Photo: 2020 Prize Bridge National Winner – Manning Crevice (Idaho) – Photo Credit: Ken Saindon

Competitive Short-Span Steel Bridges

John Hastings, PE

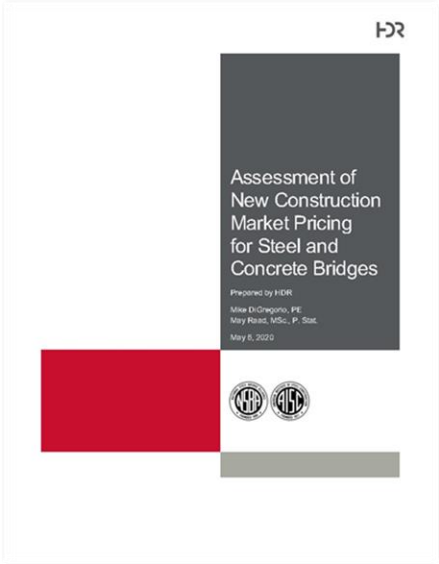
Bridge Steel Specialist, Southeast

Smarter. Stronger. Steel.

Competitive Short-Span Steel Bridges

Assessment of New Construction Market Pricing for Steel and Concrete Bridges

- Comprehensive national study of bridge cost
- Prepared by HDR
    - Michael DiGregorio, PE, MBA Professional Associate
- Conclusions
    - Steel bridges are cost-competitive
    - Rolled steel bridges are most cost-competitive
    - States exhibit a bias toward bridge types (steel vs concrete)



"These conclusions come as a surprise to the authors, who assumed that concrete bridge would be more cost-competitive than steel bridges."

Michael DiGregorio

Competitive Short-Span Steel Bridges

Project Objectives

- Determine the in-place cost of structural steel and precast concrete bridges
- Break these cost down
- Compare similar structures
- Compare national and regional cost

Competitive Short-Span Steel Bridges

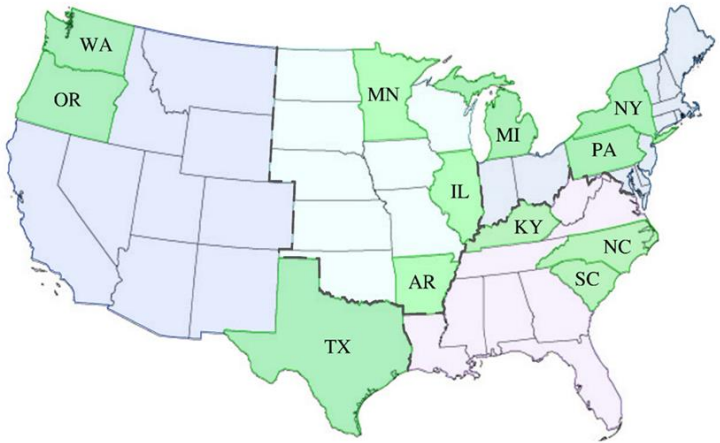
Project Scope of Work

- Structural Steel and Concrete bridges
- New and replacement structures for vehicular traffic
- Typical girder/beam/slab type bridges (i.e. no truss, arch, cable stay, suspension, etc.)
- Bridge let by State Department of Transportation agencies
- Projects constructed between 2011 and 2019
- Design-Bid-Build delivery approach

Competitive Short-Span Steel Bridges

Project Approach

- Selected 12 states
- Gathered information
    - Reviewed bridge plans
    - Reviewed Historic bid tabs



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Project Approach

Region	State	Steel								Concrete								Total
		11	14	15	16	17	18	19	Tot	11	14	15	16	17	18	19	Tot	
West	Oregon		2	1		1			4		6	7	8	2			23	**27**
	Texas				1	3	1	1	6						63	29	92	**98**
	Washington	2							2	1	9	8	10	4	3	5	40	**42**
Central	Arkansas				38	9	6		53									**53**
	Illinois						23	8	31						29	4	33	**64**
	Minnesota					2			2					42	8		50	**52**
Southeast	Kentucky				1	2			3				1	11	21	14	47	**50**
	North Carolina					12	5		17					25	29		54	**71**
	South Carolina						1	1	2		6	13	3	9	6	4	41	**43**
Northeast	Michigan			3	2	3	4	3	15			3	21	9	16	7	56	**71**
	New York				16	14	8		38				1	5	2		8	**46**
	Pennsylvania					6	1		7				30	27	33		90	**97**
Total		**2**	**2**	**4**	**58**	**52**	**49**	**13**	**180**	**1**	**21**	**31**	**74**	**134**	**210**	**63**	**534**	**714**

Competitive Short-Span Steel Bridges

Project Approach Comparable Cost

- Typical items included:
    - Mobilization
    - Structural Excavation
    - Foundations
    - Beams
    - Superstructure/Deck

Competitive Short-Span Steel Bridges

Project Approach Comparable Cost

- Typical items not included:
    - Overlay
    - Bridge rail
    - Approach Slab
    - Aesthetics

Competitive Short-Span Steel Bridges

Project Approach Cost Adjustments

- Escalation
    - Necessary to escalate project cost from past years to consistent base year for comparison (Q2 2019)
- Location Adjustment
    - Necessary to adjust project costs from state specific to national average for comparison

Competitive Short-Span Steel Bridges

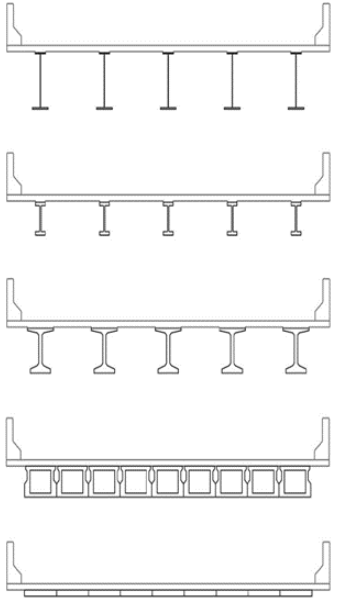
Establish Key Parameters

- Bridge Type
- Span Length Classification
- Skew Angle and Horizontal Curvature
- Phasing
- Coatings
- Grade of material

Competitive Short-Span Steel Bridges

Establish Key Parameters

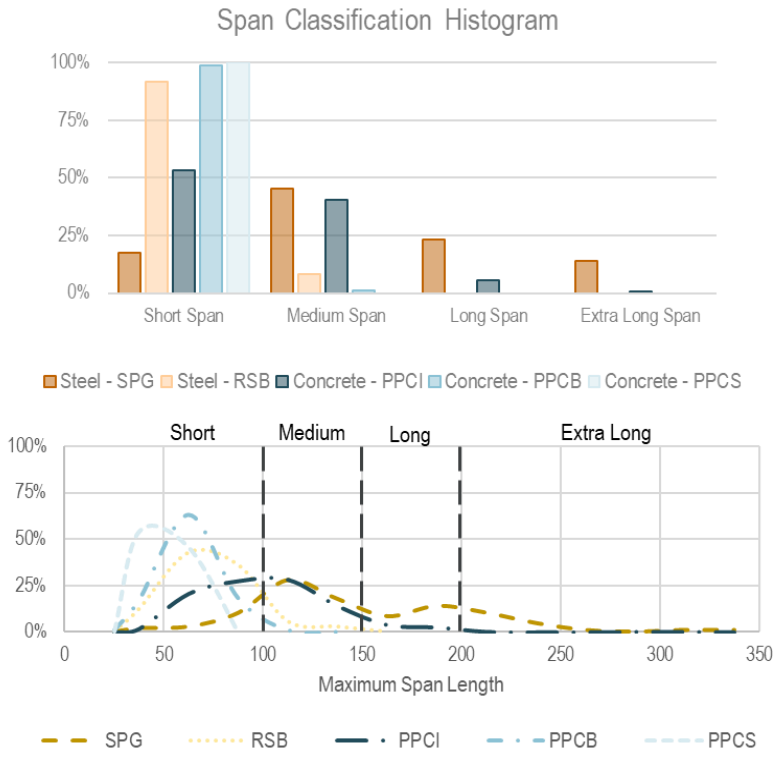
- Bridge Type and Subtype
    - Structural Steel
        - Steel plate girder (SPG)
        - Rolled steel beam (RSB)
    - Concrete
        - Precast, prestressed concrete I-beam (PPCI)
        - Precast, prestressed concrete box beam (PPCB)
        - Precast, prestressed concrete slab beams (PPCS)



Competitive Short-Span Steel Bridges

Establish Key Parameters

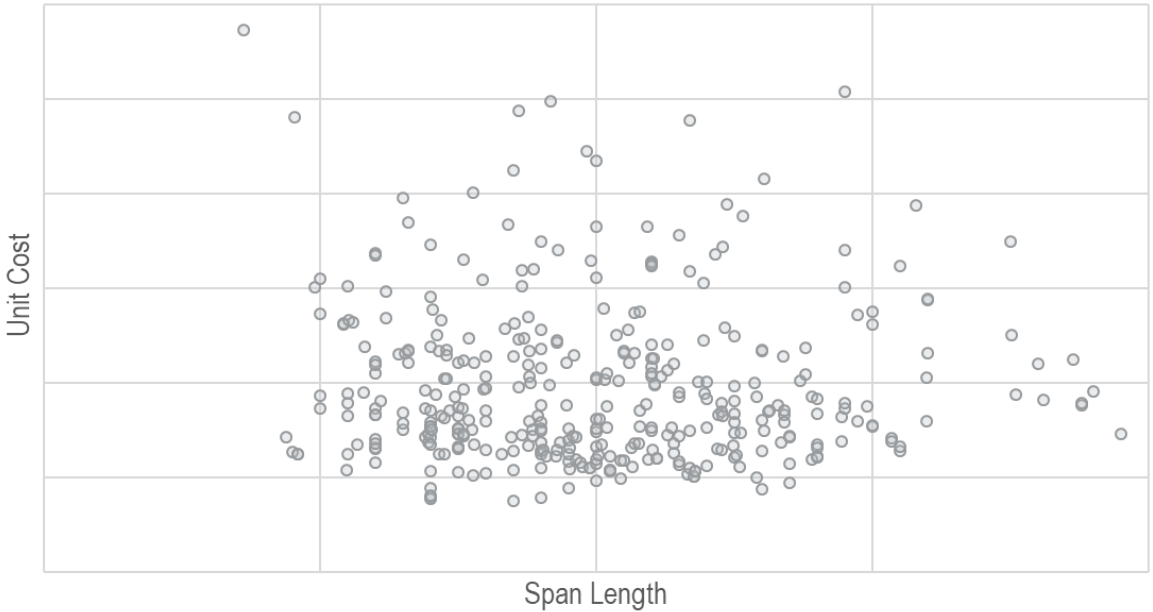
- Span Length Classification
  - Captured the length of each span for every bridge
  - Developed a histogram of maximum span length
    - Span ranges from span distribution
      - <100’
      - 100’ to 150’
      - 150’ to 200’
      - > 200’



Competitive Short-Span Steel Bridges

How to Report Costs

- Unit Price Data Set



Competitive Short-Span Steel Bridges

How to Report Costs

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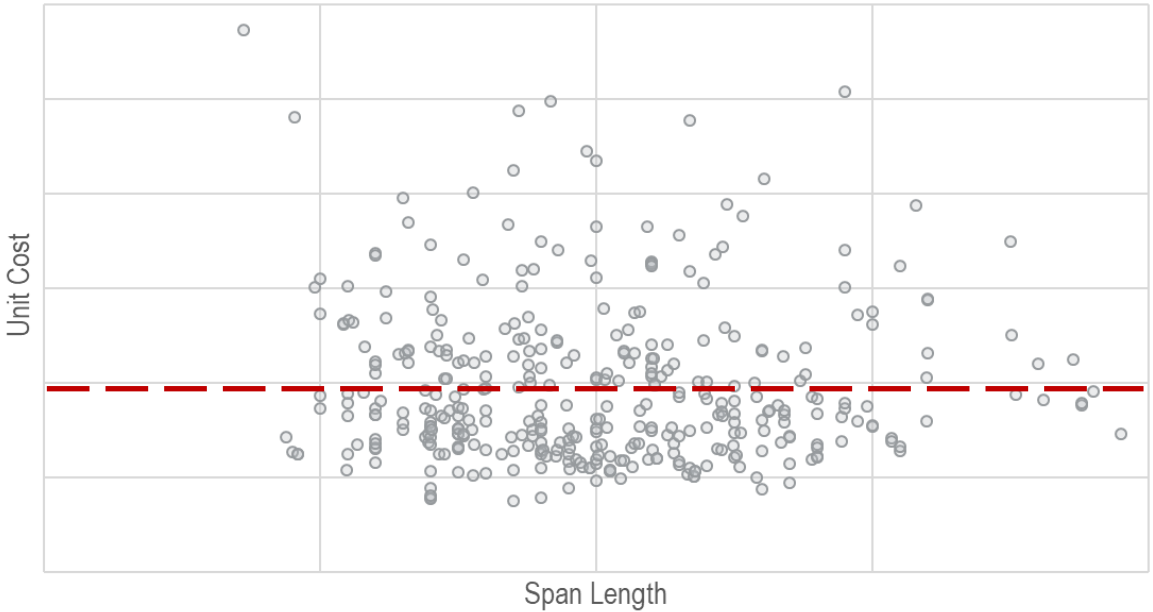

Competitive Short-Span Steel Bridges

How to Report Costs

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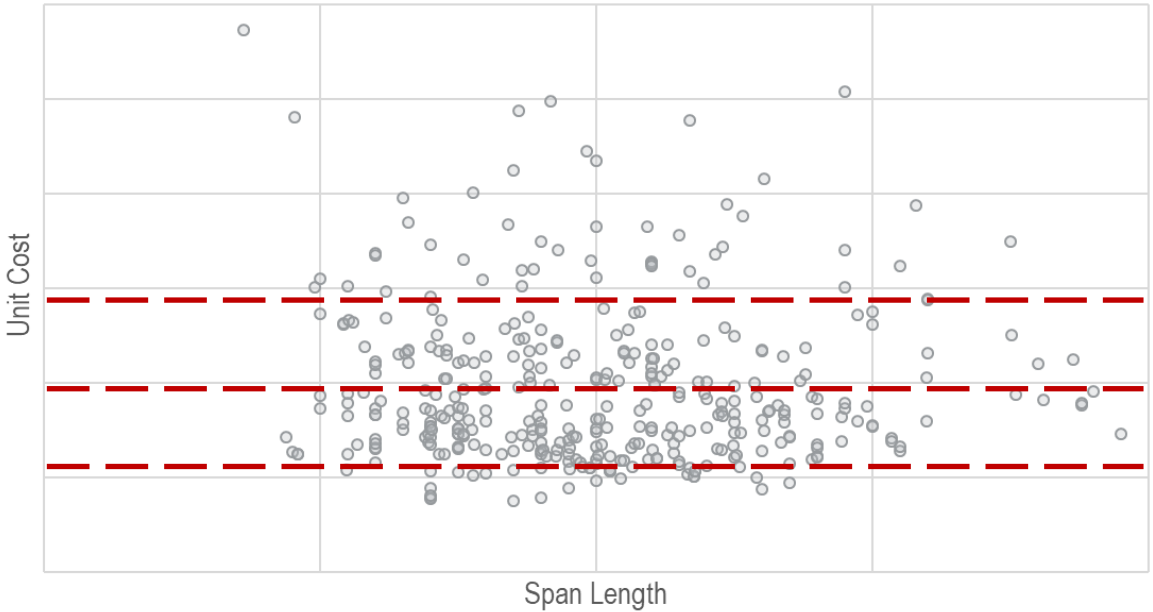

Competitive Short-Span Steel Bridges

How to Report Costs

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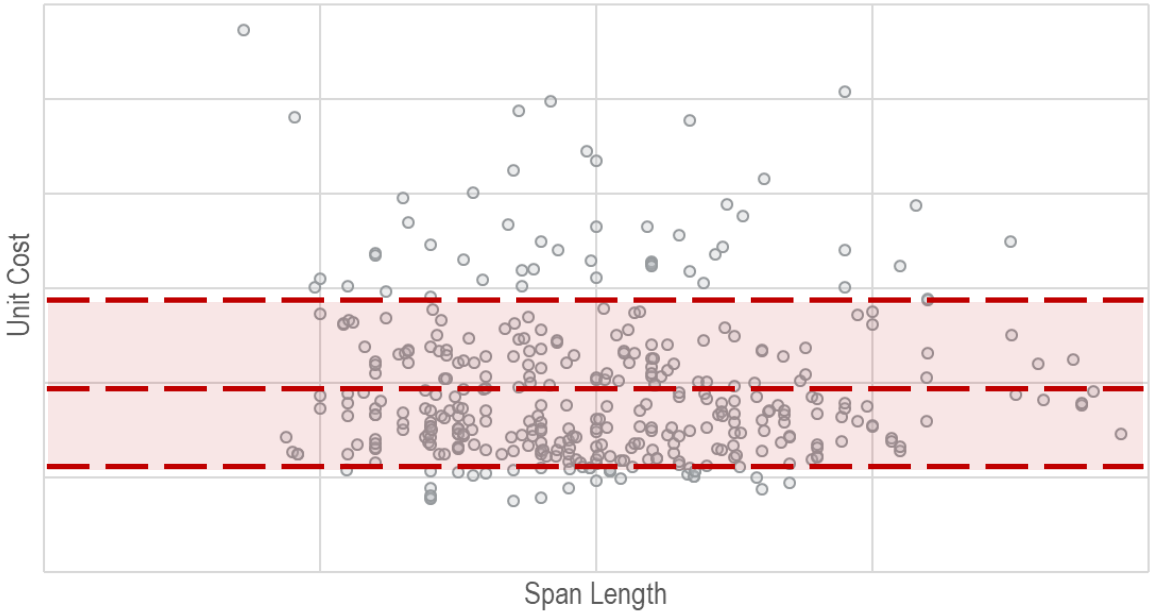

Competitive Short-Span Steel Bridges

How to Report Costs

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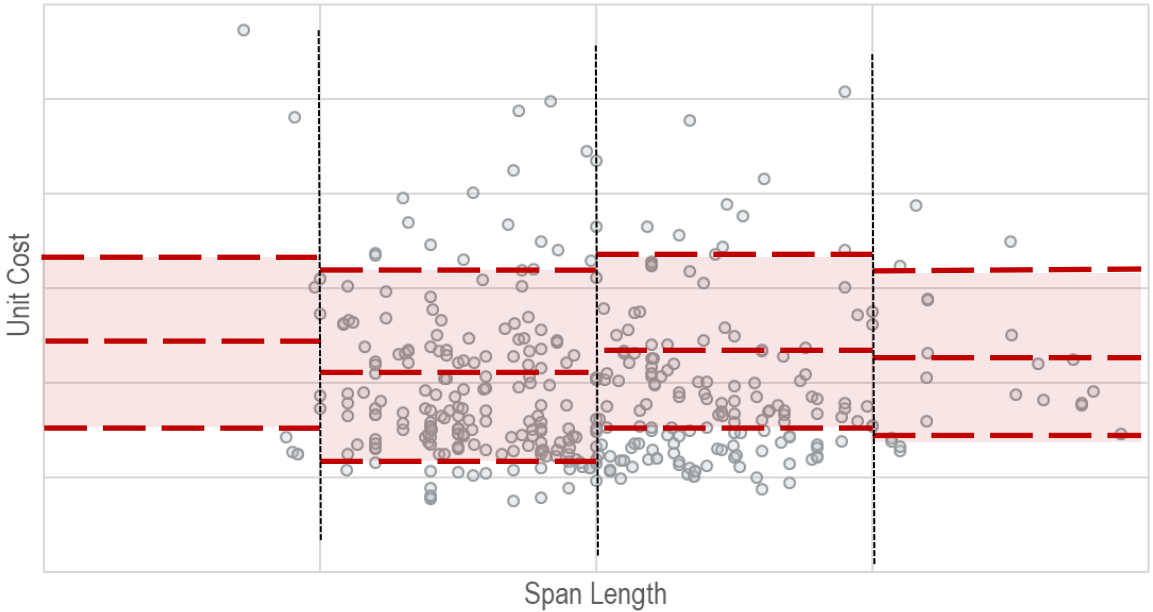
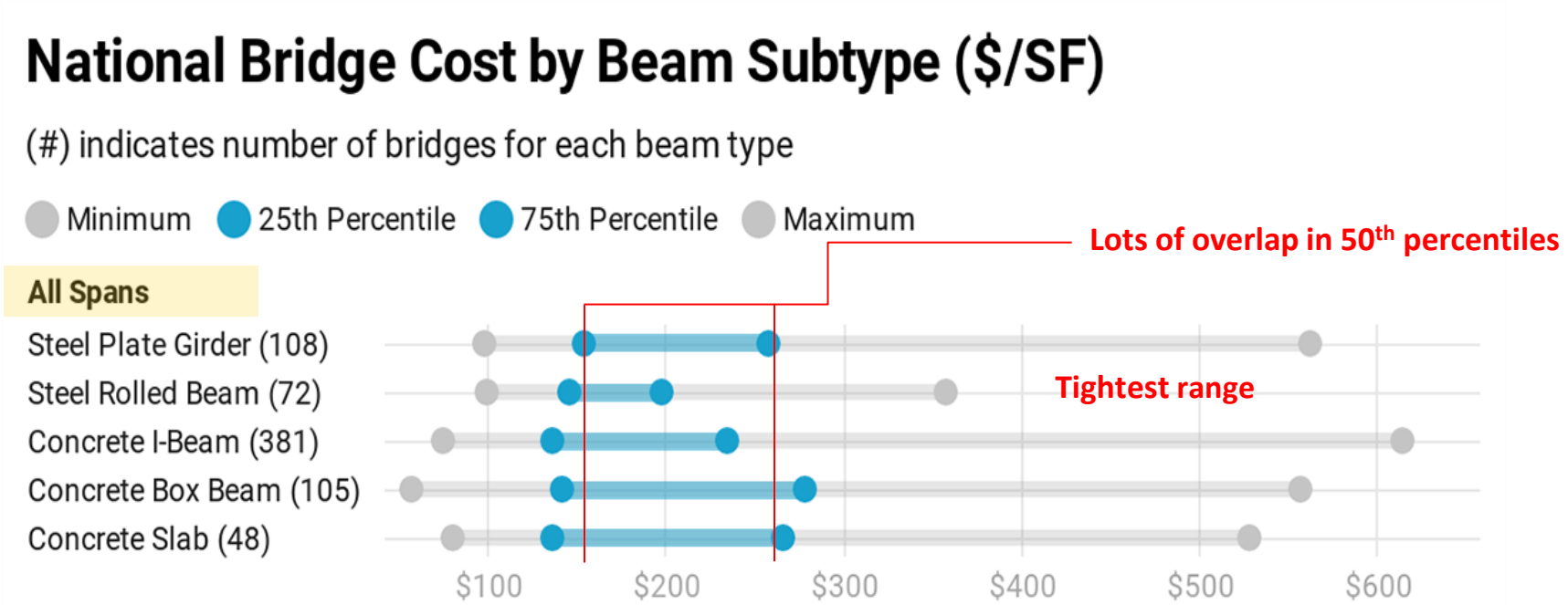
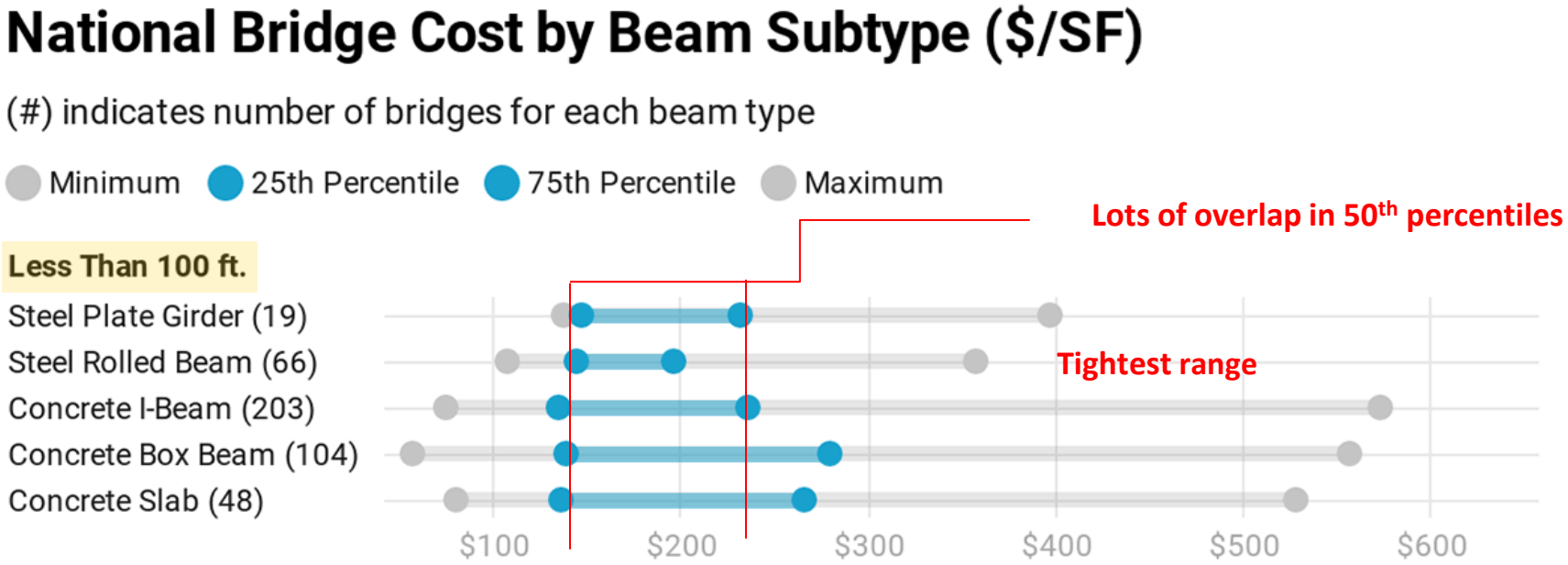


Competitive Short-Span Steel Bridges



- Cost in $/ SF for different beam types, and gray bars show overall range of bridge costs for each beam type
- Blue shaded portion highlights 50th percentile range of bridge costs
- Significant overlap with all concrete beam types

Competitive Short-Span Steel Bridges



- Steel plate girders and rolled beams are competitive with concrete

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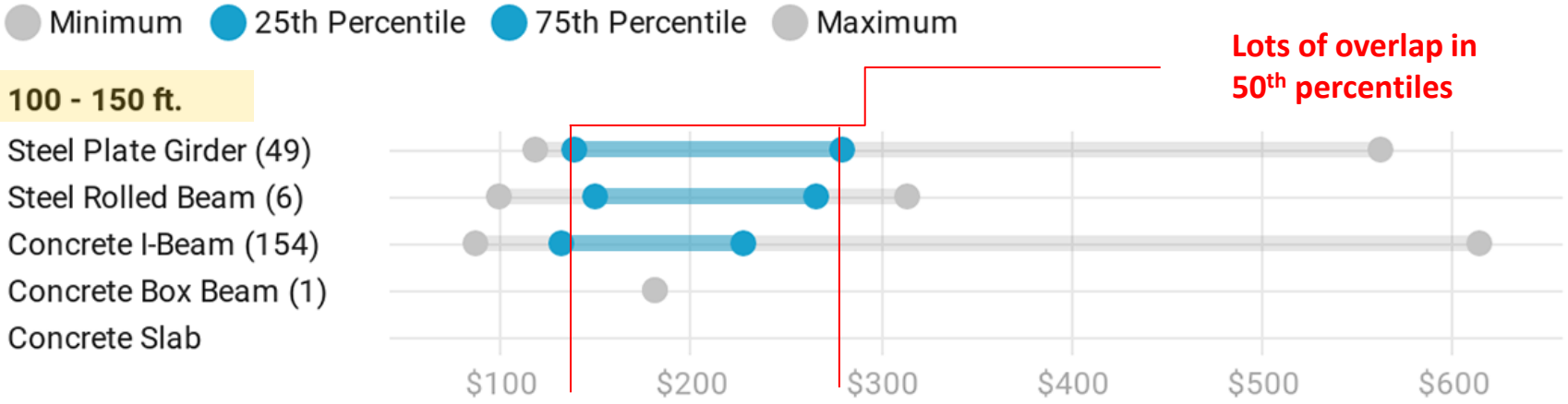
National Bridge Cost by Beam Subtype ($/SF)

(#) indicates number of bridges for each beam type



- Significant overlap between all types suggests all beam types are competitive within this span range
- Rolled steel beams aren’t as economical above 100’

Competitive Short-Span Steel Bridges

More Information

Bridge Steel Specialists

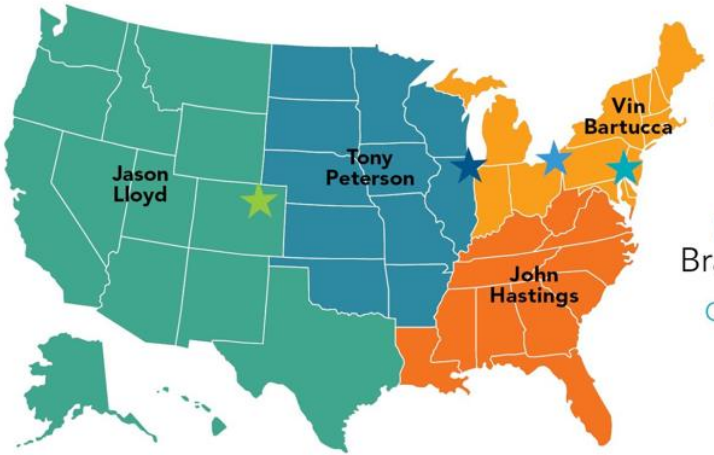
Western Market
Jason Lloyd

Central Market
Tony Peterson

Southeast Market
John Hastings

Northeast Market
Vin Bartucca

Steel Solutions Center
Devin Altman ★



Leadership Team

Director of Market Development
Jeff Carlson ★

Director of Market Development
Brandon Chavel ★

Chief Bridge Engineer
Chris Garrell ★

www.aisc.org/nsba/

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Competitive Short-Span Steel Bridges

Considerations for Steel Girder Efficiency

- Utilize balance spans when possible
    - Continuous span standards available at https://www.aisc.org/nsba/design-resources/
- Eliminate or reduce the number of piers to optimize span arrangements
    - Span-to-Weight Curves available at https://www.aisc.org/nsba/design-resources/
- Utilize wider girder spacings to reduce fabrication and erection cost.
- Balance loads in interior and exterior girders
- Optimize web depth (Simon has a feature for this, eSPAN 140)
- Simplify details

Competitive Short-Span Steel Bridges

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