

# NATIONAL TAIWAN UNIVERSITY

## Illuminance Standards for Outdoor Lighting on Campus

June 23, 2010 Passed by the Campus Planning Office at its 14<sup>th</sup> meeting, Academic Year 2009–10  
 July 27, 2010 Amended and passed by the 2,633<sup>rd</sup> Administrative Meeting

Article 1 National Taiwan University (NTU or “the University”) sets the NTU *Illuminance Standards for Outdoor Lighting on Campus* (“the Standards”) to ensure the security of outdoor venues on campus, improve landscaping aesthetics at night, protect the natural ecology, and prevent light pollution and the wasting of resources due to excessive lighting.

Article 2 Outdoor lighting at the University shall be installed in accordance with the CNS 15015 national outdoor landscape lighting standard and shall comply with the following illuminance standards:

1. Illuminance levels at general campus areas:
  - 1) Illuminance levels at pedestrian walkways on campus shall be set to at least 1 lux to ensure pedestrian safety.
  - 2) Lighting with higher illuminance levels may be installed at and around major traffic routes, security posts, and other places where people tend to gather at night.
  - 3) Lighting with the appropriate illuminance levels shall be installed in various lighting zones in accordance with the table below as well as the Map of Outdoor Lighting Zones on Campus (Figure 1).

Lighting target (zone)		Average illuminance level (lux)	Illuminance range (lux)	Uniformity (for reference)
Roads	Main roads	10	7–15	$E_{\min}/E_{\max} \geq 1/6$
	Arterial roads Roads at security posts			
	Feeder lanes	7	7–15	$E_{\min}/E_{\max} \geq 1/6$
	Pedestrian walkways	5	1–10	$E_{\min}/E_{\max} \geq 1/20$
Pedestrian walkways	Green corridors	3	1–10	$E_{\min}/E_{\max} \geq 1/40$
	Recreational trails	3	1–10	$E_{\min}/E_{\max} \geq 1/40$
Public Areas	Recreation areas	3	1–10	
	Athletic fields	20	5–30	
General		5	1–10	
Building entrances/ Outdoor stairways		5	3–15	
Parking lots		10	5–30	
Atriums		3	2–5	

2. Illuminance levels in light pollution control zones:

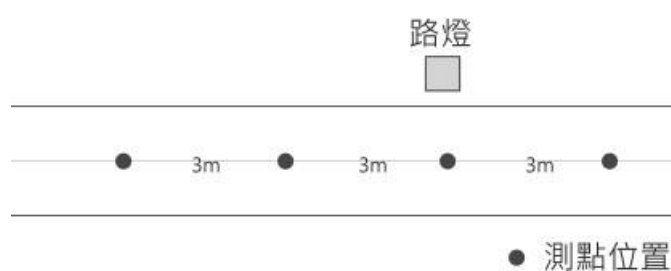
- 1) The impact of light pollution on the environment shall be taken into consideration when installing the aforementioned light fixtures. In areas with rich ecological resources (such as Drunken Moon Lake, the Liu Gong Jun Pond by Zhoushan Road, NTU Farm, and the NTU Black Forest) where lighting is required, unidirectional downward lighting, antiglare lighting, or lighting with lampshades shall be selected to control the light projection range, concentrate lighting on the ground surface, and minimize light pollution in surrounding areas.
- 2) Light pollution control zones are shown in detail on the Map of Campus Outdoor Lighting Zones (Figure 1), and their illuminance standards are as follows:

Lighting target (zone)	Average illuminance (lux)	Illuminance range (lux)	Uniformity (for reference)
Roads	5	7-15	$E_{min}/E_{max} \geq 1/6$
Green corridors	3	1-10	$E_{min}/E_{max} \geq 1/40$
Building entrances Gathering places	5	1-10	

Article 3 Illuminance shall be measured at 1 meter above ground in accordance with CNS 5065 Methods of Illuminance Measurements. The spatial intervals between and the density of measuring points are provided below:

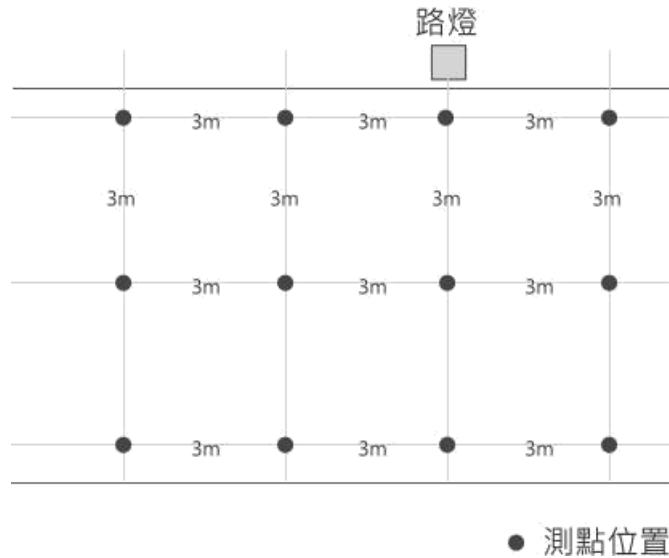
Linear walkways and passageways less than 1.5 m in breadth:

Measurements shall be taken at 3-meter intervals (adjustable based on the size of the area in question) along the center line of the route to calculate its average illuminance. Uniformity is calculated by dividing the lowest illuminance value by the highest.



Roads of 2.5 m or wider and open areas:

Measurements shall be taken at 3-meter intervals (adjustable based on the size of the area in question) within the area to calculate its average illuminance. Uniformity is calculated by dividing the lowest illuminance value by the highest.



- Article 4 The following principles shall apply when installing outdoor lighting:
1. Lighting shall be configured to minimize stray light and light pollution, with consideration given to its brightness, distribution, glare, flickering, and guidance quality to ensure vehicular and pedestrian safety.
  2. Outdoor lighting shall be consistent within the same area (including light sources, average service life, efficiency, color temperature, color rendering, style, and ballast).
  3. In principle, light sources with zero pollution, low power consumption, and high energy efficiency shall be adopted, and the selection of lamps shall be based on principles of high-efficiency, low light pollution, and anti-glare lighting.
  4. In areas with little foot traffic as well as around secondary building entrances, motion activated lighting shall be adopted where necessary to conserve energy and minimize disturbance to the natural environment caused by light pollution.
- Article 5 The Standards shall be deliberated by the Campus Planning Office Committee, passed by the Administrative Meeting, and then implemented on the date of promulgation.

**Figure 1 National Taiwan University Map of Outdoor Lighting Zones on Campus**

