

LiElectro

lielectro.com

LED Beam Angle Explained

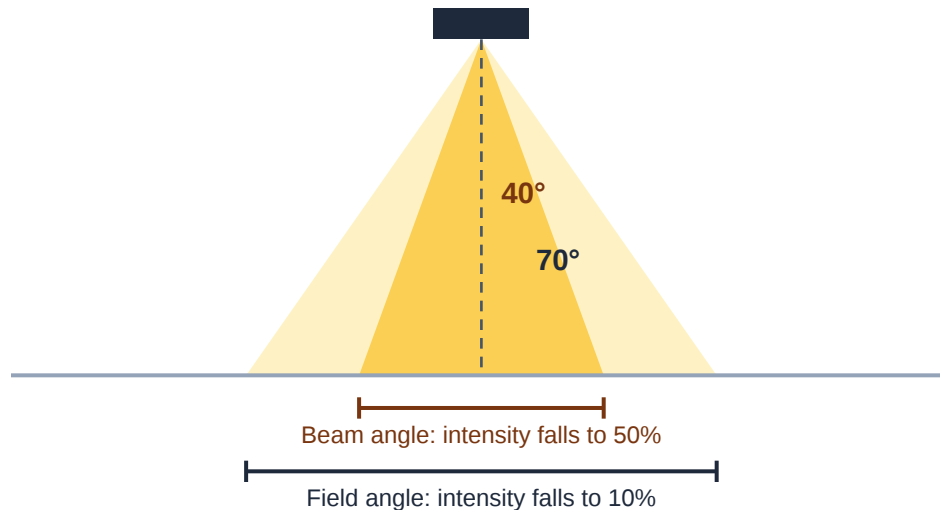
A quick guide to picking the right spread for any space



What is LED beam angle?

LED beam angle is the width of the light cone a fixture throws, measured in degrees. A small number gives a tight, punchy spot. A big number gives a soft wash that fills a room.

It is measured where light intensity falls to 50% of its peak (the Illuminating Engineering Society definition). Light fades gradually, so 50% gives every product the same yardstick.



Beam angle versus field angle. Degree values are illustrative.

Key facts at a glance

Fact	Detail	Source
Beam angle	Angle between the two directions where intensity is 50% of maximum (IES)	IES via Wikipedia
Other standards	CIE, NEMA (ANSI C78.379-2006) and ENERGY STAR use center beam intensity instead of maximum	Wikipedia: Beam angle
Field angle	Wider angle measured at 10% of peak intensity	Green Creative
ENERGY STAR bands	Spot 10° to 20°, narrow flood 20° to 30°, flood above 30°	U.S. Patent 9,500,328
Bare LED chip	Lambertian (cosine) pattern; $\cos 60^\circ = 0.5$, so about 120° with no optics	U.S. Patent 8,635,049 + math
NEMA floodlights	Types 1 to 7, from 10° to 18° up to 130°+, based on 10% angles	Beacon Products brochure
Typical ceilings	Average ceiling heights run roughly 8 to 9 feet	California LightWorks
Inverse square law	Doubling distance leaves one quarter of the light per area	California LightWorks

How wide is the light at any distance?

Beam diameter = 2 × distance × tan(beam angle ÷ 2). These figures are 50% intensity widths, so read them as the bright core of the beam.

Beam angle	Width at 4 ft	Width at 8 ft
15°	1.1 ft	2.1 ft
25°	1.8 ft	3.6 ft
40°	2.9 ft	5.8 ft
60°	4.6 ft	9.2 ft
120°	13.9 ft	27.7 ft

Calculated values, not measured data.

Brightness and beam angle

Lumens measure total output. Lux is lumens per square meter. Beam angle sets how big the patch is. **Halve the width of a light pool and its area drops to a quarter, so the same lumens hit four times as hard.** Real fixtures lose some light in lenses and reflectors, so the jump is never perfectly clean.

Beam angle categories

ENERGY STAR gives the closest thing to an official yardstick. Manufacturers slice the scale more finely and do not always agree, so read the degrees, not the label.

Name (one lighting company)	Beam angle
Very narrow spot	Under 7°
Narrow spot	7° to 15°
Spot	16° to 22°
Narrow flood	23° to 32°
Flood	33° to 45°
Wide flood	46° to 60°
Very wide flood	Over 60°

Source: Oak LED. One retailer guide calls anything up to 25° a spot, while others set the line at 45°.

Which beam angle fits which space?

Use	Suggested angle	Why
Small objects, museum-style accents	About 15°	Museums often use 15° beams for small ornaments (Super Lighting LED)
Feature wall, TV wall	About 24°	Layered halo on the wall; mount spots 25 to 30 cm from it (Super Lighting LED)
Paintings and wall decor	About 36°	Softer spot that shows texture and color (Super Lighting LED)
General room lighting	40° and up	Angles above 40° count as wide beams for overall lighting
Recessed downlights, 8 to 9 ft ceilings	Around 60° (starting point)	LiElectro rule of thumb; higher ceilings call for narrower beams
Driveways, parking lots, landscaping	Wide floods, often 45° to 120°	Wide, even coverage (TCP Lighting)
Flagpoles, tall trees, far setbacks	Narrow spot	Longer throw needs a tighter beam (Beacon Products)

Pick your angle in 4 steps

1. **Measure the distance** from the fixture to the surface.
2. **Pick the width** you want lit, like a 4 ft painting or a 6 ft sofa wall.
3. **Solve for the angle:** $\text{angle} = 2 \times \arctan(\text{width} \div (2 \times \text{distance}))$. A 4 ft width at 8 ft gives about 28°.
4. **Match a real product.** At 8 ft, a 25° lamp lights 3.6 ft and a 36° lamp lights 5.2 ft.

Common spec-sheet mistakes

- **Mixing full and half angles.** A 30° half angle is a 60° beam.
- **Comparing 50% and 10% numbers.** Field angle and NEMA floodlight numbers run much wider.
- **Trusting the words "spot" and "flood."** Manufacturers define them differently.
- **Reading wide as dim.** A wider spread lowers center intensity, but total lumens stay about the same.
- **Forgetting mounting distance.** A 25° beam spreads from 1.8 ft at 4 ft to 3.6 ft at 8 ft.

Sources

Wikipedia: Beam angle (IES, CIE, NEMA, ENERGY STAR, DLC definitions) | Green Creative: LED light beam angles | U.S. Patents 9,500,328, 8,635,049 and 9,995,439 | Beacon Products floodlighting brochure | Oak LED: beam angle for LED fixtures | Destination Lighting: beam spread guide | California LightWorks: LED beam angles guide | Super Lighting LED: spotlight vs floodlight | TCP Lighting flood light guidance.

Width tables and step calculations are computed from the formula above. Confirm details against the original standards before relying on them for design work.