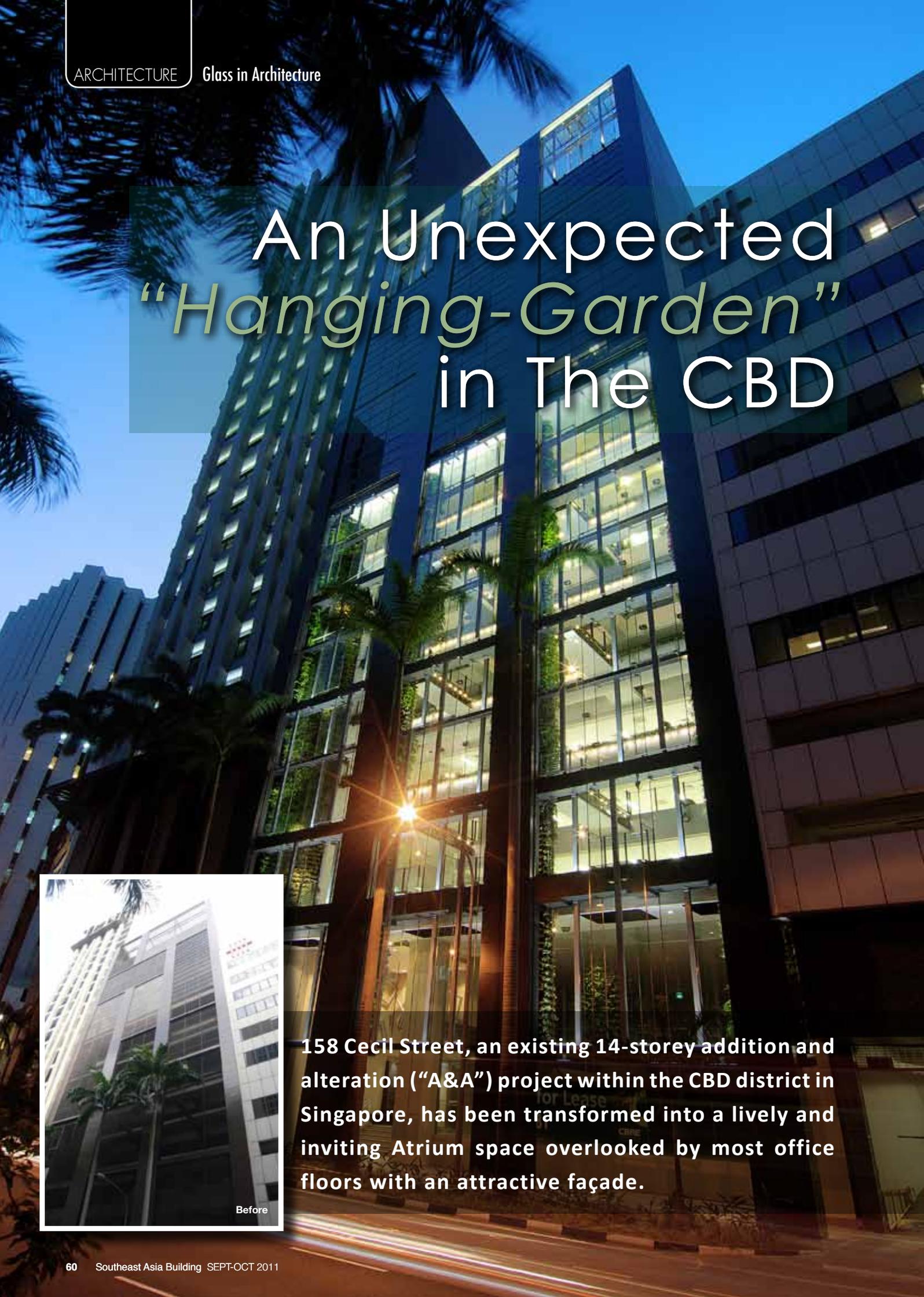


An Unexpected *“Hanging-Garden”* in The CBD



158 Cecil Street, an existing 14-storey addition and alteration (“A&A”) project within the CBD district in Singapore, has been transformed into a lively and inviting Atrium space overlooked by most office floors with an attractive façade.



The building was 10 storeys and designed to be environmentally responsive with floor plates reseeding inwards approximately 1.5 metres. Starting from L4 to L9 external RC Planters spanning 24 metres across the face of the building provided further shading to the building envelope.

Developments

Through commercial activities over the years, the latest “amendment and alterations” (“A&A”), maximised allowable Gross Floor Areas (GFA) with additional 54,000 square feet of floor space. These new floors on Levels 11 to 14 are supported by a new 1.5 storey high transfer-floor structure spanning over 40 metres across depth of the building’s floor plate. A new façade (on Cecil Street) resulted an external recessed “Atrium” juxtaposed against existing reseeding floor plates.

Despite the just completed open-façade using expanded & BRC/“chicken-wire” mesh satisfied local Fire Authority requirements, aesthetically it did meet the new Owner’s expectations.

As an “A&A to a completed A&A” project, the design team at AgFacadesign was challenged to provide solutions to achieve the following that formed the “Project Brief”;

- i) Façade Treatment - to provide a “timeless” design that is “contemporary and Inviting”
- ii) “Internal Atrium” space - to create a lively and pleasant environment for Tenants Overlooking in.

Approach

i) The Façade

The primary objective was to maintain the “Atrium” as an “external space” without the need for any fire fighting provisions like; sprinklers, smoke detectors or fans etc. the façade must be naturally ventilated. Although the existing “mesh façade” provided the natural ventilation, to do this with glass (ie non porous) is the “wrong choice of material” from the Fire Department’s perspective, which rejected it outright despite “no objection” by other Authorities and after the project commencement!

With this “limitation”, the Architect provided a creative solution with alternating glass spaced apart. To “justify” the concept, smoke control studies by fire specialist, IGnesis Consultants were consulted to demonstrate the innovative facade design would provide the required “free area” in event of fire, which finally got clearance from the Fire Department.

“Layered-façade” was created with gaps between staggered full-height glass sheets like “transparent wings” clipped onto sides of mullions provided the “free areas”. The gaps are permanently “opened” allowing natural ventilation.

ii) The “Atrium”

Enclosed by “mesh-façade”, the space appeared “cell like” provided stark and unpleasant views. The existing (disused) planters topped-up with concrete appeared like heavy RC beams across the glazed full height windows obstructed views. The entire Atrium space, painted dark Brown, created a very uninviting atmosphere.

The Architect’s main task was to transform it into a lively and stimulating space.

“A “Hanging Garden” concept was instantly thought of and to “induce life”, the Architects felt the space needed to be “visually and physically interactive” within the Atrium and presented the design which the Client said of the visuals. “The elements are sensitively integrated and



transformed from negative to positive features,” said Mr Kelvin Kan, Principal Architect & Façade Consultant of AgFacadesign, Singapore.

The end result provided a lively environment with “refreshing views” from any angle on every floor overlooking the Atrium.

Horizontally “Hanging-garden” was created by reinstating the existing disused RC Planters with “money-plant” draping over the expanded mesh (recycled from previous façade) along the edges and plants drooping from the newly created “Walkway-Planters” on either sides camouflaging the existing RC “fly-beams”.

“Vertical greening” to existing unsightly end-walls and columns in the form of “Green-Walls” and “Green-Columns” respectively were seamlessly integrated into the design concealing the uneven walls and stark columns.

Reinforcing the concept of vertical greening, “Green-columns” planting were extended to Level 2 to create a “dialogue” with Pavement walkway users where plants appear to be “penetrating” through glass floor panels strategically placed on Level 3.

The inside face of each existing structural columns from Level 2 to Level 9 on either ends of the building were covered with “green walls”, transforming the atrium into vertical gardens - a festoon of potted plants. The “green walls” combined landscape elements with building technology to create walls of strikingly bold architectural landscape both during the day and night. Specially designed lighting system offers not only display lighting effects during the night but also practical lighting for sustaining the walls of green during the day. The engineered light-frame structural system for the potted plants, neatly house all plumbing lines for irrigation and runoff from the drip irrigation system. Catwalks were camouflaged with more tray planters so as to allow ease of maintenance and enhance the indoor environment!



Before



Before





Integrating “Hanging Gardens” with Façade Design

With no horizontal landscape area within the building but only for the existing half-round planters stretching across the 7-storeys high atrium, the architect conceived the idea of a “Hanging Garden” within the existing architectural void with the design of a “Layered-glass” façade.

The challenge was how to provide the “natural elements” that are essential for plants’ survival.

“The “Layered-Façade” idea was developed to provide void spaces between the glass panels. These panels clipped onto the mullion are spaced 900mm apart with the same modules on adjacent bays and alternating on every floor enables ventilation and rain to drizzle through,” said Mr Kan.

Two 7-storeys high Green-Walls are located on either ends of the Atrium with two intermediate “Green-Columns” stretching from Level 2 to Level 10. A total of 13,000 pots of plants were mounted onto metal frames. Every pot of plant is fed by water tanks located at Level 10 through individual drip tubes via an automated irrigation system. Access for maintenance is provided via concealed platforms and ladder behind the Green Columns-Walls.

Maintenance access to all plants, for existing RC Planters and the new Maintenance Walkways built over existing the RC “flying-beams”, are either through recessed walkways or hinged-grating covers respectively.

As the Atrium faces the East has limited sunlight during the day,

artificial “growth-lights” were strategically mounted to supplement optimum lighting to all plants. By night, architectural-accent lights transform the reflective glass (by day) into a glowing lantern of “Hanging-garden” clearly visible through the layered glass façade by night.

Integrating “Sky-rise greenery architecture” into existing building

Architecture Planning:

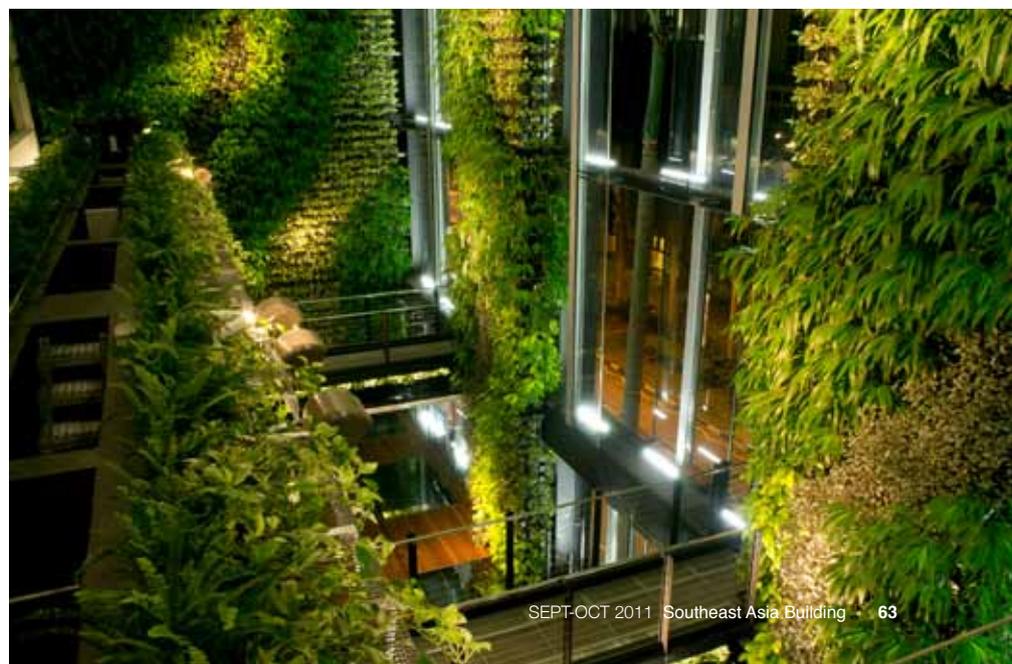
Within the Atrium’s confined space, the aim was not to add elements that would cluster up and make the space appear “smaller”. All existing elements that were “hard and uninviting” were transformed into “soft and attractive” features such as;

- Uneven end-wall converted to 7-storeys high feature “Green-Wall”
- Obtrusive Columns to pleasing “Green-Columns”
- RC Planters reinstated to create “Hanging-gardens”
- RC “fly-beams” converted to “Walkway Planters” for maintenance to reinforce the “Hanging-garden” concept.
- “Inclined Green-Wall” introduced created to conceal visible M&E services from street level

“Space Planning” Design

Juxtaposing a series of existing elements with seamlessly integrated features provided a “Visual and spatial connectivity”;

- Walkway planters extending towards the façade concealing existing RC “Fly-beams” as maintenance “sky-walks”.
- Existing platforms extended for maintenance with end-planters added to provide new perspective views across Atrium
- Glass floor panels on Level 3 provided “visual” connectivity to Pavement and road levels below





Before



Designing the Layered Façade

With detail knowledge in glass technology and façade design, the architect designed the unique façade system with two glass panels “clipped” to a mullion. Like a pair of “transparent wings” each module is placed in an “IN/OUT” arrangement alternating each module to provide the 900mm “void” between them.

The following elements form the “Layered-Façade” assembly:

- Steel mullions fixed off the edge of RC beams (or welded onto RHS beams on alternative floors).
- Laminated full-height glass panels with s/steel angles protection to exposed edges.
- Structural sealant to glass panels concealed within recessed space of mullion with s/steel channel bolted onto the steel I-mullion.
- Dead load support provided at base of glass via cantilever brackets with s/steel clamps and dead load ledge within steel mullion.
- Live Load restraints from the s/steel clamp plates at top and bottom edges of glass panels.

- Movements in X, Y and Z directions designed to ease installation and site tolerance.

Construction Methods and Planning

Working on a tight four-month construction programme the following were adopted to meet project requirements;

- Demolition of 7-storeys high RC wall - power saw cut used to minimise noise and dust as the building was tenanted within built-up downtown area.
- Pre-fabrication works used for steel members with minimal site welding for speed, QC and site constraints.
- Finishes to steel were sand blasted & pre-finished with epoxy paint to reduce site painting.
- Façade glasses pre-assembled in factory for QC control, delivered in batches and sequenced for immediate installation.
- Glass façade brackets and framings re-developed based on Architect’s concept and pre-fabricated.



Before



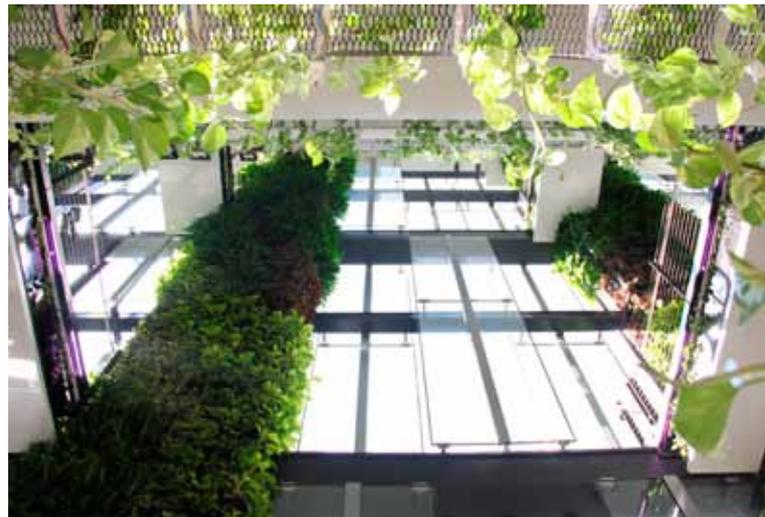


The project team for 158 Cecil Street. From left to right: Victor Tan (MC), Colleen Wu (NSC), Sia Peng Peng (Client), Yeo Seow Bon (Civil Engr), Kelvin Kan (Architect), Rajan (Landscape Consultant), Faradilla Zakaria (Architect), David Gan (MC), and Patrick Lai (MC).

Biodiversity & Sustainability

Although not intended, shortly after completion, birds, butterflies and dragonflies became frequent “guests” to the “Hanging-garden” creating a pleasant sight and environment. A bird nest was also formed but (sadly) had to be removed for safety and health reasons. Mesh from “existing” façade was recycled into “ledges” to all the RC Planter troughs to enhance the “Hanging-garden” effect. Auto irrigation and gravity fed drip tubes to every pot plants minimizes water consumption.

On completion of the project, the Client wrote to Kelvin: “Buying beautiful buildings is easy. Developing beautiful assets has its challenges. But turning ugly ducklings into something that we can all admire is probably the most difficult of all. Your involvement has made the critical difference, not just in the design but also getting it executed including the arduous task of convincing the authorities.”



PROJECT DATA

LOCATION: 158 Cecil Street, Singapore

CLIENT: Alpha Investment Partners Limited, Singapore

ARCHITECTURE FIRM: AgFacadesign, Singapore

PRINCIPAL ARCHITECT & FAÇADE CONSULTANT: Kelvin Kan, RIBA, MSIA

LANDSCAPE CONSULTANT: Tierra Design (S) Pte Ltd, Singapore

QUANTITY SURVEYOR: Northcroft Lim Consultants Pte Ltd, Singapore

STRUCTURAL ENGINEER: KKLim & Associates Pte Ltd, Singapore

M&E ENGINEER: EMPlus Pte Ltd, Singapore

MAIN CONTRACTOR: Lai Yew Seng (LYS) Pte Ltd, Singapore

GREEN-WALL CONTRACTOR: LYS / Consis Engineering Pte Ltd, Singapore

LIGHTING SUPPLIER: LYS / Illum-Tec Pte Ltd / Fabulux, Singapore

COMPLETION DATE: 25 February 2011

PHOTOS: Amir Sultan / Ben Kan / Faradilla Zakaria / Kelvin Kan