Steel Tape Corrections: Temperature, Pull, Sag and Slope

Corrections to a taped length for temperature, pull, sag and slope, and the corrected horizontal distance.

Method: Standard tape corrections (Punmia, Surveying, vol. 1–2 (Laxmi), vol. 1, ch. 3)

Input parameters

Unit system: SI

Parameter	Value	Unit
Measured length	30.000	m
Field temperature	35.000	°C
Standard temperature	20.000	°C
Expansion coefficient	11.600	µm/(m·K)
Applied pull	0.10000	kN
Standard pull	0.050000	kN
Tape cross-section	3.0000	mm²
Tape modulus	200.00	GPa
Tape weight per length	0.25000	N/m
Height difference between ends	1.5000	m

Calculated results

Parameter	Value	Unit
Temperature correction	5.2200	mm
Pull correction	2.5000	mm
Sag correction (suspended)	-7.0312	mm
Slope correction	-37.523	mm
Corrected horizontal length	29.963	m

Notes for this case

• Sag correction applies when the tape hangs freely between supports over the whole length (one span). Slope correction uses the exact √(L_c² − h²) form on the length already corrected for temperature, pull and sag. Correction for standardisation (tape's true length) is extra.

Formula and method

$$C_t = \alpha L (T - T_0), \quad C_p = \frac{(P - P_0) L}{A E}, \quad C_s = -\frac{w^2 L^3}{24 P^2}, \quad L_c = L + C_t + C_p + C_s, \quad C_h = -\left(L_c - \sqrt{L_c^2 - h^2}\right), \quad L_h = L_c + C_h$$

Variables

L	Measured length	m
T	Field temperature	K
T_0	Standard temperature	K
α	Expansion coefficient	1/K
P	Applied pull	N
P_0	Standard pull	N
A	Tape cross-section	m²
E	Tape modulus	Pa
w	Tape weight per length	N/m
h	Height difference between ends	m
C_t	Temperature correction	m

C_p	Pull correction	m
C_s	Sag correction (suspended)	m
C_h	Slope correction	m
L_h	Corrected horizontal length	m
L_c	Length after temperature, pull and sag corrections	m

Method and standards

Tape corrections.

Assumptions and limits

- The slope correction is applied to the length already corrected for temperature, pull and sag (L_c), in the exact form; h must be less than L_c.
- Single-span suspension; uniform tape.

References

- Standard tape corrections (Punmia, Surveying, vol. 1–2 (Laxmi), vol. 1, ch. 3)

Report details

Report reference	FCC-W391-A7ND (the same inputs always give the same reference)
Generated	17 November 2026, 19:36 UTC
Calculator	Steel Tape Corrections: Temperature, Pull, Sag and Slope
Method last reviewed	13 November 2026
Software release	FireCAD Calc, release of 17 November 2026
Release checks	2 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/tape-corrections

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.