Digital Structures B/C

Rules and Information

– November 29, 2020 (v1.0)–

Event Information

Digital Structures B/C will formally replace Boomilever B/C in all applicable MD Regional and State competitions in 2021. This event operates through the SkyCiv software (www.skyciv.com) and involves teams simulating boomilevers using criteria provided upon arrival to the tournament.

Event rules may be found at: https://www.soinc.org/sites/default/files/uploaded_files/DigitalStructures.pdf

(Note: event rules are subject to change and will be updated in future documents as needed)

Digital Structures was previously included in draft schedules for Regional/State competitions for 2021 and will take place in the indicated time slot. See https://scilympiad.com/md/Docs/UsefulDocs to find these schedules.

We STRONGLY recommend teams watch the following videos that will show how to use the SciOly functions in SkyCiv, as well as give a basic primer to the software and event:

- Digital Structures Description (Peter Hung, BEARSO): https://youtu.be/yDYGt_hX09c
- SkyCiv Boomilever Simulation Primer: https://youtu.be/PE9Qa5o3WUI

SkyCiv License Information

The cost of SkyCiv licenses is included as part of registration fees for the 2020-21 season and will cover the functions in the software needed for Digital Structures through June 29, 2021.***

The head coach on file for each team should receive an email from SkyCiv with info to access the license and software. Each registered school will receive 1 license per team that can be shared amongst your team members.

- ***For all registered schools***: The head coach's email has been assigned as the login email for your primary team. If you would like this changed, you may do so at any time, simply reach out to the State office.

- ***For schools with more than 1 registered team***: Because each account login is based on the email, we will need additional email(s) to register your 2nd and 3rd teams. Please inform us of any emails you would like to associate with your school's 2nd or 3rd teams. This is required so 2nd and 3rd teams may compete in the event in Regional competition.

- ***For schools not yet registered*:** When your school is registered in Scilympiad, we will grant you license access to the software as described above.

DIGITAL STRUCTURES

See General Rules, Eye Protection & other Policies on www.soinc.org as they apply to every event.

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 Loading Point 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.