NSBA Resources for Conceptual Steel Bridge Design

Multiple Girder/Beam Structural Systems

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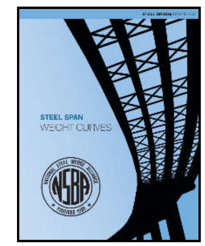
Overview of the Tools

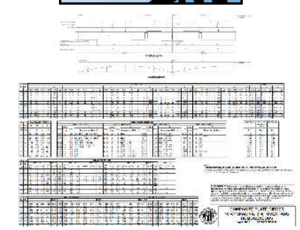
Span Weight Curves

- Quickest, superstructure weight



Span Standards

- Quick, superstructure weight + plates sizes (1, 2, 3, & 4 span configurations)



LRFD Simon

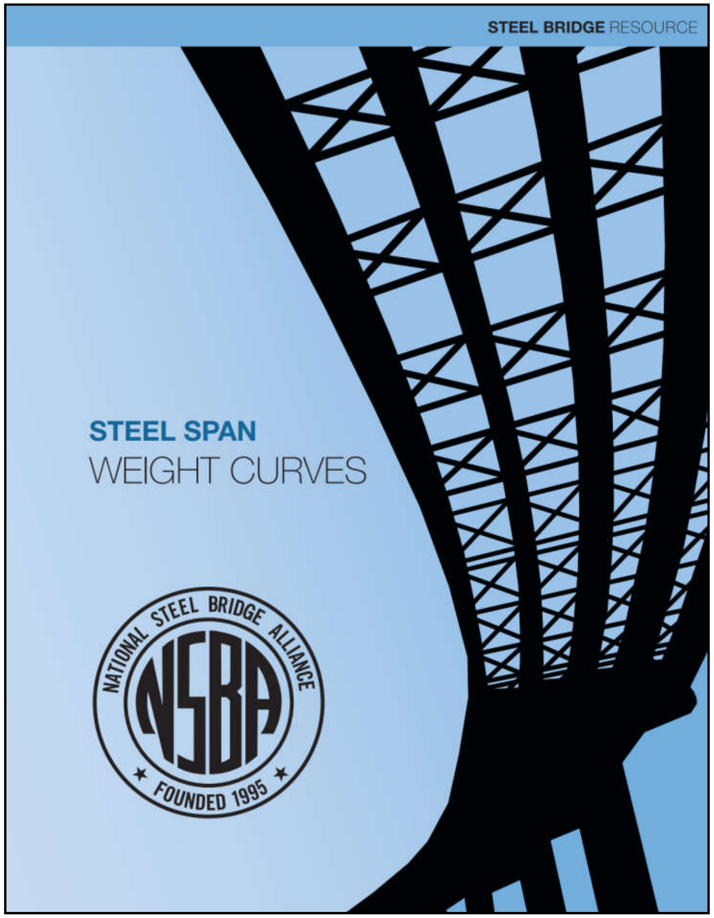
- Line girder analysis software, any span config, design & analysis, web optimization

NSBA Splice

- Excel spreadsheet and design guide to be used for steel girder splice design

NSBA Steel Span Weight Curves

- Derived from 800 economical solutions
- Quickly determine relative costs
- Various girder spacings, span lengths, and number of spans
    - Horizontally curved & straight bridges
    - Single span or multi-span
    - 7’ to over 11’ spacing
    - 50’ to 450’ main span
- Download for free @ aisc.org/spanweightcurves



Example Existing Bridge Replacement

River Crossing

- Total length = 900 ft
- 9 Simple Spans @ 100’
- Width = 35 ft
- # of piers in river = 8

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New Bridge Options

- Total length = 900’-0
- Width = 40’-0 (out-out)
  - 2 – 12 ft lanes, 8 ft outside shoulder, 4 ft inside shoulder, 4 ft barriers
- Overhang = 2’-6
- Area = 900’ x 40’ = 36,000 sf

Girder Spacing Options

- Four girder lines (3 spaces): 11’-8
- Five girder lines (4 spaces): 8’-9

New Bridge Options

1.) Six Spans – Simply Supported

- Span length = 6 @ 150’ = 900’-0
- Five interior piers in river
- Four girder lines, 3 spaces @ 11’-8

2.) Four Spans – Continuous

- Balanced span arrangement (end spans @ 78% of int spans)
- End spans length = 197’
- Interior spans length = 253’
- Three interior piers in river
- Four girder lines, 3 spaces @ 11’-8

New Bridge Options

3.) Three Spans – Continuous

- Balanced span arrangement (end spans @ 78% of int spans)
- End span length = 275’-0
- Interior span length = 350’-0
- Two interior piers in river
- Five girder lines, 4 spaces @ 8’-9

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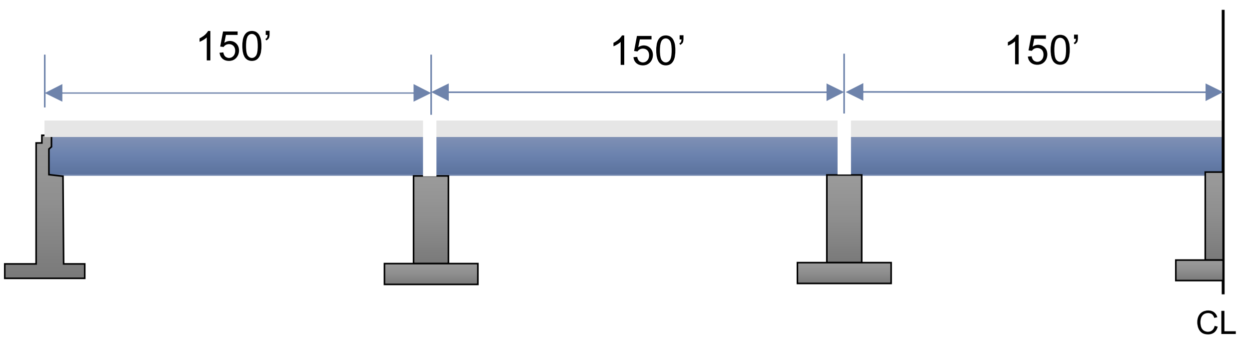
Option #1

1.) Six Spans – Simply Supported

- Five interior piers in river
- Four girder lines, 3 spaces @ 11’-8



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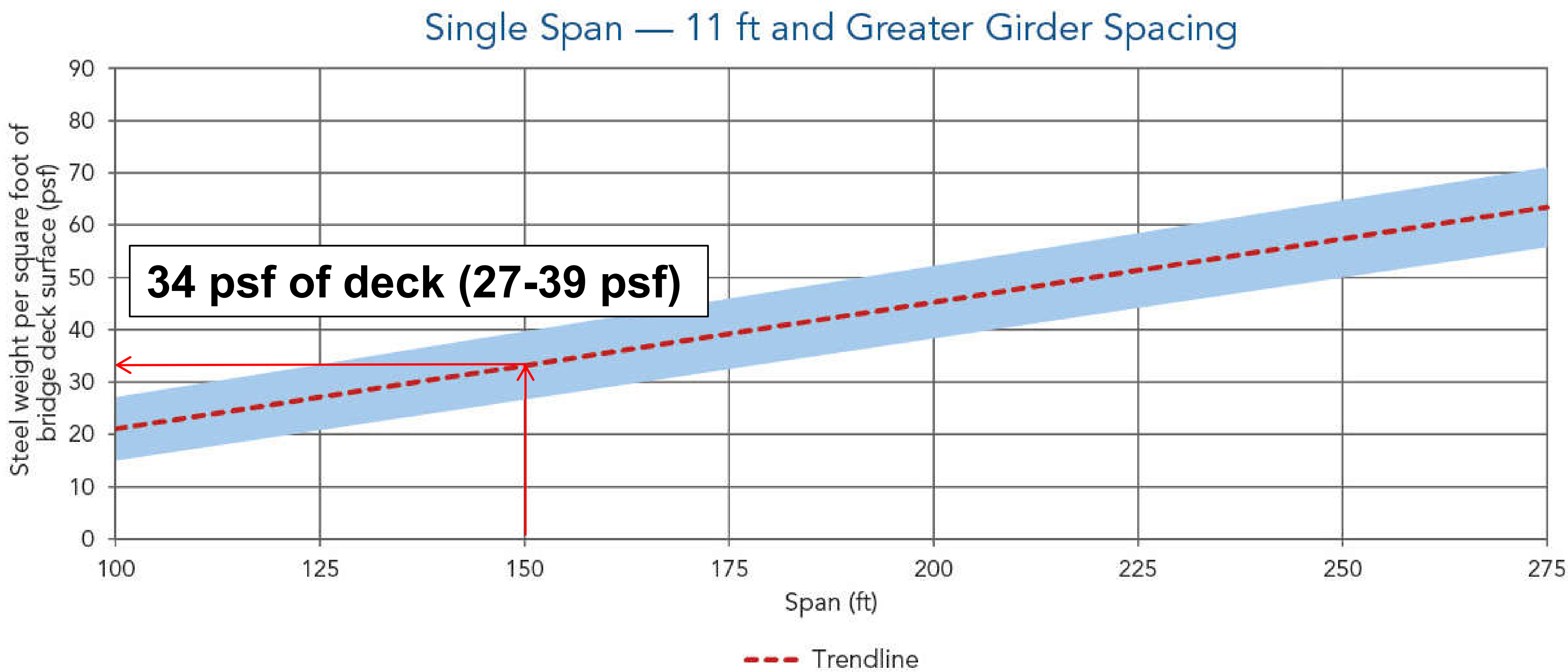


Single Span — 11 ft and Greater Girder Spacing
34 psf of deck (27-39 psf)
Steel weight per square foot of bridge deck surface (psf)
90
80
70
60
50
40
30
20
10
0
100
125
150
175
200
225
250
275
Span (ft)
Trendline

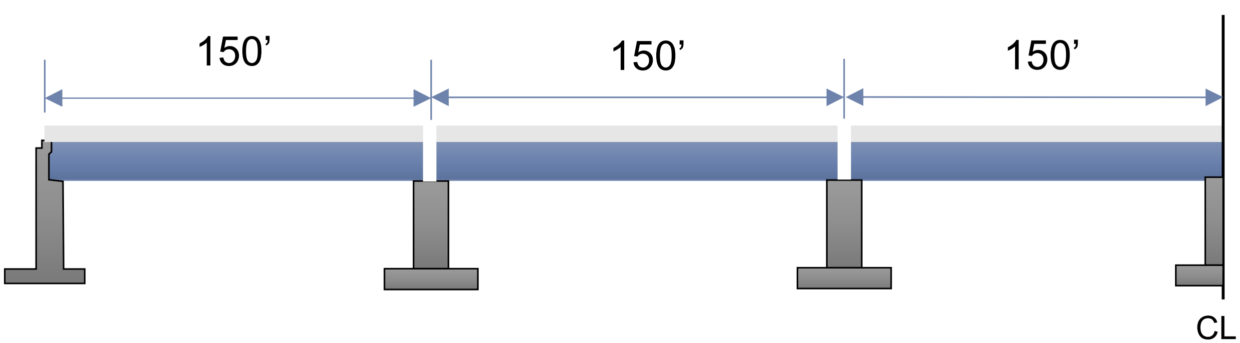
Option #1 - Results

1.) Six Spans – Simply Supported

- Estimated weight per area = 34 psf
- Total estimated superstructure weight = 36,000 sf

  x 34 psf = 1,224,000 lb
- Estimated unit cost for fabricated steel FOB = $2.00/lb
- Total estimated superstructure steel cost = $2.45 million

More on this later



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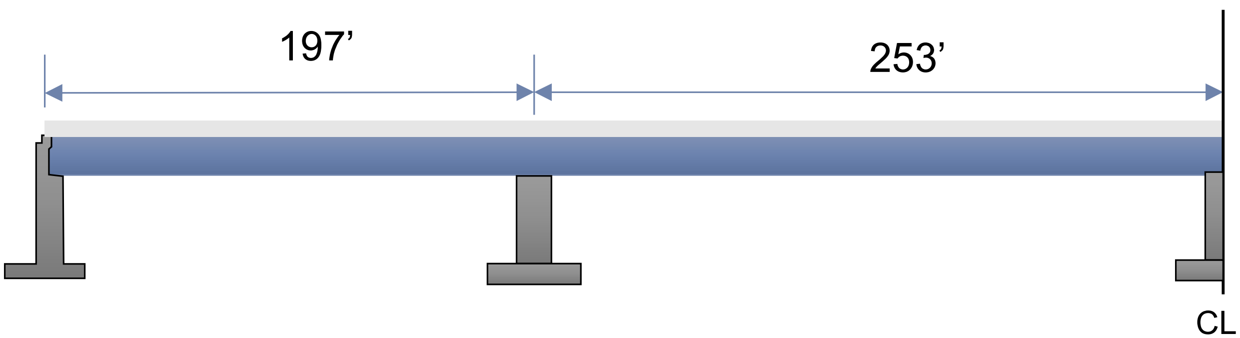
Option #2

2.) Four Spans – Continuous

- Three interior piers in river
- Four girder lines, 3 spaces @ 11’-8



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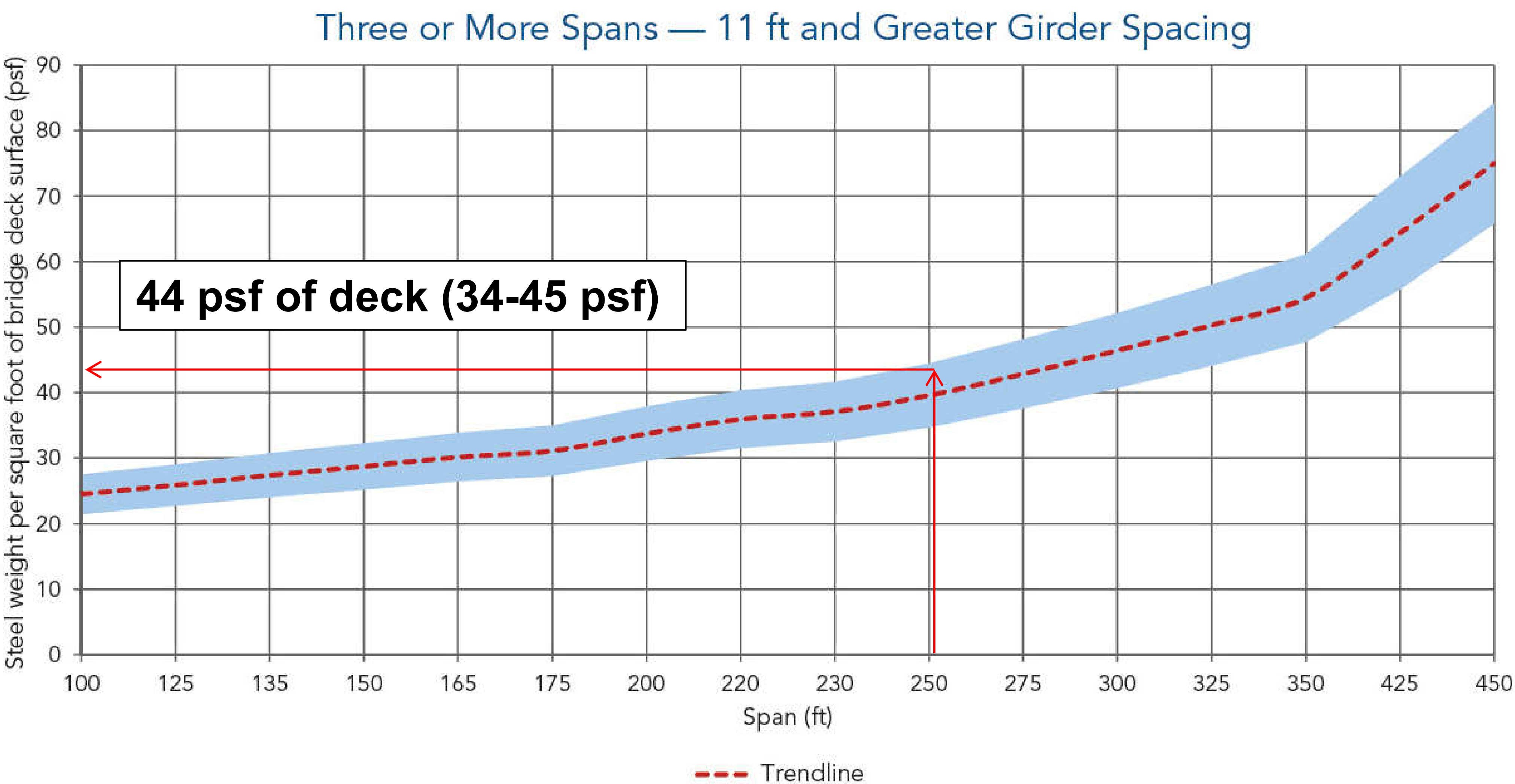
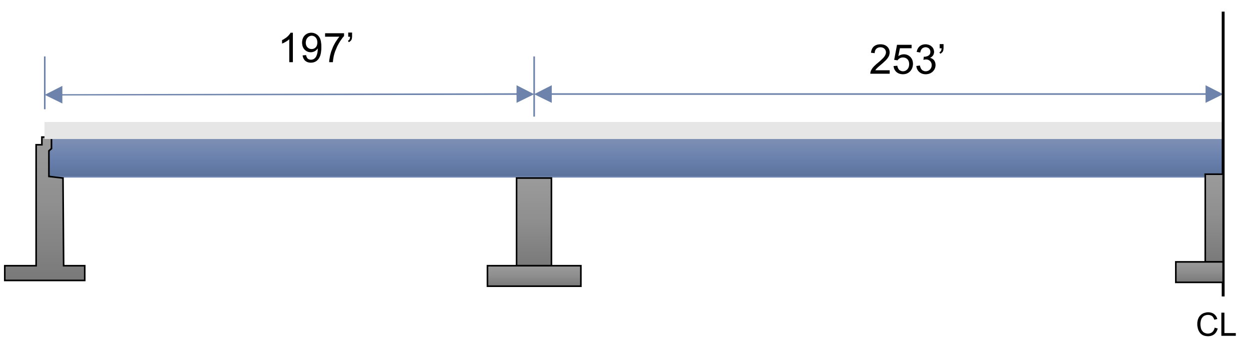

Three or More Spans — 11 ft and Greater Girder Spacing
44 psf of deck (34-45 psf)
Steel weight per square foot of bridge deck surface (psf)
90
80
70
60
50
40
30
20
10
0
100
125
135
150
165
175
200
220
230
250
275
300
325
350
425
450
Span (ft)
Trendline

Option #2 - Results

2.) Four Spans – Continuous

- Estimated weight per area = 44 psf
- Total estimated superstructure weight = 36,000 sf
  x 44 psf = 1,584,000 lb
- Estimated unit cost for fabricated steel FOB = $2.00/lb
- Total estimated superstructure steel cost = $3.17 million



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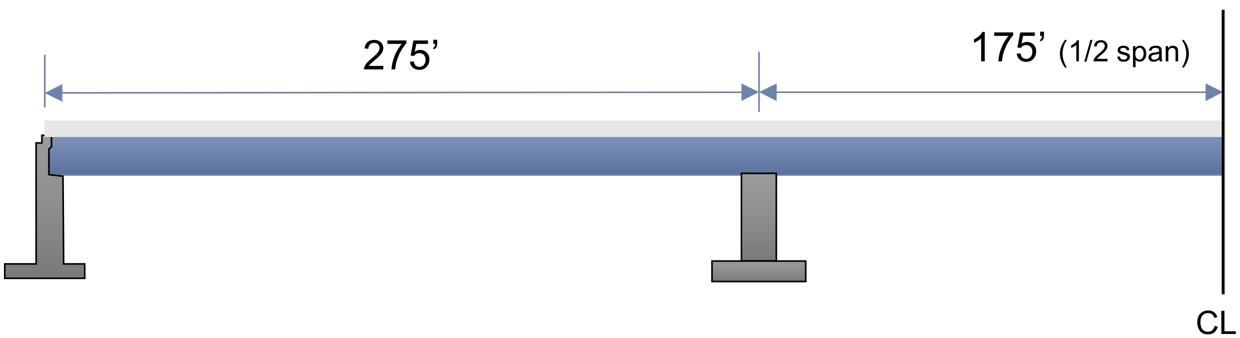
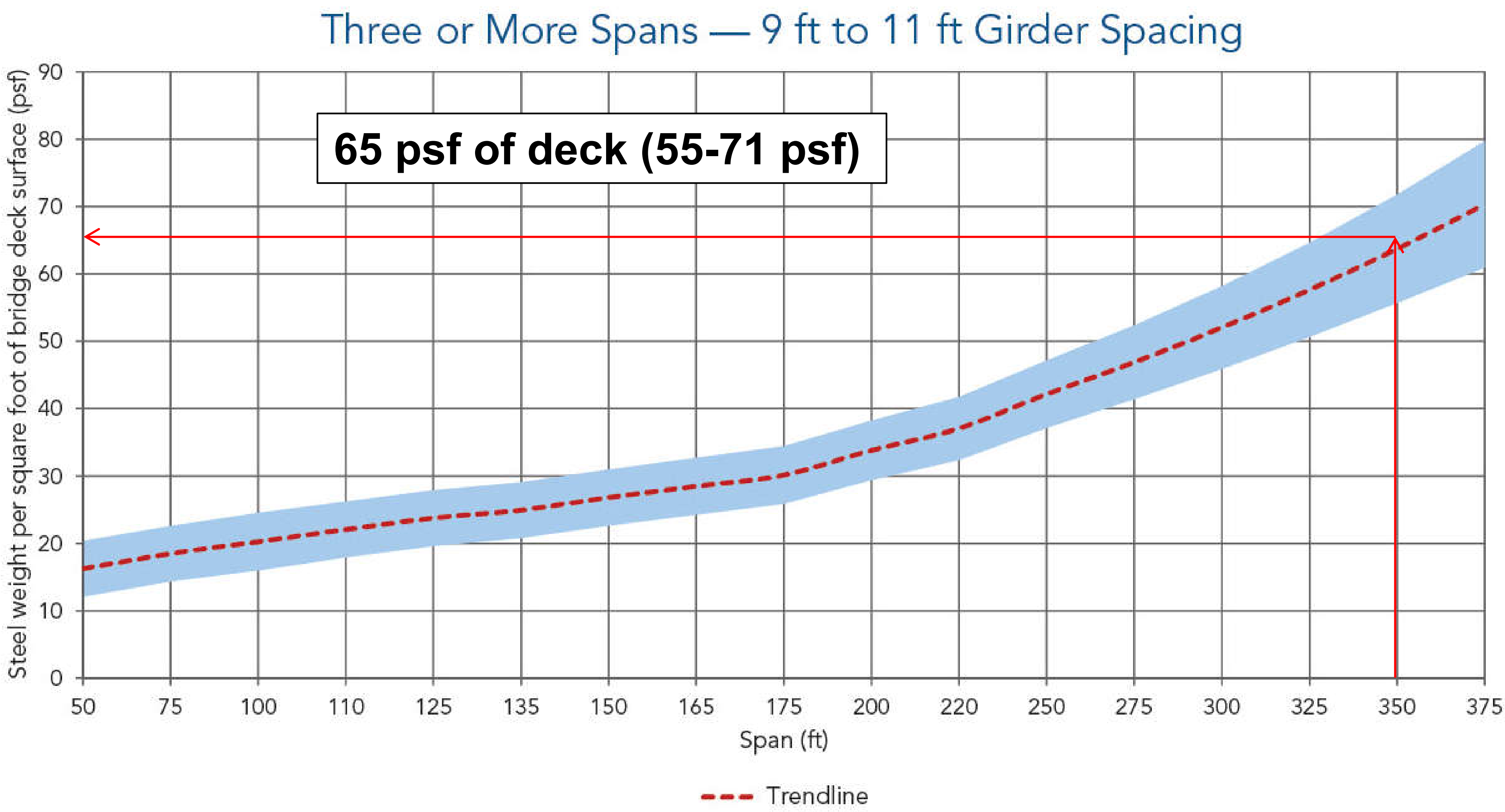
Option #3

3.) Three Spans – Continuous

- Two interior piers in river
- Five girder lines, 4 spaces @ 8’-9



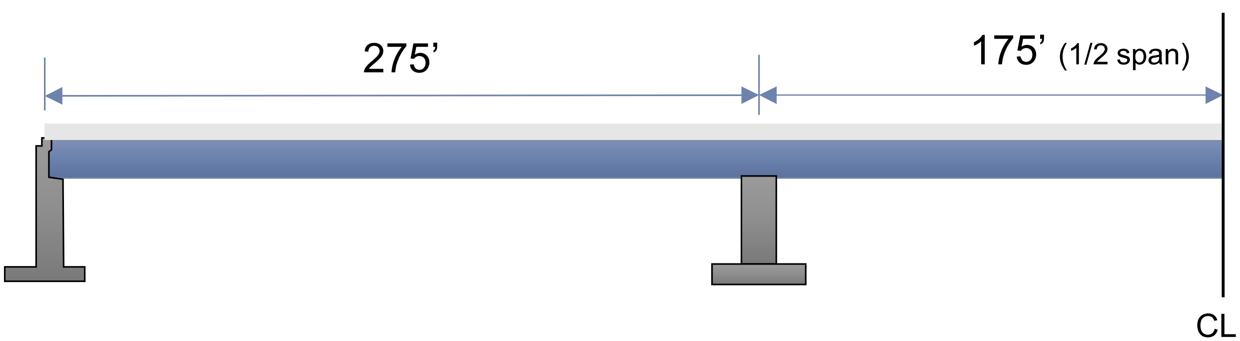

Three or More Spans — 9 ft to 11 ft Girder Spacing
65 psf of deck (55-71 psf)
Steel weight per square foot of bridge deck surface (psf)
90
80
70
60
50
40
30
20
10
0
50
75
100
110
125
135
150
165
175
200
220
250
275
300
325
350
375
Span (ft)
Trendline

Option #3 - Results

3.) Three Spans – Continuous

- Estimated weight per area = 65 psf
- Total estimated superstructure weight = 36,000 sf

  x 65 psf = 2,340,000 lb
- Estimated unit cost for fabricated steel FOB = $2.00/lb
- Total estimated superstructure cost = $4.68 million



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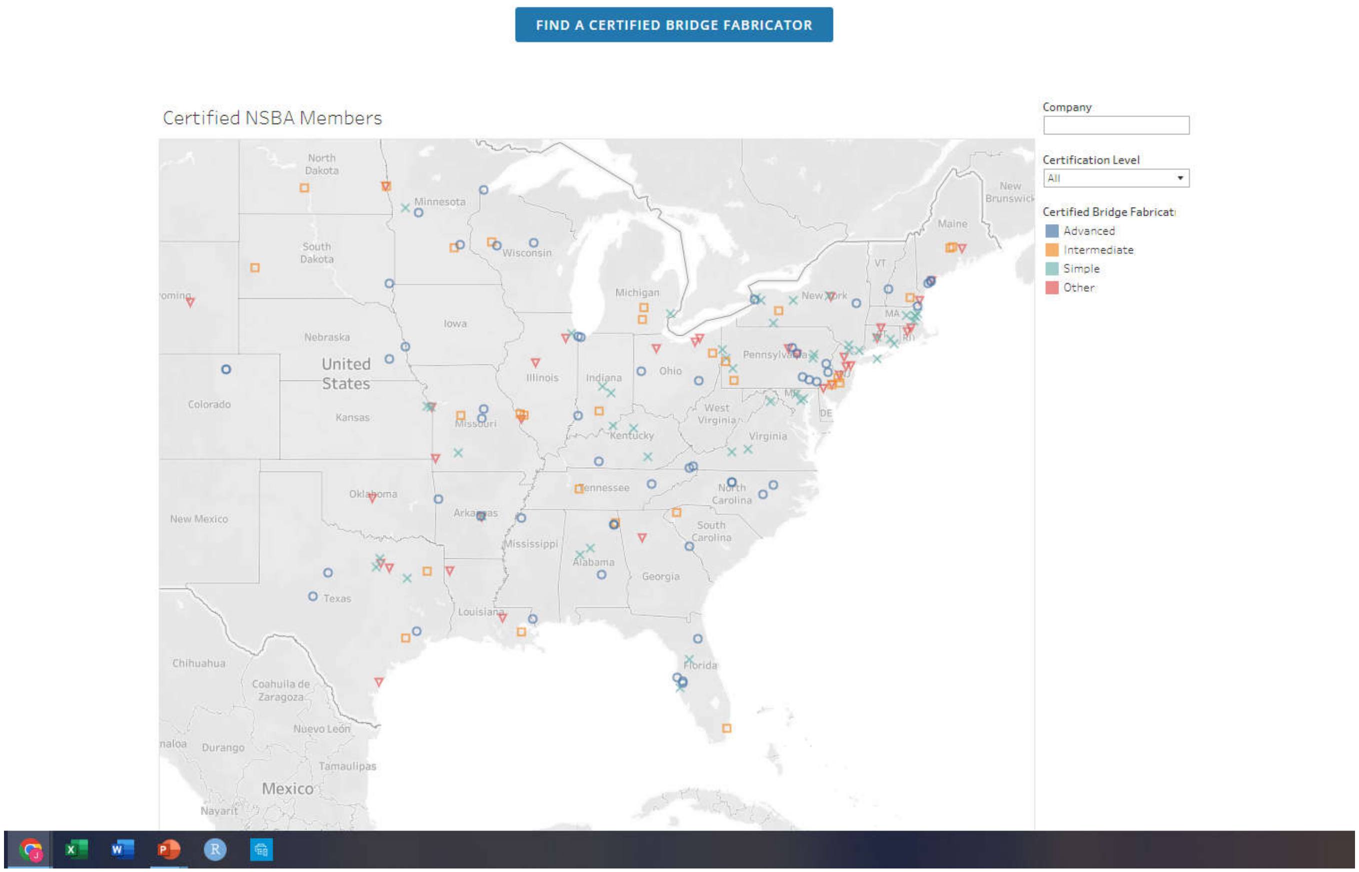
Summary Of Weight/Span Curve Options

	#1 – 6 Spans (SS)	#2 – 4 Spans (Cont)	#3 – 3 Spans (Cont.)
Average unit weight (psf)	34	44	65
Total superstructure weight (lb)	1,224,000	1,584,000	2,340,000
Estimated cost per pound	$2.00	$2.00	$2.00
Estimated superstructure cost ($)	2.45 M	3.17 M	4.68 M
# of girder lines	4	4	5
# of piers in river	5	3	2

Where To Get Pricing Information



aisc.org/certifiedbridgemembers

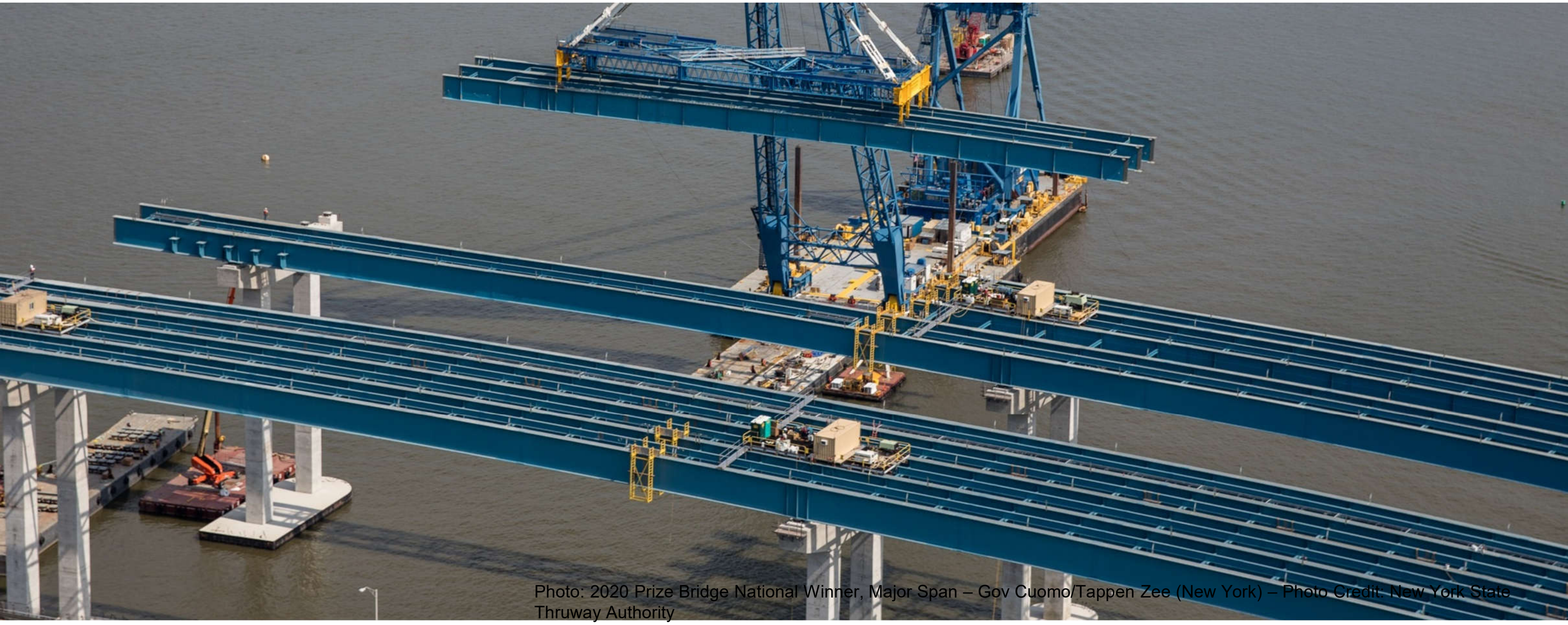


Photo: 2020 Prize Bridge National Winner, Major Span – Gov Cuomo/Tappen Zee (New York) – Photo Credit: New York State Thruway Authority

Option #1 – Weight to Span Charts vs 1-Span Standards

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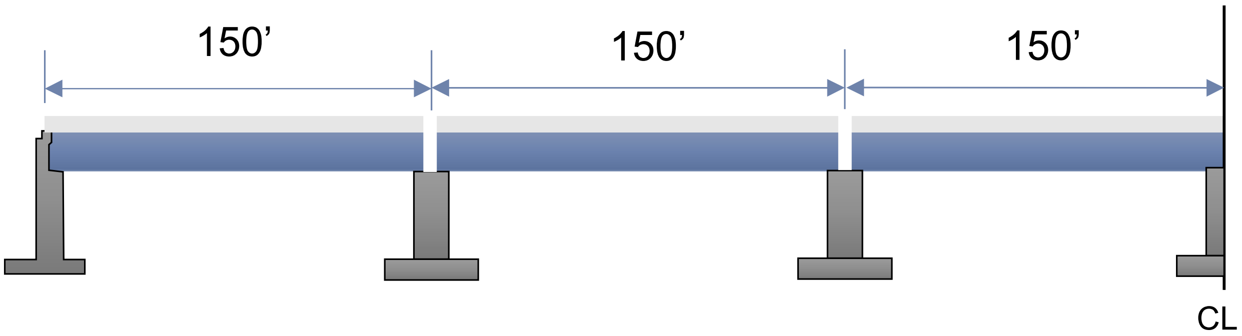
Option #1 – NSBA Bridge Standards

	Weight/Span Charts	1 Span Standards
Average unit weight (psf)	34	
Total superstructure weight (lb)	1,224,000	
# of piers in river	5	



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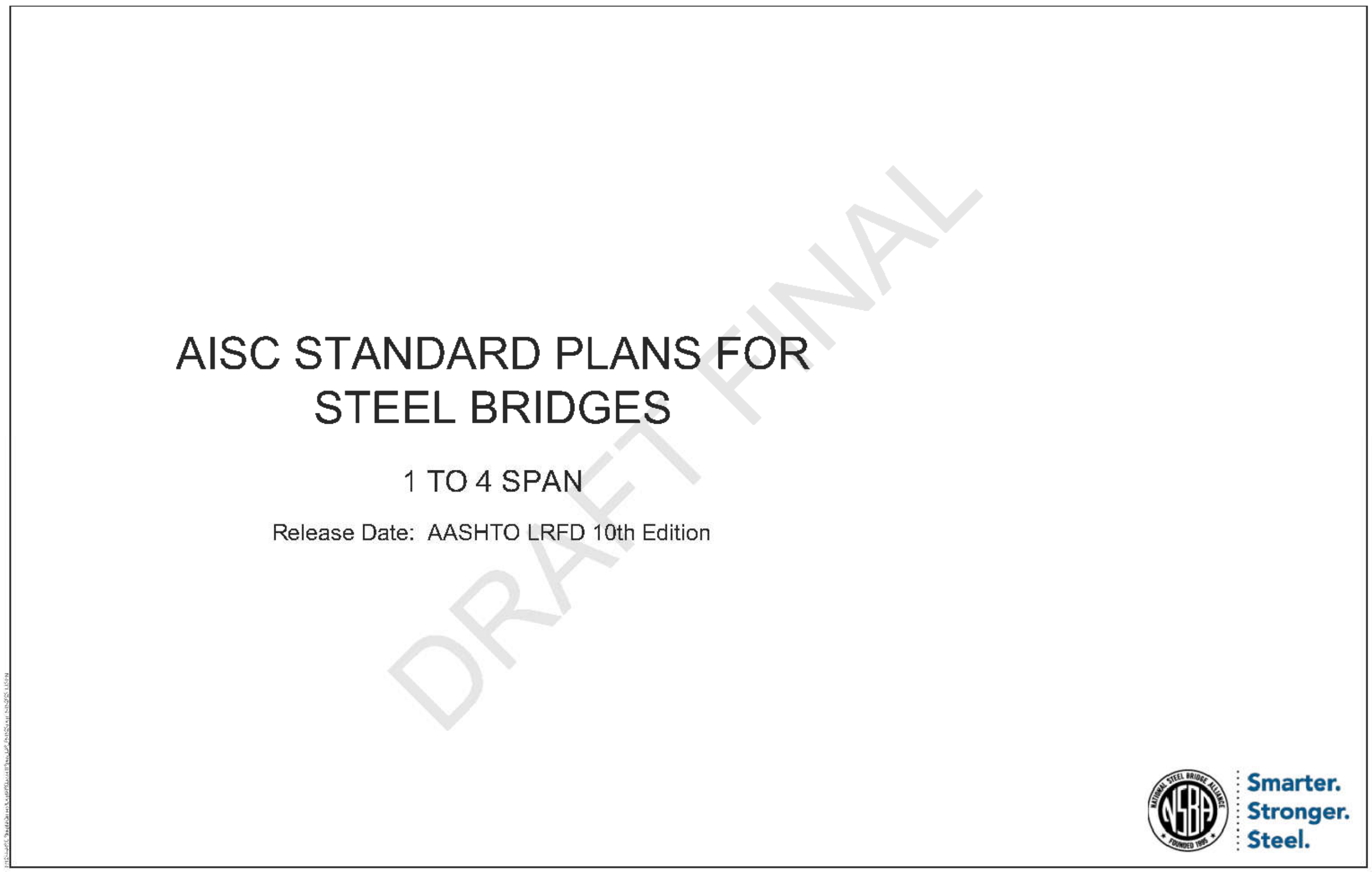
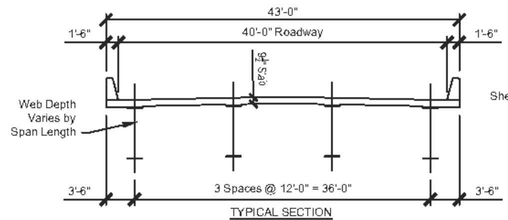
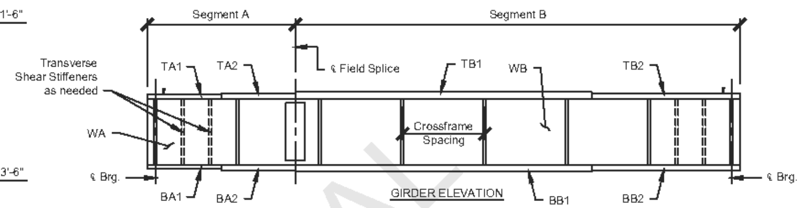
Option #1 – NSBA Bridge Standards



Option #1 – NSBA Bridge Standards





Span, ft.	SEGMENT A					SEGMENT B					Additional Footnotes
	Web A (in. x in. x ft.)	TA1 (in. x in. x ft.)	TA2 (in. x in. x ft.)	BA1 (in. x in. x ft.)	BA2 (in. x in. x ft.)	Web B (in. x in. x ft.)	TB1 (in. x in. x ft.)	TB2 (in. x in. x ft.)	BB1 (in. x in. x ft.)	BB2 (in. x in. x ft.)	
150	59 x 0.625 x 38	N/A	21 x 1.5 x 38	22 x 1 x 26	22 x 2 x 12	59 x 0.625 x 112	21 x 1.5 x 77	21 x 1 x 35	24 x 2 x 87	24 x 1 x 25	N/A
160	64 x 0.625 x 40	N/A	22 x 1.5 x 40	24 x 1 x 30	24 x 2 x 10	64 x 0.625 x 120	22 x 1.5 x 85	22 x 1 x 35	24 x 2 x 85	24 x 1.25 x 35	N/A
170	70 x 0.625 x 43	N/A	23 x 1.5 x 43	24 x 1.25 x 33	24 x 2 x 10	70 x 0.625 x 127	23 x 1.5 x 87	23 x 1 x 40	24 x 2 x 90	24 x 1.25 x 37	N/A
180	77 x 0.625 x 45	N/A	24 x 1 x 45	24 x 1.25 x 35	24 x 2 x 10	77 x 0.625 x 135	24 x 1.5 x 90	24 x 1 x 45	24 x 2 x 95	24 x 1.25 x 40	N/A
190	80 x 0.75 x 50	N/A	23 x 1 x 50	26 x 1.5 x 40	26 x 2 x 10	80 x 0.75 x 140	23 x 1.5 x 90	23 x 1 x 50	26 x 2 x 85	26 x 1.5 x 55	N/A
200	86 x 0.75 x 60	22 x 1 x 45	22 x 1.75 x 15	26 x 1.25 x 40	26 x 2.25 x 20	86 x 0.75 x 140	22 x 1.75 x 95	22 x 1 x 45	26 x 2.25 x 100	26 x 1.25 x 40	N/A
210	88 x 0.75 x 70	22 x 1 x 40	22 x 1.5 x 30	28 x 1.25 x 50	28 x 2.5 x 20	88 x 0.75 x 140	24 x 1.5 x 95	24 x 1 x 45	28 x 2.5 x 85	28 x 1.5 x 55	N/A

Note: All plates are A709 - 50W

Footnotes:

a. AASHTO DF equations were used with girder stiffness and / or span length exceeding AASHTO limits. Check with refined analysis.

b. Lateral bracing required for deck casting stability and / or wind loads. See "Lateral Bracing Details" sheet.

Span ft.	Stiffener Data Table				
	Transverse Stiffener Size and Location			Bearing Stiffener	
	Width in.	Thickness in.	Location ft.	Width in.	Thickness in.
150				9.75	0.875
160	6	0.5	8, 152	10.25	1
170	6	0.5	8.75, 26.25, 143.75, 161.25	10.75	1
180	6	0.5	9.5, 28.75, 45, 132, 151.25, 170.5	11.25	1
190				10.5	1
200				10	0.875
210	7	0.5	11, 199	10	1

Span, ft.	GIRDER WEIGHT TABLE		
	Segment A tons	Segment B tons	Total tons
150	6.29	20.53	26.82
160	7.01	22.98	29.99
170	8.23	25.36	33.59
180	8.13	28.20	36.33
190	10.60	32.70	43.30
200	13.45	35.44	48.89
210	16.40	37.43	53.83

Note: Girder weight is total weight of web and flanges only, measured between CL brg at each end. Does not include girder extension at end bearings, stiffeners, shear studs, bracing, or any other allowances

Crossframe Spacing		
Span, ft	Spacing, ft.	Type
150	25	K frame
160	26.67	K frame
170	28.33	K frame
180	30	K frame
190	23.75	K frame
200	25	K frame
210	26.25	K frame

Span, ft.	Reaction Data			
	DC kips	DW kips	Truck kips	Lane kips
150	165	18	104	55
160	178	19	104	59
170	191	20	104	63
180	202	22	104	66
190	218	23	104	69
200	233	24	104	73
210	248	25	104	77

Note: Truck and lane reactions include distribution factors, skew correction, and impact on the truck loading

SINGLE SPAN 150-210 FT
12 FT SPACING

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Option #1 – NSBA Bridge Standards

TYPICAL SECTION

Span, ft.	SEGMENT A					
	Web A (in. x in. x ft.)	TA1 (in. x in. x ft.)	TA2 (in. x in. x ft.)	BA1 (in. x in. x ft.)	BA2 (in. x in. x ft.)	Web
150	59 x 0.625 x 38	N/A	21 x 1.5 x 38	22 x 1 x 26	22 x 2 x 12	59
160	64 x 0.625 x 40	N/A	22 x 1.5 x 40	24 x 1 x 30	24 x 2 x 10	64
170	70 x 0.625 x 43	N/A	23 x 1.5 x 43	24 x 1.25 x 33	24 x 2 x 10	70
180	77 x 0.625 x 45	N/A	24 x 1 x 45	24 x 1.25 x 35	24 x 2 x 10	77
190	80 x 0.75 x 50	N/A	23 x 1 x 50	26 x 1.5 x 40	26 x 2 x 10	8
200	86 x 0.75 x 60	22 x 1 x 45	22 x 1.75 x 15	26 x 1.25 x 40	26 x 2.25 x 20	8

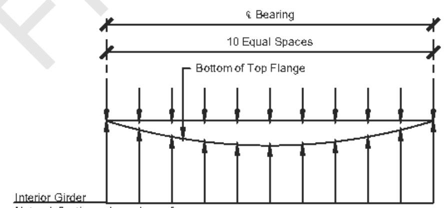
Span, ft.	GIRDER WEIGHT TABLE		
	Segment A tons	Segment B tons	Total tons
150	6.29	20.53	26.82
160	7.01	22.98	29.99
170	8.23	25.36	33.59
180	8.13	28.20	36.33
190	10.60	32.70	43.30

C
Span, ft
150
160
170
180
190

Option #1 – NSBA Bridge Standards

Deflection Summaries - Tenth Points Shown											
Tenth Points and Deflection, in.											
	0.0	**0.1**	**0.2**	**0.3**	**0.4**	**0.5**	**0.6**	**0.7**	**0.8**	**0.9**	**1.0**
150 ft. span - steel only, in.	0.00	0.61	1.13	1.54	1.79	1.88	1.80	1.55	1.15	0.62	0.00
slab, in.	0.00	2.48	4.61	6.25	7.29	7.66	7.32	6.31	4.70	2.54	0.00
barrier rails, in.	0.00	0.26	0.48	0.65	0.75	0.79	0.75	0.65	0.48	0.26	0.00
150 ft. span - total, in.	**0.00**	**3.34**	**6.23**	**8.43**	**9.84**	**10.33**	**9.87**	**8.50**	**6.33**	**3.42**	**0.00**
160 ft. span - steel only, in.	0.00	0.67	1.25	1.70	1.99	2.09	2.00	1.72	1.28	0.69	0.00
slab, in.	0.00	2.62	4.89	6.65	7.77	8.17	7.82	6.75	5.04	2.71	0.00
barrier rails, in.	0.00	0.28	0.53	0.71	0.83	0.87	0.83	0.72	0.53	0.28	0.00
160 ft. span - total, in.	**0.00**	**3.57**	**6.67**	**9.06**	**10.58**	**11.13**	**10.65**	**9.18**	**6.85**	**3.68**	**0.00**
170 ft. span - steel only, in.	0.00	0.72	1.34	1.83	2.14	2.25	2.16	1.86	1.38	0.74	0.00
slab, in.	0.00	2.67	5.01	6.83	8.00	8.42	8.06	6.96	5.19	2.80	0.00
barrier rails, in.	0.00	0.30	0.55	0.75	0.88	0.93	0.89	0.76	0.56	0.30	0.00
170 ft. span - total, in.	**0.00**	**3.68**	**6.91**	**9.42**	**11.02**	**11.60**	**11.10**	**9.58**	**7.14**	**3.84**	**0.00**
180 ft. span - steel only, in.	0.00	0.78	1.46	1.97	2.28	2.39	2.28	1.96	1.46	0.78	0.00
slab, in.	0.00	2.85	5.30	7.13	8.27	8.66	8.26	7.12	5.30	2.85	0.00
barrier rails, in.	0.00	0.31	0.58	0.79	0.92	0.97	0.92	0.79	0.59	0.32	0.00
180 ft. span - total, in.	**0.00**	**3.94**	**7.34**	**9.88**	**11.47**	**12.01**	**11.47**	**9.87**	**7.34**	**3.95**	**0.00**
190 ft. span - steel only, in.	0.00	0.95	1.78	2.40	2.79	2.93	2.80	2.41	1.79	0.95	0.00
slab, in.	0.00	3.11	5.81	7.83	9.09	9.53	9.11	7.87	5.85	3.13	0.00
barrier rails, in.	0.00	0.34	0.63	0.86	1.00	1.05	1.01	0.87	0.64	0.34	0.00
190 ft. span - total, in.	**0.00**	**4.39**	**8.22**	**11.09**	**12.88**	**13.51**	**12.91**	**11.15**	**8.28**	**4.42**	**0.00**
200 ft. span - steel only, in.	0.00	1.02	1.88	2.52	2.92	3.05	2.91	2.50	1.86	1.00	0.00
slab, in.	0.00	3.03	5.61	7.49	8.67	9.06	8.64	7.43	5.53	2.99	0.00
barrier rails, in.	0.00	0.35	0.64	0.86	1.00	1.05	1.00	0.86	0.63	0.34	0.00
200 ft. span - total, in.	**0.00**	**4.40**	**8.14**	**10.87**	**12.59**	**13.17**	**12.55**	**10.79**	**8.02**	**4.33**	**0.00**
210 ft. span - steel only, in.	0.00	1.18	2.20	2.95	3.43	3.59	3.43	2.97	2.21	1.18	0.00
slab, in.	0.00	3.38	6.25	8.38	9.71	10.17	9.73	8.41	6.28	3.37	0.00
barrier rails, in.	0.00	0.38	0.70	0.95	1.10	1.15	1.10	0.95	0.71	0.38	0.00
210 ft. span - total, in.	**0.00**	**4.94**	**9.15**	**12.27**	**14.23**	**14.91**	**14.26**	**12.32**	**9.19**	**4.93**	**0.00**

Shear Stud Layout											
Span ft.	Studs per row	Offset in.	Group 1			Group 2			Group 3		
			Spaces	Pitch in.	Length ft.	Spaces	Pitch in.	Length ft.	Spaces	Pitch in.	Length ft.
150	4	0	12	8	8	134	12	134	12	8	8
160	4	0	40	12	40	60	16	80	40	12	40
170	4	4	34	12	34	70	16	93.33	42	12	42
180	4	0	18	12	18	108	16	144	18	12	18
190	4	3	38	15	47.5	63	18	94.5	38	15	47.5
200	4	2	38	16	50.67	59	20	98.33	38	16	50.67
210	4	0	40	16	53.33	62	20	103.33	40	16	53.33



Note: deflection values shown for a typical interior girder

DEFLECTION DIAGRAM

SINGLE SPAN 150-210 FT
12 FT SPACING

Issued January 2023
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Sheet 1 of XX

Option #1 – NSBA Bridge Standards

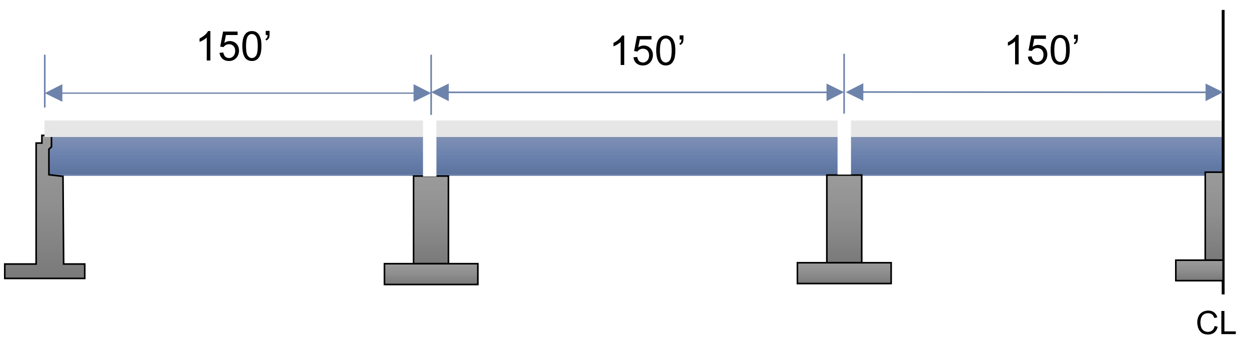
Deflection Summaries - Tenth Points Shown											
Tenth Points and Deflection, in.											
	0.0	**0.1**	**0.2**	**0.3**	**0.4**	**0.5**	**0.6**	**0.7**	**0.8**	**0.9**	**1.0**
150 ft. span - steel only, in.	0.00	0.61	1.13	1.54	1.79	1.88	1.80	1.55	1.15	0.62	0.00
slab, in.	0.00	2.48	4.61	6.25	7.29	7.66	7.32	6.31	4.70	2.54	0.00
barrier rails, in.	0.00	0.26	0.48	0.65	0.75	0.79	0.75	0.65	0.48	0.26	0.00
150 ft. span - total, in.	**0.00**	**3.34**	**6.23**	**8.43**	**9.84**	**10.33**	**9.87**	**8.50**	**6.33**	**3.42**	**0.00**
160 ft. span - steel only, in.	0.00	0.67	1.25	1.70	1.99	2.09	2.00	1.72	1.28	0.69	0.00

Shear Stud Layout											
Span ft.	Studs per row	Offset in.	Group 1			Group 2			Group 3		
			Spaces	Pitch in.	Length ft.	Spaces	Pitch in.	Length ft.	Spaces	Pitch in.	Length ft.
150	4	0	12	8	8	134	12	134	12	8	8
160	4	0	40	12	40	60	16	80	40	12	40
170	4	4	34	12	34	70	16	93.33	42	12	42
180	4	0	18	12	18	108	16	144	18	12	18
190	4	3	38	15	47.5	63	18	94.5	38	15	47.5

Option #1 – NSBA Bridge Standards

1.) Six Spans – Simply Supported

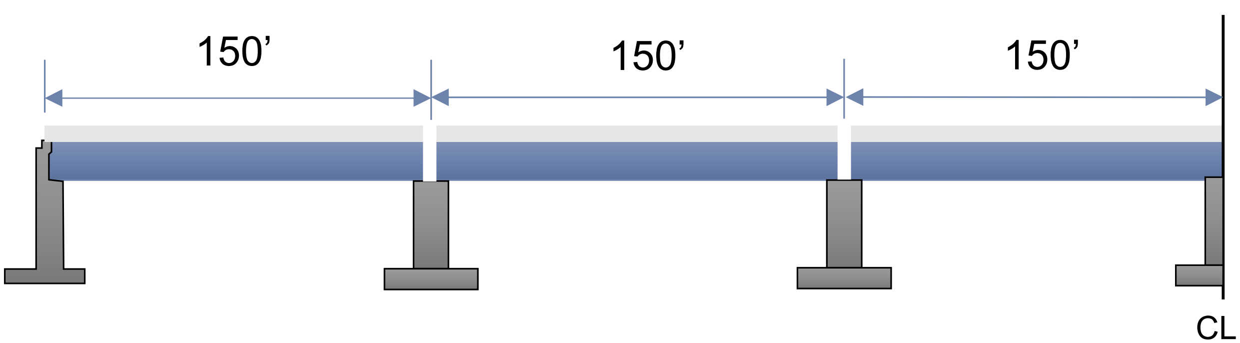
- Girder weight (1) = 27 tons
  - (27 tons) x (4 girder lines) x (6 spans) = 648 tons x 1.04 (4% for cross frames/stiffeners/etc) = 674 tons
  - This is for a 43' bridge width. Therefore, reduce by ~ (43/40) = 7.5%
  - Total estimated superstructure weight = 674 x (1-.075) = 624 tons
- Girder depth: 59" (W) + 1.5" (TF) + 2" (BF) = 62.5 inches
- Equivalent unit weight = (624 tons) x 2000 / 36,000 ft^2 = 34.67 psf



Smarter.
Stronger.
Steel.

Option #1 – NSBA Bridge Standards

	Weight/Span Charts	1 Span Standards
Average unit weight (psf)	34	34.67
Total superstructure weight (lb)	1,224,000	1,248,000
# of piers in river	5	5



Short Span Steel Bridge Alliance

eSPAN140®

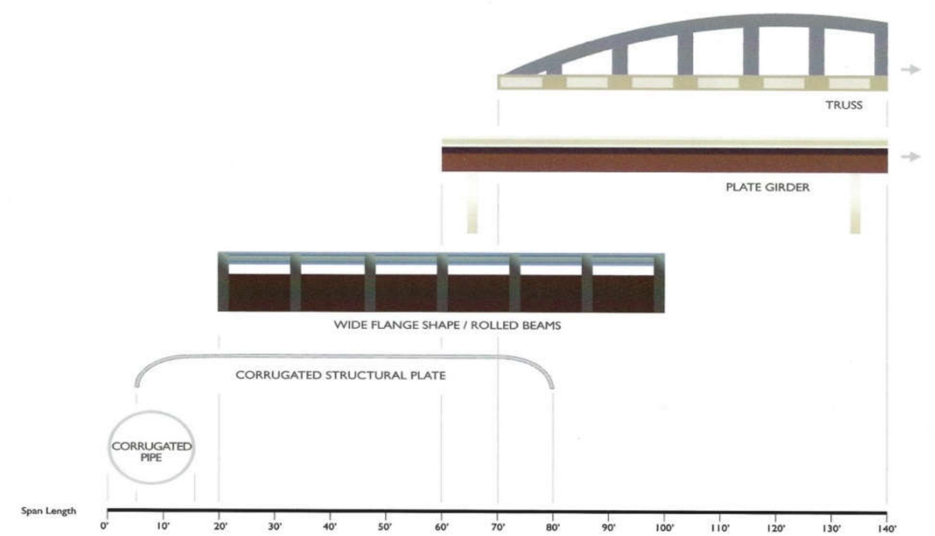
Developed by the Short Span Steel Bridge Alliance.

eSPAN140 is a free web-based design tool which provides customized steel solutions for short span crossings up to 140 feet.

SHORT SPAN STEEL BRIDGE ALLIANCE™

STEEL HAS THE SOLUTION

The Short Span Steel Bridge Alliance (SSSBA) is a group of bridge and buried soil steel structure industry leaders providing essential information on the unique benefits, innovative designs, cost competitiveness and performance related to using steel in short span installations up to 140-ft. in length. For more information on the advantages of working with steel in short span bridge construction, or to become a member, please visit our website.



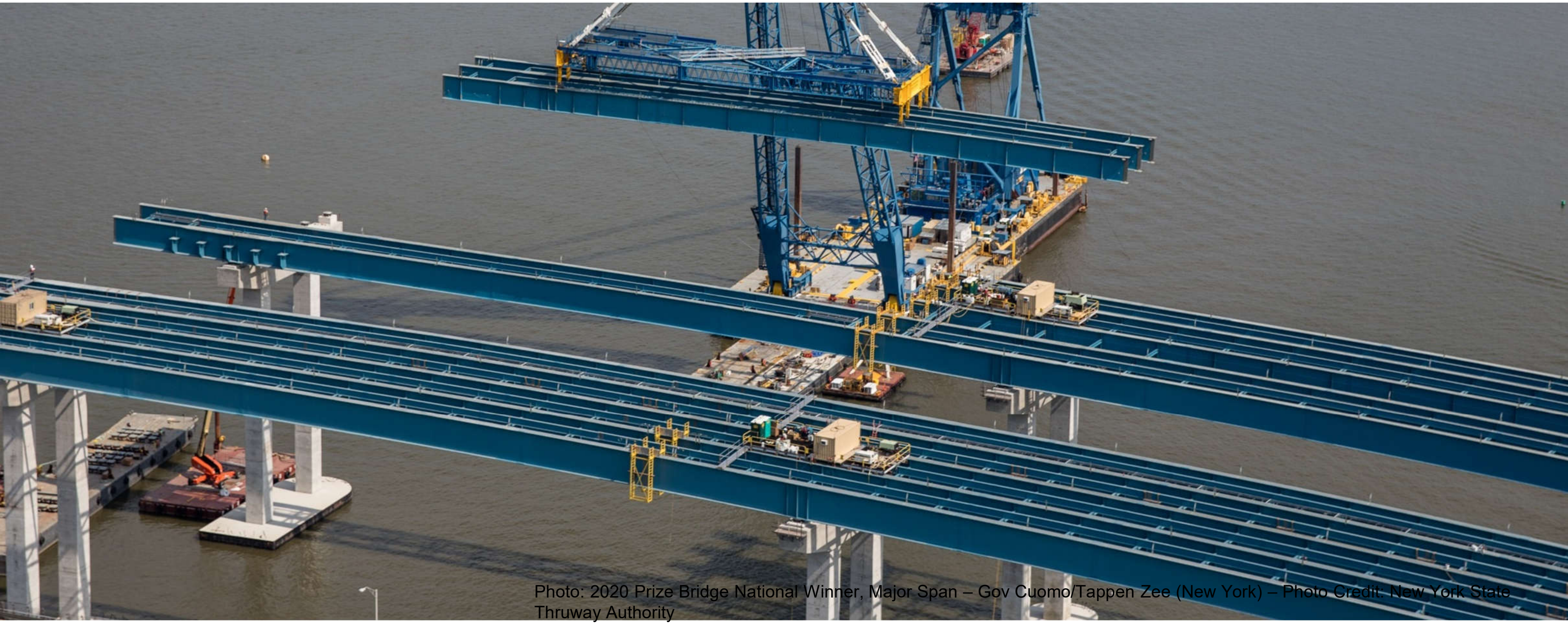


Photo: 2020 Prize Bridge National Winner, Major Span – Gov Cuomo/Tappen Zee (New York) – Photo Credit: New York State Thruway Authority

Option #2 – Weight to Span Charts vs Simon

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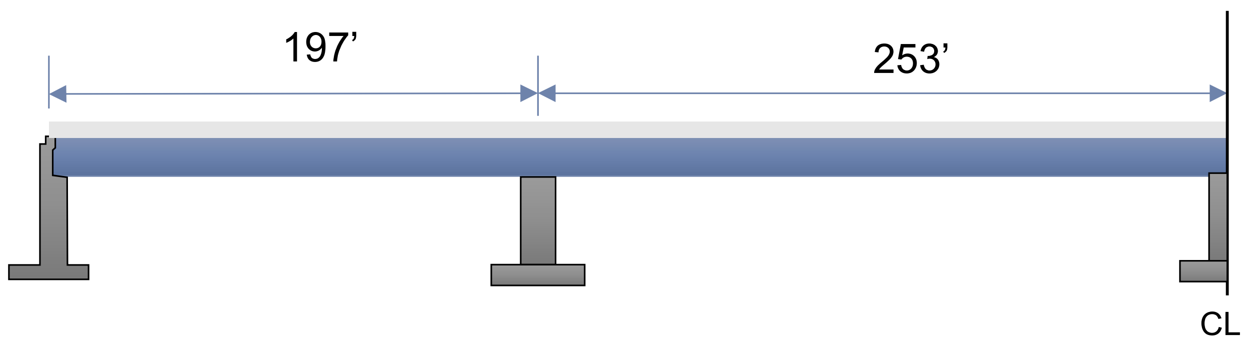
Option #2 – LRFD Simon

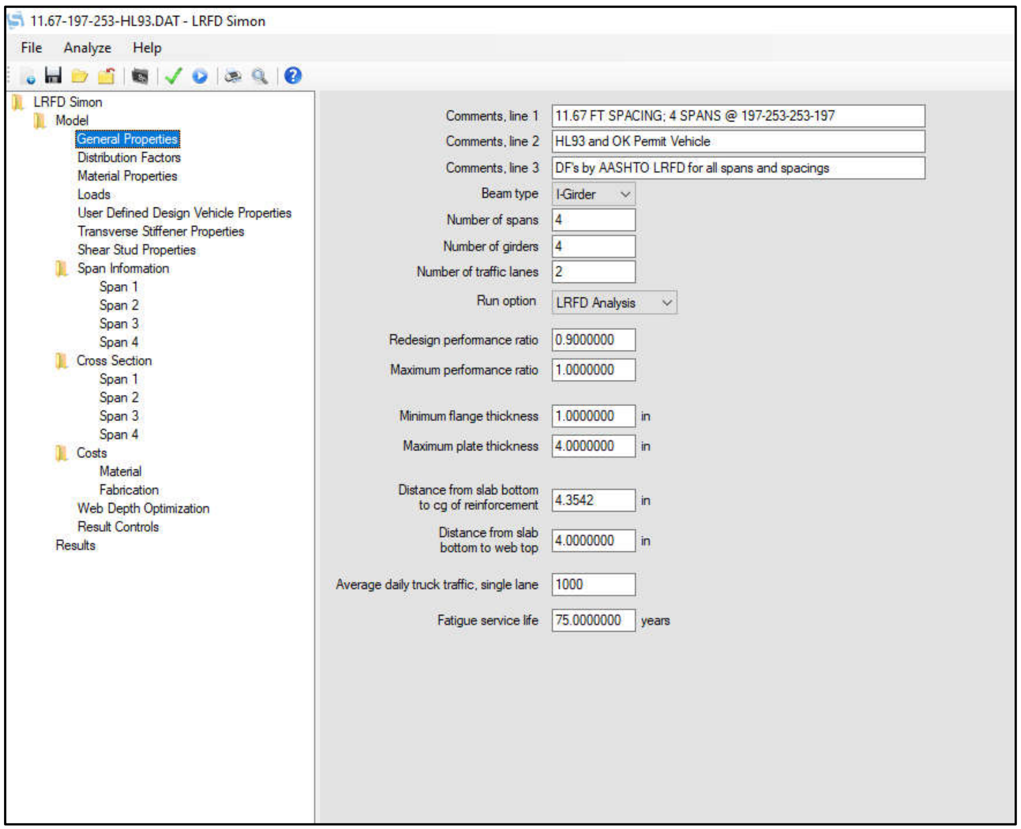
	Weight/Span Charts	Simon
Average unit weight (psf)	44	
Total superstructure weight (lb)	1,584,000	
# of piers in river	3	

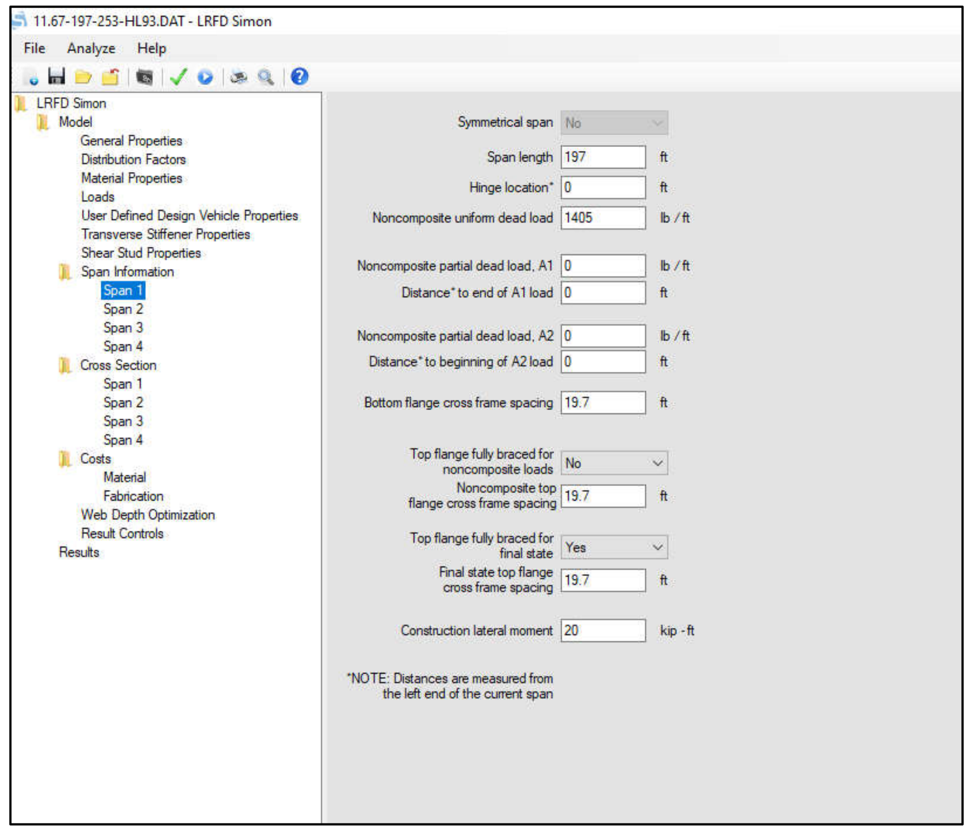


Smarter. Stronger. Steel.

Option #2 – LRFD Simon

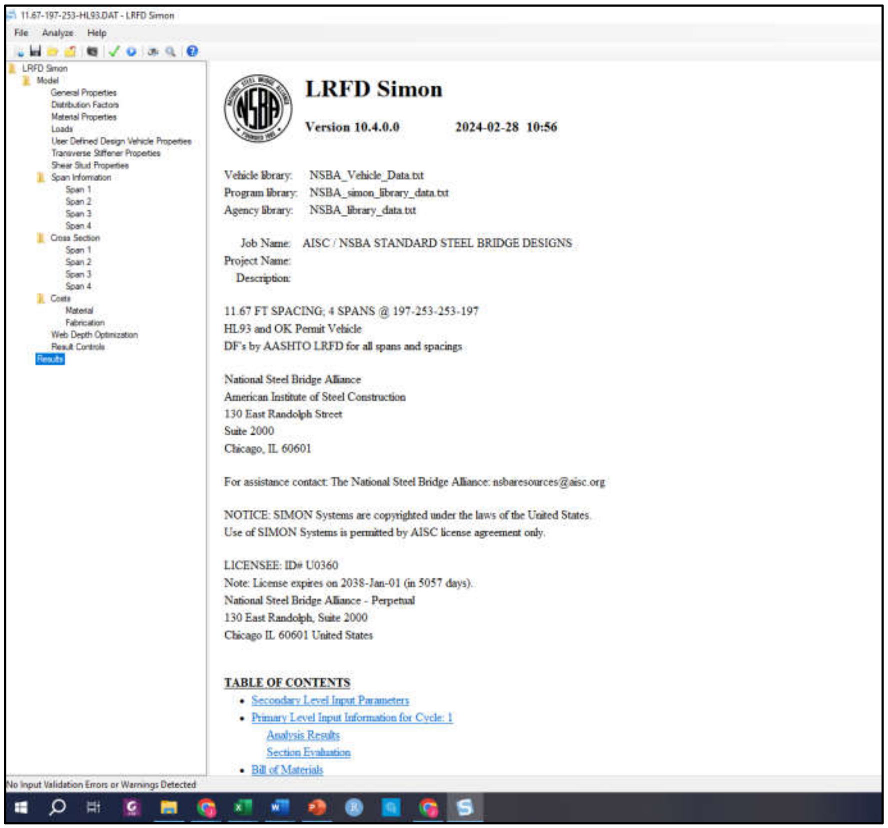
Simon Inputs





Option #2 – LRFD Simon

Simon Results



11.67-197-253-HL93.DAT - LRFD Simon

LRFD Simon

Version 10.4.0.0 **2024-02-28 10:56**

Vehicle library: NSBA_Vehicle_Data.txt
Program library: NSBA_simon_library_data.txt
Agency library: NSBA_library_data.txt

Job Name: AISC / NSBA STANDARD STEEL BRIDGE DESIGNS
Project Name:
Description:

11.67 FT SPACING; 4 SPANS @ 197-253-253-197
HL93 and OK Permit Vehicle
DF's by AASHTO LRFD for all spans and spacings

National Steel Bridge Alliance
American Institute of Steel Construction
130 East Randolph Street
Suite 2000
Chicago, IL 60601

For assistance contact: The National Steel Bridge Alliance: nsbaresources@aisc.org

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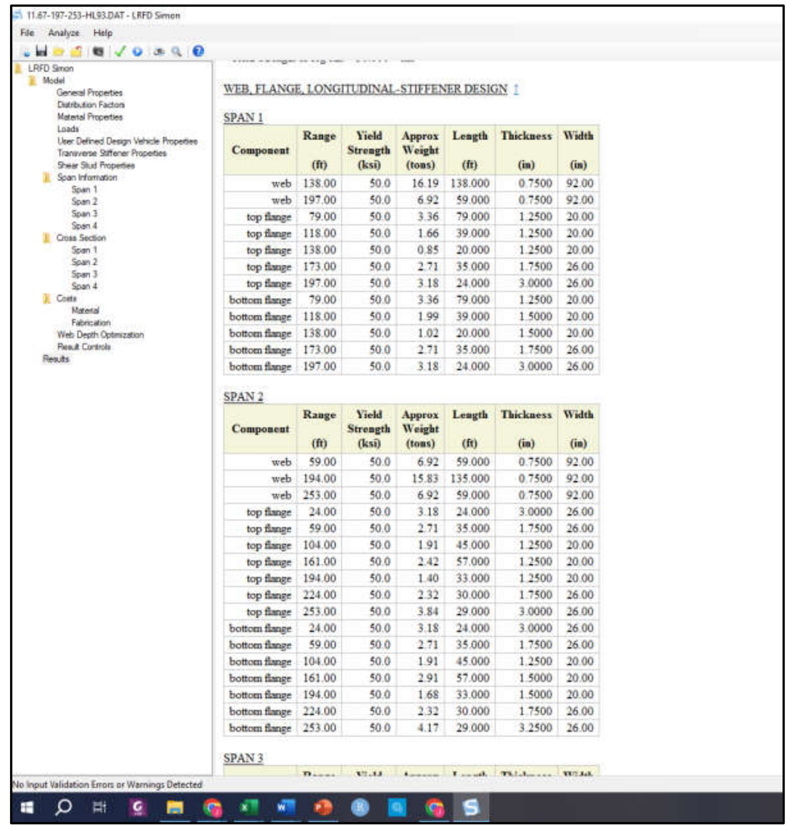
National Steel Bridge Alliance - Perpetual
130 East Randolph, Suite 2000
Chicago IL 60601 United States

TABLE OF CONTENTS

- Secondary Level Input Parameters
- Primary Level Input Information for Cycle: 1
  - Analysis Results
  - Section Evaluation
- Bill of Materials

No Input Validation Errors or Warnings Detected



11.67-197-253-HL93.DAT - LRFD Simon

WEB, FLANGE, LONGITUDINAL-STIFFENER DESIGN

SPAN 1

Component	Range (ft)	Yield Strength (ksi)	Approx Weight (tons)	Length (ft)	Thickness (in)	Width (in)
web	138.00	50.0	16.19	138.000	0.7500	92.00
web	197.00	50.0	6.92	59.000	0.7500	92.00
top flange	79.00	50.0	3.36	79.000	1.2500	20.00
top flange	118.00	50.0	1.66	39.000	1.2500	20.00
top flange	138.00	50.0	0.85	20.000	1.2500	20.00
top flange	173.00	50.0	2.71	35.000	1.7500	26.00
top flange	197.00	50.0	3.18	24.000	3.0000	26.00
bottom flange	79.00	50.0	3.36	79.000	1.2500	20.00
bottom flange	118.00	50.0	1.99	39.000	1.5000	20.00
bottom flange	138.00	50.0	1.02	20.000	1.5000	20.00
bottom flange	173.00	50.0	2.71	35.000	1.7500	26.00
bottom flange	197.00	50.0	3.18	24.000	3.0000	26.00

SPAN 2

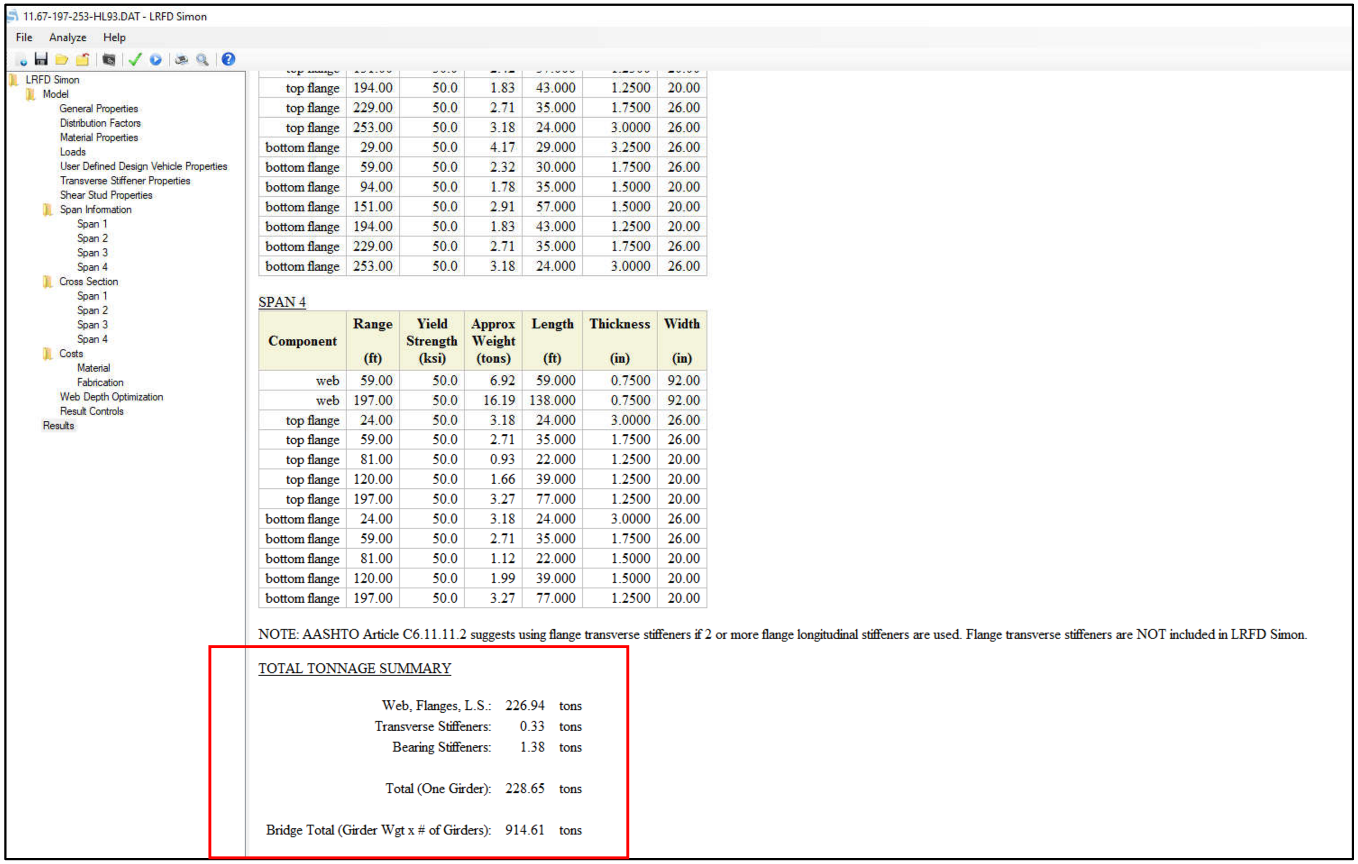
Component	Range (ft)	Yield Strength (ksi)	Approx Weight (tons)	Length (ft)	Thickness (in)	Width (in)
web	59.00	50.0	6.92	59.000	0.7500	92.00
web	194.00	50.0	15.83	135.000	0.7500	92.00
web	253.00	50.0	6.92	59.000	0.7500	92.00
top flange	24.00	50.0	3.18	24.000	3.0000	26.00
top flange	59.00	50.0	2.71	35.000	1.7500	26.00
top flange	104.00	50.0	1.91	45.000	1.2500	20.00
top flange	161.00	50.0	2.42	57.000	1.2500	20.00
top flange	194.00	50.0	1.40	33.000	1.2500	20.00
top flange	224.00	50.0	2.32	30.000	1.7500	26.00
top flange	253.00	50.0	3.84	29.000	3.0000	26.00
bottom flange	24.00	50.0	3.18	24.000	3.0000	26.00
bottom flange	59.00	50.0	2.71	35.000	1.7500	26.00
bottom flange	104.00	50.0	1.91	45.000	1.2500	20.00
bottom flange	161.00	50.0	2.91	57.000	1.5000	20.00
bottom flange	194.00	50.0	1.68	33.000	1.5000	20.00
bottom flange	224.00	50.0	2.32	30.000	1.7500	26.00
bottom flange	253.00	50.0	4.17	29.000	3.2500	26.00

SPAN 3

No Input Validation Errors or Warnings Detected

Option #2 – LRFD Simon

Simon Results



top flange	194.00	50.0	1.83	43.000	1.2500	20.00
top flange	229.00	50.0	2.71	35.000	1.7500	26.00
top flange	253.00	50.0	3.18	24.000	3.0000	26.00
bottom flange	29.00	50.0	4.17	29.000	3.2500	26.00
bottom flange	59.00	50.0	2.32	30.000	1.7500	26.00
bottom flange	94.00	50.0	1.78	35.000	1.5000	20.00
bottom flange	151.00	50.0	2.91	57.000	1.5000	20.00
bottom flange	194.00	50.0	1.83	43.000	1.2500	20.00
bottom flange	229.00	50.0	2.71	35.000	1.7500	26.00
bottom flange	253.00	50.0	3.18	24.000	3.0000	26.00

SPAN 4

Component	Range (ft)	Yield Strength (ksi)	Approx Weight (tons)	Length (ft)	Thickness (in)	Width (in)
web	59.00	50.0	6.92	59.000	0.7500	92.00
web	197.00	50.0	16.19	138.000	0.7500	92.00
top flange	24.00	50.0	3.18	24.000	3.0000	26.00
top flange	59.00	50.0	2.71	35.000	1.7500	26.00
top flange	81.00	50.0	0.93	22.000	1.2500	20.00
top flange	120.00	50.0	1.66	39.000	1.2500	20.00
top flange	197.00	50.0	3.27	77.000	1.2500	20.00
bottom flange	24.00	50.0	3.18	24.000	3.0000	26.00
bottom flange	59.00	50.0	2.71	35.000	1.7500	26.00
bottom flange	81.00	50.0	1.12	22.000	1.5000	20.00
bottom flange	120.00	50.0	1.99	39.000	1.5000	20.00
bottom flange	197.00	50.0	3.27	77.000	1.2500	20.00

NOTE: AASHTO Article C6.11.11.2 suggests using flange transverse stiffeners if 2 or more flange longitudinal stiffeners are used. Flange transverse stiffeners are NOT included in LRFD Simon.

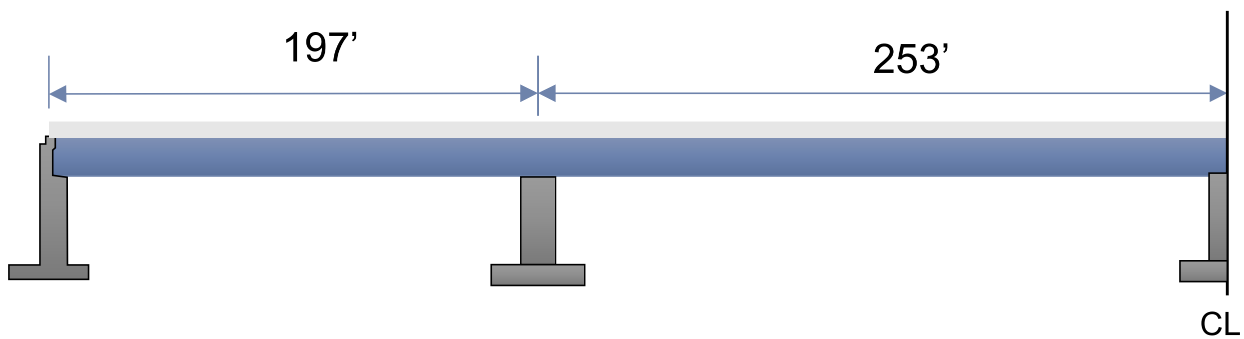
TOTAL TONNAGE SUMMARY

Web, Flanges, L.S.:	226.94	tons
Transverse Stiffeners:	0.33	tons
Bearing Stiffeners:	1.38	tons
Total (One Girder):	228.65	tons
Bridge Total (Girder Wgt x # of Girders):	914.61	tons

Option #2 – LRFD Simon

1.) Four Span - Continous

- Superstructure weight = 915 tons (without crossframes and studs)
  - 915 tons x 1.03 (3% for cross frames/studs/etc) = 943 tons
- Girder depth: 92” (W) + 1.25” (TF) + 1.50” (BF) = 94.75 inches
- Equivalent unit weight = (943 tons) x 2000 / 36,000 sf = 52.39 psf



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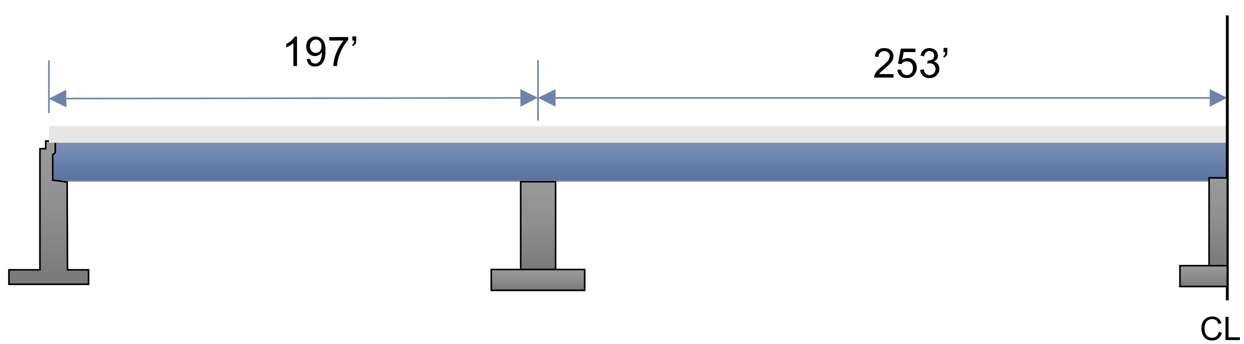
Steel.

Option #2 – LRFD Simon

	Weight/Span Charts	Simon
Average unit weight (psf)	44	52.39
Total superstructure weight (lb)	1,584,000	1,886,000
# of piers in river	3	3



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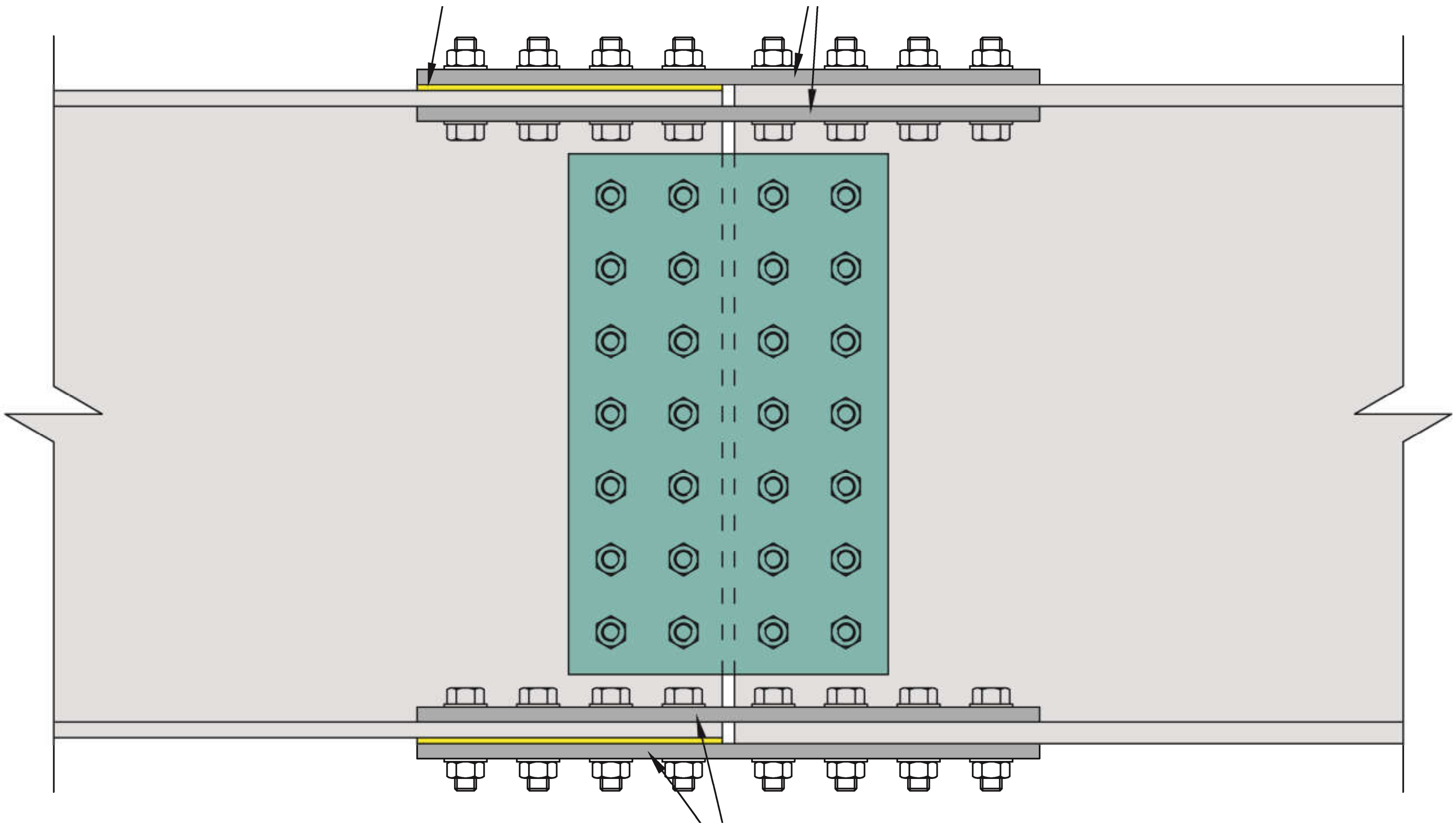
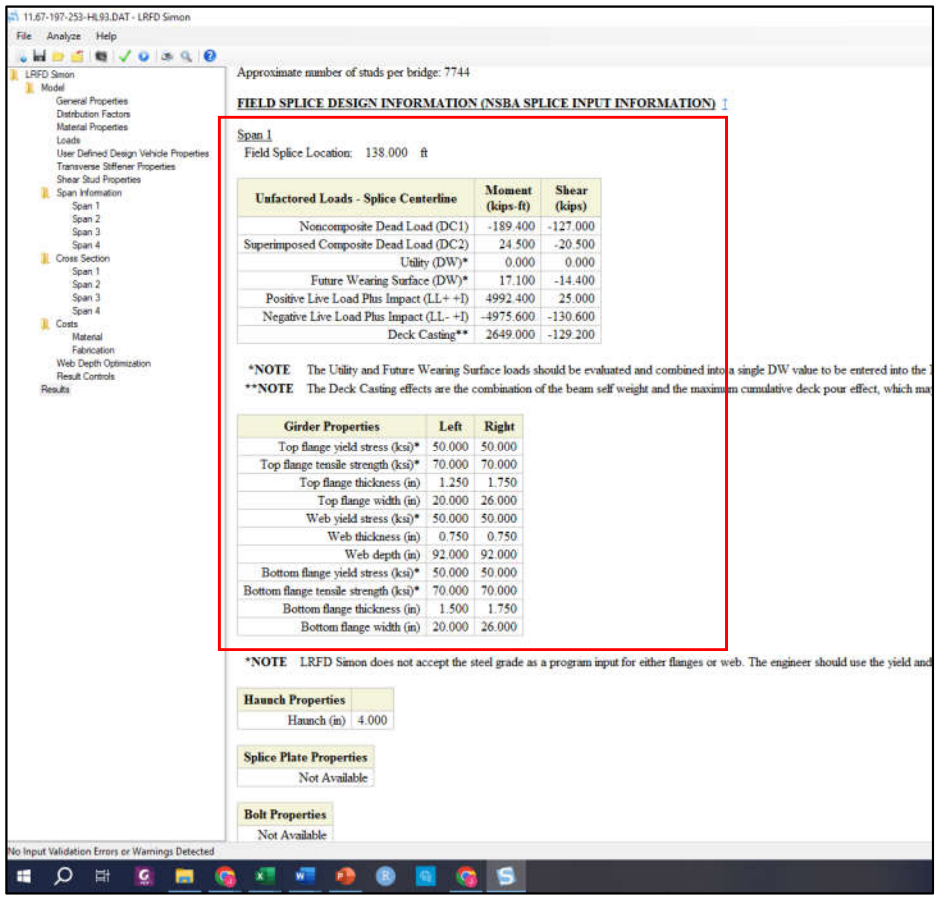
NSBA Splice – Option #2



Option #2 – NSBA Splice

Simon Output
for Splice



Approximate number of studs per bridge: 7744

FIELD SPLICE DESIGN INFORMATION (NSBA SPLICE INPUT INFORMATION)

Span 1

Field Splice Location: 138.000 ft

Unfactored Loads - Splice Centerline	Moment (kips-ft)	Shear (kips)
Noncomposite Dead Load (DC1)	-189.400	-127.000
Superimposed Composite Dead Load (DC2)	24.500	-20.500
Utility (DW)*	0.000	0.000
Future Wearing Surface (DW)*	17.100	-14.400
Positive Live Load Plus Impact (LL+ +I)	4992.400	25.000
Negative Live Load Plus Impact (LL- +I)	-4975.600	-130.600
Deck Casting**	2649.000	-129.200

*NOTE The Utility and Future Wearing Surface loads should be evaluated and combined into a single DW value to be entered into the

**NOTE The Deck Casting effects are the combination of the beam self weight and the maximum cumulative deck pour effect, which ma

Girder Properties	Left	Right
Top flange yield stress (ksi)*	50.000	50.000
Top flange tensile strength (ksi)*	70.000	70.000
Top flange thickness (in)	1.250	1.750
Top flange width (in)	20.000	26.000
Web yield stress (ksi)*	50.000	50.000
Web thickness (in)	0.750	0.750
Web depth (in)	92.000	92.000
Bottom flange yield stress (ksi)*	50.000	50.000
Bottom flange tensile strength (ksi)*	70.000	70.000
Bottom flange thickness (in)	1.500	1.750
Bottom flange width (in)	20.000	26.000

*NOTE LRFD Simon does not accept the steel grade as a program input for either flanges or web. The engineer should use the yield and

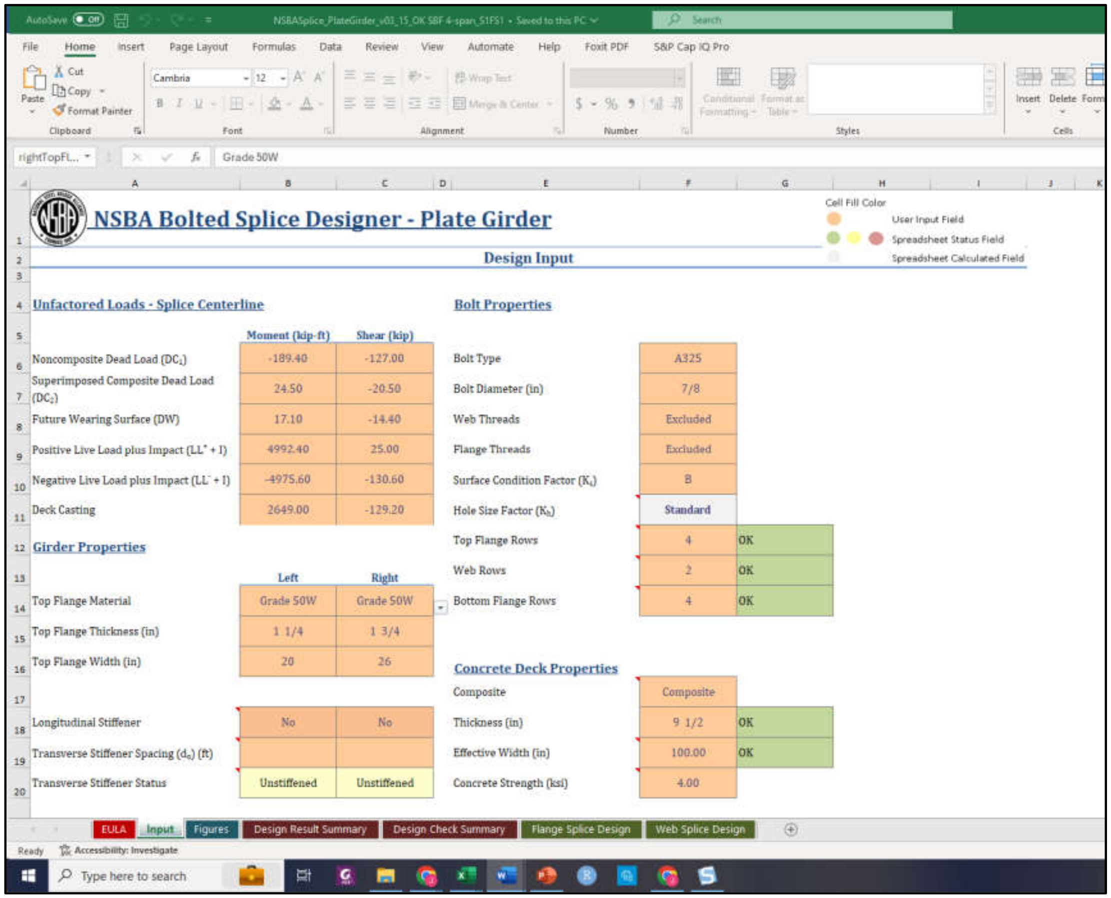
Haunch Properties	
Haunch (in)	4.000

Splice Plate Properties
Not Available

Bolt Properties
Not Available

Option #2 – NSBA Splice

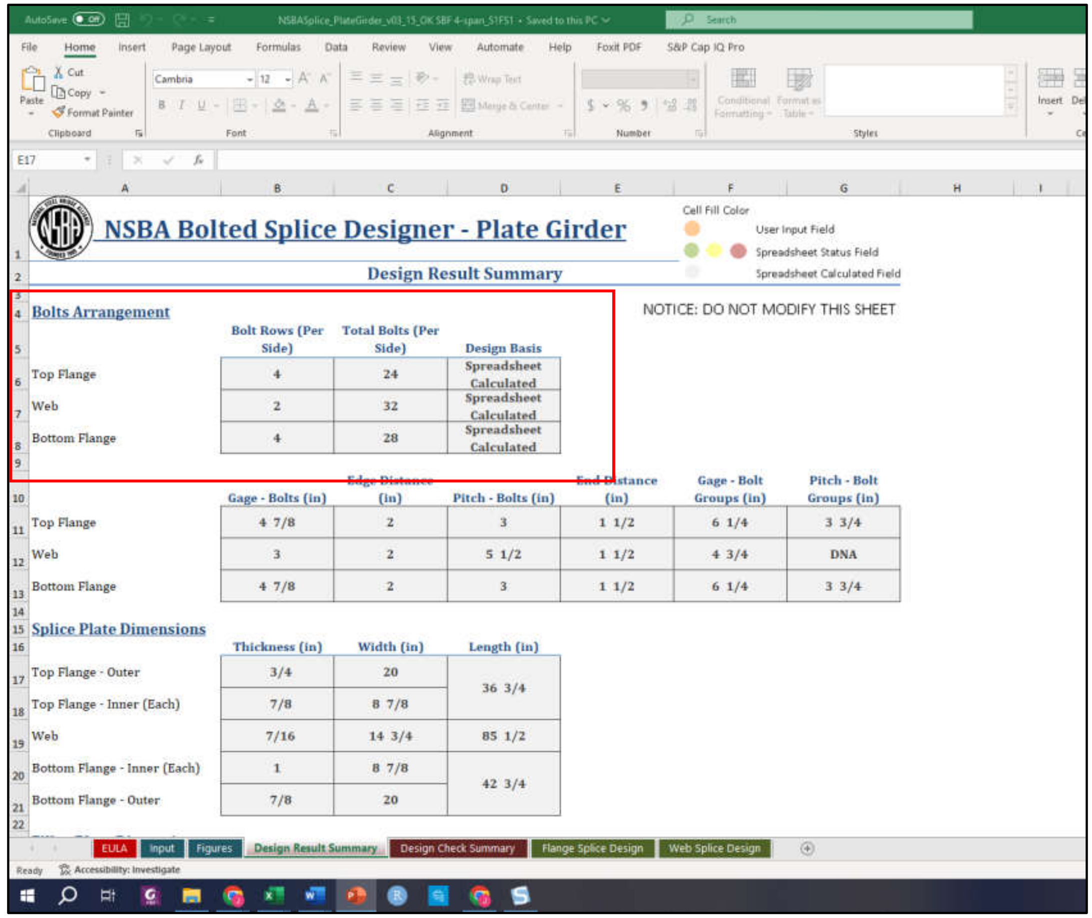
Splice Input



Option #2 – NSBA Splice

Splice Result

- Top Flange: 48 bolts
  (24 per side)
- Bottom Flange: 56 bolts
  (28 per side)
- Web: 64 bolts
  (32 per side)



NSBA Bolted Splice Designer - Plate Girder

Design Result Summary

Cell Fill Color: User Input Field; Spreadsheet Status Field; Spreadsheet Calculated Field

NOTICE: DO NOT MODIFY THIS SHEET

Bolts Arrangement

	Bolt Rows (Per Side)	Total Bolts (Per Side)	Design Basis
Top Flange	4	24	Spreadsheet Calculated
Web	2	32	Spreadsheet Calculated
Bottom Flange	4	28	Spreadsheet Calculated

	Gage - Bolts (in)	Edge Distance (in)	Pitch - Bolts (in)	End Distance (in)	Gage - Bolt Groups (in)	Pitch - Bolt Groups (in)
Top Flange	4 7/8	2	3	1 1/2	6 1/4	3 3/4
Web	3	2	5 1/2	1 1/2	4 3/4	DNA
Bottom Flange	4 7/8	2	3	1 1/2	6 1/4	3 3/4

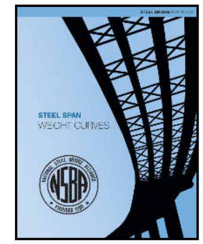
Splice Plate Dimensions

	Thickness (in)	Width (in)	Length (in)
Top Flange - Outer	3/4	20	36 3/4
Top Flange - Inner (Each)	7/8	8 7/8	
Web	7/16	14 3/4	85 1/2
Bottom Flange - Inner (Each)	1	8 7/8	42 3/4
Bottom Flange - Outer	7/8	20	

Summary of the Tools

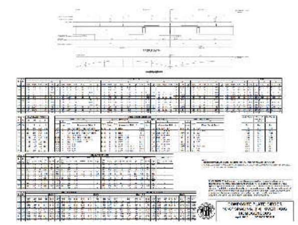
Span Weight Curves

- Quickest, superstructure steel weight



Span Standards

- Quick, superstructure steel weight + plates sizes (1, 2, 3, & 4 span configurations)



LRFD Simon

- Line girder analysis software, any span config, design & analysis, web optimization

NSBA Splice

- Excel spreadsheet and design guide to be used for steel I-girder bolted splice design

Where To Get NSBA Tools & Resources

Span to Weight Curves

- aisc.org/spanweightcurves

Span Standards

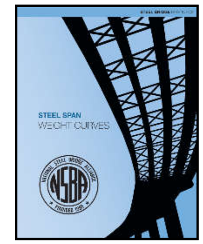
- aisc.org/nsba/design-and-estimation-resources/standard-bridge-plans/

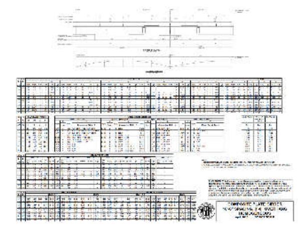
LRFD Simon

- aisc.org/simon

NSBA Splice

- aisc.org/nsba-splice





Thank You

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www.aisc.org/nsba/

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