AASHTOWare BrDR 7.6.0 Truss Tutorial 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, 3rd Edition with 2024 interims
- Using AASHTO LRFD Bridge Design Specifications, 10th Edition

Gusset plate LRFR factors and LFR factors

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

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Concrete Concrete Prestress Bar Prestress Strand		2018 (2024 Inte	rim) AASHTO LRFR Spec.

Double click on the **2018 (2024 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.

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Appurtenances	Library	Name	Description					
Official Contraction	Standard	2011 (2014 Interim) AASHTO LRF	AASHTO Man	ual for Bridge Evaluation, 2nd Edit	ion, i			
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Corrugated Metal Panel	Standard	2018 (2022 Interim) AASHTO LRF	AASHTO Man	ual for Bridge Evaluation, 3rd Editi	on, i	1		- 11
🧭 LFR	> Standard	2018 (2024 Interim) AASHTO LRF	AASHTO Man	ual for Bridge Evaluation, 3rd Editi	on, i			- <u>1</u> -
								•
→ → ↓ RFD DF Applicability Ranges	Factors: LRFR	: 2018 (2024 Interim) AASHTO LRFR S	pec. X					×
📁 LRFD Substructure Design Settings	We	ld metal - partial penetration: shear pa	ar 0.8	300				
- 🔁 Materials	We	ld metal - partial penetration: tension	n 0.8	300				
Concrete	We	ld metal - fillet welds: shear in throat o	of 0.8	300				
🗭 Prestress Bar		Axial compression: built-up section	0.9	900				
Prestress Strand Prestress Strand	Axia	al compression: built-up section witho	ut 0.9	950				
Soil		Gusset plate: compression	0.9	950				
Structural Steel		Gusset plate: basic corner check	1.0	000				
the Verring Surface		Gusset plate: chord splice	0.8	350				
···· Ø Weld		Gusset plate: shear yielding	1.0	000				
🧭 Metal Box Culvert		Gusset plate: block shear rupture	1.0	000				- 1
Metal Pipe Culvert		Gusset plate: shear fracture	0.8	300				
Spiral Rib Metal Pipe		Fasteners: bearing on material	0.8	300				
Structural Plate Pipe		Rivet: shear	0.8	300			ļ	
Prestress Shapes								
there ≥ 1 Beams							Cl	
📁 Tee Beams					5a	ve	Close	- <u>I</u>
II 💋 U Beams								T

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.



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.



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.

[
ne: L2 GP (L4 Mathcad)									
late compression - parti	l shear	C	hord splice	Plate shear	Load transfe	r (Control options		
Description Panel	oint	Fasteners	Plate tension P	late compression - whitmo	re section	Plate compress	ion - basic corne	r check	
Description:									
Plates			Condition factor:	Good or Satisfac $ \smallsetminus $					
	ies nuccet plat	er		Contains corrosion					
Different double	gusset plat	es lar							
	gusser plat								
Dimensions									
Field measured s	ection prop	erties							
Left plate				Right plate					
Material:	gu	sset plate 196	9 ~	Material:	After 1963				
As-built plate this	kness: 0.2	25 in		As-built plate thickness:		in			
	22	.5 in		Length:		in			
Length:	12	in		Height:		in			
Length: Height:									
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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**.



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**.

e:	L2 GP (L4 Mat	thcad)													
late	compression -	- partial shear		Chore	d splice		Plate	e shear		Load tr	ansfer		Control	options	
escr	ription I	Panel point	Fastene	ers	Plate tens	sion	Plate co	ompressio	n - whitmo	re sectior	n P	late comp	ression - ba	sic corner	check
eft p	olate														
		Connec	tor	NL	L (in)	NT	W (in)	N total	Le (in)	SLmin (in)	Af (in^2)	Ap (in^2)	NShear	NSlip	
>	Member 1	bolt user def	ined \vee	3	5	1			1.87505	2.5			1	1	
	Member 2	bolt user def	ined \vee	3	7	1			2.64375	3.5			1	1	
	Member 3	bolt user def	ined \vee	3	7	1			2.5	3.5			1	1	
	Member 7	bolt user def	ined \vee	3	7	1			2.5	3.5			1	1	
		·													
ght	Member 8	bolt user def	Fined ∨	3	7	1			2.64375	3.5			1	1	v
ight S	Member 8 plate Same as left pla	bolt user def	fined ~	3 L	7	1 W	Nasal	Le	2.64375 SLmin	3.5 Af	Ар	Nichaar	1	1	v
ight S	Member 8 plate Game as left pla	bolt user def ate Connector	fined ~	L (in)	7 NT	W (in)	N total	Le (in)	2.64375 SLmin (in)	Af (in^2)	Ap (in^2)	NShear	NSlip	1	
ight S	Member 8 plate Same as left pla Member 1	bolt user def	Fined ~	L (in)	7 NT	W (in)	N total	Le (in)	2.64375 SLmin (in)	3.5 Af (in^2)	Ap (in^2)	NShear	NSlip	1	•
ight S	Member 8 plate Same as left pla Member 1 Member 2	ate Connector V V	NL	3 L (in)	7 NT	W (in)	N total	Le (in)	2.64375 SLmin (in)	Af (in^2)	Ap (in^2)	NShear	NSlip	1	•
ight S	Member 8 plate Same as left plat Member 1 Member 2 Member 3	ate Connector V V V V V V V V V V V V V V V V V V V	NL	L (in)	NT	1 W (in)	N total	Le (in)	2.64375 SLmin (in)	Af (in^2)	Ap (in^2)	NShear	NSlip	1	•
ight S	Member 8 plate Same as left plate Member 1 Member 2 Member 3 Member 7	ste Connector V V V V V V V V V V V V V V V V V V V	NL	2 L (in)	NT	W (in)	N total	Le (in)	2.64375	Af (in^2)	Ap (in^2)	NShear	NSlip	1	-
ight S	Member 8 plate Same as left plate Member 1 Member 2 Member 3 Member 7 Member 8	bolt user def	NL	3	NT I	W (in)	N total	Le (in)	2.64375	Af (in^2)	Ap (in^2)	NShear	NSlip	1	•
ight S	Member 8 plate Same as left pla Member 1 Member 2 Member 3 Member 7 Member 8	bolt user def	NL NL	3	NT I	1 W (in)	N total	Le (in)	2.64375	Af (in^2)	Ap (in^2)	NShear	NSlip	1	~ ~



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 NLxNT 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.

Gusset Plate Definition – Plate tension

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

е.	L2 GP (L4 Mat	hcad)													
late	compression -	partial shear		Chord	d splice			Plate shear		Load tra	nsfer		Control op	tions	
escr	ription	Panel point		Fasteners	Pla	te tensio	n	Plate comp	ression - wł	nitmore section		Plate com	pression - basio	corner cl	neck
eft p	late														
			Yi	elding and net fi	racture					BI	ock 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
ght	plate														
ght 2 S	plate Game as left pla	ite													
ght S	plate Same as left pla	ite	١	/ielding and net	fracture	2					Block she	ar			
ght S	plate iame as left pla	Whitmore width (in)	T (in)	/ielding and net Nfasteners	fracture	Rp	Beta (LFR	Ltension (in)	Ttension (in)	¹ NTfastener	Block she s Lshea (in)	ar ır Tshea (in)	^{ar} NVfastene	rs NShe	ear
ght S	plate Game as left pla	Whitmore width (in)	T (in)	fielding and net	fracture	Rp	Beta (LFR	Ltension) (in)	Ttension (in)	NTfastener	Block she s Lshea (in)	ar Ir Tshea (in)	Ir NVfastene	rs NShe	ear
ght S	plate Game as left plate Member 1 Member 2	Whitmore width (in)	T (in)	'ielding and net Nfasteners	fracture	Rp	Beta (LFR	Ltension) (in)	Ttension (in)	NTfastener	Block she s Lshea (in)	ar ır Tshea (in)	NVfastener	rs NShe	ear
ight S	plate ame as left pla Member 1 Member 2 Member 3	Whitmore width (in)	T (in)	Vielding and net	fracture	Rp	Beta (LFR	Ltension (in)	Ttension (in)	NTfastener	Block she s Lshea (in)	ar Ir Tshea (in)	NVfastener	rs NShe	ear
ight S	plate ame as left pla Member 1 Member 2 Member 3 Member 7	Whitmore width (in)	T (in)	Vielding and net	fracture	Rp	Betz (LFR	Ltension (in)	Ttension (in)	NTfastener	Block she s Lshea (in)	ar Ir Tshea (in)	Ir NVfastener	rs NShe	ear
ght S	plate iame as left pla Member 1 Member 2 Member 3 Member 7 Member 8	Whitmore width (in)) T (in)	Vielding and net	fracture	Rp	Beta (LFR	Ltension (in)	Ttension (in)	NTfastener	Block she	ar Ir Tshea (in)	Ir NVfastener	rs NShe	ear
ght S	plate same as left pla Member 1 Member 2 Member 3 Member 7 Member 8	Whitmore width (in)) T (in)	Vielding and net	fracture	e Rp	Beta (LFR	Ltension (in)	Ttension (in)	NTfastener	Block she	ar Ir Tshea (în)	NVfastener	rs NShe	ear
S	plate ame as left pla Member 1 Member 2 Member 3 Member 7 Member 8	Whitmore width (in)	T (in)	Vielding and net	U	Rp	Beta (LFR	Ltension (in)	Ttension (in)	NTfastener	Block she Lshea (in)	ar Tshea (in)	Ir NVfastener	rs NShe	ar

Yielding and Net Fracture:

Whitmore Width = Width of the Whitmore section. If left blank, computed as $W + 2L \times tan30^{\circ}$ where W is the transverse width between extreme fasteners. Refer to MBE Figure 6A.6.12.6.8-1 and Figure C6A.6.5-1. The user should verify that the computed Whitmore Width Cannot edge be truncated due to the of the gusset plate.



Т	=	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.





Ltension	= Length of the tension plane.
Ttension	= Thickness of the gusset plate along the tension plane.
NTfasteners	= Number of fasteners along the tension plane.
Lshear	= Length of the shear plane.
Tshear	= Thickness of the gusset plate along the shear plane.
NVfasteners	= Number of fasteners along the shear plane.
Nshear	= Number of shear planes

Gusset Plate Definition – Plate compression

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

This tab contains input fields for Whitmore section and truncated Whitmore section. Whitmore section is used for LFR analysis and is the default compression method of LRFR analysis.

mpression -	partial shear		C	Chord splie	ce		Plate s	hear		Load	l transfer		0	Control options	
tion	Panel point		Fasteners		Plate ten	sion	Plate	compres	sion - whi	tmore sec	tion	Plate	e compress	sion - basic cornei	check
ate															
	W	hitmore	section					Truncate	d whitmo	re section					
	Whitmore width (in)	T (in)	Lmid (in)	K (LFR)	Тм	LM	W _M	T _R	(in) L _R	W _R	TL	L,	WL		
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											
	W	'hitmore	section					Truncate	d whitmo (in)	re section					
	Whitmore width (in)	T (in)	Lmid (in)	K (LFR)	Тм	LM	WM	T _R	LR	W _R	TL	L,	WL		
Member 1															
Member 1 Member 2															
Member 1 Member 2 Member 3															
Member 1 Member 2 Member 3 Member 7													·		
Member 1 Member 2 Member 3 Member 7 Member 8													·		
	Member 1 Member 2 Member 3 Member 7 Member 8 late me as left pl	te Whitmore width (in) Member 1 5.75 Member 2 8.125 Member 3 5.4165 Member 6 8.125	te Whitmore Whitmore T Whitmore T width T (in) S.75 Member 1 S.75 Member 2 8.125 Member 3 S.4165 Member 7 S.4165 Member 8 8.125	te Image: Image: Imag	te	Member 2 8.125	Multimore section Whitmore width (in) T Lmid (in) K T Lm Member 1 5.75 3.75 0.5 Member 2 8.125 3.75 0.5 Member 3 5.4165 3.5 0.5	Multimore section Whitmore width (in) T Lmid (in) K T LM WM Member 1 5.75 3.75 0.5 1<	Mitmore section Truncate Whitmore width (in) T Lmid (in) K T Lm W TR Member 1 5.75 3.75 0.5 <td>T Tunid K Whitmore width (in) T Lmid (in) K T L W TR LR Member 1 5.75 0.5 0.5 0.5 0.6 0.0</td> <td>Ite Whitmore section Truncated whitmore section Whitmore width (in) T Lmid (in) K T_M L_M W_M T_R L_R W_R Member 1 5.75 0 3.75 0.5 0</td> <td>te Whitmore section Tunid (in) Member 1 5.75 Image: Section (in) Image: Section (in) Member 2 8.125 Image: Section (in) Image: Sectin (in) Image: Section (in) Image: S</td> <td>Ite Whitmore section Tunid K Member 3 5.4165 3.5 0.5 Image: Colspan="6" Colspan="6">Tunid K Tunid K Member 3 5.4165 3.5 0.5 Image: Colspan="6" Colspa="6" Colspa="6" Colspan="6" Colspan="6" Colspan="6" Col</td> <td>te te t</td> <td>Interview of the section of the sectin of the section of the section of the section</td>	T Tunid K Whitmore width (in) T Lmid (in) K T L W TR LR Member 1 5.75 0.5 0.5 0.5 0.6 0.0	Ite Whitmore section Truncated whitmore section Whitmore width (in) T Lmid (in) K T_M L_M W_M T_R L_R W_R Member 1 5.75 0 3.75 0.5 0	te Whitmore section Tunid (in) Member 1 5.75 Image: Section (in) Image: Section (in) Member 2 8.125 Image: Section (in) Image: Sectin (in) Image: Section (in) Image: S	Ite Whitmore section Tunid K Member 3 5.4165 3.5 0.5 Image: Colspan="6" Colspan="6">Tunid K Tunid K Member 3 5.4165 3.5 0.5 Image: Colspan="6" Colspa="6" Colspa="6" Colspan="6" Colspan="6" Colspan="6" Col	te t	Interview of the section of the sectin of the section of the section of the section

Plate Compression - Whitmore Section

Whitmore Width =	Width o	of the	Whitmore	section.	Computed	as	W	+ 2	2L >	tan30°	if	left	blank.	Refer	to
	MBE F	igure 6	A.6.12.6.7a	ı-1.											

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

Plate Compression - Truncated Whitmore Section (LRFR only)

If the Whitmore section for a specific member is not truncated or if the Basic Corner Check method is to be used for a specific member, no input is required in these fields for that member.

- L_M , L_R and L_L = Distance from the middle, right or left of the truncated Whitmore section to the nearest fastener line. Refer to MBE Figure 6A.6.12.6.7-1.
- W_M , W_R and W_L = Width of the middle, right or left portion of the truncated Whitmore section as shown in MBE Figure 6A.6.23.6.7-1.

 T_M , T_R and T_L

= Thickness of gusset plate along the corresponding portion of the truncated Whitmore section.

ate (compression -	nartial shea	r		Chord splic	a		Plate shea	r		Load transfer			Control or	ations	
escri	ription	Panel po	int	Fasten	ers	Plate ter	nsion	Plate	compressio	n - whitmo	ore section		Plate compr	ession - bas	ic corner c	heck
eft o	plate															
								Basic cor	ner check							
		Pa	rallel surfa	ce	Orth	ogonal sur	rface		Short buc	kling span			Long bud	kling span		
		Area (in^2)	e (in)	d (in)	Area (in^2)	e (in)	d (in)	L1 (in)	L2 (in)	r (in)	Adj. surface	a (in)	b (in)	r (in)	T (in)	
>	Member 1										~					
	Member 2										~					1
	Member 3										~					
											~					
	Member 7															
ght	Member 7 Member 8										~] ,
ght	Member 7 Member 8 t plate Same as left pla	ate									~					ļ ,
ght	Member 7 Member 8 t plate Same as left pla	ate						Basic cor	ner check		~					
ight	Member 7 Member 8 t plate Same as left pla	ate Pa	rallel surfa	ce	Orth	ogonal sur	face	Basic cor	ner check Short buc	kling span	~		Long buc	kling span]
ight S	Member 7 Member 8 t plate Same as left pla	Pa Area (in^2)	rallel surfa e (in)	ce d (in)	Orth Area (in^2)	ogonal sur e (in)	face d (in)	Basic cor L1 (in)	ner check Short buc L2 (in)	kling span r (in)	Adj. surface	a (in)	Long buc b (in)	kling span r (in)	T (in)	
ght S	Member 7 Member 8 t plate Same as left plat Member 1	ate Pa Area (in^2)	rallel surfa e (in)	ce d (in)	Orth Area (in^2)	ogonal sur e (in)	face d (in)	Basic cor L1 (in)	ner check Short buc L2 (in)	kling span r (in)	Adj. surface	a (in)	Long buc b (in)	kling span r (in)	T (in)	
ight S	Member 7 Member 8 t plate Same as left plate Member 1 Member 2	ate Pa Area (in^2)	rallel surfa e (in)	ce d (in)	Orth Area (in^2)	ogonal sur e (în)	face d (in)	Basic con	ner check Short buc L2 (in)	kling span r (in)	Adj. surface	a (in)	Long buc b (in)	kling span r (in)	T (in)	
ight >	Member 7 Member 8 t plate Same as left plate Member 1 Member 2 Member 2	Area (in^2)	rallel surfa e (in)	ce d (in)	Orth Area (in^2)	ogonal sur e (in)	face d (in)	Basic cor	ner check Short buc L2 (in)	kling span r (in)	Adj. surface ~	a (in)	Long buc b (in)	kling span r (in)	T (in)	
ight S	Member 7 Member 8 t plate Same as left plat Member 1 Member 2 Member 3 Member 7	Area (in^2)	rallel surfa e (in)	ce d (in)	Orth Area (in^2)	ogonal sur e (in)	face d (in)	Basic cor	ner check Short buc (in)	kling span r (in)	Adj. surface ~ ~	a (in)	Long buc (in)	kling span r (in)	T (in)	
ight S	Member 7 Member 8 t plate Same as left plat Member 1 Member 2 Member 3 Member 7 Member 8	Area (in^2)	rallel surfa e (in)	ce d (in)	Orth Area (in^2)	ogonal sur e (in)	face d (in)	Basic cor	ner check Short buc L2 (in)	kling span r (in)	Adj. surface V V V V V V V V V V V V V V V V V V	a (in)	Long buc b (in)	kling span r (in)	T (in)	

Plate Compression – Basic Corner Check (LRFR Only)

This input is used for LRFR analysis when the **Basic corner check** is selected in the **Control options** tab. If the Basic Corner Check compression analysis is not applicable for a specific member or if this option is not enabled in the **Control options** tab, no input is required in these fields for that member.

Parallel Surface and Orthogonal Surface

Parallel Surface a	and Orthogonal Surface
These values con 6A.6.12.6.7b-1.	rrespond to the surface that is parallel or orthogonal to the chord member. Refer to MBE Figure
Area	= Area of the surface that is parallel or orthogonal to the chord member.
e	= Distance from the work point to the plane of the parallel or orthogonal surface as shown in MBE
	Figure 6A.6.12.6.7b-1.
d	= Distance from the work point to the centroid of the parallel or orthogonal surface as shown in
	MBE Figure 6A.6.12.6.7b-1.
Short Buckling S	pan
L1	= Unbraced length for column buckling of the short buckling span measured orthogonally to
	surface with smaller of the unbraced plate buckling lengths. Distance is from the intersection of
	the member centerline with the row of rivets nearest work point to nearest member edge.
	Refer to MBE Figure 6A.6.12.6.7b-2.
L2	= Unbraced length for column buckling of the short buckling span measured orthogonally to
	surface with smaller of the unbraced plate buckling lengths. Distance is from the intersection of
	member centerline with the leading member edge to nearest fastener of another truss member.
	Refer to MBE Figure 6A.6.12.6.7b-2.
r	= Radius of gyration for short buckling span. Defaults to As-built plate thickness / sqrt (12.0)
	if left blank.
Adj. Surface	= Surface adjacent with short buckling span (parallel or orthogonal surface to the chord). The
	other surface will be considered to be adjacent to the long buckling span.
Long Buckling S	pan
a	= Plate buckling length. Refer to MBE Figure 6A.6.12.6.7b-1.

= Plate buckling wi	th. Refer to MBE Figure 6A.6.12.6.7b-1.
---------------------	---

- r = Radius of gyration for long buckling span. Defaults to As-built plate thickness / sqrt (12.0) if left blank.
- T = Thickness of plate at long buckling span.

Gusset Plate Definition – Control Options (LRFR Only)

🕰 Gu	sset Plate Definiti	ion						-		×
Name	L2 GP (L4 Mat	hcad)								
De	scription	Panel point	Fasteners	Plate tension	Plate compression	on - whitmore section	Plate comp	pression - basic corner che	ck	
Pla	te compression -	partial shear	Chord sp	blice	Plate shear	Load transfer		Control options		
	LRFR									
	Plate compressi	on								
	O Whitmore	section and partial sh	ear							
	Truncated v	whitmore section								
	Warre	en truss with vertical n	nember framing into th	ne joint						
	Basic come	er check								
	Marshar									
ar	member rangement							OK Apply	Canc	:el

The default selection for plate compressive resistance is Whitmore section and partial shear.

Truncated Whitmore section and **Basic corner check** are only applicable for specific geometric configurations. If the Whitmore section is not truncated or if the basic corner check is not applicable for a specific member, values need not be entered for **Truncated Whitmore section** and **Basic corner check** for that member.

If **Truncated Whitmore section** is selected, but no Truncated Whitmore section values are entered for a specific member, compression analysis for that member will default back to **Whitmore section and partial shear**. The **Truncated Whitmore section** compression resistance method will however be used for members that have values entered for **Truncated Whitmore section** compressive resistance.

If **Basic corner check** is selected, but no values are entered for a specific member or if the member is not adjacent to a chord member, compression analysis for that member will default back to **Truncated Whitmore section** (if values are entered) or **Whitmore Section and partial shear** if values for **Truncated Whitmore section** are not entered. The **Basic corner check** compressive resistance method will be used for members that have values entered for this compressive resistance method and are adjacent to a chord member.

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.

scripti	on Pane	l point	Fasteners	Plate	tension	Plate cor	npression - w	hitmore sec	tion		Plat	e con	npre	ssion	- ba	asic co	rner che	eck
te cor	mpression - part	tial shear		Chord splic	te	Plate s	;hear	Load	d tran	nsfer			1	Con	trol	option	IS	
ear re Left p	duction factor:	0.88																
			T 1 · 1		Hole	0.11	Override	Override			Men	nber S	Selec	tion				
	Shear plane	(in)	(in)	holes	diameter (in)	angle	angle (Degrees)	member selection	1	2	3	4	5	6	7	8		
>	Vertical	12		3	0.8125													1
	Horizontal	22.5		6	0.8125													
																		,
Right	plate Same as left pl	ate			11-1-		Queite	Queile										
Right	plate Same as left pl Shear plane	te Length (in)	Thickness (in)	Number holes	Hole diameter (ip)	Override angle	Override angle	Override member	1	2	Men 3	aber S	Selec 5	tion 6	7	8		
Right	plate Same as left pl Shear plane Vertical	Length (in)	Thickness (in)	Number holes	Hole diameter (in)	Override angle	Override angle (Degrees)	Override member selection	1	2	Men 3	aber 9	Selec 5	tion 6	7	8		
Right	plate Same as left pl Shear plane Vertical Horizontal	Length (in)	Thickness (in)	Number holes	Hole diameter (in)	Override angle	Override angle (Degrees)	Override member selection	1	2	Men 3	aber S	õelec	tion 6	7	8		

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.

Gusset Plate Definition – Plate partial shear

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

- npt	ion	Panel point		acteners	D	late tension	Plate com	pression -	whitmore sectio		Plate	compression -	basic corner	check	
e co	mpression - parti	al shear		Chord s	plice		Plate shear	pression	Load tran	sfer	The contract of the contract o	Contro	l options	cincen	
Left j	plate partial shea	r planes					Right	late partia	l shear planes -						
	Member	Shear plane direction	Length (in)	Thickness (in)	Advanced options	Override Angle (Degrees)		Member	Shear plane	Length	Thickness	Advanced	Override		
>	Member 8 🗠	Horizontal $$	11.25				A		direction			options	(Degrees)		
	Member 8 🗸	Vertical \checkmark	10.625												
	Member 2 🗸	Horizontal $$	11.25												
	Member 2 🗸	Vertical \vee	10.625												
							Ŧ								

Partial Shear Planes:

= Specify	the	compression	member	for	which	the	defined	shear	plane	should
be check	ed.									
= Specify t	he di	rection of the p	partial she	ar pla	ane.					
= Length of	f the	partial shear p	lane.							
= Thicknes	s of t	he gusset plate	e along the	part	ial shear	r plar	ie.			
	 Specify be check Specify the specify the specify the specify the specify the specify the specific spec	 Specify the be checked. Specify the di Length of the Thickness of the 	 Specify the compression be checked. Specify the direction of the period Length of the partial shear period Thickness of the gusset plate 	 Specify the compression member be checked. Specify the direction of the partial shear Length of the partial shear plane. Thickness of the gusset plate along the 	 Specify the compression member for be checked. Specify the direction of the partial shear plate Length of the partial shear plane. Thickness of the gusset plate along the part 	 Specify the compression member for which be checked. Specify the direction of the partial shear plane. Length of the partial shear plane. Thickness of the gusset plate along the partial shear 	 Specify the compression member for which the be checked. Specify the direction of the partial shear plane. Length of the partial shear plane. Thickness of the gusset plate along the partial shear plane. 	 Specify the compression member for which the defined be checked. Specify the direction of the partial shear plane. Length of the partial shear plane. Thickness of the gusset plate along the partial shear plane. 	 Specify the compression member for which the defined shear be checked. Specify the direction of the partial shear plane. Length of the partial shear plane. Thickness of the gusset plate along the partial shear plane. 	 Specify the compression member for which the defined shear plane be checked. Specify the direction of the partial shear plane. Length of the partial shear plane. Thickness of the gusset plate along the partial shear plane.

Gusset Plate Definition – Chord splice

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

Description Panel point Fasteners Plate tension Plate compression - whitmore section Plate compression - basic corner of Plate compression - partial shear Control options Consider chord splice Plate shear Load transfer Control options Consider chord splice Continuous chord members Gross area: in^2 in^2 Gross area: in^3 epg: in Compression splice Isplice: in K: in Computed slenderness ratio: Computed slenderness ratio co	ne: L2 GP (L4 Mathcad)							
Plate compression - partial shear Chord splice Consider chord splice Continuous chord members Gross area: in^2 Sross section modulus: in^3 epg: Compression splice Lsplice: in K: Gusset plate thickness: in Computed slenderness ratio: Compute slenderness Compute slenderness ratio Compute slenderness In Compute slenderness In Compute slenderness In In In In In	Description Panel point	Fasteners	Plate tension	Plate compression - wh	nitmore section	Plate compressio	n - basic corner c	heck
Consider chord splice ✓ Continuous chord members Gross area: in^2 Gross section modulus: in^3 epg: in Compression splice Lsplice: in K: Gusset plate thickness: in Compute slenderness a compute slenderness	Plate compression - partial shear		Chord splice	Plate shear	Load transfe	er Co	ntrol options	
✓ Continuous chord members Gross area: in^2 Gross section modulus: in^3 epg: in Compression splice Tension splice Lsplice: in K: in Gusset plate thickness: in Compute slenderness in Compute slenderness in	Consider chord splice							
Gross area: in^2 Gross section modulus: in^3 epg: in Compression splice Tension splice Lsplice: in K: in Gusset plate thickness: in Computed slenderness ratio: Compute slenderness Image: Compute slenderness in	 Continuous chord members 							
Gross section modulus: in^3 epg: in Compression splice Tension splice Lsplice: in K: in Gusset plate thickness: in Compute slenderness in Compute slenderness in	Gross area:	i	n^2					
epg: in Compression splice Lsplice: in K: in Gusset plate thickness: in Compute slenderness Compute slendernes Compute s	Gross section modulus:	i	n^3					
Compression splice Tension splice Lsplice: in K: Net area: Gusset plate thickness: in Computed slenderness ratio: Compute slenderness	epg:	ir	n					
Lsplice: in Net area: in^2 K: Net section modulus: in^3 Gusset plate thickness: in epn: in Computed slenderness ratio: Compute slenderness ratio: in	Compression splice			Tensio	n splice			
K: Net section modulus: in^3 Gusset plate thickness: in epn: in Computed slenderness ratio: Compute slenderness in	Lsplice:		in	Net a	rea:	in^2		
Gusset plate thickness: in epn: in Computed slenderness ratio: Compute slenderness in	К:			Net se	ection modulus:	in^3		
Computed slenderness ratio:	Gusset plate thickness:		in	epn:		in		
Compute sienderness	Computed slenderness ratio:		Committee					
Fcr: ksi	Fcr:		ksi rat	io				
	Mambas							

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, Ag, of all plates in the cross-section intersecting the spliced
	plane.
Gross section modulus	= Gross section modulus, Sg, 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:	
Lsplice	= 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.
Fcr	= If the computed slenderness ratio is less than 25 as per MBE 6A.6.12.6.9-2, the
	Fcr is set to Fy.
Tension Splice:	
Net area	= Net area, An, of all plates in the cross-section intersecting the spliced plane.
Net section modulus	= Net section modulus, Sn, 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.
epn	= Distance between the centroid of the net cross-section and the resultant force perpendicular to the spliced plane.

Gusset Plate Definition – Load transfer

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

	L2 GP (L4 Mat	ncad)	Ft	Dista tanai an	Distance in the	har an			
late	compression -	partial shear	Fasteners	Chord splice	Plate compression - white Plate shear	Load transfer	ate compressi	ion - basic com Control options	er check
		% 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.

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.

in Ca	11433 1			LINK WITH			
)esc	ription	Gusset plates Specs Fa	actors				
	Panel point	Gusset plate def	Definition flipped?	Include in analysis?			
	LO	LO GP $$		\sim			1
	L1	L1 GP (L2 Mathcad) V					
ſ	L2	L2 GP (L4 Mathcad) $$					
>	L3	L1 GP (L2 Mathcad) V					
	L4	LO GP 🗸 🗸	 Image: A set of the set of the				
	U0	U0 GP (U1 Mathcadd) 🗸					
	U1	None V					
	U2	U2 GP (U3 Mathcad) 🗸 🗸					
	U3	None V					
	U4	U2 GP (U3 Mathcad) V					
	U5	None V					
	U6	U0 GP (U1 Mathcadd) V	 Image: A set of the set of the				
Sel ani	lect all for alysis	Clear all for analysis					

Truss - Factors

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

A Truss			_	- 🗆	×
Name: Truss 1	Link wit	h: None	/		
Description Gusset plates	Specs Factors				
Truss condition factor:	Good or Satisfactory	\checkmark			
	Field measured section properties				
Truss system factor:	All Other Girder/Slab Bridges	<u> </u>			
	Truss system factor override				
Gusset plate system factor:	Riveted and Bolted Gusset Plates	×			
	Gusset plate system factor overrid	2			
		ОК	Apply	Ca	ncel

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

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.

Bridge Workspace - Gusset Plate Exa	imple		ANALYSIS	REPORTS	?	_		\times
BRIDGE WORKSPACE TOOLS	VIEW	HELP	DESIGN/RATE	REPORTING				
Check Dut Check In Validate Save Revert Close	Export	2 Refresh	Open New C	Copy Paste Dup	blicate Delete	Schema	ıtic	
Bridge				Manage				
Workspace	\$ ×	Schem	atic	\$ X	Report		5	× ×
Shear Connector Definitions Stiffener Definitions Fill Floorbeam Member Locations STRINGER GROUP DEFINITION GEON MEMBER DEFINITIONS TRUSSES	ИETRY							
ITr Den ITr Copen ISS Floor Analyze		Analysi	is				2	> ×
BRIDGE ALTE View Summary Report Bridge A View Detailed Report D O								
Schematic General Preferences	6							
Close bridge workspace								

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



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.

■ Bridge	Workspace - Gusset Plate Example	ANALYSIS	REPORTS	?	_	\times
BRIDGE WORKSPACE	WORKSPACE TOOLS VIEW HELP	DESIGN/RATE	REPORTING			
a						
Analysis Analyze Analysis Settings Events	Results Check Detail Outputs Graph Result	is l				
Analysis	Results					

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.

	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	
LRFR Design Load Rating	LRFR Design Load Rating	LRFR		Public	
LRFR Legal Load Rating	LRFR Legal Load Rating	LRFR		Public	

Design review O Rating	Rating method:	LRFR	~	
Line Girder V ne / Impact loading type: As Requested V Vehicles Output Engine Description	Apply preference sett	ing: None	~	
Traffic direction: Both directions	Refresh	Temporary vehicles	Advanced	
Vehicle selection	Vehicle sum	mary		
	Add to	Venices Pais Design dot rating Beinventory I - HL-93 (US) G-Operating I - HL-93 (US) E-fatigue I - RED Fatigue Truck (US) egal load rating - Specialized hauling Permit load rating	5)	

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.**

Design review Rating Rating method: LRFR Analysis type: Line Girder Apply preference setting: None Image: Construction of the setting: None Vehicles Output Engine Description Tabular results AASHTO engine reports Image: Construction of the setting: None Vehicles Output Engine Description Tabular results AASHTO engine reports Image: Construction of the setting: None Vehicles Output Engine Description Tabular results AASHTO engine reports Image: Construction of the setting: None Vehicles Output Engine Description Tabular results AASHTO engine reports Image: Construction of the setting: None Image: Truss panel point concurrent forces report Girder properties Summary Capacity summary Capacity summary Capacity detailed computations Image: Truss panel point maximum forces report Effe model for LL analysis IL distrib. factor summary Image: Construction IL distrib. factor summary Regression data Camber Image: Secient Listers ranges Secient all Clear all Select al	Analysis Settings					-		×
Analysis type: Line Girder Lane / Impact loading type: As Requested Vehicles Output Engine Output Engine Description AASHTO engine reports Image: Second action report It we load action report Girder properties It we load action report Girder properties It we load action concurrent forces report Detailed influence line loading Capacity summary influence line loading Capacity summary influence line loading Capacity detailed computations Eff model for DL analysis Ff model for DL analysis Ff model for DL analysis It within factor computations It distrib. factor computations It within factor summary Regression data Camber Fatigue stress ranges Service II terss ranges Service II stress ranges Service II terss ranges Service II terss ranges Select all Clear all Reset Open template Save template	Design review	O Rating		Rating method:	LRFR	~		
Lane / Impact loading type: As Requested Apply preference setting: None Vehicles: Output Engine Description Tabular results:	Analysis type:	Line Girder	~					
Vehicles Output Engine Description Tabular results AASHTO engine reports © Ded load action report Girder properties © Ivie load action report Girder properties © Truss panel point concurrent forces report Detailed influence line loading © Capacity summary Capacity detailed computations © FE model for DL analysis E fe model for LL analysis © Li vieloud action report E stoons © Li vieloud action E stoons © Li vieloud action E stoons © Capacity detailed computations E fe model for LL analysis © Li vieloud action E stoons © Li vieloud or computations E stoons © Li distrib. factor summary Regression data © Camber E straige stress ranges © Serice I li stress ranges Serice tall © Serice I li stress ranges Serice tall Clear all Clear all	Lane / Impact loading typ	e: As Requested		Apply preference setting:	None	~		
Tabular results AASHTO engine reports	Vehicles Output	Engine Description						
Pead load action report Live load action report Truss panel point concurrent forces report Truss panel point maximum forces report Truss panel point maximum forces report Truss panel point maximum forces report Capacity detailed computations Ff model for DL analysis L influence lines Ff model LL influence lines Ff model LL distrib. factor computations LL distrib. factor summary Regression data Camber Sayuet ll Tress ranges Select all Clear all Reset Clear Open template Save template OK Apply Carcel	Tabular results			AASHTO engine rep	ports			
Select all Clear all Girder properties Summary influence line loading Select all Clear all Clear all Save template OK Apply Cancel OK Apply Cancel	Dead load acti	on report		Miscellaneous r	eports:			
Summary influence line loading Truss panel point maximum forces report Truss panel point maximum forces report Capacity summary Capacity detailed influence line loading Capacity detailed computations FE model for LL analysis LL influence lines FE actions LL distrib. factor summary Regression data Camber Fatigue stress ranges Specification output: Select all Clear all Reset Open template Save template OK Apply	V Live load action	n report		Girder prop	perties			
Invasignere point concurrent Dites report Detailed influence line loading Capacity summary Capacity detailed computations FE model for DL analysis E model for DL analysis Li influence lines FE model Li influence lines FE model Li strib. factor computations Li distrib. factor summary Regression data Camber Fatigue stress ranges Select all Clear all Reset Open template Save template OK		int concurrent forcer read		Summary in	nfluence line loading			
Capacity summary Capacity detailed computations F model for DL analysis F model for DL analysis F model for LL analysis LL influence lines FE model LL influence lines FE model LL distrib. factor computations LL distrib. factor computations LL distrib. factor computations LL distrib. factor summary Regression data Camber Fatigue stress ranges Secification output Capacity detailed Select all Clear all Reset Clear Open template Save template OK Apply Cancel	Truss panel po	int concurrent forces report		Detailed in	fluence line loading			
Capacity detailed computations FE model for DL analysis FE model for DL analysis Li influence lines FE model Li influence lines FE model Li distrib. factor computations Li distrib. factor computations Li distrib. factor summary Regression data Camber Fatigue stress ranges Service II stress ranges Secification output: Select all Clear all Reset Open template Save template OK	Iruss panel po	int maximum forces report		Capacity su	- Immary			
Genedal for DL analysis FE model for LL analysis FE model for LL analysis LL influence lines FE model LL influence lines FE schons LL distrib. factor computations LL distrib. factor summary Regression data Camber Fatigue stress ranges Select all Clear all Select all Clear all Save template OK Apply				Capacity de	etailed computations			
Per Hoder Kor DC analysis FE model for LL analysis LL influence lines FE model LL influence lines FE model LL influence lines FE model LL distrib. factor computations LL distrib. factor summary Regression data Camber Fatigue stress ranges Service II stress ranges Specification output VERPURER Clear all Clear all Reset Open template Save template OK				E model fr	or DL analysis			
Per moder for LL angists Li influence lines FE model Li influence lines FE model Li distrib. factor computations Li distrib. factor computations Li distrib. factor summary Regression data C amber Fatigue stress ranges Service II stress ranges Sectification output VILRFD/LRFR conc article detailed Select all Clear all Reset Open template Save template OK Apply					or DE analysis			
Implementation Implementation Implementation Implementa					or LL analysis			
IL Influence lines HE actions IL distrib. factor computations IL distrib. factor summary Regression data Camber Fatigue stress ranges Service II stress ranges Specification output: Select all Clear all Reset Open template Save template OK				LL influence	e lines FE model			
IL distrib. factor computations IL distrib. factor summary Regression data Camber Fatigue stress ranges Service II stress ranges Specification output: Vertication output: Select all Clear all Reset Clear Open template Save template				LL influence	e lines FE actions			
L Lidsrib. factor summary Regression data Camber Fatigue stress ranges Service II stress ranges Sectification output V LRFD/LRFR conc article detailed Select all Clear all Reset Open template Save template OK Apply Cancel				LL distrib. f	actor computations			
Regression data Camber Fatigue stress ranges Service II stress ranges Sectification output LRFD/LRFR conc article detailed Select all Clear all Reset Open template Save template OK Apply Cancel				LL distrib. f	actor summary			
Camber Fatigue stress ranges Service II stress ranges Specification output: Select all Clear all Reset Clear Open template Save template OK Apply Cancel				Regression	data			
Fatigue stress ranges Service II stress ranges Service II stress ranges Section output: Section output: </td <td></td> <td></td> <td></td> <td>Camber</td> <td></td> <td></td> <td></td> <td></td>				Camber				
Service II stress ranges Specification output: Sect all Clear all Reset Clear Open template Save template OK Apply Cancel				Fatigue stre	ess ranges			
Select all Clear all Reset Clear Open template Save template OK Apply Cancel				Service II st	tress ranges			
Select all Clear all Reset Clear Open template Save template OK Apply Cancel				Specification ou	utput:			
Select all Clear all Select all Clear all				LRFD/LRFR	conc article detailed			
Select all Clear all Reset Clear Open template Save template OK Apply Cancel								
Reset Clear Open template Save template OK Apply Cancel	Select all Cle	ar all		Select all Cle	ear all			
Reset Clear Open template Save template OK Apply Cancel								
	Reset Clear	r Open template	Save temp	blate	ОК	Apply	Cano	el:

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

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.

📲 Bridge V	Bridge Workspace - Gusset Plate Example					REPORTS	?	_	\times
BRIDGE WORKSPACE	WORKSPACE	TOOLS VI	EW HE		DESIGN/RATE	REPORTING			
Analysis Analyze Analysis Settings Analysis Analysis	Tabular Results Check	ication Engine Detail Outputs Results	Results Graph R	E Save Results					

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.

4	Analysis Resu								- 🗆	×	
	Print Print										
Rep	ort type:		Lane/Impact	loading type		Display Format	t				
Rating Results Summary V 🔿 As requested Detailed					Single rating	level per ro	v wc				
		1. 1. 1		D. C	1 10 -		51				
	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	8.04	0.223	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	6.83	0.273	L2L3 : L2	SER-II Gusset Plate Bolt Slip	As Requested	As Requested	
115		aine Version 760	3001								
Ana	lysis preferen	ce setting: None	.5001								
										С	lose

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.

A Specification Checks for Truss 1 - 54 of 1130

A Specification C	hecks for Truss 1	- 54 of 1130			- 0	×
		Articles				
		All articles 🗸 🗸				
Properties	Conorato	Format				
Properties	Generate	Bullet list 🗸				
Specification filter		Report				
🔺 🚞 Superstructu	ure Component	Specification reference	Limit State	Flex. Sense	Pass/Fail	
🔺 🚞 Stage 3		✓ 6.9.2.1 Axial Compression		N/A	Passed	
🔺 🚞 Truss	1	✓ 6.9.2.2.1 Combined Axial Compression and Flexure - General		N/A	Passed	
🛅 U(0U1	✗ 6.9.3 Compression Limiting Slenderness Ratio		N/A	Failed	
🛅 U	1U2	6.9.4.1.1 Nonslender Element Nominal Compressive Resistance		N/A	General Comp.	
🚞 U2	2U3	6.9.4.1.2 Truss Elastic Flexural Buckling Resistance of Truss Members	;	N/A	General Comp.	
🧰 U3	3U4	6.9.4.1.3 Elastic Torsional Buckling and Flexural-Torsional Buckling R	lesi	N/A	Passed	
🛅 U4	4U5	6.9.4.2.2 Slender Longitudinally Unstiffened Cross-Section Elements	;	N/A	General Comp.	
🚞 U:	5U6	6.9.4.2.2b Effective Width of Slender Elements		N/A	General Comp.	
	000	✓ 6.9.4.5 Plate Buckling under Service and Construction Loads		N/A	Passed	
L4U6		NA 6A.6.12.5.1 Gusset Plate Rivets in Shear		N/A	Not Applicable	
UOL1		× 6A.6.12.6.1 Gusset Plate Axial Force Rating		N/A	Failed	
	21.2	✓ 6A.6.12.6.1 Gusset Plate Bolt Slip Resistance Rating		N/A	Passed	
☐ 02	212	✓ 6A.6.12.6.1 Gusset Plate Fastener Rating		N/A	Passed	
i 14	413	✓ 6A.6.12.6.1 Gusset Plate Partial Shear Plane Rating		N/A	Passed	1
i L3	306	6A.6.12.6.2 Gusset Plate Fastener Shear Resistance - Bolt		N/A	General Comp.	- 1
i i i i i i i i i i i i i i i i i i i	101	6A.6.12.6.3 Gusset Plate Bolt Slip Resistance		N/A	General Comp.	
i L2	203	6A.6.12.6.4 Gusset Plate Bearing Resistance at Fastener Holes		N/A	General Comp.	
 L3	3U5	6A.6.12.6.7a Gusset Plate Compressive Resistance Partial Shear Plan	e	N/A	General Comp.	_
LO	DL1	NA 6A.6.12.6.7a Gusset Plate Compressive Resistance Truncated Whitm	ore	N/A	Not Applicable	
🛅 L1	1L2	6A.6.12.6.7a Gusset Plate Compressive Resistance Whitmore Section	n	N/A	General Comp.	
🚞 L2	2L3	NA 6A.6.12.6.7b Gusset Plate Compressive Resistance Basic Corner Cher	ck	N/A	Not Applicable	_
🚞 L3	3L4	6A.6.12.6.8 Gusset Plate Tensile Resistance		N/A	General Comp.	- 1
🔺 🚞 Truss	1 Panel Points	6A.6.12.6.8 Gusset Plate Tensile Resistance Block Shear Rupture		N/A	General Comp.	- 1
🚞 L0)	6A.6.12.6.8 Gusset Plate Tensile Resistance Whitmore Net Fracture		N/A	General Comp.	- 1
🚞 L1	1	6A.6.12.6.8 Gusset Plate Tensile Resistance Whitmore Yielding		N/A	General Comp.	- 1
L2 🖌 6A.6.6-7 Truss Axial Ter		✓ 6A.6.6-7 Truss Axial Tension and Compression Rating		N/A	Passed	
🚞 L3		NA 6A.6.8 Truss Combined Axial and Flexure Rating		N/A	Not Applicable	
🚞 L4		APPD6.2 Yield Moment		N/A	General Comp.	
🚞 U(0	APPD6.3.1 In the Elastic Range (Dc)		N/A	General Comp.	
i U2	2	Plastic Moment (Mp) for Steel Noncomposite Sections Plastic Mom	en	N/A	General Comp.	
<u>i</u> U4	4	Steel Elastic Section Properties		N/A	General Comp.	- 1
	0	ji i				

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.

MBE Article	Description
6A.6.12.6.2	Fastener Shear Resistance
6A.6.12.5.1	Rivets in Shear
6A.6.12.6.3	Bolt Slip Resistance
6A.6.12.6.4	Bearing Resistance at Fastener Holes
6A.6.12.6.6	Gusset Plate Shear Resistance
6A.6.12.6.7a	Gusset Plate Compressive Resistance – Partial Shear Plane
6A.6.12.6.7a	Gusset Plate Compressive Resistance – Whitmore Section
6A.6.12.6.7a	Gusset Plate Compressive Resistance – Truncated Whitmore Section
6A.6.12.6.7b	Gusset Plate Compressive Resistance – Basic Corner Check
6A.6.12.6.8	Gusset Plate Tensile Resistance – Block Shear Rupture
6A.6.12.6.8	Gusset Plate Tensile Resistance – Whitmore Yielding
6A.6.12.6.9	Chord Splices – Compressive Resistance
6A.6.12.6.9	Chord Splices – Tensile Resistance
6A.6.12.6.1	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.

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

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.

A Gusset Plate Example

