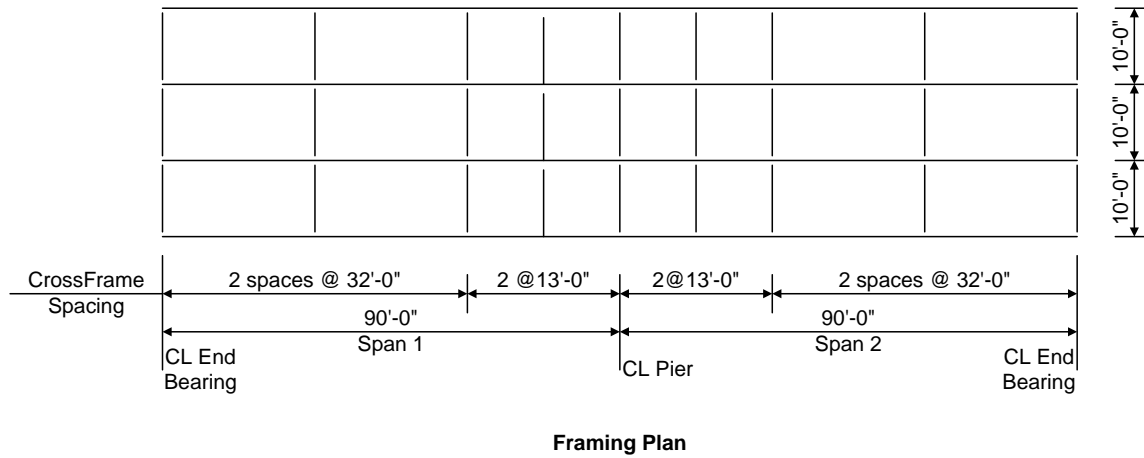
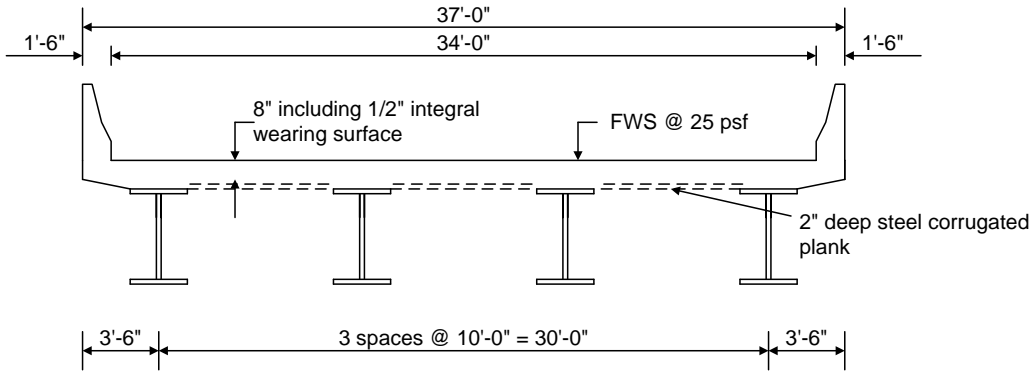
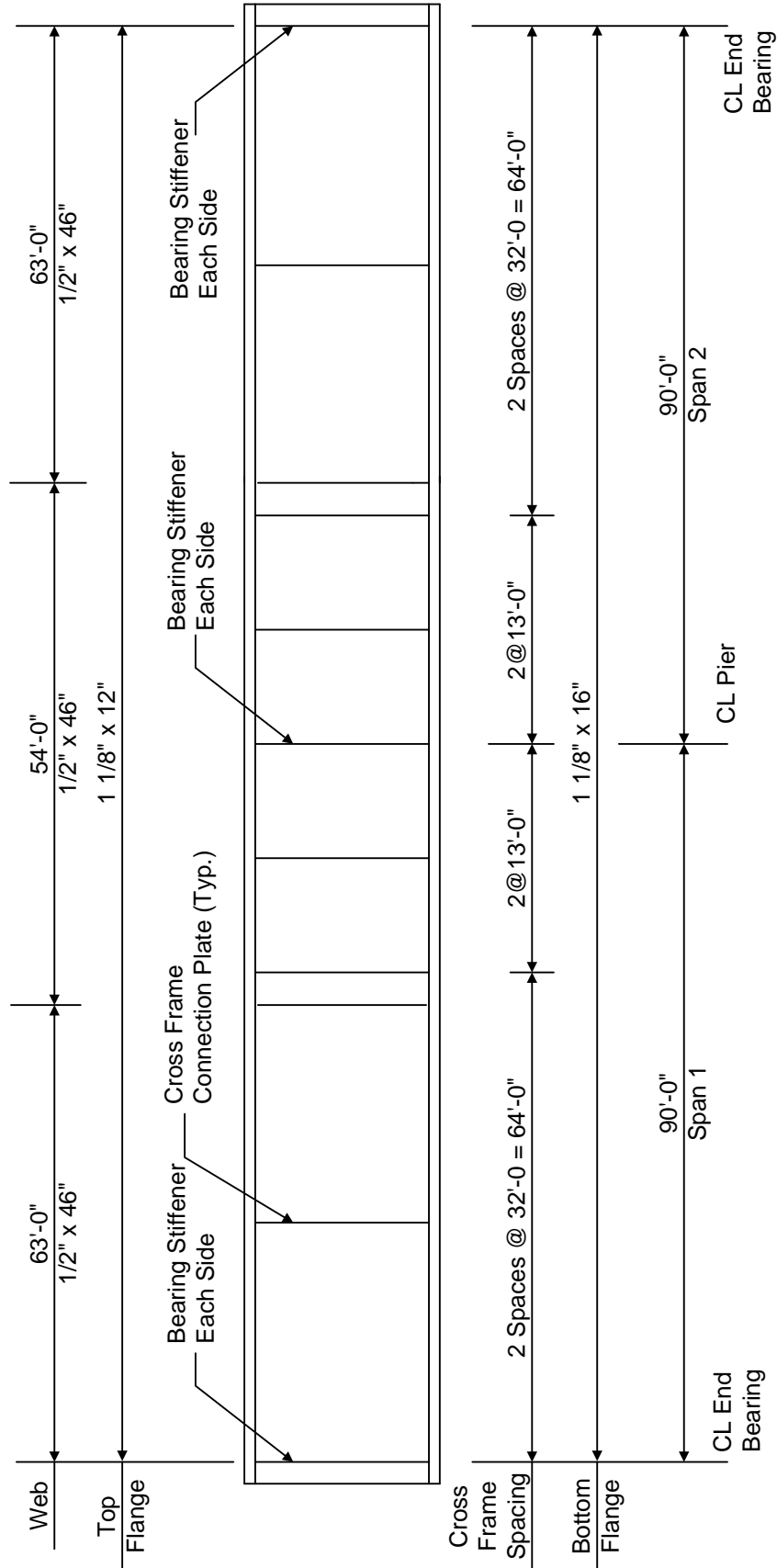

AASHTOWare BrR/BrD 6.8

Steel Tutorial

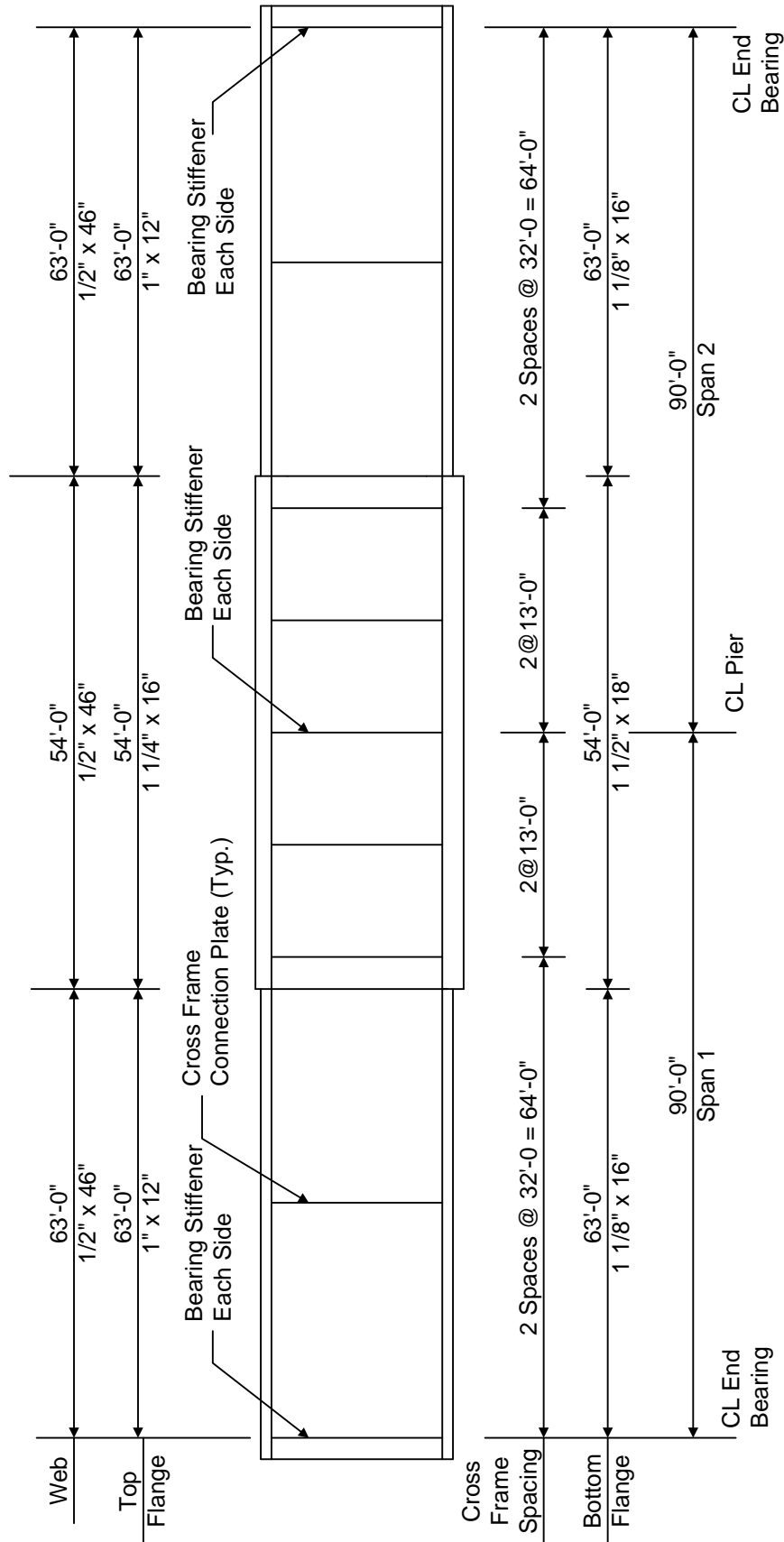
Corrugated Deck Rating

STL6 - Two Span Plate Girder Example (VO 6.3)



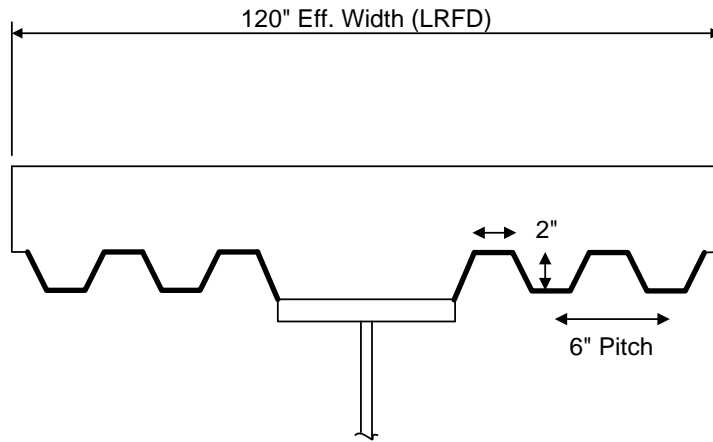


Elevation of Allow Moment Redistribution Girder

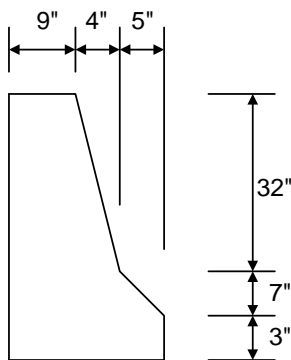


Elevation of Interior Girder

STL10 - Corrugated Deck Rating

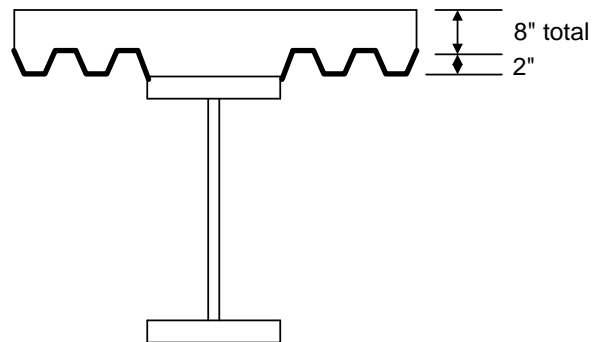


Composite Section at Pier



Weight = 536 plf

Parapet Detail



Section Detail

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

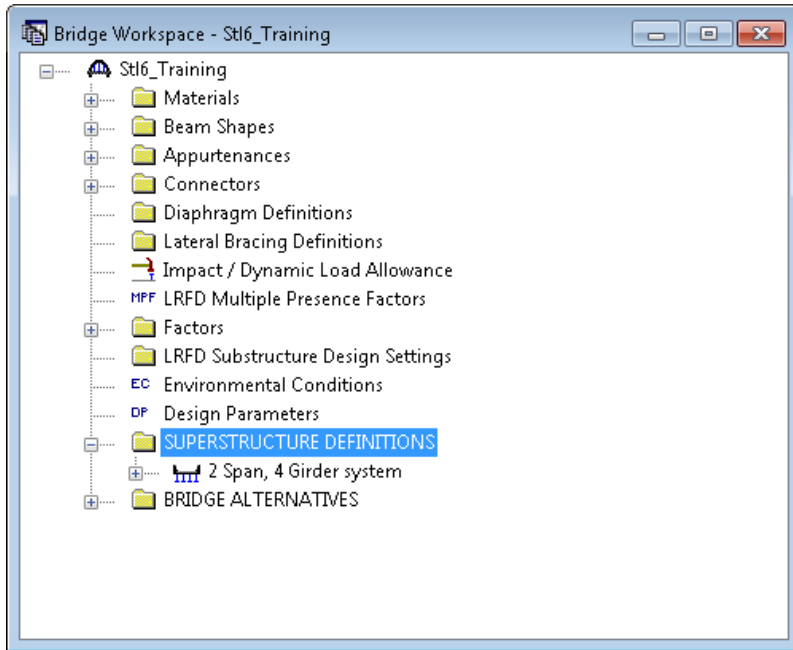
Cross Frame Connection Plates: $3/4" \times 6"$

Bearing Stiffener Plates: $7/8" \times 9"$

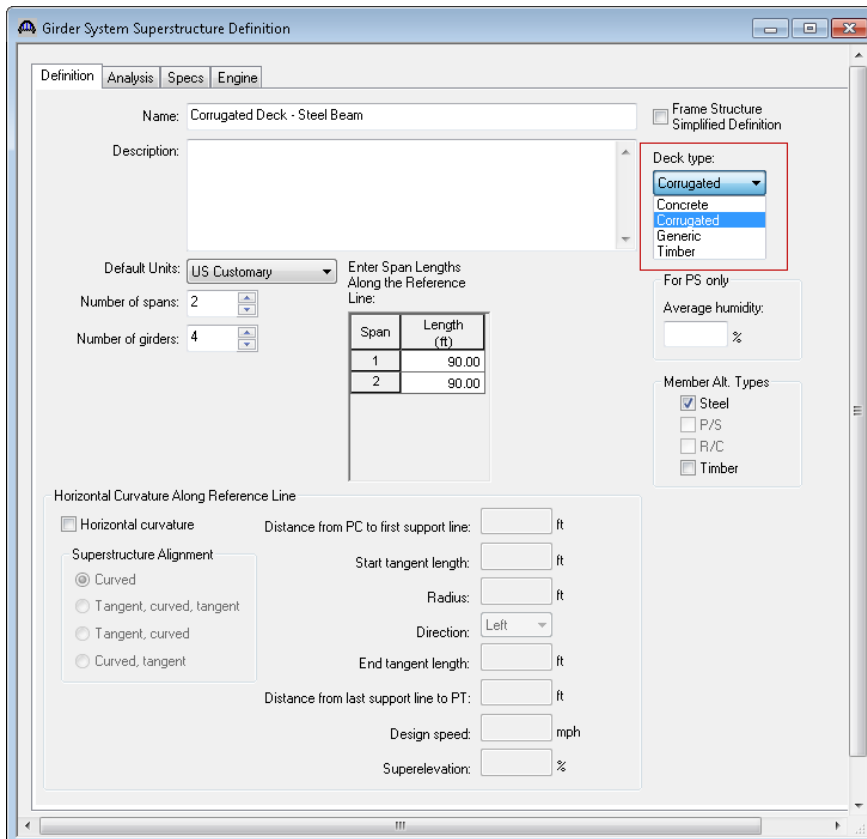
STL10 - Corrugated Deck Rating

This example assumes you have worked through STL11 - Steel Plate Girder Using AASHTO LRFD Engine

Open the Bridge Workspace for 'Stl6_Training' or import the *STL10 - Corrugated Deck Rating.xml* bridge file.

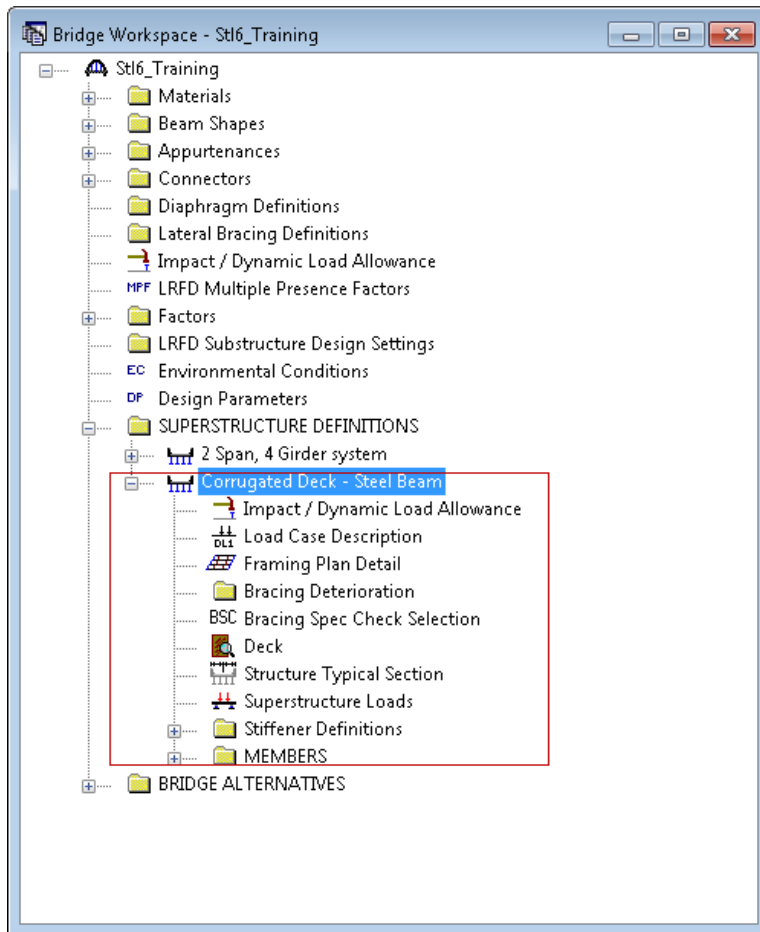


Begin a new SUPERSTRUCTURE DEFINITION for a steel girder corrugated deck system.



STL10 - Corrugated Deck Rating

Expanding the branch for the Corrugated Deck – Steel Beam the Bridge Workspace will look like:



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

STL10 - Corrugated Deck Rating

Go through:

- 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.

The screenshot displays the Bridge Explorer interface with two 'Structure Framing Plan Details' dialog boxes open. The left dialog box is for the 'Framing Plan Detail' and the right is for the 'Corrugated Deck - Steel Beam'. Both dialog boxes show the same data:

- Number of spans = 2, Number of girders = 4
- Girder Spacing Orientation: Perpendicular to girder, Along support
- Support Skew (Degrees) table:

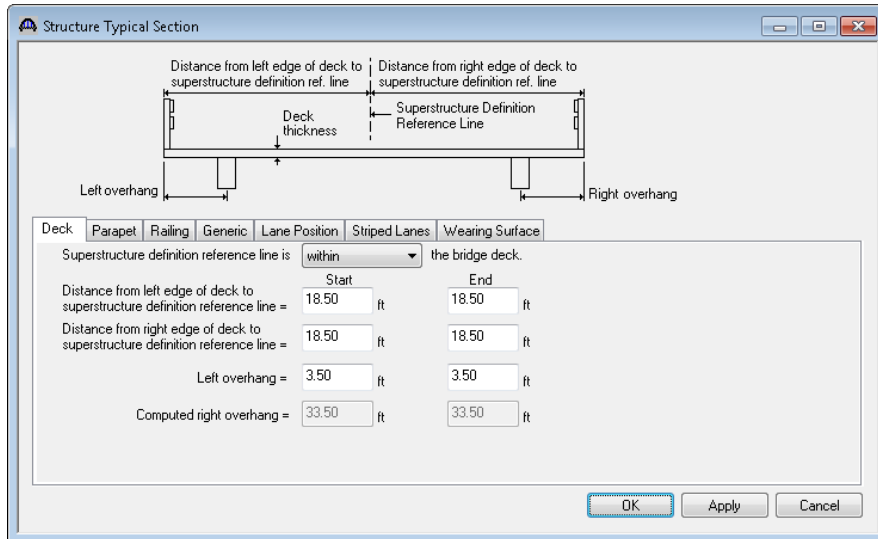
Support	Skew (Degrees)
1	0.0000
2	0.0000
3	0.0000
- Girder Spacing (ft) table:

Girder Bay	Start of Girder	End of Girder
1	10.00	10.00
2	10.00	10.00
3	10.00	10.00

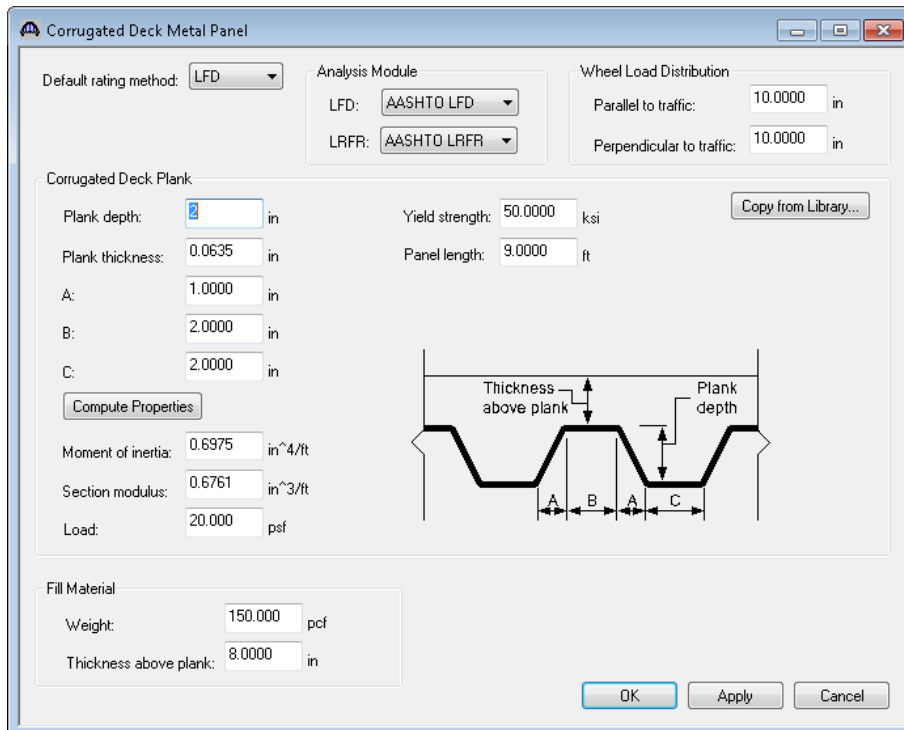
Red arrows indicate the data being transferred from the 'Framing Plan Detail' dialog to the 'Corrugated Deck - Steel Beam' dialog. The 'Bridge Explorer' tree on the left shows the project structure with 'Framing Plan Detail' and 'Corrugated Deck - Steel Beam' highlighted.

STL10 - Corrugated Deck Rating

You will see that the Superstructure Typical Section lacks a few tabs. The remaining tabs are similar to the dialog for a common concrete deck/steel girder typical definition.



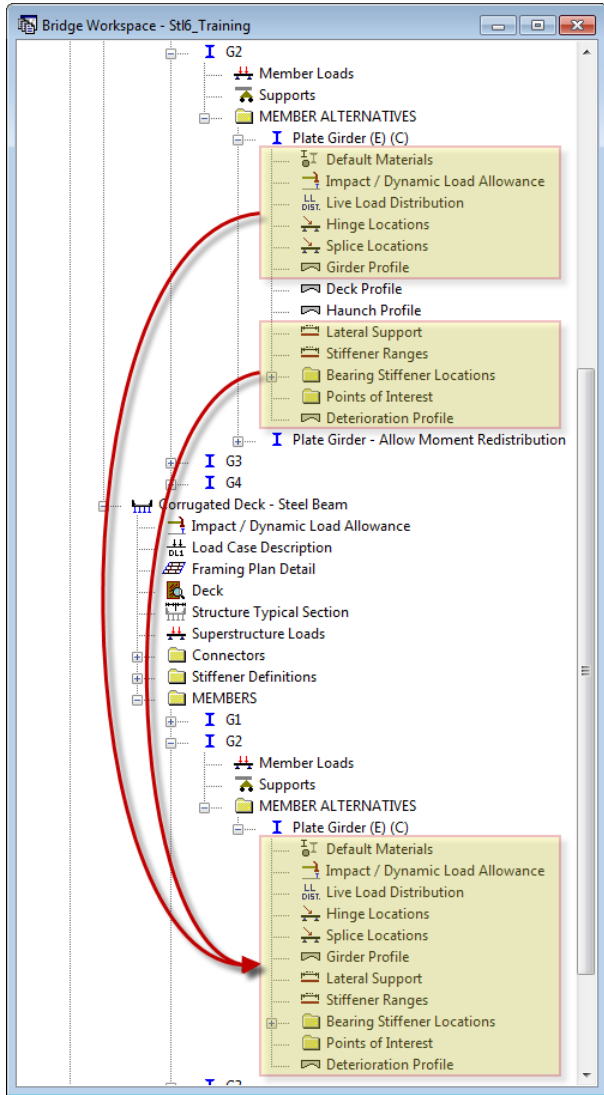
Once you have entered the above to define the Corrugated Deck definition you need to enter the details for the deck itself.



Copy the stiffener definitions from the original bridge definition to the Corrugated Deck definition. You will need to edit the titles of each to remove "Copy of" from the title.

STL10 - Corrugated Deck Rating

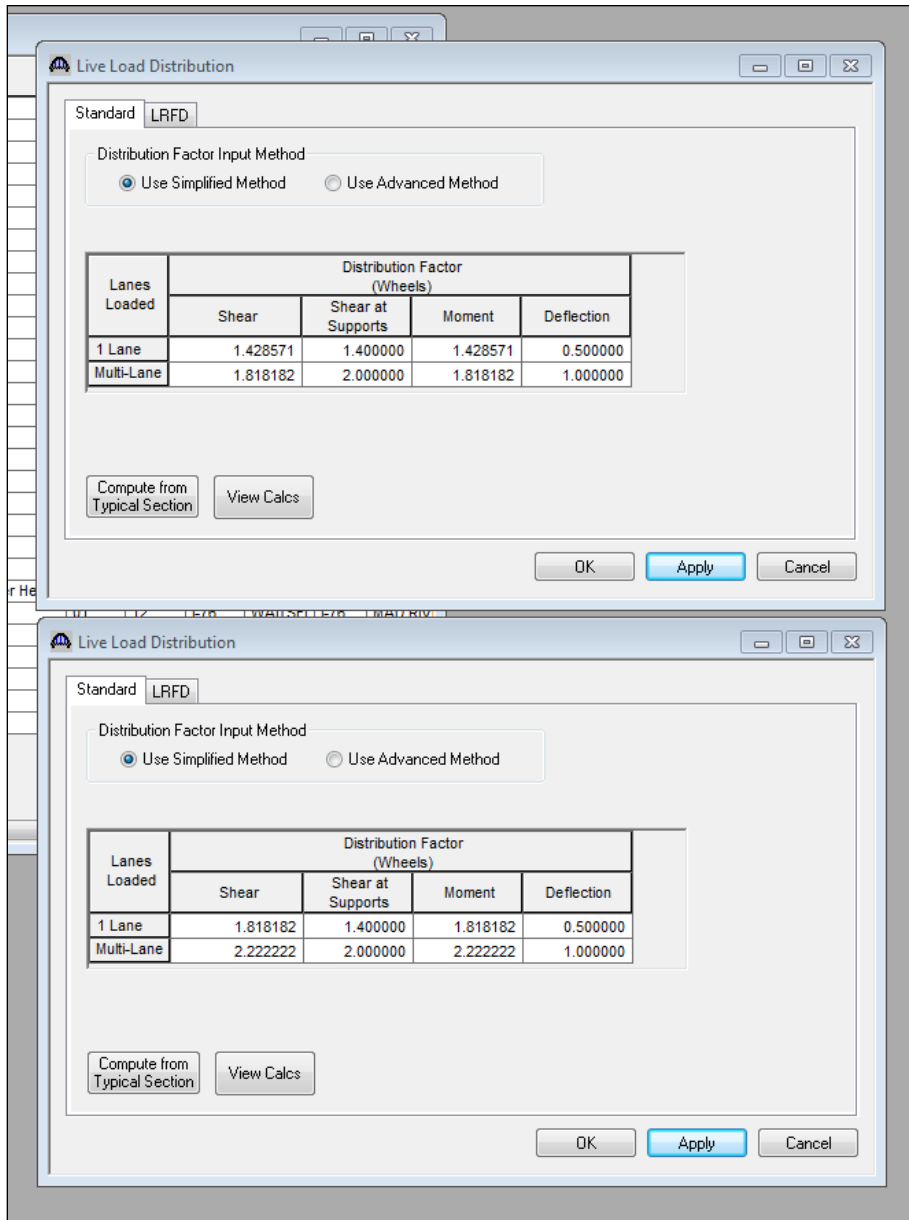
Open the MEMBER ALTERNATIVES for Girder G2 for the original bridge definition and the new Corrugated Deck definition. You will not be able to copy the member definition because there are small differences in the definitions. For example, the Corrugated Deck will not have haunches. Go through the original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



BrR has the ability to compute the Standard Specification live load distribution factors for you based on the corrugated deck definition. You can click the 'Compute from Typical Section...' button and BrR will compute the distribution factors. If you leave these fields blank, the AASHTO LFD engine will compute the distribution factors for you at

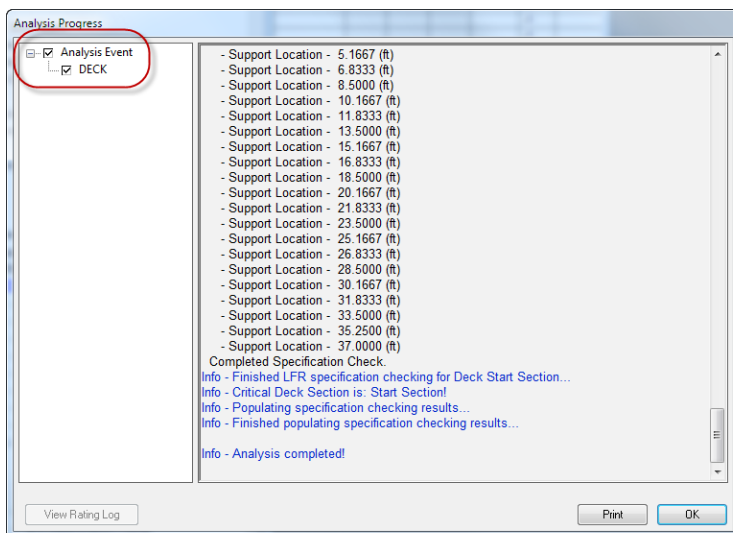
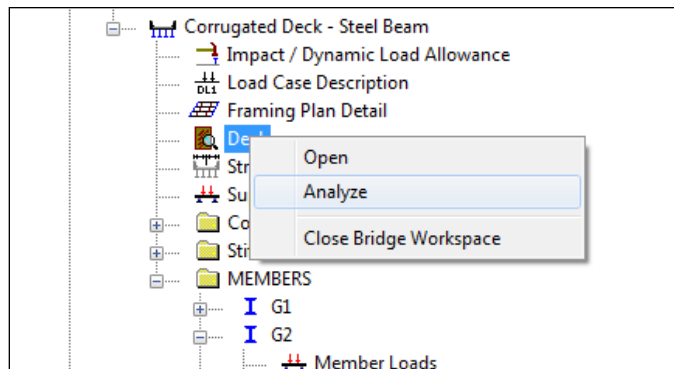
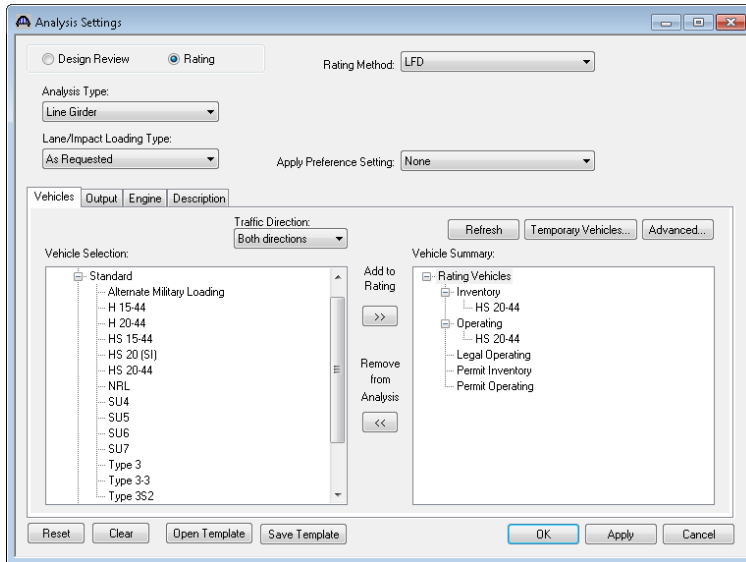
STL10 - Corrugated Deck Rating

runtime. We will let the AASHTO LFD engine compute the live load distribution factors for us so we will not enter them. The following figure shows the differences in the LLDF for LFD.



STL10 - Corrugated Deck Rating

At this point, run a LFD rating on the deck for the Corrugated Deck definition and the girder G2. Right click on the Deck line and select Analyze.



STL10 - Corrugated Deck Rating

Open the analysis results to see the ratings.

Analysis Results - Deck

Report Type: Rating Results Summary

Lane/Impact Loading Type: As Requested Detailed

Live Load	Live Load Type	Rating Method	Rating Level	Load Rating	Rating Factor	Location	Limit State	Impact	Lane
HS 20-44	Axle Load	LFD	Inventory	0.00	0.000	3.500	Design Flexure - C	As Requested	As Requested
HS 20-44	Axle Load	LFD	Operating	0.00	0.000	3.500	Design Flexure - C	As Requested	As Requested
HS 20-44	Axle Load	LFD	Inventory	0.25	0.007	28.500	Design Flexure - Si	As Requested	As Requested
HS 20-44	Axle Load	LFD	Operating	0.42	0.012	28.500	Design Flexure - Si	As Requested	As Requested

AASHTO Deck LFR Engine Version 6.8.0.2004

Analysis Preference Setting: None

Close

Then do a rating on the new girder.

Analysis Results - Plate Girder

Report Type: Rating Results Summary

Lane/Impact Loading Type: As Requested Detailed

Display Format: Multiple rating levels per row

Live Load	Live Load Type	Rating Method	Inventory Load Rating (Ton)	Operating Load Rating (Ton)	Legal Operating Load Rating (Ton)	Permit Inventory Load Rating (Ton)	Permit Operating Load Rating (Ton)	Inventory Rating Factor	Operating Rating Factor	Legal Operating Rating Factor	Permit Inventory Rating Factor
HS 20-44	Lane	LFD	18.25	30.48				0.507	0.847		
HS 20-44	Axle Load	LFD	20.59	34.39				0.572	0.955		

AASHTO LFR Engine Version 6.8.0.2004

Analysis Preference Setting: None

Close

Corrugated Specifications Check

Open the specifications checks for the corrugated 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 - 2011)

INPUT:
 Depth = 1.5000 (in)
 I = 0.7367 (in⁴)
 S = 0.8071 (in³)
 Fy = 50.0000 (ksi)

RATING FACTOR CALCULATIONS:
 $C = A1 \cdot DL$
 $RF = \frac{C}{A2 \cdot LL}$ (6B.5.1-1)

where,
 A1 = Dead Load Factor
 A2 = Live Load Factor
 DL = Dead Load Moment = 0.11 (kip-ft)
 LL = Live Load Moment (includes impact)

Rating Level	Vehicle	LL (kip-ft)	Load Factors A1	A2	Mu (kip-ft)	RF	Capacity (Ton)
Inventory	1	39.34	1.300	2.171	3.36	0.030	1.36
Inventory	1	-11.64	1.300	2.171	-3.36	0.139	4.99
Operating	1	39.34	1.300	1.300	3.36	0.063	2.27
Operating	1	-11.64	1.300	1.300	-3.36	0.232	8.33

Load Combination Legend:
 Code Vehicle
 1 HS 20-44 - Truck

The girder ratings will be similar to non-composite girder ratings.