AASHTOWare BrDR 7.5.0 Truss Tutorial T4 – Floor Truss Example

BrDR Tutorial

Topics Covered

- Floor and truss system/line superstructure definitions overview
- Floor truss description
- Analysis rating results and outputs

Floor and truss system/line superstructure definitions overview

BrDR supports the modeling of three types of floor system/line superstructure definitions and two types of truss system/line superstructure definitions.

Floor system/line superstructure definition supported configurations

- Girder-Floorbeam-Stringer
- Girder-Floorbeam
- Floorbeam-Stringer

Truss system/line superstructure definition supported configurations:

- Truss-Floorbeam-Stringer
- Truss-Floorbeam

Modeling capabilities in the system superstructure definition:

- Number of main members (girders or trusses) can be more than two.
- Continuous span main member are supported.
- Main members can directly support the deck. This enables entry of composite deck properties for the main members.
- Main member configuration type can be deck or through.
- Stringers can frame into the floor beam or rest on top of the floor beam.
- Support entry of deterioration profile information.

Modeling limitations in system superstructure definition:

- Main member spacings cannot vary along the length of the superstructure.
- Number of stringers and stringer spacings cannot vary in the superstructure.
- Deck width cannot vary along the length of the superstructure.
- Floor beams at support lines are assumed to have the same skew as the support line. All other floor beams are assumed to be perpendicular.
- Cantilevered floor beam spans are only supported for deck main member configuration type.
- Interior floor beams can only be supported by the main members.

Floor trusses are supported in the system superstructure definition and implemented as a new type in the floorbeam definition. The truss members in floor truss can have rolled and built-up cross sections. The BrDR Truss LFR Engine is the analysis module for rating floor trusses.

Floor truss description

For this example, a new floor truss definition will be added in BID 13 and the floor beam definition assigned to Floorbeam1's Alt #1 floorbeam member alternative will be replaced with this newly added floor truss definition.

From the **Bridge Explorer** double click on **BID 13 FSys GFS TrainingBridge1** to open the **Bridge Workspace**. Expand the workspace tree until the FLOORBEAM DEFINITIONS and Floorbeam1's FLOORBEAM MEMBER ALTERNATIVES are visible. The partially expanded **Bridge Workspace** tree is shown below.



Bridge Shapes

For this example, create a new steel angle as shown below. Navigate to the **Components** tab and expand the tree labelled **Beam Shapes** and **Steel Shapes** as shown below. The partially expanded **Components** tree with the **Steel Shapes** node is shown below.

Workspace		- O ×	<
Bridge	Components		\sim
	mponents Appurtenances Beam Shapes Prestress Sha Steel Shapes Angles Channels Channels Tees Timber Shape Connectors Factors LRFD Substructur Materials	pes es re Design Settings	

To add a new steel angle, click on the **Angles** node in the Components tree and select New from the **Manage** group of the **WORKSPACE** ribbon (or right mouse click on **Angles** and select **New** or double click on **Angles** in the **Components** tree). The window shown below will open.

Bridge Workspace	e - FSys GFS Training	gBridge1	ANALYSIS	REPORTS	?	_		\times
BRIDGE WORKSPACE	ORKSPACE TO	OLS VIEW	DESIGN/RATE	REPORTING				
← Check Out 💣 ← Check In Validate S	📳 👶 Restore Save 🚷 Revert	Close Export	Refresh Open	New Copy	Paste Duplicat	e Delete	Schemati	ic
	Bridge			Μ	lanage			
Workspace	\$ \$	C Schematic		\$ ×	Report		\$2	×
Bridge Components Components Components Appurtenances Components Componen	pes							
B → Chan Bar B → Chan Bar B → Chan Bar Chan Bar B → Chan Bar Chan Bar	Collapse Branch						Ś	×
Imber Si Connectors P Factors Factors D LRFD Substru	Analyze View Summary Re View Detailed Rep	port ort						
💷 🏲 Materials	General Preference Close Bridge Work	es «space						



Click the Copy from library... button. The Steel Shape Selection window will appear.

This window displays all the steel shapes available in the library. The list can be sorted by clicking on any of the column headers (e.g., **Shape**, **Year**, **Depth** etc.). Select L 2x2x0.25 and click **OK**.

4	A S	teel Shape Selection					×
					Library S A	tandard gency defined	Unit system SI US
		Shape	Year	Depth (in)	Load (lb/ft)	Sxx (in^3)	
		L 2x2x0.1875	1994	2	2.44	0.1900769	
		L 2x2x1/4	2011	2	3.19	0.2446959	
	>	L 2x2x0.25	1994	2	3.19	0.2471591	
		L 2x2x5/16	2011	2	3.92	0.2976276	
		L 2x2x0.3125	1994	2	3.92	0.3001443	
		L 2x2x0.375	1994	2	4.7	0.351173	-
						ОК	Cancel



The steel angle properties are copied to the Steel Angle window as shown below.

Click **OK** to apply the data and close the window.

Floorbeam Definition

Navigate back to the **Bridge** tab and double-click on the **FLOORBEAM DEFINITIONS** node in the Bridge Workspace tree to create a new floorbeam definition. The **New Floorbeam Definition** window appears as shown below.

Select **Steel** for the **Material type** and **Detailed Steel Truss** for the **Girder type**. Click **OK** to close this and create a new floorbeam definition.

A New Floorbeam Definition	×
Material type:	Girder type:
Steel	Built-up
	Detailed Steel Truss
	Plate
	Rolled
	OK Cancel

The **Floorbeam Definition** window will open. Enter the data as shown below. **Cross-section based** property input method is the only input method for floor truss. The 0.005 kip/ft Additional self load will be applied for each truss member in the floor truss.

re: Floortruss Def 1		
escription Geometry Specs Factor	rs Engine	
Description:		Material type: Steel
		Floorbeam type: Detailed Steel Truss
		Default units: US Customary \lor
Floorbeam property input method	Self load	
Schedule-based	Load case: Engine Assigned	
Cross-section based	Additional self load: 0.005 kip/ft	Universal mill plate not present
	Additional self load: %	
Default rating method: LFR \sim]	Floorbeam length between main members
	Cantilever	_ Length
	Cantilever lengths	Span (ft)
	Left: ft	> 1 30.00
Left Floorbeam Span Right antilever Cantilever	Kight:	

Floorbeam Definition – Geometry

Select the **Geometry** tab of this window and enter the locations of the panel points as shown below. These panel points will be used to define the truss members.

e:	Floortruss D	ef 1			J													
sc	ription Ge	ometry	Spe	ecs Fa	actors E	ngine												
	Symmetrical	Num	ber o Even Odd	number	of panels of panels													
	Panel point	Туре		X (ft)	Y (ft)													
	L1	Lower	~	0.00	0.00													
	L2	Lower	~	6.00	0.00													
	L3	Lower	~	12.00	0.00													
	L4	Lower	~	18.00	0.00													
	L5	Lower	~	24.00	0.00													
	L6	Lower	~	30.00	0.00													
	U1	Upper	~	0.00	4.00													
>	U2	Upper	~	6.00	4.00													
	U3	Upper	~	12.00	4.00													
	U4	Upper	~	18.00	4.00													
	U5	Upper	~	24.00	4.00													
	U6	Upper	~	30.00	4.00													
												New		Dupl	icate	D)elete	:
												0	K		Appl		Car	

Click OK to apply the data and close the Floorbeam Definition window.

In the **Floorbeam Definition** window **Geometry** tab, the **Symmetrical** option specifies that the entered panel point locations are symmetrical. The **Number of Panels** will be enabled when **Symmetrical** is selected. For even number of panels, enter the panel point locations from the left most panel to the central panel points. For odd number of panels, enter the panel point locations from the left most panel to the right end of the central panel. If **Symmetrical** is selected, symmetrical geometry, supports and user-defined truss member loads will be generated.



The partially expanded Bridge Workspace tree with the new Floortruss Def 1 is shown below.



Floorbeam Member Alternative

Double click on the **Floorbeam1**'s **Alt #1** floorbeam member alternative in the **Bridge Workspace** tree and change the assigned floorbeam definition to **Floortruss Def 1** as shown below.

				C-	nacity (kin)		A11	owable -t-	occ (kci)	Unberg	od lon-t	h (ft)	
Member	Cross section name	Cross section type	Override	Tension	Compression	Dead load axial force	Override	Tension	Compression	Override	Z axis	n (π) Yaxis	
						axial loice							

Click **OK** to apply the data and close the window.

The Floorbeam Member Alternative window will be populated with truss members after Floortruss Def 1 is completely defined. The General tab allows to override the computed capacities, the allowable stresses and the unbraced length defined in Floortruss Def 1.

Schematic – Floorbeam Member Alternative

While Alt #1 is selected in the Bridge Workspace tree, open the schematic for the truss by selecting the Schematic button on the WORKSPACE ribbon (or right click on Alt #1 in the Bridge Workspace and select Schematic from



The following schematic will be displayed.

Schematic					– 🗆 ×
Truss					~ ×
🖻 <u>k</u> Q, 4 🗄	₽ 🔂 🖂 🗛 🗸				÷
FSys GFS Traini FloorSystem GF 6/16/2023	ngBridge1 S Training Bridge 1	- Floor System GFS	6 with Deck - Alt #1		
[0.00, 4.00] U1	[6.00, 4.00] U2	[12.00, 4.00] U3	[18.00, 4.00] U4	[24.00, 4.00] U5	[30.00, 4.00] U6
L1 [0.00, 0.00]	L2 [6.00, 0.00]	L3 [12.00, 0.00]	L4 [18.00, 0.00]	L5 [24.00, 0.00]	L6 [30.00, 0.00]

Cross Sections

Return to the **Floortruss Def 1** description. Expand the **Floortruss Def 1** node and double click **Truss Member Cross Sections** in the **Bridge Workspace** tree to create a new rolled section. The **New Cross Section** window shown below will open. Select **Rolled Section**, click **OK** to close this window and create a new rolled section.

A New Cross Section			×
Material type: Steel ~			
Cross section type:			
Rolled Section	Builtup Double Angle	Builtup Single Angle	Builtup Channel OK

Enter the data as shown below for the rolled section. Click **OK** to apply the data and close the window.

Cross Sections	-	×
lame: Rolled Section	Type: Rolled Steel Truss Cross Section	
Dimensions Top cover plates	Bottom cover plates	
Shape: Material: Top/bottom cover plates attachment	W 6x20 v FY 36ksi Steel v Bolted v	

Similarly, double click the **Truss Member Cross Sections** in the **Bridge Workspace** tree to create another section. This will be a new **Builtup** Section.

A New Cross Section				×
Material type: Steel \checkmark				
Cross section type:				
Rolled Section	Builtup Double Angle	Builtup Single Angle	Builtup Channel OK	

Enter the data as shown below for the Builtup Section.

	Builtup Section		Туре	Builtup Stee	el Truss X-Section						
Dime	nsions Top co	ver plates	Bottom co	over plates							
v	Veb lacing			Angle	e type Four angles Double angles Single angle		Materials Top angles: Web: Bottom angles:	FY 36ksi Steel FY 36ksi Steel FY 36ksi Steel			
	6.0000 i	n	Type: Builtup Steel Truss X-Section Bottom cover plates								
	Enter angle descri	Horz. leg (in)	Vert. leg (in)	Horz. thick (in)	Vert. thick (in)		Top: 2 V	Bottom: 2	~		
>	Top angles	2.0000	2.0000	0.2500	0.2500	-					
	Bottom angles	2.0000	2.0000	0.2500	0.2500						
						-					

Select the **Top cover plates** tab to enter the top cover plate as shown below. Click **Copy to bottom cover plates** to copy the cover plate to the **Bottom cover plates** tab.

ame, builtup sectio	n	Type:	Builtup Stee	Truss X-Section						
Dimensions Top	over plates	Bottom cov	ver plates							
Attachment										
Welded			Relative position	Material	Width (in)	Thickness (in)				
O Bolted			1	FY 36ksi Steel 🗸 🗸	6.0000	0.3750				
Riveted					1					
Holes										
Size:	in									
Number:	0.000									
Effective area	in/	2								
							New	Duplicate	De	lete
Copy to bottom	cover plates									
Copy to bottom	cover plates									

Cross Sections					- 0
Name: Builtup Section Ty	pe: Builtup Ste	el Truss X-Section			
Dimensions Top cover plates Bottom	cover plates				
Attachment	Relative		Width	Thickness	
Welded	position	Material	(in)	(in)	
O Bolted	> 1	FY 36ksi Steel 🗸 🗸	6.0000	0.3750	A
Riveted		,	,		
Holes					
Size: in					
Number: 0.000					
Effective area deduction:					
					-
Copy to top cover plates					New Duplicate Delete
					OK Apply Cancel

The partial Bridge Workspace tree with the new Rolled Section and Builtup Section is shown below.







Double-click **Truss Member Properties** in the **Bridge Workspace** tree to open the **Truss Member Properties** window. Click **New** to create a new row, select **Panel point from** and **Panel point to** and populate the **Member name**, the **Z axis** and **Y axis unbraced lengths**. Enter the data as shown below for the truss members. Click **OK** to apply the data and close the window.

N	Member name	Panel point from	Pa	anel pint to	Length (ft)	Z axis unbraced length (ft)	Y axis unbraced length (ft)	Cross sectio	on	End connec	tion	к	
L1L2	!	L1 ~	L2	\sim	6	6	6	Rolled Section	\sim	Pinned	~	0.875	
L2L3		L2 ~	L3	\sim	6	6	6	Rolled Section	\sim	Pinned	~	0.875	
L3L4	ł	L3 ~	L4	\sim	6	6	6	Rolled Section	\sim	Pinned	\sim	0.875	
L4L5	i	L4 ~	L5	\sim	6	6	6	Rolled Section	\sim	Pinned	\sim	0.875	
L5L6	i	L5 ~	L6	\sim	6	6	6	Rolled Section	\sim	Pinned	~	0.875	
U1U	2	U1 ~	U2	\sim	6	6	6	Rolled Section	\sim	Pinned	\sim	0.875	
U2U	3	U2 ~	U3	\sim	6	6	6	Rolled Section	\sim	Pinned	~	0.875	
U3U	4	U3 ~	U4	\sim	6	6	6	Rolled Section	\sim	Pinned	\sim	0.875	
U4U	5	U4 ~	U5	\sim	6	6	6	Rolled Section	\sim	Pinned	\sim	0.875	
U5U	6	U5 ~	U6	\sim	6	6	6	Rolled Section	\sim	Pinned	\sim	0.875	
L1U1	1	L1 ~	U1	\sim	4	4	4	Builtup Section	\sim	Pinned	~	0.875	
L2U2	2	L2 ~	U2	\sim	4	4	4	Builtup Section	\sim	Pinned	~	0.875	
L3U3	3	L3 ~	U3	\sim	4	4	4	Builtup Section	\sim	Pinned	~	0.875	
L4U4	1	L4 ~	U4	\sim	4	4	4	Builtup Section	\sim	Pinned	~	0.875	
L5U5	5	L5 ~	U5	\sim	4	4	4	Builtup Section	\sim	Pinned	~	0.875	
L6U6	5	L6 ~	U6	\sim	4	4	4	Builtup Section	\sim	Pinned	~	0.875	
L2U1	1	L2 ~	U1	\sim	7.211103	7.21	7.21	Builtup Section	\sim	Pinned	~	0.875	
L2U3	3	L2 ~	U3	\sim	7.211103	7.21	7.21	Builtup Section	\sim	Pinned	\sim	0.875	
L3U4	4	L3 ~	U4	\sim	7.211103	7.21	7.21	Builtup Section	\sim	Pinned	\sim	0.875	
L4U3	3	L4 ~	U3	\sim	7.211103	7.21	7.21	Builtup Section	\sim	Pinned	\sim	0.875	
L5U4	4	L5 ~	U4	\sim	7.211103	7.21	7.21	Builtup Section	\sim	Pinned	\sim	0.875	
L5U6	5	L5 ~	U6	\sim	7.211103	7.21	7.21	Builtup Section	\sim	Pinned	\sim	0.875	
L304	+ 3 4 5	L4 ~ L5 ~ L5 ~	U3 U4 U6	× × ×	7.211103 7.211103 7.211103 7.211103	7.21 7.21 7.21 7.21	7.21 7.21 7.21 7.21	Builtup Section Builtup Section Builtup Section	× × ×	Pinned Pinned Pinned	× × ×	0.875	

Schematic – Floorbeam Member Alternative

While **Alt #1** is selected in the **Bridge Workspace** tree, open the schematic for the truss by selecting the **Schematic** button on the **WORKSPACE** ribbon (or right click on **Alt #1** in the **Bridge Workspace** and select **Schematic** from the manual



The following schematic will be displayed.



Alt #1	b loss Top flange le	Floorbeam definitio	n: Floortru	Iss Def 1	plate loss Bo	ottom cover p	late loss					
				Ca	pacity (kip)		All	owable str	ess (ksi)	Unbrac	ed lengt	h (ft)
Member	Cross section name	Cross section type	Override	Tension	Compression	Dead load axial force	Override	Tension	Compression	Override	Z axis	Y axis
L1L2	Rolled Section	Rolled Steel Truss Cross Section										
L2L2	Rolled Section	Rolled Steel Truss Cross Section										
L3L4	Rolled Section	Rolled Steel Truss Cross Section										
L4L5	Rolled Section	Rolled Steel Truss Cross Section										
L5L6	Rolled Section	Rolled Steel Truss Cross Section										
U1U2	Rolled Section	Rolled Steel Truss Cross Section										
U2U3	Rolled Section	Rolled Steel Truss Cross Section										
U3U4	Rolled Section	Rolled Steel Truss Cross Section										
U4U5	Rolled Section	Rolled Steel Truss Cross Section										
U5U6	Rolled Section	Rolled Steel Truss Cross Section										
L1U1	Builtup Section	Builtup Steel Truss X-Section										
L2U2	Builtup Section	Builtup Steel Truss X-Section										
L3U3	Builtup Section	Builtup Steel Truss X-Section										
L4U4	Builtup Section	Builtup Steel Truss X-Section										
L5U5	Builtup Section	Builtup Steel Truss X-Section										
L6U6	Builtup Section	Builtup Steel Truss X-Section										
L2U1	Builtup Section	Builtup Steel Truss X-Section										
L2U3	Builtup Section	Builtup Steel Truss X-Section										
L3U4	Builtup Section	Builtup Steel Truss X-Section										
L4U3	Builtup Section	Builtup Steel Truss X-Section										
L5U4	Builtup Section	Builtup Steel Truss X-Section										
L5U6	Builtup Section	Builtup Steel Truss X-Section										

Double click Floorbeam1's Alt #1 floorbeam member alternative in the Bridge Workspace tree.

The **Loss** tabs allow to describe the deteriorations of the rolled and built-up cross sections. The deterioration is defined for a truss member and described over ranges, with each range being defined by a start distance and a length.

LFR Analysis

To perform a rating on the newly added floorbeam member alternative **Alt #1**, select **Alt #1** in the **Bridge Workspace** tree and click the **Analysis Settings** button on the **Analysis** group of the **DESIGN/RATE** ribbon. The window shown below opens.

Bridge Workspace	ce - FSys GFS TrainingBridge1	ANALYSIS	REPORTS	?	_	\times
BRIDGE WORKSPACE	WORKSPACE TOOLS VIEW	DESIGN/RATE	REPORTING			
a 🛤		× B				
Analysis Analyze Analysis Settings Events	Tabular Specification Engine R Results Check Detail Outputs G	esults Save Graph Results				
Analysis	Results					

Select vehicle HS 20-44 under Inventory and Operating as shown below.

Design review Rating	g Sirder V quested V Description s V Pading	Rating method Apply preferen Re Vehic	l: efresh cle summary Rating vehic	LFR None Temporary vehicles	 X Advanced 	
Analysis type: Line G Lane / Impact loading type: As Req Vehicles Output Engine Traffic direction: Both directions Vehicle selection -Vehicles -Standard -EV2 -EV3 -H 15-44	ading	Apply preferen Re Vehic E-F	efresh ele summary Rating vehic	None Temporary vehicles	Advanced	
Lane / Impact loading type: As Req Vehicles Output Engine Traffic direction: Both directions Vehicle selection Uehicle selection Uehicles UE	quested v Description s v wading	Apply preferen Re Vehic	efresh ele summary Rating vehic	None Temporary vehicles	Advanced	
Vehicles Output Engine Traffic direction: Both directions Vehicle selection Vehicles P-Vehicles P-Standard -Alternate Military Loa -EV2 -EV3 -H 15-44	Description s v	Re Vehic	efresh le summary Rating vehic	Temporary vehicles	Advanced	
Traffic direction: Both directions Vehicle selection Vehicles Standard - Alternate Military Loa - EV2 - EV3 - H 15-44	s v	Re Vehici F	efresh :le summary Rating vehic	Temporary vehicles	Advanced	
Vehicle selection Vehicles Standard - Alternate Military Loa - EV2 - EV2 - EV3 - H 15-44	ading	Vehic	le summary Rating vehic	,		
i⊟-Vehicles i⊟-Standard —Alternate Military Loa —EV2 —EV3 —H 15-44	bading	Ė-F	Rating vehic			
H 20-44 HS 15-44 HS 20 (SI) HS 20-44 NRL SU4 SU5 SU6 SU7 Type 3 Type 3-3 Type 3S2 Agency Suer defined Temporary		Add to >> Remove from <<	-HS 21	les y 0-44 erating wentory perating		

Navigate to the Output tab and apply the settings as shown below.
--

 Design review Rating nalysis type: Line Girder Impact loading type: As Requested Vehicles Output Engine Description Tabular results Dead load action report LFR critical loads report Live load action report Truss panel point concurrent forces report Truss panel point maximum forces report 	Rating method: Apply preference setting: ASHTO engine rep Miscellaneous n Girder prop Summary ir Capacity su Capacity su Capacity de FE model fo E LL influence LL influence LL distrib. fa	LFR None ports eports ports eports: perties influence line loading inumary etailed computations or DL analysis or DL analysis e lines FE model e lines FE actions actor computations		
halysis type: Line Girder Impact loading type: As Requested Vehicles Output Engine Description Tabular results Dead load action report Lire critical loads report Live load action report Truss panel point concurrent forces report Truss panel point maximum forces report	Apply preference setting: AASHTO engine rep Miscellaneous rep Girder prop Summary ir Detailed inf Capacity su Capacity de FE model for FE model for LL influence LL influence LL distrib. fa	None ports eports: perties ifluence line loading ifluence line loading mmary etailed computations or DL analysis or DL analysis e lines FE model e lines FE actions actor computations	~	
Impact loading type: As Requested Vehicles Output Engine Description Tabular results Image: Construct of the second	Apply preference setting: AASHTO engine rep Miscellaneous r Girder prop Summary ir Detailed inf Capacity su Capacity su Capacity de FE model fc FE model fc LL influence LL influence LL distrib. fa	None ports eports: perties filuence line loading fluence line loading mmary stailed computations or DL analysis or DL analysis e lines FE model e lines FE actions actor computations	×	
Vehicles Output Engine Description Tabular results Dead load action report LFR critical loads report Live load action report Truss panel point concurrent forces report Truss panel point maximum forces report 	AASHTO engine rep Miscellaneous n Girder prop Summary ir Detailed inf Capacity su Capacity su Capacity de FE model fc FE model fc LL influence LL influence LL distrib. fa	oorts eports: eports: influence line loading fluence line loading mmary etailed computations or DL analysis or DL analysis e lines FE model e lines FE actions		
Tabular results Image: Dead load action report LFR critical loads report Live load action report Truss panel point concurrent forces report Truss panel point maximum forces report	AASHTO engine rep Miscellaneous rep Summary ir Capacity su Capacity de FE model for FE model for LL influence LL influence LL distrib. fa	eports eports: berties fluence line loading fluence line loading mmary etailed computations or DL analysis or LL analysis e lines FE model e lines FE actions actor computations		
 Dead load action report LFR critical loads report Live load action report Truss panel point concurrent forces report Truss panel point maximum forces report 	 Miscellaneous n Girder prop Summary ir Detailed inf Capacity su Capacity de FE model fc FE model fc LL influence LL influence LL distrib. fa 	eports: offuence line loading fluence line loading mmary stailed computations or DL analysis or LL analysis e lines FE model e lines FE actions		
 LFR critical loads report Live load action report Truss panel point concurrent forces report Truss panel point maximum forces report 	 Girder prop Summary ir Detailed inf Capacity su Capacity de FE model fo FE model fo FE model fo LL influence LL influence LL distrib. fa 	perties ifluence line loading ifluence line loading mmary etailed computations or DL analysis or LL analysis e lines FE model e lines FE actions actor computations		
 Live load action report Truss panel point concurrent forces report Truss panel point maximum forces report 	 Summary ir Detailed inf Capacity su Capacity de FE model fo FE model fo LL influence LL influence LL distrib. fa 	nfluence line loading fluence line loading immary etailed computations or DL analysis or LL analysis e lines FE model e lines FE actions		
 Truss panel point concurrent forces report Truss panel point maximum forces report 	 Detailed inf Capacity su Capacity de FE model fo FE model fo LL influence LL influence LL distrib. fa 	fluence line loading mmary etailed computations or DL analysis or LL analysis e lines FE model e lines FE actions		
Truss panel point maximum forces report	 Capacity su Capacity de FE model fc FE model fc LL influence LL influence LL distrib. fa 	mmary etailed computations or DL analysis or LL analysis e lines FE model e lines FE actions		
russ panel point maximum forces report	 Capacity de FE model fo FE model fo FE model fo LL influence LL influence LL distrib. fa 	etailed computations or DL analysis or LL analysis e lines FE model e lines FE actions		
	 FE model fo FE model fo FE model fo LL influence LL influence LL distrib. fa 	or DL analysis or LL analysis e lines FE model e lines FE actions		
	FE model for FE model for LL influence LL influence LL distrib. fa	or LL analysis e lines FE model e lines FE actions		
	LL influence LL influence LL distrib. fa	e lines FE model e lines FE actions		
	LL influence	e lines FE actions		
	LL distrib. fa	actor computations		
	Regression	data		
	Combox	uata		
	Camber			
				J
Select all Clear all	Select all Cle	ear all		
occer on occar an				

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

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

Bridge Workspa	ce - FSys GFS TrainingBridge1	ANALYSIS	REPORTS	?	_	\times
BRIDGE WORKSPACE	WORKSPACE TOOLS VIEW	DESIGN/RATE	REPORTING			
a 🛤	🔲 📄 🗞 🔆	2 📙				
Analysis Analyze Analysis Settings Events	Tabular Specification Engine Result Results Check Detail Outputs Grading	ults Save ph Results				
Analysis	Results					

Analysis

The **Analysis** window shows analysis progress messages during analysis. Messages in blue are information messages. Warning messages are in green and error messages are in red. The **Analysis** window indicates the analysis is successfully completed.

Analysis - Alt #1	
- Member - L5U4	×
 Ompleted Specification Check. Info - Writing rating reports Writing Truss Member Section Property Report Writing Truss Panel Point Maximum Forces Report Writing Truss Panel Point Concurrent Forces Report Info - Finished LFR specification checking Info - LFR analysis successfully completed! Info - Analysis completed! 	ļ
Errors 🛆 Warnings	
Type Description	
Close][

Analysis results and outputs

Tabular Results

When the rating analysis is completed, results can be reviewed by selecting the Alt #1 member in the Bridge

Workspace tree and clicking the **Tabular Results** button on the **Results** group of the ribbon. The window shown below will open.

🗛 Anal	lysis Re	sults - Alt #1	1							- 0	×
Print	t t										
Report ty	ype:		C Lane/	Impact load	ing type	Display	/ Format				
Rating R	Results S	Summary	× 0	As requeste	d ODetail	ed Single	rating leve	el per row 🗸 🗸			
Live	e Load	Live Load Type	Rating Method	Rating Level	Load Rating (Ton)	Rating Factor	Element Name	Limit State	Impact	Lane	
HS	20-44	Axle Load	LFR	Inventory	17.63	0.490	U3U4	AXIAL-COMPRESSION	As Requested	As Requested	-
HS	20-44	Axle Load	LFR	Operating	29.45	0.818	U3U4	AXIAL-COMPRESSION	As Requested	As Requested	1
HS	20-44	Lane	LFR	Inventory	21.60	0.600	U3U4	AXIAL-COMPRESSION	As Requested	As Requested	1
HS	20-44	Lane	LFR	Operating	36.08	1.002	U3U4	AXIAL-COMPRESSION	As Requested	As Requested	
1											
			7.5.0.0004								
AASHIO	LFK En	gine Versior	1 7.5.0.3001								
Analysis	prefere	nce setting:	None								
										Clo	se

Engine Outputs

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

Br 🖁 ANALYSIS ? \times Bridge Workspace - FSys GFS TrainingBridge1 REPORTS REPORTING BRIDGE WORKSPACE WORKSPACE TOOLS VIEW DESIGN/RATE æ 냲 5 4 Analysis Analyze Analysis Tabular Specification Engine Results Save Settings Events Results Check Detail Outputs Graph Results Analysis Results

A FSys GFS TrainingBridge1	_	×
FSys GFS TrainingBridge1 Floor System GFS with Deck Floorbeam1 FAASHTO_ASR AASHTO_LFR Stage 3 Infl Lines Virtual Stringer Model Stage 3 Infl Lines Span Model Stage 1 Span Model Stage 2 Span Model Stage 2 Span Model Stage 3 Span Model Actions Log File AASHTO_Truss_LFR FE Model for Stage 1 FE Actions for Stage 1 FE Model FE Actions for Stage 3 Influence Lines FE Actions for Stage 3 Influence Lines FE Actions for Virtual Stringer Stage 3 Influence Lines FE Actions for		

Description of the output files:

• FE Model for Stage 1

The stage 1 finite element model presents the floor truss nodes, truss elements, element properties, support conditions and load cases for the dead load analysis.

• FE Actions for Stage 1 FE Model

The stage 1 finite element result presents the support reactions, element actions and nodal displacements for each dead load case.

• FE Model for Stage 3 Influence Lines

The stage 3 influence line finite element model presents the floor truss nodes, truss elements, element properties, support conditions and load cases for the influence line analysis. Each load case represents a unit load at a panel point.

• FE Actions for Stage 3 Influence Lines FE Model

The stage 3 influence line finite element result presents the support reactions, element actions and nodal displacements for each influence line load case. The results are used to generate the axial influence lines for the truss elements and the reaction influence lines for the support nodes.

• FE Model for Virtual Stringer Stage 3 Influence Lines

The stage 3 virtual stringer influence line finite element model presents the virtual stringer nodes, beam elements, element properties, support conditions and load cases for the virtual stringer influence line analysis.

• FE Actions for Virtual Stringer Stage 3 Influence Lines FE Model

The stage 3 virtual stringer influence line finite element result presents the support reactions for each influence line load case. The results are used to generate the reaction influence line for the support node located at the floor truss.

• Virtual Stringer LL Summary File

The virtual stringer live load summary presents the reaction influence line for the support node located at the floor truss and the maximum and minimum vertical reactions for each live loading.

• Floorbeam Transverse LL Summary File

The floorbeam transverse live load summary presents the stringer reactions for each vehicle position pattern and the resulting axial force for each truss member.

• Truss Member Section Property Report

The section properties report presents the section properties for each truss member and for each component of a truss member.

• Rating Results Report

The rating result report presents all information required to perform the rating computation.

• Panel Point Maximum Forces Report

The maximum forces report presents the maximum member forces due to dead load and live load for each truss member at each panel point.

• Panel Point Concurrent Forces Report

The concurrent forces report presents the concurrent member live load forces for each panel point's member under the critical live load condition.

• Log File

The log file is the analysis log produced when the analysis is run. This file may contain errors and warnings that should be reviewed.

A portion of the **Truss Member Section Property Report** is shown below.

Member	Gross Area Comp. (in²)	Gross Area Tens. (in ²)	Effective Area Tens. (in ²)	Izz (in ⁴)	Cy (in)	Rz (in)	Iyy (in ⁴)	Cz (in)	Ry (in)	Actual Length (ft)	Unbraced Length z (ft)	Unbraced Length y (ft)	Fy (ksi)
L1L2	5.87	5.87	5.87	41.40	3.10	2.66	13.30	0.00	1.51	6.00	6.00	6.00	36.00
L2L2	5.87	5.87	5.87	41.40	3.10	2.66	13.30	0.00	1.51	6.00	6.00	6.00	36.00
L3L4	5.87	5.87	5.87	41.40	3.10	2.66	13.30	0.00	1.51	6.00	6.00	6.00	36.00
L4L5	5.87	5.87	5.87	41.40	3.10	2.66	13.30	0.00	1.51	6.00	6.00	6.00	36.00
L5L6	5.87	5.87	5.87	41.40	3.10	2.66	13.30	0.00	1.51	6.00	6.00	6.00	36.00
U1U2	5.87	5.87	5.87	41.40	3.10	2.66	13.30	0.00	1.51	6.00	6.00	6.00	36.00
U2U3	5.87	5.87	5.87	41.40	3.10	2.66	13.30	0.00	1.51	6.00	6.00	6.00	36.00
U3U4	5.87	5.87	5.87	41.40	3.10	2.66	13.30	0.00	1.51	6.00	6.00	6.00	36.00
U4U5	5.87	5.87	5.87	41.40	3.10	2.66	13.30	0.00	1.51	6.00	6.00	6.00	36.00
U5U6	5.87	5.87	5.87	41.40	3.10	2.66	13.30	0.00	1.51	6.00	6.00	6.00	36.00
L1U1	10.13	10.13	9.50	74.55	3.38	2.71	17.01	0.00	1.30	4.00	4.00	4.00	36.00
L2U2	10.13	10.13	9.50	74.55	3.38	2.71	17.01	0.00	1.30	4.00	4.00	4.00	36.00
L3U3	10.13	10.13	9.50	74.55	3.38	2.71	17.01	0.00	1.30	4.00	4.00	4.00	36.00
L4U4	10.13	10.13	9.50	74.55	3.38	2.71	17.01	0.00	1.30	4.00	4.00	4.00	36.00
L5U5	10.13	10.13	9.50	74.55	3.38	2.71	17.01	0.00	1.30	4.00	4.00	4.00	36.00
L6U6	10.13	10.13	9.50	74.55	3.38	2.71	17.01	0.00	1.30	4.00	4.00	4.00	36.00
L2U1	10.13	10.13	9.50	74.55	3.38	2.71	17.01	0.00	1.30	7.21	7.21	7.21	36.00
L2U3	10.13	10.13	9.50	74.55	3.38	2.71	17.01	0.00	1.30	7.21	7.21	7.21	36.00
L3U4	10.13	10.13	9.50	74.55	3.38	2.71	17.01	0.00	1.30	7.21	7.21	7.21	36.00
L4U3	10.13	10.13	9.50	74.55	3.38	2.71	17.01	0.00	1.30	7.21	7.21	7.21	36.00
L5U4	10.13	10.13	9.50	74.55	3.38	2.71	17.01	0.00	1.30	7.21	7.21	7.21	36.00
L5U6	10.13	10.13	9.50	74.55	3.38	2.71	17.01	0.00	1.30	7.21	7.21	7.21	36.00

Truss	Member	Section	Property	Summary

A portion of the **Rating Results Report** is shown below.

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🕰 Rating Results	Report																	- 0	×
Bridge ID FS Bridge : Floor StructDef : Flo User : bridge Date : Monday File : RatingRe Analysis Prefe	ysGFSTrainingBridge1 NBI Structure ID :FS1TrainingBrdg System GFS Training Bridge 1 Bridge At : oorSystemGFS withDeck Member : Floorbeam1 y, February 19, 2024 suits.XLL rence Setting : None								^										
Live Load	Live Load Type	Inv Element	Inv RF	Inv Capacity (Ton)	Opr Element	Opr RF	Opr Capacity (Ton)	Legal Opr Element	Legal Opr RF	Legal Opr Capacity (Ton)	Permit Inv Element	Permit Inv RF	Permit Inv Capacity (Ton)	Permit Opr Element	Permit Opr RF	Permit Opr Capacity (Ton)	Impact	Lane	1
HS 20-44 - Lane	Design Lane	U3U4	0.600	21.60	U3U4	1.002	36.08										As Requested	As Requested	s 1
HS 20-44 - Lane	Design Lane	U 3U4	0.600	21.60	U3U4	1.002	36.08										With Impact	Multi-Lane	•
HS 20-44 - Truck	Design Truck	U3U4	0.490	17.63	U3U4	0.818	29.45										As Requested	As Requested	s 1
HS 20-44 - Truck	Design Truck	U3U4	0.490	17.63	U3U4	0.818	29.45										With Impact	Multi-Lane	e
																			~

A portion of the **Panel Point Maximum Forces Report** is shown below.

ive Load:	HS 20-4	4 - Truck (I	Design Tr	uck and Des	ign Lane)		
s Requested Impac s Request Lane: L Scale Factor:	et: With Impa Multi-Lan 1.00	e					
Panel Point (ft)	Member	Theta (Degrees)	DL Force (kip)	LL Force Compression	e (kip) Tension		
	L1L2	0.00	0.00			Ę	
L1	L1U1	90.00	0.00	0.00 (T)		L1 L1L2	
[0.00, 0.00]	Net Longitu	ıdinal Force:	0.00	0.00)	•	
	Net Vertica	l Force:	0.00	0.00)		
	U1U2	0.00	-21.77	-80.51 (T)		Ý	
	L1U1	270.00	0.00	0.00 (T)			
U1	L2U1	326.31	26.16		96.76 (T)		
[0.00, 4.00]	Net Longitu	ıdinal Force:	0.00	0.00)	-247	
	Net Vertica	l Force:	14.51	53.6	7	5	
		100.00	01.77	0.0. (1. (77)		v	