

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.

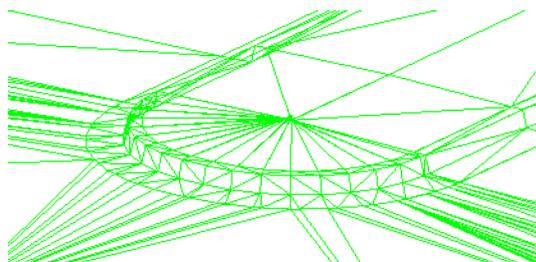
Chapter Objectives:

- 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

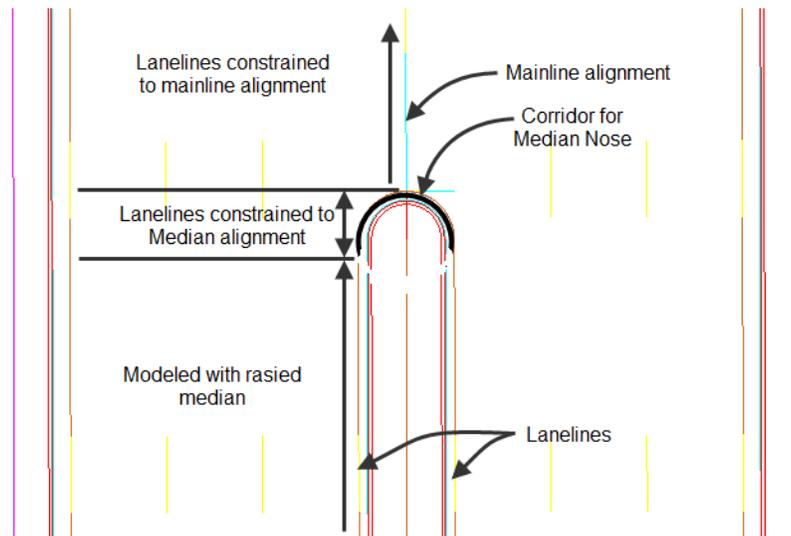
Lab 27.1 - Workflow

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



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Lab 27.2 - Open Lab Files

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

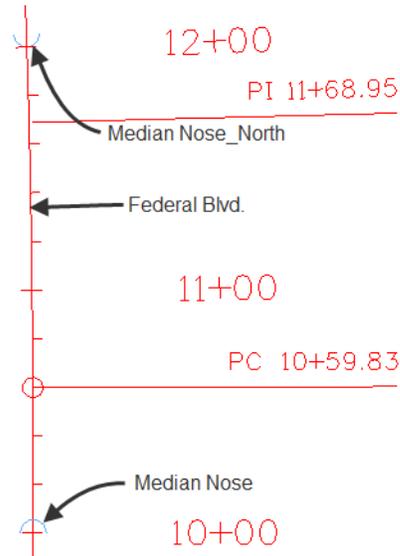
1. Open MicroStation and InRoads using the *12345DES_Model-Create Raised Median.dgn* file.
2. Verify that the file *C:\Workspace\Workspace-CDOT_XM\Standards-Global\InRoads\Preferences\CDOT_Civil.xin*
3. Select **File> Open** from the InRoads menu bar.
4. Open the following files from *C:\Projects\12345\Design\InRoads*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

Lab 27.3 - Review The Alignments

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

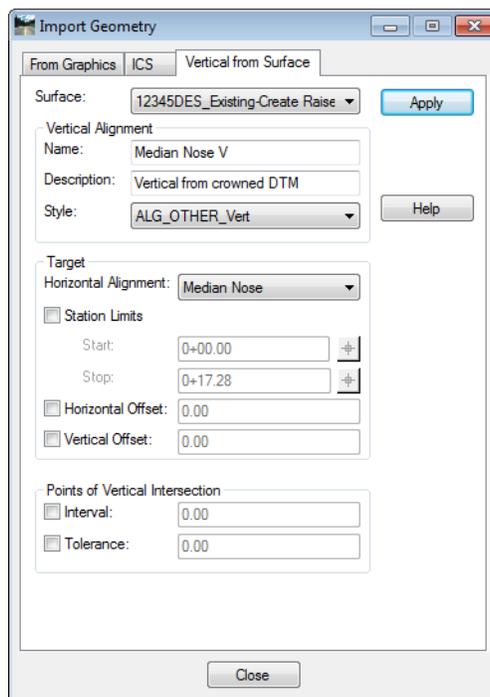
1. Select the **Geometry** tab in the *InRoads Explorer*
2. View the horizontal alignments *Federal CL*, *Median Nose* and *Median Nose_North*

3. View stationing for horizontal alignment *Federal CL*



Lab 27.4 - Review Data

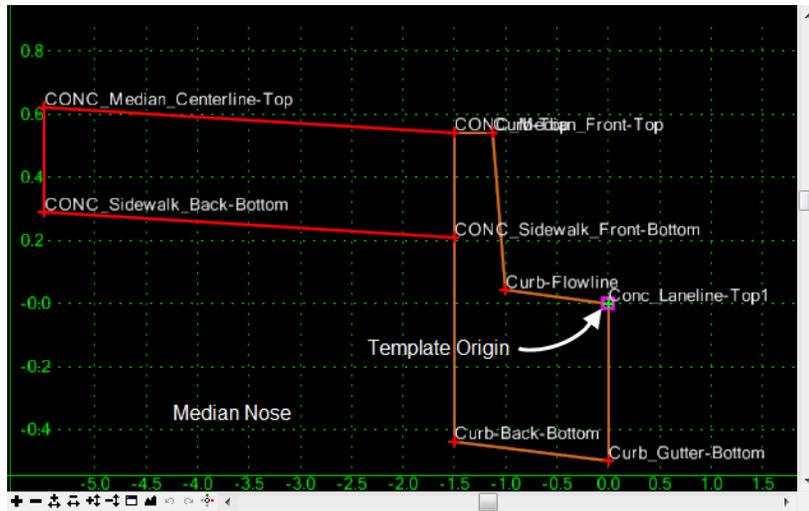
An initial model of the roadway was created using a crowned roadway section (without the raised median). This was done for the purpose of extracting the vertical profile of the median noses. This was accomplished by using the command **File > Import > Geometry [Vertical From Surface]**.



Next, the templates used for the project are reviewed.

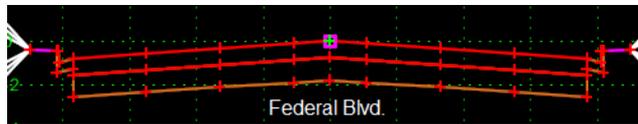
1. Select **Modeler > Create Template** from the InRoads menu bar.

2. In the *Create Template* dialog box review the template for *Median Nose* in the *1-Templates* folder.

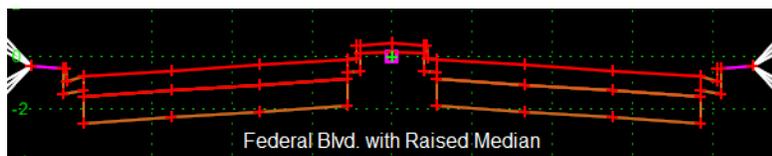


3. Also in the *Create Template* dialog box, review the templates for Federal Blvd. in the *1-Templates* folder.

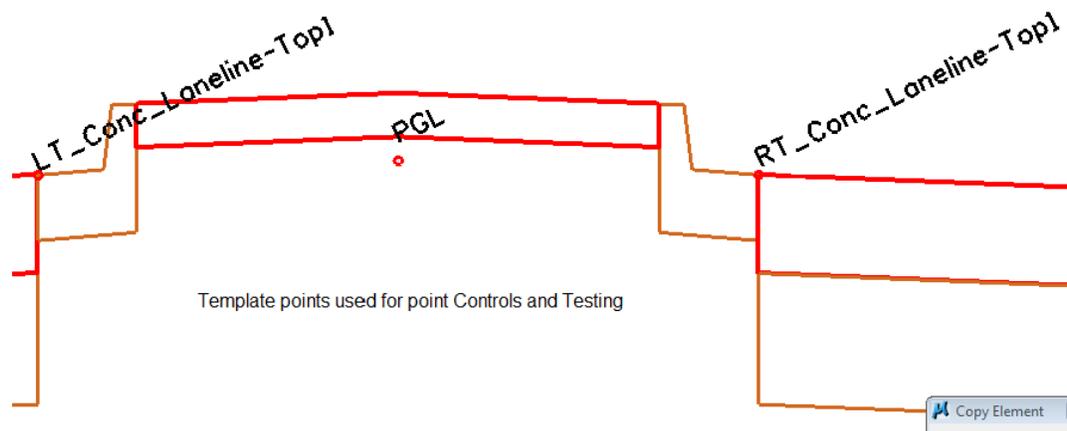
The *Federal Blvd* template was used to create a preliminary model. This model was used to extract vertical alignments for the median alignments.



The template *Federal Blvd with Raised Median*. uses display rules control to determine when the median is modeled.



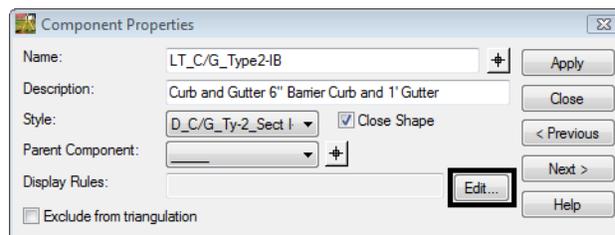
The illustration below shows an expanded view of the median. The 'Laneline' points will be controlled by both the Federal Blvd. and median alignments. Additionally the median components will be assigned display rules which will test the distance between the lanelines and the PGL.



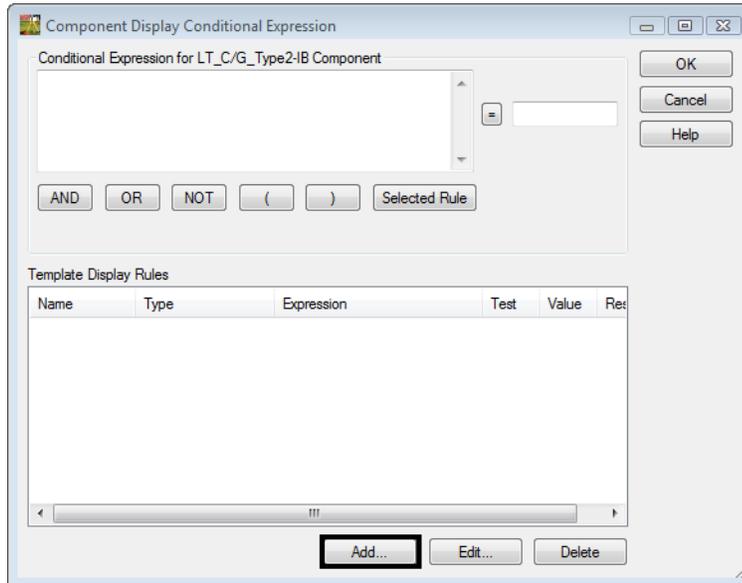
Lab 27.5 - Add Display Rules

Display rules are associated with components to test if the component should be displayed or not. The display rules turn off the median components if the distance between either lanelines and the PGL is less than 5.50'. This is the distance from the mainline alignment to the PC or PT of either median nose alignment.

1. **Copy** the template *Federal Blvd with Raised Median* to *Federal Blvd with Raised Median_DR*.
2. Open the *Federal Blvd with Raised Median_DR* template for editing.
3. Select the median curb and gutter component named *LT_C/G_Type2-1B* for editing. In the Component Properties dialog box, select the **Edit** button.

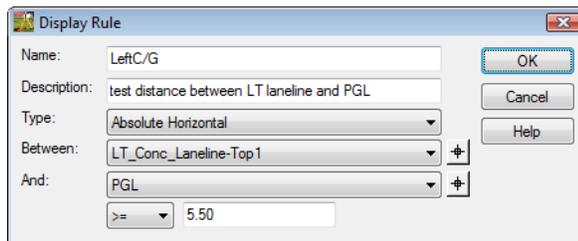


- In the **Component Display Conditional Expression** dialog box, select the **Add** button.

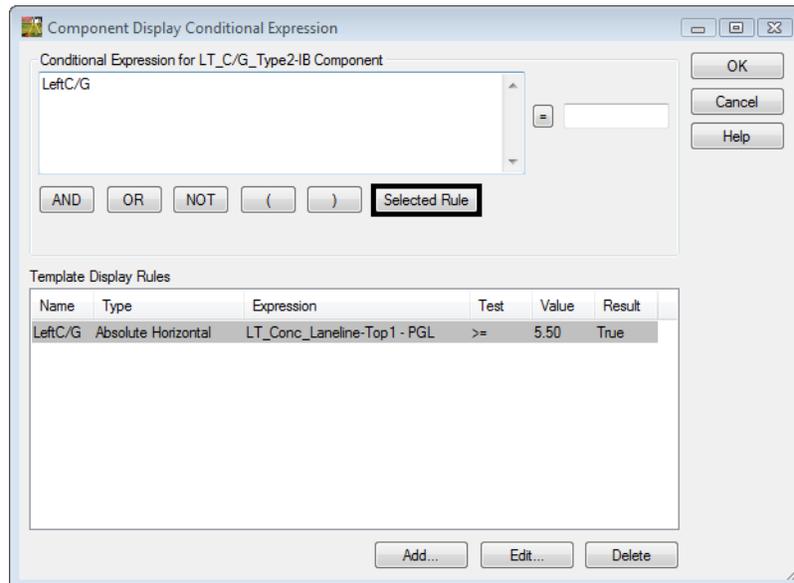


- Create** a Display Rule that tests the distance between the Left Laneline and the PGL using the following data:

- ◆ **Name:** *LeftC/G*
- ◆ **Description:** *test distance between LT laneline and PGL*
- ◆ **Type:** **Absolute Horizontal**
- ◆ **Between:** **LT_Conc_Laneline-Top1**
- ◆ **And:** **PGL**
- ◆ Test (button): **>=**
- ◆ Value (field): **5.50**

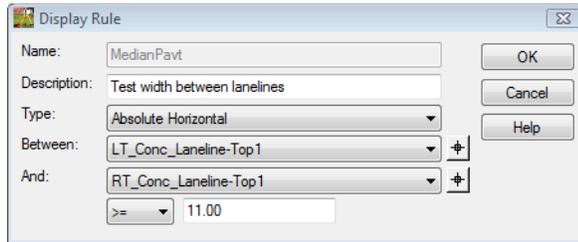


6. Highlight the rule and **<D>** the **Selected Rule** button.



7. **<D>** **OK** to use the rule and dismiss the dialog box.
8. In the *Component Properties* dialog box, **<D>** **Apply** then **Close**.
9. Select the component *RT_C/G_Type2-1B* for editing.
10. **Build** and **apply** a similar rule for the RT Laneline using the following data:
- ◆ **Name:** *RightC/G*
 - ◆ **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*) using the following data:
- ◆ **Name:** *MedianPavt*
 - ◆ **Description:** *Test width between lanelines*
 - ◆ **Type:** **Absolute Horizontal**
 - ◆ **Between:** *LT_Conc_Laneline-Top1*
 - ◆ **And:** *RT_Conc_Laneline-Top1*
 - ◆ **Test (button):** **>=**

◆ **Value: 11.00**

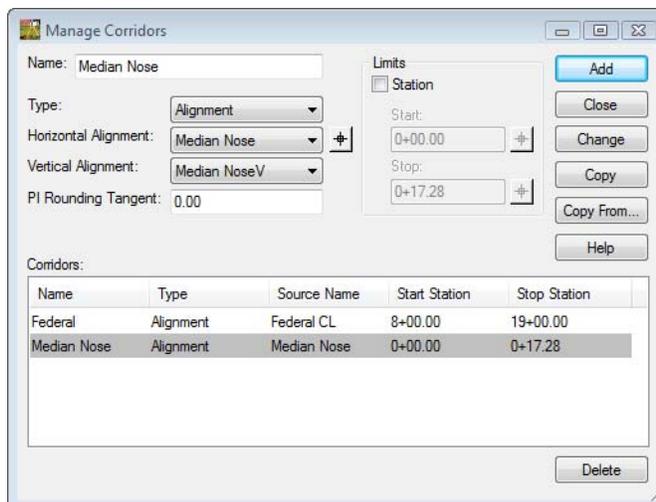


13. **Save** and **Close** the Create Template dialog box.

Lab 27.6 - Create Corridors

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

1. Select **Modeler > Roadway Designer**
2. Select **Corridor > Corridor Management** from the Roadway Designer menu bar.
3. In the *Manage Corridors* dialog box, key in **Median Nose** for the *Name*.
4. Set the *Type* to **Alignment**.
5. Set the *Horizontal Alignment* to **Median Nose**.
6. Set the *Vertical Alignment* to **Median NoseV**.
7. **<D>** the **Add** button to create the corridor.



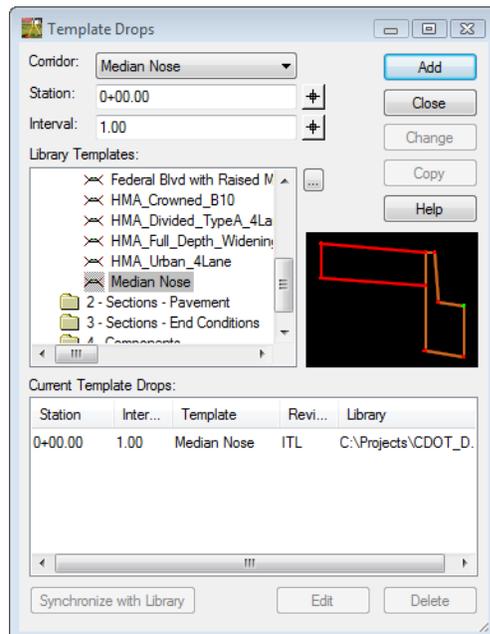
8. Repeat the steps above to add a corridor for the *Median Nose_North* alignment using the following data:
 - ◆ **Name: Median Nose_North**
 - ◆ **Type: Alignment**

- ◆ **Horizontal Alignment: Median Nose_North**
 - ◆ **Vertical Alignment: Median Nose_NorthV**
9. Create a corridor for the Mainline using the following data:
- ◆ **Name: Federal_Display_Rule**
 - ◆ **Type: Alignment**
 - ◆ **Horizontal Alignment: Federal CL**
 - ◆ **Vertical Alignment: Federal CL_V**
 - ◆ **Start Station: 8+00**
 - ◆ **Stop Station: 19+00**
10. **<D> Close** to dismiss the *Manage Corridors* dialog box.

Lab 27.7 - Add Template Drops

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 corridor, so setting the interval and selecting the desired template is all of the input that is required.

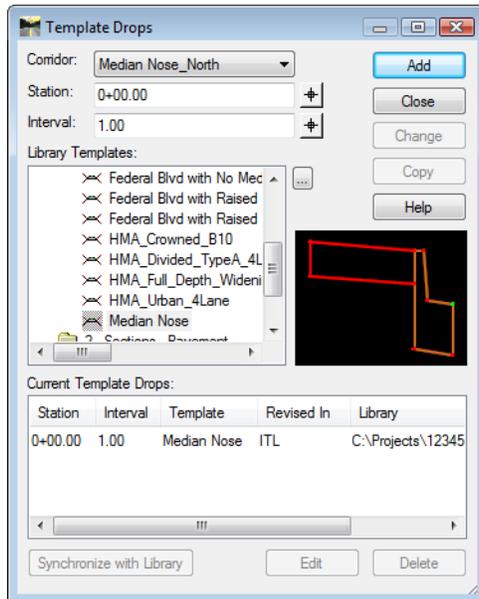
1. Select **Corridor > Template Drops** from the Roadway Designer menu bar.
2. Highlight the **Median Nose** template from the *Library Templates* list.
3. Key in **1** for the *Interval*.



4. **<D> Add** to create the template drop.

Next, add a template drop to the Median Nose_North corridor.

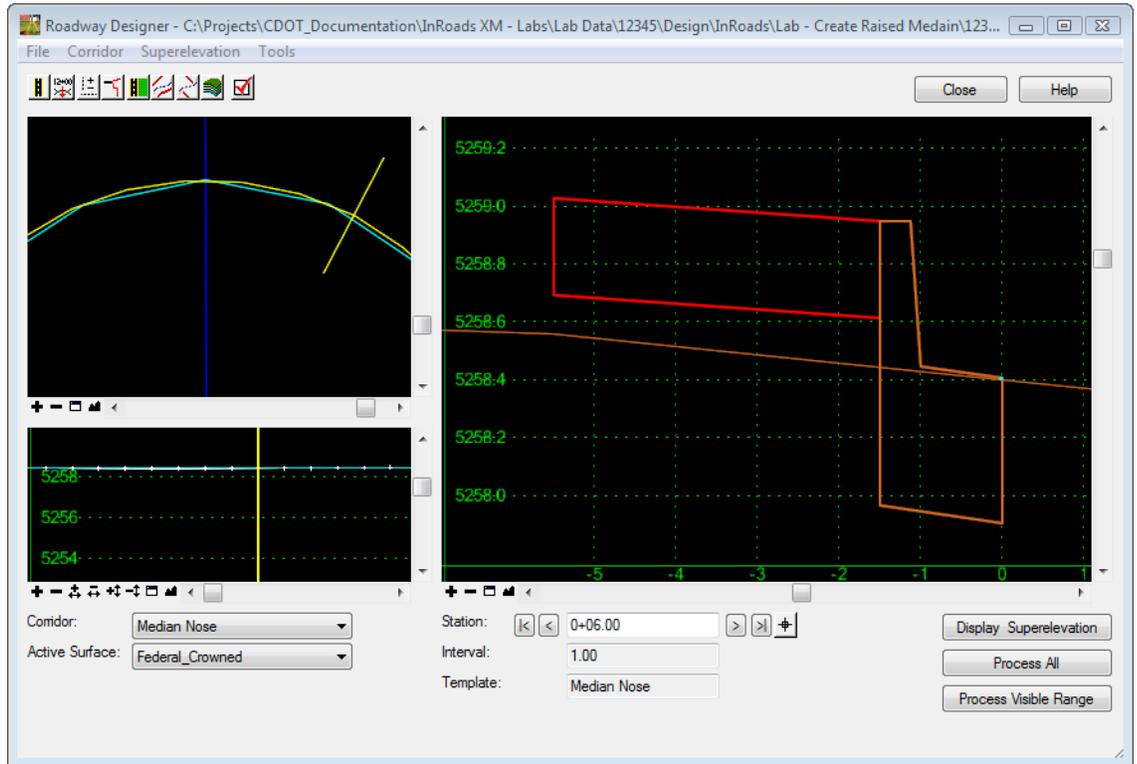
5. Set the *Corridor* to **Median Nose_North**.
6. Highlight the **Median Nose** template from the *Library Templates* list.
7. Key in **1** for the *Interval*.



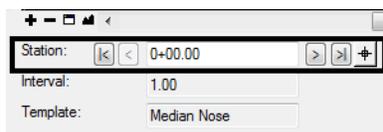
8. **<D> Add**.
9. Set the *Corridor* to **Federal_Display_Rule**.
10. Key in **8+00** for the *Station*.
11. Key in **10** for the *Interval*.
12. Highlight the **Federal Blvd with Raised Median_DR** template from the *Library Templates* list.
13. **<D> Add** then **Close** to dismiss the *Template Drops* dialog box.

Use Roadway Designer to evaluate the corridors. The template data is displayed in the cross section view of the Roadway Designer dialog box. There are two options for scrolling through the corridor; using the station arrows below the cross section view and using the station line in the plan view.

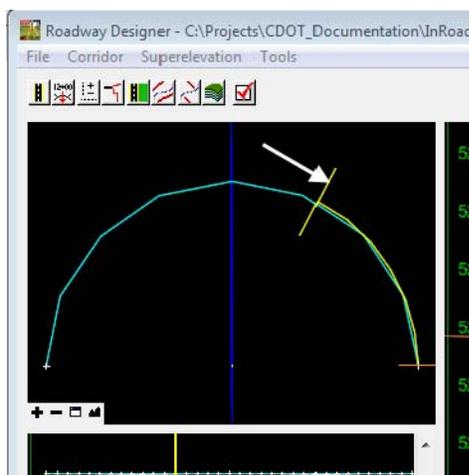
- In the *Roadway Designer* dialog box, set the *Corridor* to **Median Nose**.



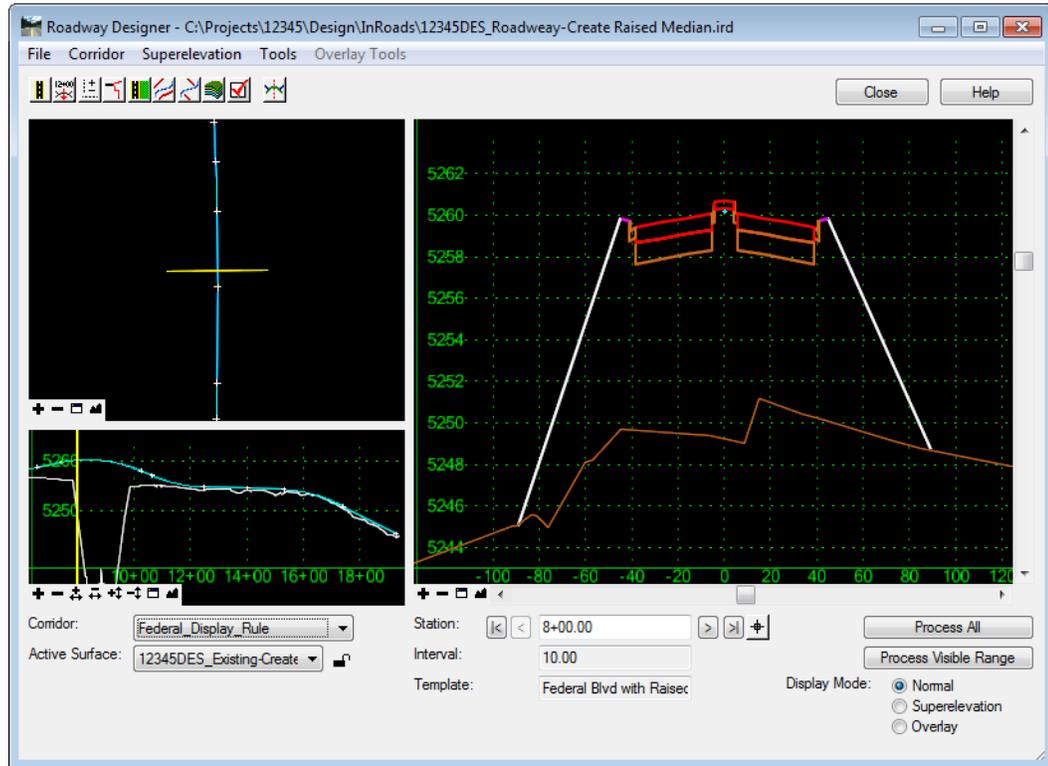
- <D>** on the station arrows to scroll through the design. Notice how the data in the cross section view is updated for each station.



- <D> and Hold** on the yellow station line. Move the pointer back and forth to scroll through the design. The data is now updated based upon the location of the station bar.



17. Evaluate the *Federal_Display_Rule* corridor.



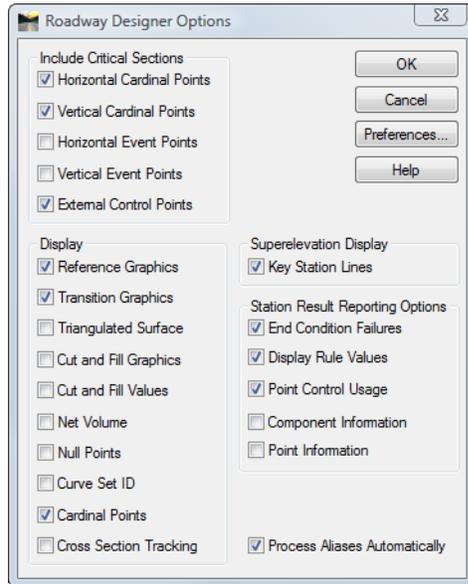
Lab 27.8 - Change Roadway Designer Settings

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, cardinal points are processed and component and point information is added to the processing report.

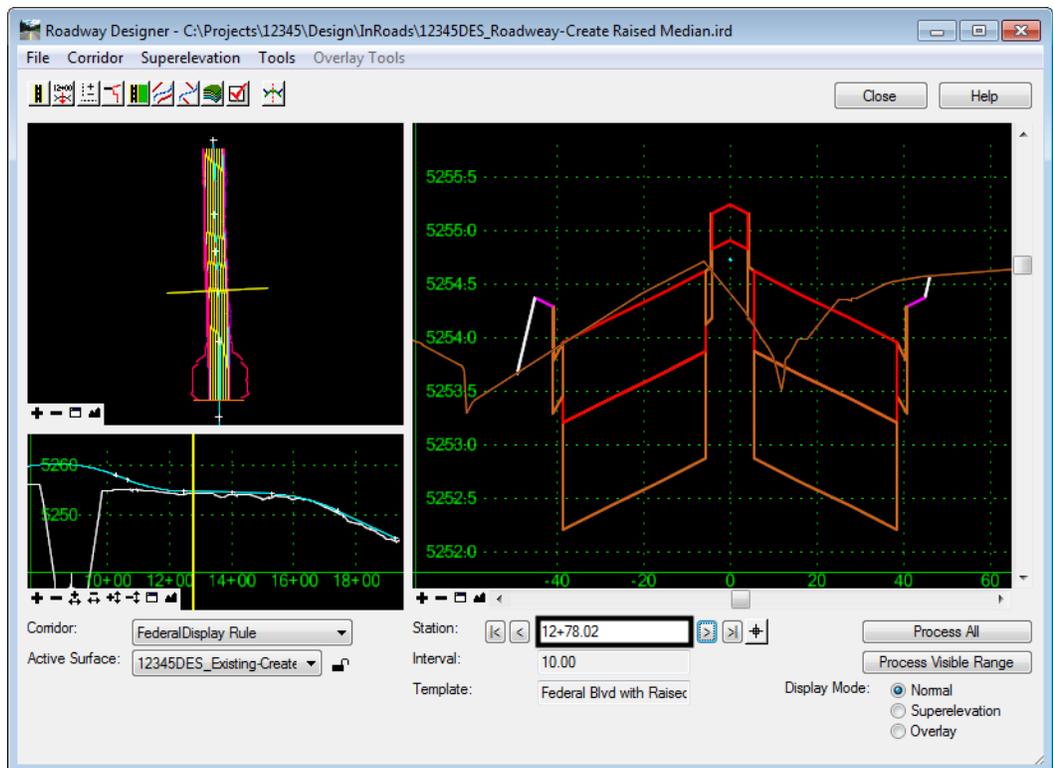
The first series of steps set Roadway Designer to process the horizontal cardinal and event points.

1. From the Roadway Designer menu bar, select **Tools > Options**.
2. In the *Roadway Designer Options* dialog box, toggle on the following options:
 - ◆ **Horizontal Cardinal Points**
 - ◆ **Vertical Cardinal Points**
 - ◆ **External Control Points**
 - ◆ **Reference Graphics**

◆ **Transition Graphics.**



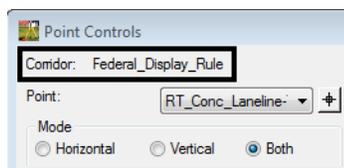
3. <D> OK.
4. Scroll through the stations and notice that some stations do not fall on even intervals. These are the cardinal and event points.



Lab 27.9 - Point Controls

This series of steps adds Point Controls (overrides) to the `Federal_Display_Rule` corridor. The roadway is modeled 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) for 6 total point controls. The first control instructs the laneline to follow a feature created by the *Median Nose* corridor. The second control instructs the laneline to follow the *mainline alignment*. The third control instructs the laneline to follow a feature created by the *Median Nose_North* corridor.

1. Verify the corridor **Federal_Display_Rule** is the active corridor.
2. Select **Corridor > Point Controls** from the Roadway Designer menu bar.



Next, create the following Point Control entries to instruct the `RT_Conc_Laneline-Top1` template point to follow a feature (by the same name) created by the Median Nose corridor.

3. Select **RT_Conc_Laneline-Top1** from the *Point* drop-down menu.
4. Set the *Mode* to **Both**.
5. Set the *Control Type* to **Corridor Point**.
6. Select **Median Nose** for the *Corridor*.
7. Select **Conc_Laneline-Top 1** for the *Reference Point*.
8. Key in **10+00.00** (begin of median radius) for the *Start* station.
9. Key in **10+05.50** (end of median radius/nose) for the *Stop* station.
10. **<D> ADD** to create the point control.

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

11. Repeat the steps above to add the other two point controls for this corridor, using the following data:
 - ◆ Second point control
 - *Point:* **RT_Conc_Laneline-Top1**
 - *Mode:* **Both**
 - *Control Type:* **Alignment**
 - *Horizontal Alignment:* **Federal CL**
 - *Vertical Alignment:* **Federal CL_V**

- **Start Station: 10+05.51** (end of median radius/nose - beginning of median opening)
- **Stop Station: 12+00.00** (beginning of north median/radius nose)

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

- ◆ Third point control
 - **Point: RT_Conc_Laneline-Top1**
 - **Mode: Both**
 - **Control Type: Corridor Point**
 - **Corridor: Median Nose_North**
 - **Reference Point: Conc_Laneline-Top 1**
 - **Start Station: 12+00.00** (begin of median radius/nose)
 - **Stop Station:** use the default station.

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

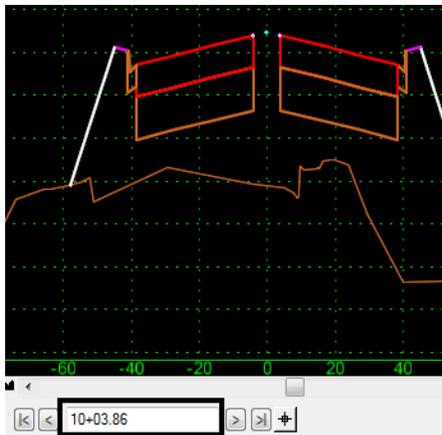
The fourth, fifth, and sixth entry for the **LT_Conc_Laneline-Top1** point. The definitions mimic the definitions use for the RT_Conc_Laneline-Top1 point.

- ◆ Fourth point control
 - **Point: LT_Conc_Laneline-Top1**
 - **Mode: Both.**
 - **Control Type: Corridor Point**
 - **Corridor: Median Nose** for the *Corridor*.
 - **Reference Point: Conc_Laneline-Top 1** for the *Reference Point*.
 - **Start Station: 10+00.00** (begin of median radius)
 - **Stop Station: 10+05.50** (end of median radius/nose)
- ◆ Fifth point control
 - **Point: LT_Conc_Laneline-Top1**
 - **Mode: Both**
 - **Control Type: Alignment**
 - **Horizontal Alignment: Federal CL**
 - **Vertical Alignment: Federal CL_V**
 - **Start Station: 10+05.51** (end of median radius/nose - beginning of median opening)
 - **Stop Station: 12+00.00** (beginning of north median/radius nose)

- ◆ Sixth point control
 - **Point:** LT_Conc_Laneline-Top1
 - **Mode:** Both
 - **Control Type:** Corridor Point
 - **Corridor:** Median Nose_North
 - **Reference Point:** Conc_Laneline-Top 1
 - **Start Station:** 12+00.00 (begin of median radius/nose)
 - **Stop Station:** use the default station.

Horizontal and Vertical Controls:							
Enabled	Priority	Name	Start Sta...	Stop Station	Mode	Type	Control
X	1	RT_Conc_Laneline-Top1	10+00.00	10+05.50	Both	Coridor Point	Median Nose:Conc_Laneline-Top1
X	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	Coridor Point	Median Nose_North:Conc_Laneline-Top1
X	1	LT_Conc_Laneline-Top1	10+00.00	10+05.50	Both	Coridor Point	Median Nose:Conc_Laneline-Top1
X	1	LT_Conc_Laneline-Top1	10+05.51	12+00.00	Both	Alignment	Federal CL:Federal CL_V
X	1	LT_Conc_Laneline-Top1	12+00.00	12+05.00	Both	Coridor Point	Median Nose_North:Conc_Laneline-Top1

12. <D> **Close** to dismiss the *Point Controls* dialog box.
13. Review the results graphically in Roadway Designer. Notice that the raised median disappears between stations 10+00.00 and 10+05.00 and again between 12+00.00 and 12+05.00. Between these station extents, the corridors for the medians will complete the model.

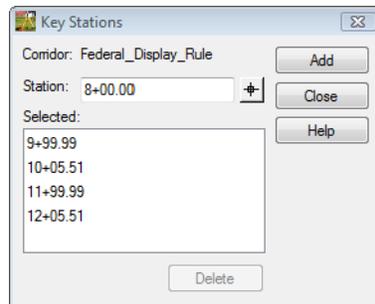


Also notice that the left and right pavement edges run together between stations 10+05.51 and 12+00.00. This represents the median opening.

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 at locations defined by key stations. Examples of Key Stations may be at driveways, side roads, drainage structures or in the case of this exercise, just prior to and after the application of point controls. This ensures that the roadway is modeled 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 Key Station button  .
2. **Key-in** the station values as shown in the list below. Select **Add** after each entry.
 - ◆ ***9+99.99***
 - ◆ ***10+05.51***
 - ◆ ***11+99.99***
 - ◆ ***12+05.51***



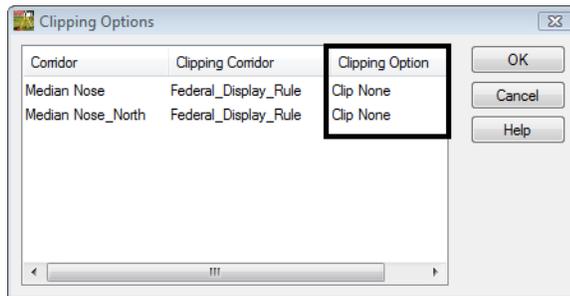
3. **<D> Close**
4. Select **File > Save** from the Roadway Designer menu.

Lab 27.11 - Creating the Model

With all the corridors, template drops 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 Create Surface button  .
2. Select the following corridors for modeling:
 - ◆ ***Federal_Display_Rule***
 - ◆ ***Median Nose***
 - ◆ ***Median Nose_North***

3. <D> on the *Clipping Options* button.



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:

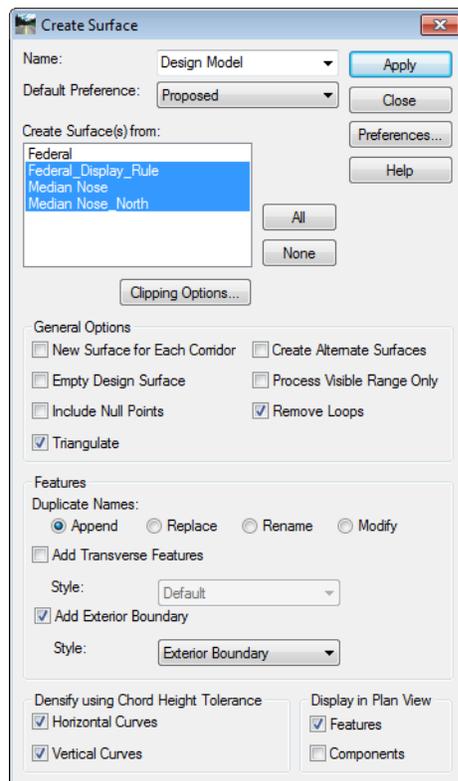
- ◆ Name: **Design Model**
- ◆ Default Preference: **Proposed**

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:**

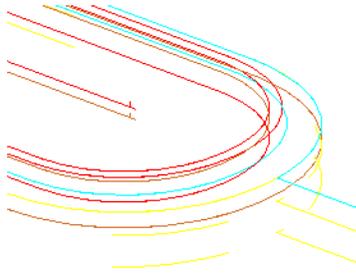


Lab 27.12 - Review the Design

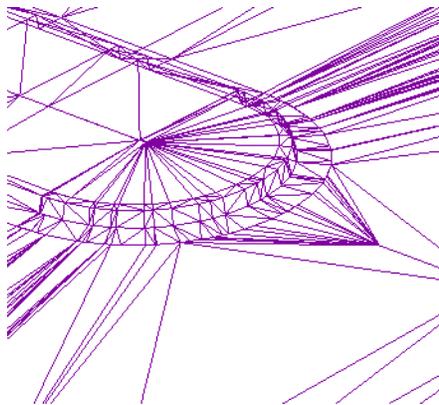
Use your knowledge of InRoads to review your model.

Some methods may include:

- A 3D isometric view of DTM features



- DTM triangles



Contours, profiles and cross sections are additional options.

Chapter Summary:

- Display Rules are used to turn on or off components based on the relationship between two points
- Point Controls are used to modify a template during processing. In this lab, the point controls were used to modify the relationship between points used in display rules to affect the display of the median components
- Key Stations and the settings under Options force the template to be processed at specific stations in addition to the processing that occurs at the normal template drop interval
- Clipping Options determine how template components are affected in areas where corridors overlap. The None option was used here, so that all of the components from each corridor would be retained.