Sustainable Building Envelope
Façade Design of Tall Building in Tropical Climate

Zak World of Facades
Kempinski, 11 July 2019
Prasetyoadi
Challenges for Sustainability
Impacts of building and construction industries to the environment

- 20% of water consumption
- 30-40% GHG emission
- 30-40% solid waste generation
- 20-40% energy consumption
Energy use in a building

Energy Usage in Building

- AC System: 60%
- Lighting: 22%
- Building Transport: 12%
- Others: 6%

Source: Green Building Index, 2010

Cooling Load on Buildings

- Building Envelope: 55%
- Lighting: 20%
- People: 10%
- Fresh Air: 9%
- Others: 6%

Source: SNI 03-6389-2000
Environmental loads on building envelope
## EEC 2 – Natural Lighting (Pencahayaan Alami)

<table>
<thead>
<tr>
<th>Prasyarat 2</th>
<th>OTTV Calculation (Perhitungan OTTV)</th>
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<tbody>
<tr>
<td></td>
<td><img src="image" alt="Solar Radiation Diagram" /></td>
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### MRC
- Building and Material Reuse (2)
- Environmentally Processed Product (3)
  - Certified wood (2)
  - Modular Design (3)
  - Regional Material (2)

### IHC
- Chemical pollutants (3)
- Outside view (1)
- Acoustic level (1)
Approach to Sustainable Façade: Natural Lighting vs Cooling Load

Sustainability and Façade

- Use of fins to reduce heat transfer by radiation into the building
- Use of materials to reduce heat gains
- Use of secondary layer to reduce heat gains

- Use of high specification materials to reduce heat gains

Direct Gain

Indirect Gain

Greenhouse Addition
Arsitektur Indonesia era Kolonialisme - Henri Maclaine Pont
Arsitektur Indonesia Modern – F. Silaban
Building Envelope Trend in Indonesia

Sarinah 1963
Kartika Plaza 1971
S. Widjojo Center 1980
Chase Plaza 1984
Wisma Dharmala Sakti 1990
Wisma '46 1996
JW Mariott Hotel 2000
Bakrie Tower 2009
Equity Tower 2010
Tempo Scan 2012
Case Studies
Menara Tendean
2017

Area
±5800 m²

Building Height
24 Storeys/107.2 m

Gross Floor Area
29,163 m²

Client
PT Singa Propertindo

Architect
DYXY
PDW

Façade Consultant
Meinhardt
MATERIAL SPECIFICATION

Single reflective glass 8mm (G-01) with horizontal capping, Vision glass SC = 0.25; U Value = 4.2

Single reflective glass 8mm (G-02) with vertical capping, Vision glass SC = 0.38; U Value = 4.3

88 mm clear glass + pvb + clear glass with hardcoat low-e glass 8mm (G-03), SC = 0; U Value = 4.1

Cladding ACP 4mm
SOUTH SIDE  
31.61 W/m²

EAST SIDE  
37.64 W/m²

NORTH SIDE  
40.26 W/m²

WEST SIDE  
51.60 W/m²

**OTTV:**  
42.95 W/m² < 45 W / m²
PCP Building
2017

Area
9,277 m²

Building Height
40 Storeys/ 210 m

Gross Floor Area
71,353.25 m²

Client
PT Prima Bangun Investama (PCPD)

Architect
PDW
Takenaka Corporation

Façade Consultant
Inhabit Group
MATERIAL SPECIFICATION

GF glass 12mm Clear HS + 1.52 PVB + 12 Clear HS SC 0.64 Uvalue 4.8

Vision glass DGU 12mm HS + 12mm airgap + 12mm HS with Low-E Coating on Face 2 SC 0.31 Uvalue 1.6 VLT 60%

Spandrel glass 6mm + 1.52 PVB + 6mm SC 0.86 Uvalue 5.3
SOUTH SIDE  
26.25 W/m²

EAST SIDE  
30.12 W/m²

NORTH SIDE  
32.43 W/m²

WEST SIDE  
51.00 W/m²

\( \text{OTTV:} \ 35.67 \text{ W/m}^2 \ < 45 \text{ W/ m}^2 \)
Gran Rubina
2011

Area
7,144 m2

Building Height
21 Storeys / 104 m

Gross Floor Area
34,729.3 m²

Client
PT Triyasa Propertindo

Architect
PDW

Sustainability Consultant
AG5

Façade Consultant
PT Paul Adams Façade
**horizontal**
To prevent solar gain on the northern and southern facades the buildings are wrapped in horizontal fins doubling as access catwalks.

**vertical**
Vertical fins prevent early morning and evening solar gain on eastern and western facades and create a buffer zone between the two skins.
28% ENERGY SAVINGS

Horizontal Shading
To prevent solar gain on the northern and southern facades the buildings are wrapped in horizontal shades doubling as access catwalks.

Vertical Shading
Vertical fins prevent early morning and evening solar gain on eastern and western facades and create a buffer zone between the two skins.

fin - aluminium sheet powder coat

DOUBLE GLASS
8 mm + 12mm, a = 6mm
MATERIAL SPECIFICATION

- 8mm Sunergy Blue Green
- 12mm Air Space
- 6mm Clear Glass
- Aluminium Vertical Fins (Secondary Skin)

SOUTH SIDE
29.32 W/m²

EAST SIDE
35.28 W/m²

NORTH SIDE
37.12 W/m²

WEST SIDE
63.54 W/m²

OTTV: 41.20 W/m²  < 45 W / m²
Terima Kasih