Chapter 7

Superelevation

7.1 Objectives

- Create a superelevation section and lane
- Calculate superelevation using a SEP file, or import data from CSV file
- Review / edit the data utilizing the table editor
- Assign the superelevation information to a corridor

7.2 Overview

Superelevation tools calculate how much banking to apply to curves and spirals in the horizontal alignment to help offset centrifugal force. These commands also compute how the road will make the transition from normal crown to a fully banked curve and back again.

Superelevation can be calculated in two ways:

Rules-based – using a set of preferences (**SEP** file) the station and associated cross slopes of the transitions are based on design speed, curvature, and other design parameters. As the design progresses and parameters change (i.e., design speed exceptions) superelevation can be reprocessed to the revised parameter(s).

Import – using a comma separate values (**CSV**) file to import the station and associated cross slope of each transition. In this option, the rules are not utilized; the data is simply applied to the superelevation lanes.

The result of superelevation is a DGN file of graphic superelevation lanes with cross slope attributes. This file can be referenced to a corridor model and associated, so the superelevation transitions are incorporated into the corridor model. The superelevation data can be in its own DGN file, or can be drawn into any of the other project DGN files with geometry, corridor, etc.

7.3 Prerequisites

In order to create superelevation, the following are minimum requirements:

- One Civil horizontal geometry element
- Superelevation preferences (an **SEP** file set) - each of these preference files calls out other files within it so be sure you have the entire set

In order to add the superelevation data to a corridor, you will need:

- Superelevation lanes
- Corridor whose template has superelevation flags for control points (for association step)

Superelevation data is drawn using the active MicroStation attributes, so no features or element templates are used or supported. Therefore, turning off the level with superelevation data removes it from the active view.

7.4 Settings

The following two sets of settings are utilized within the superelevation tools. It is prudent to set them prior to drawing lanes. There are no required values; these are user preference.

- fill settings for superelevation lanes
- decimal place settings for element handlers

7.5 Fill Settings

Located under *Workspace> Preferences* from the main MicroStation or Power product menu, the **View Options - Civil** listing provides options for the superelevation fill.

Option	Description
Color Shaded Fill	Color Shaded Fill Color fills superelevation lanes AFTER calculations are complete. The coloring is hard-coded based on the cross slope: slope < -10% =blue -10% <= slope <= -0.5% = Calculated color between green and blue -0.5% < slope < 0.5% = white 0.5% <= slope <= 10% = Calculated color between red and yellow slope > 10% = dark red Based on the side of road, the colors flip. In addition to setting this option, the View Attribute for Fill must also be toggled on.
Boundaries Only	In this option, only the outside boundary of each lane is displayed and can be selected.
None	No superelevation lanes / edit handlers are displayed; however, they are still in the file. To display them, set to one of the other two options.

7.6 Stationing and Decimal Place Settings

Located under *Settings > Design File* from the main MicroStation or Power GEOPAK product menu, the Civil Formatting category listing has options for controlling display of element handlers. These settings are not unique to superelevation; the same settings are used throughout the Civil products.

Option	Description
Station Settings:	Used for section and lane edit handlers.
Format	Controls the number of places after the delimiter.
Format Delimiter	Controls the delimiter, generally the plus (+) sign.
Precision	Defines the number of decimal places for stationing.
Profile Settings:	Used for lane edit handlers.
Slope Format	Used for cross slope edit handlers. Generally set to percentage for superelevation.
Slope Precision	Defines number of decimal places in cross slope edit handlers.

Superelevation General Workflow

The general workflow for superelevation is described in the following steps. Steps 4-6 can be done in a different order and not all steps are required.

1. Create the super section(s).
2. Define the lanes with *Create Superelevation Lanes*.
3. Calculate superelevation transitions and cross slopes.
4. Review and edit as needed.
5. Add auxiliary lanes.
6. Associate to a corridor.

7.7 Create the Super Section(s)

In this first step, the Civil horizontal geometry element is identified, and station limits of the superelevation are defined. Station limits are useful if the horizontal geometry element is substantially longer than the project limits.

In a basic project where the through lane pavement configuration is consistent (i.e., all 2 lane rural with a few turn lanes), a single section may be used. However, if there are significant changes to the road, i.e., changing from 2 lane rural to 4 lane divided, separate sections should be created.

The general rule is to create a new section if you are using rule-based calculations and the through lane configuration or pivot method changes. The changes should be based on the through lanes, as auxiliary lanes such as turn lanes, ramp entrances and exits and truck climbing lanes are handled independently. If you are importing superelevation, one section can be used for an entire alignment.

7.7.1 Create Superelevation Lanes

Once the section is defined, define the lanes. Focus on the through lanes, as the turn lanes and intermittent lanes can be added at any time. Lanes are defined by selection of the horizontal geometry and offsets. Default cross slope, used for subsequent calculations, is also defined. The result of this step is that graphic lanes (filled with green and yellow, no choice of colors) are drawn.

7.7.2 Calculate Superelevation Transitions and Cross Slopes

In this step, there are two options: **rule-based** and **imported** data. Generally, one method would be selected, however, you can use rule-based for part of the project and import other parts (although this would be confusing).

The rules-based tool uses a preferences file (**SEP** file) to compute the station and cross slopes of transitions, while the import superelevation method uses a comma separate values (**CSV**) file containing the station and cross slopes, which were calculated by an exterior program (or manually). The inputs vary depending on the method used and the preferences within the SEP file.

The result of this step is the augmentation of station/cross slopes of transitions to the lanes created in the previous step. It is easy to see the results if the fill is toggled on as the lanes change from solid yellow and green to a gradient coloring, based on cross slopes.

7.7.3 Review and Edit as Needed

There are several ways to review the superelevation data and edit if desired. Highlighting a section displays station and cross slope values for review and editing. Stationing can be changed dynamically by selecting the gray wedge and dragging to the desired station. Each lane can be manipulated independently of the adjacent lanes. The station can all be keyed into the edit field. Slopes can be changed by keying the slope into the edit field.

The superelevation editor is another way to edit the data, in a tabular format. Any changes made in the editor are automatically synced with the graphic lanes and vice versa. The fields in the editor can be customized so unused or unwanted fields can be hidden. Any data in gray cannot be edited, due to constraints used during calculations with the SEP method.

7.7.4 Add Auxiliary Lanes

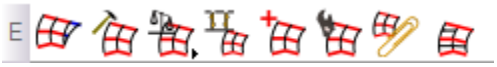
At any time during the process, additional lanes can be added in any section. Primary lanes (those lanes that are rule based) or auxiliary lanes (those with user-specified cross slopes) can be added. The result of this step is graphic superelevated primary or auxiliary lanes.

7.7.5 Associate to a Corridor

At any time during the process, the superelevated lanes can be associated with a corridor. If the superelevated lanes are in a different file than the corridor, you must be in the corridor file with the super lanes attached as a reference. They can both be in the same file.

The result of this step is the superelevated pavement is reflected in the corridor model.

7.8 Accessing Superelevation Tools



From the *Corridor Modeling* task group

 **Create Superelevation Sections** - In this tool the Civil horizontal geometry element is identified and station limits of the superelevation are defined. Station limits are useful if the horizontal geometry element is substantially longer than the project limits.

Determination of Sections

If you are importing superelevation, one section can be used for an entire alignment. The advantage of curve sets for each curve versus one large section is the ability to reprocess rules for a single curve set or two. Since rules are not used in an imported project, separate curve sets serve no useful purpose aside from shorter, piecemeal reports and more granularities in the editor.

In a basic rules-based project where the through lane pavement configuration is consistent (i.e., all 2 lane rural with a few turn lanes), a single section may be used. However, if there are significant changes to the road, i.e., changing from 2 lane rural to 4 lane divided, separate sections should be created.

The general rule is to create a new section if you are using rule-based calculations and the through lane configuration or pivot/rotation method changes. The changes should be based on the through lanes, as auxiliary lanes such as turn lanes, ramp entrances and exits and truck climbing lanes are handled independently. However, the auxiliary lanes must be drawn within a single section.

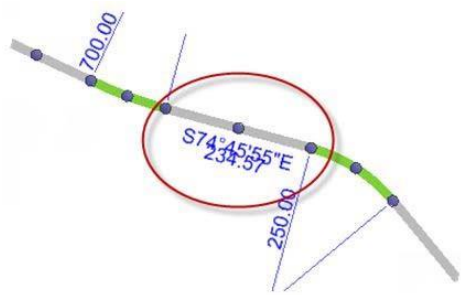
Workflow

1. Select **Create Superelevation Section.**
2. Follow the heads-up prompts.

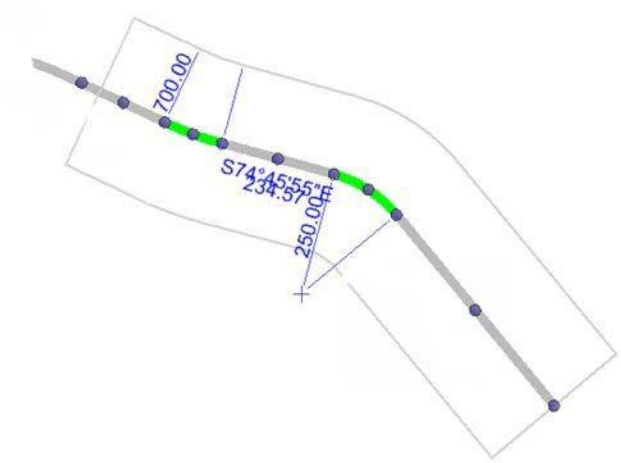
Prompt	User Action
Name	Name each section, suggestions include alignment name which can be appended -1, 2, etc. for projects with multiple sections.
Locate Reference Element	Select the Civil horizontal element to be used as a basis for superelevation lanes and calculations.
Start Station	Graphically define (based on the dashed line perpendicular to the reference element) the beginning of the section. The station can also be keyed in and locked
End Station	Graphically define (based on the dashed line perpendicular to the reference element) the ending of the section. The station can also be keyed in and locked
Minimum Tangent Length	Enter a value (in master units). If the tangent distance between two adjacent curves is less the specified value, the two curves and adjacent tangent are drawn into one curve set. If the tangent distance between two adjacent curves is greater the specified value, each curve and half of the adjacent tangent are drawn into each curve set. At the completion of this prompt, the sections are drawn and the software automatically advances to the Create Superelevation Lanes tool

Minimum Tangent Length

This variable defines the minimum tangent between curves and is the determining factor on how curve sets are defined. When using rule-based calculations, there are times when you need to reprocess part of the superelevation calculations, perhaps due to a horizontal geometry change or design speed revision. If your project is one big section, then reprocessing is performed on the entire section, and overwrites any manual editing. For flexibility, curve sets enable the processing of one curve or multiple curves, while leaving manually manipulated sets intact. In the following example, the distance between curves is 234.57 master units.



The following results illustrate the impact of the **Minimum Tangent Length.**



One curve set created (Min. Tangent Distance = 235

Two curve sets created (Min. Tangent Distance = 225

This line separates the two superelevation sections. Example: first section may have a speed limit of 30 mph and the second section may have a speed limit of 25 mph. Using the Minimum Tangent Length will allow for separate superelevation sections to accomplish the task.

 **Create Superelevation Lanes** - At any time during the process, additional lanes can be added in any section. Primary lanes (those lanes that are rule based) or auxiliary lanes (those with user-specified cross slopes) can be added. The result of this step is graphic superelevated primary or auxiliary lanes.

Workflow for Through Lanes

1. Select the **Create Superelevation Lanes** tool.
2. Follow the heads-up prompts.

Prompt	User Action
Locate First Superelevation Section	Select the first section. In lieu of selecting each section individually, drag your cursor diagonally across all desired sections. Your diagonal defines a square wherein the entire section must be encompassed in order to be included.
Locate Next Superelevation Section or Reset to Complete	Continue selecting sections until all are highlighted, then reset to move to the next prompt.
Enter Lane Name	Name each lane, suggestions include RT or LT which can be appended - 1, 2, etc. for projects with multiple lanes.
Select Side of Centerline	Select the first section. In lieu of selecting each section individually, drag your cursor diagonally across all desired sections. Your diagonal defines a square wherein the entire section must be encompassed in order to be included.
Inside Edge Offset	Enter the offset (in master units) from the baseline reference. If the lane edge is the baseline reference, enter 0.
Width	Enter the width of the lane (in master units).
Normal Cross Slope	Enter the default cross slope to be used for calculations (in percent format). It not necessary to add the percent sign.
Name	The prompts are looping again, so you can define multiple lines with a single selection of the tool. You may need to move the cursor slightly for the prompt to appear. When you have no additional lanes to define, reset to exit the tool.

Two lanes defined, yellow and green; one each side of baseline reference (red)

Adding Lanes

At any time during the process, additional lanes can be added in any section. Primary lanes (those lanes that are rule based) or auxiliary lanes (those with user-specified cross slopes) can be added using the Create Superelevation tool, but within a single section. When a single section is selected, the prompts change to reflect adding an individual lane. The result of this step is graphic superelevated primary or auxiliary lane. The lane needs to be associated to the corridor, similar to the through lanes.

Workflow for Individual Lane

1. Select the Create Superelevation Lanes tool.
2. Follow the heads-up prompts:

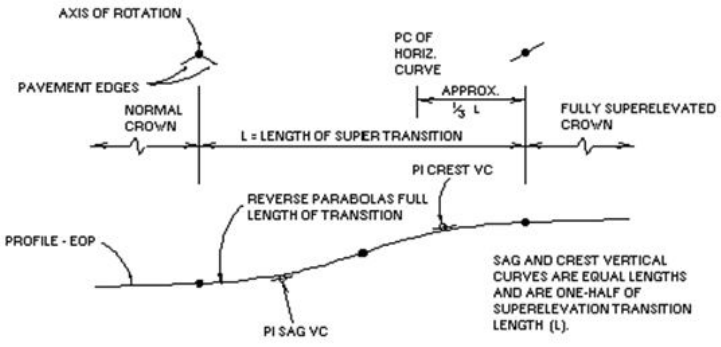
Prompt	User Action
Locate First Superelevation Section	Select the first section.
Locate Next Superelevation Section or Reset to Complete	Reset to move to the next prompt.
Type	Options include: Primary (calculations based on rules) or Auxiliary (based on user- defined). After the selection, the dialog/heads-up prompts change to reflect the selection.
Application Type (Aux. lane only)	How to define cross-slope: **None** - no cross slopes are assigned. **Constant** - Fixed slope of specified value. If lane is transition, use this option, and then modify one end in the editor or graphically after creation. **Follow Adjacent** - Projects cross slopes from adjacent lane to this lane.
Select Side of Centerline	Right or left
Inside Edge Offset	Enter the offset (in master units) from the baseline reference. If the lane edge is the baseline reference, enter 0.
Width	Enter the width of the lane (in master units). If the lane is of varying widths, you can use the widest width, or narrower than the width. In both cases, the template can control the width by parametric constraints or graphical features.
Start Station	Graphically define (based on the dashed line perpendicular to the reference element) the beginning of the lane. Station can be keyed in and locked.
End Station	Graphically define (based on the dashed line perpendicular to the reference element) the end of the lane. Station can be keyed in and locked.
Normal Cross Slope	Enter the default cross slope to be used for calculations (in percent format). It is not necessary to add the percent sign.

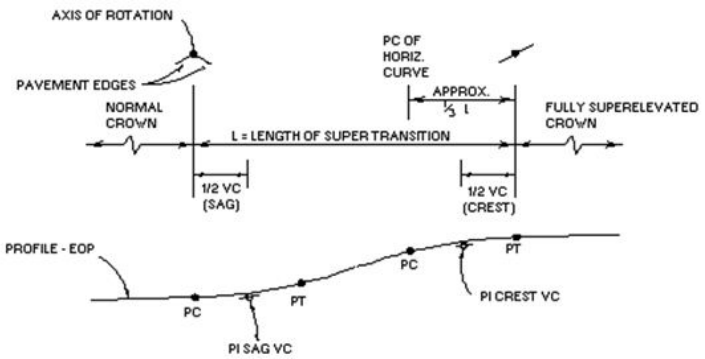
Calculate Superelevation

The rules-based tool uses a preferences file (SEP) to compute the station and cross slopes of transitions.

Workflow

1. Select **Calculate Superelevation**.
2. Follow the heads-up prompts for SEP file.

Prompt	User Action
Locate First Superelevation Section	Select the first section. In lieu of selecting each section individually, drag your cursor diagonally across all desired sections. Your diagonal defines a square wherein the entire section must be encompassed in order to be included.
Locate Next Superelevation Section; or Reset to Complete	Continue selecting sections until all are highlighted, then reset to move to the next prompt.
Standards File Name	Select the SEP containing the superelevation standards/parameters. Use <ALT> <DOWN> to open the File Manager to select directory/file. Data prompt to accept and move to the next prompt.
Note: The prompts below and their options may vary based on the options within the SEP file.	
e Selection **L Selection**	The available e and length Selection fields are filled in according to the SEP file. Those combo boxes determine which table within the .sep file will be used for computation.
Design Speed	Design Speed is to be used either in the tables or equations for e and length computations.
Pivot Method	Rotation only
Transition ID	Linear or a variety of parabolic options, based on the settings in the SEPs. If the SEP file is set to parabolic, then the following options are supported: Parabolic reverse curve - This symmetrical option utilizes the parabolic transition with no tangent and the length of each parabola is one-half the transition length.  Parabolic Reverse Nonsymmetrical Curve 1 - Lengths of the two parabolas are specified: Sag parabolic Length (L1) =45 and Crest Parabolic Length (L2) = 55. The Tangent Length = Transition Length - (L1+L2) as depicted below.

	 Parabolic Reverse Nonsymmetrical Curve 2 - Lengths of the two parabolas are specified: Sag parabolic Length (L1) =30 and Crest Parabolic Length (L2) = 40. The Tangent Length = Transition Length - (L1+L2) as depicted above. The values of the parabolic lengths are set by configuration variables by default. To change the values, add the configuration variable and the desired values.
Number of Lanes	Used to determine when adjustment factors are applied.
Facility	Divided or undivided: determines which values to use for Distribute Over and % on Tangent options.
Ease Length	Not utilized in SEP files.
Add Constraints	Not supported in SEP files.
Open Editor	When calculations are complete and lanes updated, the superelevation editor is opened and populated with the new calculated lanes.

Import Superelevation

In lieu of using rule-based superelevation transitions, the data may be imported from a CSV file, where calculations are done outside of the Civil products and just the results are imported. In this case, rules do not apply, so no SEP is needed or specified.

Entire projects can be imported, in which case, only one superelevation section is needed. However, you can also import just a turn lane or two, or part of your project. Keep in mind the superelevation section and lanes must be created prior to importing, and lane names associated with the graphics must match the names in the import file.

The Windows delimiter value is used, which is generally set to comma; however, if you are experiencing difficulties, you may want to verify this on your workstation or laptop.

If a file is imported twice, duplicate lanes are not created; rather the values of the import file overwrite any values (including manual edits) of lanes.

The file format of the comma separated values file is:

Data	Description
Superelevation Lane	Links the data to an existing superelevation lane.
Station	Units should match design file. Station equations supported based on the sections reference alignment.
Cross Slope	Formatted as a double value : ±0.0 (i.e. -2% == -0.02)
Pivot About	Enumerated list: {LS,RS} LS = left side RS = right side

The following details the optional information:

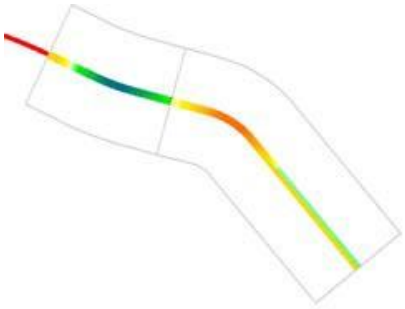
Data	Description
Point Type	Enumerated list: {NC,NCIN,NCOUT,LC,LCIN,LCOUT,RC,RCIN,RCOUT,FS,FSIN,FSOUT,U} NC = Normal Crown, LC = Level Crown, RC = Reverse Crown, FS = Full Super, U = Undefined
Transition Type	Enumerated list : {L,PC,PRC,BRC,CRC,SRC} L = Linear, PC = Parabolic Curve, PRC = Parabolic Reverse Curve, BRC = Biquadratic Reverse Curve, CRC = Cubic Reverse Curve, SRC = Symmetrical Reverse Curve
Non-Linear Curve Length	Default Value = 0.0 Only pertinent for transition type: parabolic curve or symmetrical reverse curve.

Workflow

1. Create the **CSV** file, based on file format.
2. Create superelevation section and lanes, ensuring the lane names match those used in the CSV file.
3. Select the **Import Superelevation** tool.
4. Follow the heads-up prompts:

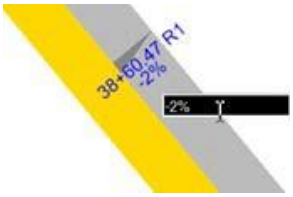
Prompt	User Action
Locate First Superelevation Section	Select the first section. In lieu of selecting each section individually, drag your cursor diagonally across all desired sections. Your diagonal defines a square wherein the entire section must be encompassed in order to be included.
Locate Next Superelevation Section or Reset to Complete	Continue selecting sections until all are highlighted, then reset to move to the next prompt.
Import File Name	Use <ALT> <DOWN> to open the File Manager to select directory / CSV file.

The results look identical to those of the calculated superelevation lanes. All functionality (i.e., editor, graphic manipulation, etc.) supported for calculation lanes is also supported for imported lanes, aside from reprocessing.



Editing Lanes

There are several ways to review the superelevation data and edit if desired. Highlighting a section displays station and cross slope values for review and editing. Stationing can be changed dynamically by selecting the gray wedge and dragging to the desired station. Each lane can be manipulated independently of the adjacent lanes. The station can all be keyed into the edit field. Slopes can be changed by keying the slope into the edit field.



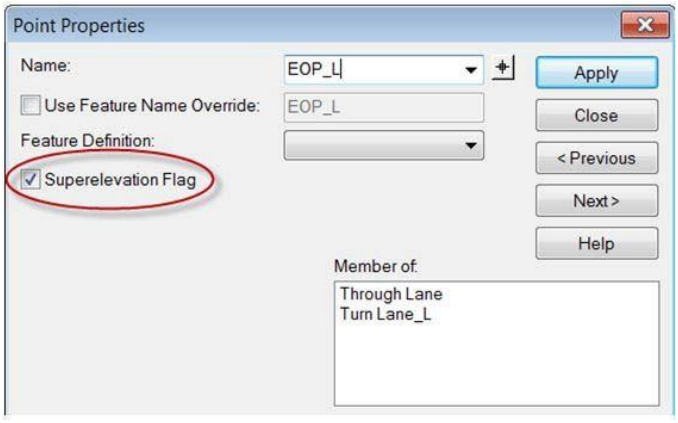
Assign Superelevation to Corridor

At any time during the process, the superelevated lanes can be associated with a corridor. If the superelevated lanes are in a different file than the corridor, you must be in the corridor file with the super lanes attached as a reference. They can both be in the same file.

The result of this step is the superelevated pavement is reflected in the corridor model.

Workflow

1. Verify that the template has the *Superelevation Flag* set for all pavement points used as candidate superelevation points. This flag is used for automatically setting the point controls. To discover if the Flag has been applied to the template, Open the Edit Template Drop and select the Template Drop handle. Once inside the Editor, double click on the EOP point.

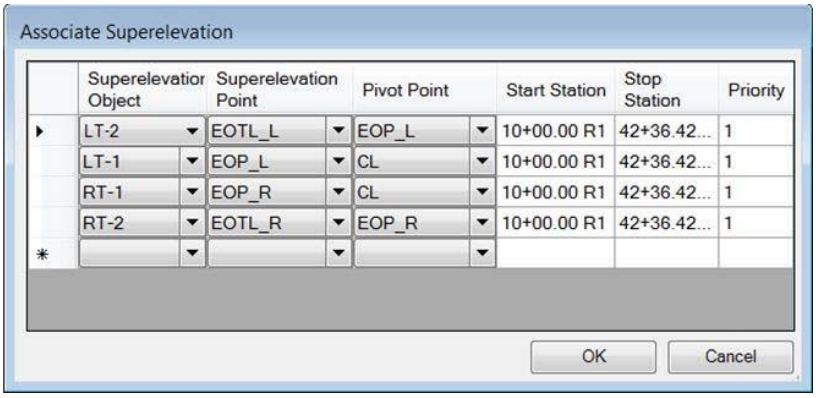


2. From within the DGN containing the corridor model, select the **Assign Superelevation to Corridor** tool.
3. Follow the heads-up prompts.

Select the first section. In lieu of selecting each section individually, drag your cursor diagonally across all desired sections. Your diagonal defines a square wherein the entire section must be encompassed in order to be included.

Prompt	User Action
Locate First Superelevation Section	Select the first section. In lieu of selecting each section individually, drag your cursor diagonally across all desired sections. Your diagonal defines a square wherein the entire section must be encompassed in order to be included.
Locate Next Superelevation Section or Reset to Complete	Continue selecting sections until all are highlighted, then reset to move to the next prompt.
Locate Corridor	Select the corridor wherein the superelevation transitions are to be applied.

The *Associate Superelevation* dialog is displayed.



1. If the information is correct, click **OK**. If not, click **Cancel** and review the template. Superelevation has been incorporated into the corridor model.
2. Generate a dynamic cross section view to see the superelevation.

Insert Superelevation/Cross slope

There may be times when an additional station and cross slope transition need to be added to an existing superelevation lane. Rather than deleting the lane and recreating it, *the Insert Superelevation Station/Cross-slope* tool can be used.

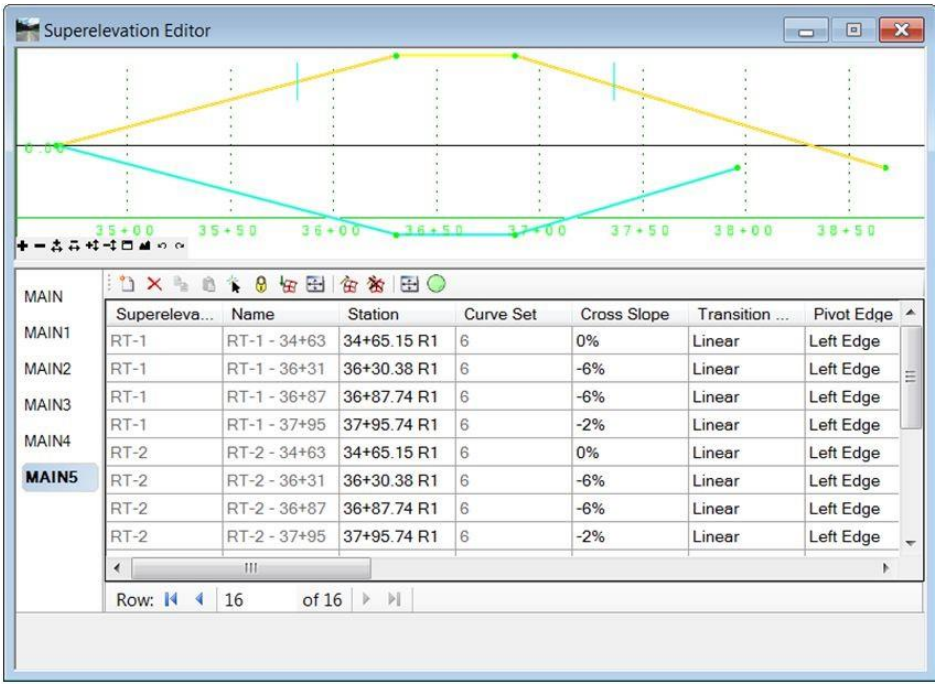
Workflow

1. Select **Superelevation Station/Cross-slope**.
2. Follow the heads-up prompts.

Prompt	User Action
Locate Superelevation	Select a previously created superelevation lane that has superelevation calculations already assigned.
Locate Reference Element	Select the Civil horizontal element to be used as a basis for superelevation lanes and calculations.
Start Station	Graphically define (based on the dashed line perpendicular to the reference element) the beginning of the section. The station can be keyed in and locked.

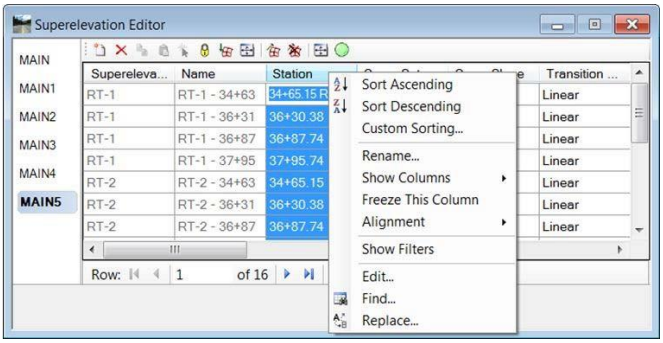
Superelevation Editor

The superelevation editor is another way to edit the data, in a tabular format. Any changes made in the editor are automatically synced with the graphic lanes and vice versa. Any data in gray cannot be edited, due to constraints used during calculations with the SEP method.



The editor is opened by selecting the tool, then selecting the superelevation section(s). The curve sets are listed along the left side. Highlighting any curve set populates the table. Colored points indicate:

- **Red** - fully constrained
- **Yellow** - partially constrained
- **Green** - not constrained



Between the diagram and the table are numerous short-cut icons to the superelevation tools.

The superelevation diagram at the top is display only. Right click on the superelevation diagram to display the Superelevation Display List dialog.

The fields in the editor can be customized so unused or unwanted fields can be hidden. This is accomplished by right-clicking on any Header in the tabular data area to open the pop-up menu.

 **Superelevation Report**

Superelevation reports can be generated for a single or multiple sections. Reports are displayed in the Civil Report browser.

Workflow

1. Select **Superelevation Report**.
2. Follow the heads-up prompts.

Prompt	User Action
Name	Name each section, suggestions include alignment name which can be appended -1, 2, etc. for projects with multiple sections.
Locate Reference Element	Select the Civil horizontal element to be used as a basis for superelevation lanes and calculations.
Start Station	Graphically define (based on the dashed line perpendicular to the reference element) the beginning of the section. The Station can also be keyed in and locked.

 **Display Superelevation In Plan**

Use the *Display Superelevation in Plan* command to automatically generate annotation for superelevation station information in plan view.

The command uses the MicroStation active symbology to display the lines and the text. The user sets active text height and width, color, line weight, and line spacing. The line spacing is used to offset the text from the top and bottom of the superelevation lines. The justification is hardcoded to be center bottom to the right of the alignment and center top to the left for the station values. The cross slope value is displayed using left center justification.

The arrow head uses the active text height to determine its height.

All text, offsets, and the height of the arrow head are scaled by the MicroStation annotation scale factor.

Workflow

1. Select Display Superelevation in Plan.
2. Follow the heads-up prompts.

7.9 Group Exercise – Road 1 Superelevation

1. Within the ***J2P0200\data_07*** folder, open the file: **Corridors_J2P0200.dgn**
2. Create a new file named **Superelevation_J2P0200.dgn** based on the following 2D seed file:

   pw:\CADD_Standards\Seed Files\Design - English\i_project_2d_PowerGEOPAK.dgn.
3. Reference in the following file:

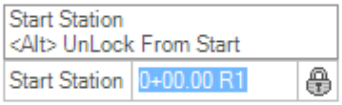
   Civil_Geometry_J2P0200.dgn

Create Superelevation Sections

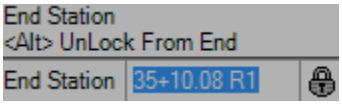
4. From the *Corridor Modeling* task choose **Create Superelevation Sections**. 
5. When prompted for the *Name* key in **Road1** and **data point** or **tab** to accept.

6. When prompted to *Locate Reference Element* data point on the **Road1** horizontal geometry.

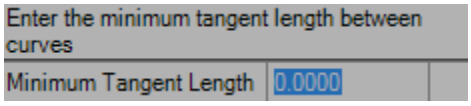
7. When prompted to enter the *Start Station* either select the beginning of Road, key in **0** for the station **or** press the **Alt** key to lock to the beginning station. **Data point** to accept.



8. When prompted to enter the *End Station* either select the end of Road, key in **3510.08** for the station **or** press **Alt** to lock to the ending station. **Data point** to accept.



9. There is only one curve on this section of Road1so there is no tangent length between curves. Therefore enter a **Minimum Tangent Length** of 0. **Data point** to accept.



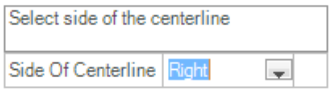
Note: If the geometry had multiple curves with different design speed then you would create multiple Superelevation Sections.

Create Superelevation Lanes

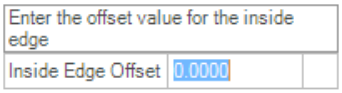
10. When prompted *Enter Lane Name,* key in **South** (stationing starts at the north end of Road1). **Data point** to accept.

11. Verify *Type* is set to **Primary**. **Data point** to accept.

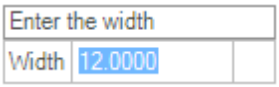
12. When prompted to *Select side of the centerline,* select **Right** from the drop-down menu by using the down arrow. **Data point** to accept.



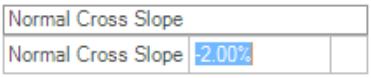
13. There is no offset. So when prompted to *Enter the offset value for the inside* edge, enter **0.00**. **Data point** to accept.



14. In the *Enter the Width* field, key in the width of the lane. This value is based on the template assigned to the corridor. Key in **12.00**. **Data point** to accept.



In the *Normal Cross Slope* dialog, enter a normal cross slope of **-2%**. **Data point** to accept.



15. When prompted to *Enter Lane Name,* enter **North**. **Data point** to accept.

16. Set the *Type* to **Primary**. **Data point** to accept.

17. Set the *Side of Centerline* to **Left**. **Data point** to accept.

18. There is no offset. Set the *Inside Edge Offset* to **0.00**. **Data point** to accept.

19. Enter a *Width* of **12**. **Data point** to accept.

20. Enter a *Normal Cross Slope* of **-2%**. **Data point** to accept.

21. **Reset** to continue.

Calculate Superelevation

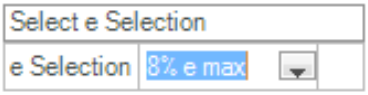
22. Open the **Calculate Superelevation** Tool. 

23. Select **<Alt> + Down** or use the dialog box to pick the **MoDOT_Standard_Plans-Undivided.sep** file delivered in the workspace.

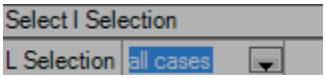
T:\MoDOT_Workspace\Gpk_Std\Superelevation\ MoDOT_Standard_Plans-Undivided.sep

Data point to accept.

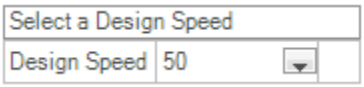
24. In the *Select e Selection* prompt select **8% e max** by using the down arrow**. Data point** to accept.



25. For *L Selection* select **all cases**. **Data point** to accept.

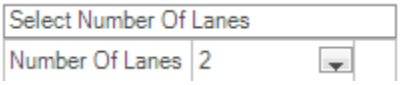


26. *Select a Design Speed* of **50**. **Data point** to accept.



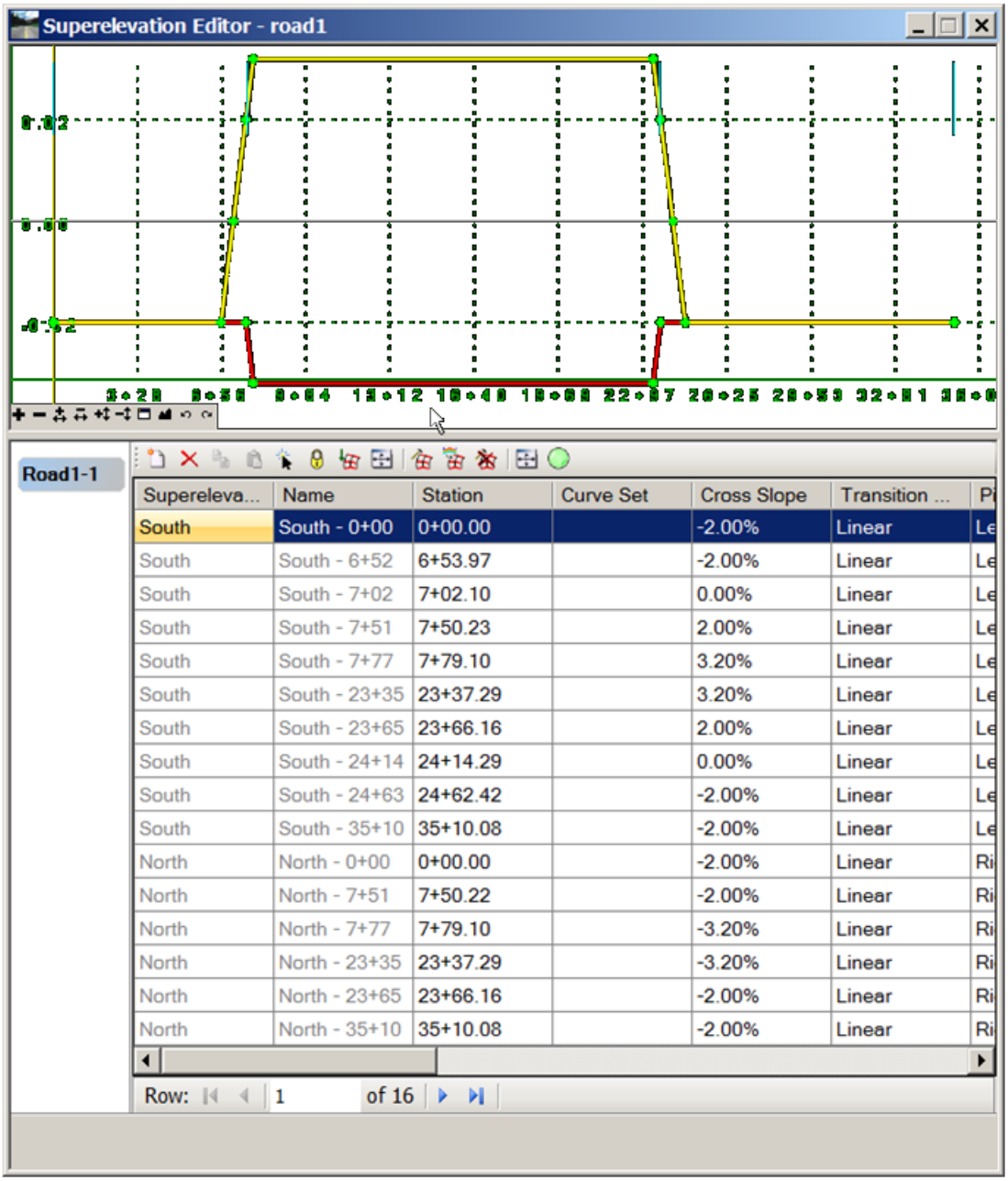
27. For *Transition ID* select **Linear**. **Data point** to accept.

28. Select **2** for the *Number Of Lanes*. **Data point** to accept.



29. Select **Undivided** in the *Select Facility* option. **Data point** to accept.

30. Select **Yes** for the ***Open Editor***. This brings up the *Superelevation Editor* dialog. Facilitating adjustments to stations to full super, slopes etc.



31. **Compress** the file and **Save Settings**.

Assign Superelevation to Corridor

Once the superelevation is created based on the alignment it must be tied to the corridor. Assigning the superelevation requires the editing of the corridor model therefore the dgn file with the corridor model must be open. Having the superelevation in a separate design file allows one user to work on super and another to work on the corridors. Also the superelevation reference can be turned off when viewing is not required.

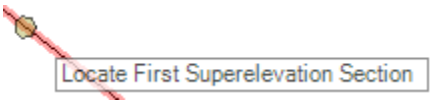
32. Select **File > Open** and select the **Corridor_J2P0200.dgn**.

33. Attach the **Superelevation_J2P0200.dgn** by opening the *References* dialog box and clicking Tools>Attach…, use the attachment method **Coincident – World** and **No Nesting**.

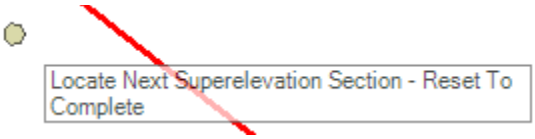
34. Close the *References* dialog box.

35. Select the **Assign Superelevation to Corridor**  in the *Corridor Modeling* task group.

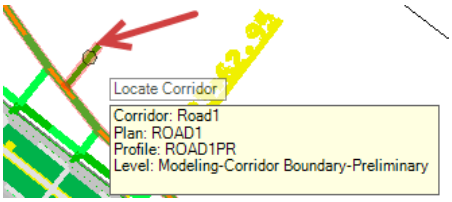
36. When prompted to *Locate First Superelevation Section* **data point** on the **Road1 s**uper section.



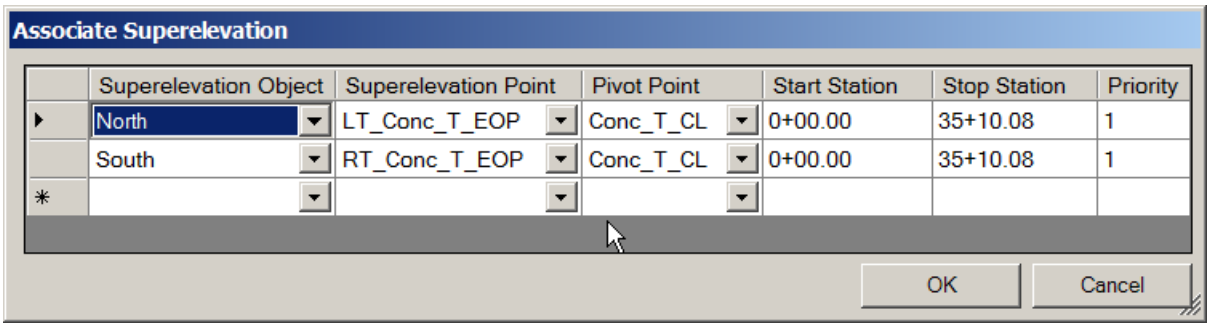
37. There is only one section, when prompted, **Reset** to Complete.



38. When prompted to *Locate Corridor*, identify one of the corridor grab handles. These extend from the outside edge of the corridor.



39. A dialog with a list of the Superelevation objects will display. Review to verify. If changes to Stations, priorities, or points are required, they can be made here. If correct click **OK**.



40. **Reset** when prompted to *Locate First Superelevation Section*.

41. Select **File** > **References**.

42. Click on the frame of **View 1**.

43. **Turn off** the display of reference file named: **Superelevation_J2P0200.dgn**.

44. **Open View 7** which contains the dynamic cross sections and review the superelevated sections.

45. Select **File** > **Update Server Copy**

7.10 Individual Exercise - Route 63 Superelevation

1. Within the ***J2P0200\data_07*** folder, open the file: **Superelevation_J2P0200.dgn**

Create Superelevation Sections

2. From the ***Corridor Modeling*** task group select the **Create Superelevation Sections**. 
3. When prompted for the name key in **Route63**. **Data point** to accept.
4. When prompted to *Locate Reference Element*, select the **RTE63** horizontal geometry.
5. When prompted for the *Start Station*, press **Alt** to lock to the beginning station. **Data point** to accept.
6. When prompted for the *End Station*, press **Alt** to lock to the ending station. **Data point** to accept.
7. There is only one curve on this section of RTE63 so there is no tangent length between curves. Therefore enter a **Minimum Tangent Length** of 0. **Data point** to accept.

Create Superelevation Lanes

8. When prompted to *Enter Lane Name*, enter **NBInside. Data point** to accept.
9. Set the *Type* to **Primary**. **Data point** to accept.
10. Set the *Side of Centerline* to **Left**. **Data point** to accept.
11. The offset value for the inside edge is 30'. Set the *Inside Edge Offset* to **30.00. Data point** to accept.
12. In the *Enter the width* dialog, key in **12.000** for the width of the lane. **Data point** to accept. This value is based on the template assigned to the corridor.
13. Enter a *Normal Cross Slope* of +2%**. Data point** to accept.
14. When prompted to *Enter Lane Name*, key in **NBOutside**. **Data point** to accept.
15. Set the *Type* to **Primary**. **Data point** to accept.
16. Set the *Side of Centerline* to **Left**. **Data point** to accept.
17. Set the *Inside Edge Offset* to **42.00**. **Data point** to accept.
18. In the *Enter the Width* key in the **12.000** width of the lane. **Data point** to accept.
19. Enter a *Normal Cross Slope* of **-2%**. **Data point** to accept.
20. When prompted to *Enter Lane Name*, key in **SBOutside**. **Data point** to accept.

21. Set the *Type* to **Primary**. **Data point** to accept.
22. Set the *Side of Centerline* to **Right**. **Data point** to accept.
23. Set the *Inside Edge Offset* to **42.00**. **Data point** to accept.
24. In the *Enter the Width* key in the **12.000** for the width. **Data point** to accept.
25. Enter a *Normal Cross Slope* of **-2%**. **Data point** to accept.
26. When prompted to *Enter Lane Name*, key in **SBInside**. **Data point** to accept.
27. Set the *Type* to **Primary**. **Data point** to accept.
28. Set the *Side of Centerline* to **Right**. **Data point** to accept.
29. Set the *Inside Edge Offset* to **30.00**. **Data point** to accept.
30. In the *Enter the Width*, key in the **12.000** for the width. **Data point** to accept. This value is based on the template assigned to the corridor.
31. Enter a *Normal Cross Slope* of +**2%**.
32. **Reset** to continue.

Calculate Superelevation

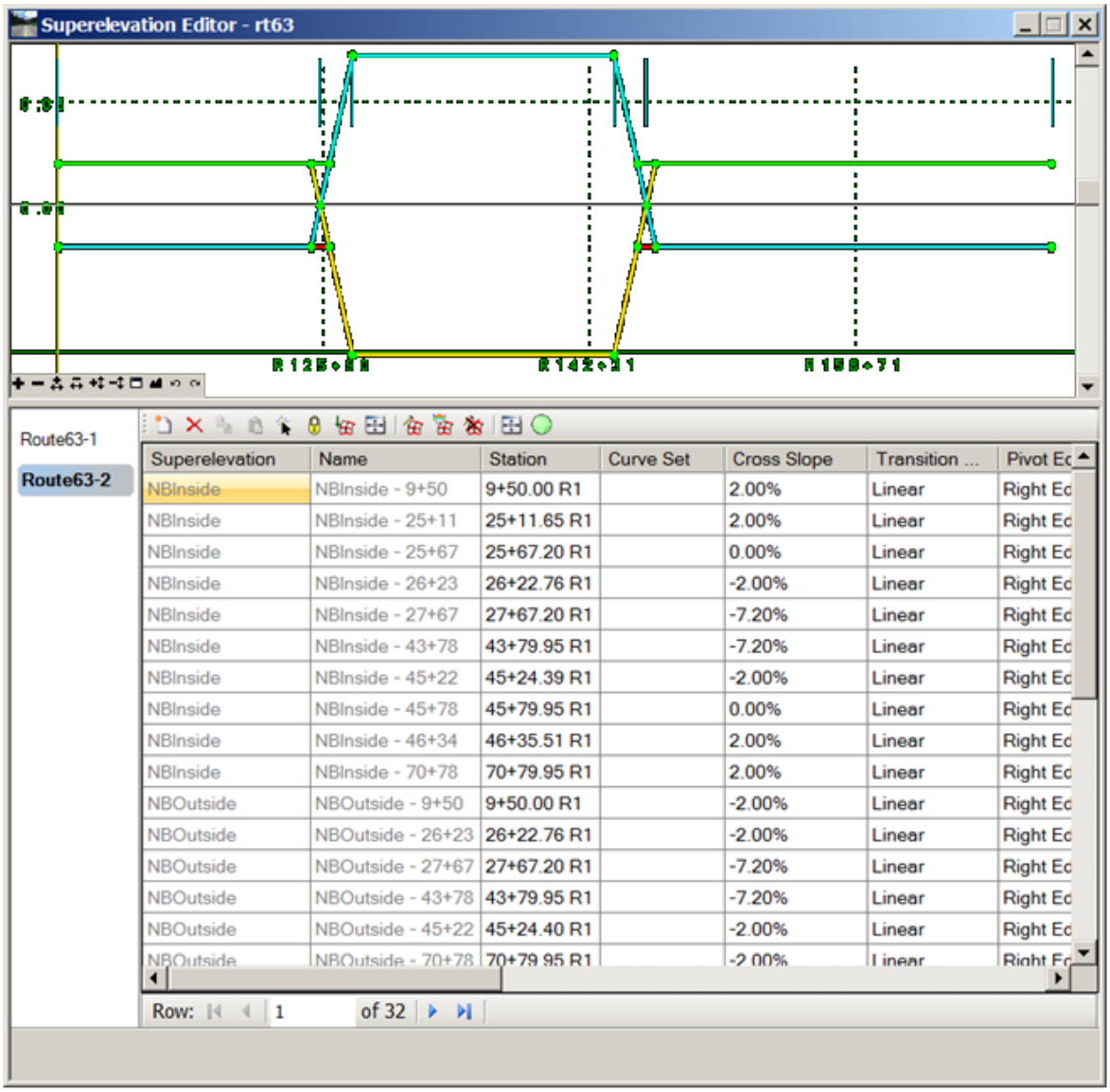
33. Select **<Alt> + Down** or use the dialog box to pick the **MoDOT_Standard_Plans-Divided.sep** file delivered in the workspace.

    ***T:\MoDOT_Workspace\Gpk_Std\ MoDOT_Standard_Plans-Divided.sep*.**

    Data point to accept.

34. In the *Select e Selection* prompt, select **8% e max**. **Data point** to accept.
35. For the *L Selection*, select **all cases**. **Data point** to accept.
36. Set a *Design Speed* of **70**. **Data point** to accept.
37. For the *Transition ID*, select **Linear**. **Data point** to accept.
38. Select **4** for the *Number Of Lanes*. **Data point** to accept.
39. Select **Divided** for the *Select Facility* option. **Data point** to accept.

40. Select **Yes** for the *Open Editor* option. **Data point** to accept. This brings up the *Superelevation Editor* dialog for facilitating adjustments to stations, slopes etc.

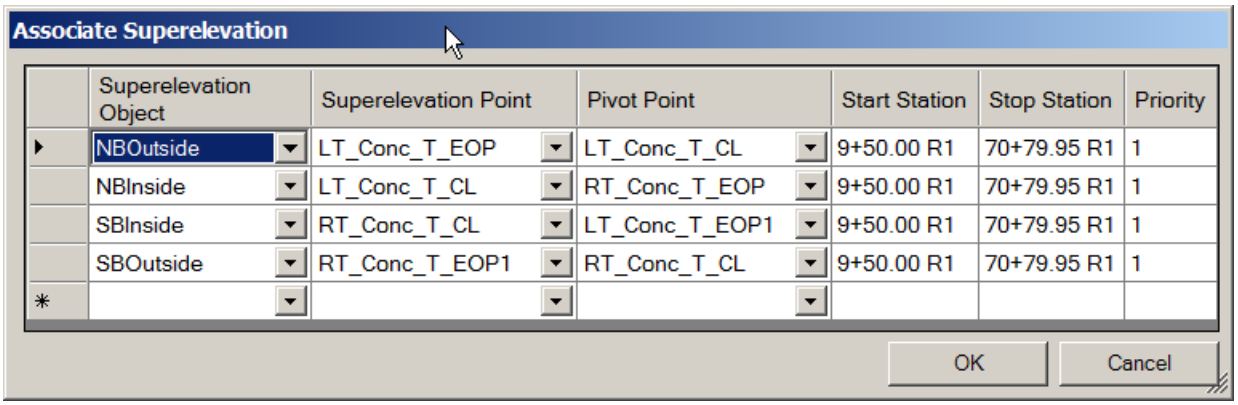


Superelevation	Name	Station	Curve Set	Cross Slope	Transition ...	Pivot Ec
NBInside	NBInside - 9+50	9+50.00 R1		2.00%	Linear	Right Ec
NBInside	NBInside - 25+11	25+11.65 R1		2.00%	Linear	Right Ec
NBInside	NBInside - 25+67	25+67.20 R1		0.00%	Linear	Right Ec
NBInside	NBInside - 26+23	26+22.76 R1		-2.00%	Linear	Right Ec
NBInside	NBInside - 27+67	27+67.20 R1		-7.20%	Linear	Right Ec
NBInside	NBInside - 43+78	43+79.95 R1		-7.20%	Linear	Right Ec
NBInside	NBInside - 45+22	45+24.39 R1		-2.00%	Linear	Right Ec
NBInside	NBInside - 45+78	45+79.95 R1		0.00%	Linear	Right Ec
NBInside	NBInside - 46+34	46+35.51 R1		2.00%	Linear	Right Ec
NBInside	NBInside - 70+78	70+79.95 R1		2.00%	Linear	Right Ec
NBOutside	NBOutside - 9+50	9+50.00 R1		-2.00%	Linear	Right Ec
NBOutside	NBOutside - 26+23	26+22.76 R1		-2.00%	Linear	Right Ec
NBOutside	NBOutside - 27+67	27+67.20 R1		-7.20%	Linear	Right Ec
NBOutside	NBOutside - 43+78	43+79.95 R1		-7.20%	Linear	Right Ec
NBOutside	NBOutside - 45+22	45+24.40 R1		-2.00%	Linear	Right Ec
NBOutside	NBOutside - 70+78	70+79.95 R1		-2.00%	Linear	Right Ec

Assign Superelevation to Corridor

Once the superelevation is created based on the alignment it must be tied to the corridor. Assigning the superelevation requires the editing of the corridor model therefore the dgn file with the corridor model must be open. Having the superelevation in a separate design file allows one user to work on super and another to work on the corridors. Also the superelevation reference can be turned off when viewing is not required.

41. Open the **Corridors_J2P0200.dgn** file.
42. Turn on the display of the **Superelevation_J2P0200.dgn** file in **View 1** in the *References* dialog box.
43. Select the **Assign Superelevation to Corridor**  in the *Corridor Modeling* task group.
44. When prompted to *Locate First Superelevation Section*, **data point** on the **Route63** Super Section.
45. **Reset** to complete.
46. When prompted to *Locate Corridor*, select one of the Corridor grab handles. These extend from the outside edge of the corridor.
47. A dialog with a list of the Superelevation objects will display. Review to verify. If changes to Stations, priorities, or points are required they can be made here. If correct, click **OK**.



48. **Reset** when prompted to *Locate First Superelevation Section*.
49. **Open View 8** which contains the dynamic cross sections and review the superelevated sections.
50. Select **File > Update Server Copy**