For this webquest, you will use several online resources to learn about bridges. The first two sections start at this website:

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

**BRIDGE BASICS:**

Use the information in Bridge Basics to fill in the following table.

|  |  |  |  |
| --- | --- | --- | --- |
| Type of Bridge | Components | Span | Sketch (label forces) |
| Beam |  |  |  |
| Truss |  |  |  |
| Arch |  |  |  |
| Suspension |  |  |  |

**FORCES LAB**

Define the following types of **forces**:

* Compression:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Tension: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Buckling: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Bending: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Shear: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Torsion: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

There are seven types of **loads** that act on a bridge. List them below and describe them in your own words. Try each load to figure out how to strengthen the bridge.

|  |  |  |
| --- | --- | --- |
| Load | Description | Strengthen the bridge by… |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |

There are eight common **materials** that are used to build bridges. Try to break each material and fill in the information below.

|  |  |  |  |
| --- | --- | --- | --- |
| Material | Pros | Cons | Applications |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |

Answer the following questions:

1. How is reinforced concrete structurally different than concrete? Which would you use to build an *arch bridge* and why?
2. How is steel structurally different than cast iron? Which would you use to build an *arch bridge* and why?

**NOVA SUPER BRIDGE**

This section starts at this website: <http://www.pbs.org/wgbh/nova/tech/build-bridge-p1.html>

This site has four pages to work through to figure out which bridges are appropriate for different sites. Work through the pages in order, completing the information below.

**Page 2: Survey the Sites**

|  |  |  |
| --- | --- | --- |
| Site | Span | Characteristics |
| **1** |  |  |
| **2** |  |  |
| **3** |  |  |
| **4** |  |  |

**Page 3: Do Your Homework**

The next page gives additional information about types of bridges and adds a new bridge type” the cable-stayed bridge. Read through the page and answer the following questions:

1. How do the **abutments** support arch bridges?
2. Discuss the issues related to span in beam bridges.
3. a. What are the advantages of using pre-stressed concrete?

 b. Briefly describe the elaboration process.

4. What are the main differences between Cable-Stayed bridges and Suspension bridges?

5. What are some of the advantages of Cable-Stayed bridges over other types of Suspension bridges?

**Page 4: Build a Bridge**

For each site, tell which bridge would work best and why.

|  |  |  |
| --- | --- | --- |
| Site | Bridge Type | Why |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |

**EXTENSION**

There have been several infamous bridge failures throughout history. One of the most famous (and a favorite of physics and engineering teachers!) is the Tacoma Narrows Bridge, a bridge that completely collapsed after only four months of use..

First, watch the video of the collapse:

<https://www.youtube.com/watch?v=j-zczJXSxnw>

Then read about why it happened:

<http://www.wsdot.wa.gov/TNBhistory/Machine/machine3.htm>

In a paragraph, summarize what happened to the bridge. Include the following information:

* What type of bridge was it?
* What material was the bridge made of?
* What types of forces were present during the collapse?
* What could have been done to prevent the collapse?