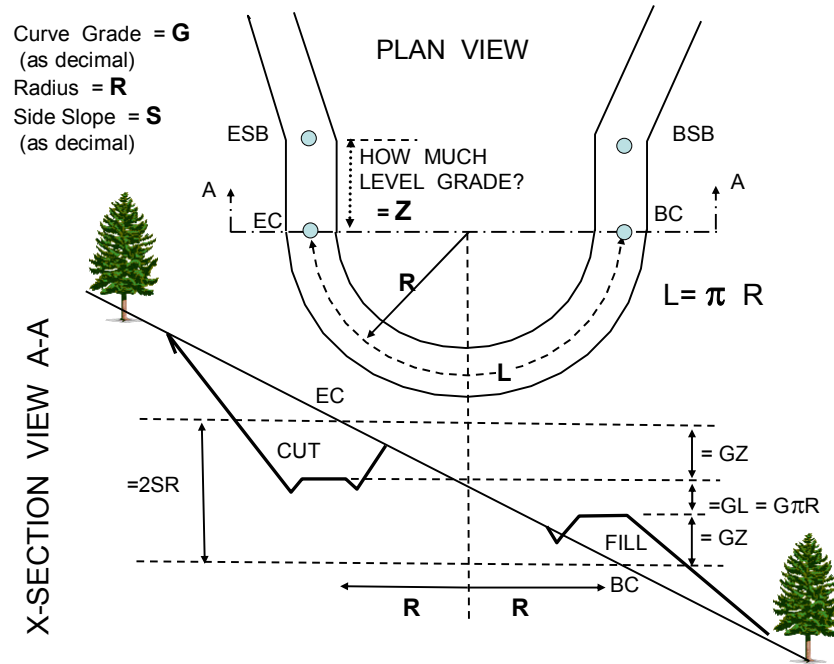


SWITCHBACKS

In addition to the curve layout, switchbacks need to consider the problem of reducing the steep road grade that results from having to turn the road directly down slope in the curve. This is accomplished by providing for a break in the surveyed grade before and after the curve portion of the switchback. The following illustration and table provide some guidelines for determining the length (Z) of level (0%) surveyed grade to provide for a switchback grade of 8%.



The formula used to determine Z is:

$$Z = \frac{SR}{G} - \frac{\pi R}{2}$$

Extension (Z) of Switchback Curve to Produce an 8% Road Grade

Curve Radius R	Side Slope (S)													
	14%	16%	18%	20%	22%	24%	26%	28%	30%	32%	34%	36%	38%	40%
16	2.9	6.9	10.9	14.9	18.9	22.9	26.9	30.9	34.9	38.9	42.9	46.9	50.9	54.9
18	3.2	7.7	12.2	16.7	21.2	25.7	30.2	34.7	39.2	43.7	48.2	52.7	57.2	61.7
20	3.6	8.6	13.6	18.6	23.6	28.6	33.6	38.6	43.6	48.6	53.6	58.6	63.6	68.6
22	3.9	9.4	14.9	20.4	25.9	31.4	36.9	42.4	47.9	53.4	58.9	64.4	69.9	75.4

Consideration must also be given to the vertical curve design. Sufficient road length is needed for transition of the grade of the switchback approaches to the grade of the switchback.