2027 State of Michigan MDOT Bridge Challenge Guidelines Grades 11 and 12 - Half-Through Arch Bridge

Note: Please thoroughly read all sections of this document to ensure adherence to the competition guidelines. Rules and specifications change each year. Participants are responsible for understanding and following instructions within the competition to avoid disqualification.

Competition For Grades 11 and 12

The Competition: The Michigan Department of Transportation (MDOT) Michigan Bridge Challenge hosts student teams to compete against other teams in their grade division from across the state of Michigan to win prizes for best overall bridge design.

Competition scoring is comprised of three parts: the business case proposal (30 percent), the business pitch presentation (35 percent) and bridge testing using bridge strength-to-weight ratio (35 percent).

Team advisors must have been trained in the MDOT Bridge Builder module prior to the proposal due date or grandfathered in prior to the 2024 competition to be eligible. All submitted proposals must be approved by the listed advisor to be eligible. If a proposal is submitted without the advisor's permission, it will be deemed ineligible. Advisors and student teams must complete the following steps during the process:

- Review the guidelines thoroughly to gain understanding of the expectations for the student division. Identify student teams of three that will participate in the Challenge. Teams **must** have all three students at the in-person competition or the team will record zero points (refer to the Eligibility section).
- Advisors will **be required to submit an interest application no later than Monday, Nov. 2, 2026**. Each advisor is limited to a maximum of six teams total entering the competition across all grade groups. Application: 2027 Michigan Bridge Challenge Application.
- Bridge kits will be shipped to groups that meet the application process, with **a shipping date no later than Nov. 13, 2026.**
- Student team proposals **must be submitted no later than 5 p.m. EST Tuesday, Feb. 2, 2027,** through email to MDOT-TRAC-Program@Michigan.gov. Receipt of email will be confirmed via email.
- Proposals will be scored and a notification of acceptance or denial will be **sent via email no later than Friday, Feb. 19, 2027,** to the submitting advisor.

- All selected grade groups will conduct their business pitch presentations via pre-scheduled Microsoft Teams meetings scheduled by the MDOT STEM Outreach Program manager. **These presentations will take place March 1-4 and 8-11.** Student teams will present to a professional panel of bridge and transportation judges and should be prepared for a question-and-answer session at the end of their presentation.
- A welcome event is currently being planned for **Monday, April 12**, **2027**. More details will be sent out as the event gets closer.
- **Attend the Bridge Challenge on Tuesday, April 13, 2027**, in Kalamazoo, Michigan (date and location subject to change).

Awards: Teams chosen to attend the MDOT Michigan Bridge Build Design Challenge will compete for gift card awards and other additional prizes. Prizes will be awarded to the first, second and third place teams in each grade division.

Challenge Components

The Business Case Proposal (30 percent): While completing the project, each team should construct their business case proposal. This portfolio should ultimately persuade the panel of judges to choose your project. The team is required to submit a digital business case proposal as a single file named as their team name, grade level, and school name as a PDF (example: Bridge Piers-11-12-MDOT High School.pdf) to the MDOT STEM Outreach Program manager at MDOT-TRAC-Program@Michigan.gov. Students should include proof of grade division eligibility with a copy of their student ID, school enrollment details with age and picture, etc. Computer-aided design (CAD) drawings are highly recommended as an included piece of the project content and will add additional points to the proposal score.

New this year: Proposals are required to be **10-12 pages**. Any length outside of these parameters will result in disqualification.

The proposal will be scored on all items specified in the proposal assessment section of this document and **must be submitted no later than 5 p.m. EST Tuesday, Feb. 2, 2027.** *Should a team experience a snow day event, they must provide proof of the snow day and turn in their proposal by the next active school day.* Be sure to include proof of age/grade verification in this year's proposal.

Bridge Construction and Testing (35 percent): The goal of this competition is to develop a **Half-Through Arch Bridge** that will carry as much weight as possible while weighing as little as possible (strength-to-weight ratio). Each team researches their assigned bridge type and design options and then designs a bridge resulting from those experiments.

Suggested software:

- Bentley Powerdraft Student Software
- ModelSmart 3D (provided with Bridge module)

Teams will want to conduct experiments to test strength-to-weight ratio ahead of the competition to ensure success and to develop content for their business case proposals. The bridge brought to the competition must be similar with no major changes to the bridge submitted in the proposal.

Bridges are to be **made only with the materials provided** in the Bridge Kit sent by MDOT. Each bridge will be checked for design according to the rules by a panel of judges. Failure to do so may result in disqualification. Please double and triple check your bridge against the specifications before the event. Bridges will be loaded by student teams on the Pitsco testers and tested for strength-to-weight ratio until the bridge shows signs of demolition. Bridges must be able to fit on the testing machine appropriately, according to the specifications.

An engineer's job is to design a safe bridge to carry required loads and make sure that it is cost-effective (least number of materials used to achieve the desired load). To simulate this process, teams will use the following strength-to-weight ratio calculation to develop a bridge that carries a high load relative to the bridge weight using only the materials provided. Strength-to-weight ratio is determined by dividing the maximum load carried by the weight of bridge.

Example: Maximum load = 120 pounds
Bridge weight = 20 grams
Ratio = 2,724
[(120 pounds x 454 grams per pound) / 20 grams]

The Business Pitch Presentation (35 percent): Ahead of the Bridge Challenge event, teams in the competition will present a 10-minute PowerPoint or Google Slides presentation to a panel of professional transportation industry judges via Microsoft Teams using the link that will be provided by the STEM Outreach Program manager. Be sure to account for a total time of 15 minutes for questions and answers at the end. Students should treat this presentation similarly to presenting a business pitch to a potential buyer of their bridge design.

These presentations will take place **March 1-4 and 8-11, 2027,** and will be scheduled following the selection of teams with the MDOT STEM Outreach Program manager. The link to join will be provided in the scheduled meeting email. Students should be prepared for one to three questions at the end of the presentation from the judging panel related to the process

or content presented. Best practices for presentations virtually include:

- Practice ahead of time so you can become familiar with Microsoft Teams and get a feel for how you will appear on camera. Also practice showing your presentation so you can see how it will appear. If you are not familiar with the software, do some research ahead of time.
- Teams will dress in business professional attire like they are presenting to a panel of buyers.
- Speak at a slightly louder volume and clearly pronounce your words at an understandable pace.
- Use persuasive tone. Your team is trying to sell your design over the next group!
- Set aside extra time so you are not rushed or late. Join the scheduled presentation meeting five minutes or more ahead of the presentation time to make sure you are in and can get your presentation uploaded.

Eligibility

- Only students actively participating in the MDOT STEM Outreach Program utilizing the Bridge Builder module can enter the competition. Educators overseeing a team must have been trained in the Bridge Builder module within the MDOT STEM Outreach Program. Contact MDOT-TRAC-Program@Michigan.gov for questions about MDOT STEM Outreach eligibility.
- Students must be in grades 11 or 12 to compete in this age group. ***Proof of eligibility is required as a component of the business case proposal for the 2027 competition.*** There are no exceptions to the grade groups.
- Teams shall be composed of **three members**. Note: If a team is chosen to compete in the state competition, all three members must be present at the state competition unless STEM Outreach Program Coordinator Nathan Hanselman is notified of extenuating circumstances. The MDOT STEM Outreach Program coordinator will have the final decision should this occur if the team can still compete. **Substitutions for new team members will *not* be allowed after submission of bridge proposals in the 2027 competition.**

To ensure fairness and originality, the use of artificial intelligence (AI) tools to create, assist or produce material for competition entries is strictly prohibited. Any entry identified as containing AI-generated content will be disqualified.

Notes to Adults: The MDOT STEM Outreach Program reiterates the importance of the fact that **work on all phases of the project is to be done by the students**. Al or adult assistance is to be limited to:

- Basic guidance of the students.
- Teaching engineering, mathematical and scientific principles applicable to the project.
- Guiding students in research.
- Assisting in the preparation of the drawings.
- Overseeing the manufacturing stages of the project.
- Encourage students to test and improve their designs.

Specifications for Half-Through Arch 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 disqualification.
- The instrument used for testing will be the Pitsco structures testing instrument (Image 2).
- Lamination **is permitted, one layer only**. Lamination is gluing two members along their length (Image 1). If two laminated members are beside each other, there must be a minimum 0.125-inch gap maintained between them.
- If spacers are used between members, the minimum spacing is 2 inches between spacers.
- Connections can be butt joints, miter joints or notched joints. Lap splices are permitted but no greater than 0.25 inches.
- The arch shall be shaped as the arc of parabola and must be one continuous piece of wood where the ends on center are 16 inches apart.
- The deck shall pass mid-height of the arch, shall be 20 inches in length and a minimum width of 2.5 inches and shall only be attached to the main arch by the hangers and support members. The deck shall not be glued directly to the main arch. Maximum thickness of the bridge deck shall be 0.5 inches.
- The total length of the bridge shall be 20 inches and the maximum width of the bridge shall be no greater than 4.25 inches.
- The bridge in Figure 1 is not representative of the required design, but final designs must be a representative of a half-through arch bridge.
- 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 as shown in Image 2 and Figure 1.
- Tester supports will be placed at 16 inches on center. Support dimensions are listed in Figure 1.
- The bridge shall only touch the top of the Pitsco Tester supports as in Figure 1. If the bridge touches any other part of the tester body, judges will record zero weight held.
  The bridge deck must have at minimum a 0.75-inch gap in mid-span both longitudinally and transverse to allow for a 0.625-inch testing rod to pass through and attach to a 10-inch block of wood for strength testing (Image 2 and Figure 1). **The rod must be able to pass through the full height of the bridge.**

Image 1

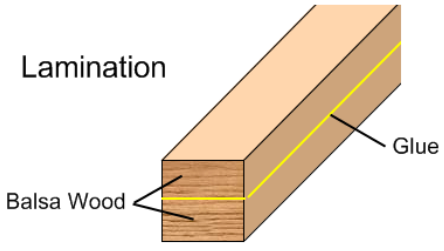
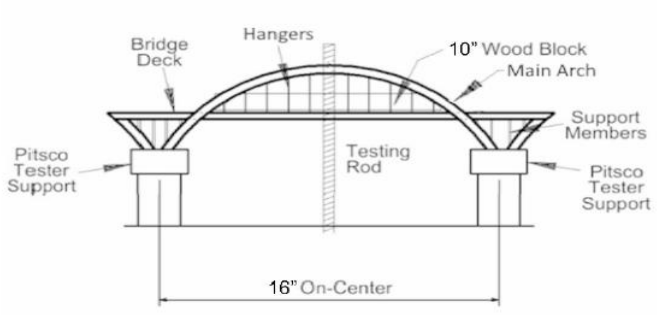


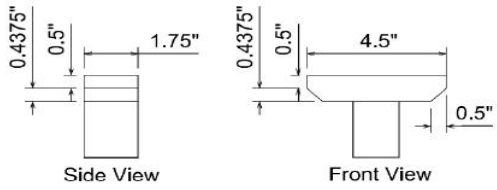
Image 2



Figure 1



Tester Configuration Detail
Not representative of required design
Use only for dimension reference



Support Detail

Proposal Format

The following information gives an indication of what the judges are looking for in each section. Proposals must receive a satisfactory rating for the team to be eligible to attend the competition.

I. **Bridge Proposal**

- **A** **Proposal Format:** The written proposal should be typed, double-spaced using size 12 font of either Arial or Times New Roman on 8.5-inch by 11-inch paper with all pages numbered, 1-inch borders all around. Sections should be as shown in section C. Mechanics such as spelling and grammar will be scored as well as overall style and presentation. It is advisable to make it visually appealing.
- **B** **Timeliness:** Proposals received after the deadline will not be accepted (refer to snow day exception).
- **C** **Proposal Content:** Please be sure to address the following content items. Thoroughness and creativity will be taken into consideration. Proposals should not be shorter than 10 pages and no longer than 12 pages.
  - **i** **Title Page**
    - The title should reflect the name of grade level challenge.
    - Team (business) name.
    - Team (business) logo.
    - Name of school or organization.
    - City and state.
    - Names of students.
    - Name of advisor.
  - **ii** **Table of Contents**
  - **iii** **Summary (Abstract) Introduction**
    - Clearly and concisely stated. (At least one-half page, no more than one page.)
    - Why should we choose your business case proposal?
    - What did you learn from the project?
  - **iv** **Introduction**
    - Team name: Why did you choose this business name?
    - Team members: Who is each individual? What do they bring to the team?
    - Team educator/advisor.
  - **v** **Body - Project Management**
    - **Initiation:** This stage of project management includes

understanding the project's purpose, objectives, resources required, anticipated potential challenges, budget, time required and who the project stakeholders are. Did you do any pre-studies? This step occurs at the beginning of the project, usually as a meeting. Please summarize how this occurred for your business team, addressing the included components.

- **Planning:** Now that you have received the 2027 Bridge Challenge guidelines, the planning may begin. This step includes assigning roles within your business team, setting project goals, identifying deliverables, estimating time and resources needed, and creating a project timeline. Please summarize this stage and include a visual of your project timeline. Who will be your business manager? Did you stay on the timeline? If not, what might have changed your timeline? What will the public say about your potential bridge if it is chosen and installed? What key performance indicators are you looking for?
- **Execution:** This stage is the backbone of your project and where you carry out the tasks and activities you defined in the first two steps. During project execution, the project manager will need to manage resources, resolve any shortcomings and build efficient workflows. This step is where you will construct your bridge. Did the bridge build meet your expectations? Are you satisfied with the outcome? What barriers or opportunities did you encounter? What project management tools could you incorporate?
- **Project monitoring and controlling:** During this phase, there is a subtle overlap between the project execution stage and the monitoring and controlling stage, as you may reconstruct your bridge. In this phase, you will conduct testing and record your outcomes (trial and error). Did you go back to the drawing board? What changes did you make? What additional guidance did you seek? What worked and what didn't? What people skills were you required to use? Is there anything you would do differently next time?
- **Closure:** At this stage, you want to make sure your business team and advisor are content with the outcome. Conduct your last project review in this stage. Are you ready to test your bridge at the competition? Did you meet your goals and objectives? What did you learn from this project? Identify any key achievements.

vi **Business team member evaluation**

- Include at least three pictures of teamwork during bridge design and construction, along with a picture of the constructed bridge (prototype or final).
- What did you learn about one another while working as a team on this project?
- What diverse perspectives did each team member bring to the project?
- Be sure to give credit where credit is due. Who contributed to which parts?
- Who would you consider to be the manager of the group? Why?

vii **Connect to Real World**

- Conduct research on careers associated with real-world bridge construction projects.
- Select two careers to highlight. For each career, identify the required education, salary range, necessary licenses or certifications, relevant academic programs or institutions, and key skills utilized in the profession.
- Describe what a typical day experience might look like for each career. Explain why these roles are essential within the field.
- Additionally, include a reflection from each team member on whether you would consider pursuing a career in the transportation industry and explain your reasoning.

viii **Acknowledgments and Conclusion**

- List the names of the adults who assisted you in the project with a brief description of how they assisted your team.
- Did you conduct any site visits or interview any professionals?
- Would you choose to do this project again?
- List all references used.

2027 MDOT Bridge Build Challenge Proposal Assessment

All proposals should follow the format below to be considered for state challenge.

Team Name: _____

Proposal Format	**Possible Points**	**Points Awarded**
Mechanics (double-spaced, font size, length, etc.)	(10 points)	_____
Information is in order, pages numbered	(5 points)	_____
Style and presentation	(5 points)	_____
Photos and visuals	(5 points)	_____

Score _____/ 25 Possible Points

Proposal Content

Title page	(3 points)	_____
Table of Contents	(2 points)	_____
Summary (no more than one page)	(10 points)	_____
Introduction	(10 points)	_____
Body	(20 points)	_____
Connect to real world	(15 points)	_____
Conclusion	(10 points)	_____
Use of CAD software with visuals	(5 points)	_____

Score _____ / 75 Possible Points

Total Score: _____/100 Points

Application
2027 MDOT Bridge Build Design Competition
Grades 11 and 12

All application forms are due by **11:59 p.m. EST Nov. 2, 2026.**

NOTE: Each advisor should submit an application to compete. Only one application is needed per advisor for the MDOT Michigan Bridge Challenge. Each advisor can submit **no more than six teams to the competition application**. In the event there are more than six registration submissions for an advisor, the STEM Outreach Program coordinator will clarify with the advisor which six teams they wish to submit, unless they cannot get a timely response. If that occurs, the STEM Outreach Program coordinator will decide which teams will move forward in the competition.

Application: 2027 Michigan Bridge Challenge Application

Business Pitch Presentation Scoring Rubric
2027 MDOT Bridge Challenge

Categories	Criteria					Points
Point totals	Excellent 40-50	Very Good 30-40	Good 20-30	Fair 10-20	Poor 0-10	___/50
Content	Students illustrate high bridge/project competence, leaving panel ready to "purchase" the project. 12-15	Students illustrate a good amount of bridge/project competence. May be considered in bidding. 9-12	Students show some competence but panel would need more information to consider a bid. 6-9	Students are lacking competence; panel would not select this project at this time. 3-6	Students are missing the mark. Not enough bridge/project competence. Back to the drawing board! 0-3	___/15
Project commitment	Students can illustrate significant research, use of professional input and opportunities to learn about bridges. 8-10	Students took initiative to add some additional research or professional input or opportunities. 6-8	Students took initiative to do significant research but did not utilize any other options. 4-6	Students did basic research to meet the goals or objectives of the project. 2-4	Students did not meet basic research requirements to satisfy project needs. 0-2	___/10
Presentation Attractiveness and Innovation	Presentation is visually and audibly appealing, with significant use of innovation in their approach. Business professional outcome. 8-10	Presentation uses some attractiveness features or innovative approaches. It's almost there! 6-8	Presentation uses basic technology and is clear and satisfactory. 4-6	Presentation does not meet basic technology expectations and is lacking innovative efforts. 2-4	Presentation is very basic, missing key aspects or cannot be delivered at all. 0-2	___/10
Timeliness	Students make the best use of their time without going over. They have practiced! 4-5	Students have one minute or more time left over or go over by less than 30 seconds. Maybe a bit more practice. 3-4	Students have two minutes or more time left over or go over by less than one minute. 2-3	Students have three minutes or more time left over or go over by less than two minutes. 1-2	Students have four minutes or more time left over or go over by less than two minutes. 0-1	___/5
Delivery	Students dressed professionally, use effective persuasion tactics, speak clearly and enthusiastically at an appropriate volume and sold their case! 8-10	Students dressed professionally, show some confidence, clarity and volume levels are appropriate, and showcase their case. 6-8	Students may appear dressed unprofessional, nervous, volume and clarity are sometimes appropriate and they showcase their case. 4-6	Students are clearly dressed unprofessionally, are nervous or unprepared but showcase their case. 2-4	Presentation is disruptive due to failure to prepare or deliver. 0-2	___/10

Student Work Agreement
2027 MDOT Bridge Build Design Competition

Turn this document in with the proposal due on Feb. 2, 2027.

We hereby certify that the majority of the ideas, design and work for this project was originated and performed by the students, with limited assistance by adults.

Student signature	Date
Student signature	Date
Student signature	Date
Educator/advisor signature	Date