



“Building Bridges” – GSSI Junior Council’s Own Badge

There are more than half a million bridges in the USA and you rely on them every day to cross a river, road or other obstacle. The Mississippi River Region is a showcase of bridges from our past and westward expansion. Today they serve as a vital role in the economy and the region. In this badge you will learn about different bridges and their uses, engineering, construction and design. Get ready and cross the bridge to understanding these structures and the impact they have on your life!

Steps

- 1. Be a bridge detective**
- 2. Take a trip**
- 3. Go back in time**
- 4. Tools of the Trade**
- 5. Under Construction**

Purpose

When I’ve earned this badge, I’ll have explored bridge design and construction in my community.

Step 1 Be a bridge detective

Be a detective and learn about the design of bridges.

CHOICES – DO ONE:

- Bridge design.** Bridges come in all kinds of designs. Find out about the four basic types of bridges: beam, arch, truss and suspension. Why are some curved and others straight? Learn about the advantages and disadvantages of each.
- How do bridges effect the environment?** Discuss the impact of bridges on transportation and the environment. Find out what steps are taken to ensure that a new bridge will be built in a most needed area with as little impact as possible on the environment and natural habitats.
Did you know that archeologists who are experts in the past, research a possible bridge site for artifacts, cemeteries, burial grounds or other significant historical items before the project begins?
- Famous bridges.** Pick one of the following famous bridges in southern Illinois and find out when it was built. How long is it? What type of bridge it is? What is it made of? What makes it famous? What cities does it connect?

- Eads Bridge – For fun take a boat ride from Laclede’s Landing in St. Louis to check out the bridge from the Mississippi River.
- General Dean Suspension Bridge
- Chain of Rocks Bridge

Step 2 **Take a trip**

CHOICES – DO ONE:

- Take a road trip.** Visit the Chain of Rocks Bridge in St. Louis (Chouteau Island in Illinois), Clark Bridge in Alton or another scenic bridge in your area. Discuss the bridge type, condition and other visual features. What type of bridge is it? Take a picture or draw a sketch include the name, date built, site and style type. Pack a lunch or hot chocolate depending on the season and look for eagles, plants and other natural things of interest.
- Take a visual tour.** Go online and research a bridge of each type - beam, arch, truss and suspension. Take notes and list one fact about each bridge. Download the picture and then sketch each. Include the name, date built, site and style type.
- Take a walk.** Sketch four different architectural structures in your community: bridge, home, church and school. Include a description of the period it was built. Who built it? Share with your family and friends.

More to Explore: Take your sketches and draw each again in different mediums, charcoal, paint or at different times of day: morning or evening. Have an art show for your family or friends and share what you learned about bridge design and architecture. For refreshments make cupcakes or cookies and decorate with different bridge designs.

Step 3 **Go Back in Time**

CHOICES – DO ONE:

- Visit a bridge festival or a covered bridge in your area.** Before your visit learn about its history, its use today and why it’s important to preserve the past. Some bridges that are still around today for visits include:
 - Little Mary’s Covered Bridge in Chester, IL. Pack a picnic lunch and visit the only remaining covered bridge in Southern Illinois. It was added to the National Register of Historic Places in 1974.
 - Eads Bridge in East St. Louis, IL
 - General Dean Suspension Bridge in Carlyle

- **Take a tour.** Visit the National Great Rivers Museum, Army Corps of Engineers sites or other public works' sites and learn how bridges have changed over the years in your community, along waterways and in different environments.
- **Take a ferry ride.** Find out how people crossed a river before bridges were built. Take a field trip to a ferry below or look online for information about ferries and how they work.
 - Brussels Ferry, Grafton, IL – located 1 mile west of Grafton & crosses the Illinois River linking Illinois Route 100 to Calhoun County, near Brussels.
 - Kampsville Ferry, Kampsville, IL – crosses the Illinois River connecting Illinois Route 108 & Illinois Route 100 near Kampsville.
 - Cave-in-Rock Ferry, Cave-in Rock, IL – crosses the Ohio River between Illinois Route 1 & Kentucky Route 91 near Cave-in Rock.

More to Explore: The Midwest has some of the most interesting flood stories. Find a community member or visit one of the area history museums and create a skit or drama that tells the tale of the flood victim - how did they prepare? Where did they go? What happened after flood waters receded?

Step 4 **Tools of the Trade**

CHOICES – DO ONE:

- **It takes many people to build a bridge.** Go online and find three careers which are related to the bridge-building industry and the education or expertise these careers require.
Check out the site below for an interview with Miguel Rosales, A.I.A., lead architect on the Stan Musial Memorial Bridge in St. Louis. Find out about his career and what considerations were taken into the design for this large urban bridge.
<http://www.pbs.org/wgbh/buildingbig/profile/interview/rosales.html>
- **Learn what kinds of safety equipment are worn when working at a bridge-building site.** How are workers kept safe around the equipment? What types of special clothing or gear do they wear?
- **Experiment with three types of flood prevention and remediation.** Take a plastic tub, like the ones used for dishwashing. Start by creating a dam out of clay, soil, sand, etc. and set it partway across the tub. Pour water to the top of one side of the tub and see how well your dam holds water. Now create a hole or breach in your levy. How quickly does the water move from one side to the other? What materials can you use to stop the flow of water, and which is the most effective? What materials can you come up with to clean up or remediate the flooded area? Examples to try – a tablespoon of sugar or sand in a piece of

plastic wrap makes a fun model of sandbags; paper towels, diaper gel crystals, driveway gravel, etc. How do you think the Army Corp of Engineers manages these dams? Why do you think they choose certain materials to stop the flooding? Once you get the water flow stopped, try challenging your fix by adding additional water!

More to Explore: Engineers solve practical problems by applying mathematical and scientific knowledge. The word engineer comes from a Latin word meaning “cleverness”. Branches of engineering include aerospace, biomedical, chemical, civil, computer, electrical, environmental, forensic, genetic, mechanical, military, nuclear, reverse, software and structural. Find out about 4 of these types of engineers. What do they do, how do they make our life easier for people?

Step 5 Under Construction

CHOICES – DO ONE:

- Build a mock bridge.** The most important part of building a bridge is the design. If the design if off the bridge will fail and people will get hurt. An obvious factor is weight capacity. Use four or six books in two stacks the same height, a package of index cards, 300 to 400 pennies and scissors. Set the two stacks of books four inches apart and lay an index card across the gap. See how many pennies it can hold before it collapses. Make changes to the bridge design to see how many pennies it can hold. Hint – try folding or bending the cards for more structural support. Visit Craggy Rock and take the Bridge Challenge at <http://www.pbs.org/wgbh/buildingbig/bridge/challenge/index.html>.
- Visit the National Great Rivers Museum and learn how locks and dams make the rivers an important corridor or try the experiment below.**

What you’ll need – grease pencil or permanent marker, 2 half-gallon milk or juice cartons, Plastic container (about 18” x 24” x 6”), modeling clay, ruler (with centimeters), scissors, water to fill plastic container 3 cc deep, pencil and paper.

- Cut the tops off of two milk cartons (Cartons A and B), about 12 centimeters (cm) from the top.
- Poke one hole 1 cm from the bottom of each carton.
- Cover the hole with clay.
 - a. Measure and draw a line inside 4 cm from the bottom of Carton A.
 - b. Measure and draw a line inside 12 cm from the bottom of Carton B.
- Pour water into the container 5 cm deep.
 - a. Pour water up to the 4 cm line in Carton A.
 - b. Pour water up to the 12 cm line in Carton B.
- Place both cartons inside the container.

- a. Remove the clay from Carton A. Make sure the hole is open. Wait about 5 minutes and measure inside Carton A. Record water level.
 - b. Remove the clay from Carton B. Make sure the hole is open. Wait about 5 minutes and measure inside Carton B. Record water level.
 - Calculate the volume in each carton and record your findings - Measure the depth of each carton and calculate the volume in cubic centimeters (cc). $\text{Volume} = \text{length} \times \text{width} \times \text{depth}$.
 - Compare the difference in volume between Cartons A and B.
 - Discuss the outcome.
- **Create a model landscape of a river and city using recyclable material and include river crossings, dams and ports.** An easy way to do this is to use an aluminum baking pan, recyclable materials like paper towel tubes, cereal boxes and aluminum cans and cover with foil. Push the foil down around the materials and use clay or other recycled materials to create buildings, bridges and roads.

More to Explore: How are materials decided on for building a bridge? What happens to a bridge when forces of nature are at play? Check out your knowledge at the Forces Lab at <http://www.pbs.org/wgbh/buildingbig/lab/forces.html>.

Add the Badge to Your Journey

Bring your TEAM together and identify a bridge that could use some help – it could be a bridge over a culvert, bike path, footpath or even a trail bridge at a Girl Scout camp. Approach the community leaders who are responsible for the bridge and see how you can use the bridge to make a POWERFUL connection in your community!

(Agent of Change)

Now that I've earned this badge, I can give service by:

- **Helping a Brownie troop work on their Building Bridges Try It.**
- **Share with my science class what I've learned about bridge design by building a mock bridge.**
- **Volunteer to work at a bridge festival or other festival in honor of a historical bridge or structure in my community.**