

2021 NEPA Regional Bridge Building Competition Criteria

These rules have been developed independent of the International Bridge Building Committee specifically for the **Northeast Pennsylvania Regional Bridge Building Competition** to be held **TBD (Sometime in April)** virtually (details to follow.)

A virtual competition will be held at a date to be determined. Materials **WILL NOT BE PROVIDED** by the committee. Participants are to use **3/32" x 3/32 Basswood** provided on their own or by their schools. (Example: Midwest Products SKU 4033) Schools are permitted to register an unlimited number of entries but all bridges **MUST** be designed and fabricated by each participant. (NO TEAMS ARE PERMITTED). All students will participate by mail-in entry, or direct delivery. We intend to setup at least one 2-4 hour period in a relatively centralized location where students can drop off their entry and receive immediate feedback on their bridge. Social distancing will be **REQUIRED**. **NO** modifications will be permitted after entry. The competition will be either live-streamed and/or recorded and posted. YouTube is expected to be the streaming platform. We will attempt to secure a venue where students may attend the competition depending on the COVID situation and state/local guidelines at the time of the event. The allowance to attend is not guaranteed. Details to follow.

Please visit our website www.neparbdgblg.com for specific suggestions and information relative to our competition. If you have any questions, please feel free to contact: Paul Schneider at nepabridge@gmail.com.

The object of this contest is to see who can design, construct and test the **most efficient** bridge within the criteria established below. Model bridges are intended to be simplified versions of real-world bridges, which are designed to permit a load to travel across the entire bridge. In order to simplify the model bridge design process, the number of loading positions is reduced, and to allow the contest to proceed in a reasonable amount of time, only one loading position is actually tested. These simplifications do not negate the requirement that the bridge must be designed to accept a load at any of the positions. Bridges determined by the judges to not meet this requirement will be disqualified and tested as unofficial bridges.

1. Materials

1. The bridge must be constructed only from **suitable** 3/32 inch square cross-section basswood and any commonly available adhesive.
2. The basswood may be notched, cut, sanded or laminated in any manner but must still be identifiable as 3/32 x 3/32 in² basswood.
3. No other materials may be used. The bridge may not be stained, painted or coated in any fashion with any foreign substance.

2. Construction

1. The bridge mass shall be no greater than **25.00 grams**.
2. The bridge (see **Figure 1**) must span a gap (**S**) of **300. mm**, be no longer (**L**) than **400. mm**, be no taller (**H**) than **100. mm** above the upper support surface, and no wider (**W**) than **80. mm** at the loading surface.
3. The bridge must be constructed to provide a horizontal support for the load (see 3.4) at each of the three possible loading locations. Any portion of the structure above the loading plane must provide clearance for the plate and the loading rod above as well as for the rod projecting below the loading plate (see Figure 2).
4. The bridge must be constructed to allow a **48. mm** diameter, **300. mm** long pipe (1.5 inch schedule 40 PVC pipe) to be passed horizontally across the bridge with the pipe's lower surface on the loading plane (**P**) between **20. and 40. mm** above the support surface. This pipe must touch all three loading locations simultaneously (see 3.4).
5. The bridge structure may project a maximum of (**B**) of **30. mm** below the support surfaces (see **Figure 1**) at any location except for a distance (**T**) **20. mm TOTAL**, A minimum of **10. mm** to the left and **10. mm** to the right of Loading Point (**Y**).

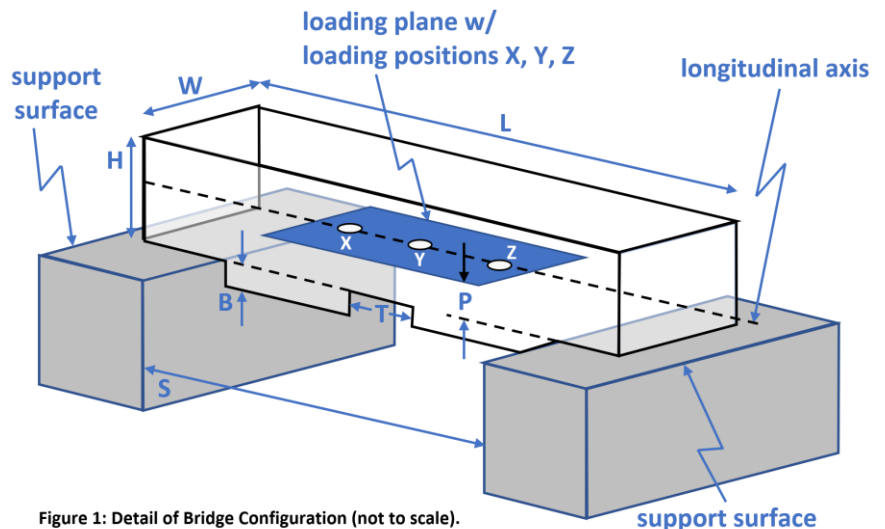


Figure 1: Detail of Bridge Configuration (not to scale).
The dimensions marked in the figure are as follows:
S = 300. mm; L = 400. mm MAXIMUM; H = 100. mm MAXIMUM;
W = 80. mm MAXIMUM; 20. mm ≤ P ≤ 40. mm.

3. Loading

1. On the day of the competition, the judges will decide which one of the three loading locations will be used; it will be the same for all bridges.
2. Competition loading will stop at **50. kg**, loading will continue until bridge failure (see **4.5**).
3. The load will be applied by means of a **40. mm** square plate (see **Figure 2**) with a thickness (**t**) of at least **6. mm** but less than **13. mm**. A **9.53 mm** (3/8 inch) diameter linkage is attached from above and below to the center of the plate. The plate will be horizontal and will be mounted with its edges parallel to the longitudinal axis of the bridge. Force will be applied to the loading plate by means of an apparatus shown schematically in **Figure 3**. The minimum initial load will be approximately **2. kg**.
4. The load will be applied with the center of the plate at one of three (3) possible locations on the longitudinal axis of the bridge: The center, **40. mm** to the right of center, and **40. mm** to the left of center of the bridge span (see **Figure 1**). The three (3) loading locations must lie in the same horizontal plane (**P**). This loading plane must lie a distance (**P**) between **20. mm** and **40. mm** above the support surface.

4. Testing

1. On the day of the contest, contestants will **center** their bridge on the support surfaces. The judges will apply the loading plate and linkages to the selected loading position with two edges of the plate parallel to the longitudinal axis of the bridge and make attachments to the apparatus.
2. The loading plate will be lowered from above on the bridge at the selected loading location with two edges of the plate parallel to the longitudinal axis of the bridge. (The bridge must accommodate this method.)
3. The load will be applied through the loading rod (from below), as described in section 3 above. Competition loading will stop at **50. kg**. However, loading will continue until bridge failure (see **4.5**).

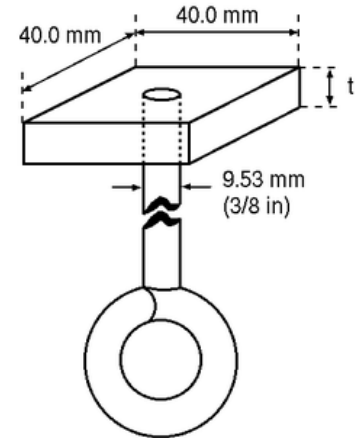


Figure 2. Loading Plate Detail

4. Bridge failure is defined as the inability of the bridge to carry additional load, or a load deflection of approximately **25.4 mm** under the loading location, whichever occurs first. If a bridge has leg(s) which fail, the bridge will have failed regardless of deflection.
5. The bridge with the highest structural efficiency, **E**, will be declared the winner. Bridges failing above **50. kg** will be considered to have held **50. kg** for efficiency calculation.

$$E = \text{Load supported in grams (50,000g maximum)} / \text{Mass of bridge in grams}$$

5. Qualification

1. All construction and material requirements will be checked prior to testing and may be checked after testing. Bridges failing to meet these requirements will be disqualified. If physically possible, disqualified bridges may be tested as exhibition bridges at the discretion of the challenge director.
2. If, during testing, a condition becomes apparent (i.e., use of ineligible materials, inability to support the loading plate, bridge optimized for a single loading point, etc.) which is a violation of the rules or prevents testing as described above in Section 4, that bridge shall be disqualified. If the disqualified bridge can accommodate loading, it may still be tested as an exhibition bridge as stated above.

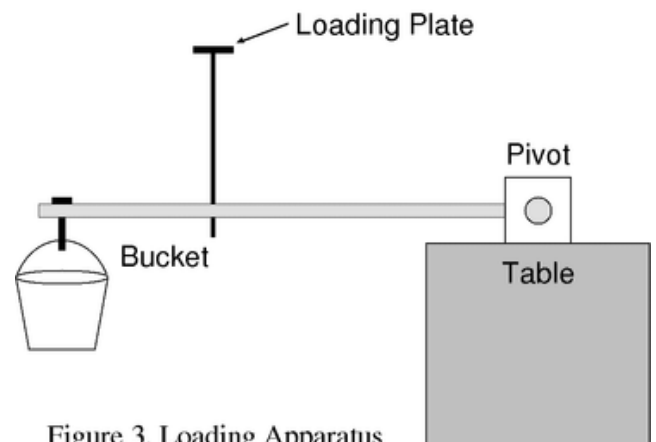


Figure 3. Loading Apparatus

Decisions of the judges are final; the above rules will not change for the Northeast Pennsylvania Regional Bridge Building Competition even if the International Rules are changed after our printing of this criteria unless posted here. If any changes occur after original posting ALL registered participants will be notified. The loading apparatus may vary from the configuration shown.