

TSA MS STRUCTURAL ENGINEERING

2018-2019 PROBLEM STATEMENT

BACKGROUND

Pedestrian bridges have become a mainstay in America and across the world as a means of providing individuals universal access.

CHALLENGE

Research truss and structural framing designs; use the research to develop, engineer, build, and test a design for a section of a pedestrian bridge structure.

Be sure to consider the following in developing a design:

1. Aesthetics
2. Types of trusses
3. Size constraints
 - a. Length
 - b. Width (inside and out)
 - c. Height
4. Railing and safety considerations
5. Dead load of the structure
6. Live load of the structure
7. Materials durability and availability
8. Maintenance

DIMENSIONS, MATERIALS, SPECIFICATIONS

<u>Actual dimensions</u>		<u>Scale dimensions for solution – 1/4" = 1'</u>	
Length of bridge:	48'	Structure length:	12" (any point on sides and/or platform measured from end to end)
Width of bridge:	13'	Outside structure width:	3 1/4" (maintained the <u>entire length</u>)
Overall height of bridge:	8'	Outside structure height:	2" (maintained the <u>entire length</u>)
		Inside structure width:	2 1/2" (maintained the <u>entire length</u>)

Materials

Balsa wood sheet - 1/32" (for the bridge platform/walking surface only and should be 2 1/2" wide x 12" long)

Balsa wood strips

1/8" x 1/8" (for **any** structural framing components)

1/8" x 1/4" (for **horizontal** structural framing components, length and width, **only**)

There are no limits placed on the amounts of the designated materials other than the 1/32" sheet balsa specified for the platform surface.

Keep in mind that the weight of the structure is factored into the formula to determine the efficiency of the structure. Excess weight will have a negative impact on the efficiency rating because of the unnecessary use of excess materials.

Specifications

1. Bridge sides: 3/8" width above the bridge platform height.
2. Bridge platform framing (below platform material at any point): 3/8" thick.
3. Bridge platform: 1/32" sheet (only one thickness allowed).
4. The bottom of the structure framing will be placed on the horizontal surface of the abutment blocks of the testing device.
5. Cross members **above** the bridge deck are **not** allowed.
6. **Substructures are not allowed.**
7. A 1" hole must be left in the center of the structure and platform so that a testing rod can be passed through it.
8. The test block will be 2" wide x 3/4" thick x 4" long.
9. For this event, *lamination* refers to the combining of two or more pieces of material with the grain running in the same direction; ***laminating pieces of same size materials is not allowed for this event.*** For allowed and illegal lamination examples, please refer to the "Design Layout Requirements" page.
10. Lap joints are allowed and involve the gluing of two pieces of balsa material with the grain pattern normally at right angles; however, any lap joint less than 10° or greater than 170° would circumvent the lamination guidelines and be ruled unacceptable.
11. Any type of glue, other than hot glue, may be used for construction; the use of glue for coating structural components is not allowed.
12. A tolerance of 1/16" will be applied for all measurements.
13. The abutments will be placed on the testing device with a **span** of 11". 1/2" of the bridge platform on each end will be on the abutments.

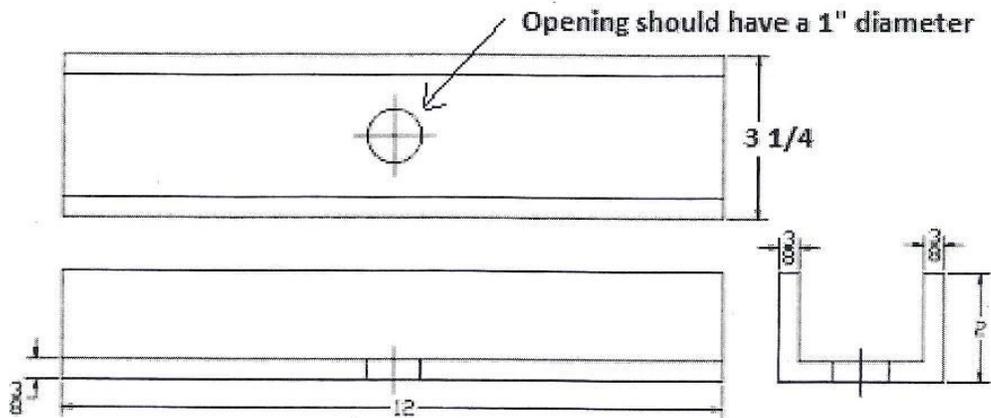
REQUIREMENTS FOR CHECK-IN

1. Completed model structure (to be submitted in an appropriate sized 'clear' plastic box labeled with team ID only)
2. Portfolio to include:
 - Verification form
 - Analysis and assessment form
 - Full size three (3) view orthographic projection drawing (front, top, & right side) of the submitted structure on paper no larger than 11"x17" (folded as needed to fit into submission box)

2018-2019 Middle School Structural Engineering Design Layout Requirements

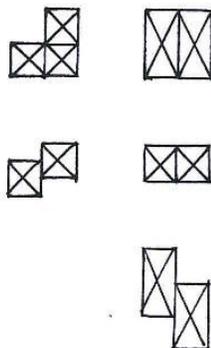
ILLUSTRATIONS

The illustrations that follow provide information about the size constraints, configurations, and types of joints that are and are not allowed for the structure.



Examples of Material Configurations Use in Construction

NOT LEGAL



ALLOWED LAMINATIONS

