

# Variable girder spacing

## Tutorial

Name:	Variable girder spacing
Description:	Procedure for developing a model with variable girder spacing.
Program:	SAP2000
Version:	14.1.0
Model ID:	na

While this tutorial was developed for the [SAP2000](#) bridge modeler, the concept also applies to [CSiBridge](#).

**On this page:**

## Key modeling steps

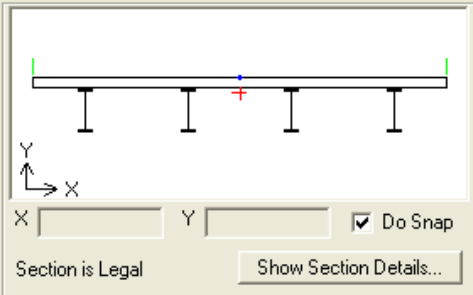
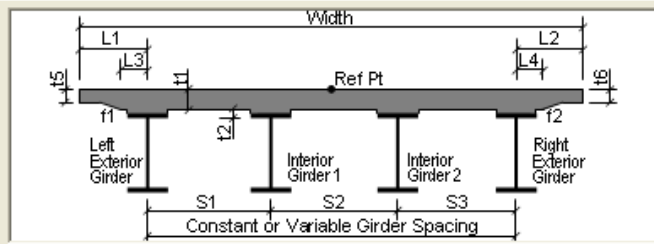
- Create a parametric variation through the Bridge > Parametric Variations option.
- Assign the parametric variation through the Bridge > Bridge Objects > Modify/Show Bridge Object > Spans > Modify/Show > Modify/Show Section Variation Along Selected Span option.

## Example

Consider a two-span bridge with two 15m long spans. The deck superstructure consists of four steel girders supporting a cast-in-place slab. Total superstructure width is 12m, girder spacing is 3m, and the overhang on each side is 1.5m.

These specifications may be defined as shown in Figure 1:

Define Bridge Section Data - Steel Girder



Section Data

Item	Value
<b>General Data</b>	
Bridge Section Name	BSEC3
Slab Material Property	4000Psi
Number of Interior Girders	2
Total Width	12.
Girder Longitudinal Layout	Along Layout Line
Constant Girder Spacing	No
Constant Girder Haunch Thickness (t2)	Yes
Constant Girder Frame Section	Yes
<b>Girder Spacing Definition</b>	
Girder Space S1	3.
Girder Space S2	3.
Girder Space S3	3.
<b>Slab Thickness</b>	
Top Slab Thickness (t1)	0.305
Concrete Haunch + Flange Thickness (t2)	0.075
<b>Girder Section Properties</b>	
Girder Section	FSEC4

Girder Output

Modify/Show Girder Force Output Locations...

Girder Spacing

Recalculate Girder Spacing...

Modify/Show Properties

Materials...

Frame Sects...

Units

KN, m, C

OK

Cancel

Figure 1 - Bridge deck section definition

For the second span, the width linearly increases from 12m to 15m. Uniform flare and one-sided flare will be considered.

### Uniform flare

Girder spacing increases from 3m to 4m. The structure is symmetric about the [layout line](#). This may be modeled as follows:

- For all girders in the second span, assign linear parametric variation (from 0m to 1m) to girder spacing.
- For the second span, assign linear parametric variation (from 0m to 3m) to the total deck width.

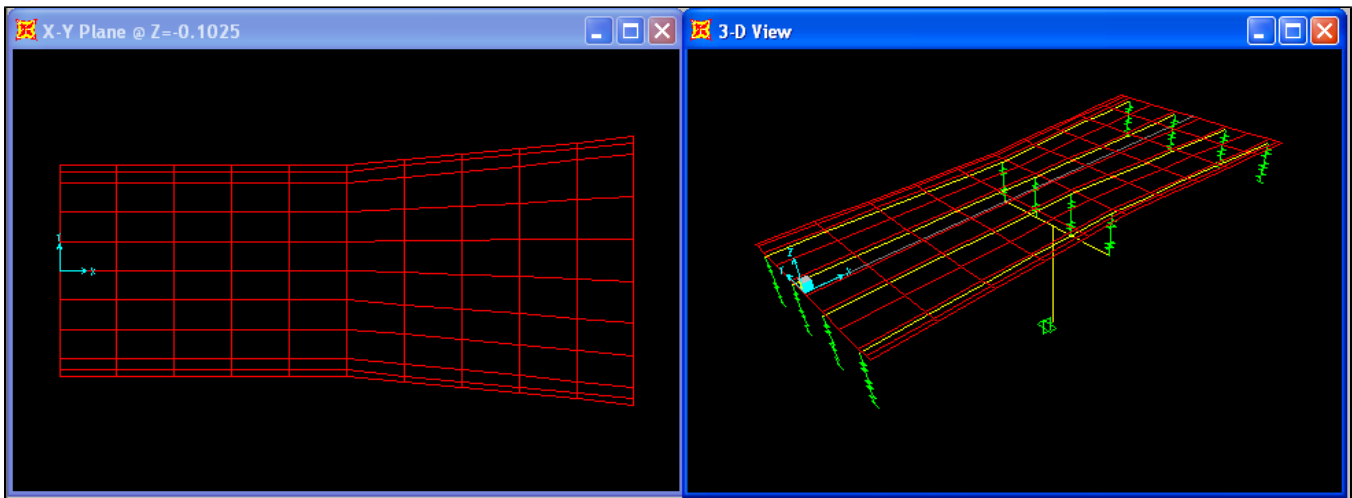


Figure 2 - Variable girder spacing for uniform flare

## One-sided flare

Girder spacing increases from 3m to 4m, while for both spans, the right edge of the bridge is straight. This may be modeled by assigning, in addition to the parametric variations for uniform flare, the following:

- Linear parametric variation (from 0m to 1.5m) to X offset from the reference point to the insertion point.

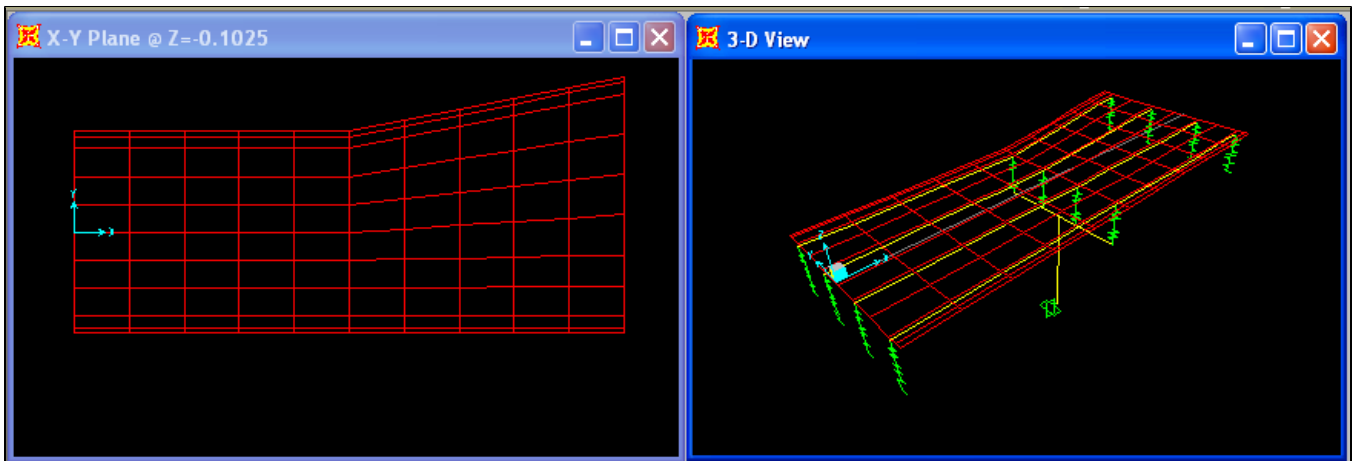


Figure 3 - Variable girder spacing for one-sided flare

## Attachments

- [SAP2000 V14.1.0 models](#) (zipped .SDB files)