AASHTOWare Bridge Design and Rating Training

Capacity Override at Points of Interest (BrDR 6.5)

Topics Covered

- Capacity Override LRFR
- Capacity Override LRFD

Capacity Override LRFR

Open BID1 in BrR and navigate to SUPERSTRUCTURE DEFINITIONS->Simple Span Structure->Members->G1->Member Alternative->Plate Girder-> Point of Interests->Span 1 80.5.

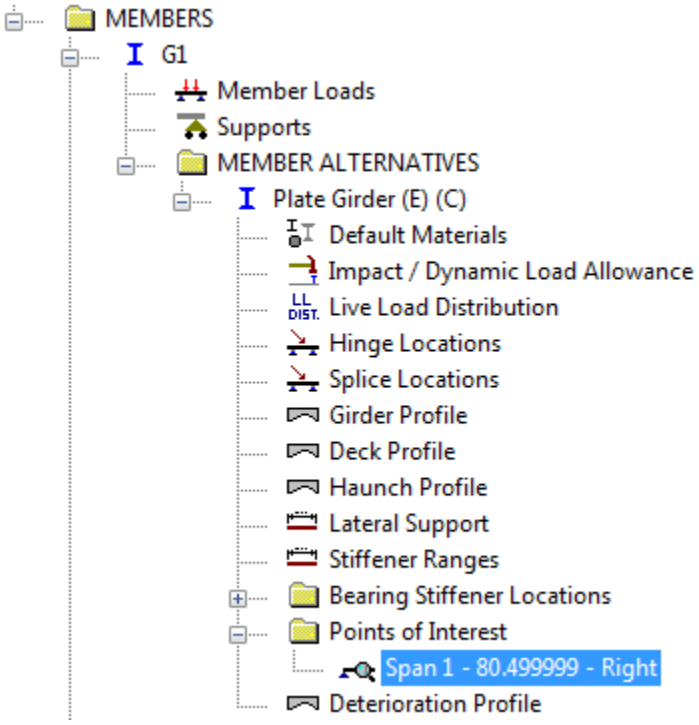

Figure 1

As seen from the window below, the option for “Override LRFR capacity” for “Positive Flexural Capacity” is not checked. Hence, the beam capacities at 80.5 ft will be computed by the AASHTO LRFR Engine.

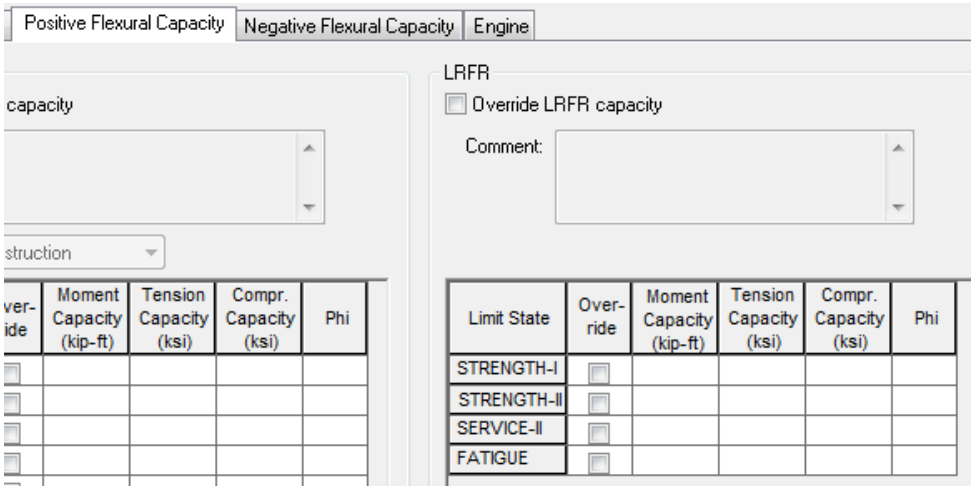

Figure 2

Open “View Analysis Settings” and choose “LRFR Design Load Rating” template for analysis.

Figure 3

Right click on “Plate Girder” and Select Analyze.

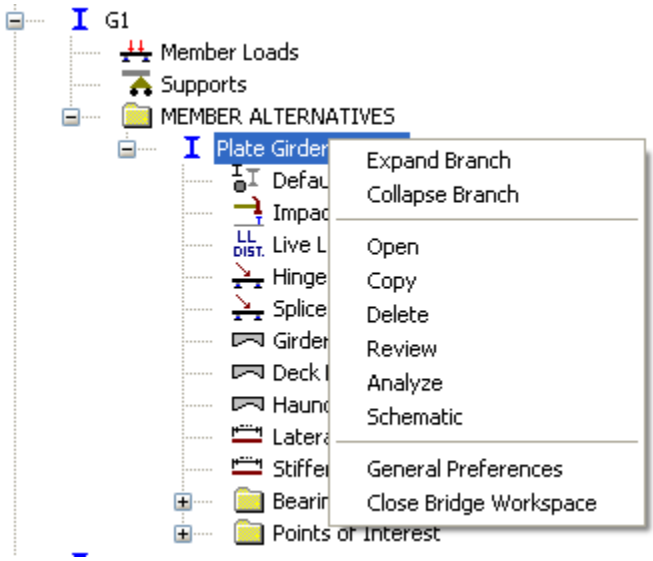

Figure 4

After the LRFR analysis is completed open “View Spec Check” and navigate to Stage 3->Plate Girder->Span 1 80.5 ft. -> Article 6.10.7.2.1.

```
INPUT:
phif =   1.000
```

Figure 5

```
                          --- Compression Flange ---
fc     = stress in the slab
f'c    = 4.5000  (ksi)
Stress = fbu
Resist = phif * Fnc
Design Ratio = Resist/Stress

Note: If the capacity has been overridden, the Resistance is computed as override phi*override capacity.
      Otherwise the Resistance is computed as per the Specification.
```

Limit State	Load Comb	Flexure Type	Component	fbu (ksi)	frd (ksi)	Fnc (ksi)	--- Override --- Phi	Fnc (ksi)	Stress (ksi)	Resist (ksi)	Design Ratio	Status
STR-I	1, DesInv	Pos	Top Flange	-48.00	0.00	50.00			-48.00	-50.00	1.042	Pass
STR-I	1, DesInv	Pos	Top Flange	-41.35	0.00	50.00			-41.35	-50.00	1.209	Pass
STR-I	1, DesOp	Pos	Top Flange	-46.48	0.00	50.00			-46.48	-50.00	1.076	Pass
STR-I	1, DesOp	Pos	Top Flange	-41.35	0.00	50.00			-41.35	-50.00	1.209	Pass
STR-I	2, DesInv	Pos	Top Flange	-46.95	0.00	50.00			-46.95	-50.00	1.065	Pass
STR-I	2, DesInv	Pos	Top Flange	-41.35	0.00	50.00			-41.35	-50.00	1.209	Pass
STR-I	2, DesOp	Pos	Top Flange	-45.67	0.00	50.00			-45.67	-50.00	1.095	Pass
STR-I	2, DesOp	Pos	Top Flange	-41.35	0.00	50.00			-41.35	-50.00	1.209	Pass

Figure 6

```
                          --- Tension Flange ---
Stress = fbu + fl/3
Resist = phif * Fnt
Design Ratio = Resist/Stress
```

Limit State	Load Comb	Flexure Type	Component	fbu (ksi)	fl (ksi)	frd (ksi)	Fnt (ksi)	--- Override --- Phi	Fnt (ksi)	Stress (ksi)	Resist (ksi)	Design Ratio	Status
STR-I	1, DesInv	Pos	Bot Flange	62.68	0.00	0.00	50.00			62.68	50.00	0.798	Fail
STR-I	1, DesInv	Pos	Bot Flange	35.10	0.00	0.00	50.00			35.10	50.00	1.425	Pass
STR-I	1, DesOp	Pos	Bot Flange	56.38	0.00	0.00	50.00			56.38	50.00	0.887	Fail
STR-I	1, DesOp	Pos	Bot Flange	35.10	0.00	0.00	50.00			35.10	50.00	1.425	Pass
STR-I	2, DesInv	Pos	Bot Flange	58.35	0.00	0.00	50.00			58.35	50.00	0.857	Fail
STR-I	2, DesInv	Pos	Bot Flange	35.10	0.00	0.00	50.00			35.10	50.00	1.425	Pass
STR-I	2, DesOp	Pos	Bot Flange	53.04	0.00	0.00	50.00			53.04	50.00	0.943	Fail
STR-I	2, DesOp	Pos	Bot Flange	35.10	0.00	0.00	50.00			35.10	50.00	1.425	Pass

Figure 7

The resistance factor “phif” value is 1.0 as shown above.

The above two figures show the resistances for the compression and the tension flange at location 80.5 ft as per F_{nc} and F_{nt} respectively which were computed.

Close the article and the View Spec Check window. Again navigate to SUPERSTRUCTURE DEFINITIONS->Simple Span Structure->Members->G1->Member Alternative->Plate Girder-> Point of Interests->Span 1 80.5.

Check the “Override LRFR capacity” for “Positive Flexural Capacity” and input the values as shown below.

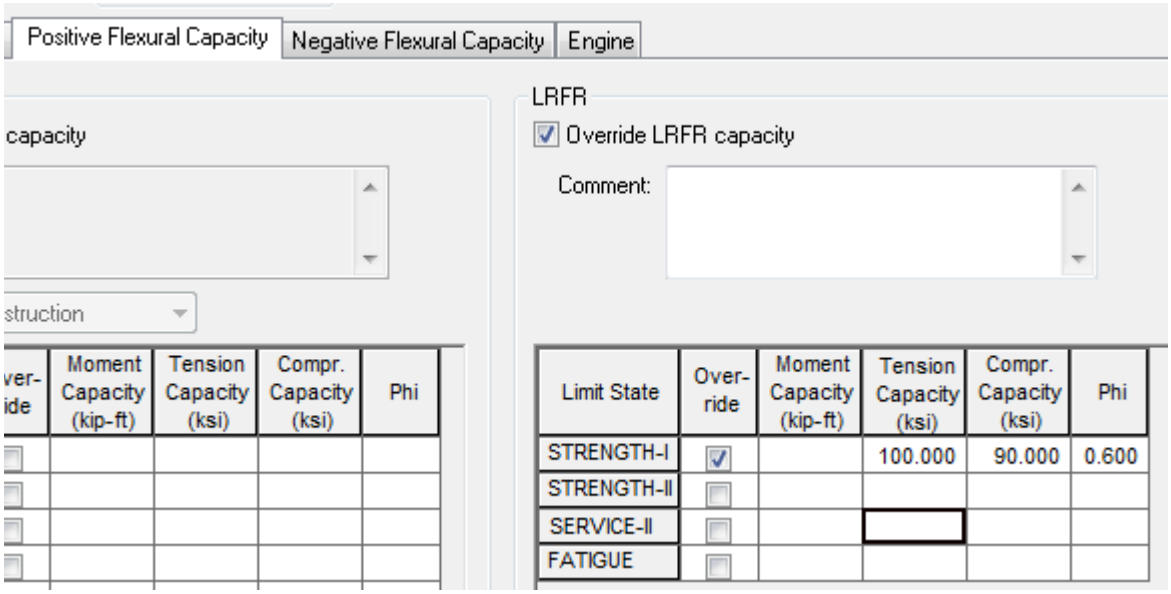

Figure 8

Click Ok to save the data and right click on “Plate Girder” and select Analyze.

After the LRFR analysis is completed open “View Spec Check” and navigate to Stage 3->Plate Girder->Span 1 80.5 ft. -> Article 6.10.7.2.1.

The “phif” value remains the same as above but it has been overridden for a specific limit state case (mentioned in the POI 80.5 ft. window) as can be seen from the figures below. The “Resist” field reflects the implementation of the capacity override.

```
                          --- Compression Flange ---
fc     = stress in the slab
f'c    = 4.5000  (ksi)
Stress = fbu
Resist = phif * Fnc
Design Ratio = Resist/Stress

Note: If the capacity has been overridden, the Resistance is computed as override phi*override capacity.
      Otherwise the Resistance is computed as per the Specification.
```

Limit State	Load Comb	Flexure Type	Component	fbu (ksi)	frd (ksi)	Fnc (ksi)	--- Override --- Phi	Fnc (ksi)	Stress (ksi)	Resist (ksi)	Design Ratio	Status
STR-I	1, DesInv	Pos	Top Flange	-48.00	0.00	50.00	0.60	90.00	-48.00	-54.00	1.125	Pass
STR-I	1, DesInv	Pos	Top Flange	-41.35	0.00	50.00	0.60	90.00	-41.35	-54.00	1.306	Pass
STR-I	1, DesOp	Pos	Top Flange	-46.48	0.00	50.00	0.60	90.00	-46.48	-54.00	1.162	Pass
STR-I	1, DesOp	Pos	Top Flange	-41.35	0.00	50.00	0.60	90.00	-41.35	-54.00	1.306	Pass
STR-I	2, DesInv	Pos	Top Flange	-46.95	0.00	50.00	0.60	90.00	-46.95	-54.00	1.150	Pass
STR-I	2, DesInv	Pos	Top Flange	-41.35	0.00	50.00	0.60	90.00	-41.35	-54.00	1.306	Pass
STR-I	2, DesOp	Pos	Top Flange	-45.67	0.00	50.00	0.60	90.00	-45.67	-54.00	1.182	Pass
STR-I	2, DesOp	Pos	Top Flange	-41.35	0.00	50.00	0.60	90.00	-41.35	-54.00	1.306	Pass

Figure 9

--- Tension Flange ---

Stress = fbu + fl/3
Resist = phif * Fnt
Design Ratio = Resist/Stress

Limit State	Load Comb	Flexure Type	Component	fbu (ksi)	fl (ksi)	frd (ksi)	Fnt (ksi)	--- Override --- Phi	--- Override --- Fnt (ksi)	Stress (ksi)	Resist (ksi)	Design Ratio	Status
STR-I	1, DesInv	Pos	Bot Flange	62.68	0.00	0.00	50.00	0.60	100.00	62.68	60.00	0.957	Fail
STR-I	1, DesInv	Pos	Bot Flange	35.10	0.00	0.00	50.00	0.60	100.00	35.10	60.00	1.710	Pass
STR-I	1, DesOp	Pos	Bot Flange	56.38	0.00	0.00	50.00	0.60	100.00	56.38	60.00	1.064	Pass
STR-I	1, DesOp	Pos	Bot Flange	35.10	0.00	0.00	50.00	0.60	100.00	35.10	60.00	1.710	Pass
STR-I	2, DesInv	Pos	Bot Flange	58.35	0.00	0.00	50.00	0.60	100.00	58.35	60.00	1.028	Pass
STR-I	2, DesInv	Pos	Bot Flange	35.10	0.00	0.00	50.00	0.60	100.00	35.10	60.00	1.710	Pass
STR-I	2, DesOp	Pos	Bot Flange	53.04	0.00	0.00	50.00	0.60	100.00	53.04	60.00	1.131	Pass
STR-I	2, DesOp	Pos	Bot Flange	35.10	0.00	0.00	50.00	0.60	100.00	35.10	60.00	1.710	Pass

Figure 10

Capacity Override LRFD

Open BID1 in BrD and navigate to SUPERSTRUCTURE DEFINITIONS->Simple Span Structure->Members->G1->Member Alternative->Plate Girder-> Point of Interests->Span 1 80.5.

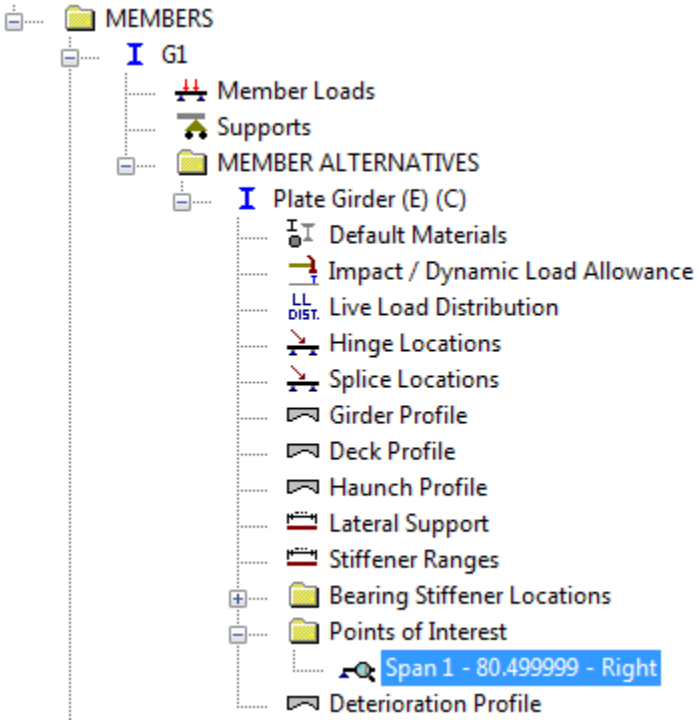

Figure 11

As seen from the window below, the option for “Override LRFD capacity” for “Positive Flexural Capacity” is not checked. Hence, the beam capacities at 80.5 ft will be computed by the AASHTO LRFD Engine.

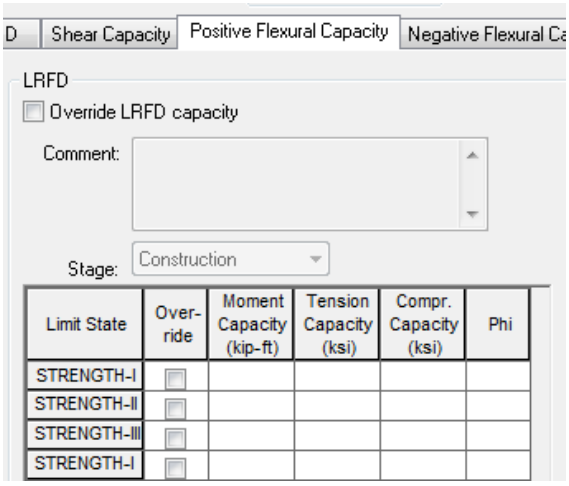

Figure 12

Open “View Analysis Settings” and choose “HL 93 Design Review” template for LRFD analysis.

Figure 13

Right click on “Plate Girder” and Select Analyze.

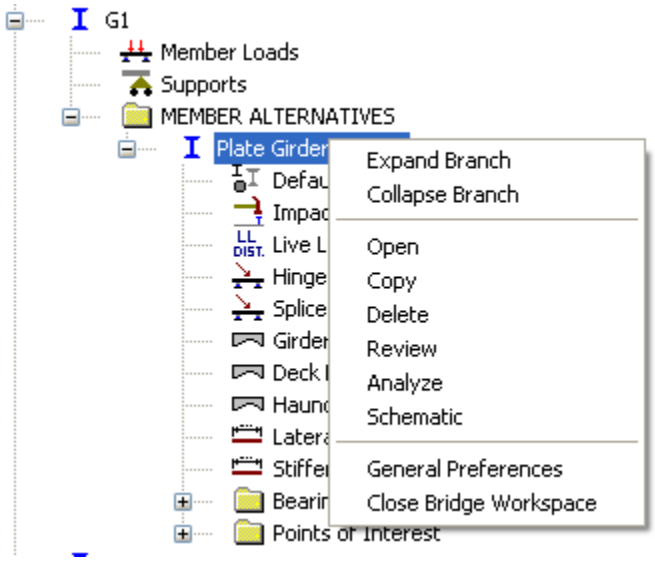

Figure 14

After the LRFD analysis is completed open “View Spec Check” and navigate to Stage 3->Plate Girder->Span 1 80.5 ft. -> Article 6.10.7.2.1.

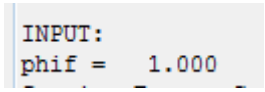

Figure 15

--- Compression Flange ---

fc = stress in the slab
f'c = 4.5000 (ksi)
Stress = fbu
Resist = phif * Fnc
Design Ratio = Resist/Stress

Note: If the capacity has been overridden, the Resistance is computed as override phi*override capacity.
Otherwise the Resistance is computed as per the Specification.

Limit State	Load Comb	Flexure Type	Component	fbu (ksi)	frd (ksi)	Fnc (ksi)	--- Override --- Phi	Fnc (ksi)	Stress (ksi)	Resist (ksi)	Design Ratio	Status
STR-I	1	Pos	Top Flange	-48.00	0.00	50.00			-48.00	-50.00	1.042	Pass
STR-I	1	Pos	Top Flange	-29.07	0.00	50.00			-29.07	-50.00	1.720	Pass
STR-I	2	Pos	Top Flange	-46.95	0.00	50.00			-46.95	-50.00	1.065	Pass
STR-I	2	Pos	Top Flange	-29.07	0.00	50.00			-29.07	-50.00	1.720	Pass
STR-III	1	Pos	Top Flange	-41.35	0.00	50.00			-41.35	-50.00	1.209	Pass
STR-III	1	Pos	Top Flange	-29.07	0.00	50.00			-29.07	-50.00	1.720	Pass
STR-III	2	Pos	Top Flange	-41.35	0.00	50.00			-41.35	-50.00	1.209	Pass
STR-III	2	Pos	Top Flange	-29.07	0.00	50.00			-29.07	-50.00	1.720	Pass
STR-V	1	Pos	Top Flange	-46.48	0.00	50.00			-46.48	-50.00	1.076	Pass
STR-V	1	Pos	Top Flange	-29.07	0.00	50.00			-29.07	-50.00	1.720	Pass
STR-V	2	Pos	Top Flange	-45.67	0.00	50.00			-45.67	-50.00	1.095	Pass
STR-V	2	Pos	Top Flange	-29.07	0.00	50.00			-29.07	-50.00	1.720	Pass

Figure 16

--- Tension Flange ---

Stress = fbu + fl/3
Resist = phif * Fnt
Design Ratio = Resist/Stress

Limit State	Load Comb	Flexure Type	Component	fbu (ksi)	fl (ksi)	frd (ksi)	Fnt (ksi)	--- Override --- Phi	Fnt (ksi)	Stress (ksi)	Resist (ksi)	Design Ratio	Status
STR-I	1	Pos	Bot Flange	62.68	0.00	0.00	50.00			62.68	50.00	0.798	Fail
STR-I	1	Pos	Bot Flange	24.06	0.00	0.00	50.00			24.06	50.00	2.078	Pass
STR-I	2	Pos	Bot Flange	58.35	0.00	0.00	50.00			58.35	50.00	0.857	Fail
STR-I	2	Pos	Bot Flange	24.06	0.00	0.00	50.00			24.06	50.00	2.078	Pass
STR-III	1	Pos	Bot Flange	35.10	0.00	0.00	50.00			35.10	50.00	1.425	Pass
STR-III	1	Pos	Bot Flange	24.06	0.00	0.00	50.00			24.06	50.00	2.078	Pass
STR-III	2	Pos	Bot Flange	35.10	0.00	0.00	50.00			35.10	50.00	1.425	Pass
STR-III	2	Pos	Bot Flange	24.06	0.00	0.00	50.00			24.06	50.00	2.078	Pass
STR-V	1	Pos	Bot Flange	56.38	0.00	0.00	50.00			56.38	50.00	0.887	Fail
STR-V	1	Pos	Bot Flange	24.06	0.00	0.00	50.00			24.06	50.00	2.078	Pass
STR-V	2	Pos	Bot Flange	53.04	0.00	0.00	50.00			53.04	50.00	0.943	Fail
STR-V	2	Pos	Bot Flange	24.06	0.00	0.00	50.00			24.06	50.00	2.078	Pass

Figure 17

The resistance factor “phif” value is 1.0 as shown above.

The above two figures show the resistances for the compression and the tension flange at location 80.5 ft. as per F_{nc} and F_{nt} respectively which were computed.

Close the article and the View Spec Check window. Again navigate to SUPERSTRUCTURE DEFINITIONS->Simple Span Structure->Members->G1->Member Alternative->Plate Girder-> Point of Interests->Span 1 80.5.

Check the “Override LRFD capacity” for “Positive Flexural Capacity” and input the values as shown below. The Stage field indicates that during which stage of design, the capacity values have to be overridden.

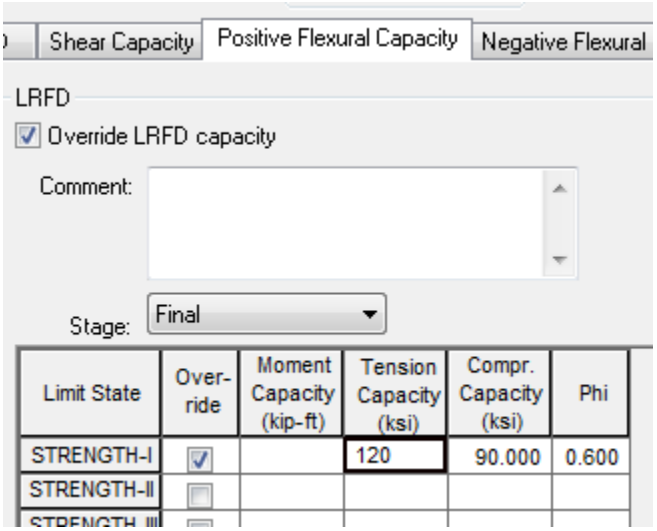

Figure 18

Click Ok to save the data and right click on “Plate Girder” and select Analyze.

After the LRFD analysis is completed open “View Spec Check” and navigate to Stage 3->Plate Girder->Span 1 80.5 ft. -> Article 6.10.7.2.1.

The “phif” value remains the same as above but it has been overridden for specific limit state case (mentioned in the POI 80.5 ft. window) as can be seen from the figures below. The “Resist” field reflects the implementation of the capacity override

--- Compression Flange ---

fc = stress in the slab
f'c = 4.5000 (ksi)
Stress = fbu
Resist = phif * Fnc
Design Ratio = Resist/Stress

Note: If the capacity has been overridden, the Resistance is computed as override phi*override capacity.
Otherwise the Resistance is computed as per the Specification.

Limit State	Load Comb	Flexure Type	Component	fbu (ksi)	frd (ksi)	Fnc (ksi)	--- Override --- Phi	Fnc (ksi)	Stress (ksi)	Resist (ksi)	Design Ratio	Status
STR-I	1	Pos	Top Flange	-48.00	0.00	50.00	0.60	90.00	-48.00	-54.00	1.125	Pass
STR-I	1	Pos	Top Flange	-29.07	0.00	50.00	0.60	90.00	-29.07	-54.00	1.857	Pass
STR-I	2	Pos	Top Flange	-46.95	0.00	50.00	0.60	90.00	-46.95	-54.00	1.150	Pass
STR-I	2	Pos	Top Flange	-29.07	0.00	50.00	0.60	90.00	-29.07	-54.00	1.857	Pass
STR-III	1	Pos	Top Flange	-41.35	0.00	50.00			-41.35	-50.00	1.209	Pass
STR-III	1	Pos	Top Flange	-29.07	0.00	50.00			-29.07	-50.00	1.720	Pass
STR-III	2	Pos	Top Flange	-41.35	0.00	50.00			-41.35	-50.00	1.209	Pass
STR-III	2	Pos	Top Flange	-29.07	0.00	50.00			-29.07	-50.00	1.720	Pass
STR-V	1	Pos	Top Flange	-46.48	0.00	50.00			-46.48	-50.00	1.076	Pass
STR-V	1	Pos	Top Flange	-29.07	0.00	50.00			-29.07	-50.00	1.720	Pass
STR-V	2	Pos	Top Flange	-45.67	0.00	50.00			-45.67	-50.00	1.095	Pass
STR-V	2	Pos	Top Flange	-29.07	0.00	50.00			-29.07	-50.00	1.720	Pass

Figure 19

--- Tension Flange ---

Stress = fbu + fl/3
Resist = phif * Fnt
Design Ratio = Resist/Stress

Limit State	Load Comb	Flexure Type	Component	fbu (ksi)	fl (ksi)	frd (ksi)	Fnt (ksi)	--- Override --- Phi	Fnt (ksi)	Stress (ksi)	Resist (ksi)	Design Ratio	Status
STR-I	1	Pos	Bot Flange	62.68	0.00	0.00	50.00	0.60	120.00	62.68	72.00	1.149	Pass
STR-I	1	Pos	Bot Flange	24.06	0.00	0.00	50.00	0.60	120.00	24.06	72.00	2.992	Pass
STR-I	2	Pos	Bot Flange	58.35	0.00	0.00	50.00	0.60	120.00	58.35	72.00	1.234	Pass
STR-I	2	Pos	Bot Flange	24.06	0.00	0.00	50.00	0.60	120.00	24.06	72.00	2.992	Pass
STR-III	1	Pos	Bot Flange	35.10	0.00	0.00	50.00			35.10	50.00	1.425	Pass
STR-III	1	Pos	Bot Flange	24.06	0.00	0.00	50.00			24.06	50.00	2.078	Pass
STR-III	2	Pos	Bot Flange	35.10	0.00	0.00	50.00			35.10	50.00	1.425	Pass
STR-III	2	Pos	Bot Flange	24.06	0.00	0.00	50.00			24.06	50.00	2.078	Pass
STR-V	1	Pos	Bot Flange	56.38	0.00	0.00	50.00			56.38	50.00	0.887	Fail
STR-V	1	Pos	Bot Flange	24.06	0.00	0.00	50.00			24.06	50.00	2.078	Pass
STR-V	2	Pos	Bot Flange	53.04	0.00	0.00	50.00			53.04	50.00	0.943	Fail
STR-V	2	Pos	Bot Flange	24.06	0.00	0.00	50.00			24.06	50.00	2.078	Pass

Figure 20