



West Point Bridge Design Contest

bridgecontest.usma.edu

United States Military Academy



<http://bridgecontest.usma.edu/>
www.wikipedia.org

The **United States Military Academy at West Point** (also known as **USMA**, **West Point**, or **Army**) is a four-year [coeducational federal service academy](#) located at [West Point](#), New York. Established in 1802, USMA is the oldest of the [United States's five service academies](#). The military garrison at West Point was occupied in 1778 and played a key role in the [Revolutionary War](#). The academy sits on scenic high ground overlooking the [Hudson River](#), 50 miles (80 km) north of New York City. The entire central campus is a [national landmark](#) and home to scores of historic sites, buildings, and monuments. The majority of the campus's [neogothic](#) buildings are constructed from gray and black [granite](#). The campus is a popular tourist destination complete with a large visitor center and the oldest museum in the [United States Army](#).

Candidates for admission must both apply directly to the academy and receive a nomination, usually from a [congressman](#). Students are officers-in-training and are referred to as [cadets](#). Tuition for cadets is fully funded by the Army in exchange for an active duty service obligation upon graduation. Approximately 1300 cadets enter the Academy each spring with about 1,000 cadets graduating. Graduates are [commissioned](#) as [second lieutenants](#). The academic program grants a [bachelor of science](#) degree with a curriculum that grades cadets' performance upon a broad academic program, military leadership performance, and mandatory participation in competitive athletics. Cadets are required to adhere to the [Cadet Honor Code](#), which states that "a cadet will not lie, cheat, steal, or tolerate those who do".

Because of the academy's age and unique mission, its traditions influenced other institutions. It was the first American college to have [class rings](#), and its technical curriculum was a model for later engineering schools. West Point's student body has a unique rank structure and lexicon. All cadets reside on campus and dine together en masse on weekdays for breakfast and lunch. The academy fields fifteen men's and nine women's [National Collegiate Athletic Association](#) (NCAA) sports teams while every student competes in at least one sport, either at intramural or intercollegiate level, each semester. Its [football](#) team was a national power in the early and mid 20th century, winning three national championships. Its alumni are collectively referred to as "The Long Gray Line" and its ranks include two [Presidents of the United States](#), numerous famous [generals](#), and seventy-four [Medal of Honor](#) recipients.

United States Military Academy



www.wikipedia.org

Engineering at West Point



Founded in 1802, the United States Military Academy at West Point was the first school in the U.S. to offer a formal program of instruction in engineering. During the first half of the 19th century, civil engineering was the foundation of the West Point curriculum. Academy graduates of that era designed and built many of the young nation's railroads, bridges, harbors, and roads. This contest commemorates West Point's engineering heritage and its role in developing the nation's infrastructure.

<http://bridgecontest.usma.edu/>





West Point Bridge Design Contest

bridgecontest.usma.edu

Purpose and Goals

Purpose

The United States Military Academy is pleased to offer the tenth annual **West Point Bridge Design Contest**.

The purpose of the contest is to provide middle school and high school students with a realistic, engaging introduction to engineering. We provide this contest as a service to education--and as a tribute to the Academy's two hundred years of service to the United States of America.

Goals

The contest will provide you with an opportunity to:

- Learn about *engineering* through a realistic, hands-on problem-solving experience.
- Learn about the *engineering design process*--the application of math, science, and technology to create devices and systems that meet human needs.
- Learn about *truss bridges* and how they work.
- Learn how engineers use the computer as a problem-solving tool.

We also hope you will have some fun pitting your problem-solving skills against those of other virtual bridge designers around the globe.

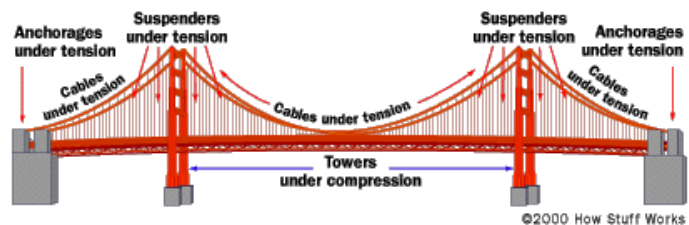
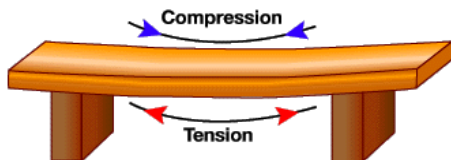
<http://bridgecontest.usma.edu/>



A **truss bridge** is a **bridge** composed of connected elements (typically straight) which may be stressed from **tension**, **compression**, or sometimes both in response to dynamic loads. Truss bridges are one of the oldest types of modern bridges. The basic types of truss bridges shown in this article have simple designs which could be easily analyzed by nineteenth and early twentieth century engineers. A truss bridge is economical to construct owing to its efficient use of materials.



- * **Compression** is a force that acts to compress or shorten the thing it is acting on.
- * **Tension** is a force that acts to expand or lengthen the thing it is acting on.



http://www.prhs.k12.ny.us/fac/HerskowitzM/images/cascade_teff_truss_bridge_476_1971_ampn.jpg



www.wikipedia.org

<http://science.howstuffworks.com/bridge1.htm>



Important Tips for West Point Bridge Designer 2011:

- Hollow tubes are better for members experiencing compression (red).
- Solid bars are better for members experiencing tension (blue).
- For a member not to fail, both the compression and tension forces acting on it must be < 1.00 .

Bridge #1 (10 points)

Use the "Howe Through Truss with High Peer (32 meter span)" template in West Point Bridge Designer 2011 to create a bridge that cost \$181,600 or less. The top 2 students in each period earn a bonus point.

Save on your W: drive (name: "Bridge 1") and attach in an email to Chris.Melville. **Subject line: "Bridge 1"**

To complete this assignment in West Point Bridge Designer 2011:

- 1) Read and close the Tip of the Day.
- 2) Select "Load a Sample Bridge Design"
- 3) Click "OK"
- 4) Select "Howe Through Truss with High Peer (32 meter span)"
- 5) Click "OK"
- 6) Begin

Bridge #2 (10 points)

Design from scratch any bridge you like using West Point Bridge Designer 2011. This bridge has no monetary constraints, so be creative! Of course your bridge must work, and it needs to get the most from its materials. So for this assignment your only constraint is that the sums of the "compression force/strengths" and "tension force/strengths" must be **at least .60 for each member**.

It may not be possible for some members to meet the .60 criteria because the software won't allow you to make them any more "slender" (skinny). In this case the members will turn a magenta (purple) color. In addition, you may find that 30 mm is the minimum thickness for a member. **If either of these situations happen, those members will be exempt from the .60 requirement.**

Each class will judge the top 2 designs with the criteria of "most creative", and those 2 designs will each earn a bonus point.

Save on your W: drive (name: "Bridge 2") and attach in an email to Chris.Melville.
Subject line: "Bridge 2".

To complete this assignment in West Point Bridge Designer 2011:

- 1) Read and close the Tip of the Day.
- 2) Select "Create a New Bridge Design".
- 3) Click "OK".
- 4) Read and follow all the steps. Notice the many interesting options available for your bridge. Experiment with them and feel free to use the "Back" button if you change your mind. In step 2 we're NOT participating in a local contest (we're competing in our own "unofficial" contest). Also, you do NOT need to fill in the "designed by" question or the "project ID".

Bridge #3 (10 points)

The final assignment is to create a bridge that is as inexpensive as possible. Along with safety and durability, this is the goal for the majority of bridges our society builds. If every bridge had the size and grandeur of the Golden Gate Bridge in San Francisco, for example, we simply couldn't afford it.

You may design as many bridges as you like, but you'll only email Mr. Melville your cheapest. The bridge may not be your same bridge from #1 or #2. You can start this bridge from scratch or use one of the "sample designs" offered to help get you going. The goal is simple: Make it cheap and make it work. You will find that some types of bridges are easier than others to get cheap. You must get this bridge **under \$177,300** to receive full credit. Be careful if you use one of the sample designs because some of them are impossible to create for under \$177,300. As in real life, usually the simplest designs cost the least. The top two bridges in each class earn a bonus point.

Save on your W: drive (name: "Bridge 3") and **when you're under \$177,300 and finished trying to improve your bridge**, attach in an email to Chris.Melville.
Subject line: "Bridge 3".