

# LAB 12 - Point Controls, Secondary Alignments, and Parametric Constraints

This lab demonstrates the use of various controls to modify a template during processing. It will highlight various settings in point controls, illustrate the effects of a secondary alignment, and demonstrate the use of parametric constraints.

## Chapter Objectives:

- Create a Horizontal Point Control to add an additional lane using offsets.
- Create a Horizontal and Vertical Point Control to add a scab-on detour.
- Create a Horizontal Point Control using a Secondary Alignment.
- Use Parametric Constraints to widen the road surface.

Before beginning this lab, verify that the following files are loaded:



- C:\Projects\12345\Design\Drawings\Reference\_Files\12345DES\_Model.dgn
- C:\Workspace\Workspace-CDOT\_XM\Standards-Global\InRoads\Preferences\CDOT\_Civil.xin
- C:\Projects\12345\Design\InRoads\12345DES\_Geometry.alg
- C:\Projects\12345\Design\InRoads\12345 existing ground.dtm
- C:\Projects\12345\Design\InRoads\12345DES.ird
- C:\Projects\12345\Design\InRoads\DES12345\_Templates.itl

## Lab 12.1 - Adding an Additional Lane with Offset Point Controls

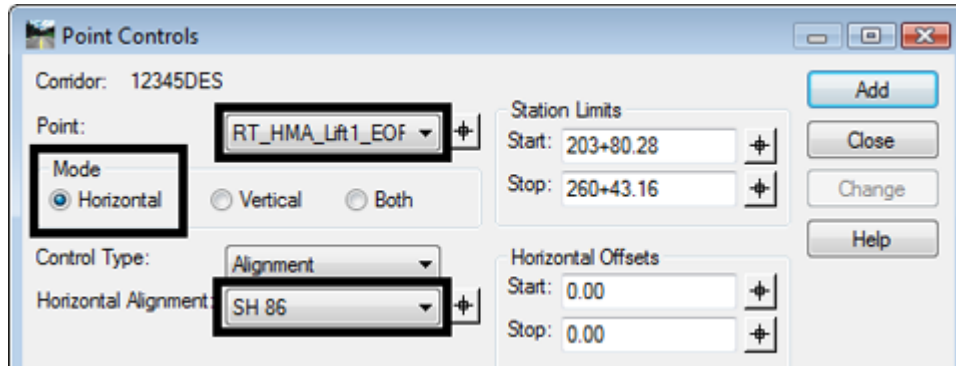
In this exercise the corridor created in the previous lab is modified by adding an additional lane to the right side of the template using a standard point control. This control is based on the centerline (SH 86) alignment and uses offset distances from this alignment to modify the template. Three control entries are required to complete the transition.

1. Select **Modeler > Roadway Designer** from InRoads.
2. Verify that the **12345DES** corridor is active.

The first point control transitions from two lanes to three lanes.

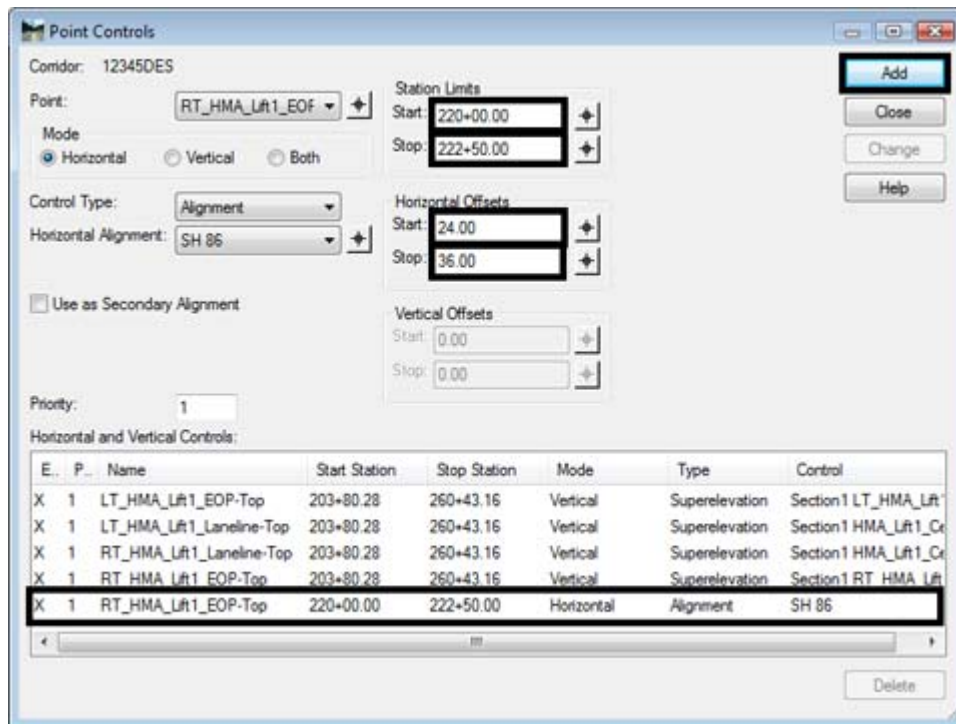
3. In the Roadway Designer dialog box, select **Corridor > Point Controls** from the menu bar or <D> the point controls button .
4. In the **Point Controls** dialog box, select **RT\_HMA\_Lift1\_EOP-Top** for the point. Use the drop down menu or <D> the “target”  button and then <D> the point in the template view to make the selection.
5. Toggle on **Horizontal** for the **Mode**.

- Set the **Horizontal Alignment** to SH 86.



- Key in **220+00.00** in the **Station Limits Start** field.
- Key in **222+50.00** in the **Station Limits Stop** field.
- Key in **24** in the **Horizontal Offsets Start** field.
- Key in **36** in the **Horizontal Offsets Stop** field.
- <D> **Add**. The entry is added to the **Horizontal and Vertical Controls** list.

This creates the beginning transition for the additional lane.



The Point, Mode, Control Type, and Horizontal Alignment stay the same for the two remaining entries. Only the Stations and Offsets change. the second point control maintains the third lane.

- Key in **222+50.00** in the **Station Limits Start** field.

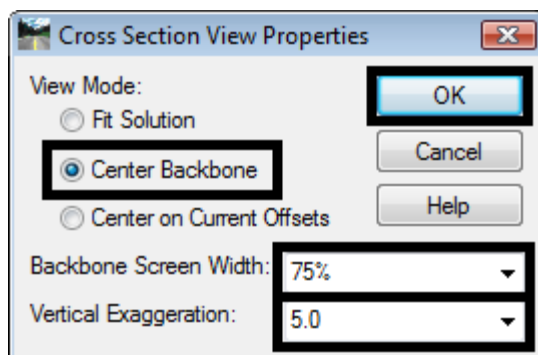
13. Key in **229+00.00** in the **Station Limits Stop** field.
  14. Key in **36.00** in the **Horizontal Offsets Start** field.
  15. Key in **36.00** in the **Horizontal Offsets Stop** field.
  16. <D> **Add**. This entry maintains the full width of the additional lane.
- The third point control transitions from three lanes back to two lanes.
17. Key in **229+00.00** in the **Station Limits Start** field.
  18. Key in **231+50.00** in the **Station Limits Stop** field.
  19. Key in **36.00** in the **Horizontal Offsets Start** field.
  20. Key in **24.00** in the **Horizontal Offsets Stop** field.
  21. <D> **Add**. This entry transitions the template back to its normal width.
  22. <D> **Close** to dismiss the **Point Controls** dialog box.

Horizontal and Vertical Controls:

Ena...	Priority	Name	Start Station	Stop Station	Mode	Type	Control
X	1	RT_HMA_Lft1_...	220+00.00	222+50.00	Horizontal	Alignment	SH 86
X	1	RT_HMA_Lft1_...	222+50.00	229+00.00	Horizontal	Alignment	SH 86
X	1	RT_HMA_Lft1_...	229+00.00	231+50.00	Horizontal	Alignment	SH 86

This series of steps sets the display in the template view to a specific size. This makes it easier to see the transitions occur when scrolling through the stations.


23. <R> in the template view of the Roadway Designer dialog box and select **Display Properties** from the menu.
24. Toggle on **Center Backbone**.
25. Key in **75%** (.75) for the **Backbone Screen Width**.
26. **Select 5** for the **Vertical Exaggeration**.
27. <D> **OK**. This makes the template change easier to see when scrolling through the stations.

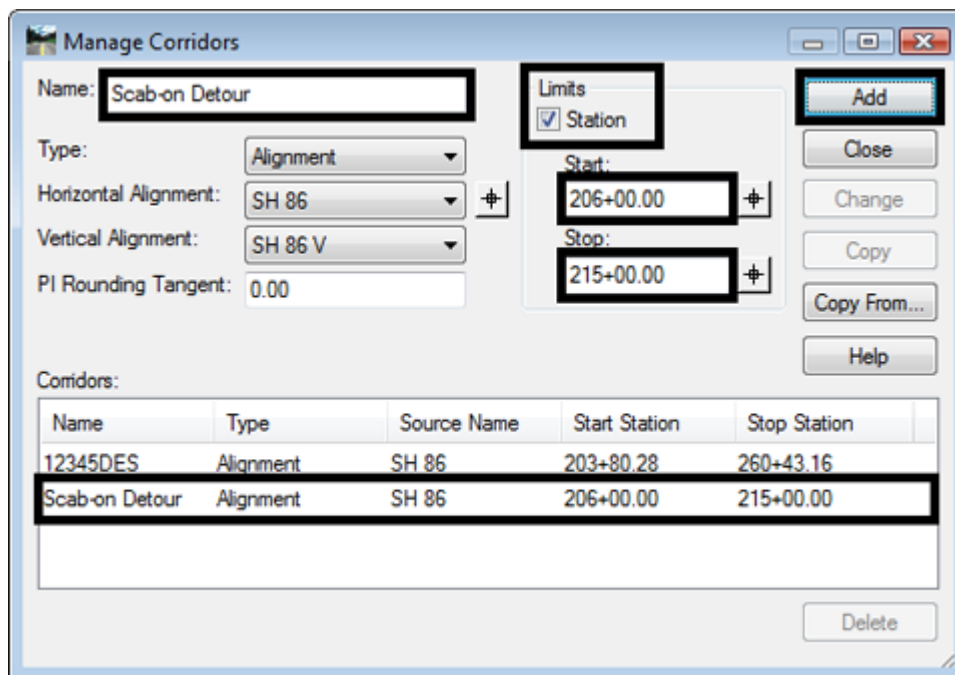


28. Scroll through the stations between 220+00.00 and 231+50.00 and notice how the template behaves.
29. Select **File > Save** from the Roadway Designer menu bar.


## Lab 12.2 - Creating a Scab-On Detour using Point Controls

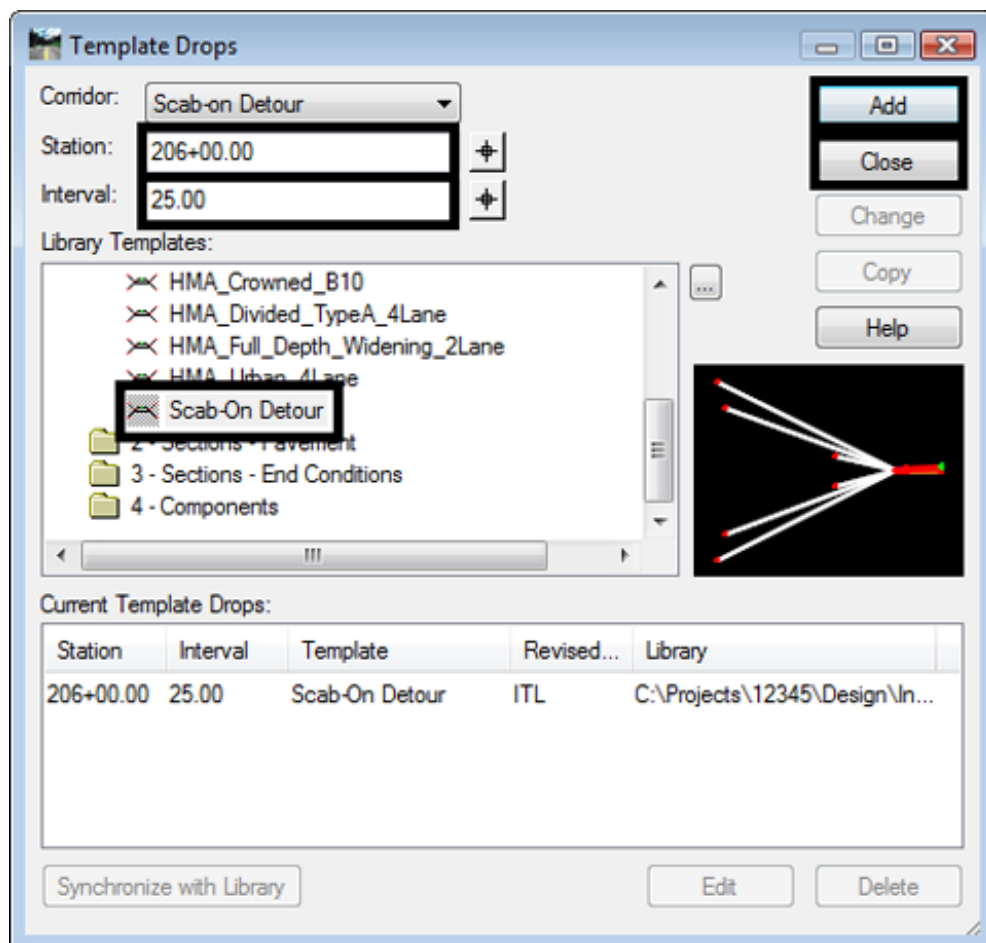
In this exercise a scab-on detour is added to the left side of the existing pavement from station 206+00 to 215+00. This requires a new corridor, template drop, and two sets of point controls. One is a horizontal and vertical control that follows the existing edge of pavement. The second is a horizontal offset control that transitions the detour to its full width.

1. Select **Corridor > Corridor Management** from the Roadway Designer menu bar or <D> the **Manage Corridors** button .
2. In the **Manage Corridors** dialog box, key in **Scab-on Detour** for the **Name**.
3. Toggle on the **Station Limits**.
4. Key in **206+00.00** for the **Start** station.
5. Key in **215+00.00** for the **Stop** station.
6. <D> **Add**.
7. <D> **Close**.



This corridor could have been built on the edge of pavement feature from the dtm, but by using the alignment it will be easier to locate stations.

8. Select **Corridor > Template Drops** from the Roadway Designer menu bar or <D> the **Template Drops** button 
9. In the **Template Drops** dialog box, key in **206+00.00** for the **Station**.
10. Key in **25** for the **Interval**.
11. Expand the **C:\Projects\12345\Design\InRoads\DES12345-Templates.itl > 1- Templates** folder in the **Library Templates** area and highlight the **Scab-on Detour** template.
12. <D> **Add**.
13. <D> **Close**.



The first point control moves the origin of the template from the SH 86 alignment to the left edge of pavement feature in the 12345 Existing Ground surface.

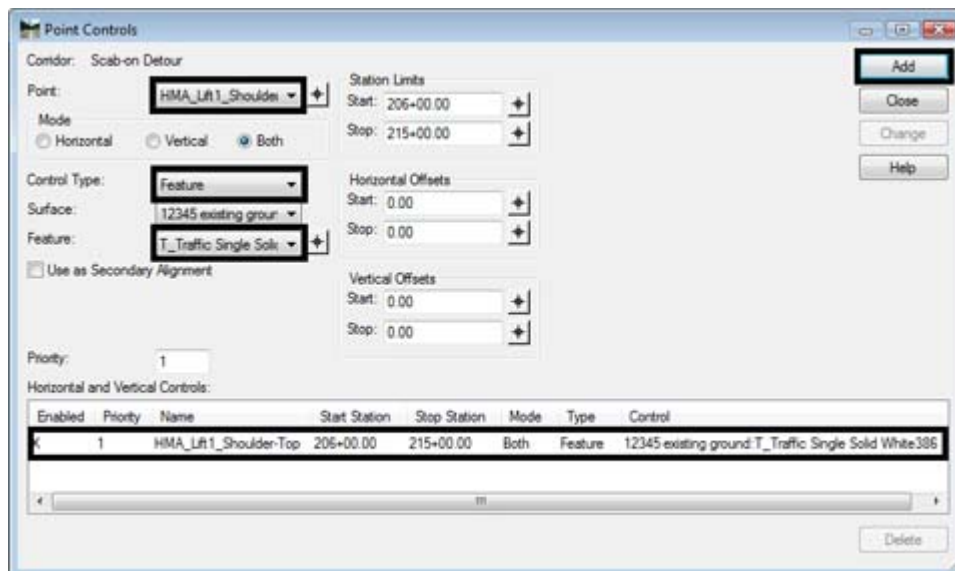
14. In the Roadway Designer dialog box, select **Corridor > Point Controls** from the menu bar or <D> the point controls button.
15. In the **Point Controls** dialog box, select **HMA\_Lift1\_Shoulder-Top** for the **Point**.

16. Toggle on **Both** for the **Mode**.
17. Select **Feature** for the **Control Type**.
18. Select **T\_Traffic Single Solid White386** for the feature (This is the 18th T\_Traffic Single Solid in the pull down list).

**Note:** Creating a feature filter will make it easier to locate the desired feature. The filter should **Start With None**, use the **Name Attribute**, and have a **Value** of **\*386\***. See the module *“Initial Surface Procedures”* of the *“Practical Guide for InRoads XM”* for more information in feature filters.

**Note:** The 12345 existing ground surface is the only dtm loaded so it is selected by default.

19. <D> Add.



Notice that the template has moved to approximately 12 feet to the left. Next, a horizontal point control is created that transitions the detour to its full width.

20. In the **Point Controls dialog** box, set the **Point** to **LT\_HMA\_Lift1\_EOP-Top**.
21. Toggle on **Horizontal** for the **Mode**.
22. Set the **Control Type** to **Alignment**.
23. Set the **Horizontal Alignment** to **SH 86**.
24. In the **Station Limits** area, key in **206+00.00** for the **Start** station.
25. Key in **208+50.00** for the **Stop** station.
26. In the **Horizontal Offsets** area, key in **-11.93** for the **Start** offset.
27. Key in **-24.00** for the **Stop** offset.

28. <D> **Add**.

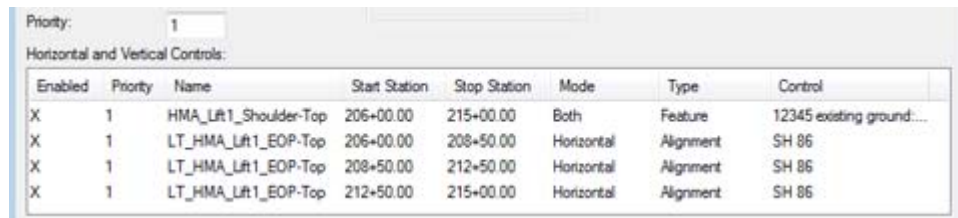
The Point, Mode, Control Type, and Horizontal Alignment stay the same for the two remaining entries. Only the Stations and Offsets change. The steps below create a point control that maintains the detour's full width.

29. Key in **208+50.00** in the **Station Limits Start** field.30. Key in **212+50.00** in the **Station Limits Stop** field.31. Key in **-24.00** in the **Horizontal Offsets Start** field.32. Key in **-24.00** in the **Horizontal Offsets Stop** field.33. <D> **Add**. This entry maintains the full width of the additional lane.

The final point control transitions from the full width to the end of the detour.

34. Key in **212+50.00** in the **Station Limits Start** field.35. Key in **215+00.00** in the **Station Limits Stop** field.36. Key in **-24** in the **Horizontal Offsets Start** field.37. Key in **-12.22** in the **Horizontal Offsets Stop** field.

**Note:** The offset distances entered are measured from the specified Horizontal alignment and not from the origin of the template.

38. <D> **Add**.


Priority: 1

Horizontal and Vertical Controls:

Enabled	Priority	Name	Start Station	Stop Station	Mode	Type	Control
X	1	HMA_Lft1_Shoulder-Top	206+00.00	215+00.00	Both	Feature	12345 existing ground...
X	1	LT_HMA_Lft1_EOP-Top	206+00.00	208+50.00	Horizontal	Alignment	SH 86
X	1	LT_HMA_Lft1_EOP-Top	208+50.00	212+50.00	Horizontal	Alignment	SH 86
X	1	LT_HMA_Lft1_EOP-Top	212+50.00	215+00.00	Horizontal	Alignment	SH 86

39. <D> **Close** to dismiss the **Point Controls** dialog box.

Scroll through the stations and notice how the template behaves. From station 206+00 to station 208+50 the template expands from the existing edge of pavement until it reaches its full width. Then it maintains that width from station 208+50 to station 212+50. Finally, it contracts back to the pavement edge from station 212+50 to station 215+00.

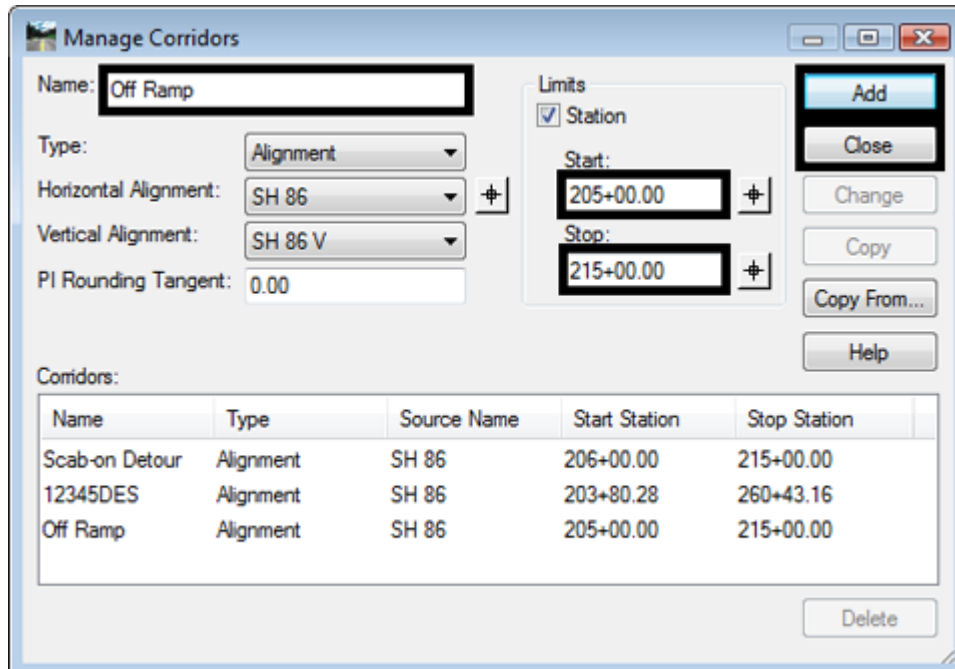
40. Select **File > Save** from the Roadway Designer menu bar.

## Lab 12.3 - Using Horizontal Point Control and a Secondary Alignment

Alignments other than the design centerline can be used for horizontal controls. Typically, they are used to modify the width of the template. They can also be used to change the direction (in relation to the design centerline) that the template components are placed. When an alignment is used in this manner, it is called a secondary alignment.

This exercise uses a secondary alignment to create the beginning of an off ramp. A new corridor is created using the SH 86 alignment.

1. Select **Corridor > Corridor Management** from the Roadway Designer menu bar or <D> the **Corridor Management** button.
2. In the **Manage Corridors** dialog box, key in **Off Ramp** for the **Name**.
3. Toggle on the **Station Limits**.
4. Key in **205+00.00** for the **Start** station.
5. Key in **215+00.00** for the **Stop** station.
6. <D> **Add**.
7. <D> **Close**.

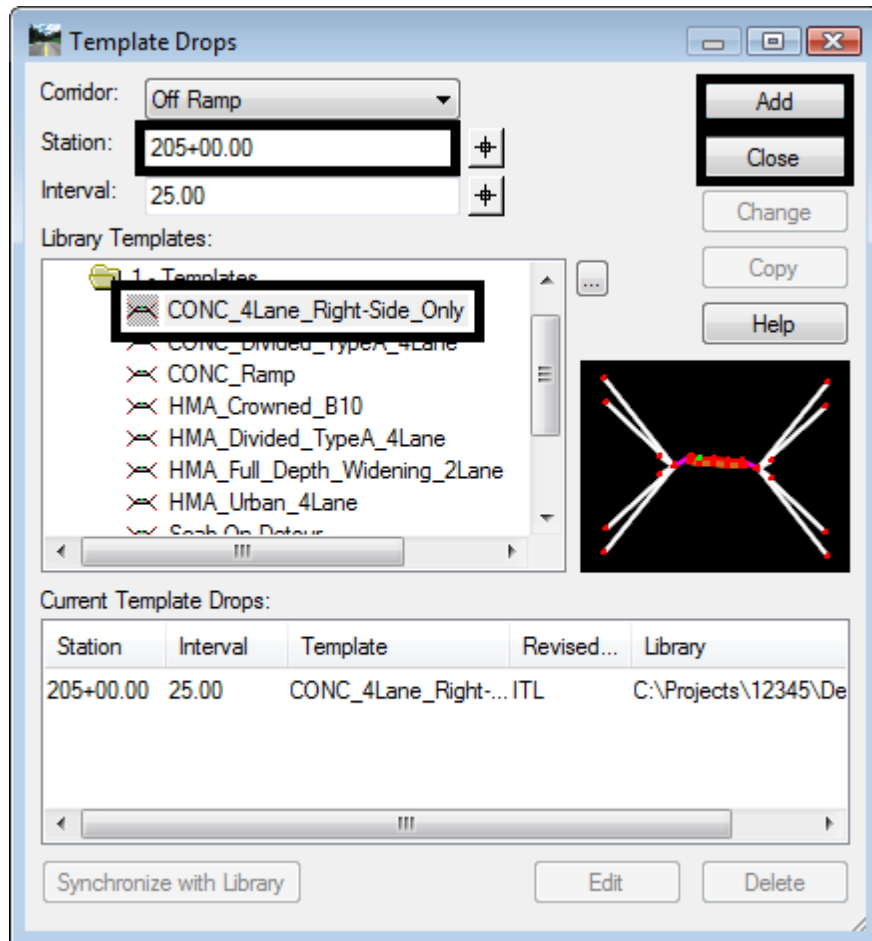


A single template drop is required for this corridor.

8. Select **Corridor > Template Drops** from the Roadway Designer menu bar or <D> the **Template Drops** button.
9. In the **Template Drops** dialog box, key in **205+00.00** for the **Start** station.



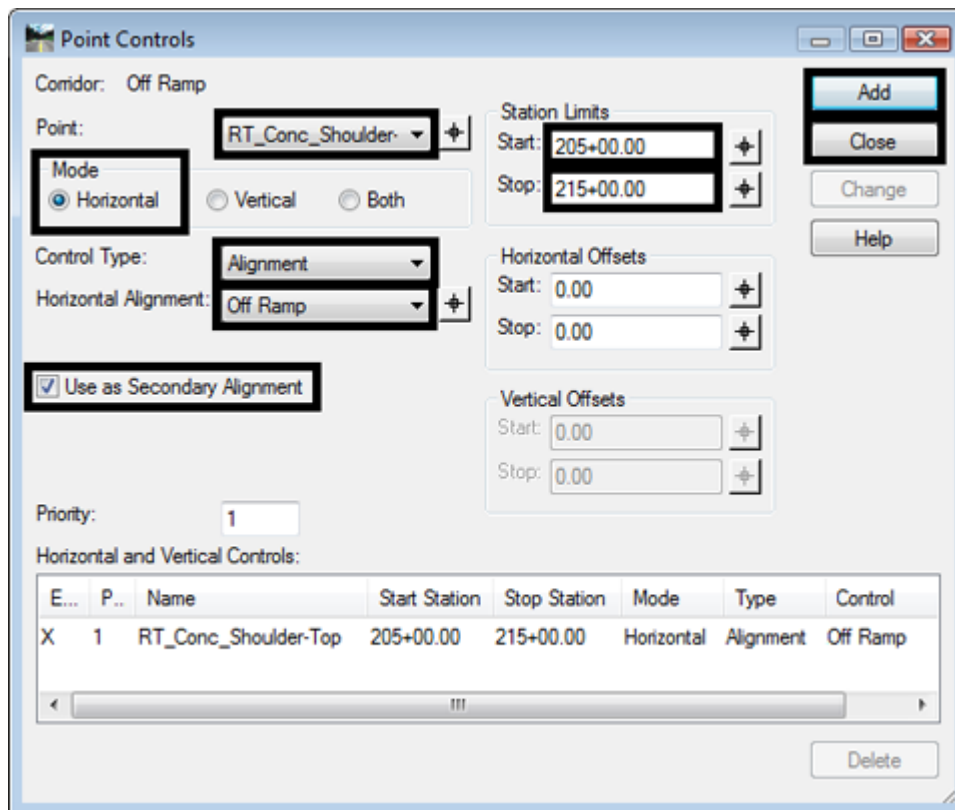
10. Key in **25** for the **Interval**.
11. Expand the **C:\Projects\12345\Design\InRoads\DES12345-Templates.itl > 1- Templates** folder in the **Library Templates** area and highlight the **CONC\_4Lane\_Right-Side\_Only** template.
12. <D> **Add**.
13. <D> **Close**.



A horizontal point control is used to widen the template and reposition its components perpendicular to the Off Ramp alignment.

14. In the Roadway Designer dialog box, select **Corridor > Point Controls** from the menu bar or <D> the point controls button.
15. In the **Point Controls** dialog box, select **RT\_Conc\_Shoulder-Top** for the **Point**.
16. Toggle on **Horizontal** for the **Mode**.
17. Select **Alignment** for the **Control Type**.
18. Select **Off Ramp** for the **Horizontal Alignment**.

19. In the Station Limits area, key in **205+00.00** for the **Start** station.
20. Key in **215+00.00** for the **Stop** station.
21. Make sure the **Horizontal Offsets** are set to **0**.
22. Toggle on **Use as Secondary Alignment**.
23. <D> **Add**.
24. <D> **Close**.



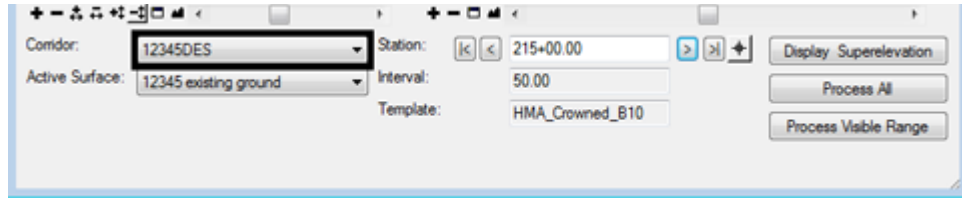
25. Scroll through the stations between **205+00.00** and **215+00.00** and notice how the template behaves. The orange line in the plan view and the template view represents the Off Ramp alignment. Notice how the template line (the yellow line in the plan view) outside the Off Ramp alignment changes so that it is perpendicular to the Off Ramp alignment.
26. Select **File > Save** from the **Roadway Designer** menu bar.

## Lab 12.4 - Using Parametric Constraints to Widen the Road Surface

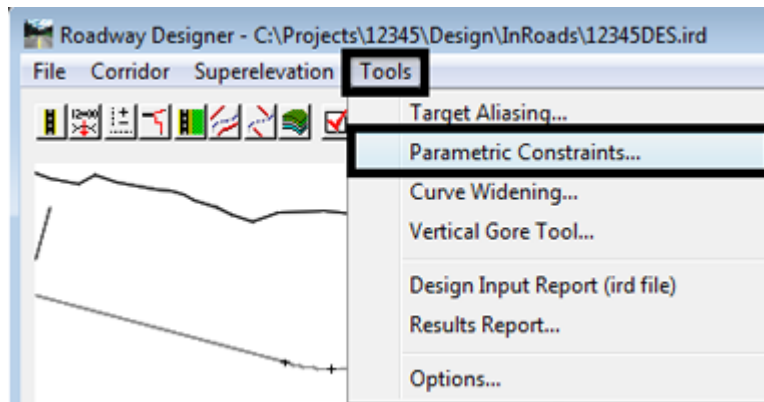
**Parametric Constraints** are used to modify the value of the constraint. This option allows greater flexibility of what can be modified during processing as slopes and vector/offsets can be modified in addition to the usual horizontal and vertical controls. In this exercise, the **Horizontal Constraint** of a template point is modified to widen the template on the left side. This is done in a similar manner to the first exercise.

The corridor used in Lab 6.1 is also used here.

1. In the Roadway Designer dialog box, select **12345DES** for the corridor.



2. Select **Tools > Parametric Constraints** from the Roadway Designer menu bar.



3. In the **Parametric Constraints** dialog box, select **LT\_EOP-Top-Horiz** for the **Constraint Label**.
4. Key in **-36** for the **Stop Value** (the **Start Value** stays the same for this entry).
5. In the **Station Limits** area, key in **237+00.00** for the **Start** station.
6. Key in **239+50.00** for the **Stop** station.

## 7. &lt;D&gt; Add.

Corridor: 12345DES

Constraint Label: LT\_EOP-Top-Horiz

Start Value: -24.00

Stop Value: -36.00

Station Limits

Start: 237+00.00

Stop: 239+50.00

Override Values:

Name	Start Value	Stop Value	Start Station	Stop Station
LT_EOP-Top-Horiz...	-24.00	-36.00	237+00.00	239+50.00

8. Key in **-36** for the **Start Value** (the **Stop Value** stays at -36).
9. In the **Station Limits** area, key in **239+50.00** for the **Start** station.
10. Key in **252+50.00** for the **Stop** station.
11. <D> Add.
12. Key in **-24** for the **Stop Value** (the **Start Value** stays at -36).
13. In the **Station Limits** area, key in **252+50.00** for the **Start** station.
14. Key in **255+00.00** for the **Stop** station.
15. <D> Add.
16. <D> Close. This dismisses the **Parametric Constraints** dialog box.

Corridor: 12345DES

Constraint Label: LT\_EOP-Top-Horiz

Start Value: -36.00

Stop Value: -24.00

Station Limits

Start: 252+50.00

Stop: 255+00.00

Override Values:

Name	Start Value	Stop Value	Start Station	Stop Station
LT_EOP-Top-Horiz	-24.00	-36.00	237+00.00	239+50.00
LT_EOP-Top-Horiz	-36.00	-36.00	239+50.00	252+50.00
LT_EOP-Top-Horiz	-36.00	-24.00	252+50.00	255+00.00

17. Scroll through the stations between **237+00.00** and **255+00.00** and notice how the template behaves.
18. Select **File > Save** from the **Roadway Designer** menu bar.
19. **<D> Close** to dismiss the Roadway Designer dialog box.

### **Chapter Summary:**

- In [Lab 12.1 -Adding an Additional Lane with Offset Point Controls](#) Horizontal Point Controls were used to add an additional lane to the design. The control was based off the design centerline with offset distances measured from that alignment.
- [Lab 12.2 -Creating a Scab-On Detour using Point Controls](#) a Horizontal and Vertical Point Control was created to locate a template on the edge of the existing pavement. The edge of pavement feature from the existing ground surface was used to locate the template. A horizontal control based off the design centerline was also used to transition the template, creating the scab-on detour.
- In [Lab 12.3 -Using Horizontal Point Control and a Secondary Alignment](#) a Horizontal Point Control using a Secondary Alignment was created. By changing the angle of the components outside of the secondary alignment, their shape is maintained around curves making this option ideal for ramps and street returns.
- [Lab 12.4 -Using Parametric Constraints to Widen the Road Surface](#) used Parametric Constraints to widen the road surface. The results were similar to those achieved in the first exercise but a different method was used.

