

# SS307-1.X – version 07.04.10

---

## Table of Contents:

---

<b>Table of Contents</b> .....	<a href="#">1</a>
<b>Description</b> .....	<a href="#">3</a>
<b>Inclusion Sequence</b> .....	<a href="#">3</a>
<b>Initial Considerations</b> .....	<a href="#">4</a>
<b>Establishing the Graded Shoulder Width</b> .....	<a href="#">7</a>
<b>Additional Processing Notes</b> .....	<a href="#">8</a>
No Graphic Ditch Line and COGO Profile .....	<a href="#">8</a>
Cut Condition .....	<a href="#">9</a>
Rock Layer .....	<a href="#">9</a>
Recoverable Ditch Backslope Placement .....	<a href="#">10</a>
Shallow Cut or Low Fill Condition .....	<a href="#">13</a>
Fill Condition .....	<a href="#">15</a>
Medium Fill Condition .....	<a href="#">15</a>
Fill Heights over “fill height” Condition .....	<a href="#">17</a>
Terminate Slope .....	<a href="#">18</a>
Proposed Grading .....	<a href="#">19</a>
Text Labeling .....	<a href="#">19</a>
Ditch Labeling .....	<a href="#">20</a>
<b>Drainage Considerations</b> .....	<a href="#">21</a>
Graphic Ditch Line or COGO Profile .....	<a href="#">21</a>
Setting the Ditch Elevation with a COGO Profile .....	<a href="#">22</a>
Setting the Ditch Offset with a Graphic Ditch Line .....	<a href="#">23</a>
Graphic Ditch Line or COGO Profile .....	<a href="#">25</a>
<b>Variable Summary</b> .....	<a href="#">26</a>
Define Variables .....	<a href="#">26</a>
Variables defined by the user .....	<a href="#">26</a>
“clear zone distance” .....	<a href="#">26</a>
“fill slope” .....	<a href="#">26</a>
“foreslope” .....	<a href="#">26</a>
“graded shoulder width lt” .....	<a href="#">26</a>
“graded shoulder width gt” .....	<a href="#">26</a>
“proposed dgn file name” .....	<a href="#">27</a>
“xs dgn file name” .....	<a href="#">27</a>
Variables assigned a default value .....	<a href="#">27</a>
Variables specific to cut conditions .....	<a href="#">27</a>
“cut section type” .....	<a href="#">27</a>
“depth of rock layer” .....	<a href="#">27</a>
“reduce distance cut” .....	<a href="#">27</a>

## SS307-1.X – version 07.04.10

---

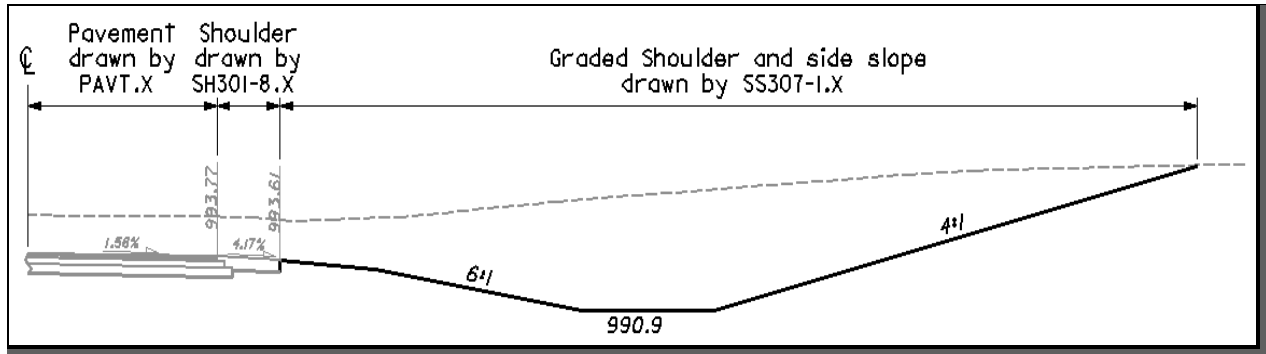
Variables specific to fill conditions.....	<a href="#">27</a>
"barrier slope" .....	<a href="#">27</a>
"bench width" .....	<a href="#">27</a>
"bench width slope" .....	<a href="#">28</a>
"fill height" .....	<a href="#">28</a>
"reduce distance fill" .....	<a href="#">28</a>
"reduce distance medium fill" .....	<a href="#">28</a>
"terminate slope" .....	<a href="#">28</a>
Labeling Variables.....	<a href="#">28</a>
"cl chain name" .....	<a href="#">28</a>
"ditch annotation style" .....	<a href="#">28</a>
"offset for construction limits" .....	<a href="#">28</a>
Variables for the ditches.....	<a href="#">29</a>
"special ditch profiles lt" .....	<a href="#">29</a>
"special ditch profiles rt" .....	<a href="#">29</a>
"depth of ditch flow" .....	<a href="#">29</a>
"recoverable ditch backslope1" .....	<a href="#">30</a>
"recoverable ditch backslope2" .....	<a href="#">30</a>
"recoverable ditch backslope3" .....	<a href="#">30</a>
"recoverable ditch backslope4" .....	<a href="#">30</a>
"recoverable ditch backslope5" .....	<a href="#">30</a>
"ditch depth" .....	<a href="#">30</a>
"normal ditch backslope" .....	<a href="#">30</a>
"normal ditch width" .....	<a href="#">30</a>
Define_DGN Variables.....	<a href="#">31</a>
"~existing ground" .....	<a href="#">31</a>
"~proposed ditch in DGN" .....	<a href="#">31</a>
"~proposed graded shoulder in dgn" .....	<a href="#">31</a>
"~rock layer" .....	<a href="#">32</a>
<b>Marked Points</b> .....	<a href="#">32</a>

## SS307-1.X – version 07.04.10

### Description:

This criteria is used to draw cut and fill side slopes using Safety Grading as defined in the Location & Design Manual, Volume 1, Roadway Design, Figure 307-1E and 307-2E. It will also draw the unpaved portion of the graded shoulder. An example of the side slope for a cut section is shown in Figure 1 below:

Figure 1



If the fill height is greater than the variable “fill height”, the criteria will draw fill side slopes using Barrier Grading as defined in Figure 307-4E.

### 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 **SS307-1.X**, a pavement and a shoulder criteria file must be included in the criteria run previous to **SS307-1.X**. The following ODOT standard pavement criteria files are available:

Pavement Criteria:  
**PAVT.X**  
**OVERLAY1.X**

**SS307-1.X** can be included directly after any of the following ODOT standard shoulder criteria files:

Shoulder Criteria:  
**SH301-8.X**  
**SH301-8B.X**  
**SH301-9.X**

# SS307-1.X – version 07.04.10

## Initial Considerations

This criteria file is used to draw cut and fill side slopes using Safety Grading as defined in the Location & Design Manual, Volume 1, Roadway Design, Figure 307-1E and 307-2E. This criteria file will place Safety Grading as detailed on Figure 307-1E and 307-2E and the following Figures 2, 3, 4 and 5 of this documentation.

Safety grading is the shaping of the roadside using 6:1 or flatter slopes within the clear zone area (Section 601.1 of Volume 1) and 3:1 or flatter foreslopes and recoverable ditches extending beyond the clear zone. Safety Grading is used on Interstate, freeways and expressways.

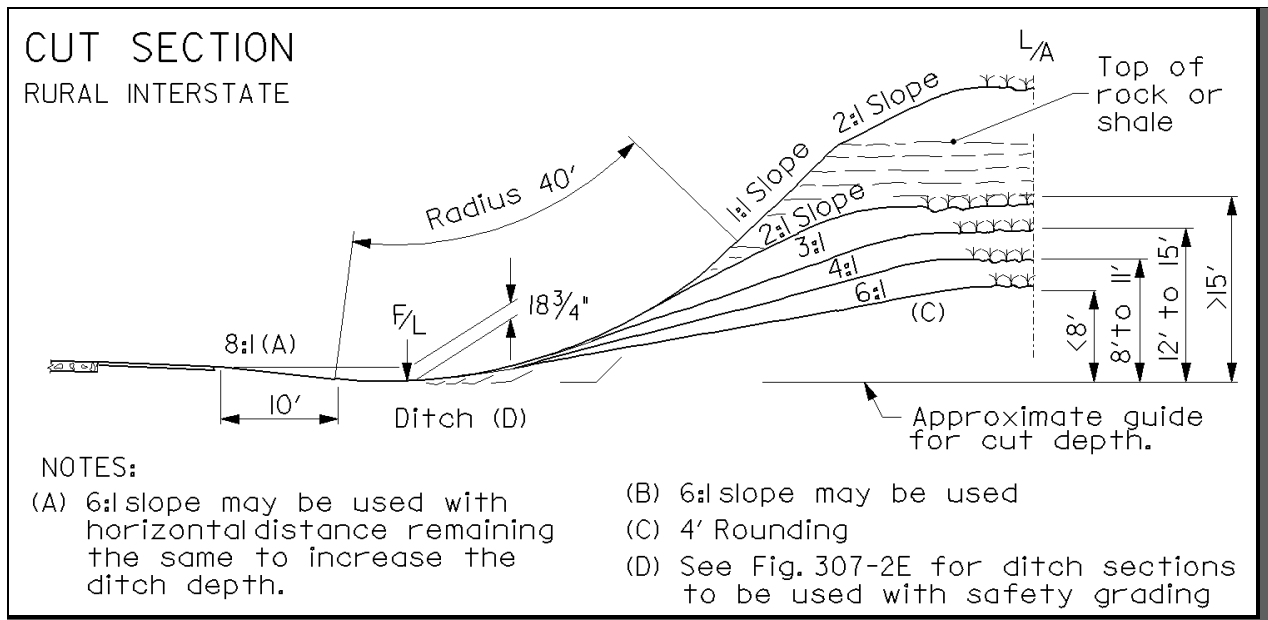
When the fill height exceeds 16', the criteria file will place Barrier Grading. Barrier Grading is the shaping of the roadside when barrier is required for slope protection. Normally 2:1 foreslopes and normal ditch sections are used. Figure 307-4E of Volume 1 and Figure 7 on page 7 shows examples of barrier grading.

Roadside ditches are generally categorized as traversable or non-traversable. Ditches that are traversable are preferred within the clear zone. This criteria file will place Recoverable Ditch Sections as detailed on Figure 307-2E and Figure 6 on page 6 for ditches located within and outside of the clear zone except as noted below.

Ditches that fall outside of the clear zone are considered non-traversable. This criteria file will place Normal Ditch Sections as detailed on Figure 307-4E and Figure 7 on page 7 for ditches placed using Barrier Grading.

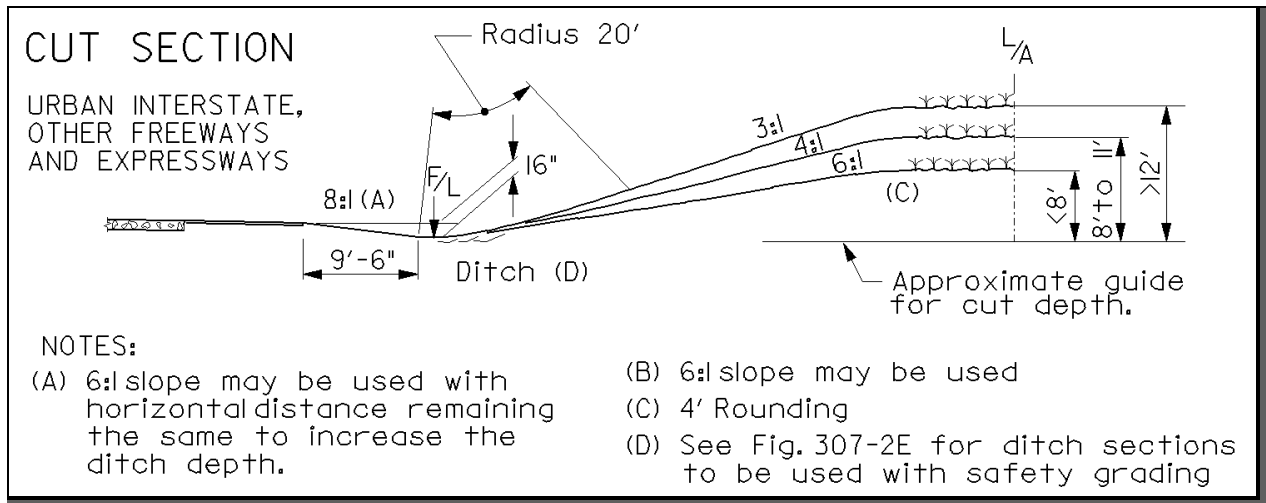
Please see the Figures below and on the following pages for the sections (cut, shallow cut, low fill, medium fill or high fill) that this criteria file will place for the conditions encountered on the cross sections.

**Figure 2:** Figure 307-1E Cut Section: Rural Interstate

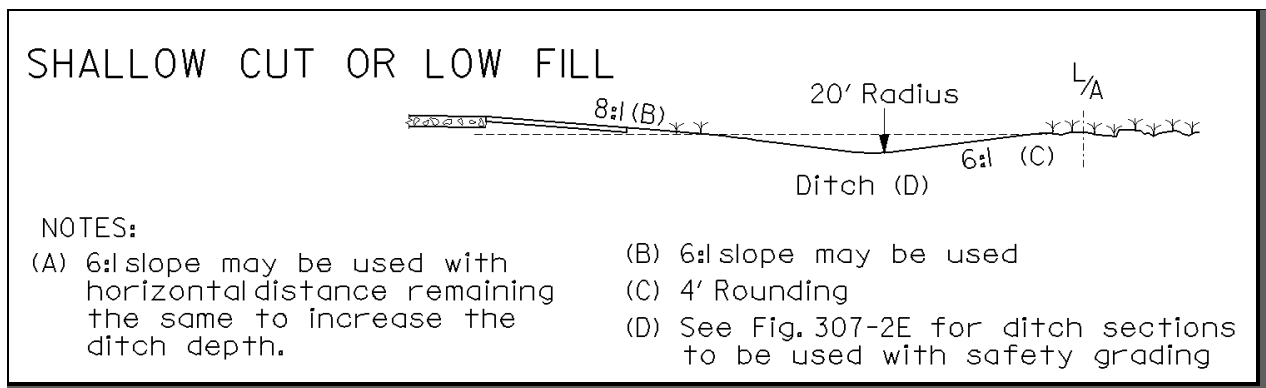


# SS307-1.X – version 07.04.10

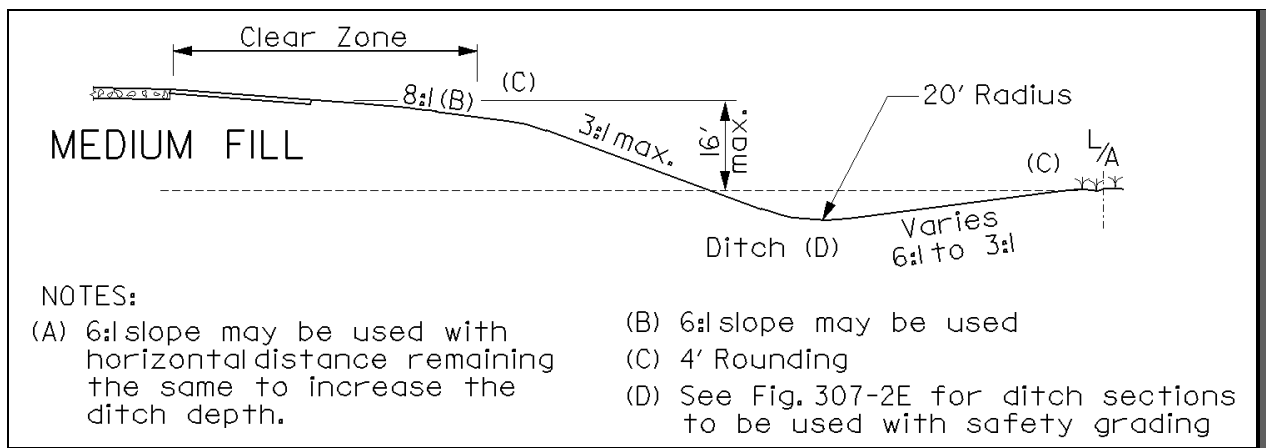
**Figure 3:** Figure 307-1E Cut Section: Urban Interstate, Other Freeways and Expressways



**Figure 4:** Figure 307-1E Shallow Cut or Low Fill Section

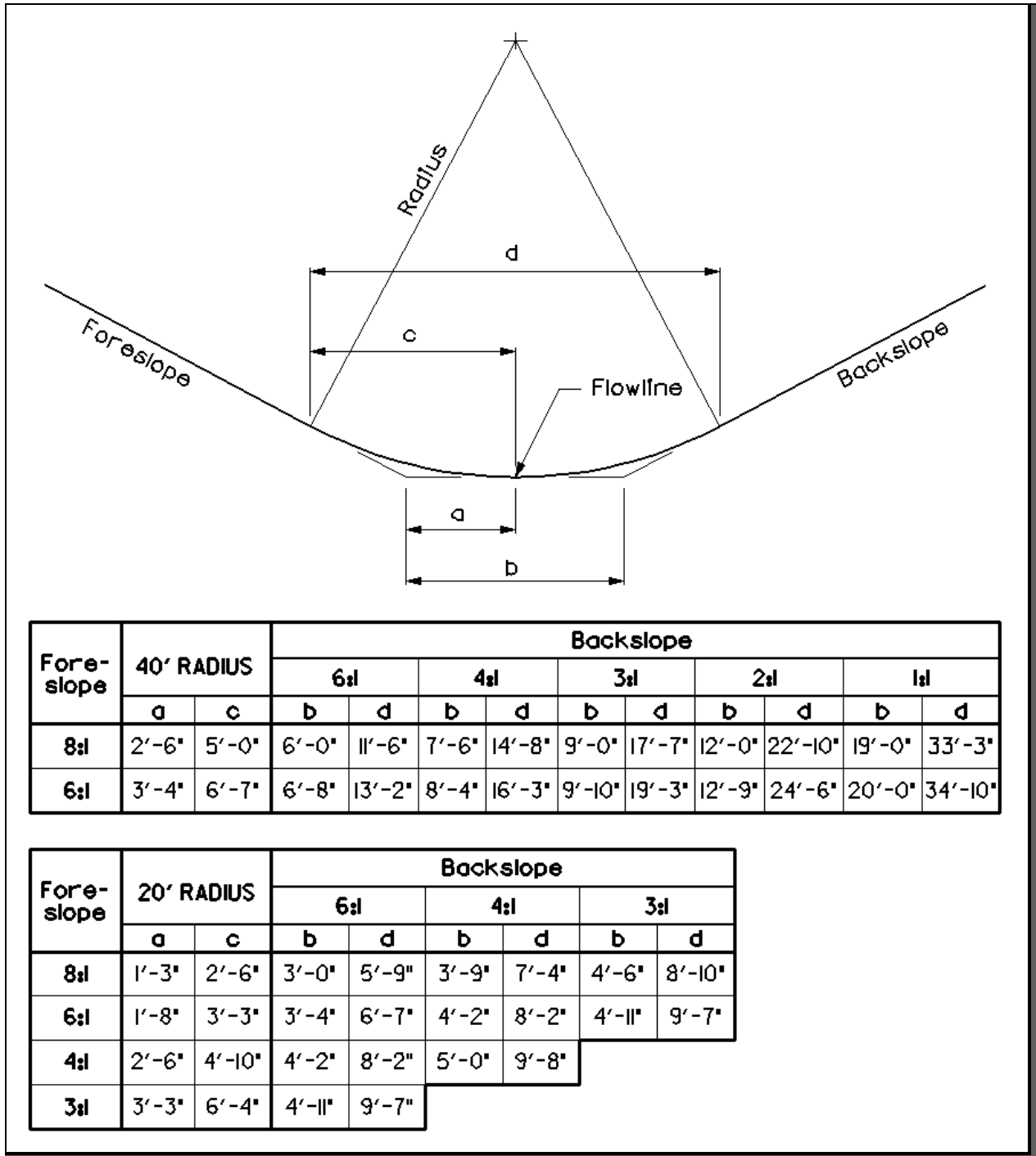


**Figure 5:** Figure 307-1E Medium Fill Section



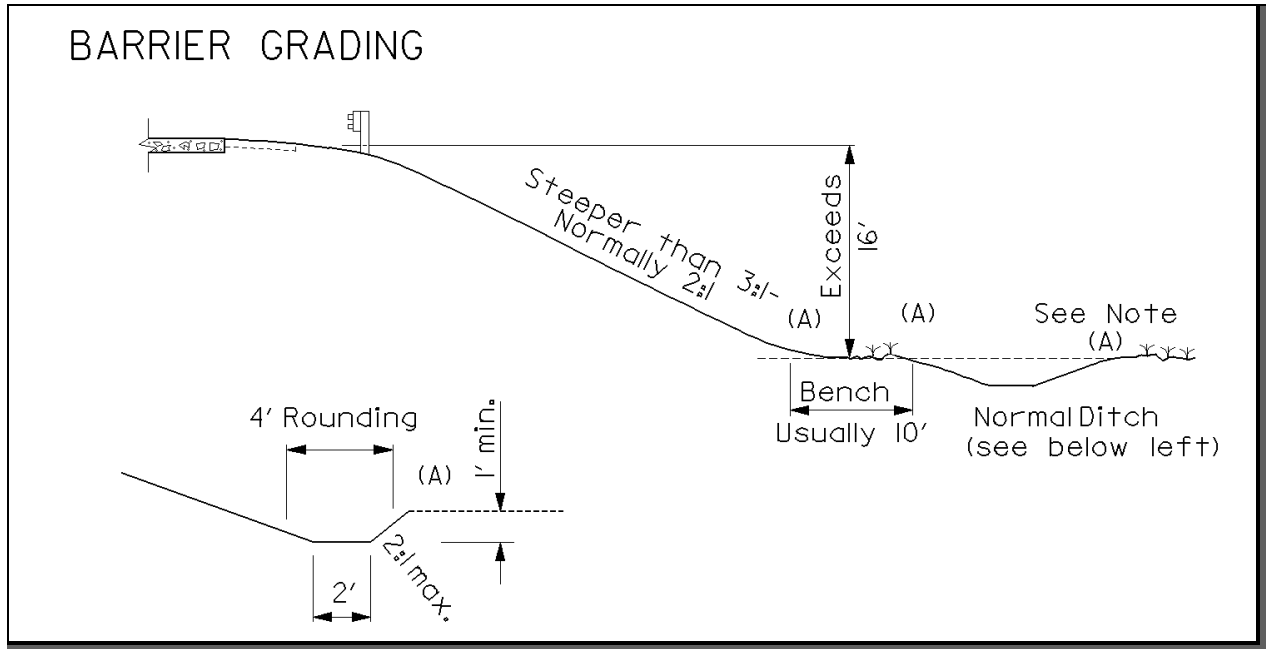
**SS307-1.X – version 07.04.10**

**Figure 6: Recoverable Ditch Sections (based upon Figure 307-2E)**



## SS307-1.X – version 07.04.10

Figure 7: Figure 307-4E Barrier Grading Sections



### Establishing the Graded Shoulder Width

The criteria will start processing from the proposed edge of paved (treated) shoulder to draw the unpaved (untreated) portion of the graded shoulder. The width of the graded shoulder can be determined by two methods:

- Meet a graphic line representing the graded shoulder location. This method should be used if the graded shoulder width is variable.
- Use a variable to set the graded shoulder width. This method should be used if the graded shoulder is a constant width.

The criteria will always look for a graphic representation of the graded shoulder first. The DGN Variable "**~proposed graded shoulder in dgn**" has been defined to establish the symbology for the graded shoulder line. The variable is defined as follows within the criteria:

```
define_dgn "~proposed graded shoulder in dgn" \  
  dgn = "proposed dgn file name" \  
  lvname = DR_P_Ditch \  
  wt = 1, ByLevel \  
  co = 9, ByLevel
```

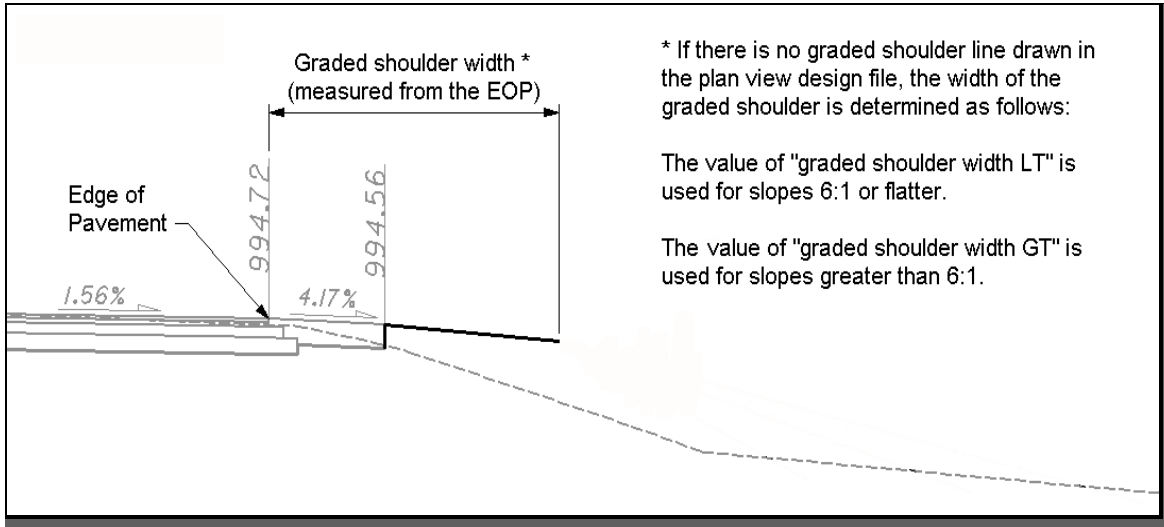
In order for the criteria to search for the graded shoulder line in the correct design file, the Define Variable "**~proposed dgn file name**" is used to establish the name of the design file that contains the graded shoulder line. Please see [page 27](#) for a detailed description of the "**~proposed dgn file name**" variable.

## SS307-1.X – version 07.04.10

If no graphics representing the graded shoulder are found, the criteria will set the width of the graded shoulder using the variables “**graded shoulder width lt**” (for sections where the foreslope is less than (lt) or equal to 6:1) or “**graded shoulder width gt**” (for sections where the foreslope is steeper than 6:1). See the Location & Design Manual, Volume 1, Figure 301-3E to determine the graded shoulder width.

The graded shoulder is drawn at a hardcoded slope of 8.0%.

**Figure 8:** Graded Shoulder Width

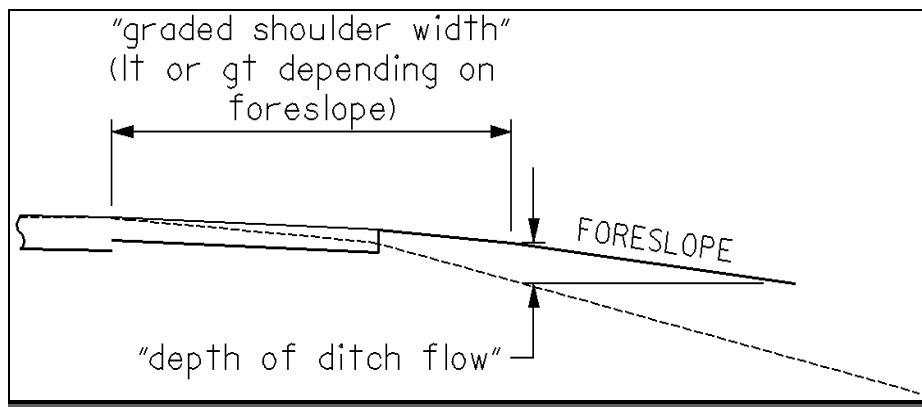


### Additional Processing Notes

#### No Graphic Ditch Line and COGO Profile

The criteria will check whether the current section is in cut or fill by locating the “**depth of ditch flow**” as shown in Figure 9. The elevation at this point is compared to the elevation of the existing ground to determine whether the section is in cut or fill. Please see the **Drainage Considerations** section on [page 21](#) for processing SS307-1.X with graphic ditch lines and/or COGO profile(s).

**Figure 9:** Locating the “**depth of ditch flow**”





## SS307-1.X – version 07.04.10

### Cut Condition

If the criteria determines the section is in cut, the cut section drawn will be dependent on the value (0 or 1) specified for the variable “**cut section type**”.

“**cut section type**” = 0.

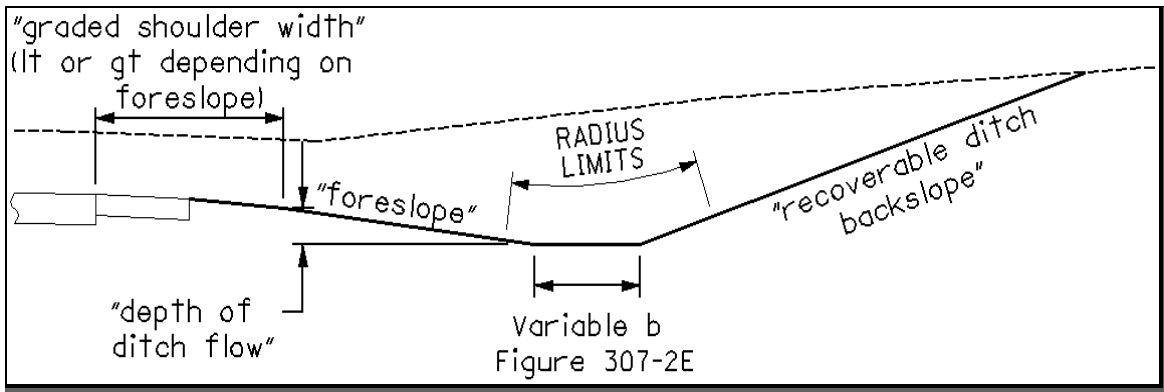
The criteria file will draw the section as shown in Figure 307-1E under Cut Section - Rural Interstate and will use the values from the Table on Figure 307-2E for 40' radius.

“**cut section type**” = 1.

The criteria file will draw the section as shown in Figure 307-1E under Cut Section - Urban Interstate, Other Freeways and Expressways and will use the values from the Table on Figure 307-2E for 20' radius.

The unpaved portion of the graded shoulder is drawn from the edge of the paved shoulder at a hardcoded slope of 8.0%, to the width determined by either (1) the “**graded shoulder width gt**” or “**graded shoulder width lt**” variables depending on the “**foreslope**” defined or (2) the graphic representation of the graded shoulder. The back of the ditch is placed based on the tables shown in Figure 307-1E labeled as the Approximate Guide For Cut Depth and the figures and tables shown on the following pages.

**Figure 10:** Cut section

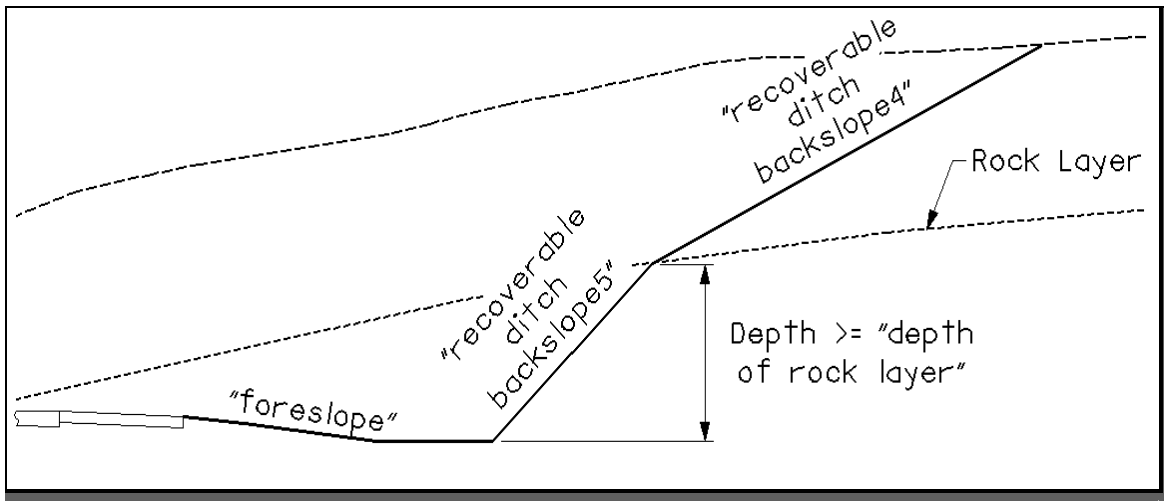


### Rock Layer

If the criteria determines that a rock layer is present and the depth of cut is greater than 15 feet, it will place a recoverable ditch section based on the backslope specified by “**recoverable ditch backslope5**” for Cut Section - Rural Interstate only. The criteria file will place the backslope specified by the variable “**recoverable ditch backslope5**” (default value of 1:1) to the rock layer. Once the criteria file reaches the rock layer, it will then place a slope specified by the variable “**recoverable ditch backslope4**” (default value of 2:1) to the existing ground as shown in Figure 11 on the following page.

**Important:** The rock layer elements must be present in the cross section design file before the criteria file **ss307-1.x** is processed. If these elements do not exist in the cross section prior to processing, the criteria file will not place the grading as shown in Figure 11. The DGN Variable “**~rock layer**” has been defined to establish the symbology for the rock layer. Please see [page 32](#) for more information on this DGN variable.

Figure 11: “depth of rock layer” for “cut section type” = 0



**Recoverable Ditch Backslope Placement**

The criteria file will place the recoverable ditch section as shown on Figure 307-2E and Figure 13 on page 11. The recoverable ditch section is placed based on the values defined for the “cut section type”, “foreslope” variables and the depth of the cut for the section.

The “cut section type” is definable by the user and sets which Radius Table the criteria file will use. The “foreslope” is defined by the user. The criteria file determines the depth of the cut for the section and compares it to the values shown in Table 2 on page 11. The criteria file will then determine the appropriate “recoverable ditch backslope” to be placed based on the value of the depth of cut.

Please see Figures 14 through 18 on the following pages for the relationship between the “recoverable ditch backslope” and the depth of cut. Once the criteria file determines what backslope to place, the ditch section is placed based on the values for the variables a, b, c shown in the Tables on Figure 307-2E.

Prior to placing the “recoverable ditch backslope1” for depth of cuts less than `_d_cut_depth1` (8 ft), the criteria will also test the next steeper “recoverable ditch backslope2” placement at the section as shown in Figure 12 on the following page.

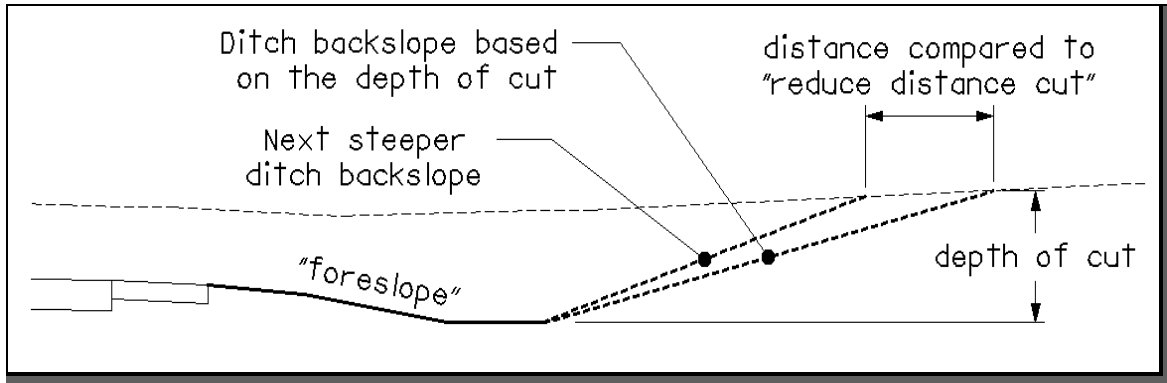
The criteria will determine the distance between the flatter and steeper backslope placements. If this distance is less than or equal to the “reduce distance cut”, the criteria places the flatter ditch backslope. If this distance is greater than the “reduce distance cut” value, the criteria will place the steeper ditch backslope.

**Note:** this will only occur on cut sections where the depth of cut is less than the `_d_cut_depth1` value (8 ft). It will only compare the distance between the backslopes for “recoverable ditch backslope1” and “recoverable ditch backslope2”.

For example, the criteria file determines the depth of cut to be less than the `_d_cut_depth1` value (8ft). Since the “recoverable ditch backslope1” is to be placed based on the sections depth of cut, the criteria will then test the placement of the next steeper ditch backslope, which would be “recoverable ditch backslope2”. The criteria will next determine the distance between these backslope placements as shown in Figure 12. If it is less than or equal to the “reduce distance cut” value the criteria will place the “recoverable ditch backslope1”. If this distance is greater than the “reduce distance cut” value, the criteria will place the “recoverable ditch backslope2”.

# SS307-1.X – version 07.04.10

**Figure 12:** The use of "reduce distance cut" to determine ditch backslope placement



The define variables in Table 1 have been given the default values shown below. If you wish to change the default values, you will need to modify the value of the variable in the cross section run. The `_d_cut_depth` values shown in Table 2 have been hardcoded in the criteria file. If you wish to modify these default values, you will need to modify the values in the criteria file itself.

Table 1		
Define Variable	Value	Backslope Placed
"recoverable ditch backslope1"	6	6:1
"recoverable ditch backslope2"	4	4:1
"recoverable ditch backslope3"	3	3:1
"recoverable ditch backslope4"	2	2:1
"recoverable ditch backslope5"	1	1:1

Table 2	
Numeric Variable	Feet
<code>_d_cut_depth1</code>	8
<code>_d_cut_depth2</code>	11
<code>_d_cut_depth3</code>	15
<code>_d_cut_depth4</code>	30

**Figure 13:** Recoverable ditch section

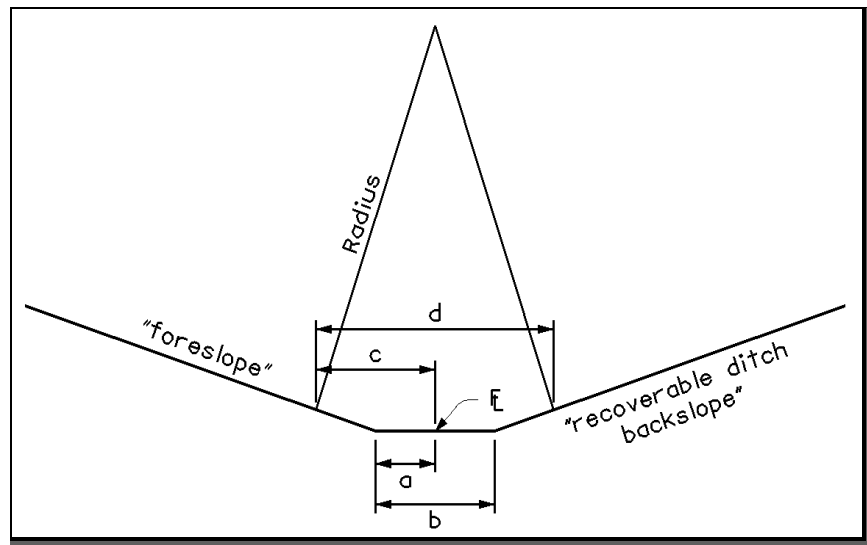


Figure 14: "recoverable ditch backslope1"

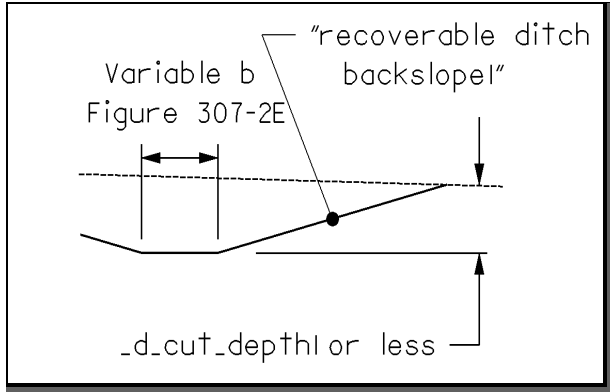


Figure 15: "recoverable ditch backslope2"

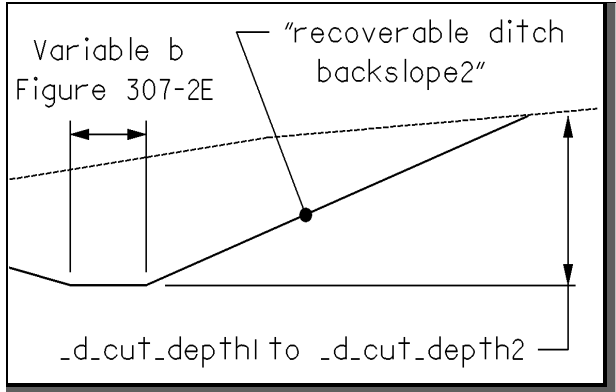


Figure 16: "recoverable ditch backslope3"

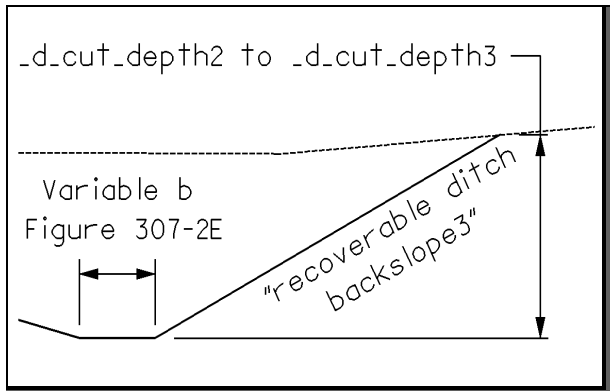


Figure 17: "recoverable ditch backslope4"

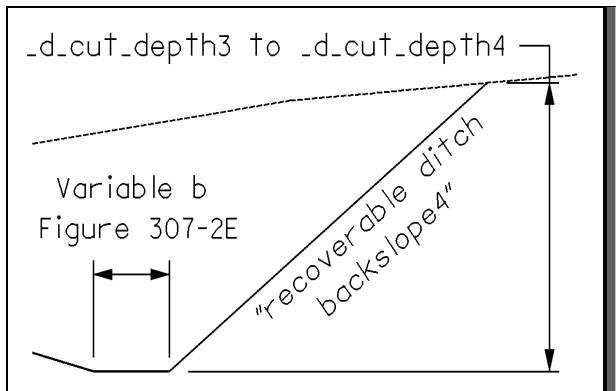
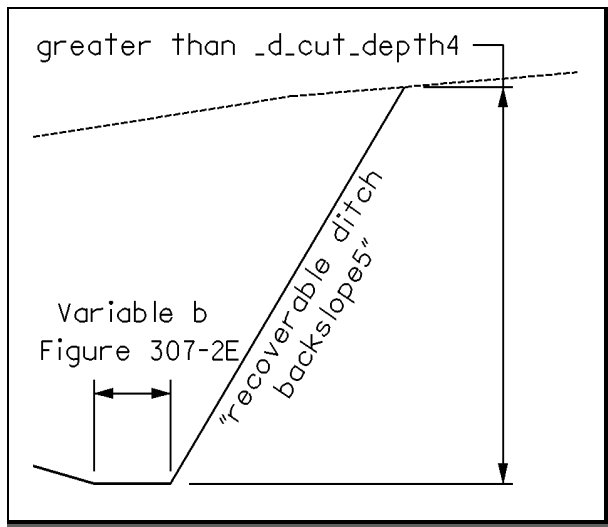


Figure 18: "recoverable ditch backslope5"



## SS307-1.X – version 07.04.10

Before the Recoverable Ditch Section is placed, the criteria file compares the distance between the beginning of the Radius placement point and edge of shoulder with the values shown on Figure 307-1E. The value is either 10' for Rural Interstate or 9'-6" for Urban Interstate, Other Freeways and Expressways.

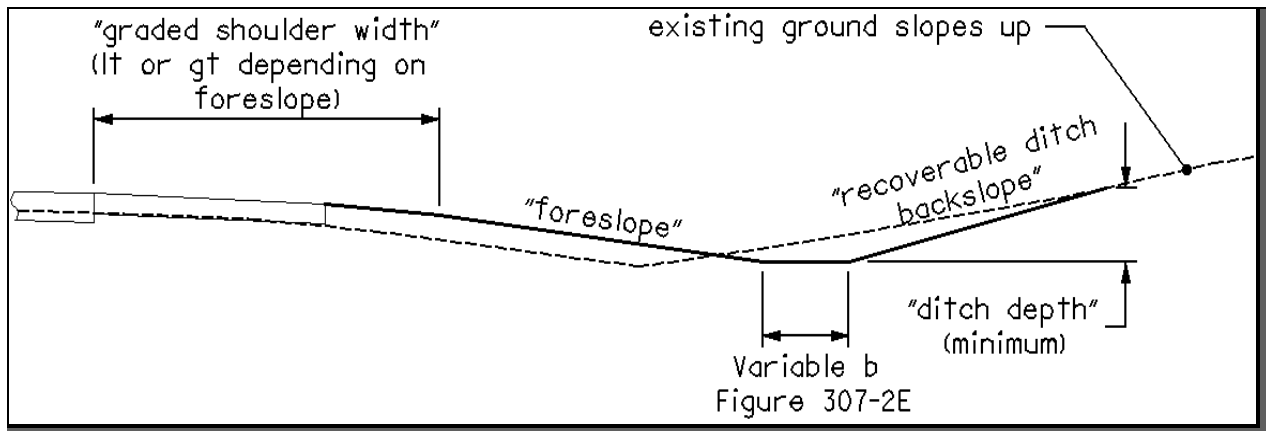
If the ditch section placed will result in the distance between the Radius starting point and the edge of graded shoulder being less than the above values, the criteria file will redraw the ditch section with the minimum values as shown on Figure 307-1E. This prevents the “**depth of ditch flow**” from being lower than the minimum even if the user sets it to a lower value.

On the other hand, if the user enters a “**depth of ditch flow**” greater than the minimum, the criteria file will place the ditch section and the resulting distance between the edge of graded shoulder and the Radius begin point will be greater than the minimum values of either 10' or 9'-6”.

### Shallow Cut or Low Fill Condition

If the criteria determines the section is in shallow cut or low fill, the criteria first draws the “**foreslope**” to the “**depth of ditch flow**” elevation. The criteria file then tests the existing ground slope to determine if a ditch can be placed meeting the minimum “**ditch depth**” requirement as shown in Figure 19 below.

**Figure 19:** Shallow cut



If the “**ditch depth**” depth can be met, the section is in shallow cut and the criteria file places and tests ditch backslopes along the existing ground until the “**ditch depth**” is met. The ditch backslope placed will vary based on the depth of cut and whether the “**ditch depth**” requirement is met.

If the criteria determines a ditch is to be placed in either low fill or shallow cut conditions, it will first place the backslope using the flattest slope which is the “**recoverable ditch backslope1**”. Prior to placing this “**recoverable ditch backslope1**”, the criteria will test the next steeper “**recoverable ditch backslope2**” placement.

The criteria determines the distance between where the flatter and steeper ditch backslopes intersect the existing ground. If this distance is less than or equal to the “**reduce distance fill**” value, the criteria file places the “**recoverable ditch backslope1**”. If this distance is greater than the “**reduce distance fill**” value, the criteria will place the “**recoverable ditch backslope2**”.

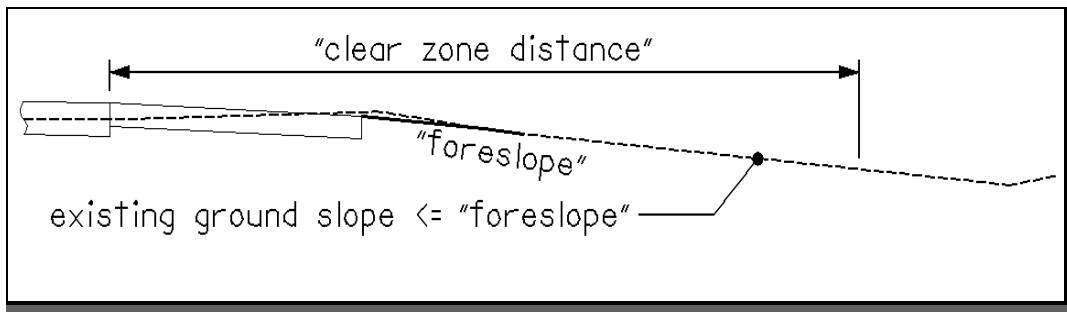
If the placement of the “**recoverable ditch backslope2**” is selected to be placed, the criteria will also test the placement of the “**recoverable ditch backslope3**”. The criteria will compare these two backslope intersections with the existing ground using the same procedure described above. Based on the results, the final ditch backslope will be placed and the section will be completed.

## SS307-1.X – version 07.04.10

If the criteria file determines the existing ground is sloping down, the section is in low fill and the criteria file draws the “**foreslope**” to the existing ground. Next, the criteria file determines where the “**foreslope**” intersects existing ground compared with the “**clear zone distance**”.

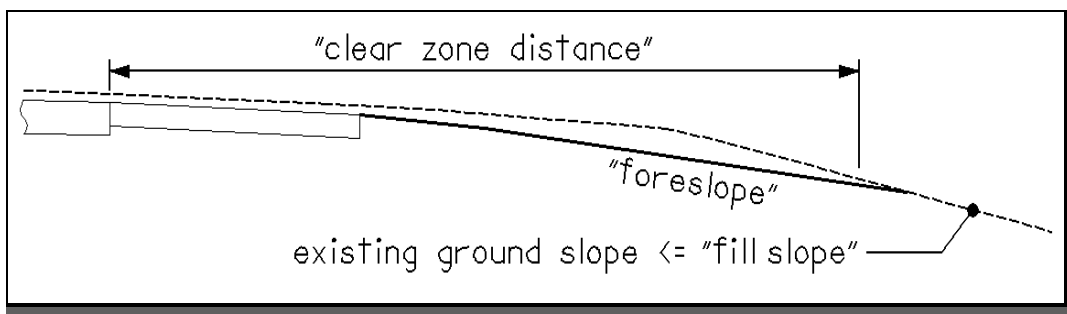
If it is within the “**clear zone distance**”, the criteria file tests the existing ground slope to determine if this slope is equal to or less than the “**foreslope**”. The criteria file also compares the existing ground slope with the “**terminate slope**” (see **Terminate Slope** section on [page 18](#)). If the existing ground slope is equal to or less than the “**foreslope**” and no ditch is to be placed, the section is completed as shown in Figure 20.

**Figure 20:** Low fill (“foreslope” within the “clear zone distance”)



If it is at or outside the “**clear zone distance**”, the criteria file tests the existing ground slope to determine if this slope is equal to or less than the “**fill slope**”. If it is, the section is completed as shown in Figure 21 below.

**Figure 21:** Low fill (“foreslope” at or outside the “clear zone distance”)

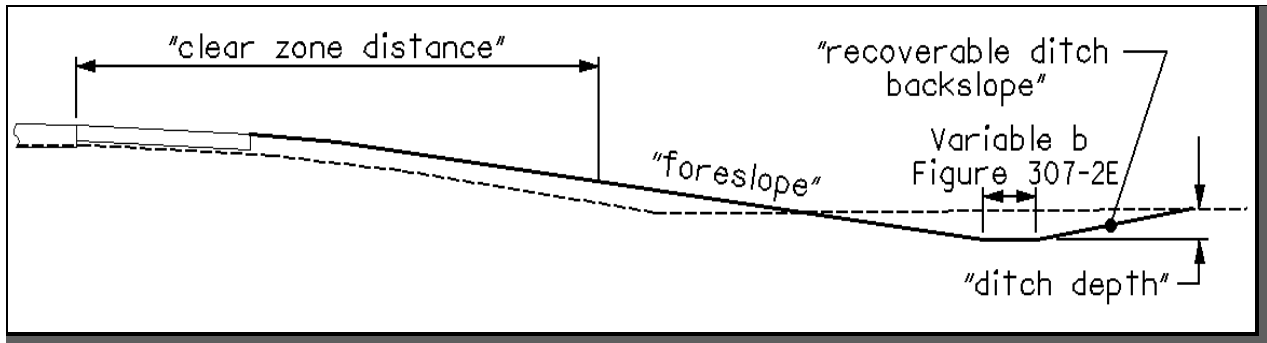


If the section is not placed in the **Low Fill Condition**, the criteria file proceeds to the **Fill Condition**.

**Fill Condition**

The criteria file draws the “foreslope” to the existing ground. The criteria file tests the existing ground slope at this location to determine the slope of the existing ground. If the existing ground slopes up or is greater than the “terminate slope” a ditch section will be placed as shown in Figure 22. The criteria file places a Recoverable Ditch Section as previously described in the **Shallow Cut Condition** on page 13.

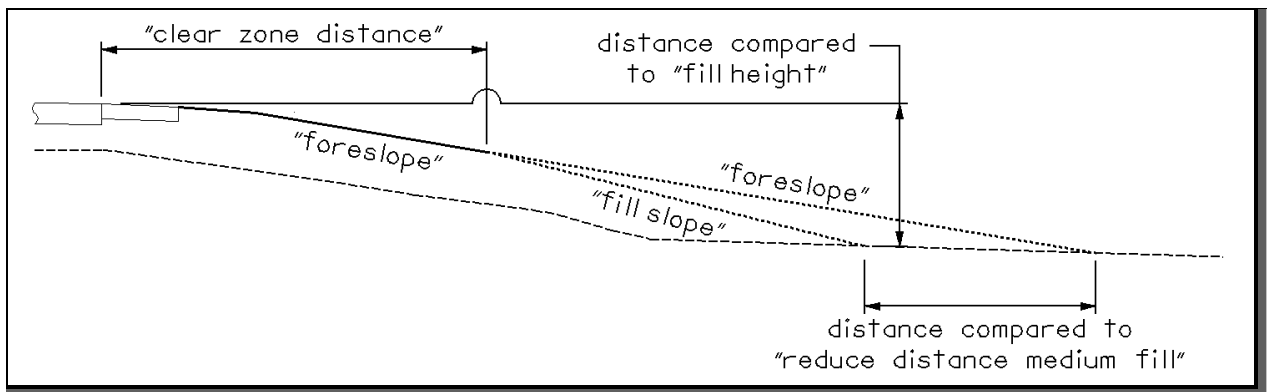
**Figure 22:** Fill section



**Medium Fill Condition**

If the criteria determines the section is in medium fill, the criteria first draws “foreslope” to the “clear zone distance” and then draws test slopes, “foreslope” and “fill slope”, to intersect existing ground as shown in Figure 23 below.

**Figure 23:** The use of “reduce distance medium fill” to determine slope placement



The criteria tests the distance between the “foreslope” and “fill slope” and if it is less than or equal to the “reduce distance medium fill” the criteria places the “foreslope” option. If this distance is greater than the “reduce distance medium fill” value, the criteria then tests the elevation difference at the “fill slope” location with the “fill height” distance. If this difference is less than or equal to the “fill height”, the section is in medium fill. If it is greater than the “fill height” the section uses Barrier Grading.

After the existing ground slope is tested and the criteria determines a ditch section is to be placed, it will first place the backslope using the flattest slope permitted for the defined “fill slope”. In the case of a “fill slope” of 3, the only permissible backslope according to the 20’ Radius Table in Figure 307-2E is the “recoverable ditch backslope1” (6) and this is the only backslope that will be placed.

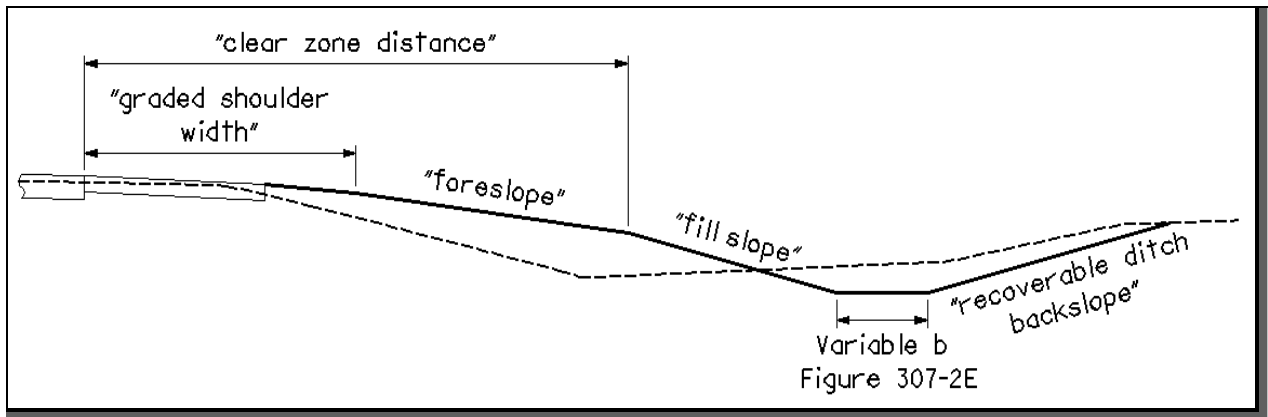
## SS307-1.X – version 07.04.10

In the case of a “fill slope” of 4, the criteria will first place the “recoverable ditch backslope1” (6). Prior to placing this backslope, the criteria will also test the placement of the next steeper “recoverable ditch backslope2” (4) placement.

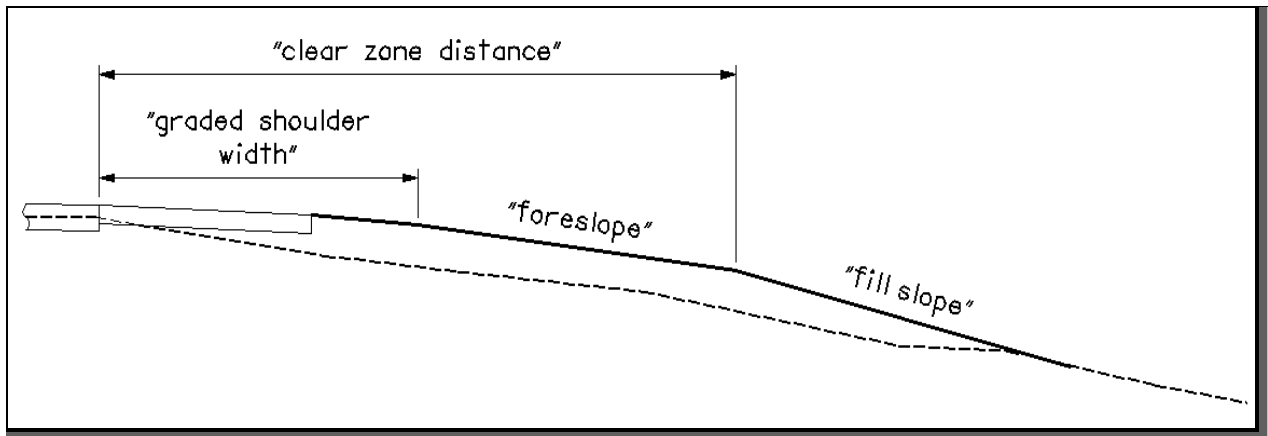
The criteria determines the distance between where the flatter and steeper ditch backslopes intersect the existing ground. If this distance is less than or equal to the “reduce distance fill” value, the criteria file places the “recoverable ditch backslope1”. If this distance is greater than the “reduce distance fill” value, the criteria will place the “recoverable ditch backslope2”.

The section will be completed based on the above processing. Two examples are shown in Figures 24 and 25.

**Figure 24:** Medium fill with ditch placed



**Figure 25:** Medium fill with no ditch placed

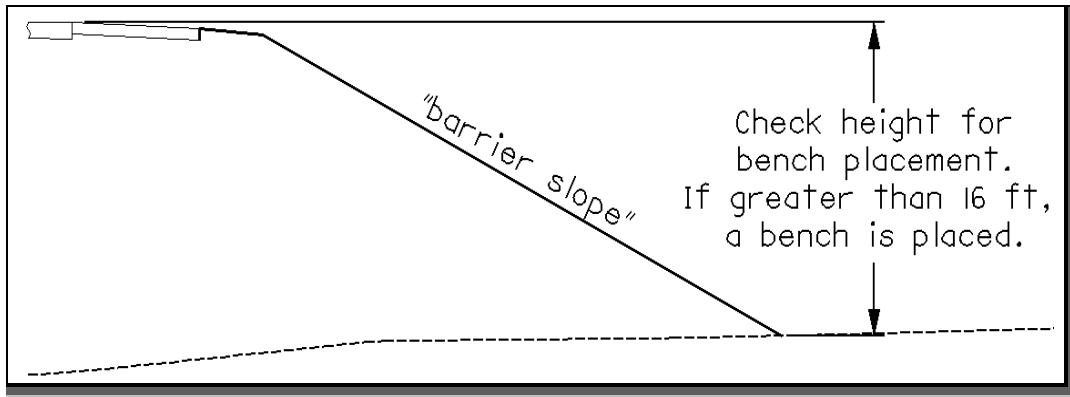




**Fill Heights over “fill height” Condition**

If the criteria processing determines the section is in high fill (fill height over “fill height”) condition, the criteria draws the section according to the Barrier Grading portion of Figure 307-4E. 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 26.

**Figure 26:** Check fill height for bench placement



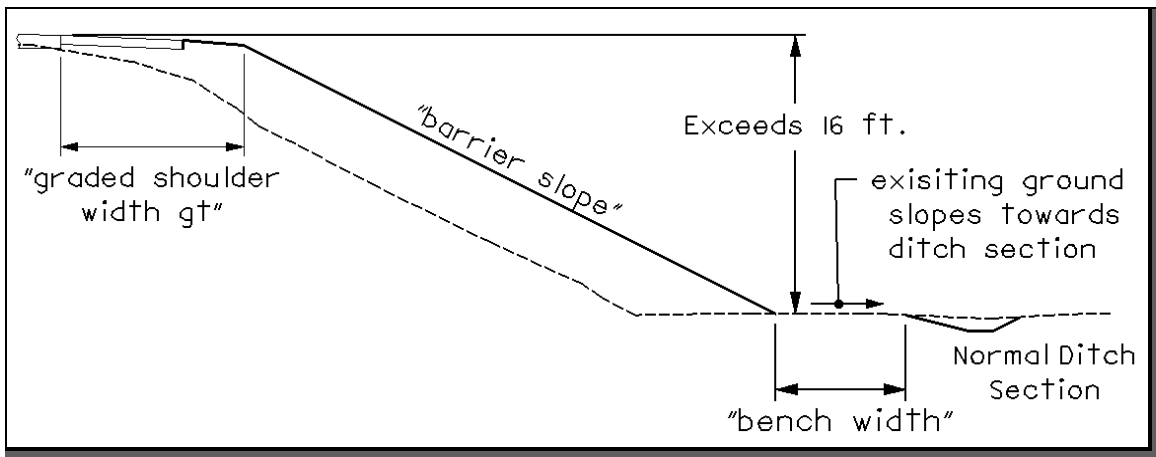
Next, the criteria tests the existing ground slope as shown in Figure 29 on page 18 to see if a ditch will be placed.

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

If the fill height is over 16 ft., a bench is placed as shown in Figure 27 or Figure 28 on the following page.

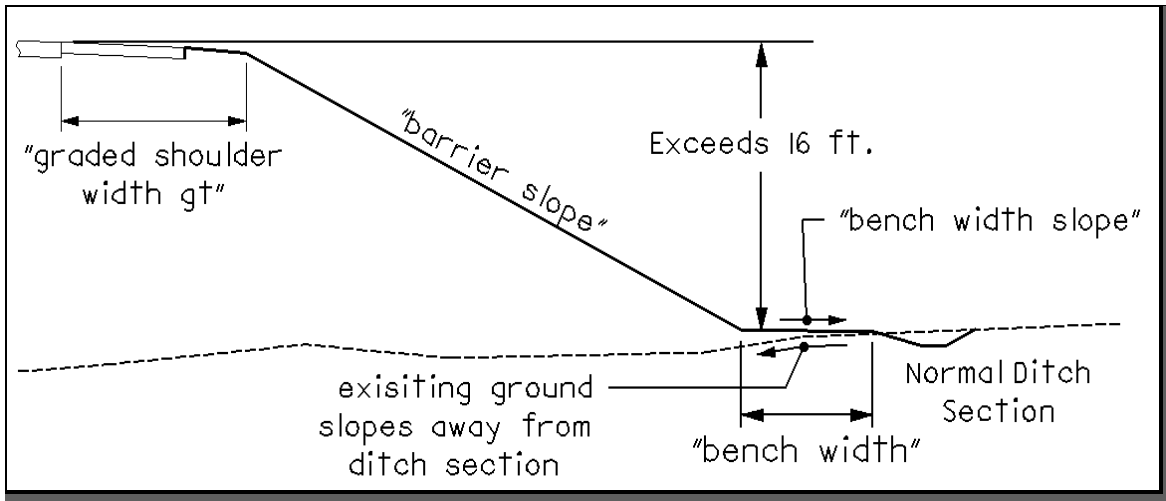
If the point where the barrier slope intersects the existing ground is higher than the ditch location, the criteria will use the existing ground as the bench as shown in Figure 27.

**Figure 27:** Existing ground bench



If the point where the barrier slope intersects the existing ground is lower than the ditch location, the criteria will draw the proposed grading to promote positive drainage using the “bench width slope”. The “bench width slope” is drawn from the “barrier slope” line to the ditch section as shown in Figure 28 on page 18.

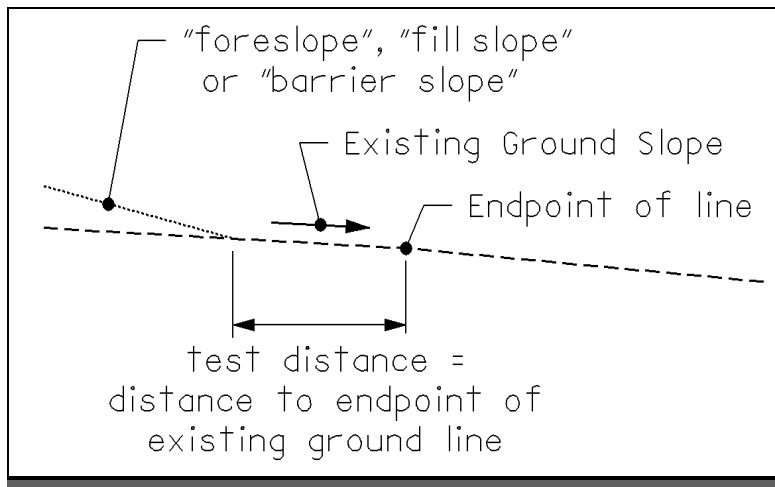
Figure 28: Proposed grading bench



**Terminate Slope**

Before any grading will be placed, the criteria tests the existing ground slope as shown in Figure 29 to determine if a ditch will be placed. The criteria will evaluate the slope of the existing ground at the point where the proposed side slope intersects the existing ground.

Figure 29: The use of "terminate slope"



If the existing ground is sloping back towards the roadway, a ditch will be drawn as shown in Figure 30. If the existing ground is sloping away from the roadway, the criteria will not place a ditch unless the existing ground slope is steeper than the value of the variable "terminate slope" as shown in Figure 31.

Figure 30

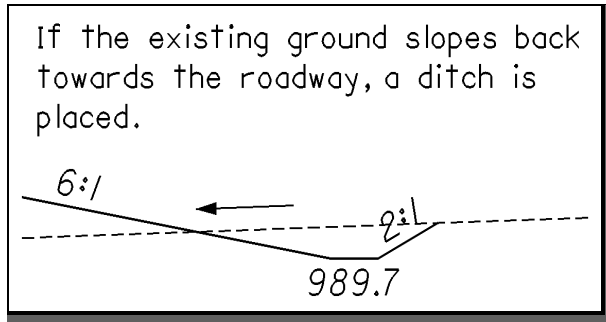
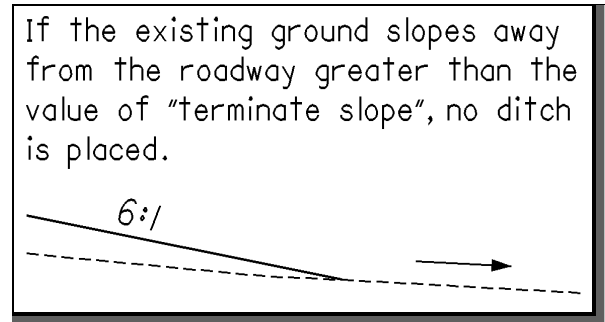


Figure 31



Changing the value of the variable “**terminate slope**” will control whether a ditch is 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) no ditch will be placed.

**Proposed Grading**

The final cross section cut and fill lines representing the proposed grading are drawn on various levels. The following levels should be shown on the final cross sections.

Table 3				
Level Name	Purpose	Symbology		
		Color	Weight	Line Style
XS_P_Finished_Grade	Proposed Ground Line	2	2	0
	Proposed Ditch Bottom	1	2	0
	Proposed Pavement Subgrade	7	2	0
	Proposed Finished Grade Line: under walls, headwalls, etc.	7	2	0

For a complete and current listing of the cross section levels refer to the CADD links accessed from the Department’s Office of Production’s web site. The web site can be accessed at the following URL address: <http://www.dot.state.oh.us/cadd/>

**Text Labeling**

The criteria will place several labels for the ditch elevation and the side slopes on level XS\_P\_Annotation.

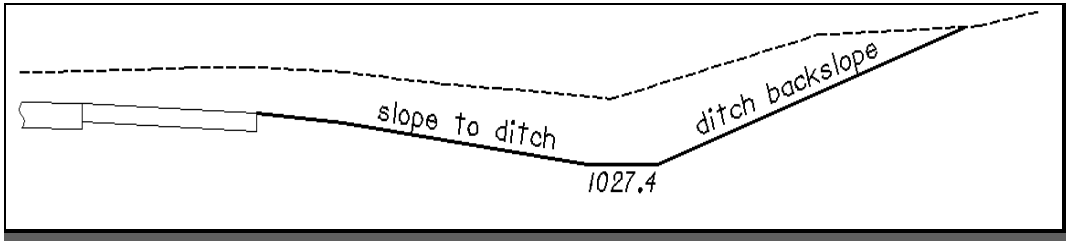
The criteria file will also place Warning, Error and/or Designer Notes when processing. The Warning and Error messages are placed on level XS\_P\_Text\_WarningMsg and the Designer Notes on level XS\_P\_Text\_Info. Users should turn these levels off on the final plotting of the cross section sheets. If you don’t want these messages to be draw, 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.

## SS307-1.X – version 07.04.10

### 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 32, 33 and 34 below. The default value is 0.

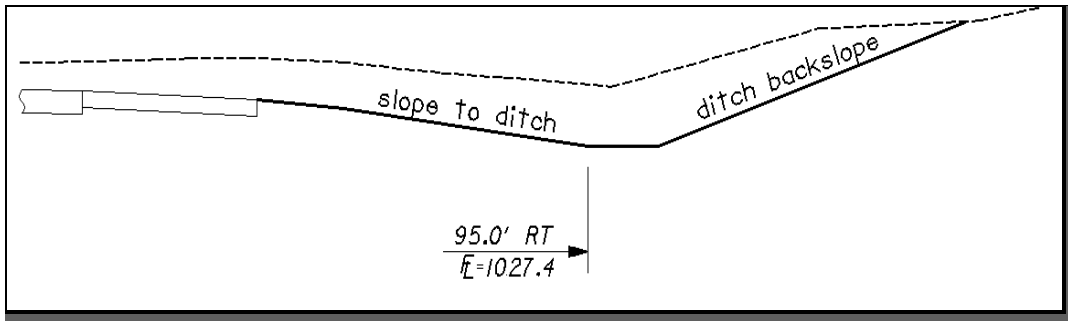
**Figure 32:** “ditch annotation style” set to 0



If “**ditch annotation style**” 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 28](#). See Figure 33 below for the usage of this variable.

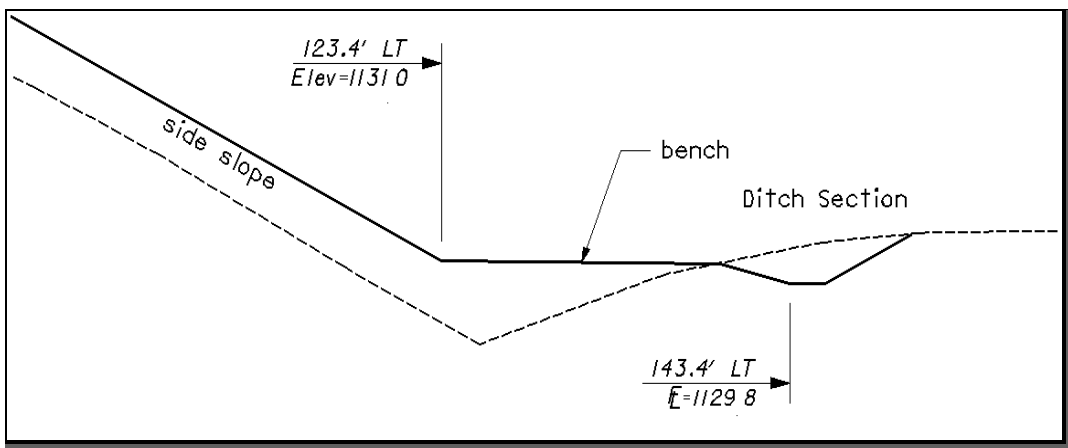
**Figure 33:** “ditch annotation style” set to 1 for a ditch section



“**ditch annotation style**” 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 28](#). See Figure 34 below for the usage of this variable.

**Figure 34:** “ditch annotation style” set to 1 for a section containing a bench



**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 in fill, the ditches are placed at the intersection of the side slope with the 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:

Table 4		
Graphic Ditch Line	COGO Profile	Criteria Result
Yes	No	Draws “foreslope”, “fill slope” (Medium Fill Condition), 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”, “fill slope” (Medium Fill Condition), or “barrier slope” until the slope intersects the elevation obtained from the COGO profile.
No	No	Places “foreslope”, “fill slope” (Medium Fill Condition), or “barrier slope” and ditches, if applicable, based on the cross section and the criteria variables as previously described starting on <a href="#">page 8</a> .

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 8](#). 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”, “fill slope” or the “barrier slope” to either:

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

## SS307-1.X – version 07.04.10

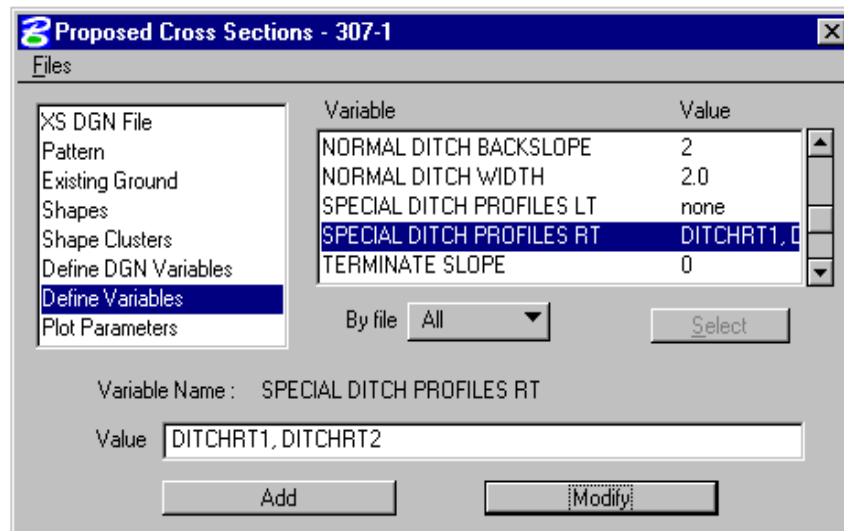
Once the criteria file determines either the offset or elevation or both offset and elevation, it will place the ditch section as described on the following pages.

### 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.

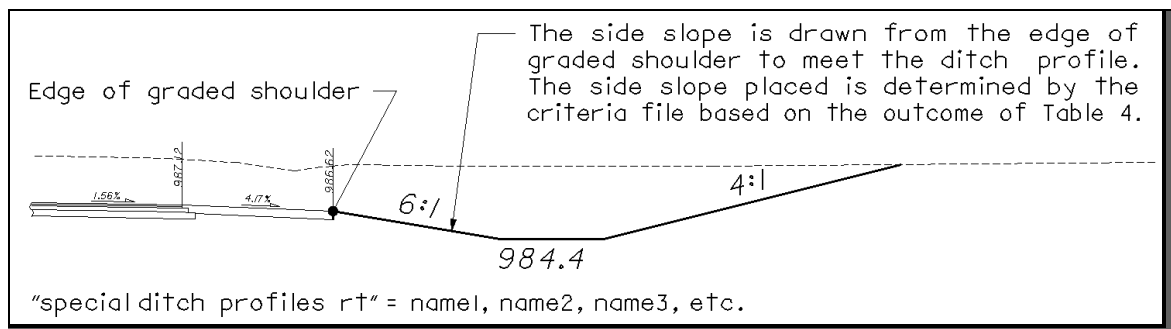
Multiple profiles can be specified for each side of the cross sections. For example, a new ditch profile DITCHRT1 has been defined for stations 53+00 to 61+00 on the right side. A second ditch profile DITCHRT2 has been defined from station 66+00 to station 71+00, also on the right side. Both profiles can be specified by separating each profile name by a coma as shown in the example below:

Figure 35



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 36 below.

Figure 36: 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 flowline graphically in the plan view design file as shown in Figure 37 below. The ditch section will be completed as shown in Figure 37. The criteria file will determine the ditch width as detailed under the **Recoverable Ditch Backslope Placement** section on [page 10](#).

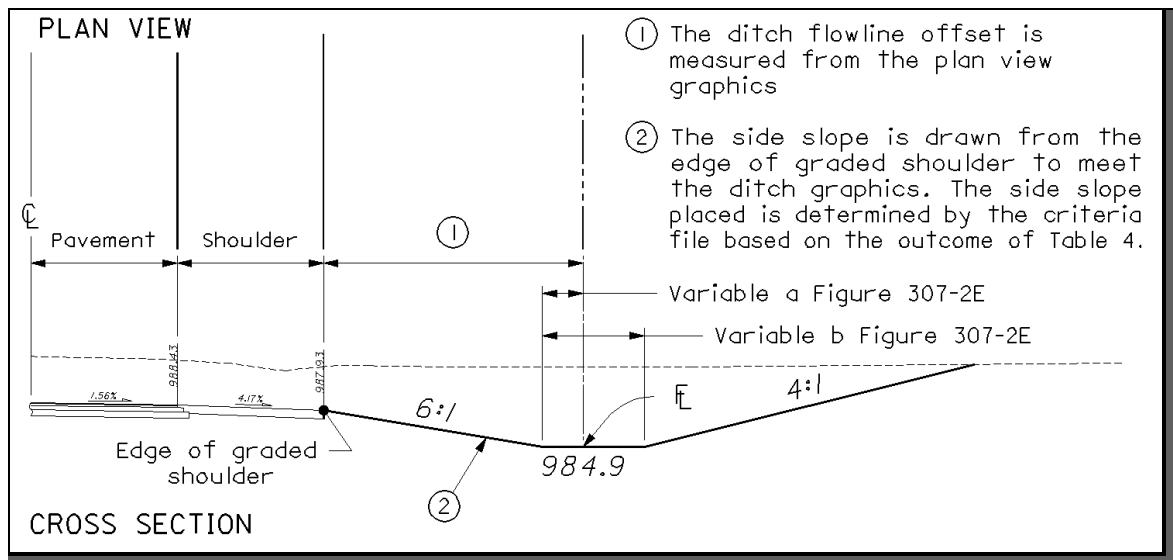
The variable “**proposed ditch in dgn**” is used to define the symbology for the graphic ditch line. The criteria will search the design file specified by the variable “**proposed dgn file name**” for the graphic ditch line. The variable is defined as follows within the criteria:

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

**Important:** The criteria searches for an intersection with a graphic ditch line from the edge of pavement out. If the criteria finds an intersection with a ditch line in the design file, it is assumed that this line is at the flowline of the ditch. The ditch width is determined as detailed under the **Recoverable Ditch Backslope Placement** section on [page 10](#). Any additional ditch lines drawn outside of the first one encountered are ignored.

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 both the ditch flowline offset and the elevation. If a graphic ditch flowline 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 section whether or not the section is above or below the existing ground.

**Figure 37:** Graphic ditch flowline example



## SS307-1.X – version 07.04.10

### Cut Condition:

The criteria file will place the “**foreslope**” to whatever is present at the section, either the graphic ditch line or a COGO ditch profile.

### Fill Condition:

Before the section is completed in the Fill Condition, the criteria will run the following tests shown in Table 5 before the ditch section is placed when a graphic ditch line or COGO ditch profile is present:

Table 5		
Criteria Test	Criteria Result	
Is the bottom of the ditch above existing ground using “ <b>foreslope</b> ”?	<ul style="list-style-type: none"> <li>• Yes, Does the existing ground slope up allowing ditch section to be placed?</li> </ul>	<ul style="list-style-type: none"> <li>• Yes, ditch section is placed using existing ground as backslope.</li> <li>• No, proceed to <b>Medium Fill Condition</b></li> </ul>
	<ul style="list-style-type: none"> <li>• No, Is the distance between “<b>foreslope</b>” and “<b>fill slope</b>” greater than the “<b>reduce distance</b>” value? (See Figure 23 on page 15 for an example of this comparison).</li> </ul>	<ul style="list-style-type: none"> <li>• Yes, determine the fill height of the ditch section placed with “<b>fill slope</b>”.</li> <li>• No, place completed ditch section using the “<b>foreslope</b>”.</li> </ul>
Is the bottom of the ditch above existing ground using “ <b>fill slope</b> ” in the <b>Medium Fill Condition</b> ?	<ul style="list-style-type: none"> <li>• Yes, Does the existing ground slope up allowing ditch section to be placed?</li> </ul>	<ul style="list-style-type: none"> <li>• Yes, ditch section is placed using existing ground as backslope.</li> <li>• No, proceed to <b>Fill Heights over “fill height” Condition</b>.</li> </ul>
	<ul style="list-style-type: none"> <li>• No, place completed ditch section using the <b>Medium Fill Condition</b>.</li> </ul>	
Is the fill height of the ditch section placed with “ <b>fill slope</b> ” greater than the user definable value “ <b>fill height</b> ”?	<ul style="list-style-type: none"> <li>• Yes, proceed to <b>Fill Heights over “fill height” Condition</b>.</li> </ul>	
	<ul style="list-style-type: none"> <li>• No, place completed ditch section using either the “<b>foreslope</b>”, “<b>fill slope</b>”, or <b>barrier slope</b>”</li> </ul>	

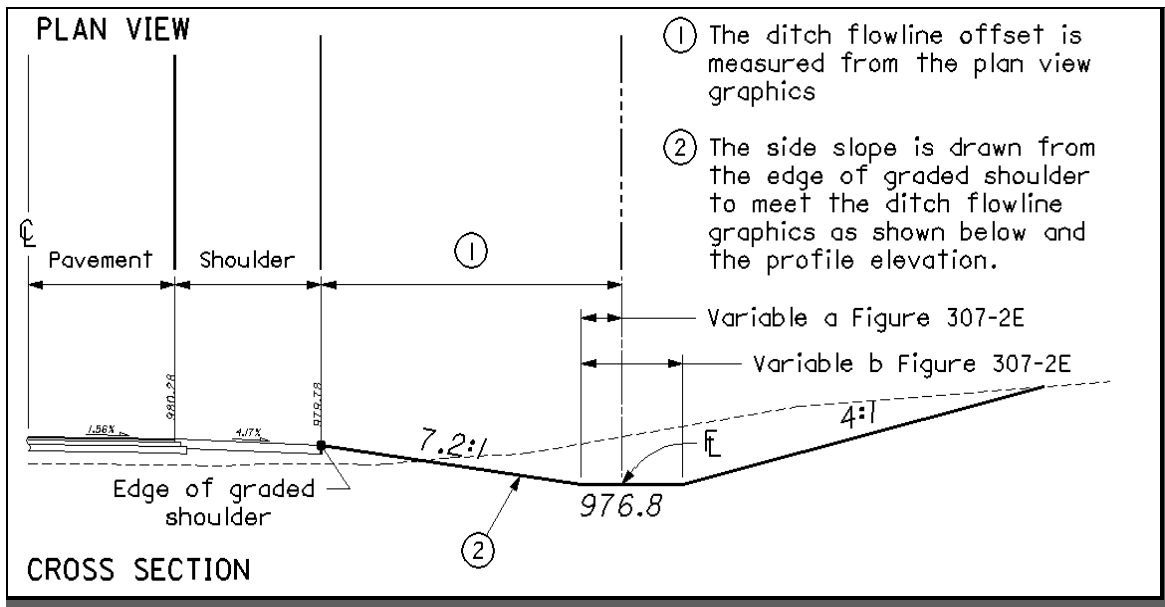


## SS307-1.X – version 07.04.10

### Graphic Ditch Line or COGO Profile

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

**Figure 38:** Example of the ditch drawn by intersecting a graphic ditch flowline and COGO profile



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

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

**Important:** The criteria searches for an intersection with a graphic ditch line from the edge of pavement out. If the criteria finds an intersection with a ditch line in the design file, it is assumed that this line is at the flowline of the ditch. The ditch width is determined as detailed under the **Recoverable Ditch Backslope Placement** section on [page 10](#). Any additional ditch lines drawn outside of the first one encountered are ignored.

**Variable Summary:**

A summary of the variables defined in **ss307-1.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**.

**Define Variables**

**Variables defined by the user:**

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

**“clear zone distance”**

This variable defines the distance from the edge of pavement to the clear zone. See the following figures and sections of the Location and Design Manual for more information:

Table 6	
Figure	Title
307-3E	Clear Zone Grading Sections
600-1	Clear Zone Widths
600-2	Clear Zone Measurements

Table 7	
Section	Title
307.2	Slopes
600.2	Clear Zone

**“fill slope”**

This variable defines the slope used for the medium fill condition. The define variable **“foreslope”** is drawn to clear zone and then **“fill slope”** is placed. See Figures 307-3E and 600-2 of the L&D Manual for the usage of this variable. Entered as single number. For example, if you require a slope of 4:1 key in 4, 3 for 3:1, etc.

**“foreslope”**

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

**“graded shoulder width lt”**

This variable defines the graded shoulder width to be used without barrier or foreslope is less than (lt) or equal to 6:1. See Figure 301-7E Graded and Treated Shoulder Widths for the usage of this variable. For recommended dimensions for this variable, see Figure 301-3E under the Graded Width Without Barrier, 6:1 or Flatter Foreslope column.

**“graded shoulder width gt”**

This variable defines the graded shoulder width to be used with barrier or foreslope is greater than (gt) 6:1. See Figure 301-7E Graded and Treated Shoulder Widths for the usage of this variable. For recommended dimensions for this variable, see Figure 301-3E under the Graded Width With Barrier or Foreslope Steeper Than 6:1 column.

## SS307-1.X – version 07.04.10

---

### Variables assigned a default value:

The following variables 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.

### 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.

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 cut conditions:

#### “cut section type”

This variable sets the cut section that will be placed for either (a) Rural Interstate or (b) Urban Interstate, other Freeways and Expressways as shown on Figure 307-1E. If this variable is set to 0, it will place the cut section shown for Rural Interstate. If the variable is set to 1, it will place the cut section shown for Urban Interstate, other Freeways and Expressways. See Figures 39 and 40 on [page 29](#) for the usage of this variable. The default value is 0.

#### “depth of rock layer”

This variable is used on Cut Section – Rural Interstate sections (“cut section type” = 0) only. The variable sets the minimum depth of rock layer at which the cut section will place the “**recoverable ditch backslope5**” (default value of 1:1) to the rock layer in the cross section. The depth is measured from ditch bottom to the rock layer. If the measured rock layer depth is greater than this value, the criteria file will place the slope of “**recoverable ditch backslope5**” (default value of 1) to the rock layer and then the slope of “**recoverable ditch backslope4**” (default value of 2) to existing ground surface. See Figure 11 for the usage of this variable. The default value is 16 ft.

#### “reduce distance cut”

This variable is used only on cut sections. The variable defines a distance measured between where the “**recoverable ditch backslope1**” and “**recoverable ditch backslope2**” intersect the existing ground for depth of cuts less than `_d_cut_depth1` (8 ft). This value allows the designer the option of placing the steeper ditch backslope instead of the flatter ditch backslope if the distance between the two is larger than the “**reduce distance cut**”. See Figure 12 for the usage of this variable. The default value is 4 ft.

## SS307-1.X – version 07.04.10

---

### Variables specific to fill conditions:

#### “barrier slope”

This variable defines the foreslope used for barrier grading. “**Barrier slope**” is drawn from the edge of graded shoulder to existing ground, bench or ditch. Entered as a single number. For example, if you require a slope of 2:1 keyin 2. The default value is 2.

#### “bench width”

For fill sections greater than 16 ft., a bench is drawn at the bottom of the fill, before the ditch as shown in Figures 27 and 28. The default value is 10 ft.

#### “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 28 for the usage of this slope. 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 safety grading (see Figure 307-4E). See Figure 23 for the usage of this variable. The default value is 16 ft as shown on Figure 307-1E.

#### “reduce distance fill”

This variable is used only on fill and shallow cut sections. The variable defines a distance measured between where the flatter and steeper ditch backslopes intersect the existing ground. This value allows the designer the option of placing the steeper ditch backslope instead of the flatter ditch backslope if the distance between the two is larger than the “**reduce distance fill**”. See Figure 12 and page 14 for the usage of this variable. The default value is 4 ft.

#### “reduce distance medium fill”

This variable is used only on medium fill sections. The variable defines a distance measured between “**foreslope**” and “**fill slope**” at existing ground intersection. This value allows the designer the option of placing the “**fill slope**” instead of the “**foreslope**” if the distance between the two is larger than the “**reduce distance medium fill**.” See Figure 23 for the usage of this variable. The default value is 4 ft.

#### “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. See **Terminate Slope** section and Figure 29 on [page 18](#) for the usage of this variable. Given in positive percent, i.e., 2 for 2%. The default is set at 0.

### 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**” below and the **Ditch Labeling** section on [page 20](#) 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 32 and 33 on [page 20](#). 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.

## 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**”, “**fill slope**”, “**barrier slope**” or a variable slope will be drawn to intersect the profile elevation. See the **Drainage Considerations** section starting on [page 21](#). The default value is *none*.

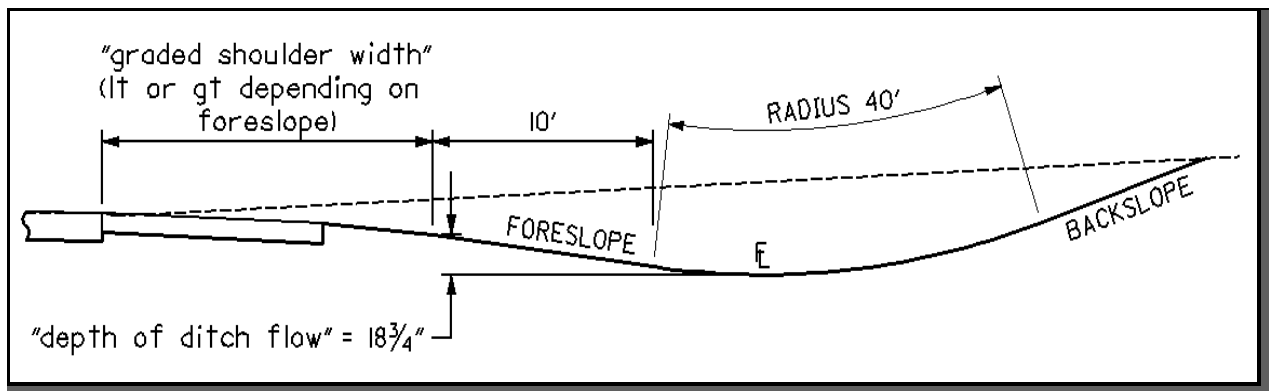
### “special ditch profiles rt”

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**”, “**fill slope**”, “**barrier slope**” or a variable slope will be drawn to intersect the profile elevation. See the **Drainage Considerations** section starting on [page 21](#). The default value is *none*.

### “depth of ditch flow”

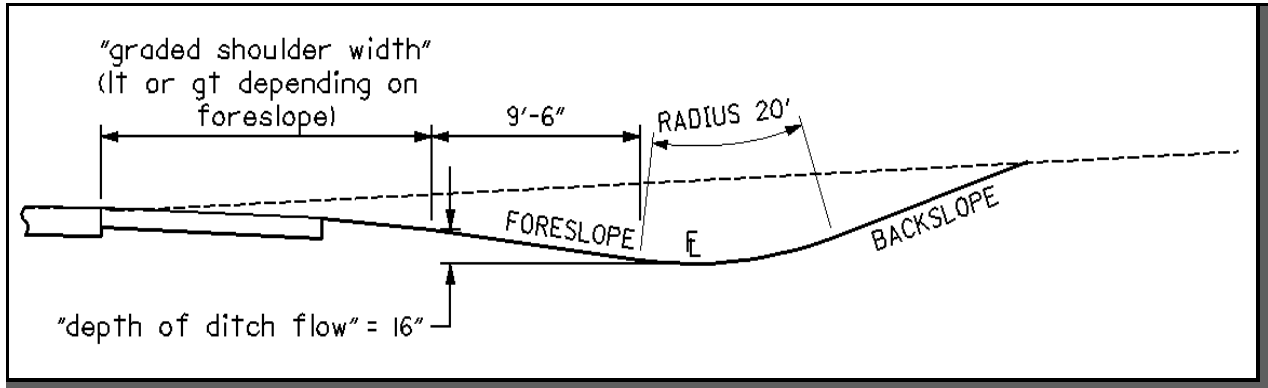
This variable sets the minimum depth of ditch flow below the edge of graded shoulder as shown below and in Figure 307-1E. The default value is 1.56 ft (18 <sup>3</sup>/<sub>4</sub>”).

Figure 39: Rural Interstate “depth of ditch flow” – “cut section type” = 0



## SS307-1.X – version 07.04.10

Figure 40: Urban Interstate, other Freeways and Expressways “depth of ditch flow” – “cut section type” = 1



### “recoverable ditch backslope1”

This variable defines the ditch backslope placed based on Figure 307-2E and Figure 6 for a recoverable ditch. See Figure 14 and the **Recoverable Ditch Backslope Placement** section on [page 12](#). The default value is 6. For example, if you require a slope of 2:1 keyin 2, 3 for 3:1, etc.

### “recoverable ditch backslope2”

This variable defines the ditch backslope placed based on Figure 307-2E and Figure 6 for a recoverable ditch. See Figure 15 and the **Recoverable Ditch Backslope Placement** section on [page 12](#). The default value is 4. For example, if you require a slope of 2:1 keyin 2, 3 for 3:1, etc.

### “recoverable ditch backslope3”

This variable defines the ditch backslope placed based on Figure 307-2E and Figure 6 for a recoverable ditch. See Figure 16 and the **Recoverable Ditch Backslope Placement** section on [page 12](#). The default value is 3. For example, if you require a slope of 2:1 keyin 2, 3 for 3:1, etc.

### “recoverable ditch backslope4”

This variable defines the ditch backslope placed based on Figure 307-2E and Figure 6 for a recoverable ditch. See Figure 17 and the **Recoverable Ditch Backslope Placement** section on [page 12](#). The default value is 2. For example, if you require a slope of 2:1 keyin 2, 3 for 3:1, etc.

### “recoverable ditch backslope5”

This variable defines the ditch backslope placed based on Figure 307-2E and Figure 6 for a recoverable ditch. See Figure 18 and the **Recoverable Ditch Backslope Placement** section on [page 12](#). The default value is 1. For example, if you require a slope of 2:1 keyin 2, 3 for 3:1, etc.

### “ditch depth”

This variable sets the minimum depth of ditch flow below existing ground on the ditch backslope side (see Figure 307-4E Normal Ditch Sections-Fill). See Figure 41 below for the usage of this variable. The default value is 1.5 ft.

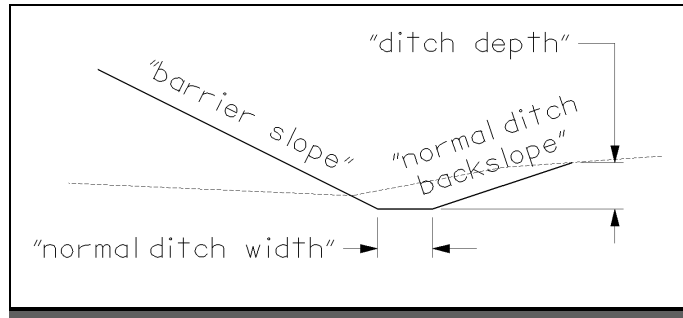
### “normal ditch backslope”

This variable defines the ditch backslope placed based on Figure 307-4E Normal Ditch Sections. This variable is used only during normal ditch placement. See Figure 41 below for the usage of this variable. Entered as single number. For example, if you require a slope of 2:1 keyin 2, 3 for 3:1, etc. The default value is 2 (for 2:1).

### “normal ditch width”

This variable defines the ditch width based on Figure 307-4E Normal Ditch Sections. See Figure 41 below for the usage of this variable. The default value is a width of 2 ft.

**Figure 41:** Normal Ditch Section



### Define\_DGN Variables

The following DEFINE\_DGN variables are used by the criteria to locate the MicroStation elements that SS307-1.X will search for in order to draw the side slopes.

These variables have been defined with the values listed below in accordance with ODOT's 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.

### “~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" \  
  lname = 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" \  
  lname = DR_P_Ditch \  
  wt = 1, ByLevel \  
  co = 11, ByLevel
```

### “~proposed graded shoulder in dgn”

The criteria will set the graded shoulder width automatically using the variables “**graded shoulder width lt**” or “**graded shoulder width gt**”. Occasionally, the graded shoulder will have a variable width. In this case, the designer has the option to draw the graded shoulder in the plan view design file. The criteria will look for a graphic graded shoulder line matching the symbology listed below. If a graded shoulder line is encountered, the criteria will ignore the value of the variables “**graded shoulder width lt**” and “**graded shoulder width gt**”.

```
define_dgn "~proposed graded shoulder in dgn" \  
  dgn = "proposed dgn file name" \  
  lname = DT_P_Graded_Shoulder \  
  wt = 1, ByLevel \  
  co = 9, ByLevel
```

### “~rock layer”

The criteria has the capability of placing grading with an existing rock layer. If rock layer is present in the cross section, the criteria file will place a slope of 1:1 (“**recoverable ditch backslope5**”) from the ditch bottom to the rock layer. At the rock layer, the criteria file will then place a slope of 2:1 (“**recoverable ditch backslope4**”) to the surface. This variable is used to define the symbology for the rock layer. The variable has been defined as follows:

```
define_dgn "~rock layer" \  
  dgn = "xs dgn file name" \  
  lname = GT_X_Rock_Outcrop \  
  co = 6, ByLevel \  
  wt = 1, 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 and shoulder criteria files in order for **SS307-1.X** to process correctly:

Edge of pavement	x1 y1
Edge of paved shoulder	x5 y5
Outside bottom of shoulder	x14 y14

**SS307-1.X** will store the following marked points during processing that should never be redefined by another criteria file:

Edge of graded shoulder	x10 y10
Inside edge of ditch	x33 y33



## SS307-1.X – version 07.04.10

Flowline of Ditch	x34 y34
Outside edge of ditch	x35 y35
Ditch backslope to existing ground	x36 y36
Proposed to existing ground	x37 y37
Construction limits	x40 y40
Depth of ditch flow	x525 y525

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 XS\_P\_Text\_MarkedPt.

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.

Cut or Shallow Fill section:

Ditch:

foreslope to ditch	x33 y33	backslope to ground	x36 y36
back of ditch	x35 y35	proposed to existing ground	x37 y37



Figure 42

No ditch (fill condition):

proposed to existing ground x37 y37

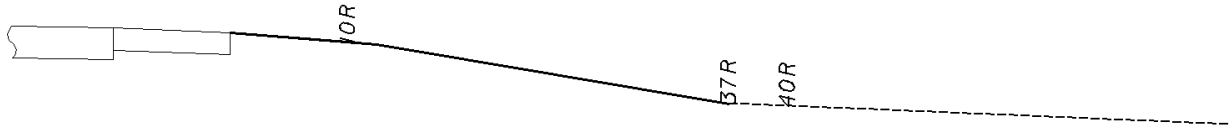


Figure 42

Cut Section:

Rock layer present:

foreslope to ditch	x33 y33	backslope to rock layer	x36 y36
back of ditch	x35 y35	proposed to existing ground	x37 y37

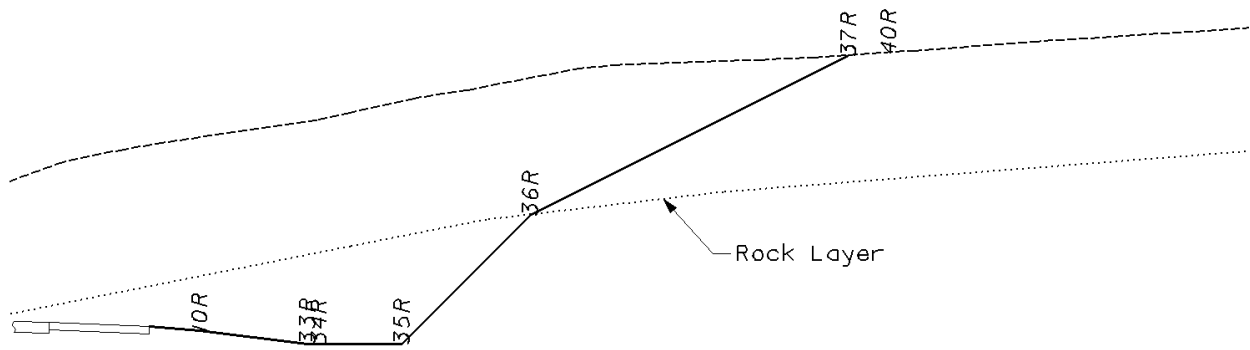


Figure 43

Medium Fill section:

Ditch:

foreslope to clear zone	x30 y30	backslope to ground	x36 y36
fill slope to ditch	x33 y33	proposed to existing ground	x37 y37
back of ditch	x35 y35		

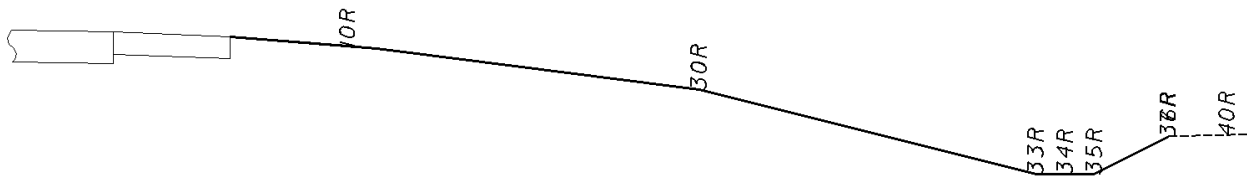


Figure 44

No ditch:  
 foreslope to clear zone x30 y30  
 proposed to existing ground x37 y37

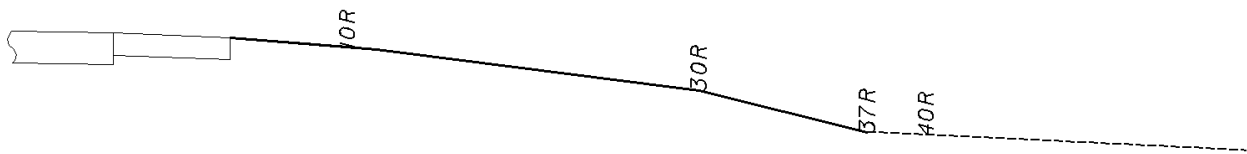


Figure 45

Barrier section:

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

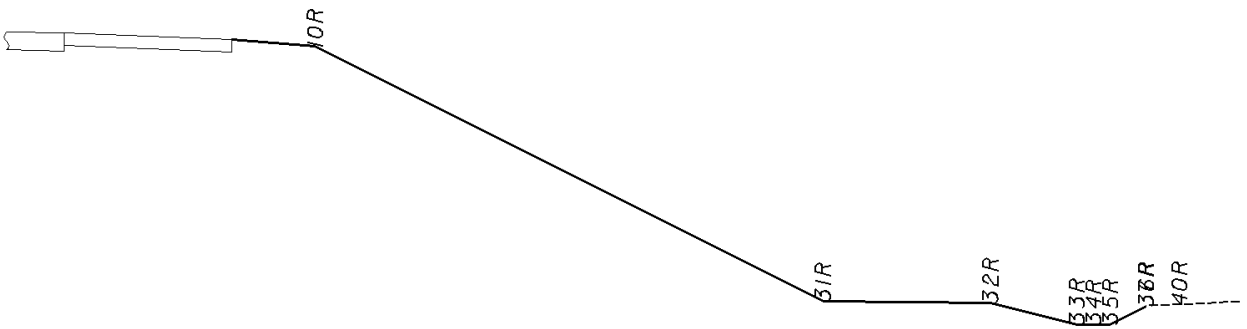


Figure 46

Ditch with no bench:  
 foreslope to ditch x33 y33 backslope to ground x36 y36  
 back of ditch x35 y35 proposed to existing ground x37 y37

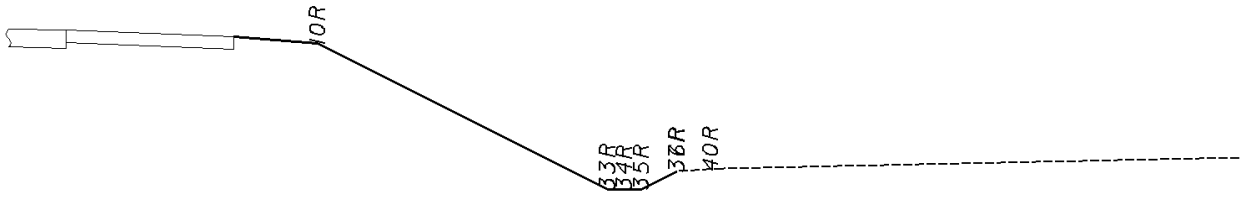


Figure 47

No ditch:  
proposed to existing ground x37 y37

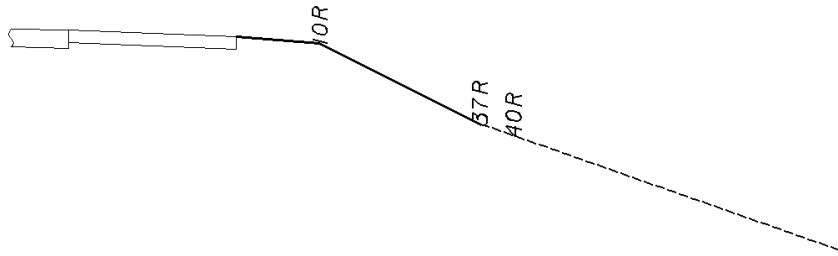


Figure 48