

# Balsa Wood Bridge Competition 2023

## Sponsored by:

The University of Tennessee, Department of Civil and Environmental Engineering

**Description:** The objective of this event is to design and construct the lightest bridge capable of supporting a given load over a given span. The bridge must allow the passage of one Hot Wheel's Car of any variety along the entire length. **EACH SCHOOL MAY BRING 2 BRIDGES!!!!**

**Materials:** The bridge can be constructed only of **BALSA WOOD AND ELMERS WOOD GLUE**. No other materials will be accepted. The balsa wood must be no larger than 1/4" (6.35 mm) high and 1/4" (6.35 mm) wide. Any dowels **cannot have a diameter greater than 1/4" (6.35 mm)**. Balsa wood comes in various sizes and shapes, such as miniature I-beams, channels, and angles.

**HINT:** Take advantage of these efficient shapes as long as they fit the size criteria. There is no limit to the length of the individual wood pieces used in the construction.

## Construction:

- ✓ All construction must be completed prior to the event.
- ✓ The bridge may **not** be coated with any material.
- ✓ Length-Must be long enough to span the **350 mm (13.78")** opening. There is no maximum length.
- ✓ The bridge must have a width of at least **100 mm (3.94")** throughout the entire cross section of the bridge
- ✓ The road surface is defined as the surface that will allow a Hot Wheel Car to pass the length of the bridge. However, the road surface does not need to be solid.

## Loading:

- The load point will be at the center of the bridge.
- The bridge must accommodate a **25 mm (.98") long X 80 mm (3.15") wide X 25 mm (.98") high loading block, which will be lowered down from above**. This means there needs to be an opening in the top of the bridge that will allow for the mechanical loading block and device to be dropped down to the loading base of the bridge. The loading base does not have to be on the road surface.

## Testing:

- All bridges will be submitted prior to the testing. This can be done prior to competition start time. The bridges will be evaluated to determine if they meet the specifications.
- **Testing Order will be decided prior to Arrival/Drop-off** to facilitate faster testing. Participants will sign up for a time slot for testing.
- The event supervisors will provide all equipment/materials for testing.
- Viewing priority will be given to teams that are testing their own bridges, but observation by other teams will be permitted.
- The bridge will be inclined by placing one end on a **50 mm (1.97")** wooden block. The Hot Wheel's car will be placed on the elevated portion of the bridge and will be allowed to roll down its entire length. If the car gets stuck, the students are allowed two restarts. If the car still does not

pass after two restarts, a penalty of **2 kgs (4.41 lbs.)** will be deducted from the sustained load until the car passes through (for example, if the bridge holds **20 kgs (44.09lbs.)** and it takes the car 3 tries to get down the bridge, the bridge will be treated as if it only holds **18 kgs (39.68 lbs.)**.)

- The event supervisor will provide the Hot Wheel's car
- The bridge will be centered on the testing apparatus, containing a **350 mm (13.78") opening** between the bridge supports.
- The loading block will be lowered to the load point of the bridge
- The laboratory supervisor will gradually add force to the mechanical loading device until the bridge fails or **deflects more than 20 mm (.787")**. **Hint:** It is no advantage to build a bridge that will hold more than **70 kgs (154.3 lbs.)**.
- The bridge must support a **5 kg (11.02 lbs.) load for a minimum of 5 seconds** to qualify for scoring.
- Students will be able to see where and how quickly their bridge failed on a graph produced by the mechanical loading device.

**Scoring:**

The winner will be determined by the largest load/mass ratio with 70 kgs (**154.3 lbs.**) as the maximum load.

## **----MAX LOAD SIDE COMPETITION----**

Each school may bring one additional bridge for a special maximum load competition. This bridge is to be constructed using the same criteria (including hot wheels test), but it will be tested to failure or a max load of 2000 lbs. In the case of a tie, the winner will be the bridge with a lower weight.