



Building Information Modelling; Conference and Exhibition

Reinventing Building Survey; Challenges for the Industry

26th & 27th November 2012; Hotel Istana, Kuala Lumpur



Ir. H.P. Looi
Association of Consulting
Engineers Malaysia



2 CONTENT

1 – What is BIM ?

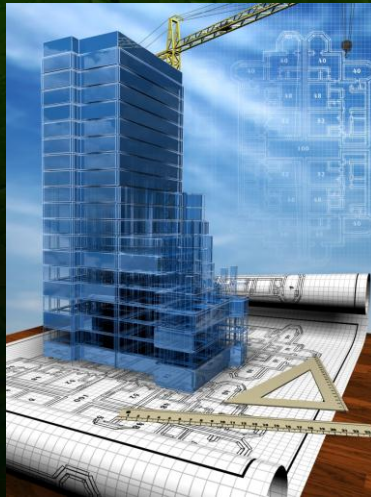
2 – Levels of BIM Application

2 – Status of BIM in Malaysia

3 – Whither BIM ?



What is BIM ?



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4 BIM INDUSTRY PERSPECTIVE

NIBS - Facility Information Council (USA)

A computable representation of the physical and functional characteristics of a facility and its related project/life-cycle information using open industry standards to inform business decision making for realizing better value
<https://www.nibs.org/>

AIA (American Institute of Architects); AEC Infosystems

Information use, reuse, and exchange with integrated 3D-2D model-based technology, of which electronic documents are just a single component

ArchiCAD A single repository including both graphical documents - drawings - and non-graphical documents - specification, schedules, and other data

Bentley A modelling of both graphical and non graphical aspect of the entire Building Life cycle in a federated database management system

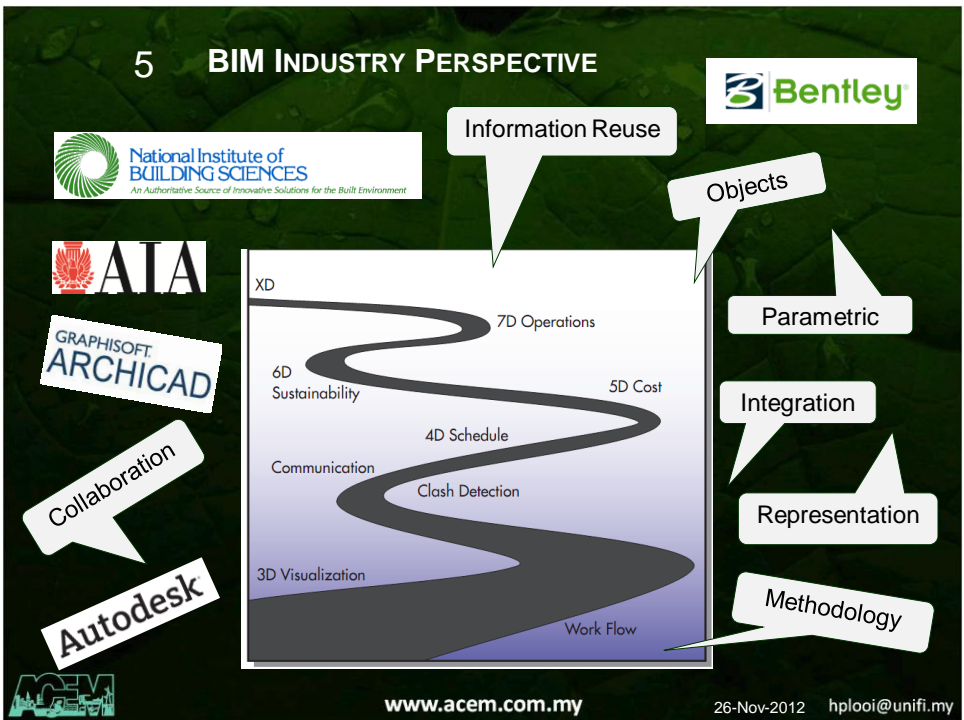
AutoDesk A building design and documentation methodology characterized by the creation and use of coordinated, internally consistent computable information about a building project in design and construction



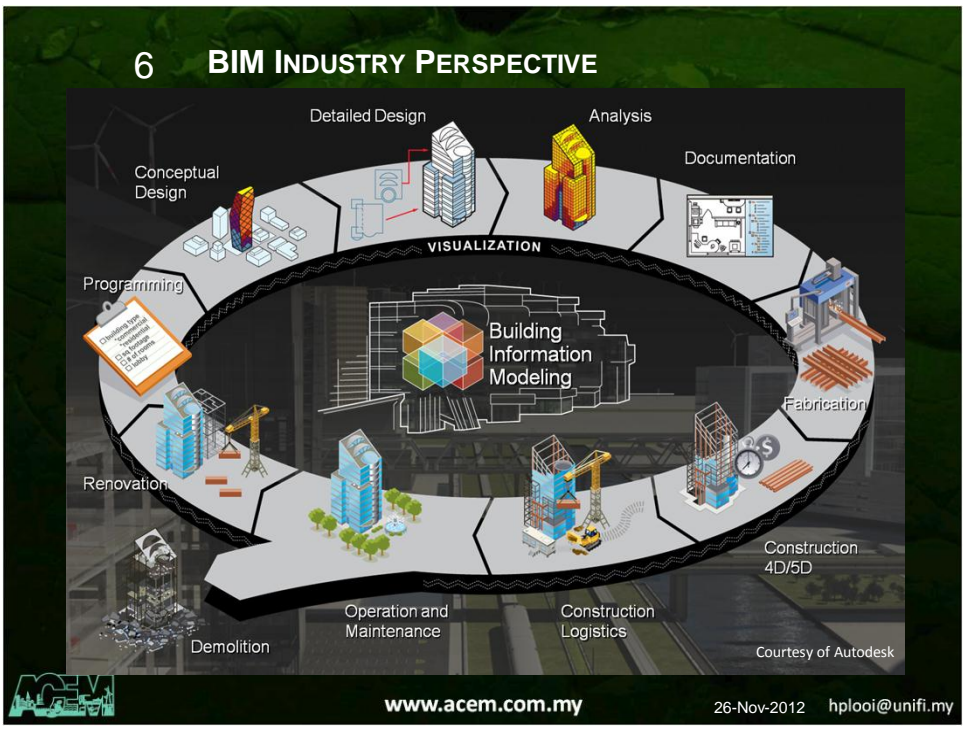
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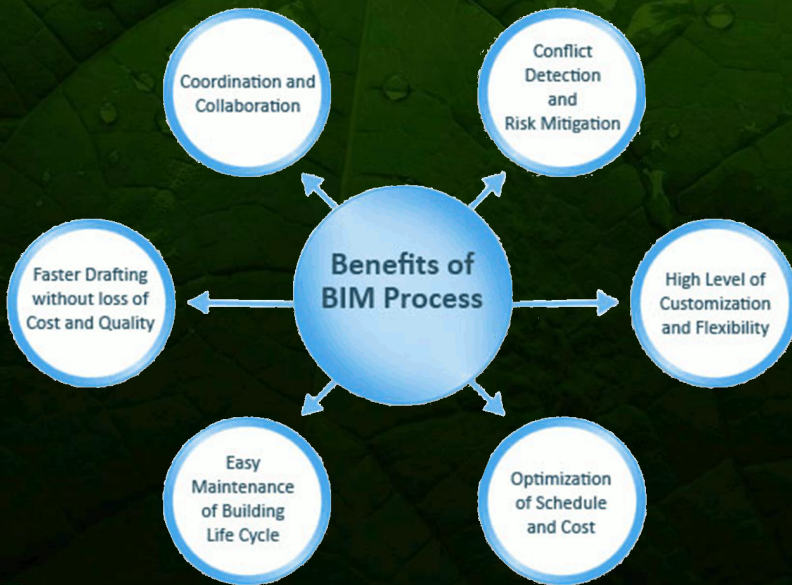
5 BIM INDUSTRY PERSPECTIVE



6 BIM INDUSTRY PERSPECTIVE



7 BIM PROJECT OPTIMISATION

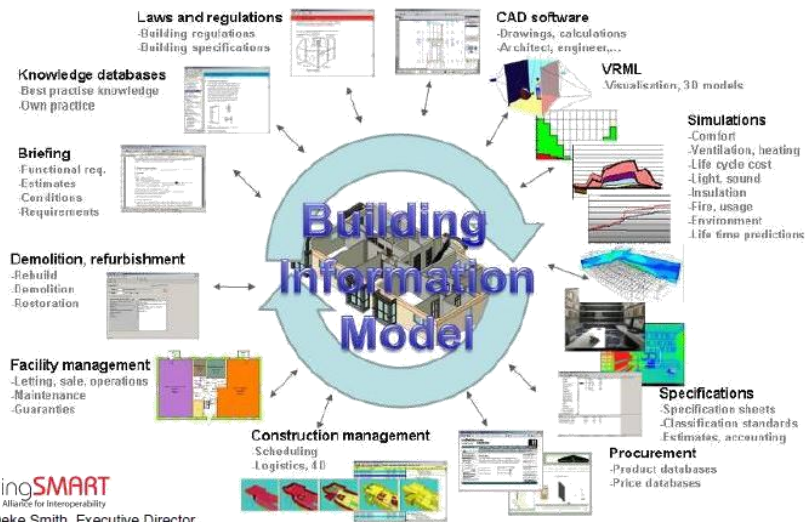


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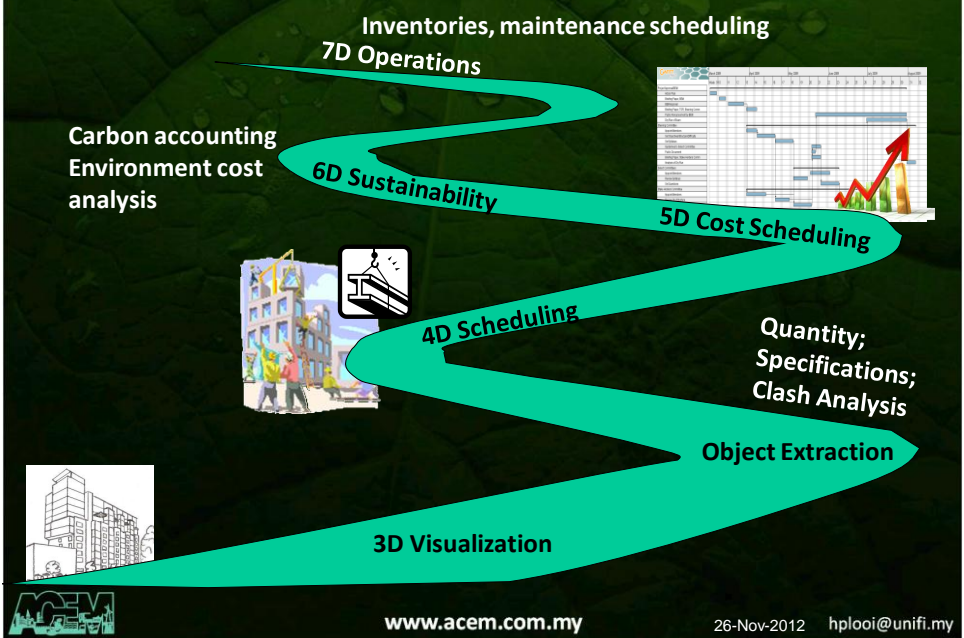
8 BIM – LIFE CYCLE VIEW

BIM Lifecycle View



buildingSMART
International Alliance for Interoperability
Courtesy of Deke Smith, Executive Director

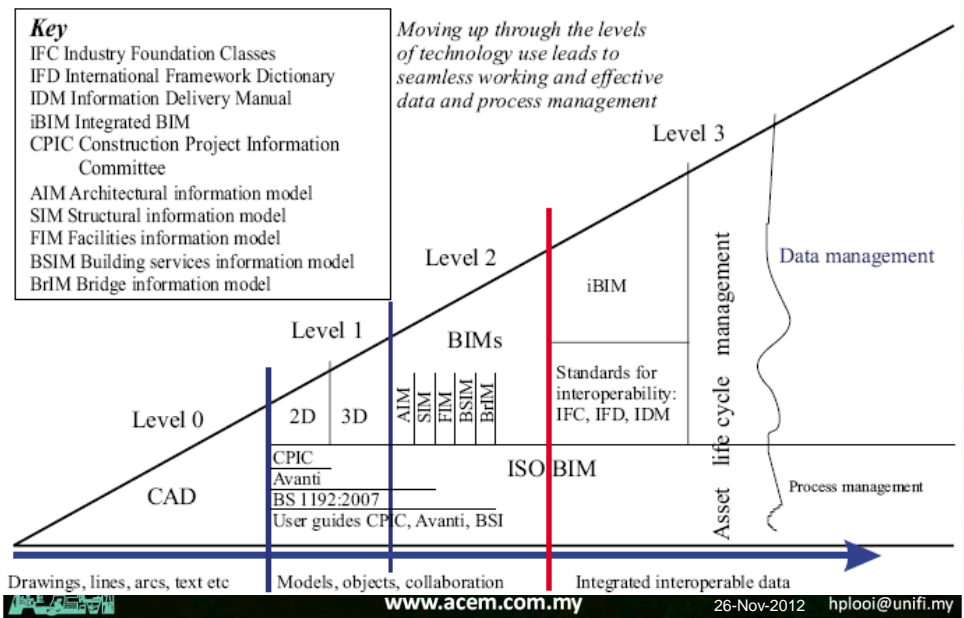
9 BIM – ROAD MAP



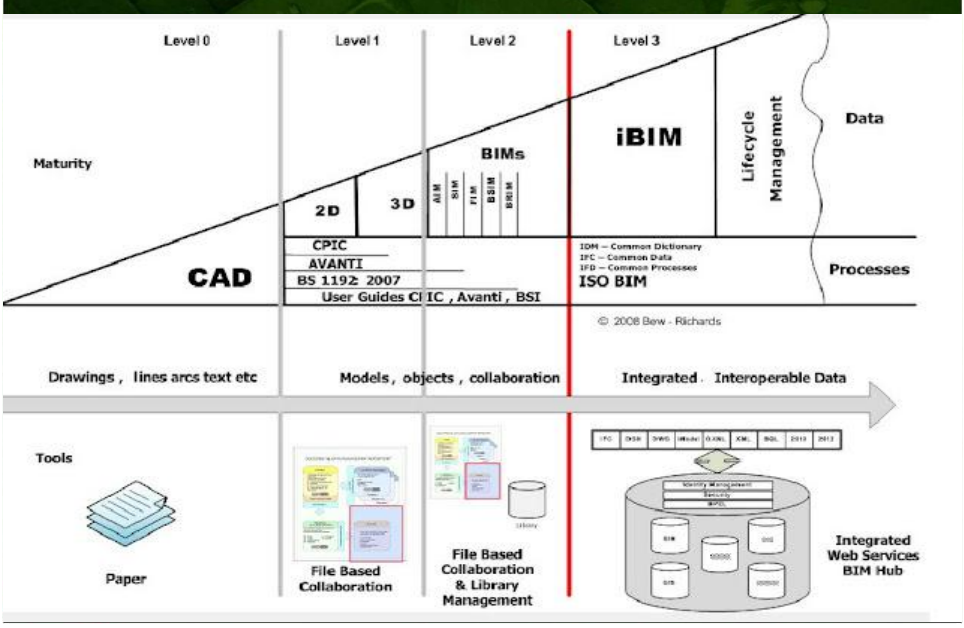
Levels of BIM Application



11 LEVELS OF CAD APPLICATION



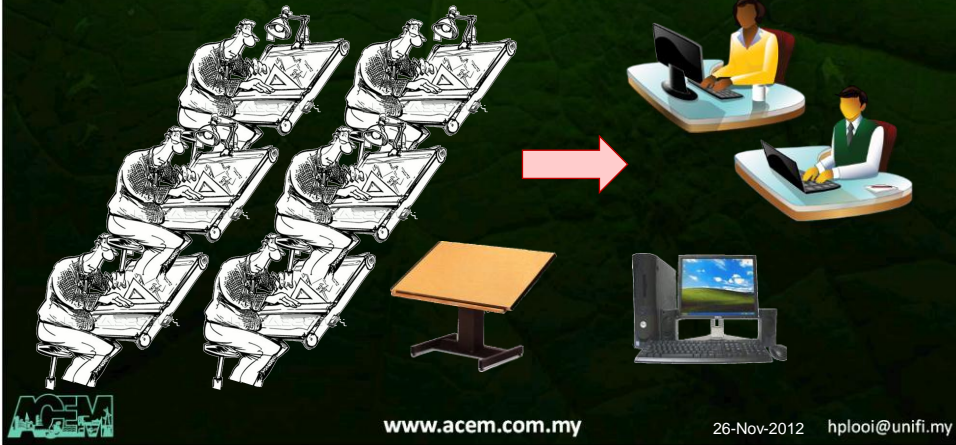
12 LEVELS OF CAD APPLICATION



13 LEVELS OF CAD APPLICATION – LEVEL 0

Level 0

CAD drawings are collection of lines, arcs and text.



14 LEVELS OF CAD APPLICATION – LEVEL 1

Level 1

Nascent



15 LEVELS OF CAD APPLICATION – LEVEL 1



Level 1

1. CAD drawings are STILL collection of lines, arcs and text.
2. 2D drawings are the norm
3. Migrating to or already proficient in 3D
4. Some beginning at inserting objects and models. The basic CAD object is the “Block”. Blocks with attribute are precursor to ‘objects’.
5. File collaboration (only within same office)
6. Drawing standards or standard drawing conventions



16 LEVELS OF CAD APPLICATION – LEVEL 1



Level 1

BSI BS 1192-5: Construction Drawing Practice - Guide for the Structuring and Exchange of CAD Data

Guidance on organisation and naming of layers in CAD files methods of structuring data, relationship between drawings and CAD models, CAD system management and data exchange

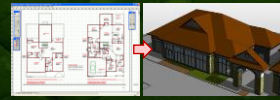
Level 1

CPIC - Construction Project Information Committee, responsible for providing best practice guidance on the content, form and preparation of construction production information, and making sure this best practice is disseminated throughout the UK construction industry.



17 LEVELS OF CAD APPLICATION – LEVEL 1

Singapore Standard CP 83 : CODE OF PRACTICE FOR Construction Computer-Aided Design (CAD)



- Part 1 : Organisation And Naming Of CAD Layers
- Part 2 : CAD Symbols
- Part 3 : Organising And Naming Of CAD Files
- Part 4 : CAD Drafting Conventions
- Part 5 : Colour And Linetype

Published 2001

SIRIM W/G on Drawing Data Interchange ; Technical Architectural and engineering drawing using computer aided design (CAD) –

- Part 1 : Drafting fundamentals
- Part 2 : Organising and naming of CAD layers
- Part 3 : Colour and line type
- Part 4 : CAD symbols/legends
- Part 5 : Organising and naming of cad files

Public comment 2012

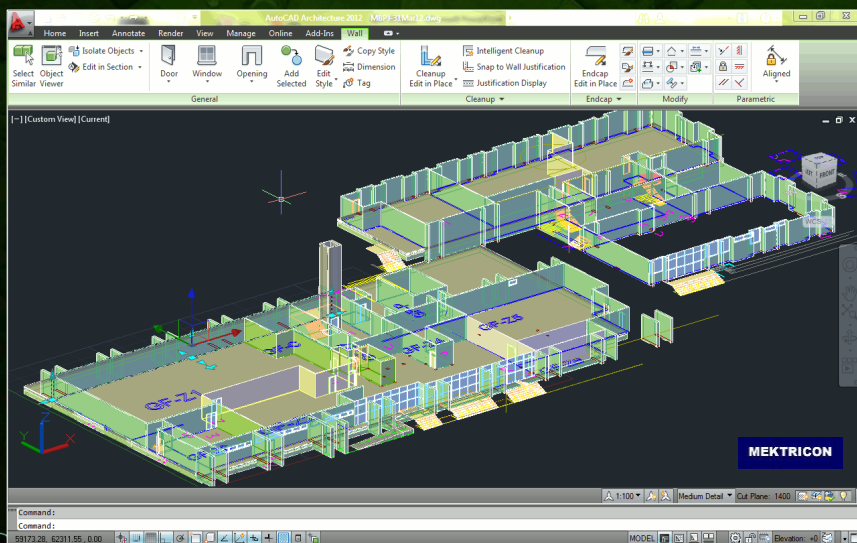


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18 LEVELS OF CAD APPLICATION – LEVEL 2

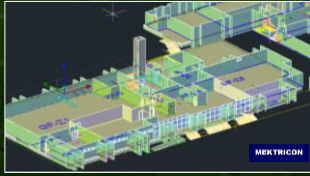
Level 2 BIM Application / Capability



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19 LEVELS OF CAD APPLICATION – LEVEL 2



Level 2 BIM Application / Capability

1. 3D Modelling is the norm.
2. Drawing is a collection of objects and models.
3. Collecting and managing library of standard objects.
4. File based collaboration however is still limited within a company.
5. No true collaboration across players even in the same project team but from different companies. DATA ISLANDING.
6. Extraction of DATA for analysis e.g. BQ extraction, clash analysis
7. Cross platform exchange of data IS A PROBLEM.



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20 LEVELS OF CAD APPLICATION – LEVEL 2



Level 2 Islands of Information

AIM – Architectural Information Model

SIM – Structural Information Model

FIM – Facilities Information Model

BSIM – Building Services Information Model

BrIM – Bridge Information Model



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21 LEVELS OF CAD APPLICATION – LEVEL 3

Level 3 Integrated BIM



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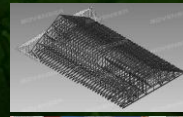
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22 LEVELS OF CAD APPLICATION – LEVEL 3

Level 3 Integrated BIM

1. Collaborative design. Cloud computing.
2. Standardisation (format and object class) across ALL players.
3. MODEL REUSE.
4. Cross platform exchange of data e.g. between architectural model and structural model.
5. Third party software inter-operability.

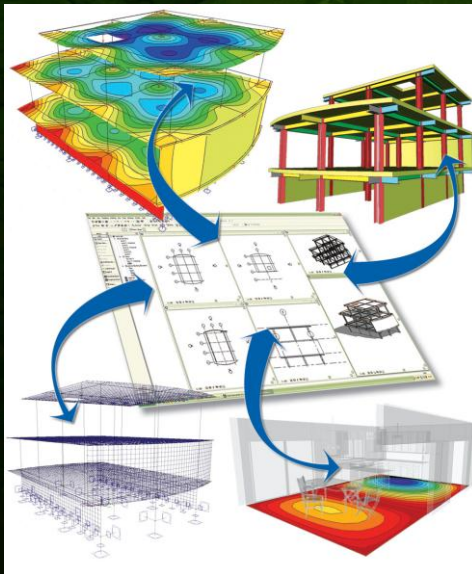


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23 INTEROPERABILITY



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24 LEVELS OF CAD APPLICATION – LEVEL 3

INTEROPERABILITY



IFC – Industry Foundation Class

Open non-proprietary object-based file format with a data model developed by buildingSMART (International Alliance for Interoperability, IA) to facilitate interoperability in the architecture, engineering and construction (AEC) industry.

IFD – International Framework Dictionary

Reference library intended to support improved interoperability in the building and construction industry. The Data Dictionary is based on a concept developed by ISO 12006-3: 2007 (Building construction: Organization of information about construction works, Part 3: Framework for object-oriented information).

IDM – Information Delivery Manual

ISO 29481-1:2010 specifies a methodology that unites the flow of construction processes with the specification of the information required by this flow, a form in which the information should be specified, and an appropriate way to map and describe the information processes within a construction life cycle.



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The Reality ?

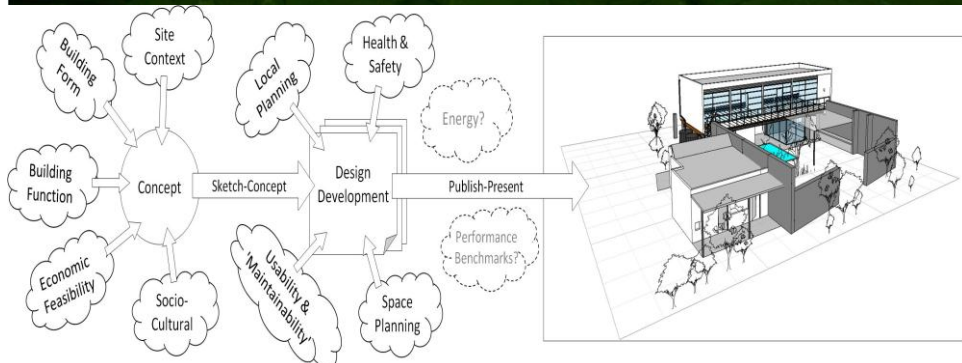


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26 THE BUILDING LIFE CYCLE







The Design Life Cycle.




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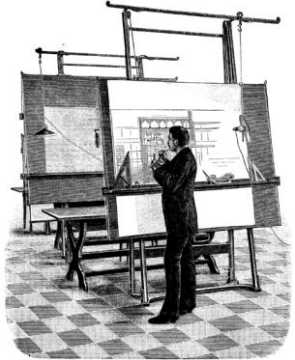
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27 THE BUILDING LIFE CYCLE

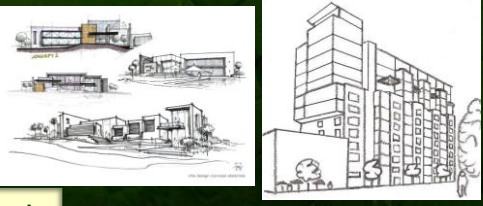
Design Concept	Design Development	Taking Off Quantities (Tender)	Taking of Quantities (Construction)	Construction	Building Operation
					
Client Architect	Architect C&S Engineer M&E Engineer	C&S Engineer M&E Engineer Quantity Surveyor	C&S Engineer M&E Engineer Quantity Surveyor	Contractor	Building
Tools	Software Tools	Software Tools	Software Tools	Software Tools	Software Tools
Manual sketch Sketch programme Physical Model	CAD Architecture Survey, Civil CAD Structure CAD Piping CAD MEP CAD	Excel spread sheet Quantity data base	Excel spread sheet Quantity data base	Project Management Excel spread sheet Quantity data base	As Built Drawings O&M Manual Component Quantity data base


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28 THE ARCHITECTS PERSPECTIVE



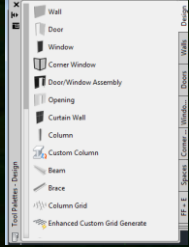
Concept Sketch







Google Sketch Up

Architectural eLibrary




Visualisation




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29 THE C&S ENGINEER'S PERSPECTIVE

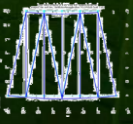



Structural

Civil




FRAMESDD








Esteem Innovation

Perancangan dan pemasangan, struktur, analisis, simulasi, dan pemantauan, dan lain-lain.



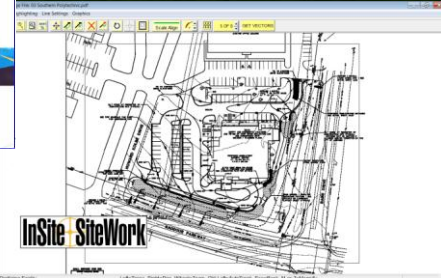
Structure eLibrary



MSMA


URBAN STORMWATER MANAGEMENT MANUAL FOR MALAYSIA



InSite SiteWork

MyCESSM


Malaysia Civil Engineering
Standard Method of Measurement



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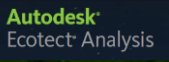
30 THE M&E ENGINEER'S PERSPECTIVE





Electrical

Mechanical












DIALux 4.10

www.dialux.de

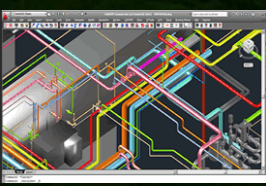



MEP eLibrary






Show me: Drawing and Sizing Ducts



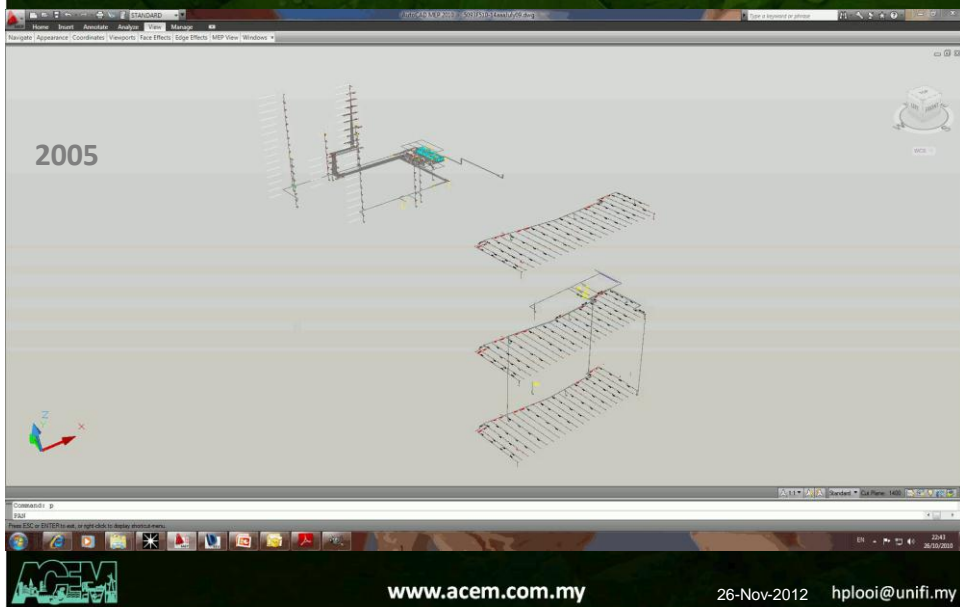




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31 THE M&E ENGINEER'S PERSPECTIVE



2005

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The screenshot shows a software application window with a 3D wireframe model of a building's structural frame. The year '2005' is displayed on the left side of the model. The software interface includes a menu bar at the top with options like 'Home', 'Insert', 'Analyze', 'View', and 'Menu'. A Windows taskbar is visible at the bottom, showing various application icons and the system clock displaying '2011 20/10/2012'. The ACEM logo is in the bottom left corner.

32 THE QS PERSPECTIVE



**Standard Method
of Measurement**

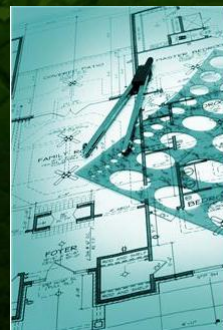


Taking off Quantities

Site Monitoring of Cost

Cost Control

- ❖ Excel Spreadsheet
- ❖ Quantity Dbase
- ❖ Construction Cost Software



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33 THE CONTRACTOR'S PERSPECTIVE



Standard Method of Measurement

Cost Control



Taking off Quantities

Construction Scheduling

Just in Time Procurement

Constructability Simulation

- ❖ Excel Spreadsheet
- ❖ Quantity Dbase
- ❖ Construction Cost Software



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34 CURRENT ISSUES

- ❖ Low penetration of 'high-end' IT usage amongst contractors (high-end IT - usage of data based software, management software, designing tools etc not just using software in simple spreadsheet applications).
- ❖ Lack of standardization format.
- ❖ Data islanding between the various parties in the construction industry even in cases where BIM is, ostensibly implemented by developers.
- ❖ Retraining of CAD operators to 'draw' in 3-D and to insert objects rather than vectors into BIM drawings.
- ❖ Lack of adoption during project 'upstream' by designers stymie adoption of BIM at project downstream.

Low Penetration of High End I.T.

Standardisation

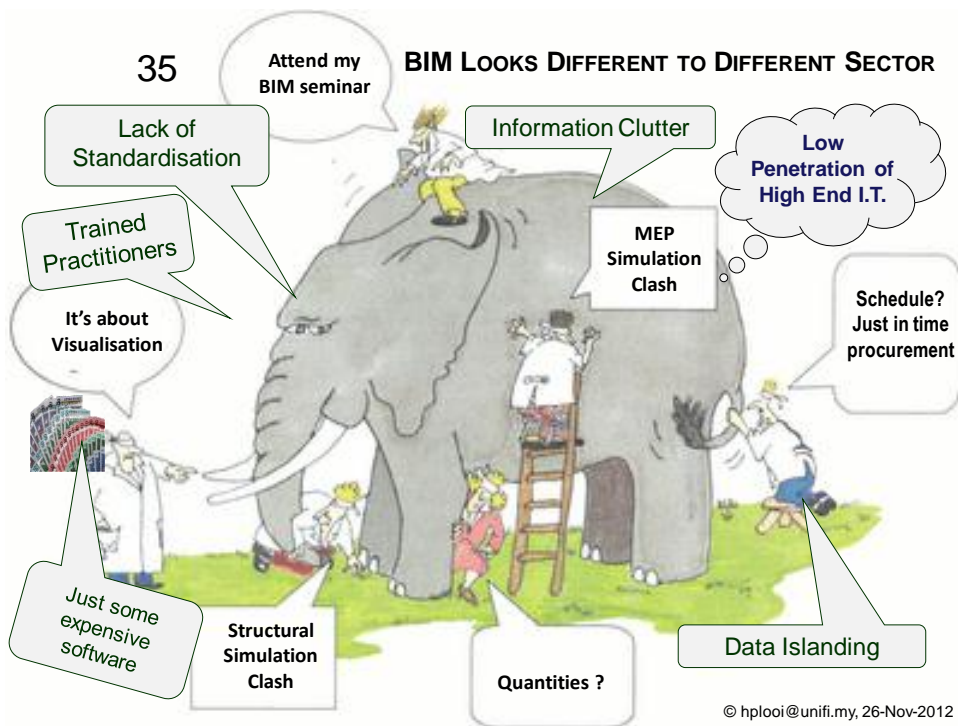
Data Islanding

Training



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36 INDUSTRY TASK FORCE ON BIM

Industry Task Force on BIM

- ❖ Promote the REAL use of BIM in the Construction Industry
- ❖ Promote Standardisation Measures for BIM to ensure true interoperability between all sectors of in the Industry.
 - (1) 'Open Source' BIM data interchange standards
 - (2) Industry-wide dialogue between software vendors, industry practitioners, academia & government
 - (3) Training for all sectors
 - (4) Affordable BIM software & hardware
- ❖ Make representation to the financial incentives from the government.
- ❖ National BIM Road Map



37 INDUSTRY TASK FORCE ON BIM

- ❖ **Standardisation** BIM is not only about the software but promotes a standard which facilitate data-interchange between various parties in the construction industry.

As part of the initiative on BIM standards, Promote standardization of data interchange with specialist engineering softwares e.g. structure, finite analysis, CFD, energy simulation softwares etc.

- ❖ **Training** Promote training and re-training of ALL industry players starting with CAD operators as BIM proficiency at ALL levels is vital for the success of this agenda.

Currently (based on dialogue between ACEM and her Singapore counterpart, the Singapore government is providing grants to industry for training and re training of industry stake holders).

- ❖ **Industry Engagement & Acceptance** For successful implementation of BIM, all sectors of the building industry should be engaged and convinced to adopt a standardized version of BIM (standards adopted from (a) above). This is to prevent 'data-islanding', piece-meal BIM and BIM-being-reduced-to-just-an-expensive-software.



38 BIM WISH LIST

Promotion of 'Open Source BIM'

BIM standards are decoupled from any software. The definition of a set of standards which define BIM will allow ANY CAD software to be BIM compliant with the minimum requirement that CAD software:

- ❖ Is able to model in 3-D;
- ❖ Is able to handle objects in standardized data-based format;
- ❖ Include as a minimum, a library of standardized building element objects;
- ❖ Include as a minimum, standardized drawing templates formatted to specified BIM compliant format.

BIM will be implemented by all players in a standardized format which is independent of CAD software platform.



39 WORK TO CONSIDER

Industry Wide BIM Survey

The Building Industry Presidential Council (BIPC) is a council of Presidents of associations and trade organisations who are key stake holders in the building industry in Malaysia. The BIPC was established sometime in the early 2000 and meets about 3 to 4 times a year to deliberate on issues relating to the building industry in Malaysia. Members of BIPC comprise the following organisations:



The Institution of Surveyors Malaysia



The Institution of Engineers Malaysia



Pertubuhan Arkitek Malaysia



The Real Estate and Housing Developers' Association



Association of Consulting Engineers Malaysia



Pertubuhan Pemborong Binaan Malaysia



Malaysian Institute of Planners

Completed Survey Forms

The completed survey forms (in electronic format) should be forwarded back to the following address:



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40 WORK TO CONSIDER

Industry Wide BIM Survey

Introduction to the BIM Survey

This survey is conducted under the purview of the Building Industry Presidents Council BIPC. The survey aims to collect data, opinions and expectations on Building Information Modelling from industry players. It is hoped that the data collected can be used to formulate an industry wide national BIM Masterplan and 'Road Map'. The survey is organised into three sections as follows:

A Company or Respondent's Information

The purpose of this section is to collect data and information on the company responding to this survey. The data collected in this section when collated against data in other section will be able to 'map' sectors of the industry against IT 'preparedness'

B Degree of Computerisation / IT Deployment

The purpose of this section is to collect data and information on the degree of IT application (hardware and software application). Analysis of data on a macro basis will provide information on the level of IT application in the industry and by extension, the level of industry 'preparedness' for the implementation of Building Information Modelling and identify 'gaps' in industry 'readiness'.

C BIM Awareness and Preparedness

This section assess the level of 'preparedness' and 'awareness' of Building Information Modelling (BIM).

Introduction to the BIM Survey

The survey form is designed in a spread sheet format to facilitate data collation and analysis. Survey forms in spread sheet format are locked. Data entry fields are on the left and are generally coloured and unlocked for data entry.



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Reinventing the Industry ?



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42 REINVENTING THE INDUSTRY



5 challenges for the QS industry:

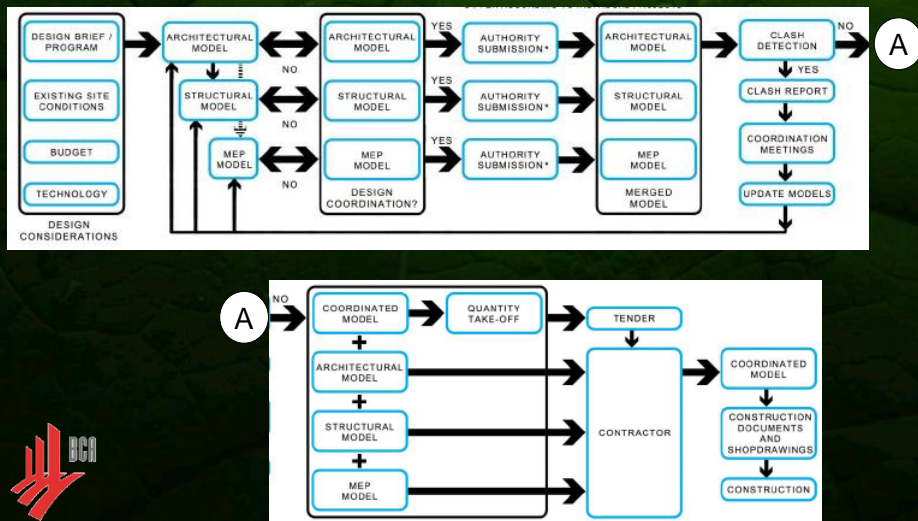
- ❖ Model for BIM Implementation in Projects
- ❖ Model for eTender – A simple example
- ❖ Standardisation of BQ (MyCESSM)
- ❖ Green Cost
- ❖ Carbon Accounting



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43 IMPLEMENTING BIM AT PROJECT LEVEL



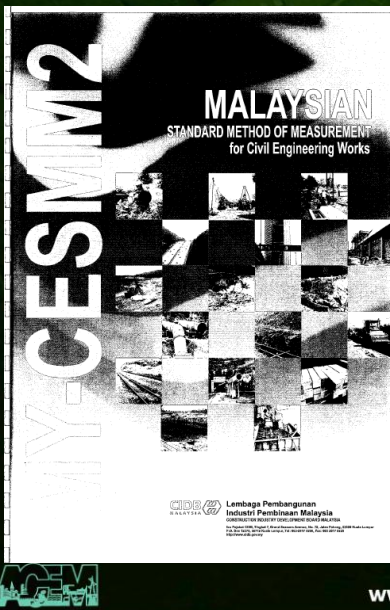
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	Employer	Architect	Consulting Engineers	Contractor / Quantity Surveyor
Conceptual Design	Provide requirements related to form, function, cost and schedule	Begin design intent model with massing concepts and site considerations	Provide feedback on initial building performance goals and requirements	Provide feedback on initial building cost, schedule, and constructability*
Schematic / Preliminary Design	Provide design review and to further refine design requirements	Refine Design Model with new input from Employer, Consulting Engineers, and Construction Manager.	Provide schematic modelling, analysis and system iterations as Design Model continues to develop	Provide design review and continued feedback on cost, schedule, and constructability *
Detailed Design	Design reviews. Final approval of project design and metrics	Continue to refine Design Model. Introduce consultants models and perform model coordination	Create Discipline specific Design Models and Analyses	Create Construction Model for simulation, coordination, estimates, and schedule *
Construction	Monitor construction and give input to construction changes and issue	Respond to construction RFI's, Perform contract administration, update Design Model with changes	Respond to construction RFI's and update Discipline specific Design Models, field conditions, and commissioning	Enhance Construction Model and perform final estimate & construction schedule, Manage bid process.
As-Built		Verify As-built model	Verify As-built model	Prepare As-built model
Facility Management	Engage Architect and Facilities Group for handing over	Coordinate information exchange through model to Facilities Group	Prepare handover documentation	

* Applicable to Design & Build projects only, where the Main Contractor is appointed at the Conceptual Design stage

45 MyCESSM



Malaysian Civil Engineering Standard Method of Measurement (MyCESSM).

- A – General Items
- B – Environmental Protection and Enhancement
- C – Traffic Management and Control
- D – Site Investigation Work
- E – Demolition and Site Clearance
- F – Earthworks
- G- Geotechnical Work
- H – Piling Works
- I – Concrete Works
- J – Brickwork, Blockwork and Masonry
- K – Timber Work
- L – Metal Work (structural)
- M – Building Work
- N – Paint Work
- O – Pipe Work
- P – Drainage Work
- Q – Roads and Pavings
- R – Tunnel Work
- S – Rail Track
- T- Miscellaneous Work

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46 AUTOMATING eTENDER

Standard specifications

Quantities inserted by QS

Bill of Quantities, Honda 3-B Centre (Mechanical & Electrical Works)			ACBM	
Description	Quantity	Rate (RM)	Total Cost (RM)	
Sub-Total from Previous Page				
RM				
(1) Flexible return air ducts (insulated) 1000mm x 600mm	1.0	Lt		RM
Supply air round ducts in ceiling space using galvanized sheet steel complete with support rods and 1" insulation				
(2) 1st Floor	1.0	Lt		RM
(3) 2nd Floor	1.0	Lt		RM
(4) 3rd Floor	1.0	Lt		RM
(5) Flexible round ducts 1000mm x 600mm	1.0	Lt		RM
Supply air round ducts in ceiling space using external fibreglass insulation and support rods as indicated				
(6) 1st Floor	1.0	Lt		RM
(7) 2nd Floor	1.0	Lt		RM
(8) 3rd Floor	1.0	Lt		RM
(9) 150mm Ø with 2" insulation	40.8	lt		RM
(10) Fire resistant fibre glass on main ducts	1.0	Lt		RM
Supply and cover track fire resistant fibreglass of 2 below ft. inside main ducts leaving AHU rooms.				
2.3 AIR GRILLES AND DAMPERS				
(1) General				
Air grilles shall be compatible with the ceiling to be installed. Irrespective of the size indicated in these BQ, it will be assumed that unit rates for main and equivalent imperial size grilles will be the same. The Contractor shall however confirm before placing order with architect on actual ceiling dimensions.				
(2) 600x600 square air diffusers	1	Lt		RM
Supply air square diffusers, (600mm x 600mm) 4-way directional diffusers complete with volume control dampers and all accessories.				
(3) 600x600 return air diffusers	24	Unit		RM
Return air square diffusers, (600mm x 600mm) complete with volume control dampers and all accessories.				
(4) 1000x200 linear diffuser supply air	24	Unit		RM
Supply air linear diffusers, (1000mm x 200mm) 2 slots side wall complete with volume control dampers and accessories.				
(5) 1000x200 linear diffuser supply air	25	Unit		RM
Supply air linear diffusers, (1000mm x 200mm) 2 slots side wall complete with volume control dampers and accessories.				
Sub-Total This Page (Carried Forward to Next Page)			RM	

Rates to be inserted by Tenderer

Total cost automatically calculated and summed

49 GREEN ACCOUNTING

TAX EXEMPTION FOR EXPENDITURE INCURRED

FOR

GREEN BUILDING INDEX (GBI)

IN BUDGET 2010

INCOME TAX (EXEMPTION) (NO.8) ORDER 2009



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50 GREEN ACCOUNTING

1. GBI CERTIFICATION (ANY LEVEL – CERTIFIED, SILVER, GOLD OR PLATINUM)
2. GBI GREEN COST SUM TO BE VALUED BY QUANTITY SURVEYOR AND ARCHITECT – THIS IS THE COST TO ACHIEVE THE GBI CERTIFICATION AND IS BASED ON THE LIST OF APPROVED GBI GREEN COST ITEMS
3. THIS GBI GREEN COST SUM IS SUBMITTED AS PART OF THE CVA AND WILL BE CHECKED BY THE GBI CERTIFIER AND THE APPROVED GBI GREEN COST SUM WILL BE LISTED IN THE FINAL GBI CERTIFICATION
4. COPY OF GBI CERTIFICATION IS GIVEN TO APPLICANT, MAINTAINED BY GBIAP AND ALSO LODGED WITH LAM

EXAMPLE

- (a) BASIC BUILDING COST = RM100mil
- (b) COST TO ACHIEVE GBI CERTIFICATION = RM108mil
- (c) GBI GREEN COST COMPONENT = RM8mil

(This sum to be valued by Quantity Surveyor and certified by Architect based on the list of GBI Green Cost items. This is submitted as part of the CVA and checked by the GBI Certifier)

- (d) THE GBI GREEN COST IS LISTED IN THE FINAL GBI CERTIFICATION



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51 GREEN ACCOUNTING

WHAT ARE ELIGIBLE GREEN COST?

- ✓ Eligible Green Cost items are all items which contribute to achieving GBI ratings.

Items which do not achieve GBI rating, even though, possessing ecolabels will not be eligible e.g. building material with LCC ecolabel as 'embedded low carbon' are not eligible as GBI (and most other building assessment tool) do not incorporate assessment of low carbon materials.

- ✓ Eligible green cost are additional cost which would be additional to a 'base cost', example normal single glazing are considered base cost, eligible green cost will be the additional cost for double-glazing glass. Some items e.g. energy monitoring system are fully eligible as green cost as the 'base-building' would be considered no to have EMS.

Download from www.greenbuildingindex.org for a list of green cost items.



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52 CARBON ACCOUNTING

Carbon Indexing

- A Carbon Index would enable a standardized measure of carbon ratings and facilitate in embodied carbon measurements
- The Carbon index can be pegged to the cost plan, that is to say, each index is pegged to a material/ trade or bunched together in a common arrangement of work sections.
- The objective is to be ready before carbon trading, carbon neutral offices and carbon footprints become common or legislated.
- Currently, DLS is collaborating with NUS and BCA on developing a Carbon Index for the Construction Industry.



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53 CARBON ACCOUNTING

Carbon Footprint

- Carbon footprint measures the current level of carbon emissions which is essential for building owners to set benchmarks to measure carbon performance and to compare amongst other properties.
- The carbon footprint for buildings includes embodied carbon and operational carbon.
- The embodied carbon of a building are from the CO₂ produced during the manufacture of materials to installation and demolition.
- Operational carbon is carbon emissions due to the operations of the building.
- Rule of thumb: 75:25 operational to embodied carbon ratio for buildings
 - Projection for the future?



54 CARBON ACCOUNTING

Carbon Calculator

What are the key components of the calculation?

- Carbon significant building components
 - Substantial quantities
 - Heavy
 - Associated with carbon intensive manufacturing processes
- Measured quantities
- Embodied carbon library items
 - Measured quantities
 - Mass and mix of components
 - Notional scope of components



55 CARBON ACCOUNTING

Generic Carbon Library Item



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Thank You for your Attention !



Ir. H.P. Looi
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