

BRIDGE BUILDER PROJECT

OBJECTIVE

To use your knowledge of forces to design and construct a free-standing bridge that spans two lab tables placed one meter apart and enables a toy vehicle to cross from one lab table to the other.

Project groups will compete for the bridge that is able to support the greatest ratio of load weight to bridge weight. The winner of the contest will be awarded 15 points of extra credit.

RULES

1. The bridge must span one meter.
2. The bridge must be free standing (supports on laboratory tabletops only).
3. The bridge is required to have a road surface that supports the weight of a toy vehicle and is large enough for the vehicle to cross the span between the lab tables. Bridge should also have on and off ramps, if needed, and a smooth enough road surface for the vehicle to cross with as little assistances as possible.
4. No metal may be used except for aluminum cans utilized only in the construction of suspension towers and small paper clips.
5. No wood may be used except for tongue depressors, popsicle sticks and toothpicks.
6. No plastic or fiberglass may be used.
7. Tape may be used as connective material but not as support material. Tape used to attach the bridge to the countertop is limited to one piece per side, each with a length no greater than the width of the bridge.
8. Corrugated cardboard from cardboard boxes is allowed, but high density cardboard is not allowed.
9. For Suspension and Cable-stayed Bridges only: string and thread (no fishing line) which is less than 2mm in diameter may be used for no more than two main support cables. String or thread less than 1mm in diameter for all other uses.
10. Suspension and Cable-stayed Bridges must have towers that are greater than 35 cm tall.
11. No lighter-than-air construction materials, such as helium balloons, may be used.
12. **Due to safety concerns the maximum weight used to break bridges will be 260 lbs, and all materials, designs and construction processes must be pre-approved by your instructor.**

See your instructor for further clarification of any rule or objective.

RESOURCES

Students may use any resource at their disposal.

Some of the recommended resources include:

- “Kinds of Bridges” information packet.
- An Internet search

Whatever type of bridge that your group decides to build, there are a few considerations common to all bridges:

- **Adhesives:** The quickest and simplest is hot glue. Your group will need to purchase the glue sticks and tongue depressors and/or Popsicle sticks. Other adhesives, including wood glue, epoxy resins and silicone are stronger but require more time to harden and are more expensive. The countertops should be covered/protected when using adhesives other than hot glue.
- **Cross supports:** Cross supports are a critical part of the rigidity and resulting strength of your bridge. If your bridge is strong vertically but is not held together with sufficient cross supports, it will collapse on its side like a house of cards.
- **Group dynamics:** Pick people to work with who have schedules that will work with your schedule and are motivated to work with you. Each member of the group will be evaluated by the other members of the group to determine the “Group Work” part of their grade.
- **Start early, plan ahead:** This project takes a considerable amount of time. Your group needs to plan the bridge (I recommend scaled drawings), get the materials and get started, or your group will not get done in time.

TIMELINE

This project is to be completed by **FRIDAY, November 30th**.

Project groups will be given an average of 68 minutes of class time for approximately 5 days to work on their projects. The groups will have the option of working on the projects outside the class day. Students not working on the project during the designated class time are required to work on homework during that time. All work completed on the bridge project must be thoroughly and completely documented. (See forms below)

Minimum Requirements for Strength Portion of Grade:

20 Points	Any Ratio	34 Points	3:1 Ratio
38 Points	5:1Ratio	42 Points	10:1 Ratio
46 Points-	15:1 Ratio	50 Points	25:1 Ratio

NAME OF BRIDGE: _____

DESIGN AND CONSTRUCTION TEAM MEMBERS (first & last):

1. To Be Filled Out Each Time Work Is Done on the Bridge Builder Project.

Date: _____ Location _____ Amount of work time _____

Team members present:

Goals and objectives to accomplish

What was accomplished?

What supplies, information, personnel, etc. are needed before the next project work time and who is going to provide what is needed?

Next scheduled work time _____

2. To Be Filled Out Each Time Work Is Done on the Bridge Builder Project.

Date: _____ Location _____ Amount of work time _____

Team members present:

Goals and objectives to accomplish

What was accomplished?

What supplies, information, personnel, etc. are needed before the next project work time and who is going to provide what is needed?

Next scheduled work time _____

3. To Be Filled Out Each Time Work Is Done on the Bridge Builder Project.

Date: _____ Location _____ Amount of work time _____

Team members present:

Goals and objectives to accomplish

What was accomplished?

What supplies, information, personnel, etc. are needed before the next project work time and who is going to provide what is needed?

Next scheduled work time _____

4. To Be Filled Out Each Time Work Is Done on the Bridge Builder Project.

Date: _____ Location _____ Amount of work time _____

Team members present:

Goals and objectives to accomplish

What was accomplished?

What supplies, information, personnel, etc. are needed before the next project work time and who is going to provide what is needed?

Next scheduled work time _____

5. To Be Filled Out Each Time Work Is Done on the Bridge Builder Project.

Date: _____ Location _____ Amount of work time _____

Team members present:

Goals and objectives to accomplish

What was accomplished?

What supplies, information, personnel, etc. are needed before the next project work time and who is going to provide what is needed?

Next scheduled work time _____

6. To Be Filled Out Each Time Work Is Done on the Bridge Builder Project.

Date: _____ Location _____ Amount of work time _____

Team members present:

Goals and objectives to accomplish

What was accomplished?

What supplies, information, personnel, etc. are needed before the next project work time and who is going to provide what is needed?

Next scheduled work time _____

7. To Be Filled Out Each Time Work Is Done on the Bridge Builder Project.

Date: _____ Location _____ Amount of work time _____

Team members present:

Goals and objectives to accomplish

What was accomplished?

What supplies, information, personnel, etc. are needed before the next project work time and who is going to provide what is needed?

Next scheduled work time _____

8. To Be Filled Out Each Time Work Is Done on the Bridge Builder Project.

Date: _____ Location _____ Amount of work time _____

Team members present:

Goals and objectives to accomplish

What was accomplished?

What supplies, information, personnel, etc. are needed before the next project work time and who is going to provide what is needed?

Next scheduled work time _____

9. To Be Filled Out Each Time Work Is Done on the Bridge Builder Project.

Date: _____ Location _____ Amount of work time _____

Team members present:

Goals and objectives to accomplish

What was accomplished?

What supplies, information, personnel, etc. are needed before the next project work time and who is going to provide what is needed?

Next scheduled work time _____

10. To Be Filled Out Each Time Work Is Done on the Bridge Builder Project.

Date: _____ *Location* _____ *Amount of work time* _____

Team members present:

Goals and objectives to accomplish

What was accomplished?

What supplies, information, personnel, etc. are needed before the next project work time and who is going to provide what is needed?

Next scheduled work time _____

EVALUATION FORM

NAME OF BRIDGE: _____

YOUR NAME _____ DUE DATE _____ TODAY'S DATE _____

DESIGN AND CONSTRUCTION TEAM MEMBERS:

BEST DESIGN AND CONSTRUCTION FEATURES OF OUR BRIDGE ARE:

COMPETITION RESULTS

WEIGHT SUPPORTED / WEIGHT OF BRIDGE = STRENGTH RATIO

_____ / _____ =

THIS STRENGTH RATIO WAS THE BEST RATIO IN THE CLASS.

SECTION BELOW TO BE COMPLETED BY YOUR TEACHER

SCORES

FULFILLS RULES (10 pts poss) _____
RECORDS OF WORK (10 pts poss) _____
GROUP WORK (10 pts poss) _____
DESIGN (10 pts poss) _____
CONSTRUCTION (10 pts poss) _____
STRENGTH RATIO (50 pts poss) _____

Total Points _____

_____ %

GRADE