Pipeline Grade Stakes: Invert, Cut and Grade Rod

Pipe invert at a stake from a starting invert and grade, the cut from stake top to invert, and the batter board height for a fixed grade rod.

Method: Staking pipeline grades

Input parameters

Unit system: SI

Parameter	Value	Unit
Station of the starting invert	0	m
Starting invert elevation	96.250	m
Pipe grade (+ rising with stationing)	0.60000	%
Stake station	75.000	m
Elevation of the stake top	99.842	m
Grade rod length	3.0000	m

Calculated results

Parameter	Value	Unit
Invert at the stake	96.700	m
Cut from stake top to invert	3.1420	m
Batter board elevation (invert + rod)	99.700	m
Batter board height above the stake top	-142.00	mm

Notes for this case

• Invert at any station = starting invert + grade × distance. Offset stakes are levelled and marked with the cut to the invert. A batter board set exactly one grade-rod length above the invert at each stake gives a string line parallel to the pipe, so the crew can check each pipe with the rod. Negative cut means fill. Allow for the pipe wall if staking to the crown or outside bottom.

Formula and method

$$I = I_0 + g(Sta - Sta_0), \quad C = E_{stake} - I, \quad E_{BB} = I + L_{rod}$$

Variables

Sta_0	Station of the starting invert	m
I_0	Starting invert elevation	m
g	Pipe grade (+ rising with stationing)	-
Sta	Stake station	m
E_{stake}	Elevation of the stake top	m
L_{rod}	Grade rod length	m
I	Invert at the stake	m
C	Cut from stake top to invert	m
E_{BB}	Batter board elevation (invert + rod)	m
h_{BB}	Batter board height above the stake top	m

Method and standards

Grade stakes.

Assumptions and limits

- Uniform grade between stations.

References

Staking pipeline grades

Report details

Report reference	FCC-ECGX-XYMD (the same inputs always give the same reference)
Generated	23 November 2026, 18:09 UTC
Calculator	Pipeline Grade Stakes: Invert, Cut and Grade Rod
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/pipeline-grade-stakes

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.