

# Navy Bridge Live Load Challenge (Elementary Students)

A bridge is a structure that spans a gorge, valley, road, railroad track, body of water, or any other physical obstacle, for the purpose of providing passage over the obstacle. There are many types of bridges: beam, truss, arch, suspension and cable stayed.

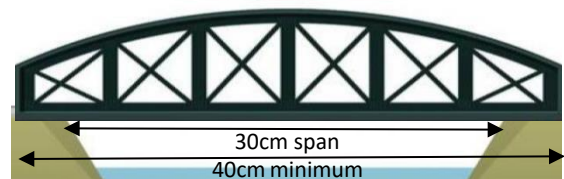


**Mission:** Research, design and construct a bridge within design constraints to hold as much weight as possible.

Engineers need to consider loads when building structures. Loads are weights and forces that a structure must withstand. The dead load of a structure is the weight of the structure itself. The dead load of the bridge, for example, includes beams, cables and the deck. The live load of a structure is the weight that is added to the structure, including people, cars and the wind.

## Design Requirements:

- Bridge must span a gap of at least 30cm. Minimum bridge length of 40cm.
- Bridge must have a continuous “road” surface that is at least 6cm wide. Bridge mid-span must be accessible for load testing.



## Materials:

- Up to 20 paper drinking straws (0.6-0.7cm in diameter). Straws may be cut.
- Up to 5 index cards
- Unlimited scotch tape
- Variety of items for load testing.

## Load Testing:

- **Virtual Load Test Challenge:** Virtual load testing will use rolls of pennies placed on the bridge at the mid-span.
- **Home/School Testing:** Find items from around your house to use for load testing such as rocks, bags of gravel, cans of food, bags of rice and coins. Weigh each item and record the weight.
- Create a gorge approximately 30cm tall in a garage or outside space so that when the bridge collapses inside floors will not be damaged. This can be accomplished with two kitchen table chairs, two stacks of books, two camping coolers, or various boxes of equal height.
- Position the “gorge walls” 30cm apart. Center your bridge on top of the gorge walls.
- Carefully add one load at a time to the bridge mid-span. Ensure your feet are out of the way when adding loads and when the bridge collapses. Record load weight as you add it.
- Consider taking a video of the load testing if you are able.

