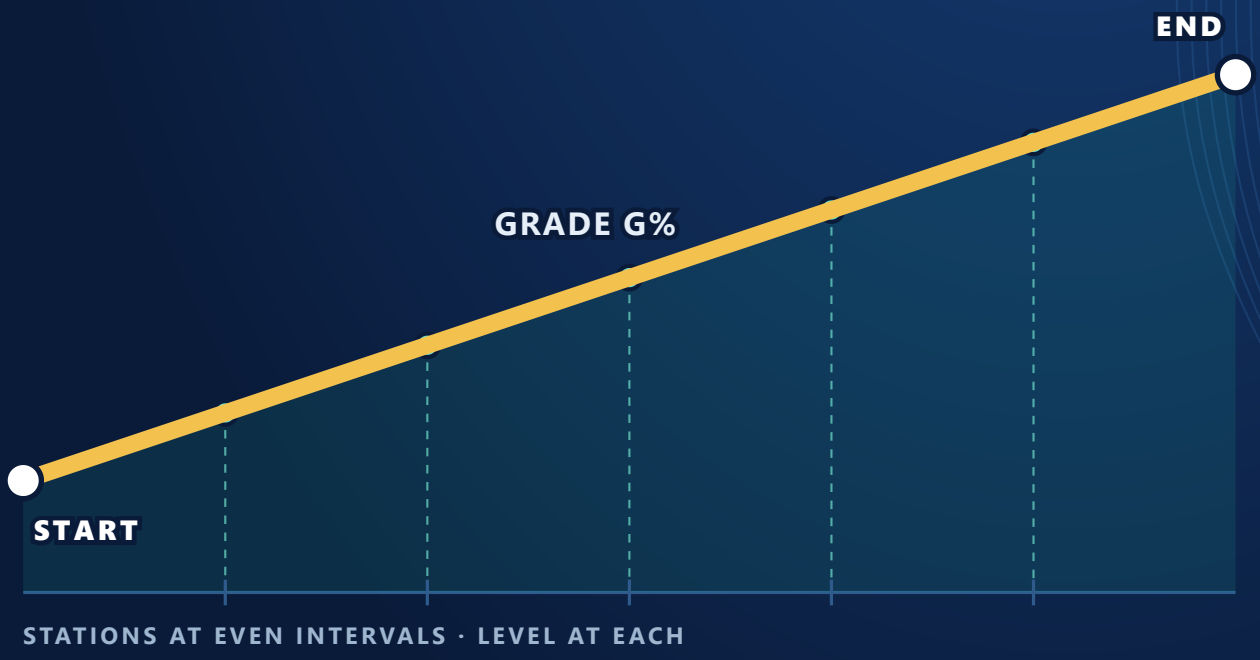
Vertical Alignment on Straight Line

Finished road levels and grades along a straight vertical alignment.



Sample Project

Client: Urban City

PREPARED & SUBMITTED BY

SP Consultant

in Joint Venture with USF Consultants

info@spconsultant.example

shahidpervaiz.net

ISSUE

November 2026

Case 1 of 5: Grade from two points (Sta 1, Elev 1, Sta 2, Elev 2) - elevation at one station, centreline

Road Grade Elevations — Straight Vertical Grade

Design report · Generated 11/6/2026 11:01:56 AM

1. Project

Project / road	Sample Project
Prepared by	SP Consultant
Date	11/6/2026

2. Input data

Method	Sta1, Elev1, Sta2, Elev2 given
Sta 1	0+000
Elev 1	100.000 m
Sta 2	0+500
Elev 2	107.500 m
Grade	1.5000%
Compute at	Single station — 0+250
Elevation type	Elevation at C/L
Decimal places	3

3. Method

Grade from two known points: $G = (Elev_2 - Elev_1) / (Sta_2 - Sta_1) = 1.5000\%$

Elevation at any station: $Elev = Elev_{ref} + G \times (Sta - Sta_{ref})$, with Sta_{ref} = 0+000.00 and $Elev_{ref}$ = 100.000 m.

4. Summary

Grade	1.5000% (rising)

5. Results

0+250.000 → Elevation = **103.750 m**

Generated with the Road Grade Elevation Calculator — https://shahidpervaiz.net/EngineeringDesignTools/vertical_alignment_design_straight_calculator. Results should be checked by a qualified engineer before use.

Sample report: illustrative data, not for design use

Case 2 of 5: Grade from two points - elevations at a 25 m interval, centreline

Road Grade Elevations — Straight Vertical Grade

Design report · Generated 11/6/2026 11:02:10 AM

1. Project

Project / road	Sample Project
Prepared by	SP Consultant
Date	11/6/2026

2. Input data

Method	Sta1, Elev1, Sta2, Elev2 given
Sta 1	0+000
Elev 1	100.000 m
Sta 2	0+500
Elev 2	107.500 m
Grade	1.5000%
Compute at	Fixed interval
Start Sta	0+000.00
End Sta	0+500
Interval	25 m
Elevation type	Elevation at C/L
Decimal places	3

3. Method

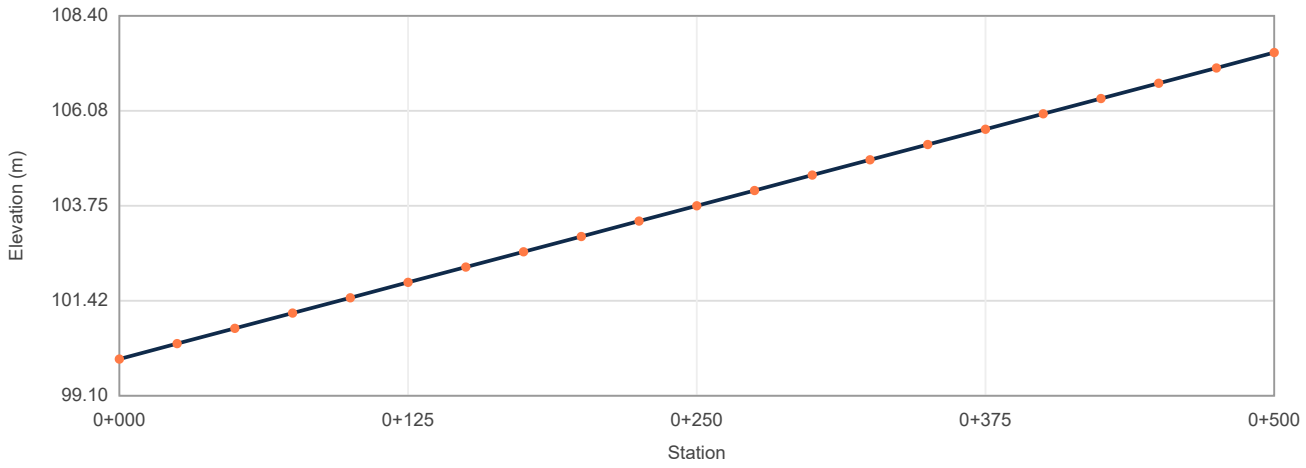
Grade from two known points: $G = (Elev_2 - Elev_1) / (Sta_2 - Sta_1) = 1.5000\%$

Elevation at any station: $Elev = Elev_{ref} + G \times (Sta - Sta_{ref})$, with Sta_{ref} = 0+000.00 and $Elev_{ref}$ = 100.000 m.

4. Summary

Stations computed	21
From	0+000.000 (PGL 100.000 m)
To	0+500.000 (PGL 107.500 m)
Rise / fall over range	7.500 m
Grade	1.5000% (rising)

5. Profile grade line



6. Results

Sta.	Elev.
0+000.000	100.000
0+025.000	100.375
0+050.000	100.750
0+075.000	101.125
0+100.000	101.500
0+125.000	101.875
0+150.000	102.250
0+175.000	102.625
0+200.000	103.000
0+225.000	103.375
0+250.000	103.750
0+275.000	104.125
0+300.000	104.500
0+325.000	104.875
0+350.000	105.250
0+375.000	105.625
0+400.000	106.000
0+425.000	106.375
0+450.000	106.750
0+475.000	107.125
0+500.000	107.500

Generated with the Road Grade Elevation Calculator — https://shahidpervaiz.net/EngineeringDesignTools/vertical_alignment_design_straight_calculator. Results should be checked by a qualified engineer before use.

Sample report: illustrative data, not for design use

Case 3 of 5: Grade from two points - station range 0+100 to 0+300 at 25 m, with pavement and shoulder edge levels

Road Grade Elevations — Straight Vertical Grade

Design report · Generated 11/6/2026 11:02:25 AM

1. Project

Project / road	Sample Project
Prepared by	SP Consultant
Date	11/6/2026

2. Input data

Method	Sta1, Elev1, Sta2, Elev2 given
Sta 1	0+000
Elev 1	100.000 m
Sta 2	0+500
Elev 2	107.500 m
Grade	1.5000%
Compute at	For some range
Start Sta	0+100
End Sta	0+300
Interval	25 m
Elevation type	Use offsets
Decimal places	3
Lt. pvt width / slope	3.65 m / -1.50%
Rt. pvt width / slope	3.65 m / -1.50%
Lt. shoulder width / slope	3.00 m / -4.00%
Rt. shoulder width / slope	3.00 m / -4.00%

3. Method

Grade from two known points: $G = (Elev_2 - Elev_1) / (Sta_2 - Sta_1) = 1.5000\%$

Elevation at any station: $Elev = Elev_{ref} + G \times (Sta - Sta_{ref})$, with Sta_{ref} = 0+000.00 and $Elev_{ref}$ = 100.000 m.

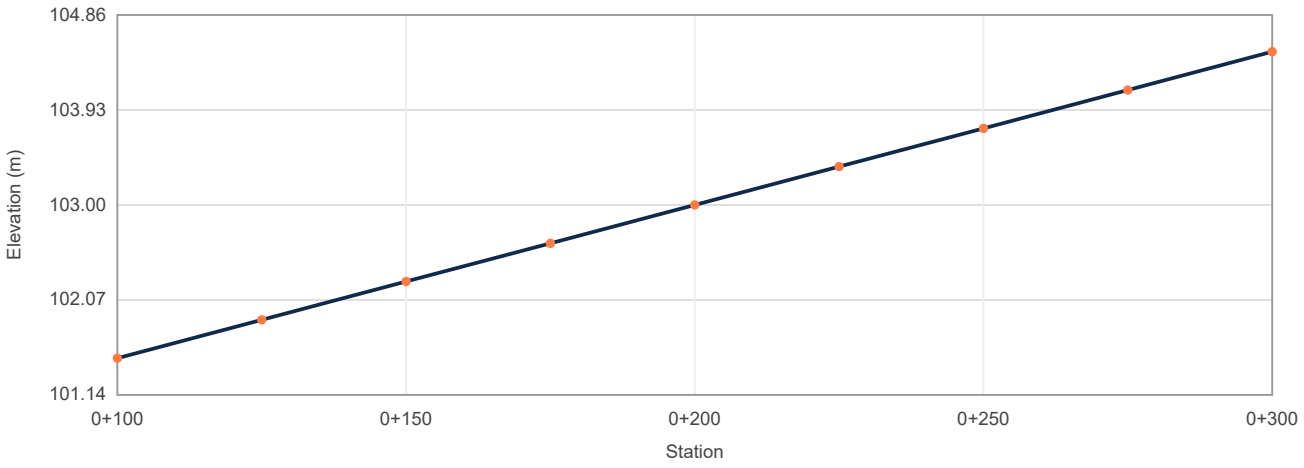
Cross-section levels: $LPE = PGL + W_{pvt,L} \times S_{pvt,L}$; $LSE = LPE + W_{shd,L} \times S_{shd,L}$ (and likewise on the right). Negative cross slopes fall away from the centreline.

PGL = profile grade line (C/L) · LPE/RPE = left/right pavement edge · LSE/RSE = left/right shoulder edge.

4. Summary

Stations computed	9
From	0+100.000 (PGL 101.500 m)
To	0+300.000 (PGL 104.500 m)
Rise / fall over range	3.000 m
Grade	1.5000% (rising)

5. Profile grade line



6. Results

Sta.	PGL	LSE	LPE	RPE	RSE
0+100.000	101.500	101.325	101.445	101.445	101.325
0+125.000	101.875	101.700	101.820	101.820	101.700
0+150.000	102.250	102.075	102.195	102.195	102.075
0+175.000	102.625	102.450	102.570	102.570	102.450
0+200.000	103.000	102.825	102.945	102.945	102.825
0+225.000	103.375	103.200	103.320	103.320	103.200
0+250.000	103.750	103.575	103.695	103.695	103.575
0+275.000	104.125	103.950	104.070	104.070	103.950
0+300.000	104.500	104.325	104.445	104.445	104.325

Generated with the Road Grade Elevation Calculator — https://shahidpervaiz.net/EngineeringDesignTools/vertical_alignment_design_straight_calculator. Results should be checked by a qualified engineer before use.

Case 4 of 5: Grade given (Station, Elevation, Grade %) - elevation at one station, centreline

Road Grade Elevations — Straight Vertical Grade

Design report · Generated 11/6/2026 11:02:39 AM

1. Project

Project / road	Sample Project
Prepared by	SP Consultant
Date	11/6/2026

2. Input data

Method	Sta, Elev & Grade% given
Station	0+000
Elevation	98.000 m
Grade	2.0000%
Compute at	Single station — 0+175
Elevation type	Elevation at C/L
Decimal places	3

3. Method

Grade given: G = 2.0000%, projected from the reference station.

Elevation at any station: Elev = $Elev_{ref}$ + G × (Sta − Sta_{ref}), with Sta_{ref} = 0+000.00 and $Elev_{ref}$ = 98.000 m.

4. Summary

Grade	2.0000% (rising)

5. Results

0+175.000 → Elevation = **101.500 m**

Generated with the Road Grade Elevation Calculator — https://shahidpervaiz.net/EngineeringDesignTools/vertical_alignment_design_straight_calculator. Results should be checked by a qualified engineer before use.

Case 5 of 5: Grade given - elevations at a 25 m interval, with pavement and shoulder edge levels

Road Grade Elevations — Straight Vertical Grade

Design report · Generated 11/6/2026 11:02:53 AM

1. Project

Project / road	Sample Project
Prepared by	SP Consultant
Date	11/6/2026

2. Input data

Method	Sta, Elev & Grade% given
Station	0+000
Elevation	98.000 m
Grade	2.0000%
Compute at	Fixed interval
Start Sta	0+000.00
End Sta	0+400
Interval	25 m
Elevation type	Use offsets
Decimal places	3
Lt. pvt width / slope	3.65 m / -1.50%
Rt. pvt width / slope	3.65 m / -1.50%
Lt. shoulder width / slope	3.00 m / -4.00%
Rt. shoulder width / slope	3.00 m / -4.00%

3. Method

Grade given: G = 2.0000%, projected from the reference station.

Elevation at any station: Elev = $Elev_{ref}$ + G × (Sta − Sta_{ref}), with Sta_{ref} = 0+000.00 and $Elev_{ref}$ = 98.000 m.

Cross-section levels: LPE = PGL + $W_{pvt,L}$ × $S_{pvt,L}$; LSE = LPE + $W_{shd,L}$ × $S_{shd,L}$ (and likewise on the right). Negative cross slopes fall away from the centreline.

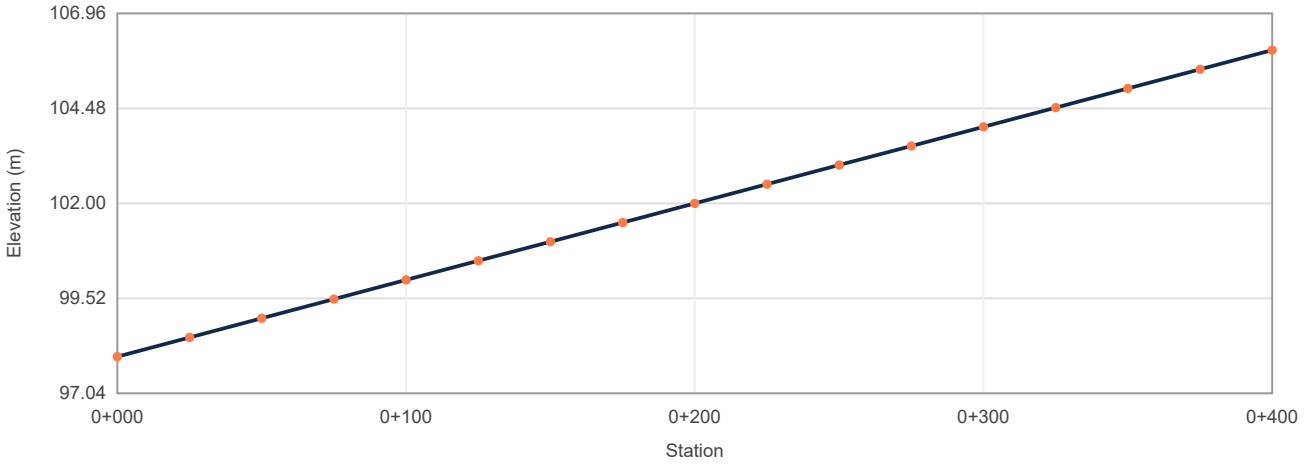
PGL = profile grade line (C/L) · LPE/RPE = left/right pavement edge · LSE/RSE = left/right shoulder edge.

4. Summary

Stations computed	17
From	0+000.000 (PGL 98.000 m)

To	0+400.000 (PGL 106.000 m)
Rise / fall over range	8.000 m
Grade	2.0000% (rising)

5. Profile grade line



6. Results

Sta.	PGL	LSE	LPE	RPE	RSE
0+000.000	98.000	97.825	97.945	97.945	97.825
0+025.000	98.500	98.325	98.445	98.445	98.325
0+050.000	99.000	98.825	98.945	98.945	98.825
0+075.000	99.500	99.325	99.445	99.445	99.325
0+100.000	100.000	99.825	99.945	99.945	99.825
0+125.000	100.500	100.325	100.445	100.445	100.325
0+150.000	101.000	100.825	100.945	100.945	100.825
0+175.000	101.500	101.325	101.445	101.445	101.325
0+200.000	102.000	101.825	101.945	101.945	101.825
0+225.000	102.500	102.325	102.445	102.445	102.325
0+250.000	103.000	102.825	102.945	102.945	102.825
0+275.000	103.500	103.325	103.445	103.445	103.325
0+300.000	104.000	103.825	103.945	103.945	103.825
0+325.000	104.500	104.325	104.445	104.445	104.325
0+350.000	105.000	104.825	104.945	104.945	104.825
0+375.000	105.500	105.325	105.445	105.445	105.325
0+400.000	106.000	105.825	105.945	105.945	105.825

Generated with the Road Grade Elevation Calculator — https://shahidpervaiz.net/EngineeringDesignTools/vertical_alignment_design_straight_calculator. Results should be checked by a qualified engineer before use.

Sample report: illustrative data, not for design use