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*AASHTOWare BrDR 7.5.0*  
*Truss Tutorial*  
*Truss Gusset Plate Example*

# TPG1-Truss Gusset Plate Example

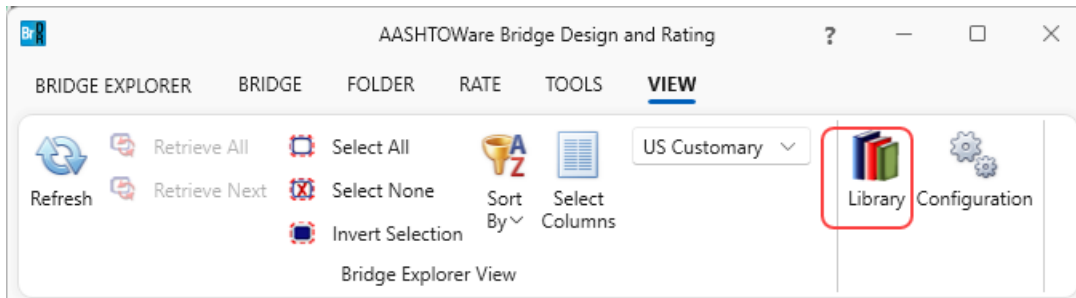
## BrDR Tutorial

### Topics Covered

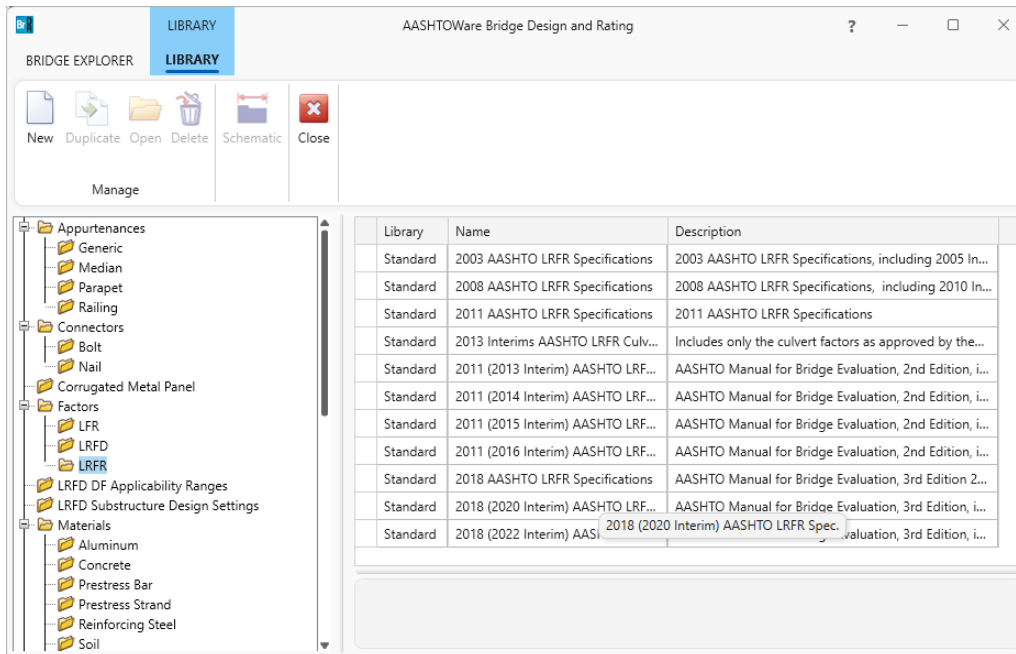
- Gusset plate LRFR factors and LFR factors
- Enter a gusset plate definition
- Assign a gusset plate definition at a panel point
- Perform truss rating with gusset plates and review the results
- Using Manual for Bridge Evaluation, 3<sup>rd</sup> Edition with 2023 interims
- Using AASHTO LRFD Bridge Design Specifications, 9<sup>th</sup> Edition

### Gusset plate LRFR factors and LFR factors

Start BrDR and open the **Library** from the **VIEW** ribbon as shown below.



Select the **LRFR** node under **Factors** to view all the **Standard LRFR** factors as shown below.



Double click on the **2018 (2022 interim) AASHTO LRFR Spec.** to open the following window and select the **Steel** tab. The gusset plate LRFR resistance factors are listed at the bottom of the table.

# TPG1-Truss Gusset Plate Example

The screenshot shows the AASHTOWare Bridge Design and Rating software interface. The 'LIBRARY' panel is active, displaying a tree view of design categories. A dialog box titled 'Factors: LRF: 2018 (2022 Interim) AASHTO LRFR Spec.' is open, showing a table of factors. The 'Gusset plate: compression' row is highlighted with a red box.

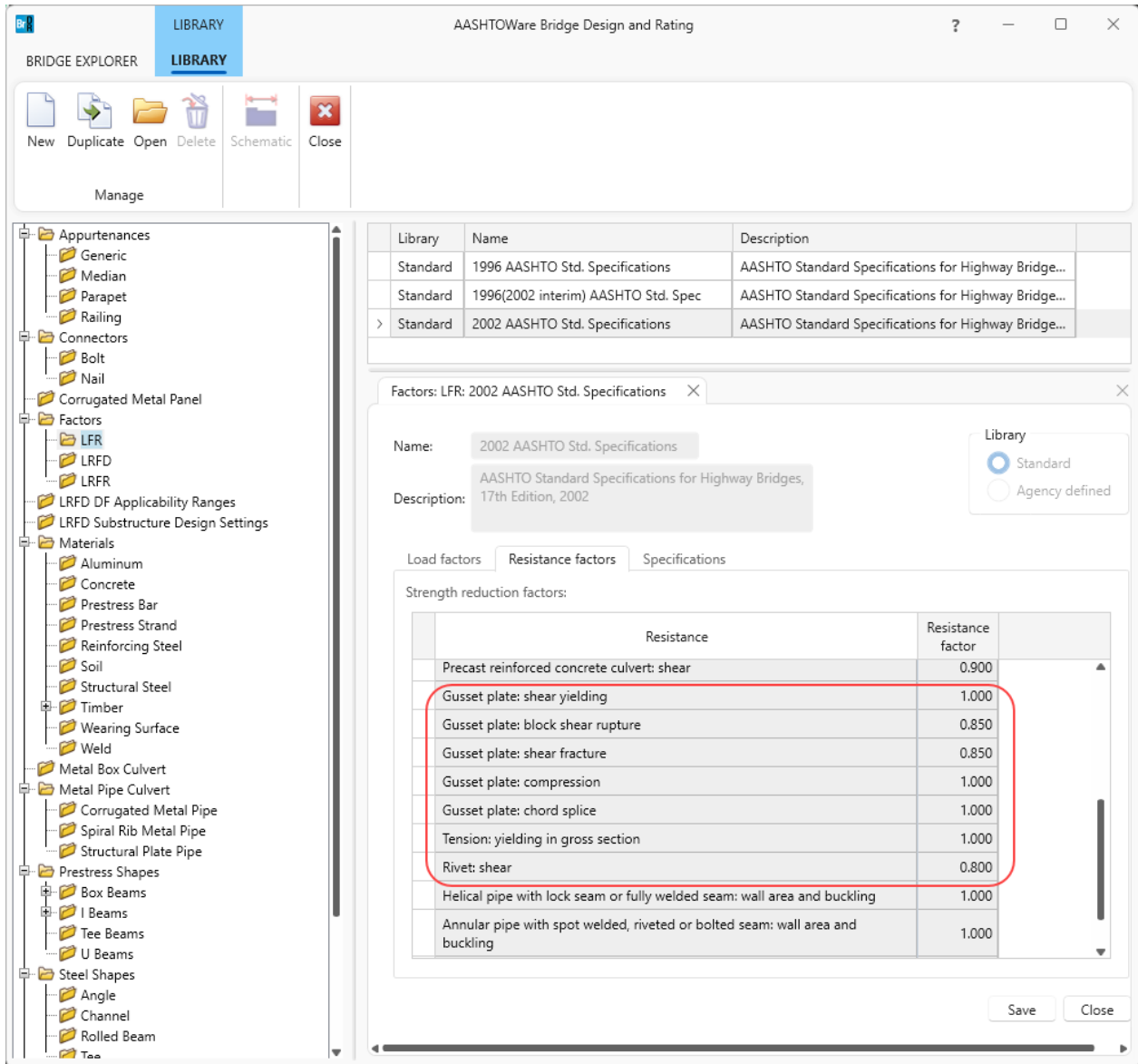
Library	Name	Description
Standard	2013 Interims AASHTO LRFR Culvert Spec.	Includes only the culvert factors as approved by the...
Standard	2011 (2013 Interim) AASHTO LRFR Spec.	AASHTO Manual for Bridge Evaluation, 2nd Edition, i...
Standard	2011 (2014 Interim) AASHTO LRFR Spec.	AASHTO Manual for Bridge Evaluation, 2nd Edition, i...
Standard	2011 (2015 Interim) AASHTO LRFR Spec.	AASHTO Manual for Bridge Evaluation, 2nd Edition, i...
Standard	2011 (2016 Interim) AASHTO LRFR Spec.	AASHTO Manual for Bridge Evaluation, 2nd Edition, i...
Standard	2018 AASHTO LRFR Specifications	AASHTO Manual for Bridge Evaluation, 3rd Edition 2...
Standard	2018 (2020 Interim) AASHTO LRFR Spec.	AASHTO Manual for Bridge Evaluation, 3rd Edition, i...
> Standard	2018 (2022 Interim) AASHTO LRFR Spec.	AASHTO Manual for Bridge Evaluation, 3rd Edition, i...

Factor	Value
weld metal	0.800
Axial compression: built-up section	0.900
Axial compression: built-up section without universal mill plate	0.950
<b>Gusset plate: compression</b>	<b>0.950</b>
Gusset plate: chord splice	0.850
Gusset plate: shear yielding	1.000
Gusset plate: block shear rupture	1.000
Gusset plate: shear fracture	0.800
Fasteners: bearing on material	0.800
Rivet: shear	0.800

# TPG1-Truss Gusset Plate Example

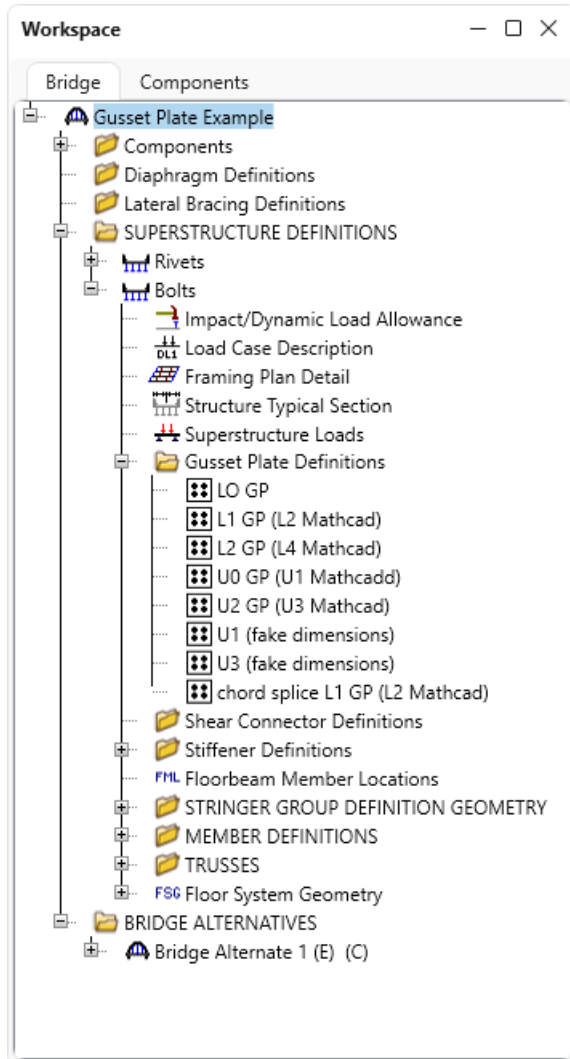
Similarly, click on **LFR** to view the LFR standard factors. Double click on the **2002 AASHTO Std. Specifications** to open the following window and select the **Resistance factors** tab. The gusset plate LFR resistance factors are listed in the table as shown below.



## TPG1-Truss Gusset Plate Example

Enter gusset plate definition

From the **Bridge Explorer**, double click on **BID 28 Gusset Plate Example** to open this bridge. Expand **Bolts** Superstructure definition and the **Gusset Plate Definitions** node in the **Bridge Workspace** tree as shown below.



## TPG1-Truss Gusset Plate Example

### Gusset Plate Definition - Description

Double click on the **L2 GP (L4 Mathcad)** to open the **Gusset Plate Definition** window. **Identical double gusset plates** is selected for this gusset plate definition and the **Material** and **Dimensions** are entered for the **Left plate**. **Left plate** is the plate on the left side of the connection when looking stations ahead. **Right plate** is the plate on the right side of the connection when looking stations ahead. If **Different double gusset plates** is selected, the right plate details must be entered. If **Identical double gusset plates** is selected and **Contains corrosion** is checked, the right plate details must be entered.

**Gusset Plate Definiton**

Name: L2 GP (L4 Mathcad)

Description | Panel point | Fasteners | Plate tension | Plate compression | Chord splice | Plate shear | Plate partial shear | Load transfer

Description:

Plates

Single gusset plates

Identical double gusset plates

Different double gusset plates

Condition factor: Good or Satisfac

Contains corrosion

Dimensions

Field measured section properties

Left plate

Material: gusset plate 1969

As-built plate thickness: 0.25 in

Length: 22.50 in

Height: 12.00 in

Right plate

Material: After 1963

As-built plate thickness: in

Length: in

Height: in

Member arrangement

OK Apply Cancel

# TPG1-Truss Gusset Plate Example

## Gusset Plate Definition – Panel point

Navigate to the **Panel point** tab of this window. This tab specifies the arrangement of truss members present in the gusset plate definition. Member 1,2,3,7 and 8 are present in this gusset plate definition. The truss member arrangement will be validated when the **Gusset Plate Definition** is assigned to a **Panel Point**.

The screenshot shows the 'Gusset Plate Definiton' window with the 'Panel point' tab active. The window title is 'Gusset Plate Definiton'. The Name field contains 'L2 GP (L4 Mathcad)'. The 'Panel point' tab is selected, showing a table of members and a technical diagram of the gusset plate layout.

	Present in panel point?
> Member 1	<input checked="" type="checkbox"/>
Member 2	<input checked="" type="checkbox"/>
Member 3	<input checked="" type="checkbox"/>
Member 4	<input type="checkbox"/>
Member 5	<input type="checkbox"/>
Member 6	<input type="checkbox"/>
Member 7	<input checked="" type="checkbox"/>
Member 8	<input checked="" type="checkbox"/>

The diagram shows a central gusset plate with eight truss members (Member 1 to Member 8) connected to it. The members are labeled with their respective centerlines (CL) and internal centerlines (ICL). The gusset plate is divided into sections by members, with labels such as W1, NT1, L1, NL1, W2, NT2, L2, NL2, W3, NT3, L3, NL3, W4, NT4, L4, NL4, W5, NT5, L5, NL5, W6, NT6, L6, NL6, W7, NT7, L7, NL7, and W8, NT8. The diagram also shows the arrangement of fasteners (represented by circles) in the gusset plate.

Member arrangement

OK Apply Cancel

# TPG1-Truss Gusset Plate Example

## Gusset Plate Definition – Fasteners

Navigate to the **Fasteners** tab of this window. Only truss members present in this definition are listed in the tables.

**Same as left plate** is checked specifying the fasteners information for the **Right Plate** is the same as the **Left Plate**.

Gusset Plate Definiton

Name: L2 GP (L4 Mathcad)

Description Panel point **Fasteners** Plate tension Plate compression Chord splice Plate shear Plate partial shear Load transfer

Left plate

	Connector	NL	L (in)	NT	W (in)	N total	Le (in)	SLmin (in)	Af (in <sup>2</sup> )	Ap (in <sup>2</sup> )	NShear	NSlip
> Member 1	bolt user defined	3	5	1			1.87505	2.5			1	1
Member 2	bolt user defined	3	7	1			2.64375	3.5			1	1
Member 3	bolt user defined	3	7	1			2.5	3.5			1	1
Member 7	bolt user defined	3	7	1			2.5	3.5			1	1
Member 8	bolt user defined	3	7	1			2.64375	3.5			1	1

Right plate

Same as left plate

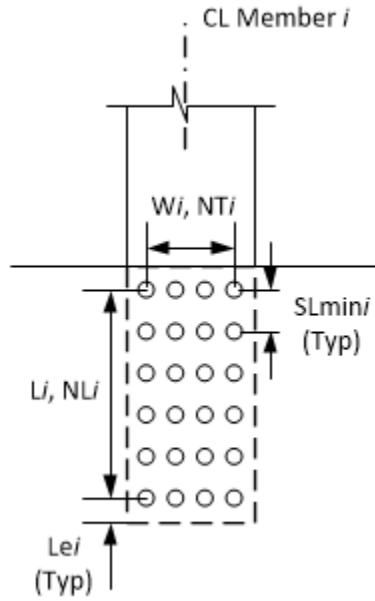
	Connector	NL	L (in)	NT	W (in)	N total	Le (in)	SLmin (in)	Af (in <sup>2</sup> )	Ap (in <sup>2</sup> )	NShear	NSlip
> Member 1												
Member 2												
Member 3												
Member 7												
Member 8												

Member arrangement

OK Apply Cancel



## TPG1-Truss Gusset Plate Example



- NL = Number of fasteners in a row along the longitudinal axis of the truss member.
- L = Length between extreme fasteners in a row along the longitudinal axis of the truss member.
- NT = Number of fasteners in a row along the transverse axis of the truss member.
- W = Width between extreme fasteners in a row along the transverse axis of the truss member.
- N Total = Total number of fasteners in the connection. Computed as  $NL \times NT$  if left blank.
- Le = Distance between center of last fastener and end of gusset plate measured in the direction of the applied bearing force (along the longitudinal axis of the truss member).
- SLmin = Minimum center-to-center spacing of fasteners along the longitudinal axis of the truss member.
- Af, Ap = Used to compute the fastener shear resistance reduction factor in MBE 6A.6.12.6.2. Leave Af and Ap blank if the reduction factor should not be computed.
- NShear = Number of shear planes per fastener.
- NSlip = Number of slip planes per fastener.

# TPG1-Truss Gusset Plate Example

## Gusset Plate Definition – Plate tension

Navigate to the **Plate tension** tab of this window. T, Tension and Tshear are disabled and defaulted to the As-built plate thickness when **Contains corrosion** is not checked in the **Description** tab.

Gusset Plate Definition

Name: L2 GP (L4 Mathcad)

Description Panel point Fasteners **Plate tension** Plate compression Chord splice Plate shear Plate partial shear Load transfer

Left plate

	Yielding and net fracture						Block shear						
	Whitmore width (in)	T (in)	Nfasteners	U	Rp	Beta (LFR)	Ltension (in)	Ttension (in)	NTfasteners	Lshear (in)	Tshear (in)	NVfasteners	NShear
> Member 1	5.75		1		0.9	0.15	0.75		1	6.875		3	1
Member 2	8.125		1		0.9	0.15	0.75		1	9.6436		3	1
Member 3	5.4165		1		0.9	0.15	1.375		1	9.5		3	1
Member 7	5.4165		1		0.9	0.15	1.375		1	9.5		3	1
Member 8	8.125		1		0.9	0.15	0.75		1	9.6436		3	1

Right plate

Same as left plate

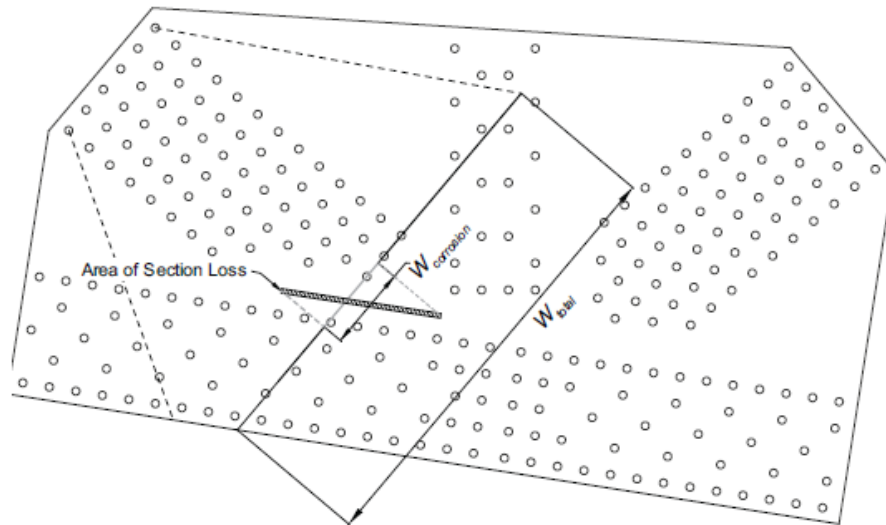
	Yielding and net fracture						Block shear						
	Whitmore width (in)	T (in)	Nfasteners	U	Rp	Beta (LFR)	Ltension (in)	Ttension (in)	NTfasteners	Lshear (in)	Tshear (in)	NVfasteners	NShear
> Member 1													
Member 2													
Member 3													
Member 7													
Member 8													

Member arrangement

OK Apply Cancel

### Yielding and Net Fracture:

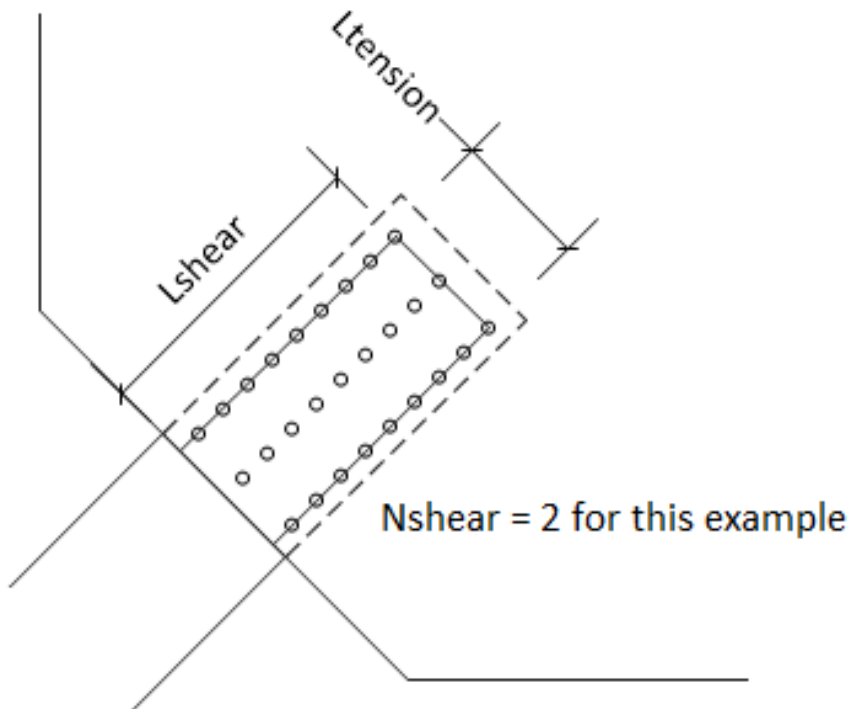
Whitmore Width = Width of the Whitmore section. If left blank, computed as  $W + 2L \times \tan 30^\circ$  where W is the transverse width between extreme fasteners. Refer to MBE Figure 6A.6.12.6.8-1. The user should verify that the computed Whitmore Width cannot be truncated due to the edge of the gusset plate.



## TPG1-Truss Gusset Plate Example

- T = Thickness of the gusset plate along the Whitmore section.
- Nfasteners = Number of fasteners along the Whitmore section. Used to compute the net area of the Whitmore section. Defaults to NT if left blank.
- U = Shear lag reduction factor. Defaults to 1.0 if left blank.
- Rp = Reduction factor for holes. Defaults to values in MBE 6A.6.12.6.8-1 based on the assigned bolt definition if left blank.
- Beta = LFR adjustment factor from MBE L6B.2.6.5. Defaults to value from spec if left blank.

### Block Shear:



- $L_{tension}$  = Length of the tension plane.
- $T_{tension}$  = Thickness of the gusset plate along the tension plane.
- $N_{Tfasteners}$  = Number of fasteners along the tension plane.
- $L_{shear}$  = Length of the shear plane.
- $T_{shear}$  = Thickness of the gusset plate along the shear plane.
- $N_{Vfasteners}$  = Number of fasteners along the shear plane.
- $N_{shear}$  = Number of shear planes

# TPG1-Truss Gusset Plate Example

## Gusset Plate Definition – Plate compression

Navigate to the **Plate compression** tab of this window. T is disabled and defaulted to the As-built plate thickness when **Contains corrosion** is not checked in the **Description** tab.

**Gusset Plate Definition**

Name: L2 GP (L4 Mathcad)

Description
  Panel point
  Fasteners
  Plate tension
  **Plate compression**
 Chord splice
  Plate shear
  Plate partial shear
  Load transfer

**Left plate**

	Whitmore width (in)	T (in)	Lmid (in)	K (LFR)
Member 1	5.75		3.75	0.5
Member 2	8.125		3.75	0.5
> Member 3	5.4165		3.5	0.5
Member 7	5.4165		3.5	0.5
Member 8	8.125		5.25	0.5

**Right plate**

Same as left plate

	Whitmore width (in)	T (in)	Lmid (in)	K (LFR)
> Member 1				
Member 2				
Member 3				
Member 7				
Member 8				

Member arrangement

OK Apply Cancel

Whitmore Width = Width of the Whitmore section. Computed as  $W + 2L \times \tan 30^\circ$  if left blank. Refer to MBE Figure 6A.6.12.6.7-1.

T = Thickness of the gusset plate along the Whitmore section.

Lmid = Distance from the middle of the Whitmore section to the nearest member fastener line in the direction of the member

K = Column effective length factor. Defaults to 0.5 if left blank.

# TPG1-Truss Gusset Plate Example

## Gusset Plate Definition – Plate shear

Navigate to the **Plate shear** tab of this window. Thickness is disabled and defaulted to the As-built plate thickness when **Contains corrosion** is not checked in the **Description** tab. The user has the responsibility to determine the critical shear plane locations based on such factors as member configuration and deterioration.

Name: L2 GP (L4 Mathcad)

Description Panel point Fasteners Plate tension Plate compression Chord splice **Plate shear** Plate partial shear Load transfer

Shear reduction factor: 0.88

Left plate

Shear plane	Length (in)	Thickness (in)	Number holes	Hole diameter (in)	Override angle	Override angle (Degrees)	Override member selection	Member Selection									
								1	2	3	4	5	6	7	8		
> Vertical	12		3	0.8125	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Horizontal	22.5		6	0.8125	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Right plate

Same as left plate

Shear plane	Length (in)	Thickness (in)	Number holes	Hole diameter (in)	Override angle	Override angle (Degrees)	Override member selection	Member Selection									
								1	2	3	4	5	6	7	8		
> Vertical					<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Horizontal					<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Member arrangement

OK Apply Cancel

Shear reduction factor = Shear reduction factor for the gusset plate. Defaults to 0.88.

### Vertical Shear Plane and Horizontal Shear Plane:

Length = Length of the shear plane.

Thickness = Thickness of the gusset plate along the shear plane.

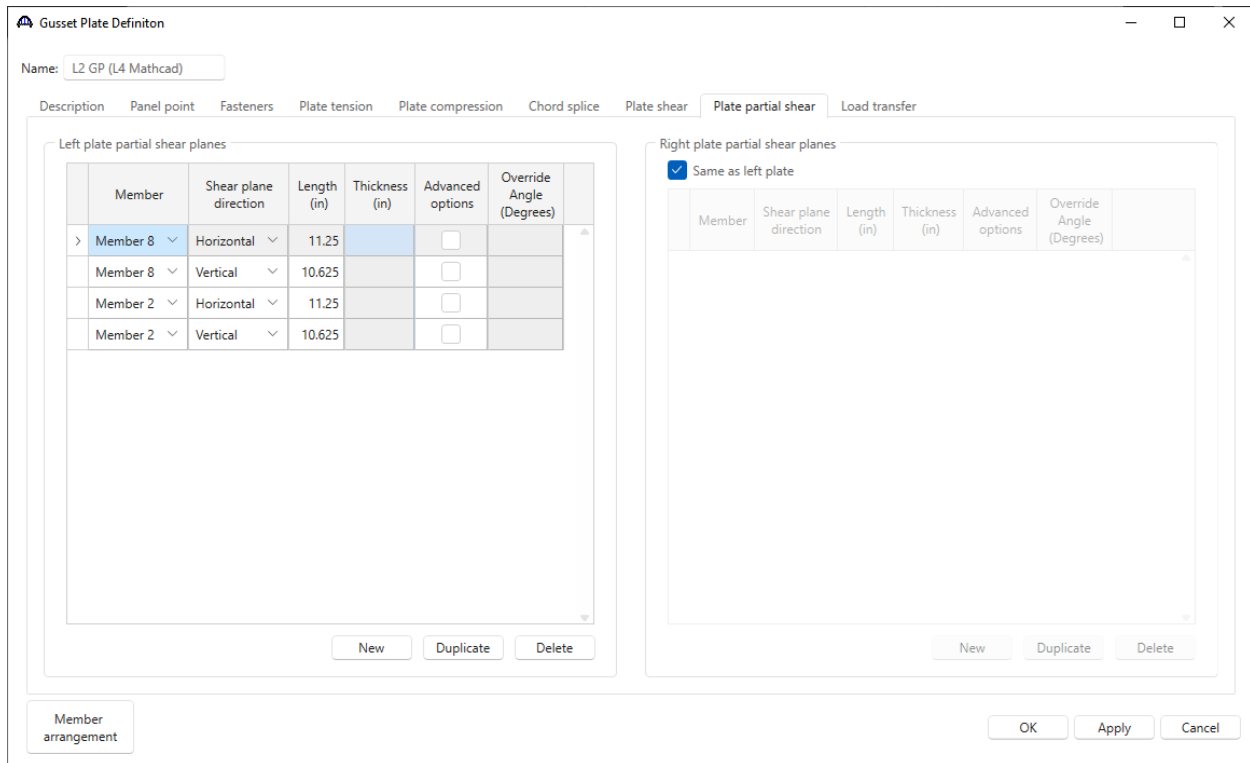
Number of Holes = Number of holes in the shear plane for the shear rupture check.

Hole Diameter = Diameter of holes in the shear plane.

# TPG1-Truss Gusset Plate Example

## Gusset Plate Definition – Plate partial shear

Navigate to the **Plate partial shear** tab of this window.



### Partial Shear Planes:

- Member = Specify the compression member for which the defined shear plane should be checked.
- Shear Plane Direction = Specify the direction of the partial shear plane.
- Length = Length of the partial shear plane.
- Thickness = Thickness of the gusset plate along the partial shear plane.

# TPG1-Truss Gusset Plate Example

## Gusset Plate Definition – Chord splice

Navigate to the **Chord splice** tab of this window.

The screenshot shows the 'Gusset Plate Definition' dialog box with the 'Chord splice' tab selected. The 'Name' field contains 'L2 GP (L4 Mathcad)'. The 'Chord splice' tab is active, showing several options and input fields. The 'Consider chord splice' checkbox is unchecked, while 'Continuous chord members' is checked. Input fields are provided for 'Gross area' (in<sup>2</sup>), 'Gross section modulus' (in<sup>3</sup>), and 'epg' (in). Below these are two sections: 'Compression splice' and 'Tension splice'. The 'Compression splice' section includes fields for 'Lsplice' (in), 'K', 'Gusset plate thickness' (in), 'Computed slenderness ratio' (a shaded field), and 'Fcr' (ksi), along with a 'Compute slenderness ratio' button. The 'Tension splice' section includes fields for 'Net area' (in<sup>2</sup>), 'Net section modulus' (in<sup>3</sup>), and 'epn' (in). At the bottom of the dialog are buttons for 'Member arrangement', 'OK', 'Apply', and 'Cancel'.

Consider chord splice = Check this box if the chord splice articles should be considered.

Continuous chord members = Check this box if the chord is continuous at this gusset plate. If the chord is continuous, there is no need to check the vertical shear plane capacity. This does not affect % load transfer. If checked, the horizontal shear plane force calculation will be along the corresponding chord member. If not checked, the horizontal shear plane force calculation will be with respect to true horizontal.

Gross area = Gross area,  $A_g$ , of all plates in the cross-section intersecting the spliced plane.

Gross section modulus = Gross section modulus,  $S_g$ , of all plates in the cross-section intersecting the spliced plane. Use the section modulus that corresponds to the edge of the splice (top or bottom) that sees the maximum axial plus bending stress.

epg = Distance between the centroid of the gross cross-section and the resultant force perpendicular to the spliced plane.

### Compression Splice:

## TPG1-Truss Gusset Plate Example

$L_{splice}$  = Center-to-center distance between the first lines of fasteners in adjoining chords.

$K$  = Effective column length factor. Defaults to 0.5 if left blank.

Gusset plate thickness = Thickness of the gusset plate. Used to compute the slenderness ratio.  
Defaults to the minimum of left and right As-built plate thickness if left blank.

Computed slenderness ratio = The computed slenderness ratio of the chord splice.

$F_{cr}$  = If the computed slenderness ratio is less than 25 as per MBE 6A.6.12.6.9-2, the  $F_{cr}$  is set to  $F_y$ .

### Tension Splice:

Net area = Net area,  $A_n$ , of all plates in the cross-section intersecting the spliced plane.

Net section modulus = Net section modulus,  $S_n$ , of all plates in the cross-section intersecting the spliced plane. Use the section modulus that corresponds to the edge of the splice (top or bottom) that sees the maximum axial plus bending stress.

$e_{pn}$  = Distance between the centroid of the net cross-section and the resultant force perpendicular to the spliced plane.



## TPG1-Truss Gusset Plate Example

### Gusset Plate Definition – Load transfer

Navigate to the **Load transfer** tab of this window.

The screenshot shows the 'Gusset Plate Definition' window with the 'Load transfer' tab selected. The window title is 'Gusset Plate Definition' and the name is 'L2 GP (L4 Mathcad)'. The 'Load transfer' tab is active, showing a table with columns for '% Load transfer via fasteners (%)' and '% Load transfer'. The table lists members 1 through 8, with members 3 and 7 having 100% load transfer in both columns. A 'Member arrangement' button is located at the bottom left, and 'OK', 'Apply', and 'Cancel' buttons are at the bottom right.

		% Load transfer via fasteners (%)	% Load transfer
>	Member 1		
	Member 2		
	Member 3	100	100
	Member 7	100	100
	Member 8		

% Load Transfer via Fasteners = The dead and live loads used in the fastener rating equations will be adjusted by this percentage. Defaults to 100% if left blank.

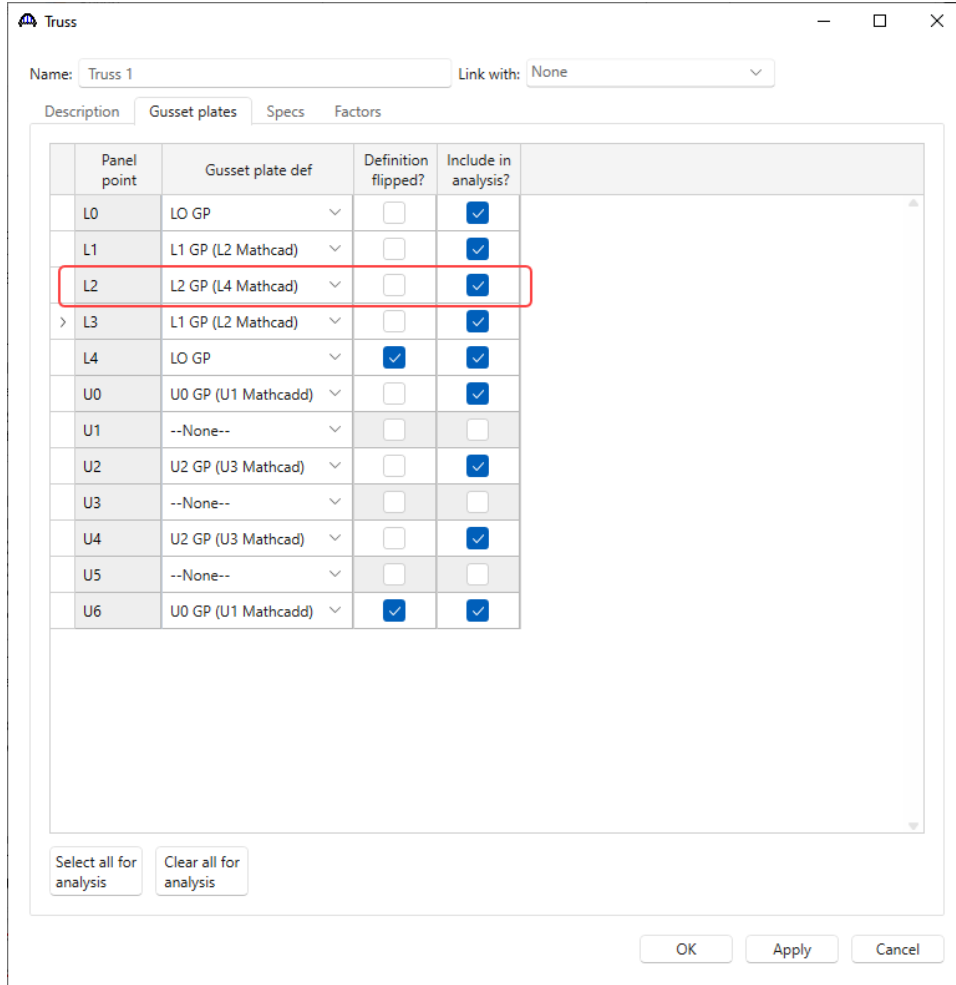
% Load Transfer = The dead and live loads used in the gusset plate rating equations will be adjusted by this percentage. Defaults to 100% if left blank.

Close the **L2 GP (L4 Mathcad) Gusset Plate Definition** window by clicking either the **OK** or the **Cancel** button.

# TPG1-Truss Gusset Plate Example

## Truss - Gusset plates

Expand the **TRUSSES** folder in the **Bridge Workspace** tree. Open the **Truss 1** window and navigate to the **Gusset plates** tab. The **L2 GP (L4 Mathcad)** Gusset Plate Definition is assigned to the **L2 Panel point**. The **L2** panel point's gusset plate is included in the truss analysis. If the **Definition Flipped?** option is checked, the member arrangement in the assigned **Gusset Plate Definition** will be flipped vertically. The gusset plate definition's member arrangement will be validated against the panel point's member arrangement when **OK** or **Apply** is clicked.



## TPG1-Truss Gusset Plate Example

### Truss - Factors

Navigate to the **Factors** tab of this window. The **Gusset plate system factor** is defaulted to **Riveted and Bolted Gusset Plates**.

The screenshot shows a software window titled "Truss" with a standard Windows-style title bar (minimize, maximize, close). Below the title bar, there are two input fields: "Name: Truss 1" and "Link with: None". Below these are four tabs: "Description", "Gusset plates", "Specs", and "Factors". The "Factors" tab is selected and active. Inside the "Factors" tab, there is a section labeled "LRFDR" containing the following settings:

- Truss condition factor:** A dropdown menu set to "Good or Satisfactory". Below it is an unchecked checkbox labeled "Field measured section properties".
- Truss system factor:** A dropdown menu set to "All Other Girder/Slab Bridges". Below it is an unchecked checkbox labeled "Truss system factor override".
- Gusset plate system factor:** A dropdown menu set to "Riveted and Bolted Gusset Plates". Below it is an unchecked checkbox labeled "Gusset plate system factor override".

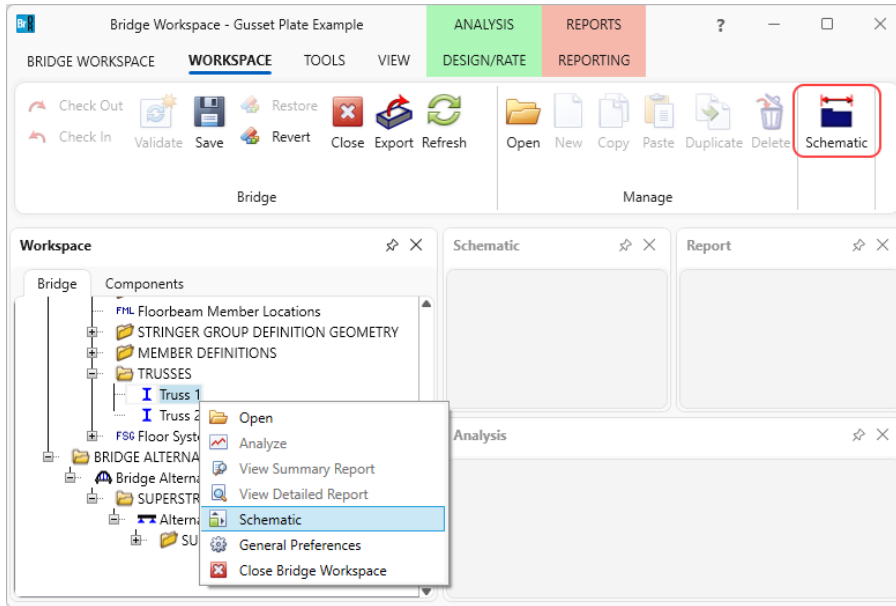
At the bottom right of the dialog box, there are three buttons: "OK", "Apply", and "Cancel".

Close the **Truss** window by clicking either the **OK** or the **Cancel** button.

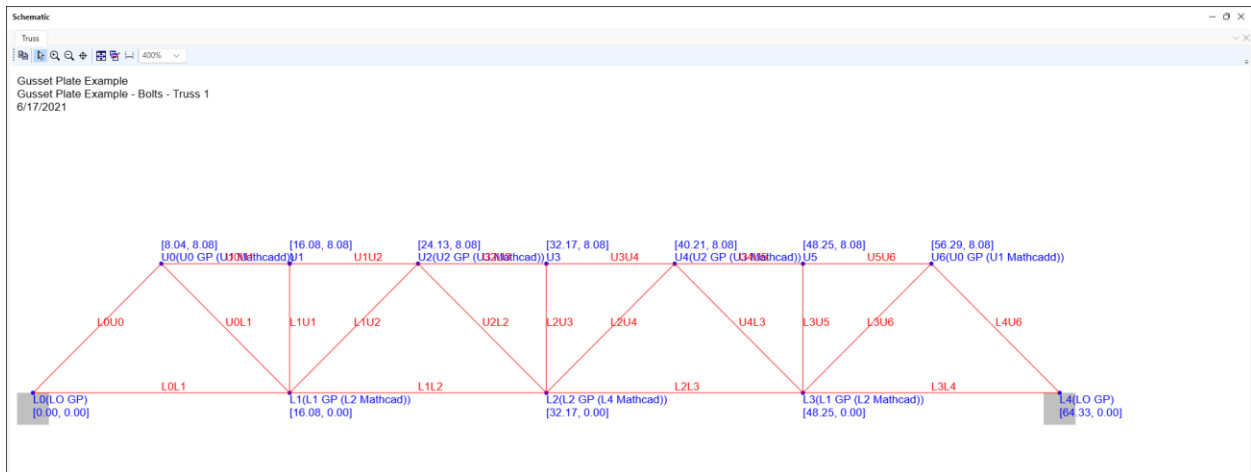
# TPG1-Truss Gusset Plate Example

## Schematic - Truss 1

Select **Truss 1** in the **Bridge Workspace** tree and click the **Schematic** button in the **WORKSPACE** ribbon (or right click and select **Schematic**) to view the schematic of this truss definition as shown below.



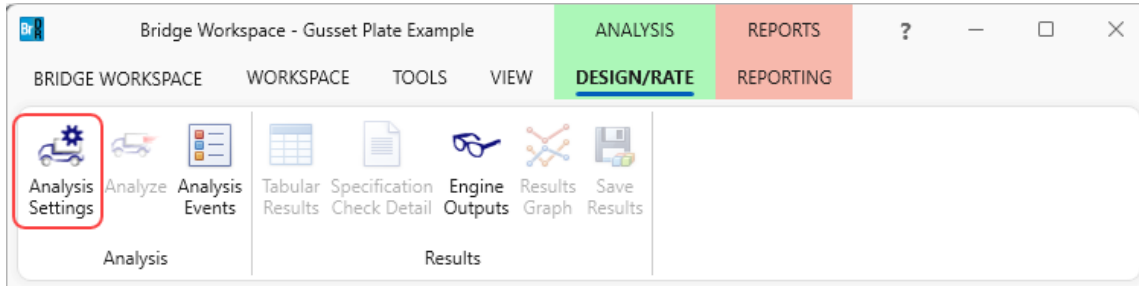
The panel point is labeled with the assigned Gusset plate definition.



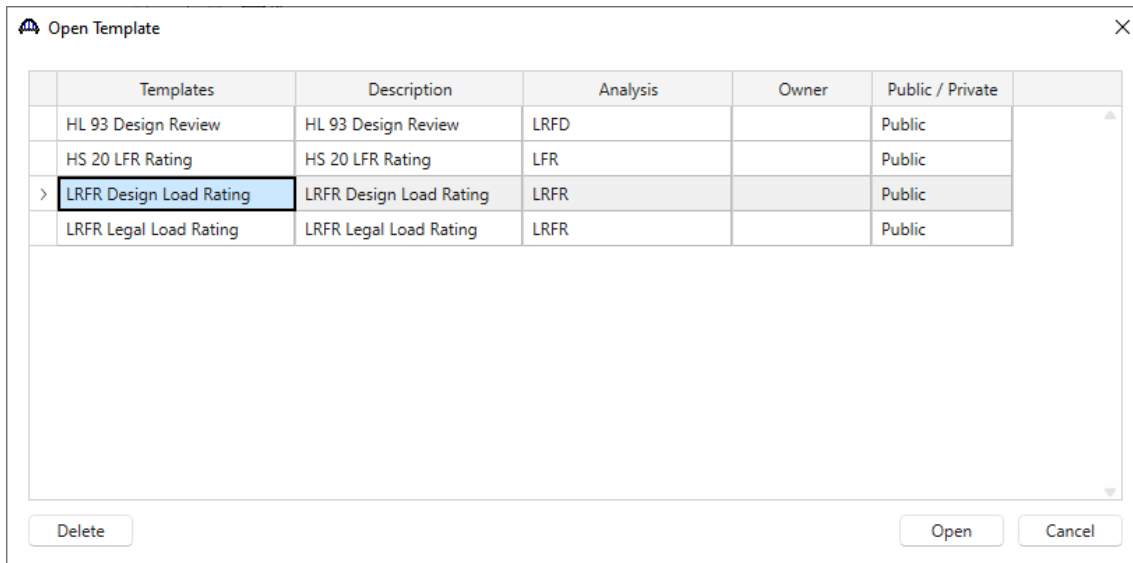
# TPG1-Truss Gusset Plate Example

## LRFR Analysis

To perform an LRFR rating on **Truss 1**, click the **Analysis Settings** button on the **Analysis** group of the **DESIGN/RATE** ribbon. The **Analysis Settings** windows shows up.

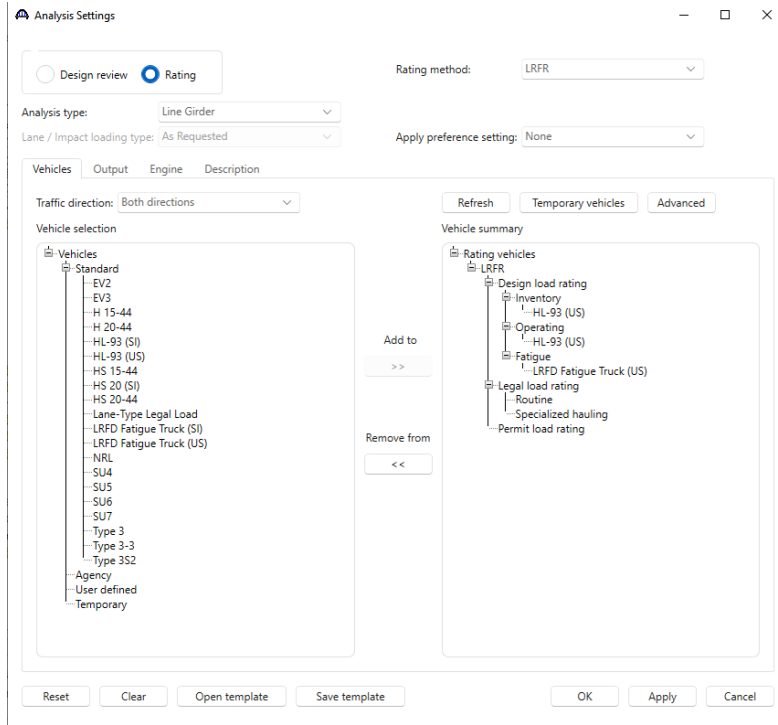


Click on the **Open template** button in the **Analysis Settings** window. The following window opens. Select the **LRFR Design Load Rating** template and click the **Open** button to apply the template.

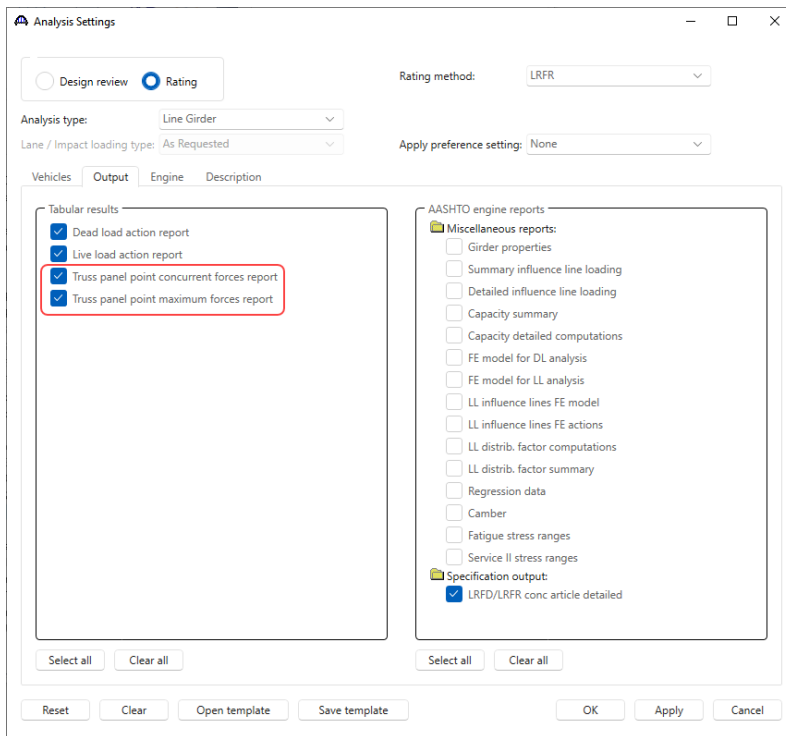


# TPG1-Truss Gusset Plate Example

The **Analysis Settings** window gets updated as shown below.



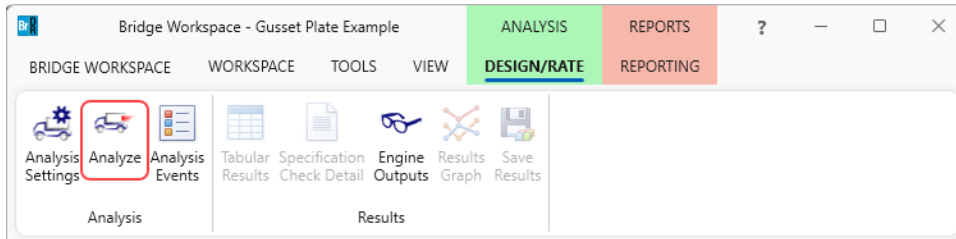
Navigate to the **Output** tab of this window and select the **Truss panel point concurrent forces report** and **Truss panel point maximum forces report**.



Click **OK** to apply the analysis settings and close the window.

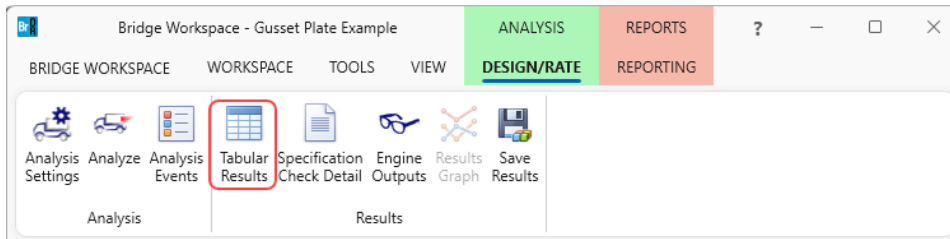
## TPG1-Truss Gusset Plate Example

Select **Truss 1** in the **Bridge Workspace** tree and click the **Analyze** button from the **Analysis** group of the **DESIGN/RATE** ribbon to perform the rating.



### Tabular Results

When the rating analysis is completed, results can be reviewed by selecting the **Truss 1** member in the **Bridge Workspace** tree and clicking the **Tabular Results** button on the **Results** group of the ribbon.



The **Analysis Results** shown below will open. This window shows the critical rating factor considering all truss members and the panel point gusset plates that were included in the analysis. The limit states specific to gusset plate are Gusset Plate Fastener, Gusset Plate Bolt Slip, Gusset Plate Tension, Gusset Plate Compression, Gusset Plate Vertical Shear and Gusset Plate Horizontal Shear. The Rating Results Summary is the only report type available.

Analysis Results - Truss 1

Print

Report type: Rating Results Summary

Lane/Impact loading type:  As requested  Detailed

Display Format: Single rating level per row

	Live Load	Live Load Type	Rating Method	Rating Level	Load Rating (Ton)	Rating Factor	Element Name	Limit State	Impact	Lane
	HL-93 (US)	Truck + Lane	LRFR	Inventory	8.96	0.249	L3L4 : L4	STR-I Gusset Plate Tension	As Requested	As Requested
	HL-93 (US)	Truck + Lane	LRFR	Operating	8.57	0.238	L2L3 : L2	SER-II Gusset Plate Bolt Slip	As Requested	As Requested
	HL-93 (US)	Tandem + Lane	LRFR	Inventory	7.22	0.289	L3L4 : L4	STR-I Gusset Plate Tension	As Requested	As Requested
	HL-93 (US)	Tandem + Lane	LRFR	Operating	7.27	0.291	L2L3 : L2	SER-II Gusset Plate Bolt Slip	As Requested	As Requested

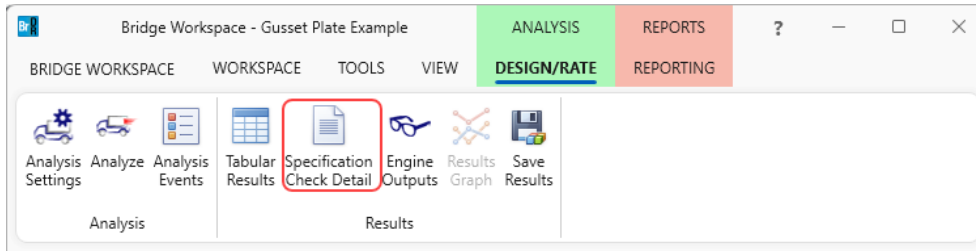
AASHTO LRFR Engine Version 7.5.0.3001  
Analysis preference setting: None

Close

# TPG1-Truss Gusset Plate Example

## Specification Check Detail

From the **Results** tab of the ribbon, click on **Specification Check Detail** to open the **Specification Checks** window.



Gusset plate specification articles specific to a member and the member loads (like fasteners, tension and compression) are listed under the truss member. Gusset plate specification articles that are for the gusset plate and all loads coming into the gusset plate (like shear and chord splice) will be listed under the panel point.

The screenshot shows the 'Specification Checks for Truss 1 - 52 of 1072' window. The window has a left sidebar with a tree view showing the structure hierarchy: Superstructure Component > Stage 3 > Truss 1 > U0U1 through U6U6. The main area displays a table of specification articles with columns for 'Specification reference', 'Limit State', 'Flex. Sense', and 'Pass/Fail'. The table lists various articles, some with green checkmarks (Passed), red X marks (Failed), or blue NA marks (Not Applicable).

Specification reference	Limit State	Flex. Sense	Pass/Fail
6.8.4 Tension Limiting Slenderness Ratio		N/A	Passed
6.9.2.1 Axial Compression		N/A	Passed
6.9.2.2.1 Combined Axial Compression and Flexure - General		N/A	Passed
6.9.3 Compression Limiting Slenderness Ratio		N/A	Failed
6.9.4.1.1 Non slender Element Nominal Compressive Resistance		N/A	General Comp.
6.9.4.1.2 Truss Elastic Flexural Buckling Resistance of Truss Members		N/A	General Comp.
6.9.4.1.3 Elastic Torsional Buckling and Flexural-Torsional Buckling Resi		N/A	Passed
6.9.4.2.2 Slender Longitudinally Unstiffened Cross-Section Elements		N/A	General Comp.
6.9.4.2.2b Effective Width of Slender Elements		N/A	General Comp.
6.9.4.5 Plate Buckling under Service and Construction Loads		N/A	Passed
6A.6.12.5.1 Gusset Plate Rivets in Shear	NA	N/A	Not Applicable
6A.6.12.6.1 Gusset Plate Axial Force Rating		N/A	Failed
6A.6.12.6.1 Gusset Plate Bolt Slip Resistance Rating		N/A	Passed
6A.6.12.6.1 Gusset Plate Fastener Rating		N/A	Passed
6A.6.12.6.1 Gusset Plate Partial Shear Plane Rating		N/A	Passed
6A.6.12.6.2 Gusset Plate Fastener Shear Resistance - Bolt		N/A	General Comp.
6A.6.12.6.3 Gusset Plate Bolt Slip Resistance		N/A	General Comp.
6A.6.12.6.4 Gusset Plate Bearing Resistance at Fastener Holes		N/A	General Comp.
6A.6.12.6.6 Gusset Plate Shear Resistance Partial Shear Plane		N/A	General Comp.
6A.6.12.6.7 Gusset Plate Compressive Resistance		N/A	General Comp.
6A.6.12.6.8 Gusset Plate Tensile Resistance		N/A	General Comp.
6A.6.12.6.8 Gusset Plate Tensile Resistance Block Shear Rupture		N/A	General Comp.
6A.6.12.6.8 Gusset Plate Tensile Resistance Whitmore Net Fracture		N/A	General Comp.
6A.6.12.6.8 Gusset Plate Tensile Resistance Whitmore Yielding		N/A	General Comp.
6A.6.6-7 Truss Axial Tension and Compression Rating		N/A	Passed
6A.6.8 Truss Combined Axial and Flexure Rating	NA	N/A	Not Applicable
APPA6.3.3.Cb Lateral Torsional Buckling Resistance - Cb Calculation	NA	N/A	Not Applicable
APPD6.2 Yield Moment		N/A	General Comp.
APPD6.3.1 In the Elastic Range (Dc)		N/A	General Comp.
Plastic Moment (Mp) for Steel Noncomposite Sections Plastic Momen		N/A	General Comp.
Steel Elastic Section Properties		N/A	General Comp.



## TPG1-Truss Gusset Plate Example

The following list of LRFR specification articles will be checked for gusset plates. The implementation of these articles is described in detail in the **AASHTO LRFR Truss Method of Solution Manual's** Appendix B.

<b>MBE Article</b>	<b>Description</b>
<b>6A.6.12.6.2</b>	Fastener Shear Resistance
<b>6A.6.12.5.1</b>	Rivets in Shear
<b>6A.6.12.6.3</b>	Bolt Slip Resistance
<b>6A.6.12.6.4</b>	Bearing Resistance at Fastener Holes
<b>6A.6.12.6.6</b>	Gusset Plate Shear Resistance
<b>6A.6.12.6.6</b>	Gusset Plate Shear Resistance – Partial Shear Plane
<b>6A.6.12.6.7</b>	Gusset Plate Compressive Resistance
<b>6A.6.12.6.8</b>	Gusset Plate Tensile Resistance – Block Shear Rupture
<b>6A.6.12.6.8</b>	Gusset Plate Tensile Resistance – Whitmore Yielding
<b>6A.6.12.6.9</b>	Chord Splices – Compressive Resistance
<b>6A.6.12.6.9</b>	Chord Splices – Tensile Resistance
<b>6A.6.12.6.1</b>	Resistance Reduction for DL/LL Ratio

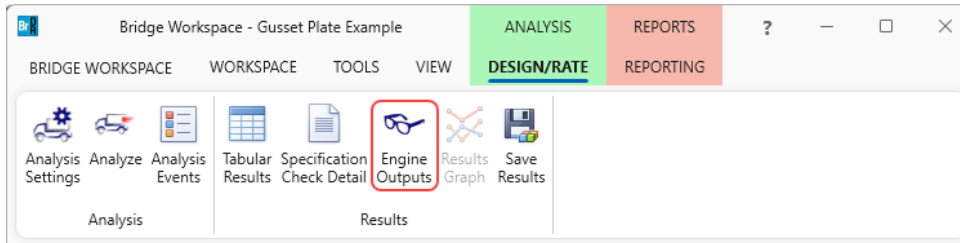
The following list of LFR specification articles will be checked for gusset plates. The implementation of these articles is described in detail in the **AASHTO LFD Truss Method of Solution Manual's** Appendix A.

<b>MBE Article</b>	<b>Description</b>
<b>L6B.2.6.1</b>	Fasteners – Shear
<b>L6B.2.6.1</b>	Fasteners – Rivets in Shear
<b>L6B5.3.1</b>	Bolt Slip Resistance
<b>L6B.2.6.1</b>	Fasteners – Bearing
<b>L6B.2.6.3</b>	Gusset Plate Shear Resistance
<b>L6B.2.6.3</b>	Gusset Plate Shear Resistance – Partial Shear Plane
<b>L6B.2.6.4</b>	Gusset Plate Compressive Resistance
<b>L6B.2.6.5</b>	Gusset Plate Tensile Resistance – Block Shear Rupture
<b>L6B.2.6.5</b>	Gusset Plate Tensile Resistance – Whitmore Yielding
<b>L6B.2.6.6</b>	Chord Splices – Compressive Resistance
<b>L6B.2.6.6</b>	Chord Splices – Tensile Resistance

## TPG1-Truss Gusset Plate Example

### Engine Outputs

After the analysis is complete, the output files can be viewed by clicking the **Engine Outputs** button on the **Results** group of the ribbon.



The **Gusset Plate Section Property Report** contains a listing of the gusset plate data. In the **Rating Results Report**, the **Overall Rating Summary** lists the critical rating results considering the truss member and panel point rating results. For each live load type, the detail truss member rating results, detail panel point rating results, panel point shear action, panel point chord splice action, and panel point shear and chord splice rating results are listed.

