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TOWER OF POWER

CIVIL CONSTRUCTION BUILDING UNIT

DESIGN PROBLEM

As we approach the tornado season once again, we hope that Wisconsin or any other state in the U.S. never experiences a tornado like the one that occurred in Siren. We all know that when bad weather strikes anything can happen! News Center 13 wants to up-grade their weather equipment at the top of a new tower. The advanced weather radar would help detect tornados or bad weather before it reaches nearby communities. This would save people, cows, schools, brothers, sisters, uncles, and basically anything you own! We need you to become problem solvers and create a plan to make the sturdiest tower possible. Remember, this tower needs to be a sound structure capable of holding up a heavy weather station at the very top of the structure.

BUILDING CODE – MATERIALS

- You will be given 14 feet of dimension lumber (7 pieces - 1/8" X 1/8" x 24").
- You may use 1 piece of construction paper for gussets. (Paper provided by instructor).
- You must use the structure glue provided by the teacher.
- The tower must be 7" high.
- The width of your tower must be at least 3".

BUILDING CODE – CONSTRUCTION TECHNIQUES

1. After brainstorming, make a full size drawing of your tower design on paper.
2. INSTRUCTOR CHECK POINT.
3. Cut the strips of wood to the exact length and angles.
4. Cover your entire design with a sheet of wax paper.
5. Without Glue, lay out your wooden pieces to check for accuracy to the plan.
6. Glue the pieces using your drawing as a guide.
7. Use the lightweight construction paper to make gussets for the intersection of wood beams
8. Glue it in place and carefully store in your locker.

EVAULATION

	25 - A	20 - B	17 - C	15 - D
Cooperative Work	Partners always show respect for one another's ideas. The workload is divided and shared equally by team members.	Partners often show respect for one another's ideas. The workload is divided and shared fairly by all team members, though workloads may vary from person to person.	Partners rarely show respect for one another's ideas. The workload was divided, but one person in the group is viewed as not doing his/her fair share of the work.	Partners argue or are disrespectful of other's ideas and input. Criticism is not constructive nor is support offered. One person mostly does the work.
Weight Held	226 Pounds and over	151 – 225 Pounds	76 – 150 Pounds	1 – 75 Pounds

Name _____

Loads Lab

About This Lab

All structures must withstand loads or they'll fall apart. Use the Building Big website to explore loads and to see real-life examples.

http://www.pbs.org/wgbh/buildingbig/lab/forces.html

Dead Load

The _____ itself is called the dead load. Anything permanently attached to the structure is part of its dead load -- including the columns, beams, nuts, and bolts.

Live Load

The weight of the stuff on the structure is called the live load. Things that move around in or on a structure, like _____, _____, and _____, are all examples of live load.

Live Load Failure

Why did the beam fail? _____

Live Load Success

How is the beam strengthened? _____

Soil

When the soil beneath a structure settles unevenly, it is called _____ load. Structures will _____ and change shape when they experience settlement load.

Settlement Failure

Why did the Structure fail? _____

Settlement Success

What was added to stop settlement failure? _____

Temperature

When a structure expands or shrinks with the temperature, it is experiencing thermal load. The temperature causes the _____and _____ to change shape and push and pull on other parts of the structure.

Thermal Failure

Why did the beam fail? _____

Thermal Success

What was added to stop thermal failure? _____

Earthquake

When the ground beneath a structure jerks back and forth during an earthquake, the structure is experiencing an earthquake, or _____ load. Earthquake loads push and pull horizontally on a structure.

Seismic Failure

Why did the beam fail? _____

Seismic Success

What was added to stop seismic failure? _____

Wind

When wind blows on a structure, it is called wind load. Wind loads push _____ on a structure.

Wind Load Failure

Why did the structure fail? _____

Wind Load Success

What was used to strengthen and stabilize the structure? _____

_____

Vibration

Loads that _____are called dynamic loads. Dynamic loads -- from wind gusts to pounding objects -- create vibrations that can become bigger and more dangerous over time.

Dynamic Load Success

How is the beam strengthened? _____

Name _____

Forces Lab

About This Lab

This lab simplifies the real-life forces and actions that affect structures, in order to illustrate key concepts. Forces act on big structures in many ways. Use the Building Big website to explore the forces at work and to see real-life examples.

http://www.pbs.org/wgbh/buildingbig/lab/forces.html

Squeezing (Compression)

Compression is a force that squeezes a material together. When a material is in compression, it tends to become_____.

Compression: See It In Real Life

The lower columns of a _____ are squeezed by the heavy weight above them. This squeezing force is called compression.

Stretching (Tension)

Tension is a force that stretches a material apart. When a material is in tension, it tends to become_____.

Tension: See It In Real Life

The weight of the _____ and all the _____ traveling on it pull on the vertical cables in this suspension bridge. The cables are in tension.

Bending

When a straight material becomes curved, one side _____ together and the other side _____ apart. This action is called bending.

Bending: See It In Real Life

The top side of the metal bar is pulled apart in _____, and the bottom side is squeezed together in _____. This combination of opposite forces produces an action called bending.

Forces Lab - Continued

Sliding (Shear)

Shear is a force that causes parts of a material to _____ past one another in opposite directions.

Shear: See It In Real Life

During an earthquake, parts of this roadway slid in opposite directions. This _____ action is called shear.

Twisting (Torsion)

Torsion is an action that _____ a material.

Torsion: See It In Real Life

In 1940, the _____ twisted violently in strong winds and collapsed. The twisting force that tore this bridge in half is called torsion.

Name _____

Materials Lab

About This Lab
What you build a structure out of is just as important as how you build it! Different materials have vastly different properties. Use the Building Big website to explore materials and to test them out.

http://www.pbs.org/wgbh/buildingbig/lab/materials.html

Directions- Select three materials and complete the questions below.

Material: _____

Pros+Cons List strengths and weaknesses
Strengths: _____
Weaknesses: _____

Applications
List two applications: _____

Compression Message

_____
_____
_____

Tension Message

_____
_____
_____

Material: _____

Pros+Cons List strengths and weaknesses

Strengths: _____

Weaknesses: _____

Applications

List two applications: _____

Compression Message

_____

_____

_____

Tension Message

_____

_____

_____

Material: _____

Pros+Cons List strengths and weaknesses

Strengths: _____

Weaknesses: _____

Applications

List two applications: _____

Compression Message

_____

_____

_____

Tension Message

_____

_____

_____