

TOWER BUILDING

1. **DESCRIPTION:** The objective of this event is to design and build the lightest tower, with the highest structural efficiency, capable of supporting a load of up to 15 kg. Each team may bring and enter only one tower.

A TEAM OF UP TO: 2 **IMPOUND:** Yes (One Tower & Log) **MAXIMUM TIME:** 10 minutes

2. **Event Parameters:**

- a) The judges will provide all equipment used for testing, except for eye protection.
- b) The testing platform will be a flat surface with a 20.0 cm x 20.0 cm square opening in its center.
- c) The portion of loading rod/chain within 5 cm below the bottom of the loading block **must be small enough to pass through a 1/4 inch diameter hole. The portion of the loading rod/chain more than 5 cm below the bottom of the loading block must fit through a 3 cm diameter hole.**
- d) Judges must verify that the combined mass of the loading block, attaching hardware, bucket and sand provided is at least 15 kg prior to loading each tower.
- e) Contestants must bring and wear approved Safety Spectacles with Side Shields or they will not be allowed to compete. (See: <http://www.soinc.org/general/protection/>).

3. **Materials:**

- a) The tower is to be a single structure, constructed of wood and bonded by glue. No other materials shall be used.
- b) Particleboard, plywood, beaverboard, and other composite wood products, bamboo or paper may not be used.
- c) The entire tower (including gussets if used) must be constructed from wood pieces no larger than 1/4 inch **high** x 1/4 inch **wide** in cross-section. If dowels are used, they may not have a diameter greater than 1/4 inch. There is no limit on the length of individual wood pieces.
- d) Any type of glue may be used.

4. **Construction:**

- a) All construction must be completed prior to the tournament.
- b) Sound engineering and construction practices such as trusses, mitered joints/corners, gussets and lamination (layers of wood glued together) are encouraged.
- c) Unlimited lamination by the students is allowed, however, commercially laminated wood is not allowed. Wood laminations may be any size provided the individual pieces used to make them comply with paragraph 3.c) above.
- d) The tower must support a square loading block, 5.0 cm long x 5.0 cm wide x 2.0 cm thick, at its top. All parts of the loading block must be a minimum of 40.0 cm above the testing platform before the load is applied. There is no maximum height.
- e) The loading block must be supported so that the loading rod/chain, suspended from its center, is within 2.5 cm of the center of the opening in the testing platform. **Towers should be constructed to insure the loading rod/chain does not contact the tower at any point.**
- f) No portion of the tower may extend below the top surface of the testing platform.
- g) Before it is impounded, the tower must be marked by the team in such a way that the judges can easily identify the team it belongs to.



h) Teams should maintain and submit a log containing **data to help them improve their future designs. The log will be used only for breaking ties.**

5. **Testing:**

- a) All towers and logs must be impounded before the start of the event and will be released from impound when the team has finished competing and appeals have been satisfied. No alterations to the tower will be allowed once it has been impounded. Appeals by teams will not be processed after they remove their device from impound unless it has been released by the appeals committee.
- b) Once teams enter the event area to compete, they may not leave the area or receive outside assistance, materials or communication until they are finished competing. Only contestants being judged will be allowed in the event area while teams are competing. Teams violating these two rules will be disqualified.
- c) All towers will be assessed prior to testing to determine if they meet the specifications under Materials and Construction.
- d) The students will place the tower on the testing platform so that the loading rod/chain will pass within 2.5 cm of the center of the opening in the test platform.
- e) The students will place the loading block on top of the tower.
- f) Students will use the rod/chain to suspend a 5-gallon bucket, approximately 30 cm in diameter, below the testing platform.
- g) **The team will be given 10 minutes to load sand into the bucket. Loading must stop when failure of the tower occurs, when the loading rod/chain comes into contact with the tower, when the maximum load of 15 kg is supported or when the time expires. Failure is defined as the inability of the tower to support an additional load. The judges will remove sand added after any of these conditions occur. The Load Supported at that time will be used to calculate the Structural Efficiency.**
- h) The mass of the loading block, eyebolt, washer, wing nut, bucket, and sand are included in the Load Supported.

6. **SCORING:**

- a) The Score will be determined by the Structural Efficiency equation:
$$\text{Structural Efficiency} = \text{Load Supported (grams)} / \text{Mass of Tower (grams)}$$
- b) Towers that hold more than 15 kg will be scored using 15 kg as the Load Supported.
- c) Towers will be scored in 3 tiers.
 - i) Towers that meet all specifications under Materials and Construction will be ranked, by their structural efficiency, in the first tier.
 - ii) Towers that DO NOT meet one or more of the specifications under Materials and Construction will be ranked, by their structural efficiency, in the second tier.
 - iii) Towers that cannot be tested for any reason (e.g. cannot accommodate the loading block or team does not have proper eye protection) will be ranked in the last tier by the tower's lighter mass.
- d) Ties will be broken **in favor of the team with the lighter tower. Remaining ties will be broken** using the team's log.

