AASHTOWare BrR/BrD 6.8

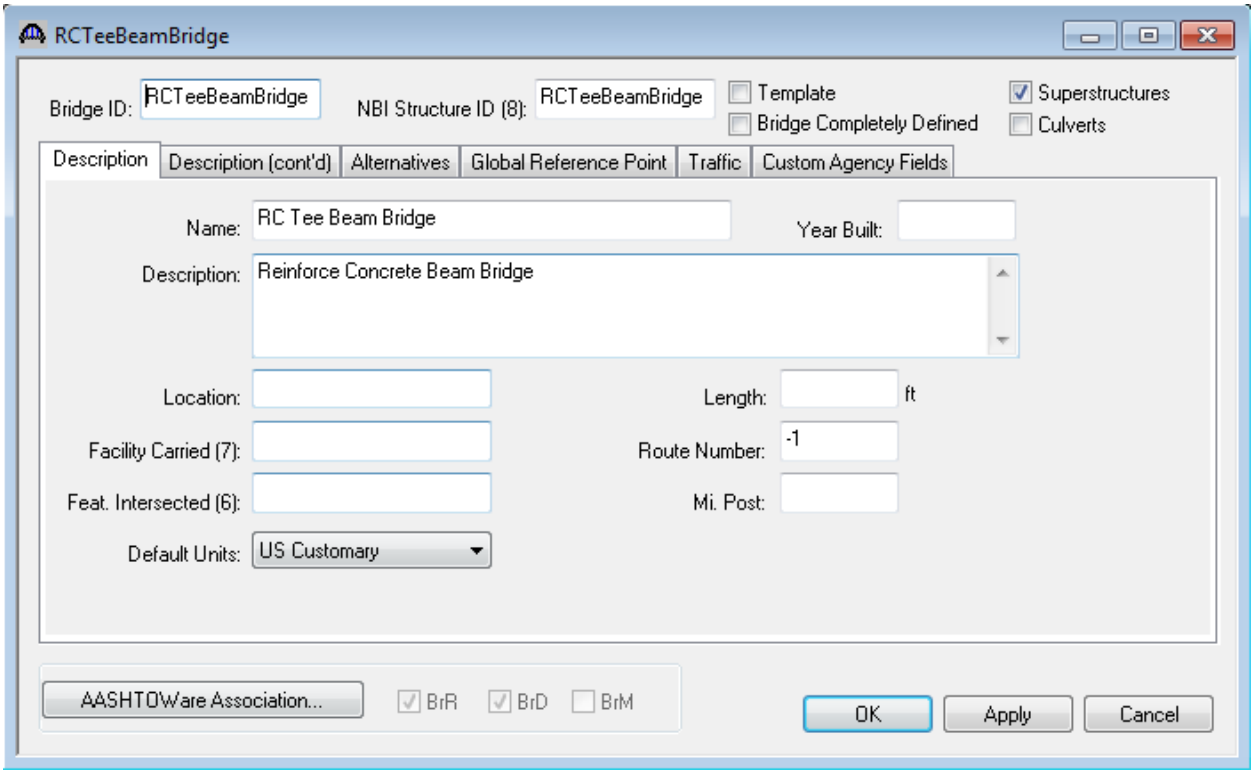
Reinforced Concrete Structure Tutorial

RC1 – Single Span Reinforced Concrete Tee Beam Example

BrR and BrD Training

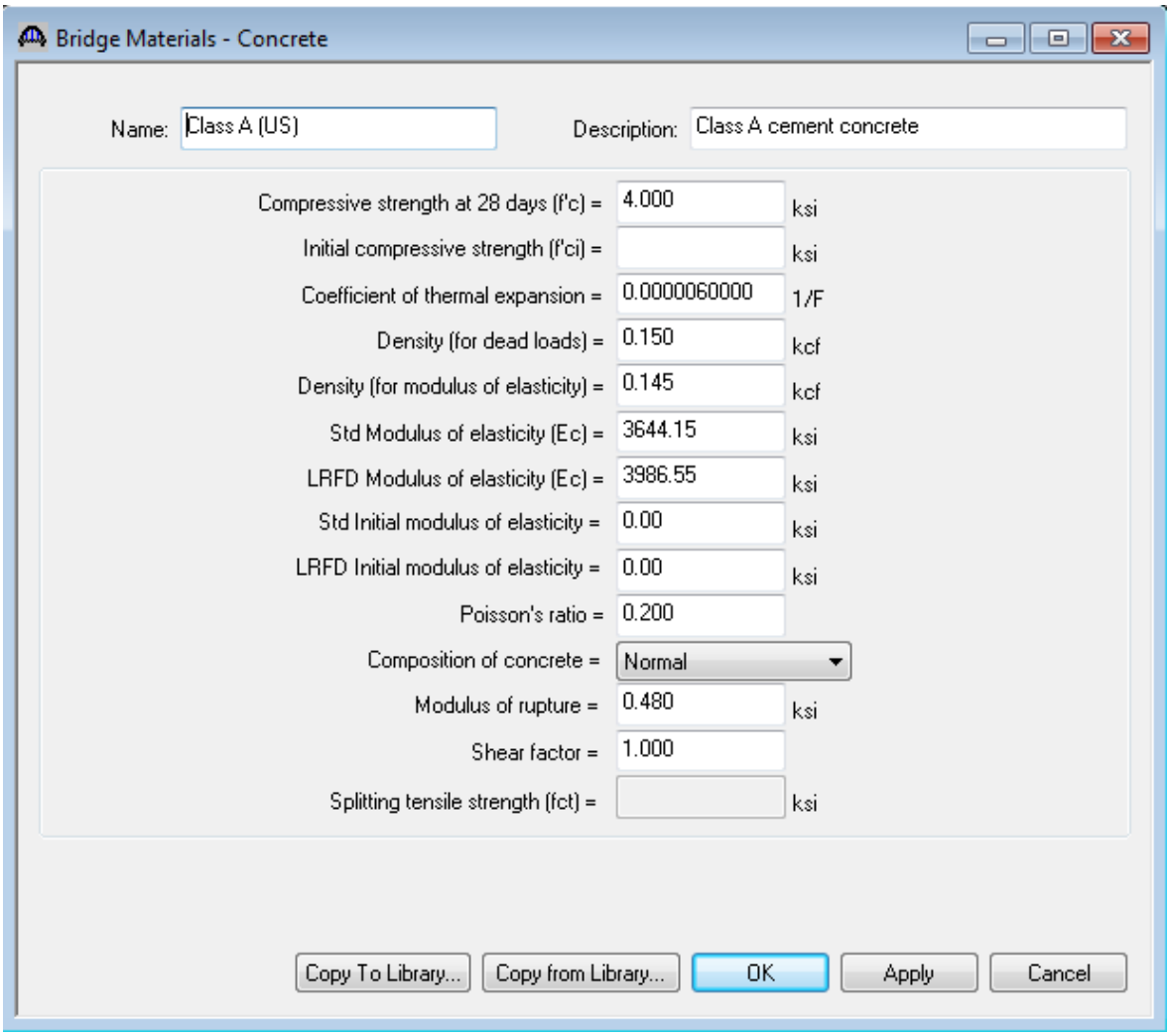
RC1 - Single Span Reinforced Concrete Tee Beam Example

From the Bridge Explorer create a new bridge and enter the following description data:

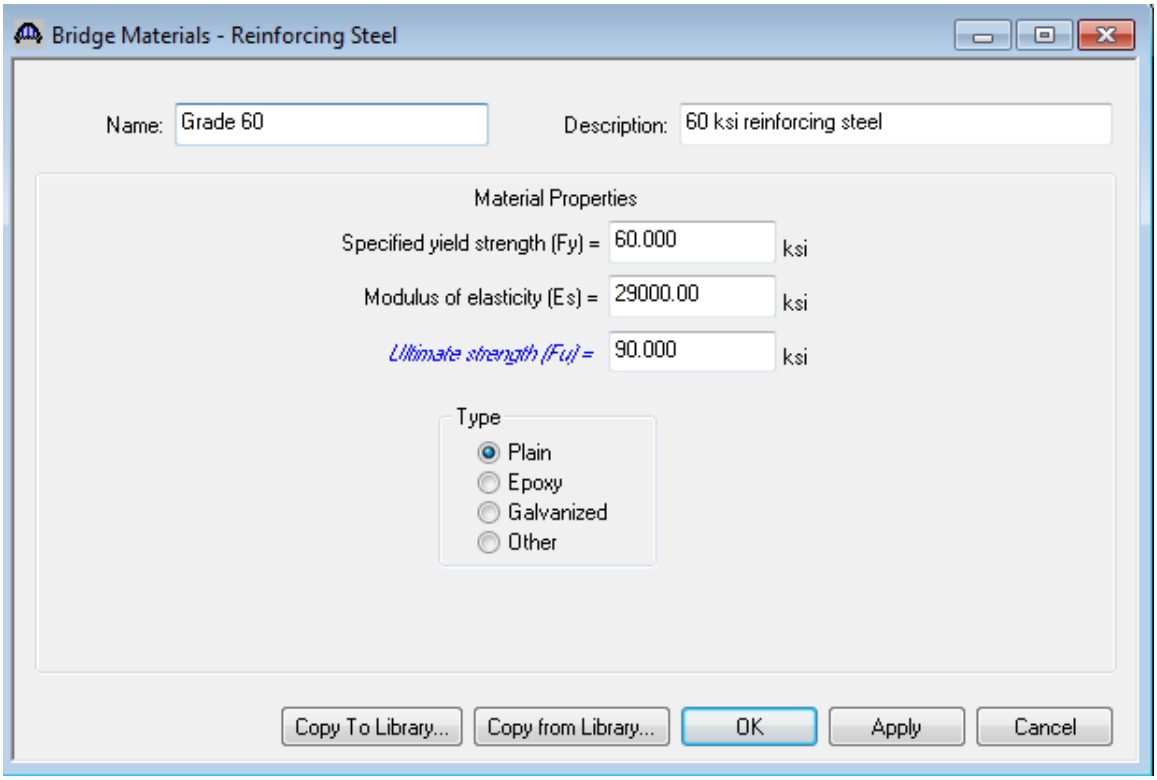


Close the window by clicking Ok. This saves the data to memory and closes the window.

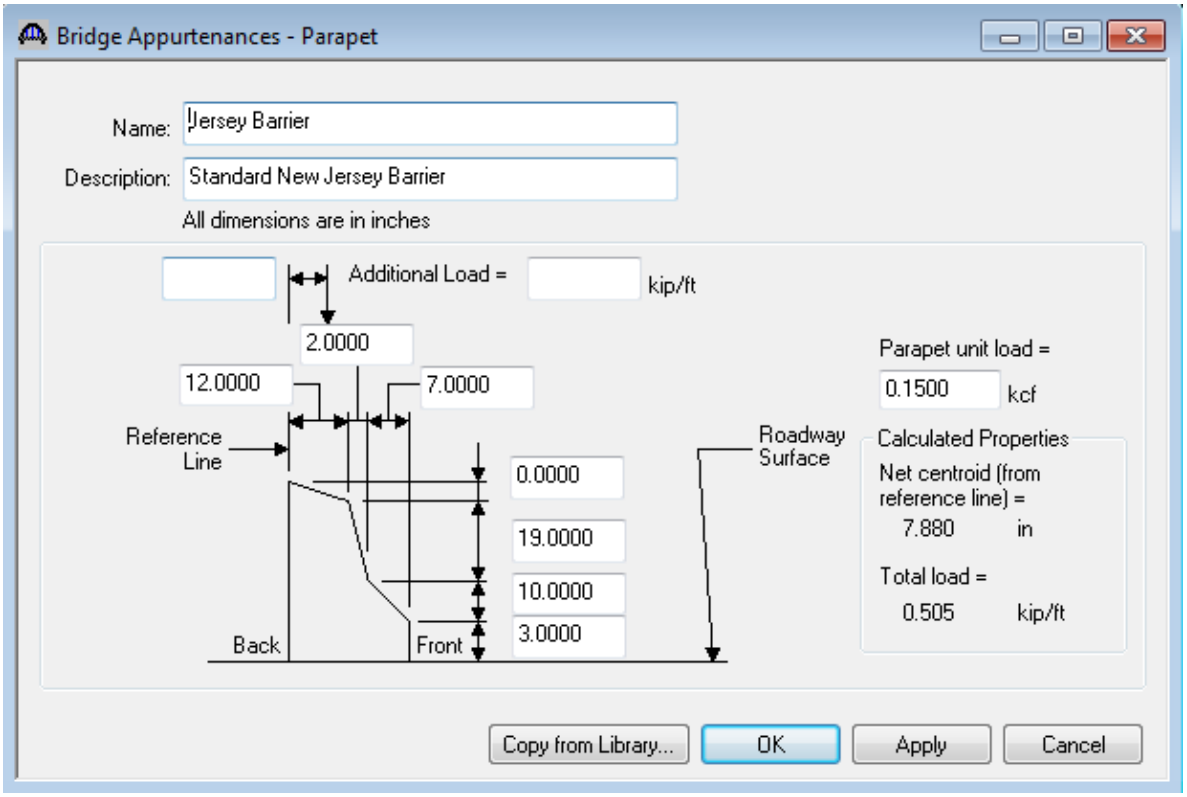
To add a new concrete material click on Materials, Concrete in the tree and select File/New from the menu (or right mouse click on Concrete and select New). The window shown below will open. Enter the values shown.



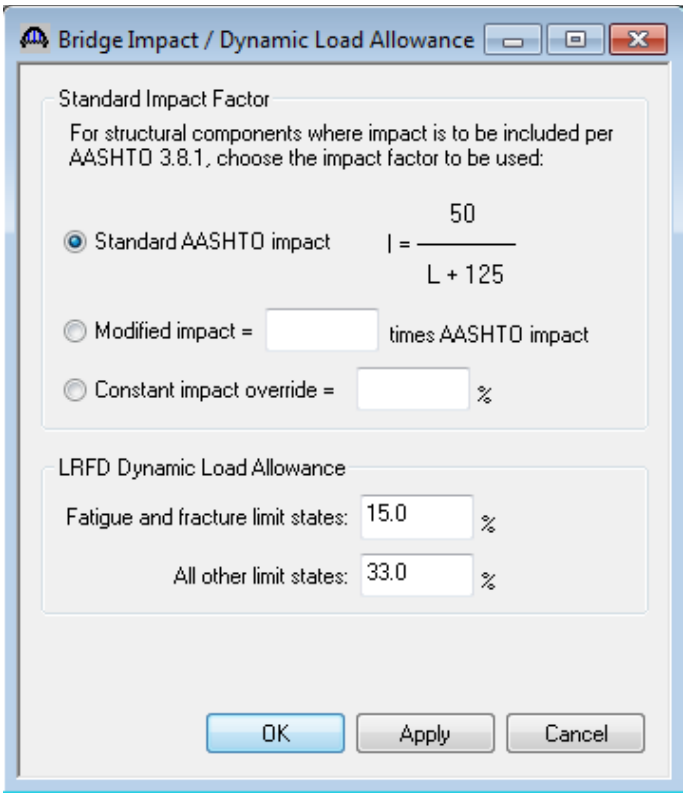
Do the same for the reinforceing steel.



To enter the appurtenances to be used within the bridge expand the tree branch labeled Appurtenances. To define a parapet double click on Parapet in the tree and input the parapet dimensions as shown below. Click Ok to save the data to memory and close the window.

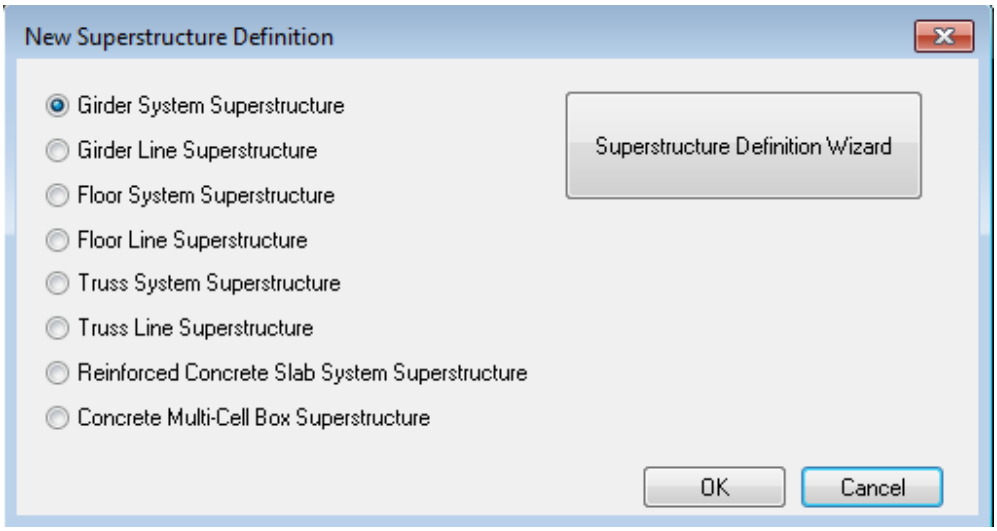


Enter the impact to be used for the entire bridge by clicking on Impact in the tree and selecting File/Open from the menu. The Bridge Impact window shown below will open. Enter the appropriate values as shown and click Ok to save the data to memory and close the window. The values shown below are default values.

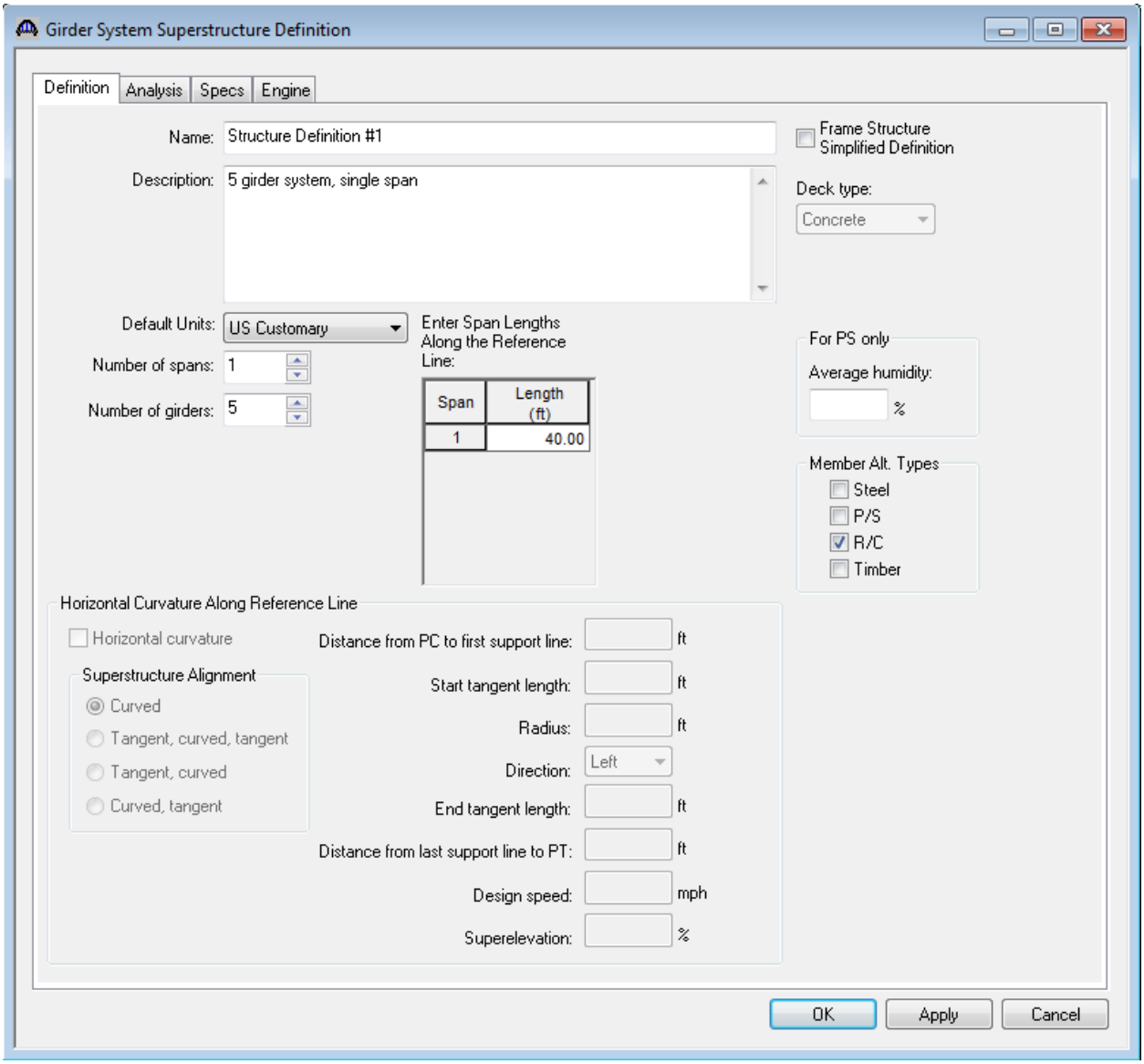


For this example problem we are not going to override the standard LRFD or LFD factors so we skip to Structure Definition.

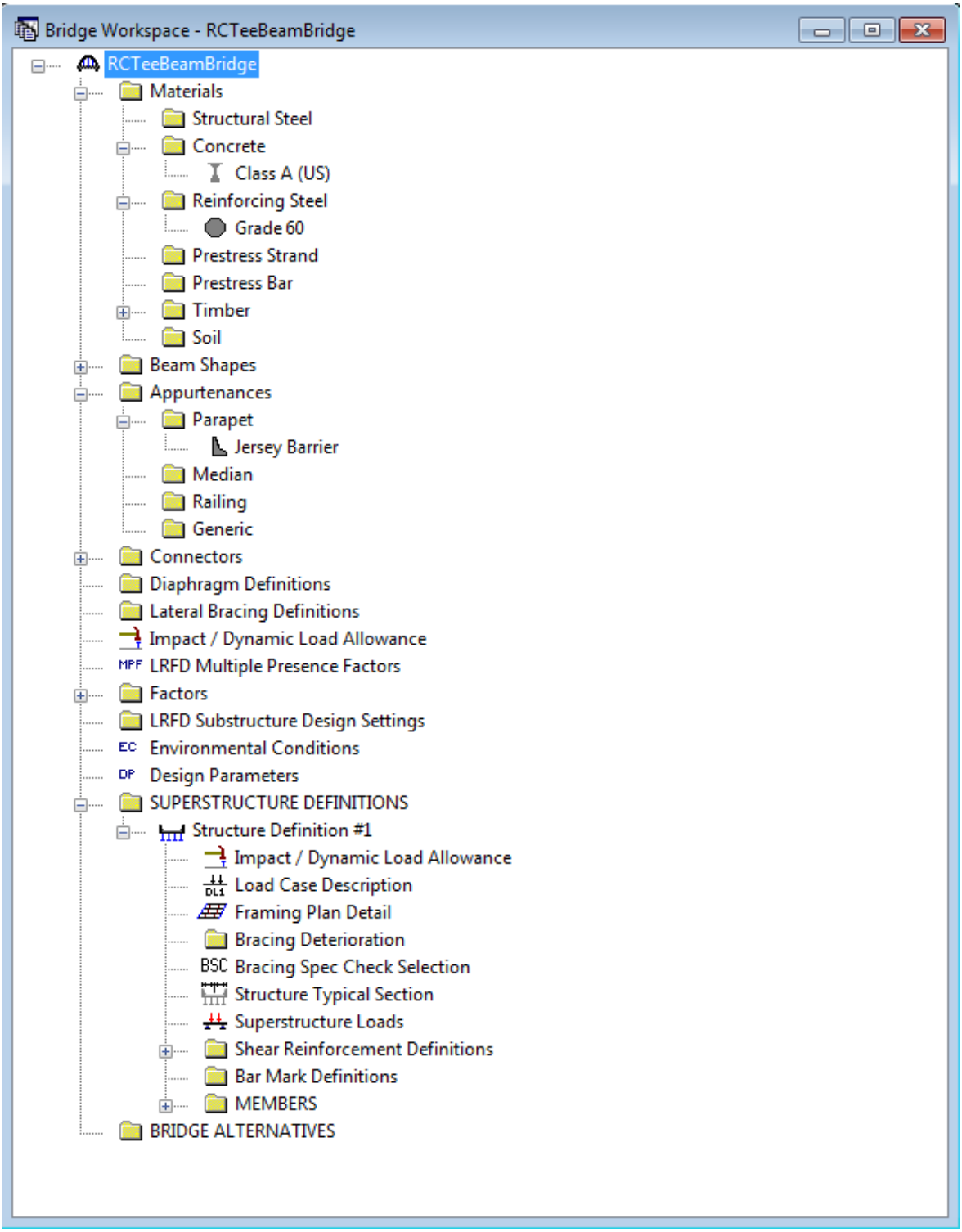
Double click on SUPERSTRUCTURE DEFINITIONS (or click on SUPERSTRUCTURE DEFINITIONS and select File/New from the menu or right mouse click on SUPERSTRUCTURE DEFINITIONS and select New from the popup menu) to create a new structure definition. The dialog shown below will appear.



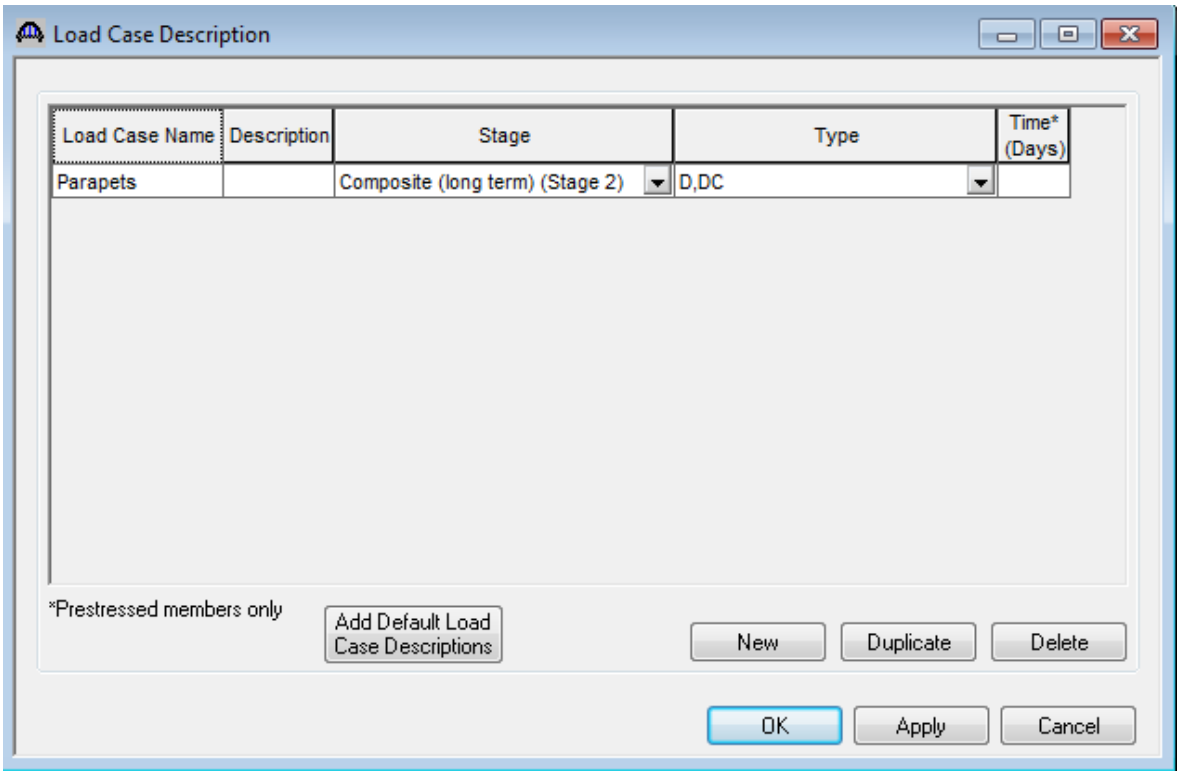
Select Girder System and the Structure Definition window will open. Enter the appropriate data as shown below:



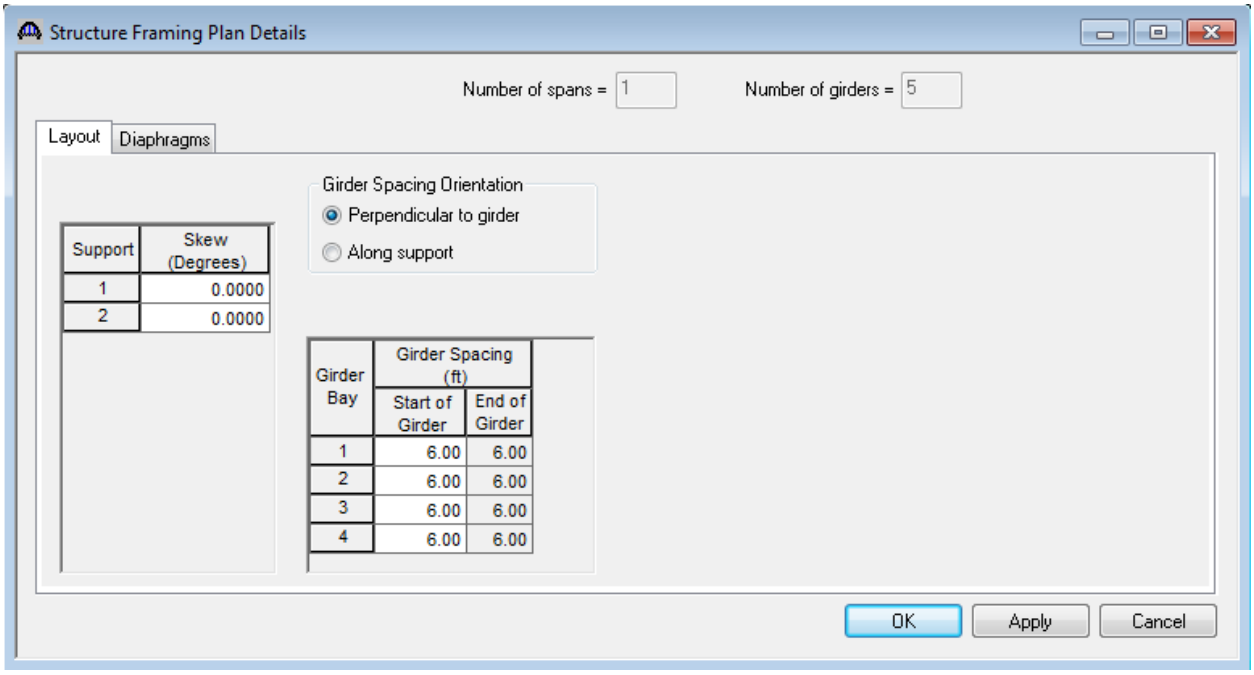
The partially expanded Bridge Workspace tree is shown below:



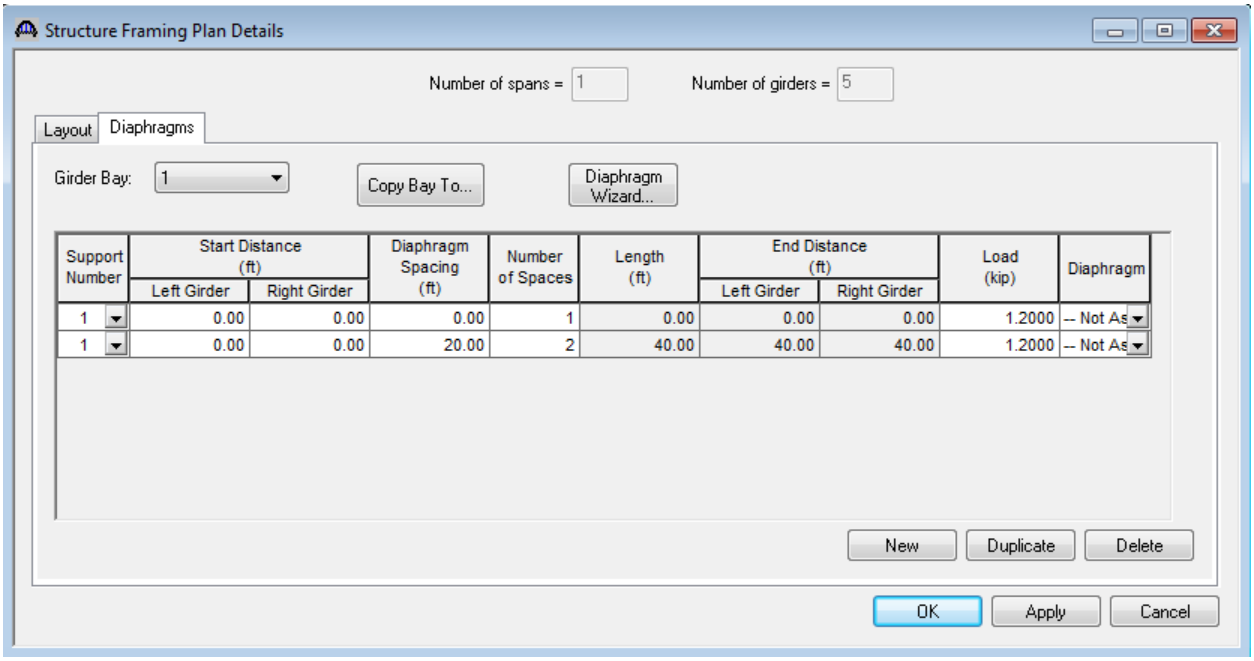
Click Load Case Description to define the dead load cases. The completed Load Case Description window is shown below.



Double-click on Framing Plan Detail to describe the framing plan. Enter the appropriate data as shown below.

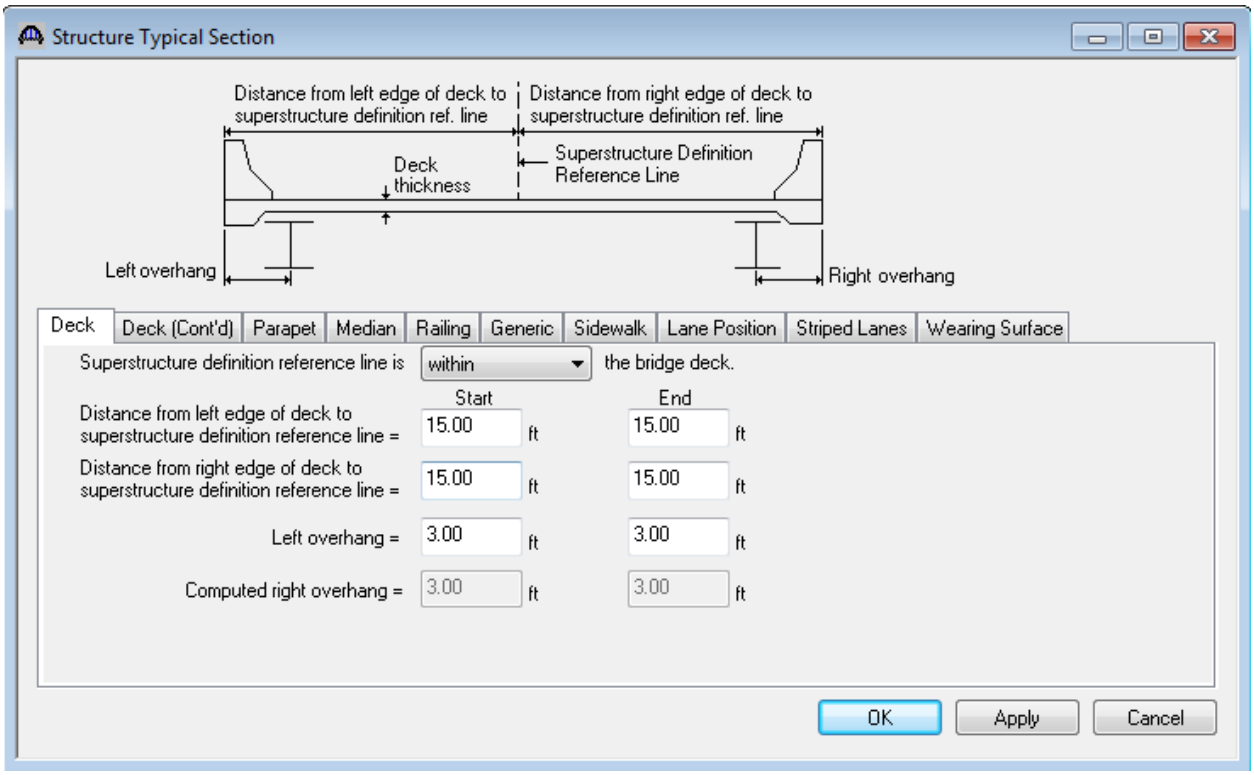


Switch to the Diaphragms tab to enter diaphragm spacing. Enter the diaphragm locations shown below for girder bay 1. Click on Copy Bay To button to copy the diaphragm locations to the bay 2 to 4.

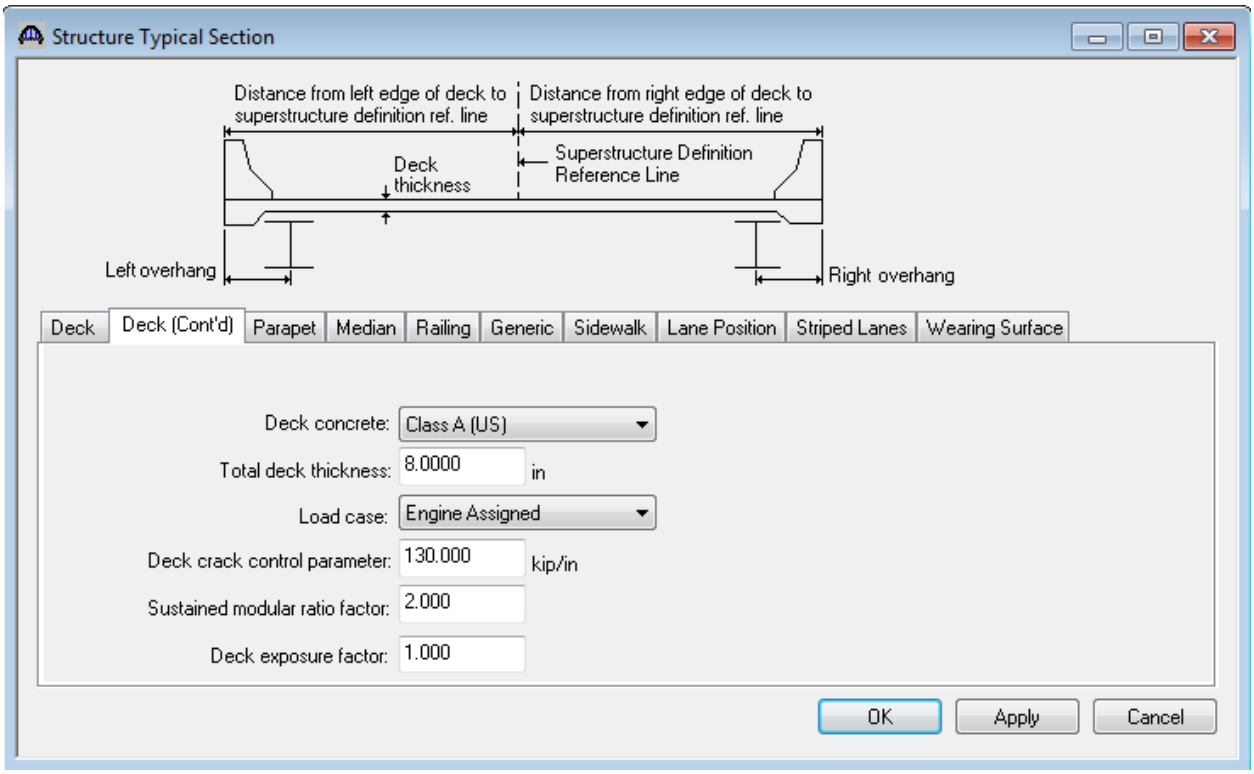


Next define the structure typical section by double-clicking on Structure Typical Section in the Bridge Workspace tree. Input the data describing the typical section as shown below. This screen initially shows steel girders as the default girder type until the member alternatives are defined.

Basic deck geometry:

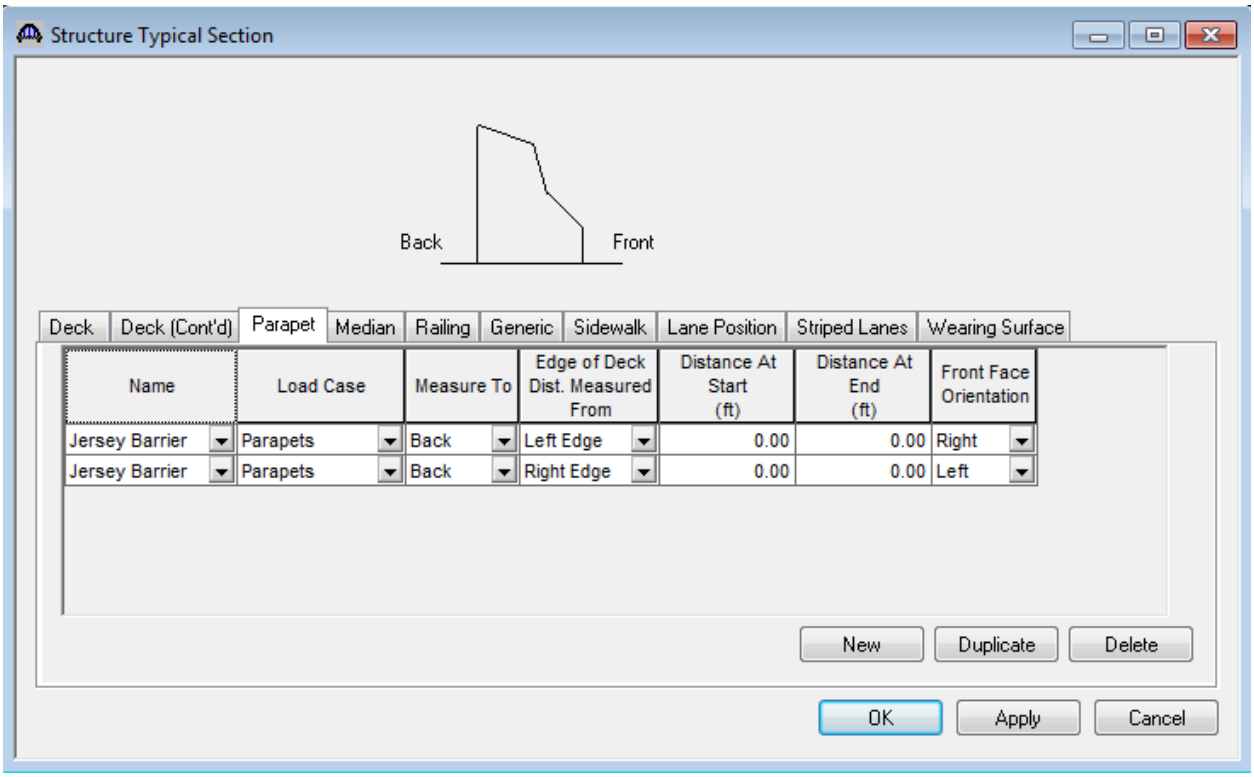


The Deck (cont'd) tab is used to enter information about the deck concrete and thickness. The material to be used for the deck concrete is selected from the list of bridge materials described before.



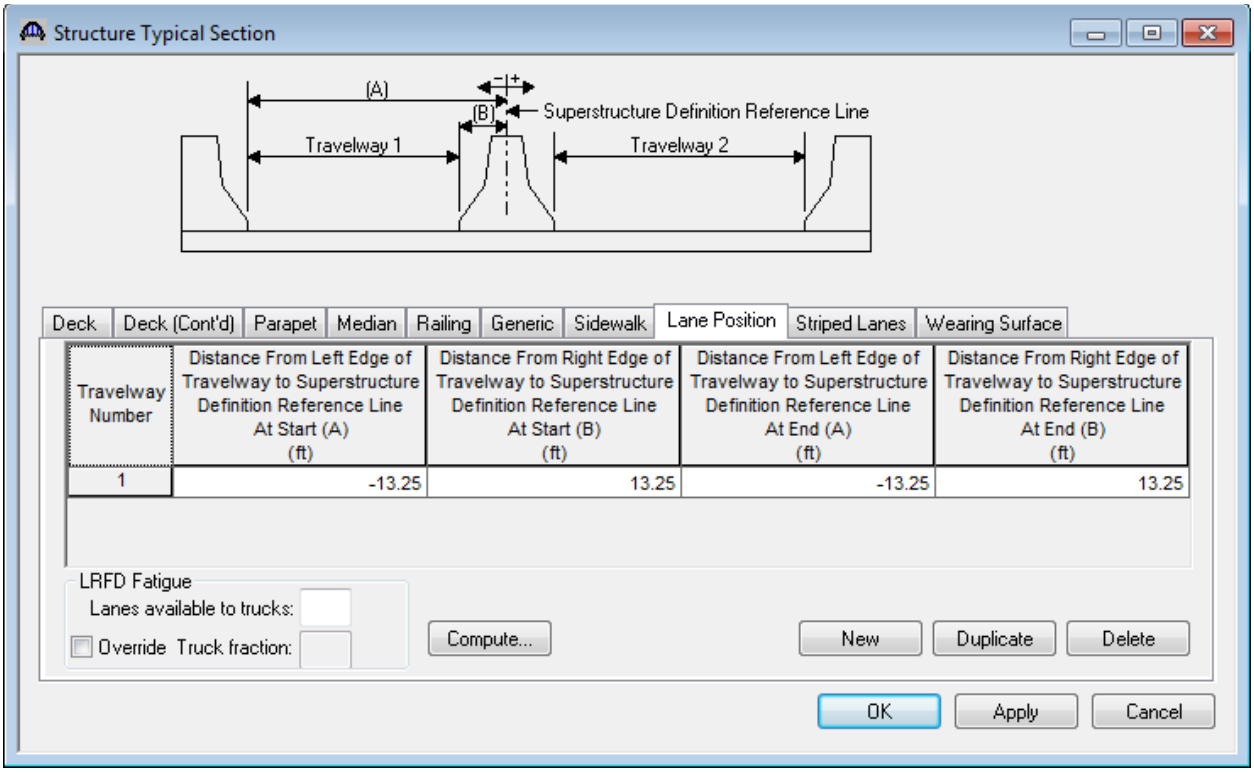
Parapets:

The two parapets are described using the Parapet tab. Click New to add a row to the table. The name of the parapet defaults to the only barrier described for the bridge. Change the "Load Case" to "Parapets" and "Measure To" to "Back" (we are locating the parapet on the deck by referencing the back of the parapet to the left edge of the deck). Enter 0.0 for the "Distance at Start" and "Distance at End". Change the "Front Face Orientation" to "Right". The completed tab is shown below.

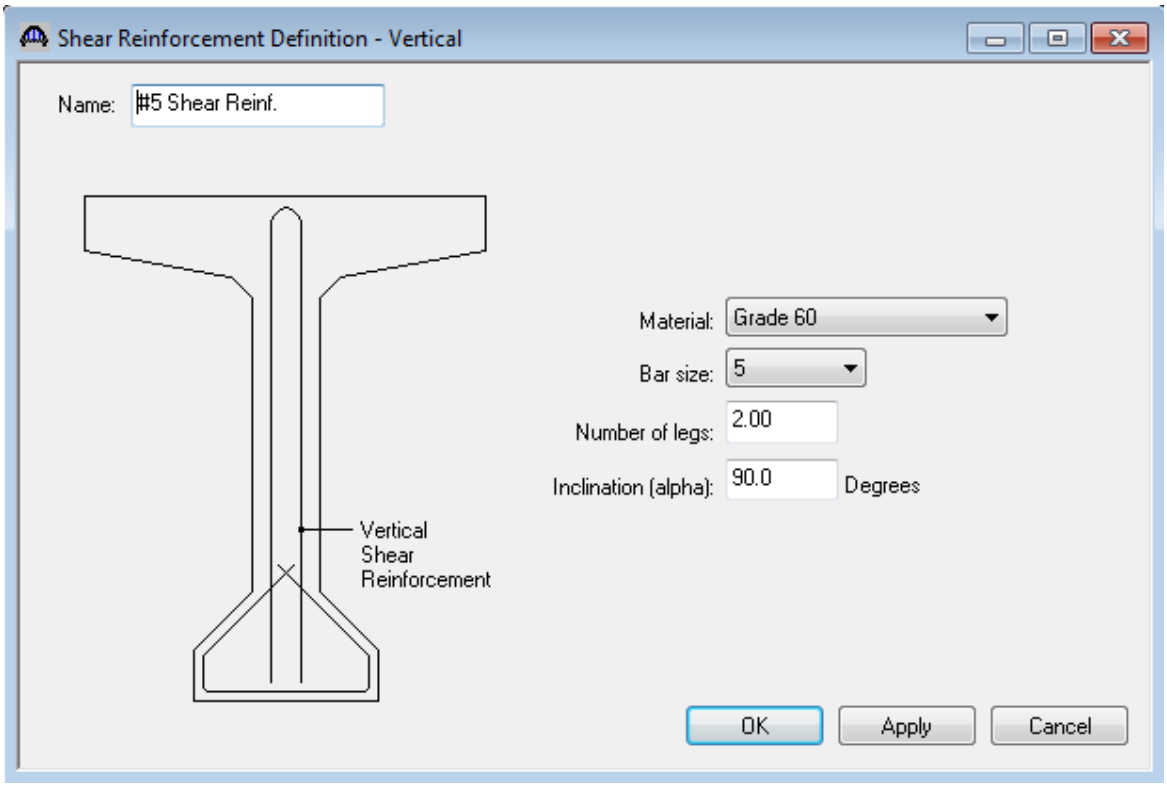


Lane Positions:

Select the Lane Position tab. Enter the values shown below or click the Compute… button to automatically compute the lane positions. A dialog showing the results of the computation opens. Click Apply to apply the computed values. The Lane Position tab is populated as shown below.

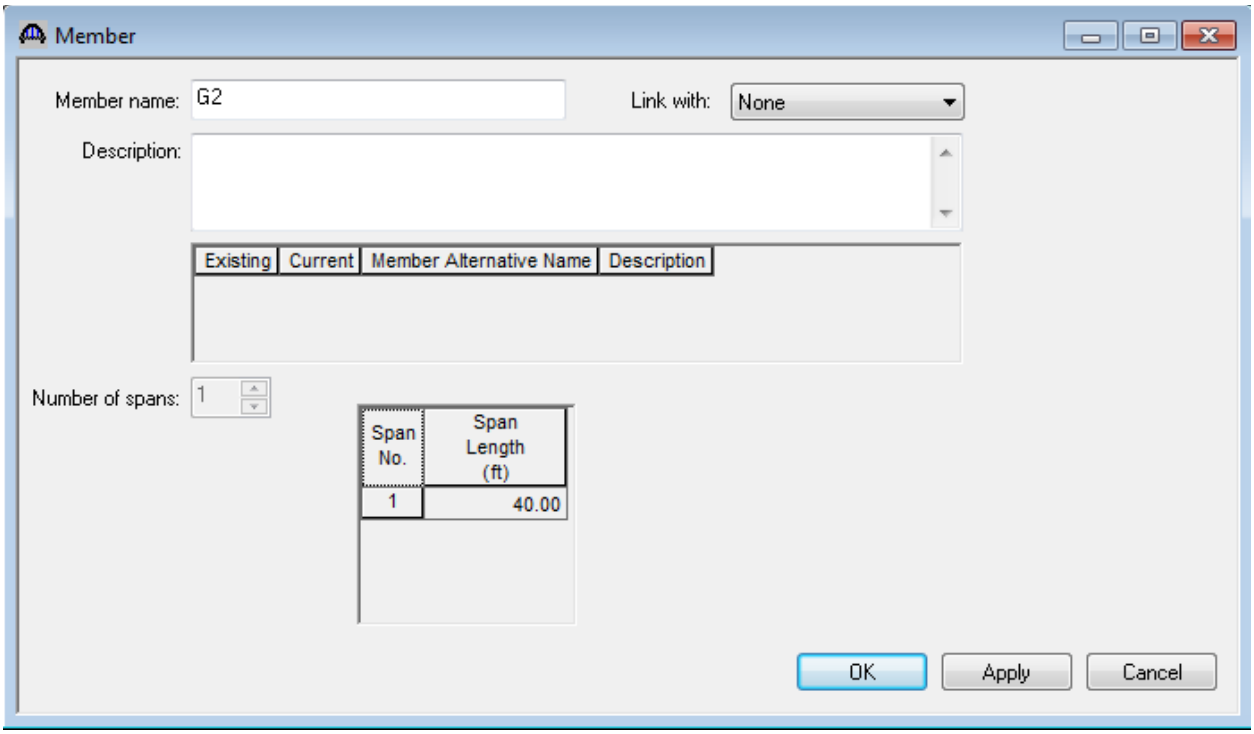


Define shear reinforcement to be used by the girders. Expand the shear Reinforcement Definitions tree item and double click on Vertical. Define the stirrup as shown below. Click Ok to save to memory and close the window.

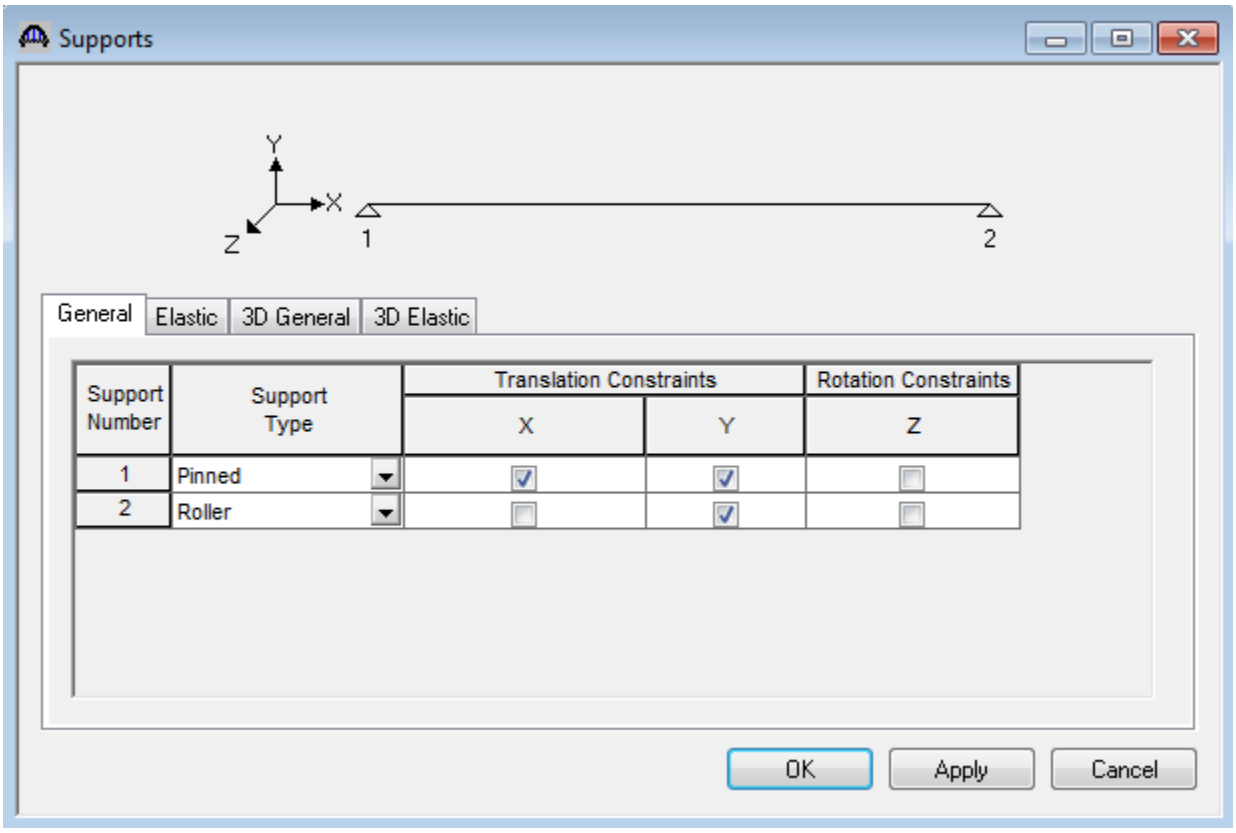


Describing a member:

The member window shows the data that was generated when the structure definition was created. No changes are required at this time. After Member Alternatives are defined it will appear in the list of member alternatives.

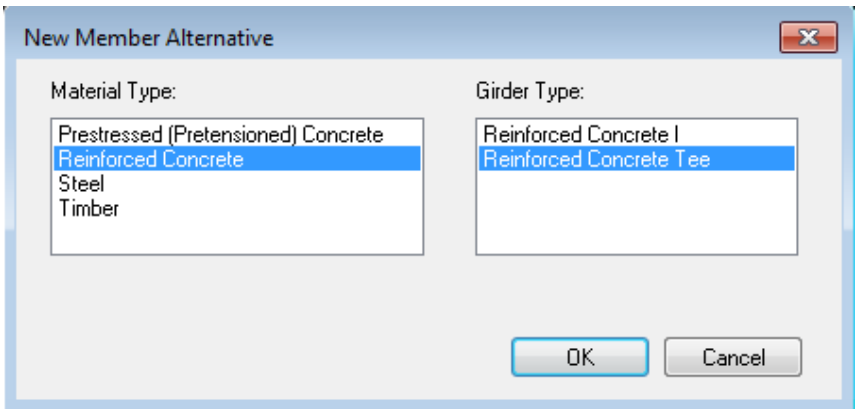


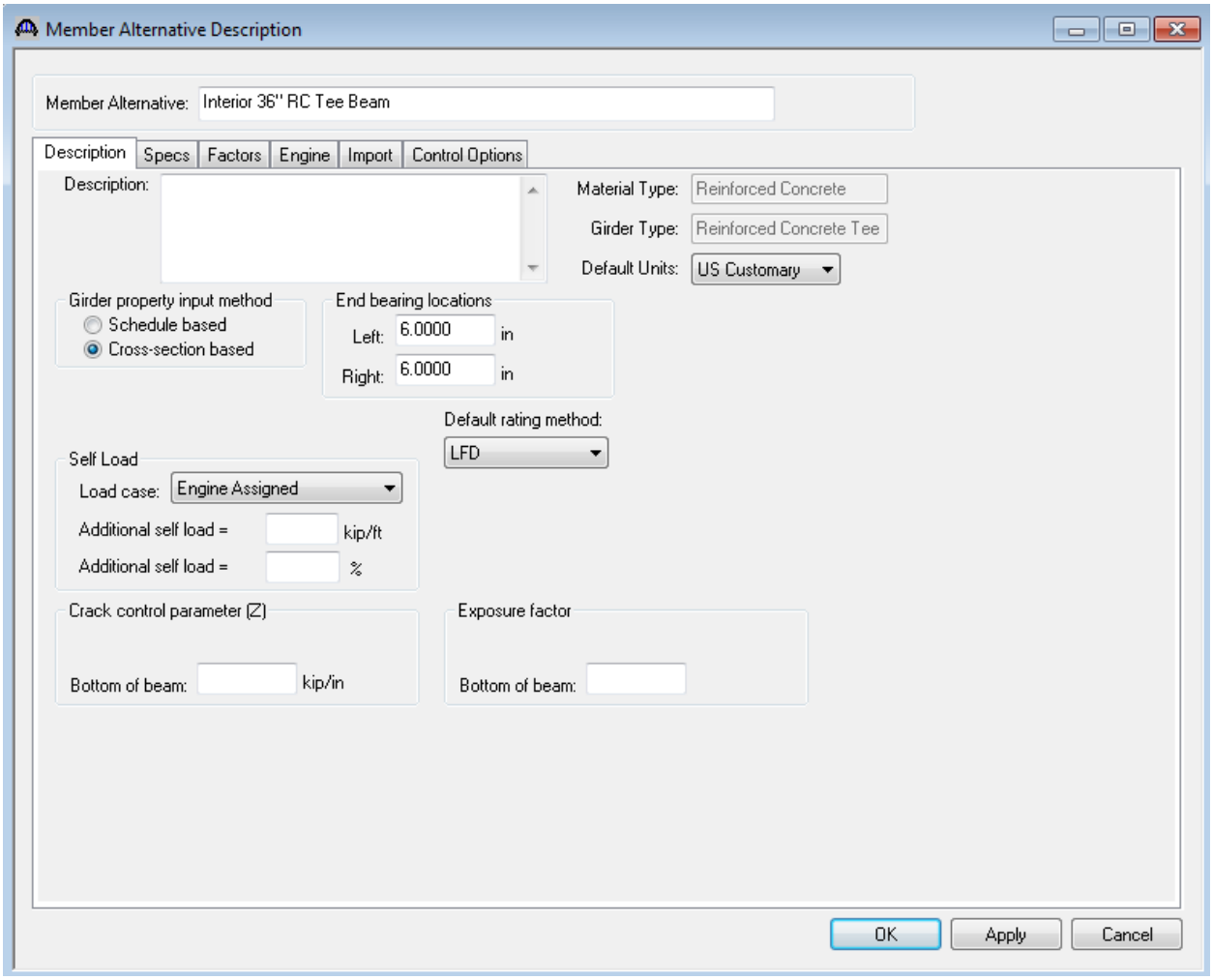
Support constraints were generated when the structure definition was created and are shown below.



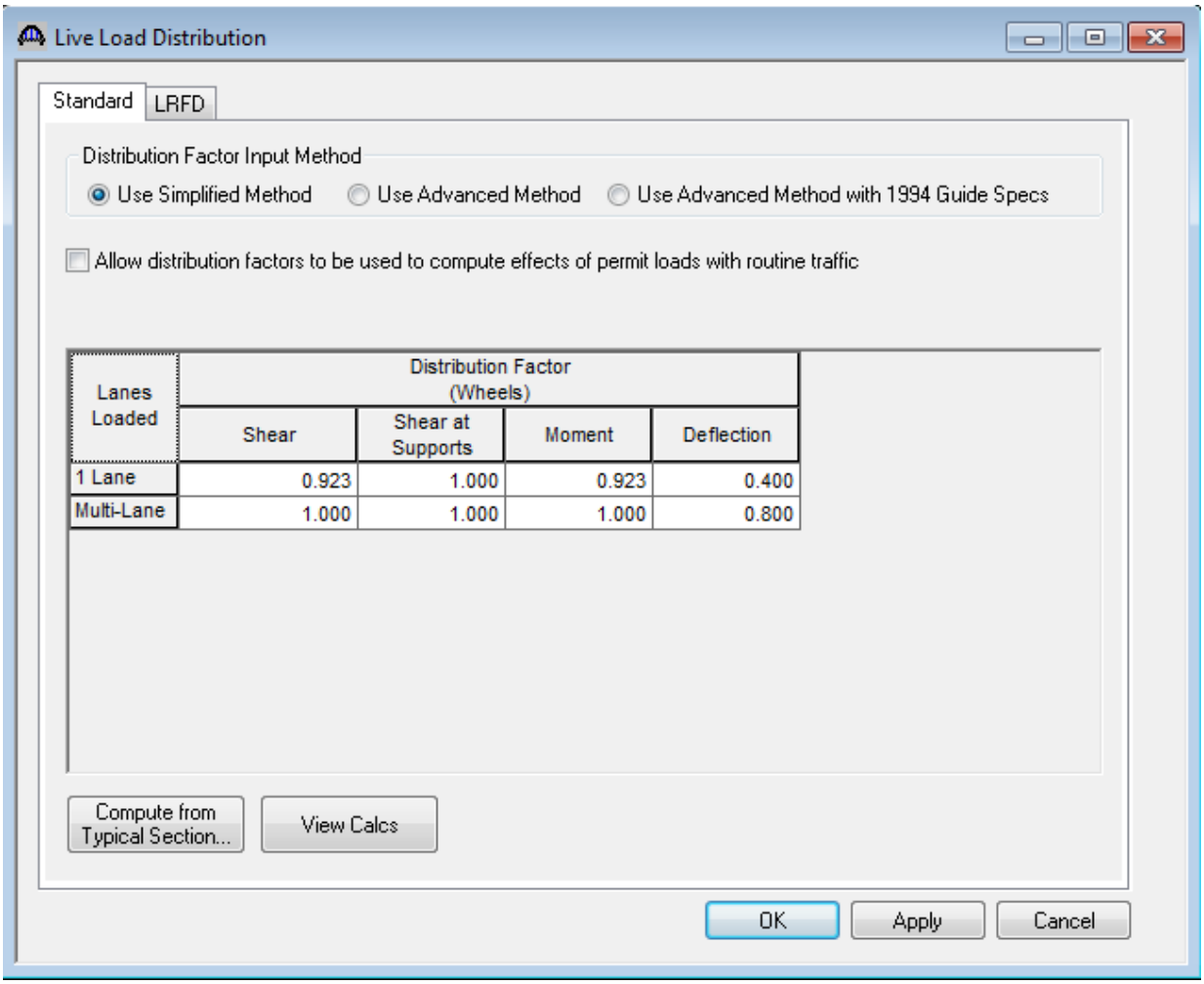
Defining a Member Alternative:

Double click MEMBER ALTERNATIVES in the tree to create a new alternative. The New Member Alternative dialog shown below will open. Select Reinforced Concrete for the Material Type and Reinforced Concrete Tee for the Girder Type.

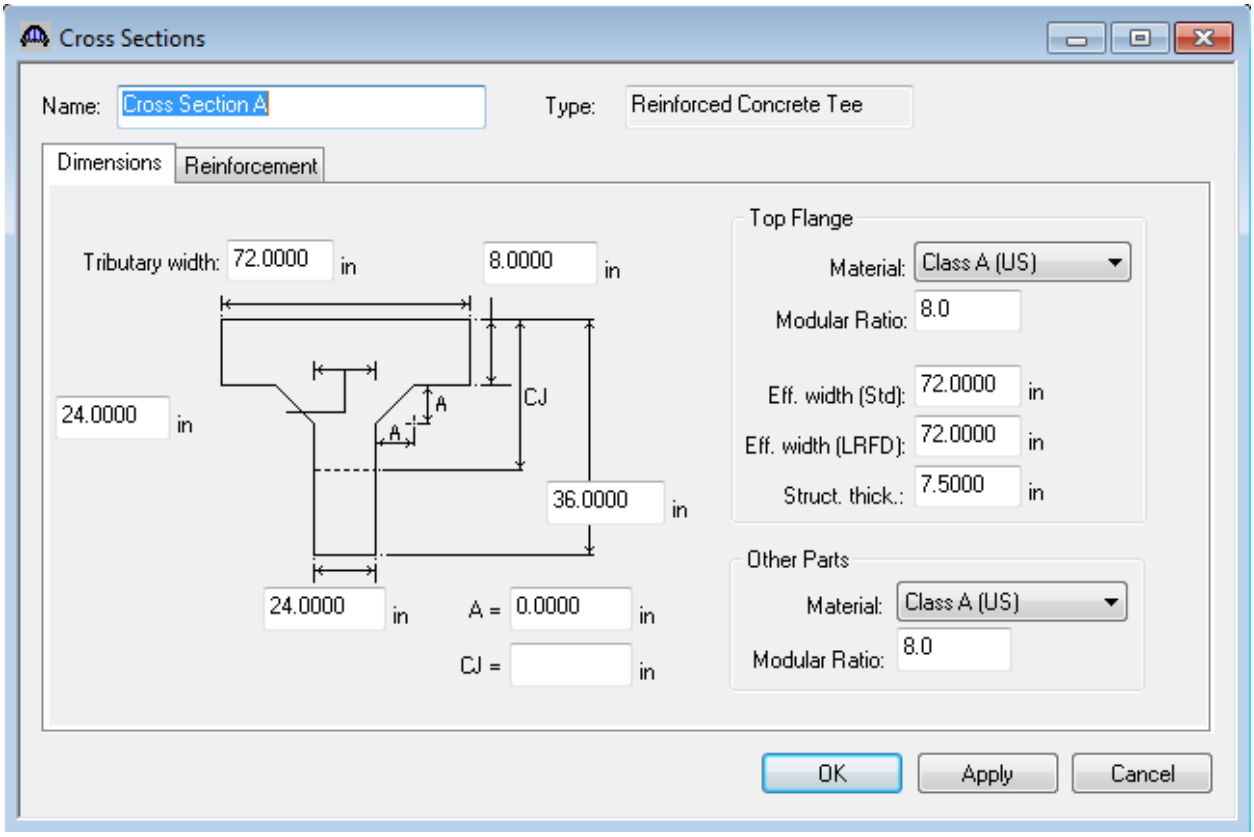



Member Alternative Description
Member Alternative: Interior 36" RC Tee Beam
Description
Specs
Factors
Engine
Import
Control Options
Description:
Material Type: Reinforced Concrete
Girder Type: Reinforced Concrete Tee
Default Units: US Customary
Girder property input method
Schedule based
Cross-section based
End bearing locations
Left: 6.0000 in
Right: 6.0000 in
Default rating method:
LFD
Self Load
Load case: Engine Assigned
Additional self load = kip/ft
Additional self load = %
Crack control parameter (Z)
Bottom of beam: kip/in
Exposure factor
Bottom of beam:
OK
Apply
Cancel

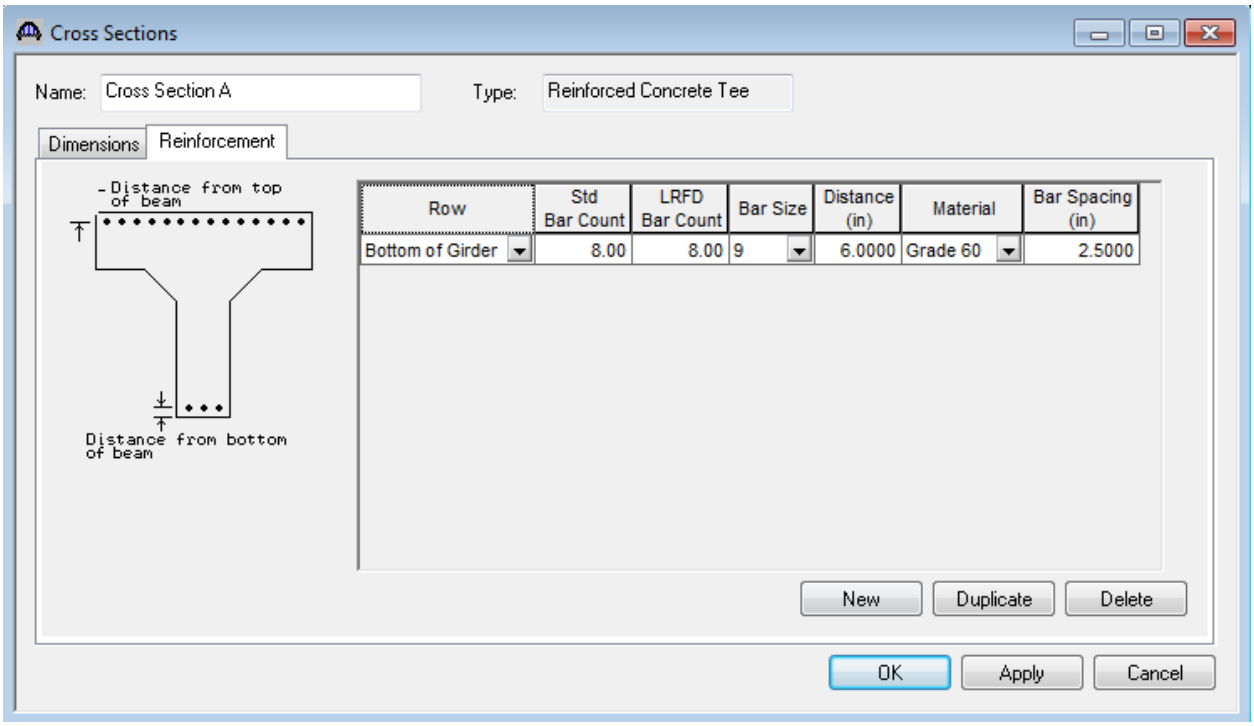
Distribution Factors (Standard Spec):



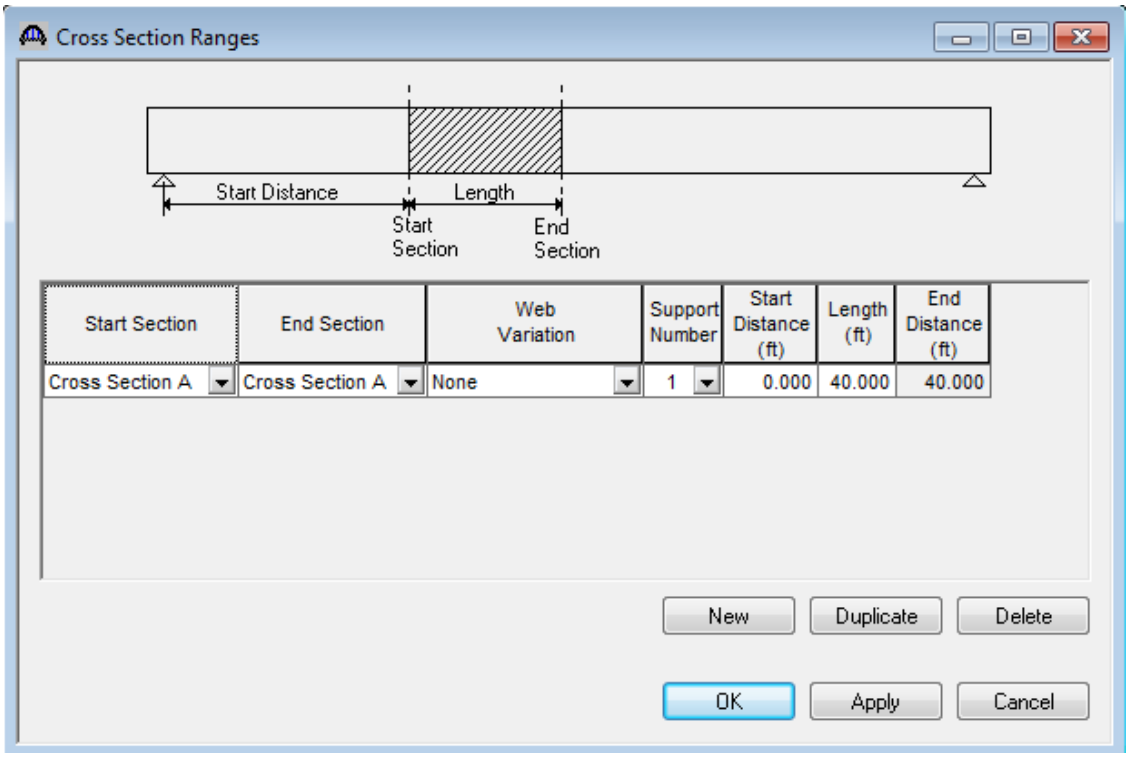
Next create the cross sections that define the girder geometry by double clicking on Cross Sections in the tree. The Dimensions tab is shown below.



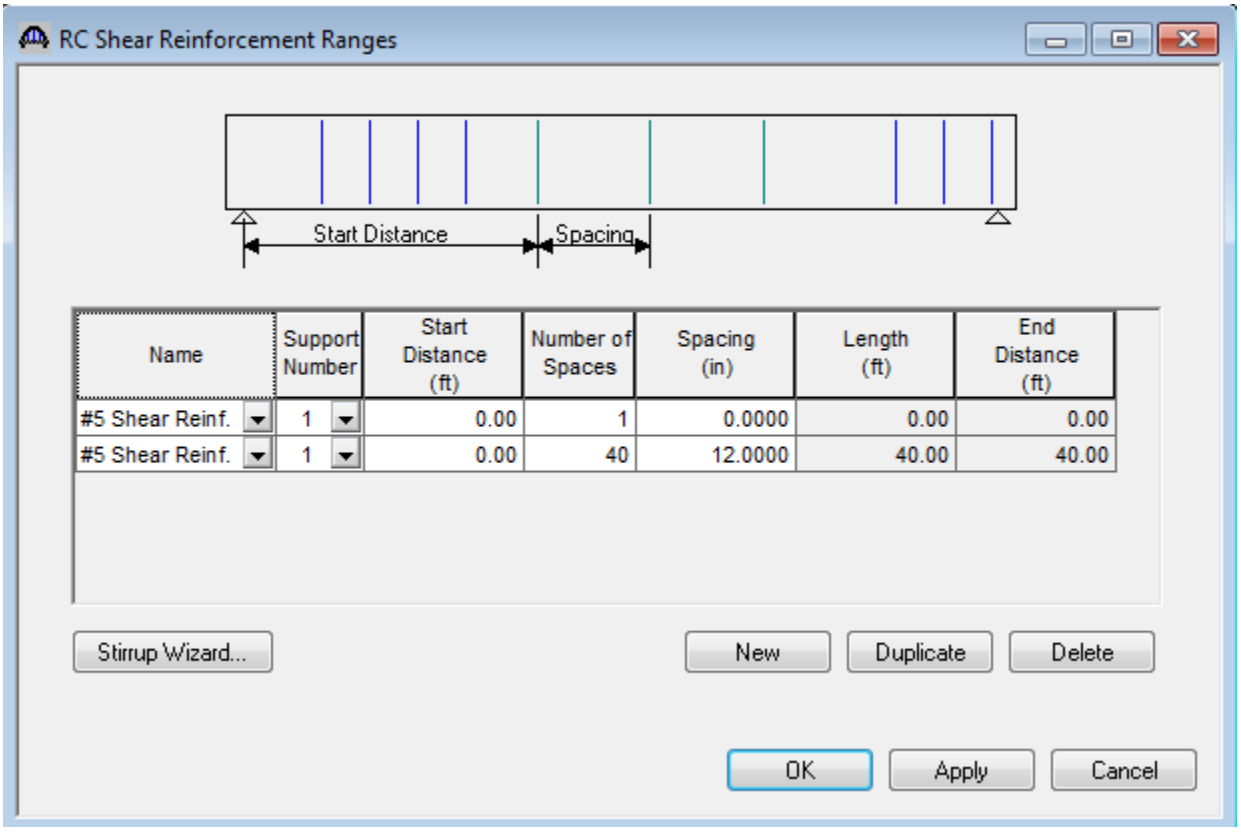
The Reinforcement tab is shown below.



Next describe the ranges over which the cross sections apply. The Cross Section Ranges window is shown below.

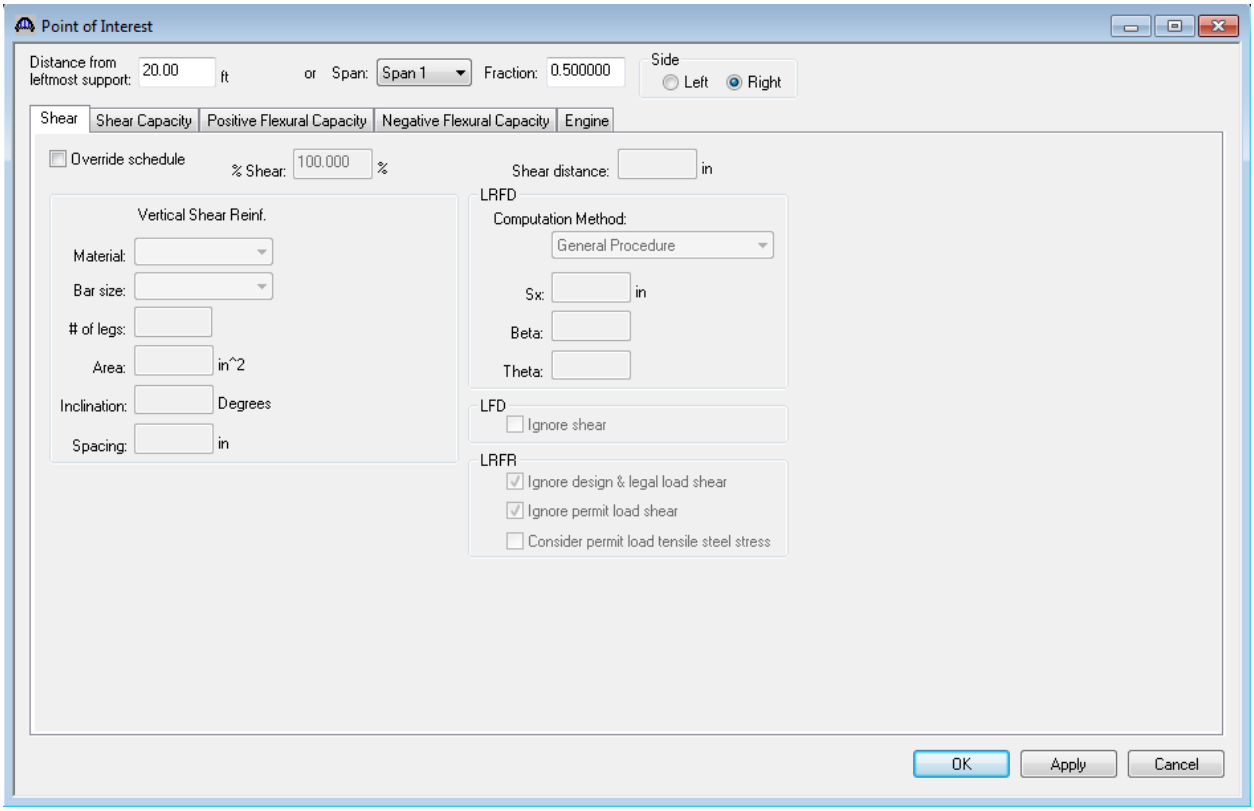


Shear reinforcement locations are described using the Shear Reinforcement Ranges window shown below.

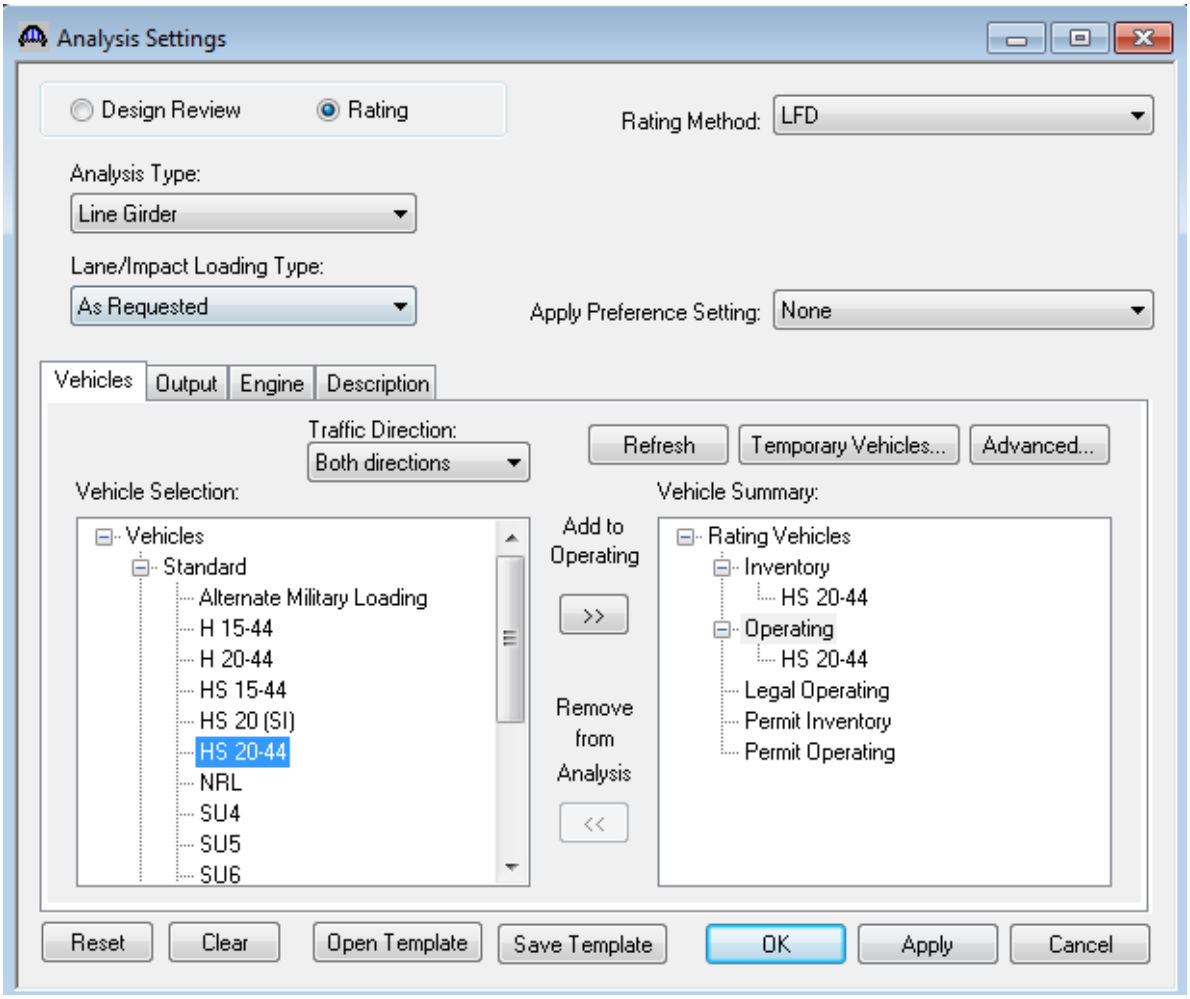


Because the range does not include a stirrup at the beginning of the range we must define two ranges. The range that begins at the left end of the beam with one space and a spacing of 0.0 inches locates the first stirrup. The range that begins at the left end of the beam with 40 spaces and a spacing of 12 inches locates the rest of the stirrups.

Define Points of Interest using the Points of Interest window shown below. A window for defining a Point of Interest is opened by double clicking on the Points of Interest tree item.

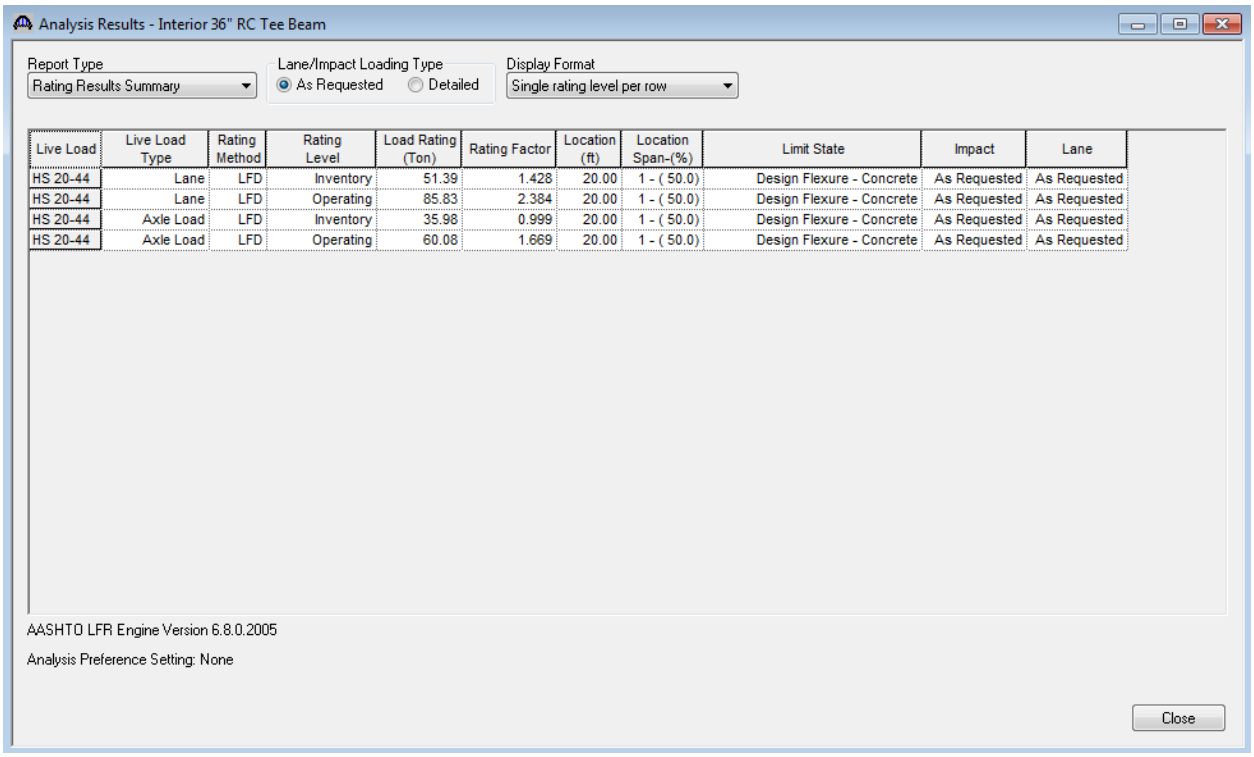


To perform a rating, select the View Analysis Settings button on the toolbar to open the window shown below. Select the vehicles to be used in the rating and click Ok.



Next click the Analyze button on the toolbar to perform the rating.

When the rating is finished you can review the results by clicking the View analysis Report on the toolbar. The window shown below will open.



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	Lane	LFD	Inventory	51.39	1.428	20.00	1 - (50.0)	Design Flexure - Concrete	As Requested	As Requested
HS 20-44	Lane	LFD	Operating	85.83	2.384	20.00	1 - (50.0)	Design Flexure - Concrete	As Requested	As Requested
HS 20-44	Axle Load	LFD	Inventory	35.98	0.999	20.00	1 - (50.0)	Design Flexure - Concrete	As Requested	As Requested
HS 20-44	Axle Load	LFD	Operating	60.08	1.669	20.00	1 - (50.0)	Design Flexure - Concrete	As Requested	As Requested