



TEXAS DEPARTMENT OF TRANSPORTATION



BRAZOS RIVER BRIDGES

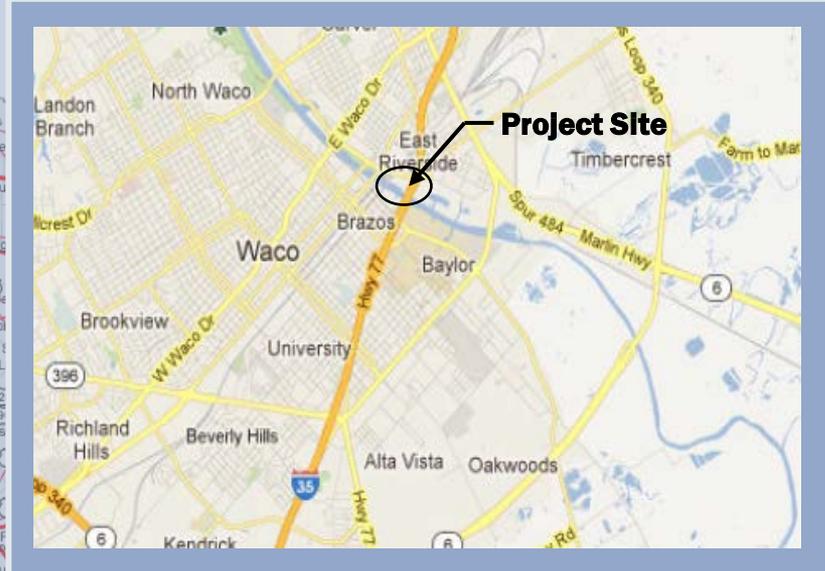
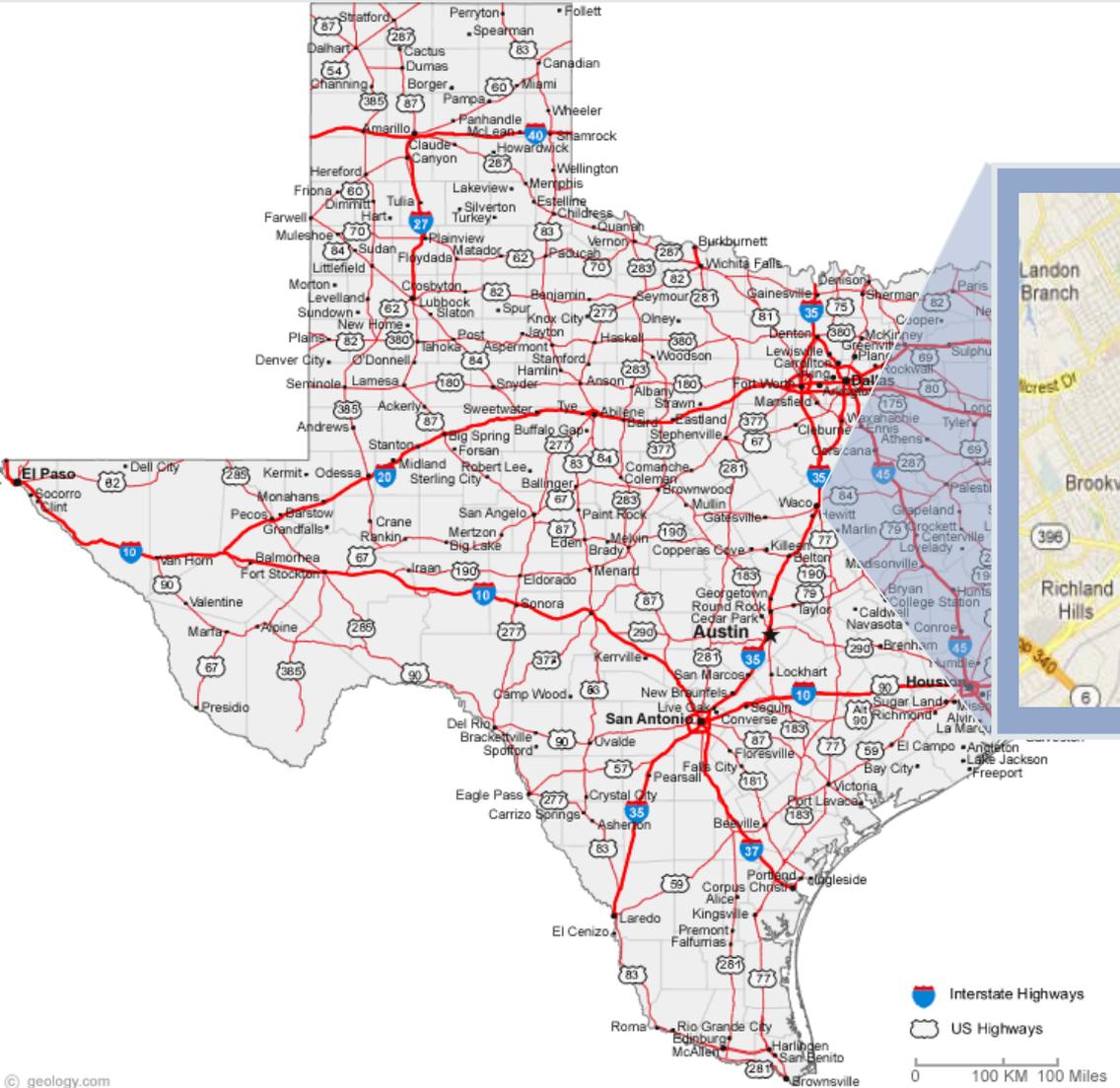
Solomon Thomas, P.E.,

Project Manager

Brazos River Bridges Project



Project Location - Waco, Texas



Project Location



Brazos River Bridges

- **Extradosed bridges**
 - **First in Texas**



**Lighting:
Partnership with City
of Waco**

Extradosed Bridges with Steel Girder Composite Cross-Sections



Pearl Harbor Memorial Bridge

New Haven, Connecticut
(Steel composite cross-section alt. designed;
CIP segmental alt. under construction)
Owner: Connecticut DOT
Designer: URS Corporation

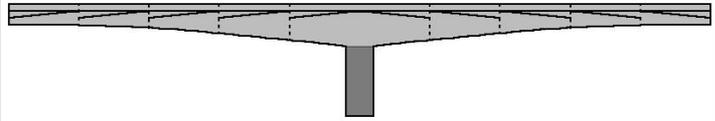
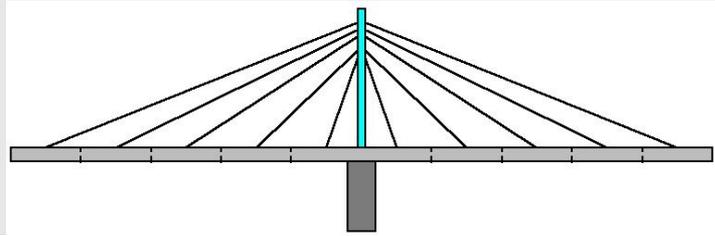
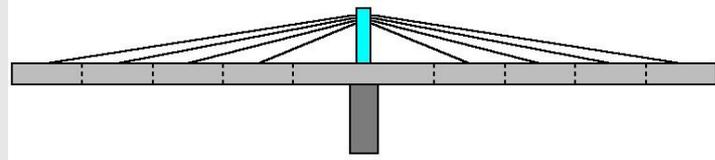


Golden Ears Bridge

Vancouver, Canada
(Only known extradosed bridge constructed to
date with steel composite cross-section)
Owner: TransLink
Designer: Buckland & Taylor Ltd.

What is an Extradosed Bridge?

- Hybrid structure that combines elements of a girder bridge with a cable-stayed bridge.
 - Loads shared between girder and stays.
 - Stays act more as pre-stressing rather than vertical support.

Girder Bridge	
Cable-Stayed Bridge	
Extradosed Bridge	

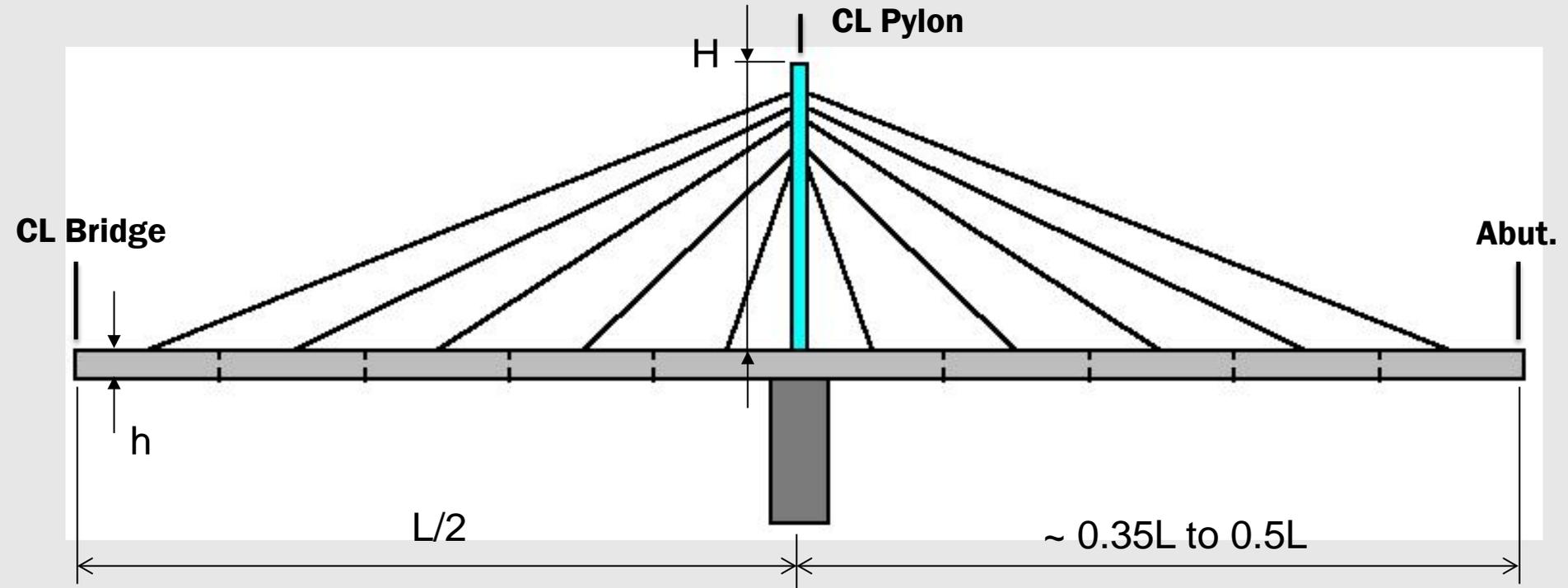
Why Extradosed?

- Derived from the Latin word “extra” meaning outside and the French word “dos” for back. Thus, “extradosed” means “out of the back.”

Or...

- Extradosed is defined as the exterior or uppermost surface of an arch. Since the original concept was for external PT tendons placed above the deck, to differentiate these shallow external tendons from cable-stays they were termed “extradosed” as they defined the uppermost surface of the bridge.

Cable-Stayed Bridge

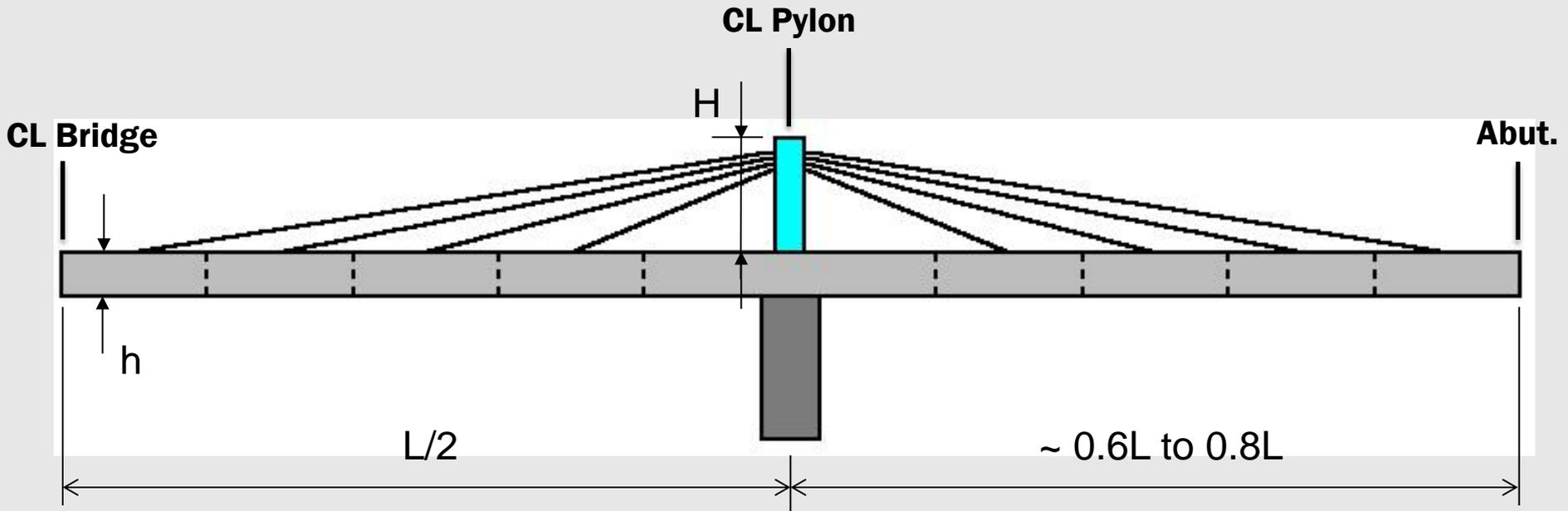


$$H \sim L/5 \text{ to } L/4$$

$$h \sim L/100$$

Maximum Stay Stress ~ 0.45 fpu (122 ksi)

Extradosed Bridge



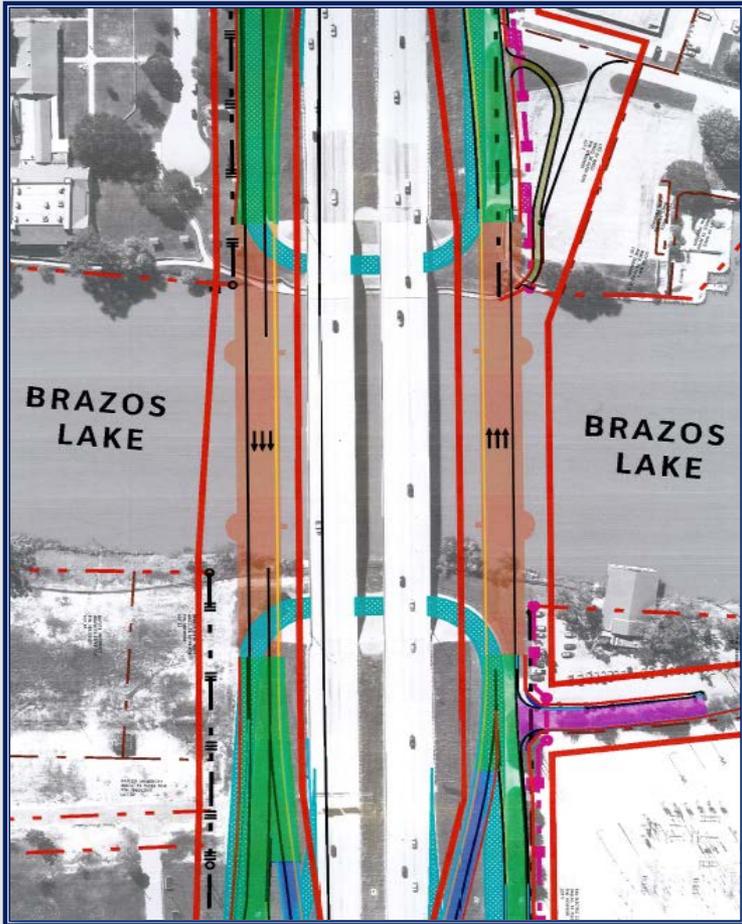
$$H \sim L/15 \text{ to } L/8$$

$$h \sim L/35$$

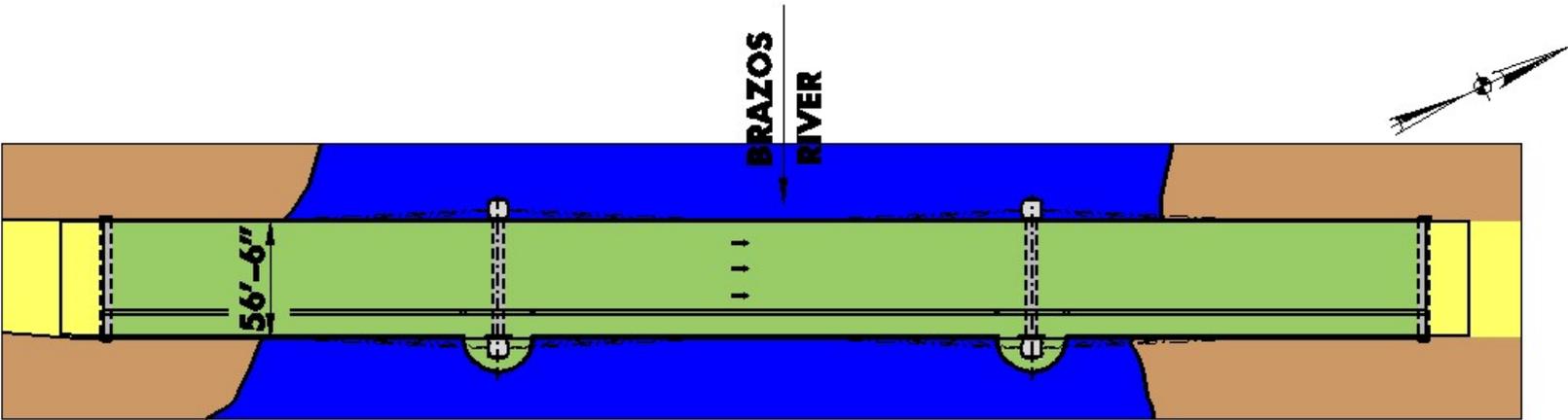
Maximum Stay Stress ~ 0.55 fpu (149 ksi)

Lower Live Load Stress Range in Stays ~ 0.025 fpu (7 ksi)

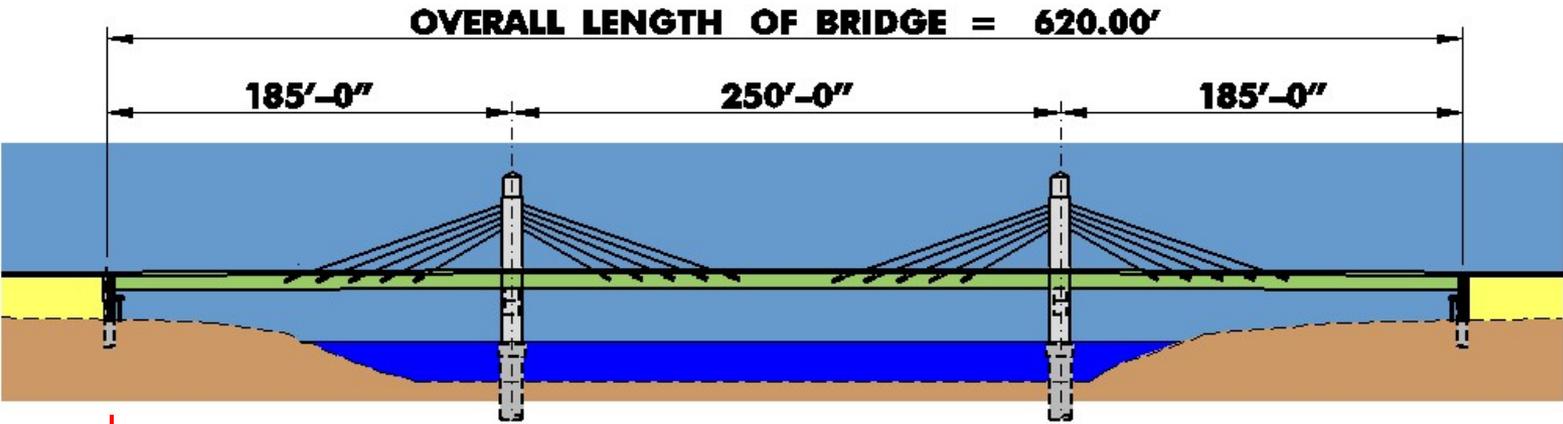
Bridge Layout



Bridge Layout



PLAN

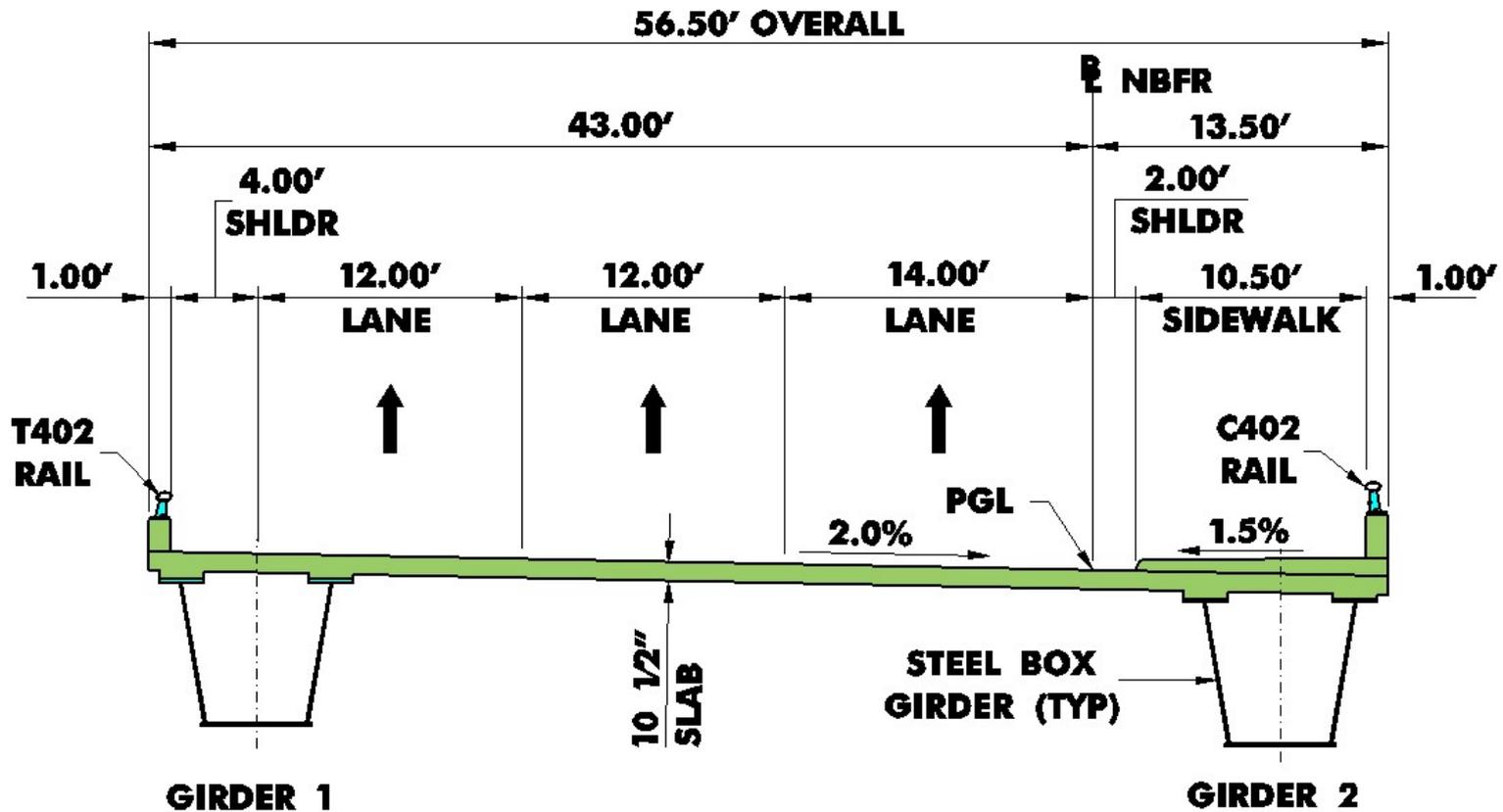


ELEVATION

0.74 L

L

Typical Section



NORTHBOUND FRONTAGE ROAD BRIDGE

Construction – Drilled Shafts

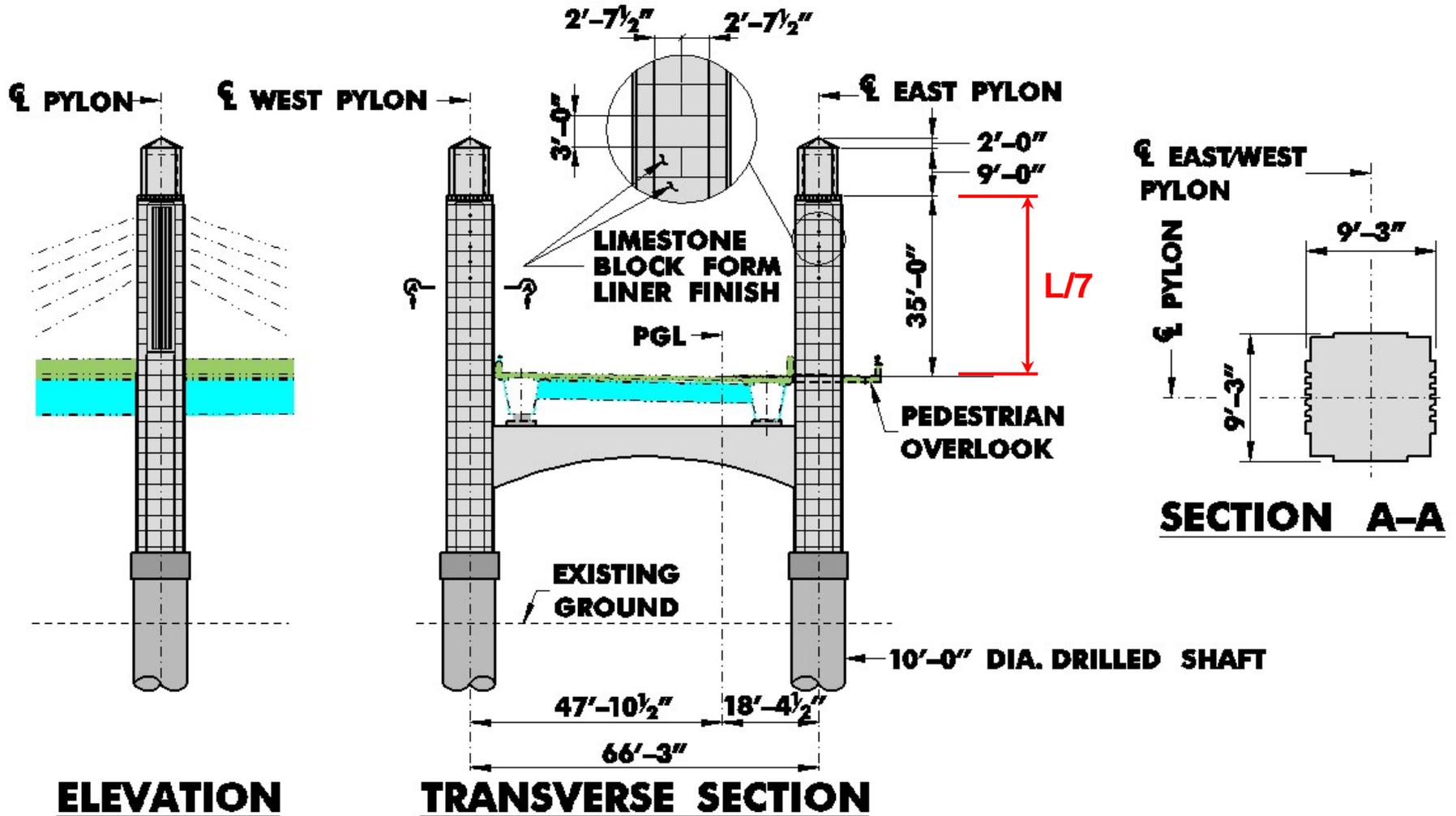


Some photos courtesy Lane Construction

Construction – Footings



Pylons



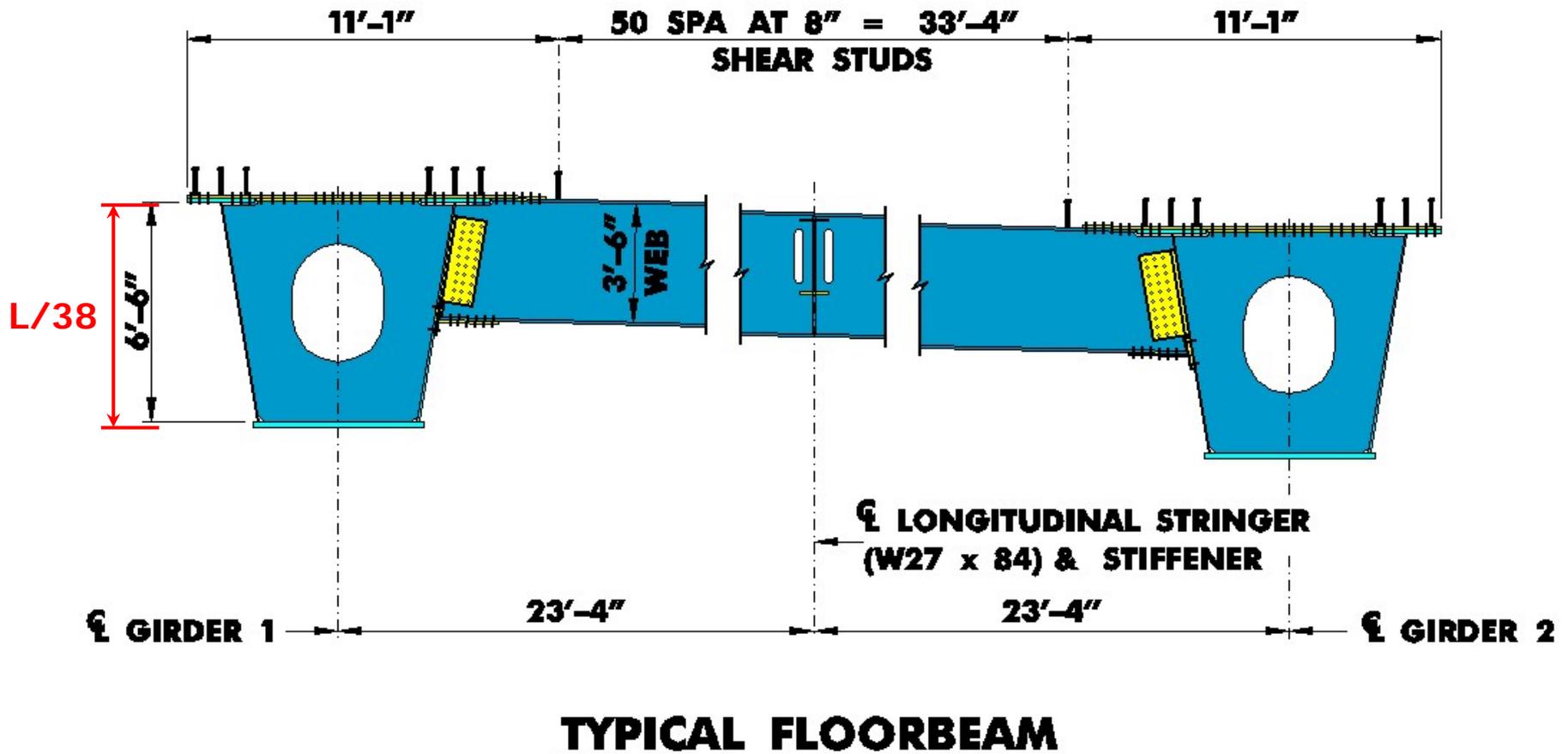
Construction – Pylons



Brazos River Bridges

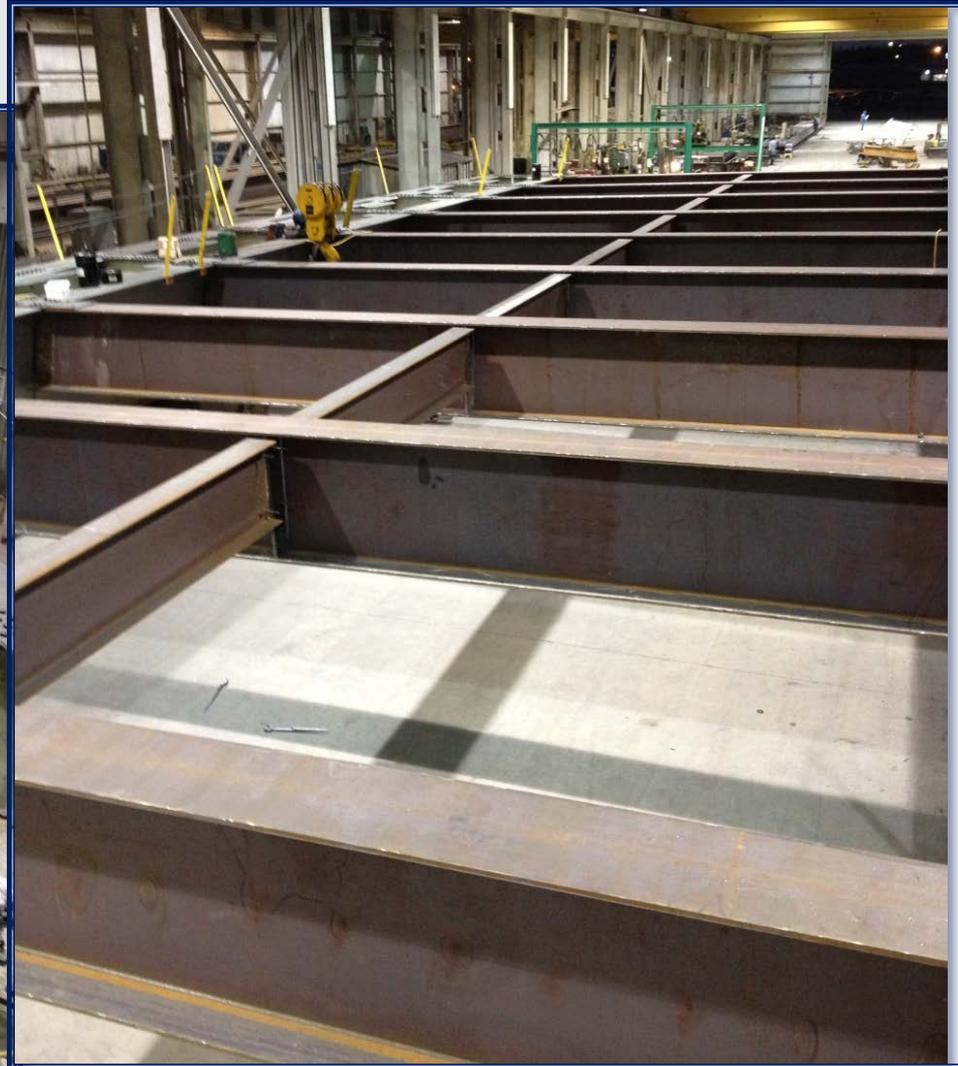
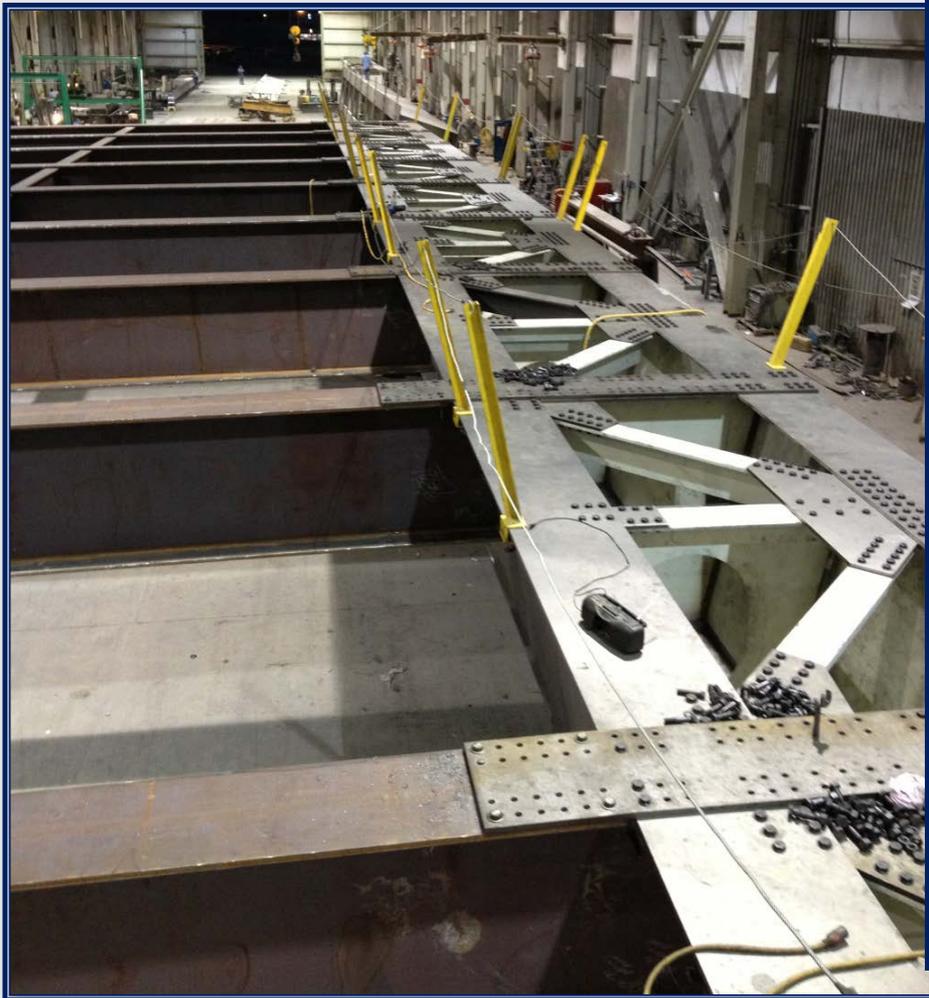


Typical Section

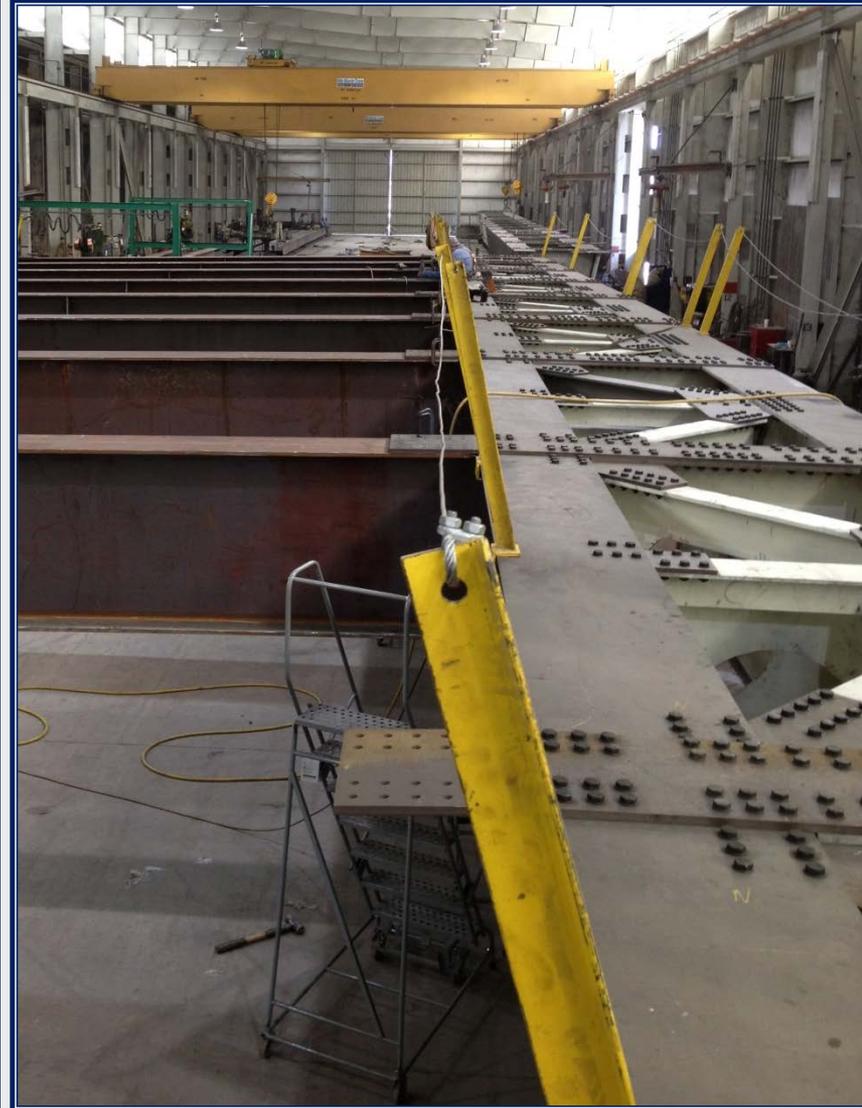
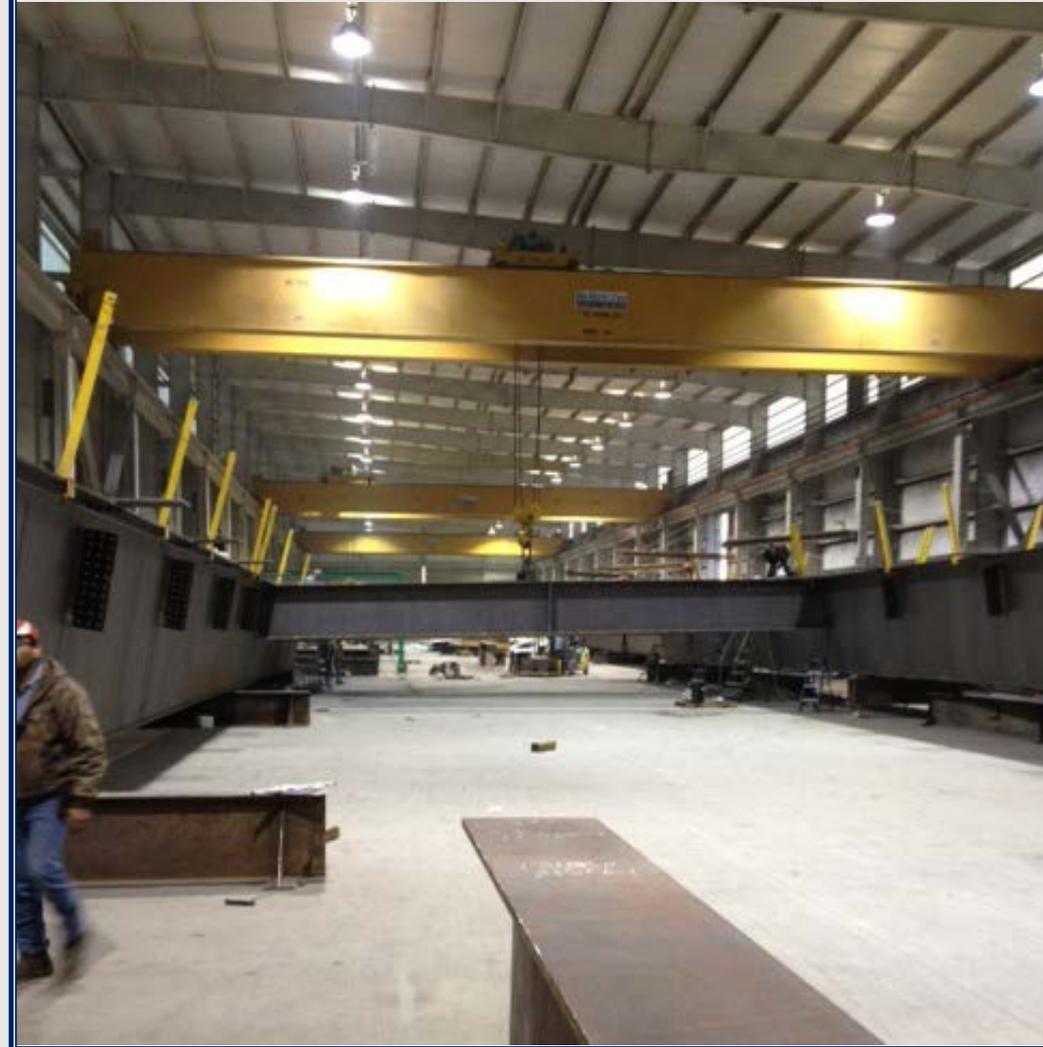


Construction – Steel Edge Girders

Steel Fabricator: Hirschfeld Industries

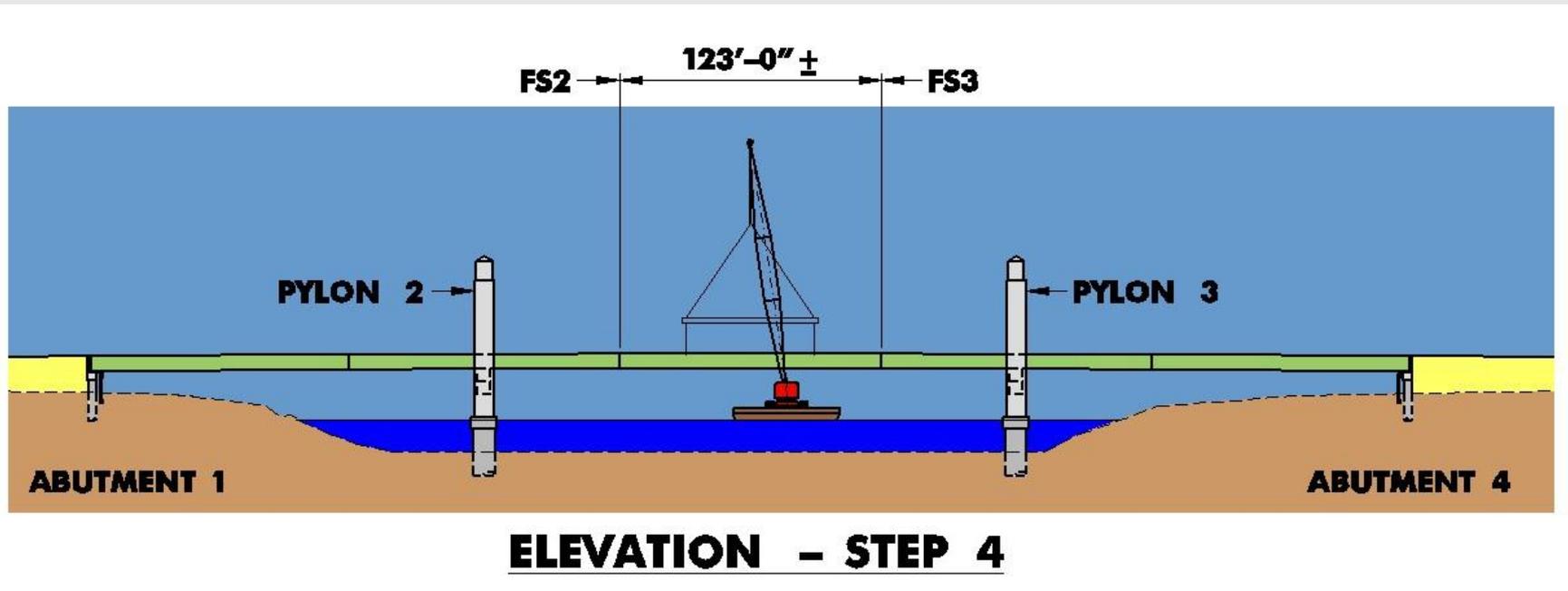


Construction – Steel Edge Girders



Construction Sequence

- Complete erection scheme for bridges developed in design and included in plans.
- Phased pouring sequence of deck and phased stressing of stays developed to limit tensile stresses in the deck during construction and preclude uplift of the bearings.



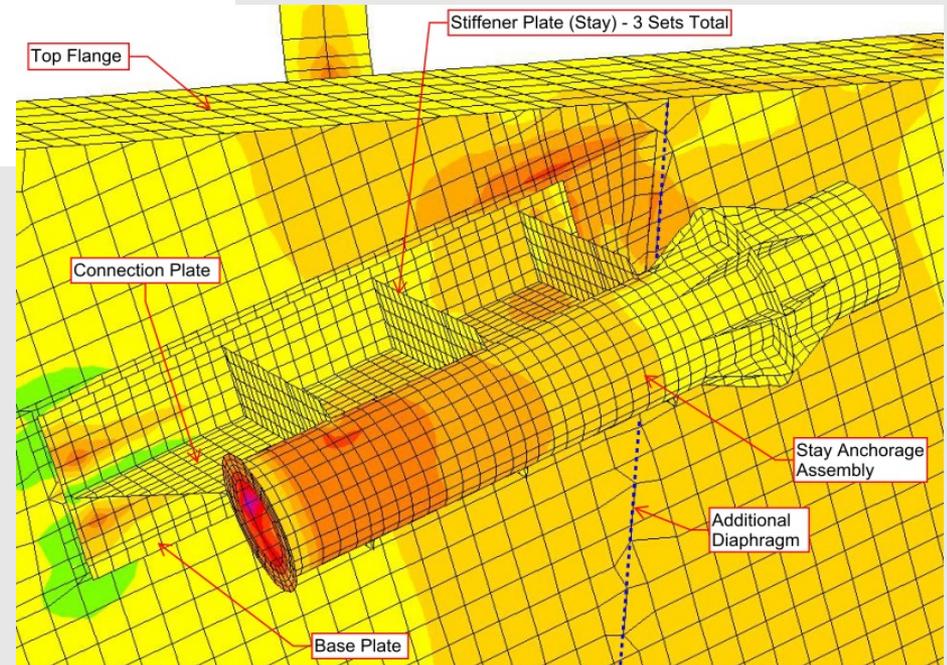
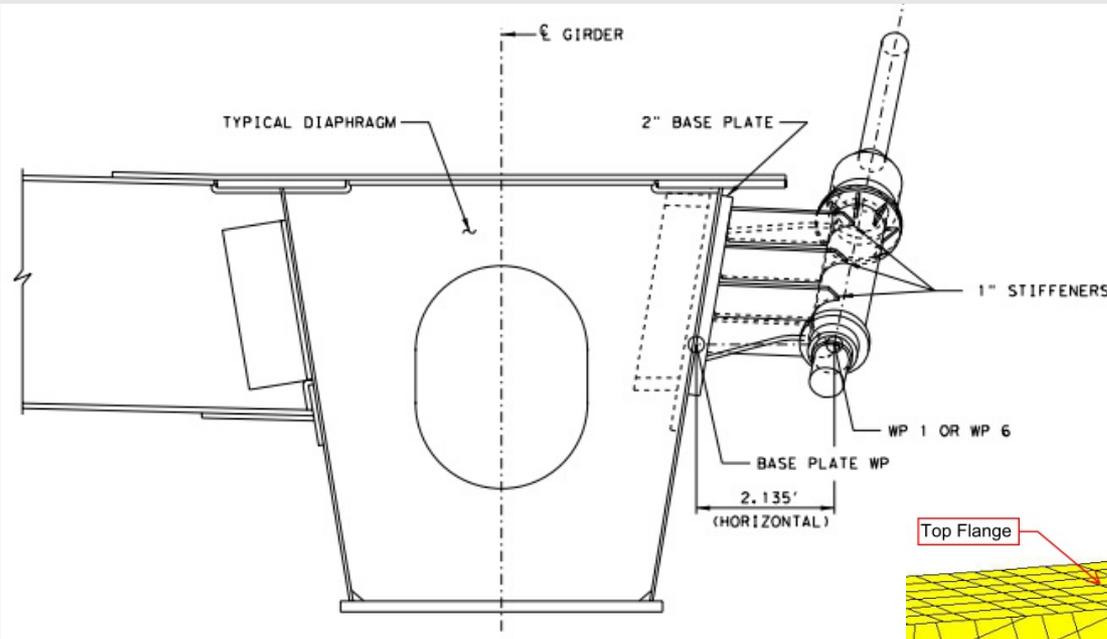
Brazos River Bridges



Brazos River Bridges



Stay Anchors at Edge Girders

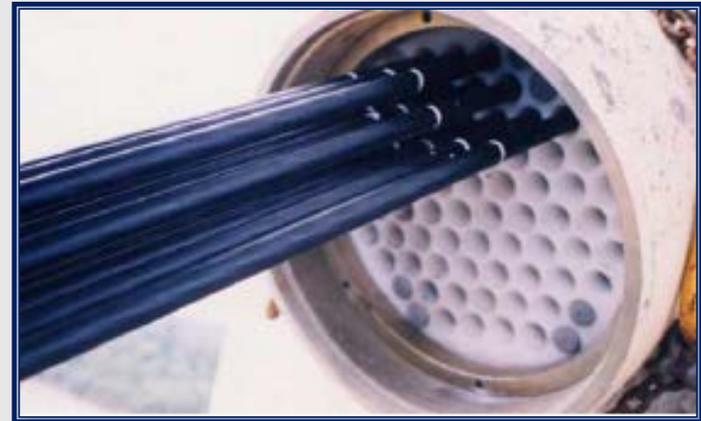


Cable Saddles at Pylons

- Patented systems that place stay strand within individual holes in saddle.
 - Allows for installation and/or replacement of strand on a strand-by-strand basis.
 - Significantly reduces risk of fretting corrosion and long-term fatigue issues.



VSL SSI Saddle



Freyssinet Multi-Tube Saddle

Construction – Stays

Stay Supplier: Freyssinet

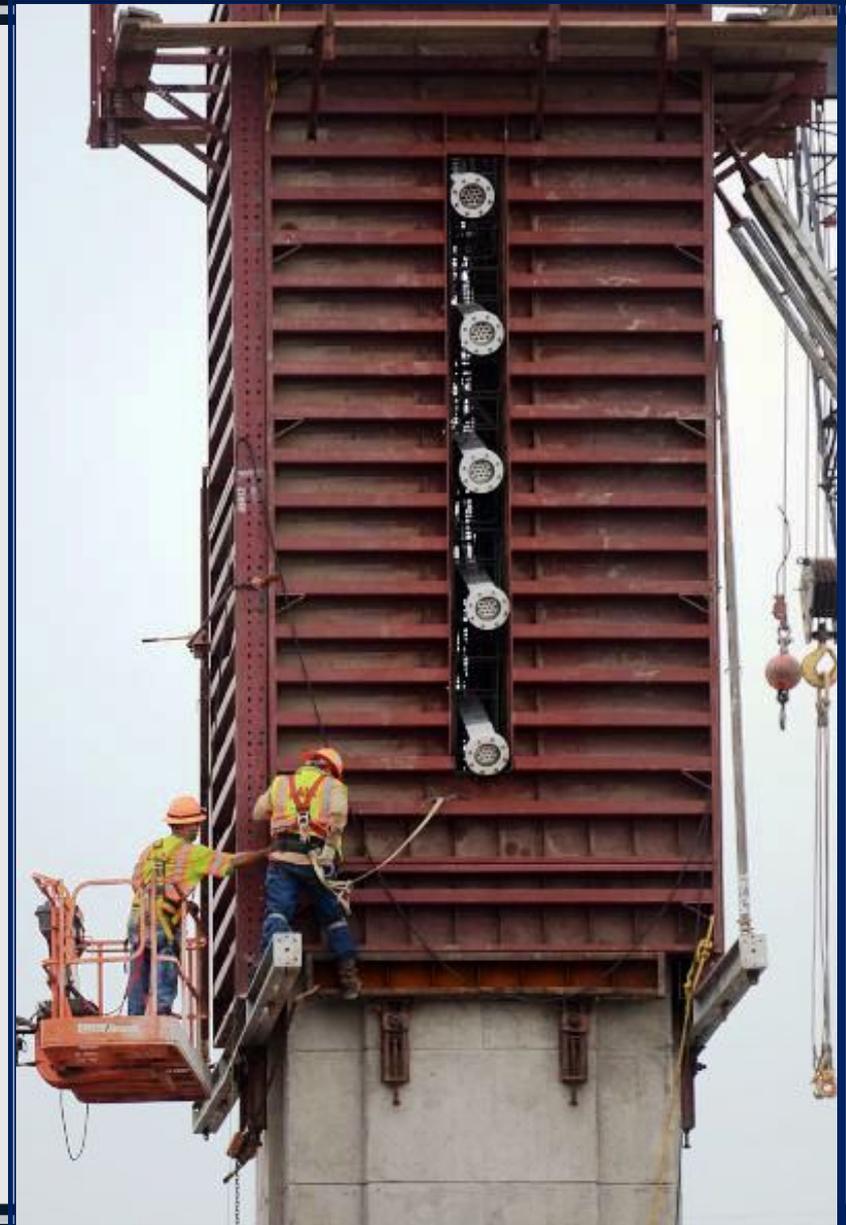
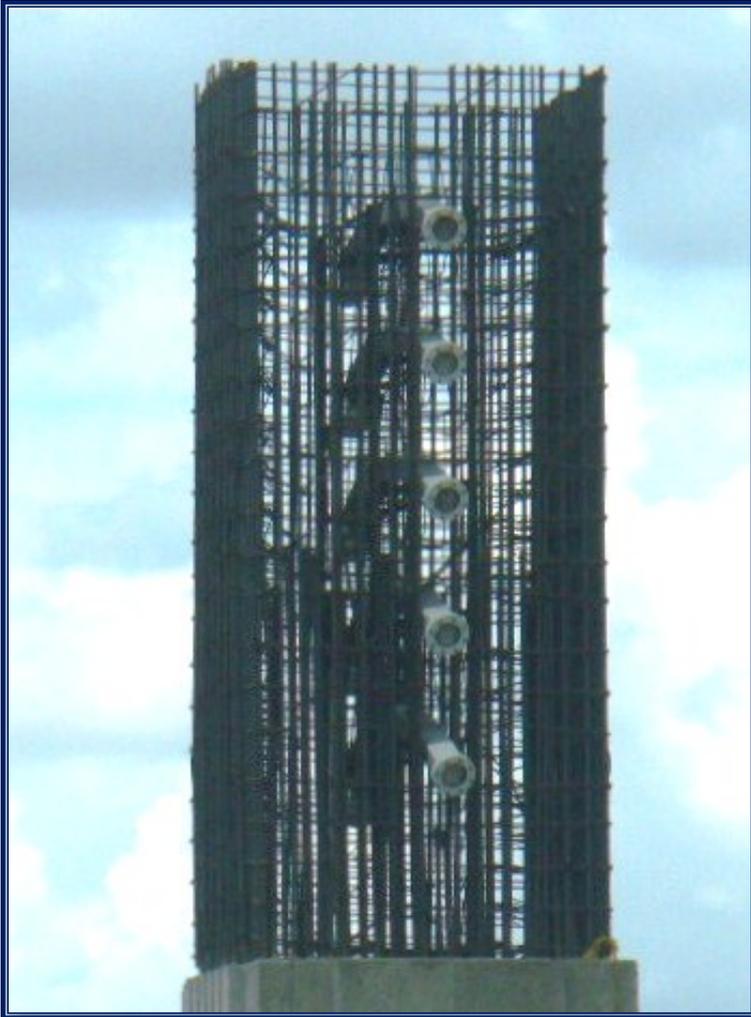


Brazos River Bridges



Brazos River Bridges

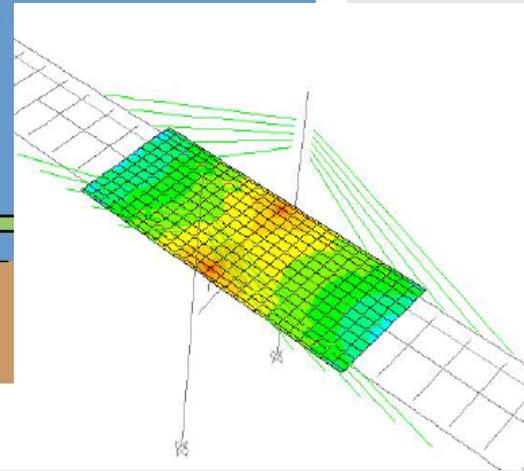
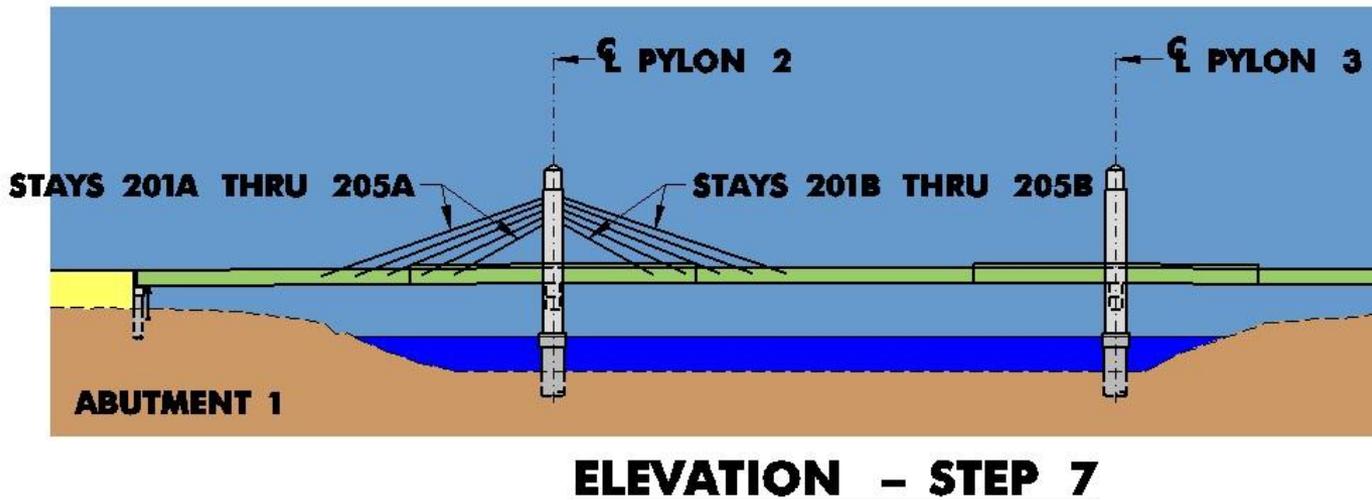
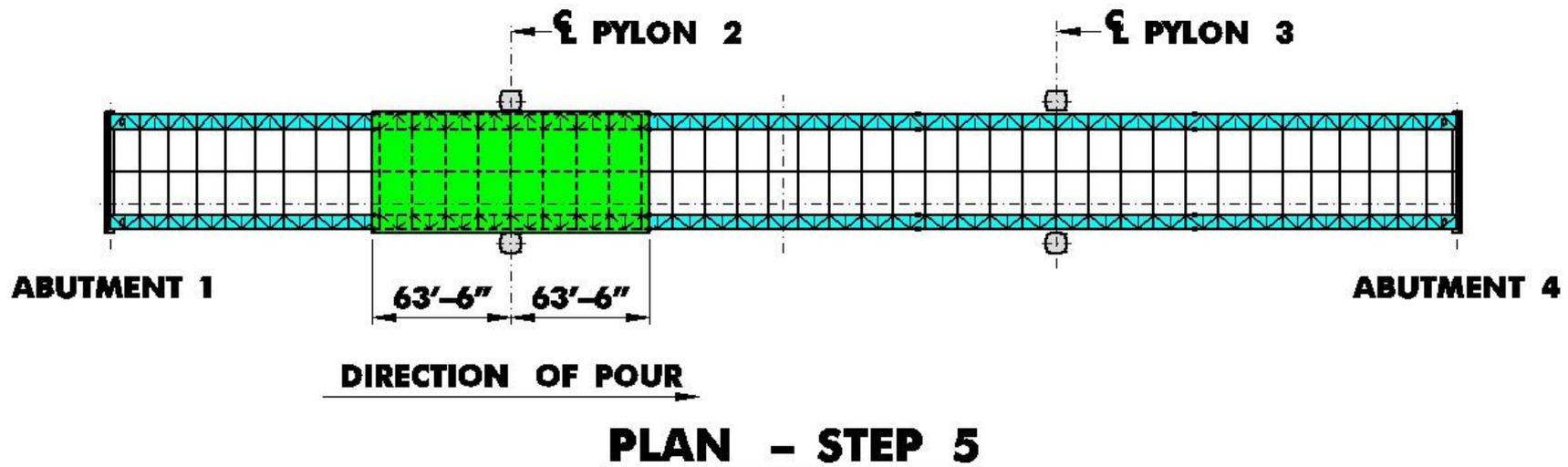
Single Tube Tower Saddle



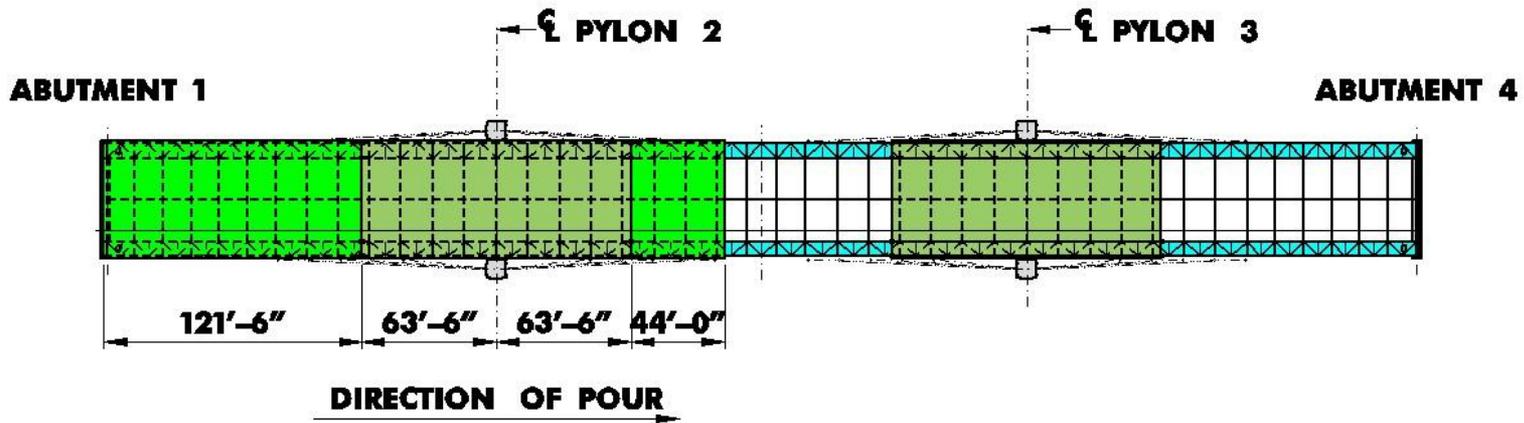
Brazos River Bridges



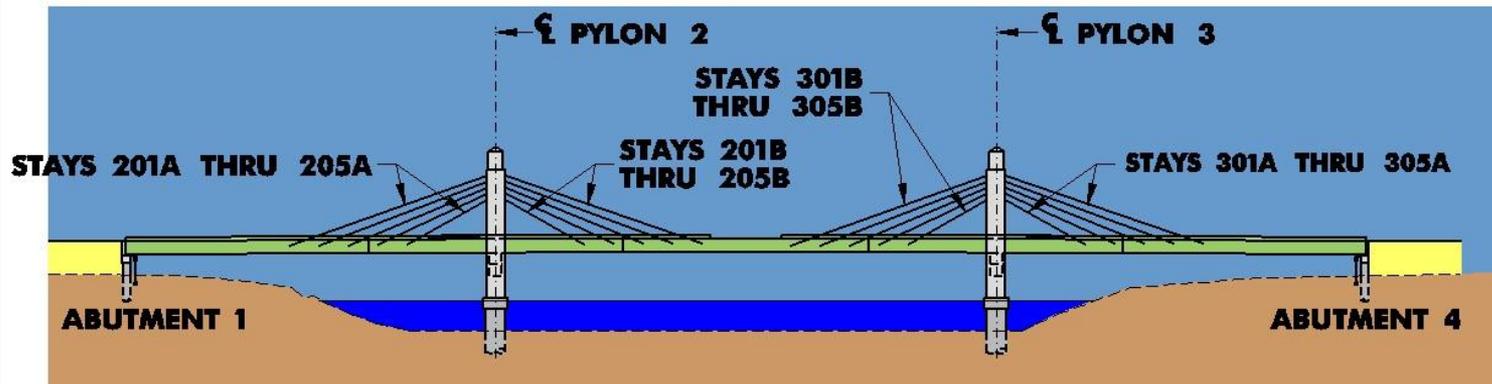
Construction Sequence



Construction Sequence

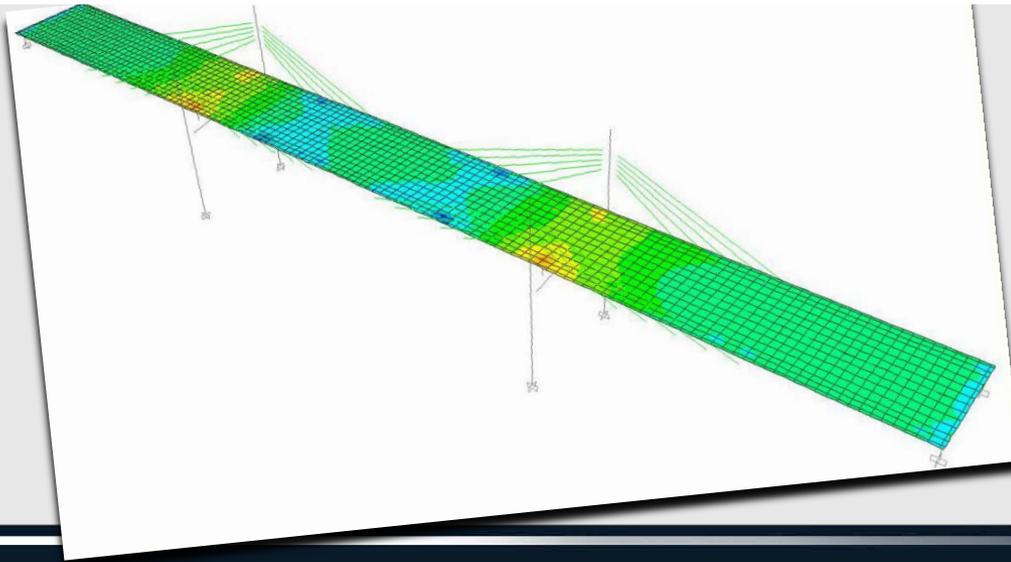
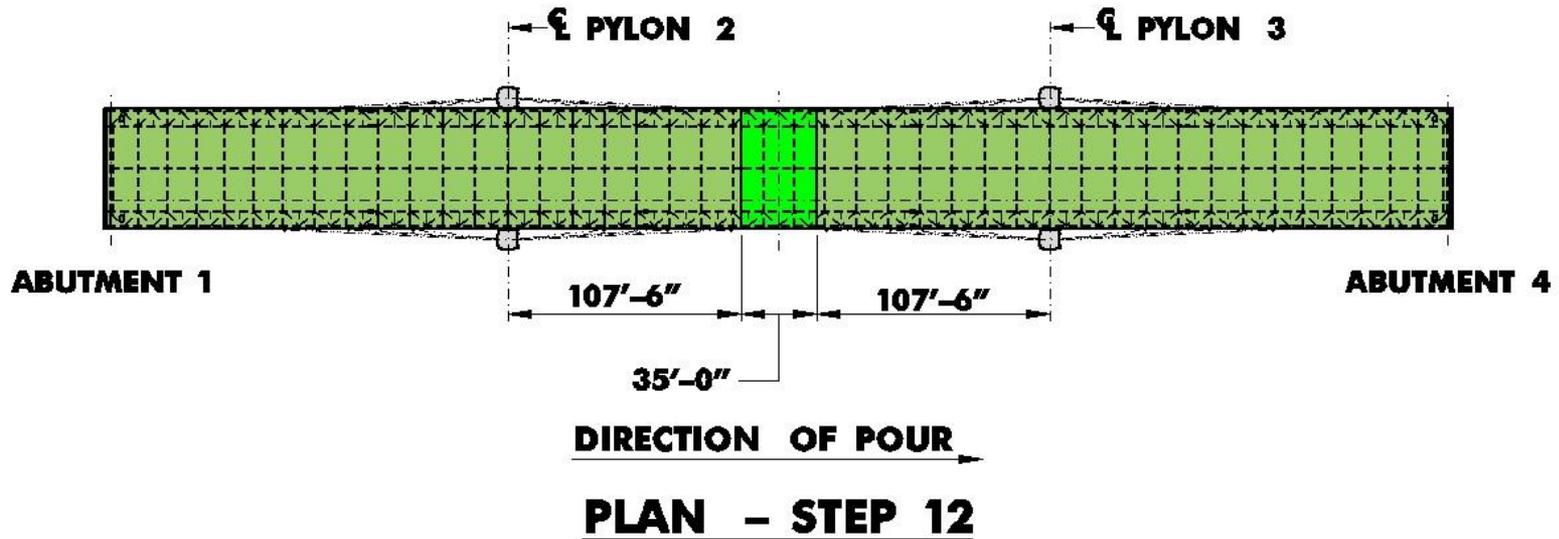


PLAN - STEP 9

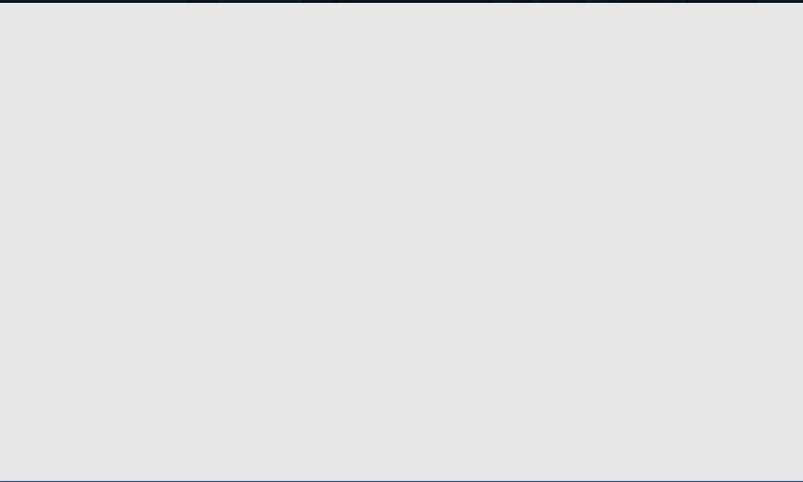


ELEVATION - STEP 11

Construction Sequence

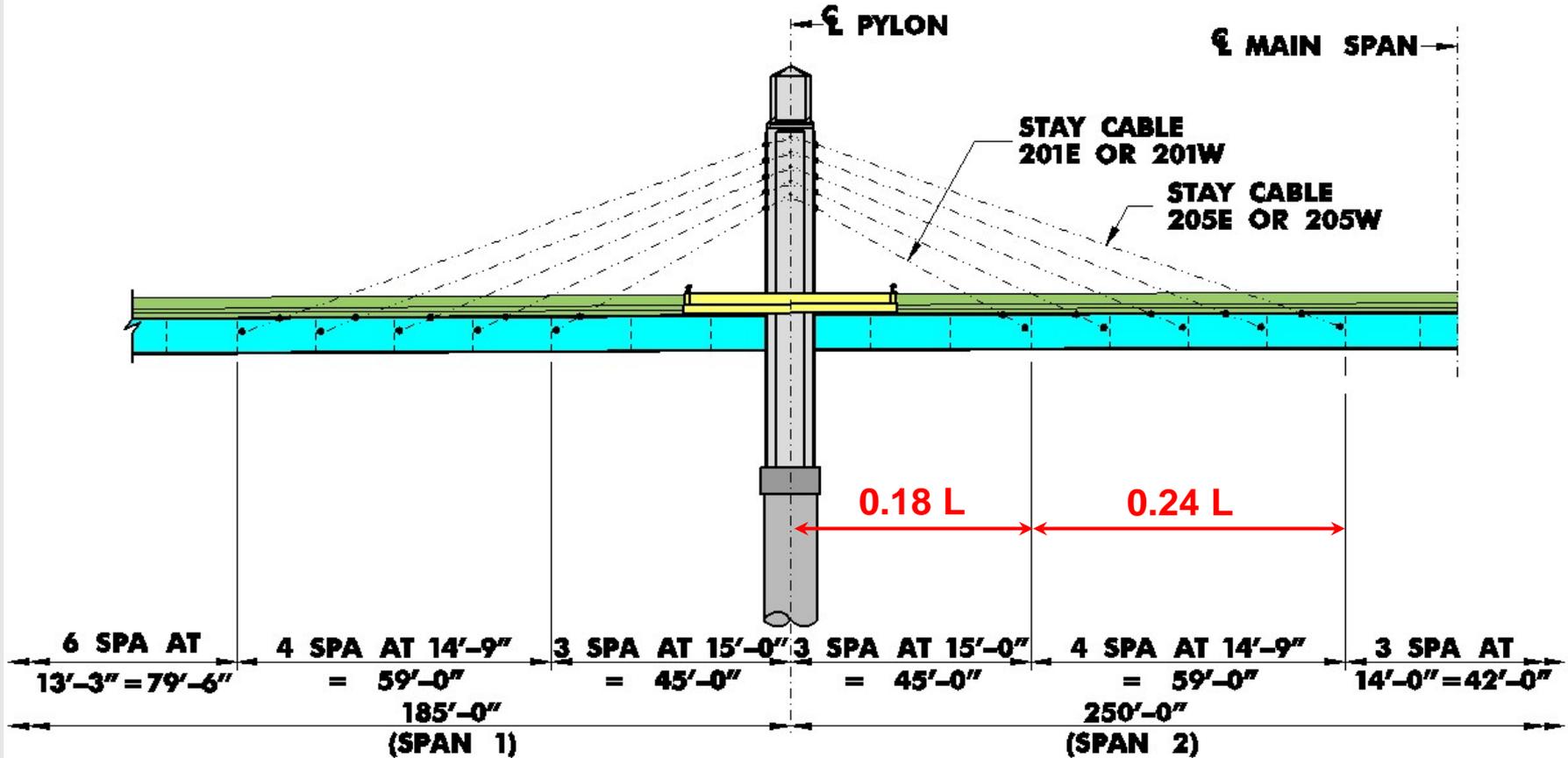


Brazos River Bridges



Stay Cables

- Single plane of 5 cable-stays at each pylon (20 total).
- All stays consist of 12 - 0.62 inch diameter strand.

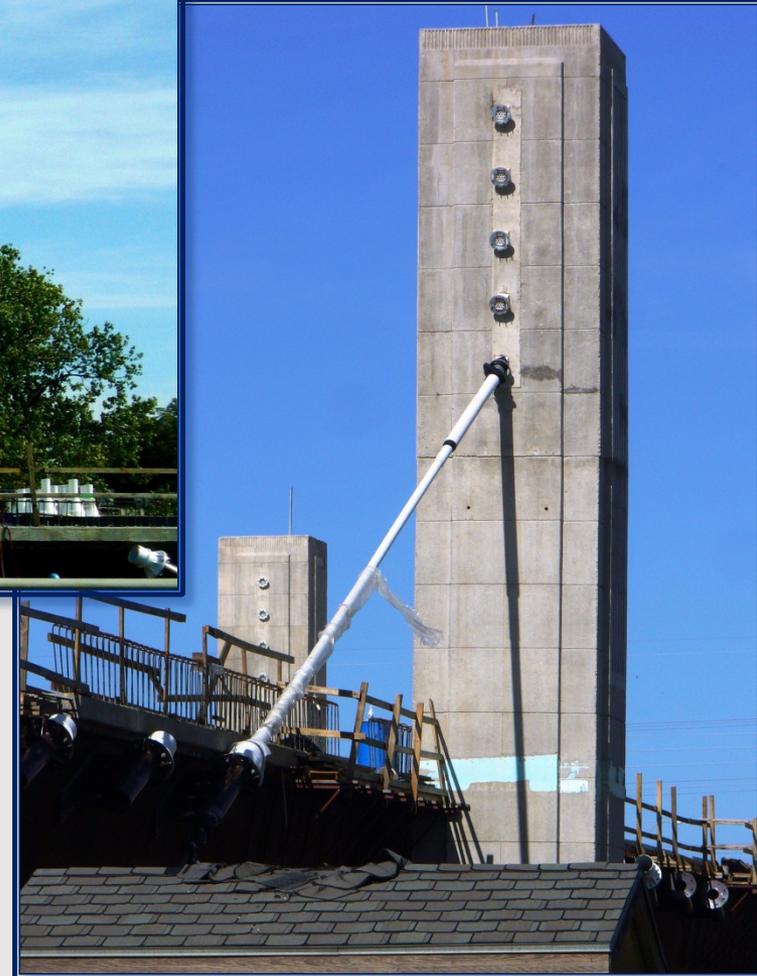


ELEVATION - STAY CABLE DESIGNATION

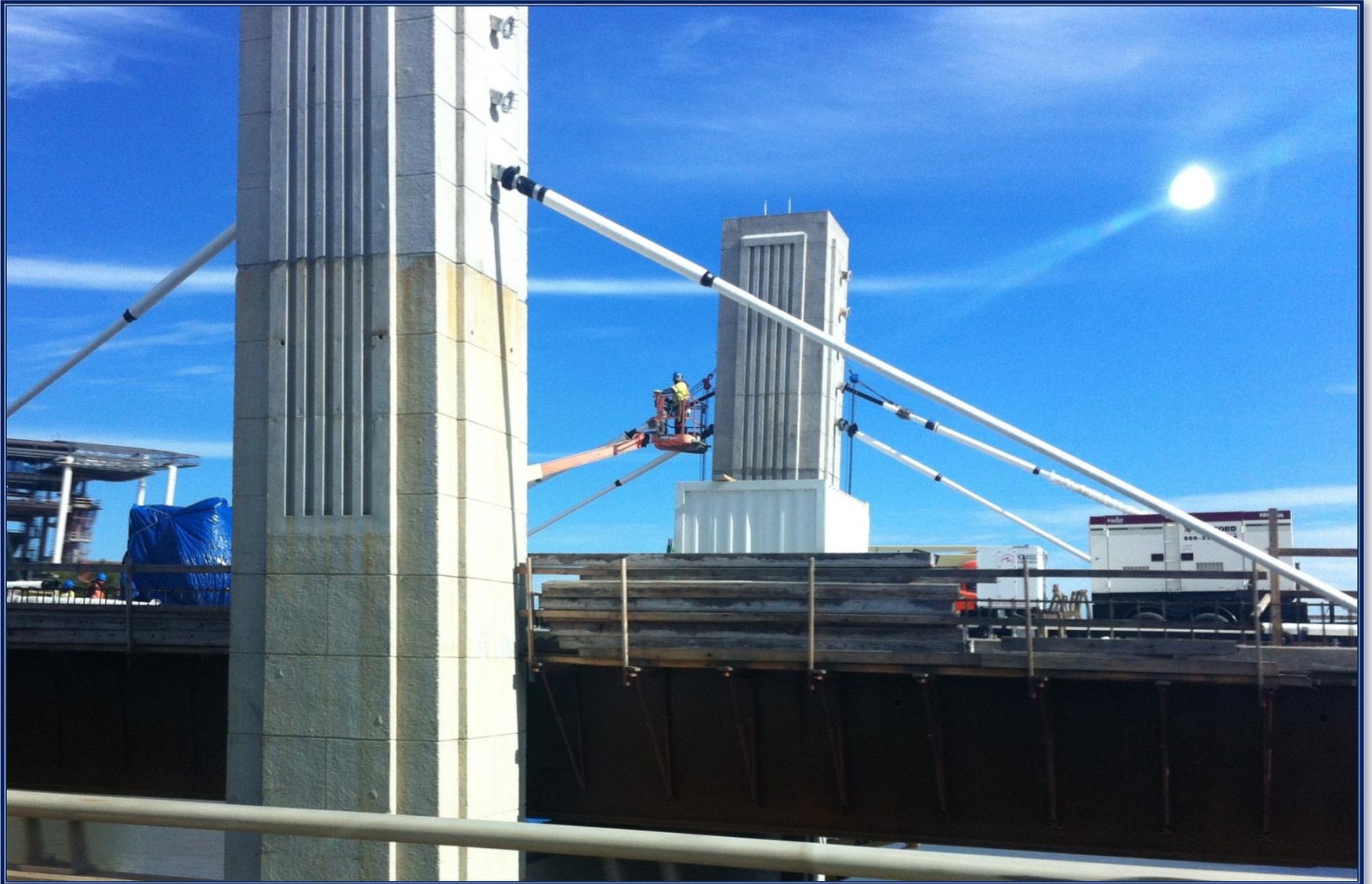
Brazos River Bridges



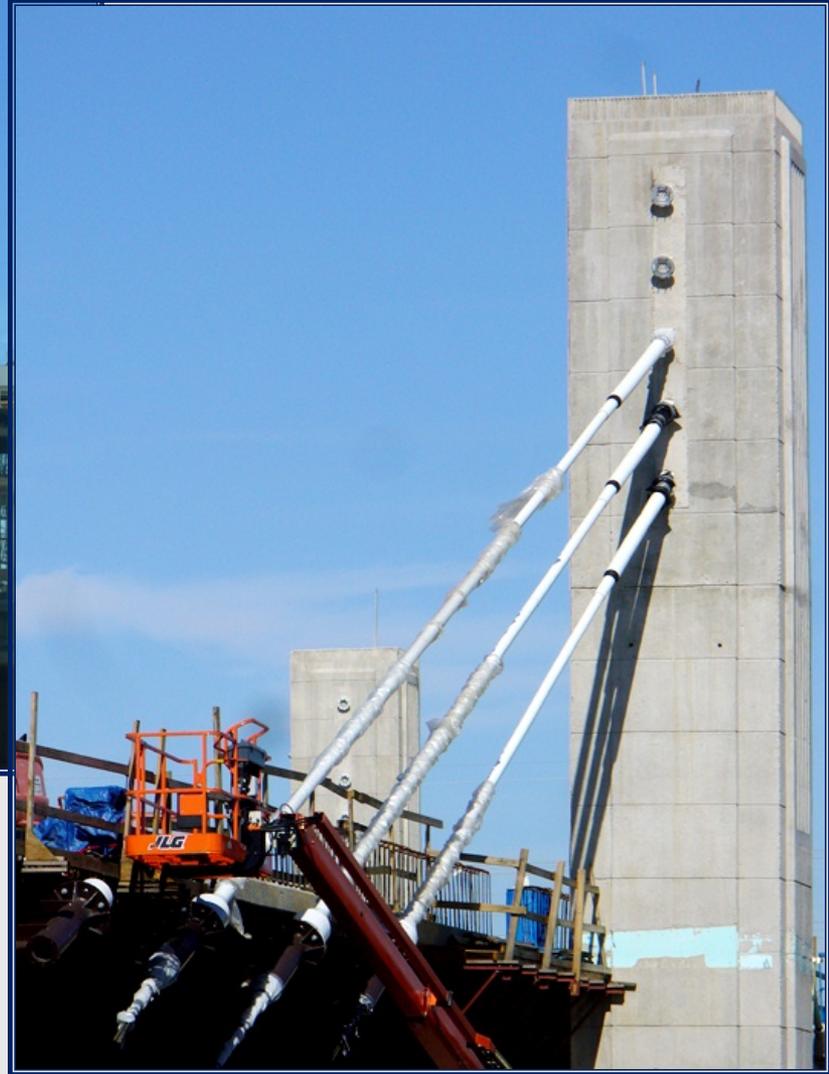
Cable Stays



Brazos River Bridges



Brazos River Bridges



Brazos River Bridges



Current Status

- IH-35 Frontage Road Bridge project combined with larger \$200 million bid package for other IH-35 corridor improvements.
- Let for bidding by TxDOT in September 2011.
- Project awarded to The Lane Construction Corporation.
- Cost of twin frontage road bridges (structural work only) approximately \$17 million or about \$240/ft².
- Construction on bridges began Fall 2012.
- Ribbon-cutting July 2, 2014

Brazos River Bridges & McLane Stadium



Game Day 8/31/2014

Brazos River Bridges



Brazos River Bridges



Photo courtesy Lane Construction

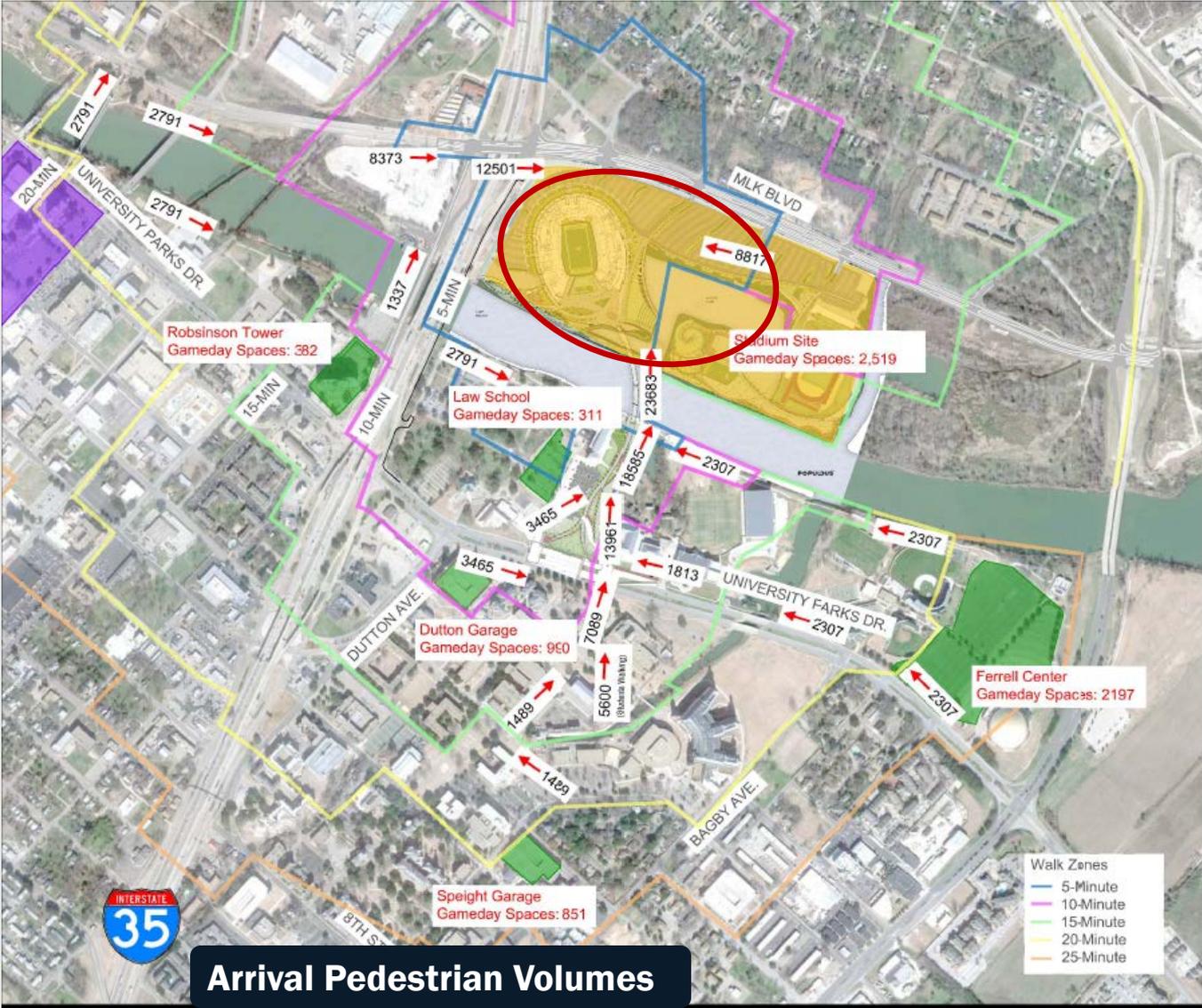
Video



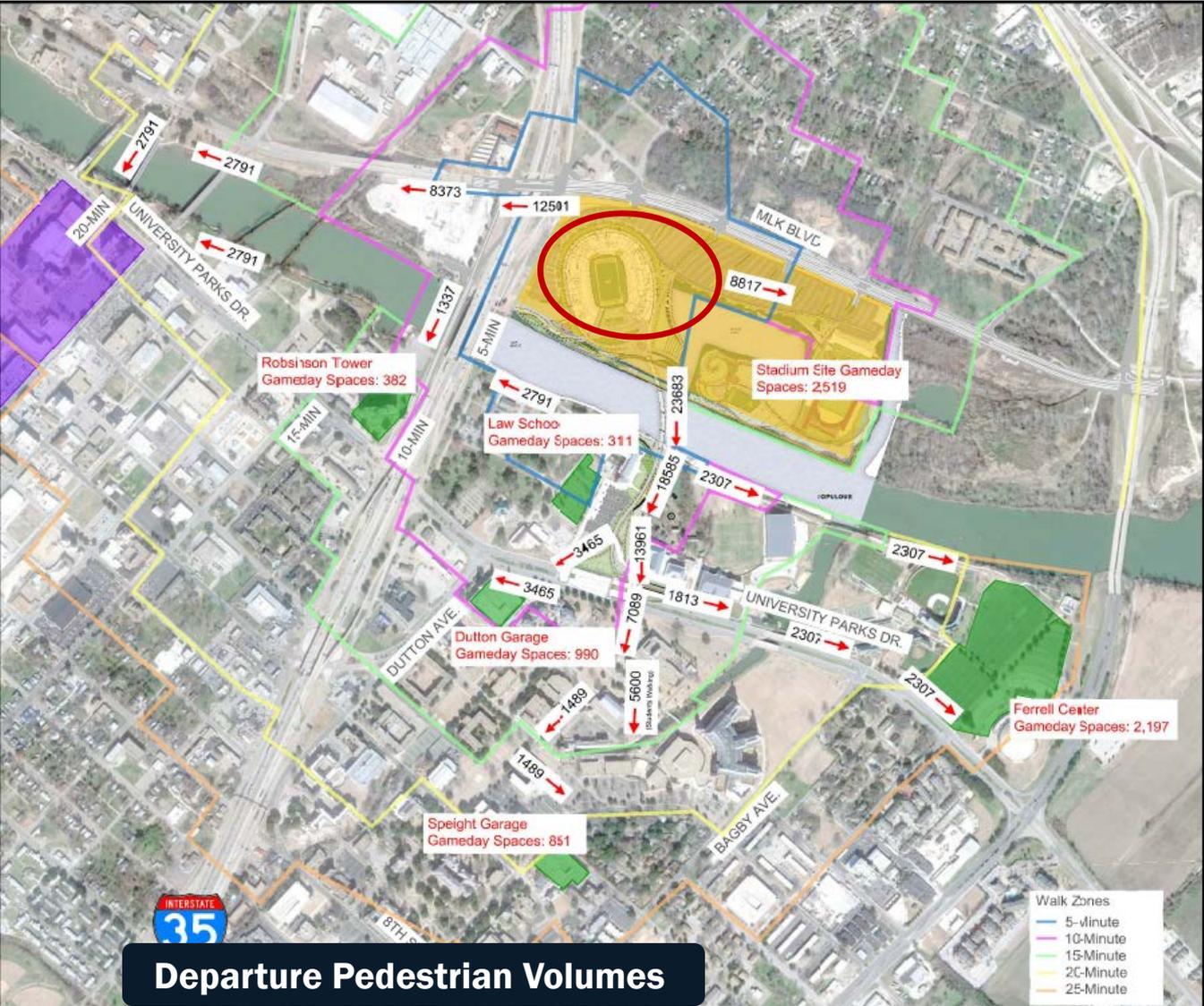
Baylor Stadium Traffic Plan



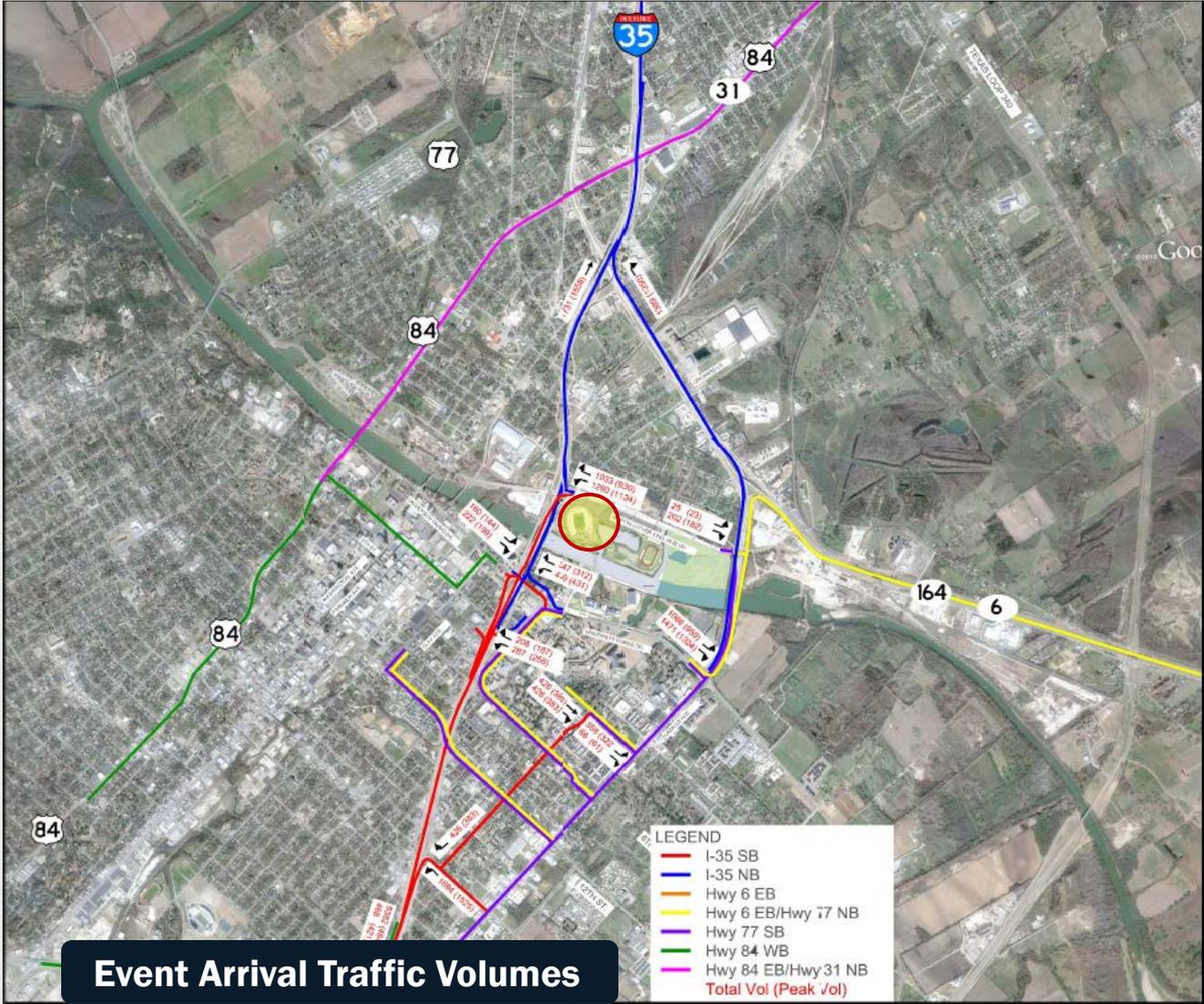
Baylor Stadium Traffic Plan



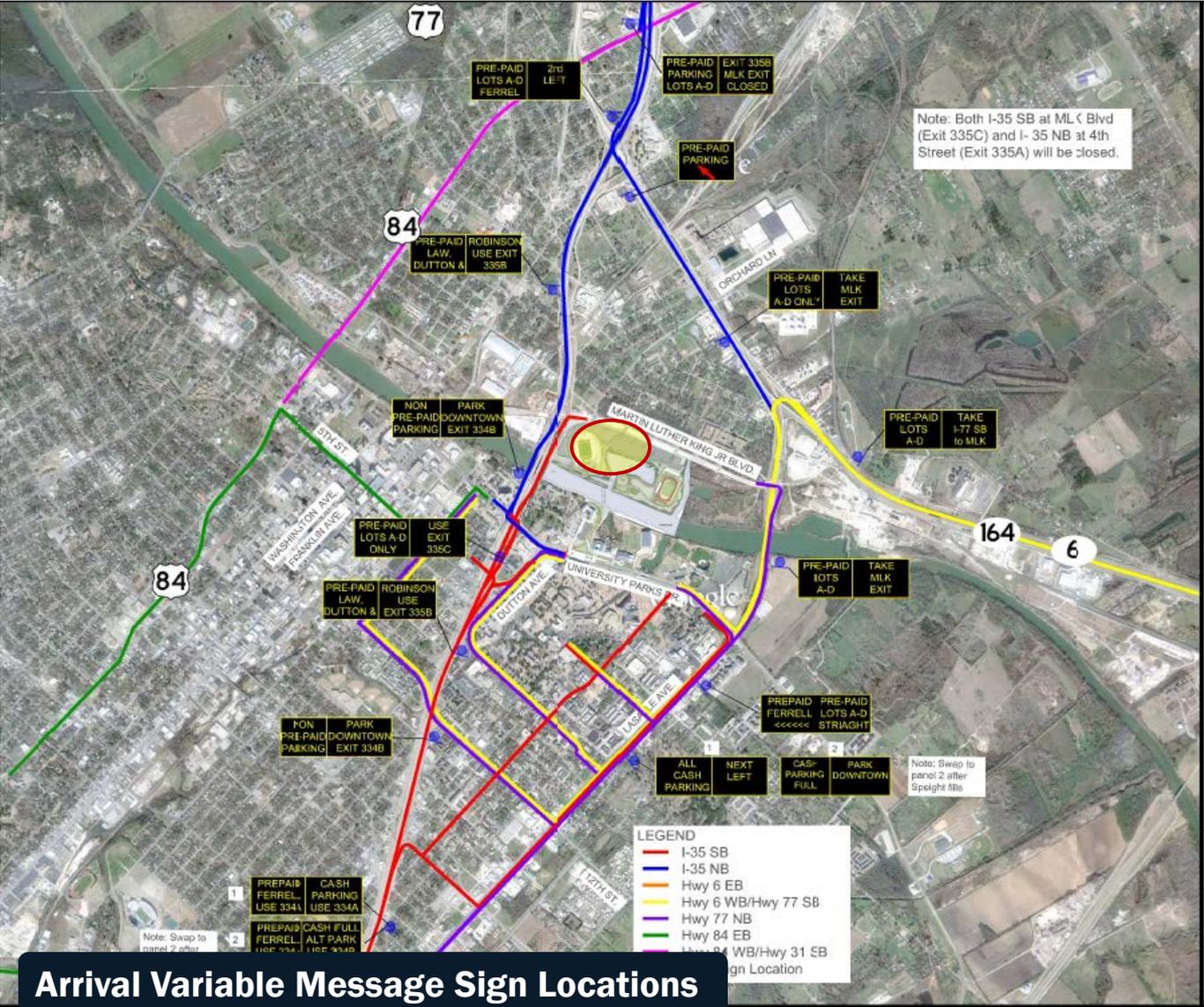
Baylor Stadium Traffic Plan



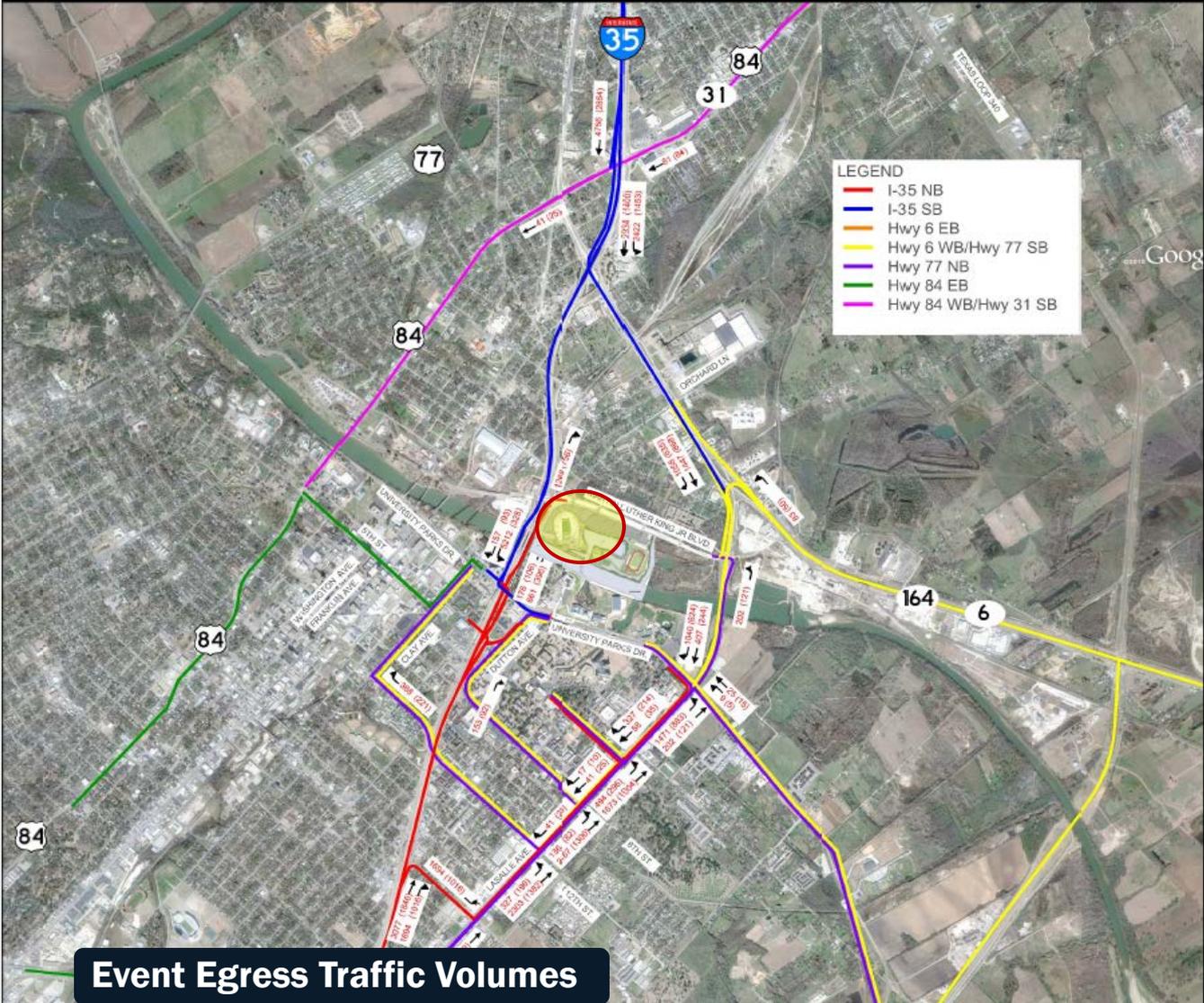
Baylor Stadium Traffic Plan



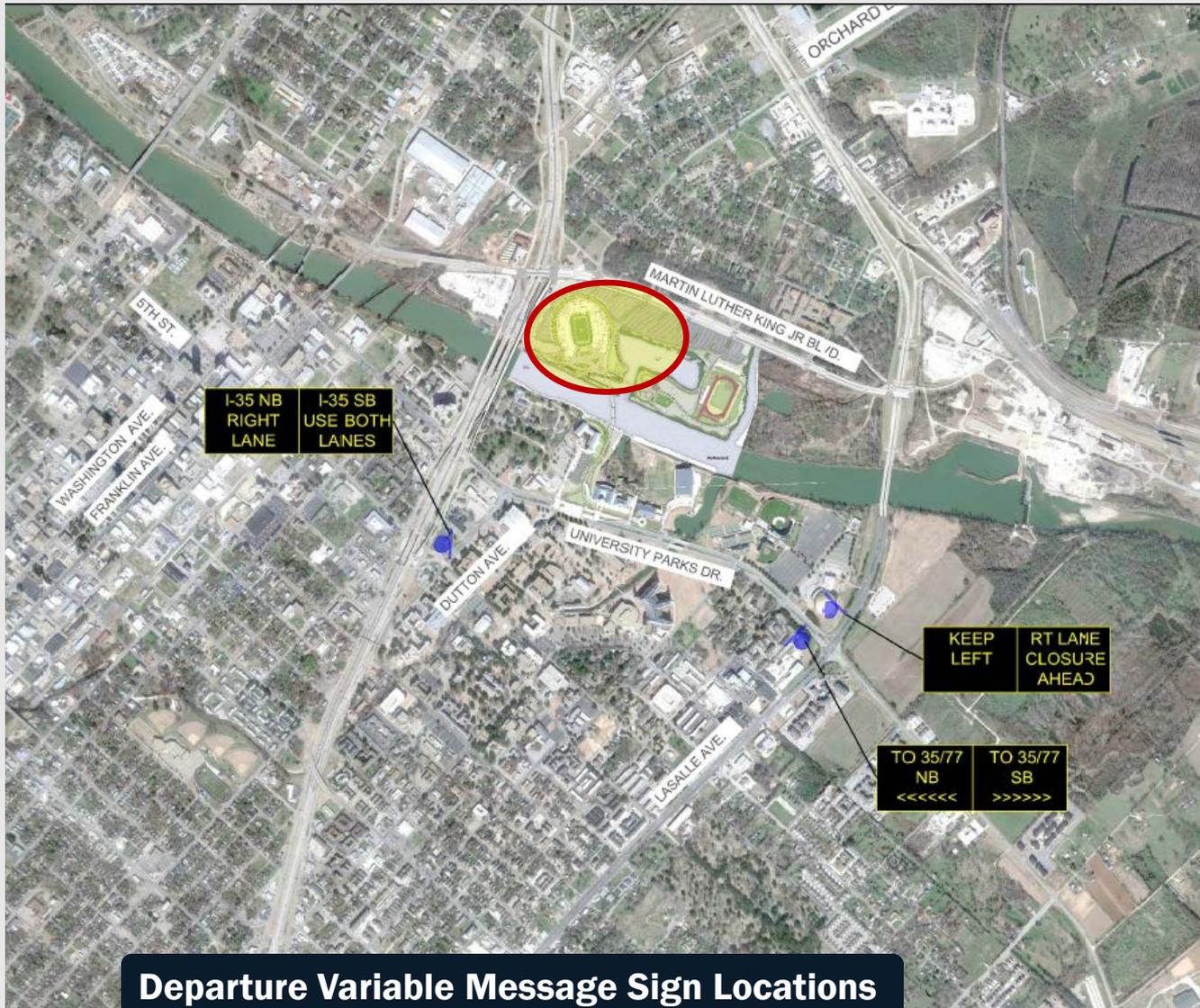
Baylor Stadium Traffic Plan



Baylor Stadium Traffic Plan



Baylor Stadium Traffic Plan



Acknowledgments



Owner: Texas Department of Transportation (TxDOT)

Designer: AECOM

Contractor: Lane Construction

**Construction Engineer: Finley
Engineering Group**

**Steel Fabricator: Hirschfeld
Industries**

Stay Supplier: Freyssinet



Waco & Lane Construction Crews



Photo Courtesy Lane Construction

TxDOT Inspectors



Area Office Inspectors:

Lawrence Wilson

Guy Wardlow



Bridge Division Inspector:

Stan Ybarra