



Operation Build a Bridge

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

Grade Level:

1st Grade

Materials:

Book:

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

Image of:

- Henry M. Flagler
- Map of the FEC Overseas Extension to Key West
- Images and descriptions of bridge types covered in book
- Images of bridge types used in Key West

Additional Supplies:

- Large Piece of Paper for your Anchor Chart
- 20 Straws per Group
- 1 Roll of Tape per Group
- 1 Paper Cup per Group
- 100 Pennies
- Wooden Blocks
- Scissors for Each Group
- Rulers for Each Group

Curriculum Connections:

Math, Social Studies, Science, Art, Florida Education

Objectives:

Students will be introduced to the Overseas Railway and will learn about different types of bridges (arch, beam, suspension, truss). They will work collaboratively to build a bridge that can hold weight.

Standards:

MA.1.M.1 : Compare and Measure the Length of Objects
SC.1.P: Physical Science
SS.1.G.1: The World in Spatial Terms
VA.1.H: Historical and Global Connections
VA.1.F: Innovation, Technology, and the Future

Corresponding Map Hot Spot:

Homestead, FL

Lesson Procedure

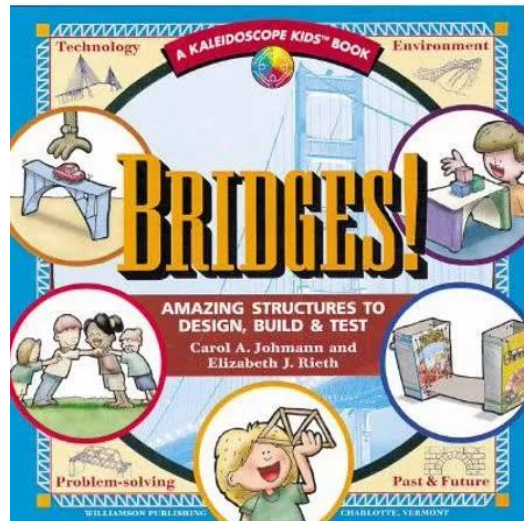
Introduction:

Introduce the theme of the lesson, the Florida East Coast Railway and Key West Extension. Have a brief discussion about the importance of connecting the Florida Keys with mainland Florida, inviting the students to imagine what life would have been like before the Overseas Railway and later, the Overseas Highway. Use the pictures of the railroad and Henry Flagler (the man responsible for railroad project) to facilitate this discussion.

Literacy Component:

Use the book, *Bridges! Amazing Structures to Design, Build and Test* by Carol A. Johnson and Elizabeth J. Rieth to discuss bridge basics and introduce the students to the different types of bridges. As you go through the story use an anchor chart to keep track of the different types of bridges.

Draw a simple sketch of each one and label it (arch, beam, suspension, truss). Get out the picture of the railroad again. Ask the students to help you decide which style of bridge was used.



Straw Bridges:

Now divide the students up into pairs. Give each group 20 straws (consider using paper straws if available), a roll of tape, a pair of scissors, a ruler, and a paper cup. Remind the students that today they are engineers that are making model bridges. The objective is to make a bridge that will span the distance between two Keys while holding the weight of 100 pennies. Place the two wooden blocks about a foot apart on a table and tell the students that these represent the islands and that each group will be testing their bridges here at the end of the build time. Before the students start, show them how strong the triangle shape is by making triangle trusses from more straws and taping them to the bridge:



Now test your bridge with the cup full of pennies. Task the students to create bridges of their own and walk around offering help and encouragement as the students work.

Test:

When the groups have finished building their bridges, call each group up to the front of the room, one by one to test their bridges across the two wooden block “Keys”.

Closure:

Review basic bridge types and the concepts of strong bridge structures (beam bridge, truss bridge, suspension bridge, arch bridge).

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 Key West Extension.

[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.

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

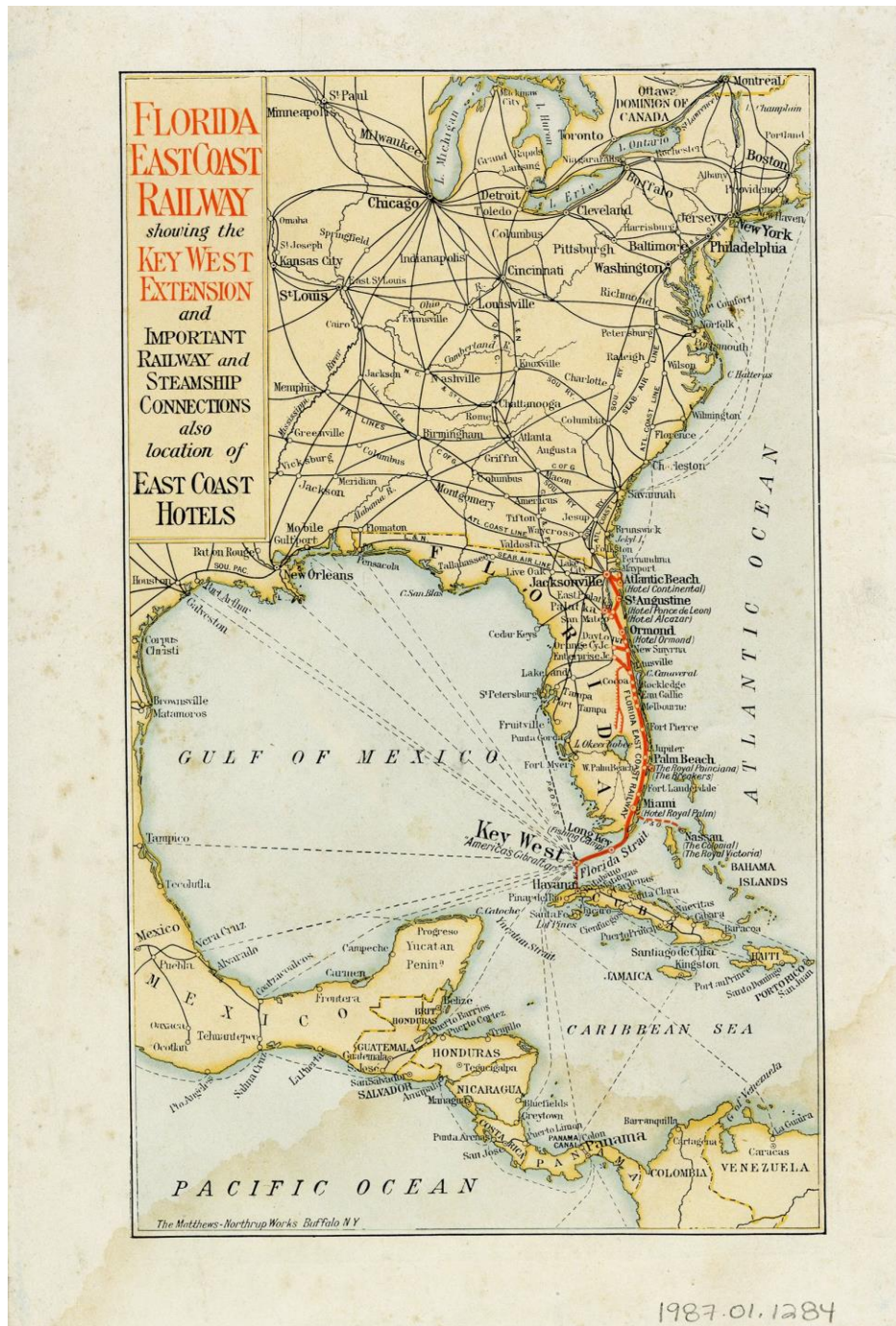


Photo: Key West Art & Historical Society

Florida East Coast Railway Key West Extension



Photo: Florida East Coast Railway

Henry M. Flagler

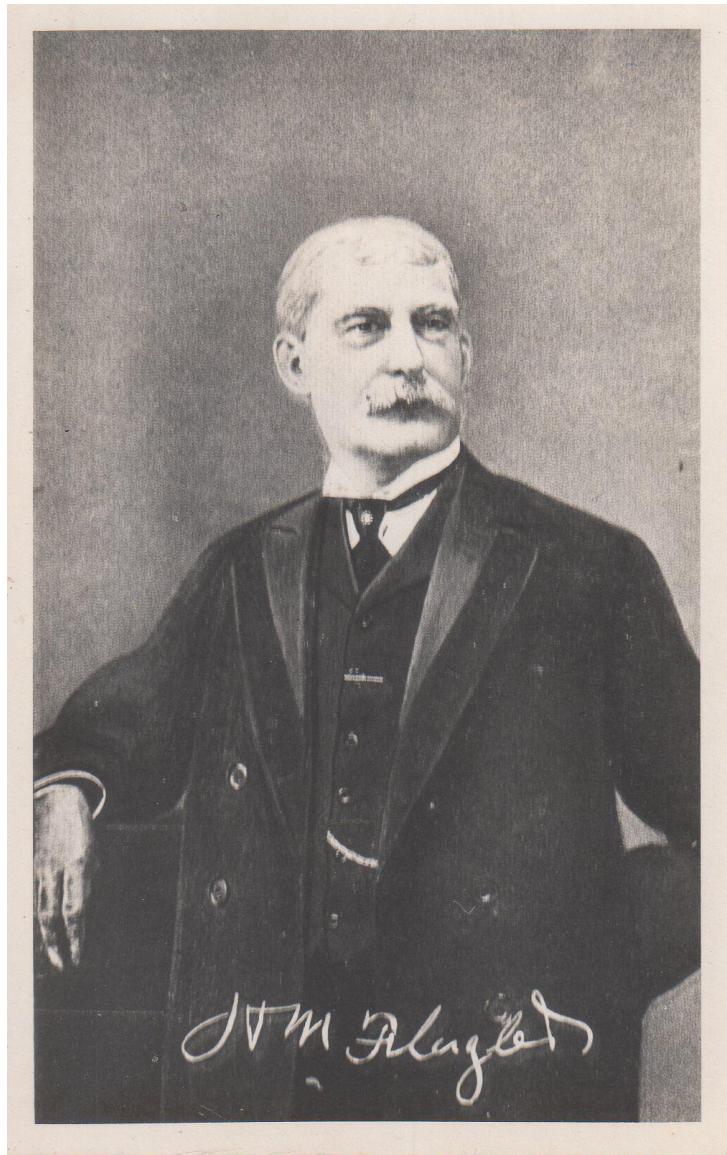
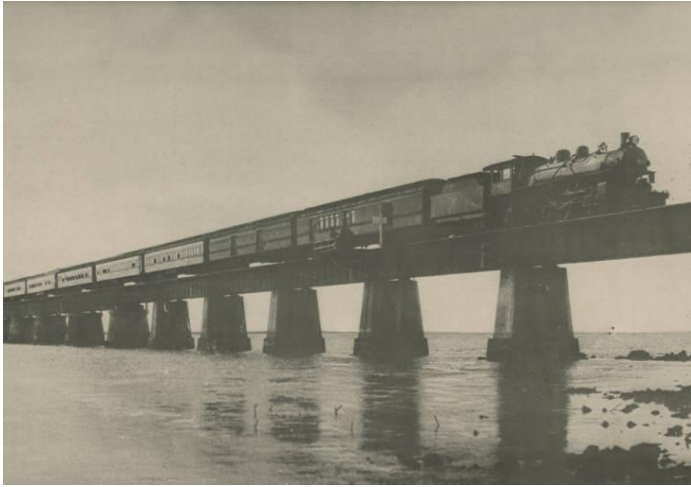


Photo: Key West Art & Historical Society

Types of Bridges



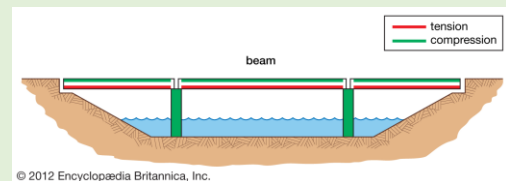
Seven Mile Bridge, Florida
Completed in 1912

Photo: Broward County Library Digital Archives

Beam Bridge:

Beam bridges are the simplest structural forms for bridge spans. The weight of the load is passed along the beam, and down through the bridge supports to the ground.

Source: *Bridges! Amazing Structures to Design, Build and Test*



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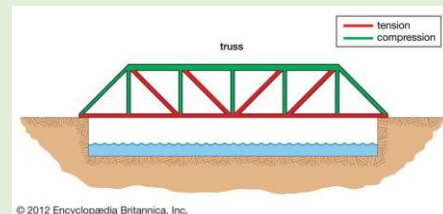
Bahia Honda Bridge, Florida
Completed in 1912

Photo: Florida Memory

Truss Bridge:

A truss bridge is similar to a beam bridge. The truss is a lightweight option added to the top or bottom of the structure to provide additional support.

Source: *Bridges! Amazing Structures to Design, Build and Test*



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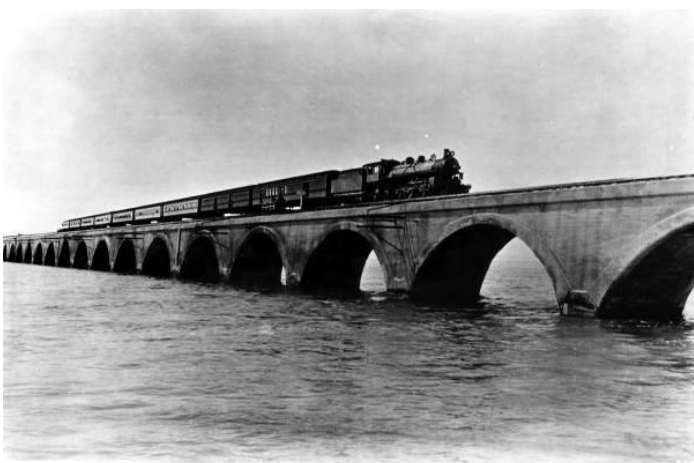
The Golden Gate Bridge, California
Opened on May 29, 1937

Photo: Golden Gate Bridge Highway & Transportation District

Suspension Bridge:

The load pulls down on hangers, which pull on cables. The cables pull on the towers and anchors, and the anchors pull back, or resist the pull on them, because they are heavy and buried in the ground. All of these parts are in tension. The towers are also compressed and as the cables push down on them and their foundations.

Source: *Bridges! Amazing Structures to Design, Build and Test*



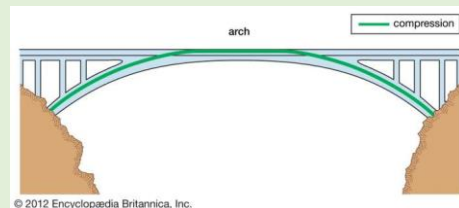
Long Key Bridge, The Florida Keys
Completed in 1907

Photo: Florida Memory

Arch:

The arch changes the downward force of gravity into a sideways push. The weight is carried along the curve to the abutments and into the ground. This creates lots of compression, but little tension.

Source: *Bridges! Amazing Structures to Design, Build and Test*



Postcard Images of the Florida East Coast Railway Key West Extension



Long Key Viaduct Bridge

Train on Long Key Viaduct Bridge:

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



Moser Channel Bridge

Florida East Coast Railway Train Crossing Moser Channel:

Black and white photograph of a Florida East Coast Railway train crossing Moser Channel, Key West Extension. The photograph is of an early 19th century postcard promoting the railway.

Photo: Key West Art & Historical Society

Postcard Images of the Florida East Coast Railway Key West Extension

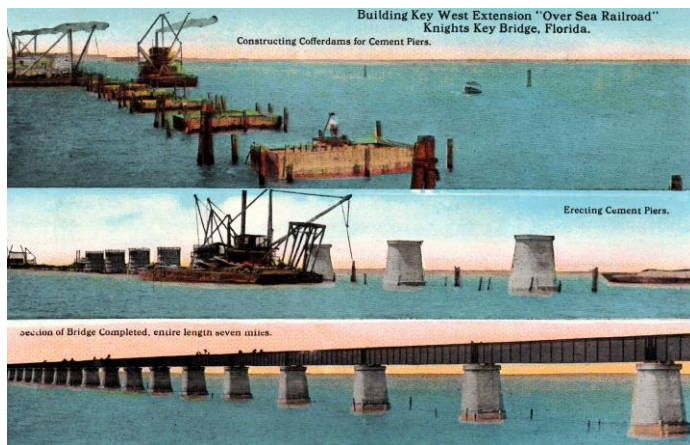


Bahia Honda Bridge

Bahia Honda Bridge, Florida:

Postcard depicting the Florida East Coast Railway truss bridge over Bahia Honda Channel. The caption reads, 'Florida East Coast Railway, Key West Extension, looking through Bahia Honda Bridge, Florida.'

Photo: Key West Art & Historical Society



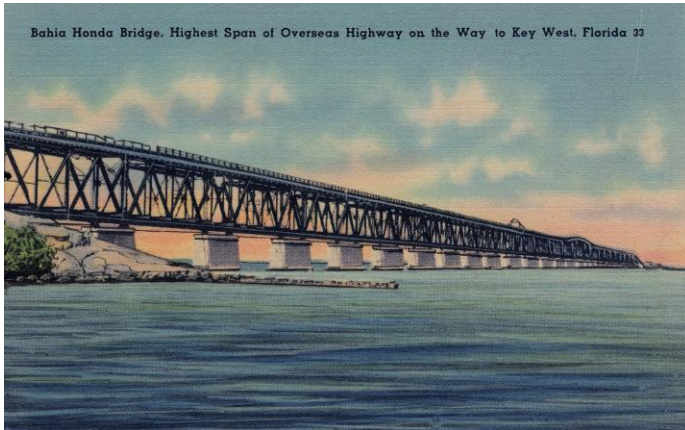
Knights Key Bridge

Constructing the Seven Mile Bridge:

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

Postcard Images of the Florida East Coast Railway Key West Extension



Bahia Honda Bridge

Bahia Honda Bridge, Highest Span of Overseas Highway on the Way to Key West, Florida:

Postcard depicting the Bahia Honda Bridge. The caption reads, 'Bahia Honda Bridge, highest span of Overseas Highway on the way to Key West, Florida'. The description on the verso reads, 'This Bridge is one of the connecting links in that modern engineering marvel the Overseas Highway, which joins Key West to the mainland.'

Photo: Key West Art & Historical Society



Seven Mile Bridge

Seven Mile Overseas Highway Bridge from Pigeon Key, at Night, on Way to Key West, Florida:

Postcard depicting the Seven Mile Bridge over Pigeon Key at night. The caption reads, 'Seven Mile Overseas Highway Bridge from Pigeon Key, at night, on way to Key West, Florida.'

Photo: Key West Art & Historical Society

Bibliography:

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

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.

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

S.n. *Photographs - - 1912 - 1935 - - Key West by rail*. 1912-1935. Broward County Library Digital Archives, Florida. <https://digitalarchives.broward.org/digital/collection/greatdays/id/305/rec/6>.

S.n. *Members of fishing party in rowboat at Bahia Honda Key*. Circa 1920. Florida Memory, Florida. www.floridamemory.com/items/show/342038.

Golden Gate Bridge Highway & Transportation District. *Golden Gate Bridge*. N.d. Golden Gate Bridge Highway & Transportation District, California. <https://www.goldengate.org/contemporary-photos/>.

S.n. *Florida East Coast Railway passenger train traveling on the Long Key Viaduct in the Florida Keys*. Circa 1900. Florida Memory, Florida. www.floridamemory.com/items/show/29601.

Published by Frank Johnson, Key West, Florida. *Train on Long Key Viaduct Bridge*. Circa 1910s. Key West Art & Historical Society, Florida. <https://kwahs.pastperfectonline.com/webobject/3825FEFA-D297-4DA7-883A-801893822410>.

S.n. *Florida East Coast Railway Train Crossing Moser Channel*. Circa 1915. Key West Art & Historical Society, Florida. <https://kwahs.pastperfectonline.com/photo/A22FA4E6-86E7-4AA0-879F-484691208237>.

Florida Artists Series. *Florida East Coast Railway Train Crossing Moser Channel*. February 11, 1914. Key West Art & Historical Society, Florida. <https://kwahs.pastperfectonline.com/photo/A22FA4E6-86E7-4AA0-879F-484691208237>.

Published by 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>.

Tichnor Quality Views. *Bahia Honda Bridge, Highest Span of Overseas Highway on the Way to Key West, Florida*. Circa 1940s. Key West Art & Historical Society, Florida. <https://kwahs.pastperfectonline.com/webobject/59E43A34-71A6-485E-8CA3-534408430138>.

Tichnor Quality Views. *Seven Mile Bridge*. May, 11, 1941. Key West Art & Historical Society, Florida. <https://kwahs.pastperfectonline.com/webobject/A9D9B7AD-4EC8-40C6-A6E4-754876824145>.