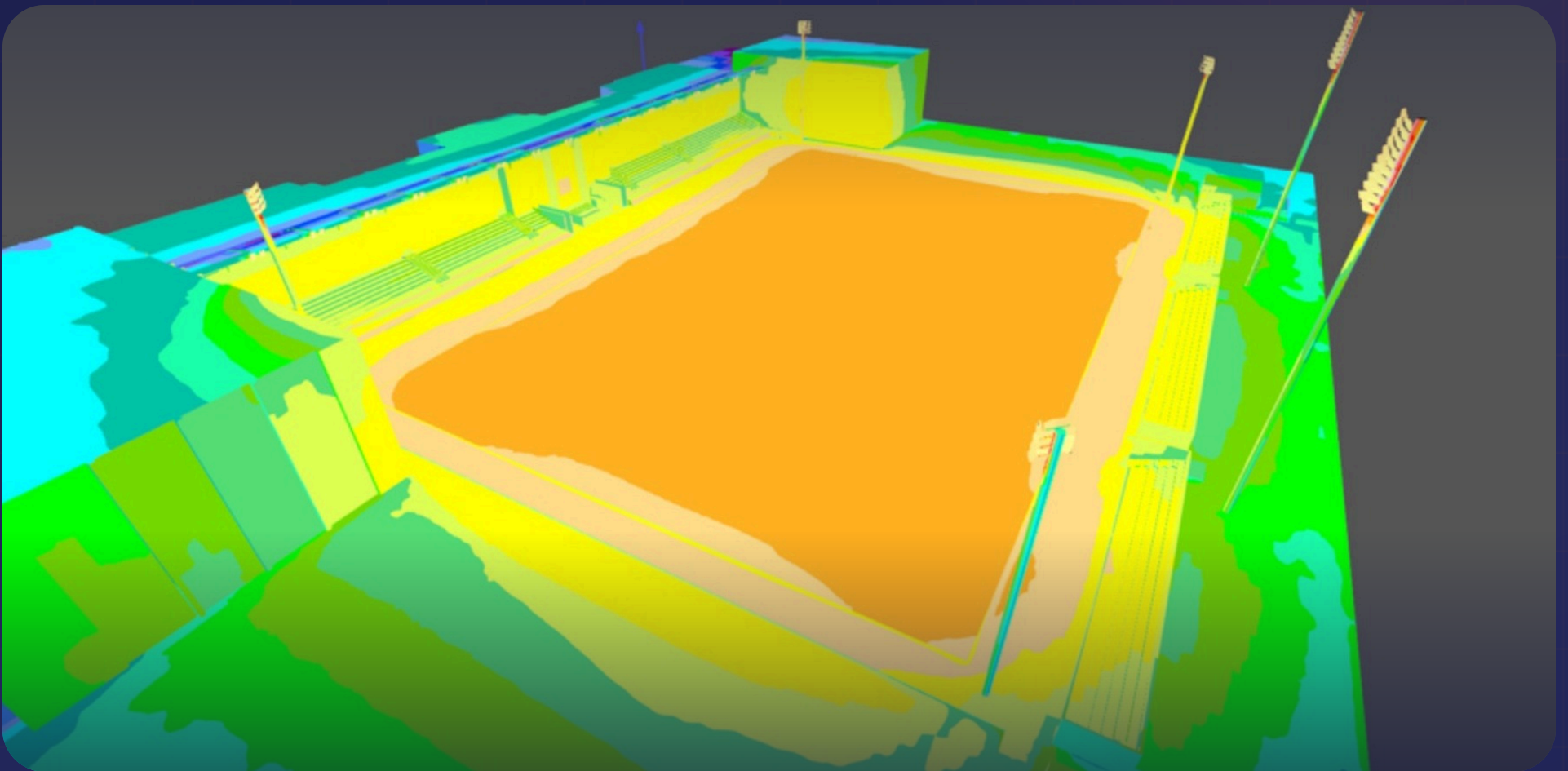




An NLC illuminance verification: every colour is a lux band on the model's own scale. This is what a target looks like once it stops being a number in a spec.

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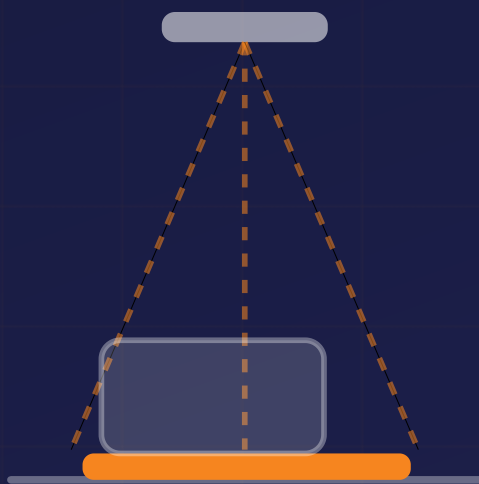
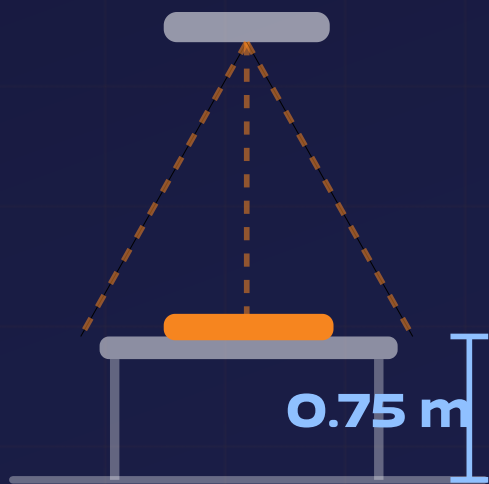
A lux target is not a number. It is five numbers and a plane.

"500 lux" tells a contractor almost nothing.

Maintained or initial? Over what area, on which plane, at what uniformity, under what glare limit? This episode is the anatomy of a lighting requirement, and how it is verified before anyone signs.

The anatomy

The plane is part of **the requirement**.

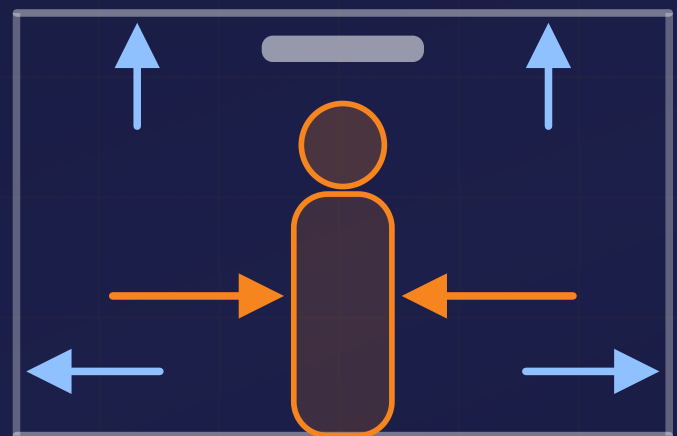
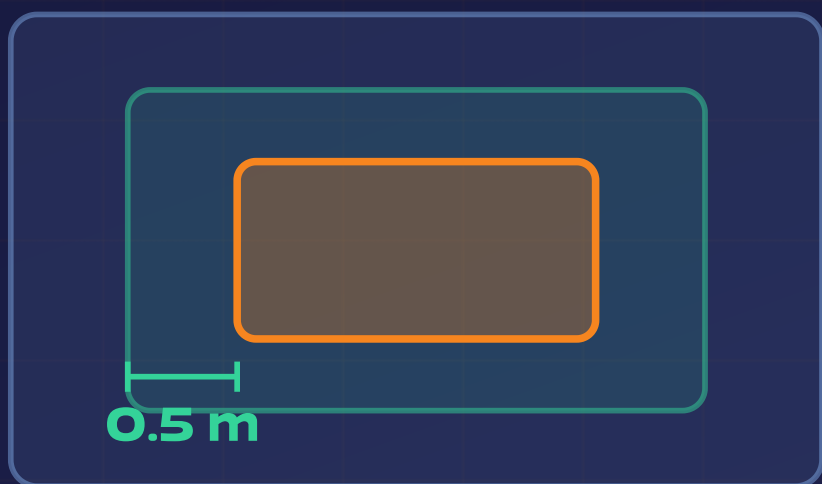


- 1** A target is a **maintained** illuminance $\bar{E}_m$ on a defined **task area**, not an average over the whole room and not a value at handover. [1]
- 2** The reference plane changes with the task: a desk task area sits at desk height, ward general lighting is specified at floor level, rack picking is a VERTICAL plane on the rack face. [2]
- 3** Four photometric values travel together in the tables: $\bar{E}_m$, U_o , UGRL and Ra. Add the reference-plane height and the requirement contains five numbers. Quoting one of them is not a specification. [2]

If a drawing says only "500 lux", **it has not said where, when or how evenly.**

The three zones

One task, **three calculation areas.**



500

Task area

$U_o \geq 0.60$ for office and classroom work.
[2]

300

Immediate surrounding

A band at least 0.5 m wide, at a related lower level, $U_o \geq 0.40$. [1]

100

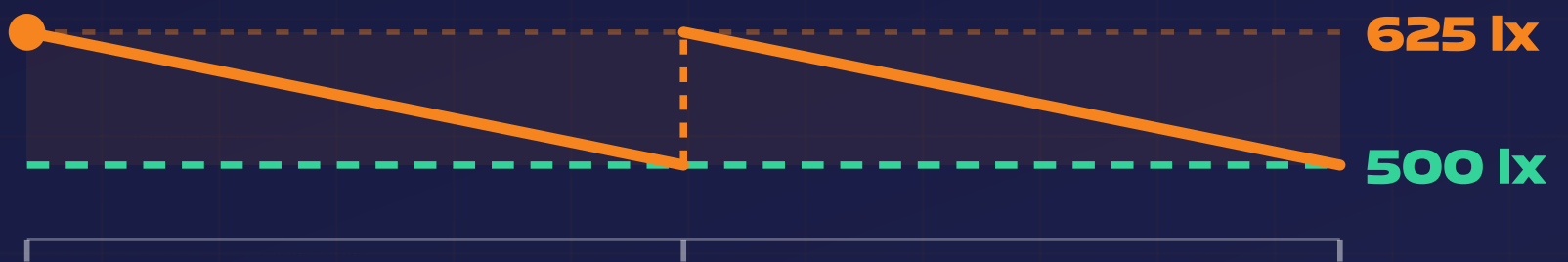
Background

Lower again, $U_o \geq 0.10$, so the room does not go black around the desk. [1]

Values shown are a compliant EXAMPLE of the relationship in EN 12464-1:2021 5.3.4 and 5.3.5 for a 500 lx task, not a second set of requirements. The 2021 edition also moved wall, ceiling and cylindrical illuminance into the Clause 7 tables, with $U_o \geq 0.10$ on walls and ceiling: light on the surfaces is now part of the spec, not a nicety. [1][2]

Maintained

You design for year five, **not for handover day.**



Orange: the installed level depreciating across one maintenance interval, then restored by a clean. **Vertical axis cropped** to the band between the two levels; shape illustrative, labels arithmetic.

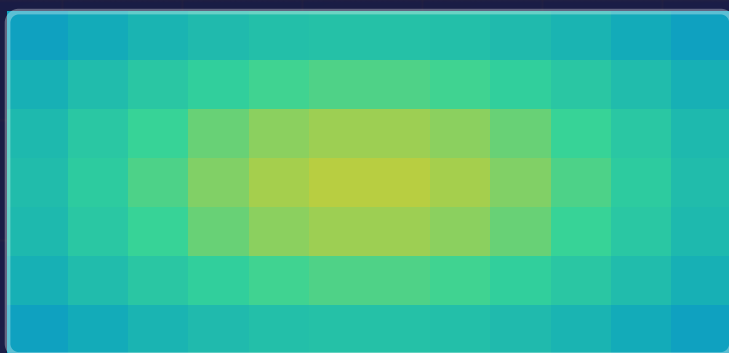
- 1 $\bar{E}_m$ is the value the installation must still deliver at the end of the maintenance interval. Design initial = $\bar{E}_m / MF$: at $MF = 0.8$ a 500 lx target needs about 625 lx on day one, roughly +25%. [6]
- 2 The factor is not a guess: $MF = LLMF \times LSF \times LMF \times RSMF$, lamp lumen maintenance, lamp survival, luminaire dirt and room-surface dirt, per CIE 97:2005. Each term needs the real cleaning interval and the real environment. [7]

EN 12464-1:2021 requires the designer to state the maintenance factor AND the maintenance schedule (6.3, 8.6). That pairing is what makes the number auditable. [6]

A model with **no declared MF and no cleaning schedule** is not a design, it is a screenshot.

Uniformity

Same average. **One of these fails.**



0  900 lx

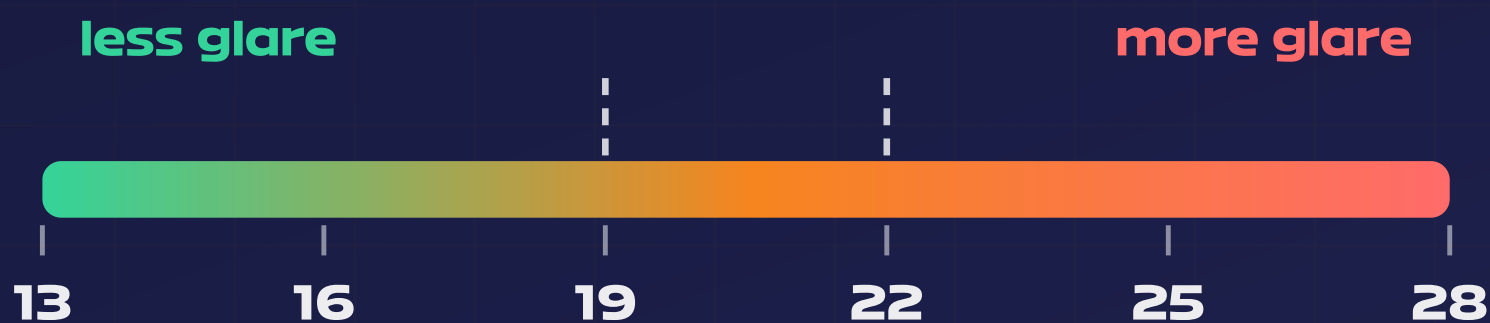
$U_o = 0.70$. Even field, the darkest point still sits well above the floor of the requirement.

$U_o = 0.35$. Bright pools under the luminaires, valleys between them. Same mean illuminance, 500 lx.

Uniformity is **$E_{min} / \bar{E}$** over the task area. Average alone cannot tell these two grids apart.

Glare

The other limit on the same line of the table.



19

Offices, classrooms

UGRL $\leq$ 19 for writing, typing, reading and teaching. [2][5]

22

Retail sales area

UGRL $\leq$ 22; the till area tightens back to 19. [2]

Annex A

Non-standard rooms

The tabular method assumes a standard room, layout and observer; EN 12464-1:2021 Annex A covers the rest. [5]

Two symbols, one page: **UGR is the calculated result, UGRL is the limit the table allows.** UGR is calculated for a room, a layout and an observer position, never printed on a luminaire; a catalogue figure is a reference-condition value that does not survive your ceiling height unchecked. [5]

The rows that get audited

Seven maintained-illuminance examples worth recognising.

i Illustrative values only, not standalone requirements. Always use the complete standard row, including the task area, reference plane, uniformity, glare limit and colour rendering.

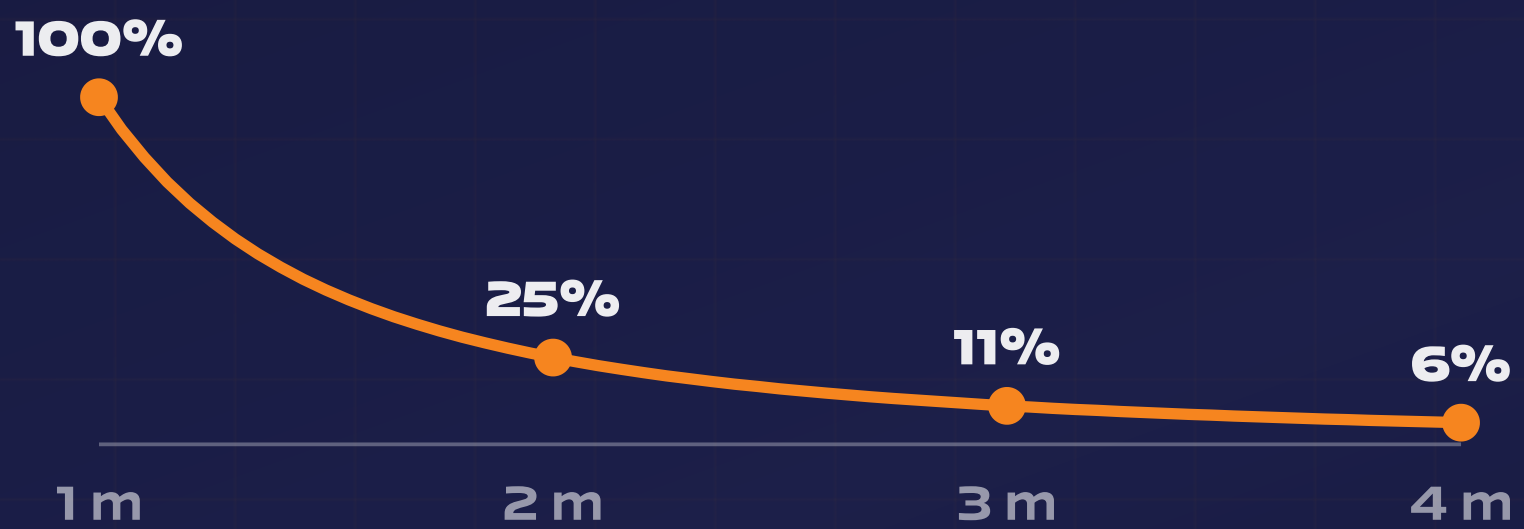
Corridor		100 lx · Uo 0.40 · floor
Hospital ward, general		100 lx · at floor level
Classroom		300 lx · UGR 19 · Uo 0.60
Retail sales area		300 lx · UGR 22
Office desk		500 lx · UGR 19 · Uo 0.60
Retail till area		500 lx · UGR 19
Hospital examination		1,000 lx

Off this chart entirely: the **surgical field** is not an EN 12464-1 quantity at all. IEC 60601-2-41 puts the surgical luminaire at **40,000 to 160,000 lx** central illuminance at 1 m. [8]

Maintained illuminance on the task area, EN 12464-1:2021 Clause 7. Storage is the row people misquote most: unmanned rack gangways sit near 20 lx, manned gangways near 150 lx, and picking is judged on the VERTICAL rack face, not the floor. [2]

Mounting height

Half the target is decided by geometry.



- 1** From a point source, illuminance falls with the square of the distance: double the distance and about 25% survives; triple it and about 11% does. Mounting height is the cheapest lever on the drawing, and the one most often fixed by the architect first.
- 2** Spacing is not a rule of thumb either. Take the maximum spacing-to-height ratio from the luminaire's own photometric file [16], then prove the resulting grid against U_0 in the model. A pattern that hits the average can still fail uniformity.

Real rooms beat the point-source curve, **because walls and ceilings give light back**. That is the next slide, and it is why the model matters.

Room surfaces

Room surfaces change what reaches the plane.



High reflectance. White ceiling, pale floor, light walls. Interreflected light does part of the work.



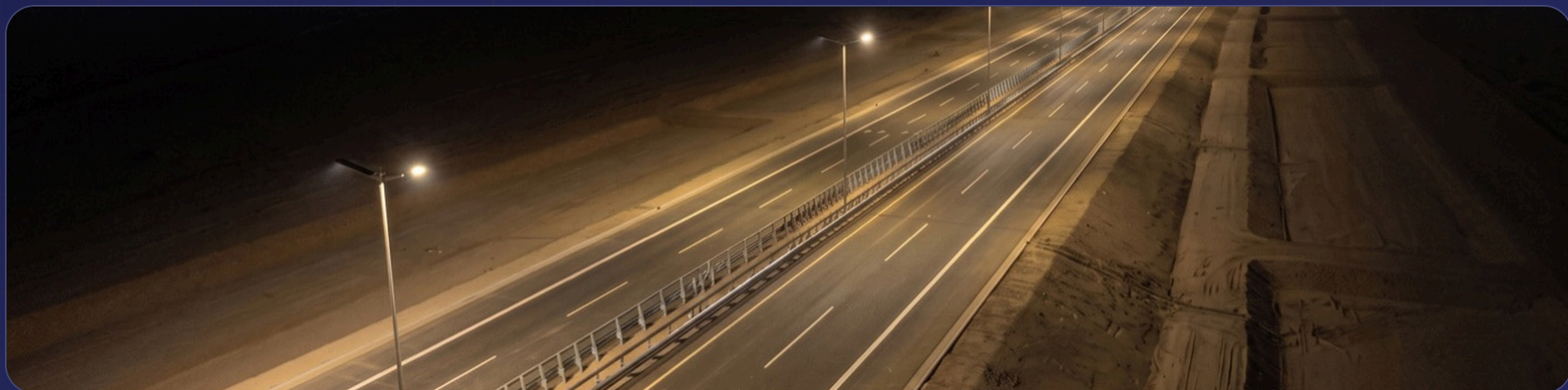
Low reflectance. Timber walls, dark seating and carpet. Surface reflectance changes how much light reaches the working plane.

Ceiling		0.7 – 0.9
Walls		0.5 – 0.8
Floor		0.2 – 0.6
Major objects		0.2 – 0.7

Reflectance ranges per EN 12464-1:2021, 5.2.2. Two rooms of one NLC project, the Dammam Public Library, with different lighting systems: they illustrate surface reflectance, they are not a controlled same-fixture comparison. How much the plane loses depends on room proportions, distribution and the direct/indirect split, so take the delta from the model at the REAL surface values, never from a rule of thumb. [3]

Outdoors

On the road the target is a class, and the class is computed.



NLC road-lighting reference project. The class system below is Saudi Arabia's own, SASO 2927:2019.

M · roads

road-surface
luminance, cd/m^2

M1	2
M2	1.5
M3	1
M4	0.75
M5	0.5
M6	0.3

C · conflict areas

average illuminance,
 lx

C0	50
C1	30
C2	20
C3	15
C4	10
C5	7.5

P · pedestrian areas

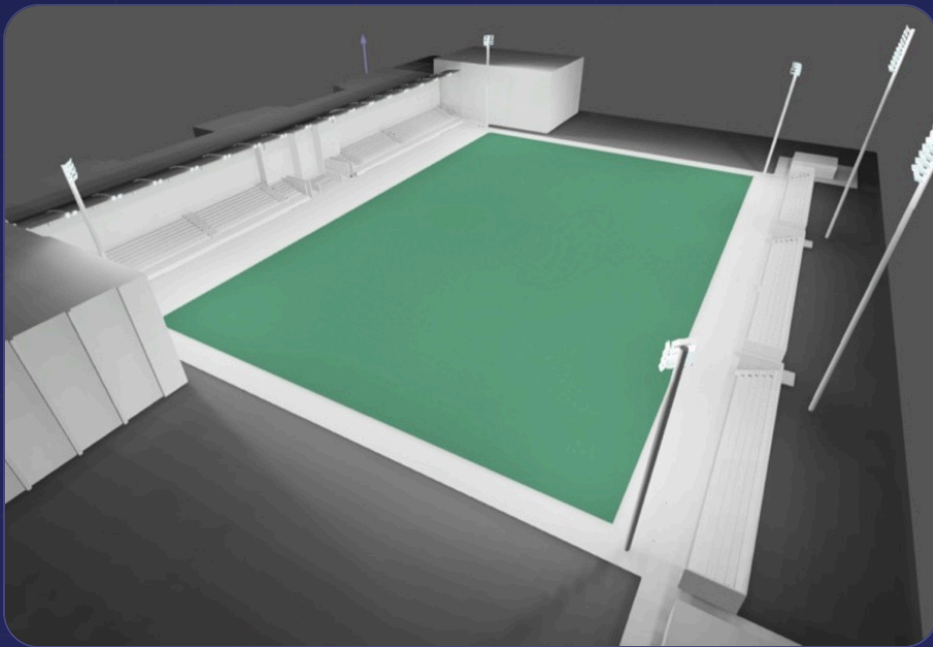
average / minimum, lx

P1	15 / 3
P2	10 / 2
P3	7.5 / 1.5
P4	5 / 1
P5	3 / 0.6
P6	2 / 0.4

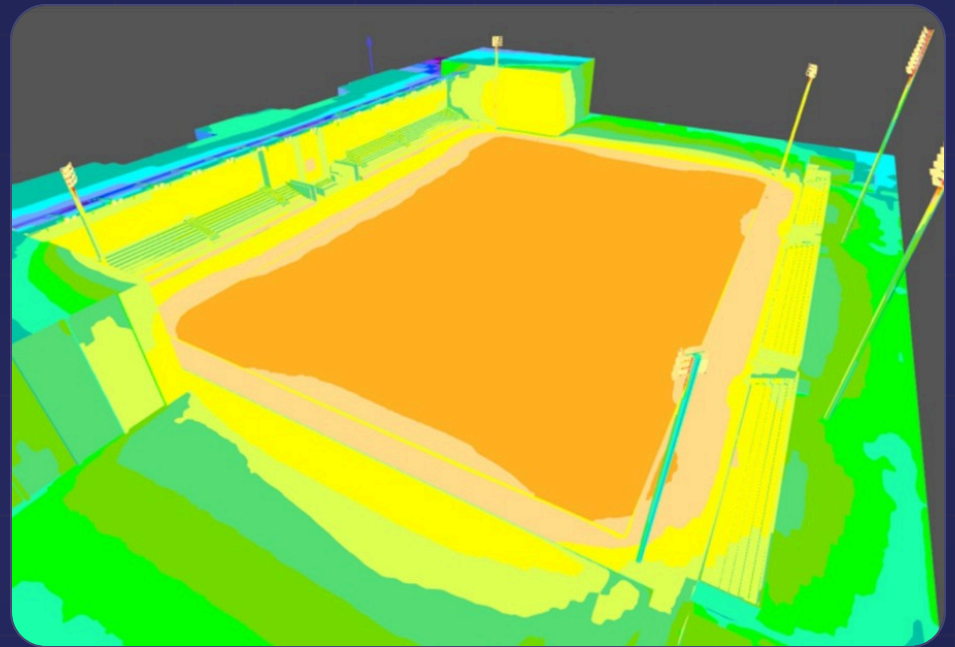
The class is not a preference: **class = 6 - the sum of weighting values** over speed, traffic volume, traffic composition, carriageway separation, junction density, parked vehicles, ambient luminance and visual guidance. [10]

Verification

Nobody should finalize a quote before the model runs.



The model. Real geometry, real surface reflectances, real luminaire photometry from the manufacturer's file.



The result. The illuminance map on the same scene, computed on the design grid, not sketched.



Both images are the same NLC lighting design, and the scale below is the render's own. A verifiable submission states the grid, maintenance factor, surface reflectances, achieved $\bar{E}$, E_{min} and U_0 per space, and calculated UGR for stated observer positions, so the results can be checked against EN 12464-1:2021 Clause 8 at handover. [1][6][18]

From the NLC range

Four spaces, four rows of the catalogue.

BOARD

Fixed-CCT indoor luminaire



UGR <16

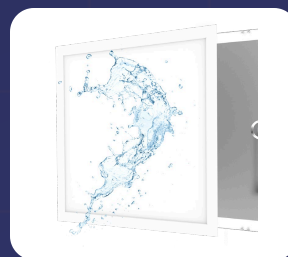
36 W · 3,000 lm

IP20

The tightest published glare figure in the range.

TIGHT

Commercial LED luminaire



UGR <22

26-40 W

120 lm/W

IP65

A sealed space that still carries an office-grade glare limit.

STONY

High bay luminaire



100-240 W

140 lm/W

60° / 90°

Two beams, one fitting: the aisle and the open floor are not one design.

COMET

LED street light



50-300 W

130 lm/W

IP66 · IK09

Match the distribution to the M, C or P class, not to the wattage.

Rows quoted from each catalogue page, read 2026-08-24; application notes are ours. A catalogue UGR is a reference-condition figure, not a substitute for the model. [17]

Before you sign

Five lines that turn a number into a passing installation.

- ☐ Write the **full row, not the lux**: maintained illuminance, task area, reference plane and height, U_o , UGR_L and Ra, per space. [2]
- ☐ Make the contractor **declare the maintenance factor** and the cleaning and replacement schedule behind it, then check the initial design level is $\bar{E}_m / MF$. [6][7]
- ☐ Ask for the model at the **real surface reflectances**, not the software defaults, and for the grid the results were calculated on. [3]
- ☐ On roads, agree the **lighting class** and the parameters that produced it before anyone counts poles; M classes are luminance, C and P classes are illuminance. [10]
- ☐ Require a **verification report** at handover: measured $\bar{E}$, E_{min} and U_o on a documented verification grid, plus calculated UGR for stated observer positions. [1]

The sources

Every number on these slides, sourced.

- [1] EN 12464-1:2021, 5.3.3-5.3.6 · [2] EN 12464-1:2021, Clause 7
- [3] EN 12464-1:2021, 5.2.2 · [4] EN 12464-1:2021, 5.3.2 (scale)
- [5] EN 12464-1:2021, 5.5.3 (UGR) · [6] EN 12464-1:2021, 6.3 + 8.6
- [7] CIE 97:2005, maintenance of indoor lighting
- [8] IEC 60601-2-41, surgical luminaires
- [9] EN 12464-2, outdoor work places
- [10] SASO 2927:2019, street lighting (M / C / P classes)
- [11] CIE 115:2010, road lighting
- [12] EN 13201-2, road lighting performance
- [13] ANSI/IES RP-2-20, retail · [14] IES RP-3, educational facilities
- [15] EN 12665, basic terms · [16] EN 13032-2, photometric data
- [17] NLC catalogue, 4 product pages · [18] NLC lighting design

Standards cited in their current active revisions. SASO 2927 values are as published in the Saudi Energy Efficiency Program workshop on the standard, which states it is a summary and not a technical reference: confirm against the standard for contractual use. Full citations, URLs and access dates (2026-08-24) are included in the episode evidence document.

PRACTICAL LIGHTING ENGINEERING

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colleague.



Read the full episode article

<https://nlc.com.sa/academy/lux-in-real-life.html>



Next episode
Painting & Light