

# **BUILD 'EM & BUST 'EM**

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## **TOOTHPICK BRIDGE BUILDING CONTEST RULES**

To all Toothpick Bridge Building Contest Entrants: **PLEASE** read all instructions before starting construction of your bridge. This will help you avoid any cause for disqualification.

### **GENERAL RULES:**

1. Each student or team can enter only one Bridge.
2. Students are encouraged to work in teams of 2-4.
3. Bridge construction and materials must conform to the rules of this contest (provided below and on last page).
4. Bridges will be judged on their strength, their weight, and their looks.

### **MATERIAL RULES:**

**The materials you will need are available at your local super market, hardware, or discount store.**

1. Standard length (3" max), uncoated, **FLAT** wood toothpicks (maximum **500 toothpicks**). You can contact the Contest Officials for examples or questions about toothpicks.
2. Elmer's white glue "**Glue-All**" (do not use washable Elmer's—it is weaker). One small bottle will do. **UNACCEPTABLE GLUES include:** wood glue, polymer glue, super glue, contact cement, rubber cement, multi-part mix, hot melt, or any other adhesive.
3. Toothpicks used must be in their purchased condition. Do not modify toothpicks (no cutting, slicing, notching, etc.).
4. Do not paint, coat, spray, or dip any part of your bridge with any substance. Glue only where toothpicks touch or where one toothpick crosses another. Toothpicks may overlap, and may even be placed side by side; however, glue coverage is limited to 50% of the toothpick (see example on last page). **Complete glue coverage of even one toothpick is not acceptable.**

### **CONSTRUCTION RULES:**

1. Bridge dimensions must meet the following requirements (see example on last page):
  - a. Width: At most **10 cm** (4 in.)
  - b. Base of Supports: At most **10 cm** by **10 cm** (4 in. by 4 in.)
  - c. Span (distance between supports): At least **20 cm** (8 in.)
  - d. Clearance (height between bottom of supports and bottom of mid-span): At least **10 cm** (4 in.)
  - e. Overall height: At most **30 cm** (12 in.)
  - f. Overall length: Unlimited (depends on length of span)
2. Bridge must stand by itself.
3. Bridge is not required to be constructed with a roadway or deck

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### **TESTING & JUDGING:**

1. Groups will register their bridge with the Bridge Building Judges upon arrival, where they will receive a matching name badge and bridge badge.
2. Judges will examine each Entrant's Bridge to ensure that the Bridge conforms to the MATERIALS RULES and CONSTRUCTION RULES (see previous page). Judges decisions are final.
3. Judges will weigh and document each Entrant's Bridge.
4. Each Bridge and Entrant is photographed before Bridge testing, since this is the last time the structure will be in one piece. Photos will be available following the event.
5. At the request of an Official, each Entrant will bring their bridge to the tester for loading (**BUSTING**). Loading will occur at the center of the span with hanging weights.
6. Bridges will be judged based upon their weight, their strength (the load at which they BUST), and their efficiency:  $\frac{\text{failure load}}{\text{weight of bridge}}$
7. Prizes will be awarded in a variety of categories (i.e. highest strength, most efficient, most aesthetic, etc.)

### **HINTS:**

1. Have FUN!
2. Think of a bridge type or bridge idea first, before you begin construction
3. Sketch your design on graph paper (full size).
4. If your bridge has flat elements, tape wax paper over your sketch, glue and place toothpicks to match your sketch. Allow 24 hours to dry and remove gently. Repeat for other flat elements, and connect them.
5. If your bridge has repetitive or non-flat elements, devise a method or template to create those elements efficiently. Example: If your bridge consists of tetrahedrons, make a bunch of tetrahedrons first, rest them on wax paper, allow 24 hours to dry, remove gently, and connect them at the same time.
6. When connecting sections or elements, prop your bridge up with household items so that it stands straight and dries appropriately.
7. Remove props as necessary and make sure your bridge is square; that it rests flat on the supports, and stands up straight (remember it will be tested in the middle).
8. Check for weak spots, and add glue or extra toothpicks to weak spots.
9. Remember that excess glue leads to excess weight. Shave extra glue off with nail file or find sand paper. Be Careful!
10. When complete, protect your bridge! Find a box/protective case to safely transport it to the event!

\*Feel free to seek out the countless examples, guides, ideas, and techniques available online. However, **be careful that these resources may not comply with this contest's rules.**

\*\*The following page contains various guidelines to material rules, construction rules, and bridge types.

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### Overlapping and Side-by-Side Toothpick Gluing Guide:

 = toothpick

 = glue

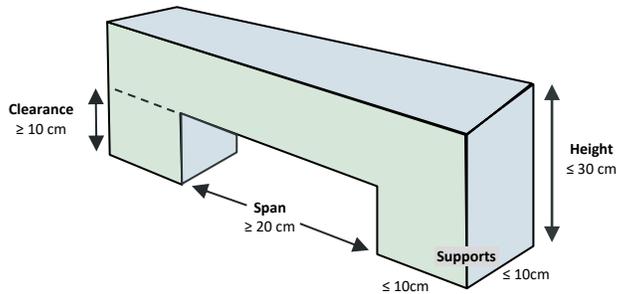
Example 1:  UNACCEPTABLE, glue along entire length

Example 2:  ACCEPTABLE, glue along at most 50%

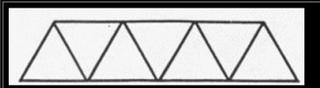
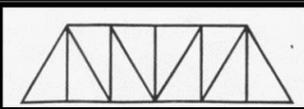
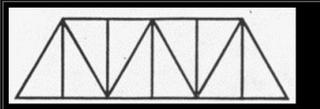
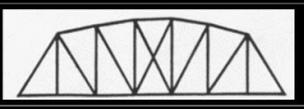
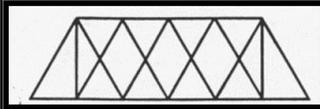
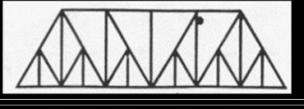
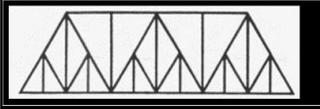
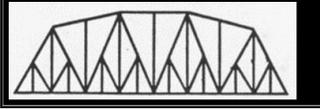
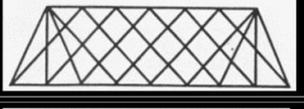
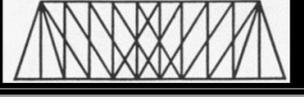
Example 3:  UNACCEPTABLE, glue along entire length

Example 4:  ACCEPTABLE, glue along at most 50%

### Requirements for Bridge Dimensions:



### Bridge Type References:

	WARREN W/O VERTICAL SUPPORTS		PRATT
	WARREN WITH VERTICAL SUPPORTS		CURVED CHORD PRATT
	QUADRANGULAR WARREN		BALTIMORE
	SUBDIVIDED WARREN TYPE		PENNSYLVANIA (PRATT)
	SUBDIVIDED WARREN TYPE		LATTICE
			WHIPPLE