**ECOLOGICALLY - DESIGNED RETAIL AND COMMERCIAL BUILDING**

**PUTRAJAYA, MALAYSIA**

**Introduction**

As the Federal Administrative Centre, Putrajaya is to be a "City in Garden." Putrajaya will be a city that focuses on the concept of a holistic and sustainable development, the creation of a city that would balance the needs of a vibrant, urban economy with the needs of a group population, and at the same time incorporating an environment that would ensure the best services and quality of the people. The development for Lot 203 Precinct 2 follows the concept of Putrajaya where this proposal will incorporate the nature and state of the art technology to create a "Garden City" concept appealing to both large multinational corporations and local government occupancy.

**Project Brief**

Putrajaya Lot 203 is a 14-storey flagship commercial hub located along the Malaysian capital city of Putrajaya's Main Boulevard.

The project is a commercial development with premium retail areas on ground floor, and commercial office spaces with ancillary facilities for example administration offices, centralized reception lobby, individual drop-off areas and sky garden with pedestrian bridge that links both tower. The project is designed to be a green commercial building that integrated with the theme of Putrajaya city which is "City in A Garden" and as well as to response to the client's requirement which include office and retail spaces as an anchor project to the overall commercial district in Precinct 2.

The façades of Lot 203 development are designed with responsive vertical glass sunshading that is arranged in accordance to different sun angles, with traditional sunken patterned ceramic fitting which acts as a buildingEnvelope. In between the glass sunshading, there are strips of open brackets for increased visual experience and site of horizontal glass sunshading. The glazing of the building uses a high performance glass by way to filter the light and heat transience into the building, and improve the overall indoor air quality. The cavity between the glazing wall and the sunshading acts as heat insulators all round the building, as well as to reduce internal and screen any external elements. This also helps lessen the building's contribution to the heat island effect when forest is replaced with concrete and asphalt, causing urban centres to become warmer than nature areas.

**Site Plan**

*Planning Tabulation*

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*Building shown in relation to the Millennium Monument*
A Jewel: Sustainable Commercial Development

As the flagship project of Putrajaya’s mixed development district (Project 2), the primary design objective is to create a self-sustaining economic development village of living, working, and leisure within the mixed-use development. The landmark building stands as an ecological, resource-efficient and sustainable certified project with the potential to integrate the surrounding urban fabric and public realm. The design pays homage to the central axis of the Dataran Merdeka, the New City Mall, and the National Mosque, amongst other influences from the 1960s to 70s.

Architecture Features

The proposed design is conceived as a jewel within Putrajaya, reflecting the structure’s unique location and function. The building is a mix of office, retail, and residential spaces. The design is inspired by the traditional Malay ‘pandan’ leaf, which is also the inspiration for the façade. The function of the building is commercial retail and public activities along the multi-level 15.xm commercial building. The central atrium between the Dataran Merdeka Putrajaya Boulevard levitates the Commercial Building towards the National Mosque from the Boulevard.

Vehicular Entry Drop-off

The individual vehicular drop-off for the two blocks improves the overall wayfinding. The visitors arrive at a 4-storey high volume of covered porte cochere, which opens up to a triangular-shaped entrance lobby, with vegetated green walls through a landscaped plaza and atrium space between the 2 building blocks. The building’s landscaped roof top and green courtyards induces the building and reduces ‘heat island effect’ onto the surrounding environment. Light and ventilation is brought into the basement car parking floors through the ‘loco-cells’, which are light-wells within the courtyared spaces, to reduce reliance on mechanical systems and artificial lighting in the basements. We proposed that the building is to be a green building.

Lift Core

The lift access to the lift lobbies is centred on the drop-off level for increased security, control, and better wayfinding.

Facade Brick Painted Glass panels with concealed LED lights

Natural ventilation

Locally grained flooring

Landscape

The landscape concept is designed as an oasis in Putrajaya, with lush forestry plantings, water features, covered walkways and seating areas.

Rainwater Harvesting

Using innovative rainwater harvesting system for high velocity surface runoff, a collection transfer tank is situated at basement level. This tank is then used as the reservoir for the water. The collected rainwater is filtered and then pumped into the Pumps that store the rainwater and is then used for the water requirement for the Vagabond Hotel and Green House.

Glass Sun-shading with Patterned Ceramic Fitting

All office areas, including the roof top, are shaded from direct sunlight and the green roof itself is a cooling mechanism for the building.

Roof Garden

For rainwater harvesting and reduction of heat island effect. Solar blanket covers the roof top, and concrete roof valley, with additional insulation on the roof. Green roof insulates heat from the sun enhancing the comfort level of the building interiors and energy minimizing energy usage for cooling the building.

Renewable Energy

The building is designed to be powered by rooftop solar panels which are to be installed to generate 1.5MW of power per year, with a 20-year lease agreement for a guaranteed power purchase agreement.

Lighting

Lighting strategies are to be high efficient LED lighting to reduce energy consumption of lighting. The design promotes the use of natural light where possible to reduce energy consumption of lighting.

Life and Facilitates

Life is to be as CCTV-verified Geometric Motors with Synchronous Motors with Permanent Magnet. The lift is to be fitted with detection sensors, Sleep mode and energy saving lighting fittings.

Green Building Index Rating

Targeted 5 Star Gold

PROJECT BRIEF

2/7
Innovation & Transferrability

The let 2CS project is a green commercial project. The physical building and facade forms are shaped in full compliance with the Detailed Urban Design Guidelines for Putrajaya Corporation.

The external facade is a performance glass sunshade. Two layers of clear glass sunshade creates an air gap between the sunshade and the internal glazing to diffuse the heat radiation into the internal office spaces, and reduce the glare while maintaining maximum visual appreciation to the external surroundings. The selection of glass sunshade and the internal glazing passes the DTT (Overall Thermal Transfer Value) requirements for LEEDS and Green Building Index (GBI).

The horizontal ceramic tiles impart an edge to the glass in the shape of traditional and cultural ‘bengkel’ patterns in a secondary sunshade properties, as well as creating visual skin patterns for the entire building.

As a majority of the building orientation faces the east and west sun angle, the building orientation dictates the optimization of the sunshade design. The general areas will be covered with horizontal glazed sunshading and shaded areas facing North West and South East incorporates vertical glass sunshade.

Part of the sustainable design and construction is to achieve buildability and stages of construction works successfully. Various methods are used for gravity areas (e.g. staircases, hll toilets, corridors, floors), the integrated Building System (IBS) is incorporated to multiple the production of the structures of site, which reduces the environmental impact in energy usage on-site and offset the overall construction period and manpower.

The floor finishes combines the local granites tiles (with multiple choices of colors (rough textured) for common usage with anti-slip facilities) with tiling areas to create contrasts at the Central Promenade.

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Primary protection areas will use more durable 12mm thick granite to allow for heavy traffic, and the occasional building maintenance vehicles and fire engines (in case of emergency). The secondary areas will be used for additional footpaths, and opportunity for heavy landscape garden to assist and collect excess rainwater at the Central Promenade.

The link bridge should provide a distinctive visual area from the Dataran Wawasan to the National Monument. This link bridge is designed to maintain a clean, minimalist design details with glass railings, as the pedestrians on the bridge will walk within and above the volume of canopies of the trees at the Central Promenade, and able to touch the trees to appreciate the flora and fauna as part of the sustainable and deep green design.

Tenancy Options on Typical Floor Level

Innovative Contributions to discipline of Architecture, urban and environmental engineering and other related fields pertaining to construction

The retail at Level 1 connects to the street pavilions along the Putrajaya Boulevard. Extended retail with alfresco dining, an landscaped terraces adds to the public realm and enhances to stimulate an active public participation.

Construction Technology

BIM Model

BUILDING INFORMATION MODELING (BIM) is the label for a body of applied and integrated software applications that produce the various building materials,忐忑, sub-assemblies, and assemblies into a 3-D Model whole building, together with associated attributes and data for all such materials, etc. into a database.

The following diagram helps illustrate how a variety of building data: Sunshading applied to the model with data being generated, calculated, and visualized for new construction, building management purposes.

Industrialised Building System (IBS) is a technique of construction whereby components are manufactured in a controlled environment, either at site or off site, and transported, positioned and assembled into construction works.

Test the retail at Let will connect to the street level along the Putrajaya Boulevard. Extended retail with alfresco dining, an landscaped terraces adds to the public realm and enhance to stimulate an active public participation.

Green panel is a highly compressed autoclaved aerated cement flat sheet material panel finish. The panel is UV resistant, non-combustible, non-corrosive and rain tight. The coating is double UV Coated and anti-static and has self cleaning properties with eco-friendly properties. The system incorporates an open ventilation system for energy efficiency and climate control.

Volumetric Dry-Off Area

The drop-off area on the first floor structure that gives a grand entrance to the public. Separated from the public at the Central Promenade, the walls and ceilings are finished with integrated lights. The volumetric space draws in cool micro-climate into the main entrance lobby, helped with natural ventilation and lighting for optimum energy efficiency.

The Central Promenade is the main public activities area. It allows inclusive retail and the verticalised high street pavilion gives a good level of public surveillance and improves wayfinding. The visual axis frames the National Millennium Monument and becomes the focal point of the Commercial Precinct.

Bioswale

Natural filtration and drainage systems are used in a portion of the site to reduce the burden of surface run off to the public drainage system. This also aids to collect this run off for reuse in the central irrigation system.

EcoShell

Essentially a cellular void inserted at intervals into fabric forms across the floors. These voids have a spiraling ramp and bring daylight into the inner part and provide opportunities for rainwater harvesting and storage, estimate water volume into the inner part of the building form, and provide natural ventilation.

Collection of excess rainwater into natural bioswales.

Innovative & Transferbility PROGRESS3/7

Putrajaya Lot 25C by T.H. Hanoteaux & Yeang Sng Bhd
WHAT IS THE GREEN BUILDING INDEX?

The Green Building Index (GBI) is Malaysia's industry-recognized green rating tool for buildings to promote sustainability in the built environment and raise awareness among Architects, Engineers, Planners, Designers, Constructors and the Public about environmental issues and our responsibility to the future generations.

The GBI rating tool provides an opportunity for developers and building owners to design and construct green, sustainable buildings that can provide energy savings, water savings, a healthier indoor environment, better connectivity to public transport and the adoption of recycling and greenery for their projects and reduce our impact on the environment.

GBI is developed specifically for the Malaysian topographical climate, environmental and developmental context, cultural and social needs and is created to:

- Define green buildings by establishing a common language and standard of measurement;
- Promote integrated, whole-building designs that provide a better environment for all;
- Recognize and reward environmental leadership;
- Transform the built environment to reduce its negative environmental impact; and
- Ensure new buildings remain relevant in the future and existing buildings are refurbished and upgraded to improve the overall quality of our building stock.

Link Bridge

Link bridge is a social connector between the two buildings. Made from a lightweight structure, the wooden slats along the canopy were from the Central Promenade while enjoying the rich biodiversity of flora and fauna.

The bridge also provides a new link within level 1, as well as greater appreciation of the façade and the building from different perspective.

Promenade

The Central Promenade combines the pedestrian highstreet retail with central retail pavilion to encourage social interaction. The immersion and variety of activities set against deep green landscapes creates harmony and balance in the urban fabric.

Boulevard

With the freeform glass and vertical green wall in the atrium, and majestic natural light from the glass canopy, the ambiance of this area is grandeur while maintaining the human scale.

Participation of Stakeholders

- Consultants
- Architects
- Contractor
- Specialist and Sub-Contractor

The retail space at level 3 adds commercial value to this premium office building and the increased pedestrian traffic along the Central Promenade, into level 3 retail with the continuous landscaped planted box, open more street level traffic.

The individual retail blocks at level 3 allow more coherent passage through the retail spaces and encourages outdoor cafés that utilise natural lighting and ventilation.

Project Activities

- Preparing of Building Plan
- Preparation of Development Order
- Approval of Development Order
- Preparation of Tender Documents
- Value Engineering
- Tender Review
- Tender Assessment
- Tender Evaluation
- Commissioning
- Amendments and Board Action
- Appointment of Contractor
- Value Engineering
- Tender Evaluation
- Commissioning
- Amendments and Board Action
- Appointment of Contractor
- Site Start
- Induction
- Site Safety
- Preparing of Building Plan
- Preparation of Development Order
- Approval of Development Order
- Preparation of Tender Documents
- Value Engineering
- Tender Review
- Tender Assessment
- Tender Evaluation
- Commissioning
- Amendments and Board Action
- Appointment of Contractor
- Value Engineering
- Tender Evaluation
- Commissioning
- Amendments and Board Action
- Appointment of Contractor
- Site Start
- Induction
- Site Safety
Low Environmental Impact

The theoretical framework of green design

A building or a designed system or a product exists both in terms of its physical being (form, setting and structure) and its functional aspects, in the systems and operations that sustain it, during its entire life cycle. Both aspects involve the built structure in relationships with the natural environment, which take place over time. This designed system acts like a living organism, in pieces of a system. If we look at energy and materials and also productive outputs into its environment, our theoretical structure should therefore model all these exchanges.

Three components are essential for any ecological model of the designed system. Our theoretical framework must include a description of the system itself, a description of its environment including the ambient ecosystem and natural resources, and a mapping of the interactions between these two components (the build environment and its environs).

The first step is systematically to take account of the internal processes of the designed system. The second step is to measure, based on a thorough knowledge of the building's physical and functional requirements, its interactions with the earth's ecosystem in the form of energy and the resources removed from the environment by the construction and ongoing operation of the system. Also to measure the amounts of matter and energy that are sent back into the natural environment as a result of the functioning of the building's internal systems. In other words, a building or system interacts with the transportation consequences of moving people and goods to and from the built structure.

A supplementary issue is the relationship of the built structure as an element in the spatial configuration of the environment. Its existence as a built environment within the natural one implies further interaction and effects on the environment. Analysis of any such impacts will also have to be factored into the theoretical framework.

The efficient use of energy in ecosystems

Solar energy is an essential part of solar energy, which is essentially a renewable source of energy and is abundant in areas with large amounts of sunshine. Over time, nature has developed the system's efficiency of the system. In the system, energy, unlike nutrients and minerals, cannot be converted through the web-like connections of an ecosystem. Most of the energy systems, ecosystem is transformed from the sun by photosynthetic and transformed into sugars and carbohydrates. Only 1% of the sunlight that reaches the earth is used, and these plants, blue-green algae and certain bacteria can achieve up to 95% of efficiency.

The carrying capacity of the land has everything to do with how much energy there is to go around in the ecosystem. As efficient as photosynthesis are in trapping and transforming sunlight into energy, only 10% is available to herbivores and only 1% of that is available to the next level in the food chain, the carnivores and on. Thus over decreasing amounts of energy becomes available to the upper trophic levels, and hence animals tend to be highly energy efficient. Plants and animals have evolved behaviors and mechanisms that are aimed at energy-saving tactics.

High Ratio of Renewable Energy

Photovoltaic Panels

The photovoltaic panels are installed at the roof level for optimal solar exposure. The panels are to be used for lighting at certain times within the building. The frame contributes to the renewable energy requirement for the Green Building Index.

Rainwater Harvesting

All rainwater will be collected in a main holding tank before filtered and used for irrigation of all the planting areas.

The main holding tank has a holding capacity of 70 days period, for water efficiency requirement for the Green Building Index (GBI).

Bioswale

Bioswale is a new natural collection of excess water from the surrounding area and an important component of the stormwater management system to replenish the underground water table.

Siphonic Gutter

Siphonic Drains is to flow past full, a syphon system operates at full capacity, when water is sucked or suctioned from the roof drain into the drain at high velocity. Downward flow throughout the system creates a vacuum that assists in the drainage process. This vacuum is created when water passes through the drain at high velocity. The air or water in the drain is then sucked into the drainage system. The air or water in the drain is then sucked into the drainage system. The air or water in the drain is then sucked into the drainage system. The air or water in the drain is then sucked into the drainage system.

Land Use Efficiency

This overall development is divided into two blocks, with a 7-storey podium block, and a 7-storey tower block on top of the podium, to give a total of 14-storey high building for both Block A and Block B.

Site Plan

Siphonic Gutter

Photovoltaic Panel

Green Roof

Green Facade made from safety glass with perforated traditional 'jali' pattern ceramic tile. Perforation is designed to provide a natural light and ventilation to the interior.

Glass Skylight is the crown of the multi-story atrium, and allows daylighting into the space, and to include a fire protection system for the atrium.

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Energy & Material Efficiency

Building Information Modeling (BIM) is the term for a body of applid and integrated software applications that produce various building materials, families, sub-assemblies, and assemblies into a 3D model while building, together with associated attributes and data for all such materials, etc. into a database. The following diagram shows how a variety of building assemblies may be applied to the model with data being generated for planning estimating, purchasing, tracking and management purposes.

Building Maintenance Unit (BMU)

A. BMU Compact Crane with 7 metres Jib Outreach & Horizontal Track System for Zone-1

B. Vertical lift with 600 kg capacity & track system for Zone-2

C. Vertical lift with 600 kg capacity & track system for Zone-3

Design Innovation

With the above SC and U value, SSP CFTV calculation is 0.259W/m².K. It is comparable to the now less than 50W/m².K as per the new national standards.
Financial Resources

Puchong Holdings also had the good fortune of building the city with the resources of a mature construction industry. Rapid urbanisation in the post-independence years after 1975 had triggered a series of construction booms that led to the growth of Malaysia's own home-grown building professionals and technical specialists. Indeed, Puchong Holdings did not have to look far for experienced and qualified personnel. The company's location programs, with 30% of the workforce localised, were set up in the hands of Malaysian consultants, contractors, technical specialists, management experts, artisans and skilled workers. Foreign input was limited to specialist areas such as the construction of the marina, wetlands, LRT tunnel and interior decor of special spaces. Raw materials too were sourced locally. Concrete was restricted to timber and steel.

Using local was more cost-efficient. It meant costs could be kept down by employing locals rather than expatriates. Economic conditions in Malaysia were much more cost-effective. Workers received higher wages. Likewise, raw material imports were kept to a minimum. The localisation programme was a big success for Puchong Holdings. It also showed that the localisation programme was a better option than setting up new plants in the region.

Economy and ecology are not mutually exclusive but determine each other. The use of renewable energy sources was not as readily available as we thought. Higher investment costs will pay off as construction companies make the switch to more sustainable practices. The benefits of renewable energy sources will become more apparent as more companies make the transition.

ECONOMIC PERFORMANCE AND COMPATIBILITY

PROSPERITY

The Value Engineering exercise taken the cost optimisation from different glass manufacturers. The engineer, thickness of glass, glass performance and the percentage of the glass with the design concept is transmitted. The structural glass for the external glass structure is determined with the assistance from the Civil & Structural Consultant.

Design Improvement for Economic Performance
Improvement of Existing Context

Traditional & Cultural "Sengo'get" Pattern for glass surround-kaiten. The "sengo'get" pattern is a traditional weaving technique applied to costumes often worn during festivals and is part of Malaysian culture. The intricate grid and silver threads in the image of flowers symbolizes cultural wealth in the multi-racial country.

The windows are trimmed with wooden frames and the wooden facade is complemented by the greenery in the garden, which also partially yonder the facade of the traditional buildings and become a landmark and a gateway to the Commercial Precinct of Putrajaya.

2) Traditional and cultural "Sengo'get" pattern on the facade is with a visual emphasis on the design and texture of the building, which is also a hallmark of the traditional Malay style.

3) The selection of glass is based on the thermal and acoustic requirements for the internal space. Low-E glass was selected for its high-performance glass that reduces heat gain in a building.

Reflective Studies

High reflectivity on the external facade can cause glare and discomfort to the adjacent buildings. This is not an issue as the reflective glass is designed to have low reflectivity.

Embodied Energy/ Carbon

Embodied energy or embodied carbon is defined as the total energy required for the production and transportation of materials used in a building. The materials used in the building are non-renewable resources and their production has an environmental impact.

Restoration of Built Environment

Wayfinding Strategy

When designing buildings, it is important to consider the relationship between the building and its environment. The design should be in harmony with the natural surroundings and the cultural context.

Architecture Qualities and Aesthetic Impact

Wayfinding is essential in public spaces where the majority of pedestrian traffic will access the site via the Central Promenade along the retail spaces. The vehicular drop-off areas will be controlled by security to access the common entrances to office buildings.

Contextual and Aesthetic Impact

The overall design of the building aims to reflect the traditional Malay style, while also incorporating modern materials and technologies. The design is intended to create a welcoming and harmonious environment that is both functional and aesthetically pleasing.

Putrajaya Lot 25C is designed to stand out while also respecting the existing buildings. The design is intended to create a sense of place that is both traditional and modern.

The development of Commercial Office Lot 25C, Putrajaya 2 Phase 2, signals a new standard in Malaysian urban development.

The concept is to address the tropical climate and the relationship between the building and its surroundings. The design aims to create a welcoming and harmonious environment that is both functional and aesthetically pleasing. The building is designed to reflect the traditional Malay style, while also incorporating modern materials and technologies. The design is intended to create a sense of place that is both traditional and modern.