







How to Determine How Many Lumens You'll Need to Properly Light Your Space

Have you ever wondered how many LED lights, or LED lumens, you need to light a room?

The question itself may be challenging and, when faced with having to calculate how much LED lighting you need to create a well lit space, it can get even more complicated. Here's how to determine how many lumens you need to properly light a space.



BULB BRIGHTNESS		450 LUMENS	800 LUMENS	1100 LUMENS	1600 LUMENS	2600 LUMENS	5800 LUMENS
	LED	6W	9 - 10W	13W	16 - 18W	24W SPECIAL HIGH VOLTAGE LAMPS	45W
	CFL	8 - 9W	13 - 14W	18 - 19W	23W	40W	85W
	Regular INCANDESCENT	40W	60W	75W	100W	150W	300W
	Halogen	29W	43W	53W	72W	150W	300W

KEY TERMS

Lumens

Lumen output, also known as brightness or light output, is a measure of the total quantity of visible light emitted by a light source per unit of time, weighted according to the human eye's sensitivity to wavelengths of light, the study of which is known as luminous efficiency function. The reference point: a standard 100-watt incandescent light bulb produces about 1,500 – 1,700 lumens.

Watts

Not a measure of brightness; instead, it's a measure of how much electricity (or energy) a light bulb consumes to reach its claimed brightness. Each type of light source, LED, fluorescent, halogen or incandescent has a different lumen-per-watt ratio. Below we're going to use lumens as a measurement to make sure we have enough light for a space.

Wattage Equivalence

Since we've conflated watts and lumens, it's easier to talk about bulbs in terms of watts. So if a 100-watt incandescent produces 1,500 lumens, and a 10-watt LED does the same, the 10-Watt LED may advertise "100-watt equivalent" on its label.

Efficacy

The number of lumens a bulb produces for each watt it consumes. The higher the number, the more efficient the bulb. For example, lighting products that have been designated with the ENERGY STAR label are deemed high efficacy, meaning they have been determined to deliver the same features while using less energy.

The Breakdown— How Much Light is Enough?

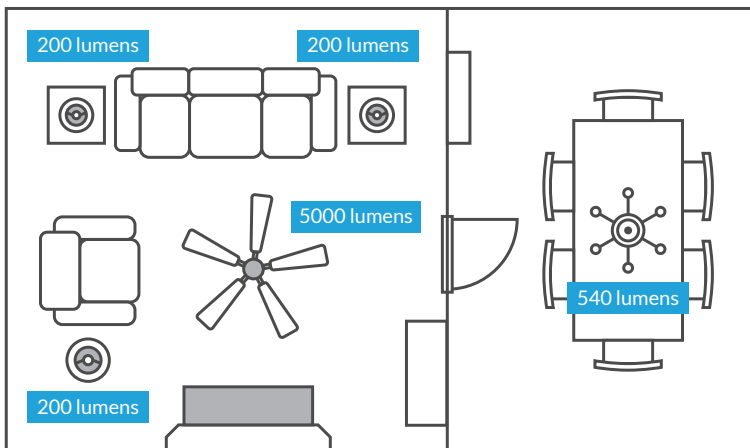
Determine Room Square Footage

Multiply the length times the width of the room to get the Room Square Footage. For example, if the room is 10 feet wide and 10 feet long, the Room Square Footage will be 100 square feet.

Determine the Footcandles by Room Type

A footcandle is how bright a light is one foot away from its source. Lighting requirements/needs vary depending on the type of room being lit. For example, a bathroom or kitchen will require more footcandles than a living room or bedroom.

Room	Footcandles Needed
Living Room	10-20
Kitchen General	30-40
Kitchen Stove	70-80
Kitchen Sink	70-80
Dining Room	30-40
Bedroom	10-20
Hallway	5-10
Bathroom	70-80



Determine the Required Lumens

To determine the lumens needed, you will need to multiply your Room Square Footage by your room footcandle requirement. For example, a 100-square-foot living room, which needs 10-20 footcandles, will need 1,000-2,000 lumens. A 100-square-foot dining room, which needs 30-40 footcandles, will need 3,000-4,000 lumens.

Summary

For the average space of 250 square feet, you'll need roughly 2,500-5,000 lumens as your primary lightsource (10-20 lumens x 250 square feet). In your dining room, you'll want about 30 lumens per square foot on your dining table (you want to see your food, but not examine it), so if your table is 6 x 3 feet, that's 540 lumens. Keep in mind, however, that these numbers are for typical conditions. If you have especially dark colored walls and furniture, or if you're using fixtures with shades, you'll need roughly an additional 10 lumens per square foot. We based our calculations on 8-foot ceilings. Finally, personal preference will play the largest part in your decision. If you like the room to be especially bright, you may want to add an additional 10 to 20% to our numbers. In fact, the best approach for most spaces is to aim high and install dimmers to bring the light down to desired levels.

Footlight Candle Index

Airplane Manufacturing

Drilling, riveting, screw fastening.....	75
Final assemble, hangar.....	100
Inspection.....	50-200
Welding.....	50

Assembly

Rough easy seeing.....	20-50
Rough difficult seeing.....	50-100
Medium.....	100-200
Fine.....	200-500(a)
Extra fine.....	500-1000(a)

Auditoriums

Social activities.....	5-10
Assembly only.....	10-20
Exhibitions.....	10-20

Automobile Manufacturing

Final assembly, finishing, inspecting.....	200
Body & chassis assembly.....	100
Body parts manufacturing.....	100
Frame assembly.....	50

Banks

Lobby general.....	10-50
Writing areas.....	20-70
Teller stations, posting & keypunch.....	50-150

Barber Shops

Beauty Parlors.....	50-100
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Chemical Works

.....	30
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Clothing Manufacturer

Receiving, storing, shipping, winding, measuring.....	20-50
Pattern making, trimming.....	50-100
Shops, marking.....	50-200
Cutting, pressing.....	100-500(a)
Sewing, inspection.....	200-500(a)

Electrical Equipment Manufacturing

Impregnating.....	20-50
Insulating coil winding, testing.....	50-100

Food Service Facilities

Dining areas	
Cashier.....	20-50
Cleaning.....	10-20
Dining.....	5-20
Food displays.....	30-100
Kitchen.....	50-100

Foundries

Annealing furnaces.....	20-50
Cleaning.....	20-50
Core making.....	50-200
Inspection	
Fine.....	100-500
Medium.....	50-100
Molding.....	50-200
Pouring, sorting.....	50-100

Garages-Motor Vehicles

Storage.....	5
Traffic Lanes	
Parking garage.....	10
Service garage.....	10-20

Entrances.....	50
Repair area.....	50-100

Gymnasiums

Assemblies.....	10
General exercise & recreation.....	30
Exhibitions, matches.....	50

Hospitals

Rooms.....	10-30
Corridors.....	5-30
Emergency rooms.....	50-100
Operating rooms.....	100-200

Hotels

Bathrooms.....	20-50
Bedrooms for reading.....	20-50
Corridors, elevators and stairs.....	10-20
Front desk.....	50-100
Linen room	
Sewing.....	100-200
General.....	10-20
Lobby	
General lighting.....	10-20
Reading and working areas.....	20-50

Iron & Steel Manufacturing

Stock, hot top, checker cellar, calcining.....	10-30
Building, slag pits, stripping yard.....	20
Control platforms, repairs, mixer building.....	30
Rolling mills.....	30-50
Shearing.....	50
Tin plate.....	50
Motor room, machine room.....	30
Inspection.....	100

Laundries

Washing.....	20-50
Ironing.....	20-100

Library

Ordinary reading, stacks.....	20-50
Book repair and binding.....	20-50
Study & notes, cataloging, card files, check desk.....	20-100

Machine Shops

Rough bench.....	20-50
Medium bench, rough grinding, buffing.....	50-100
Fine bench and work.....	200-500(a)

Materials Handling

Loading trucking.....	10-20
Picking stock classifying.....	20-50
Wrapping, packing, labeling.....	20-50

Offices

Accounting.....	50-100
Audio-visual areas.....	20-50
Conference areas.....	20-70
Corridors, stairways.....	20(k)
Drafting.....	50-200
General and private offices.....	50-100

Lobbies, lounges and reception areas.....	0-20
Mail sorting.....	50-100
Off-set printing and duplicating area.....	20-50
Spaces with VDT's.....	75

Paint Shop

Spraying, rubbing, hand art, stencil.....	20-50
Fine hand painting & finishing.....	50-100

Paper Manufacturing

Beaters, grinding.....	20-50
Finishing, cutting.....	50-100
Hand couting.....	50-100
Paper manchine reel, inspection.....	100-200
Rewinder.....	100-200

Printing

Photo engraving, etching, blocking.....	20-50
Color inspecting.....	100-200
Presses.....	50-100
Proofreading.....	100-200
Composing room.....	50-100

Schools

Reading.....	20-100
Typing.....	20-100
Demonstrations.....	100-200
Sewing.....	20-100

Sheet Metal Works

General.....	100
Tin plate inspection, galvanized, scribing.....	100-200

Stores

Circulation area stockroom.....	10-30
Merchandising, serviced.....	30-100
Merchandising, self-service.....	200

Textile Mills

Cotton picking, carding, roving, spinning.....	50
Beaming & slashing.....	150
Drawing.....	200
Others.....	100

Warehousing, Storage

Inactive.....	5-10
Active	
Rough bulky.....	10-20
Medium.....	20
Fine.....	20-50

Welding

General.....	20-50
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Woodworking

Rough sawing and bench work.....	20-50
Sizing, planing, rough sanding, medium quality machine and bench work, gluing, veneering, cooperage.....	20-50
Fine bench and machine work, fine sanding and finishing.....	50-100

Footlight Candle Index

Building Area & Task	Average Maintained Footcandles (Horizontal) (FC)	Range of Maintained Footcandles (Horizontal) (FC)	Average Maintained Footcandles (Vertical) (FC)	Range of Maintained Footcandles (Vertical) (FC)	Comments
WAREHOUSING & STORAGE					
Bulky Items—Large Labels	10		5		
Small Items—Small Labels	30		15		
Cold Storage	20	10 - 30	10	5 - 15	
Open Warehouse	20	10 - 30			
Warehouse w/Aisles	20	10 - 30	10	5 - 15	
COMMERCIAL OFFICE					
Open Office	40	30 - 50			@30" Above Finished Floor (AFF)
Private Office	40	30 - 50			@30" AFF
Conference Room	30				Matte surface reflectance for the table 40% recommended
Restroom	18	7.5 - 30			
Lunch & Break Room	15	5 - 20			
EDUCATIONAL (SCHOOLS)					
Classroom	40	30 - 50			@30" AFF
Gymnasium					
Class I (Pro or Div. 1 College)	125		30		
Class II (Div. 2 or 3 College)	80		20		
Class III (High School)	50		150		
Class IV (Elementary)	30		100		
Auditorium	7.5	3 - 10	5	2.5 - 10	
Corridor	25	10 - 40			
INDUSTRIAL/MANUFACTURING					
Assembly					
Simple (Large Item)	30	15 - 60	30	15 - 60	
Difficult (fine)	100	50 - 200	100	50 - 200	
Component Manufacturing					
Large	30	15 - 60	30	15 - 60	
Medium	50	25 - 100	50	25 - 100	

https://www.lightingdesignlab.com/sites/default/files/pdf/Footcandle_Lighting%20Guide_Rev.072013.pdf

- Horizontal—horizontal plane that average maintained foot-candles are measured, for example a tabletop.
- Vertical—vertical plane the average maintained foot-candles are measured, for example a wall.

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EXTERIOR					
Parking (Covered)	5				1FC min, 10:1 Max to Min Uniformity
Parking (Open) (Medium Activity)					
Lighting Zone 3 (Urban)	1.5	.75 - 3	.8	.4 - 1.6	
Lighting Zone 2 (suburban)	1	0.5 - 2	.6	.3 - 1.2	
Gas Station Canopy	12.5	10 - 15			
Safety (Building Exterior)	1	0.5 - 2			If security is an issue—raise average level to 3
RETAIL					
General Retail (Ambient)		50			
Department Store	40	20 - 80	15	7.5 - 30	
Perimeter			75	35 - 150	
Accent Lighting (Displays)					3 - 10 times greater than ambient light levels
AUTOMOTIVE					
Showroom	50	25 - 100	10	5 - 20	
Service Area	50	25 - 100	30	15 - 30	
Sales Lot (Exterior)					
Lighting Zone 3 (Urban)	20	10 - 40	20	10 - 40	
Lighting Zone 2 (Suburban)	15	7.5 - 30	15	7.5 - 30	
GROCERY					
Circulation	20	10 - 40	7.5	3.5 - 15	
General Retail	50	25 - 100	20	10-40	
Perimeter			50	25-100	
BANKING					
ATM	20	10-40	15		Vertical at face of ATM

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