AASHTOWare BrDR 7.5.0

Prestress Tutorial 9

Cut Strand for PS Beam Example

BrDR Training

PS9 – Cut Strand for PS Beam Example

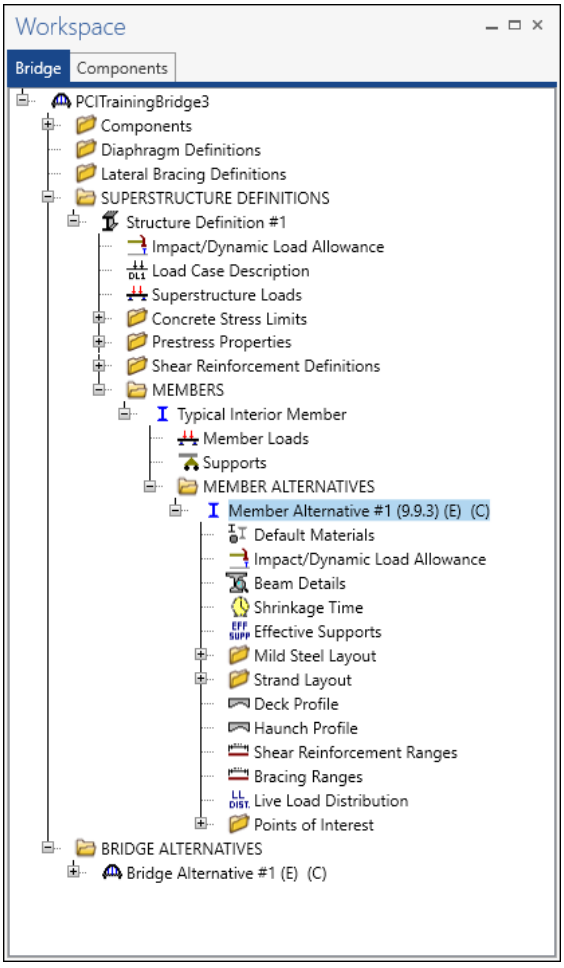
This example describes a design review of a prestressed concrete beam with temporary PS strands.

Topics Covered

- Definition of a strand layout with top strands that are debonded and cut at the center of the beam to control stresses at release.
- LRFD design review of a prestressed concrete beam with the strand layout described above.

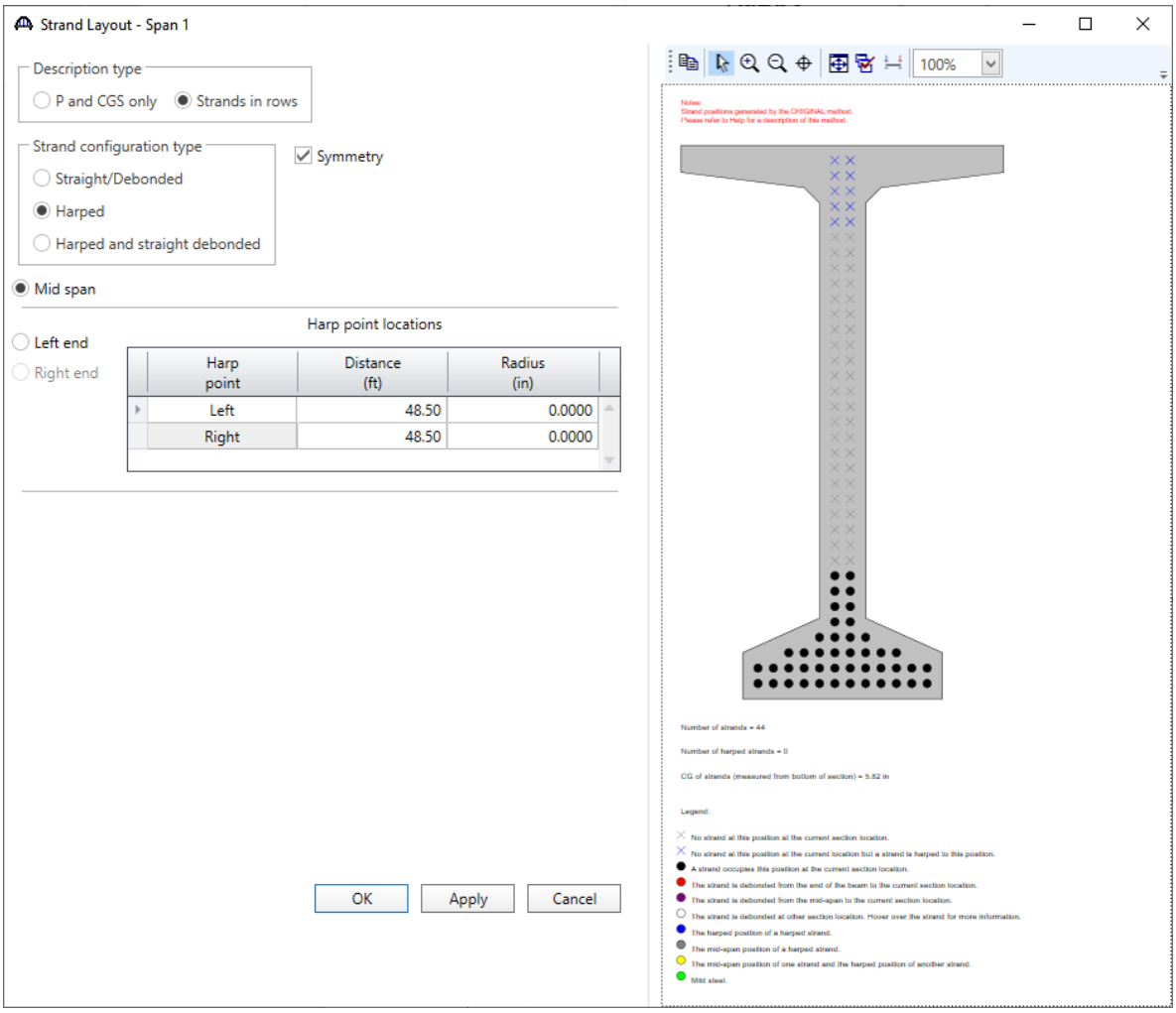
Definition of a strand layout with top strands that are debonded and cut at the center of the beam to control stresses at release.

Open the bridge **PCITrainingBridge3 (BID6)** from the **Bridge Explorer**. A partially expanded **Bridge Workspace** tree is shown below.

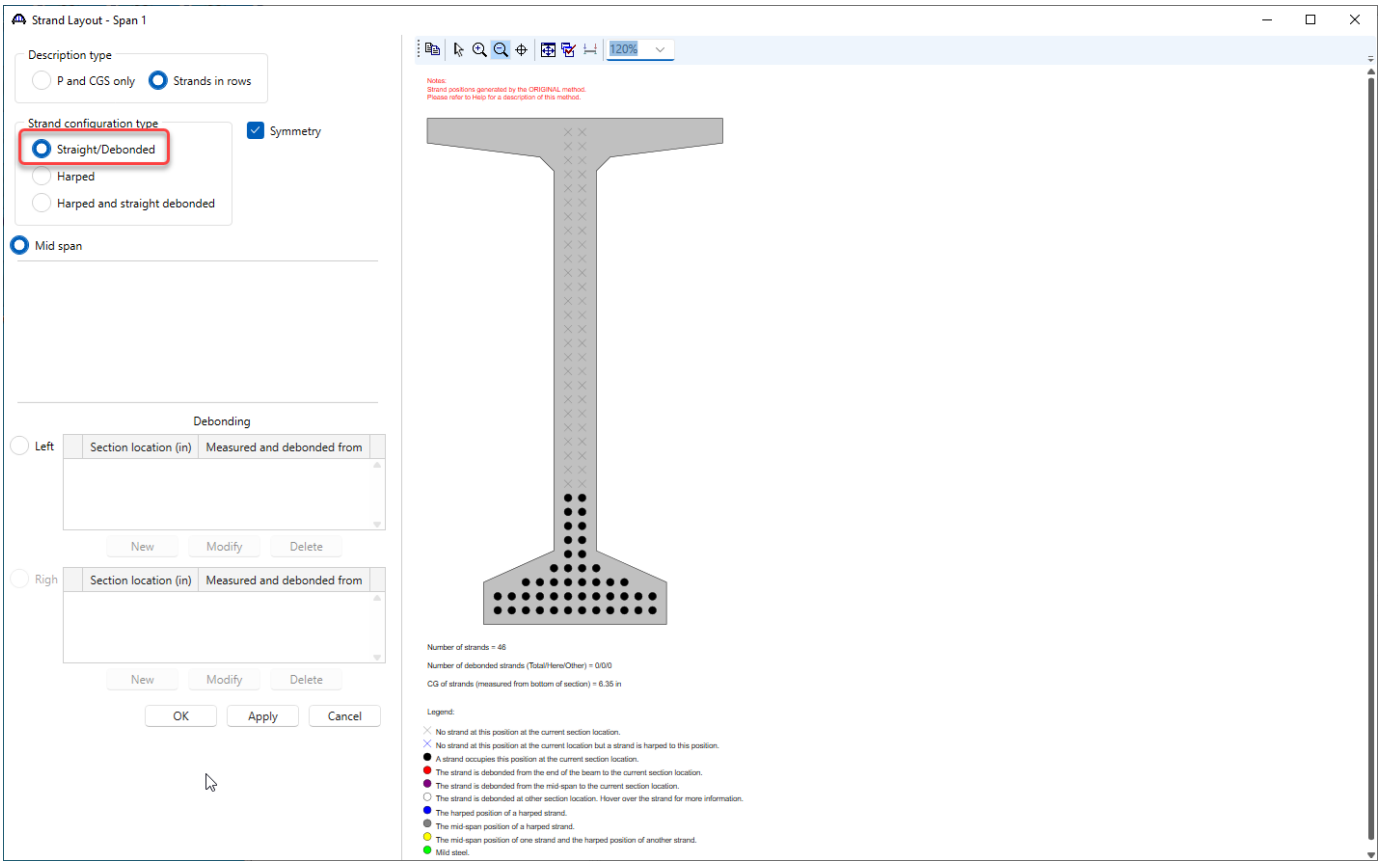


Expand the tree under the **Member Alternative #1 (9.9.3)**, expand **Strand Layout** and open the **Span 1** window by double clicking on it. Use the **ZOOM** options on the right side of the window to shrink/expand the schematic of the beam shape so that the entire beam is visible.

Strand Layout – Span 1



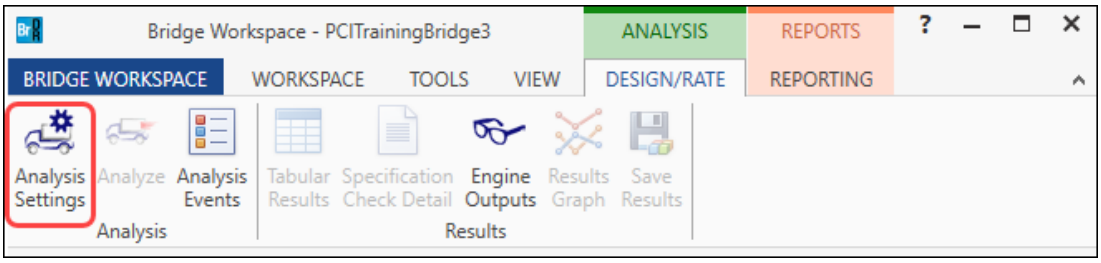
Adjust the strand pattern as follows to produce a strand pattern that results in very large top tensile stresses at release.



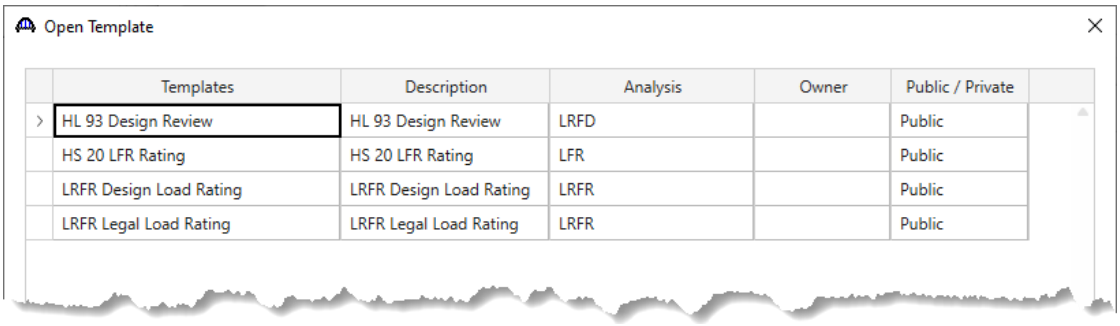
Click **OK** to apply the changes and close the window.

LRFD Design review of a prestressed concrete beam with the strand layout described above

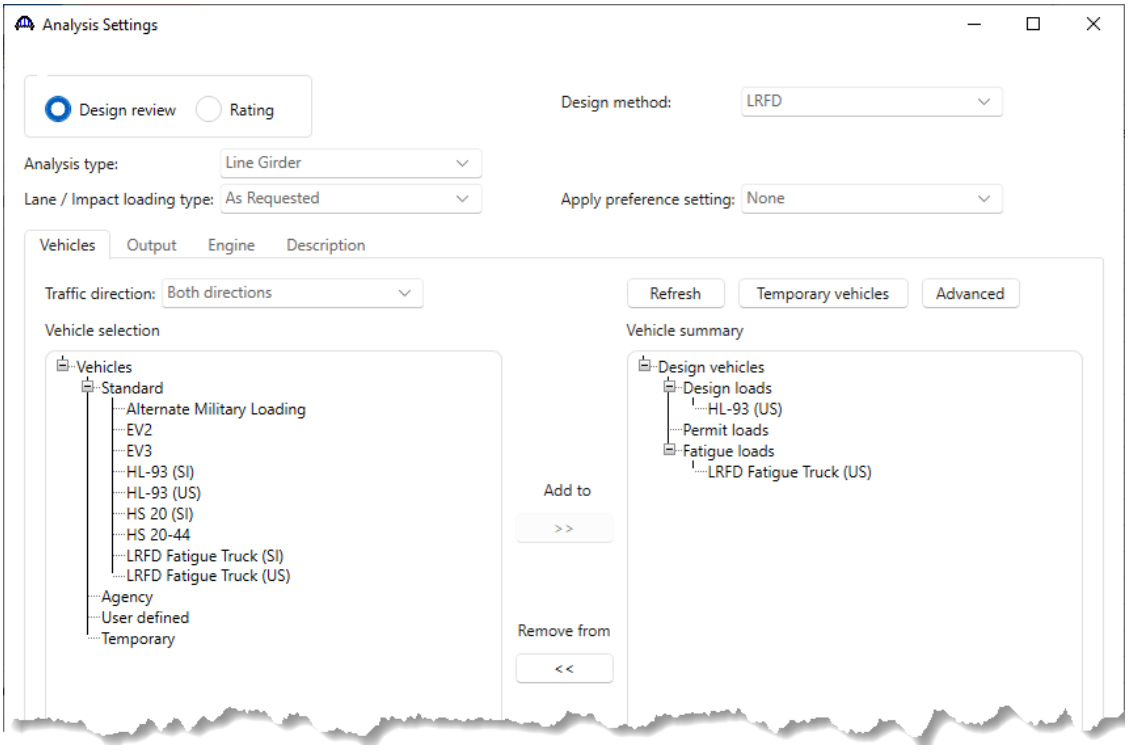
To run an LRFD design review, select the **Analysis Settings** button on the **Analysis** group of the **DESIGN/RATE** ribbon. The window shown below opens.



Click the **Open Template** button and select the **HL 93 Design Review** to be used in the analysis and click **Open**.

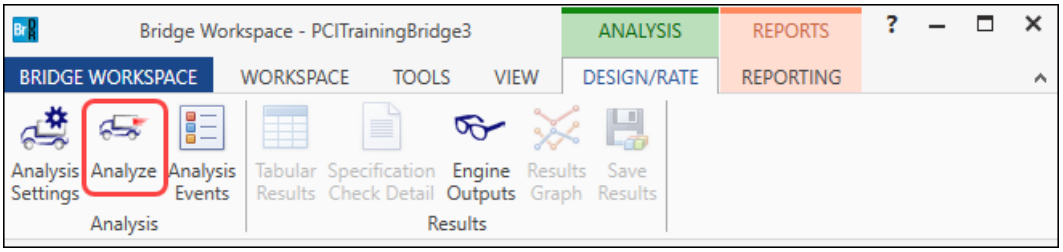


The **Analysis Settings** window will be populated as shown below.



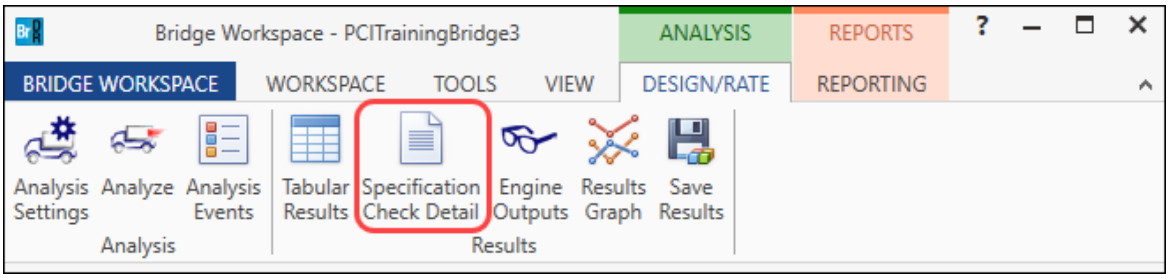
Click **OK** to apply the settings and close the window.

Run the LRFD design review on the **Member Alternative #1 (9.9.3)** by clicking on the **Analyze** button on the **Analysis** group of the **DESIGN/RATE** ribbon.

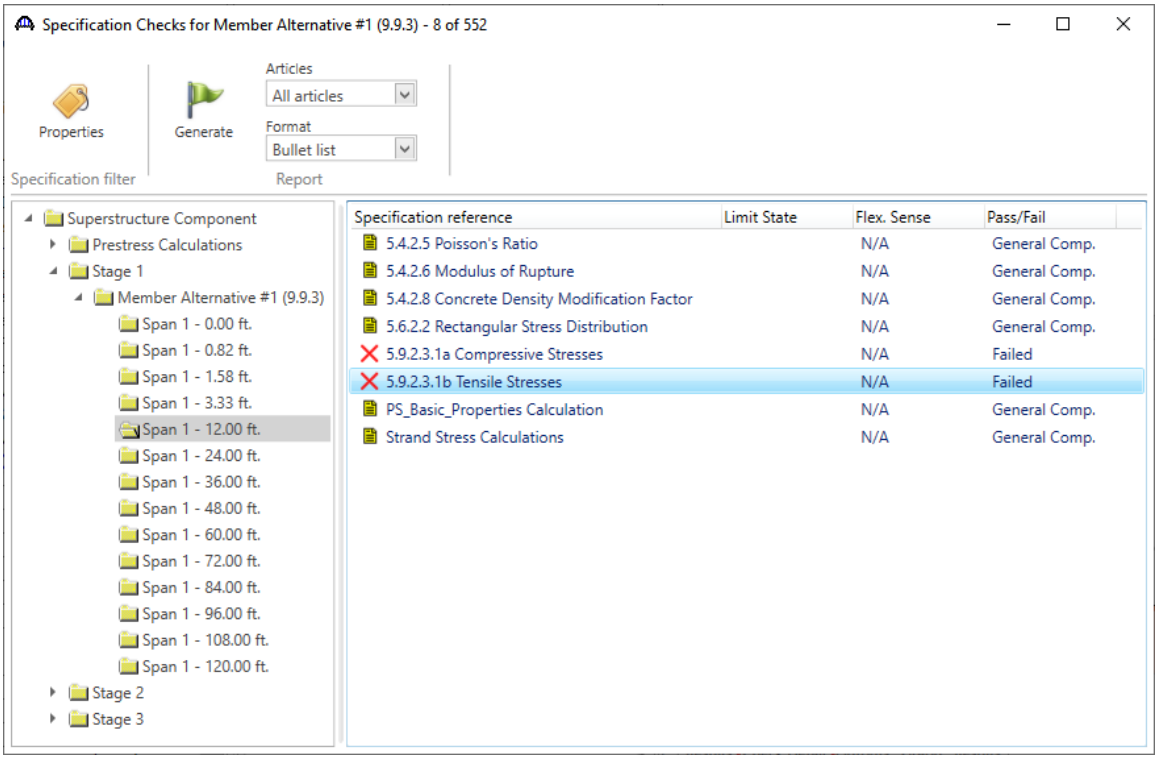


Specification Check Detail

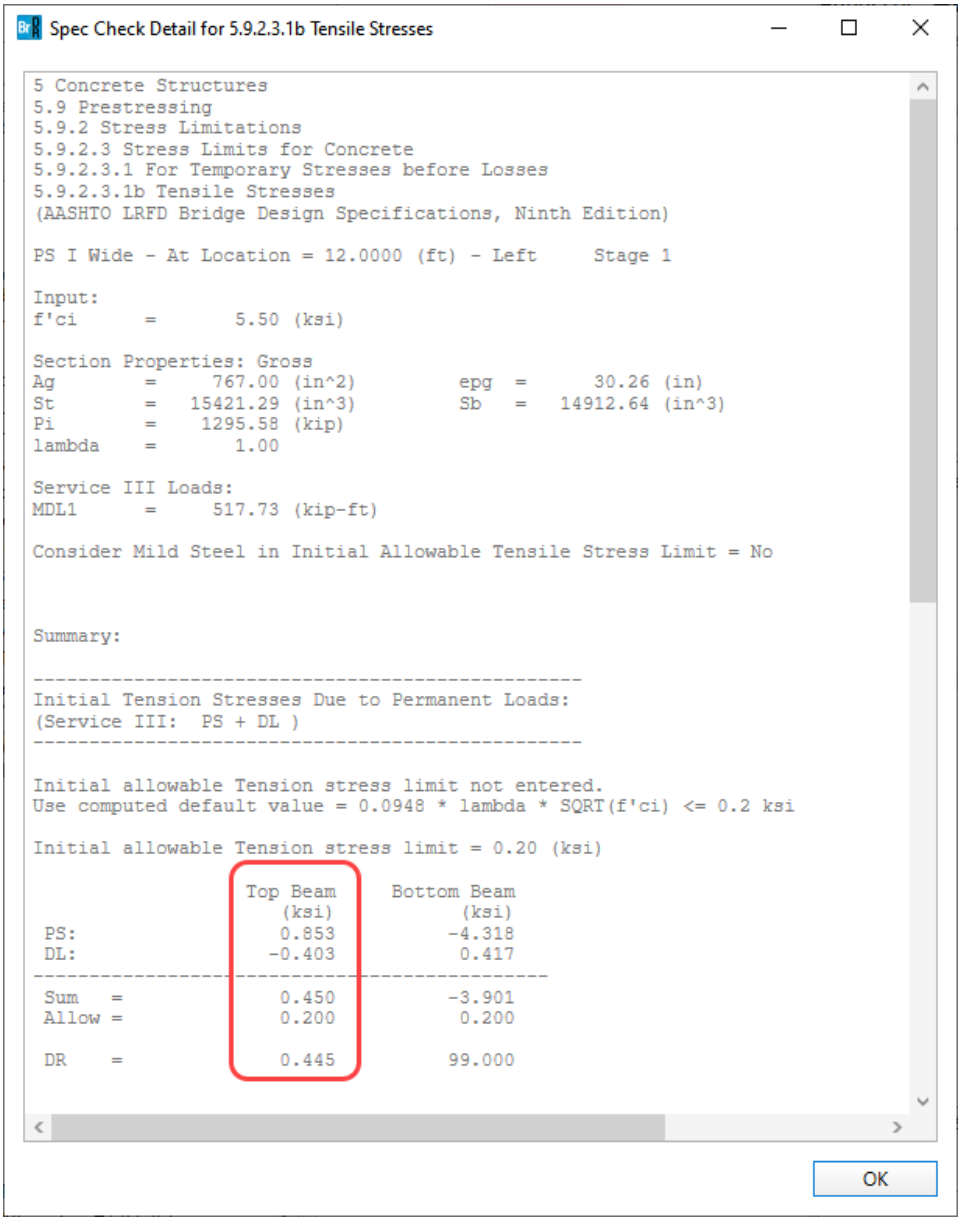
After the analysis, open the **Specification Checks** window by clicking on the **Specification Check Detail** button from the **Results** group of the **DESIGN/RATE** ribbon.



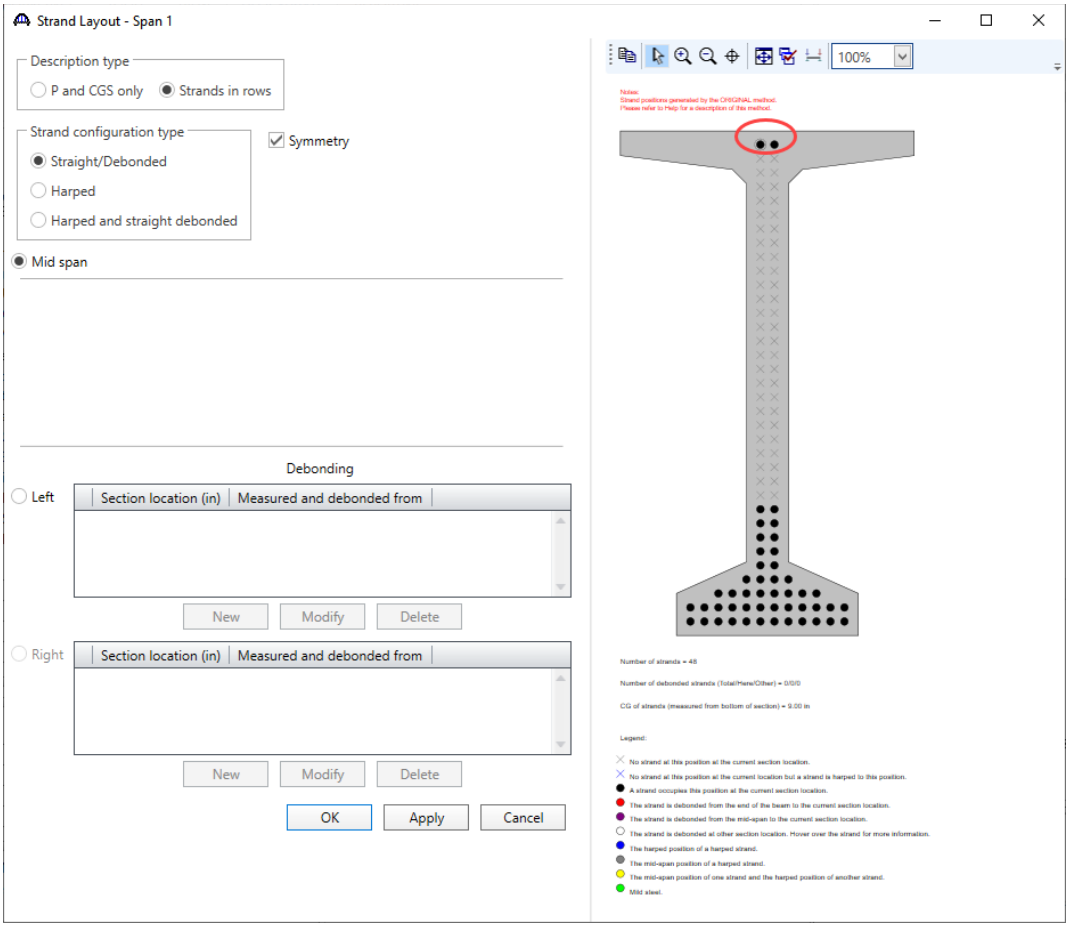
Go to **Superstructure component**, **Stage 1**, **Member Alternative #1 (9.9.3)**, **Span 1 – 12 ft**.



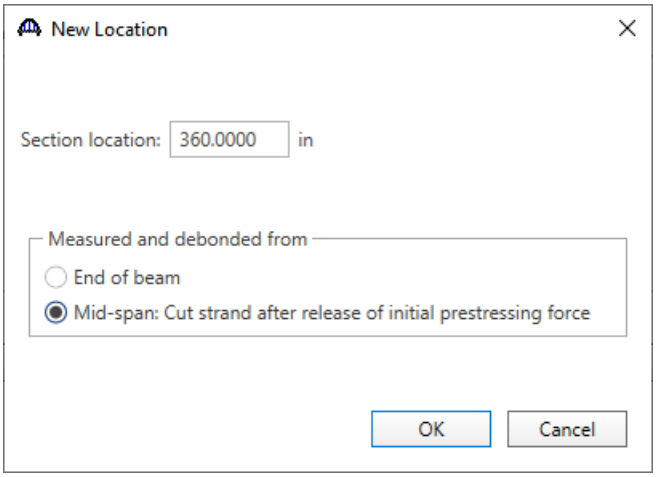
Open the **5.9.2.3.1b Tensile Stresses** article. The tension in the top of the beam at release shows a design ratio of 0.445.



Reopen the **Strand Layout – Span 1** window. Add 2 strands to the top of the beam at midspan.

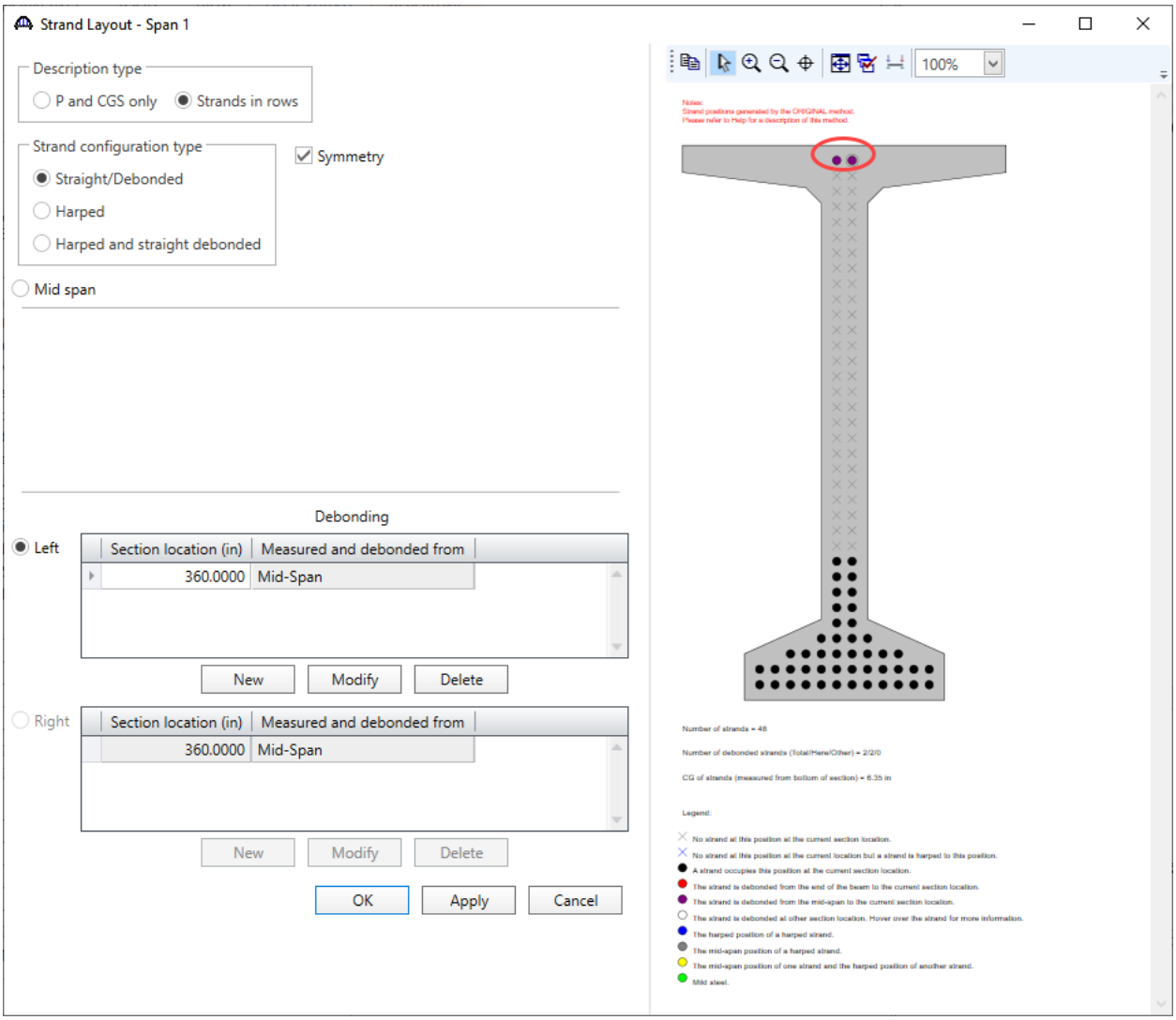


Select the **Left** radio button, click **New** to open the following window. Debond the newly added top strands over a length equal to ½ the beam length. The beam length is 120’ so debond 60’ with 30’ going to the left of midspan and 30’ to the right of midspan. When measuring from mid-span, the strand will be cut after release of the initial prestressing.



Click **OK** to close the window.

Select the top 2 strands as being debonded and cut. These 2 strands will then appear as purple strands. Click **OK** to close the window.



Adding these pretensioned top strands adds compression to the top of the beam at the ends of the beam to counteract the high tension in the top of the beam. Debonding and cutting them at midspan removed the compression in this region for the final construction stage.

Re-run the **HL-93 design review** of this member alternative. Reopen the details for article **5.9.2.3.1b Tensile Stresses** and see that the design ratio has improved. The top strands contribute to compression in this region and counteracts the high tension in the top flange.