

# LOUISIANA'S PRECAST ERECTION FOR LAKE PONTCHARTRAIN SAFETY BAY SUBSTRUCTURE

**ABC-UTC**  
**2023 IN-DEPTH WEB TRAINING**  
**Module 3**

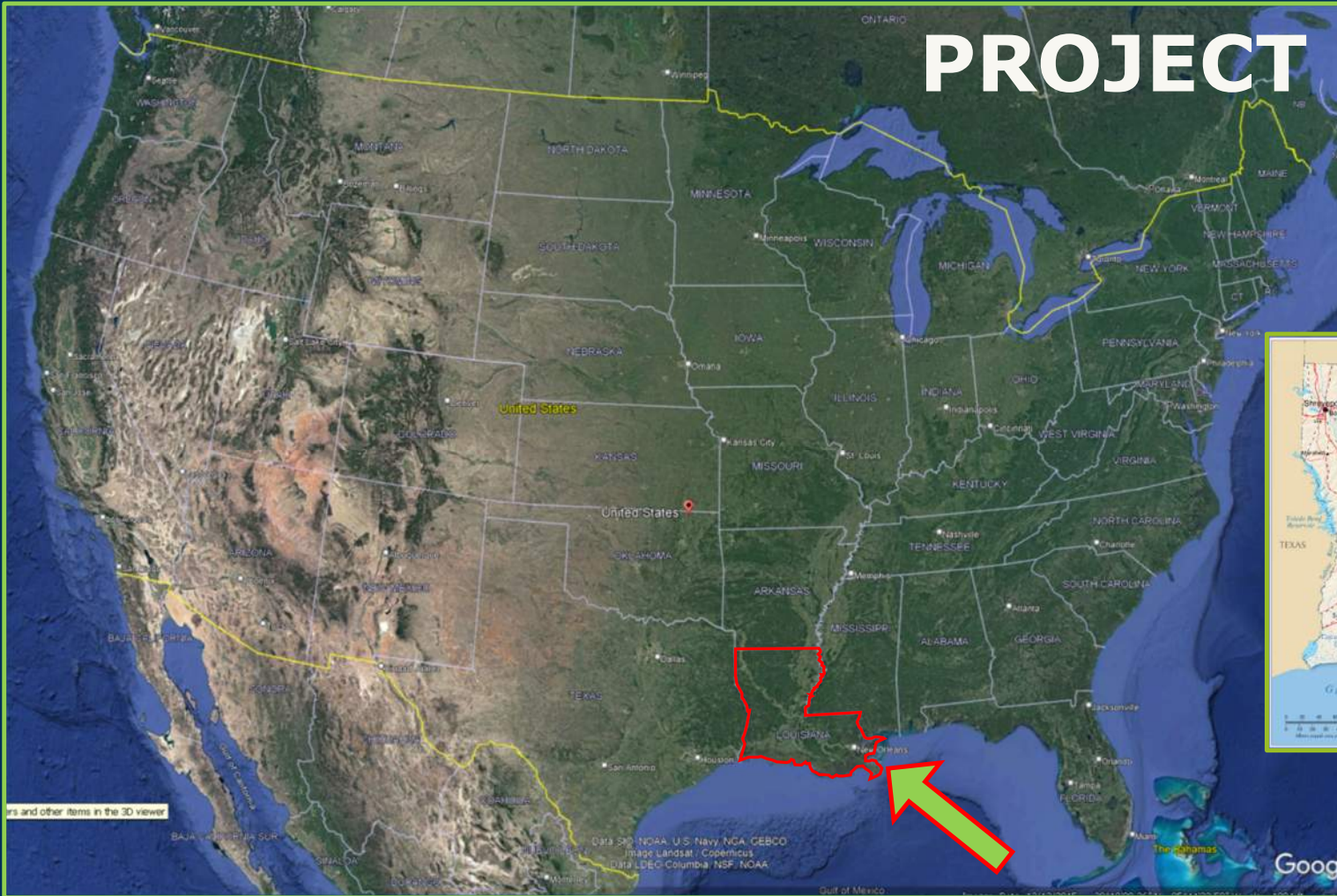
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Volkert, Inc.

FIU/ABC  
University Transportation Center  
September 12<sup>th</sup>, 2023



03/06/2019 12:29

# PROJECT LOCATION



# LAKE PONTCHARTRAIN

Causeway Bridge:  
Mandeville (North)  
to  
New Orleans/Metairie  
(South)



# FIRST CAUSEWAY BRIDGE

When opened to traffic on August 30, 1956, the Causeway Bridge became the longest bridge in the world at 23.86 miles

It was completed in 19 months for \$46-million

The first piles were driven on May 23, 1955, four-plus months after NTP

After driving the first piles, it took only 14 months to complete the bridge



# SECOND ACT

- ❑ A second (parallel) Causeway bridge began construction in June 1967 and was opened to traffic on May 10<sup>th</sup>, 1969
- ❑ It was designed by David Volkert & Associates
- ❑ It was built by the same joint venture that built the original bridge
- ❑ The bridge is 228' longer than the first bridge and is still the longest continuous bridge over water in the world

GREATER BAY COUNTY  
LAKE MICHIGAN  
VOLKERT



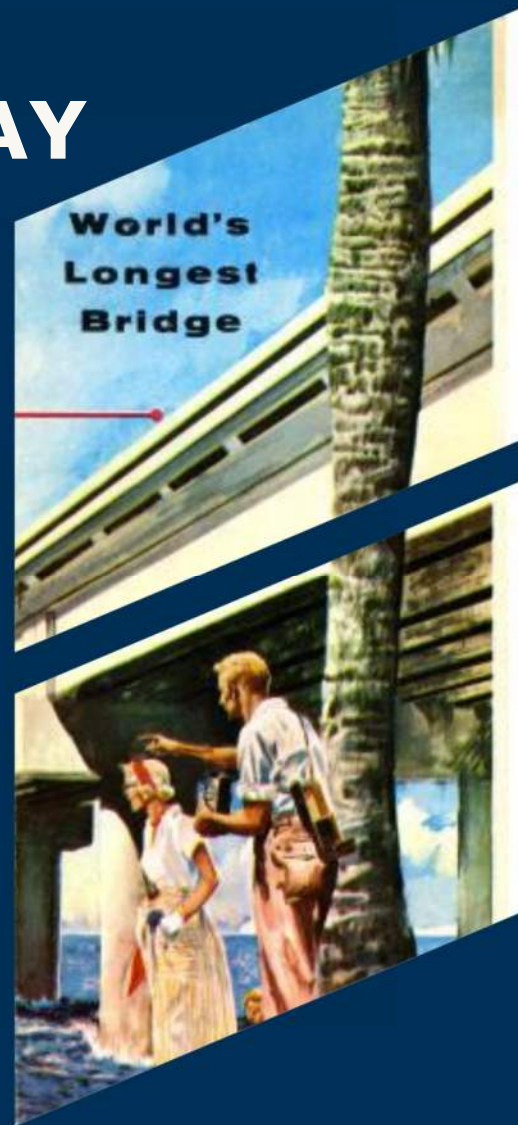
**Several enhancements were made to the second bridge:**

- ❑ **84-ft spans w/3 piles per bent instead of 56-ft w/2 piles per bent**
- ❑ **4 girder lines instead of 7**
- ❑ **31 in. high barriers instead of 25 in. high**
- ❑ **5 in. cylinder pile thickness instead of 4 in.**

- ❑ **The two bridges are 84 feet apart.**
- ❑ **There are seven crossover spans between them.**

# THE CAUSEWAY TODAY

- Current Conditions
- Safety Upgrade



# CURRENT CONDITIONS



## TRAFFIC VOLUMES:

- Original Traffic Volume  
(1956: 200,000/year)  
(1969: 2,000,000/year)
- 2017 Traffic Volume  
(12,000,000/year)  
(40,000/day)



## SAFETY

- No Shoulders
- Low Traffic Rails



# \$60M SAFETY BAY UPGRADE



- 6 Pullover Bays on Each Structure (1008'-Long)
- Spaced ~4 miles apart
- Design Competition
- CMAR Contract

# ALL PRECAST SOLUTION

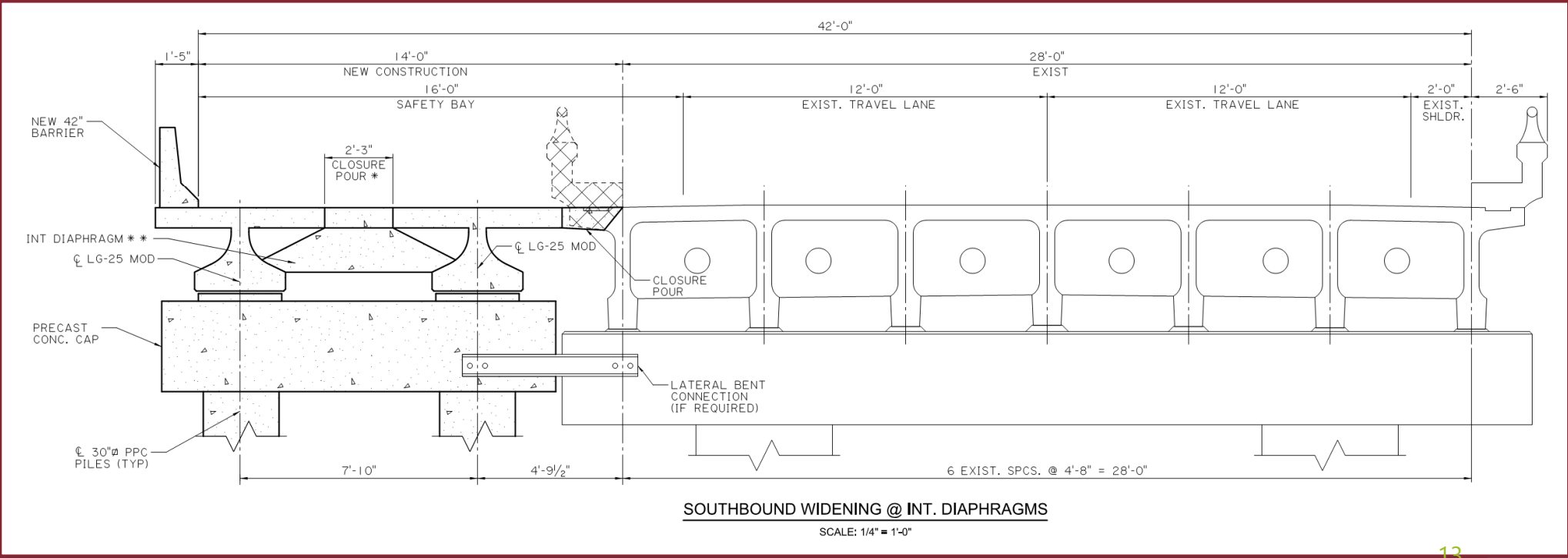
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# SAFETY BAY ERECTION



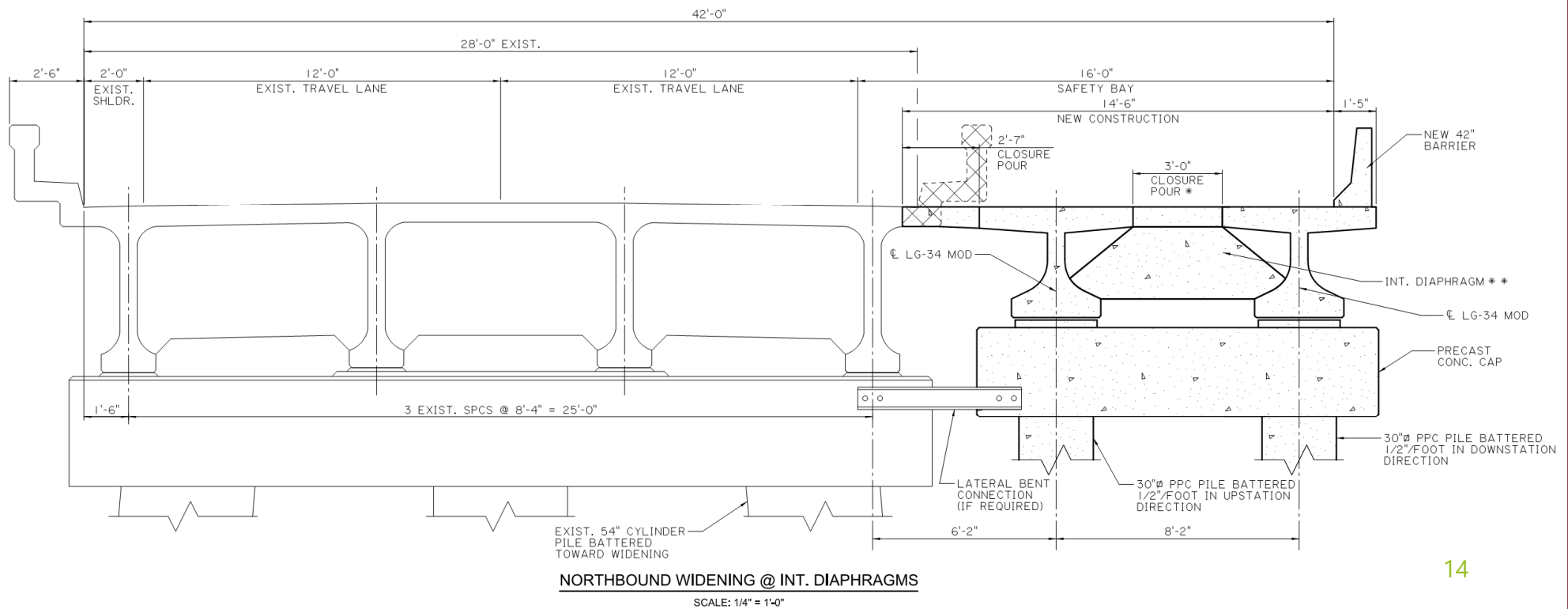
# Original Design Concept

## (Southbound Structure)



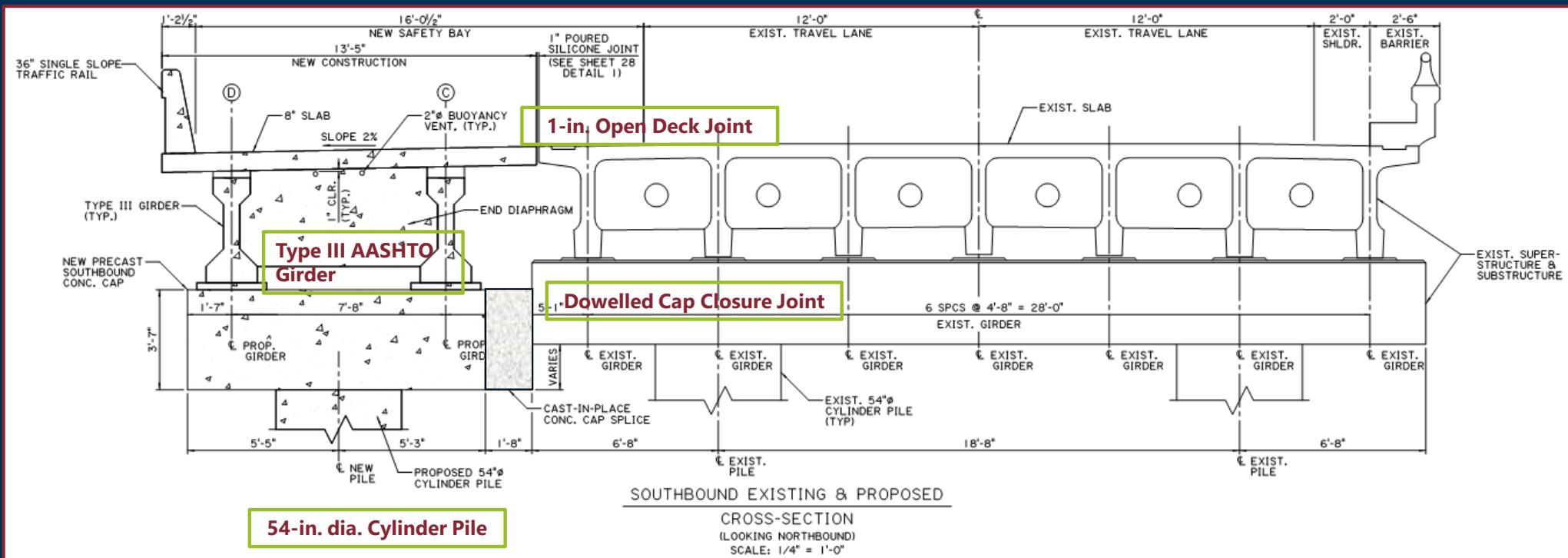
# Original Design Concept

## (Northbound Structure)



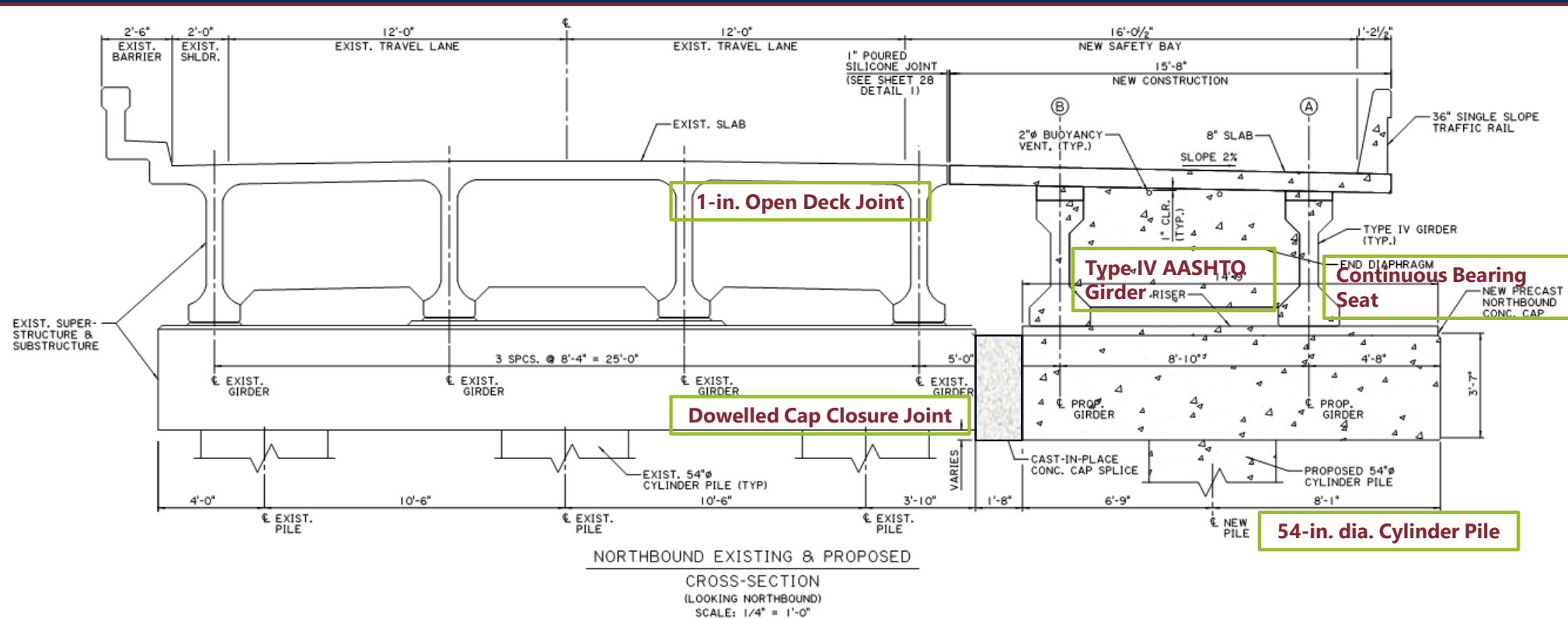
# Contractor-Initiated Revisions

## (Southbound Structure)



# Contractor-Initiated Revisions

## (Northbound Structure)

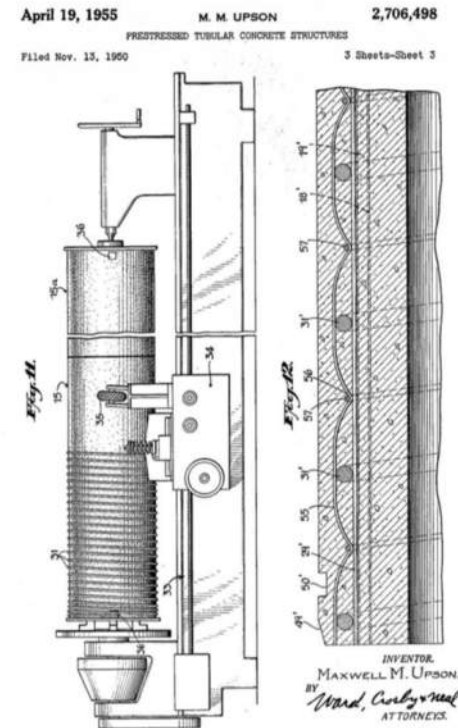
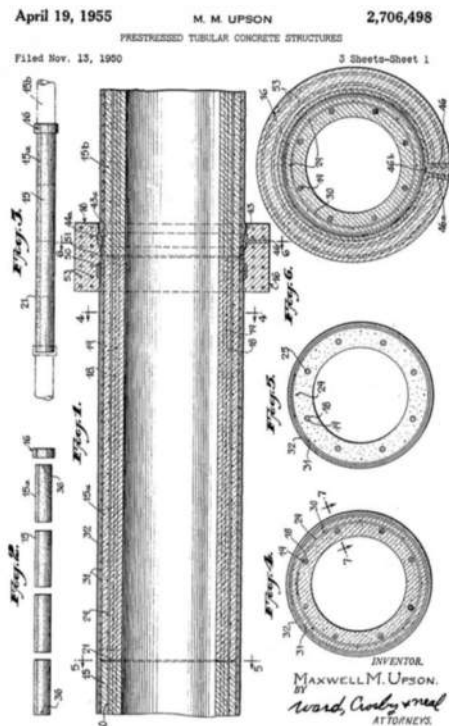




# CONCRETE CYLINDER PILES (Yesterday and Today)

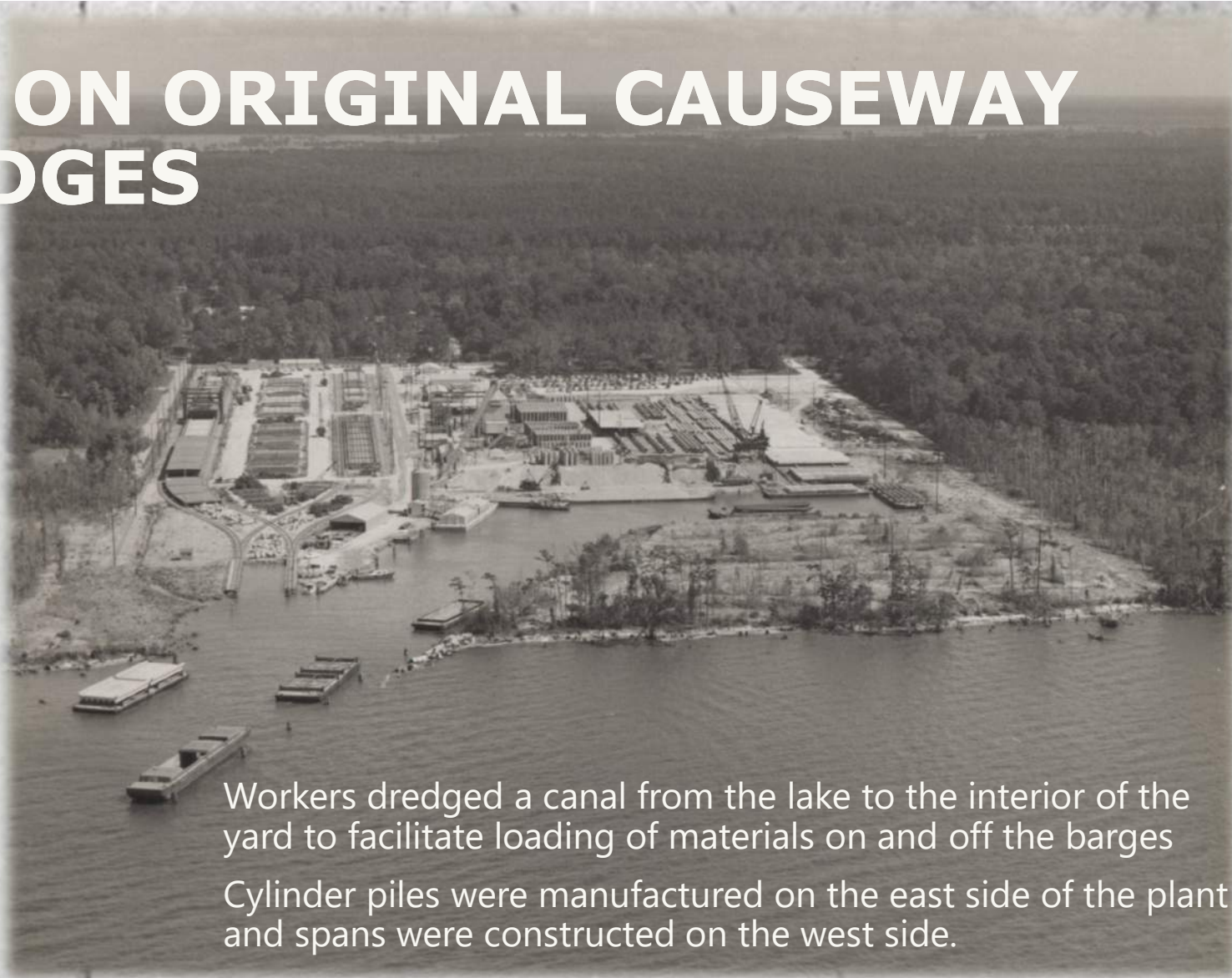


“Sherman, set the WABAC machine to November 13, 1950”



- Maxwell Upson of the Raymond Pile Company files a patent (# 2706498) for the PPC Cylinder Pile

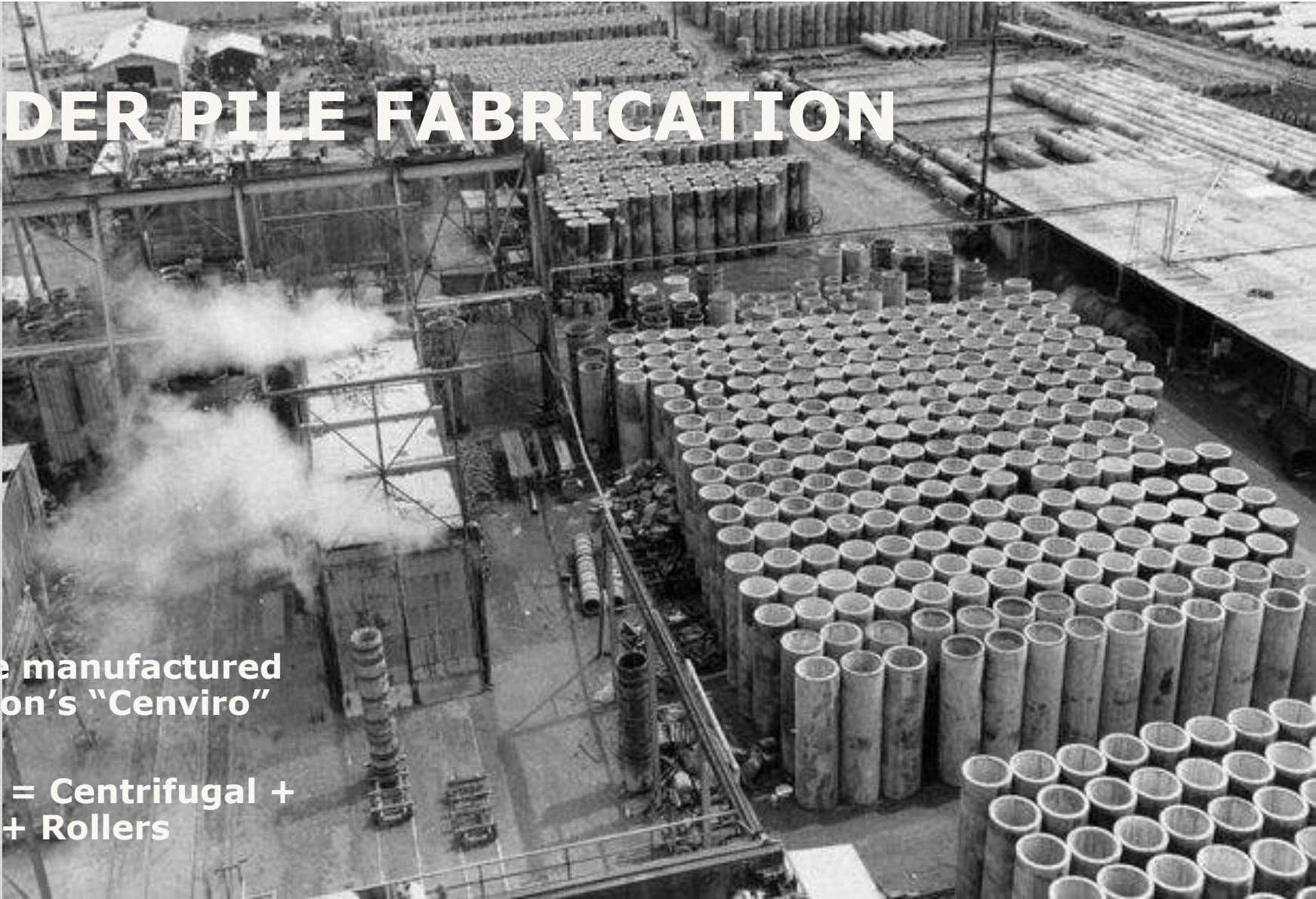
# USE ON ORIGINAL CAUSEWAY BRIDGES



Workers dredged a canal from the lake to the interior of the yard to facilitate loading of materials on and off the barges. Cylinder piles were manufactured on the east side of the plant and spans were constructed on the west side.

# CYLINDER PILE FABRICATION

- ❑ Piles were manufactured using Upson's "Cenviro" process
- ❑ "Cenviro" = Centrifugal + Vibration + Rollers



# CYLINDER PILE FABRICATION



- ❑ Piles on the original structure were 54-in. dia. w/4-in. thick walls
- ❑ Pile segments were somewhere between 10' and 16' long, joined with post-tensioning, then grouted
- ❑ Final pile lengths were ~90 feet

# USE ON SAFETY BAY PROJECT



# WHY SPUN-CAST CYLINDER PILES?



- High Axial Load Capacity
- Enhanced Lateral Capacity
- Production/Schedule Flexibility

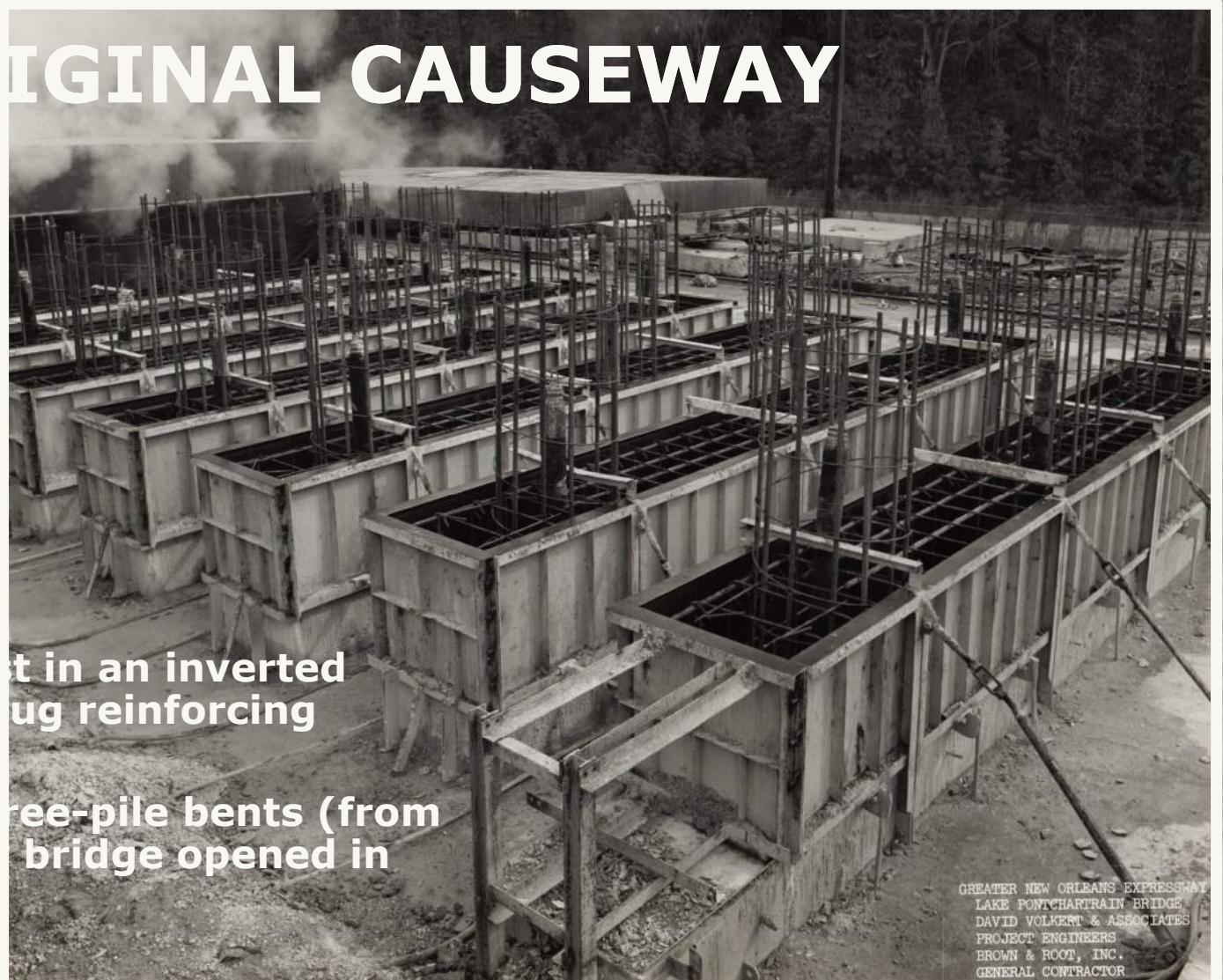
# PRECAST PILE CAPS





# USE ON ORIGINAL CAUSEWAY BRIDGES

- ❑ Pile caps were precast in an inverted position so the pile plug reinforcing projected upwards
- ❑ These caps are for three-pile bents (from the second Causeway bridge opened in 1969)

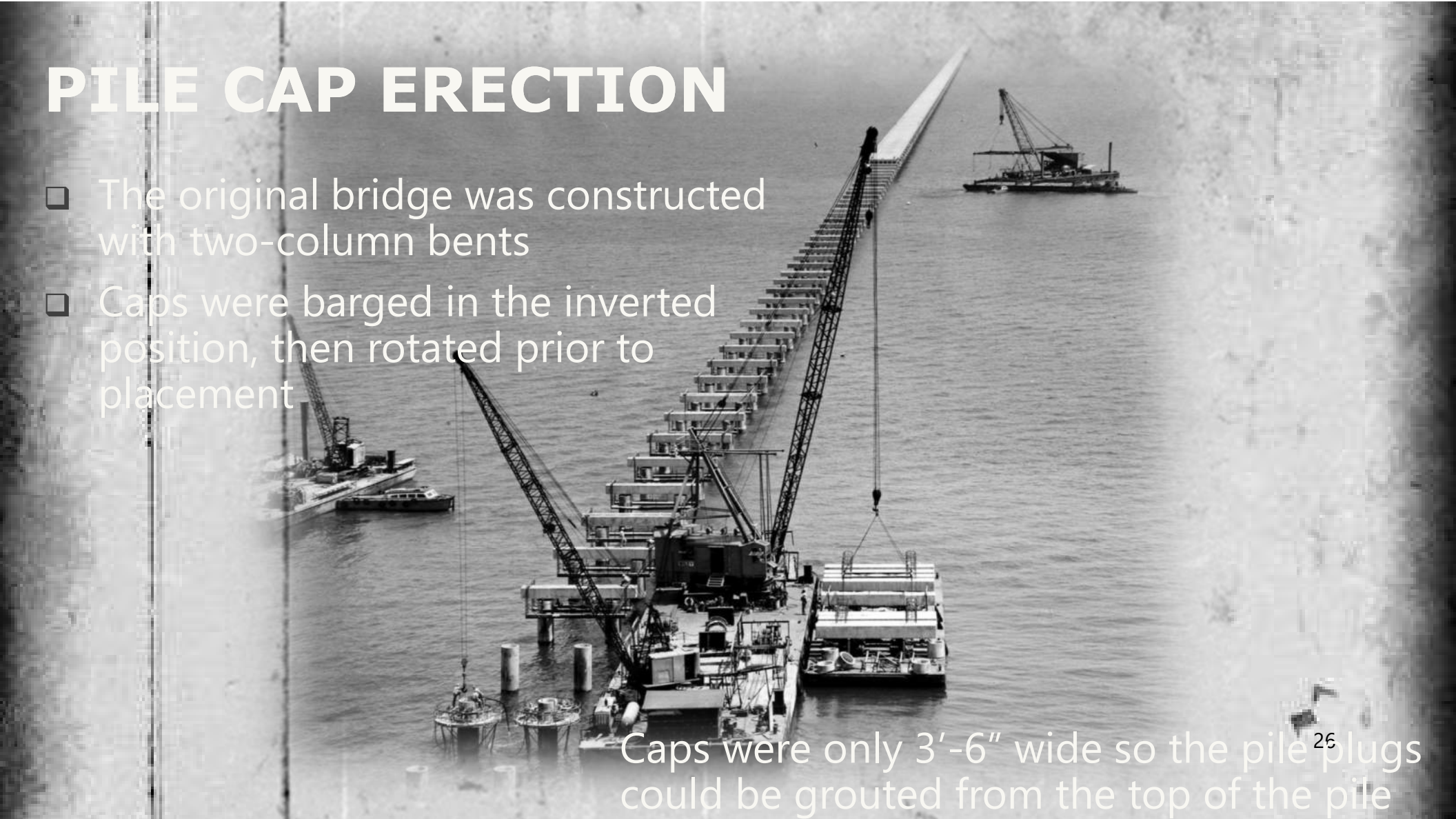


GREATER NEW ORLEANS EXPRESSWAY  
LAKE PONCHARTRAIN BRIDGE  
DAVID VOLKERT & ASSOCIATES  
PROJECT ENGINEERS  
BROWN & ROOT, INC.  
GENERAL CONTRACTOR

# PILE CAP ERECTION

- ❑ The original bridge was constructed with two-column bents
- ❑ Caps were barged in the inverted position, then rotated prior to placement

Caps were only 3'-6" wide so the pile plugs<sup>26</sup> could be grouted from the top of the pile



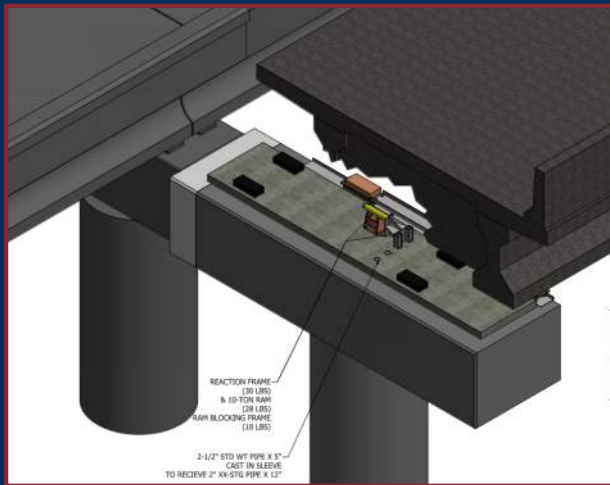
# USE ON SAFETY BAY PROJECT



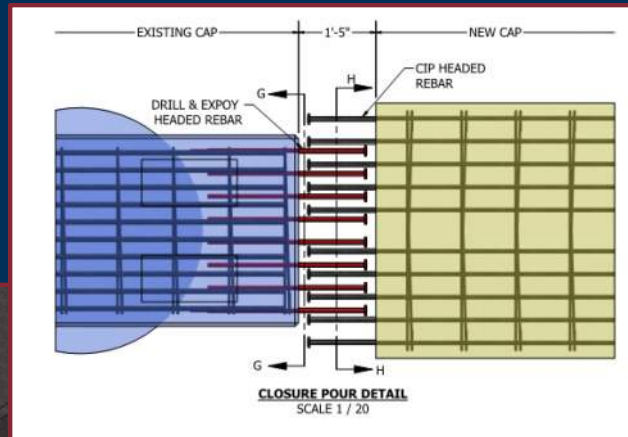
- Drill & Grout Bars into Existing Caps
- Set Safety Bay Pile Caps



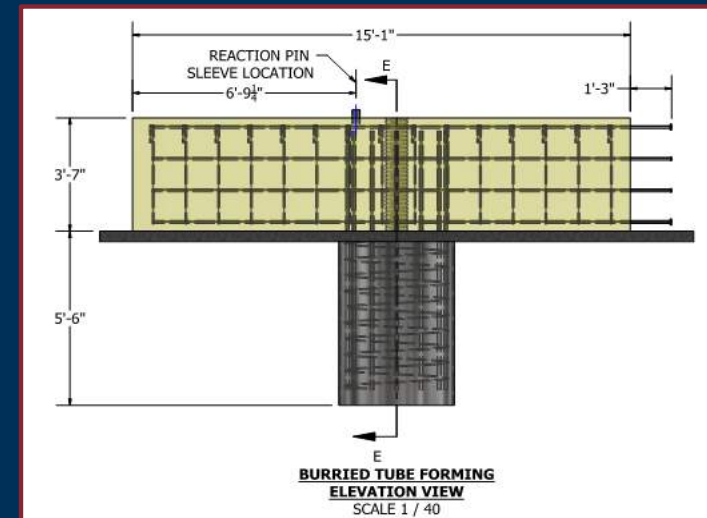
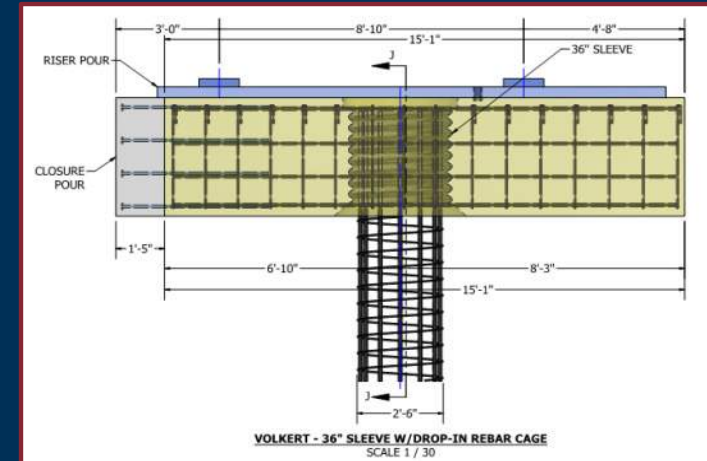
# DESIGNER/CONTRACTOR REFINEMENTS (NB)



Lateral Jacking of NB Deck Units



Cap Closure Joint Width / Splice Bar Details



Cap/Pile Grout Details

# CAP/PILE CONNECTION

- Cast Cap Closure
- Grout Cap to Pile Connection



# SUPERSTRUCTURE ERECTION



# SUCCESS!

## AGC Construction Risk Partners Build America Merit Award

GNOEC Causeway Safety Bay Improvements  
CMAR Project

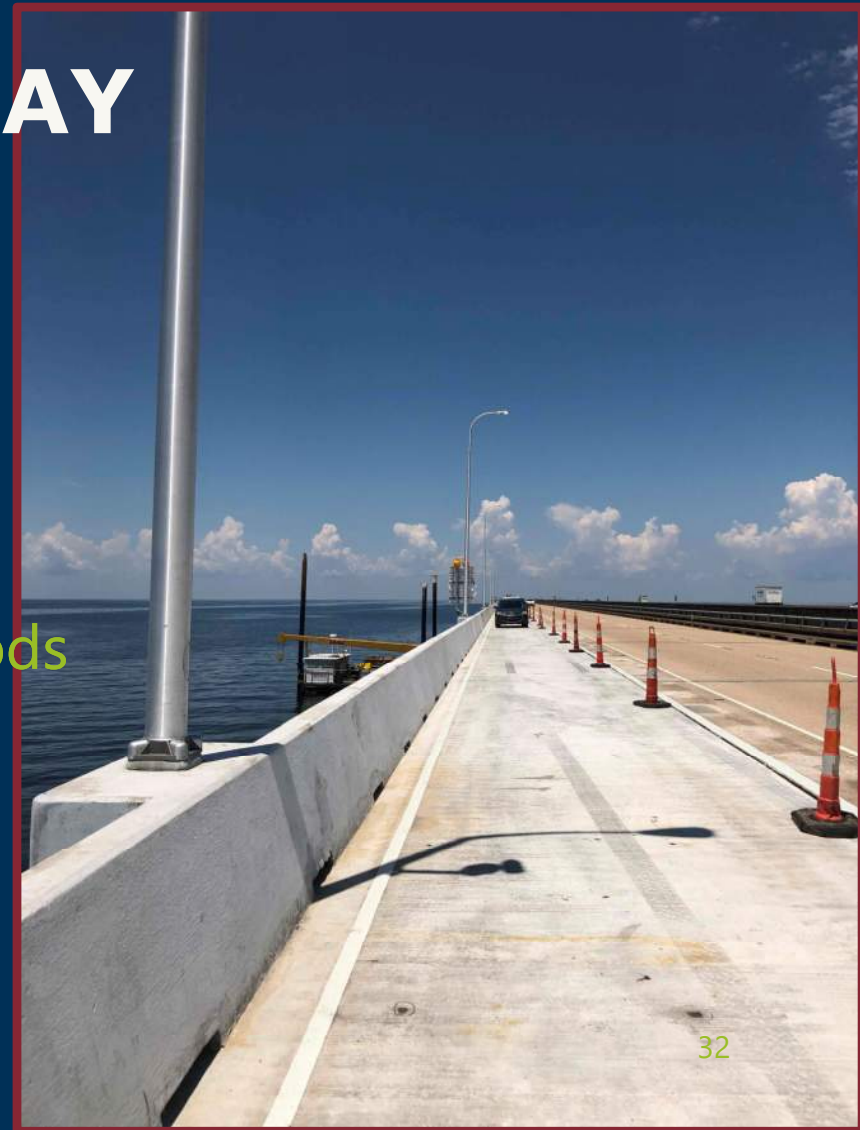


**BUILD  
AMERICA  
AWARDS**

AGC  
CONSTRUCTION RISK PARTNERS

# COMPLETED SAFETY BAY

- Met Project & Owner Objectives
  - Provides Safety to Traveling Public
  - Minimized Disruption to Traffic During Construction
  - Within Owner's Budget
- Innovative Concepts, Means & Methods
  - ABC
  - PBES
  - SPMTs
  - CMAR





# SUMMARY

**“The original Causeway Bridge is the first project ever to employ mass-production, assembly line techniques in fabricating and assembling a bridge.”**

**The use of prefabricated bridge elements and systems (PBES) and accelerated bridge construction (ABC) was truly innovative and decades ahead of its time.**

**Just as construction of the second Causeway Bridge borrowed heavily from the success of the first bridge, the Safety Bay Project borrowed from its predecessors to develop concepts, means and methods to enhance safety on America’s longest bridge.**

# QUESTIONS?



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