



‘Simple for Dead, Continuous for Live’ Designs for Optimal Performance

Presented to The Minnesota Local Technical
Assistance Program (LTAP) Short-Span Steel
Bridge Webinar Series
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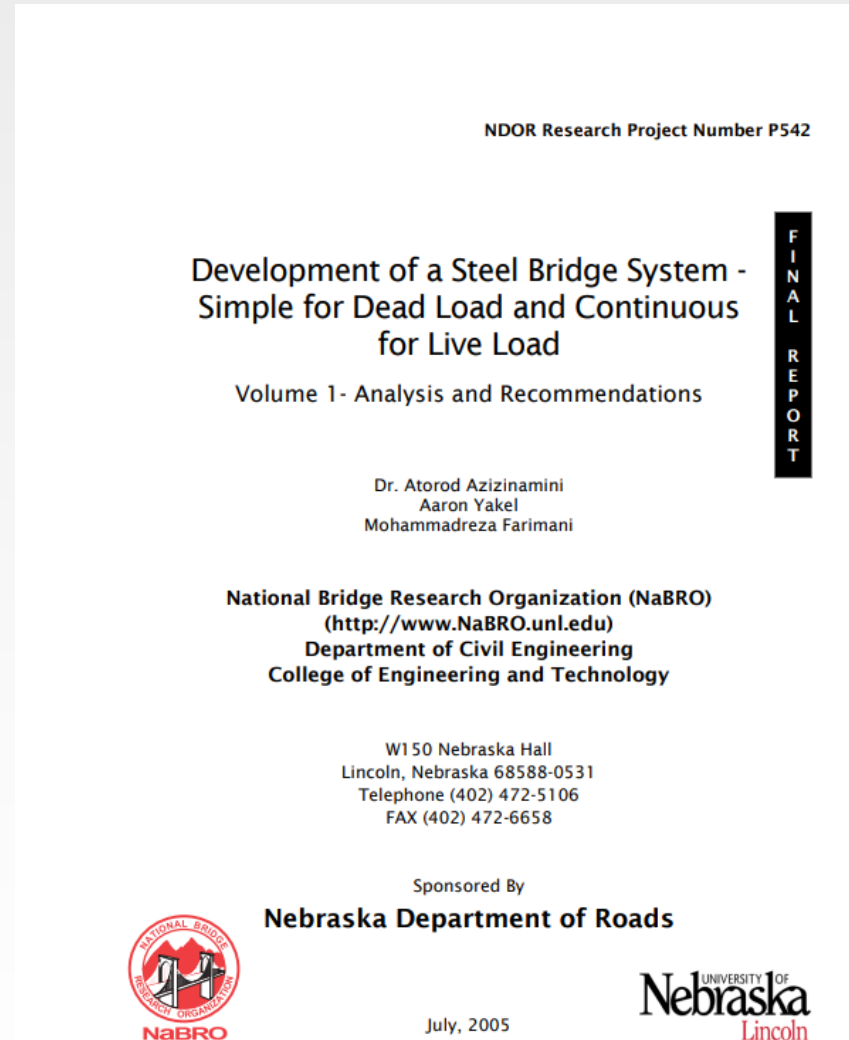
Presentation Topics



- What is Simple for Dead, Continuous for Live (SDCL)
- How did we begin using SDCL
- Why bridge bundling and summary of previous projects
- Specifics of Fixing Access to Rural Missouri (FARM) bridge project
- Additional Simple Dead, Continuous Live, (SDCL) projects
- What's next?

What is SDCL?

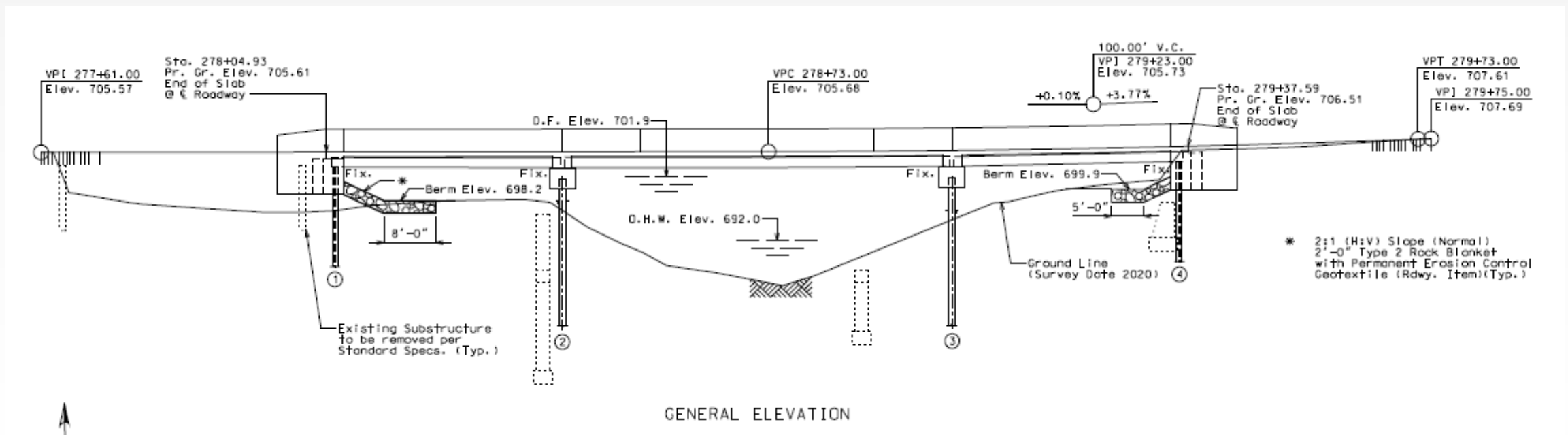
- Developed at UNL by Dr. Azizinamini sponsored by NDOR in early 2000s
- Further documented in AISC Engineering Journal in 2014, Vol. 51, Nos. 2 & 3.



What is SDCL?

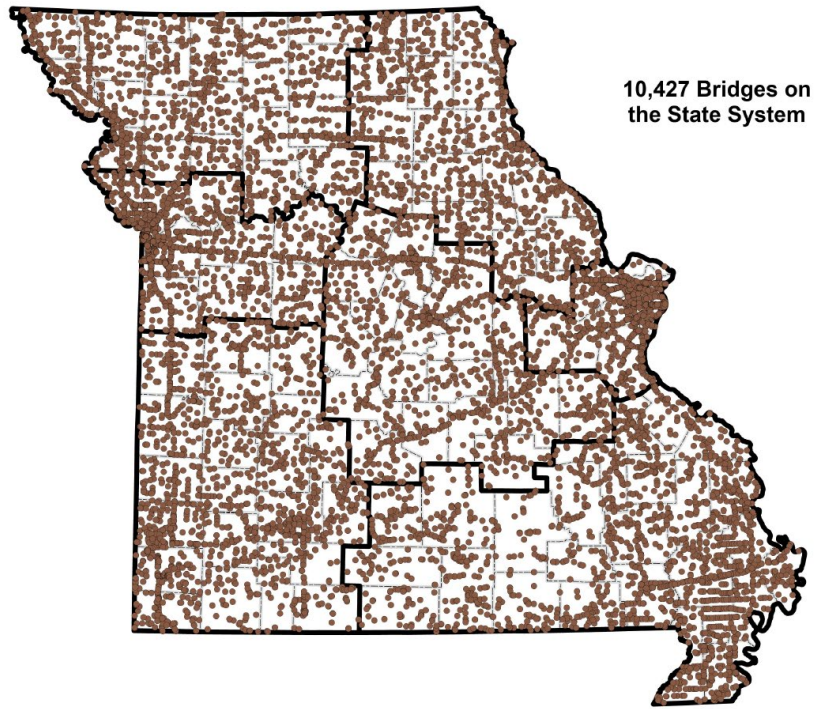


- Simple for Dead Load and Continuous for Live Load
- Multi-span bridges using simple span wide flange beams, plate girders or box girders for dead load and made continuous (like that other material) for live loads

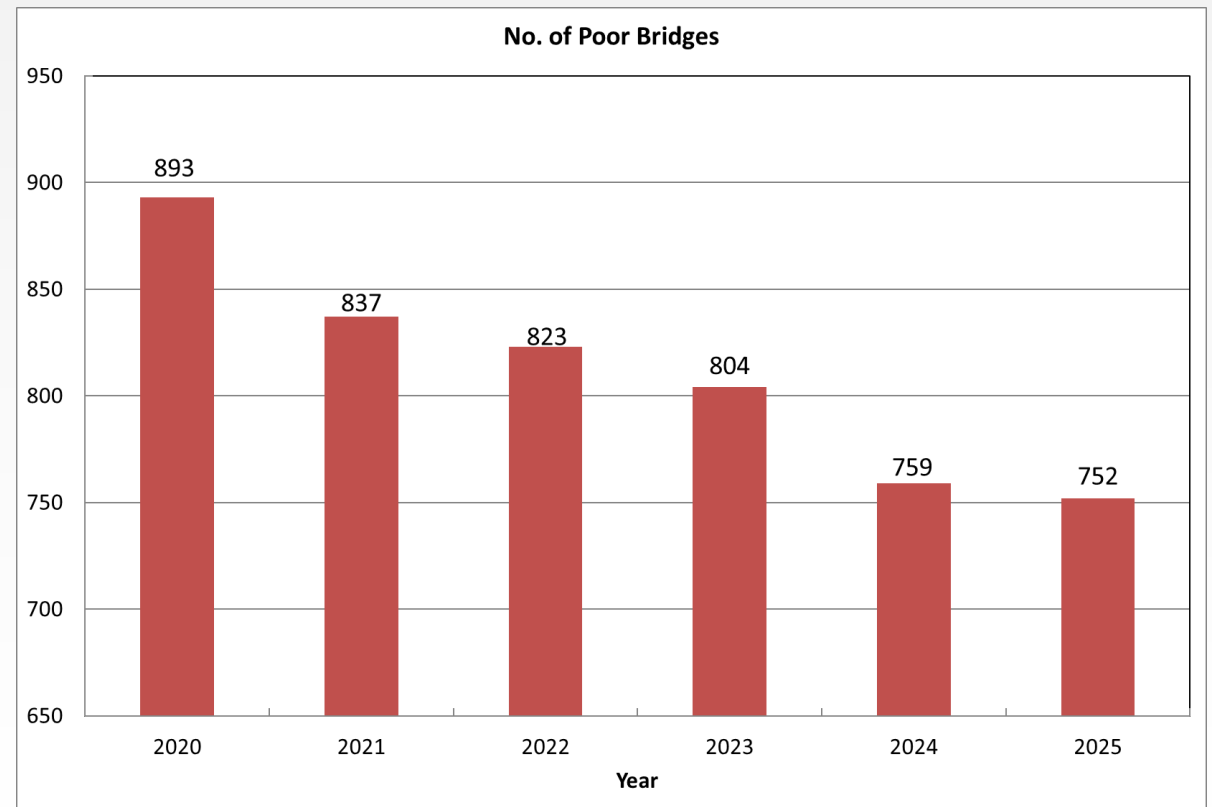
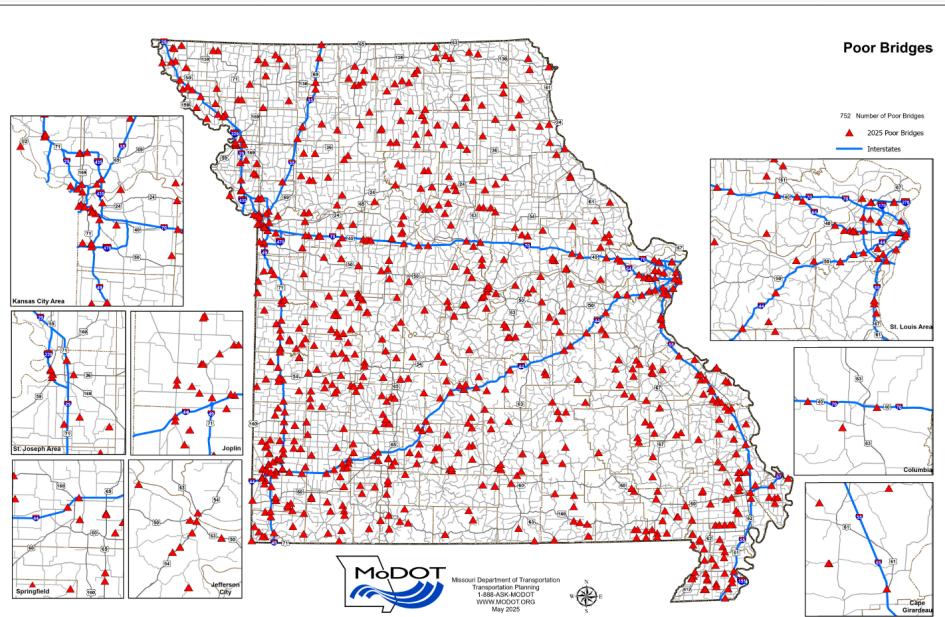


How We Began Using SDCL





Based on 2025 National Bridge Inventory (NBI) submittal



History of Design Build Law



- First allowed in 2004 with MO Statute: Section 227.107
 - <https://revisor.mo.gov/main/OneSection.aspx?section=227.107>
- Expanded in 2012
- Limited to 2% of # of STIP projects per fiscal year
- Must pre-qualify (Use 2-phase procurement)
 - Request for Qualifications (RFQ)
 - Shortlist no more than 5
 - Request for Proposals (RFP)



MoDOT's Design-Build Program



- 32 Awarded contracts worth over \$4.7 billion
- 9 Currently under contract worth over \$2.5 billion
- 2 Projects in procurement worth \$875 million
- 8 Design-build bridge bundles that improved over 700 bridges
- Fixed price best value approach has helped realize an additional 35 bridges improved



Benefits of Bridge Bundling



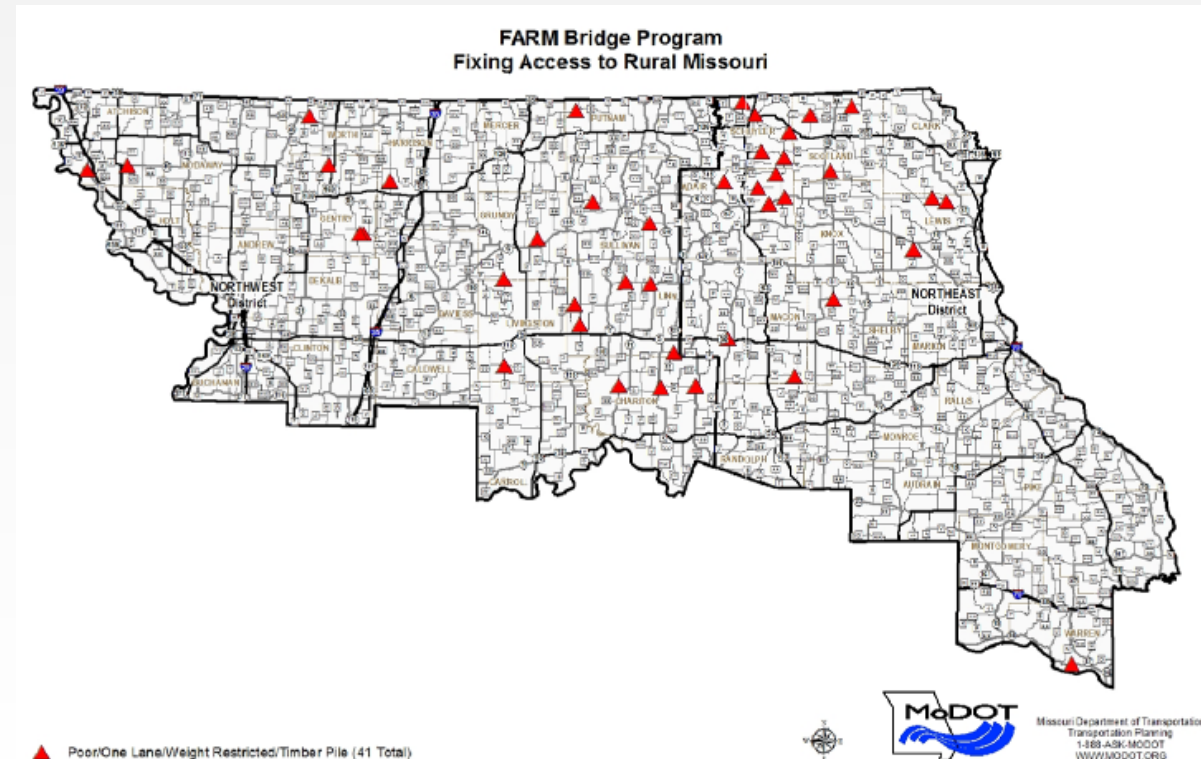
- Maximize scope for a fixed budget
- Control design cost
- Promote innovation
- Speed delivery of project



FARM Bridge Program



- Fixing Access to Rural Missouri (FARM)
- MoDOT identified 41 rural bridges in northern MO
- Four criteria
 - In poor condition
 - Weight-restricted
 - One-lane but carry 2-way traffic
 - On timber piles



FARM Bridge Program

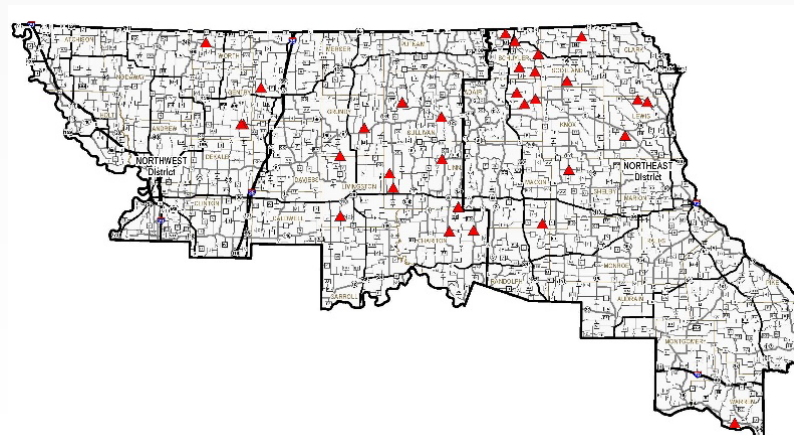


Best Value Proposal

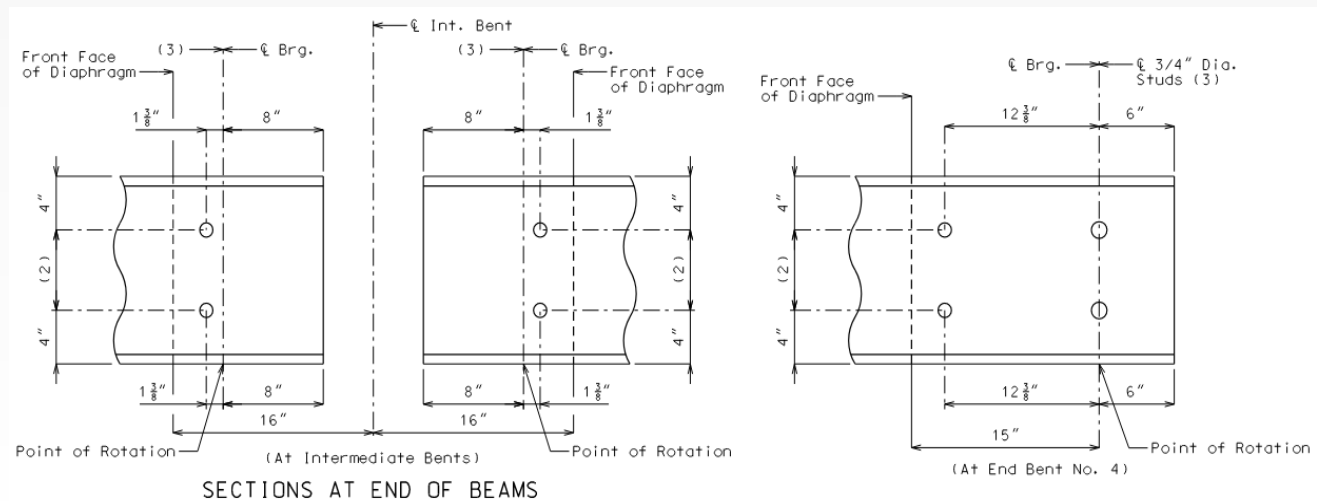
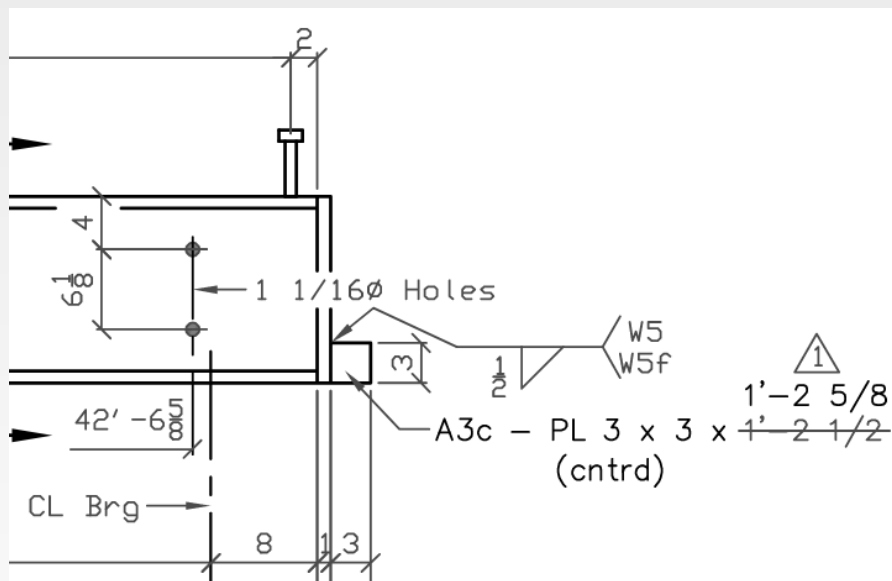


- 31 structures replaced (25 SDCL, 3 single span, 3 RCB)
- Low maintenance steel structures that allow for future re-deck and rehabilitation
- Additional 2321 SQFT of existing bridge deck replaced
- Highest average ADT for routes included of any proposal
- Highest average Benefit Cost Ratio of any proposal

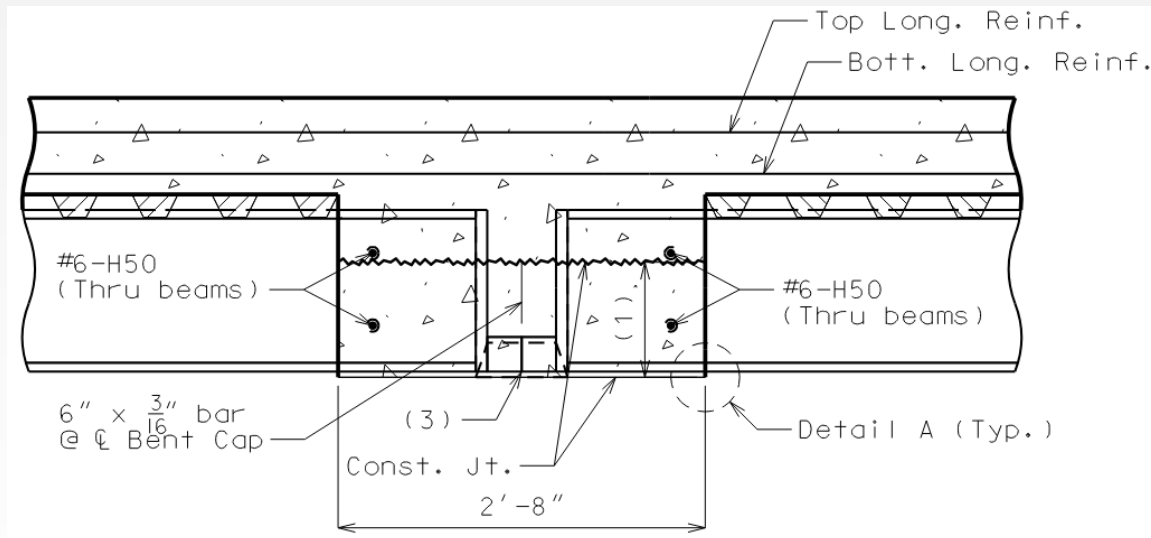
Bridge No.	SPAN	Skew (deg.)	AISC W-Shape
4	(46 - 52 - 46)	0	21x101
7	(21 - 44 - 21)	0	24x55/68
9	(37 - 39 - 37)	0	24x68
10	(27 - 45 - 27)	0	18x50/86
14	(28 - 56 - 28)	15	18x76/158
15	(31 - 40 - 21)	15	16x57/77/45
17	(35 - 60 - 35)	20	18x76/158
19	(38 - 46 - 30)	0	24x68/76/55
20	(30 - 48 - 30)	15	16x67/100
23	(29 - 47 - 29)	15	24x55/84
24	(24 - 41 - 30)	0	18x61/71/40
25	(26 - 42 - 26)	30	14x68/99
27	(25 - 37 - 25)	0	12x65/79
28	(23 - 48 - 23)	0	16x57/100
29	(36 - 44 - 25)	0	14x82/99/53
30	(30 - 47 - 38)	0	16x57/100/77
31	(28 - 36 - 28)	25	24x55
32	(31 - 45 - 31)	45	18x50/86
33	(41 - 53 - 41)	0	18x86/119
34	(30 - 42 - 30)	30	14x74/82
35	(32 - 40 - 32)	0	14x68/82
36	(48 - 54 - 48)	0	18x119
37	(34 - 42 - 34)	40	14x82/109
39	(41 - 56 - 41)	25	18x86/130
40	(44 - 43 - 25)	4	16x100/89/45



What is SDCL?



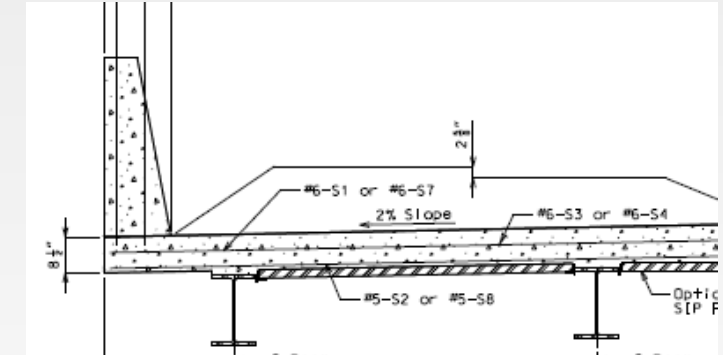
What is SDCL?



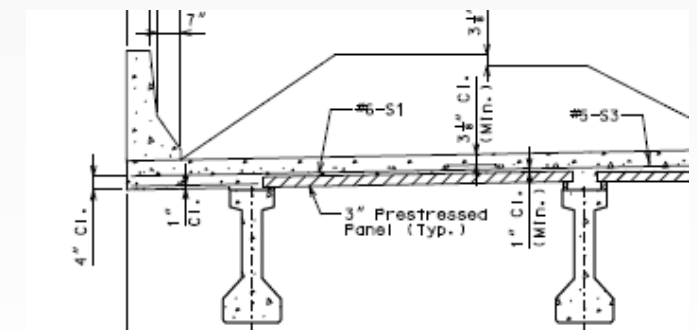
Why use SDCL?



- Eliminates the use of traditional field splices
- Simple details make steel much more competitive
- Certified Bridge Fabricator – Simple (SBR)
- Certified Bridge Fabricator – Intermediate (IBR)
- Certified Bridge Fabricator – Advanced (ABR)
- Shallower superstructure (No grade raise)
- Lighter beam weights



W18x158 @ 60' = 19.7"
9,480 pounds



MoDOT Type 3 @ 60' = 39"
23,900 pounds

Fabrication Benefits - FARM



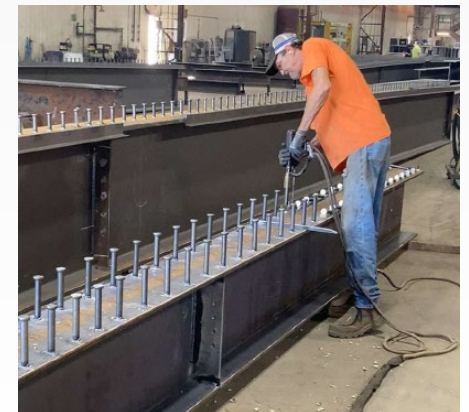
- FARM bridges were not plate girders
 - No need to cut flange plates
 - No shop welded flange plates
 - No camber cut on web plates
 - No flange to web welds
 - No bolted splices
 - Full assembly not required



Fabrication Benefits - FARM



- FARM bridges were rolled beams
 - Cut to length
 - Add diaphragm connection plates
 - Install end plates
 - Install end blocks
 - Install shear connectors



Fabrication Benefits - FARM



- FARM bridges were originally going to be weathering steel
 - Delivery time was too long
 - Switched to hot dip galvanizing



American Galvanizers Association Innovations TV Show Segment



American Galvanizers Association
2.85K subscribers



SDCL Construction Sequence



SDCL Construction Sequence



SDCL Construction Sequence



SDCL Construction Sequence



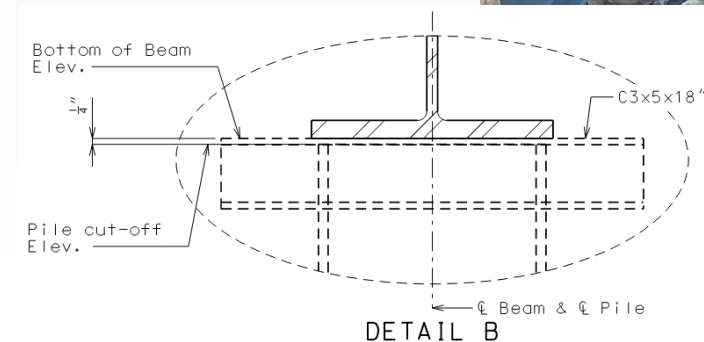
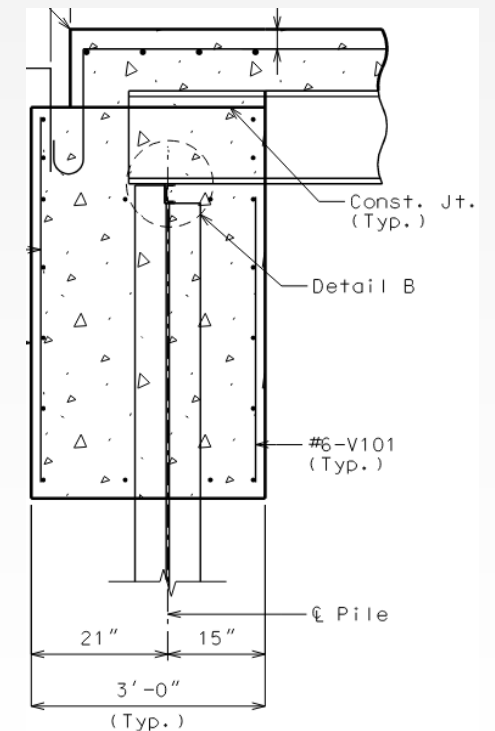
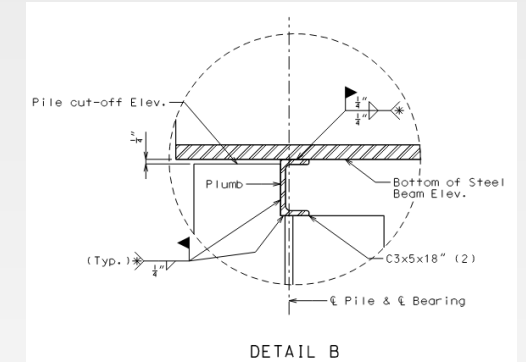
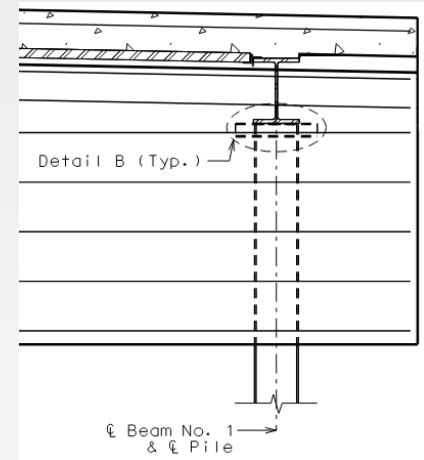
SDCL Construction Sequence



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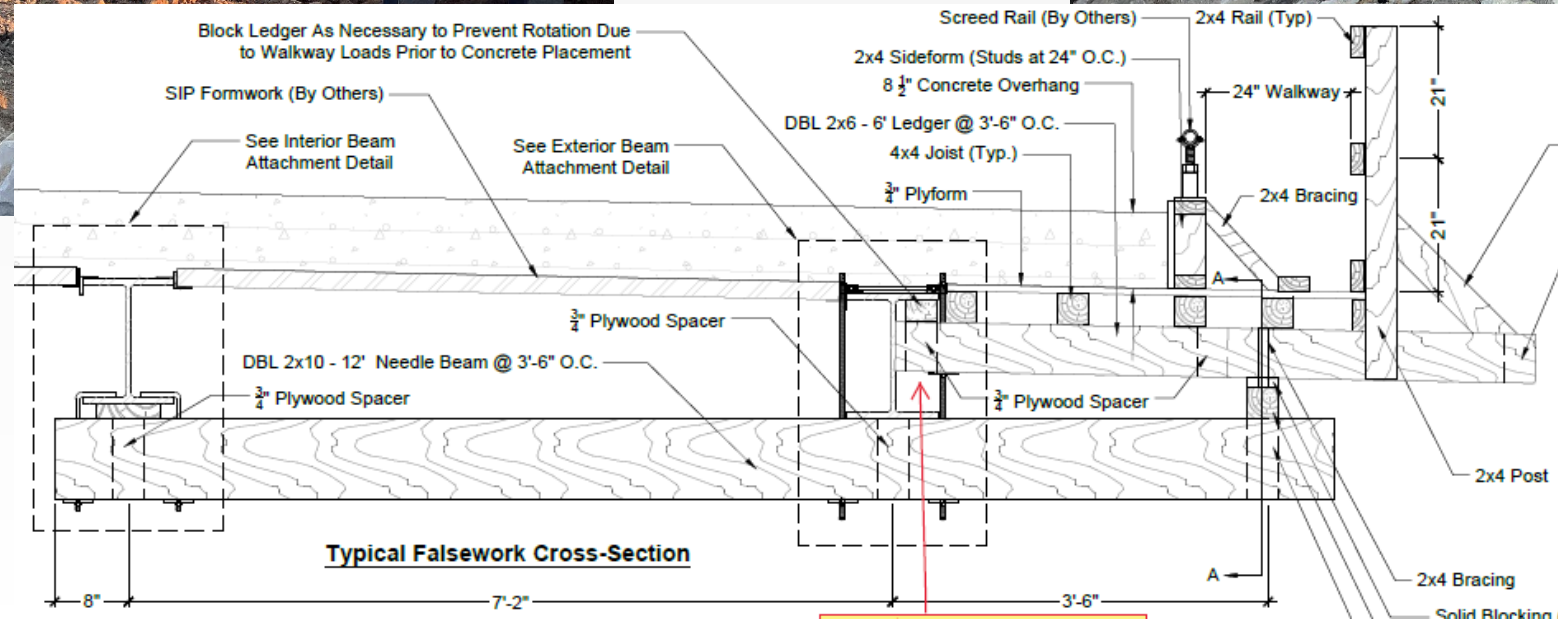
SDCL Construction Sequence



Completed FARM Bridges



SDCL Overhang Concern



Additional SDCL Projects



- NW Bridge Bundle
- 9 SDCL superstructure replacements
- 15 SDCL full bridge replacements



Additional SDCL Projects



- 14 SDCL replacements and 1 superstructure replacement by design-bid-build since September 2023



Additional SDCL Projects



- 40 SDCL replacements and 9 SDCL superstructure replacements by design-build
- 14 SDCL replacements and 1 SDCL superstructure replacements by design-bid-build since September 2023
- Currently 2 more SDCL replacements in future lettings
- Total of 66 SDCL bridge completed or in progress

What's Next?



- Continue to use SDCL where it makes sense
- Add section to our Engineering Policy Guidance (EPG) for SDCL use
- <https://epg.modot.org>

A screenshot of the MoDOT Engineering Policy Guide (EPG) website. The page features a large banner image of a construction worker on a bridge with the text "Engineering Policy Guide". Below the banner is a mission statement: "Our mission is to provide a world-class transportation system that is safe, innovative, reliable and dedicated to a prosperous Missouri." The page includes a left sidebar with a navigation menu, a main content area with four tiles for "Search the EPG with Google", "Recent Policy Changes in the EPG", "Typical Applications", and "MoDOT's MASH Implementation Information", and a footer with three tiles for "Report a Broken Link", "Engineering Policy Approval Process", and "Sign up for E-Update notices".

MoDOT

ENGINEERING POLICY GUIDE

Main Page

100 General

136 LPA Policy

200 Geometrics

300 Bases

400 Flexible Pavement

500 Rigid Pavement

600 Incidental Construction

700 Structures and Hydraulics

800 Roadside Development

900 Traffic Control

1000 Materials

1100 Maintenance Materials

Quick Reference Guides

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Other MoDOT Standards

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Standard Plans

Job Special Provisions

Design Standard Letters

Bid Items

Engineering Policy Revision Request Form

Tools

What links here

Related channels

Main Page

Engineering Policy Guide

Our mission is to provide a world-class transportation system that is safe, innovative, reliable and dedicated to a prosperous Missouri.

Search the EPG with Google

Recent Policy Changes in the EPG

Typical Applications

MoDOT's MASH Implementation Information

MoDOT's three pillars of "Safety, Service and Stability" steer our leadership and employees. Our commitment to safety includes keeping both customers and ourselves safe. Our service includes providing outstanding customer service, delivering transportation solutions of great value and using resources wisely. Keeping roads and bridges in good condition, operating a reliable and convenient transportation system, and advancing Missouri's economic development reflect our commitment to stability. Innovative concepts, such as [Practical Design](#) and [design-build](#), are used to deliver our commitments. These and other forward-thinking concepts shape the content of the ENGINEERING POLICY GUIDE (EPG). This document provides a single reference for all engineering and engineering-related [Bridge](#), [Construction](#), [Design](#), [Highway Safety & Traffic](#), [Maintenance](#), [Planning](#) and [Right of Way](#) guidance.

Report a Broken Link

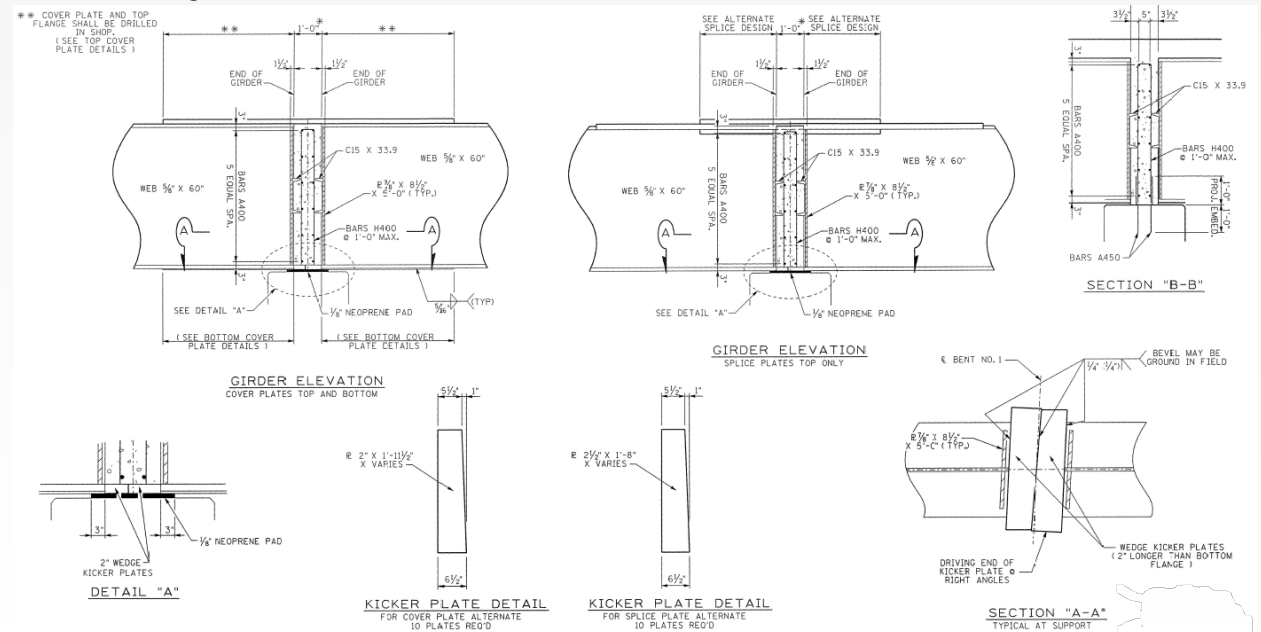
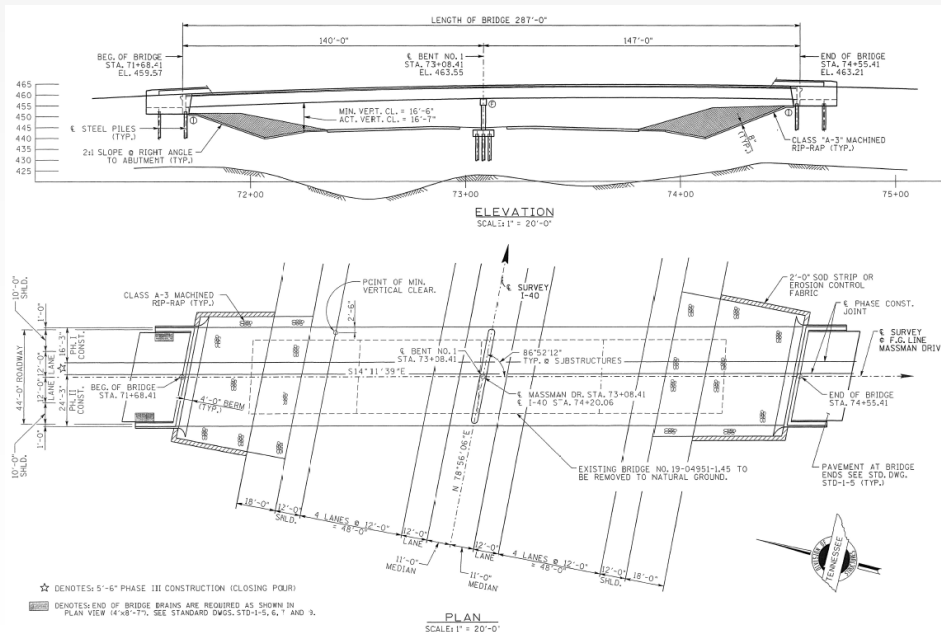
Engineering Policy Approval Process

Sign up for E-Update notices

Other States With SDCL Projects



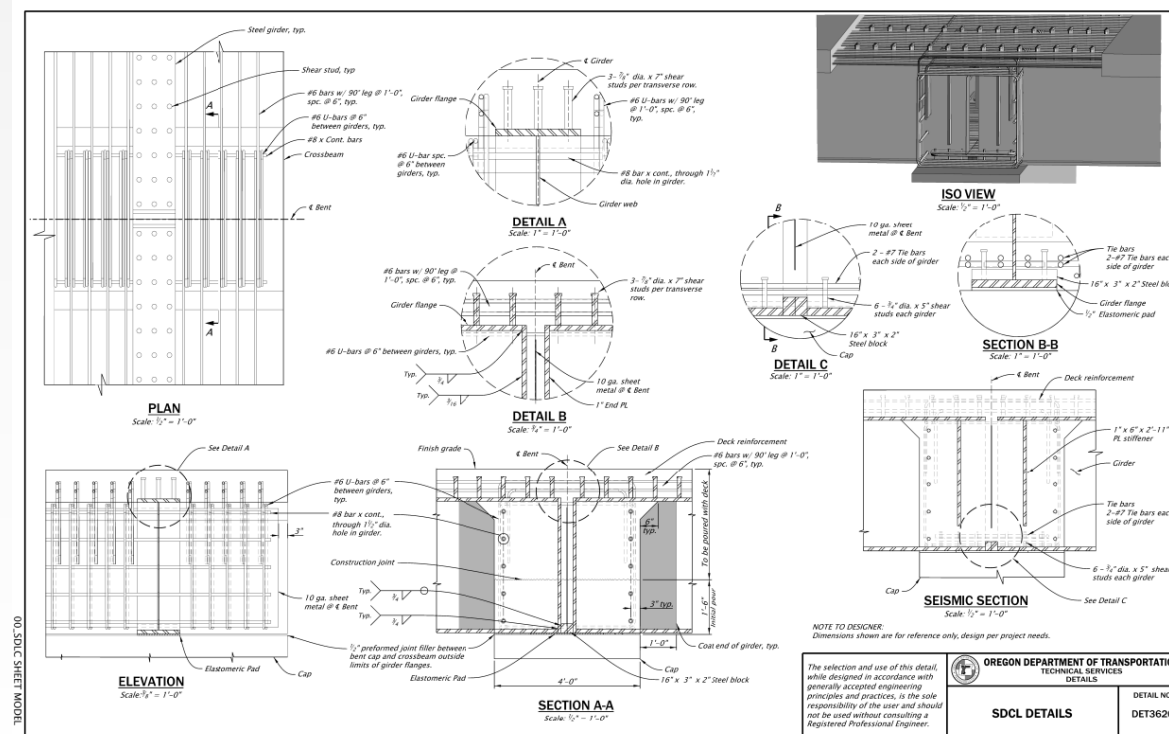
- Nebraska
 - They have three bridges in Nebraska
- Tennessee
 - Massman Drive over I-40 Davidson County



Other States With SDCL Projects



- Oregon has Bridge Manual section and detail sheet (DET3620)



Bridge Engineering Section

Bridge Design Manual - Section 1

- Eliminate details that retain water, dirt, and other debris. Provide stiffener clips for proper ventilation and drainage

1.6.2.3 Simple for Dead Load Continuous for Live Load

Consider a simple steel bridge system (SDCL) for dead load and continuous for live load in the design of multi-span structures when simple spans or full continuous spans do not provide efficient span configuration and design.

Use haunched girders with generous allowances for drainage through stiffener copes, snipes, and drain holes since the use of haunched girders complicates the efficient removal of run-off and can result in the collection of debris at the haunch.

C1.6.2.3

Span configuration plays an important role in using steel efficiently. Two span continuous girders for dead and live loads are not always efficient because of high negative moments. Three span units with interior spans about 20 to 30 percent longer than end spans are preferable, but not always possible.

Relative to full continuous, SDCL bridges reduce uplift in unbalanced spans, reduce negative moments at the bents, simplify fabrication, and eliminate the need for bolted field splices.

Concrete diaphragms are a feasible connection detail for providing live load continuity over the pier in a SDCL steel girder system when conventional construction methods are employed.

Link slabs are proven to be an economical detail for eliminating deck joints on bridges. Elimination of the deck joint increases a

Critical to the functionality of SDCL structures is the continuity connection at the interior bents. Consider use of concrete diaphragms over the bridge piers. See DET3620.

For designs intending to eliminate the deck joint at interior bents while allowing simple-span bridge behavior to be retained, consider



Any Questions?

We get people safely where they want to go.

Bryan Hartnagel, State Bridge Engineer

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