

LIGHTING HANDBOOK

YOUR GUIDELINE FOR
LIGHTING SELECTION



www.alroufled.com



sales@alroufled.com



What's Special about alrouf LED?

I take immense pleasure in introducing to you Al Rouf Lighting Technology Company, a Saudi well established company in the business of importing, exporting, supplying and installation of LED lighting Fixtures.

We understand today's global focus on power saving which reflects directly on the survival of natural resources, therefore we concentrated our scope of work on well manufactured high-efficient LED products.

Supported by a well known partners such as Philips, Pelsan, Dialight and Fiberli. We undertake bulk operations of street lighting, factories, warehouses, offices, schools, airports and all kinds of construction projects. Keeping and carrying out a true commitment to improve and lead the lighting business in the Kingdom. We will be honored to arrange a personal introductory session to further emphasize on our company's capabilities whenever it is needed.

Chapter 1

Lighting technology

Chapter 2

Standard values for indoor and outdoor lighting

Based on new european standards

Chapter 3

Lighting application

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Emergency Lighting



Lighting technology

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Quality characteristics of lighting

Light colour

The light colour describes the colour appearance of the light.

Light colour	Colour temperature	Appearance	Association
ww (warm white)	up to 3300 K	reddish	warm
nw (intermediate white)	3300–5300 K	white	neutral
tw (cool white)	from 5300 K	bluish	cool

Colour rendering

Colour rendering is the ability of a light source to reproduce surface colours (8 test colours R1 to R8) as faithfully as possible compared to a reference light source. It is identified by the colour rendering index (CRI). The best colour rendering is $R_a = 100$.




Light sources are divided up into colour rendering levels:

- $R_a > 90$ very good colour rendering
- $R_a > 80$ good colour rendering

Colour rendering of less than 80 should not be selected at workplaces. If light sources with a colour rendering index below 80 are used in exceptional cases, it has to be ensured that safety colours can be recognised without any problems.

In addition to the colours of the surfaces, it is also the light colour that determines a room’s basic atmosphere! Please refer to Chapter 4 – Technology for light colours of light sources and changes to the light colour.

The saturated test colours R9 to R14 are also used occasionally to describe special functions of a light source. The reproduction of these colours is then quoted separately.

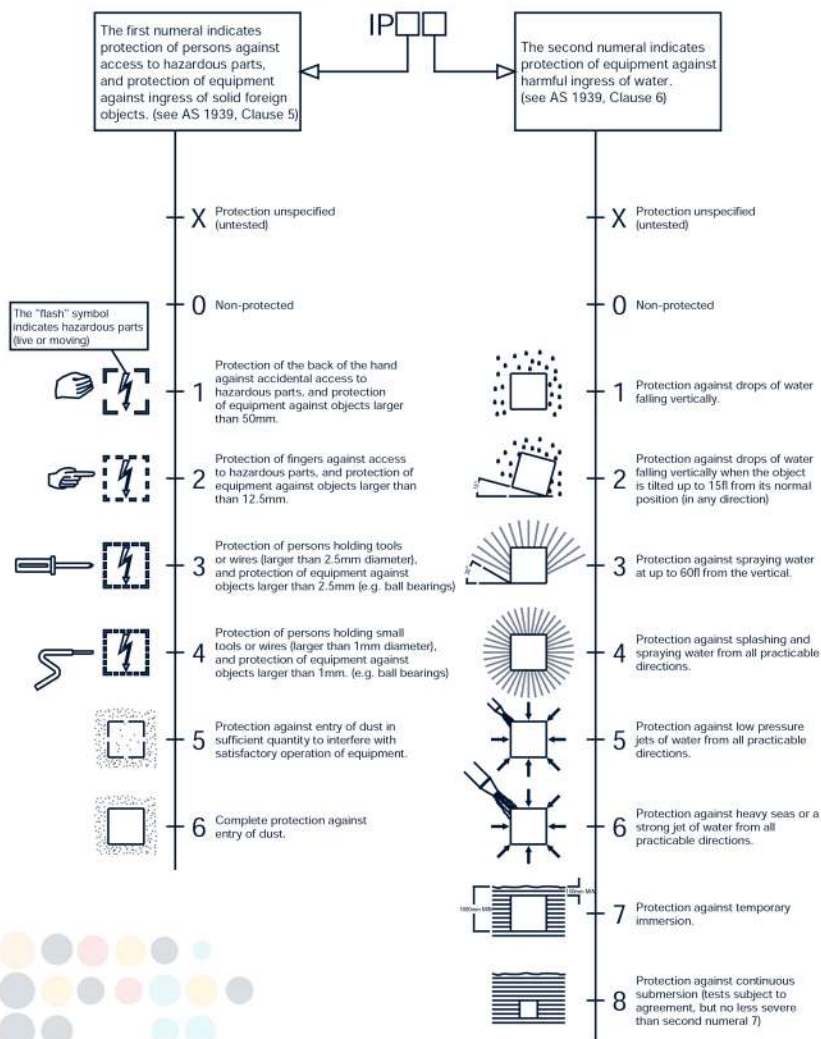
Light R_1 greyish red		Light R_5 blueish green	
Dark R_2 greyish yellow		R_6 Light blue	
Strong R_3 yellow green		R_7 Light violet	
Moderate R_4 yellowish green		R_8 Light reddish purple	
R_9 Strong red		R_{12} Strong blue	
R_{10} Strong yellow		Light R_{13} yellowish pink	
R_{11} Strong green		Moderate R_{14} olive green (leaf)	

IP Rating Chart

Protection of persons and protection of equipment indicated by the IP code.

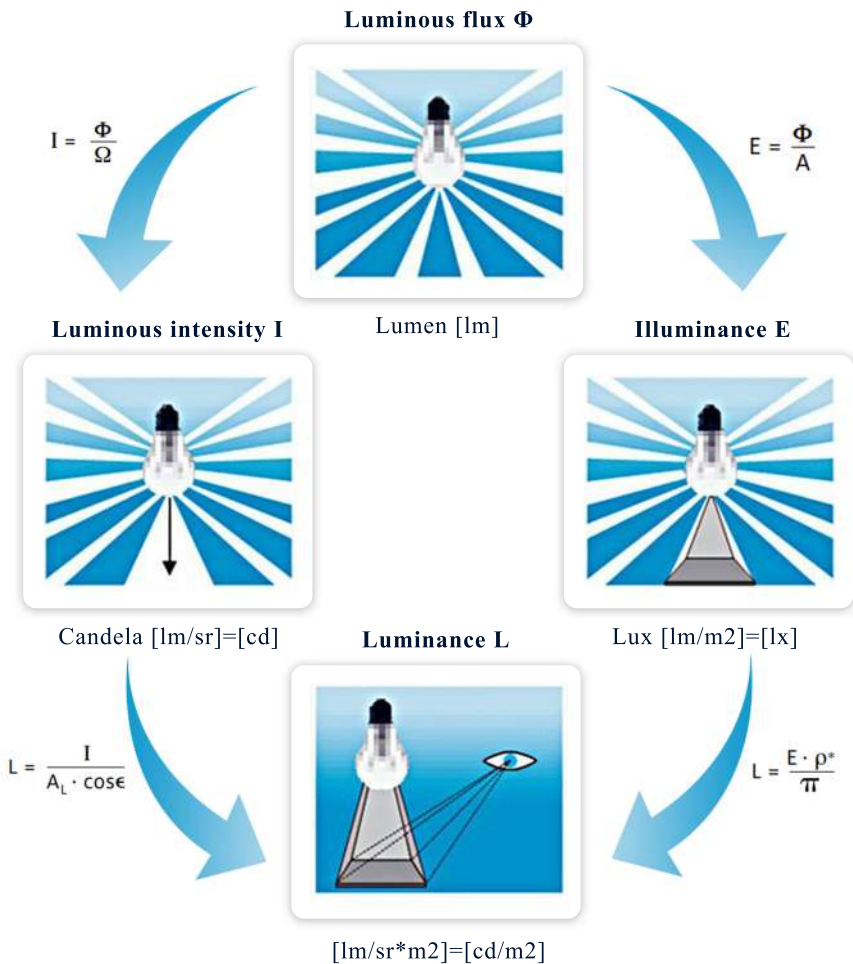
Protection provided by enclosures for electrical equipment is indicated by the IP codes two:

CHARACTERISTIC NUMERALS



Basic parameters used in lighting

Luminous flux – Luminous intensity – Illuminance – Luminance



Ω = solid angle into which luminous flux is emitted

A = area hit by luminous flux

$A_L \cdot \cos$ = visible areas of light source

ρ = reflectance of area

$\pi = 3.14$

* = for diffuse surface areas

Quality characteristics of lighting

Glare – glare limitation

Direct glare



Cause

- Luminaires without glare control
- Very bright surfaces

Effect

- Loss of concentration
- More frequent mistakes
- Fatigue

Remedy

- Luminaires with limited luminance levels
- Blinds on windows

Reflected glare



Cause

- Reflective surfaces
- Incorrect luminaire arrangement
- Incorrect workstation position

Effect

- Loss of concentration
- More frequent mistakes
- Fatigue

Remedy

- Matching luminaire to workstation (layout)
- Indirect lighting
- Matt surfaces

The evaluation of glare

The glare of all luminaires that are in the room regularly can be evaluated with the UGR method, as specified in the standard EN 12464-1 “Lighting of indoor workplaces”. However LED luminaires with very bright light points, which can be perceived individually, are crucial.

Classic VDU workstation luminaires

The standard requires the luminance of the luminaire to be below 3000 or 1500 cd/m² at an angle of 65°.

The UGR method

The standardised UGR method (unified glare rating) is used to assess (psychological) glare. The UGR value is calculated with a formula.

This takes into account all of the luminaires in the system that contribute to the impression of glare. The UGR values for luminaires are determined using the table method pursuant to CIE 117. Alrouf quotes both a UGR reference value for a reference room and the UGR tables for other room sizes for the majority of luminaires in its data sheets and on their website.

The UGR tables are available for each luminaire via the respective photometric data sheet:

Select a product > Photometry > Select a layout

The values are hereby used for a classification on a glare level. A comparison of individual values does not allow any statement Example: 18.5 is ≤ 19 (level) but not better than 19.0 (same glare level ≤ 19).

Note: the glare value RG is used outdoors. It is explained in the standard EN 12464-2.

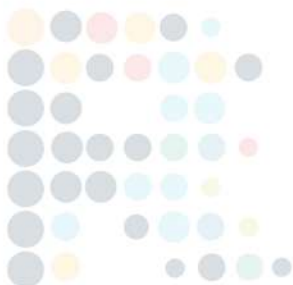
UGR limits (UGRL) that must not be exceeded:

- ≤ 16 Technical drawing
- ≤ 19 Reading, writing, training, meetings, computer-based work
- ≤ 22 Craft and light industries
- ≤ 25 Heavy industry
- ≤ 28 Railway platforms, foyers



$$UGR = 8 \log \left(\underbrace{0.25}_{(1)} \underbrace{\sum \frac{L_b}{P^2}}_{(2)} \right)$$

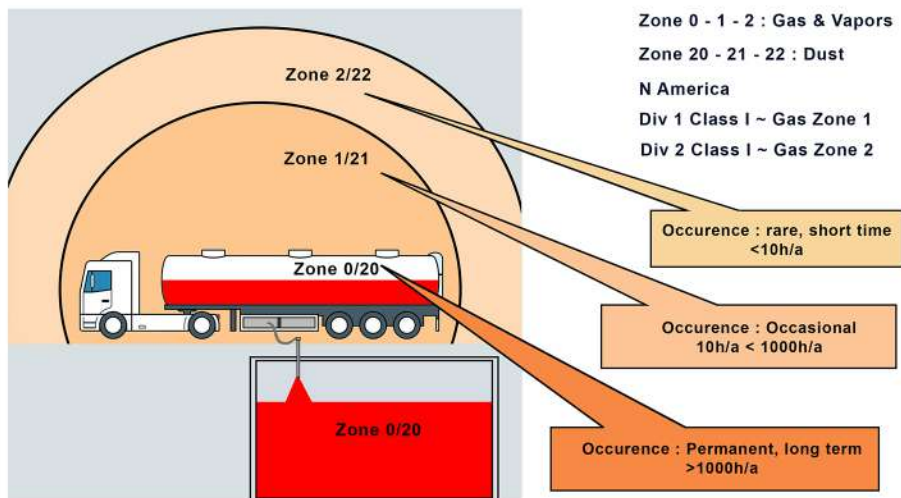
Note: the glare value RG is used outdoors. It is explained in the standard EN 12464-2.



Zone Classification

What is Zone Classification ?

Zone classification is a method of analysing and classifying the environment where explosive gas atmospheres may occur.



Hazardous areas are classified into zones based on an assessment of the frequency of the occurrence and duration of an explosive gas atmosphere, as follows:

Zone 0

An area in which an explosive gas atmosphere is present continuously or for long periods;

- Explosive atmosphere for more than 1000h/yr.

Zone 1

An area in which an explosive gas atmosphere is likely to occur in normal operation;

- Explosive atmosphere for more than 10, but less than 1000 h/yr.

Zone 2

An area in which an explosive gas atmosphere is not likely to occur in normal operation and,

- if it occurs, will only exist for a short time; Explosive atmosphere for less than 10h/yr, but still sufficiently likely as to require controls over ignition sources.



Luminous flux

The luminous flux describes the quantity of light emitted by a light source.

The luminous efficiency is the ratio of the luminous flux to the electrical power consumed (lm/W). It is a measure of a light source's economic efficiency.

Abbreviation: Φ Phi Unit: lm Lumen

Luminous intensity

The luminous flux describes the quantity of light emitted by a light source.

The luminous intensity describes the quantity of light that is radiated in a particular direction. This is a useful measure for directive lighting elements such as reflectors. It is represented by the luminous intensity distribution curve (LDC).

Abbreviation: I Unit: cd Candela

Luminance

Luminance is the only basic lighting parameter that is perceived by the eye.

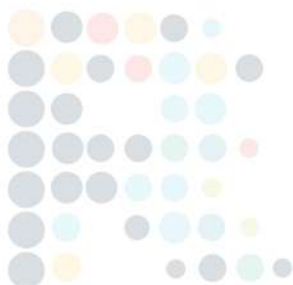
It describes on the one hand a light source's impression of brightness, and on the other, a surface and therefore depends to a large extent on the degree of reflection (colour and surface).

Abbreviation: Φ Phi Unit: lm Lumen

Illuminance

Illuminance describes the quantity of luminous flux falling on a surface. Relevant standards specify the required illuminance (e.g. EN 12464 "Lighting of indoor workplaces").

$$\text{Illuminance: } E(\text{lx}) = \frac{\text{luminous flux (lm)}}{\text{area (m}^2\text{)}}$$

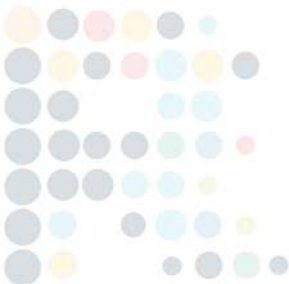


Outdoor lighting

The following aspects have to be taken into account for the illumination of squares and parks, buildings and facades:

- targeted illumination of the areas to be visualised, both horizontal and vertical
- creation of a three-dimensional perception of the room through different brightness levels and shades
- balanced brightness distribution
- avoidance of strong dark-light contrasts
- limitation of the glare effect for residents and passers-by
- choose matching light colour and colour rendering
- no unused stray light
- when illuminating horizontal areas:
 - no light emission in the upper half of the room

Darkness has to be respected at night



Outdoor lighting

In order to restrict the interfering effect, EN 12464-2 specifies the luminous intensities and luminances quoted in the table for outdoor spaces:

Maximum permissible interference effects of outdoor lighting systems

Light at the place of immission			Luminous intensity of the luminaire		Share of light pointing upwards	Luminance	
Environmental zone	E_v		I		R_{UL}	L_B	L_s
	before enforcement time*	after enforcement time	before enforcement time*	after enforcement time	%	cd/m ²	cd/m ²
						Building facade	Signs
E1	2	0	2500	0	0	0	50
E2	5	1	7500	500	5	5	400
E3	10	2	10,000	1000	15	10	800
E4	25	5	25,000	2500	25	25	1000

E1 Dark areas such as national parks or protected places

E2 Areas with little local brightness, such as industrial or residential areas in rural surroundings

E3 Areas with moderate local brightness, such as industrial or residential areas in suburbs

E4 Areas of high local brightness, such as city centres and commercial centres

E_v is the maximum vertical luminous intensity at the place of immission in lx

I is the luminous intensity of each individual light source in the potential direction of interference in cd

R_{UL} is the share of the light output of the luminaire(s) radiated above the horizontal plane with the luminaire(s) in its/their installed position and location in %

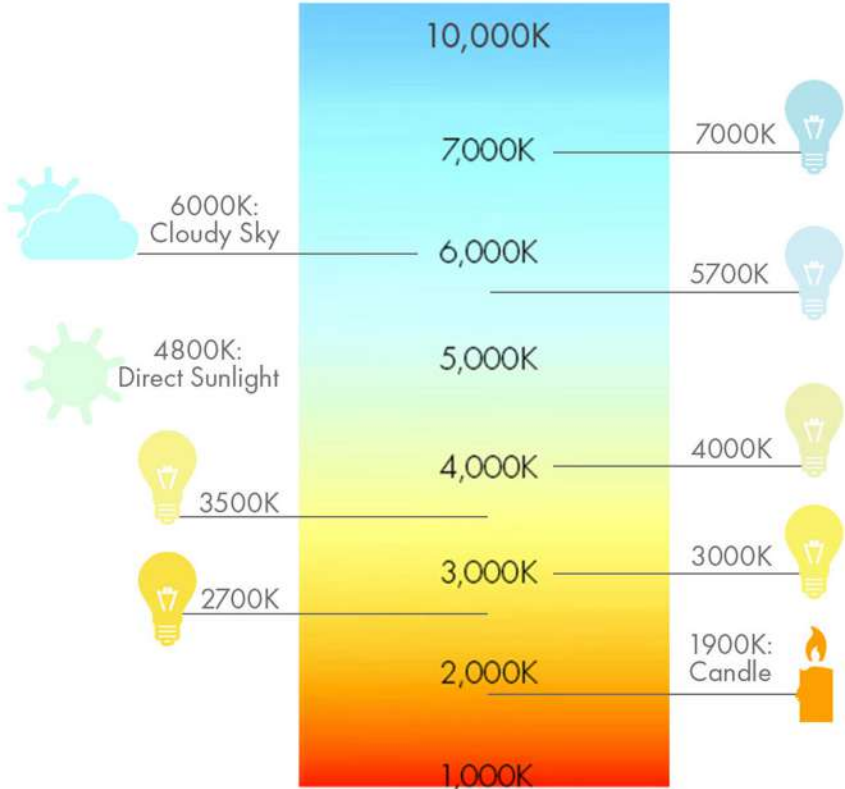
L_b is the highest mean luminance of a building's facade in cd/m²

L_s is the highest mean luminance of signs in cd/m²

* In the event that there is no enforcement time, the higher values may not be exceeded and the lower values should preferably be taken as limit values

Colour Temperature Chart

KELVIN COLOR TEMPERATURE
SCALE CHART

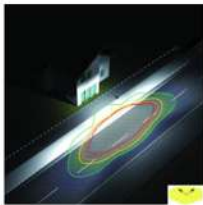


Lighting Distribution

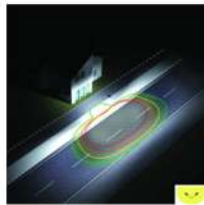
Lighting Distributions Types

The appropriate amount of light can relieve the stress. If we take an excessive amount of light or encounter frequent light disturbances, it can create an accumulated frustration and stress to human. Good lighting design should be considered to the distribution type to have a first check before installation what is a good choice for that area. Especially in the lighting project of main road that may drive faster than the secondary road. Please note that too little or too much light can cause an accident.

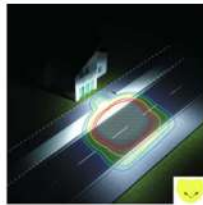
Alrouf LED provides a wide variety of optical light distributions suitable for all architectural, roadway and area lighting applications, for example, VN: very narrow, N: narrow beam, M: medium beam, W: wide beam, VW: very wide beam: E: elliptical beam, plus Type II, III, IV and ME classification from IESNA/EN.



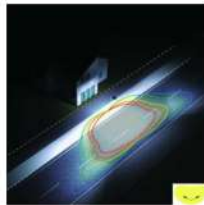
T2 – Ideal for wider walkways, entrance, roadways, bike paths and other long and narrow lighting application. Intended to be located near the side of a roadway.



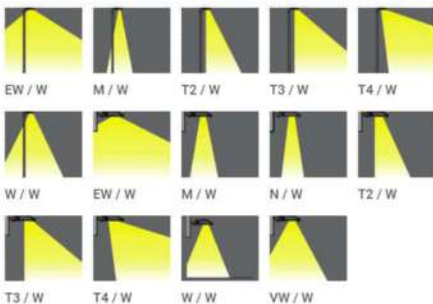
T3 – Ideal for road ways, general parking, and other lighting application.



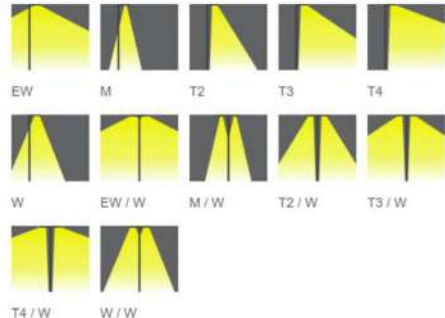
T4 – Especially suited for wall mounting or area applications and for illuminating the perimeter of parking areas.



ME – For motorized vehicles on traffic routes.



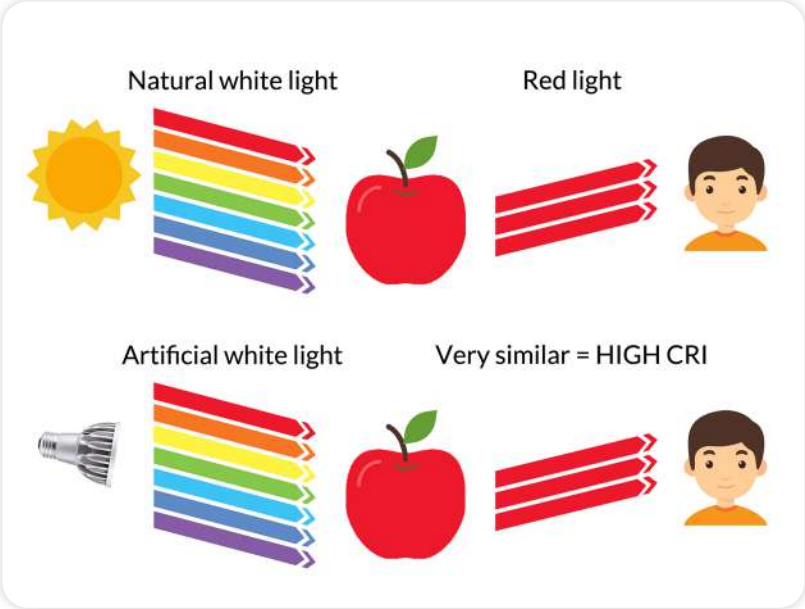
Adjustable column-mounted area floodlight. Powerful, flexible and cost-effective family with a vast array of technical optic choices.



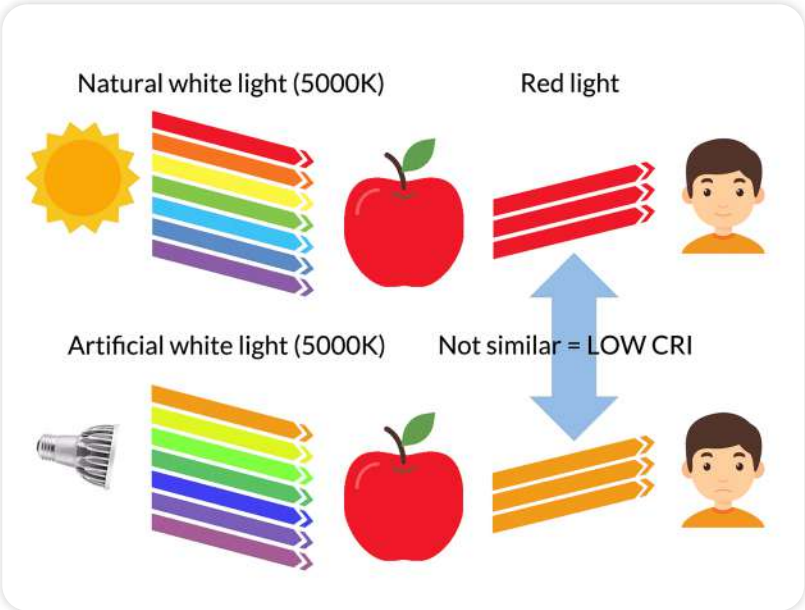
Slim, adjustable area-lighting column fixture family. Sharp, sleek profile hides copious precise beam options coupled with added adjust ability.

CRI Comparison

High CRI



Low CRI



Imprint

For questions and suggestions on
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Alrouf Lighting Technology Co Ltd
Prince Metib Road, Izdhar District,
Dammam 34252, Saudi Arabia.

 www.alroufled.com

 sales@alroufled.com

