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

The following files are used for this lab:

- C:\Projects\12345\Design\InRoads\12345DES_Geometry-Create Ramp Model.alg
- C:\Projects\12345\Design\InRoads\12345DES_Template-Create Ramp Model.itl
- C:\Projects\12345\Design\InRoads\12345DES_Roadway-Create Ramp Model.ird
- C:\Projects\12345\Design\InRoads\12345DES_Existing-Create Ramp Model.dtm
- C:\Projects\12345\Design\InRoads\CDOT_Civil-Create Ramp Model.xin

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. Open the following files from the *C:\Projects\12345\Design\InRoads* directory in InRoads:

   - 12345DES_Geometry-Create Ramp Model.alg
   - 12345DES_Template-Create Ramp Model.itl
   - 12345DES_Roadway-Create Ramp Model.ird
   - 12345DES_Existing-Create Ramp Model.dtm

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.

3. Key in *200* for the *Text* and *Cell Scale Factor* fields.

4. **<D> Apply** and **<D> Close.**

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

The Vertical Gore Tool is used to create a guide for revising the ramp vertical alignment. The output from this command is a surface with four linear features which are then displayed in 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.
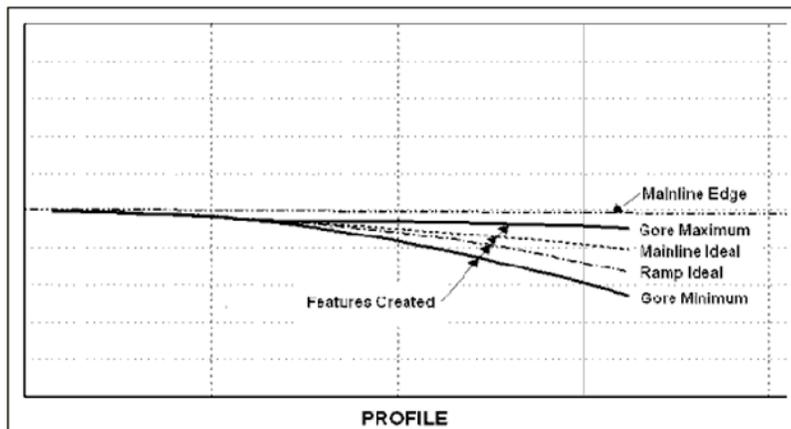

1. Select **Modeler> Roadway Designer** from the InRoads menu bar.

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.

4. Select **LT_Outside_Conc_EOP-Top** for the *Mainlined Edge* field, using the drop-down list or the selector button.
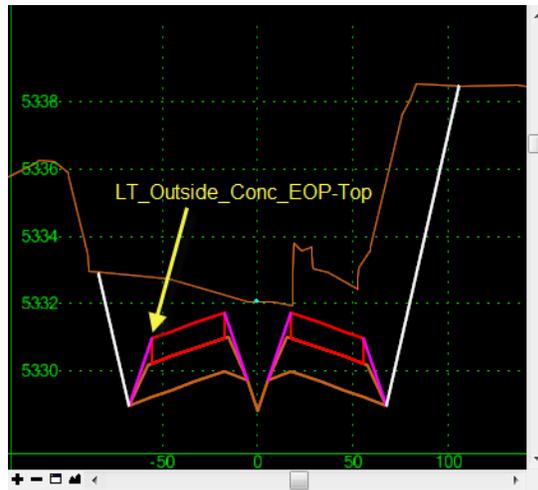
5. Select **NW Ramp** in the *Ramp Corridor* field.

6. Select **IN_Conc_EOP-Top** for the *Ramp Inside Edge* field.

7. Select **OUT_Conc_EOP-Top** for the *Ramp Outside Edge* field.
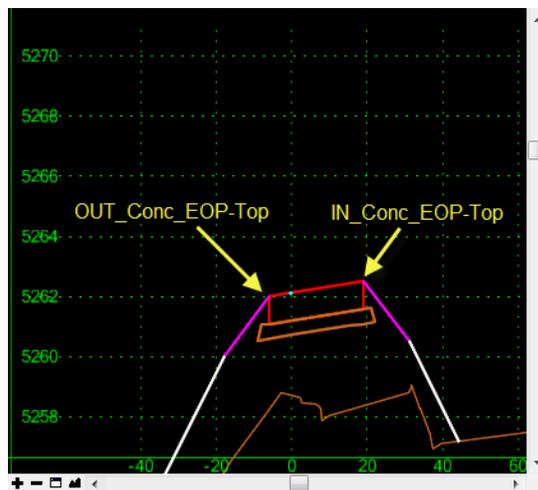
8. Key in *8%* in the *Maximum Difference* field.

9. Key in *30+50* in the *Mainline Start* field.

10. Key in *32+00* in the *Mainline Stop* field.

11. Key in *Gore Design* in the *Surface Name* field.

12. Select **D_GORE_Max_Vertical** for the *Maximum Style*.

13. Select **D_GORE_Mainline_Ideal** for the *Mainline Ideal Style*.

14. Select **D_GORE_Ramp_Ideal** for the *Ramp Ideal Style*.

15. Select **D_GORE_Min_Vertical** for the *Minimum Style*.
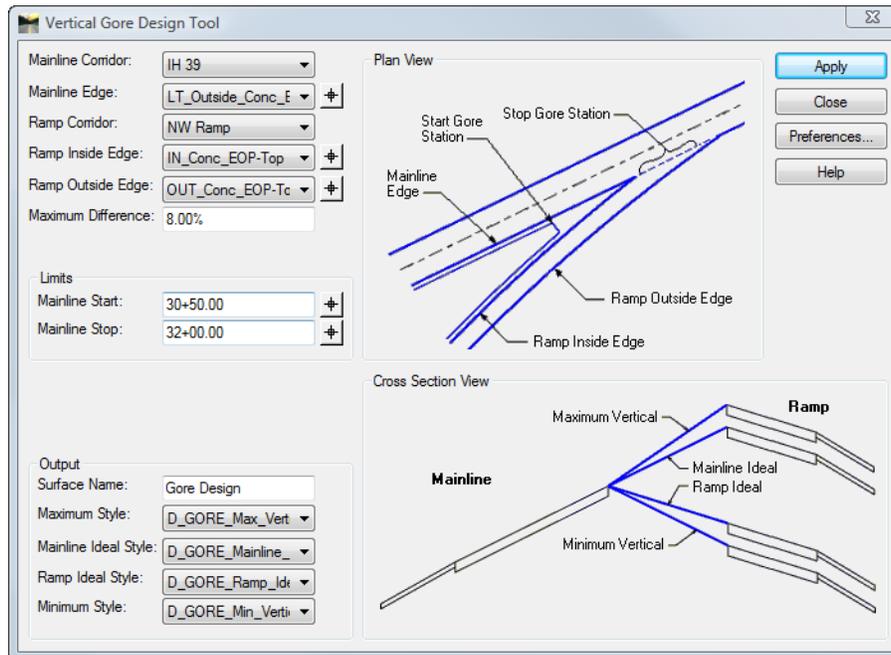
16. **<D> Apply** and **<D> Close** to dismiss the *Vertical Gore Design Tool* dialog box.

17. In the *Roadway Designer* dialog box, **<D> Close** and select **No** to save changes.

Lab 28.4 - Update NW Ramp profile and Modify the Vertical Alignment

1. Select **Evaluation> Profile> Update Profile** from the InRoads menu bar.

2. In the *Update Profile* dialog box, verify that **NW Ramp** is selected for the *Profile Set*.

3. Select **Projected Features** from the *Update Profile* tree.

4. Select **Display On** for the *Mode.*

5. Select **Gore Design** in the *Surfaces* area.

6. Select All features in the *Projected Features* area.

♦ **<D> Apply and <D> Close.**
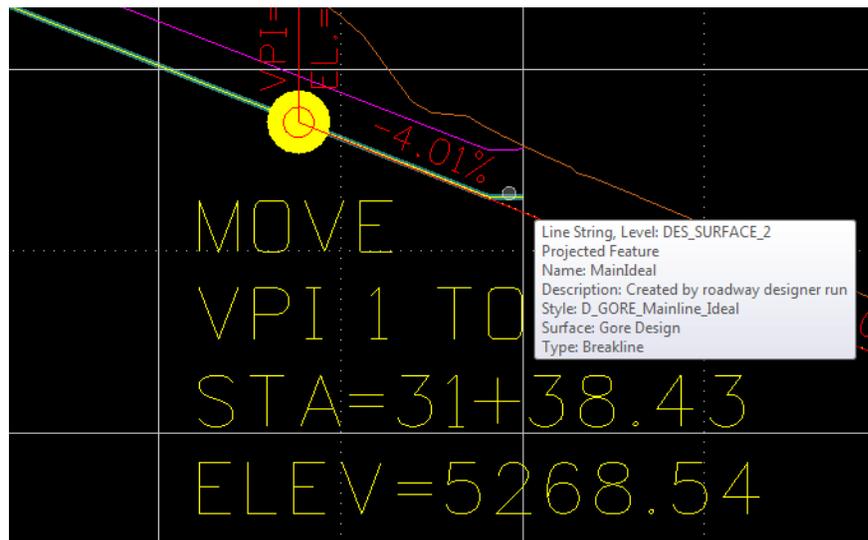
The NW Ramp vertical alignment needs to be revised to tie to the edge of lane of the mainline taper and to better tie into the mainline ditch in the infield area.

7. Set alignment *NW Ramp* as the *Active* alignment

8. Select **Geometry> Vertical Curve Set> Move PI** from the InRoads menu bar.

9. **<D> Apply** on the *Move Vertical PI* dialog box then **<D>** on the first vertical PI.

10. In the MicroStation key in window, type **se=31+38.43,5268.54** and press **Enter**.

11. **<D>** to accept the location then **<R>** to exit the command.

12. **<D> Apply** on the *Move Vertical PI* dialog box then **<D>** on the second vertical PI.

13. In the MicroStation key in window, type **se=35+75.00,5251.04** and press **Enter**.

14. **<D>** to accept the location then **<R>** to exit the command.

15. **<D> Close** to dismiss the *Move Vertical PI* dialog box.

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

17. **<D> Apply** and **<D> Close.**

18. Examine the changes in the vertical alignment.

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

19. Select **Modeler> Roadway Designer** from the InRoads menu bar.

20. In the *Roadway Designer* dialog box, select **NW Ramp** from the *Corridor* drop down menu.

21. Select **Corridor > Corridor** Management from the Roadway Designer menu bar.

22. Highlight **NW Ramp** in the *Corridors* area.

23. Key in *31+38.43* in the *Start* field.

24. **<D> Change**.

25. **<D> Close** to dismiss the *Manage Corridors* dialog box.

Lab 28.5 - Define End Condition Exceptions

1. In the *Roadway Designer* dialog box, select *IH 39* from the *Corridor* drop down menu.

2. Select **Corridor> End Condition Exceptions** from the Roadway designer menu bar.

3. Key in *31+38.43* in the *Start* field.

4. Key in *40+50* in the *Stop* field.

5. Toggle on **Left Override** in the *Apply To* area.

6. Toggle on **Backbone** Only

7. **<D> Add** and **<D> Close** to dismiss the *End Condition Exceptions* dialog box.

Next, end condition exceptions are added to right side of NW Ramp along the gore and infield area.

8. In the *Roadway Designer* dialog box, select *NW Ramp* from the *Corridor* drop down menu.

9. Select **Corridor> End Condition Exceptions** in the Roadway designer menu bar.

10. Key in *31+38.43* in the *Start* field.

11. Key in *40+50* in the *Stop* field.

12. Toggle on *Right Override* in the *Apply To* area.

13. Toggle on *Backbone* Only.

14. **<D> Add** and **<D> Close** to dismiss the *End Condition Exceptions* dialog box.

Lab 28.6 - Define Point Controls

Define Point Controls for the IH 39 corridor. Stretch westbound roadway's left edge of pavement to create the ramp taper.

1. In the *Roadway Designer* dialog box, select *IH 39* from the Corridor drop down menu.

2. Select **Corridor> Point Controls** in the Roadway designer menu bar.

3. In the *Point Controls* dialog box, select **LT_Outside_Conc_EOP-Top** for the *Point*.
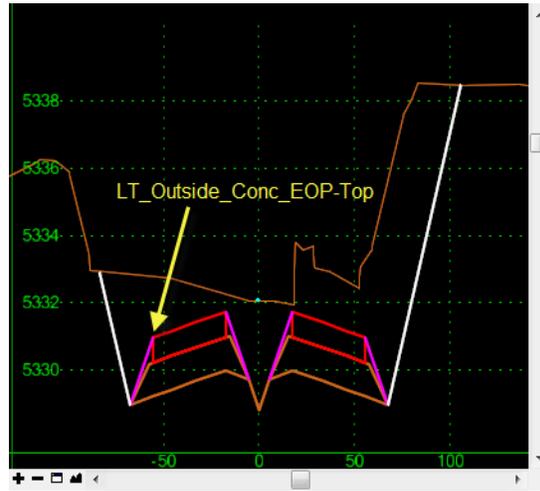
4. Toggle on **Horizontal** for the *Mode*.

5. Select **Alignment** in the *Control Type* field.

6. Select **Outside Edge of Pavement** in the *Horizontal Alignment* field.

7. Toggle on **Use as a Secondary Alignment**.

8. Key in *31+38.43* in the *Stop Station* field.

9. **<D> Add** and **<D> Close** to dismiss the *Point Controls* dialog box.

Create a special ditch between the ramp and mainline shoulder 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).

1. In the *Roadway Designer* dialog box, select *NW Ramp* from the Corridor field.

2. Select **Corridor> Point Controls** in the Roadway designer menu bar.

3. In the *Point Controls* dialog box, select **IN_Gore_Ditch** from the *Point* menu.
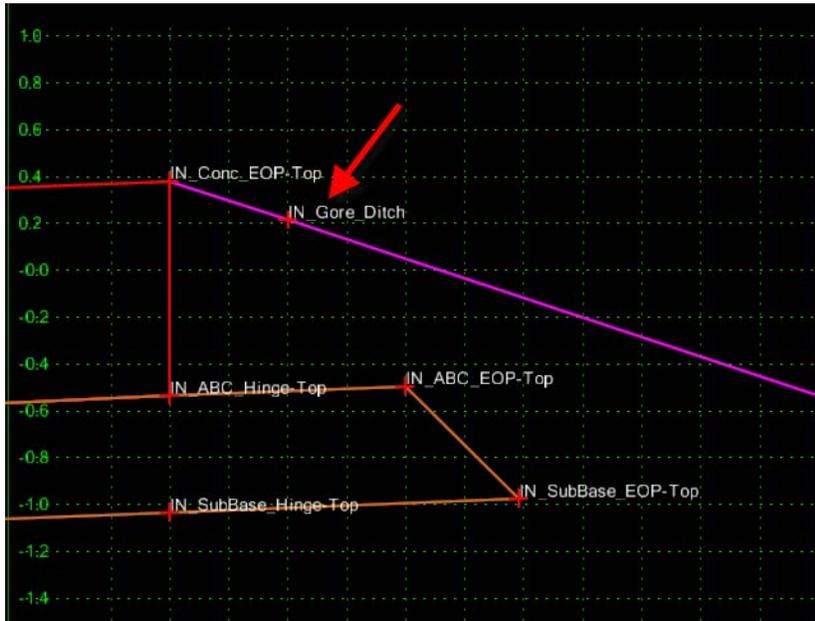
4. Toggle on **Both** for the *Mode*.

5. Select **Alignment** in the *Control Type* field.

6. Select **Special_Ditch_NW_Ramp** in the *Horizontal Alignment* field.

7. Toggle off **Use as a Secondary Alignment.**

8. Key in *31+38.43* in the *Start Station* field.

9. Key in *35+99.90* in the *Stop Station* field.

10. **<D> Add**

11. Select **IN_POSS** from the *Point* menu.
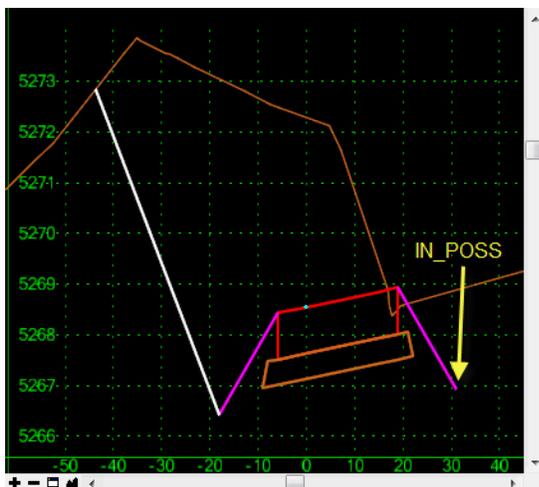
12. Toggle on **Both** for the *Mode*.

13. Select **Corridor Point** in the *Control Type* field.

14. Select **IH 39** in the *Corridor* field.

15. Select **LT_Outside_Conc_EOP-Top** in the *Reference Point* field.

16. Key in *31+38.43* in the *Start Station* field.

17. Key in *35+99.90* in the *Stop Station* field.

18. **<D> Add**

19. Select *IN_Toe-Point-Control* from the *Point* menu.

    Note: This component has a display rule.
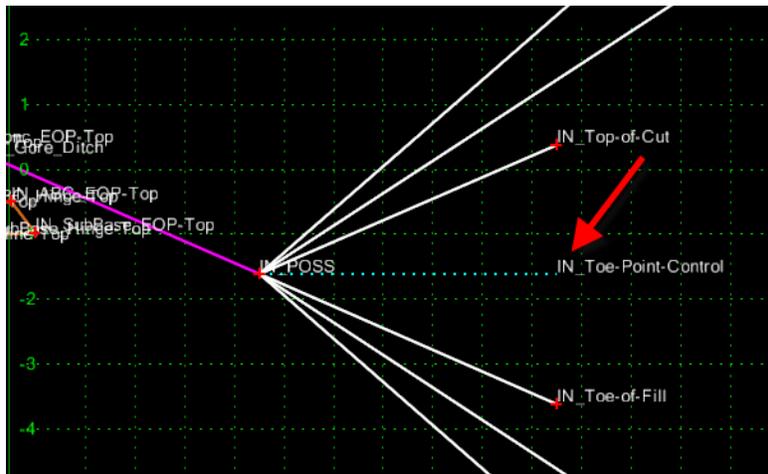
20. Toggle on **Both** for the *Mode*.

21. Select **Corridor Point** in the *Control Type* field.

22. Select **IH 39** in the *Corridor* field.

23. Select **LT_POSS** in the *Reference Point* field.

24. Key in *36+00* in the *Start Station* field.

25. Key in *40+50* in the *Stop Station* field.

26. **<D> Add** and **<D> Close** to dismiss the *Point Controls* dialog box.

Lab 28.7 - Define Key station for IH 39 corridor

1. Select *IH 39* from the Corridor drop down menu.

2. Select **Corridor> Key Stations** in the Roadway designer menu bar.

3. Key in *31+38.42* in the *Station* field.

4. **<D> Add** and **<D> Close**

Next, define Key station for NW Ramp corridor.

5. In the *Roadway Designer* dialog box, select *NW Ramp* from the Corridor drop down menu.

6. Select **Corridor> Key Stations** in the Roadway designer menu bar.

7. Key in *3599.90* in the *Station* field.

8. **<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, select *Existing_Ground* from the Active Surface drop down menu.

2. Select **Corridor> Create Surface** in the Roadway designer menu bar.

3. Select the following options as shown in the illustration below:
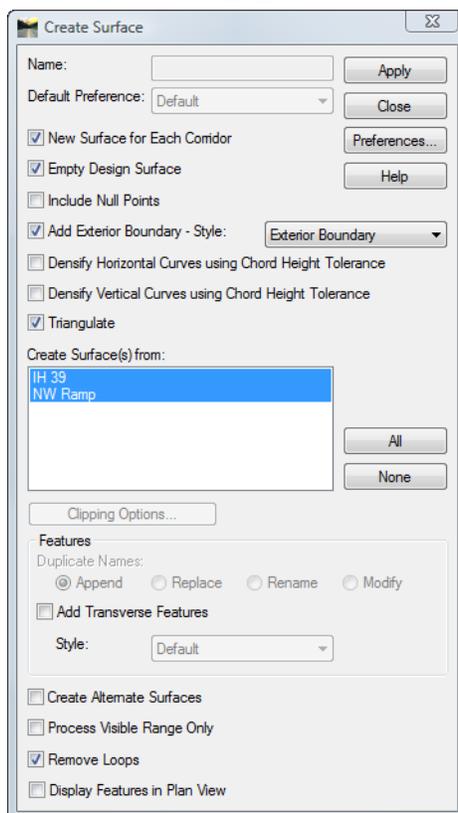
4. **<D> Apply** to create the surface.

5. Review and then close the *Results* dialog box.

6. **<D> Close** to dismiss the Create Surface dialog box.

7. In the *Roadway Designer* dialog box, select **File> Save** from the Roadway designer menu bar.

8. **<D> Close** to dismiss the *Roadway Designer* dialog box.

Lab 28.9 - Display and Review Cross Sections

9. Make **IH 39** the active alignment.

10. Select **Evaluation> Cross Section> Create Cross Sections** from the InRoads menu bar.

11. In the *Create Cross Section* dialog box, **<D> Preferences.**

12. Highlight **40H 20V 320' Wide**.

13. **<D> Load** then **Close**.

14. Toggle off **Gore** surface.
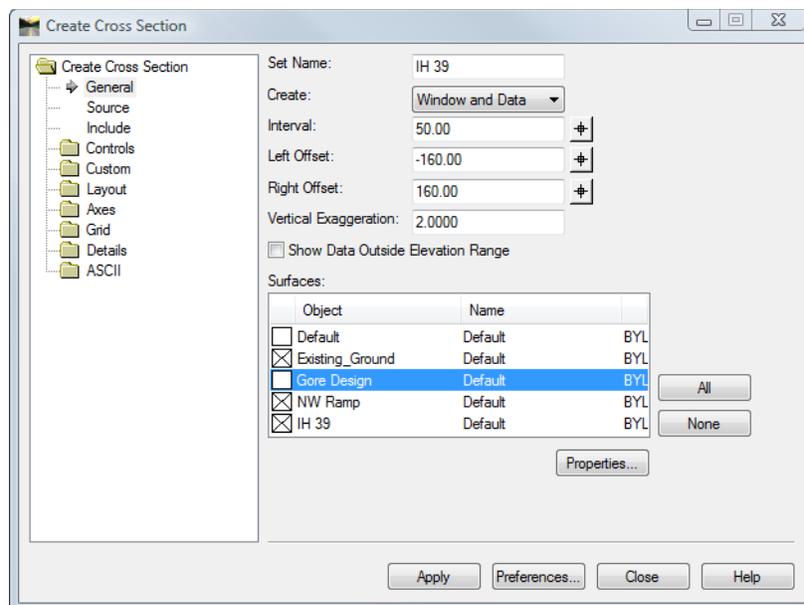
15. **<D> Apply** and **<D>** in the drawing view to display the cross section set.

16. **<D> Close** to dismiss the *Create Cross Section* dialog box.

17. Select **Evaluation> Cross Section> Cross section Viewer** from the InRoads menu bar.

18. Select **24+00.00** in the *Cross Sections* area and **<D> Run**.

19. Examine the ramp and westbound mainline sections as the viewer moves along the taper, gore, and infield areas.

Chapter Summary:

- The Vertical Gore Tool is used to create design guides for laying out vertical alignments on merging corridors
- End Condition Exceptions are used to modify or remove the sideslope within a defined station range
- A single design surface can be created from two or more corridors