

UNDERCUT.X – version 07.04.10

Description

This criteria is used to draw the bottom of the undercut for removal of unsuitable material in the cross section.

The undercut criteria file will only process beneath a set of GEOPAK pavement shapes (shape mode). A maximum of five (5) pavement shapes can be processed for each shape cluster. The undercut is drawn at the slope and width defined for each pavement shape. The width of the undercut is determined from the outermost plan view graphic (e.g., curb, shoulder, barrier, etc.) the criteria file locates. The criteria will also extend the undercut beyond the plan view elements by a user definable distance (“**undercut distance**”) using the slope determined from the adjoining pavement shape.

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.

The **UNDERCUT.X** criteria file should be run alone. The proposed subgrade (lvname = XS_P_Finished_Grade, co = 7, wt = 2, lc = 0) and finished grade (lvname = XS_P_Finished_Grade wt = 2, co = 2, lc = 0) elements must be present in the cross section design file at the time the input file is run. The **UNDERCUT.X** criteria file will not process if it is run at the same time as the pavement, shoulder, and side slope criteria files. The criteria file uses the proposed subgrade and finished grade elements to place the undercut. If these elements do not exist in the cross section prior to processing, the criteria file will not place the undercut.

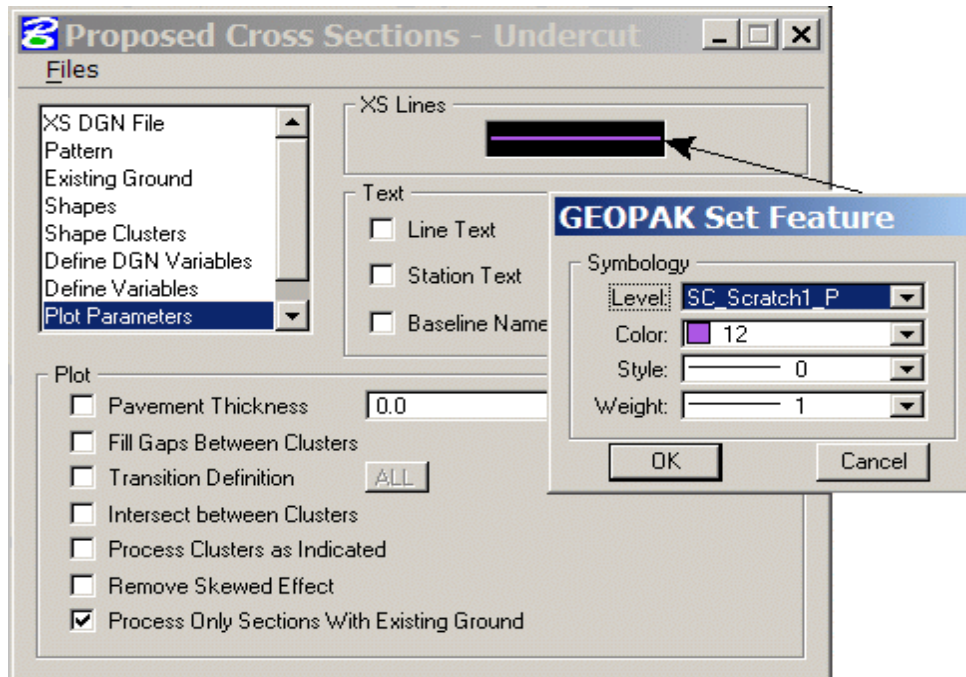
Initial Considerations

Whenever the GEOPAK Proposed Cross Section tool is processed, a set of cross section (XS) lines are drawn for the top of the shaped pavement. These XS lines will be placed using the symbology set in the *Proposed Cross Sections* dialog as shown in Figure 1 on page 2.

Since this is unavoidable, it is a good practice to draw the second set to an unused level and delete using generic MicroStation commands.

UNDERCUT.X – version 07.04.10

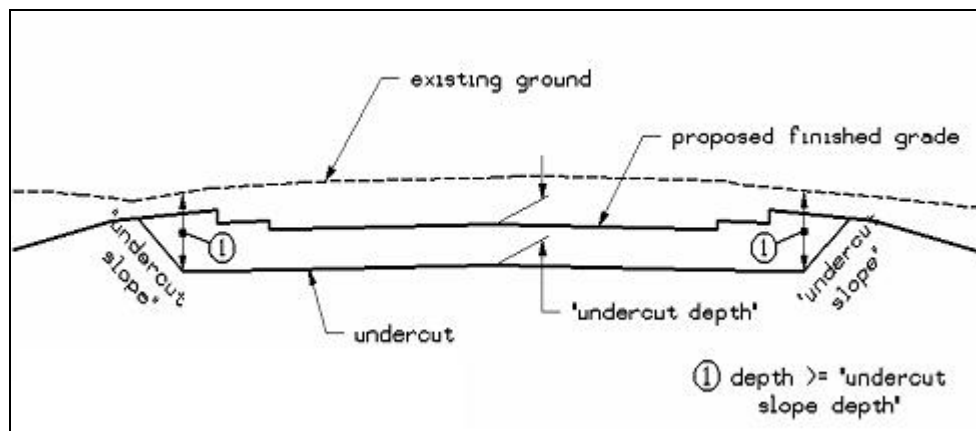
Figure 1



Examples:

Shown below are some examples of how the undercut will be drawn in the section. In the example below, the undercut is beneath the existing ground at a depth greater than the value specified by the variable “**undercut slope depth**”. Therefore, the slope placed from the bottom of the undercut to daylight will be placed using the value of “**undercut slope**”.

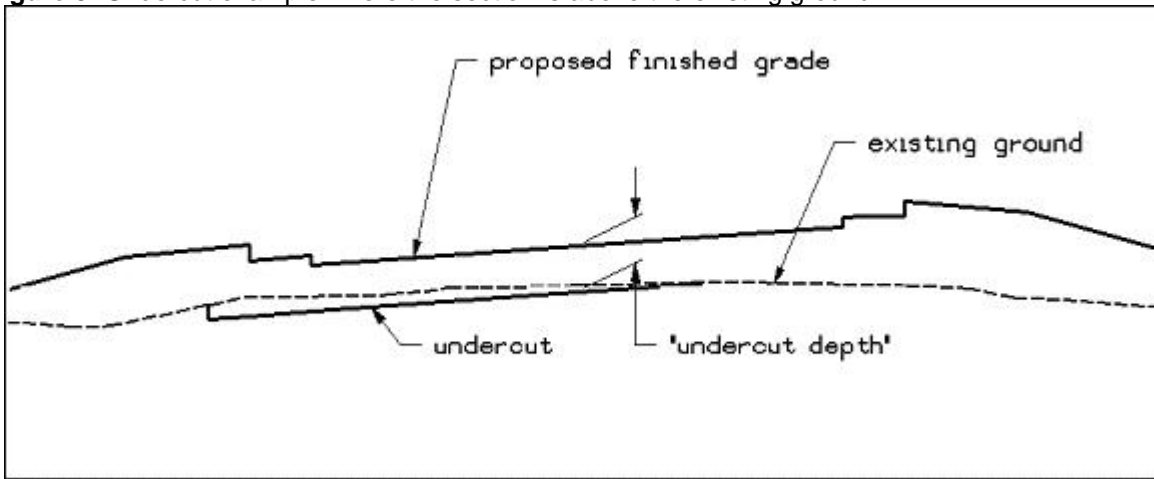
Figure 2: Undercut example where the section is below the existing ground



The example shown in Figure 3, on the following page, shows how the undercut is drawn in cases where the value of “**undercut depth**” results in the undercut line intersecting the existing ground before reaching the edge of the opposite plan view graphic. Note that the undercut line is automatically truncated at the existing ground line.

UNDERCUT.X – version 07.04.10

Figure 3: Undercut example where the section is above the existing ground



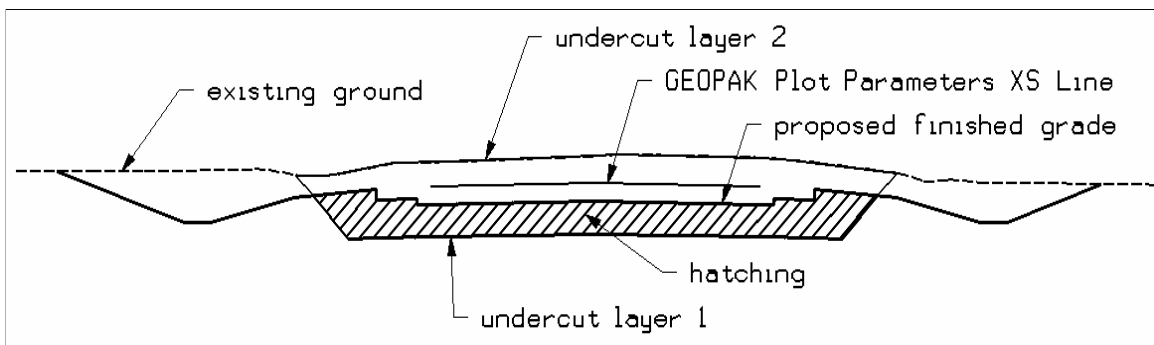
Undercut graphics

During processing of the UNDERCUT .X criteria file, the criteria file places several types of graphics on the cross section. Some of these graphics are used to process earthwork quantities when undercut is present. For additional information on processing earthworks with undercut, please see the following site for a detailed description: <http://www.dot.state.oh.us/prod/geopak/maual/Road2/07earth.pdf>

The table shown below lists the level and symbology of the graphics placed in the cross section design file and Figure 4 details these graphics.

Table 1					
Graphics	Level	Symbology			Use
		Line code	Color	Weight	
Undercut Layer 1	XS_P_Pavt_layers	0	8	1	1. Proposed undercut in cross section
Undercut Layer 2	XS_P_Undercut	0	8	2	Layer 2 for earthworks processing
Hatching	XS_P_Undercut	0	5	1	Hatching for undercut area

Figure 4: Undercut graphics placement in cross section



UNDERCUT.X – version 07.04.10

Define Variables

Design File Variables

“PROPOSED 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 "XS DGN FILE NAME" ..\roadway\basemaps\nnnnnXC###.dgn
```

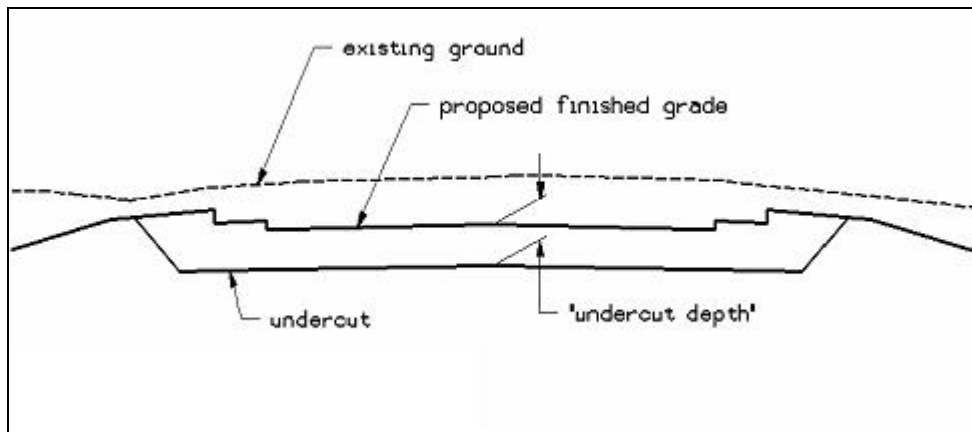
By default GEOPAK will look for design files in the Working Directory assigned for the project. Using the directory structure defined in the **ODOT CADD Engineering Standards Manual**, Section 302, Project Directory Structure, the GEOPAK Working Directory should be defined as the `geopak` folder.

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 `\roadway\basemaps` folder to find the file.

“undercut depth”

This variable defines the depth of removal for the unsuitable material, measured below the proposed subgrade, as shown in Figure 5.

Figure 5: "undercut depth"



The following variables on pages 5 and 6 have been assigned default values as noted below. If you wish to change the default values, you will need to modify the value of the variable in the cross section run.

UNDERCUT.X – version 07.04.10

“undercut distance”

This variable defines the distance the undercut is extended beyond the plan view element (shoulder, curb, etc.). See Figures 6 and 7 for the usage of this variable. The default value is 1.0 ft.

Figure 6

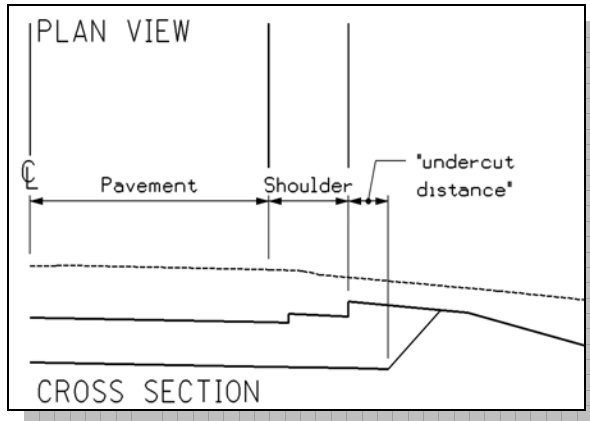
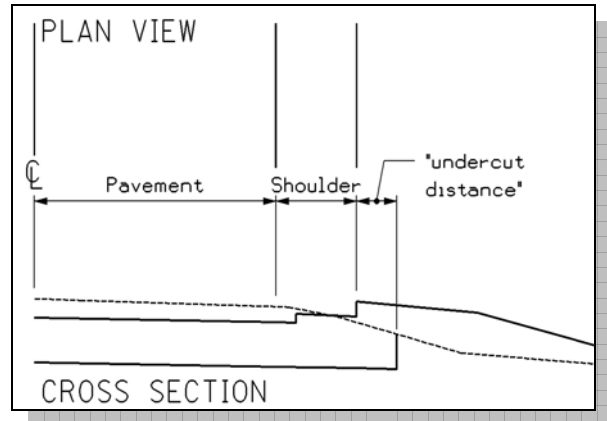


Figure 7



“undercut slope”

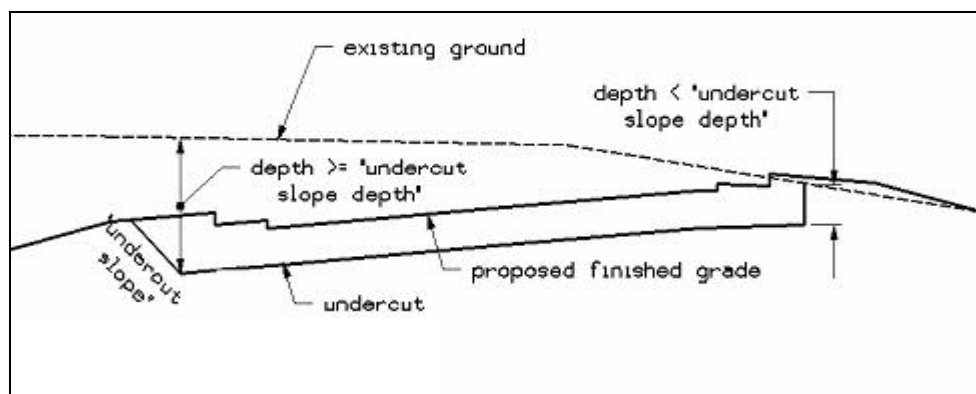
This variable sets the undercut slope. This is the slope from the bottom of the undercut to daylight that is placed if the undercut is deeper than the value of “undercut slope depth”. See Figure 8 for the usage of this slope. Entered as single number. For example, if you require a slope of 1:1 key-in 1, 2 for 2:1, etc. The default value is 1 (for 1:1).

You can force the criteria file to always place a vertical line for the slope by setting the variable “undercut slope” to zero (0).

“undercut slope depth”

This variable sets the depth below the existing ground where the criteria file will place the “undercut slope”. If the undercut is deeper than the value, the slope from the bottom of the undercut to daylight will be placed using the value of “undercut slope”. Otherwise, the criteria file will draw a vertical line. See Figure 8 for the usage of this slope. The default value is 3.0 ft.

Figure 8: The variables “undercut slope” and “undercut slope depth”



“hatch undercut removal”

This variable sets whether the criteria file will hatch the undercut removal area or not. Set the value of this variable to 1 if you would like to hatch the area. Set the variable to 0 if you would not like to hatch the area. See Figure 9 for the usage of this variable in the criteria file processing. The default value is 1.

UNDERCUT.X – version 07.04.10

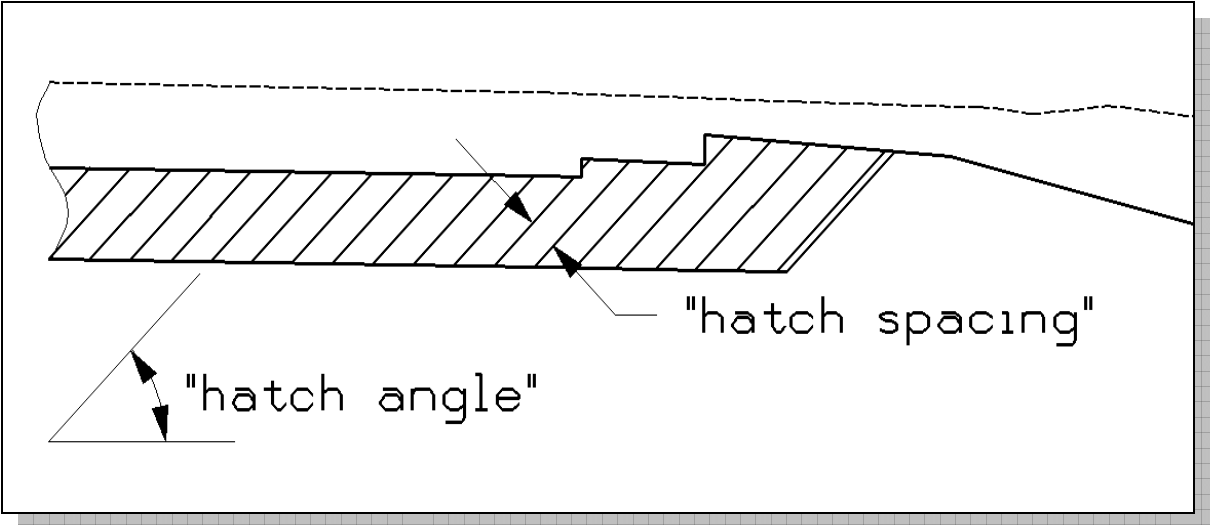
"hatch angle"

This variable sets the hatch angle to be placed. See Figure 9 for the usage of this variable. The default value is 45 degrees. Note: If an angle greater than 90 is entered, the criteria file will default to 45 degrees.

"hatch spacing"

This variable sets the hatch spacing to be placed. See Figure 9 for the usage of this variable. The default value is 1.0 ft.

Figure 9: "hatch undercut removal" set to 1



UNDERCUT.X – version 07.04.10

Define DGN Variables

The following DEFINE_DGN variables are used by the criteria to locate the MicroStation elements that UNDERCUT.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.

“~barrier shoulder in dgn”

This variable is used to define the symbology of the proposed barrier shoulder. The barrier shoulder has been defined as follows, according to Volume 3 of the Location & Design Manual:

```
define_dgn "~barrier shoulder in dgn" \  
dgn = "proposed dgn file name" \  
lvname = PV_P_Shoulder_Barrier \  
wt = ByLevel,1 \  
co = ByLevel,9 \  
lc = ByLevel,0
```

“~curb in dgn”

This variable is used to define the symbology of the proposed curb. The curb has been defined as follows, according to Volume 3 of the Location & Design Manual:

```
define_dgn "~curb in dgn" \  
dgn = "proposed dgn file name" \  
lvname = PV_P_Curb \  
wt = ByLevel,1 \  
co = ByLevel,10 \  
lc = ByLevel,0
```

“~comm curb in dgn”

This variable is used to define the symbology of any proposed commercial curb. The curb has been defined as follows, according to Volume 3 of the Location & Design Manual:

```
define_dgn "~curb in dgn" \  
dgn = "proposed dgn file name" \  
lvname = PV_P_Curb \  
wt = 1 \  
co = 8 \  
lc = 0
```

UNDERCUT.X – version 07.04.10

“~edge of pavement”

This variable is used to define the symbology of the proposed edge of pavement. The edge of pavement has been defined as follows, according to Volume 3 of the Location & Design Manual:

```
define_dgn "~edge of pavement" \  
dgn = " proposed dgn file name" \  
lvname = PV_P_EOP \  
wt = ByLevel,2 \  
co = ByLevel,0 \  
lc = ByLevel,0
```

“~finish grade in xs dgn”

This variable is used to define the symbology for the proposed finish grade in the cross section design file. The proposed finish grade has been defined as follows:

```
define_dgn "~finish grade in xs dgn" \  
dgn = "xs dgn file name" \  
lvname = XS_P_Finished_Grade \  
co = ByLevel,2,7 \  
wt = ByLevel,2 \  
lc =ByLevel,0
```

“~shoulder in dgn”

This variable is used to define the symbology of the proposed shoulder. The shoulder has been defined as follows, according to Volume 3 of the Location & Design Manual:

```
define_dgn "~shoulder in dgn" \  
dgn = " proposed dgn file name" \  
lvname = PV_P_Shoulder \  
wt = ByLevel,1 \  
co = ByLevel,6 \  
lc = ByLevel,0
```

“~subgrade in xs dgn”

This variable is used to define the symbology for the proposed subgrade in the cross section design file. The variable has been defined as follows:

```
define_dgn "~subgrade in xs dgn" \  
dgn = "xs dgn file name" \  
lvname = XS_P_Finished_Grade \  
co = 7 \  
wt = Bylevel,2 \  
lc =Bylevel,0
```