The **lumen method** is the most commonly used for calculating the total light output needed for your space. With this formula, you first establish the intended use of the space, then you measure its square footage.

This guide will help you understand what the lumen method is and how to calculate it. You can also use the lumens calculator below to determine how many lumens you need based on room size and other key variables.

Helpful Lighting Terms

Lumen

Lumen output is a measurement of the total quantity of visible light emitted by a light source. It's also commonly known as brightness or light output.

The reference point: A standard 100-watt incandescent light bulb produces about 1,500-1,700 lumens. Strictly speaking, 600 LED lumens provides the same amount of light as 600 incandescent lumens.

LED lights provide higher Color Rendering Index (CRI), so, while they more accurately reveal the colors of the subject being lighted, they don't provide more light.

Wattage

Wattage is a measure of how much electricity (or energy) a light bulb consumes to achieve its lumen output.

Each type of light source — LED, fluorescent, halogen or incandescent bulbs — has a different **lumen-to-watt ratio**. If a 100-watt incandescent light produces 1,500 lumens, and a 10-watt LED light does the same, the 10-watt LED bulb may claim 100-watt equivalency and energy efficiency.

LED LIGHTS

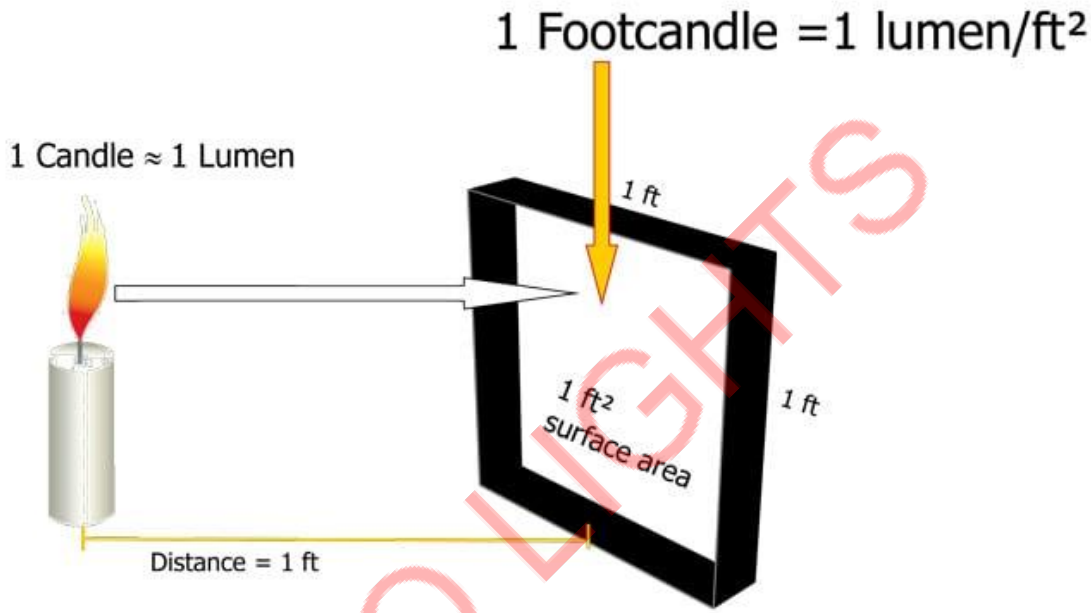
What is a foot candle?

You may be wondering, what the heck is a foot candle? Why is this so important? How many foot candles are in my building and how many are required? How do you measure this?

Believe it or not, foot candles are the most common unit of measure used by lighting professionals to calculate light levels in businesses and outdoor spaces. In a nutshell***, a foot candle is a measurement of light intensity*** and is defined as the illuminance on a one-square foot surface from a uniform source of light.

How many foot candles are recommended for your location?

Now you are probably asking yourself, how do I measure the foot candles in our facility?! That's an excellent question and exactly what I do as a LED Lighting Specialist. I have a light meter that measures the number of foot candles in each room and under each light, and this is the process I usually take to measure your foot candles for LED Lighting.



LED LIGHTS

Measuring the Light Intensity

I will use the light meter to measure the number of foot-candles that there are hitting the subject. Once I have this number, I can then use it to convert it into Lumens or Watts depending on whichever method is preferred. For the case of this example, we will base our calculations on a measurement of 50 foot-candles.

Converting to Lumens

Please note that ***one foot-candle = 10.76 Lumens****, which means that in order to convert foot-candles to lumens, I would need to take the amount of foot-candles that I measured, 50 foot-candles ,and multiply by 10.76 to get the number of lumens (50 x 10.76 = 538 lumens)

***** A lumen is the same as Lux and is what many modern light meters will calculate their measurement in.

Lumens To Watts

More Watts doesn't always mean a brighter light bulb. To choose a light bulb with the right brightness, think lumens, not Watts.

In the past, if you wanted a brighter bulb you'd simply choose one with more Watts. For example, most 75 W bulbs – irrespective of brand – put out about the same amount light.

However, today's light bulbs are so much more energy efficient, they use *fewer* Watts to produce the *same* amount of light (lumens). This is why nowadays you need to think lumens, not Watts, when buying light bulbs.

For example, you can have the same brightness from an old 60 W incandescent (which has since been phased- out) from a halogen using 42 W, CFL using about 13 W – or an LED using just 10 W.

To choose a replacement bulb with the same brightness as your old one, take it with you to the shop and match it up. If you'd like to learn more about buying a bulb based on brightness – and what the difference is between lumens and Watts – read on.

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$12

more it costs each year to run each 1100 lm halogen bulb in living areas, instead of an equivalent LED

80

The lumens per watt (lm/W) of an efficient LED – compared to 14 lm/W of an equivalent halogen. Higher lm/W means more energy efficient… and cheaper to run

800

lumens (lm) an old 60W incandescent bulb puts out – the same brightness as a 42 W halogen, 13 W CFL or 10 W LED

What Is A Watt?

Back in the day we bought incandescent bulbs based on Wattage – if we wanted a brighter bulb we'd choose one with more Watts.

However Watts are not a measure a brightness, they're a measure of energy consumption – that is, how much electricity a bulb uses. It just so happened that most old incandescent bulbs of the same wattage put out the same amount of light (lumens), even when they're from different brands.

Today's light bulbs can produce the *same* amount brightness using far *less* electricity – which makes them much cheaper to run.

For example, a 42 W halogen bulb has the same brightness (lumens) as an LED that uses just 10 W. Lower wattage means lower energy bills – and less carbon emissions. Better for your wallet and better for the environment.

The *more* energy efficient the light bulb technology, the *less* electricity (Watts) a bulb uses. This means you can't compare the brightness of light bulbs by how many Watts they use. You need to compare the lumens they put out.

What can I use Watts for?

Watts are no longer relevant when comparing the brightness of light bulbs, but they're still important when considering energy efficiency.

When comparing two bulbs of the *same* brightness (lumens), the one with the *lowest* Wattage on the box will be *cheaper* to run. This is because more efficient light bulbs waste less energy to produce the same amount of light – they consume less electricity. The energy efficiency of light bulbs is measured in lumens per Watt (lm/W) – the higher the better!

Lumens And Light – Getting It Right

If you are looking for the right amount of light (brightness), think lumens, not Watts. Lumens give a measure of the *amount* of light – the brightness – produced by a light bulb. Whether it's a CFL, LED, halogen, fluoro or incandescent bulb, the *bigger* the number, the *brighter* the bulb.

LED LIGHTS

How many lumens do I need?

If you want a brighter light bulb, choose one with more lumens.

If you aren't sure how many lumens you need to suits your space – and are still accustomed to buying bulbs by Wattage – you can use the conversion table below to work it out.

Energy Efficient Light Bulbs – More Lumens, Less Watts

The most efficient energy saving lights produce the most light (lumens) using the least electricity (Watts).

Energy efficiency in lighting products is given in lumens per Watt (lm/W) – the higher the number, the more energy efficient.

For example, an old-fashioned incandescent light bulb – which is no longer available in Australia since the phase out – produced 1100 lm and used 75 W of power, which is 15 lm/W.

A halogen lamp producing the same lumens uses 52 W, which is 21 lm/W – the halogen is more efficient.

While you can source the brightness (lumens) you need from a range of light bulb types and technologies, a quality LED is generally the most energy efficient. To see how much energy (in Watts) different bulb types use to produce the same light output (lumens), use the conversion table below.

Convert Lumens To Watts

The lumens to Watts conversion table below shows the number of lumens (and Watts) you should look for in a replacement LED, CFL or halogen light bulb. Lumen values are approximate and can vary between manufacturers.

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Output (lumens)	Power (Watts)			
	Traditional Incandescent	Halogen (mains Voltage	CFL	LED
 **250**	25	18	4-6	3-4
 **500**	40	28	7-9	5-8
 **800**	60	42	11-14	8-12

LEO LIGHTS

 **1100**	75	52	14-17	11-17
 **1500**	100	70	19-23	15-23

LEO LIGHTS

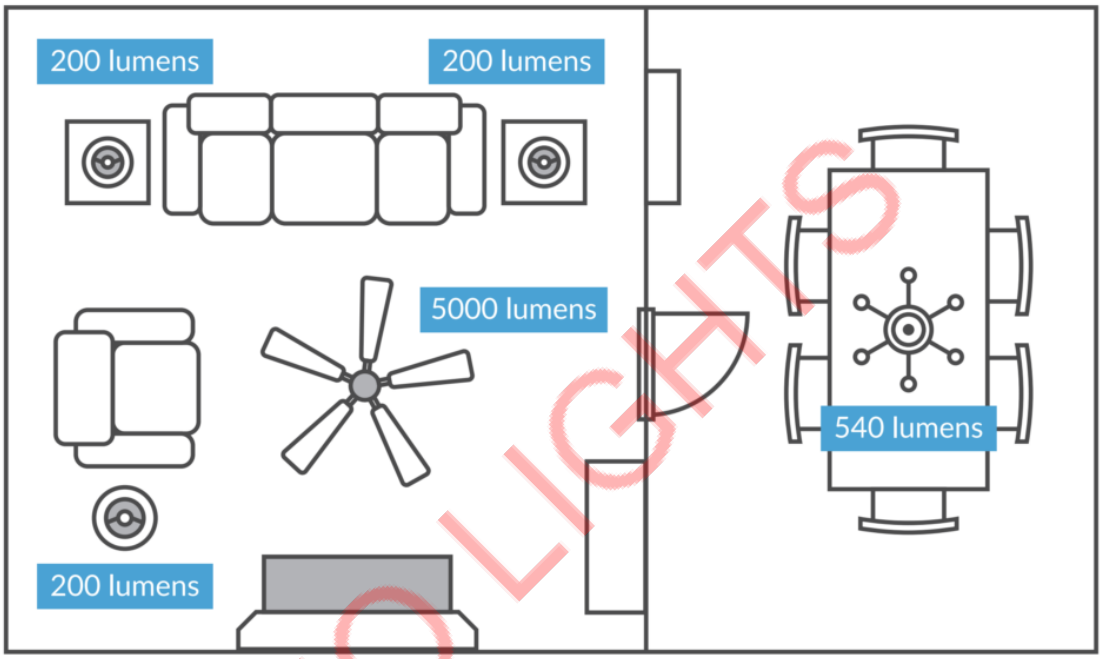
The Lumen Method – How to Calculate Total Lumens Needed

1. **Determine room size by 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.

2. **Establish the footcandle requirement for your application**. Lighting requirements vary depending on the type of room being lit, also known as the application. For example, a bathroom or kitchen will require more foot candles than a living room or bedroom. Once you establish the intended use of your

space, browse this footcandle chart for the IES-recommended footcandle requirement for your application.

3. **Multiply the room square footage by the footcandle requirement.** For example, a 100 square-foot living room, which needs 20 foot-candles, will need 2,000 lumens. A 100 square-foot dining room, which needs 40 foot-candles, will require 4,000 lumens.



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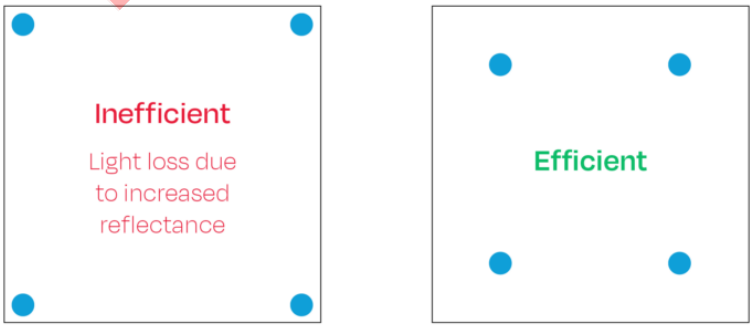
Preferred LED Lighting Layout



Lights in corner

Lights at distance from corners

For a more efficient use and distribution of lumens

We've created a helpful guide to How Many Lumens You Need that walks you through this calculation in more detail.

Footcandle Requirements for Various Applications

Commercial Lighting Footcandle Requirements

Room	Foot-candles Needed
Offices: Average Reading and Writing	50-75
Offices: Hallways	10-20
Offices: Rooms with Computers	20-50
Auditoriums / Assembly	15-30
Hospitals: General Areas	10-15
Hospitals: Labs / Treatment Rooms	75-100
Libraries	50-100
Schools	30-100

Residential Lighting Footcandle Requirements

Room	Foot-candles 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

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Summary: Calculating Total Lumens Needed for a Room

Let's recap how to gauge how much light you need for a space. Multiply your room square footage by the footcandle requirement. For example, a 100-square foot living room, which needs 20 foot candles, will need 2,000 lumens. A 100-square foot dining room, which needs 40 foot-candles, will need 4,000 lumens.

Factoring in Lumen Lighting Variables

Ceiling Height Variable

Note: *Only read this section if your ceiling height is taller than 10ft. If your ceiling height is below 10ft, the Lumen Method above and the lumens calculator below will be sufficient for determining the required light output for your application.*

If you have high ceilings in a space, then you must account for that in your lumens calculation. You do that with a **footcandle multiplier**.

To calculate for your recommended footcandle multiplier, use the following formulas:

footcandles (fc) = cd ÷ h

cd = candlepower

h = distance between the lamp and the horizontal target

Once you determine your desired footcandle level, you multiply that by your room's square footage.

Wall Color Variable

If you have especially dark-colored walls and furniture or if you're using light fixtures with shades, you'll need roughly an additional 10 lumens per square foot.

Lets take overall example :

Lets say you are making kitchen of 8ft x 10ft. so the area is 80 sqft. (80x10) As per chat kitchen need 30-40 foot candles. So lumens required are : 80 x 40 = 3200 lumens.
Now, when a normal bulb of 1 watt, delivering output of 100 lumens/watt is installed at height of 10ft, without any obstruction, on ground the output will be approx. 60 lumens.
So, lumens to watt conversion is we can say 1 watt provides 60 lumens on ground.
In case of our kitchen example, total watt required to illuminate is 3200/60 = 53 watts approx.

LED LIGHTS

Accounting for Personal Taste

Personal preference will play a large role in determining how much light you need in a space. If you like the room to be especially bright, you may want to add an additional 10-20% to our numbers and then install dimmers to adjust the light to desired levels.

When lighting is properly designed in a space, you notice the room and the objects in it. In other words, you notice *what* the lighting illuminates, not the lighting products themselves. Bad or deficient lighting design shows up as hot spots, dark spots and unintentional shadows.

Good or efficient lighting design accounts for total general and task lighting required for a space. Dynamic or superior lighting design factors the qualitative, human

experience. It lights for vertical (not merely horizontal) visual impressions, such as walls — as well as ceilings with uplighting to minimize shadows and dark spots for smooth, streamlined and evenly distributed light.

LEO LIGHTS