


SHRP2 SOLUTIONS
STRATEGIC HIGHWAY RESEARCH PROGRAM

Minnesota DOT
ABC Project Selection Methodology
Lateral Bridge Slide Experience

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September 17, 2015

U.S. Department of Transportation
Federal Highway Administration

American Association of State Highway and Transportation Officials
AASHTO

ABC Implementation

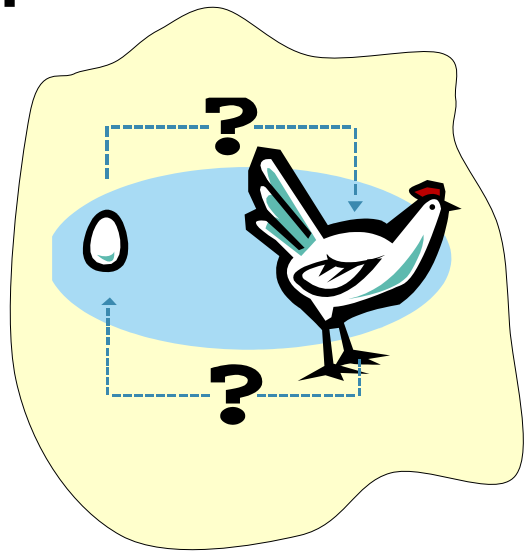
- 14 inverted tee bridges
- 2 Brs w/ precast subs (piers, abut., wing walls)
- 2 full depth concrete deck panel bridges (w/PT)
- 2 SPMT projects
- 3 Lateral bridge slides
- 1 Geosynthetic Reinforced Soil (GRS)
  Integrated Bridge System (IBS)
- Ultra High Performance Concrete (UHPC)
  – local project in 2016

ABC Project Selection

Selection by Committee

Issues

- **Inconsistent implementation**
- **Late in design process**
- **Funding issues**
- **Driven by Bridge Office**



ABC Project Selection

Need:

A methodology to provide a consistent, objective, and defensible method of selecting appropriate ABC projects.

Available Tools:

- **FHWA – Ben Beerman**
- **Utah DOT**
- **Wisconsin DOT (Bridge Design Manual)**
- **Iowa DOT (Bridge Design Manual)**
- **Oregon DOT Pooled Fund Project**
  - **Oregon State Univ.**
  - **Analytic Hierarchy Process (AHP)**
  - **Pair wise comparison – tradeoffs**

ABC Project Selection

3 Stage Process

Stage 1 – First Cut

- ABC looks viable

Stage 2 – Site specific questions

Stage 3 – Select Method/Technique

- Alternative Contracting Options

Project Selection – Stage 1

Selection of Accelerated Bridge Construction Projects
Draft MnDOT Decision Making Tool (DMT) V9

Stage 1 - Score computed using Bridge Management Data:

30% Wt. Daily Vehicle Operating Costs - Dependent on Bridge Length

"On Bridge" AADT and HCAADT Only	Distribution	Score	Criteria
Bridge Length Factor:	16.0%	0	No user costs
Total Length from 10'-100' = 1.0	16.7%	1	Less than $4,150
Total Length from 100'-300' = 1.2	16.9%	2	$4,150 to $9,250
Total Length from 300'-500' = 1.6	16.8%	3	$9,250 to $18,100
Total Length greater than 500' = 2.0	16.9%	4	$18,100 to $44,000
	16.7%	5	More than $44,000

User Cost Formula = (AADT x $0.31/mile + HCAADT x $0.64/mile) x Detour Length x Br Length Factor

20% Wt. Average Annual Daily Traffic (AADT)

Combined "On and Under" Bridge	Distribution	Score	Criteria
	16.2%	0	Less than 2,400
	16.7%	1	2,400 to 6,650
	16.9%	2	6,650 to 13,500
	16.7%	3	13,500 to 31,000
	16.7%	4	31,000 to 75,000
	16.9%	5	More than 75,000

10% Wt. Heavy Commercial Average Annual Daily Traffic (HCAADT)

Combined "On and Under" Bridge	Distribution	Score	Criteria
	16.0%	0	Less than 165
	16.7%	1	166 to 485
	16.7%	2	486 to 1,085
	16.9%	3	1,086 to 1,950
	16.7%	4	1,951 to 3,750
	16.9%	5	More than 3,750

30% Wt. Detour Length

Detour Length on Similar Functional Class Rdwy	Distribution	Score	Criteria
	15.9%	0	No Detour
	9.8%	1	Less than 1 mile
	24.2%	2	1-2 miles
	17.9%	3	2-7 miles
	16.2%	4	7-14 miles
	15.9%	5	More than 14 miles

10% Wt. Traffic Density

AADT "ON" Bridge	Distribution	Score	Criteria
Vehicles per Day/Ft of Bridge Roadway Width	16.0%	0	Less than 35
	16.7%	1	35-78
	16.9%	2	78-138
	16.9%	3	138-240
	16.7%	4	240-470
	16.7%	5	More than 470

Criteria:

User costs
Traffic volumes
Heavy commercial
Detour length
Traffic density
(Started w/ > 30)

Run statewide
Score ≥ 60

YES/NO
(35% of bridges)

Project Selection – Stage 1

Request for Bridge Scoping and Cost Estimating Assessment
Bridge Replacement or Major Rehabilitation (Form A)

Date:

Trunk Highway(s):	**S.P.:**	**S.A.P:**	**Letting Date:**
County(s):	**City(s):**		**District(s):**
Location:			
Project Stage: ☐ Planning ☐ Scoping ☐ Other	**Unique Features:**		
Geometric Layout: ☐ Yes File Name: ☐ Not yet available	**Topographic Information:** ☐ Yes File Name: ☐ Not yet available		**Mapping Information:** ☐ Yes File Name: ☐ Not yet available
Bridge:	Inplace Bridge No: Feature Crossed:		**A.B.C. Stage 1 Assessment** ☐ Yes ☐ No ☐ N/A If Yes, attach Stage 2:

Roadway Design Information:			
Design Year	Current A.D.T.	Projected A.D.T.	Design Speed M.P.H.
No. of Lanes:	Approach Inside Shoulder Width Lin. Ft.	Approach Outside Shoulder Width Lin. Ft.	
Sidewalk Width Lin. Ft. ☐ One Side ☐ Both Sides	Trail Width Lin. Ft. ☐ One Side ☐ Both Sides	Median Width Lin. Ft.	
Environmental Document: ☐ Project Memorandum ☐ EAW ☐ EA/EAW ☐ EIS - done ☐ None			
Comments:			

Bridge Estimating Unit:	
Type (Level) of Estimate Required: ☐ Planning Level ☐ Scoping Level	Total Anticipated Project Construction Cost :
Stage Construction : ☐ Yes ☐ No ☐ Unknown/Other	Grade Restrictions:

Bridge Hydraulics Unit:		
Preliminary Analysis Required from the Bridge Hydraulics Unit ☐ Yes ☐ No		Bridge Hydraulic Survey Complete: ☐ Yes ☐ No
Check All of the Following that are being Requested: ☐ Bridge Waterway	☐ Culvert Waterway	☐ Culvert/Bridge Comparison
☐ Substructure Check for Scour Stability	☐ Deck Drainage	☐ Countermeasure Recommendation
A preliminary waterway recommendation is more likely to be revised if there is minimal data. Check off available data.		
☐ Photos (Upstream, Downstream, Through Structure)	☐ Road Profile (Inplace and Proposed)	
☐ Special Considerations (Boat Passage, Bike or Pedestrian Trails, Other)	☐ D.N.R. Issues (Public Water, Fish Passage, Wildlife Crossing, Other)	
☐ Historical Performance (History of Scour, Flooding, Overtopping, Sedimentation, Maintenance)		

Project Contact:	**Consultant Project Contact:**	**List of Attachments or Location of Files:**

Project Selection – Stage 2

Site Specific Issues:

- Duration
- Traffic control complexity
- Construction windows
- Local business impacts
- Risk mitigation
  - 21 Questions

ACCELERATED BRIDGE CONSTRUCTION (ABC) SELECTION TOOL
STAGE 2 CHECKLIST

Make a determination during scoping whether the following bridge related issues are present or should be considered during project development.

Prepared By: **Date:** **District:**

Project Information:

Bridge No.:	TH:	Let Date:	
Project Description (work type, major roadway work also required?, anticipated duration):			

Question/Issue	Yes	No	Poss	N/A	Comments
1. Is bridge construction on the critical path of this project?	☐	☐	☐	☐	
2. Is it likely that this project will include complex traffic control schemes, long detours, or significant user impacts due to bridge construction?	☐	☐	☐	☐	
3. Is it likely that this project will have an extended duration due to bridge construction?	☐	☐	☐	☐	
4. Could temporary structures be required?	☐	☐	☐	☐	
5. Could additional width be needed on culverts, bridges, or shoulders to maintain traffic?	☐	☐	☐	☐	
6. Are there any issues regarding construction timeframes (e.g. fish spawning, bird nesting, high water, permits, major events)?	☐	☐	☐	☐	
7. Are there critical features or services on the route that need to be considered (e.g. hospital, emergency services, transit, load restrictions)?	☐	☐	☐	☐	
8. Could there be a need to maintain railroad traffic?	☐	☐	☐	☐	

*

Project Selection – Stage 2

Sample questions

Question/Issue	Yes	No	Poss	N/A	Comments
3. Is it likely that this project will include complex traffic control schemes, long detours, or significant user impacts due to bridge construction?					

Is it likely that this project will have an extended duration (more than one construction season, or extend into late fall) due to bridge construction?

Is bridge construction on the critical path of this project?

Does the existing bridge have features that make it difficult to accommodate staging (truss bridge, slab span, beam spacing issues, etc.)?

Is it likely that temporary bridge structures will be needed?

Does it appear that maintenance of traffic will require additional right-of-way?

*

Project Selection – Stage 2

Conclusion

Conclusion:

Based on the findings & conclusions above, further consideration of accelerated bridge construction is warranted:

YES ☐ NO ☐ Project Manager Name: _____

Date: _____

Comments:

Please send a copy of pages 1 & 2 of this completed form to the Bridge Preliminary Plans Unit at MS 610*

If further consideration is warranted the Project Manager should contact the Bridge Office Preliminary Plans Unit and the Regional Bridge Construction Engineer for assistance in selecting appropriate ABC alternatives and techniques.

Project Selection – Stage 3

Select Method or Technique:

- **Staging (1/2 at time)**
- **Full-depth precast deck panels**
- **Precast substructures**
- **Lateral slide**
- **Superstructure move – SPMT's**

Alternative Contracting Options:

*

Alternative Contracting

- **Performance specifications**
- **Warranties**
- **A+B**
- **Lane rental**
- **Incentive/Disincentive**
- **Value engineering workshops**
- **Evening/weekend/non-peak/complete closure**
- **Design Build**
- **Const. Manager General Contractor (CMGC)**

ABC Project Selection

3 Stage Process

Stage 1 – First Cut

- **Fully Automated**
- **Bridge Management Data**
- **Objective – no published scores**

Stage 2 – Site specific

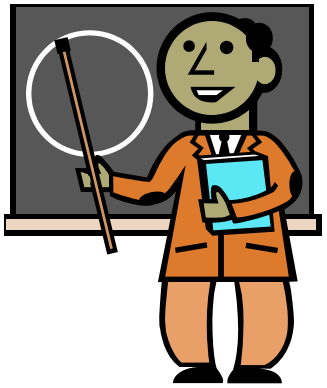
- **Occurs in District – Multi Discipline**
- **Subjective**
- **Early Determination/Funding**
- **District signature/ownership**

Stage 3 – Select Method/Technique

- **Alternative Contracting Options (Copies Available)**

Lessons Learned / Look Ahead

- Pilot Projects - District feedback
- Many excellent resources available
  - FHWA
  - Other states
- Early project site identification
  - Get discussion started
- Project Manager ownership
- Statewide implementation in next 2-3 months



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Overview of Lateral Slide in MN

Doing ABC with Design-Build

Tony Lesch, MnDOT Bridge Design-Build Engineer

September 17, 2015

U.S. Department of Transportation
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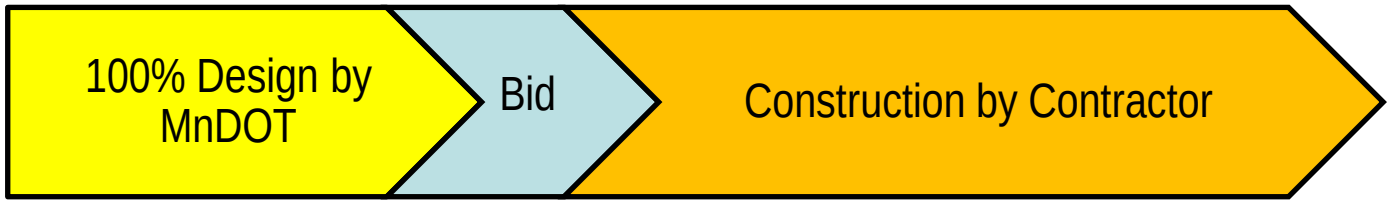
AASHTO

Outline

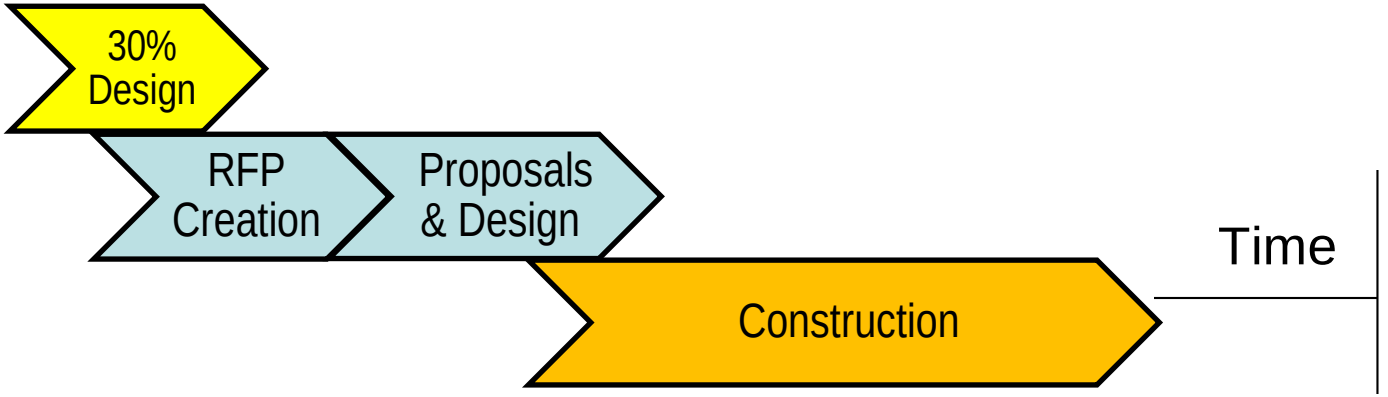
- **Delivery Methods**
  - **Design-Bid-Build**
  - **Design-Build**
  - **CMGC**
- **Lateral Slide at Larpenteur Ave.**

MnDOT Delivery Methods

Design-bid-build

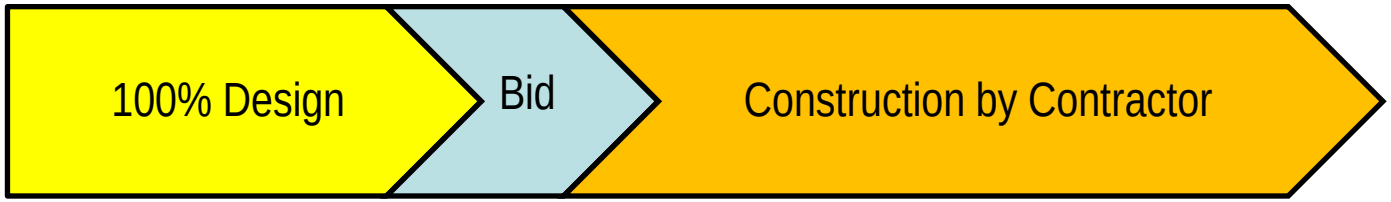


Design-build

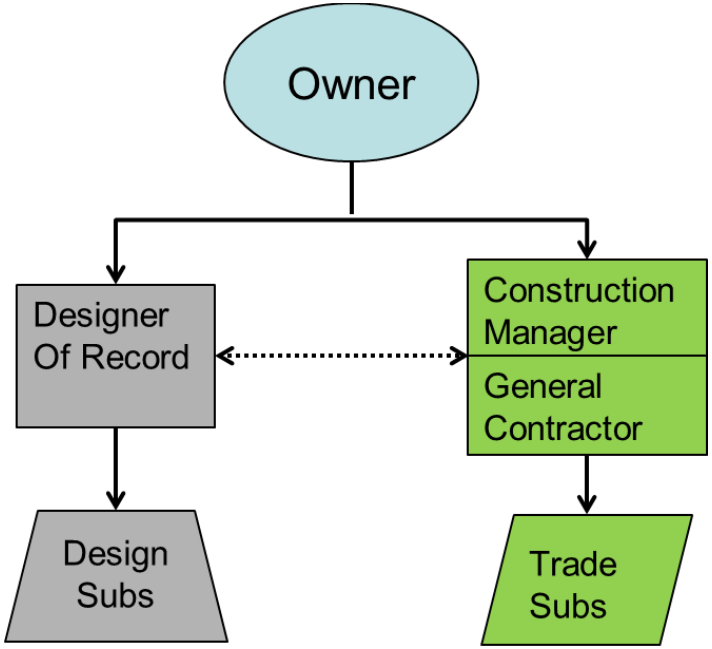


CMGC

DBB or CMGC



CMGC



MnDOT's DB Program

- 30 Awarded Projects since 1997
  - 20 Best Value
    - $1 - $234 Million
  - 10 Low Bid
    - $2.2 - $19 Million
- $1.6 Billion Total

MnDOT's DB Program

Benefits

- Accelerated Project Delivery
- Innovation
  - Competing Designs
  - Alternative Technical Concepts (ATCs)
- Risk Transfer (e.g. quantities)
- Reduced Cost (?)
- Flexibility

Drawbacks

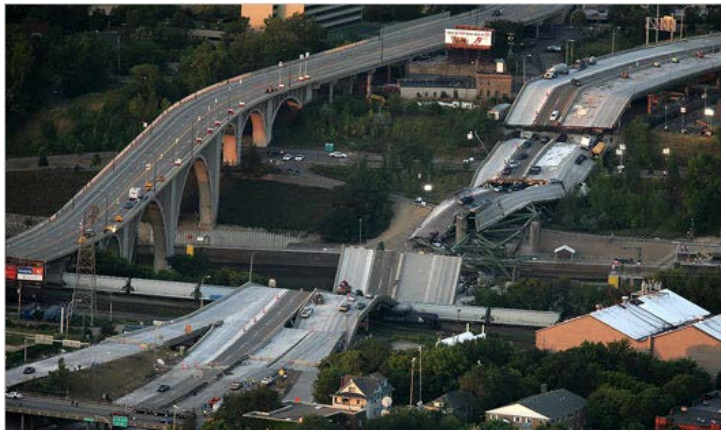
- May not be cost-effective
- Risk Transfer (e.g. environmental, third party)
- Oversight resources necessary

MnDOT's DB Program

Standard Uses

- Complicated Major Projects (10)
  - $50-250 million
  - Involves all functional areas
  - Significant complexity

- Midsize, Partially-Complicated Projects (10)
  - $20-50 million
  - At least 1-2 complicated areas
  - Possibly in need of acceleration



- Emergency Accelerations (3)
  - Improvement of dangerous intersections
  - I-35W bridge collapse

MnDOT's DB Program

Unique Uses

- Intersection Conflict Warning System (1)
- Groupings of Similar Work Types (3)
- Geotechnical Challenges (2)
- Accelerated Bridge Construction Trial (1)
  - Unfamiliar design and construction
  - Likely CMGC project if let today

MnDOT's DB Program

Standard Uses

- Complicated Major Projects
  - $50-250 million
  - Involves all functional areas
  - Significant complexity

I-35E MnPASS

35E MnPASS Project

- **DB project to add express lanes (MnPASS lanes) to existing interstate corridor**
- **Awarded to Ames Construction in July, 2013**
- **$98.4 Million**
- **Completion in Fall 2015**

35E MnPASS Project

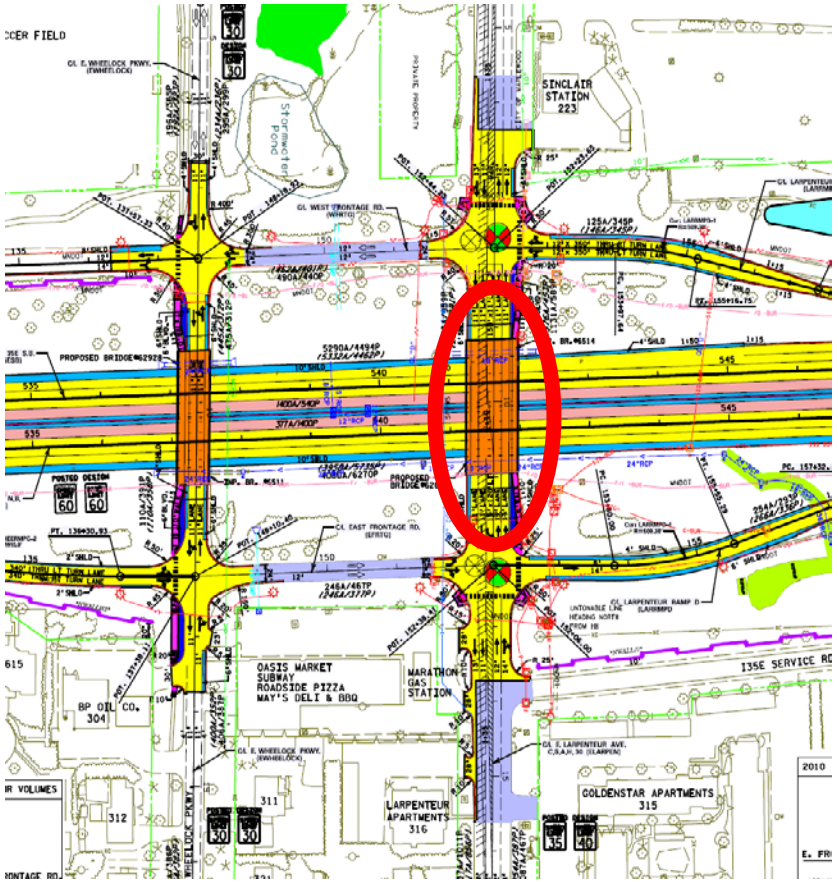
- **Project Details**
  - **Roadway**
  - **9 Bridges**
  - **Drainage**
  - **Utilities**
  - **Noise Walls**
  - **MnPASS Infrastructure**
  - **Maintenance of Traffic**

Best Value

- **Largest scored category was MOT**
- **Contractor to propose number of closure days:**
  - **I-35E first year**
  - **I-35E second year**
  - **Cross Streets**

Best Value

- **Ames Proposal**
  - **Close Larpenteur for only 47 Days**
  - **ATC to use SIBC (contract required all bridges cast-in-place)**



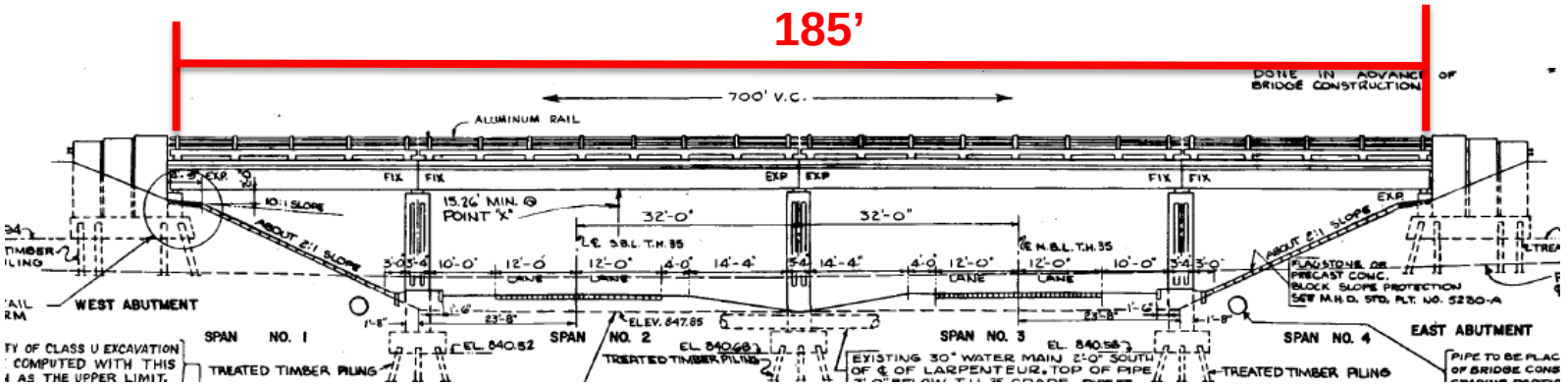
Larpenteur Ave. Bridge

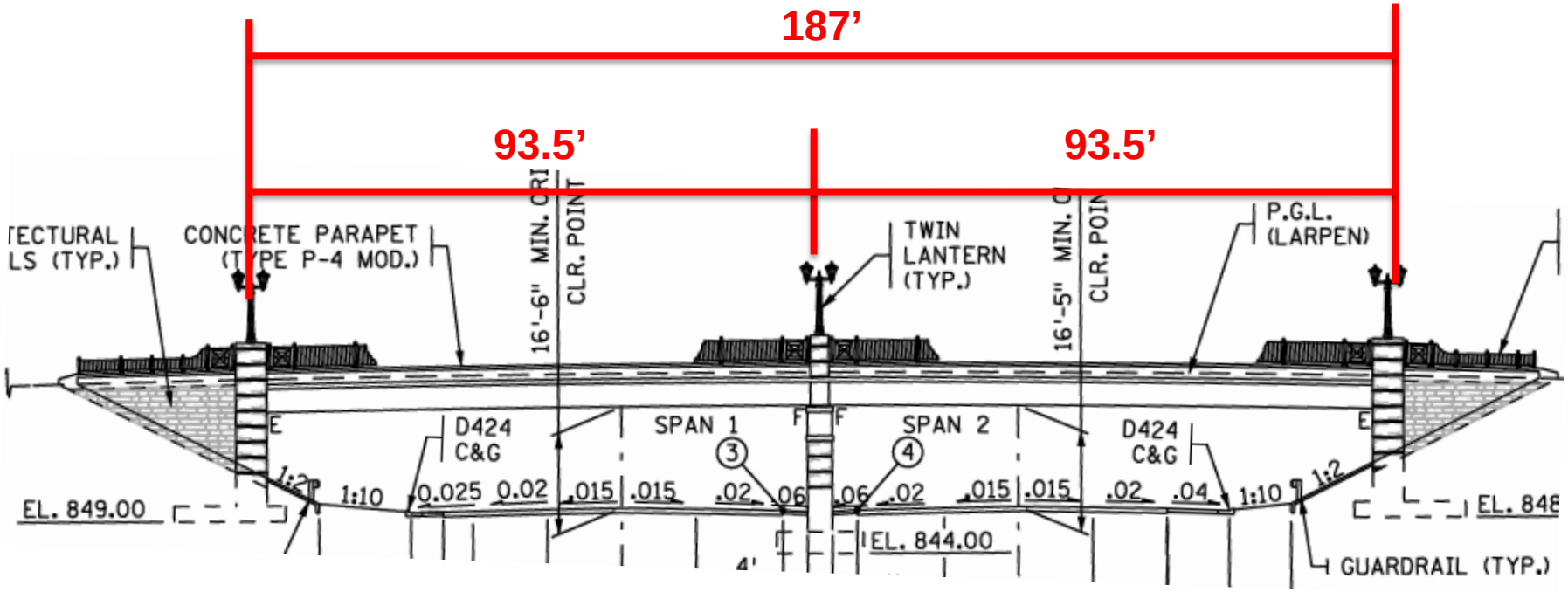
- **4-span bridge built in 1958**
- **4 lanes, narrow shoulders, one narrow sidewalk**

Larpenteur Ave. Bridge

- **2-span bridge built in 2014 – longer spans**
- **4 lanes plus turn lane, wider shoulders, wider sidewalk**

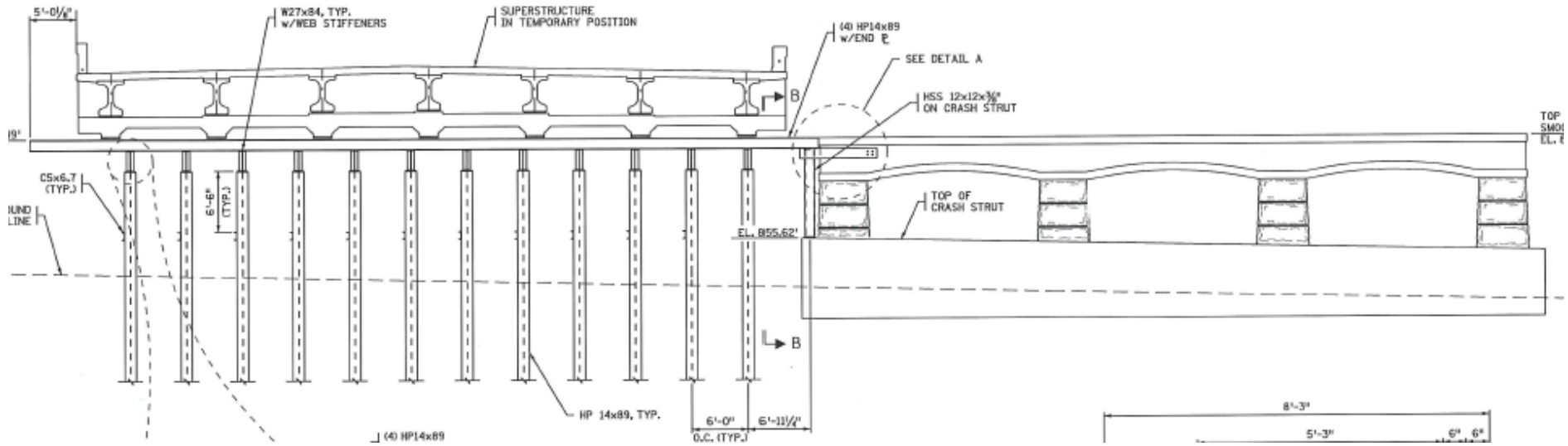
Larpenteur Ave. Bridge





SLIDE IN BRIDGE CONTSTRUCTION

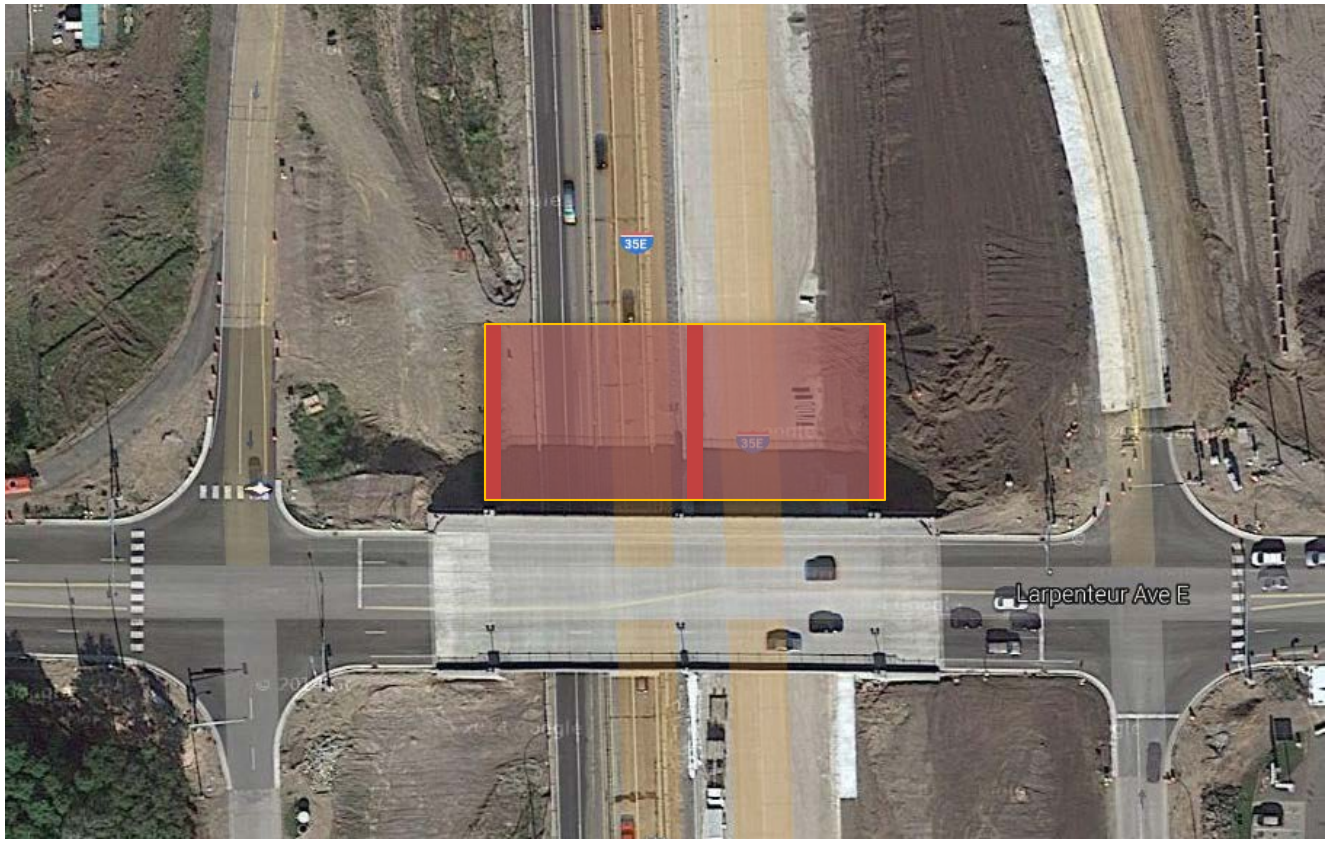
Temporary Supports



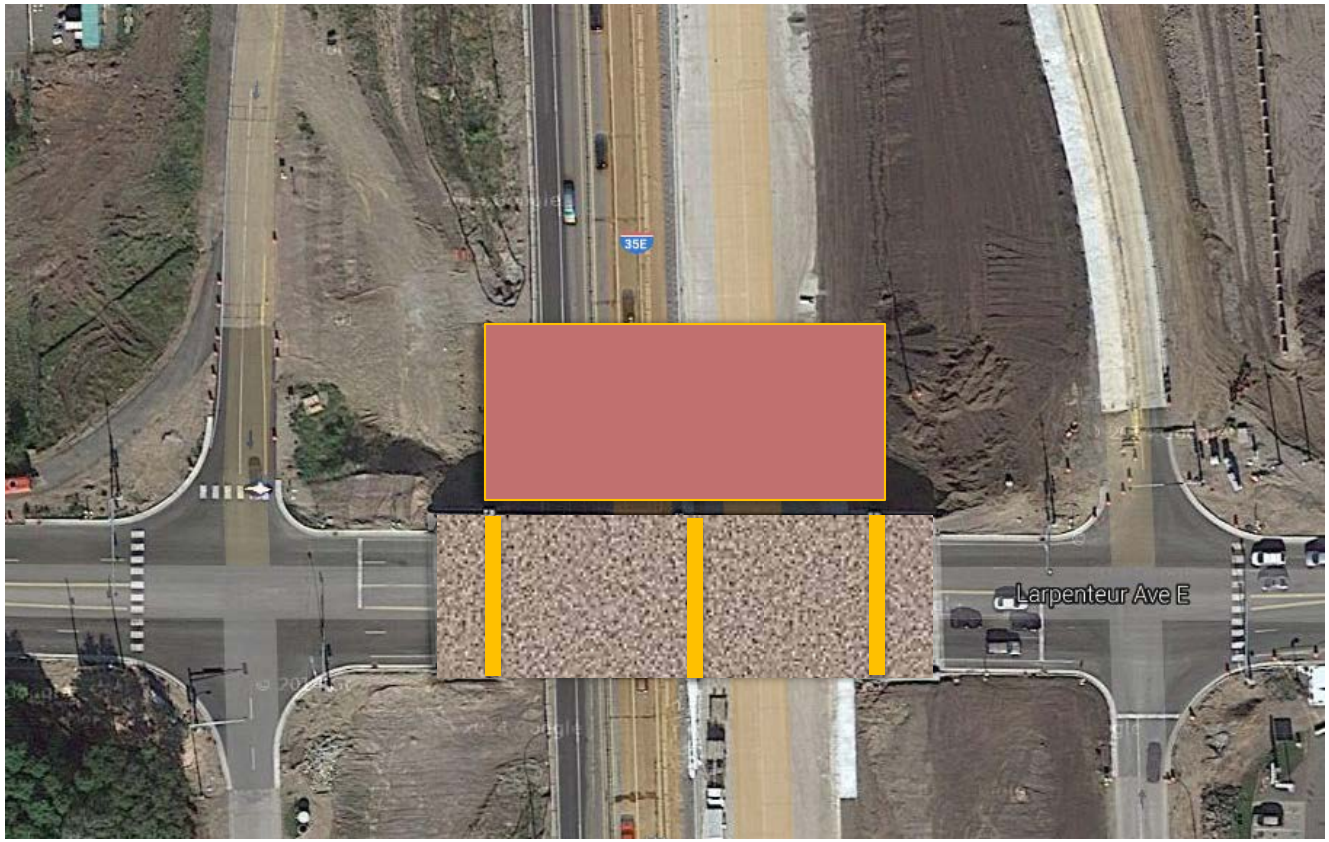
Temporary Supports

SIBC

SIBC



SIBC



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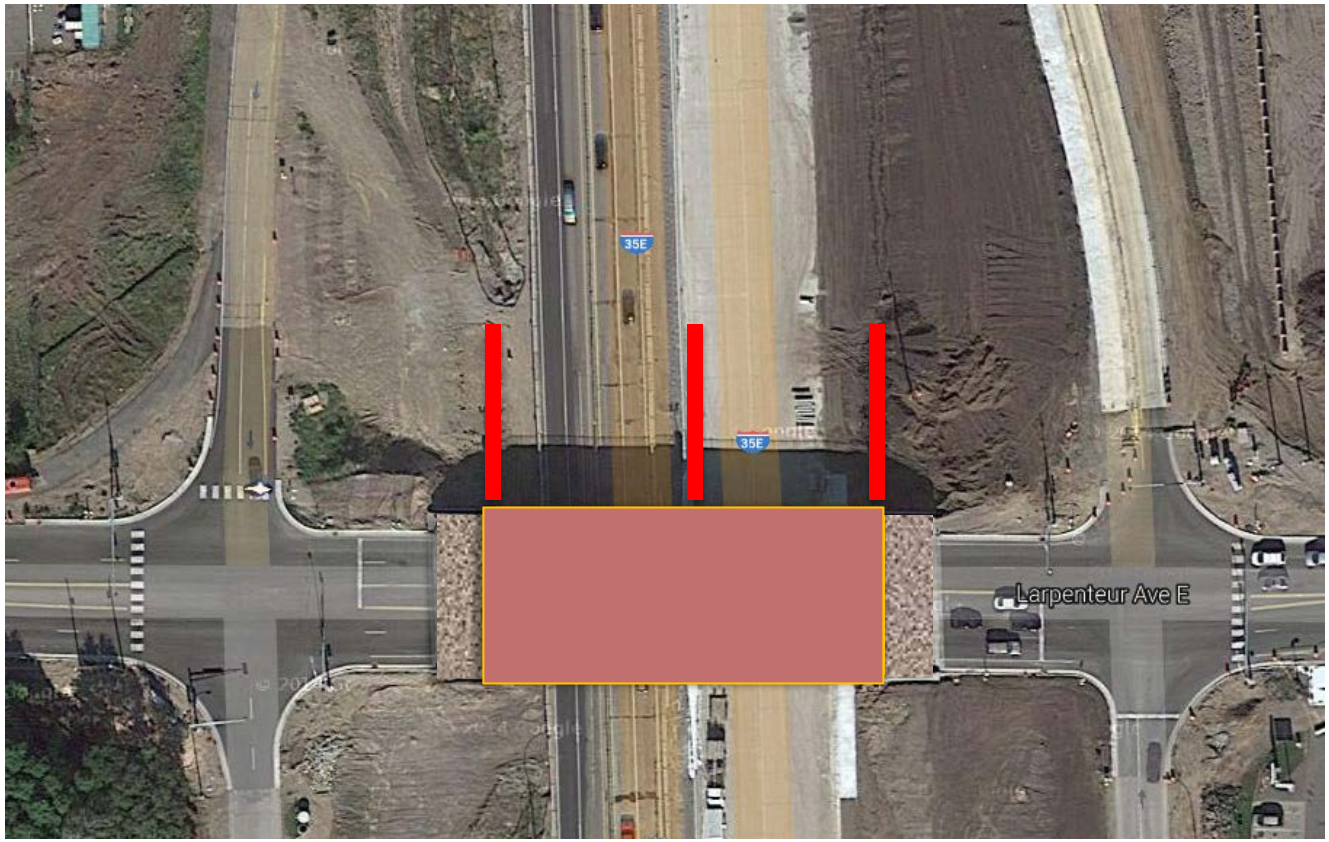


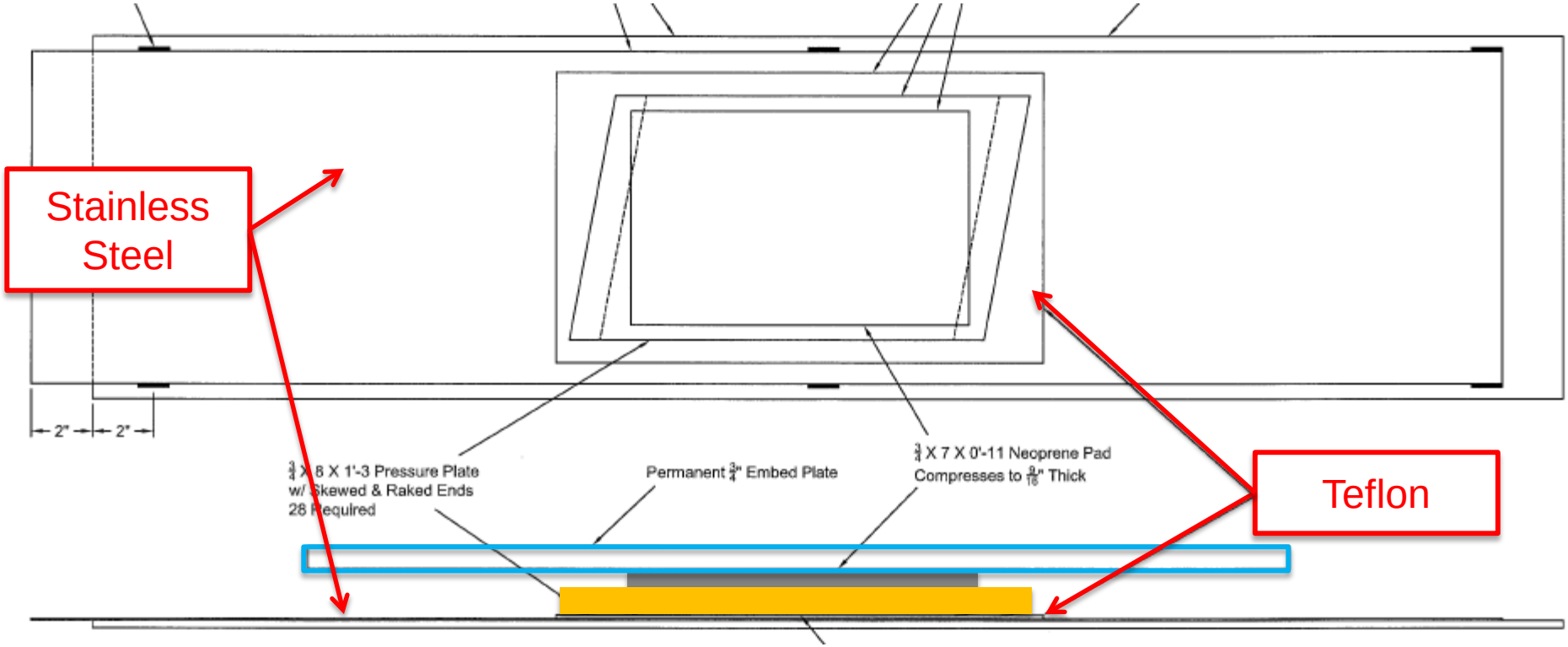
SIBC

Slide System

- **Hydraulic Jacks**
- **Jack Floats**
- **Dog Plates**

Slide System

Slide System



Slide System

- **Teflon on Polished Stainless Steel**

Highlights

- **Slide both spans together**
- **No Live Traffic**
- **Test Pushes**
- **Full Closure of Interstate**
- **Plan to move in one overnight closure**
- **Took two nights**

Larpenteur Ave. Bridge

What issues were encountered?

Issues

Slide Table Cast Against Pier, Damaged Concrete

Issues

Tolerance on track system fabrication

Issues

Tolerance on track system fabrication

Issues

Bridge Walked Sideways

Issues

Bent/Binding Guide Brackets

Issues

Bent/Binding Guide Brackets

Lessons Learned

Bridge Slide System

- **Use lubricant (dish soap), but not too much**

Lessons Learned

Bridge Slide System

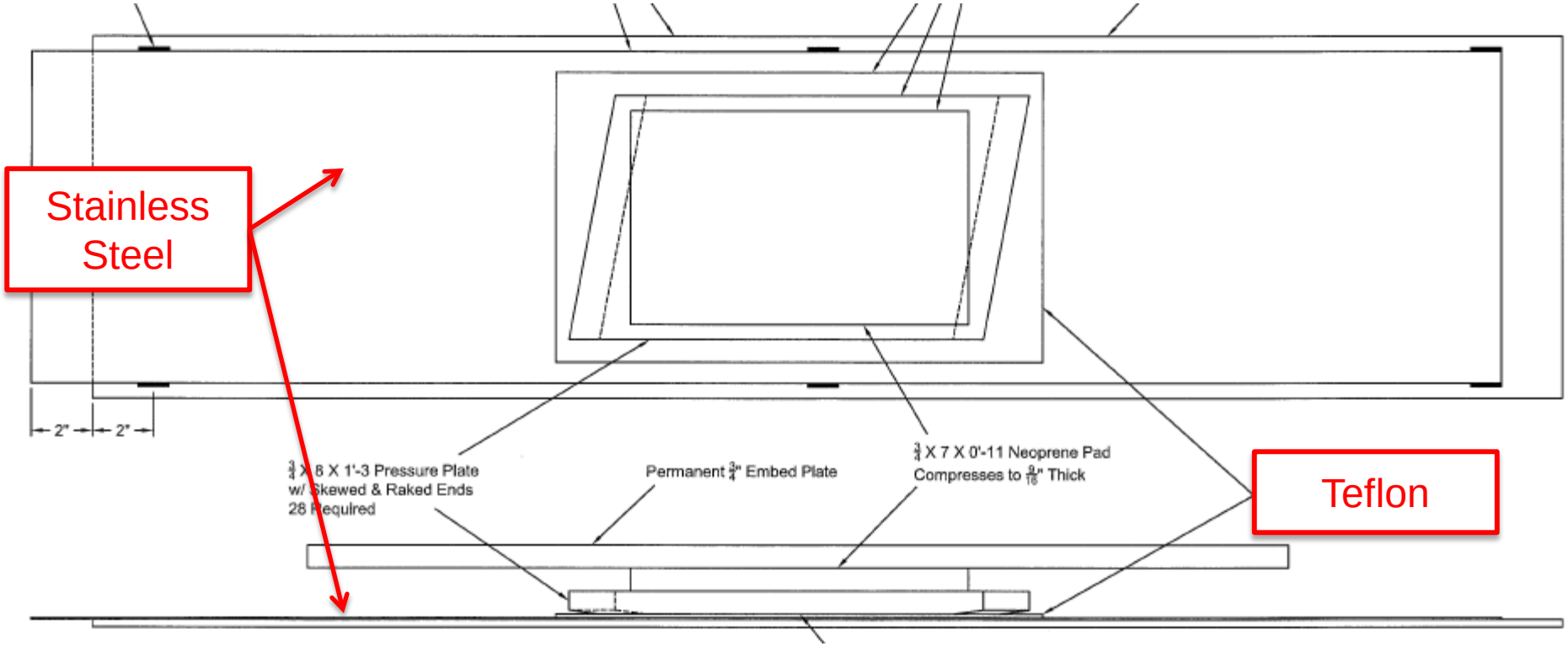
- Use lubricant (dish soap), but not too much
- Use a Single Pump (keep it simple)

Lessons Learned

Bridge Slide System

- **Use thicker teflon**
- **Use thicker elastic medium for deviations in concrete and steel**
- **Design to reduce field welding**
- **Use readily-available materials (and reusable)**
- **Design for “field friendly” tolerances**
- **Secure the sliding mechanism to bridge**

Lessons Learned

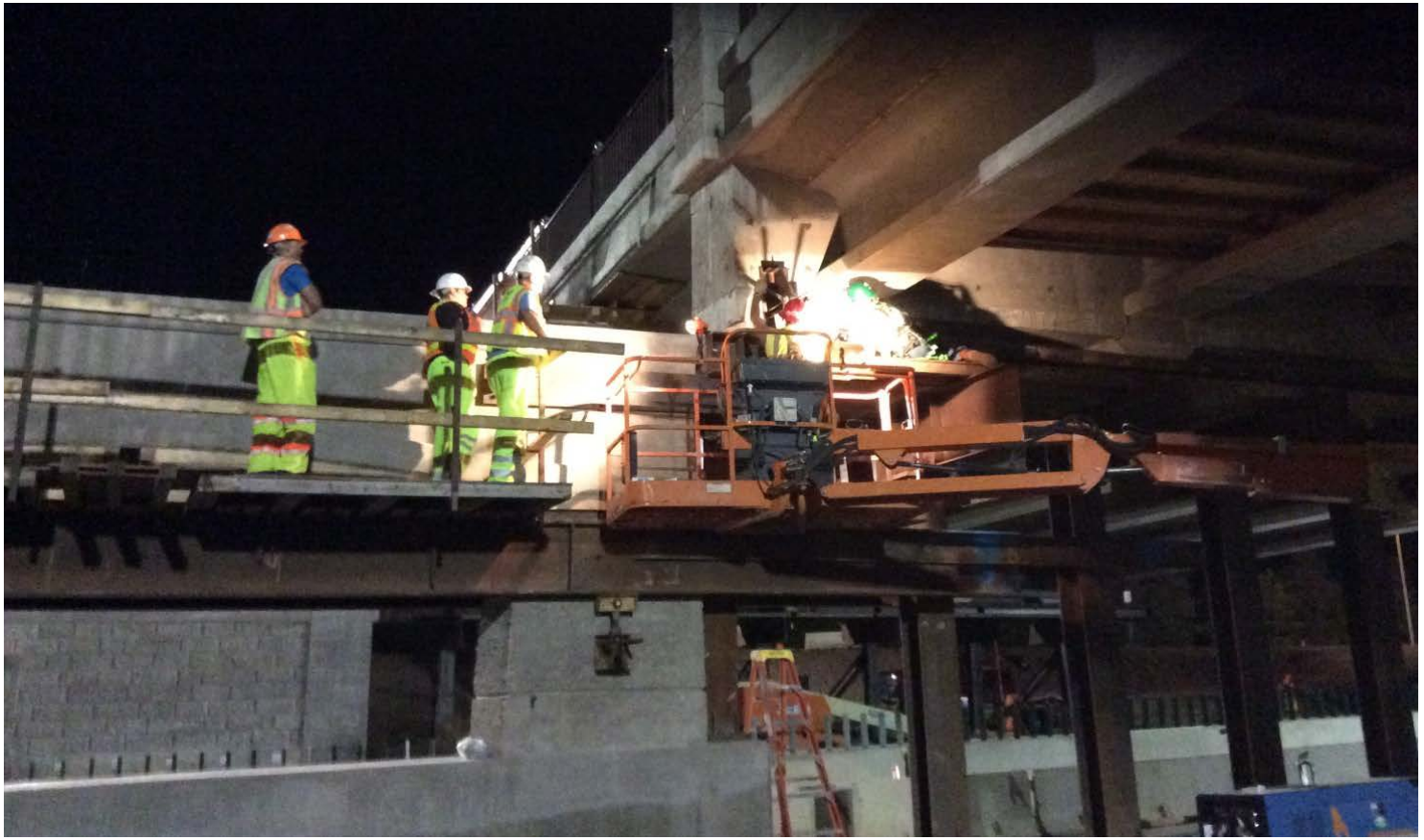


Lessons Learned

Slide Execution

- **Prepare contingency plans**
- **Survey a lot (after every step and load)**
- **Clearly identify stopping points for critical locations**
- **More Lighting**
- **Radio Communication**
- **Use scaffold/walkways rather than man lifts**

Lessons Learned



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