Manual for
IBS Content Scoring System
(IBS SCORE)

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FOREWORD

The government has put a lot of emphasis to move away from labour intensive activities towards technology intensive activities. This is part of the initiatives to achieve the objectives of producing and delivering high quality products, value for money and to stay competitive.

Over the years, CIDB has taken many initiatives to industrialise the Malaysian construction industry by promoting the use of Industrialised Building Systems (IBS). As an initial step towards open industrialisation, CIDB also promotes the use of standardised building components and off-site construction.

The IBS Content Scoring System (IBS Score) is a systematic and structured assessment system that can be used to measure the usage of IBS in a consistent way. It is intended to be a guide for those who are interested in measuring the content of IBS in any building project. The IBS Score can be used, for any purpose, be it for satisfying the regulatory requirements and also for satisfying the requirements of any incentives program.

I hope this guide will become an important initial effort towards achieving open industrialisation of the construction industry.

Dato' Ir. Hamzah Hasan
Chief Executive
CIDB Malaysia

1.0 INTRODUCTION

Prosperity and high economic growth in Malaysia have created a high demand for construction activities. As a consequence, this has attracted a huge number of foreign workers into this country to take up employment on site as unskilled labour doing manual jobs. Despite their contributions, the country is in a quagmire with a host of problems such low quality works, delays, wastages, social problems, diseases, etc.

As such, some form of government intervention is highly needed. Industrialisation of the construction industry is seen as the only feasible way forward. The government has laid out a comprehensive national Industrialised Building System (IBS) Road Map for the construction industry players to adopt in the industrialisation programme of the construction industry. Essentially, the Road Map evolves on the policy of phased reduction of dependency on foreign labour and encouragement policy on the investment in technologies, techniques and processes of construction. It lays out definite action plans which when successfully implemented shall ensure a successful upgrading of our construction industry.

As a push for utilisation of IBS, a number of encouragement and regulatory requirements have been put forward. An example of such regulatory requirement is the implementation of minimum percentage of IBS utilisation requirement in government building projects. Likewise, minimum percentage requirement is also needed for CIDB Levy exemptions. Consequently, some form of IBS content assessment is needed for the purpose.

This IBS Content Scoring System (IBS Score) is a systematic and structured assessment system that can be used to measure the usage of IBS in a consistent way.

2.0 OBJECTIVE

The objective of this Manual is to provide a well-structured assessment system for the IBS Score. It sets out the IBS Score formula, the IBS Factor for each of the elements used in the building, methods of calculating the IBS Score, explanatory notes as well as sample calculations. It is also intended to provide guidance for every professional to evaluate the IBS Score for any building project.

3.0 PRINCIPLES OF IBS SCORE

The IBS Score puts emphasis on the following attributes: -

1. the use of prefabricated and precast concrete components,
2. off-site production of components
3. the use of standardised components
4. repeatability
5. design using Modular Coordination concept

Higher IBS Score is a reflection of a higher reduction of site labour, lower wastage, less site materials, cleaner environment, better quality, neater and safer construction sites, faster project completion as well as lower total construction costs.

The method of determining the IBS Score is designed to be a simple but effective process. Points are awarded based on the IBS Factors of the structural and wall elements used. The presence of high repetitiveness in the design as well as other simplified construction solutions shall also contribute to the total score. The points are summed-up to give the IBS Score of a building. IBS score for the whole project development that consists of a group of buildings is also provided.

4.0 THE IBS CONTENT SCORING SYSTEM (IBS SCORE)

i) Maximum IBS Score for a building is **100 points.**

ii) The IBS Score is made up of the following components :

Part 1 –Structural Systems (Maximum score is 50 points)
Points are awarded for various types of structural system used
e.g. precast concrete beams and columns, steel, prefabricated timber, etc.

Part 2 – Wall Systems (Maximum score is 30 points)
Points are awarded based on various types of wall systems used
e.g. precast concrete panel, glass, dry partition, block work, etc.

Part 3 – Other Simplified Construction Solutions (Maximum score is 20 points)
Points are awarded based on usage of other simplified construction solutions
e.g. standard components based on MS 1064, standardised grids, other 3D prefabricated components such as prefabricated toilets, staircases, etc.

iii) The formula

IBS SCORE = **SCORE FOR STRUCTURAL SYSTEMS**
+
SCORE FOR WALL SYSTEMS
+
SCORE FOR OTHER SIMPLIFIED CONSTRUCTION SOLUTIONS

$$50\sum\left[\frac{Q_S}{Q_{ST}}F_S\right] + 30\sum\left[\frac{Q_W}{Q_{WT}}F_W\right] + S$$

Where:

- Q_S - Construction area of a structural system
- Q_{ST} - Total construction area of building
- F_S - IBS Factor for structural system from Table 1
- Q_W - Length of a wall system (external or internal wall)
- Q_{WT} - Total wall length (external and internal wall)
- F_W - IBS Factor for wall system from Table 2
- S - IBS Score for other simplified construction solutions from Table 3

iv) IBS score calculation only considers the superstructure elements of a building. Sub-structure works are not taken into account in the calculation.

v) For ground floor calculations, consider column and wall only – ignore types of ground beam and ground slab.

4.1 IBS Score for Structural Systems

$$50 \sum \left[\frac{Q_S}{Q_{ST}} F_S \right]$$

where

Q_s / Q_{sT} - the percentage of the construction area in which a particular structural system is used; out of the total construction area of the building

F_S - IBS Factor for the particular structural system from Table 1.

i) Maximum IBS Score for this part is 50 points.

ii) The IBS Score for a particular structural system is the product of the percentage construction area covered by the system and the corresponding IBS Factor from Table 1. In order to arrive at the IBS Score, it is multiplied by the score of 50 points.

iii) For simplicity, the dimensions for the calculation of construction areas may be read from the grid line or other methods such as direct measurement from drawings. The construction area for roof structure is taken as the plan area covered by the building line underneath it. As such, the construction area for roof is similar to construction area of beam / column underneath it. Refer to examples in Section 6.

iv) For elements that are not horizontal, e.g. roof, staircase and all other sloped surfaces; plan areas shall be used for the calculation.

v) The construction area includes car porch but excluding driveway, apron and landscaped areas

vi) Table 1 provides the IBS Factors for combinations of common floor and column / beam systems that are used. For a particular structural system that are not commonly used and not mentioned in Table 1, the F can be obtained from CIDB.

vii) For building that uses multi-structural systems, the contribution of each system is calculated and totalled up to arrive at the total IBS Score for the combination of the structural systems.

Table 1. IBS factor for structural systems

SYSTEM	FLOOR / COLUMN / BEAM [5] [6]	Precast concrete slab[1]	In-situ concrete on permanent metal formwork	In-situ concrete using reusable[3] system formwork	In-situ concrete using timber[4] formwork	Steel flooring system	Timber frame flooring system	No Floor [7]
CONCRETE	Precast column and beams	1.0	0.9	0.7	0.6	1.0	1.0	1.0
	Precast column and in-situ beams using reusable[3] system formwork	0.9	0.8	0.6	0.5	0.9	0.9	0.6
	Precast column and in-situ beams using timber[4] formwork	0.8	0.7	0.5	0.4	0.8	0.8	0.4
	Precast beams and in-situ columns with reusable[3] system formwork	0.9	0.8	0.6	0.5	0.9	0.9	0.6
	Precast beams and in-situ columns using timber[4] formwork	0.8	0.7	0.5	0.4	0.8	0.8	0.4
	In-situ column and beams using reusable system[3] formwork	0.7	0.6	0.5	0.3	0.7	0.7	0.5
	In-situ column and beams using timber[4] formwork	0.6	0.5	0.3	0.0	0.6	0.6	0.0
STEEL	Steel columns and beams	1.0	0.9	0.7	0.6	1.0	1.0	1.0
TIMBER	Timber frame system	1.0						
ROOF SYSTEM	Prefab timber roof truss	1.0						
	Prefab metal roof truss	1.0						
	Timber[4] roof trusses	0.0						

Notes:

1. Precast concrete slabs include half slab, hollow core slab, and precast prestressed planks.
2. Precast concrete includes products of factory precasting, site precasting or the use of tilt-up systems.
3. Reusable formworks include plastic, fibreglass, steel, aluminium and other metal formworks that can be used repeatedly.
4. Timber formwork (and timber roof trusses) means the timber components are sized, cut and fabricated in-situ to form the formworks and the required temporary works. This is commonly referred to as stickbuilt formwork. Timber includes plywood.
5. For structural system using **Load Bearing Wall**, whether precast or in-situ, the factor can be determined from the table by treating the wall as a wide column.
6. The IBS factor for tunnel formwork system is 0.6
7. This is for structures without floor. Refer examples in Section 6.
   For other structural systems not mentioned in the table **please refer to CIDB** for the IBS Factor.

4.2 IBS Score for Wall Systems

$$30 \sum \left[\frac{Q_W}{Q_{WT}} F_W \right]$$

Where,

Q_w / Q_{wT} - The ratio of the length of a particular wall system (external or internal) used out of the total wall length of the building.

F_w - IBS Factor a particular wall system, from Table 2.

i) Maximum IBS Score for this part is 30 points.

ii) The IBS Score for wall system is the summation of the product of the ratio of wall length covered by the wall system and the corresponding IBS Factor. In order to arrive at the IBS Score, multiply it by the score of 30 points.

iii) External basement wall for earth retaining purposes and toilet cubicle partition walls are excluded from the calculation. For cavity wall, consider the two separate skins as a wall.

iv) Parapets and corridor / balcony wall must be counted for in the calculation.

v) For buildings that use multi-wall systems, the contribution of each system is calculated and totalled up to arrive at the total IBS Score for the wall systems.

vi) Table 2 provides the IBS Factors for various common wall systems. For a particular uncommon wall system not mention in Table 2, the factor can be obtained from CIDB.

Table 2. IBS factor for wall systems

NO	WALL SYSTEM [7]	IBS FACTOR
1	Precast Concrete Panel [1]	1.0
2	Metal Cladding	1.0
3	Prefabricated Timber panel	1.0
4	Full height Glass panel [2]	1.0
5	Dry Wall system [3]	1.0
6	In-situ concrete with reusable[4] system formwork	0.5
7	In-situ concrete with timber[5] formwork	0.0
8	Precision blockworks[6]	0.5
9	Common Brickwall	0.0

Notes:

1. Precast concrete panels include sandwich panel, solid panel, hollow core panel and bay-window. Precast concrete includes products of factory precasting, site precasting or the use of tilt-up systems.
2. For full height windows, use the IBS Factor for panel glass. For wall with non-full height windows, use IBS Factor for the support material e.g. Precast concrete panel, brickwall, etc.
3. Precast dry wall includes cementitious panels and composite gypsum boards.
4. Reusable formworks include plastic, fibreglass, steel, aluminium and other metal formworks that can be used repeatedly.
5. Timber formwork means the timber components are sized, cut and fabricated in-situ to form the formworks and the required temporary works. This is commonly referred to as stickbuilt formwork. Timber includes plywood.
6. Precision precast blocks includes interlocking blocks, lighweight concrete blocks that can be laid on adhesive mortar.
7. Walls constructed using tunnel formworks, use Factor of 0.6. For other wall system not mentioned in the table **please refer to CIDB** for the IBS Factor.

4.3 IBS Score for other Simplified Construction Solutions

S

i) Part 3 of the formula provides points for those who utilise construction methods or solutions that can contribute to the objectives of industrialisation through standardisations and repetitions. Points are also awarded to labour saving solutions.

ii) Points are given based on the percentage of usage or coverage of a particular solution and summed up to form the IBS Score for this section. No points are given if the usage is less than 50%.

iii) The maximum score for this section is 20 points.

iv) For other simplified construction solutions not mentioned in Table 3, **please refer to CIDB.**

Table 3. IBS score for other simplified construction solutions

No	DESCRIPTION	UNIT	IBS SCORE	
			PERCENTAGE OF USAGE	
			50% ≤ × <75%,	75% ≤ × ≤100%
1	**UTILISATION OF STANDARDISED COMPONENTS BASED ON MS 1064**			
	i) Beams[1]	Nos	1	2
	ii) Columns[1]	Nos	1	2
	iii) Walls[1]	m	0.5	1
	iv) Slabs[1]	m^2	0.5	1
	v) Doors[2]	Nos	1	2
	vi) Windows[3]	Nos	1	2
2	**REPETITION OF STRUCTURAL LAYOUT**			
	a) For building more than 2 storeys			
	i) Repetition of floor to floor height	storey	1	2
	ii) Vertical repetition of structural floor layout	m^2	1	3
	b) For building 1 or 2 storeys			
	Horizontal repetition of structural floor layout	m^2	2	5
3	**OTHER PREFABRICATED COMPONENTS AND LABOUR SAVING SOLUTIONS**			
	i) Prefab Toilet Units	Nos	0.5	1
	ii) Prefab Staircases	Nos	0.5	1
	iii) Prefab Lift-Shafts	Nos	0.5	1
	iv) Spray plaster[4]	m^2	0.5	1
	v) Other Labour Saving Product / Solution[5]	Nos or m^2	0.5	1

Notes:

1. Refer to MS 1064 : Pt 10 : 2001 Coordinating sizes and preferred sizes for reinforced concrete components. Values to use from the tables : beams - width & depth, columns -width & length, walls -width(thickness), slab -thickness. Note that for IBS Score calculation purposes, the sizes specified in this standard are also for steel sections or other materials.
2. Refer to MS 1064 : Pt 4 : 2001 Coordinating sizes and preferred sizes for door sets
3. Refer to MS 1064 : Pt 5 : 2001 Coordinating sizes and preferred sizes for window sets
4. Spray plaster is an alternative to using manual plasterers and labour. It is a method to plaster walls using mechanical means.
5. Other labour reducing products. Please provide details in the submission.
6. For other simplified construction solutions not mentioned in the table **please refer to CIDB** for the IBS Score.

4.4 IBS Score for Projects with Group of Buildings

i) In the case of a group of buildings in one project, the IBS Score of the project shall be calculated by multiplying the percentage of construction area of the respective building (out of total construction area of project); with the IBS Score of the individual building.

$$\sum \left[\text{IBS SCORE FOR BUILDING} \times \frac{Q_{ST\ (building)}}{Q_{ST\ (project)}} \right]$$

ii) All major structures in the project, including car park building, *surau,* etc. are to be considered when computing the area covered by respective systems.

iii) Minor structures, e.g. guardhouse, trash bin and others should be excluded from the calculation provided that they are not within or structurally linked to the main building.

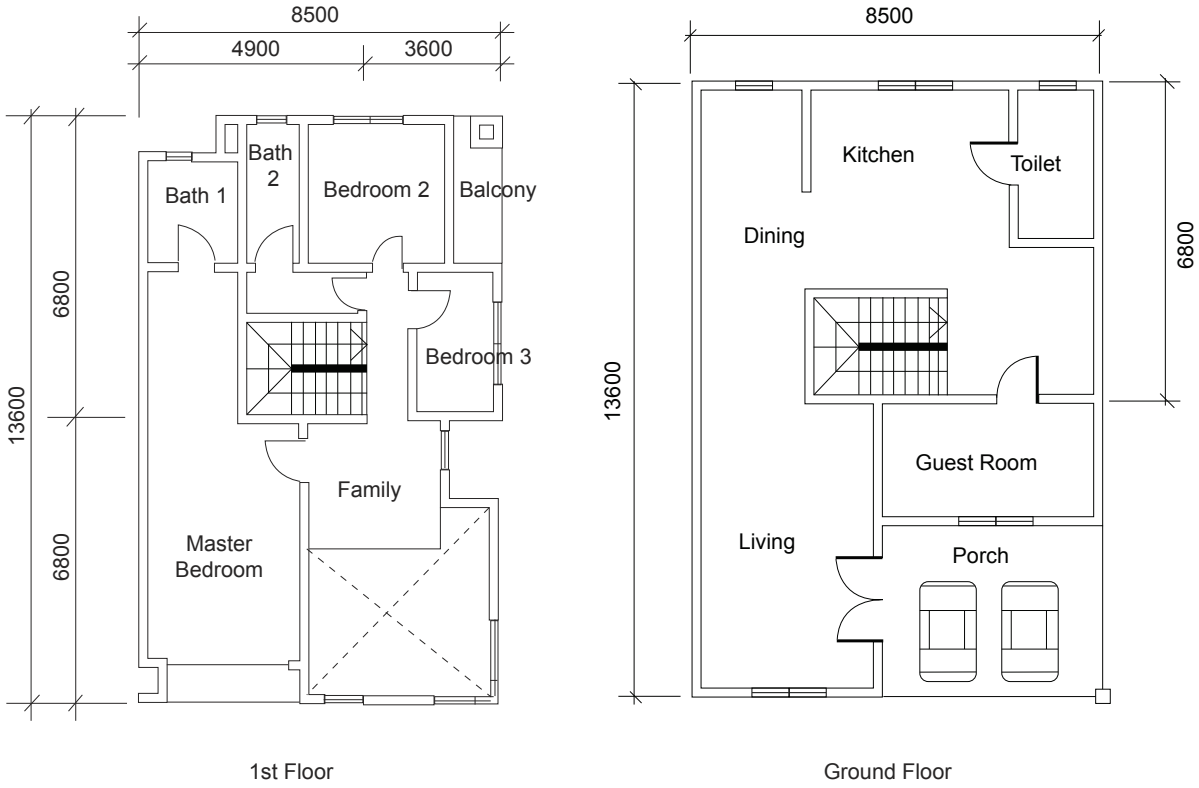
5.0 IBS SCORE CALCULATION EXAMPLES

In this section a number of examples are given to illustrate the calculation methods for determining the IBS score for various types of building.

5.1 Example 1 :

Double Storey Terrace House.

Typical layout floor plan for one unit is as shown.



1st Floor

Ground Floor

1) Construction area

i)	Construction area ground floor	=	117.0m^2
ii)	Construction area 1st floor	=	117.0m^2
iii)	Construction roof area	=	117.0m^2
	Total construction area	=	351.0m^2

2) Structural Systems

Ground Floor

i)	Beams	:	Precast concrete beams
ii)	Columns	:	In-situ concrete using steel formworks
iii)	Floor slab	:	Precast half slabs floor
iv)	Roof truss	:	Prefabricated timber roof truss

3) Wall System

i)	Internal wall	:	Precast concrete panel

ii) External wall : Precast blockworks

4) Other simplified construction solutions

i) Beams : 60% complies to MS 1064 Part 10 : 2001
Columns : 100% complies to MS 1064 Part 10 : 2001
Walls and slabs : Less than 50% complies to MS 1064 Part 10
Doors : 80% complies to MS 1064 Part 4 : 2001
Windows : 0% complies to MS 1064 Part 5 : 2001

ii) Horizontal repetition of structure = 100%

iii) Other prefab components / construction solutions = None

From the above information, the calculation can be tabulated as follows

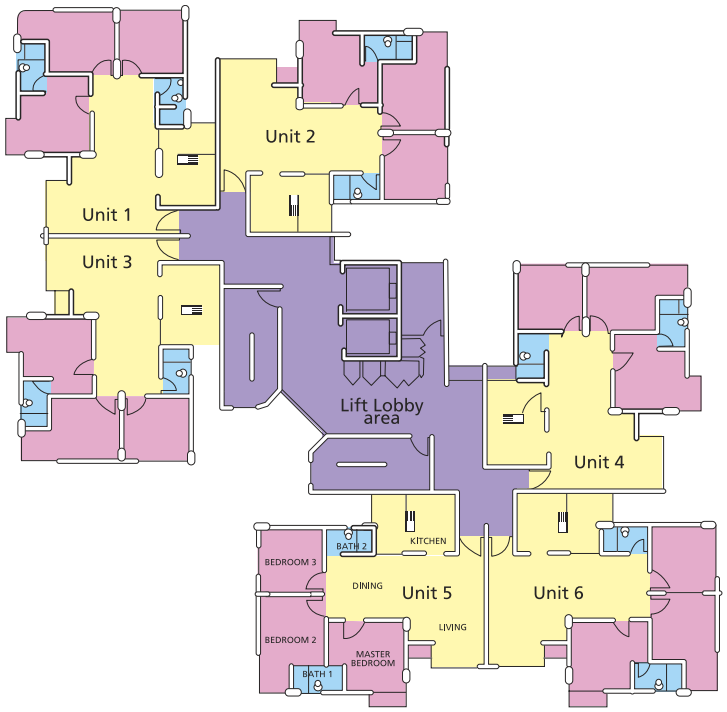
ELEMENTS	AREA (m^2) or Length (m)	IBS FACTOR[1]	COVERAGE	IBS SCORE
Part 1 : Structure Elements				
Precast beams + in-situ column with reusable formwork + precast concrete half slab floor. Ground floor area = 117.0m^2	117.0m^2	0.9	(117 / 351) = 0.33	0.33 × 0.9 × 50 = 14.9
Precast beams + in-situ column with reusable formwork (no floor) 1st floor area = 117.0m^2	117.0m^2	0.6	(117 / 351) = 0.33	0.33 × 0.6 × 50 = 9.9
Roof truss using prefab roof truss Roof area = 117.0m^2	117.0m^2	1.0	(117 / 351) = 0.33	0.33 × 1.0 × 50 = 16.5
Total Part 1	**351.0m^2**		**1.00**	**41.3**
Part 2 : Wall System				
External wall using precast concrete blockworks	87.8m	0.5	(87.8 / 167) = 0.52	0.52 × 0.5 × 30 = 7.8
Internal wall using precast concrete panel	79.5m	1.00	(79.5 / 167) = 0.48	0.48 × 1.0 × 30 =14.4
Total Part 2	**167.3m**		**1.00**	**22.2**
Part 3 : Other simplified construction solutions				
i) 60% beam sizes follow MS 1064 Part 10 : 2001			60%	1.0
ii) 100% of column sizes follow MS 1064 Part 10 : 2001			100%	2.0
iii) 80% of door sizes follow MS 1064 Part 4 : 2001			80%	2.0
iv) Horizontal repetition of structure = 100%			100%	5.0
Total Part 3				**10.00**
IBS CONTENTS SCORE OF PROJECT (Part 1 + Part 2 + Part 3)				**73.5**

[1] Refer to respective tables for IBS Factors

5.2 Example 2 :

18 storey condominium.

Typical layout floor plan for one floor is as shown.



Floor Plan

1) Construction Area per floor

Area for 1 unit of condominium	=	94.4m^2
Lift lobby area	=	140m^2
Area for 1 floor = [94.4 × 6 units + 140]	=	706.4m^2

2) Structural Systems

i) Tunnel formwork system
ii) Roof truss : prefab steel roof truss.

3) Wall System per floor

i) Precast blockworks wall = 263m length
(6 units + lobby area)
ii) Tunnel formwork wall = 120m length
(6 units + lobby area)

4) Other simplified construction solutions

i) Doors : 100% comply to MS 1064 Part 4 : 2001
Windows : 100% comply to MS 1064 Part 5 : 2001
ii) Repetition of floor to floor height = 90%
Vertical repetition of structural floor layout = 80%
iii) Staircase : 100% prefab staircase

From the information given the calculation can be tabulated as follows,

ELEMENTS	AREA (m^2) or Length (m)	FACTOR	COVERAGE	IBS SCORE
Part 1 : Structure Elements				
i) Tunnel formwork system Total area = 706.4m^2 × 18 storey = 12,715m^2	12,715m^2	0.60	12,715 / 13,421.4 = 0.95	0.95 × 0.6 x50 = 28.5
ii) Roof truss - prefab steel Roof area = 706.4m^2	706.4m^2	1.0	706.4 / 13,421.4 = 0.05	0.05 × 1.0 × 50 = 2.5
Total Part 1	13,421.4m^2		1.00	**31.0**
Part 2 : Wall System				
i) Precast blockworks wall Total length = 263 × 18 storeys	4,734	0.5	4,730 / 6,894 = 0.69	0.69 × 0.5 × 30 = 10.34
ii) External wall : tunnel formwork Total length = 120 × 18 storeys	2,160	0.6	2,160 / 6,894 = 0.31	0.31 × 0.6 × 30 = 5.58
Total Part 2	6,894		1.00	**15.93**
Part 3 : Other simplified construction solutions				
i) 100% door sizes complies to MS1064			100%	2.0
ii) 100% of windows complies to MS1064			100%	2.0
iii) Repetition of floor height = 90%			90%	2.0
iv) Vertical repetition of structure floor layout = 80%			80%	3.0
v) 100% of staircase using prefab concrete staircase			100%	1.0
Total Part 3				**10**
IBS CONTENTS SCORE OF PROJECT (Part 1 + Part 2 + Part 3)				**56.93**

5.3 Example 3 :

Calculation of IBS Score for a project (Group of Buildings)

The site plan for a housing development project is as shown.

Project information :

- Main buildings in the development consist of 4 blocks of apartments and 1 block of office building. The IBS score for each building was calculated as in the above examples.

i) Block A - 5 storey apartment

Construction area, $Q_{ST\ (building\ A)}$ = 3,000m^2
IBS Score $_{(building\ A)}$ = 83

ii) Block B - 5 storey apartment

Construction area, $Q_{ST\ (building\ B)}$ = 3,000m^2
IBS Score $_{(building\ B)}$ = 87

iii) Block C - 4 storey apartment

Construction area, $Q_{ST\ (building\ C)}$ = 3,200m^2
IBS Score$_{(building\ C)}$ = 35

iv) Block D - 4 storey apartment

Construction area, $Q_{ST\ (building\ D)}$ = 3,200m^2
IBS Score$_{(building\ D)}$ = 47

v) Block E - 3 storey office block

Construction area, $Q_{ST\ (building\ E)}$ = 3,000m^2
IBS Score$_{(building\ E)}$ = 75

Total construction area (block A + B + C + D + E) = 15,400m^2

IBS Content Score for the project can be calculated using the following formula;

$$\text{IBS Score for project} = \sum \left(\text{IBS Score of building} \times \frac{Q_{ST\ (building)}}{Q_{ST\ (project)}} \right)$$

The calculation can be tabulated as in the table below :

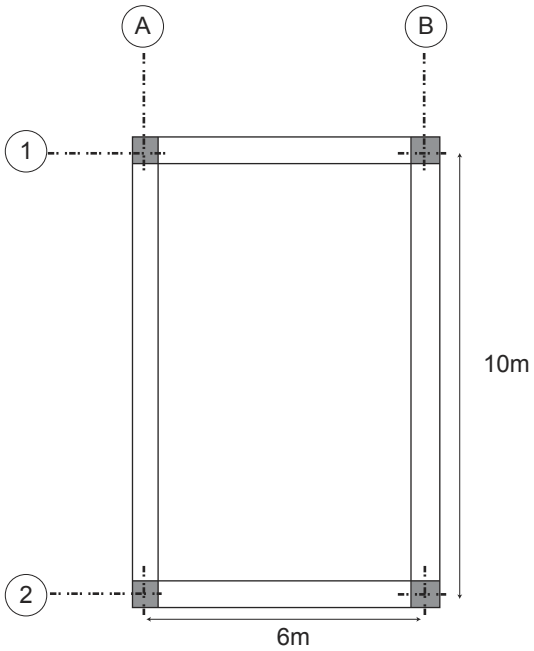
Block	Construction Area (m^2)	Coverage	IBS Score$_{(building)}$	IBS Score$_{(project)}$
A	3,000	3000 / 15400 = 0.195	83	0.195 × 83 = 16.2
B	3,000	3000 / 15400 = 0.195	87	0.195 × 87 = 17.0
C	3,200	3200 / 15400 = 0.21	35	0.21 × 35 = 7.4
D	3,200	3200 / 15400 = 0.21	47	0.21 × 47 = 9.9
E	3,000	3000 / 15400 = 0.195	75	0.195 × 75 = 14.6
Total	**15,400**	**1.0**		**65.1**

Thefore the IBS score for the whole of the development project is 65.1

6.0 CONSTRUCTION AREAS AND WALL LENGTHS

6.1 How to Calculate Construction Area

- Measure from grid to grid (ignore offset of beams / walls to gridlines)
- Ignore balcony area from calculation

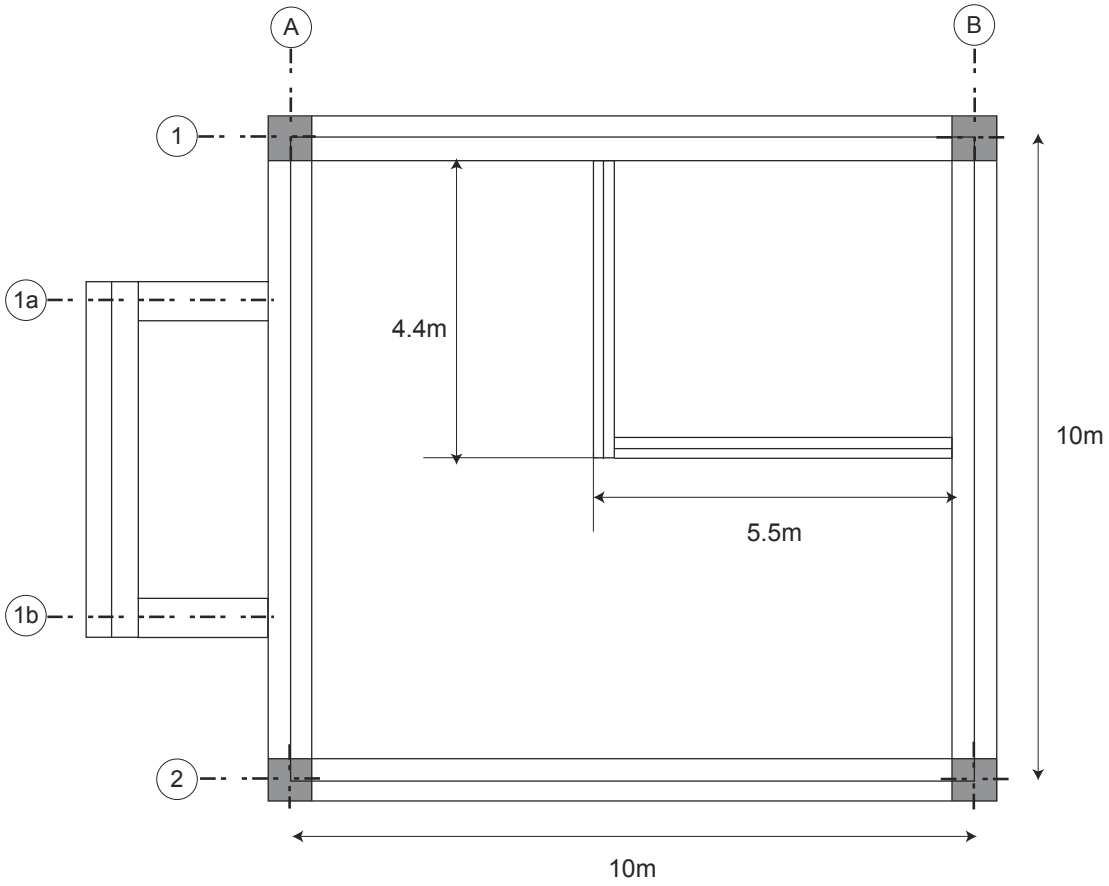


Construction Area for beam / column / slab $= 6 \times 10$
$= 60m^2$

Construction Area for roof $= 6 \times 10$
$= 60m^2$

6.2 How to Calculate Wall Length

- For curved or diagonal wall (balcony, bay window etc.), assume straight wall
- For external wall, measure wall length from grid to grid. (Ignore column)
- For internal wall, measure actual wall length



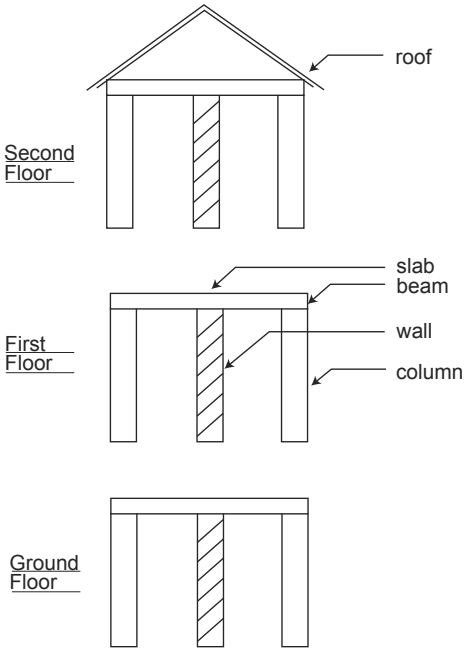
Wall Length

i) External wall = 10 + 10 + 10 + 10
= 40m

ii) Internal wall = 4.4 + 5.5
= 9.9m

6.3 How to Calculate IBS Score for Part 1 : Structural Systems and Part 2 : Wall Systems

The approach is always to treat the components as performing in an "n-shape" structure



As an example,

For Ground Level:
Consider types of structure used for 1st Level Beams, Ground to 1st Level Columns, 1st Level Floor and Ground Level Walls.

For 1st Level:
Consider 2nd Level Beams, 1st to 2nd Level Columns, 2nd Level Floor and 1st Level Walls.

For 2nd Level:
Consider Roof Level Beams, 2nd to Roof Level Columns, Roof Level Floor and 2nd. Level Walls.

If the top has roof trusses instead of the roof slabs (no floor), calculations for roof system need to be done.

For a 1-storey building without roof slab

Identify beam; say in-situ roof beam using timber formwork
Identify column; say in-situ column using timber formwork
Identify floor; no floor slab

Therefore, from Table 1, the IBS Factor is 0.

Identify roof system; say prefab timber roof trusses
From Table 1, the IBS Factor is 1.0

Calculate the area covered by the beams / columns; say 50m^2
Calculate the area covered by the roof; say 50m^2

Total area	= 100m^2
IBS Score (columns and beams)	= 50 × 50 / 100 × 0 = 0
IBS Score (roof)	= 50 × 50 / 100 × 1.0 = 25
Total IBS Score for Part 1 : Structural Systems	= 0 + 25 = 25

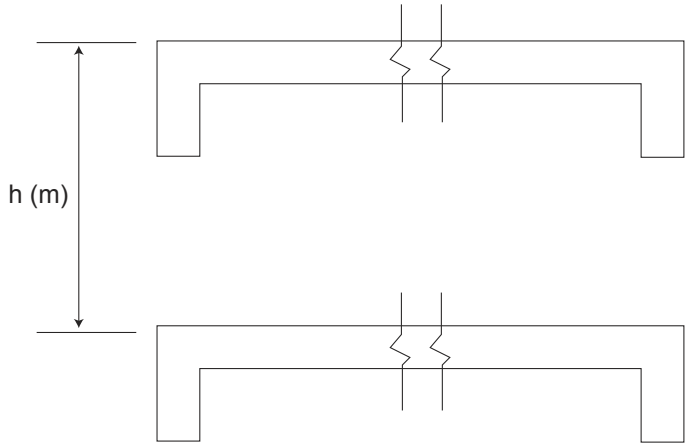
Identify wall system; say common brickwall
From Table 2, the IBS Factor is 0

Calculate the length covered by the walls; say 50m

IBS Score (walls)	= 30 × 50 / 50 × 0
Total IBS Score for Part 2: Wall Systems	= 0

6.4 How to Calculate IBS Score for Part 3 : Other Simplified Construction Solutions

- Floor height is measured from finished level to finished level



h = floor height

- A beam in between two supports is counted as one beam.
- A column in between two floors is considered as one column.
- A prefabricated toilet is a volumetric unit complete with piping, wiring, finishing on walls and floor.
- A staircase is a flight or flights of stairs connecting two floors. So a staircase with three flights and two landings is considered as one staircase.
- For lift shaft and refuse chutes, a unit of these elements connects two floors. So a lift shaft that goes all the way from 1st to 8th floor is considered as 7 numbers of lift shafts.

6.5 Standardised Components (Based on MS 1064)

Points are awarded based on the percentage of components (beams, columns, walls, slabs, doors and windows) that comply with the preferred sizes as defined in the MS 1064.

Say, a building has a total 100 columns; with the following sizes :

200mm × 200mm : 60 numbers
250mm × 250mm : 10 numbers
375mm × 375mm : 30 numbers

Between these three types, the sizes that being specified in MS 1064 : Part 10 : 2001 Section 3 are 200mm × 200mm and 250mm × 250mm.

Therefore, percentage of column that comply to MS are,

= (60 +10) / 100 × 100%
= 70%

Based on Table 3, the IBS Score for columns is 1.

Another example; say, a building has a total 100m run of walls; with the following sizes of width (thickness) :

100mm : 60 m run
130mm : 40 m run

Between these two types, the size that being specified in MS 1064 Part 10 : 2001 Section 3 is 100mm.

Therefore, percentage of wall that comply to MS are,

= 60 / 100 × 100%
= 60%

Based on Table 3, the IBS Score for walls is 0.5.

6.6 How to Calculate IBS Score for Standardised Grids

a) For buildings more than 2 storeys (levels)

1. Repetition of floor-to-floor height (Typical floor height)

Say, the building has 6 levels including basement.

Basement to Ground Floor	= 29M	= 2900mm
Ground Floor to 1st floor	= 29M	= 2900mm
1st Floor to 2nd Floor	= 30.5M	= 3050mm
2nd floor to 3rd Floor	= 30.5M	= 3050mm
3rd floor to 4th Floor	= 30M	= 3000mm
4th Floor to Roof	= 30M	= 3000mm

Therefore, take the height with the most repetition:
29M, 30M and 30.5M: Repeated two times each.
As we have three sets of typical layouts, consider a set only.
Therefore, percentage of coverage = 2 / 6 × 100%
= 33%

Based on Table 3, the IBS Score for repetition of floor-to-floor height is 0.

2. Vertical repetition of structural floor layout (Typical floor plan)

Structural (load-bearing) layout of the unit below must be identical to the unit above. Consider basement layout but ignore roof level.

Say, the building has 6 levels including basement; plus one flat concrete roof. The building has four different structural floor plans,

a. Basement
b. Ground and First: Same layout
c. Second
d. Third and Fourth: Same layout

Therefore, the building has two repetition of structural floor plan:
The Ground and First, as well as Third and Fourth.

Therefore, percentage of coverage = 2 / 6 × 100%
= 33.3%

Based on Table 3, the IBS Score for repetition of floor-to-floor height is 0.

b) For buildings less than 2 storeys (levels)

1. Horizontal repetition of structural floor layout

Mirror image of the structural layout is also considered as being repetitive.
Say, the building comprises of 6 units of one-storey dwellings with four different structural floor layout:

Unit 1
Unit 2 and 3: Mirror of each other
Unit 4
Unit 5 and 6: Identical

Therefore, the structural plan layout of 2 units is repeated.

Therefore, percentage of coverage = 2 / 6 × 100%
= 33%

Based on Table 3, the IBS Score for horizontal repetition of structural floor layout is 0.

6.7 Other Prefab Components and Labour Saving Solutions

Referring to Table 3, the points are awarded based on the percentage of prefabricated components or other labour saving solutions (prefab toilets, staircases, lift-shafts, refuse chutes and spray plaster)

As an example, say, a building uses spray plaster for part of its walls:

External:

Spray Plaster:	7,900m^2
Conventional Plaster :	2,000m^2

Internal

Spray Plaster:	200m^2
Conventional Plaster:	9,900m^2

Therefore, percentage of coverage = 8,100 / 20,000 × 100%
= 40.5%

Based on Table 3, the IBS Score for spray plaster is 0.

Another example; say, the building has a total 100 toilets:

Prefab toilet:	80 numbers
Conventional:	20 numbers

Therefore, percentage of coverage = 80 / 100 × 100%
= 80%

Based on Table 3, the IBS Score for toilets is 1.

7.0 REFERENCES

1. Industrialised Building Systems (IBS) Road Map 2003-2010, CIDB Malaysia, 2003

2. Guide to Modular Coordination in Buildings, Malaysian Standard MS 1064 : Part 1 to Part 10, Dept Of Standards Malaysia, 2003

3. Sizing Guide for Precast Concrete Building Components for Residential Buildings, CIDB Malaysia 2004

4. Code of Practice on Buildable Design, BCA Singapore, 2004

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