Two-Peg Test: Level Collimation Error

True height difference, collimation error per unit distance and the corrected far-staff reading of a surveying level from the readings of a two-peg test.

Method: Two-peg collimation test

Input parameters

Unit system: SI

Parameter	Value	Unit
Staff reading on A, level midway	1.5240	m
Staff reading on B, level midway	1.1870	m
Staff reading on A, level near A	1.4020	m
Staff reading on B, level near A	1.0710	m
Distance between the pegs	60.000	m
Distance from the level to A in the second set-up	3.0000	m

Calculated results

Parameter	Value	Unit
True difference (midway) $a_1 - b_1$	337.00	mm
Apparent difference near A $a_2 - b_2$	331.00	mm
Collimation error over the peg distance	6.0000	mm
Collimation error per 100 m	10.000	mm
Correct reading on B for the second set-up	1.0650	m
Line-of-sight inclination (+ up)	20.626	″

Notes for this case

- Midway readings cancel the collimation error, giving the true difference. Near-A readings expose it: e is the error of the far reading over the peg distance (positive: the line of sight rises).
- The error exceeds about 5 mm per 100 m (a common tolerance): adjust the level.

Formula and method

$$\Delta h = a_1 - b_1, \quad e = (a_1 - b_1) - (a_2 - b_2), \quad b_{2,correct} = a_2 - \Delta h$$

Variables

a_1	Staff reading on A, level midway	m
b_1	Staff reading on B, level midway	m
a_2	Staff reading on A, level near A	m
b_2	Staff reading on B, level near A	m
L	Distance between the pegs	m
d_{near}	Distance from the level to A in the second set-up	m
Δh	True difference (midway) $a_1 - b_1$	m
Δh_2	Apparent difference near A $a_2 - b_2$	m
e	Collimation error over the peg distance	m
e/L	Collimation error per 100 m	m
$b_{2,correct}$	Correct reading on B for the second set-up	m
α	Line-of-sight inclination (+ up)	rad

Method and standards

Level collimation testing.

Assumptions and limits

- Curvature and refraction negligible over the peg distance.

References

Two-peg collimation test

Report details

Report reference	FCC-QMG2-8BK9 (the same inputs always give the same reference)
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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/two-peg-test-collimation

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Reopens the calculator with the inputs of this report.