Levelling: Reduced Levels by the Height of Instrument Method

Reduced levels of six staff stations from a back sight on a bench mark by the height of instrument method, with the arithmetic check for the set-up.

Method: Height of instrument method of reducing levels (surveying texts)

Input parameters

Unit system: SI

Parameter	Value	Unit
Reduced level of the bench mark	100.00	m
Back sight on the bench mark	1.5250	m
Staff reading at station 1	1.8400	m
Staff reading at station 2	2.3150	m
Staff reading at station 3	0.96500	m
Staff reading at station 4	1.2100	m
Staff reading at station 5	2.6000	m
Staff reading at station 6	1.7050	m

Calculated results

Parameter	Value	Unit
Height of instrument RL + BS	101.53	m
Reduced level of station 1	99.685	m
Reduced level of station 2	99.210	m
Reduced level of station 3	100.56	m
Reduced level of station 4	100.32	m
Reduced level of station 5	98.925	m
Reduced level of station 6	99.820	m
Last RL − bench mark RL (= ΣBS − ΣFS for the set-up)	-0.18000	m

Notes for this case

- All readings from one instrument set-up; for a change point start a new calculation with the change point's RL as the bench mark.

Formula and method

$$HI = RL_{BM} + BS, \quad RL_i = HI - s_i$$

Variables

RL_{BM}	Reduced level of the bench mark	m
BS	Back sight on the bench mark	m
s_1	Staff reading at station 1	m
s_2	Staff reading at station 2	m
s_3	Staff reading at station 3	m
s_4	Staff reading at station 4	m
s_5	Staff reading at station 5	m
s_6	Staff reading at station 6	m
HI	Height of instrument RL + BS	m

RL_1	Reduced level of station 1	m
RL_2	Reduced level of station 2	m
RL_3	Reduced level of station 3	m
RL_4	Reduced level of station 4	m
RL_5	Reduced level of station 5	m
RL_6	Reduced level of station 6	m
Δ	Last RL − bench mark RL (= ΣBS − ΣFS for the set-up)	m

Method and standards

Height of instrument method.

Assumptions and limits

- One instrument set-up. The check Δ = last RL − RL_BM equals ΣBS − ΣFS (BS minus the last reading) for the set-up.
- Inverted-staff readings (staff held upside down, for example under a soffit) are entered as negative values.

References

- Height of instrument method of reducing levels (surveying texts)

Report details

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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/levelling-height-of-instrument

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Reopens the calculator with the inputs of this report.