

**LampMate**



Carbon Exchange (Hong Kong) Ltd.

# **Nano-Based Materials for Building Energy Saving and Indoor Environmental Quality Enhancement**

## **EMSD Innovative Technology Day 2018**

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# I&T Wish List



Smart  
Mobility



Smart  
Living



Smart  
Environment



Smart  
Economy



Smart  
Government



Smart  
Living



Smart  
Environment

We are addressing the  
needs of promoting “Smart  
Living and Environment” in  
Hong Kong

# About us

## GREEN • PEOPLE • HEALTH

We invest, incubate and apply green ideas and technologies in commercial market for good potential of returns. We focus and work on practical **Green** technologies and solutions that bring **Health** to **People**.



**World Technologies Incorporation Ltd** is the research arm of Carbon Exchange (Hong Kong) Ltd. focusing on development of new building material research projects.

**WTI Vision** - People Can't avoid Lighting. We Provide Affordable Green Lighting Technologies and Solutions



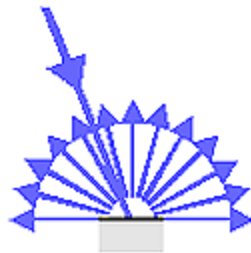
# The Project

Optical Material  
ECO-Friendly  
Quality  
Efficiency

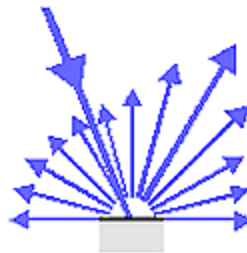
LampMate™ is an environmental friendly, highly diffusive optical material for light reflectance applications.

Applying to lighting fitting designs, LampMate™ as a patented technology can **increase the lighting quality and energy efficiency effectively.**

**LampMate**™



*Ideal diffuse reflection  
(Lambertian surface)*



*Diffuse reflection with  
directional component*





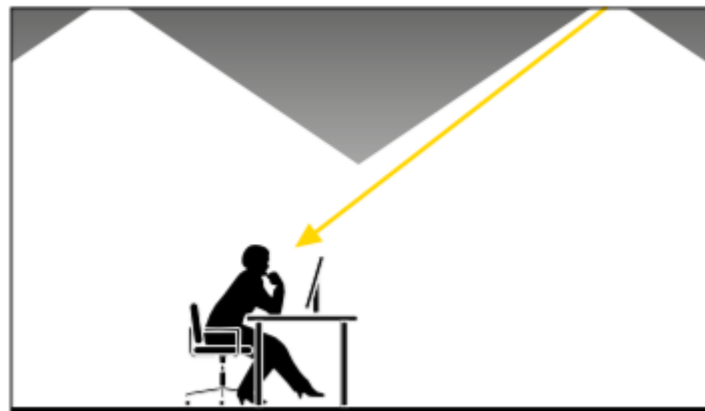
## Design Criteria

## Quality of Lighting

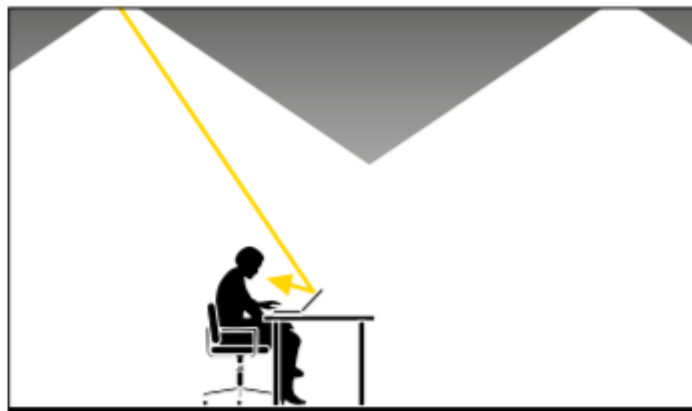
# Common Lighting Design Criteria for Hong Kong

1. **Energy Efficiency** – Energy cost savings + reduce maintenance costs
2. **Night time / Day Time Visibility** – Colour rendering + controllability
3. **Uniformity / Glare Control** – Visual comfort and high lighting quality
4. **Occupier Safety** – Surveillance management and security

Direct glare



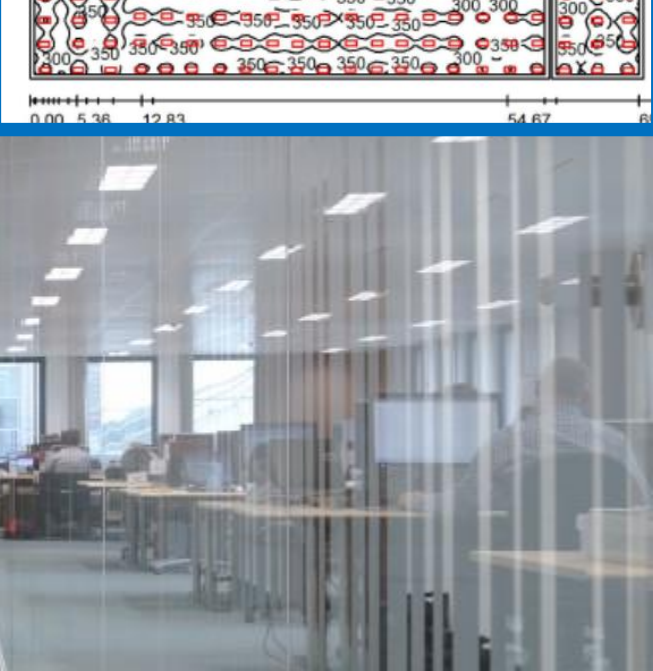
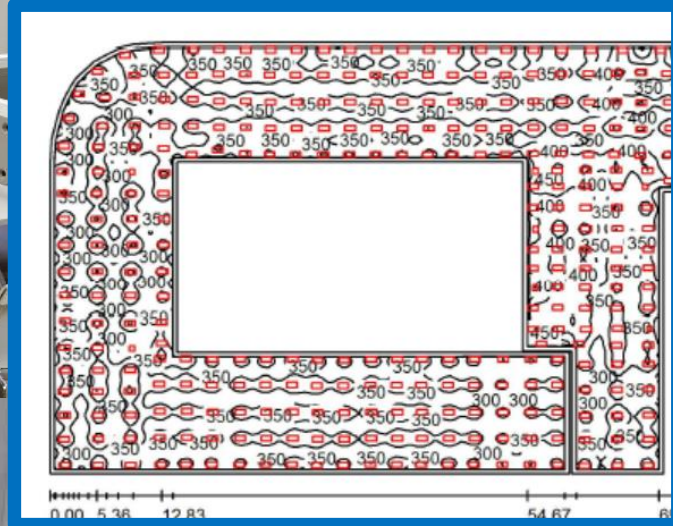
Reflected glare







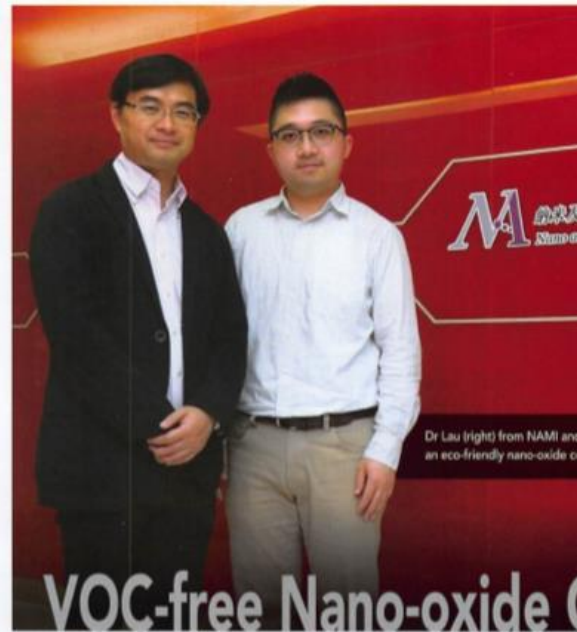




# Researched Technology

# On-going Business, Upgrading Technology

## 專題探訪 Special Feature



Dr Lau (right) from NAMI and Mr Vincent Lai, Executive Director, World Tech Incorporation Limited

## VOC-free Nano-oxide Coating for Lighting Fixture

Energy conservation is everyone's concern. Nowadays, we always look at the energy efficiency label when we shop for commercial procurement and home appliances because running cost of a piece of electrical equipment matters in a long run, maybe more than its price tag. However, apart from the energy efficiency of its functional parts, accessories also help maximize its energy output. Take lighting equipment as an example. Apart from the efficiency of the light source, the lampshades and lighting fixtures play vital roles in directing the light emitted by a light source to a work surface. "In the ideal case, using the right lampshades and fixtures with the right reflective finish could transmit 100% of the light source's output to your dining table or desk so that no energy is wasted," said Dr Tin Lau, Project Leader, Nano and Advanced Materials Institute Limited (NAMI), who recently collaborated with

### Shiny ≠ reflective

A lampshade is supposed to reflect light from a source. But being shiny like a mirror doesn't mean it reflects the most light. "Functionally speaking, a shiny surface reflects the light in one direction with a small angle of reflection, so that only a small area receives the reflected light. You'd need many of those lights to light the whole place. On the other hand, reflective surface that scatters light in a wider angle is preferred because it reflects light to a bigger area and you don't need as many light sources to light the same place," said Dr Lau.

The coating developed by NAMI and World Tech utilizes nanoparticle to enhance the wide angle reflection, which provides better performance of diffuse reflection, so as to achieve the target of energy-saving and improved lighting quality.

Traditionally, mirror-like metallic finish inside lampshade is either coated with electroplating or vacuum deposition. The former generates much toxic waste water with heavy metals that needs to be treated by expensive facilities before being discharged. The latter entails huge equipment cost and running cost. Comparatively, the nano-oxide coating developed by NAMI and World Tech costs a lot less because it can be sprayed on or dip-coated at rather low temperature and atmospheric pressure without harming the environment.

The nano-oxide coating looks like a coat of rough white paint and it does look brighter when put side by side with a mirror-like lampshade (see figure 1). But how is it different from regular white paint? Mr Lai explained, "Common white paint you get from hardware store is not made specifically for lighting fixture and it has a few problems when used that way. First off, its reflective property can't compare to the coating we make with oxide nano-particles. Second, its adhesive property may not be satisfactory so that it doesn't last long. Third, it doesn't resist the strong ultraviolet light or heat given off by the light source. That's why they turn yellowish and lose their reflective function fairly quickly. Right now, users don't have the mind-set to repair or maintain lighting fixtures. When the coat of paint comes off or turns dull, they'd just scrap the whole fixture and get new ones. This is very wasteful. By making a coating that lasts and providing retrofit options to fix and maintain aged lighting fixtures, we are putting resources to better use and cutting down wastage of both energy and materials while relieving the pressure on landfills."

### Formula and application methods

There are many levels to this project. The technology involves both the formula of the coating and its application methods. "In terms of the formula, the key component that gives the coating its reflective property is the nano-sized oxide particles which account for even reflection of light. Then, we have to think about adhesion and temperature resistance as it is put right next to light sources that give heat. For certain applications, we have to add water or chemical resistant, or even self-cleaning property to the coating. And most important of all, to make it eco-friendly, this coating is 100% water-based with no VOC whatsoever," said Dr Lau.

In terms of application, so far, the coating can be sprayed on or dip-coated on a substrate, such as aluminium or plastic. In order to enhance the quality control of the coating production, instead of using generic manual spray guns in the market, Dr Lau and his research team have been working on an auto-spray chamber to standardize the procedure of coating production. According to Mr Lai, World Tech is a technology enabler supporting all lighting designers and manufacturers to promote better light quality, energy saving, eco-friendly manufacturing process, and wastage reduction. **PLASTICS & CHEMICALS**

Acknowledgement: Dr Tin Lau, Project Leader, Nano and Advanced Materials Institute Limited (NAMI), and Mr Vincent Lai, Executive Director, World Tech Incorporation Limited



Mr Lai believes one way to relieve the pressures on landfills is to encourage repair and maintenance of lighting fixtures



Figure 1: Traditional mirror-like lampshade finish (left) looks bright only at certain angles whereas the new nano-oxide coating (right) reflects light in all angles



NAMI also worked on an auto-spray chamber to standardize the procedure of coating production



納米及先進材料研發院有限公司  
Nano and Advanced Materials Institute Limited

# LampMate

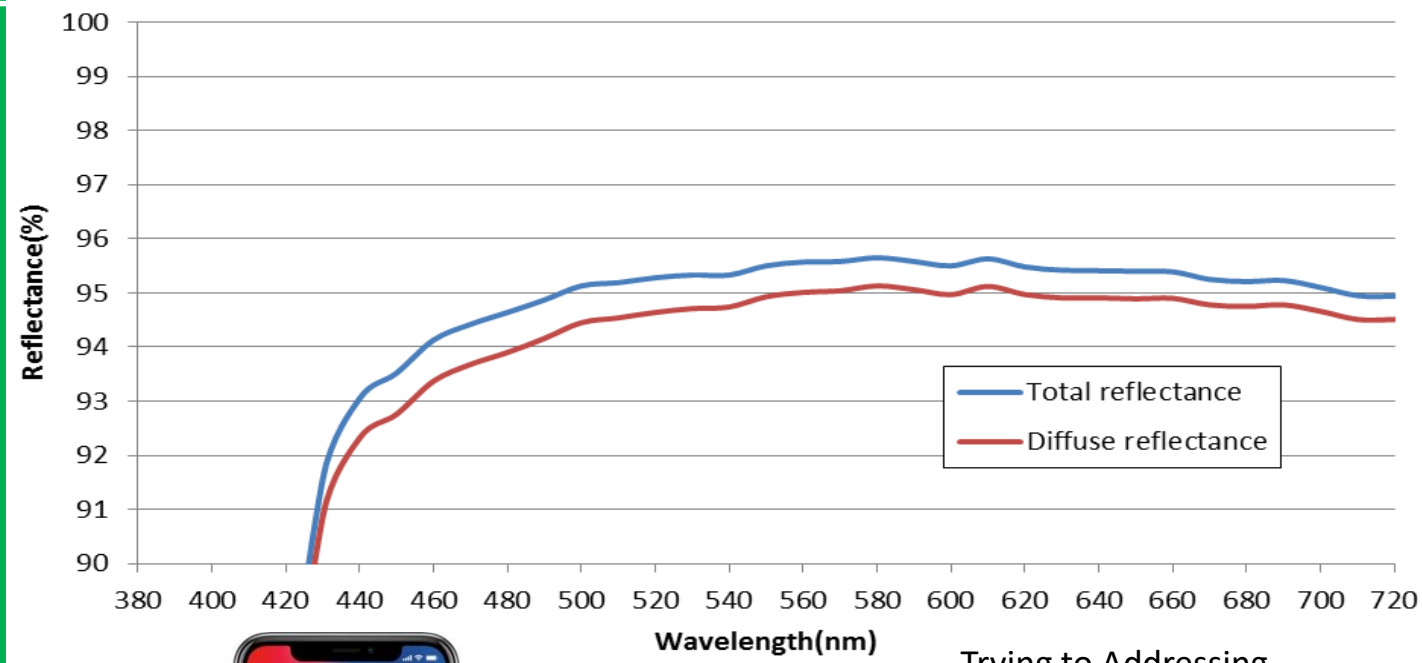
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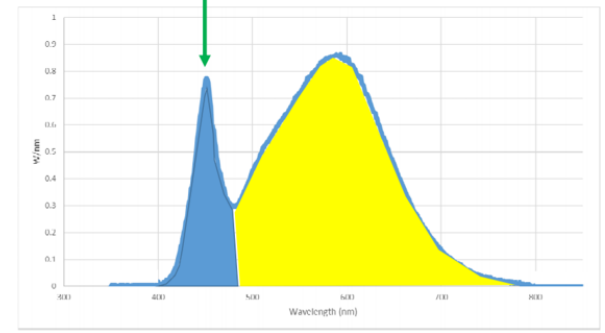
# Performance

## Total and diffuse reflectance

### Total and Diffuse Reflectance



Trying to Addressing Blue Light Hazard



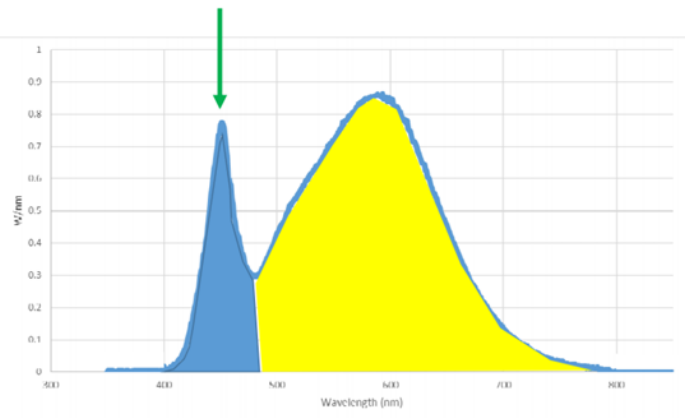
# Blue Light hazard

Blue light is known to be phototoxic for the retina.

The International Commission on Nonionizing Radiation Protection (ICNIRP) regularly reviews the biological evidence and publishes exposure guidelines.



Some wavelengths are more effective at causing harm than others, with the peak effect very close to the sensitivity of the short wavelength cones, in other words blue light at around 440 nm.



Potential Blue Light Hazard resulted from LED light source





# Now and The Trend

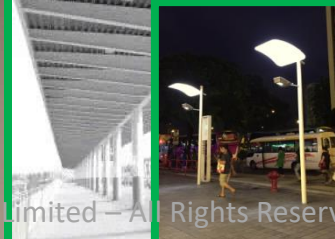
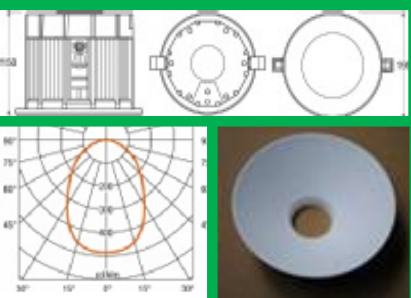
LampMate™ out-performs traditional metallic finished light reflector.

	LampMate™	Metallic Finish
Total Reflectance	higher than 95%	65% to 95% (when brand new)
Diffuse Reflectance	higher than 95%	less than 50%
Uncomfortable Glare	No	Yes (Reduce visablility)
Environmental Friendly	Yes	No (Electroplating)
True Colour	Yes	No (Red color distortion)
UV/ Chemically Inert	Yes	No (T5/T8)
Fire Retardant	Yes	No (for plastic blacking)
Cleanable	Yes	No (Damage to surface)

Technology  
Out-performer

## Now and The Trend

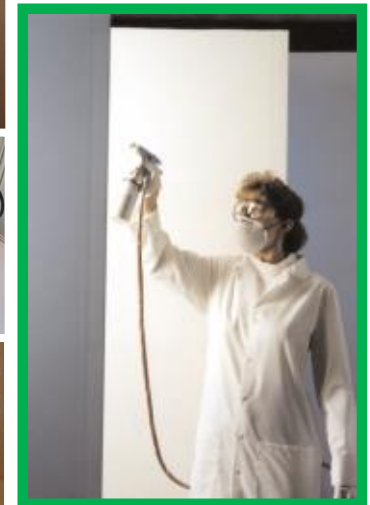
Now, LampMate™ has been applied in various types of lighting fixtures including High Bay Lighting , Florescent Tube , Down Light , Advertisement Panel, Functional Lights, etc.



# Now and The Trend

LampMate™ applies to various types of reflector designs in lighting fittings. It **REPLACES** traditional electroplating metallic finishing. Aging, rusting, environmental unfriendly, poor lighting quality, low efficiency, etc. are all shortcomings of traditional metallic reflectors and those problems are now resolved by LampMate™.

## Replace Lagging Technology



# Applications

## Improve Environmental Quality of the Premises

LampMate™ can be applied to general lighting fittings commonly applied in premises like MTR Stations, offices, warehouse, signages, etc. LampMate™ can be applied to **new lighting fittings**. LampMate™ can also be used in **retrofit projects** where old and aging lighting fittings can be fitted with our LampMate™ sheets to cover the original light reflectors.

LampMate™ can bring the following advantages to lighting designs:

1. The aged reflector of light fittings can resume light output level
2. Improve light output uniformity and less lighting points can be installed
3. Improve colour rendering and clarity of objects including people faces, advertisement boards, decorations, shop displayed items, etc. in interior space
4. Reduce wastage by extending life time of lighting fittings. Less environmental impacts and waste management costs
5. Reduce dis-comfort glare to occupiers and improve comfort level of interior environment.



Product Code : A60PSS(LED)-MR / A612PSS(LED)-MR

#### LED Indirect Luminaire

LED direct and indirect recessed luminaire (downlighter)

Designed by using LED Driver and Smps

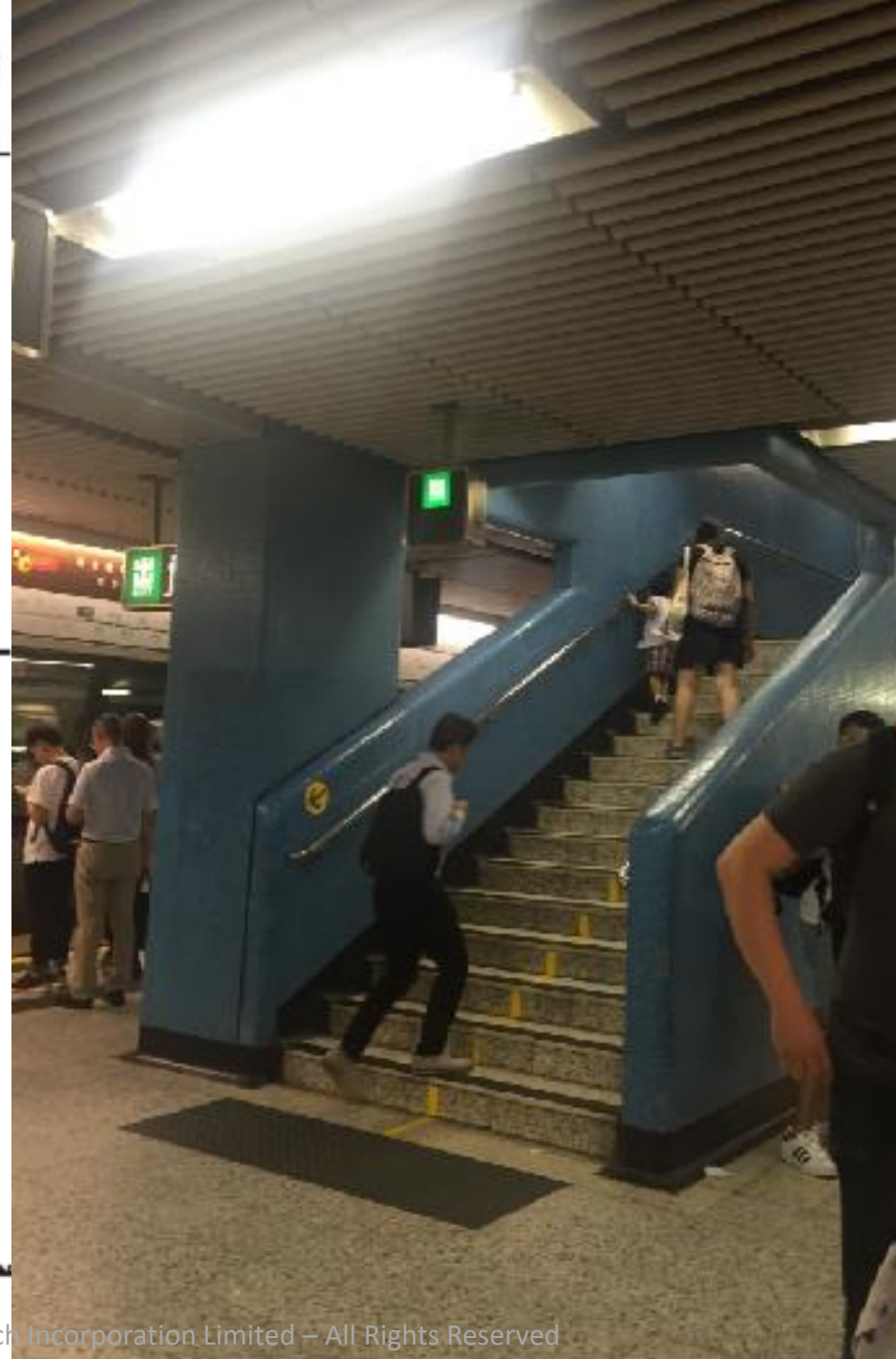
Color tolerance  $\pm 350$  Klm

LED Linear Module (20g)



Lamp type	: Philips EcoTwin LED Strip 24x1200mm @40°C TPA
Driver	: 2 pcs for A60PSS(LED)-MR / 6 pcs for A612PSS(LED)-MR
	: Philips B38 Driver
	: Minimum 20V @ 0.5-1A 54V TO 220V / Minimum 75V @ 0.7-2.0A 54V TO 220V
Lamp voltage	: 21.7V ~ 42.4V
Lamp output	: 2500lm / 5000lm
LED Efficiency	: >100lm/W
CCT	: 4000K
CRI	: >90
UGR	: <19
Dimensions	: 564mmx254mmx36mm / 1164mmx254mmx36mm
Material	: Zinc plated hardware
Color finish	: White Powder Coating (RAL 9010)
Weight	: 255g / 70g
Mounting Situation	: Recessed downlight
Air slot	: 2 pcs
Cover	: PC Diffuser
Cable	: 105°C
Voltage	: 220V
Power Factor	: 0.9
LED Life Span (L60)	: >25,000hrs
LED Life Span (T8)	: 50,000hrs

Lamp life is based on the manufacturer's data. In actual use, the lamp life may vary due to the quality of the lamp and the quality of the power supply.



# Applications

## Proposed Applications

- Railway Concourse
- Public Housing
- Shopping Mall/ Retail
- Airport Passenger Terminal
- Office Environment

**WTI Vision** - People Can't avoid Lighting. We Provide Affordable Green Lighting Technologies and Solutions



# Hong Kong Mass Transit Railways (MTR)





# Applications

## Improve Environmental Quality of the MTR Stations



A glance of Existing  
Interior Lighting Quality of  
MTR Stations

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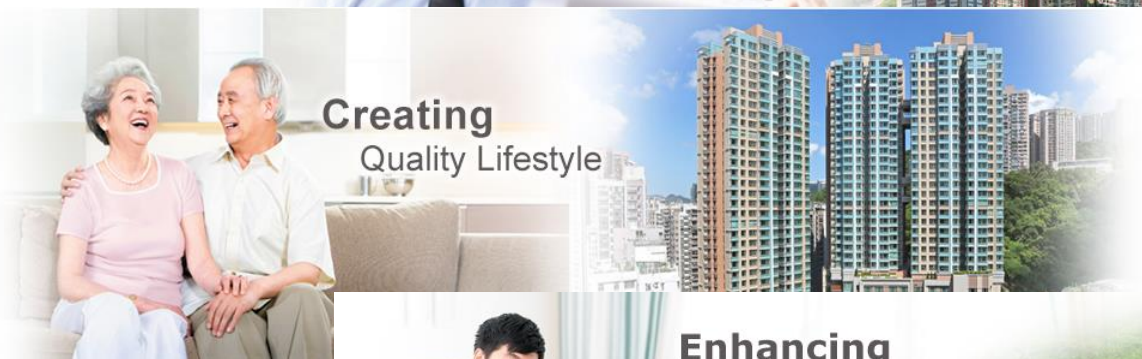
# Hong Kong Housing Society (HKHS)



**Caring**  
for the Community



**Building**  
Quality Homes



**Creating**  
Quality Lifestyle



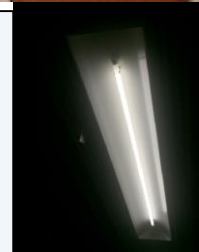
**Enhancing**  
Living Environment

# Applications

## Improve Environmental Quality of Elderly Housing



A glance of Existing  
Interior Lighting Quality of  
Public Housing



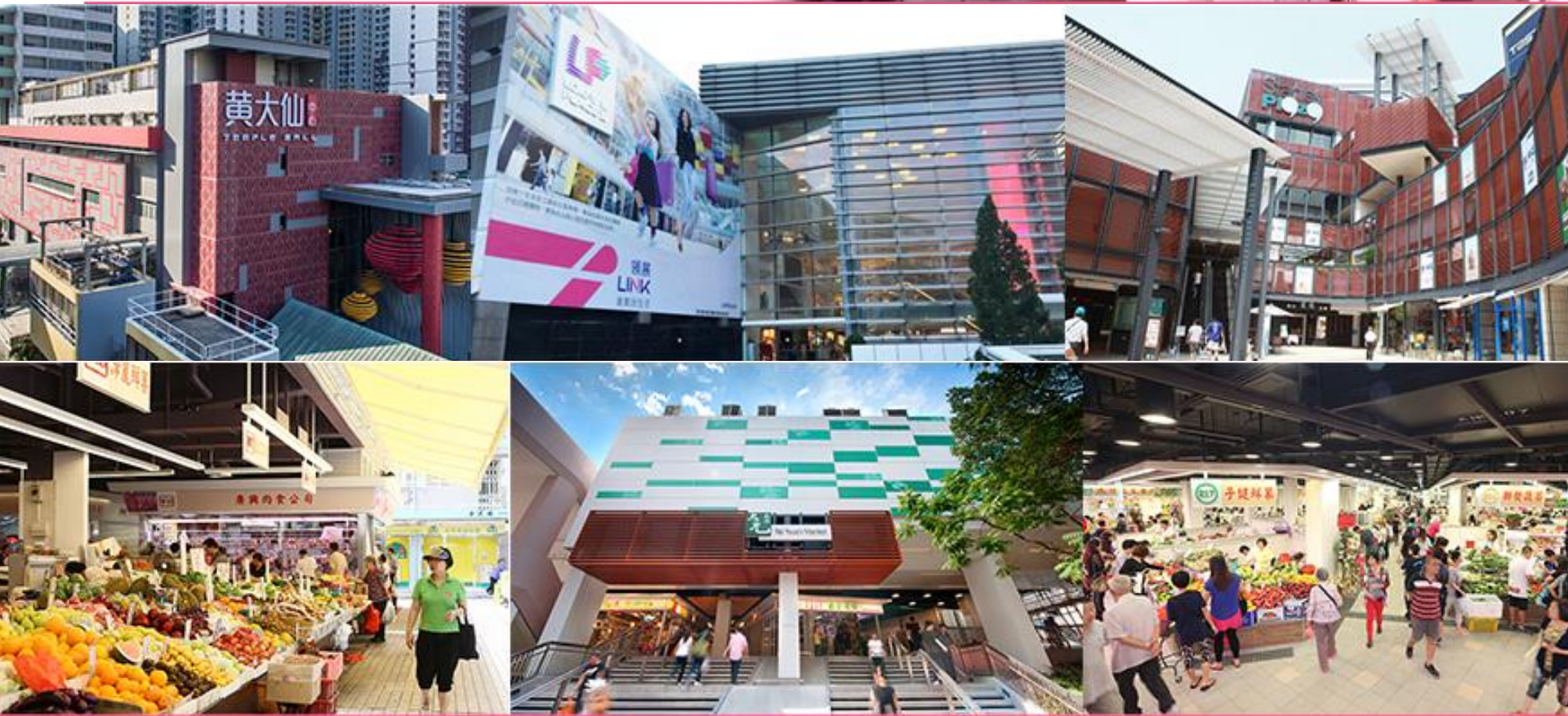


# Enhancing People's Lives

領展  
LINK



Green Financing





# Application

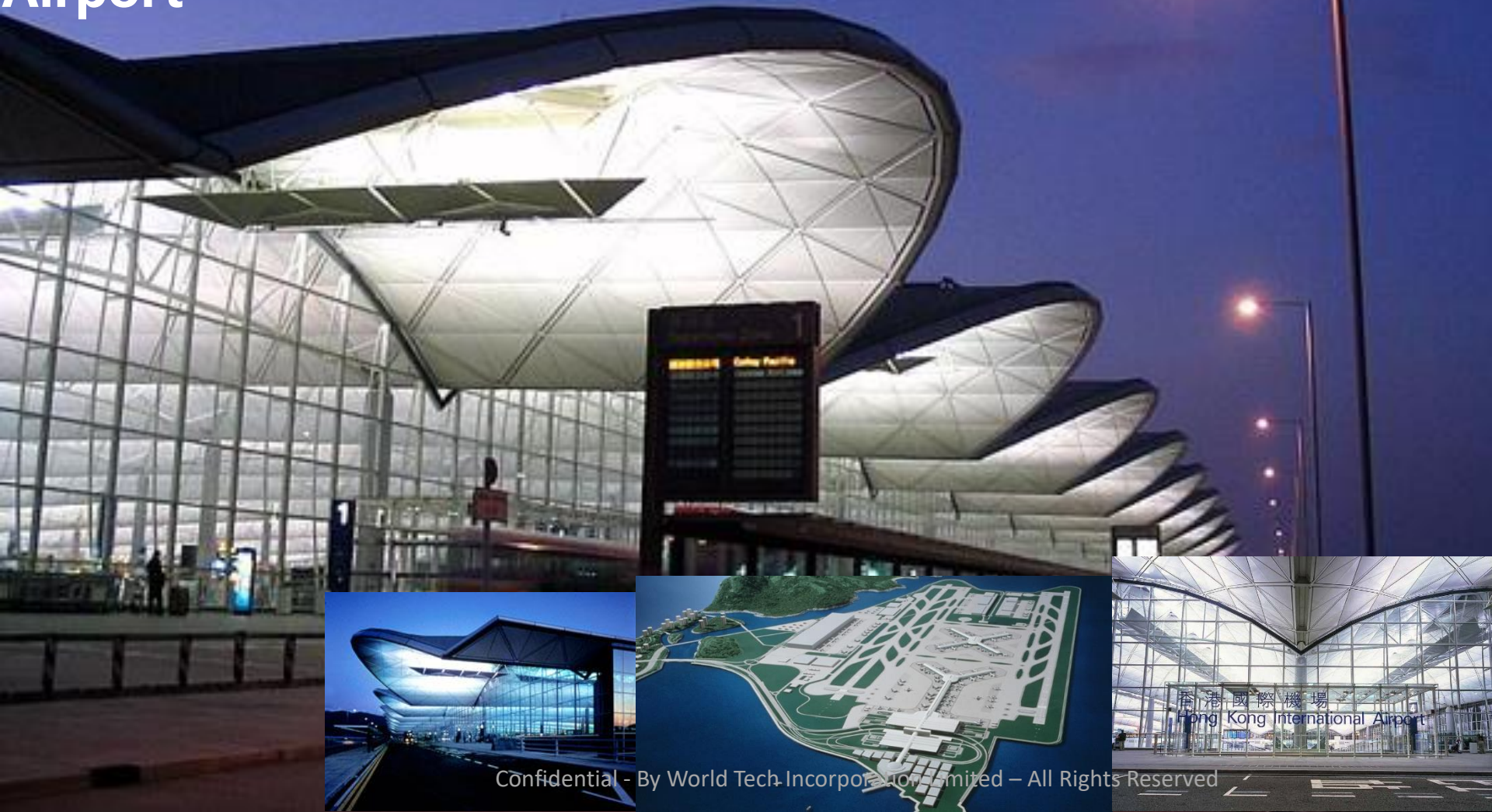
## Improve Environment Quality of Shopping Mall

## A glance of Interior Lighting Quality of LINK Venues





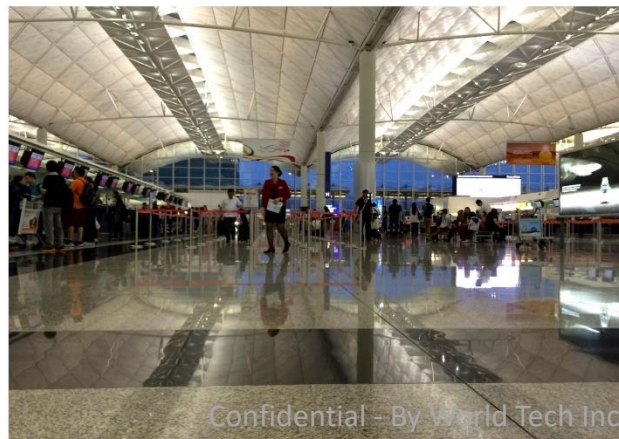
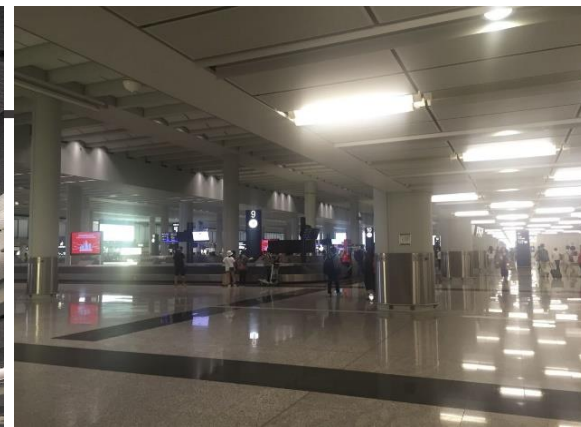
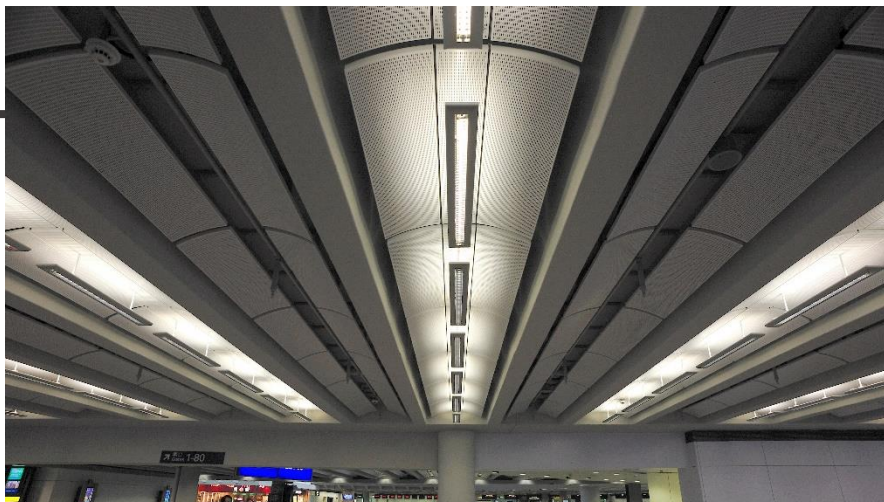
# Hong Kong International Airport





# Applications

## Improve Environmental Quality of the Airport Terminals



A glance of Interior  
Lighting Quality of  
Passenger Terminal



# Hong Kong Science Park



HKSTP

香港科技園





# Applications

Improve  
Environmental  
Quality  
of HKSTP  
Working  
Environment

A glance of Existing  
Interior Lighting Quality of  
HKSTP

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LampMate

New Generation Of  
Optical Coating Applying  
**N**ano Technology  
新一代纳米光学涂层

# Contact Us

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**LampMate**  
*inside*

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