Lesson Plan

Date: 02-20-2000
Course: Construction
Unit: Bridges
Topic: Design and Construction

Resources:

Worksheets	Booklets	Theta bridge packet
Bridge design handout	Glue	Pitsco bridge building book
Fishing Line	Balsa wood	
Weights for testing	Pins	

Learning Experiences: (Activating prior knowledge, reminders of last lesson, terms, basic parts, reviewing periodically, etc

1. You all have been in the car and drove across bridges to get across rivers, streams, ravines etc. How was that bridge held up? What supported the roadway and your car as you went across? What really heavy things do you suppose that bridge has to be designed to hold up?

2. Introduce the purpose of the lesson.
   - Design, build and test a bridge of your own.

3. Introduce concepts of Tension, Compression, Shear, and Torsion and the effects they will have on bridge structures.

4. Review how bridge designers change designs to compensate for Tension, Compression, Shear, and Torsion.

Lesson Objectives:

Upon completion of this lesson students will be able to:

- ✓ Differentiate between Tensile, Compression, Shear, and Torsion stresses
- ✓ Describe the 5 most common problems faced by bridge builders
- ✓ Give examples of recent bridge failures
- ✓ Name two basic types of materials used in bridges
- ✓ Identify 3 types of bridges
- ✓ Explain how the weight on the bridge is transferred to the ground.
- ✓ Design, build and test a bridge of their own design.

Evaluation: (Asking questions reviewing main concepts of lecture and lab lesson)

1. What designs worked well and what designs did not in our testing process?
2. What caused the failures of the structures that we tested?
3. What improvements could have been made to those structures?
4. How did these bridges stand up to the forces we described in class? (i.e. Tension, Compression, Shearing, and Torsion)

Construction Technology **Name:**_____

Bridge Construction

Unit Test 50 pts.

True or False

Read the statements below and decide if it is a true or false statement. Circle T for true and F for false.

1. **T or F** Tensile forces bend and twist materials used in building bridges.
2. **T or F** Stones, trees, and vines were used in early bridge construction.
3. **T or F** Truss bridges capitalize on the strengths of triangle shapes to distribute the bridge's weight.
4. **T or F** An arch bridge will work with or without a keystone in place.
5. **T or F** Suspension bridges use long wires or cables to support the main columns of the bridge.
6. **T or F** Primitive bridges were often only ropes stretched across rivers.
7. **T or F** In modern bridges, the two most common materials used are steel and concrete.
8. **T or F** A beam laid between two piers or supports is a cantilever beam bridge.
9. **T or F** The part of the bridge that rests on the ground is know as the abutment.
10. **T or F** Racking is a method of bridge building that makes the structure stronger.

Short Answer:

Briefly answer the following statements

11. What 4 factors must be considered when designing and building bridges?

12. What is the name of the part of an arch bridge that is placed last and completes the arch?

13. When the Romans built aqueducts using arches what were they trying to bring into their cities?

14. What geometric shapes are used when designing strength into trusses for bridges?

15. What is the job of the abutments in an arch bridge system and why must they be so large?

16. _____ Shear
17. _____ Compression
18. _____ Box Girder
19. _____ Truss
20. _____ Suspension
21. _____ Cassion
22. _____ Torsion
23. _____ Concrete
24. _____ Steel rods
25. _____ Girder

A. A bridge type using cables to hold up the load of the bridge
B. A main component in making modern bridges.
C. A structure used in building concrete piers in deep water.
D. Used to strengthen concrete under tension loads.
E. A force that tries to force two materials to slide past one another.
F. A beam type that allows for loads on top and inside of the beam.
G. A force that tries to squeeze things together.
H. A type of bridge using steel beams laid across two supports.
I. A type of bridge that uses a series of triangles to support its beam.
J. A force that tries to bend or twist materials
K. A type of bridge that relies on abutments to keep standing
L. Used in building bridge piers in shallow water, has an open top.

Construction
Bridge Unit Evaluation Sheet

NAME _____

Evaluation Criteria: 400 total points possible

1) Drawings: **50 pts**
   - ✓ Must sketch side view and end view
   - ✓ Must have scale finished drawing of bridge side view and end view

Sketches end and side view 25 | Scale drawings side and end view 25 _____

2) Bridge Measurements: **100pts**
   - ✓ Must span 10 inch opening
   - ✓ Must not be larger than 12" long, 3" wide, & 3-1/2" high

Bridge spans 10 inch opening 50 | Bridge within dimension specs 50 _____

3) Glue Joints: **50 pts**
   - ✓ Glue joints must be neat and not longer than 1/4" in length
   - ✓ Laminating (doubling thickness of pieces not allowed).

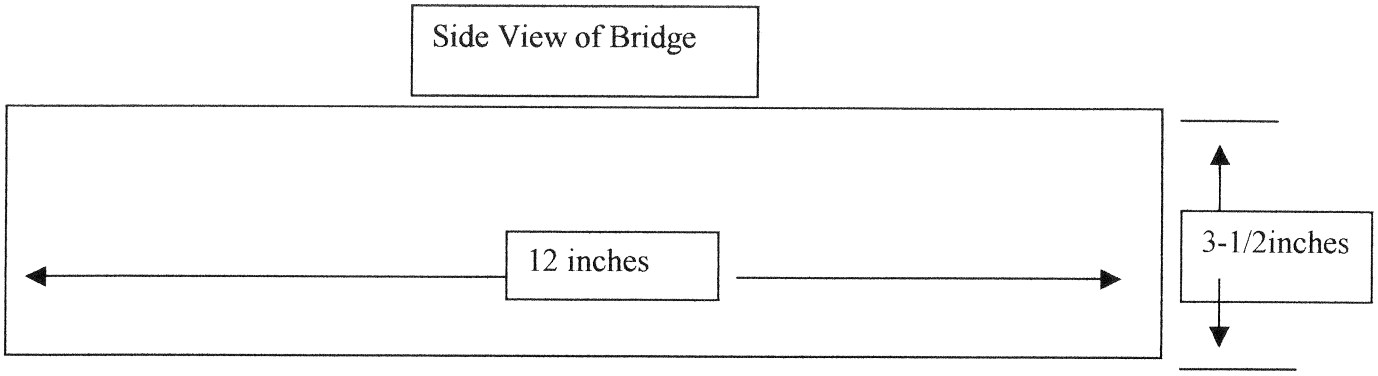
Glue joints neat and to proper size 25 | No Laminations 25 _____

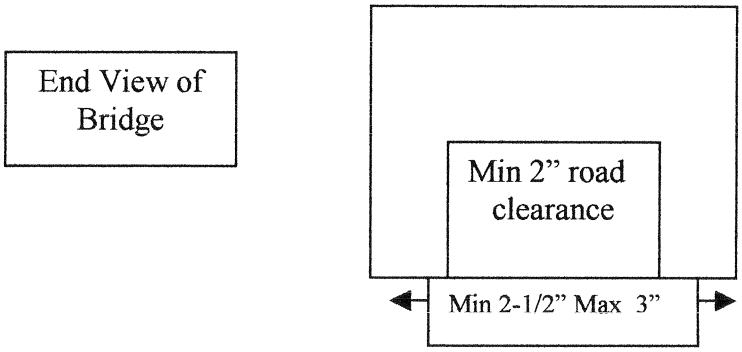
4) Roadway: **50 pts**
   - ✓ Roadway must be minimum 2-1/2" wide maximum of 3" wide _____

5) Roadway height clearance: **50 pts**
   - ✓ Roadway must have 2" vertical clearance between roadway and any structural piece (see drawing below-end view) _____

6) Load Requirements: **100 pts**
   - ✓ Bridge must hold 10 lbs of weight hanging from mid span _____

Total Points _____


Side View of Bridge
12 inches
3-1/2inches


End View of Bridge
Min 2" road clearance
Min 2-1/2" Max 3"