



A Good Foundation

All Aboard: History, Culture, and Innovation on the Florida East Coast Railway

Grade Level:

4th Grade

Materials:

Book:

- *Bridges! Amazing Structures to Design, Build and Test* by Carol A. Johmann and Elizabeth J. Rieth

Photos:

- Henry M. Flagler
- Trains on the Florida East Coast Railway

Map of:

- FEC Railway Showing Extension to Key West
- FEC Railway Extension to Key West

Additional Supplies:

- Two Medium Sized Bowls
- Popsicle Sticks
- Masking Tape
- Sand or Dirt
- Plastic Wrap
- Water
- Turkey Baster or Eye Droppers

Curriculum Connections:

Math, Art, Science, Social Studies, Florida History

Objectives:

Students will be introduced to the Florida East Coast Railway and engineering methods for building a bridge foundation under water. They will construct a cofferdam.

Standards:

MAFS.4.MD: Measurement and Data

SS.4.G.1: Geography – The World in Spatial Terms

SC.4.P: Physical Science

Corresponding Map Hot Spot:

Jewfish Creek, FL

Lesson Procedure

Introduction:

Introduce the theme of the lesson, the bridges of the Overseas Railway. Show the students the pictures of the railroad and the map.

Discuss how Henry Flagler was determined to build a railroad connecting the Keys all the way to Key West. Ask the students what they think life may have been like before the bridges.

Discuss the benefits to building a railroad connecting the Florida Keys to mainland Florida (a new way for people to travel, a new way for supplies to get in, etc.) and ask the students what the challenges to building something like this would have been (nothing like this had ever been done before, when the Key West Extension opened it was called the 8th Wonder of the World).

Guiding Questions:

- Ask the students how they think engineers build bridges?
- What's necessary for a strong bridge?

Answer: a solid foundation, a structure that can hold weight, etc.

Show the students the map of the railroad and tell them that today they are going to become engineers that will create the foundation needed to build the Seven Mile Bridge. The Seven Mile Bridge is the ultimate symbol of perseverance and ingenuity.

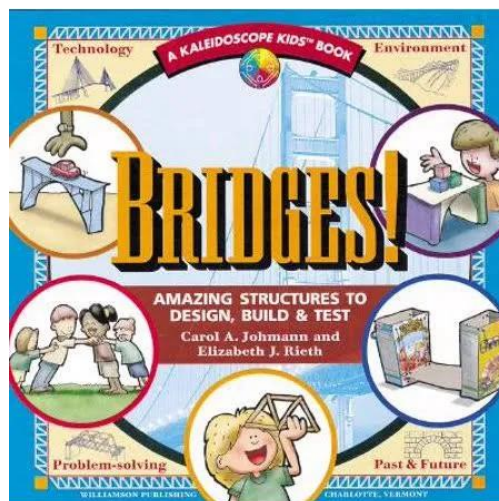
- How do engineers build structures underwater?

Answer: Cofferdams.

A cofferdam is used to temporarily remove water from around an object. The most common use of a cofferdam is when workers are building a bridge over a body of water. Workers will drive large pieces of wood and/or metal into the ground in the shape of a ring. Once a watertight seal is created, workers can use a pump to remove all of the water.

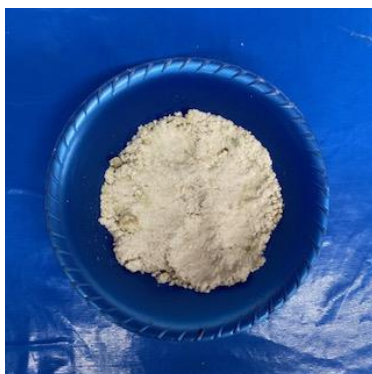
Literacy Component:

Use the book *Bridges! Amazing Structures to Design, Build and Test* by Carol A. Johmann and Elizabeth J. Rieth to start a discussion about bridge basics, bridge types, and the construction process. If your time is limited, you can read Chapter 4, "The Amazing Arch." This chapter focuses on arch styled bridges and how to construct one, the importance of concrete, and concludes with an activity on how to build a cofferdam.

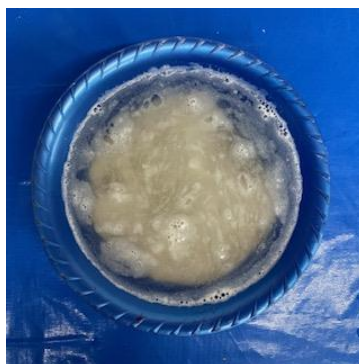


Build a Cofferdam:

1. Have the class gather round as you set out two bowls. Ask for a volunteer to pour sand into the bottom of the bowls.



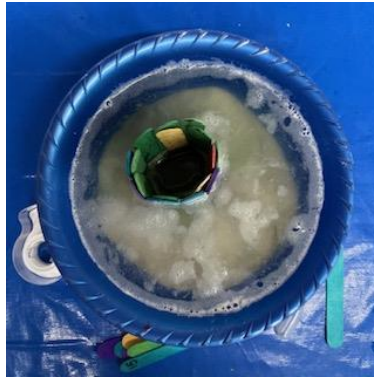
2. Ask for another volunteer to fill the bowl about half way full with water. Now, ask the students how we will ever be able to build a structure in all that water? Engineers place wood or metal structures into sand in rings and then pump the water inside out so that construction can be completed.



3. Using popsicle sticks, build a ring and tape them together. Next, add another ring of popsicle sticks around the outside and tape them together.



4. Using plastic wrap, push it inside the gap between the two rings to seal it. Also wrap the popsicle stick cofferdam in another piece of plastic wrap.



5. Place the cofferdam into the bowl and push it into the sand. Repeat for the other bowl. Now get out the turkey baster and call for volunteers to pump the water out. You can make this fun by making it a race between the two cofferdams.

Closure:

Review the concept of cofferdams and how they are useful in underwater engineering.

Additional Resources:Overseas Railway Timeline

This timeline on the Key West Art & Historical Society's website provides additional information about Henry M. Flagler's life, career, history and the development of the Florida East Coast Railway and extension to Key West, Florida.

Online Collections Database

With a collecting history that extends back to 1949, the Key West Art & Historical Society has unrivaled collections of contemporary and historic art and artifacts. Its collections, which number more than 35,000 works in all media, range from historical to present-day and span the entire Florida Keys.

Henry M. Flagler



Photo: Key West Art & Historical Society

Map of the Florida East Coast Railway Showing the Key West Extension

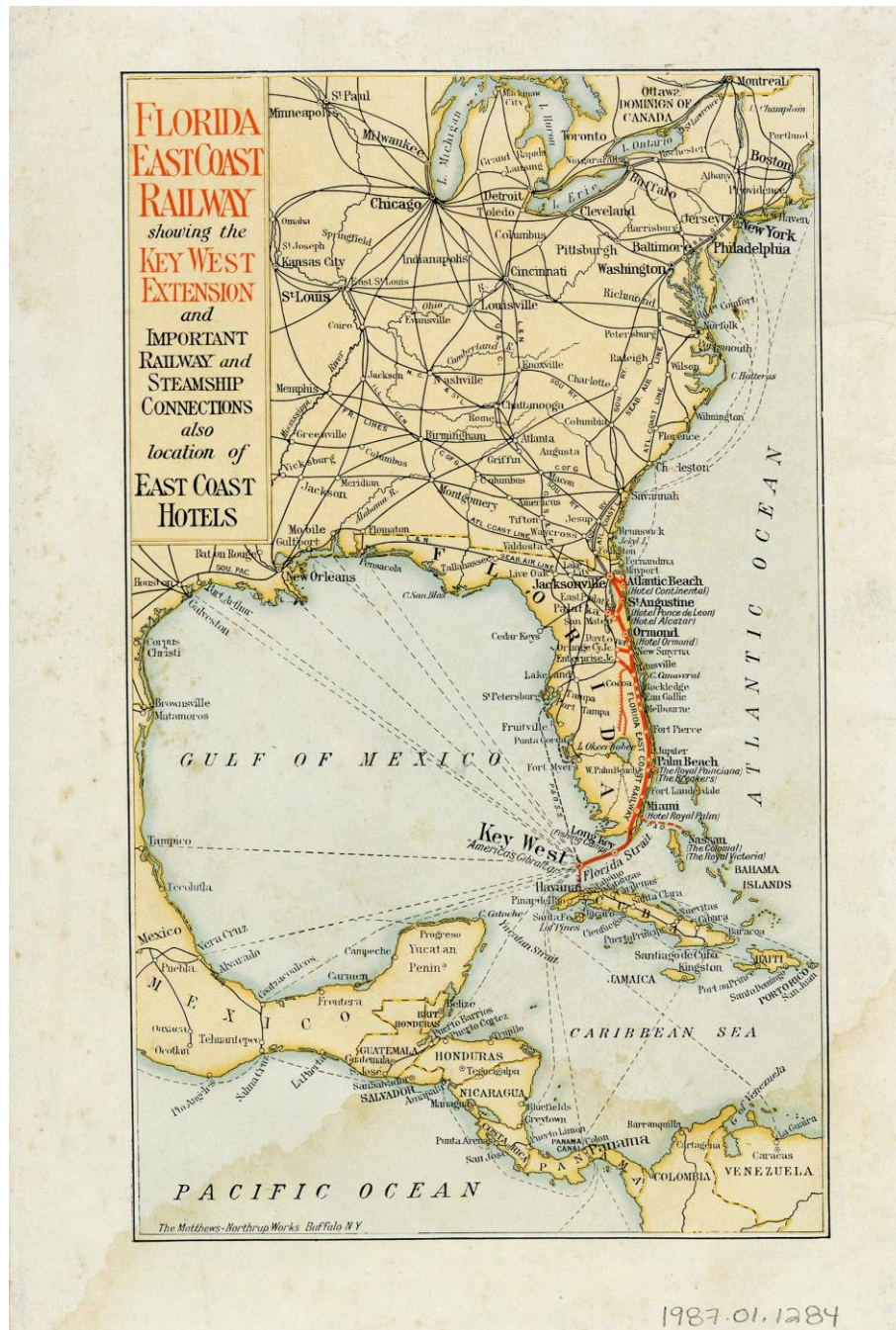


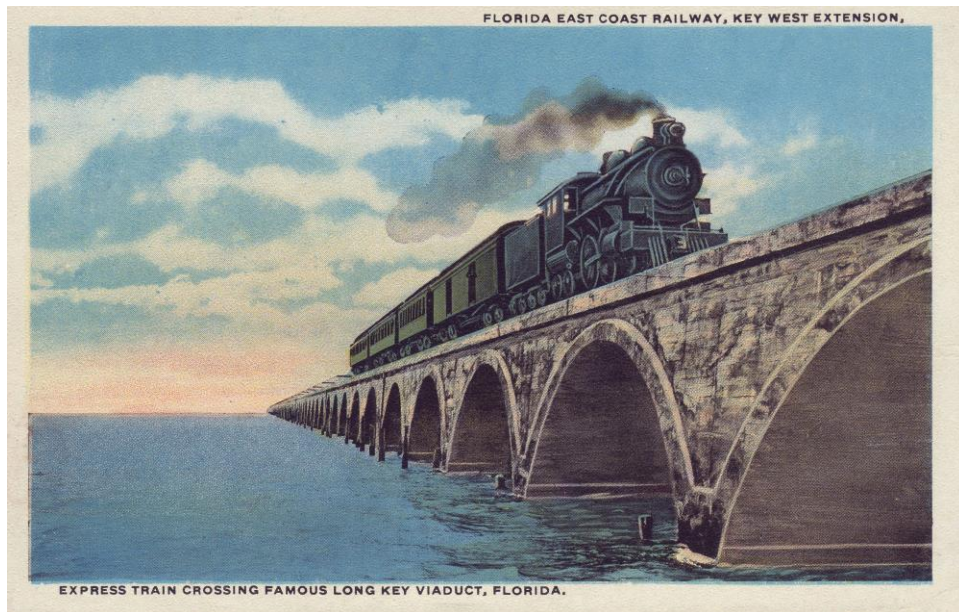
Photo: Key West Art & Historical Society

Map of the Florida East Coast Railway Key West Extension



Photo: Florida East Coast Railway

Trains on the Florida East Coast Railway



Postcard depicting an Overseas Railway train on Long Key Viaduct. The caption reads, 'Florida East Coast Railway Key West Extension, Express Train Crossing Famous Long Key Viaduct, Florida'.

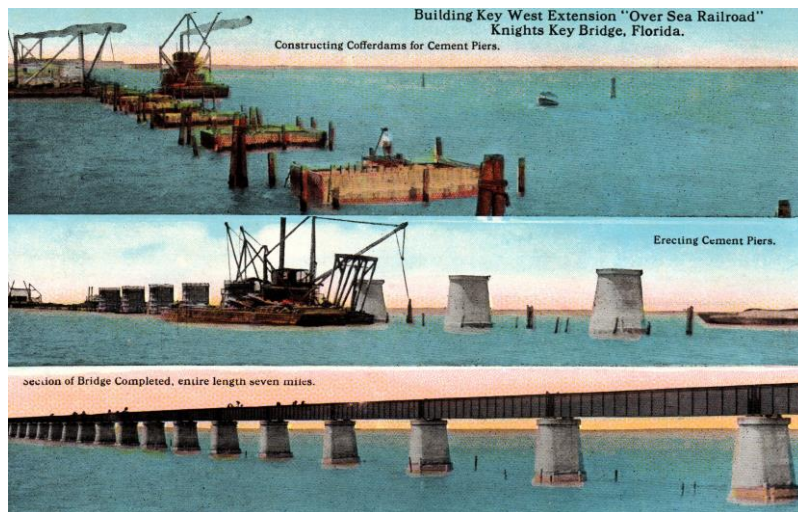
Photo: Key West Art & Historical Society



Black and white photograph of an Overseas Railway train crossing Long Key Viaduct. Passengers are standing at the rear of the train.

Photo: Key West Art & Historical Society

Images of a Cofferdam



Postcard depicting three views of the construction of the Florida East Coast Railway Seven Mile Bridge. The caption reads, 'Building Key West Extension, "Over Sea Railroad", Knights Key Bridge, Florida. Constructing cofferdams for cement piers. Erecting cement piers. Section of bridge completed, entire length seven miles.'

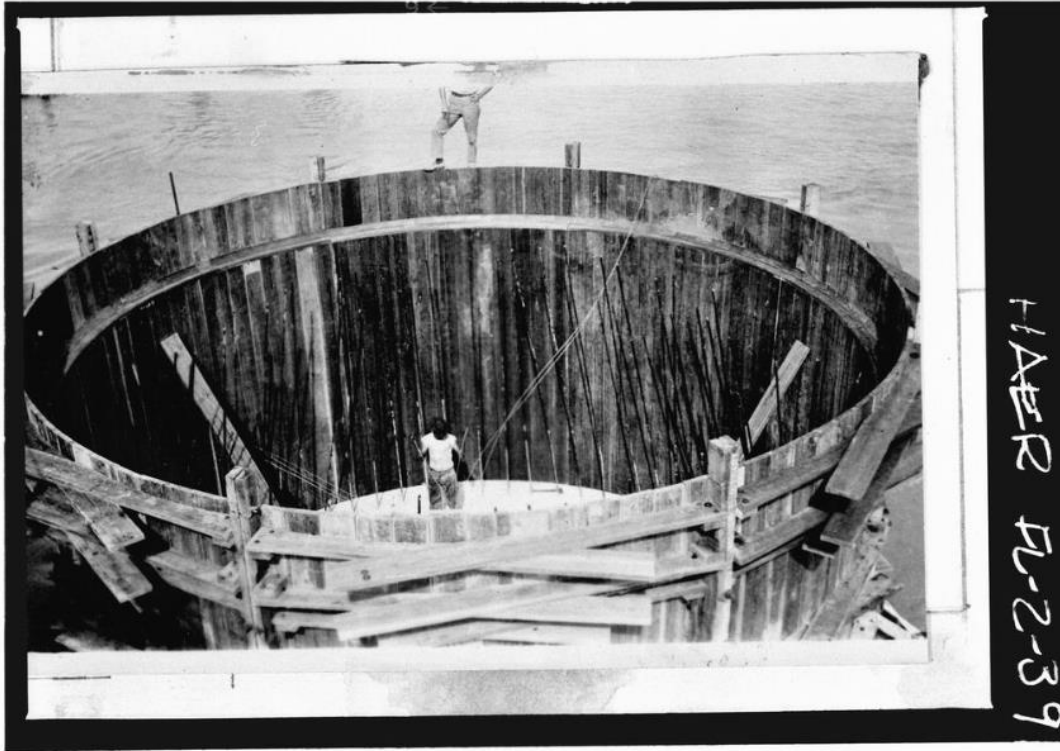
Photo: Key West Art & Historical Society



Black and white photograph taken during the construction of cofferdams in order to build concrete piers for the Long Key Viaduct on the Overseas Railway.

Photo: Key West Art & Historical Society

Image of a Cofferdam



Moser Channel Draw, view down into wood form work for center pivot pier w/steel reinforcing. Seven Mile Bridge, Linking Florida Keys, Marathon, Monroe County, FL PHOTOS FROM SURVEY HAER FL-2.

Photo: Library of Congress

Bibliography:

*Information is in the order that it appears in the document

S.n. *Studio Portrait of Henry M. Flagler*. 1904. Key West Art & Historical Society, Florida.
kwahs.pastperfectonline.com/photo/3A0FC45E-3C0C-4A56-82B7-243218404905.

The Matthews-Northrup Works Buffalo, N.Y. *Map of Florida East Coast Railway*. Circa 1917. Key West Art & Historical Society, Florida. kwahs.pastperfectonline.com/webobject/255FD84A-8976-4EE3-97CE-354071993920.

Florida East Coast Railway. *Key West extension, Florida East Coast Railway, opened January 22, 1912*. Matthews Northrop Works, 1912. doi: [www.doi.org/10.5479/sil.56485.39088001792985](https://doi.org/10.5479/sil.56485.39088001792985).

Published by Frank Johnson, Key West, Florida. *Train on Long Key Viaduct Bridge*. Circa 1940s. Key West Art & Historical Society, Florida. <https://kwahs.pastperfectonline.com/webobject/3825FEFA-D297-4DA7-883A-801893822410>.

S.n. *Overseas Railway Train on Long Key Viaduct*. Circa 1920's. Key West Art & Historical Society, Florida.
<https://kwahs.pastperfectonline.com/photo/A6BB0F78-C722-4A4F-92C1-579277521046>.

H. & W.B. Drew Company, Jacksonville, Florida. *Constructing the Seven Mile Bridge*. Circa 1910. Key West Art & Historical Society, Florida. <https://kwahs.pastperfectonline.com/webobject/44738276-845B-4AF4-99CC-554489527530>.

S.n. *Building Cofferdams for Long Key Viaduct*. Circa 1908. Key West Art & Historical Society, Florida.
<https://kwahs.pastperfectonline.com/photo/F95C7349-17C3-4348-8B30-263641690384>.

Historic American Engineering Record, Creator, American Bridge Company, C S Coe, B M Duncan, Henry Flager, William J Krome, Joseph C Meredith, and Florida Department of Transportation. *Seven Mile Bridge, Linking Florida Keys, Marathon, Monroe County, FL*. Florida Knight Key Marathon Monroe County, 1968. Documentation Compiled After. Photograph. <https://www.loc.gov/item/fl0293/>.