

A publication by SGBC • ISSUE 02

# SG GREEN

MCI permit number (MCI (P) 117/05/2015)



*Inside:*

**Capitol: Revitalising  
the Civic District**

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**SGBS: The Human Factor**

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**Smart Spaces: Bringing  
Commercial Real Estate into  
the Internet of Things**



# Green Mark with OBO



SINGAPORE  
**GREEN**  
BUILDING  
PRODUCT

**SGBC**

✓  
GOOD



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# SG GREEN

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## Publisher

Singapore Green Building Council

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## Printed by

KHL Printing Co Pte Ltd

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Photo courtesy of Capitol Singapore

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# MESSAGE FROM THE EDITORIAL TEAM

In the wake of the recent climate change negotiations in Paris, countries worldwide now have specific targets for contributing to the collective global action of reducing greenhouse gas emissions by 2030. Although Singapore has been fairly consistent in terms of its emissions target compliance, we can do more with a strong focus on Green buildings.

In a recent global report released by Dodge Data & Analytics and United Technologies Corporation, and backed by the World Green Building Council, Singapore is ranked the country with the highest level of Green building involvement. The *World Green Building Trends 2016, Developing Markets Accelerate Global Green Growth* report showed that 97 percent of Singapore-based respondents indicated that they were engaged in some degree of Green building, and that the growth of Green building activity in Singapore is expected to remain robust from 2015 through 2018.

This clearly shows that Green building as a movement will continue to rapidly gain traction, and this is great news as certified Green building products and services are the foundations for the good design, implementation and operation of every Green building. As important as it is for the materials that go into a building to be environmentally sustainable, the impact level that key Green building services can have on a building and its occupants cannot be emphasised enough. Behind every brick wall or glass façade in a Green building, there is a team of specialists whose Green expertise should be better recognised.

In this issue of SG Green, we look at Singapore's first and only certification programme for Green building services—the Singapore Green Building Services labelling scheme. Working alongside the Singapore Green Building Product labelling scheme, this scheme aims to help the industry develop better informed Green building design decisions and subsequently to use, operate and maintain Green buildings in more sustainable ways.

Also contained in this second issue of SG Green is a piece on Smart Spaces and how the Internet of Things can help maximise efficiency for commercial real estate. As prime

space in landlocked Singapore is almost a luxury, making sure that every square metre of space is well utilised can result in significant energy savings for the building owner. This can mean simply the automatic reduction or turning off of the lights in an underused area of the office, or an innovative sensor mapping system that will be able to graphically trend and show building owners where and how such opportunities can occur in their buildings.

With the great content compiled in this issue of the magazine, we hope you can develop better Green ideas and opportunities for your next Green building project.

Sincerely yours,  
SG Green Editorial Team

The logo for SG GREEN features the letters 'SG' in a large, bold, black sans-serif font. A stylized green leaf graphic is positioned between the 'S' and the first 'G'. To the right of this, the word 'GREEN' is written in a smaller, black, all-caps sans-serif font.



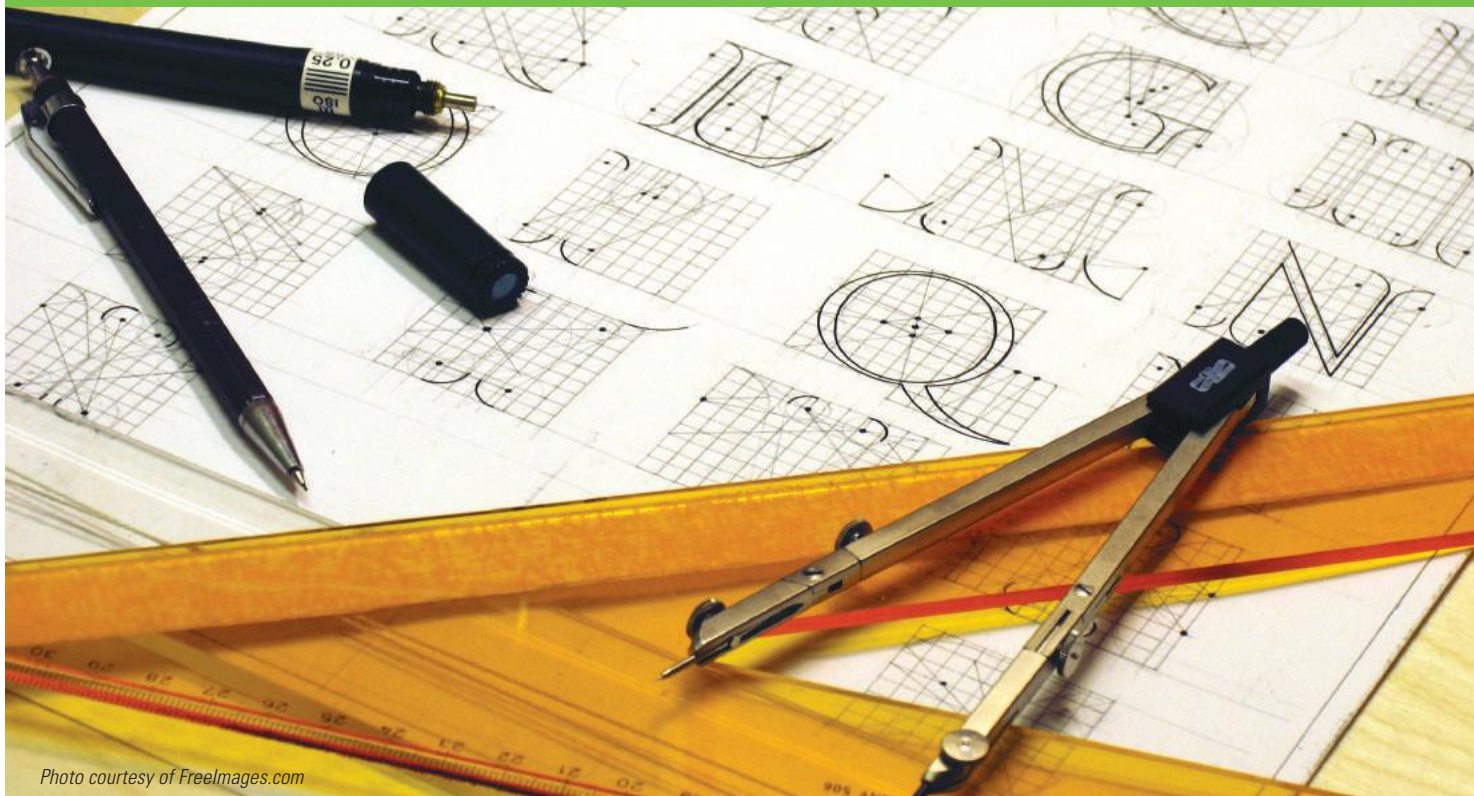


Photo courtesy of Freemages.com

# ABOUT THE SINGAPORE GREEN BUILDING SERVICES LABELLING SCHEME

A Green building can be likened to an organism: a living, breathing construct composed of a multitude of elements. From the flooring that occupants walk on to the kilometres of cable recessed into the walls, a building's materials will determine its shape, size and form, as well as its eventual environmental performance. Yet all of these can only be achieved with the input of specialists and professionals to bring the design blueprints to full materialisation.

Green building products and materials may play a pivotal role in the performance of Green buildings, but it takes more than certified plasterboards, glass and high-performance chiller systems to create a truly sustainable building. The human factor is usually required to fill this void, forming a link between the inanimate building materials and working them into the organism that is the resulting Green building. Such is the nature of Green building services.

Architects are responsible for the look and feel of a building as well as the specifications for the necessary materials required to construct the building. Further, environmentally sustainable design (ESD) consultants give their input to a design's environmental performance, while mechanical and electrical engineers are consulted to design increasingly complex infrastructure needed to operate building-related systems. Energy performance contracting (EPC) firms also help buildings improve their energy efficiency, which can be to the tune of 50 percent less than what they have been utilising. Therefore, it stands to reason that Green building services can be as important as the Green materials and products they are helping to piece together into the designed building.

This is the rationale behind the Singapore Green Building Services (SGBS) labelling scheme.



SGBS came into being in 2012, after a lengthy consultative process with representatives from the Singapore Green Building Council (SGBC) and the Building and Construction Authority (BCA). Having nothing to base this new construction service-oriented labelling scheme on, it took this working group of key industry players nine months to conceptualise and finally launch the first-ever scheme dedicated to evaluating Green building services.

SGBS certification is fairly straightforward: the scheme looks at how the company conducts its day-to-day operations as well as their Green contributions and track record in the domestic market. Also, the onus on Green must suffuse through the entire firm, from the way business is done to what the company stands for as well as the training, education and Green operations of their own staff.

## CREATING A GREEN BUILDING SERVICE

The criteria for SGBS certification broadly cover the firm's performance in the industry as well as in the greater community. First of all, environmental certification obtained by the firm will be assessed. This includes ISO 14001 and ISO 50001 international service standards, both of which form a strong testament to a firm's environmental values.

Next, the firm's track record would be taken into consideration. This comprises the nature and number of building projects certified under the BCA Green Mark scheme as well as any other recognised Green building assessment methods, such as the Leadership in Energy and Environmental Design (LEED) administered by the US Green Building Council (USGBC).



Architecture



Quantity  
Surveying



Environment  
Sustainability  
Design



Mechanical &  
Electrical



Energy  
Performance  
Contracting







The certifying service firm's Green capability building levels are then looked into. This would reflect the firm's commitment to equipping their staff with the relevant skills to excel in their scope of work, and would generally include the number of professionally trained staff as well as the extent of their Green building training.

The firm's memberships and affiliations to the wider Green building community will also be taken into consideration for certification, along with any contributions to Green building development or to Green advocacy and Green corporate social responsibility. Collectively, these demonstrate a firm's commitment to improving the profile and awareness of Green building as a whole, showcasing their tangible, overt achievements in the industry.

Lastly, the SGBS criteria look at any other accomplishments, recognised awards, prizes or accolades in the areas of Green building design and services that the firm has obtained. These will help to paint a clear picture of how the certifying firm has contributed to the Green building industry as a conscientious Green building service provider.

### A TESTAMENT TO SUSTAINABILITY

As the only dedicated Green building service labelling scheme in Singapore, certification with SGBS brings a number of benefits. Chiefly, it differentiates the certified firm from the rest of the pack, giving it a stamp of approval that increases its exposure in an increasingly crowded marketplace.

SGBS-certified firms also enjoy recognition when undertaking overseas projects, which may require some form of familiarity with aforementioned LEED certification administered by the USGBC. As buildings in Singapore are rated by the Green

Mark scheme administered by building authority BCA, not many companies would have very extensive knowledge on LEED certification criteria. However, as a key proponent of Green building design, practices and technologies in the tropics, Singapore's expertise and knowledge in this field are recognised as world-class. Therefore, having SGBS certification issued by an internationally recognised Green building council gives certified companies the confidence to prove their emphasis on sustainability.

To date, more than 50 firms have been certified under the scheme's five categories—namely Architecture, Quantity Surveying, Mechanical and Electrical, Environment Sustainability Design and Energy Performance Contracting—and these firms are listed on SGBC's Directory of Certified Services for easy access by building owners. As the demands of the dynamic building and construction industry continues to change, more building services that cover other aspects will also be added to the certification repertoire in due course, and these services include Interior Design, Facility Management and Landscape Architecture.

In the local context, recognition for SGBS certification is now stronger than ever before. With the release of Green Mark 2015 in September 2015, BCA has acknowledged the merit of SGBS-certified firms and has incorporated this recognition into the new criteria.

As part of the project team, SGBS firms can help the Green building project accrue bonus points under a specific section of the assessment criteria, which go towards the building's eventual Green Mark rating. In addition, EPC firms allow the project to garner additional points as well, provided that the implemented solution can guarantee operational system efficiency over a minimum period of five years. This creates a win-win situation: the building owner has more reason to engage an EPC firm to bolster the building's efficiency due to the additional Green Mark points awarded, while also reaping substantial energy savings from the EPC retrofit.

Like the building materials and products used in construction, Green building services are here to stay. As part of a larger ecosystem with multiple base elements, such services are crucial to the eventual development of a building, which translates to a Greener, more sustainable built environment for future generations.





Photo courtesy of Freemages.com



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## SGBP 4-tick Showcase



Leader

### ACMV Pte Ltd

59Q Tuas South Avenue 1  
Singapore 637416  
Tel +65 6863 3231  
Fax +65 6863 9665  
Category: Automatic Tube Cleaning System

### Akzo Nobel Paints (Asia Pacific) Pte Ltd

Akzonobel House 3, Changi Business Park Vista  
Level 5, Singapore 486051  
Tel +65 6635 5352  
Fax +65 6635 5365  
www.akzonobel.com  
Category: Paints & Coating

### Carrier Singapore Pte Ltd

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Singapore 608926  
Tel +65 6410 0246, 6410 0235  
Fax +65 6567 6818  
www.carrier.com.sg  
Category: Chillers

### HVS Engineering Pte Ltd

1 Bukit Batok Crescent #09-45  
WCEGA Plaza Singapore 658064  
Tel +65 6310 8918  
Fax +65 3150 5498  
www.hvs.sg  
Category: Automatic Tube Cleaning System

### Hydroball Technics (SEA) Pte Ltd

1 Joo Chiat Road #04-1019  
Joo Chiat Complex, Singapore 420001  
Tel +65 6338 8033  
Fax +65 6260 3008  
www.hbt.com.sg  
Category: Automatic Tube Cleaning System

### Interface Singapore Pte Ltd

80 Marine Parade Road  
#22-03/05 Parkway Parade  
Singapore 449269  
Tel +65 6478 1519  
Fax +65 6478 1528  
www.interfaceglobal.com  
Category: Carpet Tile

### Nippon Paint (S) Co. Pte Ltd

1, First Lok Yang Road Jurong  
Singapore 629728  
Tel +65 6265 5355  
Fax +65 6264 1603  
www.nipponpaint.com.sg  
Category: Paints & Coating

## SGBP 3-tick Showcase



Excellent

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2 Ayer Rajah Crescent  
Singapore 139935  
Tel +65 6776 5711  
Fax +65 6778 0222  
Category: Switchboard

### AGC Asia Pacific Pte Ltd

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Singapore 119963  
Tel +65 6273 5656  
Fax +65 6271 3817  
www.agc.com/english  
Category: Glazing

### Armstrong (Singapore) Pte Ltd

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CT Hub, Singapore 339407  
Tel +65 6604 6839  
Fax +65 6604 6835  
www.armstrong.com  
Category: Ceiling Board

### CBS Paints Pte Ltd

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Singapore 569566  
Tel +65 6482 5455  
Fax +65 6481 1210  
www.cbspaints.com  
Category: Paints & Coating

### Danfoss Industries Pte Ltd

25 International Business Park  
#03-57/58 German Centre, Singapore 609916  
Tel +65 6885 9788  
Fax +65 6885 9799  
www.danfoss.com  
Category: Variable Speed Drive

### Datwyler (Thelma) Cables + Systems Pte Ltd

30 Toh Guan Road #01-01A  
Singapore 608840  
Tel +65 6863 1166  
Fax +65 6897 8885  
www.cabling.datwyler.com  
Category: Network Cable

### Eaton Industries Pte Ltd

4 Loyang Lane #04-01/02  
Singapore 508914  
Tel +65 6825 1631  
Fax +65 6825 1689  
www.eaton.com  
Category: Variable Speed Drive

### Engro Corporation Limited

29 International Business Park  
#08-05/06 Acer Building Tower B  
Singapore 609923  
Tel +65 6561 7978  
Fax +65 6561 9770  
www.engro-global.com  
Category: Cement

### Faberca Pte Ltd (Faber Chimica SRL)

Blk 1 Kaki Bukit Ave 3 #07-14 KB-1  
Singapore 416087/  
Via G. Ceresani, 10, 60044 Fabriano (AN), Italy  
Tel +65 6844 8473  
Fax +65 6844 8475  
www.faberchimica.com  
Category: Floor Finish

### Filtration Engineers Pte Ltd

Blk 1003, Bukit Merah Central  
#07-18 Inno-Centre, Singapore 159836  
Tel +65 6271 5535  
Fax +65 6271 5539  
www.filtrationengrs.com  
Category: Automatic Tube Cleaning System

### Grundfos (S) Pte Ltd

25 Jalan Tukang Singapore 619264  
Tel +65 6681 9688  
Fax +65 6823 9390  
www.grundfos.com  
Category: Pump



## Johnson Controls (S) Pte Ltd

6 Changi Business Park Avenue 1  
#06-21/22 UE Bizhub East (North Tower)  
Singapore 486017  
Tel +65 6748 0202  
Fax +65 6282 4878  
www.jci.com  
Category: Chiller

## JS Creates Pte Ltd

10 Admiralty Street #03-06 North Link Building  
Singapore 757695  
Tel +65 6752 7977  
Fax +65 6752 7077  
www.jscreate.com.sg  
Category: Cooling Tower

## Kansai Paint (S) Pte Ltd

74, Joo Koon Circle  
Singapore 629093  
Tel +65 62618621  
Fax +65 6265 0301  
www.kansaipaint.sg  
Category: Floor Finish

## KSB Singapore (Asia Pacific) Pte Ltd

7 Woodlands Walk, KSB Regional Center  
Singapore 738320  
Tel +65 6757 7200  
www.ksb.com.sg  
Category: Pump

## Leoni Studer AG

Herrenmattstrasse 20  
4658 Däniken, Switzerland  
Tel +65 6863 4966  
Fax +65 6863 4955  
www.leoni.com.sg  
Category: Power Cable LSOH

## Milliken Asia Pte Ltd

438B Alexandra Road  
Alexandra TechnoPark Blk B, #08-05 Lobby 2  
Singapore 119968  
Tel +65 6593 1329  
Fax +65 +65 6377 3444  
www.millikencarpet.com  
Category: Carpet Tile

## Natsteel Holdings Pte Ltd

22 Tanjong Kling Road  
Singapore 628048  
Tel +65 6265 1233  
Fax +65 6265 8317  
www.natsteel.com.sg  
Category: Steel

## Nexans Singapore Pte Ltd

111 Somerset Road #09-06  
Singapore 238164  
Tel +65 6317 0101  
Fax +65 6317 0103  
www.nexans.com  
Category: Power & Network Cable

## Nichias Singapore Pte Ltd

25 International Business Park  
#01-15/17 German Centre  
Singapore 609916  
Tel +65 6268 6568  
Fax +65 6265 7681  
www.nichias.co.jp  
Category: Thermal Insulation

## Parexgroup Pte Ltd

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Singapore 637648  
Tel +65 6861 0632  
Fax +65 6862 3915  
www.parexdavco.com.sg  
Category: Waterproofing

## Power-Plus (S) Pte Ltd

10 Admiralty Street, North Link Building  
#02-78, Singapore 757695  
Tel +65 6752 0171  
Category: Switchboard

## ROCKWOOL Building Materials (Singapore) Pte Ltd

3 International Business Park  
Nordic European Centre #03-29  
Singapore 609927  
Tel +65 6890 6235  
Fax +65 6890 6237  
www.rockwoolasia.com  
Category: Thermal Insulation

## Schneider Electric Singapore Pte Ltd

10 Ang Mo Kio Street 65  
#02-17/20 Techpoint, Singapore 569659  
Tel +65 6484 7877  
Fax +65 6484 7800  
www.schnider-electric.com.sg  
Category: Switchboard & Variable Speed Drive

## Shaw Industries Group, Inc

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E centre@Redhill Singapore 159471  
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Fax +65 6836 6075  
www.shawcontractgroup.com  
Category: Carpet Tile

## Singapore Cables Manufacturers Pte Ltd

No. 20 Jurong Port Road  
Tel +65 6265 0707  
Fax +65 6265 2226  
www.prysmiangroup.com  
Category: Power Cable LSOH

## SMJ Furnishings (S) Pte Ltd

31 Jurong Port Road #02-20  
Jurong Logistics Hub  
Singapore 619115  
Tel +65 6261 1212  
Fax +65 6261 6512  
www.smjf.com.sg  
Category: Carpet Tile

## Suzhou Tuntex Fiber and Carpet

No. 28 ChengXi South Road  
Taicang, Jiangsu, 215400 China  
Tel +65 8182 3995  
Fax +65 6694 3164  
www.tuntex-carpet.com  
Category: Carpet Tile

## Teco Electric & Machinery Pte Ltd

18 Chin Bee Drive  
Singapore 619865  
Tel +65 6265 4622  
www.teco.com.sg  
Category: Variable Speed Drive

## The United Agencies Pte Ltd

443 Tagore Industrial Avenue  
United Agencies Building  
Singapore 786192  
Tel +65 6458 2331  
Fax +65 6454 6012  
www.uacarpet.com.sg  
Category: Carpet Tile

## Top-Mix Concrete Pte Ltd

29 International Business Park  
#08-05/06, Acer Building Tower B  
Singapore 609923  
Tel +65 6890 8863  
Fax +65 6561 9770  
Category: Ready Mix Concrete

## TRANE Distribution Pte Ltd

27 Benoi Sector  
Singapore 629859  
Tel +65 6468 8622  
Fax +65 6468 1828  
www.trane.com  
Category: Chiller

## Truwater Singapore Pte Ltd

1 Soon Lee Street, #06-33 Pioneer Centre  
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Tel +65 6686 4868  
Fax +65 6686 4887  
www.truwater.com.sg  
Category: Cooling Tower

## Vacon Pte Ltd

3 International Business Park  
#01-19 Nordic European Centre  
Singapore 609927  
Tel +65 6896 1209  
www.vacon.com  
Category: Variable Speed Drive

## Yaskawa Electric (Singapore) Pte Ltd

151 Lorong Chuan  
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Singapore 556741  
Tel +65 6282 3003  
Fax +65 6289 3003  
www.yaskawa.com.sg  
Category: Variable Speed Drive





# CAPITOL — REVITALISING THE CIVIC DISTRICT

Declared as a conservation site in 2007, the Capitol Theatre and its adjoining buildings present a unique and special opportunity to be redeveloped into a modern hub of luxurious entertainment.

Set within the Civic District of Singapore, Capitol Development is a land parcel that consists of three historically and architecturally significant buildings, namely the Capitol Theatre, Capitol Building and Stamford House, each with their own rich and deep backstories. Today, it has been transformed into a mixed-use development that integrates these historic gems that are the conservation buildings into the modern built environment.

Comprising the three aforementioned conservation buildings, the new Capitol Singapore adds a two-storey commercial podium, a 12-storey residential block, two shopping basements in an underground pedestrian mall, a hotel as well as a theatre

back-of-house into the 51,300-square-metre site. This offers the Capitol site a unique opportunity to contribute to the rich and diverse urban fabric at an important intersection in the heart of Singapore.

## A UNIQUE DEVELOPMENT OPPORTUNITY

As the winning scheme of the Urban Redevelopment Authority's (URA) Two-Envelope Land Tender System, the design of the Capitol site was crafted by the world renowned architectural firm, Richard Meier & Partners Architects. The primary goal: to create a strong sense of place by enhancing and transforming the existing site through a sensitive and elegant approach with timeless architecture. This provides the project with the brevity of a landmark without diminishing the quality and presence of the conserved buildings.

- 1 Public Plaza at night
- 2 Capitol Building Arcade walkway









The retail podium is designed to reinforce the engagement and human scale of the conserved buildings, while the setback and layered massing of the new retail podium and residential tower will mediate the weighed horizontal low-rise of conservation buildings with the surrounding buildings. As the tower approaches North Bridge Road, the terraced building form achieves a sculptured and animated urban roofscape.

Besides providing an urban realm for public activities, the Public Plaza sensitively blends the old world charm of the Theatre with its contemporary embellishments that rejuvenates the entire Civic District.

In addition to private transport, the development is well connected to the public transportation network through a network of sheltered public circulation channels throughout the site. This includes a busy connection to the City Hall Mass Rapid Transit (MRT) station at the basement as well as bus stops on the surface. Hybrid/electric vehicle refuelling/recharging stations are provided at the site's basement car parks, which further enhances the development's Green transportation approach.

## AESTHETIC INTEGRATION

The use of floor-to-ceiling height glass façade allows ample natural daylight into the retail space and residential units, thereby reducing reliance on artificial lighting. Also, the use of anti-slip glass flooring at the Public Plaza achieves the desired goal of creating a daylight quality ambience to the basement retail levels.

What used to be the prominent back lane between Capitol Building and Capitol Theatre has now been transformed into a unique lifestyle and dining destination. A skylight that permeates the high volumetric Galleria space shelters the diners from the elements.

Efforts were spent to refine the design composition of the solid and transparent elements on the façade, while complying with the Window to Wall Ratio (WWR). Ultimately, high-performance Double Glazed Unit (DGU) glass and Richard Meier's signature white aluminium insulated panels were used to achieve both the Envelope Thermal Transfer Value (ETTV) and Residential Envelope Transmittance Value (RETV) requirements. DGU, Single Laminated Low E and Single Laminated Clear glass were used in the building envelopes of both the new and conservation buildings. Horizontal scrims that are part of the architecture feature also double up as sunshading devices that help to cut down on the heat and glare to the residential units.

Despite the challenges faced by the design team with the conservation buildings, the development had successfully obtained a GoldPLUS rating under the Building and Construction Authority's (BCA) Green Mark Scheme (Residential and Non-Residential Certification Version 4.0 categories). In addition, as part of the URA Land Tender's minimum requirements, energy savings of 26.9 percent had also been achieved for the development.

- 3 Capitol Development along North Bridge Road
- 4 Glass floor at Public Plaza level
- 5 Glass floor at basement 1









6 Interior of the Capitol Theatre









## LANDSCAPE

Appropriate building setbacks, with ample open public spaces and pockets of landscaping provide Green relief throughout the development. Such spaces are the public sky terraces on the second storey of the Retail podium, third storey of the Residential communal facilities E-deck and rooftop sky garden, providing lush greenery and a natural oasis through a unique experience in an urban environment.

NEWater is used for all maintenance of greenery and plantings at the Non-Residential sections. Usage of a water-efficient irrigation system provides for more than 50 percent of the development's landscaping area.

## SUSTAINABLE APPROACH AND GREEN FEATURES

Energy efficiency is achieved through proper building form and solar orientation, innovative building envelopes, mechanical system design, the specification of advanced building operations and monitoring equipment as well as usage of Green building products certified by the Singapore Green Building Product (SGBP) labelling scheme throughout the various buildings in the entire complex.

7 & 8 Sky terraces









Certified Green materials were extensively utilised in many areas of the development. Adhesive, mortar and grouting supplied by Holcim (Singapore) Ltd and Mapei Far East Pte Ltd respectively were used for component stones and tiles application within the Residential, Retail and Hotel areas, with Geomix Non-Shrink GP (SGBP√) used in the Retail area, and Mapei Keracolor SF and Mapei Keraflex Maxi S1 (both SGBP√) used in the Hotel area.

In addition, plastering/skim coat at retail units were also applied to the Retail areas using Geomix Plaster and Geomix Screed 104 (both SGBP√), also supplied by Holcim (Singapore) Ltd. Environmentally friendly walls and ceilings—specifically the Gypsum/Fibre Cement Board System, ROXUL/ThermalRock 5 (SGBP√) provided by ROCKWOOL Building Materials (Singapore) Pte Ltd—were introduced to Residential Units and Hotel rooms, and their respective public areas.

Laticrete Hydroban (SGBP√) and Laticrete Vapex (SGBP√) waterproofing systems supplied by Laticrete (SEA) Pte Ltd were also applied widely to all of the development's wet areas.

With its strategic location, well-considered and innovative mix of conservation and new buildings with their range of Green features, Capitol Development is set to be a new iconic landmark in the Civic and Business District of Singapore.

#### **Concept Designer**

Richard Meier & Partners Architects LLP

#### **Project Architect**

Architects 61 Pte Ltd

#### **Civil & Structural Engineer**

Arup Singapore Pte Ltd

#### **Mechanical & Electrical Engineer**

Arup Singapore Pte Ltd

#### **Quantity Surveyor**

Langdon & Seah Singapore Pte Ltd

#### **Façade Consultant**

Arup Singapore Pte Ltd

#### **ESD Consultant**

Arup Singapore Pte Ltd

#### **Landscape Architect**

Grant Associates

#### **Interior Designer**

Residential – Steve Leung Designers Ltd;

Hotel – Jaya International Design;

Hotel (All Day Dining) – AvroKo Design LLC;

Theatre – Michael Fiebrich Design

#### **Lighting Consultant**

Lighting Planners Associates (Japan);

Komara & Partner Ltd

#### **Main Contractor**

Shimizu Corporation

9 Stamford House hotel room





# SMART SPACES — BRINGING COMMERCIAL REAL ESTATE INTO THE INTERNET OF THINGS

The Internet of Things (IoT) is exploding in size and impact as the number of smart devices continue to grow in almost every industry. It has taken rapid hold in corporate real estate, and it will enable owners to extract vital information from their real estate assets, thereby allowing them to aggregate data, monitor performance and make more intelligent business decisions. The expansion of these connected devices will allow building owners and operators to turn workplaces into environments that are personalised, efficient, functional and profitable.

## UNLEASHING THE POWER OF CONNECTIVITY IN BUILDINGS

By integrating and analysing data from connected furniture, lighting and conference rooms, IoT makes it possible to rethink the utilisation of space in the office. With a shift in

the use of physical space, less space is required per person, which translates to substantial reductions in real estate operating costs. Increased connectivity also helps to optimise asset utilisation, and improves performance and productivity of both physical and human assets, enabling the workforce to be productive at any time and in any place. Whether the emphasis is on collaboration or individual work, it can be executed in a more flexible manner that best suits the schedule and habits of employees.

## DEMAND FOR IOT-POWERED LIGHTING TODAY

With steady growth in the commercial building stock and net square footage expected to increase for years to come in countries like Singapore and the United States, reducing the energy intensity (energy consumption per square foot) of





building operations is the best means to achieve a net energy reduction in commercial buildings.

Until recently, these kinds of significant improvements in building energy consumption were out of reach due to technological barriers. However, with the advance of new intelligent sensor technology and IoT, huge gains in energy efficiency have become possible.

Because the IoT for commercial buildings always begins with advanced sensor installation at the lighting fixtures in a building, IoT-powered lighting systems become a more integrated and central component of every building project. The demand for this type of technology is growing worldwide as governments especially in developed nations encourage the adoption of IoT technologies in buildings.

For example, the Building and Construction Authority (BCA) of Singapore has allocated 10 points under Section 4 'Smart and Healthy Building' in its latest Green Mark 2015 for non-residential new construction, which includes technology to facilitate analytics, demand response and continuous energy monitoring. Furthermore, with the recent updates to the Title 24 Building Energy Efficiency standards in the United States, advanced lighting control systems have more or less become a legal requirement.

## LIGHTING IS THE GATEWAY TO ADVANCED BUILDING CONTROL

The lighting layout in commercial buildings represents a large untapped opportunity to learn how a business' real estate is used by its stakeholders. Smart controls today are capable of transforming this lighting infrastructure into a dense network of real-time data collection points and truly bring commercial real estate into IoT.

While networked lighting systems most obviously provide data on light levels and energy usage, this is only the beginning. Intelligent systems can collect information on temperature, space usage and more, and communicate with other building management systems such as Heating, Ventilation, and Air-Conditioning (HVAC) and security protocols to create a facility that is smart and responsive.

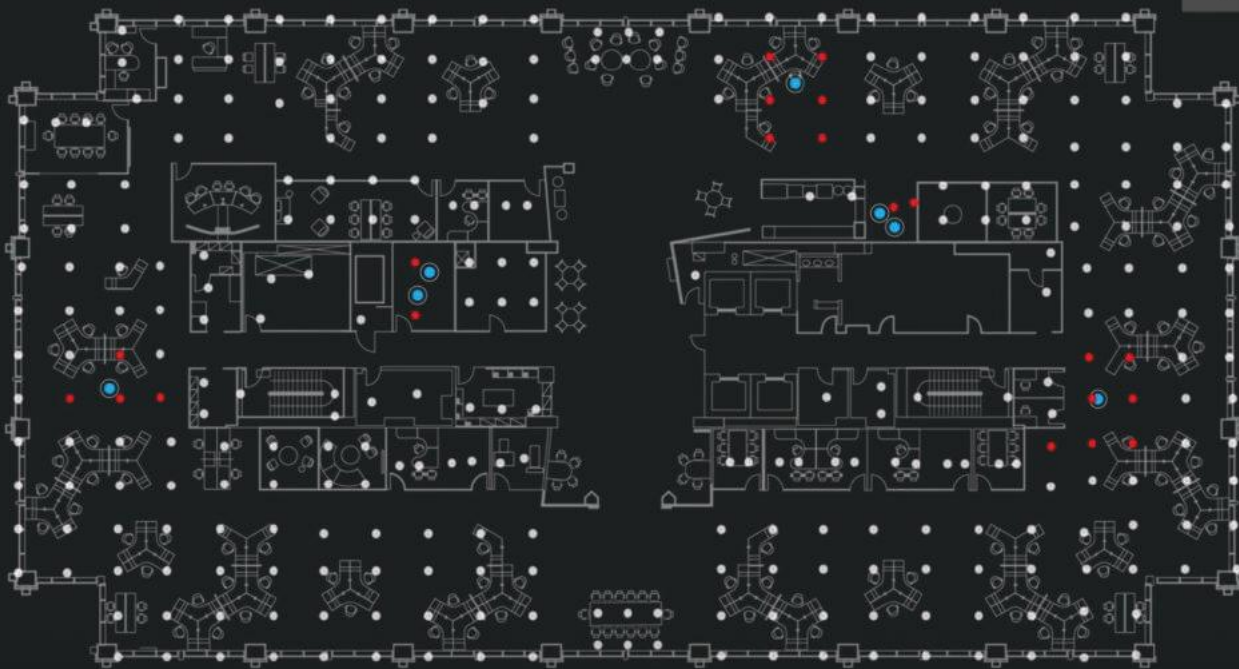
There are a number of sensor-based systems on the market today—systems that combine lighting, smart controls and data analysis. But the features and functionality vary, and customers have a number of factors to consider. Topping this list are space utilisation, energy savings and employee comfort. With smart technology making great strides to unlock the potential of IoT for commercial real estate, these factors are being tackled in innovative ways as explained below:





## LIGHTING

Personalised controls,  
increase energy savings.



LIGHT:  
20%

AMBIENT  
LIGHT:  
28%





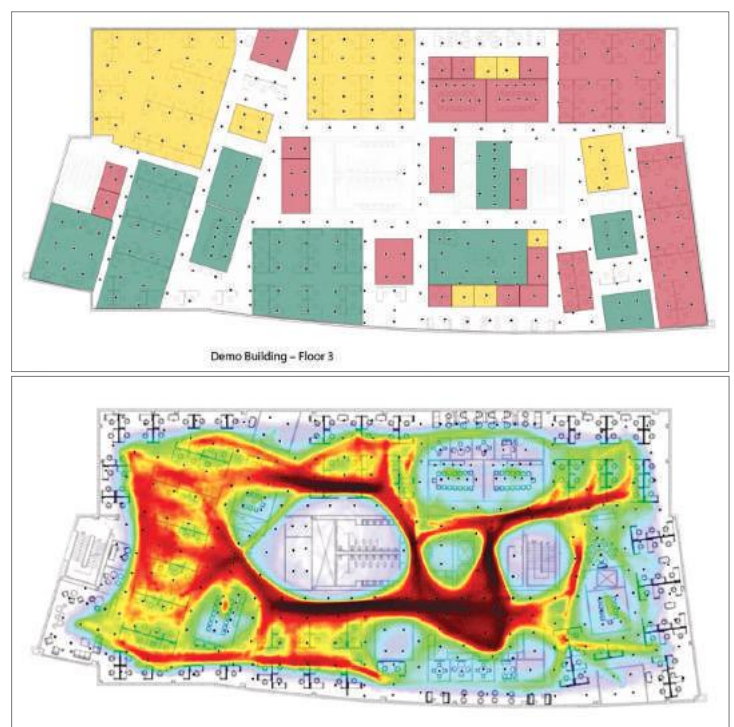
- Lighting and employee comfort:** Incorporating advanced lighting sensors can be helpful in securing additional Green Mark points on a construction project. From the data collected by smart sensors, it can be determined how to optimally light a space while taking advantage of natural light. Occupancy and vacancy sensors monitor when an area is unoccupied, helping to ensure that lighting is only present when necessary. Daylight harvesting sensors determine the amount of natural sunlight entering a space and adjust artificial light levels accordingly. Finally, task tuning allows employees to adjust the lighting in a space to meet their needs. Thus, with IoT-enabled lighting control systems, building owners can gain control over how light:
  - Is received on an as-needed basis
  - Is customised to the activities of individuals within the space
  - Is provided at the exact intensity required within each separate area
  - Is adjusted as work activities or human traffic change anywhere in the environment.

This new responsiveness will improve our experience of the world in both tangible and eventually transformative ways. Ensuring that light and heat levels are optimised can help reduce eye strain and headaches, while also promoting comfort and relaxation, and therefore increasing focus and improving productivity. Furthermore, this also means huge gains in terms of energy savings because lighting is only used when needed and to the extent it is needed. That is obviously an attractive sustainability goal for any organisation, but the savings can be huge for large companies. American multinational telecommunications corporation AT&T, for example, recently upgraded lighting systems in 1,000 of its largest energy-consuming sites and

500 retail stores. The result was a savings of \$8 million in annual lighting energy costs.

The key here is integrated sensors that also include occupancy and vacancy sensors along with ambient light and temperature sensing. After all, sensors should not be fooled by heat-producing fax machines and space heaters, or by motion created by machines and not humans.

- Space utilisation:** Space utilisation data can help update the facility based on its current and future needs. The advanced sensors in a networked lighting system track occupancy and motion for valuable insights on how space





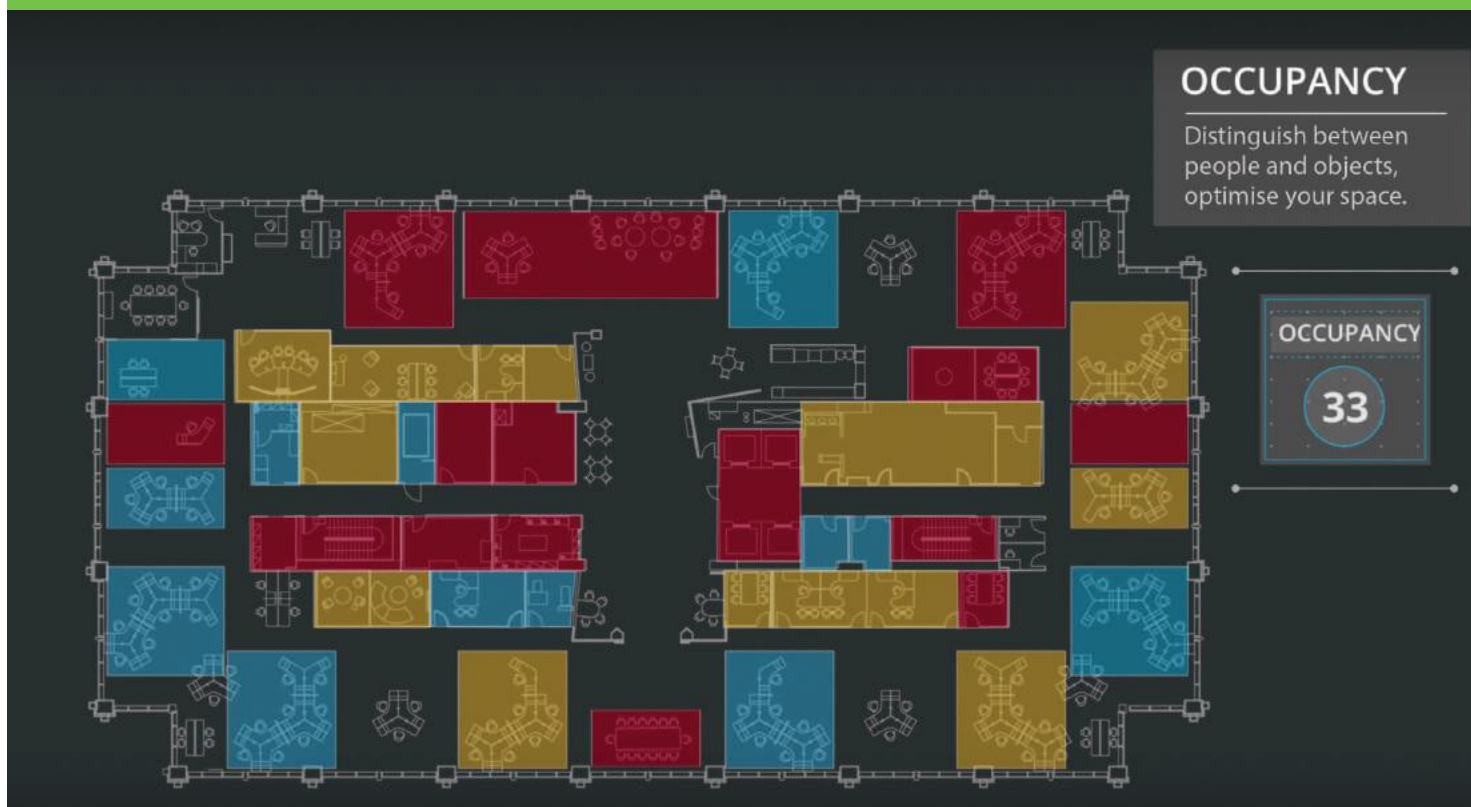
Capturing workplace productivity in real time...

TEMPERATURE

Maximise your comfort,  
reduce HVAC costs.







can be optimised. Large campuses and organisations with multiple buildings can determine when to expand based on how space is being utilised. So much is possible now—from identifying traffic patterns in a space to creating heat maps of motion, motion trails, tracking when employees arrive and leave, and more.

Cloud-based application software can provide insights into building usage and occupancy patterns using data from sensor networks within buildings. This allows customers to visualise and measure workplace use in real time and make decisions on how to better use their space.

For example, a powerful space utilisation application can provide estimates of occupied square footage and costs by department and function; vacancy reports detailing the percentage of unoccupied space; and utilisation reports showing low, medium and high workspace utilisation. Graphs display average and peak utilisation in each area of a workspace over time. This data can inform better space design, expansion and consolidation decisions. Furthermore, it can also help monitor janitorial activities, security sweeps and other such maintenance-related activities.

- **HVAC and plug loads:** Centralised HVAC systems in commercial office buildings are routinely overbuilt and waste massive amounts of energy. Temperature controls integrated in networked lighting systems can provide

information on hot and cool spots in a building to optimise HVAC usage. Occupancy and vacancy sensors can also determine spaces that are used infrequently so that they are not unnecessarily heated or cooled.

Recently, engineers and architects have begun to look at plug loads in building energy. When plug-load studies are undertaken by the design team as part of a whole system design approach (especially in equipment-intensive building types like laboratories and other critical facilities), significant energy savings are frequently discovered.





Working with right-size power supplies, reducing heat output and eliminating phantom loads can yield important energy savings. Smart data collection solutions now provide plug load management as a key efficiency capability.

- **Safety and security:** IoT technology can be used to detect intruders after hours and help locate occupants within a building during a disaster situation. Additional features of occupancy sensors can provide added benefits. For example, dim and linger controls warn occupants prior to lighting being turned off, which gives them ample time to exit the facility or override the control system. Sequential and pathway lighting controls anticipate and illuminate the pathway in front of pedestrians, customers and employees for increased visibility and security.

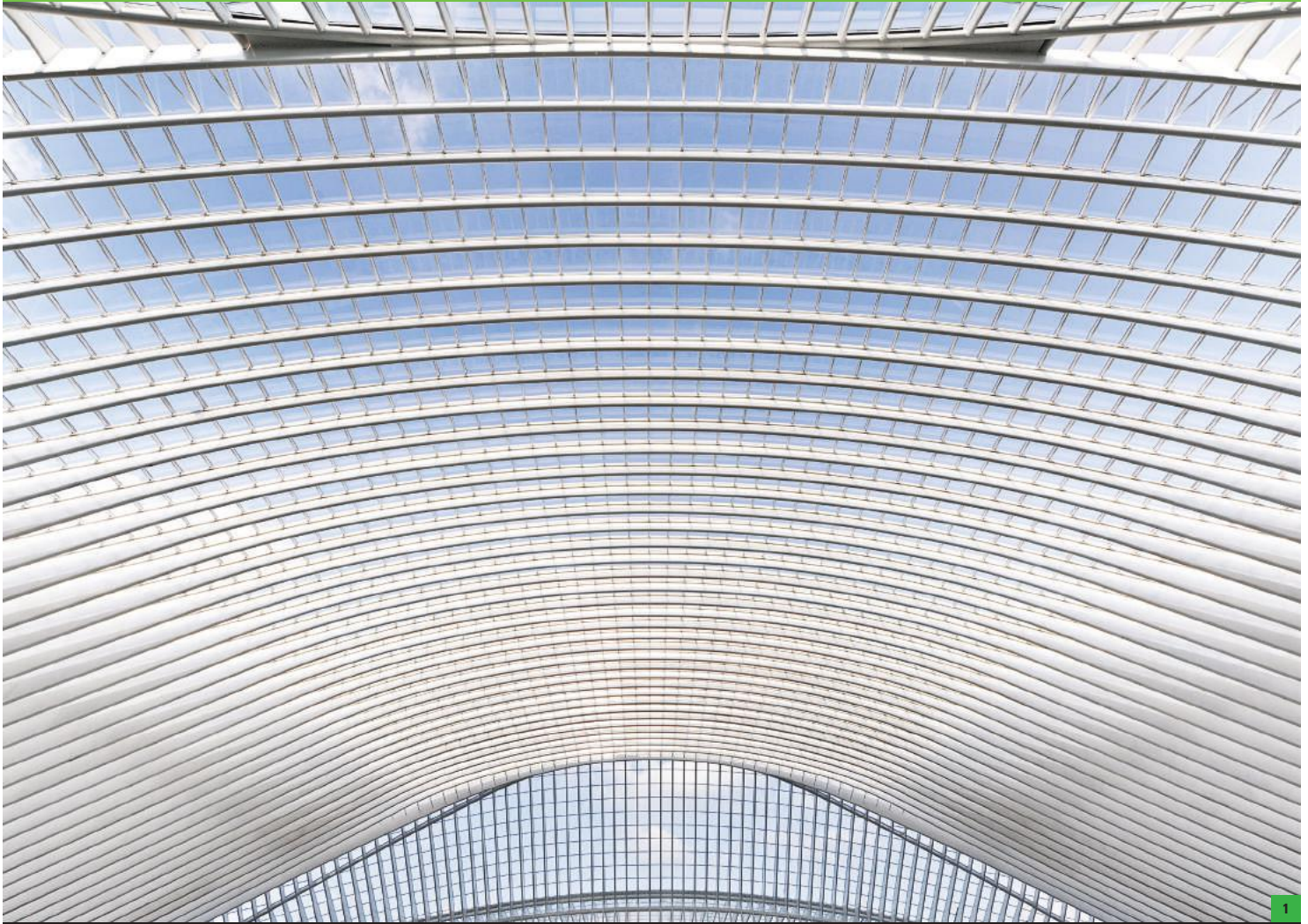
Without knowing exactly how the IoT-powered future will manifest, the fact remains that in the next 10 years, the amount of data generated by the human race is expected to increase by at least tenfold—largely due to IoT sensors coming online everywhere from outer space and underground pipes to vehicles, buildings and human body in the form of

wearable technology. What is done with this data—the problems that can be solved and how lives and livelihoods can be improved—might become an act of imagination unparalleled in human history. However in buildings, it starts with smart lighting.

“The intelligence and connectivity among key building systems can enable better monitoring, control, optimisation, personalisation and autonomy to produce a truly Green and healthy building,” said Edmond Looi, Director of Business Development at Enlighted Sales and Service Pte Ltd. “Enlighted is poised to grow exponentially and accelerate the adoption of decision-making data solutions for intelligent real estate. Our emphasis on engineering IoT apps means we can provide our customers with more ways to make the data collected by our advanced sensors actionable and help improve efficiencies for commercial real estate.”







# ASAHI GLASS COMPANY — THROUGH THE LOOKING GLASS

Every building and skyscraper in Singapore is adorned with glass in some manner or form. With a transparent quality belying its immense structural strength and incredible versatility, glass is an amazing material which makes possible a myriad of applications in the building and construction sector.

Established in 1907, Asahi Glass Co., Ltd. (AGC) draws on more than a century of research and technical innovation to develop world-class expertise in various fields related to glass, chemicals, electronics, ceramics as well as other high-tech materials and components.

Leveraging on the breadth and depth of its know-how, AGC is in the three business domains of:

- Safe, Sound and Comfortable Living Spaces and Materials
- Higher-Quality Display Devices and Communications
- Clean and Green Energy

Today, it is a truly global company contributing to a high quality of life around the world by providing a stable supply of not only high-quality glass, but also a wide range of excellent products across its three business domains.

- 1 Liège-Guillemins railway station, Liège, Belgium  
2 MyZeil shopping centre, Frankfurt, Germany



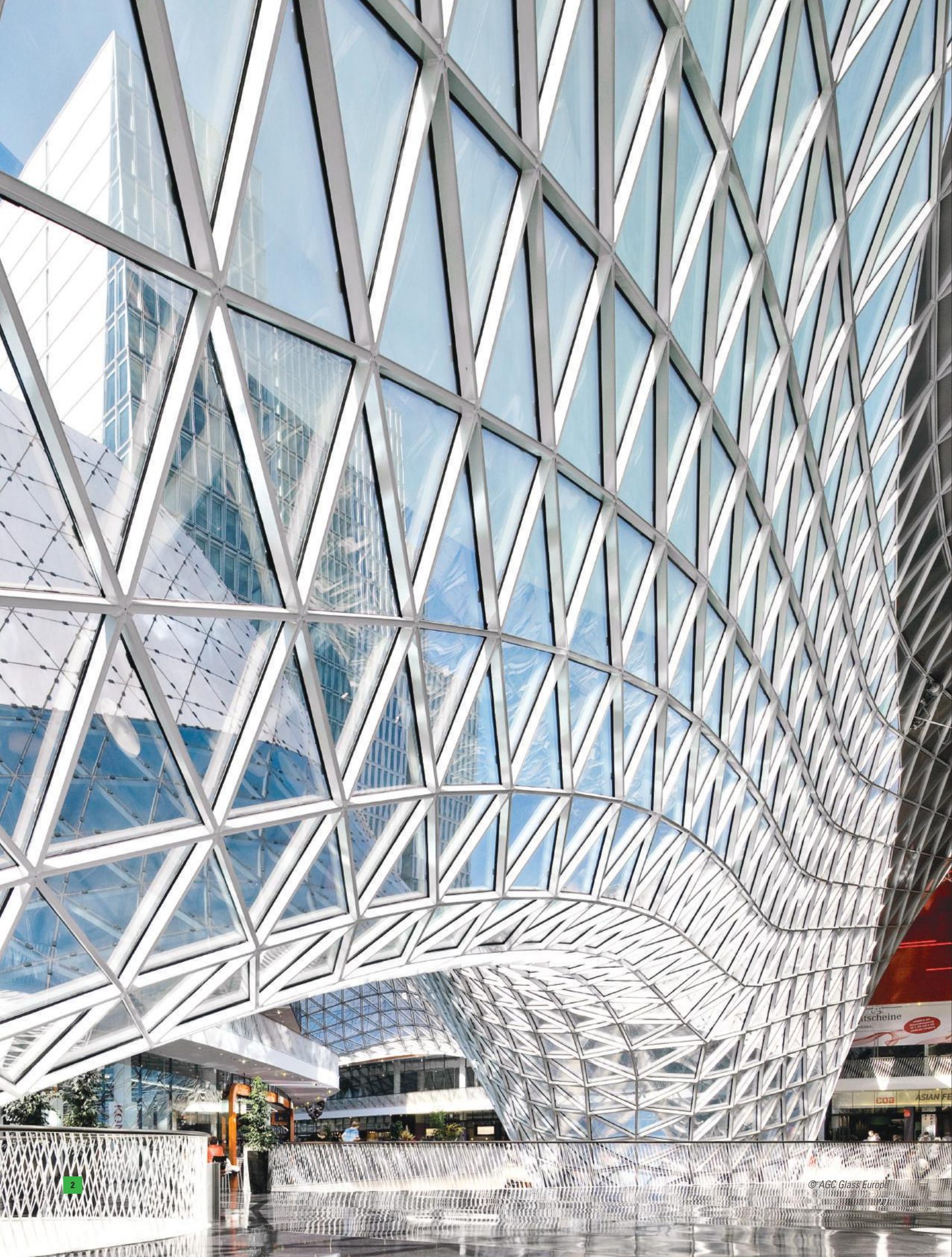






Photo courtesy of Philippe SAMYN and PARTNERS sprl, architects and engineers - BEAI sa





AGC identifies Environment as one of the four shared values in its group vision, with “Look Beyond” as a thrust focusing on reducing its load on the environment and preventing pollution.

Building upon its rich history, AGC has acquired the world’s leading market share for various glass products, including architectural glass, processed automotive glass and glass substrates for liquid crystal displays. However, the glass industry is an energy-intensive industry. Therefore, conscious of its own environmental load, AGC has been working to reduce the amount of energy used in its production activities.

At the same time, AGC is also contributing to the reduction of our society’s energy consumption as a whole through the development and supply of environment-related products, as well as aiming to expand its businesses by resolving the multitude of environmental issues impacting the world.

To spur these initiatives, AGC established a slogan for carbon dioxide (CO<sub>2</sub>) emissions reduction through environment-related products in 2014. Through its energy-saving and energy-creating products, the AGC group is conscientiously working to reduce CO<sub>2</sub> emissions by 80 million tons annually by 2020, an amount equivalent to the annual energy use of nearly 16 million average households.

### AN ONUS ON GREEN BUILDINGS

AGC regards Green buildings as an important concept as far as the built environment is concerned, taking it one step further by developing an award-winning Green building of its own. In Europe, the AGC Glass Europe Headquarters is a shining example of a company walking the talk, with the building certified “Excellent” by the Building Research Establishment Environmental Assessment Methodology (BREEAM), the second-best certification rating a building can obtain. BREEAM is the world’s leading sustainability assessment method for master planning projects, infrastructure and buildings.

Achieving this rating was no mean feat; only glass was capable of meeting the challenge of admitting maximum natural daylight while protecting the occupants from the sun’s heat and glare. The building’s designers achieved this feat using double glazing with enhanced thermal insulation in combination with louvres made of screen-printed glass.

AGC’s Asia-Pacific arm also repeated this emphasis on Green buildings when it occupied a new office in Singapore, consolidating all its staff spread across different sites. Fitted out according to Green design principles, the office is sited in a Green Mark GoldPLUS-certified building and has itself achieved a Green Mark certification of GoldPLUS for Office Interior as well.

### MANUFACTURING SUSTAINABILITY

AGC’s Environmental Management System (EMS) is designed to deal with environmental issues on a global scale and this management system provides support for achieving the goals of its environmental policy.

Pollution prevention, sustainable use of resources and a viable response to climate change are some of the key material issues identified by AGC’s Corporate Social Responsibility framework.

3 AGC’s glass building

4 AGC’s glass products are used in Singapore’s tallest building, Tanjong Pagar Centre





From the latest in oxy-combustion furnace design to heat recovery and cogeneration, these are only some of the cutting-edge technologies employed at the AGC group's manufacturing plants to achieve reduced carbon footprints.

An increasing number of AGC's manufacturing plants are installing photovoltaic panels to generate their own electricity and thereby reducing their individual carbon emissions. In 2014, the total output of AGC's collective photovoltaic installations in Europe had gone up dramatically from 10.1 MWh in 2009 to 6380 MWh in 2014.

For sustainable manufacturing, recycling is also an important strategy. AGC was the first in Japan's flat glass industry to begin recycling used glass collected from municipalities, and has been striving to develop advanced methods for separating cullet and materials attached to collected glass. In addition, AGC has initiated the ambitious REVALO project in France, focusing on the recovery and recycling of post-consumer cullet. Following the Cradle to Cradle philosophy, the REVALO project aims at recycling windows discarded from building renovations.

## PRODUCT SUSTAINABILITY

Although AGC ensures that its manufacturing processes are truly sustainable while producing sustainable products, these materials would have to meet global standards and benchmarks in order to stay relevant in a dynamic and ever-changing market. Industry certification is an important benchmarking tool, ensuring that the performance of AGC's products is commensurate with both local and global standards. Over the years, the AGC group has amassed many forms of certification for its products (both mandatory and voluntary) and manufacturing standards. Examples of such recognitions include REACH, ROHS and Cradle to Cradle. The AGC group is also the first glass manufacturer to receive certification under the Singapore Green Building Product (SGBP) labelling scheme administered by the Singapore Green Building Council (SGBC).

AGC has 11 products certified under the SGBP labelling scheme. These certified products enjoy better standing when specified for use in local building projects as the SGBP scheme directly complements the Green Mark Scheme, which is Singapore's national Green building rating tool administered by the Building and Construction Authority (BCA).

## SUSTAINABILITY OUTREACH

Despite being a corporate entity, AGC believes that to create a truly sustainable built environment, sustainability has to permeate every level of society. To that end, AGC has partnered several like-minded organisations that share the same vision as well as engage the student community. AGC actively participates in the World Business Council for Sustainable Development (WBCSD) initiatives for climate change, which is one of nine priority areas in the Council's Action 2020 programme. AGC is also initiating various actions to mitigate the effects of climate change, such as encouraging the use of energy-saving glass in exemplary buildings showcased by low-carbon cities, while also formulating climate change adaptation strategies.

AGC was awarded "Bronze Class" in the Sustainability Award 2015 conferred by RobecoSAM, a research and rating company of SRI in Switzerland. Based on opportunities and risks derived from economic, environmental and social trends and developments, RobecoSAM evaluates 3,300 of the world's largest companies in 59 industries and selects excellent companies based on their sustainability initiatives every year.

## EDUCATING FUTURE GENERATIONS

The children of today will inherit the world of tomorrow. Therefore, it is paramount for these children to understand the underlying environmental issues of the day so that they can identify and work on potential solutions to these critical issues.

One key way AGC Asia Pacific (AAP) is involved with educating the young of today is through the Green Schools Initiative (GSI), an amalgamation of targeted environmental education resources initiated by SGBC. Under the aegis of the GSI, AAP engages in interesting dialogue with secondary school students, creating a conversation on sustainability that makes an indelible impact on their lives. Activities include visits to the showroom of the AGC office in Singapore and engaging the students in various activities

<sup>5</sup> Tokyo Skytree

<sup>6</sup> Students from Woodgrove Secondary School learning about the various applications of glass

<sup>7</sup> The Gallery @ AGC is eye-catching and informative for members of the public and industry professionals alike









that help them iterate their thoughts and their vision. Lessons learnt from experiments and experiences right from the start at a young age will help them to understand the concepts of sustainability and even motivate them to think about how their future can be sustainable.

Recently, AAP hosted a group of students from Woodgrove Secondary School at the AGC office and held a learning journey to help them understand critical sustainability concepts. These enthusiastic and inquisitive students left the office with a good understanding and further food for thought about the applications of the various materials they had seen during their visit at AGC.

AAP has also partnered with Hwa Chong Institution (HCI) in their HCI STEM (Science, Technology, Engineering and Math) programme, giving students a real-world context to problem-solving and application of their acquired knowledge. In mentoring a group of students to address issues of energy efficiency in buildings, AAP also helped them to develop possible solutions to fight and mitigate the common issues faced by building occupants in recent times.

AAP also mentored a group of students from Republic Polytechnic for the Inaugural Building Energy Efficiency

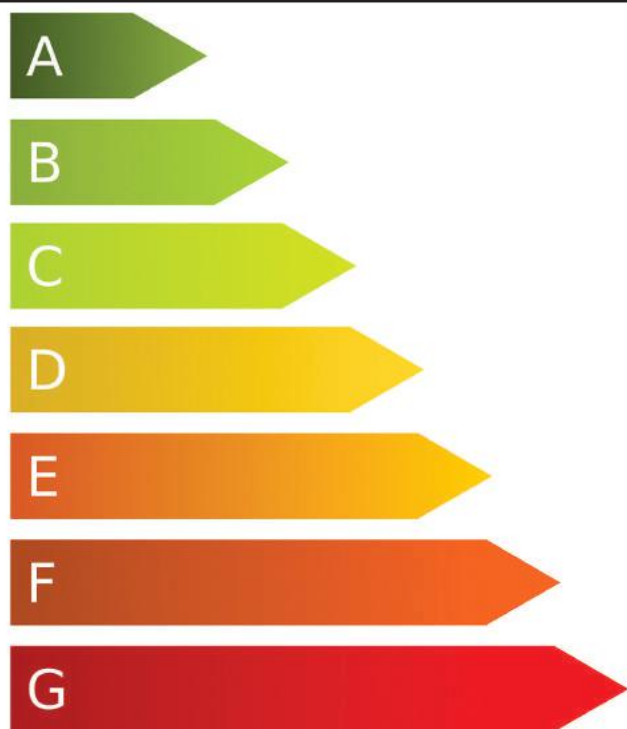
Solutions Student Competition 2015 organised by BCA. The competition challenged students to solve an energy efficiency problem faced by a Green Mark Platinum-certified building in Singapore. With AGC's long history of supplying products for buildings and AGC's experience with different building systems, the team went on to clinch the GoldPLUS award, which was the second highest honour in the competition.

### THROUGH THE LOOKING GLASS

With climate change being an inevitable reality, the world must stand firm to mitigate the effects as best as it can. Buildings account for a third of the world's total emissions, presenting a credible opportunity to stem or slow the tide of climate change. To achieve this vision, the AGC group is poised to offer its expertise and assistance, banking on its decades-long experience in creating innovative, eco-friendly building materials. AGC's various technologies and commitment to sustainability can help the world achieve a Greener, more sustainable environment—one that is real and palpable for future generations to enjoy.



# ENERGY PERFORMANCE CONTRACTING — A NEW LEASE OF LIFE FOR OLDER BUILDINGS



As Singapore steadily moves towards the goal of greening 80 percent of our existing building stock by 2030 as part of our national sustainability objectives, the building and construction industry has also shifted gears for the greening of retrofit projects. Retrofits are generally cheaper to accomplish than reconstruction, and benefits from the structural improvements are usually quite significant from the onset. However, there is still a substantial cost involved in building retrofits, thus building owners would not want to invest the capital and effort into retrofit projects that may not guarantee any significant improvement.

Energy performance contracting (EPC) is a viable building retrofit project that building owners can consider when redeveloping their buildings. The EPC firm will guarantee specific energy savings for the building over a set period of time, and such benefits are tracked either in monetary terms or a savings percentage. The EPC firm can either provide

financing to undertake all the necessary works to complete the retrofit of the building, or the building owner can finance the retrofit. For the first option, the building owner will not need to incur an initial financial outlay even as he or she starts saving energy. In both cases, the cost of these works will be offset by the energy savings as a result of the retrofitting.

In short, an EPC can guarantee energy savings for an existing building without an initial financial outlay by the building owner. Nevertheless, as a legally binding document, substantial time and effort would have to be divested to work out and negotiate every key term and condition for the contract.

To help building owners familiarise with the scope of an EPC along with its implementation, the Singapore Green Building Council (SGBC) has collaborated with the Building



## EXISTING BUILDING



### SIM LIM TOWER

Building Type	Mixed Development (Retail and Office)
GFA (m <sup>2</sup> )	23,316
Before (kWh/year)	4,331,000
After (kWh/year)	3,075,000
Savings (kWh)	1,256,000
Savings (\$\$)	\$S\$251,200
Savings (%)	29%
Green Mark Award	Green Mark GoldPLUS

and Construction Authority (BCA) to develop a standard EPC template for building owners and for EPC firms to use. The EPC standard template was developed in consultations with several established EPC firms and building owners. This assists in accelerating the retrofitting process by clearly spelling out the key conditions of contract for both the building owner and the EPC firm so that the building owner can better focus on the critical deliverable in any EPC: the amount of energy savings guaranteed.

This EPC template complements BCA's Building Retrofit Energy Efficiency Financing (BREEF) scheme which offers financing to building owners, Management Corporation Strata Titles (MCSTs), Special Purpose Vehicles and EPC firms for energy efficiency retrofits.

"With this standard template, building owners can ease into building retrofit projects, allowing their buildings to become more energy efficient, with a healthier environment for their occupants. Having in place an EPC will also allow building owners to focus on other aspects of the building, knowing that the building's energy efficiency and performance are in the hands of professionals," said Chia Ngiang Hong, President of SGBC.

As buildings present a tremendous opportunity to reduce emissions and mitigate the effects of climate change, this new EPC template is part of SGBC's commitments—made on 3 December 2015 during Buildings Day at COP21 in Paris—to drive change and market transformation for Green buildings.

"As Singapore remains committed to reduce its emissions through its Intended Nationally Determined Contributions, retrofitting existing buildings through an energy performance contract can lower the carbon emissions intensity of buildings and create a more sustainable and Greener built environment," Mr Chia added.

Furthermore, in BCA's Building Energy Benchmarking Report 2015, a study on 83 existing buildings which were certified to have met the Green Mark Gold rating or higher, showed that retrofitting existing buildings could save up to \$41 million annually.

"There is a strong business case to retrofit energy-inefficient buildings. The EPC provides a market solution to help building owners achieve energy savings and it has been gaining popularity over the years. It is now timely to launch the standard template contract, putting together the best practices. We hope that this will inspire confidence in





## NGEE ANN CITY

Building Type	Mixed Development (Retail and Office)		
GFA (m²)	182,382		
Retrofit Phase	Phase 1	Phase 2	Phases 1 and 2
Before (kWh/year)	42,093,000	30,114,000	42,093,000
After (kWh/year)	32,073,000	24,101,000	24,101,000
Savings (kWh)	10,020,000	6,013,000	16,033,000
Savings (\$0.2/kWh)	S\$2,004,000	S\$1,202,600	S\$3,206,600
Savings (%)	23.8%	20%	38%
Green Mark Award	Green Mark Platinum		

building owners to make the decision to embark on energy-saving initiatives,” said John Keung, CEO of BCA.

Echoing Dr Keung’s sentiments, Lim Fatt Seng, managing director of Singapore Green Building Services (SGBS)-certified Comfort Management Pte Ltd and the project lead for the EPC template, is confident of the document’s utility to the industry, “This standard template comes at an opportune time as building owners are increasingly looking for ways to improve the efficiency of their existing buildings, especially older buildings. With this template, there will likely be a greater and faster take-up for EPC projects, which will benefit building owners, the occupants and our future generations.”

A number of older buildings in Singapore have embarked on EPC projects, and are now reaping the benefits and savings that stem from these useful retrofits. Sim Lim Tower, Ngee Ann City, Treetops Executive Residences and Samsung Hub are examples of such existing buildings that have gleaned tremendous positivity from EPCs.

Since its retrofits have been completed in March 2015 under an EPC arrangement, 36-year-old Sim Lim Tower has achieved 29 percent savings in electricity bills (excluding tenants) with average monthly energy savings of approximately 1,256,000 kWh.

- 1 Sim Lim Tower
- 2 Ngee Ann City





## TREETOPS EXECUTIVE RESIDENCES

Building Type	Serviced Apartment		
GFA (m <sup>2</sup> )	23,769		
Retrofit Phase	Phase 1	Phase 2	Phases 1 and 2
Before (kWh/year)	5,549,000	4,057,000	5,549,000
After (kWh/year)	4,057,000	2,884,000	2,884,000
Savings (kWh)	1,492,000	1,173,000	2,665,000
Savings (S\$0.2/kWh)	S\$298,400	S\$234,600	S\$533,000
Savings (%)	27%	29%	48%
Green Mark Award	Green Mark Platinum		

3 Treetops Executive Residences



## EXISTING BUILDING

Lee Ong Chun, Chairman of MCST of Sim Lim Tower, is satisfied with the results of the EPC retrofit, "The retrofit has improved our building's energy performance, efficiency and occupants' comfort. In achieving the BCA Green Mark GoldPLUS Award, the entire exercise has added value and enhanced the image of our building. The EPC firm can help to oversee the efficiency upkeep of the retrofitted works to ensure that the same efficiency is maintained at all times, hence sustaining long-term energy savings."

The 25-year-old Ngee Ann City complex, a renowned building along Orchard Road, is expected to enjoy estimated energy savings amounting to more than 20 percent of the electricity bills (excluding tenants) or equivalent to more than 6 million kWh per year through its energy efficiency retrofits. Eric Chan, General Manager of Ngee Ann Property Management Pte Ltd, said, "Under the EPC, energy savings generated will be sufficient to pay for these retrofits over the term of the contract. After the contract ends, we will still continue to enjoy energy savings and at the same time, be able to do our part to protect the environment by reducing our carbon footprint. The retrofits also enhance the building asset in terms of its value. Any prospective buyer is willing to pay more for an energy-efficient building as the operating expenses will be kept to a minimum."

Similarly, Treetops Executive Residences, a 16-year-old Green Mark Platinum-certified residential building, has reaped energy savings of 48 percent after its retrofit. "By having an EPC with a professional vendor, the energy savings and measures that have been proposed can be constantly measured and guaranteed," said Tay Hock Soon, General Manager of Treetops Executive Residences. "The team can also give professional advice on how the targets can be achieved and ensure that the improvement in energy efficiency is sustained in the long term even upon completion of the retrofits. As the expert in this area, the EPC firm can also advise on new and better Green initiatives that tap on the latest technology advancements to push for greater sustainability. This Green retrofit has also helped us to anchor our brand position as an eco-friendly building in an increasingly competitive market."

Samsung Hub, a 10-year-old commercial property along Church Street, has managed to reduce its annual energy consumption by 2 million kWh after implementing an EPC. This was achieved through the replacement of existing chillers and the installation of other energy-efficient works proposed by the EPC firm after the initial baseline study.

According to Samsung Hub, the EPC firm scoped an attractive annual energy savings quantum of \$467,000, representing 38 percent of the building's total energy consumption and has undertaken to invest \$2 million to upgrade the chilled water plant and the lighting with a guaranteed share of savings for the building management. Through this project, Samsung Hub was recognised for its emphasis on sustainability and was certified GoldPLUS under the BCA Green Mark Scheme.

The standard template EPC will be available for purchase from SGBC in early 2016. EPC firms certified under SGBC's SGBS labelling scheme will also use this contract in their EPC projects.



### SAMSUNG HUB

<b>Building Type</b>	Office
<b>GFA (m<sup>2</sup>)</b>	35,166
<b>Before (kWh/year)</b>	5,152,000
<b>After (kWh/year)</b>	3,189,000
<b>Savings (kWh)</b>	1,963,000
<b>Savings (\$\$)</b>	S\$467,000
<b>Savings (%)</b>	38%
<b>Green Mark Award</b>	Green Mark GoldPLUS



# BCA-SGBC-SIA

## International Tropical Architecture Design Competition 2016 for Institutes of Higher Learning

### ABOUT

The International Tropical Architecture Design (ITAD) Competition is focused on tropical green architecture and sustainable building design solutions. It is open to architecture students from institutes of higher learning and aims to nurture future architects and leaders in tropical green building designs and to promote awareness of the need for sustainable living in the region.

The ITAD Competition allows students to explore the vast realms of knowledge revolving around sustainability, and also provides a platform for them to showcase their innovative sustainable ideas, encouraging them to become the green leaders of tomorrow in the process.

### WHEN

April	Registration of Interest
July	Deadline for Submission of Works
Aug	Preliminary Judging
Early Sept	Final Judging & Award Ceremony

### PRIZES

1<sup>st</sup> Prize: SGD\$5,000  
2<sup>nd</sup> Prize: SGD\$3,000  
3<sup>rd</sup> Prize: SGD\$2,000  
Merit (X2): SGD\$800

5 finalists will be invited to Singapore to present their works at the Final Judging and attend the International Green Building Conference. Flight and accommodation will be covered for one representative per team.



Winners of ITAD 2015 visiting Khoo Teck Puat Hospital, a Green Mark Platinum Project



Winners of ITAD 2015 with BCA Senior Management at the Awards Ceremony at International Green Building Conference

For more information, please visit our website at [www.itadcompetition.sg](http://www.itadcompetition.sg)

For sponsorship opportunities, please kindly contact Mr Darren Lee at [Darren\\_Lee@bca.gov.sg](mailto:Darren_Lee@bca.gov.sg), 6804 4668 Ms Lor Li Qi at [Lor\\_Li\\_Qi@bca.gov.sg](mailto:Lor_Li_Qi@bca.gov.sg), 6804 4663

Jointly organised by:

Building and Construction Authority







# DSM — BRIGHT SCIENCE, BRIGHTER LIVING

Royal DSM is a global science-based company active in health, nutrition and materials. In the design and construction of their Asia Pacific Nutrition Innovation Centre premises at Mapletree Business City, DSM's ONE DSM Culture Agenda was the key guideline. The new office space promises to bring to life DSM's Culture Agenda with forward-looking strategies for the working and collaboration private areas.

Upon entering DSM's new office space officially opened in 2015, employees and visitors are welcomed by the flow of natural sunlight filling up the entrance, creating a sense of spaciousness and openness at the reception area. The full-length windows allow for an unobstructed view of the Tanjong Pagar port. The entrance is a dynamic expression designed to convey DSM's brand promise: Bright Science. Brighter Living; the promise of ground-breaking, life-changing scientific advances for the benefit of people today and for generations to come.

A core visual element of organic and fluid ambient lighting is carried throughout the floor plan to reinforce this brand story. It encapsulates and expresses the unique combinations of different competencies, technologies and talents that work well together to create innovative and sustainable solutions. In addition, the rich colour palette used represents a company that is bright and optimistic, innovative and collaborative, trusted and committed, and one which makes a positive difference to people's lives.

Across the entire floor plate, the 'heart' of the office will emerge as a landscape that will nurture and facilitate the notion of a new everyday lifestyle for staff at work as well as to facilitate a 'city' within the office. As the nucleus from which both circulation and activity are dispersed from, the 'heart' will promote a greater sense of connectivity, symbolic of a unified business and providing settings for collaboration, interaction and customer engagement.



### VISUAL PRESENCE

In particular, the Nutrition Innovation Centre, a co-creation hub, is designed with customer brand centricity in mind. Customised spaces for baking/confectionery, beverage/dairy and sensory food tasting laboratories create a memorable experience for visitors and customers.

As staff and visitors travel along the public streets that circulate along the laboratories, the DSM branding is unveiled to them in the form of visual identification and physical product displays. These integrated design elements allow for customisation of the spatial experience for customers to feel special and part of the co-creation process.

### INCLUSION AND DIVERSITY

The design team from SCA Design (a part of the ONG&ONG Group) has recognised DSM's need for their staff to accomplish a wide spectrum ranging from 'I' work to 'We' work. They have catered for a range of spaces within the general office area to support focused tasks, collaboration, socialising and learning. The minimisation of assigned work spaces and increased shared facilities in various

configurations allow staff the freedom to conduct activities such as individual assignments, one-on-one meetings, brainstorming or team discussions, and even large-scale town hall events. Modern creative processes have created a paradigm shift in the design and usage of space, and the 40,000 square feet of facilities at DSM have been designed with this in mind.

Extensive hot desking facilities are provided within the open-plan office layout. The proportions of assigned and shared spaces were configured to optimise space productivity. In place of individual storage space, space-saving compactors were also utilised. The combined impact of these space optimisation approaches is an office that is able to comfortably accommodate large numbers of staff and visitors that DSM expects daily, while avoiding the sense of claustrophobia so prevalent in land-scarce Singapore.

- 2 Customised spaces for the laboratories create a memorable experience for visitors and customers
- 3 Soundproofed meeting room
- 4 Corridor in the office







3



4









### SUSTAINABLE CONSTRUCTION METHODOLOGY

The construction of the office itself was also subjected to stringent waste recycling methods. Utilising sound sustainable construction methodology, the builders from Facility Link—a fit-out specialist in sustainable interior construction—ensured that as much waste was recycled as possible, and that critical installations were protected from contamination throughout the construction process.

Sustainable construction products were used, including paints and adhesives with low volatile organic compounds (VOCs), sustainable drywalls and ceiling boards, as well as other necessary products that contain over 30 percent of recycled content.

Once the DSM office has been opened for operation, recycling receptacles are strategically placed throughout the office to ensure that plastic, metal and paper wastes are separated from general waste.

### INDOOR ENVIRONMENTAL QUALITY

Indoor air quality, lighting, temperature and noise levels play a significant part towards maintaining the comfort of occupants.

Indoor contaminants and environmental comfort are also controlled, with usage of products certified by the Singapore Green Building Product (SGBP) labelling scheme, such as Rockwool ThermalRock S40 insulation (SGBP✓✓) and Interface GlasBac (SGBP✓✓) carpet tiles. Both products have been certified for their low VOC content, which can prove harmful to human health if used in excess. In addition, environmentally friendly products such as dishwashing liquids, stationery, janitorial paper and printing paper are

used to ensure minimal impact on the environment, both within and beyond the office.

The stroboscopic flickering that is common in fluorescent lighting is a thing of the past. Only high-frequency ballasts are used for all fluorescent light installations, ensuring that the lighting levels are comfortable for prolonged work.

In the area of noise control, acoustic experts were engaged to determine the acoustic sweet spot for sound systems, and built-in walls were constructed to cut through the floors and ceilings to provide better soundproofing, especially in phone booths and meeting rooms.

### OFFICE GREENERY

With easy access to the roof garden at Mapletree Business City, DSM occupants are never far from nature. Within the premises, indoor planters and potted plants take up more than 2 percent of the office area, creating a lush, productive work environment.

### ENERGY EFFICIENCY

Poor energy efficiency is often the bane of sustainability in corporate offices. Air-conditioning in Singapore's temperate climate, inefficient lighting layouts and modern office equipment such as computers and laptops add up significantly to the consumption of energy within the office.

The adoption of energy-efficient Heating Ventilation and Air-Conditioning (HVAC) control systems supplied by the Mapletree Business City building (itself a Green Mark Platinum building), zoned lighting and air-conditioning, Building Management System (BMS) controlled lighting schedules, perimeter photocell sensors and Energy-Star

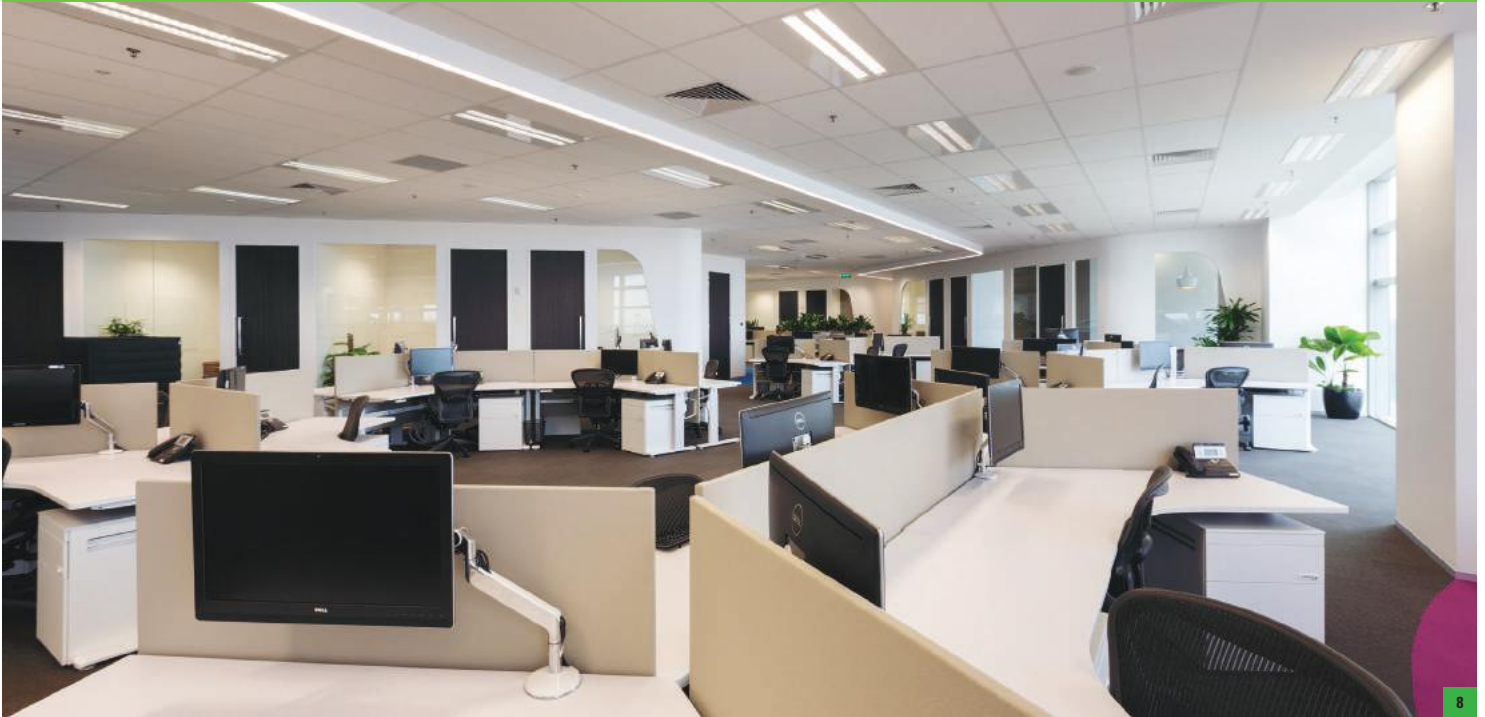
5 Full-length window allows for an unobstructed view of the exterior

6 Rooms in the office have been provided with wireless presentation functionalities, and a reduction of carbon footprint is achieved with virtual conferencing.

7 Indoor planters and potted plants create a lush, productive work environment







rated equipment all contribute to the highly improved energy efficiency of DSM's premises.

### WATER EFFICIENCY

A water efficiency improvement plan was introduced, committing to a three-year strategy of actively encouraging water efficiency in all operations. A meter tracking all water usage is made available for monthly collation of results for analysis.

### SEAMLESS INTEGRATION

Rooms in the DSM office have been provided with wireless presentation functionalities, allowing for total connectivity between users and digital content. Each display is linked to the system and allows every participant in each session to connect their laptop, tablet or phone to project and share content.

A reduction of carbon footprint is achieved for DSM's regional network of offices, clients and vendors with virtual conferencing. Remote participants connect in each session, allowing for greater ease of knowledge transfer and collaborative work. Linked with the perimeter screens, external participants can be connected easily and clearly into any co-creation session within the room.

### SUSTAINABLE OFFICE OPERATIONS

DSM's Environmental Policy for office operations was implemented, and a Green User Guide was distributed to

ensure that sustainable methods of using the premises were communicated to all staff. For the Green emphasis and focus placed on their office premises, DSM's Asia Pacific Nutrition Innovation Centre has been certified Platinum under the BCA Green Mark Scheme for Office Interiors since July 2015.

DSM's emphasis on sustainability has also made inroads, having won the 2014 Singapore Sustainability Awards under the prestigious Sustainable Business Award category. Globally, DSM has consistently topped the Dow Jones Sustainability Index for the global chemical industry since 2003.

In addition, ECO+ is DSM's programme for the development of sustainable, innovative products and solutions with ecological benefits. People+ is DSM's programme to develop solutions that measurably improve the lives of consumers, employees and communities across the value chains.

#### ID Concept Designer

SCA Design (a part of the ONG&ONG Group)

#### ID Contractor

Facility Link Pte Ltd

#### Images/Photos

Royal DSM; Facility Link Pte Ltd

<sup>8</sup> Extensive hot desking facilities are provided within the open-plan office layout

<sup>9</sup> The design team has catered for a range of spaces within the general office area to support focused tasks, collaboration, socialising and learning

<sup>10</sup> Energy-efficient HVAC control systems, zoned lighting and air-conditioning, BMS controlled lighting schedules, perimeter photocell sensors and Energy-Star rated equipment all contribute to the highly improved energy efficiency of DSM's premises





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# IMPROVING ENVIRONMENTAL PROTECTION — CHANGES TO ISO 14001:2015

As the global opinion steadily shifts in favour of environment sustainability to mitigate the effects of climate change, environment management systems (EMS) are increasingly utilised by corporations to achieve their sustainability objectives. In its simplest sense, EMS is the administration of an organisation's environmental programmes in a sustained, inclusive and systematic manner. This encompasses the full scope of work including organisational structure, development, implementation and maintenance of policies or programmes for environmental protection.

To maintain parity across the myriad of EMS programmes employed by corporations all over the world, the International Standards Organisation (ISO) established ISO 14001 as an internationally recognised guideline specifying the requirements of an EMS. Able to be utilised by any company regardless of size, type or nature, ISO 14001 is applicable to the environmental aspects of a company's activities, products and/or services. Specific environmental criteria, however, are not listed in ISO 14001.



In 2015, several changes were made to ISO 14001, captured in the new ISO 14001:2015. The changes reflect the dynamic nature of the business landscape, including and/or excluding clauses to strengthen the value and practical usage of the ISO certification.

## **STRATEGIC ENVIRONMENTAL MANAGEMENT**

A new requirement that recognises the organisation's context in the community has been added to identify and leverage on opportunities that can be of benefit to both the organisation and the environment. The onus is on issues or changing circumstances related to the needs and expectations of key stakeholders as well as on local, regional or global environmental conditions that can affect or be affected by the organisation.

## **LEADERSHIP**

A new clause has been added to allot specific responsibilities to those holding key management positions in order to improve environmental management across the organisation.

## **PROTECTING THE ENVIRONMENT**

Although ISO 14001:2015 does not spell out the definition of protecting the environment, it does include examples such as pollution prevention, sustainable use of resources, and mitigation of climate change, biodiversity and ecosystem protection.

## **LIFE CYCLE PERSPECTIVE**

ISO 14001 addresses the need to ensure that environmental aspects associated with goods and services procured

must conform to specific requirements. In ISO 14001:2015, organisations will need to expand this scope to encompass each stage of the product's entire life cycle from acquisition of raw materials to its disposal.

## **OUTSOURCED PROCESSES**

Organisations now have to take control or exert influence over any processes outsourced to other companies.

## **COMMUNICATION**

Emphasis on internal and external communication has been added in the new ISO 14001:2015. The communications strategy requires the organisation to transmit consistent and reliable information, as well as establish feedback mechanisms for personnel within the organisation to suggest improvements to the EMS. Organisations must also take into consideration the required information needed for reporting to regulatory bodies and/or other interested parties.

## **DOCUMENTATION**

With the advent of information technology and cloud-based management systems, this new revision uses terminology referring to documents and records as "documented information" instead of the older "records" and "documents" to acknowledge advancements in record-keeping practices. In alignment with ISO 9001, the organisation can decide when to implement "procedures" to ensure effective process control.

Implementing an EMS in your organisation will serve a number of key purposes, geared towards environmental protection and







sustainability. Users of ISO 14001 have indicated the following benefits:

- Demonstrates the company's compliance with current and future statutory requirements.
- Increases the involvement level of top management as well as raises the engagement levels of employees.
- Company's reputation and stakeholder confidence will improve with the use of sound, strategic communication.
- Strategic business aims can be achieved by incorporating environmental issues into business management.
- Provides competitive and financial advantages through improved efficiencies and reduced costs.
- Better environmental performance by suppliers is also encouraged as they are integrated into the organisation's business systems.

"ISO 14001 certification is the proof of a company's commitment to reduce environmental impacts, and has also become an important customer requirement," said Dr Song Bin, Chairman of the National Technical Committee for Environmental Management, "The updated standard is an opportunity for our companies to integrate environmental performance with bottom-line and top-line improvements for value creation and competitiveness."





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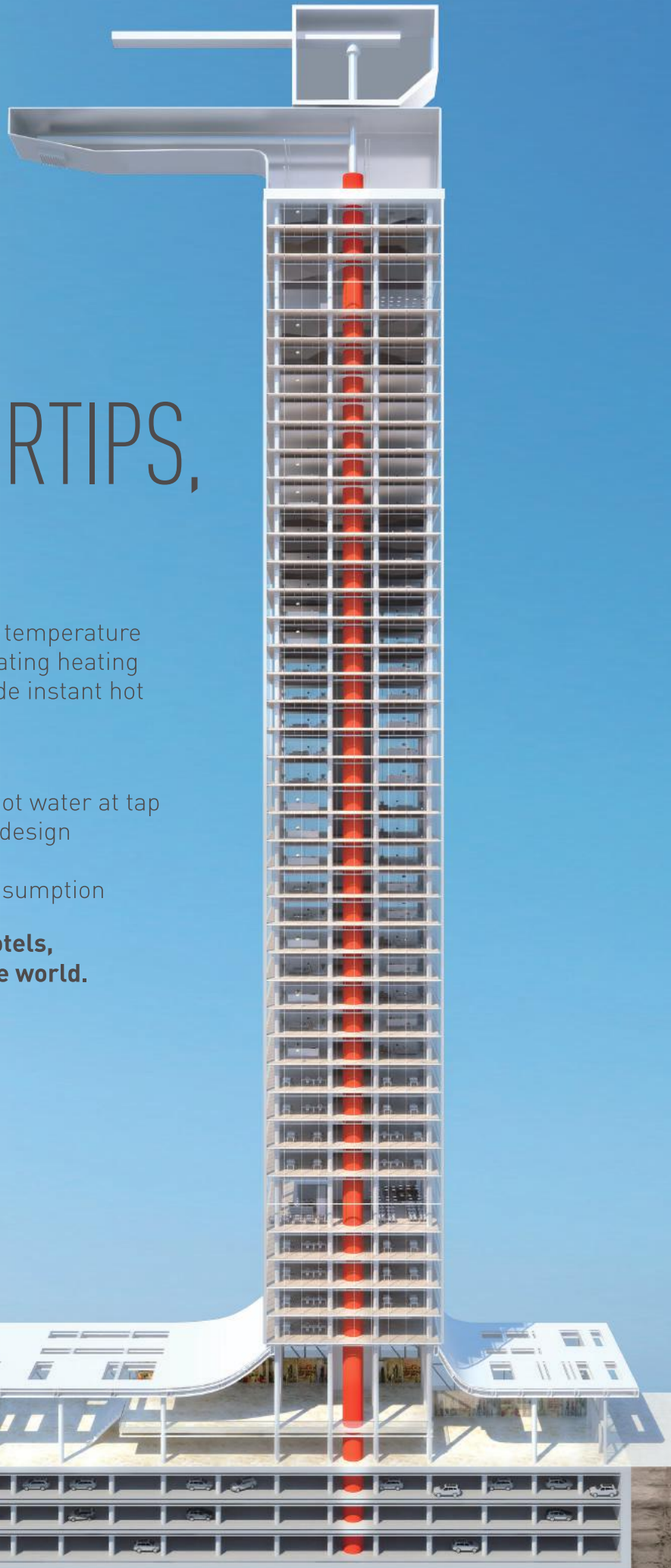
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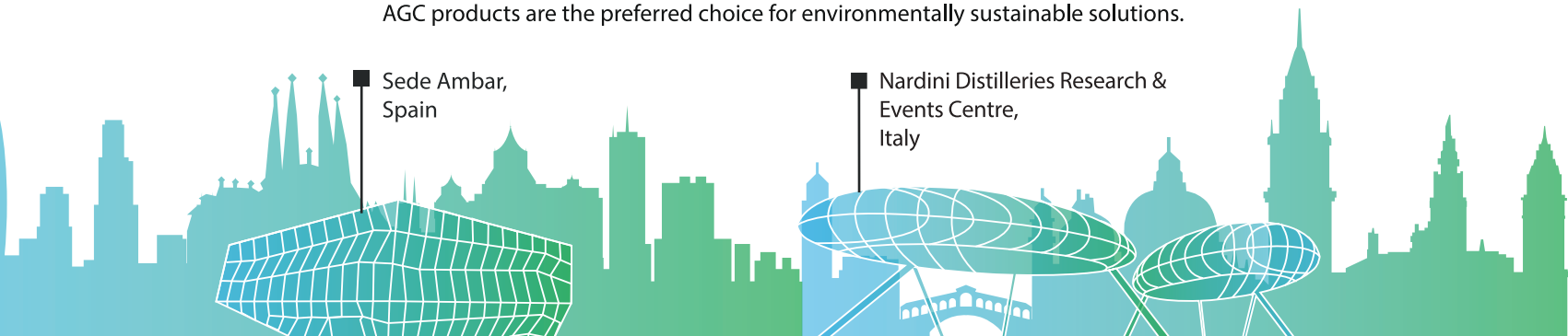
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