

*FLH Standard Criteria Files*

*Section 7 –*

*Paved Ditch Criteria Files*

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## *Paved Ditch Criteria Files*

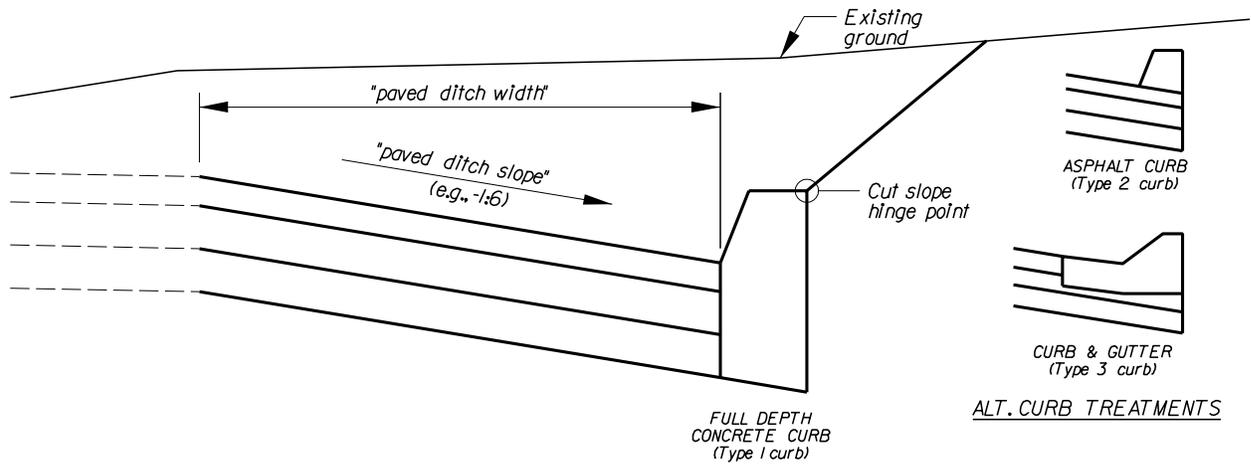
<b>Criteria File</b>	<b>Rules for Drawing Paved Ditch</b>
<b>fh_pavd1.x08</b>	Station range(s) for paved ditch set in exceptions data file. Fixed paved ditch width.
<b>fh_pavd2.x08</b>	Station range(s) for paved ditch set by "paved ditch in dgn" line in plan view dgn. Fixed paved ditch width.
<b>fh_pavd3.x08</b>	Station range(s) and paved ditch width set by "paved ditch in dgn"line in plan view dgn file.

Additional features that may be used with any of the paved ditch criteria files:

- Alternate curb/curb and gutter sections
- Fixed width bench behind paved ditch curb
- Fixed cut slopes
- Force paved ditch slope to match roadway slope on low side of super
- Typical excavation and backfill behind paved ditch curb.
- Special excavation and backfill behind paved ditch curb.

# *fh\_pavd1.x08*

Draws a fixed width paved ditch including base course, pavement, curb, and cut/fill slopes using station ranges specified in the exceptions data file.



***define variables that must be assigned values in the input data file:***

Required:

- "paved ditch width"
- "paved ditch slope" (rise:run, e.g., -1:6)
- "paved ditch curb type" (see Curb/Curb and Gutter Options)

Required when type 1 curb (full depth concrete curb) is used:

- "paved ditch curb height"
- "paved ditch curb top width"
- "paved ditch curb bottom width"

Required when type 2 curb (asphalt curb) is used:

- "paved ditch curb height"
- "paved ditch curb top width"
- "paved ditch curb bottom width"

Required when type 3 curb (concrete curb & gutter) is used:

- "pd c&g total width" (default = 0.60 m)
- "pd c&g gutter width" (default = 0.30 m)
- "pd c&g curb top width" (default = 0.10 m)
- "pd c&g curb inside height" (default = 0.15 m)
- "pd c&g curb outside height" (default = 0.30 m)
- "pd c&g gutter slope" (default = -1:8)
- "pd c&g gutter thickness" (default = 0.15)

Optional:

- "use variable paved ditch slope"
- "paved ditch bench width lt"
- "paved ditch bench width rt"
- "paved ditch fixed cut slope lt"
- "paved ditch fixed cut slope rt"
- "use paved ditch special excavation details"

## ***fh\_pavd1.x08***

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***define\_dgn variables that must be assigned values in the input data file:***

None

***Variables that must be defined in exceptions data file:***

*\_d\_draw\_paved\_ditch\_lt*

*\_d\_draw\_paved\_ditch\_rt*

***Notes for fh\_pavd1.x08:***

1. Station ranges for paved ditch are set in the exceptions data file. (Contrast this with fh\_pavd2.x08 and fh\_pavd3.x08 which use "paved ditch in dgn" line drawn in a plan view dgn file to specify the station ranges for paved ditch.)
2. The width of the paved ditch is a fixed value ("paved ditch width" defined in the input file). Contrast this with fh\_pavd3.x08 which allows for a variable width paved ditch.
3. The "first full length layer" variable determines whether all the base course and pavement layers are drawn for the paved ditch.
4. There are three different curb/curb and gutter options that the user can select from by using the define variable "paved ditch curb type" in the input file. (1 = full depth concrete curb, 2 = asphalt curb, 3 = curb and gutter) By default, the full depth concrete curb section shown above is used. See the Curb/Curb and Gutter Options section below for details. (Revised 8/9/00)
5. In order to maintain backward compatibility, "paved ditch curb type" may be set to 0 to use the old-style method for picking which type of curb/curb and gutter to use. For this case the various combinations of the variables "use pd curb and gutter" and "paved ditch curb full depth" control curb type selected. ("use pd curb and gutter" = 1 plus "paved ditch curb full depth" = anything results in curb and gutter; "use pd curb and gutter" = 0 plus "paved ditch curb full depth" = 1 results in full depth curb; "use pd curb and gutter" = 0 plus "paved ditch curb full depth" = 0 results in asphalt curb.) (Revised 8/9/00)
6. The user has the option to force the slope for paved ditch sections on the low side of super and in normal crown to match the roadway cross-slope setting the define variable "use variable slope paved ditch" to 1 in the input file. By default this option is turned off. See the Variable Paved Ditch Slope Options section below for details.
7. An optional fixed width bench can be drawn behind the paved ditch curb by setting the variables "paved ditch bench width lt" and/or "paved ditch bench width rt" to the desired bench width. This option works only if (1) the old style special excavation details are not used, and (2) the top of curb is below existing ground. By default both of these variables are set to 0 (i.e., no bench is drawn). (Added 8/9/00)
8. An option to force all the cut slopes behind the paved ditch curb to a fixed value can be activated by setting the variables "paved ditch fixed cut slope lt" and/or "paved ditch fixed cut slope rt" to the desired RISE:RUN slope ratio (e.g., 1:2). This option works only if (1) the old style special excavation details are not used, and (2) the top of curb is below existing ground. By default both

of these variables are toggled off (i.e., "normal" slope selection procedure is used to determine the cut slope ratio). (Added 8/9/00)

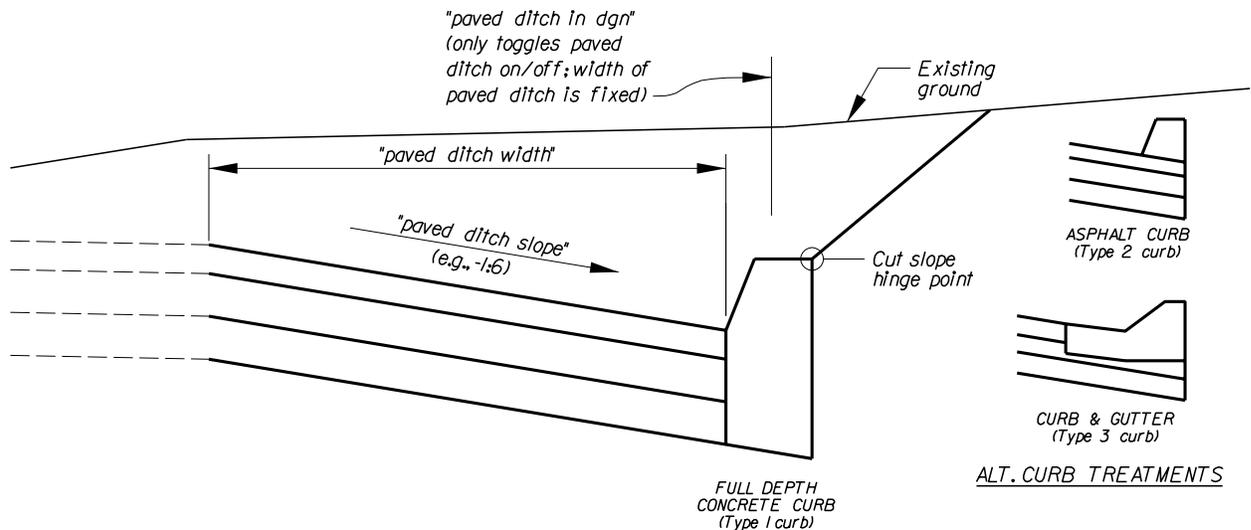
9. The lines representing the back face of curb/curb & gutter and the line tying off the outside of the pavement undercut layers are tilted slightly outward from vertical to work around a continuing bug in the slope stake report procedure. The hidden variable "*~near vertical tilt factor*" is used in the criteria to set the amount of "tilt". The variable is the RISE portion of the RISE:1 slope of the lines. A value of 500 is used by default and should be OK when the MU:SU:PU are 1:1000:10 in the x-section file; this value may be too high if the resolution of the x-section file is lower. (Revised 8/9/00)
10. The slope label for the paved ditch may be toggled off by setting the hidden variable "*~place paved ditch slope labels*" equal to 0 in the input file. The slope label will be placed by default if the variable is not defined in the input file. The size of the slope label text is set by the "*text size*" variable (which controls the text size for all the various slope labels drawn by all the standard criteria files). (Revised 8/9/00)
11. Text is placed at hinge points and catches to allow red/blue top report to be used to create xyz format slope stake reports. (Added 8/9/00)
  - "HPC" at hinge point for cuts
  - "HPF" at hinge point for fills
  - "SSC" at slope stake for cuts
  - "SSF" at slope stake for fills
12. Previous versions of the paved ditch criteria files have allowed the designer to draw fairly detailed excavation and backfill behind the paved ditch curb (referred to hereafter as special excavation/backfill details). Use of these special excavation/backfill features discouraged. A simpler method (referred to hereafter as typical excavation/backfill details) is the preferred method. (See "Design Consistency and Guidance" memo from Haussler and Hirsbrunner.)
13. Despite the fact that the use of the special excavation details is discouraged, they are still available to the designer in order to maintain backward compatibility with older versions of the paved ditch criteria files. The special excavation/backfill details can be activated by defining the "*use paved ditch special excavation details*" to be 1 in the input file. This will cause the paved ditch criteria to behave identically to previous versions. (Revised 8/9/00)
14. When special excavation details are used (see note above), level/symbology of the backfill area behind the curb is set up to allow the earthwork procedure to calculate a separate quantity for paved ditch curb backfill. (Earthwork will not be calculated correctly if the special excavation lines behind the curb are made coincident with the back face of the curb by setting "*paved ditch spec exc width*" to 0 and "*paved ditch spec exc slope*" to 1000:1.)
15. There are several optional variables that can be used to control how the special excavation and backfill behind the paved ditch curb is drawn. All these variables have been assigned reasonable default values. In general, these variables should not be defined in the input file unless the user wishes to override the default values. See the Special Excavation and Backfill section below for

details.

16. By default the cut/fill slopes drawn by this criteria behind the paved ditch curb are labeled with the RISE:RUN slope value. The size of this text is set using the "text size" variable in the input file. If the cut/fill slopes labels aren't needed, they maybe toggled off by setting the "*~place cut/fill slope labels*" variable to 0 in the input file.

# *fh\_pavd2.x08*

Draws a fixed width paved ditch including base course, pavement, curb, and cut/fill slopes using a line drawn in a plan view dgn file to locate station ranges where paved ditch is used.



***define variables that must be assigned values in the input data file:***

Required:

"paved ditch width"

"paved ditch slope" (rise:run, e.g., -1:6)

"paved ditch curb type" (see Curb/Curb and Gutter Options)

Required when type 1 curb (full depth concrete curb) is used:

"paved ditch curb height"

"paved ditch curb top width"

"paved ditch curb bottom width"

Required when type 2 curb (asphalt curb) is used:

"paved ditch curb height"

"paved ditch curb top width"

"paved ditch curb bottom width"

Required when type 3 curb (concrete curb & gutter) is used:

"pd c&g total width" (default = 0.60 m)

"pd c&g gutter width" (default = 0.30 m)

"pd c&g curb top width" (default = 0.10 m)

"pd c&g curb inside height" (default = 0.15 m)

"pd c&g curb outside height" (default = 0.30 m)

"pd c&g gutter slope" (default = -1:8)

"pd c&g gutter thickness" (default = 0.15)

Optional:

"use variable paved ditch slope"

"paved ditch bench width lt"

"paved ditch bench width rt"

"paved ditch fixed cut slope lt"

## *fh\_pavd2.x08*

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"paved ditch fixed cut slope rt"  
"use paved ditch special excavation details"

### *define\_dgn variables that must be assigned values in the input data file:*

"paved ditch in dgn"

### *Variables that must be defined in exceptions data file:*

None

### *Notes for fh\_pavd2.x08:*

1. Station ranges for paved ditch are set by "*paved ditch in dgn*" line drawn in a plan view dgn file. (Contrast this with fh\_pavd1.x08 which uses the exceptions data file to specify the station ranges for paved ditch.)
2. The width of the paved ditch is a fixed value ("*paved ditch width*" defined in the input file). Contrast this with fh\_pavd3.x08 which allows for a variable width paved ditch.
3. The "*first full length layer*" variable determines whether all the base course and pavement layers are drawn for the paved ditch.
4. There are three different curb/curb and gutter options that the user can select from by using the define variable "*paved ditch curb type*" in the input file. (1 = full depth concrete curb, 2 = asphalt curb, 3 = curb and gutter) By default, the full depth concrete curb section shown above is used. See the Curb/Curb and Gutter Options section below for details. (Revised 8/9/00)
5. In order to maintain backward compatibility, "*paved ditch curb type*" may be set to 0 to use the old-style method for picking which type of curb/curb and gutter to use. For this case the various combinations of the variables "*use pd curb and gutter*" and "*paved ditch curb full depth*" control curb type selected. ("*use pd curb and gutter*" = 1 plus "*paved ditch curb full depth*" = anything results in curb and gutter; "*use pd curb and gutter*" = 0 plus "*paved ditch curb full depth*" = 1 results in full depth curb; "*use pd curb and gutter*" = 0 plus "*paved ditch curb full depth*" = 0 results in asphalt curb.) (Revised 8/9/00)
6. The user has the option to force the slope for paved ditch sections on the low side of super and in normal crown to match the roadway cross-slope setting the define variable "*use variable slope paved ditch*" to 1 in the input file. By default this option is turned off. See the Variable Paved Ditch Slope Options section below for details.
7. An optional fixed width bench can be drawn behind the paved ditch curb by setting the variables "*paved ditch bench width lt*" and/or "*paved ditch bench width rt*" to the desired bench width. This option works only if (1) the old style special excavation details are not used, and (2) the top of curb is below existing ground. By default both of these variables are set to 0 (i.e., no bench is drawn). (Added 8/9/00)
8. An option to force all the cut slopes behind the paved ditch curb to a fixed value can be activated by setting the variables "*paved ditch fixed cut slope lt*" and/or "*paved ditch fixed cut slope rt*" to

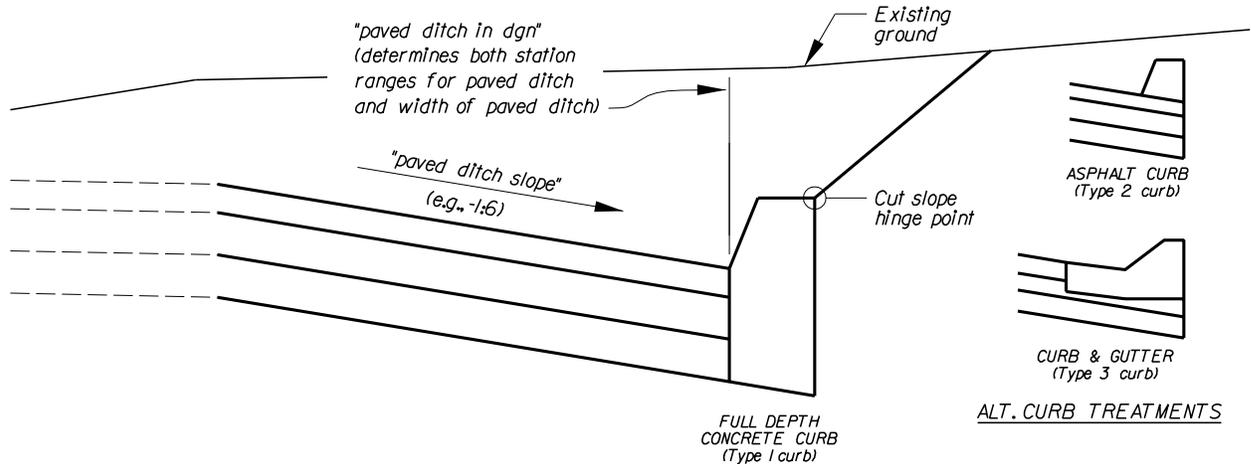
the desired RISE:RUN slope ratio (e.g., 1:2). This option works only if (1) the old style special excavation details are not used, and (2) the top of curb is below existing ground. By default both of these variables are toggled off (i.e., "normal" slope selection procedure is used to determine the cut slope ratio). (Added 8/9/00)

9. The lines representing the back face of curb/curb & gutter and the line tying off the outside of the pavement undercut layers are tilted slightly outward from vertical to work around a continuing bug in the slope stake report procedure. The hidden variable "*~near vertical tilt factor*" is used in the criteria to set the amount of "tilt". The variable is the RISE portion of the RISE:1 slope of the lines. A value of 500 is used by default and should be OK when the MU:SU:PU are 1:1000:10 in the x-section file; this value may be too high if the resolution of the x-section file is lower. (Revised 8/9/00)
10. The slope label for the paved ditch may be toggled off by setting the hidden variable "*~place paved ditch slope labels*" equal to 0 in the input file. The slope label will be placed by default if the variable is not defined in the input file. The size of the slope label text is set by the "*text size*" variable (which controls the text size for all the various slope labels drawn by all the standard criteria files). (Revised 8/9/00)
11. Text is placed at hinge points and catches to allow red/blue top report to be used to create xyz format slope stake reports. (Added 8/9/00)
  - "HPC" at hinge point for cuts
  - "HPF" at hinge point for fills
  - "SSC" at slope stake for cuts
  - "SSF" at slope stake for fills
12. Previous versions of the paved ditch criteria files have allowed the designer to draw fairly detailed excavation and backfill behind the paved ditch curb (referred to hereafter as special excavation/backfill details). Use of these special excavation/backfill features discouraged. A simpler method (referred to hereafter as typical excavation/backfill details) is the preferred method. (See "Design Consistency and Guidance" memo from Haussler and Hirsbrunner.)
13. Despite the fact that the use of the special excavation details is discouraged, they are still available to the designer in order to maintain backward compatibility with older versions of the paved ditch criteria files. The special excavation/backfill details can be activated by defining the "*use paved ditch special excavation details*" to be 1 in the input file. This will cause the paved ditch criteria to behave identically to previous versions. (Revised 8/9/00)
14. When special excavation details are used (see note above), level/symbology of the backfill area behind the curb is set up to allow the earthwork procedure to calculate a separate quantity for paved ditch curb backfill. (Earthwork will not be calculated correctly if the special excavation lines behind the curb are made coincident with the back face of the curb by setting "*paved ditch spec exc width*" to 0 and "*paved ditch spec exc slope*" to 1000:1.)
15. There are several optional variables that can be used to control how the special excavation and backfill behind the paved ditch curb is drawn. All these variables have been assigned reasonable

default values. In general, these variables should not be defined in the input file unless the user wishes to override the default values. See the Special Excavation and Backfill section below for details.

16. By default the cut/fill slopes drawn by this criteria behind the paved ditch curb are labeled with the RISE:RUN slope value. The size of this text is set using the "text size" variable in the input file. If the cut/fill slopes labels aren't needed, they maybe toggled off by setting the "*~place cut/fill slope labels*" variable to 0 in the input file.

Draws a variable width paved ditch including base course, pavement, curb, and cut/fill slopes using a line drawn in a plan view dgn file to locate station ranges where paved ditch is used and to define the width of the paved ditch.



***define variables that must be assigned values in the input data file:***

Required:

"paved ditch slope" (rise:run, e.g., -1:6)

"paved ditch curb type" (see Curb/Curb and Gutter Options)

Required when type 1 curb (full depth concrete curb) is used:

"paved ditch curb height"

"paved ditch curb top width"

"paved ditch curb bottom width"

Required when type 2 curb (asphalt curb) is used:

"paved ditch curb height"

"paved ditch curb top width"

"paved ditch curb bottom width"

Required when type 3 curb (concrete curb & gutter) is used:

"pd c&g total width" (default = 0.60 m)

"pd c&g gutter width" (default = 0.30 m)

"pd c&g curb top width" (default = 0.10 m)

"pd c&g curb inside height" (default = 0.15 m)

"pd c&g curb outside height" (default = 0.30 m)

"pd c&g gutter slope" (default = -1:8)

"pd c&g gutter thickness" (default = 0.15)

Optional:

"use variable paved ditch slope"

"paved ditch bench width lt"

"paved ditch bench width rt"

"paved ditch fixed cut slope lt"

"paved ditch fixed cut slope rt"

"use paved ditch special excavation details"

## *fh\_pavd3.x08*

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### *define\_dgn variables that must be assigned values in the input data file:*

"paved ditch in dgn"

### *Variables that must be defined in exceptions data file:*

None

### *Notes for fh\_pavd3.x08:*

1. Station ranges for paved ditch are set by "*paved ditch in dgn*" line drawn in a plan view dgn file. (Contrast this with fh\_pavd1.x08 which uses the exceptions data file to specify the station ranges for paved ditch.)
2. The width of the paved ditch is by "*paved ditch in dgn*" line drawn in a plan view dgn file. (Contrast this with fh\_pavd1.x08 and fh\_pavd2.x08 which both use a fixed width for the paved ditch.)
3. The "*first full length layer*" variable determines whether all the base course and pavement layers are drawn for the paved ditch.
4. There are three different curb/curb and gutter options that the user can select from by using the define variable "*paved ditch curb type*" in the input file. (1 = full depth concrete curb, 2 = asphalt curb, 3 = curb and gutter) By default, the full depth concrete curb section shown above is used. See the Curb/Curb and Gutter Options section below for details. (Revised 8/9/00)
5. In order to maintain backward compatibility, "*paved ditch curb type*" may be set to 0 to use the old-style method for picking which type of curb/curb and gutter to use. For this case the various combinations of the variables "*use pd curb and gutter*" and "*paved ditch curb full depth*" control curb type selected. ("*use pd curb and gutter*" = 1 plus "*paved ditch curb full depth*" = anything results in curb and gutter; "*use pd curb and gutter*" = 0 plus "*paved ditch curb full depth*" = 1 results in full depth curb; "*use pd curb and gutter*" = 0 plus "*paved ditch curb full depth*" = 0 results in asphalt curb.) (Revised 8/9/00)
6. The user has the option to force the slope for paved ditch sections on the low side of super and in normal crown to match the roadway cross-slope setting the define variable "*use variable slope paved ditch*" to 1 in the input file. By default this option is turned off. See the Variable Paved Ditch Slope Options section below for details.
7. An optional fixed width bench can be drawn behind the paved ditch curb by setting the variables "*paved ditch bench width lt*" and/or "*paved ditch bench width rt*" to the desired bench width. This option works only if (1) the old style special excavation details are not used, and (2) the top of curb is below existing ground. By default both of these variables are set to 0 (i.e., no bench is drawn). (Added 8/9/00)
8. An option to force all the cut slopes behind the paved ditch curb to a fixed value can be activated by setting the variables "*paved ditch fixed cut slope lt*" and/or "*paved ditch fixed cut slope rt*" to the desired RISE:RUN slope ratio (e.g., 1:2). This option works only if (1) the old style special excavation details are not used, and (2) the top of curb is below existing ground. By default both

of these variables are toggled off (i.e., "normal" slope selection procedure is used to determine the cut slope ratio). (Added 8/9/00)

9. The lines representing the back face of curb/curb & gutter and the line tying off the outside of the pavement undercut layers are tilted slightly outward from vertical to work around a continuing bug in the slope stake report procedure. The hidden variable "*~near vertical tilt factor*" is used in the criteria to set the amount of "tilt". The variable is the RISE portion of the RISE:1 slope of the lines. A value of 500 is used by default and should be OK when the MU:SU:PU are 1:1000:10 in the x-section file; this value may be too high if the resolution of the x-section file is lower. (Revised 8/9/00)
10. The slope label for the paved ditch may be toggled off by setting the hidden variable "*~place paved ditch slope labels*" equal to 0 in the input file. The slope label will be placed by default if the variable is not defined in the input file. The size of the slope label text is set by the "*text size*" variable (which controls the text size for all the various slope labels drawn by all the standard criteria files). (Revised 8/9/00)
11. Text is placed at hinge points and catches to allow red/blue top report to be used to create xyz format slope stake reports. (Added 8/9/00)
  - "HPC" at hinge point for cuts
  - "HPF" at hinge point for fills
  - "SSC" at slope stake for cuts
  - "SSF" at slope stake for fills
12. Previous versions of the paved ditch criteria files have allowed the designer to draw fairly detailed excavation and backfill behind the paved ditch curb (referred to hereafter as special excavation/backfill details). Use of these special excavation/backfill features discouraged. A simpler method (referred to hereafter as typical excavation/backfill details) is the preferred method. (See "Design Consistency and Guidance" memo from Haussler and Hirsbrunner.)
13. Despite the fact that the use of the special excavation details is discouraged, they are still available to the designer in order to maintain backward compatibility with older versions of the paved ditch criteria files. The special excavation/backfill details can be activated by defining the "*use paved ditch special excavation details*" to be 1 in the input file. This will cause the paved ditch criteria to behave identically to previous versions. (Revised 8/9/00)
14. When special excavation details are used (see note above), level/symbology of the backfill area behind the curb is set up to allow the earthwork procedure to calculate a separate quantity for paved ditch curb backfill. (Earthwork will not be calculated correctly if the special excavation lines behind the curb are made coincident with the back face of the curb by setting "*paved ditch spec exc width*" to 0 and "*paved ditch spec exc slope*" to 1000:1.)
15. There are several optional variables that can be used to control how the special excavation and backfill behind the paved ditch curb is drawn. All these variables have been assigned reasonable default values. In general, these variables should not be defined in the input file unless the user wishes to override the default values. See the Special Excavation and Backfill section below for

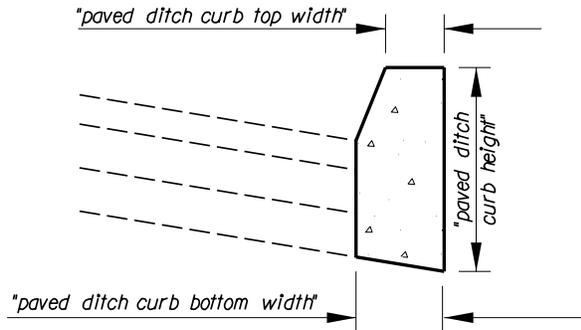
details.

16. By default the cut/fill slopes drawn by this criteria behind the paved ditch curb are labeled with the RISE:RUN slope value. The size of this text is set using the "text size" variable in the input file. If the cut/fill slopes labels aren't needed, they maybe toggled off by setting the "*~place cut/fill slope labels*" variable to 0 in the input file.

# Curb/Curb & Gutter Options for Paved Ditch

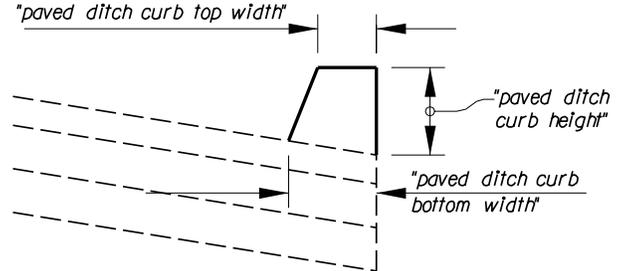
Use the variable "paved ditch curb type" in the input file to select the curb/curb and gutter type:

- 1 = full depth concrete curb (default)
- 2 = asphalt curb
- 3 = concrete curb and gutter



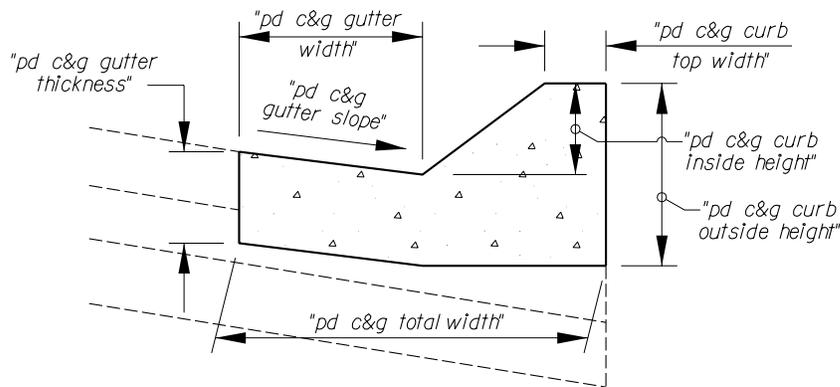
**FULL DEPTH CONCRETE CURB**

define "paved ditch curb type" 1  
 (This curb alternate is the default)



**ASPHALT CURB**

define "paved ditch curb type" 2



**CONCRETE CURB AND GUTTER**

define "paved ditch curb type" 3  
 (default dimensions from M609-50)

In order to maintain backward compatibility with previous versions of the paved ditch criteria files, "paved ditch curb type" may be set to 0 to enable the old-style method for choosing curb type. For this case the various combinations of the variables "use pd curb and gutter" and "paved ditch curb full depth" control curb type.

## define "paved ditch curb type" 0

"use pd curb and gutter"	"paved ditch curb full depth"	Curb type
0	1	Full depth concrete curb
0	0	Asphalt curb
1	anything	Curb and gutter

## ***Curb/Curb & Gutter Options for Paved Ditch***

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***define "paved ditch curb type" 1*** or

***define "paved ditch curb type" 2***

The following define variables are used to set the dimensions for both full depth concrete curb and asphalt curb. The figures above show how these variables control the shape of the curb section. Notice that "paved ditch curb height" has a slightly different meaning for the two types of curb.

"paved ditch curb height"

"paved ditch curb top width"

"paved ditch curb bottom width"

If curb and gutter is being used for the paved ditch, then none of the above variables should be defined in the input file.

***define "paved ditch curb type" 3***

The following define variables are used to set the dimensions for curb and gutter sections. The figures above show how these variables control the shape of the curb and gutter section.

"pd c&g total width" (default = 0.600)

"pd c&g gutter width" (default = 0.300)

"pd c&g curb top width" (default = 0.100)

"pd c&g curb inside height" (default = 0.150)

"pd c&g curb outside height" (default = 0.300)

"pd c&g gutter slope" (default = -1:8)

"pd c&g gutter thickness" (default = 0.150)

The default values shown above for the curb and gutter dimensions are taken from the CFL standard detail drawing M609-50. The user should put define statements for these variables in the input file only if curb and gutter is being called for and the default dimensions aren't acceptable. Also, if curb and gutter is not being used, then none of these variables should be defined in the input file.

## *Variable Slope Options for Paved Ditch*

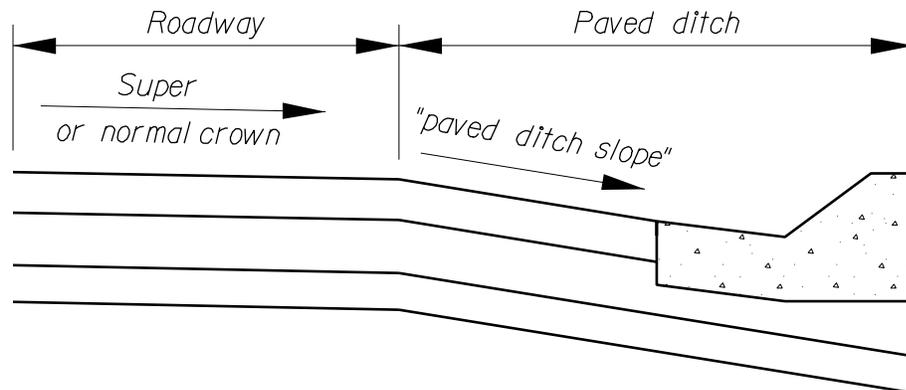
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By default the slope of paved ditch sections is fixed as the value specified with the "paved ditch slope" variable in the input file. The user can force the slope of paved ditch sections at the low side of super and normal crown to vary to match the roadway cross-slope (rather than the fixed "paved ditch slope") by setting the define variable "use variable paved ditch slope" to 1 in the input file. This variable is toggled off by default, and if the user doesn't want this option then the "use variable paved ditch slope" variable shouldn't be in the input file.

See the examples below for clarification of how setting "use variable paved ditch slope" affects paved ditch sections.

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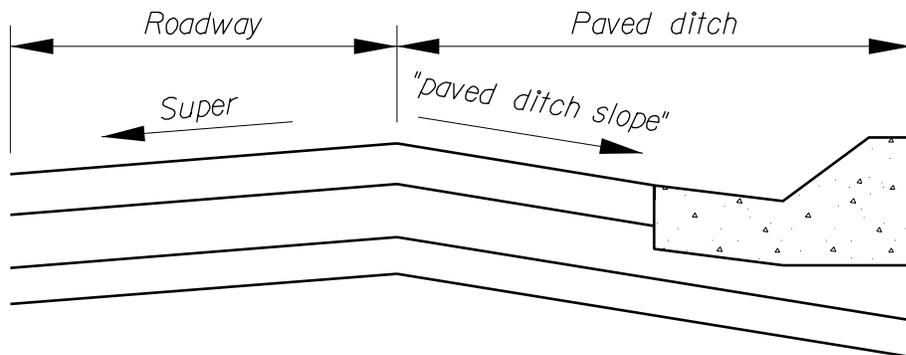
Example of paved ditch on low side of super with "use variable paved ditch slope" not defined in input file. Notice that paved ditch slope is the fixed "paved ditch slope" value.



*Normal crown or supered toward paved ditch*

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Example of paved ditch on low side of super with "use variable paved ditch slope" set to 1 in input file. Notice that paved ditch slope matches the roadway cross-slope.

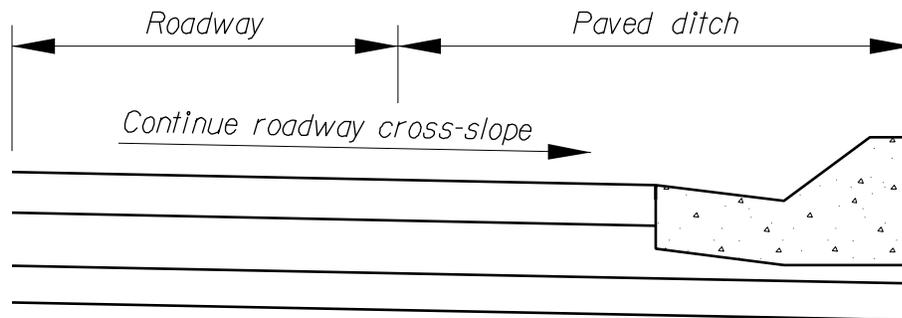


*Supered away from paved ditch*

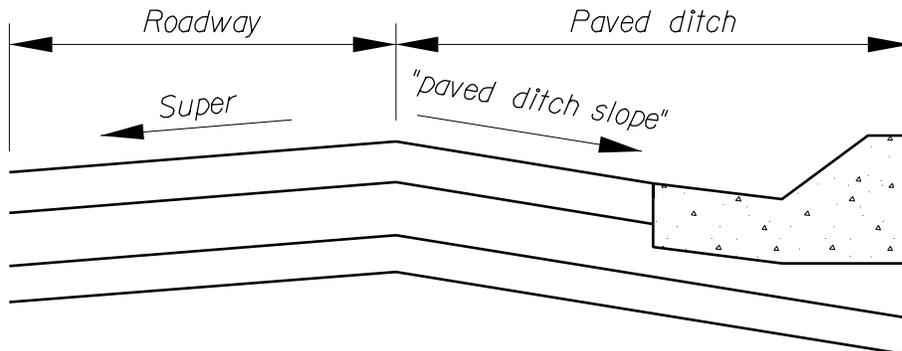
## *Variable Slope Options for Paved Ditch*

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Example of paved ditch slope on high side of super regardless of whether "use variable paved ditch slope" is used. The slope of the paved ditch on the high side of super will always be the fixed "paved ditch slope" value.



*Normal crown or supered toward paved ditch*



*Supered away from paved ditch*

## ***Typical Excavation/Backfill Details for Paved Ditch***

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For most cases, the designer should use the typical excavation and backfill details as shown below. These details are based on the guidelines outlined in the "Design Consistency and Guidance" memo from Terry Haussler and Heidi Hirsbrunner:

1. Use the top, outside corner of the curb as the hinge point.
2. Do not show on x-sections or calculate quantities for any special "construction" excavation behind the neat line of the curb.
3. Do not calculate separate quantities for curb backfill.

Previous versions of the paved ditch criteria files have allowed the designer to draw fairly detailed special excavation and backfill behind the paved ditch curb and to calculate curb backfill quantities. Use of these special excavation/backfill features is discouraged, however they remain in the criteria files for backwards compatibility. See the Special Excavation and Backfill section below for details on how to invoke these features.

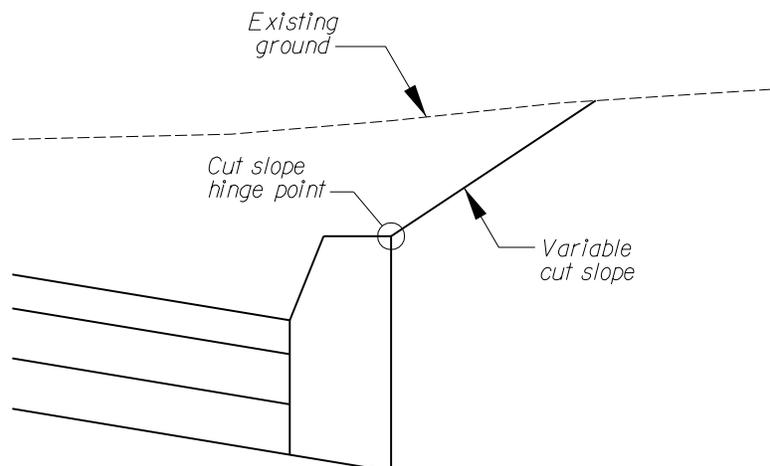
There are several variables that the user may optionally use to control how the excavation and backfill behind the paved ditch curb is drawn. In general, the default values for these variables are reasonable. If the default values are acceptable then there is no point in defining these variables in the input file. If some (or all) of the defaults aren't acceptable, then the designer should define those variables in the input file.

- "paved ditch bench width lt" (default is 0, no bench drawn)
- "paved ditch bench width rt" (default is 0, no bench drawn)
- "paved ditch bench fixed cut slope lt" (RISE:RUN value; default is 0, use normal slope selection)
- "paved ditch bench fixed cut slope rt" (RISE:RUN value; default is 0, use normal slope selection)
- "paved ditch curb backfill max width" (default = 2.00)
- "paved ditch curb backfill slope" (default = 1:20)
- "paved ditch curb embank top width" (default = 0.30)
- "paved ditch curb embank slope" (default = -1:2)

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Example showing preferred detail for hinge point location for cut situations.

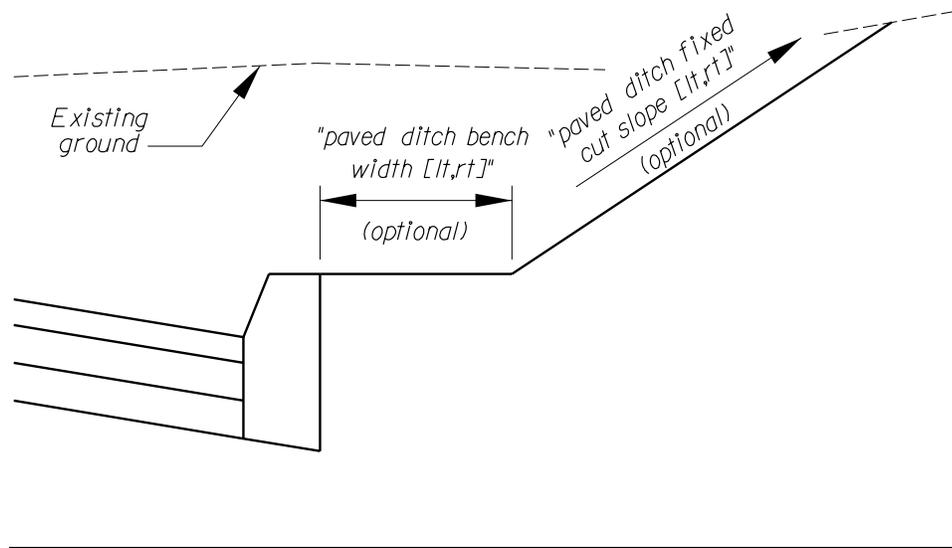
Use the neat line of curb as limit of excavation rather than using the special excavation options to draw additional construction excavation and backfill.



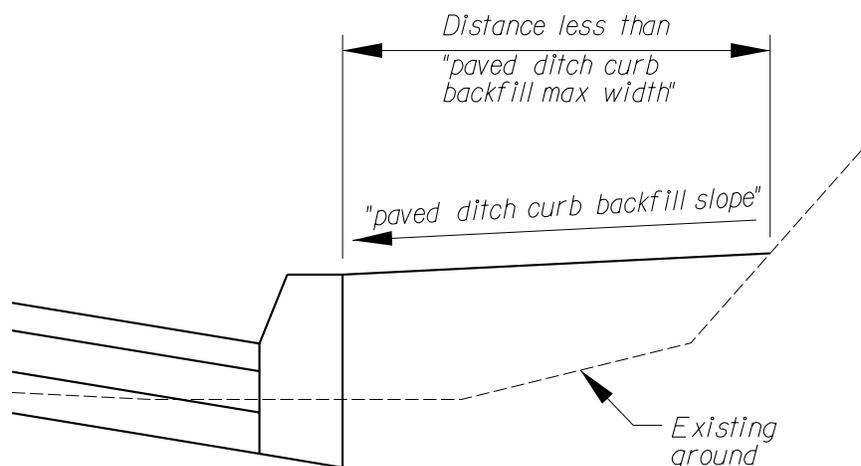
## ***Typical Excavation/Backfill Details for Paved Ditch***

Example showing optional paved ditch bench and optional fixed cut slope. By default both of these options are turned off.

To toggle either or both options on, define the "paved ditch bench width *lt*", "paved ditch bench width *rt*", "paved ditch fixed cut slope *lt*", and/or "paved ditch fixed cut slope *rt*" to the desired value(s) in the proposed cross section input file. (If "paved ditch fixed cut slope [*lt,rt*]" is used, it should be defined as a RISE:RUN value, e.g., 1:2.)



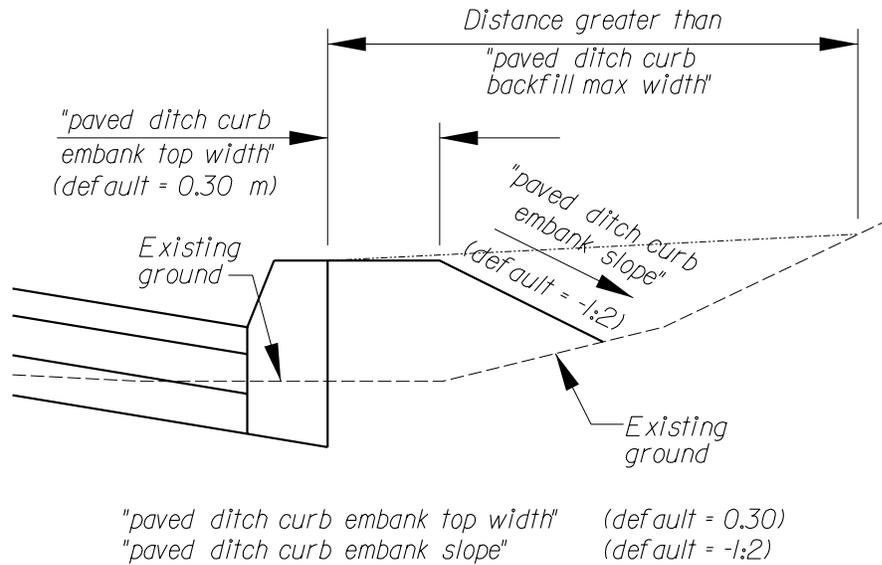
Example showing how "paved ditch curb backfill max width" can be used to force in-sloping backfill for fill situations where existing ground is sloping up and away from the roadway. If backfill slope catches within the "paved ditch curb backfill max width" (default is 2.00) then in-sloping backfill is drawn as shown. Otherwise an embankment is drawn behind the curb as shown in the next example. Define "paved ditch curb backfill slope" in the input file as a RISE:RUN value (default is 1:20).



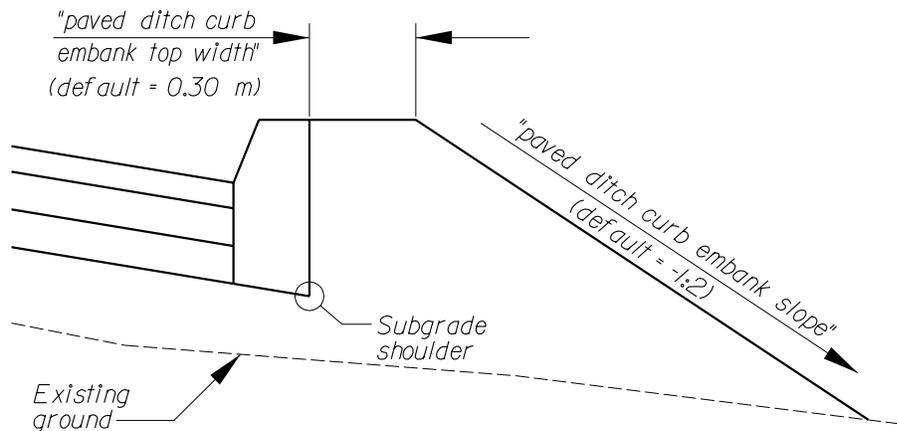
"paved ditch curb backfill max width" (default = 1.50)  
"paved ditch curb backfill slope" (default = 1:20)

# Typical Excavation/Backfill Details for Paved Ditch

Example showing what is drawn for a fill situation where the "paved ditch curb backfill slope" (default = 1:20) doesn't catch existing ground within the "paved ditch curb backfill max width" distance (default = 2.00).



Example showing how the paved ditch criteria files handle an extreme fill condition.



## ***Special Excavation/Backfill Details for Paved Ditch***

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Previous versions of the paved ditch criteria files have allowed the designer to draw fairly detailed special excavation and backfill behind the paved ditch curb and to calculate curb backfill quantities. **Use of these special excavation/backfill features is discouraged.** (See "Design Consistency and Guidance" memo for explanation. See Typical Excavation and Backfill Details section above for the preferred alternative.) However, to maintain backward compatibility with older versions of the paved ditch criteria files, the special excavation/backfill details shown below can be activated by defining the "use paved ditch special excavation details" to be 1 in the input file.

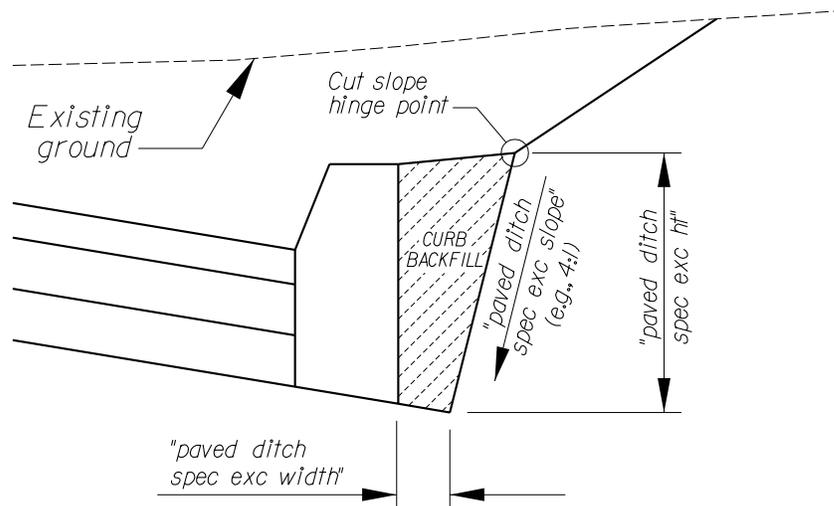
The following variables are used to control how the excavation and backfill behind the paved ditch is drawn. **They have been assigned reasonable default values. In general, these variables should not be defined in the input file unless the user wishes to override the default values for a specific situation.**

"use paved ditch special excavation details" 1  
"paved ditch spec exc width"  
"paved ditch spec exc ht"  
"paved ditch spec exc slope" (e.g., 4:1)  
"paved ditch curb backfill max slope" (default = 1:2)  
"paved ditch curb backfill max width" (default = 1..50)  
"use spec exc ht" (default = 1)  
"paved ditch curb backfill slope" (default = 1:20)  
"paved ditch curb embank top width" (default = 0.30)  
"paved ditch curb embank slope" (default = -1:2)

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Example showing special excavation/backfill for any of the paved ditch criteria files.

(Note: Use of these special excavation/backfill details is discouraged. See Typical Excavation/Backfill Details section above for preferred alternative.)



*PAVED DITCH WITH OPTIONAL SPECIAL EXCAVATION*

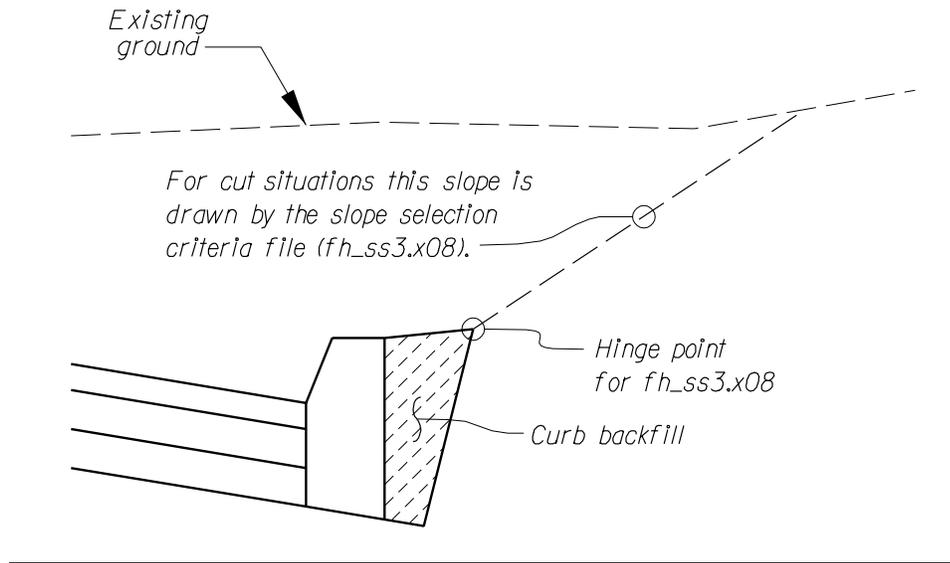
*Toggle on with "use paved ditch special excavation details" in input file*

## *Special Excavation/Backfill Details for Paved Ditch*

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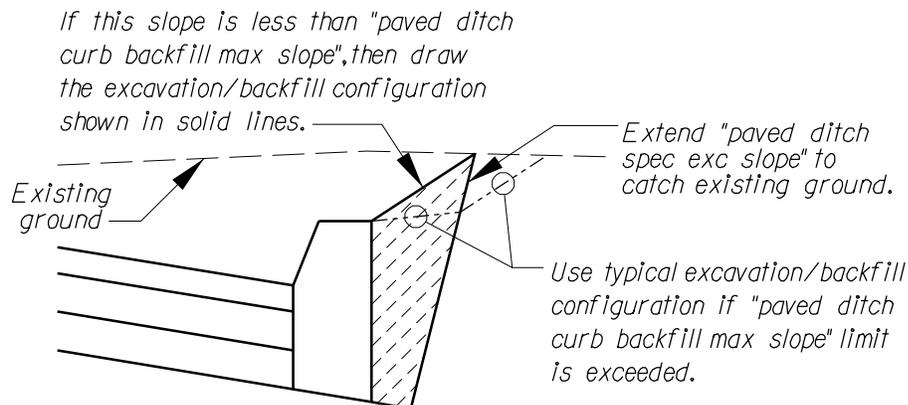
Example showing special excavation/backfill for any of the paved ditch criteria files.

(Note: Use of these special excavation/backfill details is discouraged. See Typical Excavation/Backfill Details section above for preferred alternative.)



Example showing how "paved ditch curb backfill max slope" can be used to force the special excavation behind the curb to daylight rather than creating a shallow compound cut slope.

(Note: Use of these special excavation/backfill details is discouraged. See Typical Excavation/Backfill Details section above for preferred alternative.)



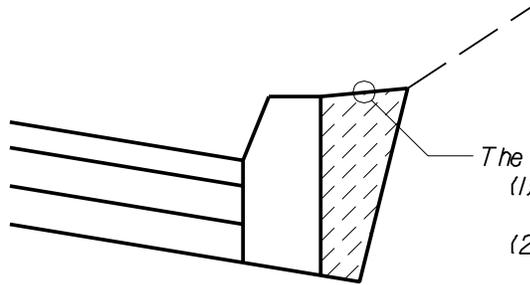
## *Special Excavation/Backfill Details for Paved Ditch*

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Example showing the two methods for setting the curb backfill slope:

1. indirectly, by setting "use spec exc ht" to 1 and thereby allowing "paved ditch special exc ht" to control the slope (the default), or
2. directly, by setting "use spec exc ht" to 0 which fixes the backfill slope at "paved ditch curb backfill slope" and forces the special excavation height behind the curb to vary as necessary.

(Note: Use of these special excavation/backfill details is discouraged. See Typical Excavation/Backfill Details section above for preferred alternative.)

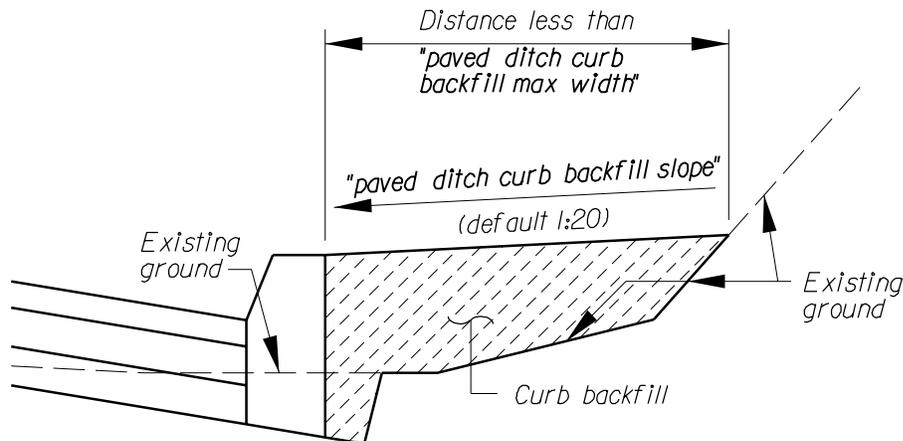


"use spec exc ht" (default = 1)  
"paved ditch curb backfill slope"

The slope for the curb backfill can be set in either of two ways:  
(1) By default the slope of the curb backfill is set indirectly by defining "paved ditch spec exc ht" in the input file.  
(2) Alternatively, the user can set the curb backfill slope directly by defining "use spec exc ht" to be 0 and "paved ditch curb backfill slope" as whatever the desired fixed slope is (e.g., 1:10).

Example showing how "paved ditch curb backfill max width" can be used to force in-sloping backfill in fill situations where existing ground is sloping up and away from the roadway.

(Note: Use of these special excavation/backfill details is discouraged. See Typical Excavation/Backfill Details section above for preferred alternative.)



"paved ditch curb backfill max width" (default = 1.50)  
"paved ditch curb backfill slope" (default = 1:20)

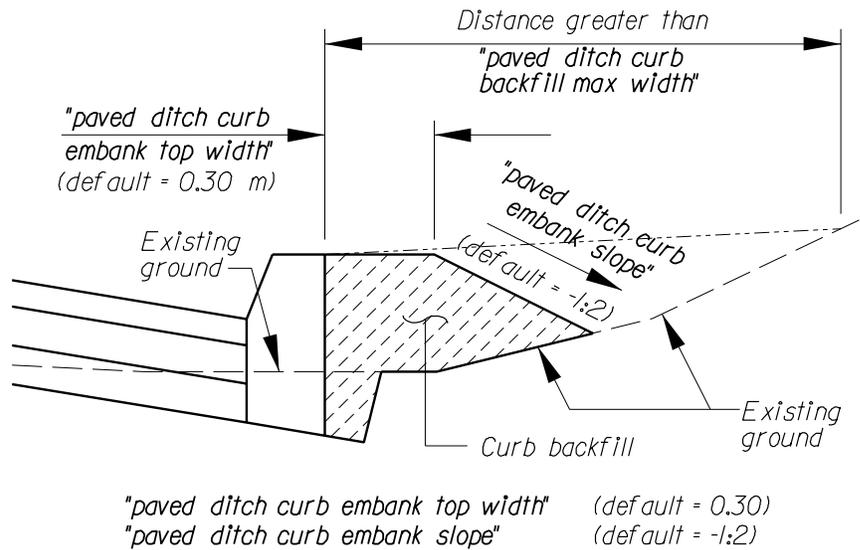
## *Special Excavation/Backfill Details for Paved Ditch*

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Example showing how a typical fill situation is handled by the paved ditch criteria files.

Notice that if the "paved ditch curb backfill max width" variable is set to a large enough value the user can force a constant fill slope from the top of the curb to existing ground in most cases.

(Note: Use of these special excavation/backfill details is discouraged. See Typical Excavation/Backfill Details section above for preferred alternative.)



Example showing an extreme fill situation is handled by the paved ditch criteria files.

(Note: Use of these special excavation/backfill details is discouraged. See Typical Excavation/Backfill Details section above for preferred alternative.)

