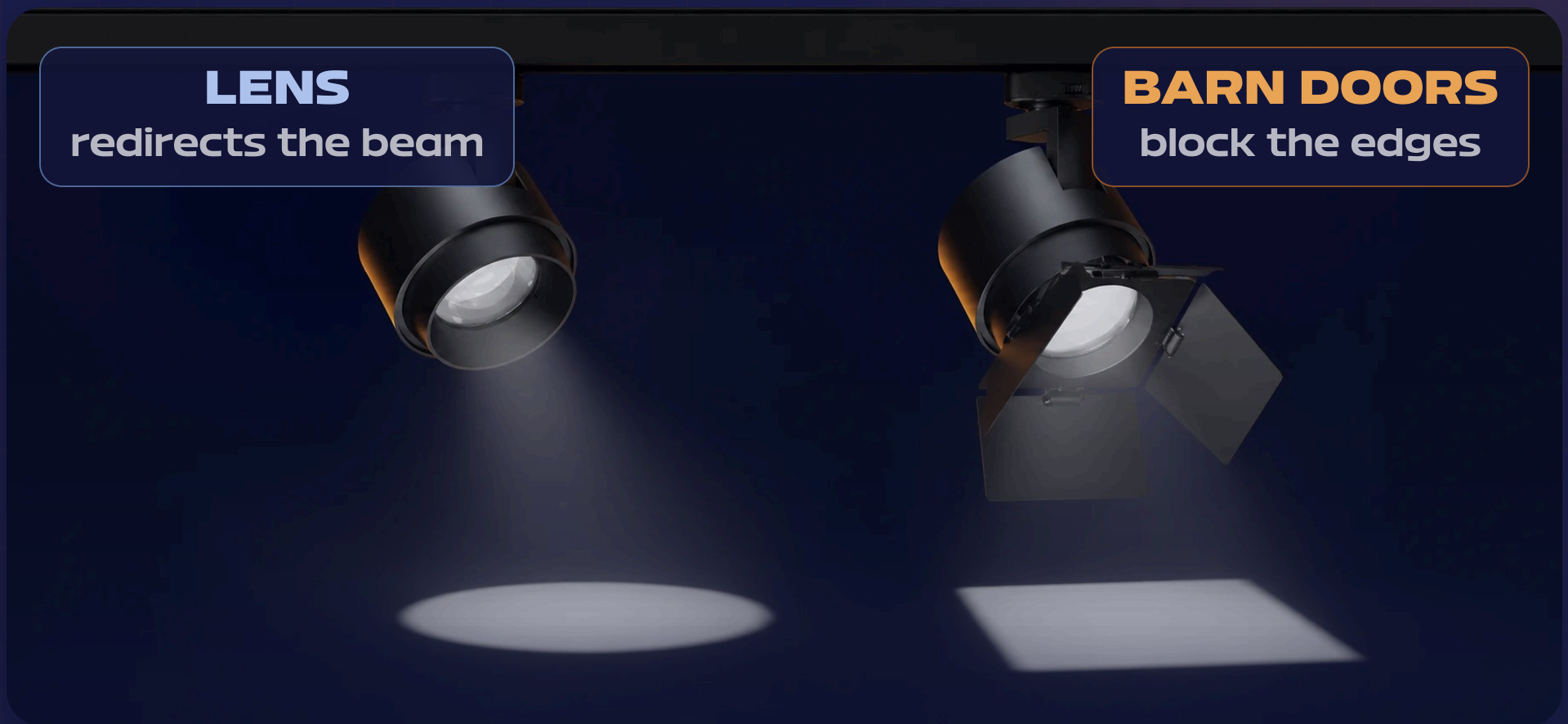




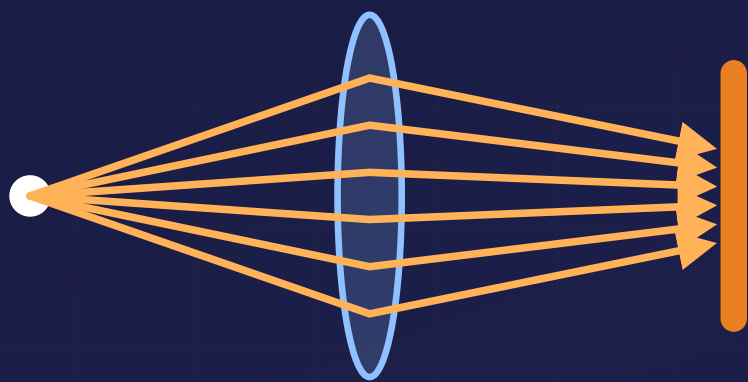
NLC Academy | Episode 09

Shape the beam: **bend it, or block it.**

Two strategies turn a wide LED output into the beam your design needs. A lens redirects most of the flux toward the target; barn doors carve the shape by blocking the edges. Knowing when to use each saves energy and delivers precision only where the project justifies it.

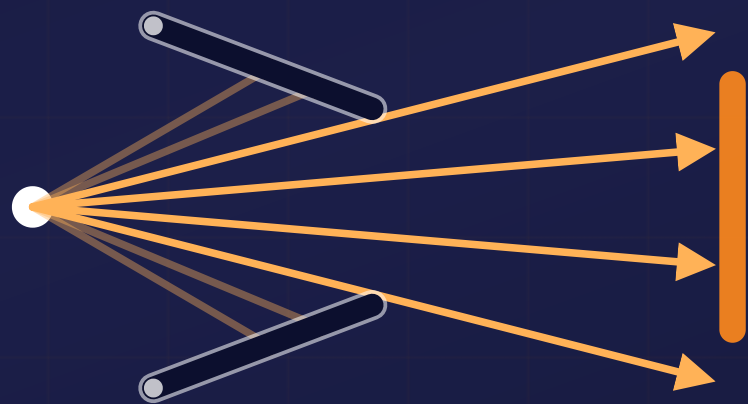
The two strategies

One redirects. One blocks.



LENS · **redirects**

Most rays redirected toward the target, little flux lost



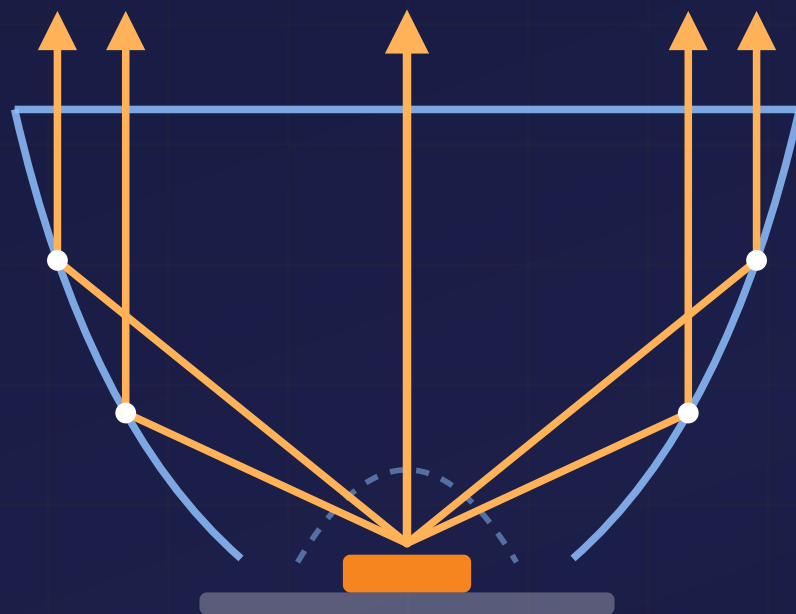
BARN DOORS · **block**

Edge rays are intercepted; a tight cut can cost much of the beam

A lens redirects most rays toward the target, typically with about **5-10% optical loss**. Barn doors block the edges of a wide beam: a cleaner cut-off, **paid for in delivered flux**.

Inside the lens

TIR: the lens that works like a reflector.



1 The LED sits in a hollow cavity. Central rays refract straight through the body.

2 Side rays strike the internal surface at an incidence angle greater than the critical angle and undergo total internal reflection, so the beam leaves collimated.



3°



8°



12°



24°



36°



10°x30°

One collimator family: flat face 3° spot, beaded faces 8° to 36°, linear-prism 10°x30° strip. Illustrative render.

The mechanical answer

Four flags, **hand-set on site.**



A theatre Fresnel with four barn-door flags.

- 1** Hinged flags block the spread you do not want. The cut is set by hand, and reset tomorrow.
- 2** Blocked light is not redirected; most of it is absorbed by the flags, so a tight cut can cost much of the output.

Theatre, film, hospitality accent: **the wall you light tonight is not the wall you light tomorrow.**

Where the lumens go

The lens keeps it. Barn doors spend it.

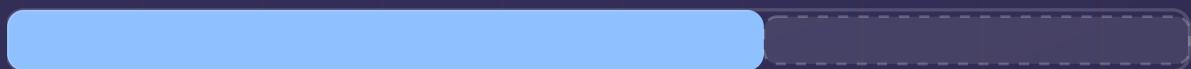
TIR lens

92% delivered to target



Barn doors

64% delivered, the rest is intercepted by the flags



Illustrative example, not a universal comparison: one 24° spot delivering a 15° cut, comparing a moulded TIR optic against the same lamp flagged down mechanically. Metric: share of luminaire flux reaching the target zone. Barn-door loss depends heavily on beam geometry and how far the flags close.

Buy the sharp shadow when the design needs it, but budget for the lost lumens.

The reference

Seven ways to **shape a beam.**



TIR lens
Streetlight · spot



85-94%



Fresnel lens
Stage · spotlight



80-90%



Reflector, specular
Highbay · downlight



80-90%



Refractor, textured
Office panel · diffuse



78-88%



Reflector, diffuse
Troffer · glare control



70-85%



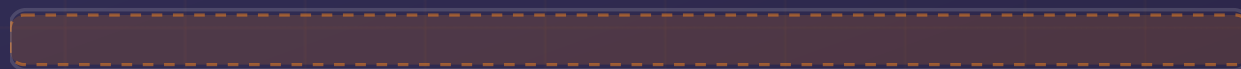
Honeycomb louvre
Museum · gallery



varies



Barn doors
Theatre · accent



varies

Metric: optical efficiency, the share of LED flux leaving the optic.
Indicative bands, not product data. The last two rows carry no figure:
mechanical control intercepts the beam instead of passing a fixed
share.

The glare fix

Honeycomb: glare control **by subtraction.**



- 1 A grid of small cells in front of the optic intercepts rays beyond the cell-wall angle, so far less off-axis glare leaves the fixture.
- 2 It cuts the high-angle glare that veils computer screens, in offices held to $UGR \leq 19$ by BS EN 12464-1.



Real catalogue hardware: the ATHENE accessory set, coloured diffusers, elliptical filters, honeycomb grille, anti-glare snoot.

The decision

Fixed distribution, or field-adjustable?



Locked at manufacture

The beam is part of the product spec, and a lens does the work at high efficiency.

- ▶ Streetlights: the road profile never moves
- ▶ Downlights and panels: one geometry, thousands of units
- ▶ Anything unreachable after install



Tuned on site

The cut must move with the set, the menu, the exhibition, so a person aims it.

- ▶ Theatre and film: re-set per scene
- ▶ Hospitality accent: miss the curtain, hit the table
- ▶ Galleries: the art changes, the track stays

Choose the beam-control method based on **who will set the beam**: the factory, or the installer.

The spec mistake

Specify the result, **not the hardware.**



"Supply spotlights fitted with barn doors."

Names a mechanism, not a result. It forecloses TIR alternatives and invites the most wasteful way to hit the shape.



"Beam angle 15° FWHM, intensity at or below 10% of peak beyond 35° from axis."

Defines the beam and its tolerances in metrics a photometric file can prove. Any compliant optic can compete: lens, flag, louvre, or a combination.

Write the beam angle, the tolerance and the spill limit, **then let the catalogue answer.**

THE PRACTICAL SOLUTION

Every beam-control tool from this episode, **on one spotlight.**



MAGIC-T is an NLC track spotlight that combines a lensed optical system with interchangeable beam-control accessories. Choose from beam-angle options between 17° and 55°, depending on the exact model.

Accessory availability and beam-angle options vary by MAGIC-T model; confirm the exact model in the datasheet.



Elliptical optic

Stretches the distribution for aisles, shelves and long displays.



Honeycomb louvre

Reduces high-angle glare and improves visual comfort.



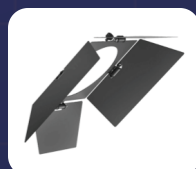
Cross louvre

Adds directional shielding where tighter visual control is required.



Wall washer

Redirects the distribution towards vertical surfaces.



Barn doors

Trims the beam edges manually for changing displays and accent lighting.

Before you sign the spec

Five checks for **every beam line.**

- ☐ Write the **beam angle as FWHM with a tolerance** from the measured photometric report, and the spill limit beyond it, never just a hardware name.
- ☐ Where flags or louvres close down a beam, **check delivered lux, not fixture lumens**: a tight cut can cost much of the output.
- ☐ Adding a louvre to control glare? **Budget a significant flux loss**, and re-check the UGR target in the layout model.
- ☐ Reconfigurable space? **Spec the accessory mount**, track adapter or snoot ring, so control can be added later.
- ☐ Check the **datasheet beam options for the exact model**; not every wattage ships in every angle.

PRACTICAL LIGHTING ENGINEERING

Configure MAGIC-T for your next project.



Request the photometric files, available beam angles and compatible accessory list from the NLC team.



Explore the complete lighting lesson

<https://nlc.com.sa/academy/lenses-vs-barn-doors.html>

Save this and send it to a colleague.