Levelling Misclosure, Permissible Error and Adjustment

Observed closing level, misclosure against a known benchmark, permissible closing error by C√K, and the correction per set-up for a levelling line.

Method: Levelling closure and distribution of error

Input parameters

Unit system: SI

Parameter	Value	Unit
Starting benchmark level	100.00	m
Sum of back sights	18.745	m
Sum of fore sights	15.130	m
Known closing benchmark level	103.60	m
Length of the levelling route	2.4000	km
Number of set-ups	12.000	
Permissible error constant (mm/√km)	12.000	

Calculated results

Parameter	Value	Unit
Observed closing level	103.62	m
Misclosure (observed − known)	15.000	mm
Permissible error	18.590	mm
Ratio to permissible	0.80687	
Correction per set-up	-1.2500	mm

Notes for this case

• Arithmetic check: RL_last − RL_first = ΣBS − ΣFS. The misclosure against the known benchmark is compared with C√K (K in km): about 4 mm/√km for precise, 12 mm/√km for ordinary engineering and 24 mm/√km for rough levelling (common values; follow the job specification). If acceptable, the error is distributed equally per set-up (cumulatively: the i-th change point gets i times the per-set-up correction), or in proportion to distance.

Formula and method

$$RL_{obs} = RL_0 + \Sigma BS - \Sigma FS, \quad e_p = C\sqrt{K}, \quad c_s = -\frac{e}{n}$$

Variables

RL_0	Starting benchmark level	m
ΣBS	Sum of back sights	m
ΣFS	Sum of fore sights	m
RL_1	Known closing benchmark level	m
K	Length of the levelling route	m
n	Number of set-ups	-
C	Permissible error constant (mm/√km)	-
RL_{obs}	Observed closing level	m
e	Misclosure (observed − known)	m
e_p	Permissible error	m
	e	/e_p$
c_s	Correction per set-up	m

Method and standards

Misclosure.

Assumptions and limits

- Random errors; equal set-up weights.

References

Levelling closure and distribution of error

Report details

Report reference	FCC-VGKN-HC2D (the same inputs always give the same reference)
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Calculator	Levelling Misclosure, Permissible Error and Adjustment
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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/levelling-misclosure-adjustment

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.