Steel Bridge Forum – North Dakota

Anthony (Tony) Peterson, PE
Senior Steel Bridge Specialist, Central Market
April 2025

Smarter. Stronger. Steel.

Purpose of Forum

- Provide design, fabrication and constructability assistance to engineers regarding steel bridges.
- Make it known that NSBA is here to provide assistance and guidance regarding steel bridges.
- AASHTO steel bridge design updates.
- Steelmaking and redundancy.

Thanks to the North Dakota DOT Bridge Office for hosting the Forum, providing PDH certificates and overall coordination.

Smarter. Stronger. Steel.

Agenda

Time	Topic	Presenter
8:00 - 8:15 am	Welcome & Introductions	Jason Thorenson – NDDOT
8:15 - 8:45 am	NSBA Steel Bridge Resources for Design, Fab, and Pricing	Tony Peterson – NSBA
8:45 - 10:15 am	Steel Bridge Design Basics	Dusten Olds – HDR
10:15 - 10:30 am	Break, and Bolting Demonstration	Jeff Greene – LeJeune Bolt
10:30 - 11:00 am	NSBA Tools for Steel Bridge Design	Tony Peterson – NSBA
11:00 - 11:30 pm	AASHTO 10th Edition updates	Dusten Olds – HDR
11:30 – Noon	Steelmaking of Bridge Steels	Jason Lloyd – NUCOR
Noon – 1:00 pm	Lunch Provided, and Bolting Demonstration	Jeff Greene – LeJeune Bolt
1:00 - 1:30 pm	Redundancy for Steel Bridges	Jason Lloyd – NUCOR
1:30 – 2:00 pm	Grant Marsh Bridge Rehabilitation	Brian Raschke – NDDOT, Curtis Schroeder – WJE
2:30 - 3:00 pm	Steel Girder Erection and Constructability	Mike Briggs – HNTB
3:00 – 3:15 pm	Break, and Bolting Demonstration	Jeff Greene – LeJeune Bolt
3:15 – 4:15 pm	Steel Bridge Fabricator Overview and Roundtable	*Intro*: Nick Zacher – True North *Moderated*: Tony Peterson – NSBA *Participants*: • Nick Zacher – True North • Mark Garrison – Veritas • Gary Wisch – DeLongs • Chuck Sidles – CCI • Jeff Greene – LeJeune Bolt • Jasmine Sonmor, Aura • Matt Gregg, Wheeler
4:15 - 4:45 pm	The FARM project: Simple Beam Spans Made Continuous	Gary Wisch - DeLongs
4:45 - 5:00 pm	Closing Remarks and Feedback Comments	Tony Peterson – NSBA

Smarter.
Stronger.
Steel.

National Steel Bridge Alliance (30 yrs old)

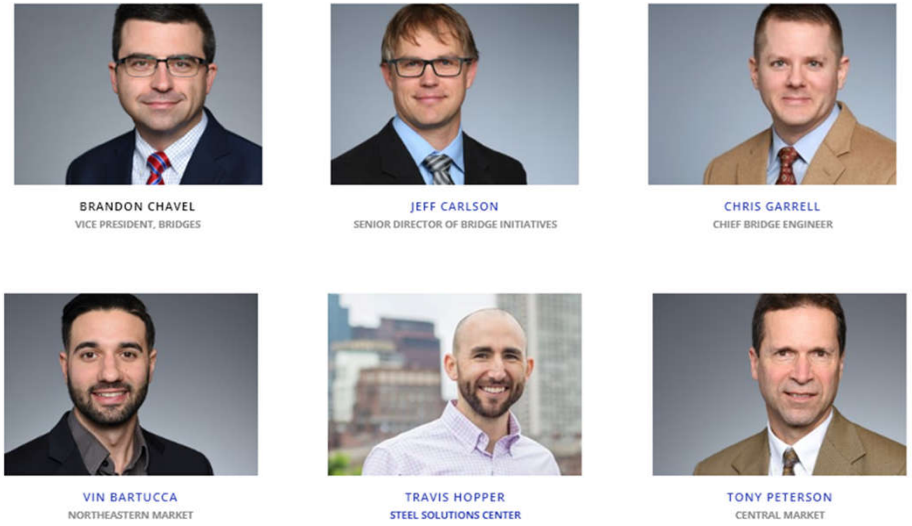
A Division of AISC (100 yrs old)

- Technical Institute & Trade Association
- Not-for-profit
- Focused specifically on the advancement of steel bridge design, fabrication and construction
- Vehicular, railroad, and pedestrian bridges

Meet the NSBA

- Brandon Chavel
  - Vice President Bridges
- Jeff Carlson
  - Senior Director of Bridge Initiatives
- Chris Garrell
  - Chief Bridge Engineer

- Steel Bridge Specialists
  - Vin Bartucca
    - Northeastern Market
    - Contractor Engagement
  - Tony Peterson
    - Central Market
    - Railroad Bridges
  - Travis Hopper
    - Steel Solutions Center



- Duncan Paterson
  - Director of Education

STEEL SOLUTIONS CENTER

The Steel Solutions Center is your gateway to nearly 100 years of steel knowledge, and it's just a phone call or email away.

aisc.org/askaisc

solutions@aisc.org

866.ASK.AISC

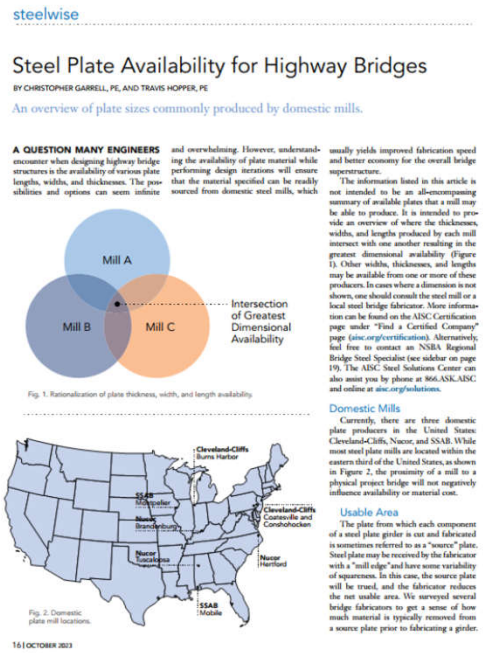
- answer your technical questions about structural steel design.
- help you understand NSBA's technical publications.
- help you reduce project risk by connecting decision-makers with AISC bridge-member fabricators for price and schedule information.
- provide conceptual solutions for steel girder and beam bridges, including framing plan and girder spacing concepts, preliminary girder sizes, and steel tonnage estimates.

Modern Steel Construction

- Have an idea for a great bridge article?
- Submit it to: www.aisc.org/bridgeideas

Circulation = 60,000

68%	Engineers
15%	Architects
8%	Fabricators


steelwise

Steel Plate Availability for Highway Bridges

BY CHRISTOPHER GARRELL, PE, AND TRAVIS HOPPER, PE

An overview of plate sizes commonly produced by domestic mills.

A QUESTION MANY ENGINEERS encounter when designing highway bridge structures is the availability of various plate lengths, widths, and thicknesses. The possibilities and options can seem infinite and overwhelming. However, understanding the availability of plate material while performing design iterations will ensure that the material specified can be readily sourced from domestic steel mills, which usually yields improved fabrication speed and better economy for the overall bridge superstructure.

The information listed in this article is not intended to be an all-encompassing summary of available plates that a mill may be able to produce. It is intended to provide an overview of where the thicknesses, widths, and lengths produced by each mill intersect with one another resulting in the greatest dimensional availability (Figure 1). Other widths, thicknesses, and lengths may be available from one or more of these producers. In cases where a dimension is not shown, one should consult the steel mill or a local steel bridge fabricator. More information can be found on the AISC Certification page under "Find a Certified Company" page (aisc.org/certification). Alternatively, feel free to contact an NSBA Regional Bridge Steel Specialist (see sidebar on page 19). The AISC Steel Solutions Center can also assist you by phone at 866.ASK.AISC and online at aisc.org/solutions.

Mill A
Mill B
Mill C
Intersection of Greatest Dimensional Availability

Fig. 1. Rationalization of plate thickness, width, and length availability.

Cleveland-Cliffs Burns Harbor
SSAB Montpelier
Nucor Brandenburg
Cleveland-Cliffs Coatesville and Conshohocken
Nucor Tuscaloosa
Nucor Hertford
SSAB Mobile

Fig. 2. Domestic plate mill locations.

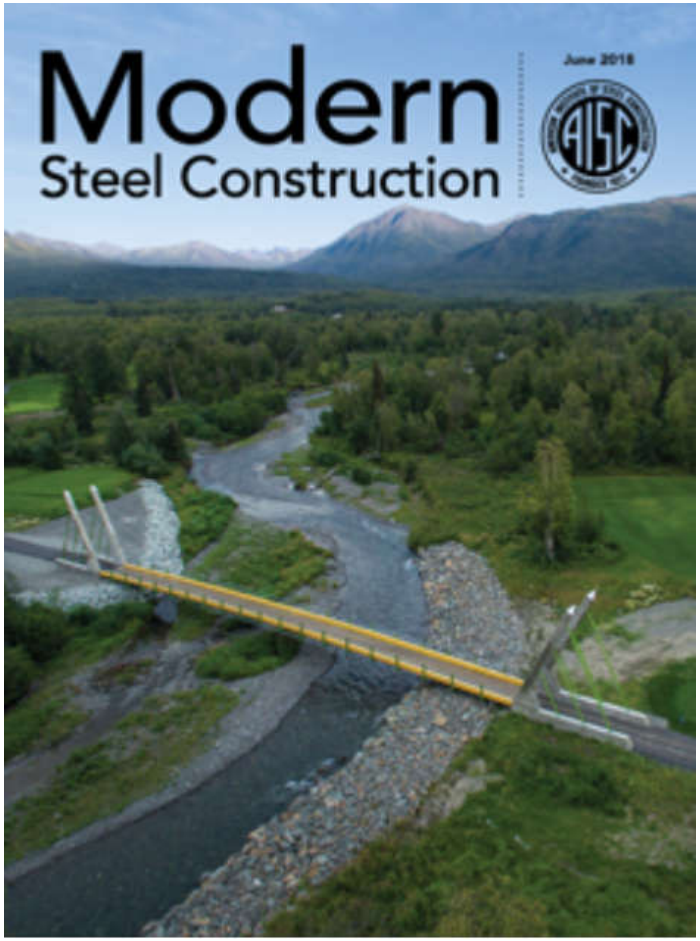
Domestic Mills

Currently, there are three domestic plate producers in the United States: Cleveland-Cliffs, Nucor, and SSAB. While most steel plate mills are located within the eastern third of the United States, as shown in Figure 2, the proximity of a mill to a physical project bridge will not negatively influence availability or material cost.

Usable Area

The plate from which each component of a steel plate girder is cut and fabricated is sometimes referred to as a "source" plate. Steel plate may be received by the fabricator with a "mill edge" and have some variability of squareness. In this case, the source plate will be trued, and the fabricator reduces the net usable area. We surveyed several bridge fabricators to get a sense of how much material is typically removed from a source plate prior to fabricating a girder.

16 | OCTOBER 2023



What We Do

- Focus on upcoming bridge design/construction projects and promote the advantages of steel when appropriate.
- Meet with owners, designers and decision-makers.
- Steel Bridge Forums.
- AASHTO Collaboration Meetings.
- Industry Meetings and Trade Shows.
- Work closely with FHWA, AASHTO & AREMA.
- Maintain an ever- expanding library of publications and white papers to assist designers, fabricators and owners.

What We Provide

The NSBA maintains a growing list of technical resources to aid in making steel bridges more economical and constructible.

- Design support strategies
- Free software
- Design Handbook, AASHTO/NSBA collaboration documents
- Technical white papers
- Modern Steel Construction Articles
- New steel bridge technology in the marketplace
- Material availability
- Conceptual steel bridge design
- Basic raw material price info

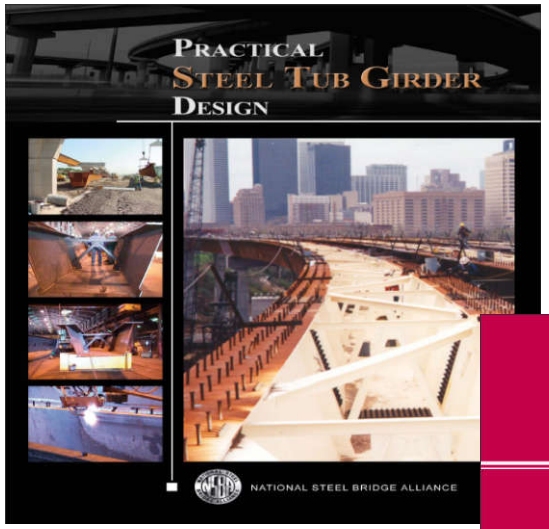
NSBASPLICE
SOFTWARE SOLUTION FOR SPLICE DESIGN

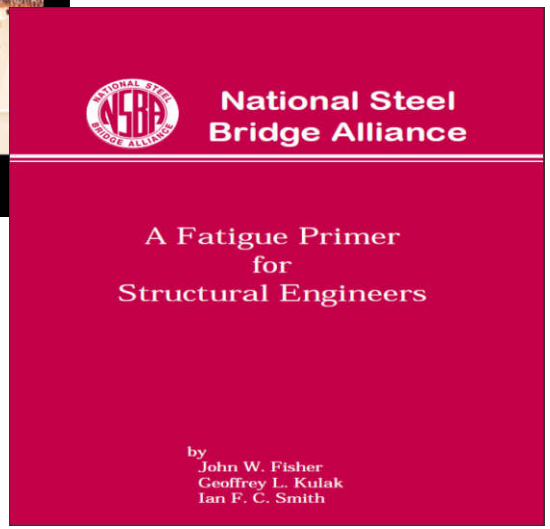
LRFD SIMON
SOFTWARE SOLUTION FOR PRELIMINARY BRIDGE DESIGN

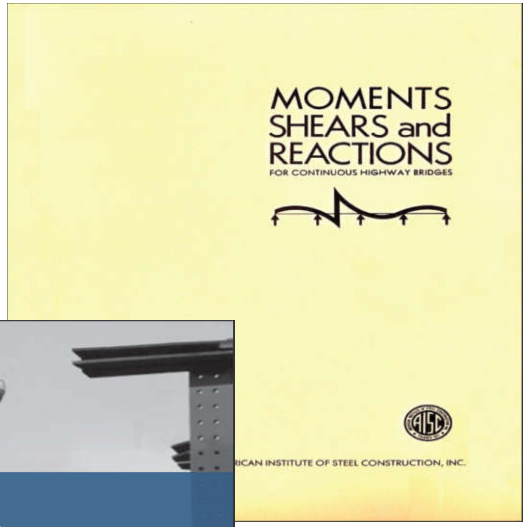
Both updated to AASHTO 9th Edition & in the process of being updated to 10th Edition

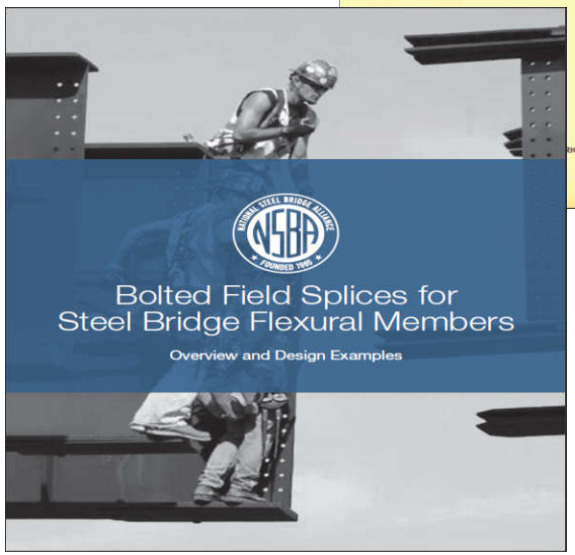
Internally Redundant Member Evaluator

NSBA/AISC Technical Resources

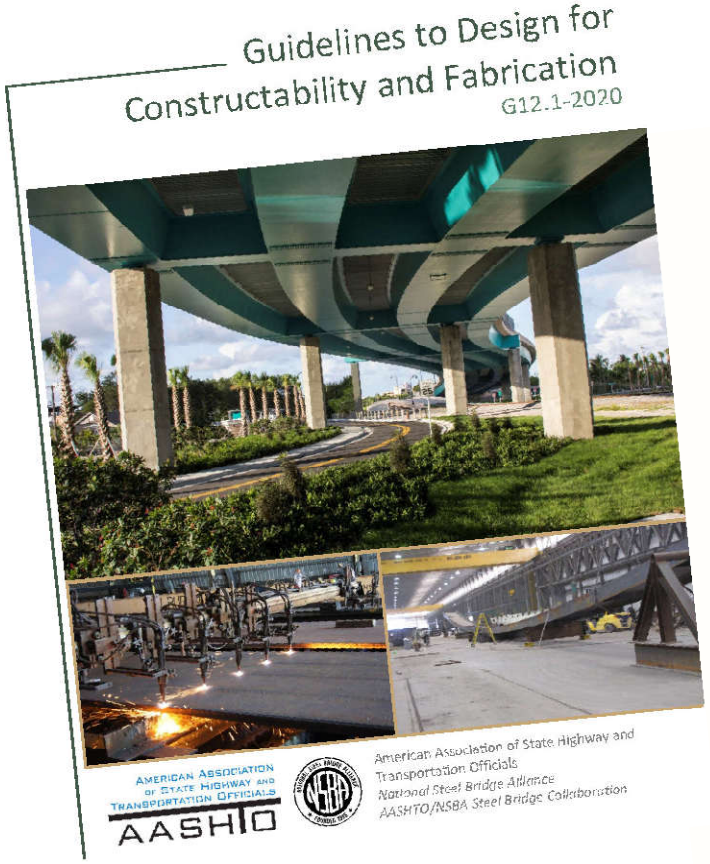


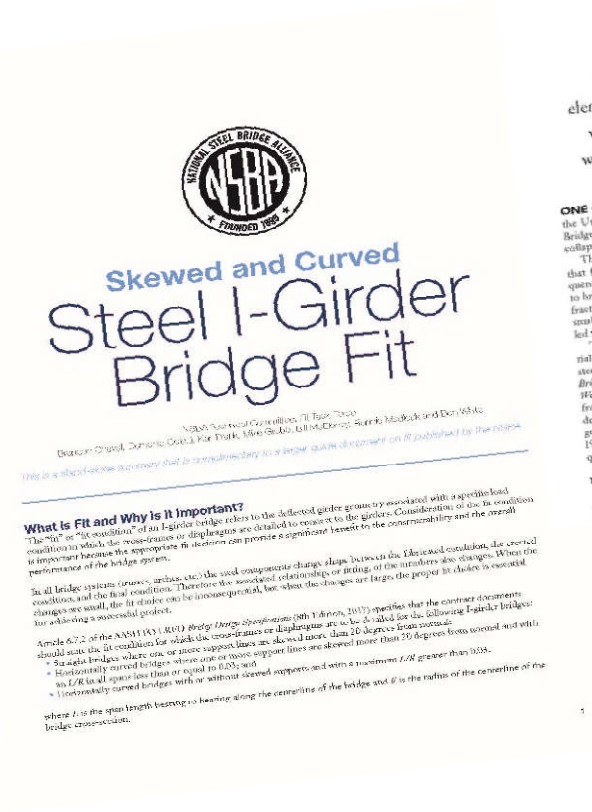






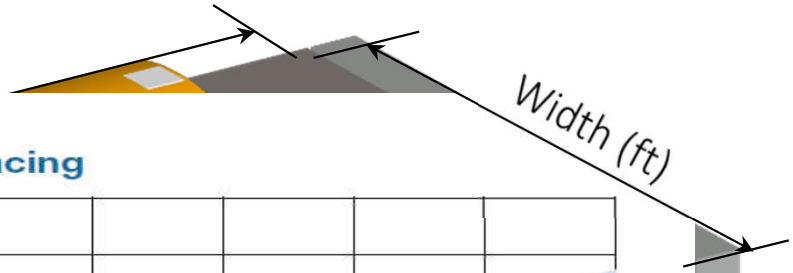
NSBA/AISC Technical Resources

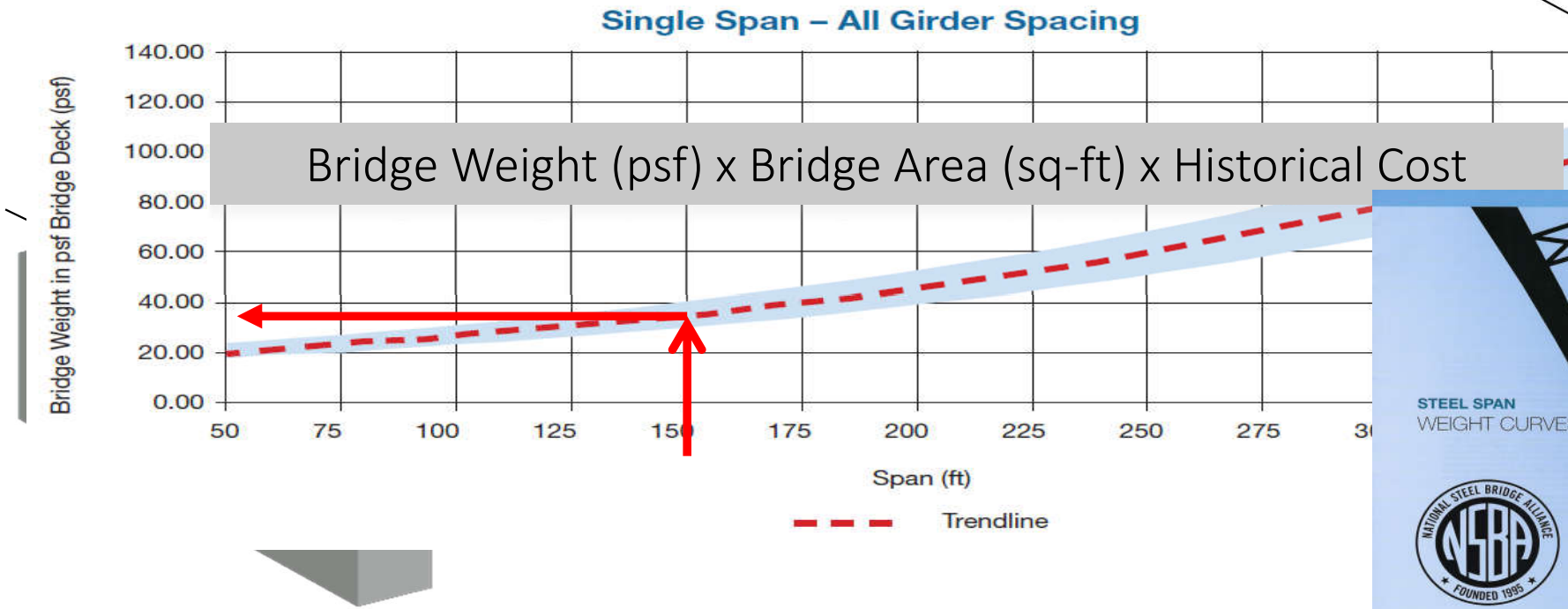




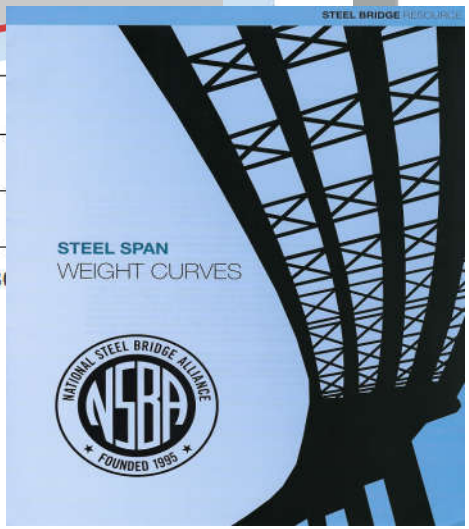
Preliminary Steel Weight Estimates

Span to Weight Charts





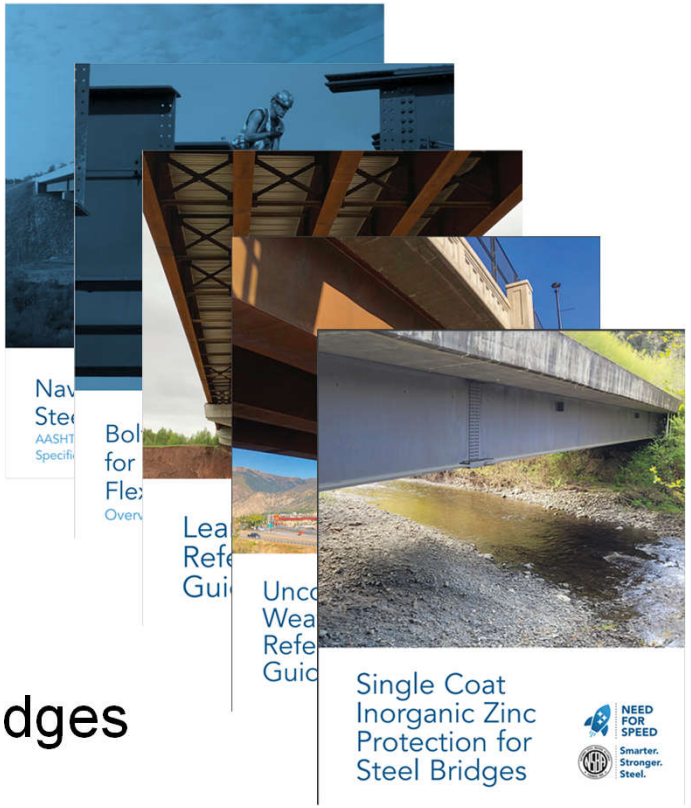
Bridge Weight (psf) x Bridge Area (sq-ft) x Historical Cost



AISC's Need For Speed Initiative

What has been developed?

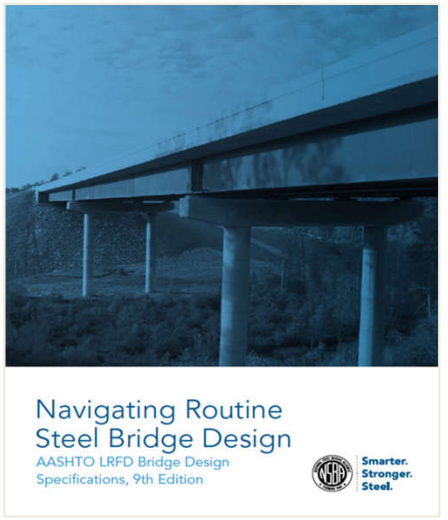
- Guide to Navigating Routine Steel Bridge Design
  - aisc.org/streamlineddesign
- Bolted Field Splice for Flexural Members
  - aisc.org/nsba-splice
- Lean-on Bracing Reference Guide
  - aisc.org/leanonbracing
- Uncoated Weathering Steel Reference Guide
  - aisc.org/uwsguide
- Single Coat Inorganic Zinc Protection for Steel Bridges
  - aisc.org/sioz-report



NSBA Resources

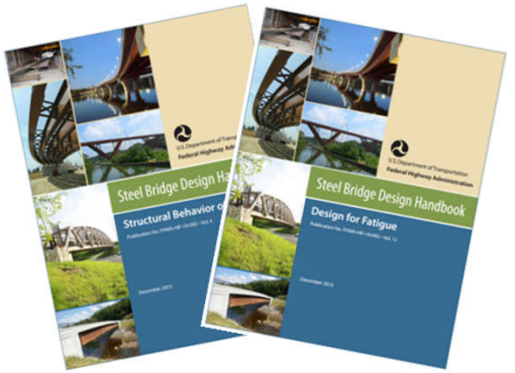
Guideline for Navigating Routine Steel Bridge Design

- for straight, low skew, <200’ span steel girder bridges (“routine”)
- Implement AASHTO LRFD BDS with greater efficiency and quality
  - aisc.org/streamlineddesign



Steel Bridge Design Handbook Update

- FHWA handed back to NSBA
- Updated for AASHTO LRFD 9th Edition
  - aisc.org/sbdh



Uncoated Weathering Steel Reference Guide

Reduce cost from fabrication & life cycle cost through long term maintenance costs

Major Chapters

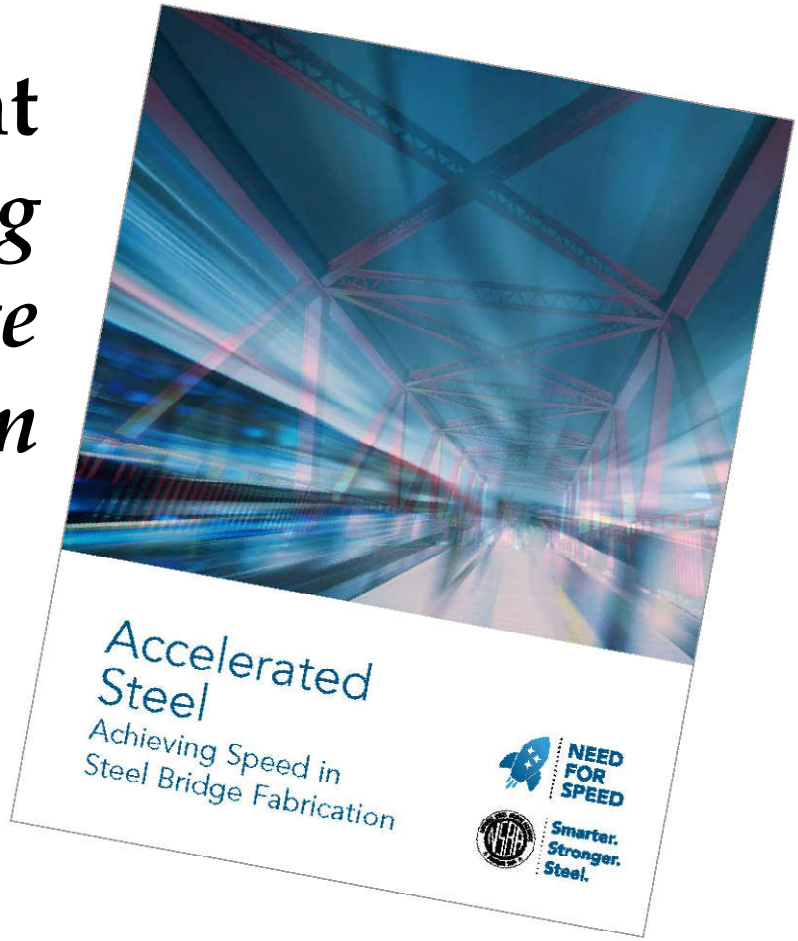
- Benefits and Appropriate Use.
- Design and Detailing Recommendations.
- Fabrication and Construction Considerations
- In-Service Inspection and Maintenance.
- Preservation and Repair.

aisc.org/uwsguide

Update to NSBA Document *Accelerated Steel: Achieving Speed in Steel Bridge Fabrication*

Addition of a New Chapter for Emergency Projects

Ronnie Medlock
With Frank Russo
24 September 2024



Current NSBA Initiatives

Steel Girder Bridge Design Standards

- Develop a National Standard for single, two, three and four-span bridges.
- Girder Spacings of 8’, 10’, 12’, and 14’
- Span lengths up to 300’
- Includes cross-frames, bolted field splices
- Link Slabs
- Deflections, cambers, weights & shear studs

Lean-on Bracing Reference Guide

Easiest method for achieving cost effectiveness for straight steel I-girder bridges with little or no skew.

Major Chapters

- Stability Fundamentals.
- Available Literature and Research.
- Design Approach.
- Fabrication and Erection Consideration.
- Case Studies.
- Design Examples

Lean-on Bracing Reference Guide

NEED FOR SPEED

Smarter. Stronger. Steel.

aisc.org/leanonbracing

Educational Outreach

University Bridge Design Course Material

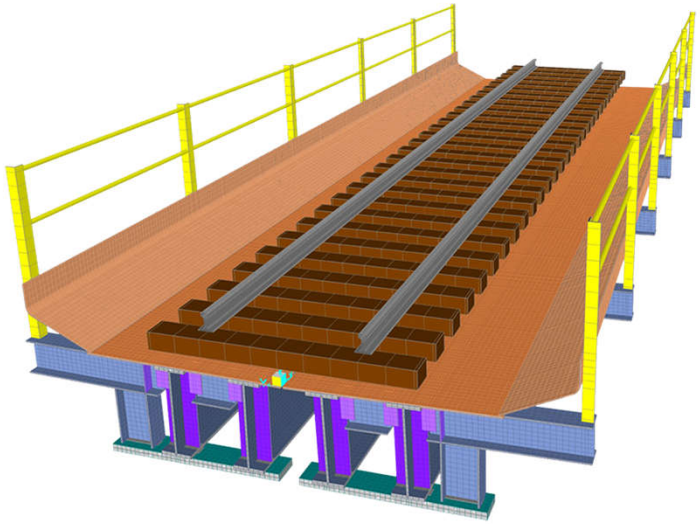
- Develop materials for a collegiate level class on steel highway bridge design.
- Materials include course syllabus, and presentation slides with speaker notes for each lecture. Videos in the making.
- Content based upon Steel Bridge Design Handbook.

Main Chapters

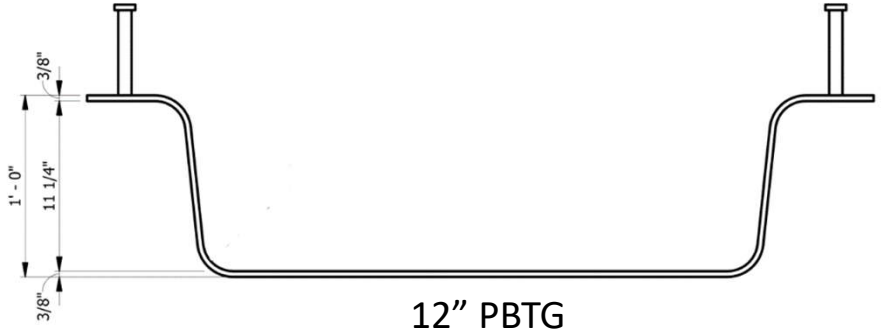
- Intro to Bridges and Steel
- Bridges - Planning and Layout
- Loads
- Methods of Analysis
- Shear in Girders
- Flexure Design
- Splices and Connections
- Tension and Compression Members
- Bearings and Joints
- Decks and Railings

Available Now!

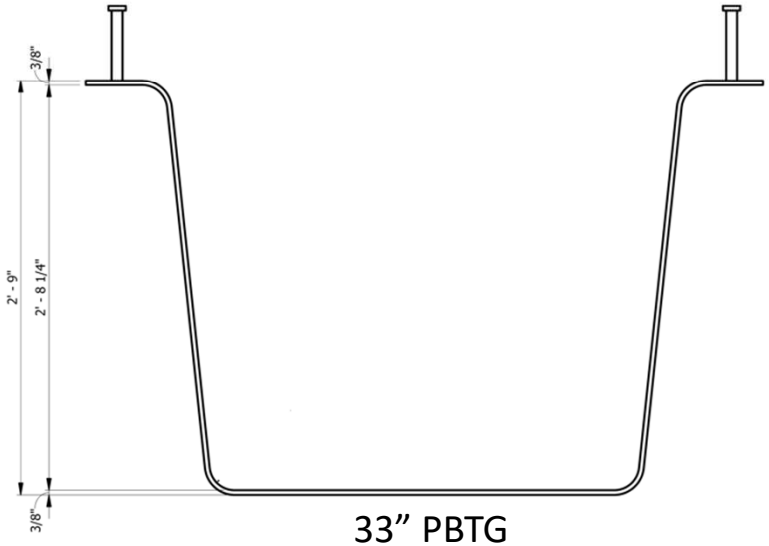
Short Span Railroad Bridges



NSBA PBTG Design Manual



12” PBTG



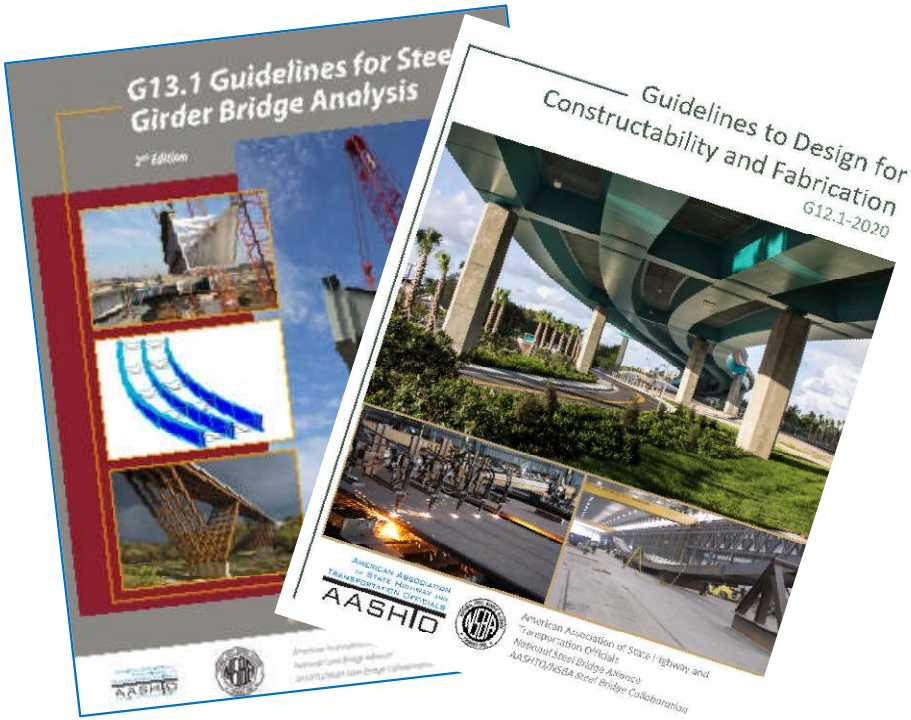
33” PBTG

AASHTO/NSBA Steel Bridge Collaboration

<u>Task Groups</u>

TG 1 - Detailing
TG 2 - Fabrication Specification
TG 4 - QA/QC
TG 8 – Coatings
TG 9 - Bearings
TG 10 - Erection
TG 11 - Design
TG 12 - Design for Constructability & Fabrication
TG 13 - Analysis of Steel Bridges
TG 14 – Field Repairs and Retrofits
TG 15 - Data Modeling for Interoperability
TG 16 - Orthotropic Deck Panels
TG 17 – Steel Castings
TG 18 – Duplex Stainless Steels

- October 22 – 24, 2024, New Orleans, LA
- April 29 – May 1, 2025, Philadelphia, PA



AASHTO/NSBA Steel Bridge Collaboration

Available Documents

Guide Specifications (standard template for contract documents):

4 Total - Fabrication, Erection and Coatings

Guideline Documents (best practices):

12 Total - Detailing, Fabrication, QA/QC, Bearings, Constructability and Analysis

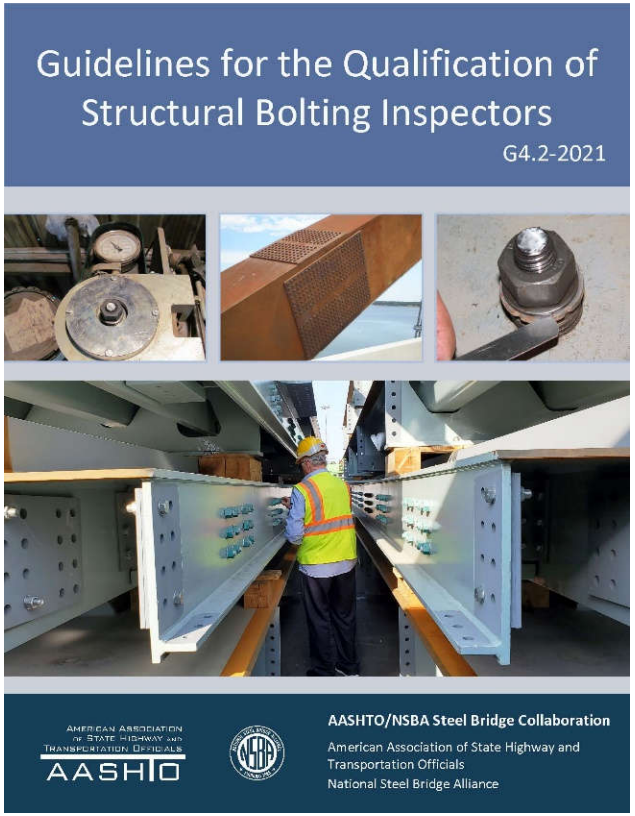
Download Posting

- AASHTO Bookstore: store.transportation.org/
- NSBA Website: www.aisc.org/nsba/

AASHTO/NSBA Collaboration

G4.2 Qualification of Bolting Inspectors - 2021

- **About this Document:** Assist owners with the development of individual training and qualification programs for structural bolting inspectors.
- **About this Version:** Update of the 2006 Edition.
- **Status:** Released.



AASHTO/NSBA Collaboration

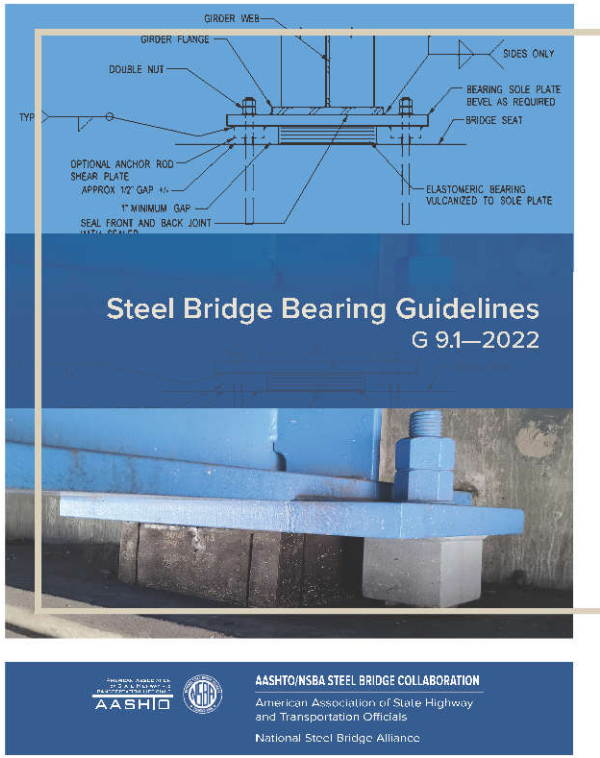
S8.3 Hot Dip Galvanizing Specification - 2022

- **About this Document:** Represents best practices for design and fabrication as well as providing information on properties of hot-dip galvanizing, types of materials suitable for hot-dip galvanizing, venting and draining, distortion control and more.
- **About this Version:** New document intended for adoption directly in state DOT standard specifications.
- **Status:** Released.

AASHTO/NSBA Collaboration

G9.1 Steel Bridge Bearing Guidelines - 2022

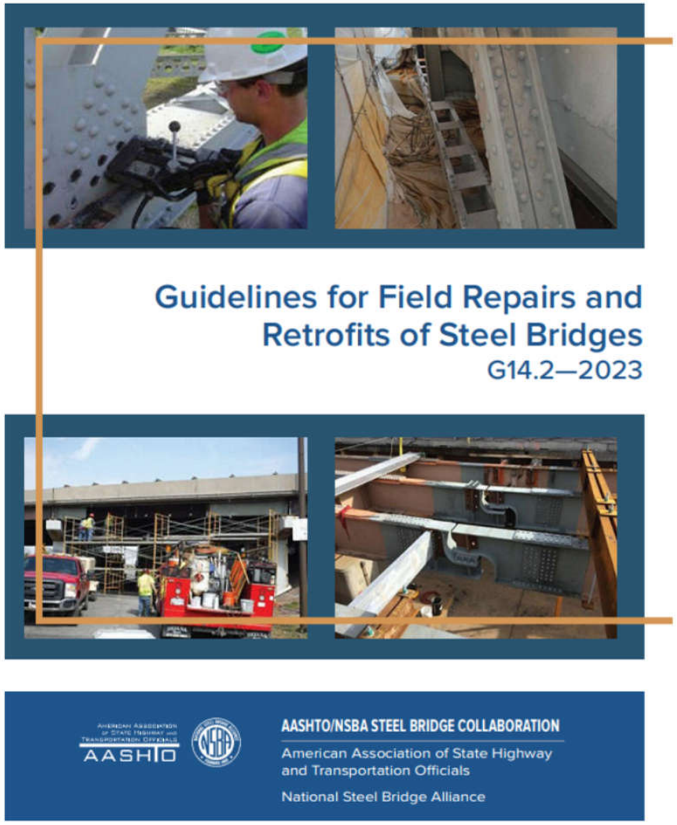
- **About this Document:** Focuses on cost effective detailing for steel bridge bearings with design guidance on the connection of the bearing to the girders. It is intended to supplement the design requirements in the AASHTO LRFD BDS.
- **About this Version:** Update of previous document that was adopted and published by AASHTO in 2004.
- **Status:** Released.



AASHTO/NSBA Collaboration

G14.2 Guidelines for Field Repairs and Retrofits of Steel Bridges - 2023

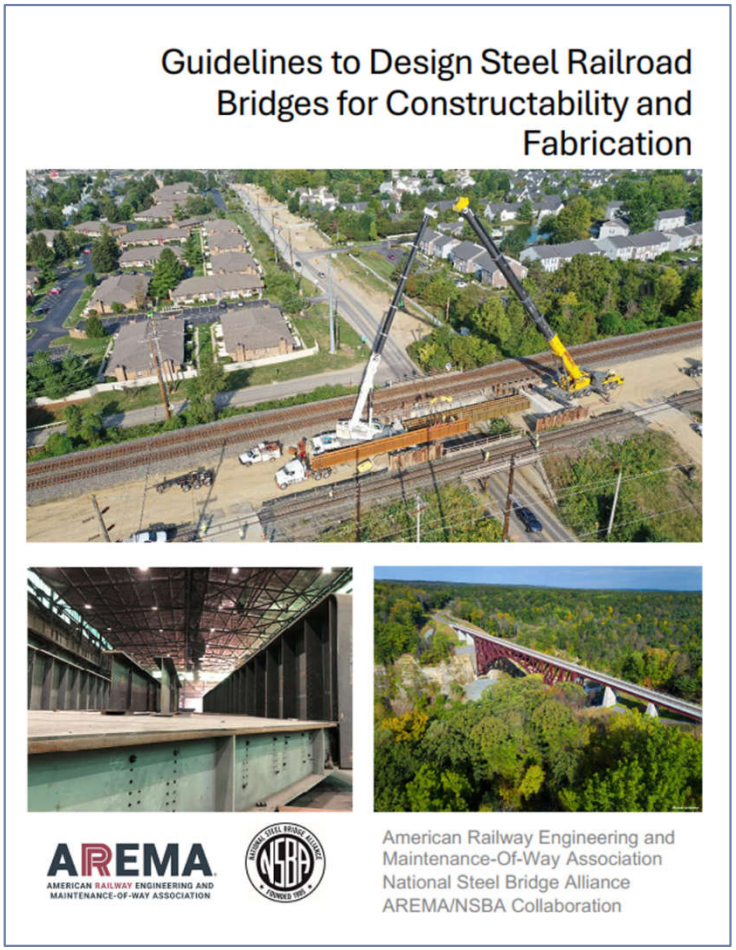
- **About this Document:** Provides guidance and strategies related to the most common forms of damage in steel bridges and options for repair.
- **About this Version:** New Document.
- **Status:** Released.



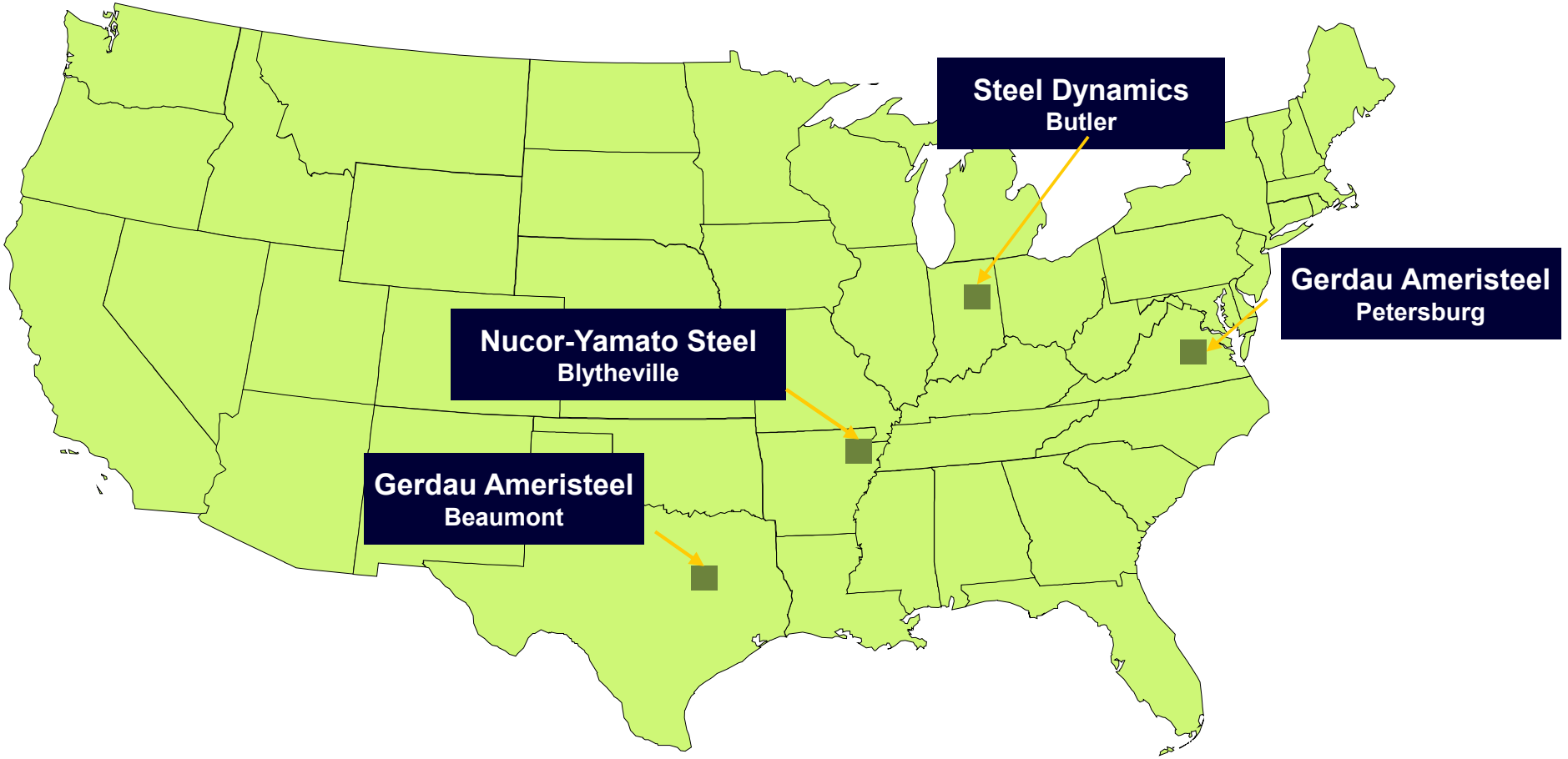
AREMA/NSBA Steel Bridge Collaboration

Guidelines to Design of Steel Railroad Bridges for Constructability and Fabrication

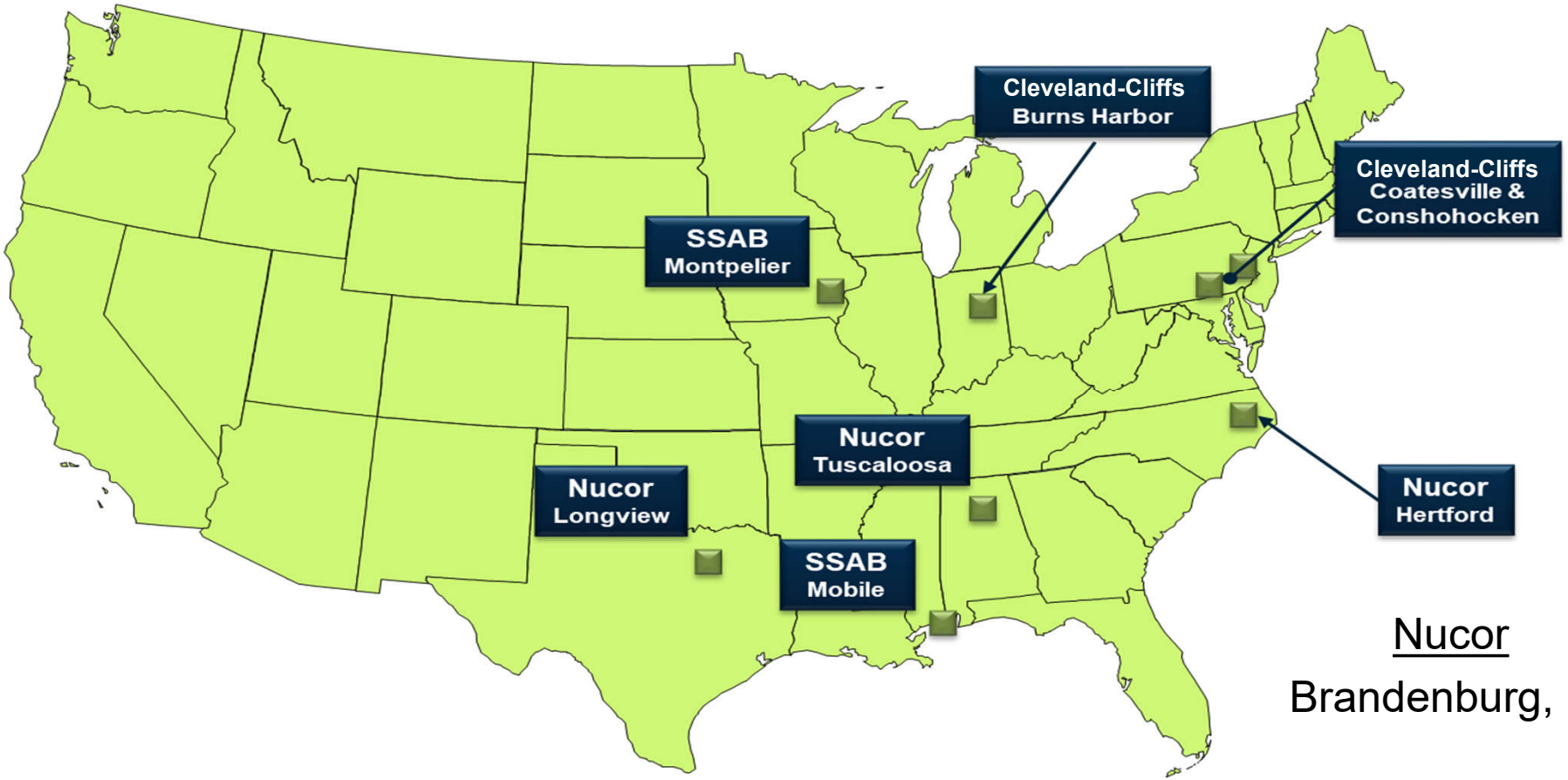
- Joint AREMA/NSBA Document



Structural Shape Availability



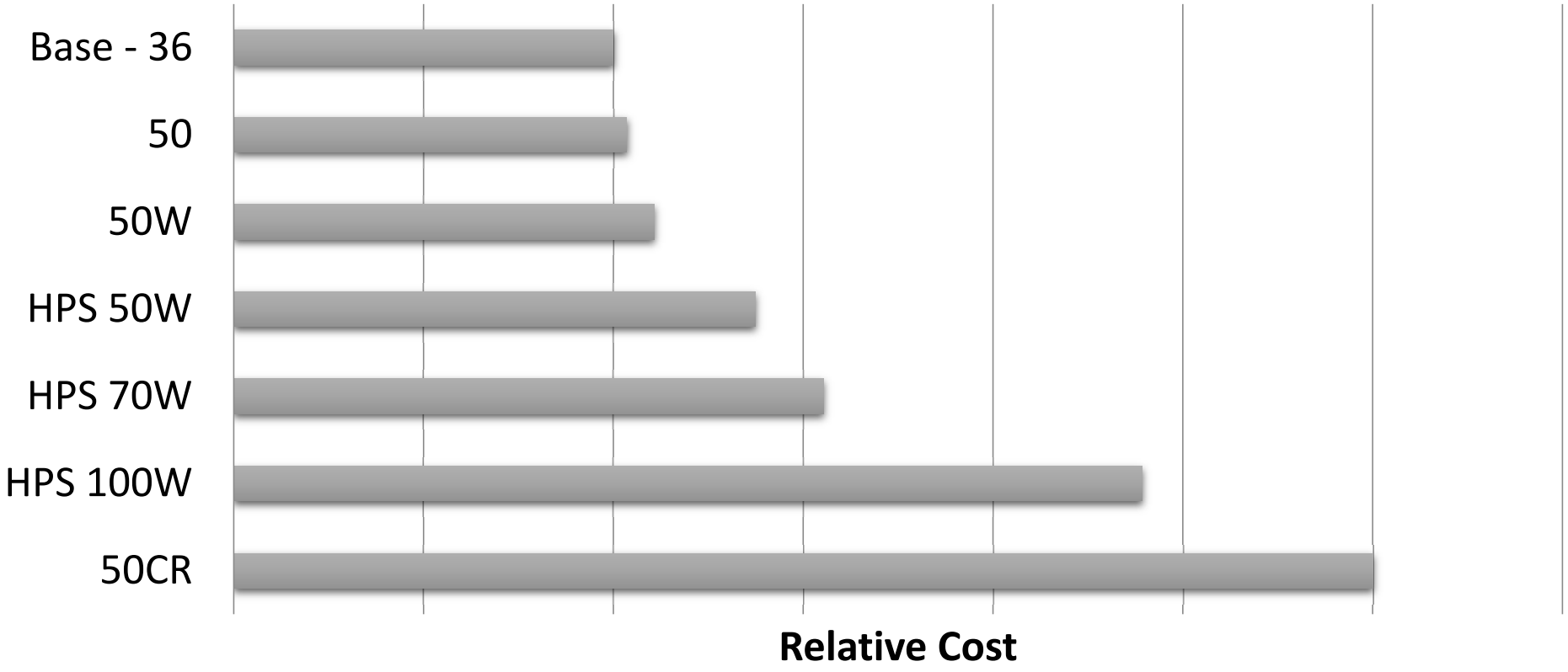
Structural Plate Availability



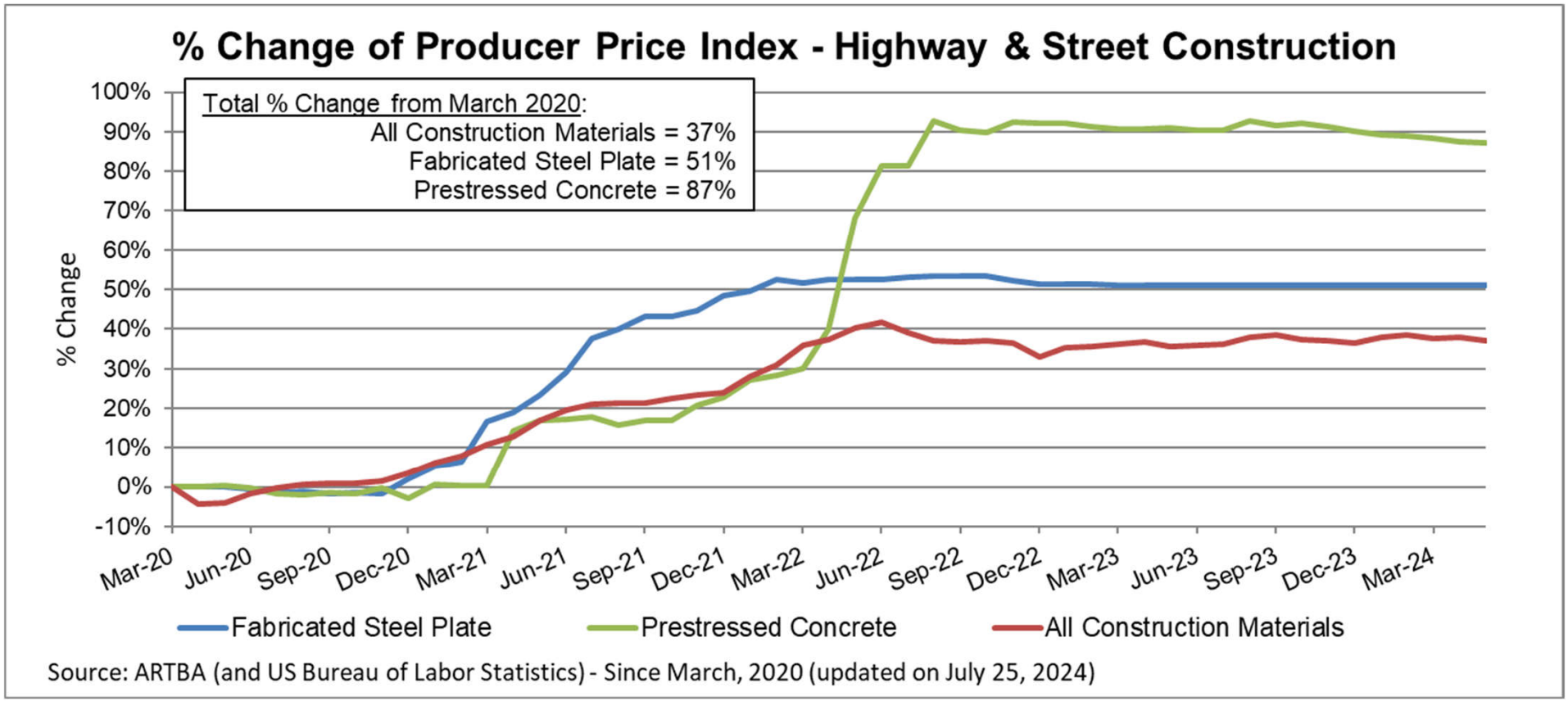
Nucor

Brandenburg, KY

Relative Material Cost



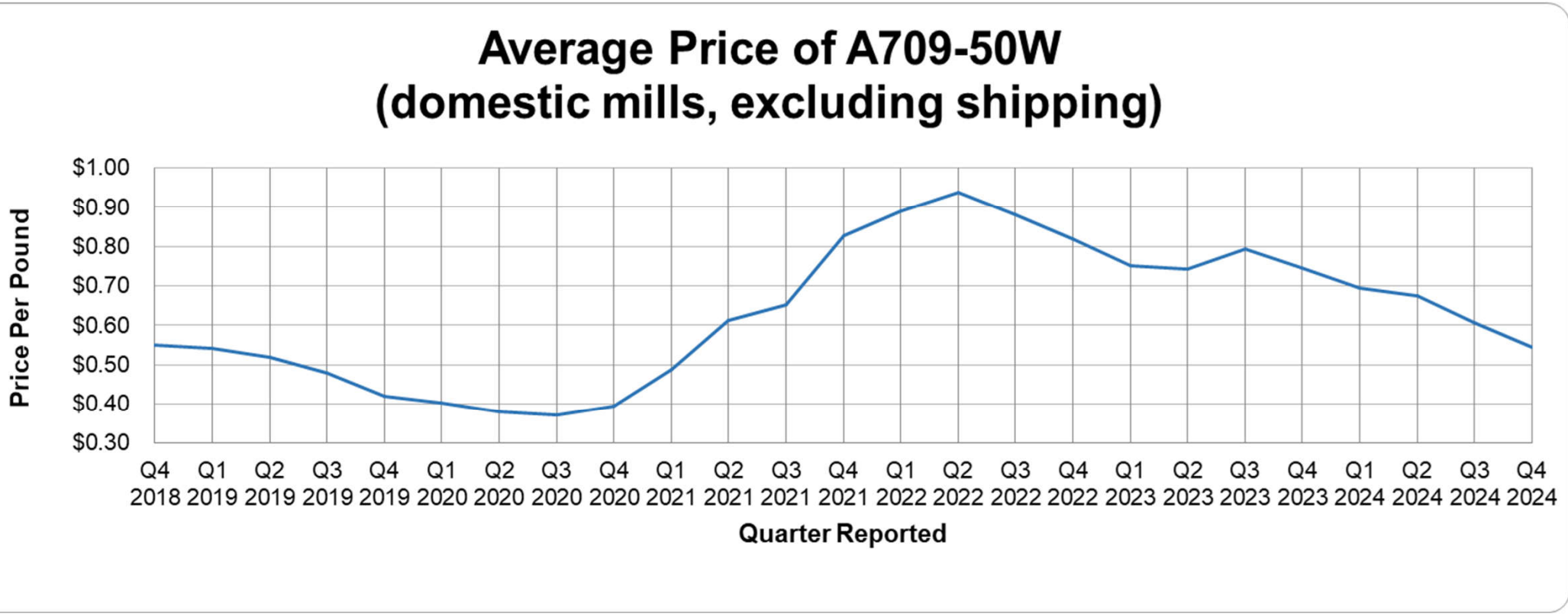
Historical Fabricated Steel Costs



Also available at artba.org/economics/materials-dashboard/

Average Mill Price of A709-50W

Size 1 ½ in. thick x 96 in. wide x 636 in. long



Raw material pricing presented in this chart is a small snapshot of a limited time and is not representative of long term historical and future trends.

Bridge Cost Breakdown

- Total cost to owner.
  - Raw material - 33%
  - Labor - 33%
  - Erection & construction - 33%
- Saving material (designing for least weight) can result in a greater fabrication labor cost
- Consider amount of steel rebar in piers, pier caps, deck, and other substructure elements
- Designers should talk with bridge fabricators about their design before finalizing it
- Lead times

Steel Bridge Fabrication Lead Times

Medium Size Steel Plate Girder Bridge

Time from placing steel order to arrival at fabricator shop

- Currently 8 – 10 weeks (can be shorter/longer for rolled beams)
- 8 – 10 weeks pre-pandemic
- 16 – 20 weeks during pandemic

Time from placing steel order to arrival of fabricated steel at bridge site

- Currently 8 – 10 months (5 – 6 months for rolled beam bridge)
- 8 – 10 months pre-pandemic
- 12 – 18 months during pandemic

Registration and Travel Stipends for Owner's

Next Year in Atlanta

Notable Events at WSBS

- Constructability Design Requirements for Steel I-Girder Bridges Workshop
- Steel Industry Roundtable
- Kentucky Steel Bridge Session
- Fabricator Panel Session
- Movable Bridges
- Tied Arches
- Welding
- Corrosion Protection
- Railroad Bridges

Bridges to Prosperity – Rwanda

VIDEO

Steel Bridge Advantages

- Inspectability
- Deck Replacement
- Widening & Lengthening
- Reusable & Repurpose
- Strengthening
- Relatively light (improved seismic, less foundation, ABC friendly)
- Repairability
- Damage Repair
- Sustainable & Resilient
- Proven Material

Anthony (Tony) Peterson
peterson@aisc.org
515.499.2029
www.aisc.org/nsba/

Smarter.
Stronger.
Steel.