Superelevation

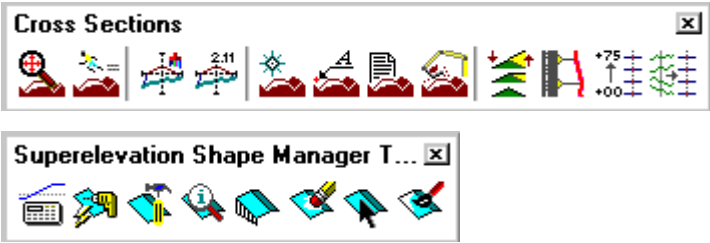## 11.1 Introduction

Objectives	Learn to use GEOPAK **Automated Superelevation** dialog box and **Autoshape Builder** to apply superelevation to a roadway.
Project Manager	Calculate Superelevation
Tools	
Menu Bar Application	GEOPAK Road > Cross Sections >Superelevation Shape Manager Tools

GEOPAK supports a myriad of options for the definition of pavement on proposed cross sections. They range from a single slope specification emanating from a baseline / profile on each section, to a complicated multiple roadway, each with its own superelevation transitions.

The most basic is the project where no superelevation transitions are required, i.e., the roadway slope for all pavement (if any) can be specified as a single value. In this case, the slope can be defined with the proposed cross section processing and any additional superelevation work is not required.

Another option is the definition of superelevation when roadways are constant widths without tapers, i.e., turn lanes, acceleration and deceleration lanes, etc. In these areas, the automated superelevation can be utilized, based on a user-defined design speed and considering the geometry of the specified roadway. After careful review of the data (in ASCII format) and overriding the computed values, GEOPAK draws pavement representations as complex shapes into a MicroStation 2D design file.

A third option is the definition of superelevation when roadways are not constant widths, i.e., gore areas, turn lanes, acceleration and deceleration lanes, etc. In these areas, graphic elements within a MicroStation 2D design file are utilized to create complex shapes which define the superelevation transitions.

A combination of these tools can be combined with a project, or even within a single roadway. The shapeless mode is excellent for rural applications, low volume city streets, frontage roads, etc., while the automated method quickly generates automated shapes for more complex roadways. Any area, which cannot be defined via the automated method, can be augmented by the graphical method.

For some users, only simple narrow shapes will be required when designing new roadways or performing slope correction for reconstruction projects. The proposed cross section criteria will stretch the pavement out to the true proposed edge of pavement based on finding plan view elements that represent the EOP.

## 11.2 Automated Superelevation (AutoShape Input File Maker)

Project Manager	Calculate superelevation
Tools	**Superelevation Shape Manager T... ☒**

The GEOPAK Superelevation package enables the user to create, edit, and run an autoshape input file quickly, basing it on an existing COGO alignment.

A rich set of preferences is available which gives the user complete control over every aspect of the standardization of the superelevation design process. AASHTO Method V is available as a default, along with the ability to employ user-defined lookup tables both for e (superelevation rate) and for runoff length. User-defined equations may also be entered to compute these values. A thorough set of options is available for resolving the superelevation conflicts of Reverse Curves, Compound Curves, Broken Back Curves, and Short Curves.

GEOPAK calculates superelevation transition locations for any alignment stored into the coordinate geometry database. The main superelevation dialog box is simple and straightforward, allowing the user to select which preference file is to be used for the current session, as well as enabling the entry of the typical section lane configuration in the simple engineering terms of Number of Lanes, Lane Widths, Median Width (if any), and Cross Slope.   More complex lane configurations may be represented as needed.

Upon computation of the superelevation parameters (cross slopes and stationing), the information is stored in an ASCII file, where the user may review and modify the transitions, if desired.   After reviewing the information, the ASCII file is executed from the Autoshape Builder to generate superelevation shapes.
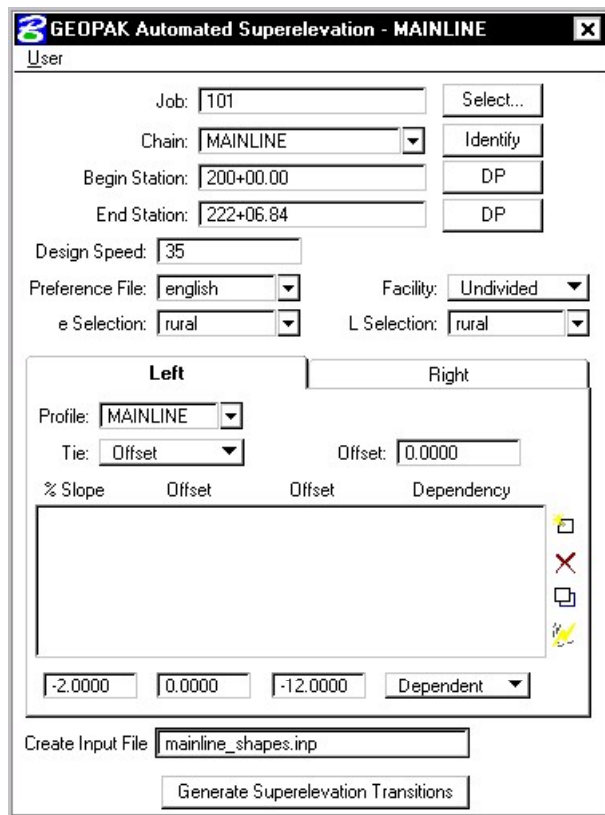
Job   Coordinate geometry database wherein the desired chains and profiles are stored.

Chain   GEOPAK baseline chain dictating the horizontal geometry for which superelevation transitions are calculated. This chain is also called the Shape Cluster Baseline in the Auto Shape input file.

Begin Station	When the chain is defined, GEOPAK populates the Begin Station with the default beginning of the chain. To compute superelevation for part of a chain, adjust the station.
End Station	When the chain is defined, GEOPAK populates the End Station with the default beginning of the chain. To compute superelevation for part of a chain, adjust the station.
Design Speed	Design speed that determines what Design Speed is to be used either in the tables or equations for e and length computations.
Preference File e selection L selection	The Preferences File combo box selects which Preference File is to be used for this computation. The various Preferences Files which are available in the combo box are determined by what files have the .sep file extension in the Preference Files Path on the User Directories dialog box. When it is set, the available e and length Selection combo boxes are filled in according to the csv file names as specified in the Preferences File. Those combo boxes determine which table within the .csv file will be used for computation.
Facility	Facility determines whether the roadway cross section is to be divided or undivided. This option determines two things. For the dialog box box, it determines whether or not the values Profile, Tie (Offset or PGL), and or the Tie or PGL values may be different. If they are different then two shape clusters are to be generated, which usually is required for a median. The state of the Facility option button also determines which Preference is used as found on the Distribution tab of the Preferences dialog box.
Left / Right tabs	The area enclosed in the Left / Right tabs are for the determination of values specific to shape clusters.
	NOTE: The right and left tabs contain data pertaining to each lane within each roadway. If the Facility is undivided, then the left tab is for the left lane(s) while the right tab is for the right lane(s). If the Facility is divided, then the right tab is for the entire right roadway, while the left tab is for the left roadway.
Create Input File	ASCII file wherein GEOPAK creates the autoshape input file. DO NOT include the extension, as GEOPAK adds .inp to the field.
Generate Superelevation Transitions	Commence automatic superelevation calculations
Profile	GEOPAK profile defined as the Shape Cluster Profile in the Auto Shape input file.
Tie	Offset - Horizontal distance from the Profile (PGL) to the Chain. PGL Chain - Chain stored in the gpk file that the shapes will be computed from. This chain does not require a profile be stored with it as the defined profile will be applied to this chain.
Offsets	Offsets define the dimension of the shape (usually a lane) by two offset distances from the baseline. Note that tapers are not supported. Offset distances are negative if measured to the left. . Each lane must have the same offset on the left as the left adjacent lane and must have the same offset on the right as the right adjacent lane (no gaps in offsets). Computation may not proceed if this condition is not met.

% Slope	Cross slope of each shape in normal crown in percent format. A negative sign denotes the roadway going downward, while emanating away from the PGL. A Normal Crown section of 2.0% would, therefore, be entered as –2.0. Lane offset values are entered in terms of master units, i.e., feet or meters.
Dependent / Independent	One dependent shape, which is based on the profile, is required for each cluster. Other shapes, drawn not based on the profile, but on adjoining lanes, are independent. For example, turn lanes are drawn abutting next to the mainline roadway, so they are independent. However, a lane based on the profile for its initial elevation, such as one of the through lanes, is profile dependent.
Edit buttons: **Add** **Delete** **Edit**	To add a line to the list box, type in the values in the edit fields, then click the Add icon. To delete a line, highlight the desired line, then click the Delete icon. To modify a line, highlight the desired line, (which is then displayed in the edit fields), change the desired values, then click the Edit icon, which updates the list box.
Quick Entry	Enables the user to populate the shape cluster list boxes quickly while entering the data using engineering terminology. When clicked, the dialog box depicted below opens.

Selection of the **Generate Superelevation Transitions** button performs the actual superelevation computations. Three things happen at this point.

● First, the superelevation transitions as computed by GEOPAK are written to the Autoshape Input File specified by the user (in the Create Input File field).

● Second, the log file is written.

● Finally, the Autoshape Input File is loaded into the text editor running within MicroStation. This Autoshape Input File Editor has an icon at the top that allows the Autoshape Input File to be run. Autoshape Input files can also be run from the Autoshape Builder.

11.2.1 Example - Auto Shape ASCII Input File

```
/* Superelevation Settings and Parameters:
Project Name:  C:\data\geo\vdot\road1\17682.prj
User:          C:\data\geo\vdot\road1\projdbs\VDOT
Run Name:      MAINLINE
Unit System is english.
Created input file "mainline_shapes.inp".
Created activity log file "mainline_shapes.log".
Created on Wed, Nov 06, 2002 at 13:11.
Using Preference File "english standard"
Using e Selection of "rural".
Using Length Selection of "rural"
Using Design Speed of 35.000000.

*/

auto shape
job number = 101

    auto shape set
        shape cluster baseline   = MAINLINE
        shape cluster profile    = MAINLINE
        shape cluster tie        = 0.0000
        dependent shape
        chain  /  offset
           MAINLINE   -8.0000
           MAINLINE   -20.0000
        filler line station / slope
           200+00.000000   -2.0000
           206+46.876488   -2.0000
           208+45.876488    4.8000  /* Curve ML-1 */
           209+80.032227    4.8000  /* Curve ML-1 */
           211+79.032227   -2.0000
           213+13.162662   -2.0000
           213+31.032227   -2.6000  /* Curve ML-2 */
           219+02.785686   -2.6000  /* Curve ML-2 */
           219+20.655251   -2.0000
           222+06.840000   -2.0000

    auto shape set
        shape cluster baseline   = MAINLINE
        shape cluster profile    = MAINLINE
        shape cluster tie        = 0.0000
        independent shape
        chain  /  offset
           MAINLINE   -20.0000
           MAINLINE   -32.0000
        filler line station / slope
           200+00.000000   -2.0000
           206+46.876488   -2.0000
           208+45.876488    4.8000  /* Curve ML-1 */
           209+80.032227    4.8000  /* Curve ML-1 */
           211+79.032227   -2.0000
           213+13.162662   -2.0000
           213+31.032227   -2.6000  /* Curve ML-2 */
           219+02.785686   -2.6000  /* Curve ML-2 */
           219+20.655251   -2.0000
           222+06.840000   -2.0000
```

```
auto shape set
    shape cluster baseline   = MAINLINE
    shape cluster profile    = MAINLINE
    shape cluster tie        = 0.0000
    dependent shape
    chain  /  offset
       MAINLINE   8.0000
       MAINLINE   20.0000
    filler line station / slope
        200+00.000000   -2.0000
        207+63.935312   -2.0000
        208+45.876488   -4.8000   /* Curve ML-1 */
        209+80.032227   -4.8000   /* Curve ML-1 */
        210+61.973403   -2.0000
        211+94.032227   -2.0000
        213+31.032227    2.6000   /* Curve ML-2 */
        219+02.785686    2.6000   /* Curve ML-2 */
        220+39.785686   -2.0000
        222+06.840000   -2.0000

auto shape set
    shape cluster baseline   = MAINLINE
    shape cluster profile    = MAINLINE
    shape cluster tie        = 0.0000
    independent shape
    chain  /  offset
       MAINLINE   20.0000
       MAINLINE   32.0000
    filler line station / slope
        200+00.000000   -2.0000
        207+63.935312   -2.0000
        208+45.876488   -4.8000   /* Curve ML-1 */
        209+80.032227   -4.8000   /* Curve ML-1 */
        210+61.973403   -2.0000
        211+94.032227   -2.0000
        213+31.032227    2.6000   /* Curve ML-2 */
        219+02.785686    2.6000   /* Curve ML-2 */
        220+39.785686   -2.0000
        222+06.840000   -2.0000

Plot Parameters
    Dependent Shape
       lv = 63
       co = 6
       lc = 0
       wt = 2
    Dependent Text
       lv = 63
       co = 6
    Independent Shape
       lv = 63
       co = 1
       lc = 0
       wt = 2
    Independent Text
       lv = 63
       co = 1

Write shapes into dgn = C:\data\geo\vdot\road1\d17682work.dgn
```

11.3   Draw Shapes into Plan View File

Project Manager	None
Tools	
Menu Bar Application	GEOPAK Road > Cross Sections >Superelevation Shape Manager Tools

Once the shape input file (fname.inp) has been created and reviewed, the designer can run the input file to place the superelevation shapes into the specified graphics file. To use the interactive method to define roadway superelevation (in a .dgn file) the designer pushes the **Autoshape Builder** icon from the Superelevation Shape Manager Tools tool bar (or alternately from this same icon within the Text Editor as described above).
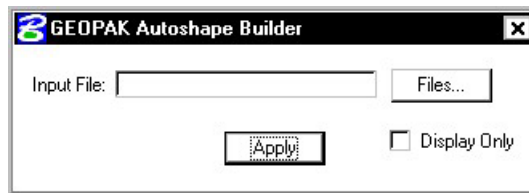
Input File   Name of .inp file (fname.inp) created by the Automated superelevation generation containing the transitions.

Display Only   Create the shapes in "Display Only" mode. That is, they are not written to the design file and a view Update operation eliminates them, as does zoom in, etc.

The shapes are placed in a 2D graphics file on level 63 by default. The plot parameters can be modified in the input file with a text editor prior to building the shapes into the graphics file or with the **User > Symbologies** pull down on the Automated Superelevation dialog box.

11.4 Shape Analysis Tools

Tools	
	Cross Sections ☒ **Superelevation Shape Manager T...** ☒
Menu Bar Application	GEOPAK Road > Cross Sections >Superelevation Shape Manager Tools

The tools in the Superelevation Shape Manager Tools toolbox are detailed below.

Auto. Superelevation

Performs the actual calculations and stores the results in an ASCII file, known as the autoshape input file.

Autoshape Builder

Processes the autoshape input file and draws corresponding complex shapes in the specified 2D design file.

Shape Maker

Graphical method of drawing irregular superelevation shapes. This method is utilized for gore areas, turn lanes, etc.

Shape Analyst

The Shape Analyst tool provides information on any point within a GEOPAK superelevation shape.

Shape Profiler

The Shape Profiler tool provides profile information based on user-define increments intersecting a GEOPAK superelevation shape.

Shape Editor

The Shape Editor tool enables the user to dynamically change parameters on a previously created shape. This includes filler line stationing, dynamic moving of shapes, etc.

Shape Selector

The Shape Selector tool highlights or selects shapes based on a wide range of user queries or filters.
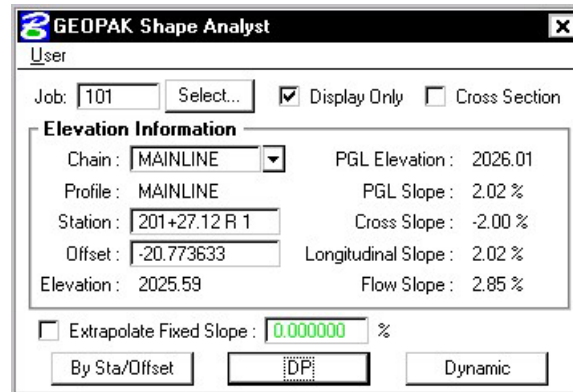
Shape Properties

The Shape Properties tool provides information on any GEOPAK superelevation shape. In addition, this shape information can be modified on individual shapes of selections of shapes.

11.4.1 Shape Analyst

The Shape Analyst tool is extremely useful, as it provides information on any point within a GEOPAK superelevation shape.

Before using this tool, the **Job Number** must be selected. Upon selecting a Job Number, a **Chain** must be selected that the shapes are defined relative to. If **Display Only** is enabled, information like elevation and a flow arrow are drawn to the view, but they are not written as elements to the active MicroStation file.

When the **Cross Section** toggle is not activated and a data point is issued within a shape, the elevation of the data point and a flow arrow are displayed. When the toggle is activated, a dashed line is placed through the data point, radial to the shaped cluster baseline. In addition to the elevation and flow arrow placed at the data point, elevations are displayed where the cross section line intersects any superelevation shape and cross slopes are labeled for each shape.

The **By Sta/Offset** button causes the current Station / Offset value to be projected back onto the shape cluster baseline and the elevation of the projected point is displayed. This option can be manual entry only and requires no data point on the screen.

The **DP** button works within a superelevation shape whose X, Y coordinates are utilized to compute station / offset from the specified shape cluster baseline, which is subsequently utilized in conjunction with the shape to compute the various slopes and elevations. After the DP button is clicked, numerous data points can be placed. It is not necessary to click the DP button again. Each corresponding station / offset is displayed along with the associated output information.

The **Dynamic** button activates the dynamic mode. As the cursor moves across the screen, any momentary pause places the elevation and flow arrow in the MicroStation file and computes and displays the analysis information.

The **Extrapolate Fixed Slope** toggle is another option supported in the Shape Analyst tool. The option is utilized when the data point, dynamic point or station / offset is outside of the shape. When the option is not activated, the data point is projected back to the shape's chain. The elevations at the edges of the shape are displayed and the slope of the outside shape is projected to the data point. When the toggle is enabled, the user defined slope is projected from the outer most shape to the data point to determine an elevation.

11.4.2 Shape Profiler

The Shape Profiler tool computes elevations along any GEOPAK Shape or MicroStation element at a user specified interval. The element can be inside or outside of the shapes.
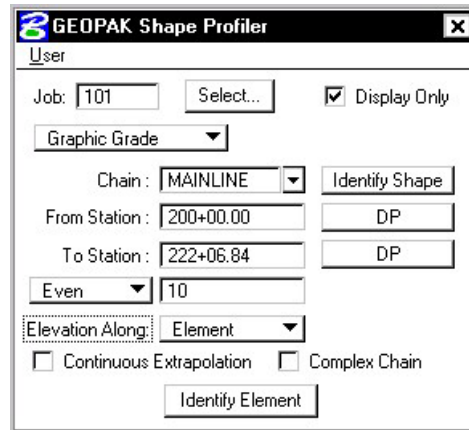
The **Job** field can be populated by key in or using the **Select…** button. After selecting a GPK file, click **Identify Shape** and data point on any shape along the desired **Chain**. Set the **From Station** and **To Station** fields by keying in values or using the **DP** buttons.
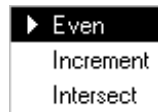
Even should be selected when it is desired to have the elevations compute at the even station values. **Increment** will allow the elevations to be computed starting at the **From Station**, then adding the increment value to that station. Intersect is used with an element to compute elevations at all locations that the element intersects the shape(s).

The **Elevation Along** toggle can be set to **Shape** or **Element**. When set to **Shape**, elevations will be computed based on the Even/Increment value along both longitudinal edges of the shape. When set to **Element** the elevations are computed along the element based on the Even/Increment/Intersect toggle.

Continuous Extrapolation allows the user to identify multiple longitudinal elements outside of the shape area and compute elevations by a user defined **Slope** and one of three methods: **Radial to Baseline, Radial From Element, or Radial to Element**.

LAB 11: Superelevation

As a reminder, our project contains distinct sections:

Section 1	4 lane divided highway with depressed median from Sta. 200+00 to Sta. 202+00. Left side of the roadway will be resurfacing while the right side is new construction.
Section 2	4 lane divided highway with raised median from Sta. 202+00 to Sta. 204+25. Left side of the roadway will be resurfacing while the right side is new construction.
Section 3	4 lane undivided highway from Sta. 204+25 to Sta. 211+00.
Section 4	2 Lane highway with Entrances and Exit Ramps from Sta. 211+00 to Sta. 220+00.
Section 5	Exit Ramp (RampA)

Based on this information, we will need to process the Superelevation separately for each of the above sections. Each process will create a shape input file that can be run individually.

11.1 Automated Superelevation – Section 1

Step 1. Execute **C:\data\geo\VDOT\road1\LAB11.EXE**.

Step 2. Open the MicroStation file **c:\data\geo\VDOT\road1\d17682work.dgn**

Step 3. Open Project Manager.

Step 4. Click Calculate Superelevation button from the Road Project: 17682.prj workflow dialog box.

Step 5. Create a new run called '**ML1**' and click **OK**. Once the Automated Superelevation dialog box has been invoked, the dialog box on the right will be displayed.
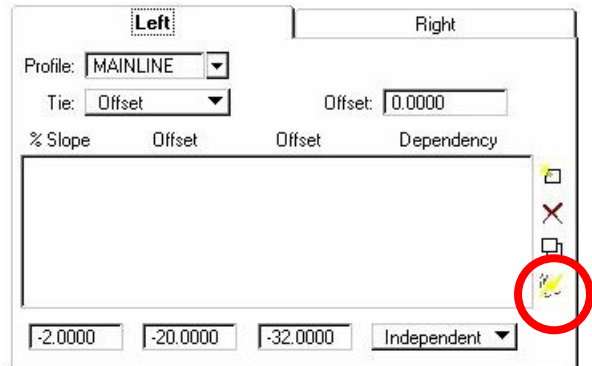
Fill out the upper portion of the dialog box as shown.

Step 6. The profile should be set to **MAINLINE** for both the Left and Right tabs.

Step 7. The **Tie** option should be set to **offset** and the offset value should be set to **0.0** to force the PGL (Profile Grade Line) to run along the centerline of construction (MAINLINE).
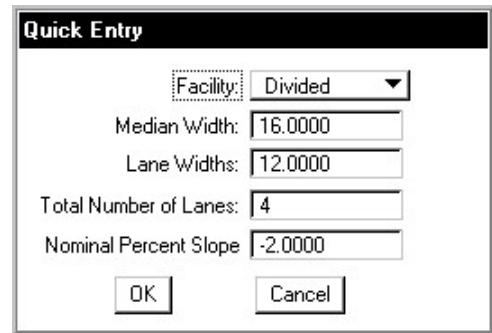
_____
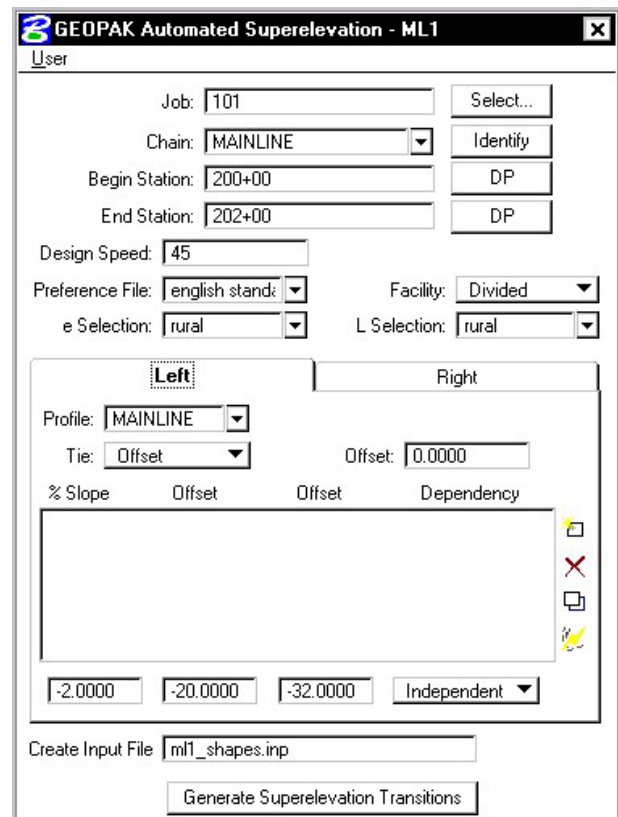
Step 8. Press the **Quick Entry** icon as shown in the image below.

Step 9. Fill out the Quick Entry dialog box as shown to the right and press OK.

NOTE**:** Quick Entry can be used only if the lane configuration to the left and right sides of the baseline are the same.

The dialog box should appear as shown:

NOTE**:** Quick Entry may reset your OFFSET. Please ensure that the offset for both the left and right roadways is set to 0.

Step 10. Provide an Input Filename (**ml1_shapes.inp**) to store the computed transitions for this station range.

Step 11. Click the **Generate Superelevation Transitions** button to initiate the calculation of the transitions for the Left and Right roadway.

Step 12. Review the computations within the Text Editor dialog box.

Step 13. To build these shapes into the graphics file, click the **Autoshape Builder** icon within the Text Editor dialog box. This will automatically draw the shapes into your design file on level 63.

Step 14. Close the Text Editor dialog box as well as the automated superelevation dialog box. When prompted to Save Superelevation settings, click **Yes**.

Step 15. Review the Superelevation shapes created in the design file.
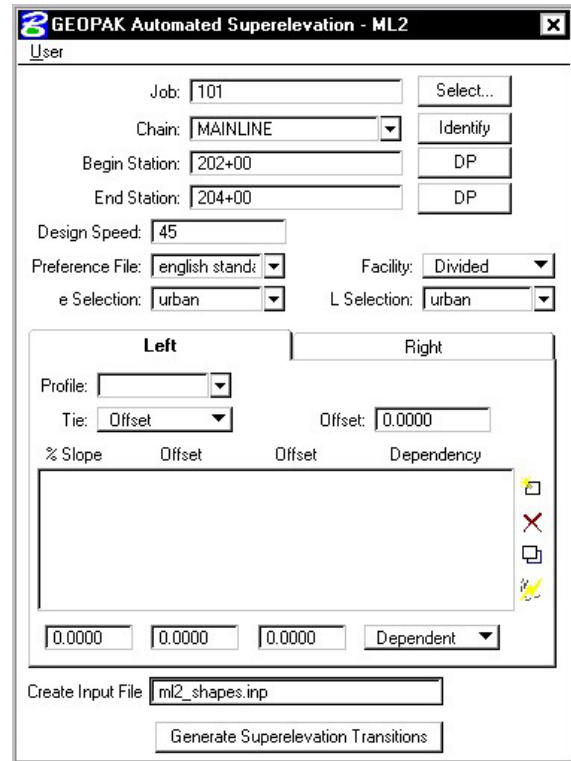
11.2 Automated Superelevation – Section 2

Step 1. Click the **Calculate Superelevation** button from the **Road Project: 17682.prj** workflow dialog box.

Step 2. Create a new run called '**ML2'** and click **OK**. Once the Automated Superelevation dialog box has been invoked, the dialog box on the right will be displayed.
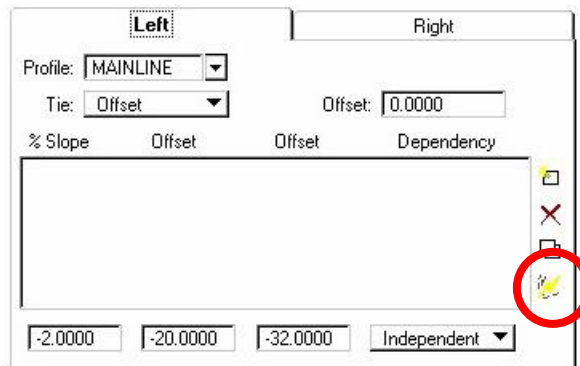
Fill out the upper portion of the dialog box as shown.

Step 3. The profile from which the shapes should be computed should be set to **MAINLINE** for both the Left and Right roadway tabs.

Step 4. The **Tie** option should be set to **offset** and the offset value should be set to **0.0** to force the PGL (Profile Grade Line) to run along the centerline of construction (MAINLINE).

Step 5. Press the **Quick Entry** icon as shown in the image below.

Step 6. Fill out the Quick Entry dialog box as shown below and press OK.

Quick Entry

Facility:	Divided ▼
Median Width:	16.0000
Lane Widths:	12.0000
Total Number of Lanes:	4
Nominal Percent Slope	-2.0000

OK   Cancel

NOTE**:** Quick Entry can be used only if the lane configuration to the left and right sides of the baseline are the same.

The dialog box should appear as shown:

GEOPAK Automated Superelevation - ML2

User

Job:	101	Select...
Chain:	MAINLINE ▼	Identify
Begin Station:	202+00	DP
End Station:	204+00	DP

Design Speed: 45
Preference File: english standa ▼   Facility: Divided ▼
e Selection: urban ▼   L Selection: urban ▼

Left	Right

Profile: MAINLINE ▼

Tie: Offset ▼   Offset: 0.0000

% Slope	Offset	Offset	Dependency
-2.0000	-8.0000	-20.0000	Dependent
-2.0000	-20.0000	-32.0000	Independent

| 0.0000 | 0.0000 | 0.0000 | Dependent ▼ |

Create Input File ml2_shapes.inp

Generate Superelevation Transitions

NOTE**:** Quick Entry may reset your OFFSET. Please ensure that the offset for both the left and right roadways is set to 0.

Step 7. Provide an Input Filename (**ml2_shapes.inp**) to store the computed transitions for this station range.

Step 8. Click the **Generate Superelevation Transitions** button to initiate the calculation of the transitions for the Left and Right roadway.

Step 9. Review the computations within the Text Editor dialog box.

Step 10. To build these shapes into the graphics file, click the **Autoshape Builder** icon within the Text Editor dialog box. This will automatically draw the shapes into your design file on level 63.

Step 11. Close the Text Editor dialog box as well as the automated superelevation dialog box. When prompted to Save Superelevation settings, click **Yes**.

Step 12. Review the Superelevation shapes created in the design file.
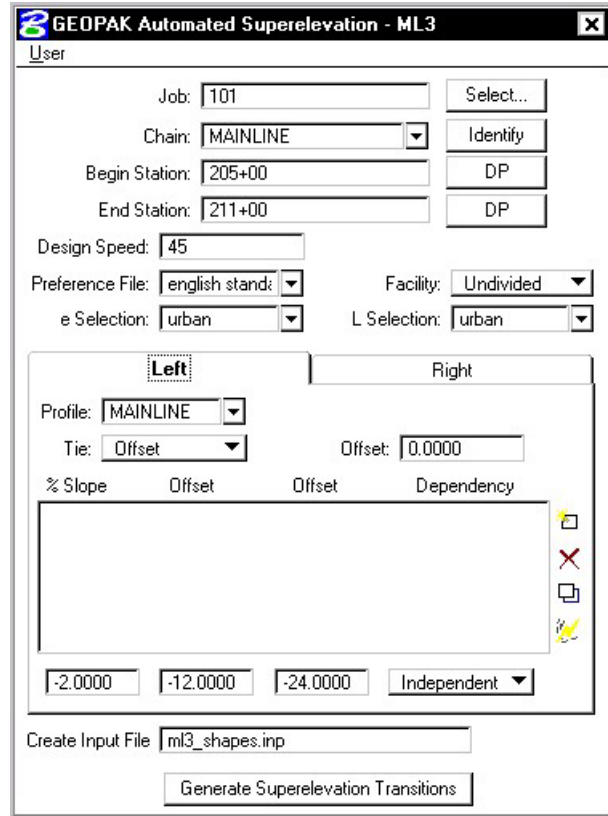
11.3 Automated Superelevation – Section 3

Step 1. Click the **Calculate Superelevation** button from the **Road Project: 17682.prj** workflow dialog box.

Step 2. Create a new run called '**ML3'** and click **OK**. Once the Automated Superelevation dialog box has been invoked, the dialog box on the right will be displayed.
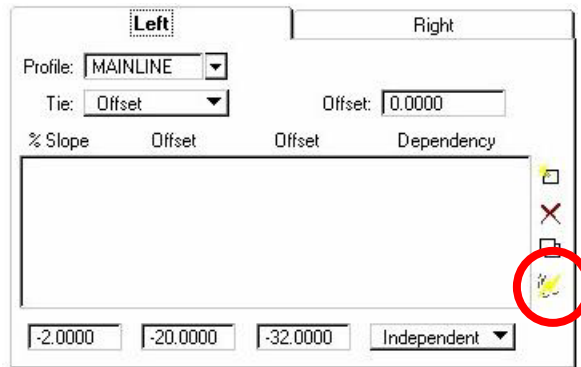
Fill out the upper portion of the dialog box as shown.

Step 3. The profile from which the shapes should be computed should be set to **MAINLINE** for both the Left and Right roadway tabs.

Step 4. The **Tie** option should be set to **offset** and the offset value should be set to **0.0** to force the PGL (Profile Grade Line) to run along the centerline of construction (MAINLINE).

Step 5. Press the **Quick Entry** icon as shown in the image below.

Step 6. Fill out the Quick Entry dialog box as shown below and press OK.

Quick Entry

Facility:	Undivided ▼
Median Width:	0.0000
Lane Widths:	12.0000
Total Number of Lanes:	4
Nominal Percent Slope	-2.0000

OK   Cancel

NOTE**:** Quick Entry can be used only if the lane configuration to the left and right sides of the baseline are the same.

The dialog box should appear as shown:

GEOPAK Automated Superelevation - ML3
U̲ser

Job: 101	Select...
Chain: MAINLINE ▼	Identify
Begin Station: 205+00	DP
End Station: 211+00	DP

Design Speed: 45

Preference File: english standa ▼   Facility: Undivided ▼

e Selection: urban ▼   L Selection: urban ▼

Left	Right

Profile: MAINLINE ▼

Tie: Offset ▼   Offset: 0.0000

% Slope	Offset	Offset	Dependency
-2.0000	0.0000	-12.0000	Dependent
-2.0000	-12.0000	-24.0000	Independent

-2.0000	-12.0000	-24.0000	Independent ▼

Create Input File ml3_shapes.inp

Generate Superelevation Transitions

Step 7. Provide an Input Filename (**ml3_shapes.inp**) to store the computed transitions for this station range.

Step 8. Click the **Generate Superelevation Transitions** button to initiate the calculation of the transitions for the Left and Right roadway.

Step 9. Review the computations within the Text Editor dialog box.

Step 10. To build these shapes into the graphics file, click the **Autoshape Builder** icon within the Text Editor dialog box. This will automatically draw the shapes into your design file on level 63.

Step 11. Close the Text Editor dialog box as well as the automated superelevation dialog box. When prompted to Save Superelevation settings, click **Yes**.

Step 12. Review the Superelevation shapes created in the design file.

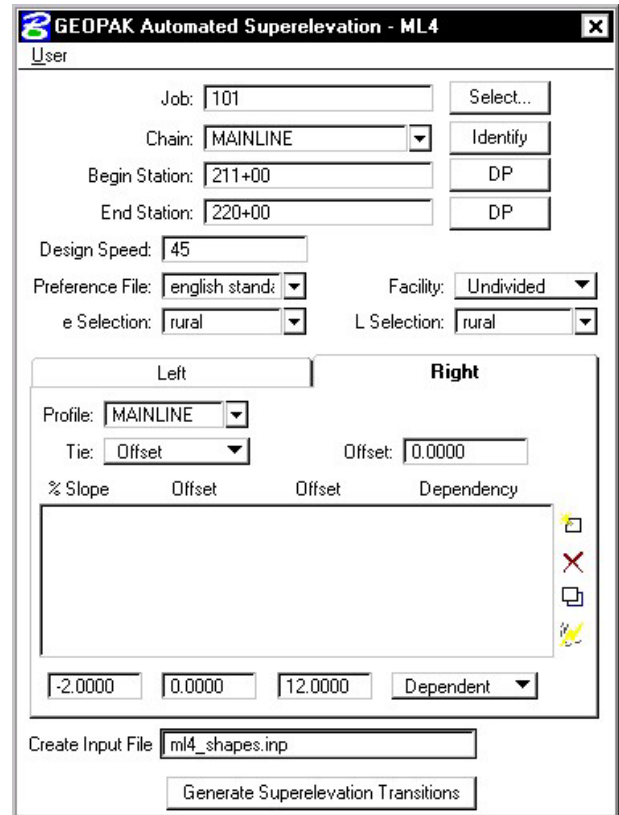## 11.4 Automated Superelevation – Section 4

Step 1.   Click the **Calculate Superelevation** button from the **Road Project: 17682.prj** workflow dialog box.

Step 2.   Create a new run called '**ML4**' and click **OK**.   Once the Automated Superelevation dialog box has been invoked, the dialog box on the right will be displayed.
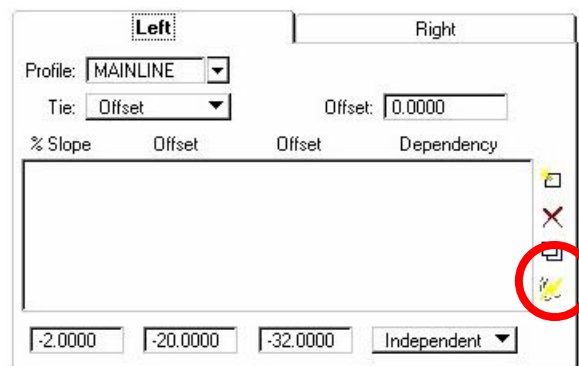
Fill out the upper portion of the dialog box as shown.

Step 3.   The profile from which the shapes should be computed should be set to **MAINLINE** for both the Left and Right roadway tabs.

Step 4.   The **Tie** option should be set to **offset** and the offset value should be set to **0.0** to force the PGL (Profile Grade Line) to run along the centerline of construction (MAINLINE).

Step 5.   Press the **Quick Entry** icon as shown in the image below.

Step 6. Fill out the Quick Entry dialog box as shown below and press OK.

NOTE**:** Quick Entry can be used only if the lane configuration to the left and right sides of the baseline are the same.

The dialog box should appear as shown:

Step 10. Provide an Input Filename (**ml4_shapes.inp**) to store the computed transitions for this station range.

Step 11. Click the **Generate Superelevation Transitions** button to initiate the calculation of the transitions for the Left and Right roadway.

Step 12. Review the computations within the Text Editor dialog box.

Here's where the ability to review your calculations and make changes comes in handy.

Notice that from Sta. 205+00 to Sta. 211+00 we used an Urban Standard, which gave us a slope of 0.4624% at Sta. 211+00. But notice now we've used a Rural standard from Sta. 211+00 to Sta. 220+00, which gives us a slope of 1.2037% at Sta. 211+00.

Let's fix this by hand-editing the superelevation calculations and changing the slope at Sta. 211+00 from 1.2037 to 0.4624 to match the slope coming out of the urban area.

Important: You must SAVE the file before processing it.

```
Text Editor: ml4_shapes.inp                          _ □ ✕
File  Edit  Criteria

  🗋  📂  💾   ✂  📋  📋   ↺  ↻   🔨

Using Preference File "english ULS"                    ▲
Using e Selection of "rural".
Using Length Selection of "rural"
Using Design Speed of 45.000000.

*/

auto shape
job number = 101

    auto shape set
        shape cluster baseline   = MAINLINE
        shape cluster profile    = MAINLINE
        shape cluster tie        = 0.0000
        dependent shape
        chain  /  offset
            MAINLINE   -12.0000
            MAINLINE    0.0000
        filler line station / slope
            211+00.000000    1.2037    /* Curve ML-1 */
            211+71.611682   -2.0000
            212+86.419170   -2.0000
            213+26.763997   -3.8000    /* Curve ML-2 */
            219+00.119019   -3.8000    /* Curve ML-2 */
            219+40.463847   -2.0000
            220+00.000000   -2.0000
                                                       ▼
                                   Line: 29    Col: 35
```

Step 13. To build these shapes into the graphics file, click the **Autoshape Builder** icon within the Text Editor dialog box. This will automatically draw the shapes into your design file on level 63.

Step 14. Close the Text Editor dialog box. When prompted to Save Changes, click **Yes**.

Close the automated superelevation dialog box. When prompted to Save Superelevation settings, click **Yes**.

Step 15. Review the Superelevation shapes created in the design file.

11.5 Automated Superelevation – Section 5

Step 1.   Click the **Calculate Superelevation** button from the **Road Project: 17682.prj** workflow dialog box.

Step 2.   Create a new run called '**RampA'** and click **OK**. Once the Automated Superelevation dialog box has been invoked, the dialog box on the right will be displayed.

Fill out the upper portion of the dialog box as shown.

Step 3.   The profile from which the shapes should be computed should be set to **RAMPA** for both the Left and Right roadway tabs.

Step 4.   The **Tie** option should be set to **offset** and the offset value should be set to **0.0** to force the PGL (Profile Grade Line) to run along chain RAMPA.

NOTE**:** Quick Entry cannot be used this time since the lane configuration for RampA is not the same on both sides of the baseline.

Step 5.   Since Quick Entry cannot be used for the lane configuration, we'll fill out the lane offsets and slopes manually.

Fill out the %Slope and Offset fields as shown and then add them to the list box by pressing the **Add** icon.

The dialog box should appear as shown:

Step 6.   Provide an Input Filename (**rampa_shapes.inp**) to store the computed transitions for this station range.

Step 7.   Click the **Generate Superelevation Transitions** button to initiate the calculation of the transitions for the Left Roadway.

Step 8. Review the computations within the Text Editor dialog box.

Step 9. To build these shapes into the graphics file, click the **Autoshape Builder** icon within the Text Editor dialog box. This will automatically draw the shapes into your design file on level 63.

Step 10. Close the Text Editor dialog box as well as the automated superelevation dialog box. When prompted to Save Superelevation settings, click **Yes**.

Step 11. Review the Superelevation shapes created in the design file.

11.6   Building Manual Shapes

> NOTE**:** There are times when the Autoshape Builder cannot be used. These normally occur in areas of lane transition where standard offsets are not sufficient enough to define the shape.

Step 1.   From the MicroStation menu bar select **Utilities > Saved Views**, access the Saved View "**TRANS1**".

Step 2.   Click the **Superelevation Shapes** button from the **Road Project: 17682.prj** workflow dialog box.

> NOTE**:**   When building manual shapes, it's desirable to only display the graphics that are absolutely required to define edges of the shapes. Also note that there may be times you will need to add graphical elements to the design file (such as lane lines) in order to be able to build a shape correctly.

Step 3.   Turn off the Reference File Levels 4,7 and 31. Also, turn off the patterns (Level 50) in the active design file.

Step 4.   Create the first slope filler line by filling out the dialog box as shown and pressing **Create**.

> Style = 0 and Weight = 2

Step 5. Create the second slope filler line by filling out the dialog box as shown and pressing **Create**.
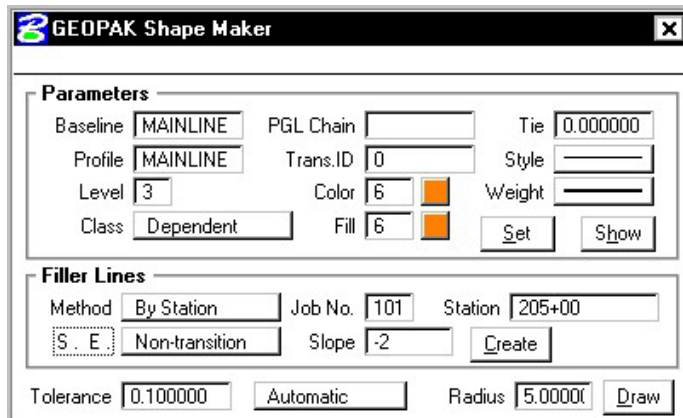
Step 6. Now press the DRAW button and issue a DP inside the lane as shown in the image below.
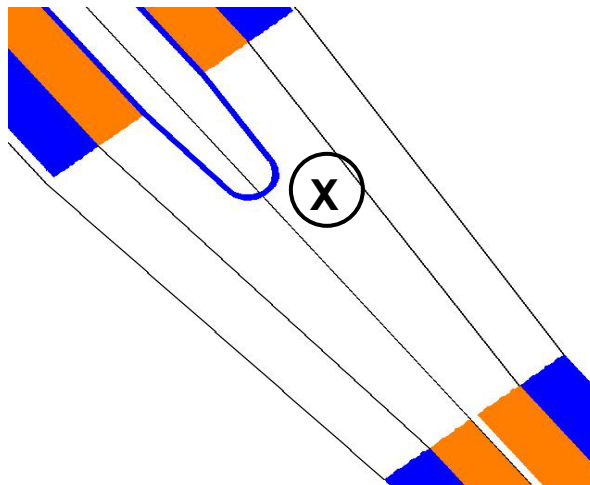
Step 7. Repeat Steps 4-6, this time issuing a DP for the other inside lane as shown in the image below.
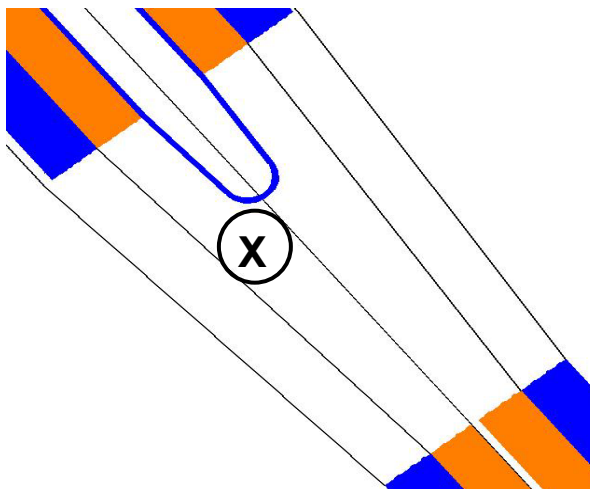
Step 8.   Change the Class, Color and Fill in the dialog box as shown below.
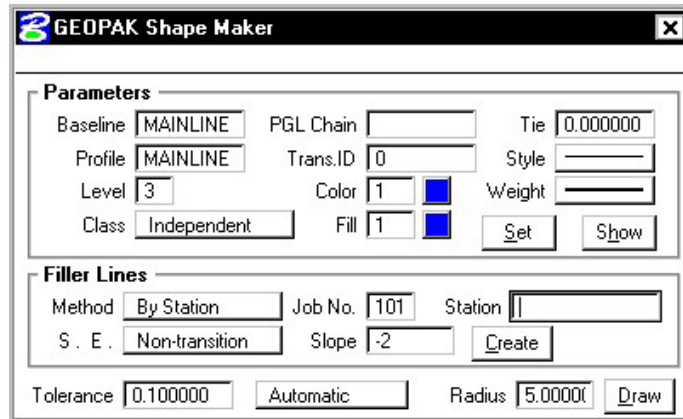
Step 9.   Repeat Steps 4-6 twice more to create the shapes for the two outside lanes.

11.7 Draw Superelevation Diagram

In the next steps we'll draw a Superelevation Diagram on the Profile Cell using a custom 3PC application. We will run this in two passes. One from Station **205+00 R 1 to 211+00 R 1** and one from Station **211+00 R 1 to 220+00 R 1**.

Step 1.   Open the MicroStation file **c:\data\geo\VDOT\road1\d17682prof.dgn**

Step 2.   Open Design and Computation Manager. Double click item **Road Design > Special Applications > Super Diagram**.

Step 3.   Populate the dialog box as show below. Click **OK**.

<p align="center">205+00 R1 to 211+00 R 1</p>


NOTE**:** Use the **Identify Cell** button to populate the upper left portion of the dialog box.

Shapes Input File = ml3_shapes.inp

Proposed Design File = d17682des.dgn

Step 4.   Click **OK** when the prompt below appears.

Step 5. Double click item **Road Design > Special Applications > Super Diagram** again.

Step 6. Populate the dialog box as show below. Click **OK**.

211+00 R1 to 220+00 R 1

VDOT Super Elevation Diagram

Job Number   101   Select

PGL Chain   MAINLINE   Select

Location and Scales

Horizontal Scale   25

Vertical Scale   5

No Gap ▼

Reference Station   200+00.000000 R 1

Reference Elevation   1900

X   2720975.783
Y   339105.81   DP

Profile Cell

Identify Cell

Pavement Section Information

Shapes Input File   4_shapes.inp   Select

Normal Crown Slope   -2.00

For -2.00% Keyin -2

Roadway Selection   Undivided Roadway ▼

PGL Grid Elevations

Starting Elevation Station   211+00.00 R 1

example --> 0+00 R 1

Ending Elevation Station   220+00.00 R 1

example --> 150+00 R 1

Elevation Grid Increment   50

example --> 50

Typical Outside Edge of Pavement Offsets

Left Edge of Pavement Offset   -12

Right Edge of Pavement Offset   12

Note: If the edge of pavement is not at these offsets, then the offset will be labeled. For divided, both offsets should be negative or both positive.

Proposed Design File   7682des.dgn   Select

Must Contain Proposed E/P

Units   English ▼

OK   CANCEL

NOTE**:** Use the **Identify Cell** button to populate the upper left portion of the dialog box.
Shapes Input File = ml4_shapes.inp
**Proposed Design File = d17682des.dgn**

Step 7. Click **OK** when the prompt below appears.

Prompt

Super Transitions Found --> Process Completed Successfully.

OK   Cancel

11.8 Update the Project Manager

We are completing the Plan View category of the Working Alignment Definition in Project Manager.

Step 1.   From the Workflow dialog box of Project Manager, click the **Define** button.

Step 2.   Highlight the **Plan View > Shapes** option and populate the Shapes Design file as shown below:
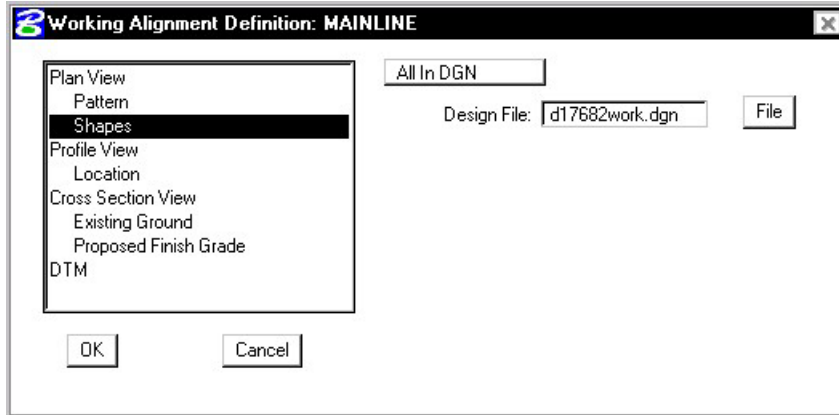
Step 3.   Click the **OK** button to save the updates and close the dialog box.

Step 4.   **Exit** MicroStation.