IMPROVING ENERGY EFFICIENCY AND INDOOR ENVIRONMENTAL QUALITY

Green Building Index Emphasis

Main Sustainable Strategies

- Energy Efficiency
- Indoor Environmental Quality
- Water Efficiency
- Material and Resources
- Site Management
- Innovation
Green Buildings

- Minimizes Impact to the Environment
- Adds Value to the Surroundings
- Best Indoor Environmental Quality for Occupants
- Efficient in the Use of Resources

Energy Use

Typical Energy Usage in a Commercial Building

- Central Plant: 44%
- AHU/FCU: 27%
- Lighting: 12%
- Other Equipment: 17%

Approx. 70% - Air Conditioning System
Two Important Renewable Resources for Malaysia

Priority Pyramid

Need/Demand

Efficiency/Reused/Recycled

Renewable Sources/Generation
Energy Efficiency Design

Design
- Plant to suit operation
- Automation
- Efficiency of Equipment / Renewables

Commissioning
- Verification of Performance
- User Manual

Energy Management System
- Trending & Data Collation
- Monitoring

Energy Manager
- Analysis
- Tuning / Modification

ACMV Design
- Must match the usage profile, and not only the peak loads.

Automation and Controls
- System perform only as needed/required
- On Demand use of Energy
Energy Efficiency Design

- Matching good design with the anticipated performance
- Verification of system performance
- Tuning and documenting
UBBL 2012 Amendment on Energy Efficiency

38A. Energy efficiency in buildings.

1. New or renovated non-residential buildings with air-conditioned space exceeding 4,000 square metres shall be

   a) designed to meet the requirements of MS 1525 with regards to the Overall Thermal Transfer Value (OTTV) and the Roof Thermal Transfer Value (RTTV); and

   b) provided with an Energy Management System.

Energy Efficiency
Energy Management System

- Means of monitoring and trending energy and water use in hotels
- Data collation
- Early warning for excessive use and any leakages
Energy Efficiency
Energy Manager

Analysis of data from BMS and EMS
Remedification, Tuning to achieve or better operational figures.

Indoor Environmental Quality
Indoor Environmental Quality
Major Concerns

- Ventilation (Indoor air quality)
- Environmental tobacco smoke control
- Carbon dioxide monitoring
- Indoor contaminant
- Thermal comfort
- Odour
- Daylighting
- Visual comfort
- Acoustics

Indoor Environmental Quality
Thermal Comfort

ASHRAE Std 62.1 – most widely recognised standard internationally
Adopted by most countries and HVAC engineers worldwide
Indoor Environmental Quality
Indoor Air Quality & CO2 Control

Occupancy in buildings fluctuates
Implemented to modulate fresh air intake

<table>
<thead>
<tr>
<th>Indoor Air Contaminants</th>
<th>Eight-hours time-weighted average airborne concentration</th>
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<tr>
<td></td>
<td>ppm</td>
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<tr>
<td>Chemical contaminants</td>
<td></td>
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<tr>
<td>(a) Carbon dioxide</td>
<td>10</td>
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<tr>
<td>(b) Carbon monoxide</td>
<td>0.1</td>
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<tr>
<td>(c) Formaldehyde</td>
<td>0.05</td>
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<tr>
<td>(d) Ozone</td>
<td>-</td>
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<tr>
<td>(e) Respirable particulates</td>
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<tr>
<td>(f) Total volatile organic</td>
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<td>compounds (TVOC)</td>
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<td>Biological contaminants</td>
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<tr>
<td>(a) Total bacterial counts</td>
<td>-</td>
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<tr>
<td>(b) Total fungal counts</td>
<td>-</td>
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Indoor Environmental Quality
Environmental Tobacco Smoke Control

- Adopting no smoking policy within the hotel
- Provision and Segregation of smoking areas
- Addressing second hand tobacco smoke by providing dedicated external areas, and/or purging/filtration system
Indoor Environmental Quality
Air Contaminants

Products used for buildings emit more than 11,000 individual chemicals

Use of low VOC and formaldehyde free products minimize exposure of occupants to indoor contaminants
Primary factors to be addressed:
1. Metabolic rate
2. Clothing insulation
3. Air temperature
4. Radiant temperature
5. Air speed
6. Humidity
Indoor Environmental Quality
Odour

- Negative pressure for kitchens.
- Odour control equipment and system provision

Indoor Environmental Quality
Daylight Harvesting

Daylighting
Daylighting increasingly emphasized and rising in importance in green buildings
- Reduces electrical energy consumption
- Reduces air conditioning load

Glare Control
- manual control blinds
- automatic blinds
**Indoor Environmental Quality**

**Lighting and Visual Comfort**

**Lighting Quality**
Provide adequate lighting levels for use and ambience but not to be overly. Provide good lighting fixtures to reduce eyestrain – high frequency ballasts

**External Views**
Green buildings promote visual connectivity for the occupants with the outdoor environment
- good for relaxation
- reduces stress

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**Indoor Environmental Quality**

**Acoustics**
Noise affects human productivity, performance and comfort

Acoustics of a space improves the ambience and mood of occupants
Noise at working spaces within acceptable levels to provides conducive working environment
Thank You