



2021 CLF Bridge Building Invitational Guidelines

7th & 8th Grade Division
9th & 10th Grade Division
11th & 12th Grade Division

This is a guideline for the 2021 CLF Transportation And Civil Engineering (TRAC) Bridge Building Invitational. Note there is a maximum limit of 100 students. All application(s) will be accepted on a first-come, first-serve basis. CLF will not be hosting any large, indoor gathering for this event. Virtual participation and social distance measures (when testing/breaking bridges) will be discussed in complete detail with participants. The EVENT DATE for the 2021 CLF TRAC Bridge Invitational Competition Date is set (tentatively) on April 24, 2021. **Please save 4/24/2021 and apply today!**

CHALLENGE

The Challenge:

This invitational challenge is designed to allow students the opportunity to develop a **Truss Bridge** that can be tested for strength-to-weight ratio. Interested students should fill out the attached application for materials and submit it prior to the deadline of **February 19, 2021**. CLF will give a TRAC Challenge Entry Kit (balsa wood, glue, precision cutter, cutting mat) to each student to begin their project. Please note there is a **maximum limit of 100 students**. Application will be accepted first come first serve basis. You will receive an email to pick-up instruction for the Entry Kit in February.

Other materials needed not provided in kit:

- Bentley PowerDraft Student Software (download link below). Software requires a PC.
 - <http://apps.bentley.com/studentserver/home/index> or see pages 10-11 of this document.
 - If the PowerDraft software cannot be downloaded, contact us at activities@clfmd.org
- School Supplies

Who Can Enter?

Students must be in grades

- 7th or 8th for the 7th & 8th Grade Division
- 9th & 10th Grade for 9th & 10th Grade Division
- 11th & 12th Grade for 11th & 12th grade Division.
- Due to Covid-19 restrictions, students will participate as **individual**, no team works required.

APPLICATION

Click on the link below to fill out the application. Applications will be taken through February 19, 2021.

[2021 CLF TRAC BRIDGE BUILDING INVITATIONAL CHALLENGE APPLICATION, CLICK HERE](#)

If link doesn't work, go to www.clfadvancedstudies.org/trac

The Problem:

The goal of this challenge is to develop a **Truss Bridge** that will carry as much weight as possible while weighing as little as possible (strength-to-weight ratio). Each student is to research the bridge type, design and conduct experiments to test for strength-to-weight ratio, and then design a bridge resulting from those experiments. The students are to construct a bridge **made only with the materials provided** in the TRAC Challenge Material Kit. As a part of the Design Challenge, the student is required to develop a report portfolio describing the design and testing of the bridge and create design drawings using Bentley PowerDraft CAD software.

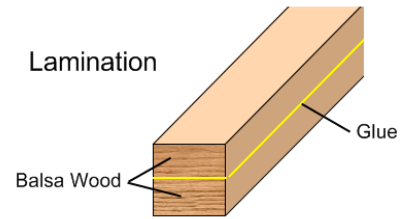
The Challenge:

An engineer's job is to not only design a safe bridge to carry required loads, but also to make sure that it is cost effective (least amount of materials used to achieve the desired load). To simulate this process, students will use the following strength-to-weight ratio calculation to develop a bridge that carries a high load relative to the bridge weight. Strength to weight ratio is determined by dividing the maximum load carried by the weight of bridge.

Example: Maximum load = 120.0 pounds
 Bridge weight = 20.0 grams
 Ratio = 2724.0
 [(120 pounds x 454g/pound) / 20 g]

Specifications for Truss Bridge:

- The materials provided in the kit are the **ONLY** materials to be used when building the bridge structure. Any modifications to the structural properties of the balsa wood or using different glue than provided will result in judges recording zero weight held.
- Lamination is permitted one layer only. Lamination is gluing two members along their length as shown in the picture on the right. If two laminated members are beside each other, there must be a minimum 1/8 inch gap maintained between them.
- Butt joints, notched joints, and lap joints are permitted. Lap joints should be no greater than ¼ inch.
- **For 7th & 8th Grade Division** - End to end, the length of the entire bridge must be **16** inches with no height restriction on the bridge.
- **For 9th & 10th Grade Division** – End to end, the length of the entire bridge must be **18** inches with no height restriction on the bridge.
- **For 11th & 12th Grade Division** – End to end, the length of the entire bridge must be **24** inches with no height restriction on the bridge.
- The minimum width of the bridge shall be no less than 2.5 inches and the maximum width of the bridge shall be no more than 4.5 inches.
- **For 7th & 8th Grade Division** – A block of wood that is **10** inches long by 2 inches wide by 1 inch high must be able to be laid across the bridge deck. This block of wood will also act as the testing block. The deck does not have to be solid.
- **For 9th & 10th Grade Division** – A block of wood that is **12** inches long by 2 inches wide by 1 inch high must be able to be laid across the bridge deck. This block of wood will also act as the testing block. The deck does not have to be solid.
- **For 11th & 12th Grade Division** – A block of wood that is **18** inches long by 2 inches wide by 1 inch high must be able to be laid across the bridge deck. This block of wood will also act as the testing block. The deck does not have to be solid.
- Testing block will not be allowed to be placed on top of truss for testing.
- Tester supports shall be placed in a consistent manner for testing each Grade Division bridge to accommodate the Grade Division, supporting only the last 2 inches on each end of the span.
- The bridge shall only touch the top of the testing machine supports.
- The bridge must be designed in a manner to fit your classroom’s testing device.



PORTFOLIO FORMAT

The information below gives an indication of what is considered to be a complete proposal. Proposal submission deadline is **March 31st, 2021. 11:59pm.**

I. BRIDGE PROPOSAL (See next page for Assessment)

- A. Proposal Format: The written proposal should be typed, double-spaced using a size 12 font of either Arial or Times New Roman on 8.5 x 11 paper with all pages numbered, 1" borders all around. Sections must be in order of the outline below:
- B. Timeliness: Proposals received after the deadline will not be accepted.
- C. Proposal Presentation: Portfolio **MUST** contain all the sections outlined below:

I. Title Page. Include name of challenge, name of school or organization, name of student, name of teacher or advisor.

II. Table of Contents.

III. Summary (abstract). Clearly and concisely stated. (At least ½ page, no more than two pages)

IV. Introduction. Indicate the student's name, as well as the background of the student.

V. Body. The main part of the report. This may be divided into several sections (such as Design, Development, etc.). In general, this part should:

- a) Explain the scientific principles behind your design. (at least ½ page, no more than one page)
- b) Include Data Tables, Graphic Representation of Tests, and supporting Calculations page.
- d) Include scaled drawings of preliminary and final bridge designs.
- e) Include at least five pictures of your work during bridge design and construction, along with a picture of the constructed bridge (prototype or final).
- f) Explain how you tested your design, and the improvements this led you to make. (at least ½ page, no more than one page)

VI. Conclusions (and Recommendations). How successful is your project? What did you learn by taking part?

VII. Acknowledgments. List the names of the adults who assisted you in the project with a brief description of what they did. Include a certification, signed by yourself and adults assisting, stating that: "We hereby certify that the majority of the ideas, design, and work was originated and performed by the student, with limited assistance by adults, as described above."

VIII. Bibliography. List all references used, including Internet, books and magazines.

PORTFOLIO ASSESSMENT

ALL PROPOSALS SHOULD FOLLOW THE FORMAT BELOW TO BE CONSIDERED COMPLETE.

Proposal Format

- Typed (1 point)
 - Double Spaced (1 point)
 - 12 Point Font (Arial or Times New Roman) (1 point)
 - All pages on 8.5 x 11 paper (1 point)
 - Information is in the proper order (2 point)
 - All pages are numbered (1 point)
 - Style and presentation (1 points)
 - Mechanics (1 points)
 - Visuals (1 points)
- Score _____ / 10 points

Proposal

- Title page (2 point)
 - Table of Contents (2 point)
 - Summary (8 points)
 - Introduction (2 points)
 - Body
 - Sections identified (5 points)
 - Scientific principles of the design (8 points)
 - Design challenges (8 points)
 - Tables, Graphs, Calculations (8 points)
 - Detailed scaled drawings (10 points)
 - Photos during and after construction (5 points)
 - Testing and improvements (8 points)
 - Conclusion
 - Recommendations (5 points)
 - Success of the project (5 points)
 - What was learned by taking part (5 points)
 - Acknowledgements
 - Adults involved (2 points)
 - Description of what the adults did (1 points)
 - Certification and signatures (1 points)
 - Bibliography (5 points)
- Score _____ / 90 Points

TOTAL SCORE: _____ / 100 Points

VIDEO SUBMISSION GUIDELINES

Participants will submit a 1-5 minute video of presentation to activities@clfmd.org as a link or MP4 . This presentation can include voice over, graphics, photos, etc. We urge all participants to think creatively as they present their bridge!

CLF will certify your registration after your presentation has been reviewed by our staff. High scoring projects have the potential to be shared on CLF's social media accounts and websites. Any videos containing questionable content will be disqualified.

Please see directions on how to submit your performance.

1. Video must be in MP4 format with clear audio and visuals.
2. Directly send an email to activities@clfmd.org and attach the video
3. Upload on Google Drive or any online storage and share with activities@clfmd.org email address.

Video Presentation: Bridge Challenge

GUIDELINES – FOR INDEPENDENT USE ONLY

NOTE: This rubric will help you to prepare your video presentation. All video presentations have a possible score of 100 points. Each category will be judged on a scale from 1 to 25 points. Please be sure to submit your presentation link/video to activities@clfmd.org

CATEGORY	25	20	15	10	5	0	Sub-Score
Content	Covers topic in-depth with details and examples. Subject knowledge is excellent.	Includes essential knowledge about the topic. Subject knowledge appears to be good.	Includes essential information about the topic but there are 1-2 factual errors.	Content is minimal OR there are several factual errors	Information presented did not fulfill requirements	No content to evaluate	_____/25
Organization	Content is well organized using headings or bulleted lists to group related material.	Uses headings or bulleted lists to organize, but the overall organization of topics appears flawed.	Content is logically organized for the most part.	There was no clear or logical organizational structure, just lots of facts.	Information presented did not fulfill requirements	No content to evaluate	_____/25
Presentation	Interesting, well-rehearsed with smooth delivery that holds audience attention.	Relatively interesting, rehearsed with a fairly smooth delivery that usually holds audience attention.	Delivery not smooth, but able to hold audience attention some of the time.	Delivery not smooth, audience attention lost.	Information presented did not fulfill requirements	No content to evaluate	_____/25
Attractiveness	Makes excellent use of font, color, graphics, visual effects, etc. to enhance the presentation.	Makes good use of font, color, graphics, visual effects, etc. to enhance presentation.	Moderate use of font, color, graphics, visual effects, etc. but they may distract from the presentation content.	Poor use of font, color, graphics, visual effects, etc. that distract from the presentation content.	Information presented did not fulfill requirements	No content to evaluate	_____/25
<p>Total Sub-Score _____/100</p> <p>Each Minute Over 5 Minutes: (-5) _____</p> <p>TOTAL SCORE _____</p>							

BRIDGE CHALLENGE FINALS

Students will compete independently at the CLF Bridge Building Invitational on April 24th (tentatively). There will be 2 testing dates set students break bridge and record their ratio for portfolios. Students will come one by one according to a sign-up and break their bridges. There will no large gathering.

- A. SPECIFICATIONS: Prior to testing, the bridge will be checked for adherence to the specifications on page three of this document. Specification violations will be discussed with the team prior to testing.
- B. PORTFOLIO (30% of the total score): Students will email a Proposal written and formatted according to guidance on page four of this document. A rubric has been provided for the portfolio as a guide.
- C. PERFORMANCE (40% of the total score): Bridges will be weighed and then tested on any testing system devised by the school. Results will be used to calculate strength-to-weight ratio.
- D. VIDEO PRESENTATION (30% of the total score): Record yourself and submit a 1-5-minute video of presentation

PREPARING FOR THE CHALLENGE

Form a team of interested students or friends. Discuss the challenges and design specifications. Teams shall consist of three students. Each team must have at least one teacher or other adult to help and advise, though a single adult may be advisor to more than one team.

Study the rules. The individual challenge documents and the grading criteria will give important information, which must be followed if your team is to achieve the best results. Failure to adhere to the rules could lead to penalties, or even disqualification. If any of the information is not clear, please call for additional help.

Plan the timing of the project. Ensure that everyone in the team knows the date for submission of the written report, and recognizes that this means that all major development work should be finished before this date.

Keep records of meetings and working drawings carefully, and give members of the team responsibility for different sections of the final report.

Notes to Adults: TRAC would like to stress that **the work on all phases of the project is to be done by the students**. Adult assistance is to be limited to:

- Mentoring
- Basic guidance of the students
- Teaching engineering, mathematical and scientific principles applicable to the project
- Guiding students in research
- Assisting in the production of the report and preparation of the drawings
- Overseeing the manufacturing stages of the project

Guidance should be in the form of asking questions, (leading questions if necessary) to promote creative thinking by the students to identify the scientific and engineering principles involved. **Encourage students to consult credible web sites and other resources** to help with the project. **Encourage students to test and improve their designs**. A good way to begin is for each student to design and/or construct a rough prototype. Test it and make improvements.

Suggestions and Helpful Hints

1. Students should be prepared for questions at the end of the presentation. These questions may be concentrated in the following topics. However, note that the judges are free to ask any question about any topic. Therefore, each team should be prepared.
 - a) Choice of design
 - b) Civil engineering careers related to bridges
 - c) Safety
 - d) Impacts of bridges
 - e) Lessons learned
2. Stay organized and keep track of time limits.
3. If you have a question, ASK. You can contact school STEM Coordinators
 - Nuri Bayram, CMIT North HS- nbayram@cmitacademy.org
 - Ashish Vadalia, CSP- avadalia@mycsp.org
 - Ozkan Soykan, CMIT South- osoykan@cmitsouth.org
 - Esra Kocaskan, CMIT North MS- einci@cmitacademy.org
 - or Cihan Bicer at CLF activities@clfmd.org
4. Contact your DOT engineers. They will answer many of your questions.
5. Check out other bridges in your area or around the world
6. Include detailed information in the team portfolio.
7. RESEARCH



TRAC & RIDES

Getting started with Bentley's STUDENTserver:

Faculty and students must first create accounts, using the following **School Code** to set up an individual account:

ceUlppmq/CV1ia8npF48K6sfC6t3hqy0JPihQw5FgQ/XzFpJ0krLiA==

Visit STUDENTserver at <http://apps.bentley.com/StudentServer> and click JOIN NOW

Create your account:

1. Add your School Code to that field, as requested in the registration form.
2. Add your personal information in the other form fields.
3. Submit the form, and an Email will be sent to you from Bentley for further verification.
(If you do not see email within a few minutes check you spam/junk folder)

Verify your account:

Click the link in the account verification Email to activate your STUDENTserver account.

Once you verify your new account, you can log in and access all that STUDENTserver has to offer.

Download the software:

- Go to the "download" page on STUDENTserver.
- You can search for the application you want, or browse the options and filter by brand, product line, language, and other options.
- Take note of the "site activation key;" this is what you'll use to activate the product when prompted during the installation process.
- When you've found the application you want, click on the "All Downloads" tab under the product description and find the latest version with your preferred language and download the application by clicking on the green download icon on the right.

- Once the installer is downloaded, open it and follow the instructions. When the product needs to be activated, use the site activation key as described above.

Access training:

- Go to the “Leaning” page on [STUDENTserver](#).
- Browse the product categories to find the application for which you want training.
- Click on the blue product name to follow the link to the learning path page on LEARNserver, our training access point.
- Click on the “find training” below the course you want to open up the course materials for download or viewing.
- Once you have completed a training course, you can view and print out transcripts for that course in the “certificate and transcript” page of STUDENTserver.
- To view a list of learning paths recommended for students, go to our learning paths Communities page [here](#).

Get connected:

- Join our Academic Programs community on Bentley Communities [here](#) to get view information on upcoming events, suggested training opportunities, design challenges, and more.
- Join our facebook page [here](#).
- Visit our [YouTube page](#) to view training views, walkthroughs, and more.
- Our library of on-demand videos can be found [here](#) and can be sorted by product and language.

Bentley step by step videos https://www.michigan.gov/mdot/0,4616,7-151-9623_38029_38059_41397-394779--,00.html