LAB 26 - Using Walls in a Corridor Run

Walls Are used to reduce the width of sideslopes in areas restricted by right of way, roads or other structures, or natural obstacles. Other labs in this series describe the design of independent walls. In this lab, walls are used as part of the template in a corridor run.

Chapter Objectives:

- Modify an existing wall component for a specific situation.
- Add the modified wall component to a template.
- Construct a new wall component that targets a surface feature.

The Following files are used in this lab:

- C:\Projects\12345\Design\Drawings\Reference_Files\12345DES_Walls-Lab.dgn
- C:\Projects\12345\Design\InRoads\12345DES_Walls-Lab.alg
- C:\Projects\12345\Design\InRoads\12345DES_Walls-Lab.ird
- C:\Workspace\Workspace-CDOT_XM\Standards-Global\InRoads\Templates\CDOT_Template-Library.itl
- C:\Projects\12345\DesignROW_Survey\InRoads\DTM\12345 Walls-Lab.dtm

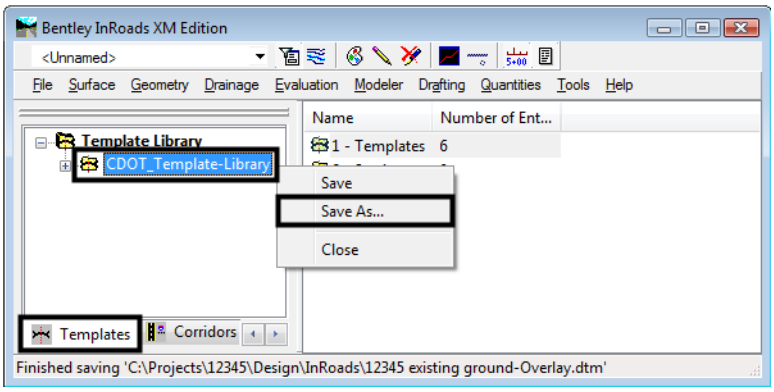
Each of these walls are applied to the same corridor. The wall component that is currently in the library is used on the right side of the template. The new wall component, that is built as part of the lab, is used on the left side.

Lab 26.1 - Add an Existing Wall Component to a Template

The existing wall component has the basic layout needed for this project. It just needs a couple of minor alterations to make it fit into the location where it is used. In this exercise, the wall component is added to the template and the minor changes are made.

1. Open MicroStation and InRoads using the **C:\Projects\12345\Design\Drawings\Reference_Files\12345DES_Walls-Lab.dgn** file.
2. Load the following files into InRoads:
   - **C:\Projects\12345\Design\InRoads\12345DES_Walls-Lab.alg**
   - **C:\Projects\12345\Design\InRoads\12345DES_Walls-Lab.ird**
   - **C:\Projects\12345\ROW_Survey\InRoads\DTM\12345 Walls-Lab.dtm**
   - **C:\Workspace\Workspace-CDOT_XM\Standards-Global\InRoads\Templates\CDOT_Template-Library.itl**
3. Verify that the **C:\Workspace\Workspace-CDOT_XM\Standards-Global\InRoads\ Preferences\CDOT_Civil.xin** file is loaded.
4. In the InRoads explorer, **<D>** the **Template** tab.

5. **<R>** on the **CDOT_Template-Library** and select **Save As** from the right click menu.



6. In the **Save As** dialog box, verify that the **C:\Projects\12345\Design\InRoads** directory is selected.

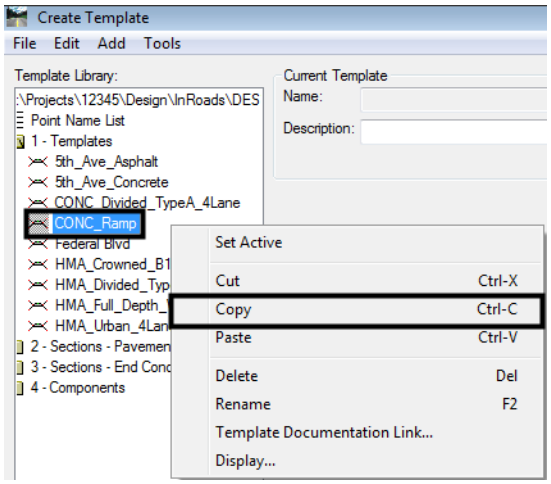
7. In the ***File name*** field, key in ***DES12345_Walls-Lab***.

8. **<D> Save** then **<D> Cancel**.

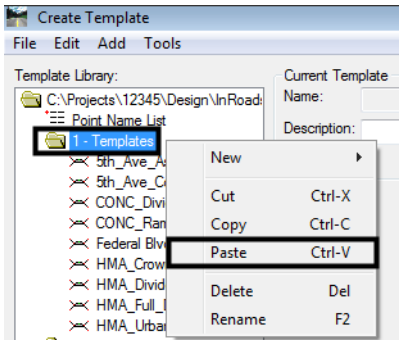
9. From the InRoads menu bar, select **Modeler > Create Template**.

10. In the ***Create Template*** dialog box, expand the **C:\Projects\12345\Design\InRoads\DES12345_Walls-Lab > 1 - Templates** folder.

11. **<R>** on the **CONC_Ramp** template and select **Copy** from the right click menu.



12. **<R>** on the **1 - Templates** folder and select **Paste** from the right click menu. This creates the ***CONC_Ramp1*** template.



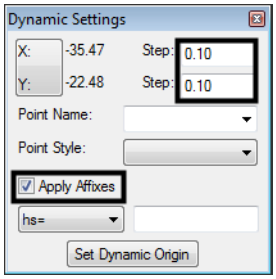
13. **<R>** on the **CONC_Ramp1** template and select **Rename** from the right click menu.

14. Key in ***CONC_Ramp_with_Walls*** for the name.

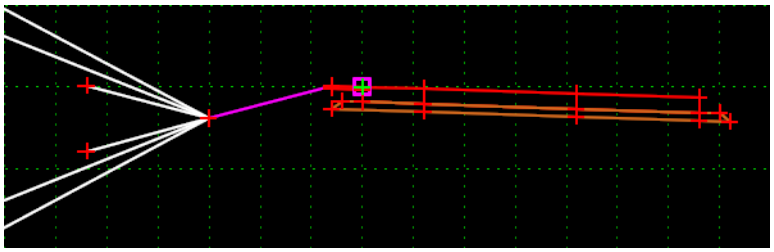
15. **<D> <D>** on the **CONC_Ramp_with_Walls** template to make it active. Display the ***Dynamic Settings*** dialog box.

16. In the ***Dynamic Settings*** dialog box, set the ***Steps*** to ***0.10***.

17. Toggle on **Apply Affixes**.



18. Delete the POSS and end condition components from the right side of the template. The illustration below shows the template with the components deleted.

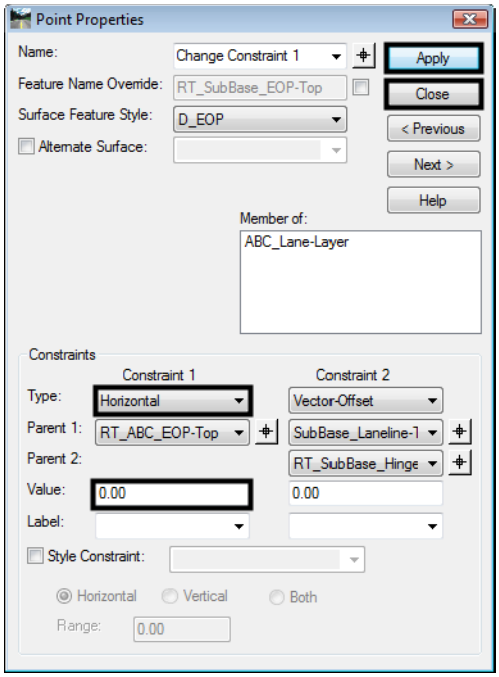


Next, the RT_SubBase_EOP-Top point is moved to line up under the RT_ABC_EOP-Top point. This is so that it will not overlap into the wall base.

19. **<D> <D>** on the **RT_SubBase_EOP-Top** point to display the ***Point Properties*** dialog box.

20. Change the ***Constraint 1 Type*** from ***Slope*** to **Horizontal**.

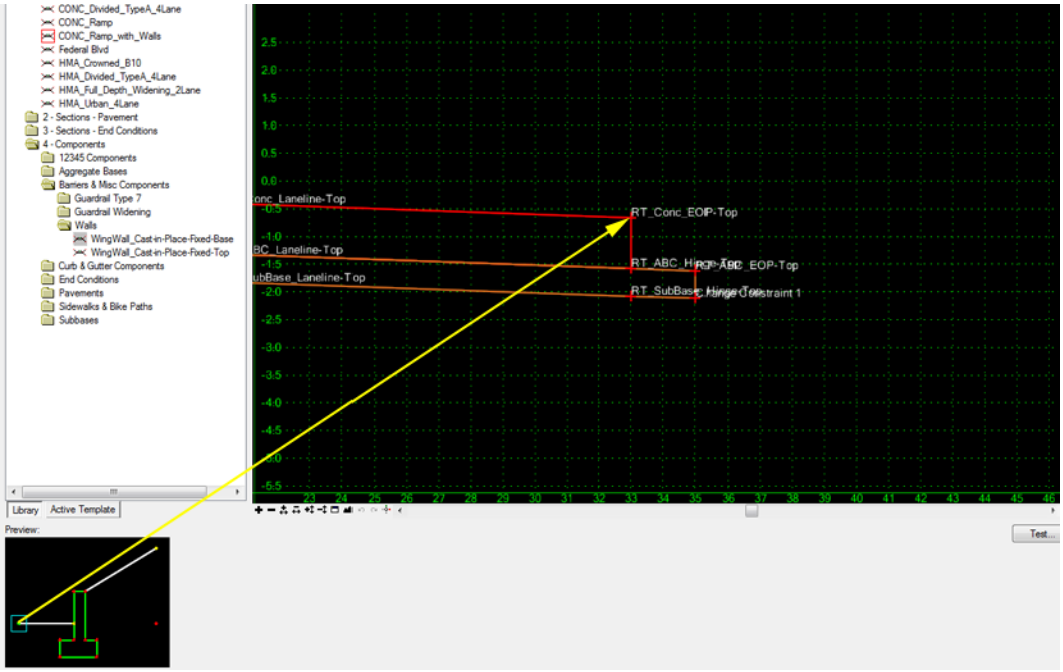
21. Key in ***0.00*** for the ***Value***.
22. **<D>** the **Apply** button then **<D> Close** to dismiss the dialog box.



Now the wall component can be added to the template.

23. In the Template Library explorer, expand the folders to show the contents of the **C:\Projects\12345\Design\InRoads\DES12345_Walls-Lab.itl > 4 - Components > Barriers & Misc Components > Walls** folder.
24. **<D>** on the **WingWall_Cast-in-Place-Fixed-Base** component to display it in the ***Preview*** window.
25. **<D> and hold** on the wall component's origin (the far left point).

26. **Drag and drop** it onto the ***RT_Conc_EOP-Top*** point.

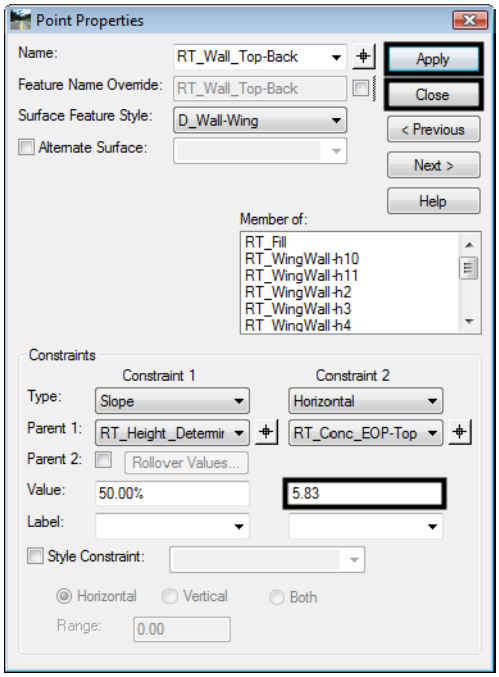


Currently, the wall is set 4 feet from the pavement edge. If the wall is extended to its full height, the footer of the wall will expand into the ABC material of the ramp. To correct this problem, the wall is moved 1 foot to the right.

27. **<D> <D>** on the **RT_Wall_Top-Back** point to display the ***Point Properties*** dialog box.

28. In the ***Point Properties*** dialog box, Change the ***Value*** of ***Constraint 2*** (the Horizontal constraint) to ***5.83***.

29. **<D> Apply** then **<D> Close** to dismiss the dialog box.



This has moved the wall 1 foot to the right. It has also left a gap between the wall and the segment that connects the wall to the rest of the template. Next this gap is closed and a shallow "V" ditch is created between the wall and pavement edge.

30. **<D> <D>** on the **RT_SwaleToe** point.

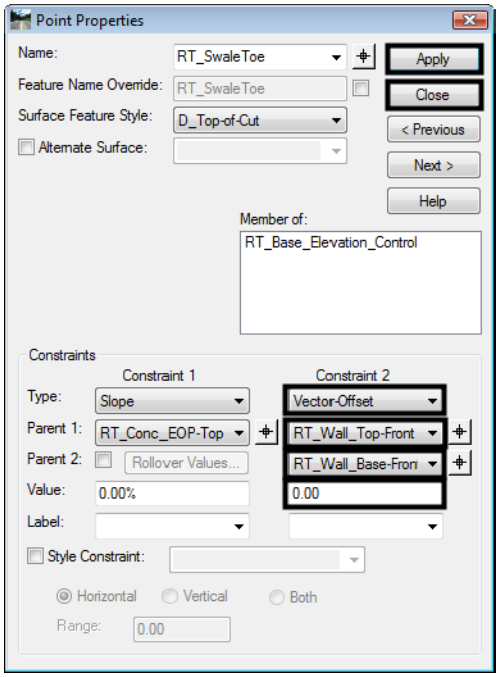
31. In the ***Point Properties*** dialog box, Set the ***Constraint 2 Type*** to **Vector-Offset**.

32. Set the ***Constraint 2 Parent 1*** to **RT_Wall_Top-Front**.

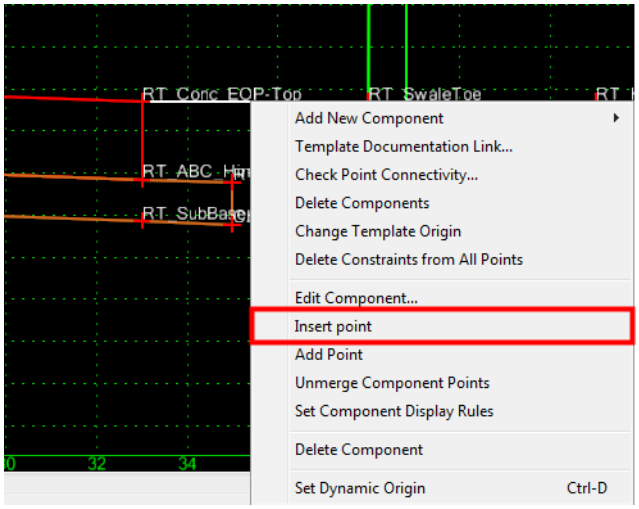
33. Set the ***Constraint 2 Parent 2*** to **RT_Wall_Base-Front**.

34. Key in ***0.00*** for the ***Constraint 2 Value***.

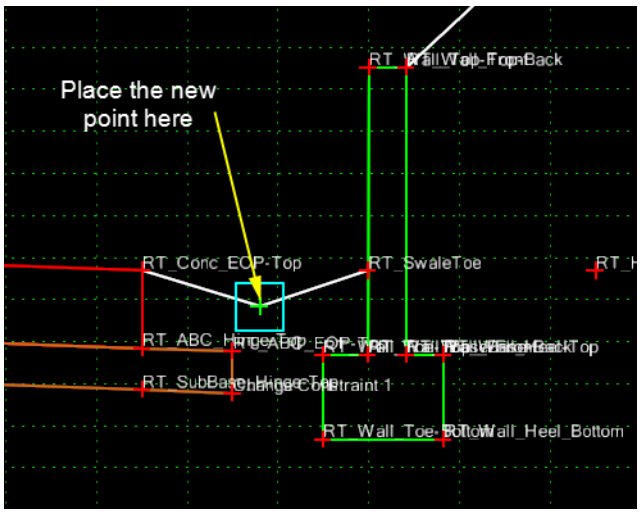
35. **<D> Apply** then **<D> Close** to dismiss the dialog box.



36. **<R>** on the **RT_Base_Elevation_Control** component (the line that connects the Wall with the pavement edge) and select **Insert Point** from the right click menu.

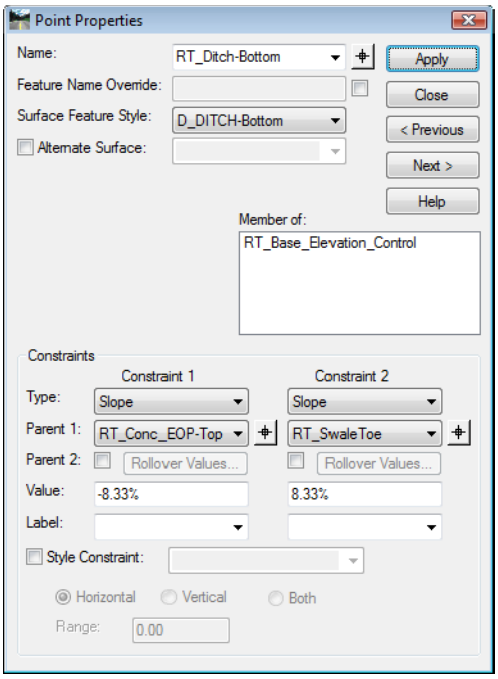


37. Place the point between and below the ***RT_Conc_EOP-Top*** and ***RT_SwaleToe*** points.



38. **<D> <D>** on the new point to display the ***Point Properties*** dialog box.
39. In the ***Point Properties*** dialog box ***Name*** field, key in **RT_Ditch-Bottom**.
40. Set the ***Surface Feature Style*** to **D_Ditch-Bottom**.
41. Set the ***Type*** for both constraints to **Slope**.
42. Set the ***Parent 1*** for ***Constraint 1*** to **RT_Conc_EOP-Top**.
43. Set the ***Parent 1*** for ***Constraint 2*** to **RT_SwaleToe**.
44. Key in ***-8.33%*** for the ***Value*** of ***Constraint 1***.
45. Key in **8.33%** for the ***Value*** of ***Constraint 2***.

46. **<D> Apply** then **<D> Close** to dismiss the dialog box. The illustration below shows the dialog box as completed



This completes the edits to the template.

47. Select **File > Save** from the ***Create Template*** menu bar.

48. **<D>** the **Close** button on the ***Create Template*** dialog box to dismiss it.

Now, examine how the template behaves in Roadway Designer.

49. Select **Modeler > Roadway Designer** from the InRoads menu bar.

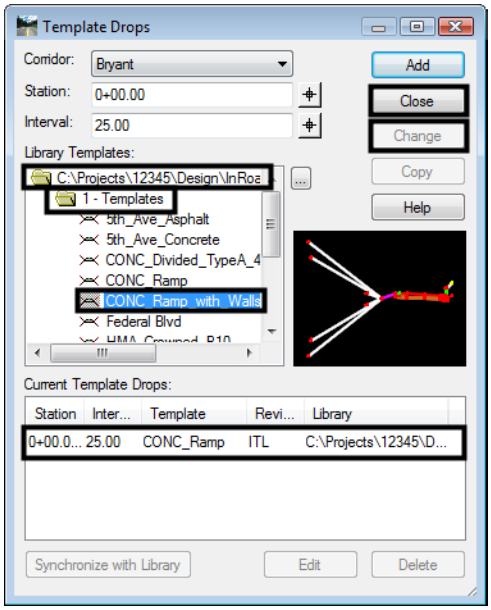
50. From the ***Roadway Designer*** menu bar, select **Corridor > Template Drops**.

51. In the ***Template Drops*** dialog box, highlight the entry in the ***Current Template Drops*** area.

52. Expand the Template library folder to show the contents of the ***1 - Templates*** folder.

53. **Highlight** the **CONC_Ramp_with_Walls** template from the ***Library Templates*** list.

54. **<D> Change** then **<D> Close** to dismiss the dialog box.



55. Scroll through the template drops in the Cross Section view of the Roadway Designer dialog box.

56. Verify that the wall is expanding and contracting to meet the existing ground.

57. Select **File > Save** from the ***Roadway Designer*** dialog box.

58. **<D> Close** to dismiss the dialog box.

Section Summary:

- The Wall_Top-Back point is the controlling point for the wall component's shape. Change its horizontal constraint to move the wall away from or closer to the template origin.
- Adjust the horizontal constraint on the Height Control Point to change the width of the Fill component that extends from the back of the wall to the existing ground.
- Aside from the Wall_Top-Back, SwaleToe, and Height _Control_Point try not to edit other points on the wall component as these can change the shape of the visible component but not the hidden components.

Lab 26.2 - Creating a Custom Wall

There are cases where the wall components in the template library are not suited for the situation under design. In the exercise below, a wall is required on the left side of the template from station 1+50 to the end of the project. The height of the wall is determined by running a 10 to 1 slope from a target feature in the existing ground dtm up to the base of the wall.

Section Objectives:

- Make a copy of the CONC_Ramp_with_Walls template.
- Add an end condition that seeks a surface feature.
- Build the slope component from the targeted feature to the base of the wall.
- Build the wall components.
- Update the corridor to use the templates.

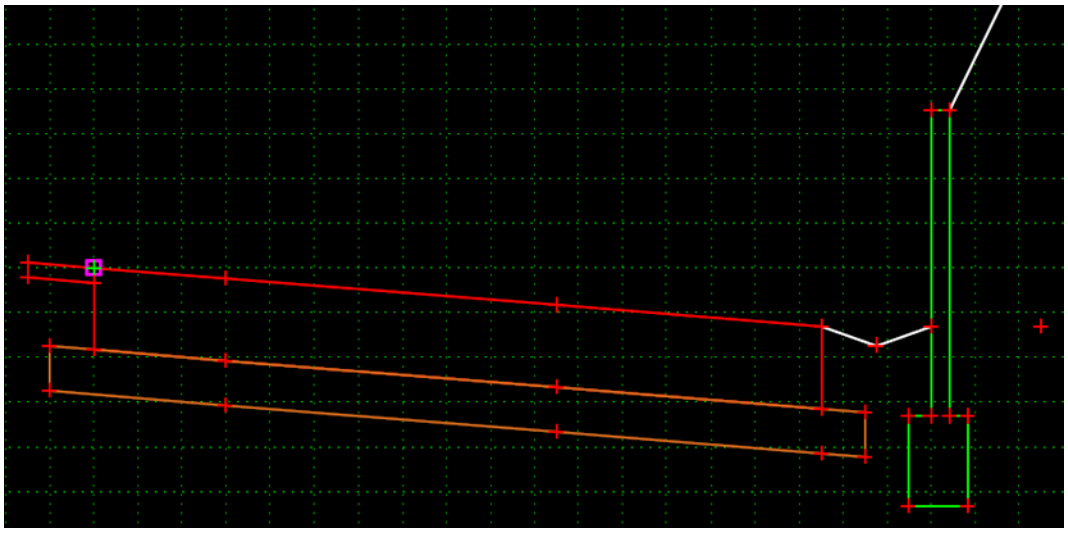
First, a copy of the CONC_Ramp_with_Walls template is made. This template is used for the first 150' of the project.

1. From the InRoads menu bar, select **Modeler > Create Template**.
2. In the Create Template dialog box, expand the **C:\Projects\12345\Design\InRoads\DES12345_Templates-Overlay.itl > 1 - Templates** folder.
3. **<R>** on the **CONC_Ramp_with_Walls** template and select **Copy** from the right click menu.
4. **<R>** on the **1 - Templates** folder and select **Paste** from the right click menu. This creates the ***CONC_Ramp_with_Walls1*** template.
5. **<R>** on the **CONC_Ramp_with_Walls1** template and select **Rename** from the right click menu.
6. Key in ***CONC_Ramp_with_Wall-Rt*** for the name.

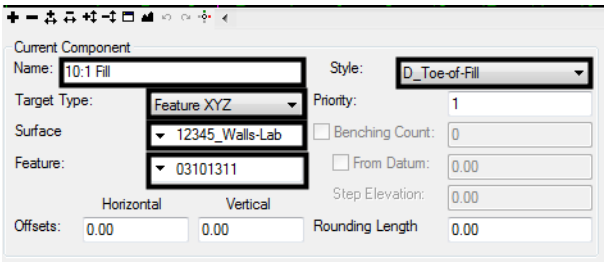
The CONC_Ramp_with_Wall-Rt template is used for the first 150' of the project. The CONC_Ramp_with_Walls template will be modified with a wall on the left side and is used on the remainder of the project.

7. Verify that the **CONC_Ramp_with_Walls** template is active.

8. Delete the POSS and end condition components from the left side of the template. The illustration below shows the template with the left end conditions deleted:

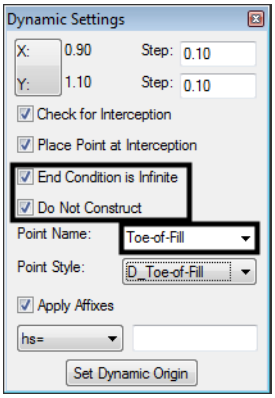


9. Display the ***Dynamic Settings*** dialog box.
10. In the ***Dynamic Settings*** dialog box, verify that the ***Steps*** are set to ***0.10***.
11. Verify that **Apply Affixes** is toggled on.
12. **<R>** in a blank area of the template view and select **Add New Component > End Condition** from the right click menu.
13. In the ***Current Component*** area, key in ***10:1 Fill*** for the ***Name***.
14. Set the ***Style*** to **D_Toe-of-Fill**.
15. Set the ***Target Type*** to **Feature XYZ**.
16. Set the ***Surface*** to **12345_Walls-Lab**.
17. Select **03101311** for the ***Feature***.



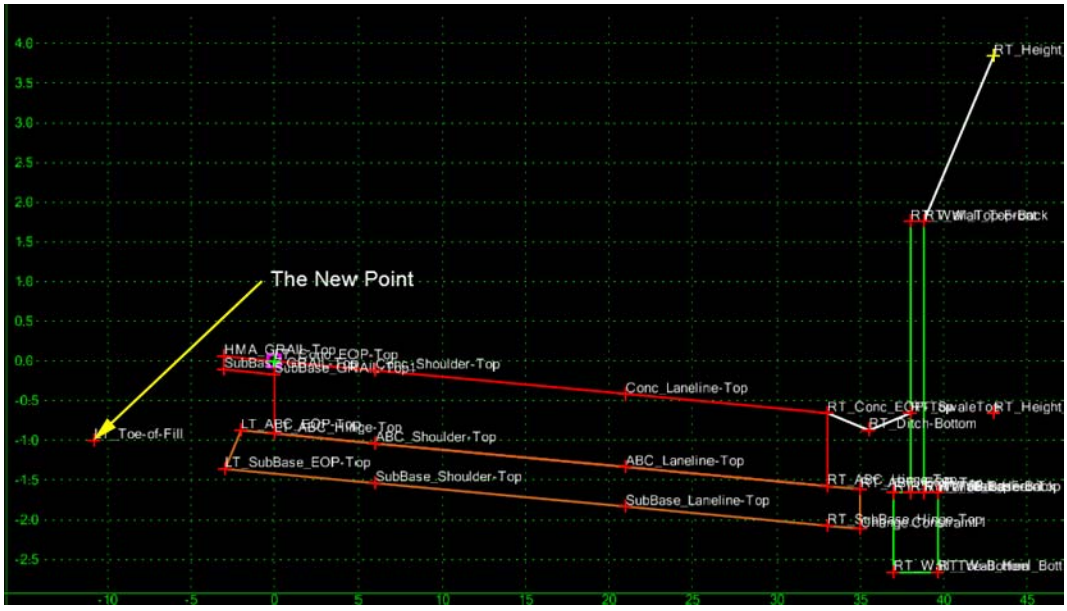
18. **<D>** on the **HMA_GRAIL-Top** point.
19. In the ***Dynamic Settings*** dialog box, toggle on **End Condition is Infinite** and **Do Not Construct**.

20. Select **Toe-of-Fill** for the **Point Name**.



21. **<D>** below and to the left of the **HMA_GRAIL-Top** point.

22. **<R>** and select **Finish** from the right click menu. The only thing that is displayed is a single point (LT_Toe-of-Fill).



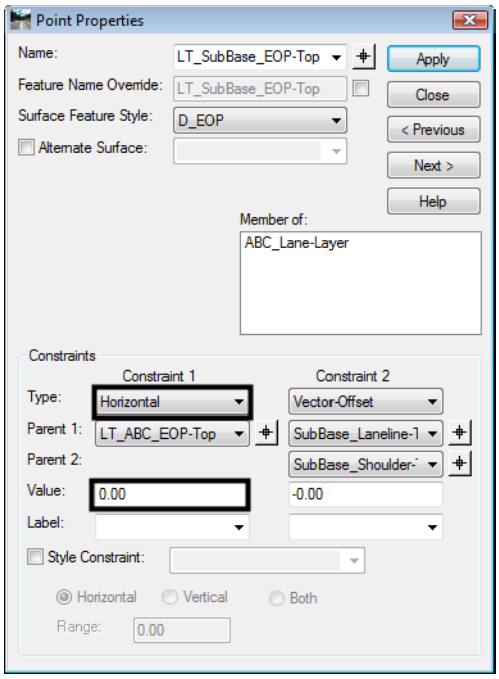
This component is only used to locate the feature. The slope and wall will be built back from this point to the rest of the template.

Next, the ABC component is modified on the left side and the Wall component is added.

23. **<D> <D>** the **LT_SubBase_EOP-Top** point to display the ***Point Properties*** dialog box.

24. In the ***Point Properties*** dialog box, change the ***Slope*** constraint to a **Horizontal** constraint (Constraint 1 in this example).

25. Key in ***0.00*** for the ***Value*** of the ***Horizontal*** constraint. This moves the point out of the way of the wall.



26. **<D> Apply** then **<D> Close** to dismiss the dialog box.

27. **<R>** in a blank area of the template view and select **Add New Component > Unconstrained** from the right click menu.

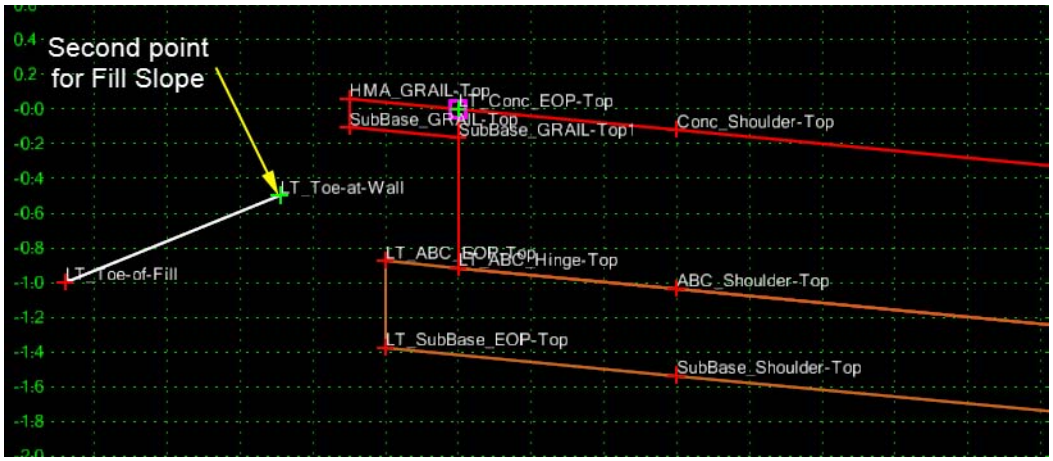
28. In the ***Current Component*** area, key in ***Fill Slope*** for the ***Name***.

29. **<D>** on the **LT_Toe-of-Fill** point.

30. In the ***Dynamic Settings*** dialog box, key in ***Toe-at-Wall*** for the ***Point Name***.

31. Verify that the ***Style*** is set to **D_Toe-of-Fill**.

32. **<D>** just to the left and below the guardrail asphalt component as shown in the illustration below:



33. **<R>** and select **Finish** from the right click menu. Constraints will be added to the ***LT_Toe-at-Wall*** point after the wall component is added.

34. **<R>** in a blank area of the template view and select **Add New Component > Unconstrained** from the right click menu.

35. In the ***Current Component*** area, key in ***Wall*** for the ***Name***.

36. Select **D_Wall-Retaining** for the ***Style***.

37. **<D>** on the **HMA_GRAIL-Top** point.

38. In the ***Dynamic Settings*** dialog box, key in ***Wall_Base-Back*** for the ***Point Name***.

39. Set the ***Style*** set to **D_Wall-Retaining**.

40. **<D>** directly below the **HMA_GRAIL-Top** point about half way through the ABC component.

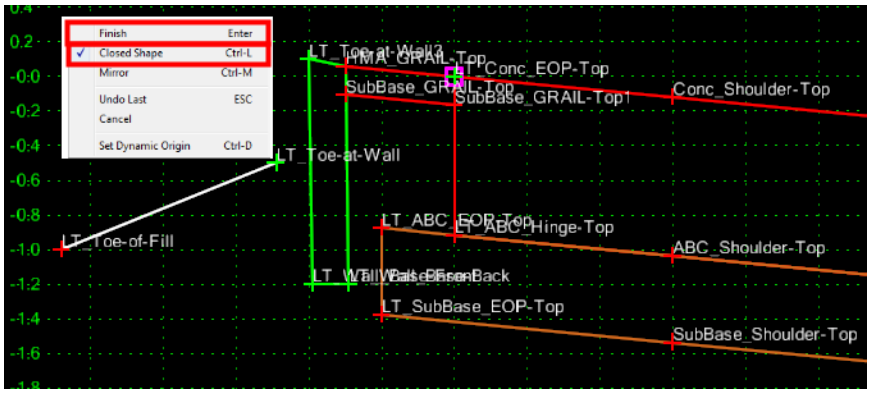
41. In the ***Dynamic Settings*** dialog box, key in ***Wall_Base-Front*** for the ***Point Name***.

42. Move the cursor to the left until the ***X*** coordinate reads ***-3.90*** in the ***Dynamic Settings*** dialog box then **<D>**.

43. In the ***Dynamic Settings*** dialog box, key in ***Wall_Top-Front*** for the ***Point Name***.

44. Move the Cursor straight up and **<D>** near the level of the ***HMA_GRAIL-Top*** point.

45. **<R>** and verify that ***Closed Shape*** is toggled on, then select **Finish** to complete the component. The illustration below shows the new wall component.



46. **<D> <D>** the **LT_Wall_Base-Back** point to display the ***Point Properties*** dialog box.

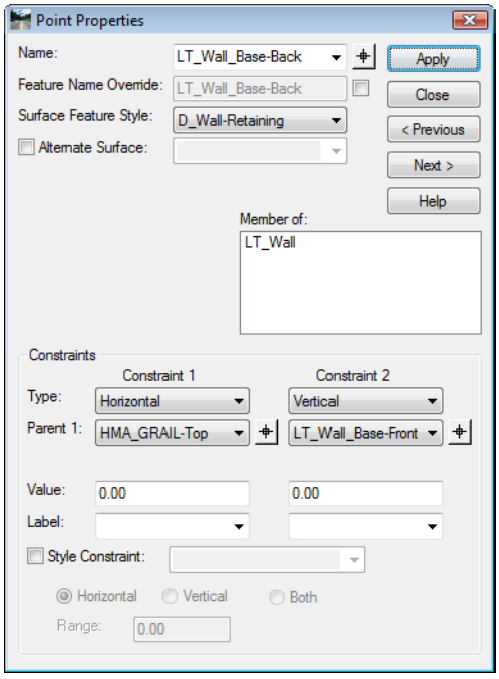
47. In the ***Point Properties*** dialog box, set the ***Constraint 1 Type*** to **Horizontal**.

48. Set the ***Constraint 2 Type*** to **Vertical**.

49. Set the ***Parent 1*** for ***Constraint 1*** to **HMA_GRAIL-Top.**

50. Set the ***Parent 1*** for ***Constraint 2*** to **LT_Wall_Base-Front.**

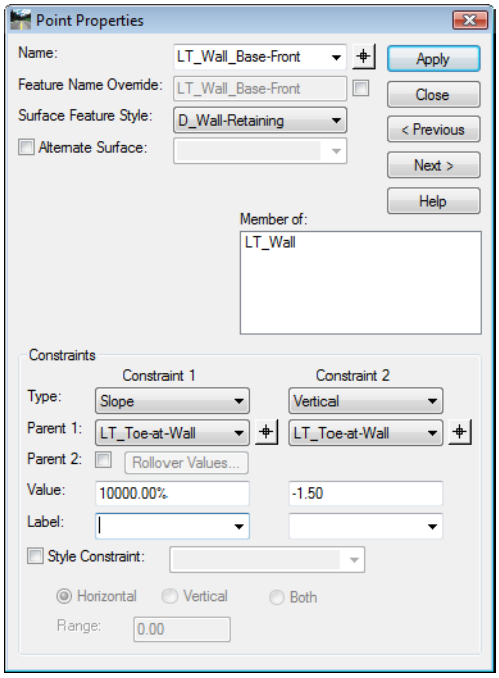
51. Key in ***0.00*** for the ***Value*** of both constraints. The illustration below shows the completed dialog box.



52. **<D> Apply** then **<D> Close** to dismiss the dialog box.

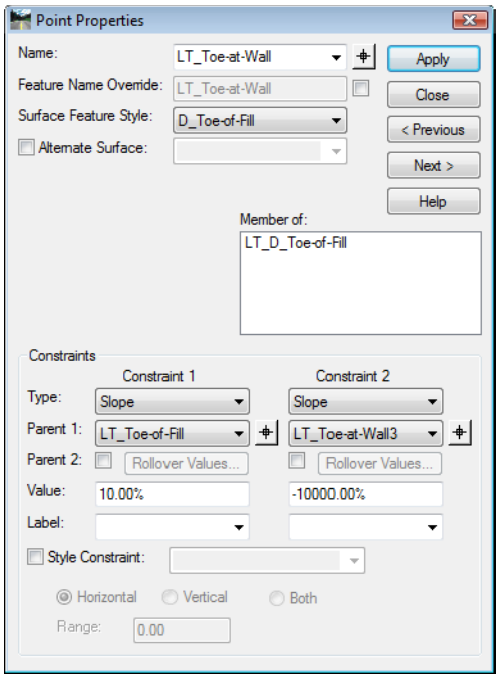
53. **<D> <D>** the **LT_Wall_Base-Front** point.

54. Set the ***Constraint 1 Type*** to **Slope**.
55. Set the ***Constraint 2 Type*** to **Vertical**.
56. Set the ***Parent 1*** for both constraints to **LT_Toe-at-Wall**.
57. Key in ***10000%*** for the ***Value*** of ***Constraint 1***.
58. Key in ***-1.50*** for the ***Value*** of ***Constraint 2***. The illustration below shows the completed dialog box.



59. **<D> Apply** then **<D> Close** to dismiss the dialog box.
60. **<D> <D>** the **LT_Toe-at-Wall** point.
61. Set the ***Type*** of both constraints to **Slope.**
62. Set the ***Parent 1*** for ***Constraint 1*** to **LT_Toe-of-Fill.**
63. Set the ***Parent 1*** for ***Constraint 2*** to **LT_Wall_Top-Front.**
64. Key in ***10.00%*** for the ***Value*** of ***Constraint 1***.

65. Key in ***-10000%*** for the ***Value*** of ***Constraint 2***. The illustration below shows the completed dialog box.



66. **<D> Apply** then **<D> Close** to dismiss the dialog box.

67. **<D> <D>** the **LT_Wall_Top-Front** point.

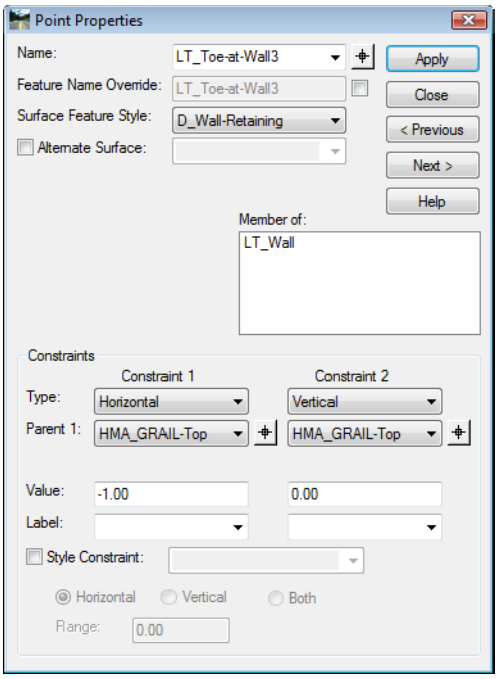
68. Set the ***Constraint 1 Type*** to **Horizontal**.

69. Set the ***Constraint 2 Type*** to **Vertical**.

70. Set the ***Parent 1*** for both constraints to **HMA_GRAIL-Top**.

71. Key in ***-1.00*** for the ***Value*** of ***Constraint 1***.

72. Key in ***0.00*** for the ***Value*** of ***Constraint 2***. The illustration below shows the completed dialog box.

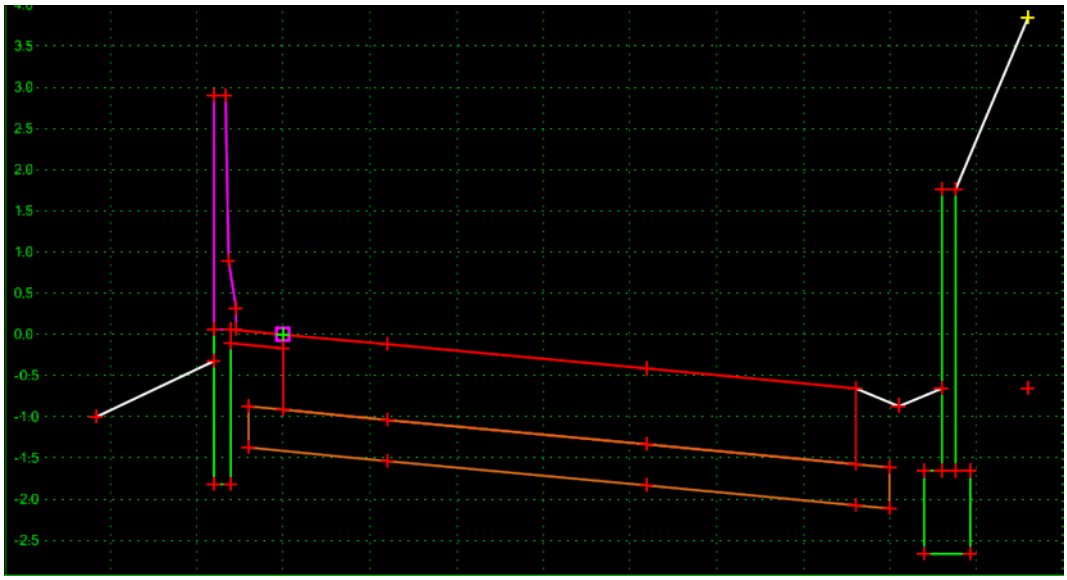


73. **<D> Apply** then **<D> Close** to dismiss the dialog box.

74. In the Template Library explorer, expand the folders to show the contents of the **C:\Projects\12345\Design\InRoads\DES12345_Walls-Lab.itl > 4 - Components > Barriers & Misc Components > Guardrail Type 7** folder.

75. **<D>** on the **Guardrail_Type 7-CD** component.

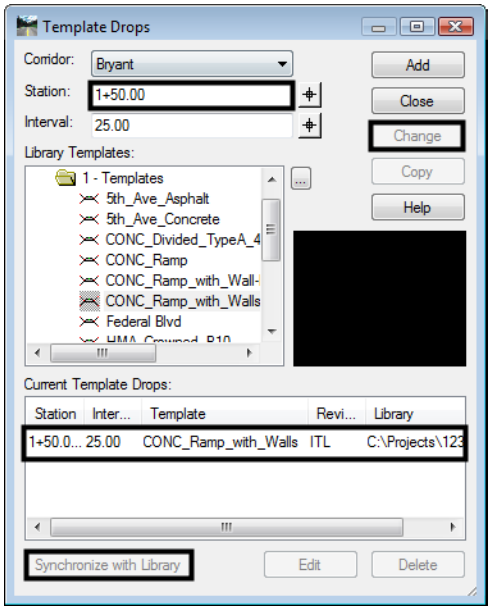
76. Drag the component by the origin (lower left corner) and drop it on to the LT_Wall_Top-Front point. The illustration below shows the completed template.



77. Select **File > Save** from the ***Create Template*** menu bar.
78. **<D>** the **Close** button on the ***Create Template*** dialog box to dismiss it.

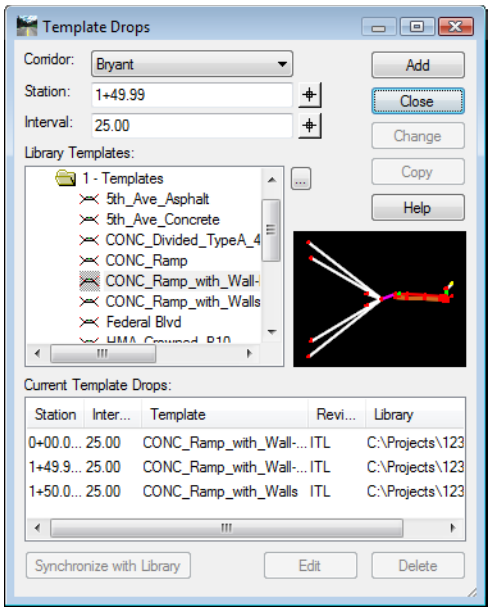
The template is now ready to use in the corridor.

79. Select **Modeler > Roadway Designer** from the InRoads menu bar.
80. From the ***Roadway Designer*** menu bar, select **Corridor > Template Drops**.
81. In the ***Template Drops*** dialog box, highlight the entry in the ***Current Template Drops*** area.
82. In the ***Station*** field, key in ***1+50.00***.
83. **<D>** the **Change** button.
84. Highlight the entry again and **<D>** the **Synchronize with Library** button.



85. In the ***Station*** field, key in ***0+00.00***.
86. Expand the Template library folder to show the contents of the ***1 - Templates*** folder.
87. **Highlight** the **CONC_Ramp_with_Wall-Rt** template from the ***Library Templates*** list.
88. **<D>** the **Add** button.
89. In the ***Station*** field, key in ***1+49.99***.

90. **<D>** the **Add** button then **<D> Close** to dismiss the dialog box. The completed dialog box is shown below.



91. Scroll through the template drops in the Cross Section view of the Roadway Designer dialog box.

    - Verify that the wall is expanding and contracting to meet the existing ground.

92. Select **File > Save** from the ***Roadway Designer*** dialog box.

93. **<D> Close** to dismiss the dialog box.

94. Close InRoads and MicroStation.

Section Summary:

- An end condition was used to locate the feature to tie to. This can also be done with a Null point and a point control.
- A true vertical segment can not be used to create a triangulated surface, that is why the wall face has a 10000% slope.

Chapter Summary:

- Add walls to a corridor using dedicated templates and template drops. Using walls as part of an end condition solution may result in walls occurring in areas where they are not wanted or not occurring in areas where they are needed.
- Wall sections will contain either an end condition or point control to determine the height of the wall.
- Changes from the non-wall to the wall template should occur within 0.01 feet. This ensures a clean change from one template to the other.