

*AASHTOWare BrDR 7.5.0*

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*Feature Tutorial*

*Field Verified Wearing Surface Thickness*

# Field Verified Wearing Surface Thickness

## Topics Covered

- [Field verified wearing surface thickness for LRFR analysis.](#)

**Note:** Field measured wearing surface thickness is used only in the LRFR analysis. LFR and ASR analysis do not use this feature.

Field verified wearing surface thickness for LRFR analysis.

BID	Bridge ID	Bridge Name	District	County	Facility	Location	Route	Feature Inters
1	TrainingBridge1	Training Bridge 1(LRFD)	Unknown	Unknown (P)	SR 0051	Pittsburgh	0051	SR 6060
2	TrainingBridge2	Training Bridge 2(LRFD)	Unknown	Unknown (P)	N/A	N/A	-1	N/A
3	TrainingBridge3	Training Bridge 3(LRFD)	Unknown	Unknown (P)	I-79	Pittsburgh	0079	Ohio River
4	PCITrainingBridge1	PCI TrainingBridge1(LFD)					-1	
5	PCITrainingBridge2	PCI TrainingBridge2(LRFD)					-1	
6	PCITrainingBridge3	PCI TrainingBridge3(LFD)					-1	
7	PCITrainingBridge4	PCI TrainingBridge4(LRFD)					-1	
8	PCITrainingBridge5	PCI TrainingBridge5(LFD)					-1	
9	PCITrainingBridge6	PCI TrainingBridge6(LRFD)					-1	
10	Example7	Example 7 PS (LFD)					-1	
11	RCTrainingBridge1	RC Training Bridge1(LFD)					-1	
12	TimberTrainingBridge1	Timber Tr. Bridge1 (ASD)					-1	
13	FSys GFS TrainingBridge1	FloorSystem GFS Training Bridge 1	Unknown	Unknown (P)	NJ-Turnpike	NJCity	-1	
14	FSys FS TrainingBridge2	FloorSystem FS Training Bridge 2	Unknown	Unknown (P)	I-95	NYC	-1	
15	FSys GF TrainingBridge3	FloorSystem GF Training Bridge 3	Unknown	Unknown (P)	I-95	ATL	-1	
16	FLine GFS TrainingBridge1	FloorLine GFS Training Bridge 1	Unknown	Unknown (P)	I-75	JAX	-1	
17	FLine FS TrainingBridge2	FloorLine FS Training Bridge 2	Unknown	Unknown (P)	I-75	GNV	-1	
18	FLine GF TrainingBridge3	FloorLine GF Training Bridge 3	Unknown	Unknown (P)	I-95	NY	15	
19	TrussTrainingExample	Truss Training Example					5	
20	LRFD Substructure Example 1	LRFD Substructure Example 1						
21	LRFD Substructure Example 2	LRFD Substructure Example 2			SR 4034	ERIE COUNTY	4034	FOUR MILE C
22	LRFD Substructure Example 3	LRFD Substructure Example 3						
23	LRFD Substructure Example 4	LRFD Substructure Example 4 (NHI Hammer Head)					-1	
24	Visual Reference 1	Visual Reference 1	Unknown	Unknown (P)	I-76	WAITSFIELD	I-76	MAD RIVER
25	Culvert Example 1	Culvert Example 1					STH60	
26	LFD Curved Guide Spec	LFD Curved Guide Spec Example					1	
27	MultiCell Box Examples	Multi Cell Box Examples					100	
28	Gusset Plate Example	Gusset Plate Example	Unknown			Some Highway		
29	Splice Example	Splice Example					-1	
30	Simple DL-Cont LL-Splice	Simple DL Splice	Unknown	Unknown (P)	N/A	N/A	-1	N/A
31	MetalCulvertExample1	MetalCulvertExample 1					1	

Open BrDR. From the Bridge Explorer select **TrainingBridge1 (BID 1)** and double click (or right click and select Open) to open it.

## Field Verified Wearing Surface Thickness

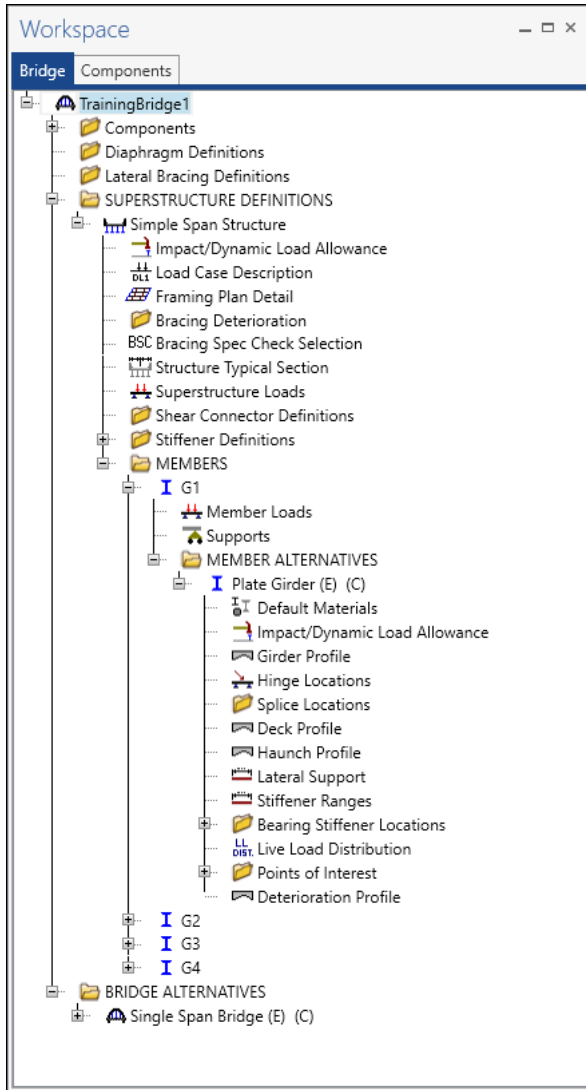
To evaluate a fatigue truck, the  $ADTT_{SL}$  values need to be entered. To do this, double-click on **Training Bridge1** in the Bridge Workspace to open the **TrainingBridge1** window. Click on **Traffic** tab and enter the values as shown below:

The screenshot shows the 'TrainingBridge1' window with the 'Traffic' tab selected. The window title is 'TrainingBridge1'. At the top, there are two text boxes: 'Bridge ID: TrainingBridge1' and 'NBI structure ID (8): TrainingBridge1'. To the right of these are four checkboxes: 'Template' (unchecked), 'Superstructures' (checked), 'Bridge completely defined' (checked), and 'Substructures' (unchecked). Below this is a tabbed interface with tabs for 'Description', 'Description (cont'd)', 'Alternatives', 'Global reference point', 'Traffic', and 'Custom agency fields'. The 'Traffic' tab is active, showing several input fields and a dropdown menu. The fields are: 'Truck PCT:' (empty), 'ADT:' (empty), 'Directional PCT:' (empty), 'Recent ADTT:' (empty) with a 'Compute' button, 'Design ADTT:' (2500), 'Exp. annual  $ADTT_{SL}$  growth rate:' (empty), 'Fatigue importance factor:' (Main Arterial, Interstate, Other) with a dropdown arrow, and an 'Importance factor override' checkbox (unchecked). Below these are three more input fields: '(ADTT<sub>SL</sub>)<sub>0</sub>:' (1000), '(ADTT<sub>SL</sub>)<sub>PRESENT</sub>:' (2000), and '(ADTT<sub>SL</sub>)<sub>LIMIT</sub>:' (2500). At the bottom left, there is a 'Bridge association...' button and three checkboxes: 'BrR' (checked), 'BrD' (checked), and 'BrM' (unchecked). At the bottom right, there are three buttons: 'OK', 'Apply', and 'Cancel'.

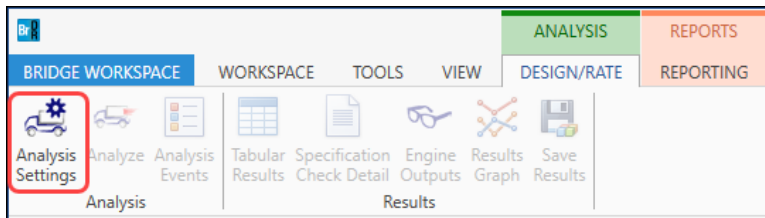
Click the **OK** button to save and close the window.

## Field Verified Wearing Surface Thickness

In the Bridge Workspace tree, expand the **Simple Span Structure** node located under **SUPERSTRUCTURE DEFINITIONS** by clicking on the + button. Expand the **MEMBERS, G1** and **Plate Girder (E) (C)** nodes as shown below:



Select the member alternative **Plate Girder (E) (C)**, and then click on the **Analysis Settings** button located on the **Analysis** group of the **DESIGN/RATE** ribbon as shown below.



## Field Verified Wearing Surface Thickness

### Analysis Settings

Click the **Open template** button in the **Analysis Settings** window as shown below.

Analysis Settings

Design review  Rating

Rating method: LFR

Analysis type: Line Girder

Lane / Impact loading type: As Requested

Apply preference setting: None

Vehicles Output Engine Description

Traffic direction: Both directions

Refresh Temporary vehicles Advanced

Vehicle selection

- Vehicles
  - Standard
    - Alternate Military Loading
    - EV2
    - EV3
    - H 15-44
    - H 20-44
    - HS 15-44
    - HS 20 (S1)
    - HS 20-44
    - NRL
    - SU4
    - SU5
    - SU6
    - SU7
    - Type 3
    - Type 3-3
    - Type 3S2
  - Agency
  - User defined
  - Temporary

Add to >>

Remove from <<

Vehicle summary

- Rating vehicles
  - Inventory
  - Operating
  - Legal operating
  - Permit inventory
  - Permit operating

Reset Clear **Open template** Save template OK Apply Cancel

### Open Template

Select the **LRFR Design Load Rating** template. Click **Open** to apply this template.

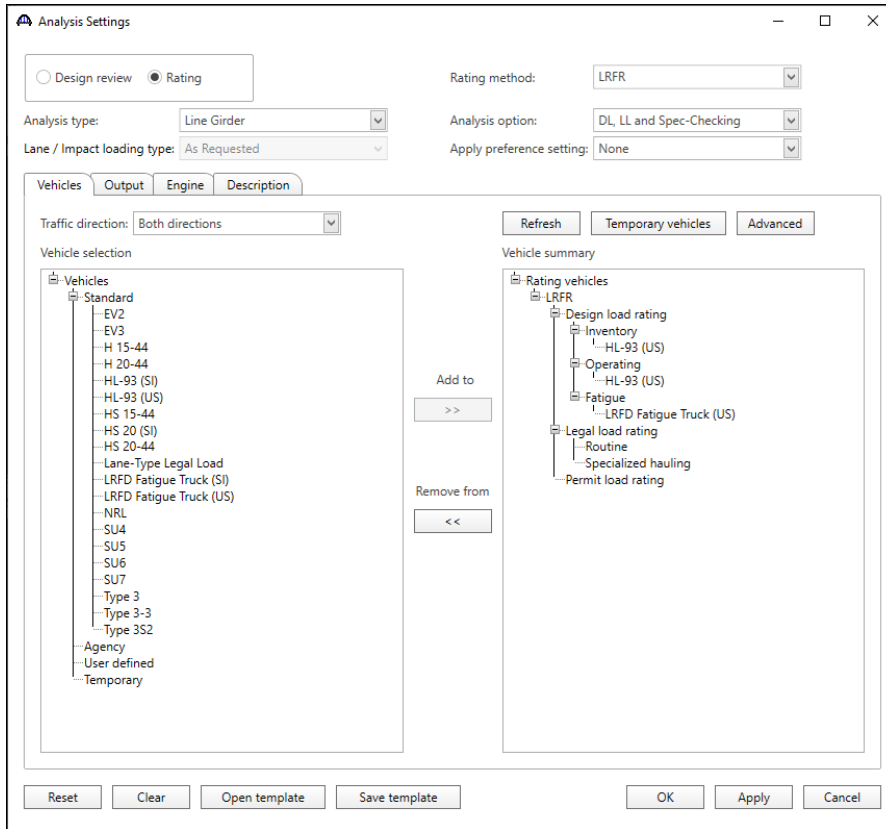
Open Template

Templates	Description	Analysis	Owner	Public / Private
HL 93 Design Review	HL 93 Design Review	LRFD		Public
HS 20 LFR Rating	HS 20 LFR Rating	LFR		Public
<b>LRFR Design Load Rating</b>	LRFR Design Load Rating	LRFR		Public
LRFR Legal Load Rating	LRFR Legal Load Rating	LRFR		Public

Delete Open Cancel

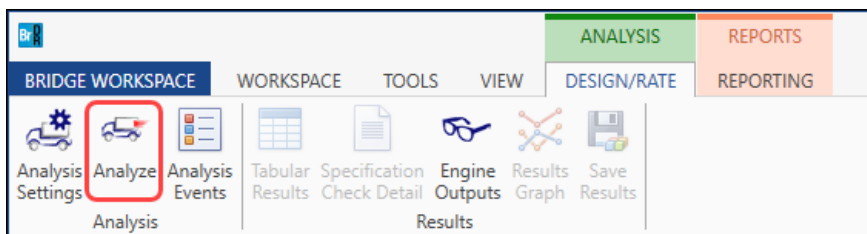
## Field Verified Wearing Surface Thickness

The **Analysis settings** window with the selected vehicles is shown below.



Click the **OK** button to save and close the **Analysis Settings** window.

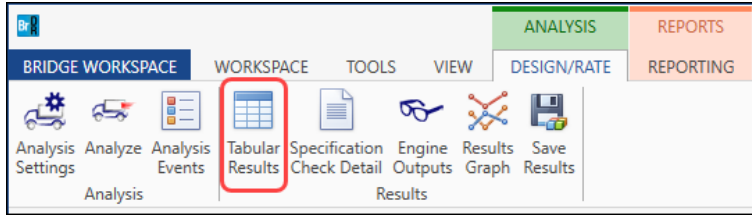
To Analyze, click the **Analyze** button on the Analysis group of the **DESIGN/RATE** ribbon to start the rating process as shown below



## Field Verified Wearing Surface Thickness

### Tabular Results

Once the analysis is complete, click the **Tabular Results** button on the **Results** group of the **DESIGN/RATE** ribbon to review the results as shown below.



On the **Analysis Results** window select Display Format as **Single rating level per row** to display analysis results as shown below.

The screenshot shows the 'Analysis Results - Plate Girder' window. At the top left, there is a 'Print' icon. Below it, the 'Report type' is set to 'Rating Results Summary'. The 'Lane/Impact loading type' is set to 'As requested'. The 'Display Format' is set to 'Single rating level per row'. The main area contains a table with the following data:

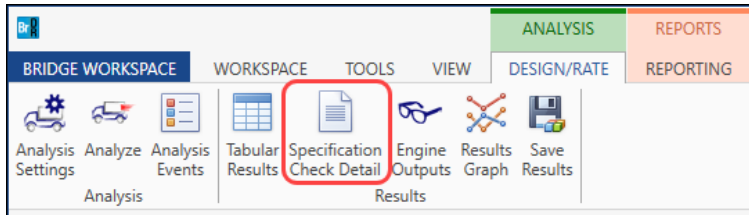
Live Load	Live Load Type	Rating Method	Rating Level	Load Rating (Ton)	Rating Factor	Location (ft)	Location Span-(%)	Limit State	Impact	Lane
HL-93 (US)	Truck + Lane	LRFR	Inventory	19.45	0.540	80.50	1 - (50.0)	STRENGTH-I Steel Flexure Stress	As Requested	As Requested
HL-93 (US)	Truck + Lane	LRFR	Operating	25.22	0.700	80.50	1 - (50.0)	STRENGTH-I Steel Flexure Stress	As Requested	As Requested
HL-93 (US)	Tandem + Lane	LRFR	Inventory	23.07	0.641	80.50	1 - (50.0)	STRENGTH-I Steel Flexure Stress	As Requested	As Requested
HL-93 (US)	Tandem + Lane	LRFR	Operating	29.91	0.831	80.50	1 - (50.0)	STRENGTH-I Steel Flexure Stress	As Requested	As Requested
LRFD Fatigue Truck (US)	Axle Load	LRFR	Inventory	45.54	1.518	80.50	1 - (50.0)	FATIGUE-I Steel Fatigue Stress	As Requested	As Requested

At the bottom left of the window, the text reads: 'AASHTO LRFR Engine Version 7.5.0.3001' and 'Analysis preference setting: None'. A 'Close' button is located at the bottom right.

## Field Verified Wearing Surface Thickness

### Specification Check Detail

Select the **Specification Check Detail** button on the **Results** group of the **DESIGN/RATE** ribbon to open the **Specification Checks** window as shown below.



Expand **Stage 3** -> **Plate Girder** and select **Span 1 – 80.50 ft.** (midpoint of span 1). This displays a list of articles checked for this location. Select and open article **6A.4.2.1 General Load Rating Equation – Steel Flexure Stress** by double clicking on it.

The screenshot shows a window titled 'Specification Checks for Plate Girder - 46 of 954'. It has a left sidebar with a tree view showing the hierarchy: Superstructure Component > Stage 3 > Plate Girder > Span 1 - 80.50 ft. The main area displays a table of specification checks for this span. The table has columns for 'Specification reference', 'Limit State', 'Flex. Sense', and 'Pass/Fail'. The row for '6A.4.2.1 General Load Rating Equation - Steel Flexure Stress' is highlighted in blue and has a red 'X' icon in the 'Pass/Fail' column, indicating it failed.

Specification reference	Limit State	Flex. Sense	Pass/Fail
6.10.7.2.2 Nominal Flexural Resistance		N/A	General Comp.
6.10.7.3 Flexural Resistance - Ductility Requirement		N/A	Passed
6.10.8.1.1 Discretely Braced Flanges in Compression	NA	N/A	Not Applicable
6.10.8.1.2 Discretely Braced Flanges in Tension	NA	N/A	Not Applicable
6.10.8.1.3 Continuously Braced Flanges in Tension or Compression	NA	N/A	Not Applicable
6.10.8.2.1 General		N/A	General Comp.
6.10.8.2.2 Local Buckling Resistance		N/A	General Comp.
6.10.8.2.3 Lateral Torsional Buckling Resistance		N/A	General Comp.
6.10.8.2.3.Cb Lateral Torsional Buckling Resistance - Cb Calculation		N/A	General Comp.
6.10.8.2.3.rt Lateral Torsional Buckling Resistance - rt and Lp Calculation		N/A	General Comp.
6.10.8.3 Flexural Resistance Based on Tension Flange Yielding		N/A	General Comp.
6.10.9 LRFD Shear Resistance		N/A	Passed
6.10.9.1 Shear Resistance - General		N/A	General Comp.
6.10_General_Flexural_Results		N/A	Failed
6.6.1.2.2 Design Criteria		N/A	Passed
6A.4.2.1 General Load Rating Equation - Steel Flexure Moment		N/A	Passed
6A.4.2.1 General Load Rating Equation - Steel Flexure Stress		N/A	Failed
6A.4.2.1.fl		N/A	General Comp.
6A.6.4.2.2 Service Limit State		N/A	Failed
7.2 Load-Induced Fatigue-Damage Evaluation		N/A	Failed
7.2.6 Fatigue Serviceability Index		N/A	General Comp.
APPD6.1 Plastic Moment		N/A	General Comp.
APPD6.2 Yield Moment		N/A	General Comp.
APPD6.3.1 In the Elastic Range (Dc)		N/A	General Comp.
APPD6.3.2 Depth of the Web in Compression at Plastic Moment		N/A	General Comp.
Steel Elastic Section Properties		N/A	General Comp.
Unbraced Length Calculations		N/A	General Comp.



## Field Verified Wearing Surface Thickness

This opens the spec check detail computation of the article. The Load Factors **DW-WS** is considered as 1.50 according to MBE Table 6A.4.2.2 -1.

Spec Check Detail for 6A.4.2.1 General Load Rating Equation - Steel Flexure Stress

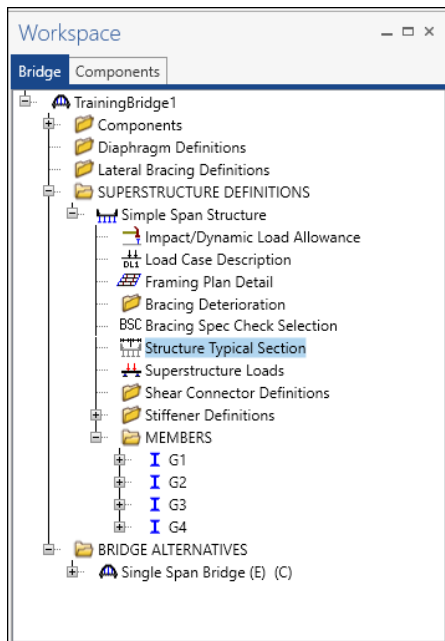
Top Flange Rating																							
Load	Load Combo	Limit State	Component	Flexure Type	LL (kip-ft)	Adj. LLs (kip-ft)	Adj. LL (kip-ft)	DC	DW	DW-WS	LL	Unfactored fLLs (ksi)	f1 (ksi)	Adj. fLL (ksi)	Factored User Input f1 (ksi)	Factored User Input f1 DL (ksi)	Factored User Input f1 LL (ksi)	Phi	FR (ksi)	Phi	FR (ksi)	RF	Capacity (Ton)
DesignInv	1	STR-1	Top Flange	Pos	5340.2	---	---	1.25	1.50	1.50	1.75	-3.80	0.00	---	0.00	0.00	0.00	1.00	-50.00	---	---	1.301	46.85
DesignInv	1	STR-1	Top Flange	Pos	0.0	---	---	1.25	1.50	1.50	1.75	0.00	0.00	---	0.00	0.00	0.00	1.00	-50.00	---	---	99.000	3564.00
DesignOp	1	STR-1	Top Flange	Pos	5340.2	---	---	1.25	1.50	1.50	1.35	-3.80	0.00	---	0.00	0.00	0.00	1.00	-50.00	---	---	1.687	60.73
DesignInv	1	STR-1	Top Flange	Pos	0.0	---	---	1.25	1.50	1.50	1.35	0.00	0.00	---	0.00	0.00	0.00	1.00	-50.00	---	---	99.000	3564.00
DesignInv	2	STR-1	Top Flange	Pos	4502.2	---	---	1.25	1.50	1.50	1.75	-3.20	0.00	---	0.00	0.00	0.00	1.00	-50.00	---	---	1.544	55.07
DesignInv	2	STR-1	Top Flange	Pos	0.0	---	---	1.25	1.50	1.50	1.75	0.00	0.00	---	0.00	0.00	0.00	1.00	-50.00	---	---	99.000	3564.00
DesignOp	2	STR-1	Top Flange	Pos	4502.2	---	---	1.25	1.50	1.50	1.35	-3.20	0.00	---	0.00	0.00	0.00	1.00	-50.00	---	---	2.001	72.04
DesignOp	2	STR-1	Top Flange	Pos	0.0	---	---	1.25	1.50	1.50	1.35	0.00	0.00	---	0.00	0.00	0.00	1.00	-50.00	---	---	99.000	3564.00

Legends:  
Top flange continuously supported. Top flange lateral stresses are set to zero.

Bottom Flange Rating																							
Load	Load Combo	Limit State	Component	Flexure Type	LL (kip-ft)	Adj. LLs (kip-ft)	Adj. LL (kip-ft)	DC	DW	DW-WS	LL	Unfactored fLLs (ksi)	f1 (ksi)	Adj. fLL (ksi)	Factored User Input f1 (ksi)	Factored User Input f1 DL (ksi)	Factored User Input f1 LL (ksi)	Phi	FR (ksi)	Phi	FR (ksi)	RF	Capacity (Ton)
DesignInv	1	STR-1	Bot Flange	Pos	5340.2	---	---	1.25	1.50	1.50	1.75	15.76	0.00	---	0.00	0.00	0.00	1.00	50.00	---	---	0.540	19.45
DesignInv	1	STR-1	Bot Flange	Pos	0.0	---	---	1.25	1.50	1.50	1.35	15.76	0.00	---	0.00	0.00	0.00	1.00	50.00	---	---	0.700	25.22
DesignOp	1	STR-1	Bot Flange	Pos	5340.2	---	---	1.25	1.50	1.50	1.35	0.00	0.00	---	0.00	0.00	0.00	1.00	50.00	---	---	99.000	3564.00
DesignOp	1	STR-1	Bot Flange	Pos	0.0	---	---	1.25	1.50	1.50	1.35	0.00	0.00	---	0.00	0.00	0.00	1.00	50.00	---	---	99.000	3564.00
DesignInv	2	STR-1	Bot Flange	Pos	4502.2	---	---	1.25	1.50	1.50	1.75	13.29	0.00	---	0.00	0.00	0.00	1.00	50.00	---	---	0.641	23.07
DesignInv	2	STR-1	Bot Flange	Pos	0.0	---	---	1.25	1.50	1.50	1.75	0.00	0.00	---	0.00	0.00	0.00	1.00	50.00	---	---	99.000	3564.00
DesignOp	2	STR-1	Bot Flange	Pos	4502.2	---	---	1.25	1.50	1.50	1.35	13.29	0.00	---	0.00	0.00	0.00	1.00	50.00	---	---	0.831	29.91
DesignOp	2	STR-1	Bot Flange	Pos	0.0	---	---	1.25	1.50	1.50	1.35	0.00	0.00	---	0.00	0.00	0.00	1.00	50.00	---	---	99.000	3564.00

Load Combination Factors:

Close the article and the Specification Check Detail window. Again, navigate to the **SUPERSTRUCTURE DEFINITIONS** -> **Simple Span Structure**. Double click on the **Structure Typical Section** to open this window.



## Field Verified Wearing Surface Thickness

### Structure Typical Section

On the **Structure Typical Section** window go to the **Wearing Surface** tab. Select field measured wearing surface thickness by checking the check box for **Thickness field Measured (DW = 1.25 if checked)**. Click the **OK** button to save and close the **Structure Typical Section** window. Now rerun the analysis by clicking the **Analyze** button on the **Analysis** group of the **DESIGN/RATE** ribbon.

Structure Typical Section

Distance from left edge of deck to superstructure definition ref. line | Distance from right edge of deck to superstructure definition ref. line

Deck thickness | Superstructure Definition Reference Line

Left overhang | Right overhang

Deck | Deck (cont'd) | Parapet | Median | Railing | Generic | Sidewalk | Lane position | Striped lanes | **Wearing surface**

Wearing surface material: Asphalt

Description: Asphalt - 25 psf

Wearing surface thickness: 2.7800 in  Thickness field measured (DW = 1.25 if checked)

Wearing surface density: 108.000 pcf

Load case: DW

After the analysis is completed open the **Specification Checks** window by clicking on the **Specification Check Detail** button on the **Results** group of the **DESIGN/RATE** toolbar. From the spec articles list open spec article **6A.4.2.1 General Load Rating Equation – Steel Flexure Stress** for Stage 3, Span 1 – 80.50ft.

In this article the load factors for DW-WS are now taken as 1.25 according to MBE Table 6A.4.2.2-1 foot note point 3.

Spec Check Detail for 6A.4.2.1 General Load Rating Equation - Steel Flexure Stress

Top Flange Rating		Load	Load Combo	Limit State	Component	Flexure Type	IL (kip-ft)	Adj. ILL (kip-ft)	Adj. ILL (kip-ft)	DC	DW	DW-WS	LL	Unfactored ILL (ksi)	f1 (ksi)	Adj. f1 (ksi)	User Input f1 (ksi)	Factored User Input f1 DL (ksi)	Factored User Input f1 LL (ksi)	Phi	FR (ksi)	Override FR (ksi)	RF	Capacity (Ton)	
DesignInv	1	STR-I	Top Flange	Pos	5340.2	---	---	---	1.25	1.50	1.25	1.75	0.00	-3.80	0.00	---	0.00	0.00	0.00	1.00	-50.00	---	---	1.363	49.05
DesignInv	1	STR-I	Top Flange	Pos	0.0	---	---	---	1.25	1.50	1.25	1.75	0.00	0.00	0.00	---	0.00	0.00	0.00	1.00	-50.00	---	---	99.000	3564.00
DesignOp	1	STR-I	Top Flange	Pos	5340.2	---	---	---	1.25	1.50	1.25	1.95	-3.80	0.00	0.00	---	0.00	0.00	0.00	1.00	-50.00	---	---	1.766	63.99
DesignOp	1	STR-I	Top Flange	Pos	0.0	---	---	---	1.25	1.50	1.25	1.95	0.00	0.00	0.00	---	0.00	0.00	0.00	1.00	-50.00	---	---	99.000	3564.00
DesignInv	2	STR-I	Top Flange	Pos	4502.2	---	---	---	1.25	1.50	1.25	1.75	-3.20	0.00	0.00	---	0.00	0.00	0.00	1.00	-50.00	---	---	1.618	55.18
DesignInv	2	STR-I	Top Flange	Pos	0.0	---	---	---	1.25	1.50	1.25	1.75	0.00	0.00	0.00	---	0.00	0.00	0.00	1.00	-50.00	---	---	99.000	3564.00
DesignOp	2	STR-I	Top Flange	Pos	4502.2	---	---	---	1.25	1.50	1.25	1.95	-3.20	0.00	0.00	---	0.00	0.00	0.00	1.00	-50.00	---	---	2.095	75.42
DesignOp	2	STR-I	Top Flange	Pos	0.0	---	---	---	1.25	1.50	1.25	1.95	0.00	0.00	0.00	---	0.00	0.00	0.00	1.00	-50.00	---	---	99.000	3564.00
Legend: Top Flange continuously supported. Top Flange lateral stresses are set to zero.																									
Bottom Flange Rating		Load	Load Combo	Limit State	Component	Flexure Type	IL (kip-ft)	Adj. ILL (kip-ft)	Adj. ILL (kip-ft)	DC	DW	DW-WS	LL	Unfactored ILL (ksi)	f1 (ksi)	Adj. f1 (ksi)	User Input f1 (ksi)	Factored User Input f1 DL (ksi)	Factored User Input f1 LL (ksi)	Phi	FR (ksi)	Override FR (ksi)	RF	Capacity (Ton)	
DesignInv	1	STR-I	Bot Flange	Pos	5340.2	---	---	---	1.25	1.50	1.25	1.75	15.76	0.00	0.00	---	0.00	0.00	0.00	1.00	50.00	---	---	0.566	20.97
DesignInv	1	STR-I	Bot Flange	Pos	0.0	---	---	---	1.25	1.50	1.25	1.75	0.00	0.00	0.00	---	0.00	0.00	0.00	1.00	50.00	---	---	99.000	3564.00
DesignOp	1	STR-I	Bot Flange	Pos	5340.2	---	---	---	1.25	1.50	1.25	1.95	15.76	0.00	0.00	---	0.00	0.00	0.00	1.00	50.00	---	---	0.733	26.41
DesignOp	1	STR-I	Bot Flange	Pos	0.0	---	---	---	1.25	1.50	1.25	1.95	0.00	0.00	0.00	---	0.00	0.00	0.00	1.00	50.00	---	---	99.000	3564.00
DesignInv	2	STR-I	Bot Flange	Pos	4502.2	---	---	---	1.25	1.50	1.25	1.75	13.29	0.00	0.00	---	0.00	0.00	0.00	1.00	50.00	---	---	0.671	24.16
DesignInv	2	STR-I	Bot Flange	Pos	0.0	---	---	---	1.25	1.50	1.25	1.75	0.00	0.00	0.00	---	0.00	0.00	0.00	1.00	50.00	---	---	99.000	3564.00
DesignOp	2	STR-I	Bot Flange	Pos	4502.2	---	---	---	1.25	1.50	1.25	1.95	13.29	0.00	0.00	---	0.00	0.00	0.00	1.00	50.00	---	---	0.870	31.32
DesignOp	2	STR-I	Bot Flange	Pos	0.0	---	---	---	1.25	1.50	1.25	1.95	0.00	0.00	0.00	---	0.00	0.00	0.00	1.00	50.00	---	---	99.000	3564.00

## Field Verified Wearing Surface Thickness

### 6A.4.2.2—Limit States

Strength is the primary limit state for load rating; service and fatigue limit states are selectively applied in accordance with the provisions of this Manual. Applicable limit states are summarized in Table 6A.4.2.2-1.

### C6A.4.2.2

Service limit states that are relevant to load rating are discussed under the articles on resistance of structures (see Articles 6A.5, 6A.6, and 6A.7).

**Table 6A.4.2.2-1—Limit States and Load Factors for Load Rating**

Bridge Type	Limit State*	Dead Load $\gamma_{DC}$	Dead Load $\gamma_{DW}$	Design Load		Legal Load $\gamma_{LL}$	Permit Load $\gamma_{LL}$
				Inventory $\gamma_{LL}$	Operating $\gamma_{LL}$		
Steel	Strength I	1.25	1.50	1.75	1.35	Tables 6A.4.4.2.3a-1 and 6A.4.4.2.3b-1	—
	Strength II	1.25	1.50	—	—	—	Table 6A.4.5.4.2a-1
	Service II	1.00	1.00	1.30	1.00	1.30	1.00
	Fatigue	0.00	0.00	0.75	—	—	—
Reinforced Concrete	Strength I	1.25	1.50	1.75	1.35	Tables 6A.4.4.2.3a-1 and 6A.4.4.2.3b-1	—
	Strength II	1.25	1.50	—	—	—	Table 6A.4.5.4.2a-1
	Service I	1.00	1.00	—	—	—	1.00
Prestressed Concrete	Strength I	1.25	1.50	1.75	1.35	Tables 6A.4.4.2.3a-1 and 6A.4.4.2.3b-1	—
	Strength II	1.25	1.50	—	—	—	Table 6A.4.5.4.2a-1
	Service III	1.00	1.00	0.80	—	1.00	—
	Service I	1.00	1.00	—	—	—	1.00
Wood	Strength I	1.25	1.50	1.75	1.35	Tables 6A.4.4.2.3a-1 and 6A.4.4.2.3b-1	—
	Strength II	1.25	1.50	—	—	—	Table 6A.4.5.4.2a-1

\* Defined in the *AASHTO LRFD Bridge Design Specifications*.

Notes:

- Shaded cells of the table indicate optional checks.
- Service I is used to check the  $0.9 F_y$  stress limit in reinforcing steel.
- Load factor for  $DW$  at the strength limit state may be taken as 1.25 where thickness has been field measured.
- Fatigue limit state is checked using the LRFD fatigue truck (see Article 6A.6.4.1).

### MBE Table 6A.4.2.2 -1.