



### **3. OTHER EMERGING PRACTICES / TECHNOLOGIES** *(OT May 23)*

Publication date: May 2023

# Introduction

- (1) These slides contain potential innovative / performance enhancement technologies that may be applied to green building projects / existing buildings.
- (2) Sources of these technologies include: past CPD events held by HKGBC, information on the Internet, suppliers or trade/industry organisations that proactively approached HKGBC, or case sharing by government departments.
- (3) Interested users may directly contact the concerned suppliers whose information or website addresses have been indicated on the slides.

# **Construction Method & Management**



# MiLift

## 減少高空作業 提升安全

升降機井道狹窄，傳統安裝方式通常只容許兩名工人入內工作，把零件逐一帶入井道裝嵌，要進行大量現場接駁，過程需「擒高擒低」，安裝時間較長。相反，工廠採用橫向安裝，容許4至5名工人同時工作，組裝好後會調試、對準等，提高安裝質量。同時，大部分零件已在工廠裝好，能即插即用，有效減少現場工作及人手，降低高空工作機會，提升工業安全。

傳統做法會把升降機各部件送到工地存放，像行人天橋這類相對開放的環境，若擺放太多木箱，會對公眾造成滋擾，且工地環境相對複雜，存放的木箱較易遺失，重新訂貨需花額外時間，拆箱後的木材、膠袋等廢料亦要處理。至於組裝合成升降機，零件會送到工廠組建，再運到工地安裝。除了減低對公眾滋擾，木箱等包裝材料在工廠可重複使用，減少超過七成廢料，符合環境、社會和管治（ESG）概念。



在內地工場橫向安裝升降機的主要部件，例如導軌、對重、機廂等。（TK Elevator影片擷圖）

<https://blog.tkelevator.com/milift-modular-integration-to-meet-customer-needs/>



<https://startupbeat.hkej.com/?p=131139>

# **Materials & Waste**

# Lightweight concrete + high-strength steel for MiC modules

## Benefits 優勢

- **Lightweight concrete for reduced MiC weight and enhanced residential comfort**  
應用輕質混凝土材料降低模塊單元的重量和提升住戶體驗
- **High strength steel for reduced member sizes**  
高強度鋼構件減少結構構件尺寸
- **Innovative connection detail**  
創新的節點連接
- **Innovative waterproof materials**  
創新防水材料



Conventional steel structural based MiC with mineral wool wall panels has the advantage of lightweight but is not appealing for residential markets, while concrete based MiC is relatively heavy thence of smaller dimension under the lifting & installation consideration. With the advancement of lightweight concrete technology, NAMI has developed MiC steel/concrete hybrid structural systems using high performance concrete and steel materials. The structural bearing components remain to be steel while the wall panels are made of lightweight high-performance concrete. Such hybrid MiC has both the advantages of lightweight and concrete-feel wall system, enabling high quality MiC for future needs of Hong Kong.



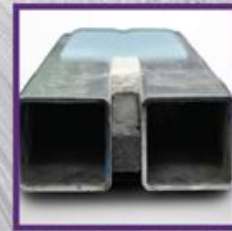
**Lightweight Concrete**  
輕質混凝土

- ▶ 35% lighter than normal concrete  
較普通混凝土輕35%
- ▶ High compressive strength  
高抗壓強度
- ▶ Fire-resistant  
防火



**High-strength Steel**  
高強度鋼材

- ▶ Reduced section size  
減少結構構件尺寸



**Triple-proof Stitching System**  
三防模塊拼接系統

- ▶ Good movement accommodation capability  
良好適應位移能力
- ▶ Fireproof, smokeproof & waterproof  
防火、防煙及防水



# Low-carbon concrete

Replace 60% of cement with Ground Granulated Blastfurnace Slag (GGBS) in concrete, realizing

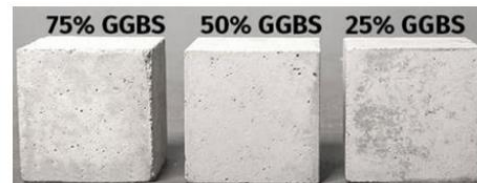
**53%** of carbon reduction.



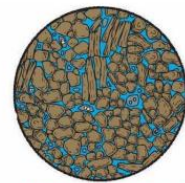
**Green Concrete**

含 60% 高爐礦粉成分的低碳混凝土

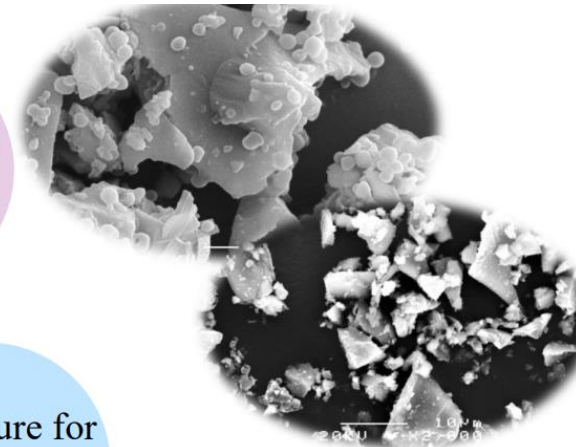
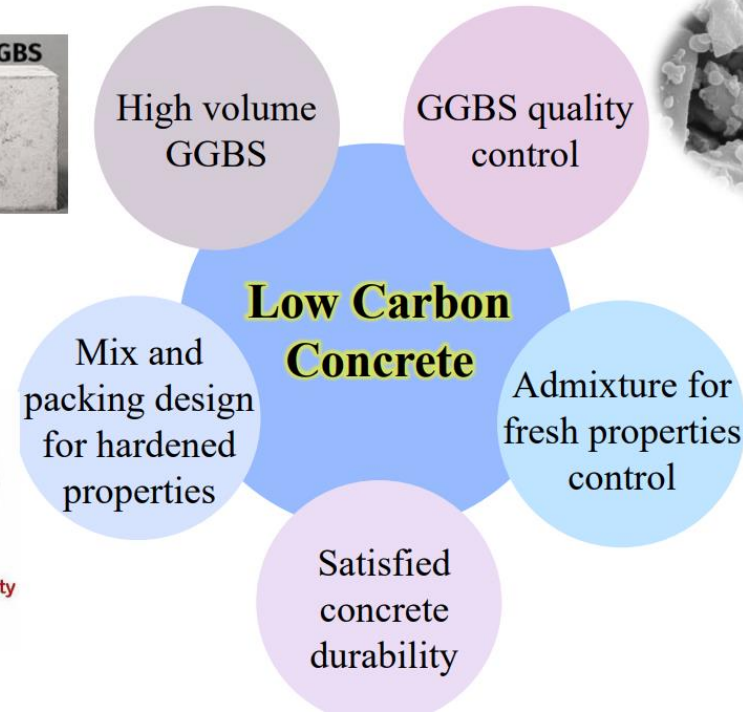
*NAMI*



Lower bulk density  
Lower weight  
More pore space




Higher bulk density  
Higher weight  
Less pore space



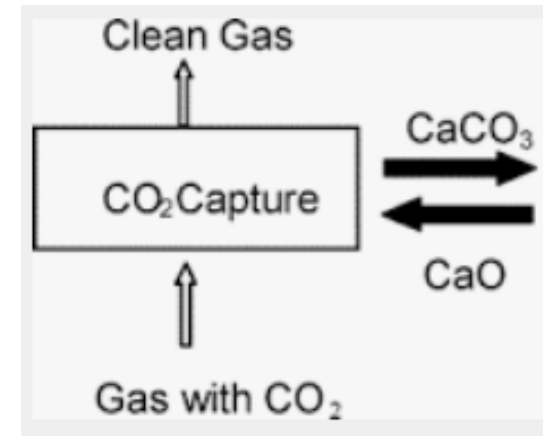
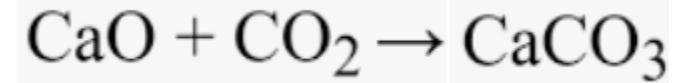
# Carbon capture, utilisation & storage (CCUS) bricks

應用了「碳捕集、利用與封存」  
技術的二氧化碳 礦養護混凝土  
固碳磚



CCUS

Develop Carbon Capture Utilization and Storage (CCUS) technology to **reserve the carbon dioxide in the off-gas** from power station or other suitable facilities in concrete blocks during curing process.





# Low-carbon rebars

## Low carbon rebars, TUK33

**Manufacturer:** Shiu Wing Steel Ltd  
**Category:** Reinforcing Bar and Structural Steel  
**Origin:**  
**Carbon Rating:**



**CIC GREEN**  
PRODUCT CERTIFICATION  
**platinum**

**CFP Value:** 1.334 tonne CO<sub>2</sub>e/tonne product  
**Certificate No.:** CICGPC-L-21173(00)  
**Licence End Date:** 2024-12-01



**Low-carbon  
rebar**



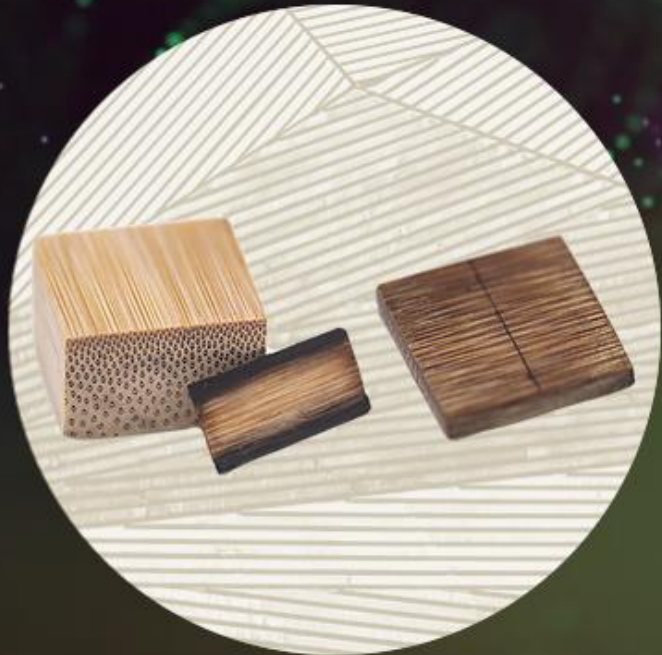
Purchase rebar with 100% of recyclable materials via supply chain management, realizing **67%** of carbon reduction.

# Bamboo (augmented) as a strong building material

## Super Bamboo™

**STRONGER** than steel, **GREENER** than wood.

Bamboo material focused on maximum strength and cleanliness.



## Super Bamboo Limited

Super Bamboo is a green material science start-up that designs advanced augmented bamboo materials to help save the earth. We combine nature's friendliest resource with innovative engineering to push it to do what was previously considered impossible.

### Achievement(s)

1. CityU HK Tech 300 Angel Fund (2021)
2. CityU HK Tech 300 Seed Fund (2021)
3. Gold Medal, Inventions Geneva Evaluation Days (IGED) (2021)

### Company website

<https://www.thesuperbamboo.com/>

### Email

[info@thesuperbamboo.com](mailto:info@thesuperbamboo.com)

# Flexible sprinkler drops replace rigid G.I. pipes

- Ease of installation
- Eliminate non-valued steps
  - No need for measuring
  - No cutting/ threading
- Standardization of pipe layout
- Reduce installation time



- Reduce on-site waste
- Future: Easy to change

消防處  
牌照及審批處  
消防設備課  
香港九龍彌敦道六十一號  
新明大樓二樓

FIRE SERVICES DEPARTMENT  
LICENSING AND CERTIFICATION COMMAND  
Fire Service Installations Division  
2/F, Centre Point, 11 Sheung Yuet Road,  
Kowloon Bay, Kowloon, Hong Kong

本處接獲OUR REF.: FS13/11445 號  
來函編號YOUR REF.: L/ISS/09/2818  
原文編號FAX: 852-2367-3286  
電 話TEL: 852-3161-8299

2 November 2018

InnoTec Engineering Limited  
Unit 1109, 11/F,  
Tower 3, Phase 1,  
Enterprise Square,  
9 Sheung Yuet Road,  
Kowloon Bay,  
Kowloon,  
Hong Kong  
(Attn: Mr. Peter LAM)

Dear Sir,

3/F-5/F, Tsuen Wan Industrial Centre, 220-248 Teuxso Road, Tsuen Wan, New Territories  
Flexible Sprinkler Droppers

I refer to your above letter dated 11.9.2018 seeking our view on your proposed adoption of flexible sprinkler droppers for an upgrading project in the captioned premises.

Your ground for application is well considered. In view of inevitable suspension of automatic sprinkler installation without subsidiary zone valve in the course of future alteration of sprinkler layouts which would lead to a temporary loss of sprinkler protection to the entire building, I would advise you that this office would have no objection in principle, for the sake of fire safety, to your proposed use of flexible sprinkler droppers for final sprinkler head connections to range pipes provided the following are strictly observed:-

(a) All flexible sprinkler droppers shall be listed products complying with LPS 1261. The requirements of TB227.2.4: 2015 shall be complied with.

(b) All flexible sprinkler droppers should be securely fixed onto ceiling with steel brackets or installation instructions specified under the listing condition by the relevant product certification body with workmanship and installation details conforming to the requirements.

(c) Form FSU/314A and amended plans should be submitted in case of change of any change to the sprinkler installation with clear indication on the proposed amendment. FS 251 should be submitted timely according to the Fire Service (Installations and Equipment) Regulations.

.../2

REF. NUMBER AND DATE SHOULD BE QUOTED IN REFERENCE TO THIS LETTER  
凡 來 往 來 件 均 須 註 明 此 字 樣

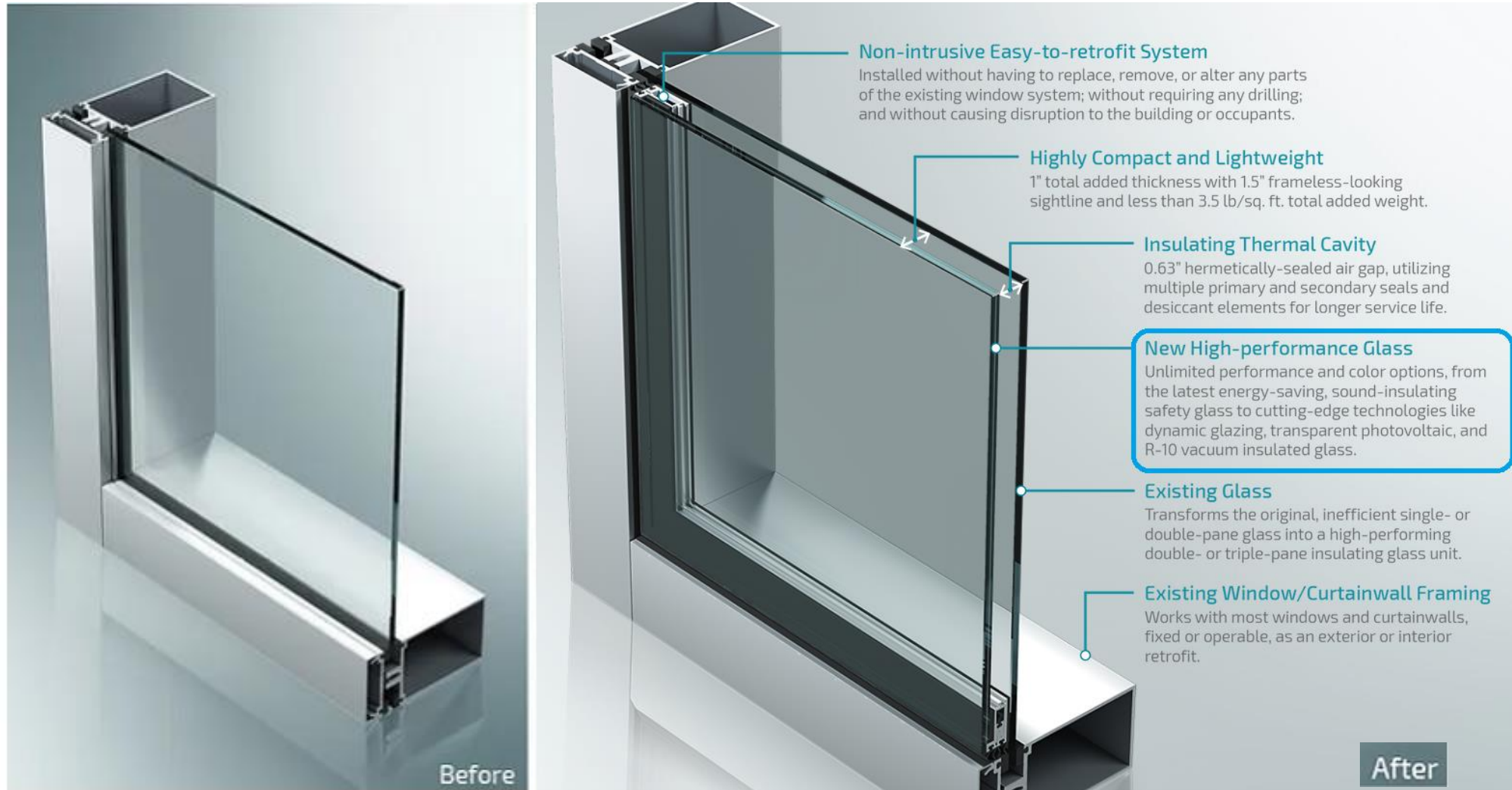
FR 107A (Rev.1/09/0)

<https://www.cic.hk/files/page/10325/210305-06-InnoTec.pdf>

# Energy Use



# Vacuum insulated glass (VIG) retrofit to curtain walls, etc.





# BIPV applied to roof tiles, road tiles and curtain walls



發電瓦片



[mondoge.com](http://mondoge.com)



發電幕牆

[了解更多](#)

發電路磚

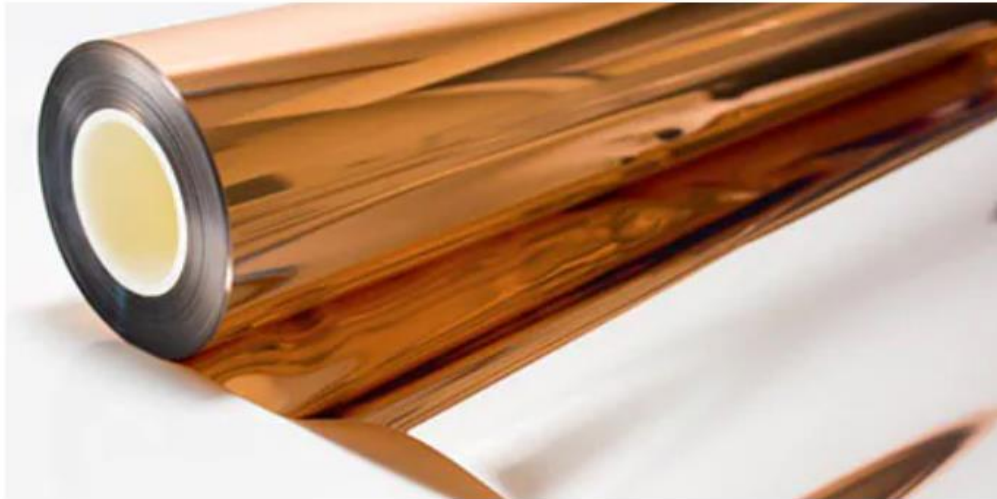
[了解更多](#)



# Passive radiative cooling films

Passive Radiative Cooling is a natural phenomenon that only occurs at night in nature because all nature materials absorb more solar energy during the day than they are able to radiate to the sky. At night, the surrounding environment cools the material to a temperature that is below the dew point or below freezing to form frost. This explains why you may see frost on your car windshield in the morning, even after the air temperature is above freezing. 3M's Passive Radiative Cooling Film (PRCF) reflects enough solar energy to allow passive radiative cooling to occur during the day.

While the concept has been known for centuries, 3M scientists only recently applied their experience in multi-layer optical films and materials science to develop a solar reflective film with passive radiative cooling capabilities. With careful selection of materials, they have optimized a property called selective emissivity which enables PRCF to radiate heat into the sky in the precise infrared wavelength known as the atmospheric window. PRCF enables 24/7 supplemental cooling and 10-20% energy savings when integrated with building refrigeration and HVAC systems. It can also be applied to other surfaces such as bus shelter roofs to passively cool them during the day and at night.



## 3M Passive Radiative Cooling Film: Supplemental cooling inspired by nature

3M's Passive Radiative Cooling Film (PRCF) has high reflectivity in solar wavelengths, high emissivity in longer infrared wavelengths, high UV durability, and cost-effective manufacturing.

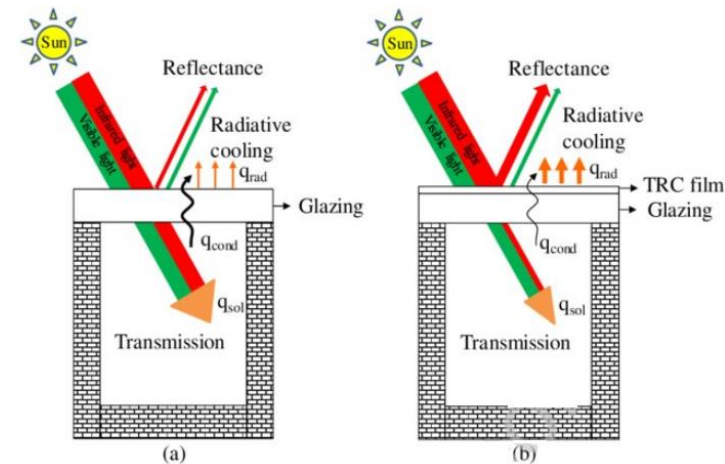


Fig. 3. Schematic of solar irradiation and heat transfer through: a) a typical silica glass glazing; b)

[https://www.researchgate.net/publication/343225787\\_A\\_Transparent\\_Radiative\\_Cooling\\_Film\\_for\\_Building\\_Energy\\_Saving](https://www.researchgate.net/publication/343225787_A_Transparent_Radiative_Cooling_Film_for_Building_Energy_Saving)

[https://www.3m.com/3M/en\\_US/energy-conservation-us/applications/passive-radiative-cooling/](https://www.3m.com/3M/en_US/energy-conservation-us/applications/passive-radiative-cooling/)



# Coating retrofit for AC condenser coils

Based on a graphene-improved technology, Thermal-XR features a carbon composite protective fin coating, which produces powerful thermal conductivity that is up to 10 times greater than conventional impregnated coatings. The ultra-thin layer of Thermal-XR will permanently prevent corrosion and reduce the level of energy consumption by your HVAC system. The application of this HVAC condenser coil coating will improve efficiency with a rating similar to installing new equipment.

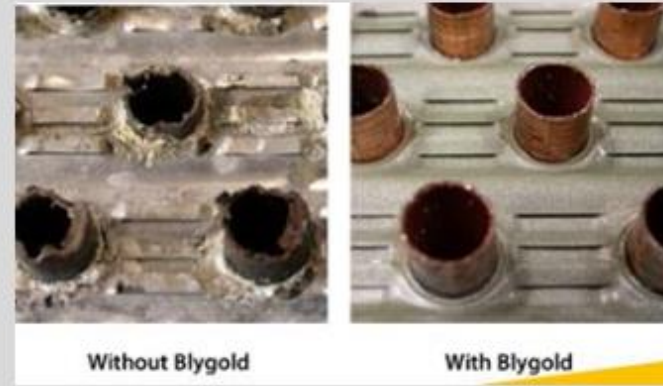
Promak Technologies installs sensors to record electrical consumption and cooling output of air conditioners. Real-time data is then uploaded to the cloud for monitoring baseline efficiency.

[www.promektechnologies.com.au](http://www.promektechnologies.com.au)



The image shows a blue banner with the Carrier logo in the top left corner. Below the logo, the text reads "GREEN MAINTENANCE OF COIL" in large, white, bold letters. Underneath this, in smaller white text, it says "MAINTAIN OPERATING EFFICIENCY AND EXTEND CHILLER SERVICE LIFE". The background of the banner features a photograph of an air conditioning unit with a bright sun flare effect on the left side.

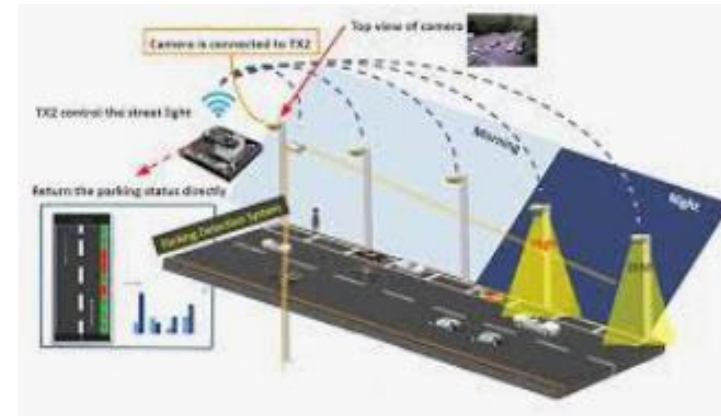
Vast majority of air-cooled condenser coils in Hong Kong are facing great challenge from rust corrosion every day, resulting in deterioration of coil fin surface, degrade in equipment performance and even shortening of their service life span. Act now and plan ahead, enjoy energy savings and extended machine life with our reliable coating service, Blygold® PoluAL XT on new condenser coil replacement.



Enquiries: [Chk.service@Carrier.com](mailto:Chk.service@Carrier.com) or [Service.Marketing@Carrier.com](mailto:Service.Marketing@Carrier.com)

# Predictive control for carpark vent / light or street lighting based on car movement detection (computer vision / IoT)

Conventional demand-control carpark ventilation is based on a detection of the carbon monoxide level. But when the CO level increases, it would be a bit too late to turn on the ventilation fans. To improve the design, a better approach would be to turn on the fans immediately when moving cars are detected. Today, modern IoT devices / computer vision allows such moving-car presence to be detected accurately. The signal so generated can be used to activate ventilation fans at an early stage AND to adjust upward the lighting level so that the carpark environment can be enhanced, and the energy consumed in lighting can also be saved (as there is no need to keep the carpark lit up at full level all the times). Similar control logic can also be applied to outdoor street lighting.



# Smart AC controller (AI) for home application

worldjournal.com/wj/story/121254/6727974

## AI遙控 輕鬆省電



〈亦莊亦閒〉莊偉茵 2022-11-05 02:00 ET

朋友想知更多省電祕訣，我請教了公司的「省電專家」盧博士。平日用電最多的家電是冷氣機，盧博士說不少人開冷氣只維持同一溫度，很少會因應溫度和濕度的變化，去調校冷氣溫度，耗電量自然多。盧博士向我推介智能省電法寶——人工智能 (AI) 冷氣遙控，可以自動幫客戶輕鬆省電。

這個AI冷氣遙控配備感應器，全天候監測屋內的溫度和濕度。它更會定時透過應用程式，了解用家在不同環境下，對冷熱舒適度的要求。經過AI分析和演算各項數據後，計算出量身而設的「舒適模式」、「微暖模式」等，然後自動調控冷氣運作。

在用電高峰時段，AI冷氣遙控也發揮很好的效用。盧博士分享在今年最熱的7月，公司舉辦兩次「省電任務」中，AI冷氣遙控會為參加客戶自動調校冷氣到「微暖模式」，減少製冷同時保持舒適度，做到輕鬆舒服省電。使用了AI冷氣遙控的參加家庭，在活動期間更比其他參加家庭省電三成。其中一名客戶葉先生，分享他在四小時任務內就成功省了六度電。



<https://www.ambiclimat.com/>



# Lighting management system for outdoor lighting

Switching luminaires on and off isn't the only thing photocells can do, they can dim lighting levels too. This means that councils can save even more money and conserve more energy by changing the intensity of the streetlight, should it be required.

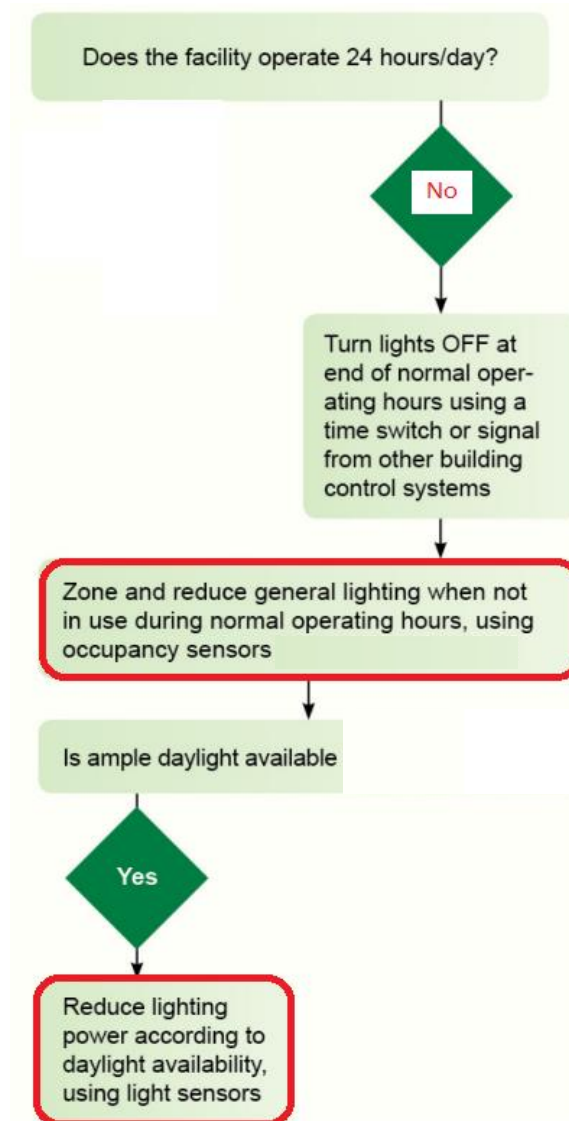
Many councils use the dimming feature of photocells as an alternative to switching off streetlights completely; useful to keep streets and roads safely illuminated, or should seasonal change deem the need for higher or lower dimming profiles.

Throughout the entire lighting network the Council can use the dynamic control system to dim the lights to 70% & 50% if required.

Since the countywide installation, it has been reported\* that the scheme has helped the Council save £26million in energy costs, to date, and a reduction in carbon emissions of 5,500 tonnes of CO2 a year.

<https://www.lucyzodion.com/smart-street-lighting-making-the-switch/>

\* <https://www.lucyzodion.com/case-study-a-decade-of-digital-streetlighting-control/>

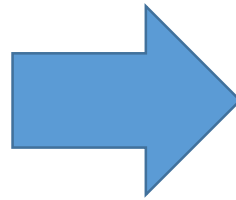


<u>Conventional</u>	<u>New Approach</u>
Daylight -> Switch on/off outdoor lighting	Daylight -> Dim up/down outdoor lighting
Presence -> Does not monitor of person	Presence -> Dim up/down outdoor lighting



<https://splighting.com.hk/solgenix>

# Clothes drying racks – an innovative form



## DISADVANTAGES OF CONVENTIONAL DRYING RACKS:

- 碰到下雨时没办法像以前快速将一整个竹竿的衣服拿进来即可避雨，必须一件一件收才行，放晴后又要一件件晒出；
- 晒衣服时必须非常专注小心，收衣服也不能心急，否则衣服就有掉下楼的风险；
- 每次晒衣前都必须擦拭室外晒衣杆；
- 如果不是滑动式的，想晒到杆子的另一端，就需要打开另外的窗口。

## Innovative drying rack: Quick slide-out type

<https://www.redants.sg/overview/story20221110-6699>

# Renewable energy certificate / carbon credit purchase to achieve carbon neutrality

## Chinachem Group Signs Deal with CLPe to Launch Hong Kong's First Zero-Carbon Chiller System Project

13 February 2023

Under the agreement, the electricity consumed by the chiller plants at Nina Tower will be matched by an equal amount of **Green Electricity Certificates** linked to a renewable energy project of CLP Holdings, making it Hong Kong's first **zero-carbon** chiller system. This is in line with Chinachem Group's CCG 3050+ roadmap which is aimed at reducing carbon emissions by not less than 51.8% by 2030 compared with base year 2020

<https://www.chinachemgroup.com/en/news/news-centre/2023/chinachem-group-signs-deal-with-clpe-to-launch-hong-kong-first-zero-carbon-chiller-system-project>

Remark: For contractors, they may also purchase carbon credits to offset the carbon emissions during construction.

結合碳信用抵銷施工期剩餘的碳排放，以實現項目施工期碳中和。



# Cascade water supply system to save pumping energy

Traditional plumbing system design would employ a high-head transfer pump to transfer water from G/F to the Roof. Then the water is fed down to lower floors of the building. When pressure is excessive, pressure reducing valves (PRVs) are installed at suitable intervals down the building to reduce the operating pressure to an acceptable range.

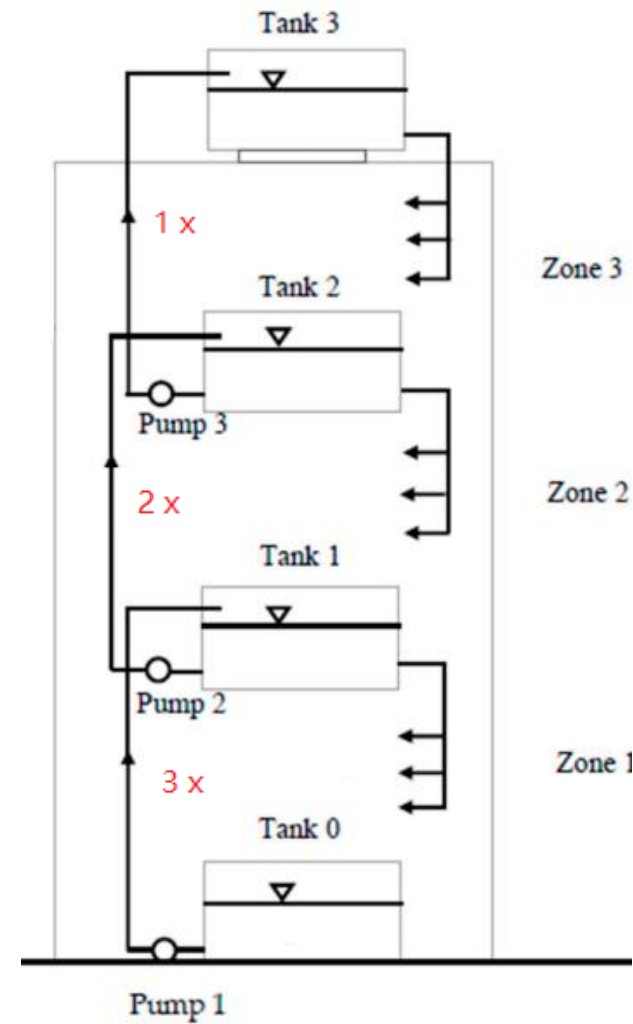
The disadvantage of the above design is that a large part of the water would be unnecessarily pumped to a high height, causing it to accumulate excessive potential energy that needs to be dissipated via the PRVs. Such a design represents a waste of pumping energy.

To eliminate the above disadvantage, the "Cascade Water Supply System" features a staged approach to pumping, i.e. as we examine the amount of water being pumped along the height of the building, we will see that the higher the height, the lesser would be the amount of water being pumped.

This is obviously a much better design in terms of saving of energy.

The intermediate tanks also act as pressure break tanks so that each of them would be used to feed the floors at a distance sufficiently below the tank. In this way, there is no need to install pressure booster pumps; nor is there a need to install pressure reducing valves - these would help to save energy / eliminate energy wastage.

$x = \text{flow rate}$



No PRVs are installed in this system !

A cascade water supply system in a skyscraper.



# On-demand control of hot water recirculation pumps

Hot water usage patterns in hospitality, commercial applications tend to reflect periods of heavy use (weekday mornings and early evenings), as well as periods of low or no use (between midnight and 5 a.m.). To ensure that hot water is immediately available at all times, building owners typically install **central recirculation loops that operate continuously**, even during periods of low or no use. This results in continuous circulation pump electricity consumption, as well as wasted energy to constantly reheat water as it circulates through the building.

To limit these pump and reheat costs, building managers often use aquastat and **time clock** recirculation loop controls. However, because these controls work on schedules preset for low use, hot water draws are significantly delayed during periods when the pump is off. When occupants complain about the delays, building managers often bypass or remove the time clock-based controls. In the hospitality sector, where guests' hot water usage patterns are particularly **unpredictable**, managers are left with little choice beyond continuous recirculation to avoid risking customer dissatisfaction.

Unlike crude traditional controls, the new demand systems use temperature and demand inputs, so the controller **activates recirculation** when both (a) the recirculation loop return water has dropped below a prescribed temperature and (b) a DHW demand is sensed as water flow into the system. Demand controls (Figure 1) respond more quickly to deliver hot water during low use periods, resulting in greater building manager acceptance and persistent savings.

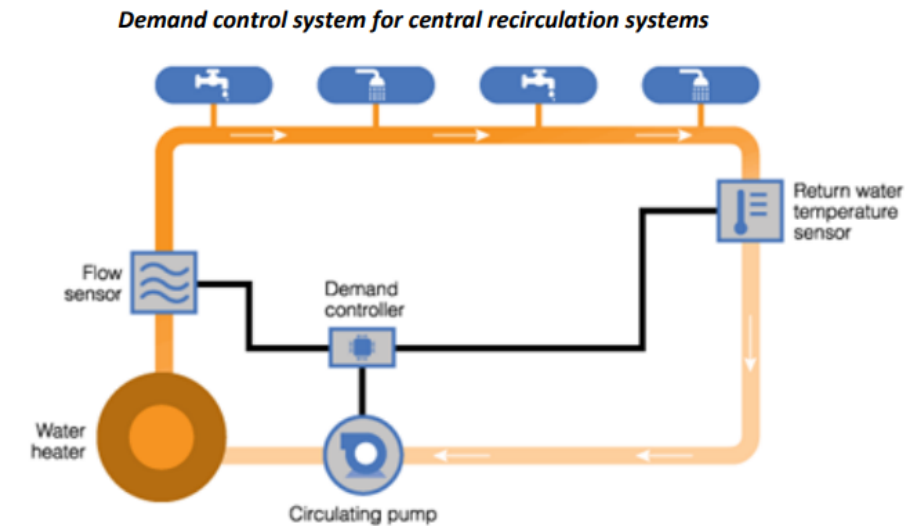


Figure 1



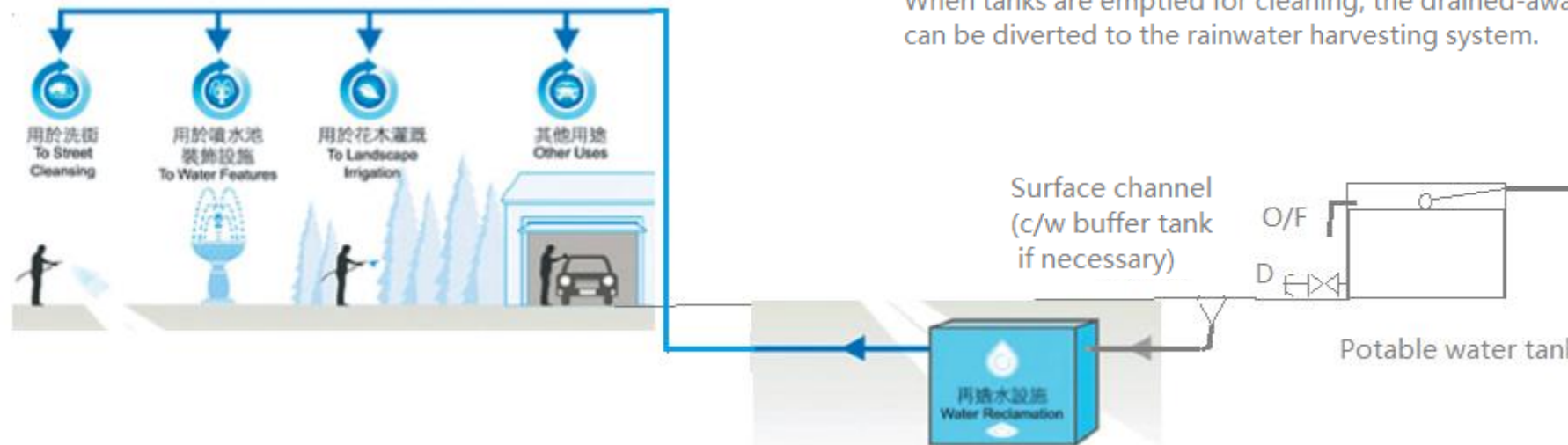
# Water Use

# Overflow water / drained water reclaimed for re-use

When the ball float valve of a sump tank or the level control switch of a roof tank fails, water would eject from the O/F (overflow) pipe of the tank. Under such circumstances, a very large amount of fresh water could be wasted.

By carefully designing the drainage provisions, the overflowed water can be directed into a rainwater harvesting system so that the water can be utilized for irrigation / cleansing / water features. Thus, water would not be wasted even in the event of an emergency.

The same can be applied to the "drain outlet" of the tanks. When tanks are emptied for cleaning, the drained-away water can be diverted to the rainwater harvesting system.



(Remark: Buffer tank near the surface channel is required when the expected amount of water is large and there is a risk of flooding.)

# Health and Wellbeing

# NanoFil innovative filters

## Conventional filters vs NanoFIL

Pre-filter and Metal Box Filters



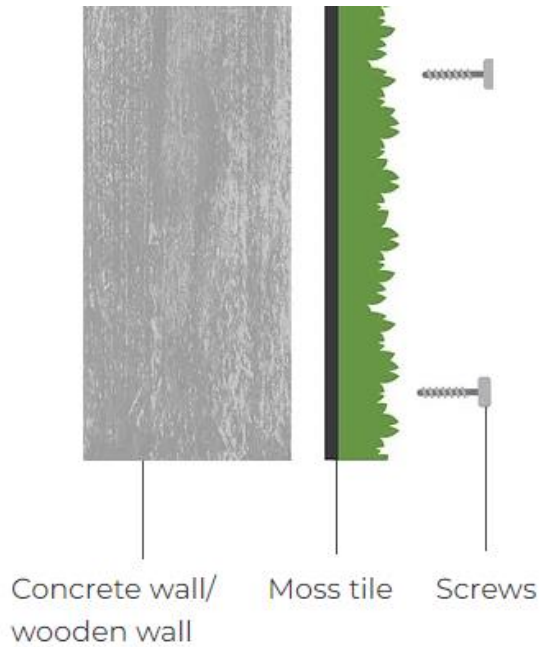
Replace a 2" pre-filter plus 12" metal box filter with a single 2" NanoFil filter

- 1) Reduction in storage space and landfill !
- 2) Potential saving on filter maintenance
- 3) Potential energy saving due to lower pressure drop

- NanoFil combines the use of electrospinning, electrostatic and absorption technologies in its filter media, with more advantages than traditional filter
- A multifunctional nanofiber air filter that can effectively filter out airborne allergens and air contaminants, including PM2.5 and odor
- It can remove 90% VOC, formaldehyde, acetone, benzene
- It can be able to kill >99% bacteria without using visible light, ozone, plasma, UV and etc.
- Electrostatically-enhanced filtration facilitates high filtration efficiency and low pressure drop



# Green moss and microalgae green walls



## Why Moss?

Moss can be custom made and adapt into any product by your creative design

Compare with other green material such as artificial grass, Moss does not produce any harmful smell

Moss is preserved eco-friendly without any toxic and hazardous chemicals. The Moss colors are non-fading and it keeps a very long period

### Greenest Moss

- 100%真實植物 人手採摘天然地衣
- 永久保存 無須打理
- 專營MOSS WALL 室內綠化及空間點綴設計
- 防火。防塵。吸音。抗蟲。無害。

Whatsapp: 5346 2722

<https://gmoss.hk/>



## Microalgae Green Wall for Air Purification

Global warming is caused by emission of greenhouse gases, 72% is caused by CO<sub>2</sub> from automobiles, power plants and industries. To reduce CO<sub>2</sub>, mitigation measures such as growing trees or absorption technology are necessary.

NAMI has developed a technology in CO<sub>2</sub> removal using microalgae. Microalgae are aquatic species which are very tiny and can only be observed under microscope that carries out photosynthesis and absorbs CO<sub>2</sub> to release O<sub>2</sub>. They can consume more than 100 times amount of CO<sub>2</sub> than the same mass of trees.

Microalgae green wall composed of microalgae has a CO<sub>2</sub> consumption of over 90%, employing state of the art technologies in microalgae species selection, cultivation, and design. The green wall is covered with natural growing greenery and can reduce temperature by transpiration. Microalgae green wall technology is currently applied in both indoor and outdoor environments, combining functionality with aesthetic.



[www.greentins.com](http://www.greentins.com)

# Paints with graphene / silver ions that avoid condensation and absorb CO<sub>2</sub> / achieve antimicrobial property



## Ecological lime paint with graphene for exteriors

Biosphere Premium is a natural mineral paint for outdoor matt finish. Ideal for construction, restoration and repainting. Thanks to its formula based on artisanal lime with graphene technology, it is breathable, avoids condensation, is washable, does not yellow and absorbs CO<sub>2</sub>

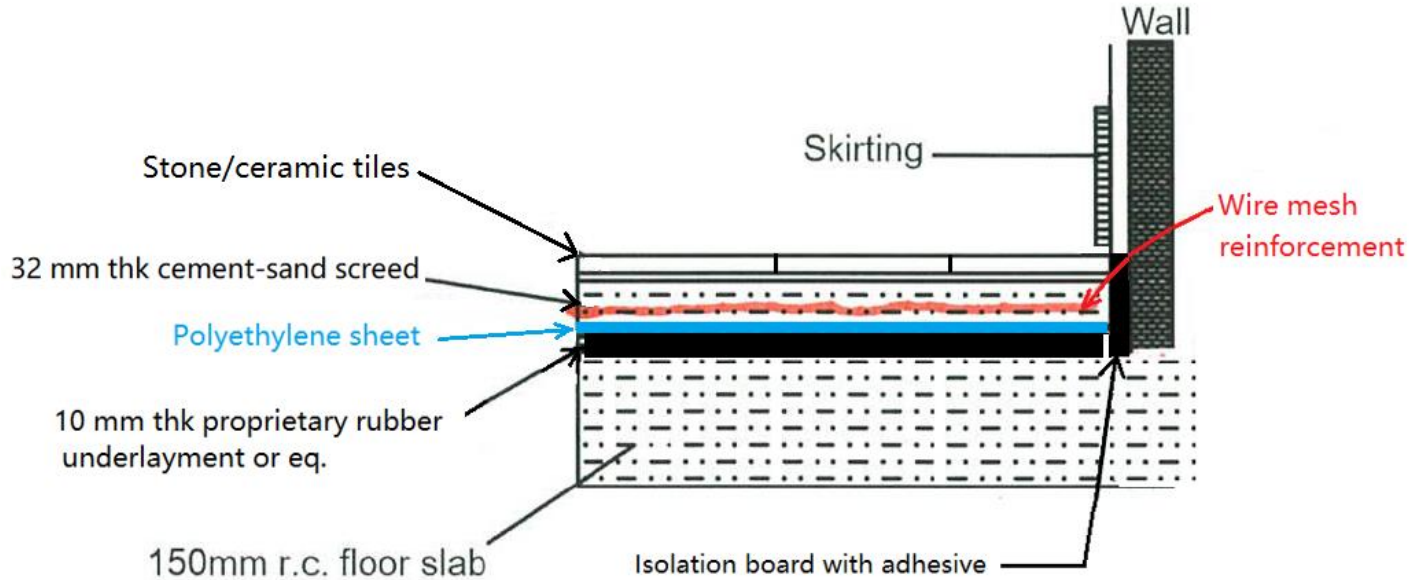


## Ecological antibacterial paint with graphene

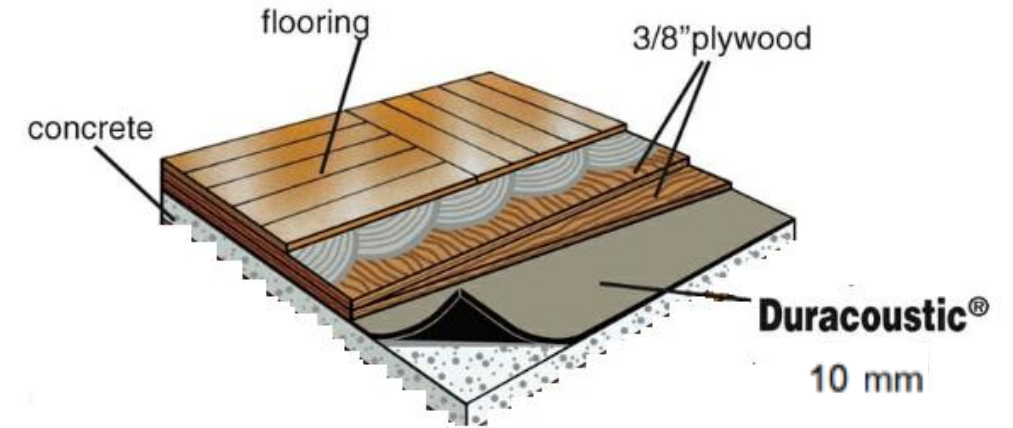
GrafClean Ag+ Premium is an ecological paint with silver ion (Ag+) formula, which gives it antimicrobial properties preventing the development of bacteria, fungus, viruses and protozoa.

<https://www.zilver.com.hk/>

# Impact noise isolation (floating floor finish) for residential buildings



Option A - Stone/ceramic tile floor finish



Duracoustic S.T.O.P.™ Floor Impact Noise Reduction Underlayment

[https://www.acousticalsurfaces.com/acoust\\_flooring/duracoustic.htm](https://www.acousticalsurfaces.com/acoust_flooring/duracoustic.htm)

Option B - Timber floor finish

(Remark: For floor finish of flexible texture (e.g. vinyl), direct laying on sound isolation mat may be feasible subject to mat manufacturer's recommendation.)



# Solar responsive ventilator

*“Solar Responsive Ventilator”* This patented technology keeps tenants comfortable when sitting beside curtain walls. When the sun shines, a cushion of cool air envelops the window area, keeping the temperature comfortable while letting in enjoyable daylight.



**Solar Responsive Ventilator**



# Disclaimers

- (1) The indications of suppliers are not exhaustive. The inclusion of any particular brands in these slides is meant to be examples only and does NOT imply endorsement.
- (2) The use of the above technologies does not necessarily mean that IA / IV points would be attained under BEAM Plus. Granting of points is on a case-by-case basis based on degree of innovativeness, amount of environmental benefit and other considerations.
- (3) Any suppliers who wish to share their innovative or performance enhancement technologies via these slides can contact HKGBC Secretariat via tel no. 3994 8868.