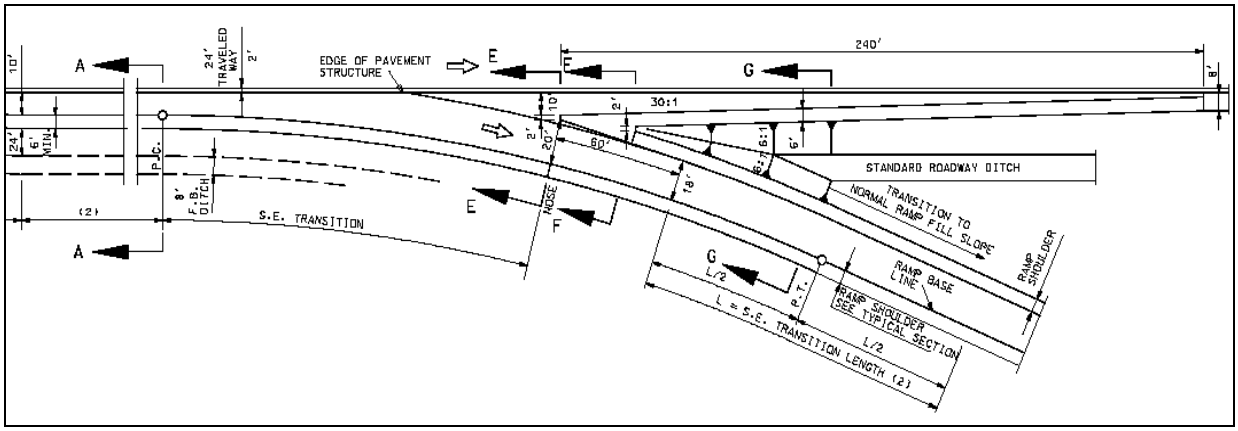
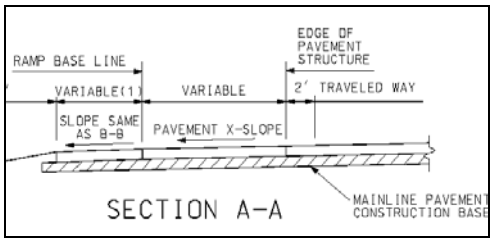
Ramp Transition Exercise

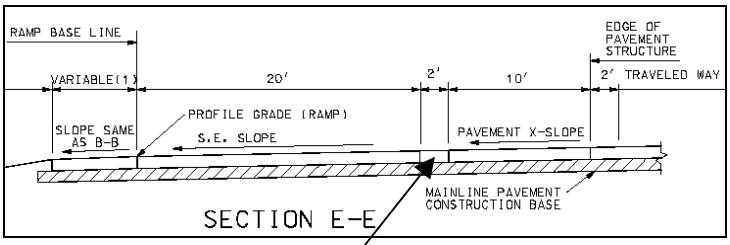
Objective and Background Information

The objective of this exercise is to demonstrate how the GEOPAK shape tools and COGO can be used to create a profile for a ramp transition. This is the area between the sections A-A and E-E in the following figure from Missouri Standard Plans for Highway Construction (203.41). The profile will be applied along the ramp chain.



As the figure indicates, the ramp is in superelevation transition from the pavement cross slope at Section A-A to the superelevation required for the beginning curve of the ramp at Section E-E. These two sections as shown in the standard plans are provided below.





The break in the slope between the mainline and the ramp can occur anywhere within these 2'

Before proceeding with the steps to create the profile, a decision needs to be made regarding the location of the break line between the mainline and ramp cross slopes. According to the Design Standards group, the exact location of this break line at Section E-E is not set. It can be located anywhere within the two-foot width of the ramp nose. For the purposes of this exercise, it will be located on the ramp side of the nose and held at a constant offset of 20' relative to the ramp chain from the ramp nose back to the point where this offset intersects with the mainline edge of pavement. As a designer, you can determine its location for your project.

Also needed is the superelevation rate at the ramp nose, which is base on the design speed of the ramp and the radius of the curve. The radius of the first curve in Ramp 2 is 1,041+ feet.

The relevant portion of the superelevation table from Missouri Standard Plan 203.20F is shown below. Based on e_{max} = 8%, the ramp's design speed of 40 M.P.H. and a rounded radius of 1000', the superelevation for the start of the ramp is 6.0%.

SUPERELEVATION AND WIDENING TABLE, e_{max} = 8%

DESIGN SPEED	30 M.P.H. OR LESS					40 M.P.H.					50 M.P.H.				
NORMAL SURFACE WIDTH			20'	22'	24'			20'	22'	24'			20'	22'	24'
RADIUS (FEET)	e%	L	W			e%	L	W			e%	L	W		
17000	NC	0	0	0	0	NC	0	0	0	0	NC	0	0	0	0
14000	NC	0	0	0	0	NC	0	0	0	0	NC	0	0	0	0
12000	NC	0	0	0	0	NC	0	0	0	0	NC	0	0	0	0
10000	NC	0	0	0	0	NC	0	0	0	0	NC	0	0	0	0
8000	NC	0	0	0	0	NC	0	0	0	0	NC	0	0	0	0
6000	NC	0	0	0	0	NC	0	0	0	0	RC	48	0	0	0
5000	NC	0	0	0	0	RC	41	0	0	0	2.4	58	2.0	0	0
4000	NC	0	0	0	0	RC	41	2.0	0	0	2.9	70	2.0	0	0
3500	NC	0	0	0	0	2.3	48	2.0	0	0	3.2	77	2.0	0	0
3000	RC	36	2.0	0	0	2.6	54	2.0	0	0	3.7	89	2.5	0	0
2500	RC	36	2.0	0	0	3.0	62	2.5	0	0	4.3	103	2.5	0	0
2000	2.4	44	2.5	0	0	3.7	77	2.5	0	0	5.1	122	2.5	0	0
1800	2.6	47	2.5	0	0	4.0	83	3.0	0	0	5.5	132	3.0	2.0	0
1600	2.9	53	2.5	0	0	4.4	91	3.0	0	0	5.9	142	3.0	2.0	0
1400	3.2	58	3.0	0	0	4.8	99	3.0	2.0	0	6.4	154	3.0	2.5	0
1200	3.6	65	3.0	2.0	0	5.4	112	3.5	2.5	0	7.0	168	3.5	2.5	0
1000	4.2	76	3.5	2.5	0	6.0	124	3.5	2.5	0	7.6	182	3.5	3.0	2.0
900	4.5	82	3.5	2.5	0	6.4	132	4.0	3.0	2.0	7.8	187	4.0	3.5	2.5

Procedure:

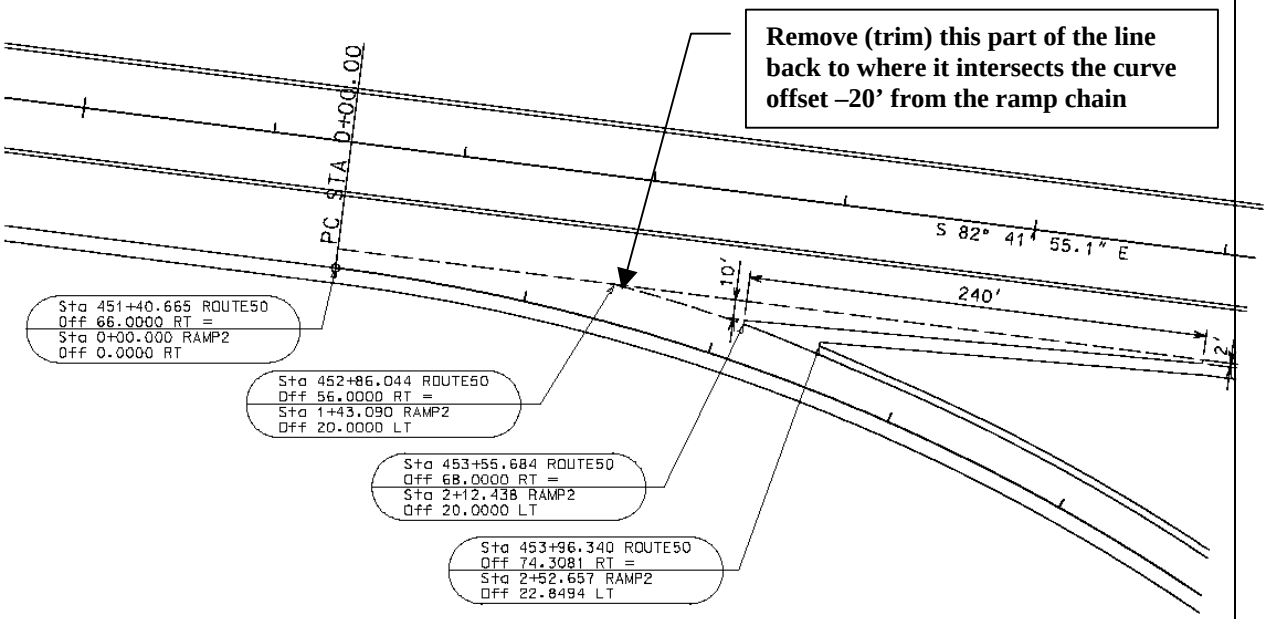
The following steps will be used to create the ramp profile:

1. In the plan view drawing, place a break line from **D&C Manager - EOP New** that indicates the location of the switch between the mainline and ramp slopes. This line is needed for the proposed cross sections.
2. In the shapes file, with the mainline shapes already plotted, place a line along the edge of the shape(s) next to the ramp. This line is to begin 5' before the beginning mainline station for the ramp transition and go to the ending mainline station of the transition.
3. Create a complex MicroStation element (using the same mainline station range as used in step 2) at the location of the break line created in the plan view drawing. Note that this line string will be longer at its beginning than the break line drawn in step 1.
4. Determine the cross slope on the ramp at each end of the transition. The cross slope at one end will match the mainline cross slope and will be at full superelevation for the ramp horizontal curve at the other end.
5. Use the Shape Analyst to find the elevation at the end of the break line as projected from the mainline shape next to the ramp. Based on this elevation and the cross slope for the ramp at this point, calculate the projected elevation along the ramp chain.
6. Store points along the ramp chain using the Shape Profiler in the continuous extrapolation mode to project the main line cross slope to the break line and the ramp cross slope from the break line to the ramp chain.
7. Re-station the points by create a dummy chain form the list with the beginning station set to match the ramp station at that point.
8. Create a point profile from the list of points, which will be the profile for the ramp transition.
9. Cut proposed cross sections for the transition area for RAMP2 only.

Instructions:

1. Open the MicroStation file

pw:\DistrictCADD\design\Osage\J5P0123\data\plan_50_J5P0123.dgn and adjust the window area to the beginning of Ramp 2, as shown below. The white dashed lines indicate the location of the mainline edge of pavement at the ramp and the -20' offset from the ramp chain. Several key points are labeled giving the station and the offset of the point relative to the mainline (**ROUTE50**) and ramp (**RAMP2**) chains.



Trim the east (right) **end of the dashed line** showing the mainline edge of pavement **back to where it intersects the curve offset –20' from the ramp**. Use the Draw Transition Tool and the D&C Manager EOP New to draw this line. It represents the break in EOP for the transition area. Use the adhocs to set the pavement type. **Save the changes to the DGN**.

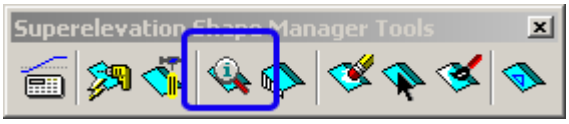
Enter the GEOPAK project **pw:\DistrictCADD\design\Osage\J5P0123\poject\j5p0123.prj** as **userc** and select the **RAMP2TR** working alignment.

2. Open the MicroStation file

pw:\DistrictCADD\design\Osage\J5P0123\data ramps_shape.dgn and adjust the window area to the beginning of Ramp 2.

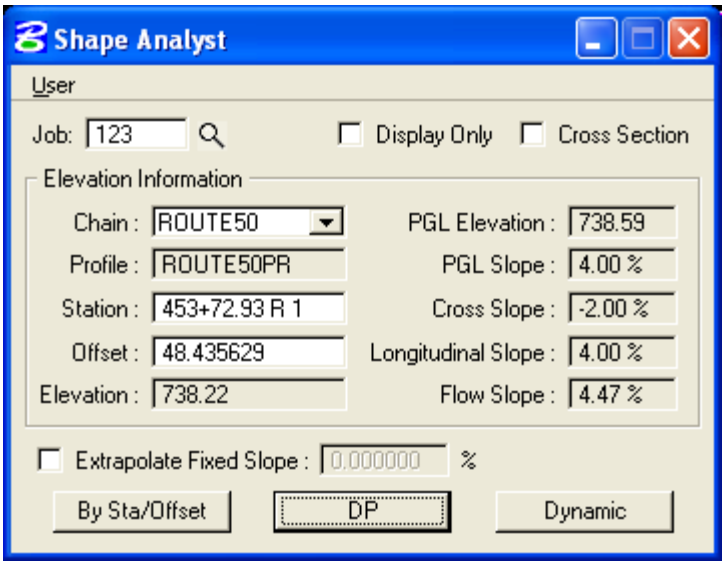
Use the shape analyst tool to determine the elevation projected from the mainline shapes where the break line intersects the ramp nose. This elevation will be used to determine the elevation for last VPI in a point profile for the ramp transition. The Shape Profiler will be used later to generate the rest of the VPI elevations. Activate **Superelevation Shape Manager Tools**

3. Select the **Shape Analyst** from the dialog. It is the forth icon from the left as shown in the figure.

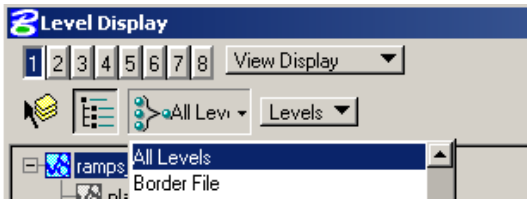


The **Shape Analyst** tool is shown below.

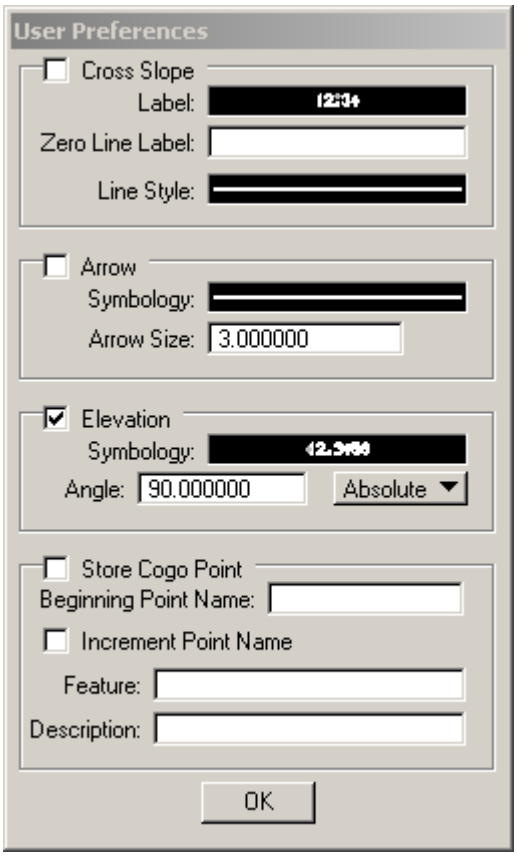
- In the Shape Analyst, shown below, toggle on **Display Only**, select the **DP** button, and data point inside the **Gold** (color-5) shape for Route 50 at the **start of the ramp**. This lets us know that the **cross slope for Route 50 at this point is –2%**. It provides other information about the shape as shown in the dialog. You will have different information based on the location of your DP.

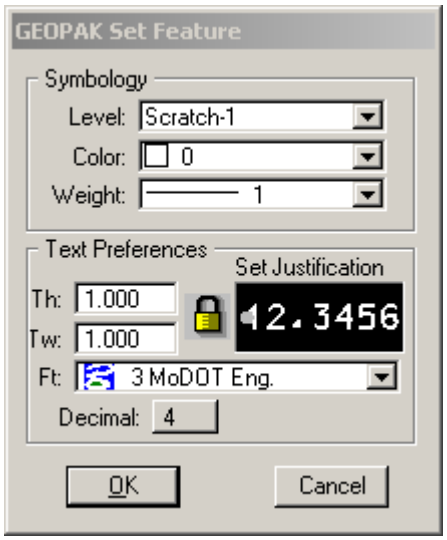


4. Go to the MicroStation **Level Display** and make sure the Level Filter is set to **All Levels or None**.

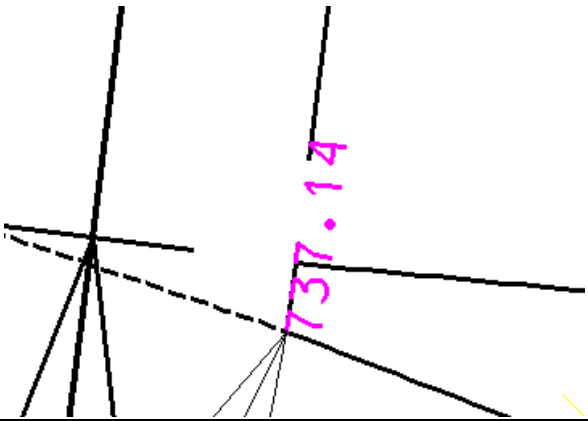


5. Open **User > Preferences** and toggle on **Elevation**, set the text settings as shown below right.





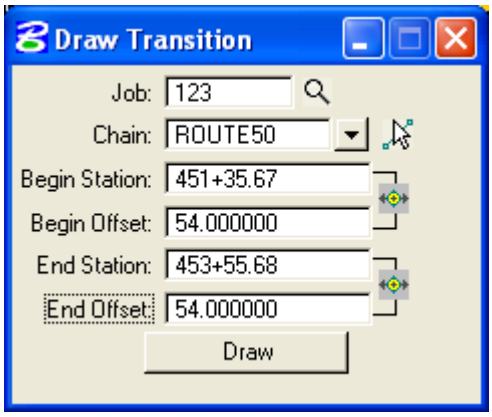
- Close the dialog by clicking on **OK**.
- **Turn off Display Only**.
- Select the **DP** button, **snap** to the **outside pavement edge of the ramp nose** (**Route 50 Sta. 453+55.68**, offset 68’ to the right), and data point to accept. The **elevation at this location is 737.14** as projected from the Route 50 shapes.



6. The Shape Profiler will be used to extrapolate the elevations from the mainline shapes onto the ramp chain to locate the VPIs for the profile. Elevations will be determined at 5' increments. Before doing this, lines need to be added to the shapes file to let the profiler know how to extrapolate the elevations.

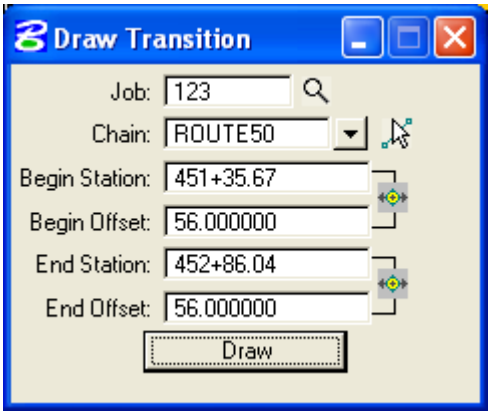
The first line needs to be along the outside edge of the mainline shapes start 5' before the ramp transition and going to the other end of the transition. For this project the line needs to run from Route 50 station 451+35.67 (5' before the start of the ramp) to station 453+55.98, which is the mainline station at the ramp nose, with a constant offset of 54'

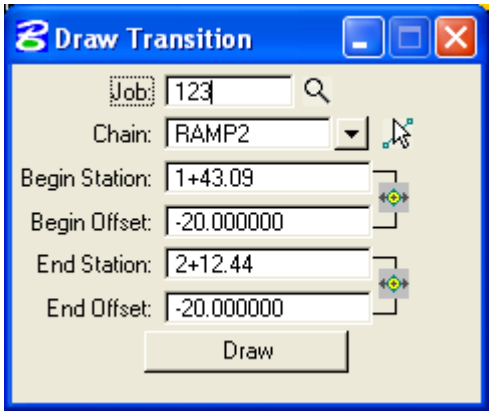
Use Draw Transition to place a line on Level Scratch-2 at a constant offset of 54' from Route50 Station 451+35.67 to 453+55.68.



The second line needs to be a single element that defines the change in cross slope. For this project the line will be offset 56' from Route50 Station 451+35.67 to Station 452+86.04, which is the same a Ramp2 Station 1+43.09 with an offset of -20'. The line continues from that point with a constant offset from Ramp2 Station 1+43.09 to Station 2+12.44.

Use Draw Transition to place a line on level Scratch-2 at a constant offset of 56' from Route50 Station 451+35.67 to 452+86.04. Draw a second line with a constant offset of -20' from Ramp2 Station 1+43.09 to Station 2+12.44.

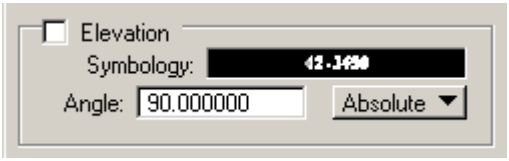




7. **Use the MicroStation Create Complex Chain tool to create a single element from these two lines**. The tool is the one selected in the MicroStation Groups toolbox shown below.

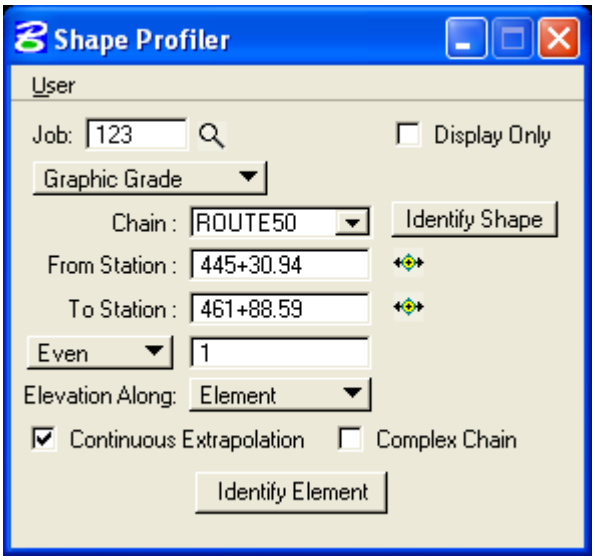
8. **Open the Shape Profiler.**

The Shape Profiler uses the same User Preferences dialog as the Shape Analyst. **Go to User > Preferences** and toggle **off** the **Elevation Option** as shown below since the elevations at the edge of the shape are not needed.



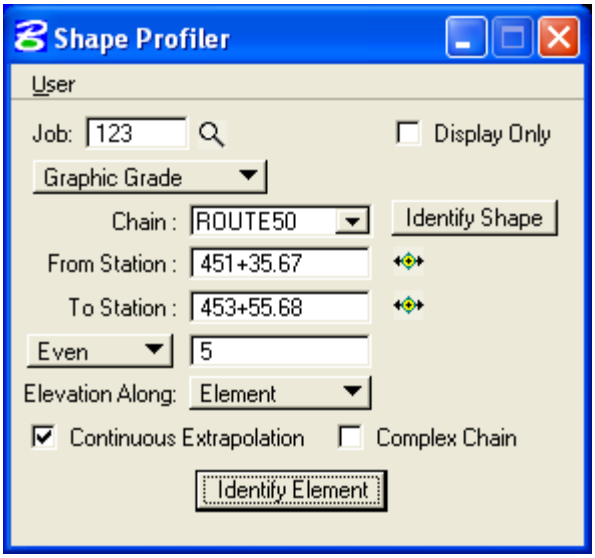
Click **OK** to save the changes to the preferences.

Click on **Identify Shape** in the Shape Profiler and **select the edge of the color-5 shape for Route 50 adjacent to the Ramp 2**. This will fill-in the Chain field in the dialog as well as the shape's from and to station values.



9. Click on the **DP** button next to the **From Station** field and **snap on the end of the complex element** created in the previous step **near the beginning of Ramp 2**. Accept the snap.

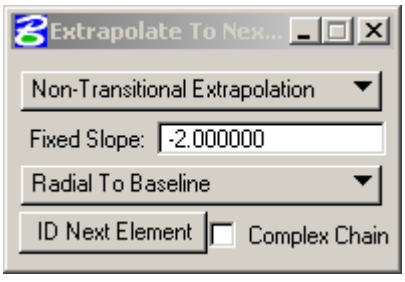
Click on the **DP** button next to the **To Station** field and **snap on the end of the same element** at **the ramp nose**. Accept the snap. This will set the station range for the Shape Profiler.



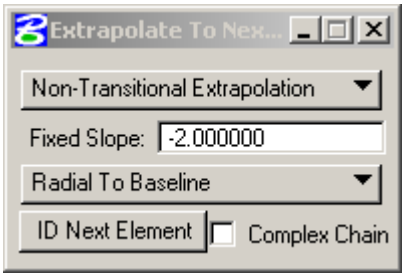
Set the distance between points option to an **Increment** of **5**, as show in the above dialog figure. This area of the dialog is directly below the station range fields.

Set **Elevation Along:** to **Element**. Have **Continuous Extrapolation toggled on** and **Complex Chain turned off**.

10. Click on the **Identify Element** button and select line created in the previous step that runs along the edge of the **Route 50 shape**. This will bring up the following dialog:

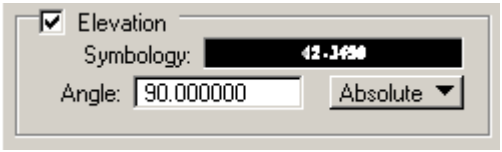


11. Set up the dialog as shown below. This tool will project elevations from the edge of the shape selected onto the next element chosen. This extrapolation can be **Non Transitional** or **Transitional**, which is chosen at the top of the dialog. The next part of the dialog is used to set the slope and direction of the extrapolation, which can be **Radial To Baseline** (used for the shape), **Radial From Element** (which is the current element), or **Radial To Element** to be chosen next.

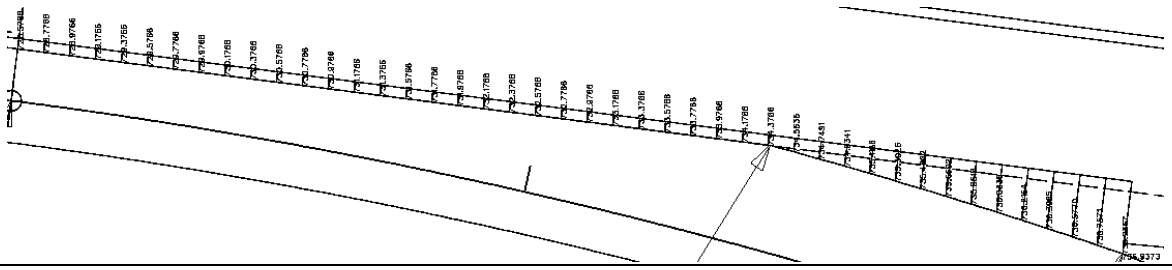


Since the next element chosen will be the line representing the change in cross slope, the slope to the next element is the same slope as the mainline shape. In this example the mainline shape is non transitional with a cross slope of –2%, which is the value to be used. If the shape were in superelevation transition, the Transitional Extrapolation option would be used. The "**From Slope"** equaling the cross slope of the shape and the start of the ramp transition area and the "**To Slope"** set to the cross slope of the shape at the other end of the ramp transition or the end of the shape, which ever comes first.

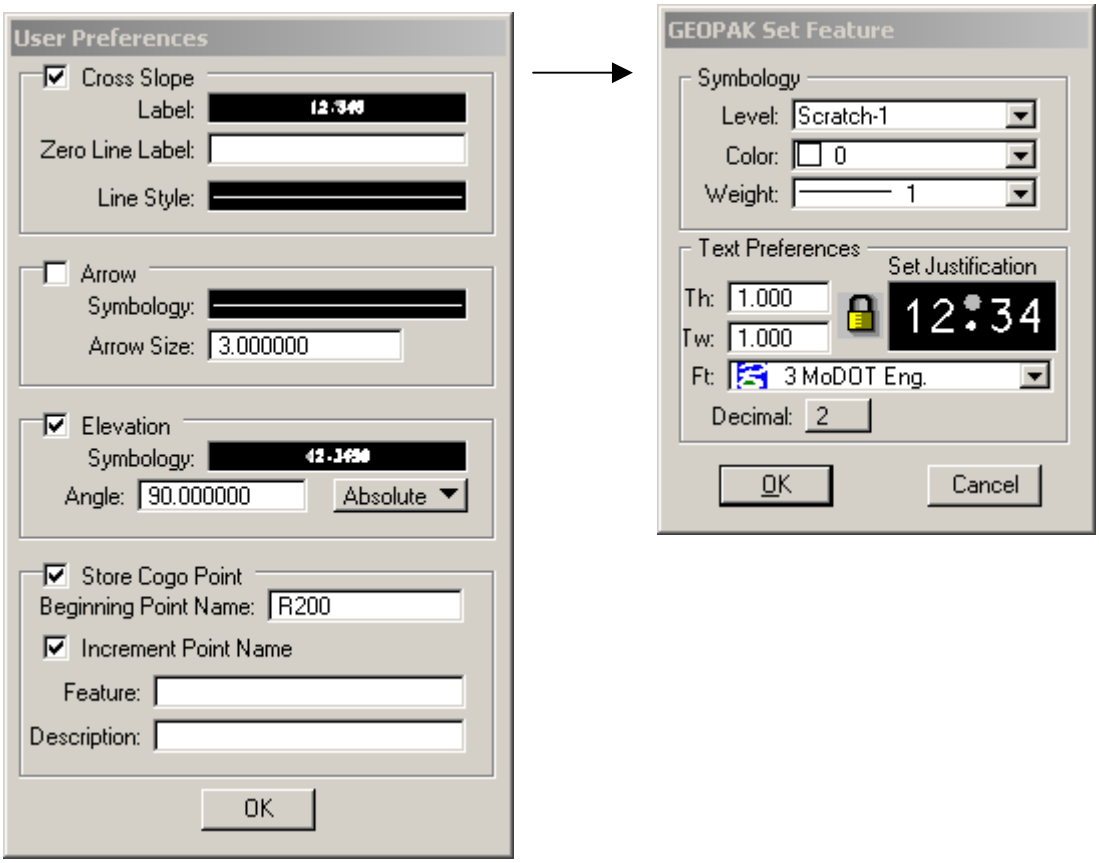
12. For the class example, plot the elevation along the next element chosen. To do this, go to **User > Preferences** in the Shape Profiler and **toggle on the Elevation option** as shown below. Click **OK** at the bottom of User Preferences to accept the change.



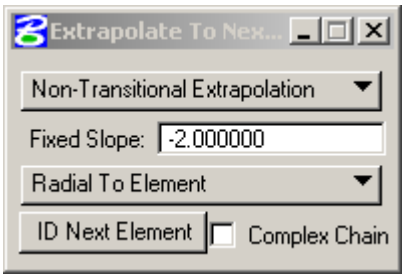
13. In the Extrapolate to Next Element dialog, click on the **ID Next Element** button and select the complex element created in the previous step. You should get the following results:



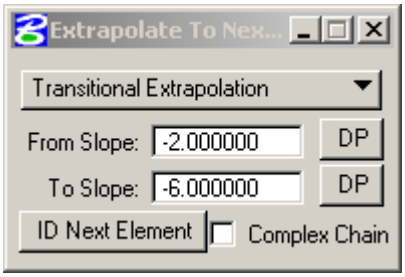
14. The next projection is from the element just identified to the ramp chain. Since the elevations from the next projection will be used to create the profile for the first part of the ramp, preferences need to be changed. Also, it would nice to see the change in the cross slope at each point in the projection to verify that it is being done correctly. To change the preferences, go to **User > Preferences** in the Shape Profiler and **toggle on Cross Slope** and **Store Cogo Point**, as shown in the figure below. Click **OK**, to close the User Preferences dialog.



15. This extrapolation needs to be radial to the ramp chain since that is the direction of the cross slope for the ramp. To do this, switch the projection option to **Radial to Element** in the Extrapolate to Next Element dialog as shown below.

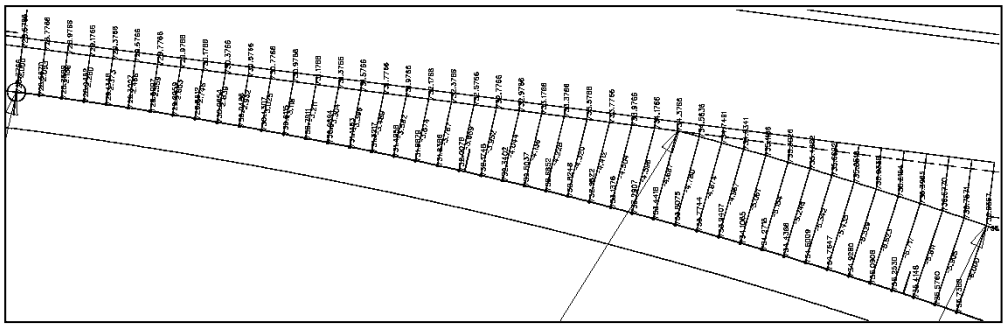


16. Because the ramp cross slope is in transition, change the first option to **Transitional Extrapolation**. This will change the dialog to the form shown in the next figure.



Set the **From Slope:** to **–2** and the **To Slope:** to **–6** as to the left. Click on the **From Slope: DP** and place a data point at the **start of the ramp**. Click on the **To Slope: DP** and place a data point at the **ramp nose**. The offset of these data points can be anywhere on or between the break line and the ramp chain. It is the station value that is used and not the offset.

Click on the **ID Next Element** button and select the **ramp chain**. The results are shown in the figure to the bottom.

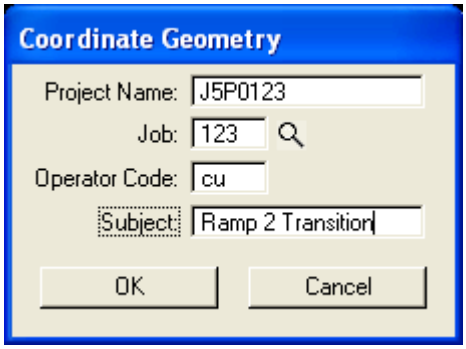


17. **Close the Shape Profiler**. If you look closely at the last projection line you will notice that is just short of the ramp nose. It was because of this that the Shape Analyst was used to project the Route 50 cross slope to the break line. Consequently, the elevation for the VPI for the ramp profile at the nose of the ramp needs to be calculated. It is the elevation at the nose end of the break line + the cross slope on the ramp at that point time the distance from the break line to the ramp. For this example the calculation is:

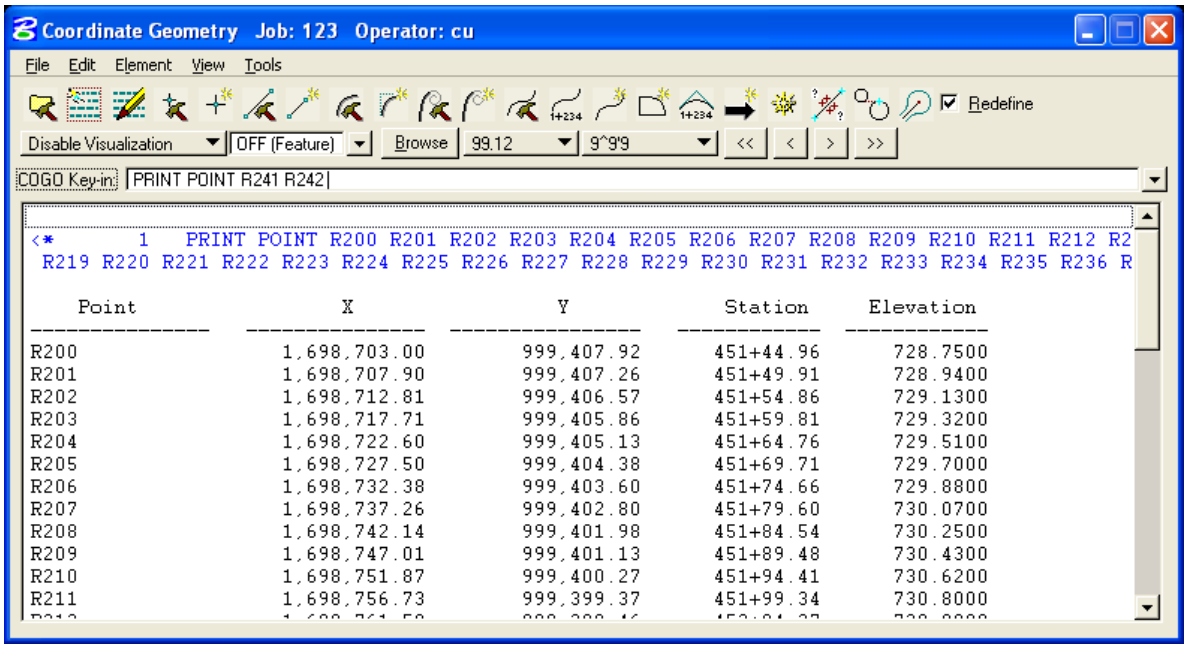
VPI elevation =737.1409 + (-6% * 20') = 737.1409 – 0.06 * 20
737.1409 – 1.2 = **735.9409**

This elevation will be used for the last VPI of the **Ramp 2 Transition (Station 2+12.42)**. We will store this point in COGO to use for our RAMP2TR chain and profile.

18. **Open Coordinate Geometry** to look at the information for the points just created. Enter the session using the information shown in the dialog below.



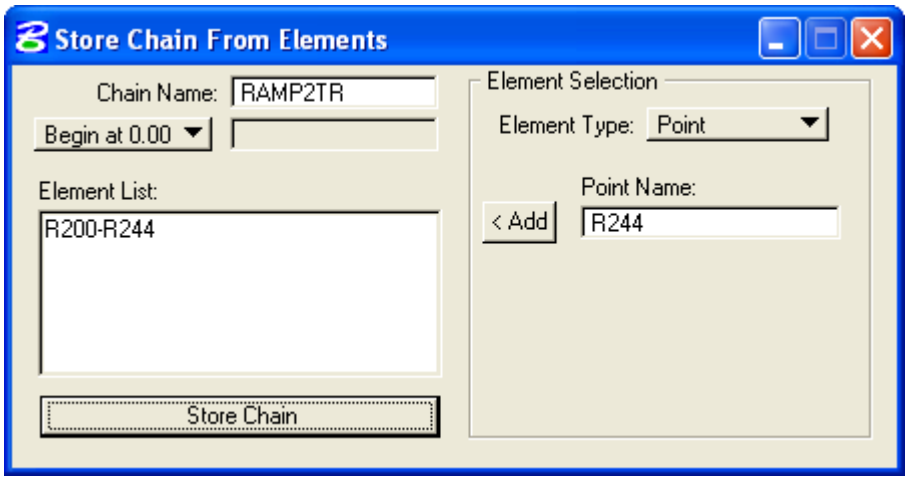
Open the COGO Navigator and look at the list of points. Scroll down until you get to Point R200. Click on **R200 to highlight that point**. Scroll down to the last point in the range. It should be point R243. **Hold down the shift key and click on the last point in the range to select all points in the range**. **Describe the points**. Notice that the points are about 5 feet apart and the stationing corresponds to that from the mainline.



19. Before the points can be used to create a profile for the ramp, we need to add the point we calculated by hand earlier.

Store point number R244 and make sure to toggle and place the elevation of 735.94.

Create chain RAMP2TR beginning at station 0+00 and consisting of the points R200-R244 as shown in the dialog below.



Describe your chain so you can see the stationing. You'll notice that it's not exactly the same as the RAMP2 chain stationing. This is due to the beginning point of the RAMP2TR didn't start exactly at 0+00 on the RAMP2 stationing. You can also figure out the elevation at that precise point using the same method we used to calculate R244. For the purpose of this exercise we won't. For a real design, you want to ensure that you get the correct stationing for your transition area for each RAMP.

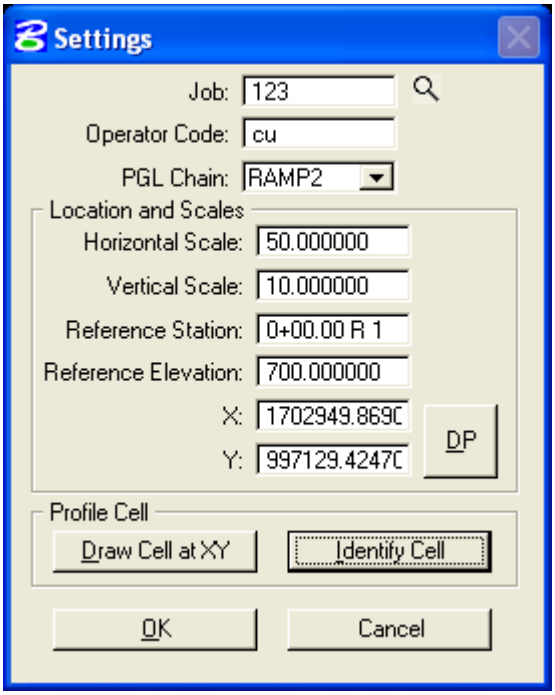
20. The next step is to create the profile for the transition area in Ramp 2. A key-in command needs to be used for this step. It has the following format: STORE PROFILE name pa-pi. Type in the following COGO command:

S PRO RAMP2TR R200-R244

Exit Coordinate Geometry.

21. Open the MicroStation file **pw:\DistrictCADD\design\Osage\J5P0123\data\profile_J5P0123.dgn. Go to the Microstation Utilities Pulldown Menu** and select Saved Views and pick the RAMP2 saved view.

22. Open the **Vertical Alignment** generator and set up the settings and preferences as shown (use the "Identify Cell" button and select the RAMP2 cell in the view:



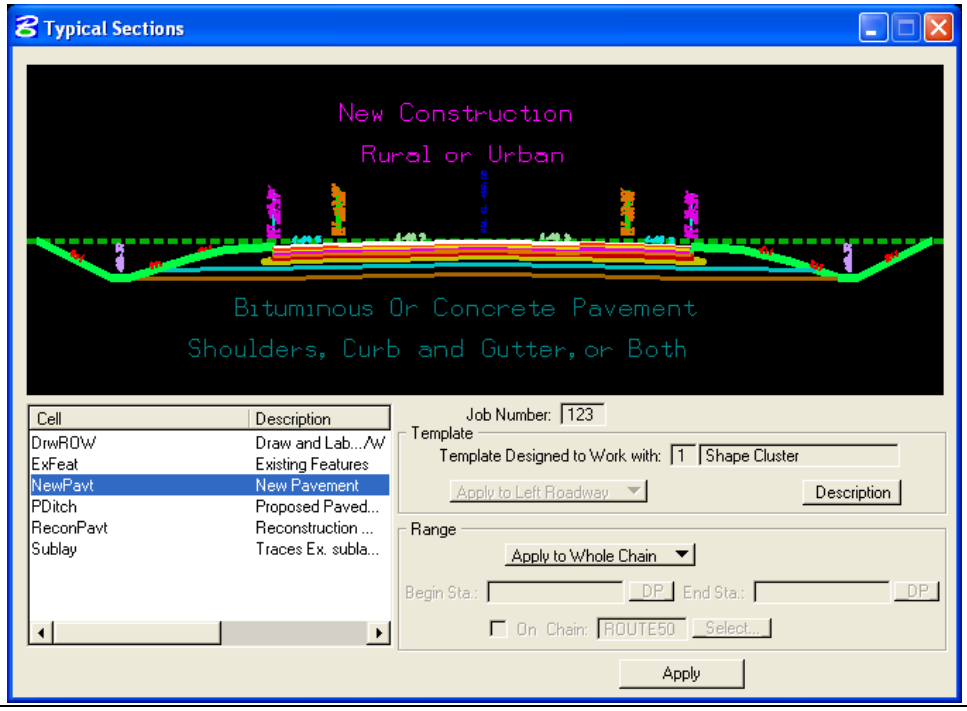
Select **File > Load** and load the profile RAMP2TR to review and make any changes if needed. Exit the Vertical Alignment Generator

23. Open Microstation file
pw:\DistrictCADD\design\Osage\J5P0123\data\xs_ramp2tr_J5P0123.dgn

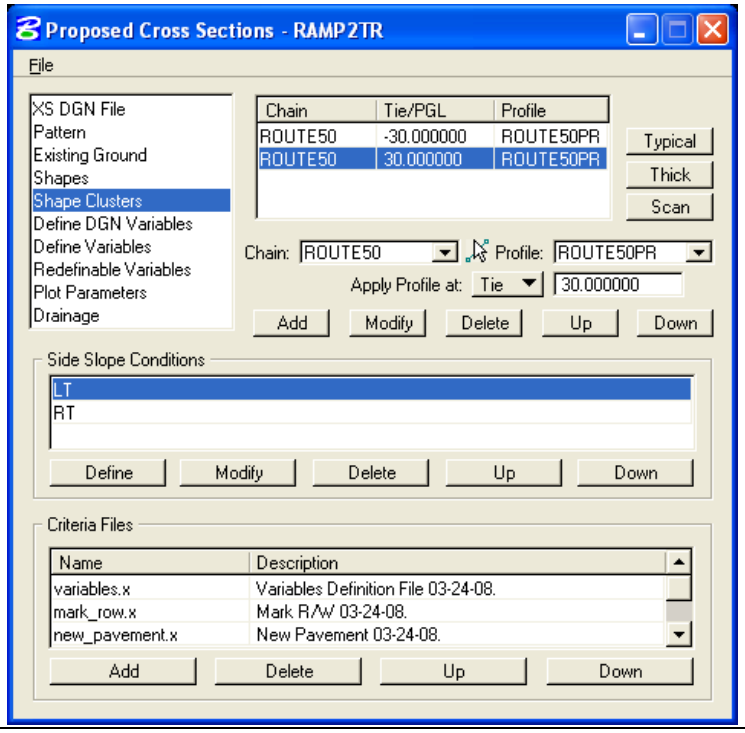
Ensure you are still in RAMP2TR working alignment in your Project Manager Road Dialog. Let's review your working alignment definition.

Select Proposed Cross Sections from the dialog box. Copy the MoDOT run and name it RAMP2TR. Enter the newly created run.

24. Set up the shape clusters. Scan for your shapes and add the Route50PR shapes. Start by adding the –30 tie first. Apply the typical section "New Pavt" to each shape cluster.



25. When finished setting up your shape clusters you should end up with a set up like the one shown below.



26. Set up your Define Variables as shown below:

Right of Way DGN:	plan_50_J5P0123.dgn
Cross Section DGN:	xs_ramp2tr_J5P0123.dgn
Proposed Plan DGN:	plan_50_J5P0123.dgn
Geopak Lines DGN:	ramps_shape.dgn
xs scale:	10
Plan scale:	50

27. No Redefinable Variables will be set up for this run. We are using the ad-hocs in the plan view geometry to expedite things. So, we will leave all Redefinable Variables as default.

28. Run proposed cross sections and review when finished.

Bonus Material

Steps 1- 28 have demonstrated a typical application of the procedure given at the beginning of this exercise. Part of the design process involves beginning with "dummy profiles" to get you close to where you need to be. Ideally, you would go back to the first transition ramp chain and profile and add points at the true beginning and end of the RAMP chain so that your cross sections have the appropriate labeling.

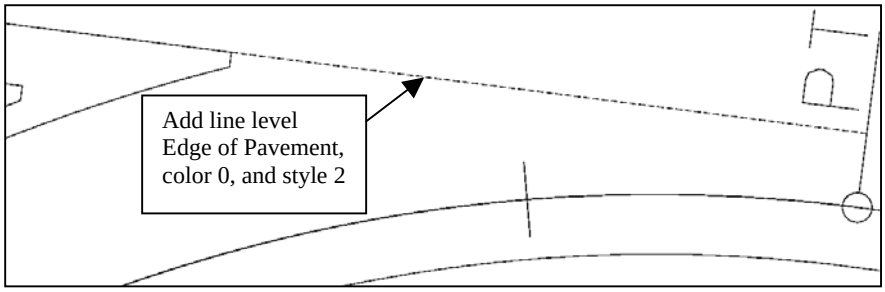
Design recommendations for designing ramps:

- Always start by designing each of the transition areas first, and then tie them together by creating the full profile.
- Do not shape ramp transition areas. Instead use the shape profiler tool and the criteria to handle the cross slope change.
- Cut cross sections for the ramp separate from the mainline except for the transition area, which should be included in the main line sections. This will ensure that your earthwork is being paid accurately.
- Create matchlines for the grass gore areas to keep earthwork from the mainline separate from the ramps.

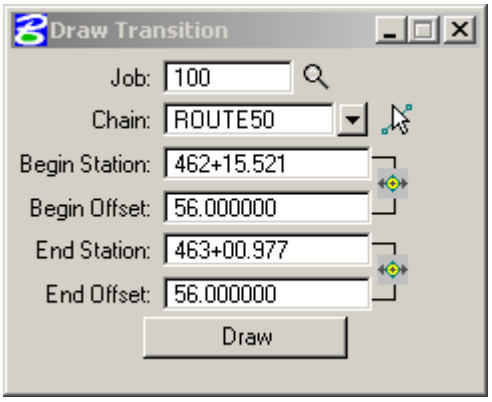
The rest of this exercise looks at two more cases to show most of the changes in application that will be encountered.

Merging ramps following the same direction of mainline stationing.

Ramp 4a) Open the MicroStation file **pw:\DistrictCADD\Design\cole\j5p0100\data\plan_50_J5P0100.dgn** and adjust the window area where Ramp 4 merges with the mainline. Ramp 4 is the loop on ramp for the eastbound lane.

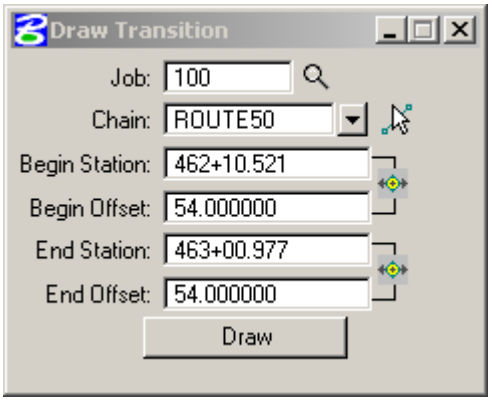


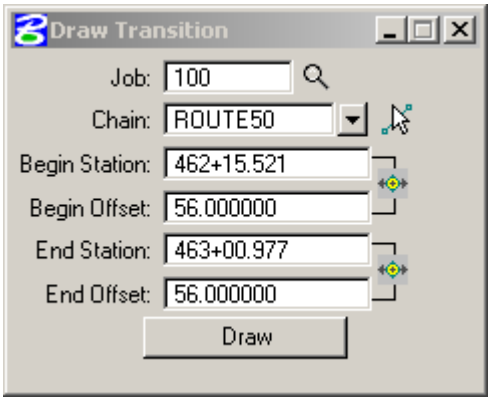
Use **Draw Transition** to place a dashed pavement line offset 56' to the right of the ROUTE50 chain between the ramp nose and the end of the ramp to define the break in pavement cross slope between the mainline and the ramp. In this example, a straight line without the curve is used to define the break in the slope.



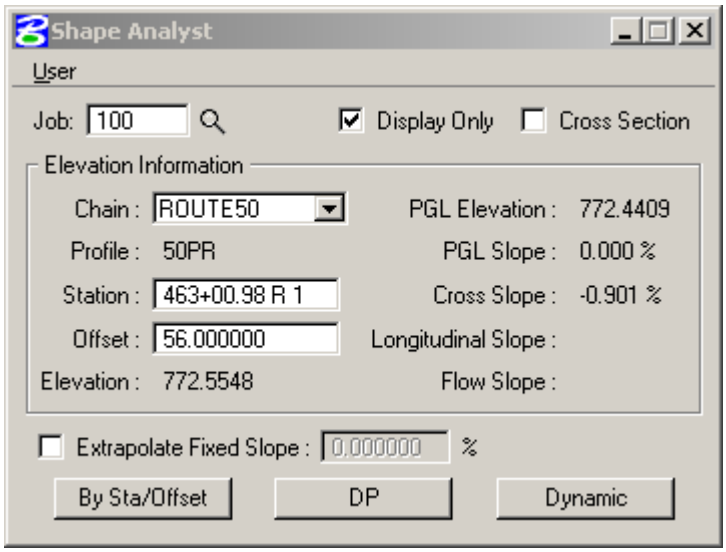
Ramp 4b) Open the MicroStation file **pw:\DistrictCADD\Design\cole\j5p0100\data\ramps_shape.dgn** and adjust the window area to the beginning of Ramp 4.

Notice that the stationing for the mainline runs is increasing from the ramp nose to the end of the ramp. Thus the extension of the line along the edge of the mainline shape next to the ramp is at the nose end for this situation. **Draw 2 lines on level Scratch 2 between ROUTE50 stations 462+10.521 and 463+00.977** (the station at the end of the ramp): **one** at an **offset of +54'** and **the other** at an **offset of +56'** from the chain. **Note**: Since the break line is made up of only one element, Step C from the Procedure given on page 2 of this exercise is not needed for this situation.





Ramp 4c) Determine the cross slope on the ramp at each end of the transition: Because of the tight radius of the ramp curve, the cross slope is the **8% maximum at the nose**. Since the mainline shape is in superelevation transition at the end of the ramp, use the Shape Analyst to determine cross slope. You should get the results shown below indicating a cross slope of –0.901% for the mainline. Use a ramp cross slope of **+0.901% at its end point**.



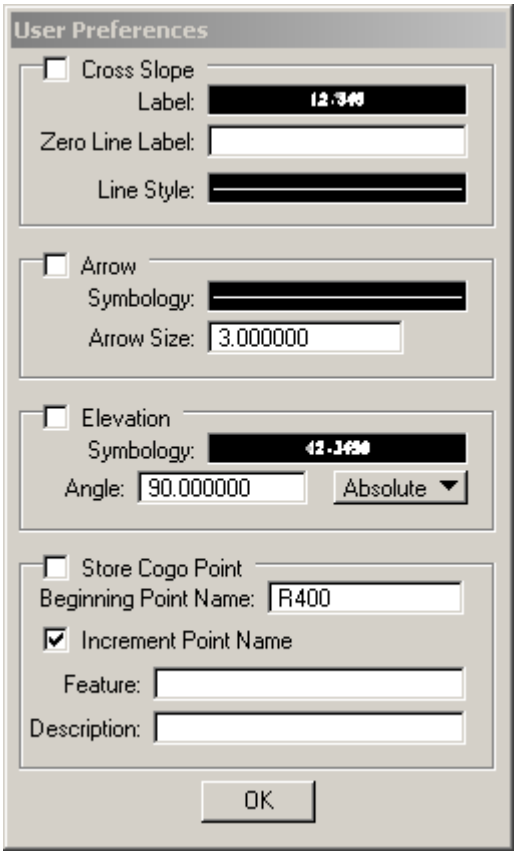
Ramp 4d) Use the Shape Analyst to determine the elevation at the end of the break line as projected from the mainline shape. The dialog above gives the elevation as 772.5548. Thus, the elevation for the ramp profile VPI at the end of the ramp is:

VPI elevation = 772.5548 + (-0.901% * 10') = 772.5548 – 0.009 * 10
772.5548 – 0.0901 = **772.4647**.

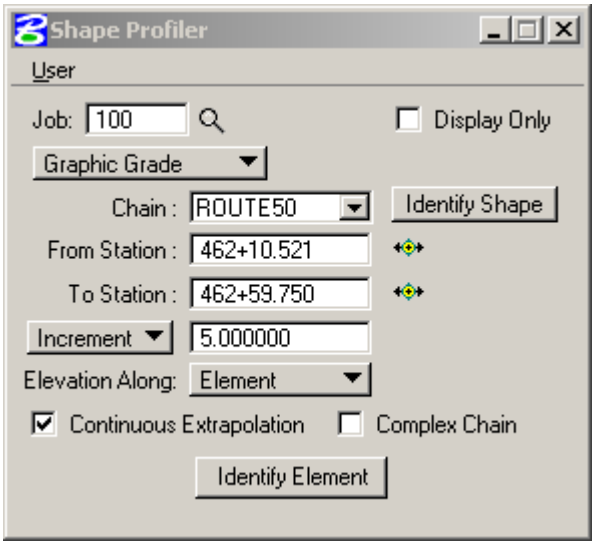
This elevation will be used for the VPI at **the end of the Ramp 4 chain** for this situation.

Ramp 4e) Use the Shape Profiler to store points along the ramp chain by projecting the cross slopes from the mainline. After opening the dialog for this tool, go to **User > Preferences**

Turn **off** all of the options and set the **Beginning Point Name** to **R400**, as shown in the figure to the left. Select **OK** to close the User Preferences.

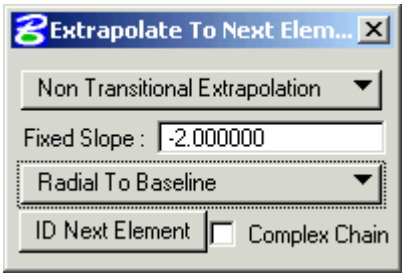


Ramp 4f) Click on the **Identify Shape** button and data point on the edge of the mainline shape **near the ramp nose**. Notice that the shape does not go all of the way to the end of the ramp. Press **DP** next to the From Station Field and snap and accept to the end of the break line near the end of the nose. Leave the To Station as the station for the end of the shape. You should get the station range shown in the following figure.

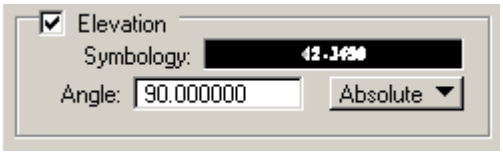


Leave the distance between points option to an **Increment** of **5**, **Elevation Along:** to **Element**, **Continuous Extrapolation toggled on** and **Complex Chain turned off**, as shown above.

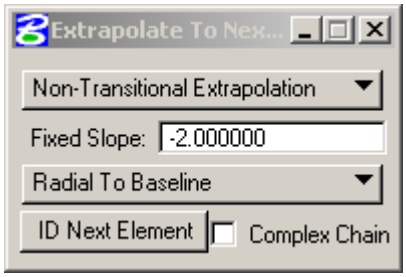
Ramp 4h) Click on the **Identify Element** button and select line that runs along the edge of the Route 50 shape. This will bring up the following dialog:



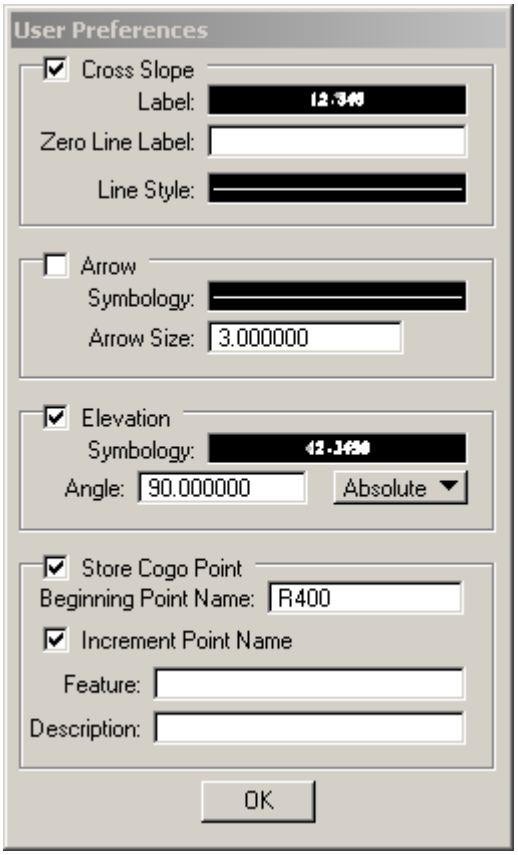
Ramp 4i) Plot the elevation along the next element chosen. To do this, go to **User > Preferences** in the Shape Profiler and **toggle on the Elevation option** as shown below. Click **OK** at the bottom of User Preferences to accept the change.



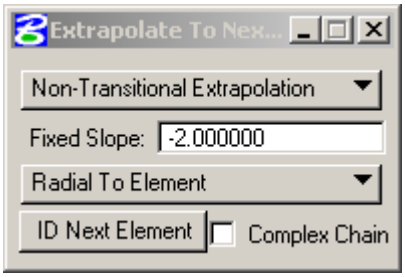
Ramp 4j) Set up the dialog as shown below. Since the next line is parallel to the main alignment baseline, any of the three options (Radial To Baseline, Radial From Element and Radial to Element) can be used since they will all produce the same result. Because the projection method does mater most of the time, select **Radial to Baseline**, click on **ID Next Element**, and **data point on the break line** defining the change in slope between the mainline and the ramp.



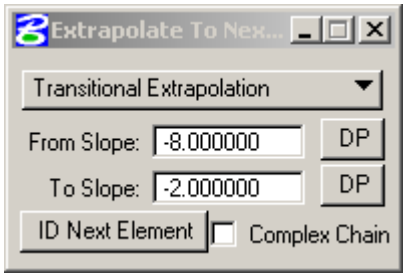
Ramp 4k) The next projection is from the element just identified to the ramp chain. Since the elevations from the next projection will be used to create the profile for the first part of the ramp, preferences need to be changed. Also, it would nice to see the change in the cross slope at each point in the projection to verify that it is being done correctly. To change the preferences, go to **User > Preferences** in the Shape Profiler and **toggle on Cross Slope** and **Store Cogo Point**, as shown in the figure below. Click **OK**, to close the User Preferences dialog.



Ramp 4l) This extrapolation needs to be radial to the ramp chain since that is the direction of the cross slope for the ramp. To do this, switch the projection option to **Radial to Element** in the Extrapolate to Next Element dialog as shown below.

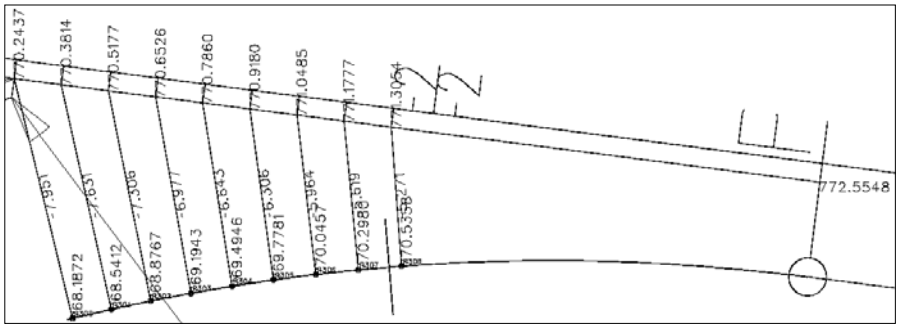


Because the ramp cross slope is in transition, change the first option to **Transitional Extrapolation**. This will change the dialog to the form shown in the next figure.



Set the **From Slope:** to **–8** and the **To Slope:** to **–2** as shown to the left. Click on the **From Slope: DP** and DP at the ramp side of the **ramp nose**, since the Superelevation for the ramp is defined at that side of the nose. Click on the **To Slope: DP** and place a data point at the **end of the ramp** anywhere on or between the break line and the ramp chain. <u>It is the station value that is used and not the offset.</u>

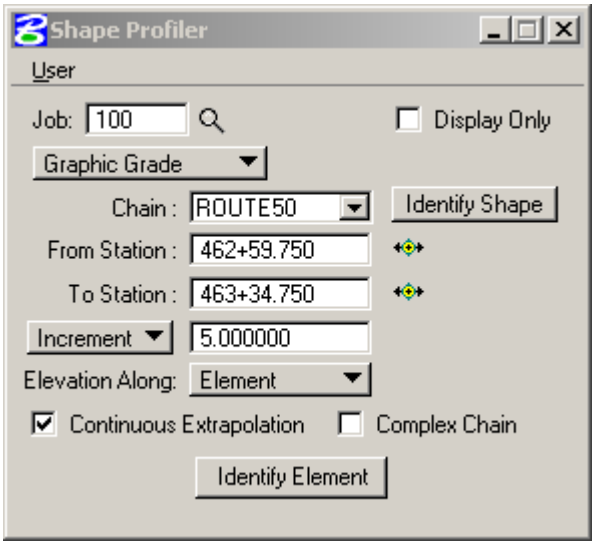
Click on the **ID Next Element** button and select the **ramp chain**. The results are shown in the figure to the left. Notice that only the first part of the ramp is done since that is limit of the shape.



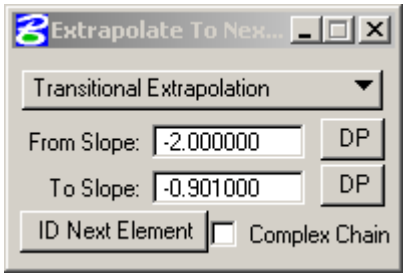
Ramp 4m) Repeat the process for the rest of the ramp. To do this, **close Extrapolate to Next Element**.

Turn off all of the Shape Profiler options by going to **User > Preferences** and **toggling off Cross Slope, Text, and Store Cogo Point**. Leave the Beginning Point Name alone to continue incrementing the point numbers.

Click on **Identify Shape** and data point on the edge of the mainline shape **near the end of the ramp**. Leave the **From Station** as is. Press **DP** next to the To Station Field and set the station to the value at the end of the break line near the end of the ramp. You should get the station range shown in the figure to the right.

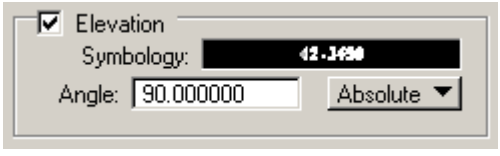


Click on the **Identify Element** button and select line that runs along the edge of the Route 50 shape. This will bring up the dialog below.



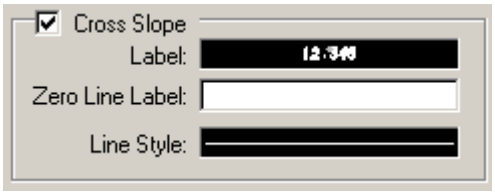
Set the dialog as shown and apply the From Slope to the beginning of the shape and the To Slope to the end of the ramp.

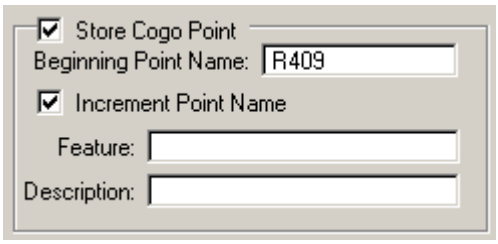
Ramp 4n) Go to **User > Preferences** and **toggle on Text**, as shown to the left. Select **OK** to save the changes.



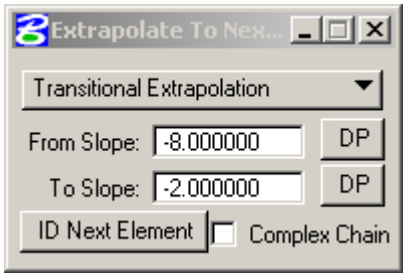
Click the ID Next Element in the Extrapolate to Next Element dialog and ID the slope break line.

Return to **User > Preferences** and **toggle on Cross Slope and Store Cogo Point**. Select **OK** to save the changes.

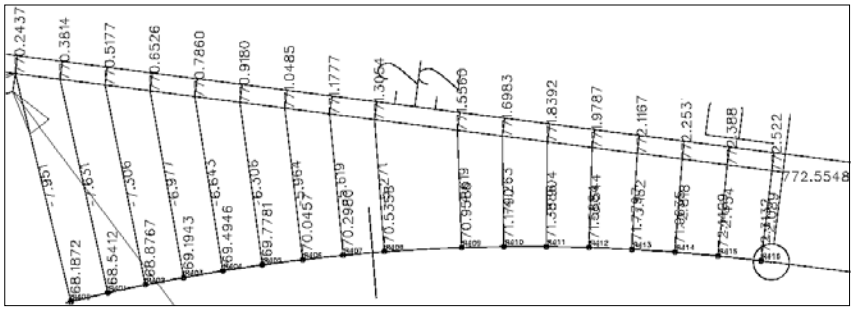




Set the **From Slope:** to **–8** and the **To Slope:** to **–2** as shown to the left. Click on the **From Slope: DP** and data point on the ramp side of the **ramp nose**. Click on the **To Slope: DP** and place a data point at the **end of the ramp**.



Click on the **ID Next Element** button and select the **ramp chain**. The results are shown below. Notice that the second part of the ramp that's within the limits of this shape has been added.

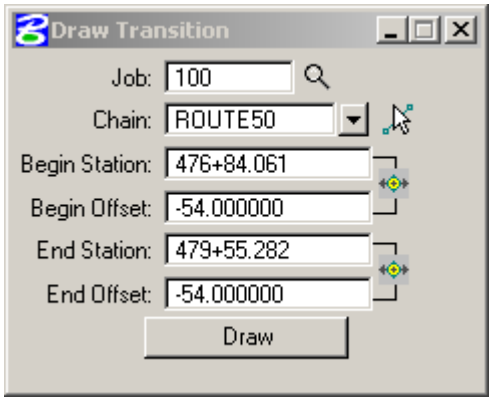


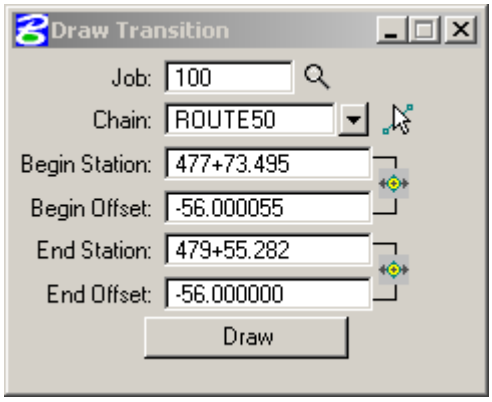
Ramp 4o) All that is needed to complete this case is to follow procedures for creating the chains and profiles. Since this is a straightforward process, it is not repeated as part of this exercise.

Ramp 3a) There is one more case is considered. It is that provided by Ramp 3 for the project. In the file **pw:\DistrictCADD\Design\cole\j5p0100\data\ramps_shape.dgn** window in on the Ramp 3 transition, which is the exit ramp for the west bound lane. This case is unique in that the stationing for the mainline and the ramp are running in opposite directions. This has two implications. The first is that plotted Ramp3 chain will not work as a projection line because it is orientated in the opposite direction from the mainline. Consequently, MicroStation curve will need to be plotted in the file and orientated in the same direction as the mainline cure. The second implication is that an increasing point range will not work when creating the chain to re-station the COGO points. The order of the range must be reversed.

Ramp 3b) The location of the cross slope break line has already been added to the plan view drawing. Plot the needed lines in **ramps_shape.dgn**. Since the mainline stationing runs from left to right, the left end of the line along the mainline shape edge needs to be extended 5' feet in order to include the ramp nose in the shape profile projection. The lines for the mainline will be added first.

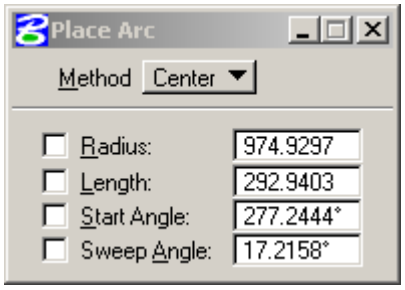
Use Draw Transition to place a line on level Scratch-2 at a constant offset of -54' from Route50 Station 476+84.061 (476+89.061-5ft) **to Station 479+55.282**. **Draw a second line with a constant offset of -56' between Route50 Stations 477+73.495 and 479+55.282**.

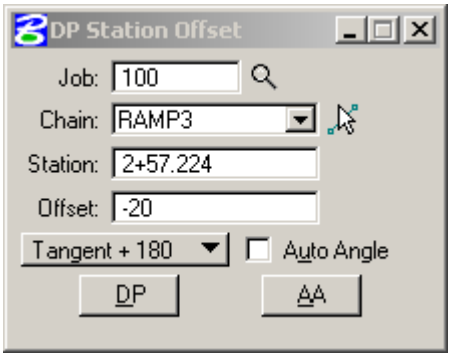




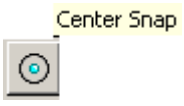
Ramp 3c) The lines for the ramp will need to be drawn using the MicroStation Place Arc tool and the GEOPAK DP Station/Offset tool. The arc with a Ramp 3 offset of –20ft will be placed first.

Start the **Place Arc** tool with the **Method** set to **Center** as shown to the left. Set **DP Station/Offset** as shown below. Click on **DP** to start placing the arc.





The next step is to locate the arc center. Use the **Center Snap** to locate the arc center at the center of curve RAMP3-1.

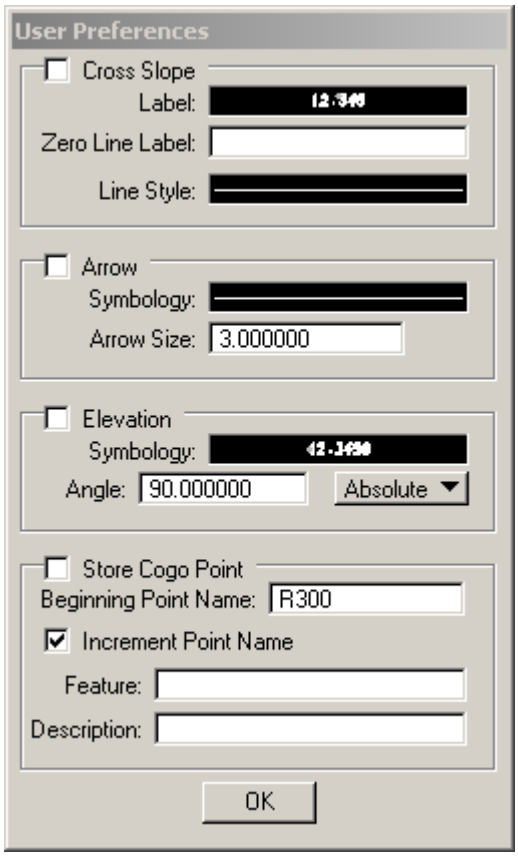


Complete the placement of the arc by using either a key point snap to end the arch at the beginning of the ramp or DP Station/Offset to issue the ending data point at RAMP3 Station **0+00**.

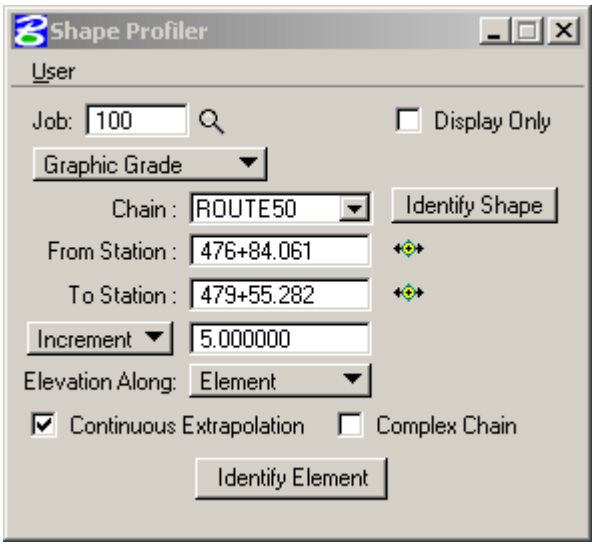
Ramp 3d) To make the next steps easier, **turn off the display for reference file plan_50_J5P0100.dgn** and level .

Use the MicroStation **Create Complex Chain** to join the two elements that define the change in cross slope between the mainline and the ramp.

Ramp 3e) Start **Shape Profiler** and go to **User >Preferences**. Set the beginning point name to R300 and turn off all of the display options as shown to the left. Click **OK** to accept the changes to the preferences.

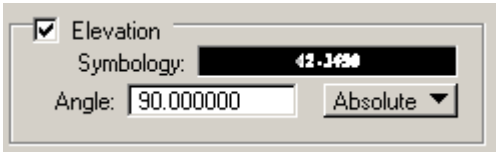


Ramp 3f) In Shape Profiler, click on **Identify Shape** and select the mainline shape nearest to Ramp 3. Set the station range to those shown in the following dialog.



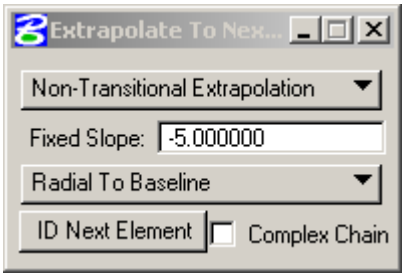
Click on **Identify Element** and select the line plotted along the edge of the shape.

Ramp 3g) Return to **User > Preferences** and **turn on Text**, as shown below. Click **OK** to save the changes.



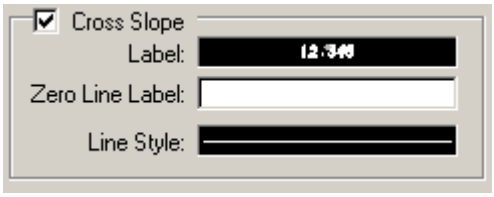
Ramp 3h) In the **Extrapolate to Next Element** dialog, set the following options:

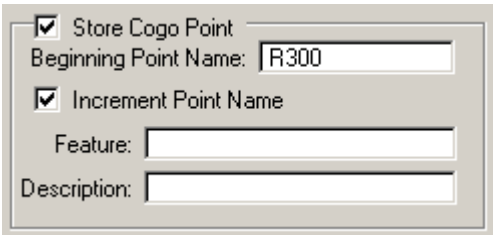
Non Transitional Extrapolation,
Fixed Slope of –5, and
Radial to Baseline as in the figure below.



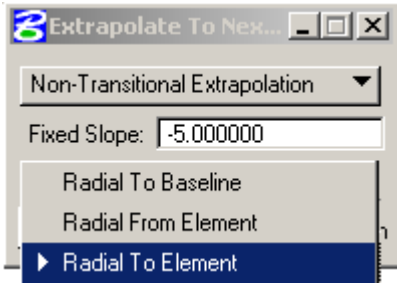
Click on **ID Next Element** and select the cross slope break line.

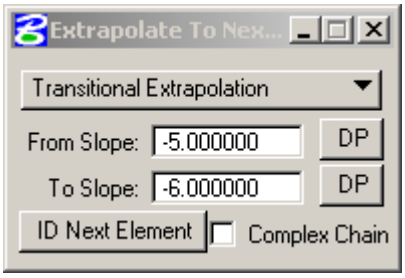
Ramp 3i) Under **User > Preferences**, **toggle on Cross Slope** and **Store Cogo Point**





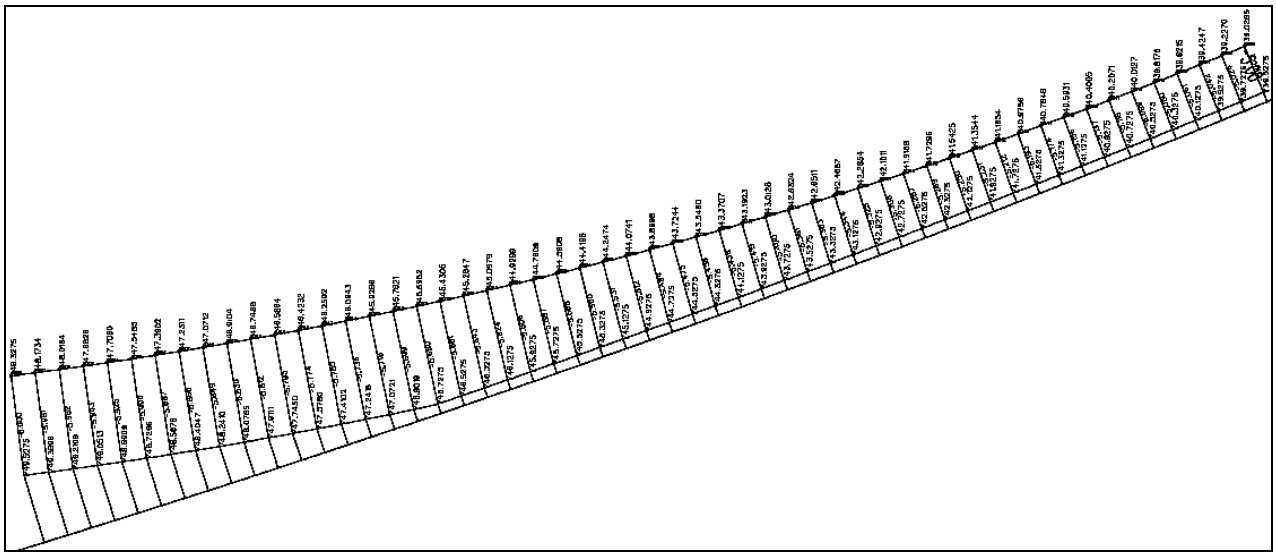
Ramp 3j) In the **Extrapolate to Next Element box**, change Radial to Baseline to **Radial to Element** as shown in the figure on the left below. Change Non Transition Extrapolation to **Transition Extrapolation** and the following **From Slope: –6** & **To Slope: –5**, as shown below on the right.



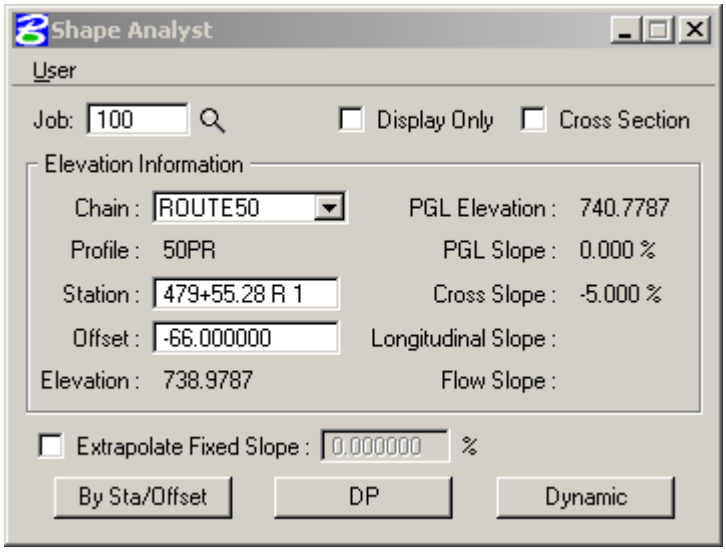


Set the **From Slope DP at the beginning of the ramp** and the **To Slope DP at the nose of the ramp**.

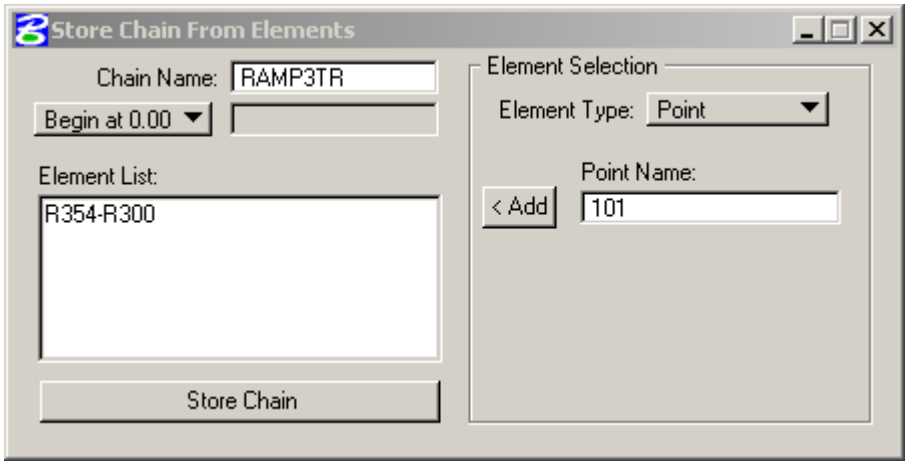
Click on **ID Next Element** and select the projection to line. The end results are shown below.



Ramp 3k) Use the Shape Analyst tool to store one more point. Enter the Station and Offset values shown below and identify the point by using the **By Sta/Offset** button. You should get the options shown.



Ramp 3l) In COGO, use **Element >Chain > Store > From Elements** to re-station the points by creating a chain using the **Begin at 0+00** option. Make sure the points are listed in reverse order (R354-R300) as shown below, where R354 is the point stored using the Shape Analyst tool at the beginning of the ramp and R300 is the first point stored using the Shape Profiler.



Ramp 3m) The COGO command to store the profile from these points needs to the same reverse range option. The profile store command for the transition part of Ramp 3 is:

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Once this part of the profile is stored, the other VPI stations and elevation plus the vertical curves can be added to the profile using the Vertical Alignment Generator as was done for Ramp 2.