SR 66 and Green River Road Project
“Transforming a Bottleneck”

Mark Eckert, P.E.
Michael McCool, P.E.

Project Location:

• SR 66 (Lloyd Expressway) at Green River Road
• Eastside of Evansville, Vanderburgh County
• INDOT’s Vincennes District
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Need for Improvement:

• Heavily Congested
  – AADT (2001)
    • 50,000 vpd SR 66
    • 40,200 vpd Green River Road
  – Projected AADT (2021)
    • 63,700 vpd SR 66
    • 51,200 vpd Green River Road

• Delays
  – Major Approaches
  – Minor Approaches

• Safety Concerns

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Existing Conditions:

• Tight Urban Diamond
• Highly Developed Area
• Utilities
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Existing Conditions:

- SR 66 over Green River Road
  - 5 Lanes (2 EB; 3 WB)
  - Shoulders
  - Depressed Median

- Green River Road
  - 4 Travel Lanes
    - 2 each direction
  - Auxilliary Lanes
    - Left & Right to SR 66
  - Two Distinct Intersections
    - Little storage under bridge
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Existing Conditions:

- SR 66 Ramps to Green River Road
  - Single Lane
    - Entrance
    - Exit
  - Adjacent to MSE Walls
  - Widen Lanes at Green River Road
    - 2 Left
    - 1 Right
  - Signals at Ramp Termini

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Alternates Considered:

- Retain Existing Bridge
- Single Point Urban Interchange
- No Action
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Alternates Considered:

• Retain Existing Bridge
  – Unable to Obtain Acceptable LOS without Significant Impacts

• No Action
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Alternates Considered:

- SR 66 (Lloyd Expressway)
  - 3 Lanes Each Direction
  - Shoulders
  - Barrier Wall in Median
  - Necessary to Raise Grade
  - Maximize Use of Existing Pavement

Alternates Considered:

- Green River Road
  - No Change to Thru Lanes
  - Dual Left Turn Lanes to SR 66

- Ramps
  - Widen and Lengthen
  - Maintain Existing Vertical Alignments
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Issues to be Addressed:
- Provide Dual Lefts
- Minimize Grade Raise
- Maintain Vertical Alignments on Ramps
- Construct Under Traffic
- Coordinate with Adjacent Projects
- Signalize Under Bridge
  - Keep Signals Visible
  - Channelization

Design Criteria:
- SR 66 – Principal Arterial
  - 4R (Partial Reconstruction)
  - Design Speed: 50 mph
  - 6 Lanes at 12 ft
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Design Criteria:

- Green River Road
  - 3R (Non-Freeway)
  - Design Speed: 30 mph
  - 4 Lanes at 12 ft
  - Left Turn lanes 11 ft

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Roadway Design Issues:

- Establish SR 66 Profile
  - Dual Left Turns on Green River Road
  - Vertical Clearance
  - Horizontal Clearance
    - Substructure – Iterative Process
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Roadway Design Issues:

- Maintenance of Traffic – SR 66
  - Maintain 2 Lanes Each Direction
  - Coordinate with Adjacent Projects
  - Phased Construction
    - Phase 1 - Construct WB maintain on EB
    - Phase 2 - Construct EB maintain on WB
  - Multiple Shifts on Ramps
    - Temporary Signals with Video Detection

- Maintenance of Traffic – Green River Road
  - Schedule of Ramp Closings
  - Phased Construction
    - Phase 1 – Widen to Outside
    - Phase 2 – Construct Medians
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Roadway Design Issues:

• Utilities
  – SE Quadrant
    • Gas Distribution
    • Electrical Substation
  – Lack of Information
    • Location
    • Facilities Present

• Tight Urban Project
• Time of Construction Limited
• Adjacent Project Overlap
• Utilization of Existing Storm
• Location of Signal Equipment
  – Existing
  – Proposed
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Roadway Stats:

- Project Length
  - 2,800 ft SR 66
  - 1,500 ft Green River Road
- Contaminated Soil 1,400 cyd
- Pavement Removal 25,000 syd
- QC/QA PCCP 37,000 syd
- Temporary Signal with Video

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Bridge and MSE Walls:

- Existing Conditions
- Bridge and Wall Design
- Constraints
- New Bridge and Reconstructed MSE Walls
- Design
- Construction Sequencing
- End Results
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Existing Bridge:
- The existing single span steel girder bridge was built in 1988.
- The bridge span length was 122 feet.
- The bridge consisted of twin structures carrying eastbound and westbound traffic.

Existing Substructure:
- The existing substructure consisted of full face abutments on a pile foundation.

Existing MSE Walls:
- The approach roadway was elevated by the use of MSE walls.
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Design Constraints:

- Interchange Geometrics
- Required Vertical Clearance
- Maximum Vertical Grade Raise for Existing MSE Walls
- Existing Substructure Conflicts
- Required Maintenance of Traffic during Construction

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Design Constraints:

- The single point interchange required a bridge that would span the entire intersection and also provide sufficient length to accommodate dual left turn lanes to and from Green River Road under SR 66.
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Design Constraints:

• The SR 66 roadway grade was raised to accommodate a 16’-6” minimum vertical clearance over all ramps and Green River Road.

• This increase in vertical clearance along with the increased construction depth of the superstructure required an approximate 3 foot grade raise on SR 66.

• It was determined that the existing MSE walls could be utilized in accommodating the 3 foot grade raise.
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Design Constraints:

• The existing abutments are in the same location as the interior bents.

• Traffic on SR 66 and Green River Road had to maintain a minimum of two travel lanes in each direction at all times.

• Phased construction was utilized to maintain traffic on SR 66 and Green River Road.
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New Bridge and Reconstructed MSE Walls:
- Three span twin structures that are 317'-6" in length.
  Superelevated curved bridge decks on
  kinked post-tensioned bulb-tee beams embeded in
  post-tensioned straddle bent caps on
  columns located within turn islands on
  pile foundations.
- Integral end bents on piles with MSE walls.
- Approach roadway with reconstructed MSE walls.
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New Bridge:
• Curved bridge decks in superelevation.

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New Bridge:
• Kinked post-tensioned bulb-tee beams
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New Bridge:
- Post-Tensioned Straddle Bent Caps

- The staddle bent caps are on columns located within the turn islands of the interchange.
- Multi-directional pot bearings support the straddle bent caps on columns.
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New Bridge:
  • Due to the geometric constraints of the single point interchange, some of the existing piles were utilized in the interior straddle bent column footings.

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New Bridge:
  • Integral end bents on piles with MSE walls
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Reconstructed MSE Walls:
• Approach roadway with reconstructed MSE walls.
• The MSE walls at the outside shoulder were modified to accommodate the grade raise and concrete barrier.

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Design:
• Finite element analysis was used for the superstructure and straddle bent design.
• Time-dependent analysis of all construction/post-tensioning stages.
• Kinked Post-Tensioned Beams
• Design for seismic performance Category B.
• Phased Construction
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Construction Sequencing:
• Staged post-tensioning to accommodate the loading sequence for the bridge construction.
• Total of 5 major construction stages per structure.

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Construction (Stage 1):
• Construct sheet pile wall between structures
• Remove existing bridge
• Remove portions of MSE wall
• Construct lower portions of end bents
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Construction (Stage 1):
- Construct interior bent columns and footings
- Construct temporary falsework

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Construction (Stage 2):
- Place end bent concrete to encase beams
- Install duct splices at staddle bents
- Place straddle bent concrete to encase beams
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Construction (Stage 2):
- Stress 1 of 3 tendons in beams
- Stress 8 of 10 tendons in straddle bent caps

Construction (Stage 3):
- Place concrete in diaphragms
- Take screed elevations
- Place deck forms and resteel
- Stress second tendon in beams
- Grout all tendons stressed to date
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Construction (Stage 4):
• Place concrete in deck
• Stress and grout the third tendon in beams
• Stress and grout final 2 tendons in straddle bent

Construciton (Stage 5):
• Remove temporary supports
• Pour concrete barriers
• Open to traffic
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Results:
• The unique components of the project make the interchange bridge aesthetically pleasing.
• The bridge was designed to fit into the tight configuration of an urban interchange and minimize impacts to the right of way.

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Results:
• INDOT has expressed their satisfaction with this project.
• The Executive Director of the Evansville Urban Transportation Study (EUTS) has expressed extreme satisfaction with the project.
• The Director quoted “The project exceeded her expectations and had nothing but praise for the work that was completed”
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Results:

• The final construction cost of the project was $12,272,699, with an original budget estimate of $12,321,768.
BEST BRIDGE WITH SPANS BETWEEN 65 AND 135 FEET

SR 66 over Green River Road, Evansville, Indiana

Engineer:
Beam, Longest & Neff

Owner:
Indiana Department of Transportation