

## APPENDIX I

### SPECIAL DITCHES

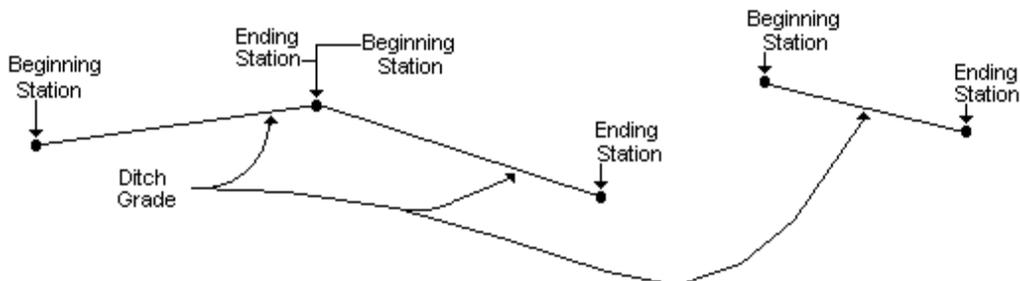
Special ditch data can serve to modify the ditch grades or locations of both medians and sideslope shapes. A special ditch grade can be a 3D MicroStation or IGrds geometry element or a grade line similar to vertical alignment data, except that there are no parabolic curves and the data may be discontinuous. This special ditch feature may also be used to control the beginning bench slope elevations. Up to ten special ditch grades can be defined per side of any design roadway (numbered 0 through 9).

#### SPECIAL DITCH DEFINITION

For the IGrds IG Option, special ditches are defined using the Special Ditches dialog box within the Design Data Manager. Two types of special ditches are supported: 3D geometry elements and the more traditional grade lines. As mentioned above, up to ten special ditch grades of either or both types can be defined per side of any design roadway. These can be applied to either median or sideslope shapes. The two types are discussed in more detail below.

#### Grade Line Type

The user defines each grade line type ditch with respect to certain stations along a specified roadway and designates the number and on which side of the road the particular ditch is located. The actual transverse location of the ditch, with respect to a particular slope segment, is defined as part of median or side slope data using the various special ditch options and indicating which ditch applies. Grade line type special ditch data is a vertical alignment without vertical curves as shown here.



The grade line type special ditches need not be continuous.

### **3D Geometry Element Type**

First, the user selects appropriate 3D IGrds geometry elements or MicroStation linear elements. If a MicroStation element is selected, it is automatically converted to a geometry element. Then the user indicates the roadway station limits, and designates the number and on which side of the road the particular ditch is located. 3D geometry elements used as special ditch grades are much more flexible in that the horizontal location of the special ditch as well as the vertical location can be derived from the geometry element. The various special ditch options within sideslopes and medians control how the ditch is actually created. Also, 3D geometry element type special ditches need not be continuous.

### **SIDESLOPE SPECIAL DITCHES**

Sideslope patterns containing special ditches must indicate which special ditch to apply to which segment. Any special ditch option, along with the ditch number, describes the slope segment to which the particular special ditch is to apply. The special ditch options indicate the following:

S - Segment slope is held and horizontal distance varies

D - Segment horizontal distance is held and slope varies

T - Segment slope is held from 3D geometry element

E - Segment horizontal distance is held from 3D geometry element

G - 3D geometry element controls end of segment

Special ditches may be applied only to fixed slopes, but up to ten special ditches may be applied to a single slope pattern. Special ditch options can be used on either cut or fill patterns. For a particular segment, if no special ditch grade is given, the pattern will be built as if no special ditch option were specified. Each special ditch option is discussed in more detail in the following paragraphs.

#### **S Special Ditch - Segment Slope Held**

The S special ditch segment option implies that for grade line type special ditches, the segment slope is extended to the special ditch grade and the segment distance varies. See Figure I-1a. If a 3D geometry element is specified as the special ditch grade with this option, then the segment slope is extended to the elevation of the 3D geometry element. The horizontal or offset component of the geometry element is ignored as is the segment distance. See Figure I-1b. The S option is available for both sideslope and median conditions.

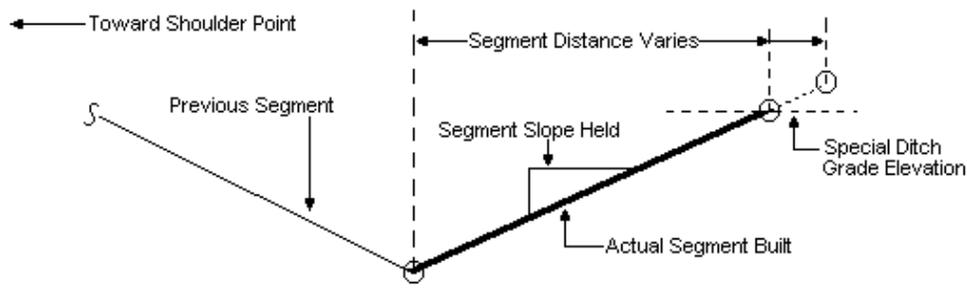


Figure I-1a - S Special Ditch Option, Grade Line Type Special Ditch

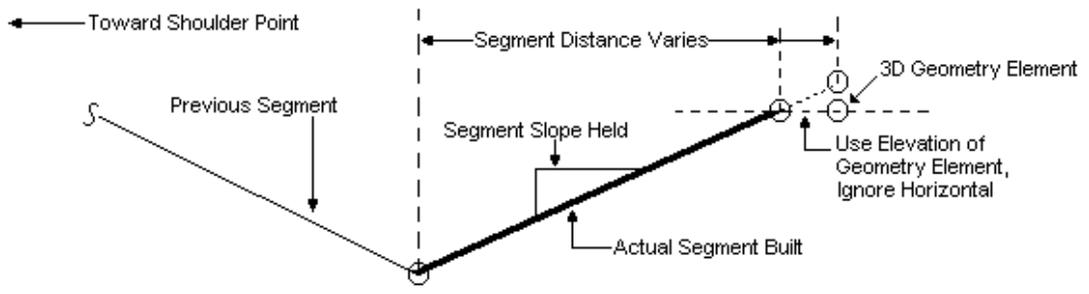


Figure I-1b - S Special Ditch Option, 3D Geometry Element Type Special Ditch

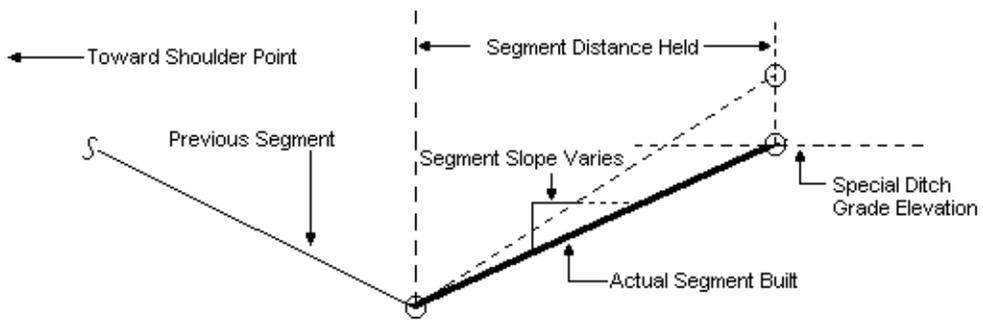


Figure I-2a - D Special Ditch Option, Grade Line Type Special Ditch

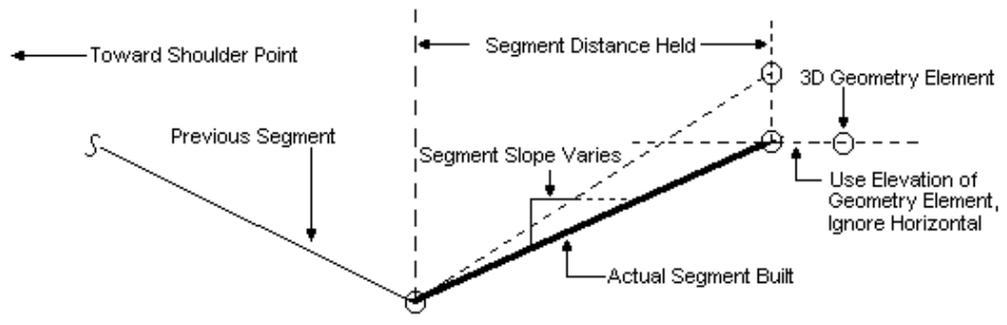


Figure I-2b - D Special Ditch Option, 3D Geometry Element Type Special Ditch

### **D Special Ditch - Segment Horizontal Distance Held**

The D special ditch segment option implies that for grade line type special ditches the segment distance is extended to the special ditch grade and the segment slope varies. See Figure I-2a. If a 3D geometry element is specified as the special ditch grade, the segment distance is extended to the elevation of the 3D geometry element ignoring the segment slope. Again, the horizontal or offset component of the 3D geometry element is ignored. See Figure I-2b. The D option is available for both the sideslope and median conditions.

### **T Special Ditch - Segment Slope Held from Geometry Element**

The T special ditch is available for sideslope conditions only. Likewise, it can only be used with 3D geometry elements. The T option implies that the end of the segment being defined will coincide with the elevation and offset of the 3D geometry element. The beginning of the segment is calculated by projecting the slope of the segment backwards toward the previous segment until an intersection occurs with the previous segment (or an extension of the previous segment). The ending point of the previous segment is moved to this intersection point. See Figure I-3.

### **E Special Ditch - Segment Horizontal Distance Held from Geometry Element**

The E special ditch segment option is available for sideslope conditions only. It, like the T option, can only be used with 3D geometry elements. The E option also implies that the end of the segment being defined will coincide with the elevation and offset of the 3D element. The beginning of the segment is calculated by projecting the distance of the segment being defined backwards toward the previous segment thereby establishing the elevation of the point along the previous segment (or an extension of the previous segment). Again, the ending point of the previous segment is moved to this point (elevation and offset). See Figure I-4.

### **G Special Ditch - 3D Geometry Element Controls End of Segment**

The G special ditch option is available for both sideslope and median conditions. This option implies that the end of the segment being defined is controlled both horizontally and vertically by the 3D geometry element. The G option, like the E and T options, is used only with 3D geometry elements. See Figure I-5.

## **MEDIAN SPECIAL DITCHES**

For median patterns, special ditches are indicated in the same manner as in sideslopes; i.e., for a particular segment, a special ditch option is entered along with the ditch number from the appropriate roadway. The special ditch options are defined in the same fashion. However, for medians only, the S, D, and G options are allowed. For medians, special ditch grades can apply to any segment of the median pattern. If no special ditch grade exists, then the segment is built as defined. The right side segments reference the left side special ditches of the right roadway, and vice versa.

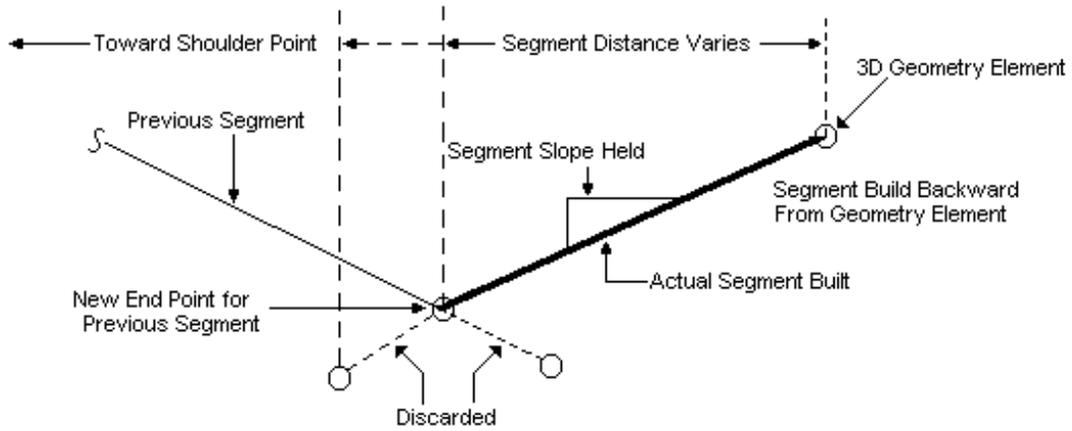


Figure I-3 - T Special Ditch Option

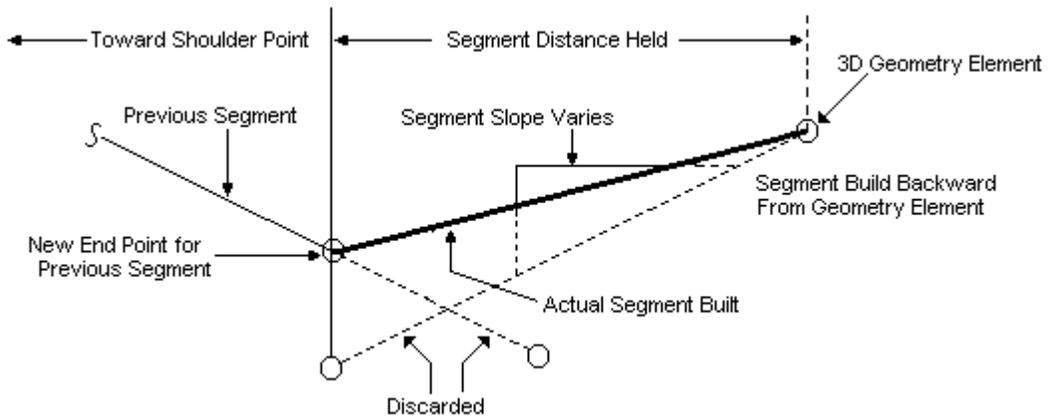


Figure I-4 - E Special Ditch Option

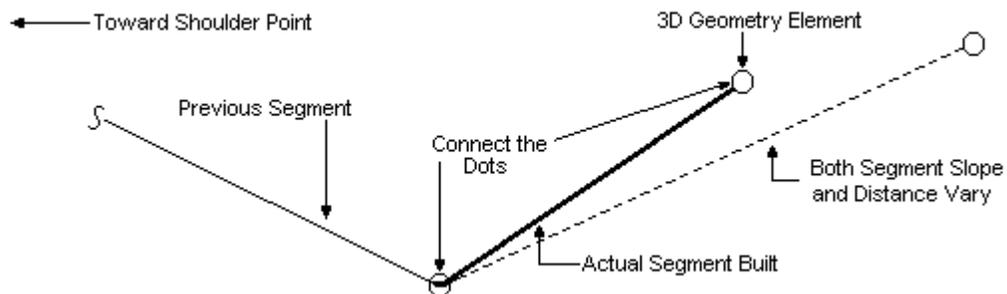


Figure I-5 - G Special Ditch Option

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