InRoads – Sawcut & Widening to Match Existing Cross Slopes

Saw Cut and Widening Workflows

Overview

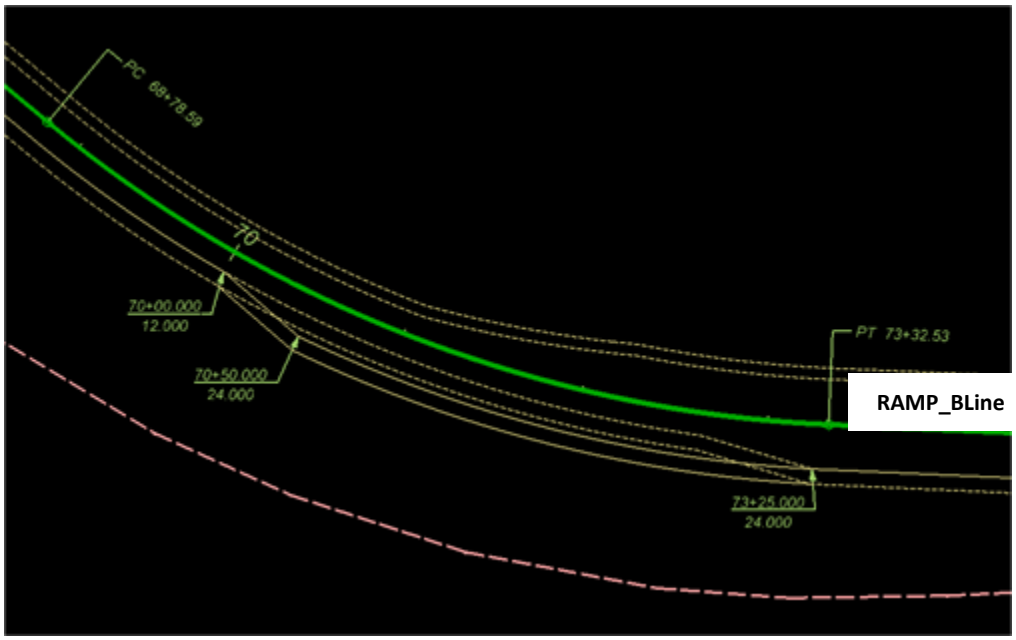
Sawcut and widening is a common WSDOT design process. There are different possible InRoads workflows available to accomplish this task and determining which one to use depends on project specific factors. The process detailed here is particularly well suited to matching existing superelevation transitions.

This process uses two user-defined longitudinal features along the existing roadway surface. Locate the inside feature to best capture any existing crown or superelevation in the roadway; the outside feature would typically be the edge of the existing traveled way (ETW) or proposed sawcut which is normally one foot inside of the ETW. These two features define a DTM of the existing roadway.

The existing cross slope created from these two features is projected laterally by a distance or to a graphic element Edge of Traveled Way (ETW) for the proposed widening.

The example dataset for this Tech Note is from the InRoads Production Level Design course. The RAMP_BLine ramp final surface is merged into the IR201_Exist surface to create a new existing surface for the proposed widening. The merge is done with the *Surface > Edit Surface > Merge Surfaces* command.

The project scope is to lengthen the right turn lane by 275 feet to provide additional storage length as shown below.



Workflow

Define and Project Existing Roadway

1. Create MicroStation elements for sawcut line and mid-lane elements that best define the portion of the roadway surface to match and widen.

   At least two linear longitudinally-placed features are needed in the lane. Choose locations that avoid ruts and other non-representative positions.

2. Design the proposed ETW limit using either MicroStation elements or InRoads alignments, to the appropriate design standards.

   The edge of paved shoulder feature (EPS**)** is created during the modeling process.

3. Import the graphic elements from step 1 into a new InRoads surface using the *File* > *Import Surface* > *From Graphics* command.

   Import the graphics into a new design surface as breaklines with elevations derived by draping on the existing DTM. Triangulate and view the design and existing surfaces in cross sections to verify that the locations chosen accurately model the roadway surface and modify or re-import if necessary.

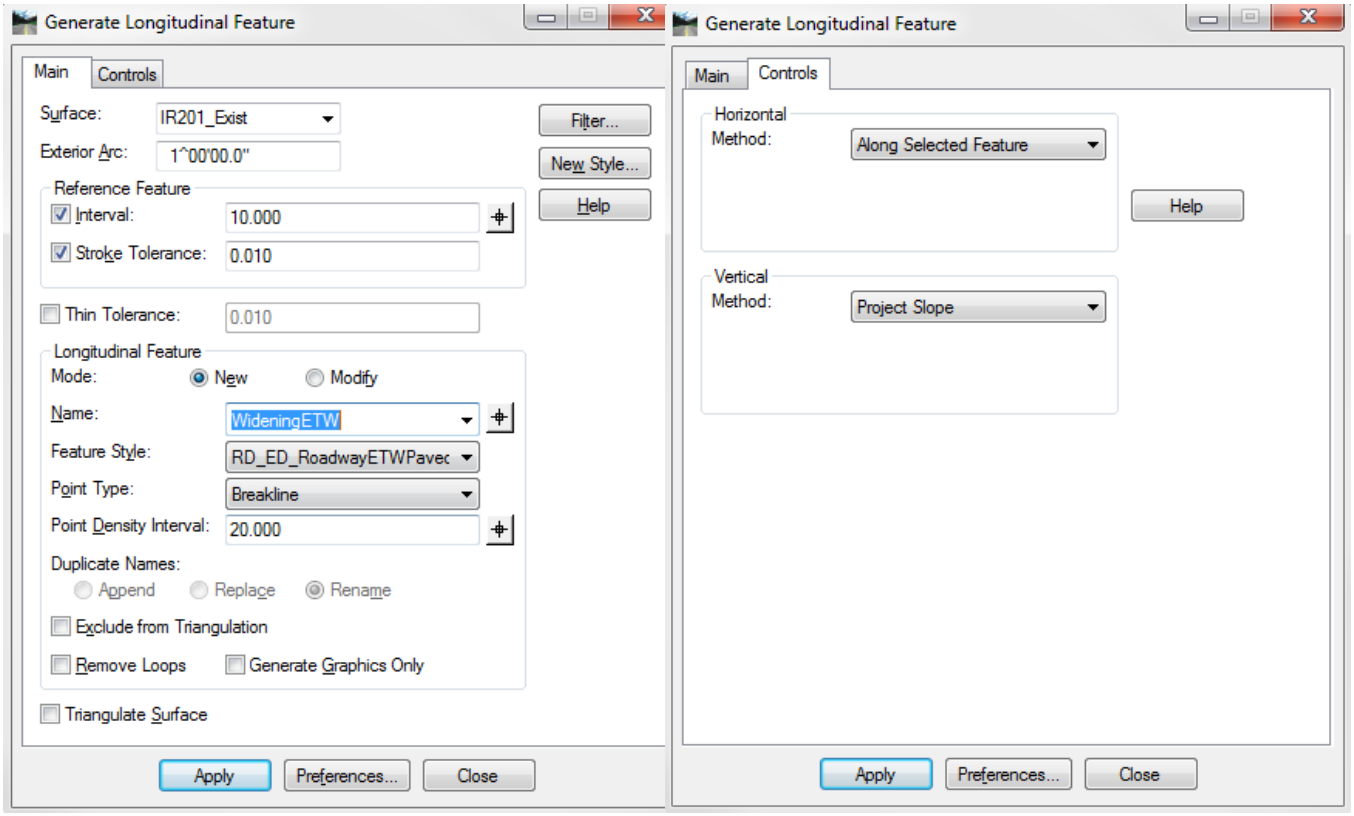
   It is crucial to have a surface that accurately reflects the existing roadway and does not have any “holes” or “spikes” in it. Check the surface properties and review the data ranges.

4. Project the surface to the new ETW graphic using the *Surface* > *Design Surface* > *Generate Longitudinal Feature* command.

   This command “projects” the surface created in step 3 at a slope defined by the two surface features to a user defined limit resulting in a new surface feature.

   Consider using smaller exterior arc angles in order to smooth out features created on curves. Triangulate and view the surface cross sections to verify the results. This command requires using a 3D file.

   Make sure that you display and use the features created in the **Generate Longitudinal Feature** command and not the original graphics – the features work best as input for this command.



The **Generate Longitudinal Feature** command prompts for:

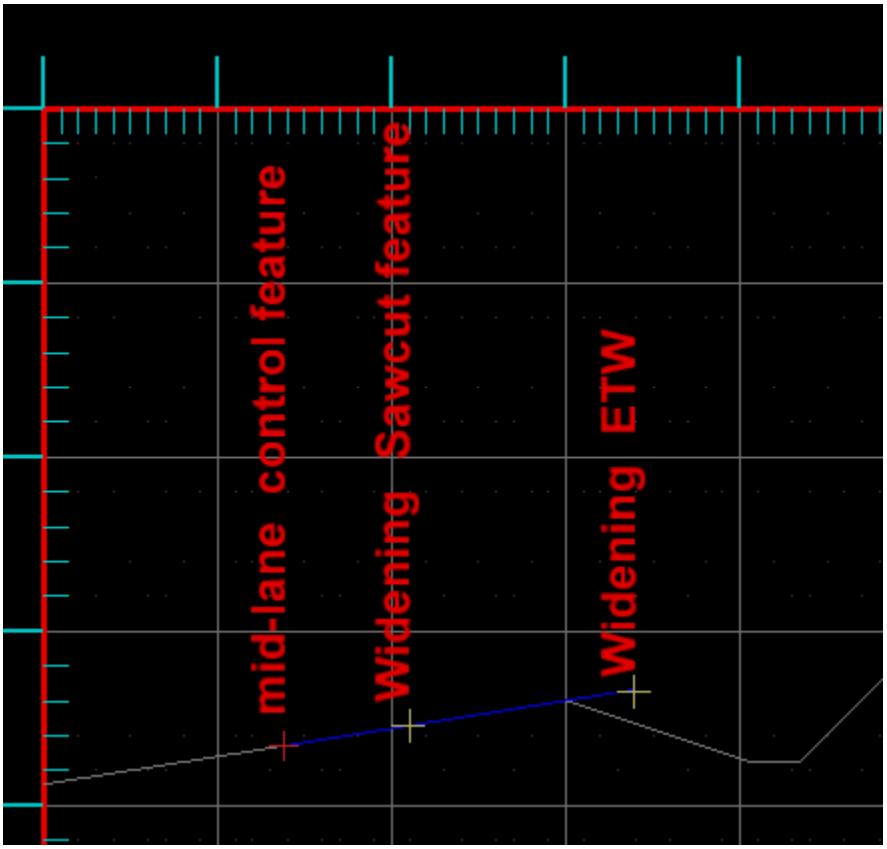
- **Identify Primary Element** – select the mid-lane control feature
- **Identify Secondary Element** – select the sawcut feature
- **Identify element used to set Horizontal offset** – select the new ETW graphic

  Make sure that the ETW graphic is one complete element from beginning to end. Use the **Create complex chain** command in MicroStation if necessary.
- **Identify Reference Element** – select the mid-lane control feature

  This reference element is used as the control and the new feature is created by projecting perpendicularly at the specified interval.
- **Identify beginning / Reset for entire** – used to set longitudinal station limits

  This can be the entire reference element or just a portion.

View the projected surface, create cross sections and review against the existing roadway. Review the surface properties and check for 'holes' or spikes' or any other anomilies.



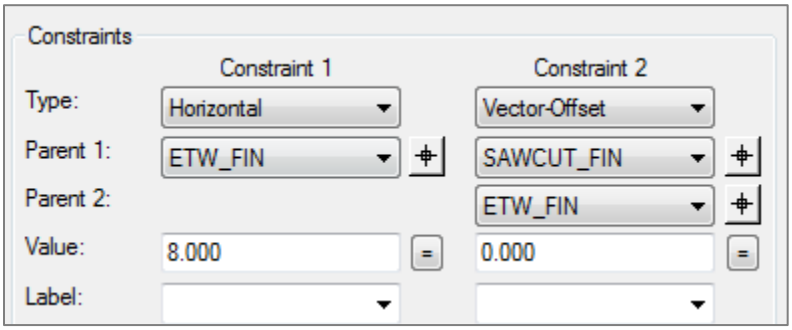
Create Widening Template

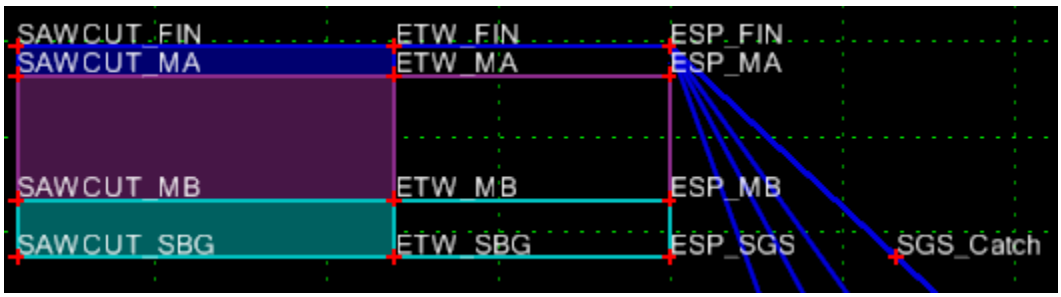
Create a roadway template for the widening. The type and complexity of the project will determine the number of templates needed. The template described here will use the sawcut feature as the origin and insertion point.

1. Open the **Create Template** command.
2. Begin at **0, 0** to define lane and shoulder components, in this case on the right side only, along with the desired end conditions.

   Template placement along a corridor alignment, or in this case, a feature is tied to this 0, 0 location and not the dynamic origin represented by the magenta colored square. This is simply a relative origin used in template creation and can be moved around to any desired point.
3. Constrain the **EPS_FIN** shoulder point with a horizontal constraint from the **ETW_FIN** point and a Vector-Offset constraint defined by the slope between the **SAWCUT_FIN** and **ETW_FIN** points.

   This Vector-Offset constraint for the shoulder point ensures that the shoulder slope will always match the lane slope.





Create Roadway Corridor

Open the project's **Roadway Designer** library.

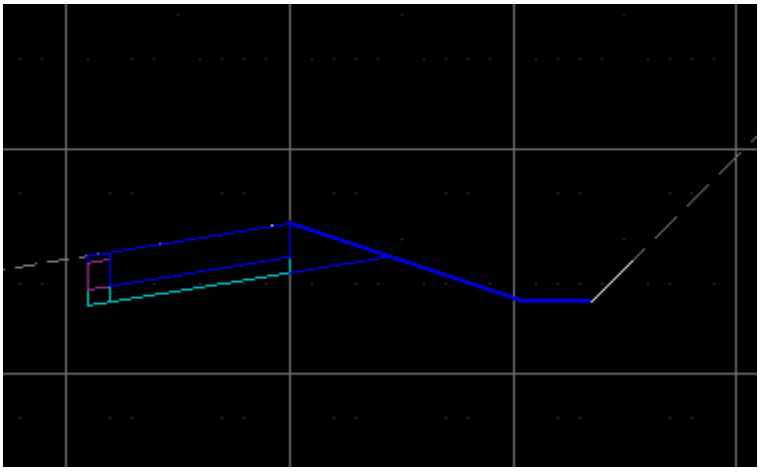
1. Create a new corridor.
2. Set the *Type* to **Feature**.
3. Select the widening surface.
4. Select the widening sawcut feature.
5. Assign template drops.
6. In the *Tools* > *Options* command, uncheck the **Horizontal** and **Vertical Cardinal Point** options.

   If these are enabled, you may get unwanted template intervals at each vertices of the feature, which can number in the hundreds.

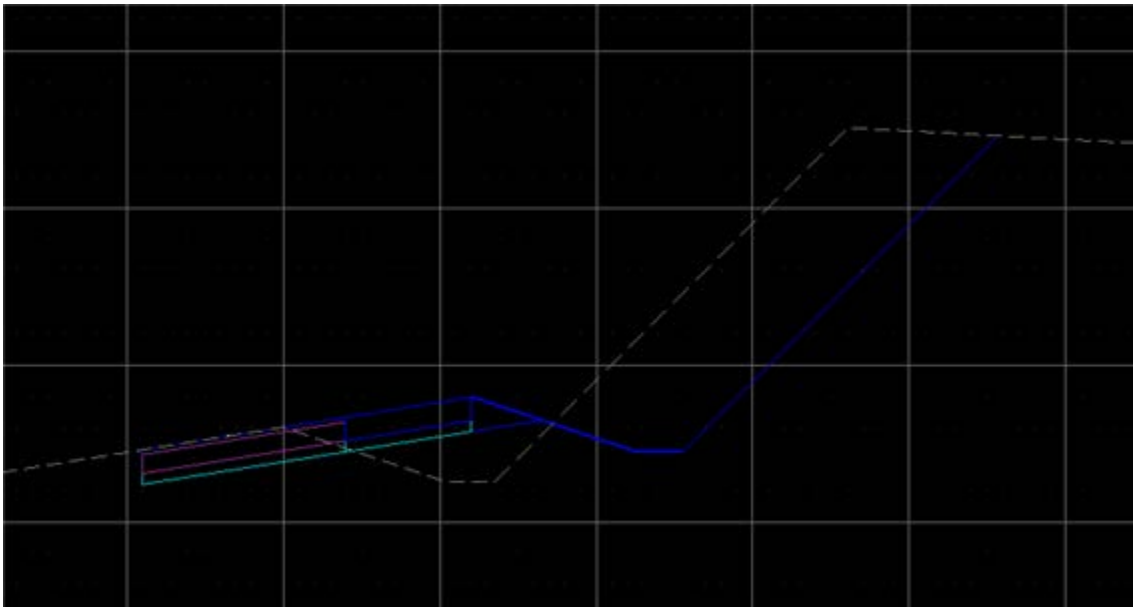
   An important step is to properly tie template points to features and/or alignments using Point Controls. These point controls override the template constraints and control the horizontal and/or the vertical placement of the key template points.

Define a horizontal and vertical control (**Both**) tying the **ETW_FIN** template point to the **Widening_ETW** surface feature. Since this feature represents the projected existing surface, it ensures that the ETW point in the template is tied three dimensionally to properly match the surface widening.

7. Process the design and review. When you are satisfied that the design is correct, create a finished surface.
8. Create cross sections and view the results.



This is the first section at station 70+00 and depicts the one foot wide sawcut into the lane.



This section is at full widening.

For questions or comments on this tech note, contact your regional CAE Support Coordinator or the WSDOT CAE Help Desk at (360) 709-**8013**.