

Construction Cost Handbook

SINGAPORE 2022

Arcadis Singapore Pte Ltd



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Unless otherwise stated, costs reflected in this handbook are current as at **4th Quarter 2021**.

Business Registration No: 199508550H

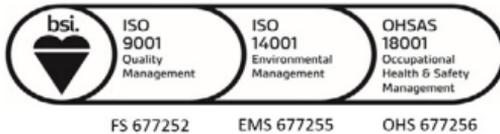


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Electronic Cost Handbook

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 - Click the results that says “Construction Cost Handbook”
 - Scroll down and click “Download full PDF” to download the latest Singapore Construction Cost Handbook
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INTRODUCTION

Arcadis Singapore has been involved in the publication of construction costs handbooks for countries such as China and Hong Kong, India, Malaysia, Philippines, Thailand and Vietnam and is also the editor of the Spon's Asia Pacific Construction Costs Handbook.

As in the previous editions, the Arcadis Handbook Singapore 2022 focuses on the construction cost profile of Singapore and those of the major cities in Asia.

The handbook is structured to serve as a general reference guide on construction cost indicators in Asia.

The information contained in this handbook has been compiled by Arcadis Singapore Pte Ltd. Any further information and/or if advice relating to particular projects is required, please contact any of the regional offices listed under the Directory of Offices at the end of this handbook.

Arcadis Singapore Pte Ltd

2021

JANUARY							FEBRUARY							MARCH						
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● Public Holidays ■ School Holidays

2023

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CONSTRUCTION TRENDS

1

Construction Outlook

Tender Price Indices

Material Prices

CONSTRUCTION OUTLOOK¹

CONSTRUCTION MARKET REVIEW² IN 2021

Total construction demand increased by 42% to a preliminary estimate of about \$30 billion in 2021, largely driven by public housing and infrastructure projects as well as an improvement in investor sentiments. This was about 7% higher than the upper bound of BCA's earlier forecast of between \$23 billion and \$28 billion, mainly due to an increase in tender prices resulting from manpower and materials cost inflation. The public sector construction demand increased from \$12.2 billion in 2020 to \$18.2 billion in 2021, while the private sector construction demand expanded from \$8.9 billion in 2020 to \$11.8 billion in 2021.

CONSTRUCTION DEMAND OUTLOOK IN 2022

Based on the feedback received in BCA's Development Plans Survey (DPS) conducted in Oct/Nov 2021 as well as the prevailing economic outlook, total construction demand is projected to reach between \$27 billion and \$32 billion³ in 2022, with the mid-point at \$29.5 billion comparable with the preliminary estimate of 2021's demand (Table 1).

¹ All currencies stated in this paper are in nominal Singapore dollars unless otherwise stated.

² Construction demand is measured by the total value of construction orders or contracts awarded. Reclamation contracts are excluded from this paper unless otherwise stated.

³ In view of the current highly volatile market condition amid various downside risks including a resurgence in COVID-19 cases due to Omicron or other variants that may result in unforeseen work disruptions or delay in implementation of new projects, the forecast may be subject to significant revision. BCA will review and update the forecast again during the mid-year review in Aug 2022.

Residential Construction Demand

Public Housing

Public residential construction demand is expected to stay firm but moderate slightly from \$5.5 billion in 2021 to between \$4.8 billion and \$5.1 billion in 2022. While construction demand for new housing units is expected to moderate in 2022 as compared to 2021, upgrading projects including those from the Home Improvement Programme (HIP) are anticipated to increase for the rejuvenation of existing HDB estates.

Private Housing

Following the latest round of property cooling measures effected on 16 December 21, residential building demand is anticipated to moderate amid more cautious market sentiments. Nevertheless, the expected redevelopment of some previously transacted en bloc sites and the Central Business District (CBD) Incentive Scheme on conversion to residences as well as a potential pick-up in GLS could mitigate the drop to some extent. Hence, the private sector residential construction demand is projected to be between \$3.5 billion and \$4.0 billion in 2022, moderating from the \$4.0 billion in 2021.

Commercial Construction Demand

On the other hand, commercial building demand is anticipated to increase to between \$2.6 billion and \$3.2 billion in 2022, from \$2.6 billion in 2021. Growth is likely to be supported by the redevelopment of ageing commercial premises to enhance asset values and refurbishment of hotels and attractions to prepare for inbound tourism revival.

Industrial Construction Demand

Industrial building investments are likely to maintain their momentum in the year ahead, driven by the sustained global demand for production from the local manufacturing clusters. Total industrial building construction demand is projected to stay at between \$4.1 billion and \$5.1 billion in 2022, comparable with the \$4.7 billion in 2021.

Institutional & Other Building Construction Demand

On the back of more healthcare and educational building developments in the pipeline, total institutional building construction demand is anticipated to improve to between \$3.3 billion and \$4.1 billion in 2022, from \$3.3 billion in 2021. The public sector institutional building construction demand in 2022 is likely to increase to between \$2.5 billion and \$3.1 billion, while the private sector institutional building construction demand is likely to stay stable at between \$0.8 billion and \$1.0 billion in 2022.

Civil Engineering Construction Demand

Civil engineering construction demand is projected to stay firm at between \$8.6 billion and \$10.5 billion in 2022, comparable with the \$9.8 billion in 2021. Public sector infrastructure works are expected to continue to dominate the total civil engineering construction demand with a contribution of about 90%.

CONSTRUCTION OUTLOOK FOR 2023-2026 (Excluding Changi Airport Terminal 5 development and Integrated Resorts expansion)⁴

Over the medium-term, total construction demand is projected to be between \$25 billion and \$32 billion per annum from 2023 to 2026. The projection excludes Changi Airport Terminal 5 development and its associated infrastructure projects as well as the two Integrated Resorts' expansion since uncertainty over the trajectory of the global pandemic remains a heightened risk which could derail their planned construction schedules significantly.

The public sector will continue to lead demand and is expected to contribute to between \$14 billion and \$18 billion per annum in 2023-2026, with building projects and civil engineering works each taking up about half of the share.

The private sector construction demand is projected to remain steady over the medium-term (i.e. approximately between \$11 billion and \$14 billion per annum in 2023-2026) in view of the healthy investment appetite amid Singapore's strong economic fundamentals. In addition, there is potential for further upside should the planned expansion of the two Integrated Resorts (IRs) proceed during this period.

CONCLUSION

In spite of the downside risks precipitated by the COVID-19 variants, the silver lining from a strong pipeline of public sector projects will continue to support a firm total construction demand at between \$27 billion and \$32 billion in 2022. Over the next few years, the public sector is anticipated to remain the key pillar offering plenty of development potential and opportunities for housing and infrastructure projects while the private sector navigates the pandemic-induced disruption and adapts in a new normal with steady investments.

*Contributed by :
Economic Research Department,
Strategic Planning and Transformation Office
Building and Construction Authority
26 January 2022*

1 CONSTRUCTION TRENDS

Table 1: Private Sector Contracts Awarded (\$billion)

YEAR	RESIDENTIAL	COMMERCIAL	INDUSTRIAL
2012	8.5	2.9	6.1
2013	9.6	3.7	5.2
2014	6.5	3.7	6.0
2015	4.0	1.9	4.5
2016	3.2	2.9	2.8
2017	3.0	1.7	2.5
2018	5.2	1.4	4.0
2019	5.0	1.8	4.8
2020	2.8	1.3	2.7
2021 [#]	4.0	2.5	3.7
2022 ^{##}	3.5 - 4.0	2.6 - 3.1	3.5 - 4.1

Table 2: Public Sector Contracts Awarded (\$billion)

YEAR	RESIDENTIAL	COMMERCIAL	INDUSTRIAL
2012	3.3	0.1	0.3
2013	6.4	0.1	0.3
2014	4.8	0.1	0.6
2015	3.8	0.3	1.2
2016	3.3	0.1	0.8
2017	3.2	0.1	1.7
2018	3.8	0.1	0.8
2019	3.6	0.1	2.7
2020	2.6	0.4	2.0
2021 [#]	5.5	0.1	1.0
2022 ^{##}	4.8 - 5.1	0.1 - 0.1	0.6 - 1.0

Note: [#] preliminary figure, ^{##} forecast

INSTITUTIONAL	TOTAL BLDG	CIVIL ENG*	TOTAL
1.0	18.6	2.7	21.2
1.1	19.5	1.4	20.9
1.9	18.1	1.4	19.5
1.7	12.1	1.7	13.8
0.6	9.5	1.5	11.0
0.7	7.9	1.1	9.0
1.4	12.0	0.2	12.2
1.6	13.2	1.3	14.5
1.3	8.1	0.8	8.9
1.0	11.3	0.5	11.8
0.8 - 1.0	10.4 - 12.2	0.6 - 0.8	11.0 - 13.0

INSTITUTIONAL	TOTAL BLDG	CIVIL ENG*	TOTAL
3.7	7.4	2.1	9.5
2.6	9.4	5.5	14.9
5.2	10.8	8.5	19.2
4.1	9.4	3.8	13.3
3.7	7.9	7.5	15.4
2.5	7.6	8.3	15.8
4.4	9.1	9.2	18.3
5.0	11.3	7.8	19.0
2.5	7.5	4.7	12.2
2.3	8.9	9.3	18.2
2.5 - 3.1	8.0 - 9.3	8.0 - 9.7	16.0 - 19.0

Source: BCA as at 26 January 2022; * Without Reclamation

TENDER PRICE INDICES

Generally

Tender Price Index (TPI) is used to track the historical trends in the movement of tender price level of construction contracts let out during the respective periods. In addition to reflecting the changes in material elements of competition in the market place and the risk and profit factored in the Contractors' bids. Besides being use to establish historical cost trends, TPI also serve as a useful tool to provide an indication of future cost trends.

Indices

Besides Arcadis Singapore Tender Price Index (TPI), the other established index is the Building and Construction Authority Tender Price Index (BCA TPI).

BCA TPI provides information on the general movement of tender prices in Singapore construction industry for the three sectors namely Public Residential (HDB flats), Private Non-Landed Residential and Commercial Office whereas Arcadis Singapore TPI gives an indication of tender price movements based on the projects handled by Arcadis Singapore Pte Ltd.

Price Movement

Based on Arcadis Singapore's data, tender prices for 4th Quarter 2021 increased by approximately 18% compared to 4th Quarter 2020. This is mainly driven by increased labour prices due to shortage of labour, rise in the cost of specialist works, and increased material prices due to higher raw material prices and supply disruptions.

According to preliminary figures published by BCA on 26 January 2022, total construction demand in 2021 was \$29.9 billion, an increase of approximately 42% as compared to 2020. Public sector construction demand increased by 49% from \$12.2 billion to \$18.2 billion, while private sector construction demand expanded 33% from \$8.9 billion to \$11.8 billion. The growth was mainly driven by public housing and infrastructure projects together with an improved investor sentiment.

Based on BCA's forecast, total construction demand for 2022 (excluding reclamation works) is projected to reach between \$27 billion and \$32 billion. Public sector construction demand is expected to contribute approximately 59% of the total construction demand at between \$16 billion and \$19 billion, while private sector construction demand is projected to reach between \$11 billion and \$13 billion.

Looking ahead, we anticipate that material prices in 2022 are likely to remain high due to a combination of supply chain disruptions, increased freight charges and increased global demand driven by plans of many countries to ramp up infrastructure spending to stimulate economic growth. Higher global energy prices are also expected to add pressure to production cost.

We also anticipate labour cost to stabilise as labour shortages improve with the help of support measures from the government and gradual reopening of borders. However, it is unlikely to return to pre-pandemic levels in the short term given the recent announcement of tightening measures on foreign workers' quotas. As explained in Budget Speech 2022, the Dependency Ratio Ceiling (DRC) will be reduced from 1:7 to 1:5 starting 1 January 2024 which will likely cause further strain on the labour market.

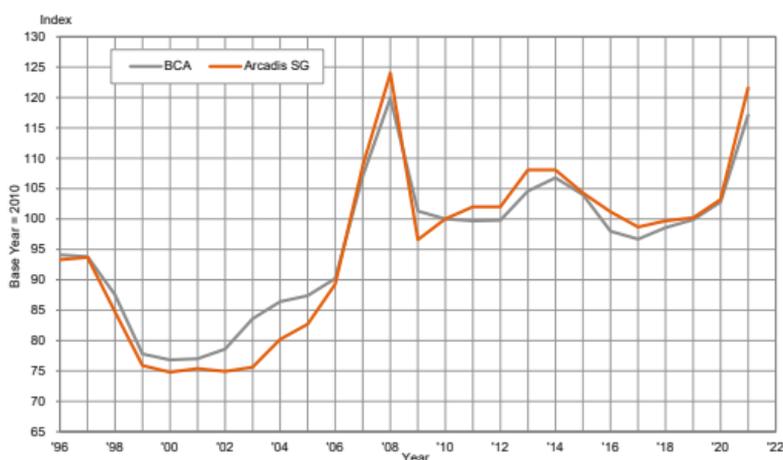
As such, the construction industry should brace itself for wider adoption of design alternatives to overcome shortages through the increased adoption of Design for Manufacturing and Assembly technologies and methodologies. Planning more construction processes off site can help shorten construction period and reduce required manpower on site, thus improving productivity and workmanship.

In January 2022, we forecast tender prices to increase by 3% to 6% for the whole year of 2022. This was based on several factors including increase in key construction materials prices, shortage in contracting resources and improvements in market sentiments due to the gradual reopening of borders.

Since the Russia-Ukraine conflict began in end February

1 CONSTRUCTION TRENDS

2022, key construction material costs have surged due to an unprecedented spike in energy and commodities prices. At this juncture, it is difficult to predict how this crisis will unfold, how long it will last and what will be its impact on construction prices. We anticipate that tender prices will continue to be very volatile for another two or three years especially due to high energy prices and supply chain disruptions brought by the consequential slowdown in industrial production to reduce energy usage. Based on our forecast, we expect construction costs in the first half of 2022 to increase by 8% to 10%. The actual cost increase will depend on prevailing market sentiment, adverse ramifications of prevailing economic instability, geopolitical tensions and the COVID-19 pandemic situation.

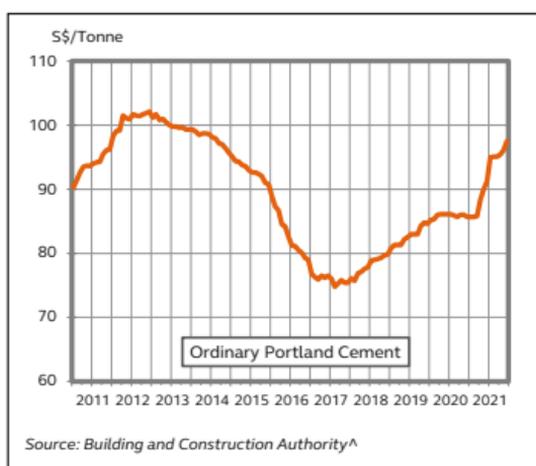


Year	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
BCA*	99.8	104.6	106.8	104.0	98.0	96.7	98.6	99.9	102.8	117.1
Arcadis SG^	102.0	108.1	108.1	104.3	101.2	98.7	99.7	100.2	103.2	121.6

Source: * Building and Construction Authority (BCA TPI based on average for the whole year)

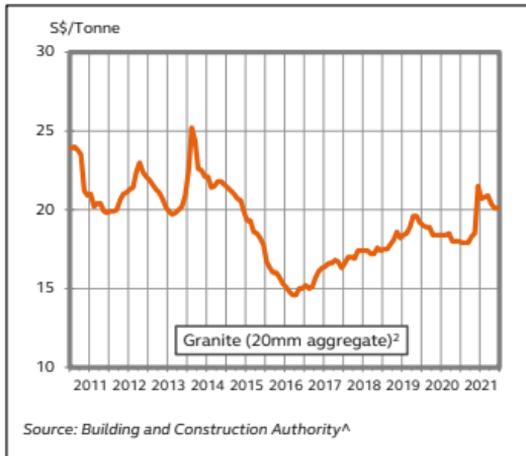
^ From 2009 onwards, Arcadis Singapore TPI based on 4th Quarter Index

MATERIAL PRICES



Notes:

- ¹ Prices of rebar other than 16-32mm dimensions may subject to surcharge
- ¹ With effect from Jan 2015, the market prices of rebar (without cut & bend) are based on fixed price supply contracts with contract period 1 year or less
- [^] In view of lack of business transactions for materials due to a stoppage/slowdown of most construction activities on the back of the Covid-19 fallout, the BCA construction material market prices in May, Jun and Jul 2020 (except for rebar prices in Jun and Jul 2020) are assumed unchanged from those of Apr 2020



Notes:

- ² Prices of granite and concreting sand exclude local delivery charges to concrete batching plants
- ³ The market prices of ready mixed concrete are based on contracts with non-fixed price, fixed price and market retail price for Grade 40 pump
- [^] In view of the lack of business transactions for materials due to a stoppage/slowdown of most construction activities on the back of the Covid-19 fallout, the BCA construction material market prices in May, Jun and Jul 2020 (except for rebar prices in Jun and Jul 2020) are assumed unchanged from those of Apr 2020



CONSTRUCTION COST DATA 2

Preambles

Construction Costs For Singapore

Construction Costs For Selected
Asian Cities

Construction Cost Specification

Cost Breakdown For Different
Building Types

Major Rates For Selected Asian Cities

M&E Costs For Singapore

M&E Costs For Selected Asian Cities

Office M&E Cost Components

M&E Cost Charts

Utility Costs For Selected Asian Cities

PREAMBLES

The construction costs for the respective categories given on the following pages are average costing at 4th Quarter 2021. They are based on interpolation of competitive tenders received.

Based on Arcadis Singapore's data, tender prices for 4th Quarter 2021 increased by approximately 18% compared to 4th Quarter 2020. This is mainly driven by increased labour prices due to shortage of labour, rise in the cost of specialist works, and increased material prices due to higher raw material prices and supply disruptions.

Looking ahead, we anticipate that material prices in 2022 are likely to remain high due to a combination of supply chain disruptions, increased freight charges and increased global demand driven by plans of many countries to ramp up infrastructure spending to stimulate economic growth. Higher global energy prices are also expected to add pressure to production cost.

The construction cost serves as a guide for preliminary cost appraisals and budgeting. It must be understood that the actual cost of a building will depend upon the design and many other factors such as major infrastructure of the buildings/structures, etc. and may vary from the figures shown. The costs per square metre are based on construction floor areas measured to the outside face of the external walls/external perimeter including lift shafts, stairwells, plant rooms, water tanks and the like.

As a guide, it might be worth to note that construction costs generally may vary accordingly depending on the following specific requirements:

- a. Complexity of the project
- b. Site encumbrances
- c. The need of special structural such as heavy transfer structures over MRT/RTS structures/tracks/boxes, etc. or due to close proximity to nearby infrastructure such as canals, bridges, etc.
- d. The types of structural system (i.e. reinforced concrete or structural steel system, precast/prefabrication, etc.)

- e. The types of temporary works required (i.e. diaphragm walls, sheet piling, etc.)
- f. The method of construction e.g. conventional or top down
- g. Basement works which are carried out in phases may require additional temporary works and different types of construction sequence
- h. Deep basement (i.e. levels of basement)
- i. Selection of Contractor (i.e. local or foreign)
- j. Shape of the existing site as longish sites would generally attract higher cost due to higher wall to floor ratio
- k. The level of Green Mark rating, Buildability-Scores, Constructability-Scores, etc.
- l. Economic and political issues (e.g. disruption in supply of materials, etc.)

All buildings are assumed to have no basements (except otherwise stated) and are built on flat ground with normal soil conditions. The costs exclude the following:

- Professional fees
- Authorities' plan processing charges
- Land cost
- Financing charges
- Site inspectorate
- Administrative expenses
- Legal costs and disbursements
- Demolition of existing building(s)
- Furniture and fittings (unless otherwise stated)
- Operating equipment
- External works
- Prefabricated Prefinished Volumetric Construction (PPVC) / Prefabricated Bathroom Units (PBUs) / Structural Steel Structure / Prefabricated Mechanical, Electrical and Plumbing (MEP) systems
- Cross Laminated Timber (CLT) / Glued Laminated Timber (Glulam)
- BCA Green Mark Gold and above
- Cost escalation
- Goods and Services Tax

The codes and standards for each category of building vary from country to country and do not necessarily follow those of Singapore.

CONSTRUCTION COSTS FOR SINGAPORE

TYPES	OVERALL COST	
	LOW S\$/m ²	HIGH S\$/m ²
<u>RESIDENTIAL</u>		
Terraced Houses	2,900	3,200
Semi-Detached Houses	3,150	3,600
Detached Houses	3,650	4,900
Average Standard Condominium	2,250	2,450
Above Average Standard Condominium	2,550	3,350
Luxury Condominium	3,450	5,100
<u>OFFICE</u>		
Average Standard Offices	2,900	3,200
Prestige Offices	3,250	3,500
<u>COMMERCIAL</u>		
Shopping Centres, Average Quality	3,250	3,350
Shopping Centres, High Quality	3,450	3,750
<u>CAR PARKS</u>		
Multi-Storey Car Parks	1,150	1,600
Basement Car Parks	1,600	2,150

The above costs are at 4th Quarter 2021 levels
 For latest costs information, please refer to our 'Arcadis Singapore Quarterly Construction Cost Review'.

TYPES	OVERALL COST	
	LOW S\$/m ²	HIGH S\$/m ²
<u>INDUSTRIAL</u>		
Flatted Light Industrial Buildings	1,550	1,700
Flatted Heavy Industrial Buildings	1,750	2,350
Single Storey Industrial Buildings	1,450	1,600
Flatted Warehouses	1,450	1,600
Single Storey Warehouses	1,350	1,600
<u>HOTEL (Including Furniture and Fittings)</u>		
3-Star Hotels	3,600	4,000
4-Star Hotels	3,950	4,550
5-Star Hotels	4,650	5,200
<u>HEALTH</u>		
Private Hospitals	4,650	4,900
Polyclinics, Non Air-conditioned	2,000	2,200
Nursing Homes, Non Air-conditioned	2,000	2,300
Medical Centres	3,550	3,750

CONSTRUCTION COSTS FOR SELECTED ASIAN CITIES

BUILDING TYPE	US\$/m ² CFA			
	SINGAPORE [◆]	HONG KONG [£]	MACAU [¥]	KUALA LUMPUR
DOMESTIC				
Apartments, high rise, average standard	1,665 - 1,815	3,030 - 3,500	2,479 - 3,032	320 - 635 [▲]
Apartments, high rise, high end	2,555 - 3,780	3,930 - 4,570	3,462 - 5,290	725 - 1,520
Terraced houses, average standard	2,150 - 2,370	4,170 - 4,810	4,224 - 5,041	230 - 375 [▲]
Detached houses, high end	2,705 - 3,630	6,060 up	5,152 - 6,703	770 - 1,060
OFFICE / COMMERCIAL				
Medium/high rise offices, average standard	2,150 - 2,370 [*]	3,020 - 3,440	2,853 - 3,684	605 - 815 [■]
High rise offices, prestige quality	2,405 - 2,595 [*]	3,590 - 4,130	3,684 - 4,030	950 - 1,380 [▼]
Out-of-town shopping centre, average standard	2,405 - 2,480	2,980 - 3,480	2,687 - 4,030	550 - 775
Retail malls, high end	2,555 - 2,780	3,850 - 4,580	4,224 - 5,097	705 - 1,085
HOTELS				
Budget hotels - 3-star, mid market	2,665 - 2,965	3,810 - 4,060	3,754 - 4,252	1,030 - 1,520
Business hotels - 4/5-star	3,445 - 3,850	3,940 - 4,600	5,097 - 6,093	1,350 - 2,360
Luxury hotels - 5-star	3,445 - 3,850	4,600 - 5,250	6,093 - 7,202	1,970 - 2,650

INDUSTRIAL						
Industrial units, shell only (Conventional single storey framed units)	1,000 - 1,185	N/A	N/A	330 - 470		
Owner operated factories, low rise, light weight industry	N/A	2,310 - 2,900	N/A	435 - 560		
OTHERS						
Underground/basement car parks (<3 levels)	1,185 - 1,595	3,260 - 3,890	2,229 - 3,268	320 - 570		
Multi storey car parks, above ground (<4 levels)	850 - 1,185 ♥	1,950 - 2,310	1,232 - 1,621	220 - 370		
Schools (primary and secondary)	N/A	2,540 - 2,730	2,465 - 2,853	255 - 330 ♦		
Students' residences	2,000 - 2,110	2,900 - 3,260	1,953 - 2,271	305 - 390 ♦		
Sports clubs, multi purpose sports/leisure centres (dry sports)	2,445 - 2,595	3,800 - 4,330	N/A	610 - 785		
General hospitals - public sector	3,445 - 3,630	4,830 - 5,330	N/A	860 - 1,255		
Exchange Rate Used : US\$1 =	S\$ 1.35	HK\$ 7.79	MOP 8.01	RM 4.15		

The above costs are at 4th Quarter 2021 levels, inclusive of preliminaries but exclusive of contingencies.

- £ Offices of average standard are built to the following provisions:
- ♣ Curtains wall/window wall facade
 - ♦ Tenant areas include screeded floor, painted wall and ceiling
 - ♥ Schools (primary and secondary) are of public authority standard, no alc and complete with basic external works.
 - ♠ Rates are exclusive of any management contract fee.
 - ♣ Rates are nett of GST
 - ♠ Includes raised floor and ceiling to tenanted areas but excludes office carpets (normally under tenant's fit-out). Open on all sides with parapet.
 - ♠ 6 - 12 units per floor, 46m² - 83m² per unit, exclude air-conditioning equipment, kitchen cabinets and home appliances.
 - ♠ Terraced houses exclude air-conditioning, kitchen cabinets and home appliances.
 - ♠ Offices exclude tenant fitout and raised floor.
 - ♠ Offices exclude tenant fitout.
 - ♠ Schools with standard government provisions.
 - ♠ Student hostels to university standard.

(Cont'd)

CONSTRUCTION COSTS FOR SELECTED ASIAN CITIES

CONSTRUCTION COSTS FOR SELECTED ASIAN CITIES (Cont'd)

BUILDING TYPE	US\$/m ² CFA			
	SHANGHAI ⁺	BEIJING ⁺	GUANGZHOU/ SHENZHEN ⁺	CHONGQING/ CHENGDU ⁺
<u>DOMESTIC</u>				
Apartments, high rise, average standard	810 - 893	713 - 783	711 - 783	577 - 672
Apartments, high rise, high end	1,829 - 1,994	1,728 - 1,967	1,155 - 1,264	846 - 1,061
Terraced houses, average standard	1,119 - 1,219	1,021 - 1,106	1,066 - 1,236	763 - 897
Detached houses, high end	1,968 - 2,088	1,962 - 2,047	2,045 - 2,324	981 - 1,112
<u>OFFICE / COMMERCIAL</u>				
Medium/high rise offices, average standard	1,039 - 1,373	1,017 - 1,370	994 - 1,107	1,109 - 1,268
High rise offices, prestige quality	1,335 - 1,826	1,653 - 2,250	1,478 - 1,783	1,402 - 1,846
Out-of-town shopping centre, average standard	N/A	760 - 1,016	957 - 1,050	898 - 1,128
Retail malls, high end	1,411 - 1,902	1,375 - 1,893	1,416 - 1,980	1,336 - 1,825
<u>HOTELS</u>				
Budget hotels - 3-star, mid market	1,137 - 1,386	1,125 - 1,386	1,282 - 1,410	1,202 - 1,460
Business hotels - 4/5-star	1,832 - 2,480	1,917 - 2,531	2,072 - 2,958	2,154 - 2,647
Luxury hotels - 5-star	2,477 - 2,961	2,440 - 3,141	2,817 - 3,105	2,649 - 3,132

INDUSTRIAL							
Industrial units, shell only (Conventional single storey framed units)	320 - 392	314 - 383	371 - 442	550 - 680			
Owner operated factories, low rise, light weight industry	495 - 620	607 - 696	N/A	N/A			
OTHERS							
Underground/basement car parks (<3 levels)	849 - 1,184	869 - 955	657 - 1,048	514 - 710			
Multi storey car parks, above ground (<4 levels)	435 - 608	523 - 528	468 - 517	409 - 500			
Schools (primary and secondary)	649 - 819	605 - 781	521 - 573	543 - 597			
Students' residences	475 - 648	428 - 605	329 - 363	380 - 543			
Sports clubs, multi purpose sports/leisure centres (dry sports)	1,095 - 1,345	1,036 - 1,045	908 - 998	856 - 938			
General hospitals - public sector	1,673 - 2,157	1,362 - 1,706	1,375 - 1,719	1,368 - 1,692			
Exchange Rate Used : US\$1 =	RMB 6.40	RMB 6.40	RMB 6.40	RMB 6.40			

The above costs are at **4th Quarter 2021** levels, inclusive of preliminaries but exclusive of contingencies.

- + Schools (primary and secondary) are of public authority standard, no a/c and complete with basic external works.

(Cont'd)

CONSTRUCTION COSTS FOR SELECTED ASIAN CITIES

CONSTRUCTION COSTS FOR SELECTED ASIAN CITIES (Cont'd)

BUILDING TYPE	US\$/m ² CFA				
	MANILA ^Ω	INDIA ^ϕ	BANGKOK [⊖]	HO CHI MINH &	JAKARTA *
DOMESTIC					
Apartments, high rise, average standard	1,047 - 1,384	635 - 715	714 - 846	662 - 821	852 - 965
Apartments, high rise, high end	1,427 - 2,514	955 - 1,160	952 - 1,172	842 - 965	1,173 - 1,324
Terraced houses, average standard	948 - 1,160	440 - 465	446 - 549	446 - 524	453 - 589
Detached houses, high end	1,841 - 3,123	577 - 615	774 - 935	509 - 621	1,228 - 1,372
OFFICE / COMMERCIAL					
Medium/high rise offices, average standard	968 - 1,263	490 - 550	790 - 937	774 - 895	841 - 932
High rise offices, prestige quality	1,401 - 1,791	620 - 675	988 - 1,267	892 - 1,216	1,236 - 1,383
Out-of-town shopping centre, average standard	824 - 1,026	480 - 540	674 - 873	N/A	724 - 801
Retail malls, high end	1,124 - 1,575	675 - 745	905 - 954	723 - 946	797 - 864
HOTELS					
Budget hotels - 3-star, mid market	1,229 - 1,520	895 - 990	1,234 - 1,365	1,436 - 1,757	1,462 - 1,727
Business hotels - 4/5-star	1,402 - 2,325	1,395 - 1,675	1,579 - 1,810	N/A	1,992 - 2,151
Luxury hotels - 5-star	1,939 - 3,683	1,765 - 1,955	1,842 - 2,139	1,813 - 2,175	2,113 - 2,383

INDUSTRIAL									
Industrial units, shell only (Conventional single storey framed units)	549 - 707	398 - 465	526 - 659	317 - 400	390 - 425				
Owner operated factories, low rise, light weight industry	737 - 927	420 - 495	N/A	329 - 474	423 - 467				
OTHERS									
Underground/basement car parks (<3 levels)	612 - 819	315 - 345	593 - 790	657 - 784	601 - 738				
Multi storey car parks, above ground (<4 levels)	490 - 746	260 - 285	197 - 322	422 - 463	390 - 425				
Schools (primary and secondary)	722 - 996	325 - 365	N/A	555 - 606	N/A				
Students' residences	763 - 982	365 - 405	N/A	555 - 713	N/A				
Sports clubs, multi purpose sports/leisure centres (dry sports)	1,216 - 1,771	660 - 700	N/A	821 - 877	1,224 - 1,835				
General hospitals - public sector	1,464 - 1,712	700 - 800	N/A	N/A	N/A				
Exchange Rate Used : US\$1 =	PHP 50.77	INR 74.39	BAHT 33.889	VND 23,450	IDR 14,288				

The above costs are at **4th Quarter 2021** levels, inclusive of preliminaries but exclusive of contingencies.

Ω Rates include 12% VAT.

₹ Rates are based on projects in Bangalore and are nett of GST.

₹ Mumbai costs are generally 8% higher.

The data for India is provided by

Arkind LS Private Limited, an Arcadis Alliance Partner.

& Rates are nett of VAT and contingencies.

∅ Rates exclude VAT.

* The data for Jakarta is provided by PT Lantera Sejahtera Indonesia.

Rates exclude VAT

CONSTRUCTION COST SPECIFICATION

CONSTRUCTION COST SPECIFICATION

BUILDING TYPE	OUTLINE SPECIFICATION
<u>DOMESTIC</u>	
Apartments, high rise, average standard	Apartment units with fit-out, including air-conditioning (a/c), kitchen cabinets and home appliances, but <u>excluding</u> decorative light fittings and loose furniture
Apartments, high rise, high end	Apartment units with good quality fit-out, including a/c, kitchen cabinets and home appliances, but <u>excluding</u> decorative light fittings and loose furniture
Terraced houses, average standard	Houses with fit-out, including a/c, kitchen cabinets and home appliances, but <u>excluding</u> decorative light fittings, loose furniture, garden and parking
Detached houses, high end	Houses with good quality fit-out, including a/c, kitchen cabinets and home appliances, but <u>excluding</u> decorative light fittings, loose furniture, garden and parking
<u>OFFICE / COMMERCIAL</u>	
Medium/high rise offices, average standard	RC structure, curtain wall, including public area fit-out, tenant area with raised floor/ carpet, painted wall and false ceiling
High rise offices, prestige quality	

Out-of-town shopping centre, average standard	Including public area fit-out and M&E, but excluding shop fit-out
Retail malls, high end	
<u>HOTELS</u>	
Budget hotels - 3-star, mid market	1) Including interior decoration, furniture (fixed and movable), and special light fittings (chandeliers, etc.) 2) Excluding Operating Supplies and Equipment (OS&E)
Business hotels - 4/5-star	
Luxury hotels - 5-star	
<u>INDUSTRIAL</u>	
Industrial units, shell only (Conventional single storey framed units)	RC structure with steel roof and M&E to main distribution, but excluding a/c, heating and lighting
Owner operated factories, low rise, light weight industry	RC structure, including small office with simple fit-out and M&E, but excluding a/c and heating

(Cont'd)

CONSTRUCTION COST SPECIFICATION

CONSTRUCTION COST SPECIFICATION (Cont'd)

BUILDING TYPE	OUTLINE SPECIFICATION
<u>OTHERS</u>	
Underground/basement car parks (<3 levels)	RC structure
Multi storey car parks, above ground (<4 levels)	RC structure, natural ventilation, no facade enclosure
Schools (primary and secondary)	Including fit-out and a/c, but excluding educational equipment
Students' residences	Including fit-out, loose furniture and a/c
Sports clubs, multi purpose sports/leisure centres (dry sports)	Dry sports (no swimming pool) and are for 'leisure centre' type schemes including main sports hall, ancillary sports facilities, changing and showers, restaurant / cafe, bar, etc. Costs include a/c, Furniture, Fittings and Equipment (FF&E).
General hospitals - public sector	Excluding medical and operating equipment

Notes:

1. The costs for the respective categories given above are averages based on fixed price competitive tenders. 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. The costs per square metre are based on Construction Floor Areas (CFA) measured to the outside face of the external walls / external perimeter including lift shafts, stairwells, balconies, plant rooms, water tanks and the like.
3. The costs include foundation and substructure.
4. All buildings are assumed to have no basements (except otherwise stated) and are built on flat ground, with normal soil and site condition. The costs exclude site formation works, external works, land cost, professional fees, finance and legal expenses.
5. The standard for each category of building varies from region to region and do not necessary follow that of each other.
6. All costs are in US\$/m² CFA. Fluctuation in exchange rates may lead to changes in construction costs expressed in U.S. dollars.

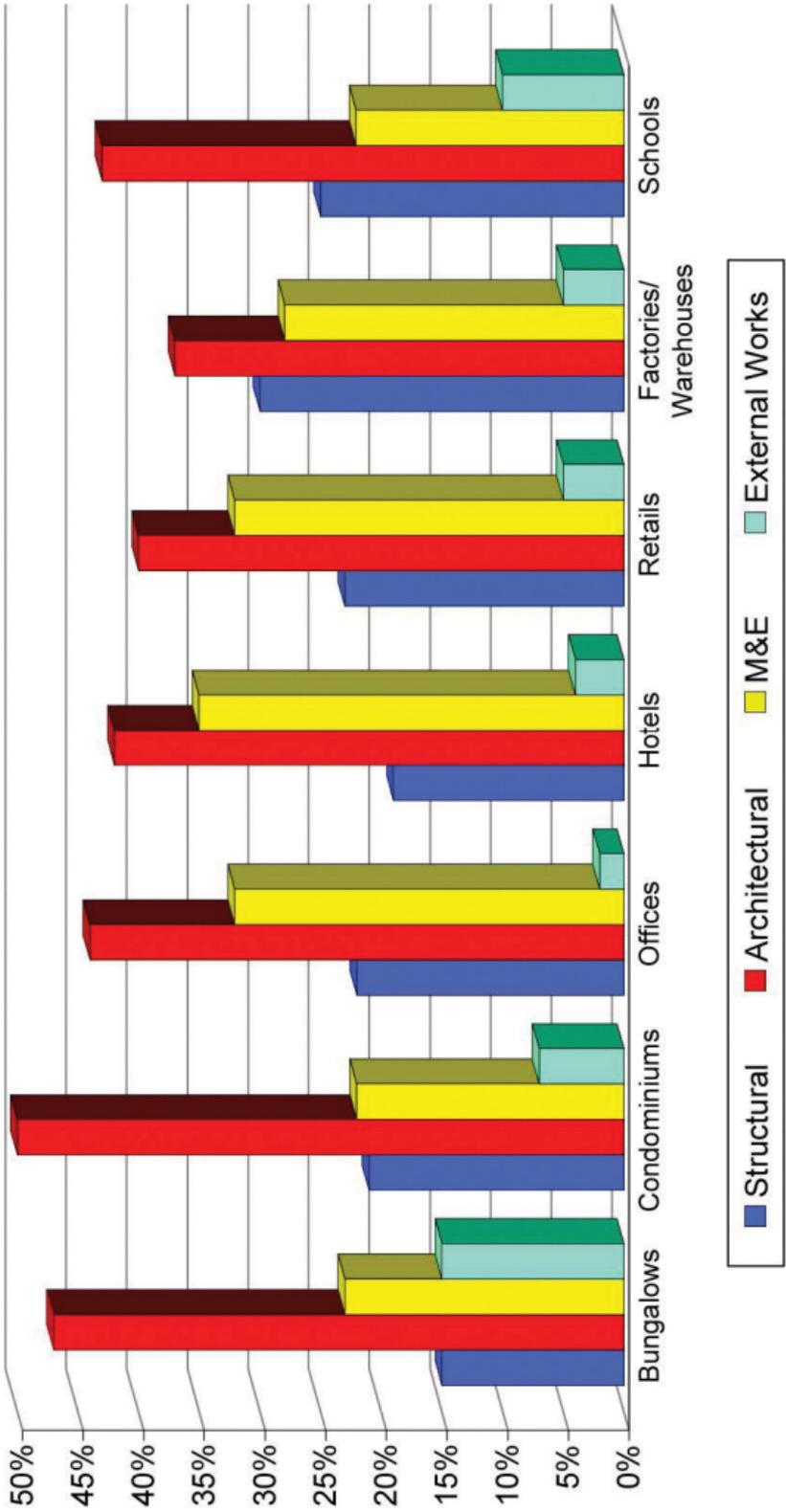
COST BREAKDOWN FOR DIFFERENT BUILDING TYPES

BUILDING TYPES	STRUCTURAL	ARCHITECTURAL	M&E SERVICES	EXTERNAL WORKS
Bungalows	15%	47%	23%	15%
Condominiums	21%	50%	22%	7%
Offices	22%	44%	32%	2%
Hotels	19%	42%	35%	4%
Retails	23%	40%	32%	5%
Factories / Warehouses	30%	37%	28%	5%
Schools	25%	43%	22%	10%

Notes: a. Structural includes Piling, Foundation and Structure.

b. Architectural includes External Walls, Internal Walls, Roof Finishes & Drainage, Wall Finishes, Ceiling Finishes, Floor Finishes, Sanitary Fittings & Accessories, Windows & Doors and Joinery Fittings.

c. M&E includes Electrical Services, Fire Protection, Plumbing & Sanitary, Vertical Transportation and ACMV.



MAJOR RATES FOR SELECTED ASIAN CITIES

DESCRIPTION	UNIT	SINGAPORE	HONG KONG	MACAU	KUALA LUMPUR
		S\$	HK\$	MOP	RM
1. Excavating basement ≤ 2.00m deep	m ³	26	220	150	16 - 27
2. Excavating for footings ≤ 1.50m deep	m ³	26	200	180	16 - 27
3. Remove excavated materials off site	m ³	20 - 26	290 ^o	150	18 - 35
4. Hardcore bed blinded with fine materials	m ³	63	940	1,300	72 - 110
5. Mass concrete grade 15	m ³	235 - 248**	1,150	1,500	230 - 300
6. Reinforced concrete grade 30	m ³	159 - 165	1,250	1,400	250 - 310
7. Mild steel rod reinforcement	kg	1.95 - 2.05	12	7.5	4.0 - 5.5
8. High tensile rod reinforcement	kg	1.95 - 2.05	12	7.5	4.0 - 5.5
9. Sawn formwork to soffits of suspended slabs	m ²	51	400	280	40 - 50
10. Sawn formwork to columns and walls	m ²	51	400	280	40 - 50
11. 112.5mm thick brick walls	m ²	41.5 - 47.0	400	450	43 - 52
12. "Kliplok Colorbond" 0.64mm profiled steel sheeting	m ²	50.5	1,100	N/A	72 - 100

13. Aluminium casement windows, single glazed	m ²	340	4,000	4,000	390 - 680
14. Structural steelwork - beams, stanchions and the like	kg	6.0 - 6.7	37	30	7.2 - 11
15. Steelwork - angles, channels, flats and the like	kg	6.0 - 6.7	45	40	7.2 - 11
16. 25mm cement and sand (1:3) paving	m ²	25	155	120	18 - 27
17. 20mm cement and sand (1:4) plaster to walls	m ²	26	160	150	19 - 30
18. Ceramic tiles bedded to floor screed (measured separately)	m ²	85	400	450	60 - 100
19. 12mm fibrous plasterboard ceiling lining	m ²	35.5	570	650	36 - 50
20. Two coats of emulsion paint to plastered surfaces	m ²	4.1 - 4.7	120	200	3.5 - 5.5
Average expected preliminaries	%	14 - 18	10 - 15	10	6 - 15

The above costs are at **4th Quarter 2021** levels and are based on lump sum fixed price contract rates exclusive of preliminaries and contingencies.

♣ Rates are nett of GST.

♣♣ Rate for lean concrete blinding.

♣ Rate including dumping charges.

(Cont'd)

MAJOR RATES FOR SELECTED ASIAN CITIES

MAJOR RATES FOR SELECTED ASIAN CITIES (Cont'd)

DESCRIPTION	UNIT	SHANGHAI		BEIJING		GUANGZHOU/ SHENZHEN		CHONGQING/ CHENGDU	
		RMB	RMB	RMB	RMB	RMB	RMB	RMB	RMB
1. Excavating basement ≤ 2.00m deep	m ³	30	35	40	35	40	35	35	35
2. Excavating for footings ≤ 1.50m deep	m ³	30	40	40	35	40	35	35	35
3. Remove excavated materials off site	m ³	160	160	160	160	150	65	65	65
4. Hardcore bed blinded with fine materials	m ³	210	220	220	180	210	180	180	180
5. Mass concrete grade 15	m ³	800	750	750	580	740	580	580	580
6. Reinforced concrete grade 30	m ³	850	850	850	610	800	610	610	610
7. Mild steel rod reinforcement	kg	6.5	7.6	7.6	6.2	7.5	6.2	6.2	6.2
8. High tensile rod reinforcement	kg	6.5	7.6	7.6	6.2	7.5	6.2	6.2	6.2
9. Sawn formwork to soffits of suspended slabs	m ²	95	90	90	75	90	75	75	75
10. Sawn formwork to columns and walls	m ²	90	85	85	75	85	75	75	75
11. 112.5mm thick brick walls	m ²	105**	80	80	80	100	80	80	80
12. "Kliplok Colorbond" 0.64mm profiled steel sheeting	m ²	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

13. Aluminium casement windows, single glazed	m ²	780	850*	700	800*
14. Structural steelwork - beams, stanchions and the like	kg	11	14.5	14	10
15. Steelwork - angles, channels, flats and the like	kg	9.5	13	12	9
16. 25mm cement and sand (1:3) paving	m ²	36	34	36	35
17. 20mm cement and sand (1:4) plaster to walls	m ²	36	34	36	35
18. Ceramic tiles bedded to floor screed (measured separately)	m ²	160	155	155	150
19. 12mm fibrous plasterboard ceiling lining	m ²	160	162	165	150
20. Two coats of emulsion paint to plastered surfaces	m ²	42	34	35	35
Average expected preliminaries	%	6 - 12	5 - 12	7 - 10	6 - 12

The above costs are at **4th Quarter 2021** levels and are based on lump sum fixed price contract rates exclusive of preliminaries and contingencies.

* Rate for double glazed window.

** Rate for 120mm thick concrete block walls

(Cont'd)

MAJOR RATES FOR SELECTED ASIAN CITIES

MAJOR RATES FOR SELECTED ASIAN CITIES (Cont'd)

DESCRIPTION	UNIT	MANILA		INDIA ⁶		BANGKOK ^{ce}		HO CHI MINH #		JAKARTA [@]	
		PHP	INR	BAHT	VND	IDR					
1. Excavating basement ≤ 2.00m deep	m ³	300	255	120 - 150	72,400	70,000					
2. Excavating for footings ≤ 1.50m deep	m ³	538	235	140 - 180	72,400	105,000					
3. Remove excavated materials off site	m ³	350	N/A	120 - 150	84,700	50,000					
4. Hardcore bed blinded with fine materials	m ³	1,400 - 1,600	4,800 - 5,000	650 - 750	280,900	680,000					
5. Mass concrete grade 15	m ³	4,500	6,735	2,300 - 2,500	1,606,400	1,100,000					
6. Reinforced concrete grade 30	m ³	6,300	8,430	2,800 - 3,200	1,912,291	1,140,000					
7. Mild steel rod reinforcement	kg	63 - 65	75	25 - 28	23,480	14,300					
8. High tensile rod reinforcement	kg	64 - 67	68 - 71	25 - 28	23,480	14,500					
9. Sawn formwork to soffits of suspended slabs	m ²	950 - 1,200	700 - 750	450 - 500	235,000	250,000					
10. Sawn formwork to columns and walls	m ²	1,200	780 - 825	450 - 500	280,000	200,000					
11. 112.5mm thick brick walls	m ²	N/A	1,240 - 1,250	650 - 850	312,780	250,000					
12. "Kliplok Colorbond" 0.64mm profiled steel sheeting	m ²	1,500	1,900 - 1,950	1,200	480,000 - 680,000	350,000					

13. Aluminium casement windows, single glazed	m ²	12,500 ^Ω	6,500 - 6,790	7,200	6,630,750	1,650,000
14. Structural steelwork - beams, stanchions and the like	kg	180	145	55 - 70	53,515	33,000
15. Steelwork - angles, channels, flats and the like	kg	160	145	55 - 70	53,515	33,000
16. 25mm cement and sand (1:3) paving	m ²	650	500 - 550	200 - 260	94,000	90,000
17. 20mm cement and sand (1:4) plaster to walls	m ²	500 - 700	400 - 450	220 - 280	144,000	100,000
18. Ceramic tiles bedded to floor screed (measured separately)	m ²	1,800	1,800 - 1,925	1,200	674,180	200,000
19. 12mm fibrous plasterboard ceiling lining	m ²	1,400 - 1,700	1,450 - 1,550	750 - 850	255,700	215,000
20. Two coats of emulsion paint to plastered surfaces	m ²	500 - 800	220 - 250	140 - 180	96,000	35,000
Average expected preliminaries	%	12 - 18	9 - 13	12 - 18	8 - 12	8 - 10

The above costs are at **4th Quarter 2021** levels and are based on lump sum fixed price contract rates exclusive of preliminaries and contingencies.

^Ω Rate for aluminium with anodized finish; 6mm thick.

^Φ All rates above are Supply and Fix, based on projects in Bangalore and are net of GST. Mumbai costs are generally 8% higher.

The data for India is provided by Arkind LS Private Limited, an Arcadis Alliance Partner.

^α Rates are net of VAT.

[#] Rates are net of VAT.

[®] The data for Jakarta is provided by PT Lantera Sejahtera Indonesia. Rates exclude VAT.

M&E COSTS FOR SINGAPORE

TYPES	ACMV S\$/m ² CFA	ELECTRICAL S\$/m ² CFA
<u>RESIDENTIAL</u>		
Detached Houses	126 - 181	185 - 248
Average Standard Condominium	105 - 131	127 - 177
Luxury Condominium	118 - 198	192 - 274
<u>OFFICE</u>		
Average Standard Offices	194 - 275	180 - 242
Prestige Offices	261 - 300	271 - 329
<u>INDUSTRIAL</u>		
Flatted Factories	65 - 137	84 - 157
Warehouses	38 - 76	63 - 100
<u>HOTEL</u>		
3-Star Hotels	251 - 286	322 - 388
5-Star Hotels	269 - 324	365 - 427
<u>OTHERS</u>		
Multi-Storey Car Parks	23 - 38	15 - 39
Basement Car Parks	32 - 54	28 - 47
Shopping Centres	170 - 284	185 - 354

The above costs are at 4th Quarter 2021 levels.

HYDRAULIC	FIRE	LIFTS	BAS
S\$/m² CFA	S\$/m² CFA	S\$/m² CFA	S\$/m² CFA
154 - 219	0 - 28	-	-
91 - 124	27 - 40	47 - 57	-
100 - 166	33 - 60	64 - 130	-
30 - 53	36 - 59	74 - 119	10 - 28
42 - 64	48 - 80	115 - 188	17 - 33
21 - 42	42 - 58	47 - 99	5 - 17
21 - 32	26 - 58	47 - 121	0 - 10
141 - 182	32 - 61	57 - 80	29 - 42
151 - 198	37 - 63	73 - 95	33 - 45
5 - 18	20 - 37	0 - 26	0 - 5
11 - 23	32 - 49	0 - 26	5 - 10
53 - 93	42 - 63	65 - 104	10 - 38

M&E COSTS FOR SELECTED ASIAN CITIES

M&E COSTS FOR SELECTED ASIAN CITIES

BUILDING TYPE	SINGAPORE ♦		HONG KONG		MACAU		KUALA LUMPUR	
	S\$/m ² CFA		HK\$/m ² CFA		MOP/m ² CFA		RM/m ² CFA	
<u>MECHANICAL SERVICES</u>								
Offices	194 - 300		2,000 - 2,600		N/A		360 - 530	
Industrial *	38 - 137		300 - 450		N/A		100 - 200	
Hotels	251 - 324		2,200 - 2,600		2,590 - 2,990		345 - 640	
Shopping Centres	170 - 284		2,100 - 2,600		2,350 - 2,940		340 - 510	
Apartment	105 - 198		800 - 2,000 up		900 - 1,200		135 - 220	
<u>ELECTRICAL SERVICES</u>								
Offices	180 - 329		2,000 - 2,400		N/A		330 - 495	
Industrial **	63 - 157		750 - 900		N/A		170 - 205	
Hotels	322 - 427		2,000 - 2,600		2,590 - 3,090		340 - 580	
Shopping Centres	185 - 354		1,700 - 2,500		2,590 - 2,940		335 - 490	
Apartment	127 - 274		1,000 - 2,200up		1,000 - 1,290		125 - 225	
<u>HYDRAULIC SERVICES</u>								
Offices	30 - 64		700 - 850		N/A		50 - 75	
Industrial	21 - 42		500 - 650		N/A		50 - 60	
Hotels	141 - 198		1,800 - 2,700		1,790 - 2,190		200 - 290	

Shopping Centres	53 - 93	700 - 900	600 - 790	40 - 45
Apartment	91 - 166	1,350 - 2,000	1,490 - 1,990	60 - 105
<u>FIRE SERVICES</u>				
Offices	36 - 80	600 - 750	N/A	70 - 90
Industrial	26 - 58	450 - 600	N/A	60 - 75
Hotels	32 - 63	600 - 850	910 - 1,120	70 - 105
Shopping Centres	42 - 63	600 - 750	610 - 810	65 - 85
Apartment	27 - 60	100 - 600	250 - 300	25 - 35
<u>LIFTS / ESCALATORS</u>				
Offices	74 - 188	700 - 1,100	N/A	150 - 375
Industrial	47 - 121	550 - 750	N/A	60 - 185
Hotels	57 - 95	550 - 850	610 - 810	120 - 310
Shopping Centres	65 - 104	850 - 1,000	460 - 710	110 - 125
Apartment	47 - 130	450 - 850	460 - 610	75 - 115

The above costs are at **4th Quarter 2021** levels, exclusive of contingencies.

- * Generally without A/C.
- ** Excludes special power supply.
- ♣ Rates are nett of GST, excluding BAS.

(Cont'd)

M&E COSTS FOR SELECTED ASIAN CITIES

M&E COSTS FOR SELECTED ASIAN CITIES (Cont'd)

BUILDING TYPE	SHANGHAI	BEIJING	GUANGZHOU/ SHENZHEN	CHONGQING/ CHENGDU
	RMB/m ² CFA	RMB/m ² CFA	RMB/m ² CFA	RMB/m ² CFA
<u>MECHANICAL SERVICES</u>				
Offices	838 - 1,055	783 - 1,212	783 - 1,162	778 - 1,050
Industrial *	185 - 310	172 - 283	157 - 288	155 - 252
Hotels	1,060 - 1,370	960 - 1,236	1,070 - 1,364	991 - 1,355
Shopping Centres	820 - 985	814 - 980	722 - 920	930 - 1,060
Apartment	336 - 440	144 - 464	154 - 414	161 - 317
<u>ELECTRICAL SERVICES</u>				
Offices	658 - 735	494 - 893	545 - 803	518 - 734
Industrial **	330 - 462	342 - 483	323 - 464	287 - 388
Hotels	717 - 906	755 - 1,011	722 - 960	643 - 900
Shopping Centres	572 - 710	515 - 725	505 - 697	572 - 729
Apartment	277 - 403	271 - 426	288 - 505	246 - 363
<u>HYDRAULIC SERVICES</u>				
Offices	117 - 172	98 - 144	104 - 186	95 - 132
Industrial	94 - 136	98 - 144	90 - 125	100 - 137
Hotels	397 - 540	381 - 495	394 - 505	387 - 514

Shopping Centres	148 - 197	144 - 206	115 - 170	110 - 161
Apartment	180 - 242	175 - 236	152 - 283	108 - 189
<u>FIRE SERVICES</u>				
Offices	245 - 341	186 - 273	232 - 354	261 - 314
Industrial	170 - 280	155 - 232	144 - 275	147 - 253
Hotels	312 - 416	226 - 387	288 - 429	293 - 394
Shopping Centres	278 - 411	226 - 387	250 - 387	284 - 405
Apartment	60 - 110	72 - 139	79 - 204	66 - 121
<u>LIFTS / ESCALATORS</u>				
Offices	294 - 578	297 - 583	295 - 517	313 - 576
Industrial	142 - 410	146 - 404	150 - 440	157 - 364
Hotels	230 - 520	234 - 525	250 - 480	261 - 449
Shopping Centres	342 - 520	330 - 525	325 - 470	317 - 474
Apartment	173 - 306	177 - 292	130 - 450	146 - 253

The above costs are at **4th Quarter 2021** levels, exclusive of contingencies.

* Generally without A/C.

** Excludes special power supply.

(Cont'd)

M&E COSTS FOR SELECTED ASIAN CITIES

M&E COSTS FOR SELECTED ASIAN CITIES (Cont'd)

BUILDING TYPE	MANILA ^α		INDIA ^β		BANGKOK ^φ		HO CHI MINH		JAKARTA #	
	PHP/m ² CFA		INR/m ² CFA		BAHT/m ² CFA		VND/m ² CFA		IDR/m ² CFA	
<u>MECHANICAL SERVICES</u>										
Offices	4,000 - 8,030	5,366 - 7,485	4,400 - 4,800	2,390,000 - 3,400,000	1,022,000 - 1,177,000					
Industrial *	800 - 1,600	2,520 - 4,778	1,550 - 1,600	N/A	463,000 - 740,000					
Hotels	3,500 - 12,350	6,216 - 7,490	4,600 - 5,200	N/A	1,054,000 - 1,369,000					
Shopping Centres	2,890 - 7,070	5,476 - 7,629	4,600 - 4,800	2,690,000 - 3,580,000	900,000 - 1,081,000					
Apartment	1,390 - 4,940	2,825 - 4,029	4,300 - 4,500	1,790,000 - 2,460,000	1,006,000 - 1,278,000					
<u>ELECTRICAL SERVICES</u>										
Offices	3,500 - 8,140	4,851 - 7,415	3,400 - 3,800	2,470,000 - 2,960,000	826,000 - 1,054,000					
Industrial **	2,000 - 3,500	2,856 - 5,270	1,950 - 2,200	N/A	585,000 - 729,000					
Hotels	4,900 - 10,200	5,381 - 8,159	3,800 - 4,500	N/A	851,000 - 1,172,000					
Shopping Centres	3,060 - 6,600	4,625 - 6,880	2,800 - 3,200	2,240,000 - 2,800,000	719,000 - 905,000					
Apartment	3,600 - 6,300	2,447 - 3,563	2,800 - 3,400	2,170,000 - 2,740,000	948,000 - 1,107,000					
<u>HYDRAULIC SERVICES</u>										
Offices	1,260 - 2,260	840 - 1,439	780 - 950	380,000 - 710,000	208,000 - 293,000					
Industrial	820 - 1,440	578 - 1,124	750 - 790	N/A	138,000 - 213,000					
Hotels	2,310 - 7,010	4,421 - 7,394	1,400 - 1,750	N/A	995,000 - 1,172,000					

Shopping Centres	1,250 - 1,650	1,260 - 2,531	790 - 950	310,000 - 560,000	197,000 - 304,000
Apartment	2,310 - 4,210	1,995 - 3,066	1,200 - 1,450	740,000 - 860,000	1,006,000 - 1,192,000
<u>FIRE SERVICES</u>					
Offices	1,180 - 2,070	1,355 - 1,963	780 - 850	735,000 - 1,210,000	283,000 - 373,000
Industrial	1,080 - 3,000	620 - 947	730 - 750	N/A	149,000 - 213,000
Hotels	1,320 - 2,630	1,575 - 2,236	780 - 890	N/A	330,000 - 410,000
Shopping Centres	1,310 - 2,080	1,297 - 1,664	780 - 850	670,000 - 820,000	277,000 - 324,000
Apartment	1,140 - 1,550	725 - 958	750 - 890	580,000 - 720,000	314,000 - 341,000
<u>LIFTS / ESCALATORS</u>					
Offices	1,800 - 4,930	1,071 - 1,434	1,100 - 1,400	730,000 - 1,400,000	441,000 - 1,059,000
Industrial	0 - 730	714 - 942	N/A	N/A	N/A
Hotels	1,800 - 3,500	1,607 - 2,381	1,100 - 1,400	N/A	703,000 - 1,097,000
Shopping Centres	1,600 - 3,010	1,880 - 2,450	300 - 500	1,500,000 - 2,100,000	324,000 - 873,000
Apartment	850 - 3,440	966 - 1,284	600 - 800	820,000 - 1,200,000	714,000 - 889,000

The above costs are at **4th Quarter 2021** levels, exclusive of contingencies.

* Generally without A/C.

** Excludes special power supply.

Ω Transformer, included in Electrical Services.

⊘ Based upon nett enclosed area and nett of VAT.

The data for Jakarta is provided by PT Lantera Sejahtera Indonesia.

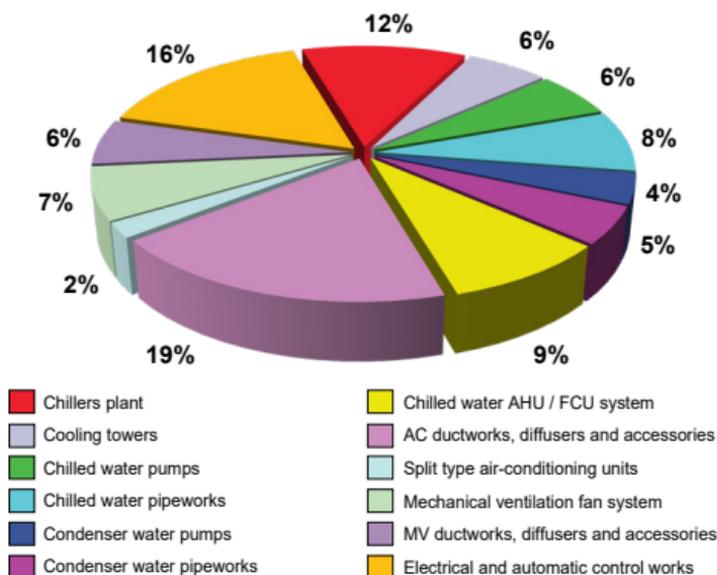
Rates exclude VAT

⊘ Rates are based on projects in Bangalore and are nett of GST. Mumbai costs are generally 8% higher.

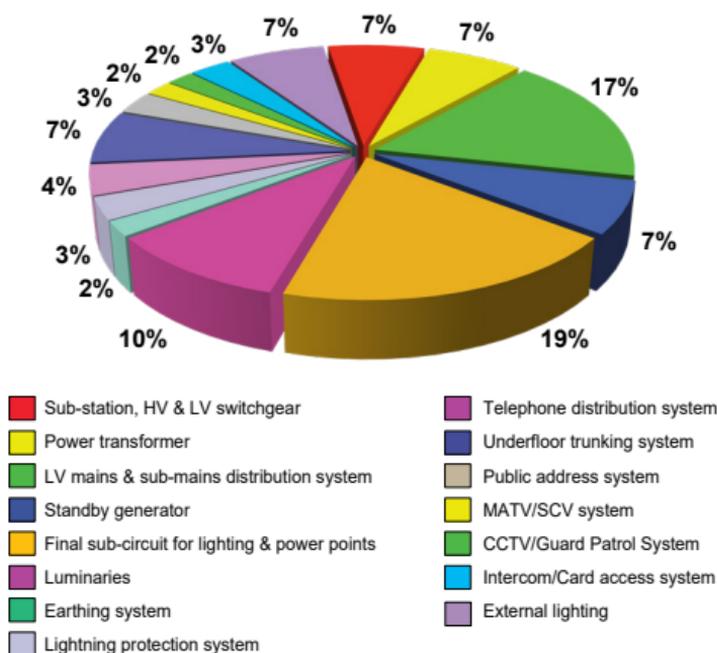
The data for India is provided by Arkind LS Private Limited, an Arcadis Alliance Partner

OFFICE M&E COST COMPONENTS

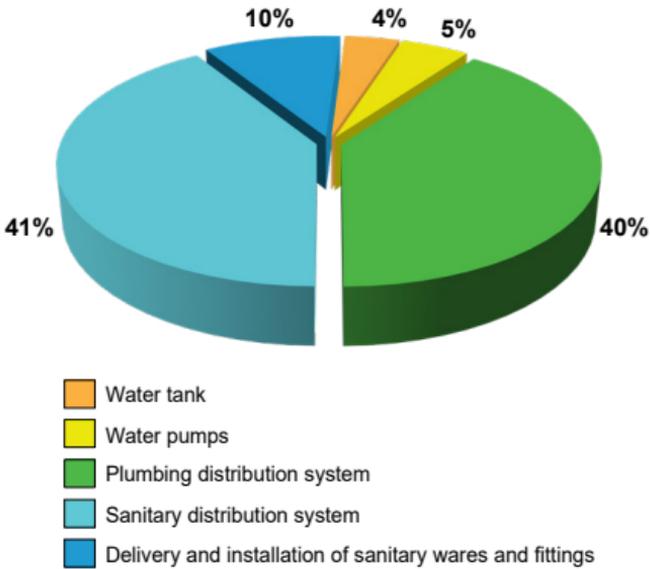
ACMV Installation Cost Breakdown for Office Building



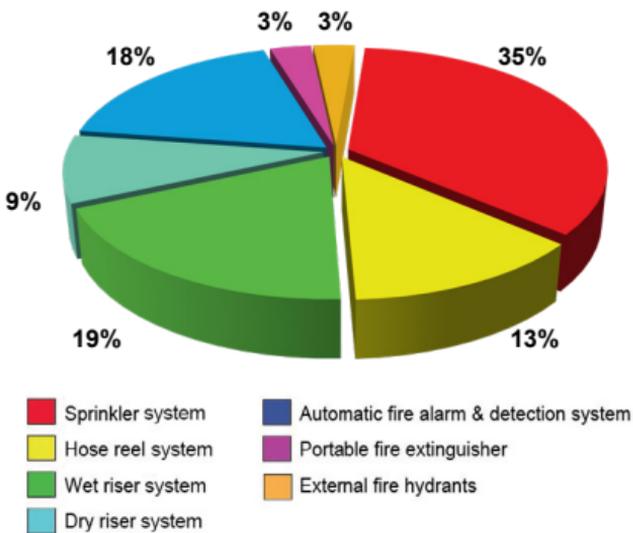
Electrical Installation Cost Breakdown for Office Building



Plumbing and Sanitary Installation Cost Breakdown for Office Building

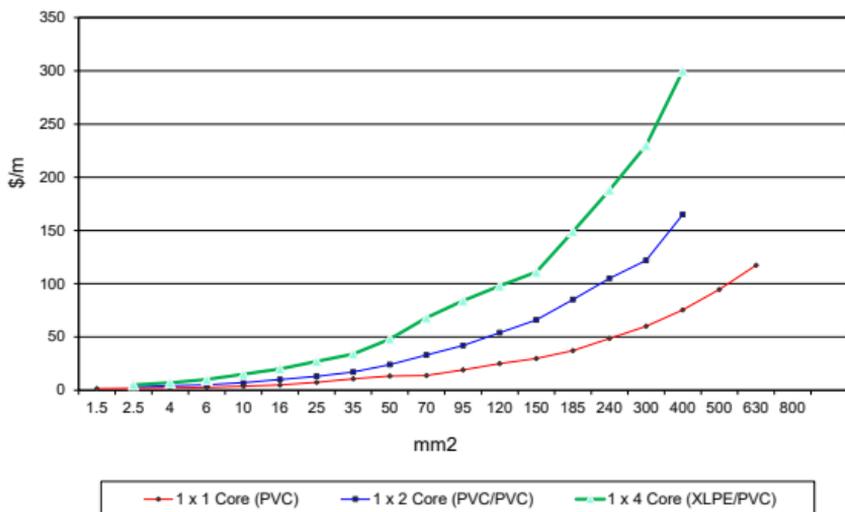


Fire Protection Installation Cost Breakdown for Office Building

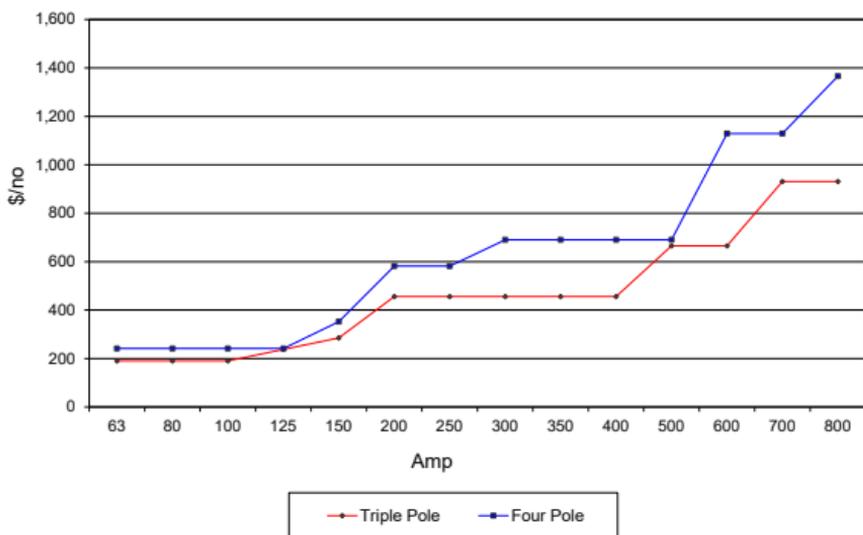


M&E COST CHARTS

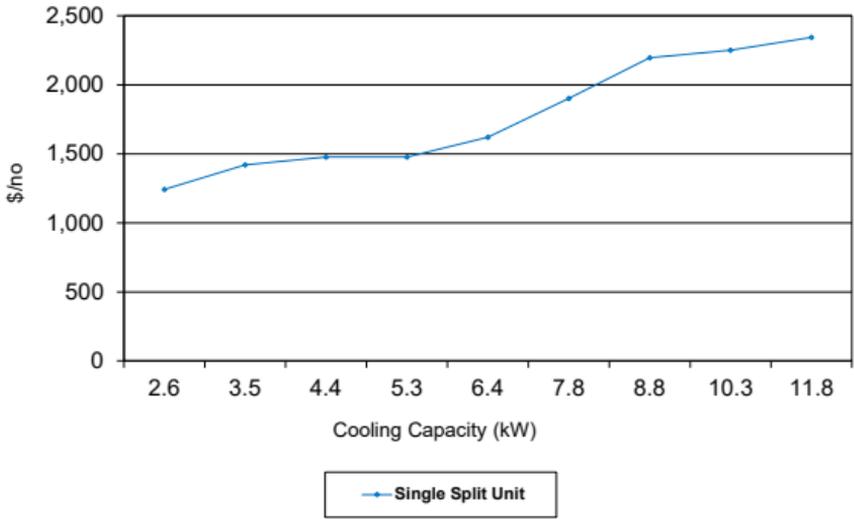
Single Core PVC Cables



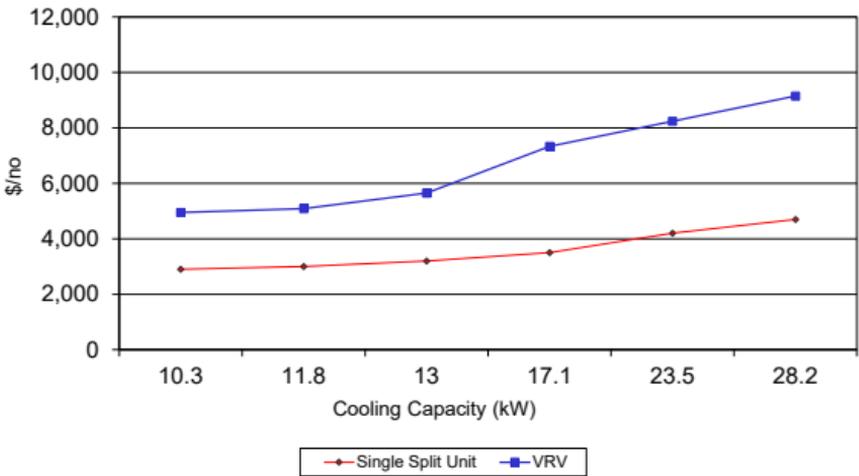
22kV MCCB



Wall Mounted Direct Expansion Fan Coil Unit



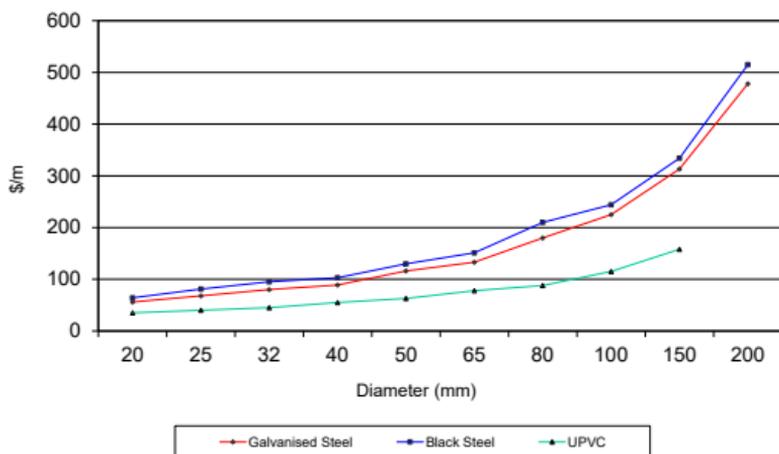
Condensing Unit



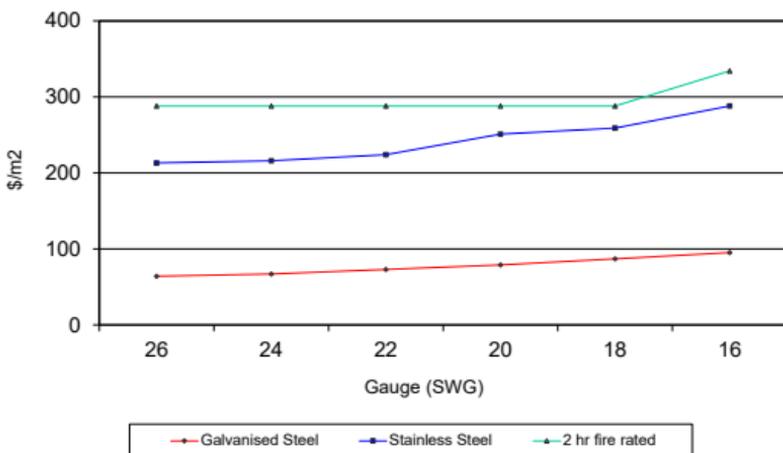
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M&E COST CHARTS

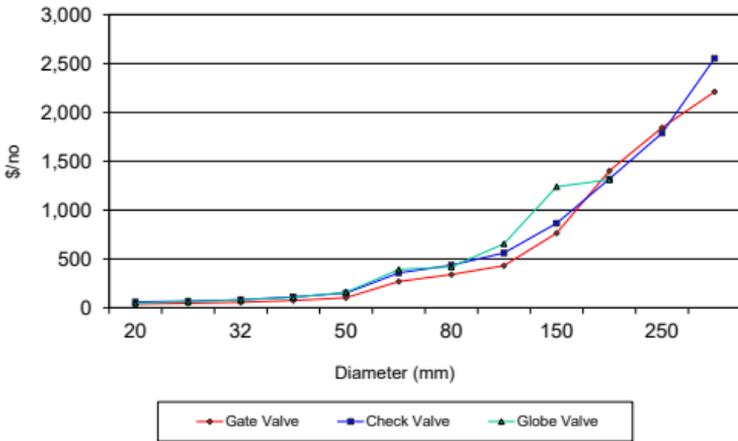
Pipework



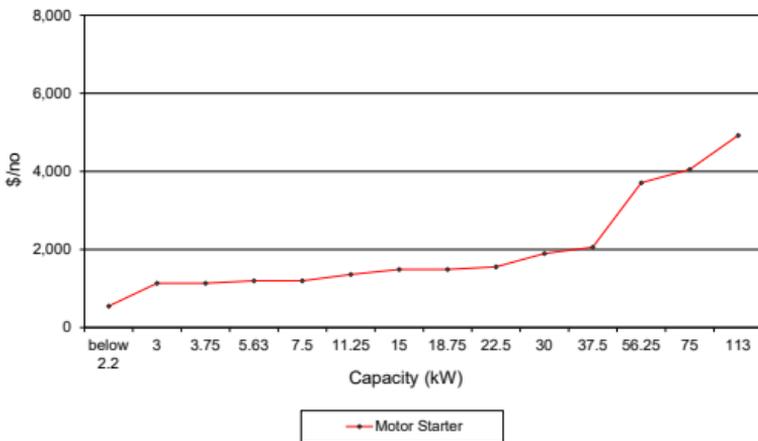
Ductwork



Valve



Motor Starter



UTILITY COSTS FOR SELECTED ASIAN CITIES

CITIES	EXCHANGE RATE USED US\$1=	ELECTRICITY (US\$/kwh)		WATER (US\$/m3)		FUEL (US\$/LITRE)		
		DOMESTIC	COMMERCIAL/ INDUSTRIAL	DOMESTIC	COMMERCIAL/ INDUSTRIAL	DIESEL	LEADED	UNLEADED
Singapore*	S\$1.35	0.18 [^]	0.18 [^]	2.03 ^{^^} -2.73 ^{^^^}	2.03 ^{^^^}	1.57 ^{^^^}	N/A	2.34 ^{^^^}
Bangalore	INR74.39	0.075-0.107	0.092-0.135	0.590-0.738	1.48	1.155	NA	1.385
Bangkok	BAHT33.889	0.069-0.130 ^{**}	0.091-0.094	0.251-0.426	0.280-0.467	0.874	N/A	0.930*
Beijing	RMB6.40	0.068-0.110	0.190-0.192 (peak) 0.118-0.120 (normal)	0.694~1.251	1.251~1.319	1.30	N/A	1.46
Chongqing	RMB6.40	0.080-0.128	0.087-0.102	0.520-0.877	0.68	1.13	N/A	1.245*
Guangzhou	RMB6.40	0.091-0.138	0.091-0.105	0.309-0.619	0.79	1.13	NA	1.18 [□]
Ho Chi Minh+	VND23,450	0.12	0.11/0.06	0.27	0.84/0.52	0.88	NA	1.14
Hong Kong	HK\$7.79	0.11 ^{ss}	0.13	0.83 ^{ss1}	0.59	2.25	N/A	2.62
Jakarta	IDR14,288	0.101*	0.101 ^{**}	0.073-0.521*	0.477-1.025 ^{**}	0.91	N/A	0.63
Kuala Lumpur	RM4.15	0.053 - 0.138	0.092 - 0.123	0.137 - 0.482	0.499 - 0.549	0.518	N/A	0.494
Macau	MOP8.01	0.1700	0.1700	0.56-0.910	0.75000	1.77	N/A	1.59
Manila	PHP50.77	0.142-0.210'	0.177'	0.474-0.707'	2.409'	1.03	N/A	1.162
New Delhi	INR74.39	0.021-0.108	0.161	0.07-0.59	0.50-2.36	1.167	N/A	1.398
Shanghai	RMB6.40	0.048-0.153 [^]	5.316 (basic tariff) ^{^^} 0.092 (summer) ^{^^} 0.087 (non-summer) ^{^^}	0.539-0.911	0.78	1.12	N/A	1.25 ^{^^}

Singapore	*	All rates are nett of GST
	^	Electricity tariff is based on low tension power supply
	^^	Domestic water tariff effective from 1 July 2018. Rate includes water conservation tax, water-borne fee, sanitary appliance fee and is an average for $\leq 40\text{m}^3$
	AAA	Domestic water tariff effective from 1 July 2018. Rate includes water conservation tax, water-borne fee, sanitary appliance fee and is an average for $> 40\text{m}^3$
	AAAA	Non-domestic water tariff effective from 1 July 2018. Rate includes water conservation tax, water-borne fee and sanitary appliance fee
	AAAAA	As at 27 October 2021
	AAAAAA	98 Unleaded petrol as at 27 October 2021
Banglore	*	The data is provided by Arkind LS Private Limited, an Arcadis Alliance Partner
Bangkok	**	Unleaded = Gasohol 95
Beijing		For normal tariff with consumption not exceeding 150kWh per month Electricity (below 1kV): (Dom/month): 1-240kWh = US\$0.068; 241-400kWh = US\$0.075; 400kWh above = US\$0.110 Electricity: (Comm/Ind (1-10kV): Central Districts: Peak = US\$0.192, Normal = US\$0.120; Other Districts: Peak = US\$0.190, Normal = US\$0.118 Water: (Dom/year): 1-180m ³ = US\$0.694; 181-260m ³ = US\$0.972; 261m ³ above = US\$1.251 Comm/Ind: Central Districts: US\$1.319; Other Districts= US\$1.251 Unleaded 92# = US\$1.178/litre; Unleaded 95# = US\$1.245/litre Unleaded gasoline 92# = US\$1.18; Unleaded 95# = US\$1.283/litre; Unleaded 98# = US\$1.461/litre
Chongqing	*	All rates are VAT inclusive
Guangzhou	□	Electricity: (Dom): 0-400kWh = US\$0.11; 400-1,000kWh = US\$0.13; 1,000-1,800kWh = US\$0.15; 1,800-2,600kWh = US\$0.19; 2,600-3,400 kWh = US\$0.22;
Ho Chi Minh	+	3,400-4,200kWh = US\$0.23; Above 4,200kWh = US\$0.23 (Based on tariff scheme of CLP Holding Limited and is charged on bi-monthly consumption)
Hong Kong	SS	Water: (Dom): 0-12m ³ = F.O.C; 12-43m ³ = US\$0.53/m ³ ; 43-62m ³ = US\$0.83/m ³ ; Above 62m ³ = US\$1.16/m ³
Jakarta	SS1	The data is provided by PT Lantera Sejahtera Indonesia
Kuala Lumpur	*	Domestic group in Indonesia will cover residence, religion building, non-profit organization building and government hospital
	**	Commercial group in Indonesia will cover luxury residence, apartment, offices, hotel, commercial building, and factories
	0	Fuel: Rates for 11-17 November 2021. Unleaded = Petrol Ron 95
	00	Electricity (Commercial/Industrial): Low voltage
	000	Water: Consumption charge : US\$0.56/m ³ for 28m ³ or below; US\$0.64/m ³ for 29m ³ to 60m ³ ; US\$0.75/m ³ for 61m ³ to 79m ³ and US\$0.90/m ³ for 80m ³ or above; Other charges (Depending on meter size 15mm-200mm): Meter rental = US\$0.34-57.64/month
Manila	*	Electricity tariff are composition of demand charges, consumption charges, fuel clause adjustment and government tax
New Delhi	^	Charges for ordinary users (e.g. Business, government/buildings, schools, associations, hospitals and others) only
Shanghai	^	Special users (e.g. gaming industries, hotels, saunas, golf courses, construction, public infrastructures and other temporary consumption) are excluded
	^^	Electricity - (Dom): 50kWh-652kWh: (Comm/Ind): 34,351kWh; Water - (Dom): 17m ³ -35m ³ ; (Comm/Ind): 13m ³
	AAA	The data is provided by Arkind LS Private Limited, an Arcadis Alliance Partner
	AAAA	Electricity: (Dom): 0-3, 120kWh = US\$0.096 (peak) / US\$0.048 (normal); 3,120-4,800kWh = US\$0.106 (peak) / US\$0.053 (normal);
	AAAAA	Above 4,800kWh = US\$0.153 (peak) / US\$0.076 (normal); (Charged on yearly consumption)
	AAAAAA	Commercial/Industrial Electricity in dual tariff system, Rate of 10KVA
		Unleaded 95



CONTRACT PROCUREMENT

3

COMMON STANDARD FORMS OF CONTRACT IN SINGAPORE - CURRENT AS OF DECEMBER 2021

- SIA Building Contract 2016 With Quantities published by the Singapore Institute of Architects, 1st Edition, July 2017
- SIA Building Contract 2016 Without Quantities published by the Singapore Institute of Architects, 1st Edition (EA), July 2017
- SIA Building Contract 2016 Design and Build With Employer's Design published by the Singapore Institute of Architects, 1st Edition (EA), July 2017
- Articles and Conditions of Contract for Minor Works 2012 published by the Singapore Institute of Architects, 1st Edition, December 2012
- SIA Sub-Contract 2016 for use in conjunction with the Main Contract, 1st Edition (EA), July 2017
- Articles and Conditions of Sub-Contract for use in conjunction with the Minor Works Contract published by the Singapore Institute of Architects, 1st Edition, March 2019
- REDAS Design and Build Conditions of Main Contract published by the Real Estate Developers' Association of Singapore, 3rd Edition July 2013
- REDAS Design and Build Conditions of Sub-Contract published by the Real Estate Developers' Association of Singapore, 1st Edition July 2013
- Public Sector Standard Conditions of Contract for Construction Works published by the Building and Construction Authority, 8th Edition, July 2020
- Public Sector Standard Conditions of Contract for Design and Build published by the Building and Construction Authority, 7th Edition, July 2020
- Standard Conditions of Nominated Sub-Contract for use in conjunction with the Public Sector Standard Conditions of Contract for Construction Works published by the Building and Construction Authority, 5th Edition December 2008

STANDARD FORMS (PRIVATE SECTOR) - MAIN FEATURES

SIA Building Contract 2016

1. Contractor's rates include all other works necessary to complete the Works, whether or not specifically mentioned in the Contract Documents [Article 8]
2. Architect's orders must be expressed as 'directions' or 'instructions' [Clause 1(2)]
3. Contractor is responsible for own design and of his sub-contractors or suppliers [Clause 3(1)]
4. Contractor must supply a make-up of his prices [Clause 5]
5. Contractor to submit setting out and levelling proposal [Clause 8]
6. Provision is made for staged possession of the site and phased completion of the Works [Clauses 10 and 25]
7. No provision for Employer to take out insurances [Clauses 19 and 20]
8. Contractor's notification within 28 days of any event, direction or instruction entitling the Contractor to an extension of time with condition precedent to an extension of time [Clause 23(2)]
9. Architect to determine extension of time within 28 days from cessation of delay event and receipt of sufficient information [Clause 23(5)]
10. Architect to apportion "equitably" extension of time for concurrent delay events [Clause 23(6)]

3 CONTRACT PROCUREMENT

11. Following failure of Contractor to remedy any defects within 84 days from Schedule of Defects (or such other period as stated in Appendix), Architect must direct the Contractor, within 14 days from the expiry of 84 days from the issue of the Schedule of Defects, that a defect need not be remedied with a corresponding reduction in the contract sum based on the estimated cost incurred by the Employer to employ other Contractors to remedy the defects [Clause 27(3)]
12. Architect to issue Maintenance Certificate within 14 days after all defects are either remedied, or dealt with under Clause 27(3) [Clause 27(5)]
13. Contractor is responsible for Designated/Nominated Sub-Contractors in respect of design, delays, etc. [Clause 28(3)]
14. Duo track of payment processes - contractual payment scheme [Clause 31]; and separate clause on statutory payment and adjudication [Clause 40]
15. Architect issues Interim Certificates on the dates or at the milestones for issuing interim payment named Appendix [Clause 31(1)]
16. Contractor to submit final account claim after completion has been achieved and last statutory instrument obtained or before end of Maintenance Period, whichever is later [Clause 31(9)]
17. Architect issues Final Certificate within 84 days from receipt of final account claim or issue of maintenance certificate whichever is the later [Clause 31(10)]
18. Architect has no power to certify compensation to Contractor for breaches of contract by Employer [Clause 31(12)]
19. Parties may refer dispute to mediation; provision for mediation does not affect or prejudice right to refer dispute to arbitration [Clause 38]

20. Parties may refer technical disputes to expert determination; provision for expert determination does not affect or prejudice right to refer dispute to mediation or arbitration [Clause 39]
21. Optional clauses permit fluctuations on specified materials [Clause 41] and insurance excesses [Clause 42]

SIA Sub-Contract 2016

1. Contractor issues directions and instructions to the Sub-Contractor [Clause 2.1]
2. Contractor orders variations on sub-contract works [Clause 4.1]
3. Application for extension of time is made to the Contractor, not the Architect [Clause 9.2]
4. Time period for notification of any event, direction or instruction entitling the Sub-Contractor to an extension of time is 21 days [Clause 9.2]
5. Extension of time is assessed and granted by the Contractor [Clause 9.2]
6. The following certificates are issued by the Contractor:
 - Sub-Contract Completion Certificate [Clause 8.1]
 - Sub-Contract Maintenance Certificate [Clause 11.2]
 - Sub-Contract Termination Certificate [Clause 12.2]
7. Provision for recovery of general damages only amount is set off and deducted from monies due to the Sub-Contractor after condition precedents are satisfied [Clause 10]
8. Duo track of payment processes - contractual payment scheme [Clause 13]; and separate clause on statutory payment and adjudication [Clause 17]

3 CONTRACT PROCUREMENT

9. Sub-Contractor entitled to interim payment based on the amount certified in the Architect's Interim Certificate under the Main Contract Conditions [Clause 13:2]
10. Parties may refer dispute to mediation; provision for mediation does not affect or prejudice right to refer dispute to arbitration [Clause 15]
11. Parties may refer technical disputes to expert determination; provision for expert determination does not affect or prejudice right to refer dispute to mediation or arbitration [Clause 16]

SIA BUILDING CONTRACT – DESIGN AND BUILD WITH EMPLOYER’S DESIGN {ONLY MAIN FEATURES WHICH DIFFER FROM THE “BUILD” FORM ARE HIGHLIGHTED BELOW}

1. Merging procurement practice of Early Contractor Involvement (“ECI”) [ECI Preamble]
2. Parties to perform contract in good faith [Article 12]
3. Architect empowered to issue Architect’s Instructions to vary Design Concept, Employer’s Architectural Design Requirements (“EADR”), Employer’s Project Objectives (“PO”), Project Objective Priorities (“POP”) [Clause 1(4)]
4. Period for Design Contractor’s confirmation of verbal direction(s) / instruction(s) is within 14 days from receipt of said request [Clause 1(1)]
5. Employer is responsible for his design contained in the EADR before the Design Contractor is appointed. The Design Contractor shall be responsible for implementing the EADR and continuing the design. [Clause 2(1)]
6. Design Contractor shall warrant that the Design Contractor’s works proposal (“DCWP”) and the Works shall meet the Employer’s requirements and shall be fit for the purpose with respect to the EADR. [Clause 2(1)]
7. Design Contractor to procure professional indemnity insurance for his design works [Clause 2(1)]
8. Architect to provide design and specification as defined in EADR. Employer shall not be obliged to furnish the complete or all obligations, requirements by technical agencies over the works [Clause 3(1)]
9. Contractor to design, integrate design, supervise, make applications to obtain statutory permits and/or approvals and complete the Works [Clause 3(2)]

3 CONTRACT PROCUREMENT

10. Architect to issue the following certificates in relation to completion [Clauses 3(7) and 22]:
 - Completion of Design Works Certificate [on completion of Building Works and obtainment of the last statutory instrument of any authority governing the Building Works]
 - Completion of Building Works Certificate
 - Completion of the Works Certificate [on or after the completion of the Design Works and the Building Works]
11. Design Contractor shall carry out any variation of the Works required for compliance with legal requirements without adjustment of the contract sum or extension of time [Clause 7(2)]
12. Provisions on respective dates for commencement of design works and commencement of building works [Clause 10]
13. Architect to determine extension of time as soon as reasonable after cessation of delay event and it is possible to decide the length of period of extension [Clause 23(5)]
14. Provisions on nominated and designated subcontractors classified as optional clause [Clause 40]

REDAS Design and Build Conditions of Main Contract

1. No order of priority for Contract Documents; in the event of any discrepancies between the documents, Employer's Requirements shall prevail [Clause 1.7]
2. Contractor to provide a performance bond (either as cash deposit or on-demand bond from a bank) within 28 days from letter of acceptance or such other longer period as stated in Appendix [Clause 4.5]
3. Provision for Named Sub-Contractors; Contractor is entitled to rights of objection [Clauses 2.4 and 2.5]

4. Contractor's Works and design shall be fit for their intended purpose in accordance with the Employer's Requirements; Contractor also responsible for the sufficiency and correctness of the Employer's designs, specifications and calculations in the Employer's Requirements [Clause 4.1]
5. Contractor to engage qualified design professionals for the design and submission of the Works [Clause 4.3]
6. Administration of the Contract is carried out by the Employer's Representative appointed by the Employer; Employer's Representative's duties can be delegated to assistants with Employer's consent [Clause 5]
7. Provision is made for completion of the Works in whole or in phases/sections [Clause 10]
8. Contractor must satisfy extensive criteria before handing over [Clause 11]
9. Employer may occupy any parts of the Works upon issuance of the Handing Over Certificate of Occupied Part by the Employer's Representative [Clause 12]
10. Contractor's application for extension of time within 28 days of occurrence of cause of delay is a condition precedent to an extension of time [Clause 16.2]
11. Contractor entitled to serve payment claim (which is defined as having the same meaning ascribed in the Building and Construction Industry Security of Payment Act) ("the SOP Act") on the Employer on the last day of each month following the month in which the Contract is made (or otherwise by such time or on such day as stated in Appendix 1) [Clause 22.1]
12. Employer's Representative issues Interim Payment Certificate within 14 days of receipt of payment claim [Clause 22.2]

3 CONTRACT PROCUREMENT

13. Interim payment certificate or final payment certificate issued by the Employer's Representative shall be deemed the payment response from the Employer under the SOP Act if the Employer does not provide any response within 21 days of service of payment claim. Where the Employer provides a payment response within 21 days of service of payment claim, such response shall take precedence over the interim payment certificate or final payment certificate [Clause 22.4]
14. Application for final payment claim by Contractor to issuance of final payment certificate by the Employer's Representative is regulated by a procedure [Clause 24]
15. Claims for additional payment are regulated by a claims procedure [Clause 29]
16. Employer may at his convenience at any time to terminate the Contract without cause [Clause 30.1]
17. Contractor entitled to suspend work pursuant to provisions of SOP Act [Clause 31.1]
18. Contractor entitled to serve Notice of Termination following failure of payment of adjudicated amount by Employer [Clause 31.2]
19. Upon issuance of a Notice of Taking Over, Employer may take over design and construction of a part of the Works where termination for default is not practical as a default may relate to a specific part only [Clause 32]
20. Parties may refer dispute to mediation; provision for mediation does not affect or prejudice right to refer dispute to arbitration [Clause 33]
21. Additional optional clause permit fluctuations on specified materials used for permanent works only [Clause 34]

22. Option Module (with Employer's Architectural Design) where the Employer retains his own design consultants to provide the architectural design works and make the statutory submissions.

REDAS Design and Build Conditions of Sub-Contract

1. Sub-Contract Sum inclusive of all ancillary and other necessary works and expenditure, whether or not specifically mentioned in the Sub-Contract Documents [Clause 2.3]
2. Sub-Contract shall be construed consistently with the requirements of the Main Contract Documents [Clause 3]
3. Sub-Contractor to engage suitably qualified design professionals and/or site supervisors to carry out Sub-Contract Works [Clause 6.4]
4. Contractor issues instructions to the Sub-Contractor [Clause 7.1]
5. Sub-Contractor to provide a performance bond (either as cash deposit or on-demand bond within 14 days from sub-contract letter of acceptance. Sub-Contractor may obtain bond from financial institution (and not bank) unlike the Main Contract Conditions [Clause 8]
6. Sub-Contract Works and design shall be fit for their intended purpose in accordance with the Employer's Requirements; Sub-Contractor also responsible for the sufficiency and correctness of the Contractor's and Employer's designs, specifications and calculations in the Employer's Requirements insofar as they apply to the Sub-Contract Works [Clause 9.1]
7. Sub-Contractor entitled to a grant of extension of time for delay arising from events set out in clause 16.1 of the Main Contract, or from any act, default and breach of the Sub-Contract by the Contractor [Clause 12.1]

3 CONTRACT PROCUREMENT

8. Application for extension of time is made to the Contractor, not the Employer's Representative [Clause 12.2]
9. Time period for notification of any event, direction or instruction entitling the Sub-Contractor to an extension of time is 21 days [Clause 12.2.1]
10. Time period for notification of Sub-Contractor's in principle entitlement to his extension of time claim is 35 days of request to do so. [Clause 12.2.3]
11. Provision for recovery of general damages for delay in completion only - amount is set off and deducted from monies due to the Sub-Contractor after condition precedents are satisfied [Clauses 12.3 & 12.4]
12. Where the Contractor's employment is terminated for any reason whatsoever, and should the Employer so requires, the Sub-Contractor agrees that Sub-Contract shall be novated to Employer or any party nominated by the Employer [Clause 13.2]
13. Sub-Contract Maintenance Period shall commence upon the date of handing over as set out in the Sub-Contract Handing Over Certificate and shall continue until the issue of the Sub-Contract Maintenance Certificate by the Contractor [Clause 14.1]
14. Contractor orders variations on Sub-Contract works [Clause 17.1]
15. Sub-Contractor entitled to serve payment claim (which is defined as having the same meaning ascribed in the Building and Construction Industry Security of Payment Act) ("the SOP Act") on the Contractor on the 24th day of each month following the month in which the Sub-Contract is made (or otherwise by such time or on such day as stated in Appendix 1) [Clause 18.1]
16. Contractor responds to payment claim within 21 days of receipt of Sub-Contractor's payment claim [Clause 18.6]

17. Sub-Contractor to serve his Final Payment Claim on the Contractor within 14 days after the occurrence of the events specified in Clause 24.3.1 of the Main Contract Conditions whichever is the later [Clause 18.7]
18. Contractor to provide payment response by issuing Final Payment Certificate within 14 days of receipt of the Final Payment Claim [Clause 18.7]
19. Sub-Contractor is entitled to serve notice of termination following failure of adjudicated amount by Contractor [Clause 22.5]
20. Parties may refer dispute to mediation; provision for mediation does not affect or prejudice right to refer dispute to arbitration [Clause 25.1]

STANDARD FORMS (PUBLIC SECTOR) - MAIN FEATURES

Public Sector Standard Conditions of Contract for Construction Works (PSSCOC)

1. Superintending Officer, Superintending Officer's Representative and assistants to Superintending Officer and Superintending Officer's Representative are appointed for design, cost control and contract administration [Clause 2]
2. Failure to comply with the Superintending Officer's instructions entitles the Employer to recover any cost, loss, expense and damage incurred in employing another contractor and any other loss or damage as a result of the Contractor's default [Clause 2]
3. Contractor must provide a security deposit (either as cash deposit or guarantee from a bank or Monetary Authority of Singapore approved insurer) within 14 days from letter of acceptance or such other longer period as stated in Appendix [Clause 4.5]
4. Employer is required to provide geotechnical information concerning the Site upon Contractor's request, save for any confidential or sensitive information but it does not relieve the Contractor from carrying his own investigation or search for existing and other additional relevant information [Clause 5.1]
5. If Contractor encounters adverse physical conditions (which include unforeseen sub-surface and ground conditions and underground services), he may be granted extension of time and loss and expense provided such conditions could not have been reasonably foreseen by an experienced contractor [Clause 5.2]
6. Superintending Officer has express power to suspend the Works, and if suspension is more than 90 days, Contractor may regard it as omission of the affected part (which is suspended) or a termination (where the suspension affected the whole Works) [Clause 13]

7. Ground for extension of time include force majeure event. Force majeure is defined as an event which is beyond the Contractor's reasonable control. In view of the global COVID-19 events in 2020. [Clause 14.2]
8. As part of the pandemic resilient contracting practices, new grounds extension of time are introduced for pandemic outbreaks and delays arising from measures that the government or any other statutory or public authority of Singapore requires the Contractor to implement in respect of the Works to curb the spread of the pandemic [Clause 14.2]
9. If progress or completion of the Works will be delayed, Contractor has to notify the Superintending Officer within 60 days of occurrence of the delaying event, the submission of the notice being a condition precedent [Clause 14.3]
10. Cumulative amount of liquidated damages is capped at \$50 million or contract sum whichever is lower [Clause 16 and Appendix]
11. Superintending Officer may require the Contractor to submit a quotation for any proposed variation before issuing an instruction [Clause 19.3]
12. Contractor may submit alternative proposals for variations to the Works which are likely to offer significant benefits. Actual cost savings shared by Employer and Contractor in equal proportions [Clause 19.4]
13. Superintending Officer has 60 days from the date of certified substantial completion of the variation works to value the amount due and notify the Contractor [Clause 20.2]
14. Superintending Officer is empowered to adjust contracted schedule of rates if found rates to be grossly excessive or inadequate [Clause 20.5]
15. Provision is made for Contractor to recover loss and expense as a result of regular progress and/ or completion of the Works having been disrupted, prolonged or materially affected by variation instructions, failure to give site possession, suspension, late supply of information, Superintending

3 CONTRACT PROCUREMENT

Officer's instructions (which Employer is liable to pay loss and expense), unforeseeable adverse physical conditions, acts or omissions of other contractors and Employer's act of prevention or breach of contract [Clause 22]

16. Provisions for contract parties to co-share equally additional direct costs incurred arising from pandemic or measures introduced by the Singapore government to curb the spread of a pandemic, subject to a cap of 5% of contract sum [Clause 22.1]
17. Superintending Officer has power to certify amounts payable to the Contractor for all work executed until termination (where such termination is without default of the Contractor) and any loss and expense suffered by the Contractor [Clause 31.4]
18. Contractor entitled to serve payment claim (which is defined as having the same meaning ascribed in the Building and Construction Industry Security of Payment Act) ("the SOP Act") on the Employer at monthly intervals (on the day of each month specified by the Superintending Officer following the month in which the Contract is made [Clause 32.1]
19. Superintending Officer issues Payment Certificate to the Contractor within 14 days of receipt of Payment Claim [Clause 32.2(1)]
20. Payment Certificate issued by Superintending Officer shall be deemed the Payment Response from the Employer under the SOP Act if the Employer does not provide any response within 14 days from the Payment Claim [Clause 32.2(2)]
21. Where the Employer provides a Payment Response within 14 days from the Payment Claim, such response takes precedence over the Superintending Officer's Payment Certificate [Clause 32.2(2)]
22. Contractor has 90 days from the Date of Substantial Completion to submit Final Payment Claim which shall constitute a Payment Claim under the SOP Act [Clause 32.4]

23. Superintending Officer has 21 days from receipt of Final Payment Claim to provide Contractor with an Interim Final Account and at the same time issue a Payment Certificate [Clause 32.5(1)]
24. Where Contractor fails to submit a Final Payment Claim, Superintending Officer has 150 days from the Date of Substantial Completion to issue Interim Final Account, and a further 30 days thereafter to issue a payment certificate. Interim Final Account and payment certificate under such circumstances are not subject to the SOP Act [Clause 32.5(2)]
25. Mechanism for fluctuation of materials prices applicable to specified materials in Appendix [Clause 33]
26. Any dispute or difference which involves a Payment Claim or Payment Response to which the SOP Act applies, Contractor entitles to make an adjudication application [Clause 35.5(1)]
27. Employer can only recover from the Contractor any sum due or to become due under this contract (and not from any other contract between the Employer and the Contractor) [Clause 36.1]
28. Advance payment to Contractor for projects adopting Prefabricated Prefinished Volumetric Construction (PPVC); Advance payment will only be made after receipt of advance payment guarantee (issued by bank or Monetary Authority of Singapore approved insurance company) [Option Module D]

3 CONTRACT PROCUREMENT

Public Sector Standard Conditions of Contract for Design and Build (PSSCOC D&B) (only main features which differ from the 'Build' form are highlighted below)

1. Contractor is responsible for choice of plant, materials, goods, workmanship and coordinating all design work [Clause 4.1]
2. Contractor to engage and include all fees, costs, etc. in the Contract Sum for suitable qualified personnel viz, Qualified Persons, Resident Engineer and any others as required by statute; such persons cannot be replaced without prior consent of the Superintending Officer. Where Accredited Checker or Registered Inspector is required, they shall be engaged by the Employer [Clause 4.2]
3. Contractor must indemnify the Employer against all claims and proceedings for infringements of any patent rights, design, trademark name or copyright [Clause 4.6]
4. Contractor warrants that the Contractor's Proposals meet the Employer's Requirements and are fit for the purpose [Clause 6.1]
5. Contractor indemnifies the Employer for any breach of design responsibility in contract and under common law [Clause 6.1]
6. When the Works are substantially completed and the Temporary Occupation Permit obtained, Contractor gives notice plus an undertaking to complete any outstanding work during the defects liability period; Superintending Officer has 21 days from the notice to either issue certificate or instructions on works still to be completed [Clause 17]
7. No provision for Nominated Sub-Contractors

CONTRACTUAL ARRANGEMENTS

Contractual arrangements are concerned with the type of agreement to be entered into and the obligations, responsibilities, rights and liabilities assumed by the parties under a contract. It deals with the situation that exists from the time when a contract is formed until the time when all the obligations created by it have been discharged.

Contractual arrangements may comprise the following:

Conventional Contracts

The commonest form of contract is one based upon the SIA Conditions of Contract. The design is prepared by the Employer's Consultant and Contractor carries out work as shown/described in documents. The price of the works determined before award, usually by competition but occasionally by negotiation. Small projects tend to be based upon specification and drawings whilst large projects are usually based upon bills of quantities.

Design and Build Contracts

A design and build contract is a contractual arrangement where the Employer employs a Contractor to design and build the project.

The Contract Sum is inclusive of design work, management and construction costs.

Develop and Construct Contracts

A develop and construct contract is a contractual arrangement where the Employer engages consultants to design the project to a certain stage; the Contractor then develops and completes the design and constructs the building.

Term Contracts

Under term contracts, the Contractor signs a contract to carry out an indefinite amount of work within a certain framework over a time period or 'term'. While exactly what is to be done may be uncertain, the general character of the work will usually be fairly easy to define.

Orders for work are issued progressively from time to time throughout the contract period. The work is measured, valued and the Contractor is paid accordingly subject to the tendered adjustment on the Schedule of Rates.

Guaranteed Maximum Price (GMP) Contracts

A GMP, effectively a guaranteed lump sum price for a project, is a set of conditions that can be introduced and used in conjunction with any standard form of contract, e.g. SIA Standard Form (for traditional procurement), JCT Standard Form with Contractor's Design or REDAS Design and Build Standard Form (for design-build procurement) and JCT Management Contract Standard Form (for management contracting). It is not a standard form of contract.

The guaranteed price is not subject to upward adjustment except for fundamental and material changes in the client scope of work or as a result of legislation or statutory requirements.

The guaranteed price forms the price cap – with the risk of final cost exceeding this cap falling on the contractor. If the work is completed for less than the GMP, the contract may provide for some financial incentives, usually by way of a mutually agreed cost savings sharing scheme.

The benefits of GMP include greater price certainty, early start as design and construction can overlap, contractor's input and contribution on buildability, best practice construction methods and mutually beneficial partnering-style relationship.

Management Contracts

A management contract is one in which the Management Contractor is appointed by the Employer to manage the planning and construction of a project and in which the construction work is executed by Works Contractors selected and contracted with the Management Contractor as the job proceeds.

The Management Contractor prepares the programme, decides on the contents of each work package to be let out, organises and manages the construction of all works which are undertaken by Sub-Contractors, each selected in competition.

Construction Management Contracts

Construction management contracts entail an interactive procurement concept involving combined efforts of the Employer, Construction Manager, design consultants and multitude of work package contractors.

Under construction management contracts, the Construction Manager is appointed to manage the entire delivery process from inception to completion while construction work is executed by a myriad of work package contractors engaged by the Employer, selected and appointed as the job proceeds.

Public-Private Partnership (PPP)

Public-Private Partnership (PPP) is a generic term which describes the various structures possible whereby the public and private sectors work together in the delivery of services and the provision and operation of assets. Typical forms of project structures under PPP include PFI (Private Finance Initiative), DBFO (Design, Build, Finance, Operate), DCMF (Design, Construct, Manage, Finance), BOO (Build, Own, Operate), BOT (Build, Operate, Transfer) and BOOT (Build, Own, Operate, Transfer).

Broadly, a typical PPP model involves the procuring authority (or public agency) contracting with the Special Purpose Vehicle (SPV) under a long fixed-term service purchase agreement for the design, construction, maintenance and operation of the facility. The SPV enters into a range of sub-contracts for the building works, and operations and maintenance of the new asset.

Early Contractor Involvement (ECI)

Early Contractor Involvement (ECI) is a project delivery method whereby a contractor is engaged either during the earlier stages of design (i.e. concept design or schematic design stages) or during an extended period of tendering to seek the contractors' expertise especially in the areas of buildability, constructability, construction scheduling and planning, value management or value engineering and the latest construction technologies or methods. It has been said that ECI promotes "partnering" in a tendering environment.

An ECI exercise is to engage the contractors and to seek their input on certain project risks which as an end result could create greater certainty on the estimated cost and expected delivery of the project.

ECI is not a contract form but rather a procurement process that could be adopted on any form of contract.



OTHER INFORMATION

4

Prime Rates

Currency Fluctuations

Conversion Factors

Relevant Websites

4 OTHER INFORMATION

PRIME RATES

Indicative prime rates as at 4th Quarter 2021

COUNTRY	RATE (% pa)
China*	4.75
Hong Kong	5.00
India [§]	8.80
Jakarta ^{§§}	4.25
Macau	5.25
Malaysia [^]	5.49
Philippines	6.03
Singapore	5.25
Thailand [#]	6.15
United Kingdom ^{**}	0.10
United States of America	3.25
Vietnam ^{##}	6.00

Note: Depending on the circumstances, prime rates may vary from time to time

China* = 5-Year Benchmark Lending Rate

India[§] = The data is provided by Arkind LS Private Limited, an Arcadis Alliance Partner

Jakarta^{§§} = The data for Jakarta is provided by PT Lantera Sejahtera Indonesia

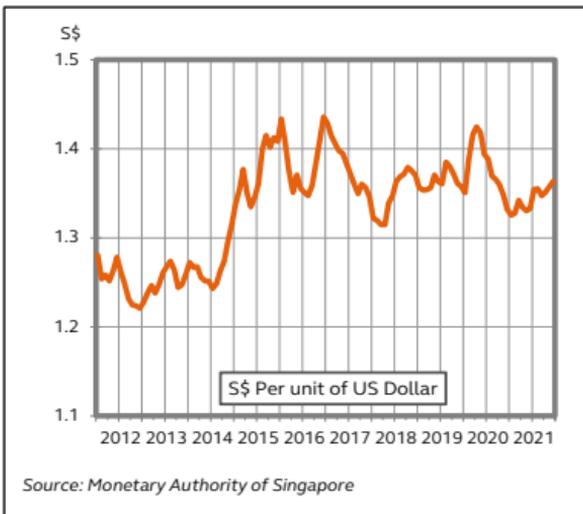
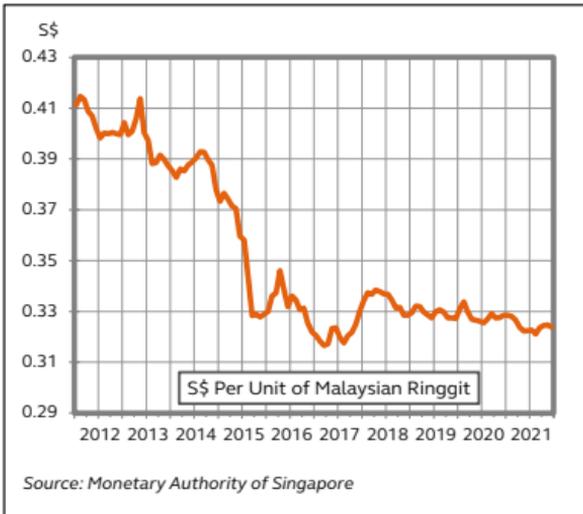
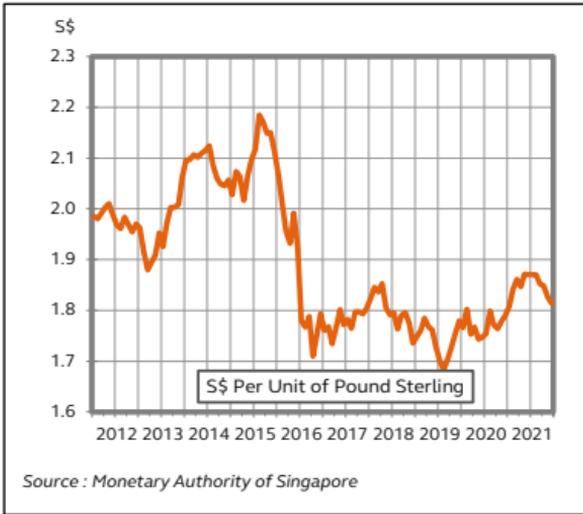
Malaysia[^] = Base Lending Rate (September 2021)

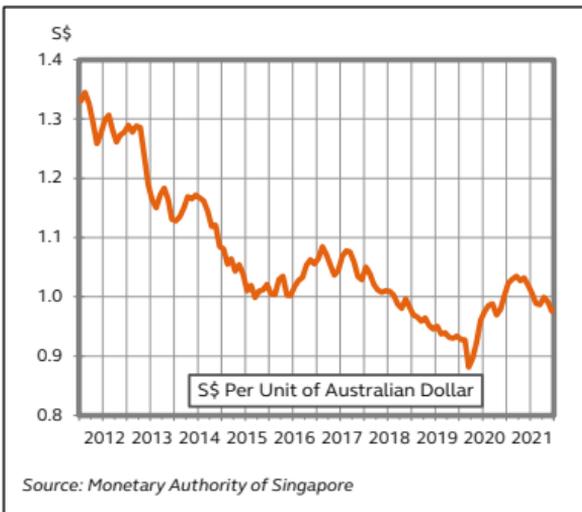
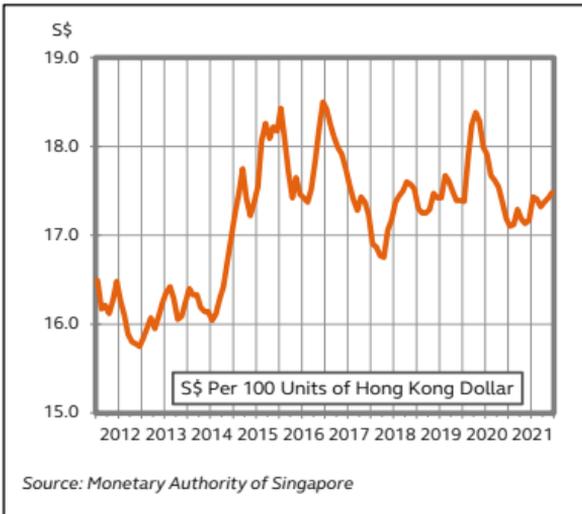
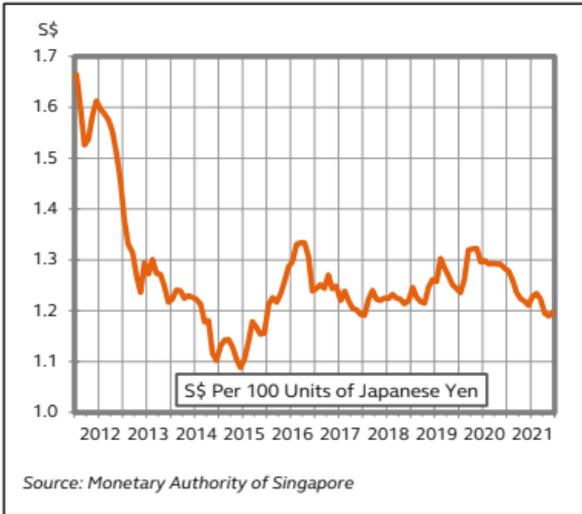
Thailand[#] = Minimum Loan Rate % per annum (Average based on local bank)

United Kingdom^{**} = Bank Rate (Bank of England base rate)

Vietnam^{##} = Minimum and in VND per year

CURRENCY FLUCTUATIONS





4 OTHER INFORMATION

CONVERSION FACTORS

UNIT	
<u>LENGTH</u>	
10 mm = 1 cm	12 in = 1 ft
100 cm = 1 m	3 ft = 1 yd
1,000 m = 1 km	1,760 yd = 1 mile
<u>AREA</u>	
10,000 m ² = 1 ha	9 ft ² = 1 yd ²
100 ha = 1 km ²	4,840 yd ² = 1 acre
	640 acre = 1 mile ²
<u>VOLUME</u>	
1,000 ml = 1 l	(UK) 8 pt = 1 gal
	(US) 8 pt = 1 gal
<u>MASS</u>	
1,000 g = 1 kg	16 oz = 1 lb
1,000 kg = 1 tonne	2,240 lb = 1 ton
16 tael = 1 catty	
<u>POWER</u>	
<u>TEMPERATURE</u>	

TO METRIC (APPROX)	TO IMPERIAL (APPROX)
1 in = 25.400 mm 1 ft = 30.480 cm 1 yd = 0.914 m 1 mile = 1.609 km	1 cm = 0.394 in 1 m = 3.281 ft 1 m = 1.094 yd 1 km = 0.621 mile
1 ft ² = 0.093 m ² 1 yd ² = 0.836 m ² 1 acre = 0.405 ha 1 mile ² = 2.590 km ²	1 m ² = 10.764 ft ² 1 m ² = 1.196 yd ² 1 ha = 2.471 acres 1 km ² = 0.386 mile ²
(UK)1 pt = 0.568 l (US)1 pt = 0.473 l (UK)1 gal = 4.546 l (US)1 gal = 3.785 l	(UK)1 l = 1.760 pt (US)1 l = 2.113 pt (UK)1 l = 0.220 gal (US)1 l = 0.264 gal
1 oz = 28.350 g 1 lb = 0.454 kg 1 ton = 1.016 tonne 1 catty = 0.605 kg	1 gram = 0.035 oz 1 kg = 2.205 lb 1 tonne = 0.984 ton
1 hp = 0.746 kw	1 kw = 1.341 hp
°C = (°F-32)x5/9	°F = (°Cx9/5)+32

RELEVANT WEBSITES

Singapore Government

Accounting and Corporate Regulatory Authority

Board of Architects Singapore

Building and Construction Authority

Central Provident Fund Board

Enterprise Singapore

Housing & Development Board

Inland Revenue Authority of Singapore

Integrated Land Information Service

Intellectual Property Office of Singapore

Land Surveyors Board Singapore

Land Transport Authority

Ministry of Communications and Information

Ministry of Culture, Community and Youth

Ministry of Defence

Ministry of Education

Ministry of Finance

Ministry of Foreign Affairs

Ministry of Health

Ministry of Home Affairs

Ministry of Law

Ministry of Manpower

Ministry of National Development

Ministry of Social and Family Development

Ministry of Sustainability and the Environment

Ministry of Trade and Industry

Ministry of Transport

Monetary Authority of Singapore

National Parks Board

Professional Engineers Board Singapore

Public Utilities Board

www.acra.gov.sg
www.boa.gov.sg
www.bca.gov.sg
www.cpf.gov.sg
www.enterprisesg.gov.sg
www.hdb.gov.sg
www.iras.gov.sg
app1.sla.gov.sg/inlis/#/
www.ipos.gov.sg
lsb.mlaw.gov.sg
www.lta.gov.sg
www.mci.gov.sg
www.mccy.gov.sg
www.mindef.gov.sg
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www.moh.gov.sg
www.mha.gov.sg
www.mlaw.gov.sg
www.mom.gov.sg
www.mnd.gov.sg
www.msf.gov.sg
www.mse.gov.sg
www.mti.gov.sg
www.mot.gov.sg
www.mas.gov.sg
www.nparks.gov.sg
www.peb.gov.sg
www.pub.gov.sg

RELEVANT WEBSITES

Singapore Government (Cont'd)

Singapore Civil Defence Force
Singapore Department of Statistics
Singapore Economic Development Board
Singapore Government Website
Singapore Land Authority
Strata Titles Boards
Urban Redevelopment Authority

Construction-Related Associations in Singapore

Real Estate Developers' Association of Singapore
Singapore Green Building Council
Singapore Institute of Planners
Singapore Institute of Architects
Association of Consulting Engineers Singapore
The Institution of Engineers Singapore
Society of Project Managers
Singapore Institute of Surveyors and Valuers
Association of Property and Facility Managers
Singapore Institute of Building Limited
The Law Society of Singapore
Singapore Power Ltd

Others

Arcadis
Arcadis Singapore Pte Ltd
Arcadis Pte Ltd

www.scdf.gov.sg

www.singstat.gov.sg

www.edb.gov.sg

www.gov.sg

www.sla.gov.sg

www.stratatb.gov.sg

www.ura.gov.sg

www.redas.com

www.sgbc.sg

www.planning.org.sg

www.sia.org.sg

www.aces.org.sg

www.ies.org.sg

www.sprojm.org.sg

www.sisv.org.sg

www.apfm.org.sg

www.sibl.com.sg

www.lawsociety.org.sg

www.spgroup.com.sg

www.arcadis.com

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ARCADIS SINGAPORE 5

Our Core Values

About Us In Singapore

Professional Services

Arcadis Contract Advisory Services

Arcadis Singapore

Arcadis Asia Services

Directory of Offices

Acknowledgements

OUR CORE VALUES



People First

We care for each other and create a safe and respectful working environment where our people can grow, perform, and succeed.



Client Success

We are passionate about our clients' success and bring insights, agility, and innovation to co-create value.



Integrity

We always work to the highest professional and ethical standards and establish trust by being open, honest and responsible.



Sustainability

We base our actions for clients and communities on environmental responsibility and social and economic advancement.



Collaboration

We value the power of diversity and our global capabilities and deliver excellence by working as One Arcadis.

ABOUT US IN SINGAPORE

Arcadis is the leading **global Design & Consultancy for natural and built assets**. Applying our deep market sector insights and collective design, consultancy, engineering, project and programme management services, we work in partnership with our clients to deliver exceptional and sustainable outcomes throughout the lifecycle of their natural and built assets. We support UN-Habitat with knowledge and expertise to improve the quality of life in rapidly growing cities around the world.

At Arcadis Singapore we have over 260 dedicated professionals armed with a vast background across a variety of specialist skills acquired from more than 85 years of experience. We combine our global connections with local market knowledge and practical experience to offer our clients the unique benefits of international expertise and local delivery. We understand that clients operating in natural and built environments today have to tackle a growing number of complex issues. Arcadis has a range of expertise and solutions ranging from quantity surveying, project management, management consultancy, design and engineering, environmental to water solutions to deliver client success.

We are 27,000 people, active in over 70 countries that generate €3.5 billion in revenues. Within the Asia region, we have access to over 3,500 people across 30 offices, as well as over 2,800 people in our Global Excellence Centres. Arcadis is proud to have contributed to Asia's built asset and natural environments delivering some of the most iconic projects in Asia such as Gardens by the Bay in Singapore, Television Cultural Centre in Beijing, Hong Kong International Airport and International Finance Centre in Seoul.

To find out more visit www.arcadis.com or visit our social media pages on:

LinkedIn - Arcadis-Asia

Twitter - @ArcadisAS

Instagram - @arcadisasia

ARCADIS CORPORATE SOCIAL RESPONSIBILITY COMMITMENT

In the bid to conserve our diminishing global energy reserve and reduce carbon emissions, we are determined to minimise the impact of the construction industry on our environment through our internal environmental policies. With this commitment, we contribute to a more environmentally friendly approach to buildings and continually promote a more sustainable development mindset to our Clients and our Communities.

We continually strive to commit our effort and time towards the underprivileged in our society. We organise and participate actively in outreach and fundraising activities for the community and have supported various causes such as the Reusable Mask-Making Initiative for Migrant Workers at Homestay Lodge SG, Dollar for Dollar Fundraiser for COVID-19 Migrant Support Coalition by Ray of Hope and Children's Christmas Charity Drive for Beyond Social Services. In 2020, we attained the SHARE Bronze Award for our outstanding contributions towards the Community Chest. In 2021, we started a project aiming to improve social and mental wellbeing of migrant workers through providing gardens to their dormitories.

BUSINESS EXCELLENCE

In our quest for excellence and improvement, we continuously enhance core aspects of our business to delight our Clients and business partners. We share with our Clients and business partners various hot topics impacting the industry through events and publications such as:

- Construction Cost Handbook
- International Construction Cost
- Quarterly Construction Cost Review
- Arcadis Insights Paper
- Arcadis Professional Development Seminars

ENVIRONMENT, HEALTH AND SAFETY

Environmental, Health and Safety are pillars in the core vision of Arcadis and thus keen interest is laid in providing a healthy and safe working environment for our staff, with a considerate approach in managing our environmental footprint and by reducing resource consumption and proper waste management practices. Arcadis Singapore has been recognized as providing a safe workplace for staff by the Workplace, Health and Safety Council. For years, we have been awarded the BizSafe STAR and is certified ISO 45001 and 14001. This will of course not stop and Arcadis continues to improve its environmental, health and safety system every year, ensuring employees have the proper tools to perform their work safely and create a shared responsibility, by showing stewardship in this effort.

Arcadis continues to focus on both the physical and mental health of our employees. Where mental health is increasingly becoming a topic that can be talked about and is further understood in the region. The recent implementation of the Employee Assistance Program (EAP) since 2020 for providing support to employees on topics related to their health and personal situation shows this continued effort to ensure staff can receive the advice they need in moments where some challenges arise.

After the office renovation in 2018, Arcadis significantly reduced our office's environmental footprint on energy, water and paper consumption. This reduction continued for the years after, with the addition of adding a campaign to reduce Single Use Plastics (SUPs) in the office. Plastic inventories were created, and staff awareness increased, to after all reduce the amount of plastic that is produced by our office. This added efforts for reducing our office's environmental footprint have been noticed by the Singapore Environmental Council (SEC) which is discussed later in our Eco-Office certification.

ECO-OFFICE PLUS 'ELITE' CERTIFICATION

Eco-Office Plus Certification is a programme run by Singapore Environment Council (SEC). SEC is an independently managed, non-profit and non-governmental organization which influences thinking on sustainability issues and coordinates environmental efforts across Singapore. We are pleased to announce that Arcadis Singapore office became Eco-Office Certified under the 'Elite' category (effective 1 September 2020 to 2022), which is the highest cadre under this certification. Along with our in-house sustainability strategies, we will now incorporate SEC's framework to ensure enhanced continual improvement and sustainability performance tracking. Our commitment can be complemented positively by the following efforts from our employees:

- **Turn off your monitors** when not needed (including those in meeting rooms) and ditch the screensaver.
- Be aware of vampire power: electronics use standby power, even when off. Hence **unplug all idle electronics**.
- **Turn off the power** of electronics or your power strip at the end of each working day.
- **Assess whether business travel is necessary**, particularly by flight.
- Consider meeting locations that **reduce mileage for all parties**.
- **Carshare, walk or use public transport** where possible.

DIGITAL CAPABILITIES

To remain competitive and to align with the Building Construction Authority (BCA)'s implementation of Integrated Digital Delivery (IDD), Arcadis has expanded our digital services to include the following:

- 1) Building Information Modelling (BIM) and Management
 - Cost and Commercial Management
 - Design and Engineering
- 2) Digital Cost and Commercial Management
 - Remote Monitoring
 - Cost Clarity

Building Information Modelling (BIM) and Management

In Arcadis, BIM is one of our global key strategic drivers which we adopt across our capabilities. BIM leads to better performance by increasing efficiency, providing better quality, reducing production time, and lowering costs, bringing full lifecycle benefits for assets.

The Singapore BIM team consists of 16 BIM personnel who are certified in the Building and Construction Authority Academy (BCAA) BIM Management course and British Standards Institution (BSI) Level 2 Professional Training Course. Our team is supported by Global Excellence Centres (GEC) of over 1,500 staff that collaborate closely virtually to deliver effective BIM Execution Plans in projects.

Cost and Commercial Management

The team has a strong track record with BIM experience in several iconic projects such as Funan, The Woodleigh Residences and The Woodleigh Mall, CapitaSpring, Jewel Changi Airport, Bulim Square, Immigration & Checkpoints Authority (ICA) Building and Changi General Hospital. We spare no effort in training and challenging the team to be up to date on the latest BIM technology and processes.

In 2012, we were the first Quantity Surveyor team to participate in a 48-hour BCA BIM competition where we came in as 2nd Runner Up. In 2013, we came in as 1st and 2nd Runners-up in the 48-hour virtual BCA BIM Competition.

In 2019, we were the only consultancy firm placed in the Top 5 of the Singapore BIM Quantity Surveying Competition hosted by Glodon Singapore and supported by the Singapore Institute of Surveyors and Valuers (SISV). Team members joined the finals on 6 September which tested their modelling, accuracy, and collaborative competencies. The team was also evaluated based on their BIM software competency and professional construction knowledge. The competition aims to promote BIM application for the Quantity Surveying profession in Singapore and lead greater BIM implementation and digitalization within Singapore's built environment.

In 2020, we won the Quantity Surveying Team of the Year at the RICS Awards 2020 Southeast Asia. Arcadis played a crucial role in the redevelopment of Funan, embracing technology to achieve cost-effective, timely and high-quality project delivery. This integrated development offers a combination of retail, office, and serviced apartments, and is designed to appeal to digitally-savvy consumers in a sustainable and creative environment. The transformation of the former 31-year-old mall was filled with many complexities including phasing requirements, cost apportionment methodology, and underground pedestrian link, incorporation of smart features, an urban farm and kinetic wall. All contract packages were delivered within budget and backed by effective cost estimates through close collaboration and strong working relationships with the client and contractors.

DIGITAL CAPABILITIES

Building Information Modelling (BIM) and Management Cost and Commercial Management

In 2021, we won the Quantity Surveying Team of the year at the RICS Awards 2021 Southeast Asia for its work on CapitaSpring, an integrated development that is sustainable, people-centric and empowers occupants with new levels of flexibility and mobility. The transformation

of the old carpark complex into a future-ready integrated development was filled with many complexities such as managing a tight schedule, collaboration between multiple trades, and mitigating the impact of COVID-19 on the project. Arcadis demonstrated teamwork, professionalism, strong technical acumen in value engineering and applied value-added innovations, as well as BIM and VDC. This enabled the smooth delivery of an excellent suite of cost and commercial management where all contract packages were awarded within budget with significant cost savings for the Client.

Design and Engineering

In 2019, Arcadis launched its Design and Engineering Service in Singapore in addition to its existing core services of Cost and Commercial Management, Project and Programme Management, Business Advisory and Environmental Solutions. Arcadis now offers full range design and engineering consultancy services for the whole project lifecycle of infrastructure projects including tunnels, rail, bridges, highways, marine & coastal in Singapore.

Arcadis is currently providing detailed engineering and permitting services for the Deep Tunnel Sewerage System (DTSS) Phase 2 Contract T-07 for ED Zublin AG.

Arcadis has also been appointed as the client's representative on two marine projects for Jurong Port Pte Ltd, a subsidiary of JTC Corporation and port operator headquartered in Singapore. For the Berth J9 project, our scope involves the Front-End Engineering Design (FEED) for dredging works, as well as the demolition and rehabilitation of an existing wharf. The other project involves A&A works for an existing warehouse in proximity to the waterfront.

In 2021, Design and Engineering capability was instrumental for Arcadis to winning the NSC Project and DE1378 QPS Services projects with LTA. Arcadis is also actively pursuing design and built opportunities with various contractors with active participation in the Cross Island Line and Jurong Regional Line. Arcadis also supported contractors with digital solutions such as BIM and visualization services, further expanding our range of services to clients in the Singapore market.

DIGITAL COST AND COMMERCIAL MANAGEMENT

Remote Monitoring

Despite the COVID-19 pandemic, we adopted new technology, a remote site monitoring tool to track site progress and carry out works for variations and progress payments. With the extended support by Arcadis Hong Kong, our HSBC fit-out project team was trained and on-boarded.

Cost Clarity

In 2021, Arcadis' Cost and Commercial Management team launched an internally developed global software, Cost Clarity. It is an online application designed to improve and maximize client experience. Cost Clarity provides our clients with instantaneous access to their project cost data. It will challenge and improve project performance by generating advanced analytics and insights providing clients with an elevated understanding of the cost of their decisions. It also represents a quantum shift in the delivery of Cost and Commercial Management services.

HUMAN CAPITAL STRATEGY

We recognize that human capital is our vital asset and inculcate that our people are our investments leading to our excellence through delivering good services and in turn Deliver Success for our firm.

We select only capable, qualified and enthusiastic individuals to be part of our team. To further groom our staff and maximize staff potential, numerous coaching, mentoring and various training programmes have been implemented through our learning and development programmes.

LEARNING AND DEVELOPMENT

We invest heavily in our people. Through our blended learning programmes, we ensure our people are continually learning, growing and developing into one of our leaders of tomorrow.

Our emphasis on research, training and professional development are a key differentiating factor for us in this dynamic economic landscape. Our people are constantly updated on the latest development in the industry as we advocate an organizational learning environment through organizing a variety of in-house workshops, external vendors' workshops as well as sending staff for professional bodies' seminars. In addition, we also conduct industry seminars to create awareness on the latest industry developments as part of our corporate social responsibility.

We also have a full curriculum and tools for manager training at all levels, technical academies, as well as a global mentoring platform.

QUALITY ASSURANCE

By adherence to Quality Assurance and Quality Control principles, we aim to produce an efficient and economic System of Best Practice, to the benefit of Arcadis and its Clients, and aim to produce the right service, first time, on time, everytime.

Our Quality Management System provides for a cycle of corrective and preventive action, to create positive opportunity for continuous improvement.

Directly linked into our Management System are the Performance Development and Training Programmes, geared to assess effectiveness, identify training needs and delivery of training to meet those needs.

Our Quality Control and Monitoring

For effective control, monitoring and communication, regular review meetings between all personnel in the project team are convened. The frequency varies with the size and complexity of the individual projects, the particular phase of work and the difficulties encountered.

Our Quality Audits

To ensure compliance with the documented procedures, internal quality audits are carried out periodically to ensure compliance with the procedures set out in the Asia Quality Framework Manual and Practice Manual.

Audits are carried out by an independent trained personnel in accordance with the procedures set out in the Internal Quality Audit Procedure.

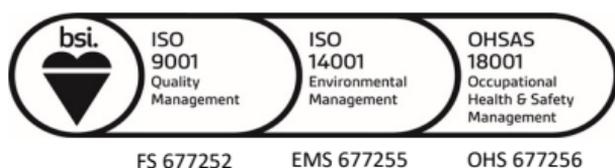
In addition, a third party certification body also conducts audit to verify the quality management system within the organization is effective and constantly maintained.

As part of our continual efforts, we constantly update our audit procedures to take into account latest changes in regulations and legislations, especially latest judgements and standard forms. Thus, ensuring that our staff are properly equipped with the correct and relevant information to carry out their tasks and that the Clients' interests are always protected.

ISO 9001 Certification

Arcadis is an ISO 9001 certified firm with British Standards International (BSI)

The award of the ISO 9001 Quality Certificate is a tangible echo and testimony of the management commitment of the firm to provide all Clients with a service which has been scrutinised by an independent third party certification body.



PROFESSIONAL SERVICES

Arcadis Singapore offers an unparalleled range of compatible and integrated cost and project management services which alongside their particular fields of specialisms are designed to provide a seamless service to the construction industry and property market.

At the very essence in the success of any project is the selection of an appropriate procurement strategy in terms of the Client's requirements, project characteristics, time and cost certainty, quality targets and distribution of risk. Arcadis is well placed and has the relevant experience to advise on various procurement options from the traditional and straightforward to bespoke hybrid methods - in response to the Client's priorities. These include:

- Measurement contracts
- Lump sum contracts
- Cost reimbursement contracts
- Design and build contracts
- Develop and construct contracts
- Turnkey contracts
- Construction management contracts
- Management contracts
- Term contracts
- Guaranteed maximum price contracts

Arcadis Singapore provides a total integrated cost and project management service in the following areas to meet and add value to each individual Client's specific needs:

- Quantity Surveying
- Mechanical and Electrical Engineering Quantity Surveying
- Civil Engineering Quantity Surveying
- Project & Programme Management
- Services of Employer's Agent or Representative (for Design and Build projects)
- Contract Advisory Services

- Value Management
- Due Diligence Reports
- Project Cost and Contract Audits
- Capital Allowances Taxation Assistance
- Fire Insurance Valuations (or Reinstatement Cost Assessments)
- Advice on Development Brief

The types of construction projects undertaken cover both new building and refurbishment work such as:

- Airports and Airport Buildings
- Arts and Cultural Buildings
- Business Park Developments
- Civic Buildings
- Civil Engineering and Infrastructure Works
- Educational Buildings
- Health and Hospital Buildings
- Historic and Gazetted Buildings
- Hotels
- Internet Data Centres
- Industrial/Warehouse Developments
- Leisure Projects
- Office Buildings and Interior Fit-out Works
- Parks and Recreational Projects
- Petro-chemical Projects
- Power Generation Projects
- Public Buildings
- Residential Developments
- Retail Developments
- Sports Centres
- Transportation
- Water and Waste Projects

ARCADIS CONTRACT ADVISORY SERVICES

Arcadis Contract Advisory (ACA) - is a Specialist Unit with Arcadis Singapore. ACA works closely with and supports Arcadis with their work in both traditional quantity surveying and specialist integrated management services such as cost & project management, cost engineering, loan monitoring, insurance valuation & loss adjuster assessment, sustainable construction, construction supervision & investment appraisal. ACA works in close collaboration with and supports Construction Lawyers involved in claims and disputes avoidance and resolution.

Our TEAM - Professionally qualified and legally trained individuals with a wealth of experience in contract administration and construction disputes and resolution form the backbone of our team. Being part of Arcadis, our Team can draw on the knowledge and expertise of the various divisions of Arcadis including the Cost, Project Management, and Mechanical and Electrical QS services. The Team is thus able to deal with complex and technical matters and so provide relevant and essential support.

Our CLIENTS - Our services are provided to and for developers, building owners, construction professionals, insurance companies, financial institutions, contractors, sub-contractors, lawyers, evaluators, mediators, adjudicators and arbitrators handling construction claims and disputes within Singapore, the region and the international arena.

SERVICES PROFILE

Front End Contract Advisory Work

- Project procurement strategy
- Incorporation of Conditions of Contract
- Interpretation and selection of appropriate forms of:
 - Contract and Sub-Contract Agreements
 - Indemnities and warranties
 - Performance bond

Claims Assessment, Legal and Litigation Support

- Contractual validity of claims
- Evaluation of claims including preparation of documents for claim, discovery process, trial, mediation, adjudication and arbitration
- Project monitoring
- Audit and recording
- Extensions of time
- Defects and liabilities
- Loss and expense
- Acceleration cost
- Prolongation cost
- Valuation and measurement methods
- Determination and termination

ARCADIS CONTRACT ADVISORY SERVICES

Expert Advisory Work

- Contractual validity of claims and entitlements and on time and cost disputes
- Defective work, quantum of claims, negligence claims and disputes on quantum or value

Dispute Management - Avoidance and Resolution

- Facilitate negotiation
- Support and advise on cost-effective resolution
- Neutral evaluation
- Expert determination
- Adjudication and arbitration
- Other forms of resolution

Evaluator, Mediator, Adjudicator and Arbitrators

Research and Development

Publications

- The Singapore Standard Form of Building Contract - An Annotation
- Design-Build Contract Administration Guide
- PSSCOC Contract Administration Forms
- Contract Administration Guide to the Singapore Standard Form of Building Contract
- Arcadis Insights: an information sheet on topical legal and technical issues (formerly known as “...@ Arcadis’ Executive Summaries for the Practitioner”)
- Construction Procurement Contract Administration and Law

Conference Papers

- Refurbishment Procurement Procedures

- Design-Build: Evolution or Revolution?
- Construction Insolvency: Some Practice Issues
- Contract Procurement - Which Way Forward?
- Bankruptcy and Liquidation Issues under SIA and PSSCOC Standard Forms - Contract Administration Issues for the Practitioner
- Procurement Management: Philosophy and Approaches
- Construction Insurance - Contract Provisions and Insurance Programmes
- Contract Administration - Some Practice Pointers under SIA and PSSCOC Standard Forms
- Making Design-Build Better!
- Indemnities, Performance Bonds and Insurances - How effective are they?
- Instructions, Certificates, Notices and Conditions Precedent under SIA and PSSCOC Forms
- Public-Private Partnership (PPP) - Introduction and Overview
- Building and Construction Industry Security of Payment Act (SOP) - Introduction and Overview
- New Applications in Construction Procurement
- Contract Administration under FIDIC Standard Form
- Contract Administration under PSSCOC Standard Form
- REDAS Design and Build Conditions of Contract
- Managing Variation Claims - An Effective Contract Administration Approach
- Security of Payment Act - Who Makes the Best Adjudicator?
- Early Contractor's Involvement (ECI) – A Paradigm Shift in Procurement Approach

ARCADIS CONTRACT ADVISORY SERVICES

- Collaborative Contracting – Project Perspective
- A Value Approach Through Value Management
- Design for Manufacturing & Assembly – Prefabricated Pre-Finished Volumetric Construction
- Collaborative Contracting – Is the Singapore Construction Industry Ready?

ARCADIS SINGAPORE

Arcadis Singapore also provides specialist services in the areas of cost research, feasibility studies, early cost appraisals and development studies, value management, capital allowances taxation, reinstatement cost assessments and also mechanical and electrical engineering quantity surveying services.

SERVICES PROFILE

1) Cost Research

Cost Analyses and Research

- Analysis of tender prices
- Collation of cost data
- Tender price indices
- Cost trends

Land Tenders, Feasibility Studies, Early Cost Appraisals and Development Studies

- Estimated construction cost advice

Value Management / Risk Management

- Value Management / Value Engineering studies and workshops
- Risk Management / Risk Analysis studies and workshops

Capital Allowances Taxation

- Assessment of viability of various design features, materials and specifications to achieve tax-efficient solutions and maximise capital allowances at the minimum cost
- Valuation and identification of items qualifying as plant and equipment, and their related costs

ARCADIS SINGAPORE

Reinstatement Cost Assessments

- Assessment of reinstatement costs for fire insurance purposes

Project Excellence

- Providing a systematic dashboard approach to Project Auditing

Research and Development

2) Building Services

Mechanical and Electrical Quantity Surveying Services

- Pre-contract cost advice
- Preparation of design briefs and requirements
- Post-contract services
- Cost audits
- Capital allowances taxation assistance
- Dispute resolution
- Value engineering studies
- Term contract management
- Life cycle costing

Research and Development

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