

Balsa Crash Test (TE)



2027 Nebraska State Tournament

DESCRIPTION

Teams design and build a lightweight balsa structure designed to protect a standard golf ball through a series of progressively higher drops. Structures are tested at increasing heights, with points awarded for each successful drop and an additional efficiency bonus for lighter designs. Teams will put their creativity and engineering skills to the test to find the best balance between strength, impact protection, and weight.

A TEAM OF UP TO: 2 **IMPOUND: NO** **EYE PROTECTION: NO** **APPROX TIME: 5 MIN**

CONSTRUCTION RULES:

- a. The structure must be constructed entirely of balsa wood and adhesive glue. No materials other than balsa wood and adhesive may be used as part of the structure.
- d. The completed structure must have a maximum mass of 15.0 g.
- e. The completed structure must fit within a 20 cm × 20 cm × 20 cm cube prior to testing.
- f. The structure must be designed to hold and protect the competition golf ball during the drop. The golf ball must be placed inside the structure immediately before each test within 5 seconds.
- g. Teams may not make modifications to the structure between drops.
- h. The competition golf ball will be supplied by the Event Supervisor. Competitors will be informed before competition that a regulation golf ball will be used.

Build it. Drop it. Survive the crash.

COMPETITION:

- a. The Event Supervisor will provide a designated drop area and landing surface.
- B. Each team gets one competition golf ball for testing.
- c. The structure will be dropped from the following 5 heights:

DROP	HEIGHT	Survival Points
1	1.0 m	10
2	1.5 m	20
3	2.0 m	30
4	2.5 m	40
5	3.0 m	50

- d. The Event Supervisor will release the structure without intentionally imparting additional horizontal or downward force.
- e. After each successful drop, the Event Supervisor will inspect the structure and golf ball before proceeding to the next height.
- f. A drop is considered **successful** when the golf ball remains secured by the structure, and the golf ball is not visibly damaged.
- g. If the golf ball separates from the structure or is visibly damaged, the team receives no points for that drop and will not continue to the next height.
- h. A structure that is damaged but continues to securely contain the golf ball may continue to the next drop.
- i. The Event Supervisor may repeat a drop if the structure makes significant contact with something other than the designated landing surface or if the drop was not conducted according to the event procedure.

SAFETY

Event Supervisor

- Safety glasses (optional but recommended)
- ONLY THE event supervisor can drop the structure

Competitors

- Hands off the apparatus once testing begins.
- Stand at least one arm's length away.
- No reaching toward the apparatus while loading.

Spectators

- Stay behind the testing area.

SCORING

a. The team's **Survival Score** is the total number of points earned from successful drops.

b. The team will also receive an **Efficiency Bonus** based on the mass of the structure:

$$\text{Efficiency Bonus} = 100 \div \text{Structure Mass (g)}$$

c. The team's final score is:

$$\text{Final Score} = \text{Survival Score} + \text{Efficiency Bonus}$$

d. The structure's mass will be measured by the Event Supervisor before testing. The mass of the golf ball is **not included** in the structure mass.

e. The team with the highest Final Score will place the highest.

f. **TIES** will be broken by:

1. Highest successful drop height
2. Lowest structure mass

Example Score

A team builds a structure with a mass of 8.0 g and completes the first four drops but fails at 3.0 m.

Survival Score:

$$10 + 20 + 30 + 40 = \mathbf{100 \text{ points}}$$

Efficiency Bonus:

$$100 \div 8.0 = \mathbf{12.5 \text{ points}}$$

Final Score:

$$100 + 12.5 = \mathbf{112.5 \text{ points}}$$

NOTES

The purpose of the event is to encourage students to explore lightweight structural design, impact absorption, and engineering trade-offs. Structures do not need to remain intact after a successful drop; the primary requirement is that the golf ball remains secured and undamaged.