W-03: Driving Efficiency in Steel Bridge Design with Innovative Tools, Resources, and Examples

International Bridge Conference
June 16, 2026
8:00 – 10:00AM ET

Dan Snyder

- American Iron and Steel Institute
- Director of SSSBA

Objectives and Speakers

Objective: Learn how free online tools can streamline steel bridge design, support informed project decisions, and improve overall project cost-efficiency.

Agenda

- **Michael Barker, University of Wyoming and SSSBA Director of Education**
    - eSPAN140, eBEAM140, ePLATE140
    - Streamline preliminary design, detailed beam analysis, and standardized bridge solutions for routine spans under 140 feet
- **Brandon Chavel, National Steel Bridge Alliance**
    - LRFD Simon is a line-girder analysis and preliminary design tool for steel I-girder highway bridges.
- **Frank Russo, Russo Structural Services**
    - AISC/NSBA Standard Plans for optimized I-girder bridge solutions covering spans from 80 - 300 feet
- **Open Discussion /Q&A**

Download Presentations

www.ShortSpanSteelBridges.org

Building Bridges: Short Span Steel Bridges

International Bridge Conference
Steel Bridge Workshop
Short Span Steel Bridge Alliance
June 16, 2026

Michael G. Barker, PE
University of Wyoming &
SSSBA, Director of Education

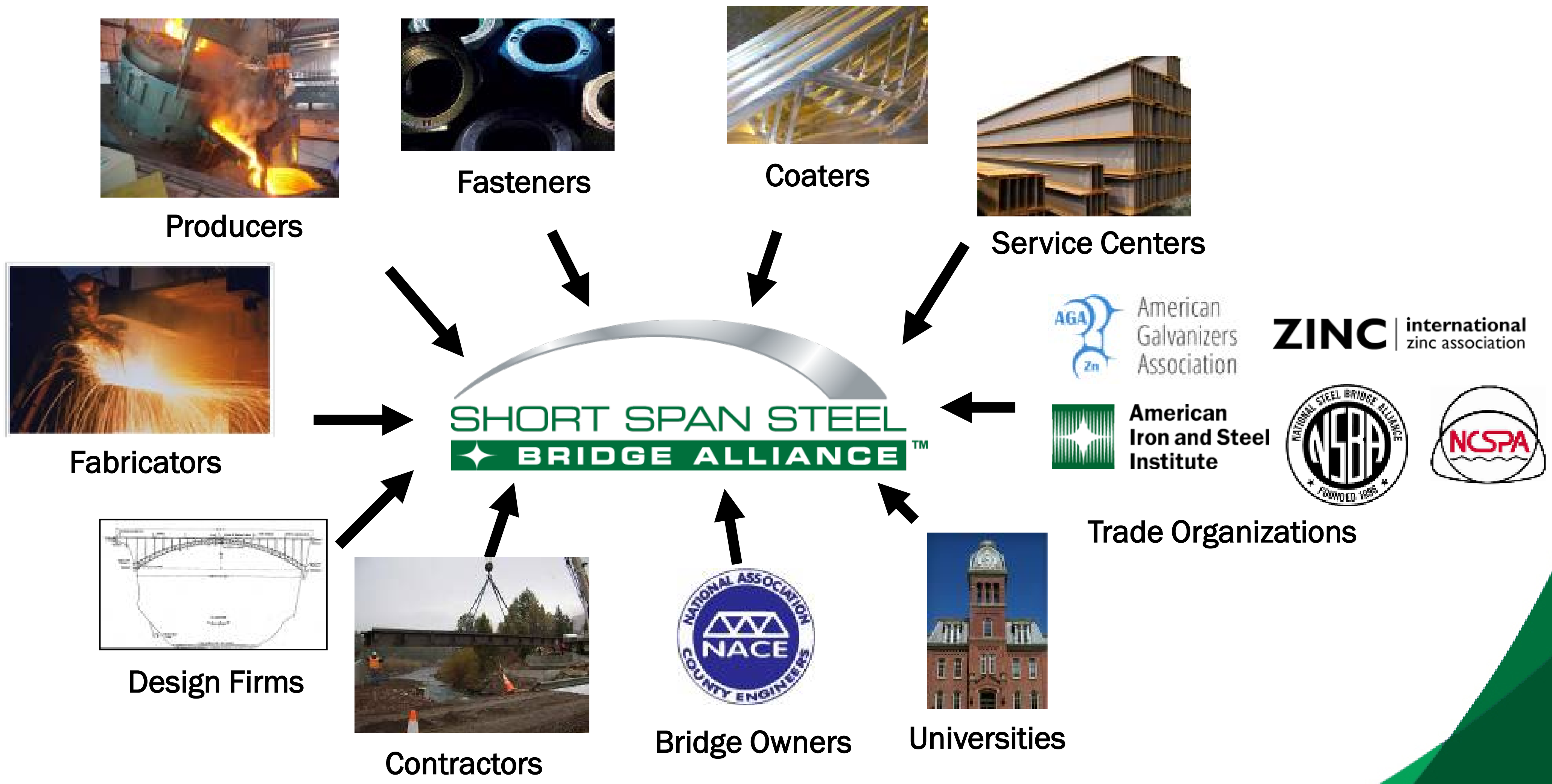
Short Span Steel Bridge Alliance

ESTABLISHED
2007

SHORT SPAN STEEL
BRIDGE ALLIANCE™

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**.

115 Members



To join, contact Dan Snyder, Director, SSSBA, dsnyder@steel.org, (301) 367-6179

SSSBA Supports All Steel Solutions

Buried Bridges

Rolled Beam & Plate Girders

Press-Brake-Formed Tub Girders

Truss Bridges

What Do We Provide?

- Education
  - Workshops, Webinars, Newsletter
- Technical Resources
  - Standards, best practices, case studies
- Simple Design Tools (eSPAN140, eBEAM140)
- Project Assistance
- Find a Supplier
- Networking / SSSBA Semiannual Meeting

SSSBA Education – The 5 Cs

Cost

- Case Studies
- Cost Studies
- Life Cycle Costs
- Economical & Practical Design

Convenience

- eSPAN140, eBEAM140 & ePLATE140
- Standard Designs
- State Standards
- Design Software

Construction

- Accelerated Bridge Construction
- Case Studies / Manufacturer Solutions
- Equipment

County Built

- DIY County Bridges
- Case Studies

Carbon – CO_2e

- Sustainability of Rural Bridges

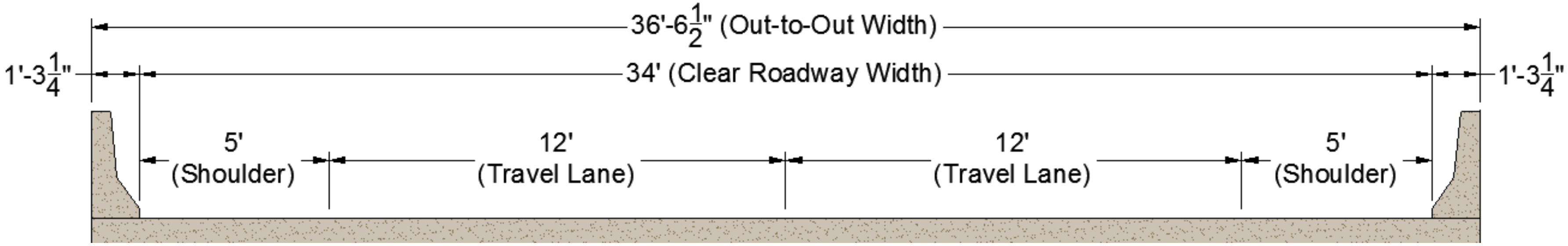
Plus Resiliency

Design of Steel Bridges

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

Bridge Need and Basic Information

- Decided by Owner/Engineer:
  - 80 ft Simple Span Composite – Steel Girders
  - Two 12 ft Travel Lanes, ADT = 5600 one direction
  - 34 ft Roadway Width
  - Jersey Barriers (1 ft – 3 ¼ in wide)



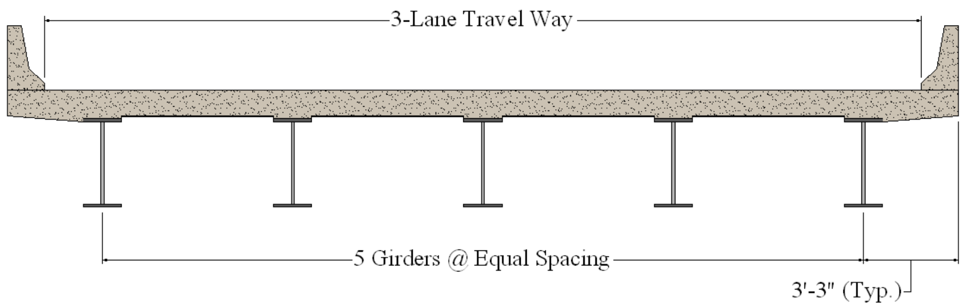
Need an Initial Design for the Bridge SuperStructure

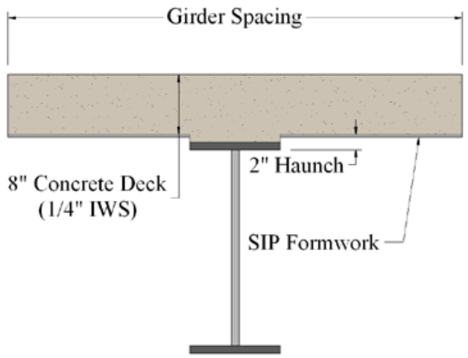
eSPAN140 - Standard Designs for Short Span Steel Bridges - www.ShortSpanSteelBridges.org

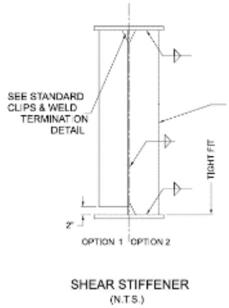
Span lengths 20 ft to 140 ft (in 5 ft increments)

Four girder spacing: 6’-0”, 7’-6”, 9’-0” and 10’-6”,

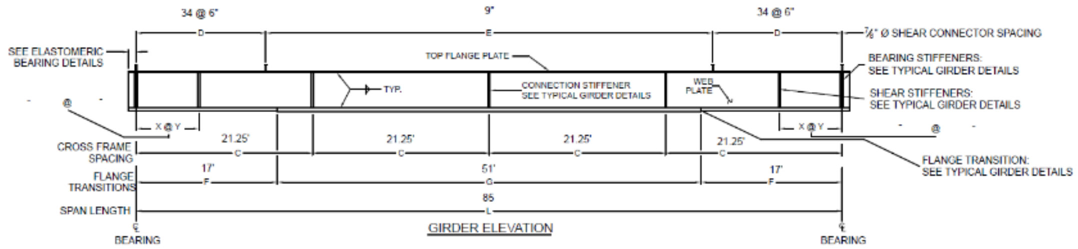
- For each of these increments: Steel girders, Shear stud & stiffener layouts, Welding and fabrication details, Elastomeric bearings, and Concrete deck design

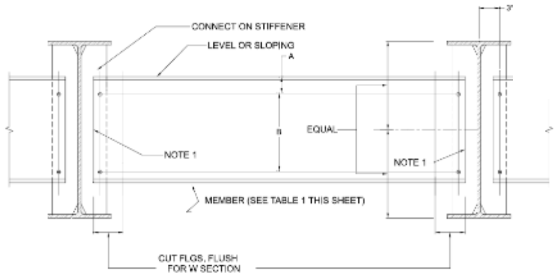






COMPOSITE PLATE GIRDER WITH PARTIALLY STIFFENED WEB - 4 GIRDERS AT 8' 10" GIRDER SPACING, HOMOGENEOUS





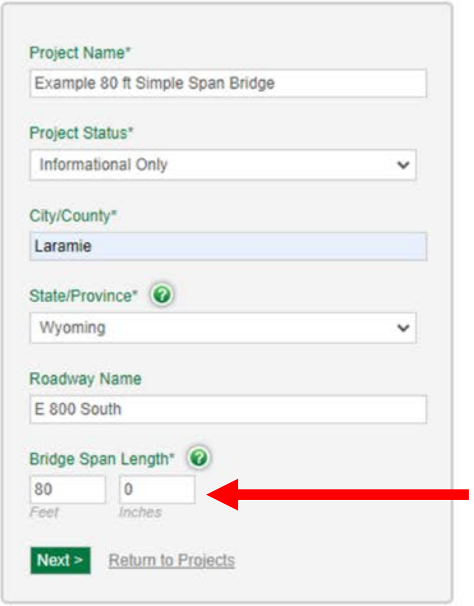
eSPAN140 Preliminary Design

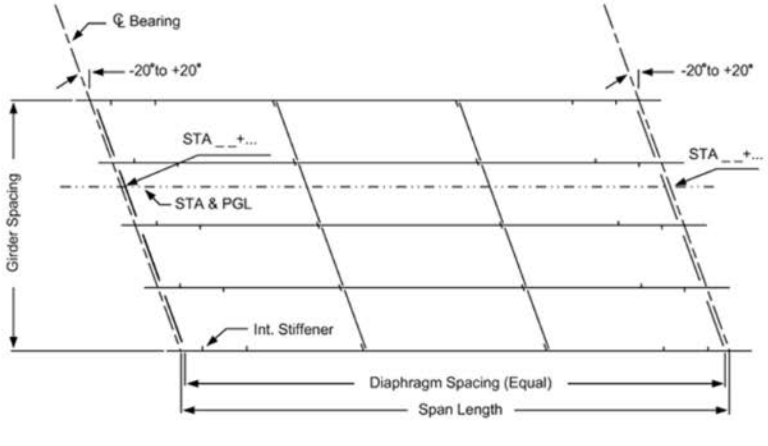
Solution Type*	Bridge Span Length								Skew Angle	Overhang Width
	0'	20'	40'	60'	80'	100'	120'	140'		
Rolled Beam (40' to 100')**									+/- 20 degrees	3'3" or less
Homogeneous Plate Girder (60' to 140')**									+/- 20 degrees	3'3" or less
Press Brake Tub Girders (0' to 80')									+/- 20 degrees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

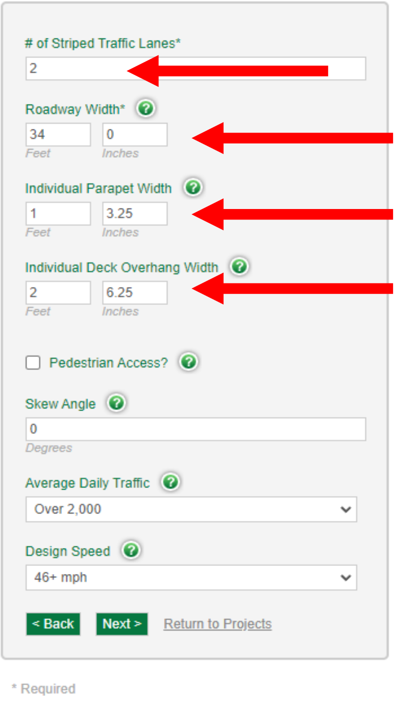
**** Can be greater if site geometry allows.

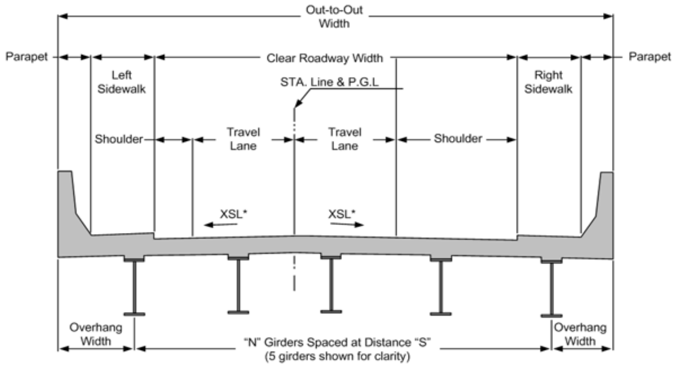
eSPAN140 Preliminary Design



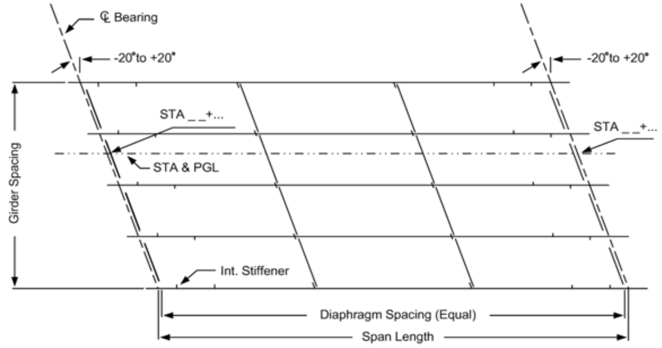


Skew Angle (Overhead View)





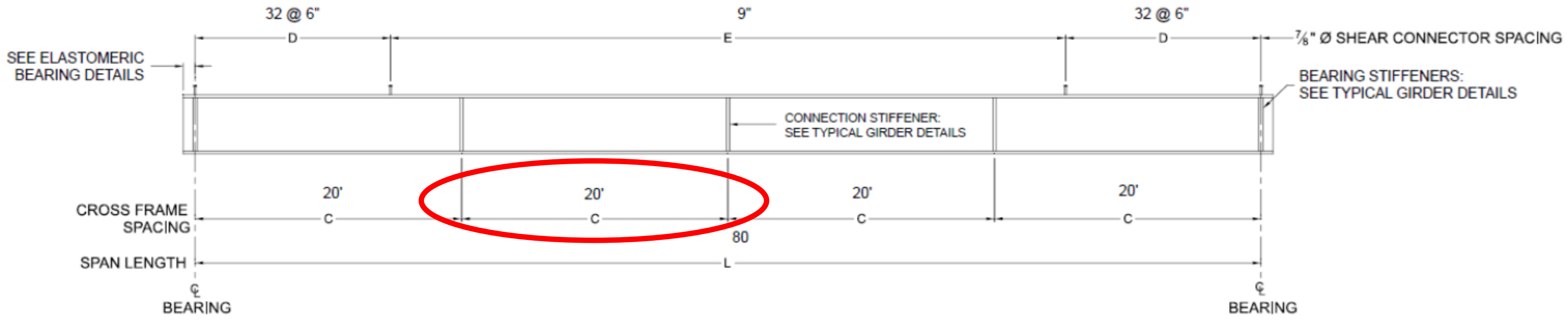
Cross-section of Bridge



Rolled Beam Recommendation

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

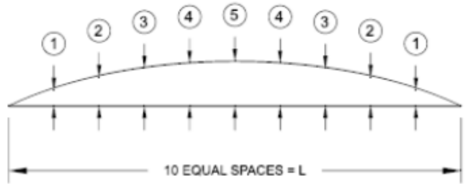
The selected rolled beam section is based on the widest (10'-6") girder spacing used in the development of the standards. The steel industry generally recommends the use of the widest girder spacing possible to reduce the potential number of girder lines for optimum economy.



BEAM ELEVATION

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

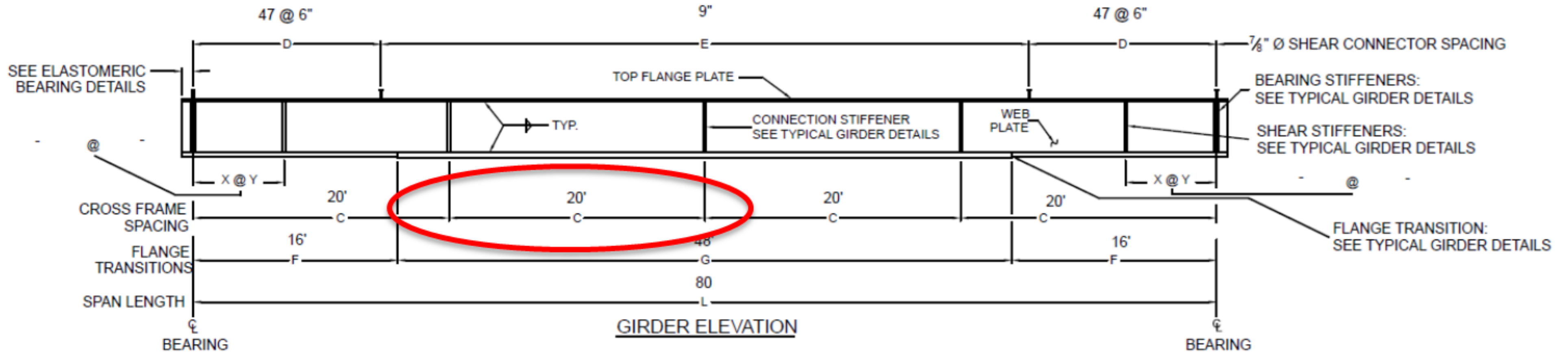
STEEL D.L. CAMBER - in					TOTAL D.L. CAMBER - in				
1	2	3	4	5	1	2	3	4	5
0.178"	0.337"	0.461"	0.540"	0.567"	1.255"	2.375"	3.250"	3.807"	3.997"



D.L. CAMBER

Plate Girder Recommendation

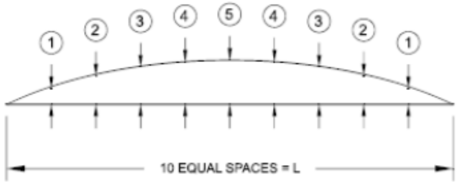
COMPOSITE PLATE GIRDER WITH PARTIALLY STIFFENED WEB - 4 GIRDERS AT 10' 6" GIRDER SPACING, HOMOGENEOUS



GIRDER ELEVATION

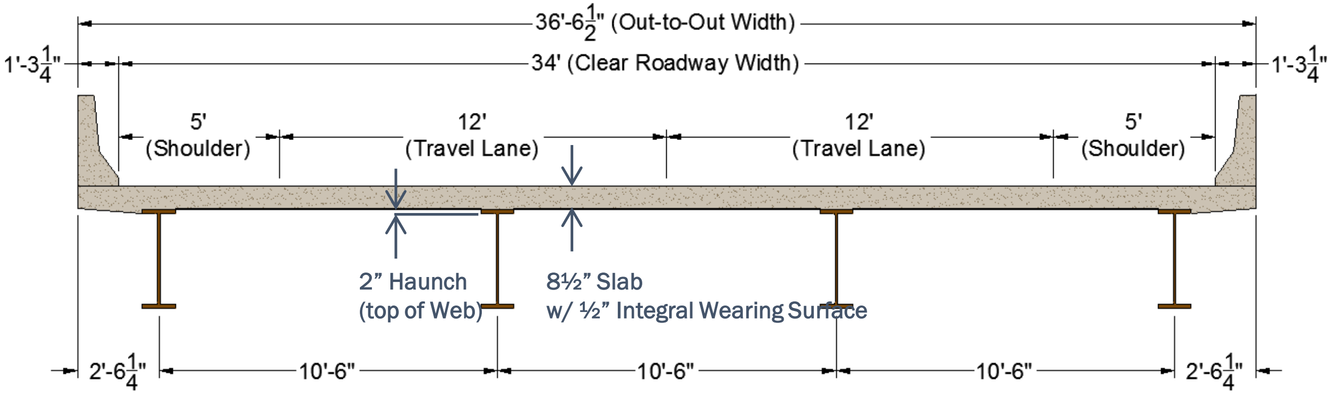
SPAN (L) - ft	PLATE GIRDER SIZE						DIAPHRAGM SPACING (C) - ft	SHEAR STIFFENERS		SHEAR CONNECTOR MAX. SPACING		INDIVIDUAL GIRDER WEIGHT
	TOP FLANGE - in	BOTTOM FLANGE (F)		BOTTOM FLANGE (G)		WEB PLATE- in		X (NO. REQ'd)	Y - ft. (SPACING)	D	E	
		PLATE - in	LENGTH - Ft	PLATE - in	LENGTH - Ft							
80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

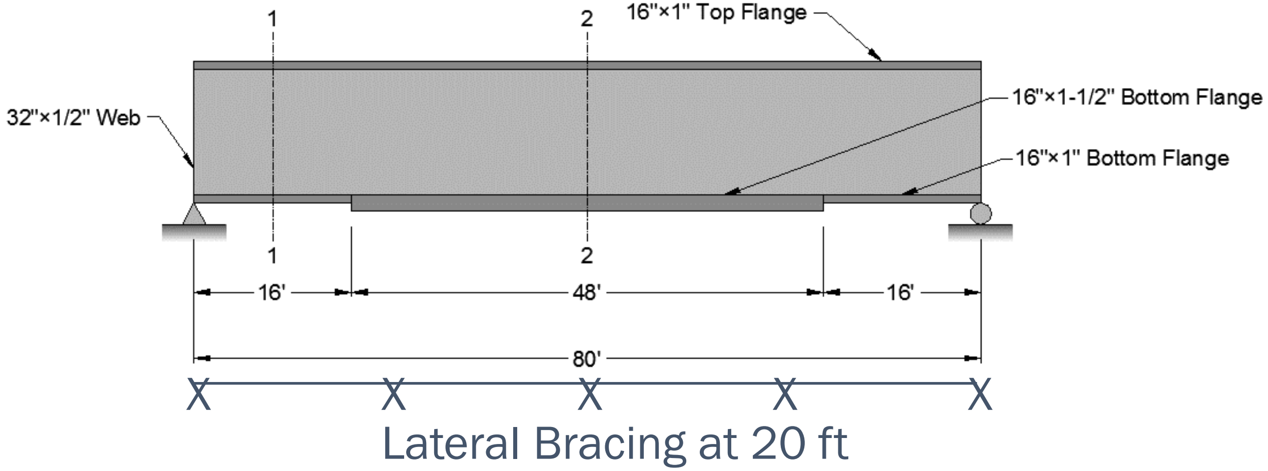
STEEL D.L. CAMBER - in					TOTAL D.L. CAMBER - in				
1	2	3	4	5	1	2	3	4	5
0.178"	0.334"	0.454"	0.530"	0.557"	1.397"	2.618"	3.554"	4.149"	4.355"



D.L. CAMBER

Design for Homogeneous Plate Girder Bridge





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

eSPAN140 Summary

Composite Rolled Beam and Plate Girder Designs

1000's of Designs Performed

Has Worked Well

What's Next?

Update to AASHTO 10th Edition

Adding NonComposite Bridges

Including Additional Solution Options

Release TBD

eSPAN140™

Gets You in the BallPark

NEW Short Span Steel Bridge Alliance eBEAM140

Noncomposite and Composite Simple-Span Rolled-Section Steel Bridge Design

eBEAM140

Excel Based Rolled Beam Design Software

Version 1.0 - Beta

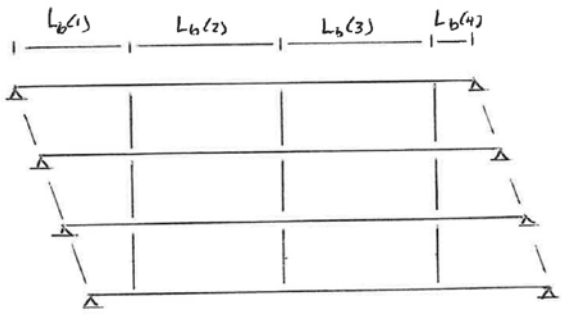
https://www.shortspansteelbridges.org/ebeam140/

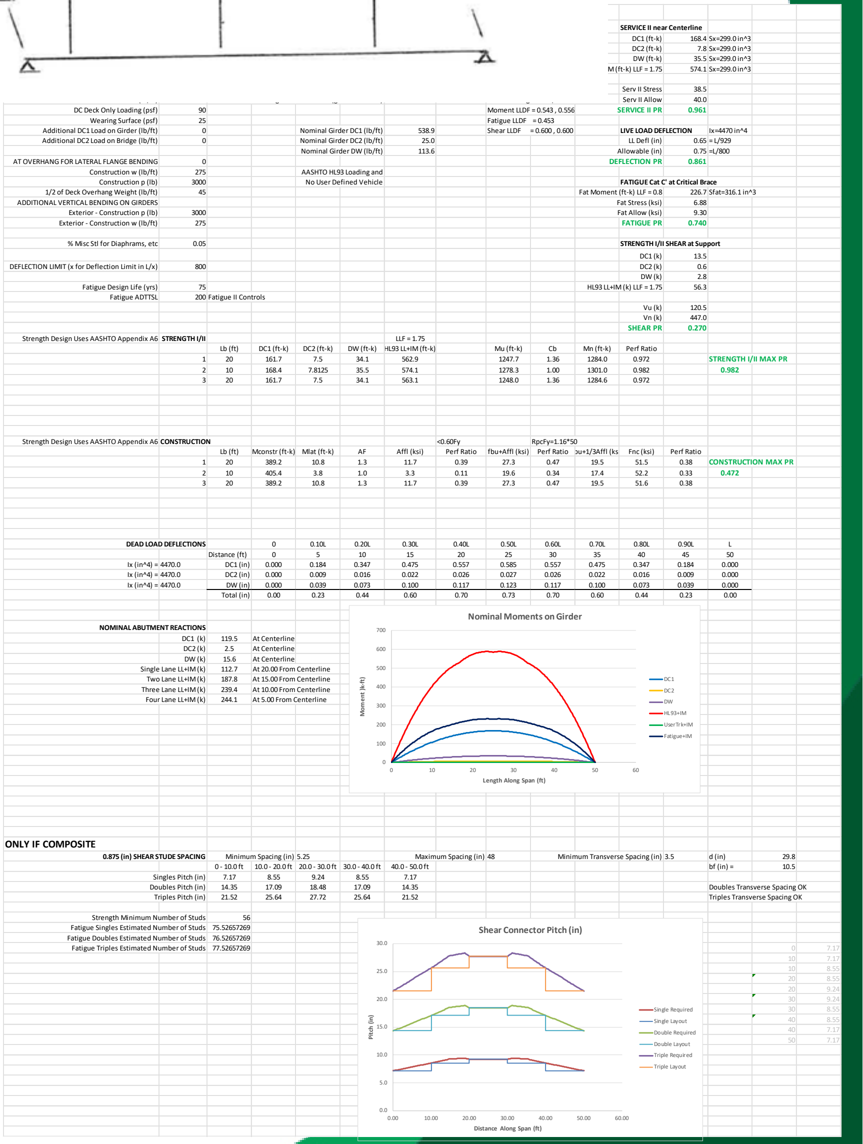
eBEAM140 Disclaimer: *This document has been prepared in accordance with information available to the American Iron and Steel Institute (AISI) and its Short Span Steel Bridge Alliance (SSSBA) program, at the time of preparation. While it is believed to reasonably reflect the present state of knowledge as to the subject, it has not been prepared for conventional use as an engineering or construction document and should not be used or relied upon for any specific application without competent professional examination and verification of its accuracy, suitability, and applicability by a licensed engineer, architect or other professional. AISI and the SSSBA disclaim any liability arising from information provided by others or from the unauthorized use of the information contained in this document, and do not accept any obligation to issue supplements or corrections in the event of errors being discovered or advances being made in the techniques discussed in the document.*

Design Software

Excel Based Rolled Beam Design Software

- NonComposite & Composite Design
- 33, 36, 50, 65 or 70 ksi Steel
- Bridge Layout
- Diaphragm Variable Along Span
- Any Decking: Wood, Grid, CMD, NonComposite Concrete, Composite Concrete
- Vehicular Loading: AASHTO HL93 & User Defined Vehicle (i.e., U-80)
- User Defined Design Characteristics
- “What-If” Analysis





Design Software

Excel Based Rolled Beam Design Software

- Allows User to Investigate Alternatives to
  - Diaphragm Spacing
  - Lightest Weight Solution
  - Other Readily Available Sections

ENTER W SECTION FOR MORE INFORMATION

W36X135	**NonComposite**	Weight (lb/ft): 135

OVERALL PERFORMANCE FOR W36X135

Strength I/II	Service II	Construction	Fatigue	Deflection	Overall
PR	PR	PR	PR	PR	PR
0.993	0.727	0.161	0.599	0.763	0.993
In Lb #	At Centerline	In Lb #	At Critical Brace	At Centerline Equal to	Strength I/II
1		1		L/1049	

PERFORMANCE BY UNBRACED LENGTH FOR W36X135

Unbraced Length	Unbraced Length (ft)	Lb Range	Strength I/II PR	Mn/My	Cb
1	26	0 - 26 ft	0.993	0.778	1.255
2	26	26 - 52 ft	0.993	0.778	1.256

LIST OF ALL W SHAPES RANKED FROM STRENGTH I, SERVICE II & CONSTRUCTION

Top 20 That Meet Min Depth, Max Depth & W40 & W44 Limits

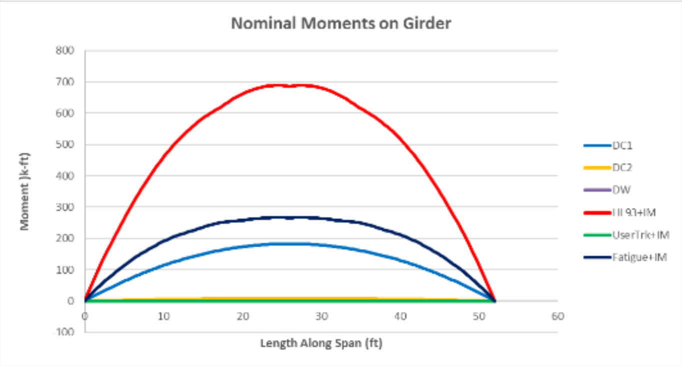
Shape	Strength I/II	Service II	Construction	Fatigue	Deflection	Overall
	PR	PR	PR	PR	PR	PR
W36X135	0.99	0.73	0.16	0.60	0.76	0.99
W33X141	0.92	0.71	0.15	0.58	0.80	0.92
W27X146	0.79	0.77	0.14	0.62	1.05	1.05
W30X148	0.95	0.73	0.16	0.58	0.89	0.95
W40X149	0.90	0.62	0.15	0.51	0.61	0.90
W36X150	0.81	0.64	0.13	0.52	0.66	0.81
W33X152	0.81	0.66	0.14	0.53	0.73	0.81
W36X160	0.73	0.59	0.12	0.48	0.61	0.73
W27X161	0.71	0.70	0.13	0.55	0.94	0.94
W24X162	0.77	0.78	0.14	0.60	1.15	1.15
W40X167	0.70	0.54	0.12	0.43	0.51	0.70
W33X169	0.69	0.59	0.12	0.46	0.64	0.69
W36X170	0.66	0.56	0.11	0.44	0.57	0.66
W30X173	0.59	0.60	0.11	0.47	0.72	0.72
W24X176	0.70	0.72	0.13	0.54	1.05	1.05
W27X178	0.63	0.64	0.12	0.50	0.85	0.85
W36X182	0.61	0.52	0.11	0.41	0.53	0.61
W40X183	0.59	0.48	0.10	0.38	0.45	0.59
W30X191	0.53	0.54	0.10	0.42	0.65	0.65
W24X192	0.63	0.66	0.12	0.50	0.95	0.95

Design Software

Excel Based Rolled Beam Design Software

- Design Summary
  - All Superstructure Design Results Specific to Limit States, Unbraced Lengths, etc.
  - Dead Load Deflections for Camber
  - Abutment Reaction Cases for Multi-Lane
  - If Composite: Strength and Fatigue Stud Design

W44	**SERVICE II near Centerline**		
	DC1 (ft-k)	183.1	Sx=439.0 in^3
	DC2 (ft-k)	8.5	Sx=439.0 in^3
	DW (ft-k)	0.0	Sx=439.0 in^3
	HL93 LL+IM (ft-k)	670.5	Sx=439.0 in^3
	Serv II Stress	29.1	
Lane	Serv II Allow	40.0	
	SERVICE II PR	**0.727**	
	LIVE LOAD DEFLECTION		Ix=7800 in^4
	LL Defl (in)	0.60	= L/1049
	Allowable (in)	0.78	=L/800
	DEFLECTION PR	**0.763**	
	FATIGUE Cat C' at Critical Brace		
	Fat Moment (ft-k) LLF = 0.8	265.8	Sfat=458.6 in^3
	Fat Stress (ksi)	5.57	
	Fat Allow (ksi)	9.30	
	FATIGUE PR	**0.599**	
	STRENGTH I/II SHEAR at Support		
	DC1 (k)	14.1	
	DC2 (k)	0.7	
	DW (k)	0.0	
	HL93 LL+IM (k) LLF = 1.75	60.6	
	Vu (k)	124.5	
	Vn (k)	591.9	
	SHEAR PR	**0.210**	



Strength Design Uses AASHTO Appendix A6	**STRENGTH I/II**					LLF = 1.75							
		Lb (ft)	DC1 (ft-k)	DC2 (ft-k)	DW (ft-k)	HL93 LL+IM (ft-k)		Mu (ft-k)	Cb	Mn (ft-k)	Perf Ratio		
	1	26	183.1	8.45	0.0	670.4		1412.6	1.26	1422.9	0.993		**STRENGTH I/II MAX PR**
	2	26	183.1	8.45	0.0	670.5		1412.9	1.26	1423.3	0.993		**0.993**

Strength Design Uses AASHTO Appendix A6	**CONSTRUCTION**						<0.60Fy		RpcFy=1.16*50				
		Lb (ft)	Mconstr (ft-k)	Mlat (ft-k)	AF	Affl (ksi)	Perf Ratio	fbu+Affl (ksi)	Perf Ratio	ou+1/3Affl (ks	Fnc (ksi)	Perf Ratio	
	1	26	228.9	0.0	1.0	0.0	0.00	6.3	0.13	6.3	38.9	0.16	**CONSTRUCTION MAX PR**
	2	26	228.9	0.0	1.0	0.0	0.00	6.3	0.13	6.3	38.9	0.16	**0.161**

NOMINAL ABUTMENT REACTIONS			
DC1 (k)	84.5	At Centerline	
DC2 (k)	2.6	At Centerline	
DW (k)	0.0	At Centerline	
Single Lane LL+IM (k)	114.3	At 9.00 From Centerline	
Two Lane LL+IM (k)	190.4	At 4.00 From Centerline	

eBEAM140 Summary

Rolled Shape Bridge Design: Composite & NonComposite

- User Manual & Examples
- Released on www.ShortSpanSteelBridges.org September 2025

https://www.shortspansteelbridges.org/ebeam140/

Optimized Rolled-Shape Design

SOON Short Span Steel Bridge Alliance ePLATE140

Noncomposite and Composite Simple-Span Plate-Girder Steel Bridge Design

ePLATE140

Excel Based Rolled Beam Design Software

Version 1.0 - Beta

SIMILAR

eBEAM140 Disclaimer: *This document has been prep[illegible] accordance with information available to the American Iron and Steel Institut[illegible] Short Span Steel Bridge Alliance (SSSBA) program, at the time of pr[illegible]s believed to reasonably reflect the present state of knowledge [illegible]ot been prepared for conventional use as an engineeri[illegible]nd should not be used or relied upon for any specific a[illegible] professional examination and verification of its accuracy, [illegible] by a licensed engineer, architect or other professional. AISI and [illegible]any liability arising from information provided by others or from th[illegible] use of the information contained in this document, and do not accept [illegible]gation to issue supplements or corrections in the event of errors being discovere[illegible] advances being made in the techniques discussed in the document.*

ePLATE140 Design Software - 2026

Excel Based Plate Girder Design Software

- Allows User to Investigate Alternatives to
  - Diaphragm Spacing
  - Lightest Weight Solution
  - Other Readily Available Flanges & Webs

Target L/D:
- Target L/D – 2”
- Target L/D
- Target L/D + 2”
- Target L/D + 4”
- Target L/D + 6””

5100 possible design combinations for
5 different Web Depths

User Specified Solution

ENTER SECTION FOR MORE INFORMATION

bfc	tfc	D	tw	bft	tft	Weight (lb/ft)	Total Wt (tons)
13.00	0.750	38.00	0.500	17.00	0.750	141	22.6

bfc>=D/6 OK
bfc/2tfc<=12 OK
D/tw<=150 OK
2Dcp/tw<=lrw OK
lyc/lyt>=0.3 OK

Meets Reqrments for A6?
Yes
Construction Uses A6

OVERALL PERFORMANCE FOR TF:13 x 0.75 Web:38 x 0.5 BF:17 x 0.75

Strength I/II	Service II	Construction	Fatigue	Deflection	Overall
PR	PR	PR	PR	PR	PR
0.917	0.973	0.933	0.703	0.807	0.973
In Lb #	At Centerline	In Lb #	At Critical Brace	At Centerline Equal to	Service II
3		2		L/992	

PERFORMANCE BY UNBRACED LENGTH FOR TF:13 x 0.75 Web:38 x 0.5 BF:17 x 0.75

Compression Flange Laterally Braced for Final State			Strength I/II		
Unbraced Length	Unbraced Length (ft)	Lb Range	PR	Mn/My	Cb
1	20	0 - 20 ft	0.703	1.995	1.509
2	20	20 - 40 ft	0.917	1.995	1.052
3	20	40 - 60 ft	0.917	1.995	1.052
4	20	60 - 80 ft	0.703	1.995	1.509

LIST OF GIRDERS RANKED FROM STRENGTH I, SERVICE II & CONSTRUCTION

Shape	Strength I/II PR	Service II PR	Construction PR	Fatigue PR	Deflection PR	Overall PR	Total Wt (tons)
TF:13 x 0.75 Web:38 x 0.5 BF:17 x 0.75	0.92	0.97	0.93	0.70	0.81	0.97	22.6
TF:13 x 0.75 Web:38 x 0.5 BF:13 x 1	0.91	0.97	0.93	0.69	0.80	0.97	22.7
TF:14 x 0.75 Web:36 x 0.5 BF:18 x 0.75	0.95	0.99	0.87	0.72	0.87	0.99	22.9
TF:13 x 0.75 Web:38 x 0.5 BF:18 x 0.75	0.89	0.94	0.93	0.68	0.78	0.94	23.0
TF:14 x 0.75 Web:38 x 0.5 BF:17 x 0.75	0.92	0.97	0.81	0.70	0.81	0.97	23.0
TF:14 x 0.75 Web:34 x 0.5 BF:15 x 1	0.97	0.99	0.93	0.71	0.91	0.99	23.1
TF:14 x 0.75 Web:36 x 0.5 BF:14 x 1	0.94	0.97	0.86	0.70	0.85	0.97	23.1
TF:15 x 0.75 Web:36 x 0.5 BF:18 x 0.75	0.95	0.99	0.78	0.72	0.87	0.99	23.3
TF:13 x 0.75 Web:38 x 0.5 BF:14 x 1	0.88	0.92	0.92	0.66	0.76	0.92	23.3
TF:14 x 0.75 Web:38 x 0.5 BF:18 x 0.75	0.89	0.94	0.81	0.68	0.78	0.94	23.4
TF:15 x 0.75 Web:38 x 0.5 BF:17 x 0.75	0.92	0.97	0.73	0.70	0.81	0.97	23.4
TF:15 x 0.75 Web:34 x 0.5 BF:15 x 1	0.97	0.99	0.83	0.71	0.91	0.99	23.5
TF:14 x 0.75 Web:34 x 0.5 BF:16 x 1	0.94	0.94	0.93	0.68	0.87	0.94	23.7
TF:12 x 1 Web:36 x 0.5 BF:18 x 0.75	0.95	0.99	0.88	0.72	0.87	0.99	23.7
TF:14 x 0.75 Web:36 x 0.5 BF:15 x 1	0.91	0.93	0.86	0.67	0.81	0.93	23.7
TF:16 x 0.75 Web:36 x 0.5 BF:18 x 0.75	0.96	0.99	0.72	0.72	0.87	0.99	23.7
TF:14 x 0.75 Web:38 x 0.5 BF:14 x 1	0.88	0.92	0.80	0.66	0.76	0.92	23.7

ePLATE140 Plans

Plate GirderBridge Design: Composite & NonComposite

AASHTO 10th Edition

Develop Users Manual & Examples

Industry Review

Release Sept 2026

ePLATE140

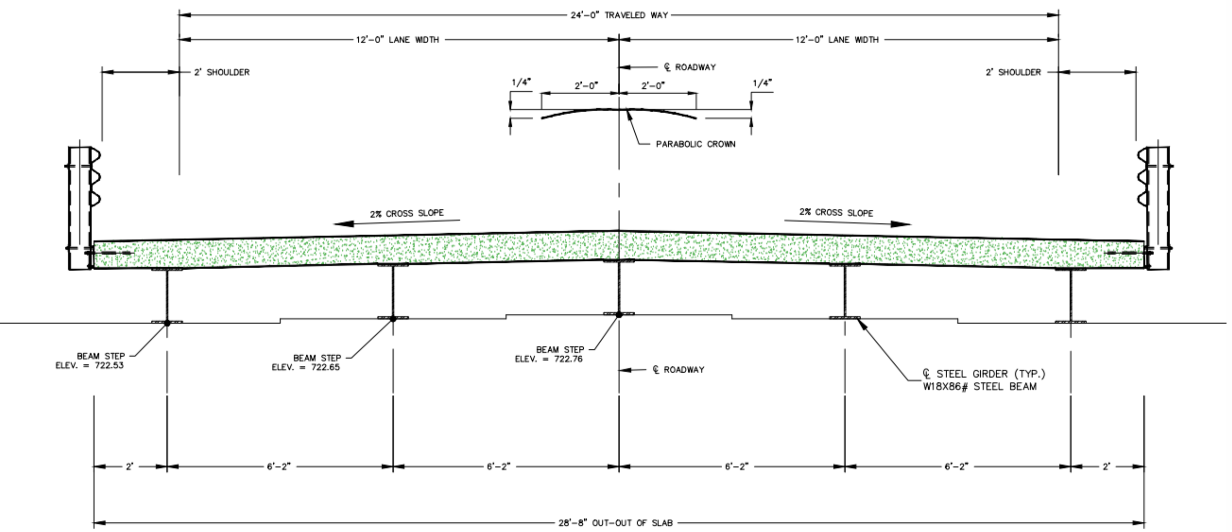
Optimized Plate Girder Design

Example Bridge Designs – SSSBA Plate Girder Study

Study: Economical Mid-Range (60 ft – 100 ft) Simple Span Bridges

- Two Cross Sections from Actual Bridges
- Three Lengths: 70, 80 & 90 ft
- Optimized Solutions from eBEAM140 and ePLATE140
- Fabricated Costs from Delong's

70 ft Simple Span: Lockhart Bridge Section

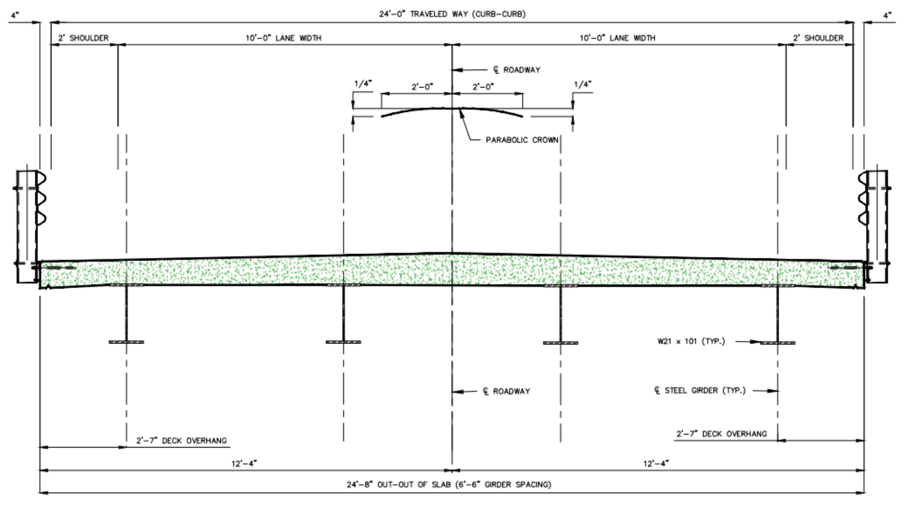


44.8 tons	Yield Strength (ksi)	50	**Bridge Width (ft)**	**28.67**		Consider W40 & W44 Beams?	Yes		
	Bridge Length (ft)	70	**Roadway Width (ft)**	**28.00**		L/D Limited to	30		
	Girder Spacing (ft)	6.1667	**Shoulders (ft) each side - Double for One Sided**	**2.00**		Minimum Depth Beam (in)	W12		
	Number of Girders	5	**2 Striped Lanes and 2 Design Lanes**			Maximum Depth Beam (in)	W44		
	Overhang (32.4% of Girder Spacing) (ft)	2							
	Barrier Width (ft)	0.3333	**Composite Design**	8 in Structural Deck with No SIP Forms					
	Barrier Load on Girder (lb/ft)	25							
	DC Deck Only Loading (psf)	106.25	**AASHTO HL93 Loading and**						
	Wearing Surface (psf)	25	**No User Defined Vehicle**			Compression Flange Laterally Braced for Final State			
	Additional DC1 Load on Girder (lb/ft)	0					Unbraced		
	Additional DC2 Load on Bridge (lb/ft)	0					Length #	Lb	Cb
			Strength Design Uses AASHTO Appendix A6				1	23.33	1.43
	AT OVERHANG FOR LATERAL FLANGE BENDING						2	23.33	1.01
	Construction w (lb/ft)	275	**Fatigue Design Life (yrs)**	75			3	23.33	1.43
	Construction p (lb)	3000	Fatigue $ADTT_{SL}$	200	Fatigue II Controls				
	1/2 of Deck Overhang Weight (lb/ft)	106.25							
	ADDITIONAL VERTICAL BENDING ON GIRDERS		**Limit States Checked**						
	Exterior - Construction p (lb)	3000	Strength I & II						
	Exterior - Construction w (lb/ft)	275	Service II						
			Constructability						
	% Misc Stl for Diaphrams, etc	0%	Fatigue						
			Deflection						
	DEFLECTION LIMIT (x for Deflection Limit in L/x)	800					7		

- W Shape 28.0 tons W36 x 160
- Plate Girder 22.0 tons TF16x¾ ; W26x½ ; BF16x¾

Plate Girder 12000 lbs less than W36x160

80 ft Simple Span: Hendricks Bridge Section



TYPICAL BRIDGE CROSS SECTION

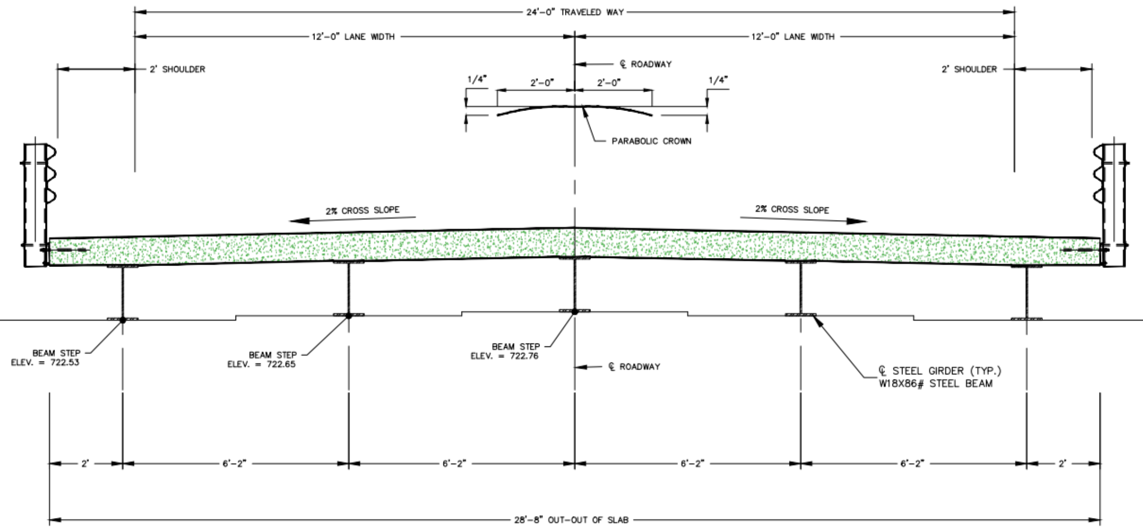
Yield Strength (ksi)	50	**Bridge Width (ft)**	**24.67**		Consider W40 & W44 Beams?	Yes	
Bridge Length (ft)	80	**Roadway Width (ft)**	**24.00**		L/D Limited to	30	
Girder Spacing (ft)	6.5	**Shoulders (ft) each side - Double for One Sided**	**0.00**		Minimum Depth Beam (in)	W12	
Number of Girders	4	**2 Striped Lanes and 2 Design Lanes**			Maximum Depth Beam (in)	W44	
Overhang (39.7% of Girder Spacing) (ft)	2.5833						
Barrier Width (ft)	0.3333	**Composite Design**	8 in Structural Deck with No SIP Forms				
Barrier Load on Girder (lb/ft)	25						
DC Deck Only Loading (psf)	106.25	**AASHTO HL93 Loading and**					
Wearing Surface (psf)	25	**No User Defined Vehicle**			Compression Flange Laterally Braced for Final State		
Additional DC1 Load on Girder (lb/ft)	0				Unbraced		
Additional DC2 Load on Bridge (lb/ft)	0				Length #	Lb	Cb
		Strength Design Uses AASHTO Appendix A6			1	20.00	1.51
AT OVERHANG FOR LATERAL FLANGE BENDING					2	20.00	1.05
Construction w (lb/ft)	275	**Fatigue Design Life (yrs)**	75		3	20.00	1.05
Construction p (lb)	3000	Fatigue $ADTT_{SL}$	200	Fatigue II Controls	4	20.00	1.51
1/2 of Deck Overhang Weight (lb/ft)	137.2378						
ADDITIONAL VERTICAL BENDING ON GIRDERS		**Limit States Checked**					
Exterior - Construction p (lb)	3000	Strength I & II					
Exterior - Construction w (lb/ft)	275	Service II					
		Constructability					
% Misc Stl for Diaphrams, etc	0%	Fatigue					
		Deflection					
DEFLECTION LIMIT (x for Deflection Limit in L/x)	800				7		

- W Shape 26.7 tons W40 x 167
- W Shape 27.2 tons W36 x 170
- Plate Girder 21.8 tons TF14x¾ ; W38x½ ; BF14x¾

Plate Girder 9800 lbs less than W40x167

Plate Girder 10800 lbs less than W36x170

90 ft Simple Span: Lockhart Bridge Section



Yield Strength (ksi)	50	Bridge Width (ft)	28.67		Consider W40 & W44 Beams?		Yes	
Bridge Length (ft)	90	Roadway Width (ft)	28.00		L/D Limited to		30	
Girder Spacing (ft)	6.1667	Shoulders (ft) each side - Double for One Sided	2.00		Minimum Depth Beam (in)		W12	
Number of Girders	5	2 Striped Lanes and 2 Design Lanes			Maximum Depth Beam (in)		W44	
Overhang (32.4% of Girder Spacing) (ft)	2							
Barrier Width (ft)	0.3333	Composite Design	8 in Structural Deck with No SIP Forms					
Barrier Load on Girder (lb/ft)	25							
DC Deck Only Loading (psf)	106.25	AASHTO HL93 Loading and						
Wearing Surface (psf)	25	No User Defined Vehicle			Compression Flange Laterally Braced for Final State			
Additional DC1 Load on Girder (lb/ft)	0					Unbraced		
Additional DC2 Load on Bridge (lb/ft)	0					Length #	Lb	Cb
		Strength Design Uses AASHTO Appendix A6				1	22.50	1.51
AT OVERHANG FOR LATERAL FLANGE BENDING						2	22.50	1.05
Construction w (lb/ft)	275	Fatigue Design Life (yrs)	75			3	22.50	1.05
Construction p (lb)	3000	Fatigue ADTT$_{SL}$	200	Fatigue II Controls		4	22.50	1.51
1/2 of Deck Overhang Weight (lb/ft)	106.25							
ADDITIONAL VERTICAL BENDING ON GIRDERS		Limit States Checked						
Exterior - Construction p (lb)	3000	Strength I & II						
Exterior - Construction w (lb/ft)	275	Service II						
		Constructability						
% Misc Stl for Diaphrams, etc	0%	Fatigue						
		Deflection						
DEFLECTION LIMIT (x for Deflection Limit in L/x)	800					7		

- W Shape 44.8 tons W40 x 199
- W Shape 47.3 tons W36 x 210
- Plate Girder 32.3 tons TF15x¾ ; W38x½ ; BF16x¾

Plate Girder 25000 lbs less than W40x199

Plate Girder 30000 lbs less than W36x210

Estimated Costs for Fabricated Girders

Although fabricated plate girders require more shop labor (e.g., welding), they often offer (1) weight savings and better fit-up, (2) easier cambering, and (3) more refined detailing, which can offset some of the added fabrication effort.

Description	PG or W	Tonnage	Budgetary Price	% Diff (From Lowest)
70' Lockhart	PG	22.0		-
70' Lockhart	W36	28.0		9.5%
80' Hendricks	PG	21.8		-
80' Hendricks	W40	26.7		10.6%
80' Hendricks	W36	27.2		4.6%
90' Lockhart	PG	32.3		-
90' Lockhart	W40	44.8		25.9%
90' Lockhart	W36	47.3		22.7%

Two Initial Observations

Plate Girder Less Cost than W Shapes (Fabrication costs offset by weight savings)

Premium on W40 makes W40 Shapes less Economical (Less weight, but more cost than W36)

If W36 Costs $500k & Concrete Cost is $450k

Steel Loses with only W Shapes

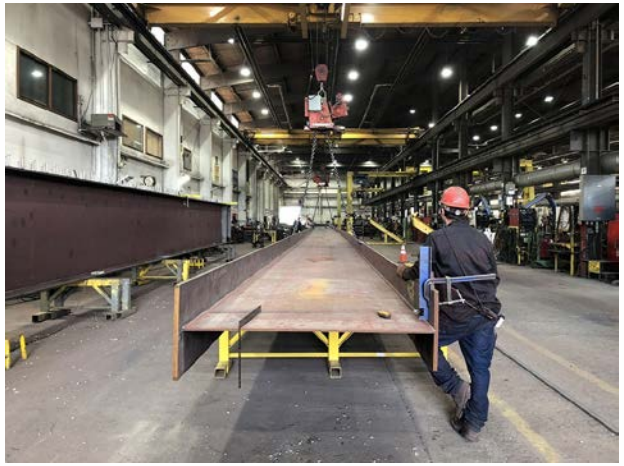
If PG Costs $500*(1-0.227) = $390k

Steel Wins with Plate Girder

Economical Plate Girders for Mid-Span Bridges (60-100’)

Expected Outcomes:

- Demonstrate the cost advantages of optimized plate girder designs
- Offer examples that empower fabricators and engineers to propose plate girder options where rolled beams may fall short
- Increase steel’s competitiveness in bridge bids
- Add to SSSBA education and marketing program



Resource Tools for Simple Span Steel Bridge Design

eSPAN140™

Preliminary Composite Rolled Shape and Plate Girder

eBEAM140

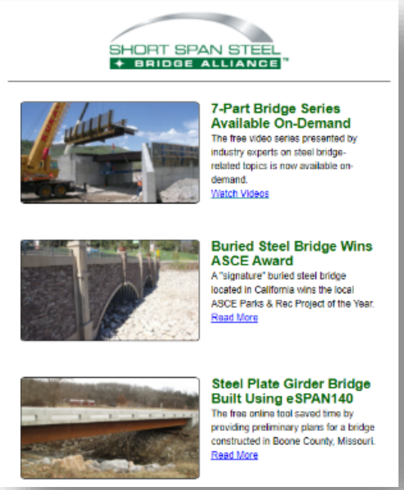
Optimized Composite & NonComposite Rolled Shape

ePLATE140

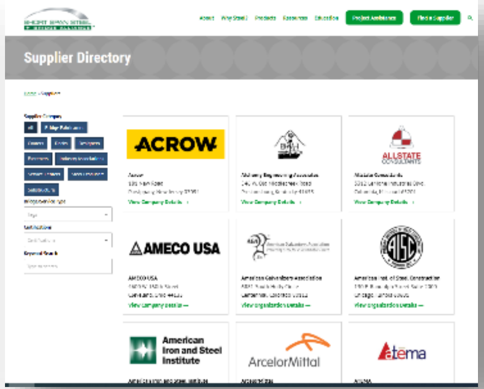
Optimized Composite & NonComposite Plate Girder

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

eSPAN140™

eBEAM140

4. Receive Free Project Assistance

5. Schedule a Workshop/Webinar

www.ShortSpanSteelBridges.org

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

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Twitter: @ShortSpanSteel

Facebook: Short Span Steel Bridge Alliance