Integrating Capital Cost with Energy Efficiency
Presented by: CK Tang, ck@ckatwork.com
## Perception – Green is Expensive!

### Incremental Cost of Going Green

<table>
<thead>
<tr>
<th>GBI MALAYSIA</th>
<th>CERTIFIED</th>
<th>SILVER</th>
<th>GOLD</th>
<th>PLATINUM</th>
</tr>
</thead>
<tbody>
<tr>
<td>GBI POINTS</td>
<td>50 - 65</td>
<td>66 - 75</td>
<td>76 - 85</td>
<td>86 – 100</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>INCREMENTAL CONSTRUCTION COST</th>
</tr>
</thead>
<tbody>
<tr>
<td>AVERAGE</td>
</tr>
<tr>
<td>CORRECTED AVG</td>
</tr>
<tr>
<td>RNC ALONE</td>
</tr>
<tr>
<td>LOWEST NRNC</td>
</tr>
<tr>
<td>LOWEST RNC</td>
</tr>
<tr>
<td>GBI RANGE</td>
</tr>
<tr>
<td>LEED AVERAGE FOR LARGE BLDG</td>
</tr>
</tbody>
</table>

Green Building Index Malaysia 2016

Notes: Corrected Average

1. Omit NRNC Case Study 6 – exceptionally high EE1 cost for Gold
2. Omit NRNC Case Study 7 – exceptionally high EE1 cost for Certified
Current Industry Practice

- Total Construction Cost is 2 Separate Budgets
  - QS budget
  - M&E budget
- QS Budgets covers:
  - Civil and Structural Works
  - Architectural Works
  - Sometimes ID Works as well
  - BUT… Always Exclude M&E!
Quantity Surveyor

- QS mainly worried only about their own budget
  - Typical Wall
  - Typical Glazing
  - Typical Roof
  - M&E?
  - Out of Scope
M&E

• *Little* to no *interest* in building materials.

• Leave it to others to specify building materials.
How do you size Air-Cond?

### Air Conditioning Square Footage Range by Climate Zone

<table>
<thead>
<tr>
<th>Tons</th>
<th>Zone 1</th>
<th>Zone 2</th>
<th>Zone 3</th>
<th>Zone 4</th>
<th>Zone 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.5</td>
<td>600 - 900 sf</td>
<td>600 - 950 sf</td>
<td>600 - 1000 sf</td>
<td>700 - 1050 sf</td>
<td>700 - 1100 sf</td>
</tr>
<tr>
<td>2</td>
<td>901-1200 sf</td>
<td>951 - 1250 sf</td>
<td>1001 - 1300 sf</td>
<td>1051 - 1350 sf</td>
<td>1101 - 1400 sf</td>
</tr>
<tr>
<td>2.5</td>
<td>1201 - 1500 sf</td>
<td>1251 - 1550 sf</td>
<td>1301 - 1600 sf</td>
<td>1351 - 1650 sf</td>
<td>1401 - 1650 sf</td>
</tr>
<tr>
<td>3</td>
<td>1501 - 1800 sf</td>
<td>1551 - 1850 sf</td>
<td>1601 - 1900 sf</td>
<td>1651 - 2000 sf</td>
<td>1701 - 2100 sf</td>
</tr>
<tr>
<td>3.5</td>
<td>1801 - 2100 sf</td>
<td>1851 - 2150 sf</td>
<td>1901 - 2200 sf</td>
<td>2001 - 2250 sf</td>
<td>2101 - 2300 sf</td>
</tr>
<tr>
<td>4</td>
<td>2101 - 2400 sf</td>
<td>2151 - 2500 sf</td>
<td>2201 - 2600 sf</td>
<td>2251 - 2700 sf</td>
<td>2301 - 2700 sf</td>
</tr>
<tr>
<td>5</td>
<td>2401 - 3000 sf</td>
<td>2501 - 3100 sf</td>
<td>2601 - 3200 sf</td>
<td>2751 - 3300 sf</td>
<td>2751 - 3300 sf</td>
</tr>
</tbody>
</table>
Air-Cond Sizing

• Is Dependent On:
  • Wall Insulation
  • Roof Insulation
  • Glazing Properties
  • Fresh Air Requirements
  • Additional Air Leakages
  • Lighting Qty and Types
  • No of People and Type of work done
  • Small Power
  • Type of Air-Conditioning System

So how do you know the most optimum selection for the lowest cost?
Cost@Work

Based on BEET v2.0
Provided free to the industry to estimate building energy consumption in Malaysia.

Enhancement Made
Capital Cost Optimization.
Takes account of capital cost of building material and equipment with the capital cost of air-conditioning equipment at the same time.

Integration of Architectural Design with Air-Conditioning Design to derive the most cost effective solution for the project.

Savings up to 5% of building capital cost has been demonstrated.

Environmental design + Capital Cost Reduction

Energy Efficiency
Cost Efficiency
Carbon Reduction

Setting Benchmark in Industry
• Higher Efficiency
• Lower Cost
• Greater Environmental Impact
Typical Wall Scenario

**Wall Type** | **Descriptions**
--- | ---
**Base** | Concrete Wall 120mm
**T2** | Concrete Wall 200mm
**T3** | Concrete Wall 250mm
**T4** | Brickwall
**T5** | Brickwall with insulation
**T6** | AAC 100mm
**T7** | AAC 150mm
**T8** | AAC 200mm
**T9** | Aluminium Comp.Wall no insul
**T10** | Aluminium Comp.Wall insulation

![Graph showing RM Capital Cost, Wall Additional Cost, and Air Cond Additional Cost for different wall types.](image-url)
Demonstration of Cost@Work
Thank you