Sliding Into History
Milton – Madison Bridge Project
Milton, KY – Madison, IN

The existing Milton-Madison Bridge was constructed in 1929. This photo was taken on September 3, 2010.

Project Scope
Replacement of 80-Year Old Truss

2011 – A Record Year
No way to start a project

Wettest year on record along the Ohio Valley. The project experienced 8 flood events in the first 14 months. Walsh lost 240 days to high water conditions.
2011 – The Worst Day

- Normal Pool = 492
- Ordinary High Water/Flood Day = 432.2
- Highest Water Level = 456

Causeway

River Access from the Indiana shore

- Causeway for access from the Indiana shoreline.

Kentucky Laydown Yard

- 7 acres for laydown and pre-assembly
Trestle & Work Platform
Access from the Kentucky Shore

- Work platform designed for a 275 ton crane with a max lift of 100 tons

Cofferdams

- Top of cofferdam = 435'. Ordinary high water or flood stage = 552.4'.

Cofferdams – Pouring the Seal

- A 6' concrete seal was poured in each river cofferdam.
Caisson Coring

- 2", 3", & 4" holes were cored into the caisson to depths ranging from 10' to 70'.

Caisson Reinforcing

- #10, #11, & #14 epoxy coated reinforcing bars were grouted in place.

Pull-out Testing

- The contract required a pull-out test on the caisson reinforcing to prove the bond strength of the grout.
Pier 5 Shear Connectors

- #7 epoxy coated resteel shear connectors anchored 12" deep and placed on 2' o.c. Over 7000 were installed in the three river piers.

Pier Stem Reinforcing Steel

- Design included bundled #11 & #14 vertical rebar.

Pier 3 Stem Strengthening Forms

- 20' sections were formed with EF500 plate girder forms.
Pier 3 Stem Strengthening Pour

A typical pier stem “jacket” pour. Mass concrete thermal control measures were used for pours 4’ thick or greater.

Pier 3 Stem Strengthening Jacket

Complete pier strengthening jacket. Concrete varied in thickness from 2’ to 6’.

Pier 4 Stem Ready to Pour....

An all too common occurrence.
Indiana Temporary Ramp

A cross-sectional view of how the ramp was constructed. Just add asphalt & barrier rail.

Indiana Temporary Ramp

34" and 28" pipe piles were driven to bearing to support the temporary ramps.

Indiana Temporary Ramp

Indiana temp ramp nearly ready for asphalt.
Kentucky Temporary Ramp

Temporary earth fill was used to construct a portion of the Kentucky temp ramp.

Removing the Old Approach

Removing an Indiana approach span in order to connect the temporary ramp.

“Dropping” an Indiana Span

This span had to removed quickly in order to connect the Indiana temporarily ramp to the existing truss.
Connecting the IN Temp Ramp

- Once the approach span was dropped, the crew installed cap and stringer beams, timber mats, concrete barrier, and laid the asphalt... in just three days.

Connecting the KY Temp Ramp

- The same sequence of construction was used to connect the KY temp p ramp.

Indiana Temp Ramp Open

- The temp ramps were rated for 15 tons and were designed to carry vehicles up to 50' in length.
**Indiana Temporary Ramp**

- Designed to carry traffic for just a few months, with minimal maintenance, the ramp was in operation for 13 months.

**New Truss Barge Grillage**

- Surveying instruments were used to precisely position the barge grillage used for preassembling spans 2 & 3.

**Truss Span 2 Pre-assembly**

- The pre-assembly of Span 2 begins.
Truss Span 2 Pre-assembly

Delivering the truss members to the assembly crane.

Half of Span 2 Truss

The majority of the connection work for the spans assembled on the barge was performed from aerial lifts.

Span 2 - Preassembly

Span 2 nearing preassembly.
Span 2 Preassembled

- Span 2 Preassembled
- Center Section of span 3 being preassembled

Barge Impact Frame as Template

- Pile alignment given special attention

Piling for Temp Piers

- 36" x 1" thick walled pipe piles driven to bedrock using a 3100 ft-lb diesel hammer with a minimum capacity of 2900 kips
Truss Temp Support Piers

- The temporary pier sections were preassembled and hauled in sections to each pier.

Temporary Pier Positioning

- Installed square and center to the pier

Temporary Pier Construction

- The temporary pier connected to the piling.
Temporary Jacking Towers

The jacking tower atop the temporary pier.

Temporary Jacking Towers

The jacking tower sits on piers 3 & 4.

Temporary Jacking Towers

Installing the jacking platforming.
Position Tine Girders

Tine girders ready to receive the sliding girders.

Positioning the Tine Girders

Connecting the tine girder assembly to the pedestal and temporary pier.

Tine Girders
Jacks Ready for Strands

- The strands were cut to length and threaded one strand at a time.

Strand

- 7 wires made up each strand. Each strand was 56' in diameter.

Locking the Strands

- VSL technicians locking the strands in position.
Strand Jack Wedge Assembly

- The strand jack wedge assembly.

Lifting a Jack onto the platform

- Each jack was flown into position "fully loaded."

Strand Jacks Ready to Lift

- Four jacks were used at each platform.
Span 2 Ready to Lift

Strand Jacking Span 2

- Span 2 weighed just under 1700 tons when lifted.

Span 2 Ready for Sliding Girders

- Span 2 reaching the top.
Threading the Needle

- Each girder weighed 90 tons and was installed using a single crane pick.

Marrying Girder to Tines

- Once the tines were connected to the sliding girder, the assembly was rolled into its final position using Almon rollers.

Sliding Girder & Tines Secured

- Sliding girder on designed station
Span 3 Lift

- Span 3 weighted 1800 tons

Span 3 Lift Nearly Complete

- The navigational channel could only be closed for 24 hours. Walsh began the float in just after midnight and secured the truss at 7:30 pm.

Erecting Span 1

- Span 1 was “stick-built” in place.
Erecting Spans 1 & 4

Conventionally, "box-building" is used to assemble Spans 1 & 4.

Erecting Span 4

Connectors using their skills to erect span 4.

Preparing to Pour Truss Deck

Metal SIP forms were used to deck the truss.
Preparing to Pour Truss Deck

Overhangs were formed and the deck reinforcing steel installed.

Preparing to Pour Truss Deck

800’ of rigid pipe carried the concrete from the pump to the spider.

Pouring the truss deck

A “spider” was used to distribute the concrete.
Shifting Traffic to New Truss

The Indiana transition span.

Shifting Traffic to New Truss

The Kentucky transition span.

Old Truss Demo

The explosive cutting of the channel span.
Old Truss Demo

- With only 48" between trusses, it was essential that the old truss followed a straight path downward.

Pier Cap Formwork

- Specially shaped EFCO forms were used to form the new pier cap.

Pier Cap Rebar

- Extra reinforcing steel was placed along the slabe path.
Pier Cap Insert Template

- The trusses on top of the forms were used to hold inserts needed for the slide.

Pier Cap Pour

- Taking advantage of the new truss to pour the pier caps.

Pier Cap Pour

- Cap pours usually began around 1:00 am.
Span D Slide

The Slide By the Numbers

- 2,427-foot-long, 4-span, continuous truss bridge
- Total weight approximately 15,260 US tons
- 55-foot lateral slide distance
- 95 feet above the Ohio River at normal pool
Truss Slide

- Dimpled PTFE on polished, greased, carbon steel
  - Permanent bearings utilized for sliding
- 1" thick slide plate, varied from 37" to 78" wide
  - Flatness of slide path critical
- Guided at only one pier (P4)
- BRAVO laser control system
- Bearing harness system
- Eight 350-ton strand jacks

Slide Jacking Platform

Truss Bearing Sliding Surface
Pier 4 Sliding Surface

- P4 slide plate complete with guide angle

Pier 5 Sliding Surface

- Pier 5 slide plate

Piers 2 & 6 Truss Bearing

- The shape of this bearing created the need for a unique “keeper”
Piers 3, 4, 5 Sliding Harness

Sliding Harness

Sliding Harness
Sliding Harness Tie Rods

- Iron workers installing the tie rods between the lead and trailing bearing.

Strand Jacks

- BRAVO System

Slide Control

- Command Center
Slide Braking

Truss slide “braking” system

Slide

Halfway home...

Just a Few Feet to Go
New Milton-Madison Bridge