



BrD Steel Plate Girder Design Tool

RADBUG Meeting, 2019



Software Design and Requirements

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- ▶ User interface look & feel and capabilities will be based off the Prestressed Concrete Design Tool
 - ▶ Wizard style navigation
 - ▶ On-demand validation
 - ▶ Input report feedback loop
 - ▶ Design input run **and** Design review run
 - ▶ Design run tracking and export to BrD



Software Design and Requirements

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- ▶ Follow the steps laid out in the FHWA's LRFD Design Example for Steel Girder Superstructure Bridge
- ▶ Initial trial girder sections will be selected based on the user entered minimum and maximum widths and thicknesses and the recommendations in the FHWA's Steel I-Girder Bridge design examples
- ▶ Guidelines provided by AASHTO/NSBA for constructability will also be considered for initial trial girder sections and subsequent optimization cycles





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File Design Input Design

Project

Geometry

Deck

Typical Section Loads

Beam Parameters

Lateral Support

Member Loads

Control Options

Input Report



Project: Murray Bridge, Center Street Over Fall River

Description: Br# D1-234-5678

Designer: JAR

Date: 7/4/2015

Open F1 Help

Choices are 7th with 2015 Interim, 7th, 6th with 2013 Interim and 6th editions

LRFD Specifications

Edition: AASHTO LRFD Bridge Design Specifications, 7th Edition with 2015 Interim

Limit States:

- Strength-I
- Strength-II
- Strength-III
- Strength-V
- Service-II
- Fatigue-I
- Fatigue-II

Design Vehicles

Design Load: HL-93 (US)

Permit Load:

Fatigue Load: LRFD Fatigue Truck (US)

Open Library Data dialog

Design ADTT: 2500

Validation Off





File

Design Input

Design

Project

Geometry >>

Deck

Typical Section Loads

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Input Report

Structure Definition Type: System Definition

Number of Spans: 2

Number of Beams: 4

Girder Spacing: 12 ft

Support Skew: 0 Degrees

Number of Design Lanes: 3

Spans:

	Span	Length (ft)
	1	120
	2	120

Supports:

	Support	Support Type
	1	Pinned
	2	Roller
	3	Roller

Default to Pinned for Support = 1
Default to Roller for Support > 1

End Bearing Location: Left: 6 in Right: 6 in

Validation

Off



- Project
- Geometry
- Deck** >>>
- Typical Section Loads
- Beam Parameters
- Lateral Support
- Member Loads
- Control Options
- Input Report

Deck Concrete: ...

Deck Total Thickness: in

Deck Structural Thickness: in

Open Library Data dialog

Choices are:
Top of Structural Thickness
Bottom of Deck

Deck Reinforcement

Material: ...

Support	Start Distance (ft)	Length (ft)	End Distance (ft)	Bar Size	Clear Cover (in)	Measured From	Bar Spacing (in)
1	0	240	240	7	2.5	Top of Struct	10
1	0	240	240	7	1.5	Bottom of De	10

Deck Overhang: ft

Haunch Depth: in

Edge of the haunch to edge of the beam: in

Insert a new row below the current row

Composite Deck

Disable Shear Connectors if not selected

Shear Connectors

Stud Diameter: in

Provide shear studs in negative flexure regions

Splice Location Gaps:

Support	Splice Location		Left Gap (ft)	Right Gap (ft)
	Left or Right of Support	Distance (ft)		
2	Left	30	1	1
2	Right	30	1	1



Hide First Interior for Number of Beams = 2



Murray Bridge.brd - AASHTOWare Bridge Design: Steel Design Tool



File Design Input Design

- Project
- Geometry
- Deck
- Typical Section Loads >>**
- Beam Parameters
- Lateral Support
- Member Loads
- Control Options
- Input Report

Stage 2 Load Distribution: Uniformly to all girders
 By tributary area
 By percentage: Exterior: % First Interior: %

Wearing Surface: Thickness: in Density: pcf

Appurtenance Loads:

Locations of parapet, median, railing, generic and sidewalk loads

Insert a new row below the current row

New Duplicate Delete

Exterior Diaphragm Loads:

Locations of diaphragm loads

Insert a new row below the current row

New Duplicate Delete

Validation Off



File Design Input Design

- Project
- Geometry
- Deck
- Typical Section Loads
- Beam Parameters** ! >>
- Lateral Support
- Member Loads (X)
- Control Options
- Input Report (X)

Validation:
Error

Validation:
Warning

Validation on

Validation

On

Section Configuration

Web	Min (in)	Max (in)	Increment (in)
Depth	65	65	
Thickness	0.5	1	

Top Flange	Min (in)	Max (in)	Increment (in)
Width	20	24	1
Thickness	1	2	

Bottom Flange	Min (in)	Max (in)	Increment (in)
Width	20	24	1
Thickness	1	2	

Disabled

Select from the Web Plate Thickness Table in the Library

Select from the Flange Plate Thickness Table in the Library

Disabled
Thickness increment is based on the Plate Thickness Table

Use Transverse Stiffeners

Disable table if not selected

Beam	One Sided	Max Spacing (in)
Exterior	<input checked="" type="checkbox"/>	190
Interior	<input type="checkbox"/>	190

Structural Steel Materials

Top Flange: Grade 50W

Bottom Flange: Grade 50W

Web: Grade 50W

Transverse Stiffener: Grade 50W

Bearing Stiffener:

Message

Tooltip validation message





File

Design Input

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Input Report



Top Flange Lateral Support :

Ranges

Locations

Support	Start Distance (ft)	Length (ft)	End Distance (ft)
1	0	240	240

Support	Start Distance (ft)	Number of Spaces	Spacing (in)	Length (ft)	End Distance (ft)
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New

Duplicate

Delete

Insert a new row below the current row

Validation

Off




	Beam	Name	Stage	Load Type	Support	Distance (ft)	Py (kip)
(x)	1		1	DC	1		

Project

Geometry

Deck


Typical Section Loads

Beam Parameters 

Lateral Support

Member Loads  >>

Control Options


Input Report 

Validation: Warning

Validation: Error

Validation on

Validation On

Distributed Concentrated  Pedestrian

Beam	Name	Stage	Load Type	Support	Start Distance (ft)	Length (ft)	End Distance (ft)	Load Start (kip/ft)	Load End (kip/ft)
2	Utility	2	DW	1	0	240	240	0.086	0.086

Beam	Load (kip/ft)
1	0.075

New Duplicate Delete

Insert a new row below the current row

Back Forward



File

Design Input

Design

Project

Geometry

Deck

Typical Section Loads

Beam Parameters

Lateral Support

Member Loads

Control Options



Input Report

- Allow moment redistribution
- Use Appendix A6 for flexural resistance
- Allow plastic analysis
- Ignore longitudinal reinforcement in negative moment capacity
- Consider deck reinforcement development length

Validation



Off



Web:

	Depth (in)	Thickness (in)	Support	Start Distance (ft)	Length (ft)	End Distance (ft)
	67	0.5	1	0	240	240

New Duplicate Delete

Top Flange:

	Width (in)	Thickness (in)	Support	Start Distance (ft)	Length (ft)	End Distance (ft)
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New Duplicate Delete

Bottom Flange:

	Width (in)	Thickness (in)	Support	Start Distance (ft)	Length (ft)	End Distance (ft)
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New Duplicate Delete

Read-only

Transverse Stiffeners

Stiffener Width: inStiffener Thickness: in

Read-only

	One Sided	Support	Start Distance (ft)	Number of Spaces	Spacing (in)	Length (ft)	End Distance (ft)
	<input checked="" type="checkbox"/>	1	30	1	0	0	30
	<input checked="" type="checkbox"/>	1	30	2	360	60	90
	<input checked="" type="checkbox"/>	2	30	1	0	0	30
	<input checked="" type="checkbox"/>	2	30	2	360	60	90

New

Duplicate

Delete

Bearing Stiffener Pairs

Stiffener Width: inStiffener Thickness: in

	Support	Offset (in)
	1	0
	2	0
	3	0

New

Duplicate

Delete

Girder Profile

Stiffeners

Shear Connectors

Shear Connectors

Stud Height: in

Steel Minimum Tensile Strength: ksi

Read-only

Shear Connector	Number per Row	Number of Spaces	Transverse Spacing (in)	Support	Start Distance (ft)	Length (ft)	End Distance (ft)
Stud	2	96	19	1	0	48	48
Stud	2	54	19	1	48	41	89
Composite				1	89	2	91
Stud	2	38	19	1	91	29	120
Stud	2	58	19	2	0	29	29

New

Duplicate

Delete

Questions?

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