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1.0 INTRODUCTION

1.0 Introduction

The construction industry in Malaysia is faced with lack of access, accuracy, width and depth of industry data. Information is an important element in the decision-making process. Although cost information on the Malaysian construction industry is available through various organisations, most of it is available for that organisations' usage only but not easily accessible by third parties.

The Building Cost Information Services Malaysia (BCISM Sdn Bhd) was formed in July 2019. It is a collaborative effort between the Malaysian Construction Industry Development Board (CIDB) and Royal Institution of Surveyors Malaysia (RISM).

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OUR PRODUCTS



Building Material Prices



Labour Wage Rates



Machinery Hire Rates
and Equipment
Purchase Prices



Material Cost Index



Labour Cost Index



Machinery and
Equipment Cost
Index



Building Cost Index



Tender Price Index



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2.0 CONSTRUCTION COST DATA

2.1 Introduction and Scope

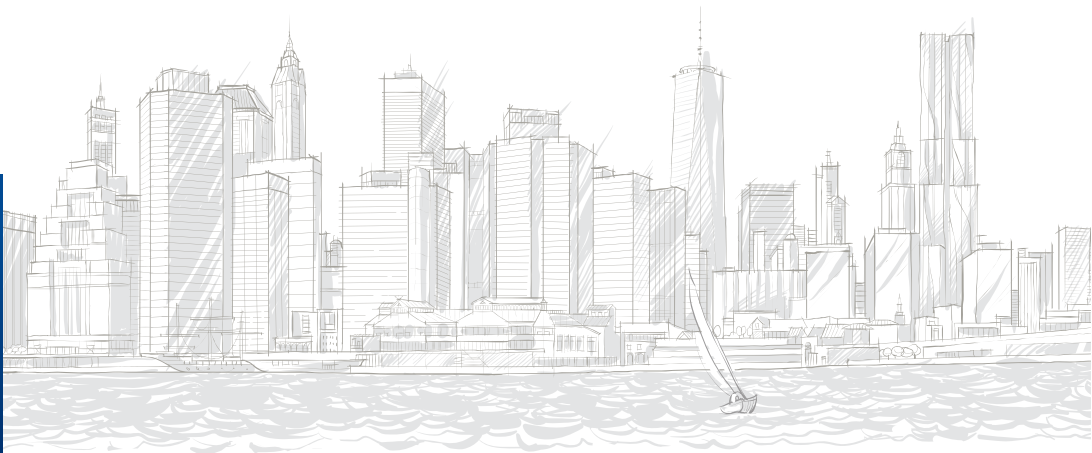
BCISM Costbook 2021 is a compilation of useful construction related cost and project information in a condensed format to serve as a compact quick-reference guide. Unless otherwise stated, costs reflected in this costbook are Malaysian costs at 4th quarter 2020.

All data are derived by BCISM from actual data collected. For more details, subscribe to CIDB National Construction Cost Centre (n3c.cidb.gov.my).

The construction costs for a variety of building types are given in unit area (square metre) of the built-up floor area of the building in Ringgit Malaysia and have been based on analysis of the contract bills of quantities submitted by contractors to CIDB. The Gross Floor Area (GFA) is used for the built-up floor area.

GFA is the total of all enclosed spaces fulfilling the functional requirements of the building measured to the internal face of enclosing walls (or columns, doors, and the like). It includes:

- Area occupied by partitions, columns, internal structural or party walls, stairwells, lift wells and the like.
- Lifts, plant and tank rooms and the like above main roof slab.
- Sloping surfaces such as staircases and the like but measured flat on plan.



2.2 Building Price Specifications

Type of Buildings	Building Categories	Brief Specifications
Industrial Buildings	Light duty factories	Steel structure and roof with light weight concrete roof with M&E services but excludes air-conditioning, lift and communication installation.
	Warehouses	Steel structure with metal deck roofing and M&E services but excludes lift and communication installation.
Office Buildings	3-storey offices, owner operated	RC structure, structural steel roof with metal decking and M&E services. Office fit-out excluded from this cost.
	Shop offices	RC structure, lightweight steel roof truss system with painting and tiling works for finishes. Fit-out, lift and communication are excluded.
Refreshment, Entertainment, and Recreational Buildings	Restaurants	RC frame with tiling and painting works for finishes and include M&E services.
	Multi-purpose halls	RC frame with tiling and painting as it finishes.
Religious Buildings	Mosques	RC structure including tiling, decorative motifs, dome roof, painting and carpet for finishes. The M&E include plumbing, electrical installation and air-conditioning installation.
Residential Buildings	2-storey bungalows	Houses with prefabricated roof trusses and roof tiles as covering. Tiling and painting works as its finishes. Fittings and furnishings are excluded.
	2-storey terrace houses	Houses without fit out but including sanitary appliances, plumbing and electrical installation. The finishes are tiling and painting works.
	Luxury apartments	Apartments with built-in fitments excluding loose furniture. M&E are included.
Buildings, Spaces in General	Elevated car parks	RC structure with M&E that includes electrical, fire protection and lift installation.

NOTES

- All buildings are assumed to have no basements and no piling (except otherwise stated) and are built on flat ground, with normal soil and site conditions. The costs exclude site formation works, external works, professional fees, finance, legal expenses and land costs.
- The figures shown are for budgetary guidance only, it must be understood that the actual cost of a building will depend upon the design and many other factors and may vary from the figures shown.

2.3 Average Building Prices

No.	Building Categories	RM/ m ² GFA
A	Industrial Buildings	
1	Light duty factories	1,380 – 1,530
2	Warehouses	1,650 – 1,780
B	Office Buildings	
3	3-storey offices, owner operated	1,420 – 1,790
4	Shop offices	1,250 – 1,720
C	Refreshment, Entertainment, and Recreational Buildings	
5	Restaurants	1,890 – 2,000
6	Multi-purpose halls	2,020 – 2,410
D	Religious Buildings	
7	Mosques	2,160 – 3,460
E	Residential Buildings	
8	2-storey bungalows	2,950 – 3,110
9	2-storey terrace houses	1,180 – 1,310
10	Luxury apartments	2,840 – 3,250
F	Buildings, Spaces in General	
11	Elevated car parks	700 – 800

NOTES

- Source: CIDB Cost Benchmark.
- Cost data predominantly extracted from projects in West Malaysia.
- Cost at 4th quarter 2020, including preliminaries (10%) BUT excluding piling work and contingencies.

2.4 Average Mechanical and Electrical Prices

No.	Building Categories	RM/ m ²				
		Electrical	Plumbing	A/C	Fire Services	Lift & Escalators
A	Industrial Buildings					
1	Light duty factories	100–130	40–60	0	80–100	0
2	Warehouses	90–200	10–20	90–100	90–190	0
B	Office Buildings					
3	3-storey offices, owner operated	130–150	4–20	0	20–60	90–100
4	Shop offices	80–260	60–70	40	20–60	0
C	Refreshment, Entertainment, and Recreational Buildings					
5	Restaurants	70–100	70–80	0	20–60	0
6	Multi-purpose halls	320–400	50–60	150–200	40–80	0
D	Religious Buildings					
7	Mosques	950–1,040	50–60	580–630	40–80	0
E	Residential Buildings					
8	2-storey bungalows	70–90	140–150	30–40	0	0
9	2-storey terrace houses	40–70	80–90	0	0	0
10	Luxury apartments	340–440	120–130	210–230	70–80	70–130
F	Buildings, Spaces in General					
11	Elevated car parks	140–160	0	0	40–60	30–40

NOTES

- Source: CIDB Cost Benchmark.
- Cost data predominantly extracted from projects in West Malaysia.
- Cost at 4th quarter 2020, including preliminaries (10%) BUT excluding piling work and contingencies.

2.5 Major Unit Rates

No.	Items	Unit	RM
1	Excavation (Up to 1.50m deep)	m ³	18.00
2	Hardcore bed; average 150mm thick	m ³	100.00
3	Lean concrete Grade 15	m ³	290.00
4	Vibrated reinforced concrete Grade 30	m ³	310.00
5	Mild steel/ high tensile bar reinforcement	kg	3.50
6	Sawn formwork to vertical/ horizontal surfaces	m ²	38.00
7	Half brick wall bedded & jointed in cement mortar	m ²	42.00
8	Metal deck roofing; 0.48mm thick c/w all accessories	m ²	62.00
9	Aluminium composite casement windows	m ²	280.00
10	Timber flush door (hollow core); single leaf excluding ironmongeries	No.	290.00
11	One hour fire rated door; single leaf including ironmongeries	No.	700.00
12	Structural steelwork in column and the like	kg	7.40
13	20mm thk cement and sand (1:6) plaster to wall	m ²	20.00
14	25mm thk cement and sand (1:3) paving to floor	m ²	18.00
15	300mm x 300mm homogeneous tiles (include floor screed)	m ²	80.00
16	4mm thk plainface plaster skim coat	m ²	12.00
17	Aluminium strip ceiling	m ²	175.00
18	9mm thk fibrous plaster ceiling	m ²	40.00
19	Painting to plastered surfaces; one coat sealer and two coats of emulsion paint; internally	m ²	6.00

NOTES

- Cost data extracted from projects in West Malaysia.
- Measurements based on SMM2.

2.6 Major Material Prices

No.	Material	Unit	Price (RM)				
			Selangor	Penang	Johor	Kota Kinabalu	Kuching
1	Ordinary Portland cement, 50 kg bag	Bag	15.40	15.20	15.90	16.80	19.30
2	Granite aggregate 3/4"	MT	36.00	37.00	37.00	36.00	40.00
3	Normal river sand	MT	30.00	31.00	31.00	51.30	53.80
4	Mild steel round bar R10, MS146	MT	2,661.70	2,661.70	2,648.30	2,521.70	2,548.30
5	High tensile deformed bar-Y12, MS146	MT	2,560.00	2,560.00	2,560.00	2,469.70	2,498.30
6	Ready mix concrete, normal mix, granite – Grade 30	m ³	206.00	195.00	214.00	299.00	308.00
7	Cement sand bricks	Piece	0.20	0.20	0.30	0.30	0.40
8	Plain homogeneous floor tiles, 300mm x 300mm x 8mm - Grade 1	Piece	3.00	3.00	3.00	5.00	2.80
9	Clear float glass 5mm thk	m ²	65.00	65.00	65.00	65.00	65.00

NOTES

- Price at average of 4th quarter 2020.
- Price is the transaction price between contractors and suppliers under 60 days delivery credit terms.

2.7 Labour Wage Rates

No.	Labour	Specification	Wage Rate (RM/ day)				
			Selangor	Penang	Johor	Kota Kinabalu	Kuching
1	General construction worker	Semi-skilled	100.00	80.00	80.00	90.00	90.00
2	Concretor	Skilled	120.00	110.00	110.00	110.00	110.00
3	Bricklayer	Skilled	120.00	100.00	100.00	110.00	110.00
4	Plasterer	Skilled	130.00	110.00	110.00	120.00	120.00
5	Barbender	Skilled	120.00	110.00	110.00	120.00	120.00
6	Steel structure fabricator	Skilled	130.00	120.00	120.00	130.00	130.00
7	Plumber – building & sanitary	Skilled	140.00	110.00	110.00	120.00	120.00
8	Painter	Skilled	130.00	110.00	110.00	120.00	120.00
9	Excavator operator	Skilled	120.00	100.00	100.00	110.00	110.00
10	IBS precast concrete installer	Skilled	190.00	160.00	160.00	180.00	180.00

NOTES

- Rate for local workers average 8 hours/ day excluding overtime.
- Rate at average of 4th quarter 2020.

2.8 Machinery Hire Rates and Equipment Purchase Prices

No.	Machinery	Specification	Hire Rate (RM/ day)				
			Selangor	Penang	Johor	Kota Kinabalu	Kuching
1	Mini hydraulic excavator	Operating weight 6,000kg	350-360	360-370	360-370	380-390	380-390
2	Bulldozer	CAT D4 or equivalent	540-550	540-550	540-550	580-590	580-590
3	Vibratory soil compactor	Operating weight 10,000kg	390-640	400-650	400-650	420-690	420-690
4	Motor grader	3.7m/ 12ft Blade	720-750	730-770	730-770	770-800	770-800
5	Dump truck	Operating weight 10,000kg/ six wheels	390-420	400-430	370-430	420-460	420-460
6	Lorry	BTM 3,000kg	220-310	220-310	230-320	270-340	260-320
7	Mobile crane	Operating weight 20,000kg	530-700	540-710	540-710	570-750	570-750
8	Backhoe	Loader bucket breakout 6,000kg	350-420	360-430	360-430	380-460	380-460

No.	Equipment	Specification	Purchase Price (RM)				
			Selangor	Penang	Johor	Kota Kinabalu	Kuching
1	Diesel generator set	Max output 25KVA	41,590-42,000	42,420-42,840	42,420-42,840	44,920-45,360	44,920-45,360
2	Piston air compressor	Capacity of 5HP	4,100-4,480	4,180-4,570	4,180-4,570	4,430-4,840	4,430-4,840

NOTES

- Range between lowest and highest price recorded at 4th quarter 2020.
- Machinery hire rate includes operator.
- Equipment purchase price is the transaction price between contractors and suppliers under normal credit terms.

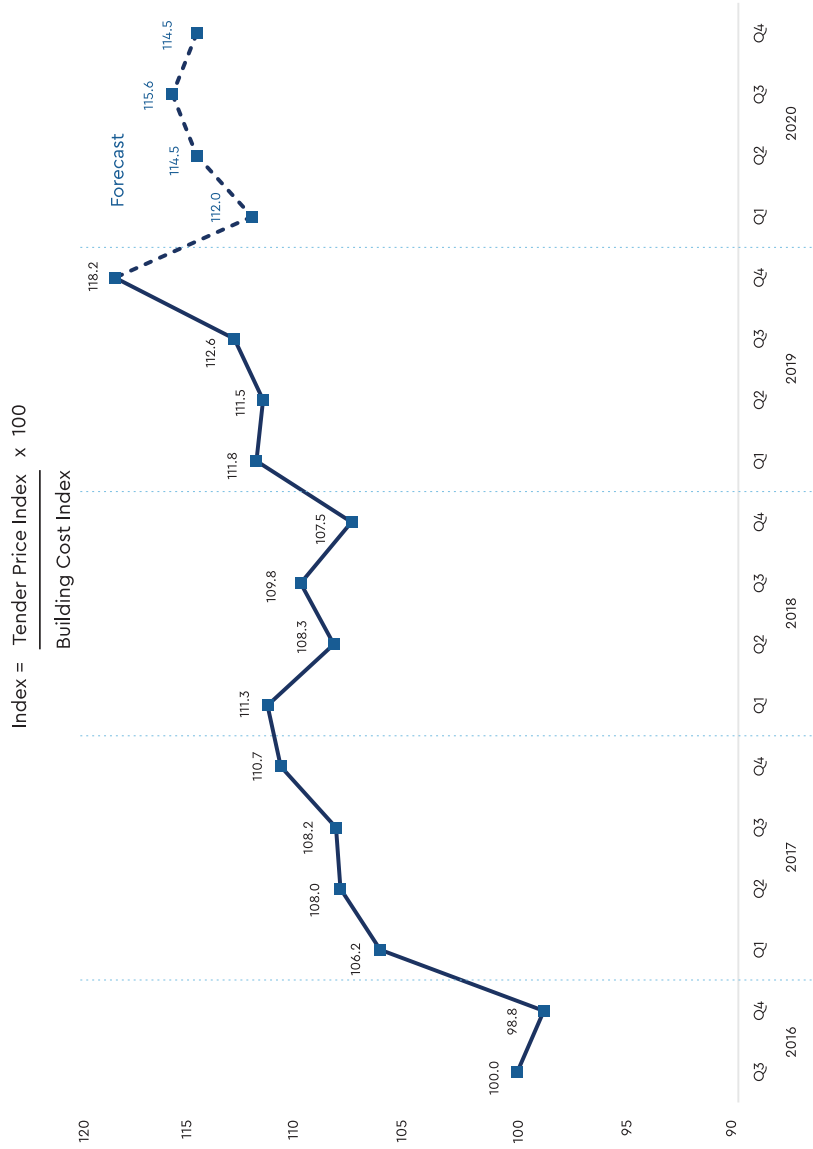
2.9 Building Material Cost Index Changes

Month	Percentage Change (2020 vs 2019)			
	Cement	Ready Mixed Concrete	Sand	Steel Reinforcement
JAN	12%	19%	14%	0%
FEB	12%	17%	14%	-2%
MAR	9%	17%	14%	-6%
APR	9%	17%	14%	-4%
MAY	9%	17%	14%	-7%
JUN	9%	17%	14%	-5%
JUL	9%	17%	14%	-5%
AUG	7%	16%	14%	1%
SEP	2%	16%	14%	2%
OCT	-3%	12%	14%	4%
NOV	-1%	12%	14%	7%
DEC	-6%	12%	14%	23%

NOTES

- The table is derived from N3C Building Material Price Index.

2.10 Market Conditions Index



NOTES

- The graph is derived from N3C Tender Price Index and Building Cost Index.
- Base year 2016.

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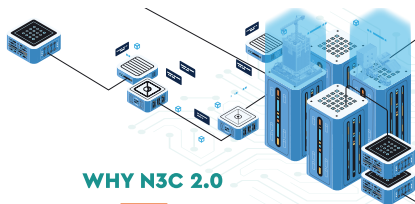
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3.0 LABOUR AND PLANT CONSTANTS

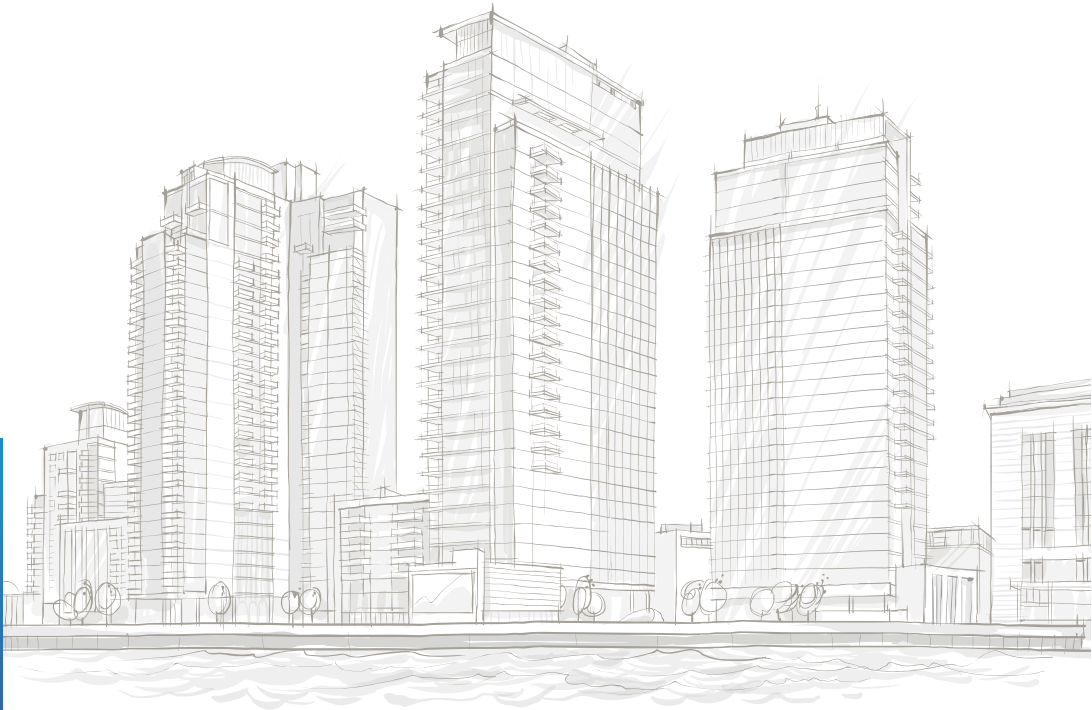
3.1 Introduction

All data were collected between March 2018 to March 2019 and computed from field surveys on selected active building sites of private and public sector projects located in Selangor, Kuala Lumpur, Penang, Pahang, Negeri Sembilan and Johor. All respondents are active contractors registered under Grade G7 with CIDB.

The figures are presented in the form of productivity by speed which is the amount of output produced over a given period namely one man-hour and one plant-hour, respectively.

The computed labour constant and plant constant had included the time spent on tea break, moving of materials within site, idling time, minor down time occurred within the process of activities recorded.

The source is from CIDB Labour Constant and Plant Constant for Building Construction Works 2019.



3.2 Labour Constants

No.	Trade	Workdone per man-hour
1	Concrete: place only including preparatory works	
	Ready mixed concrete including vibrating and trowelling smooth to uniform level in upper floor slab and beam.	1.41m ³ / man-hr
2	Reinforcement: fabrication and fixing only	
	6mm, 10mm, 12mm, 16mm, 20mm, 25mm and 32mm rods, BRC A7 & A8 on upper floor slab and beam.	44.84kg/ man-hr
3	Formwork: fix and dismantle only	
	System formwork (aluminium) to sides and soffit of upper floor slab and beam.	3.72m ² / man-hr
4	Brickworks: lay only	
	100mm thick cement and sand brick wall bedded and jointed in cement & sand mortar (1:3) reinforced with and including "exmet" reinforcement at every fourth course.	1.38m ² / man-hr
5	Wall plaster: labour only	
	20mm thick internal plaster consist of 2 coats of cement & sand (1:3) finished with steel float including raking out joints of brickwall or hacking concrete surface for key on sides of brickwall and associated column and beam.	1.08m ² / man-hr
6	Wall tiling: labour only	
	600mm x 300mm wall tiles with cement & sand (1:3) backing screed, adhesive mortar and pointed in coloured cement to match.	0.84m ² / man-hr
7	Paving: labour only	
	25mm thick cement and sand (1:3) paving trowelled with a steel float to a smooth and level surface.	2.87m ² / man-hr
8	Floor tiling: labour only	
	600mm x 300mm floor tiles with cement & sand (1:3) floor base screed, adhesive mortar and pointed in coloured cement to match.	1.29m ² / man-hr
9	Painting: labour only	
	Prepare and apply one (1) primer coat and two (2) finishing coats internally on surfaces of plastered sides of wall and associated column and beams.	10.40m ² / man-hr

NOTES

- The above output doesn't take into account the COVID-19 standard operating procedures.

3.3 Plant Constants

No.	Plant	Work done per plant-hour
1	Piling driving	
	Drive only 400mm x 400mm precast concrete pile/ 400mm diameter precast spun pile with jack-in pile rig. (non adverse ground and weather conditions)	14.29m/ plant-hr
2	Excavator 20–30 tonnes operating weight	
	Excavation to foundation/ basement. (non adverse ground and weather conditions)	72.15m ³ / plant-hr
3	Dump truck 10 wheels	
	Disposal of excavated earth off site to dumping tip within 30km distance with dumping truck.	7.96m ³ / plant-hr
4	Asphalt paver 10–20 tonnes operating weight	
	Paving of 50mm to 75mm thick binder/ wearing course with asphalt paver.	330.88m ² / plant-hr
5	Road roller tandem compactor 6,500kg operating weight	
	Compaction of 50mm to 75mm thick binder/ wearing course with road roller tandem compactor.	457.43m ² / plant-hr
6	Tower crane 1–2 tonnes operating weight	
	Hoisting of building materials 10–20 storeys height using 1–2 tonne operating weight.	12.07trip/ plant-hr
7	Mobile crane 20–30 tonnes operating weight	
	Hoisting of building materials up to 10 storeys high using 20–30 tonnes mobile crane operating weight.	10.55trip/ plant-hr

NOTES

- The above output doesn't take into account the COVID-19 standard operating procedures.

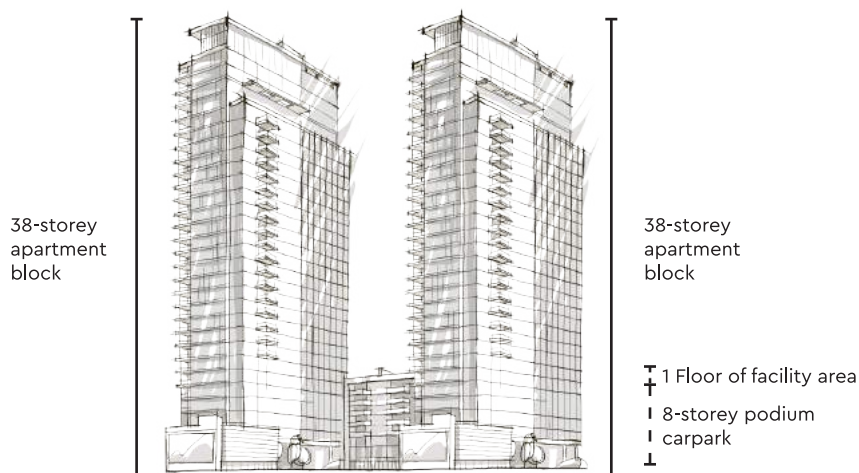


4.0 DATA APPLICATION

4.1 Simplified Feasibility Study

To estimate the viability for development of high rise serviced apartment project in Bangi.

Scenario



1	Estimated cost for buildings*	
a)	2 blocks of 38-storey high rise serviced apartment (95,000m ² GFA)	RM1,500.00/ m ² GFA
b)	1 floor of facility area on podium carpark (8,900 m ² GFA)	RM1,230.00/ m ² GFA
c)	8-storey podium carpark (71,000m ² GFA)	RM700.00/ m ² GFA
2	Allowances for piling cost (non adverse ground and weather conditions)**	RM180.00/ m ² GFA
3	Allowances for external works (5.34 acres land)**	8% of building cost
4	Allowances for predevelopment cost**	25% of total construction cost
5	Allowances for contingencies**	5% of total construction cost
6	No. of unit (average size 84m ² / unit)	904 units
7	Estimated value (RM5,200/ m ²)**	RM436,800.00/ unit

NOTES

- Predevelopment cost includes **land cost**, soil investigation, surveying fees, plan and submission fees, contribution to agencies, CIDB levy, professional fees, management fees, **legal fees**, advertisement fees.
- *Source: CIDB Cost Benchmark.
- **The above figures are examples and for guidance purposes only.

4.1 Simplified Feasibility Study (cont'd)

Calculation

GROSS DEVELOPMENT COST (GDC)

Piling Cost

$$\text{Piling works} = 174,900.00\text{m}^2 \text{ GFA} \times \text{RM}180.00\text{m}^2 \text{ GFA} = \text{RM}31,482,000.00$$

Building Cost

$$\text{High-rise serviced apartment} = 95,000.00\text{m}^2 \text{ GFA} \times \text{RM}1,500.00\text{m}^2 \text{ GFA} = \text{RM}142,500,000.00$$

$$\text{Facility area} = 8,900.00\text{m}^2 \text{ GFA} \times \text{RM}1,230.00\text{m}^2 \text{ GFA} = \text{RM}10,947,000.00$$

$$\text{Podium carpark} = 71,000.00\text{m}^2 \text{ GFA} \times \text{RM}700.00\text{m}^2 \text{ GFA} = \text{RM}49,700,000.00$$

$$\text{Total Building Cost} = \text{RM}234,629,000.00$$

$$\text{External works (8\%)} = \text{RM}18,770,320.00$$

$$\text{Total Construction Cost} = \text{RM}253,399,320.00$$

$$\text{Pre-development Cost (25\%)} = \text{RM}63,349,830.00$$

$$\text{Contingencies (5\%)} = \text{RM}12,669,966.00$$

$$\text{Total GDC} = \text{RM}329,419,116.00$$

GROSS DEVELOPMENT VALUE (GDV)

$$\text{Serviced apartment (84m}^2\text{)} = 904 \text{ units} \times \text{RM}436,800.00/\text{unit} = \text{RM}394,867,200.00$$

$$\text{DEVELOPER'S PROFIT} = \text{GDV} - \text{GDC} = \text{RM}65,448,084.00$$

$$= \underline{\underline{19.87\%}}$$

NOTES

- Buildings are assumed to have 100% occupancy.

4.2 Computation for Capital Allowances

To calculate the capital allowances for business income tax.

Scenario		
1	Equipment	Diesel generator set, max output 25KVA
2	Purchase price*	RM42,000.00
3	Installation cost	RM3,000.00
4	Initial allowances (IA)**	20%
5	Annual allowances (AA)**	14%

Calculation		
Description	RM	RM
Year of Assessment 2020		
Qualifying Expenditure		45,000
IA (RM45,000 × 20%)	9,000	
AA (RM45,000 × 14%)	6,300	15,300
Residual Expenditure		29,700
Year of Assessment 2021–2023		
AA (RM45,000 × 14%)	(6,300 × 3 years)	18,900
Residual Expenditure		10,800
Year of Assessment 2024		
AA (restricted to)		10,800
Residual Expenditure		0

NOTES

- *Source: N3C Building Material Prices.
- **Source: LHDN Public Ruling No.12/ 2014
- "Qualifying Expenditure" means capital expenditure incurred on the provision, construction or purchase of plant or machinery. Refer LHDN Public Ruling No.12/ 2014.

4.3 Built-up Rate Calculation

To calculate rate for 12mm diameter high tensile steel reinforcement in straight and bent bars in column.

Built-up of Rate

1	Price for 12mm dia H.T. reinf.*	RM2,475.00/ tonne
2	Barbender**	RM120.00/ day
3	General construction worker- Helper**	RM100.00/ day
4	Labour constant	0.045 tonne/ man-hour
5	Profit and overhead***	10% of total cost

Calculation

Material Cost

12mm dia H.T steel reinf.		=	RM2,475.00
Spacer block and wastage	=	5% of material cost	= RM123.75

Labour Cost

General construction worker	=	$\frac{\text{RM100.00/ day}}{8 \text{ hours}}$	x	$\frac{1 \text{ man-hour}}{0.045 \text{ tonne}}$	=	RM277.78
Barbender	=	$\frac{\text{RM120.00/ day}}{8 \text{ hours}}$	x	$\frac{1 \text{ man-hour}}{0.045 \text{ tonne}}$	=	RM333.33

Total cost	=	RM3,209.86
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Profit & Overhead (10%)	=	RM320.99
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Cost/ tonne	=	RM3,530.85
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Cost/ kg	=	<u><u>RM3.53</u></u>
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NOTES

- * Source: N3C Building Material Prices.
- **Source: N3C Labour Wage Rates.
- ***The above figures are examples and for guidance purposes only.

4.3 Built-up Rate Calculation (cont'd)

To calculate rate to excavate trench to receive foundations starting from reduced level maximum depth not exceeding 1m.

Built-up of Rate

1	Rental rate for mini hydraulic excavator with 6,000kg operating weight*	RM360.00/ day
2	General construction worker- Helper**	RM100.00/ day
3	Plant constant	4.00m ³ / hour
4	Labour constant	5.00m ³ / hour
5	Operational cost***	20% of machinery rate
6	Profit and overhead***	15% of total cost

Calculation

Machinery Cost

$$\text{Mini hydraulic excavator} = \frac{\text{RM360.00/ day}}{8 \text{ hours}} \times \frac{1 \text{ hour}}{4.00\text{m}^3} = \text{RM11.25}$$

$$\text{Operational cost (20\%)} = \text{RM2.25}$$

Labour Cost

$$\text{General construction worker} = \frac{\text{RM100.00/ day}}{8 \text{ hours}} \times \frac{1 \text{ hour}}{5.00\text{m}^3} = \text{RM2.50}$$

$$\text{Total cost} = \text{RM16.00}$$

$$\text{Profit \& Overhead (15\%)} = \text{RM2.40}$$

$$\text{Cost/ m}^3 = \underline{\underline{\text{RM18.40}}}$$

NOTES

- * Source : N3C Machinery Hire Rates and Equipment Purchase Prices.
- ** Source: N3C Labour Wage Rates.
- ***The above figures are examples and for guidance purposes only.

4.4 Variation of Price Calculation

To calculate material price variation for building works between the award date and current date.

Scenario

1	Building category	Commercial
2	Region	Selangor
3	BMCI awarded month (July 2018)*	99.5
4	BMCI current month (July 2020)*	101.2
5	Value of work done	RM2.5 mil
6	Material weightage for concrete**	0.8

Calculation

$$\begin{aligned}
 \text{Material VOP} &= \text{Material weightage} \times \left(\frac{\text{Current BMCI} - \text{Previous BMCI}}{\text{Previous BMCI}} \right) \times \text{Value of work done} \\
 &= 0.8 \times \left(\frac{101.2 - 99.5}{99.5} \right) \times \text{RM2,500,000.00} \\
 &= \underline{\underline{\text{RM34,170.85}}}
 \end{aligned}$$

NOTES

- * Source : N3C Building Material Cost Index (BMCI).
- ** The above figures are examples and for guidance purposes only.

4.5 Recommended Fire Insurance Valuation

To calculate recommended value for fire insurance of building.

Scenario

1	Base building cost	RM75,000,000.00
2	Building category	Residential
3	Region	Selangor
4	Base BCI in June 2017*	99.8
5	Current BCI in June 2020*	101.9
6	f% (other development cost & profit)**	20%

Calculation

$$\begin{aligned}
 \text{Building insurance} &= \text{Base building cost} \times \left(\frac{\text{Current Index}}{\text{Base Index}} \right) \times (1.0 + f\%) \\
 &= \text{RM75,000,000.00} \times \left(\frac{101.9}{99.8} \right) \times (1.0 + 0.2) \\
 &= \text{RM91,893,787.58} \\
 &\approx \underline{\underline{\text{RM92,000,000.00}}}
 \end{aligned}$$

NOTES

- * Source : N3C Building Cost Index (BCI).
- ** The above figures are examples and for guidance purposes only.

4.6 Labour Productivity Calculation

To estimate time needed for labour to complete internal wall plastering work.

Scenario

1	Total wall area internally for plastering works	1,000m ²
2	Labour constant	1.08m ² / man-hour
3	Number of workers available	9 workers
4	Working time	8 hours/ day

Calculation

$$\begin{aligned}
 \text{Time needed} &= \text{Total wall area internally} \div \left(\text{Labour constant} \times \text{Number of worker} \right) \div \text{Working time} \\
 &= 1,000\text{m}^2 \div \left(1.08\text{m}^2/\text{hr} \times 9 \text{ workers} \right) \div 8 \text{ hours} \\
 &= \underline{\underline{12.86 \text{ days}}}
 \end{aligned}$$

NOTES

- Assuming there is no disturbance or interruptions that may affect the speed or continuation of work for whatever reason including bad weather etc.

4.7 Plant Productivity Calculation

To estimate plant time to complete basement excavation work.

Scenario

1	Total volume of excavated soil	6,500m ³
2	Plant constant	72.15m ³ / plant-hour
3	Number of plant available	2 excavators
4	Working time	8 hours/ day

Calculation

Time needed = Total volume of excavated soil ÷ (Plant constant x Number of plant) ÷ Working time

= 6,500m³ ÷ (72.15m³/ hour x 2 excavators) ÷ 8 hours

= 5.63 days

NOTES

- Assuming there is no disturbance or interruptions that may affect the speed or continuation of work for whatever reason including bad weather etc.



cype

Your BIM-based cost estimation solution



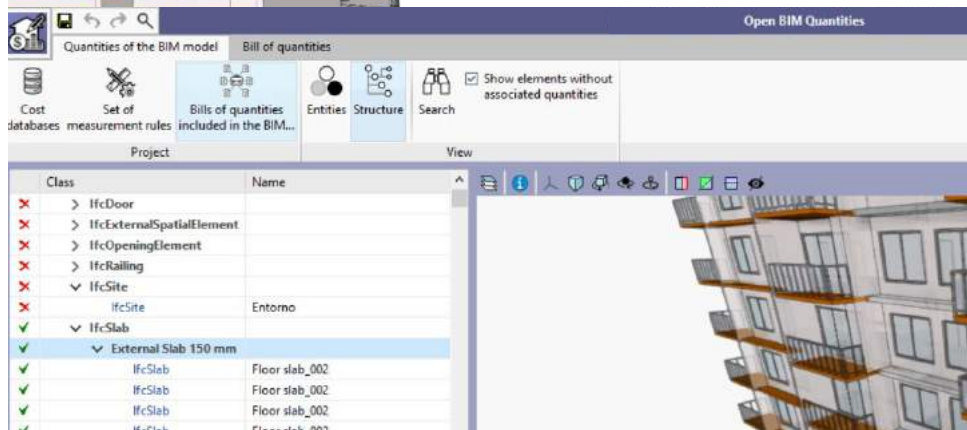
Open BIM Cost Estimator

Automatically estimates the execution cost of a construction project during its preliminary phases.



Open BIM Quantities

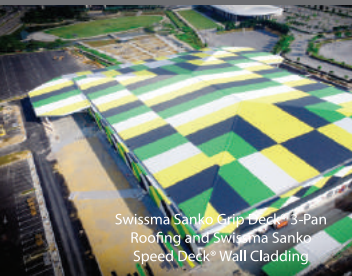
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5.0 USEFUL INFORMATION

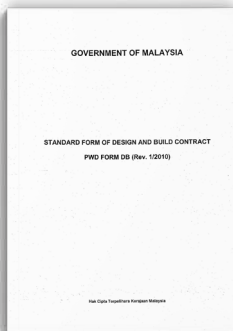
5.1 Contracts and Procurements

Design and Build

Design and Build is a procurement approach where the Contractor is responsible for both the design and construction of the project. It is called 'one-stop shop' for the client to build and complete a project. In the event of defects, there are no disputes on responsibilities.

The process begins with the Client producing an Employer's Requirements (ER) documenting clear objectives to be achieved by the Contractor. The ER consists of the requirements for all the elements of the project such as architectural works, structural works, fittings, M&E works and external works etc. The Contractor then provides their Contractor's Proposal which consists of design options for the proposed project. There are situations where Client appoints his own design team to support the ER by producing preliminary designs and design criteria to the Contractor. The Contractor then produces detailed designs. This is an appropriate approach in which the Client requires the Contractor to understand the design intention. It also saves time as the Contractor only needs to produce one design for proposal. Evaluation then takes place and both parties will come to agreement of the design and cost. An alternative approach can be made to the contract where Client establish a guaranteed maximum price with incentives to Contractor to get the best value for the project.

JKR Standard Form of Design and Build Contract PWD Form DB (Rev.1/ 2010) is very suitable for this procurement. FIDIC Conditions of Contract for Design-Build and Turnkey (1999) and JCT Design and Build Contract 2016 are also suitable contract form for this procurement with amendments to suit local conditions.



PWD Form DB (Rev.1/ 2010)



FIDIC Orange Book



JCT D&B Contract 2016

NOTES

- Book cover source : Jabatan Kerja Raya (JKR), International Federation of Consulting Engineers (FIDIC), Joint Contracts Tribunal (JCT).

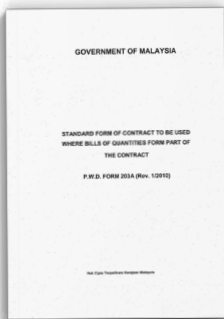
5.1 Contracts and Procurements (cont'd)

Conventional

Conventional procurement approach is where the Client is responsible for design and call tender based on bill of quantities (BQ), then appoints Contractor to carry out the works. The design and construction proceed sequentially, with the construction commencing only after the design is completed. In this approach, there is a complete separation of design and construction responsibility.

The process begins with the Client appointing a consultant team to prepare detailed designs and BQ for the project. The Client also have the option to prepare detailed designs for tender based on lump sum without quantities. However, a BQ is an important document to be provided by the Client to make sure the Contractor prices according to the Client budget. It facilitates easier comparison of tenders received.

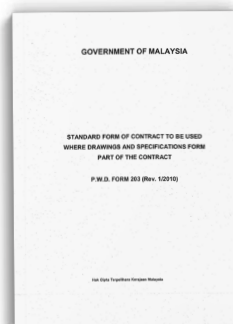
JKR Standard Form of Contract PWD 203A (Rev.1/ 2010) and PAM Contract 2018 (with quantities) is commonly used contract form for this procurement. Alternatively, a lump sum without quantities contract can use JKR Standard Form of Contract PWD 203 (Rev.1/ 2010) and PAM Contract 2018 (without quantities).



PWD 203A (Rev.1/ 2010)



PAM Contract 2018
(with Quantities)



PWD 203 (Rev.1/ 2010)

NOTES

- Book cover source : Jabatan Kerja Raya (JKR), Pertubuhan Arkitek Malaysia (PAM).

5.1 Contracts and Procurements (cont'd)

Construction Management

Construction Management procurement approach is where the Client appoints a Construction Manager (CM) to manage the project on his behalf. This approach is suitable when the Client needs to construct a project with multiple work packages. Having a professional CM can help the Client manage the work packages. The CM is paid a professional service fee by the Client for his service.

The process begins with the Client appointing a CM, a consultant team and appointing multiple Trade Contractors for separate works. The consultant team prepares detailed designs and BQs. The CM advises on the costing, scheduling and buildability as the design develops, organise work into packages and manage the construction process. The Client then awards the work packages to multiple Trade Contractors and they construct under the management of the CM. CM has no contractual liability towards the Trade Contractors' works.

JCT Construction Management Contract is suitable for this procurement with amendments to suit local conditions. Local conventional forms of contract also can be amended to suit this approach.



JCT Construction Management
Trade (CM/ TC)

NOTES

- Book cover source : Joint Contracts Tribunal (JCT)

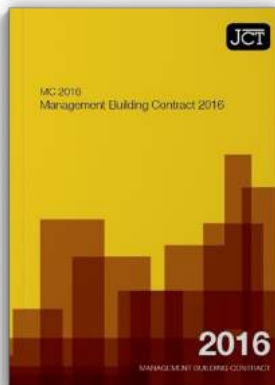
5.1 Contracts and Procurements (cont'd)

Management Contracting

Management Contracting procurement approach is where the Client awards the project to a Management Contractor (MC). The MC works as a CM, but he has the responsibility towards the Work Packages Contractors. The Client has no contractual relationship with Work Contractors. The MC is paid a management fee by the Client for his service.

The process begins with the Client appointing a consultant team to prepare detailed designs and BQ for the project. Then an MC appointed to manage it. The MC will organise the project into work packages. He then appoints and manages Work Packages Contractors to construct the project. MC is responsible to provide attendance for the Work Contractors' works.

JCT Management Building Contract is suitable for this procurement with amendments to suit local conditions. Local conventional forms of contract also can be amended to suit this approach.



JCT Management Building Contract (MC)

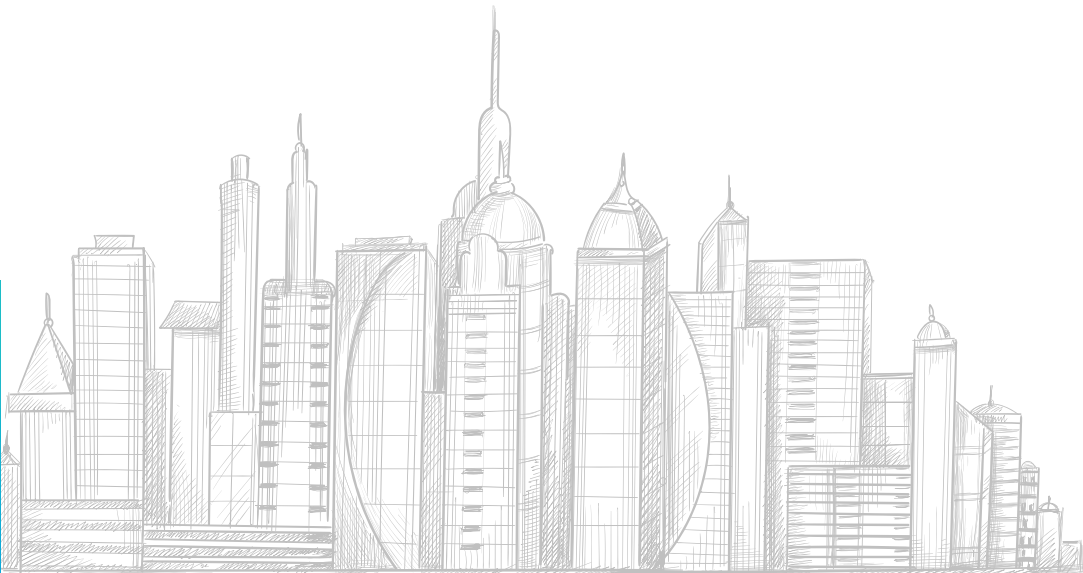
NOTES

- Book cover source : Joint Contracts Tribunal (JCT)

5.1 Contracts and Procurements (cont'd)

Other Standard Form of Contracts

1. CIDB Standard Form of Contract for Building Works (2000).
2. CIDB Standard Terms of Construction Contract for Renovation and Small Projects (2015).
3. CIDB Model Terms of Construction Contract for Subcontract Work (2007).
4. JKR Standard Form of Sub-Contract for Nominated Sub-Contractor Where The Main Contract is Based on Form PWD 203 or PWD 203A, PWD 203N (Rev.1/ 2010).
5. JKR Standard Form of Sub-Contract for Nominated Suppliers Where The Main Contract is Based on Form PWD 203 or PWD 203A, PWD 203P (Rev.1/ 2010).
6. PAM Agreement and Conditions of Contract 2018 (without Quantities).
7. PAM Agreement and Conditions of Sub-Contract 2018 for Use when the Sub-Contract is Nominated under PAM Contract 2018.
8. IEM Form of Contracts for Civil Engineering Works (Third Edition, January 2017).
9. IEM Form of Contracts for Mechanical and Electrical Engineering Works (Third Edition, January 2017).
10. IEM Form of Nominated Sub-Contract for Engineering Works (July 2020).



5.2 Estimating Rules of Thumb

Percentage of Element in a Building

Building Category	Substructure (%)	Superstructure (%)	Architectural (%)	Fittings (%)	M&E (%)
Low-rise residential	5	15	70	0	10
High-rise residential	5	20	45	5	25
Low-rise shops	3	15	67	0	15
Low-rise office	5	18	54	8	15
Mid-rise office	5	20	45	5	25
High-rise office	5	15	40	5	35
Hotels	5	15	25	15	40

External wall/ floor ratio

Building	Ratio
Residential apartments	1.0m ² / m ²
Office, hotel	0.4m ² / m ²

Internal wall/ floor ratio

Building	Ratio
Residential apartments	1.0m ² / m ²
Office, hotel	0.5m ² / m ²

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