SR 7 Emergency Bridge Repairs During Design
SR 7 Emergency Bridge Repairs During Design

Two SR 7 Bridge projects, both of which experienced failures during the design phase.

SR 7 over Camp Creek, Town of DuPont, IN
SR 7 over Little Sand Creek, near the Town of Elizabethtown, IN

Both Bridges are in INDOT’s Seymour District and were awarded to Burgess & Niple for Design in 2010

- Innovative repairs
- Practical Design solutions
- Impacts on Design Schedules
- Cost savings
SR 7 Over Camp Creek, DuPont Indiana
SR 7 Over Camp Creek
Initial Scope of the Project

- The original scope of the project was the replacement of the existing Earth Filled Concrete Arch Structure with a new single span bridge.

- The original structure was built in 1925 as a 60 foot Single Span Concrete Arch

- The bridge was widened in 1965 by adding 2 prestressed box beams to each side of the existing structure.

- Existing concrete was sound so it was decided to reuse the existing footings to minimize impacts to Camp Creek.
Existing condition

Strands exposed on box beam

Crack through the box beam at center of beam line #2
Existing condition

The deck above the East side box beams
May 20, 2010
Failure of Existing Box Beams

- Call from INDOT Seymour District requesting B&N meeting at the site May 27, 2010

- INDOT installed temporary cribbing.
SR 7 Over Camp Creek

The deck above the East side box beams taken May 27, 2010
SR 7 Over Camp Creek

The Failed East Side Box Beams taken May 27, 2010 (DOCI)
SR 7 Over Camp Creek

Failed East Side Box Beams, May 27, 2010 (DOCI)
SR 7 Over Camp Creek
SR 7 Over Camp Creek

Timber Cribbing Installed, May 28, 2010
Concept

- Temporary shoring had already been put into place by INDOT but was not deemed adequate to last until construction of the new structure was ready.
- Replace all 4 Box beams on the structure, 2 each on the east and west sides.
- Reuse new beams as a part of the final construction
- Beams were designed to be field cut to fit with new bridge
Emergency Repair

- **Design Criterion**: 
  - Beams will be designed for the temporary and permanent loading condition. i.e. two different span lengths required temporary with one final span length required in the permanent bridge.
  - Unique details were required for attaching the temporary barriers to the box beams.
  - Special barrier end treatments/guardrail transitions designed.
Emergency Repair

- **Design Criterion:**
  - Bearing Pads designed for both temporary and permanent use
  - Plate attached on the exterior of the beams to contain aggregate and pavement for the temporary condition.
  - Beams will be designed for the temporary and permanent span lengths and be designed so that they can be field modified during the permanent construction of the bridge.
SR 7 Over Camp Creek

Repair Plans Contract B-33337
SR 7 Over Camp Creek
SR 7 Over Camp Creek

Shop Plans for Emergency Repair Beams  (Prestress Services Ind.)

**Typical Beam Length**

**Guardrail Post Location**

**Flow**

**Fascia**

**Bent 1**

**Bridge Plan**

**Bent 2**
SR 7 Over Camp Creek

Shop Plans for Emergency Repair Beams  (Prestress Services Ind.)
SR 7 Over Camp Creek

Removal if the Existing Beams (doc1)
SR 7 Over Camp Creek

Placement of New Beams

(DDCI)
SR 7 Over Camp Creek

Existing Beams in Place (DOCI)
SR 7 Over Camp Creek
Summary:

- Able to incorporate emergency repairs into the design to save money.
- Done quickly to avoid major disruption of adjacent elementary school.
- Cost of the emergency repair was $222,663.
- Reuse of the Beams Saved $102,200 in the final cost of the new bridge.
SR 7 Over Camp Creek

Project Complete 2014
SR 7 over Little Sand Creek
Initial Scope of the Project

- The original scope of the project was the replacement of the existing 2 lane, 62 foot Non-composite Adjacent Box Beam Structure built in 1980 founded on original 1930 concrete end bents.
- SR 7 average daily traffic volume over 13,000 VPD.
- Existing structure was hydraulically deficient. Replacement bridge span was increased to 90 feet to hold the existing PG.
- MOT was to use a temporary runarround at the site of the structure.
- Site distance improvements due to the offset intersection of CR 525 E either side of the bridge.
- Very high concentration of Utilities on both sides of the bridge.
SR 7 over Little Sand Creek
Design Timeline, Modifications

- Passing Blister Added at CR 525 E due to traffic volume.
- INDOT corridor study of SR 7 was conducted after the design award and determined that a left turn lane needed to be added that extended onto the bridge.
- Practical Design Determination made to Widen the Bridge to Allow for Phasing of construction
SR 7 over Little Sand Creek

Original Section with Runaround

Temporary Runaround
SR 7 over Little Sand Creek

First modification: Addition of a Passing Blister
Second Modification: Addition of a Left Turn Lane (CR 525E)
Practical Design Concepts

- Practical design meeting held with the district
- Signalizing for MOT could not be implemented with traffic volumes above 10,000 vpd.
- Local detour was no feasible due to conditions and volume of traffic
- Archeological sensitive area NW approach along the existing R/W line.
  - Proposal was to eliminate the Temporary Runaround and add 6 feet of additional road and Bridge widening.
    - Allowed for the construction of the Bridge in phases while maintaining the existing 2 lanes of traffic
SR 7 over Little Sand Creek

Cost savings eliminating Runaround

- Eliminated large portion of Temp. R/W (Approx. 1 acre)
- Reduced utility conflicts
- Permanent asset to INDOT as opposed to throw away construction
- Allows future maintenance to be performed while keeping 2 lanes open.
- Able to accomplish without Archeological disturbance.

Reduction in estimated cost from the original design concept
$112,000
Widening from Practical Design Meeting to allow Phasing
Eliminating Run Around
SR 7 over Little Sand Creek

PHASE I

PHASE II
Failure of Existing Box Beam

- Adjacent prestressed box beam bridge
- Federal guideline and focus on rating and INDOT implementation
- Upon reevaluating the bridge the posting was required to be lowered to 5 tons.
- Several beams across structure showed spalling and delamination across the restressing strands on the bottom of the beam.
SR 7 over Little Sand Creek
Design of Bridge Emergency Repair

- Several temporary repair options discussed however none would easily allow for the proposed phasing of construction.
- Shoring had to accommodate the phased construction proposed.
- INDOT staff did shoring design in House.
SR 7 over Little Sand Creek

Sketch of Failed Beams
Temporary Shoring
SR 7 over Little Sand Creek

Temporary Shoring
SR 7 over Little Sand Creek
SR 7 over Little Sand Creek
Emergency repair plans were included via a special provision in the letting documents to notify the contractor.
The Emergency repair put in place by INDOT allowed the Bridge to remain open without posting until the design contract could be let.

Construction cost of the temporary repair $144,827.

Construction is scheduled this spring on the phased replacement of the bridge.
SR 7 over Little Sand Creek

Questions ?