Competitive Short-Span Steel Bridges

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Bridge Steel Specialist, Southeast
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
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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
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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
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Project Approach

• Selected 12 states
• Gathered information
  • Reviewed bridge plans
  • Reviewed Historic bid tabs
## Competitive Short-Span Steel Bridges

### Project Approach

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<th>Region</th>
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Project Approach Comparable Cost

• Typical items included:
  • Mobilization
  • Structural Excavation
  • Foundations
  • Beams
  • Superstructure/Deck
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Project Approach Comparable Cost

• Typical items not included:
  • Overlay
  • Bridge rail
  • Approach Slab
  • Aesthetics
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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
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Establish Key Parameters

- Bridge Type
- Span Length Classification
- Skew Angle and Horizontal Curvature
- Phasing
- Coatings
- Grade of material
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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)
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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’
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How to Report Costs

- Unit Price Data Set
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National Bridge Cost by Beam Subtype ($/SF)

(#) indicates number of bridges for each beam type

- 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

Lots of overlap in 50th percentiles

Tightest range

- Steel Plate Girder (108)
- Steel Rolled Beam (72)
- Concrete I-Beam (381)
- Concrete Box Beam (105)
- Concrete Slab (48)
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National Bridge Cost by Beam Subtype ($/SF)

(#) indicates number of bridges for each beam type

- Minimum
- 25th Percentile
- 75th Percentile
- Maximum

**Less Than 100 ft.**
- Steel Plate Girder (19)
- Steel Rolled Beam (66)
- Concrete I-Beam (203)
- Concrete Box Beam (104)
- Concrete Slab (48)

- Steel plate girders and rolled beams are competitive with concrete

Lots of overlap in 50th percentiles

Tightest range
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National Bridge Cost by Beam Subtype ($/SF)

(#) indicates number of bridges for each beam type

- Minimum
- 25th Percentile
- 75th Percentile
- Maximum

100 - 150 ft.

- Steel Plate Girder (49)
- Steel Rolled Beam (6)
- Concrete I-Beam (154)
- Concrete Box Beam (1)
- Concrete Slab

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

Lots of overlap in 50th percentiles
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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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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