



1. **DESCRIPTION:** Teams will design and test a Boomilever using SkyCiv structural analysis software that meets requirements specified in these rules to achieve the highest structural efficiency.

A TEAM OF UP TO: 2

EVENT TIME: 45 minutes

2. **EVENT PARAMETERS:**

- a. Each participant may bring one stand-alone non-programmable, non-graphing calculator.
- b. This event will take place on an internet-connected computer with browser access to SkyCiv.

3. **CONSTRUCTION PARAMETERS:**

- a. The Boomilever must be a single structure constructed by connecting members made of the material available in SkyCiv Science Olympiad app. The cross-section of individual pieces must be rectangular with minimum cross-sectional dimensions as specified in SkyCiv is 1.5 mm by 1.5 mm.
- b. The yz-plane ($x = 0$) will be defined as the Testing Wall. The entire Boomilever must be on the non-negative-x side of the yz-plane. The Boomilever must be supported using a “3D Pin Support” with one node at the origin ($x = 0, y = 0, z = 0$) to simulate being attached to the Testing Wall using a Mounting Hook.
- c. The Boomilever must be designed to support an Area Load in the negative y-direction over a 5.0 cm by 5.0 cm rectangular area so that the **Area Load node** closest to the Testing Wall is 20.0-45.0 cm from the Testing Wall in the positive x-direction.
- d. No portion of the Boomilever (both nodes and the entire cross section of any members) may touch the Testing Wall between the Contact Width Lines or below the Contact Depth Line except at the origin.
 - i. The Contact Depth Line is an imaginary horizontal line parallel to the z-axis and 20.0 cm (Division B) or 15.0 cm (Division C) from the origin in the negative y-direction.
 - ii. The Contact Width Lines are two imaginary vertical lines parallel to and symmetric about the y-axis and 3.0-7.0 cm from the origin in the positive and negative z-directions.

4. **THE COMPETITION:**

- a. The Event Supervisor will determine the minimum distance, to the closest 0.1 cm, between the Testing Wall and the Loading Point closest to the Testing Wall (3.c.), and the distance from the origin to the Contact Width Lines (3.d.ii.). At the beginning of each session, the Event Supervisor will tell teams these distances. The same distances will be used for all teams at the tournament.
- b. After being told the distances in 4.a. and prior to testing, participants must submit their Estimated Load Supported to be used as a tiebreaker.
- c. Participants will have 45 minutes to build and to test their Boomilever up to 5 times in SkyCiv.
- d. SkyCiv will stop loading when the Boomilever touches the Testing Wall between the Contact Width Lines (3.d.i.) or below the Contact Depth Line (3.d.ii.), or failure occurs. Failure is defined as any member of the Boomilever experiencing stress exceeding the parameters of that member.
- e. The maximum Load Supported is 15,000 g.

5. **SCORING:**

- a. High score wins. Score = Load Score (g)/Mass of Boomilever (g).
- b. The Load Score = Load Supported (4.d.) + Bonus.
- c. Boomilevers that have a Load Supported of 15,000 g will earn a Bonus of 5,000 g.
- d. Boomilevers will be placed in three tiers as follows:
 - i. Tier 1: Holding any load and meeting all construction parameters and competition requirements
 - ii. Tier 2: Holding any load with any violations of the construction parameters and/or competition requirements
 - iii. Tier 3: Unable to hold any load and will be ranked by lowest mass
- e. Ties are broken as follows:
 - i. Estimated Load Supported closest to, without exceeding, the actual Load Supported
 - ii. Ranked by lowest Boomilever mass
- f. Example score calculations:
 - i. Device 1: Mass = 10.12 g, Load Supported = 12,134 g; Score = 1,199
 - ii. Device 2: Mass = 12.32 g, Load Supported = 15,000 g + Bonus (5,000 g) = 20,000 g;
 - iii. Score = 1,623

Recommended Resources: The Science Olympiad Store (store.soinc.org) carries the Boomilever Video Download & Problem Solving/Technology CD; other resources are on the Boomilever event page at soinc.org.