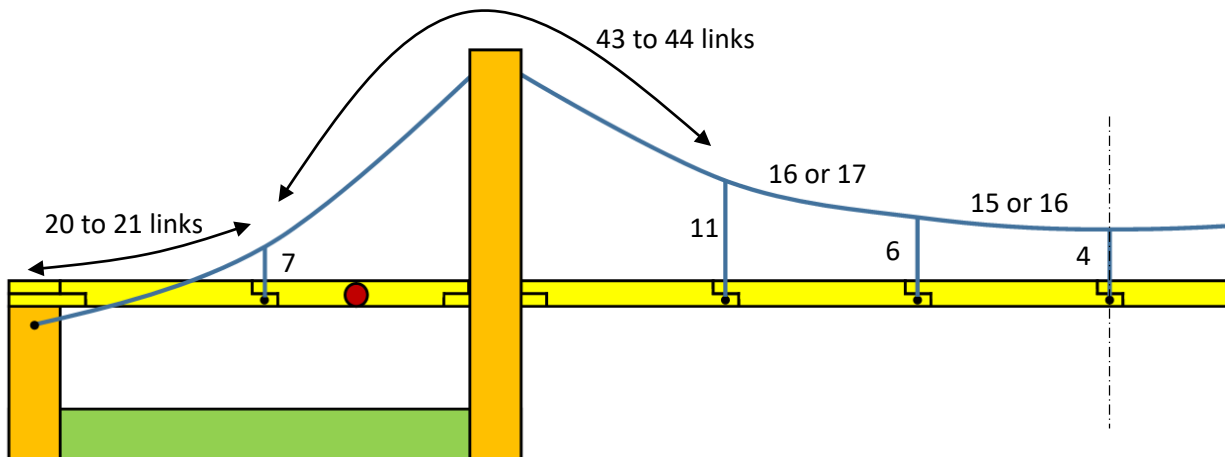


Fig. 4 – Approximate Number of Links in Each Chain Segment