CRI, R9 and TM-30: *what to specify* for decorative and hospitality lighting

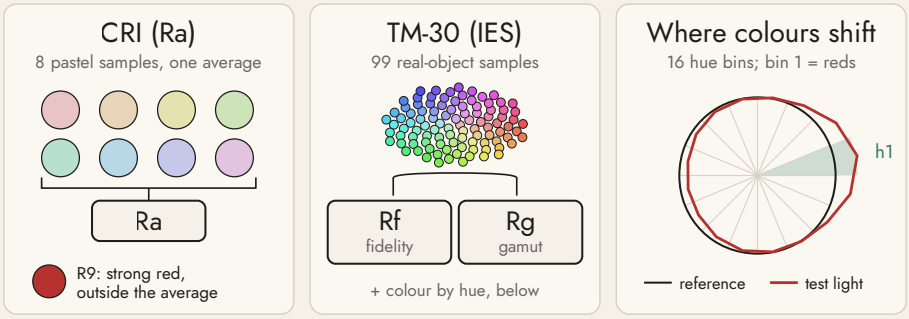
What CRI, R9 and TM-30 each measure, what the rules and programmes we read ask for, and how to ask for all three for a decorative or hospitality light at the levels the room will use.

Compliance guidance. UK figures are from SI 2021/1095 and Approved Document L (England), US figures from a California Energy Commission slide, a US DOE fact sheet and a PNNL tutorial, all read on 6 November 2026. CIE 13.3, ANSI/IES TM-30 and BS EN 12464-1 were not read: check current editions. Figures in square brackets are examples, not rules. Guidance, not legal or engineering advice.

AT A GLANCE

Number	What it measures	Scale	Figures we found	Use it for
Ra (CRI)	Average fidelity to a reference light over eight pastel samples (CIE 13.3)	0 to 100; negative values are possible	UK floor 80 for a light source (SI 2021/1095 Sch 3, Table 5). California residential high-efficacy: 90 (JA8-2019)	A quick filter, not enough alone
R9	Fidelity of one strong red, a special CIE sample outside Ra	Unusual scale; can be negative	US DOE (2016): above 0 generally acceptable. California: above 50	Skin, timber, leather, food, red fabric
Rf and Rg	Fidelity (Rf, 0 to 100) and change in saturation (Rg, 100 = none) over 99 real-object samples (TM-30; CIE 224 describes Rf)	Rg about 60 to 140	TM-30 Annex E: Rf 70 to 78 and Rg 89 to 95 or more (preference); Rf 85 to 95 (fidelity)	A truer successor to Ra
Rcs,h1 and Rf,h1	Saturation shift and fidelity of the red hue bin; the colour vector graphic shows all 16 bins	Per cent; 0 to 100	Annex E preference: -12 to +23 per cent (P3), -1 to +15 per cent (P1)	Reds: the TM-30 counterpart of R9
UK declaration	CRI and R9 are declared in the technical documentation for LED sources (Sch 9 para 1(e))	Packaging shows CRI to the nearest whole number	A tested CRI may fall 2.0 units below the declared one (Sch 2 Table 1)	Ask for the declaration and the test report

Figures read on 6 November 2026. TM-30 Annex E figures are as printed in a PNNL tutorial for the TM-30-20 edition and apply at 200 to 700 lux. None is a UK requirement for decorative lighting except the floor of 80 for light sources.



Schematic. Not a measurement of any light.

Three ways of scoring colour rendering: Ra averages eight pastel samples and leaves R9, a strong red, outside the average; TM-30 scores 99 real-object samples and gives Rf and Rg; its colour vector graphic shows which of 16 hue bins shift. Schematic, not a measurement of any light. Original drawing by Make Bespoke Studio.

SPECIFICATION WORDING

COLOUR RENDERING

Light sources visible in [space] to have a colour rendering index Ra not less than [90] and R9 not less than [50], at full output and at [50] and [10] per cent, as measured on the supplied model by [accredited laboratory] and not only declared. Report to show the measured values at the lowest dimming level reached. These are the specifier's figures, not a legal requirement; the UK floor for a light source is Ra 80 [where SI 2021/1095 applies].

TM-30 REPORT

The maker is to supply, for each light source and fitting family, the spectral power distribution file and an ANSI/IES TM-30 report [edition TM-30-24] giving Rf, Rg, Rcs,h1, Rf,h1 and the colour vector graphic, at [2700] K and at [100, 50 and 10] per cent output. Design intent [P2 of TM-30 Annex E, or: Rf not less than [ ], Rg between [ ] and [ ], Rcs,h1 between [ ] and [ ] per cent].

SAMPLES AND MOCK-UP

Approved samples of [timber, leather, brass and fabric] for [space] to be lit by one production-standard fitting at the evening scene and at the lowest dimming level, and accepted in writing by [lighting designer] before production. The mock-up to be repeated if the light source, driver, optic or tuning curve changes.

NO CHANGE AFTER APPROVAL

No change of LED module, lamp, driver or tuning curve after approval without a new test report showing Ra, R9, Rf, Rg and Rcs,h1 not worse than the approved values and the written approval of [lighting designer]. The approved model numbers are to be listed on the schedule and in the handover pack.

TERMS USED

Colour rendering index (CRI, Ra)

The mean of the scores for eight colour samples under a test light, each compared with a reference light of the same colour temperature (CIE 13.3; CIE e-ILV 17-22-111). 100 means identical to the reference.

R9

The special colour rendering score for a strong red sample, TCS09. It is not part of Ra. A US DOE fact sheet says an R9 above 0 is generally considered acceptable.

TM-30 (Rf and Rg)

The IES method that scores 99 real-object colour samples. Rf is average fidelity from 0 to 100; Rg is average change in saturation, 100 meaning no change; a colour vector graphic shows the shift in 16 hue bins.

Spectral power distribution (SPD)

The energy a source emits at each wavelength of the visible spectrum. Colour rendering metrics are calculated from it (US DOE).

STANDARDS AND SOURCES

- SI 2021/1095, Lighting Products Regulations 2021 (Sch 1, Sch 2 para 3 and Table 1, Sch 3, Sch 9): revised text, no outstanding effects shown; read 6 Nov 2026.
- Approved Document L, Vol 1 (2021 and 2026 editions) and Vol 2 (2026), England: Vol 1 2026: para 5.57, Table 5.7; Vol 2: para 5.65.
- CIE 13.3-1995; CIE 224:2017; CIE S 017:2020 (e-ILV): publication pages and e-ILV read; CIE 13.3 itself not read.
- ANSI/IES TM-30-24 (IES); PNNL tutorial by Royer (Leukos, 2022): Annex E figures as printed for TM-30-20; confirm against TM-30-24.
- US DOE, LED Color Characteristics fact sheet (2016): CRI, R9; dated.
- California Energy Commission, 2019 Energy Code: Residential Lighting (JA8-2019): JA8-2022 not read.
- BS EN 12464-1:2021: listed current by BSI; not read; check for any colour rendering figure for your space type.

Full guide: https://makebespoke.com/trade/technical/cri-r9-and-tm-30. Make Bespoke Studio coordinates manufacture through its partner workshops. Figures are guidance only and your specification governs; some may be superseded, so contact the studio to verify.