Design and Construction of the John James Audubon Bridge

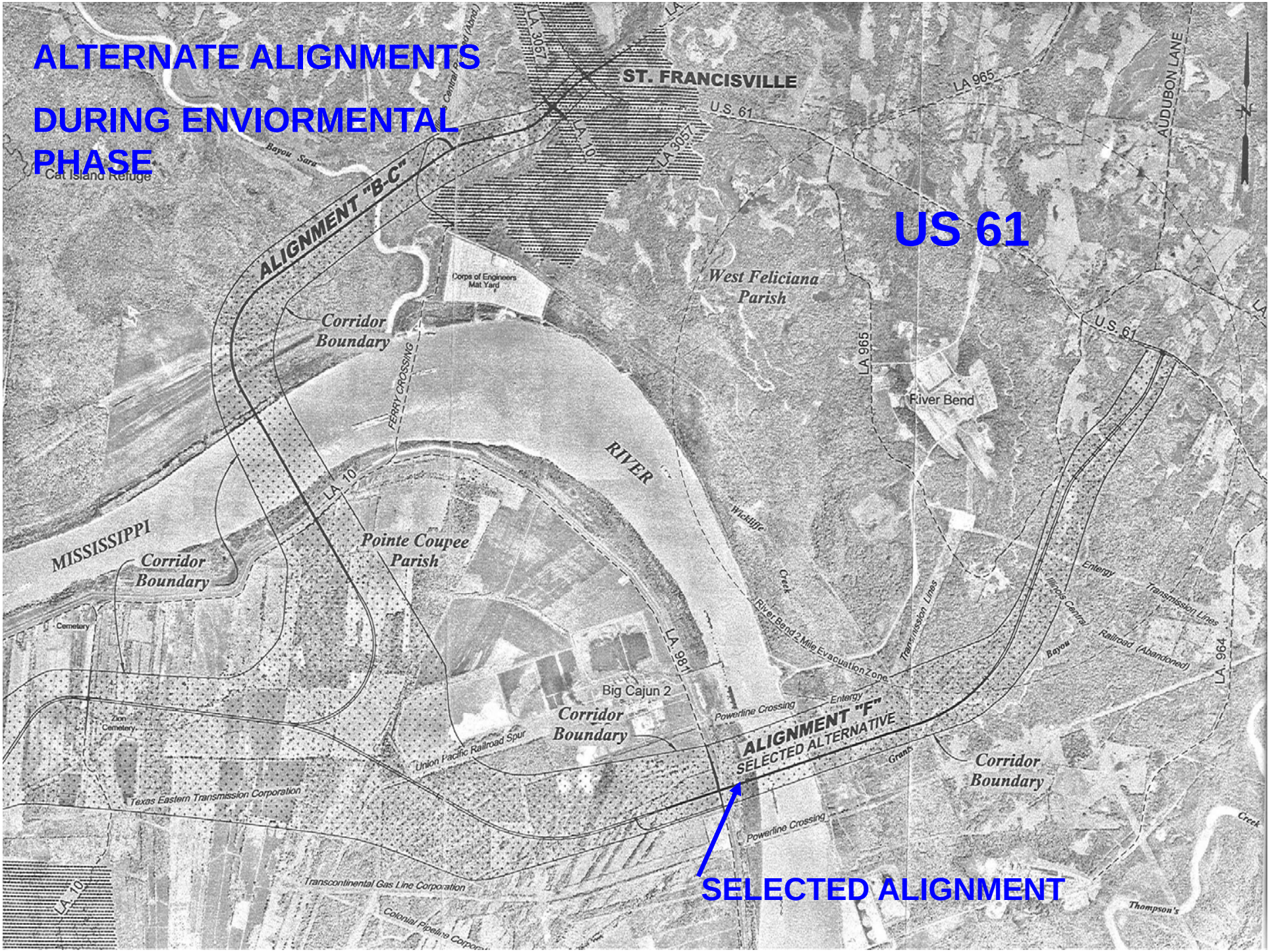
SASHTO ANNUAL CONFERENCE, New Orleans, LA
August 25, 2014

Paul Fossier, P.E., F.ASCE, Bridge Design Engineer Administrator

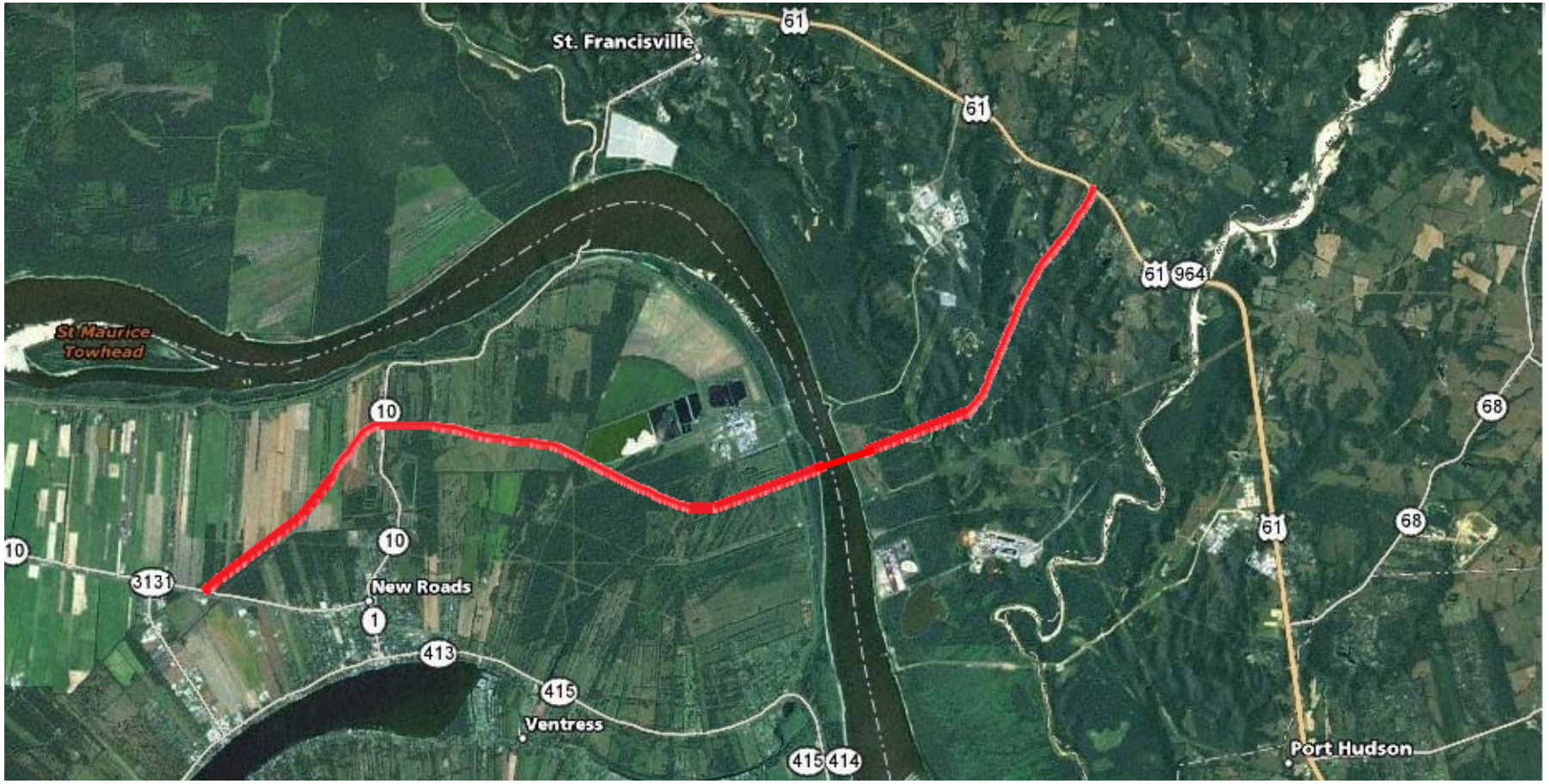
LOUISIANA BRIDGE INVENTORY

(2013 FHWA National Bridge Inventory Data)

- **13,050 LA. BRIDGES (607,751 in U.S.)**
  - **8,087 ON SYSTEM (STATE)**
  - **4,963 OFF SYSTEM (NON-STATE)**
  - **1st in US -151 ARE MOVABLE (Lift, Swing, Bascule, Pontoon) BRIDGES**
  - **12 Miss. River Crossings (10 Truss, 2 Cable Stay)**
  - **21th in US, NUMBER OF BRIDGES**
  - **4th in US, BRIDGE AREA (Length x Width)**

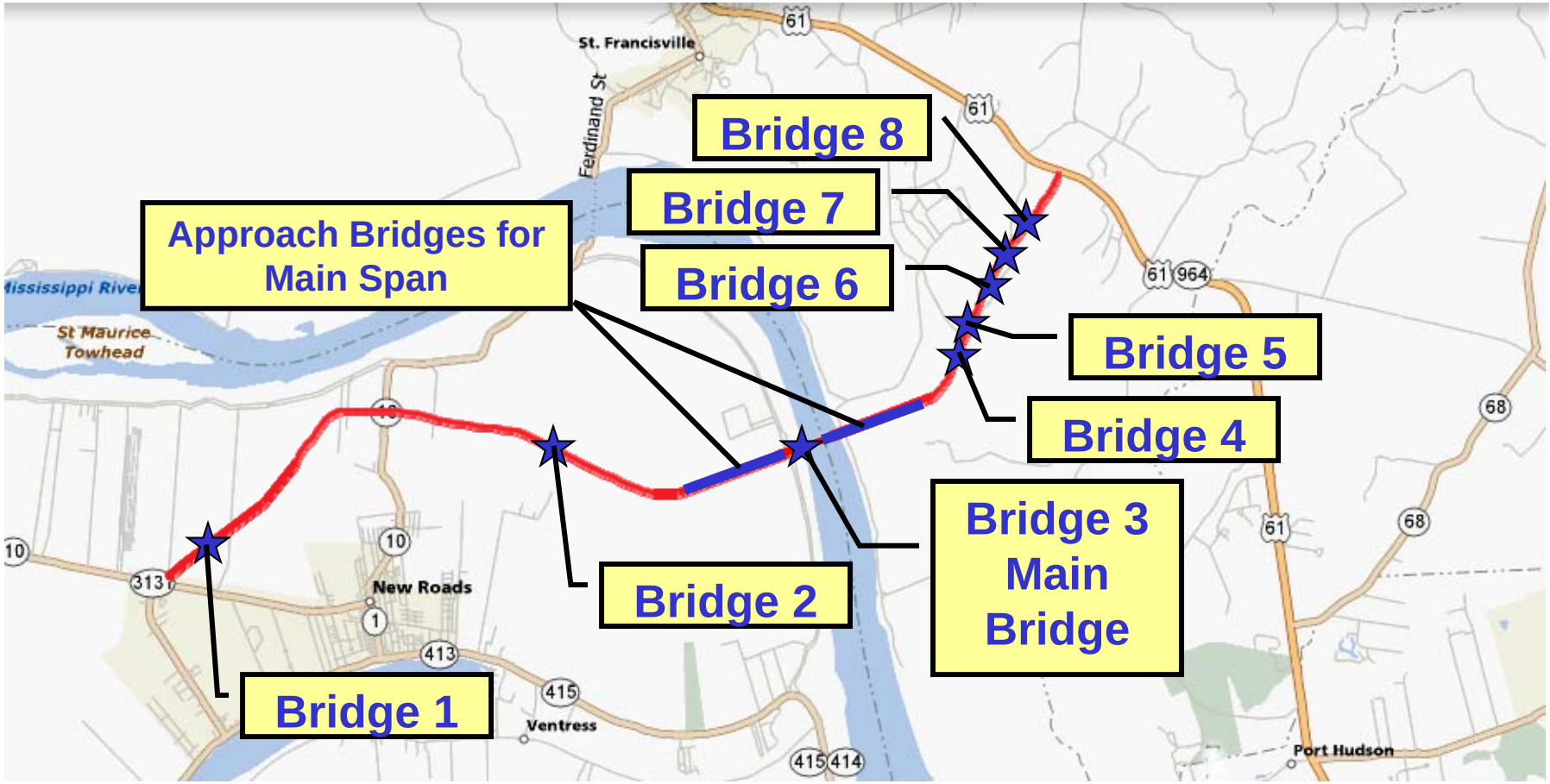

ALTERNATE ALIGNMENTS
DURING ENVIORMENTAL PHASE
US 61
SELECTED ALIGNMENT
ST. FRANCISVILLE
ALIGNMENT "B-C"
ALIGNMENT "F"
SELECTED ALTERNATIVE
Corridor Boundary
West Feliciana Parish
Pointe Coupee Parish
MISSISSIPPI
RIVER
River Bend
Big Cajun 2
Cat Island Refuge
Corps of Engineers Mat Yard
PERRY CROSSING
Bayou Sara
Wickliffe Creek
River Bend 2 Mile Evacuation Zone
Transmission Lines
Entergy
Illinois Central Railroad (Abandoned)
Powerline Crossing
Union Pacific Railroad Spur
Texas Eastern Transmission Corporation
Transcontinental Gas Line Corporation
Colonial Pipeline Corporation
Cemetery
Zion Cemetery
Thompson's Creek
AUDUBON LANE
LA 10
LA 3057
LA 965
LA 964
LA 981
U.S. 61

Project Scope



- **Total Cost $406 Million, LA "TIMED" PROGRAM, 4 cent gas tax, sold bonds**
- **Project Length 15.3 miles**
- **Bridge Length: 4.0 miles (main bridge & main bridge approach 4 lanes, other bridges 2 lanes)**
- **Roadway 11.3 miles (2 lane, buy R/W for future 4 lane)**
- **First Design-Build Procurement for LA DOTD**
- **Successful Letting March 2, 2006, Start construction May, 2006.**
- **Opened to traffic on May 5, 2011, Other misc. work and punch list items not completed till February 2012**

The Bridges


Bridge 8
Bridge 7
Approach Bridges for Main Span
Bridge 6
Bridge 5
Bridge 4
Bridge 3 Main Bridge
Bridge 2
Bridge 1
St. Francisville
Ferdinand St
St Maurice Towhead
New Roads
Ventress
Port Hudson
61
964
68
10
313
1
413
415
414

BRIDGE PROJECT FEATURES

- **Cable Stayed Superstructure Main Span:**

  - 1583 ft. longest stay cable span in Western Hemisphere when completed.

  - Galvanized and sheathed 7 wire prestressed strands and outer HDPE pipe (multi levels of protection)

  - Steel edge girders, steel floor beams, weathering unpainted steel.

  - Precast concrete panels with latex concrete overlay

  - Concrete cast-in-place towers. Lock up device at one towers.

  - Wind Analysis with computer simulation and wind tunnel, Wind faring plate used on main span

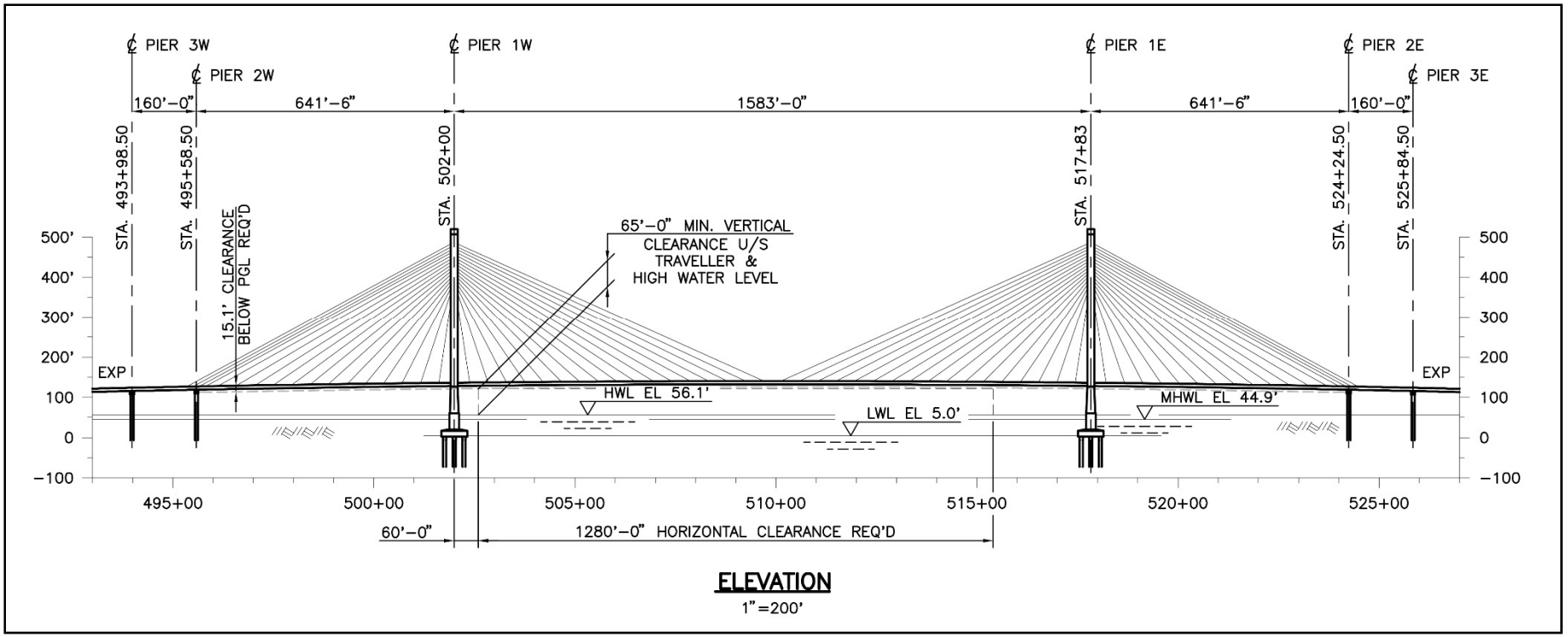
- **Main Span River Piers**:

  - Unique cofferdam for low water footing, first on Miss. River with drilled shafts. Designed for vessel /barge impact loads.

  - Tip grouted 8' dia. drilled shafts in river, Construction Techniques- Oscillated and Fully Cased

  - O(Osterburg) - Cell load testing to verify shaft load capacities

Cable-Stayed Main River Span

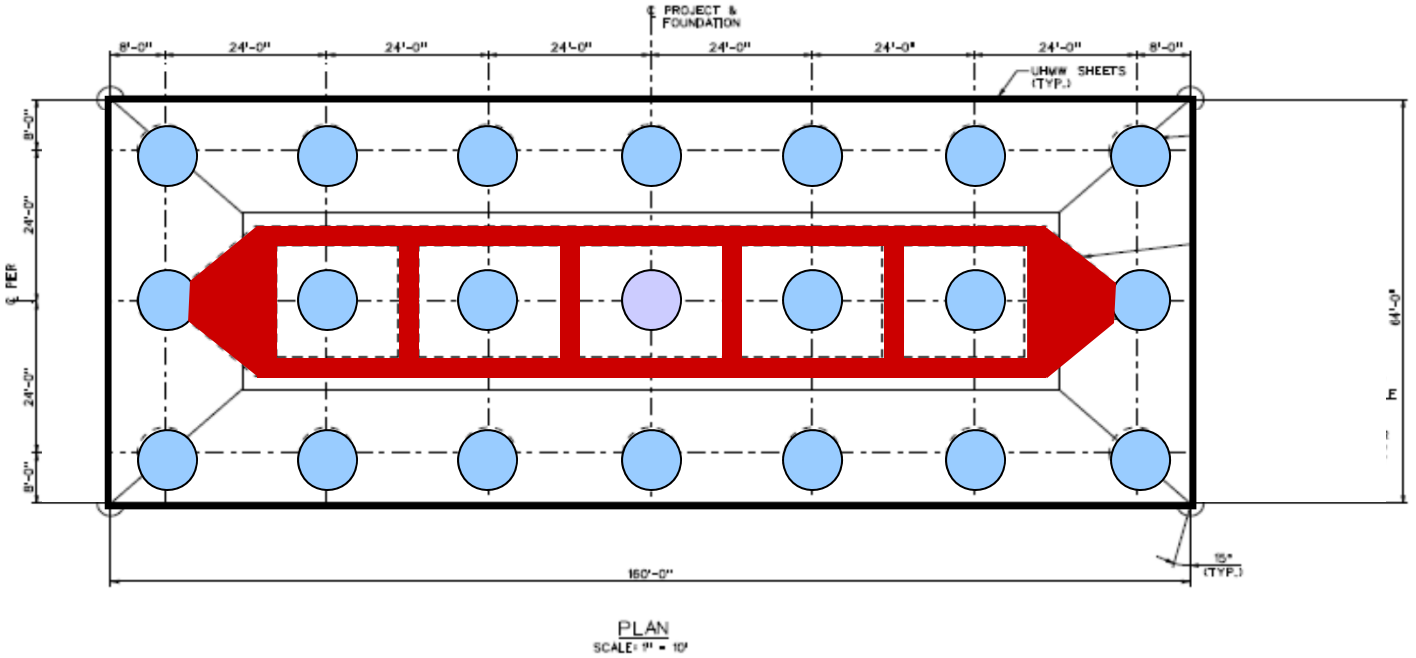


1583 ft main span, 1463 ft navigational clearance

Main span substructure

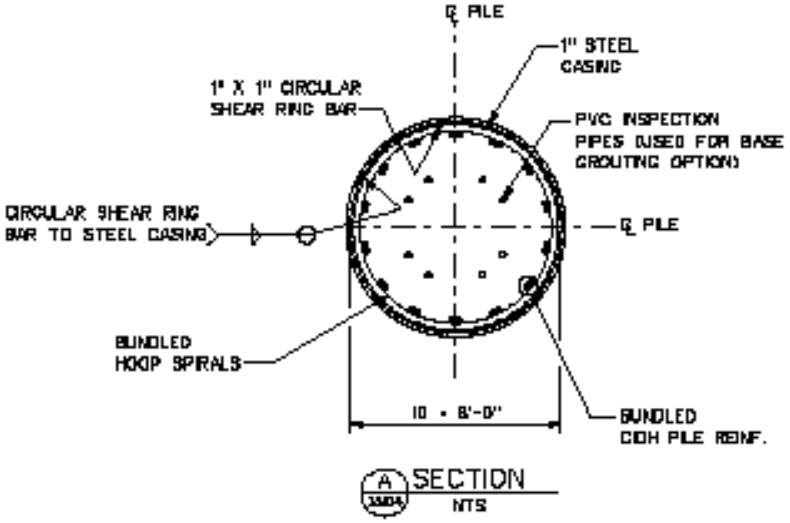
Tower Foundations 1W & 1E

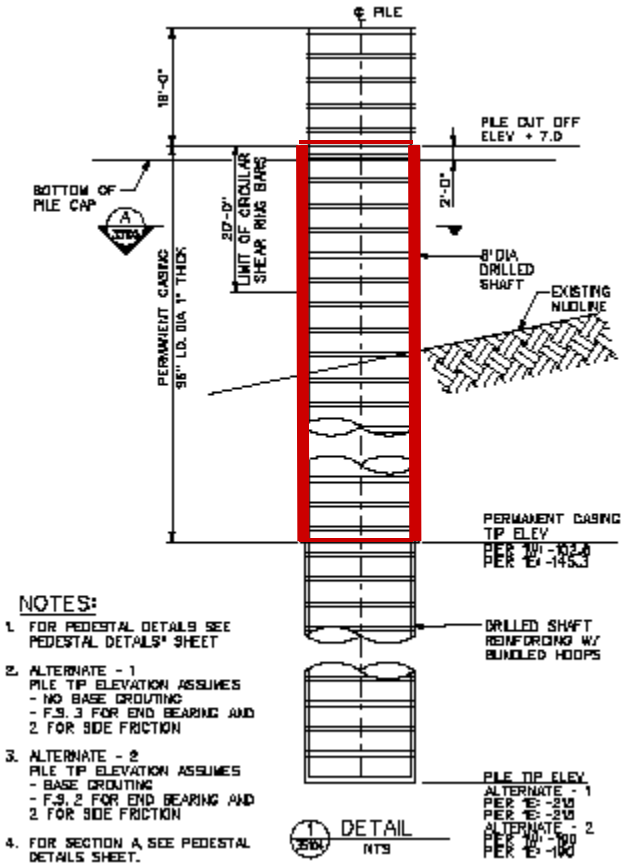
- 160’ x 64’ x 18’ Cap
- 7 by 3 drilled shaft group
- 8’-0” diameter shafts - 21 per each pier



Tower Shafts

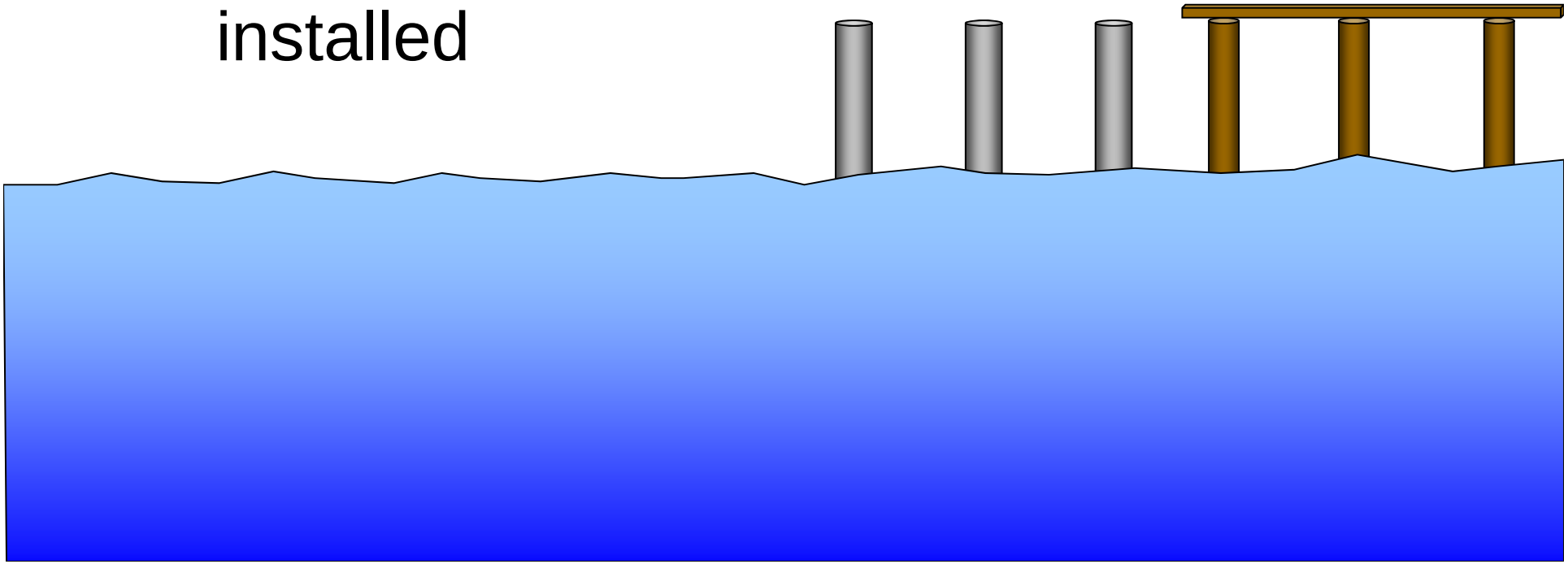
- 96” dia permanent casing
- 90” dia drilled shaft
- Pile tip Elev. -175 to -180
- Tip grouting





Footing Cofferdam Structure Sequence

Piles and trestle have been installed



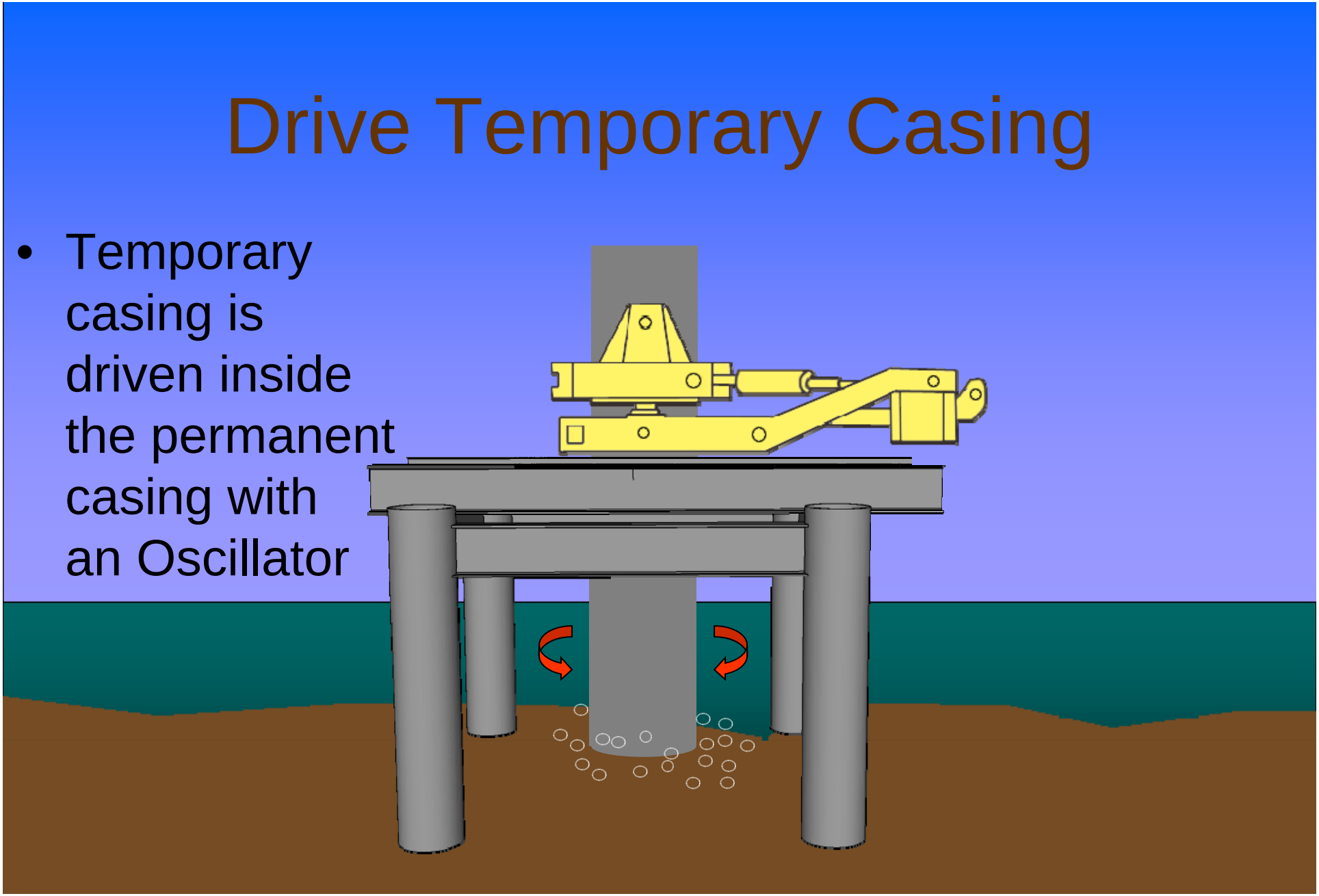
Shaft Template

Drive Permanent Casing

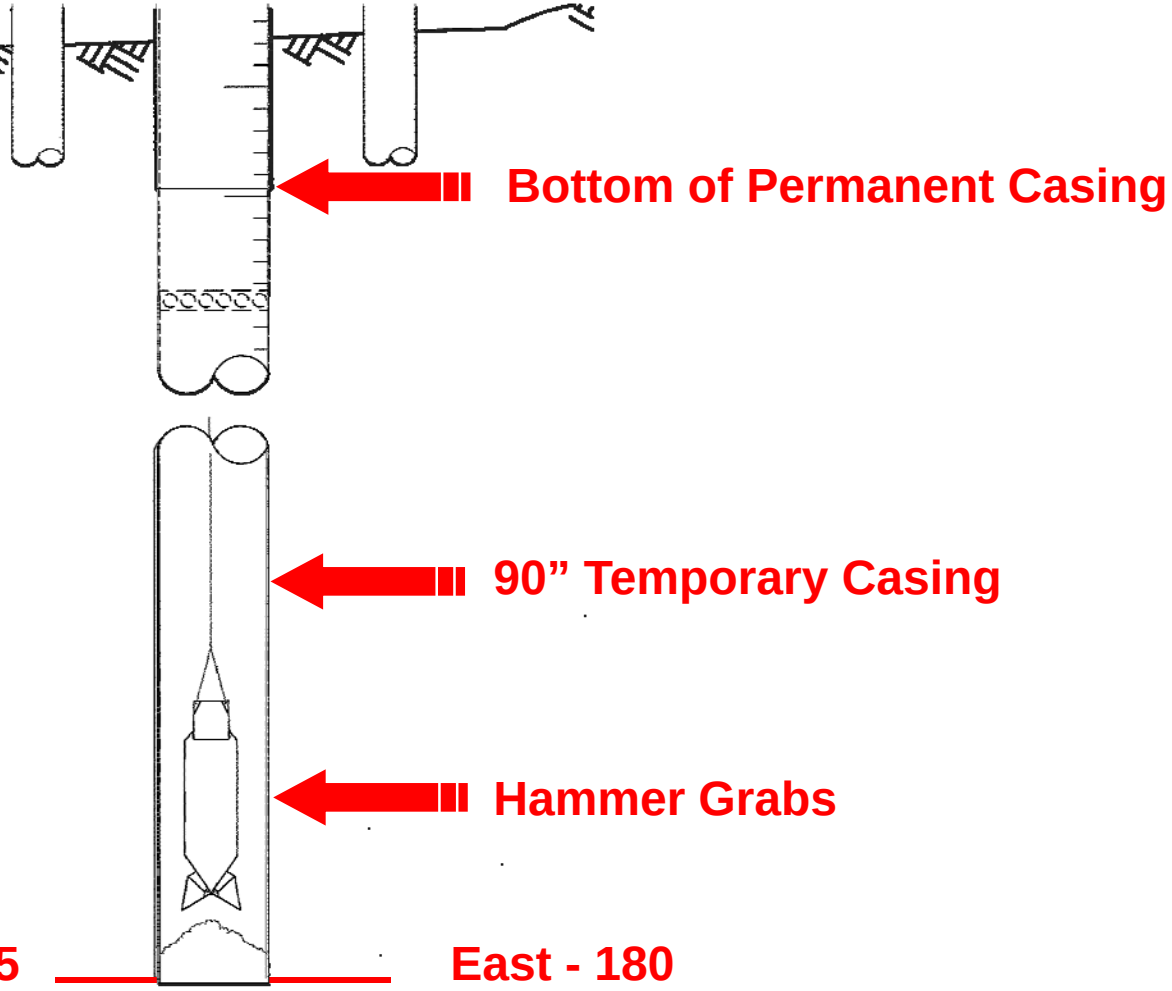
- Vibratory hammer driving the casing into the ground

Drive Temporary Casing

- Temporary casing is driven inside the permanent casing with an Oscillator



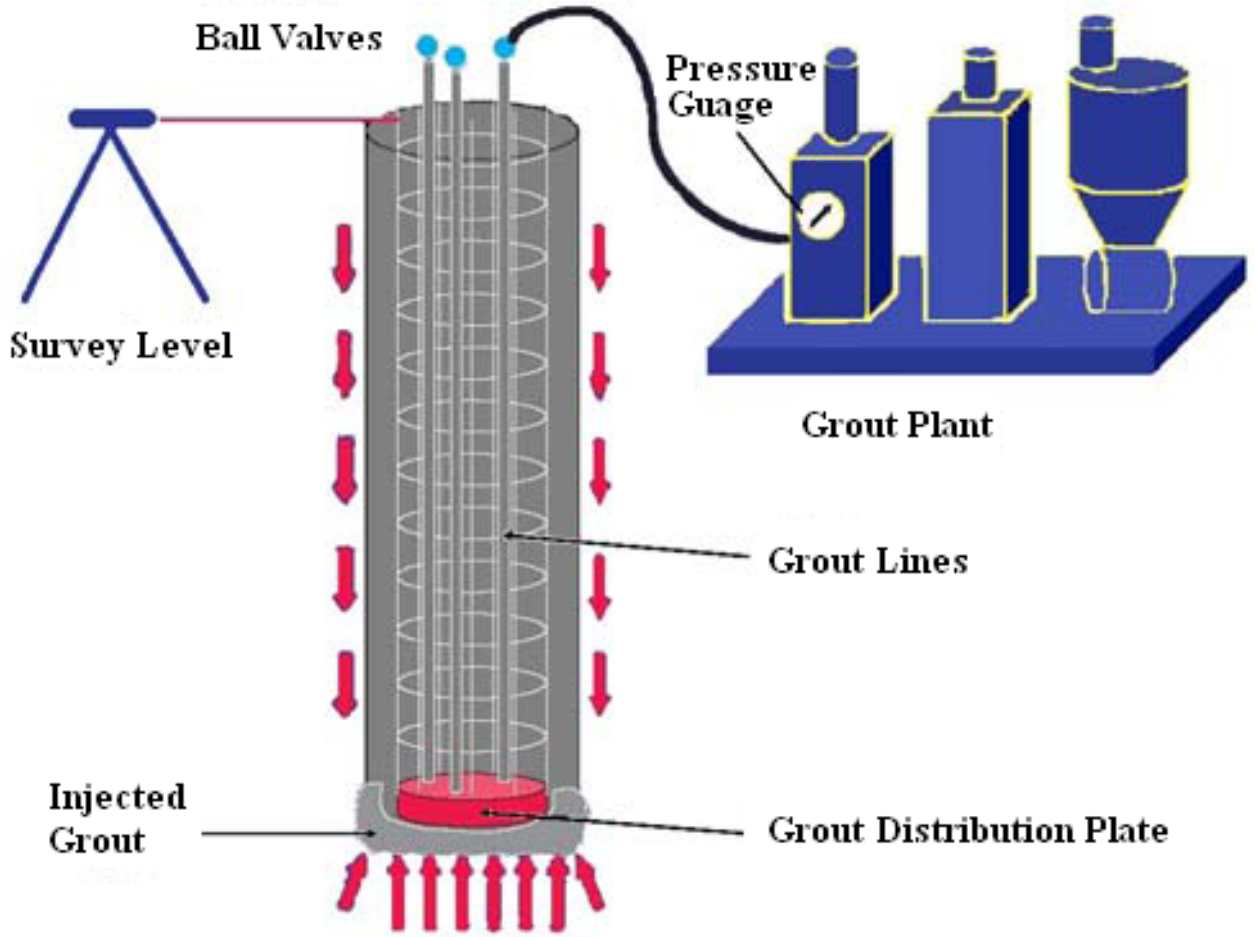
Excavate Temporary Casing – Hammer Grab or Air Lifts



Excavation by Air Lifts

Base grouting verification

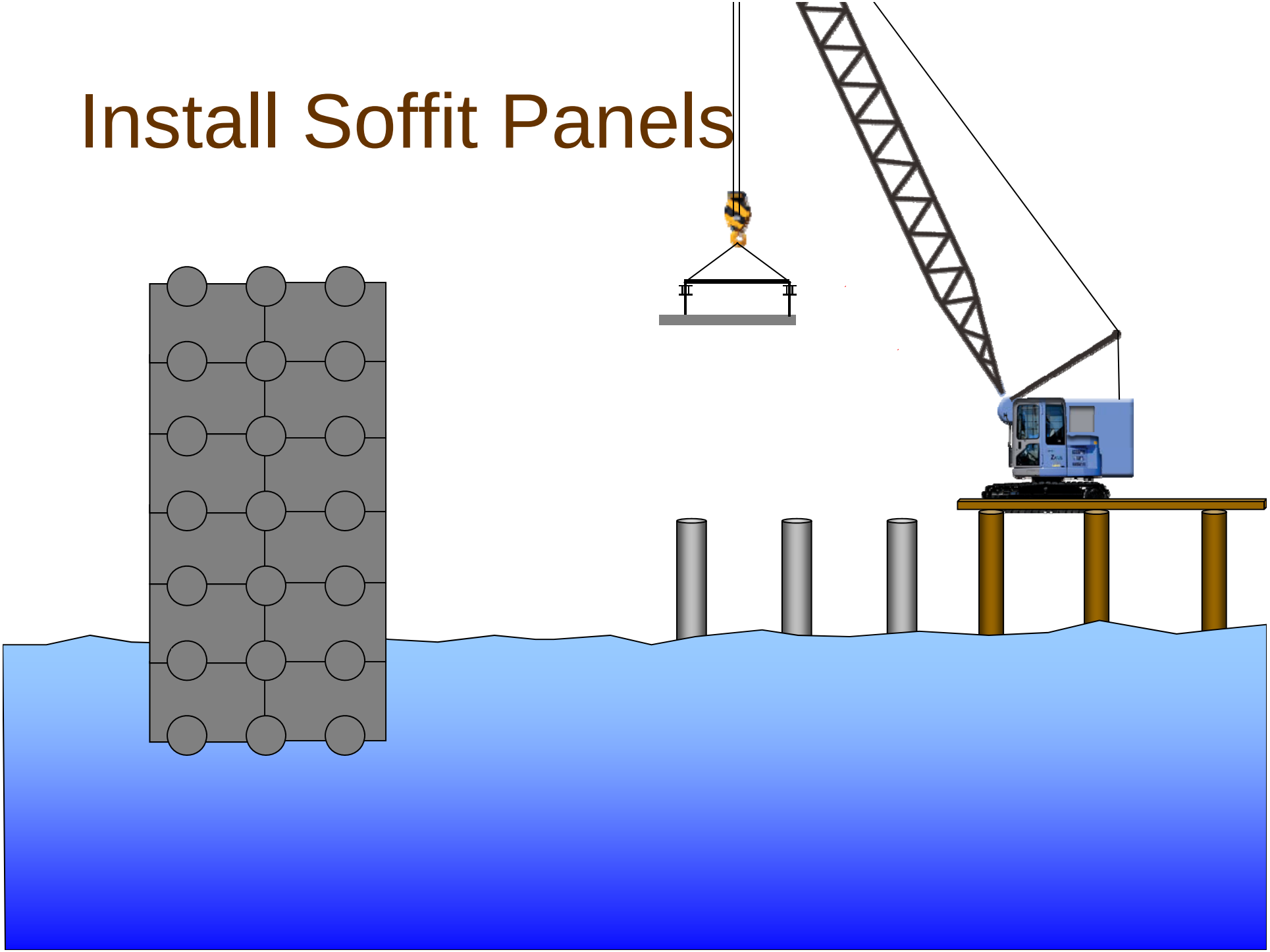
- Pressure
- Volume
- Movement of Shaft




JVC
CHROMA
CONTRAST
VOLUME/SELECT
MENU
PHASE
BRGHT
INPUT SELECT
POWER
SYSTEM
MICROPHO
ON

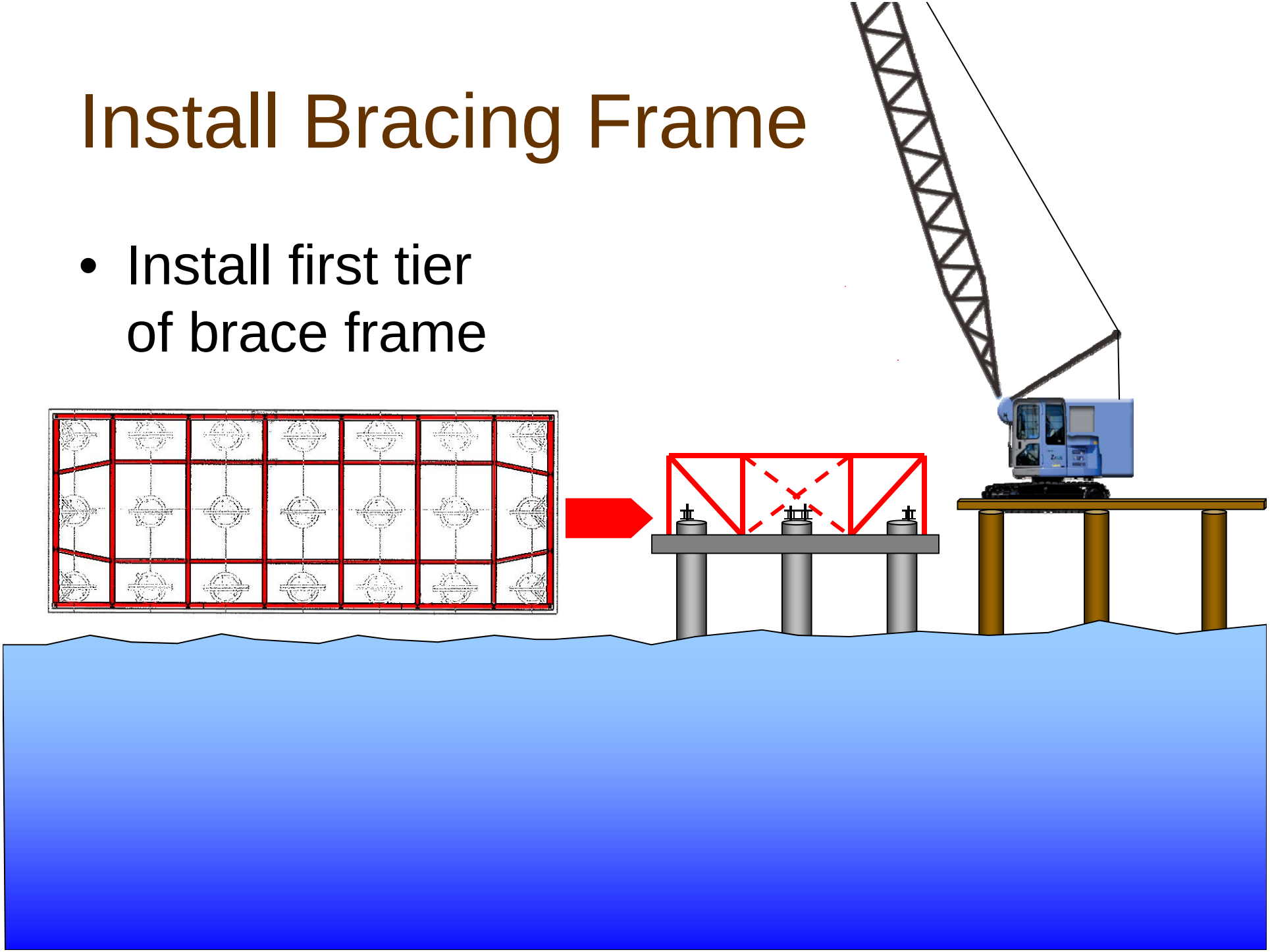

AFT

Install Soffit Panels



Install Bracing Frame

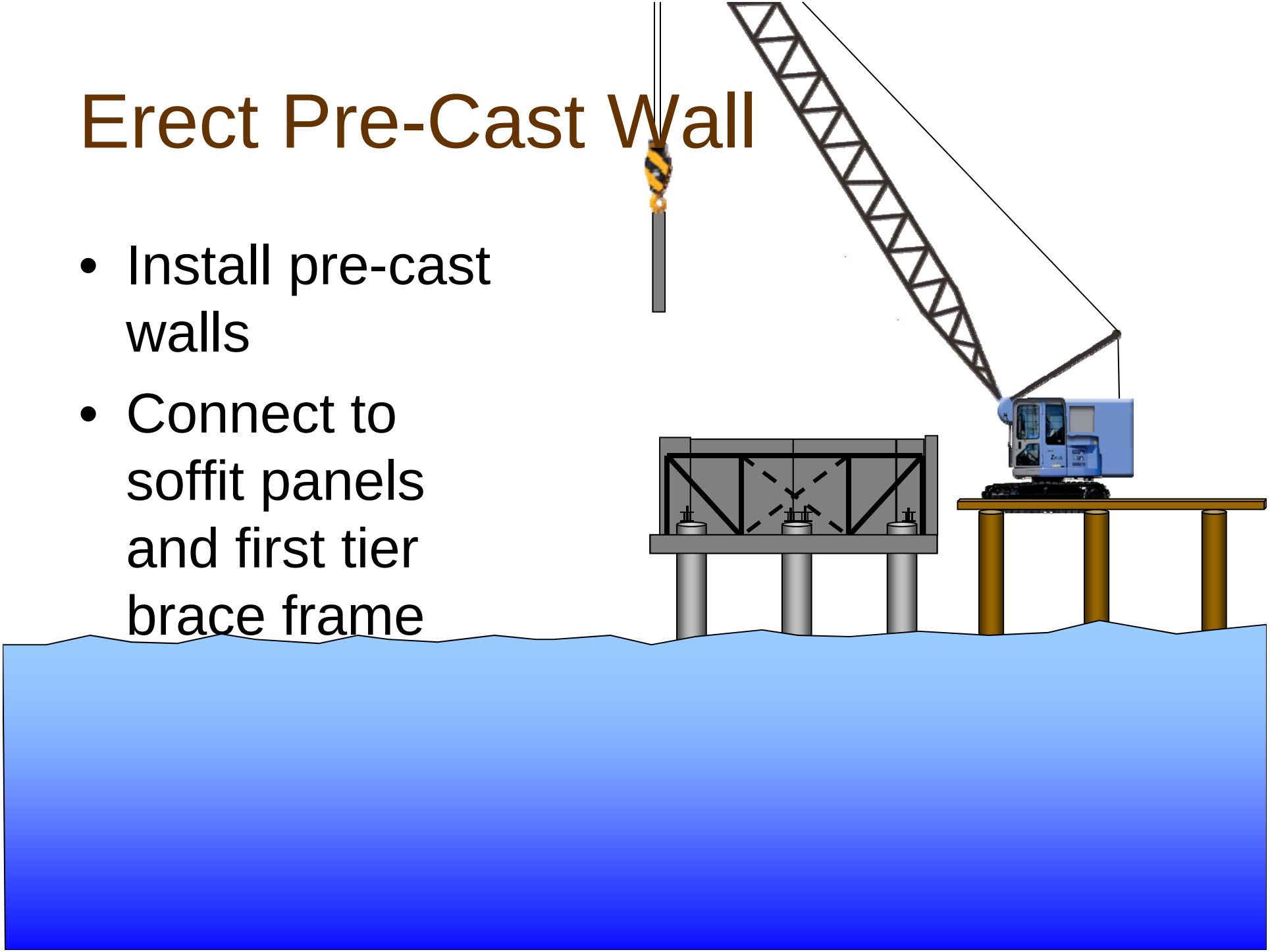
- Install first tier of brace frame




12/10/2008

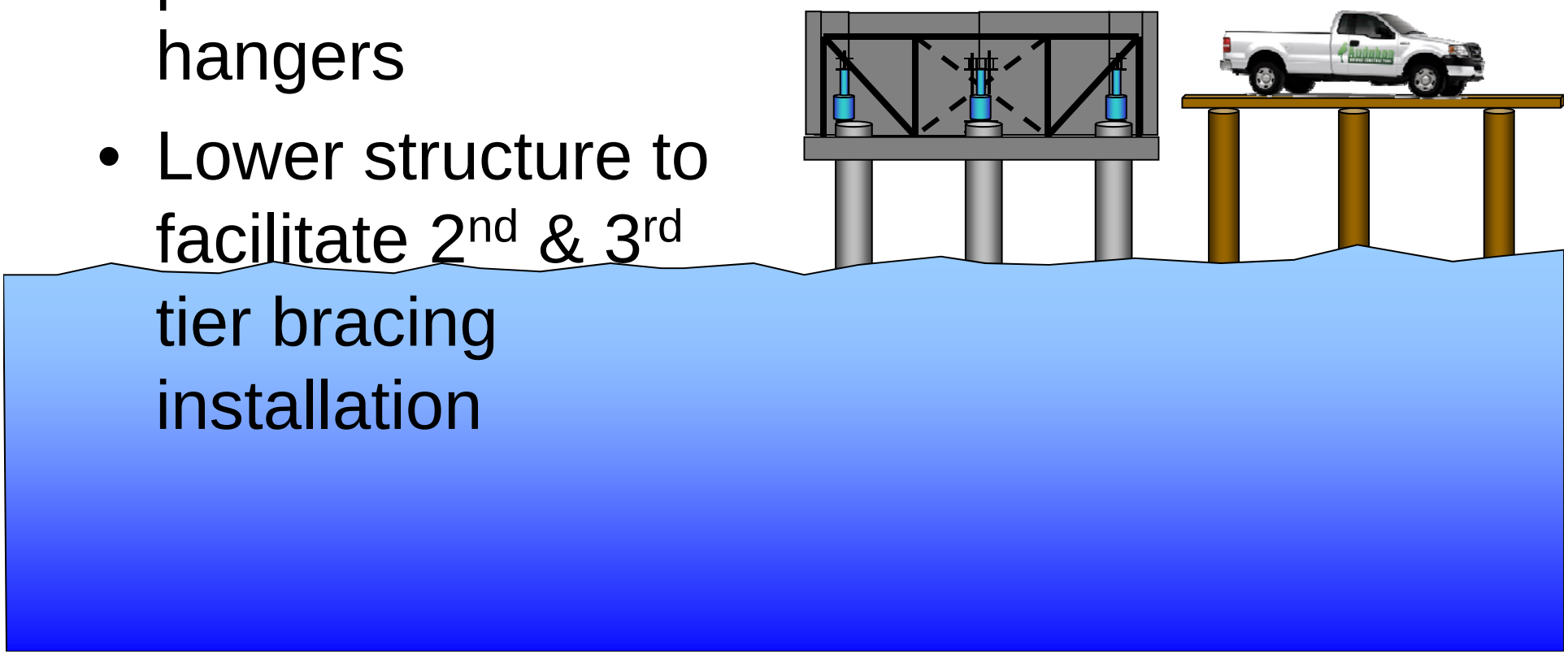
Erect Pre-Cast Wall

- Install pre-cast walls
- Connect to soffit panels and first tier brace frame



Install Jacking System

- Install jacking system with permanent hangers
- Lower structure to facilitate 2nd & 3rd tier bracing installation

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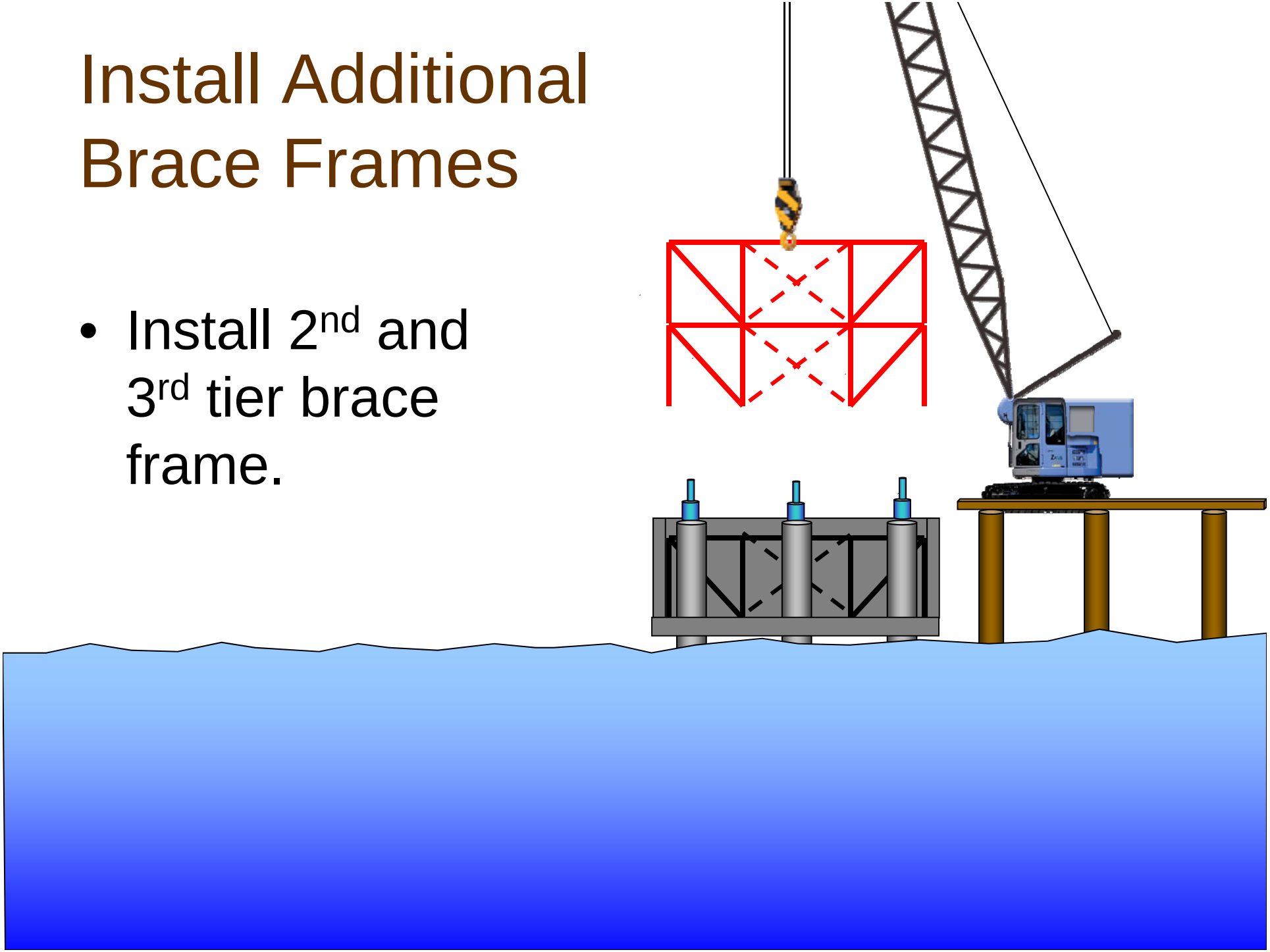
Install Additional Brace Frames

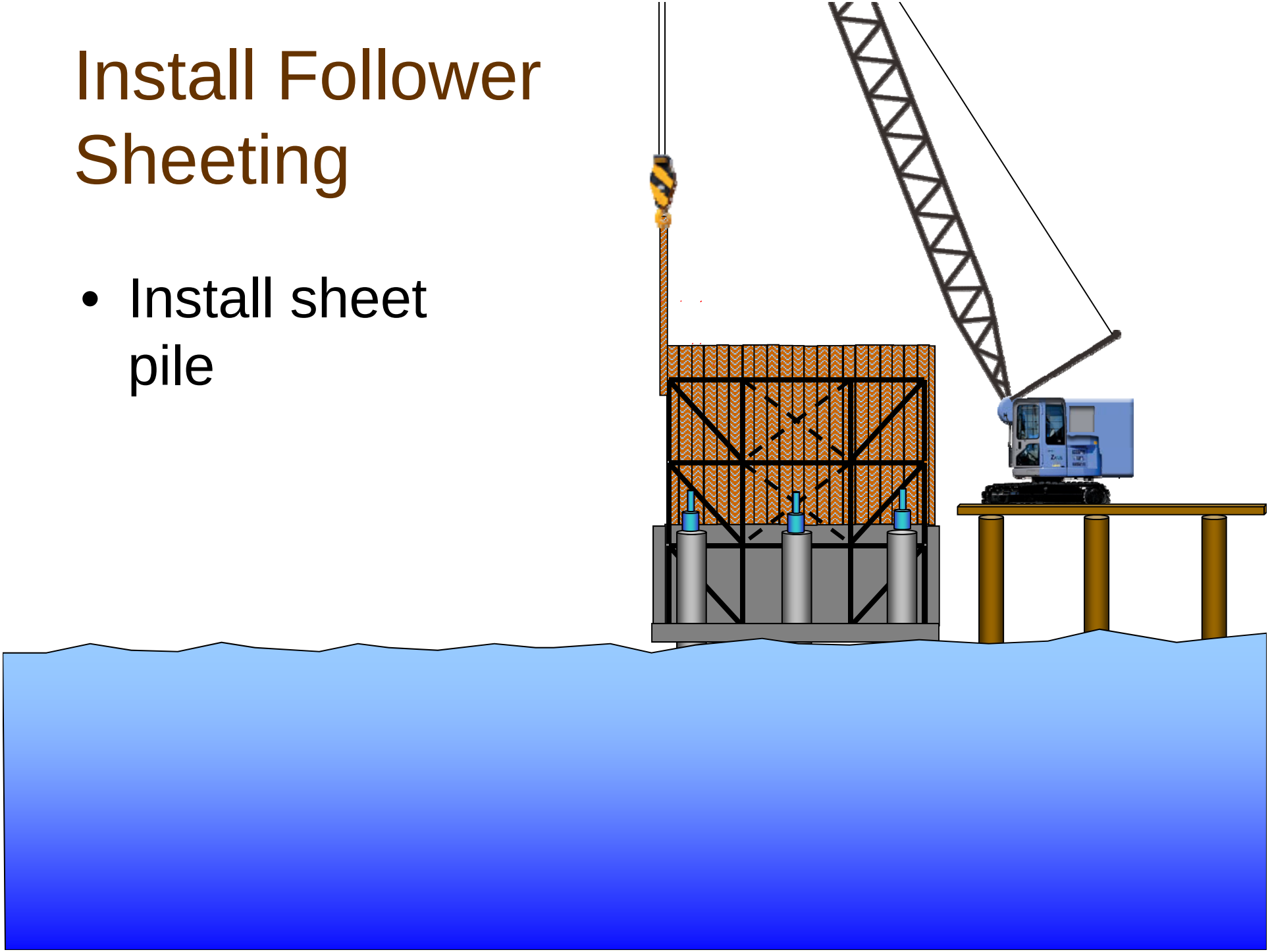
- Install 2nd and 3rd tier brace frame.



Cofferdam Structure with Bracing

Install Follower Sheeting

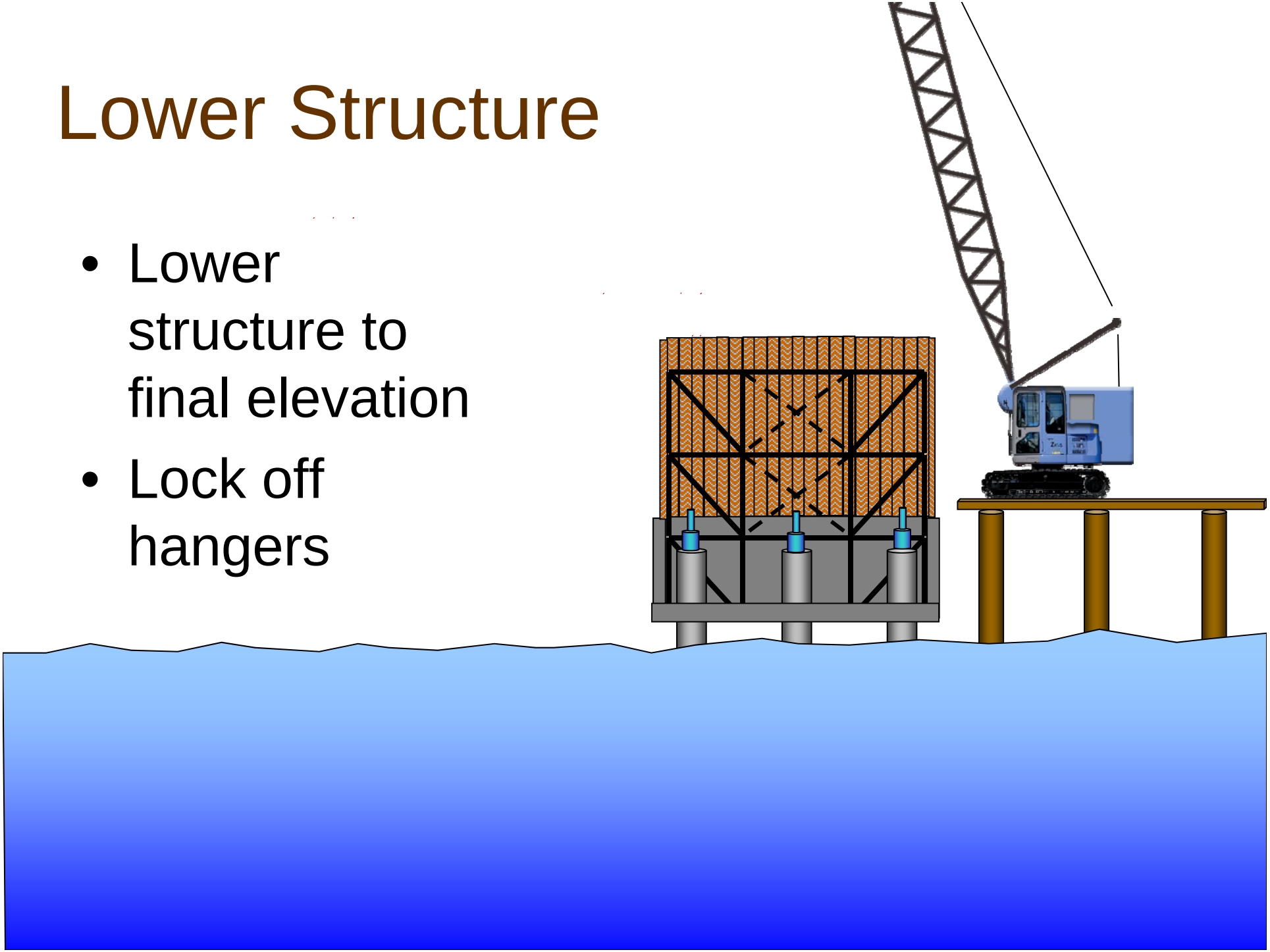
- Install sheet pile




RSC Equipment Rental
02/12/2009 12:54

Lower Structure

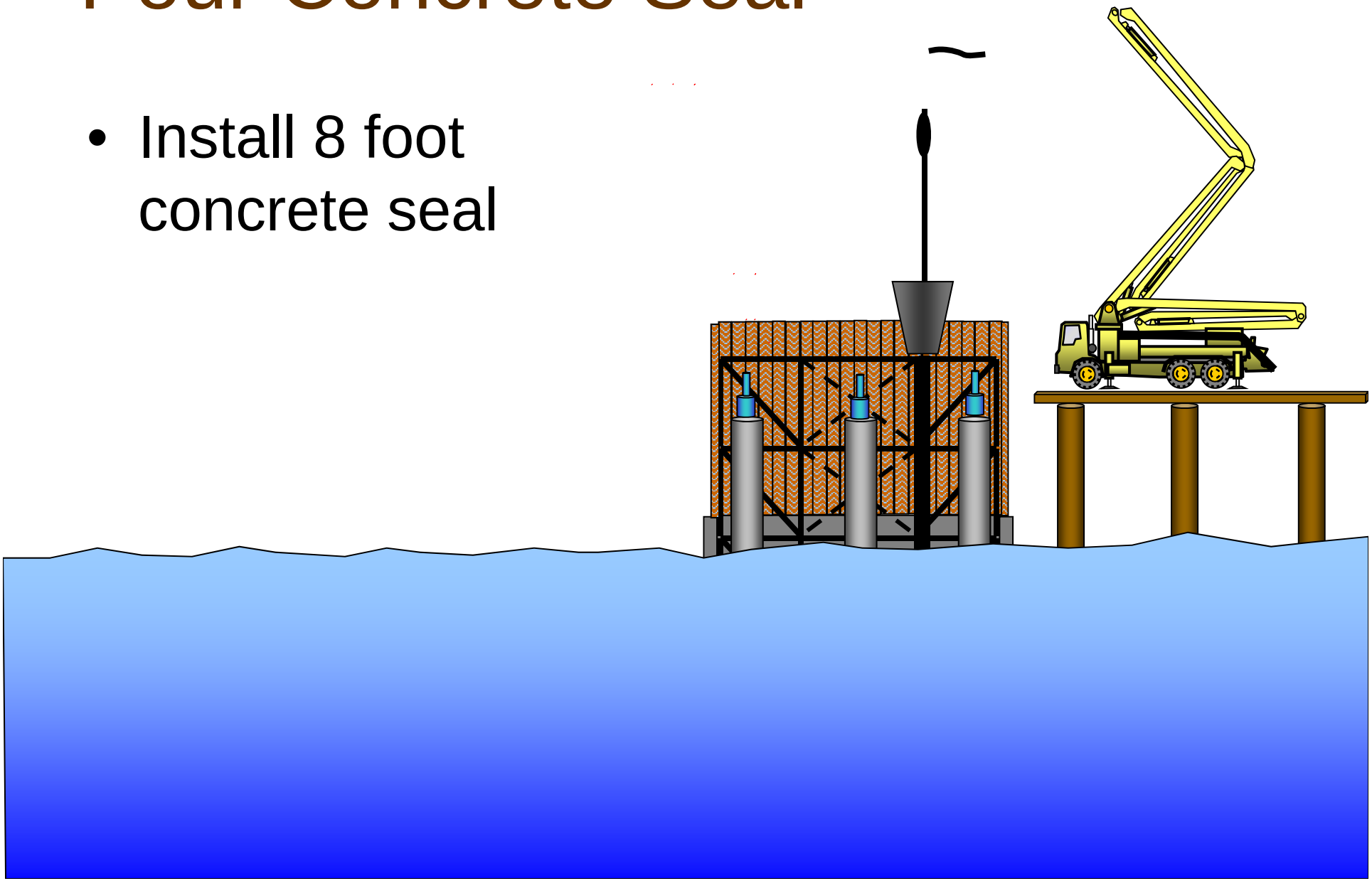
- Lower structure to final elevation
- Lock off hangers




January 11,
2009

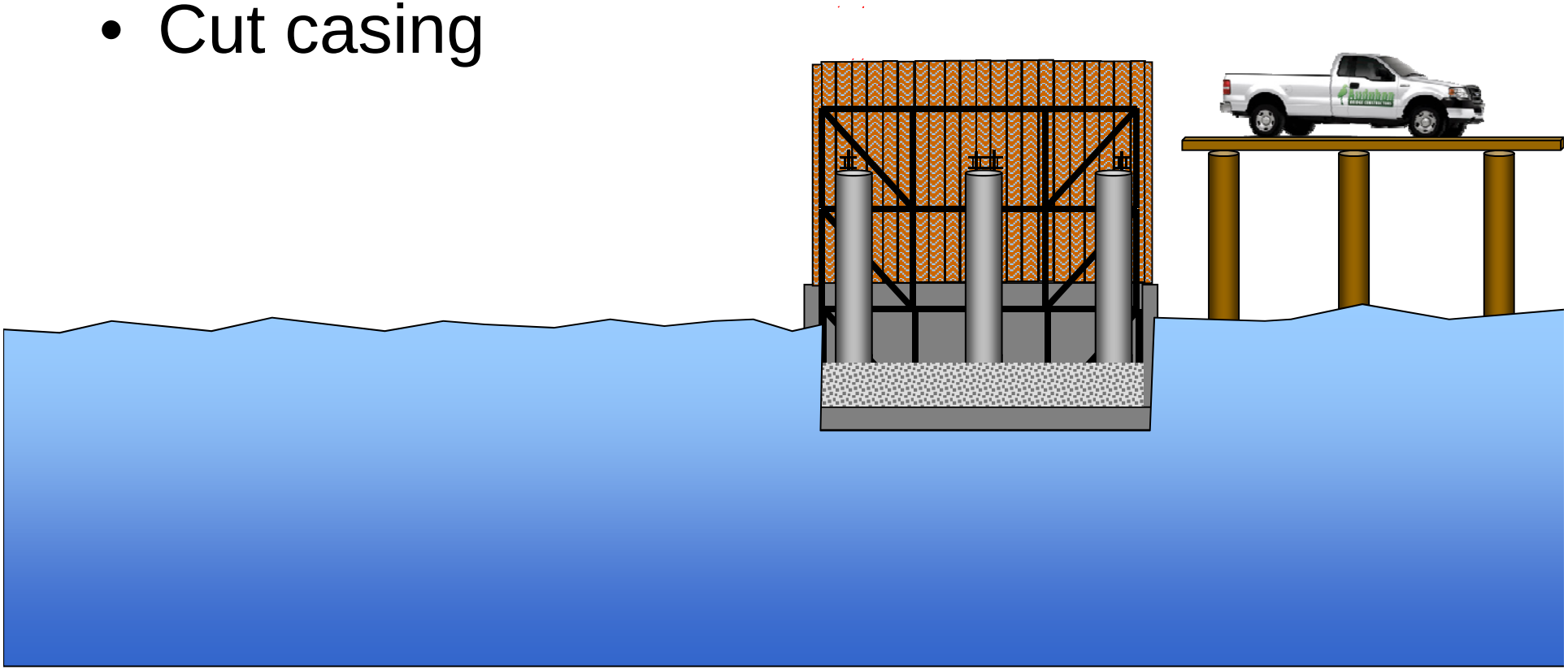
Pour Concrete Seal

- Install 8 foot concrete seal



Remove Hangers and Cut Casing

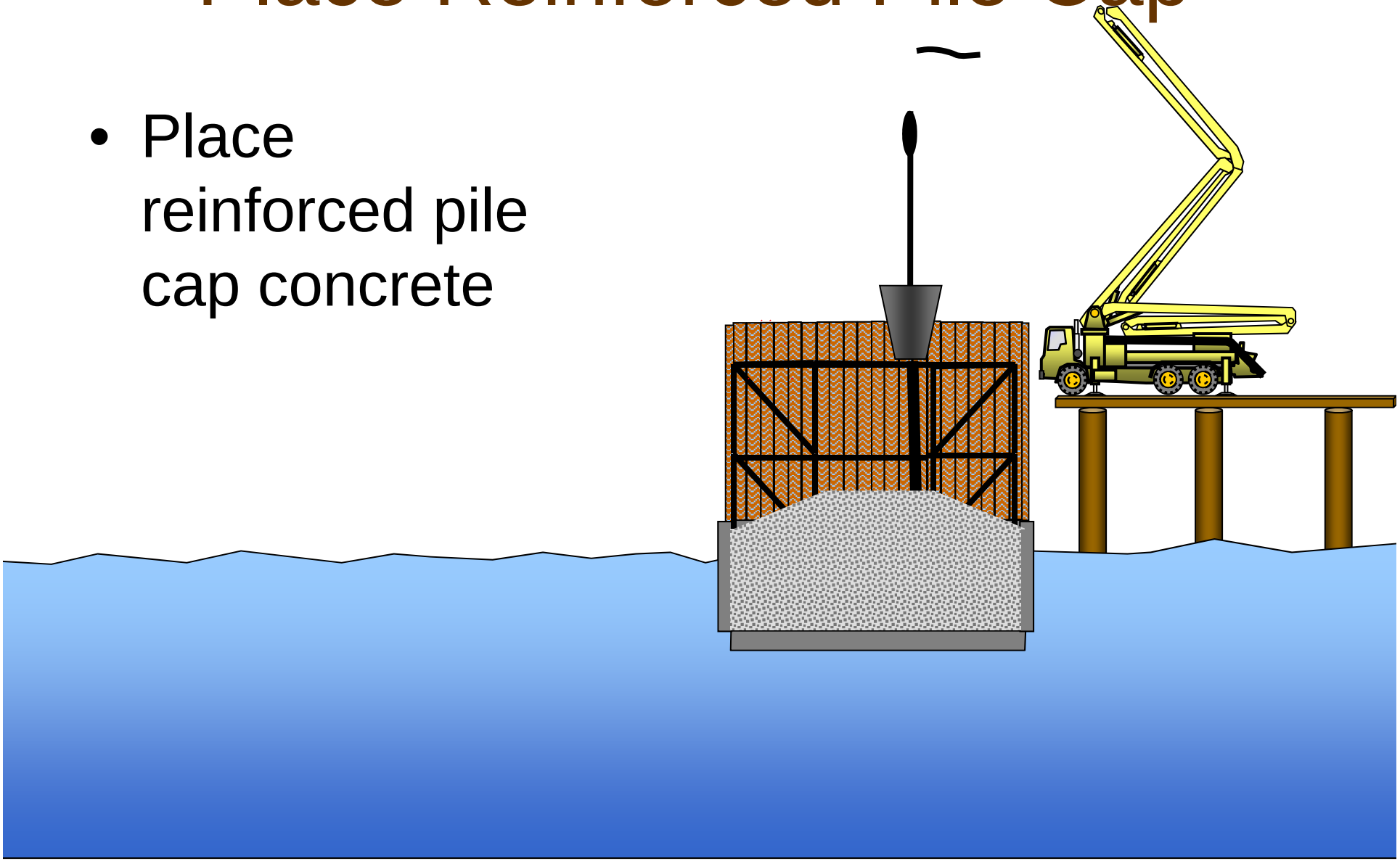
- Remove hangers
- Cut casing




05/27/2009 14:01

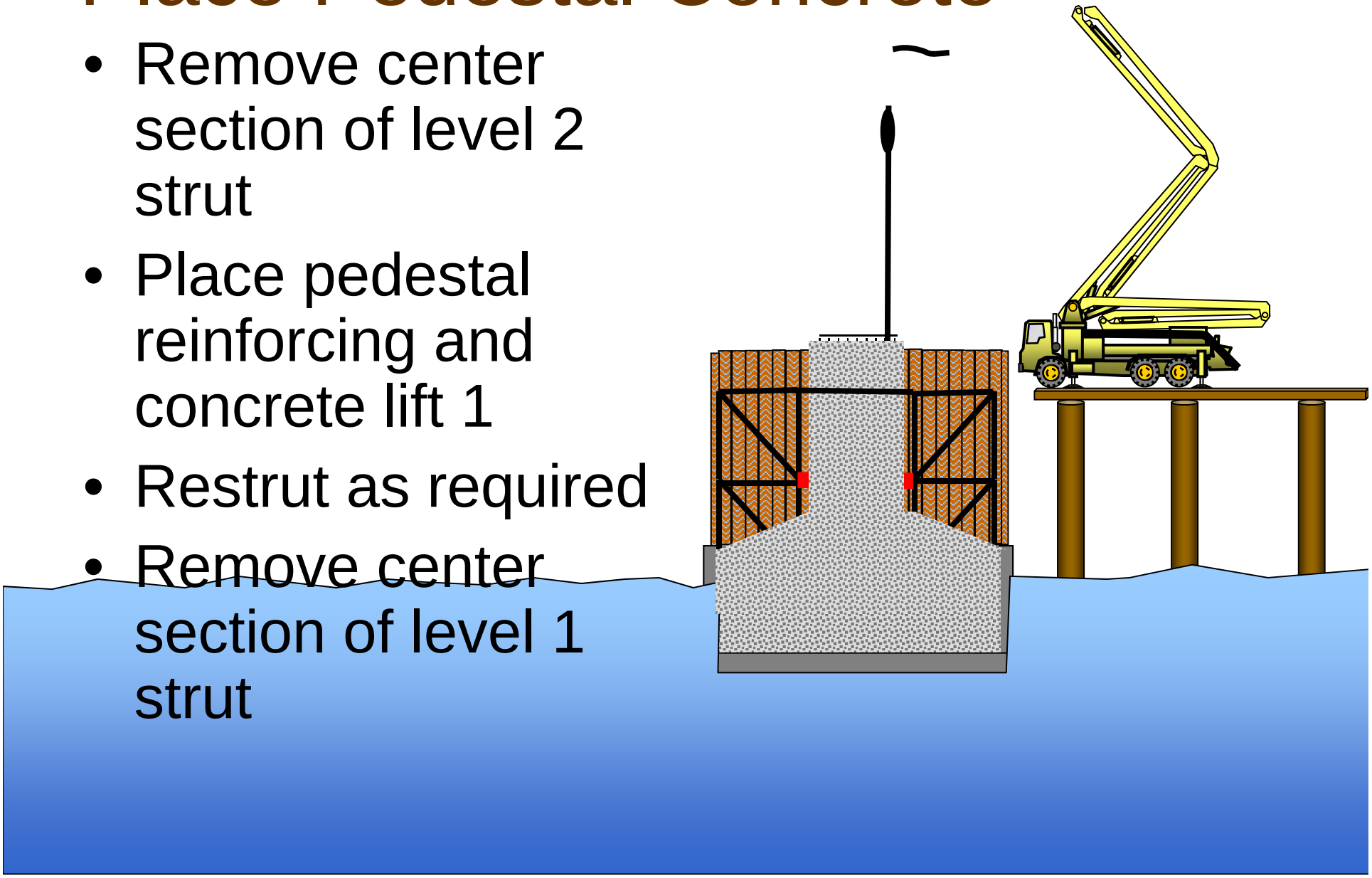
Place Reinforced Pile Cap

- Place reinforced pile cap concrete



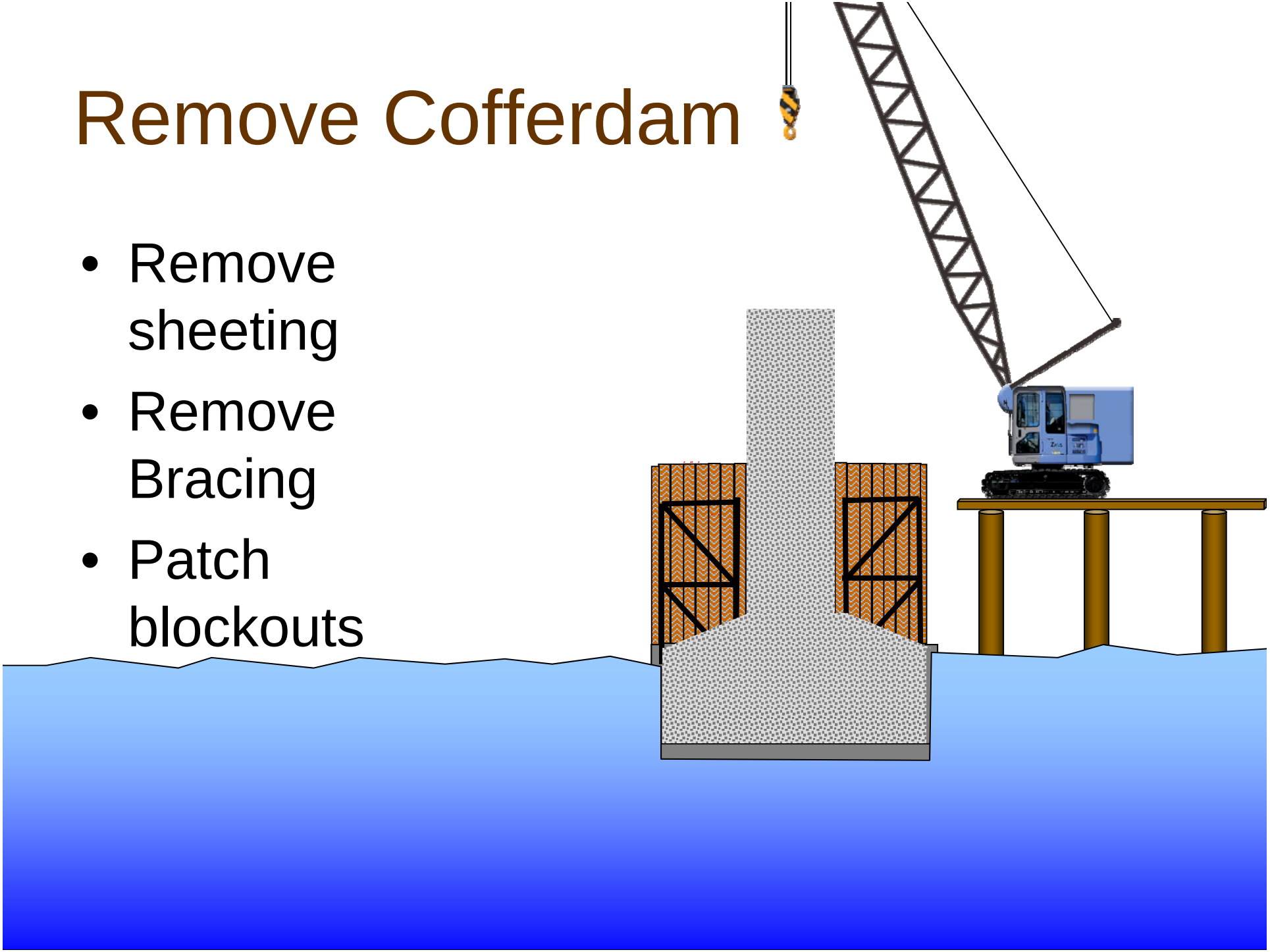
Place Pedestal Concrete

- Remove center section of level 2 strut
- Place pedestal reinforcing and concrete lift 1
- Restrut as required
- Remove center section of level 1 strut



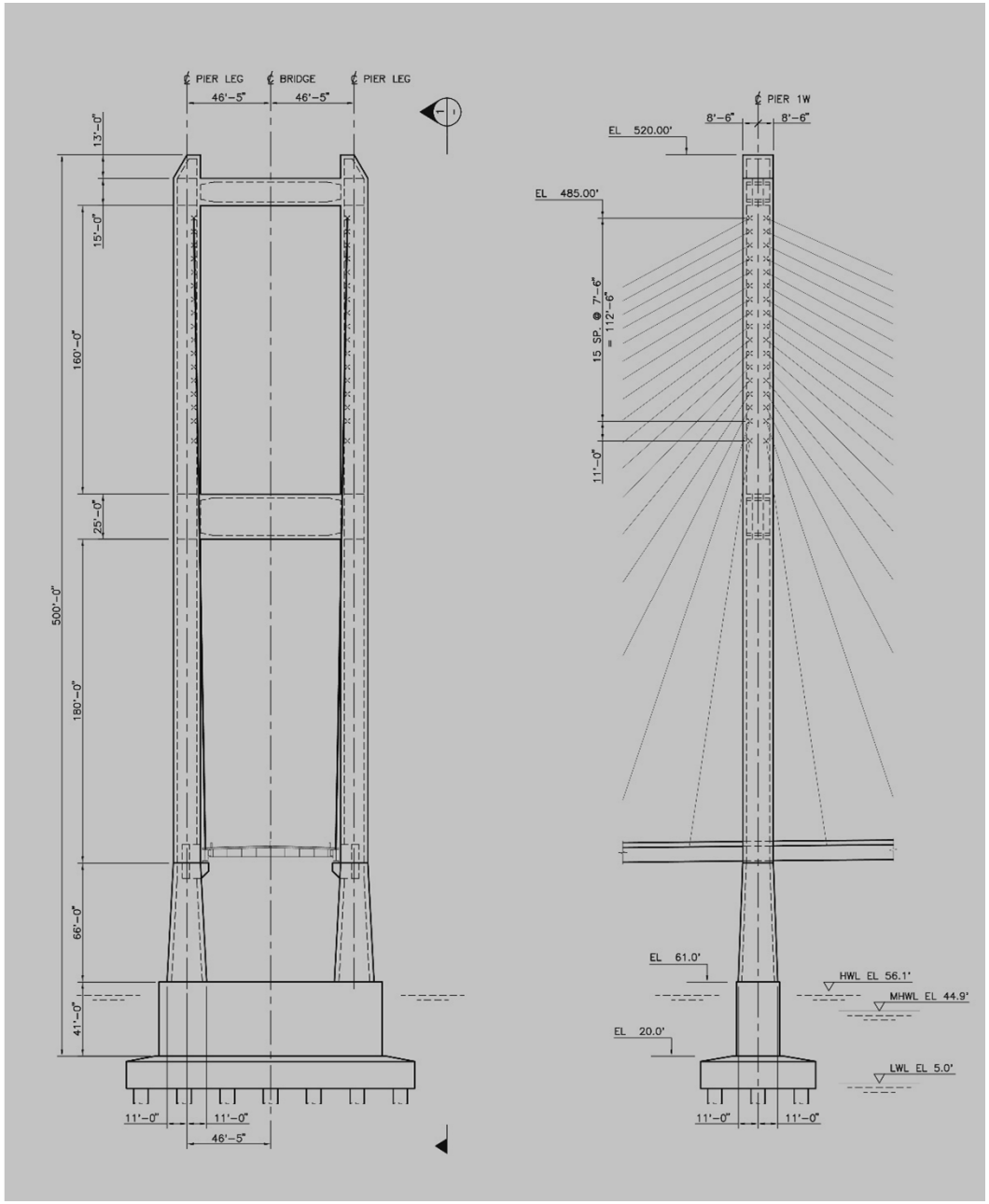
Remove Cofferdam

- Remove sheeting
- Remove Bracing
- Patch blockouts

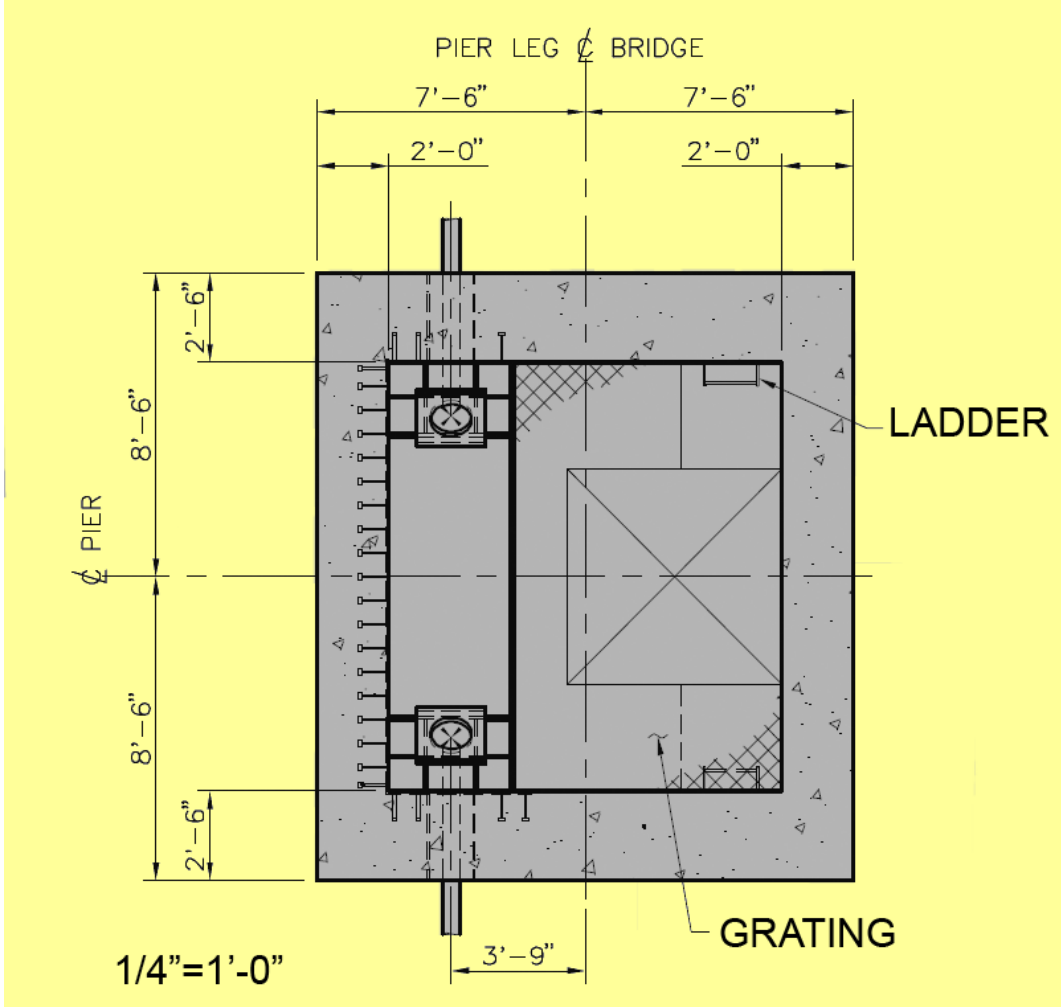


Main Span Towers

- 500’ high
- 136 cable stays
- 2 Crossbeams
- Top of tower is elevation 520’
- Deck Elevation is 130’
- Corbels for deck support
- Maintenance traveler under the deck



Tower Cross Section



- Anchor box sections for simple jump forming
- Cable anchorage inside tower wall
- Elevator in each leg

Tower and Cross-Beam Forms

Main span Superstructure

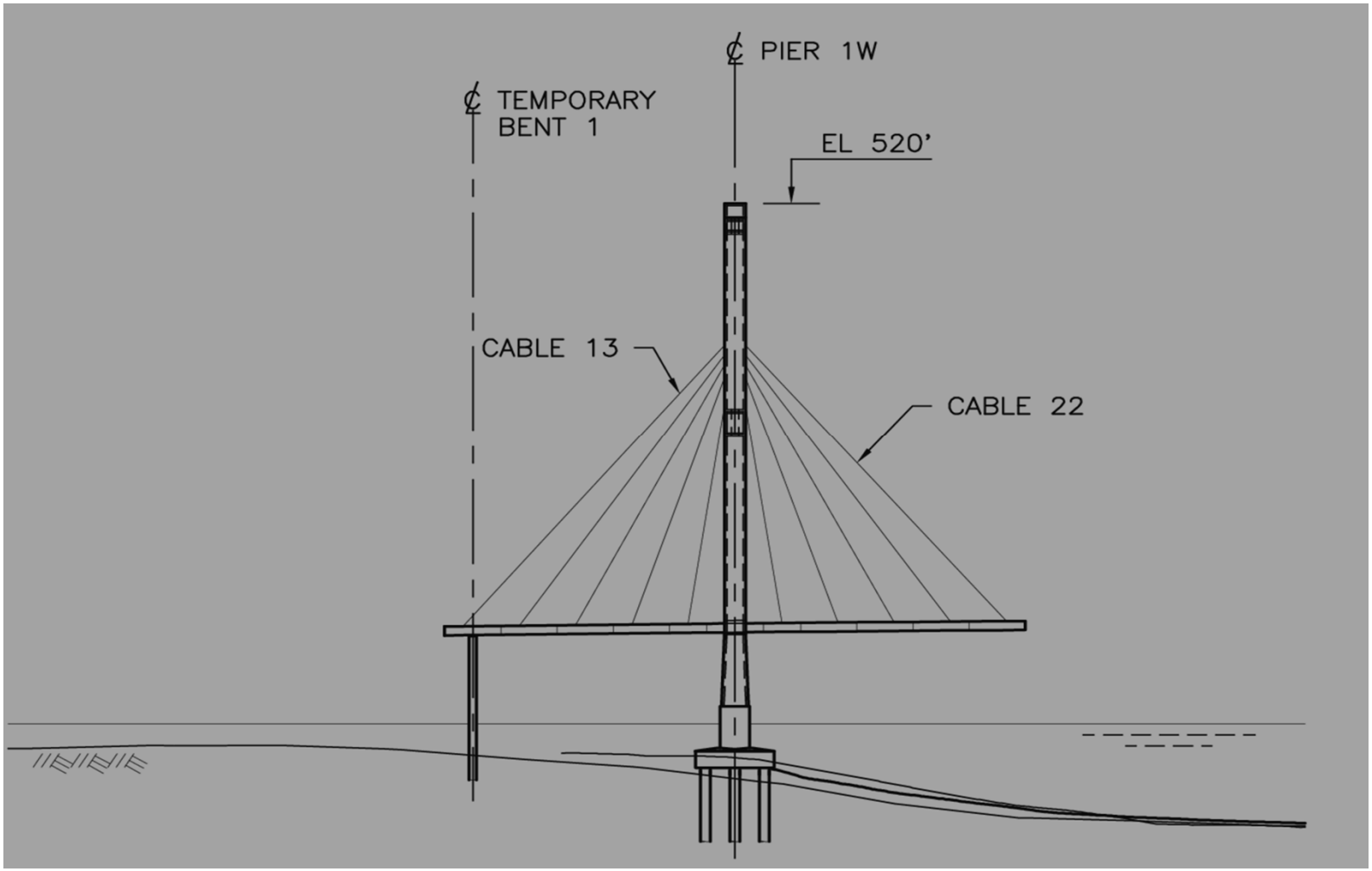
Stage-by-Stage Analysis

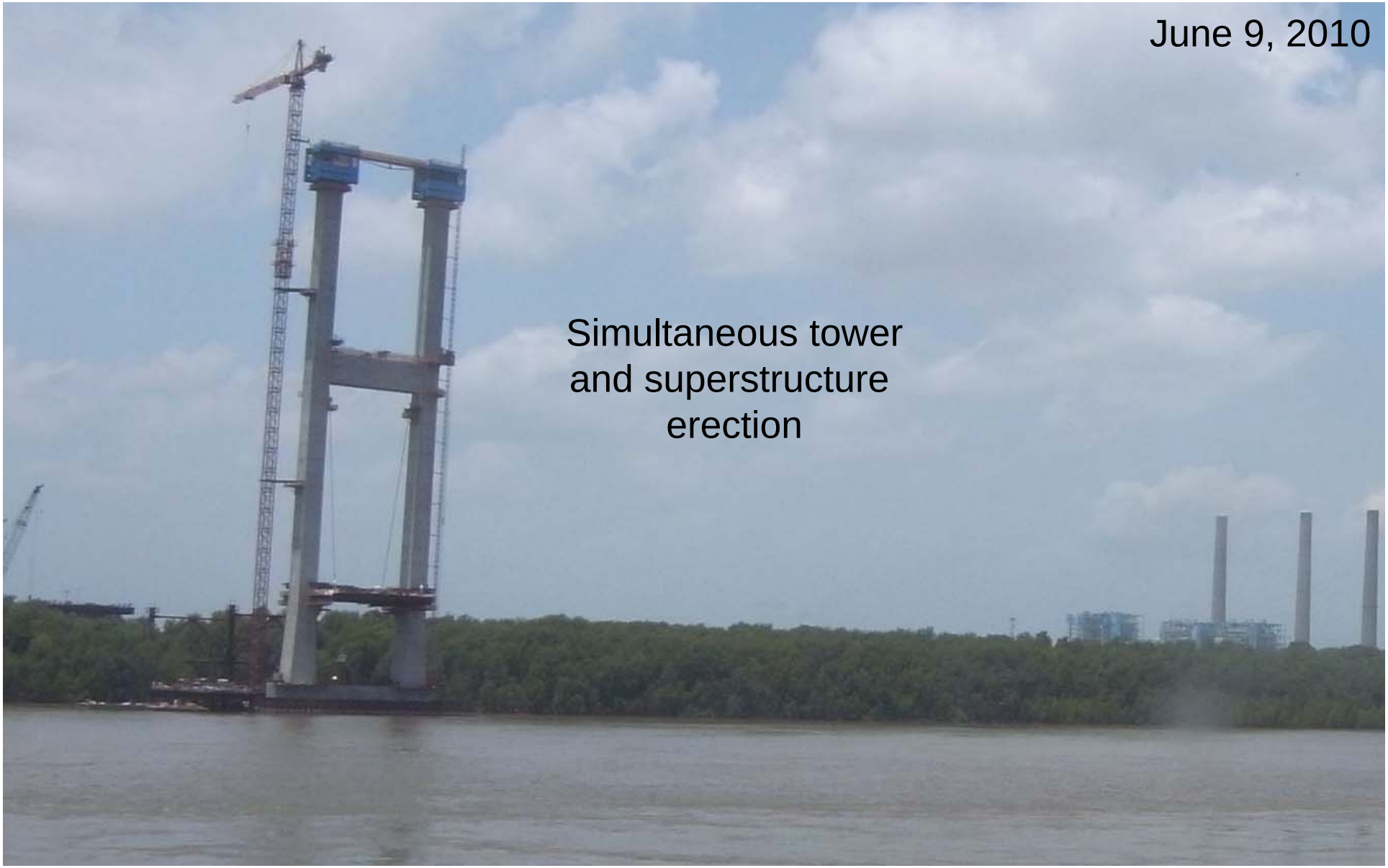
- Structure built one segment at a time
- Precisely captures locked-in effects
- Models time-dependent effects during construction
- Required for tracking bridge geometry during construction
- Performed prior to bridge construction

Construct pier table

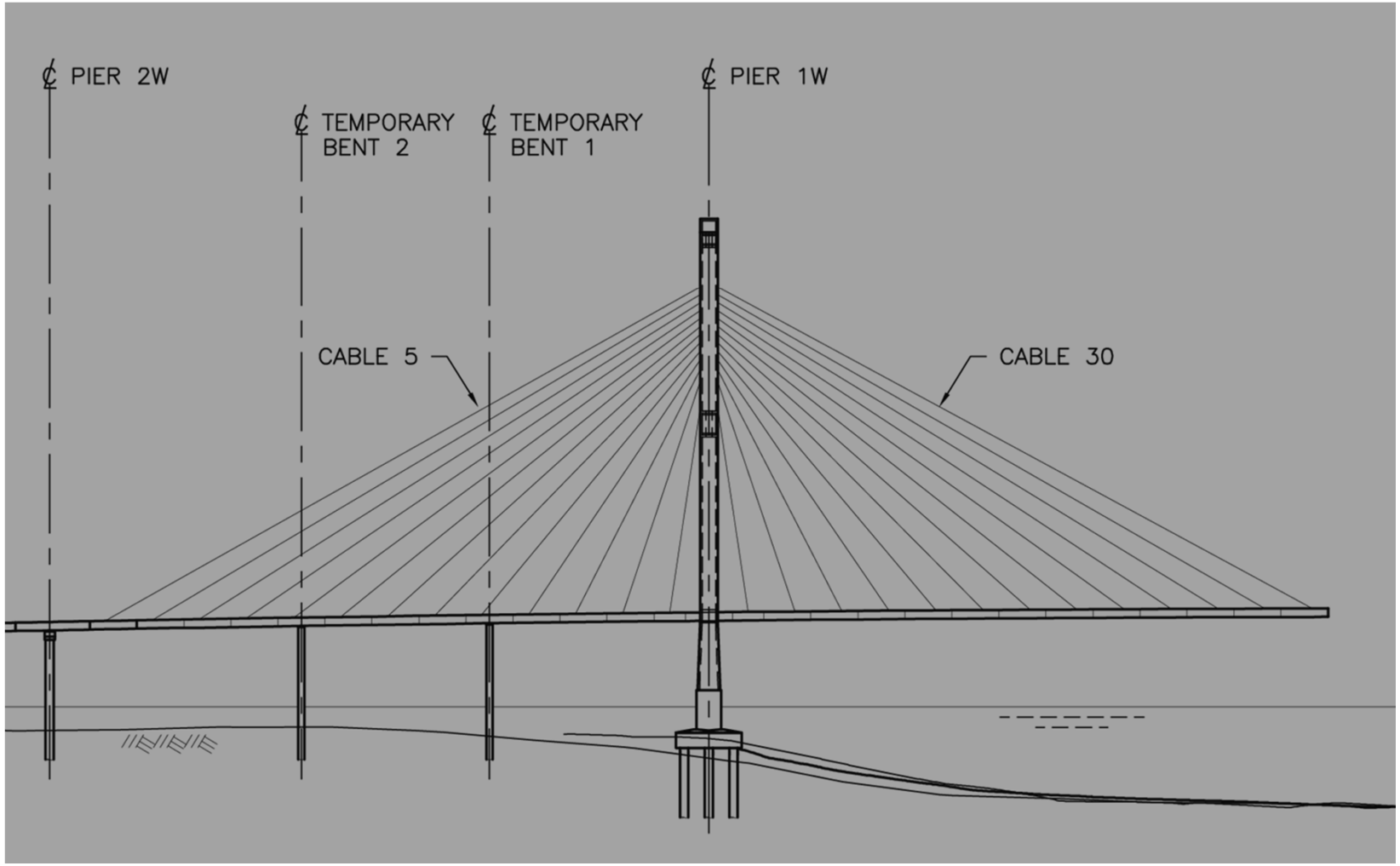

April 4, 2010
Pier Table Erection

Bridge Construction




June 9, 2010
Simultaneous tower
and superstructure
erection

Bridge Construction

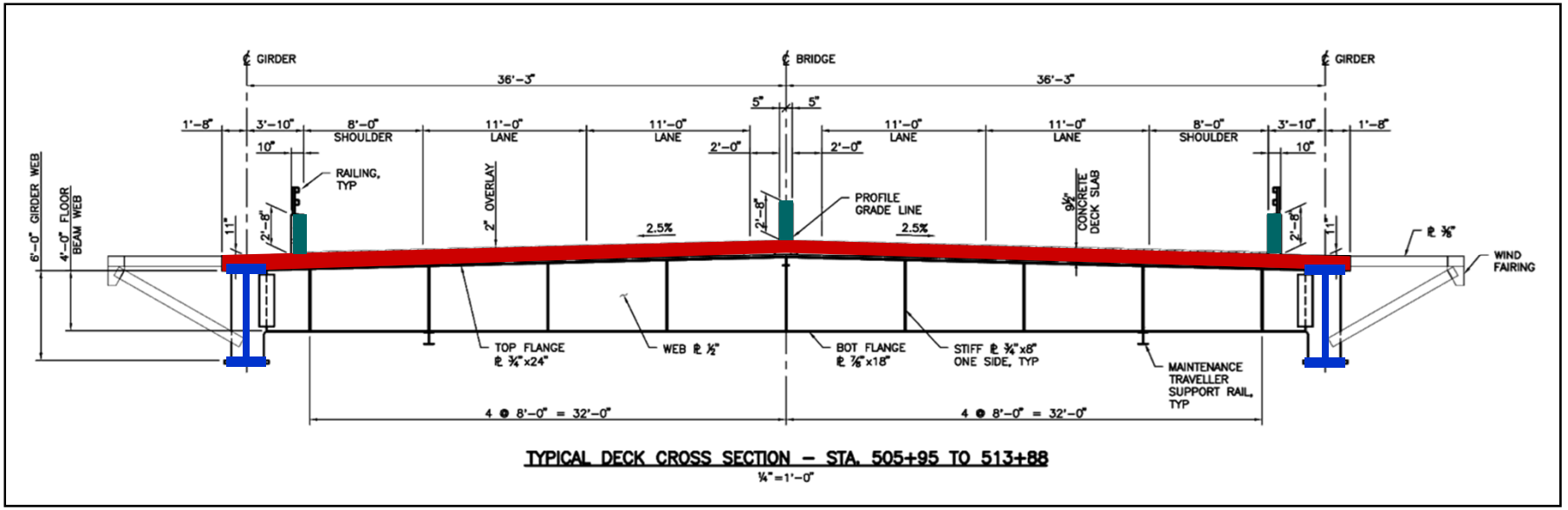



November 7, 2010
Completion of
Backspan and Transition Span


December 12,
2010

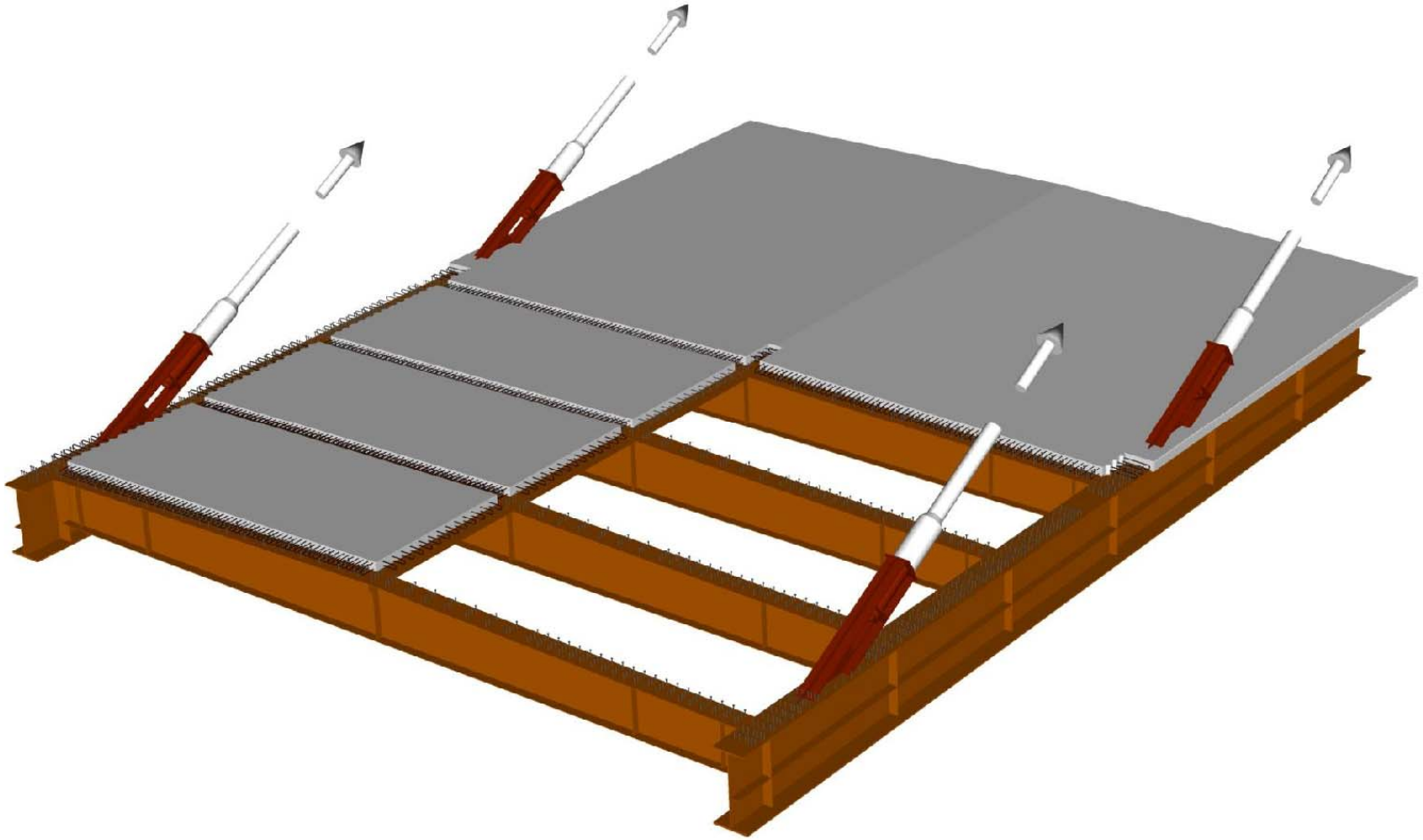
12/29/2010

Composite Deck Cross-Section



- Economy, simplicity and constructability
- Durability
- Accessibility
- Low maintenance

Composite Deck Cross-Section




12/28/2010

Stay System

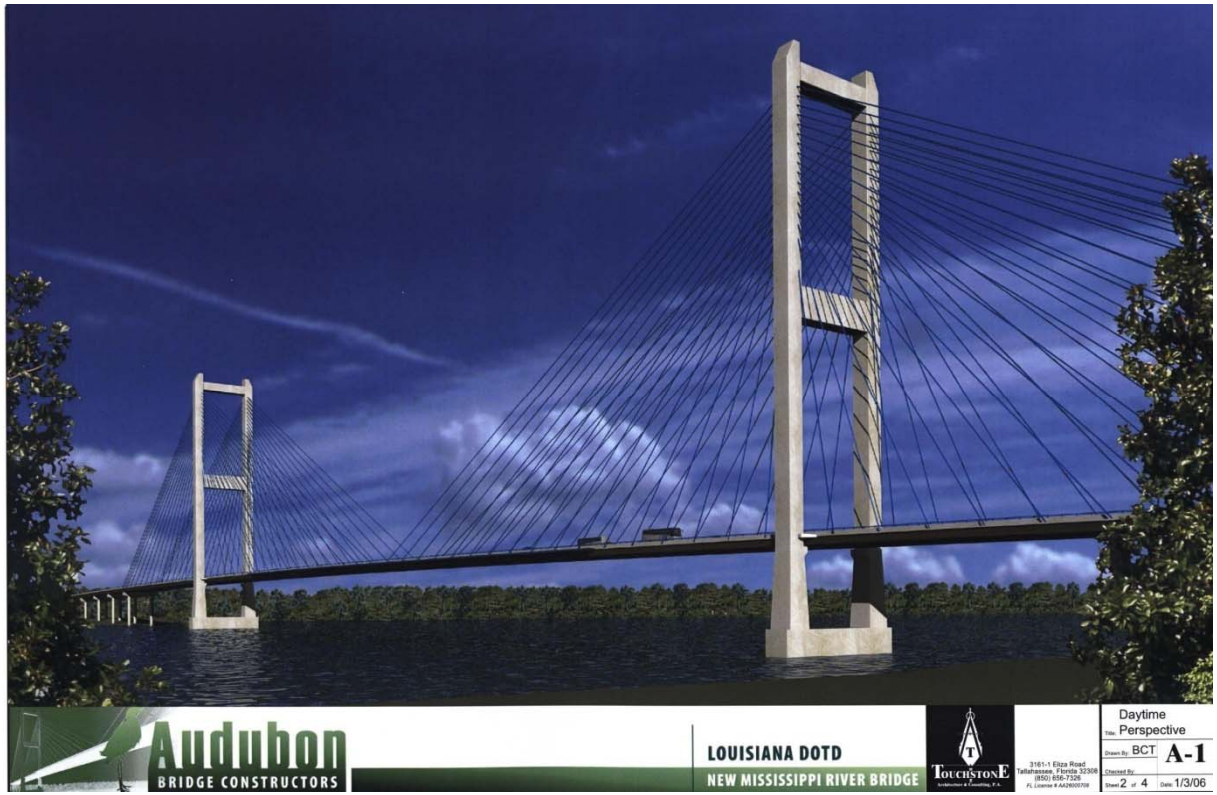
- 7-Wire parallel strand
- Monostrand Jacking
- State-of-the-Art Corrosion Protection
  - Galvanizing
  - Grease
  - Strand PE
  - Coextruded HDPE Pipe
- Vibration suppression
- Anti-Vandilism end pipe


01/04/2008

Audubon BRIDGE CONSTRUCTORS

Joint Venture of:

- **Granite Construction**
- **Flatiron Construction**
- **Parsons Transportation Group**



DOTD
LOUISIANA DEPARTMENT OF TRANSPORTATION & DEVELOPMENT

LTM – LOUISIANA TIMED MANAGERS – PB, GEC, LPA Group
Main Span EOR: Buckland Taylor & Parsons Transportation
LA DOTD Project Manager - DOTD Bridge Design Section