

## The ENGINEERING ENCOUNTERS Bridge Design Contest

### Instructions for Organizing a Local Contest

#### A. Introduction

The ENGINEERING ENCOUNTERS Bridge Design Contest (<http://bridgecontest.org>) is a nationwide Internet-based competition intended to provide middle school and high school students with a realistic, engaging introduction to engineering. The contest infrastructure includes a mechanism for organizing and running local bridge design contests. Using this system, any organization that establishes a local contest will receive its own web-based Local Contest Scoreboard, which allows the contest organizers to monitor the level of participation and the performance of local contest participants on a daily basis.

There are two different formats for local contests:

- **Local contests based on a single Bridge Design Project.** In this format, participants in a given local contest are assigned *one* specific bridge length, height, support configuration, and load case. This type of contest uses a 6-character Local Contest Code (see below) and is available only while the national ENGINEERING ENCOUNTERS Bridge Design Contest is *not* underway (September to mid-December).
- **Local contests based on all possible Bridge Design Projects.** In this format, participants in a given local contest are permitted to use *any* bridge length, height, support configuration, and load case offered by the West Point Bridge Designer software. This type of contest uses a 4-character Local Contest Code (see below) and is available anytime (except for the period from mid-December to mid-January, when we will be setting up for the start of the national contest.)

Starting in 2014, the national ENGINEERING ENCOUNTERS Bridge Design Contest provides separate contest categories for eligible middle-school (grades 6-8) and high-school (grades 9-12) students. Thus, it is possible for you to offer your local contest for:

- middle school students,
- high school students,
- both, or
- neither (e.g., for college students, non-U.S. students, teachers)

#### B. Local Contests based on a single Bridge Design Project

The term “Bridge Design Project” refers to a unique set of initial constraints—span length, height, support configuration, and load case—used by contestants to design their bridges. Single-project local contests can be particularly useful for small school-based competitions, because all contestants begin their designs from the same starting point. This format is also useful when the configuration of the winning designs from the previous year’s national contest is known by potential local contest participants. By specifying a Bridge Design Project that is

substantially different the previous year's winner, the local contest coordinator can "level the playing field" for the local contest.

Single-project local contests can only be used during the period from **September to mid-December**, while the national contest is not underway.

If you would like to run a local contest based on a single Bridge Design Project, please use the following procedure:

1. Decide on the Bridge Design Project you would like to use for your local contest. For detailed guidance on selecting a Bridge Design Project, see Appendix A of this document.
2. Decide whether your local contest will be for middle-school students, high-school students, both, or neither. (*Note:* If your contest will involve large numbers of students you do not know personally, then allowing *both* middle school and high school contestants will be the administratively simplest option.)
3. Request a Local Contest Code by sending a message to the Contest Coordinator at <http://bridgecontest.org/contact/>. Provide your name, e-mail address, selected Bridge Design Project, and a brief description of your proposed local contest. As a minimum, describe the target audience, sponsoring organization or school, prizes (if any), and the start and end dates of your contest. Note that your contest must end by mid-December, so we can clear our database for the start of the national contest in January.
4. The national Contest Coordinator will assign you a unique **6-character** Local Contest Code. The final three characters of the Local Contest Code identify your selected Bridge Design Project.
5. Publicize your local contest. As part of your local contest publicity, provide the following information:
  - a. Identify your eligibility requirements (middle school students, high school students, both, etc.)
  - b. Provide the Local Contest Code to all potential local contest participants.
  - c. Ask your local contest participants to register for the ENGINEERING ENCOUNTERS Bridge Design Contest at <http://bridgecontest.org/enter/register/>. Teams of participants who are not eligible to compete for prizes in the national contest may still participate in your local contest by registering in the Open Competition.
  - d. As part of the on-line registration process, your contest participants will be asked to enter the Local Contest Code. (This occurs on the final registration page—the same page on which the registrant enters his or her e-mail address and password.)
  - e. If the registrant enters a valid Local Contest Code, he or she will receive a confirmation on the Team Home Page.
6. Students competing in your local contest will use the **West Point Bridge Designer (WPBD)** software to design their bridges. This software is available for free download from the contest website
7. At startup, WPBD will prompt the user to enter the 6-character Local Contest Code. When your contestants enter your Local Contest Code, WPBD will automatically configure itself for the selected Bridge Design Project. (Recall that the Bridge Design Project, consisting of the load case and site configuration, is embedded within the Local Contest Code.) This process ensures that your contestants all use the designated Bridge Design Project for their designs.

8. Once the Local Contest Code is in our system, our server will generate a Local Contest Scoreboard automatically every 24 hours and post it to a web page. You will be able to access this page to get up-to-date information about participation in your contest. The URL for the Local Contest Scoreboard is <http://judge.bridgecontest.org/standings/local/#####>. The symbol “#####” refers to your unique six-character Local Contest Code.
9. Any team that enters the specified Local Contest Code will appear on your Local Contest Scoreboard, regardless of whether that team meets your eligibility requirements. At the end of the local contest, you will need to eliminate ineligible teams from your final standings.
10. The Scoreboard will not display contestants' last names or personal contact information. Contact information for local contest winners will be supplied only to the local contest organizer, if requested.
11. Once your local contest has ended, you may request your local winners' full names and contact information by sending a message to the national Contest Coordinator at <http://bridgecontest.org/contact/>.

### **C. Local Contests based on all possible Bridge Design Projects**

Use this format if you do not wish to constrain your local contest participants to a single “Bridge Design Project”—a single span length, height, support configuration, and load case. This local contest format allows for a truly open-ended design experience and provides contestants with much broader opportunities to explore design alternatives and demonstrate creativity. This format also permits students to participate in both the local contest and the national ENGINEERING ENCOUNTERS Bridge Design Contest simultaneously.

This type of contest is available *anytime*, except during the period from mid-December to mid-January, when we will be setting up for the start of the national contest.

If you would like to run a local contest based on all possible Bridge Design Projects, please use the following procedure:

1. Decide whether your local contest will be for middle-school students, high-school students, both, or neither. (*Note:* If your contest will involve large numbers of students you do not know personally, then allowing *both* middle school and high school contestants will be the administratively simplest option.)
2. Request a “Local Contest Code” by sending a message to the national Contest Coordinator at <http://bridgecontest.org/contact/>.
3. Provide your name, e-mail address, phone number, and a brief description of your proposed local contest. As a minimum, describe the target audience, sponsoring organization or school, prizes (if any), and relevant dates.
4. The national Contest Coordinator will assign you a unique **4-character** Local Contest Code.
5. Publicize your local contest. As part of your local contest publicity, provide the following information:
  - a. Identify your eligibility requirements (middle school students, high school students, both, etc.)
  - b. Provide the Local Contest Code to all potential local contest participants.

- c. Ask your local contest participants to register for the ENGINEERING ENCOUNTERS Bridge Design Contest by accessing <http://bridgecontest.org>. Participants who are not eligible to compete for prizes in the national contest may still participate in your local contest by registering in the Open Competition.
  - d. As part of the on-line registration process, your contest participants will be asked to enter the Local Contest Code. (This occurs on the final registration page—the same page on which the registrant enters his or her e-mail address and password.)
  - e. If the registrant enters a valid Local Contest Code, he or she will receive a confirmation on the Team Home Page.
  - f. If your local contest is being run while the national ENGINEERING ENCOUNTERS Bridge Design Contest is underway, then this process results in registration for *both* the national contest and the local contest.
6. Your local contest must always use the most current version of the West Point Bridge Designer posted on the ENGINEERING ENCOUNTERS website.
  7. At startup, both versions of WPBD will ask if the user is participating in a local contest. The user should not (and cannot) enter the 4-character Local Contest Code at this time. The code is not needed, since this contest format does not specify a particular Bridge Design Project.
  8. Once the Local Contest Code is in our system, our server will generate a Local Contest Scoreboard automatically every 24 hours and post it to a web page. You will be able to access this page to get up-to-date information about participation in your contest. The URL for the Local Contest Scoreboard is <http://judge.bridgecontest.org/standings/local/####>. The symbol “####” refers to your unique 4-character Local Contest Code.
  9. Any team that enters the specified Local Contest Code will appear on your Local Contest Scoreboard, regardless of whether that team meets your eligibility requirements. At the end of the local contest, you will need to eliminate ineligible teams from your final standings.
  10. The Scoreboard will not display contestants' last names or personal contact information. Contact information for local contest winners will be supplied only to the local contest organizer, if requested.
  11. Once your local contest has ended, you may request your local winners' full names and contact information by sending a message to the national Contest Coordinator at <http://bridgecontest.org/contact/>.
  12. After the national contest ends, the contest website will remain fully operational until July. Thus, local contests do not need to end when the national contest ends and may run through the remainder of the standard school year--but no later than July 1.

## **D.**

### **E. Frequently Asked Questions**

#### **Q1: What if a team forgets to enter the Local Contest Code during registration?**

**A1:** If a team does not enter the Local Contest Code, then that team will not appear on the Local Contest Scoreboard. However, a team can add the Local Contest Code to its registration *at any time*—even after the initial registration has been completed

#### **Q2: What if a team does not enter the Local Contest Code into the West Point Bridge Designer when designing their bridge?**

**A2:** If your local contest format is based on a *single Bridge Design Project*, then participants *must* enter the 6-character Local Contest Code into WPBD at startup. The code sets up WPBD, such that all bridge designs will be based on the correct Bridge Design Project for your contest. If the contestant does not enter the code or enters it incorrectly, the design will be rejected when it is submitted to the contest website.

If your local contest is based on *all possible Bridge Design Projects*, then participants should not (and cannot) enter the Local Contest Code into the WPBD software at start-up. For this contest format, the code is not necessary to configure the WPBD software.

**Q3: Can a team enter a local contest and the national contest at the same time?**

**A3:** While the national contest is underway, any design submitted as an entry in a local contest is automatically entered in the national contest as well. Contestants who wish to enter the national contest with a Bridge Design Project that is different from the one designated for their local contest may form a new team to do so. The new team should *not* be registered in the local contest.

**Q4: Can a team enter more than one local contest at the same time?**

**A4:** No. Unfortunately, at the present time, the registration system can only accommodate one code per team.

**Q5: Can I run two local contests—one before mid-December and one after mid-January?**

**A5:** Yes, but they must be organized as two separate contests, because they will use two different versions of the West Point Bridge Designer software. The spring contest will need to use the new software version released in mid-January for the national contest.

**Q6: Can my local contest be conducted between mid-December and mid-January?**

**A6:** No. The contest registration and judging system will be shut down during that period, because we will be setting up for the national contest.

**Q7: If I plan to run a local contest in January, in conjunction with the national contest, may I request a Local Contest Code prior to the start of the national contest?**

**A7:** Yes. You may request a Local Contest Code the national Contest Coordinator at <http://bridgecontest.org/contact/> at any time. Because your contest will run in conjunction with the national contest, its format must be *based on all possible Bridge Design Projects*.

**Q8: May I publicize my local contest prior to the start of the national contest?**

**A8:** Yes. As soon as you have received an approved Local Contest Code from the national Contest Coordinator, you may publicize your local contest.

**Q9: Can my local contest run beyond the end of the national contest?**

**A9:** Yes. The contest registration and judging system will not be deactivated until July.

**Q10: This local contest system seems like a lot of work. Why can't the national Contest Coordinator just send me a list of all contest participants who registered from my town or zip code?**

**A10:** The national contest typically draws over 15,000 registered teams. This project is run by three volunteers who also have full-time jobs. It is simply not possible for us to provide

customized data queries for hundreds of local contests. Use of the Local Contest Code allows you to gain real-time access to the contest database without direct intervention by the contest staff.

**Q11: How should I publicize my local contest?**

**A11:** In the past, our most successful local contests have been publicized primarily by *direct, personal contact* between contest organizers and local math, science, and technology teachers. Another effective technique is to hold a public event, at which students can try out the West Point Bridge Designer software on a computer workstation. Simply posting a notice on your organization's website is not likely to be effective.

**Q12: I am a high school teacher. Can I organize a local contest just for a project in my math or science classes?**

**A12:** Yes. Even if you are doing a bridge design project that isn't really a contest, you may use our local contest system to keep track of your students' participation and standings.

**Q13: I am planning to run a local contest in conjunction with the national contest in January. Can participants in my local contest practice prior to the official start of the Qualifying Round?**

**A13:** Yes. Participants can download the current edition of the West Point Bridge Designer software from our website and can practice designing bridges in preparation for the contest. The new version, released in January, will be very similar to the previous year's version, except that cost factors and loads will be changed.

**F. Conclusion**

A local contest is a great way to facilitate participation in the ENGINEERING ENCOUNTERS Bridge Design Contest, while also providing a mechanism for keeping track of and recognizing the achievements of contest participants in your local area, organization, school, or course. If you have any questions about the local contest system, please send a message to the national Contest Coordinator at <http://bridgecontest.org/contact/>. Good luck!

--The Contest Team

## **Appendix A**

### **ENGINEERING ENCOUNTERS Bridge Design Contest**

### **BRIDGE DESIGN PROJECTS**

A Bridge Design Project consists of two components—the **load case** and the **site configuration**. There are four available load cases and 98 available site configurations. When a local contest organizer requests to set up a local contest, that request should include:

- The desired load case (specify **Load Case A, B, C, or D**)
- The desired site configuration (specify **Site Configuration #1 - #98**)

If you have no preference for a particular load case or site configuration, simply note this in your request and the national Contest Coordinator will choose them for you.

**NOTE:** Your selected load case and site configuration will be embedded in the Local Contest Code that is provided to you by the national Contest Coordinator. For example, if your Local Contest Code is “XYZ38B”, then your local contest will be using Site Configuration #38 and Load Case B. Local contest participants must know their Local Contest Code in order to enter the local contest; however, it is not necessary for contestants to know the specific load case and site configuration which are being used in the local contest. At start-up, the West Point Bridge Designer software will prompt the user for the Local Contest Code and, based on that code, will automatically configure itself for the correct load case and site configuration.

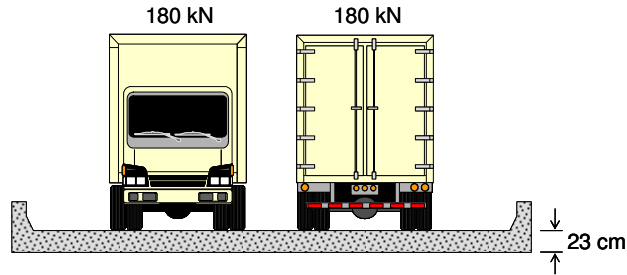
### **Some Considerations for Selecting a Load Case and Site Configuration**

1. In general, a greater *deck height* (i.e., a longer span) will result in a more complex and challenging design. Thus, consider using a lower deck height for younger students or for projects that must be completed in a limited period of time.
2. Site configurations that include *cable anchorages* offer opportunities to explore many unique and interesting bridge types—suspension bridges and cable-stayed bridges, for example. Consider using cable anchorages as a stimulus for contestants’ development of creative design concepts. It is important to note that the inclusion of cable anchorages in the site configuration adds to the total cost of the bridge design, regardless of whether the anchorages are actually used.
3. In deciding on a load case, recognize that the weight of the concrete deck is a *static load*—it doesn’t move—while the weight of the truck is a *moving load*. In general terms, load cases with relatively larger moving load and relatively smaller static load tend to be somewhat more challenging. The moving load will cause the internal force in some structural members to vary considerably—sometimes from tension to compression and vice versa—as the truck crosses the bridge. The design of members subjected to load reversals is somewhat more difficult than the design of members subjected to tension alone or compression alone. Thus, Load Case D will tend to be the most challenging, while Load Case A will tend to be the most straightforward.

## Load Cases

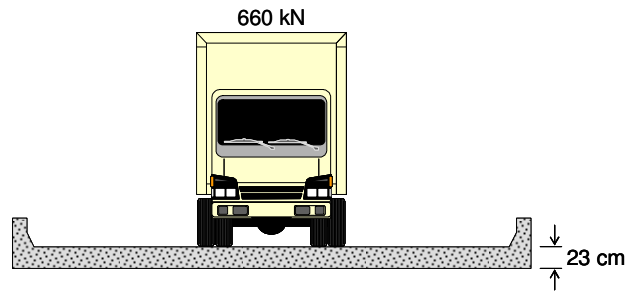
### Load Case A:

- Medium-strength concrete deck (*heavier but less expensive than high-strength concrete*)
- Standard 180 kN H20-44 truck loading in two lanes



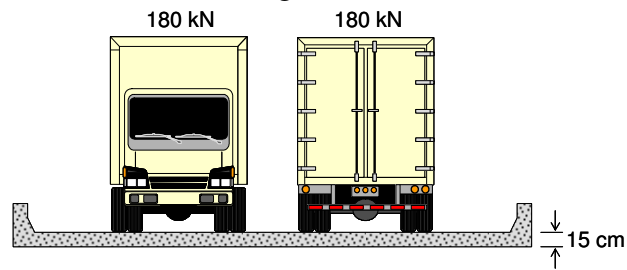
### Load Case B:

- Medium-strength concrete deck (*heavier but less expensive than high-strength concrete*)
- One 660 kN permit loading on the bridge centerline



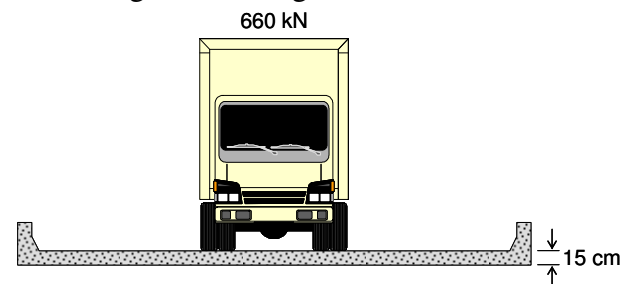
### Load Case C:

- High-strength concrete deck (*lighter but more expensive than medium-strength concrete*)
- Standard 180 kN H20-44 truck loading in two lanes



### Load Case D:

- High-strength concrete deck (*lighter but more expensive than medium-strength concrete*)
- One 660 kN permit loading on the bridge centerline

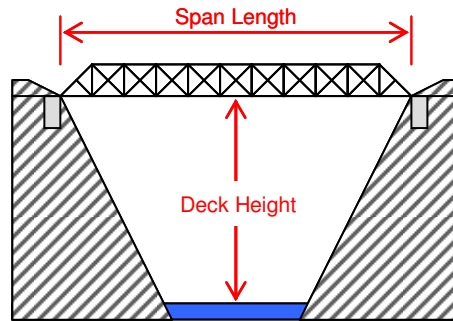




## Bridge Site Configurations

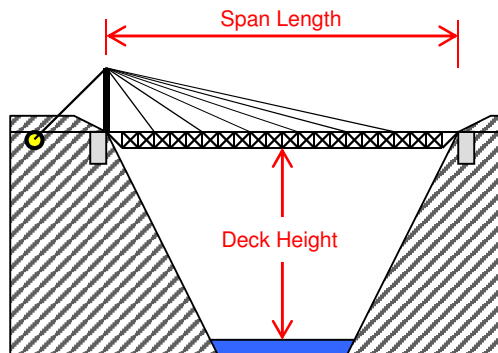
### Standard Abutments

Site Config. #	Deck Height (meters)	Span Length (meters)
01	24	44
02	20	40
03	16	36
04	12	32
05	8	28
06	4	24
07	0	20



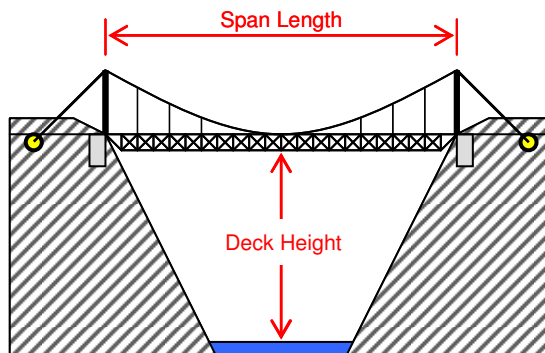
### Standard Abutments with One Cable Anchorage

Site Config. #	Deck Height (meters)	Span Length (meters)
08	24	44
09	20	40
10	16	36
11	12	32
12	8	28
13	4	24
14	0	20



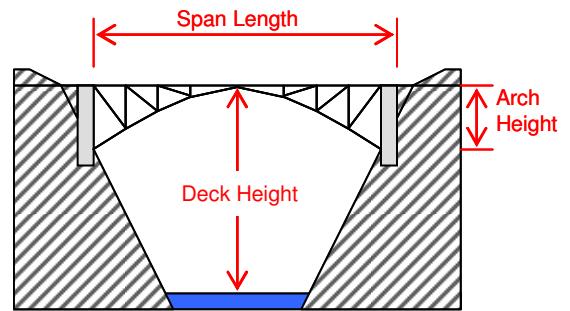
### Standard Abutments with Two Cable Anchorages

Site Config. #	Deck Height (meters)	Span Length (meters)
15	24	44
16	20	40
17	16	36
18	12	32
19	8	28
20	4	24
21	0	20



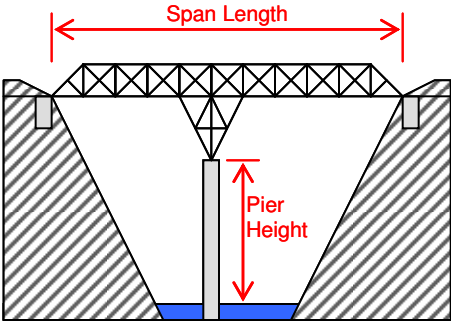
## Arch Abutments

Site Config. #	Deck Height (meters)	Span Length (meters)	Arch Height (meters)
22	24	40	4
23	24	36	8
24	24	32	12
25	24	28	16
26	24	24	20
27	24	20	24
28	20	36	4
29	20	32	8
30	20	28	12
31	20	24	16
32	20	20	20
33	16	32	4
34	16	28	8
35	16	24	12
36	16	20	16
37	12	28	4
38	12	24	8
39	12	20	12
40	8	24	4
41	8	20	8
42	4	20	4



**Standard Abutments with Pier**

Site Config. #	Deck Height (meters)	Span Length (meters)	Pier Height (meters)
43	24	44	0
44	24	44	4
45	24	44	8
46	24	44	12
47	24	44	16
48	24	44	20
49	24	44	24
50	20	40	0
51	20	40	4
52	20	40	8
53	20	40	12
54	20	40	16
55	20	40	20
56	16	36	0
57	16	36	4
58	16	36	8
59	16	36	12
60	16	36	16
61	12	32	0
62	12	32	4
63	12	32	8
64	12	32	12
65	8	28	0
66	8	28	4
67	8	28	8
68	4	24	0
69	4	24	4
70	0	20	0



## Standard Abutments with Pier and Two Cable Anchorages

Site Config. #	Deck Height (meters)	Span Length (meters)	Pier Height (meters)
71	24	44	0
72	24	44	4
73	24	44	8
74	24	44	12
75	24	44	16
76	24	44	20
77	24	44	24
78	20	40	0
79	20	40	4
80	20	40	8
81	20	40	12
82	20	40	16
83	20	40	20
84	16	36	0
85	16	36	4
86	16	36	8
87	16	36	12
88	16	36	16
89	12	32	0
90	12	32	4
91	12	32	8
92	12	32	12
93	8	28	0
94	8	28	4
95	8	28	8
96	4	24	0
97	4	24	4
98	0	20	0

