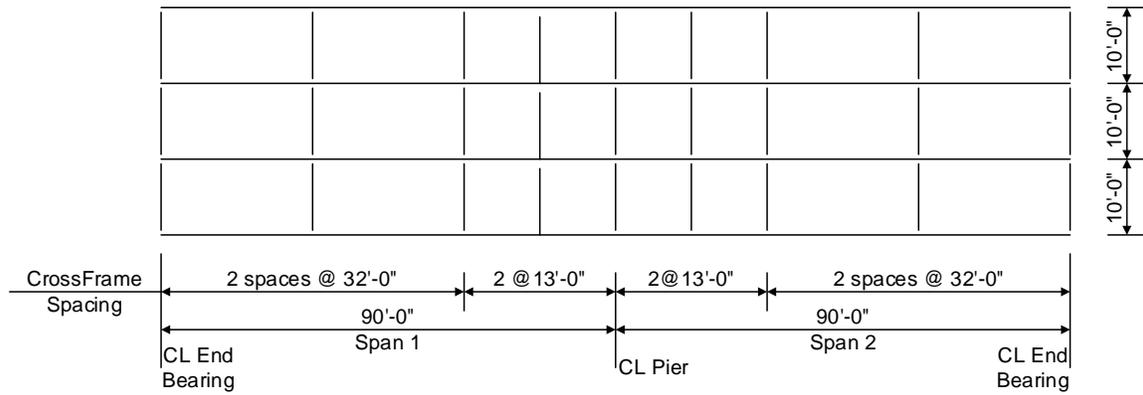
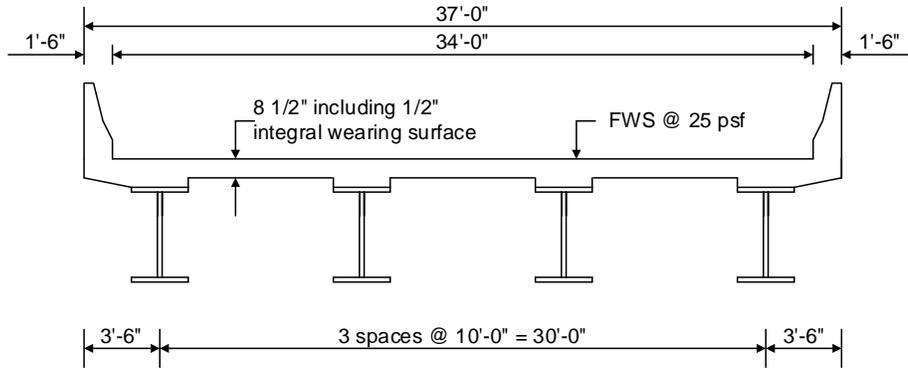
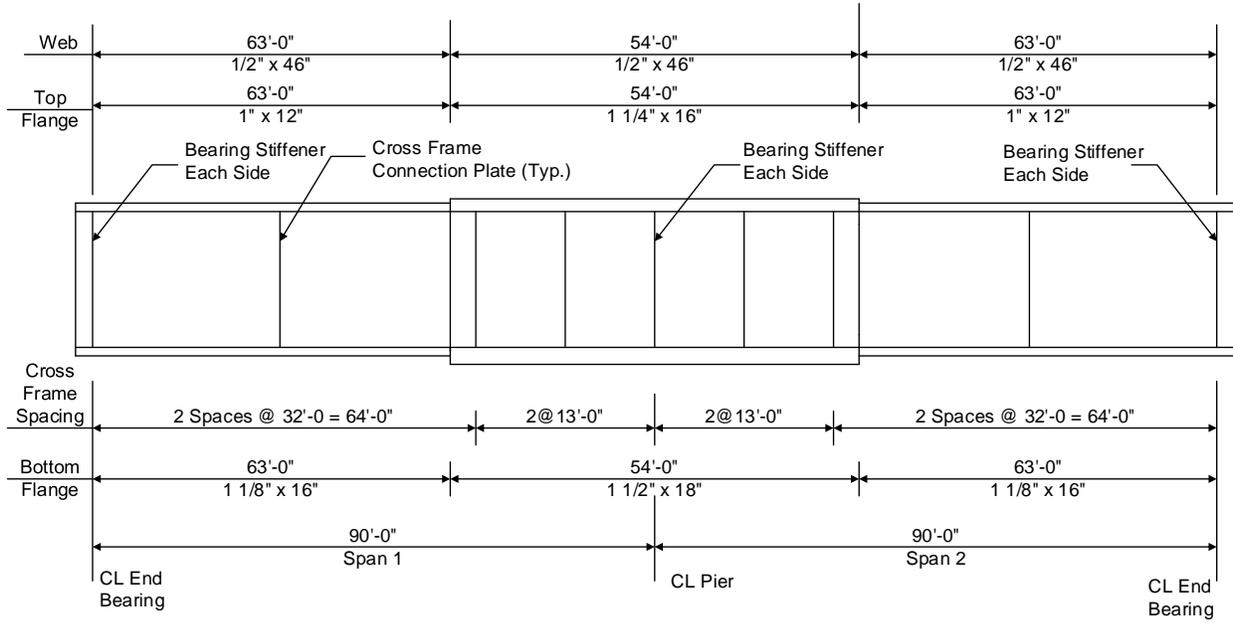

AASHTOWare BrDR 7.5.0
Steel Tutorial
STL10-Corrugated Deck Rating

STL6 - Two Span Plate Girder Example

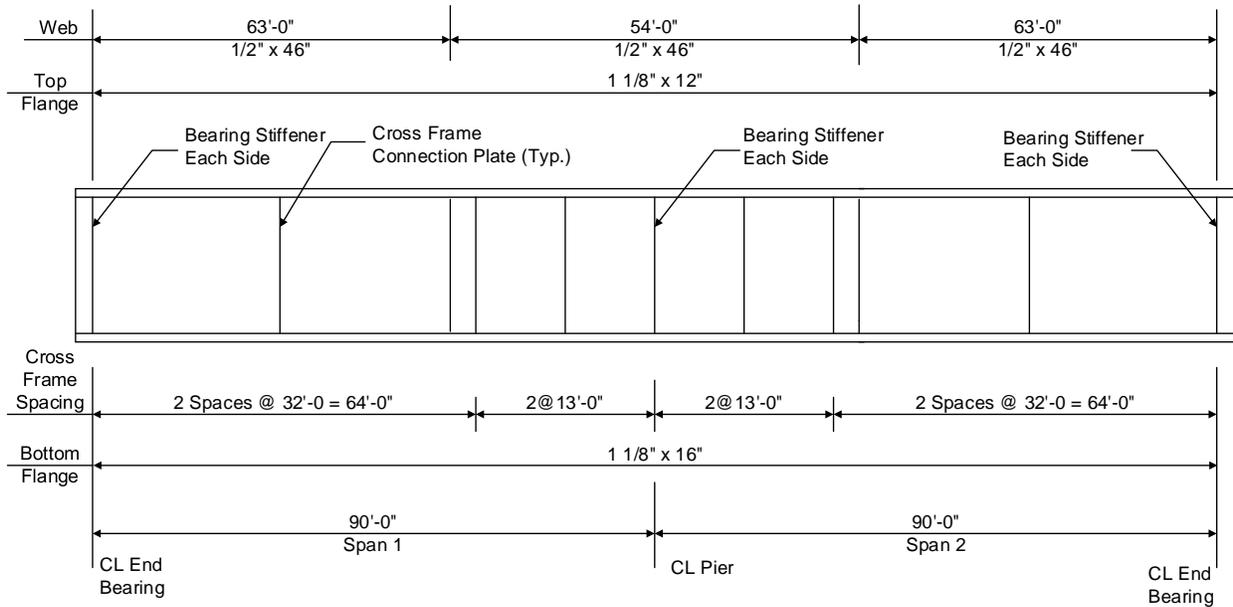


Framing Plan

STL10-Corrugated Deck Rating

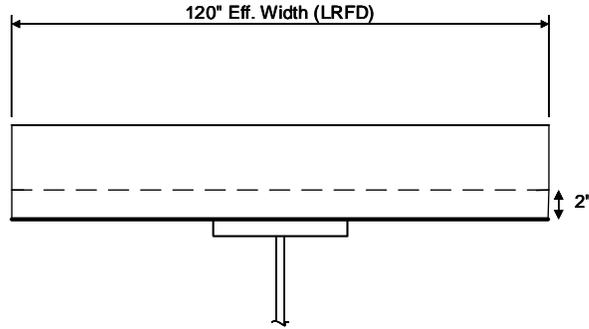


Elevation of Interior Girder

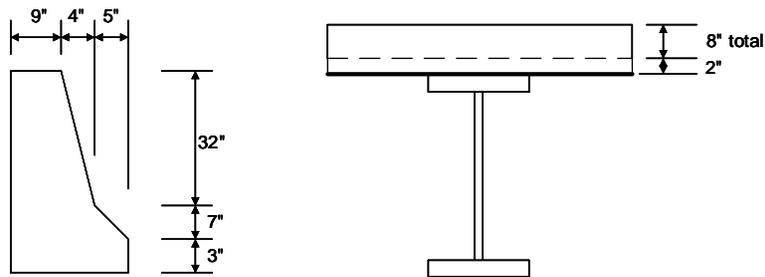


Elevation of Allow Moment Redistribution Girder

STL10-Corrugated Deck Rating



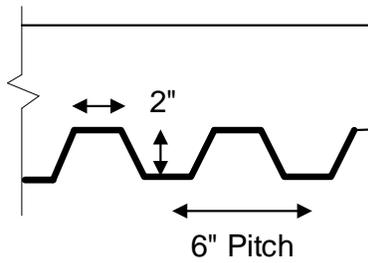
Composite Section at Pier



Weight = 536 plf

Parapet Detail

Section Detail



Cross-Section of Corrugated Deck

Material Properties

Structural Steel: AASHTO M270, Grade 50W uncoated weathering steel with $F_y = 50$ ksi

Deck Concrete: $f'_c = 4.0$ ksi, modular ratio $n = 8$

Slab Reinforcing Steel: AASHTO M31, Grade 60 with $F_y = 60$ ksi

2" Corrugated steel plank: Grade 50 galvanized steel

Cross Frame Connection Plates: 3/4" x 6"

Bearing Stiffener Plates: 7/8" x 9"

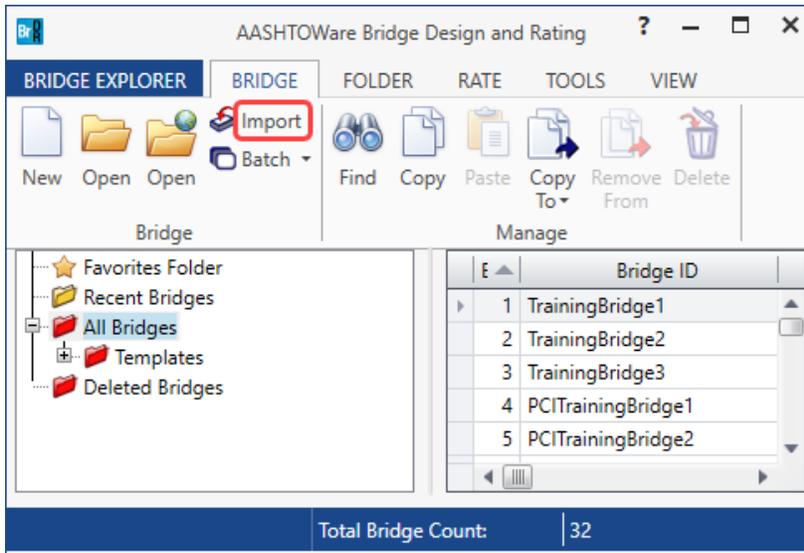
STL10-Corrugated Deck Rating

BrDR Tutorial

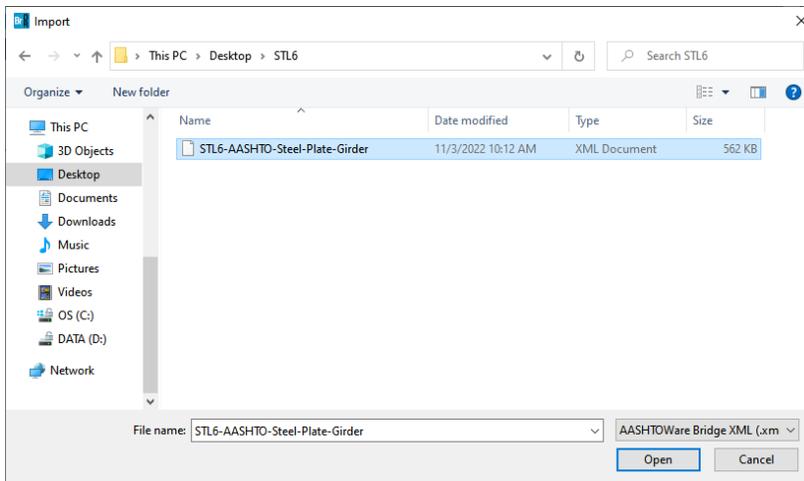
This example assumes that the user has worked through STL11 – Steel Plate Girder Using AASHTO LRFD Engine.

For this example, use the bridge from the **STL6 tutorial** or import the bridge provided for the STL10 tutorial - **STL10 - Corrugated Deck Rating.xml**.

Use the **Import** function of **BrDR** to import the bridge **STL6-AASHTO-Steel-Plate-Girder.xml** provided for this tutorial. Open **BrDR** and click on the **Import** button from the **Bridge** group of the **BRIDGE** ribbon as shown below.

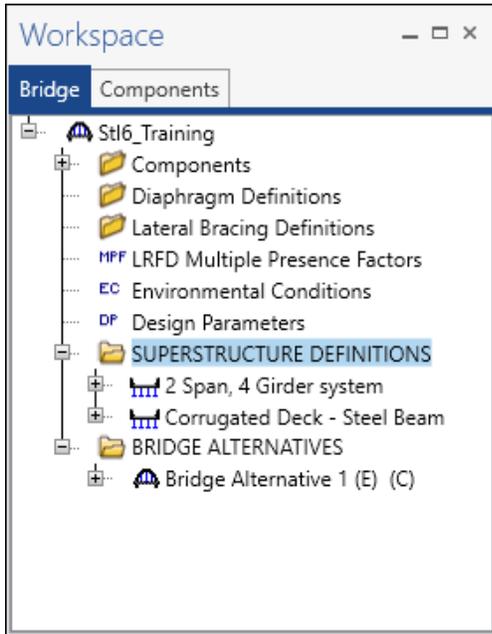


Select the bridge from the **STL6** tutorial and click the **Open** button to import this bridge into **BrDR**.

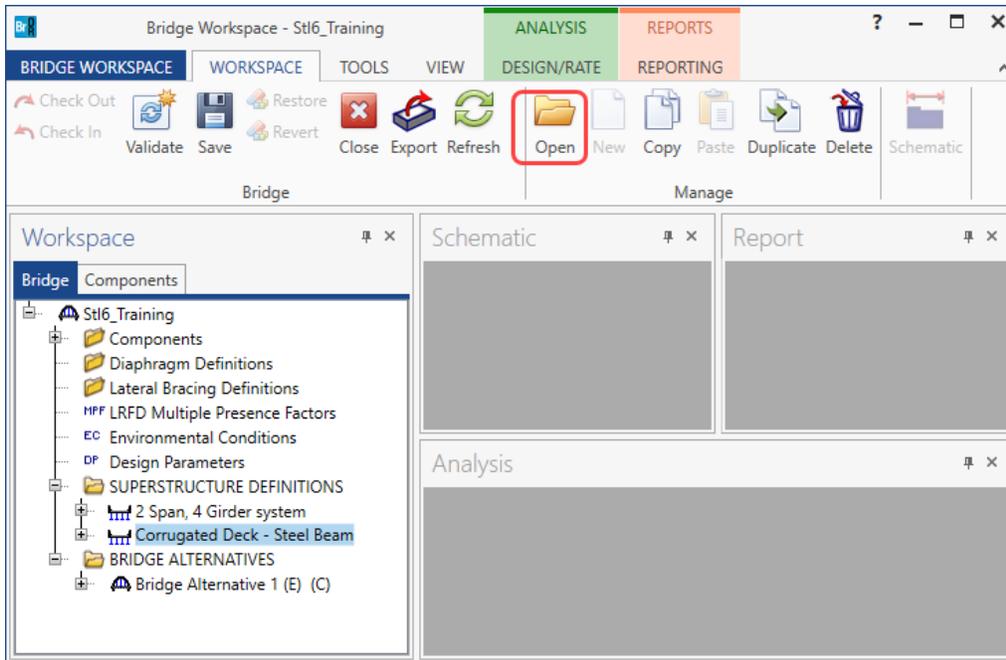


STL10-Corrugated Deck Rating

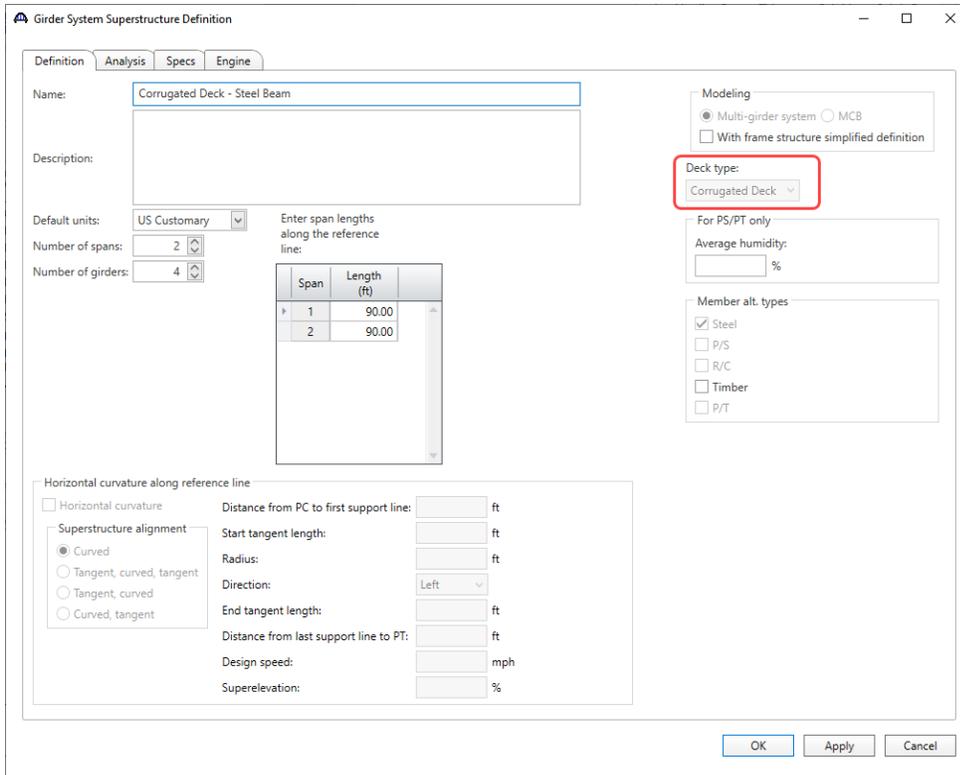
The partially expanded **Bridge Workspace** tree is shown below.



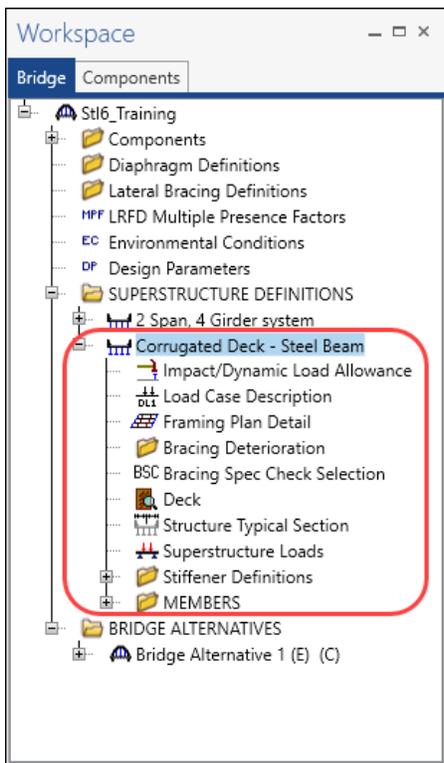
Select the **Corrugated Deck – Steel Beam** node in the **Bridge Workspace** tree and click the **Open** button from the **Manage** group of the **WORKSPACE** ribbon (or double click on **Corrugated Deck – Steel Beam**) to open the selected superstructure definition. This was created by selecting the **Deck type** as **Corrugated** in this window.



STL10-Corrugated Deck Rating



The partially expanded **Bridge Workspace** tree for **Corrugated Deck – Steel Beam** member alternative is shown below.



STL10-Corrugated Deck Rating

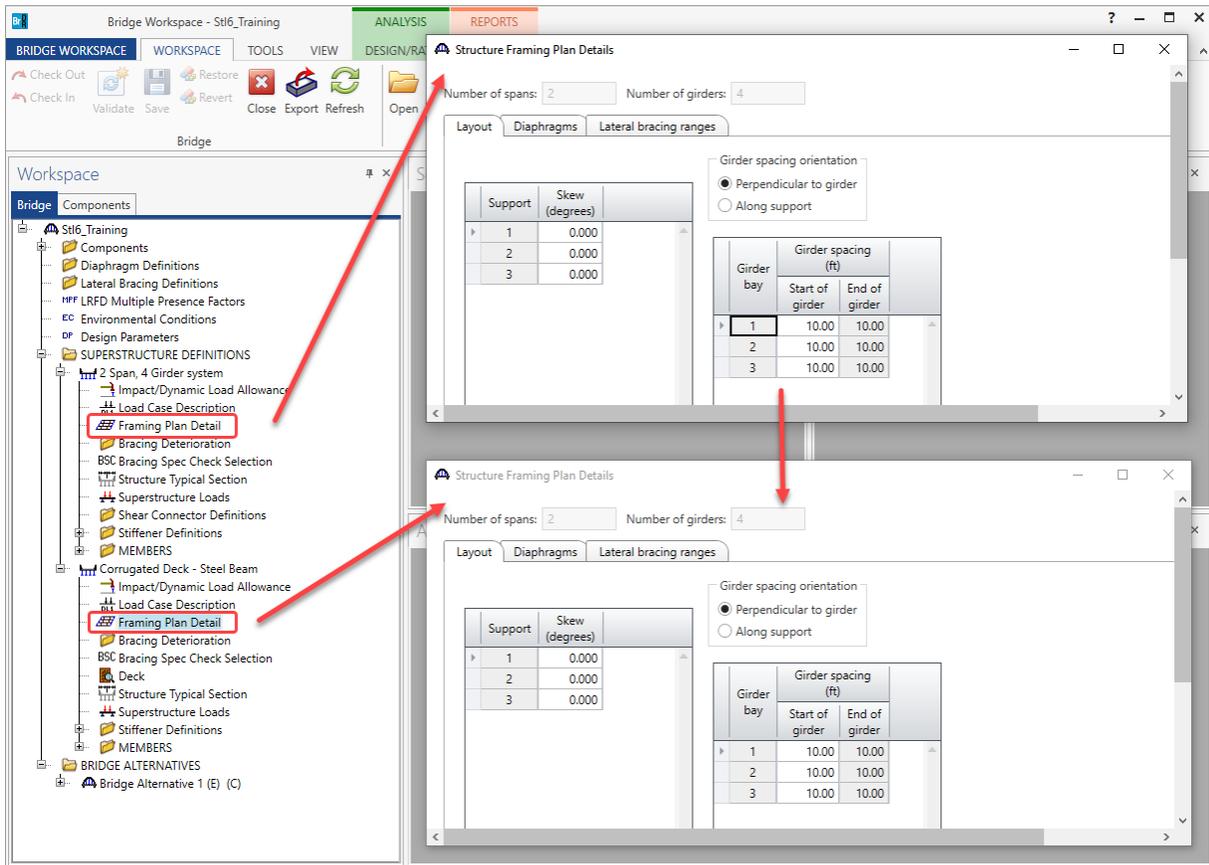
Much of the data entry will be the same as with the STL6 example. Impact, Load Case Description, and framing plan will be set up the same as for the STL6 example.

Topics Covered

- Impact/Dynamic Load Allowance
- Load Case Description
- Framing Plan Detail
- Structure Typical Section
- Superstructure Loads

Enter the data from the original bridge definition to the Corrugated Deck bridge definition (See image below).

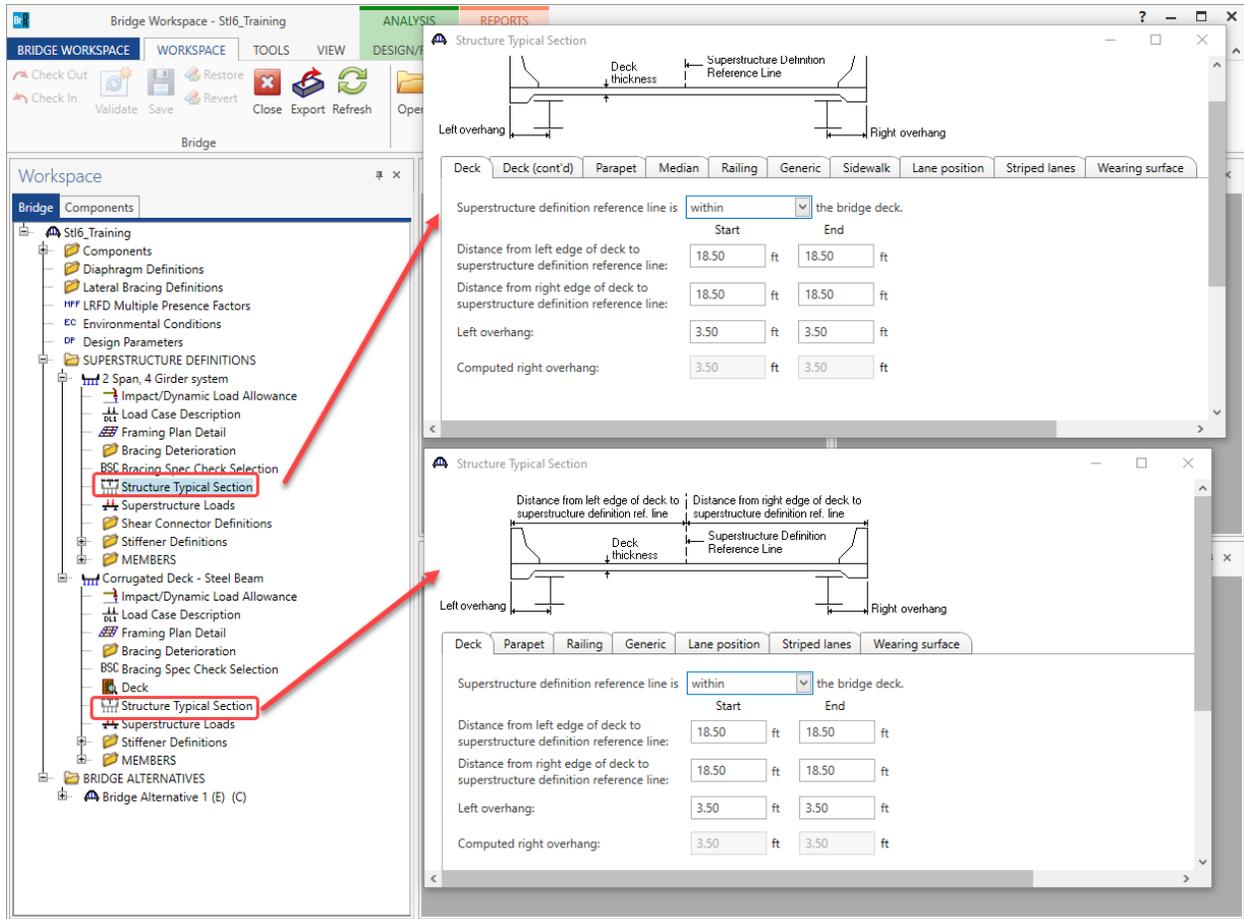
Framing Plan Detail



STL10-Corrugated Deck Rating

Structure Typical Section

The **Structure Typical Section** window for the **Corrugated deck** superstructure has fewer tabs (See image below). The remaining tabs are similar to the window for a common deck/steel girder typical definition.



STL10-Corrugated Deck Rating

Corrugated Deck Metal Panel

Double click on the **Deck** node for the superstructure **Corrugated Deck – Steel Beam** in the **Bridge Workspace** tree to open the **Corrugated Deck Metal Panel** window. Enter the data as shown below.

Corrugated Metal Deck Panel

Default rating method:

Analysis module
LFR:
LRFR:

Wheel load distribution
Parallel to traffic:
Perpendicular to traffic:

Corrugated deck plank

Plank depth: in Yield strength: ksi

Plank thickness: in Panel length: ft

A: in
B: in
C: in

Moment of inertia: in⁴/ft
Section modulus: in³/ft
Load: psf

Fill material

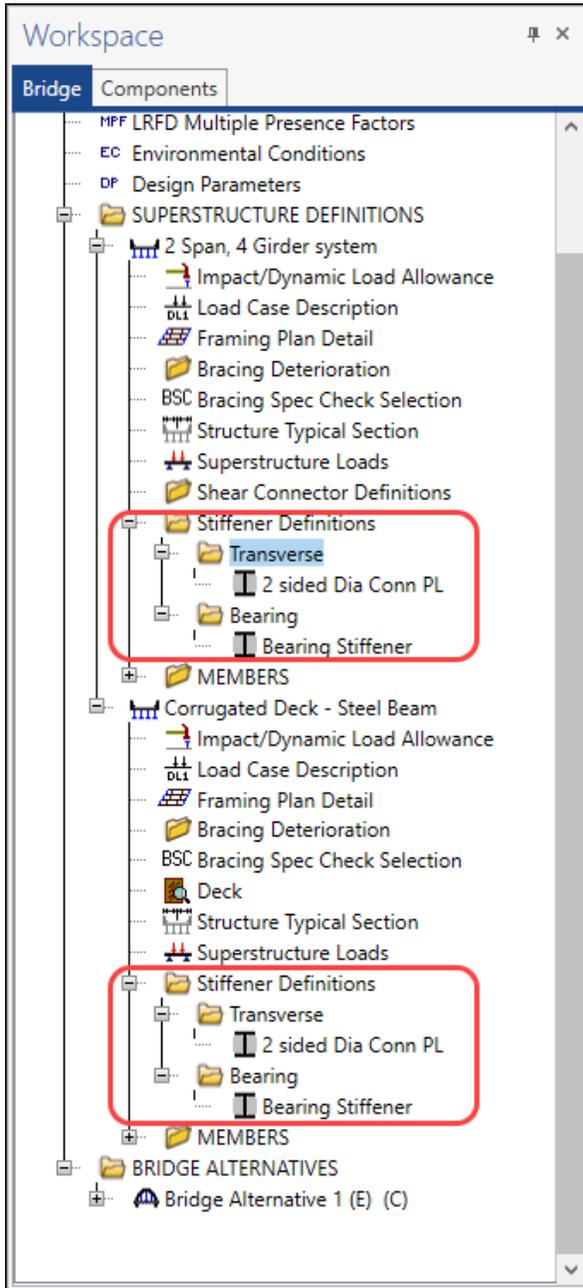
Weight: pcf
Thickness above plank: in

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

STL10-Corrugated Deck Rating

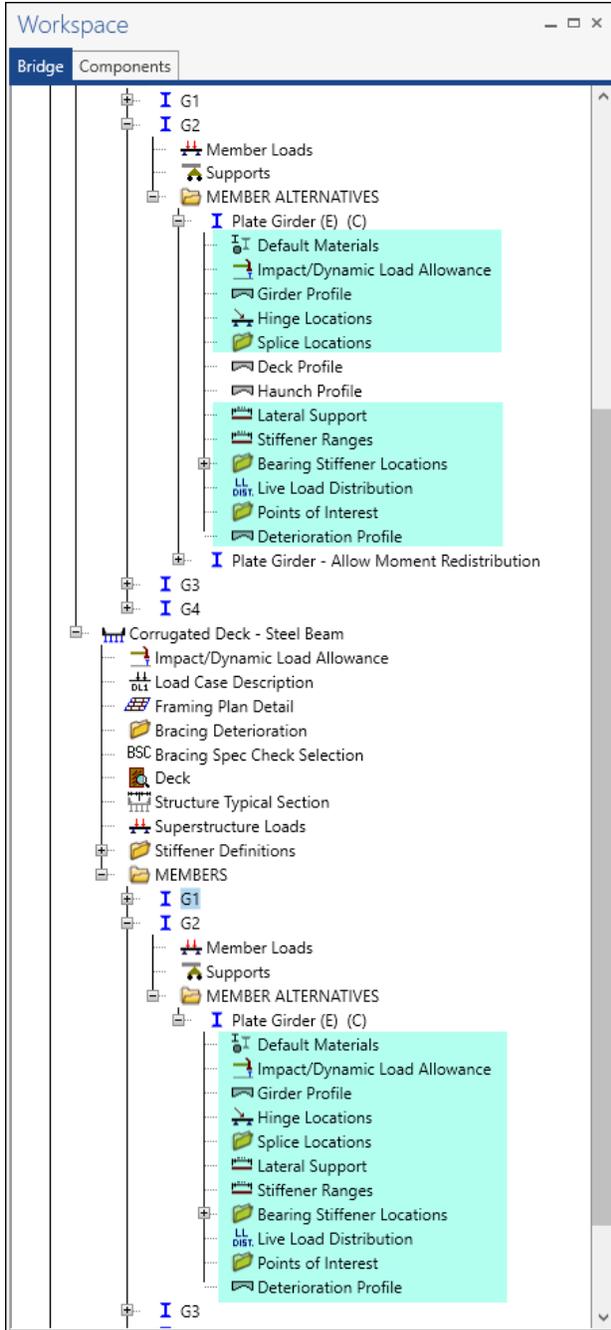
Stiffener Definitions

Copy the stiffener definitions from the original bridge definition to the Corrugated deck definition (See image below).



STL10-Corrugated Deck Rating

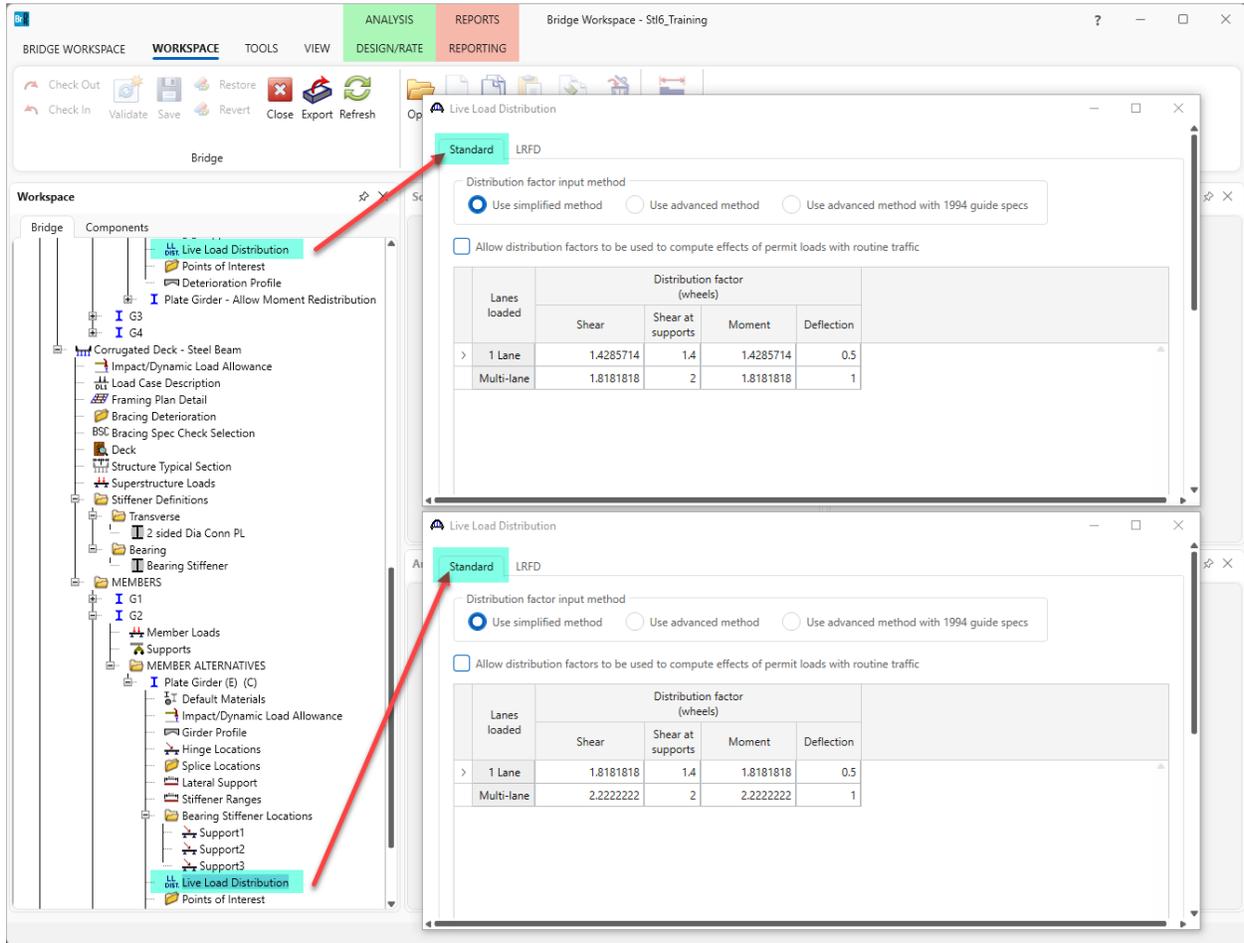
Open the **MEMBER ALTERNATIVES** for Girder **G2** for the original bridge definition and the new **Corrugated Deck** definition. Member definitions cannot be copied because there are small differences in the definitions. For example, the Corrugated Deck will not have haunches. Go through the original member definition and reenter the data in the new member definition where such data is similar.



STL10-Corrugated Deck Rating

Live Load Distribution

Double click on the **Live Load Distribution** node for the superstructure **Corrugated Deck – Steel Beam** in the **Bridge Workspace** tree to open the **Live Load Distribution** window. BrDR can compute the Standard Specification Live Load Distribution Factors (**LLDF**) based on the corrugated deck definition. Click the **Compute from typical section** button to compute the factors. If left blank, AASHTO LFR engine will compute these factors during the analysis. The image below shows the differences in the standard LLDFs.

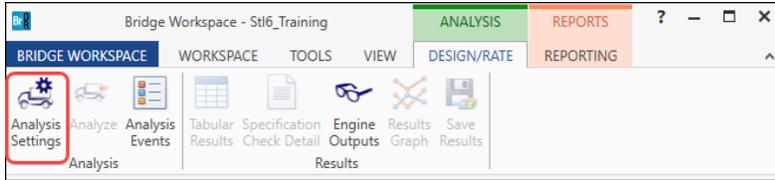


Click **OK** to apply the data and close the window.

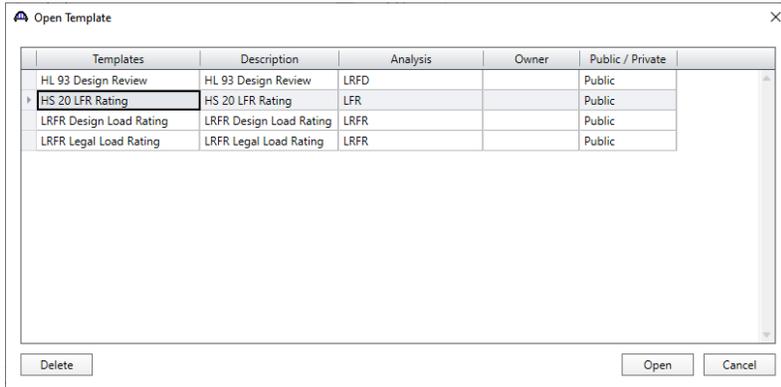
STL10-Corrugated Deck Rating

LFR Analysis – Corrugated deck

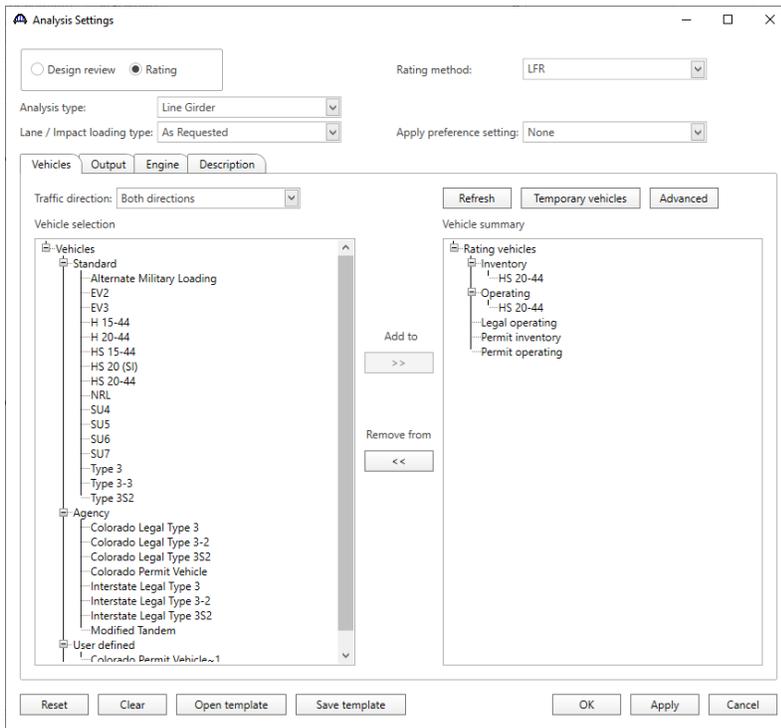
To perform an **LFR** rating on the deck for the corrugated deck definition, select the **Analysis Settings** button on the **Analysis** group of the **DESIGN/RATE** ribbon. The window shown below opens.



Click the **Open Template** button and select the **HS 20 LFR Rating** t used in the rating and click **Open**.



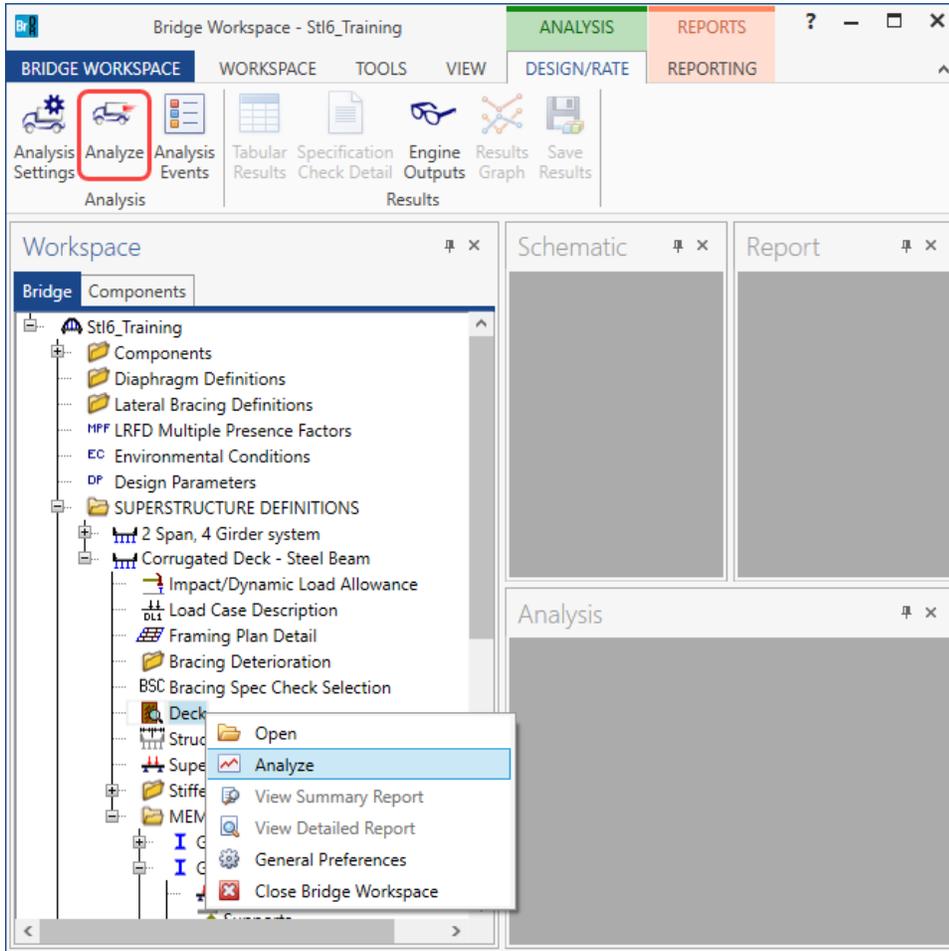
The **Analysis Settings** window is populated as shown below.



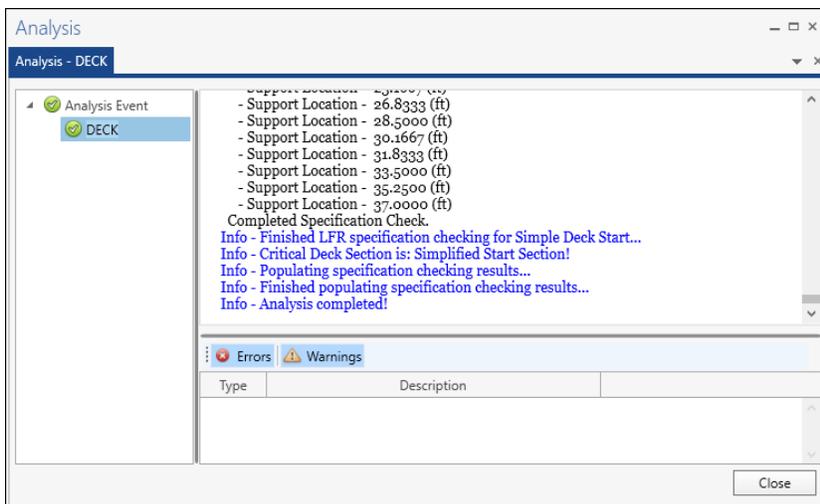
Click **OK** to apply the settings and close the window.

STL10-Corrugated Deck Rating

Select the **Deck** node for this superstructure in the **Bridge Workspace** tree and click the **Analyze** button on the **Analysis** group of the **DESIGN/RATE** ribbon (or right click **Deck** and select **Analyze** from the menu) to perform the rating as shown below.

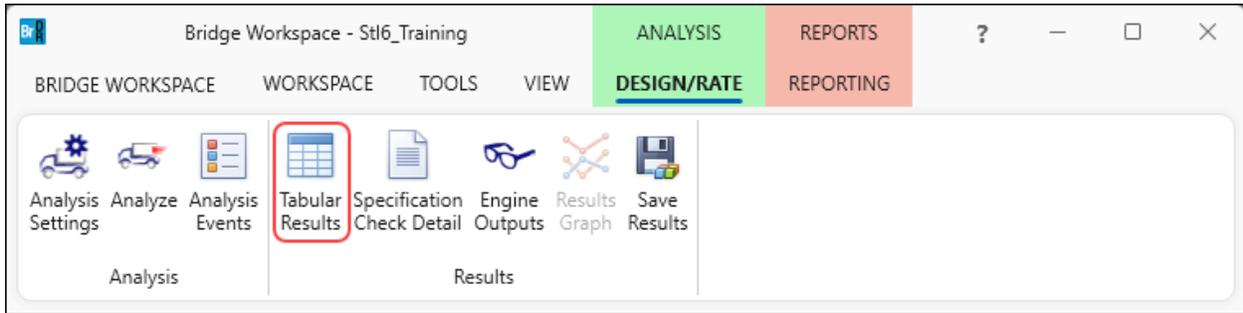


The **Analysis** window is shown below.

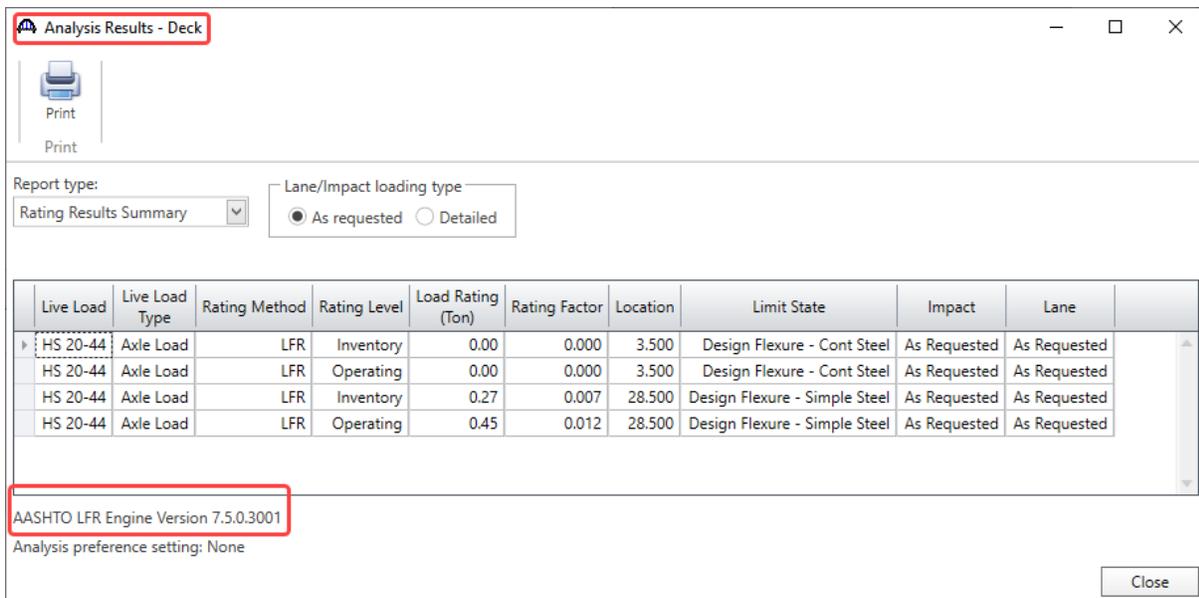


STL10-Corrugated Deck Rating

Tabular Results



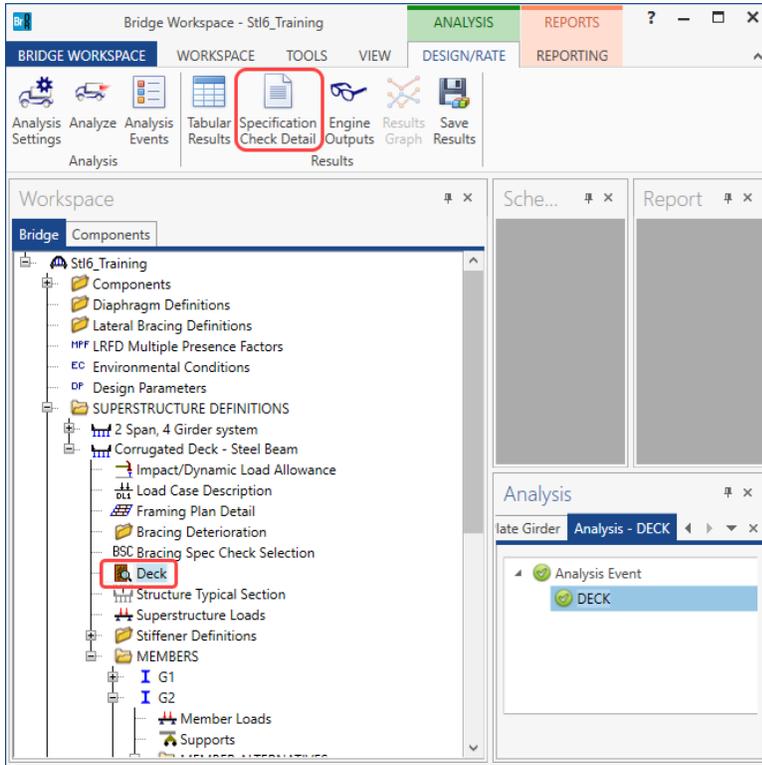
When the rating is complete, results can be reviewed by clicking the **Tabular Results** button on the **Results** group of the **DESIGN/RATE** ribbon.



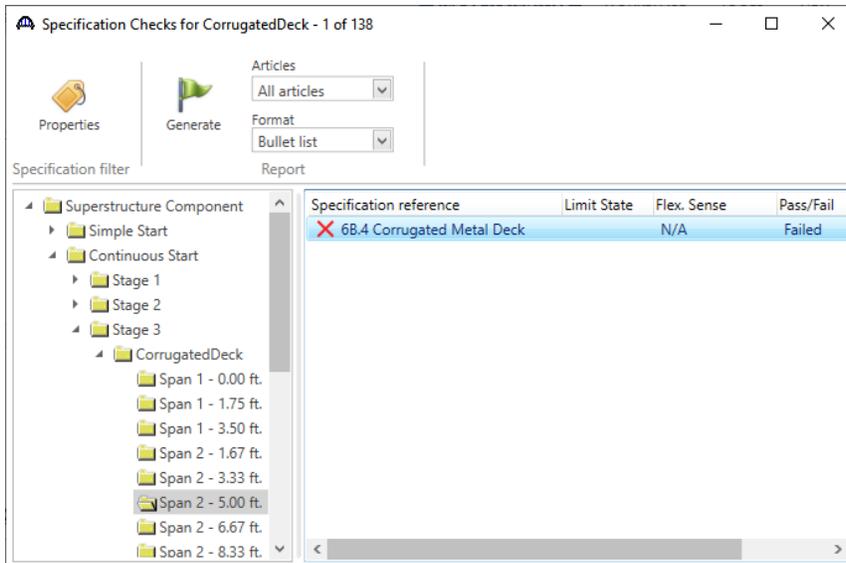
STL10-Corrugated Deck Rating

Corrugated Deck Specification Check Detail

The specification checks for the deck analysis can be viewed by selecting the **Deck** and clicking the **Specification Check Detail** button from the **Results** group of the **DESIGN/RATE** ribbon.



Expand **Continuous Start, Stage 3, CorrugatedDeck**, select **Span 2 – 5.00 ft.** and open the article **6B.4 Corrugated Metal Deck** as shown below.



STL10-Corrugated Deck Rating

Spec Check Detail for 6B.4 Corrugated Metal Deck

Part B - ALLOWABLE STRESS RATING AND LOAD FACTOR RATING
 6B.4 RATING EQUATION
 6B.4.1 General - Corrugated Metal Deck
 (AASHTO Manual for Bridge Evaluation, Second Edition with 2011 Interims)

INPUT:

Depth = 2.0000 (in)
 I = 0.6975 (in⁴)
 S = 0.6761 (in³)
 Fy = 50.0000 (ksi)

RATING FACTOR CALCULATIONS:

$$RF = \frac{C - A1*DL}{A2*LL} \quad (6B.4.1-1)$$

where,

A1 = Dead Load Factor
 A2 = Live Load Factor
 DL = Dead Load Moment = 0.18 (kip-ft)
 LL = Live Load Moment (includes impact)

Rating Level	Vehicle	LL (kip-ft)	Load Factors		Mu (kip-ft)	RF	Capacity (Ton)
			A1	A2			
Inventory	1	39.34	1.300	2.171	2.82	0.030	1.09
Inventory	1	-11.64	1.300	2.171	-2.82	0.121	4.35
Operating	1	39.34	1.300	1.300	2.82	0.050	1.82
Operating	1	-11.64	1.300	1.300	-2.82	0.202	7.27

Load Combination Legend:

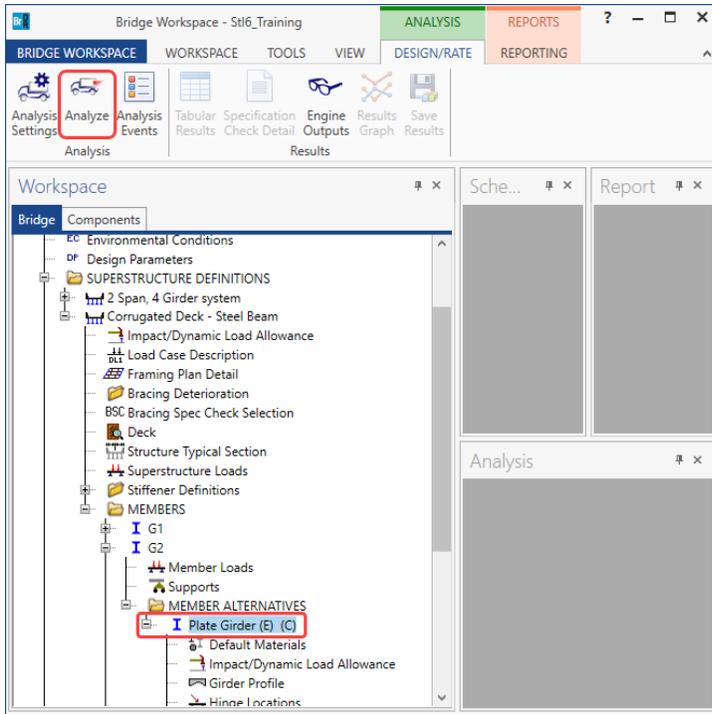
Code	Vehicle
1	HS 20-44 - Truck

OK

STL10-Corrugated Deck Rating

LFR Analysis – Plate Girder member alternative (Corrugated Deck - Steel Beam)

Similarly run an **LFR** analysis on the **Plate Girder** member alternative of the **Corrugated Deck** superstructure as shown below.



Tabular Results

View the tabular results for this analysis as shown below.

Analysis Results - Plate Girder
- □ ×

Print

Report type:
 Rating Results Summary

Lane/Impact loading type
 As requested Detailed

Display Format
 Single rating level per row

Live Load	Live Load Type	Rating Method	Rating Level	Load Rating (Ton)	Rating Factor	Location (ft)	Location Span-(%)	Limit State	Impact	Lane
HS 20-44	Axle Load	LFR	Inventory	20.59	0.572	36.00	1 - (40.0)	Design Flexure - Steel	As Requested	As Requested
HS 20-44	Axle Load	LFR	Operating	34.39	0.955	36.00	1 - (40.0)	Design Flexure - Steel	As Requested	As Requested
HS 20-44	Lane	LFR	Inventory	18.25	0.507	90.00	1 - (100.0)	Design Flexure - Steel	As Requested	As Requested
HS 20-44	Lane	LFR	Operating	30.48	0.847	90.00	1 - (100.0)	Design Flexure - Steel	As Requested	As Requested

AASHTO LFR Engine Version 7.5.0.3001
 Analysis preference setting: None

Close