LAB 27 - Create Raised Median

This lab demonstrates a procedure for modeling a roadway which includes a raised median and a median opening. The exercise below uses a single template which utilizes point controls and display rules to achieve the two different roadway sections. Additionally a second template is used to model the median openings.

Chapter Objectives:

- Use a single template to model the mainline with and without a median
- Create display rules which determine when the raised median excluded
- Use point controls to define the location of the median nose
- Model multiple corridors
- Combine corridors in a single final surface

Lab 27.1 - Open Lab Files

An initial model of the roadway is crated using the roadway typical section without the median. This is done for the purposed of extracting the profile gradeline for the median noses.

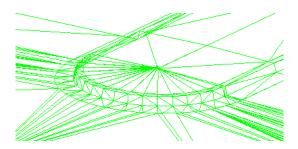
- 1. Open MicroStation and InRoads using the *12345DES_Model-Create Raised Median.dgn* file.
- 2. Select File> Open from the InRoads menu bar.
- 3. Select the file C:\Workspace\Workspace-CDOT_XM\Standards-Global\InRoads\ Preferences\CDOT_Civil.xin
- 4. Continue to select the following files from *C*:*Projects**12345**Design**InRoads*\ and the <D> Open button.
 - ◆ 12345DES_Existing-Create Raised Median.dtm
 - 12345DES_Geometry-Create Raised Median.alg
 - 12345DES_Templates-Create Raised Median.itl
 - 12345DES_Roadweay-Create Raised Median.ird
- 5. **<D> Cancel** the *Open* dialog box to close.

Lab 27.2 - Workflow

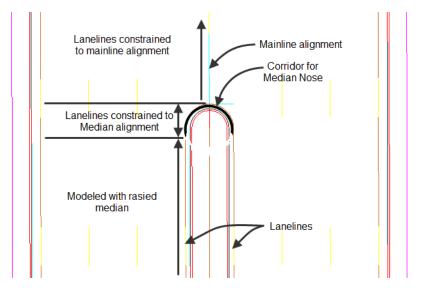
A summary of the overall process

- 1. In addition to the mainline horizontal and vertical alignments, create horizontal alignment(s) for the median nose.
- 2. Create a template for the crowned roadway without the raised median.
- 3. Model the mainline using the crowned template.
- 4. Create the vertical alignments for the median noses by extracting their elevations from the surface created in the previous step.
- 5. Create a template for the median noses

- 6. Model the median noses
- 7. Create a template for the raised median
- 8. Add Display Rules to the components of the raised median.
- 9. Create a corridor definition for the raised median
- 10. Add point controls to constrain the raised median template to run as defined, constrained to the medians or to the mainline alignment.
- 11. Define key stations for template drops.
- 12. Create the final design surface by modeling the mainline and median openings simultaneously.



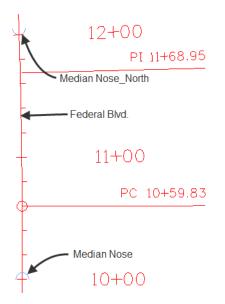
Modeling Schematic



Lab 27.3 - Review The Alignments

In this exercise three alignments are used. *Federal CL* for the main corridor and *Median Nose* & *Median Nose_North* which define the median opening and termination.

- 1. Select the Geometry tab in the InRoads Explorer
- 2. View the horizontal alignments Federal CL, Median Nose & Median Nose_North
- 3. View stationing for horizontal alignment Federal CL

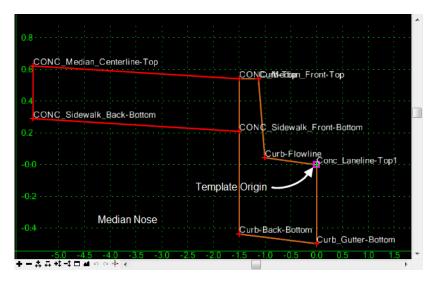


Lab 27.4 - Review Data

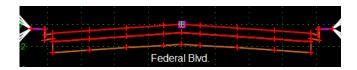
An initial model of the roadway was created using a crowned roadway section (without the raised median). This is done for the purpose of extracting the vertical profile of the median noses which is accomplished by using the command File > Import > Geometry [Vertical From Surface]. This step has already been completed.

🔀 Import Geon	netry					
From Graphics	ICS	Vertical from Surface				
Surface:	Federa	al_Crowned 🔹	Apply			
Vertical Align						
Name:	Mediar	n NoseV				
Description:	Vertica	I from crowned DTM				
Style:	ALG_C	OTHER_Vert ▼	Help			
Target						
Horizontal Alig	gnment:	Median Nose 🔹				
Station Lin	nits					
Start		0+00.00 +				
Stop:		0+17.28 +				
Horizontal	Offset:	0.00				
- Points of Vert	ical Inte	rection				
Interval:		0.00				
Tolerance		0.00				
		Close				

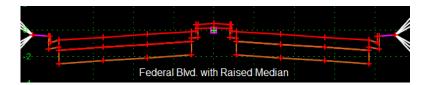
- 1. Select **Modeler > Create Template** from the InRoads menu bar.
- 2. In the *Create Template* dialog review the template for *Median Nose* in the *1-Templates* folder.



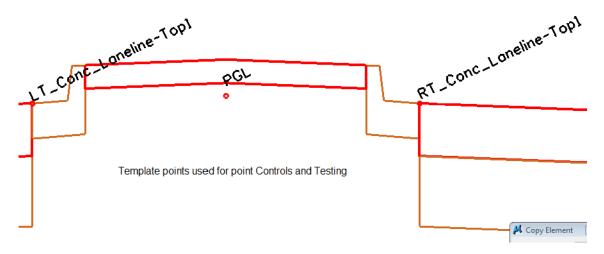
3. Also in the *Create Template* dialog review the template for *Federal Blvd* in the *1-Templates* folder. This template was use to create a preliminary model. This model was used to extract vertical alignments for the median alignments.



4. The template *Federal Blvd with Raised Median*. Display rules control if the median is modeled.



5. An expanded view of the median. The 'Laneline' points will be controlled by both the Federal Blvd. and median alignments. Additionally the median components will be assigned display rules which will test the distance between the lanelines and the PGL.



Lab 27.5 - Add Display Rules

Display rules can be associated with components to test if the component should be displayed or not.

- 1. Copy the template *Federal Blvd with Raised Median* to *Federal Blvd with Raised Median_DR*
- 2. Open Federal Blvd with Raised Median_DR for editing
- 3. The goal is to eliminate the construction of the median components if the distance between either lanelines and the PGL is less than 5.50'.
 - **Note:** 5.50 feet represents the distance from the mainline alignment to the PC or PT of the alignments for the median noses.

4. Select the median curb and gutter component named *LT_C/G_Type2-1B* for editing.

Component Prop	erties	X
Name:	LT_C/G_Type2-IB	+ Apply
Description:	Curb and Gutter 6" Barrier Curb and 1' Gutter	Close
Style:	D_C/G_Ty-2_Sect I Close Shape	< Previous
Parent Component:	+	
Display Rules:		Edit
Exclude from triang	ulation	Help

5. Select Edit

🔣 Compone	nt Display Condi	ional Expression			C	
Conditional E	Expression for LT_C	C/G_Type2-IB Component				ОК
			-			Cancel Help
AND	OR NOT	() Select	ed Rule			
Template Disp	Type	Expression	Test	Value	Re	
<		III			4	
		Add	Edit	Delet	e	1.

- 6. Select Add
- 7. **Create** a Display Rule that tests the distance between the Left Laneline and the PGL.
 - ♦ Name: LeftC/G
 - Description: test distance between LT laneline and PGL
 - Type: Absolute Horizontal
 - Between: LT_Conc_Laneline-Top1 and PGL
 - Test: $\geq =$
 - ◆ Value: 5.50

🔣 Display R	ule		×
Name:	LeftC/G		ОК
Description:	test distance between LT laneline and PGL		Cancel
Туре:	Absolute Horizontal		Help
Between:	LT_Conc_Laneline-Top1	÷	
And:	PGL 🔹	÷	
	>=		

Compo	onent Display Conditio	nal Expression					
Condition	al Expression for LT_C/0	G_Type2-IB Compone	ent				ОК
LeftC/G				*	=		Cancel Help
AND Template [OR NOT	()	Selected Rule				
Name	Туре	Expression		Test	Value	Result	1
	Absolute Horizontal	LT_Conc_Laneline-	Fop 1 - PGL	>=	5.50	True	-
			Add	Edi	t	Delete	

8. Select Rule for the LT Laneline, OK & Apply

- 9. Select the component *RT_C/G_Type2-1B* for editing.
- 10. Build and apply a similar rule for the RT Laneline.
 - ♦ Name: RightC/G
 - Test between RT_Conc_Laneline-Top1 and PGL
 - All other fields are the same
- 11. Edit the component CONC_Sidewalk-4"
- 12. *Build* and Apply a Display Rule to test for a minimum distance of 11.00 feet between the RT and LT Lanelines for the Median Cover (Conc_Sidewalk-4")
 - ♦ Name: MedianPavt
 - Description: Test width between lanelines
 - ◆ Type: Absolute Horizontal
 - Between: LT_Conc_Laneline-Top1 and RT_Conc_Laneline-Top1
 - Test: $\geq =$
 - ♦ Value: 11.00

🔣 Display R	ule	8
Name:	MedianPavt	ОК
Description:	Test width between lanelines	Cancel
Туре:	Absolute Horizontal	Help
Between:	LT_Conc_Laneline-Top 1	
And:	RT_Conc_Laneline-Top1 +	J
	>= • 11.00	

13. Save and Close the Create Template dialog.

Lab 27.6 - Create Corridors

Corridors contain definitions for which alignments, templates, point controls, etc. to incorporate when modeling the roadway. In this exercise, three corridors are defined, one for each median nose and one for the mainline.

- 1. Select Modeler > Roadway Designer
- 2. Select Corridor > Corridor Management from the Roadway Designer menu bar or <D> the Manage Corridors button **I**.

- 3. Add corridors for both median openings.
 - ♦ Name: Median Nose
 - Type: Alignment ٠
 - Horizontal Alignment: Median Nose
 - Vertical Alignment: Median NoseV

/ertical Alignment: Median NoseV ▼ Stop: PI Rounding Tangent: 0.00	Close Change Copy Copy From
Vertical Alignment: Median NoseV Stop: U+17.28 Corridors:	Сору
PI Rounding Tangent: 0.00 0+17.28 + Co	
Comidors:	Copy From
	Help
Federal Alignment Federal CL 8+00.00 19+00.00)
Median Nose Alignment Median Nose 0+00.00 0+17.28	

- 4. Add corridor definition for corridor Median Nose North
 - Name: Median Nose North
 - ◆ Type: Alignment
 - ♦ Horizontal Alignment: Median Nose North
 - Vertical Alignment: Median Nose NorthV
- 5. Add and Close

Lab 27.7 - Add Template Assignments

Templates define the cross section of the design model. They are assigned to the corridor through the Template Drops dialog box. The starting station defaults to the beginning of the alignment so setting the interval and selecting the desired template is all of the input that is required.

- Select Corridor > Template Drops from the Roadway Designer menu bar or <D> the template drops button X
- 2. Add template assignment to *Median Nose*
 - Template: Median Nose
 - ♦ Interval of 1'

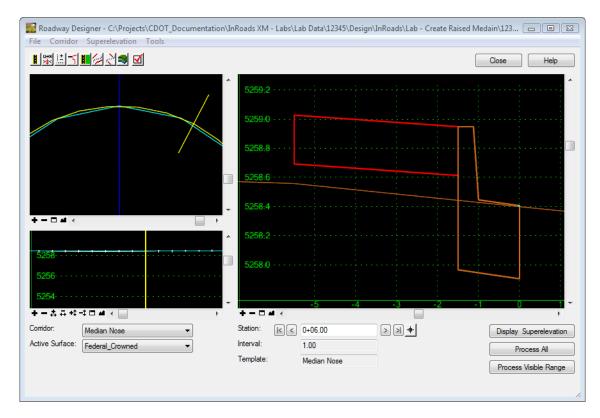
🔣 Templ	ate Drops				
Corridor:	Median No:	se	•		Add
Station:	0+00.00			+	Close
Interval:	1.00			+	Change
Library Ter	mplates:			_	
	∝ Federal B ∝ HMA Cro	lvd with Raised I wood P10	M 🔺]	Сору
	_	ided_TypeA_4Li	а		Help
	HMA_Urb Median N - Sections - - Sections -	ose Pavement End Conditions	Ŧ		
Station	Inter	Template	F	levi	Library
0+00.00	1.00	Median Nose	IT	L	C:\Projects\CDOT_D.
 Synchror 	nize with Libra	III ary		Edit	Delete

3. **<D> Add** then **Close**.

- 4. Add template assignment to *Median Nose_North*
 - Template: Median Nose_North
 - ♦ Interval of 1'

🐂 Templa	ate Drops			- 0 🔀			
Corridor:	Median N	ose_North	•	Add			
Station:	0+00.00		+	Close			
Interval:	1.00		+	Change			
Library Ten							
		Blvd with No M		Сору			
		Blvd with Raise Blvd with Raise	-	Help			
HMA Crowned B10							
>>< HMA_Divided_TypeA_4L >>< HMA_Full_Depth_Wideni							
><>> HMA_Urban_4Lane							
333		Pavamont					
Current Ter	mplate Dro						
Station	Interval	Template	Revised In	Library			
0+00.00	1.00	Median Nose	ITL	C:\Projects\12345			
•				4			
Synchron	nize with Lib	prarv	Edit	Delete			

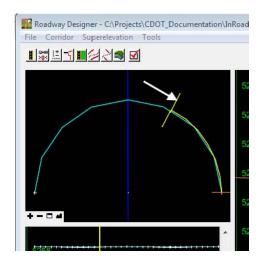
- 5. $\langle D \rangle$ Add then Close.
- 6. Roadway Designer can be used to evaluate the two median corridors.



- **Note:** The template data is displayed in the template view. There are two options for scrolling through the design, using the station arrows below the template view and using the station line in the plan view.
- 7. **<D>** on the station arrows to scroll through the design.

+	4		
Station:	K <	0+00.00	+ K <
Interval:		1.00	
Template:		Median Nose	

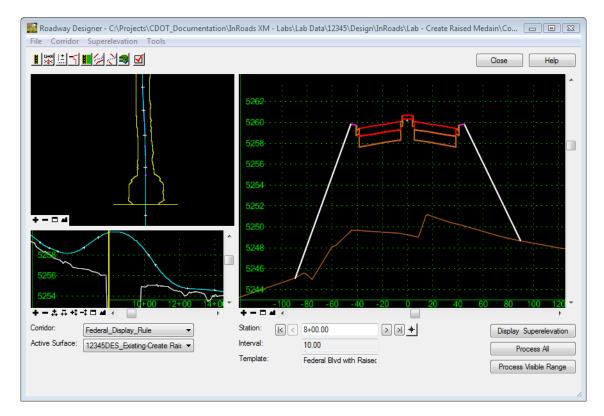
8. **<D> and Hold** on the yellow station line. Move the pointer back and forth to scroll through the design.



The median models are now ready to be evaluated.

- 9. From the pull down menu in the Roadway Designer dialog **Corridor > Corridor Management**.
- 10. Create a corridor for the Mainline.
 - Name: Federal_Display_Rule
 - Type: Alignment
 - Horizontal Alignment: Federal CL
 - Vertical Alignment: Federal CL_V
 - ♦ Start Station: 8+00
 - ♦ Stop Station: 19+00
- 11. <D> Add
- 12. <D> Close
- 13. From the Roadway Designer dialog Corridor > Template Drops
- 14. Add template assignments to the corridor Federal_Display_Rule.
 - ♦ Station: 8+00

- ♦ Interval of 10'
- Template:Federal Blvd with Raised Median_DR
- 15. **<D> Add**
- 16. **<D> Close**
- 17. Evaluate the *Federal_Display_Rule* corridor.



Lab 27.8 - Change Roadway Designer Settings

The Roadway Designer settings determine if additional stations are processed, what information is displayed in the views, and what information is included in the processing report. In this exercise, horizontal cardinal and event points are processed, cut and fill information is added to the template view, and component and point information is added to the processing report.

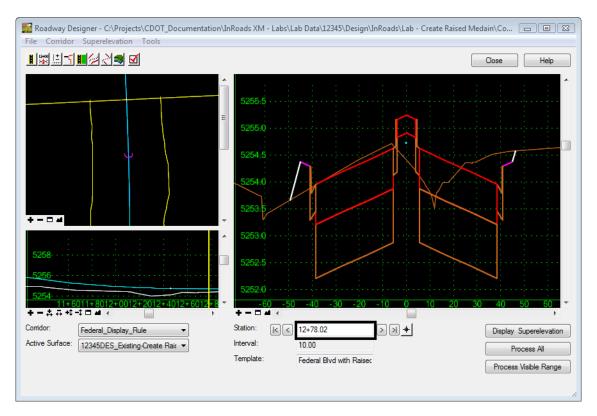
The first series of steps tell the Roadway Designer to process the horizontal cardinal and event points.

1. From the Roadway Designer menu bar, select **Tools > Options**.

2. In the *Roadway Designer Options* dialog box, toggle on Horizontal Cardinal Points, Vertical Cardinal Points, External Control Points, Reference Graphics, and Transition Graphics.

Roadway Designer Options Include Critical Sections Include Critical Sections Include Critical Cardinal Points IV Vertical Cardinal Points IV Horizontal Event Points IV Vertical Event Points IV External Control	OK Cancel Preferences Help
Display Reference Graphics Transition Graphics	Superelevation Display Key Station Lines Station Result Reporting Options
 Triangulated Surface Cut and Fill Graphics 	 End Condition Failures Display Rule Values
Cut and Fill Values Net Volume	 Point Control Usage Component Information
Null Points	Point Information
Cardinal Points	Process Aliases Automatically

- 3. **<D>OK**.
- 4. Scroll through the stations and notice that some stations do not fall on even intervals. These are the cardinal and event points.



Lab 27.9 - Point Controls

This series of steps adds Point Controls (overrides) to the corridor definition previously defined in Roadway Designer.

1. Select Corridor > Point Controls from the Roadway Designer menu bar or <D> the

Point Control button

- 2. The roadway will model as defined until it encounters a point control. For this design, three point controls are required for each side of the roadway (Left laneline and Right laneline). The first control instructs the laneline to follow a feature created by the *Median Nose* corridor. The second control instructs the laneline to follow a feature created by the *Median Nose*. The third control instructs the laneline to follow a feature created by the *Median Nose*. North corridor.
- 3. Verify the corridor Federal_Display_Rule is the active corridor.

Point Control	s		
Corridor: Federa	L_Display_Rule		
Point:	RT_Conc_	Laneline-	+
Mode Morizontal	Vertical	Both	

- 4. Create the following Point Control entries to instruct the template point RT_Conc_Laneline-Top1 to follow a feature (by the same name) created by the Median Nose corridor.
- 5. First Point Control
 - Point: RT_Conc_Laneline-Top1
 - ♦ Mode: Both
 - Control Type: Corridor Point
 - Corridor: Median Nose
 - Reference Point: Conc_Laneline-Top 1
 - Station Start: 10+00.00 (begin of median radius)
 - Station Stop: 10+05.50 (end of median radius/nose)
- 6. **<D> ADD**

Horizonta	Horizontal and Vertical Controls:							
Enab	Priority	Name	Start Station	Stop Station	Mode	Туре	Control	
x	1	RT_Conc_Laneline-Top1	10+00.00	10+05.50	Both	Corridor Point	Median Nose:Conc_Laneline-Top1	

- 7. Second Point Control
 - Point: RT_Conc_Laneline-Top1
 - ♦ Mode: Both
 - Control Type: Alignment

- Horizontal Alignment: Federal CL
- Vertical Alignment: Federal CL_V
- Station Start: 10+05.51 (end of median radius/nose beginning of median opening)
- Station Stop: 12+00.00 (beginning of north median/radius nose)
- 8. **<D> ADD**

Horizontal and Vertical Controls:								
Enab	Priority	Name	Start Station	Stop Station	Mode	Туре	Control	
x	1	RT_Conc_Laneline-Top1	10+00.00	10+05.50	Both	Corridor Point	Median Nose:Conc_Laneline-Top1	
Х	1	RT_Conc_Laneline-Top1	10+05.51	12+00.00	Both	Alignment	Federal CL:Federal CL_V	

- 9. Third Point Control
 - Point: RT_Conc_Laneline-Top1
 - ♦ Mode: Both
 - Control Type: Corridor Point
 - Corridor: Median Nose_North
 - Reference Point: Conc_Laneline-Top 1
 - Station Start: 12+00.00 (begin of median radius/nose)
 - Station Stop: 12+05.00 (end of median radius)
- 10. **<D> ADD**

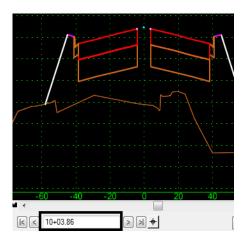
Horizontal	orizontal and Vertical Controls:							
Enab	Priority	Name	Start Station	Stop Station	Mode	Туре	Control	
х	1	RT_Conc_Laneline-Top1	10+00.00	10+05.50	Both	Corridor Point	Median Nose:Conc_Laneline-Top1	
Х	1	RT_Conc_Laneline-Top1	10+05.51	12+00.00	Both	Alignment	Federal CL:Federal CL_V	
Х	1	RT_Conc_Laneline-Top1	12+00.00	12+05.00	Both	Corridor Point	Median Nose_North:Conc_Laneline-Top1	

11. Add the fourth, fith, and sixth entry for the *LT_Conc_Laneline-Top1* point. The definitions mimic the definitions use for the RT_Conc_Laneline-Top1 point.

	orizontal and Vertical Controls:									
Enabled	Priority	Name	Start Sta	Stop Station	Mode	Туре	Control			
х	1	RT_Conc_Laneline-Top1	10+00.00	10+05.50	Both	Corridor Point	Median Nose:Conc_Laneline-Top1			
х	1	RT_Conc_Laneline-Top1	10+05.51	12+00.00	Both	Alignment	Federal CL:Federal CL_V			
x	1	RT_Conc_Laneline-Top1	12+00.00	12+05.00	Both	Corridor Point	Median Nose_North:Conc_Laneline-Top1			
Х	1	LT_Conc_Laneline-Top1	10+00.00	10+05.50	Both	Corridor Point	Median Nose:Conc_Laneline-Top1			
х	1	LT_Conc_Laneline-Top1	10+05.51	12+00.00	Both	Alignment	Federal CL:Federal CL_V			
х	1	LT_Conc_Laneline-Top1	12+00.00	12+05.00	Both	Corridor Point	Median Nose_North:Conc_Laneline-Top1			

- 12. **<D> ADD**
- 13. <D> Close

14. Review the results graphically in Roadway Designer. You should see the raised median disappear between stations 10+00.00 and 10+05.00 and again between 12+00.00 and 12+05.00. Between these station limits, the corridors for the medians will complete the model.



15. You should also see the left and right pavement edges running together between stations 10+05.51 and 12+00.00. This represents the median opening.

Lab 27.10 - Adding Key Stations

Key Stations are specific locations you define relative to your design. At these locations an additional template is processed. You can also elect to create a cross section a locations defined by key stations. Examples of Key Stations may be at driveways, side roads, drainage or in the case of this exercise, just prior to and after the application of point controls. This ensures the roadway models as designed and eliminates transitions between point controls and the next corridor defined interval.

1. Select Corridor > Key Stations from the Roadway Designer menu bar or <D> the Point

Control button .

- 2. **Key-in** the station values immediately before and after the point controls. Select **Add** after each entry.
 - ♦ 9+99.99
 - ♦ 10+05.51
 - ♦ 11+99.99

♦ 12+05.51

Comdor:	Federal_Dis	play_Rule		Add
Station:	8+00.00		+	Close
Selected:				Help
9+99.99				Thoip
10+05.5				
11+99.99)			
12+05.5				

- 3. D > Close
- 4. Select **File > Save** from the Roadway Designer menu.

Lab 27.11 - Creating the Model

With all the corridors, template applications, point controls and key stations defined, the model is ready to be created.

1. Select **Corridor > Create Surface** from the Roadway Designer menu bar or **<D>** the

Point Control button

- 2. Select the following corridors for modeling:
 - Federal_Display_Rule
 - ♦ Median Nose
 - ◆ Median Nose_North
- 3. **<D>** on *Clipping Options*

Corridor	Clipping Corridor	Clipping Option	ОК
Median Nose	Federal_Display_Rule	Clip None	Cancel
Median Nose_North	Federal_Display_Rule	Clip None	
			Help

4. Under the Clipping Option column, <D> to cycle through the options and set both the *Median Nose* and *Median Nose_North* corridors to *Clip None*.

Also set:

- Name: *Design Model*
- Default Preference: *Proposed*

And toggle on:

- Densify Horizontal Curves using Chord Height Tolerance
- Densify Vertical Curves using Chord Height Tolerance
- ♦ Triangulate
- ♦ Remove Loops
- Display Features in Plan View

And toggle off:

♦ Add Exterior Boundary - Style:

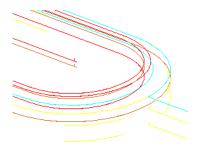
Create Surface			83
Name:	Design Model		Apply
Default Preference:	Proposed	•	Close
New Surface for	Each Comidor		Preferences
Empty Design Su	uface		Help
🔲 Include Null Poin	ts		<u> </u>
Add Exterior Bou	ndary - Style:	Exterior Bo	undary 👻
Densify Horizonta	al Curves using Chor	rd Height To	plerance
Densify Vertical (Curves using Chord I	Height Tole	rance
Triangulate			
Federal Federal_Display_Ri Median Nose Median Nose_North			All
Clipping Optio	ons		
Features Duplicate Names:			
	Replace	Rename	Modify
Add Transverse	e Features		
Style:	Default	▼]	
Create Alternate	Surfaces		
Process Visible F	Range Only		
Remove Loops			
Display Features	in Plan View		

Lab 27.12 - Review the Design

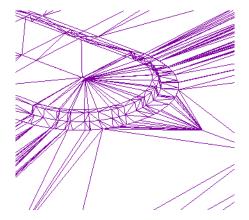
Use you knowledge of InRoads to review your model.

Some methods may include:

• A 3D isometric view of DTM features



• DTM triangles



Contours, profiles and cross sections are additional options.

Chapter Summary:

- In *Lab 27.5 -Add Display Rules* were created and associated with template components.
- In *Lab* 27.9 -*Point Controls* were defined to modify the application of the defined template
- In *Lab 27.10 Adding Key Stations* are used to define supplemental template application stations.
- In *Lab 27.11 Creating the Model* multiple corridors are modeled simultaneously and corridor clipping option are defined.