
Tutorial

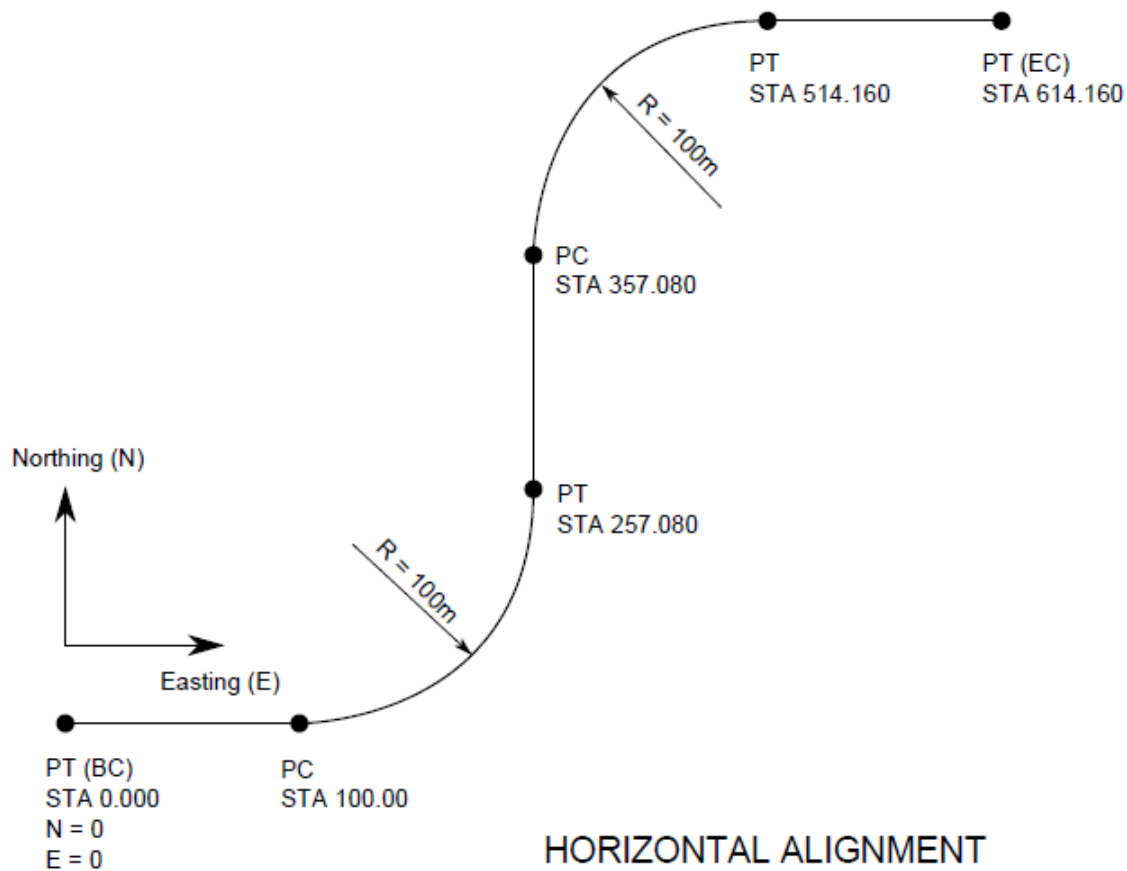
Name:	Baseline geometry
Description:	Guidelines for defining baseline vertical and horizontal geometry.
Program:	SAP2000
Version:	all
Status:	Finalize
Id:	ok/test_problems/baseline

This tutorial explains how horizontal and vertical layout line geometry can be defined in SAP2000. The layout line is broken into a number of segments between the transition points (PT - point of tangent, PC - point for curvature, PVT - point of vertical tangent, PVC - point of vertical curve). A segment is defined using the parameters available in the relevant SAP2000 form.

1. Baseline Geometry

A sample baseline to be entered into SAP2000 is described in the following two sections.

1.1. Horizontal Profile



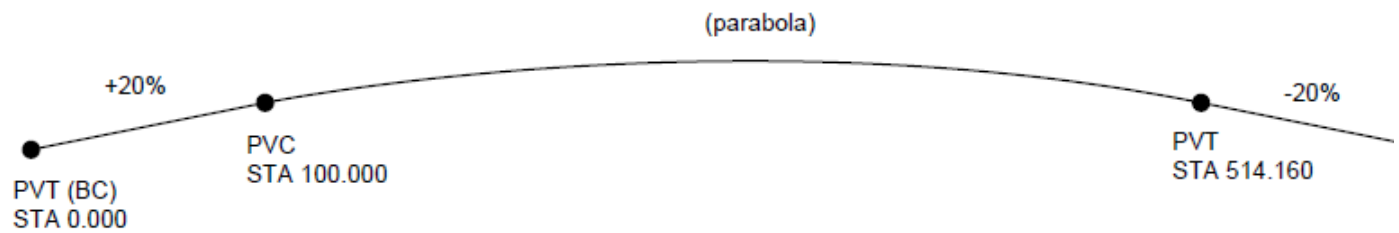
Horizontal Alignment

(all dimensions are in [m] units)

Point No.	Point Type	Station	Northing (N)	Easting (E)
1	PT	0.000	0	0
2	PC	100.000	0	100
3	PT	257.080	100	200
4	PC	357.080	200	200
5	PT	514.160	300	300
6	PT	614.160	300	400

Curve Name	Radius	Northing of Center	Easting Center
C1	100	100	
C2	100	200	

1.2. Vertical Profile



VERTICAL ALIGNMENT

Vertical Profile

(all dimensions are in [m] units)

Point No.	Point Type	Station	Elevation
1	PVT	0	0
2	PVC	100	20
3	PVI	307.08	61.42
4	PVT	514.16	20
5	PVT	614.16	0

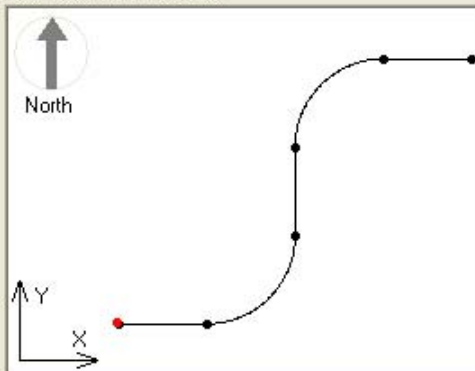
Comment

Elevation of PVI, not point on the curve


2. Data to be entered to SAP2000

Bridge Layout Line Data

Bridge Layout Line Name BLL1	Coordinate System GLOBAL	Shift Layout Line Modify Layout Line Stations...	Units KN, m, C
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Plan View (X-Y Projection)


Station: 0.
Bearing: N 90°00'00" E
Radius: Infinite
Grade: 20. %
X: 0.
Y: 0.
Z: 0.

Developed Elevation View Along Layout Line


Refresh Plot

Coordinates of Initial Station
Global X: 0.
Global Y: 0.
Global Z: 0.

Initial and End Station Data
Initial Station (m): 0.
Initial Bearing: N900000E
Initial Grade in Percent: 0.
End Station (m): 614.16

Horizontal Layout Data
Define Horizontal Layout Data... Quick Start...

Define Layout Data
Define Vertical Layout Data... Quick Start...

OK Cancel

Each row in the SAP2000 table below is used to define one segment of the horizontal alignment as follows:

- The first row indicates that the initial bearing is N 90° 0' 0" E.
- The 2nd row defines straight segment, 100m long at the previous bearing, ie. N 90° 0' 0" E.
- The 3rd row defines the first curved segment. For our alignment, there are no transition curves as the entire second segment has 100m. Therefore, we need to enter the end bearing such that it exactly corresponds to the final station for the segment. In general, the end bearing is sufficient to define a circular curve with constant radius. **If you specify radius and end bearing that do not define a circular segment with constant curvature, then an arc of the specified constant is centered within the specified station length is less than the difference in stations, transitions are created of where the curvature varies linearly from 1/R at the start to zero at the corresponding station end point.**
- The description of the next three rows is similar to the previous rows.

Bridge Layout Line - Horizontal Layout Data

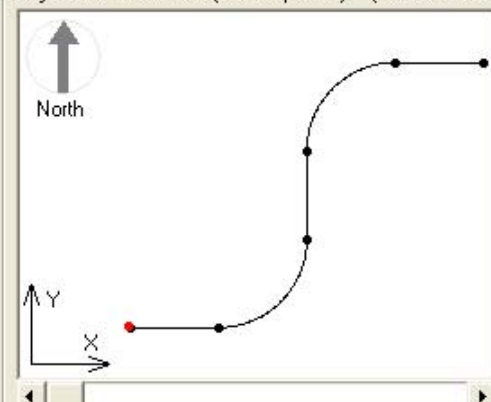
Bridge Layout Line Name: Coordinate System: Quick Start Templates:

Layout Line Segment Data

	Layout Line Segment Type	Station m	Radius m	Bearing PI to EC
	<input type="text" value=""/>	<input type="text" value="0."/>		<input type="text" value="N900000E"/>
1	Initial Station and Bearing	0.		N900000E
2	Straight at Previous Bearing To Station	100.		N900000E
3	Curve Left to New Bearing at Station	257.08	100.	N000000E
4	Straight at Previous Bearing To Station	357.08		N000000E
5	Curve Right to New Bearing at Station	514.16	100.	N900000E
6	Straight at Previous Bearing to End	614.16		N900000E

For quick editing of an existing segment right click either a table row or a segment in the sketch below.

Layout Line Plan View (X-Y Projection) (Double Click Picture for Enlarged View)



Units:

Station: Bearing: Radius: Grade: X: Y: Z: OK Cancel Refresh Plot

Each row in the SAP2000 table below is used to define one segment of the vertical alignment as follows:

- The first row lists initial elevation and initial grade as entered on the "Bridge Layout Line Data" form.
- The 2nd row defines constant slope (20% segment) up to station 100.
- The 3rd row defines parabolic segment with initial slope +20% and end slope -20%.
- Finally, the 4th row defines constant slope (-20% segment) up to station 614.16.

Bridge Layout Line - Vertical Layout Data

Bridge Layout Line Name: BLL1

Coordinate System

GLOBAL

Quick Start Templates

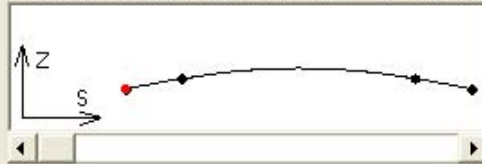
Quick Start...

Layout Line Segment Data

Layout Line Segment Type	Station m	Elevation Z m	Grade Percent	
	614.16	0.	-20.	
1 Initial Station, Elevation Z and Grade	0.	0.	0.	Insert Above
2 Constant At New Grade to Station	100.	20.	20.	Insert Below
3 Parabolic to New Grade at Station	514.16	20.	-20.	Modify
4 Constant at Previous Grade to End	614.16	0.	-20.	Delete
				Delete All

For quick editing of an existing segment right click either a table row or a segment in the sketch below.

Developed Elevation View Along Layout Line (Double Click Picture for Enlarged View)



Station: 0.
 Bearing: N 90°00'00" E
 Radius: Infinite
 Grade: 20. %
 X: 0.
 Y: 0.
 Z: 0.

Refresh Plot

Units

KN, m, C

OK

Cancel

Labels

[layout-line](#) [bridge-modeler](#) [status-ready-for-review](#)