



NLC Academy | Episode 08

Same lux. Different CCT. **A completely different room.**

Colour temperature helps shape how a space feels and functions. From warm-white 2700 K in a majlis to daylight-cool 6500 K over an inspection bench, the number belongs to the task and the hour.

The scale

Lower is warmer. Higher is cooler.



2700-3000 K

Warm white

Homes · hotels ·
mosques

4000 K

Neutral

Offices · retail ·
classrooms

5000-6500 K

Cool / daylight

Workshops · labs ·
outdoor

CCT (correlated colour temperature) describes the appearance of white light, not its brightness: **a 2700 K source and a 6500 K source can produce the same illuminance in lux.**

The reference

Where each CCT fits.

2200 K

Candle / sunset

Restaurants · spa · evening lounges

2700 K

Warm white

Homes · hotel rooms · majlis

3000 K

Soft white

Hotel lobbies · mosques · upscale retail

4000 K

Neutral

Offices · classrooms · most retail

5000 K

Cool white

Workshops · kitchens · labs

5700 K

Daylight

Street lighting (KSA practice) · industry

6500 K

Cool daylight

Inspection benches · colour QC

These CCT assignments are NLC practical design guidance. Verify project illuminance and glare requirements against BS EN 12464-1, and circadian targets against WELL v2 and CIE S 026.

Common in Saudi projects

Four spaces, four Kelvins.



Illustrative scenes generated for this episode; the CCT labels are the design targets for each space type, not site measurements.

Across the Gulf market, warm white is the usual choice for living spaces: **reserve 4000 K for areas where the task calls for it, such as kitchens, garages and offices.**

The fine print

CCT is an approximation, **not a full colour spec.**



+ Above the locus the tint drifts green; two fixtures can share one label and not match.

- Below the locus the tint drifts magenta / pink. The Duv value states the side and how far.

Both dots are sold as "4000 K". On one ceiling they visibly disagree: **for colour-critical work, spec Duv and binning too, Episode 11 covers how.**

The other label

Same Kelvin, different colours: CRI.

CRI 95



CRI 70



1 CRI indicates how faithfully a source renders colours against a reference, on a 0-100 scale. Reds, skin tones and food usually reveal poor rendering first.

2 Kelvin sets the tint of the WHITE; CRI decides what everything under it looks like.

Illustrative comparison; the low-CRI shift is exaggerated for clarity. Catalogue values: LUXO CRI >90; most of the range >80, with >90 optional on several models.

**Where colour carries the sale, retail, food and hospitality:
write CRI ≥ 90 next to the CCT.**

Kelvin and lumens

The warm option gives **about 7% fewer lumens.**

2700 K

1,450 lm



3000 K

1,510 lm



4000 K

1,560 lm



5000 K

1,560 lm



6500 K

1,560 lm

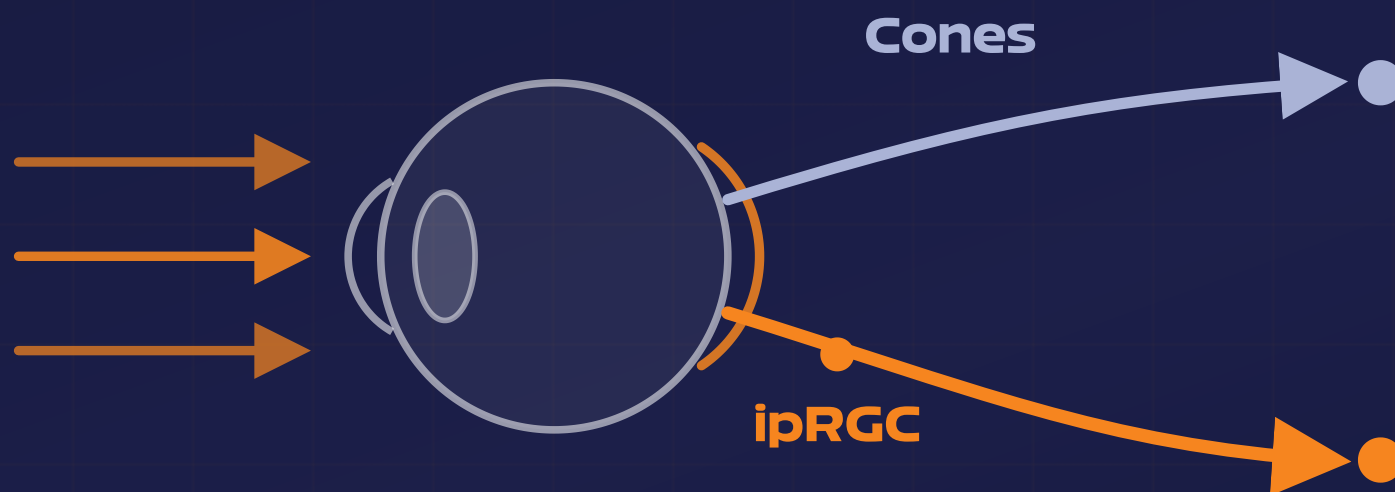


SOLID's published table, one 24 W / 4.8 m run at every CCT: identical fixture, identical power draw; the warmer phosphor mix trades a little output for warmth. Other models differ; check the datasheet.

At the same 24 W, the 2700 K build delivers **1,450 lm** against **1,560 lm** at 4000 K, **about 7% fewer lumens.** Not a power or cost penalty, and not the halving the myth suggests. Figures are for this SOLID configuration; other products differ.

The biology

One eye, two pathways.



- 1 Cones → vision. Photopic lux, what a lux meter reads, was designed around this pathway.
- 2 ipRGC cells → the body clock. Blue-rich light on this pathway suppresses melatonin.

CCT is only a rough proxy for spectrum. Modern practice tracks **melanopic EDI (CIE S 026)**, the stimulus reaching the ipRGC pathway, and WELL v2 scores circadian lighting on melanopic light at eye level, not on CCT.

Same lux, different signal

Cool light carries **more wake-up signal.**

2700 K

≈ 0.45



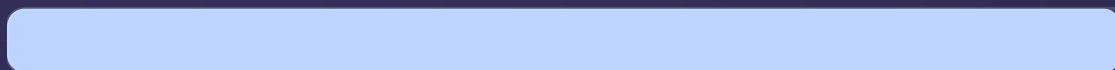
4000 K

≈ 0.65



6500 K

≈ 0.90



Illustrative melanopic daylight efficacy ratios (mDER, CIE S 026) for typical phosphor-converted LED spectra. Actual values depend on each product's SPD; published sets vary.

At equal photopic illuminance, a typical 6500 K spectrum carries roughly **twice the melanopic stimulus of a typical 2700 K spectrum.** Intensity, timing and duration matter as much as the spectrum, so treat this as direction, not a dose.

The office myth

**4000 K is a common default;
6500 K is not automatically better.**



6500 K

The old gold standard

Daylight CCT was long treated as the productivity ceiling. At office light levels late in the day it raises melanopic exposure with no proven gain in output.

4000 K

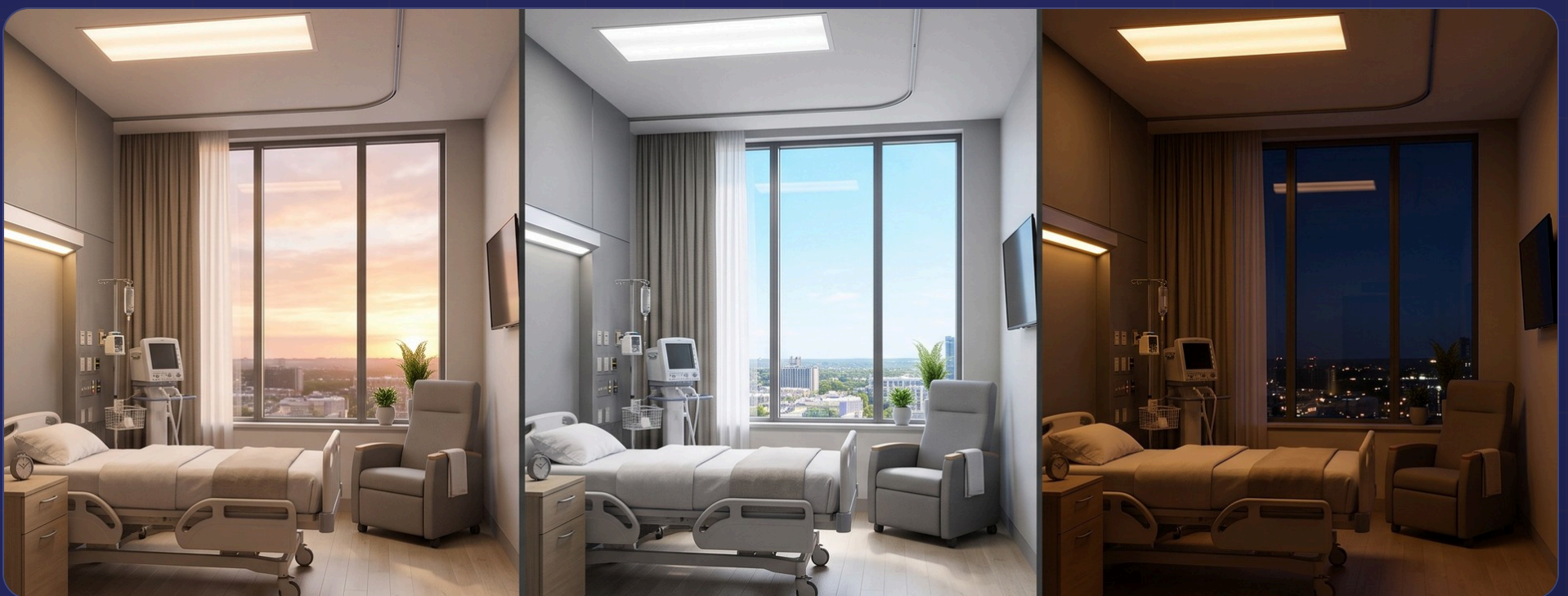
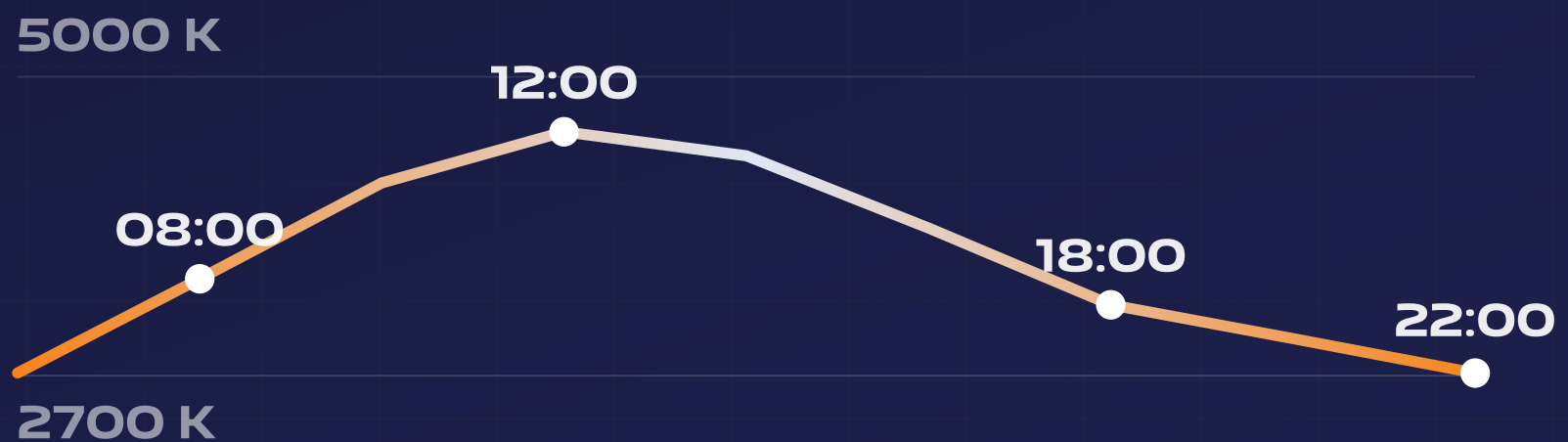
The current default

Widely used as a neutral-white office choice. Research comparing office CCTs stays mixed: results shift with spectrum, illuminance, task, time of day and personal preference.

Use 5000 K and above where the task, the visual criteria and the intended melanopic exposure support it: **not as a productivity shortcut.**

Human-centric lighting

Brighter and cooler by day, dimmer and warmer after sunset.



Morning · 3000 K

Midday · 4600 K

Evening · 2700 K

One room, one day: **cooler and brighter through working hours, warmer and dimmer after sunset.** Shifting CCT without shifting intensity is not a complete strategy. Increasingly common in new hospitals.

The catch

Tunable white is a system, **not a fixture.**

Fixture alone

A 2700-6500 K tunable luminaire without controls powers up at one fixed point: a range paid for, a single CCT installed.

Fixture + protocol

The same hardware becomes a working dynamic-lighting system only with compatible drivers, controls, commissioning and a schedule that suits the space.



ABB i-bus® KNX DALI Gateway DG/S 1.16.1

A real DIN-rail KNX-DALI gateway: one module addresses up to 64 DALI devices in 16 groups; ABB's Premium DG/S x.64.5.1 gateways add DALI Type 8 tunable-white control.

Product photo: ABB.

 **DALI Type 8**

 **Dual-channel
0-10 V**

 **Daily circadian
schedule**

NLC Lighting Control designs include **DALI Type 8 tunable-white fixtures with circadian profiles** for offices, schools, and hospital wards.

Outdoors has a ceiling

Near homes and habitats: **3000 K or warmer.**

Why cooler hurts outdoors

Blue-rich light scatters more in the atmosphere and in the ageing eye: more skyglow over the city, harsher glare on the road.

The guidance

The DarkSky + IES outdoor principles close on warm-coloured light; DarkSky-approved luminaires are capped at 3000 K, and sensitive habitats often specify ~2200 K amber.



3000 K near homes



Amber ~2200 K · habitats



Full cut-off first



STARV ships **4000 K standard with 2700 / 3000 K and Amber optional**: near homes, wildlife, and coastal zones, order the warm or Amber build.

From the NLC range

Choose the CCT from the catalogue.

LUXO

Recessed LED
downlight



2700 K 3000 K

4000 K

5000 K

Homes and
hospitality: order it
warm, 2700 K or
3000 K.

CENTURY

Linear suspension
luminaire



2500 K 3000 K

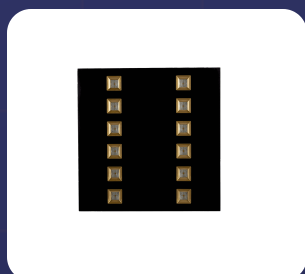
4000 K

5000 K 6500 K

Dining and
reception features:
options from
2500 K to 6500 K.

CHESS

LED panel



2700 K 3000 K

4000 K 6500 K

Offices and
classrooms: neutral
4000 K.

SOLID

LED strip · IP67



2700 K 3000 K

4000 K

5000 K 6500 K

Cove lines and
facades: 2700 K to
6500 K, indoors
and out (IP67).

CCT options as published on the NLC catalogue pages; confirm with the product datasheet.



Before you sign the spec

Five checks for **every CCT line.**

- ☐ Write a **kelvin number per area**, never just “white”: 2700-3000 K residential and hospitality, 4000 K work areas.
- ☐ Two “4000 K” fixtures can disagree: **ask for Duv and the binning tolerance** on colour-critical ceilings.
- ☐ In bedrooms and other sleep-supportive spaces, **limit bright, high-melanopic light near bedtime**; schedule dimmer, warmer scenes instead.
- ☐ Specifying tunable white? **Name the protocol**, DALI Type 8 or dual-channel 0-10 V, and who programs the schedule.
- ☐ Check the **datasheet CCT options for the exact model**; not every product ships in every Kelvin.

PRACTICAL LIGHTING ENGINEERING

**Save this. Send it to a
colleague.**



Read the full article and sources

<https://nlc.com.sa/academy/kelvin-human-centric.html>



Next episode
Lenses vs Barn Doors