Demo Copy - some information was not included to reduce the file size for easy downloading. espan140 **Steel Bridge Solutions** Steel Bridge Example Test Test **Test Member Account** 6/19/2012 10:23 AM

www.ShortSpanSteelBridges.org | www.eSPAN140.com



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eSPAN140 Introduction

About Short Span Steel Bridge Alliance

The Short Span Steel Bridge Alliance (SSSBA) is a group of bridge and culvert industry leaders including steel manufacturers, fabricators, service centers, coaters, researchers, and representatives of related associations and government organizations - 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.



For more information about the SSSBA, please contact:

Daniel R. Snyder

Manager, Business Development Steel Market Development Institute, a Business Unit of AISI 25 Massachusetts Ave, NW Suite 800 Washington, DC 20001 Work Phone: (301) 367-6179 Email: <u>dsnyder@steel.org</u>

For media related information, please contact:

Dianne Newton-Shaw

The Placemaking Group 299 Third Street Oakland, CA 94607 Work Phone: (510) 496-2352 ext 206 Fax: (510) 238-0589 Email: <u>dnshaw@placemakinggroup.com</u>

Design Support

The Short Span Steel Bridge Alliance offers complimentary design support for questions relating to bridge and culvert design. Design support is offered by the following organizations (to submit an inquiry, please visit <u>www.ShortSpanSteelBridges.org</u> and click on the "Bridge Technology Center" link on the homepage):

Standard Design and Details of Short Span Bridges (Plate Girder & Rolled Beam Bridges)

The Bridge Technology Center is a complimentary resource available for questions specific to standard design and detail solutions of short span steel bridges (refer to the section of this Solutions Book on plate girder and rolled beam standards, if applicable). It is a resource provided by West Virginia University and the University of Wyoming.



Standard Design and Details of Corrugated Steel Pipe and Structural Plate

The National Corrugated Steel Pipe Association provides complimentary design support for questions pertaining specifically to standard design and detail solutions of corrugated steel pipe and corrugated structural plate (refer to the section of this Solutions Book on corrugated steel pipe and corrugated structural plate standards, if applicable).

Manufactured Steel Solutions

For questions pertaining to a specific manufacturer's solution (refer to section on Manufacturer's Steel Solutions of this Solutions Book), it is recommended that you directly contact the manufacturer by utilizing the contact information listed with the solution.

UNIVERSITY OF WYOMING New Thinking



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roject	Input	Details
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User Name:	Test Test		
User Company:	Test Member Account		
User Input Date:	06/19/2012		
Project Name:	Steel Bridge Example		
City:	Washington		
State/Province:	DC		
Roadway:	Lincoln Road over Route 35		
Span Length:	81' 3"		
Number of Striped Traffic Lanes:	2		
Roadway Width:	26' 0"		
Total Parapet Width:	3' 2"		
Total Deck Overhang Width:	6' 5"		
Pedestrian Access:	Yes		
Number of Sidewalks:	1		
Total Width of Each Sidewalk:	7' 2"		
Skew Angle:	9.00000 degrees		
Average Daily Traffic (ADT):	501-2,000		
Design Speed:	0-45 mph		
Waterway Area:	6 ft²		
Height of Cover:	4' 0"		

Disclaimer

This document has been prepared in accordance with information made available to the Short Span Steel Bridge Alliance (SSSBA) at the time of its 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. SSSBA disclaims any liability arising from information provided by others or from the unauthorized use of the information contained in this document, and does 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.

Notes

- and 100 feet and skew angles under 20 degrees.*
- between 60 and 140 feet and skew angles under 20 degrees.*
- 80 and 140 feet and skew angles under 20 degrees.*
- Design standards for rolled beam and plate girder solutions are rounded in five (5) foot increments.
- feet.*

• Short span standards for rolled beam solutions are only available for input lengths between 40

• Short span standards for homogeneous plate girder solutions are only available for input lengths

• Short span standards for hybrid plate girder solutions are only available for input lengths between

Corrugated steel pipe and structural plate standards are only available for input lengths under 85

• Customized prefabricated manufacture solutions are available for all lengths and skew angles.

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



Standard Design and Details of Short Span Steel Bridge Solutions

Steel Bridge Example | Test Test | Test Member Account | June 19, 2012



COMPOSITE ROLLED BEAM WITH PARTIALLY STIFFENED WEB - 4 GIRDERS AT 8' 10" GIRDER SPACING, LIGHTEST WEIGHT



	SELECTED SECTIONS	DIAPHRAGM SPACING (C)	SHEAR CONNECT	WEIGHT	
SPAN (L) - IL		- ft	D	E	WEIGHT
85	W36x247	26.25'	36 @ 6"	9"	20,995 lbs

STEEL D.L. CAMBER - in				TOTAL D.L. CAMBER - in					
1	2	3	4	5	1	2	3	4	5
0.219"	0.415"	0.568"	0.665"	0.698"	1.259"	2.381"	3.259"	3.817"	4.008"





Typical Girder Details



- 1. All CJP welds to be ground and tested per state specifications.
- 2. Fit to bearing is to be 50% in contact with flange and within 1/16" for remainder.
- 3. MT 1' of every 10' (extents of mag particle inspection for fillet welds) -OR- see state specs.

eSPAN140[®] Fabrication Details

Rolled Shape and Bent Plate Diaphragm Details



- 1. Slope diaphragm and keep holes vertical in stiffener at constant dimensions (to keep all stiffeners the same) and cut ends of diaphragm square.
- 2. At expansion joint, orient channel flanges away from joint opening.
- 3. Minimum radius as per AASHTO/NSBA fabrication S2.1 table 4.3.2-1. Per section 4.3.2, if the bend is parallel to direction of rolling, multiply the minimum radii by 1.5.
- 4. All holes to be 15/16" ø for 7/8" ø HS bolts, ASTM A325 type 3 w/ F436-3 washers (RCT).
- 5. Threads excluded from shear plane.



Framing Plan



- 1. Superstructure may sit on existing bridge seats. Contractor to verify spacing in field.
- 2. Design will accommodate skews up to 20° from \perp , but are intended to be parallel.
- 3. Station line is intended to be on a tangent alignment.
- 4. Max grade at bearing is \pm 5%.
- 5. Orient toes of channel diaphragm down grade.
- 6. Diaphragms may be placed on either side of connection plate at the contractor's discretion.
- 7. Keep diaphragm lines parallel to bearing lines.
- 8. Int. stiffeners are required on one side of web only. On fascia girders, orient stiffeners to the inside of the girder. On interior girders, stiffeners should alternate sides. See Girder Elevations for spacing.



Fabrication Details

Typical Section







- 1. For shear stud spacing, see Girder Elevations.
- 2. Parapets per state DOT requirements, if cast in place, provide 2'-0" lap with transverse bars.



Deck Design



NOTES:

1. Forming brackets must extend to bottom flange.



Standard Design and Details of Corrugated Steel Pipe and Structural Plate Solutions



Single-Radius Arch 15x5.5



SDAN ft in	RISE - ft - in	WATERWAY	RADIUS - in		
SPAN - IL - III		AREA - ft ²	Rt	Rs	
82' 0"	41' 0"	2641'	41' 0"	96	

MINIMUM COVER

For specific details on minimum height of cover requirements for this gauge, profile, and shape, please contact the NCSPA.

MAXIMUM COVER

For specific details on maximum height of cover requirements for this gauge, profile, and shape, please contact the NCSPA.



Multi-Radius Arch 15x5.5 - Solution 1



SPAN - ft - in	RISE - ft - in	BOTTOM SPAN - ft - in	WATERWAY AREA - ft ²	RADIL		
				Rt	Rc	KETUKN ANGLE
82' 0"	24' 4"	81' 10"	1580.0'	745"	174"	6.9

MINIMUM COVER

For specific details on minimum height of cover requirements for this gauge, profile, and shape, please contact the NCSPA.

MAXIMUM COVER

For specific details on maximum height of cover requirements for this gauge, profile, and shape, please contact the NCSPA.



Manufacturer's Steel Solutions -Customized Solutions from Members of the Short Span Steel Bridge Alliance





Wheeler Lumber, LLC David Clemens Sales Manager, Highway www.wheeler-con.com 9330 James Avenue South Bloomington, MN 55431 925-929-7854 dclemens@wheeler-con.com Wheeler's Steel Fabrication Division is an extension of the experience gained by 100+ years of designing & supplying bridge materials. The parent organization, Wheeler Lumber, LLC, has been "Committed to Performance", producing solutions for a variety of construction segments since 1892. Wheeler is multifaceted, providing quality building materials & related services, serving both public and private infrastructures. We have a staff of Professional Engineers & drafters who provide detailed plans specific to each project. Wheeler maintains AISC certification for Simple and Major Steel

Steel Stringer Vehicle Bridges utilizing Transvers

Treated timber deck panels provide a versatile option as prefabricated bridge components. The deck panels are a good compliment to steel stringer superstructures. The combination results in a complete bridge kit. All components are shop fabricated ready for installation. The deck panels can be designed for all loading conditions (ie. HS20, HS25, HL93, U80, U102). The panel thickness is based on loading condition and stringer spacing. The deck panels are custom detailed to the specific application. Individual deck laminae are

fabricated and pressure treated before being assembled into the panels. This enhances the long term durability of the deck system. Multiple attachment systems can be used to connect the panels to the steel stringers. As they are installed the panels are interconnected to provide load transfer improving the performance of an asphalt overlay wear surface.

Crash-tested timber railing kits attach directly to the deck panels. Pedestrian railings are available.

Advantages:

Shipped as a kit Components are largely preassembled and sized for easy handling Shop fabricated to control quality Speeds installation at the site Accepts traffic immediately after installation Not temperature sensitive, no curing time Ideal for remote sites Treatment is water resistant, not susceptible to damage from road salt Multiple wear surface options including asphalt Compatible with crash-tested railing system

Wheeler provides complete superstructure plans for all projects supplied. All hardware is included. Foundation designs are available depending on site conditions.

Contact us for project specific pricing and application advice.

Set your project apart with a bridge from Wheeler.





Wheeler

Wheeler Lumber, LLC David Clemens Sales Manager, Highway www.wheeler-con.com 9330 James Avenue South Bloomington, MN 55431 925-929-7854 dclemens@wheeler-con.com Wheeler's Steel Fabrication Division is an extension of the experience gained by 100+ years of designing & supplying bridge materials. The parent organization, Wheeler Lumber, LLC, has been "Committed to Performance", producing solutions for a variety of construction segments since 1892. Wheeler is multifaceted, providing quality building materials & related services, serving both public and private infrastructures. We have a staff of Professional Engineers & drafters who provide detailed plans specific to each project. Wheeler maintains AISC certification for Simple and Major Steel

Steel Stringer Vehicle Bridges utilizing Transvers







Durability Solutions



Durability Solutions



American Galvanizers Association Philip G. Rahrig **Executive Director** www.galvanizeit.org

6881 South Holly Circle, Ste. 108 Centennial, CO 80112 720.554.0900 x 12 prahrig@galvanizeit.org

Founded in 1935, the American Galvanizers Association (AGA) is a non-profit trade association dedicated to serving the needs of fabricators, architects, specifiers, and engineers, providing technical support on today's innovative applications and state-of-the-art technological developments in hot-dip galvanizing for corrosion control. The AGA maintains a large technical library, provides multimedia seminars, and offers a toll-free technical support hotline to assist specifiers in North America.

Hot-Dip Galvanizing

The Process

Hot-dip galvanizing (HDG) is the process whereby fabricated steel, structural steel, or small parts, including fasteners, are immersed in a kettle or vat of molten zinc, resulting in a metallurgically bonded alloy coating that protects the steel from corrosion.Galvanizing forms a metallurgical bond between the zinc and the underlying steel or iron, creating a barrier that is part of the metal itself. During galvanizing, the molten zinc reacts with the surface of the steel or iron article to form a series of zinc/iron alloy layers actually harder than the substrate steel it is protecting. The galvanizing process naturally produces coatings that are at least as thick at the corners and edges as the coating on the rest of the article. Because the galvanizing process involves total immersion of the material, all surfaces are coated.

How Hot-Dip Galvanizing Works

Galvanizing takes place in a factory regardless of weather or humidity conditions and is available 24/7/365 in close proximity to most new bridge locations. Freshly galvanized steel progresses through a natural weathering process to develop a corrosion resistant patina made up of zinc-oxide, zinc-hydroxide, and zinc carbonate. Typically, it takes approximately 6-12 months to fully develop. Because the corrosion rate of zinc is approximately 20 times less than that for black steel, the HDG coating has durability beyond the intended life of most steel structures. The chart below shows the typical time to first maintenance for bridges located in five different environmental exposures.

Economics and Life-cycle Cost

HDG is typically very similar and often lower in initial cost than most other corrosion protection systems considered for steel bridges and because it requires zero maintenance for 75 years or more, the life-cycle cost is typically 4 to 8 times less.

Natural and Sustainable Zinc

Zinc is found everywhere in daily life: in every cell of the human body, in the earth, in food and in products consumer products (sunblock, automobiles, cosmetics, airplanes, appliances, surgical tools, zinc lozenges). Children need zinc for growth and adults need zinc for reproduction and good health.



The U.S. Recommended Daily Allowance is 15 milligrams of zinc. Zinc is 100% recyclable and over 80% of the zinc available for recycling is currently recycled. For more information, click on http://www.galvanizeit.org/about-hot-dip-galvanizing/is-hdg-sustainable/

Bridge Projects

HDG is commonly used on short-span bridges, especially when the bridge will be located in relatively corrosive environments such as above rivers and streams and in humid climates. To view examples of bridges utilizing HDG steel, click on http://galvanizeit.org/project-gallery/gallery (and select "sector" and then "Bridge & Highway)

*Time to first maintenance is defined as the time to 5% rusting of the steel surface.