

2019 Charleston County Transportation Development Department Bridge Competition Rules

BRIDGE EVALUATION AND AWARDS

Individual bridges will be registered at the beginning of the competition. One bridge per student may be entered. Students may work in teams. Award categories and judging criteria for the Charleston County Transportation Development Department Bridge Competition are summarized below:

Best Structural Design (criteria 25%)

Bridges will be loaded at mid-span until load to failure of 445 N (100 lb) has been placed on the structure unless failure occurs at a lighter load. The lightest bridge to support the Design Load will be identified as the Best Structural Design.

Additional recognition will be given to the 1st Runner Up and 2nd Runner Up.

If fewer than three structures successfully resist the design load, the winning structure will have the highest load to weight ratio, calculated by dividing the failure load by the structure weight.

Best Architectural Design (criteria 75%)

Prior to load testing, bridges will be evaluated by a panel of judges based on quality of the finished product and general aesthetics.

Additional recognition will be given to the 1st Runner Up.

BRIDGE LOADING

Bridges will be loaded at 5lb increments applied at midspan. This plate must be able to sit evenly on top of the bridge structure (or roadway deck for beam bridge). See Figure 2.

Design load: 445 N (100 lb)

Bridges should be designed to resist a 445N load applied at midspan without failure of any bridge members, member connections, or failure of the overall bridge structure.

Minimum load: 25 N (5 lb)

To be considered for the various award categories, a bridge must support a minimum 25 N (5 lb) load applied at midspan without failure of any bridge members, member connections, or failure of the overall bridge structure.

MATERIALS

The bridge itself may only consist of:

- Wooden craft sticks: 113 mm by 10 mm (4½ in by ¾ in)
- Carpenters wood glue

No other materials may be used. Bridges may not be painted.

BRIDGE SPECIFICATIONS

Length: Between 900 mm and 950 mm

Each end of the bridge must extend at least 50 mm and not more than 75 mm beyond the edge of the platform on which it will be supported. Therefore, the bridge must be at least 900 mm long and cannot be longer than 950 mm. See Figure 1.

Clear span: 800 mm

The bridge must be self-supporting with a clear span of 800 mm as shown in Figure 1.

Cross-section Dimensions:

Height: Less than 150mm

The bridge structure must be no taller than 150 mm including the 100mm tall travel path, as shown in Figure 1. Note that the entire bridge and travel path must fit in the shaded box shown in Figure 1 (i.e., no substructures are permitted).

Width: Between 150mm and 200mm

Total width of the bridge shall provide for a minimum 150 mm wide roadway. The total bridge width shall be no wider than a maximum of 200 mm as shown in Figure 2.

Travel path: Greater than 150mm wide and 100mm high within height and width

The roadway must be located within the gross bridge dimensions and must be a minimum of 150 mm wide and 100 mm high. These minimum dimensions must extend continuously throughout the entire length of the structure and cannot be penetrated by any structural bridge members. See Figure 2. The roadway must be flat and the block shown in Figure 2 must be able to fit through (or over) the bridge as a car would pass over the bridge. Traffic may pass either through the truss configuration such as the bridge truss on I-526 passing over the Wando River, or over the bridge as on a girder bridge. *Note that sticks are not required to represent the roadway along the bottom of the structure.*

Note that pony truss and beam bridges will be permitted so long as the final structure fits inside the box shown in Figure 1 and so long as a car can pass along the invisible roadway between pony trusses or on top of beam structure. All members must still meet the construction requirements in these rules.

Loading platform:

For all bridges, the designer must include supporting members for the 220 mm x 220 mm block that applies the load at midspan on top of the structure or on the bridge deck for a beam bridge. See Figure 2.

Weight:

This project focuses on design optimization, therefore no weight limit established for the bridge.