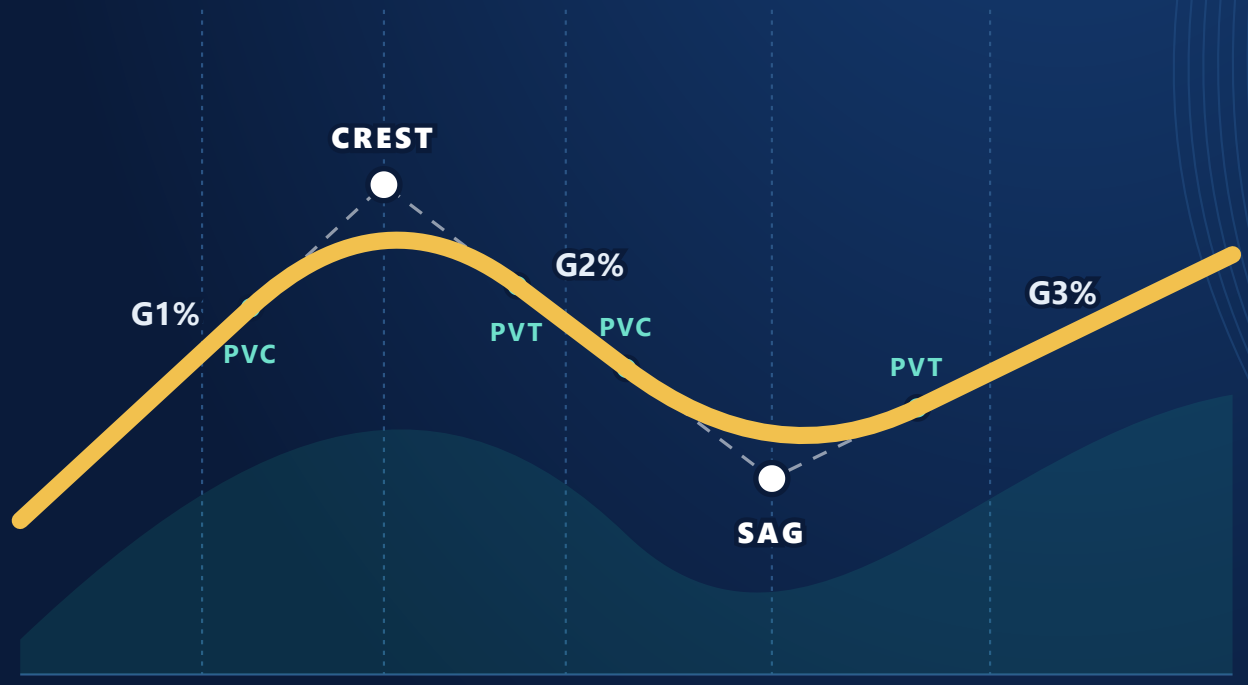
Vertical Curve Design Report

Parabolic crest and sag curves through a chain of PVIs (AASHTO K values).



Sample Road

Client: Urban City

PREPARED & SUBMITTED BY

SP Consultant

in Joint Venture with USF Consultants
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ISSUE

November 2026

Case 1 of 3: Elevation at one station (2+640, on the crest curve at PVI 9)

Vertical Curve Design — Design Report

PVI chain & parabolic vertical curves · Generated 11/11/2026 1:47:14 PM

1. Project

Road name	Sample Road
Design speed	80 kph
Number of PVIs	10
Alignment	0+017.500 to 2+800.000
Date	11/11/2026

2. Design criteria

Minimum K — crest (AASHTO, 80 kph)	26
Minimum K — sag (AASHTO, 80 kph)	30
Curves checked	8 (8 OK, 0 below minimum)

3. Method

Grades: G_1, G_2 = ΔElev / ΔSta between successive PVIs; algebraic difference $A = G_2 - G_1$ ($A < 0$ crest, $A > 0$ sag).

Curve: PVC = PVI − L/2, PVT = PVI + L/2; elevation within the curve $Elev(x) = Elev_{PVC} + G_1 \cdot x + (A / 2L) \cdot x^2$, x measured from the PVC.

K = L / |A%|; middle ordinate M = |A%| · L / 800; high/low point at $x = -G_1 \cdot L / A$ where it falls within the curve.

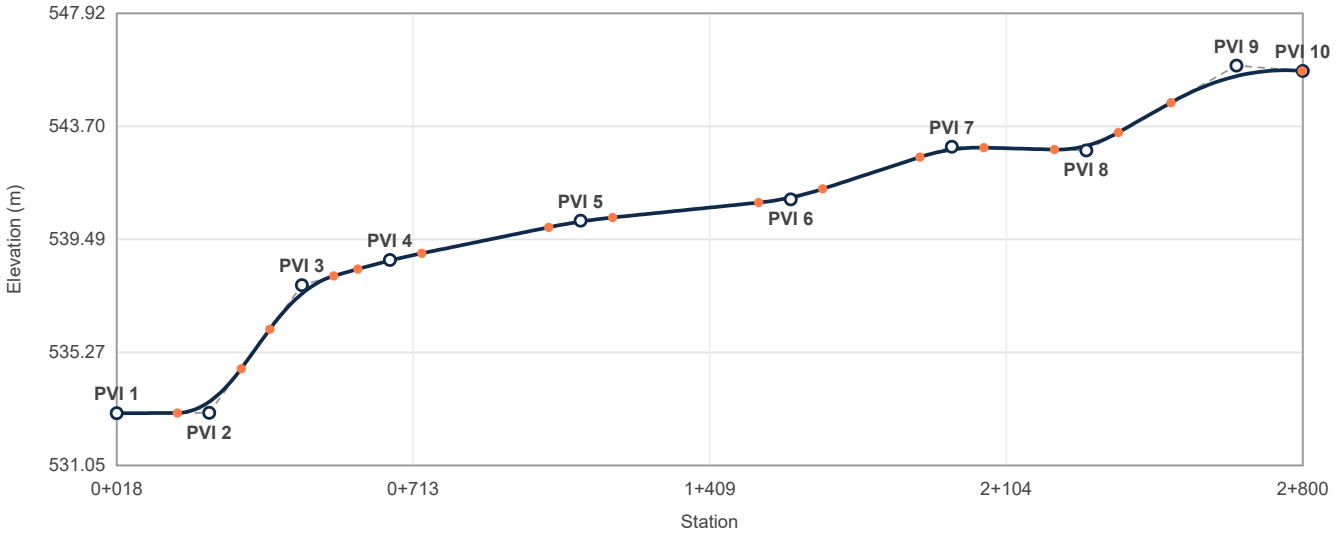
4. PVI chain

PVI	Role	Station	Elevation	Curve L
1	Start	0+017.500	533.000	–
2	Interior	0+234.510	533.020	150.000
3	Interior	0+451.680	537.780	150.000
4	Interior	0+658.310	538.720	150.000
5	Interior	1+105.870	540.180	150.000
6	Interior	1+598.680	540.980	150.000
7	Interior	1+976.580	542.940	150.000
8	Interior	2+292.350	542.800	150.000
9	Interior	2+644.550	545.970	307.301
10	End	2+800.000	545.765	–

5. Curve data

PVI	Type	G1	G2	A	L	K	Min K	Check	PVC Sta / Elev	PVT Sta / Elev	M	High / low point
2	Sag	0.009%	2.192%	2.183%	150.000	68.7	30	OK	0+159.510 / 533.013	0+309.510 / 534.664	0.409	–
3	Crest	2.192%	0.455%	-1.737%	150.000	86.4	26	OK	0+376.680 / 536.136	0+526.680 / 538.121	0.326	–
4	Crest	0.455%	0.326%	-0.129%	150.000	1165.4	26	OK	0+583.310 / 538.379	0+733.310 / 538.965	0.024	–
5	Crest	0.326%	0.162%	-0.164%	150.000	915.3	26	OK	1+030.870 / 539.935	1+180.870 / 540.302	0.031	–
6	Sag	0.162%	0.519%	0.356%	150.000	421.0	30	OK	1+523.680 / 540.858	1+673.680 / 541.369	0.067	–
7	Crest	0.519%	-0.044%	-0.563%	150.000	266.4	26	OK	1+901.580 / 542.551	2+051.580 / 542.907	0.106	High 2+039.767 / 542.909
8	Sag	-0.044%	0.900%	0.944%	150.000	158.8	30	OK	2+217.350 / 542.833	2+367.350 / 543.475	0.177	Low 2+224.392 / 542.832
9	Crest	0.900%	-0.132%	-1.032%	307.301	297.8	26	OK	2+490.899 / 544.587	2+798.201 / 545.767	0.396	High 2+758.929 / 545.793

6. Profile



Solid line: finished profile · dashed: tangents through the PVIs · orange dots: PVC / PVT.

7. Elevations

2+640.000 → Elevation = **545.556 m** (curve)

Curve L 307.301 m, Start 2+490.899 → End 2+798.201

Generated with the Vertical Curve Design Calculator — https://shahidpervaiz.net/EngineeringDesignTools/vertical_curve_design_calculator.
Results should be checked by a qualified engineer before use.

Sample report: illustrative data, not for design use

Case 2 of 3: Elevations at a 50 m interval along the whole alignment (0+017.50 to 2+800)

Vertical Curve Design — Design Report

PVI chain & parabolic vertical curves · Generated 11/11/2026 1:47:28 PM

1. Project

Road name	Sample Road
Design speed	80 kph
Number of PVIs	10
Alignment	0+017.500 to 2+800.000
Date	11/11/2026

2. Design criteria

Minimum K — crest (AASHTO, 80 kph)	26
Minimum K — sag (AASHTO, 80 kph)	30
Curves checked	8 (8 OK, 0 below minimum)

3. Method

Grades: G_1, G_2 = ΔElev / ΔSta between successive PVIs; algebraic difference $A = G_2 - G_1$ ($A < 0$ crest, $A > 0$ sag).

Curve: PVC = PVI − L/2, PVT = PVI + L/2; elevation within the curve $Elev(x) = Elev_{PVC} + G_1 \cdot x + (A / 2L) \cdot x^2$, x measured from the PVC.

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PVI	Role	Station	Elevation	Curve L
1	Start	0+017.500	533.000	–
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3	Interior	0+451.680	537.780	150.000
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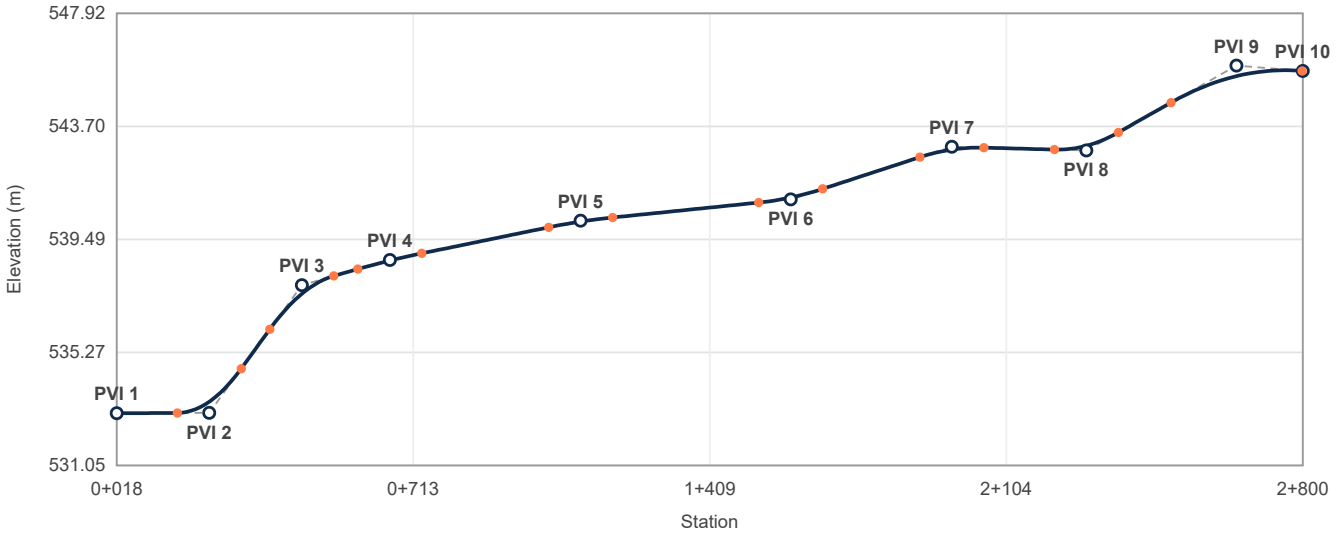
6	Interior	1+598.680	540.980	150.000
7	Interior	1+976.580	542.940	150.000
8	Interior	2+292.350	542.800	150.000
9	Interior	2+644.550	545.970	307.301
10	End	2+800.000	545.765	–

5. Curve data

PVI	Type	G1	G2	A	L	K	Min K	Check	PVC Sta / Elev	PVT Sta / Elev	M	High / low point
2	Sag	0.009%	2.192%	2.183%	150.000	68.7	30	OK	0+159.510 / 533.013	0+309.510 / 534.664	0.409	—
3	Crest	2.192%	0.455%	-1.737%	150.000	86.4	26	OK	0+376.680 / 536.136	0+526.680 / 538.121	0.326	—
4	Crest	0.455%	0.326%	-0.129%	150.000	1165.4	26	OK	0+583.310 / 538.379	0+733.310 / 538.965	0.024	—
5	Crest	0.326%	0.162%	-0.164%	150.000	915.3	26	OK	1+030.870 / 539.935	1+180.870 / 540.302	0.031	—
6	Sag	0.162%	0.519%	0.356%	150.000	421.0	30	OK	1+523.680 / 540.858	1+673.680 / 541.369	0.067	—
7	Crest	0.519%	-0.044%	-0.563%	150.000	266.4	26	OK	1+901.580 / 542.551	2+051.580 / 542.907	0.106	High 2+039.767 / 542.909
8	Sag	-0.044%	0.900%	0.944%	150.000	158.8	30	OK	2+217.350 / 542.833	2+367.350 / 543.475	0.177	Low 2+224.392 / 542.832
9	Crest	0.900%	-0.132%	-1.032%	307.301	297.8	26	OK	2+490.899 / 544.587	2+798.201 / 545.767	0.396	High 2+758.929 / 545.793

6. Profile



Solid line: finished profile · dashed: tangents through the PVIs · orange dots: PVC / PVT.

7. Elevations

Sta.	Elev.	Segment	Curve L	Curve Start Sta	Curve End Sta
0+017.500	533.000	tangent	—	—	—
0+067.500	533.005	tangent	—	—	—
0+117.500	533.009	tangent	—	—	—
0+167.500	533.018	curve	150.000	0+159.510	0+309.510
0+217.500	533.263	curve	150.000	0+159.510	0+309.510
0+267.500	533.871	curve	150.000	0+159.510	0+309.510

Sta.	Elev.	Segment	Curve L	Curve Start Sta	Curve End Sta
0+317.500	534.839	tangent	—	—	—
0+367.500	535.935	tangent	—	—	—
0+417.500	536.934	curve	150.000	0+376.680	0+526.680
0+467.500	537.649	curve	150.000	0+376.680	0+526.680
0+517.500	538.075	curve	150.000	0+376.680	0+526.680
0+567.500	538.307	tangent	—	—	—
0+617.500	538.529	curve	150.000	0+583.310	0+733.310
0+667.500	538.731	curve	150.000	0+583.310	0+733.310
0+717.500	538.912	curve	150.000	0+583.310	0+733.310
0+767.500	539.076	tangent	—	—	—
0+817.500	539.239	tangent	—	—	—
0+867.500	539.402	tangent	—	—	—
0+917.500	539.566	tangent	—	—	—
0+967.500	539.729	tangent	—	—	—
1+017.500	539.892	tangent	—	—	—
1+067.500	540.048	curve	150.000	1+030.870	1+180.870
1+117.500	540.177	curve	150.000	1+030.870	1+180.870
1+167.500	540.279	curve	150.000	1+030.870	1+180.870
1+217.500	540.361	tangent	—	—	—
1+267.500	540.442	tangent	—	—	—
1+317.500	540.524	tangent	—	—	—
1+367.500	540.605	tangent	—	—	—
1+417.500	540.686	tangent	—	—	—
1+467.500	540.767	tangent	—	—	—
1+517.500	540.848	tangent	—	—	—
1+567.500	540.952	curve	150.000	1+523.680	1+673.680
1+617.500	541.115	curve	150.000	1+523.680	1+673.680
1+667.500	541.337	curve	150.000	1+523.680	1+673.680
1+717.500	541.596	tangent	—	—	—
1+767.500	541.856	tangent	—	—	—
1+817.500	542.115	tangent	—	—	—
1+867.500	542.374	tangent	—	—	—
1+917.500	542.629	curve	150.000	1+901.580	2+051.580
1+967.500	542.811	curve	150.000	1+901.580	2+051.580
2+017.500	542.900	curve	150.000	1+901.580	2+051.580
2+067.500	542.900	tangent	—	—	—
2+117.500	542.878	tangent	—	—	—
2+167.500	542.855	tangent	—	—	—
2+217.500	542.833	curve	150.000	2+217.350	2+367.350
2+267.500	542.890	curve	150.000	2+217.350	2+367.350
2+317.500	543.105	curve	150.000	2+217.350	2+367.350
2+367.500	543.476	tangent	—	—	—

Sta.	Elev.	Segment	Curve L	Curve Start Sta	Curve End Sta
2+417.500	543.926	tangent	—	—	—
2+467.500	544.376	tangent	—	—	—
2+517.500	544.815	curve	307.301	2+490.899	2+798.201
2+567.500	545.178	curve	307.301	2+490.899	2+798.201
2+617.500	545.457	curve	307.301	2+490.899	2+798.201
2+667.500	545.653	curve	307.301	2+490.899	2+798.201
2+717.500	545.764	curve	307.301	2+490.899	2+798.201
2+767.500	545.792	curve	307.301	2+490.899	2+798.201
2+800.000	545.765	tangent	—	—	—

Generated with the Vertical Curve Design Calculator — https://shahidpervaiz.net/EngineeringDesignTools/vertical_curve_design_calculator.
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Case 3 of 3: Station range 2+490 to 2+800 at 10 m, through the crest curve at PVI 9

Vertical Curve Design — Design Report

PVI chain & parabolic vertical curves · Generated 11/11/2026 1:47:43 PM

1. Project

Road name	Sample Road
Design speed	80 kph
Number of PVIs	10
Alignment	0+017.500 to 2+800.000
Date	11/11/2026

2. Design criteria

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6	Interior	1+598.680	540.980	150.000
7	Interior	1+976.580	542.940	150.000
8	Interior	2+292.350	542.800	150.000
9	Interior	2+644.550	545.970	307.301
10	End	2+800.000	545.765	–

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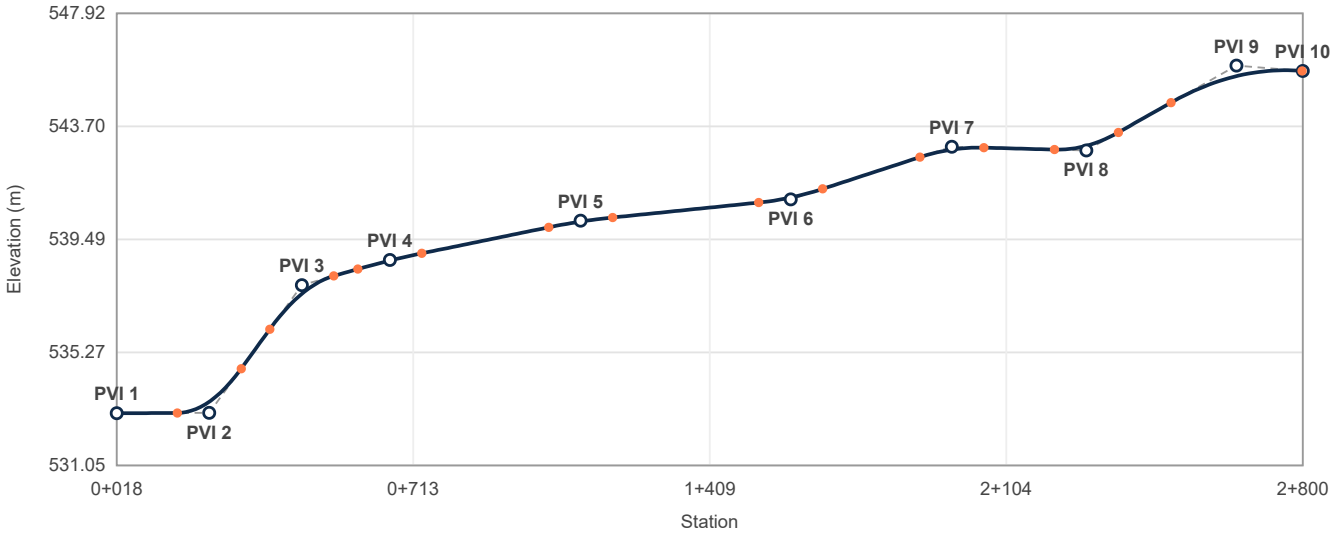

Solid line: finished profile · dashed: tangents through the PVIs · orange dots: PVC / PVT.

7. Elevations

Sta.	Elev.	Segment	Curve L	Curve Start Sta	Curve End Sta
2+490.000	544.579	tangent	—	—	—
2+500.000	544.668	curve	307.301	2+490.899	2+798.201
2+510.000	544.753	curve	307.301	2+490.899	2+798.201
2+520.000	544.835	curve	307.301	2+490.899	2+798.201
2+530.000	544.913	curve	307.301	2+490.899	2+798.201
2+540.000	544.989	curve	307.301	2+490.899	2+798.201

Sta.	Elev.	Segment	Curve L	Curve Start Sta	Curve End Sta
2+550.000	545.060	curve	307.301	2+490.899	2+798.201
2+560.000	545.129	curve	307.301	2+490.899	2+798.201
2+570.000	545.194	curve	307.301	2+490.899	2+798.201
2+580.000	545.256	curve	307.301	2+490.899	2+798.201
2+590.000	545.314	curve	307.301	2+490.899	2+798.201
2+600.000	545.369	curve	307.301	2+490.899	2+798.201
2+610.000	545.421	curve	307.301	2+490.899	2+798.201
2+620.000	545.469	curve	307.301	2+490.899	2+798.201
2+630.000	545.514	curve	307.301	2+490.899	2+798.201
2+640.000	545.556	curve	307.301	2+490.899	2+798.201
2+650.000	545.594	curve	307.301	2+490.899	2+798.201
2+660.000	545.629	curve	307.301	2+490.899	2+798.201
2+670.000	545.660	curve	307.301	2+490.899	2+798.201
2+680.000	545.689	curve	307.301	2+490.899	2+798.201
2+690.000	545.713	curve	307.301	2+490.899	2+798.201
2+700.000	545.735	curve	307.301	2+490.899	2+798.201
2+710.000	545.753	curve	307.301	2+490.899	2+798.201
2+720.000	545.768	curve	307.301	2+490.899	2+798.201
2+730.000	545.779	curve	307.301	2+490.899	2+798.201
2+740.000	545.787	curve	307.301	2+490.899	2+798.201
2+750.000	545.792	curve	307.301	2+490.899	2+798.201
2+760.000	545.793	curve	307.301	2+490.899	2+798.201
2+770.000	545.791	curve	307.301	2+490.899	2+798.201
2+780.000	545.786	curve	307.301	2+490.899	2+798.201
2+790.000	545.777	curve	307.301	2+490.899	2+798.201
2+800.000	545.765	tangent	—	—	—

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