

Comprehensive Template Design



Engineering\CADD Systems Office

Variable Templates

Learning Objectives

◆ UI, Points, Components

- ✓ The Basics – Point Properties, Component Properties, and Constraints
- ✓ Creating Simple (Static) Templates -
- ✓ Setting Preferences
- ✓ Dynamic Settings \ Apply Affixes
- ✓ Working with Components – Deleting, Merging Points, Updating Constraints
- ✓ End Conditions

◆ Creating Variable Templates

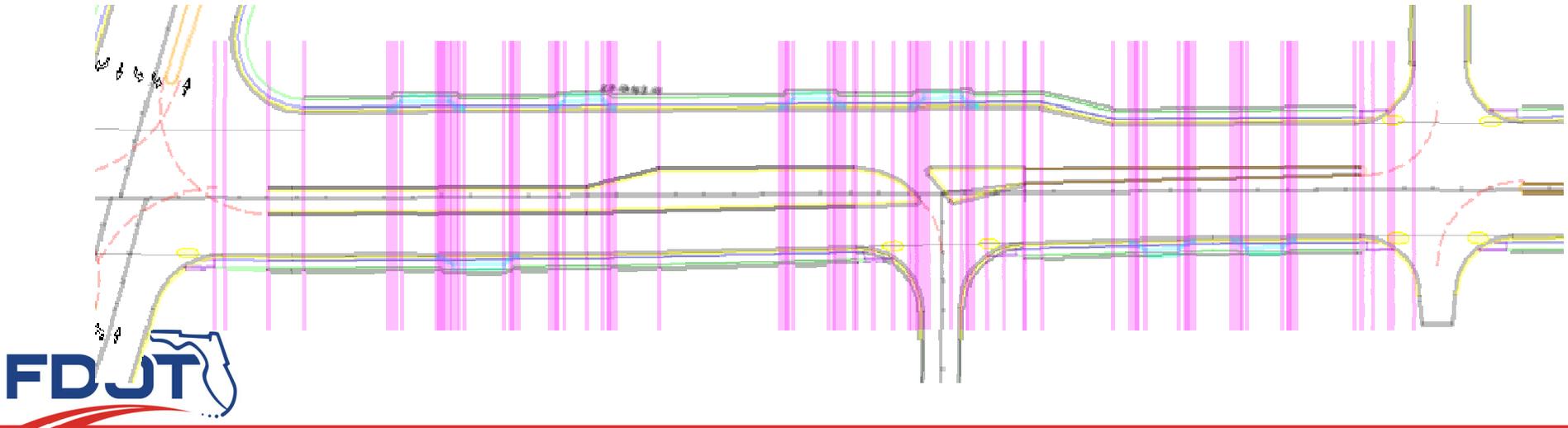
- ✓ Hierarchy of Constraints
- ✓ Horizontal Feature Constraints
- ✓ End Conditions as Trigger Lines
- ✓ Parent \ Child Relationships
- ✓ Active Template View
- ✓ Switches
- ✓ Display Rules
- ✓ Parametric Constraints
- ✓ Trigger Lines
- ✓ Organizing \ Stacking Conditions and Parametric Constraints
- ✓ Top 10 Best Practices



Creating Variable Templates

A “Typical” is not typical.

- ◆ Conditions change frequently along a corridor that would represent a change in the model.



Hierarchy of Constraints

A points location can be overridden in various ways to produce variable results from a single template.

- ◆ Point Constraints
- ◆ Horizontal Feature Constraints
- ◆ Parametric Constraints
- ◆ Point Controls
- ◆ Superelevation (specialized point control)



Horizontal Feature Constraint

- ◆ Overrides the point constraints if a Feature or alignment with a matching Feature found within a specified horizontal range.
- ◆ Only elements added as “External References”
- ◆ **Range** specifies the maximum horizontal distance to search from the point's current location
 - ✓ Negative values will search left.
 - ✓ Positive values to the right.
 - ✓ A value of zero causes the search to find the closest instance of the Feature.

The screenshot shows the 'Point Properties' dialog box with the following settings:

- Name: LT_PVT_EOP_IN
- Use Feature Name Override: (unchecked)
- Feature Definition: PavementAsphalt_pm
- Superelevation Flag: (unchecked)
- Alternate Surface: (empty)
- Member of: LT_PvtOverlay_02, LT_ShldrOverlay_In
- Constraints:
 - Constraint 1: Type: Horizontal, Parent 1: LT_ML_IN_END_SEARC, Value: 0.000000
 - Constraint 2: Type: Slope, Parent 1: LT_PVT_OLAY_OUT, Value: 2.00%
- Horizontal Feature Constraint: PavementMilling(ML), Range: 30.000000



Horizontal Feature Constraint

- ◆ Horizontal Feature Constraints can be used to override the point constraints so a point on the template can follow an element with the selected Feature.
 - ✓ In this example the horizontal constraint (Constraint 1) defines the width of the pavement but with the Horizontal Feature Constraint defined it will follow the EOP line as it transitions.
- ◆ The Range defines the distance from the “Parent” point it will search for a line with the Feature “PavementAsphalt(EOPA)”. If found the constraints will be overridden to that elements horizontal offset.

The screenshot shows the 'Point Properties' dialog box with the following settings:

- Name: RT_PVT_EOP_OUT
- Use Feature Name Override: RT_PVT_EOP_OUT
- Feature Definition: PavementAsphalt_pm
- Superelevation Flag:
- Alternate Surface: [Empty]
- Member of: RT_Pavement3%Outside, RT_ShoulderPavedOutside
- Constraints:
 - Constraint 1: Type: Horizontal, Parent 1: RT_PVT_ADJ1_OUT, Value: 12.0000, Label: EOP_WidthOutRt
 - Constraint 2: Type: Slope, Parent 1: RT_PVT_ADJ1_OUT, Value: -3.0000%, Label: EOP_SlopeOutRt
- Horizontal Feature Constraint: PavementAsphalt(EOPA), Range: 20.0000

Horizontal Feature Constraints

Horizontal Feature Constraints begin from where the point is defined in the template.

In this example, if the “PavementAsphalt(EOPA)” line varied inside of 12’ or outside of 22’, a 12’ lane will be drawn because the Horizontal Feature Constraints conditions were not met.

The image shows a software interface with a 'Point Properties' dialog box overlaid on a cross-section diagram. The dialog box has the following fields:

- Name: RT_PVT_EOP_OUT
- Use Feature Name Override: RT_PVT_EOP_OUT
- Feature Definition: PavementAsphalt_pm
- Alternate Surface: (empty)
- Member of: RT_Pavement3%Outside, RT_ShoulderPavedOutside
- Constraints:
 - Constraint 1: Type: Horizontal, Parent 1: RT_PVT_ADJ1_OUT, Value: 12.0000, Label: EOP_WidthOutRt
 - Constraint 2: Type: Slope, Parent 1: RT_PVT_ADJ1_OUT, Value: -3.0000%, Label: EOP_SlopeOutRt
- Horizontal Feature Constraint: PavementAsphalt(EOPA), Range: 20.0000

The background diagram shows a cross-section with a blue line representing the pavement and a red line representing the shoulder. A red callout bubble points to a specific location on the diagram with the text: "The search for an element with a matching Feature starts at the".



Horizontal Feature Constraint – Range Example

Component that will be drawn with 8' Horiz. Offset and 20' Range

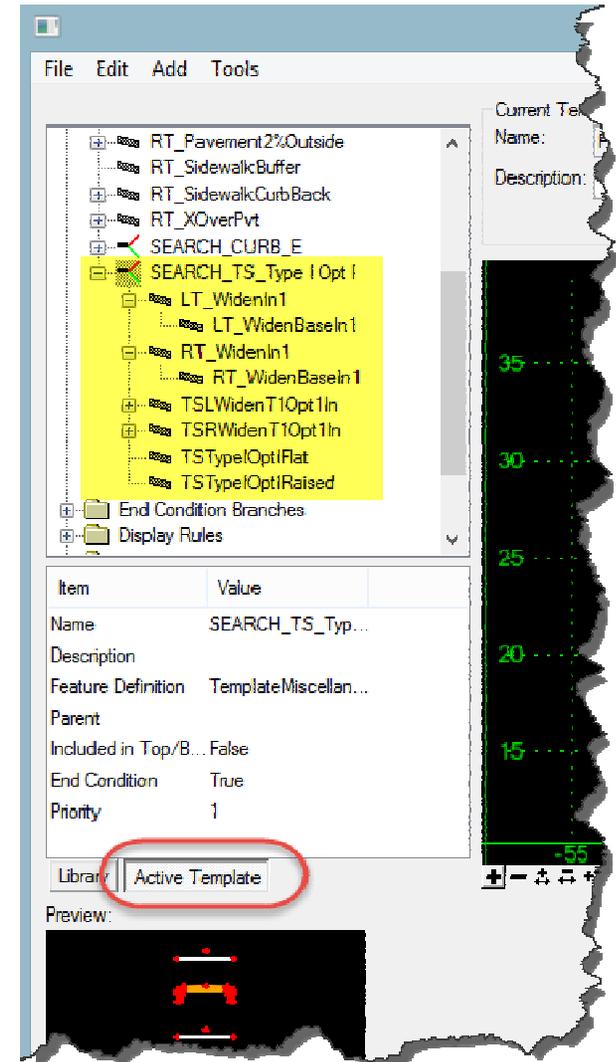
Constraints

	Constraint 1	Constraint 2
Type:	Horizontal	Slope
Parent 1:	PVT_CROWN	PVT_CROWN
Value:	8.0000	-2.00%
Label:	EOP_WidthOutRt	EOP_SlopeOutRt
Style Constraint:	Pavement - Proposed	
	<input checked="" type="radio"/> Horizontal	<input type="radio"/> Vertical <input type="radio"/> Both
Range:	20.0000	

Parent \ Child Relationships

Defining a Parent\Child relationship between related components makes it much easier to manage their display in variable conditions.

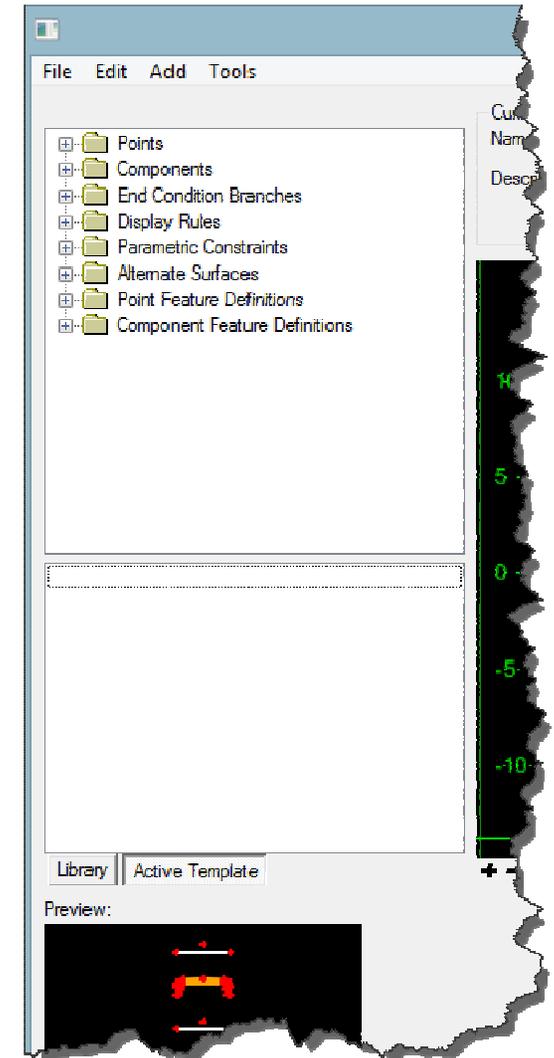
- ◆ End Conditions, Switches, and Display Rules applied to the parent are applied to the children.
- ◆ Deleting a parent component deletes all children.
- ◆ Component Relationships can be viewed as a hierarchical tree using the Active Template tab on the Create Template dialog.
 - ✓ Relationships can be created by dragging and dropping on the Active Template tab.



Active Template View

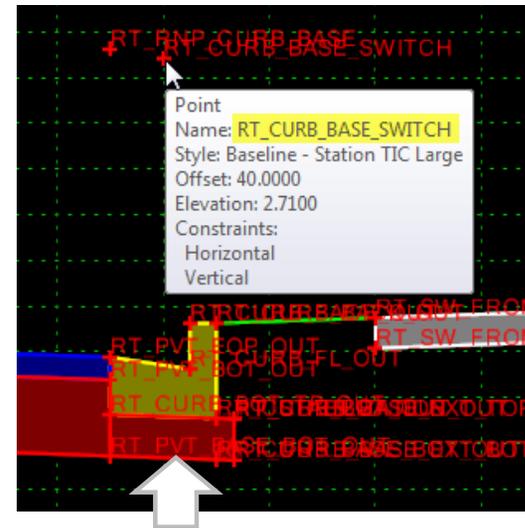
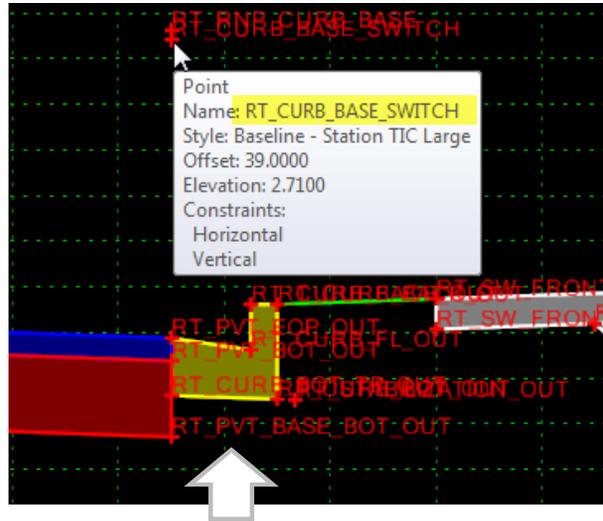
The Active Template view allows you to see and modify properties for all parts of the active template.

- ◆ Points - List of all points. Highlights the selected point in the template.
- ◆ Components – List of Components in hierarchical tree.
- ◆ End Condition Branches – List of end conditions in hierarchical tree.
- ◆ Display Rules – List of all Display Rules . Highlights the selected Display Rules in the template.
- ◆ Parametric Constraints – List of all Labels defined in the active template.
- ◆ Alternate Surfaces – List of all Alternate Surfaces and their components.
- ◆ Point Feature Definitions – List of Points categorized by Feature.
- ◆ Component Feature Definitions - List of Components categorized by Feature.



Switches

If a component or template has a point with the word '**SWITCH**' in the point name, then the '**SWITCH**' Points Horizontal value can be modified to change the components that are displayed.



Switches

“Switch” is a term for using the horizontal distance between two points to switch from one condition to another.

- ✓ If the distance between LT_Switch and LT_Switch1 is 1' display a Type F Curb and Gutter
 - ✓ If the distance between LT_Switch and LT_Switch1 is 2' display a Type E Curb and Gutter
 - ✓ If the distance between LT_Switch and LT_Switch1 is 3' display a Drop Curb
- ◆ Display Rules are applied to each of the possible conditions so as the distance changes one condition is turned off and another is turned on.

Name	Type	Expression	Test	Value	Result
LT_SWITCH1	Horizontal	LT_SWITCH1 - LT_SWITCH	=	1.000000	False
LT_SWITCH2	Horizontal	LT_SWITCH1 - LT_SWITCH	=	2.000000	True
LT_SWITCH3	Horizontal	LT_SWITCH1 - LT_SWITCH	=	3.000000	False
LT_SWITCH4	Horizontal	LT_SWITCH1 - LT_SWITCH	=	4.000000	False
LT_SWITCH5	Horizontal	LT_SWITCH1 - LT_SWITCH	=	5.000000	False
RT_SWITCH...	Horizontal	RT_SWITCH1 - RT_SWITCH	=	1.000000	False
RT_SWITCH...	Horizontal	RT_SWITCH1 - RT_SWITCH	=	2.000000	False
RT_SWITCH...	Horizontal	RT_SWITCH1 - RT_SWITCH	=	3.000000	False
RT_SWITCH...	Horizontal	RT_SWITCH1 - RT_SWITCH	=	4.000000	False
RT_SWITCH...	Horizontal	RT_SWITCH1 - RT_SWITCH	=	5.000000	False



Display Rules

- ◆ A Display Rule is a condition statement that can be assigned to a component. Once assigned the component can only be displayed when the conditional statement is true.
 - ✓ Evaluated at each interval
 - ✓ Affects the component and all children

Component Properties

Name: SEARCH_ML

Use Name Override: SEARCH_ML

Description:

Feature Definition: TemplateMiscellaneous

Parent Component:

Display Rules: NOT SEARCH_EOP [Edit...](#)

Exclude From Top/Bottom Mesh

End Condition Properties

Target Type: Feature Definition Horizontal Priority: 1

Feature Definition: PavementMilling(ML) Benching Count: 0

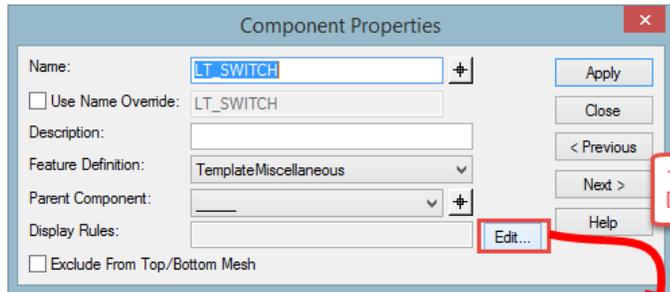
No Datum

Horizontal Vertical

Offsets: -0.000000 0.000000 Rounding Length 0.000000

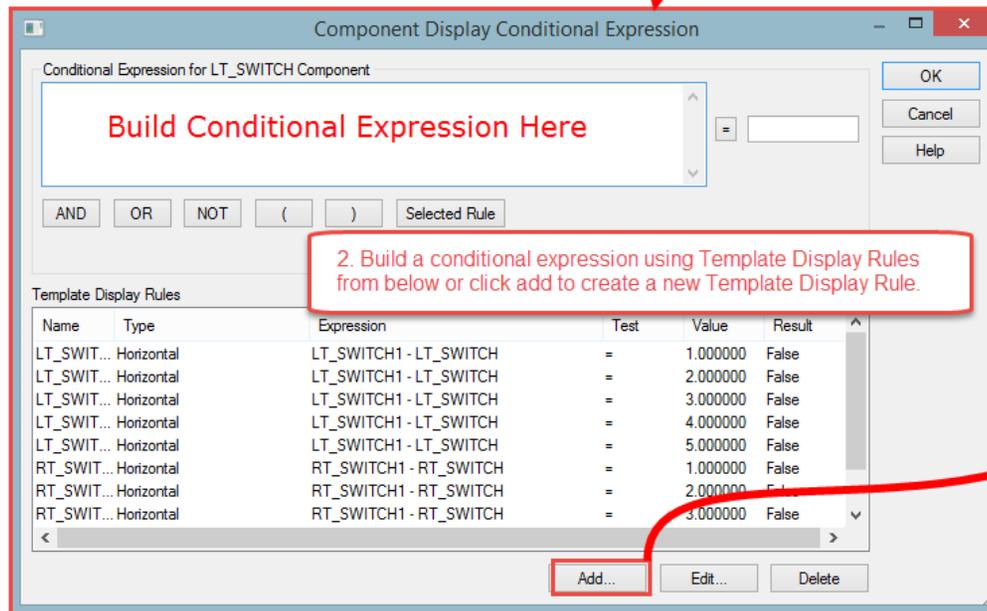


Creating Display Rules



Component Properties dialog box. Name: LT_SWITCH. Use Name Override: LT_SWITCH. Description: [empty]. Feature Definition: TemplateMiscellaneous. Parent Component: [empty]. Display Rules: [empty]. Exclude From Top/Bottom Mesh: [checked]. Buttons: Apply, Close, < Previous, Next >, Help. An arrow points from the 'Edit...' button to the next dialog.

1. Click Edit to add a Display Rule



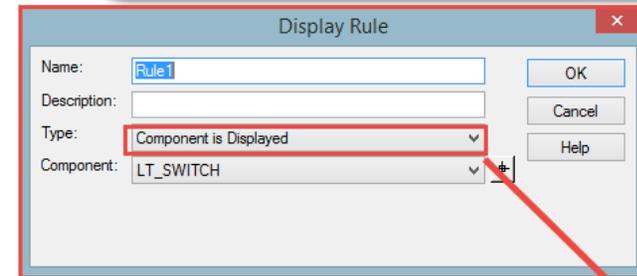
Component Display Conditional Expression dialog box. Conditional Expression for LT_SWITCH Component: Build Conditional Expression Here. Buttons: AND, OR, NOT, (,), Selected Rule. Table of Template Display Rules:

Name	Type	Expression	Test	Value	Result
LT_SWIT...	Horizontal	LT_SWITCH1 - LT_SWITCH	=	1.000000	False
LT_SWIT...	Horizontal	LT_SWITCH1 - LT_SWITCH	=	2.000000	False
LT_SWIT...	Horizontal	LT_SWITCH1 - LT_SWITCH	=	3.000000	False
LT_SWIT...	Horizontal	LT_SWITCH1 - LT_SWITCH	=	4.000000	False
LT_SWIT...	Horizontal	LT_SWITCH1 - LT_SWITCH	=	5.000000	False
RT_SWIT...	Horizontal	RT_SWITCH1 - RT_SWITCH	=	1.000000	False
RT_SWIT...	Horizontal	RT_SWITCH1 - RT_SWITCH	=	2.000000	False
RT_SWIT...	Horizontal	RT_SWITCH1 - RT_SWITCH	=	3.000000	False

Buttons: Add..., Edit..., Delete. An arrow points from the 'Add...' button to the next dialog.

2. Build a conditional expression using Template Display Rules from below or click add to create a new Template Display Rule.

3. Enter a Name for the Display Rule and choose the type of rule from the "Type" drop-down. Each type will require additional properties be defined once selected.



Display Rule dialog box. Name: Rule 1. Description: [empty]. Type: Component is Displayed. Component: LT_SWITCH. Buttons: OK, Cancel, Help. An arrow points from the 'Type' dropdown to the next list.

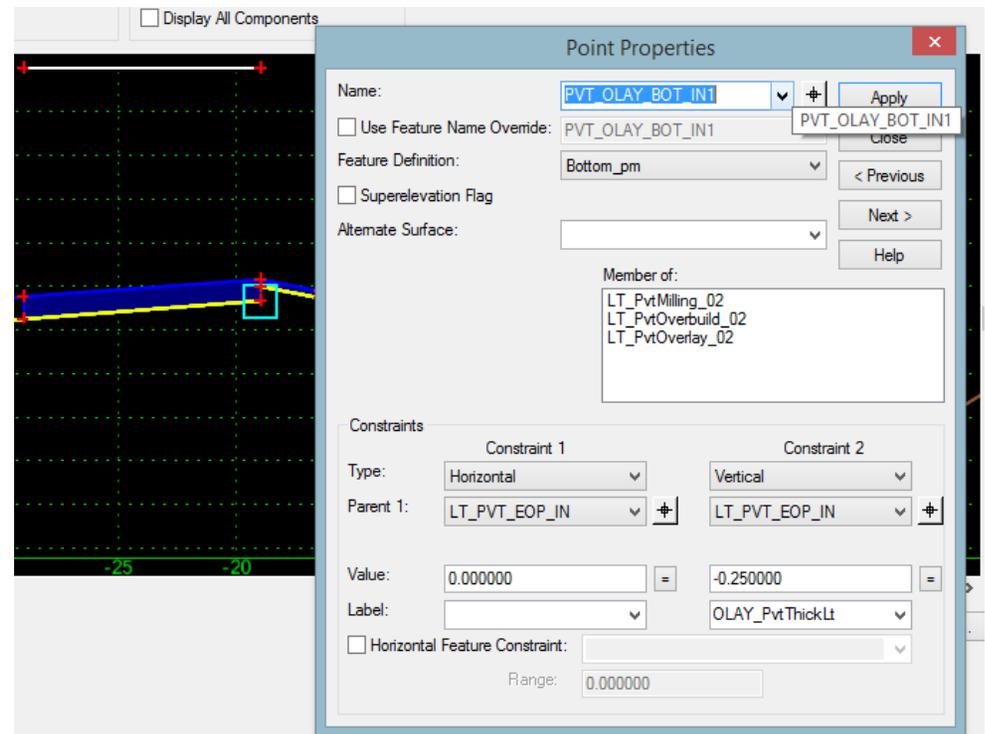
- Horizontal
- Absolute Horizontal
- Vertical
- Absolute Vertical
- Slope
- Absolute Slope
- Component is Displayed



Defining Parametric Constraints (Labels)

Parametric Constraints use the Label property defined on a points constraints to override the defined value over a specified station range.

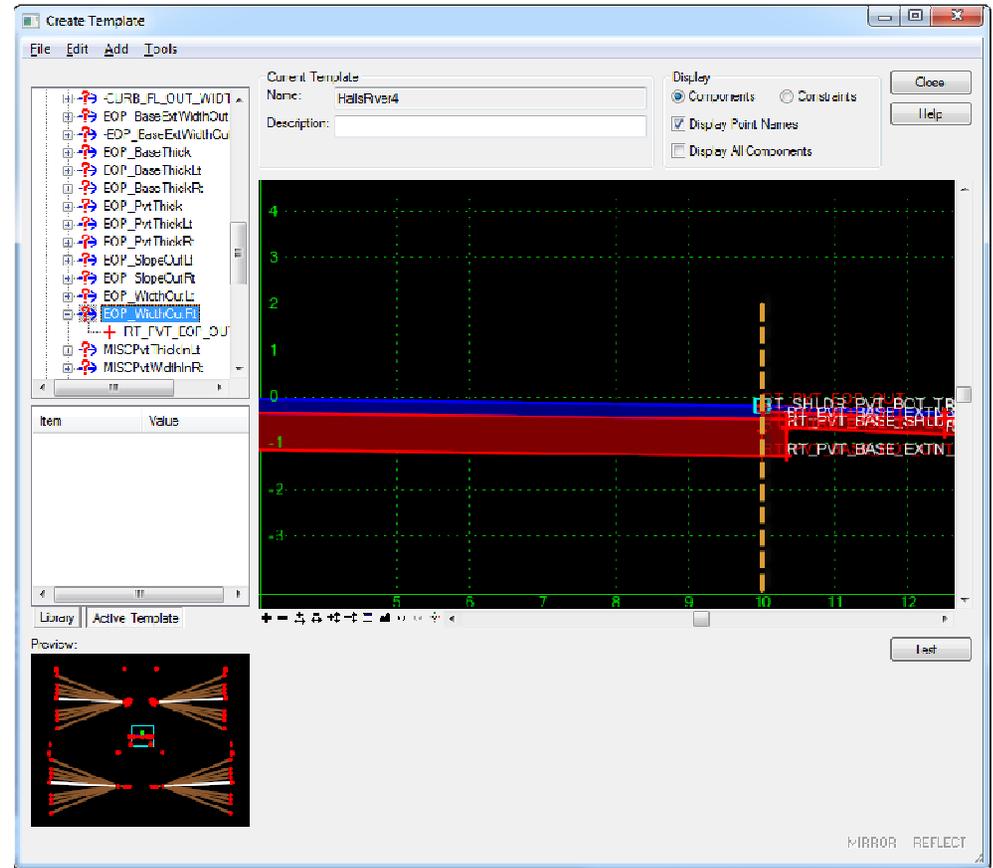
- ◆ Labels for common constraints should be the same.
 - ✓ Pavement Depth
 - ✓ Lane Width
 - ✓ Switches



Parametric Constraints

To edit Parametric Constraints on the Create Template dialog:

1. Select the “Active Template” tab.
2. Expand the Parametric Constraints folder
3. Double-click the Label name
4. Enter a value in the “Edit Default Parametric Value” dialog
5. Click OK.



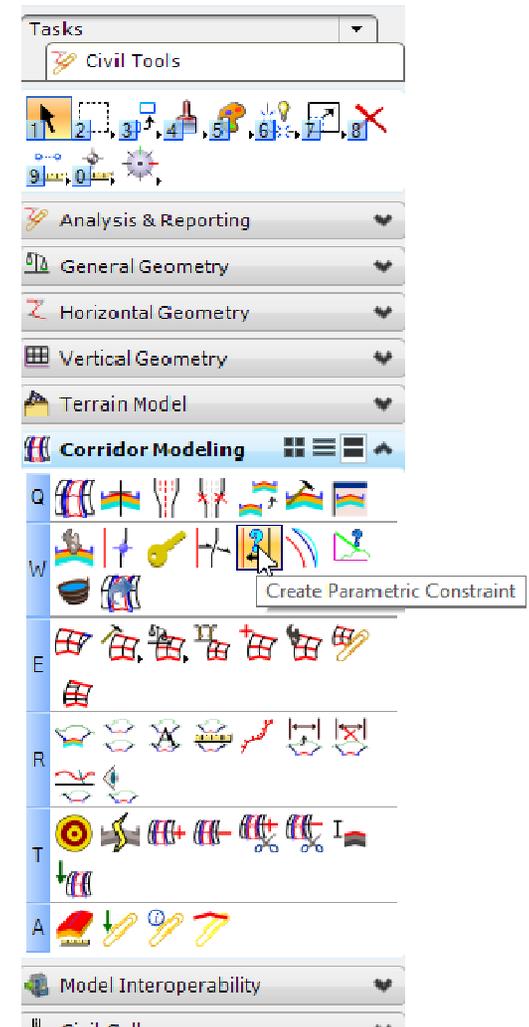
Applying Parametric Constraints

To apply a parametric Constraint to a corridor select “Civil Tools > Corridor Modeling > Create Parametric Constraint from the Task Menu.

◆ After selecting the corridor you will be prompted for :

- ✓ Start station
- ✓ Stop station
- ✓ Constraint Label
- ✓ Start Value
- ✓ End Value

Lock To Start	<input type="checkbox"/>
<input checked="" type="checkbox"/> Start	546+34.39 R1
Lock To End	<input type="checkbox"/>
<input type="checkbox"/> Stop	495+00.53 R1
Constraint Label	OLAY_PvtThickLt
Start Value	-0.250000
Stop Value	-0.250000

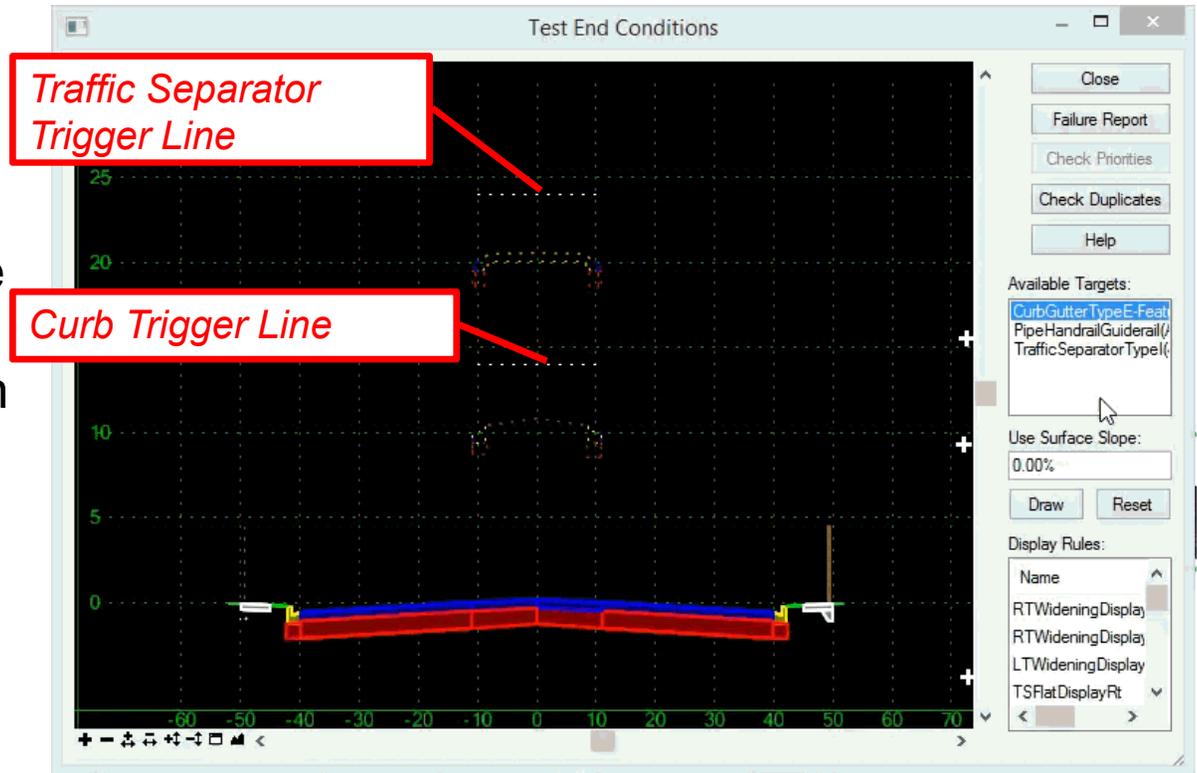


Trigger Lines

“Trigger Line” is a term for the use of End Conditions as display controls.

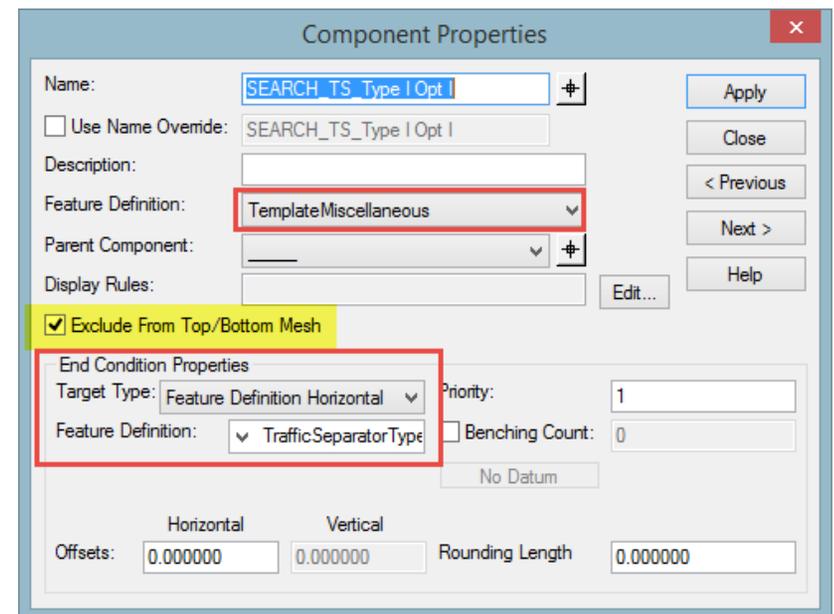
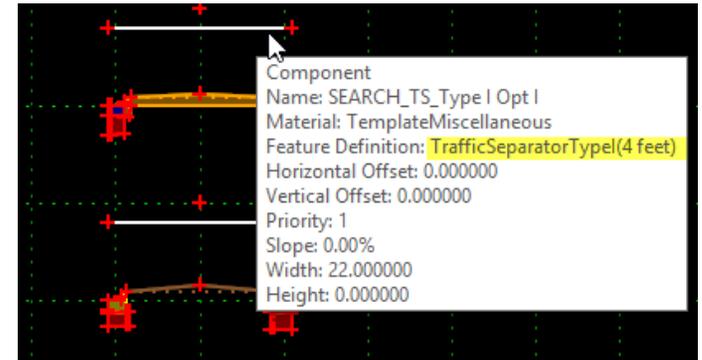
Trigger Lines are used to make a template dynamic by including multiple possibilities in a single template.

- ✓ Reduces the number of template drops required along a corridor.
- ✓ Especially useful in urban areas where conditions change frequently.



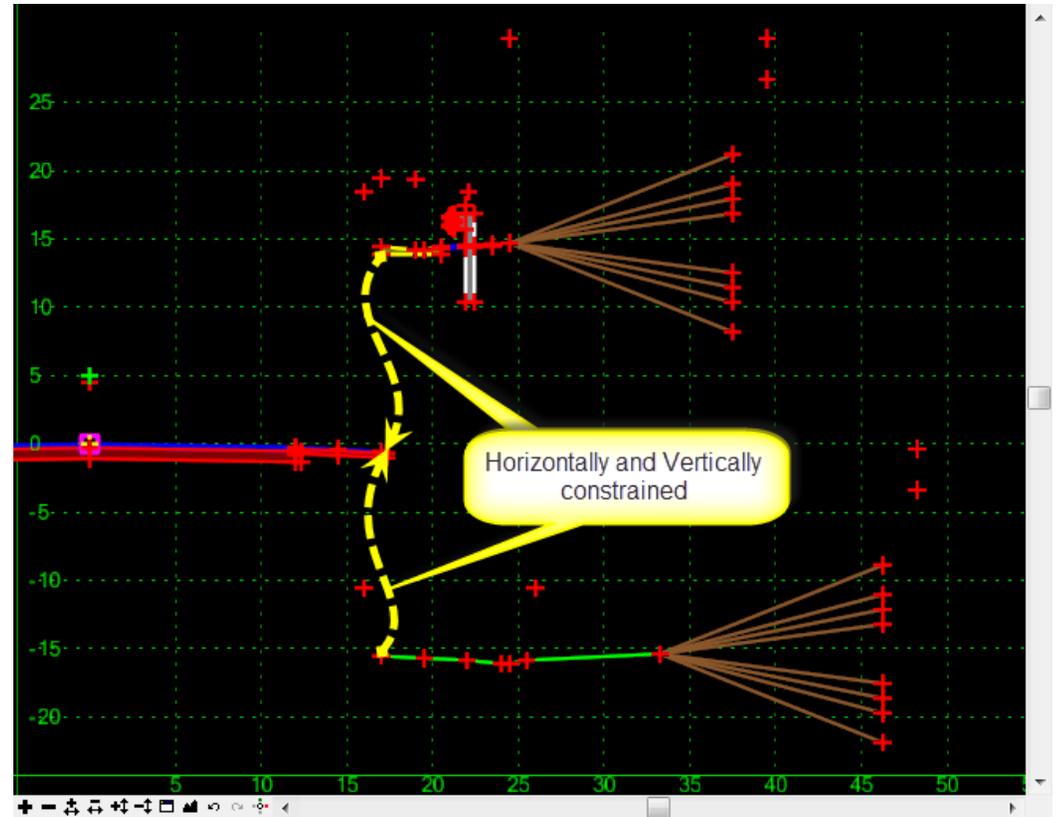
Creating Trigger Lines

- ◆ An End Condition (Trigger Line) is configured to search for a specific target.
- ◆ Make Trigger Line the Parent of related components.
- ◆ All related components of that Trigger Line will be displayed when the Target is located and they will not be displayed when the when the Target is not found.
- ◆ Exclude Trigger Lines from triangulation.



Organizing \ Stacking Conditions

- ◆ Instead of stacking all of the end conditions on top of each other they can be offset.
- ◆ All end conditions can be attached using Horizontal and Vertical constraints
- ◆ Parametric Constraints can be used to override the Horizontal and Vertical constraints to zero values when applied to the corridor.



Best Practices

1. Create a project template library in the project folder
2. Use TLO to copy FDOT templates
3. Organize templates by corridor
4. Version the templates or organize by template drop stations
5. Use Apply Affixes when building new templates (tools options)
6. One green point per template (as a rule)
7. Remove point name overrides (All white text), except on common tie down points
8. Remove component name overrides except on common tie down components
9. Use the same label on common constraints
10. Create a good Parent/Child relationship Organized in Active Template



Contact Info

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