BRIDGE BOOM IN THE BURGH

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OVERVIEW

I currently work at the Pittsburgh Gifted Center. We provide services for students in grades kindergarten to grade eight. Our theme this year is PITTSBURGH 250 to go along with the theme of our city. We get a different group of students each day of the week, from more than fifty schools throughout the city. The same basic lesson is taught each day, for a week. There are two, two hour blocks of time each day, so there is time to delve into a topic.

Teaching *Bridges of Pittsburgh* within a unit on Geometry, with a cross-curriculum tie-in with the History of Pittsburgh during the late 1800's and 1900's would make a natural connection for third and fourth grade students and fit perfectly into our Center's theme. They could use their basic knowledge and understanding of geometry and apply it to a bigger picture. Since they are elementary students, the lessons and activities will expose the students to the vocabulary and history of the bridges, showing them how these bridges were an integral part of the growth of Pittsburgh, economically and socially. High Ability/Gifted students already have a strong grasp on the basics, so this unit will take them to a deeper understanding of geometry in their surroundings, and push them to think new thoughts about the order and planning that went in to the engineering of the bridges.

Students who are residents of Pittsburgh will find out more about the city they live in and be more aware of the importance of the bridges they see and use daily.
Teachers with students who live in other cities can learn more about Pittsburgh and why it is a special place. As they learn about the bridges, they will also learn more about how and when Pittsburgh developed into the city it is today, and the people who had the vision to bring about the necessary changes.
RATIONALE

This unit on the Bridges in Pittsburgh will be used within a cross-curriculum unit, to expand and enhance the history of Pittsburgh and the influence of the engineers and urban developers who brought their visions to reality. It can be used within a social studies unit on Pittsburgh, a writing unit on nonfiction, a geometry unit showing how triangles and arches add strength to a structure, and an art lesson on design, for grades three and four.

To clarify what type of bridges we will be studying, a definition for a bridge needs to be established. According to Webster, bridge can mean any structure carrying a pathway or roadway over a depression or obstacle. That can mean many things: A structure carrying a pathway can be for vehicles, people, or a pipeline or water. It can cross over a gorge, valley, road, railroad track, river or any other physical obstacle. Bridge can also be used to define part of a violin, upper part of your nose, part of a ship, or a card game. So, for our purposes, we will define a bridge as a structure that crosses over a river, for the purpose of a roadway for vehicles and people, namely in the Pittsburgh area, and focusing on the Allegheny and Monongahela Rivers. Even with that limiting definition, it still covers almost twenty structures.

Most of the bridges that were first used by man were ready-made such as a fallen log lying across a stream, a rock arch, or tangled vines growing across a ravine. When the need arose for a stronger, bigger crossing than the ready-make one, he rolled another log beside the first one, then another. When they needed to fill in the cracks to make a smoother pathway, they used materials that were available in the area. This served him fine until loads got heavier and then new structures had to be developed.
When the first explorers arrived in the Pittsburgh area, they had to use ferryboats and rafts to transverse the rivers. As more people settled in the area a more permanent structure needed to be constructed to allow easy passage across the rivers to the Point. The first bridges in Pittsburgh were made of wood. However, as time and conditions showed, their susceptibility to deterioration when exposed to natural elements required frequent repairs and constant maintenance. The first bridge over the Monongahela was destroyed in the Great Fire of 1845. The Liberty Bridge was built in 1928 at the cost of $3,400,000. The bridge led into the Liberty Tube giving the residents of Pittsburgh direct access to the South Hills.

By the mid 1880's the structure and materials used to make bridges more durable were developed. They resulted from a history of ideas, trial and error, and sharing ideas with engineers from Europe. Pittsburgh's need for bridges all but guaranteed that it would became a mecca for innovation in bridge design. (Regan, 25) John Roebling, Gustav Lindenthal and George Ferris are three fathers of modern bridge design, and they have connections to Pittsburgh. Due to the city's most prolific era of bridge building, their influence was felt far and wide.

Gustav Lindenthal was born in Austria where he attended a provincial college and then polytechnical schools in his hometown and in Vienna. He worked on railroads in Austria and Switzerland before emigrating t the U.S. in 1874 where he soon found work as a construction engineer for the Centennial Exposition in Philadelphia. By 1881, he had established an engineering practice in Pittsburgh, where he built several bridges, including the Smithfield Street Bridge, a stunning example of the lenticular truss. He also worked on a variety of railroad projects in Pennsylvania.

John Roebling designed the Sixth Street suspension bridge which replaced an old covered bridge. John Roebling was born in 1806 in Muhlhausen, Thuringia, Prussia, now Germany. He was educated in the public schools of Muhlhausen and the city Gymnasium, and was also tutored privately to qualify him for entrance to the Royal Polytechnic School at Berlin. His courses included architecture and engineering, bridge construction, hydraulics, languages, and philosophy. He emigrated to the U.S. in 1831 and settled in the area of Pittsburgh, Pennsylvania. He was the pioneer in America manufacturing wire rope, used first for portage railroads. The general idea of suspension bridges had been a favorite one with him ever since his college days when it formed the subject of his graduating thesis.

George Ferris was born in Galesburg, Illinois. He graduated from Rensselaer Polytechnic Institute with a degree in Civil Engineering. He founded a company, G.W.G. Ferris & Co. in Pittsburgh, Pennsylvania, to test and inspect metal for railroads and bridge builders. He was best known for inventing the first Ferris Wheel for the World Columbian Exposition in Chicago in 1893. He wanted to create something as impressive as the Eiffel Tower in Paris, France.
Several types of bridges, with the help of these men, were developed to serve the growing needs of heavier and more types of vehicles in the Pittsburgh area:

- **BEAM BRIDGES**

Beam bridges are simple in design and so they cost the least to construct. Beams called girders span the needed distance and are often made of concrete and steel. The ends of the girders rest on supports on each end of the bridge called abutments. More supports called piers are placed at various points along the girders. A beam bridge works because the weight of the beam and the load it carries push down on its supports.

- **TRUSS BRIDGES**

A truss bridge is an arrangement of beams or planks fastened together in such a way that each member shares part of the weight of the bridge and the load it is intended to carry. Truss beams or planks can be either above or below the roadway of the bridge (a deck truss), or form a framework around the roadway (a through truss).

- **ARCH BRIDGES**

An arch bridge is shaped like a curve or arch where the roadway lies either above or below the arch. When the roadway is above the arch it is supported by columns called spandrels, and when it is below the arch, it is supported by beams extending down from the arch. The key point is the apex. In masonry arch bridges, this is marked by a wedge-shaped "keystone". The forces exerted by the weight of the bridge and its load pass through the keystone down both sides of the arch to its base at the abutments of intermediate piers.

- **SUSPENSION BRIDGES**

The suspension bridge hangs on cables which are fastened to high towers on each bank. Long suspension bridges are usually supported by several cables which can be over three feet thick, and are made of thousands of twisted steel wires. The cables stretch from one end of the bridge to the other and both ends of the cable are firmly anchored in huge concrete blocks. Most of the bridge's weight is distributed through the cables to the anchored points

- **CANTILEVER BRIDGE**

The cantilever bridge is built using cantilevers, which are horizontal structures supported only at one end. A cantilever bridge usually consists of two sections which extend from opposite banks and meet above the middle of the stream. Each section consists of an anchor arm and a cantilever arm and rest on a pier located about one-fourth of the distance across the stream. Cantilever bridges sometimes feature additional spans suspended between two cantilever arms to cross particularly wide streams.

We will research each of the main bridges in the Pittsburgh area, using study guides and the internet, to find information and data on their history. Starting with the Fort Pitt Bridge, we will then move on to the Smithfield Street Bridge, the Liberty Bridge, Tenth Street Bridge, Hot Metal Bridge, Birmingham Bridge, Glenwood Bridge, and stop at the Homestead High Level Bridge.

Pittsburgh's topography is very diverse with a lot of hills, valleys and waterways. To get from one community or area to another was difficult. By building bridges and tunnels, traveling from one place to another became possible and so expansion and growth could occur.

To tackle these problems, prominent engineers and architects John Roebling, Gustav Lindenthal, and George Richardson came to the Pittsburgh area from Europe. They made names for themselves by using the resources available in the area to create bridges that were strong, sturdy, and still in use today.

Another big happening that contributed to the building of bridges in Pittsburgh was the Pittsburgh Renaissance. This was the title given to the city's enormous gathering of energy and leadership in the years that followed the Second World War and to the changes that came to the city. Pittsburgh's great effort had been to remake itself, to change as fast as it could from the environment of the old nineteenth-century technology into the sleek new form of the future. The city was racing time because it had no inclination to look back and it had no nostalgia for the past. The city welcomed tomorrow because yesterday was hard and unlovely for those in the area. Pittsburgh erected buildings that glistened with stainless steel and aluminum. It had little time for the niceties of architectural criticism. It counted the gains and shrugged off the losses, not even respecting landmarks. Pittsburgh took pleasure in the swing of the headache ball and the crash of falling brick. It tore down bridges without a second thought, and it regarded a tunnel through a mountain as the most natural kind of highway possible. It remembered when the Golden Triangle was more grime than gold and when there were no buildings erected in downtown Pittsburgh for twenty years.

When the war was over the city contemplated its future, the people learned to their surprise that their city government could be a constructive force for the general welfare. The city and county government were executing great urban renewal programs, operating a huge airport at a profit, constructing parking facilities that paid their way. Pittsburgh, after all the grim years, was proud and self-confident in its future. It began to receive good notices in the national magazines and in the international press.

The renowned city planner of New York was asked to advise the Pittsburgh Regional Planning Association and to suggest ways of easing the flow of traffic in and around the city. In 1939, Robert Moses agreed to act as a diagnostician and he submitted a 26 page report which included 23 illustrations and would cost thirty-eight million dollars. A number of his proposals were adopted by the city.

Two leaders, Richard King Mellon and David L. Lawrence emerged during the Pittsburgh Renaissance. They joined hands to clean up, rebuild and improve their city. The cooperation of these traditional rivals, the wealthy Republican industrialists and financiers with the Democratic city politicians, augured well for the future of Pittsburgh.

The Mellon prestige, money and professional competence, merging with Lawrence's political astuteness and the support of the rank and file Democrats and organized labor, accomplished what neither man could have done working alone. Lawrence focused his political future on smoke control while Mellon used his influence on business leaders to enlist their help in improving and rebuilding their city. Together the two men achieved a minor miracle: the smog over the city vanished, modern buildings replaced slums, the ever-recurring floods were brought under control, new and vital roads, bridges and tunnels were designed and built. Pittsburgh became of the sunniest and most beautiful cities in the nation.

David Lawrence lived from 1889 to 1966, and was the mayor of the city from 1946 to 1959. He was the governor of the Commonwealth from 1959 to 1963. For more than half a century in political life, he was one of the main forces in the rebuilding of Pittsburgh.

Richard King Mellon lived from 1899 to 1970, was governor and President of T. Mellon & Sons, was the head of the Mellon interests that controlled Gulf Oil, Koppers and Alcoa and which had a dominant influence on many other corporations like U.S. Steel, Westinghouse Air Brake, Pennsylvania Railroad, Pittsburgh Plate Glass, and Pittsburgh Consolidation Coal. A shy and retiring man, he offered his leadership to all those who played a part in the rebuilding of Pittsburgh.

Another major influence came from Arthur Van Buskirk. He lived from 1896 to 1972. He was governor of T. Mellon & Sons, board chairman of the Cleveland Federal Reserve Bank, a key figure in Pittsburgh's Renaissance, and a spokesman for the Mellons. He, along with a number of other civic minded citizens created the Allegheny Conference and planted the seeds that led to the development of Gateway Center. From the earliest days of the Allegheny Conference Van Buskirk was the anchorman of Richard K. Mellon. While he believed that physical improvements were of immediate importance at the beginning of the city's renaissance, he knew that there also had to be a spiritual rejuvenation. Next to roads, bridges, tunnels, parks, new office buildings, the city must also have improved labor relations., fresh educational facilities, more up-to-date governmental methods, and other achievements. For Van Buskirk, the triumph of Pittsburgh's rebuilding meant that leaders of both industry and government had been able to work together for the good of the city, above either party or economic interest, and that at the municipal level they forged a new and stronger democracy of significance to the nation as a whole.

Wallace Richards lived from 1904 to 1959. He was one of the prime movers behind Pittsburgh's redevelopment. He had the powers to dream and think up things that some of the more staid people could not grasp. He was a super salesman with a talent to influence the public and put over what he had in mind. He was a man of tremendous vitality. While he was working in Maryland on one of the country's model planned communities, Richards was invited to come to be the assistant of veteran city planner Frederick Bigger. Subsequently, Richards was named to the Parking Authority and became civic advisor to Richard K. Mellon, who had great confidence in him. Richard took part in the foundation of the Allegheny Conference, becoming the first secretary of the executive committee. There was hardly a highway or civic improvement project in the city with which he was not associated.

OBJECTIVES

- The student will learn the names and locations of the major Pittsburgh Bridges that cross the Monongahela River and the Allegheny River, near the Point.
- The student will discover why bridges are designed with triangles and arches through hands-on experiments and activities.
- The student will work with a group to research a designated bridge in Pittsburgh.
- The students and their group will share their findings through an oral presentation using graphic aids.
- The student will contribute pictures and articles pertaining to bridges for a class bulletin board.
- The student will learn about the history of the Pittsburgh area.
- The student will cite primary and secondary sources.
- The student will construct a bridge in 2-D or 3-D

STRATEGIES

To initiate this unit, I will have the students list the Pittsburgh bridges that cross the Allegheny and Monongahela Rivers, and make a chart of what they already know about them. Then, I will have the students put the names of each of the bridges on a separate card. On a large mural with an outlined map of Pittsburgh highlighting the rivers, the students will be asked to place the cards in the general location of the bridges.

We would go over vocabulary words to familiarize the students to words associated with bridges. To review these words, I would have them use the words in a team activity, and keep the words posted in the classroom for ready reference.
Next, I would show the class a video on the bridges of Pittsburgh to give them a quick overview of the more prominent and historical bridges in the area.

Then starting with the Fort Pitt Bridge crossing the Monongahela River near the Point, and going to the Smithfield Street Bridge, Liberty Bridge, Tenth Street Bridge, Hot Metal Bridge, Birmingham Bridge, Glenwood Bridge, and then Homestead Grays Bridge, we can look at the designs of the bridges using the internet in *pghbridges.com* and in the book *Pittsburgh's Bridges: Architecture and Engineering.* By making a template of characteristics and facts to look for on each bridge, we can learn about the physical aspects of them. Which ones are suspension bridges? Pier bridges? A truss bridge? A combination of features? Pittsburgh's topography is very diverse with a lot of hills and valleys and waterways. To get from one community or area to another was difficult. By building bridges and tunnels, traveling from one place to another became possible and so expansion and growth could occur. To tackle these problems, prominent engineers and architects such as John Roebling, Gustav Lindenthal, and George Richardson, came to the Pittsburgh area from all over Europe. They made names for themselves by using the resources available in the area, around the turn of the century, to create bridges that were strong, sturdy, and as a result, they are still in use today. So, we would spend time learning about them and their contributions through the study of bridges. To accomplish this, the class would be divided up into groups of 4 students. Each group would be assigned a bridge to research extensively so to become an expert on that bridge. They will have a guide of what information needs to be found. As a group, they can then decide how to display it and how they will present it to the class. They will also be asked to design a d 2-D or 3-D representation of their bridge.

After all the groups have presented their findings, a culminating discussion will follow.
As a cross-curriculum activity in Science, they will do experiments to show why arches and triangles give strength to structures.

CLASSROOM ACTIVITIES:

This unit on the bridges of Pittsburgh will consist of about eight lessons. The first lesson would involve learning vocabulary words, defining bridges, labeling all the major parts of bridges, and having them list all the names of bridges they are familiar with in the area, and the bridges they are most familiar. To lay a foundation for understanding bridges, learning vocabulary words associated with bridges is important. [Appendix A].

To make learning new vocabulary words fun and interesting, put each word on an individual card and each definition on an individual card. Tape all the words face down on the left side of the board and all the definitions taped face down on the right side of the board. Divide the class into two or three teams. Have a student from each team take turns picking a word from the left side, reading it out loud, and then trying to match the corresponding definition from the right side. See which team finds the most matches.

As an ongoing activity, I will set aside a bulletin board and ask that students look for articles and pictures about the bridges in Pittsburgh, and have them post them as they find them. They can use newspapers, magazines, the internet, or tourist brochures to find current information that is relevant to our unit of study.

During class, we will watch the first eighteen minutes of the video, "*Flying Off the Bridge to Nowhere and Other Tales of Pittsburgh Bridges,",* narrated by Rick Sebak. The video begins with interviews with iron workers and people who love and are fascinated with the history of bridges. They talk about the Smithfield Street Bridge and its history. The discussion turns to the Duquesne Bridge and how it became known as "The Bridge to Nowhere" due to delays while it was under construction in 1961-1968, and how a student from Pitt drove off of it. Then they discuss how Pittsburgh is the city of bridges, describing many different types and styles of bridges found in Pittsburgh from footbridges to double deck bridges. A brief segment is on the problem of rusting bridges and how iron workers repair them. The design of bridges and some of the prominent bridges are then discussed. At this point, I would stop the video and review it, discussing the main topics, the historical highlights, and the structural characteristics of the bridges.

The next lessons will be centered on the bridges in Pittsburgh that are in the downtown area starting with the Smithfield Street Bridge, Fort Pitt Bridge, and the Fort Duquesne Bridge. We will discuss their history, the prominent engineers, the public climate at the time, and their design, using resources books and the internet to document the known facts and timelines.

For the next activity, the students will be grouped into teams of four. They will be assigned a bridge to be the "expert" reporters. They will be given a research guide to outline what facts and information about the bridge to locate: [Appendix B]
Where is the bridge located? What does it connect? What does it cross over?
When was the bridge built? How long is the bridge?
Who designed it and what company was contracted to construct the bridge?
How much did the bridge cost? Who paid for it?
How long did it take to build? How many cars cross it daily?
Find five interesting facts that make this bridge unique.

As a cross-curriculum activity with problem solving in Math, I will have the students break up into groups of two or three to solve riddles involving the years some of the prominent bridges in Pittsburgh opened. [Appendix F]

The riddles will be printed on individual cards. Each group will be given one card at a time to solve as a team. As they find the solutions, they will be given another card with another riddle. The goal is to be the first group to successfully solve all six riddles. [Answers can be found in Appendix E]

The group will then be instructed to make a model of the bridge they researched using any recycled materials they choose. They can create a 3-D model of it, they can make a mosaic, or they can make a two-dimensional illustration of it using 3-D materials. They will be evaluated by using the RUBRIC FOR BRIDGE PROJECT. [Appendix C]

Class time will be allotted for each group to present their findings and to field questions from the rest of the class. The groups will be encouraged to be creative in their mode of presentation. They can create a poster, a power point, a brochure, a skit, a documentary, hold a panel discussion, or a write a magazine article. Each group will be given the opportunity to self-evaluate their presentation using the RUBRIC FOR ORAL PRESENTATION OF BRIDGES. [Appendix C]

After all the presentations are complete, we will study the researched bridges, noting similarities in their structure. This will then lead into a discussion of the reasons why certain geometric shapes seem common in the bridges and delve into the reasons why these shapes are used in the construction of bridges. To see how important different geometric shapes are in designing and building bridges, I will have the students conduct some experiments. [Appendix D] These experiments will deal with arches and triangles. There are also many other experiments to do using the book *Bridges! Amazing Structures to Design, Build and Test* by Carol A. Hohmann and Elizabeth J. Rieth, with many helpful illustrations and diagrams.

By the end of the unit, the students will come away with a better understanding of bridge design and the immense impact these bridges made on the growth and development of the City of Pittsburgh.

APPENDICES:

→ **A. Vocabulary Words to understand Bridges**

→ **B. Graphic Aid for Bridge Research**

→ **C. Rubrics**

For Bridge Project

For oral presentation

D. Experiment On Strength Of Shapes

→ Why shapes are important in building strong bridges

→ **E. Chart: Facts about bridges in Pittsburgh**

APPENDIX A

WORDS TO KNOW ABOUT BRIDGES:

1. Abutment – The part of an arch bridge that carries the weight of an arch.

2. Anchorage – In a suspension bridge, the part that anchors the cables and keeps them secure.

3. Aqueduct – A man-made structure that carries water from its source to a place where it is needed.

4. Cable – A large-diameter steel rope made of many smaller steel strands.

5. Cantilever – A beam or system of beams that extends from a tower and supports a span of one type of beam bridge.

6. Cast iron – A type of metal made of iron and other elements that are melted together, and then poured into a mold to create the shape needed.

7. Deck – The roadway of a bridge.

8. Engineer – A person who designs, constructs, or manages the construction of a structure, such as a bridge.

9. Girder – A type of heavy beam.

10. Pier – A structure made of concrete or metal used to support the end s of bridge spans.

11. Pylon - Tower from which cables radiate in a cable-stayed bridge.

12. Span – To extend across something. Also, the distance between supports on a bridge.

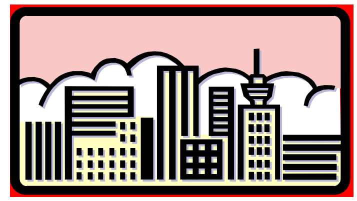
13. Spandrels – Columns that support an arch bridge.

14. Truss - A rigid structure that is made up of interlocking triangles.

15. Viaduct – An elevated roadway; a series of spans or arches used to carry a road or railroad over terrain or other roadways.

APPENDIX B:

BRIDGES OF PITTSBURGH, PA



Name of Bridge:

____

Crosses over: ____

Connects _____________________ to ___________________

Constructed in the year _________________

Length of Bridge ______________________

Engineers: ____

Type of bridge: ____

Interesting facts about the bridge: ____________________________

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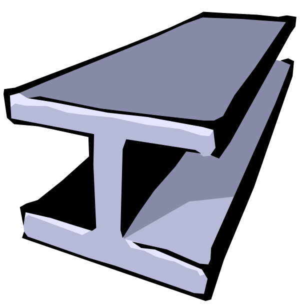

Primary and Secondary Sources:

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APPENDIX C:

RUBRICS

	RUBRIC FOR BRIDGE PROJECT	RUBRIC FOR ORAL PRESENTATION OF BRIDGES
4	• All required data on assigned bridge was documented • A visual was chosen to clearly and effectively display the data • Primary and secondary sources were documented	• Consistently speaks effectively to the group • Consistently uses good eye contact • Consistently keeps the attention of the audience
3	• Most of the required data on assigned bridge was documented • A visual was chosen to clearly display the data • Some primary and secondary sources were documented	• Frequently speaks effectively to the group • Frequently uses good eye contact • Frequently keeps the attention of the audience
2	• Some of the required data on assigned bridge was documented • A visual was chosen to display the data • Few primary and secondary sources were documented	• Occasionally speaks effectively to the group • Occasionally uses good eye contact • Occasionally keeps the attention of the audience
1	• Very little of the required data on assigned bridge was documented • A visual was not used to display the data • Primary and secondary sources were not documented	• Minimally speaks effectively to the group • Minimally uses good eye contact • Minimally keeps the attention of the audience

APPENDIX D:

EXPERIMENT ON STRENGTH OF SHAPES

To see how important shapes are in building strong bridges, test them out using these varied paper shapes:

Materials:

- 5 pairs of thick hardcover books for supports
- (The books in each pair must be the same height.)
- Stack of paper
- Paper clips, pennies, toy cars, or small blocks to use as load
- Ruler, glue, scissors

1. **Clear off a table because you will need a lot of space.**
2. **Stand the pairs of books upright like bookends, about 6 inches or so apart. Place a piece of paper across the first pair.**
3. **Curve a piece of paper upward and tuck its ends inside the book covers of another pair of books.**
4. **Gently add paper clips, one by one, to the middle of each bridge.**
   Which one can take more load before it begins to sag?

Now, see if the two shapes together would make a stronger bridge:

1. **Glue two or three pieces of paper together end to end to make one long piece. It needs to be as high as the books are when it's propped up between them in an arch.**
2. **Place a piece of paper on top.**

Can this bridge hold more paper clips than the first two?

Next, try this:

1. **Fold a piece of paper accordion style, lengthwise. Place it across the top of the fourth pair of books.**
2. **Fold another piece of paper in the same way. Glue pieces of paper to its bottom and top. Try not to squish the folds. Make a fifth bridge with it.**

Which of the last three bridges do you think is strongest?

Test your guess by gradually adding load to one of them unit it falls.

See if the other two can carry the same or more load.
Did you guess right?
What could you do to make the strongest bridge even stronger?

Adapted from: *Bridges! Amazing Structures to Design, Build, & Test*

APPENDIX E:

FACTS ABOUT BRIDGES IN PITTSBURGH:

BRIDGE	LENGTH IN FEET	YEAR OPENED	Type of Construction
Fort Pitt Bridge	750	1959	Steel bowstring arch; double-deck
Smithfield Street Bridge	1,184	1883	Steel lenticular truss
Liberty Bridge	448	1927	Steel cantilever Concrete piers
South 10th Street Bridge	725	1931	Steel suspension Stone piers
Birmingham Bridge	1662	1977	Steel bowstring arch, wire rope suspenders
Glenwood Bridge	2280	1966	Steel, cantilever, through warren truss
Homestead High Level Bridge	516.3	1936	Steel cantilever spandrel-braced deck arch
Fort Duquesne Bridge	426	1969	Steel bowstring arch; double-deck
Roberto Clemente Bridge	884	1928	Self-anchored suspension
Andy Warhol Bridge	1061	1926	Self-anchored suspension
Rachel Carson Bridge	995	1928	Self-anchored suspension
16th Street Bridge	1996	1923	Steel trussed arch
Veteran's Bridge	1050	1987	Steel welded girder
Hot Metal Bridge	1174	1887/2000	Two sets of trussed on shared piers

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A book about the history of the covered bridges in Pennsylvania with many colorful illustrations and information about each bridge.

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A book describing the bridges in Pittsburgh and some interesting facts about them

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A teacher's book on how to do experiments with kids on the strength of shapes, how to set the experiments up, and background information.

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A book of colorful illustrations, descriptions, and facts about bridges in the Pittsburgh area.

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A book that goes in to detail about prominent bridges in Pittsburgh and the engineers who designed them.

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A book by a local historian on the bridges in Pittsburgh, how and when they were built, and who designed them.

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