

AASHTOWare BrDR 7.5.0

Feature Tutorial

ADJ1 – Analysis with Routine Traffic in Adjacent Lane

ADJ1 – Analysis with Adjacent Lane Routine Traffic Example

Topics Covered

- Methodology implemented for considering routine traffic in adjacent lane
- Allow distribution factors to be used to compute effects of permit loads with routine traffic
- Specify adjacent vehicle in the Analysis Settings window
- Example 1: LFR analysis and LRFR analysis using BID 10 (Example 7)
- Example 2: LFR analysis using BID 19 (TrussTrainingExample)
- Example 3: LRFD design review using BID 1 (TrainingBridge1)

Methodology implemented for considering routine traffic in adjacent lane.

The release version 7.5.0 provides users with the capability to perform the design review and rating analysis for permit vehicles with routine traffic in adjacent lanes. When an adjacent vehicle is included in the rating analysis, the live load distribution factor approach specified in LRFD Article 4.6.2.2.5 will be used to deduct the adjacent vehicle live load demand from the capacity. Capacity articles that are dependent on the load applied will use the combined force effect when determining the capacity.

LRFD Article 4.6.2.2.5:

$$G = G_P \left(\frac{g_1}{Z} \right) + G_D \left(g_m - \frac{g_1}{Z} \right)$$

G = Final force effect applied to a girder

G_P = Force effect due to overload truck

g_1 = Single lane live load distribution factor

G_D = Force effect due to design loads

g_m = Multiple lane live load distribution factor

Z = A factor taken as 1.20 where the lever rule was not utilized, and 1.0 where the lever rule was used for a single lane live load distribution factor

The single lane live load distribution factor, g_1 , will be applied to the permit vehicle. The multiple lane live load distribution factor, g_m , minus the single lane live load distribution factor, g_1 , will be applied to the adjacent vehicle. For Standard Specifications rating, the Z factor will be ignored.

ADJ1 – Analysis with Adjacent Lane Routine Traffic Example

Allow distribution factors to be used to compute effects of permit loads with routine traffic.

In the **Live Load Distribution** window, the **Allow distribution factors to be used to compute effects of permit loads with routine traffic** checkbox specifies whether the live load distribution factor approach in LRFD Article 4.6.2.2.5 is allowed.

The **Standard** tab of the **Live Load Distribution** window is shown below.

The screenshot shows the 'Live Load Distribution' dialog box with the 'Standard' tab selected. The 'Distribution factor input method' section has three radio buttons: 'Use simplified method' (selected), 'Use advanced method', and 'Use advanced method with 1994 guide specs'. Below this is a checkbox labeled 'Allow distribution factors to be used to compute effects of permit loads with routine traffic', which is currently unchecked. A table displays distribution factors for two lane configurations: '1 Lane' and 'Multi-lane'. The table columns are 'Lanes loaded', 'Shear', 'Shear at supports', 'Moment', and 'Deflection'. At the bottom of the dialog are buttons for 'Compute from typical section...', 'View calcs', 'OK', 'Apply', and 'Cancel'.

Lanes loaded	Distribution factor (wheels)			
	Shear	Shear at supports	Moment	Deflection
1 Lane	1.793	1.615	1.793	0.500
Multi-lane	1.793	1.731	1.793	1.350

ADJ1 – Analysis with Adjacent Lane Routine Traffic Example

The **LRFD** tab of the **Live Load Distribution** window is shown below.

Live Load Distribution

Standard | LRFD

Distribution factor input method
 Use simplified method Use advanced method

Allow distribution factors to be used to compute effects of permit loads with routine traffic

Action: Deflection Sufficiently connected to act as a unit

Support number	Start distance (ft)	Length (ft)	End distance (ft)	Distribution factor (lanes)	
				1 lane	Multi-lane
1	0.00	161.000	161.00	0.300	0.638

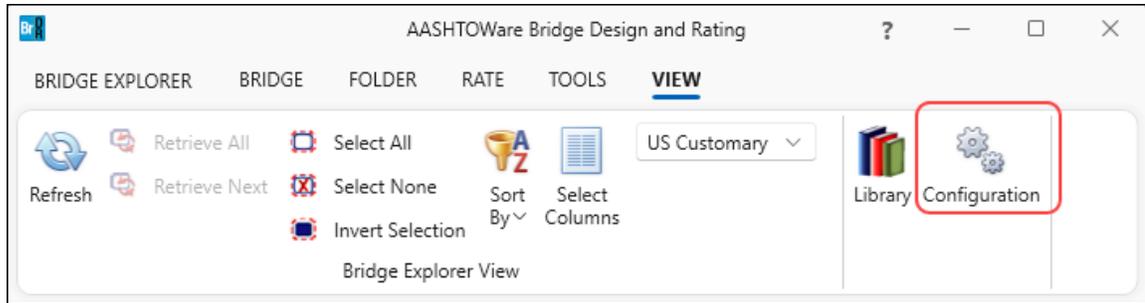
Compute from typical section... View calcs New Duplicate Delete

OK Apply Cancel

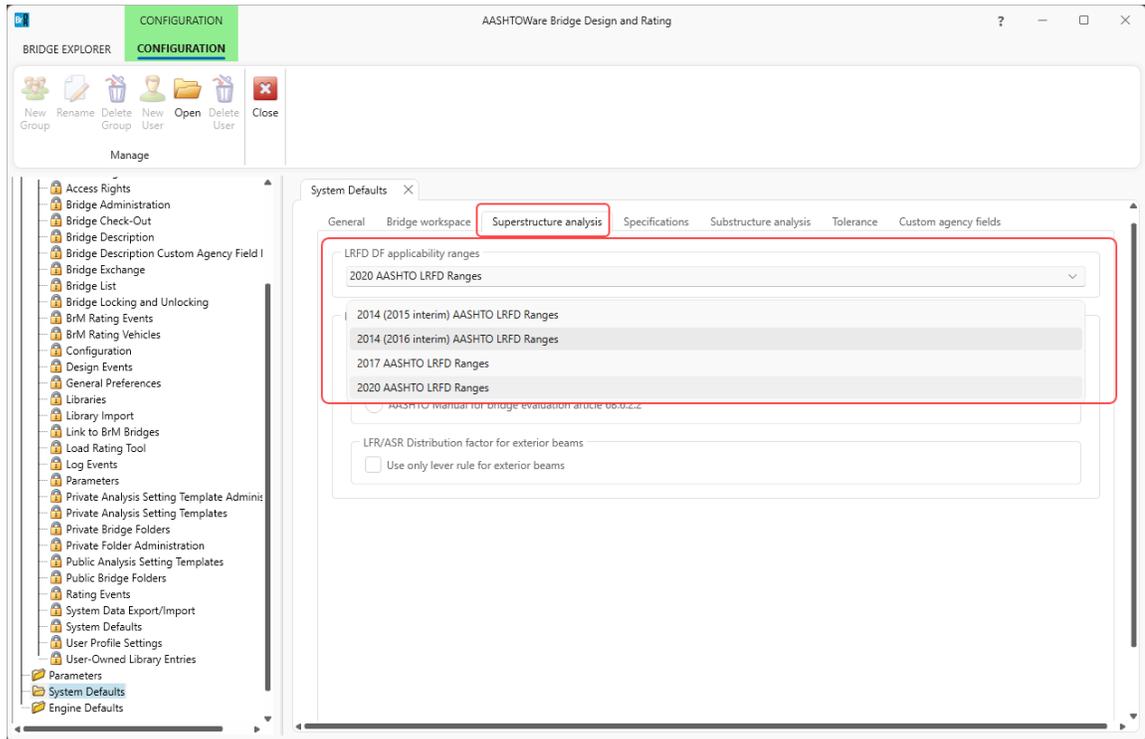
The **Compute from typical section...** button in this window will compute the live load distribution factors by checking the following two restrictions listed in LRFD Article 4.6.2.2.5:

- The lever rule has been specified for both single lane and multiple lane loadings. The **Library - LRFD DF Applicability Range Form** allows the user to define the applicability ranges using the AASHTO LRFD Specification equations for live load distribution factors when the factors are computed by BrDR. A Standard applicability range from the AASHTO LRFD Specification is delivered with BrDR and set as the default in the **System Defaults: Superstructure Analysis** window. The **Library - LRFD DF Applicability Range Form** window allows users to create an Agency applicability ranges and assign it as the default in the **System Defaults: Superstructure Analysis** window. The System Default applicability range will be used when BrDR computes the LRFD and LRFR distribution factors. To view this default range, click on the **Configuration** button from the **VIEW** ribbon of the Bridge Explorer as shown below.

ADJ1 – Analysis with Adjacent Lane Routine Traffic Example



The **LRFD DF applicability ranges** can be selected from the drop down menu shown below.



- The special requirement for exterior girders of beam-slab bridge cross-sections with diaphragms specified in Article 4.6.2.2.2d has been utilized for simplified analysis.

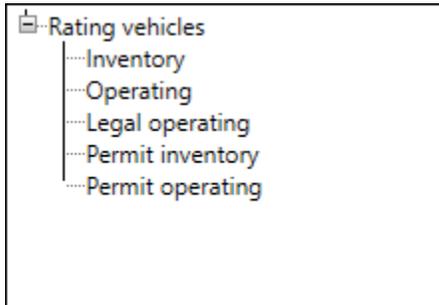
If the live load distribution factors are not entered, the AASHTO Engine will compute the live load distribution factors and determine whether the live load distribution factor approach for analyzing the adjacent vehicle is allowed.

ADJ1 – Analysis with Adjacent Lane Routine Traffic Example

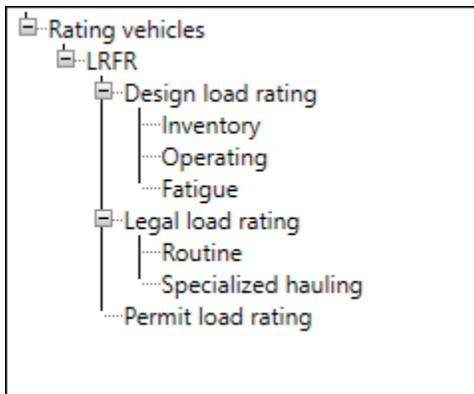
Specify adjacent vehicle in the Analysis Settings window.

In the **Analysis Settings** window, an adjacent vehicle can be specified in the **Legal operating**, **Permit inventory** and **Permit operating** categories for an **LFR** analysis. Inventory load factors are applied to the **Permit inventory** vehicles. Operating load factors are applied to the **Legal operating** and **Permit operating** vehicles. **Legal operating** analysis considers the legal train of vehicles with the adjacent vehicle requirement (MBE 6B.7.2).

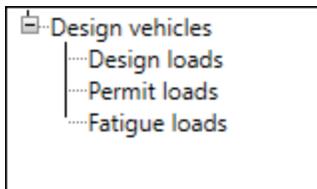
See the LFR analysis options below.



For LRFR analysis, adjacent vehicle can be specified in the **Permit load rating** category. See LRFR analysis options below:



For an LRFD design review, an adjacent vehicle can be specified in the **Permit Loads** category as shown below.

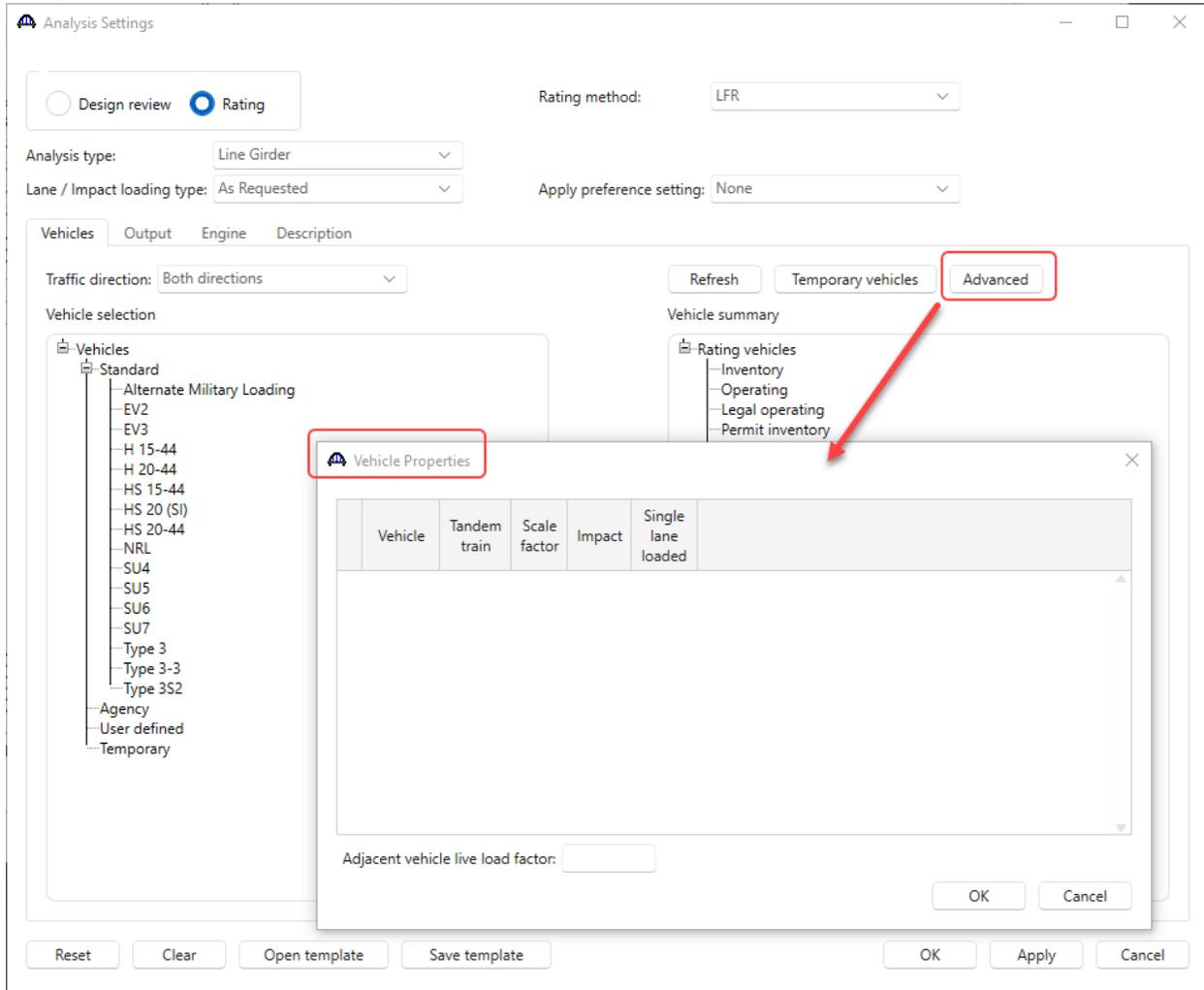


ADJ1 – Analysis with Adjacent Lane Routine Traffic Example

The live load factor to be applied to the adjacent vehicle is entered in the **Vehicle Properties** window. If the **Adjacent vehicle live load factor** is not entered, the adjacent vehicle will not be included in the analysis. For an LRF analysis, the adjacent vehicle will not be considered for permits that have **Unlimited Crossing** frequency.

Vehicle Properties

The **Vehicle Properties** window is accessible from the **Analysis Settings** window as shown below.



ADJ1 – Analysis with Adjacent Lane Routine Traffic Example

The **LFR Analysis** version of the **Vehicle Properties** window is shown below.

Vehicle	Tandem train	Scale factor	Impact	Single lane loaded
Type 3	<input type="checkbox"/>	1.000		<input type="checkbox"/>

Adjacent vehicle live load factor:

OK Cancel

The **LRFR Analysis** version of the **Vehicle Properties** window is shown below.

Vehicle	Tandem train	Scale factor	Impact	Single lane loaded	Legal pair	Override	Legal live load factor	Frequency	Loading condition	Override	Permit live load factor
Type 3	<input type="checkbox"/>	1.000		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		Single Trip	Mixed with traffic	<input type="checkbox"/>	

Permit lane load: kip/ft. Adjacent vehicle live load factor:

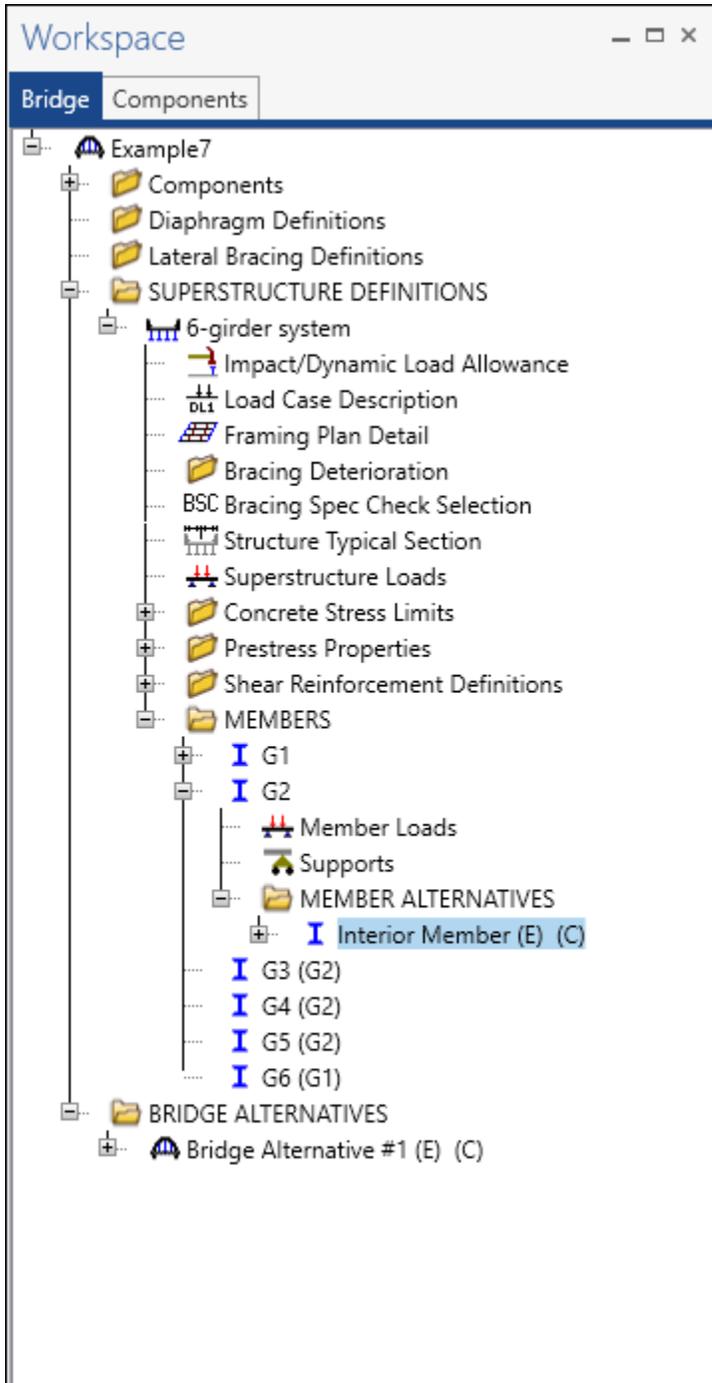
Exclude permit lane load from permit vehicle location

OK Cancel

ADJ1 – Analysis with Adjacent Lane Routine Traffic Example

Example 1: LFR analysis and LRFR analysis using BID 10 (Example 7)

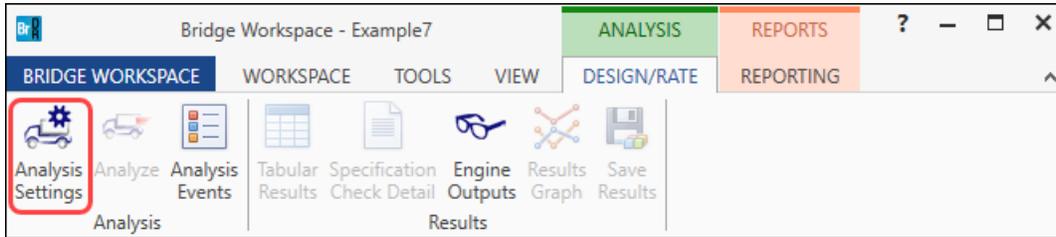
From the **Bridge Explorer**, open the bridge **BID 10 (Example7)**. Expand the **Bridge Workspace** and select member **G2**'s member alternative **Interior Member**. The **Bridge Workspace** for **BID10 (Example 7)** is shown below.



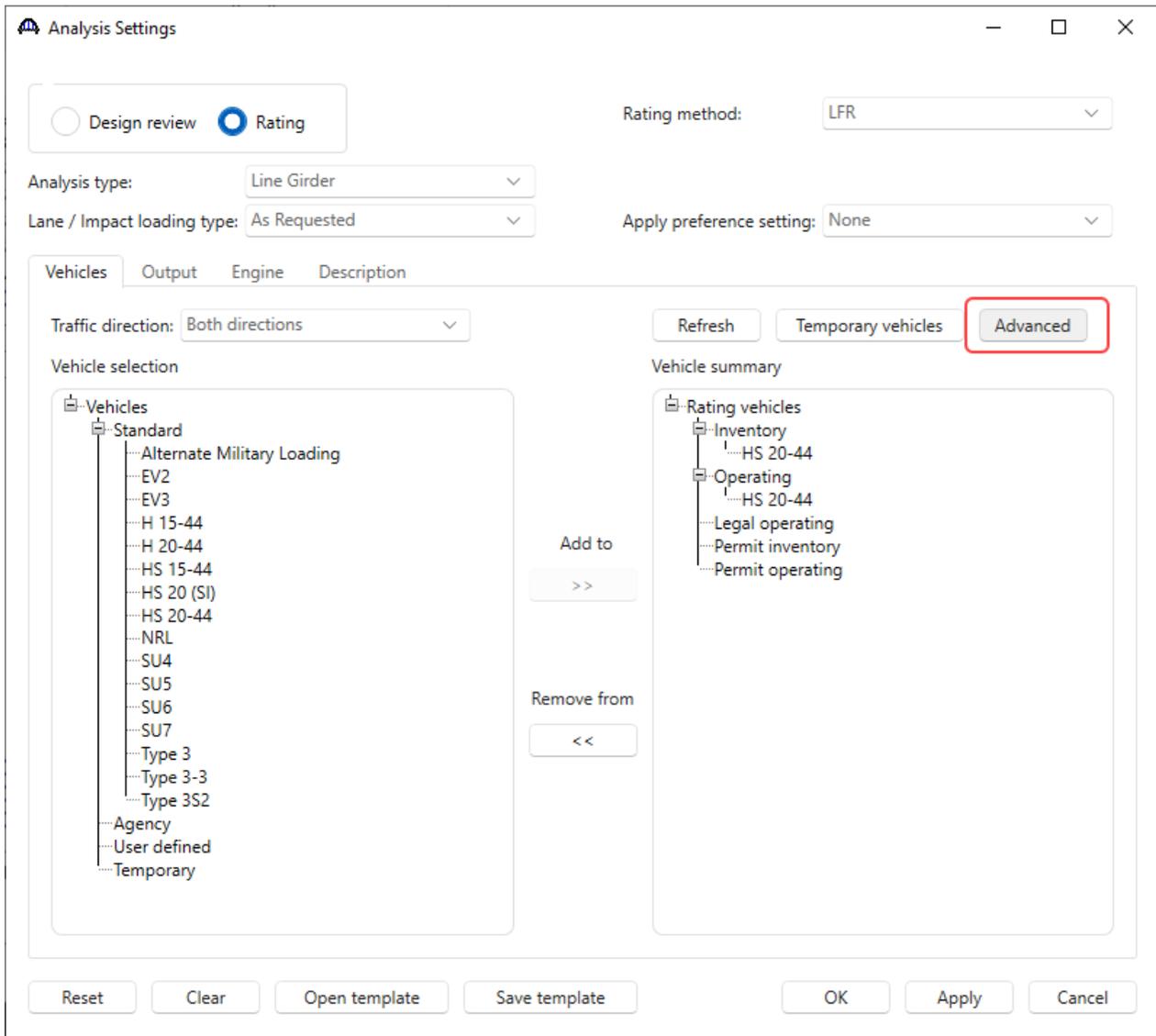
ADJ1 – Analysis with Adjacent Lane Routine Traffic Example

LFR analysis

Open the **Analysis Settings** window by clicking the **Analysis Settings** button on the **Analysis** group of the **DESIGN/RATE** ribbon.

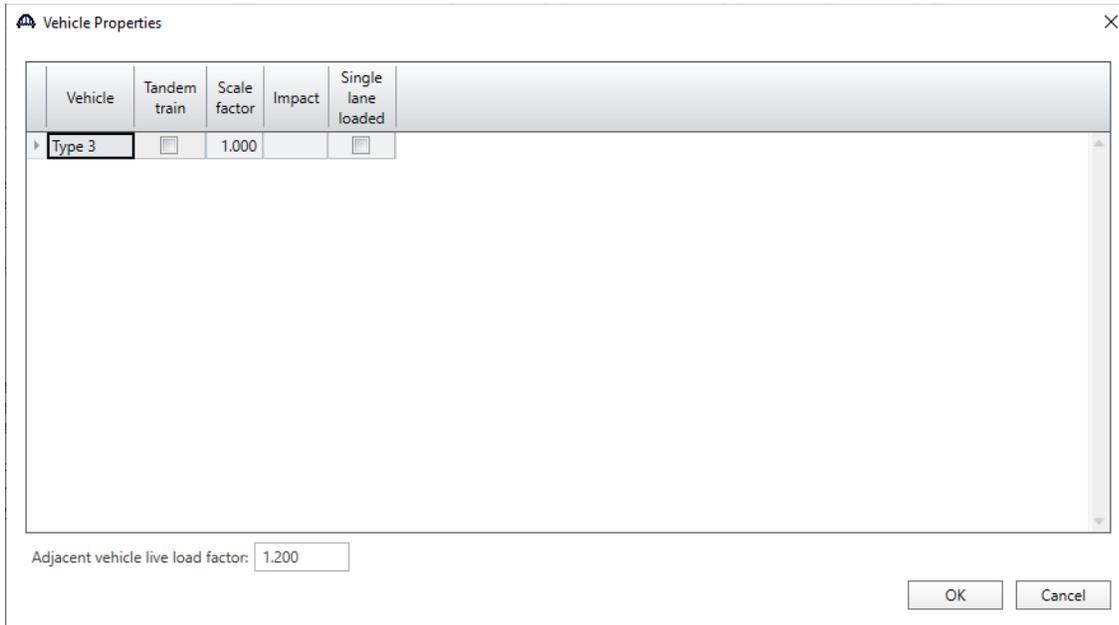


Select the **Rating Method** as **LFR** to perform an LFR rating, add the **Type 3** vehicle to the **Permit operating** category and the **HS 20-44** vehicle as the **Adjacent Vehicle**. Click the **Advanced** button to open the **Vehicle Properties** window as shown below.



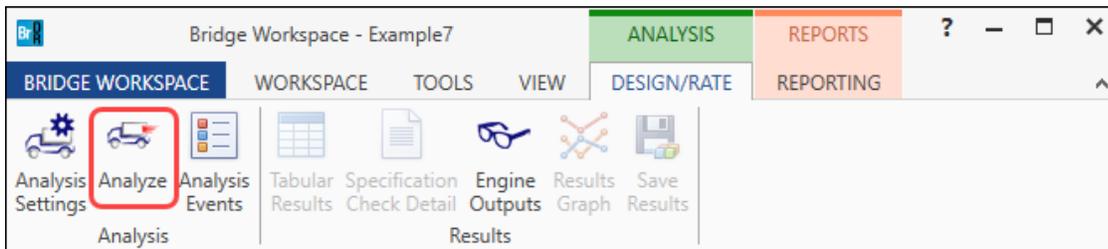
ADJ1 – Analysis with Adjacent Lane Routine Traffic Example

Enter **1.2** as the **Adjacent vehicle live load factor**.



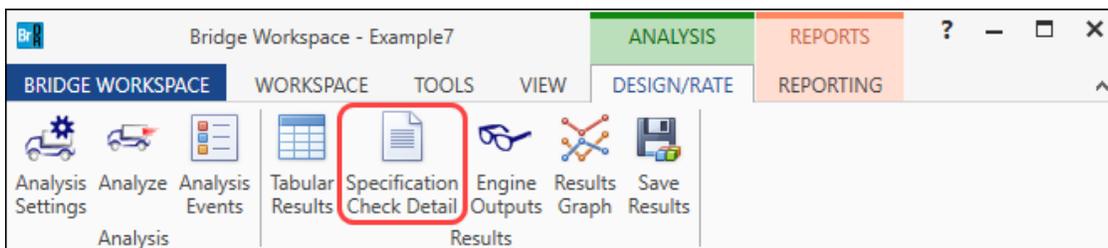
Click **OK** to save the settings and close the window.

Next click the **Analyze** button on the **Analysis** group of the **DESIGN/RATE** ribbon to perform the rating.



Specification Check Detail

When the rating is completed, click on the **Specification Check Detail** button on the **Results** group of the **DESIGN/RATE** ribbon to open the **Specification Checks** window.



ADJ1 – Analysis with Adjacent Lane Routine Traffic Example

Expand the tree and select the **Stage 3's Span 1 - 60.00 ft** folder. Open the **Spec Check Detail** window for the **6B.5.3.3 PS Flexure Rating** specification reference to review the ratings.

Specification reference	Limit State	Flex. Sense	Pass/Fail
✓ 6B.5.3.3 PS Concrete Compressive Stress		N/A	Passed
✓ 6B.5.3.3 PS Concrete Tensile Stress		N/A	Passed
✓ 6B.5.3.3 PS Flexure Rating		N/A	Passed
6B.5.3.3 PS Moment Capacity		N/A	General Comp.
✓ 6B.5.3.3 PS Shear Rating		N/A	Passed
✓ 6B.5.3.3 PS Steel Tensile Stress		N/A	Passed
8.16.2.7 Design Assumptions		N/A	General Comp.
9.15.2.3 Concrete - Cracking Stress		N/A	General Comp.
✓ 9.17 Flexural Strength		N/A	Passed
9.18.2.1 Ductility Limits - Minimum Steel		N/A	General Comp.
9.20.1.3 Nominal Shear Capacity		N/A	General Comp.
9.20.2.1 Shear Strength Provided by Concrete		N/A	General Comp.
9.20.2.2 Shear Strength Provided by Concrete		N/A	General Comp.
9.20.2.3 Shear Strength Provided by Concrete		N/A	General Comp.
9.20.2.5 Shear Strength Provided by Concrete		N/A	General Comp.
9.20.3.1 Shear Strength Provided by Web Reinforcement		N/A	General Comp.
9.28 Embedment of Prestressed Strand		N/A	General Comp.
Computation of Vp		N/A	General Comp.
PS Basic Properties Calculation		N/A	General Comp.
PS Gross Composite Section Properties		N/A	General Comp.
Stresses		N/A	General Comp.

Part B - ALLOWABLE STRESS RATING AND LOAD FACTOR RATING
 6B.5 NOMINAL CAPACITY: C
 6B.5.3 Load Factor Method
 6B.5.3.3 Prestressed Concrete Flexure Rating
 (AASHTO Manual for Bridge Evaluation, Third Edition with 2022 Interims)

PS I Wide - At Location = 60.0000 (ft) - Left Stage 3

Flexure Rating Factor Calculations

Input:

Phi = 1.0000
 MDL1 = 3097.52 (kip-ft)
 MDL2 = 540.00 (kip-ft)
 Ignore Positive Moment = No
 Adjacent Vehicle LL Factor: 1.200

Note: If the capacity has been overridden, the Resistance is computed as override phi*override capacity.
 Otherwise the Resistance is computed as per the Specification.

Rating Level	Vehicle	LL (kip-ft)	Adj. LL (kip-ft)	A1	A2	Mn (kip-ft)	Phi	Mn (kip-ft)	RF	Capacity (Ton)
PermitOpr	1	1041.88	396.88	1.30	1.30	10411.93	---	---	3.844	96.11
PermitOpr	1	0.00	0.00	1.30	1.30	10411.93	---	---	99.000	2475.00

Load Combination Legend:

Code	Vehicle
1	Type 3 - Permit Truck

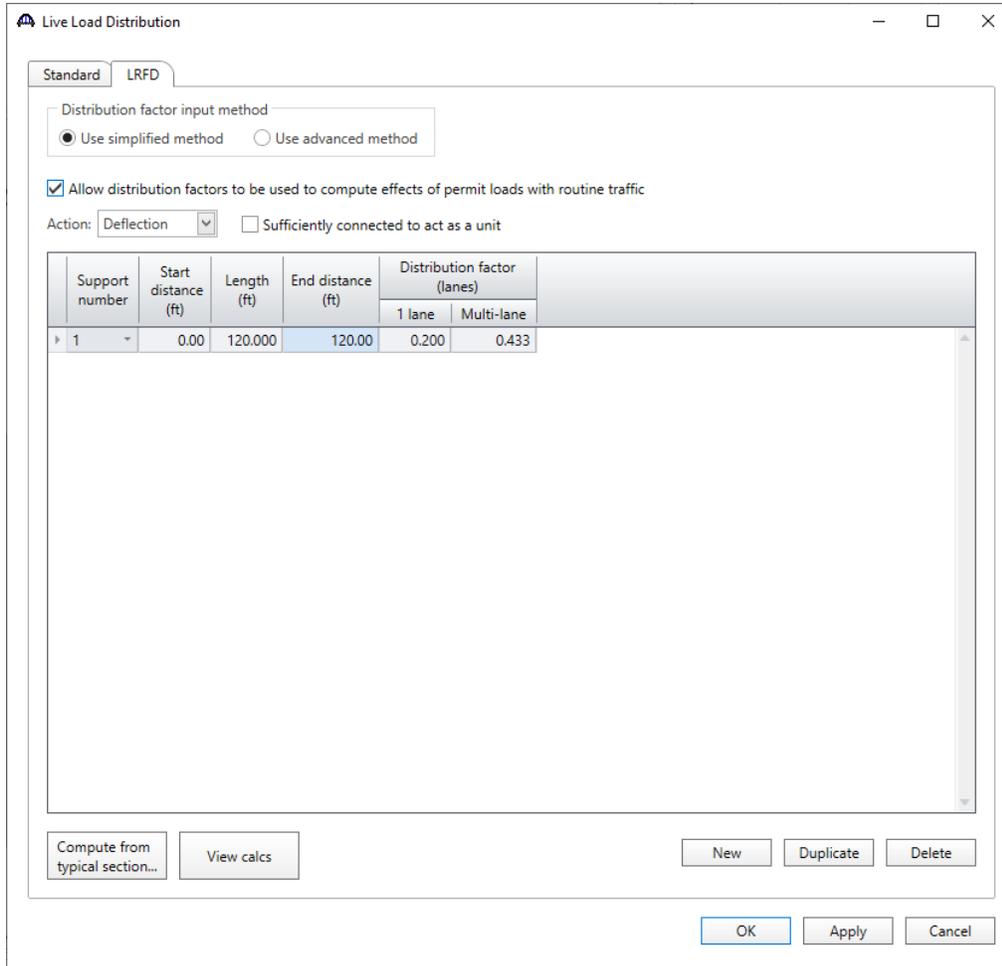
OK

Close the **Spec Check Detail** window.

ADJ1 – Analysis with Adjacent Lane Routine Traffic Example

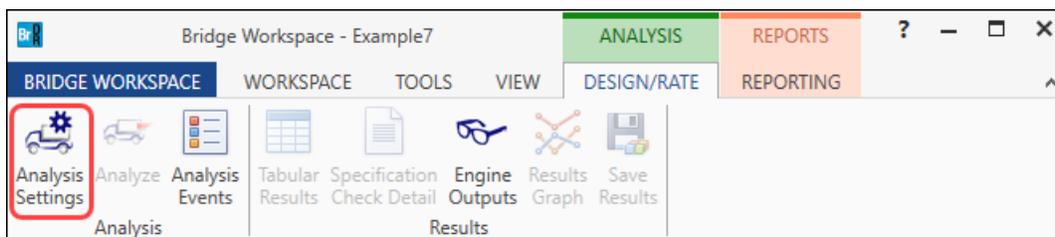
LRFR analysis:

Expand the member alternative - **Interior Member** in the **Bridge Workspace** tree. Open the **Live Load Distribution** window and select the **LRFD** tab. Select the **Allow distribution factors to be used to compute effects of permit loads with routine traffic** checkbox. Click **OK** to close the **Live Load Distribution** window.



Select member **G2**'s member alternative **Interior Member** in the **Bridge Workspace** tree.

Open the **Analysis Settings** window by clicking the **Analysis Settings** button on the **Analysis** group of the **DESIGN/RATE** ribbon.



ADJ1 – Analysis with Adjacent Lane Routine Traffic Example

Select the **Rating Method** as **LRFR** to perform an LRFR rating, add the **Type 3** vehicle to the **Permit Load Rating** category and the **HL-93 (US)** vehicle as the **Adjacent Vehicle**. Click the **Advanced** button to open the **Vehicle Properties** window and enter **1.2** as the **Adjacent vehicle live load factor**. (see below)

Analysis Settings

Design review Rating

Rating method: LRFR

Analysis type: Line Girder

Lane / Impact loading type: As Requested

Apply preference setting: None

Vehicles Output Engine Description

Traffic direction: Both directions

Refresh Temporary vehicles **Advanced**

Vehicle selection

- Vehicles
 - Standard
 - EV2
 - EV3
 - H 15-44
 - H 20-44
 - HL-93 (SI)
 - HL-93 (US)**
 - HS 15-44
 - HS 20 (SI)
 - HS 20-44
 - Lane-Type Legal Load
 - LRFD Fatigue Truck (SI)
 - LRFD Fatigue Truck (US)
 - NRL
 - SU4
 - SU5
 - SU6
 - SU7
 - Type 3
 - Type 3-3
 - Type 3S2
 - Agency
 - User defined
 - Temporary

Add to >>

Remove from <<

Vehicle summary

- Rating vehicles
 - LRFR
 - Design load rating
 - Inventory
 - Operating
 - Fatigue
 - Legal load rating
 - Routine
 - Specialized hauling
 - Permit load rating
 - Type 3
 - Adjacent vehicle**
 - HL-93 (US)

Reset Clear Open template Save template OK Apply Cancel

Vehicle Properties

Vehicle	Tandem train	Scale factor	Impact	Single lane loaded	Legal pair	Override	Legal live load factor	Frequency	Loading condition	Override	Permit live load factor
> Type 3	<input type="checkbox"/>	1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		Single Trip	Mixed with traffic	<input type="checkbox"/>	1.2

Permit lane load: _____ kip/ft Adjacent vehicle live load factor: 1.2

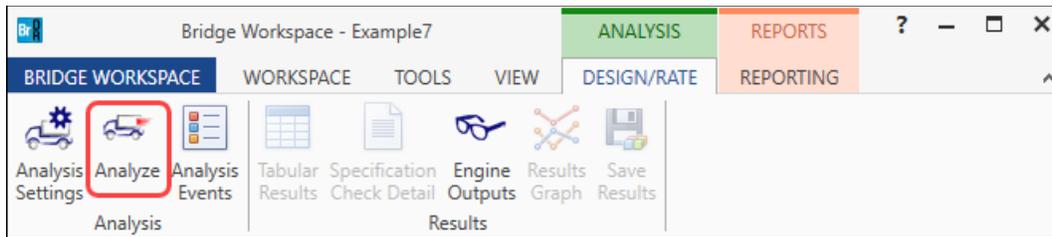
Exclude permit lane load from permit vehicle location

OK Cancel

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

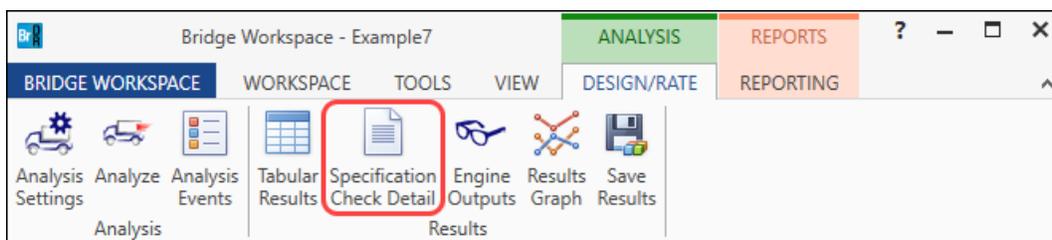
ADJ1 – Analysis with Adjacent Lane Routine Traffic Example

Next click the **Analyze** button on the **Analysis** group of the **DESIGN/RATE** ribbon to perform the rating.



Specification Check Detail

When the rating is completed, click on the **Specification Check Detail** button on the **Results** group of the **DESIGN/RATE** ribbon to open the **Specification Checks** window.

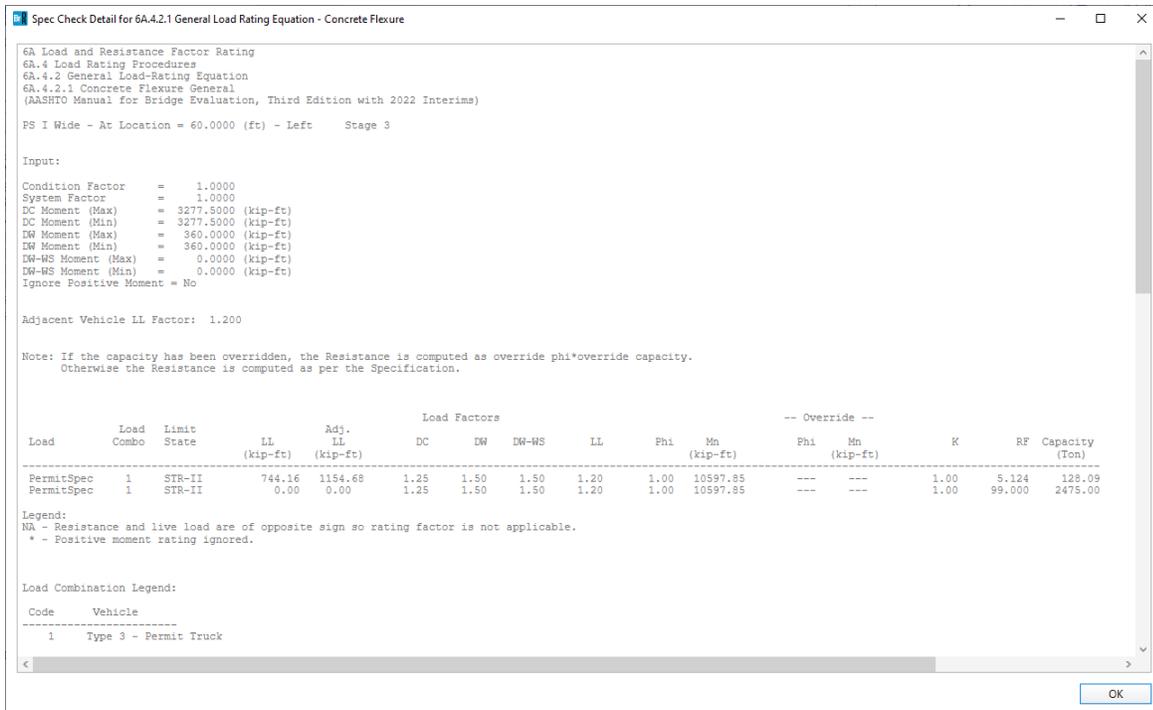


Expand the tree and select the **Stage 3's Span 1 - 60.00 ft** folder. Open the **Spec Check Detail** window for the **6A.4.2.1 General Load Rating Equation – Concrete Flexure** specification reference to review the ratings.

The screenshot shows the 'Specification Checks for Interior Member - 26 of 0' window. The left pane shows a tree view with 'Stage 3' expanded to 'Interior Member' and 'Span 1 - 60.00 ft' selected. The right pane shows a table of specification checks.

Specification reference	Limit State	Flex. Sense	Pass/Fail
NA 5.5.3.2 Reinforcing Bars and Welded Wire Reinforcement		N/A	Not Required
5.5.4.2 PS Strength Limit State - Resistance Factors		N/A	General Comp.
5.6.2.2 Rectangular Stress Distribution		N/A	General Comp.
✓ 5.6.3.2 PS Flexural Resistance (Prestressed Concrete)		N/A	Passed
✓ 5.6.3.3 Minimum Reinforcement		N/A	Passed
✓ 5.7.2.5 Minimum Transverse Reinforcement		N/A	Passed
✓ 5.7.2.6 Maximum Spacing of Transverse Reinforcement		N/A	Passed
✓ 5.7.3.3 Nominal Shear Resistance		N/A	Passed
5.7.3.4 Procedures for Determining Shear Resistance		N/A	General Comp.
✓ 5.7.3.5 Longitudinal Reinforcement		N/A	Passed
✓ 5.7.4 Interface Shear Transfer		N/A	Passed
✓ 5.7.4.2 Minimum Area of Interface Shear Reinforcement		N/A	Passed
✓ 5.9.2.3.2a Compressive Stresses		N/A	Passed
✓ 5.9.2.3.2b Tensile Stresses		N/A	Passed
5.9.4.3.2 Bonded Strand		N/A	General Comp.
✓ 6A.4.2.1 Design Load Rating Prestress Service III Tensile Stress		N/A	Passed
✓ 6A.4.2.1 General Load Rating Equation - Concrete Flexure		N/A	Passed
✓ 6A.4.2.1 General Load Rating Equation - Concrete Shear		N/A	Passed
Computation of Vp		N/A	General Comp.
Cracked_Moment_of_Inertia Section Property Calculations		N/A	General Comp.
PS_Basic_Properties Calculation		N/A	General Comp.
PS_Gross_Composite_Section_Properties PS Gross Composite Section		N/A	General Comp.

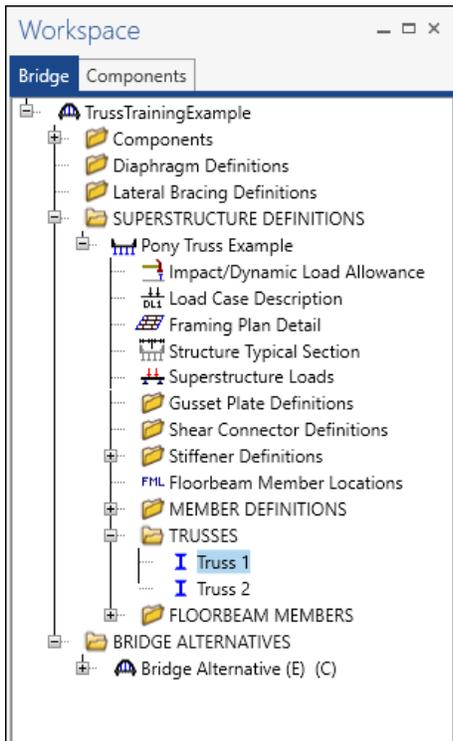
ADJ1 – Analysis with Adjacent Lane Routine Traffic Example



Close the **Spec Check Detail** window.

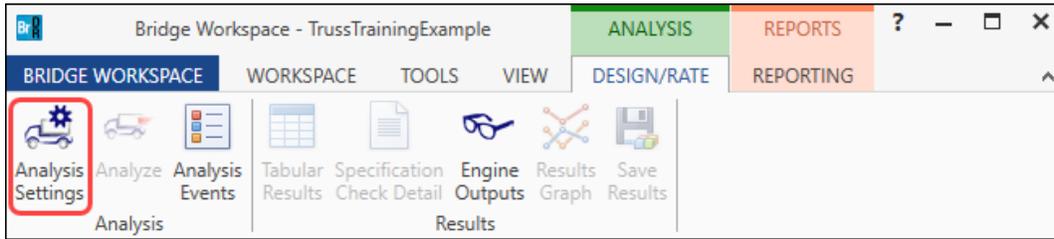
Example 2: LFR analysis using BID 19 (TrussTrainingExample)

From the **Bridge Explorer**, open the **Bridge Workspace** for **BID 19 (TrussTrainingExample)**. Expand the **Bridge Workspace** and select **Truss 1** as shown below.

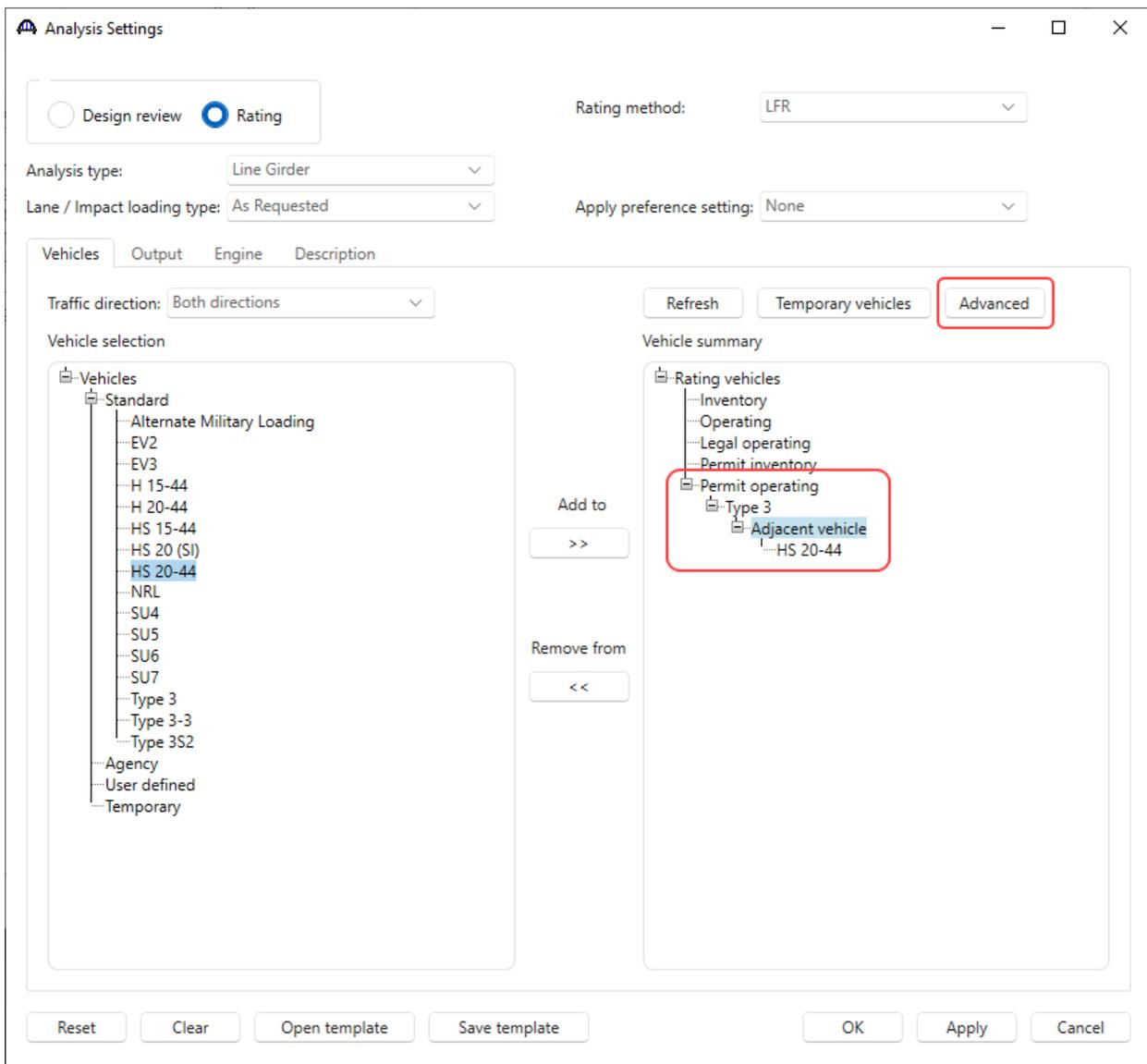


ADJ1 – Analysis with Adjacent Lane Routine Traffic Example

Open the **Analysis Settings** window by clicking the **Analysis Settings** button on the **Analysis** group of the **DESIGN/RATE** ribbon.



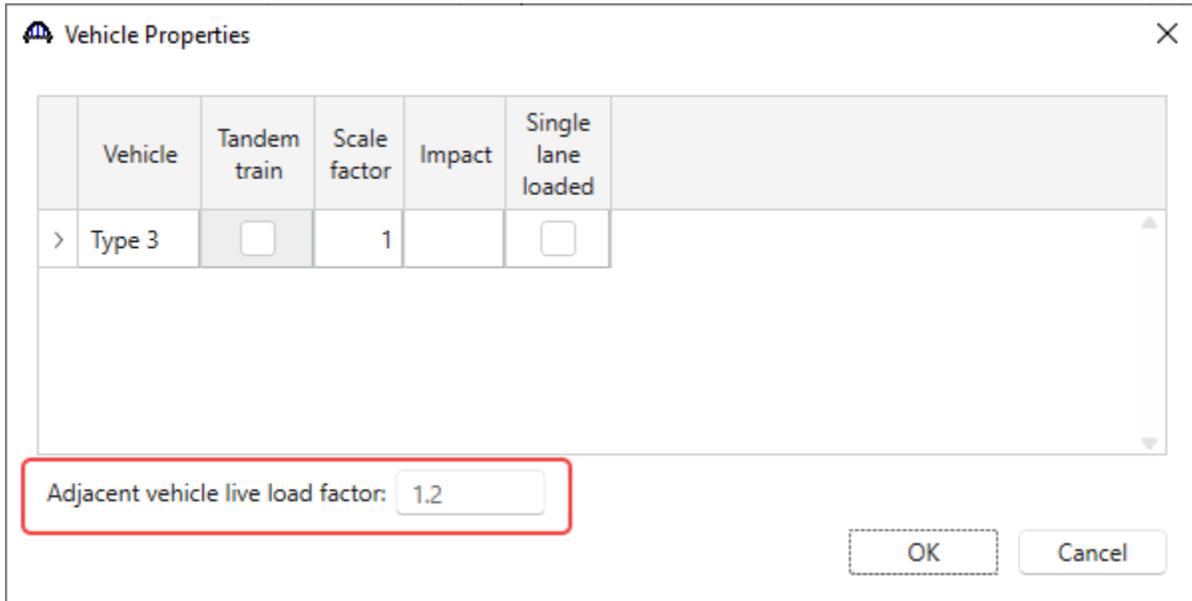
Select the **Rating Method** as **LFR** to perform an LFR rating, add the **Type 3** vehicle to the **Permit operating** category and the **HS 20-44** vehicle as the **Adjacent Vehicle**. Click the **Advanced** button to open the **Vehicle Properties** window as shown below.



ADJ1 – Analysis with Adjacent Lane Routine Traffic Example

Vehicle Properties

Enter **1.2** as the **Adjacent vehicle live load factor**.



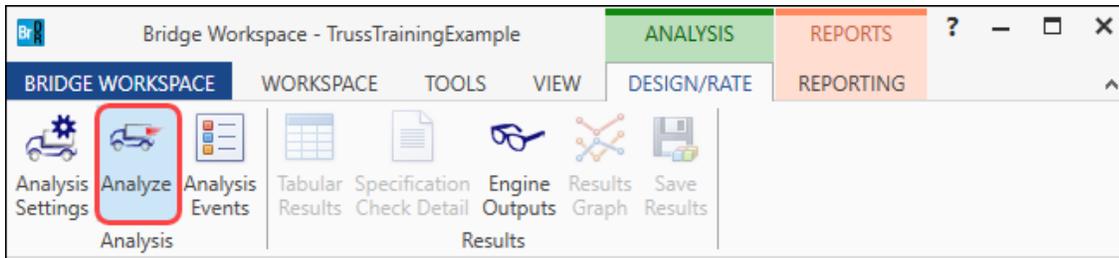
The Vehicle Properties dialog box contains a table with the following data:

Vehicle	Tandem train	Scale factor	Impact	Single lane loaded
> Type 3	<input type="checkbox"/>	1		<input type="checkbox"/>

Below the table, the 'Adjacent vehicle live load factor' is set to 1.2. The dialog also includes OK and Cancel buttons.

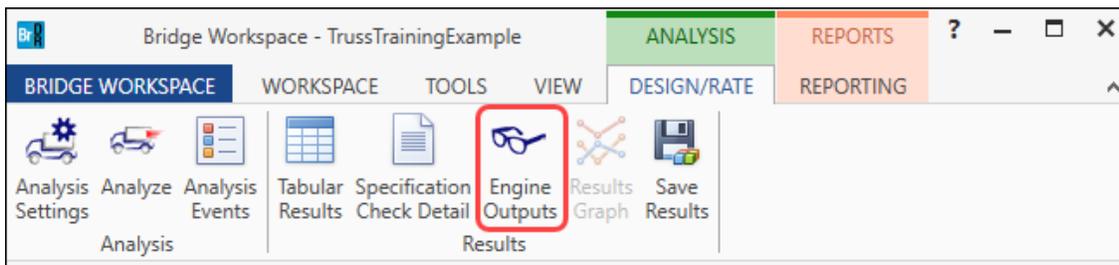
Click **OK** to save the analysis settings and close the window.

Next click the **Analyze** button on the **Analysis** group of the **DESIGN/RATE** ribbon to perform the rating.

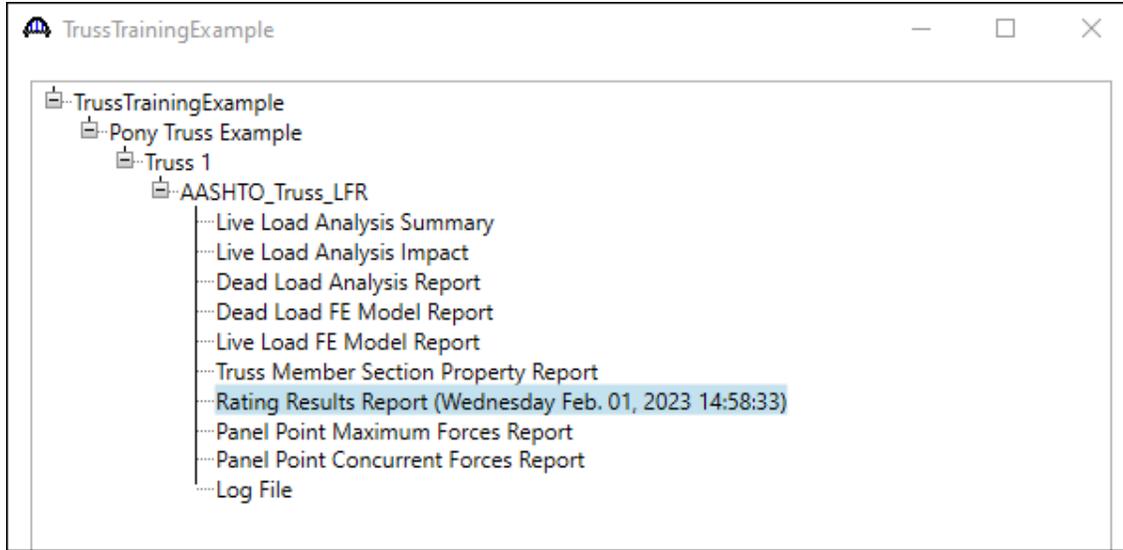


Engine Outputs

When the rating is completed, click on the **Engine Outputs** button on the **Results** group of the **DESIGN/RATE** ribbon to open the **Engine Outputs** window as shown below.



ADJ1 – Analysis with Adjacent Lane Routine Traffic Example



Open the **Rating Results Report** to review the ratings. (See below)

Bridge ID : TrussTrainingExample
 Bridge : Truss Training Example
 StructDef : PonyTrussExample
 User : bridge
 Date : Wednesday, February 1, 2023
 File : RatingResults.XML
 Analysis Preference Setting : None

NBI Structure ID : TrussTrainingEx
 Bridge Alt :
 Member : Truss1

Overall Load Factor Rating Summary

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
Type 3 - Truck	Permit Truck													U5U7	1.227	30.69	As Requested	As Requested
Type 3 - Truck	Permit Truck													U5U7	1.227	30.69	With Impact	Multi-Lane

Live Load: Type 3 - Truck (Permit Truck)

Detailed Truss Member Rating Results

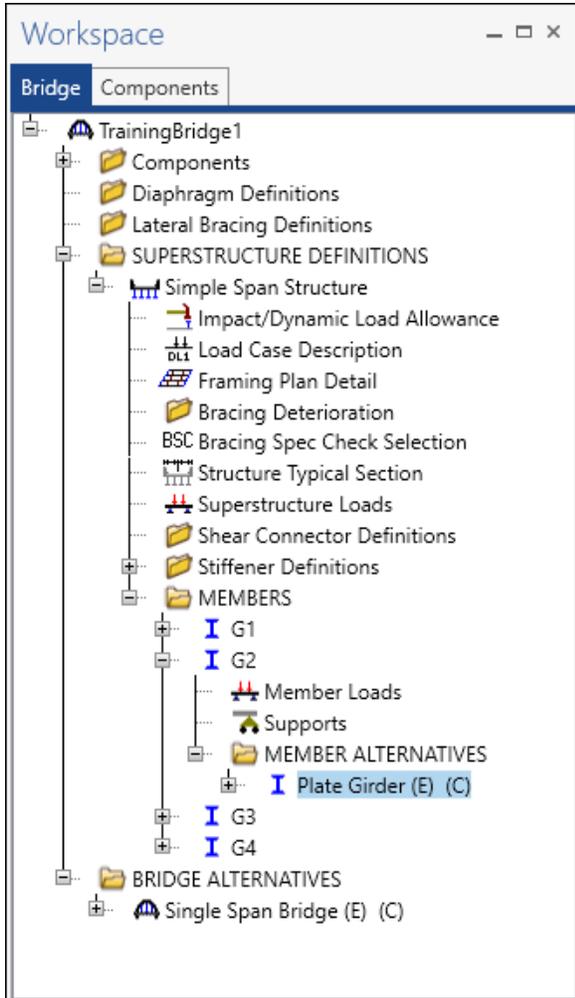
LL Scale Factor = 1.00
 Adjacent Vehicle LL Factor = 1.20
 Operating:
 A1 = 1.30, A2 = 1.30
 Note: Rating factor is outputted as 99.00 when it is greater than 99

Member	Truss Element	DL Force (kip)	LL Force			Capacity		Adj Veh Demand		One Lane LLDF	Multi Lane LLDF	Inv RF	Opr RF	Legal Opr RF	Permit Inv RF	Permit Opr RF
			Comp. (kip)	IF	Tens. (kip)	IF	Comp. (kip)	Tens. (kip)	Comp. (kip)							
L0L1	Lower-Chord	98.06			41.62	1.21		597.60		58.69						8.938
L1L2	Lower-Chord	98.06			41.62	1.21		597.60		58.69						8.938
L2L3	Lower-Chord	180.64			74.53	1.21		978.00		104.40						7.829
L3L4	Lower-Chord	180.64			74.53	1.21		978.00		104.40						7.829
L4L5	Lower-Chord	201.13			81.40	1.21		1113.00		113.33						8.244
L5L6	Lower-Chord	201.13			81.40	1.21		1113.00		113.33						8.244
L6L7	Lower-Chord	180.86			74.53	1.21		978.00		104.40						7.826
L7L8	Lower-Chord	180.86			74.53	1.21		978.00		104.40						7.826
L8L9	Lower-Chord	98.26			41.62	1.21		597.60		58.69						8.933
L9L10	Lower-Chord	98.26			41.62	1.21		597.60		58.69						8.933
U1U3	Upper-Chord	-154.87	-65.04	1.21			-431.11		-91.46		1.075					2.418

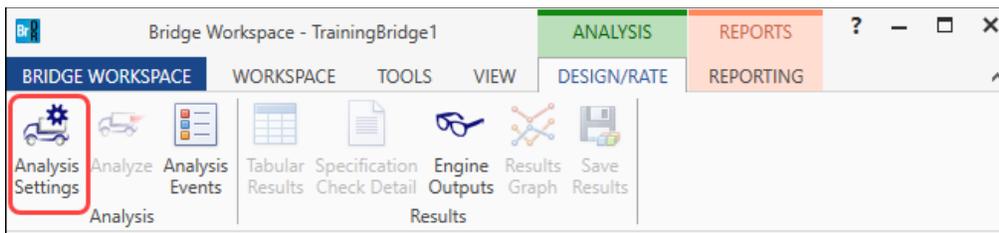
ADJ1 – Analysis with Adjacent Lane Routine Traffic Example

Example 3: LRFD design review using BID 1 (TrainingBridge1)

From the **Bridge Explorer**, open the **Bridge Workspace** for **BID 1 (TrainingBridge1)**. Expand the **Bridge Workspace** and select member **G2**'s member alternative **Plate Girder**.

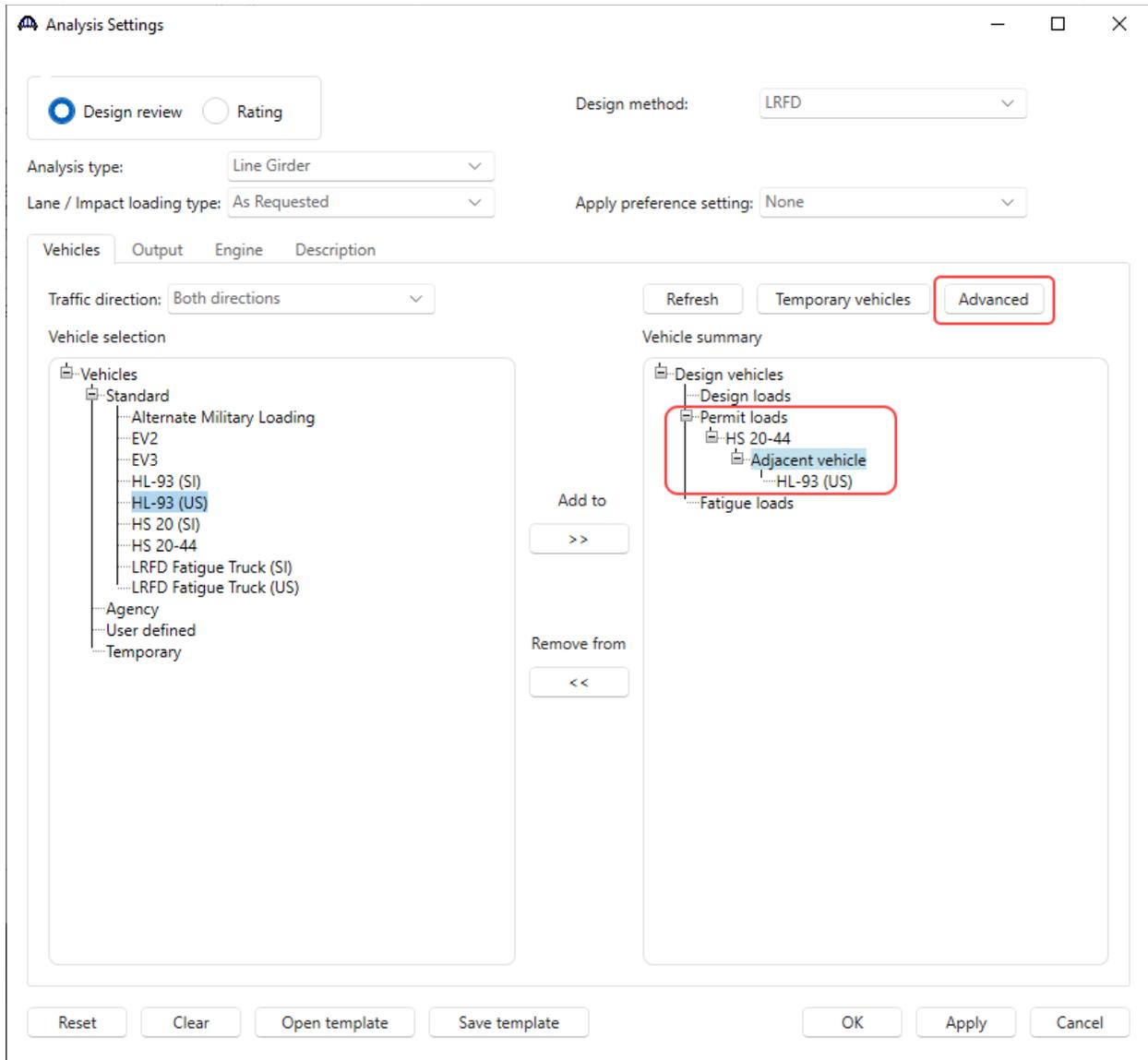


Open the **Analysis Settings** window by clicking the **Analysis Settings** button on the **Analysis** group of the **DESIGN/RATE** ribbon.



ADJ1 – Analysis with Adjacent Lane Routine Traffic Example

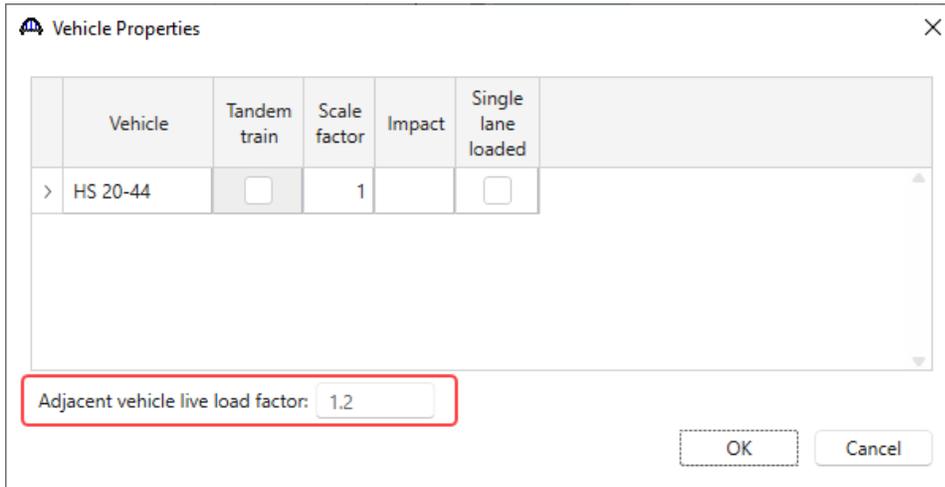
Select the **Design review** button. **LRFD** is selected as the **Design method**. Add the **HS 20-44 3** vehicle to the **Permit Loads** category and the **HL-93 (US)** vehicle as the **Adjacent Vehicle**. Click the **Advanced** button to open the **Vehicle Properties** window.



ADJ1 – Analysis with Adjacent Lane Routine Traffic Example

Vehicle Properties

Enter **1.2** as the **Adjacent vehicle live load factor**.



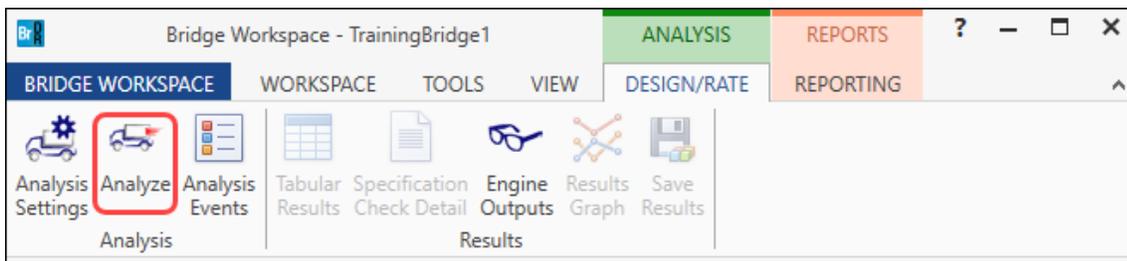
The Vehicle Properties dialog box contains a table with the following data:

Vehicle	Tandem train	Scale factor	Impact	Single lane loaded
> HS 20-44	<input type="checkbox"/>	1		<input type="checkbox"/>

Below the table, the 'Adjacent vehicle live load factor' is set to 1.2. The dialog also includes OK and Cancel buttons.

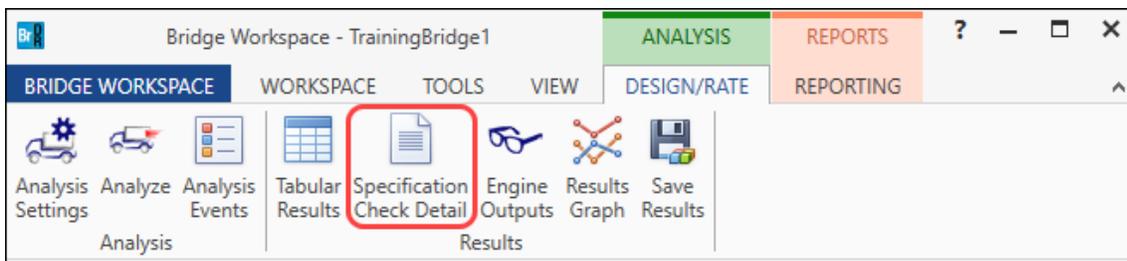
Click **OK** to save the analysis settings and close the window.

Next click the **Analyze** button on the **Analysis** group of the **DESIGN/RATE** ribbon to perform the design review.



Specification Check Detail

When the design review is finished, click on the **Specification Check Detail** button on the **Results** group of the **DESIGN/RATE** ribbon to open the **Specification Checks** window.



ADJ1 – Analysis with Adjacent Lane Routine Traffic Example

Expand the tree and select the **Stage 3's Span 1 – 80.50 ft** folder. Open the **Spec Check Detail** window for the **6.10.9 Shear Resistance** specification reference to review the article.

Specification Checks for Plate Girder - 43 of 1069

Articles: All articles
Format: Bullet list

Specification filter: Report

Specification reference	Limit State	Flex. Sense	Pass/Fail
✓ 6.10.2 Cross-Section Proportion Limits		N/A	Passed
NA 6.10.4.2.2 Flexure		N/A	Not Applicable
NA 6.10.5.3 Special Fatigue Requirement for Webs		N/A	Not Applicable
6.10.6.2.2 Composite Sections in Positive Flexure		N/A	General Comp.
6.10.6.2.3 Composite Sections in Negative Flexure and Noncomposite		N/A	General Comp.
NA 6.10.7.1.1 General		N/A	Not Applicable
NA 6.10.7.1.2 Nominal Flexural Resistance		N/A	Not Applicable
✗ 6.10.7.2.1 General		N/A	Failed
6.10.7.2.2 Nominal Flexural Resistance		N/A	General Comp.
✓ 6.10.7.3 Flexural Resistance - Ductility Requirement		N/A	Passed
NA 6.10.8.1.1 Discretely Braced Flanges in Compression		N/A	Not Applicable
NA 6.10.8.1.2 Discretely Braced Flanges in Tension		N/A	Not Applicable
NA 6.10.8.1.3 Continuously Braced Flanges in Tension or Compression		N/A	Not Applicable
6.10.8.2.1 General		N/A	General Comp.
6.10.8.2.2 Local Buckling Resistance		N/A	General Comp.
6.10.8.2.3 Lateral Torsional Buckling Resistance		N/A	General Comp.
6.10.8.2.3.Cb Lateral Torsional Buckling Resistance - Cb Calculation		N/A	General Comp.
6.10.8.2.3.rt Lateral Torsional Buckling Resistance - rt and Lp Calculatic		N/A	General Comp.
6.10.8.3 Flexural Resistance Based on Tension Flange Yielding		N/A	General Comp.
✓ 6.10.9 LRFD Shear Resistance		N/A	Passed
6.10.9.1 Shear Resistance - General		N/A	General Comp.
✗ 6.10_General_Flexural_Results		N/A	Failed
NA 6.13.3.2.4 Fillet Welded Connections		N/A	Not Applicable
APPD6.1 Plastic Moment		N/A	General Comp.
APPD6.2 Yield Moment		N/A	General Comp.
APPD6.3.1 In the Elastic Range (Dc)		N/A	General Comp.
APPD6.3.2 Depth of the Web in Compression at Plastic Moment		N/A	General Comp.
Steel Elastic Section Properties		N/A	General Comp.
Unbraced Length Calculations		N/A	General Comp.

ADJ1 – Analysis with Adjacent Lane Routine Traffic Example

Br: Spec Check Detail for 6.10.9 LRFD Shear Resistance

6 Steel Structures
 6.10 I-Section Flexural Members
 6.10.9 Shear Resistance
 (AASHTO LRFD Bridge Design Specifications, Ninth Edition)

Steel Plate - At Location = 80.5000 (ft) - Left Stage 3
 Section within Top Flange Continuous Bracing Region

Article 6.10.9.2 Unstiffened Panels

$V_r = \phi_n * V_n = 239.20$

Note: If the capacity has been overridden, the Resistance is computed as override ϕ_n *override capacity. Otherwise the Resistance is computed as per the Specification.

Limit State	Load Combo	--- Override ---				Design Ratio	Code
		V_u (kip)	Φ (kip)	V_n (kip)	V_r (kip)		
STR-II	3	53.25			239.20	4.492	Pass
STR-II	3	-53.25			-239.20	4.492	Pass
STR-II	4	69.63			239.20	3.435	Pass
STR-II	4	-69.63			-239.20	3.435	Pass

Load Combination Legend:

Code	Vehicle
3	HS 20-44 - Lane
4	HS 20-44 - Permit Truck

OK

Close the **Spec Check Detail** window. Perform another **LRFD Design Review** without the adjacent vehicle and review the **6.10.9 Shear Resistance** specification reference for comparison.