CONDUIT
SUTHERLAND PAMO
to
SAN VICENTE RESERVIOR

DIETZGEN
TRADE MARK

ENGINEERS'
FIELD BOOK #2
No. 404

W180

EUGENE DIETZGEN CO.

DRAWING MATERIALS, MATHEMATICAL and SURVEYING INSTRUMENTS

Chicago New York San Francisco New Orleans Pittsburg Toronto

Distances from Center of Roadway for Cross-Sectioning
Roadway 16 feet wide. Side Slopes 1 on 1.
For Single Track Embankment.

H	0	.1	.2	.3	.4	.5	.6	.7	.8	.9	H
0	8.0	8.1	8.2	8.3	8.4	8.5	8.6	8.7	8.8	8.9	0
1	9.0	9.1	9.2	9.3	9.4	9.5	9.6	9.7	9.8	9.9	1
2	10.0	10.1	10.2	10.3	10.4	10.5	10.6	10.7	10.8	10.9	2
3	11.0	11.1	11.2	11.3	11.4	11.5	11.6	11.7	11.8	11.9	3
4	12.0	12.1	12.2	12.3	12.4	12.5	12.6	12.7	12.8	12.9	4
5	13.0	13.1	13.2	13.3	13.4	13.5	13.6	13.7	13.8	13.9	5
6	14.0	14.1	14.2	14.3	14.4	14.5	14.6	14.7	14.8	14.9	6
7	15.0	15.1	15.2	15.3	15.4	15.5	15.6	15.7	15.8	15.9	7
8	16.0	16.1	16.2	16.3	16.4	16.5	16.6	16.7	16.8	16.9	8
9	17.0	17.1	17.2	17.3	17.4	17.5	17.6	17.7	17.8	17.9	9
10	18.0	18.1	18.2	18.3	18.4	18.5	18.6	18.7	18.8	18.9	10
11	19.0	19.1	19.2	19.3	19.4	19.5	19.6	19.7	19.8	19.9	11
12	20.0	20.1	20.2	20.3	20.4	20.5	20.6	20.7	20.8	20.9	12
13	21.0	21.1	21.2	21.3	21.4	21.5	21.6	21.7	21.8	21.9	13
14	22.0	22.1	22.2	22.3	22.4	22.5	22.6	22.7	22.8	22.9	14
15	23.0	23.1	23.2	23.3	23.4	23.5	23.6	23.7	23.8	23.9	15
16	24.0	24.1	24.2	24.3	24.4	24.5	24.6	24.7	24.8	24.9	16
17	25.0	25.1	25.2	25.3	25.4	25.5	25.6	25.7	25.8	25.9	17
18	26.0	26.1	26.2	26.3	26.4	26.5	26.6	26.7	26.8	26.9	18
19	27.0	27.1	27.2	27.3	27.4	27.5	27.6	27.7	27.8	27.9	19
20	28.0	28.1	28.2	28.3	28.4	28.5	28.6	28.7	28.8	28.9	20
21	29.0	29.1	29.2	29.3	29.4	29.5	29.6	29.7	29.8	29.9	21
22	30.0	30.1	30.2	30.3	30.4	30.5	30.6	30.7	30.8	30.9	22
23	31.0	31.1	31.2	31.3	31.4	31.5	31.6	31.7	31.8	31.9	23
24	32.0	32.1	32.2	32.3	32.4	32.5	32.6	32.7	32.8	32.9	24
25	33.0	33.1	33.2	33.3	33.4	33.5	33.6	33.7	33.8	33.9	25
26	34.0	34.1	34.2	34.3	34.4	34.5	34.6	34.7	34.8	34.9	26
27	35.0	35.1	35.2	35.3	35.4	35.5	35.6	35.7	35.8	35.9	27
28	36.0	36.1	36.2	36.3	36.4	36.5	36.6	36.7	36.8	36.9	28
29	37.0	37.1	37.2	37.3	37.4	37.5	37.6	37.7	37.8	37.9	29
30	38.0	38.1	38.2	38.3	38.4	38.5	38.6	38.7	38.8	38.9	30
31	39.0	39.1	39.2	39.3	39.4	39.5	39.6	39.7	39.8	39.9	31
32	40.0	40.1	40.2	40.3	40.4	40.5	40.6	40.7	40.8	40.9	32
33	41.0	41.1	41.2	41.3	41.4	41.5	41.6	41.7	41.8	41.9	33
34	42.0	42.1	42.2	42.3	42.4	42.5	42.6	42.7	42.8	42.9	34
35	43.0	43.1	43.2	43.3	43.4	43.5	43.6	43.7	43.8	43.9	35
36	44.0	44.1	44.2	44.3	44.4	44.5	44.6	44.7	44.8	44.9	36
37	45.0	45.1	45.2	45.3	45.4	45.5	45.6	45.7	45.8	45.9	37
38	46.0	46.1	46.2	46.3	46.4	46.5	46.6	46.7	46.8	46.9	38
39	47.0	47.1	47.2	47.3	47.4	47.5	47.6	47.7	47.8	47.9	39
40	48.0	48.1	48.2	48.3	48.4	48.5	48.6	48.7	48.8	48.9	40

Example—If point is 22.6 ft. above grade, how far should it be from center line to be a slope stake point? Ans. from Table 30.6. For same slopes but other widths of roadbed, correct above figures by one-half difference in width of roadbed; thus in example above, for 20 ft. roadbed distance will be 30.6+(20—16)÷2 or 2 ft. added to 30.6 =32.6. For slopes of 1 on 1½ see inside of back cover.

Book # 180

Sta. 1116 + 33.36 to 1364 + 75.6 1-8

Levels over Tunnel #7 & #8 9-12

Inst on 1112+11.8 Elev 851.99

Sta	Ob. Dist	V.A	Hor. Dist	Diff Elev	Gr. Rod
1116+33.36	8.74	-2°29	873.3	-37.97	814.02

Inst on 1116+33.36 Elev 814.02

1127+87.36	11.54	+1°50	1154	+37	851.02
1134+61	18.30	+2°36	1827.5	+83	897.02
1136+97.06	20.72	+3°50	2063.7	+138.26	952.28

Inst on 1136+97.06 Elev 952.28

1139+70.12	2.94	+15.52	273.06	+77.57	1029.85

Inst on 1139+70.12 Elev 1029.85

1144+20.12	4.70	+12°02	450	+96.22	1126.07

Inst on 1144+20.12 Elev 1126.07

1166+36.12	22.36	-5°33	2216	-214.75	911.32

Inst on 1166+36.12 Elev 911.32

1146+84.12	19.60	+4°07	1952	+140.40	1051.72
1155+79.12	10.56	-1°00	1057	-18.40	892.92
1162+33.2	4.05	-5°02	403	-35.5	875.82
1164+68.3	1.72	-10°04	167.8	-29.8	881.5
1167+37.12	1.00	+0°47	101	+1.37	912.61

"Y" Levels over Tunnel #5. (Con)

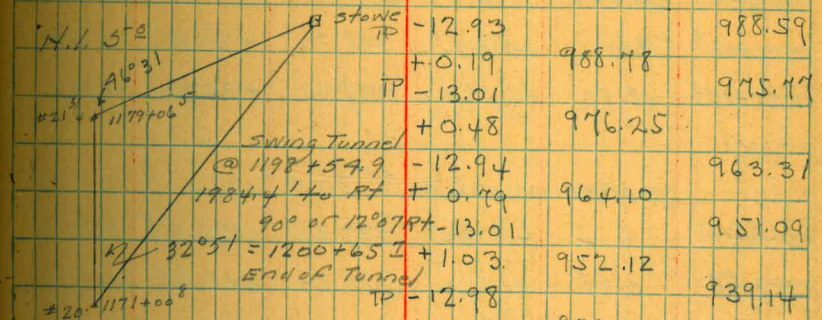
	Rod		H	Elev
H.I. 5.0			869.53	
TP	-0.0			869.53
	+12.86	882.39		
TP	-0.0			882.39
H.I. 5.2	+10.83	893.22		
TP	-0.0			893.22
	+12.81	906.03		
TP	-0.0			906.03
	+12.15	918.18		
TP	-0.31			917.87
	+12.96	930.83		
H.I. 5.2	TP -0.0			930.83
	+11.75	942.58		
TP	-0.0			942.58
	+12.21	954.79		
TP	-0.0			954.79
	+13.02	967.81		
H.I. 5.2	TP -0.06			967.75
	+12.78	980.53		
TP	-0.03			980.50
	+13.08	993.58		
TP	-0.08			993.50
	+12.86	1006.36		
TP	-0.22			1006.14
	+12.52	1018.66		
TP	-0.0			1018.66
	+7.57	1026.23		
TP	-0.41			1025.82
	+1.33	1027.15		

Inst on 1167+37 12 Elev 912.69

Sta	Ob. Dist	V.A.	Hor. Dist	Diff Elev	Elev.
1171+00 82	3.67	-6°15	363.7	-39.75	872.94
	Inst on 1171+00 82 Elev 872.94				
1174+56 4	3.74	-13°09	353.6	-83 0	789.94
1180+81 6	10.00	-8°11	980.8	-141 0	731.94
1176+47	5.62	-9°48	547 0	-94.4	778.5
1179+06 5	8.24	-8°50	805 1	-125.15	747.79
1196+04 11	20.50	-3°02	2049.4	-108.5	764.4
	Inst on 1196+04 1 Elev 764.44				
1213+83 1	17.80	-2°06	1779.0	-65.3	699.4

Sta	+	H.	—	Elev	Gr Rod
TP	10.27	692.79		692.52	
1200+65 I			+(-0.02)	692.81	
1201			-2.40	690.39	
+54	Low Point in Cr. 13ed Elev 691.42 150' Rt on down stream		-6.19	686.60	
TP	+10.87	703.40		692.53	
1202			-14.7	688.7	
1204			-11.6	691.8	
TP 1205+80	+12.58	715.39	-0.59	702.81	

H.I. 5 0



683.51 Cut 9 3

683.47 Cut 6 9

683.42 Cut 3 2

Cg line of Tunnel #5

683.37 Cut 5 3

683.17 Cut 8 8

683.00 Cut 19 8

"Y" Levels over Tunnel #5 Con.

	Rod	1027.15	Elev
TP	-13.05		1014.10
	+ 0.10	1014.20	
TP	-12.93		1001.27
	+0.25	1001.52	
Stowe TP	-12.93		988.59
	+0.19	988.78	
TP	-13.01		975.77
	+0.48	976.25	
	-12.94		963.31
	+ 0.79	964.10	
	-13.01		951.09
	+1.03	952.12	
TP	-12.98		939.14
	+0.17	939.31	
TP	-13.10		926.24
	+ 0.10	926.34	
TP	-12.63		913.68
	+0.10	913.78	
TP	-12.97		900.81
	+ 0.34	901.15	
TP	-12.86		888.29
	+0.04	888.33	
TP	-12.91		875.42
	+0.34	875.76	
TP	-12.89		862.87
	+0.80	863.67	
TP	-10.29		853.38
	+0.08	853.46	
TP	-13.06		840.40
	+0.45	840.85	
TP	-13.02		827.83
	+ 0.11	827.94	
TP	-12.66		815.28
	+ 0.16	815.44	

Tunnel # 6

sta 1205+80 to 1280+72.5

Inst on 1204+00 Elev 691.8

sta	Ob. Dist	V.A.	Hor Dist	DIFF Elev	Elev
1212+88 7	9.10	+8°58	888.70	+130.29	822.1
1221+87 5	18.50	+10°33	1787.55	+336.30	1028.1
Inst on 1221+87 5 Elev 1028.1					
1215+98 2	6.4	-16°30	589.35	-174.55	853 4
1222+83 3	0.98	+10°20	95.84	+17.48	1045 6
Inst on 1222+83 3 Elev 1045 6					
1226+59 7	3.82	+7°33	376.33	+49.87	1095.5
Inst on 1226+59 7 Elev 1095.5					
1227+05 7	0.45	+0°0	46.00	-4.9	1090.6
Inst on 1227+05 7 Elev 1090.6					
1234+66 2	8.22	-16°06	760.5	-219.3	871.3
1237+25 4	10.30	-6°04	1019.7	-108.4	982.2
1239+69 0	12.66	-3°04	1263.45	-67.7	1022.9
1246+60	6.90	0°0	691.0	+7°	1029.9

"Y" Levels over Tunnel # 5 Con

Correct Course of Tunnel
True S 75°33 E
Mag N 88°27 E 3/11-24

		Rod		Elev
			815.44	
H.I. 5 3	TP	-13.06		802.38
party came clear		+0.46	802.84	
	TP	-6.03		796.81
Rod of 15 3		+2.28	799.09	
	TP	-5.93		793.16
		+0.56	793.72	
	TP	-13.02		780.70
H.I. 5 3		+4.06	784.76	
	TP	-12.88		771.88
		+0.27	772.15	
	TP	-8.61		763.54
		+1.50	765.04	
H.I. 5 3	TP	-12.91		752.13
		+0.12	752.25	
	TP	-12.48		739.77
		+2.11	741.88	
H.I. 5 1	TP	-9.68		732.20
Rod of 10 0		+0.52	732.72	
	TP	-8.48		724.24
		+0.92	725.16	
H.I. 5 0	TP	-12.95		712.21
		+0.46	712.67	
	TP	-9.00		703.67
		+0.41	704.08	
Rod of 12 0	TP	-11.55		692.53
		+0.30	690.83	
	TP	-7.91		684.92
		+7.87	692.79	
1200+65 7		+(-0.02)		692.81

Inst on 1246+60 Elev 1029.9

Sta	Ob. Dist	V.A.	Hor. Dist	Diff Elev	Elev
1243+19½	3.96	-22°17	340.6	-139.2	890.7
1247+51⅜	0.95	+12°54	91.25	+20.89	1050.8

Inst on 1247+51⅜ Elev 1050.8

Sta	Ob. Dist	V.A.	Hor Dist	Diff Elev	Elev
1248+15⅝	0.65	+9°28	64.24	10.70	1040.1

Inst on 1248+15⅝ Elev 1040.1

1254+83²¹	7.40	-18°20	667.7	-221.3	818.8
1262+35⅝	14.20	+1°43	1420°	+42⅝	1082.6
1265+16.9	17.04	+2°36	1701⅝	+77²³/₁₀₀	1117.3

Inst on 1265+16.9 Elev 1117.3

1269+66.9	4.50	50' below 1271+59.3			956.9
1271+59.3	6.60	-9°46	642.4	-110.4	1006.9
1282+62.3	17.80	-8°07	1745.4	-249°	868.3

Inst on 1282+62.3 Elev 868.3

1278+22.3	4.40	+2°41	-440°	+20.6	888.9
1279+87.3	2.75	50' below 1278+22.3			833.4
Swung 90° Left to 17A	7.40	-13.09	703.6	-164.1	704.2

Inst on 17'A'

49°01 R From B.S Upstream	2.78	-6°21	275.4	-30.4	672.57

"Y" Levels over ④ Tunnel #6

		Rod	T	Elev
H.I 5°				
	TP 1205+80	+12.58	715.39	702.81
Rod on 12°	TP	-0.0		715.39
		+12.82	728.21	
	TP	-0.0		728.21
		+13.08	741.29	
H.I. 5-B	TP	-0.06		741.23
		+12.99	754.22	
	TP	-0.0		754.22
		+12.50	766.72	
	TP	-0.0		766.72
H.I. 5-3/		+12.84	779.56	
	TP	-0.11		779.45
Bot Canyon		+12.92	792.37	
Shoulder of H'N	TP	-0.0		792.37
Ridge		+12.51	804.88	
	TP	-0.02		804.86
H.I 5-3/		+13.07	817.93	
	TP	-0.07		817.86
Sm. Draw		+12.87	830.73	
Ridge	TP	+0.05		830.68
"		+12.96	843.64	
	TP	-0.01		843.63
		+8.31	851.94	
H.I. 5-2	TP	-7.88		844.06
Ridge		+12.70	856.76	
Sm. Dr	TP	-0.0		856.76
		+12.60	868.86	
	TP	-0.0		868.86
		+12.06	880.92	
	TP	-0.0		880.92
		+12.39	893.31	

Sta	+	682.17	−	Elev	Gr. Rod
1280+72.5			-2.87	679.30	
1281+10	℄ Creek Bed		-5.17	677.00	
1281+40	E. Side Creek		-2.77	679.30	
1282			-1.37	680.80	
	+11.12	690.42			
1284				set to Gr.	11.50
1286				" " "	11.70
1288				" " "	11.90
1290				" " "	12.10
TP 1291	+9.03	687.25	-12.20	678.22	
1293				set to Gr.	9.23
1294				" "	9.33
1296				" "	9.53
TP 1297	+10.56	688.44	-9.37	677.88	
+75.				set to Gr	10.89
1299				" " "	11.02
1300				" " "	11.12
TP 1302	+11.20	688.32	-11.32	677.12	
1303				set to Gr	11.30
1304				" " "	11.40
1305	+12.96	689.78	-11.50	676.82	
1306					-13.06
1308					-13.26
1309+25	Tunnel Portal		-2.81	686.97	

2/11-24

"Y" Levels over Tunnel #6 (5)

Grade		Party Same Clear	Rod	T	Elev
679.25	End Tunnel W. side Cr.			893.31	
679.18	Fill 2 3/4	TP	-0.0		893.31
			+12.77	906.03	
679.18	Cut 0 1/4	TP	-0.03		906.00
			+12.96	918.96	
679.12	Cut 1 1/4	TP	-0.0		918.96
			+12.98	931.94	
		TP	-0.05		931.89
678.92			+12.55	944.44	
678.72		TP	-0.0		944.44
			+12.99	957.43	
678.52		TP	-0.0		957.43
678.32			+12.92	970.35	
678.22		TP	-0.05		970.30
678.12			+13.00	983.30	
677.95		TP	-0.0		983.30
677.72			+12.60	995.90	
677.62	C 0 3/4	TP	-0.0		995.90
			+12.74	1008.64	
677.55		TP	-0.01		1008.63
677.42			+11.74	1020.37	
677.32		TP	-0.0		1020.37
			+12.75	1033.12	
677.12		TP	-0.0		1033.12
677.02			+12.59	1045.71	
676.92		TP	-0.0		1045.71
676.82			+12.67	1058.38	
676.72		TP	-0.0		1058.38
676.52			+12.28	1070.66	
676.39	C 10 1/4	TP	-0.04		1070.62
			+11.85	1082.47	

Tunnel #7

Sta 1309+25 to 1315+72.5

Inst on 1309+25 Elev 686.97

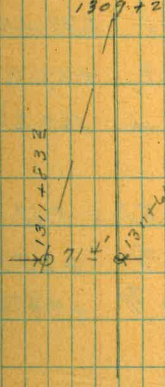
Sta	ob. Dist	V.A.	Hor. Dist	Diff Elev	Elev
1311+66.3	2.47	+9°30	241.3	+45.37	732.34
	Inst. on 1311+66.3 Elev. 732.34				
90° to L	71.4 to sta 1311+83.2			Elev 732.6	
	Inst on 1311+83.2 Elev 732.6				
1316+33°	4.54	-6°11	449.8	-48.6	684°
1311+18.4	-0.64	-3°09	64.8	-3.5	729.1
1314+62.8	2.81	-5°27	279.6	-21.6	711°

Sta	+	A	−	Elev	Gr. Rod
1315+72.5		686.75	0.0	686.75	
1316+33				Set to Gr.	10.75
1318				" " "	10.92
1320				" " "	11.12
1322				" " "	11.32
R1323	+12.48	687.80	-11.43	675.32	
1324				Set to Gr.	12.57
1325					12.67
1326			-8.28	679.52	

2/12-24
Party Same
Clear

"Y" Levels over Tunnel #6

		Rod	A	Elev.
B.M. 5.2				
Dist thru	TP	-0.18	1082.47	1082.29
Tunnel 647.5		+8.07	1090.36	
0.5' per 1000'	TP	-12.80		1077.48
		+12.56	1090.04	
Rod at 10.2	TP	-2.93		1087.11
		+1.71	1088.82	
B.M. 5.3	TP	-12.88		1075.94
		+0.21	1076.15	
	TP	-13.02		1063.13
		+0.52	1063.65	
	TP	-12.61		1051.04
B.M. 5.31		+0.76	1051.80	
	TP	-12.78		1039.02
		+0.96	1039.98	
	TP	-12.82		1027.16
		+0.16	1027.32	
Grade	TP	-12.46		1014.86
676.06 C 10.58		+0.06	1014.92	
	TP	-12.54		1002.38
676.00 E 2°		+0.32	1002.70	
675.83	TP	-12.83		989.87
		+0.45	990.32	
675.63	TP	-12.22		978.10
675.43		+0.20	978.30	
675.33	TP	+13.0		963.30
675.23		+0.32	965.62	
675.13	TP	-12.92		952.70
675.03 Cut 4.5'		+0.58	953.28	
	TP	-12.75		940.53
		+0.46	940.99	



Sta	+	687.80	-	Elev
1327	12.23	694.66	-5.37	682.43
1328			-6.21	688.45

Tunnel #8

Sta 1328 to 1361+34

Random line of Tunnel N48.9°E True Outlet swung South 9°26 to N57°26 E True Bearing

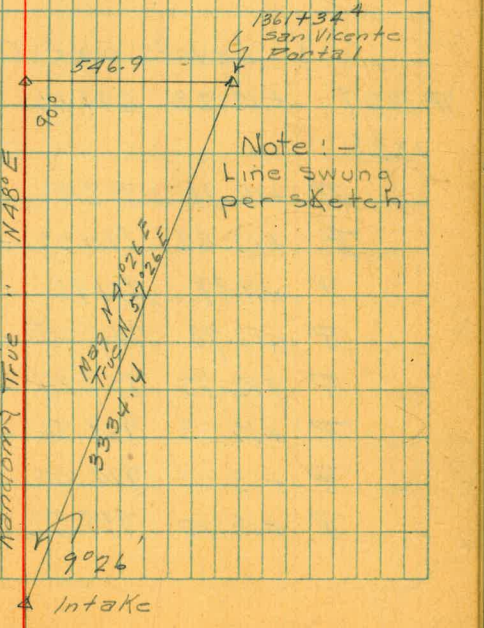
	Inst at 1328		Elev	688.45	
1330+29	2.32	+6°46	229.9	+27.2	715.65
1333+65	6.12	+16°12	565.4	160.23	848.7
	Inst at 1333+65		Elev	848.7	
1335+01	1.40	+10°22	136.5	+25.0	873.6
1337+78	4.35	+13°22	412.7	+99.06	947.9
	Inst at 1337+78		Elev	947.9	
1341+40	3.63	+4°22	362.0	+27.6	975.5
1347+92	10.20	+4°44	1014.1	+83.92	1031.84
	Inst at 1347+92		Elev	1031.84	
1349+47	1.54	+1°12	154.9	-0.75	1031.11
	Inst at 1349+47		Elev	1031.11	
1351+01	1.53	-1.52	153.9	-9.02	1021.90

		Rod	940.99	Elev
674.93 Cut 7½	TP	-12.92		928.07
		+0.64	928.71	
674.83 C 13½	TP	-12.97		915.94
Dist thru Tunnel		+0.68	916.62	
3334.4 Grade	TP	-12.89		903.73
on Tunnel 0.3 per 100		+0.18	903.91	
True N48°00 E	TP	-13.06		890.85
Mag N32°00 E		+0.35	891.20	
H.I. 5½	TP	-12.98		878.22
		+0.0	878.22	
	TP	-12.53		865.69
Rod at 9½		+0.12	865.81	
	TP	-12.59		853.22
H.I. 5½		+0.13	853.35	
	TP	-12.88		840.47
Rod at 12½		+0.09	840.56	
" " 4½	TP	-12.58		827.98
		+0.05	828.03	
H.I. 5¼	TP	-12.69		815.34
		+0.27	815.61	
Rod at 11 ft. 125' ahead & 125' lower - 130 ft or more	TP	-12.86		802.75
		+0.36	803.11	
	TP	-12.76		790.35
H.I. 5½		+0.30	790.65	
	TP	-12.65		778.00
Rod at 9½		+0.36	778.36	
	TP	-12.94		765.42
H.I. 5 3/4		+0.38	765.80	
	TP	-12.94		752.86
Rod at 9 3/4		+0.08	752.94	

	Inst on 1351+01 Elev 1021.90				
1351+52.8	.54	-14°02	51.8	-12.95	1008.9
	Inst on 1351+52.8 Elev 1008.9				
1353+72.5	2.42	-18°04	219.7	-76.66	932.3
	Inst on 1353+72.5 Elev 932.3				
1354+60	0.97	-19°16	87.5	-30.55	901.7
	Inst on 1354+60 Elev 901.7				
1355+29.2	0.75	-17°32	69.2	-24.85	876.7
	Inst on 1355+29.2 Elev 876.7				
1357+35.5	2.14	-11°38	206.3	-42.47	834.2
	Inst on 1357+35.5 Elev 834.2				
1360+75.6	3.46	-8°08	340.2	-48.1	786.1
	Inst on 1360+75.6 Elev 786.1				
1362+93.8	2.32	-14°40	219.5	-57.4	728.7
	Inst on 1362+93.8 Elev 728.7				
1362+32.6	0.62	-9°48	-61.2	-10.56	718.14
1363+46.3	0.58	-19°32	52.5	-18.6	710.1
1364+75.6	1.84	-7°32	181.8	-24.0	704.1

		Rod	752.94	Elev
H.I. 5.4	TP	-12.95		739.99
		+0.42	740.41	
H.I. 5.3	TP	-12.70		727.71
		+0.40	728.11	
Rod on P 10.3	TP	-12.80		715.31
		+0.34	715.65	
H.I. 5.0	TP	-12.42		703.23
		+1.34	704.57	
	TP	-12.74		691.83
		+2.20	694.03	
Rod on P 8.2	TP	-13.2		681.03
		+1.14	682.17	
	1280+72.5	-2.87		679.30
H.I. 5.1				
H.I. 4.7				
H.I. 5.3				

Bot of Cr back from Sta 1342+93.8 Downstream " "



Levels over Tunnel #7

Sta	+	689.78	−	Elev
1309+25			2.81	686.97
TP	+12.58	702.36	-0.0	689.78
TP	+12.56	714.92	-0.0	702.36
TP	+12.81	727.73	-00	714.92
TP	+7.71	735.42	-0.02	727.71
TP	+0.05	722.53	-12.94	722.48
TP	+0.15	709.66	-13.02	709.51
TP	+0.11	696.77	-13.00	696.66
TP	+0.57	684.38	-12.96	683.81
TP	+10.75	686.75	- 8.38	676.00
1315+725			- 0.0	686.75

"Y" Levels over Tunnel #8

TP 1327	+12.23	694.66		682.43
1328			- 6.21	688.45
TP	+12.96	707.42	- 0.20	694.46
TP	+12.82	720.23	- 0.01	707.41
TP	+11.97	731.92	- 0.28	719.95
TP	+12.73	744.65	- 0.0	731.92
TP	+12.72	757.37	- 0.0	744.65
TP	+12.13	769.50	- 0.0	757.37
TP	+13.01	782.42	- 0.09	769.41
TP	+13.10	795.52	-0.0	782.42

Tunnel Portal

Tunnel Portal

"Y" Levels over Tunnel #8 (Con.)

Sta	+	795.52	−	Elev
TP	+13.10	808.62	0.0	795.52
TP	+12.92	821.53	-0.01	808.61
TP	+12.83	834.36	-0.0	821.53
TP	+13.03	847.39	-0.0	834.36
TP	+12.93	860.31	-0.01	847.38
TP	+12.68	872.99	-0.0	860.31
TP	+13.09	886.08	-0.0	872.99
TP	+13.01	898.99	-0.10	885.98
TP	+13.05	912.04	-0.0	898.99
TP	+12.99	924.99	-0.04	912.00
TP	+13.01	938.00	-0.0	924.99
TP	+12.86	950.86	-0.0	938.00
TP	+12.81	963.66	-0.01	950.85
TP	+12.38	976.03	-0.01	963.65
TP	+13.02	988.93	-0.12	975.91
TP	+12.87	1001.70	-0.10	988.83
TP	+12.91	1014.58	-0.03	1001.67
TP	+12.91	1027.37	-0.12	1014.46
TP	+11.92	1039.30	+a(-0.01)	1027.38
TP	+6.01	1040.44	-4.87	1034.43
TP	+0.63	1029.17	-11.90	1028.54
TP	+1.06	1017.25	-12.98	1016.19
TP	+1.46	1005.62	-13.09	1004.16
TP	+0.34	993.15	-12.81	992.81

"Y" Levels over Tunnel #8 Con

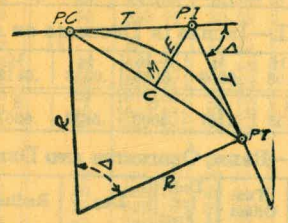
		993.15		
TP	+0.23	980.43	-12.95	980.20
TP	+0.08	967.68	-12.83	967.60
TP	+1.45	956.11	-13.02	954.66
TP	+1.13	944.27	-12.97	943.14
TP	+0.52	931.78	-13.01	931.26
TP	+0.73	919.54	-12.97	918.81
TP	+0.27	907.05	-12.76	906.78
TP	+0.53	894.73	-12.85	894.20
TP	+0.19	881.97	-12.95	881.78
TP	+1.04	870.05	-12.96	869.01
TP	+0.79	857.87	-12.97	857.08
TP	+0.22	845.24	-12.85	845.02
TP	+1.02	833.30	-12.96	832.28
TP	+0.60	820.97	-12.93	820.37
TP	+0.27	808.27	-12.97	808.00
TP	+0.31	796.15	-12.43	795.84
TP	+0.29	783.40	-13.04	783.11
TP	+0.23	770.54	-13.09	770.31
TP	+0.13	757.67	-13.00	757.54
TP	+0.39	745.43	-12.63	745.04
TP	+0.10	732.79	-12.74	732.69
TP	+0.47	720.54	-12.72	720.07
TP	+0.84	708.85	-12.53	708.01
TP	+0.48	696.22	-13.11	695.74

"Y" Levels over Tunnel #8 Con

		696.22		
TP	+0.41	683.55	-13.08	683.14
TP	+0.50	671.20	-12.85	670.70
TP	+1.01	663.49	-8.72	662.48
TP	+0.37	650.94	-12.92	650.57
TP	+0.24	638.65	-12.53	638.41
TP	+0.35	626.08	-12.92	625.73
TP	+0.59	613.81	-12.86	613.22
			-4.68	609.13

Check on 610 Contour Point San Vicente Dam site

DIETZGEN'S RAILROAD CURVE AND REDUCTION TABLES



CURVE FORMULAS

Radius=R=$\frac{50}{\text{sin. } D/2}$ (1) Degree of Curve=D and sin. $\frac{D}{2}=\frac{50}{R}$ (2)

Tangent=T=R tan $\frac{\Delta}{2}$ (3) Length of Curve=L=100$\frac{\Delta}{D}$ (4)

Middle ordinate=M= R(1—cos. $\frac{\Delta}{2}$) (5) =R vers $\frac{\Delta}{2}$ (6)

External=E=T tan $\frac{\Delta}{4}$ (7) =R÷cos. $\frac{\Delta}{2}$—R (8)=R exsec $\frac{\Delta}{2}$ (9)

Long Chord=C=2 R sin. $\frac{\Delta}{2}$ (10) Δ=Central Angle

EXPLANATION AND USE OF TABLES

Stations.—Given P. I.=Sta. 161+60.35 to find Sta. of P. C. and P. T. Δ=62° 10′ D=8° 20′. From Table IV for 1° curve T=3454.1 and÷8⅓=414.49 ft. From Table V correction=.36 or T=414.85 ft. P. C.=Sta. P.I.—T=157+45.50. Also from (4) L=746.00 and P. T.=Sta. P. C. +L=164+91.50.

Offsets.—Tangent offsets vary (approximately) directly with D and with square of the distance. Thus tangent offset for Sta. 158 on above curve is 2.16 ft. found as follows. From Table III tangent offset for 100 ft.=7.27 ft. Distance=158—Sta. P. C.=54.50, hence offset=7.27 (54.50÷100)²=2.16 ft. Also square of any distance divided by twice the radius equals (approximately) the distance from tangent to curve. Thus (54.50)²÷(2 x 688.26)=2.16 ft.

Deflections.—Deflection angle=½ D for 100 ft., ¼ D for 50 ft., etc. For c ft.=(in minutes) .3 x C x D° or=defl. for 1 ft. from Table III x C. For Sta. 158 of above curve=.3 x 54.5 x 8⅓=136.2′ or 2° 16.2′, or=2.50 x 54.5=136.2′ from Table III. For Sta. 159 deflection angle=2° 16.2′+8° 20′÷2=6° 26.2′, etc.

Externals.—May be found in similar manner to tangents. Thus E for curve above is 91.37. For from Table IV for 1° curve E=960.6 for 8° 20′=960.6÷8⅓=91.27 and from Table V correction=.10 or E=91.37 ft. Or suppose Δ=32° and E is measured and found to be 42 ft. What is D? From Table IV E=230.9 and÷42=5.5 or D=5° 30′.

DISTANCES FROM CENTER OF ROADWAY FOR CROSS-SECTIONING.

Roadway 16 feet wide. Side Slopes 1 on 1½.

For Single Track Embankment.

H	0	.1	.2	.3	.4	.5	.6	.7	.8	.9	H
0	8.0	8.2	8.3	8.5	8.6	8.8	8.9	9.1	9.2	9.4	0
1	9.5	9.7	9.8	10.0	10.1	10.3	10.4	10.6	10.7	10.9	1
2	11.0	11.2	11.3	11.5	11.6	11.8	11.9	12.1	12.2	12.4	2
3	12.5	12.7	12.8	13.0	13.1	13.3	13.4	13.6	13.7	13.9	3
4	14.0	14.2	14.3	14.5	14.6	14.8	14.9	15.1	15.2	15.4	4
5	15.5	15.7	15.8	16.0	16.1	16.3	16.4	16.6	16.7	16.9	5
6	17.0	17.2	17.3	17.5	17.6	17.8	17.9	18.1	18.2	18.4	6
7	18.5	18.7	18.8	19.0	19.1	19.3	19.4	19.6	19.7	19.9	7
8	20.0	20.2	20.3	20.5	20.6	20.8	20.9	21.1	21.2	21.4	8
9	21.5	21.7	21.8	22.0	22.1	22.3	22.4	22.6	22.7	22.9	9
10	23.0	23.2	23.3	23.5	23.6	23.8	23.9	24.1	24.2	24.4	10
11	24.5	24.7	24.8	25.0	25.1	25.3	25.4	25.6	25.7	25.9	11
12	26.0	25.2	26.3	26.5	26.6	26.8	26.9	27.1	27.2	27.4	12
13	27.5	27.7	27.8	28.0	28.1	28.3	28.4	28.6	28.7	28.9	13
14	29.0	29.2	29.3	29.5	29.6	29.8	29.9	30.1	30.2	30.4	14
15	30.5	30.7	30.8	31.0	31.1	31.3	31.4	31.6	31.7	31.9	15
16	32.0	32.2	32.3	32.5	32.6	32.8	32.9	33.1	33.2	33.4	16
17	33.5	33.7	33.8	34.0	34.1	34.3	34.4	34.6	34.7	34.9	17
18	35.0	35.2	35.3	35.5	35.6	35.8	35.9	36.1	36.2	36.4	18
19	36.5	36.7	36.8	37.0	37.1	37.3	37.4	37.6	37.7	37.9	19
20	38.0	38.2	38.3	38.5	38.6	38.8	38.9	39.1	39.2	39.4	20
21	39.5	39.7	39.8	40.0	40.1	40.3	40.4	40.6	40.7	40.9	21
22	41.0	41.2	41.3	41.5	41.6	41.8	41.9	42.1	42.2	42.4	22
23	42.5	42.7	42.8	43.0	43.1	43.3	43.4	43.6	43.7	43.9	23
24	44.0	44.2	44.3	44.5	44.6	44.8	44.9	45.1	45.2	45.4	24
25	45.5	45.7	45.8	46.0	46.1	46.3	46.4	46.6	46.7	46.9	25
26	47.0	47.2	47.3	47.5	47.6	47.8	47.9	48.1	48.2	48.4	26
27	48.5	48.7	48.8	49.0	49.1	49.3	49.4	49.6	49.7	49.9	27
28	50.0	50.2	50.3	50.5	50.6	50.8	50.9	51.1	51.2	51.4	28
29	51.5	51.7	51.8	52.0	52.1	52.3	52.4	52.6	52.7	52.9	29
30	53.0	53.2	53.3	53.5	53.6	53.8	53.9	54.1	54.2	54.4	30
31	54.5	54.7	54.8	55.0	55.1	55.3	55.4	55.6	55.7	55.9	31
32	56.0	56.2	56.3	56.5	56.6	56.8	56.9	57.1	57.2	57.4	32
33	57.5	57.7	57.8	58.0	58.1	58.3	58.4	58.6	58.7	58.9	33
34	59.0	59.2	59.3	59.5	59.6	59.8	59.9	60.1	60.2	60.4	34
35	60.5	60.7	60.8	61.0	61.1	61.3	61.4	61.6	61.7	61.9	35
36	62.0	62.2	62.3	62.5	62.6	62.8	62.9	63.1	63.2	63.4	36
37	63.5	63.7	63.8	64.0	64.1	64.3	64.4	64.6	64.7	64.9	37
38	65.0	65.2	65.3	65.5	65.6	65.8	65.9	66.1	66.2	66.4	38
39	66.5	66.7	66.8	67.0	67.1	67.3	67.4	67.6	67.7	67.9	39
40	68.0	68.2	68.3	68.5	68.6	68.8	68.9	69.1	69.2	69.4	40

Example—If point is 22.6 ft. above grade, how far should it be from center line to be a slope stake point? Ans. from Table 41.9. For same slopes but other widths of roadbed correct above figures by one-half difference in width of roadbed; thus in example above for 20 ft. roadbed distance will be 41.9+(20—16)÷2 or 2 ft. added to 41.9 =43.9. For slopes of 1 on 1 see inside of front cover.

Made in Germany.