Illuminance from a Point Source (Inverse Square and Cosine Law)

Illuminance on a horizontal surface from a lamp of given luminous intensity at a mounting height and horizontal distance, by the inverse-square and cosine laws.

Method: Inverse-square law and Lambert's cosine law

Input parameters

Unit system: SI

Parameter	Value	Unit
Luminous intensity in the direction of the point, I(θ) (candela)	5,000.0	
Mounting height above the surface	6.0000	m
Horizontal distance from the point below the lamp	4.0000	m

Calculated results

Parameter	Value	Unit
Distance from the lamp to the point	7.2111	m
Angle of incidence	33.690	°
Illuminance on the horizontal surface (lux)	80.005	
Illuminance on a surface facing the lamp (lux)	96.154	

Formula and method

$$E_h = \frac{I\cos\theta}{d^2} = \frac{I\,h}{(h^2+x^2)^{3/2}}, \quad E_n = \frac{I}{d^2}$$

Variables

I	Luminous intensity in the direction of the point, I(θ) (candela)	-
h	Mounting height above the surface	m
x	Horizontal distance from the point below the lamp	m
d	Distance from the lamp to the point	m
θ	Angle of incidence	rad
E_h	Illuminance on the horizontal surface (lux)	-
E_n	Illuminance on a surface facing the lamp (lux)	-

Method and standards

Point-source photometry.

Assumptions and limits

- Point source, no reflections.
- I is the intensity in the direction of the point, I(θ), from the luminaire's polar curve; the nadir (0°) value applies only to the point directly below.

References

- Inverse-square law and Lambert's cosine law

Report details

Report reference	FCC-M4FT-CF8K (the same inputs always give the same reference)
Generated	17 November 2026, 19:44 UTC
Calculator	Illuminance from a Point Source (Inverse Square and Cosine Law)
Method last reviewed	12 November 2026
Software release	FireCAD Calc, release of 17 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/electrical/lighting/illuminance-point-source

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.