

AASHTOWare BrD/BrR 6.8

Steel Structure Tutorial

STL4 - Simple Span Plate Girder with Loss Example

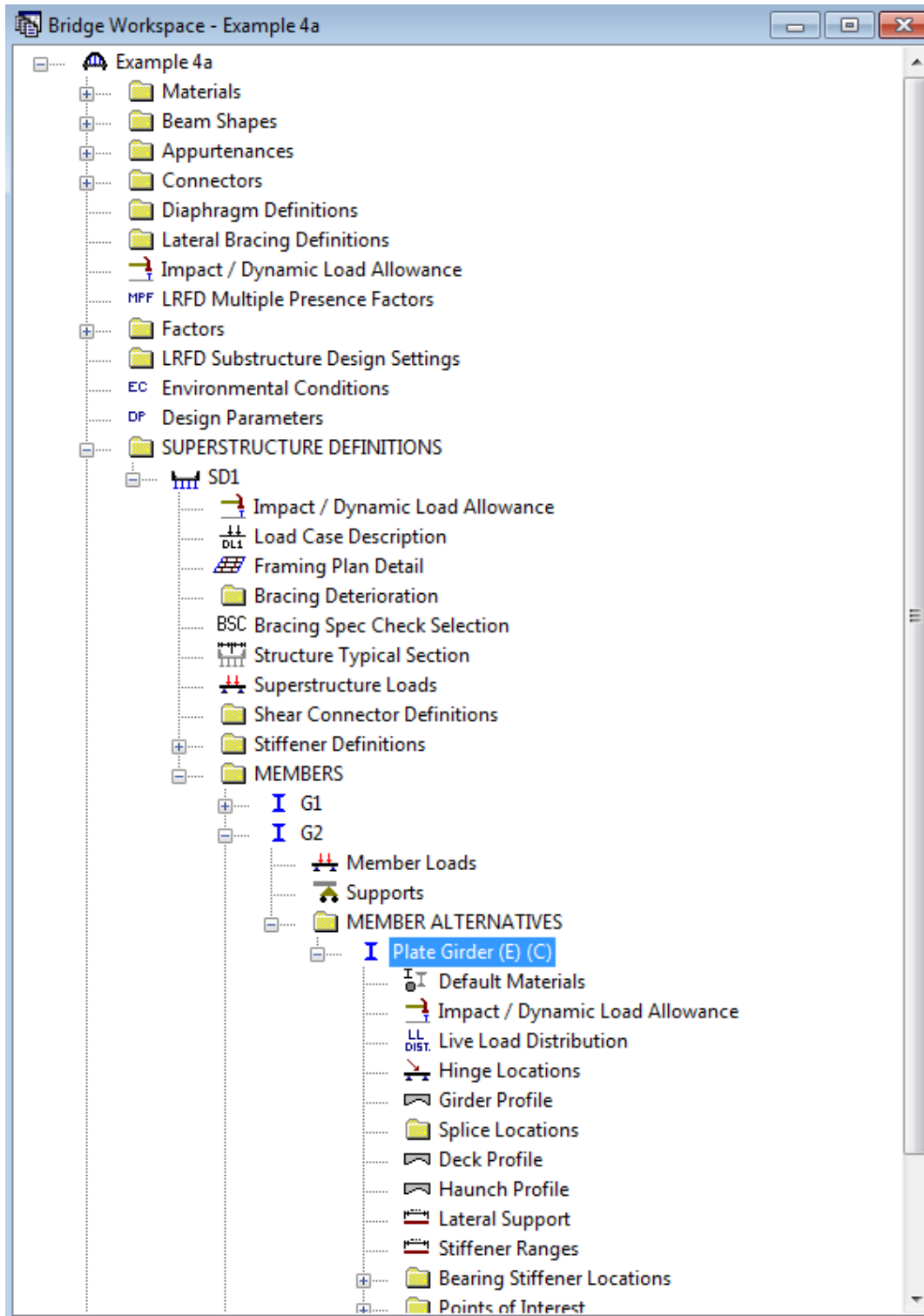
BrD and BrR Training

STL4 - Simple Span Plate Girder with Loss Example

BrR allows deterioration to be entered for steel members. The Deterioration window is not available in BrD. Deterioration data is only used in Rating analyses. It is not used in Design Review analyses. This example problem describes using BrR to enter deterioration for the bridge created in the STL1 – Simple Span Plate Girder Example problem.

STL4 - Simple Span Plate Girder with Loss Example

The following Bridge Workspace should exist after completing example problem STL1:

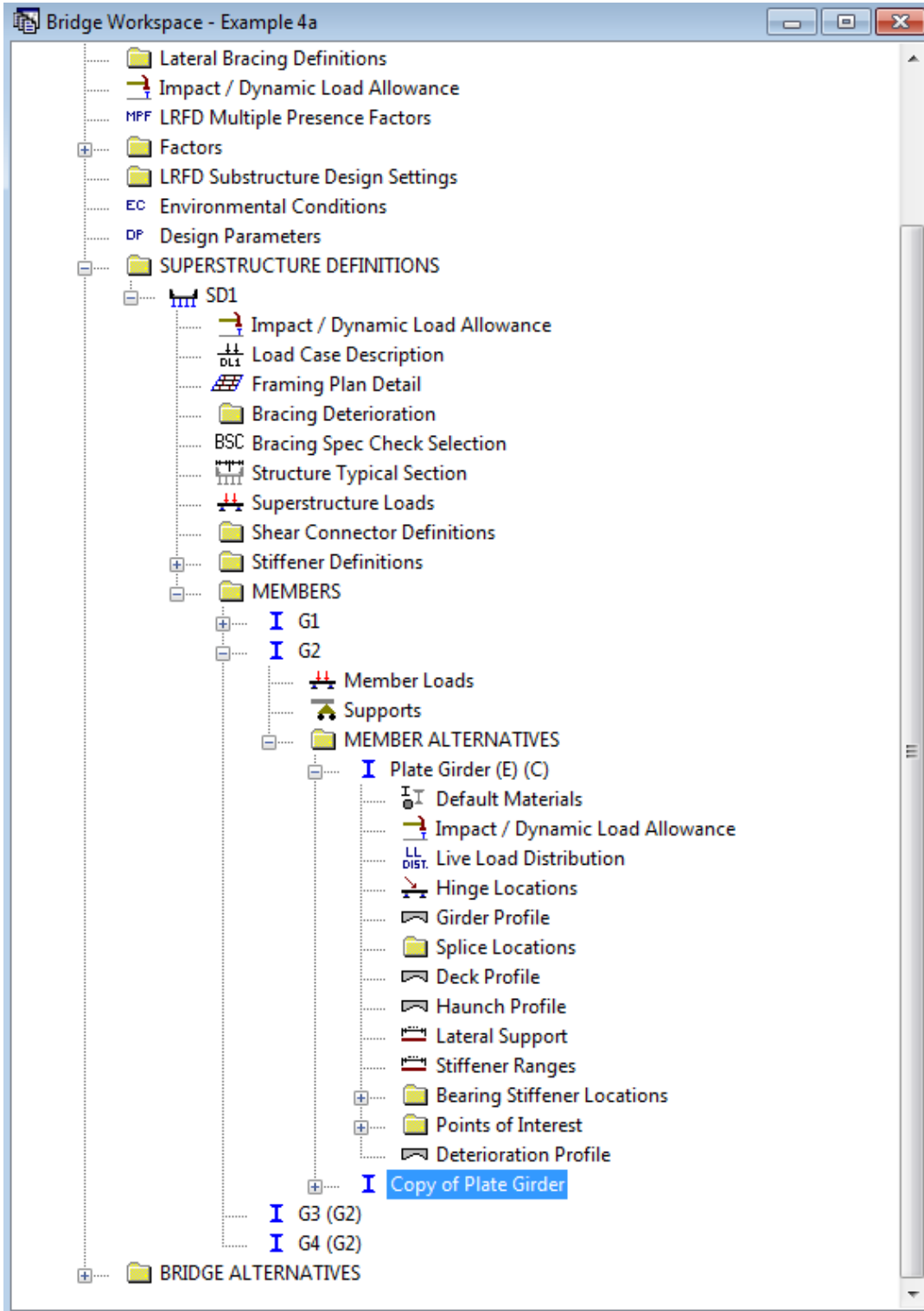


STL4 - Simple Span Plate Girder with Loss Example

We will make a copy of the “Plate Girder” member alternative for member G2 and enter the deterioration for this copy. This way, we can keep a copy of both the original member and the member with deterioration. To make a copy of “Plate Girder”, click on “Plate Girder” in the tree and select Edit/Copy from the menu (or right mouse click on “Plate Girder” and select Copy or select the Copy button on the toolbar). Now select MEMBER ALTERNATIVES in the tree and select Edit/Paste from the menu (or right mouse click on MEMBER ALTERNATIVES and select Paste or select the Paste button on the toolbar).

STL4 - Simple Span Plate Girder with Loss Example

The following Bridge Workspace tree will result.



STL4 - Simple Span Plate Girder with Loss Example

Now open the Member Alternative Description window for the alternative we just created and change its name to “Plate Girder with Section Loss”. The alternative we just created is the “Copy of Plate Girder” appearing in the tree. It does not have the (E)(C) designation in the name.

Member Alternative: Plate Girder with Section Loss

Description Specs Factors Engine Import Control Options

Description: add additional self weight for steel details such as diaphragms and stiffeners

Material Type: Steel

Girder Type: Plate

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

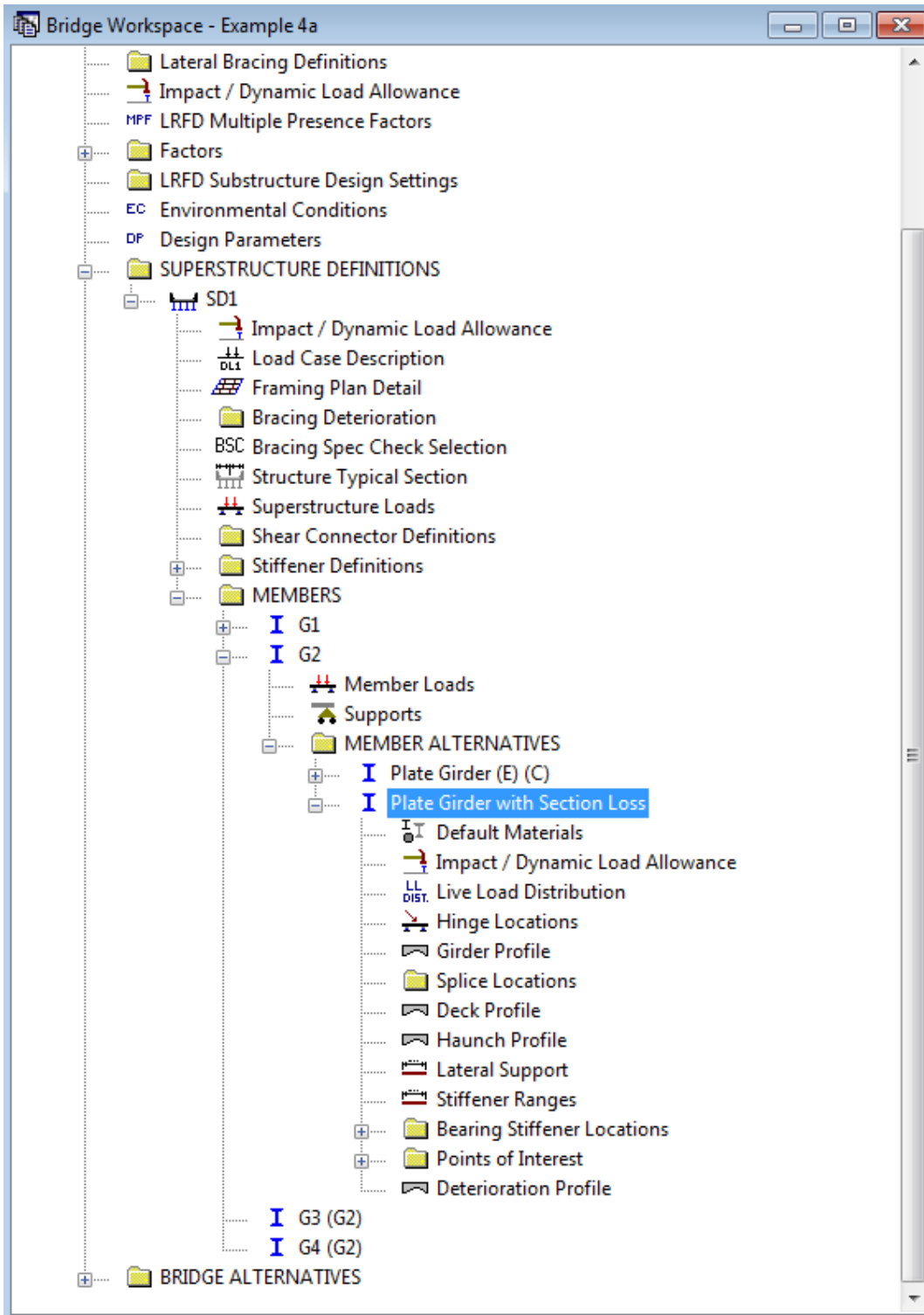
Additional self load = 0.034 kip/ft

Additional self load = %

OK Apply Cancel

STL4 - Simple Span Plate Girder with Loss Example

We now have the following Bridge Workspace:



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define deterioration for the bottom flange by double clicking on Deterioration Profile in the tree. Enter the following data on the Bottom Flange tab. Click OK to save the data to memory and close the window.

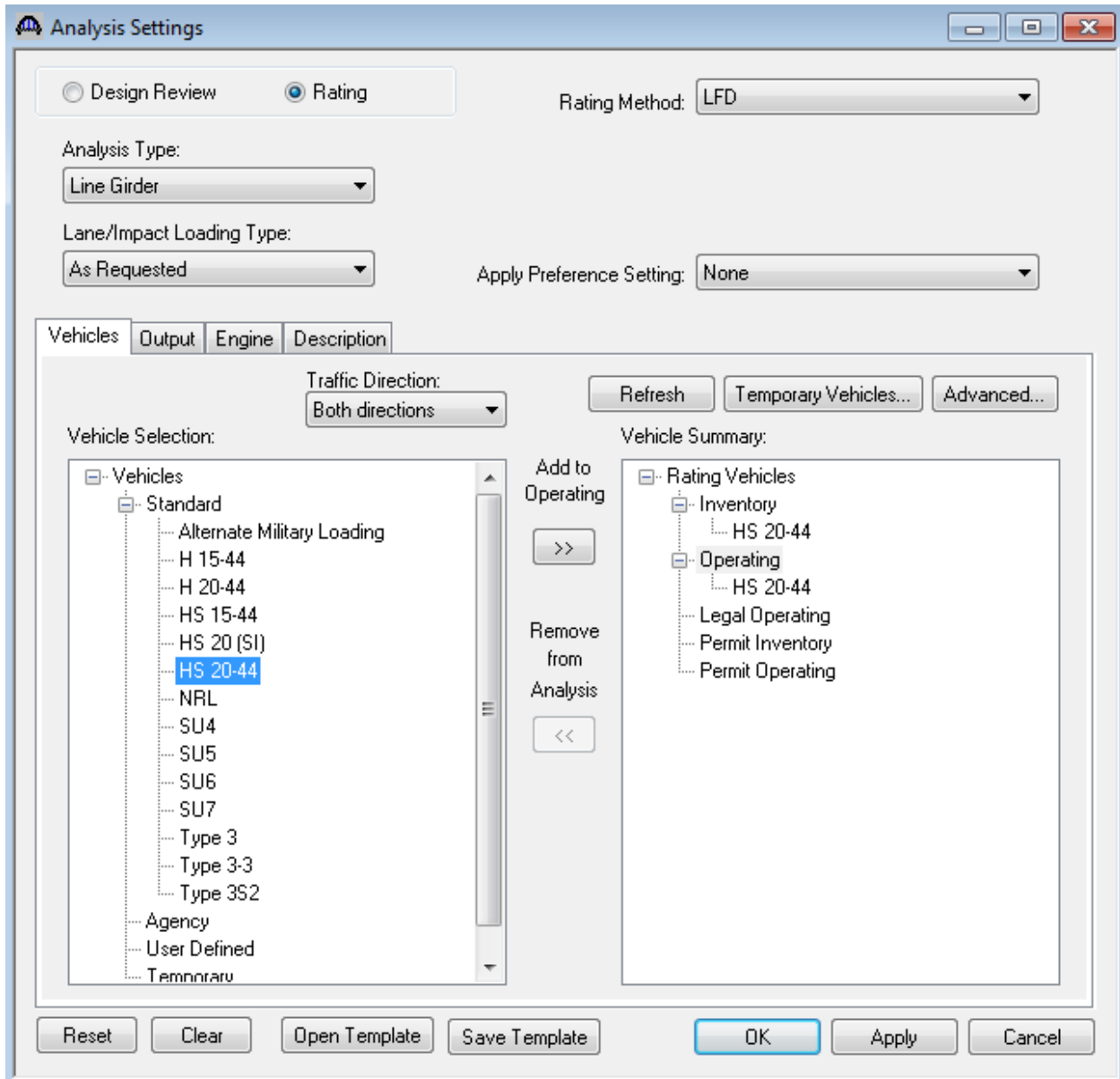
The screenshot shows a software window titled "Deterioration Profile". At the top, there is a "Type:" field containing "Plate Girder". Below this are three tabs: "Web", "Top Flange", and "Bottom Flange", with "Bottom Flange" being the active tab. The main area contains a table with the following data:

% Width Loss (%)	% Thickness Loss (%)	Support Number	Start Distance (ft)	Length (ft)	End Distance (ft)
	10.0	1	78.00	5.00	83.00

Below the table are three buttons: "New", "Duplicate", and "Delete". At the bottom of the window are three buttons: "OK", "Apply", and "Cancel".

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We can now compare ratings for the original member alternative and the member alternative with section loss. Open the Analysis Settings window by clicking the View Analysis Settings button on the toolbar or selecting Bridge/Analysis Settings from the menu. Enter the following data and click OK to save the data to memory and close the window.



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Select “Plate Girder (E)(C)” in the tree and run an analysis by selecting the Analyze toolbar button or selecting Bridge/Analyze from the menu. View the rating results by selecting the View Analysis Report toolbar button or Bridge/Tabular Report from the menu. The following results are displayed.

Analysis Results - Plate Girder

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	Lane	LFD	Inventory	31.35	0.871	80.50	1 - (50.0)	Service - Steel	As Requested	As Requested
HS 20-44	Lane	LFD	Operating	52.36	1.454	80.50	1 - (50.0)	Service - Steel	As Requested	As Requested
HS 20-44	Axle Load	LFD	Inventory	33.51	0.931	80.50	1 - (50.0)	Service - Steel	As Requested	As Requested
HS 20-44	Axle Load	LFD	Operating	55.96	1.554	80.50	1 - (50.0)	Service - Steel	As Requested	As Requested

AASHTO LFR Engine Version 6.8.0.3001
 Analysis Preference Setting: None

Close

Now run an analysis for the Plate Girder with Section Loss. The following results are produced.

Analysis Results - Plate Girder with Section Loss

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	Lane	LFD	Inventory	24.48	0.680	80.50	1 - (50.0)	Service - Steel	As Requested	As Requested
HS 20-44	Lane	LFD	Operating	40.89	1.136	80.50	1 - (50.0)	Service - Steel	As Requested	As Requested
HS 20-44	Axle Load	LFD	Inventory	26.17	0.727	80.50	1 - (50.0)	Service - Steel	As Requested	As Requested
HS 20-44	Axle Load	LFD	Operating	43.70	1.214	80.50	1 - (50.0)	Service - Steel	As Requested	As Requested

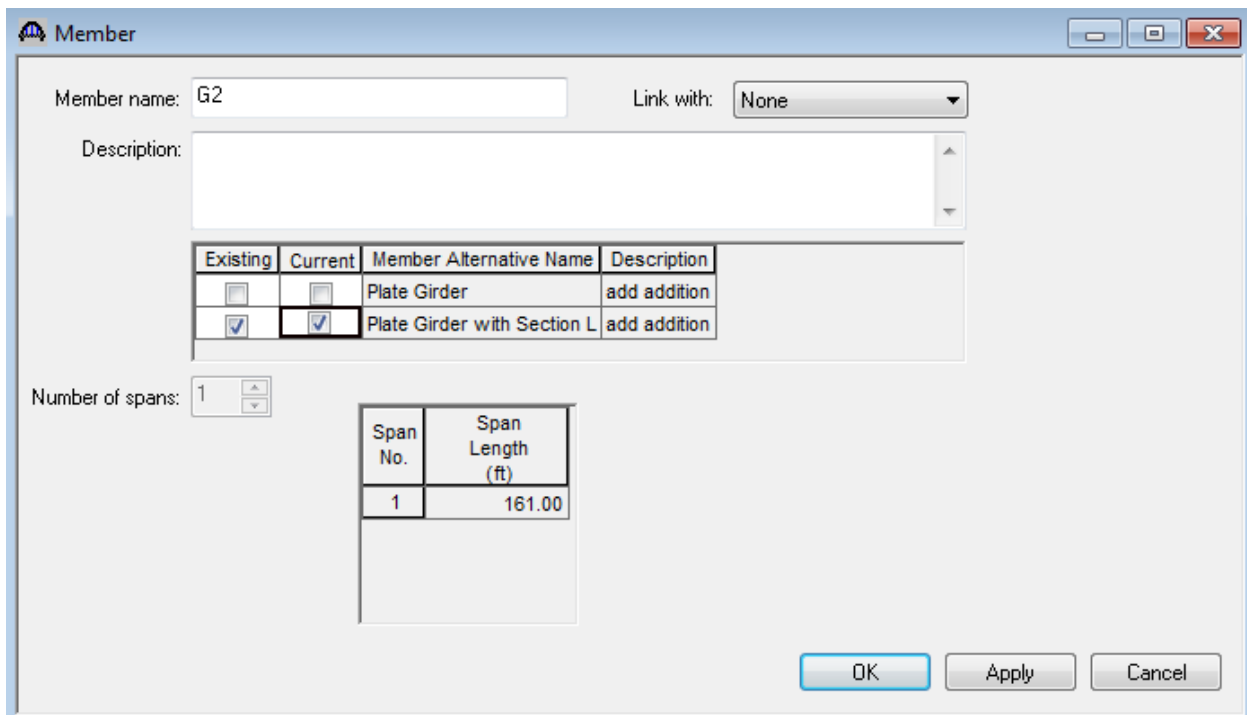
AASHTO LFR Engine Version 6.8.0.3001
 Analysis Preference Setting: None

Close

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We now have two member alternatives for Member G2. If we want the alternative with section loss to be the alternative analyzed in batch analysis processes, we must make that alternative the “Existing” alternative. A batch analysis can be performed in one of two ways. If we sit on the structure definition “SD” in the Bridge Workspace tree and select the Analyze toolbar button or Bridge/Analyze from the menu, the batch analysis will process each of the member alternatives in this structure definition that are marked as the Existing alternative. A batch analysis can also be performed in the Bridge Explorer. Multiple bridges can be selected in the Bridge Explorer and the Rate toolbar button used to rate all of the bridges. The analysis will process each of the member alternatives in the bridges that are marked as the Existing alternatives.

We can make the new alternative with section loss the alternative that is analyzed in a batch analysis by selecting it as “Existing” in the G2 Member window. Open the G2 Member window and select the “Existing” checkbox next to the Plate Girder with Section Loss alternative. The “Current” designation in this window does not mean that this alternative is the member that currently exists on the bridge today. It only indicates that this member alternative will be the member displayed in the Structure Typical Section schematic window. Select the “Current” checkbox next to the Plate Girder with Section Loss to keep it consistent with the Existing member alternative.



Member name: G2 Link with: None

Description:

Existing	Current	Member Alternative Name	Description
<input type="checkbox"/>	<input type="checkbox"/>	Plate Girder	add addition
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Plate Girder with Section L	add addition

Number of spans: 1

Span No.	Span Length (ft)
1	161.00

OK Apply Cancel

Now when this bridge is part of a batch analysis on the Bridge Explorer or in the Bridge Workspace, the analysis will be performed on the member alternative with section loss.