CONTENTS

1.0  ST DIAMOND BUILDING

2.0  GREEN FEATURES AND GREEN RATINGS ~ GREENMARK AND GBI PLATINUM
**Our Team**

**Client**
: Suruhanjaya Tenaga

**Developer**

**Consultants**
- **Architect**
  : NR Architect in association with Prof. Soontorn Boonyatikarn
- **Interior Designer**
  : NR Interior Design
- **Energy Efficiency & Sustainability Consultant**
- **GBI Facilitator**
  : Exergy Malaysia Sdn Bhd
- **Civil & Structural Engineer**
  : Perunding SM Cekap
- **Mechanical & Electrical Engineer**
  : Primetech Engineers Sdn. Bhd.
- **Landscape Architect**
- **Quantity Surveyor**
- **Contractor**
1.0 THE PROJECT

SURUHANJAYA TENAGA’s CORPORATE HEADQUARTERS

THE DIAMOND BUILDING
<table>
<thead>
<tr>
<th><strong>KEY DATA</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>ST DIAMOND BUILDING</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Base Building Cost</strong></th>
<th>RM 64.6 Millions (USD 20.56M)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Construction Start Date</strong></td>
<td>13 September 2007</td>
</tr>
<tr>
<td><strong>Completion Date</strong></td>
<td>15 March 2010 (Ahead 15 days)</td>
</tr>
<tr>
<td><strong>No. of Storey</strong></td>
<td>1.5 + 8</td>
</tr>
<tr>
<td><strong>Gross Floor Area (GFA)</strong></td>
<td>14,230m²</td>
</tr>
<tr>
<td><strong>Nett Floor Area (NFA)</strong></td>
<td>11,473m²</td>
</tr>
<tr>
<td><strong>Floors Efficiency</strong></td>
<td>75%</td>
</tr>
<tr>
<td><strong>Green Landscape Area</strong></td>
<td>3,600m²</td>
</tr>
<tr>
<td><strong>Occupant Possession</strong></td>
<td>26 Jun 2010</td>
</tr>
</tbody>
</table>
Objective is to present:

- Architectural Concept
- Passive Architectural Design Features
- Energy Efficient & Sustainable Features
Facilities consistent with EC’s role as Authority and Regulator for energy sector

Show case energy efficient and sustainable building

Energy index of 85 kWh/m2/year (2800 hours)

State-of- the art building technologies

A landmark building
- The site is on Lot 2C15 Precinct 2, Putrajaya.

- Precinct 2, is the Commercial and Business District of Core Island, Putrajaya

- The plot area is 4,928.11sq.m
View of Site from the East, Pancarona Park

The Site – Lot 2C15

Palace Of Justice
Putrajaya Corporation
Immigration Department
Kem. Dalam Negeri & Hal Ehwal Pengguna
A distinctive diamond form:

- is prominent and unique
- symbolizes value, quality, transparency & durability,
- characterise EC’s role as a regulatory body
- is an optimum passive design approach to achieve energy efficiency
- The diamond form with the Tilting Façade avoid direct sun rays into building.
- Tilting Façade results in smaller building footprint which allows for more area for landscape.
- Surrounding landscape reduce heat gain into the building.
Glass Entrance Canopy with Water Elements

Pedestrian Walkway

Rooftop Garden

Sloping Roof For PV Installation Purposes

Slanting Façade

Tall Tree Lined Streetscape For Shading/Cooling Effect

Dome

View of dome from atrium space below

Overall Cross Section

Cross Section at Light Shelf
Lush landscape around the building

Lush landscape at Sunken Garden

The arcade

Landscape signage of the building

GROUND FLOOR
Basement 1/ 1A Plan

Landscape at sunken garden

Main ramp at Basement 1

View of Sunken Garden from Basement 1
Typical Floor Plan – Level 4

View of typical work station

View of typical office cubicle around the atrium

View of typical office room with glass partition

View of typical waiting area at the atrium
Main Meeting Room with Light Trough along the windows

Board Room

Main Meeting Room with Light Trough along the windows

Theatrette

Lounge area below Light trough
7 Green Roof Elements are incorporated on Level 8:

- Building Integrated Photovoltaic (PV) Panel
- Glass Dome
- Rainwater Harvesting
- Roof Light Trough
- Greeneries on the Roof
- Insulated Concrete Roof
- Roof/Floor Slab Cooling
Green Roof Feature 1: Photovoltaic Panel

Seamless Integration of PV with metal roof

Access to view PV panel

PV inverter room

Roof Plan: Integration of PV with metal roof

Integration of PV and Metal Decking

View of PV panels on the roof

PV panels on metal frame
**Green Roof Feature 2: Dome**

- Dome with Spectrally selective glass
- Access staircase to glass dome (access panel) from Level 8
- View of dome from the access panel opening
- Dome Blind – Reducing Glare
- Internal view of dome from the atrium in the day
- Internal view of dome from the atrium at night
Green Roof Feature 3: Rainwater Harvesting

- Rainwater from the dome is harvested through a stainless steel gutter.
- Rainwater harvesting tanks.
- Rainwater used for irrigation.
- Rainwater used for toilet flushing system.
Green Roof Feature 4: Roof Light Trough

Indirect daylight drawn into the Roof Light Trough to the space below.

View of Roof Light Trough from dome access panel platform.

Lounge area on Level 7 below the Roof Light Trough.
Green Roof Feature 5: Greeneries on the Roof

Section of roof top through the landscape area, showing surface water run off

Greeneries on the roof

Preparation for roof garden – Insulation & earth

Completed roof garden
Green Roof Feature 6: Insulated Concrete Roof

Installation of 100mm thick insulation board in progress

Spraying of PU insulation to vertical upstands in progress
Green Roof Feature 7: Roof/Floor Slab Cooling

Floor slab cooling pipes laid before pouring of concrete

Manifold riser for slab cooling pipes (PERT pipes)
2.0 THE SUSTAINABLE DESIGN FEATURES

DIAMOND BUILDING-THE GREEN REVOLUTION
OVERALL DESIGN STRATEGY

Energy Commission of Malaysia
Corporate Headquarters

REDUCE DEMAND

ENERGY EFFICIENCY
- Strategies:
  - Light zoning
  - Advance EE Performance BEI
  - Sustainable maintenance
  - Active Measures Energy efficient cooling, lighting systems
  - Renewable Energy production with PV

INDOOR ENVIRONMENTAL QUALITY
- Strategies:
  - Use low VOC, non-toxic materials
  - Maintain odour free indoor environment
  - Thermal comfort
  - Daylight Glare control

SUSTAINABLE SITE PLANNING & MGMT
- Strategies:
  - Landscaping to reduce heat island effect
  - Reduce use of virgin resources by using recycled content materials
  - Reduce waste during construction and during occupancy

EFFICIENCY

MATERIAL & RESOURCES
- Strategies:
  - Recycle content material
  - Regional materials
  - Drip Irrigation system for landscaping

WATER EFFICIENCY
- Strategies:
  - Rainwater harvesting
  - Water Recycling
  - Efficient water fittings and fixtures
  - Metering & Leak detection system

GENERATION

INNOVATION
- Strategies:
  - Heat pipe technology
  - Thermal Mass Storage
  - Advance air filtration
  - Composting
Energy Efficiency
Summary of Energy Savings

<table>
<thead>
<tr>
<th>Energy Efficient Lighting</th>
<th>ST Building</th>
</tr>
</thead>
<tbody>
<tr>
<td>40.6%</td>
<td>212 MWh/yr</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Day-Lighting</th>
<th>EE Improvement</th>
</tr>
</thead>
<tbody>
<tr>
<td>21%</td>
<td>8 MWh/yr</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Air-Con System</th>
<th>ST Building</th>
</tr>
</thead>
<tbody>
<tr>
<td>47%</td>
<td>31 MWh/yr</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>AHU Fans</th>
<th>ST Building</th>
</tr>
</thead>
<tbody>
<tr>
<td>91%</td>
<td>97 MWh/yr</td>
</tr>
</tbody>
</table>

GBI Platinum submission
Breakdown of Energy Consumption

Electrical consumption percentages

- **Cooling System**: 49%
- **Lighting**: 19%
- **Small Power**: 16%
- **Others**: 16%

**Note:**
- District cooling has been converted to electricity using COP of 3.8

GBI Platinum submission
Additional Green Features
Day-Lighting - Atrium

BLIND - GLARE CONTROL

Atrium blind
(maximise use of daylighting)
1. The windows size becomes **larger** deeper into the atrium to cater for lower daylight levels

2. A band of **Tannenbaum** reflector panels are applied to **4th and 5th** floor to deflect daylight across the atrium to **1st and 2nd** floor where daylight levels are the lowest. The ‘christmas tree’ profile reflectors have an inclination of **10°** and reflect about **85%** of the light in semi-diffuse manner, hence, avoiding visual glare issues for the building occupants.
Day-Lighting Office (Perimeter)

Typical Cross Section

- Mirror light shelf
- Fixed blinds for glare control
- Daylight reflected onto ceiling
Diffuse light deflected into room by light shelf and window sill

LIGHT REFLECTIONS FROM:
Lightshelf + Window sill

Lightshelf only

Window sill only

50% daylit
Mirror Light Shelf
Fixed white louvres
White painted window sill

Mirror lightshelf with fixed louver

Facade Daylight Design
The building is 50% daylit. The façade daylighting system consists of a mirror lightshelf and a white painted window sill. Both deflect daylight onto the white ceiling for improved daylight distribution until 5 meters from the façade + 2 additional meters of corridor space. Fixed white louvres with top surface mirror finish on the top side are mounted with a 30° tilt angle above the lightshelf for glare protection while still allowing daylight to be deflected onto the ceiling. To increase daylight throw into the rooms, the suspended ceiling was omitted giving a floor to ceiling height of 3.7 m.
Lighting Levels

No need to switch on lights automatically: Save energy

Office (lux)

- Singapore (common practise): 500 lux
- Malaysia (code): 350 lux
- Daylight level still comfortable to most people: 100 lux
- ST staff. Lowest still off: 33 lux
Slab Cooling

About 40% of cooling delivered by floor slab cooling.

Increase thermal comfort and energy efficiency

Reduces peak-load
Radiant Cooling

- Concrete slabs are charged at night with chilled water 18°C to 20°C.
- PERT Pipes are embedded in the concrete slab, which acts as “cooling rechargeable battery”
- Surface temperature of slab is at 20-23°C.
- Dew Point Temperature is 17°C; no condensation on the surface of slabs would occur.

Radiant Cooling, advantages

- Improved thermal comfort
- Reduced pump and fan load
- Reduced demand charge to GDC
- Continued cooling during power cuts
- Less Noise
Renewable Energy – Solar PV

**System Information:**

- Thin-film modules
- Installed power: 71.4 kW<sub>p</sub>
- Measured yield: 1425 kWh/kW<sub>p</sub>
- Annual production: 102 MWh
- 9.5% of Energy Consumption

Typical Cross Section
## Energy Efficient IT Purchasing Policy

<table>
<thead>
<tr>
<th>IT equipment</th>
<th>Quantity</th>
<th>EnergyStar compliant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Desktop (Brand A) with flat screen</td>
<td>50</td>
<td>Yes</td>
</tr>
<tr>
<td>Desktop (Brand B) with flat screen</td>
<td>58</td>
<td>Yes</td>
</tr>
<tr>
<td>Laptops</td>
<td>34</td>
<td>Yes</td>
</tr>
<tr>
<td>Photocopier</td>
<td>1</td>
<td>Yes</td>
</tr>
</tbody>
</table>

- Desktop (Brand A)
- Desktop (Brand B)
- Laptop
- Printer/photocopier
Water Efficiency
Water Efficient Fittings

67% reduction

Dual flush toilets

Waterless urinals (with water tap for Muslim users)

Taps with aerators
Rainwater Harvesting

Rainwater for toilet flushing & irrigation

Rainwater Storage Capacity: 2400 gal

Water Saved: 35.2%

Water Saved: 818 m³/year
Greywater Recycling

Greywater from wash basins and floor traps

Mini-wetlands (top & side view)

View of Main Meeting Room
Environmental Friendly Materials

- Recycled plaster board (Green Label)
- Low VOC paint (Green Label)
- Recycled content carpet (Green Label)
Greenery – cooling the surroundings

**GROUND LEVEL**
Landscape all around the building

**ROOF LEVEL**
Grass turf on much of the roof

Concrete roof
Grass roof

35.1°C
30.6°C

**Diagram:**
- Roof turfing by landscape architect
- Zoya matrella
- 20mm thick sand bedding
- 100mm thick soil mixture
- Geotextile
- 30mm thick gravel

**Temperatures:**
- Concrete roof: 35.1°C
- Grass roof: 30.6°C
Green Mark Overview
Green Building Provisional Certification

Green Mark Platinum

- Energy Efficiency: 70
- Water Efficiency: 10
- Environmental Protection: 12
- Indoor Env. Quality: 5
- Other Green Features: 3

Total: 100

Achieved

- 46% reduction in energy consumption
- 35% reduction in water consumption
PLATINUM CERTIFICATE
ISSUED BY BCA OF SINGAPORE

DATE OF ISSUE: 27 APRIL 2011
Green Building Index Overview
**DESIGN PROPOSAL – SUSTAINABILITY**

<table>
<thead>
<tr>
<th>GBI Points</th>
<th>GBI Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>86+</td>
<td>Platinum</td>
</tr>
<tr>
<td>76 to 85</td>
<td>Gold</td>
</tr>
<tr>
<td>66 to 75</td>
<td>Sliver</td>
</tr>
<tr>
<td>50 to 65</td>
<td>Certified</td>
</tr>
</tbody>
</table>

**GREEN BUILDING INDEX RATING**

The ST Building will also be rated under the Green Building Index assessment tools for Platinum. ST Building is the First Platinum Winner under this rating.
## GBI CVA SUBMISSION OF 90 POINTS-PLATINUM

<table>
<thead>
<tr>
<th>PART</th>
<th>CRITERIA</th>
<th>ITEM</th>
<th>MAX POINT</th>
<th>CVA CLAIM SCORE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>EE</td>
<td>ENERGY EFFICIENCY</td>
<td>35</td>
<td>34</td>
</tr>
<tr>
<td>2</td>
<td>IEQ</td>
<td>INDOOR ENVIRONMENTAL QUALITY</td>
<td>21</td>
<td>19</td>
</tr>
<tr>
<td>3</td>
<td>SM</td>
<td>SUSTAINABLE SITE PLANNING AND MANAGEMENT</td>
<td>16</td>
<td>15</td>
</tr>
<tr>
<td>4</td>
<td>MR</td>
<td>MATERIAL &amp; RESOURCES</td>
<td>11</td>
<td>5</td>
</tr>
<tr>
<td>5</td>
<td>WE</td>
<td>WATER EFFICIENCY</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>6</td>
<td>IN</td>
<td>INNOVATION</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td></td>
<td>TOTAL</td>
<td>100</td>
<td>90</td>
</tr>
</tbody>
</table>
GBI PLATINUM CERTIFICATE

VALIDITY :-
27 APR 2011 TO
26 APR 2014
A shining example

Diamond building wins top award for energy efficiency

KUALA LUMPUR: The Energy Commission’s Diamond Building in Putrajaya was named the most energy-efficient building at the Asian Energy Awards (AEA) 2012 held in Phnom Penh, Cambodia.

The Diamond Building won the top prize in the category of “New and Existing Buildings”.

The category was open to buildings that were not more than five years old.

The award ceremony was held during the joint gala dinner of the Asian Ministers of Energy Meeting and the Asian Energy Business Forum on Wednesday. It was attended by Energy, Green Technology and Water Minister Datuk Sen. Peter Chin.

The AEA, which began in 2006, is an annual awards programme that recognises “outstanding work for excellence, creativity, practicality and dedication to a cause in the field of energy”.

The seven-storey Diamond Building is the first office building in Malaysia to obtain the Green Building Index platinum rating.

Shining glory: The Diamond Building in Putrajaya is the first in Malaysia to obtain the Green Building Index platinum rating.

Local firm JR Architect was involved in the design of the building, with Thai architect Dr. Sombat Boonyathorn as the principal architect and IEN Consultants as the sustainability consultant.

The Diamond Building uses mostly natural light and its energy consumption principles incorporated in the architecture of the building,” said Gregory Kernmann of IEN Consultants.

“Everything in the building is made from sustainable and energy-saving materials, from energy-efficient computers and lighting systems to non-toxic cleaning materials.

Meanwhile, the Ministry’s Green Data Centre won the Energy and Efficiency Best Practices Award, while the Sungaipering mini-hydro power station in Bentong, Pahang, won the best practices on Renewable Energy award.

The UTM One Stop Centre for
DOUBLE PLATINUM BUILDING

THANK YOU

Winner for CIDB MCIEA 2010 Awards: Grade G7 & Innovation