



Refinement to Convert Line Model to System Model

Presented by David Foremsky, PE, ProMiles

Line Model versus System Model

Line Model

- Traditional way of modeling girders
- One member at a time; all members are independent
- Can be the result of importing old files (BARS, BAR7)
- Requires calculations outside of BrDR

System Model

- Enter the cross section and framing plan information
- Members are dependent on each other for some calculations
- BrDR calculates loads and distribution factors

Why convert to system model?

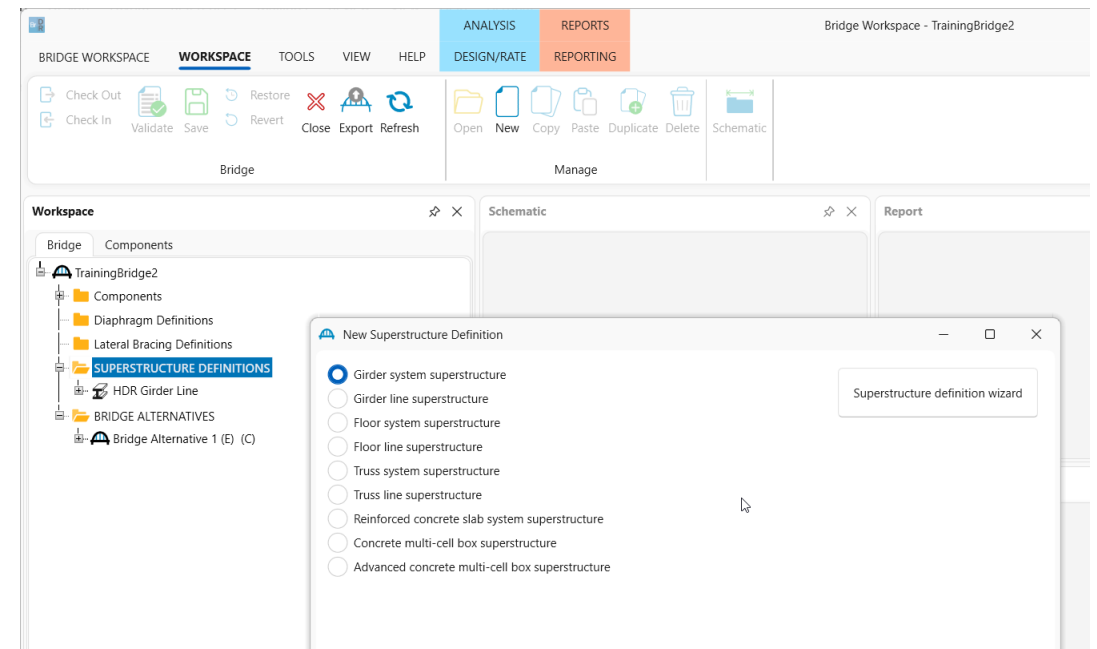
- 3D FEM analysis
- Non-standard gage analysis
- Specify travel path for permit analysis
- Distribution factor calculation
- Able to use substructure module
- Different deterioration for each member
- Easier to keep history of each member
- Can define and rate diaphragms

Do you want to build a snowman? system?

- Be prepared!
- Locate drawings of the bridge
- Inspection reports for deterioration

How to Get Started

- Can be defined two different ways
 - Manually create a new Superstructure Definition
 - Using the Superstructure Definition Wizard can save some keystrokes



Information needed for a system

- Framing plan information
 - Girder spacing
 - Support skews
 - Diaphragm locations
 - Lateral bracing information

The screenshot displays the Bridge Workspace software interface. The main window shows a project tree on the left with folders like 'Components', 'Diaphragm Definitions', 'Lateral Bracing Definitions', 'SUPERSTRUCTURE DEFINITIONS', and 'MEMBERS'. The 'Framing Plan Detail' folder is selected. A dialog box titled 'Structure Framing Plan Details' is open in the foreground. It contains the following information:

Number of spans: 1 Number of girders: 4

Layout Diaphragms Lateral bracing ranges

	Support	Skew (Degrees)
>	1	-34.9994134
	2	-34.9994134

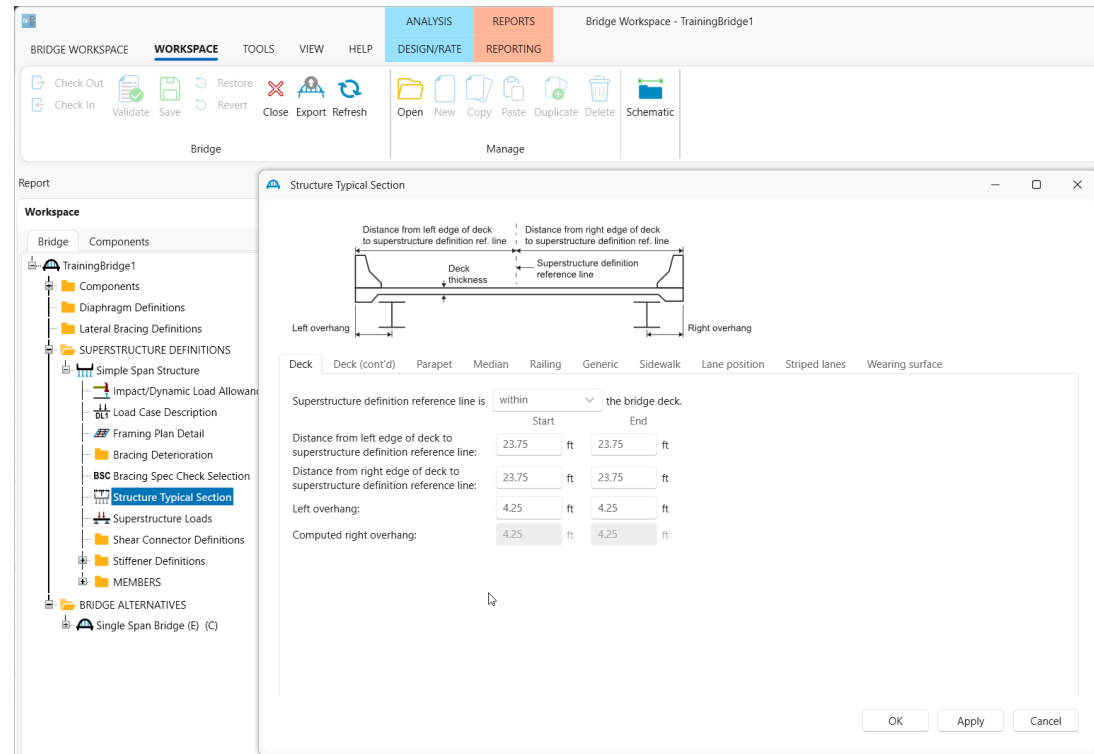
Girder spacing orientation:
☒ Perpendicular to girder
☐ Along support

Girder bay	Girder spacing (ft)	
	Start of girder	End of girder
>	1	13
	2	13
	3	13

OK Apply Cancel

Information needed for a system

- Typical section information
 - Appurtenance type and location (parapet, railing, sidewalk, etc.)
 - Deck
 - Travelway



Dead Loads

Can be copied from the line model and used as part of the verification process

Probably will want to ultimately delete in favor of the values calculated by BrDR

Superstructure Loads

Uniform temperature Gradient temperature Wind DL distribution

Stage 1 dead load distribution

☐ By tributary area
☐ By transverse simple-beam analysis
☐ By transverse continuous-beam analysis
☒ By percentage

Girder	Percentage (%)
> 1	
2	
3	
4	

☒ User-defined dead load

Stage 2 dead load distribution

☐ Uniformly to all girders
☐ By tributary area
☐ By transverse simple-beam analysis
☐ By transverse continuous-beam analysis
☒ By percentage

Girder	Percentage (%)
> 1	
2	
3	
4	

☒ User-defined dead load

Girder Member Loads

Pedestrian load: lb/ft

Uniform Distributed Concentrated Settlement

	Load case name	Span	Uniform load (kip/ft)	WS field measured*	Description
>	DC2	All Spans	0.268	☐	
	DW2	All Spans	0.213	☐	

*DW=1.25 if checked

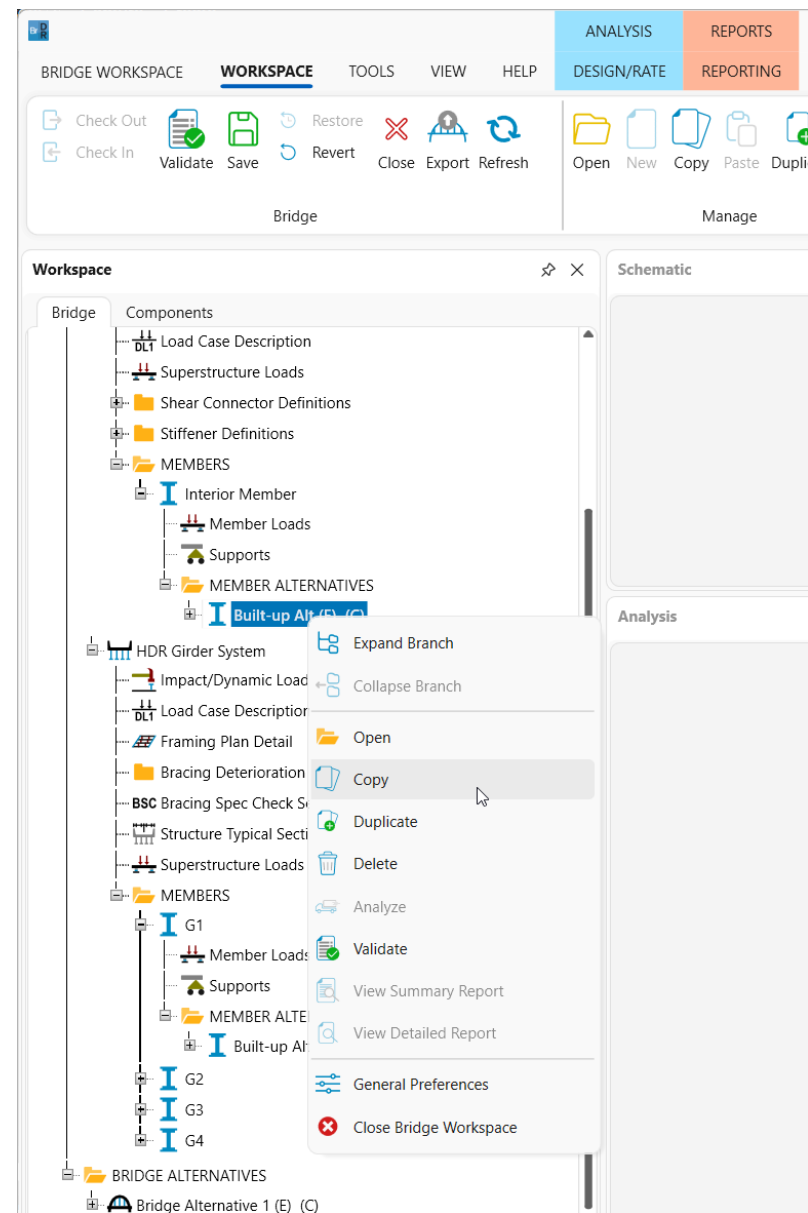
New Duplicate Delete

OK Apply Cancel

Member Alternatives

Can copy and paste from
the line model

Members can also be linked
in the system model



Distribution Factors

If the Member Alternative has been copied from a girder line model, the distribution factors will have already been manually entered

You can delete the distribution factors to have them calculated during the analysis process, or click the “Compute from typical section” button to repopulate the window

May want to keep original distribution factors while verifying the model, and delete or overwrite later

Live Load Distribution

Standard LRFD

Distribution factor input method

☒ Use simplified method ☐ Use advanced method

☐ Allow distribution factors to be used to compute effects of permit loads with routine traffic

Action: Deflection ☐ Sufficiently connected to act as a unit

Support number	Start distance (ft)	Length (ft)	End distance (ft)	Distribution factor (lanes)	
				1 lane	Multi-lane
> 1	0	180	180	0.3	0.5

Click to compute the values here

Compute from typical section... View calcs

New Duplicate Delete

OK Apply Cancel

Delete Deflection, Moment and Shear DFs

Other Systems

- The information described so far applies mostly to girder systems
- Procedure is very similar for reinforced concrete slab systems
- Floor systems are not as easy to create and define as the girder systems, but there are similar benefits with respect to load and distribution factor calculations

You've got a friend in us!

- There a tutorial example on girder line – girder system conversion on the support page at aashtowarebrdr.org/bridge-rating-and-design/training/

AASHTOWare BrDR 7.5.0

BrDR Tutorial

CNVRT1 – Converting Girder Line to Girder System Example

- Support is always available at brdr@promiles.com



Thank you!

You're welcome!

ProMiles®

AASHTOWare Rating and Design Bridge User Group Meeting 2026