Suruhanjaya Tenaga
Energy Commission

diamondbuilding

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Introduction

The Diamond Building, which is the Energy Commission's headquarters is located at Precinct 2, Putrajaya. The building is designed with innovative features that will reduce the energy consumption and potable water usage, while promoting the use of sustainable building materials that will provide enhanced indoor environmental quality. A holistic approach for the building envelope, atrium design, mechanical and electrical systems, daylight system, landscaping and material selection features the design of an environmentally sustainable building.

The building is designed to accommodate the hot and humid climate of Malaysia by integrating a multitude of disciplines into the design concept. Although the building incorporates a combination of new concept and ideas for sustainability, its occupants' comfort is placed at the highest priority.

Design Strategy

The diamond design was selected for its philosophical and practical values bearing the concept of an iconic office building. The diamond symbolises transparency, value and durability; characteristics that represent the Energy Commission's role and mission as a regulatory body. The unique shape represents an optimum design approach to achieve energy efficiency.

During the design stage, extensive computer simulations of the diamond form was conducted to ensure that the expected performance of energy and daylight are met. In order to maintain the occupant's visual comfort, various daylight simulation exercises were conducted to ensure there is adequate and well distributed daylight withing the building. The data and information obtained from the simulation exercises also proved to be useful in developing the appropriate measures that can be adopted in reducing energy consumption without compromising the comfort level of the occupants.

The Diamond Building's design strategy is encapsulated through four main aspects, namely **energy efficiency, water efficiency, indoor environmental quality and environmental protection.**

The Building Energy Index (BEI) is a measurement on the total annual energy used in a building in kilowatt hours divided by the floor area in square metres. The BEI of a typical office building in Malaysia has an average energy index of 210 kWh/m² per year. The Diamond Building is designed with a BEI of 85 kWh/m² per year at 2,800 hours usage which is a 65% reduction in energy consumption. At present, the Diamond Building's average BEI is at 65 kWh/m² per year.

The total integration of the building's systems is also taken into account. The mechanical and electrical systems are linked through the building automation systems in order to control the building's performance.

Photography by Trends Magazine. Courtesy of Senandung Budiman Sdn. Bhd.

Energy Efficiency

Photography by : Trends Magazine. Courtesy of Senandung Budiman Sdn. Bhd.

Passive Features

Tilting Façade

- The tilting façade (face of the building) allows self shading for the lower floors, protection from direct sun rays into the building and a smaller building footprint, resulting in a larger area for landscaping.

Sunken Garden Area

- The sunken garden located at the basement serves as a void space which provides natural ventilation to the parking area at the basement level.

Building Orientation

- The building is oriented in accordance with the solar path, (the rising and setting of the sun) minimising the areas impacted by direct sunlight.

Active Features

Photovoltaics

- The building is installed with thin film telluride module type photovoltaic (PV) panels with a total installed capacity of 71.4 kWp, fed indirectly to the national grid. This total capacity produced is estimated to cover approximately 10% of the building's energy needs.

- In general, the expected electricity generated is 102,000 kWh per year which is equivalent to RM40,000.00 in cost savings annually or an avoidance of 63 metric tonnes of carbon dioxide (CO^2) emission annually.

Daylighting – Natural and Artificial

- The Diamond Building is designed to obtain 50% of its daylighting needs from natural lighting.

- The crown of the building is a "diamond dome" skylight made from laminated tempered glass. Located within the dome space are fixed blinds that filter and diffuse daylight to provide an even and glare-free natural lighting for the offices around the atrium.

- For the atrium, the window size becomes larger while delving deeper into the area to provide more daylight for the lower levels. The atrium is also optimised for daylight utilisation with Tannenbaum reflective panels.

- The glass façade is installed with low-emissivity (low-e) glazing that is reflective on the outside, allowing daylight into the building and minimising heat gain from the sun.

- A split window design for all exterior façades together with an internal light shelf helps to redirect natural light into the depths of the working space.

- Energy-efficient lighting such as T5 fluorescent tubes are used throughout the building instead of the conventional T8 fluorescent tubes. Integration with daylight sensors enables the artificial lighting to be switched off when daylight is adequate, resulting in energy savings.

- A roof light trough is incorporated to bring in sufficient daylight to illuminate the lounge area on the seventh floor.

Insulated Concrete Roof

- To reduce heat absorption in the building, the roof top area is insulated using boards with a thickness of 100 mm. The concrete roof is tightly insulated both horizontally and vertically.

Water Efficiency

Photography by : Trends Magazine. Courtesy of Senandung Budiman Sdn. Bhd.

- **Rainwater Harvesting**
- **Efficient Water Fittings**
- **Grey Water Recycling for Wetlands**

Rainwater harvested is used for lavatory flushing and combined with efficient water fittings such as dual flush systems, waterless urinals and water taps equipped with aerators which reduces potable water usage by more than 65%. To further optimise the efficient use of water in the building, grey water collected from the wash basins is also recycled to irrigate the wetlands on the ground floor.

Indoor Environmental Quality

Photography by : Trends Magazine. Courtesy of Senandung Budiman Sdn. Bhd.

Thermal Comfort via Radiant Cooling

- The Diamond Building is cooled by radiant cooling slabs that have chilled water pipes embedded in the concrete slab itself. This is complemented with the conventional cold air supply system.

- Since the highest heat capacity of the building is rested in the concrete mass, direct cooling of the concrete slabs with embedded water pipes is the most efficient means to cool the building mass.

Noise Control

- The advantage of the above cooling system is that the air ventilation rate is reduced significantly. The noise from the ducts is also reduced significantly, improving the acoustic comfort.

Use of Sustainable Materials

- The building design is also aimed to provide the occupants with a healthy and productive working environment. Use of resources is reduced by doing away with suspended ceilings, except for small areas to conceal the ducts. This reduces the material used as compared to conventional buildings.
- Green labelled plasterboards are used for the ceiling and the internal partitions. The plasterboards have a low Volatile Organic Compound (VOC) emission and has 30% recycled content.
- The floor carpeting is also green labelled for low VOC emission and has at least 10% recycled content.
- The interior paint used in the building is also of low VOC content.
- The workstations contain material that protects its users against ultraviolet (UV) rays.

Photography by Trends Magazine. Courtesy of Senandung Budiman Sdn. Bhd.

Environmental Protection

Recycled Content Material

- Usage of recycled content as defined in accordance with the ISO 14021 in the building was established during the design phrase. The use of recycled materials in the building makes up at least 30% of the project's total value.

Storage and Collection of Recyclables

- During building occupancy, recycle bins are provided at each occupant’s workstation and every printing room. Recyclables are then collected daily by the cleaners and stored at the allocated recycle bins for collection on a weekly basis by recycling companies that are appointed by the local authority.

Priority Green Vehicle Parking

- Reserved parking lots are provided for green vehicles, thereby encouraging the use of such vehicles and carpools in reducing single occupancy vehicle use. Bicycle racks and showers are also provided in the building to encourage occupants who stay within the area to cycle rather than drive to work.

Contribution to Reduce Global Warming Effects

- The building has been designed to always operate efficiently. The **total annual energy savings achieved is 2,029 MWh/year or equivalent to an avoidance of 1,388 metric tonnes of yearly CO^2 emissions.**

Green Building Awards Received

The Diamond Building has been awarded with the ASEAN Energy Awards 2012 for Energy Efficient Building - New and Existing Category, Platinum Certificates for meeting the standard of the Malaysian Green Building Index (GBI) and the Singapore BCA Green Mark.

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