LED Lumen Maintenance Projection and L70 Life

Exponential lumen maintenance fitted through two test points, the projected hours to a lumen maintenance level such as L70 and the output at a chosen time.

Method: Exponential lumen maintenance projection; IES TM-21; …

Input parameters

Unit system: SI

Parameter	Value	Unit
First test time	1,000.0	h
Lumen maintenance at t_1	98.500	%
Second test time	6,000.0	h
Lumen maintenance at t_2	95.500	%
Maintenance level of interest	70.000	%
Time of interest	50,000	h

Calculated results

Parameter	Value	Unit
Decay rate	6.1861e-06	1/h
Initial constant	0.99111	
Projected life to the level	56,215	h
Lumen maintenance at the time of interest	72.744	%
Usual extrapolation limit (6 × test duration)	36,000	h

Notes for this case

• Φ(t) = B·e^(−αt) through the two points; L_x = ln(B/x)/α. The standard projection method fits the same exponential by least squares to all data after 1,000 h and limits reported life to six times the test duration; results beyond that are shown as greater than the limit. Driver and luminaire temperature govern real life.

Formula and method

$$\Phi(t) = Be^{-\alpha t}, \quad \alpha = \frac{\ln(\Phi_1/\Phi_2)}{t_2 - t_1}, \quad L_x = \frac{\ln(B/x)}{\alpha}$$

Variables

t_1	First test time	s
Φ_1	Lumen maintenance at t_1	-
t_2	Second test time	s
Φ_2	Lumen maintenance at t_2	-
x	Maintenance level of interest	-
t	Time of interest	s
α	Decay rate	1/s
B	Initial constant	-
L_x	Projected life to the level	s
$\Phi(t)$	Lumen maintenance at the time of interest	-
$6t_2$	Usual extrapolation limit (6 × test duration)	s

Method and standards

Lumen maintenance.

Assumptions and limits

- Exponential decay; same drive current and temperature as the test.

References

Exponential lumen maintenance projection, IES TM-21, Projecting Long Term Lumen Maintenance of LED Light Sources (exponential projection form)

Report details

Report reference	FCC-BJ6A-BAC7 (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/electrical/lighting/led-lumen-maintenance-projection

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.