

WebQuest Project: Student Pages

Main Page

Title: Don't Burn, Build: Bridge Design Challenge

Grade Level: 9-12

Subject: Geometry, Physics

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Introduction

You are part of an elite engineering team, personally invited by the Indian government, to participate in a major competition to design a new bridge for the city of Calcutta, or Kolkata. If your design is selected, your team will receive professional acclaim; and you will help to advance this growing city. The currently standing Howrah Bridge (or Rabindra Setu) has become one of the world's busiest bridges and a symbol for the city of Kolkata as well as the state of West Bengal. You have an opportunity to rival the Rabindra Setu in engineering genius and urban efficiency.

However, building a bridge is not as easy as merely drawing up a blueprint. Kolkata experiences high traffic congestion, monsoons, and limited space. Your skills in critical thinking, research, geometry, and physics will be put to the test. Are you ready for the challenge?

Task

To enter the bridge contest for the city of Kolkata, you must design a blueprint of the bridge. Each of you will choose a role and research information in those roles. You will then come together as team members, bringing knowledge of architecture and environment, construction, and structural engineering to the project. Consider each branch of knowledge since all are important factors in designing your bridge.

Kolkata, the capital city of West Bengal, is an expanding metropolis and the site of a major port. A steady stream of traffic crosses the three major bridges that currently connect the city of Kolkata, on the west bank of the river Hooghly, to the twin city of Howrah. Residents and travelers require the new bridge over the Hooghly River for two main reasons.

- Ease traffic congestion on the bridges
- Connect northern suburbs of Kolkata (and international airport) to industrial center of Howrah

You do not need to consider cost in designing the bridge; a major financial donor with a business interest will be providing the funding. After designing the blueprint of your bridge, you will make a persuasive presentation to the class justifying your bridge design. You will need to convince your peers, acting as the contest judges, that your design is the best based on your research and analysis of the landscape, environment, and bridge structure.

Process

You have many factors to consider in designing Kolkata's newest bridge. As you proceed, be conscious of creating a structure that is in harmony with the preexisting bridges, city architecture, and natural landscape. With your group members, examine the following web sites on blueprint design, bridge structure, and the city of Kolkata.

Bridge Blueprints

<http://www.ltconsulting.com/roe/elem/lasalle/bprint.htm>

Calcutta: A Virtual Tour

<http://home.att.net/~dakku/cal5.html>

Bridges Basics

<http://www.pbs.org/wgbh/buildingbig/bridge/basics.html>

The Roles

Complete your research individually, but you will need to assist each other throughout the process. Don't hesitate to ask your group members if you have a question.

Design Engineer

Materials Contractor

Site Engineer

Putting It All Together

After you have acquired enough knowledge to complete your role worksheets and make preliminary design decisions, meet as a group. You should share the information you have compiled on your worksheets and bring your specific area of expertise to the design meeting. Remember, no single design is perfect; you must share knowledge and collaborate to design the most beautiful and efficient structure. Be creative! At this point, you will complete the group worksheet and choose:

- Type of bridge
- Location for bridge
- Materials needed

Now you must draw blueprints for the bridge, using the provided materials, and plan your persuasive presentation. The final step is to present your bridge design and justification to the judges.

Complete THREE sketches of your bridge:

- Top View
- Side View
- Road View

For each blueprint, include:

- Scale
- Specific measurements in metric
- Use appropriate professional tools for the drawing process

Some Helpful Web Sites:

Bridge Blueprints

<http://www.ltconsulting.com/roe/elem/lasalle/bprint.htm>

Blueprints

http://www.scs.k12.tn.us/STT99_WQ/STT99/Millington_CHS/hirschm/slideshow/sld004.htm

Cycling in Hackney

<http://www.hackney-cyclists.org.uk/sideview.htm>

Bridges: Step by Step Guide

<http://c1.k12.md.us/bridges/bsteps.htm>

Building Bridges!!

http://www.mste.uiuc.edu/courses/ci303fa01/students/mkorolis/unit_plan/bridge_activity_home_work.htm

Evaluation

You will be evaluated as a group on your blueprints and presentation and individually on your participation and cooperation. Grades will be determined based on the following guidelines:

	Beginning 1	Developing 2	Accomplished 3	Exemplary 4	Score
Blueprints					
Completion	No blueprint ready for presentation.	One or two sketches of design.	All three views complete.	Detailed drawings of all three views.	
Professional Finish	Convolutd or messy presentation. Difficult to read and understand.	Difficult in some places to read and understand.	Can be read and understood. May include some pencil lines or eraser marks.	Very neat presentation. Easy to read and understand. Free from pencil lines or eraser marks.	
Technical Content	Inaccurate or missing measurements and scale.	Several inaccurate or missing measurements and scale.	Accurate measurements and scale.	Clear and accurate measurements and scale.	
Presentation					
Organization	No logical sequence.	Follows some type of logical sequence.	Interesting and in logical order.	Highly organized and well rehearsed.	
Justification	No justification for choice of design. Displayed no knowledge from individual roles.	Weak justification for choice of design, based on some elements of math, physics, environment, aesthetics. Presented little knowledge from individual roles.	Sufficient reason for choice of design, based on math, physics, environment, aesthetics. Somewhat strong elements of persuasion. Exhibited knowledge from individual research.	Strong support for choice of design, based on math, physics, environment, aesthetics. Very strong elements of persuasion. Demonstrated expertise in each role.	
Delivery	Lack of appropriate and technical language.	Spoke clearly and understandably. Used some technical terms.	A fluid delivery was used. Use of technical language.	Very smooth, confident, professional delivery. Skilled use of technical language.	
Individual					
	Did not meet expectations of their role. Little to no participation or cooperation in process and presentation of bridge design.	Met some expectations of their role. Some participation and cooperation in process and presentation of bridge design.	Fulfilled the expectations of their role. Participated and cooperated in process and presentation of bridge design.	Went above and beyond expectation of their role. Participated and cooperated fully in process and presentation of bridge design.	
				Total	

Conclusion

Congratulations on your hard work and finished design! The city officials have determined that the winner of the contest will choose the name of the new bridge. Draw upon all of your research into the environment of India, the city of Kolkata, design techniques, bridge engineering, and materials. Your name should reflect your design process as well as the unique characteristics of your bridge.