

## SH301-9.X – version 07.04.10

### Description

SH301-9.X is used to draw a paved shoulder according to the standards defined in the Location & Design Manual, Volume One, Roadway Design, Figure 301-9. The width of the shoulder is determined from the plan view graphics. The criteria will also draw the pavement steps, beneath the shoulder, as shown in Figure 1 below.

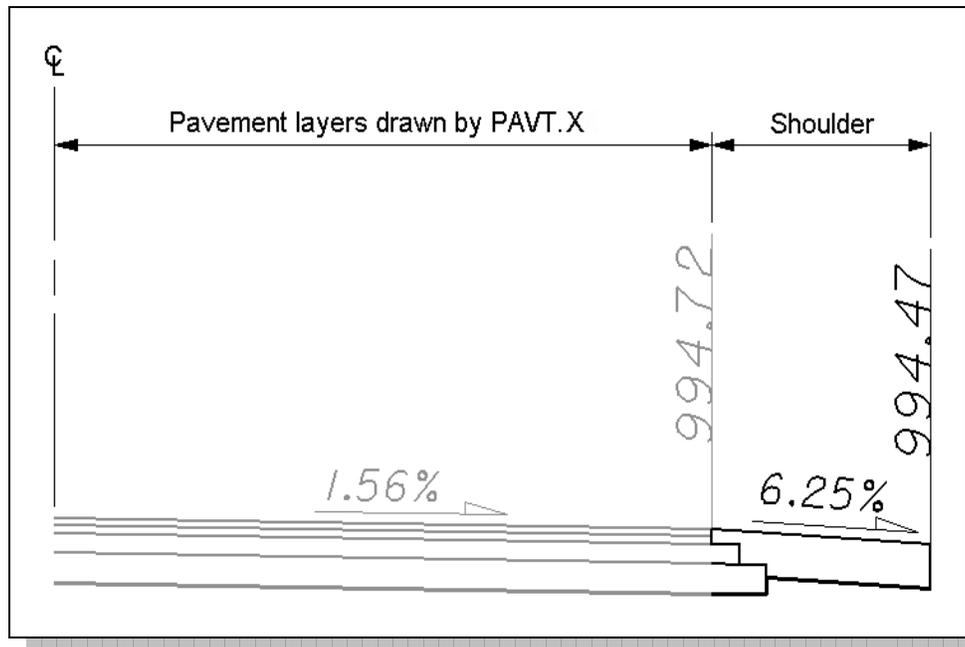


Figure 1

### 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.

SH301-9.X can be included directly after the following ODOT Standard Criteria files:

```
PAVT.X  
PAVT_EXIST.X  
PAVT_OVERLAY1.X  
PAVT_SHAPELESS.X  
PAVT_WIDEN.X
```

## Processing Notes

Starting from the proposed edge of pavement, the criteria will search the design file specified by the variable “**proposed dgn file name**” for elements matching the symbology for a proposed shoulder as defined by the dgn variable “**~shoulder in dgn**”. If a shoulder line is encountered, the criteria will draw the shoulder using the width measured from the graphics.

## NORMAL SECTIONS

The criteria will next test the cross slope of the proposed pavement. If the proposed pavement is in normal crown, the shoulder is drawn as shown in Figure 2 below.

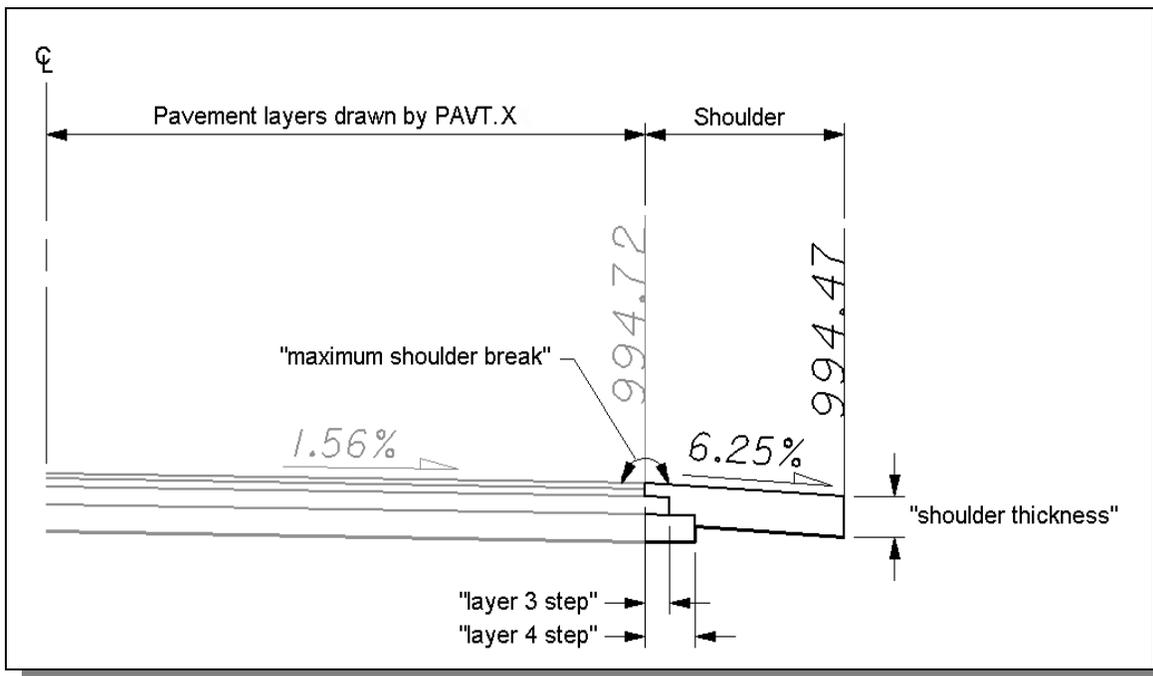


Figure 2

The criteria file will draw steps for the proposed pavement layers as necessary. The step widths are measured from the edge of pavement as shown in Figure 2. The step width for pavement layers 2 through 6 is controlled by the variables “**layer 2 step**”, “**layer 3 step**”, “**layer 4 step**”, “**layer 5 step**”, “**layer 6 step**”. The default value for each of the steps is 0. Pavement layer 1 can not be stepped.

The variable “**shoulder thickness**” is used to set the total thickness of the shoulder buildup.

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## SUPERELEVATED SECTIONS

On the low side of superelevated sections, the criteria will maintain the shoulder slope of 4.17 % until the pavement slope exceeds the shoulder slope. From that point forward, the criteria will draw the shoulder at the same slope as the pavement as shown in Figure 3 below.

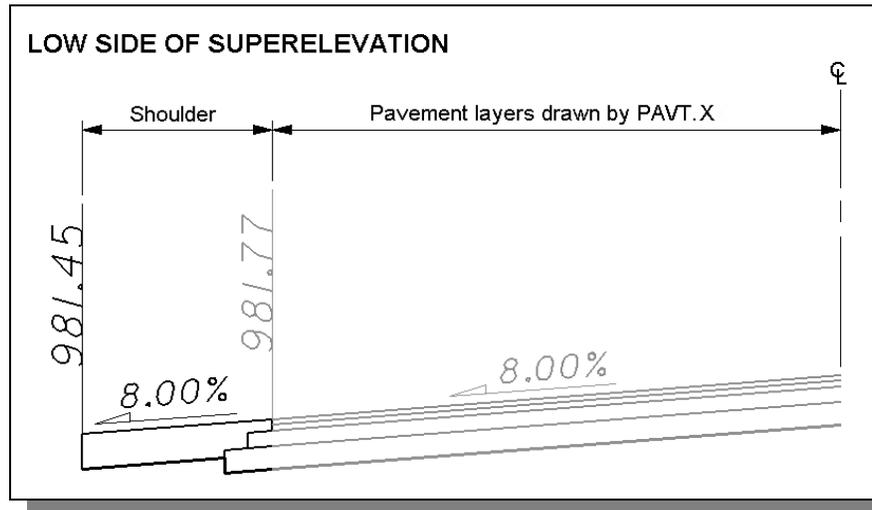


Figure 3

On the high side of superelevation, the criteria will break the shoulder slope as shown in Figure 4 below.

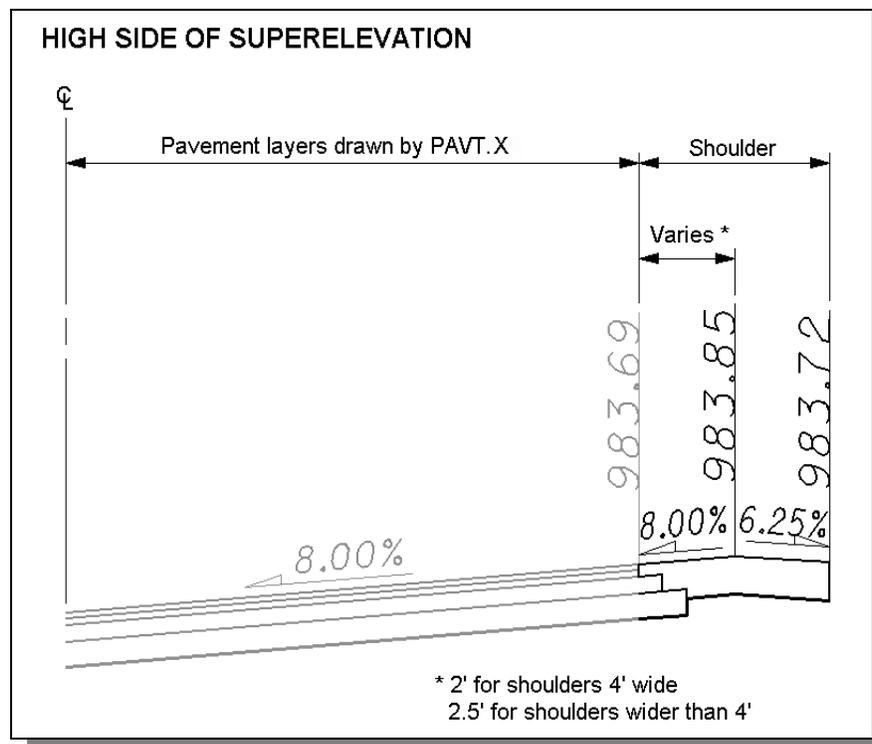


Figure 4

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### Define Variables

A summary of the variables defined in **SH301-9.X** is included below. Each variable has 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 variables.

#### “PROPOSED DGN FILE NAME”

This variable is used by the DEFINE\_DGN variables to identify the base map MicroStation design file that contains the proposed plan view graphics. The default value for the variable has been defined using a relative path as follows:

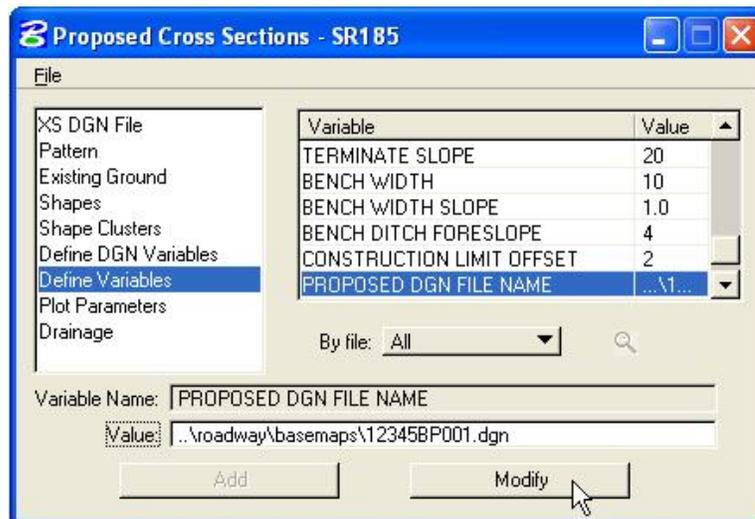
```
define "PROPOSED DGN FILE NAME" ..\roadway\basemaps\nnnnnBP###.dgn
```

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, `nnnnnBP###.dgn`, 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.

The name and path of the “PROPOSED DGN FILE NAME” variable can be edited in the GEOPAK *Proposed Cross Sections* dialog as shown below.



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**"shoulder thickness"**

The pavement thickness for the paved shoulder in Master Units.

**"maximum shoulder break"**

The maximum shoulder break over for the high side of super elevation. The default value is 7%.

**"number of layers"**

The total number of pavement layers. Up to six pavement layers can be defined. This variable is initially defined in the pavement criteria. The default value is 4.

**"layer 2 step"**

The step width for pavement layer 2 in Master Units, measured from the edge of pavement.  
The default value is 0.

**"layer 3 step"**

The step width for pavement layer 3 in Master Units, measured from the edge of pavement.  
The default value is 0.

**"layer 4 step"**

The step width for pavement layer 4 in Master Units, measured from the edge of pavement.  
The default value is 0.

**"layer 5 step"**

The step width for pavement layer 6 in Master Units, measured from the edge of pavement.  
The default value is 0.

**"layer 6 step"**

The step width for pavement layer 6 in Master Units, measured from the edge of pavement.  
The default value is 0.

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### Define DGN Variables

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The following DEFINE\_DGN variables are used by the criteria to graphically locate the MicroStation elements that SH301-9.X will search for in order to draw the proposed shoulder.

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

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

#### "~shoulder in dgn"

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

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

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### Labels and Symbology

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#### PROPOSED GRADING

The final cross section cut and fill lines representing the proposed grading are drawn on level XS\_P\_Finished\_Grade. This level should always be shown on the final cross sections.

#### PAVEMENT LAYERS

The pavement layers are drawn on level XS\_P\_Pavt\_Layers for reference only. This Layer is not normally shown on the final cross sections.

#### TEXT LABELS

The criteria will place labels and direction arrows annotating the shoulder slope. The criteria will also place labels for the elevation at the edge of the shoulder. These labels are all placed on level XS\_P\_Text\_Info for the designers reference and are not normally shown on the final cross sections.

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## 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 must be referred to by multiple criteria files. The following marked points must be previously defined by the pavement criteria files in order for SH301-9.X to process correctly:

Edge of pavement	x1	y1
Bottom of pavement layer 1	x101	y101
Bottom of pavement layer 2	x201	y201
Bottom of pavement layer 3	x301	y301
Bottom of pavement layer 4	x401	y401
Bottom of pavement layer 5	x501	y501
Bottom of pavement layer 6	x601	y601

The ODOT standard pavement criteria files mark the points listed above in memory.

The following Marked Points are stored by the criteria, as shown in Figure 5 below:

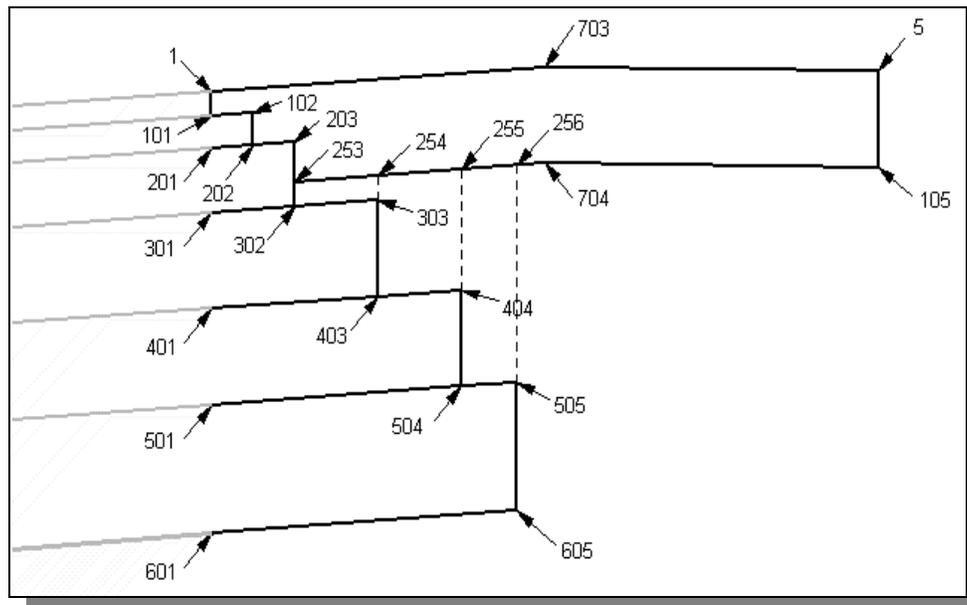


Figure 5

Marked points 251 (not shown), 252 (not shown), 253, 254, 255 and 256 are located at the intersection of the bottom of the paved shoulder with the pavement layers.

Marked points 703 and 704 are stored only on the high side of superelevation in the shoulder break case.