

CURB_GRADING.X – version 07.04.10

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Description

This criteria is used to draw grading from the back of curb to existing ground according to Figure 307-6 of the Location and Design Manual, Volume 1, Roadway Design. This criteria also handles additional grading conditions for dual roadway and commercial curb (See Figure 803-6), roadway curb and commercial parking lot (See Figure 803-4), dual drainage systems (curb with a ditch behind the curb), and a walk behind the curb (See Figure 306-1).

The criteria will also place pavement buildups for parking lots, allow placement of Type 6 or Type 7 curbs for commercial areas behind the roadway curb and allows for “special ditch profile” placement for drainage systems.

Examples:

Figure 1: Section in cut

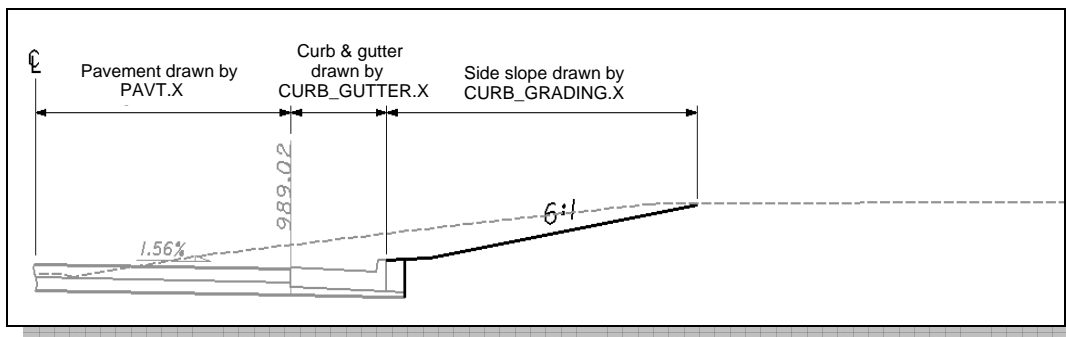


Figure 2: Section in fill

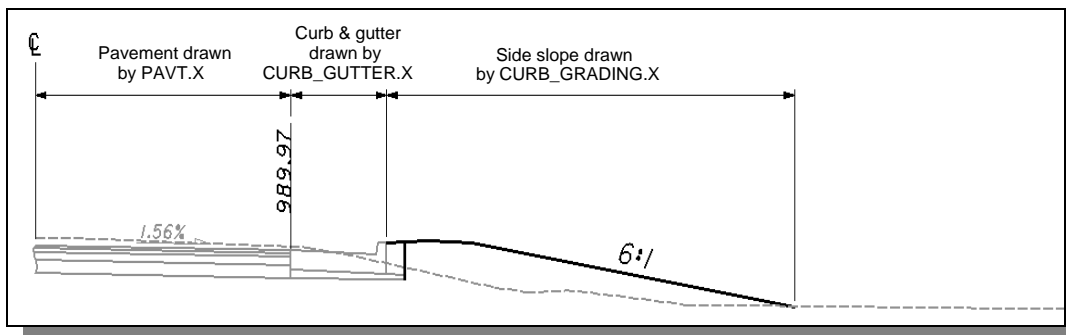
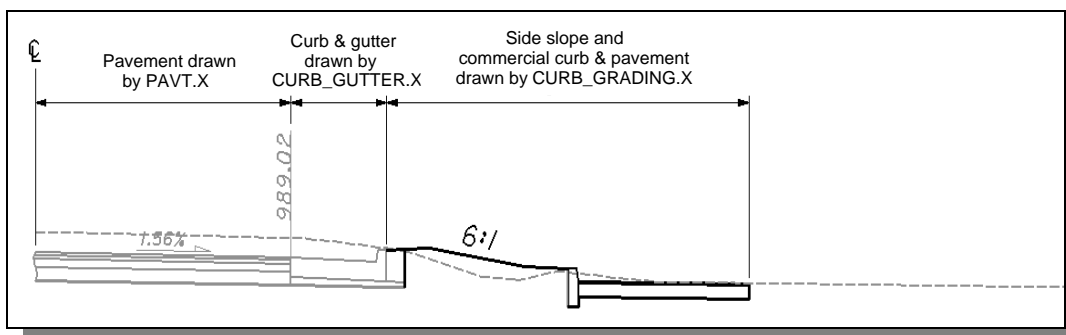


Figure 3: Section with Type 6 commercial curb



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Figure 4: Section with parking lot

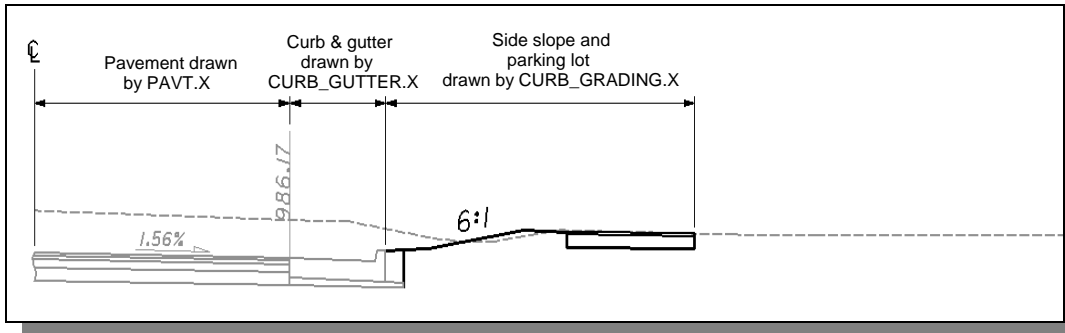


Figure 5: Section with dual drainage

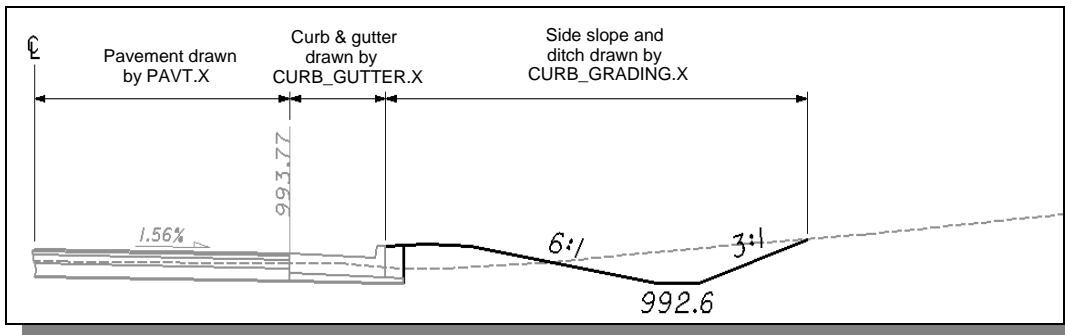


Figure 6: Section in cut with walk

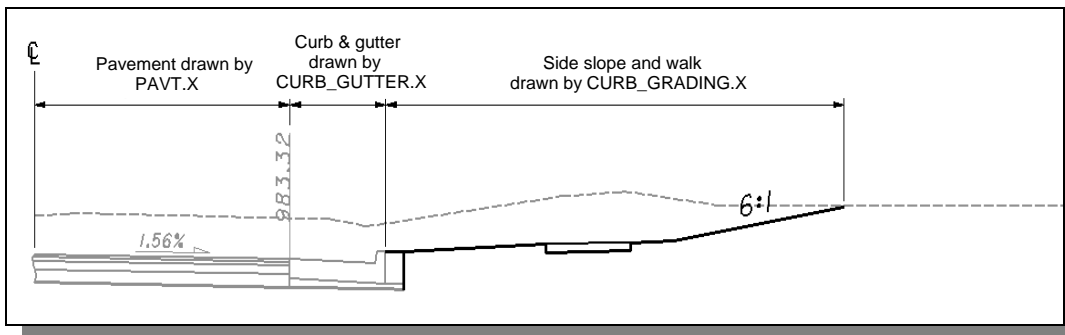
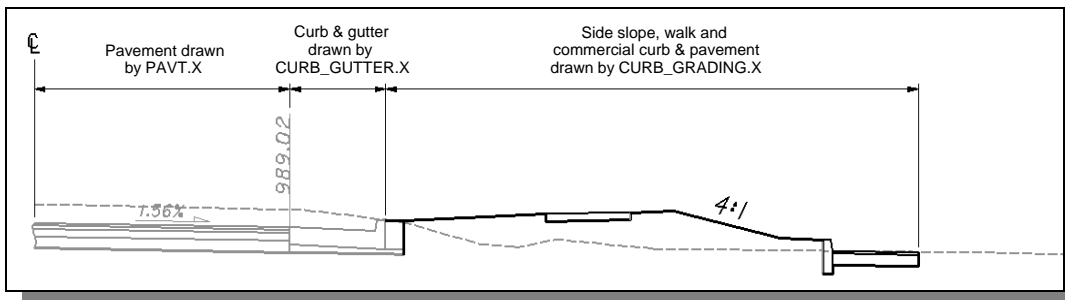


Figure 7: Section with walk and Type 6 commercial curb



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Inclusion Sequence

ODOT's criteria files are written so that each individual file is responsible for drawing only a specific component of the proposed cross section design. This allows for greater flexibility when utilizing the criteria files to accommodate a wide variety of design scenarios. When a criteria run is processed, the user will specify the individual criteria files that will be used to draw each component. The order in which these components are specified is significant. Criteria files must be included in the order that they will process from the centerline out. For example, the pavement criteria must be included before the shoulder criteria which must be included before the side slope criteria. Each criteria file will start drawing where the previous criteria file ended.

The ODOT Standard criteria file DEFINE.X contains default definitions for some of the Define Variables used by ODOT's criteria files. DEFINE.X must always be included first in any criteria run.

In order to process CURB_GRADING.X, a pavement and a curb criteria file must be included in the criteria run previous to CURB_GRADING.X. The following ODOT standard pavement criteria files are available:

Pavement Criteria:

PAVT.X
PAVT_OVERLAY1.X

CURB_GRADING.X can be included directly after any of the following ODOT standard curb criteria files:

Curb Criteria:

CURB.X
CURB_GUTTER.X

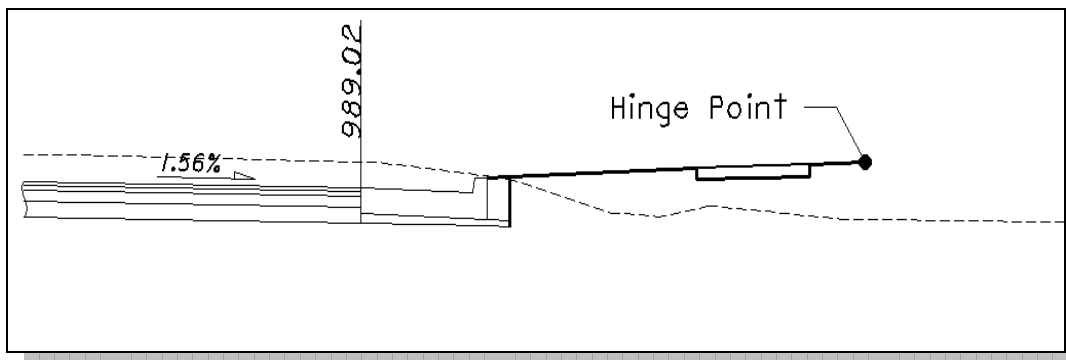
Additional Processing Notes

Proposed Plan View Graphics:

Before any processing occurs, the criteria file scans the design file at the current cross section to determine if any graphical elements are present. The criteria file will look for walk, commercial curb, parking lot and ditch line.

The criteria file will first search the design file at the current cross section for walk. If walk is found, the criteria will process the walk up to the hinge point as shown in Figure 8 below.

Figure 8: Section with walk processed to hinge point



Whether a walk is encountered or not, the criteria file will next search the design file at the current cross

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section for commercial curb or parking lot graphics. If the criteria file finds either commercial curb or parking lot, the criteria will complete the section as shown in Figures 9 and 10.

Figure 9: Section with walk and commercial curb

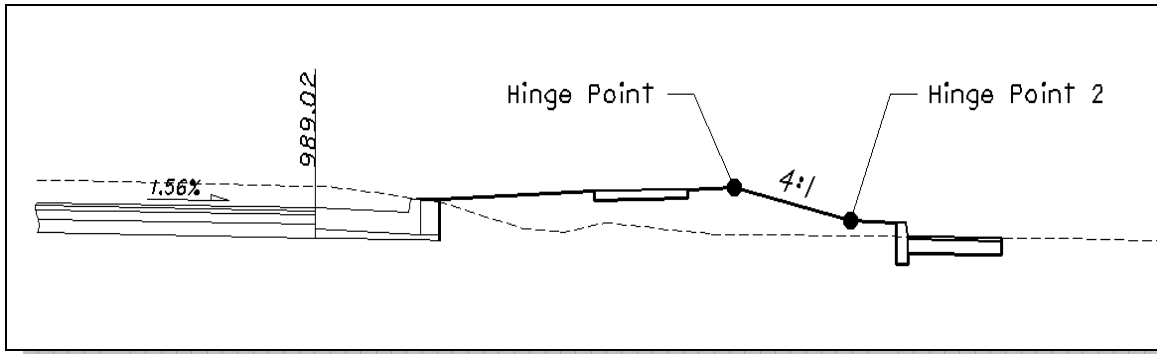
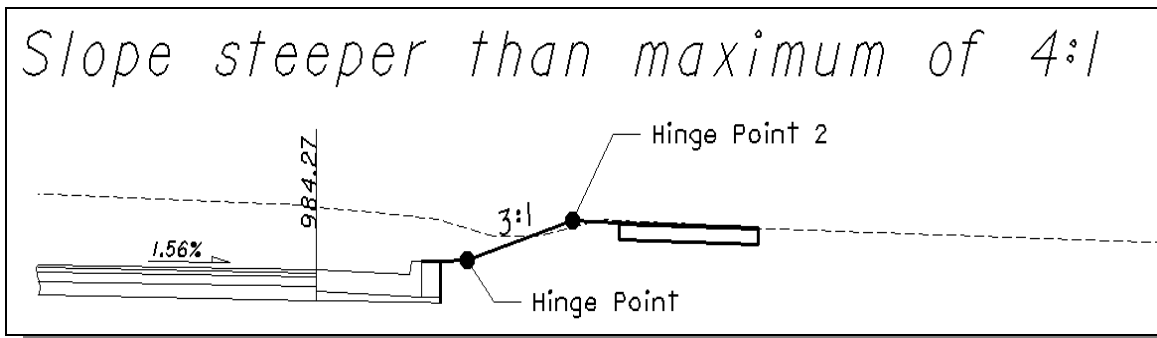


Figure 10: Section with parking lot and no walk



Note: The criteria file will place a warning message if the slope placed between the hinge point and the commercial curb or parking lot hinge point 2 exceeds the “**maximum allowable slope**” value.

If no commercial curb or parking lot is found in the design file at the current cross section, the criteria will remain at the hinge point and will proceed with processing.

Next the criteria file will search the design file at the current cross section for a ditch element and will also search the COGO database to determine if a user defined ditch profile exists at this cross section station. If no MicroStation ditch element and/or COGO ditch profile is encountered at the current cross section, the criteria file will proceed as described below. If a MicroStation ditch element and/or COGO ditch profile is encountered, the criteria section will proceed as described in the **Drainage** Considerations section on [page 15](#).

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Cut or Fill Condition:

The criteria file will first determine whether the section is in cut or fill. First, the criteria file will determine the location of the hinge point as shown in Figures 11 and 12 below.

Figure 11: Hinge Point above existing ground

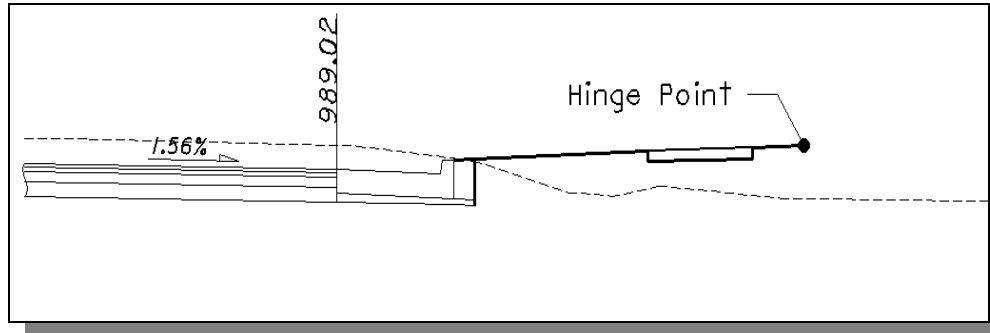
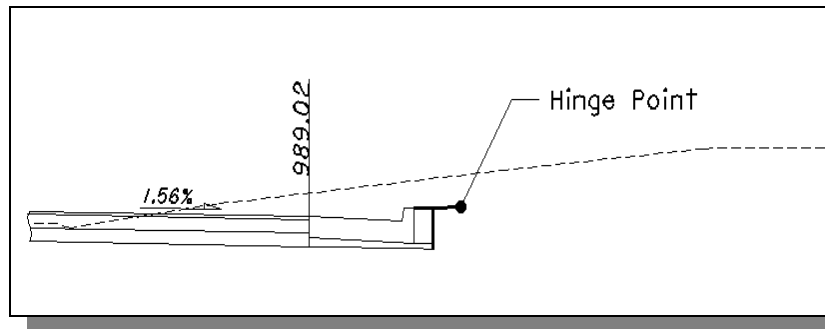
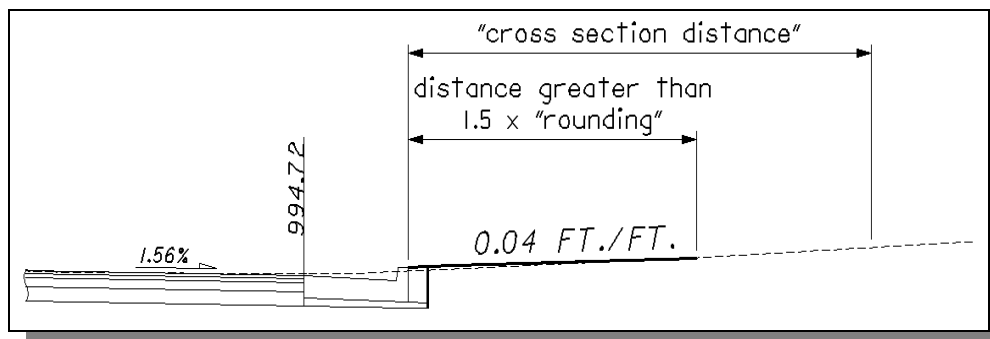


Figure 12: Hinge point is below existing ground



Before the criteria processes the section in cut or fill, the criteria will first attempt to draw a slope using the value of “**break to slope**” to the existing ground. If this slope intersects the existing ground and meets the requirements of “**rounding**” and “**cross section distance**”, the section is completed as shown in Figure 13.

Figure 13: Section completed using “break in slope”



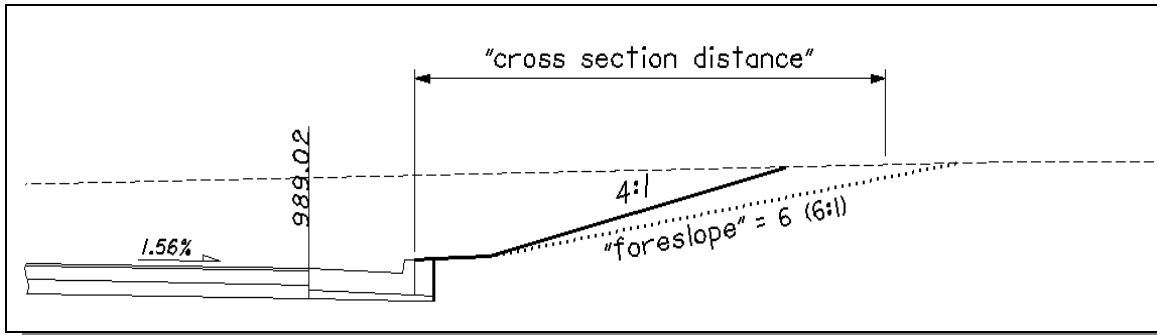
Cut Condition:

If the criteria file does not complete the section using the “**break to slope**” and the hinge point is below the existing ground as shown in Figure 12, the section is considered to be in cut. The criteria first draws the “**foreslope**” up to the existing ground. Next, the criteria file determines where the “**foreslope**” intersects the existing ground compared with the “**cross section distance**” as shown in Figure 14. If it is within the “**cross section distance**” and meets the “**rounding**” requirement, the section is completed as shown in Figure 1.

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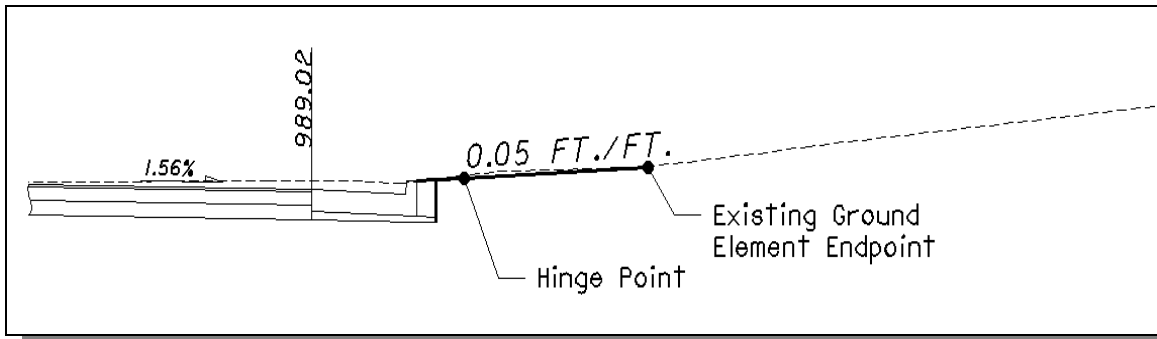
If the “foreslope” is outside the “cross section distance”, the criteria file draws the “maximum allowable slope” to the existing ground. If it meets the “cross section distance” and the “rounding” requirements, the section is completed as shown in Figure 14.

Figure 14: Cut section with “maximum allowable slope” placed



If both the “foreslope” and “maximum allowable slope” fail to be placed, the criteria will attempt to place a slope from the hinge point to an endpoint of an existing ground element. This slope will be variable and dependent on the location of the existing ground endpoint. It also must meet the “cross section distance” and the “rounding” requirements before the section is placed as shown in Figure 15.

Figure 15: Cut section with variable slope placed



If all the previous slope attempts fail to be placed, the criteria will place the “barrier slope” to existing ground as the last option.

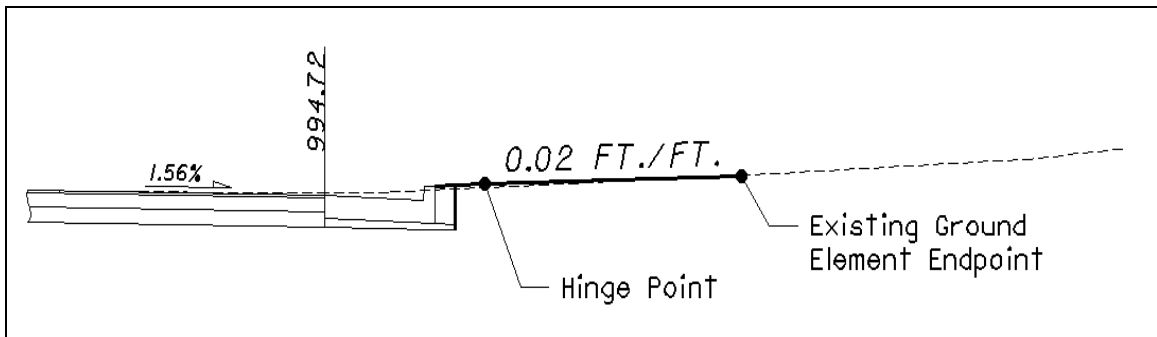
Fill Condition:

If the criteria file does not complete the section using the “break to slope” and the hinge point is above the existing ground as shown in Figure 11, the section is considered to be in fill. The criteria will first attempt to place the “break to slope” down to the existing ground. If this placement meets the “cross section distance” and the “rounding” requirements, the section is completed.

Before the criteria file tests the “foreslope” placement, the criteria will attempt to place a slope from the hinge point to an endpoint of an existing ground element. This slope will be variable and dependent on the location of the existing ground endpoint. It must meet the “cross section distance” and the “rounding” requirements and the slope must be a minimum of 1% before the section is placed as shown in Figure 16.

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Figure 16: Fill section with a variable slope placed

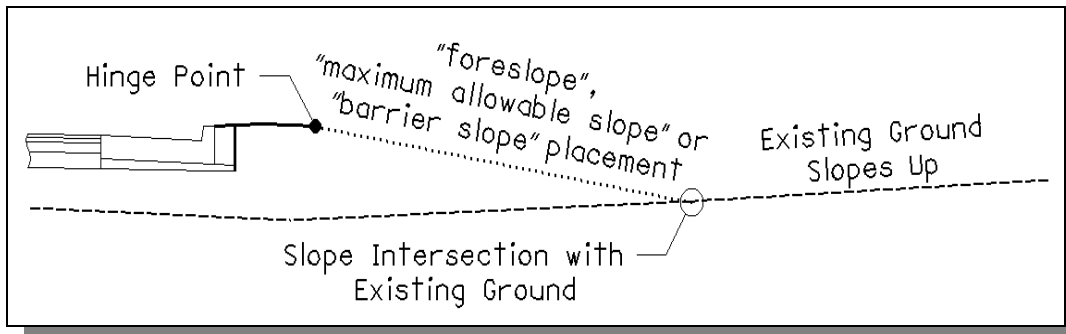


If the section is not completed, the criteria draws the “foreslope” down to the existing ground. The criteria file then tests the existing ground slope to determine whether the existing ground slopes up or down.

Fill Condition: Existing Ground Slopes Up:

If the criteria file determines that the existing ground slopes up as shown in Figure 17 below, the criteria file will then proceed as described in the **Drainage Considerations** section on [page 15](#).

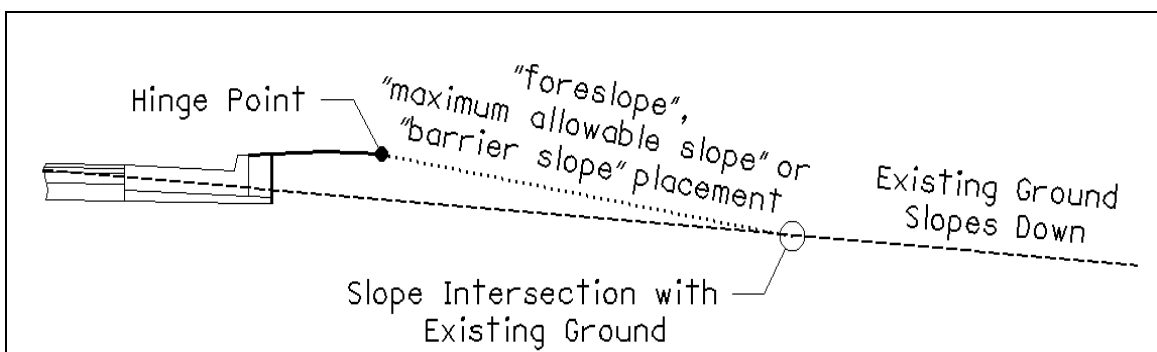
Figure 17: Existing ground slopes up at intersection with proposed grading



Fill Condition: Existing Ground Slopes Down:

If the criteria file determines the existing ground is sloping down as shown in Figure 18 below, the criteria file tests the existing ground slope at this location to determine the slope of the existing ground. If the existing ground slope is less than the “**terminate slope**” a ditch section will be placed as described in the **Drainage Considerations** section on [page 15](#).

Figure 18: Existing ground slopes down at intersection with proposed grading



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If the slope of the existing ground is greater than the “**terminate slope**,” no ditch will be placed. For example, if “**terminate slope**” is set to 1 and the existing ground slope is 0.5% (down), a ditch will be placed but if the existing ground slope was 1.2% (down) then no ditch will be placed. Note: if the existing ground slopes up at this test location, a ditch will always be placed.

If no ditch is to be placed, the criteria file determines where the “**foreslope**” intersects the existing ground compared with the “**cross section distance**”. If it is within the “**cross section distance**”, the section is completed as shown in Figure 2.

If the “**foreslope**” is outside the “**cross section distance**”, the criteria file draws the “**maximum allowable slope**” to the existing ground. The criteria file then proceeds through the same tests as outlined above for the “**foreslope**” placement.

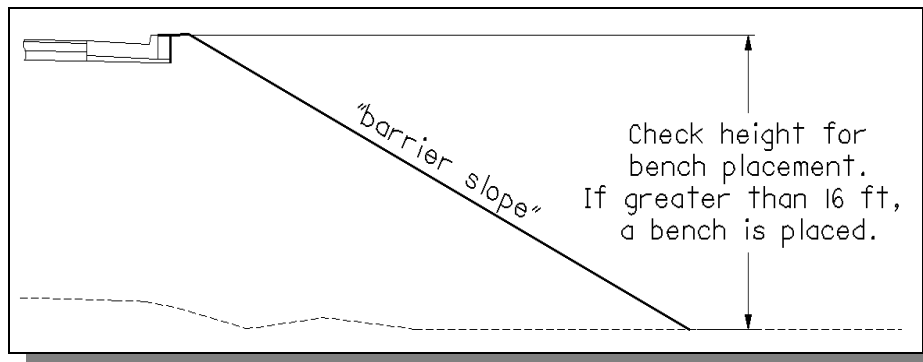
If the “**maximum allowable slope**” does not intersect the existing ground, the criteria file draws the “**barrier slope**” to the existing ground as the last option for slope placement.

Before any of the slopes are placed and the section is completed, the criteria calculates the elevation difference between the proposed grading intersection with the existing ground and the top of the roadway curb. The criteria compares the elevation difference with the “**fill height**” value. If this difference is less than or equal to the “**fill height**”, the section is completed. If it is greater than the “**fill height**” the section uses “**barrier slope**” as described in the **Fill Heights over “fill height” Condition** below.

Fill Heights over “fill height” Condition:

If the criteria determines the section is in high fill (fill height over “**fill height**”), the criteria draws grading using the “**barrier slope**”. Before the grading will be placed, the criteria first tests to see if a bench will be placed for fill heights over 16 ft as shown in Figure 19 below.

Figure 19: Check fill height for bench placement



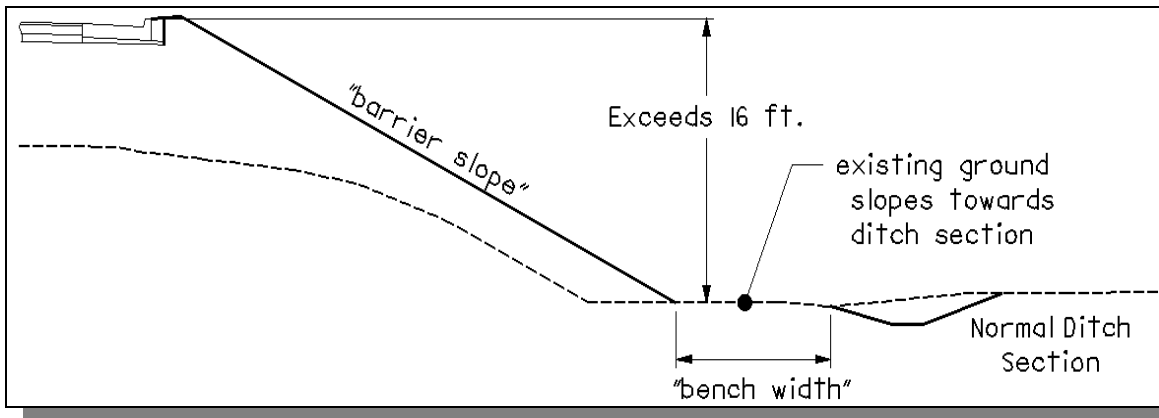
Next, the criteria tests the existing ground slope as shown on the previous page to see if a ditch will be placed.

After the existing ground slope is tested, the section will be completed based on the outcome.

If the fill height is over “**fill height**”, then a bench is placed as shown in Figure 20. If the point where the barrier slope intersects the existing ground is lower than the ditch location, the criteria will draw the proposed grading using the “**bench width slope**” back to this “**barrier slope**” line to promote proper drainage as shown in Figure 20 on the following page.

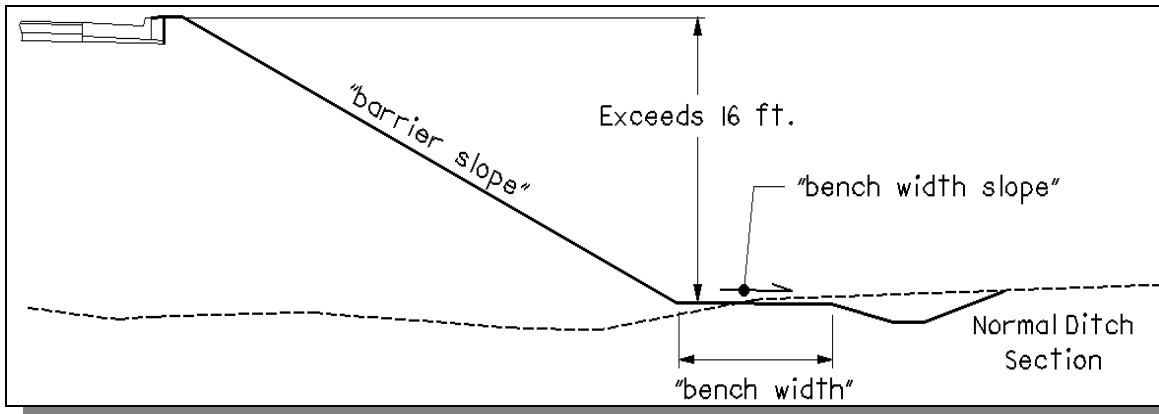
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Figure 20: Existing ground bench



If the point where the barrier slope intersects the existing ground is higher than the ditch location, the criteria will draw the section as shown in Figure 21.

Figure 21: Proposed grading bench



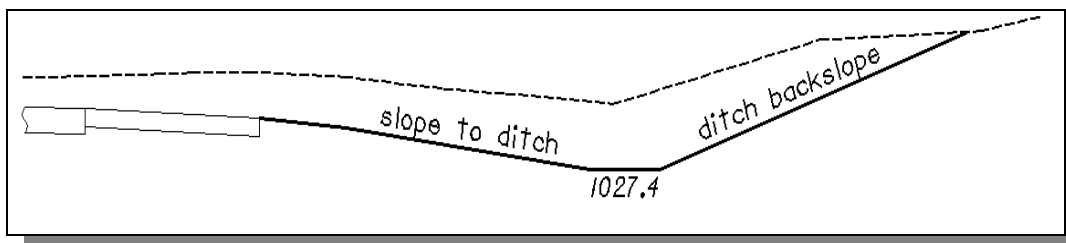
Proposed Grading:

The final cross section cut and fill lines representing the proposed grading are drawn on level 8. This level should always be shown on the final cross sections.

Ditch Labeling:

The criteria file provides two options for how the ditch labels will be placed. The variable “**ditch annotation style**” is used to select the desired label as shown in Figures 22, 23 and 24 below. The default value is 0.

Figure 22: “ditch annotation style” set to 0

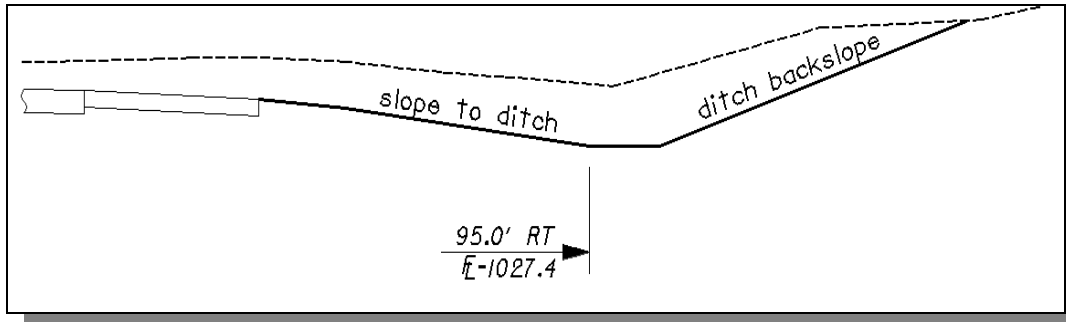


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If "ditch annotation style" is set to 1 for a ditch section:

When using this option, the user must set the COGO chain from which the offsets will be measured from under "cl chain name". Please see the explanation of this variable "cl chain name" on [page 22](#). See Figure 23 below for the usage of this variable.

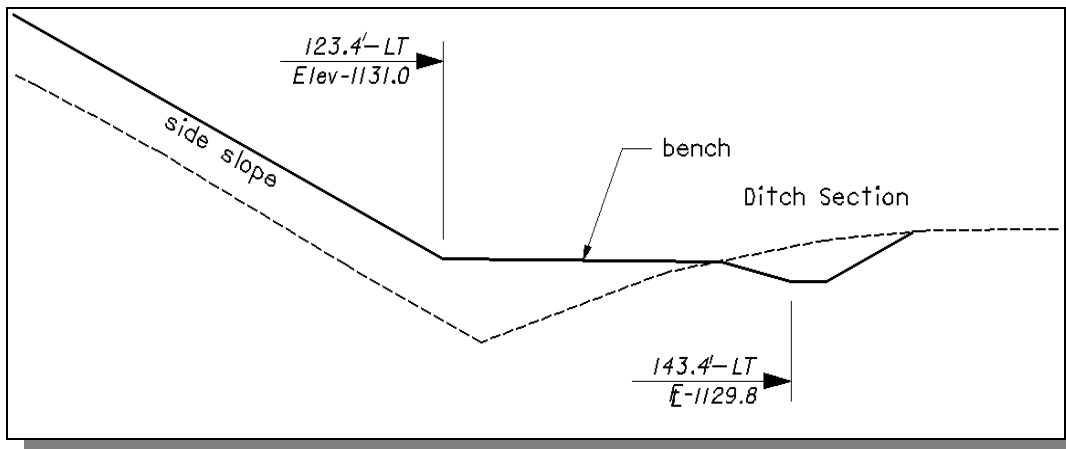
Figure 23: "ditch annotation style" set to 1 for a ditch section



If "ditch annotation style" is set to 1 for a section containing a bench:

When using this option, the user must set the COGO chain from which the offsets will be measured from under "cl chain name". Please see the explanation of this variable "cl chain name" on [page 22](#). See Figure 24 below for the usage of this variable.

Figure 24: "ditch annotation style" set to 1 for a section containing a bench



Text Labeling:

The criteria will place several labels for the ditch elevation and the side slopes. The labels are placed on level XS_Annotation_P and the scale is determined by the user's input to the **DEFINE.X** criteria file.

The criteria file will also place Warning, Error and/or Designer Notes when processing. The messages are placed on level SC_Scratch2_P. Warning and Error messages are drawn in magenta (color 7) and Drainage notes are drawn in cyan (color 5). Users should turn this level off on the final plotting of the cross section sheets. If you wish not to have these messages plot, you will need to modify the `_d_warning_message` value from 1 to 0 in the criteria file itself. The `_d_warning_message` value has been hardcoded in the criteria file.

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GEOPAK Process Cross Sections Warning Messages:

If no intersection with a walk element is found during the cross section processing, the following message will be displayed in the GEOPAK Process Cross Sections Display dialog box:

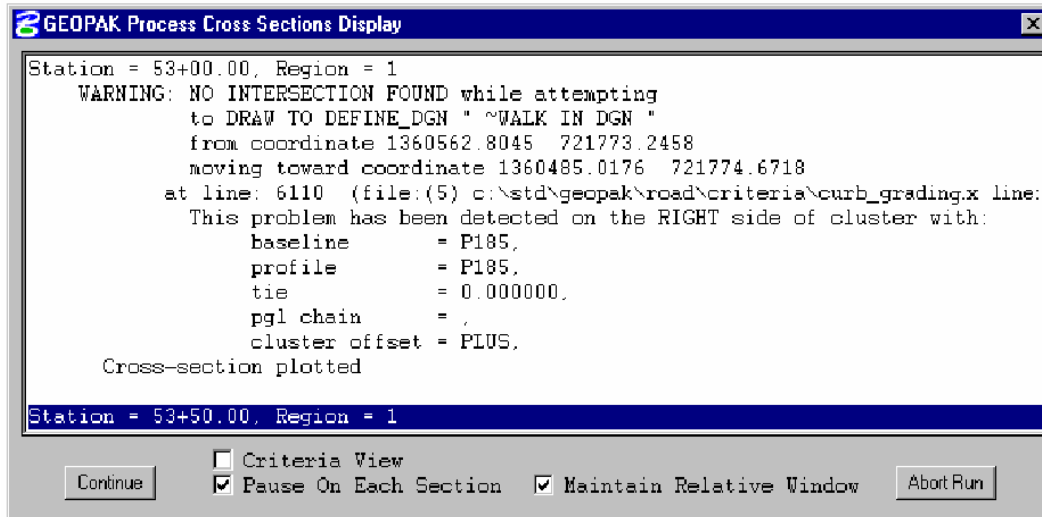


Figure 25

This message is not necessarily an indication that an error has occurred during processing and should be considered normal if a condition similar to the one shown in Figure 26 below is encountered.

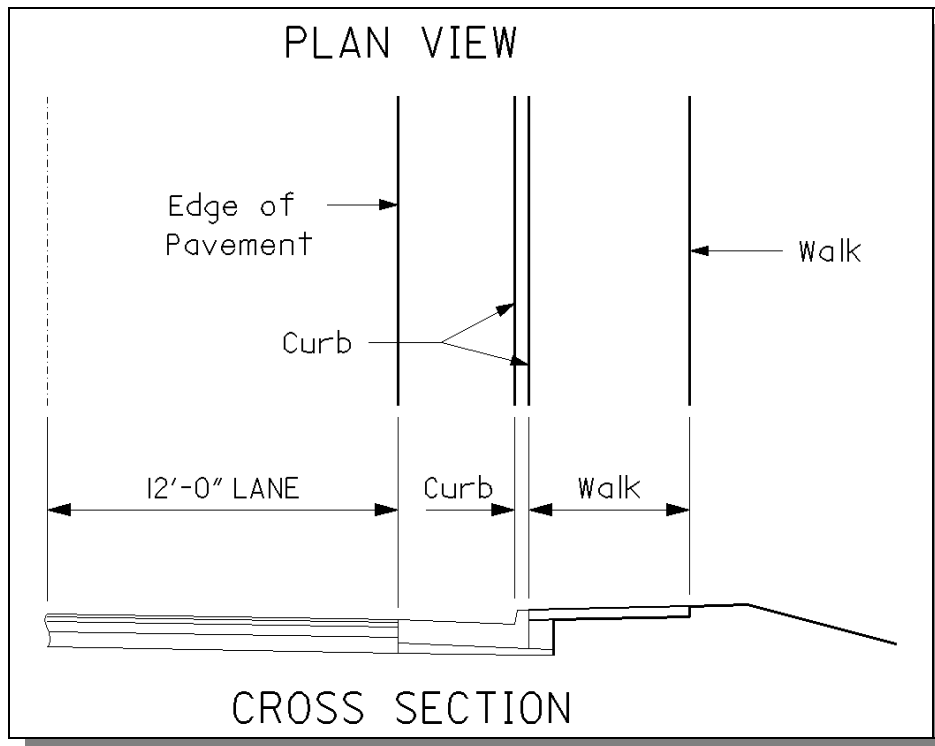


Figure 26

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If no intersection with a parking lot element is found during the cross section processing, the following message will be displayed in the **GEOPAK Process Cross Sections Display** dialog box:

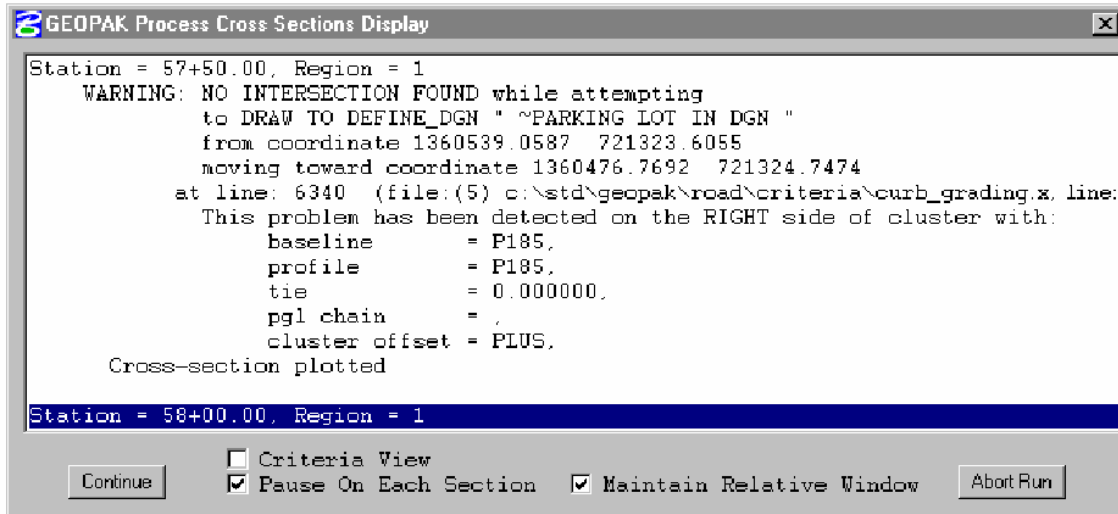


Figure 27

This message is not necessarily an indication that an error has occurred during processing and should be considered normal if a condition similar to the one shown in Figure 28 below is encountered.

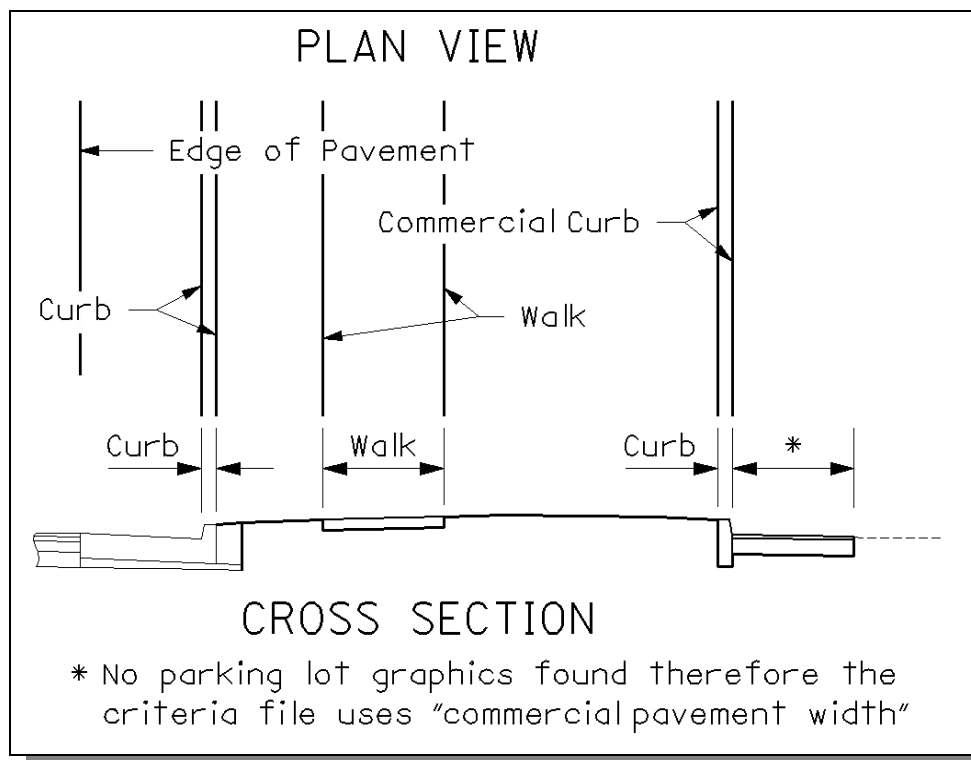


Figure 28

Drainage Considerations

After the side slope criteria has been processed for the first time, the designer must review the ditch elevations to ensure proper drainage. For sections if fill, the ditches are placed at the intersection of the side slope with existing ground. This may not result in ditches that flow as the user desires. The designer has two options to correct the ditch elevations to ensure proper flow:

Manually edit the cross sections.

If only a few sections need modified it is easiest to manually edit the cross sections to make the necessary changes.

Specify the ditch location with a COGO profile and/or graphic ditch line.

In cases where several cross sections need changed, the user has the option to define the ditch elevations by storing a COGO profile that represents the desired ditch profile. Additionally, the criteria provides the capability to specify the ditch offset by graphically drawing the ditch location in the plan view design file.

This criteria file is capable of determining the side slopes and the location of the drainage ditches by one of the following:

Graphic Ditch Line	COGO Profile	Criteria Result
Yes	No	Draws “foreslope”, “maximum allowable slope”, or “barrier slope” until the slope intersects the graphic ditch line.
Yes	Yes	The graphic ditch line is used to determine the offset for the ditch and the COGO profile is used to determine the elevation of the ditch. This may produce side slopes which vary from the standard.
No	Yes	Draws “foreslope”, “maximum allowable slope”, or “barrier slope” until the slope intersects the elevation determined from the COGO profile.
No	No	Places “foreslope”, “maximum allowable slope”, or “barrier slope” and ditches, if applicable, based on the cross section and the criteria variables.

The criteria will first search the MicroStation design file specified by the variable “**proposed dgn file name**” for elements meeting the symbology specified by the variable “**~proposed ditch in DGN**”. If an element is encountered meeting the symbology, the criteria will next check to see if a COGO profile exists at this location. The COGO profile name is specified by the variables “**special ditch profiles lt**” (left side) or “**special ditch profiles rt**” (right side). If neither the graphic ditch line or COGO profile exist at the current location, the criteria file will proceed as described starting on [page 20](#). The graphic ditch line and COGO Profile options are detailed on the following pages.

Graphic Ditch Line or COGO Profile

In either of these cases, the criteria file will draw the “foreslope”, “maximum allowable slope” or the “barrier slope” to either:

- Graphic ditch line. The graphic ditch line will be used to determine the offset for the ditches.
- COGO profile. The COGO profile will be used to determine the elevation of the ditch.

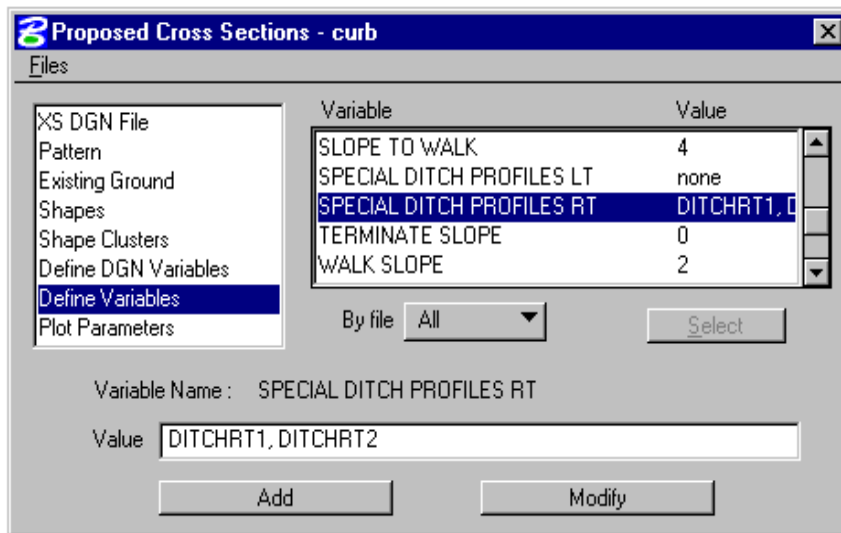
Once the criteria file determines either the offset or elevation, it will place the ditch section using the criteria variables as described on the following pages.

Setting the Ditch Elevation with a Cogo Profile

The criteria will allow the designer to specify a COGO profile to define the ditch elevations independently for the left and right sides of the cross sections. The variables “**special ditch profiles lt**” and “**special ditch profiles rt**” are used to specify the names of the profiles for the left and right side ditches respectively. By default, these variables have been set to look for a profile named “none”. If a profile named “none” is found in the COGO database, the elevations of the profile will be used for the cross sections that fall within the station limits of the profile.

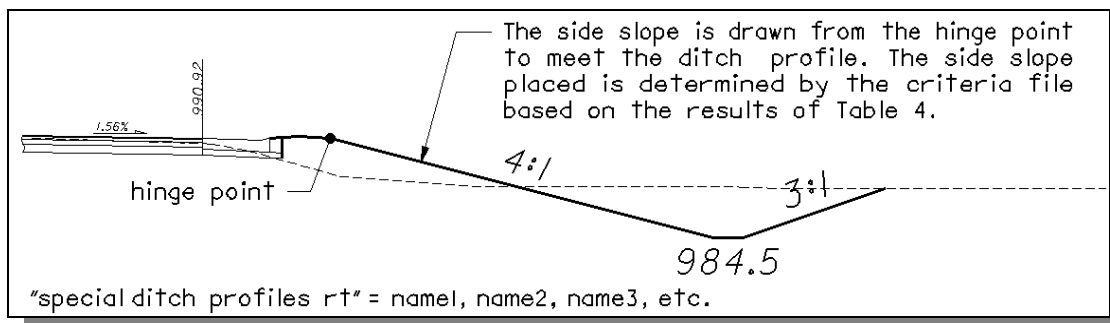
Multiple profiles can be specified for each side of the cross sections. For example, a new ditch profile has been defined for stations 53+00 to 61+00 on the right side. A second ditch profile has been defined from station 66+00 to station 71+00, also on the right side. Both profiles can be specified by separating each profile name by a coma as shown in the example below:

Figure 29



If a ditch profile has been specified, it does not matter whether the cross sections is in cut or fill. The side slope will be extended to meet the profile elevation as shown in the Figure 30 below.

Figure 30: COGO ditch profile example



Setting the Ditch Offset with a Graphic Ditch Line

This option will allow the designer to specify the horizontal location of the ditch graphically in the plan view design file as shown in Figure 31 below. The ditch offset was established by extending the foreslope to meet the ditch line graphic.

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The variable “proposed ditch in dgn” is used to define the symbology for the graphic ditch line. The criteria will search the design file specified by the variable “proposed dgn file name” for the graphic ditch line. The variable is defined as follows within the criteria:

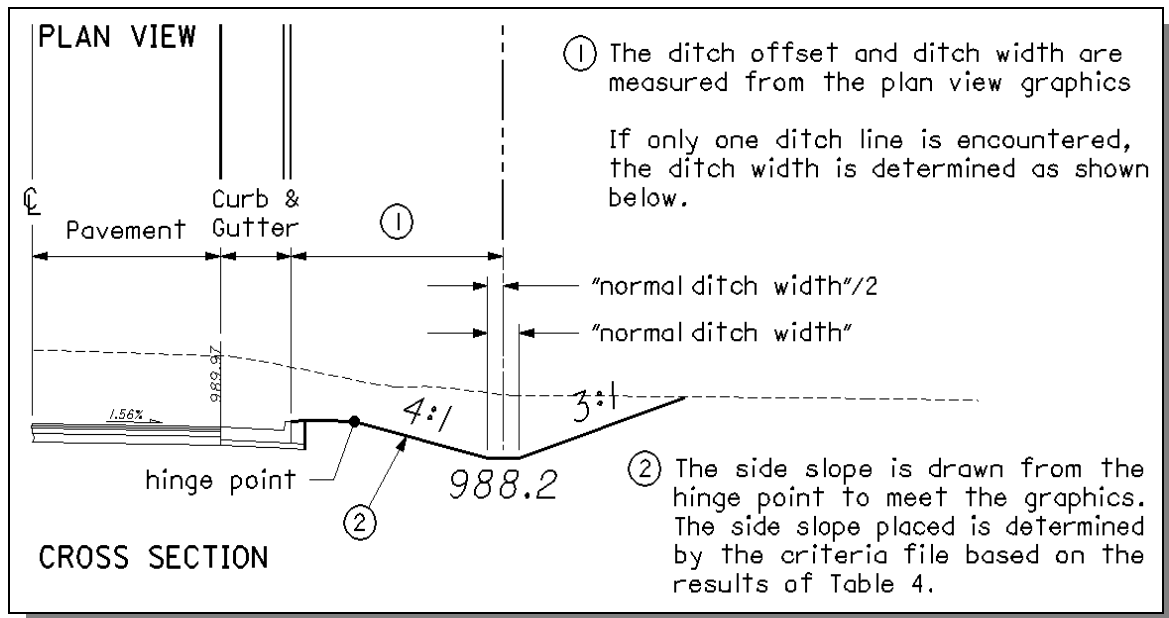
```
define_dgn "~proposed ditch in DGN" \  
  dgn = "proposed dgn file name" \  
  lname = DR_P_Ditch \  
  wt = 1, ByLevel \  
  co = 11, ByLevel
```

If two ditch lines are drawn in the plan view, the criteria will draw the width of the ditch to match the plan view graphics.

If only one ditch line is encountered, it is assumed that this line is at the center of the ditch. The ditch width is determined by the variable “normal ditch width” in this case.

If the criteria finds a graphic ditch line, but no profile has been defined by the variables, “special ditch profiles lt” (left side) or “special ditch profiles rt” (right side), the graphic ditch line will be used for the ditch offset. If a graphic ditch line has been found, it does not matter whether the cross sections is in cut or fill. The side slope will be extended to meet the ditch offset whether or not the ditch elevation is above or below the existing ground.

Figure 31: Graphic ditch line example



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Fill Condition:

Before the section is completed in the Fill Condition, the criteria will run the following tests before the ditch section is placed when a graphic ditch line or COGO ditch profile is present:

Table 2	
Criteria Test	Criteria Result
<p>Is the bottom of the ditch above existing ground using the following slopes in order?</p> <ol style="list-style-type: none"> 1. “foreslope” 2. “maximum allowable slope” 3. “barrier slope” 	<ul style="list-style-type: none"> • Yes, Does the existing ground slope up by at least 6:1 allowing ditch section to be placed?
	<ul style="list-style-type: none"> • Yes, ditch section is placed using existing ground as backslope. • No, test placement of the next slope <ol style="list-style-type: none"> 2. “maximum allowable slope” 3. “barrier slope” If placement of “barrier slope” fails then place grading using “maximum allowable slope” and place an error message in the design file.
	<ul style="list-style-type: none"> • No, Is the “cross section distance” requirement met?
	<ul style="list-style-type: none"> • Yes, Is the “ditch depth” requirement met?
	<ul style="list-style-type: none"> • Yes, place normal ditch section. • No, test placement of the next slope <ol style="list-style-type: none"> 2. “maximum allowable slope” 3. “barrier slope” If placement of “barrier slope” fails, place grading using “maximum allowable slope” and place an error message in the design file.
<p>Is the fill height of the ditch section placed with “foreslope” or “maximum allowable slope” greater than the user definable value “fill height”?</p>	<ul style="list-style-type: none"> • No, test placement of the next slope <ol style="list-style-type: none"> 2. “maximum allowable slope” 3. “barrier slope” If placement of “barrier slope” fails, place grading using “maximum allowable slope” and place an error message in the design file.
	<ul style="list-style-type: none"> • Yes, proceed to Fill Heights over “fill height” Condition. • No, place completed normal ditch section using either the “foreslope”, “maximum allowable slope” or “barrier slope”.

Cut Condition:

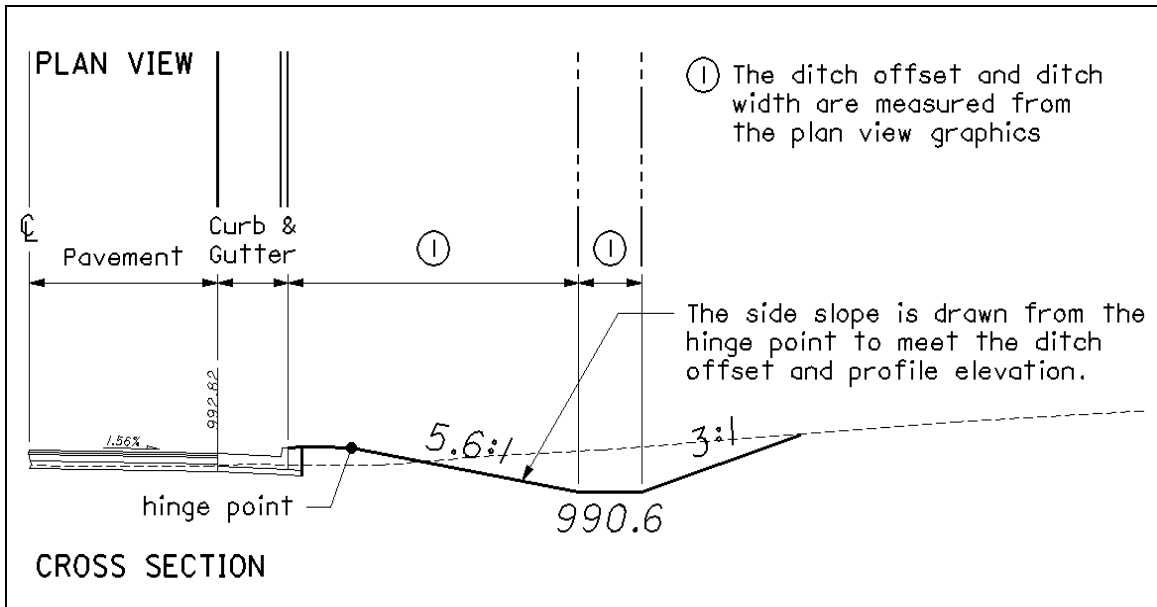
Before the section is completed in the Cut Condition, the criteria will run the test for the “cross section distance” requirement before the ditch section is placed when a graphic ditch line or COGO ditch profile is present. If the slope placement is outside the “cross section distance”, the criteria file will proceed to the next slope placement.

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Graphic Ditch Line and COGO Profile

In this case, a graphic ditch line is used to determine the offset for the ditch and a COGO profile is used to determine the elevation of the ditch.

Figure 32: Example of ditch drawn by intersecting a graphic ditch line and a COGO profile



Note that the side slopes are determined by the ditch offset and the profile elevation. This can result in variable slopes as shown in the figure above.

If two ditch lines are drawn in the plan view, the criteria will draw the width of the ditch to match the plan view graphics.

If only one ditch line is encountered, it is assumed that this line is at the center of the ditch. The ditch width is determined by the variable “**normal ditch width**” in this case.

This method can be used for sections in cut or fill. In either case, the offset and the elevation of the ditch is determined by the plan view graphics and the COGO profile.

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No Graphic Ditch Line or COGO Profile

If no MicroStation element or COGO profile is encountered, the criteria file will then proceed as described below.

Table 3		
Criteria Test	Criteria Result	
<p>Do the following slopes in the order shown intersect the existing ground?</p> <ol style="list-style-type: none"> 1. “foreslope” 2. “maximum allowable slope” 3. “barrier slope” 	<ul style="list-style-type: none"> • Yes, place the normal ditch section. 	
	<ul style="list-style-type: none"> • Yes, is the “cross section distance” requirement met when a normal ditch section is placed? 	<ul style="list-style-type: none"> • Yes, Is the “ditch depth” requirement met?
		<ul style="list-style-type: none"> • No, test placement of the next slope <ol style="list-style-type: none"> 2. “maximum allowable slope” 3. “barrier slope” If placement of “barrier slope” fails then place grading using “maximum allowable slope” and place an error message in the design file.
	<ul style="list-style-type: none"> • No, test placement of the next slope <ol style="list-style-type: none"> 2. “maximum allowable slope” 3. “barrier slope” If placement of “barrier slope” fails then place grading using “maximum allowable slope” and place an error message in the design file. 	
<p>Is the fill height of the ditch section placed with “foreslope” or “maximum allowable slope” greater than the user definable value “fill height”?</p>	<ul style="list-style-type: none"> • Yes, proceed to Fill Heights over “fill height” Condition. • No, place completed normal ditch section using either the “foreslope”, “maximum allowable slope” or “barrier slope”. 	

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Summary of Variables

A summary of the variables defined in **CURB_GRADING.X** is included below. Most of the **Define Variables** have been assigned a default value within the criteria. The user should review the variables below to ensure that the default values are acceptable for the project. The value of each variable can be changed by the user before processing the criteria, as needed. See the ODOT GEOPAK Road Training Guide, Part 2, Chapter 5 for more information on modifying the default value of the **Define Variables**.

The following variables must be defined by the user before processing.

“foreslope”

This variable defines the foreslope used for cut or fill condition placed from the hinge point to ground or ditch. Entered as single number. For example, if you require a slope of 4:1 key in 4, 6 for 6:1, etc.

The following variables have been assigned default values as noted on the following pages. If you wish to change the default values, you will need to modify the value of the variable in the cross section run.

Design File Variables

“PROPOSED DGN FILE NAME”

“RW DGN FILE NAME”

“XS DGN FILE NAME”

These variables are used by the DEFINE_DGN variables to identify the base map MicroStation design file that contains the existing, proposed, and cross section graphics. The default value for each variable has been defined using a relative path as follows:

```
define "PROPOSED DGN FILE NAME" ..\roadway\basemaps\nnnnnBP###.dgn
define "RW DGN FILE NAME" ..\row\basemaps\nnnnnBR###.dgn
define "XS DGN FILE NAME" ..\roadway\basemaps\nnnnnXC###.dgn
```

By default GEOPAK will look for design files in the Working Directory assigned for the project. Using the directory structure defined in the **ODOT CADD Engineering Standards Manual**, Section 302, Project Directory Structure, the GEOPAK Working Directory should be defined as the `geopak` folder.

The “..” syntax will instruct GEOPAK to look for the proposed design file by starting in the Working Directory, and then go up the project folder path one directory. From there, go into the appropriate sub-folder to find the file.

The name of the design file must be edited to reflect the name of the plan view design file for your project. See the **ODOT CADD Engineering Standards Manual**, Section 304 File Naming Conventions for design file names.

Variables specific to fill conditions:

“barrier slope”

This variable defines the foreslope used for barrier grading. “Barrier slope” is drawn from the hinge point to ground or ditch. Entered as single number. For example, if you require a slope of 2:1 key in 2. The default value is 2.

“bench width”

For fill sections greater than “fill height”, a bench is drawn at the bottom of the fill, before the ditch as shown in Figures 20 and 21. The default value is 10 ft.

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“bench width slope”

This variable sets the bench width slope. This is the slope the bench is placed with if proposed grading is placed instead of using an existing ground bench. See Figure 21 for the usage of this variable. Given in positive percent, i.e., 2 for 2%. The default value is 1.

“fill height”

This variable is the value for fill height where the fill section uses barrier grading instead of the “foreslope” or “maximum allowable slope”. See Figure 19 and the **Fill Heights over “fill height” Condition** on [page 10](#). The default value is 16 ft.

“fill section type”

This variable sets the type of fill section to be used behind the curb using the “distance to break” value. This variable only applies to sections in fill. See Figures 35 and 36 on [page 24](#) for the application of this variable. The default value is set to 0.

If the section is in cut or in locations where the “fill height” is exceeded, the section will be placed as shown in Figure 37 for cut and Figure 36 for high fill locations. In the high fill locations, the criteria file will place the “barrier slope” instead of the “foreslope” as shown in Figure 37.

If walk, commercial curb or parking lot is present at the section, the criteria file will ignore the above variable. For details on how the section will be placed with these items please see the following figures and the **Additional Processing Notes** section:

Item	Figures
walk	6, 7, 8, 9, 26, 28, 39, 40
commercial curb	3, 7, 9, 28, 41
parking lot	4, 10, 42, 43, 44

Labeling Variables:

“cl chain name”

This variable identifies the name of the COGO chain to be used for any criteria function which measures offsets from a chain. This function is used in labeling ditch offsets and bench offsets (please see “**ditch annotation style**” for more information on the usage of this variable). The default value is none.

“ditch annotation style”

This variable sets the ditch annotation style for the labeling of the ditch section. If this variable is set to 1, it will also place offsets with sections containing benches. The two styles are shown in the Figures 22 and 23 on [pages 11 and 12](#). The default value is 0.

“offset for construction limits”

This variable defines the distance from the edge of proposed grading to the construction limits. This sets and places a marked point 40. The default value is 2 ft.

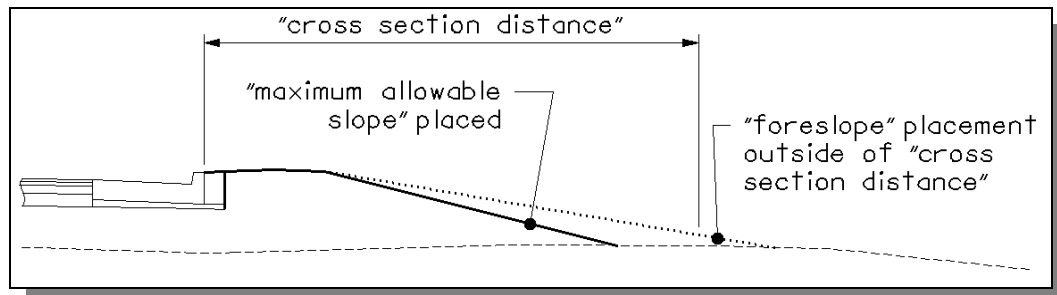
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Variables specific to grading placement:

“cross section distance”

This variable sets the maximum distance for which the proposed grading will be placed. The distance is measured from the back of curb out as shown in Figure 33 below. If the “foreslope” placement is outside this maximum distance, the criteria file will place the “maximum allowable slope”. The default value is 20 ft. This variable may be optionally set to the existing right of way limits. See “use existing rw line” on the next page.

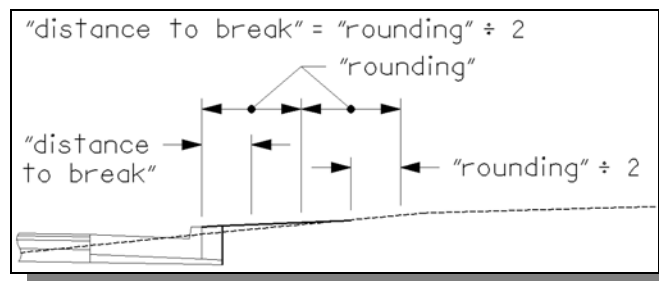
Figure 33: “Cross section distance”



“rounding”

This variable sets the rounding width to be used at the break points and at the intersection with the existing ground line. The criteria uses this value to place the minimum grading behind curbs which will meet this rounding requirement in areas with minor cut or fill. See Figure 34 for the usage of this variable. The default value is 4 ft.

Figure 34: Minimum grading placement using “rounding”



“slope to break”

This variable sets the slope to be placed for the grading at the following locations: (1) behind the roadway curb to the hinge point for the width set by the variable “distance to break” and (2) behind the commercial curb or parking lot to hinge point 2 for the width set by the variable “distance from commercial curb/lot”. See Figures 35 through 37 for location (1) usage of this slope. For location (2) usage of this slope see Figures 43 and 44. The value is entered as a percent. The default value is 4%.

“terminate slope”

This variable defines the maximum slope of existing ground (in the down direction) at which the proposed foreslope in a fill section terminates and no ditch is placed. Given in positive percent, i.e., 2 for 2%. The default is set at 0.

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“distance to break”

This variable sets the width of grading to be placed behind the roadway curb to the hinge point. The grading uses the slope set by the variable “**slope to break**.” The hinge point is dependent on whether the section is in cut or fill. If the section is in fill, the hinge point location and placement is also dependent on the variable “**fill section type**”. See the figures below for sections in cut and fill and the use of the “**fill section type**” variable. The default value is 2 ft. If walk is present, this variable is not used and the section will be placed as shown in Figure 39.

Figure 35: Section in fill (“fill section type” = 1)

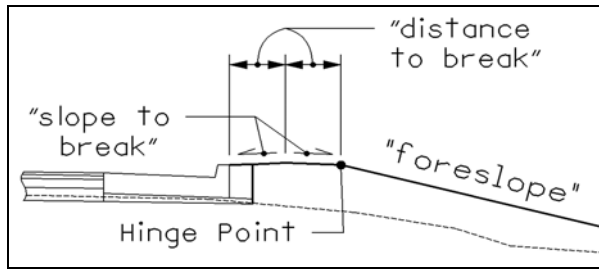


Figure 36: Section in fill (“fill section type” = 0)

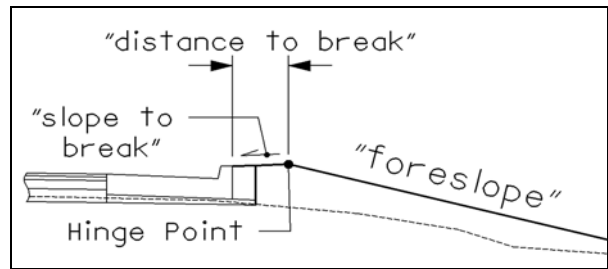
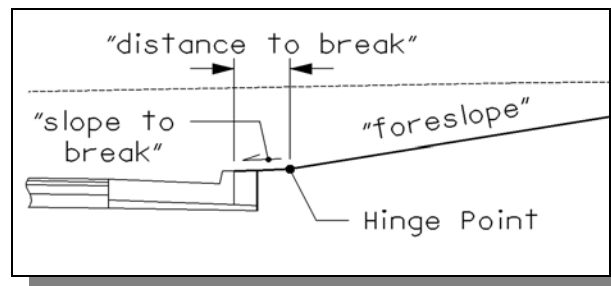


Figure 37: Section in cut



“use ex rw line”

This variable indicates whether or not the user wishes to have the “**cross section distance**” set to the existing right of way limits. A value of 1 enables the option. For sections where one or both right of way limits are not found, the criteria will use the initial value entered for the “**cross section distance**”. A value of 0 disables the option. The default value is 0.

Variables for the ditches:

“special ditch profiles lt”

This variable identifies the name of the COGO profile to be used on the left side of the pavement for the ditch. If the ditch profile is found at the station being processed, the “**foreslope**”, “**maximum allowable slope**”, “**barrier slope**” or a variable slope will be drawn to intersect the profile elevation. See the **Drainage Considerations** section starting on [page 15](#). The default value is none.

“special ditch profiles rt”

This variable identifies the name of the COGO profile to be used on the right side of the pavement for the ditch. If the ditch profile is found at the station being processed, the “**foreslope**”, “**maximum allowable slope**”, “**barrier slope**” or a variable slope will be drawn to intersect the profile elevation. See the **Drainage Considerations** section starting on [page 15](#). The default value is none.

“ditch depth”

This variable sets the minimum depth of ditch below existing ground on the ditch backslope side. See Figure 38 on page 25 for the usage of this variable. The default value is 1 ft.

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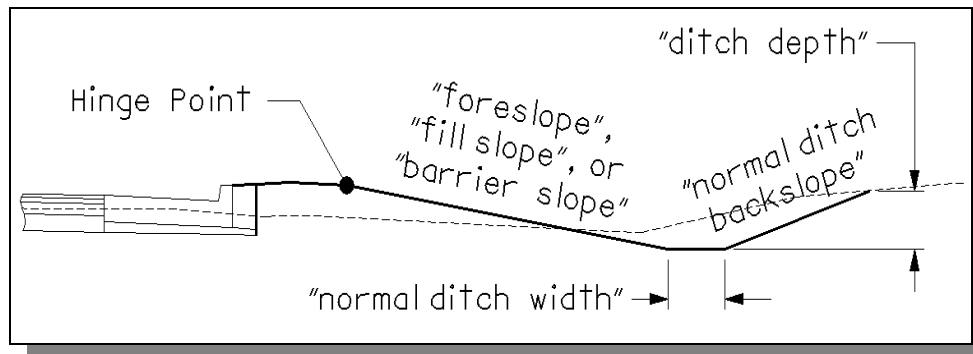
“normal ditch backslope”

This variable defines the ditch backslope placed based on Figure 307-4 for a normal ditch section. This variable is used only during normal ditch placement. Entered as single number. For example, if you require a slope of 2:1 key in 2, 3 for 3:1, etc. See Figure 38 for the usage of this variable. The default value is 2 (for 2:1).

“normal ditch width”

This variable defines the ditch width based on Figure 307-4 for a normal ditch section. See Figure 38 for the usage of this variable. The default value is a width of 2 ft.

Figure 38: Normal ditch section placement



Variables specific for walk:

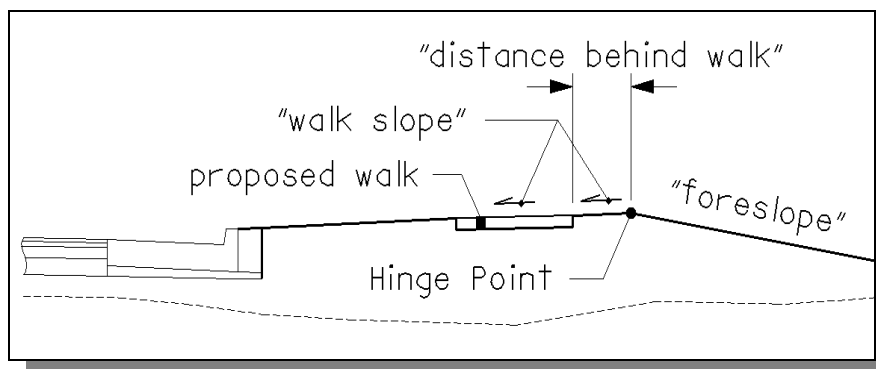
“distance behind walk”

This variable sets the width of grading to be placed behind the walk to the hinge point where the foreslope placement will begin. See Figure 39 for the usage of this variable. The grading uses the slope set by the variable “walk slope.” The default value is 2 ft.

“slope to walk”

This variable sets the slope to be placed for grading from behind the curb to the front of the walk. The value is entered as a percent. See Figure 39 for the usage of this variable. The value is entered as a percent. The default value is 4%.

Figure 39:



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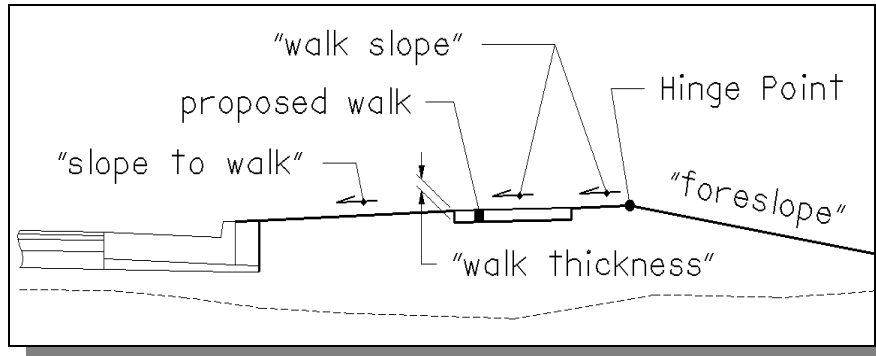
“walk slope”

This variable sets the slope to be placed for the walk. The value is entered as a percent. See Figures 39 and 40 for the usage of this variable. The default value is 2%.

“walk thickness”

This variable sets the walk thickness to be placed. See Figure 40 for the usage of this variable. The default value is 0.3333 ft (4 in.).

Figure 40: Walk placement variables



Variables specific to commercial curb and/or pavement placement:

“commercial curb type”

This variable sets the commercial curb type to be placed in areas where the commercial curb exists behind the roadway curb. The criteria will support either Type 6 or Type 7 curbs. The default value is 6 (for Type 6). For Type 7 curb, enter 7 for the value of this variable.

“commercial number of layers”

This variable sets the number of pavement layers to be placed in parking lot areas or for pavement placement when commercial curbs are to be constructed. See Figures 41 and 42 for the usage of this variable. Maximum number of pavement layers supported is four (4). The default value is 2. Note: the slope used to place the pavement is determined by the slope of existing ground adjacent to the new pavement.

Figure 41: Commercial pavement placement next to commercial curb

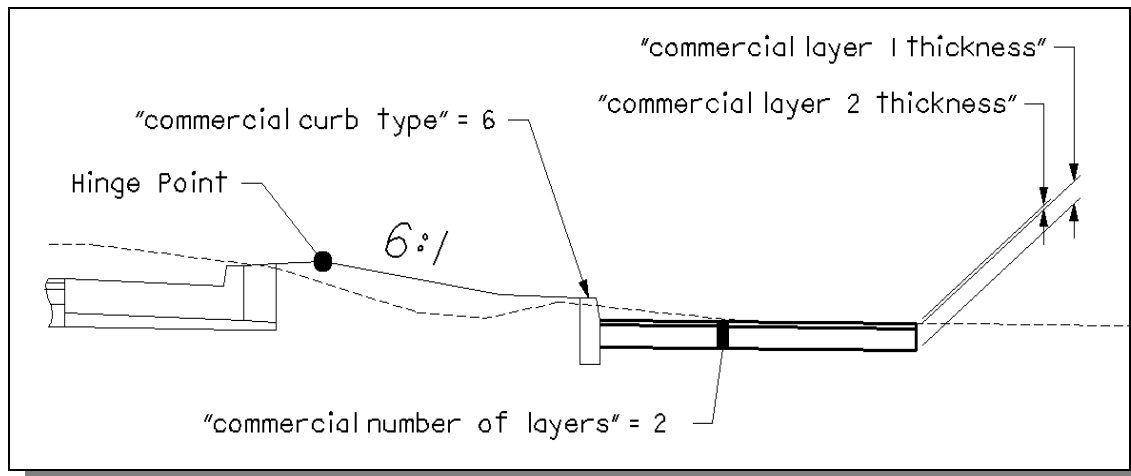
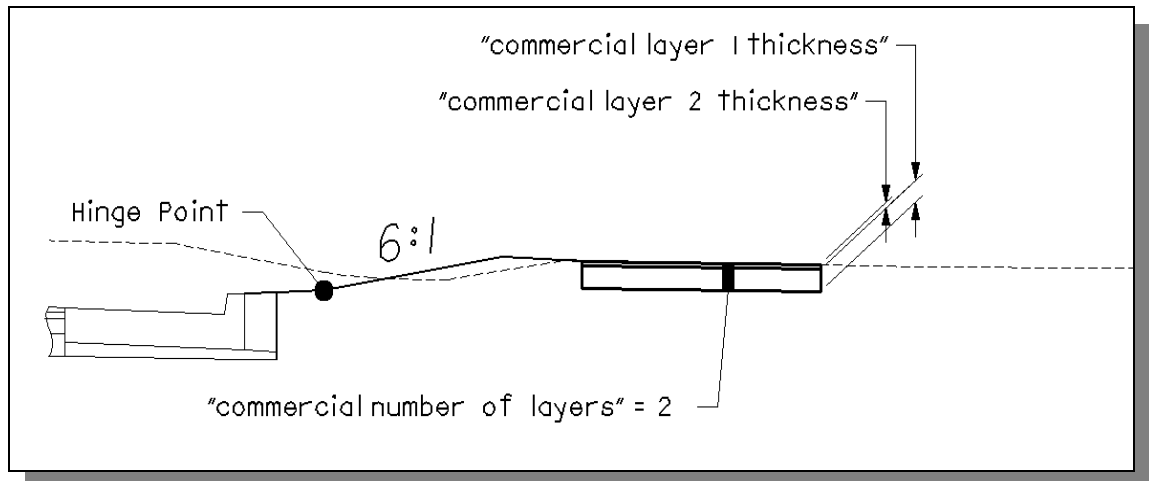


Figure 42: Commercial pavement placement in parking lot area



“commercial layer 1 thickness”

This variable sets layer 1 thickness of the pavement to be placed in parking lot areas or for pavement placement when commercial curbs are to be constructed. The default value is 0.1042 ft (1.25 in.).

“commercial layer 2 thickness”

This variable sets layer 2 thickness of the pavement to be placed in parking lot areas or for pavement placement when commercial curbs are to be constructed. The default value is 0.5000 ft (6 in.).

“commercial layer 3 thickness”

This variable sets layer 3 thickness of the pavement to be placed in parking lot areas or for pavement placement when commercial curbs are to be constructed. The default value is 0.6667 ft (8 in.).

“commercial layer 4 thickness”

This variable sets layer 4 thickness of the pavement to be placed in parking lot areas or for pavement placement when commercial curbs are to be constructed. The default value is 0.8333 ft (10 in.).

“commercial pavement width”

This variable sets the width of the pavement to be placed in parking lot areas or for pavement placement when commercial curbs are to be constructed. The default value is 4 ft.

The width of the pavement to be placed in the cross section can also be set by placing a graphical line at the limit of the pavement placement in the proposed plan view MicroStation design file (for more information on the graphical line to be used please see the **DEFINE_DGN VARIABLE** section under the define_dgn variable “**~parking lot in dgn**” on [page 29](#)).

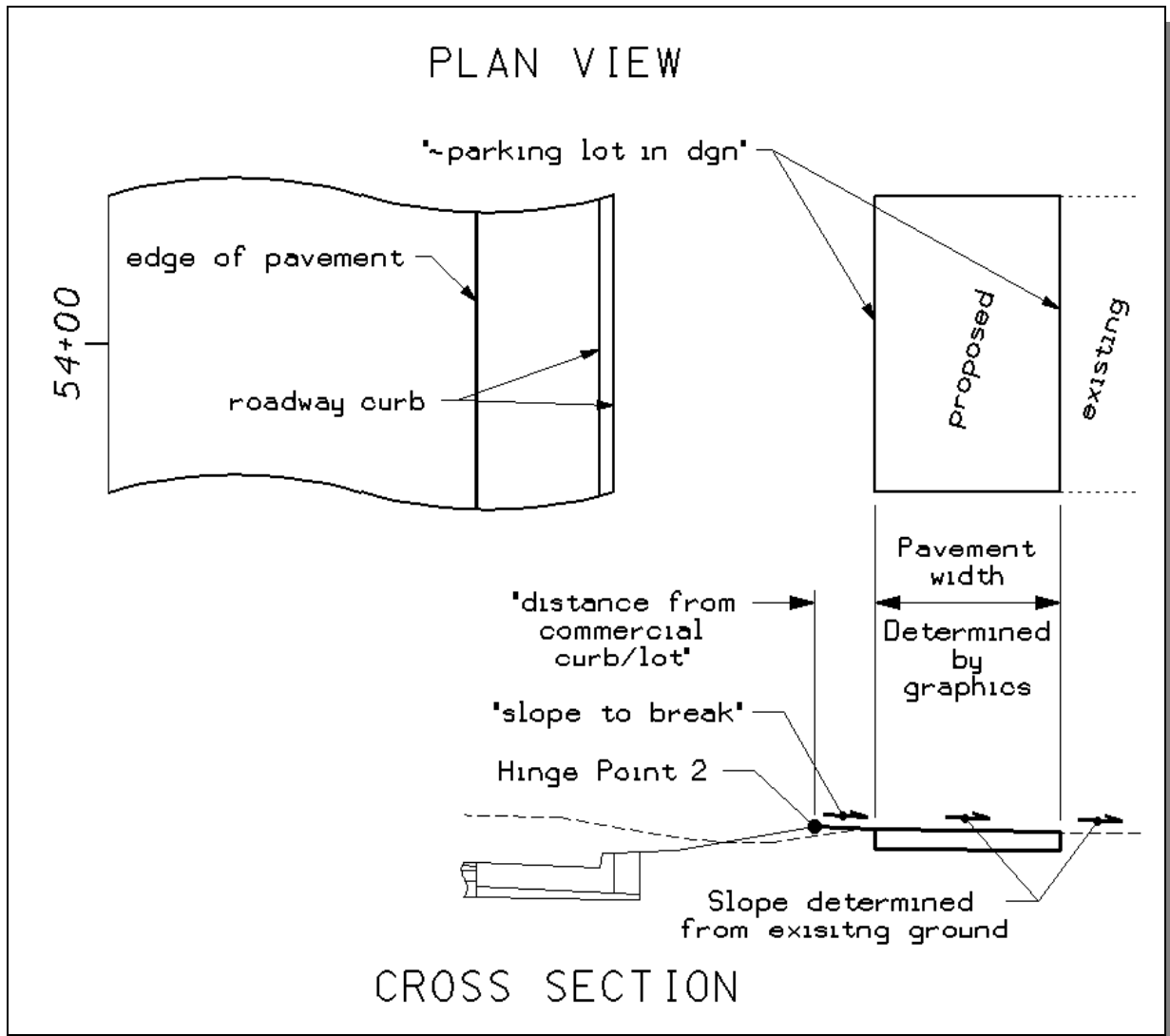
During placement of the commercial pavement, the criteria file will first determine if there is a graphic placed at the location of the pavement width limit matching the symbology of the “**~parking lot in dgn**” define_dgn variable. If no graphic is found the criteria file will use the variable “**commercial pavement width**” to draw the width in the cross section. Otherwise, the width will be determined by the graphic in the design file. See Figures 43 and 44 on the following pages for the usage of this variable.

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“distance from commercial curb/lot”

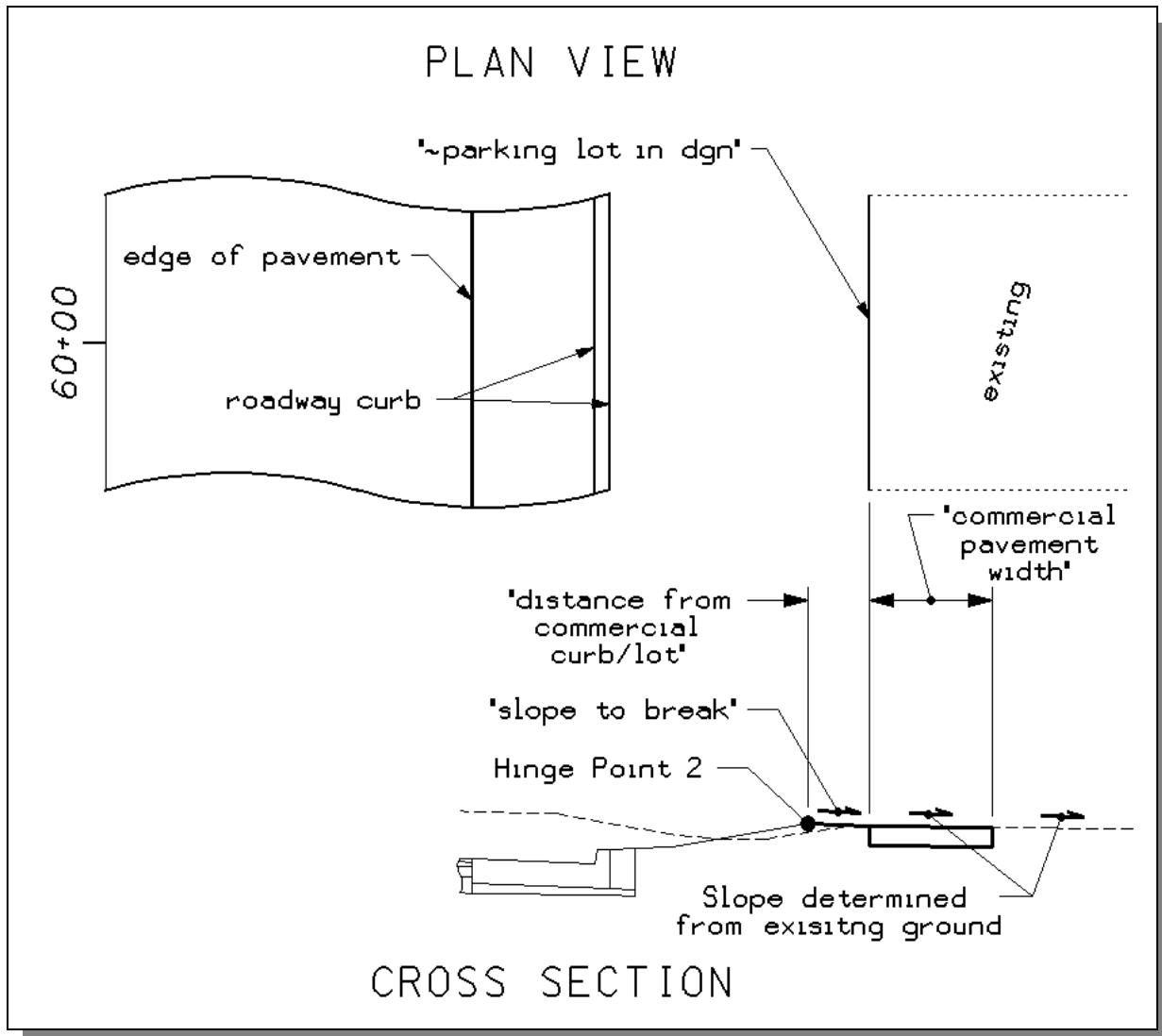
This variable sets the width of grading to be placed from the commercial curb or parking lot back toward the roadway. The grading uses the slope set by the variable “**slope to break.**” See Figures 43 and 44 for the usage of this variable. The default value is 2 ft.

Figure 43: Two graphical parking lot lines placed in the design file



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Figure 44: One graphical parking lot line placed in the design file



Define_DGN Variables

The following DEFINE_DGN variables are used by the criteria to locate the MicroStation elements that FILENAME.X will search for in order to draw the

These variables have been defined with the values listed below in accordance with ODOT standards and should never be redefined by the user.

Additionally, these variables have been defined as "hidden" variables and will not show up in the DEFINE_DGN Variables portion of the Proposed Cross Sections dialog box when preparing a criteria run.

See Figure 45 on the following page to see an example of the use some of these variables.

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“~commercial curb in dgn”

This variable is used to define the symbology for the proposed commercial curb behind the roadway curb. This variable has been defined as follows:

```
define_dgn "~commercial curb in dgn" \  
dgn = "proposed dgn file name" \  
lname = PV_P_Curb \  
co = 8
```

“~parking lot in dgn”

This variable is used to define the symbology for the proposed parking lot behind the roadway curb. This variable has been defined as follows:

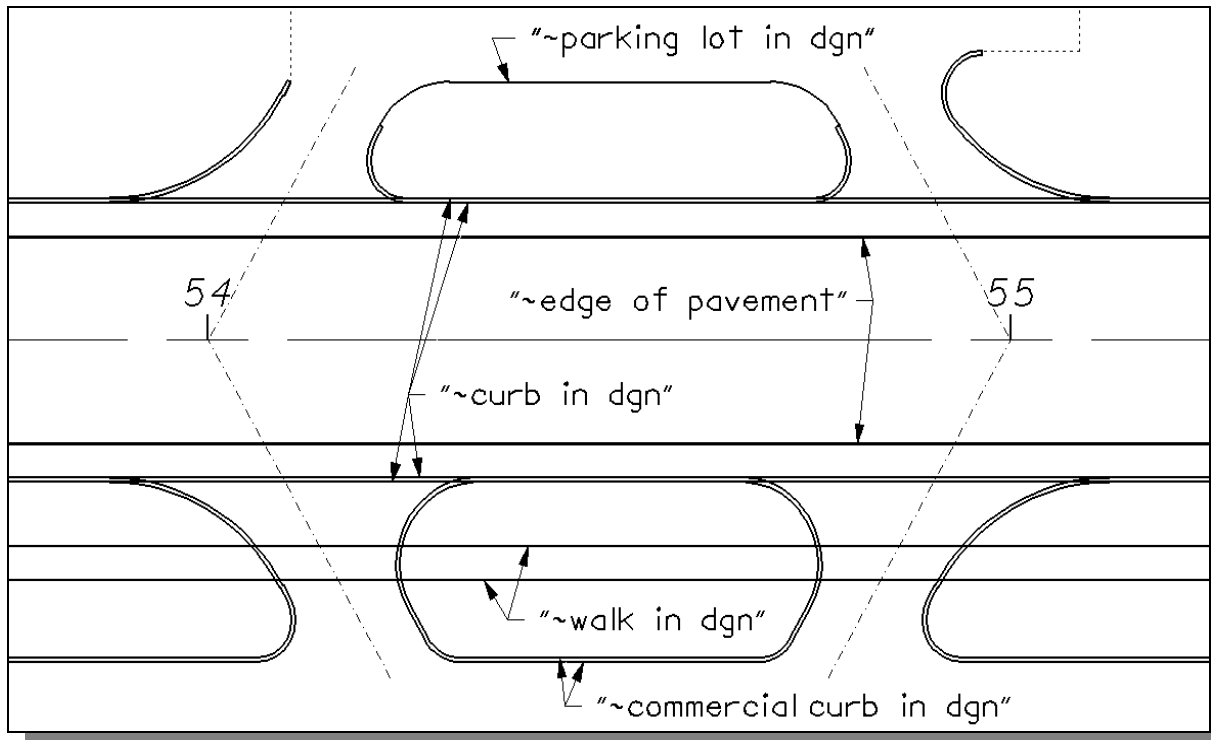
```
define_dgn "~parking lot in dgn" \  
dgn = "proposed dgn file name" \  
lname = PV_P_Parking_Lot \  
co = 1, ByLevel
```

“~walk in dgn”

This variable is used to define the symbology for the proposed walk behind the roadway curb. This variable has been defined as follows:

```
define_dgn "~walk in dgn" \  
dgn = "proposed dgn file name" \  
lname = PV_P_Walk \  
co = 13, ByLevel
```

Figure 45: Define_DGN Variables in a Microstation Design File



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“~existing ground”

The criteria has the capability of determining the existing ground slope at the location where proposed grading intersects the existing in the cross section MicroStation design file. This variable is used to define the symbology for the existing ground line. The variable has been defined as follows:

```
define_dgn "~existing ground" \  
dgn = "xs dgn file name" \  
lvsname = XS_X_Ground_Line \  
co = 0, 2, ByLevel\  
wt = 1, ByLevel\  
lc = 3, ByLevel
```

“~proposed ditch in DGN”

The criteria has the capability of placing the proposed drainage ditches at the location of a ditch line placed in the plan view MicroStation design file. This variable is used to define the symbology for the proposed ditch line. It is assumed that the ditch line is drawn at the inside edge of the drainage ditch. The variable has been defined as follows:

```
define_dgn "~proposed ditch in DGN" \  
dgn = "proposed dgn file name" \  
lvsname = DR_P_Ditch \  
wt = 1, ByLevel \  
co = 11, ByLevel
```

“~ex rw in DGN”

The criteria has the capability of discerning the existing right of way limits in a plan view MicroStation design file. This variable is used to define the file containing the existing right of way lines and their symbology. The variable has been defined as follows:

```
define_dgn "~ex rw in DGN" \  
dgn = "proposed dgn file name" \  
lvsname = RW_X_Right_of_Way \  
wt = 2, ByLevel \  
co = 5, ByLevel
```

Marked Points

GEOPAK has a simple, yet very important way of "remembering" where the location of various points are during the drawing process. This is accomplished with marked points.

Some marked points are stored during the criteria processing that are only used temporarily and do not need to be "remembered" as processing continues. These points can be subsequently redefined by another criteria file. There are, however, certain key locations that are referred to by subsequent criteria files. The following marked points must be previously defined by the pavement/shoulder and curb criteria files in order for **CURB_GRADING.X** to process correctly:

Edge of pavement	x1 y1
Edge of paved shoulder	x5 y5
Top of the back of the curb	x13 y13
Bottom of the pavement buildup either	x14 y14
a) under curb or	
b) at the bottom edge of the curb	

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CURB_GRADING.X will store the following marked points during processing that should never be redefined by another criteria file:

Break point (fill section only)	x29 y29	Outside edge of ditch	x35 y35
Hinge point	x30 y30	Ditch backslope to existing ground	x36 y36
Hinge point 2 (commercial curb or parking lot only)	x31 y31	Proposed to existing ground	x37 y37
Inside edge of ditch	x33 y33	Commercial pavement limit	x39 y39
Flowline of Ditch	x34 y34	Construction limits	x40 y40

This criteria file will place a piece of text on the cross section at the location of the marked point. On the left side of the cross section, the text is placed using the marked point number and is appended with the letter "L". On the right side, the letter "R" is appended to the marked point number. This text is placed on level 51.

The figures shown on the following pages display the marked points which are labeled for use in preparing grading plans or creating profiles.

The GEOPAK Profile Grade Report can be used to search for the marked point text and store a COGO chain and/or profile. For example, the Profile Grade Report can be run to search each cross section for the text "40R" in order to store a COGO chain by measuring the offset from the centerline to the text origin. Once the chain is stored, it can be plotted as a construction limit line in the plan view design file using the Design and Computation Manager. For more information on the Profile Grade Report tool, see the GEOPAK online help.

The marked point text can also be used for preliminary evaluation of drainage ditches. For example, the criteria can be run without a ditch profile or a graphic ditch line. In this case, the criteria will place the ditch using the values of the define variables. After this initial processing of the cross sections, the Profile Grade Report can be used to connect all the 33L or 33R points as a separate COGO ditch profile. The ditch profile can be edited using the Vertical Alignment Generator, and then a second criteria run can be processed using the variables "special ditch profiles lt" or "special ditch profiles rt" to force the criteria to draw the ditches at the elevation set with the new profile.

Section in cut or fill - No Ditch:

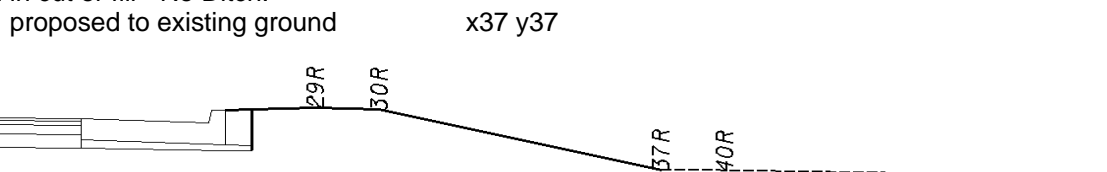


Figure 46

Section in fill - Ditch:

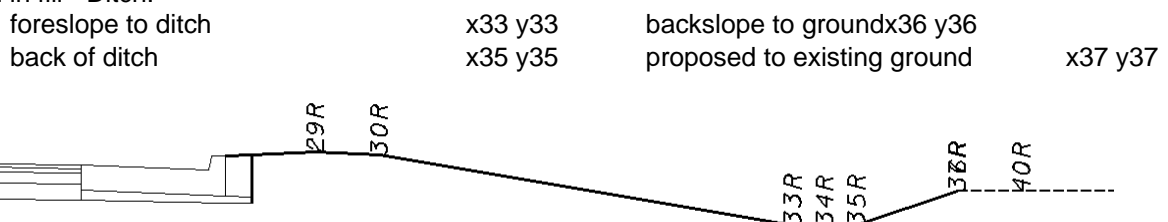


Figure 47

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Section with commercial curb and pavement:

hinge point	x30 y30	proposed to existing ground	x37
hinge point 2	x31 y31	commercial pavement limit	x39 y39

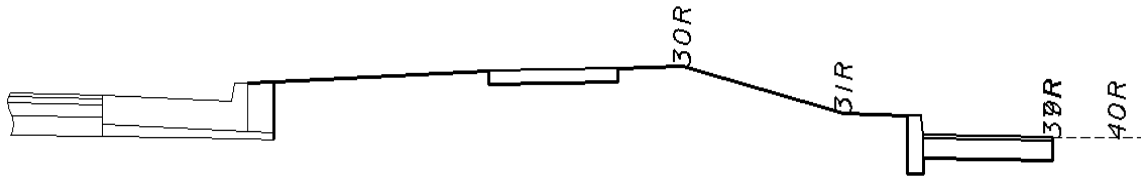


Figure 48

Section with parking lot:

hinge point	x30 y30	proposed to existing ground	x37
hinge point 2	x31 y31	commercial pavement limit	x39 y39

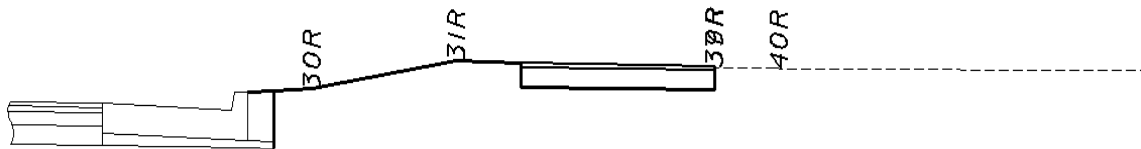


Figure 49

Section with walk:

proposed to existing ground	x37 y37
-----------------------------	---------

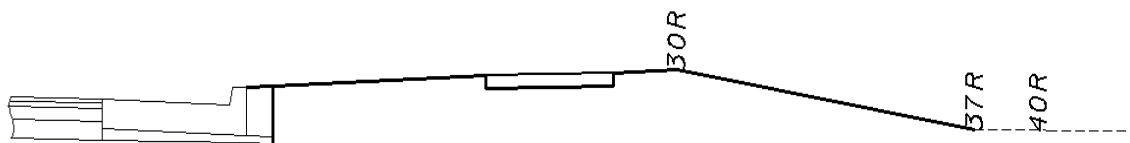


Figure 50

CURB_GRADING.X – version 07.04.10

Section in high fill - Ditch with Bench:

barrier slope to ground	x31 y31	back of ditch	x35 y35
bench width to ditch	x32 y32	backslope to ground	x36 y36
ditch foreslope to bottom	x33 y33	proposed to existing ground	x37 y37

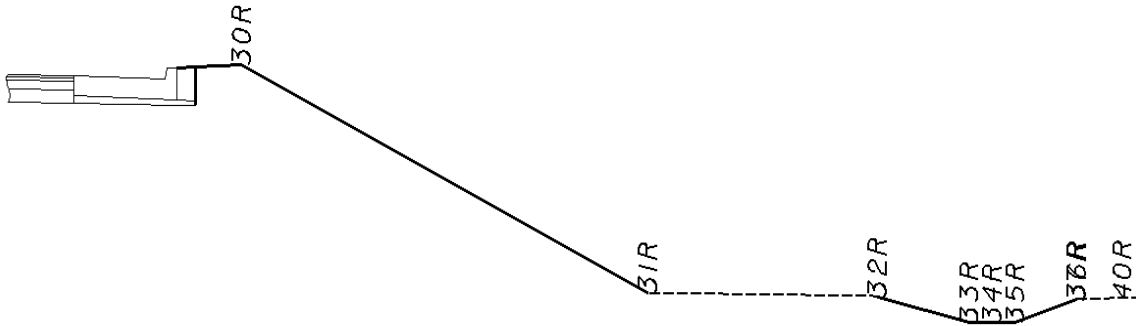


Figure 51