Widening of the Huey P. Long Bridge

2008 LTRC Seminar Series – Bridge Structures
Introduction

- Background
- Final Design Features
  - Main Bridge – Substructure
  - Main Bridge – Superstructure
    - Truss Widening
  - Railroad Modifications
  - Approaches and Main Bridge
    - Deck Widening
- Project Status
  - Project Timeline
  - Construction Photographs
  - Design Work Completed – Letting Pending
Location

- French Quarter
- Huey P. Long Bridge
- New Orleans Metro Area
Before the Bridge
Construction of The Existing Bridge
Background – Huey P. Long Bridge

- Combined railroad – highway bridge
  - 2 tracks
  - 4 lanes – 9 ft. width
Background – Huey P. Long Bridge

- Very heavily built
- Carries largest modern RR load without distress
- Many years of service life remaining
Project Background

• By widening the existing structure rather than constructing a new river crossing:
  – Reduce environmental impact, property takings.
  – Reduce project cost.
  – Reuse existing right-of-way and traffic corridors.

Project Background

EXISTING

PROPOSED WIDENING
# Project Background

<table>
<thead>
<tr>
<th>Year</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1982</td>
<td>Study of new bridge in corridor; 5 alternates considered. High cost and large amount of ROW; project dropped.</td>
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<tr>
<td>1986</td>
<td>LADOTD authorized M&amp;M to perform conceptual widening study. 3 widening alternates considered.</td>
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<tr>
<td>1990</td>
<td>Geotechnical investigation of soil capacity under cassions.</td>
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<td>1999-2000</td>
<td>Environmental Processing Agency Consensus</td>
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<tr>
<td>2000-2007</td>
<td>Completion of final design plans; main bridge widening, railroad modifications, and approaches,</td>
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<tr>
<td>2006-Present</td>
<td>Construction main bridge substructure widening, railroad modifications, and main bridge superstructure widening.</td>
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Huey P. Long Widening Project

- **START PROJECT**
- **WEST BANK RR MOD**
- **WEST BANK APPR.**
- **MAIN BRIDGE PIER, TRUSS, AND DECK WIDENING**
- **EAST BANK APPR.**
- **EAST BANK RR MOD**
- **END PROJECT**
Main Bridge Pier Widening
Main Bridge Pier Widening

EXISTING

PROPOSED WIDENING

Pier A
Piers I & II
Pier III
Pier IV
Widened Pier

Caisson

Steel Frame
Upper Encase
Lower Encase
Load Factor Design
- SLD “typically” used for the design of railroad bridges
- Normally LFD is disadvantageous for railroad live loads
- Large dead loads in this case make LFD more economic

Additional Loading Groups
- Construction loads
- Hurricane wind
- Substructure jacking to shift dead load
Widened Pier - Details

- The upper portion of the pier widening is composed of a steel frame.
- The steel frame significantly reduces the loads on the pier by eliminating concrete and permits the center bearing to be jacked, relieving load from the exterior bearings.
- This is beneficial by reducing load on the end faces of the existing concrete distribution block on top of the existing caisson.
Widened Pier - Details

The lower portion of the pier widening serves several functions

- The nose areas are columns to support the widening truss support bearings.
- The remainder confines the existing pier concrete and granite masonry blocks which currently has minimal reinforcing.
Existing Pier Conditions


Piers I, II, III, & IV examined and found to be in good condition.

The equipment provided detailed information of the existing conditions.

Examination though the use of a diver would be more costly, must be performed in extreme low to no visibility, and is dangerous.
Existing Pier Conditions

Pier I – North Face
Existing Pier Conditions

Pier II – West Nose
Main Bridge Truss Widening

- START PROJECT
- WEST BANK RR MOD
- EAST BANK APPR.
- END PROJECT
- WEST BANK APPR.
- EAST BANK RR MOD
- MAIN BRIDGE PIER, TRUSS, AND DECK WIDENING
Main Bridge Truss Widening

- Cantilever Truss Span
- Simple Through Truss Span

EXISTING

PROPOSED WIDENING
Cross Sections – Existing Bridge
Widened Main Bridge Features

- 2 new trusses added, parallel to existing trusses.
- Roadways widened from 18 ft. to 43 ft.
- Currently: 2 – 9 ft. lanes
  No offset
- Proposed: 3 – 11 ft. lanes
  8 ft. shoulder
  2 ft. offset
Widened Main Bridge - Design

- 3-D analysis used to obtain loads in final structure
- Obtain the coordinates of the influence surface along an influence profile line ("slice") taken through the influence surface
- 12 influence profile lines established for the structure
- Assign loads to influence surface using simple beam distribution
- Is an approximate method, but is simple and slightly conservative
Construction and Erection

• Sequence of construction
  – Widening Truss
  • Imbalance
  – Widened Floor System
Construction and Erection

• Maximum Permitted Imbalance
  – 2 panel points on one side of truss
  – Only 1 location on the structure
Deflection Issues

- Camber of widening truss versus existing truss elevation plus changes due to widening
- Anchor arms erected as cantilever spans
- Main span of the widening truss is erected as a long cantilever span
- After closure main span converted to a short cantilever span supporting a simple span
Deflection Issues

- Top laterals, bottom laterals, sway frames, and portal frames must hinge to permit movement.
- Erect rigid part over roadways open to traffic; hinge remaining part.
Maintenance of Traffic Through Construction

• Marine Traffic Maintained  
  – same vertical and horizontal clearances

• Rail Traffic Maintained

• Vehicular Traffic Maintained  
  – by use of staged construction
Main Bridge Maintenance of Traffic

WORK PERFORMED IN TRUSS WIDENING CONTRACT
Railroad Modifications - Westbank

- START PROJECT
- WEST BANK RR MOD
- EAST BANK APPR.
- END PROJECT
- WEST BANK APPR.
- MAIN BRIDGE PIER, TRUSS, AND DECK WIDENING
- EAST BANK RR MOD
Railroad Modifications - Westbank

Project Site

Railroad

LA 18

Hwy. 90
Huey P. Long Widening Project
Westbank Railroad Modifications

Existing Site Conditions
Huey P. Long Widening Project
Westbank Railroad Modifications

Replacement Support

Final Site Conditions
Huey P. Long Widening Project
Westbank Railroad Modifications
Huey P. Long Widening Project
Westbank Railroad Modifications
Huey P. Long Widening Project
Westbank Railroad Modifications
Westbank

Sequence of Construction

1. Construct foundations for new cross girders
2. Install falsework to lift existing girder spans
3. Begin 24 hour rail traffic closure
4. Lift existing girder spans off steel tower
5. Remove upper portion steel tower
6. Erect cross girders
7. Lower existing girder spans onto new cross girders
8. Restore rail traffic
9. Remove remaining portion of steel tower
Railroad Modifications - Eastbank

- START PROJECT
- WESTBANK RR MOD
- EASTBANK APPR.
- MAIN BRIDGE PIER, TRUSS, AND DECK WIDENING
- END PROJECT

WESTBANK APPR.
EASTBANK RR MOD

Railroad Modifications - Eastbank
Railroad Modifications - Eastbank
Huey P. Long Widening Project
Eastbank Railroad Modifications

Existing Site Conditions

Existing Superstructure and Towers to be Replaced
Huey P. Long Widening Project
Eastbank Railroad Modifications

Final Site Conditions

New Bents

To Huey P. Long Bridge

Clearview Pkwy

Future Elevated Roadway

Vacant Gas Station

Future Roadway

QWEST Line

Jefferson Hwy.
Huey P. Long Widening Project
Eastbank Railroad Modifications
Eastbank
Sequence of Construction

1. Construct new concrete straddle bents
2. Prepare steel tower and other falsework
3. Begin 24 hour rail traffic closure
4. Remove girders under one of the tracks
5. Erect new girders for one track
6. Re-establish track
7. Restore rail traffic
8. Repeat girder replacement for other track
9. Remove steel tower
Approaches & Deck Widening

- START PROJECT
- WEST BANK RR MOD
- EAST BANK APPR.
- WEST BANK APPR.
- MAIN BRIDGE PIER, TRUSS, AND DECK WIDENING
- EAST BANK RR MOD
- END PROJECT
Approaches & Deck Widening

Start Project

Bridge City Ave. Interchange

WEST BANK APPROACH

Conflict w/ Existing Rdwy
Approaches & Deck Widening

- Cantilever Truss Span
- Simple Through Truss Span

EXISTING

PROPOSED WIDENING
Approaches & Deck Widening

- EAST BANK APPROACH
- Jefferson Hwy Interchange
- NOPBRR Spur
- End Project
- Conflict w/ Existing Rdwy
Main Bridge Deck Widening

WORK PERFORMED IN APPROACH CONTRACT
Approaches & Deck Widening

Pile Contour Lines at Various Elevations
Approaches & Deck Widening

- W.P.
- CAP
- TRUMPET
- COLUMN
- TRUMPET PC
- FOUNDATION
Approaches & Deck Widening

184 - TOTAL SUBSTRUCTURE UNITS
123 - 4’ X 6’ COLUMN BENTS

[Diagram showing substructure units with dimensions: 8’ x 14’, 8’ x 12’, 6’ x 12’, 4’ x 6’]
Approaches & Deck Widening

Column Type 4: 8’ x 14’

Column Type 3: 8’ x 12’

Column Type 2: 6’ x 12’

Column Type 1: 4’ x 6’
Approaches & Deck Widening

Trumpets for 4’ x 6’ columns

Trumpets for 6’ & 8’ x 12’ columns

Trumpet for 8’ x 14’ Columns

Trumpet for 4’ x 6’ Columns

8’ x 14’

6’ x 12’

8’ x 12’

4’ x 6’
Approaches & Deck Widening

Adjust Footing Depth As Necessary

- Typical Bent
- Full Height Trumpet
- Sub-Trumpet Size 1
- Sub-Trumpet Size 2
Approaches & Deck Widening
Approaches & Deck Widening
Approaches & Deck Widening

Location of West Bank Steel Girder Spans

West Bank Approach
East Bank Bound
Approaches & Deck Widening

Location of East Bank Steel Girder Spans

East Bank Approach

West Bank Bound
Approaches & Deck Widening

West Bank Approach - West Bank Bound

East Bank Approach - East Bank Bound
### Project Timeline

- **Work Under Construction**
  - Main Bridge Pier Widening
  - Railroad Modifications
  - Main Bridge Truss Widening

- **Work To Be Let 2008**
  - West Bank Approach, Main Bridge Deck Widening, East Bank Approach
Main Bridge Pier Widening

• Letting Date:
  – December 14, 2005

• Notice To Proceed Date:
  – April 10, 2006

• Construction Bid:
  – $98,826,907

• Contractor:
  – Massman Construction Co.
Main Bridge Pier Widening
Main Bridge Pier Widening
Main Bridge Pier Widening

06/23/2006
Main Bridge Pier Widening
Main Bridge Pier Widening
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Main Bridge Pier Widening

Distribution Block

07/20/2006
Main Bridge Pier Widening
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01/18/2007
Main Bridge Pier Widening
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Main Bridge Pier Widening

G&G Steel

New Orleans
Main Bridge Pier Widening
Main Bridge Pier Widening
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Main Bridge Pier Widening

10/18/2007

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Main Bridge Pier Widening
Railroad Modifications

• Letting Date:
  – May 10, 2006

• Notice To Proceed Date:
  – August 28, 2006

• Construction Bid:
  – $13,782,713

• Contractor:
  – Boh Bros. Construction Co.
Railroad Modifications - Westbank

Project Site

Railroad

LA 18

Hwy. 90

EXISTING
Railroad Modifications - Westbank
Railroad Modifications - Westbank
Railroad Modifications - Westbank
Railroad Modifications - Westbank

G&G Steel

New Orleans
Railroad Modifications - Westbank

05/14/2007

05/17/2007
Railroad Modifications - Westbank
Railroad Modifications - Eastbank

EXISTING

Project Site

Clearview Pkwy.

Jefferson Hwy
Railroad Modifications - Eastbank
Huey P. Long Widening Project
Eastbank Railroad Modifications
Huey P. Long Widening Project
Eastbank Railroad Modifications
Railroad Modifications - Eastbank
Railroad Modifications - Eastbank
Main Bridge Truss Widening

- Letting Date: March 28, 2007
- Notice to Proceed Date: November 5, 2007
- Construction Bid: $452,605,568
- Contractor: Massman Construction Co., Traylor Brothers Inc., and IHI, Inc.
Main Bridge Truss Widening

EXISTING

Cantilever Truss Span

Simple Through Truss Span

PROPOSED WIDENING
Main Bridge Truss Widening

- **Industrial Steel Construction**
  - Gary, IN

- **American Bridge Manufacturing**
  - Coraopolis, PA

- **New Orleans**
West Bank Approach, Main Bridge Deck Widening, East Bank Approach

• Letting Date:
  – March 19, 2008

• Estimated Construction Cost:
  – $400 to $425 Million
Acknowledgements

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Project Manager, Bridge Engineer Manager

Jan Grenfell
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Hossein Ghara
Bridge Engineer

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General Manager

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Chief Engineer

R. Kollmar
Assistant Chief Engineer

S. Sponsel
General Superintendant, Bridge

M. Dumas
Bridge Supervisor
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- Karen Wicker
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- D.Kelley

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- Wayne L. Coco, AIA

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- Gregory Rigamer
- Mona Nosari

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Design Team – M & M

- W. B. Conway
- D. F. Sorgenfrei
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Widening of the Huey P. Long Bridge

2008 LTRC Seminar Series

Bridge Structures