MINISTRY OF TRANSPORTATION

InRoads Typical Example 3:

New Construction of an Urban and Rural Undivided Highway

Prepared by: **Design Innovation Section,**
Design and Contract Standards Office

Table of Contents

1.0 Overview 1

2.0 InRoads Project Setup 5

2.1 Project Directory Set-up 5
2.2 Project Defaults 10
2.3 Project Files 11

3.0 Existing Conditions 14

3.1 Viewing Original Ground (OG) Surface 14
3.2 Viewing OG Surface in Cross Sections 18
3.3 Generating Cross Section Reports 19
3.4 Check Existing Pavement Width 20

4.0 Horizontal Alignment 22

4.1 Viewing the Active Horizontal Alignment 22
4.2 Stationing 22
4.3 Reviewing Horizontal Alignments 23
4.4 Displaying Stationing 24
4.5 Annotating Horizontal Alignments 25
4.6 Generating Horizontal Alignment Report 26

5.0 Profile and Vertical Alignment 28

5.1 Extracting OG Profile 28
5.2 Viewing Vertical Alignment 29
5.3 Reviewing Vertical Alignment 29
5.4 Annotating Vertical Alignment 30
5.5 Generating Vertical Alignment Report 31

6.0 Typical Sections 34

6.1 Setting Up Project Template Library 34
6.2 Creating Example 3 Templates 37

7.0 Roadway Modeling 81

7.1 Roadway Designer Overview 81
7.2 Creating Corridor 81
7.3 Inserting Template Drops 83
7.4 Point Controls 85
7.5 End Condition Exceptions 88
7.6 Creating Finished Surface 93
7.7 Creating Alternate Surfaces 95
7.8 Updating Project File 98

8.0 Cross Sections 99
8.1 Creating Cross Sections 99
8.2 Updating Cross Sections 101
8.3 Annotating Cross Sections 104
9.0 Volumes 108
9.1 Calculating End-Area Volumes 108
9.2 Saving End-Area Volume Parameter File 113
10.0 Reports 115
10.1 End-Area Volume Report 115
10.2 Cross Section Reports 115
10.2.1 Top of Pavement (TP) Report 115
10.2.2 TA and TB Reports 116
10.2.3 Subgrade Report 119

1.0 Overview

This typical example illustrates the process for using Power InRoads in the design of an urban and rural undivided highway new construction/resurfacing project. The project presented in this example is for demonstration only. The example doesn't reflect the whole range of InRoads capabilities and there are different ways for doing things in InRoads. The work flow may need to be modified from project to project to reflect different conditions and requirements.

For easy identification, the directory, folder and file names are in *italics* in this document.

In this example, all the InRoads commands are accessed from the InRoads Explorer menu bar.

Project Type

Urban and rural undivided highway new construction.

Prerequisites

Drafting:

- Basic View Control & Editing Command in MicroStation Environment

InRoads:

User should be familiar with InRoads:

- Working Environment
- Tools
- Surfaces
- Features
- Geometry
- Template
- Roadway Designer
- Reports

It is also recommended that the user be familiar with the following:

- MTO InRoads Project Template
- MTO Customization Documentation
- MTO InRoads Standards and Preferences Manual – Power InRoads V8i(SS2)

Highway Design:

- Design principles
- MTO Design Manuals, Guidelines, and Policies

Software Version

- Power InRoads V8i (SELECTseries 2) – Version 08.11.07.615

Design Data and InRoads Files

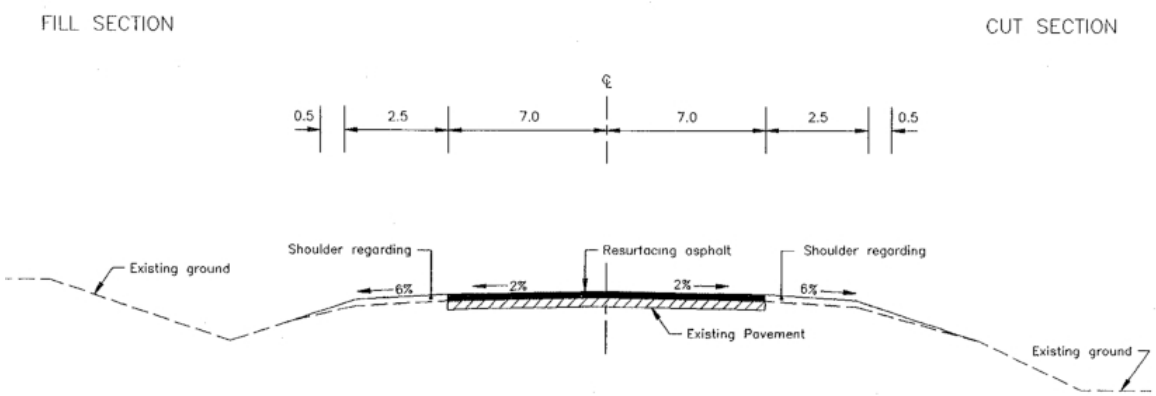
The design data used in this example project is for demonstration only. Actual projects may vary.

The length of this example project is 500m.

<u>Proposed Design</u>

Rural Resurfacing

From station 11+000 to 11+100, the following typical is to be used:

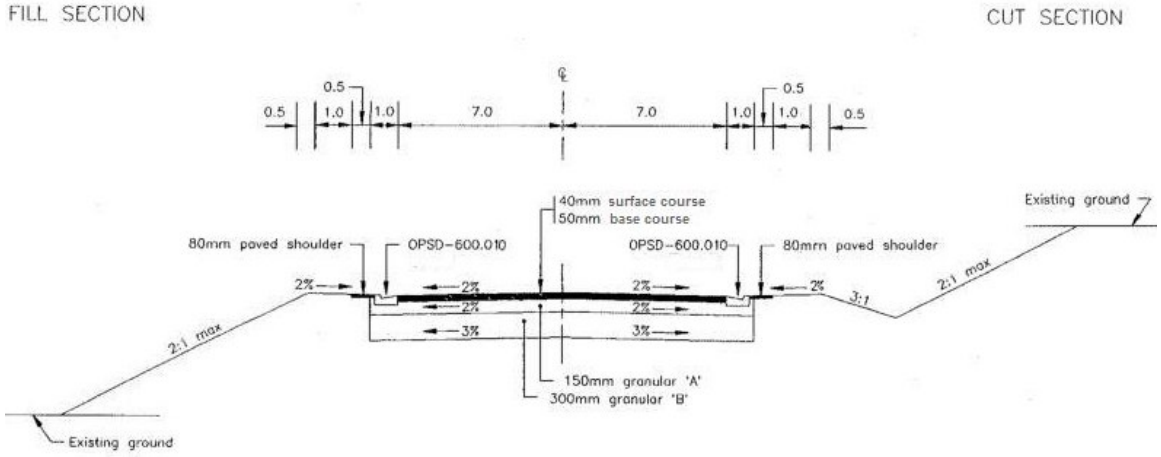


Pavement:

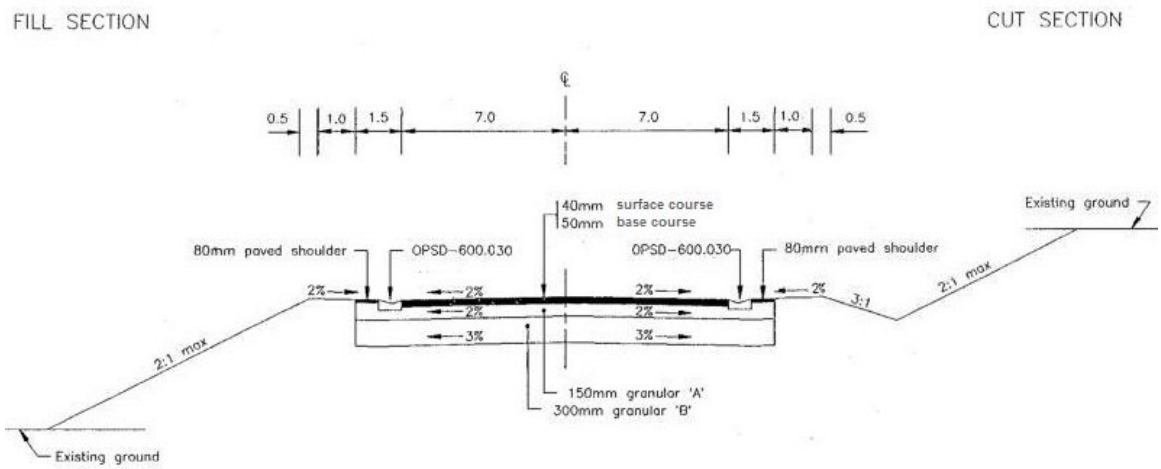
40mm Asphalt Top Course
50mm Asphalt Base Course
50mm (max.) Partial Depth Pavement Removal

Urban New Construction

From station 11+100 to 12+300, the following typical is to be used:



From station 12+300 to 12+500, the following typical is to be used:



Pavement:

40mm Asphalt Top Course
50mm Asphalt Base Course
150mm Granular A
300mm Granular B

Partially Paved Shoulder:

80mm Asphalt Surface Course

Concrete Curb and Gutter

From station 11+100 to 12+300:

OPSD 600.010 (Barrier Curb 600mm)

From station 12+300 to 12+500:

OPSD 600.030 (Mountable Curb 800mm)

<u>The files listed and described below are provided in the **Example 3** data set *Data3.zip*:</u>

Existing Ground Surface (.dtm)
……*Data3.zip\Surfaces\Ex3_OG.dtm*

Geometry File (.alg)
……\ *Data3.zip\Geometry\Ex3.alg*

AutoCAD Drawings (.dwg)
……*Data3.zip\Standards\MTO_InRoads_Template_SS2.dwg*

Inroads Template Library (.itl)
……*Data3.zip\Standards\MTO_STD_Templates.itl*

MTO Preference File (.xin)
……\ *Data3.zip\Standards\MTO_civil_SS2.xin*

Project Configuration File (.pcf)
……\ *Data3.zip\Standards\pcf\PROJECTNAME.pcf*

<u>The following files will be created for the project design:</u>

Projects (.rwk)

Roadway Design (.ird)

Design Surfaces (.dtm)

Reports (XML Data, .xml)

Design Drawings (Plan, Profile, Cross Section, .dwg)

Topics Covered:

- Setting up Power InRoads Workspace
- Setting up InRoads Project
- Viewing Surface
- Reviewing and Annotating Horizontal Alignment
- Creating Existing Ground Profile
- Reviewing and Annotating Vertical Alignment
- Defining Typical Section
- Modeling Roadway
- Applying End Condition Exceptions
- Creating Design Surfaces and Cross Sections
- Performing Quantity Computations
- Generating Design Drawings
- Producing InRoads Reports

2.0 InRoads Project Setup

Note: All InRoads data files shall be as per the **MTO InRoads Project** directory structure posted on the MTO web site: http://www.xfer.mto.gov.on.ca/PTASapps/index.htm

This directory structure is mandatory for all in-house and service provider design work done with InRoads.

This section describes how to set-up the Power InRoads workspace and InRoads project directory and file structure.

2.1 Project Directory Set-up

Getting started

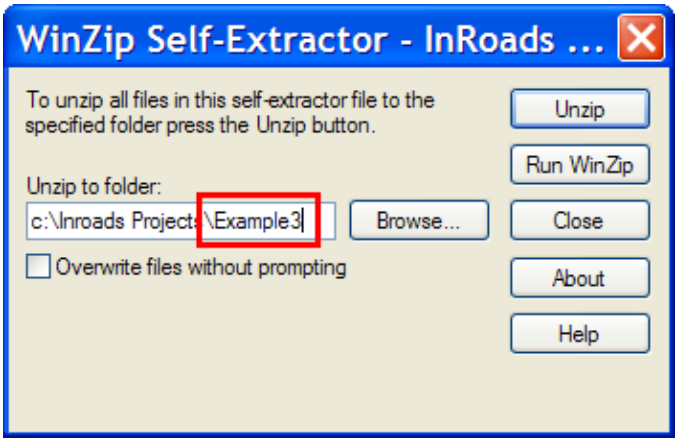
1. For this example, on your C drive create a project folder named *InRoads Projects* and then a folder named *Example3*.

   The folder path should now be: C:*InRoads Projects\Example3*.

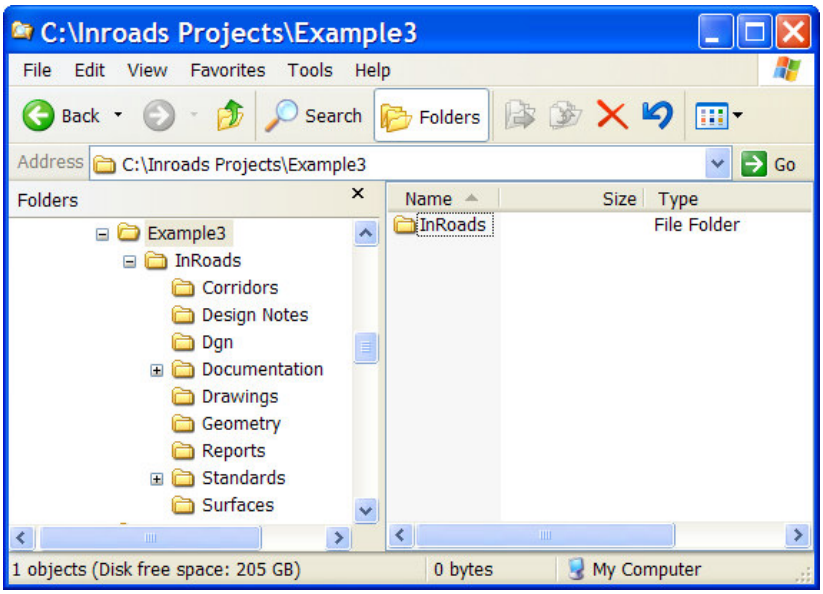
   Note: For all InRoads design work, put in the project *GWP/WP* folder a subfolder called *InRoads* or something similar. This is where the InRoads highway design files should be kept.

   ---

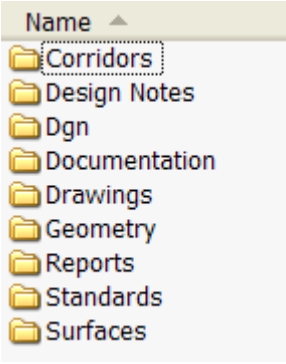
2. Go to the web site:
   http://www.xfer.mto.gov.on.ca/PTASapps/index.htm
   Click on **InRoads** under Menu on the left side of the page. A list of InRoads files will be shown on the right side of the page. Click on the file *Power InRoads V8i(SS2)PreferenceManual.zip* and save it to the folder called *InRoads Projects* that you created in step 1. Click **Close**.
3. Extract the downloaded .zip file to the current folder. Double clicking on the file *InRoads Project Template_SS2.exe* to run the file. By default, the *Unzip to folder* is pointing to the current folder *InRoads Projects.* Use the **Browse** button to find the Example3 folder or you can type in ***\Example3*** after the default folder.



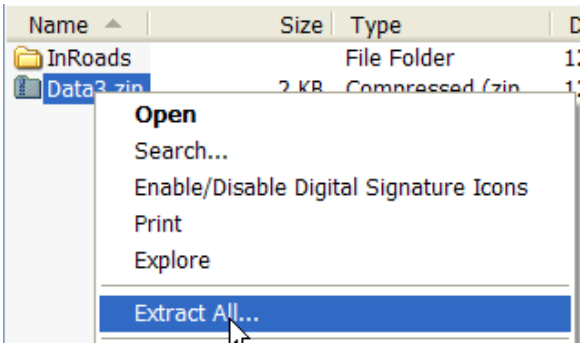
4. Click **Unzip** button. A folder called *InRoads* will be created in the Example3 folder if it does not exist and all subfolders will be automatically set-up. When it is finished, close the WinZip dialog.
5. The folder *Example3* will now look like this:



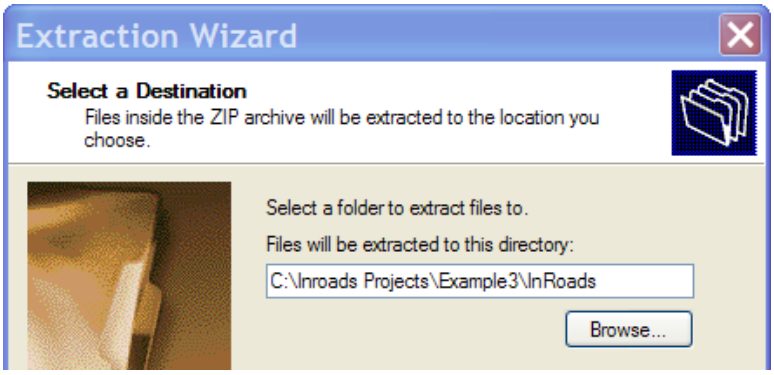
6. The *InRoads* folder in the Example3 contains the following subfolders:



7. Copy Example 3 data set Data3.zip to the folder Example3. Right click on the compressed file **Data3.zip** and select **Extract All** from the pop-up menu.

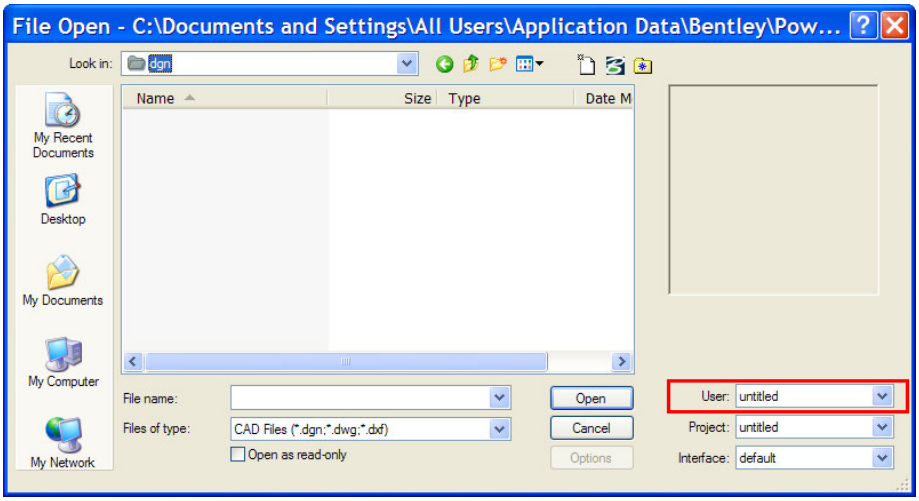


8. Follow the Extraction Wizard. When the target directory appears on the dialog, make sure the path is pointed to the folder: *…\Example3\InRoads*.

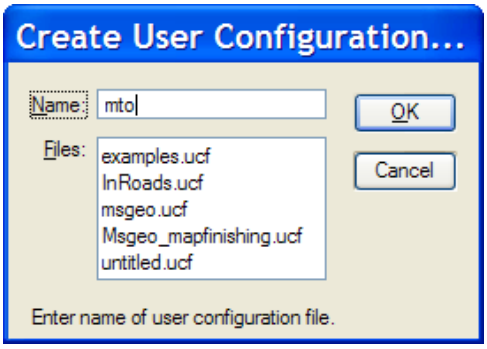


9. When finish, go through each folder to verify that files are installed properly as described under sample data set section in Section 1.
10. Locate the Project Configuration File (*.pcf) in the following folder:

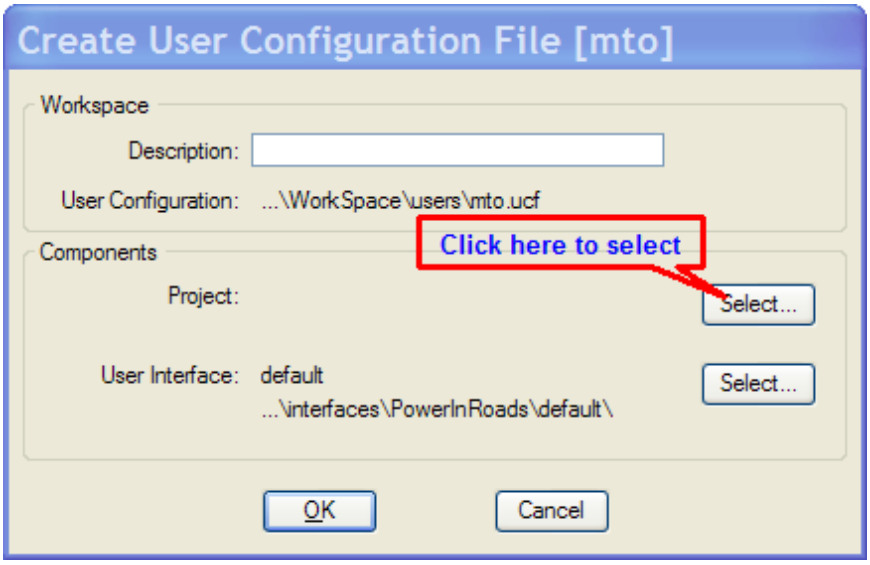
    ……\InRoads\Standards\pcf
11. Copy the file ***PORJECTNAME.pcf*** to the folder C:*InRoads Projects* and rename it to ***Example3.pcf***.
12. Start Power InRoads V8i (SELECTseries 2). On the File Open dialog of Power InRoads, locate the *User* list field at the bottom right of the dialog.



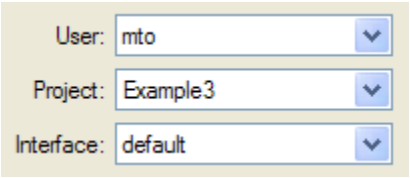
13. If you haven't created a user configuration file pointing to the project configuration file folder C:*InRoads Projects*, click in the *User* field and select **New** from the list. If you have done so, select the user configuration file on the list, then click the *Project* field, the project configuration file *Example3.pcf* will be shown on the project list.
14. To create user configuration, select **New** from the *User* list, Create User Configuration dialog pops up. Type a name in the *Name* field on the dialog.



15. Click **OK**. Create User Configuration File dialog appears, type description in the *Description* field and click the **Select** button on the right side of the *Project* field.



16. Browse to the project configuration file folder *C:\InRoads Projects*. Select the project configuration file ***Example3.pcf*** and click **Open.**
17. When return to the Create User Configuration File dialog, the project configuration file you selected appears in the *Project* field. Click **OK** to close the dialog.
18. When return to the File Open dialog, you can also select a customized user interface or leave it with the default user interface.



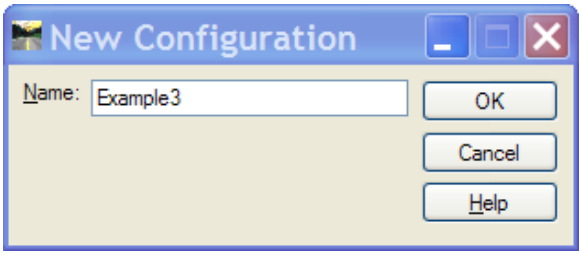
19. Open MTO_InRoads_Template_SS2.dwg from the folder *...\Example3\\InRoads\Standards*.
20. Verify that the value of the MicroStation configuration variable ***MS_DWGSAVEAPPLICATIONDATA*** is set to 1. Refer to MTO InRoads Standards and Preferences Manual Power InRoads V8i(SELECTseries 2) for details.
21. Click **File > Save As** from MicroStation main menu bar to save the drawing to folder *…\Example3\InRoads\Drawings* and name it as ***Ex3.dwg***.

Note: MTO_InRoads_Template_SS2.dwg file contains proper layers and is set up for using MTO InRoads preference file as described in MTO InRoads Standards and Preference Manual (V8i_SS2).

2.2 Project Defaults

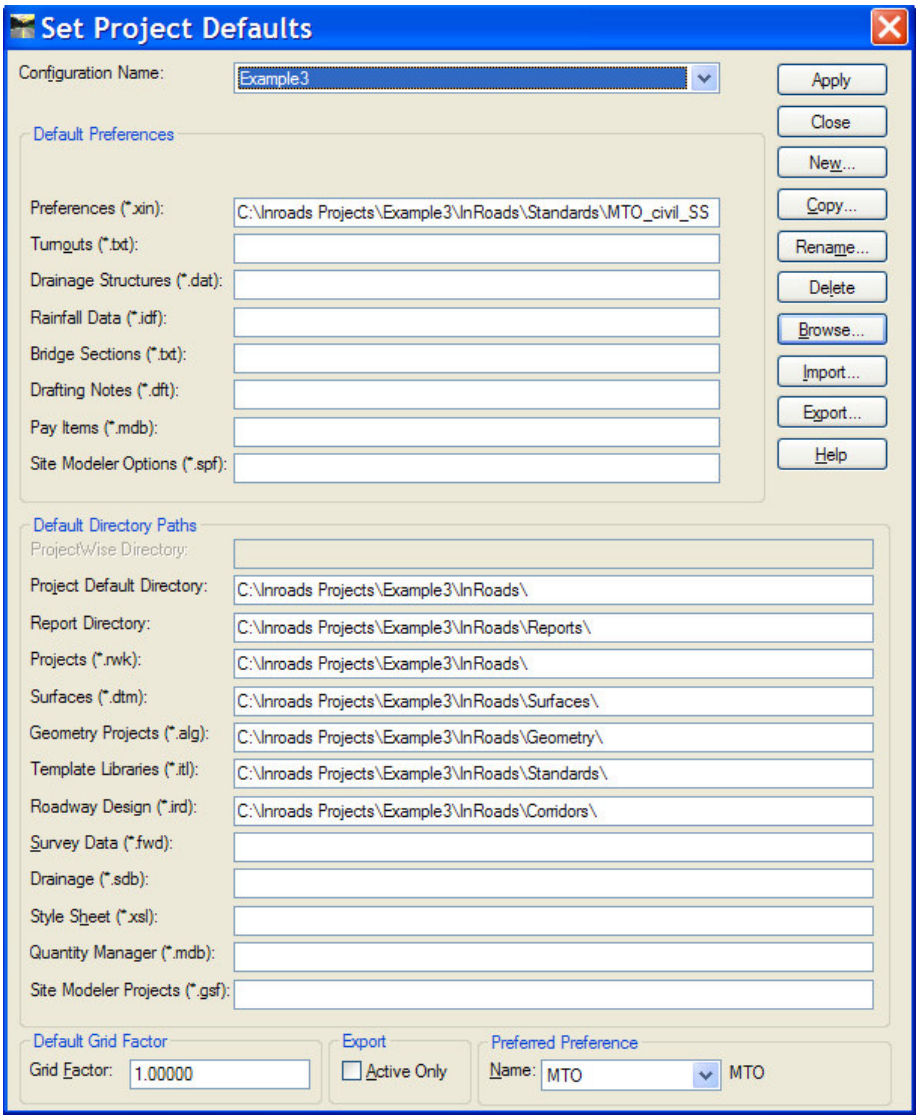
By setting up the project defaults, the user can set the default directory locations for opening/saving files for project design. The InRoads **Project Defaults** command is used to set up default directories for all file types that can be accessed through the File/Open and File/Save As dialog boxes. These include Project (.rwk), Surface (.dtm), Geometry (.alg), Template Library (.itl), and Roadway Design (.ird). All other files, which are opened or saved throughout the program, use the Project Default Directory setting. The project default file directories are stored in the computer's registry.

1. Click to **File > Project Defaults** on the InRoads Main Menu.
2. Click on the **New** button and the New Configuration dialog box will appear.
3. Type in ***Example3*** in the *Name* field, click **OK** to save and close the dialog box.



4. Click in the *Preferences (*.xin)* field and click the **Browse** button. The Open dialog will appear. Browse to …*Example3**InRoads**Standards* folder.
5. Select *MTO_civil_SS2.xin*, and click **Open**,
6. Click in the *Project Default Directory* field and click the **Browse** button. The Open dialog will appear. Browse to …*Example3**InRoads*, and Click **Open**.
7. Click in the *Report Directory* field and click the **Browse** button. The Open dialog will appear. Browse to …*Example3**InRoads**Reports*, and Click **Open**.
8. Click in the *Projects (*.rwk)* field and click the **Browse** button. The Open dialog will appear. Browse to …*Example3**InRoads*, and Click **Open**.
9. Click in the *Surfaces (*.dtm)* field and click the **Browse** button. The Open dialog will appear. Browse to …*Example3**InRoads**Surfaces*, and Click **Open**.
10. Click in the *Geometry Projects (*.alg)* field and click the **Browse** button. The Open dialog will appear. Browse to …*Example3**InRoads**Geometry*, and Click **Open**.

11. Click in the *Template Libraries (*.itl)* field and click the **Browse** button. The Open dialog will appear. Browse to …*Example3**InRoads**Standards*, and Click **Open**.
12. Click in the *Roadway Design (*.ird)* field and click the **Browse** button. The Open dialog will appear. Browse to …*Example3**InRoads**Corridors*, and Click **Open**.
13. Click the **Apply** button to save the configuration, and then click the **Close** button.



2.3 Project Files

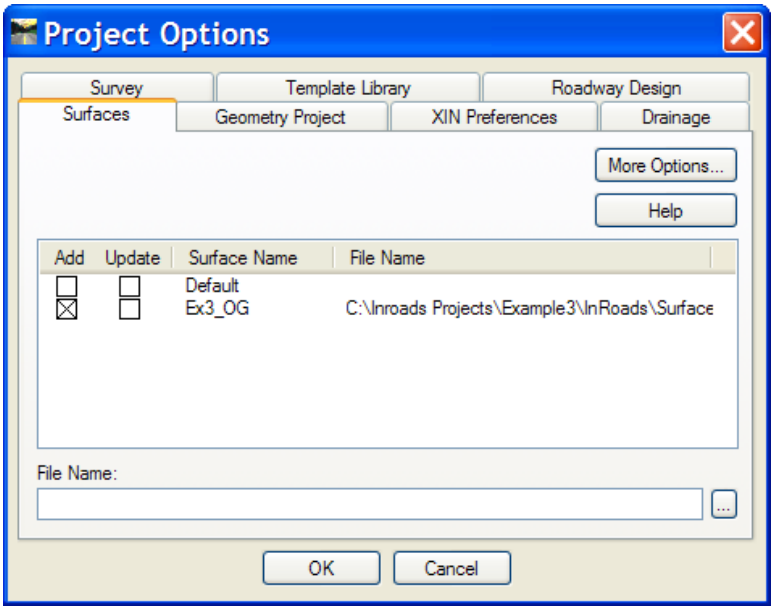
InRoads allows users to create a project file for each project. With project file, the user can quickly load all files needed for a particular project. A project file is composed of a list of files with path names. To create a project file for example 3:

1. Click to **File > Open** on the InRoads Main Menu.
2. Change the *Files of type* to Surfaces (*.dtm) and select *Ex3_OG.dtm.* Click **Open**.

Note: After selecting the file type, the path will change to the folder as defined in the Project Defaults.

---

3. Change the *Files of type* to Geometry Projects (*.alg) and select *Ex3.alg*. Click **Open**.
4. Change the *Files of type* to Template Libraries (*.itl) and select *MTO_STD_Templates*. Click **Open** and then **Cancel**.
5. Create Project file (.rwk). Click to **File > Save > Project** on the InRoads Main Menu.
6. On the lower right corner of the Save As dialog box, click the **Options (…)** button. The Project Options dialog box will appear.



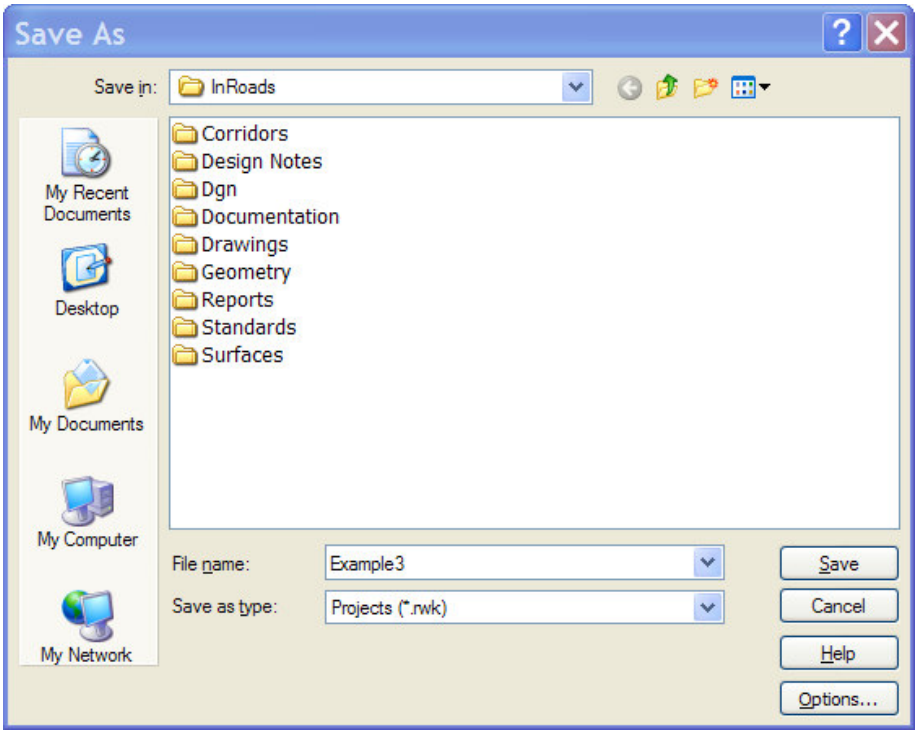
7. For Surfaces tab, check **Add** for the Existing surface ***Ex3_OG*** that was loaded in step 2.

Note: Proposed surfaces will be created in the design process. These files will be checked with both **Add** and **Update** options.

---

8. For the Geometry Project tab, check **Add** for the geometry project ***Ex3*** that was loaded in step 3.

9. For the XIN Preferences and Template Library tabs, check **Add** and **Update** on each file listed under the **File Name**.
10. Click **OK** button to close the Project Options dialog box.
11. In the Save As dialog box click in the *File name* field and type in ***Example3***. Click the **Save** to complete creating the project file. Click **Cancel** to close the dialog.



Note: Project files must be maintained and updated through the project design process. After running Roadway Designer and creating proposed surfaces, the surfaces (.dtm) and Roadway Design (.ird) will be added to the .rwk.

3.0 Existing Conditions

3.1 Viewing Original Ground (OG) Surface

Viewing OG surface

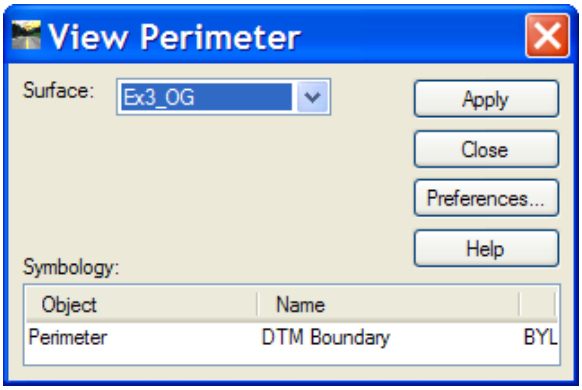
InRoads provides users several viewing tools to display the surface data including the perimeter, triangles, contours and features.

1. Turn off the *Style* lock and select *Pencil* mode on the *Locks* toolbar.

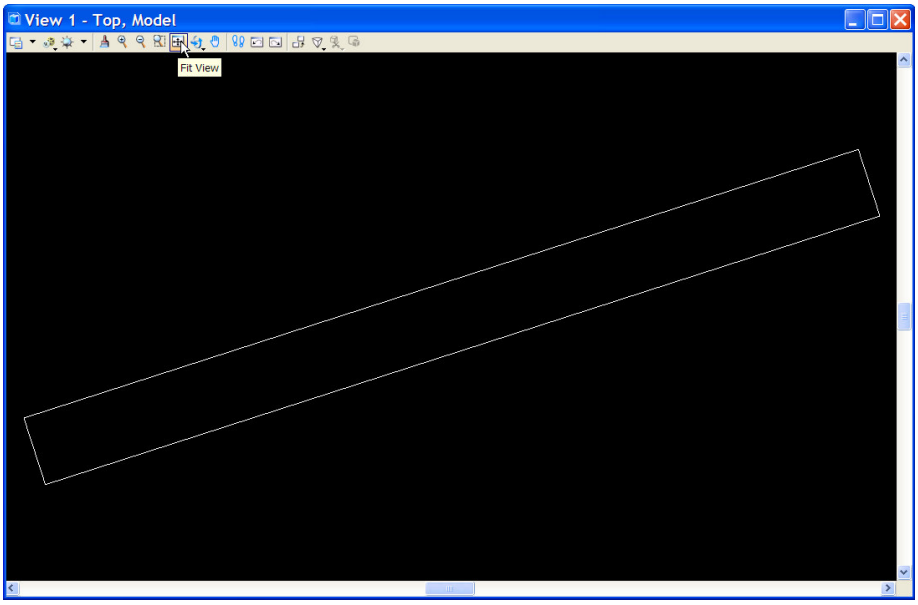
Note: If the *Style* lock is on, the dialog box will not appear when you choose one of the View Surface commands.

---

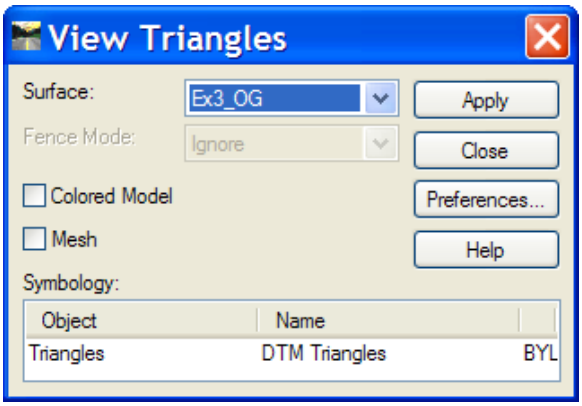
2. Select **Surface > View Surface > Perimeter**.



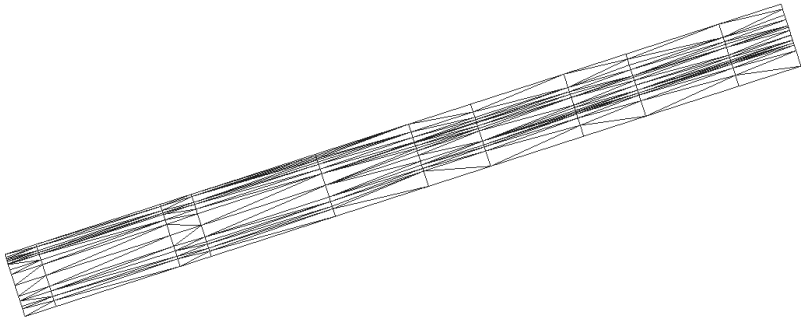
3. Click on the **Preferences** button. Make sure the preference **MTO** is selected. Close the Preference dialog.
4. Select the *Surface* ***Ex3_OG*** from the drop-down list.
5. Click on the **Apply** button and the perimeter is drawn in MicroStation.
6. Click **Close** to close the View Perimeter dialog.
7. In McroStation View 1 window, click on the **Fit View** icon from the view controls tool bar. Now you can see the perimeter in the model.



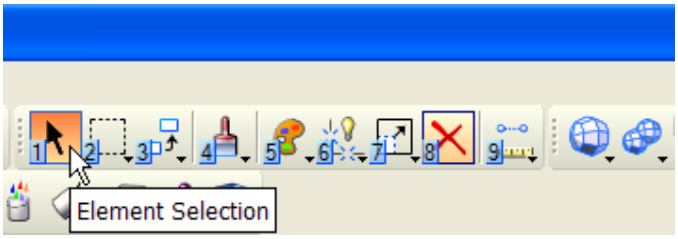
8. Select **File > Save Settings** form MicroStation main menu bar or using **Ctrl +F** keys to save current view settings.
9. Select **File > Save** form MicroStation main menu bar or using **Ctrl +S** keys to save the changes.
10. Select **Surface > View Surface > Triangles.**

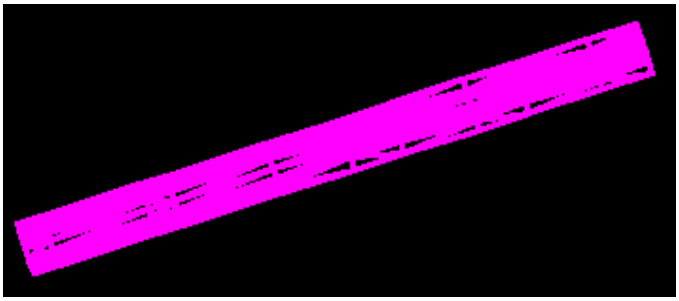


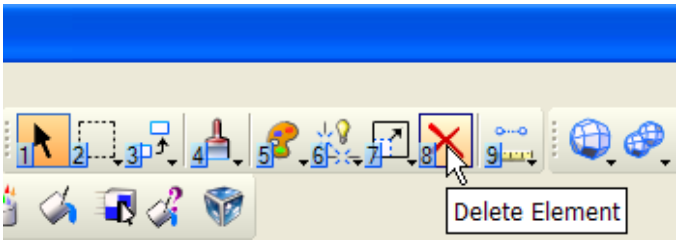
11. Click on the **Preferences** button. Make sure the preference **MTO** is selected. Close the Preference dialog.
12. Select the *Surface* ***Ex3_OG*** from the drop-down list.
13. Click on the **Apply** button and the triangles are drawn in MicroStation.



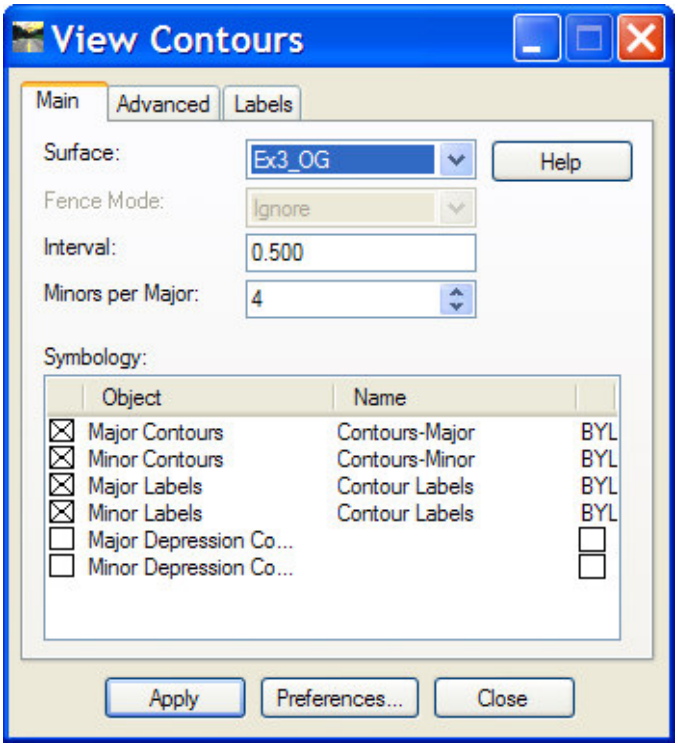
14. Click **Close**.
15. Active MicroStation **Element Selection** tool and select the perimeter and triangles, and then select the **Delete Element** tool to delete.



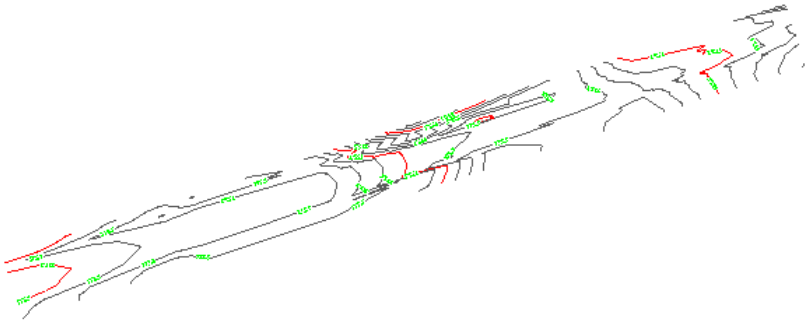




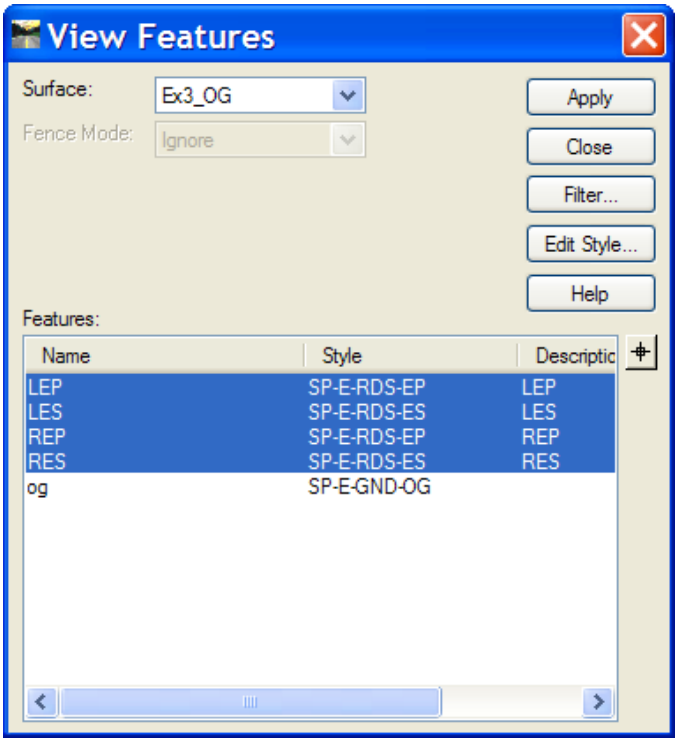
16. Select **Surface > View Surface > Contours.**



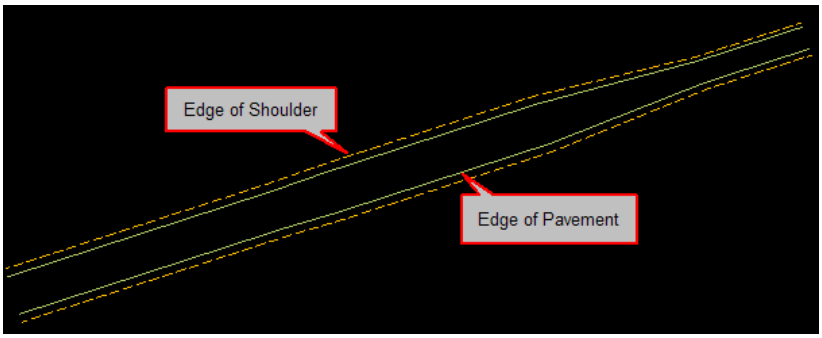
17. Click on the **Preferences** button. Select and load the preference **MTO.** Close the Preference dialog.
18. Select the *Surface* ***Ex3_OG*** from the drop-down list.
19. Click on the **Apply** button and the contours are drawn in MicroStation.



20. Click **Close**.
21. Delete the contours in MicroStation.
22. Select **Surface > View Surface > Features.**
23. On View Features dialog, select the *Surface* ***Ex3_OG*** from the drop-down list.
24. Select all ***EP/ES*** features from the *Features* list.



25. Click **Apply** then **Close**.
26. Selected EP/ES features are drawn with given styles in MicroStation.

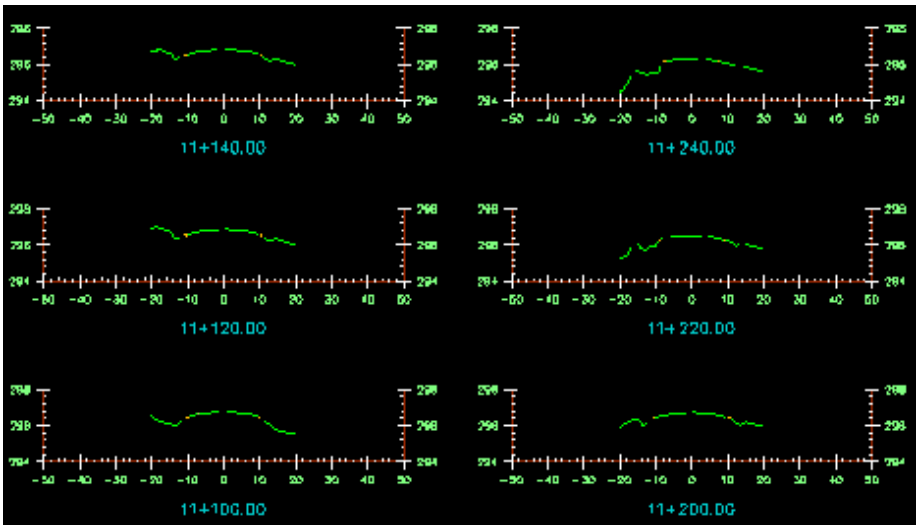


3.2 Viewing OG Surface in Cross Sections

The original ground surface can be viewed in cross sections along the given alignment (*Ex3.alg*).

1. Make sure the geometry project *Ex3.alg* is loaded and is the active geometry project.
2. Select **Evaluation > Cross Section > Cross Sections**.
3. Click **Preferences** button.
4. If the *Active Preference* is not **MTO**, load it. Click **Close**.
5. Select *General* leaf. Set interval to ***20*** and check surface *Ex3_OG* in the Surfaces list.

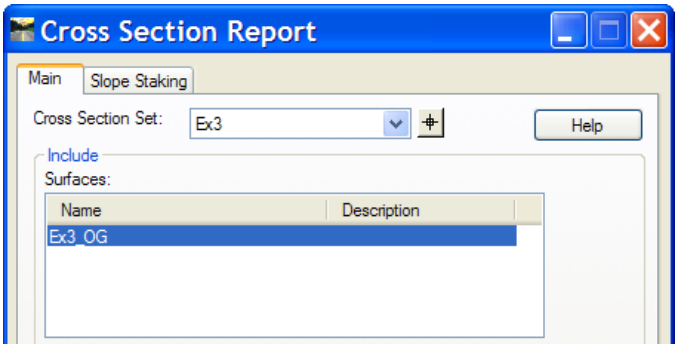
6. Select *Source* leaf. Make sure alignment *Ex3* is selected.
7. Click **Apply** and select an insert point in MicroStation.



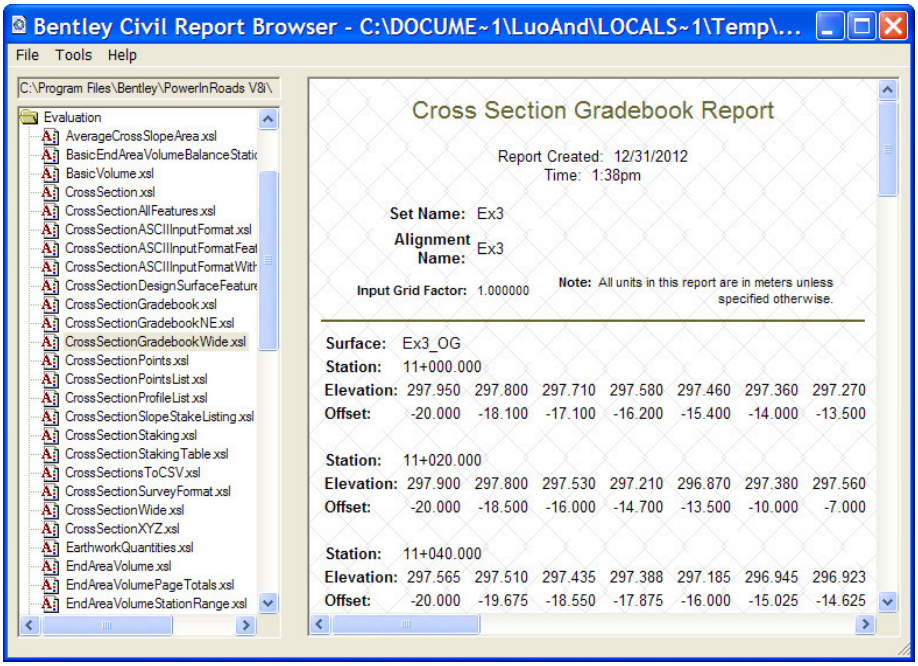
3.3 Generating Cross Section Reports

After generate the cross section set, the Cross Section Report command can be used to create station, offset, and elevation report.

1. Select **Evaluation > Cross Section > Cross Section Report**.
2. On the Cross Section Report dialog, select *Cross Section Set* ***EX3***.
3. Select ***Ex3_OG*** from the *Include Surfaces* list.



4. Click on **Apply**.
5. In the Bentley Civil Report Browser, select ***CrossSectionGradbookWide.xsl*** under Evaluation. The surface is reported in Station, Elevation, and Offset format.

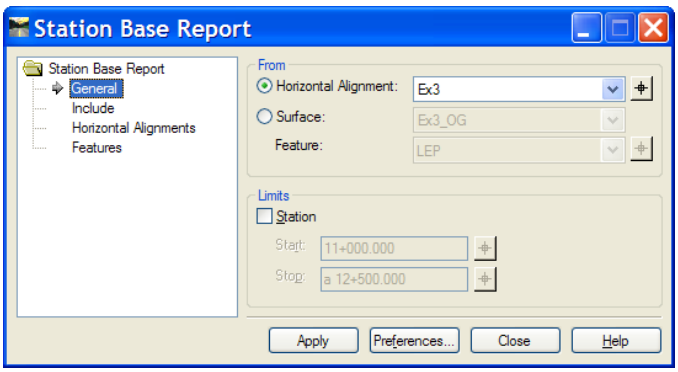


Note: For multiple surfaces, you can report each surface separately or select all the surfaces and report them in one single report.

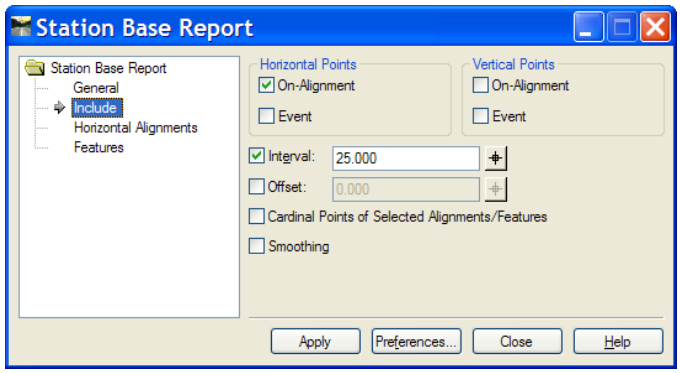
3.4 Check Existing Pavement Width

In this section, InRoads XML report is used to report existing pavement width. The information can be used to analyse the existing pavement condition and then used for creating the project templates.

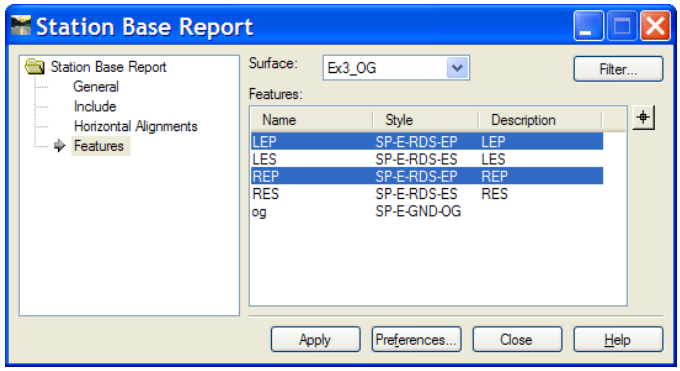
1. Select **Tools > XML Reports > Station Base**.
2. On the Station Base Report dialog, select *General* leaf.
3. Select **Horizontal Alignment** option from the *From* field and select ***Ex3*** from the drop-down list as the reporting alignment.



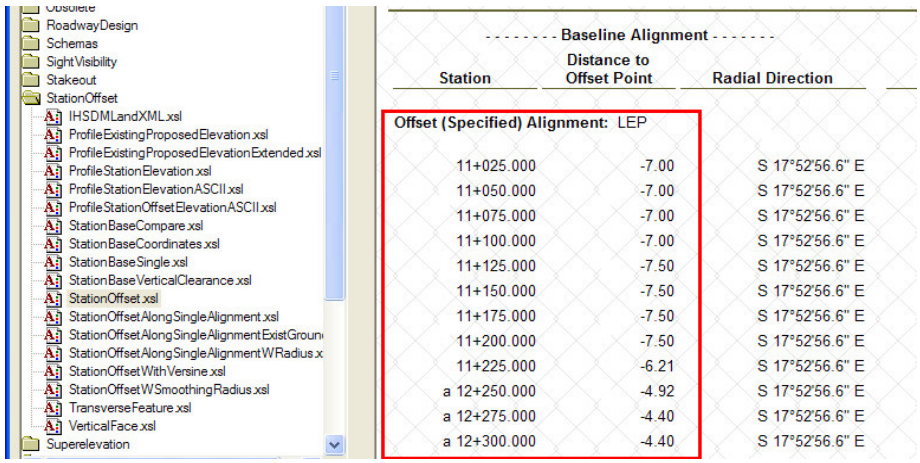
4. Select *Include* leaf, toggle on **Interval** option and set to ***25***.



5. Select *Features* leaf. On the dialog, select ***Ex3_OG*** from the Surface list then select ***LEP*** and ***REP*** from the Features list.



6. Click Apply. In the Bentley Civil Report Browser, select **StationOffset > StationOffset.xsl**.



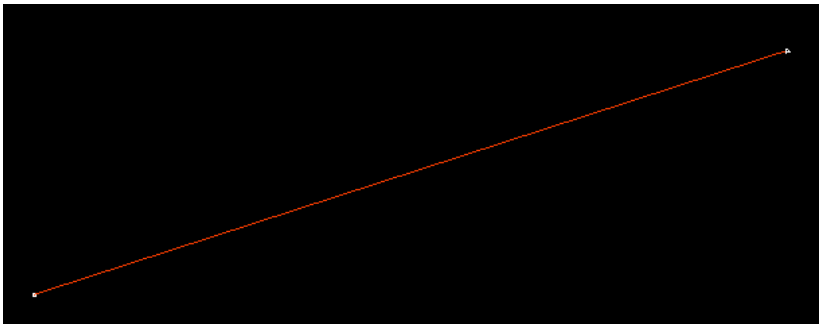
7. Save the report.

4.0 Horizontal Alignment

A geometry project Ex3.alg is provided with the sample data set. It contains a horizontal alignment Ex3 and a vertical alignment with the same name Ex3.

4.1 Viewing the Active Horizontal Alignment

1. Delete the graphics in MicroStation.
2. Select **Geometry > View Geometry > Active Horizontal.** Horizontal alignment is displayed in MicroStation with the assigned style.



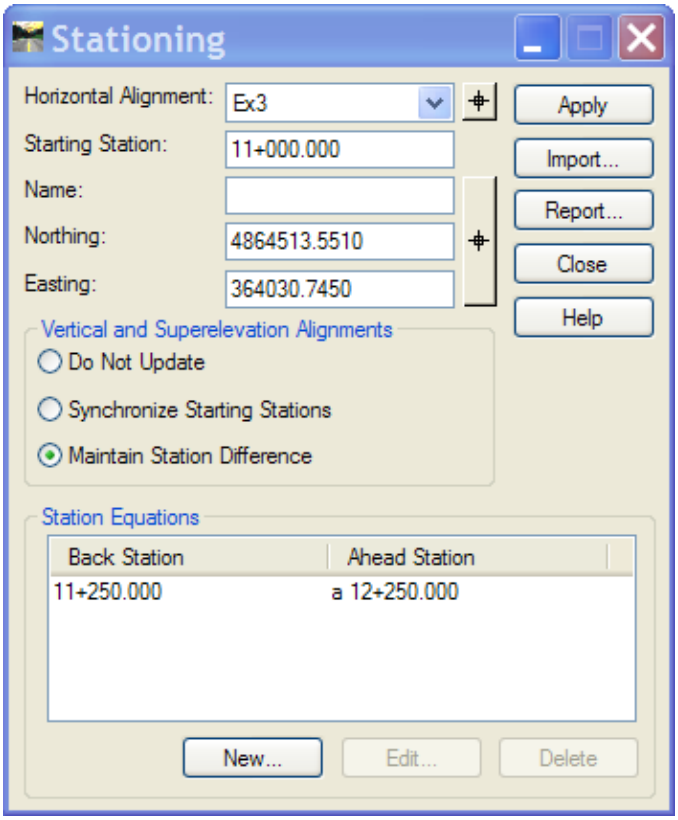
4.2 Stationing

A chainage equation is included in this example.

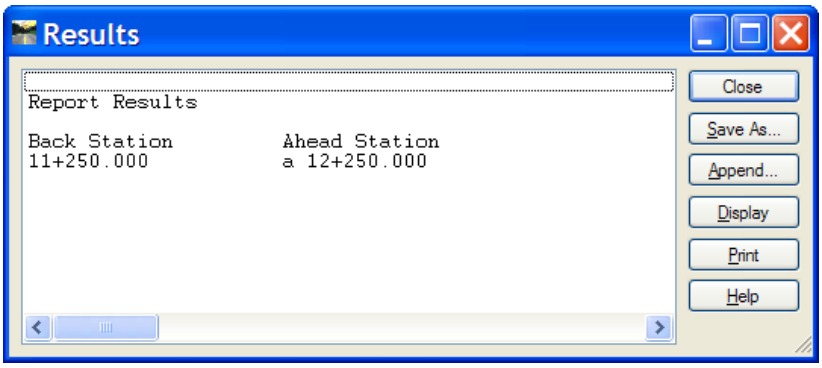
1. To add, modify or review chainage equation, select **Geometry > Horizontal Curve Set > Stationing**.
2. At the bottom portion of the Stationing dialog is the *Station Equations* list. The following station equation is included in the project:

   11+250 = a 12+250

Note: When entering the ahead station, you must specify a name for the station equation. An alpha character must be included in the ahead station to differentiate the ahead station from the back station.



3. Click **Report.** InRoads generates the following results:



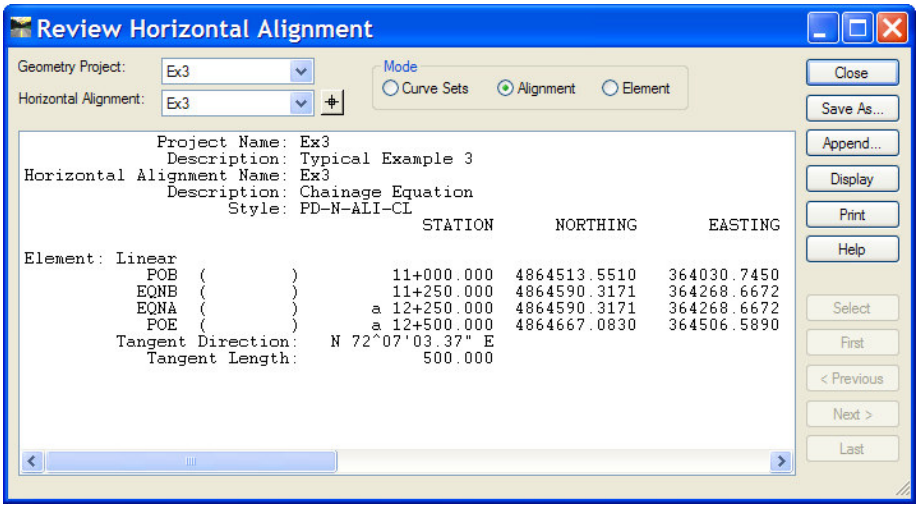
4. Close all the dialogs.

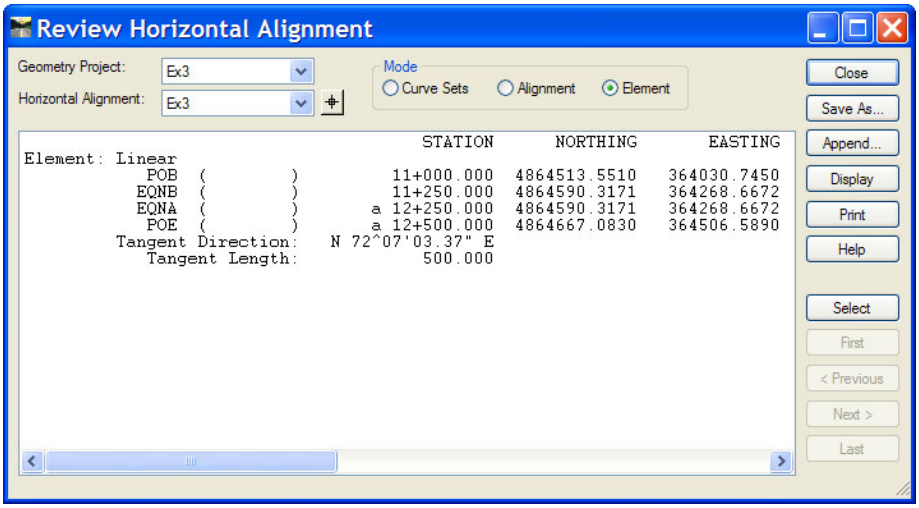
4.3 Reviewing Horizontal Alignments

The Review Horizontal Alignment command is used to review a selected geometry in detail.

1. Select **Geometry > Review Horizontal**.
2. On the Review Horizontal Alignment dialog, there are three different modes can be selected in the *Mode* section to display different

information. Shown below are the Review Horizontal Alignment dialogs with the *Alignment* and *Element* mode selected. The review information can be displayed in MicroStation using the Display button or saved as an ASCII file using the Save As button, and be used to recreate the horizontal alignment.

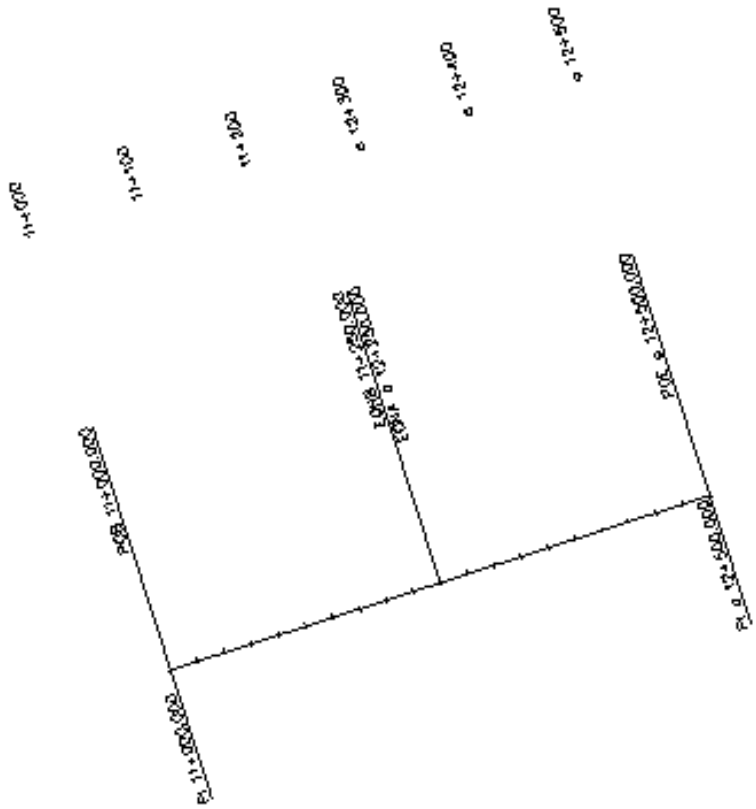




4.4 Displaying Stationing

The View Stationing command is used to place station annotation text along the active horizontal alignment at a specified interval.

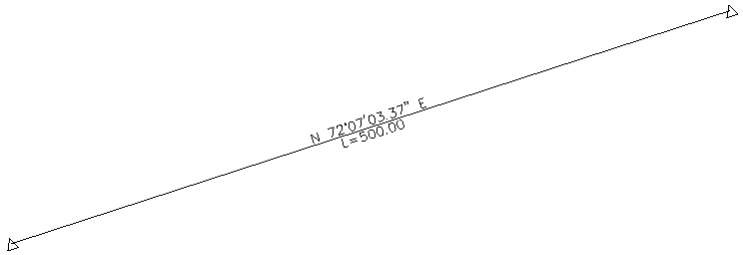
1. Select **Geometry > View Geometry > Stationing**.
2. Click on the **Preferences** button. Select and load the named preference **MTO_Alignment_P&D.** Close the Preference dialog.
3. Click **Apply** and then **Close**.
4. Stationing will be generated on the Planning and Design layer as defined in MTO AutoCAD Standards Guide.



4.5 Annotating Horizontal Alignments

Horizontal Annotation command is used to display and annotate horizontal alignments, points, and elements.

1. Select **Geometry > View Geometry > Horizontal Annotation**
2. Click **Preferences** button.
3. On Preferences dialog, select ***MTO_Alignment_P&D***, click **Load > Close**.
4. Click in the *Horizontal Alignments Include* field.
5. Click **Filter** button.
6. On the Geometry Selection Filter dialog, select alignment ***Ex3*** from the *Available* side.
7. Click **Add** button to put the alignment on the *Selected* side.
8. Click **OK** to return to the View Horizontal Annotation dialog.
9. Click **Apply**. The selected alignment is displayed with element data.



10. Click **Close**.

4.6 Generating Horizontal Alignment Report

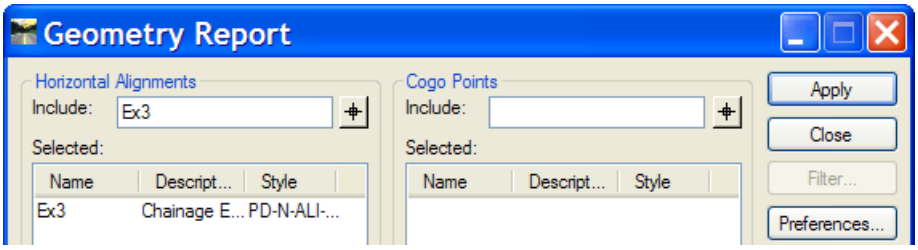
The Review Horizontal command can be used to report detailed information about the elements in selected horizontal alignment. The information can be displayed in MicroStation or saved to an ASCII file. Select different *Mode* to report different parts of the alignment.

1. Select **Geometry > Review Horizontal.**
2. Select ***Ex3*** for *Geometry Project* and ***Ex3*** for *Horizontal Alignment*.
3. Select *Mode* to review and report information in different format.

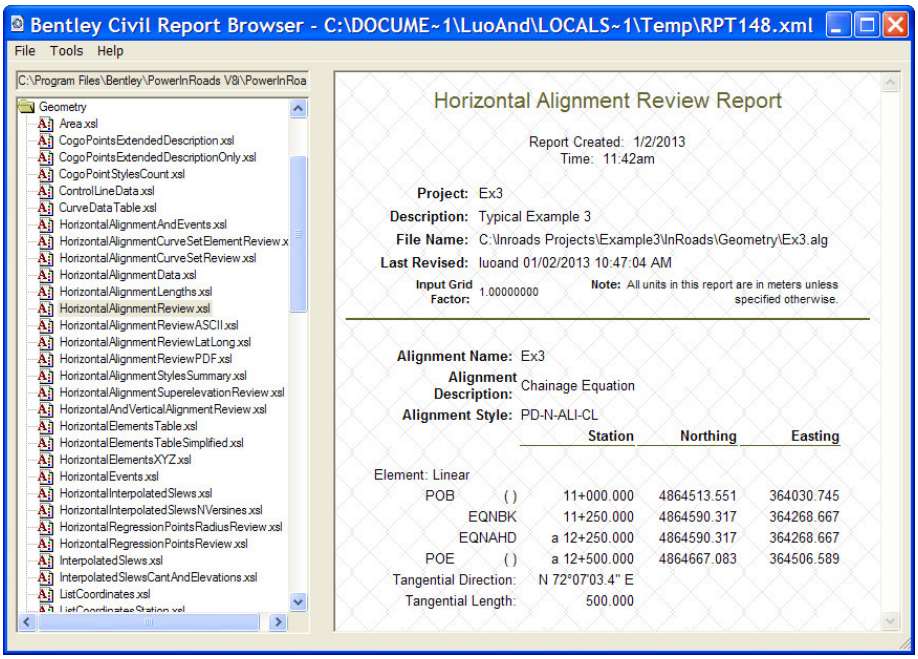
Horizontal Alignment Report also can be generated by InRoads XML Reports command and used with a large number of style sheets.

1. Select **Tools >XML Reports >Geometry**.
2. On the Geometry Report dialog, type ***Ex3*** in the *Horizontal Alignments Include* field.
3. Press **Tab** on the keyboard. The alignment *Ex3* is listed on the *Selected* list.

Note: *Filter* or select button also can be used to select alignments. Use * will select all the alignments in the geometry project.



4. Click **Apply** to create the report. Bentley Civil Report Browser is displayed.
5. Select ***HorizontalAlignmentReview*** style sheet.

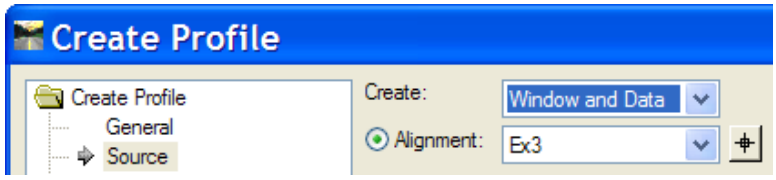


6. Select **Tools > Format Options** in the Bentley Civil Report Browser.
7. Make the desired changes to the format of the generated report.
8. Select **File > Save As** in the Bentley Civil Report Browser to save the data into file with selected file type.

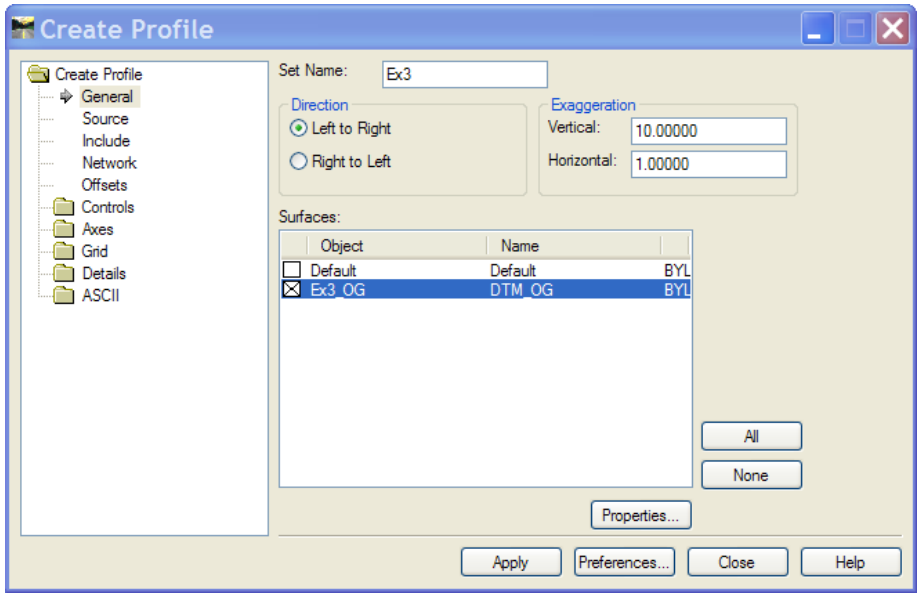
5.0 Profile and Vertical Alignment

5.1 Extracting OG Profile

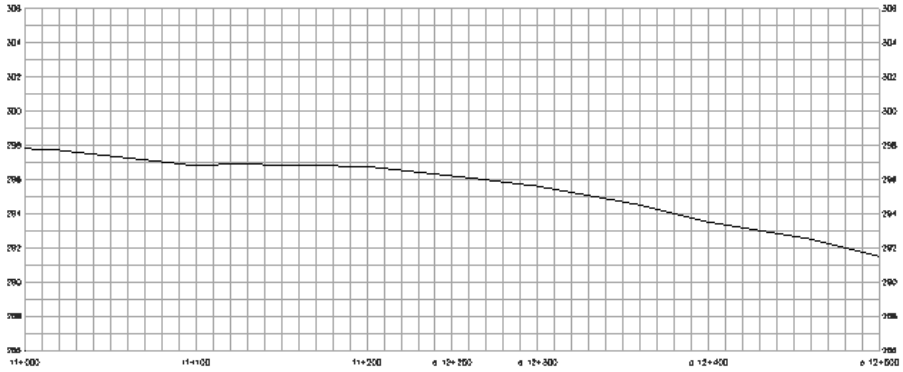
1. Select **Evaluation > Profile > Create Profile** and the Create Profile dialog will appear.
2. Click on **Preferences** button. Select and load named preference **MTO**.
3. Close the Preference dialog.
4. Click on the *Source* leaf. The *Create* field should be *Window and Data*.
5. Check and make sure the *Alignment* is ***Ex3***.



6. Click on *General* leaf. By default, the *Set Name* is set to the active horizontal alignment *Ex3*.
7. Make sure surface *Ex3_OG* is checked in the *Surfaces* list.



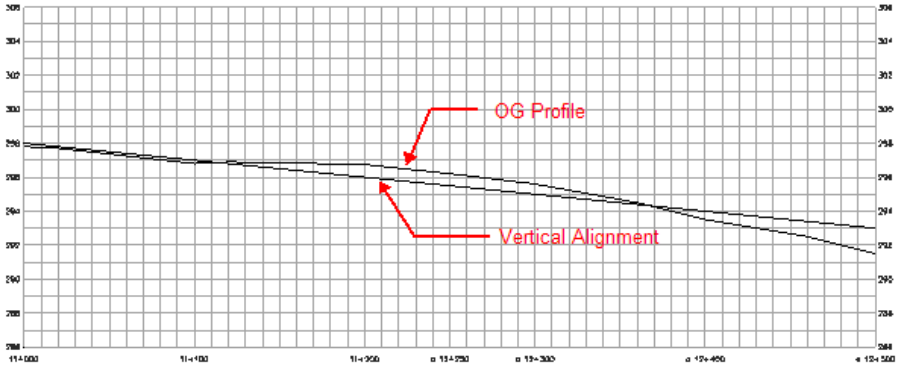
8. Click on *Controls* leaf. Make sure the *Elevation* range and *Station* range are not used.
9. Click **Apply** and select an insertion point in MicroStation.



5.2 Viewing Vertical Alignment

The Active Vertical command is use to display the active vertical alignment without annotation. The geometry style associated with the alignment when they are created will be used for displaying.

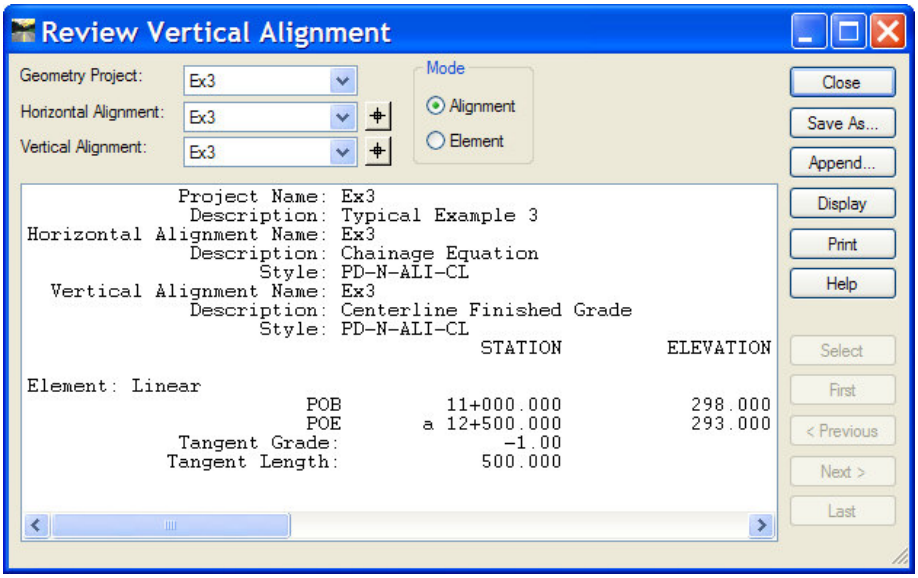
Select **Geometry > View Geometry > Active Vertical**.



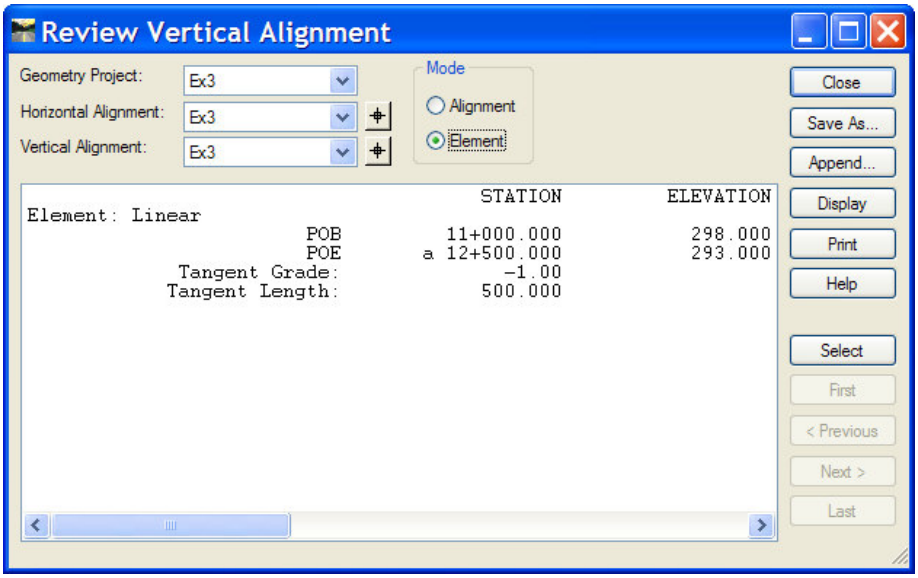
5.3 Reviewing Vertical Alignment

Review Vertical Alignment command can be used to display information about the geometry of the active vertical alignment. The vertical alignment review information can be displayed in MicroStation or saved as an ASCII file.

1. Select **Geometry > Review Vertical**.



2. In the *Mode* section, select ***Element***.

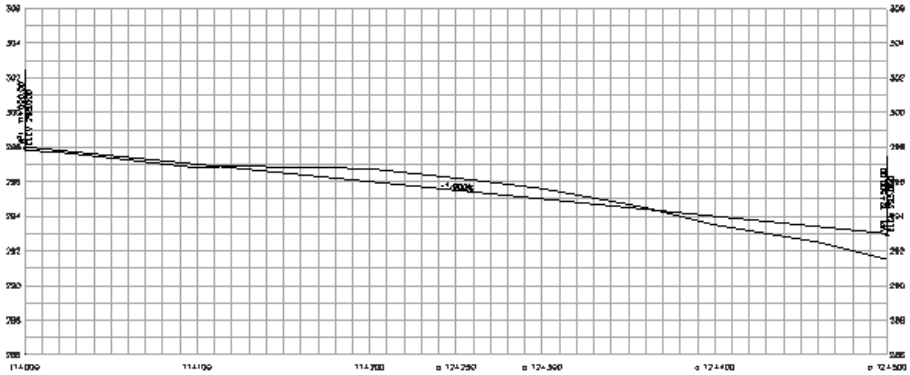


Note: The active element is highlighted in the profile window.

5.4 Annotating Vertical Alignment

Use the Vertical Annotation command for more detailed annotation and display. Predefined preference is used to display the alignment points, tangent lines and vertical curves, and annotate the geometry.

1. Select **Geometry > View Geometry > Vertical Annotation**.
2. Make sure both the Horizontal Alignment and Vertical Alignment are *Ex3*.
3. Click **Preferences**.
4. Select named preference ***MTO_Proposed*** and **Load** it.
5. Close Preferences dialog
6. Click **Apply**.

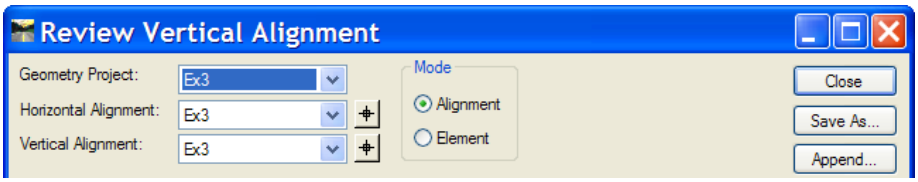


7. Use MicroStation view controls to zoom in and view annotation.
8. Close the View Vertical Annotation dialog box.

5.5 Generating Vertical Alignment Report

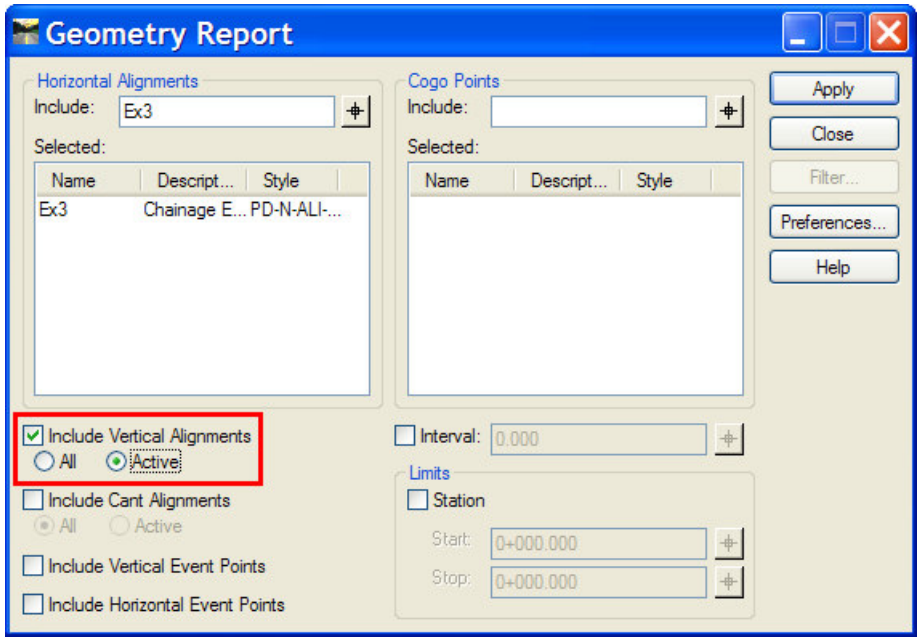
The Review Vertical command can be used to report detailed information about the geometry of the active vertical alignment. The information can be displayed in MicroStation or saved to an ASCII file. Select different *Mode* to review alignment or element information.

1. Select **Geometry > Review Vertical**.
2. Select ***Ex3*** for *Geometry Project*, ***Ex3*** for *Horizontal Alignment* and ***Ex3*** for *Vertical Alignment*.
3. Select *Mode* to review and report information in different format.

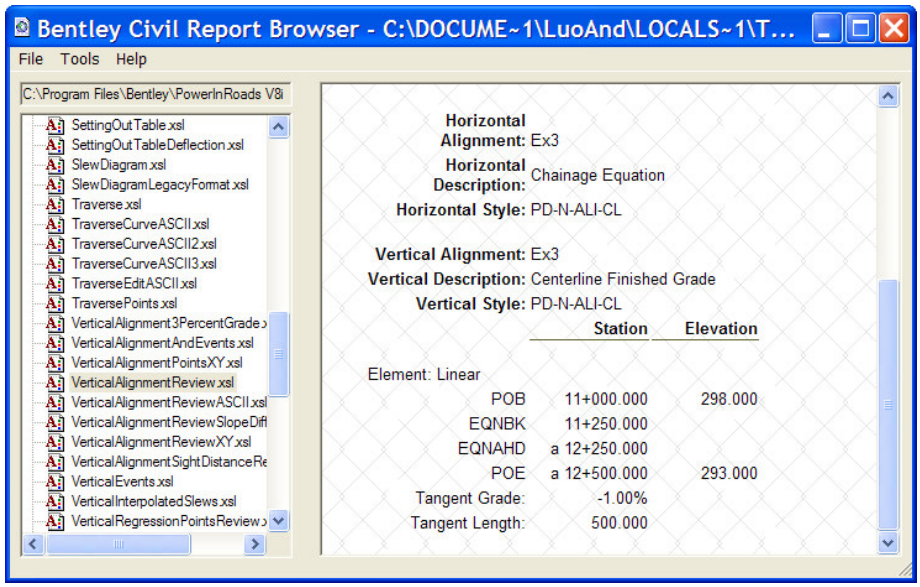


Vertical Alignment Report also can be generated by InRoads XML Reports command and used with a large number of style sheets.

1. Select **Tools >XML Reports >Geometry**.
2. On the Geometry Report dialog, type ***Ex3*** in the *Horizontal Alignments Include* field.
3. Press **Tab** on the keyboard. The alignment *Ex3* is listed on the *Selected* list.
4. Check the *Include Vertical Alignments* section.
5. Toggle on the *Active* option.



6. Click **Apply**. Bentley Civil Report Browser is displayed.
7. Select ***VerticalAlignmentReview*** style sheet.



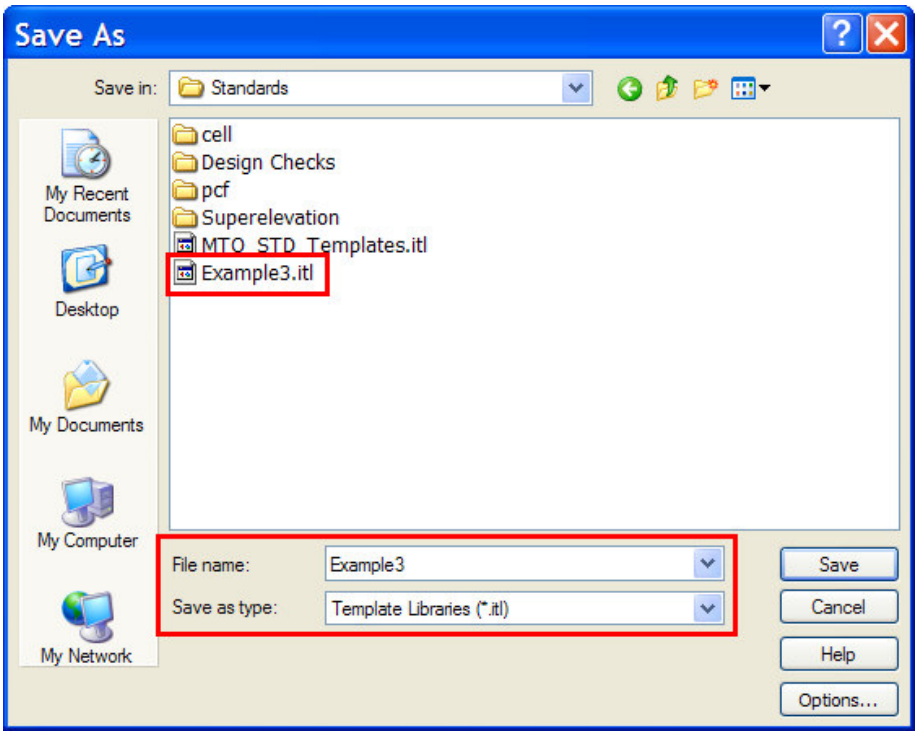
8. Select **Tools > Format Options** in the Bentley Civil Report Browser.
9. Make the desired changes to the format of the generated report.
10. Select **File > Save As** in the Bentley Civil Report Browser to save the data into file with selected file type.

6.0 Typical Sections

6.1 Setting Up Project Template Library

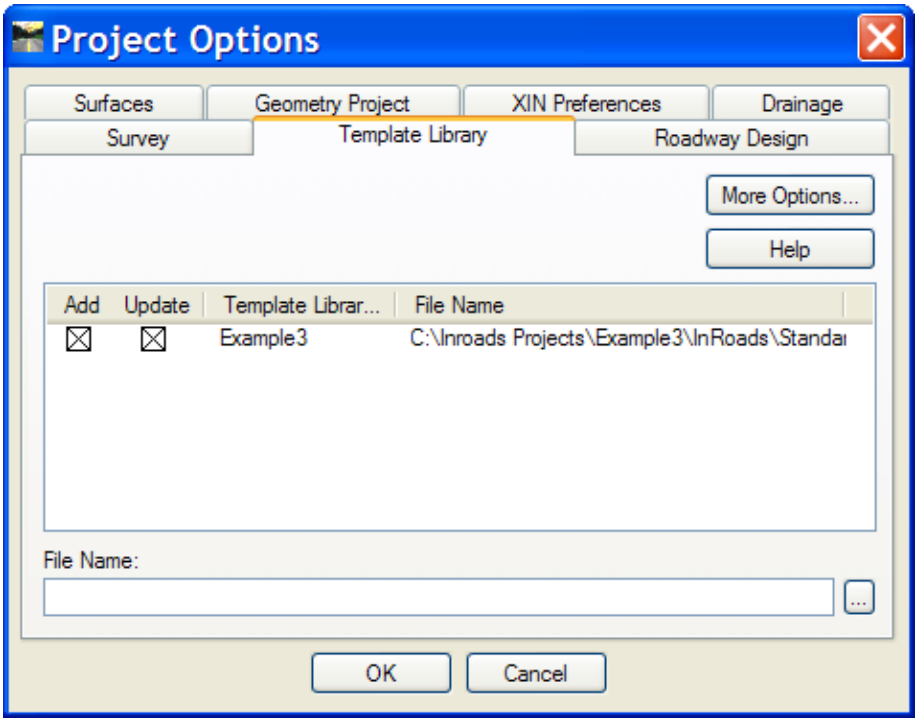
MTO standard template library contains predefined typical sections, components, and a point name list that point names are associated with MTO standard styles. This template library can be used as a start point to create project specific template library.

1. Select **File > Save As**.
2. On the Save As dialog, Change the *Save as type* to Template Libraries (*.itl).
3. In the *File name* field, type in ***Example3***.
4. Click **Save**. A new template library *Example3* is saved to the proper project folder as defined in project default.

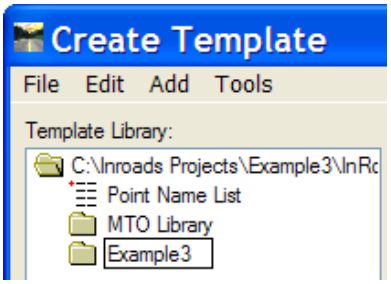


5. On the Save As dialog, Change the *Save as type* to Projects (*.rwk).
6. Select *Example3.rwk* from the file list. *Example3.rwk* will appear in the *File name* field.

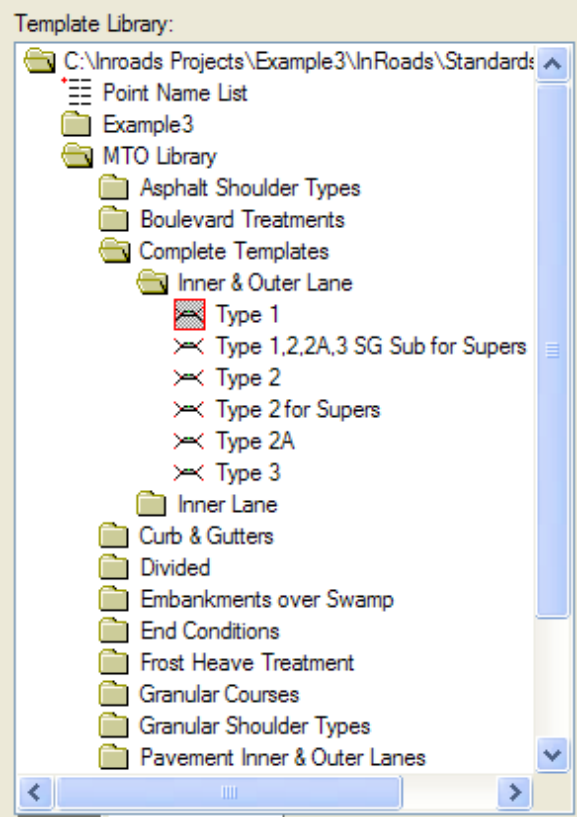
7. Click **Options** then select *Template Library* tab.
8. On Project Options dialog, check both **Add** and **Update** options for template library *Example3*.



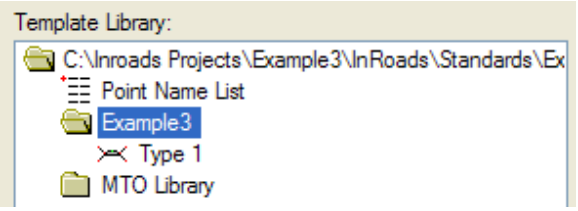
9. Click OK to close the Project Options dialog.
10. Click **Save** then **Yes** to confirm replace the existing project file.
11. Click **Cancel** to close the Save As dialog.
12. Select **Modeler > Create Template**. The Create Template dialog will appear.
13. Select **File > New > Folder**.
14. Type in ***Example3*** for the name of the new folder in the Template Library window.



15. Double click on **MTO Library > Complete Templates > Inner & Outer Lane**.
16. Select template **Type 1**.



17. Select **Edit > Copy**.
18. Select folder *Example3*.
19. Select **Edit > Paste**.
20. Double click folder *Example3*. The standard template is copied to folder *Example3*.



21. Click **File > Save**.

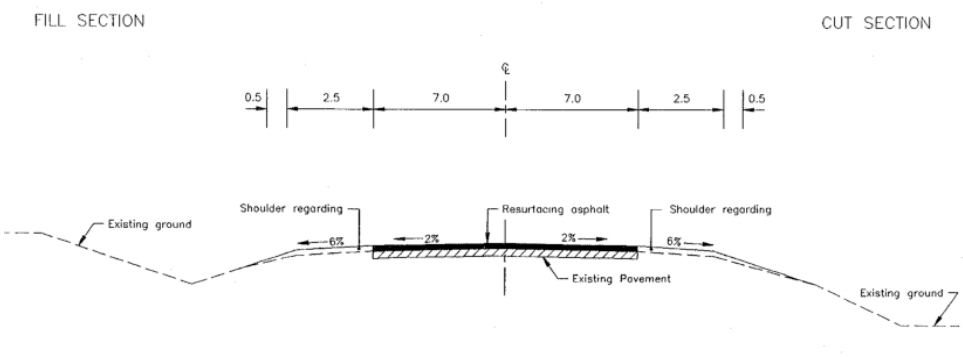
Note: Project specific templates should be created/copied and modified in the project specific folder.

6.2 Creating Example 3 Templates

In previous section, a template is selected from MTO Library folder and copied to the project template folder. This template is going to be modified to use in this example for rural section resurfacing.

Rural Resurfacing Template

The following typical is used to create rural resurfacing template:

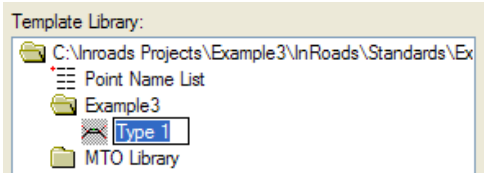


The assumptions made below are for this example only.

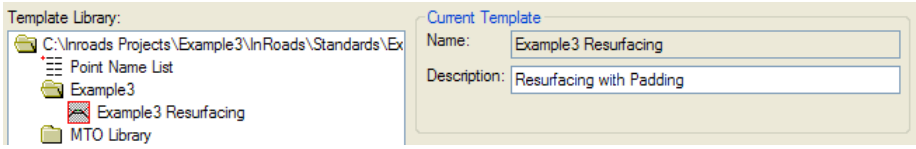
a) Existing pavement asphalt to be partially removed up to 50mm.

b) New pavement asphalt to be 40mm top course and 50mm base course.

1. Review the Station Offset report generated in section 3.4. For resurfacing section from 11+000 to 11+100, the new pavement edges match the existing pavement edges. Milling and padding will be from left EP to right EP.
2. Select the new copied template *Type 1* in the *Example3* folder.
3. Select **Edit > Rename**.



4. Type in a new name: ***Example3 Resurfacing***.
5. Provide additional information in the *Description* field in the Current Template section.

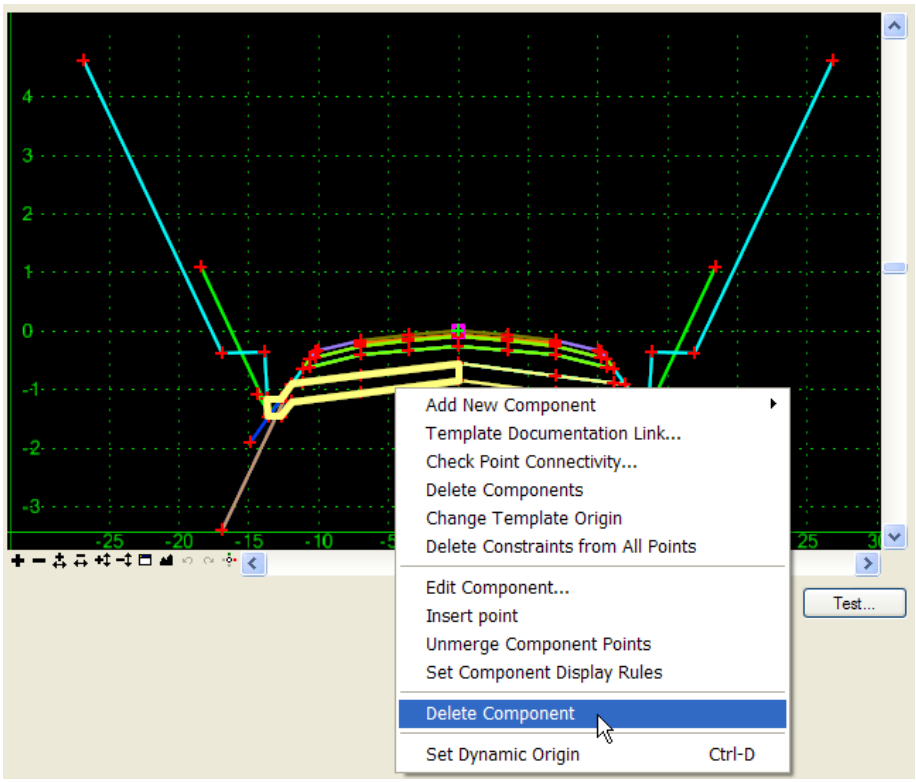


6. Click **File > Save**.

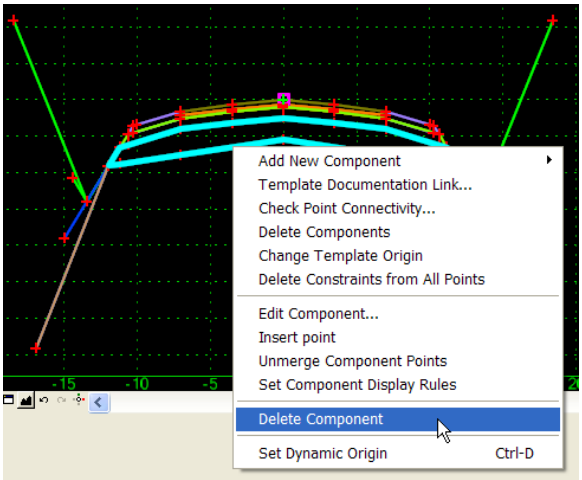
Note: During the process of customize the project template, save the template library when the modification is worth saving.
Refer to Proposed Design in section 1 for parameters to be used in the project template.

---

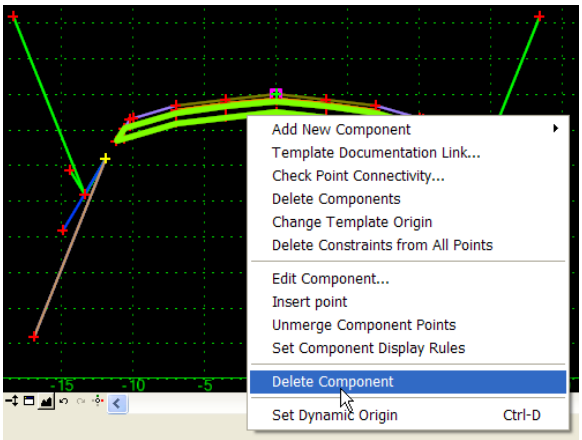
7. Delete all rock related components since no rock is present in this project. In the template display window, find and right click on component **L-Rock Shatter**, select **Delete Component** from the pop-up menu.



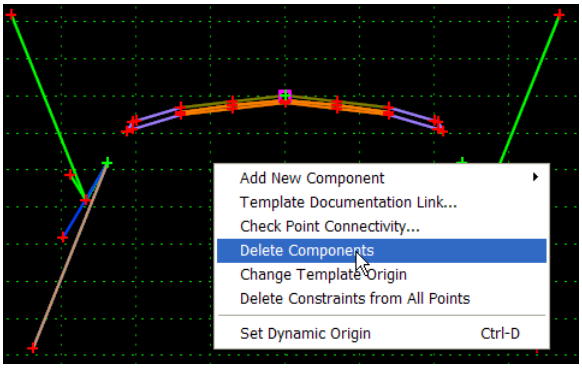
8. Find and delete component **L-Rock Cut, L-Rock Cut1, R-Rock Shatter, R-Rock Cut,** and **R-Rock Cut1.**
9. Right click on **Granular B** component, select **Delete Component** from the pop-up menu.



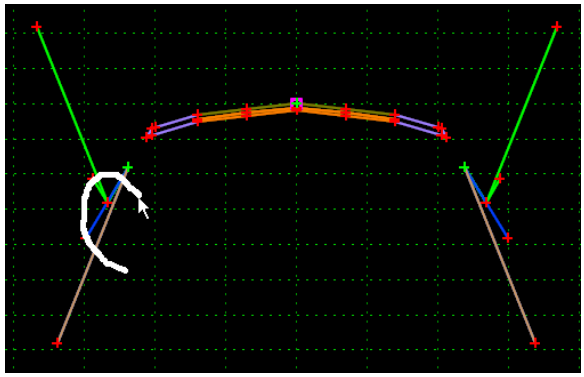
10. Right click on **Granular A** component, select **Delete Component** from the pop-up menu.



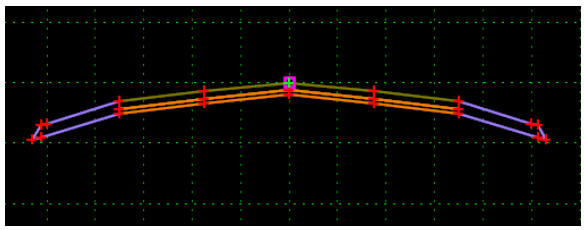
11. In the template display window, right click and select **Delete Component** from the pop-up menu.



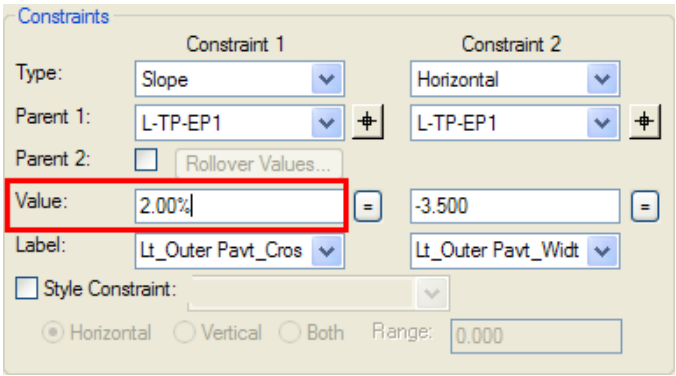
12. Left click and hold the left mouse button to draw a freehand line over the left side end condition components to delete.



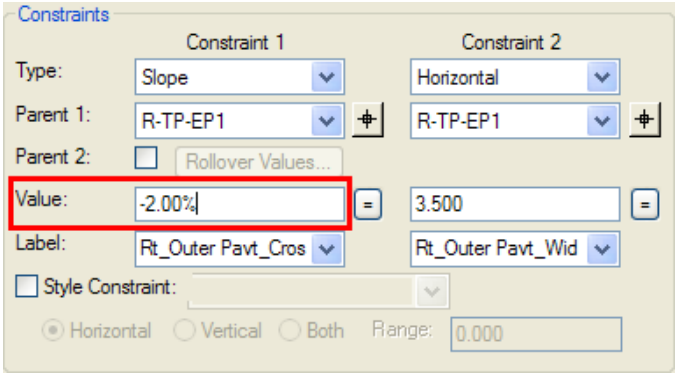
13. Delete all the end condition components on the right side.



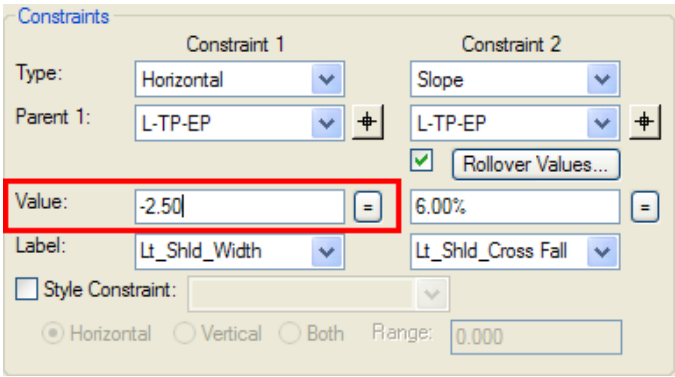
14. Click **File > Save**.
15. In the template display window, find and double click on the point **L-TP-EP**. On the Point Properties dialog, go to *Constraints* section. Type ***2.00%*** in the *Value* field for the *Slope* constraint.



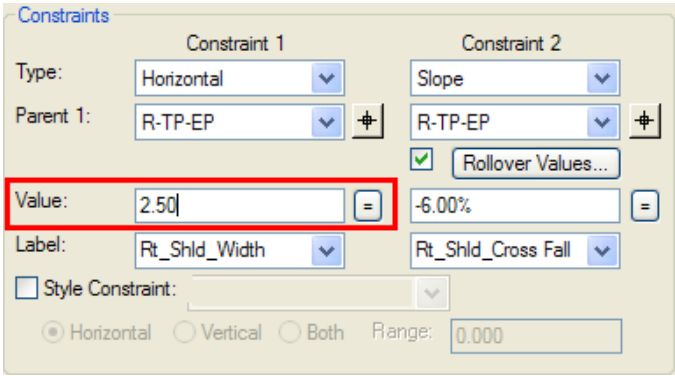
16. Click **Apply** Then **Close**.
17. Find and double click on the point **R-TP-EP** in the template display window. On the Point Properties dialog, type ***-2.00%*** in the *Value* field for the *Slope* constraint.



18. Click **Apply** Then **Close**.
19. Verify that the *Slope* constraint value is 2.0% for points *L-TP-EP1* and *R-TP-EP1*.
20. In the template display window, find and double click on the point **L-TP-ES**. On the Point Properties dialog, go to *Constraints* section. Type ***-2.50*** in the *Value* field for the *Horizontal* constraint.

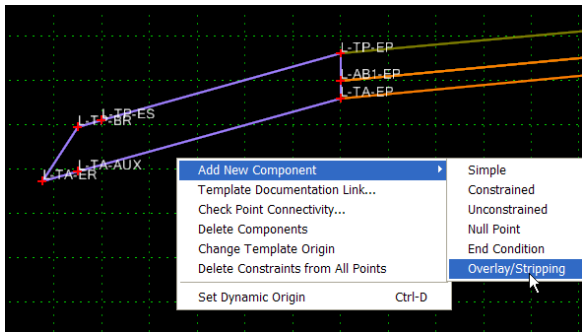


21. Click **Apply** Then **Close**.
22. Find and double click on the point **R-TP-ES** in the template display window. On the Point Properties dialog, type ***2.50*** in the *Value* field for the *Horizontal* constraint.

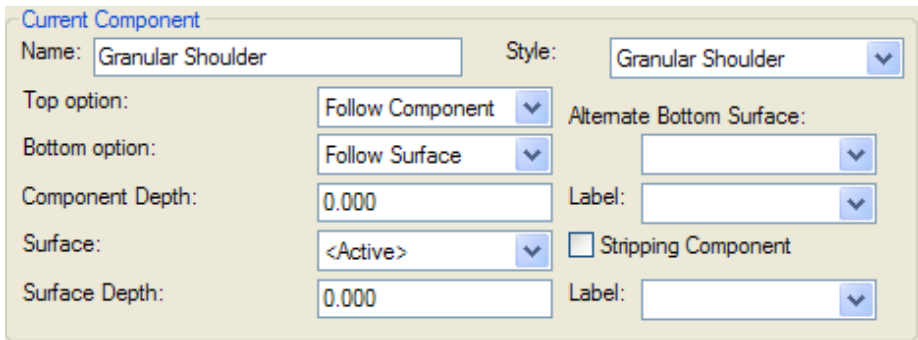


23. Click **Apply** then **Close**.

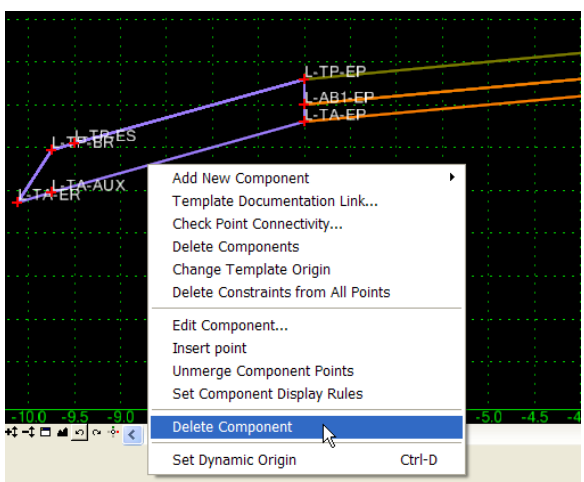
24. Right click in the template display window, select **Add New Component > Overlay/Stripping** from the pop-up menu.



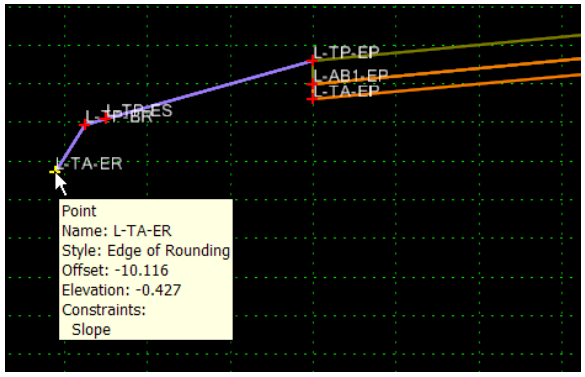
25. Set the *Current Component* at the bottom of Create Template dialog with information input as shown below:



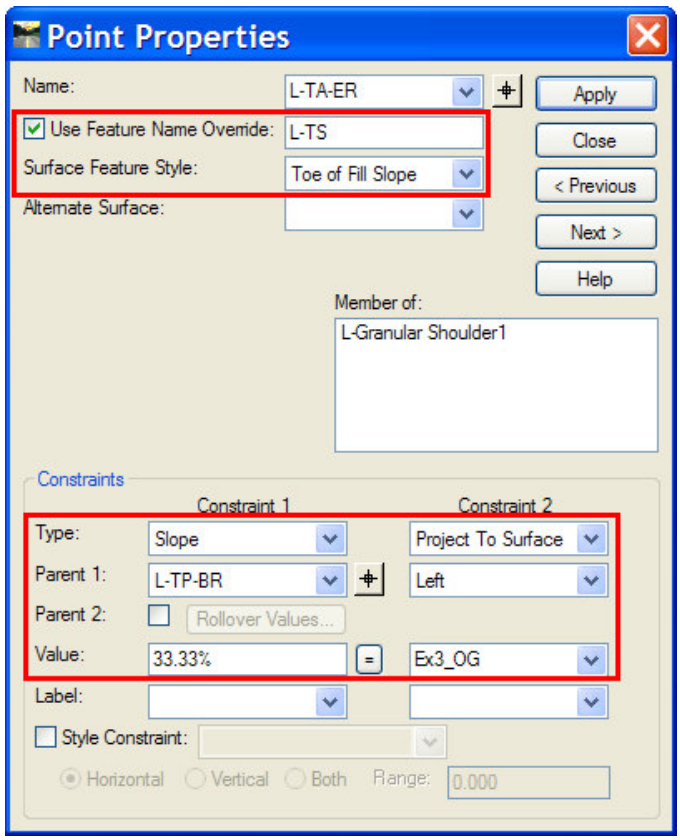
26. Place the component along the top of existing left side granular shoulder. Start from point *L-TP-EP*, go through points *L-TP-ES, L-TP-BR*, and end to point *L-TA-ER*.
27. Right click on existing left shoulder component (**L-Granular Shoulder**) and select **Delete Component** from the pop-up menu to delete.



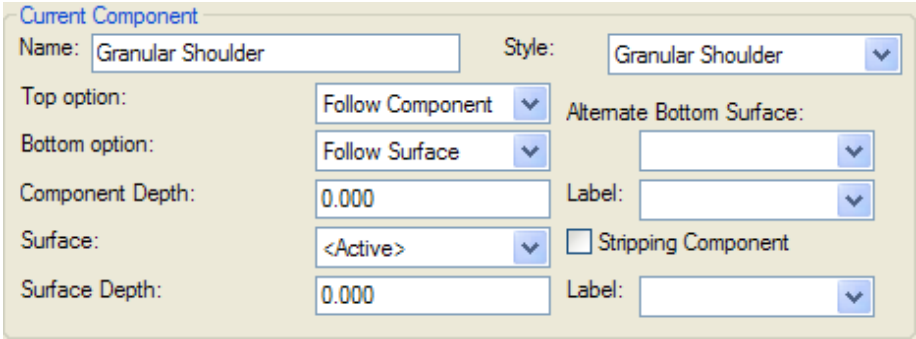
28. Double click on the point **L-TA-ER** in the template display window.



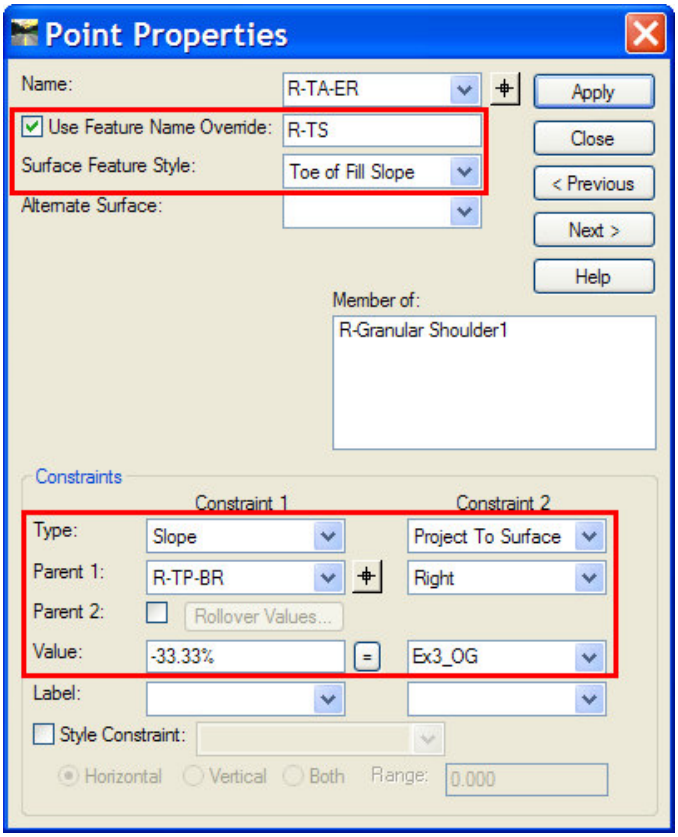
29. Set the Point Properties as:



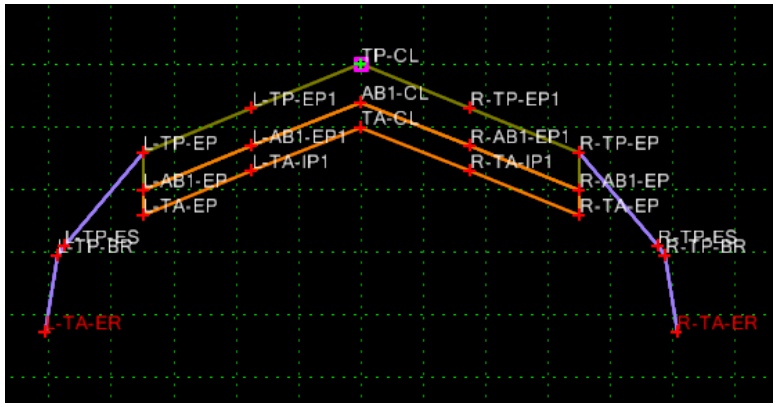
30. Click **Apply** then **Close**. Right click in the template display window, select **Add New Component > Overlay/Stripping** from the pop-up menu.
31. Set the *Current Component* at the bottom of Create Template dialog with information input as shown below:



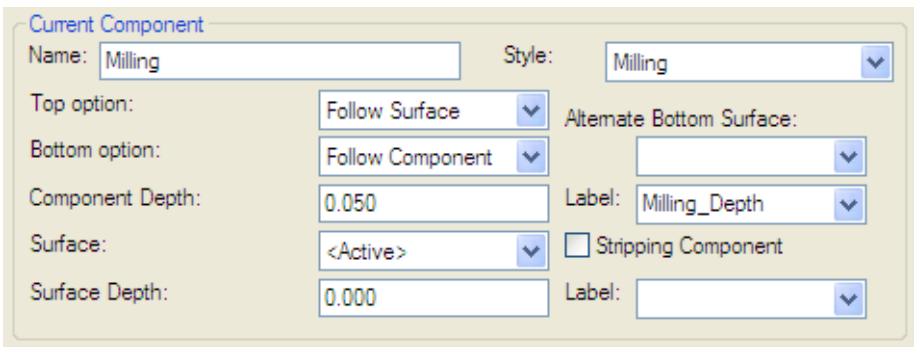
32. Place the component along the top of existing right side granular shoulder. Start from point *R-TP-EP*, go through points *R-TP-ES, R-TP-BR*, and end to point *R-TA-ER*.
33. Right click on existing right shoulder component (**R-Granular Shoulder**) and select **Delete Component** from the pop-up menu to delete.
34. Double click on the point **R-TA-ER** in the template display window and set the Point Properties as:



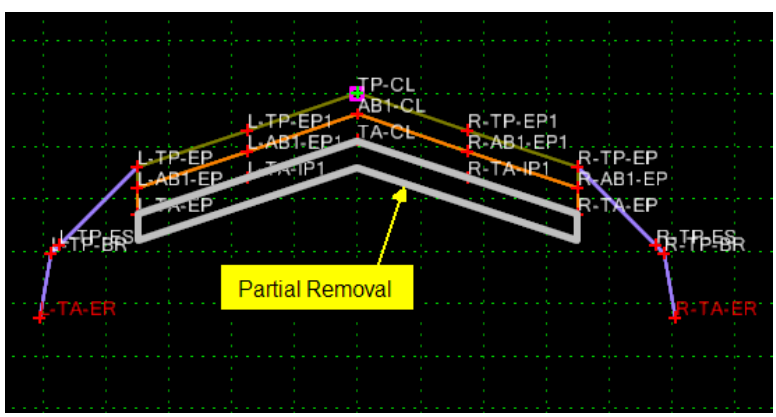
35. Click **Apply** then **Close**.



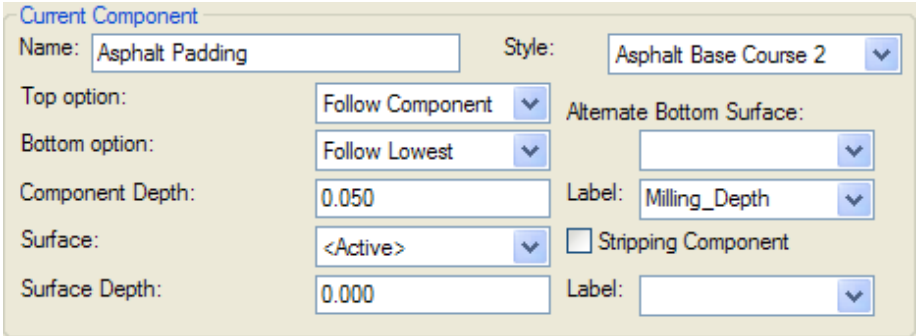
36. Click **File > Save.**
37. For asphalt top course depth, set *Vertical* constraint value to ***-0.04*** for points *L-AB1-EP, L-AB1-EP1, AB1-CL, R-AB1-EP1*, and *R-AB1-EP*.
38. For asphalt base course depth, set *Vertical* constraint value to ***-0.05*** for points *L-TA-EP, L-TA-IP1, TA-CL, R-TA-IP1*, and *R-TA-EP*.
39. Create a new *Overlay/Stripping* component ***Milling*** for existing pavement partial removal with information input as shown below:



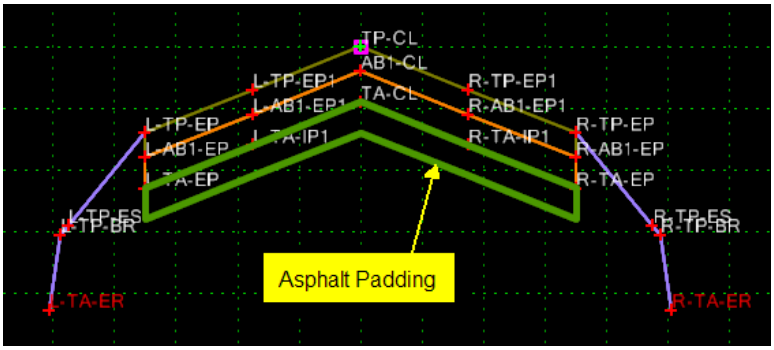
The component is to be placed at the bottom of asphalt base course. Start from point *L-TA-EP*, go through point *TA-CL*, and end to point *R-TA-EP*.



40. Create a new *Overlay/Stripping* component ***Asphalt Padding*** and set component properties as shown below:



The component is to be placed at the bottom of asphalt base course. Start from point *L-TA-EP*, go through points *L-TA-IP1, TA-CL, R-TA-IP1*, and end to point *R-TA-EP*.



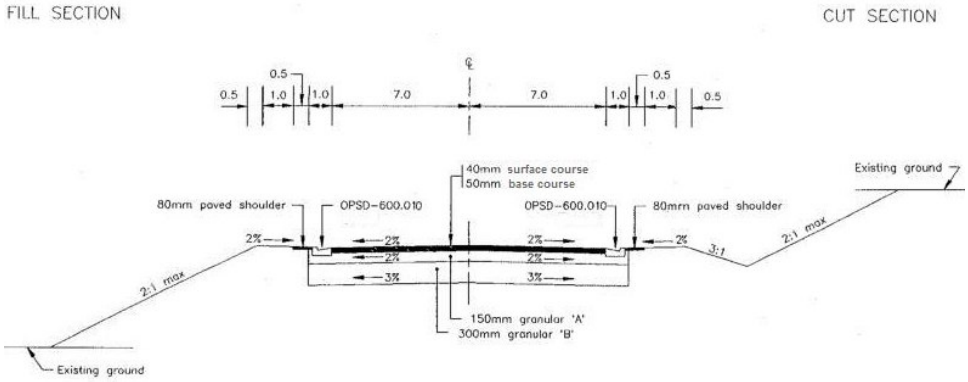
41. Select **File > Save** to save changes made to the template.
42. **Close** the Create Template dialog.

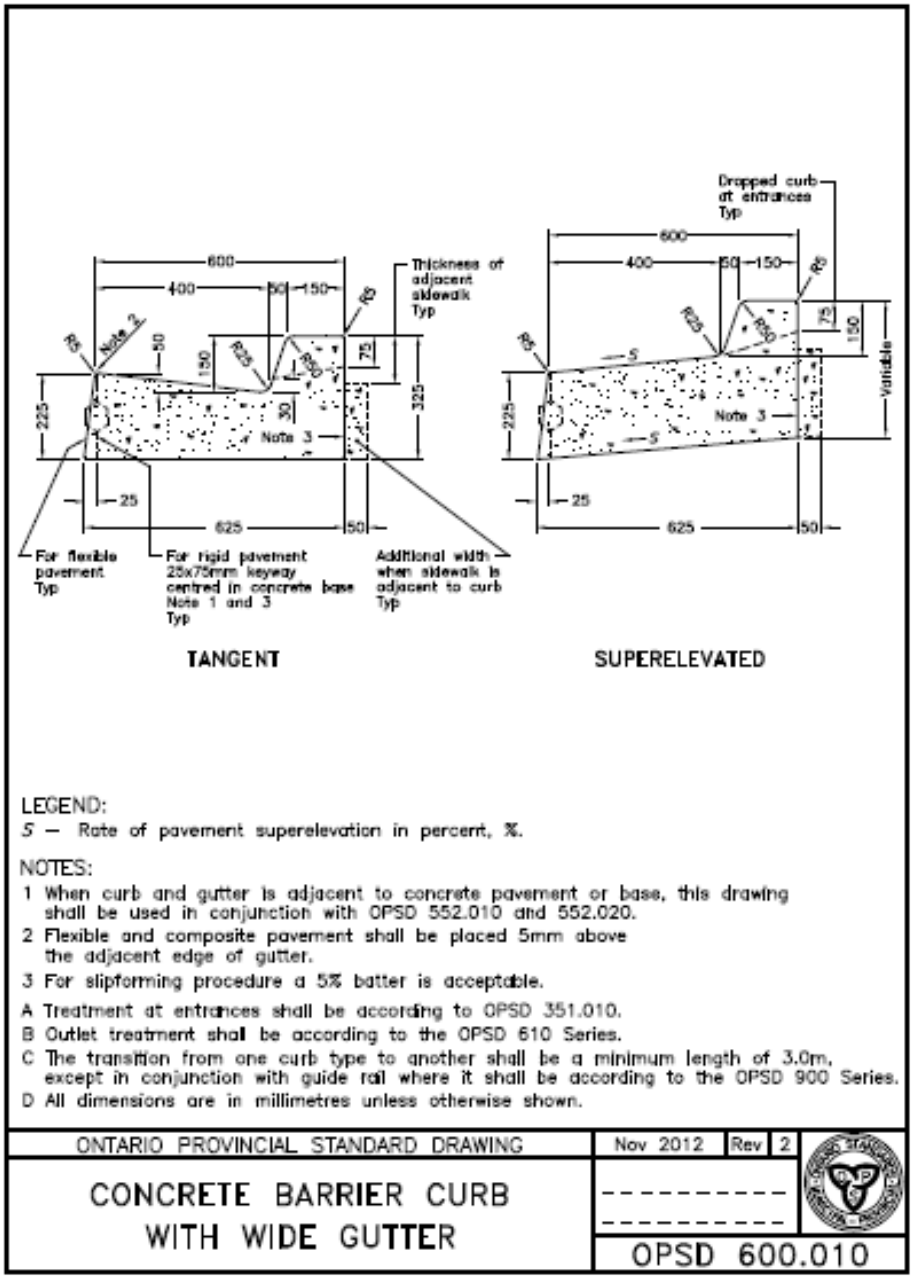
Urban New Construction Template

Two templates are to be created for the urban new construction section of this example one with barrier curb and one with mountable curb.

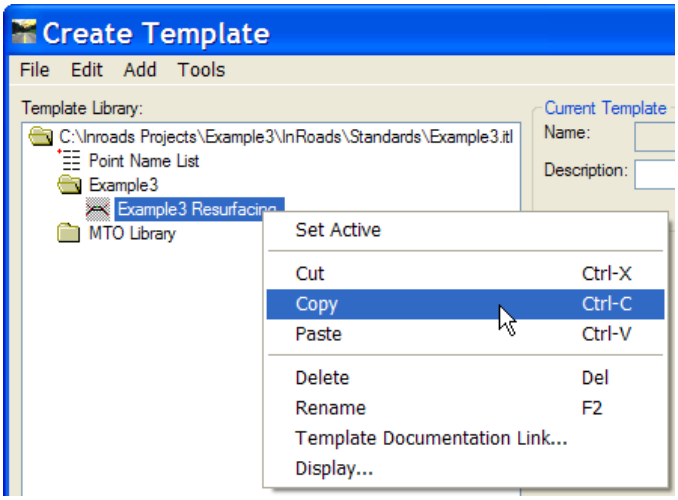
A) Urban Section with Barrier Curb Template

The following typical and OPSD 600.010 Concrete Barrier Curb With Wide Gutter are used to create urban section with barrier curb template.

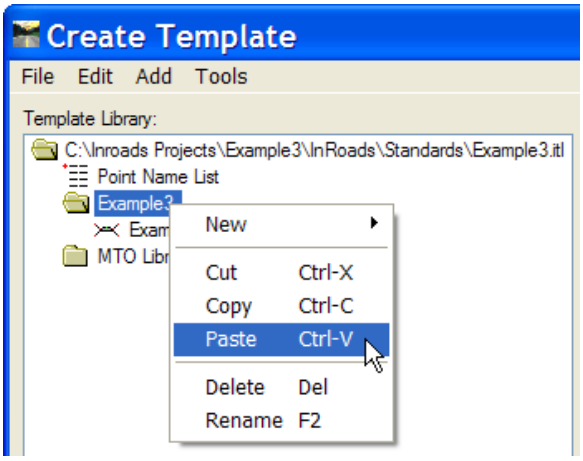

FILL SECTION
CUT SECTION
0.5
1.0
7.0
40mm surface course
50mm base course
80mm paved shoulder
OPSD-600.010
2%
3%
2:1 max
3:1
Existing ground
150mm granular 'A'
300mm granular 'B'


600
400
50
150
R5
Note 2
R25
R50
75
150
325
225
30
Note 3
25
625
Thickness of adjacent sidewalk Typ
Dropped curb at entrances Typ
Variable
S
For flexible pavement Typ
For rigid pavement 25x75mm keyway centred in concrete base Note 1 and 3 Typ
Additional width when sidewalk is adjacent to curb Typ
TANGENT
SUPERELEVATED
LEGEND:
S — Rate of pavement superelevation in percent, %.
NOTES:
1 When curb and gutter is adjacent to concrete pavement or base, this drawing shall be used in conjunction with OPSD 552.010 and 552.020.
2 Flexible and composite pavement shall be placed 5mm above the adjacent edge of gutter.
3 For slipforming procedure a 5% batter is acceptable.
A Treatment at entrances shall be according to OPSD 351.010.
B Outlet treatment shall be according to the OPSD 610 Series.
C The transition from one curb type to another shall be a minimum length of 3.0m, except in conjunction with guide rail where it shall be according to the OPSD 900 Series.
D All dimensions are in millimetres unless otherwise shown.
ONTARIO PROVINCIAL STANDARD DRAWING
Nov 2012
Rev 2
CONCRETE BARRIER CURB WITH WIDE GUTTER
OPSD 600.010

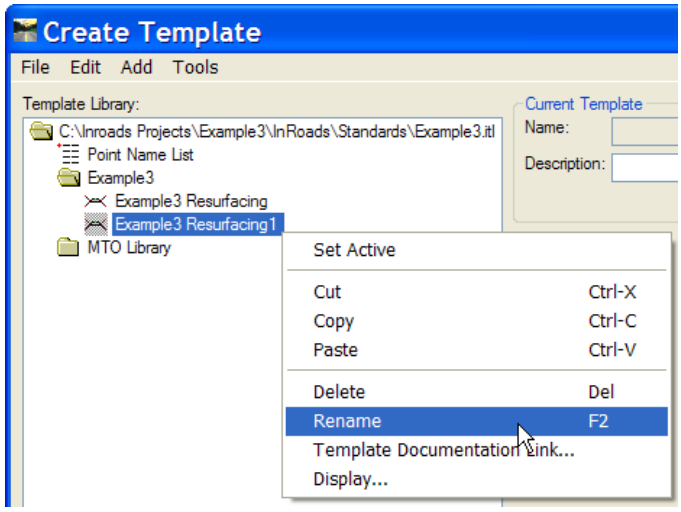
1. Select **Modeler > Create Template** to open the Create Template dialog.
2. Select the template ***Example3 Resurfacing*** from the *Template Library* on the left side of the dialog. Right click on the template then click **Copy** on the pop-up menu.

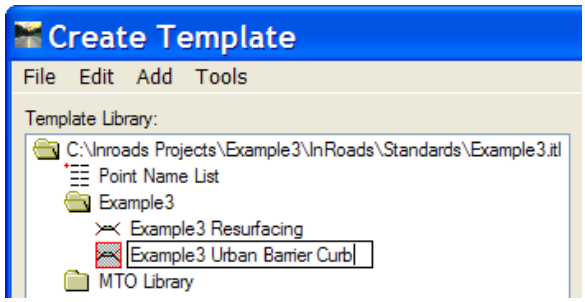


3. Right click on the folder *Example3* then click **Paste** on the pop-up menu.

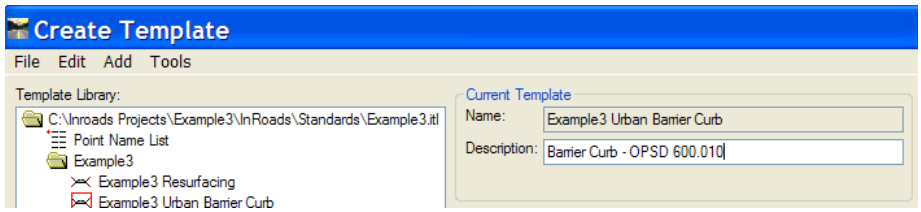


4. Right click on the newly copied template and click **Rename** on the pop-up menu. Type in a new name ***Example3 Urban Barrier Curb.***

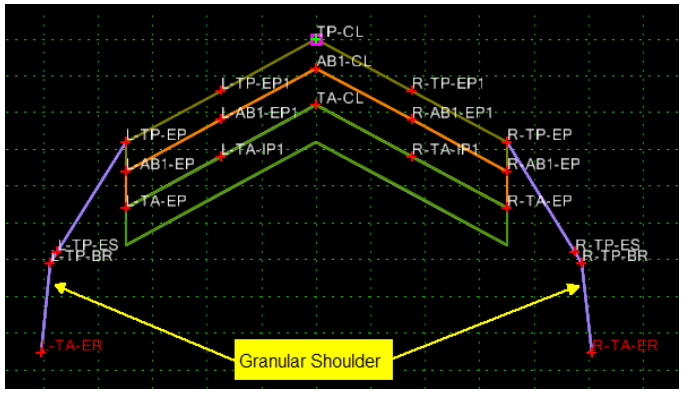




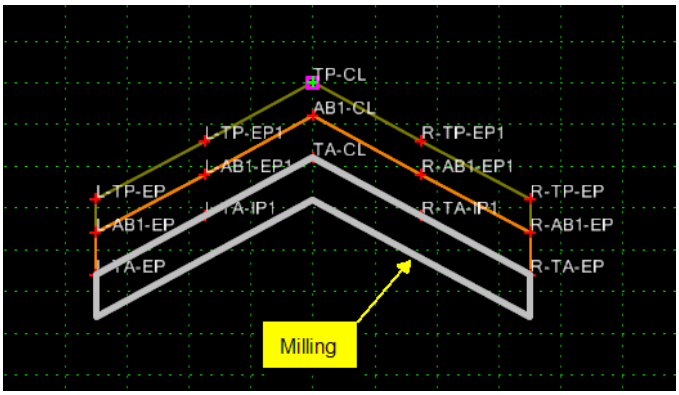
5. Change the information in the *Description* field for template *Example3 Urban Barrier Curb*. Click **File > Save**

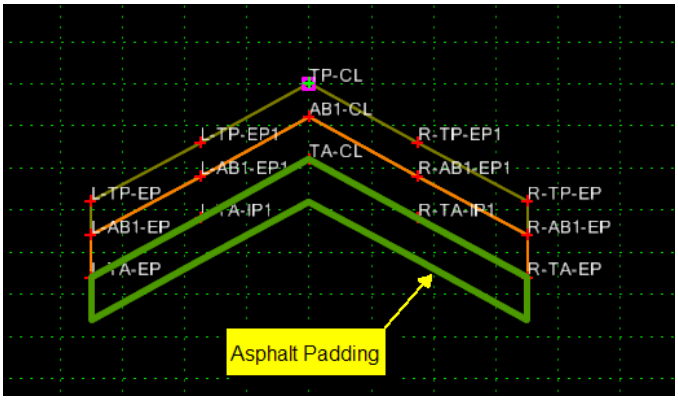


6. Delete the **Granular Shoulder** components on both sides.

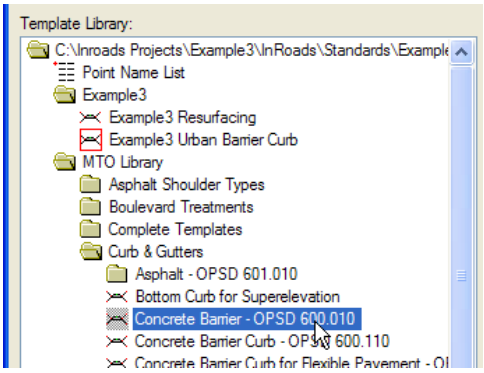


7. Delete component **Milling** and **Asphalt Padding**.

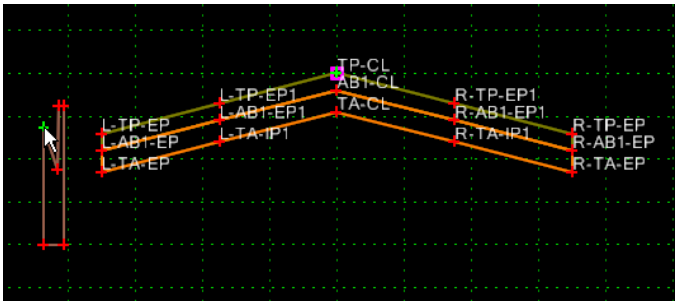




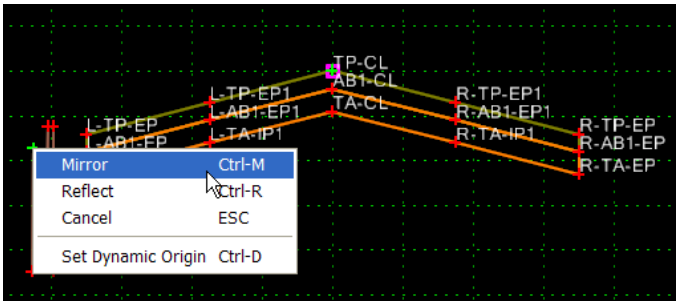
8. Double click on **MTO Library > Curb & Gutters** from the *Template Library* on the left side of Create Template dialog. Left click and hold the left mouse button on the template **Concrete Barrier - OPSD 600.010**.



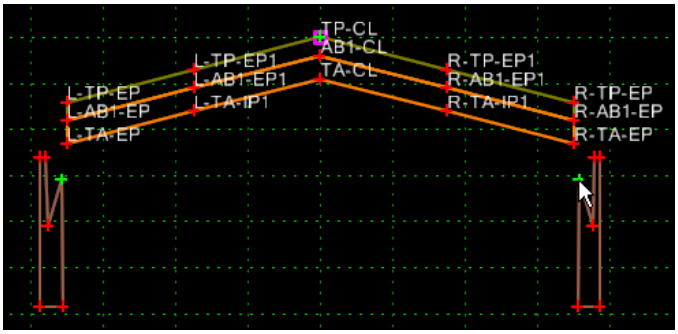
9. Drag the selected template to the right into the template display window.



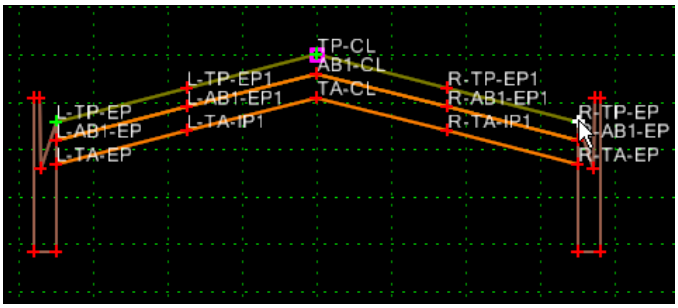
While holding the left mouse button, right click on the right button. Select **Mirror** option from the pop-up menu.



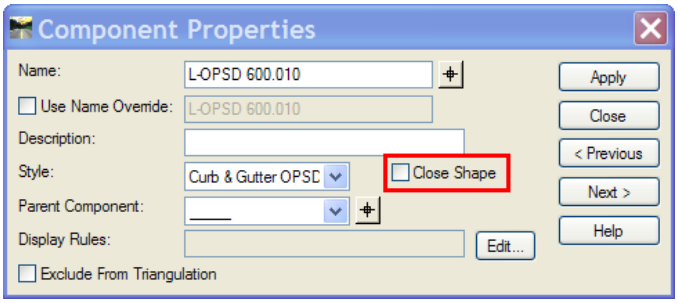
Two Curb & Gutter components appear.



Select point **R-TP-EP** as the attach point.

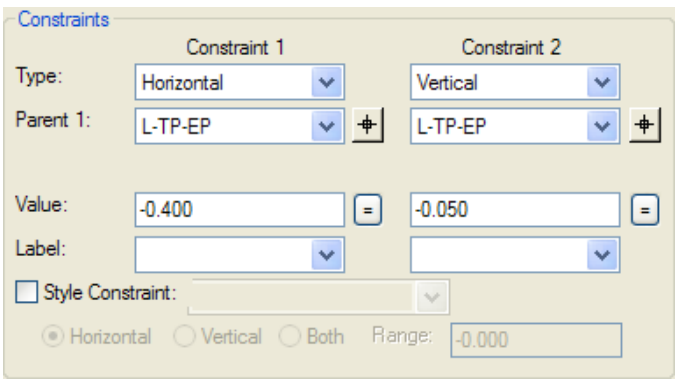


10. Double click on component **L-OPSD 600.010**. On the Component Properties dialog, toggle off the *Close Shape* option if it is on.

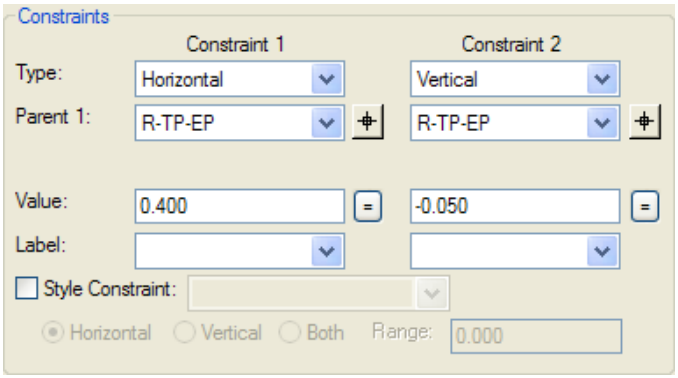


11. Double click on component **R-OPSD 600.010**. On the Component Properties dialog, toggle off the *Close Shape* option if it is on.
12. Verify the dimensions of inserted curb and gutter components as per the OPSD provided. Update the components accordingly.
13. Change the *Vertical* constraint value to ***-0.05*** for both points *L-TP-GU2* and *R-TP-GU2*.

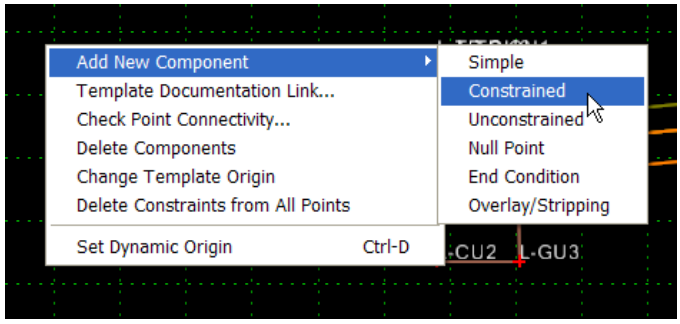
L-TP-GU2



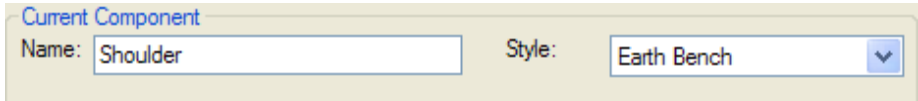
R-TP-GU2



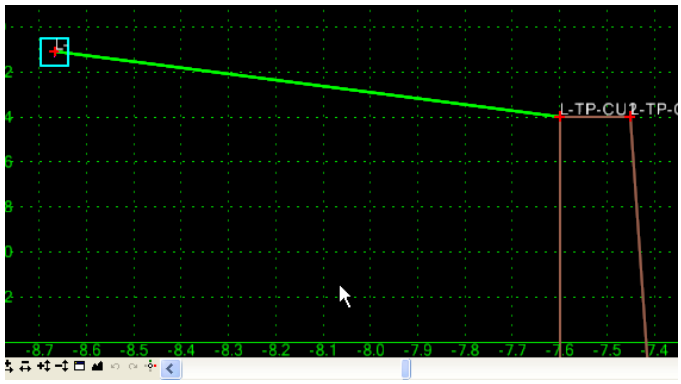
14. Create a new shoulder component ***L-Shoulder***. Right click in the template display window. Select **Add New Component** then **Constrained** from the pop-up menu.



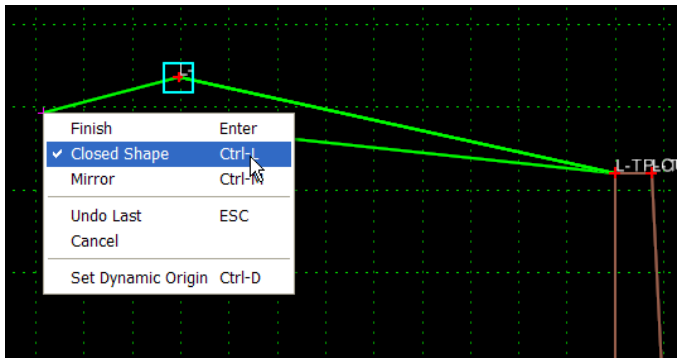
Set the *Current Component* as shown below:



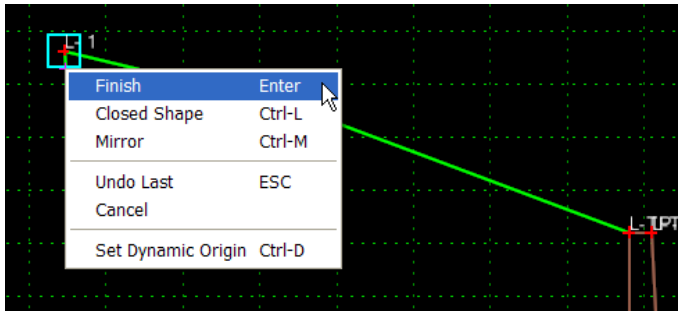
15. Start from point *L-TP-CU2* then click a point in the window to the left of the point *L-TP-CU2*.

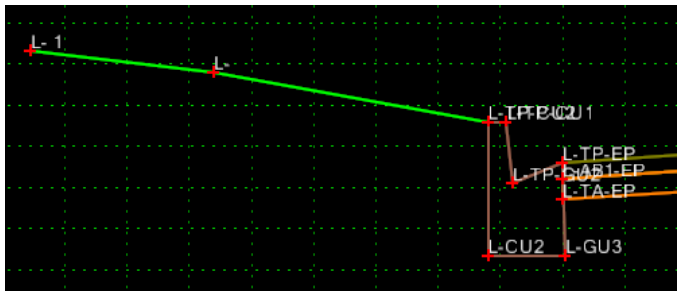


16. Move the cursor to the left of the newly created point *L-*, right click and toggle of the ***Closed Shape*** option from the pop-up menu.

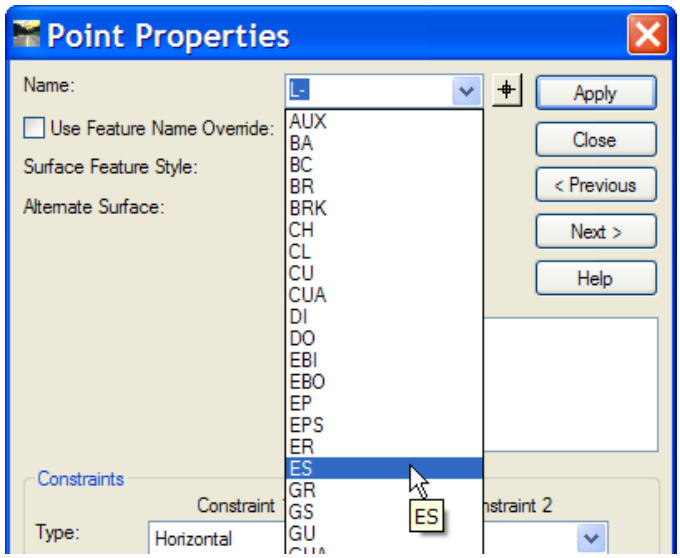


Left click to the left of point *L-* then right click and select ***Finish*** from the pop-up menu to complete the command.

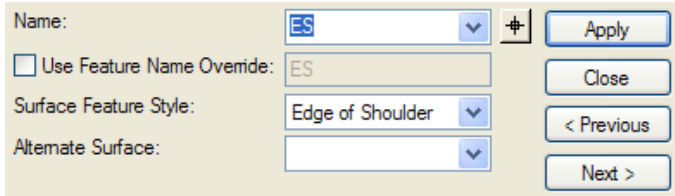




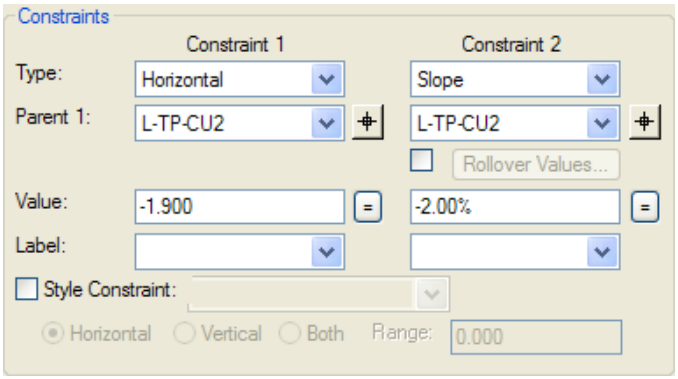
17. Double click on point ***L-***. The Point Properties dialog will appear. On the Point Properties dialog, select ***ES*** from the *Name* drop-down list.



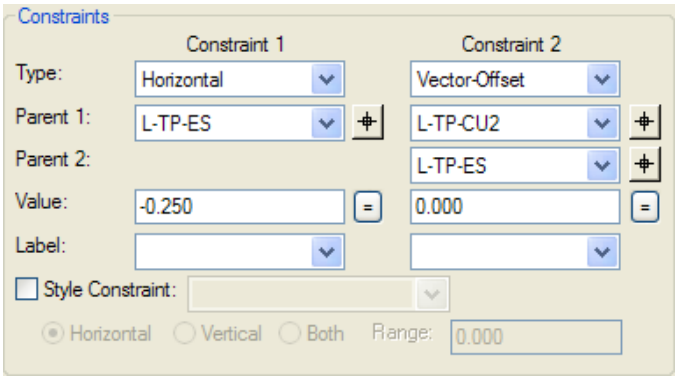
The *Name* field is populated with the selected name *ES* and the *Surface Feature Style* is changed to the style associated with the point name ES.



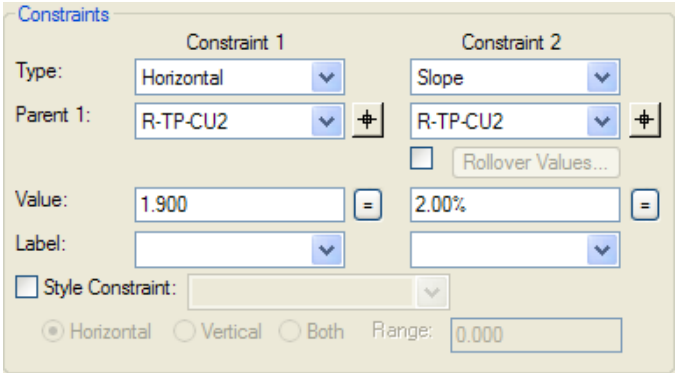
18. Rename the point name to ***L-TP-ES***. Click **Apply**. Set the point constraints as:



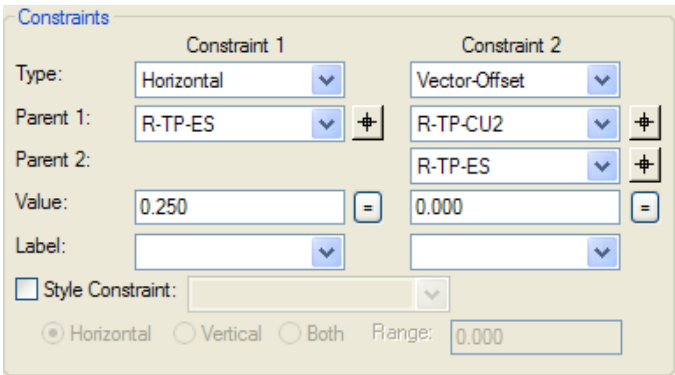
19. Click **Apply** and **Close**.
20. Double click on point ***L-1***. The Point Properties dialog will appear. On the Point Properties dialog, select ***BR*** from the *Name* drop-down list. Rename the point name to ***L-TP-BR***. Click **Apply**. Set the point constraints as:



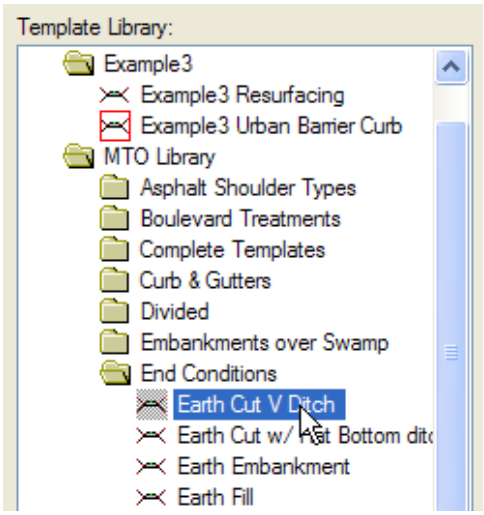
21. Click **Apply** and **Close.**
22. Similarly to the shoulder on the left side, create a new shoulder component ***R-Shoulder*** on the right side.
23. Rename the edge of shoulder point to ***R-TP-ES*** and set the point constraints as:



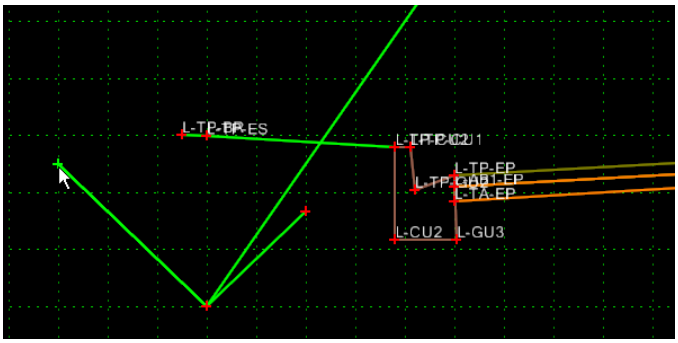
24. Rename the rounding breakpoint to ***R-TP-BR*** and set the point constraints as:



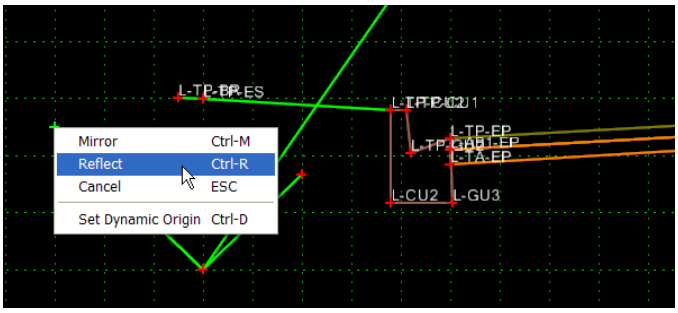
25. Click **Apply** and **Close.**
26. Attach end conditions to the template. Double click on **MTO Library > End Conditions** from the *Template Library* on the left side of Create Template dialog.
27. Left click and hold the left mouse button on the template **Earth Cut V Ditch.**



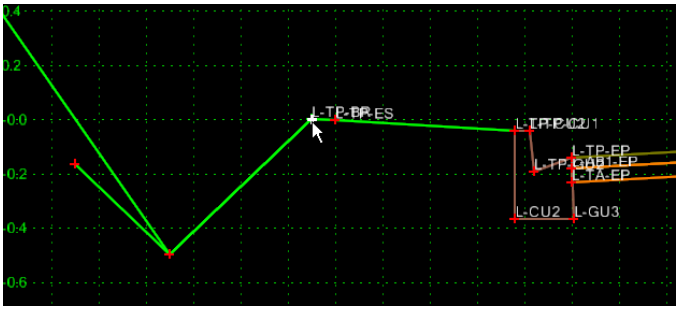
Drag the selected template to the right into the template display window.



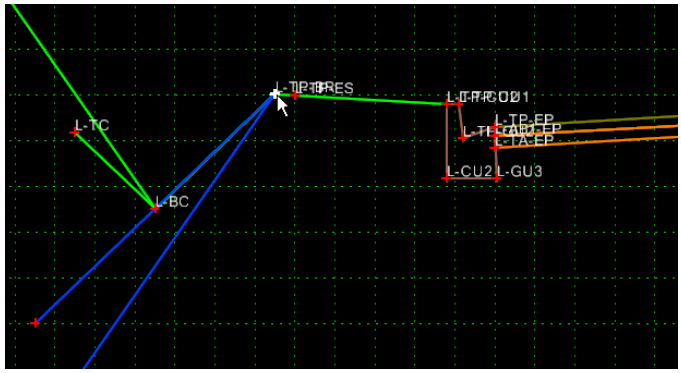
While holding the left mouse button, right click on the right button. Select **Reflect** option from the pop-up menu.



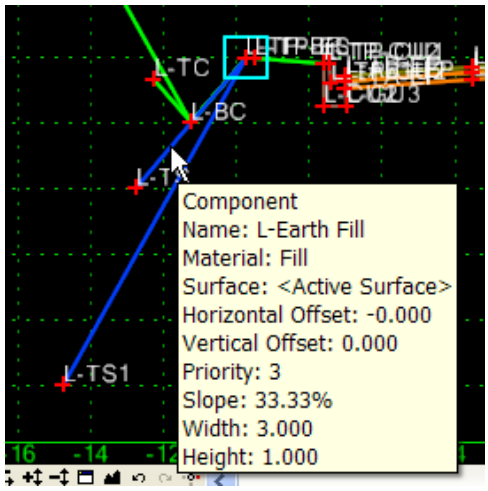
Attach to point *L-TP-BR*.

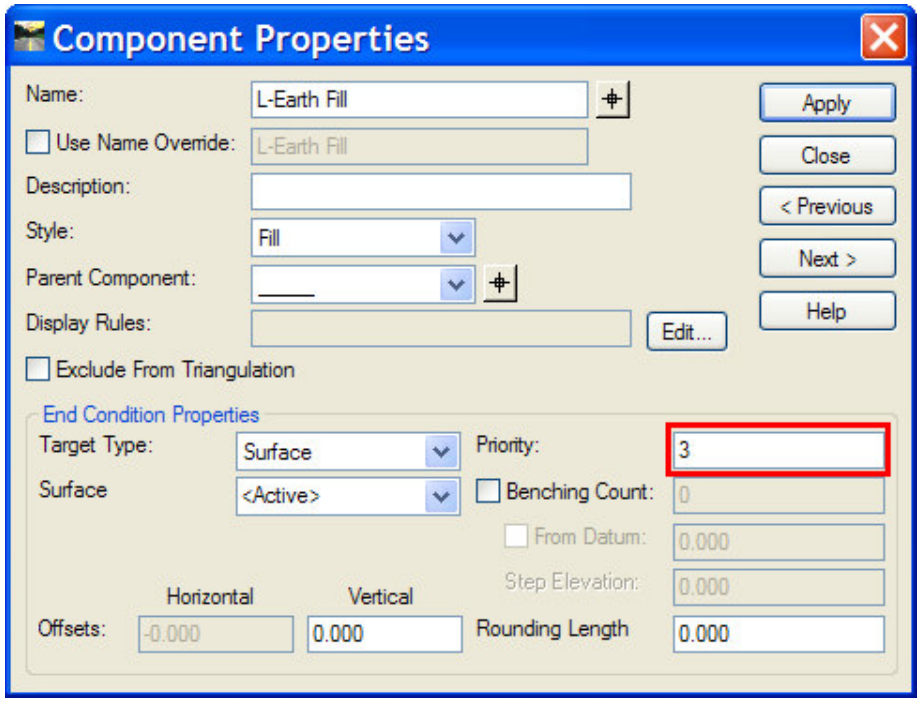


28. Select the template **Earth Fill** in the folder **MTO Library > End Conditions** from the *Template Library* on the left side of Create Template dialog.
29. Left click and hold the left mouse button on the template **Earth Fill**. Drag it into the template display window and attach to point *L-TP-BR*.

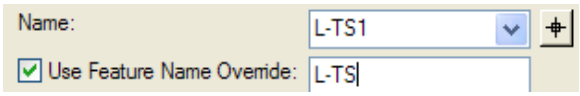


30. Double click on component **L-Earth Fill**. On the Component Properties dialog, change the **Priority** to ***3***.

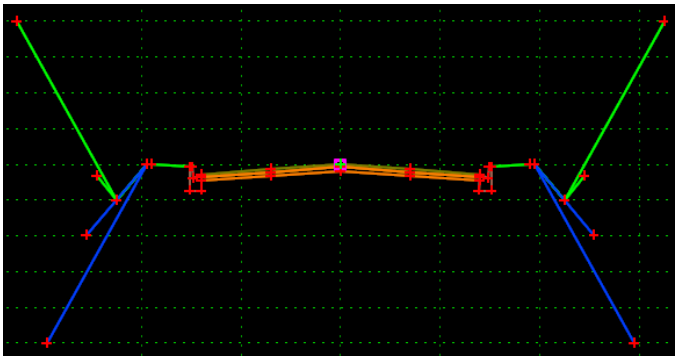




31. Click **Apply** and **Close**.
32. Double click on component **L-Earth Fill2**. On the Component Properties dialog, change the **Priority** to ***4***. Click **Apply** and **Close**.
33. Double click on point **L-TS1**. Toggle on *Use Feature Name Override* and type in ***L-TS***. Click **Apply** and **Close**.

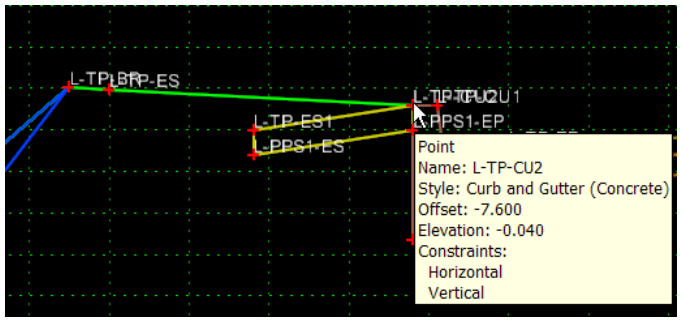


34. Double click on point **L-TC1**. Toggle on *Use Feature Name Override* and type in ***L-TC***. Click **Apply** and **Close**.
35. Select the template **Earth Cut V Ditch** in the folder **MTO Library > End Conditions** from the *Template Library* on the left side of Create Template dialog.
36. Left click and hold the left mouse button on the template **Earth Cut V Ditch**. Drag it into the template display window. While holding the left mouse button, right click on the right button. Toggle off the **Reflect** option from the pop-up menu. Attach the template to point *R-TP-BR*.
37. Select the template **Earth Fill** in the folder **MTO Library > End Conditions** from the *Template Library* on the left side of Create Template dialog.
38. Left click and hold the left mouse button on the template **Earth Fill**. Drag it into the template display window and attach to point *R-TP-BR*.

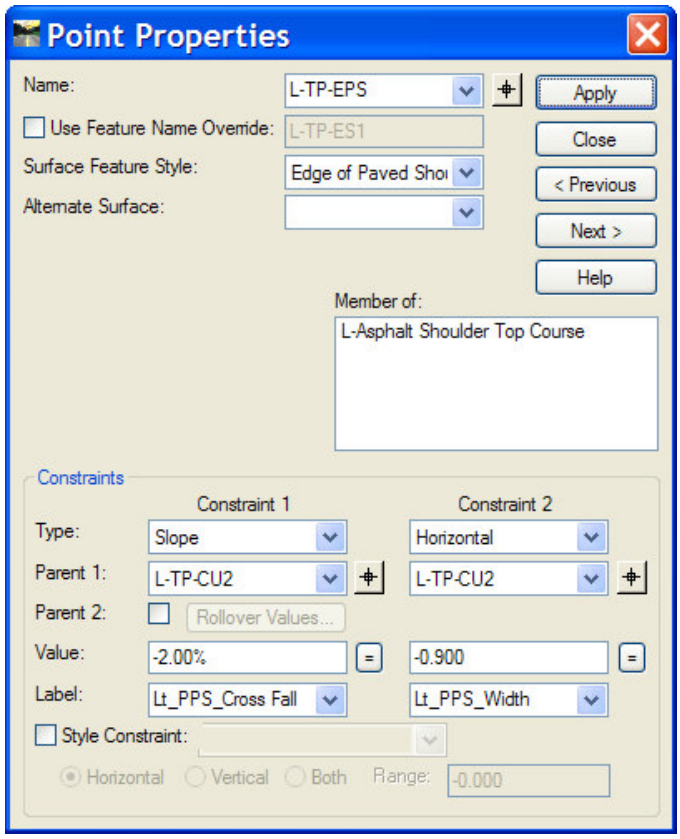


39. Find component **R-Earth Fill** and change the **Priority** to ***3***.
40. Find component **R-Earth Fill2** and change the **Priority** to ***4***.
41. Toggle on *Use Feature Name Override* for both points **R-TS1** and **R-TC1**. Override *R-TS1* with name ***R-TS*** and *R-TC1* with name ***R-TC***.
42. Add paved shoulder components to the template. Double click on **MTO Library > Asphalt Shoulder Types > Partially Paved – Type 3** from the *Template Library* on the left side of Create Template dialog.

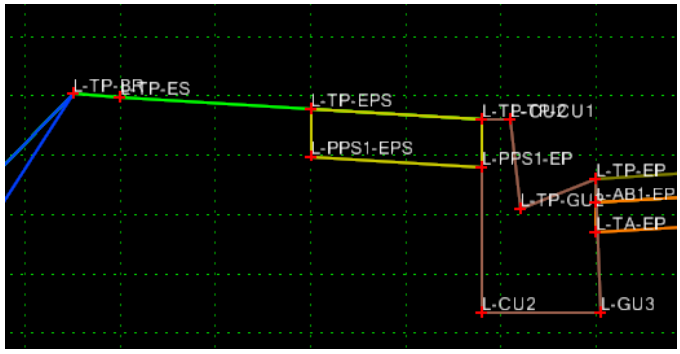
43. Left click and hold the left mouse button on the template **Asphalt Shoulder Top Course**. Drag it into the template display window. Toggle on the **Reflect** option and attach to point *L-TP-CU2*.



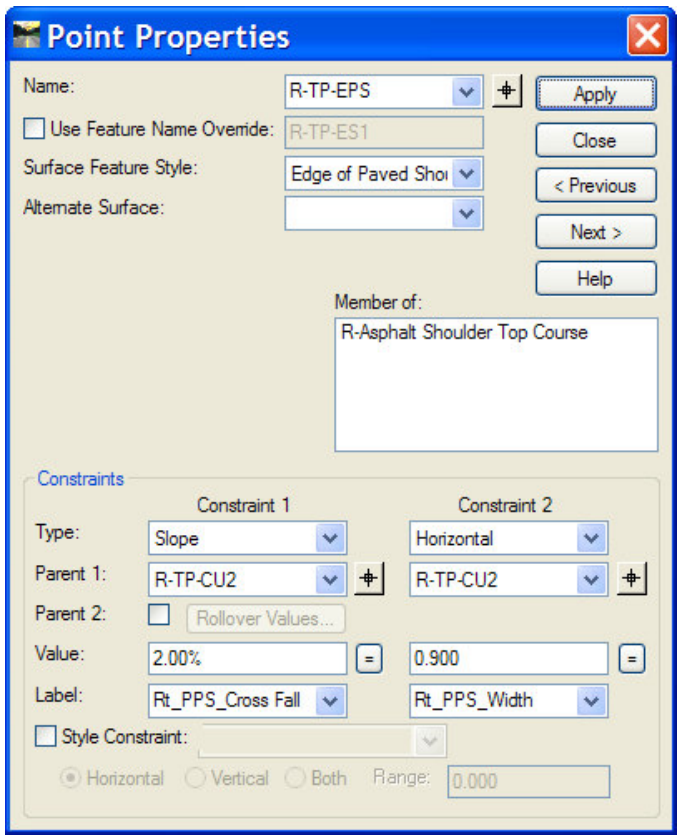
44. Rename point *L-TP-ES1* to ***L-TP-EPS*** and set Point Properties as shown below.



45. Rename point *L-PPS1-ES* to ***L-PPS1-EPS*** and change the *Surface Feature Style* to ***Edge of Paved Shoulder***.
46. Change the *Vertical* constraint value to ***-0.08*** for both points *L-PPS1-EPS* and *L-PPS1-EP*.

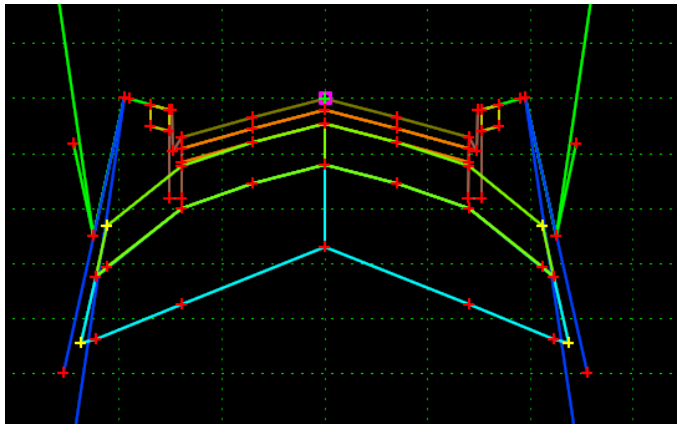


47. Add paved shoulder components to the right shoulder. Attach the template **Asphalt Shoulder Top Course** to point *R-TP-CU2* with the **Reflect** option toggled off.
48. Rename point *R-TP-ES1* to ***R-TP-EPS*** and set Point Properties as shown below.

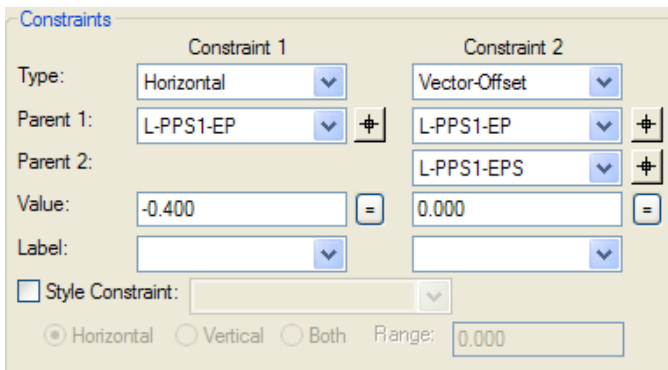


49. Rename point *R-PPS1-ES* to ***R-PPS1-EPS*** and change the *Surface Feature Style* to ***Edge of Paved Shoulder***.
50. Change the *Vertical* constraint value to ***-0.08*** for both points *R-PPS1-EPS* and *R-PPS1-EP*.
51. Add granular components to the template. Double click on **MTO Library > Granular Courses > Granular A & B** from the *Template Library* on the left side of Create Template dialog.

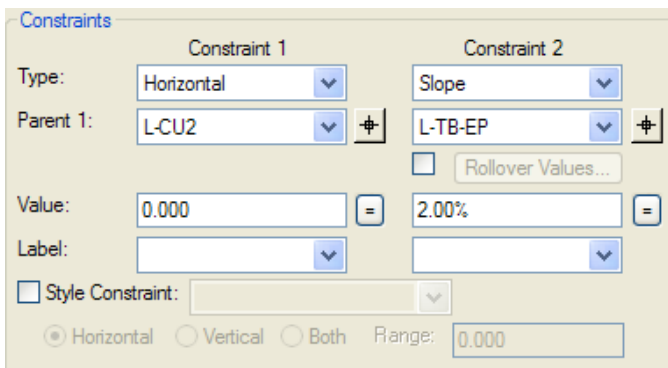
52. Left click and hold the left mouse button on the template **Inner & Outer Lanes**. Drag it into the template display window. Toggle on the **Mirror** option and attach to point *TP-CL*.



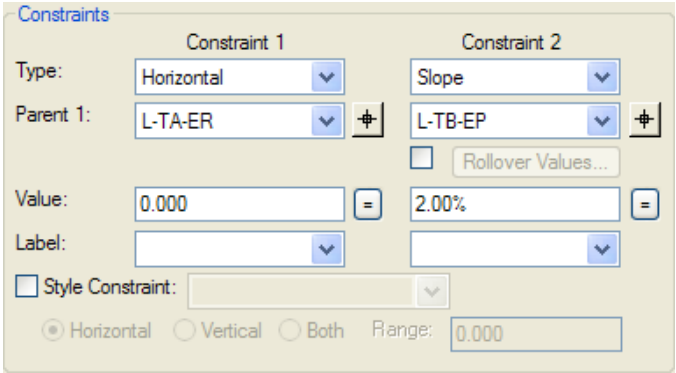
53. Move point *L-TA-EP1* to point *L-TA-EP* and merge with point *L-TA-EP*. Set point constraints for point ***L-TA-ER*** as:



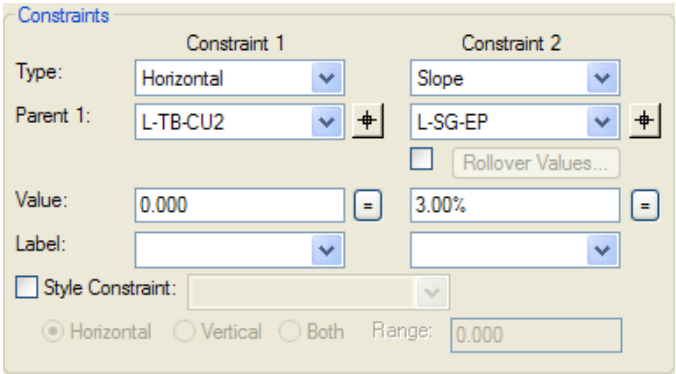
54. Rename point *L-TB-AUX* to **L-TB-CU2** and set point constraints as:



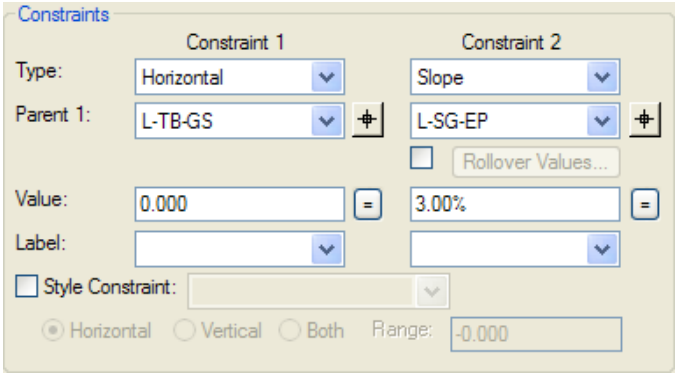
55. Set point constraints for point ***L-TB-GS*** as:



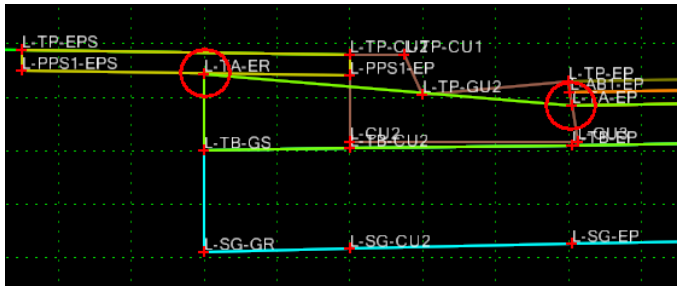
56. Rename point *L-SG-AUX* to **L-SG-CU2** and set point constraints as:



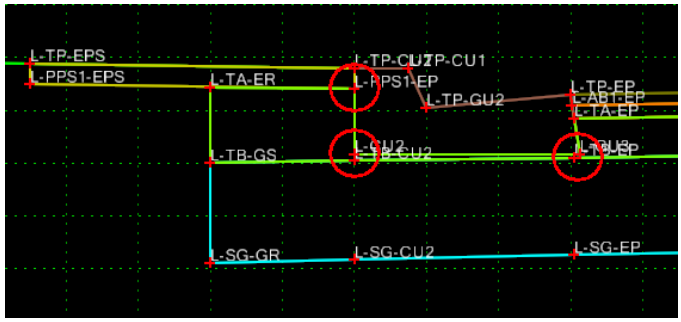
57. Set point constraints for point ***L-SG-GR*** as:



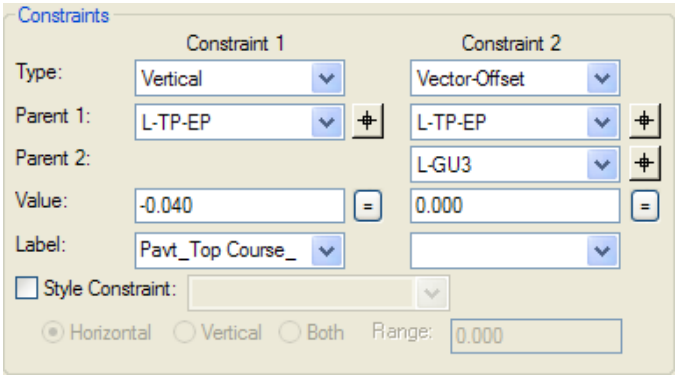
58. Add three points on components **L-Granular A** between points *L-TA-ER* and *L-TA-EP*.



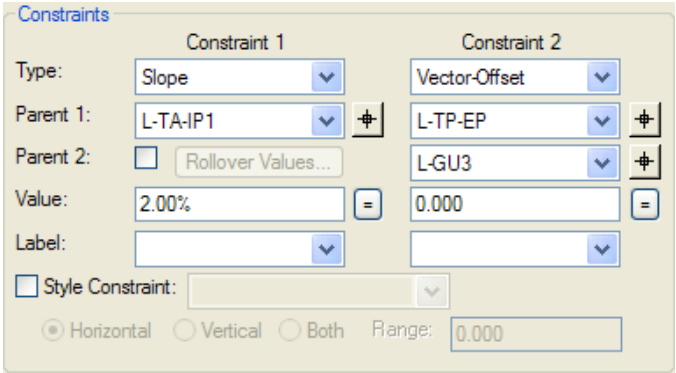
59. Insert the first point at existing points *L-PPS1-EP* and merge with point ***L-PPS1-EP***. Insert the second point at *L-CU2* and merge with **L-Cu2**. Insert the third point at *L-GU3* and merge with ***L-GU3***.



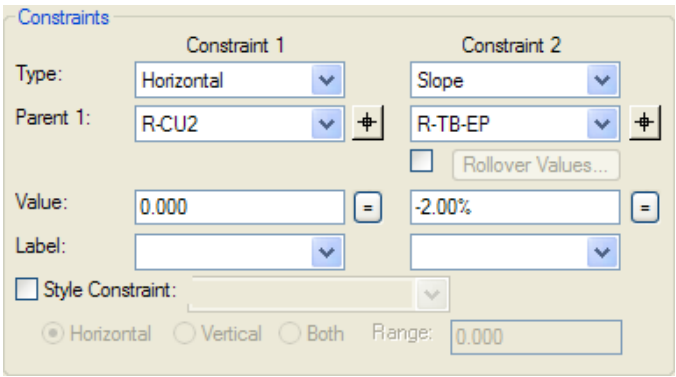
60. Set point constraints for point ***L-AB1-EP*** as:



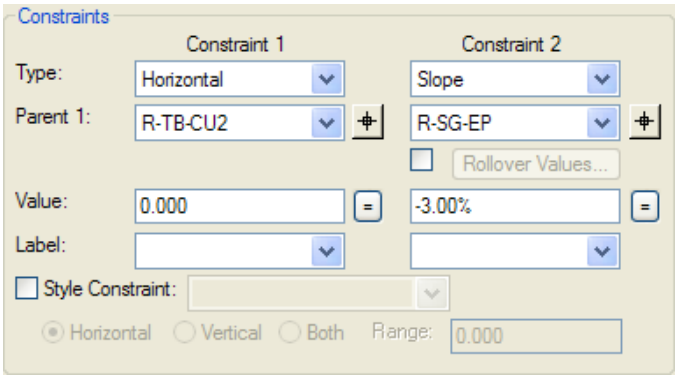
61. Set point constraints for point ***L-TA-EP*** as:



62. Repeat above process to modify the granular components on the right side. Rename point *R-TB-AUX* to **R-TB-CU2** and set point constraints as:



63. Rename point *R-SG-AUX* to **R-SG-CU2** and set point constraints as:



64. The point constraints for points ***R-TA-ER, R-TB-GS, R-SG-GR, R-AB1-EP,*** and ***R-TA-EP*** are set as:

R-TA-ER

Constraints

	Constraint 1	Constraint 2
Type:	Horizontal	Vector-Offset
Parent 1:	R-PPS1-EP	R-PPS1-EP
Parent 2:		R-PPS1-EPS
Value:	0.400	0.000
Label:		

R-TB-GS

Constraints

	Constraint 1	Constraint 2
Type:	Horizontal	Slope
Parent 1:	R-TA-ER	R-TB-EP
		Rollover Values...
Value:	0.000	-2.00%
Label:		

R-SG-GR

Constraints

	Constraint 1	Constraint 2
Type:	Horizontal	Slope
Parent 1:	R-TB-GS	R-SG-EP
		Rollover Values...
Value:	0.000	-3.00%
Label:		

R-AB1-EP

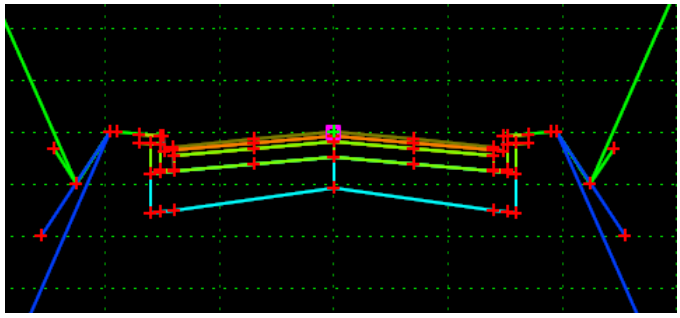
Constraints

	Constraint 1	Constraint 2
Type:	Vertical	Vector-Offset
Parent 1:	R-TP-EP	R-TP-EP
Parent 2:		R-GU3
Value:	-0.040	0.000
Label:	Pavt_Top Course_	

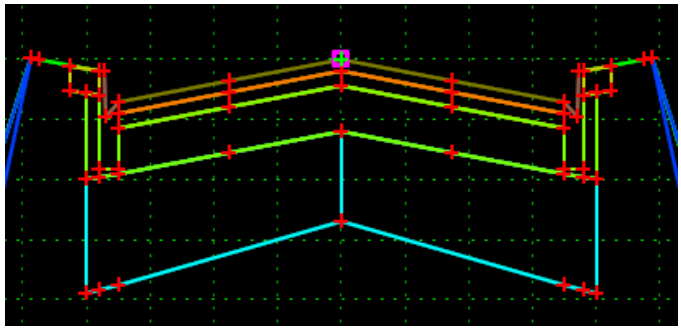
R-TA-EP

Constraints

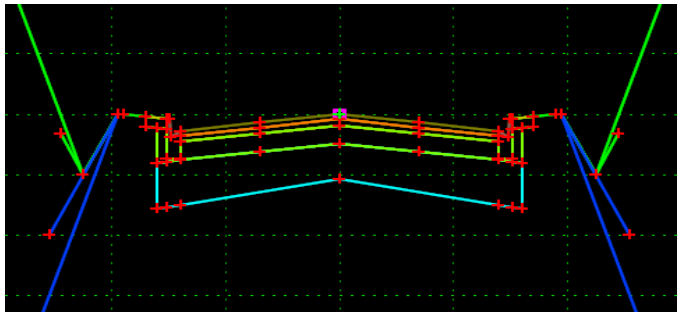
	Constraint 1	Constraint 2
Type:	Slope	Vector-Offset
Parent 1:	R-TA-IP1	R-TP-EP
Parent 2:	Rollover Values...	R-GU3
Value:	-2.00%	0.000
Label:		



65. Right click on the vertical line between components **L-Granular A** and **R-Granular A** then select **Merge Components** from the pop-up menu. Rename the merged component to **Granular A**.



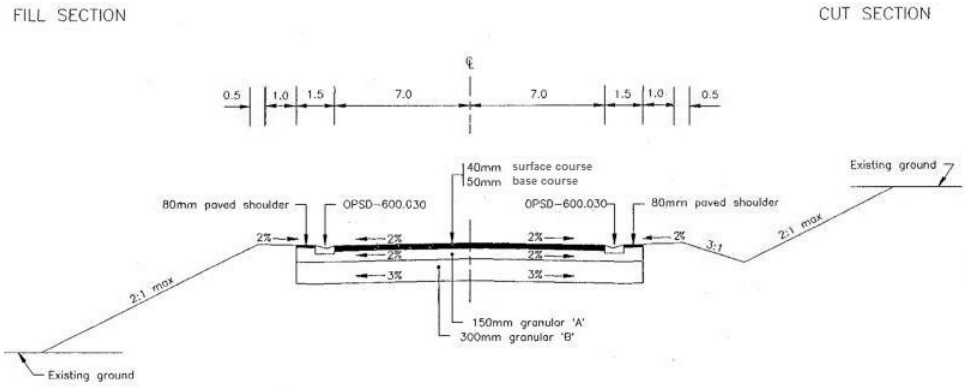
66. Right click on the vertical line between components **L-Granular B** and **R-Granular B** then select **Merge Components** from the pop-up menu. Rename the merged component to **Granular B**.

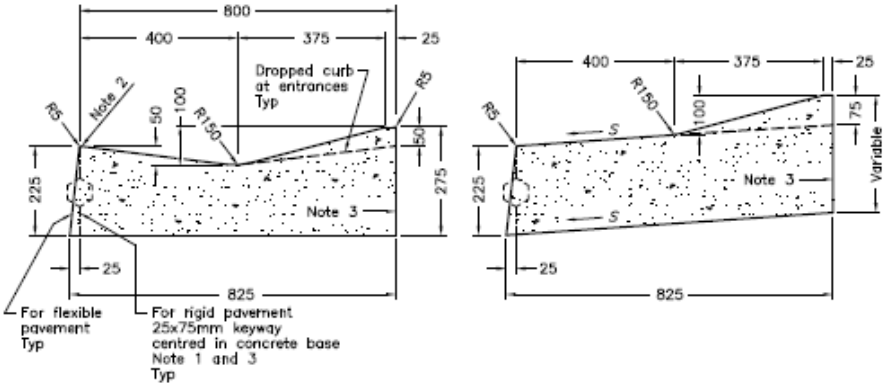


67. Click **File > Save**.

B) Urban Section with Mountable Curb Template

The following typical and OPSD 600.030 Concrete Mountable Curb With Wide Gutter are used to create urban section with mountable curb template.





TANGENT

SUPERELEVATED

LEGEND:

S – Rate of pavement superelevation in percent, %.

NOTES:

1 When curb and gutter is adjacent to concrete pavement or base, this drawing shall be used in conjunction with OPSD 552.010 and 552.020.

2 Flexible and composite pavement shall be placed 5mm above the adjacent edge of gutter.

3 For slipforming procedure a 5% batter is acceptable.

A Treatment at entrances shall be according to OPSD 351.010.

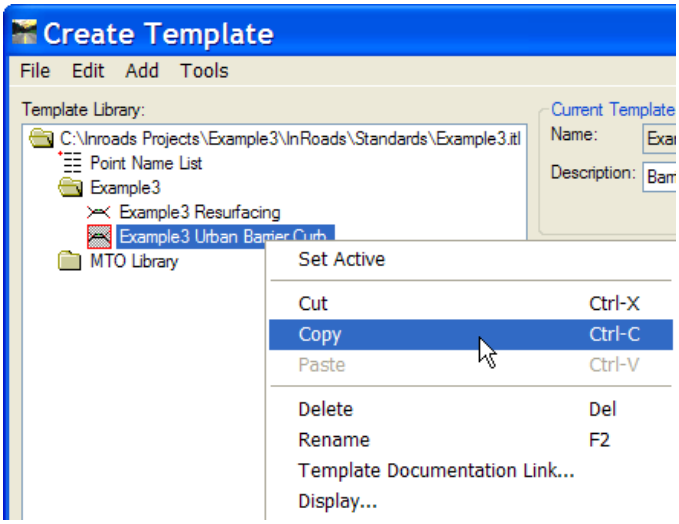
B Outlet treatment shall be according to the OPSD 610 Series.

C The transition from one curb type to another shall be a minimum length of 3.0m, except in conjunction with guide rail where it shall be according to the OPSD 900 Series.

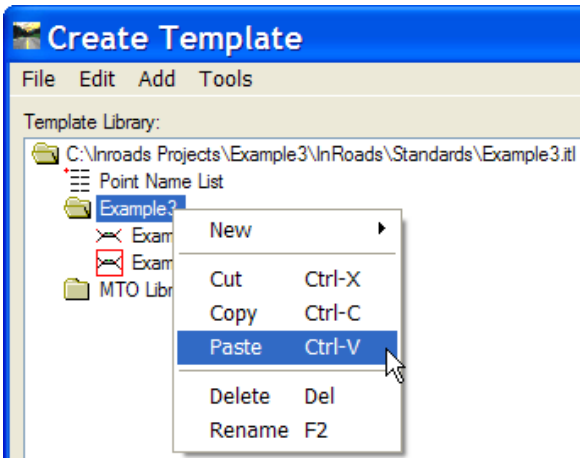
D All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2012	Rev	2
CONCRETE MOUNTABLE CURB WITH WIDE GUTTER	---------- ----------		
	OPSD 600.030		

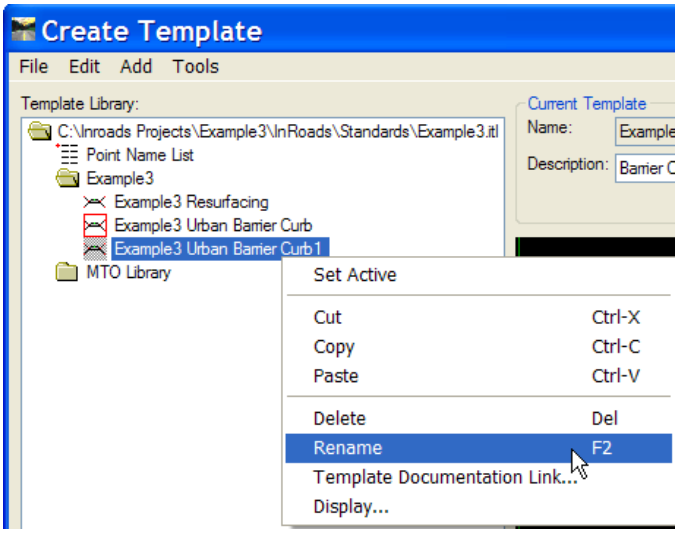
1. Select **Modeler > Create Template** to open the Create Template dialog.
2. Select the template ***Example3 Urban Barrier Curb*** from the *Template Library* on the left side of the dialog. Right click on the template then click **Copy** on the pop-up menu.



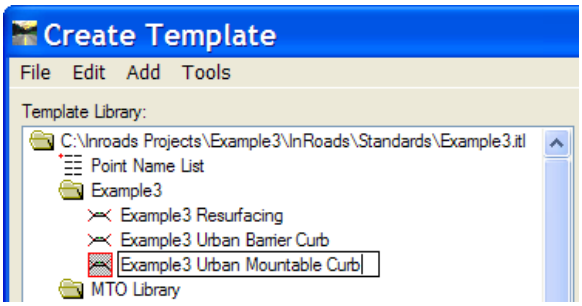
3. Right click on the folder *Example3* then click **Paste** on the pop-up menu.



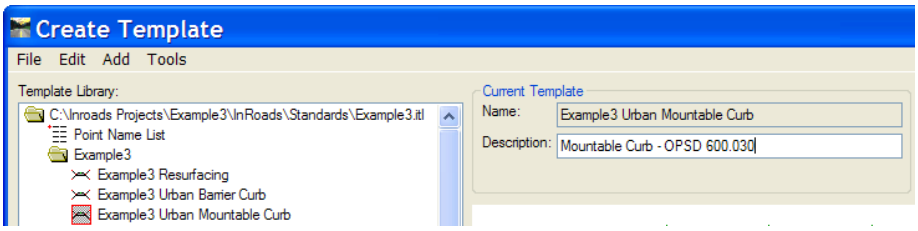
4. Right click on the newly copied template and click **Rename** on the pop-up menu.



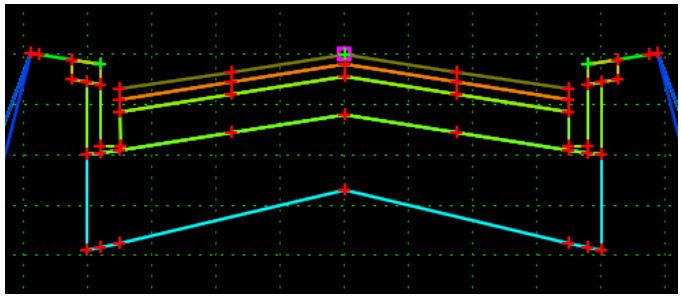
Rename it to ***Example3 Urban Mountable Curb.***



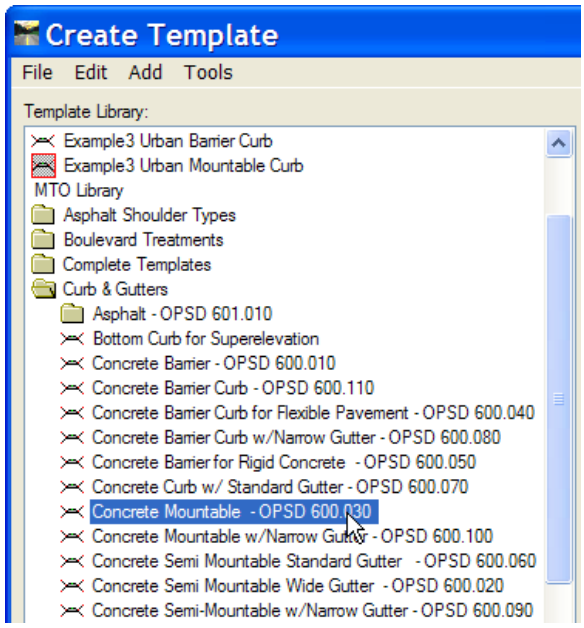
5. Change the *Description* for template *Example3 Urban mountable Curb*.



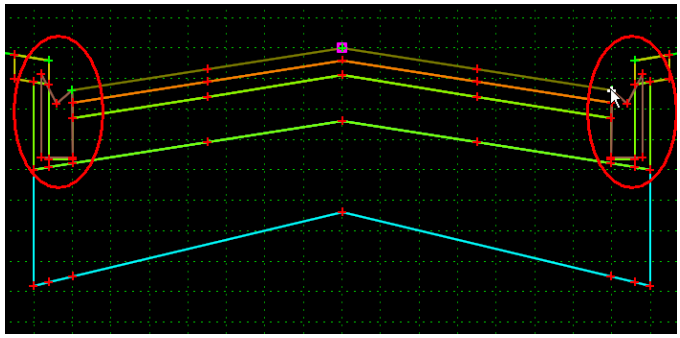
6. Click **File > Save**.
7. Delete the barrier curb components on both sides.



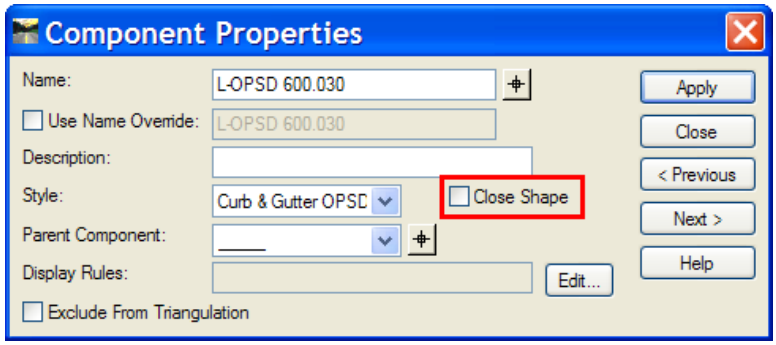
8. Double click on **MTO Library > Curb & Gutters** from the *Template Library* on the left side of Create Template dialog.
9. Left click and hold the left mouse button on the template **Concrete Mountable - OPSD 600.030**.



10. Drag the selected template to the right into the template display window. While holding the left mouse button, right click on the right button. Toggle on the **Mirror** option from the pop-up menu and attach the template to point *R-TP-EP*.

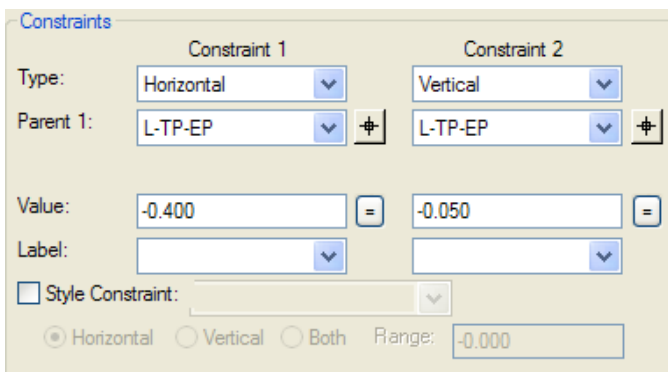


11. Double click on component **L-OPSD 600.030**. On the Component Properties dialog, toggle off the *Close Shape* option if it is on.

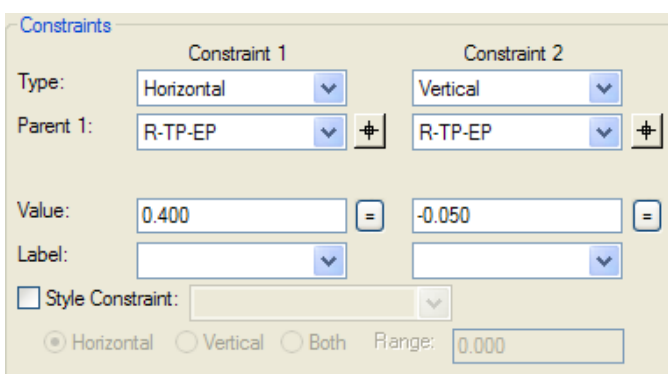


12. Double click on component **R-OPSD 600.030**. On the Component Properties dialog, toggle off the *Close Shape* option if it is on.
13. Verify the dimensions of inserted curb and gutter components as per the OPSD provided. Update the components accordingly.
14. Change the *Vertical* constraint value to ***-0.05*** for both points *L-TP-GU2* and *R-TP-GU2*.

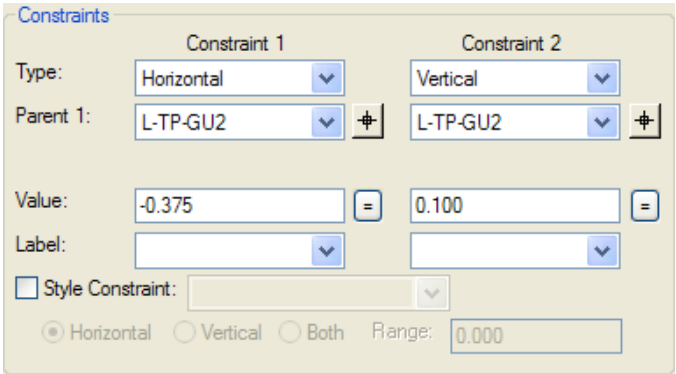
L-TP-GU2



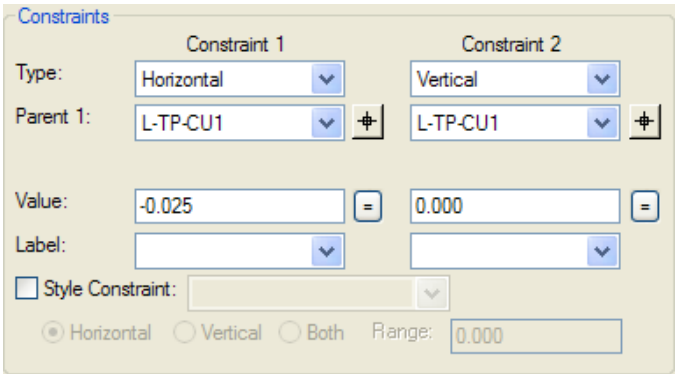
R-TP-GU2



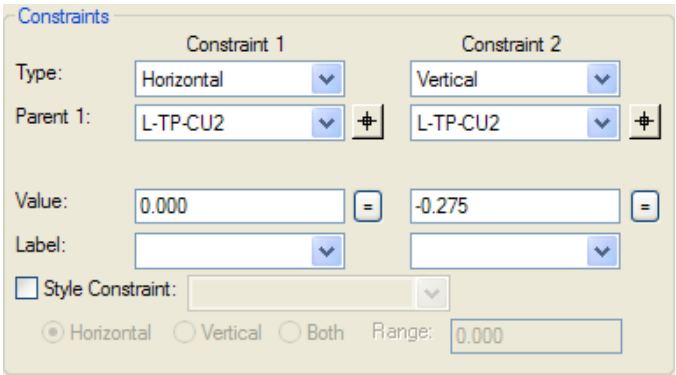
15. Insert a point ***L-TP-CU1*** between points *L-TP-CU21* and *L-TP-GU2*. Set point constraints as:



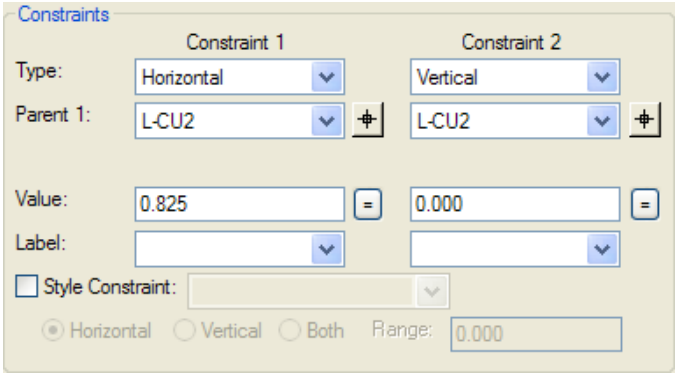
16. Move point *L-TP-CU21* to point *L-TP-CU2* and merge with point *L-TP-CU2*. Set point constraints for point ***L-TP-CU2*** as:

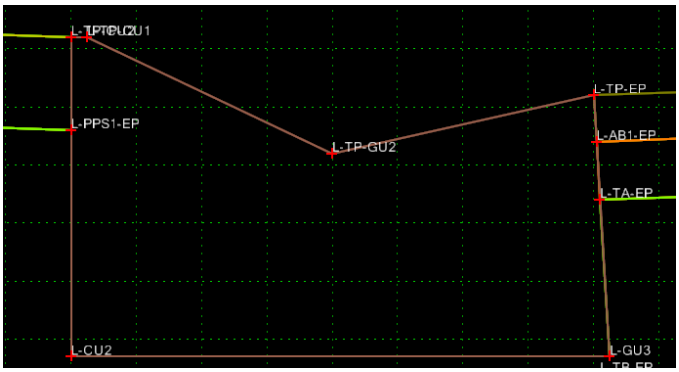


17. Move point *L-CU2* to point *L-CU21* and merge with point *L-CU2*. Set point constraints for point ***L-CU2*** as:

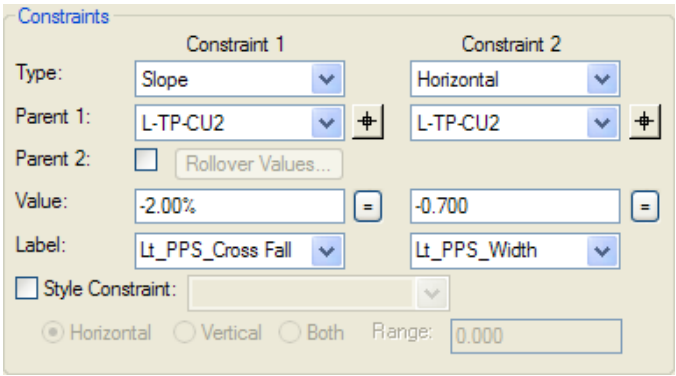


18. Move point *L-GU3* to point *L-GU31* and merge with point *L-GU3*. Set point constraints for point ***L-GU3*** as:

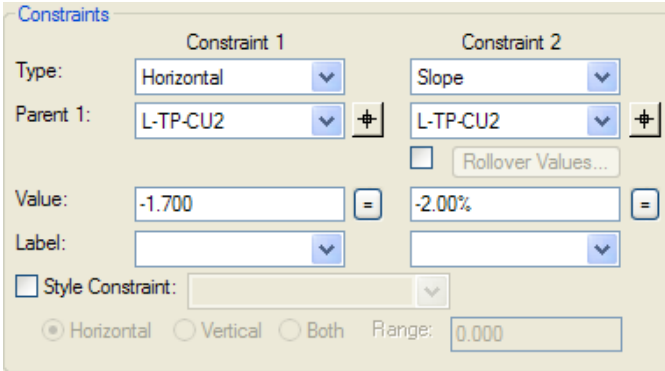




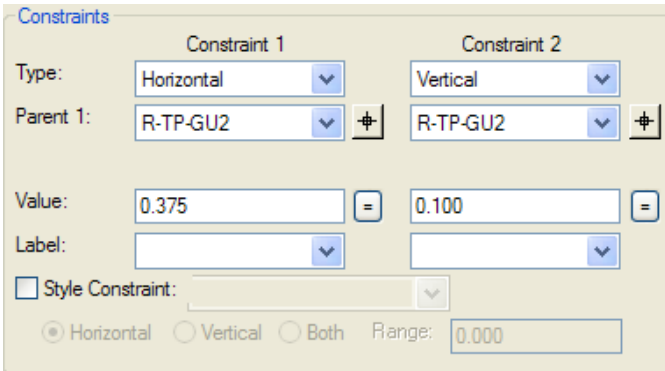
19. Set point constraints for point ***L-TP-EPS*** as:



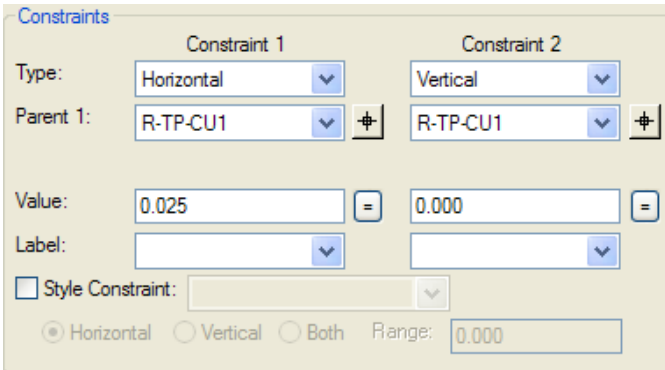
20. Set point constraints for point ***L-TP-ES*** as:



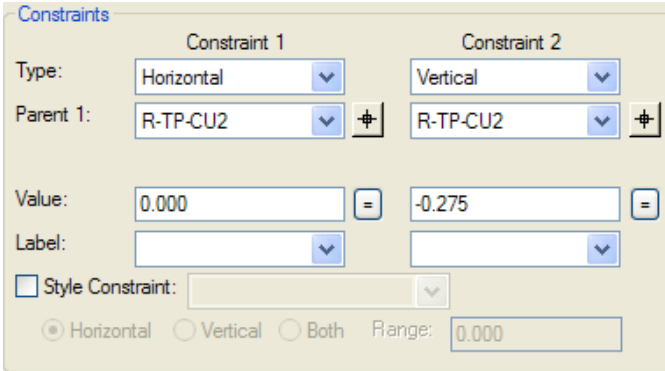
21. Insert a point ***R-TP-CU1*** between points *R-TP-CU21* and *R-TP-GU2*. Set point constraints as:



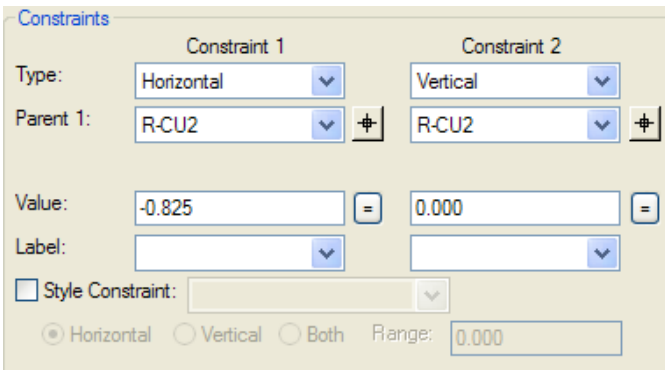
22. Move point *R-TP-CU2* to point *R-TP-CU21* and merge with point *R-TP-CU2*. Set point constraints for point ***R-TP-CU2*** as:

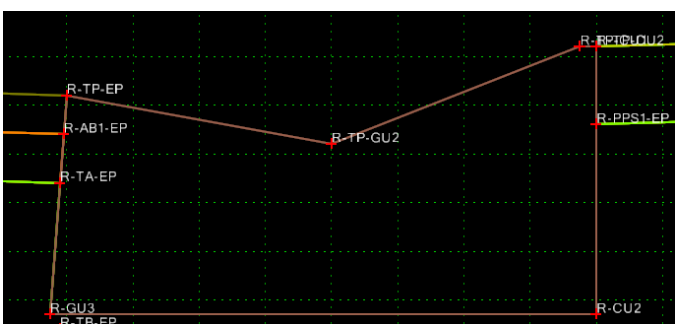


23. Move point *R-CU2* to point *R-CU21* and merge with point *R-CU2*. Set point constraints for point ***R-CU2*** as:

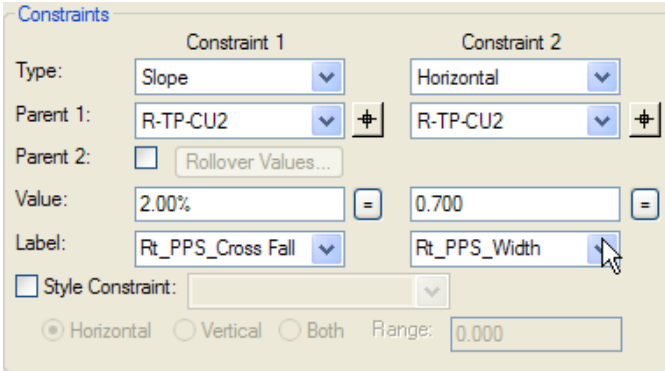


24. Move point *R-GU3* to point *R-GU31* and merge with point *R-GU3*. Set point constraints for point ***R-GU3*** as:

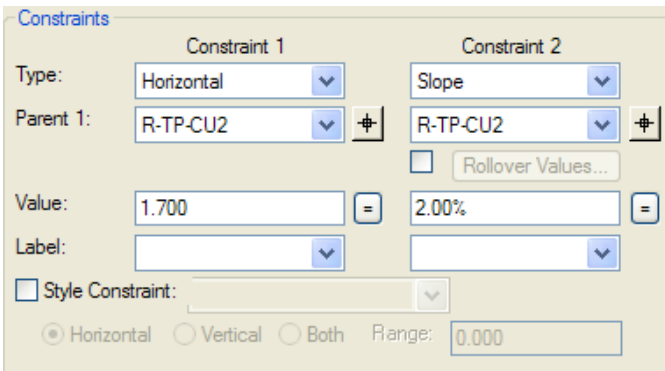




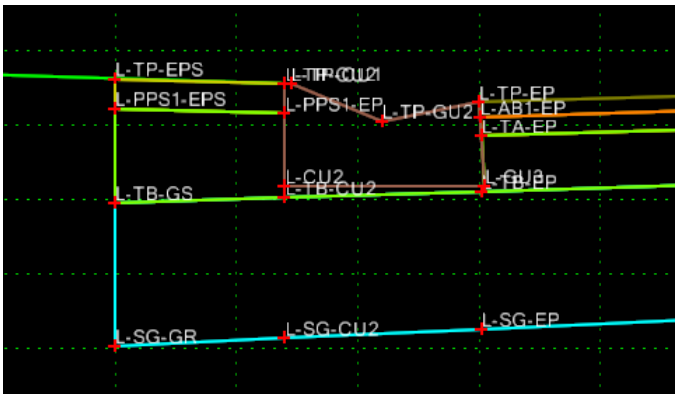
25. Set point constraints for point ***R-TP-EPS*** as:



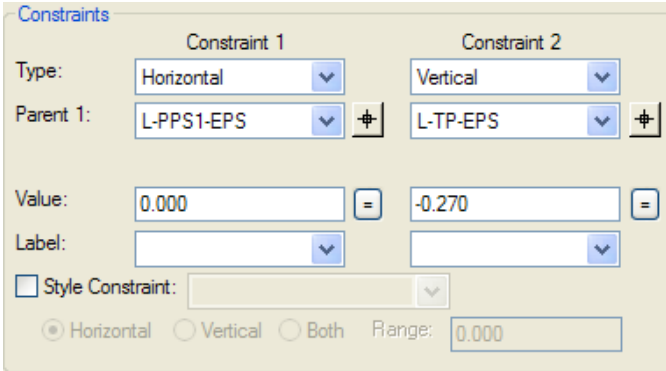
26. Set point constraints for point ***R-TP-ES*** as:



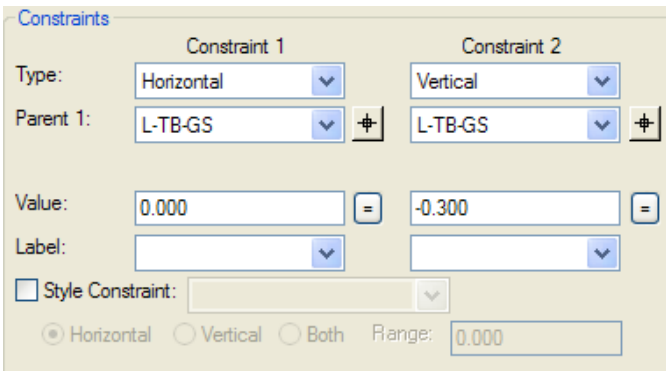
27. Move point *L-TA-ER* to point *L-PPS1-EPS* and merge with point *L-PPS1-EPS*.

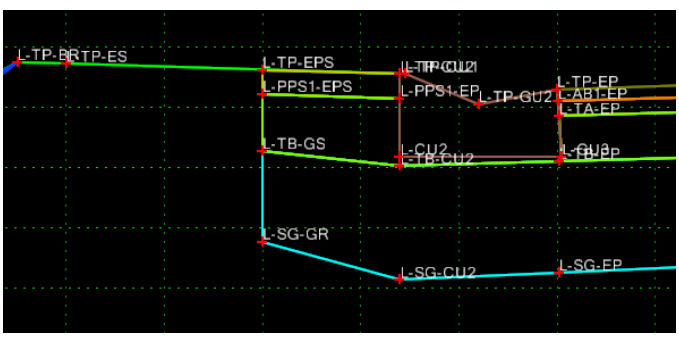


28. Set point constraints for point ***L-TB-GS*** as:

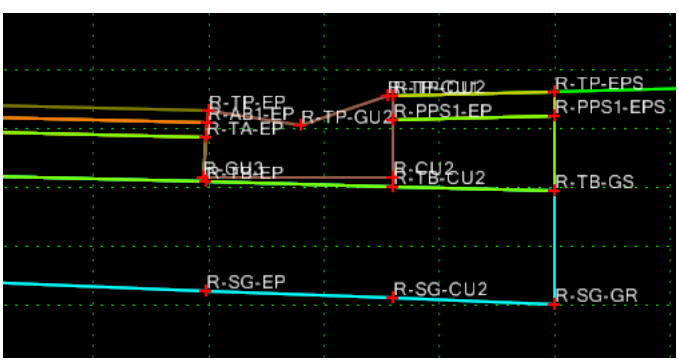


29. Set point constraints for point ***L-SG-GR*** as:

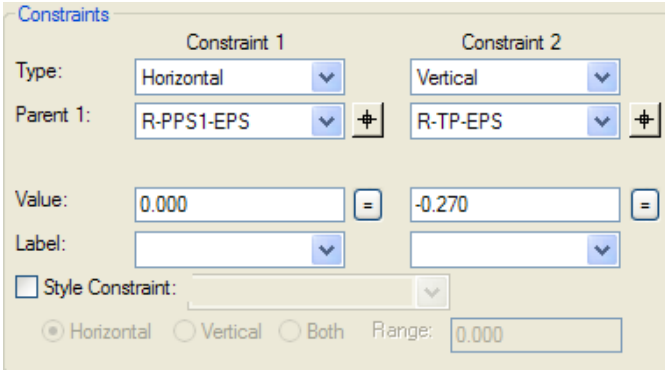




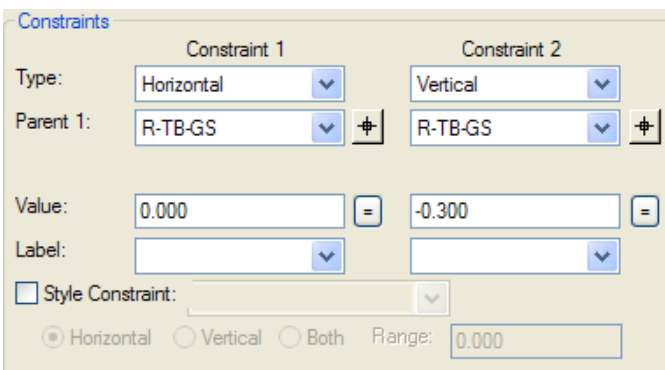
30. Move point *R-TA-ER* to point *R-PPS1-EPS* and merge with point *R-PPS1-EPS*.

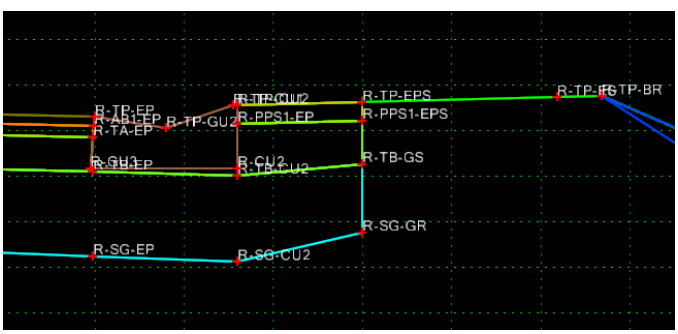


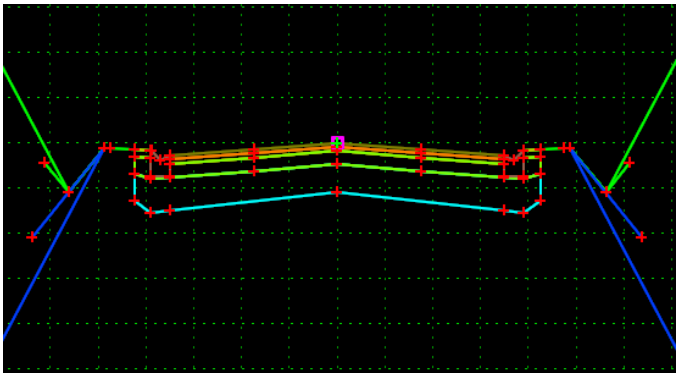
31. Set point constraints for point ***R-TB-GS*** as:



32. Set point constraints for point ***R-SG-GR*** as:







33. Click **File > Save**. Close the dialog.

7.0 Roadway Modeling

7.1 Roadway Designer Overview

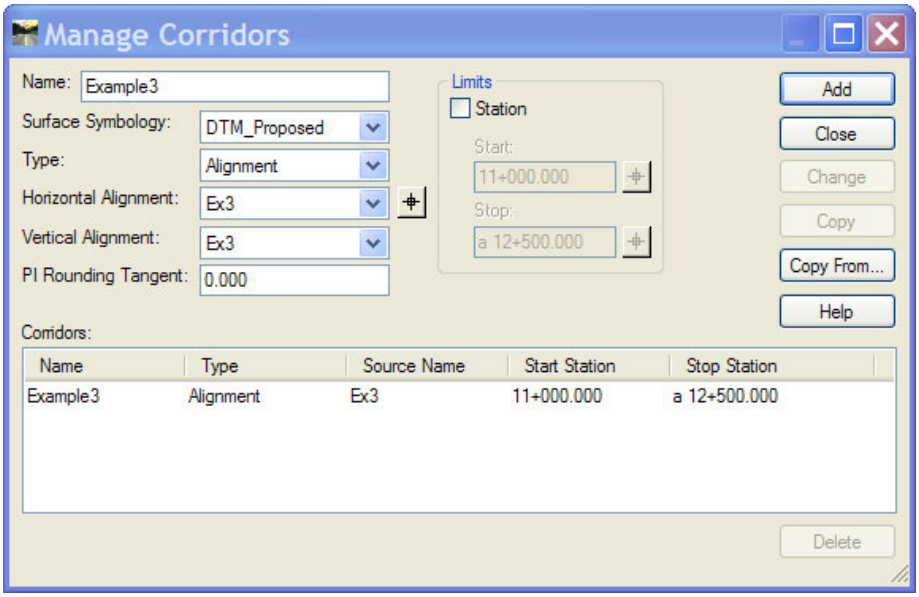
InRoads Road Designer is a highly interactive command that allows user to perform a majority of the road design within the command itself. The main dialog has 3 views in standard mode and 4 views in superelevation or overlay mode. User will see the design results simultaneously in plan, profile, and the cross section at the current station. This command is also used to create new design surfaces that represent a new roadway or other type of surface.

Before running Roadway Designer, you must have:

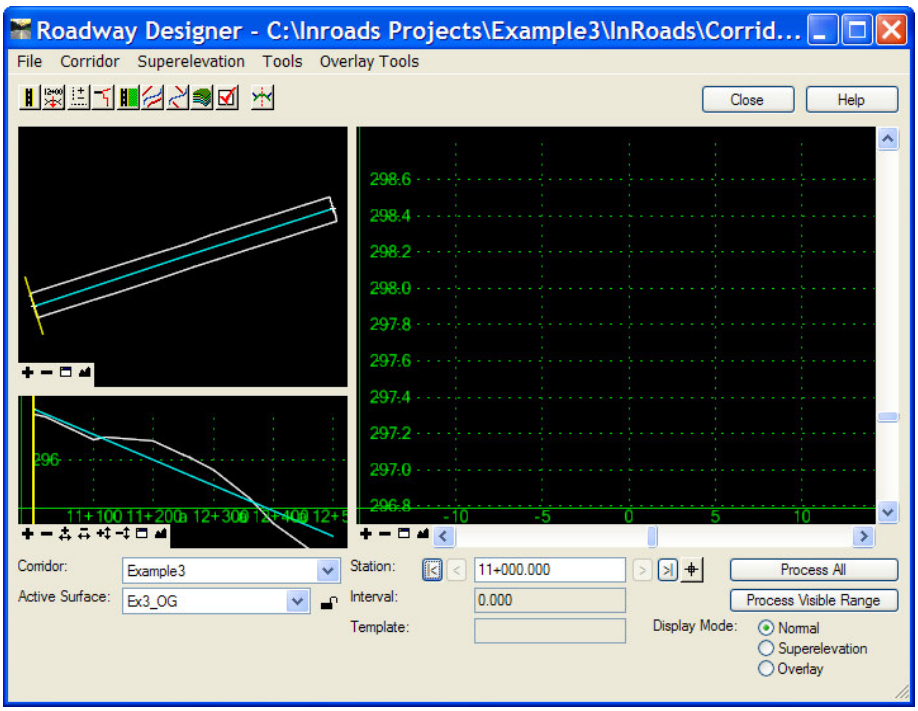
- A horizontal and vertical alignment or a surface feature that defines the location of the roadway.
- One or more existing surfaces.
- One or more templates to define the proposed typical section(s).

7.2 Creating Corridor

1. Select **Modeler > Roadway Designer**. The Roadway Designer dialog appears with three view windows.
2. Select **Corridor > Corridor Management**.
3. On the Manage Corridors dialog, type ***Example3*** in the *Name* field.
4. Set the *Surface Symbology* to ***DTM_Proposed***.
5. Set the *Type* to ***Alignment***.
6. Select ***Ex3*** for the *Horizontal Alignment*.
7. Select ***Ex3*** for the *Vertical Alignment*.
8. Set *PI Rounding Tangent* to ***0.000***
9. Toggle off the station *Limits* for applying to the entire alignment.
10. Click **Add** to create the corridor.



11. Click **Close** to dismiss Manage Corridors dialog. If the *Active Surface* is not *Ex3_OG*, make sure it is loaded and select it from the drop-down list.



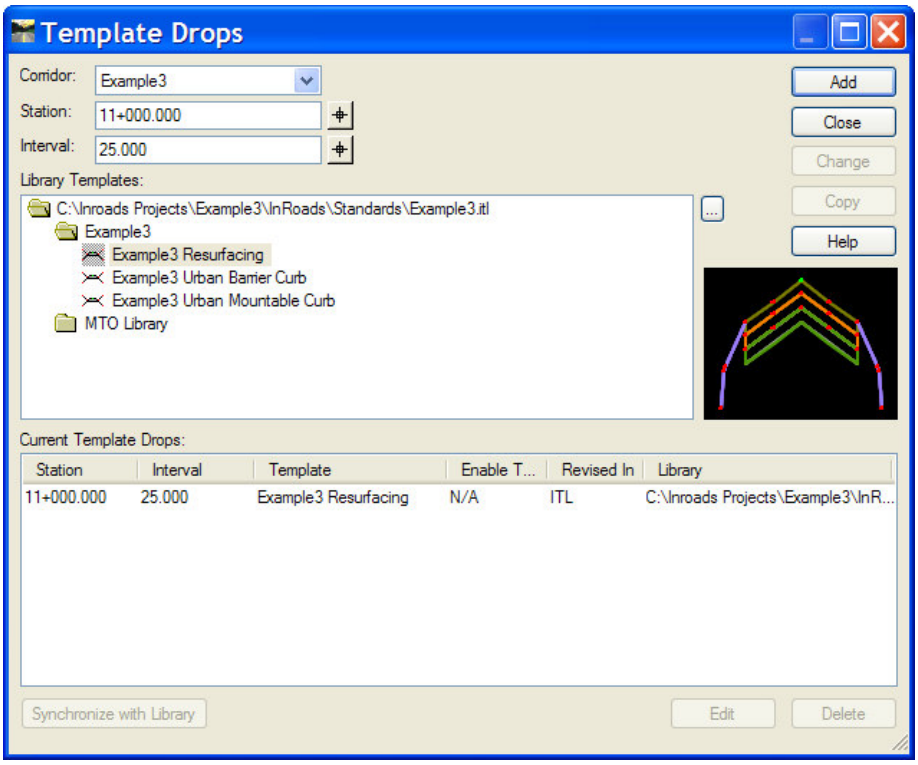
12. Click **File > Save As**. The Save Roadway Design As dialog will appear. The location will be …*Example3\InRoads\Corridors* as defined in the project default.
13. For *Save as type*, select ***Roadway Design (*.ird)***.
14. For *File name*, type ***Ex3***.
15. Click **Save** and close the Save As dialog.

16. Go to InRoads main menu, select **File > Save As** to update the project file with newly created Roadway Design file.

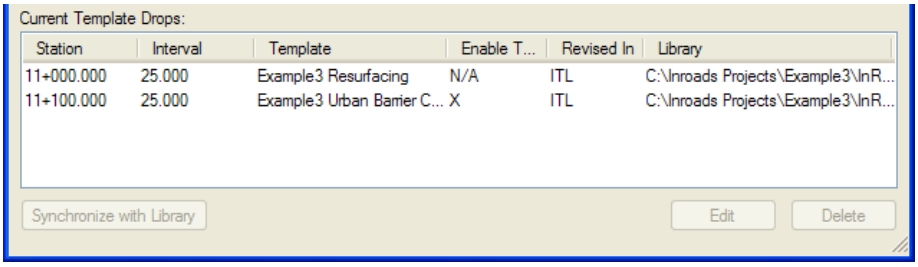
7.3 Inserting Template Drops

With an active corridor in place, the template drops can be added to the roadway design.

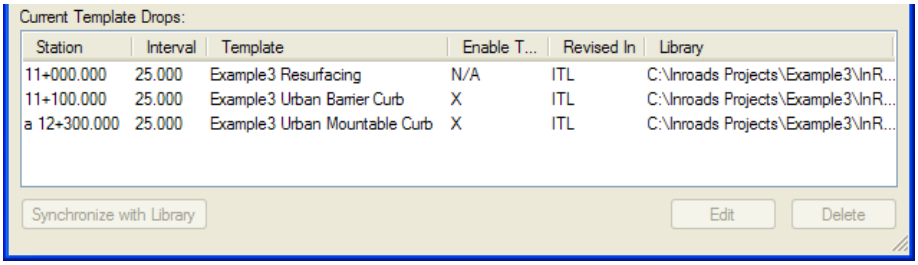
1. On the Roadway Designer dialog, select **Corridor > Template Drops**. The Template Drops dialog will appear.
2. In the *Library Templates* list window, select template ***Example3 > Example3 Resurfacing***.
3. Change the *Interval* to 25 and the *Station* should be ***11+000.000***.
4. Click **Add**. The selected template is added to the *Current Template Drops* list.



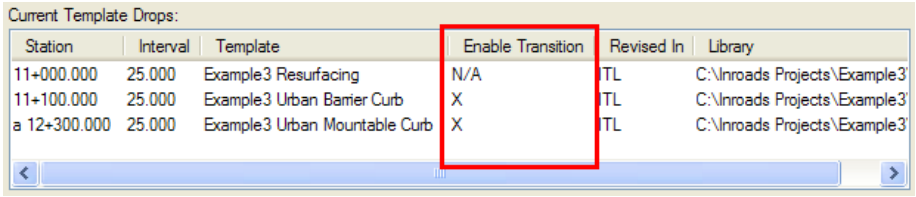
5. In the *Library Templates* list window, select template ***Example3 > Example3 Urban Barrier Curb***.
6. Change the *Station* to ***11+100.000***. Click **Add**. The selected template is added to the *Current Template Drops* list.



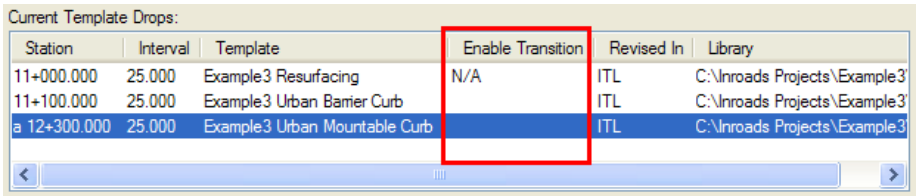
7. In the *Library Templates* list window, select template ***Example3 > Example3 Urban Mountable Curb***.
8. Change the *Station* to ***a 12+300.000***. Click **Add**. The selected template is added to the *Current Template Drops* list.



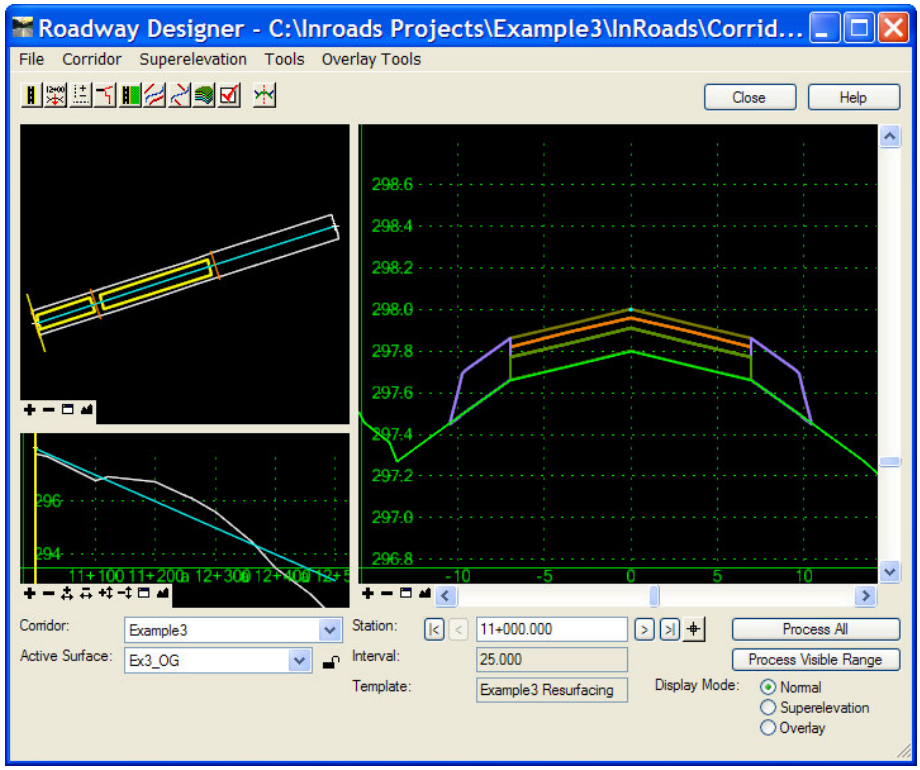
9. Disable template transition by clicking on the **X** in the *Enable Transition* column in the *Current Template Drops* list.



The column will show blank after the transitions have been removed between the templates.



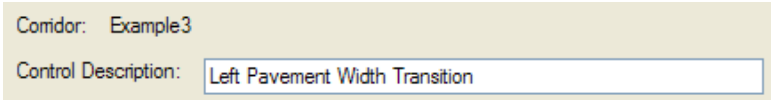
10. Close the Template Drops dialog. Make sure the Active Surface is **Ex3_OG**.



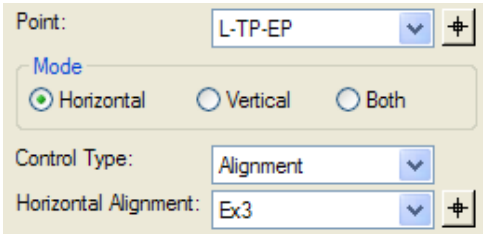
7.4 Point Controls

Point controls are used to modify the behavior of points in a template. Depending on the *Mode* selected, different control types can be applied to a point. Point Controls are used for pavement width transition.

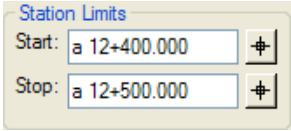
1. Select **Corridor > Point Controls**. The Point Controls dialog appears.
2. On the Point Controls dialog, type ***Left Pavement Width Transition*** in the *Control Description* field.



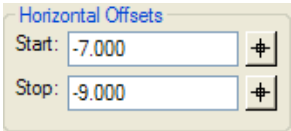
3. Select ***L-TP-EP*** from the *Point* drop-down list (or use the locate button). Set the *Mode* to ***Horizontal***. Then select ***Alignment*** for *Control Type*, ***Ex3*** for *Horizontal Alignment*.



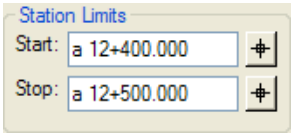
4. Set *Station Limits*. Type ***a 12+400*** in the *Start* field and ***a 12+500*** in the *Stop* field.

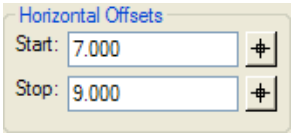


5. Set *Horizontal Offsets*. Type ***-7*** in the *Start* field and ***-9*** in the *Stop* field. Click **Add**.

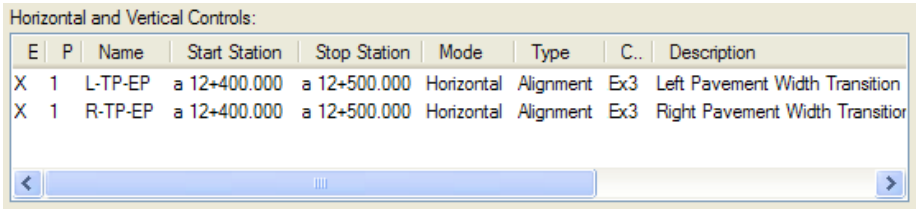


6. Change the *Control Description* to ***Right Pavement Width Transition***.
7. Select ***R-TP-EP*** from the *Point* drop-down list (or use the locate button). Make sure the *Mode* is ***Horizontal***, the *Control Type* is ***Alignment***, and the *Horizontal Alignment* is ***Ex3***.
8. Set *Station Limits* and *Horizontal Offsets* as:



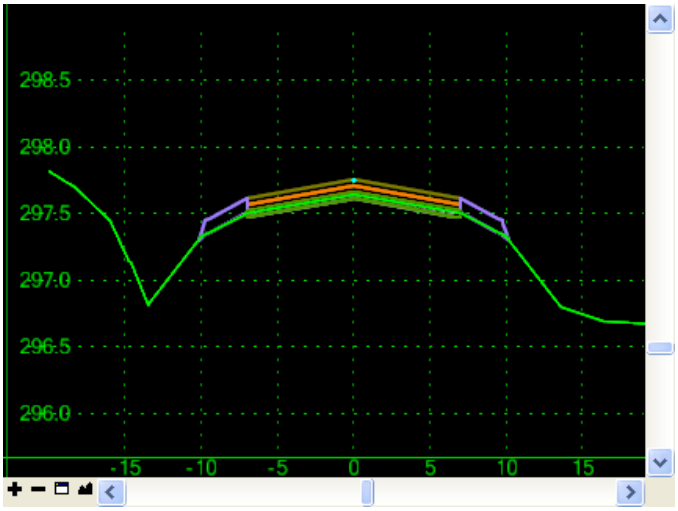


9. Click **Add**.

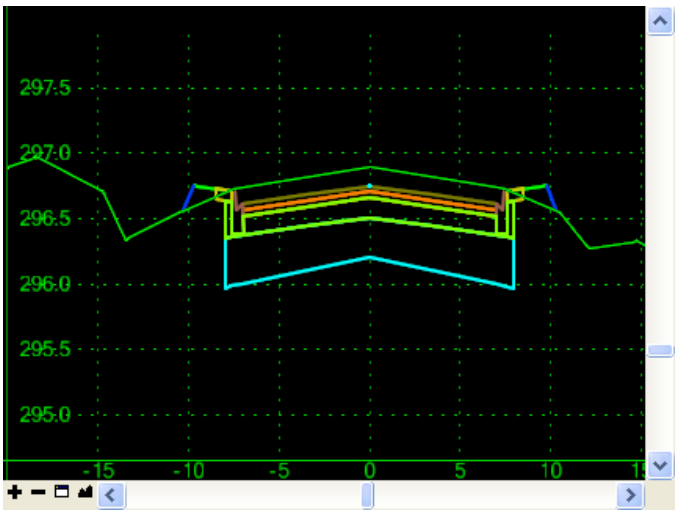


10. Close the Point Controls dialog. Select **File > Save** to save the changes.
11. Review sections in Cross Section Display.

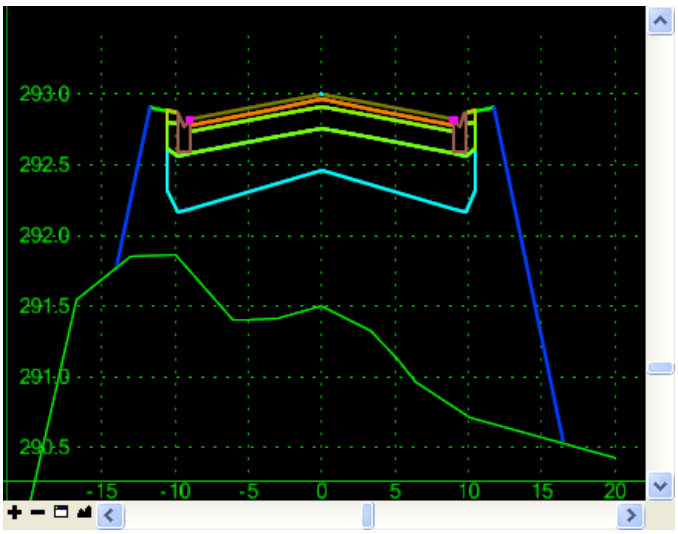
Resurfacing:



Urban Barrier Curb:



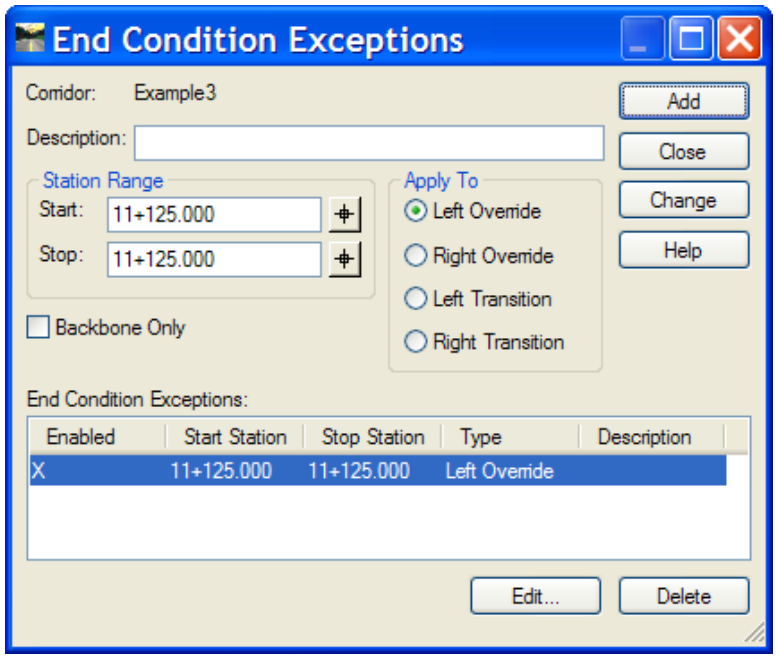
Urban Mountable Curb:



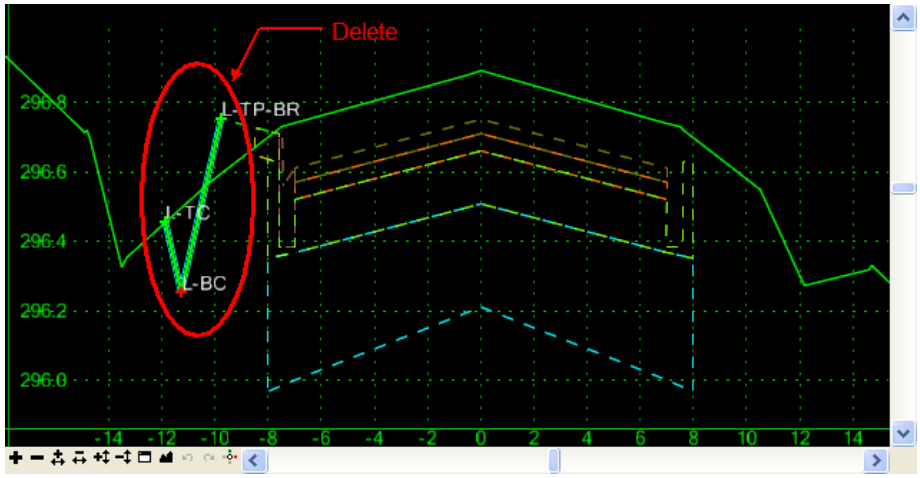
7.5 End Condition Exceptions

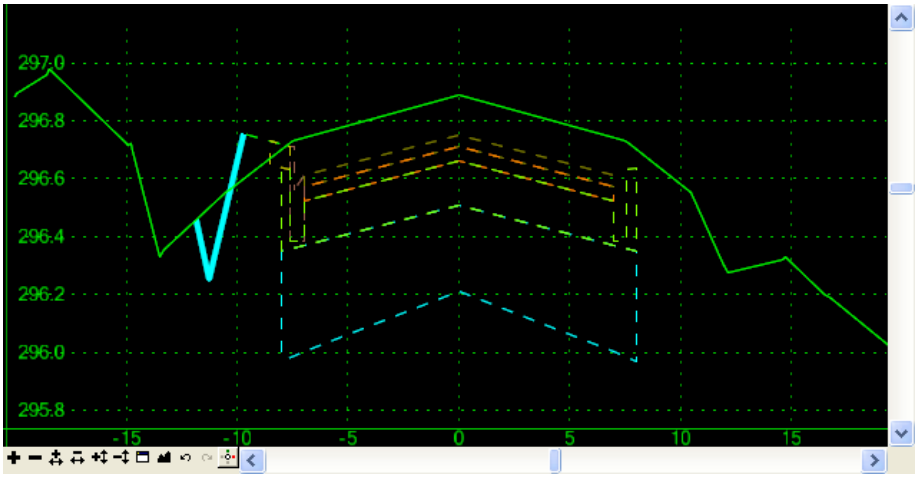
If the template end conditions do not provide a desired solution or a end condition transition is necessary, the *End Condition Exceptions* tool can be used to define end condition exceptions which are used to override the template's end condition solution over a specified range.

1. On the Roadway Designer dialog, select **Corridor > End Condition Exceptions**.
2. Set both the *Start* and the *Stop* station to ***11+125***.
3. Set *Apply To* option to ***Left Override***. Click **Add**.

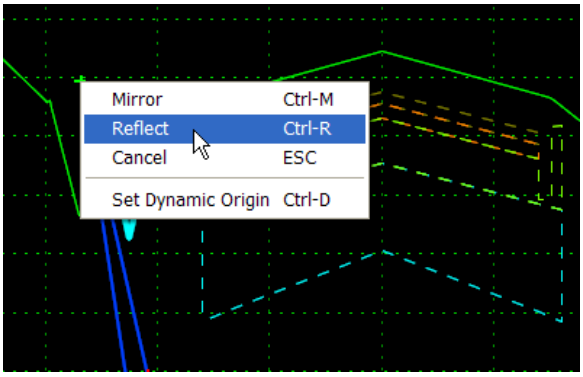


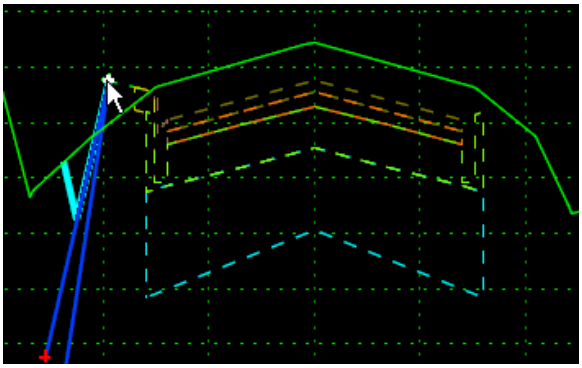
4. Click on **Edit** button. On the Left Override dialog, delete the current end condition solution.



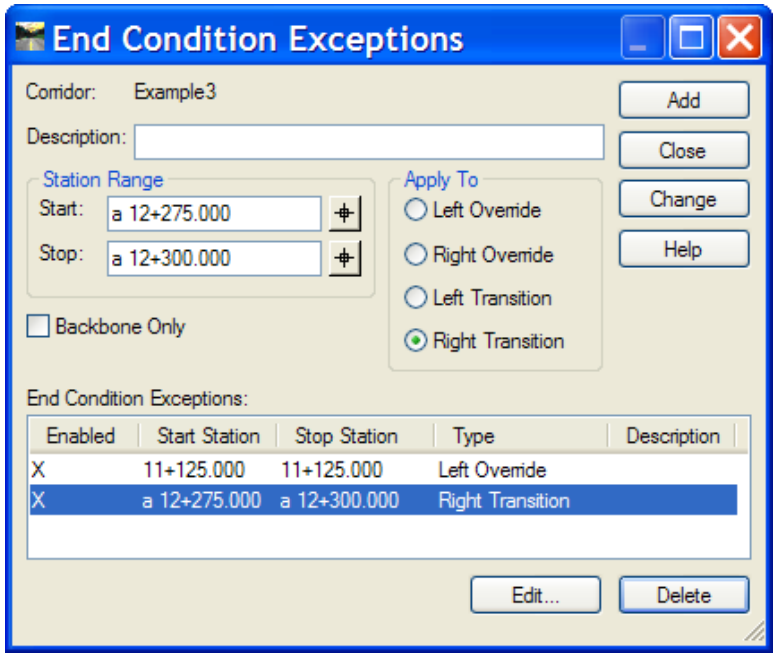


5. Double click on **MTO Library > End Conditions** from the *Template Library* on the left side of the dialog.
6. Left click and hold the left mouse button on the template **Earth Fill**. Drag it into the template display window. Toggle on the **Reflect** option and attach to the end condition attaching point.

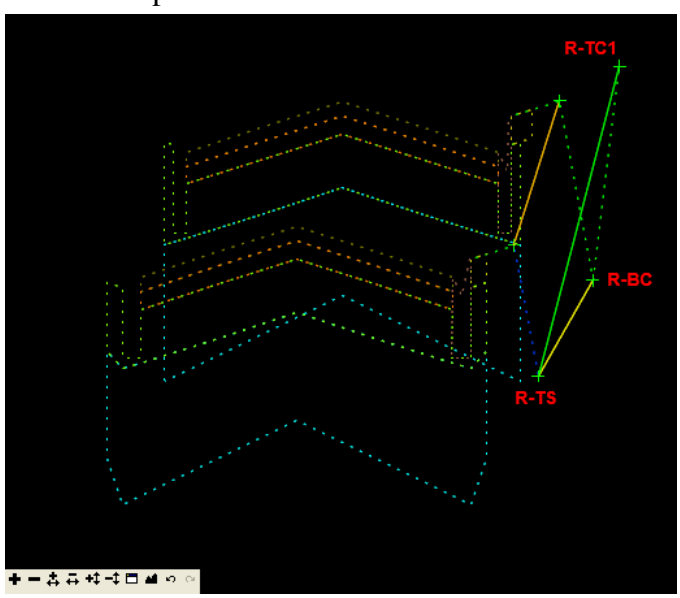




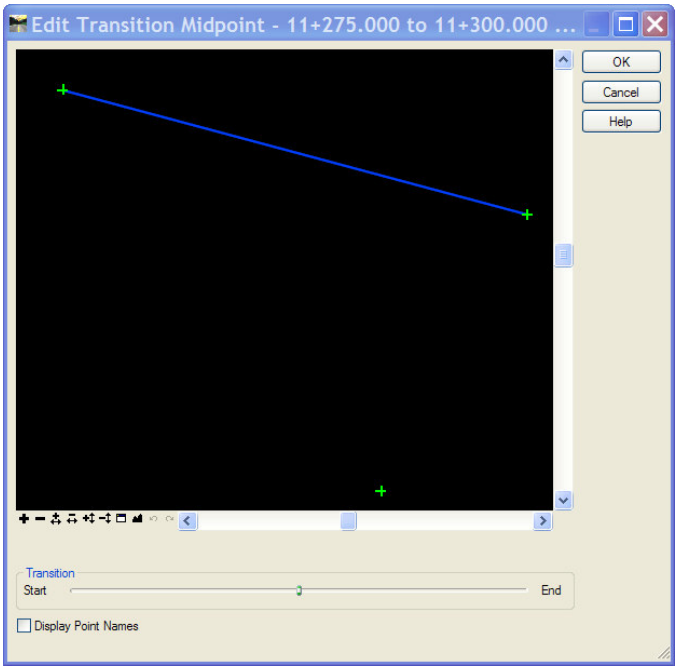
7. Click **OK** to close the editing dialog and return to End Condition Exceptions dialog.
8. Change the *Start* station to ***a 12+275*** and the *Stop* station to ***a 12+300***.
9. Set *Apply To* option to ***Right Transition***. Click **Add**.



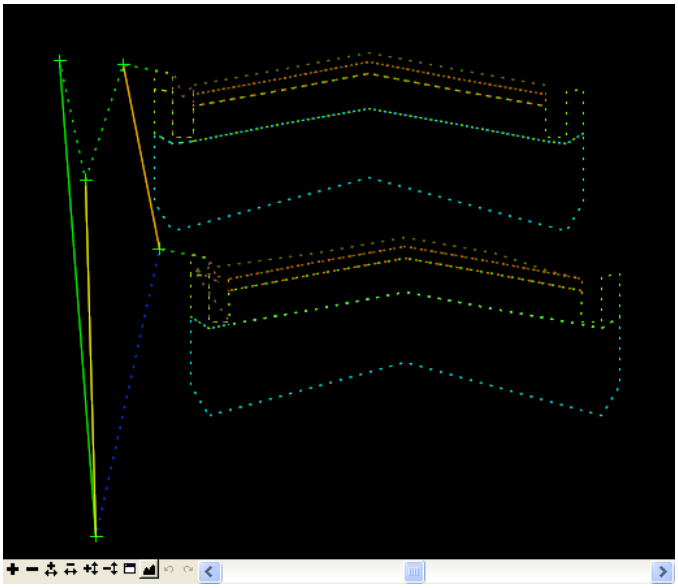
10. Click **Edit**.
11. On the Edit Transition dialog, connect the points with thick green (+) symbols. Move mouse over the point and pause the mouse to display the point name. Connect both points **R-TC1** and **R-BC** from the template with ditch component to the point **R-TS** on the template with the fill component.



12. Click **OK**. The Edit Transition Middle point dialog appears to allow user to review the entire transition or add new components, edit points, merge points, add and delete point constraints.

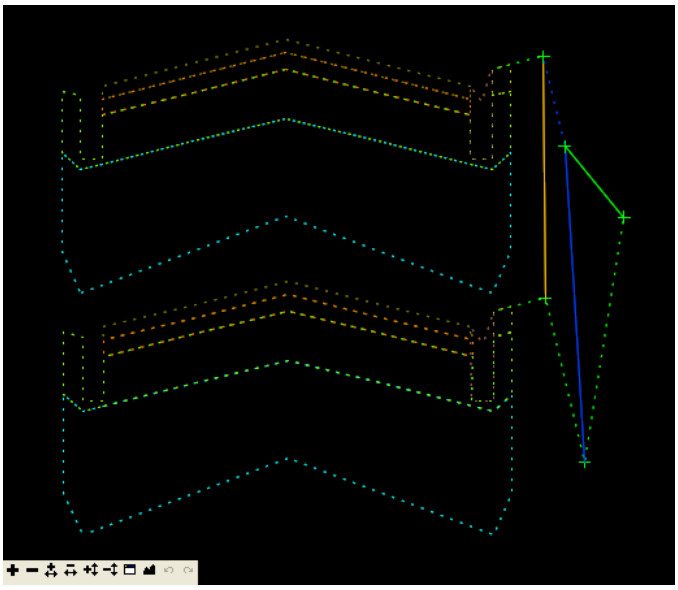


13. Click **OK** to accept the solution or **Cancel** to return edit mode.
14. Change the *Start* station to ***a 12+350*** and the *Stop* station to ***a 12+400***.
15. Set *Apply To* option to ***Left Transition***. Click **Add**.
16. Click **Edit**. On the Edit Transition dialog, connect the points with thick green (+) symbols.

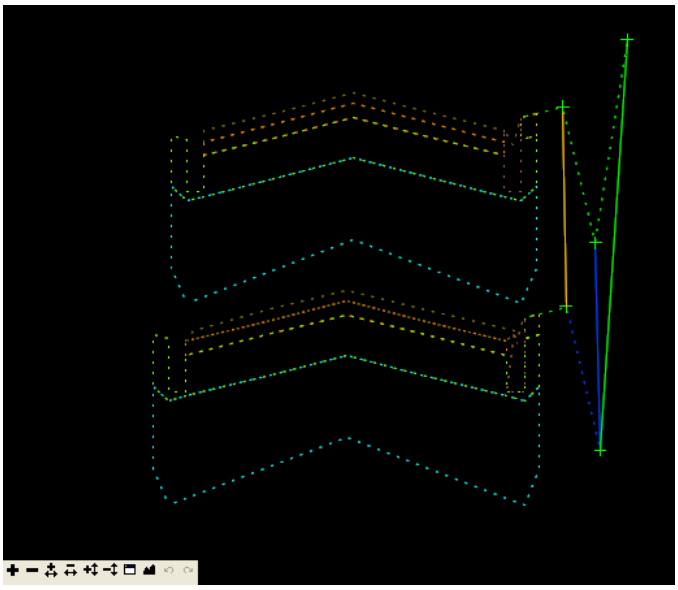


17. Click **OK** to review the transition and click **OK** to accept it.
18. Change the *Start* station to ***a 12+375*** and the *Stop* station to ***a 12+400***.
19. Set *Apply To* option to ***Right Transition***. Click **Add**.

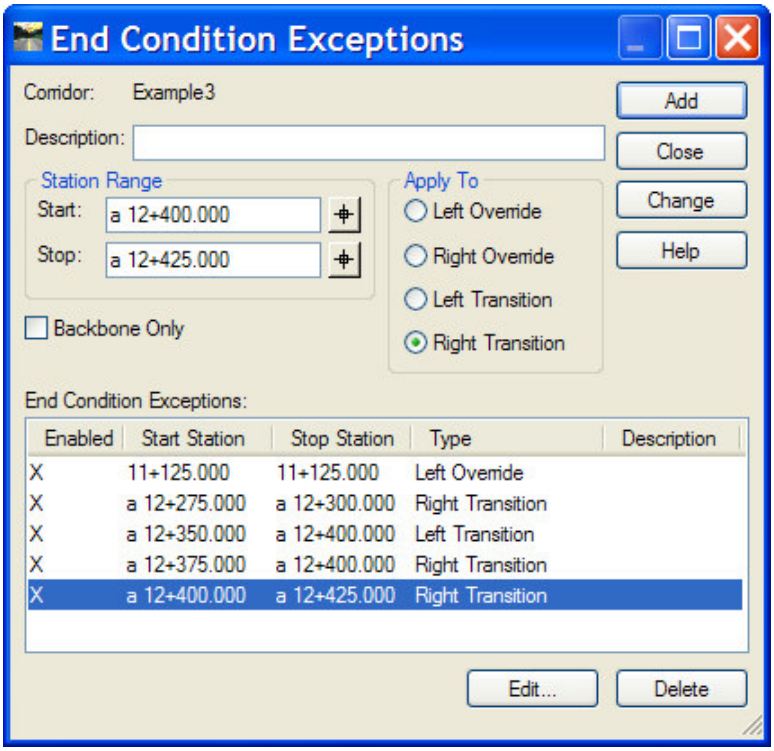
20. Click **Edit**. On the Edit Transition dialog, connect the points with thick green (+) symbols.



21. Click **OK** to review the transition and click **OK** to accept it.
22. Change the *Start* station to ***a 12+400*** and the *Stop* station to ***a 12+425***.
23. Set *Apply To* option to ***Right Transition***. Click **Add**.
24. Click **Edit**. On the Edit Transition dialog, connect the points with thick green (+) symbols.



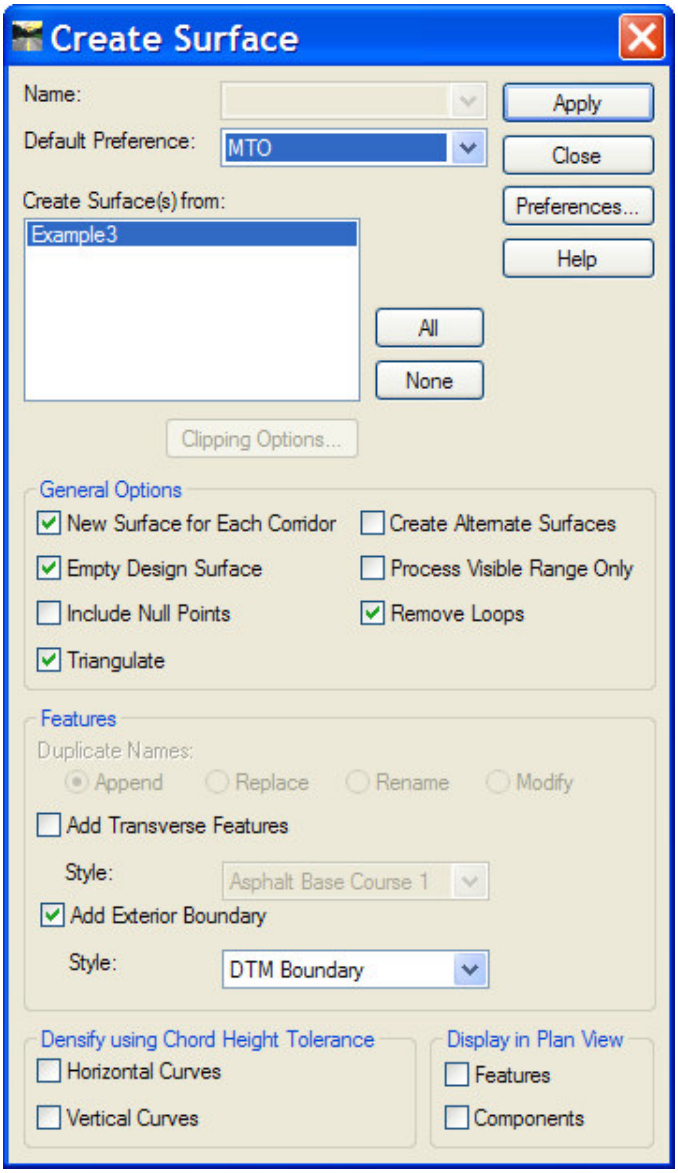
25. Click **OK** to review the transition and click **OK** to accept it.



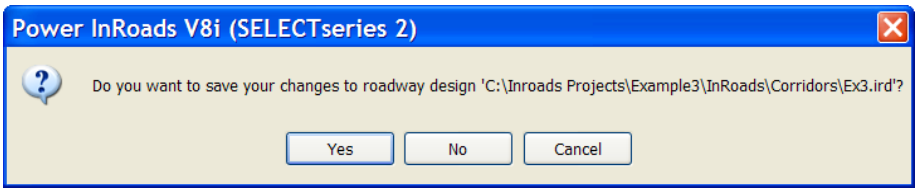
26. Click **Close** to return to Roadway Designer dialog. Click **Process All** the sections and use the arrow button to review each section in the view.
27. Select **File > Save** to save the changes.

7.6 Creating Finished Surface

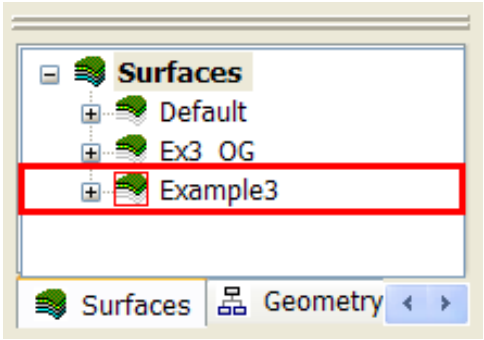
1. On the Roadway Designer dialog, click **Process All** button under the cross-section view.
2. Select **Corridor > Create Surface**.
3. On the Create Surface dialog, verify that only corridor ***Example3*** (if you have more than one corridors) is selected and all the options selected as shown below:



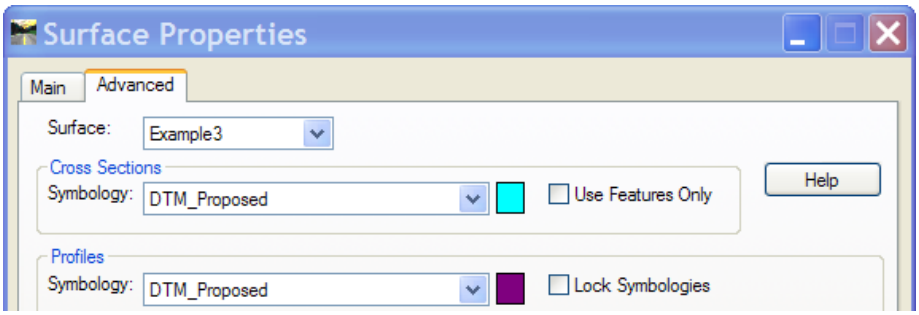
4. Click **Apply**. InRoads will process all the cross section in the selected corridor. When the process finish, click **Close** to dismiss the Create Surface dialog.
5. Close Roadway Design. Save the changes when see following message.



6. Go to InRoads Explorer. In the left pane, check the *Surfaces* folder. Surface *Example3* is listed under *Surfaces*.



7. Right click on surface ***Example3*** and select ***Properties*** from the pop-up menu.
8. Click on the **Advanced** tab on the Surface Properties dialog. Select ***DTM_Proposed*** from the *Symbology* drop-down list for both *Cross Sections* and *Profiles*.

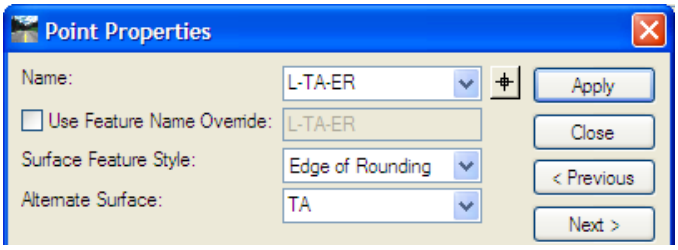


9. Click **Apply > Close**.
10. Save design surface *Example3*.

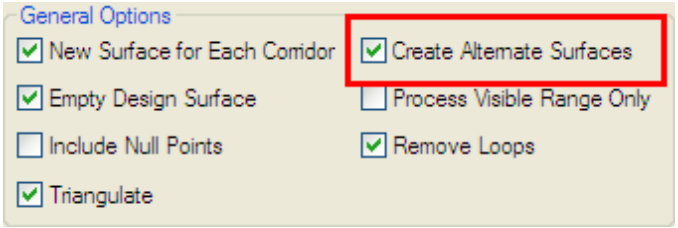
7.7 Creating Alternate Surfaces

To create TA, TB and SG surfaces, specify the alternate surface name in the point properties and then check the Alternate Surface option when use Create Surface command.

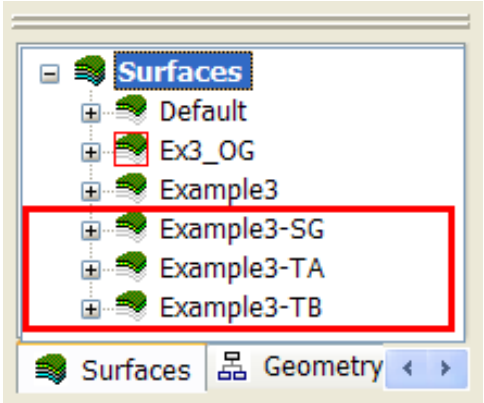
1. Select **Modeler > Create Template**.
2. On the Create Template dialog, select template ***Example3 Urban Barrier Curb*** from Template Library.
3. Double click on point ***L-TA-ER*** and type ***TA*** in the *Alternate Surface* field. Click **Apply** button.



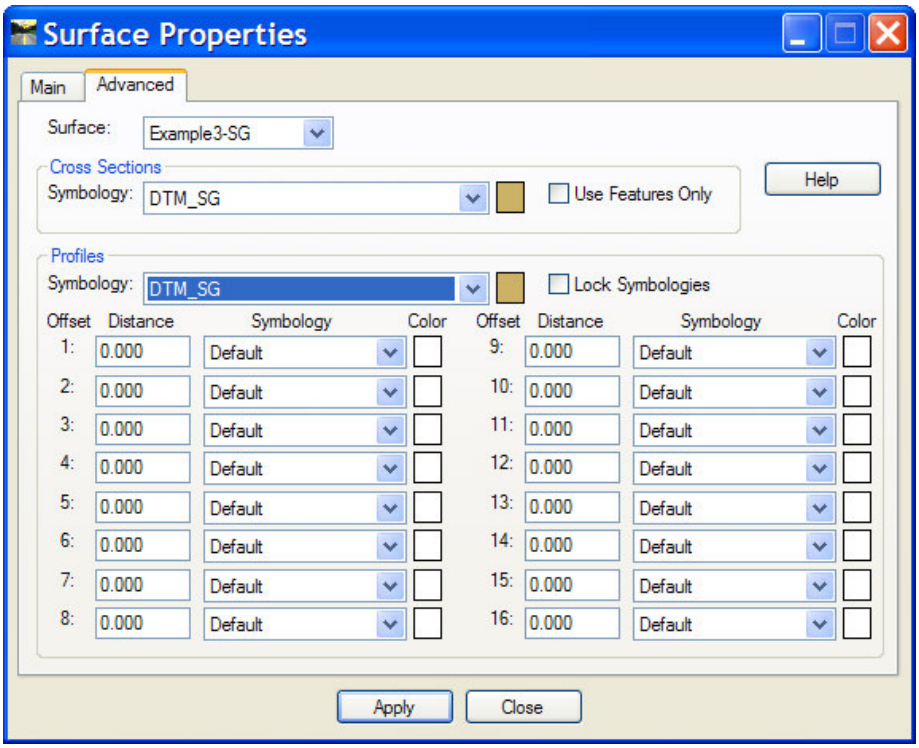
4. Repeat above process for points *L-PPS1-EP, L-TA-EP, L-TA-IP1, TA-CL, R-TA-IP1, R-TA-EP, R-PPS1-EP,* and *R-TA-ER*.
5. Set *Alternate Surface* name to ***TB*** for points *L-TB-GS, L-TB-GU2, L-TB-EP, L-TB-IP1, TB-CL, R-TB-IP1, R-TB-EP, R-TB-CU2*, and *R-TB-GS*.
6. Set *Alternate Surface* name to ***SG*** for points *L-SG-GR, L-SG-CU2, L-SG-EP, SG-CL, R-SG-EP, R-SG-CU2,* and *R-SG-GR*.
7. Save template library.
8. Select template ***Example3 Urban Mountable Curb*** from Template Library.
9. Set *Alternate Surface* name to ***TA*** for points *L-PPS1-EPS, L-PPS1-EP, L-TA-EP, L-TA-IP1, TA-CL, R-TA-IP1, R-TA-EP, R-PPS1-EP,* and *R-PPS1-EPS*.
10. Set *Alternate Surface* name to ***TB*** for points *L-TB-GS, L-TB-CU2, L-TB-EP, L-TB-IP1, TB-CL, R-TB-IP1, R-TB-EP, R-TB-CU2,* and *R-TB-GS*.
11. Set *Alternate Surface* name to ***SG*** for points *L-SG-GR, L-SG-CU2, L-SG-EP, SG-CL, R-SG-EP, R-SG-CU2,* and *R-SG-GR*.
12. Save template library and close the Create Template dialog.
13. Select **Modeler > Roadway Designer.**
14. Select **Corridor > Templates Drops**.
15. Select all the template drops in red and click on the **Synchronize with Library** button. Close the dialog.
16. *Process All* the cross sections.
17. Select **Corridor > Create Surface.**
18. Select corridor ***Example3***.
19. Check the *Create Alternate Surfaces* option on the Create Surface dialog.



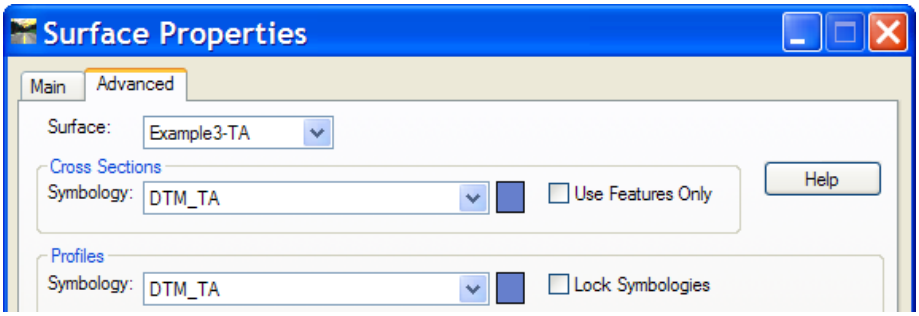
20. Click **Apply**. Save Roadway Designer and close the dialog.
21. Go to InRoads Explorer. In the left pane, check the *Surfaces* folder. Alternate surfaces are created under *Surfaces.*



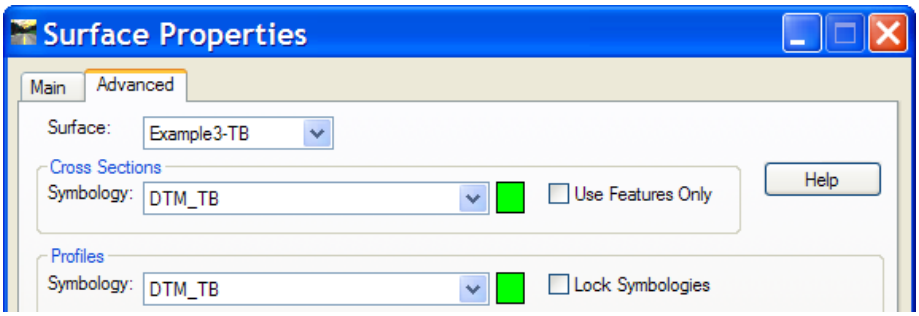
22. Right click on surface ***Example3-SG*** and select ***Properties*** from the pop-up menu.
23. Click on the **Advanced** tab on the Surface Properties dialog. Select ***DTM_SG*** from the *Symbology* drop-down list for both *Cross Sections* and *Profiles*.



24. Click **Apply > Close**.
25. Repeat the process to set symbology ***DTM_TA*** for surface ***Example3-TA***.



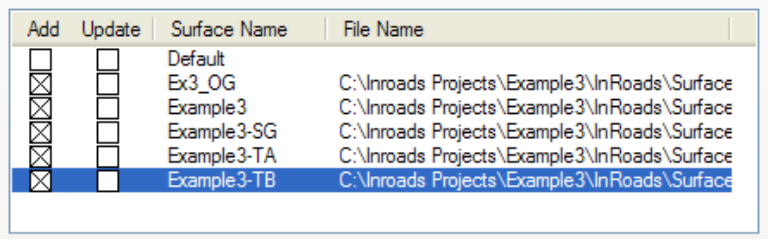
26. Set symbology ***DTM_TB*** for surface ***Example3-TB***.



27. Save surfaces Example3, Example3-TA, Example3-TB, and Example3-SG.

7.8 Updating Project File

1. Go to InRoads main menu, select **File > Save As**.
2. On the Save As dialog, verify the *Save as type* is Projects (*.rwk) and select *Example3.rwk.*
3. Click the **Options (…)** button on the lower right corner of the Save As dialog box. The Project Options dialog box will appear.
4. Click *Surfaces* tab, check **Add** for Example3 surface.



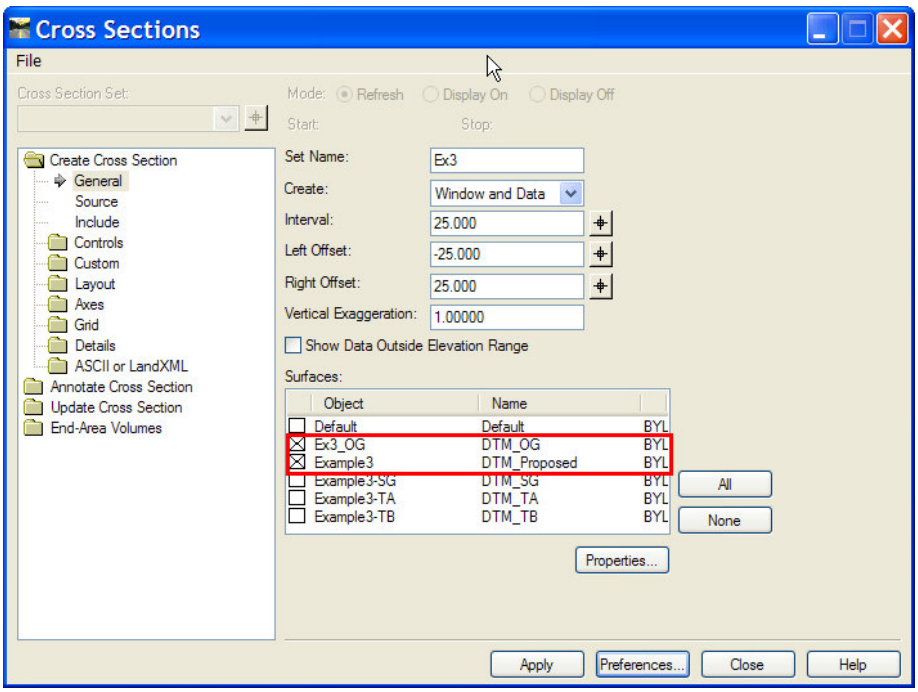
Add	Update	Surface Name	File Name
☐	☐	Default	
☒	☐	Ex3_OG	C:\Inroads Projects\Example3\InRoads\Surface
☒	☐	Example3	C:\Inroads Projects\Example3\InRoads\Surface
☒	☐	Example3-SG	C:\Inroads Projects\Example3\InRoads\Surface
☒	☐	Example3-TA	C:\Inroads Projects\Example3\InRoads\Surface
☒	☐	Example3-TB	C:\Inroads Projects\Example3\InRoads\Surface

5. Click **OK** button to close the Project Options dialog box.
6. Click the **Save** button and confirm to replace existing project file.

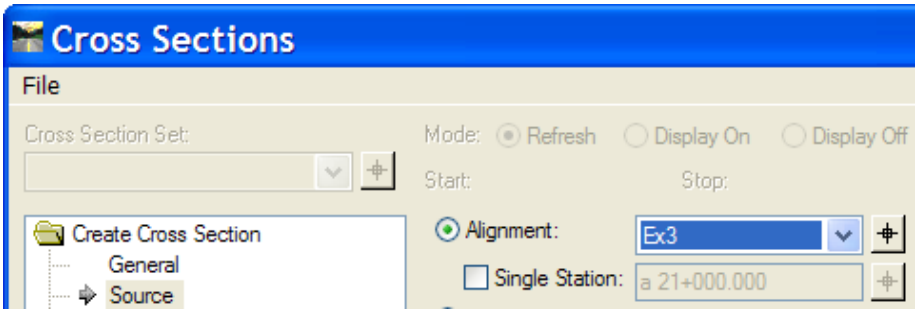
8.0 Cross Sections

8.1 Creating Cross Sections

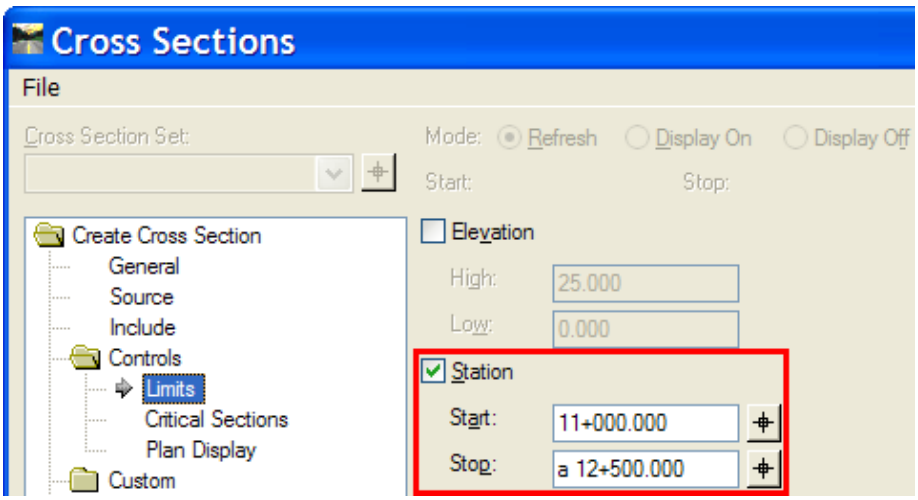
1. Load *MTO_InRoads_Template_SS2.dwg* from project folder...*Example3**InRoads**Standards.*
2. Click MicroStation's **File > Save As** command to save the drawing to project folder …*Example3**InRoads**Drawings* with name ***Ex3_CrossSections***.
3. Set the **Global Scale Factors** to ***0.1***.
4. Select **Evaluation > Cross Section > Cross Sections**.
5. Click **Preferences** and load named preference **MTO_Sheet(1:100).** On the dialog of *General* leaf, select surface ***Ex3_OG*** and ***Example3*** from the *Surfaces* list.



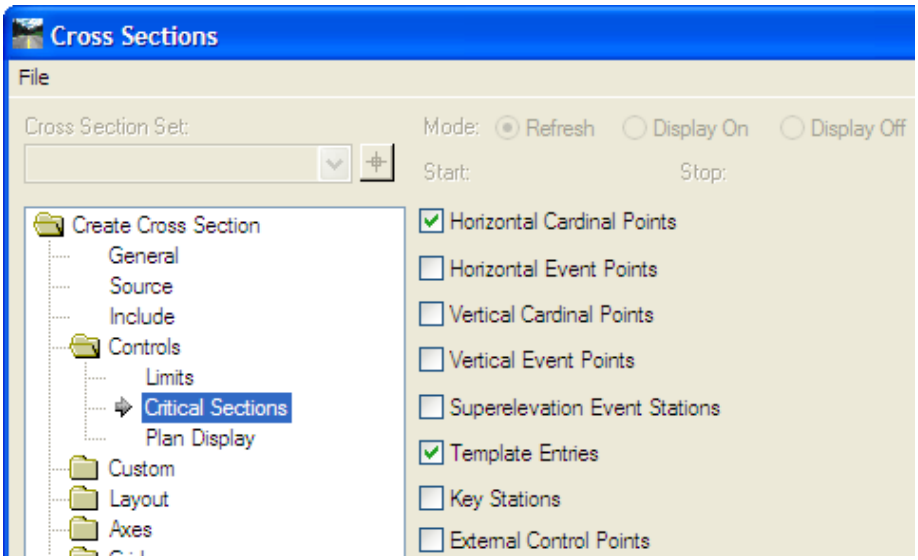
6. Click **Source** and verify that alignment *Ex3* is show in the *Alignment* field.



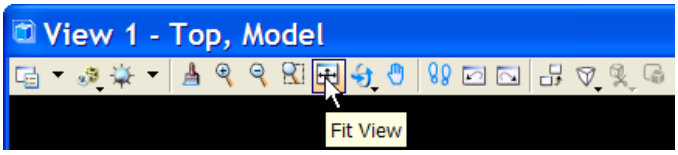
7. Click **Controls > Limits**. Verify the Station range.



8. Click **Critical Sections** under *Controls*. Select options.

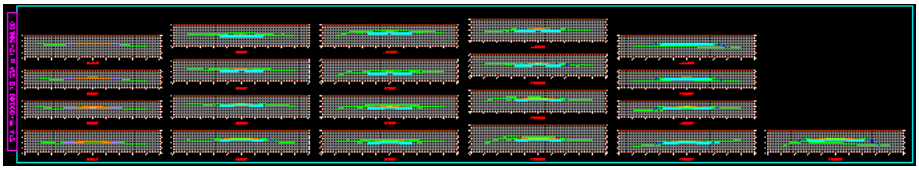


9. Click **Apply** and follow the prompt from the status bar at the bottom of MicroStation window to provide an insert point in the drawing.
10. Click **Fit View** icon from the view control bar at the top of the view window to see all the cross sections generated from Create Cross Section command.

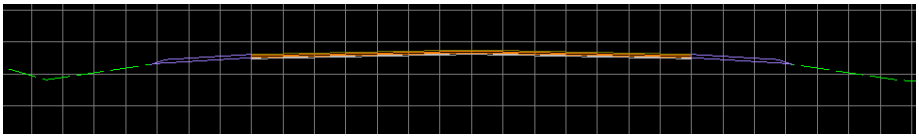


11. Use the view control icons in the view control bar to change the view settings and exam the cross sections that have been created.

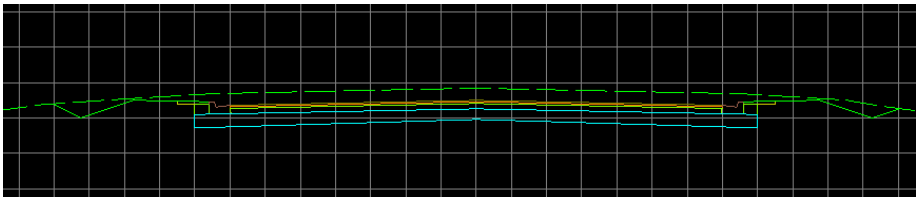
Whole Sheet:



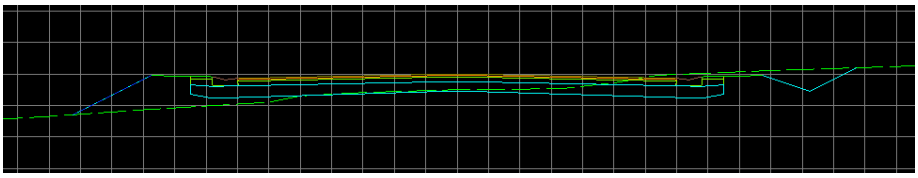
Resurfacing:



Urban Barrier Curb:

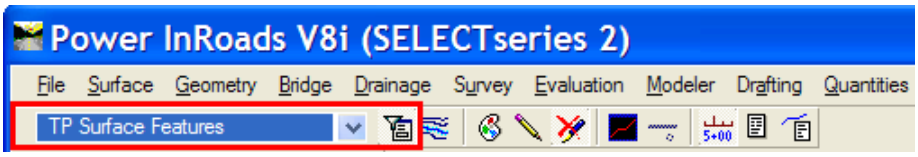


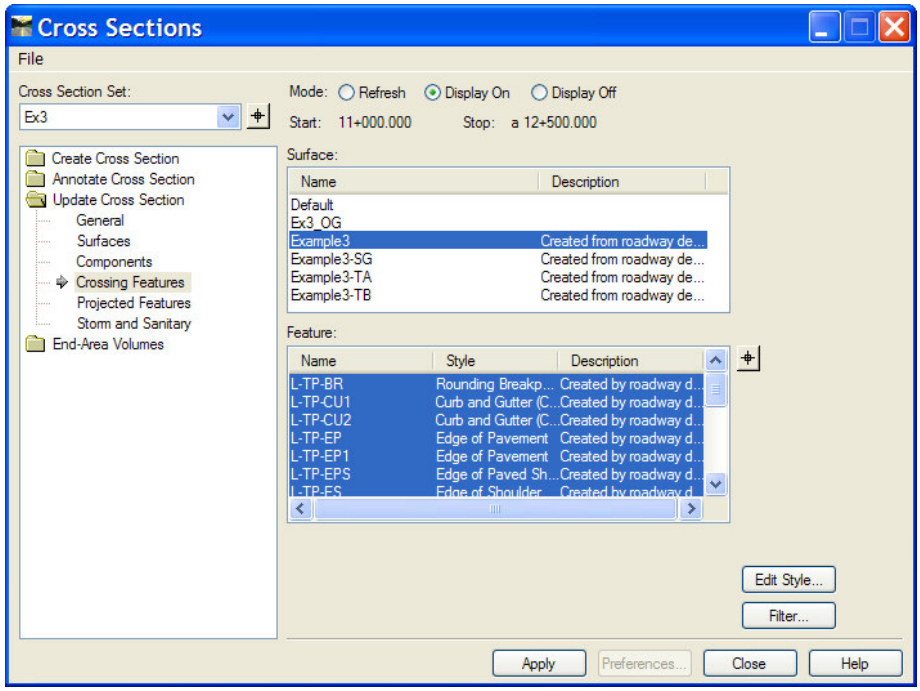
Urban Mountable Curb:



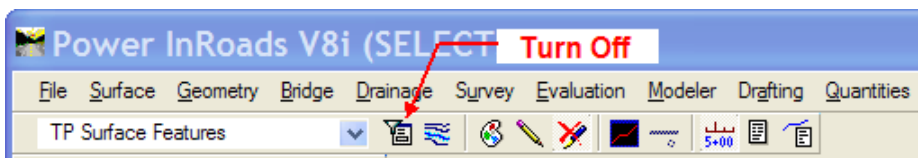
8.2 Updating Cross Sections

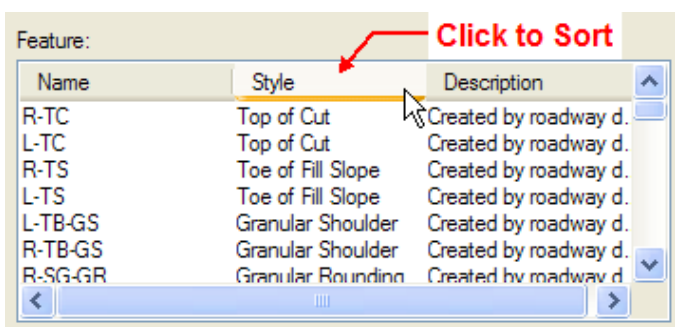
1. Select **Evaluation > Cross Section > Cross Sections**.
2. Click on the **Update Cross Section** folder on the left pane of Cross Sections dialog.
3. Click on *Crossing Features* leaf. Toggle on the **Display On** option.
4. Select surface ***Example3*** from the *Surface* list.
5. Turn on the *Feature Filter Lock* and select filter ***TP Surface Features***, and then select all the features in the *Feature* list.



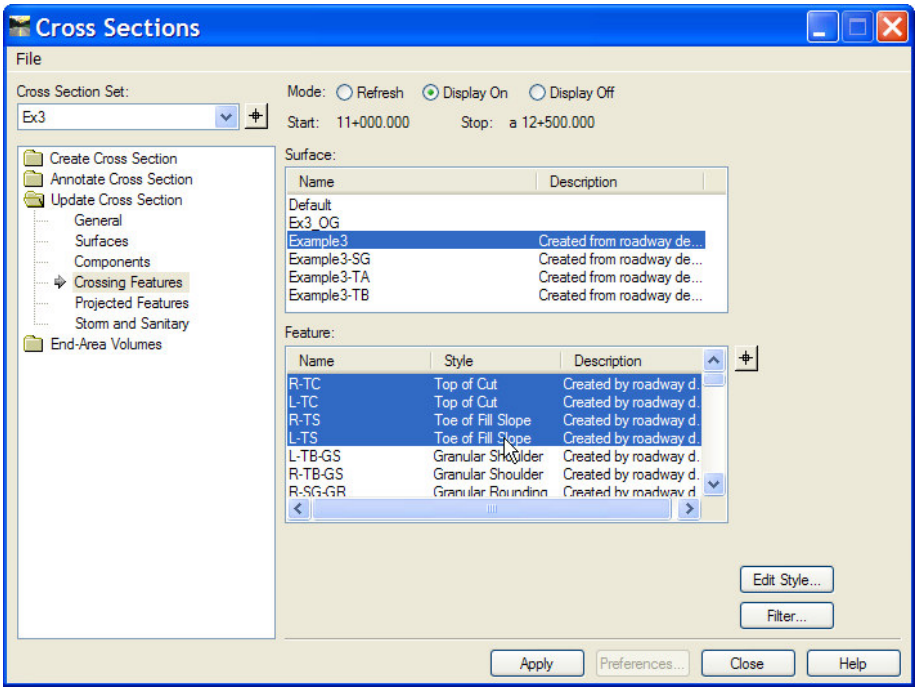


6. Click **Apply**. Top surface features are displayed in the cross sections (shown as points).
7. Turn off the *Feature Filter Lock*, select surface ***Example3*** from the *Surface* list and click on the *Style* column in the *Feature* list to sort the features by style.

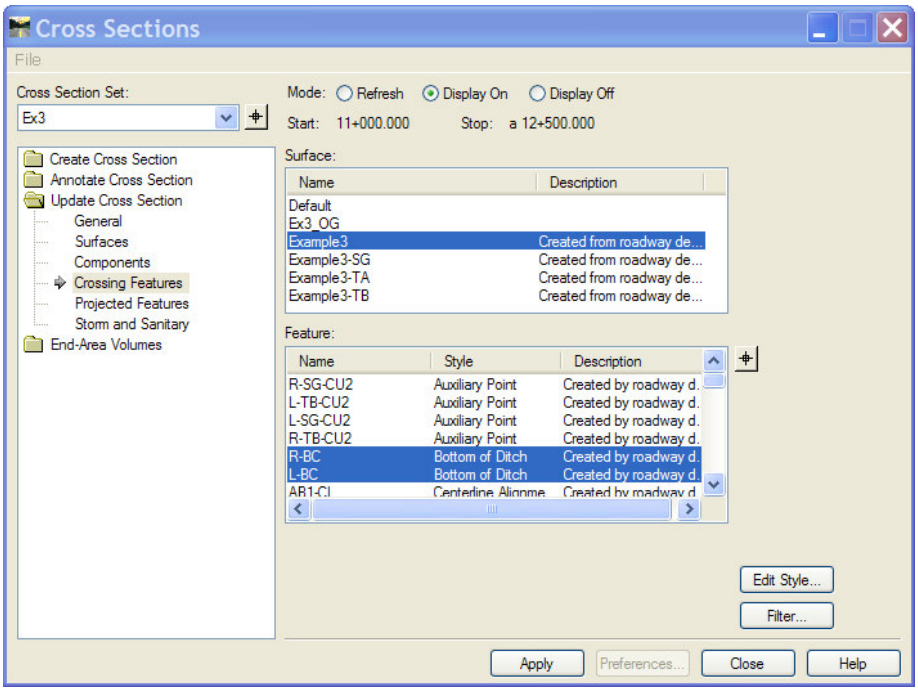




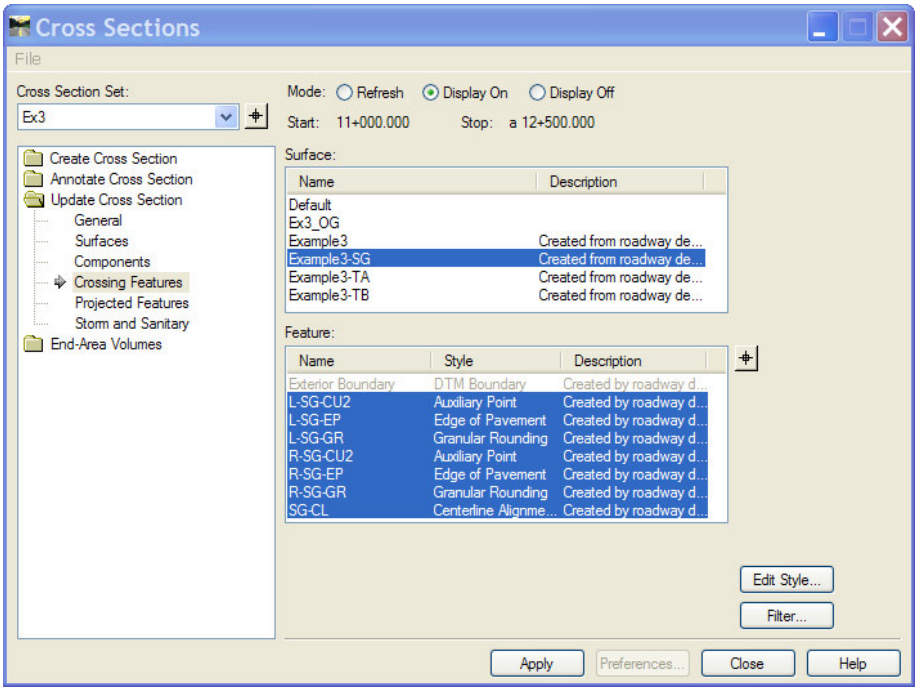
8. Select features *R-TC, L-TC, R-TS,* and *L-TS* in the *Feature* list. Click **Apply** to display all the selected features in the cross sections (shown as points).



9. Select surface Example3 and sort the list again. Select features *R-BC* and *L-BC* from the list. Click **Apply** to display in the cross sections.



10. Select surface ***Example3-SG*** from the *Surface* list.
11. Select all the features in the *Feature* list (feature *Exterior Boundary* is greyed out and will not be selected).



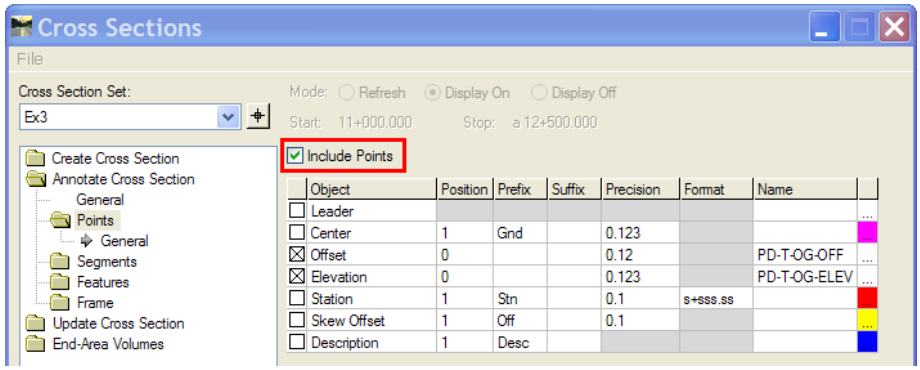
12. Click **Apply**. All the subgrade surface features are displayed in the cross sections (shown as points).
13. Close the dialog.

8.3 Annotating Cross Sections

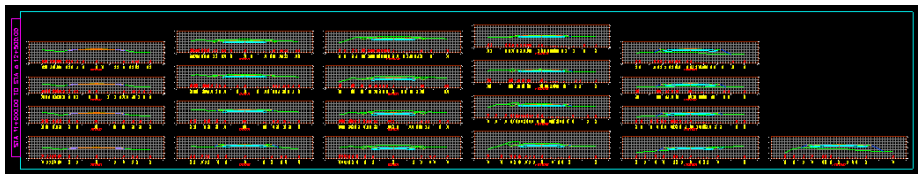
Surface or surface crossing features (if loaded) can be annotated in cross sections. Verify that the **Global Scale Factors** is set to ***0.1***.

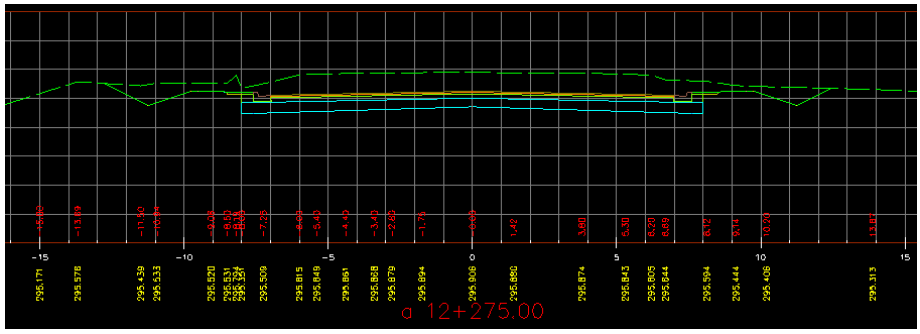
OG surface

1. Select **Evaluation > Cross Section > Cross Sections**.
2. Click on the **Annotate Cross Section** folder on the left pane of Cross Sections dialog.
3. Click on **Preferences** and load named preference ***MTO_OG (1:100).***
4. Click on *General* leaf and select ***Ex3_OG*** surface.
5. Click on *Points* leaf and toggle on **Include Points** option.



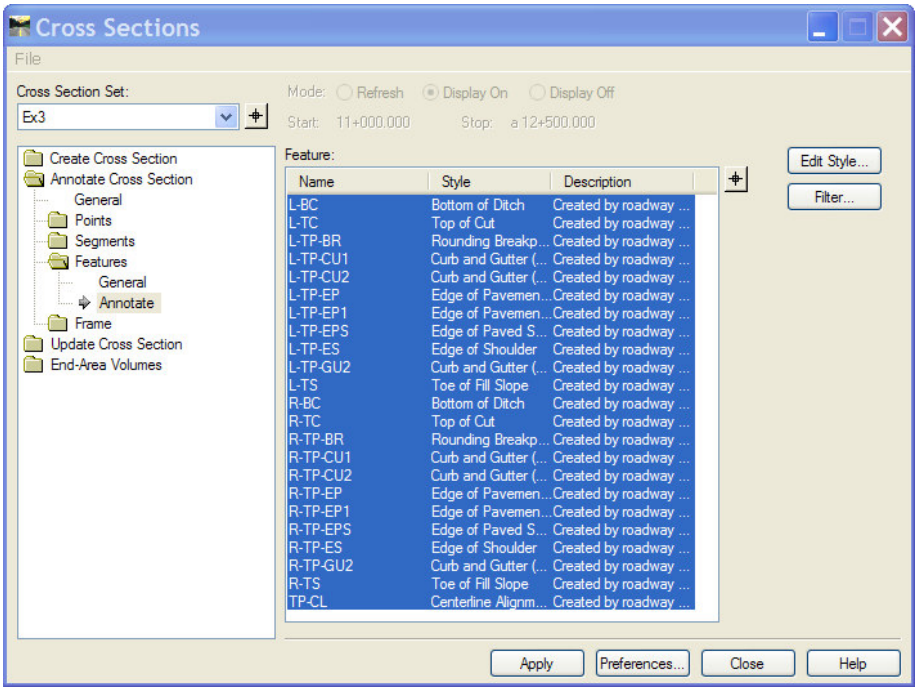
6. Click **Apply**. The OG surface is annotated in cross sections.



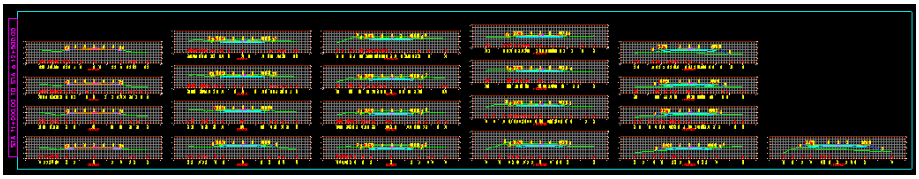


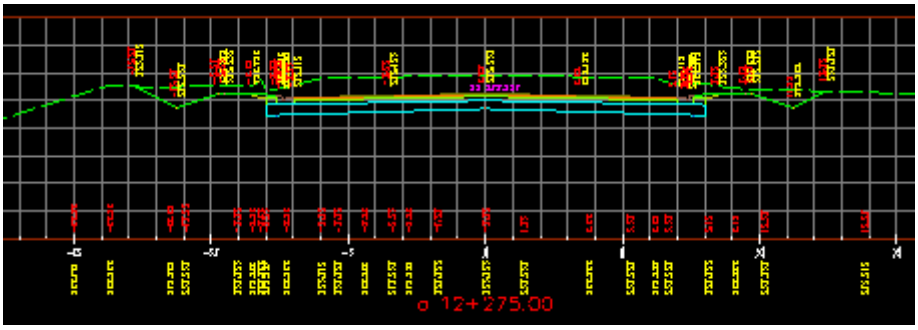
TP Surface.

1. With the Cross Sections dialog open, click on **Preferences** and load named preference ***MTO_TP (1:100)***.
2. Click on *General* leaf. Unselect surface ***Ex3_OG*** and select surface ***Example3***.
3. Click on *Features* leaf then click on *Annotate*. All the features added to the cross section set in section 8.2 are shown in the *Feature* list.



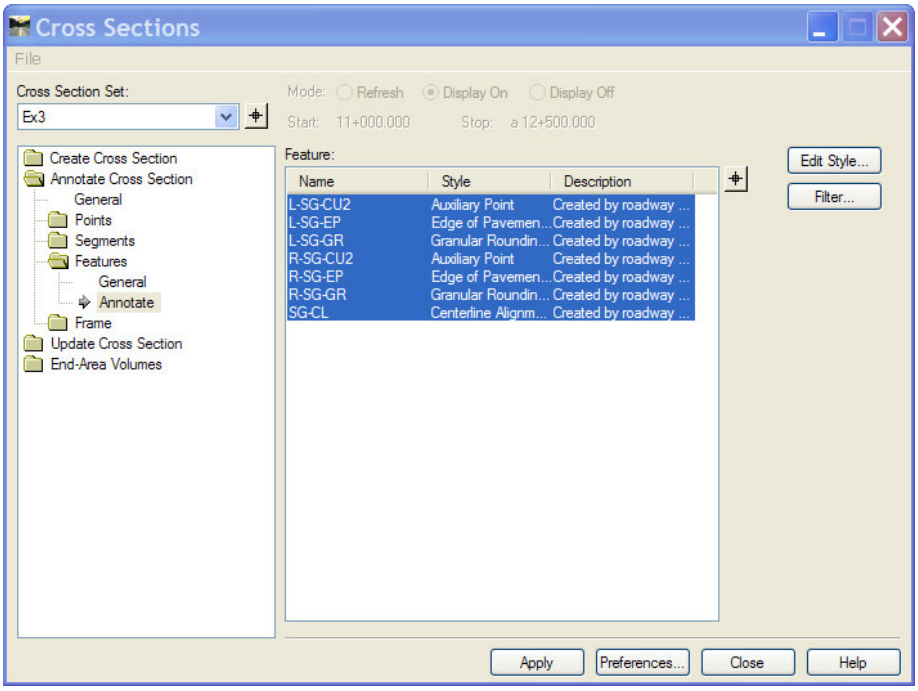
4. Click **Apply**. The top surface is annotated in cross sections.



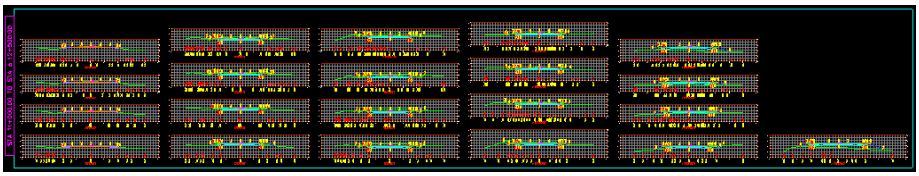


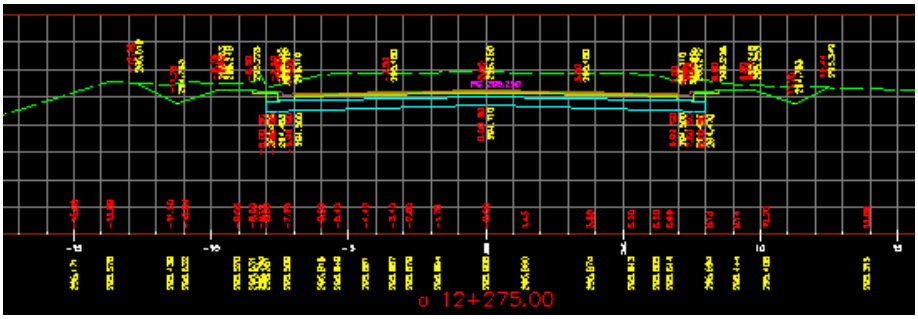
SG Surface.

1. With the Cross Sections dialog open, click on **Preferences** and load named preference ***MTO_SG (1:100).***
2. Click on *General* leaf. Unselect surface ***Example3*** and select surface ***Example3_SG.***
3. Click on *Features* leaf then click on *Annotate*. Select all the features from the *Feature* list.



4. Click **Apply**. The subgrade surface is annotated in cross sections.





5. Close the Cross Sections dialog and save the drawing.

9.0 Volumes

After creating cross section set, the End-Area Volumes can be used to perform the traditional end-area volume calculation to compute cut, fill, and net volumes. To compute the quantities of components, the components must be displayed in the cross section.

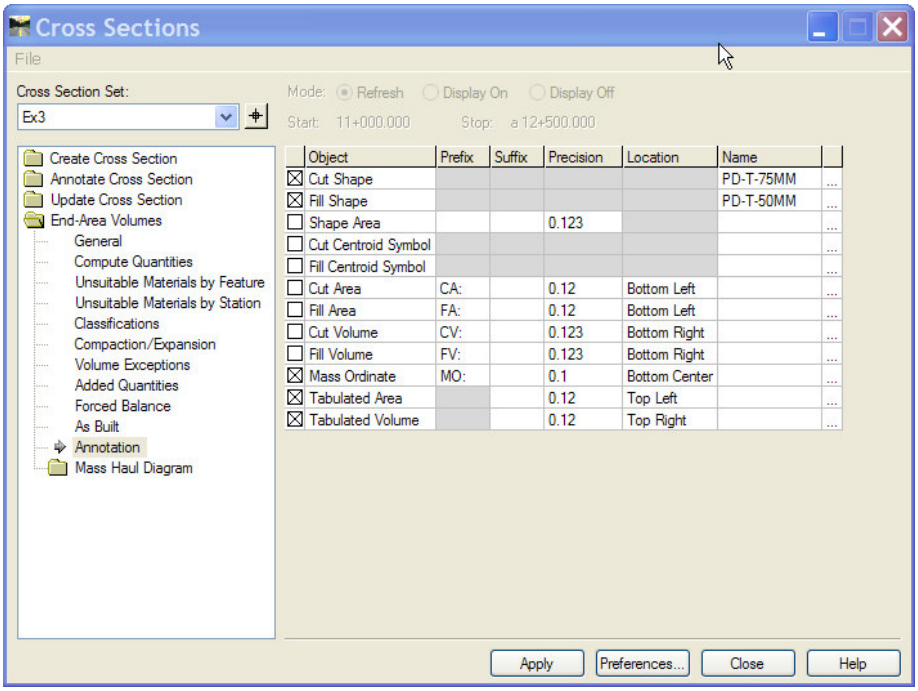
InRoads calculates the exact end areas at each stations. The neat volumes area calculated between stations using the average end area method. The computed volumes can be adjusted for shrinkage or expansion.

9.1 Calculating End-Area Volumes

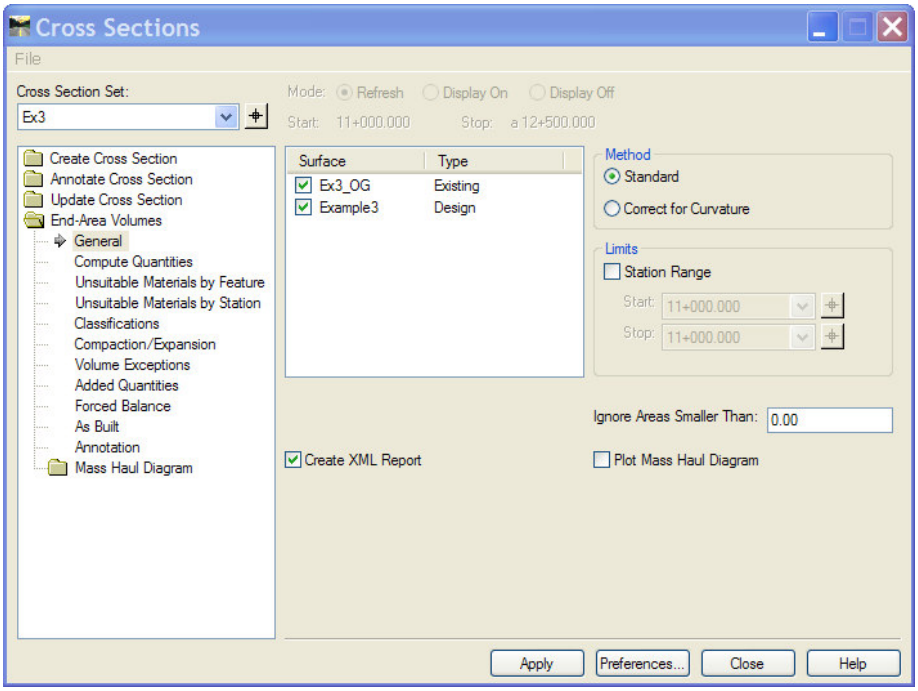
Note: The Compaction/Expansion factor and stripping depths used in this example are for demonstration only. For individual projects, refer to Geotechnical Report or the Regional Geotechnical Section's recommendation.

---

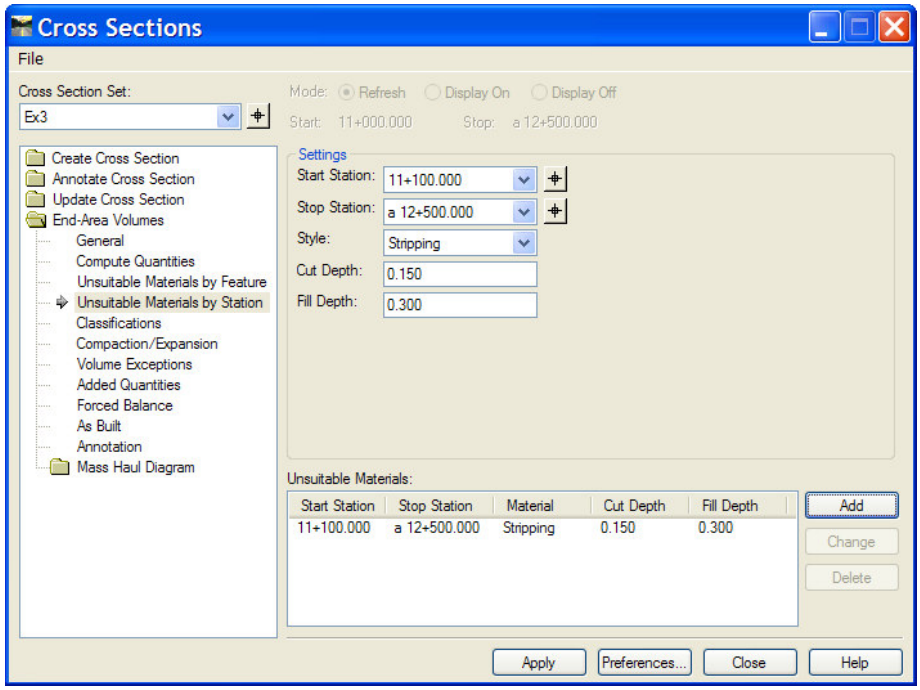
1. Verify that the cross section drawing created in previous section is loaded in MicroStation.
2. Verify that the **Global Scale Factors** is set to ***0.1***.
3. Select **Evaluation > Cross Section > Cross Sections**.
4. Click on the **End-Area Volumes** folder on the left pane of Cross Sections dialog.
5. Click on **Preferences** and load the named preference **MTO.**
6. Click on **Annotation**. Check the default settings of the named Preference **MTO**. Change the options as you need.



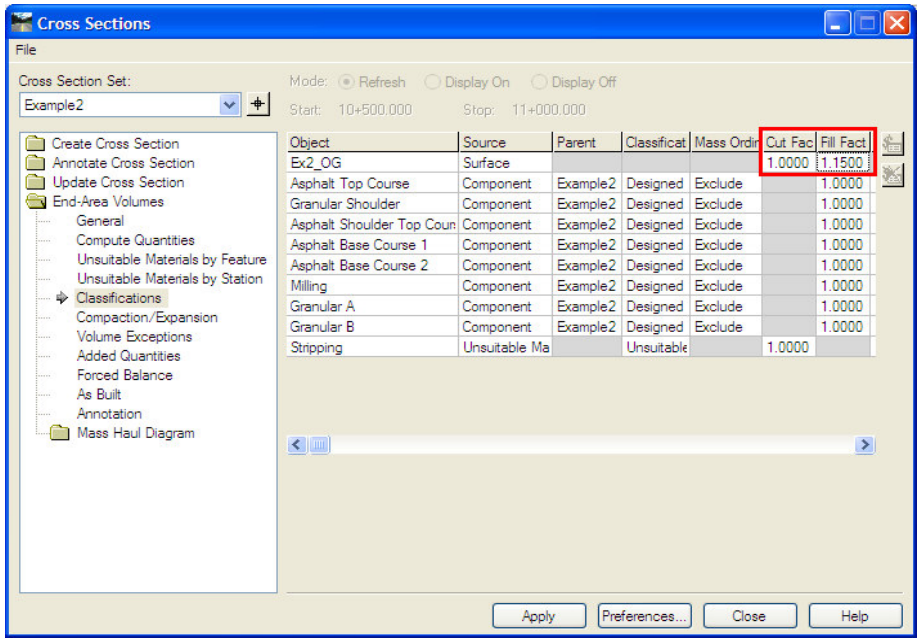
7. Click **General**. In the Surface list, make sure the existing surface ***Ex3_OG*** and the design surface ***Example3*** are checked. With the preference *MTO*, the volume will be calculated for whole cross section set and the *Create XML Report* option is toggled on.



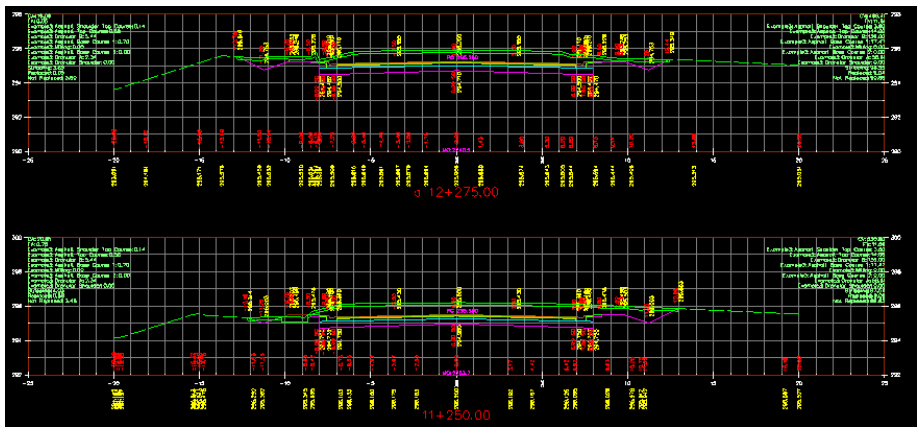
8. Click **Unsuitable Materials by Station.** For new construction, assume stripping will be across the entire cross section. Also assume the stripping depths are 0.15m in cuts and 0.30 in fills.
9. Add the stripping section (11+100 to a 12+500) to the list with the *Style* set to ***Stripping***, *Cut Depth* ***0.15m*** and *Fill Depth* ***0.30m***.



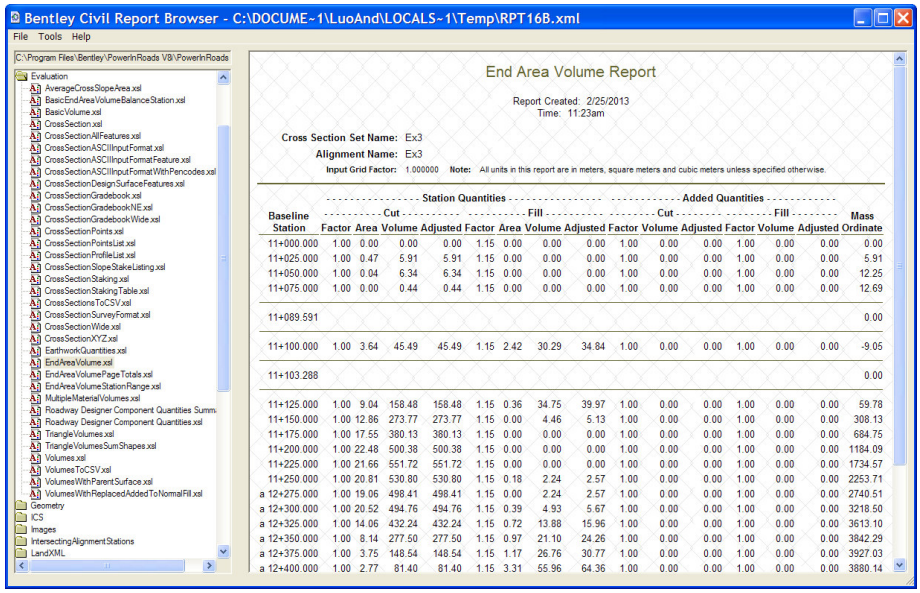
10. Click **Classification**. Use *Cut/Fill Factor* to account for any swell or shrinkage that may occur when remove/place material. Assume 15% increase for the computed earth fill quantity to compensate handing and compaction lose. Edit the Cut/Fill factors in the Materials List table.



11. Click **Apply** to calculate the volumes. InRoads will annotate the cross section set based on the selections on the *Annotation* leaf.



12. With *Create XML Report* option toggled on, Bentley Civil Report Browser displayed. Select **EndAreaVolume** style sheet from the *Evaluation* folder in the left pane of the dialog to view the results.



Bentley Civil Report Browser - C:\DOCUME~1\LuoAnd\LOCALS~1\Temp\RPT16B.xml

File Tools Help

C:\Program Files\Bentley\PowerInRoads V8\PowerInRoads

Evaluation
- AverageCrossSlopeArea.xsl
- BasicEndAreaVolumeBalanceStation.xsl
- BasicVolume.xsl
- CrossSection.xsl
- CrossSectionAllFeatures.xsl
- CrossSectionASCIIInputFormat.xsl
- CrossSectionASCIIInputFormatFeature.xsl
- CrossSectionASCIIInputFormatWithPencodes.xsl
- CrossSectionDesignSurfaceFeatures.xsl
- CrossSectionGradebook.xsl
- CrossSectionGradebookNE.xsl
- CrossSectionGradebookWide.xsl
- CrossSectionPoints.xsl
- CrossSectionPointsList.xsl
- CrossSectionProfileList.xsl
- CrossSectionSlopeStakeListing.xsl
- CrossSectionStaking.xsl
- CrossSectionStakingTable.xsl
- CrossSectionsToCSV.xsl
- CrossSectionSurveyFormat.xsl
- CrossSectionWide.xsl
- CrossSectionXYZ.xsl
- EarthworkQuantities.xsl
- EndAreaVolume.xsl
- EndAreaVolumePageTotals.xsl
- EndAreaVolumeStationRange.xsl
- MultipleMaterialVolumes.xsl
- Roadway Designer Component Quantities Summ
- Roadway Designer Component Quantities.xsl
- TriangleVolumes.xsl
- TriangleVolumesSumShapes.xsl
- Volumes.xsl
- VolumesToCSV.xsl
- VolumesWithParentSurface.xsl
- VolumesWithReplacedAddedToNormalFill.xsl

Geometry
ICS
Images
IntersectingAlignmentStations
LandXML

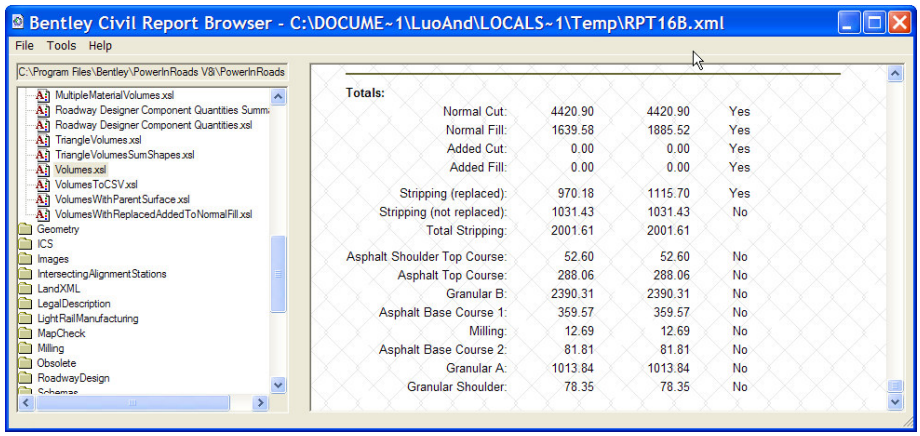
End Area Volume Report

Report Created: 2/25/2013
Time: 11:23am

Cross Section Set Name: Ex3
Alignment Name: Ex3
Input Grid Factor: 1.000000 **Note:** All units in this report are in meters, square meters and cubic meters unless specified otherwise.

Baseline Station	Station Quantities: Cut Factor	Cut Area	Cut Volume	Cut Adjusted	Fill Factor	Fill Area	Fill Volume	Fill Adjusted	Added Quantities: Cut Factor	Cut Volume	Cut Adjusted	Fill Factor	Fill Volume	Fill Adjusted	Mass Ordinate
11+000.000	1.00	0.00	0.00	0.00	1.15	0.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	0.00	0.00
11+025.000	1.00	0.47	5.91	5.91	1.15	0.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	0.00	5.91
11+050.000	1.00	0.04	6.34	6.34	1.15	0.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	0.00	12.25
11+075.000	1.00	0.00	0.44	0.44	1.15	0.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	0.00	12.69
11+089.591															0.00
11+100.000	1.00	3.64	45.49	45.49	1.15	2.42	30.29	34.84	1.00	0.00	0.00	1.00	0.00	0.00	-9.05
11+103.288															0.00
11+125.000	1.00	9.04	158.48	158.48	1.15	0.36	34.75	39.97	1.00	0.00	0.00	1.00	0.00	0.00	59.78
11+150.000	1.00	12.86	273.77	273.77	1.15	0.00	4.46	5.13	1.00	0.00	0.00	1.00	0.00	0.00	308.13
11+175.000	1.00	17.55	380.13	380.13	1.15	0.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	0.00	684.75
11+200.000	1.00	22.48	500.38	500.38	1.15	0.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	0.00	1184.09
11+225.000	1.00	21.66	551.72	551.72	1.15	0.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	0.00	1734.57
11+250.000	1.00	20.81	530.80	530.80	1.15	0.18	2.24	2.57	1.00	0.00	0.00	1.00	0.00	0.00	2253.71
a 12+275.000	1.00	19.06	498.41	498.41	1.15	0.00	2.24	2.57	1.00	0.00	0.00	1.00	0.00	0.00	2740.51
a 12+300.000	1.00	20.52	494.76	494.76	1.15	0.39	4.93	5.67	1.00	0.00	0.00	1.00	0.00	0.00	3218.50
a 12+325.000	1.00	14.06	432.24	432.24	1.15	0.72	13.88	15.96	1.00	0.00	0.00	1.00	0.00	0.00	3613.10
a 12+350.000	1.00	8.14	277.50	277.50	1.15	0.97	21.10	24.26	1.00	0.00	0.00	1.00	0.00	0.00	3842.29
a 12+375.000	1.00	3.75	148.54	148.54	1.15	1.17	26.76	30.77	1.00	0.00	0.00	1.00	0.00	0.00	3927.03
a 12+400.000	1.00	2.77	81.40	81.40	1.15	3.31	55.96	64.36	1.00	0.00	0.00	1.00	0.00	0.00	3880.14

13. Select **Volumes** style sheet and go to the end of the report. A summary table of total volumes of each material is generated by InRoads. There are 4 columns in the table. From left to right they are Material (component style) Name, Volume, Adjusted Volume, and if the material is included in the Mass Ordinate.



Bentley Civil Report Browser - C:\DOCUME~1\LuoAnd\LOCALS~1\Temp\RPT16B.xml

File Tools Help

C:\Program Files\Bentley\PowerInRoads V8\PowerInRoads

- MultipleMaterialVolumes.xsl
- Roadway Designer Component Quantities Summ
- Roadway Designer Component Quantities.xsl
- TriangleVolumes.xsl
- TriangleVolumesSumShapes.xsl
- Volumes.xsl
- VolumesToCSV.xsl
- VolumesWithParentSurface.xsl
- VolumesWithReplacedAddedToNormalFill.xsl

Geometry
ICS
Images
IntersectingAlignmentStations
LandXML
LegalDescription
LightRailManufacturing
MapCheck
Milling
Obsolete
RoadwayDesign

Totals:

Normal Cut:	4420.90	4420.90	Yes
Normal Fill:	1639.58	1885.52	Yes
Added Cut:	0.00	0.00	Yes
Added Fill:	0.00	0.00	Yes
Stripping (replaced):	970.18	1115.70	Yes
Stripping (not replaced):	1031.43	1031.43	No
Total Stripping:	2001.61	2001.61	
Asphalt Shoulder Top Course:	52.60	52.60	No
Asphalt Top Course:	288.06	288.06	No
Granular B:	2390.31	2390.31	No
Asphalt Base Course 1:	359.57	359.57	No
Milling:	12.69	12.69	No
Asphalt Base Course 2:	81.81	81.81	No
Granular A:	1013.84	1013.84	No
Granular Shoulder:	78.35	78.35	No

14. Based on the template and the input during quantity calculation, the quantity of:

    a. Excavation = Normal Cut
    = 4420.90 m^3

    b. Milling is the volume of the partial depth pavement removal (up to 50mm) calculated with the component *Milling*.

Note: Refer to Resurfacing Template in Section 6.2 for details.

Milling =12.69 m^3

c. To calculate the materials available for fill, the volume of pavement removed is to be subtracted from the excavated volume.

Available Materials for Fill:

= Normal Cut (excavation) – Milling

= 4420.90 – 12.69

= 4408.21

d. Asphalt Base Course 2 is the volume of asphalt padding.

Note: Refer to Resurfacing Template in Section 6.2 for details.

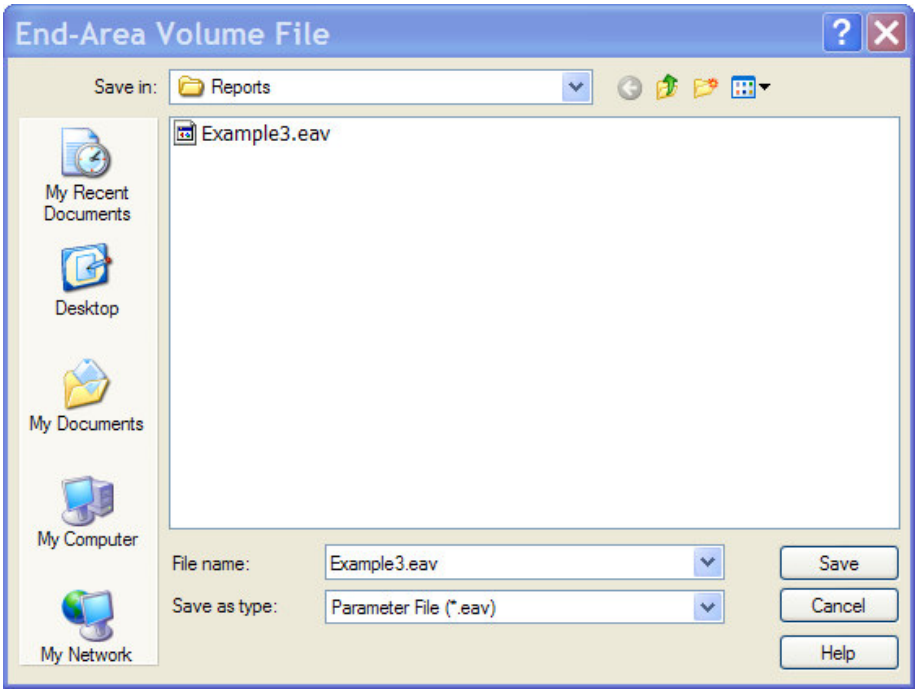
---

15. Save the drawing with a different name (Cross section with end-area quantities).

9.2 Saving End-Area Volume Parameter File

InRoads allows user to load and save project specific parameter files. Generating end-area volumes involves project specific parameters, the parameters used for End-Area Volumes calculation can be stored in an End-Area Volume parameter file (*.eav). The *Open, Save*, and *Save As* commands can be accessed from the *File* menu on the Cross Section Dialog.

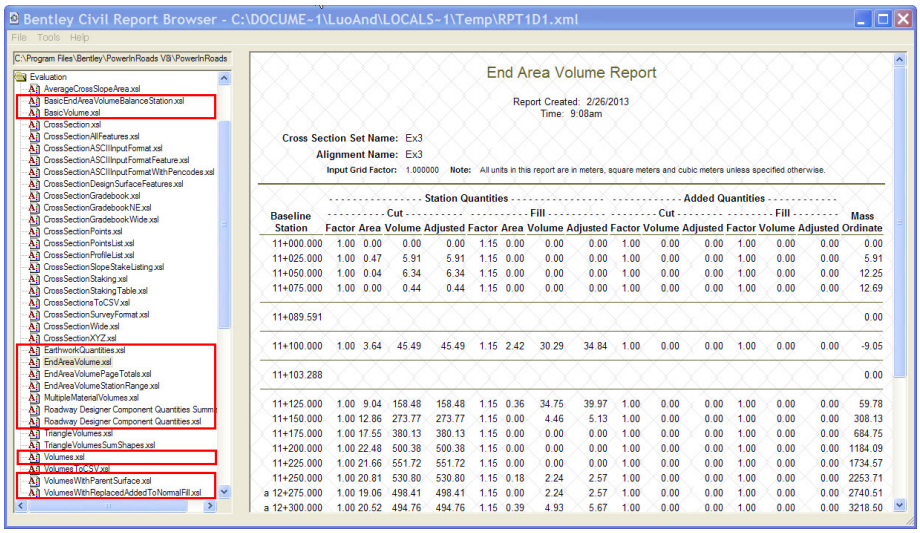
1. On the Cross Section dialog, select **File > Save As**.
2. On the End-Area Volume File dialog, click the ***Save in*** field to select a folder so save the file. By default the folder is the *Reports* folder as defined in project default.
3. In the File Name field. Type in ***Example3.***
4. Click **Save**. A new .eav file *Example3* is created. All the parameters entered under **End-Area Volumes** folder in previous section are now saved.


End-Area Volume File
Save in:
Reports
Example3.eav
My Recent Documents
Desktop
My Documents
My Computer
My Network
File name:
Example3.eav
Save as type:
Parameter File (*.eav)
Save
Cancel
Help

10.0 Reports

10.1 End-Area Volume Report

The End-Area Volume Report is generated with End-Area Volumes command. Refer to Section 9.1 for details about end-area volume calculation and report generation. Once the report is generated by InRoads and the Bentley Civil Report Browser is displayed, a few style sheets from the Evaluation folder can be used to view End-Area Volume.



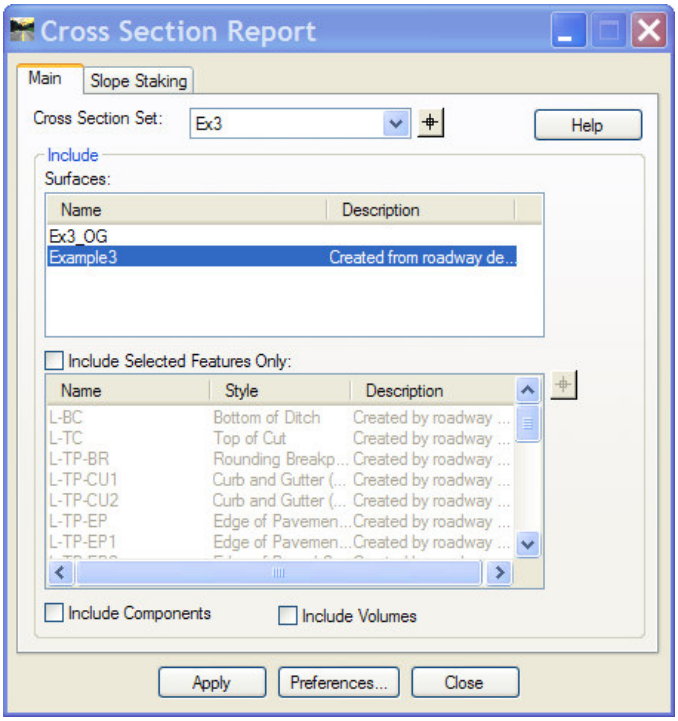
10.2 Cross Section Reports

Cross Section Report command is used to create station, offset, and elevation report for a specified cross section set. All surfaces, features, and components that you want in the report must be displayed in the cross section set.

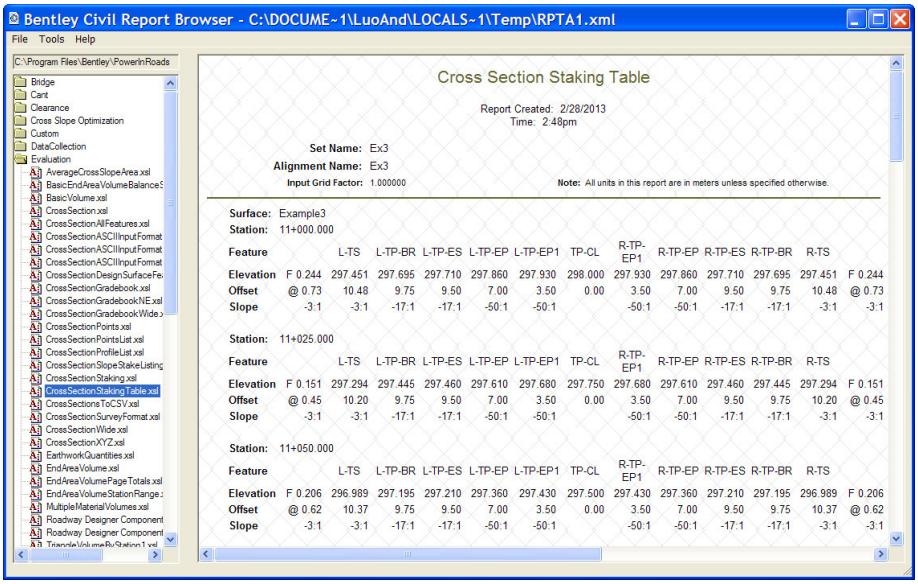
10.2.1 Top of Pavement (TP) Report

The InRoads generated design surface can be used for Top of Pavement report.

1. Open the saved cross section drawing (or you can generate a new set).
2. Select **Evaluation > Cross Section > Cross Section Report**.
3. On the Cross Section Report dialog, verify the *Cross Section Set* is ***Ex3***.
4. Select surface ***Example3*** (design surface) from the *Include Surfaces* list.



5. Click **Apply**.
6. In the Bentley Civil Report Browser, select **Evaluation > CrossSectionStakingTable.xsl**.

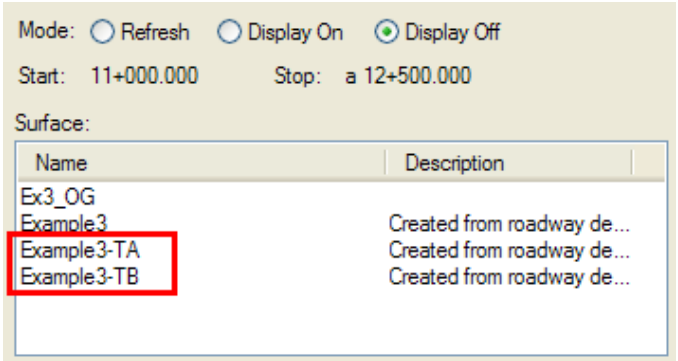


7. Save the report then close the Bentley Civil Report Browser.

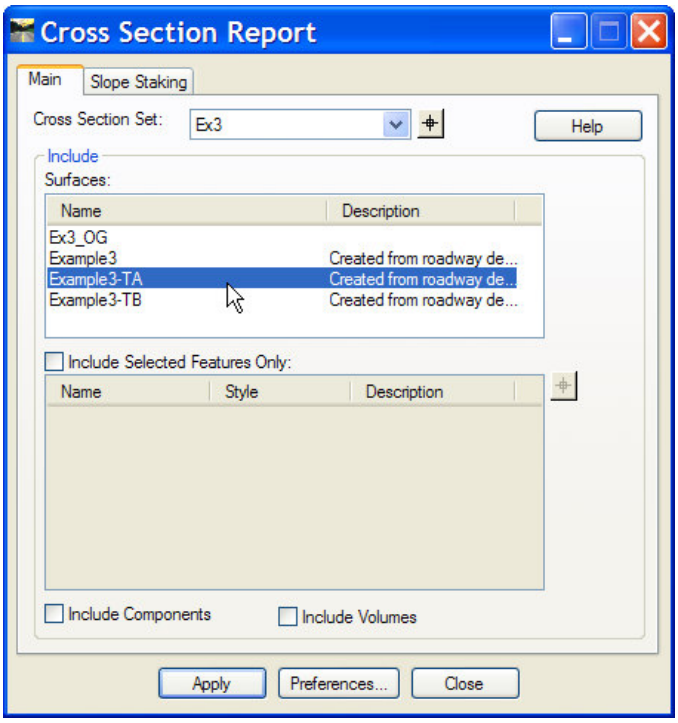
10.2.2 TA and TB Reports

1. Select **Evaluation > Cross Section > Cross Sections**.

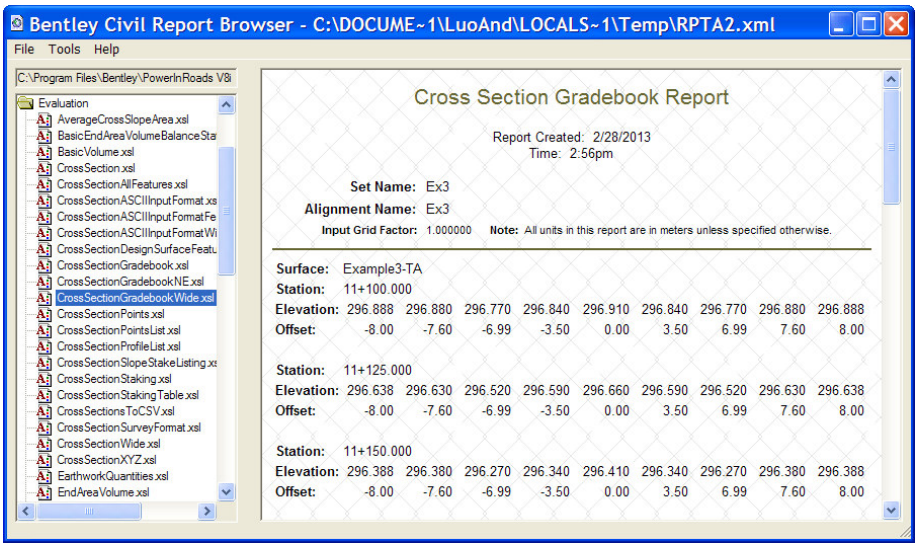
2. Click on the **Update Cross Section** folder on the left pane of Cross Sections dialog.
3. Click on *Surfaces*. Toggle on the **Display On** option.
4. Select surface ***Example3-TA*** from the *Surface* list. Click **Apply**.
5. Select surface ***Example3-TB*** from the *Surface* list. Click **Apply**.
6. Toggle on the **Display Off** option to make sure TA and TB surfaces have been added to the cross section set.



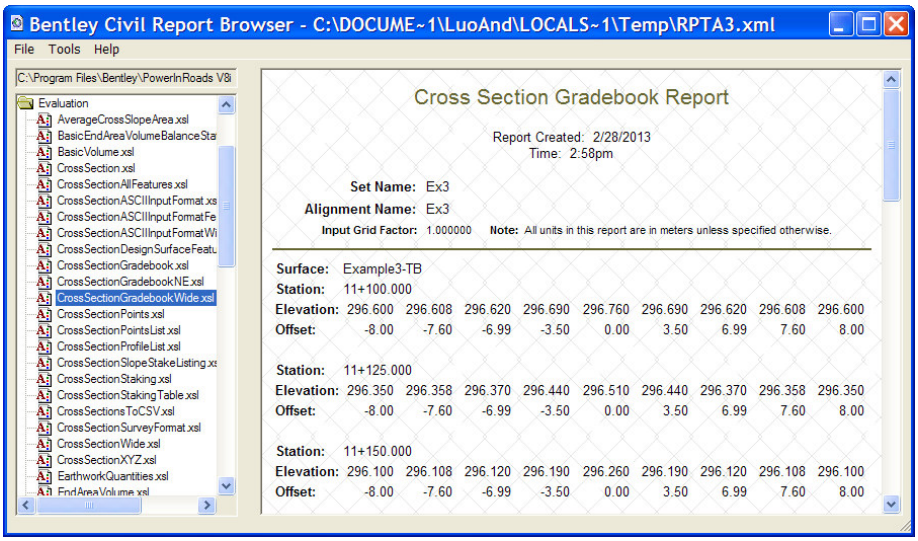
7. Close Cross Sections dialog.
8. Select **Evaluation > Cross Section > Cross Section Report**.
9. On the Cross Section Report dialog, verify the *Cross Section Set* is ***Ex3***.
10. Select surface ***Example3-TA*** from the *Include Surfaces* list.



11. Click **Apply**.
12. In the Bentley Civil Report Browser, select **Evaluation > CrossSectionGradeBookWide.xsl**.



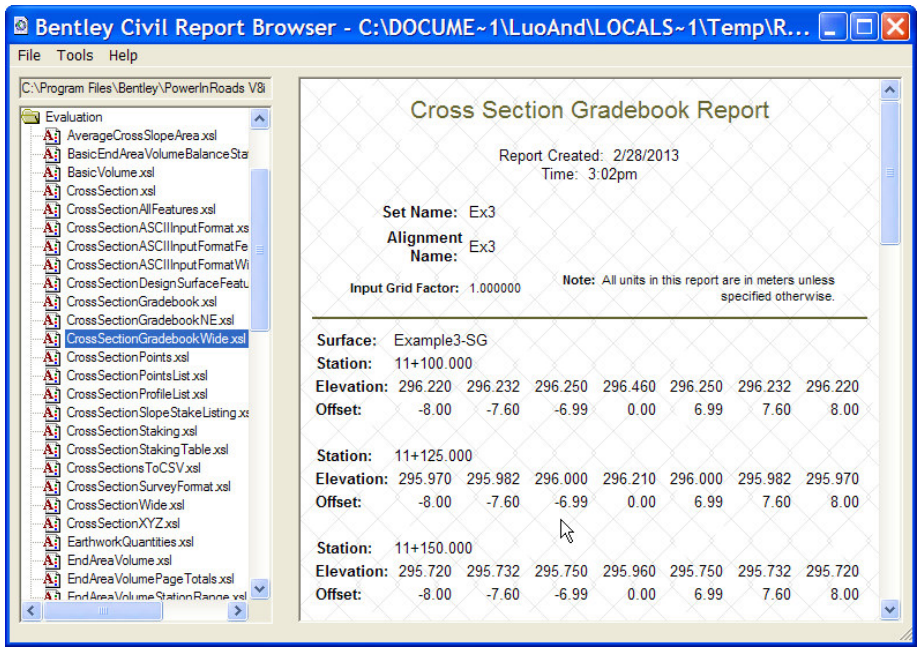
13. Save the report then close the Bentley Civil Report Browser.
14. On the Cross Section Report dialog, select surface ***Example3-TB*** from the *Include Surfaces* list.
15. Click **Apply**.
16. In the Bentley Civil Report Browser, select **Evaluation > CrossSectionGradeBookWide.xsl**.



17. Save the report then close the Bentley Civil Report Browser.
18. Close the Cross Section Report dialog.

10.2.3 Subgrade Report

1. Repeat steps 1 to 7 in section 10.2.2 to add surface ***Example3-SG*** to the cross section set.
2. Select **Evaluation > Cross Section > Cross Section Report**.
3. On the Cross Section Report dialog, verify the *Cross Section Set* is ***Ex3***.
4. Select surface ***Example3-SG*** from the *Include Surfaces* list.
5. Click **Apply**.
6. In the Bentley Civil Report Browser, select **Evaluation > CrossSectionGradeBookWide.xsl**.



7. Save the report then close the Bentley Civil Report Browser.
8. Close the Cross Section Report dialog.