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
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.
SR 7 Over Camp Creek

**Existing condition**

- Strands exposed on box beam
- Crack through the box beam at center of beam line #2
SR 7 Over Camp Creek

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

Timber Cribbing Installed, May 28, 2010
SR 7 Over Camp Creek

Design of Bridge Emergency Repair

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

Guardrail Post Loc.

TYP. BEAM LENGTH (MK. 01) 77'-6"

Guardrail Post Loc.

TYP. BEAM LENGTH (MK. 02) 69'-2"

Guardrail Post Loc.

TYP. BEAM LENGTH (MK. 03) 77'-6"

11 SPACES @ 6'-3" = 68'-9"

Fascia

Note: Posts, rail, etc. by anchor devices per TST-1-99 cast in re studs, nuts, & washers.
SR 7 Over Camp Creek

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

Removal if the Existing Beams (DOTI)
Placement of New Beams

(DOCI)
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 runaround 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.
Summary:

- 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.
Questions ?