



# Short Span Steel Bridges: Learning by Example

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**Tools & Resources to Designing Cost-Effective Steel Bridges**  
**August 8, 2023**

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Short Span Steel Bridge Alliance

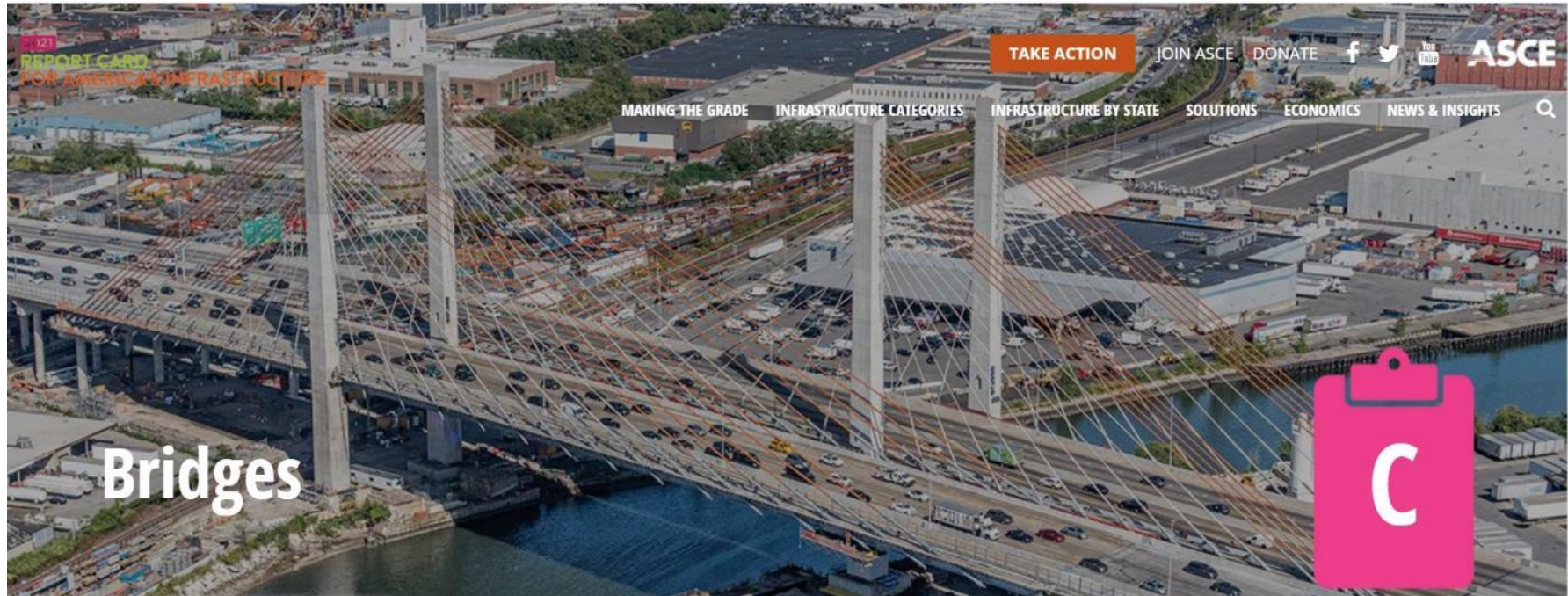


# Steel Bridges

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- National Bridge Needs
- Infrastructure Investment & Jobs Act (IIJA)
- The Short Span Steel Bridge Alliance
- Common Short Span Steel Bridges
- Traditional Fabricated Steel Bridges
  - Standard Designs
  - eSPAN140 Design
- Today's Steel Bridges
- Summary & Additional Resources

# Bridge Industry Statistics – State of our Bridges



According to the American Society of Civil Engineers, a recent estimate for the nation's backlog of bridge repair needs is \$125 billion through 2025.

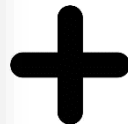
# It's a Great Time to Be in the Bridge Industry!

## *Bipartisan Infrastructure Law*



\$27 billion over 5 years to repair or replace as many as 15,000 bridges

Minimum 15% must be used to build “off-system” bridges



Additional \$12.5 Billion for New Competitive Bridge Investment Program



**\$39.5 Billion**



# Short Span Steel Bridge Alliance – Who We Are

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*A group of **bridge** and **buried soil structure** industry leaders who have joined together to provide **educational information** on the design and construction of short span steel bridges in installations up to **140 feet in length**.*

Rolled Beam & Plate Girder



Truss



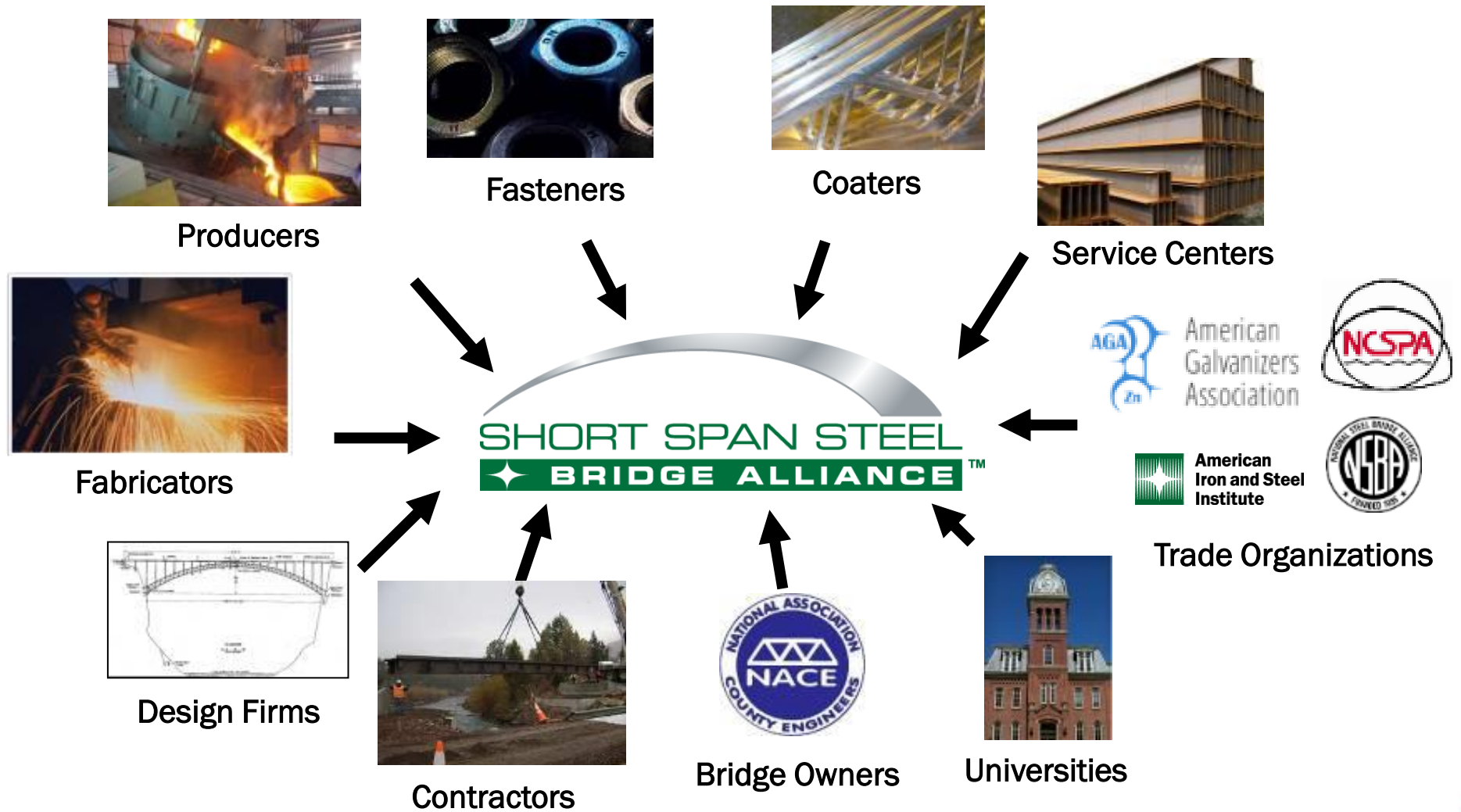
Buried Bridges



Press Brake Tub



# SSSBA - Our Members



# SSSBA – What We Do

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- Education (webinars, workshops, forums, conferences)
- Technical Resources (standards, guidelines, best practices)
- Case Studies (economics: steel is cost-effective)
- Simple Design Tools (eSPAN140)
- Answer Questions (Bridge Technology Center)
- Prefabricated Bridge Manufacturers (industry contacts)
- Innovative & ABC Design

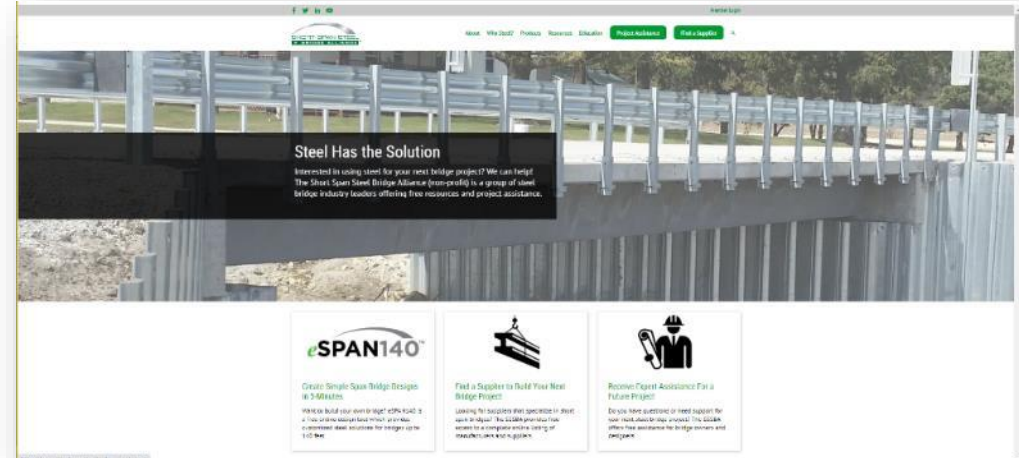


eSPAN140™



# SSSBA Website: [www.ShortSpanSteelBridges.org](http://www.ShortSpanSteelBridges.org)

- eSPAN140 Web-based Design Tool
- Bridge Technology Center
- Technical Design Resources
- Catalog of Short Span Steel Solutions
- Project Case Studies
- Video Library
- News Updates & Social Media (Twitter / LinkedIn / Facebook)
- Email Newsletter (sign-up to receive it)
- Calendar of Industry Events



[www.ShortSpanSteelBridges.org](http://www.ShortSpanSteelBridges.org)



# Common Simple Span Steel Bridge Types

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Corrugated Steel Pipe  
(Buried Steel Bridge)



Corrugated Steel Plate  
(Buried Steel Bridge)



Rolled Beam Shape



Plate Girder



Truss



Press-Brake Tub Girder

# Traditional Fabricated Steel Bridges

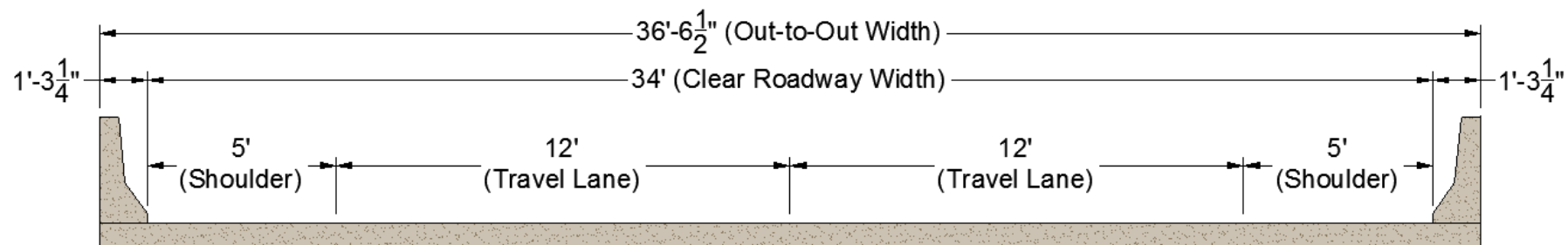
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Design Superstructure for Two-Lane, 80 ft Simple Span Bridge



# Bridge Need and Basic Information

- Decided by Owner/Engineer:
  - 80 ft Simple Span – Steel Girders
  - Two 12 ft Travel Lanes, ADT = 5600 one direction
  - No Clearance Issues / Can Close for Re-Decking
  - Concrete Riding Surface
  - 34 ft Roadway Width
  - Jersey Barriers (1 ft – 3 ¼ in wide)



Need an Initial Design for the Bridge SuperStructure

# eSPAN140 - Standard Designs for Short Span Steel Bridges - [www.ShortSpanSteelBridges.org](http://www.ShortSpanSteelBridges.org)

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## Goal:

- Economically competitive (repetitive details and member sizes)
- Expedite the design process
- Homogeneous plate girders
- Lightest weight rolled beams
- Limited depth rolled beams

## AASHTO LRFD Bridge Design:

- Strength I,
- Service II,
- Fatigue,
- Constructability,
- L/800 Deflection
- HL-93 Vehicular Live Loading

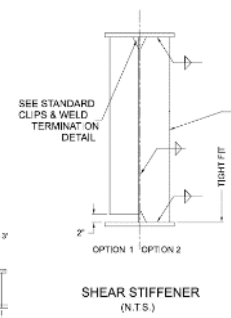
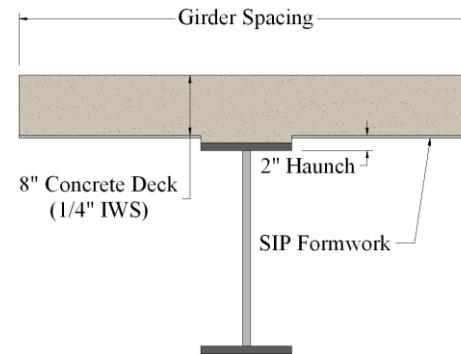
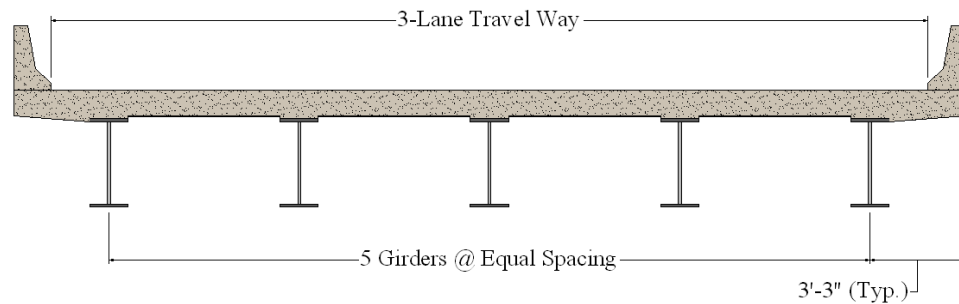


# eSPAN140 - Standard Designs for Short Span Steel Bridges - [www.ShortSpanSteelBridges.org](http://www.ShortSpanSteelBridges.org)

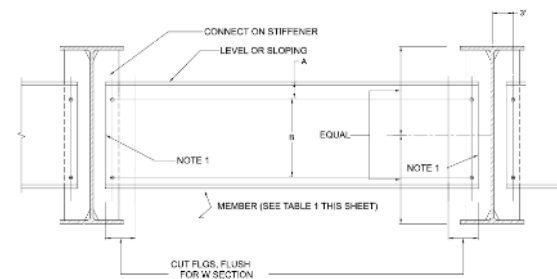
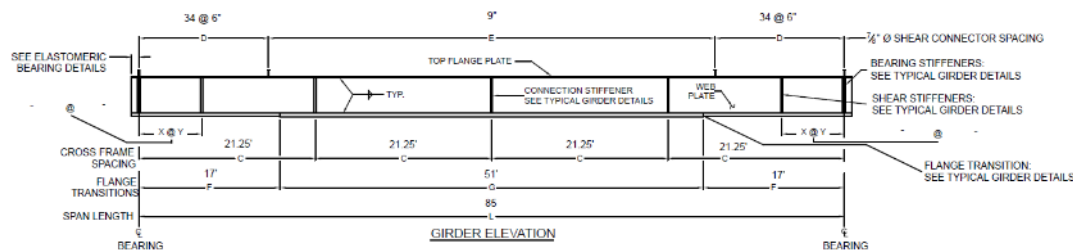
Span lengths 20 ft to 140 ft (in 5 ft increments)

Four girder spacing: 6'-0", 7'-6", 9'-0" and 10'-6",

For each of these increments: Steel girders, Shear stud & stiffener layouts, Welding and fabrication details, Elastomeric bearings, and Concrete deck design



COMPOSITE PLATE GIRDER WITH PARTIALLY STIFFENED WEB - 4 GIRDERS AT 8' 10" GIRDER SPACING, HOMOGENEOUS



# eSPAN140 Preliminary Design

Solution Type*	Bridge Span Length								Skew Angle	Overhang Width
	0'	20'	40'	60'	80'	100'	120'	140'		
Rolled Beam (40' to 100')**			█						+/- 20 degrees	3'3" or less
Homogeneous Plate Girder (60' to 140')**				█					+/- 20 degrees	3'3" or less
Press Brake Tub Girders (0' to 80')	█								+/- 20 degrees	3'3" or less
Buried Bridges (all)***	█								+/- 35 degrees****	N/A

\* For bridges outside of this range, standard designs will not appear in your solutions book.

\*\* Standard designs for rolled beam and plate girder solutions are rounded in five (5) foot increments.

\*\*\* Depending on project requirements this solution will require multiple spans.

\*\*\*\* Can be greater if site geometry allows.

# eSPAN140 Preliminary Design

Project Name\*  
Example 80 ft Simple Span Bridge

Project Status\*  
Informational Only

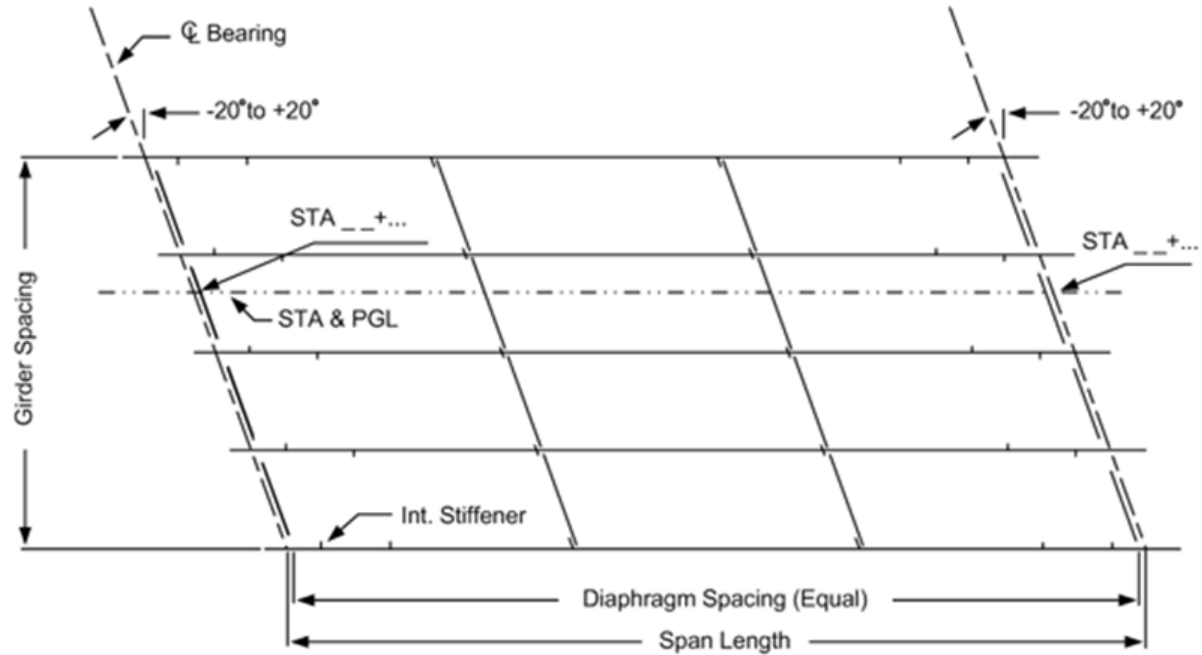
City/County\*  
Laramie

State/Province\*  
Wyoming

Roadway Name  
E 800 South

Bridge Span Length\*  
80 Feet    0 Inches

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Skew Angle (Overhead View)

# eSPAN140 Preliminary Design

# of Striped Traffic Lanes\*

Roadway Width\*  
   
Feet Inches

Individual Parapet Width\*  
   
Feet Inches

Individual Deck Overhang Width\*  
   
Feet Inches

Pedestrian Access?

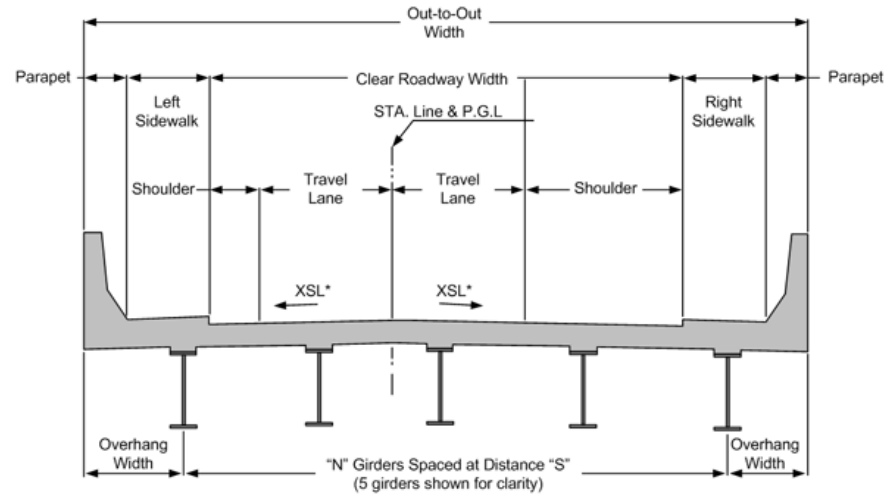
Skew Angle  
  
Degrees

Average Daily Traffic

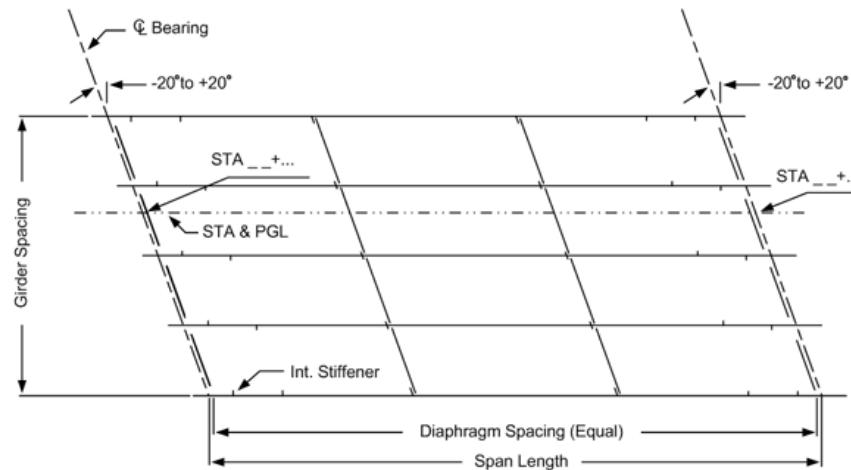
Design Speed

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\* Required



Cross-section of Bridge

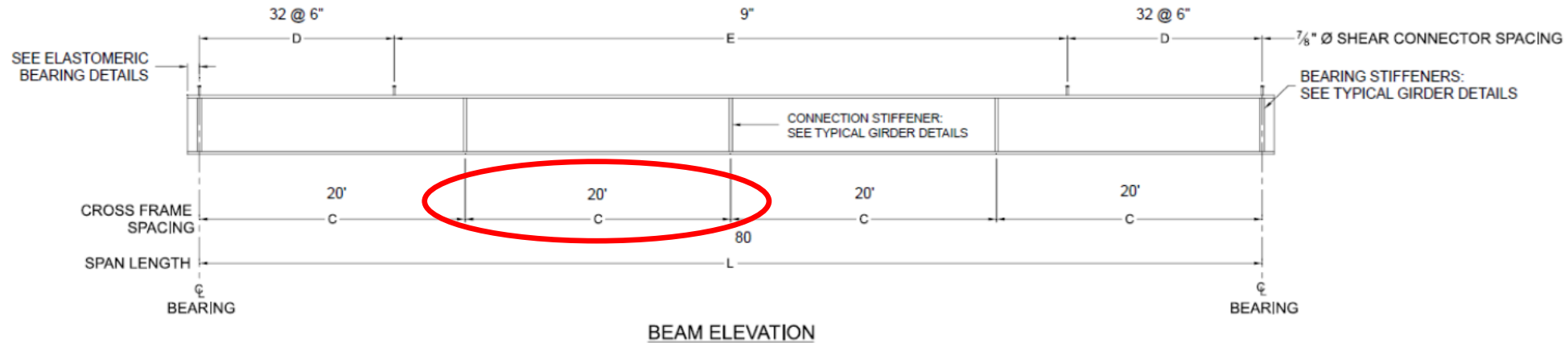




# Rolled Beam Recommendation

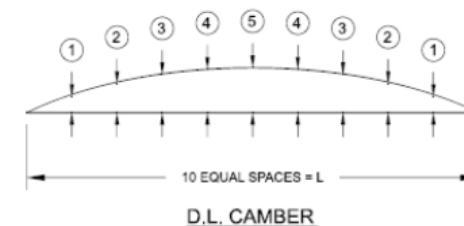
## COMPOSITE ROLLED BEAM WITH PARTIALLY STIFFENED WEB - 4 GIRDERS AT 10' 6" GIRDER SPACING, LIGHTEST WEIGHT

The selected rolled beam section is based on the widest (10'-6") girder spacing used in the development of the standards. The steel industry generally recommends the use of the widest girder spacing possible to reduce the potential number of girder lines for optimum economy.



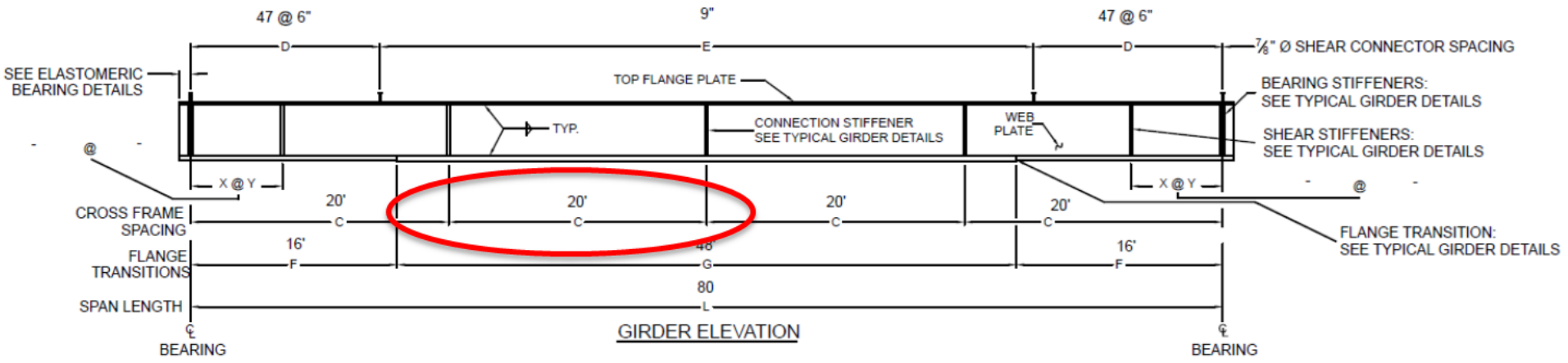
SPAN (L) - ft	ROLLED BEAM	DIAPHRAGM SPACING (C) ft	SHEAR CONNECTOR MAX. SPACING		WEIGHT
			D	E	
80	W36x210	20'	32 @ 6"	9"	16,800 lbs

STEEL D.L. CAMBER - in					TOTAL D.L. CAMBER - in				
1	2	3	4	5	1	2	3	4	5
0.178"	0.337"	0.461"	0.540"	0.567"	1.255"	2.375"	3.250"	3.807"	3.997"



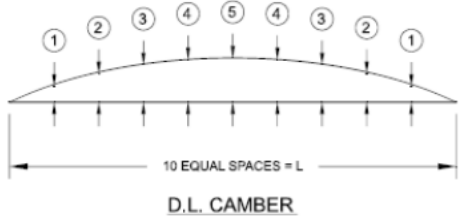
# Homogeneous Plate Girder Recommendation

COMPOSITE PLATE GIRDER WITH PARTIALLY STIFFENED WEB - 4 GIRDERS AT 10' 6" GIRDER SPACING, HOMOGENEOUS

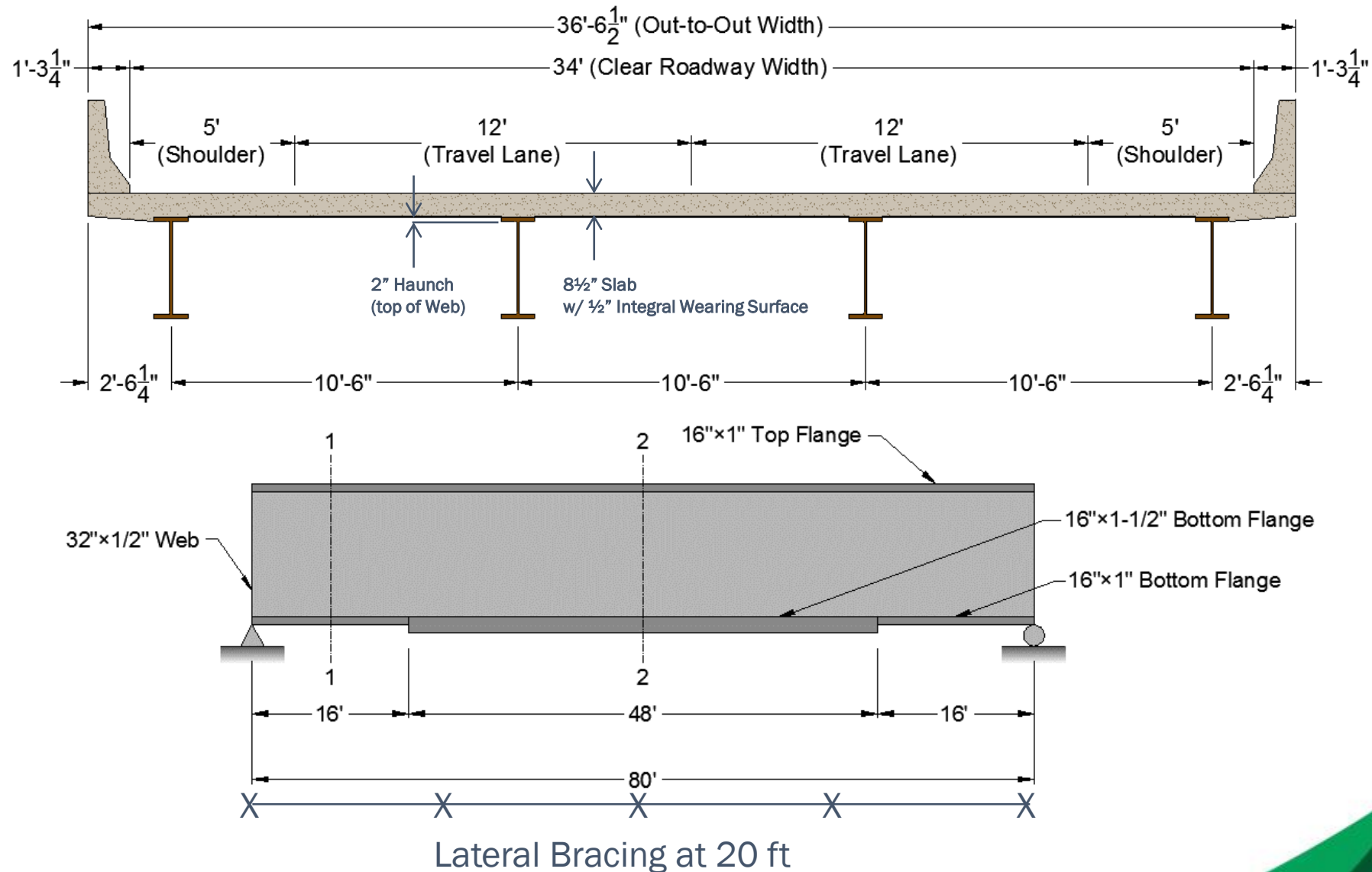


SPAN (L) - ft	PLATE GIRDER SIZE						DIAPHRAGM SPACING (C) - ft	SHEAR STIFFENERS		SHEAR CONNECTOR MAX. SPACING		INDIVIDUAL GIRDER WEIGHT
	TOP FLANGE - in	BOTTOM FLANGE (F)		BOTTOM FLANGE (G)		WEB PLATE - in		X (NO. REQ'd)	Y - ft. (SPACING)	D	E	
		PLATE - in	LENGTH - Ft	PLATE - in	LENGTH - Ft							
80	16 x 1"	16 x 1"	16'	16 x 1 1/2"	48'	32 x 1/2"	20'	-	-	47 @ 6"	9"	14,373 lbs

STEEL D.L. CAMBER - in					TOTAL D.L. CAMBER - in				
1	2	3	4	5	1	2	3	4	5
0.178"	0.334"	0.454"	0.530"	0.557"	1.397"	2.618"	3.554"	4.149"	4.355"

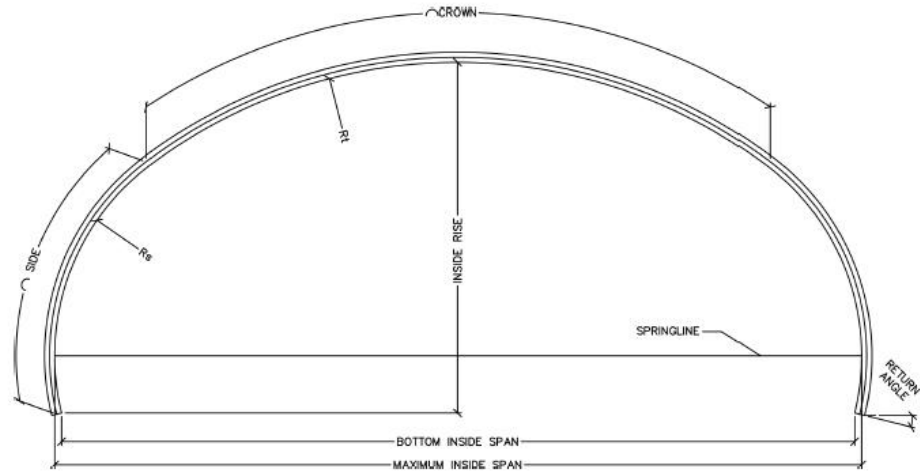


# Design for Homogeneous Plate Girder Bridge



# Buried Steel Bridge Recommendation

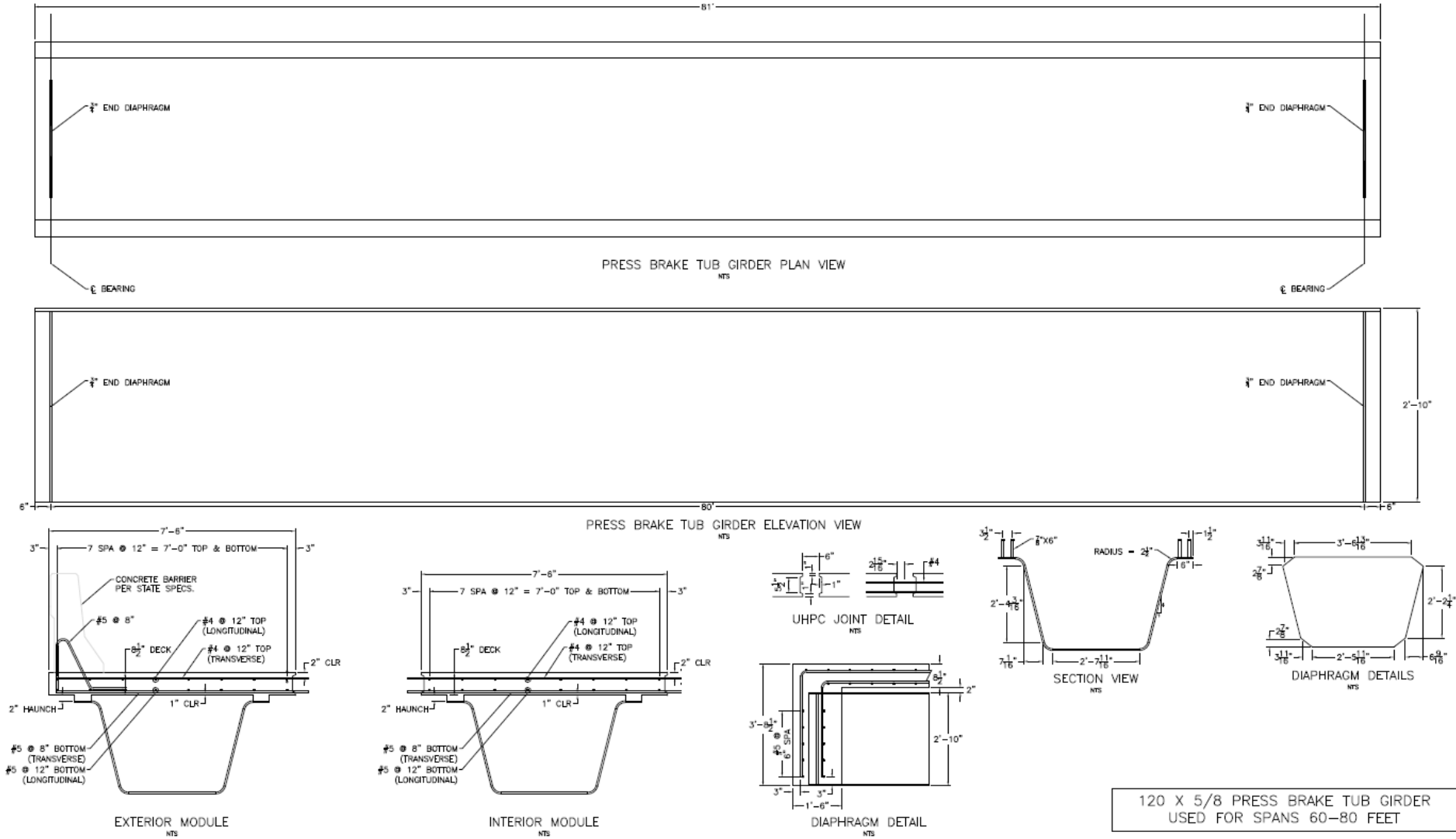
Multi-Radius Arch 15x5.5



SPAN - ft - in	RISE - ft - in	BOTTOM SPAN - ft - in	WATERWAY AREA - ft <sup>2</sup>	RADIUS - in		RETURN ANGLE
				Rt	Rc	
80' 5"	24' 0"	80' 0"	1545.0'	745"	174"	8.1



# Press Brake Tub Girder Recommendation



# Today's Steel Bridges

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## State of the Art

- Light Weight, permits lighter equipment
- Local Crew Installation
- Close Tolerances, more efficient erection
- Longer Spans, minimize disruption underneath



## Durable

- Robust, highly resistant to extreme natural disasters
- Weathering Steel, Galvanizing, Metalizing, Painting and 50CR (Stainless) produce Long Life
- Long Life, many steel bridges well over 100 years old

# Today's Steel Bridges

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## Speed of Construction – Accelerated Bridge Construction

- Wide Range of Modular/Prefabricated Steel Bridges, install in a weekend
- Lighter Equipment, Ease of Erection

## Cost Effectiveness

- Competitive with Other Bridge Materials
- Whole Project Savings, lighter abutments, smaller equipment, fast installation
- Weathering Steel, Galvanizing, Metalizing & 50CR Steel, can reduce initial costs and life cycle costs



# Today's Steel Bridges

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## Sustainability

- Steel is North America's #1 Recycled Material – over 90% of steel in a beam is from recycled materials
- Recycled Steel Conserves Energy, enough to power 18 million homes
- Steel's Energy Use Reduced 33% Since 1990
- Greenhouse Gas Emissions Reduced by 45% since 1975

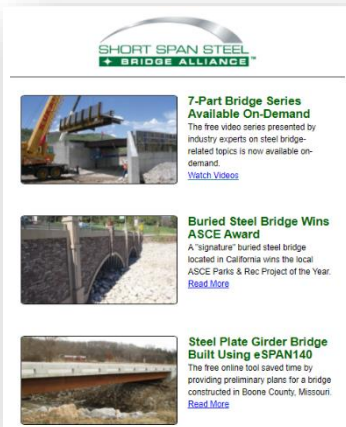
## Resiliency

- Long Service Life
- Ease of Inspection
- Ease of Repair
- Strengthening for Increased Loads
- Recycling & Repurposing
- Habitat Protection

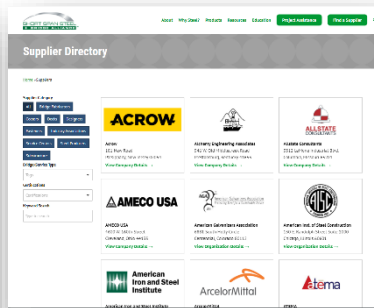


# 5 Ways to Keep Learning About Steel Bridges

## 1. Subscribe to the Weekly Newsletter



## 2. Find a Supplier



## 3. Design a Bridge in 5-Minutes



## 4. Receive Free Project Assistance



## 5. Schedule a Workshop/Webinar



## Free Customized Workshops for Counties, DOTs, and Design Firms

**Topics:** Education, Events, Professional, Recommended

Short span bridges provide vital links in the nation's infrastructure network. Yet, nearly a quarter of these bridges are classified as structurally deficient or functionally obsolete.

According to ASCE, more than 30% of existing bridges have exceeded their 90-year design life. This situation presents a significant challenge for cash-strapped state and local governments.

The SSSBA has developed technological and design innovations for bridges under 140 feet that save significant time and costs for county and state bridge officials.

Over the past 10-years, over 17,000 bridge owners and designers have learned about the cost and time advantages of short span steel bridges in SSSBA workshops and conferences throughout North America.

And now, the SSSBA is offering complimentary customized educational guest speakers/webinars and workshops (on-site or virtual) specifically for county engineers, state DOTs, and design firms. The webinars/workshops are taught by industry experts with decades of experience in the cost-effective design and construction of short span steel bridges.

The workshops can be set up as:

- 1-2 hour webinar on a specific topic (can be used as a "guest speaker" for your event).
- 3-4 hour (half-day) workshop to provide practical information on the safe and cost-effective design, detail, fabrication and installation of short span steel bridges.
- 6 hour (full-day) session to provide an in-depth overview of short span steel bridges.

**View Sample Agenda**

**Suggested topics to select from include:**

- Practical and Cost-Effective Steel Bridge Design
- Free Design Tools (eSPAN140 and SIMON)
- Pre-engineered Bridge Solutions
- Coating Solutions (galvanized, painted, and weathering steel)
- Innovative/Accelerated Bridge Construction Options
- Case Studies (from local counties)
- Buried Soil Steel Bridge Structure Alternatives
- Life-Cycle Analysis

**For more information or to customize a workshop for your organization, please contact:**

- Dan Snyder (Director of the SSSBA) at [dsnyder@steel.org](mailto:dsnyder@steel.org) or 301-367-6179.
- Michael Barker (University of Wyoming & SSSBA Director of Education) at [barker@uwyo.edu](mailto:barker@uwyo.edu)

[www.ShortSpanSteelBridges.org](http://www.ShortSpanSteelBridges.org)

Questions? Dan Snyder, Director, SSSBA, [dsnyder@steel.org](mailto:dsnyder@steel.org), (301) 367-6179



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