AASHTOWare BrDR 7.6.1

Feature Tutorial

MBE 2024 Spec Interim Update – Permit Rating Example

AASHTOWare Bridge Design and Rating Training

MBE 2024 Spec Interim Update – Permit Rating Example

Summary

This tutorial demonstrates the provisions for permit vehicle loading as specified in the AASHTO MBE 3rd Edition with 2024 interims. A multi-span steel superstructure is used to illustrate several aspects of the new provisions. The process for permit vehicle loading is similar for all line girder, 3D and truss analysis methods.

The permit vehicle definition can describe an actual permit vehicle with its exact wheel weights or can describe a collection of permit vehicles as indicated by the notional vehicle selection. For a notional permit vehicle, only axles which contribute to the maximum force effect are considered.

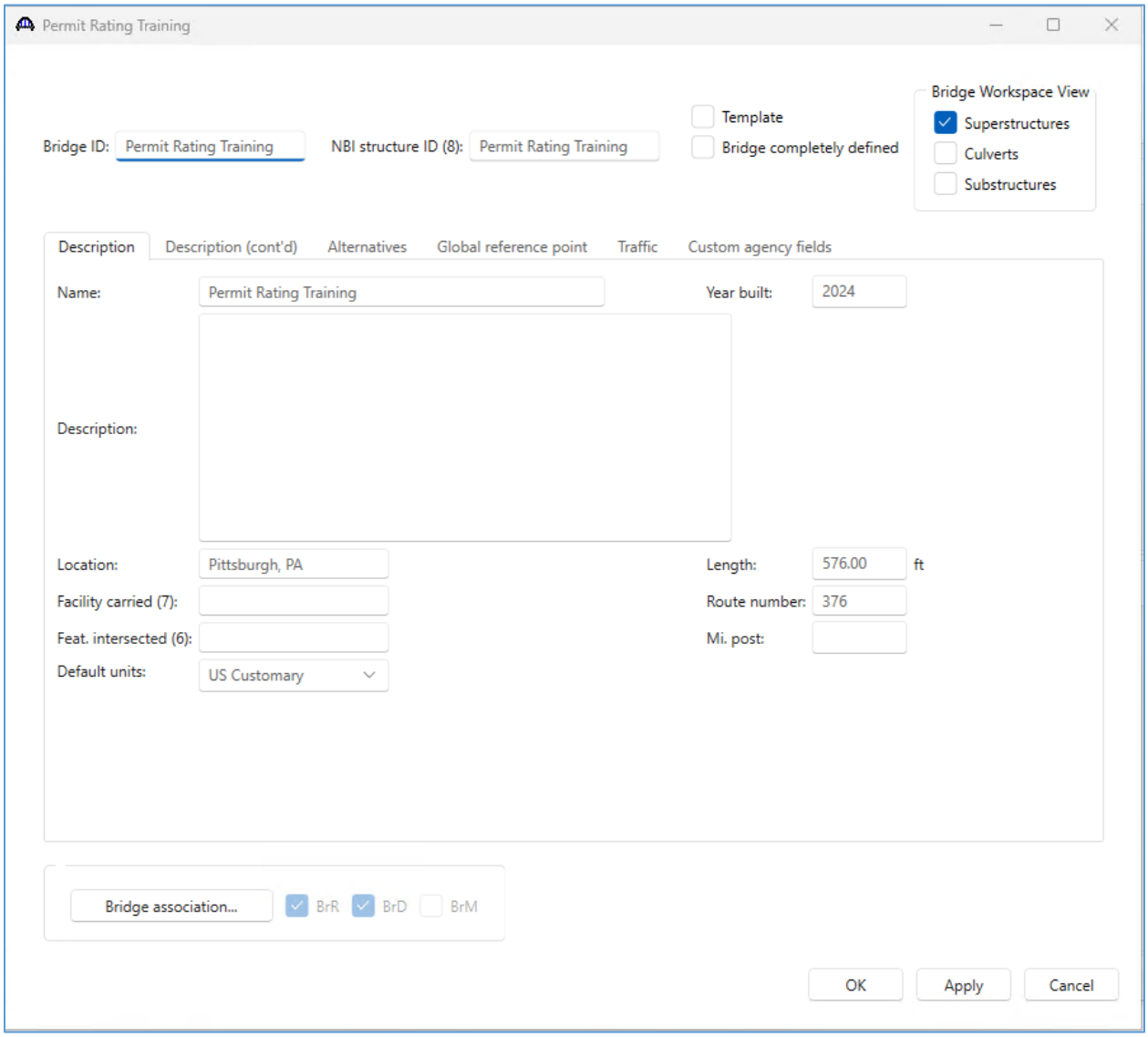
An additional permit lane load can be assigned with the advanced analysis settings options. When a permit lane load is defined, the program applies the load as described in the AASHTO MBE 3rd Edition with 2024 interims. The permit lane load is only applied to bridges with an average daily truck traffic (ADTT) greater than 500. If the recent ADTT is not input for a bridge, the program assumes it to be greater than 500 and applies the lane load. For spans between 200 and 300 ft. the permit lane load contributes to all load effects, and for other span lengths it only contributes to negative moments, shears and reactions between contraflexure points over interior supports.

For truss structures the lane load is applied to the truss members as follows:

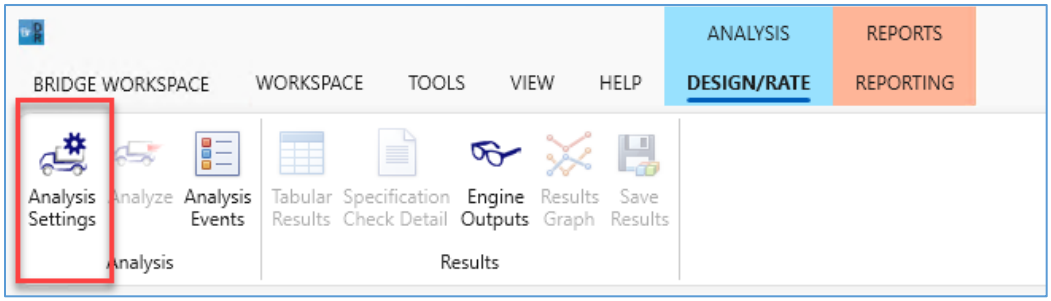
- To all truss members when the span length is between 200 and 300 ft.
- Truss chord members between points of contraflexure near intermediate piers.
- Diagonals and vertical members within the first panel adjacent to an interior pier.

LRFR Analysis – Permit Vehicle Rating

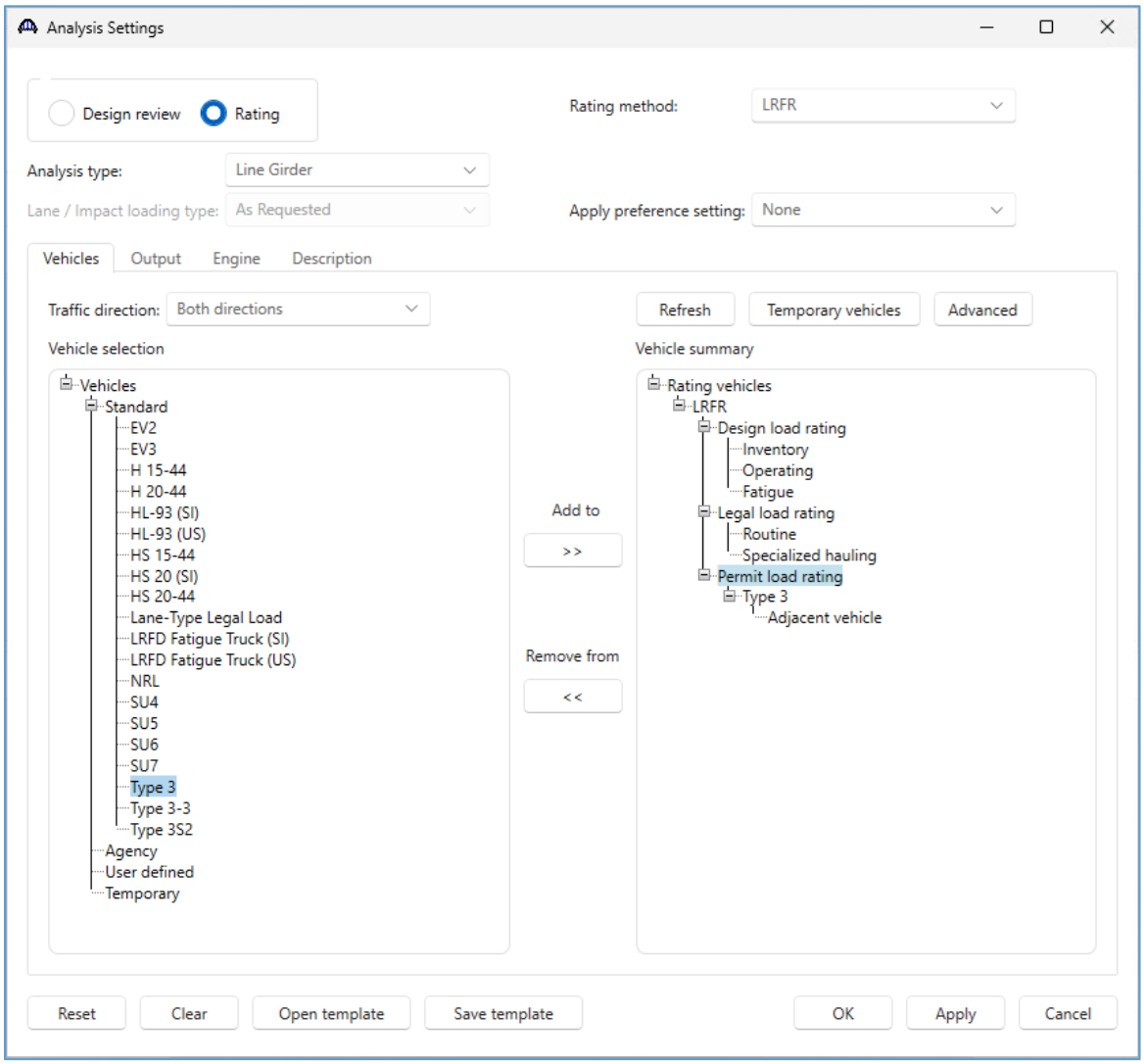
Start by importing the Permit-Rating-With-BrDR-7.6.1.xml example file. This is a three span steel plate girder bridge. The first and third spans are less than 200 ft., and the second span is greater than 200 ft. This configuration will illustrate several aspects of the permit lane application using the AASHTO MBE 3rd Edition with 2024 interims.



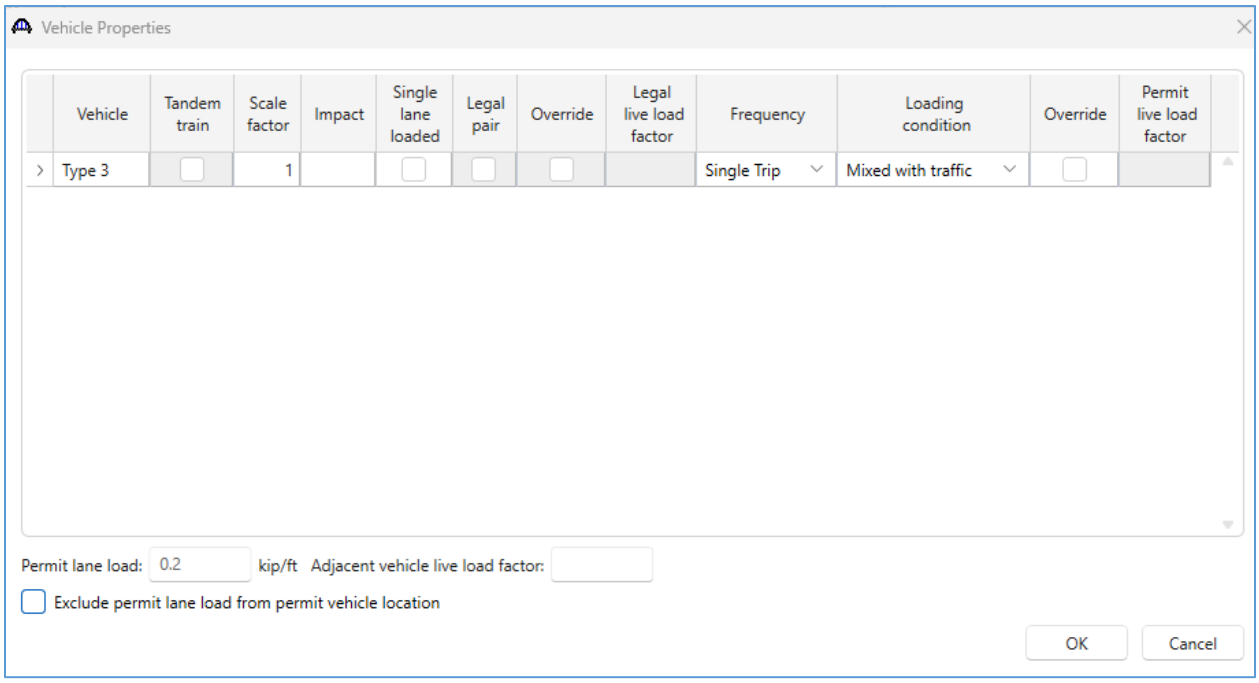
Analyze the **Haunched Plate Girder** member alternative for **G1**. To perform an **LRFR** rating, select the **Analysis Settings** button on the **Analysis** group of the **DESIGN/RATE** ribbon. The window shown below opens.



Assign the **Type 3** vehicle to the LRFR Permit load rating category in the **Analysis Settings** window as shown below.



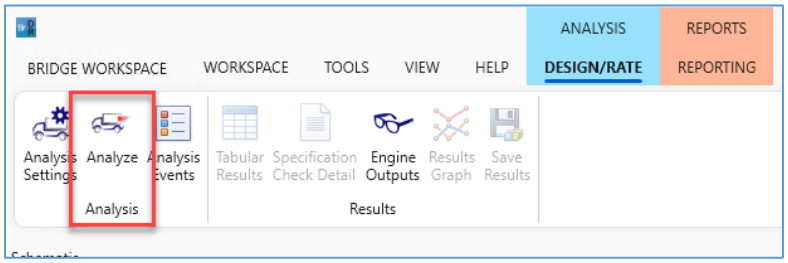
In the **Vehicle Properties** window, add a 0.2 kip/ft **Permit lane load**. This indicates that the permit lane load should be considered during the analysis and defines the magnitude of the load. The application of this load depends on the recent ADTT and the span configuration of the structure.



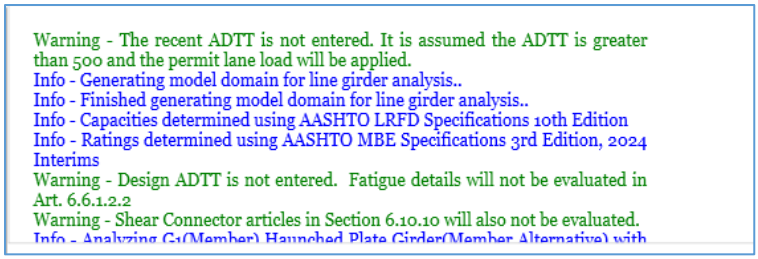
Click **OK** to apply the data and close the window.

Tabular Results

With **G1** member alternative – **Haunched Plate Girder** selected, click the **Analyze** button on the **Analysis** group of the **DESIGN/RATE** ribbon to perform the rating.

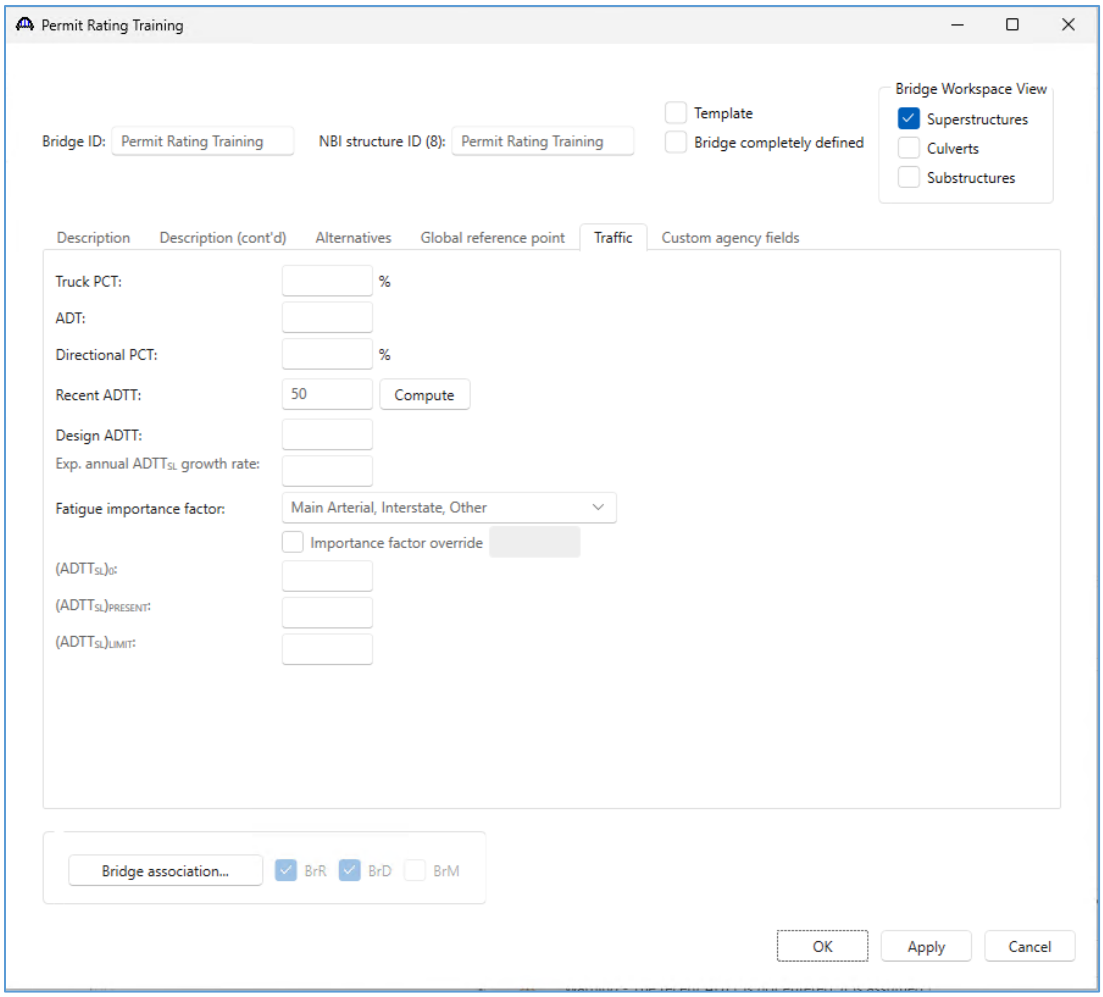


The analysis log indicates that the permit lane load is assumed to apply since the ADTT is not defined.

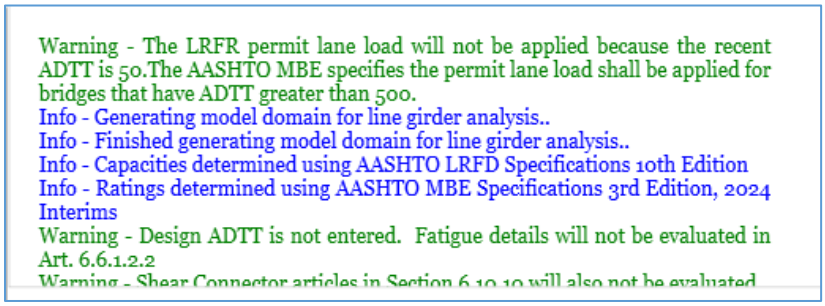


To define the ADTT, open the bridge description window by double clicking on the **Permit Rating Training** node in the bridge workspace tree. Open the **Traffic** tab.

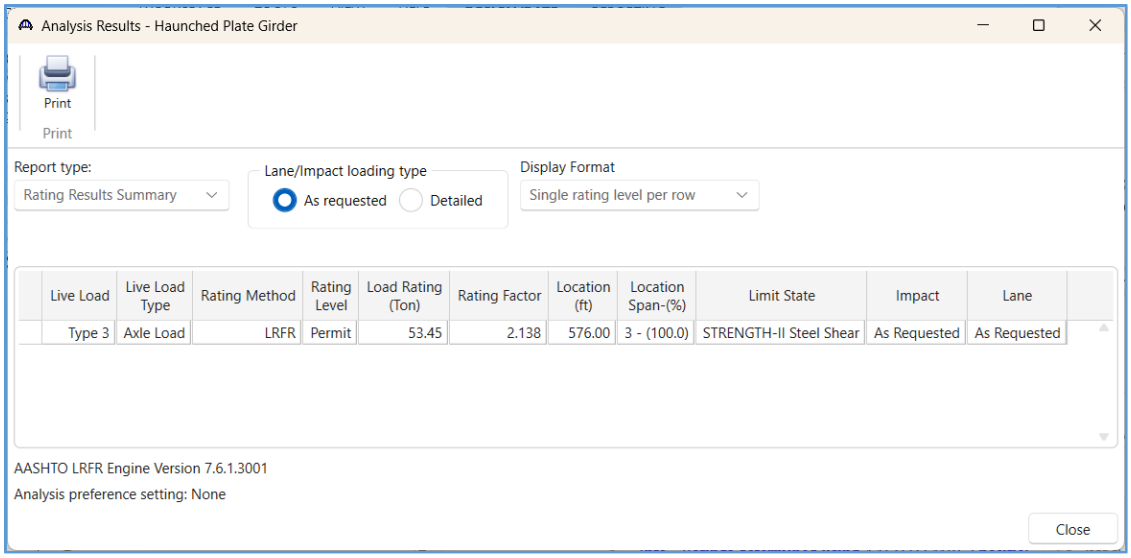
Input a recent ADTT of 50.



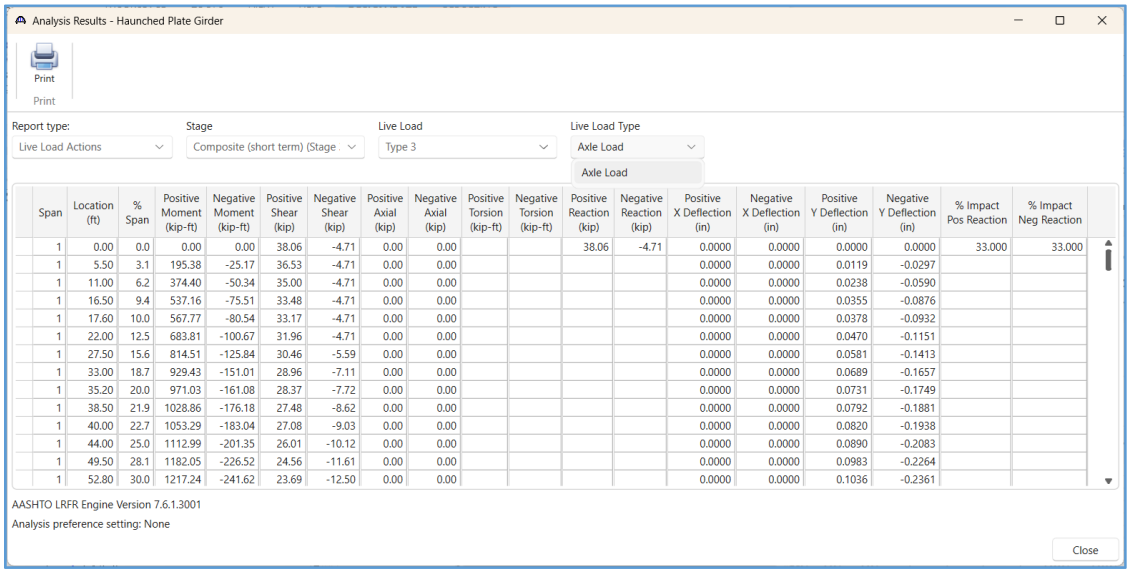
Reanalyze **G1**. The analysis log shows the permit lane load is not applied.



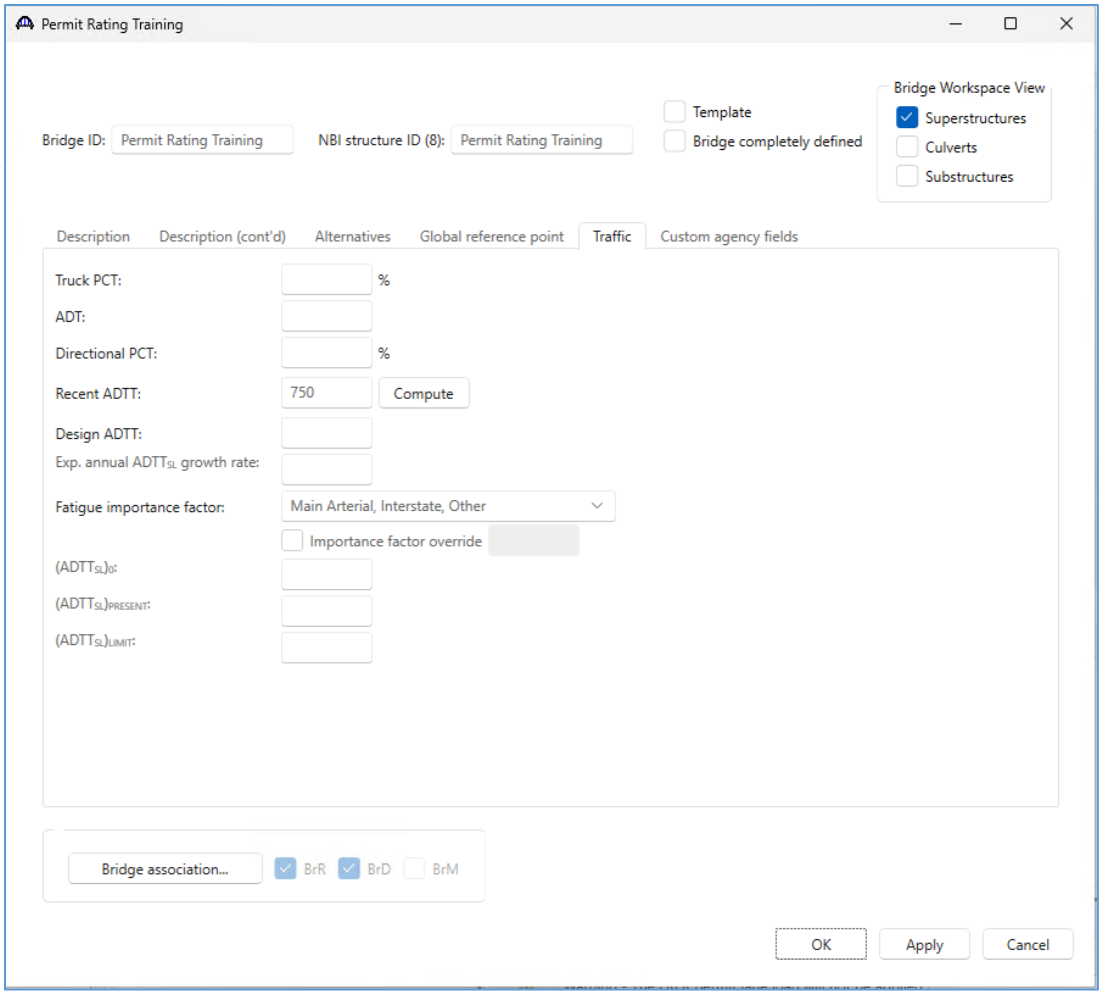
The tabular results window shows a critical rating factor of 2.138.



The live load actions table shows only an axle load component computed for the Type 3 permit vehicle.

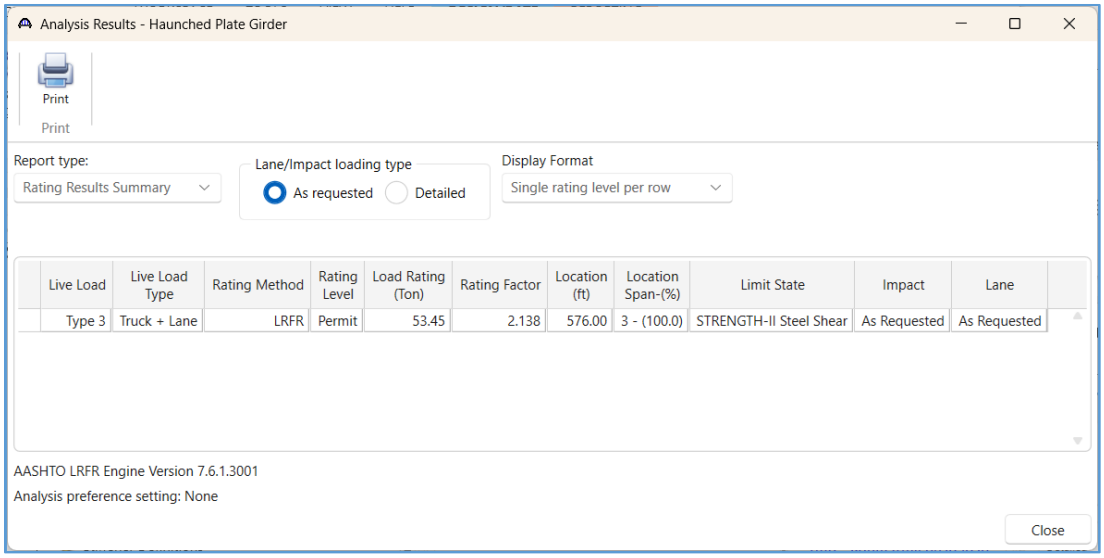


Change the ADTT to 750. Open the bridge description window by double clicking on the **Permit Rating Training** node in the bridge workspace tree and open the **Traffic** tab.



Reanalyze **G1**.

The tabular results window shows a critical rating factor of 2.138. This is the same controlling rating as without the permit lane applied, but this time the live load type is shown as Truck + Lane. The controlling location is span 3 – 100%. The permit lane load is considered during the analysis, but not at this POI because this POI is not in a span between 200 and 300 ft. or in a negative contraflexure region over an interior support.



The live load actions table shows both axle load and lane components for the Type 3 permit vehicle. The lane load portion of the permit vehicle shows all actions are considered in span 2 because the length of span 2 is between 200 and 300 ft. Since the length of span 3 is less than 200 ft., all actions are not always considered from the lane load. The portion of the span in the negative contraflexure region considers negative moments, shears and reactions and the portion of the span in the positive contraflexure region does not consider any actions from the lane load.