

LAB 28 - Create Ramp Model

This lab demonstrates the InRoads design process for creating a single lane freeway entrance ramp (tapered type) model and the infield, gore and taper area segment of the the mainline model. The Vertical Gore Tool is used to create a guide for revise and tie the ramp vertical alignment into the edge of lane of the mainline taper. The corridors are created for both the ramp and mainline models. Display rules, Point controls, and end condition exceptions are used to tie the inside of the ramp model into the mainline corridor model in the gore and infield area. The outside lane of the mainline corridor is widened with a point control to create the ramp taper. After the ramp and mainline surfaces are created from the Roadway Designer, cross sections are displayed and examined to view the results.

Chapter Objectives:

- Revise and tie a ramp vertical alignment into the edge of lane of the mainline taper using the Vertical Gore Tool.
- Create a freeway entrance ramp (tapered type) model and the infield, gore and taper area segment of the the mainline model.
- Create a ramp and mainline surfaces from the Roadway Designer, display cross sections and examine the results.

Lab 28.1 - Open InRoads Data Files

1. Open MicroStation and InRoads using the *12345DES_Model-Create Ramp Model.dgn* file.
2. Load *CDOT_Civil-Create Ramp Model.xin*

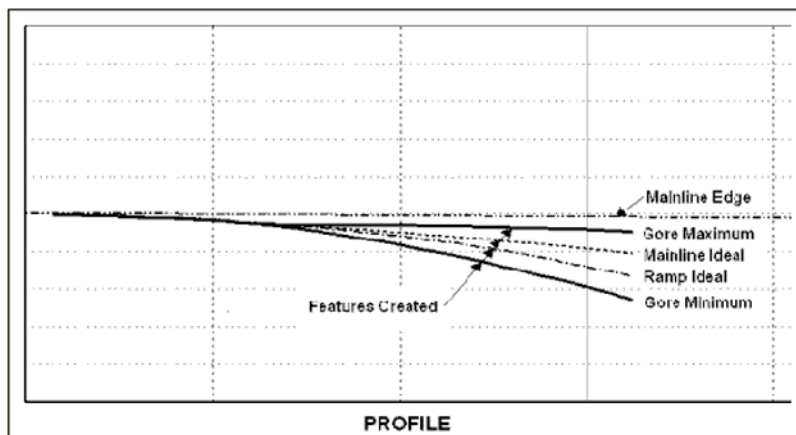
In the MicroStation drawing, notice the entrance ramp and mainline proposed linework displayed as a reference and the profile views for each alignment.
3. Select **File> Open** from the InRoads menu bar.
4. Select the following files from *C:\Projects\12345\Design\InRoads* and **<D> Open** them.
 - ◆ *12345DES_Geometry-Create Ramp Model.alg*
 - ◆ *12345DES_Template-Create Ramp Model.itl*
 - ◆ *12345DES_Roadway-Create Ramp Model.ird*
 - ◆ *12345DES_Existing-Create Ramp Model.dtm*
5. **<D> Cancel** the *Open* dialog box to close.

Lab 28.2 - Set the Global Scale Factors

1. Select **Tools> Options** from the InRoads menu bar.
2. In the *Options* dialog box:
 - ◆ Select *Factors* tab.
 - ◆ Key in *200* in the Factor fields.
 - ◆ **<D> Apply and <D> Close.**

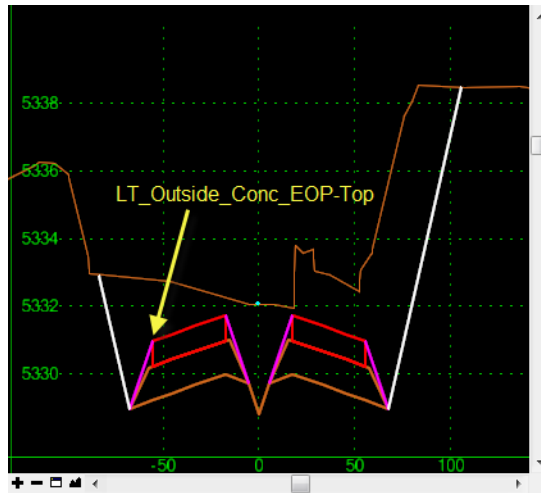
Lab 28.3 - Create Ramp Vertical Alignment Guide with Vertical Gore Tool

Use the Vertical Gore Tool to create a guide for revising the ramp vertical alignment. This command is used to create a surface feature envelope of a ramp that merges into a mainline corridor. The output from this command includes a surface with four linear features which are designed to be plotted on the profile of the ramp alignment. These features specify the allowable maximum and minimum elevations of the ramp vertical alignment, as well as the ideal locations to make the gore cross slope match the mainline and ramp cross slopes. The exercise will use the Mainline Ideal cross slope to set the ramp's vertical alignment. This is used because the mainline's cross slope extends out at a constant 2% from the crown in the 50:1 taper section. Note the Ramp Ideal cross slope feature is at the same location.

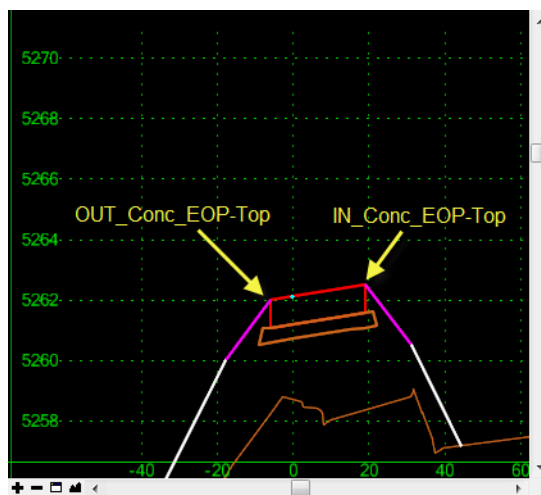


1. Select **Modeler> Roadway Designer** from the InRoads menu bar.
2. Select **Tools> Vertical Gore Tool** from the Roadway Designer menu bar.
3. In the *Vertical Gore Design Tool* dialog box:
 - ◆ Select **IH 39** in the Mainline Corridor field

- ◆ Select *LT_Outside_Conc_EOP-Top* for the Mainlined Edge field, using the drop-down list or the selector button and <D> on the template point in the Roadway Designer dialog box.

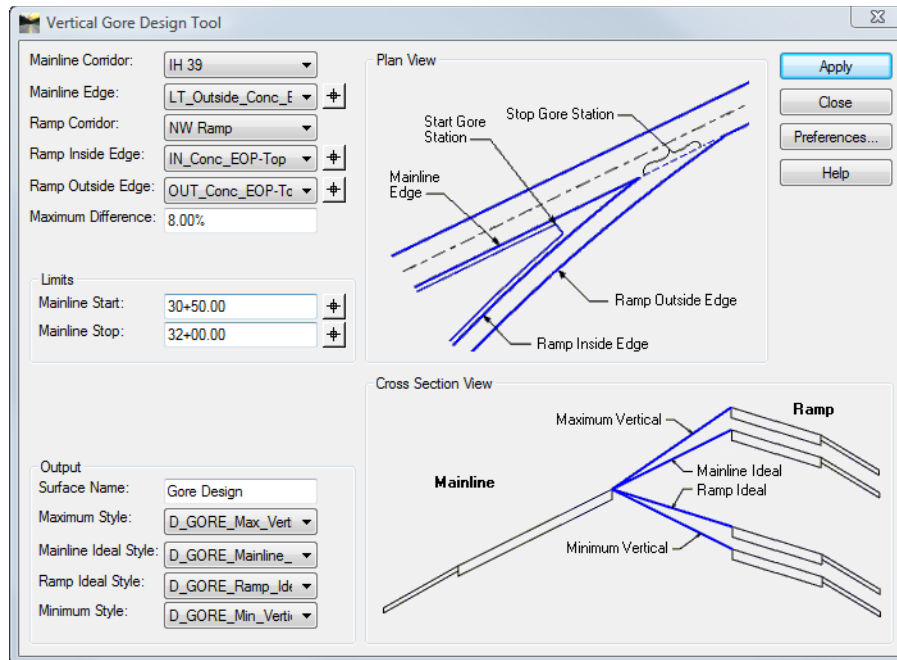


4. Set *NW Ramp* as the ramp corridor field.
5. Select *IN_Conc_EOP-Top* for the Ramp Inside Edge field, using the selector button and <D> on the template point in the Roadway Designer dialog box.
 - ◆ Select *OUT_Conc_EOP-Top* for the Ramp Outside Edge field, using the selector button and <D> on the template point in the Roadway Designer dialog box.



- ◆ Key in **8%** in the Maximum Difference field.
- ◆ Key in **30+50** in the Mainline Start field.
- ◆ Key in **32+00** in the Mainline Stop field.
- ◆ Key in **Gore Design** in the Surface Name field.
- ◆ Select *D_GORE_Max_Vertical* for the Maximum Style.
- ◆ Select *D_GORE_Mainline_Ideal* for the Mainline Ideal Style.
- ◆ Select *D_GORE_Ramp_Ideal* for the Ramp Ideal Style.

- ◆ Select *D_GORE_Min_Vertical* for the Mimimum Style.



- ◆ <D> Apply and <D> Close

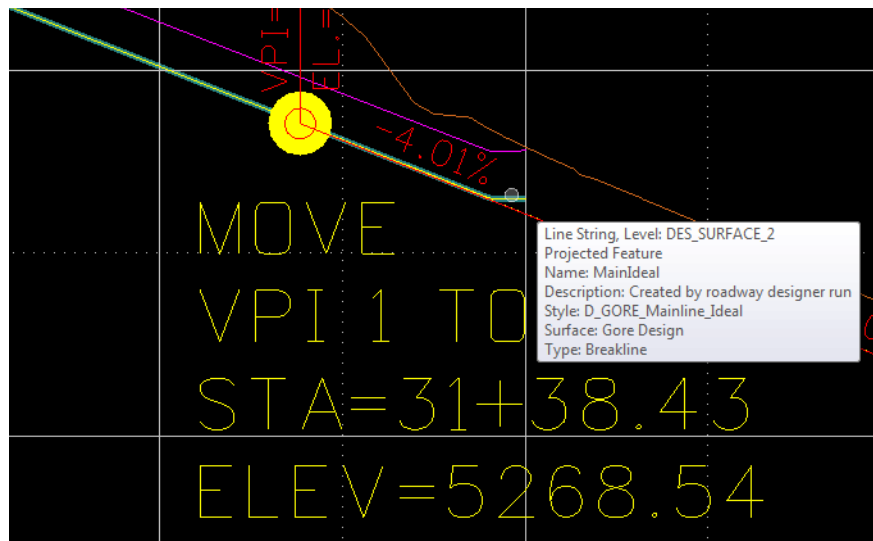
6. In the *Roadway Designer* dialog box:

- ◆ <D> Close and select *No* to save changes

Lab 28.4 - Update NW Ramp profile view to display Projected Features from the Gore Design surface

1. Select **Evaluation> Profile> Update Profile** from the InRoads menu bar.
2. In the *Update Profile* dialog box:
 - ◆ Verify *NW Ramp* for the Profile Set.
 - ◆ Select *Projected Features* in the Update Profile area.
 - ◆ Select *Display On* for the Mode.
 - ◆ Select *Gore Design* in the Surfaces area.
 - ◆ Select All features in the Projected Features area.

◆ <D> Apply and <D> Close.



The vertical alignment displayed in the profile view does not tie into the mainline and was created to model the NW Ramp corridor for use in the Vertical Gore design Tool. The NW Ramp vertical alignment needs to be revised to tie into the edge of lane of the mainline taper. Revise VPI #1 to begin at Sta. 31+38.43 and the slope of feature D_GORE_Mainline Ideal is extended to the revised VPI #2 location of the proposed sag vertical curve at Sta. 35+75.00. The ramp vertical alignment is lowered to better tie into the mainline ditch in the infield area.

3. Set alignment *NW Ramp* as the *Active* alignment
4. Select **Geometry> Vertical Curve Set> Move PI** from the InRoads menu bar.
5. **Move** VPI #1 to Station 31+38.43, Elev. 5268.54
6. **Move** VPI #2 to Station 35+75.00, Elev. 5251.04

Note: The keyin *se=station,elevation* can be used to move the PI's

7. Select **Geometry> View Geometry> Vertical Annotation** from the InRoads menu bar.

◆ <D> Apply and <D> Close.

Revise NW Ramp corridor to start at the beginning of the ramp's revised vertical alignment.

8. Select **Modeler> Roadway Designer** from the InRoads menu bar.
9. In the *Roadway Designer* dialog box:
 - ◆ Select *NW Ramp* in the Corridors field.
 - ◆ Select **Corridor > Corridor Management** from the Roadway Designer menu bar.
 - ◆ <D> on corridor NW Ramp
 - ◆ Key in **31+38.43** in the Start field.

◆ **<D> Change.**

Define End Condition Exceptions for the IH 39 corridor. Apply Left Override, Backbone Only to left side of IH 39 along the NW Ramp gore and infield area.

10. In the *Roadway Designer* dialog box:
11. Select **IH 39** in the Corridor field and select **Corridor> End Condition Exceptions** in the Roadway designer menu bar.
 - ◆ Key in **31+38.43** in the Start field.
 - ◆ Key in **40+50** in the Stop field.
 - ◆ Select **Left Override** in the Apply To area.
 - ◆ Select **Backbone Only**
 - ◆ **<D> Add and <D> Close**

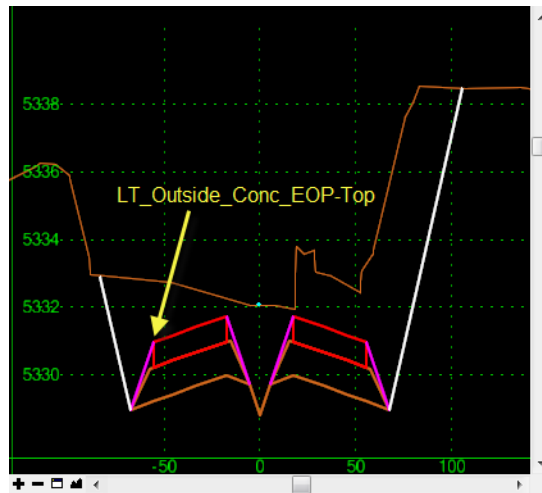
Lab 28.5 - Define End Condition Exceptions for NW Ramp corridor

Apply Right Override, Backbone Only to right side of NW Ramp along the gore and infield area.

1. In the *Roadway Designer* dialog box:
2. Select **NW Ramp** in the Corridor field and select **Corridor> End Condition Exceptions** in the Roadway designer menu bar.
 - ◆ Key in **31+38.43** in the Start field.
 - ◆ Key in **40+50** in the Stop field.
 - ◆ Select **Right Override** in the Apply To area.
 - ◆ Select **Backbone Only**
 - ◆ **<D> Add and <D> Close**

Define Point Controls for the IH 39 corridor. Stretch westbound roadway's left edge of pavement to create the ramp taper.
3. In the *Roadway Designer* dialog box:
4. Select **IH 39** in the Corridor field and select **Corridor> Point Controls** in the Roadway designer menu bar.
5. In the *Point Controls* dialog box:

- ◆ Select *LT_Outside_Conc_EOP-Top* for the Point field, using the selector button and <D> on the template point in the Roadway Designer dialog box.



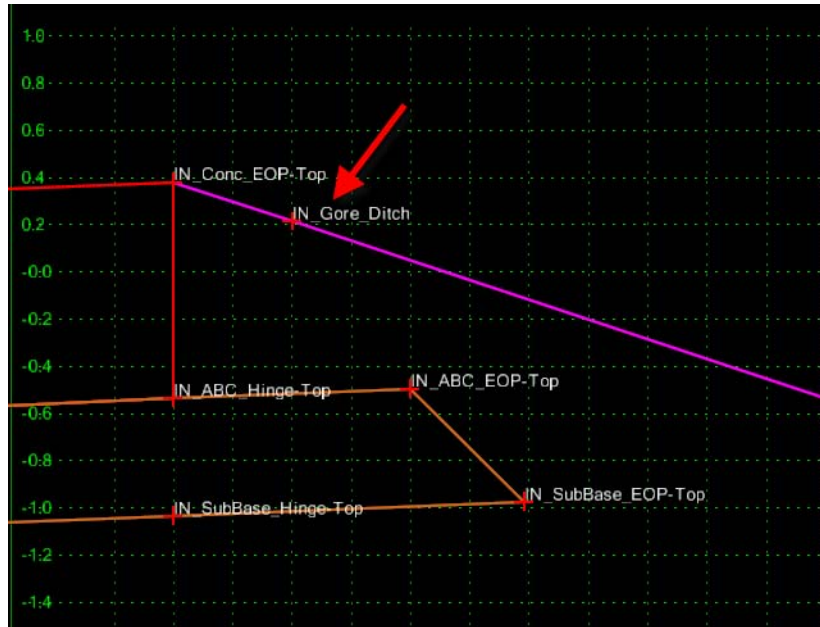
- ◆ Select *Horizontal* for the Mode.
- ◆ Select *Alignment* in the Control Type field.
- ◆ Select *Outside Edge of Pavement* in the Horizontal Alignment field.
- ◆ Select *Use as a Secondary Alignment*.
- ◆ Key in *31+38.43* in the Stop field.
- ◆ <D> Add and <D> Close

Lab 28.6 - Define Point Controls for the NW Ramp corridor

Create a special ditch between the ramp and mainline shoulders pavements from the gore nose to a station where the mainline ditch starts (when the ramp fore slope is flatter than the 3:1 maximum) and tie the inside (right) fore slope of the ramp to the mainline ditch along the infield area when the mainline ditch starts.

1. In the *Roadway Designer* dialog box:
2. Select *NW Ramp* in the Corridor field and select **Corridor> Point Controls** in the Roadway designer menu bar.
3. In the *Point Controls* dialog box:

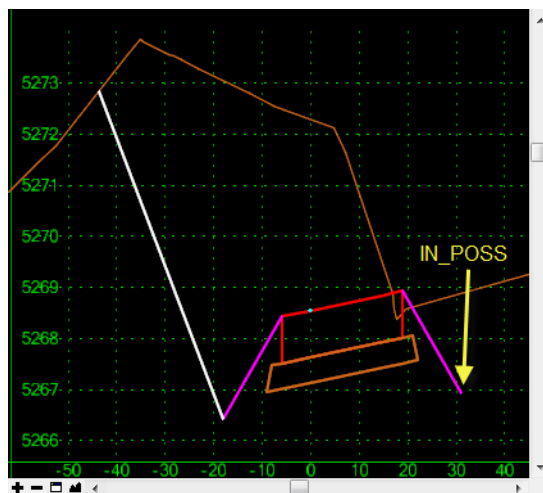
- ◆ Select *IN_Gore_Ditch* for the Point field, from the drop-down list..



- ◆ Select *Both* for the Mode.
- ◆ Select *Alignment* in the Control Type field.
- ◆ Select *Special_Ditch_NW_Ramp* in the Horizontal Alignment field.
- ◆ Unselect *Use as a Secondary Alignment*.
- ◆ Key in *31+38.43* in the Start field.
- ◆ Key in *35+99.90* in the Stop field.
- ◆ **<D> Add**

4. In the *Point Controls* dialog box:

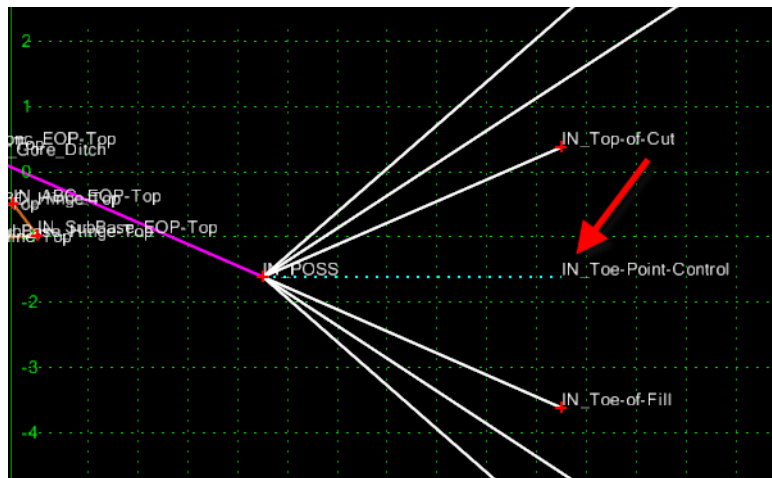
- ◆ Select *IN_POSS* for the Point field, using the selector button and **<D>** on the template point in the Roadway Designer dialog box.



- ◆ Select **Both** for the Mode.
- ◆ Select **Corridor Point** in the Control Type field.
- ◆ Select **IH 39** in the Corridor field.
- ◆ Select **LT_Outside_Conc_EOP-Top** in the Reference Point field.
- ◆ Key in **31+38.43** in the Start field.
- ◆ Key in **35+99.90** in the Stop field.
- ◆ **<D> Add**

5. In the **Point Controls** dialog box:

- ◆ Select **IN_Toe-Point-Control** for the Point field, from the drop-down list..
Note: This component has a display rule.



- ◆ Select **Both** for the Mode.
- ◆ Select **Corridor Point** in the Control Type field.
- ◆ Select **IH 39** in the Corridor field.
- ◆ Select **LT_POSS** in the Reference Point field.
- ◆ Key in **36+00** in the Start field.
- ◆ Key in **40+50** in the Stop field.
- ◆ **<D> Add and <D> Close**

Lab 28.7 - Define Key station for IH 39 corridor

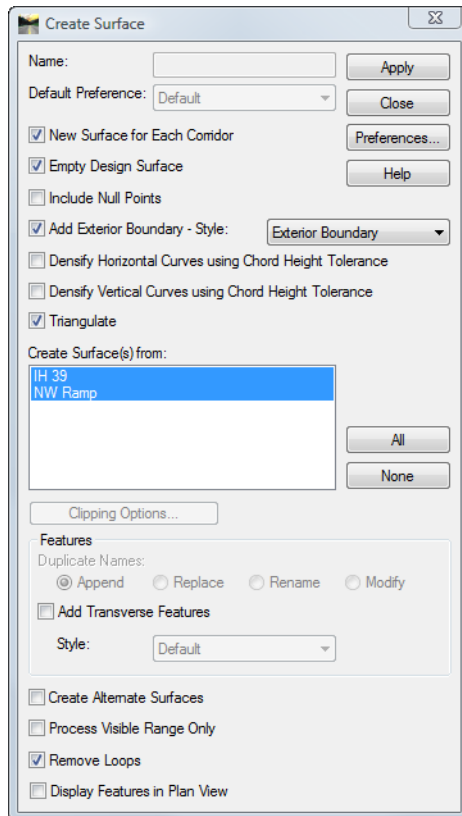
1. In the **Roadway Designer** dialog box:
2. Select **IH 39** in the Corridor field and select **Corridor> Key Stations** in the Roadway designer menu bar.
 - ◆ Key in **31+38.42** in the Station field.
 - ◆ **<D> Add and <D> Close**

Define Key station for NW Ramp corridor.

3. In the *Roadway Designer* dialog box:
4. Select *NW Ramp* in the Corridor field and select **Corridor> Key Stations** in the Roadway designer menu bar.
 - ◆ Key in **3599.90** in the Station field.
 - ◆ **<D> Add** and **<D> Close**

Lab 28.8 - Create Surfaces to display in cross sections to examine design models

1. In the *Roadway Designer* dialog box:
2. Select *Existing_Ground* in the Active Surface field and select **Corridor> Create Surface** in the Roadway designer menu bar.
 - ◆ Select the following options and **<D> Apply** and **<D> Close**

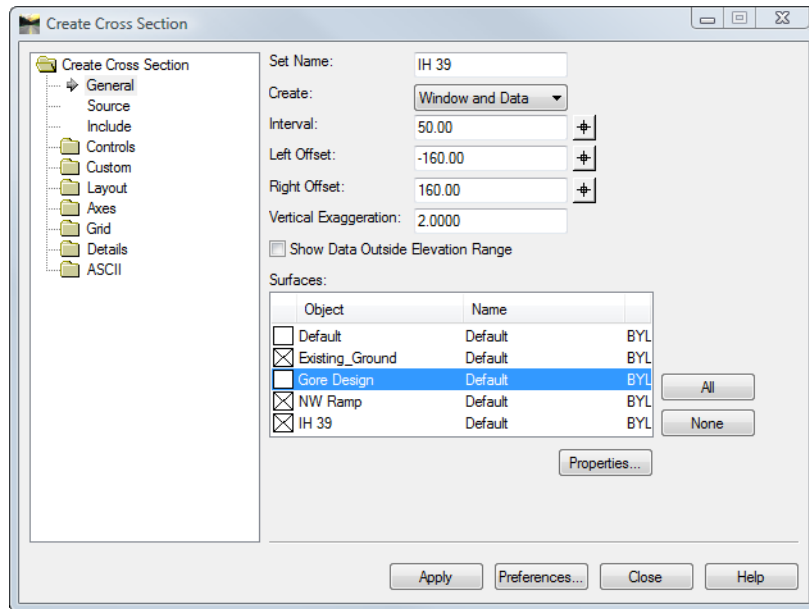


3. In the *Roadway Designer* dialog box:
 - ◆ Select **File> Save** in the Roadway designer menu bar.

Lab 28.9 - Display cross sections and use cross section viewer to examine mainline and ramp design models together

1. Make *IH 39* the active alignment

2. Select **Evaluation> Cross Section> Create Cross Sections** from the InRoads menu bar.
3. **<D> Preferences** and select 40H 20V 320' Wide
4. Uncheck Gore design surface



- ◆ Display cross sections in an area to the right of the design data.
5. **<D> Apply** and **<D>** in the drawing view to display the cross section set
 6. **<D> Close** and
 7. Select **Evaluation> Cross Section> Cross section Viewer** from the InRoads menu bar.
 8. Select 24+00.00 in the Cross Sections area and **<D> Run**.
 9. Examine the ramp and westbound mainline sections as the viewer moves along the taper, gore, and infield areas.

