Michael Baker INTERNATIONAL

*Innovation Done Right...We Make a Difference*

# Milton Madison Bridge Project

## August 25th, 2014 - New Orleans, LA


SASHTO
NEW ORLEANS, LOUISIANA
2014

RBF CONSULTING | jma | THE LPA GROUP TRANSPORTATION CONSULTANTS | KASEMAN | SALLYPORT

**Presenter: Aaron Stover, PE, SE**

# Project Partners

MILTON-MADISON BRIDGE PROJECT

Michael Baker INTERNATIONAL

## Owners

INDIANA DEPARTMENT OF TRANSPORTATION — INDOT

DEPARTMENT OF TRANSPORTATION — UNITED STATES OF AMERICA

KENTUCKY TRANSPORTATION CABINET

## Design Build Team

BURGESS & NIPLE

WALSH — Walsh Construction

BUCKLAND & TAYLOR LTD. — a COWI company

## Preliminary Engineering and Consultant Oversight

Michael Baker INTERNATIONAL

AMERICAN STRUCTUREPOINT INC.

CDM WilburSmith ASSOCIATES

# The Challenge

MILTON-MADISON BRIDGE PROJECT

Michael Baker INTERNATIONAL

- **Existing Bridge**
  - 80+ year old bridge
  - Structurally Deficient
  - Functionally Obsolete
  - Sufficiency Rating of 6.5
  - Remaining life <10 years
- **Constructible Affordable Replacement Bridge**

# Presentation Outline

MILTON-MADISON BRIDGE PROJECT

Michael Baker INTERNATIONAL

- **Project Overview**
- **Procurement**
- **Maintenance of Traffic**
- **Truss Lifts**
- **Lateral Bridge Slide**

# Project Location Map


## Location

One of two Ohio River bridges between Cincinnati and Louisville

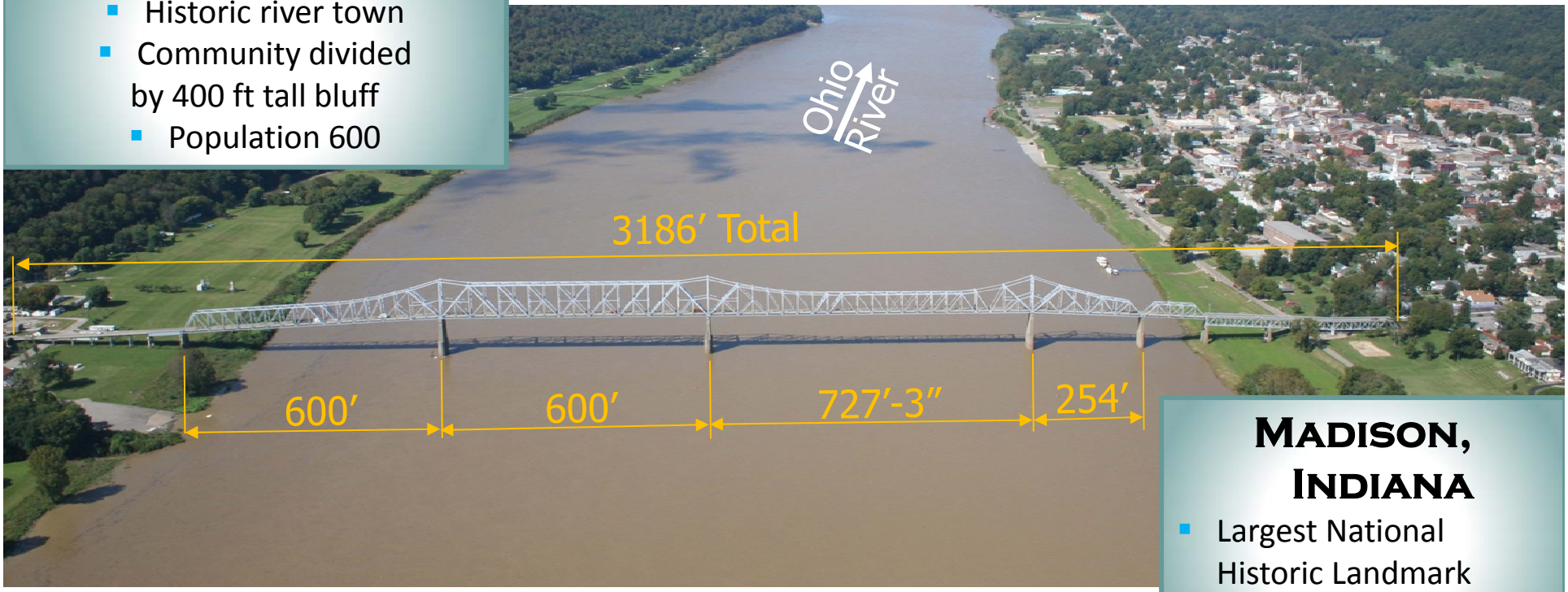
I-65 Bridge - 46 miles
Markland Dam - 26 miles
I-275 Bridge – 65 miles

# Project Site

Michael Baker INTERNATIONAL

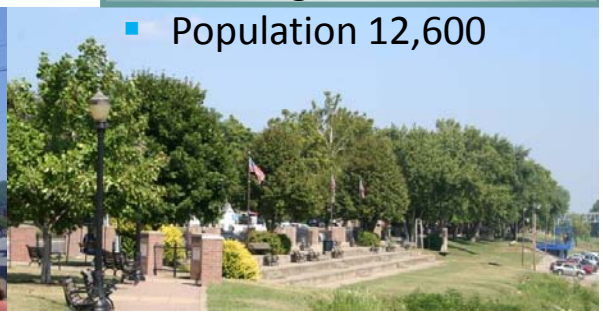
## Milton, Kentucky

- Historic river town
- Community divided by 400 ft tall bluff
- Population 600

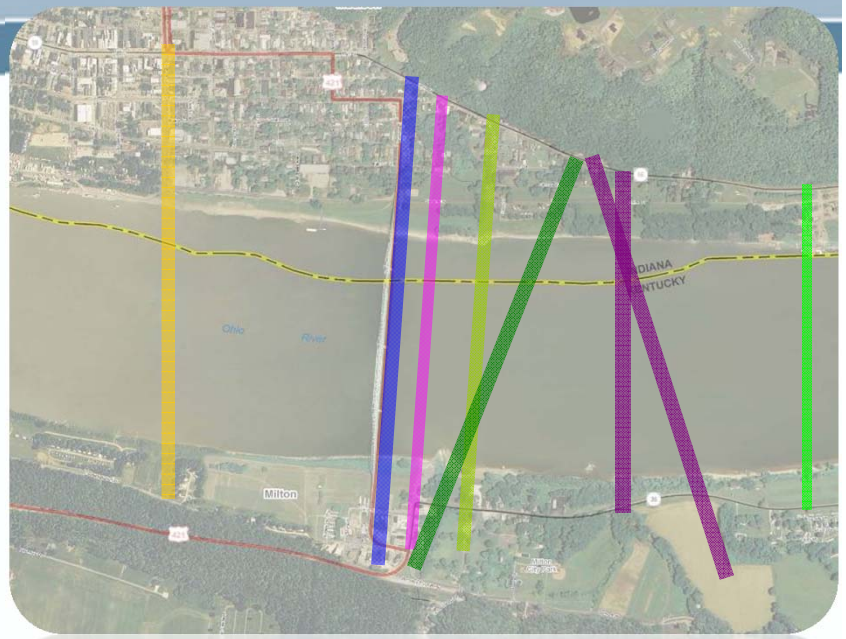



## Madison, Indiana

- Largest National Historic Landmark District with 1,800+ buildings
- Population 12,600

# Bridge Alternatives



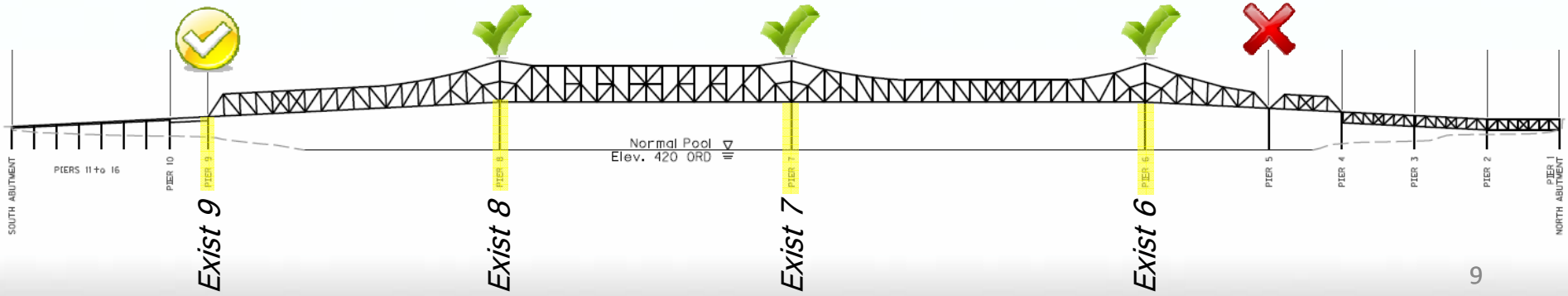

- **Do Nothing**
- **Rehabilitation**
- **Bridge Replacement**
- **Superstructure Replacement**
  - Potential game changer
  - Lower costs
  - Less impacts to the historic district
  - But is it Feasible?

# Challenges in Reusing Existing Piers

- **Double the Bridge Width**
- **75 service life**
- **Updated Design loads, Wind, Vessel Collision, Seismic**
- **Consideration of soil support loss (scour)**
- **Limited existing rock capacity.**
- **12 months max closure**

# Pier Testing and Inspection

- **Vertical Coring *(Jan-Feb 09)***
- **Physical Inspection Feb-Mar09**
  - NDT, Lab Testing of Samples
  - Condition/ Service life
- **Results, Generally good**
  - Some durability concerns

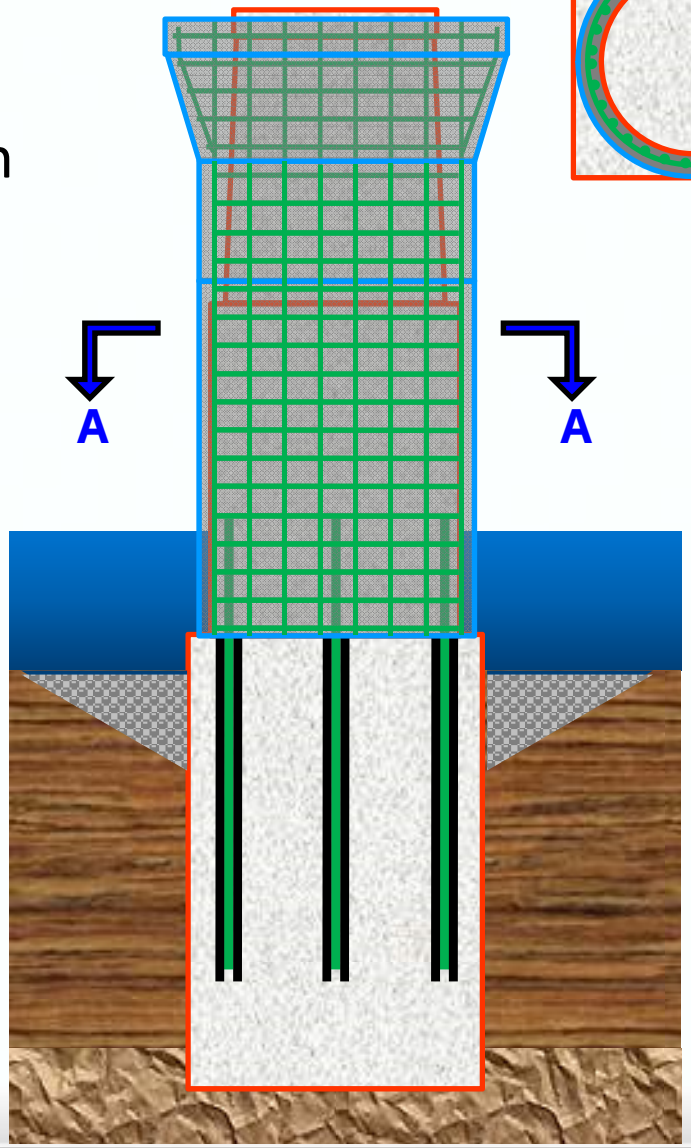


# Pier Strengthening

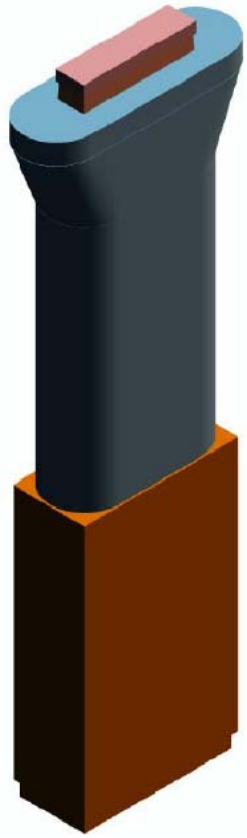
MILTON-MADISON BRIDGE PROJECT

Michael Baker INTERNATIONAL

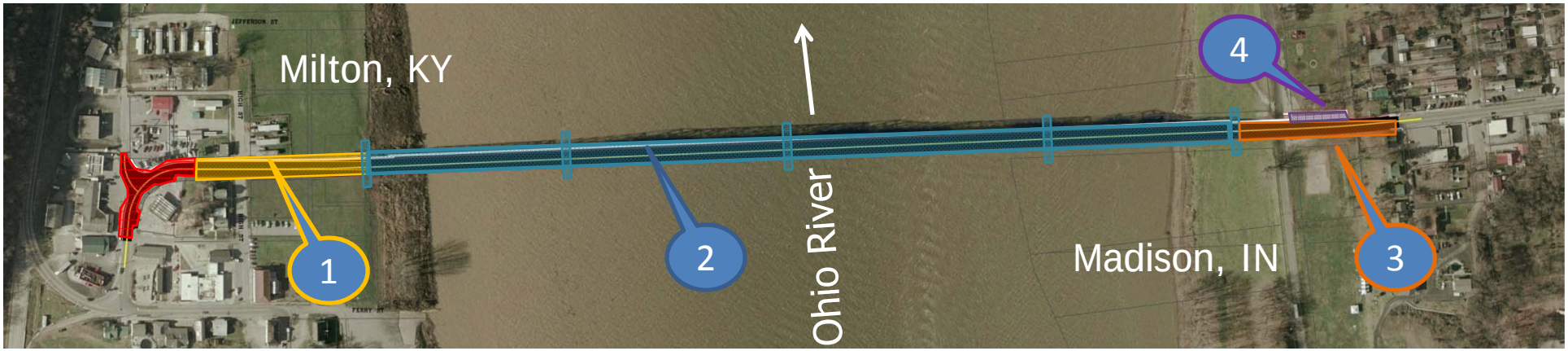
1. Drill holes into ex. caisson
2. Grout Rebar into Caisson
3. Add Stem Reinforcement
4. 2’ thick encapsulation
5. Pier Cap Reinforcement
6. Cast new Pier cap
7. Scour Countermeasure




SECTION A-A



# Superstructure Replacement

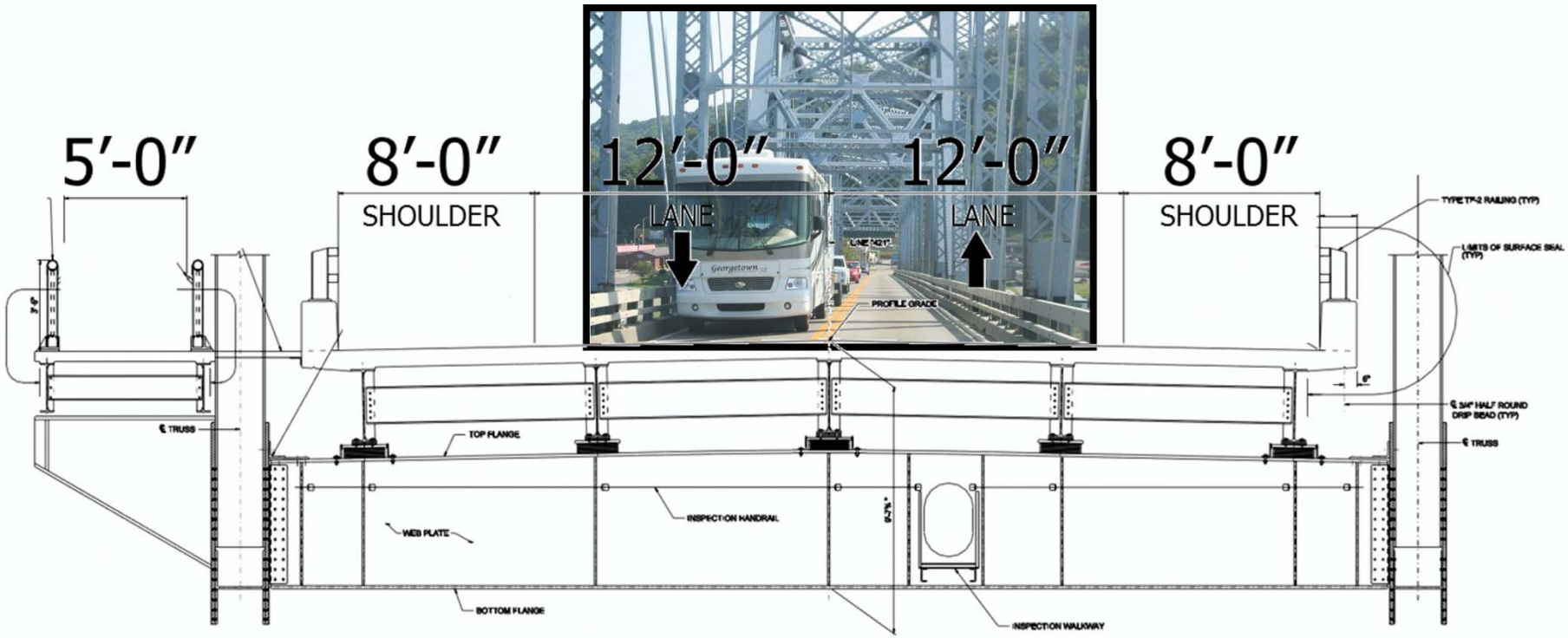



- **Milton Approach Re-construction**
- **STR 1 Replace KY Approaches**
- **STR 2 Truss Replacement**
  - Pier Strengthening And Scour Mitigation
  - Superstructure Replacement
- **STR 3 – Replace IN Approaches**
- **STR 4 – Pedestrian Access**

***No Right-of-Way required***

# Typical Section

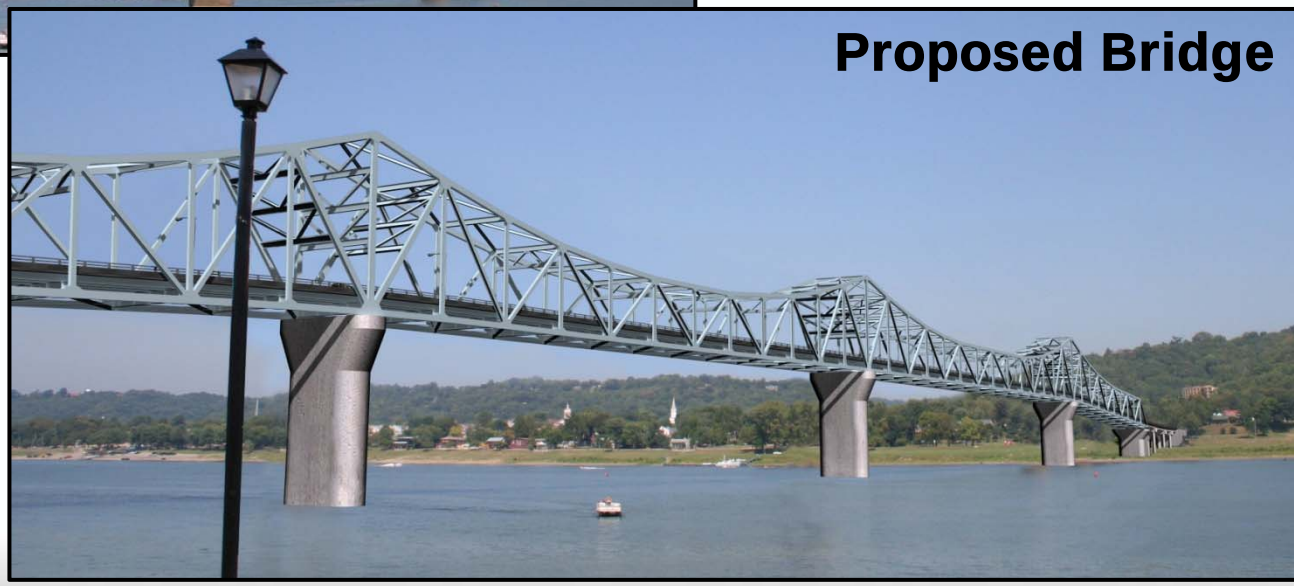
- *Existing 20ft Curb to Curb*
- **Proposed 40ft Curb to Curb**
- **5 ft pedestrian walkway**



# Superstructure Replacement

MILTON-MADISON BRIDGE PROJECT

Michael Baker INTERNATIONAL

# 12 Month Closure

MILTON-MADISON BRIDGE PROJECT

ael Baker
NATIONAL

# Why Design-Build?

- **Little Room for Innovation**
  - Very prescriptive project
- **Aggressive Schedule**
  - TIGER required substantial completion in 2012
  - No R.O.W. or Utilities
- **Minimize Impacts**
  - 12 Month Closure
  - Overall Duration
- **Just one problem…**
  - Kentucky didn't have D/B legislation in place.
  - But INDOT did…

# Design/Build Letting Summary

- **September 22, 2010**
- **Five Contractors submitted bids**
- **Formula for Effective Bid Price**
  - lowest effective bid wins
- **[A + B – Adjustment]**
  - A = construction cost
  - B = closure days x $25,000/day.
  - Adjustment = $3.75 million for early opening

    *(Sept 2012 or May 2013)*

# Design/Build Letting Summary

- **September 22, 2010**
- **Five Contractors submitted bids**
- **Formula for Effective Bid Price**
  - lowest effective bid wins

Walsh Construction

- **[A + B – Adjustment]**
  - A = construction cost *($102-$127 million)*
  - B = closure days x $25,000/day. *(365 days max)*
  - Adjustment = $3.75 million for early opening *(Sept 2012 or May 2013)*

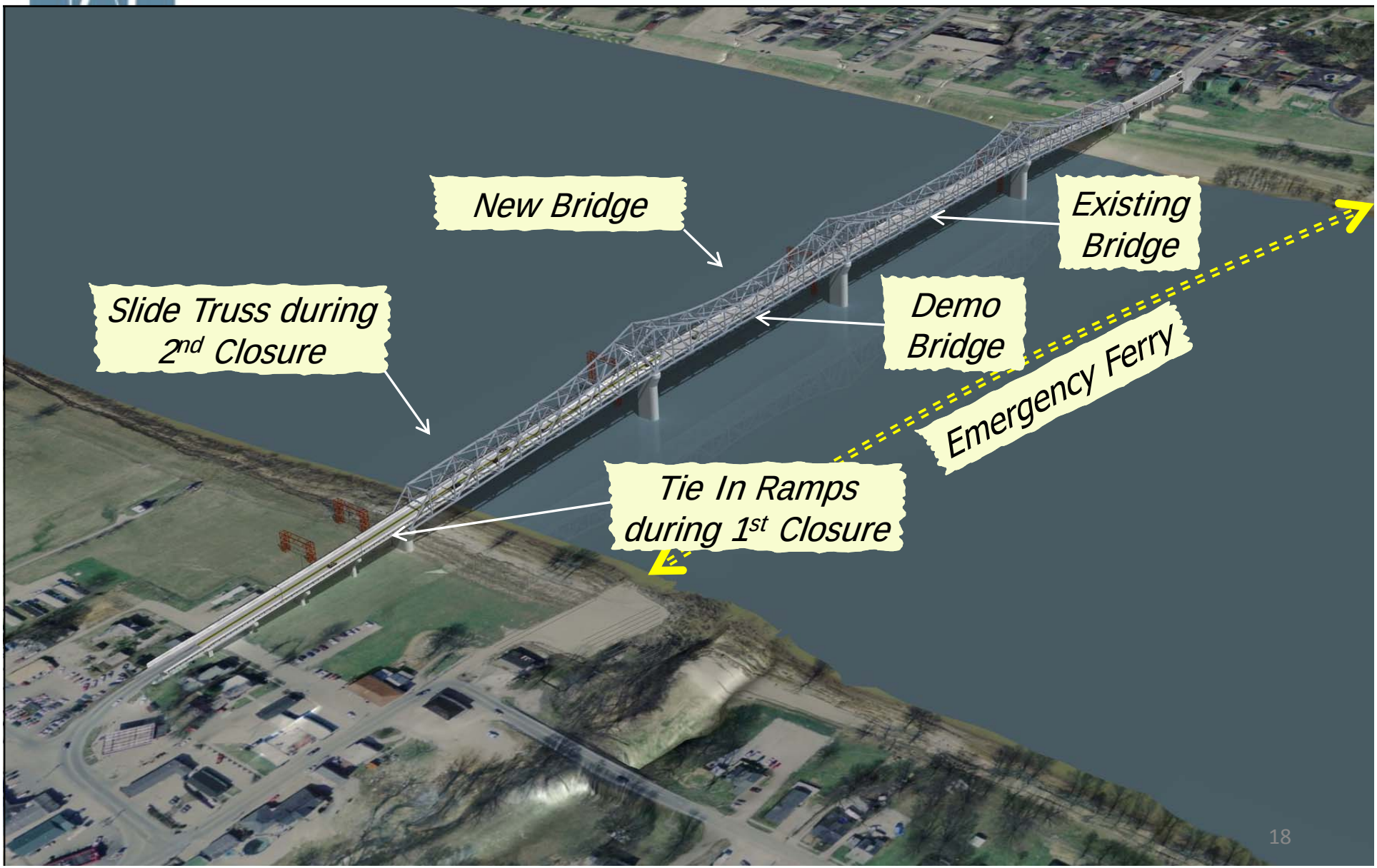
**$103.7 M**

**10 Days**

**Sept 2012**

# Maintenance of Traffic

Michael Baker INTERNATIONAL

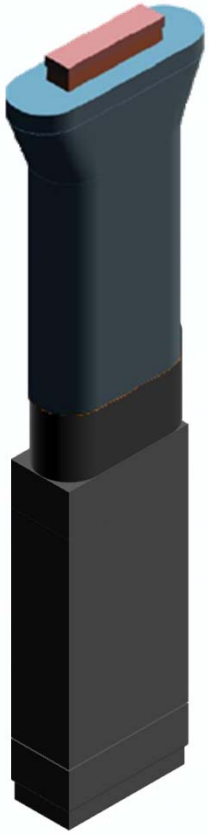


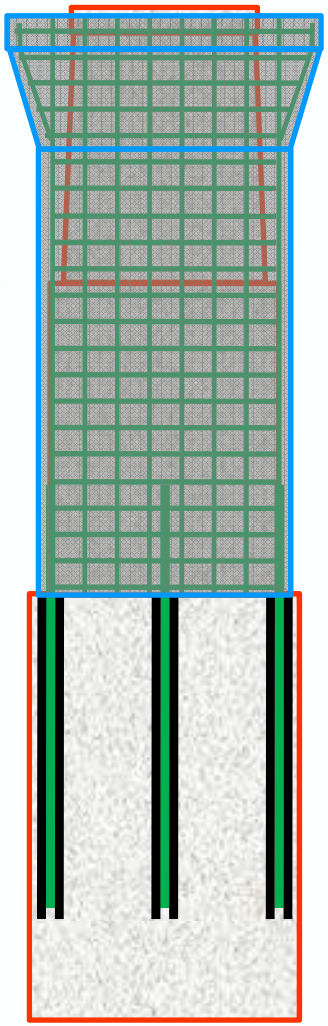
# Maintenance of Traffic

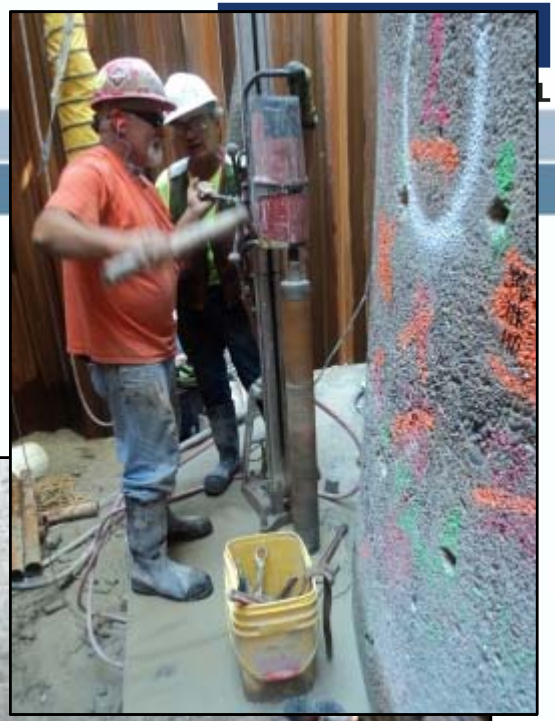
MILTON-MADISON BRIDGE PROJECT

Michael Baker INTERNATIONAL

# Pier Strengthening

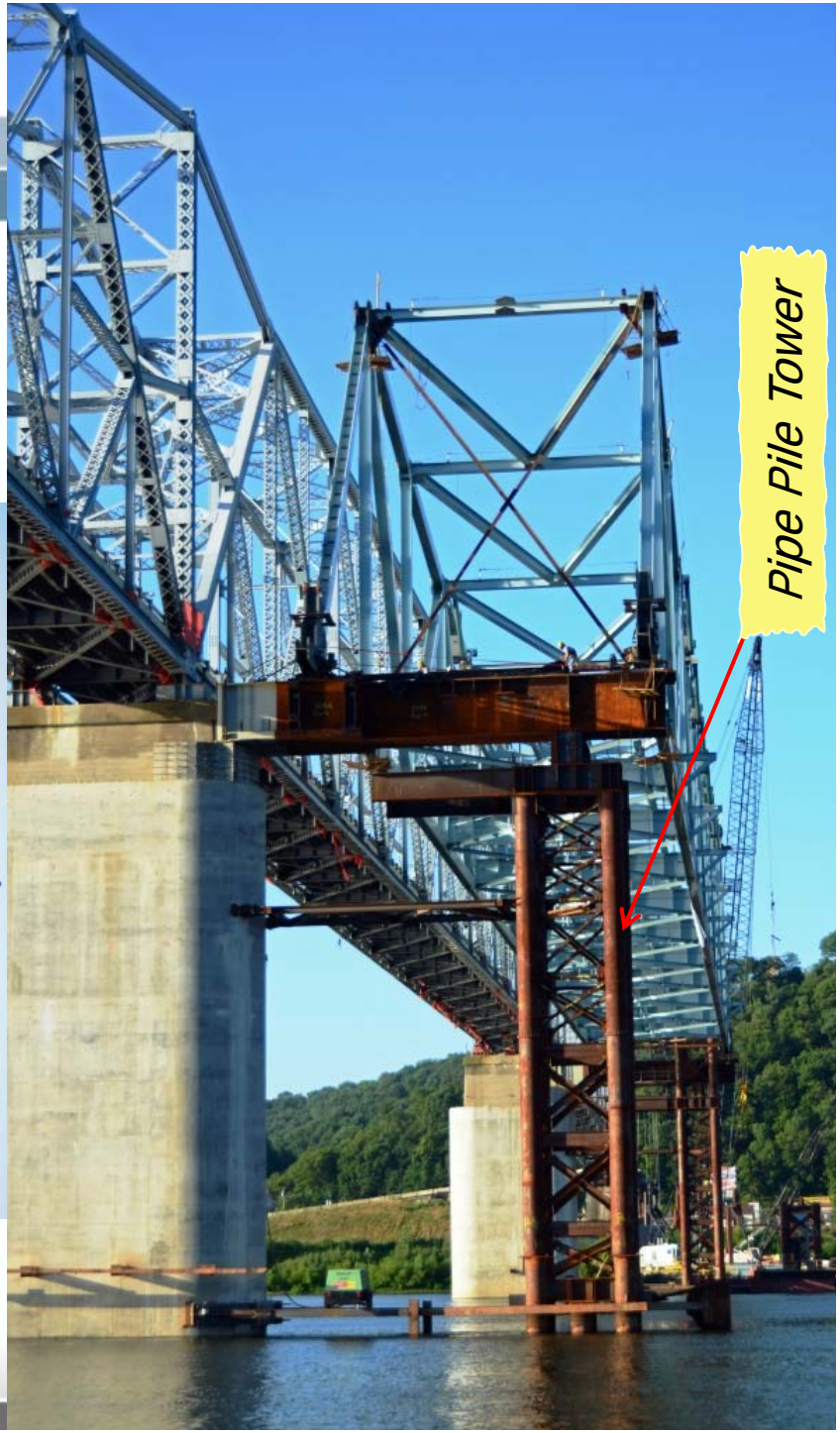






# Temp Tower

- ***Temporary Towers supporting the truss***

# Span 2 Floated Out (June '12)

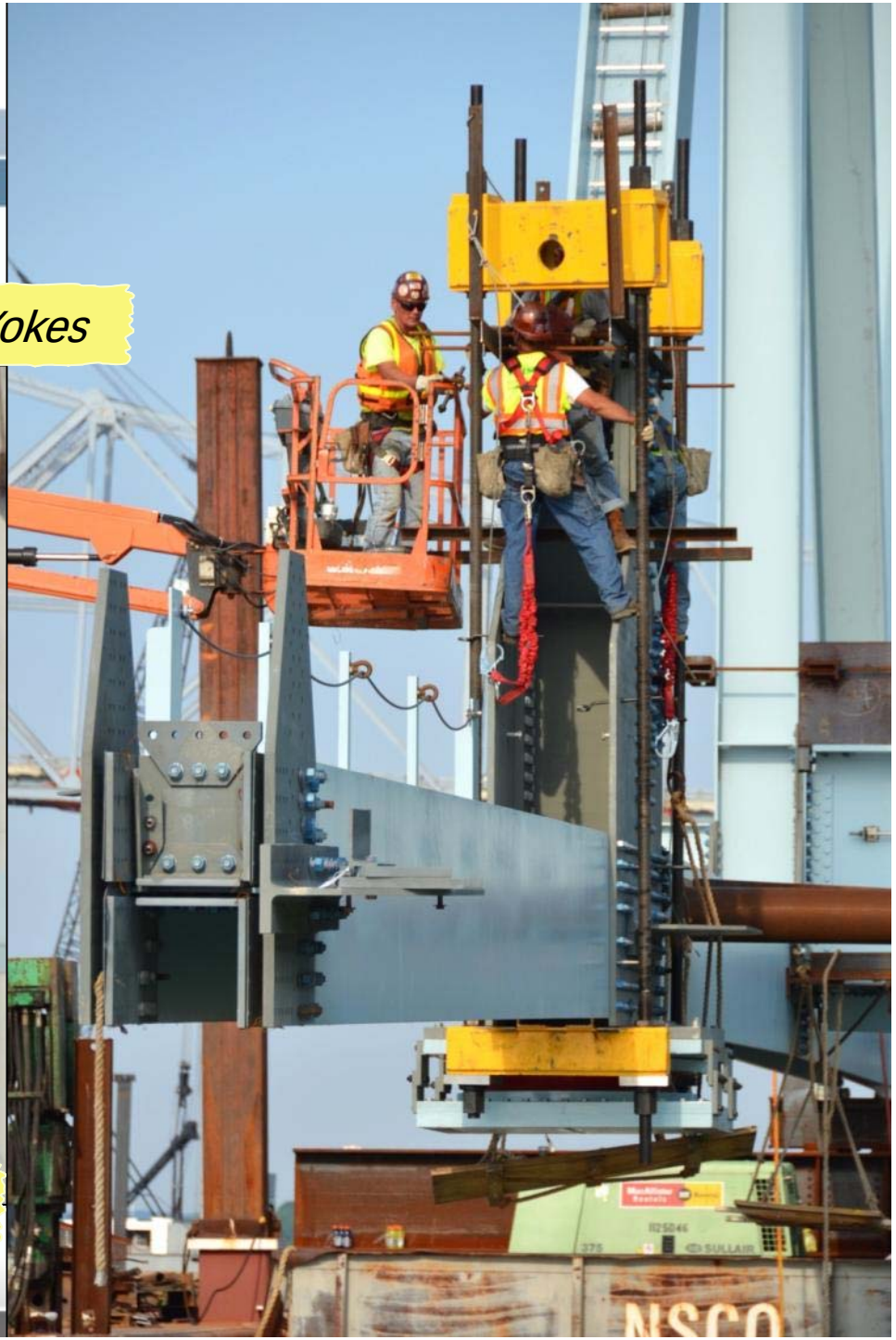
Michael Baker INTERNATIONAL

# Strand Jack

- **Span 2 Lift**
  - 600 ft Section
  - 1776 ton lift
  - 8 – 360T VSL jacks
  - 22” Stroke
  - 2.5 Safety Factor

# Lifting Yokes

MILTON-MADISON BRIDGE PROJECT

# Span 3 Lift – 9/10/12

MILTON-MADISON BRIDGE PROJECT

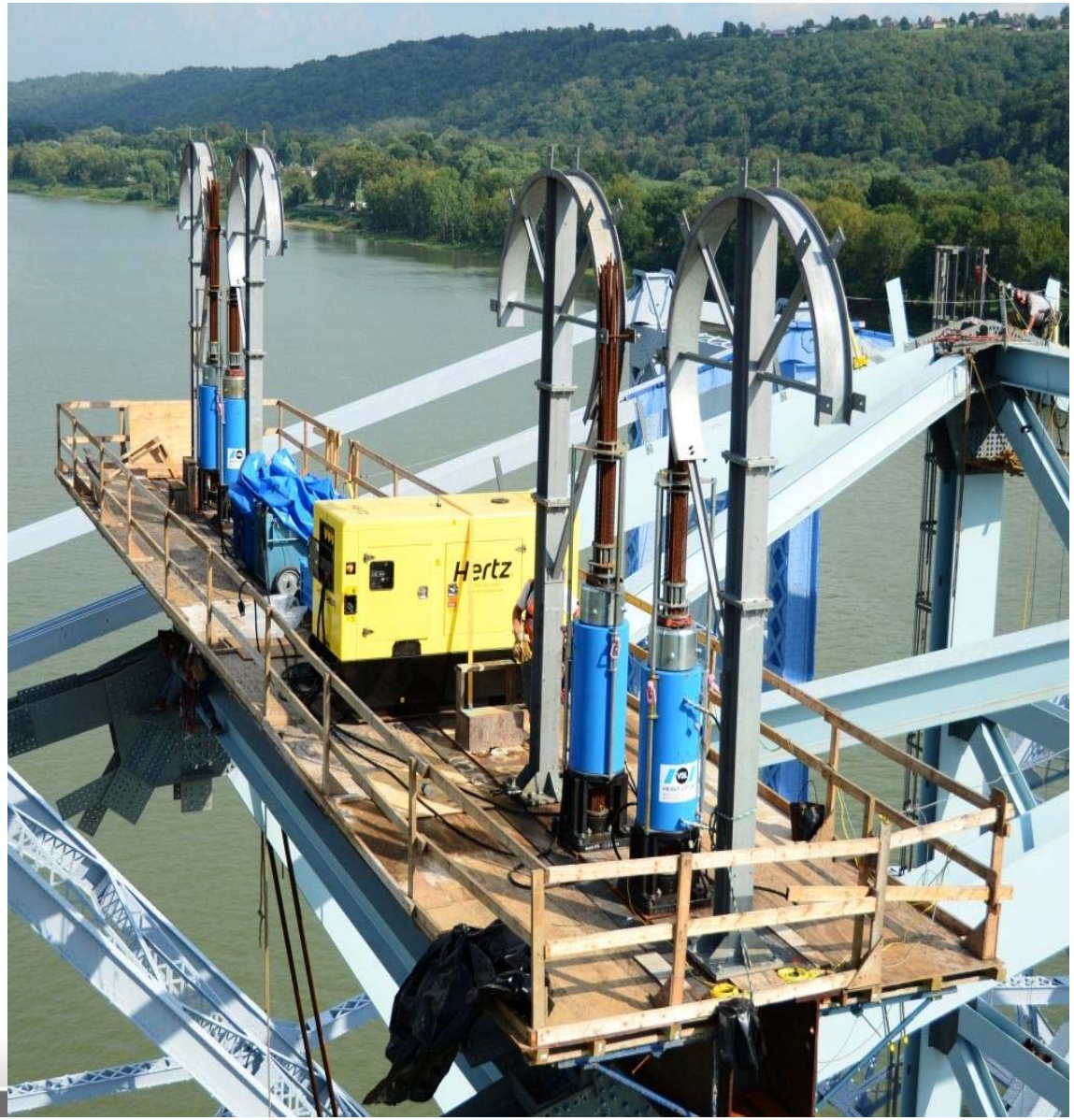
Michael Baker INTERNATIONAL

# Jacking Platform

MILTON-MADISON BRIDGE PROJECT

Michael Baker INTERNATIONAL

- **Span 3 Lift**
  - ~727 ft Section
  - 1900 Ton lift
  - **24 hr Closure**
  - 8 – 360T VSL jacks
  - 22” Stroke
  - 2.5 Safety Factor



# Sidewalk Superintendents

MILTON-MADISON BRIDGE PROJECT

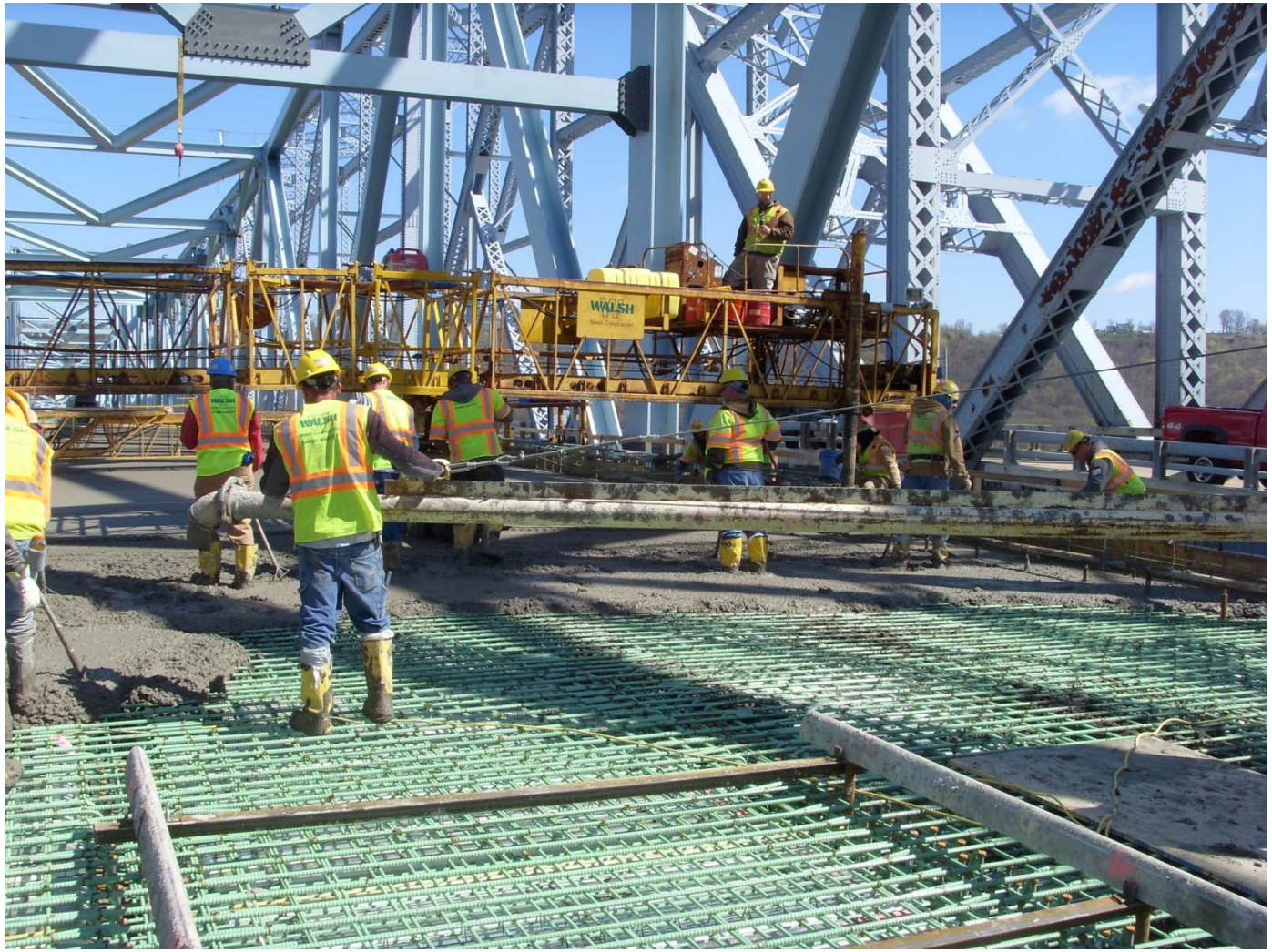
Michael Baker INTERNATIONAL

# Bridge Deck Placement

MILTON-MADISON BRIDGE PROJECT

Michael Baker INTERNATIONAL

- **2,427 L.F.**
- **3 pours of ~1,000 yd ea**
- **Spider and slickline for placement**



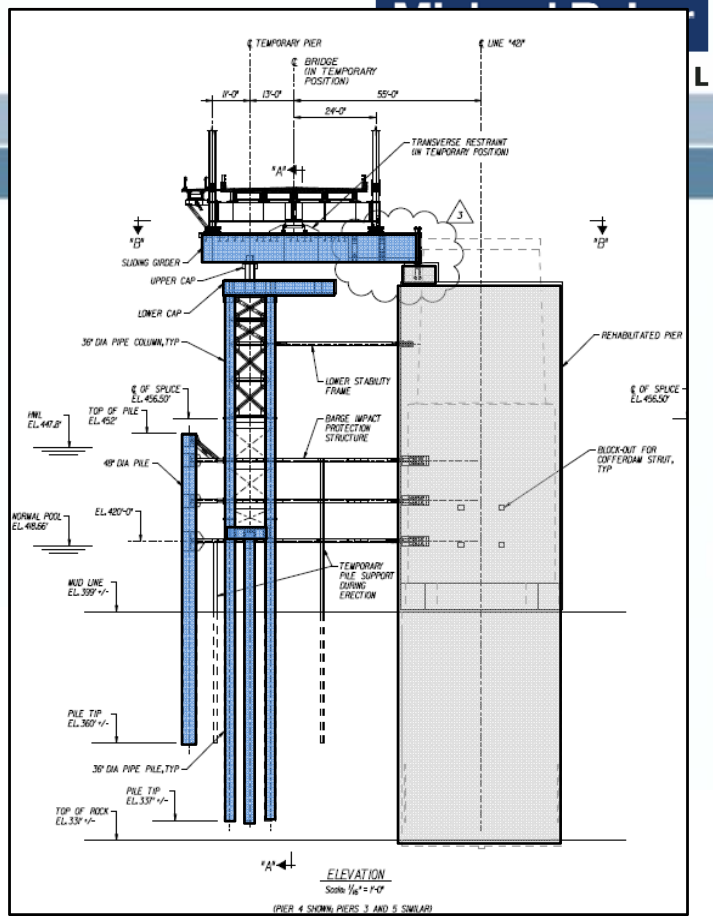
Michael Baker
INTERNATIONAL

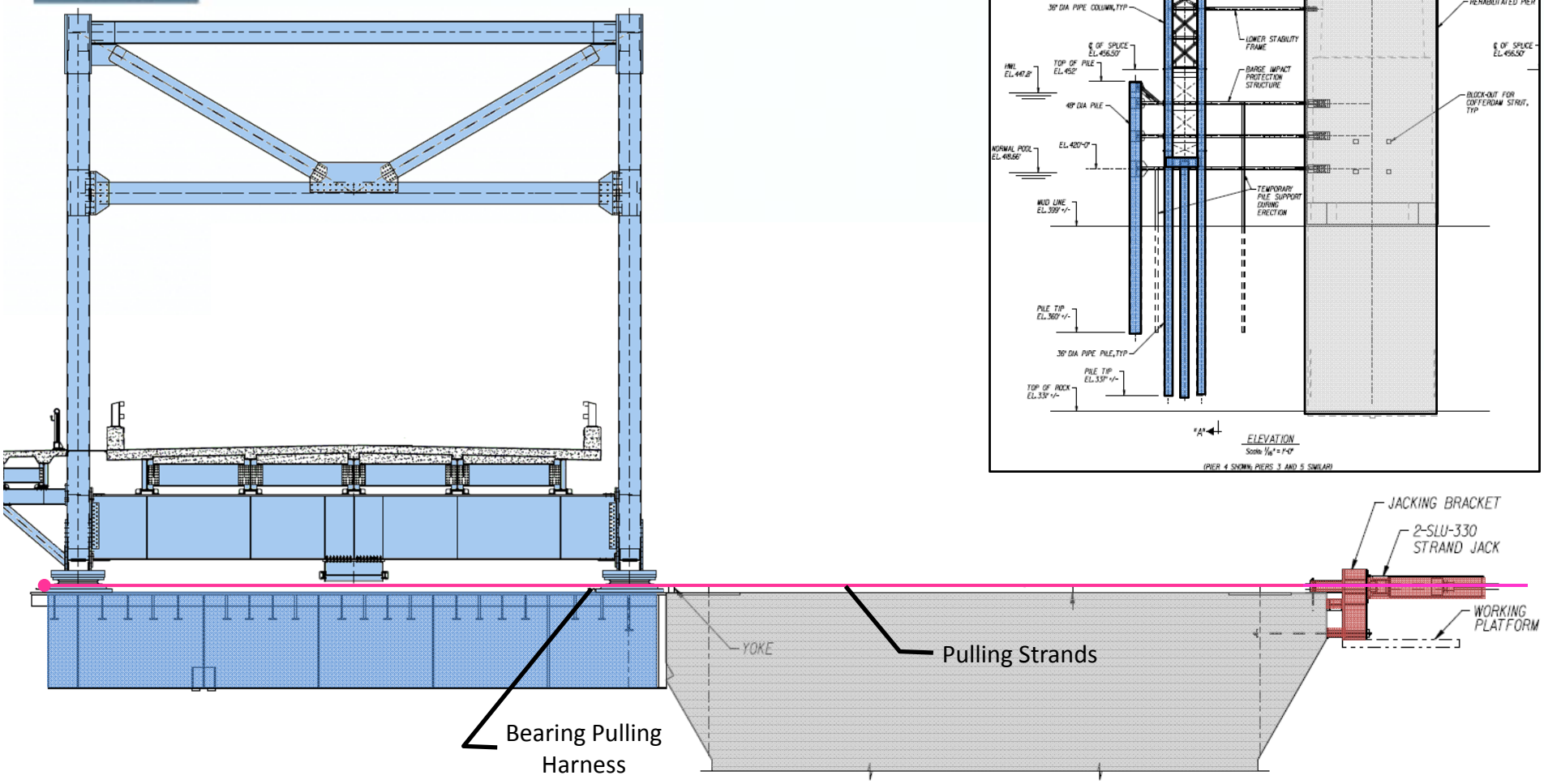
# Demolition

# New Truss on Temp Piers

Michael Baker
INTERNATIONAL

# Sliding

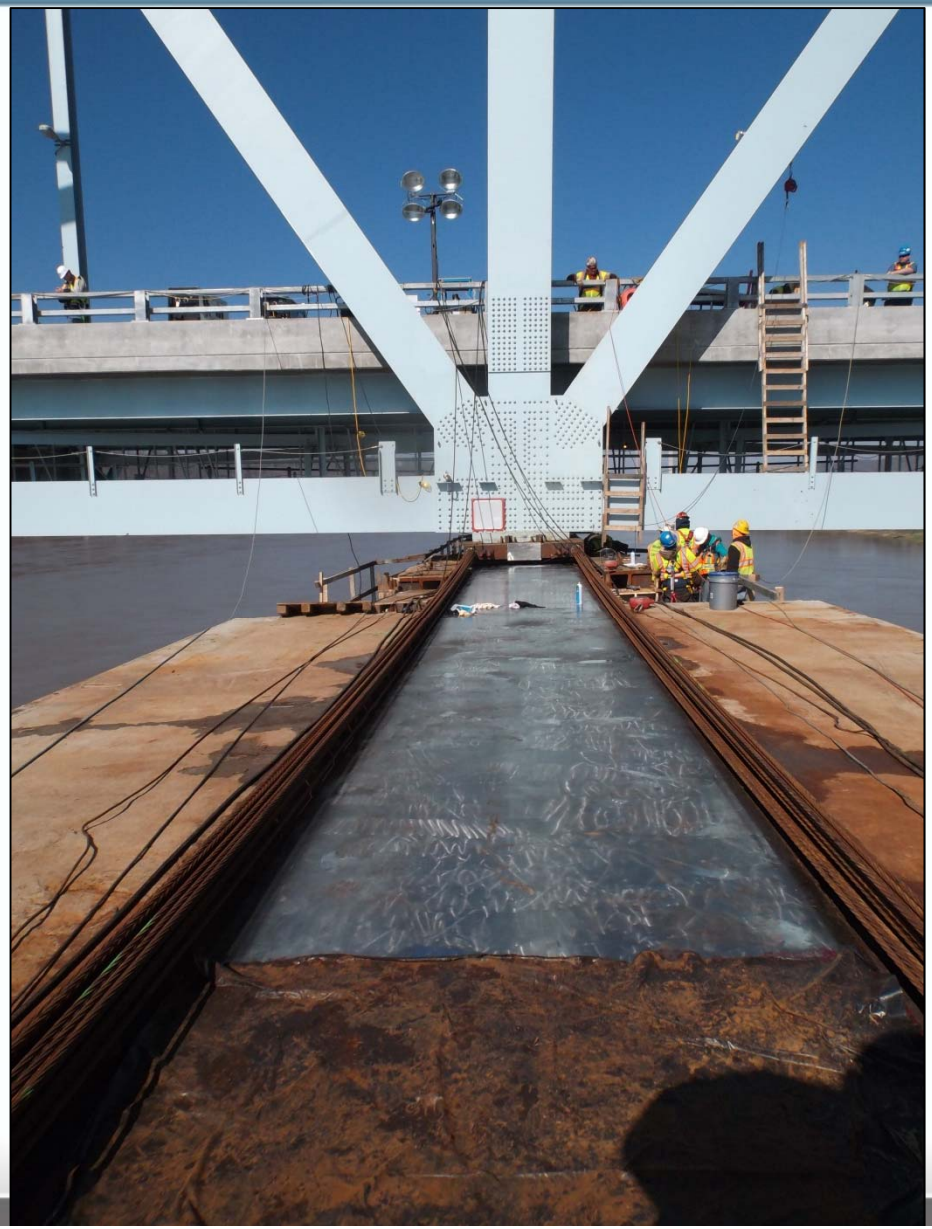

℄ TEMPORARY PIER
℄ BRIDGE (IN TEMPORARY POSITION)
℄ LINE "40"
TRANSVERSE RESTRAINT (IN TEMPORARY POSITION)
SLIDING GIRDER
UPPER CAP
LOWER CAP
36" DIA PIPE COLUMN, TYP
LOWER STABILITY FRAME
REHABILITATED PIER
BARGE IMPACT PROTECTION STRUCTURE
BLOCK-OUT FOR COFFERDAM STRUT, TYP
TOP OF PILE EL.452'
48" DIA PILE
NORMAL POOL EL.418.86'
EL.420'-0"
MUD LINE EL.399'+/-
TEMPORARY PILE SUPPORT DURING ERECTION
PILE TIP EL.360'+/-
36" DIA PIPE PILE, TYP
PILE TIP EL.333'+/-
TOP OF ROCK EL.331'+/-
ELEVATION
(PIER 4 SHOWN; PIERS 3 AND 5 SIMILAR)


JACKING BRACKET
2-SLU-330 STRAND JACK
WORKING PLATFORM
YOKE
Pulling Strands
Bearing Pulling Harness

# Polishing Sliding Plates

MILTON-MADISON BRIDGE PROJECT

Michael Baker INTERNATIONAL

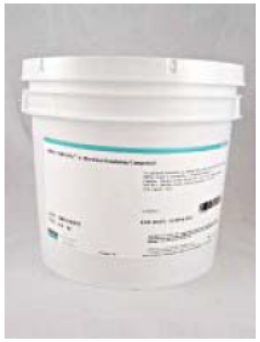



# Slide Lubricant

MILTON-MADISON BRIDGE PROJECT

Michael Baker INTERNATIONAL

## Product Details



Enlarge

### Product Name:

Dow Corning 4 Electrical Insulating Compound White 3.6 kg Pail

### Part#:

4 CMPD 3.6KG

### Description:

Dow Corning 4 Electrical Insulating Compound is practically nonvolatile, odorless, moisture resistant, electrically insulating, excellent rubber lubrication, excellent release and sealing properties, resistant to oxidation, essentially nontoxic and non-melting and shows little tendency to dry out in service. 3.6 kg Pail.

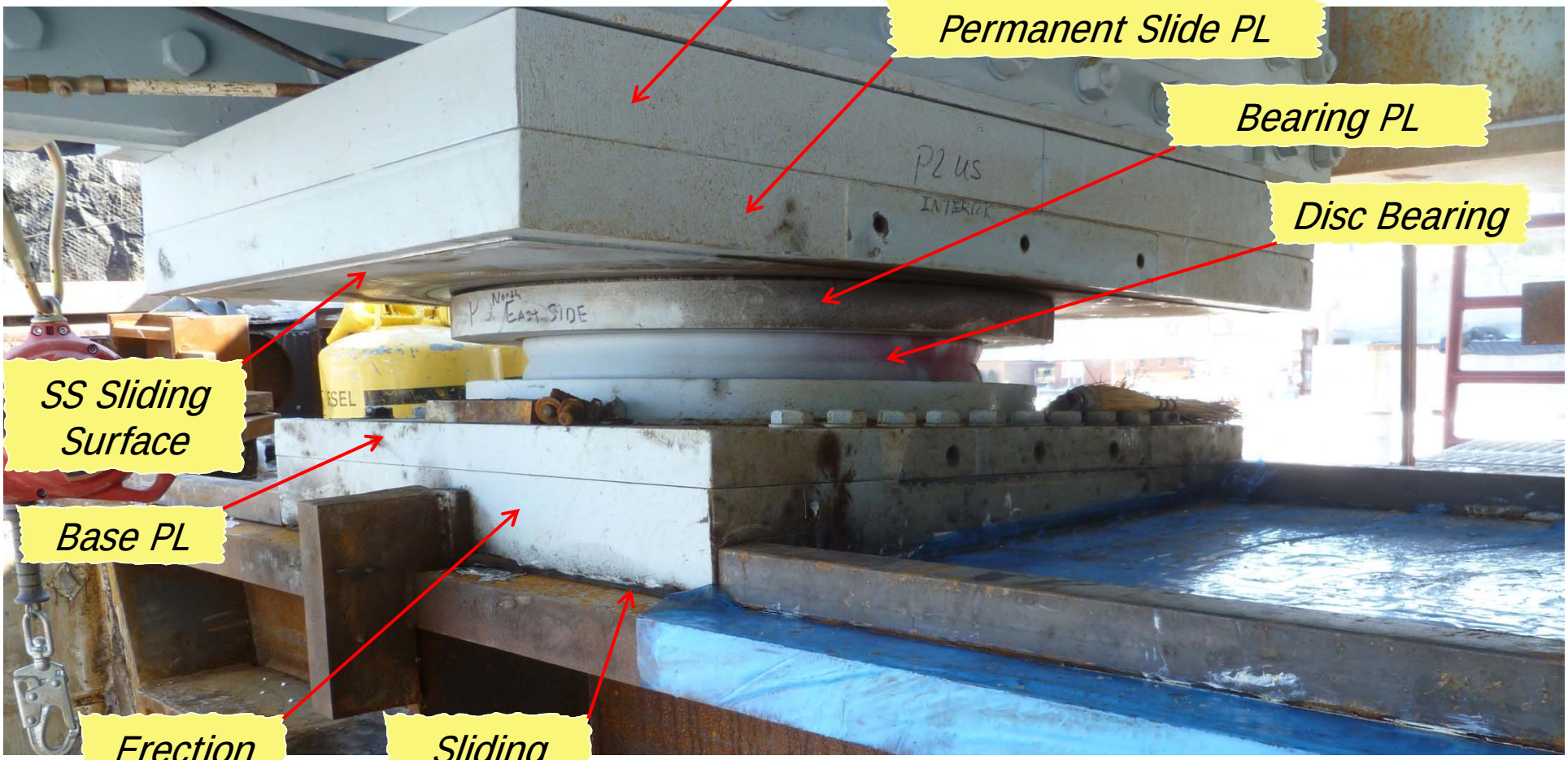
See related items below.

**Product Information**

**Typical Use:** Used for making a moisture-proof seal for aircraft, automotive and marine ignition systems and spark plug connections, electrical assemblies and terminals, assembly lubricant for various metal-on-plastic and metal-on-rubber combinations.

**Atypical Use:** Bridge Sliding Grease

# Disc Bearings



# Bearing Harness


Push PL



Pulling Rods to Trailing Bearing

Strands

Restraint PL

# Dislodged Bearing

MILTON-MADISON BRIDGE PROJECT

Michael Baker INTERNATIONAL

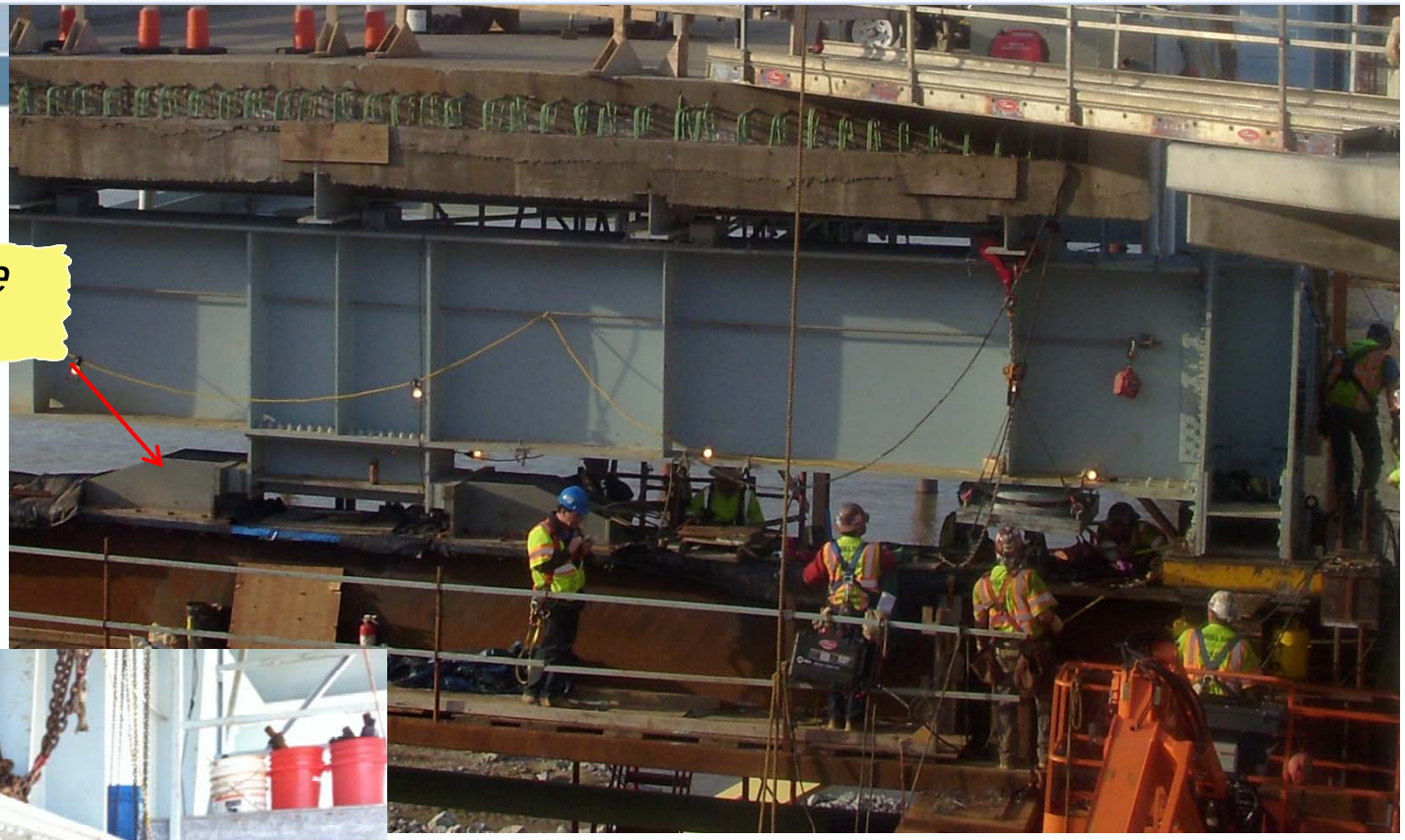
*10” Drop*

# Span D Slide

MILTON-MADISON BRIDGE PROJECT

Michael Baker INTERNATIONAL

# Transverse Restraints




# Longitudinal Restraint for Slide

MILTON-MADISON BRIDGE PROJECT

Michael Baker INTERNATIONAL

*Pier 4 Bearing Harness*

*Guided Angles Installed At Pier 4*

# VSL Strand Jacks

MILTON-MADISON BRIDGE PROJECT

Michael Baker INTERNATIONAL

# Strand Jacking

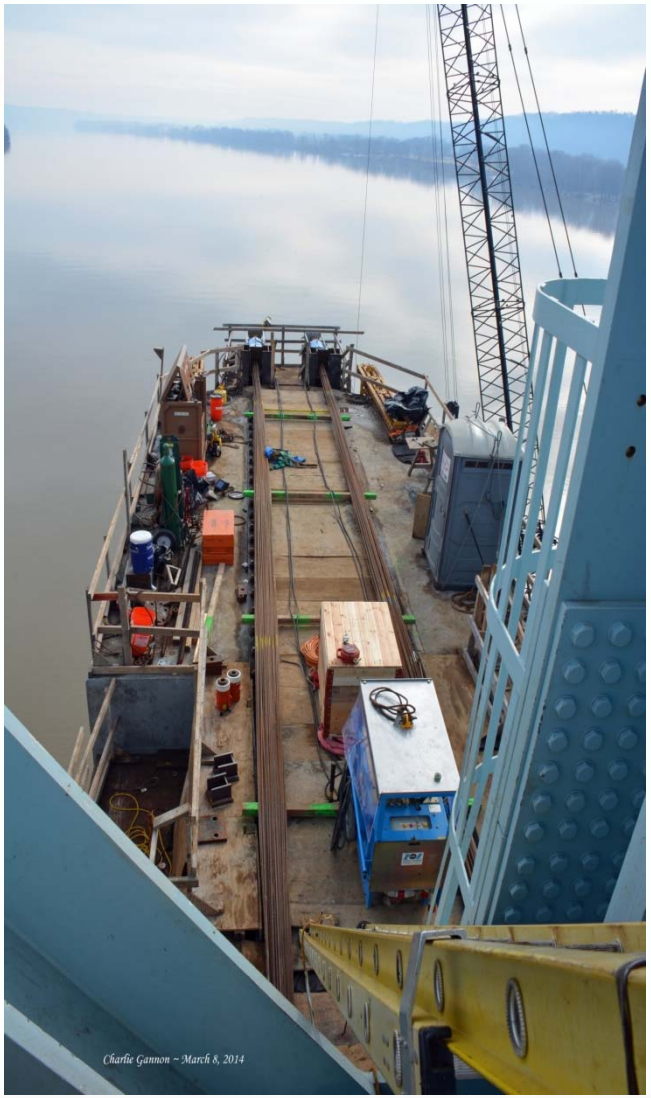
- **Design Load (10% Friction)**
- **Reserve Capacity**
- **Observed Friction was much less**

| PIER | LOAD PER JACK AT 10% FRICTION (NOMINAL DESIGN LOAD) | JACK LOAD NOT TO EXCEED | No. OF STRANDS PER JACK |
|---|---|---|---|
| 2 | 281 KIPS (141 TONS) | 400 KIPS (200 TONS) | 22 |
| 3 | 431 KIPS (216 TONS) | 700 KIPS (350 TONS) | 31 |
| 4 | 405 KIPS (203 TONS) | 700 KIPS (350 TONS) | 31 |
| 5 | 462 KIPS (231 TONS) | 700 KIPS (350 TONS) | 31 |
| 6 | 174 KIPS (87 TONS) | 400 KIPS (200 TONS) | 22 |

# VSL Strand Setup

MILTON-MADISON BRIDGE PROJECT

Michael Baker INTERNATIONAL





# VSL Command Center

Michael Baker
INTERNATIONAL

# Bumper System

MILTON-MADISON BRIDGE PROJECT

Michael Baker INTERNATIONAL

# Needs Brakes

Michael Baker
INTERNATIONAL

# Playing “Chicken”

Michael Baker
INTERNATIONAL

# Truss Slide Video

MILTON-MADISON BRIDGE PROJECT

Michael Baker INTERNATIONAL

# Expansion Joint Installation

MILTON-MADISON BRIDGE PROJECT

Michael Baker INTERNATIONAL

# Open to Unrestricted Traffic

MILTON-MADISON BRIDGE PROJECT

Michael Baker INTERNATIONAL

# Peregrine Falcons Hatched

MILTON-MADISON BRIDGE PROJECT

Michael Baker INTERNATIONAL

- **15 chicks fledged by Kessel and Asa Crane**

- **2011**
- Lucky
- Edie Falco
- Hammer
- Diana


*Kessel feeding her brood.*

- **2013**
- Heracles
- Lelantos
- Artemis
- Britomartis

- **2012**
- Jack Tripper
- Janet Wood
- Chrissy Snow

- **2014**
- Bessica
- Harriet
- Amelia
- Sally

# By the Numbers – Questions?

| | | | |
|---|---|---|---|
| Wt. for Slide | *15,260 tons* | Wt. of Stone | *46,000 tons* |
| Slide Distance | *55 feet* | Concrete Poured | *12,730 cu yds* |
| Length of Truss | *2,427 feet* | Wt. of Rebar | *1,907,000 lbs* |
| Height of Truss | *180 feet above water* | Workers (Peak) | *135* |
| Wt. of Truss Members | *8,000 tons* | Workers (Average) | *50* |
| Truss Members | *2,200 pieces* | Equipment | *300 pieces* |
| Bolts | *145,000 pieces* | Explosives | *124 charges* |
| L.F. of Concrete Beam | *3,462 feet* | ADT | *11,000* |
| Wt. of Asphalt | *4,000 tons* | Project Cost | *$ 104 Million* |