

Profile (Longitudinal Section)

(5)

Example/ Draw the profile depending on data below and calculate the depth of the cut and fill in each station, where the grade elevation of A was 51m and the design grade was raised and was 0.5%. The R.L.A was 52.0

Staff reading	staff station	Distance	H.I	R.L	grade	cut	fill	
B.S	I.S	F.S						
1.85			A	0	53.85	52	51	1.0
	2.1		B	20	=	51.75	51.1*	0.65
	1.1		C	60	=	52.75	51.3**	1.45
		0.98	D	80	=	52.87	51.4***	1.47

$$\text{grade elev. of next point} = \text{grade elev. of previous point} \pm \text{slope} * \text{Distance between these points}$$

↑ fall
↓ Rise

$$* = 51 + \frac{0.5}{100} * 20 = 51.1 \text{ m}$$

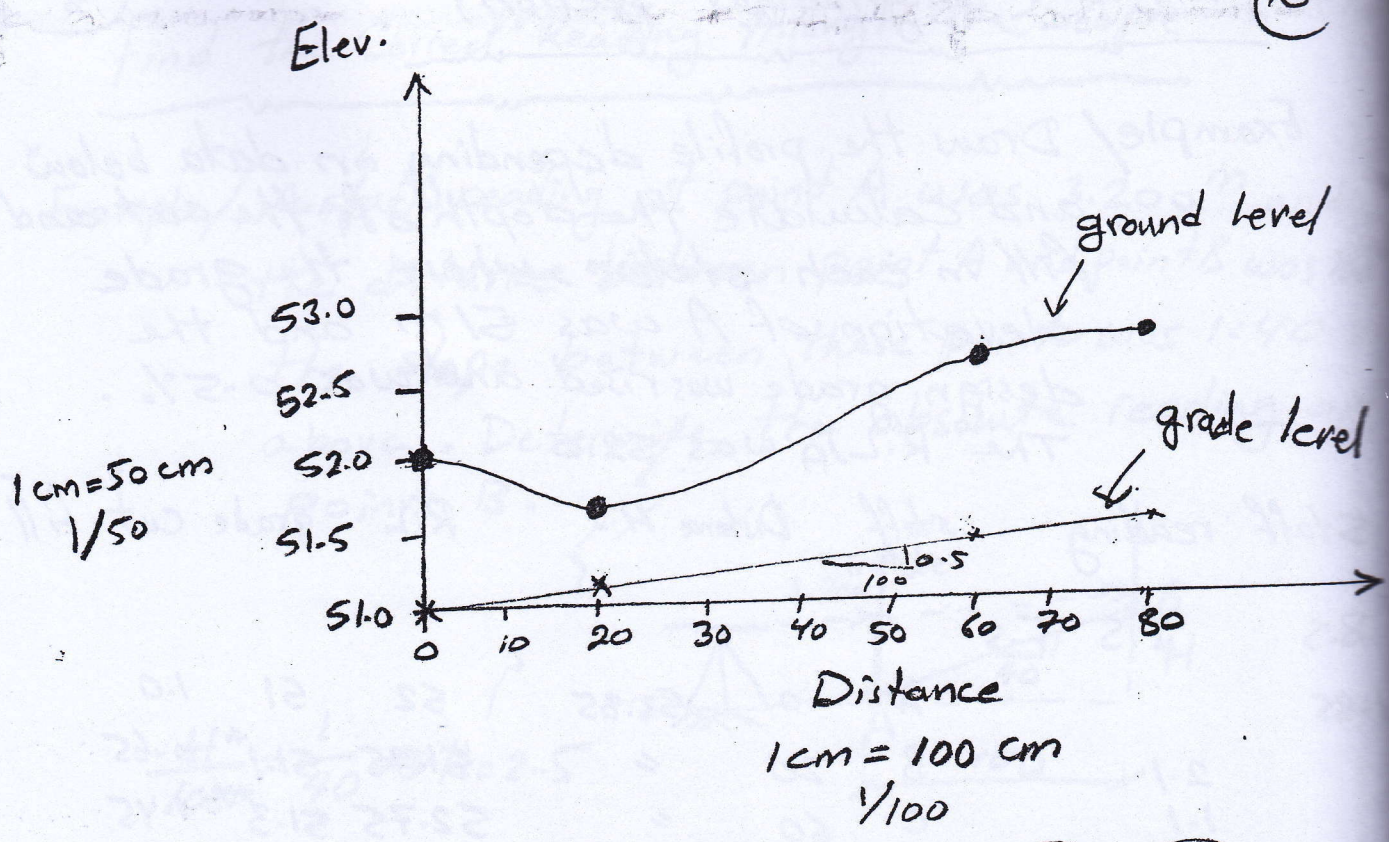
$$** \left\{ \begin{array}{l} 51 + \frac{0.5}{100} * 60 = 51.3 \text{ m} \\ \text{or } 51.1 + \frac{0.5}{100} * 40 = 51.3 \text{ m} \end{array} \right.$$

$$*** \left\{ \begin{array}{l} 51 + \frac{0.5}{100} * 80 = 51.4 \text{ m} \\ \text{or } 51.3 + \frac{0.5}{100} * 20 = 51.4 \text{ m} \end{array} \right.$$

$$\begin{aligned} 52 - 51 &= 1.0 \text{ m} \\ 51.75 - 51.1 &= 0.65 \text{ m} \\ 52.75 - 51.3 &= 1.45 \text{ m} \\ 52.87 - 51.4 &= 1.47 \text{ m} \end{aligned}$$

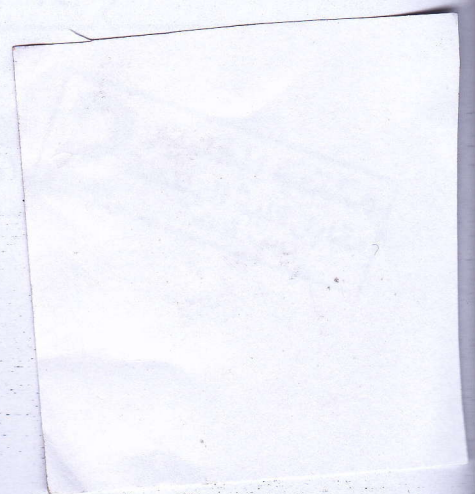
$$\text{ground elev.} - \text{grade elev.} = \begin{matrix} + \text{Cut} \\ - \text{Fill} \end{matrix}$$

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note:

$$\text{Slope} = \frac{(\Delta \text{ grade}) \text{ between two points}}{(\Delta \text{ distance}) \text{ between the same points}}$$



(7)

Example/ For construction a channel with 65m length and filling slope from 0^m to 30^m with angle equal to 5° and from 30^m to 50^m with angle 3° and from 50^m to the end with zero angle. The reading staff and distance as follow:

Dist.	0	5	10	15	20	25	30	35	40	45	50	55	60	65	B.M
Staff Reading	1.5	1.7	2.3	1.35	2.2	2.7	2.1	0.67	0.9	1.8	1.7	1.2	2.6	2.4	2.5

R.L of B.M was 40m. Calculate the depth of cut for every point. Assume the depth of cut at point zero was 1.3m.



Sol.

(8)

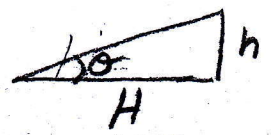
Dist.	staff reading			H.I	R.L	grade	cut
	B.S	I.S	F.S.				
0	1.5			42.5	41.0	39.7*	1.3
5		1.7		"	40.8	39.26	1.54
10		2.3		"	40.2	38.82	1.38
15		1.35		"	41.15	38.38	2.77
20		2.2		"	40.3	37.94	2.36
25		2.7		"	39.8	37.5	2.3
30		2.1		"	40.4	37.06	3.34
35		0.67		"	41.83	36.8	5.03
40		0.9		"	41.6	36.54	5.06
45		1.8		"	40.7	36.28	4.42
50		1.7		"	40.8	36.02	4.78
55		1.2		"	41.3	36.02	5.28
60		2.6		"	39.9	36.02	3.88
65		2.4		"	40.1	36.02	4.08
B.M			2.5	"	40	36.02	3.98
	1.5		2.5				

$$\sum B.S - \sum F.S = R.L)_{last} - R.L)_{first}$$

$$1.5 - 2.5 = 40 - R.L)_{first} = 41.0m$$

∴ ground elev. - grade elev. = cut
(R.L)

$$41 - \text{grade elev.})_{0m} = 1.3 \Rightarrow \text{grade elevation at } 0m = 41 - 1.3 = 39.7m^*$$



$$\tan \theta = \frac{h}{H} \Rightarrow h = H \tan \theta$$

$$= 5 \tan 5^\circ = \begin{cases} -0.44 & (0-30m) \\ -0.26 & (30-50m) \end{cases}$$