Slope Stakes: Catch Point Offset for Cut or Fill

Offset from the centreline and the cut or fill at the catch point where a road or channel side slope meets ground with a uniform cross slope.

Method: Slope staking for earthwork

Input parameters

Unit system: SI

Parameter	Value	Unit
Half-width of the roadway (centre to shoulder)	6.0000	m
Side slope (horizontal per 1 vertical)	2.0000	
Grade (finished) elevation at the centreline	102.40	m
Ground elevation at the centreline	100.10	m
Ground cross slope (rising outward +)	-5.0000	%

Calculated results

Parameter	Value	Unit
Cut (+) or fill (−) at centreline	-2.3000	m
Catch point offset from the centreline	11.778	m
Cut or fill height at the catch point	2.8889	m
Ground elevation at the catch point	99.511	m

Notes for this case

• The side slope leaves the shoulder at grade elevation and runs outward at s horizontal per 1 vertical; the ground runs from the centre at the cross slope. In fill: x = w + s(G − E(x)); in cut: x = w + s(E(x) − G), with E(x) = E₀ + g_x·x, solved directly for uniform ground. In the field the rodperson moves the stake by trial until the measured and computed offsets agree, because real ground is irregular.

Formula and method

$$x = \frac{w + s|G - E_0|}{1 \pm s g_x}, \quad E_x = E_0 + g_x x$$

Variables

w	Half-width of the roadway (centre to shoulder)	m
s	Side slope (horizontal per 1 vertical)	-
G	Grade (finished) elevation at the centreline	m
E_0	Ground elevation at the centreline	m
g_x	Ground cross slope (rising outward +)	-
c/f	Cut (+) or fill (−) at centreline	m
x	Catch point offset from the centreline	m
h	Cut or fill height at the catch point	m
E_x	Ground elevation at the catch point	m

Method and standards

Slope staking.

Assumptions and limits

- Uniform ground cross slope; level roadway section.

References

Slope staking for earthwork

Report details

Report reference	FCC-8XEG-96QY (the same inputs always give the same reference)
Generated	23 November 2026, 18:08 UTC
Calculator	Slope Stakes: Catch Point Offset for Cut or Fill
Method last reviewed	17 November 2026
Software release	FireCAD Calc, release of 22 November 2026
Release checks	3 reference cases of this calculator, computed independently, are checked on every release

Results are for engineering estimation. Verify critical designs against the referenced standards and your own data.

This calculator online

https://calc.firecad.com/civil/surveying/slope-stake-catch-point

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.