2009 Roads and Bridges Conference

EW-9

Advanced Template End Conditions for Roadway Designer

Presenter: Ray Filipiak, Bentley Civil, SR. Advisory Pre-Sales Technical Support Engineer

Bentley Systems, Incorporated
685 Stockton Drive
Exton, PA 19341
www.bentley.com

Lesson Name: Opening a Project (InRoads User)

LESSON OBJECTIVE:

In this lesson the student will learn to access an InRoads project in preparation for creating templates to design a model in Roadway Designer. Note: this lesson is for InRoads users only. For GEOPAK users, please proceed to the next lesson on the next page.

EXERCISE: GETTING STARTED (INROADS USER)

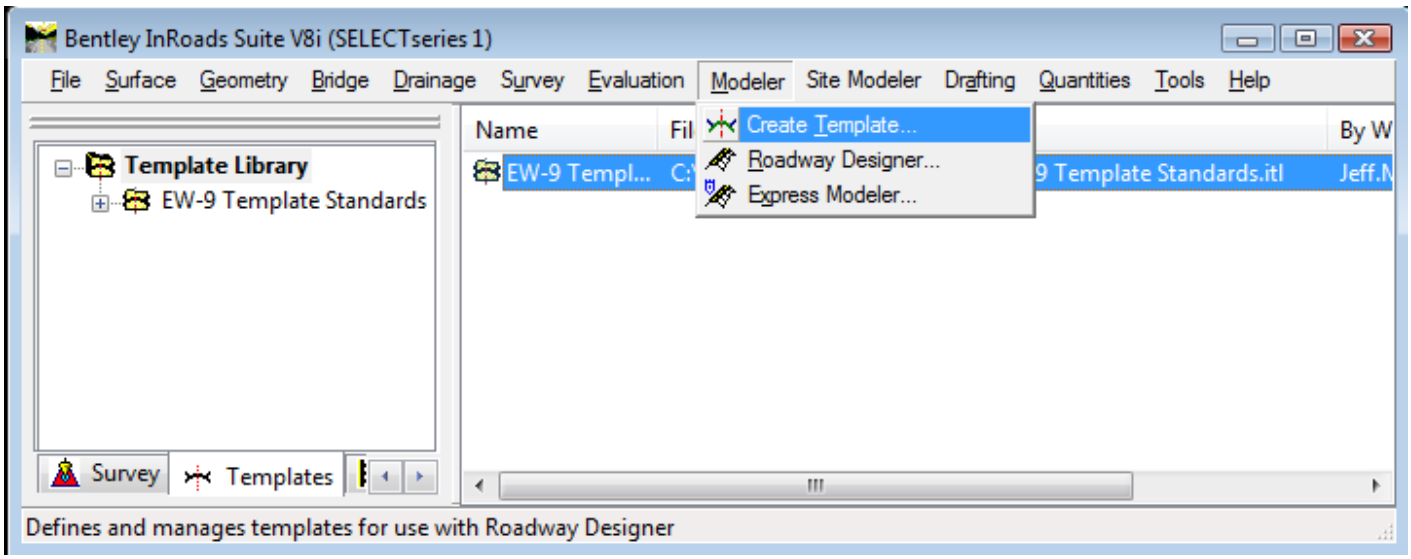
This exercise will guide you through the steps to get started

1. Go to **Start > Programs > Bentley > InRoads Group V8i (SELECTSeries 1) > InRoads Suite**.
2. Open the file **SR 2067 Bypass.dgn** in the C:\EW-9\Advanced EC\DGN\ folder.
3. When the InRoads Explorer appears, go to **File > Open** from the InRoads menu.
4. When the Open dialog appears select the InRoads project file:

   C:\EW-9\RWK Files\Advanced EC.rwk and press **OK**.

   Opening the *RWK* project file opens the following files:

   SR 2067 Bypass.alg
   EW-9 Template Standards.itl
   Existing Ground.dtm
   Bentley Training.xin
5. Select **Modeler > Create Template** from the InRoads Explorer menu to access Create Template.



LESSON NAME: OPENING A PROJECT (GEOPAK USER)

LESSON OBJECTIVE:

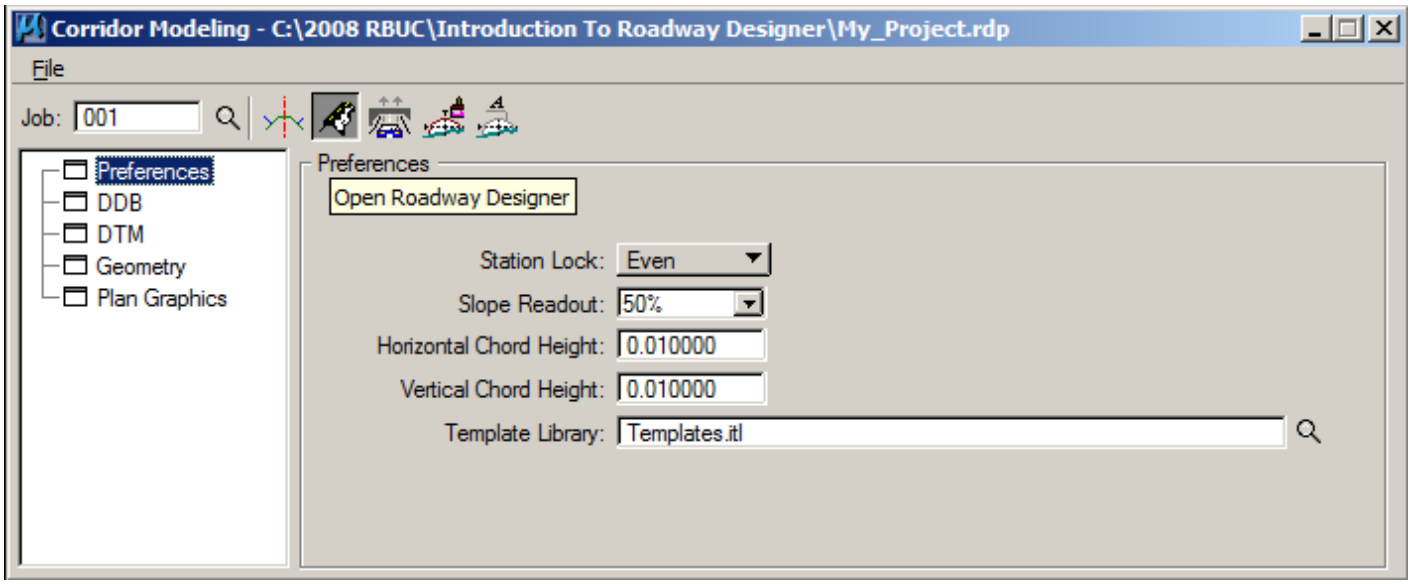
In this lesson the student will learn to access a GEOPAK Corridor Modeler project in preparation for designing a model in Roadway Designer. Note, this lesson is for GEOPAK users only.

EXERCISE: GETTING STARTED (GEOPAK USER)

This exercise will guide you through the steps to get started

1. Go to **Start > Programs > Bentley > MicroStation V8i > Bentley MicroStation V8i**.
2. The instructor will provide the appropriate path location for this project. When the MicroStation Manager appears select the file:

   Plan.dgn and press **OK**.
3. Go to **Applications > Road > 3D Tools > Corridor Modeling**.
4. Select the GPK job number **001**
5. Choose **File > Load** from the Corridor Modeling dialogue.
6. Load the Corridor Modeler project file entitled **My_Project.rdp**.
7. Choose the **Open Roadway Designer** icon from the Corridor Modeling dialogue to access Roadway Designer.



© 2008 Bentley Systems, Incorporated

LESSON NAME: END CONDITION OVERVIEW

LESSON OBJECTIVE:

To understand End Condition Processing Logic to be able to provide conditional solutions.

What are End Components?

They Daylight

They Seek

They Sequence

End Components tie the Design Surface into the existing surface. End Conditions seek Targets. They provide a logical branching and sequencing capability.

• Engineering Criteria, for slope treatment in particular, are often specified in Ifthen-else terms:**If** a 1:6 cut slope can find daylight in less than 18 feet [6 m], **then** use a 1:6 slope; **else**

• **if** it can find daylight in less than 32 feet [8 m] at 1:4, **then** use a 1:4 slope, **else**

• **if** it can find daylight in less than 45 feet [12 m] at 1:3, **then** use a 1:3 slope, **else** use a 1:2 slope to intersection. End Condition components provide solutions to these conditional engineering specifications by providing the following abilities

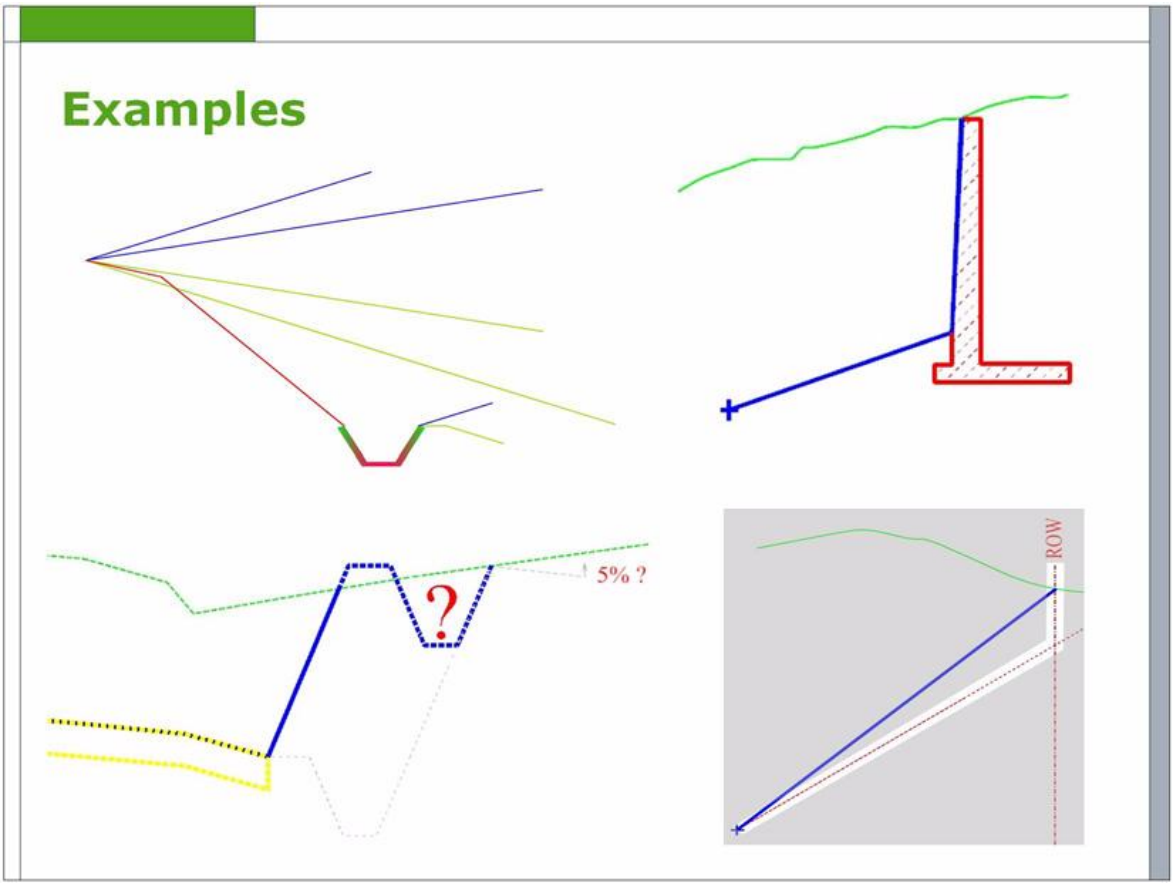
• The ability to seek the existing ground (and other targets) within width limits, if desired.

• The ability to succeed or fail in the search.

• The ability to logically branch depending on the seek results.

© 2008 Bentley Systems, Incorporated

EXAMPLES OF END CONDITIONS



Examples of End Condition solutions we will build in class include:

- Multiple Slope Cut and Fill Solutions, with a Fill Ditch
- Retaining Walls that seek a horizontal wall location then seek the surface
- A Cut Solution that places a Brow Ditch if and only if the existing surface drains towards the road
- A Template that automatically forces the daylight line to the ROW limit if the steepest standard slope intrudes beyond the right of way line.

 End conditions cannot be closed shapes. Closed shapes, such as a ditch lining, can be constrained to end condition points, however.

EC CONCEPTS

EC's Seek Targets

Succeed or Fail

Multiple Options = Branching

Priorities

Seek Targets

End Conditions seek targets such as surfaces. The seek can succeed or fail, different things happen based on the success or failure.

Multiple End Condition Components can start from the same template point. The Components are processed in a user-defined order. If a component fails, the next component starting at the point attempts to find its target. The first component to succeed is placed. In this way a sequenced engineering specification can be applied.

Succeed or Fail

An End Component Solution is a collection of one or more End Condition Components. Each End Component has a Target it is seeking. It can succeed or fail in finding that target. The Success or Failure of a Component affects the processing of other Components in the solution.

Multiple options = Branching

A Branch Point is any Point with more than one EC Component or EC Path starting at the same point. At Branch Points Paths are processed in order of Priority (lower numbers are processed first). Once an End Condition Path ends with Success the solution is found; there is no need to continue solving other paths. If a Branch Point is found within a Path all Paths at that point are evaluated for success.

Priorities

Given two End Conditions starting from the same point, Roadway Designer will start processing with the Component with the lowest priority number. While two components having the same Priority will process, they may not process properly and it is poor technique. Multiple solutions for cut or for fill tend to have clearpriorities: tying in with a flat slope is better than tying in with a steep slope when possible. For example, a typical cut solution might have the following clear priorities:

Try to tie in at 1:6, then 25%, then 1:3. Use 1:2 for the deepest cuts.

© 2008 Bentley Systems, Incorporated

End Condition Point Properties

Common: Name/Style

Special EC:
- Check for Interception
- Place Point at Interception
- End Condition is Infinite
- Do Not Construct

Check for Interception

To intercept a target such as a surface the Point's *Check for Interception* property must be set. Sometimes segments such as Ditch Foreslopes are not meant to intercept a target. They are meant to be placed only if a later segment finds the target. These segments' *Check for Interception* property should be clear.

Place Point at Interception

In order to place a point at the target the *Place Point at Interception* property must be set. Sometimes a point needs to be placed at the end of a segment even if the target is intercepted prior to the end of the segment. An example is a minimum depth ditch foreslope. In this case, clearing the *Place Point at Interception* property will place a 5 foot [1.5 m] ditch foreslope even if the surface is found before that at three feet [1 m].

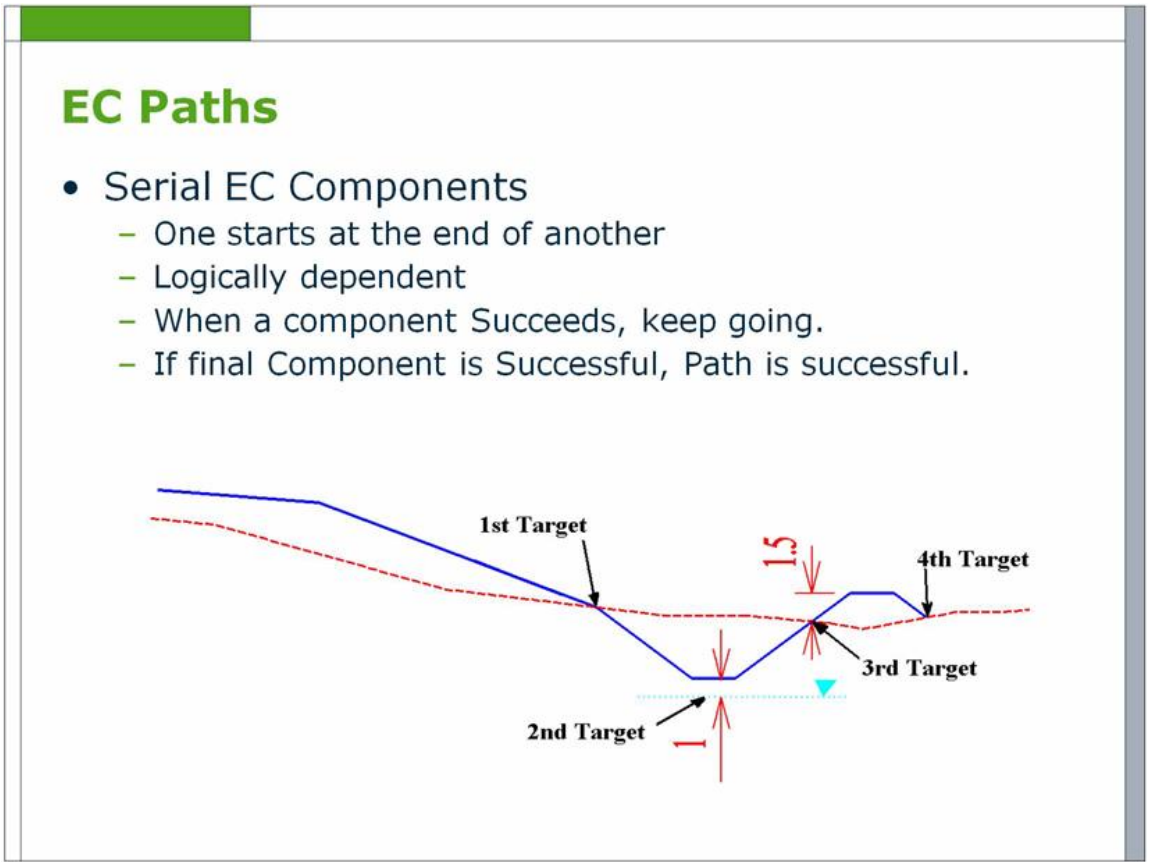
End Condition is Infinite

Very often the constraints of an End Condition Point are *Slope* and *Horizontal*. The *Horizontal* Constraint value represents the maximum width within which to check for the target. For example a 1:6 slope may be appropriate for a maximum width of 18 feet [4 m]. This would be represented as a segment with a 1:6 slope and a *Horizontal* Constraint of 18 feet [4 m], with the *End Condition is Infinite* check box clear. If the *End Condition is Infinite* check box is set the segment seeks the surface without limit. This check box is generally set on the final cut or fill alternative. For example, 1:6 slopes may have a Horizontal Constraint of 18 ft. [4 m], 1:4 24 ft.[6 m], 1:3 30 ft.[10 m], and 1:2 infinite.

Do Not Contruct

The *Do Not Construct* check box specifies the point will be solved like all other points in the end-condition, but the point will be skipped when drawing the component segments. This is useful in many situations, including variable slope solutions.

© 2008 Bentley Systems, Incorporated



There are many side slope solutions with a sequence of dependent targets. One common example is to fill to the existing ground and then add an exterior fill ditch which must then tie in to the existing ground. A more elaborate example might be to fill to the ground, put in a ditch to within one foot of the water table and finish with an exterior berm.

These are examples of serial targets: once an initial target is found additional earthwork is performed prior to tying back in to the existing surface.

The software logic follows the engineering logic. If the first target is not found further operations are not attempted. If, for example, you have a cut specification but are in fill, the initial cut seek will never find the existing ground. Following further cut specifications are moot. Any component failure in an End Condition path stops the path processing.

Path Rules

- When a component Succeeds keeping going.

- Once a Component in a path fails the whole Path fails. Processing returns to the next path at a branch point, if one exists.

- A single End Condition component follows the same rules and behaves as a Path.

A Component or Path that has no Seeking segments counts as a Success, but is only placed if the subsequent path succeeds. An example of this is might be a single-segment EC component from shoulder to the hinge point from which a series of related EC Components start. This is shown in a later Practice Exercise.

© 2008 Bentley Systems, Incorporated

Lesson Name: Build a Fill Ditch Template

LESSON OBJECTIVE:

In this lesson the student will learn how to create a Fill Ditch Template by intercepting the Active Surface twice, set up a 3:1 Fill End Condition, place and create the Fill Ditch components and points and finally test the template to insure it works as designed.

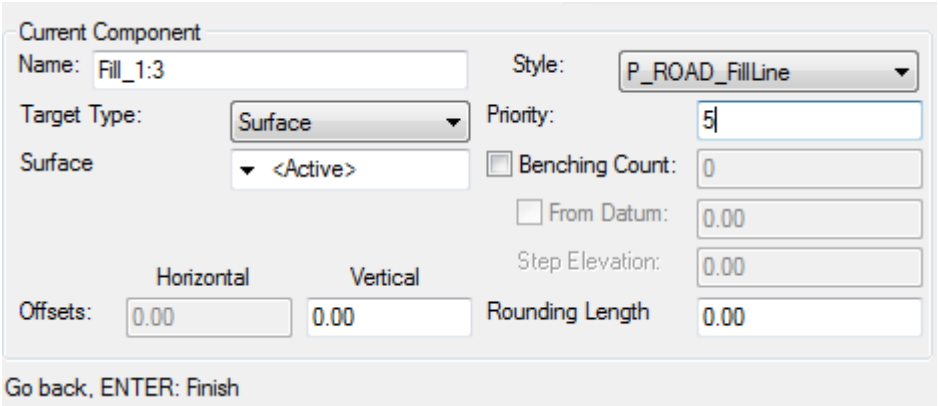
Exercise: Build a Fill Ditch

Create a New Template

1 In the *EW-9Template Standards.itl* file, open the *Build_A_Fill_Ditch* folder.
2 Right-click the *Build_A_Fill_Ditch* folder. Select **New > Template**.
3 Rename the *New Template* to **Fill Ditch_2SurfaceSeeks**.

Set up the Fill_1:3 End Condition Component

1 Select the **Add New Component > End Condition** menu item.
2 Set the Component *Name* to **Fill_1:3**.
3 Set the *Style* to *P_Road_FillLine.*
4 Set the *Priority* to **5**.
5 Set the *Target Type* to *Surface.*
6 Set the *Surface* to *<Active>.*



Place the First Component Points

1 In the Dynamic Settings dialog, select a *Point Name* of **Hinge**. The *Point Style* should automatically be set to *P_ROAD_Hinge*.

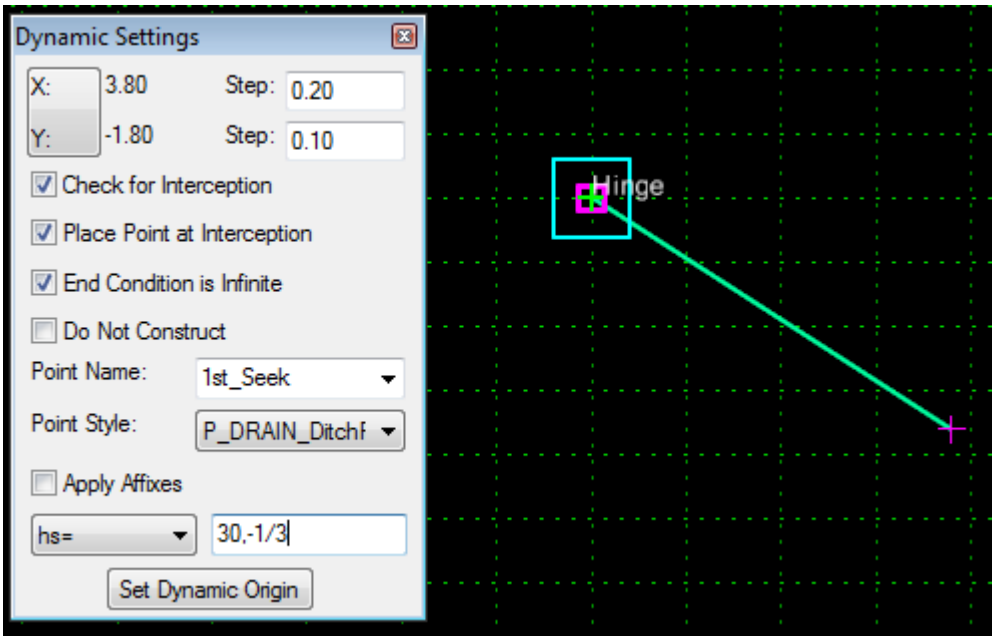
2 Place the point at *xy*= **0,0**.

3 In the Dynamic Settings dialog, key in a *Point Name* of **1st_Seek** and select a *Point Style* of *P_DRAIN_DitchForeslope*; set the *Check for Interception*, *Place Point at Interception* and *End Condition is Infinite* check boxes; clear the *Do Not Construct* check box.

4 Place the next point at *hs*=**30,-1/3** [*hs*=**10,-1/3**].

5 Right-click in the window and select **Finish**.

6 **Test** the Template.



Create the Fill Ditch Component

1 Select the **Add New Component > End Condition** menu item.

2 Set the *Component Name* to **Fill_Ditch**.

3 Set the *Style* to *P_ROAD_Ditch.*

4 Set the *Priority* to **5**.

This step is probably unnecessary. It is unlikely that there will be a branch from this point.

5 Set the *Target Type* to *Surface.*

6 Set the *Surface* to *<Active>.*

Place the Fill_Ditch points

1 Place the first point at the *1st_Seek* point.

Make sure the point turns white indicating that the new point will merge with the old.

2 In the Dynamic Settings dialog, set *Point Name* to **Fill_Ditch** and the *Point Style* to *P_ROAD_Ditch*; clear the *Check for Interception*, *Place Point at Interception, End Condition is Infinite* and *Do Not Construct* check boxes.

3 Place the next point at *hs*=**2,-50%** [*hs*=**1,-50%**].

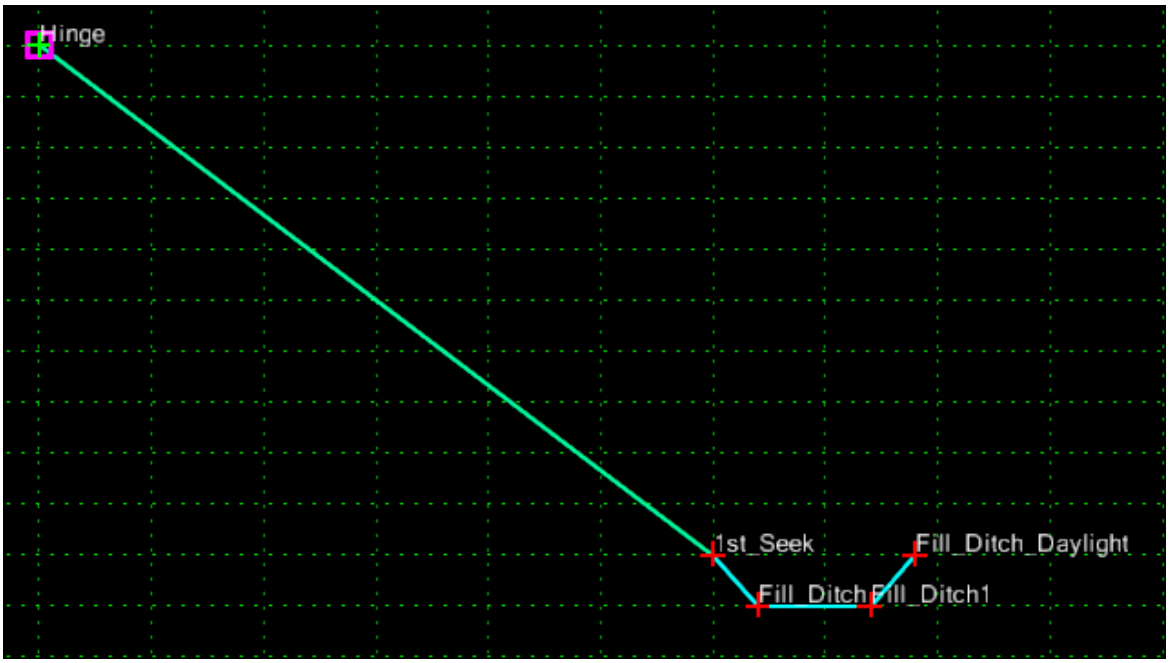
4 Place the next point at *hs*=**5,0%** [*hs*=**2,0%**].

5 In the Dynamic Settings dialog, set *Point Name* to **Fill_Ditch_Daylight** and the *Point Style* to *P_ROAD_FillLine*; set the *Check for Interception, Plac3 Point at Interception* and *End Condition is Infinite* check boxes; clear the *Do Not Construct* check box.

6 Place the next point at *hs*=**2,50%** [*hs*=**1,50%**].

7 Right-click in the window to select **Finish**.

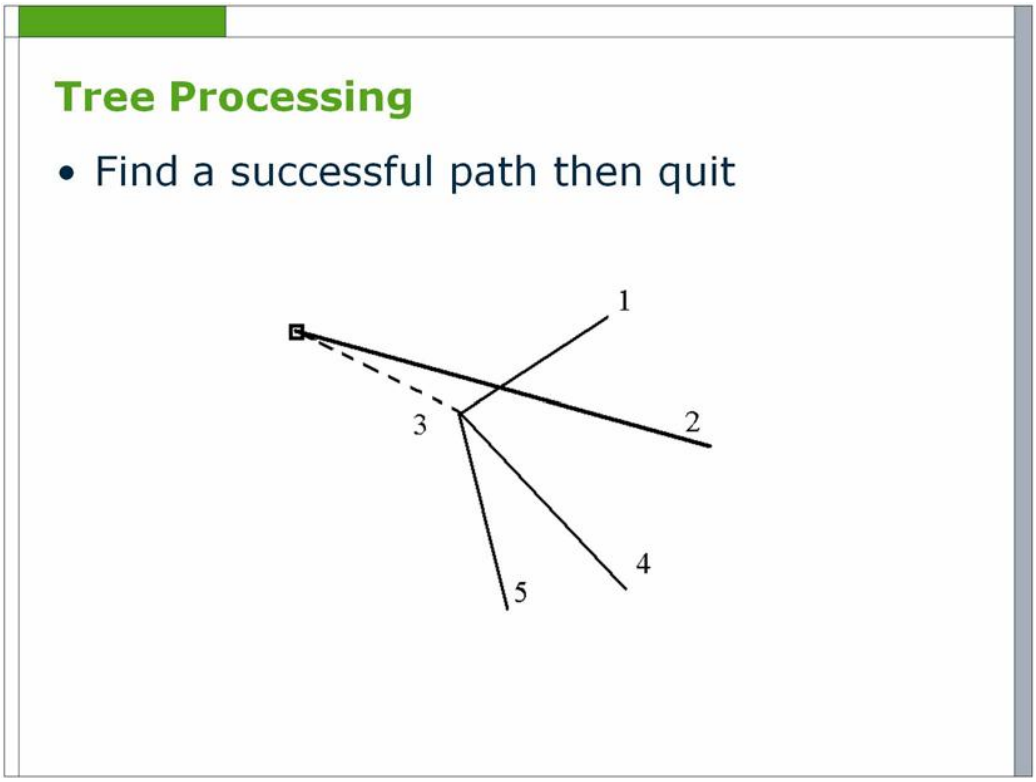
8 **Test** the template.



Lesson Name: Multiple Options > Tree Branching

LESSON OBJECTIVE:

In this lesson the student will learn how the Branching abilities of end conditions enable setting up templates that enact even the most complex engineering specifications. You'll review component priorities, predict the behavior of the template and test to confirm your predictions.



End Condition Processing Sequence

First, the End Condition Start Points are found.

A Start Point is any point the starts an End Condition that is not at the end of another End Condition.

There is no limit to the number of start points in a template. The order in which the start points are processed is based on priority. All the End Condition Components attached to the Start Point is referred to as an End Condition Tree.

For each start point in a template Roadway Designer attempts to solve all the End Condition paths starting from that start point. The first path that succeeds is placed and processing of the End Condition Tree stops**.**

© 2008 Bentley Systems, Incorporated

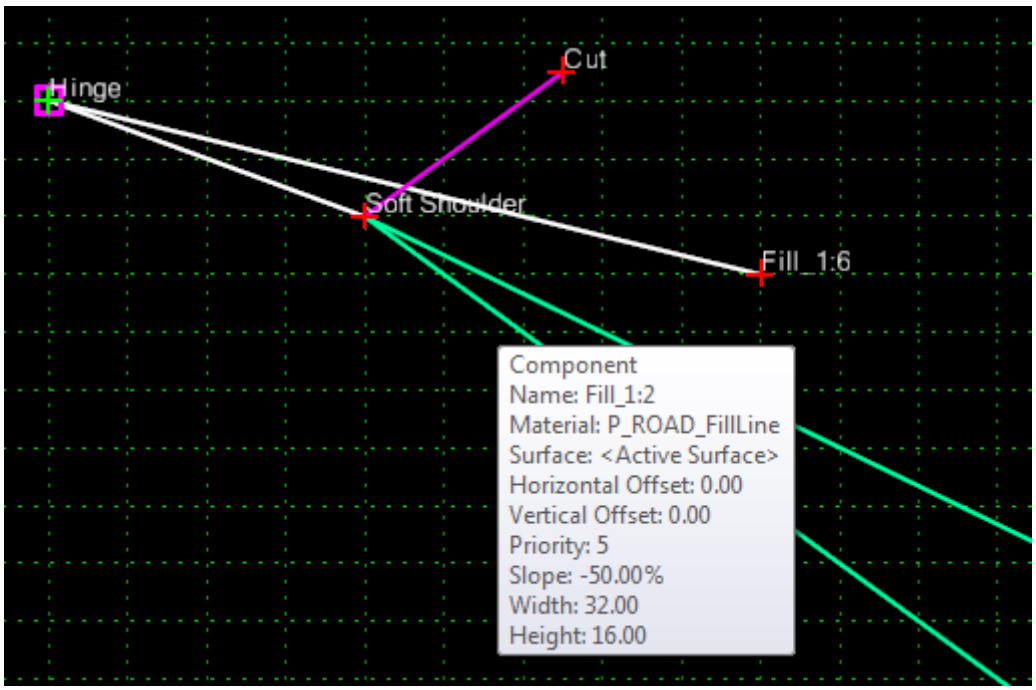
Exercise-Multiple Branches

Select the Template

1 In the *EW-9 Template Standards.itl* file, open the *Review_A_MultiBranch*folder.
2 Double-click the *Fill_Branch_&_BranchPath* template to make it active.

Review the Component Priorities

1 Review the component Priorities
2 Predict the behavior of the template

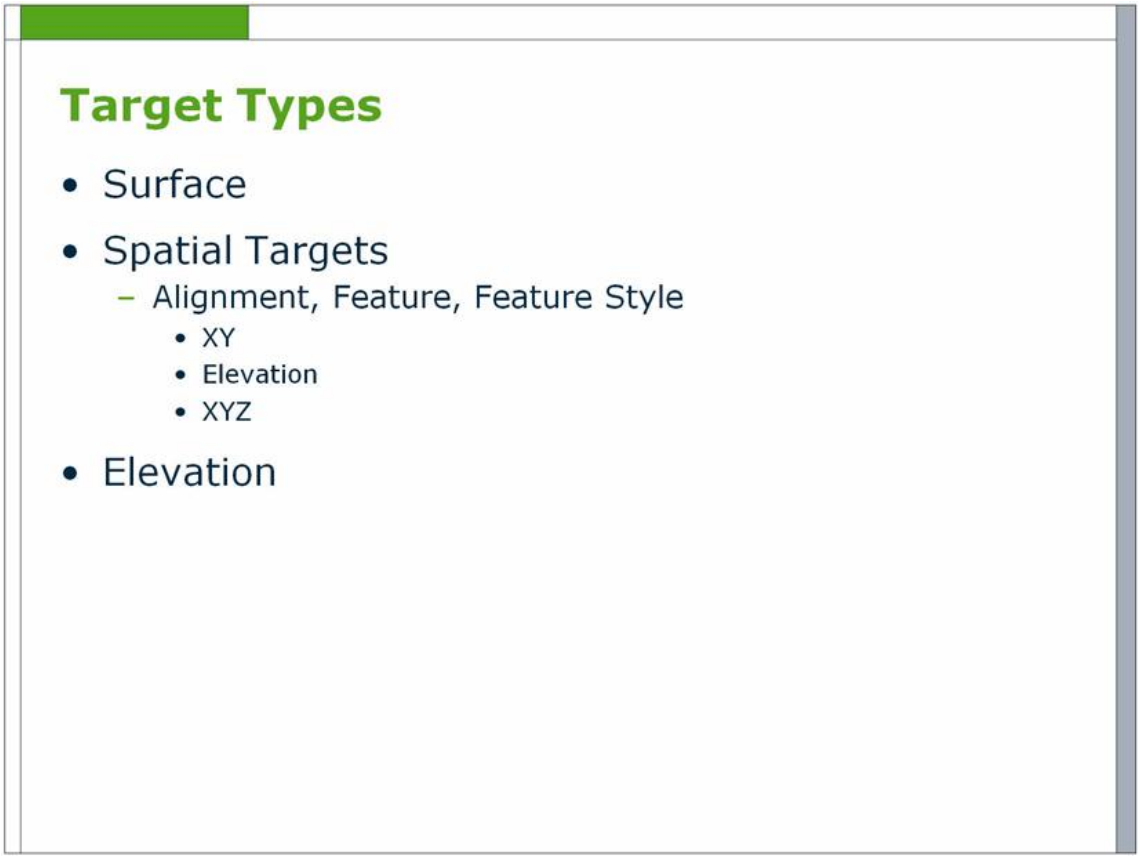


Test the Template

1 Use the Test button to confirm your predictions about the template behavior.

Did the behavior differ from what you expected? If so, review the Priorities and the Branch/Path logic rules.

Target Types



The Targets for End Condition Component consist of three types. Tying into a surface, particularly the existing surface, is perhaps the most obvious Target type.

End Conditions can target an absolute Elevation value. An example of this is when having a single cut bench at a specific elevation.

The other category of End Condition Targets uses the horizontal and/or vertical geometry of InRoads alignments or features as targets.

The user can select Alignment, Feature or Feature Style as the element type. Horizontal and/or Vertical targeting is specified as follows:

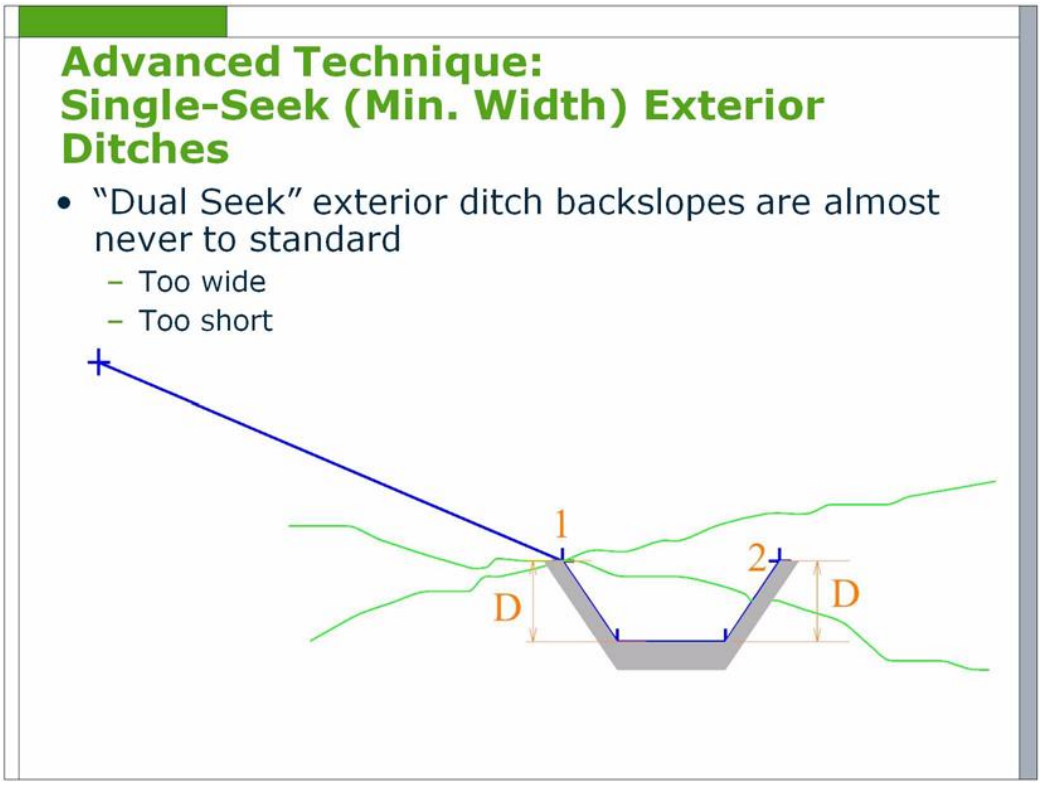
- XY is horizontal only
- Elevation is vertical only
- XYZ is both horizontal and vertical only

Lesson Name: Advanced Techniques for creating Exterior Ditches

LESSON OBJECTIVE:

In this lesson the student will learn the steps to create an Exterior Fill Ditch.

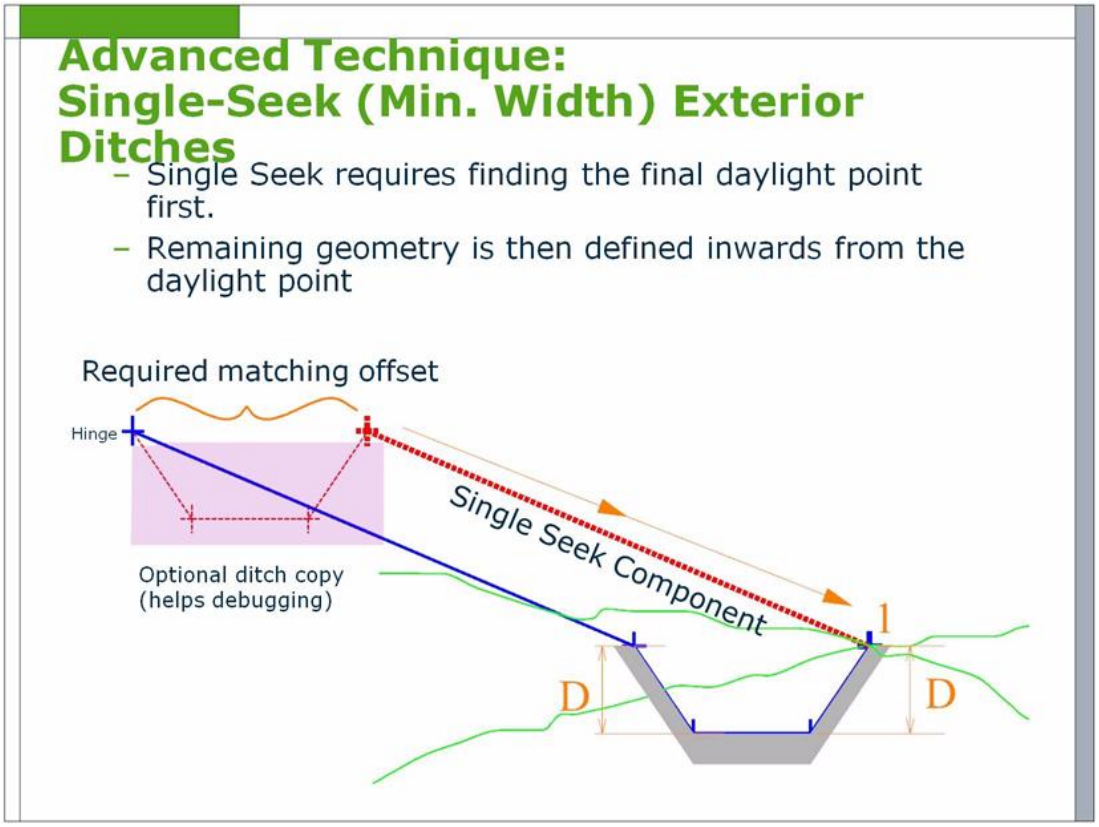
Minimum Width Exterior Ditches



Cut or fill ditches can be defined by a template seeking the existing ground twice, once for the cut or fill slope and again for the outside ditch slope, these dual-seek templates only provide an optimum solution if the existing ground is level at the ditch. If not level the ditch slope either does not provide enough freeboard or too much freeboard.

Targeting the surface for the inside wall of the ditch is actually unnecessary:generally there is no need in the final solution to tie the inside ditch wall to where the existing surface used to be. The true requirement is to provide the required ditch in the narrowest footprint.

Single-Seek (Min. Width) Exterior Ditches

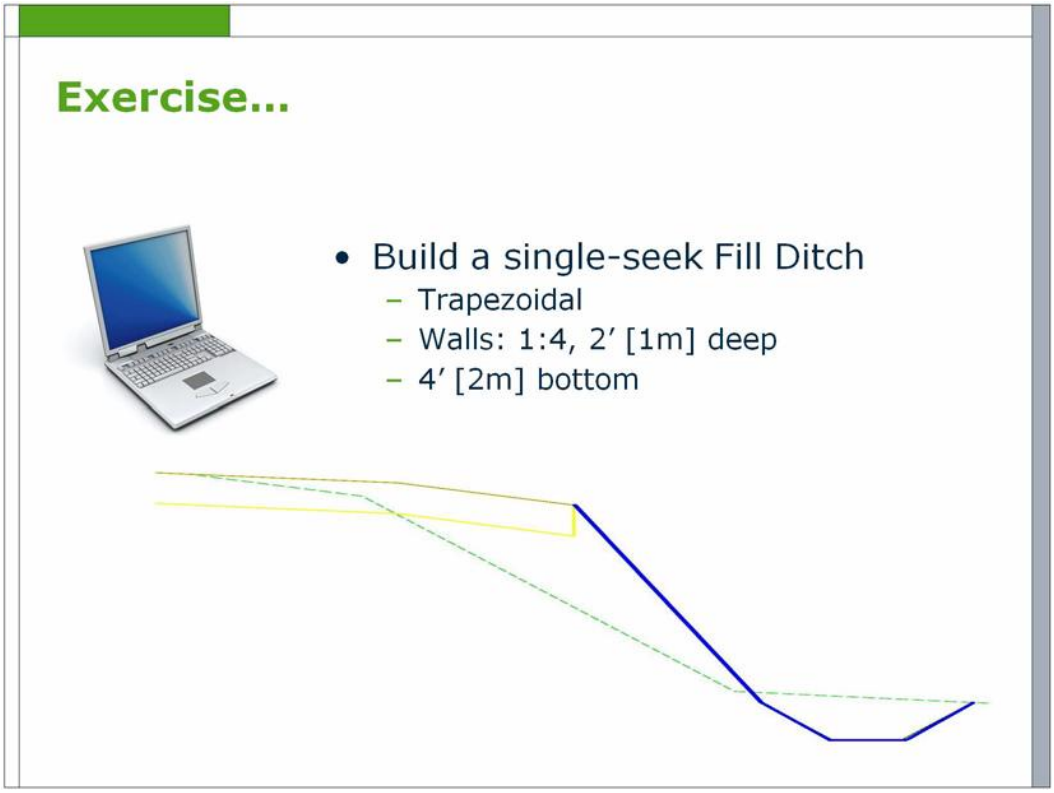


Exterior ditch solutions generally have one variable: the length of the cut or fill slope; the rest of the geometry is fixed. The trick to building a single-seek template is to position the origin of the seeking segment at an offset equivalent to the fixed geometry, which in simple cases is the ditch. From this offset origin the seek point finds the Daylight point.

None of the points in the template used find the daylight point have engineering value and should not become part of the resulting surface. The Components owning the placeholder points should have their "Exclude from Triangulation" property set so that the points do not get triangulated in the surface. Using keywords or prefixes, such as "xDNC_" may make segregating and deleting points and components easier.

Once the Daylight point is found, enough information exists to build the side slope and ditch components. These components should not be End Conditions; they should, however, be children of the seeking segment, so that if the seek fails, they are not placed. The fixed ditch portion should be defined from the Daylight point. The hinge point and the ditch portion interior point should not be constrained to each other; this is the variable segment whose geometry has been determined by the seek segment.

Exercise-Create a Single-Seek Cut Ditch



Create the Brow Ditch Template

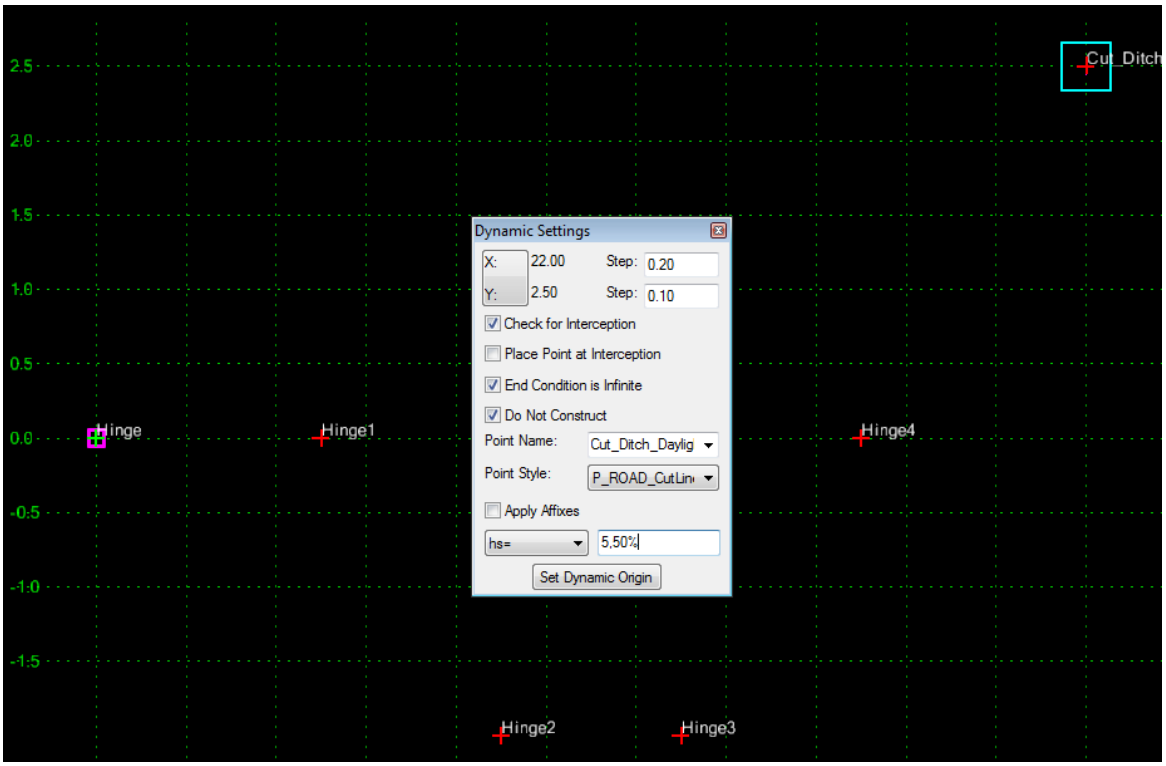
1 In the *EW-9Template Standards.itl* file, right-click the folder *SingleSeekDitch*, select **New > Template**.
2 Rename the new *Template* to **Ditch_Cut_Tight**.

Create the Placeholder Ditch End Condition Component

1 Select the **Add New Component > End Condition** menu item.
2 Set the *Component Name* to **xDNC_Cut_Ditch**.
3 Set the *Style* to *DNC.*
4 Set the *Priority* to **3**.
5 Set the *Target Type* to *Surface.*
6 Set the *Surface* to *<Active>.*

Place the placeholder points

1 In the **Dynamic Settings** dialog, set *Point Name* to **Hinge** and the *Point Style* to *DNC*.
2 Place the point at *xy*= **0,0**.
3 In the Dynamic Settings dialog, clear the *Check for Interception*, *Place Point at Interception* and *End Condition is Infinite* check boxes; set the *Do Not Construct* check box.
4 Place the next point at *hs*= **5,0** [*hs*= **2,0**].
5 Place the next point at *hs*= **4,-50%** [*hs*= **1.2,-25%**].
6 Place the next point at *hs*= **4,0%**[*hs*= 1.**2,25%**].
7 Place the next point at *hs*= **4,50%** [*hs*= **1.2,25%**].
8 In the Dynamic Settings dialog, set the *Check for Interception*, *Place Point at Interception*, *End Condition is Infinite* and the *Do Not Construct* check boxes.
9 In the Dynamic Settings dialog, set *Point Name* to **Cut_Ditch_Daylight** and the *Point Style* to *P_ROAD_CutLine.*
10 Place the next point at *hs*= **5,50%** [*hs*= **2,50%**].
11 Right-click in the window to select **Finish**.



Create the Cut Ditch Component

1 Select the **Add New Component > Constrained** menu item.

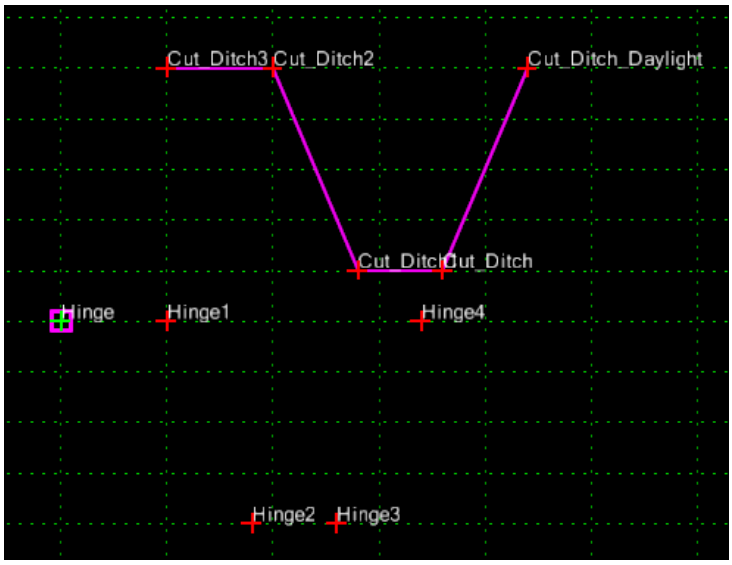
Since the points are constrained to the previous point we need to work from the outside to the inside.

2 Set the *Component Name* to **Cut_Ditch**.

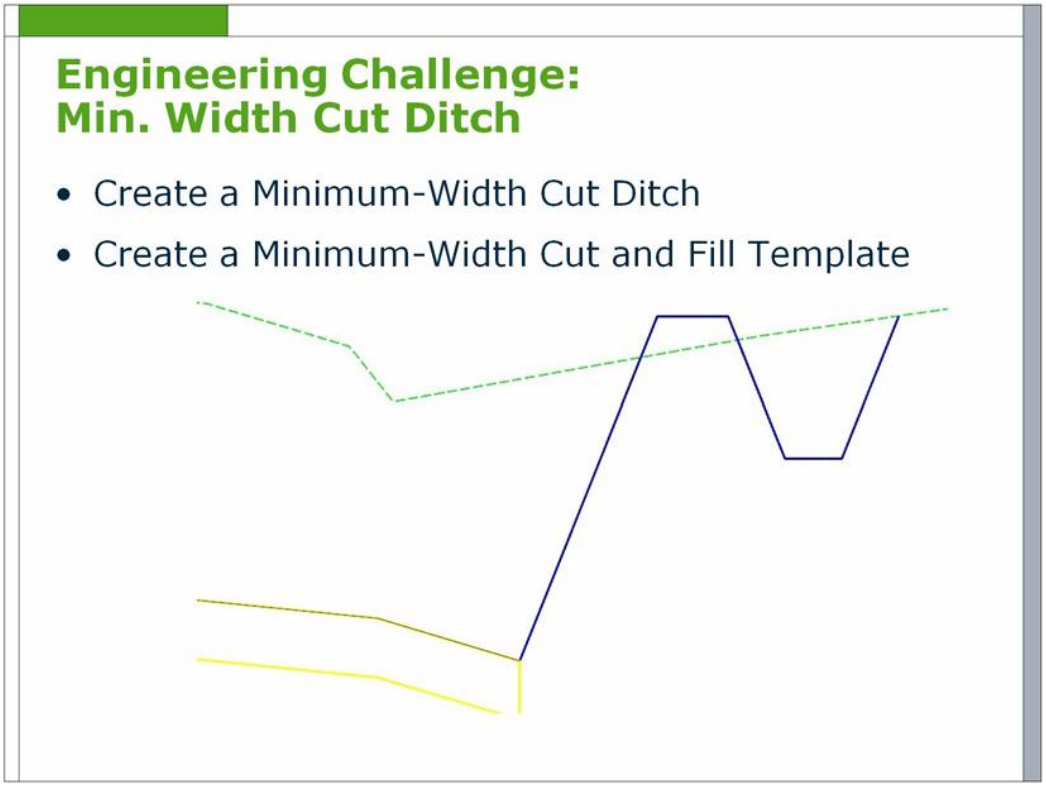
3 Set the *Style* to *P_ROAD_CutLine.*

Place the Ditch points

1 In the Dynamic Settings dialog, set *Point Name* to **Cut_Ditch** and the *Point Style* to *P_ROAD_CutLine*.
2 Place the point at the *Cut_Ditch_Daylight* point. (May want to right click and turn off Closed Shape)
3 Place the next point at *hs*= **-4,50%** [*hs*= -1.**2,50%**].
4 Place the next point at *hs*= **-4,0%** [*hs*= -1.**2,0**].
5 Place the next point at *hs*= **-4,-50%** [*hs*= -1.**2,-50%**].
6 Place the next point at *hs*= **-5,0** [*hs*= -1.**5,0**].
7 Place the next point at the **Hinge** point.
8 Right-click in the window to select **Finish**.
9 Right-click on the *Cut_Ditch* component, select *Edit Component*.
10 In the **Component Properties** dialog, select *xDNC_Cut_Ditch* for the *Parent Component*.
11 Select **Apply**.
12 **Test** the template.



Exercise-Create a Single-Seek Fill Ditch



This exercise complements the Cut Ditch Exercise by providing the steps to create a Fill Ditch.

Create the Fill Ditch Template

1 Right-click the *SingleSeekDitch* folder, select **New > Template**.
2 Rename the new *Template* to **Ditch_Fill_Tight**.

Create the Placeholder Ditch End Condition Component

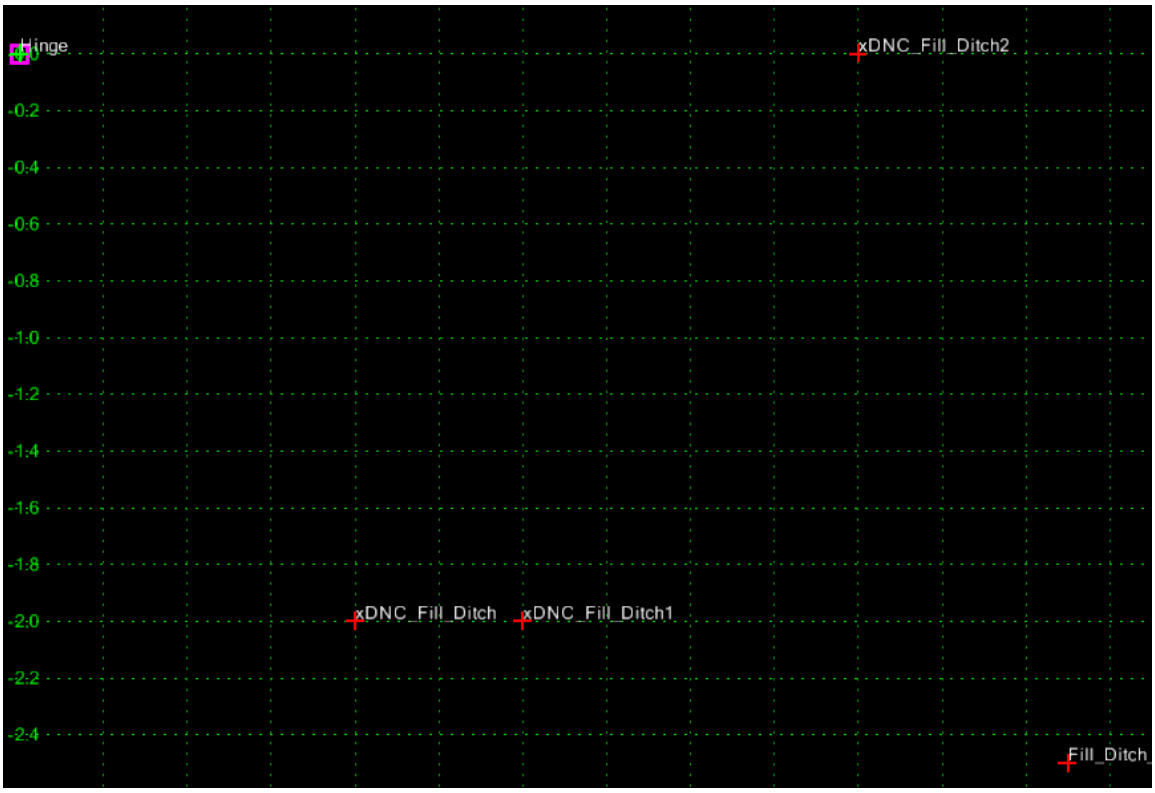
1 Select the **Add New Component > End Condition** menu item.
2 Set the Component *Name* to **xDNC_Fill_Ditch**.
3 Set the *Style* to *DNC.*
4 Set the *Priority* to **3**.
5 Set the *Target Type* to *Surface.*
6 Set the *Surface* to *<Active>.*

Place the placeholder points

1 In the Dynamic Settings dialog, set the *Point Name* to **Hinge** and the *Point Style* to *P_ROAD_Hinge*.
2 Place the point at *xy*= **0,0**.
3 In the Dynamic Settings dialog, set the *Point Name* to **xDNC_Fill_Ditch** and the *Point Style* to *DNC*.
4 In the **Dynamic Settings** dialog, clear the *Check for Interception*, *PlacePoint at Interception,* and *End Condition is Infinite* check boxes; set the *Do Not Construct* check box.
5 Place the next point at *hs*= **8,-25%** [*hs*= **2,-25%**].
6 Place the next point at *hs*= **4,0%** [*hs*= **1.2,0%**].
7 Place the next point at *hs*= **8,25%** [*hs*= **2,25%**].

Create the Daylight Seek Point

1 In the Dynamic Settings dialog, set all four check boxes: *Check for Interception*, *Place Point at Interception*, *End Condition is Infinite,* and *Do Not Construct*.
2 In the Dynamic Settings dialog, set the *Point Name* to **Fill_Ditch_Daylight** and the *Point Style* to *P_ROAD_FillLine*.
3 Place the next point at *hs*= **5,-50%** [*hs*= **1.5,-50%**].
4 Right-click in the window to select **Finish**.



Create the Fill Ditch Component

1 Select the **Add New Component > Constrained** menu item.

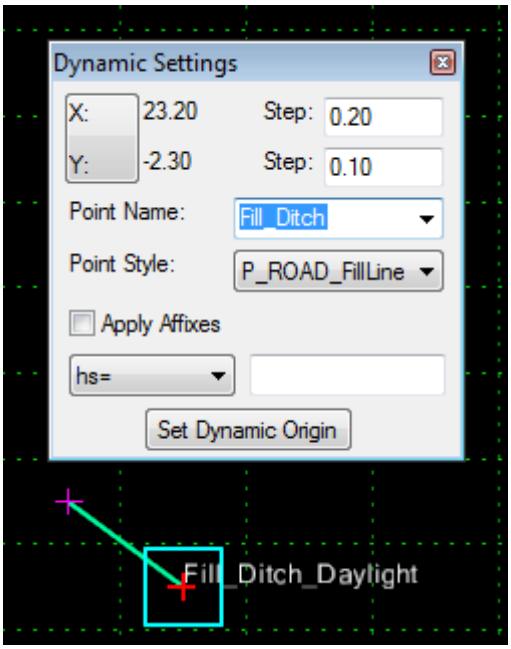
Since the points are constrained to the daylight point we need to work from the outside to the inside.

2 Set the *Component Name* to **Fill_Ditch**.

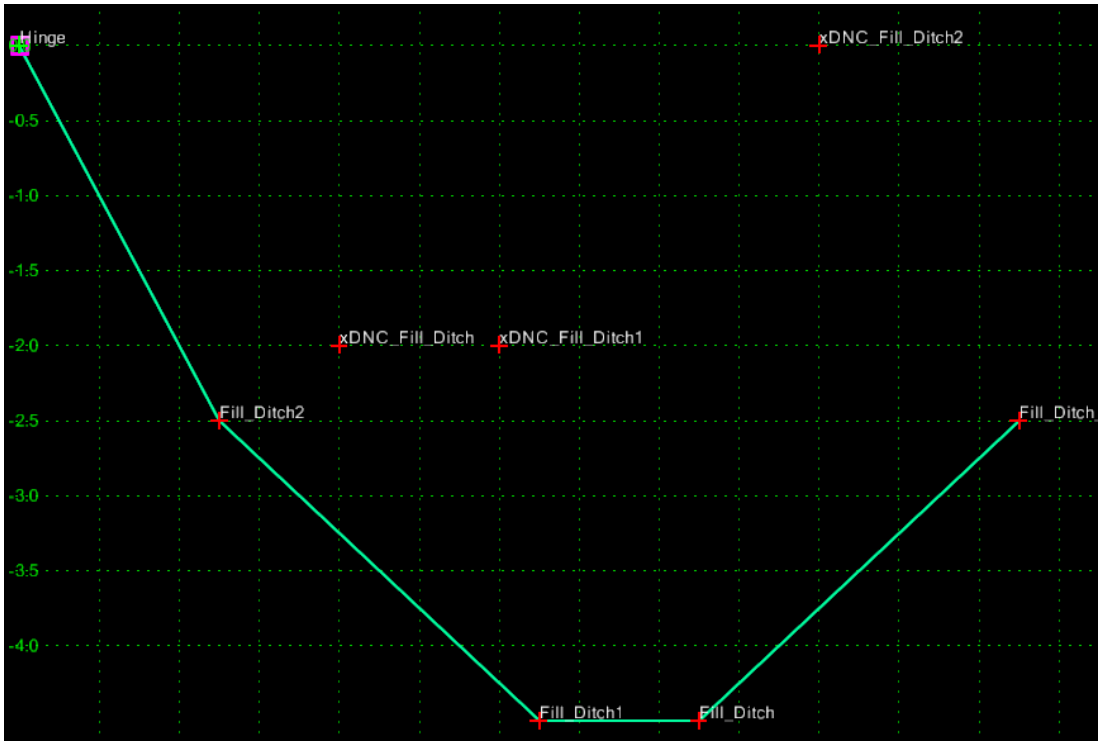
3 Set the *Style* to *P_ROAD_FillLine.*

Place the Ditch points

1 In the Dynamic Settings dialog, set *Point Name* to **Fill_Ditch** and the *Point Style* to *P_ROAD_FillLine*.
2 Place the point at the *Fill_Ditch_Daylight* point.



3 Place the next point at *hs*= **-8,25%** [*hs*= -**2,25%**].
4 Place the next point at *hs*= **-4,0%** [*hs*= -**1.2,0%**].
5 Place the next point at *hs*= **-8,-25%** [*hs*= -**2,-25%**].
6 Place the next point at the **Hinge** point.
7 Right-click in the window to select **Finish**.
8 **Test** the template



Make the Ditch a Child of the End Condition

While the template behaves properly as is, making the Fill Ditch component a child of the End Condition component simplifies managing these components when used in more complex template.

1 Right-click on the *Fill_Ditch* component, select *Edit Component*.

2 In the **Component Properties** dialog, select *xDNC_Fill_Ditch* for the *Parent Component*.

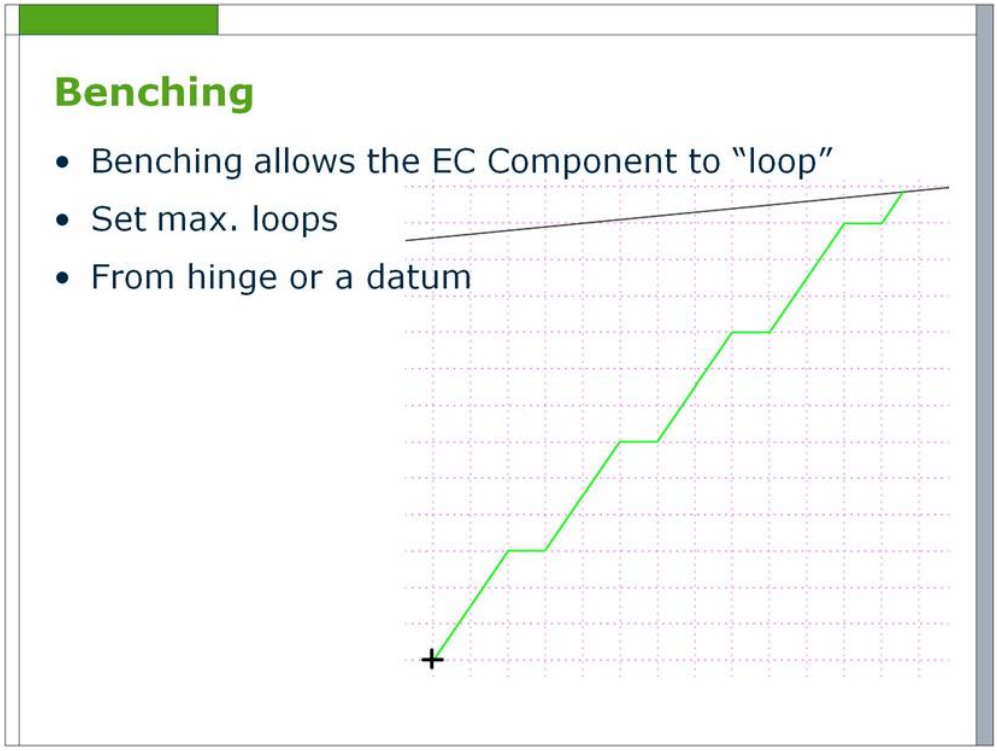
3 Select **Apply**.

4 **Close** the dialog.

Lesson Name: Advanced Techniques for creating Exterior Ditches

LESSON OBJECTIVE:

In this lesson the student will learn how to create a template that will deal with common erosion control and rockfall protection requirements for high cuts and fills to break up long slopes with flatter sections known as benches.



The requirements typically specify a maximum slope distance or height allowed without a bench. Very long slopes may require many benches.

End Condition components, by definition, seek a target subject to the constraints of their geometry. Any End Condition component can be looped up to a userspecified maximum iterations searching for its target. Like all End Conditions, if the target is found the solution is placed otherwise the End Condition fails.

Roadway Designer accommodates both bench elevation methods:

- Relative to the start point.
- Relative to a datum with defined elevation steps.

© 2008 Bentley Systems, Incorporated

Exercise-Benching

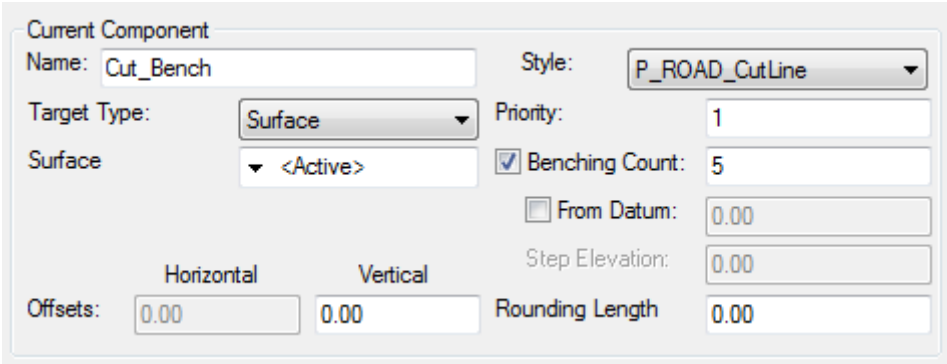
We will be defining a benched cut solution.

Create the Bench Cut Template

1 Right-click the *Benching* folder and select **New > Template**.
2 Rename the new *Template* to **BenchCut**.

Create the End Condition

1 Select the **Add New Component > End Condition** menu item.
2 Set the Component *Name* to **Cut_Bench**.
3 Set the Component *Style* to *P_ROAD_CutLine.*
4 Set the *Target Type* to *Surface.*
5 Set the *Surface* to *<Active>.*
6 Set the *Benching Count* to *5.*



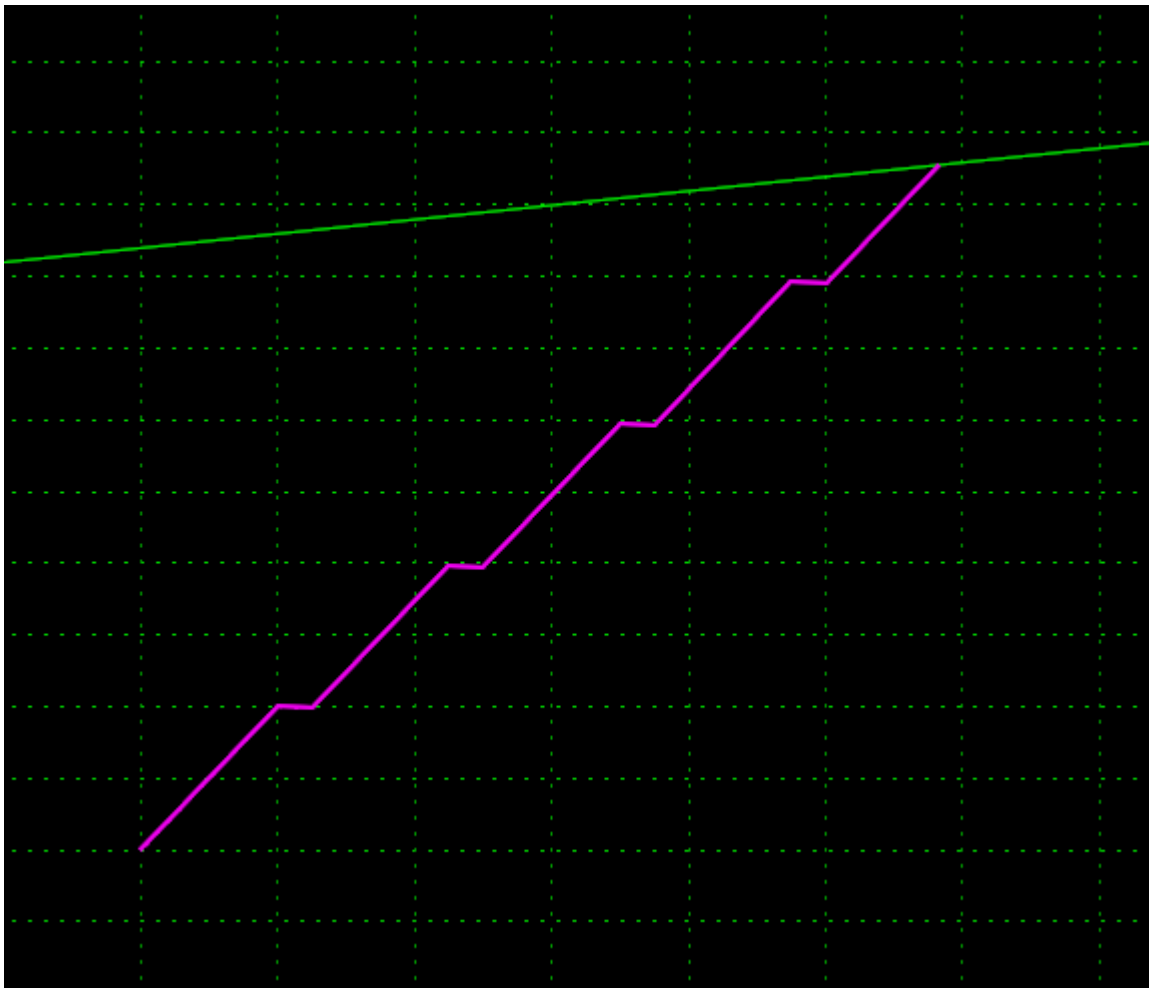
Place the Bench points

1 In the Dynamic Settings dialog, set *Point Name* to **Hinge** and the *Point Style* to *P_ROAD_Hinge*.
2 Place the point at *xy*= **0,0**.
3 In the Dynamic Settings dialog, key in a *Point Name* of **Cut_Bench** and set the *Point Style* to *P_Road_CutLine*; set the *Check for Interception*, *Place Point at Interception* check boxes; clear the *End Condition is Infinite* and *Do Not Construct* check boxes.
4 Place the next point at *hs*= **20,100%** [*hs*= 5**,100%**].

5 Place the next point at *hs*=**5,-5%** [*hs*= 1.6**,-5%**].

6 Right-click and select **Finish**.

7 **Test** the template.



Lesson Name: Creating a Barrier – Mountable Gutter Template

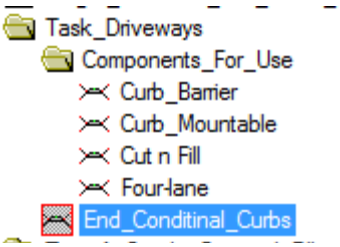
LESSON OBJECTIVE:

In this lesson the student will design a template that When the template encounters a driveway style, place a mountable gutter and draw a driveway from the back of the gutter to the 3D driveway feature. Also, When the template does not encounter a driveway style, place a barrier gutter and normal cut and fill slopes.

Exercise: Building the End Condition

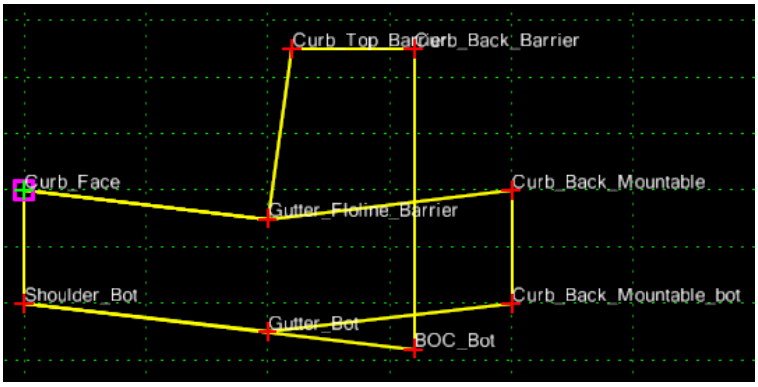
Opening the File and Template Library

1. Open C:\EW-9\Tasks\End Conditions**working.dgn**.
2. Open C:\EW-9\RWK**End Conditions.rwk**
3. Open **Modeler > Create Template**
4. Go to the **End_Conditions** template folder and select the **Task_Driveways** folder.
5. Right click > New Template and name it **End_Conditional_Curbs**.



Placing the Gutter Templates

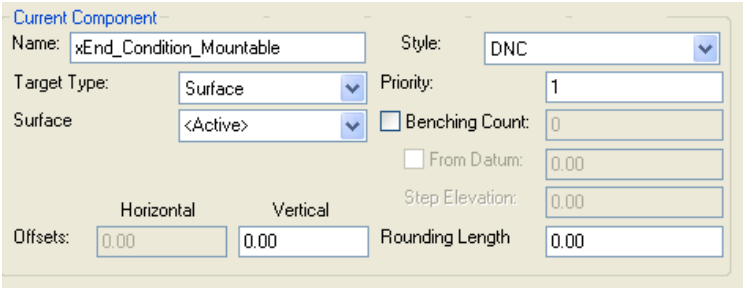
1. Drag the **Curb_Barriers** into the active template at the origin and fit the template.
2. Drag the **Curb_Mountable** into the active template at the origin making sure the point turns white and fit the template.



3. Open Tools > Dynamic Settings and Key-in **xEndCond_Mountable** for the point name and Point Style = **DNC.**

Create the End Condition

1 Select the **Add New Component > End Condition** menu item.
2 Set the Component *Name* to **xEndCond_Mountable**.
3 Set the Component *Style* to *DNC.*
4 Set the *Target Type* to *Surface.*
5 Set the *Surface* to *<Active>.*



Place the Gutter Mountable points

1 Place the point by clicking on the Curb_Face point.

2 In the Dynamic Settings dialog, clear the *Check for Interception*, *Place Point at Interception* and *Do Not Construct* check boxes check boxes; set the *End Condition is Infinite* check box.

3 Place the next point at *Gutter_FloLine_Barrier*

4 Place the last point at *Curb_Back_Mountable*

5 Right-click and select **Finish**.

Place the Gutter Barrier points

1 In the Dynamic Settings dialog, key-in xEndCond_Barrier for the Point Name.

2 Select the **Add New Component > End Condition** menu item.

3 Set the Component *Name* to **xEndCond_Barrier** and Priority = **2**.

4 Place the 1st point by clicking on the Curb_Face point.

5 Place the next point at *Gutter_FloLine_Barrier*

6 Place the next point at *Curb_Top_Barrier*

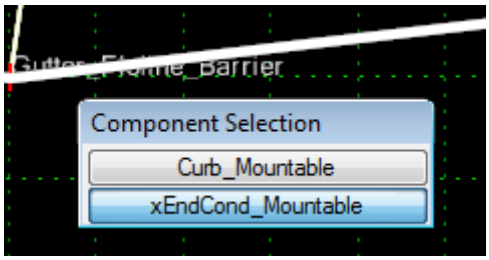
7 Place the last point at *Curb_Back_Barrier*

8 Right-click and select **Finish**.

Editing the xEndCond_Mountable Component Properties

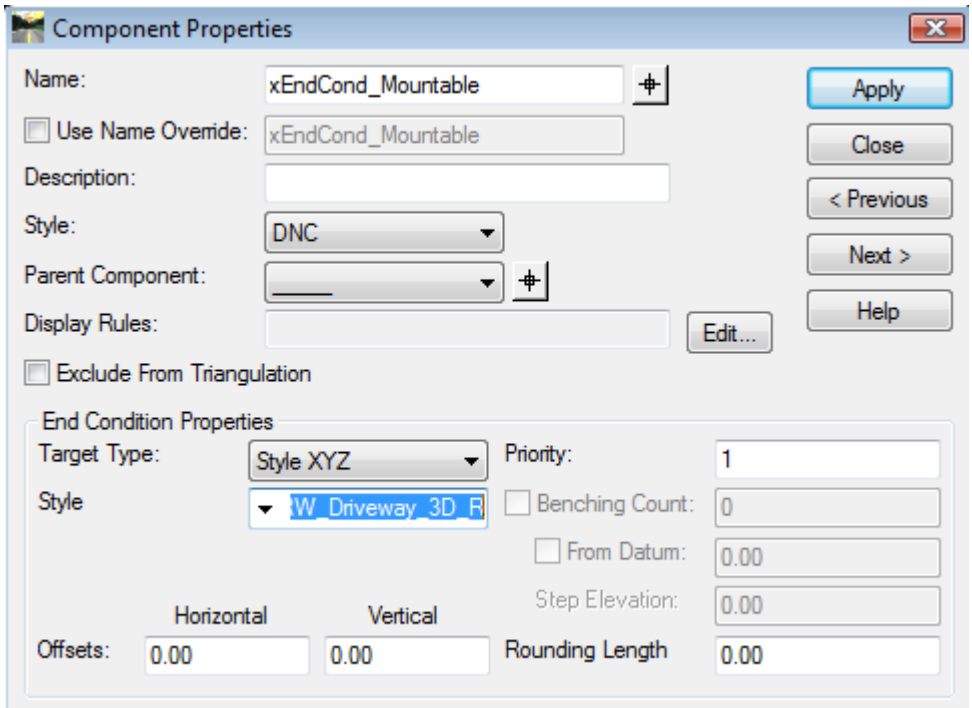
1 Right Click on the xEndCond_Mountable component > Edit Component.

2 Select **xEndCond_Mountable**



3 The Components Properties dialog opens. Select End Conditions Properties > **Target**.

4 Set the value to **Style XYZ**.



5 Set the Style to **E_RW_Driveway_3D_R**

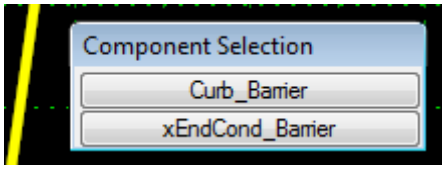
6 Click > **Apply** then **Close**

Editing the xEndCond_Barrier Component Properties

1 Right Click on the Curb_Barrier component > Edit Component.

2 Click the Locate Button adjacent to Parent Component

3 Select the curb face and then Select > xEndCond_Barrier



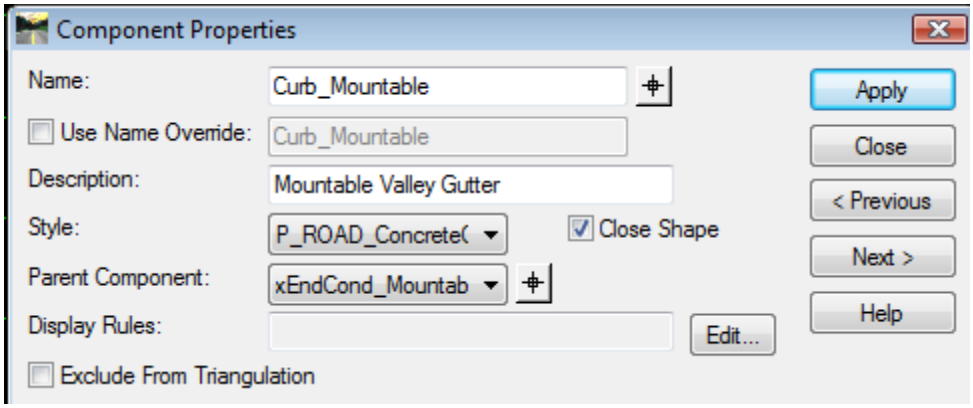
4 Click > **Apply**

Setting the xEndCond_Mountable Parent Component

1 Click on the **Locate Button** adjacent to Name.

2 Select the **Curb_Mountable** Component

3 Set the Parent Component to **xEndCond_Mountable**



4 Click **Apply** then **Close**

Attaching a Cut/Fill End Condition

1 Drag template **Cut n Fill** into the active template and place it on the **Curb_Back_Barrier** point.

2 Click the Scroll Bar to move to the right

Create the Driveway End Condition

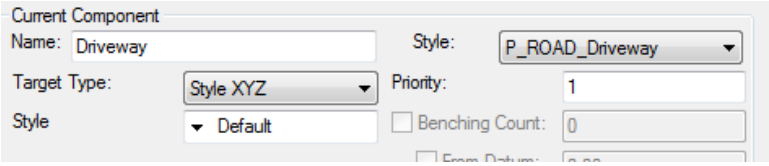
1 Select the **Add New Component > End Condition** menu item.

2 Set the Component Name to *Driveway*.

3 Set the Component Style to *P_ROAD_Driveway.*

4 Set the *Target Type* to *Style XYZ.*

5 Set the *Surface* to *<Active>.*

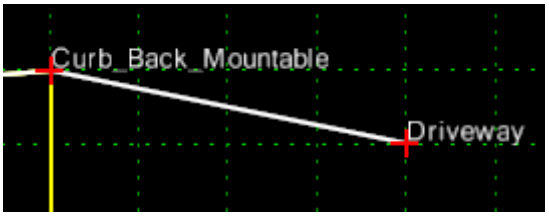


6 In the Dynamics Settings dialog set the Point Name to *Driveway*

7 Set the Style to *P_Road_Driveway*;

8 Click on the **Curb_Back_Mountable** point. Set *End Condition is Infinite*; *Check for Interception, and Place Point at Interception;* Clear *Do Not Construct*

9 Place the Driveway point somewhere to the right and down



Edit the Driveway Component

1 Select the Component Name *Driveway*; right click > **Edit Component**.

3 Set Parent Component to *xEndCondition_Mountable.*

4 Set the Style to *E_RW_Driveway_3D_R.*

5 Click **Apply** then **Close**

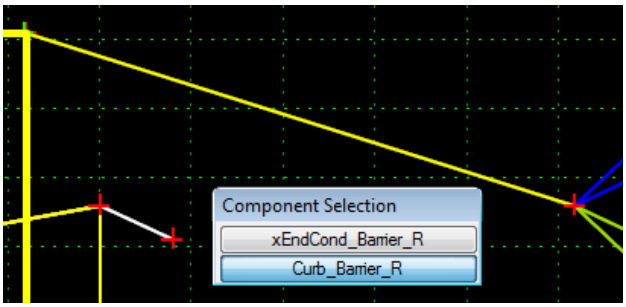
6 Test the template

Edit the Cut N Fill Components

1 Select the Component Name *clear_R*; right click > **Edit Component**.

3 Click **Apply**

4 Set the Parent Component to *Curb_Barrier_R* for the two cut and two fill conditions



5 Click **Apply** then **Close**

4 Test the template

Lesson Name: Creating a Four Lane Template

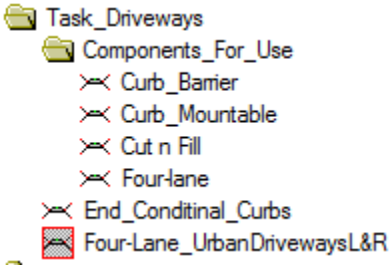
LESSON OBJECTIVE:

In this lesson the student will create a 4-Lane template that will utilize the previously created Barrier – Mountable Gutter end condition.

Exercise: Building the 4 Lane Template

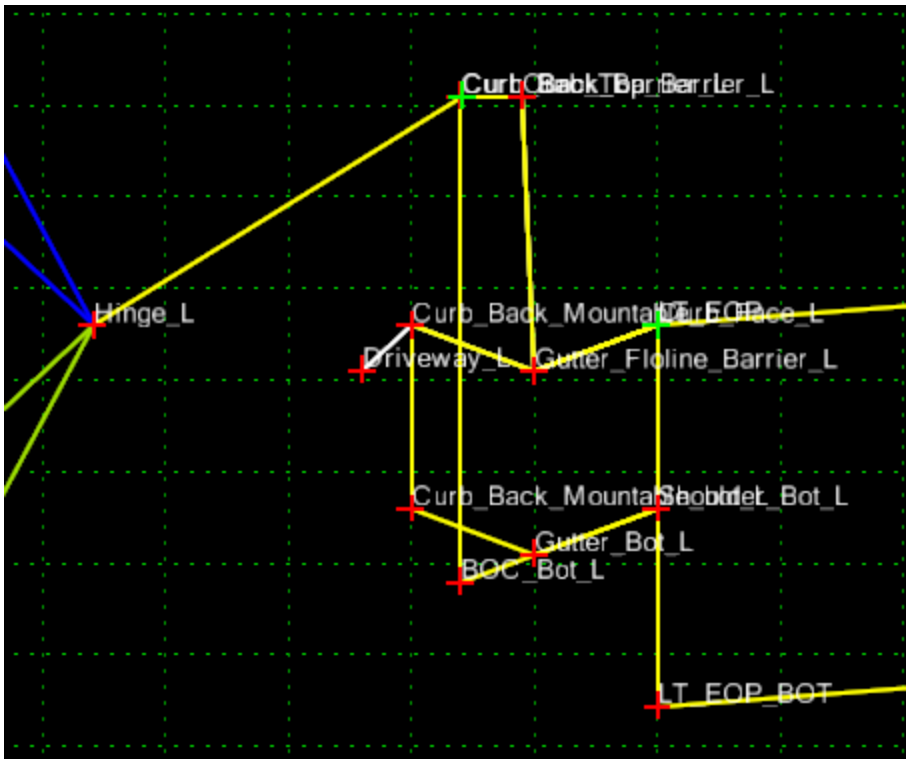
Creating the Four-Lane_UrbanDrivewaysL&R Template

1. Continuing in C:\EW-9\Tasks\End Conditions**working.dgn**.
2. Staying in the *EW-9Template Standards.itl* file, *Tasks_Driveways >* folder
3. Right click > New Template and name it **Four-Lane_UrbanDrivewaysL&R**.

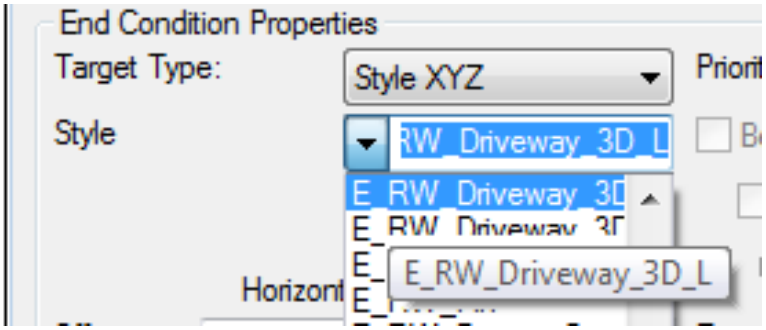


Assembling the template

1, **Drag** the *four lane component* into the active template window (use Mirror)
2. **Fit** the template.
3.**Toggle On** *Apply Affixes* in the Dynamic Settings dialog
4. Drag the End_Conditional_Curbs template into the active template (use Mirror)
5. **Fit** the template
6. Window area around the left gutter assembly



6. Select the *Driveway_L* component, right click > **Edit Component**
7. Set **End Condition Properties > Style** to *E_RW__Driveway_3D_L*



8. Click **Apply** then **Close**
9. **Fit** the template

Lesson Name: Pushing the Four Lane Template and Creating the Sections

LESSON OBJECTIVE:

In this lesson the student will push the newly create 4-Lane template onto a corridor that will utilize the Barrier – Mountable Gutter end condition and make the appropriate decision as to whether a barrier or mountable curve will be designed.

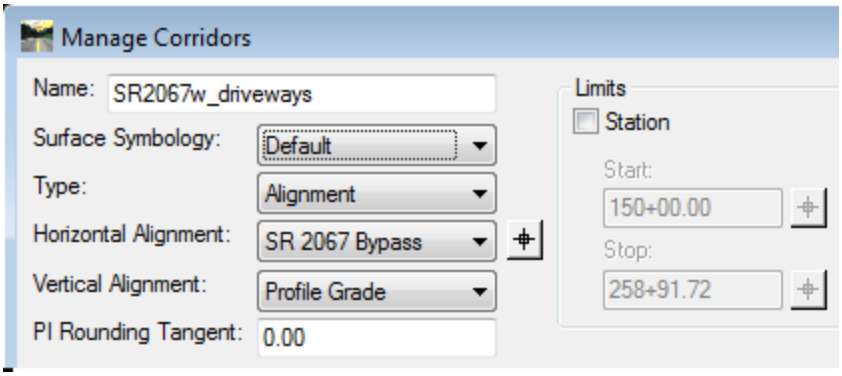
Exercise: Pushing the 4 Lane Template

Saving your template

1. **Select** *File > Close* and *Yes* when prompted to save your work.

Managing the Corridor

1. **Open** *Roadway Designer*
2. **Click** the *Manage Corridor* icon or go to the Corridor menu and select *Corridor Management*
3. Set the dialog as shown below

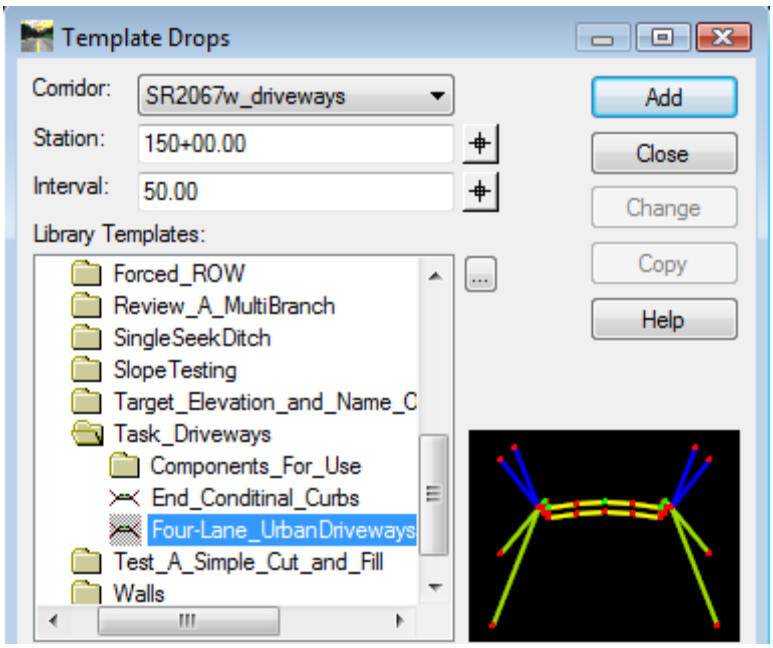


4. **Click** *Add* then *Close*

© 2008 Bentley Systems, Incorporated

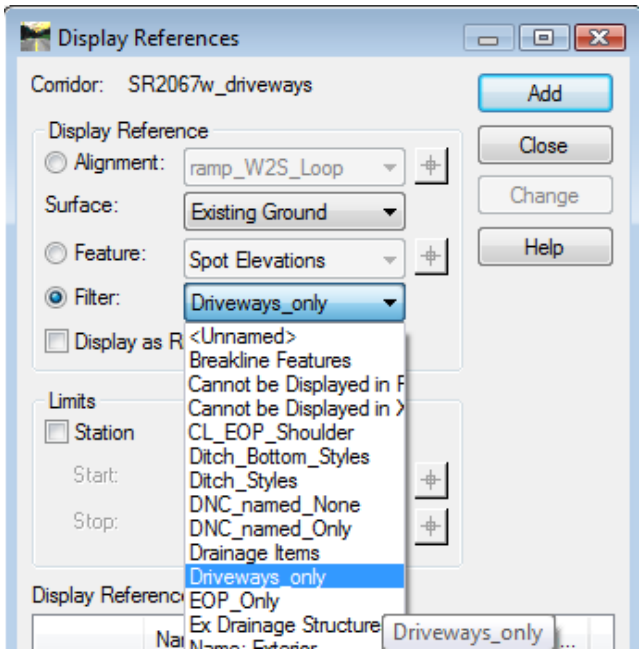
Dropping the Template

1. **Click** the *Template Drops* icon or go to the Corridor menu and select *Template Drops*
2. **Open** to the EW-9\Standards\Templates*EW-9 Template Standards.itl* file
3. **Navigate** to the Task)Driveways Folder and **select** the *Four-Lane_UrbanDrivewaysL&R*

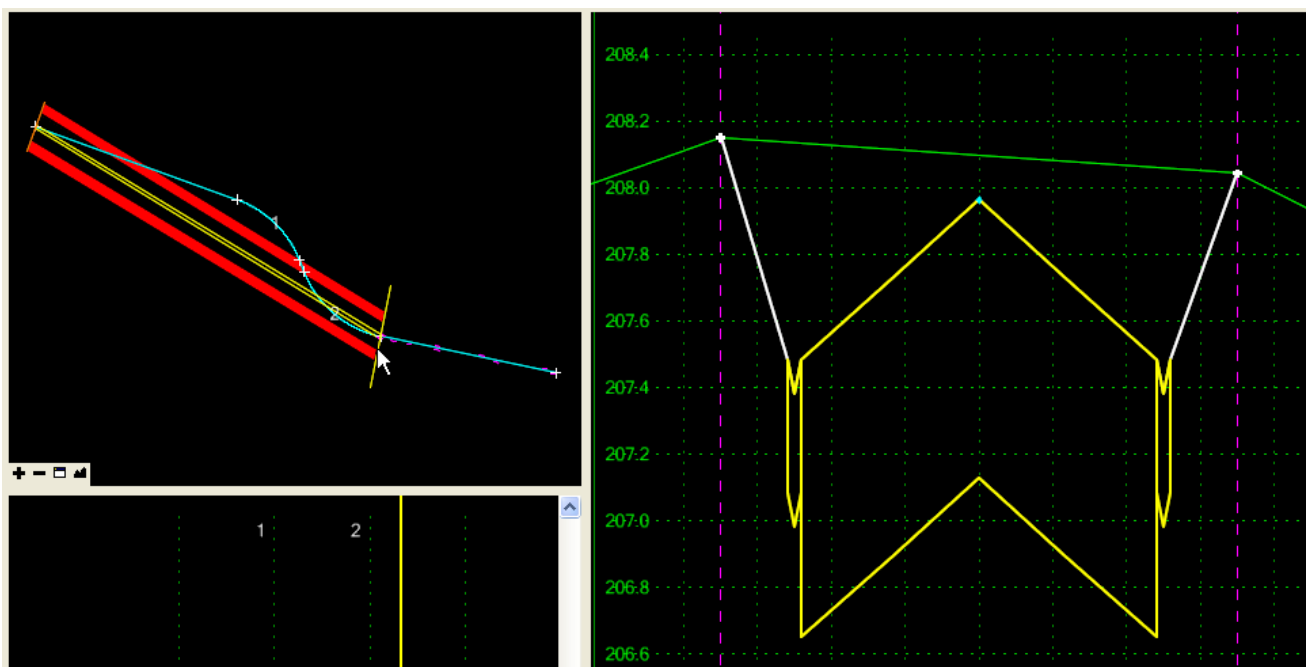


4, **Click** *Add* then *Close*

5. **Click** the *Display References* icon or go to the Corridor menu and select *Display References*
6. **Select** the *Filter* radio button and set the value to *Driveways_only*



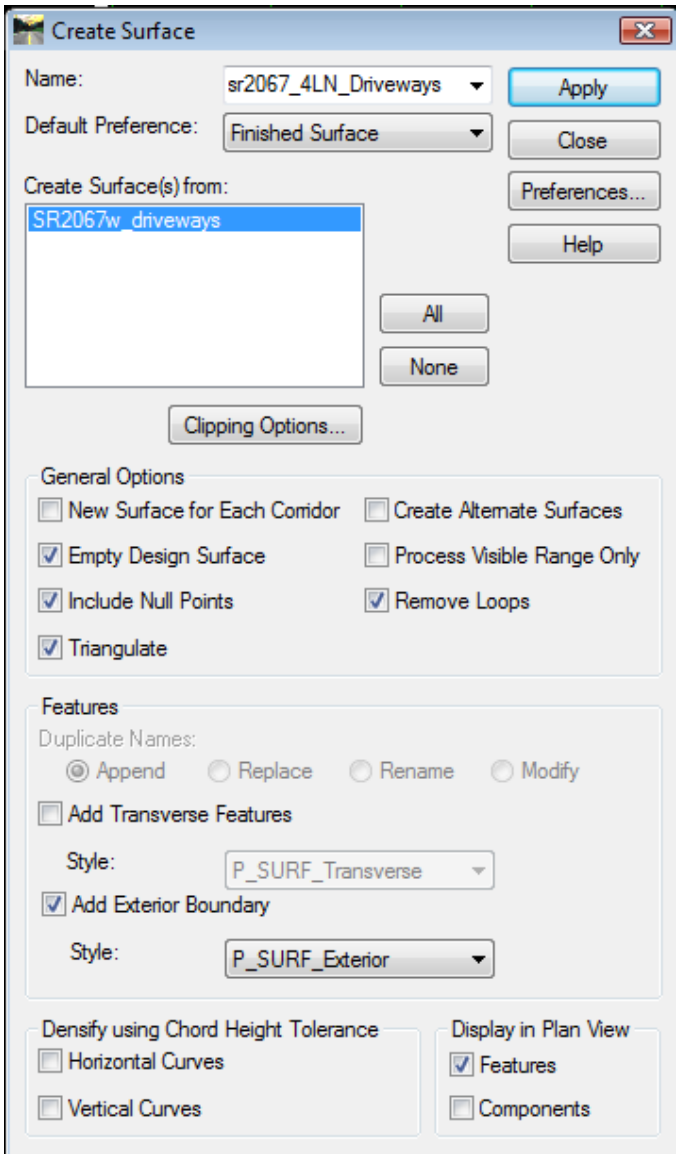
7. **Click** *Add* then *Close*
8. **Double click** in the plan view



9. **Scroll** through the cross sections to view the remaining driveway locations

Creating the Surface

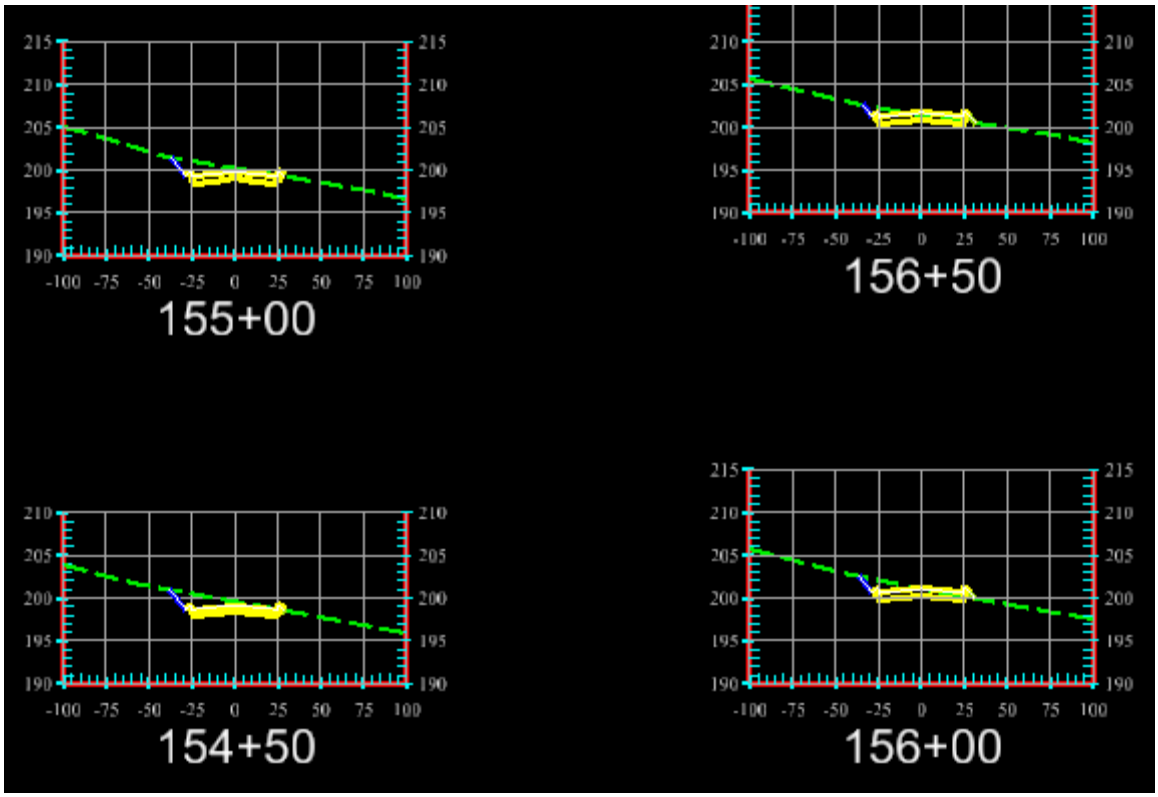
1. **Click** the *Create Surfaces* icon or go to the Corridor menu and select *Create Surface*
2. **Key-in** *sr2067_4LN_Driveways* for the finished surface name
3. **Set** the remainder of the dialog box as shown below



4. **Click** *Apply* the *Close*
5. **Exit** Roadway Designer and **Save** your work as *sr2067_wDriveways.ird*

OPTIONAL: Creating the Cross Sections

1. For InRoads Users**, Select** *Evaluation>Create Cross Sections*
2. For Geopak Users**, Select** *Create Cross Sections* from the Corridor Manager
3. **Select** the *sr2067 4LN_Driveways* surface
4. **Set** the alignment to *SR2067Bypass*
5. **Click** *Apply*, **DP** the location then *Close*



Lesson Name: End Condition Exceptions

LESSON OBJECTIVE:

In this lesson the student will use End Condition Exceptions to override end conditions along a range of corridor stations.

Exceptions are used when end conditions are not desired in the design. For example when a corridor passes through an intersection or over a bridge.

End condition exceptions are shown as a cyan colored shape in the plan view that can be double clicked to access the End Condition Exceptions dialog.

Exercise: Create an End Condition Exception

1 **Open** SR 2067 Bypass.dgn in the *C:\EW-9\Advanced EC\DGN\ folder.*

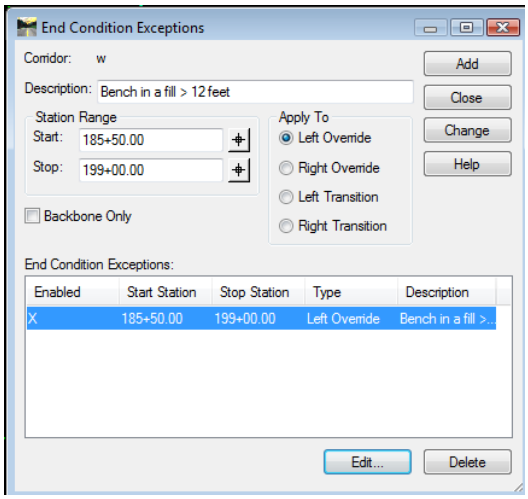
2 **Place** the *sr2067 Bypass* corridor and **drop** the Task Driveways > *Four-Lane_UrbanDriveways* template onto the corridor.

3 **Navigate** to the cross section at *station 185+00.* We will place a Fill Bench end condition starting at this location, ending at *station 199+00.*

4 **Open** *Corridor > End Condition Exceptions.*

5 **Set** the station range accordingly and provide a description if desired.

6 **Set** the *Apply to Left Override* option.



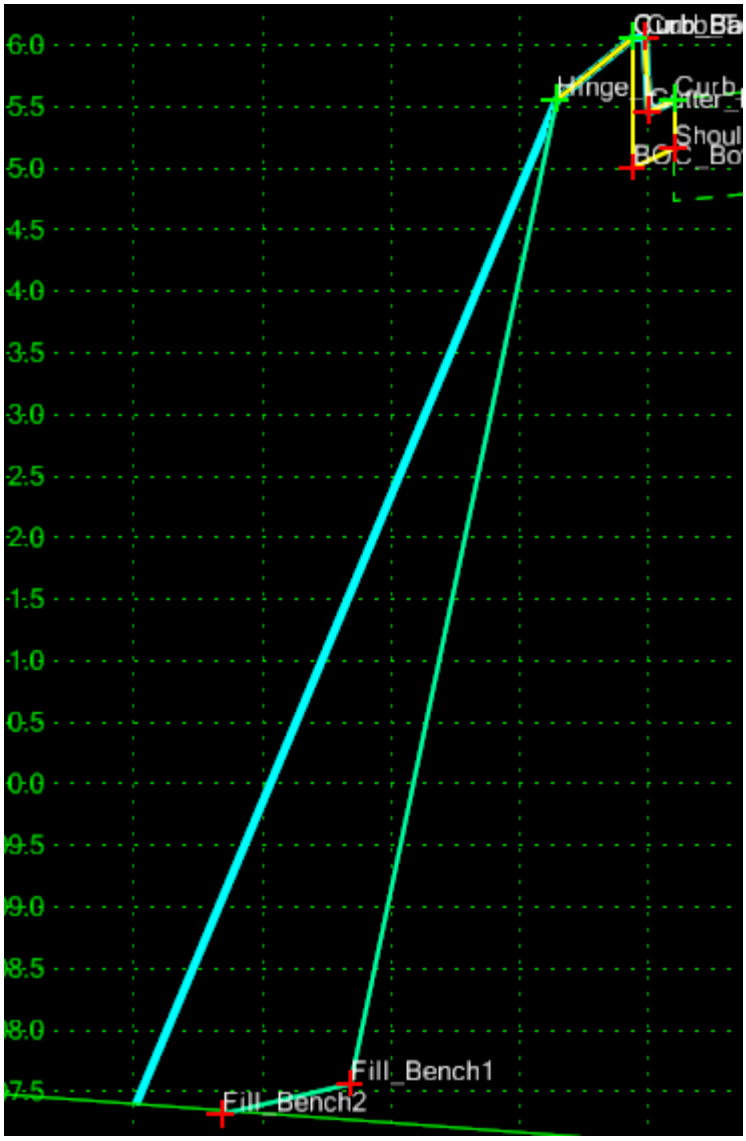
7 **Click** *Add* then *Edit.* This displays the Left Override – 185+00 to 199+00 dialog.

8 **Right Click** on the *left fill slope* (a cyan colored line) and **select** *Delete Component*. Note that the Fill_2to1_L point disappears

9 **Navigate** to the *End Conditions > Benching* folder and **select** the *Fill Bench template.*

10 **Drag** the *Fill Bench* template into the active template view and right click. With the left mouse button still held down, **select** *Reflect*.

11 **Move** the *Fill Bench* end condition to the *Hinge_L* point (make sure the point becomes a **bold** white plus sign) and **click**.



12 **Click** *OK* on the *Left Override – 185+00 to 199+00* dialog.

13 **Close** the *End Conditions Exception* dialog.

Note that the end condition exception displays in the Plan View as a cyan shaded area.

Review and Save the Roadway Design

1 **Process All**, **close** the *Results dialog* and **review** the design.

2 **Save** the roadway design

3 Optional: **Create** the End Condition Exception on the *right side* and **save** the design.